

# National Weather Service Flagstaff, Arizona



## Annual Report 2024

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February 2024

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# The National Weather Service: Your Source for Weather Support and Forecasts

## Dr. Brian Klimowski, Meteorologist-in-Charge

The weather of 2024 in Northern Arizona was marked by extremes, with everything from intense winter storms to record-breaking heat, deadly flash floods, extreme winds, and severe drought. While the region experienced relatively few wildfires in 2024, the year will likely be remembered for several key events: winter storms that closed highways and stranded travelers, extreme summer and fall heat, the devastating flood in Havasu Creek (Supai area), and the ongoing dry conditions that persisted through the year. By December 31st, snowpack levels across northern Arizona were among the lowest on record.



Throughout these challenges, the National Weather Service (NWS) Flagstaff team remained dedicated to providing essential warnings, forecasts, and support to our partners – 24 hours a day, every day. Our work, however, extends beyond just issuing weather forecasts and warnings. In 2024, we strengthened our relationships with key partners, working collaboratively to improve notifications, preparedness, and response to high-impact weather events. One of these collaborations resulted in the creation of a first-of-its-kind satellite-based warning capability that was tested during the Summer of 2024 (details in the Report).

The NWS is part of a broader network of agencies and organizations that support emergency preparedness and community resilience. This year, we took important steps to expand our presence beyond our Bellemont office. One of the highlights was the pilot program placing NWS staff at the Coconino County Emergency Management office regularly throughout the spring. Additionally, we continued our successful collaboration with the Prescott Fire Dispatch, stationing a meteorologist on-site during the peak fire season and monsoon transition. We witnessed firsthand how strong partnerships between local governments, emergency services, and residents bolstered our community's preparedness, highlighting the power of collaboration in times of crisis. This collective effort is key to ensuring that, no matter the weather, we are better prepared and more adaptable.

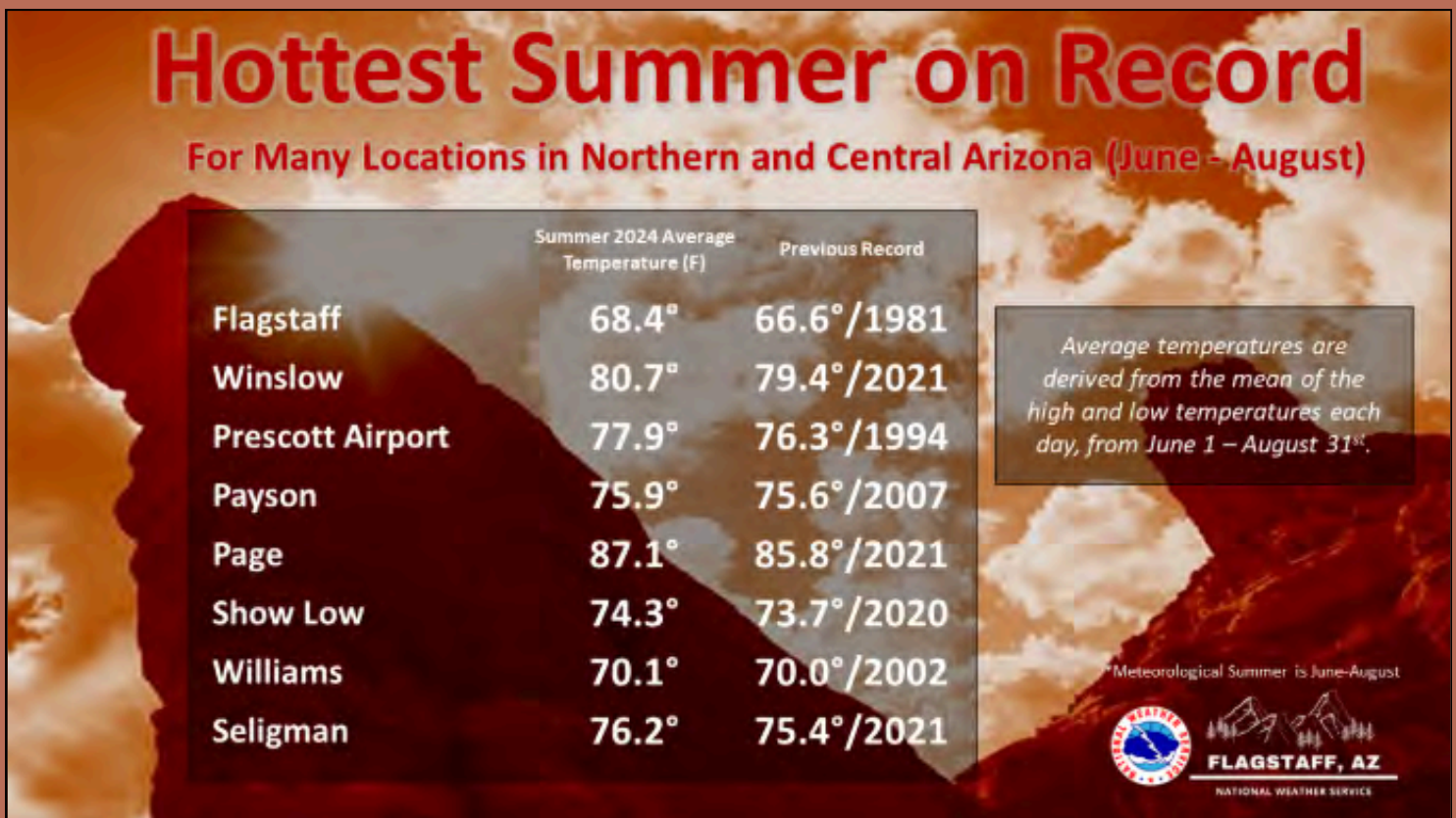
As we look to the future, we remain committed to working even closer with our partners, increasing face-to-face interactions, and improving communication about weather threats. Our goal is to enhance decision-making by providing more targeted and actionable information, including new tools and probabilistic forecasts. By deepening our partnerships, we aim to ensure that communities across Northern Arizona remain better informed, resilient, and prepared to face whatever weather challenges lie ahead.

# Overview of 2024 Weather: Record Heat

Justin Johndrow, Climate Focal Point

## 2024 One of the Warmest Years on Record

2024 was hot...most observing sites in northern Arizona experienced a 'Top 5 warmest' year in 2024. The above normal warmth was especially focused throughout the summer months, and again from late September through the middle of October. While a few daily records were set over the summer, it was the consistently hot temperatures due to sparse Monsoon storms that pushed this to be the hottest summer on record for most of the state. NWS Flagstaff maintains over 40 observing sites in northern Arizona, allowing us to track and compare temperatures from year to year.



## Fall Heat Wave

Another unusual late-season heat wave hit the region from late September to mid October. Many daily record highs were set during the heat wave, including 11 at Flagstaff, 12 at Prescott, and 17 at Winslow that included an unprecedented 12 days in a row. This long stretch of record highs at Winslow is made even more impressive considering we have been recording temperatures there since 1915!





# Grand Canyon Alerts - New in 2024!

## Megan Taylor, Warning Coordination Meteorologist

Each year, over 24,000 people embark on guided river trips along the Colorado River in the Grand Canyon. The Grand Canyon stretches across 225 miles of remote, back-country wilderness with rafting trips lasting from a few days to as long as 25 days. The majority of these rafting trips occur during the summer months, coinciding with the North American Monsoon (NAM), which brings the threat of torrential rains and life-threatening flash floods. NOAA Weather Radio coverage and cell phone coverage are sparse within the Canyon, and essentially non-existent along the Colorado River. Therefore, the traditional methods for communicating weather hazards and warnings do not work throughout much of the Grand Canyon area. Satellite-based devices have proven to be effective and routinely used by river raft guides for communication.

In a joint effort between the U.S. Geological Survey (USGS) Grand Canyon Monitoring and Research Center, Coconino County Emergency Management, the National Weather Service (NWS) in Flagstaff, and the Grand Canyon National Park Service, a new alerting system was implemented for sending emergency alerts to satellite devices along the Colorado River. The goal of the project is to enhance safety for boaters and hikers navigating rugged and remote areas of the Grand Canyon.

In order to improve the effectiveness of our warnings, USGS provided NWS Flagstaff with updated geo-referenced datasets such as river miles and well known campsites to use in our warnings. The NWS and USGS are working together to develop a community science application for reporting flash flood events which will improve the verification and documentation of flash floods and debris flows within the Grand Canyon.

This pilot season of the project had as many as 849 subscribers to the alerts (both cell phone and satellite devices). In addition to flash flood warnings, the warning alert system was utilized to send search and rescue information and boating hazards. Here's a brief [Grand Canyon NPS article](#) about the program. We look forward to continuing the project in 2025, and perhaps disseminating additional weather alerts.



NWS Flagstaff presenting the Grand Canyon Alerts project at the river Guides Training Seminar in Lees Ferry, AZ in March 2024.

# On-Site w/ Partners: Coconino County, Prescott Dispatch & Tribal Partners

Megan Taylor, Warning Coordination Meteorologist

## Coconino County Emergency Management

In an effort to increase eye-to-eye contact with Core Partners, the NWS Flagstaff office successfully completed a colocation experiment with Coconino County Emergency Management (CCEM) in Flagstaff, AZ. Over the course of five months, 10 meteorologists from NWS Flagstaff volunteered to work on-site at the CCEM office. Meteorologists provided the most current weather information to CCEM in person, regardless of current or forecast weather conditions. This routine IDSS (Impact-Based Decision Support Services) allowed meteorologists to be an integral part of the emergency management day-to-day operations. The NWS Flagstaff office now has a permanent working location at CCEM, which was utilized to provide support during the Arizona Department of Emergency and Military Affairs regional tabletop exercise this fall. This multi-agency exercise provided crucial opportunities to coordinate emergency response efforts across the state during a complex winter storm. It also gave NWS Flagstaff keen insight into the decision making process at the county and city level and what information is critical to convey in a storm of this magnitude.



NWS Flagstaff meteorologist, Megan Taylor, at Coconino County Emergency Operations Center for AZ-DEMA North Tabletop Exercise.

## Prescott National Forest Dispatch Center

This was our 8th year of providing support at the Prescott National Forest Dispatch Center, where we deployed two meteorologists over a two-week long period. Our meteorologists provide weather information during the critical transition between fire season and the onset of monsoon thunderstorms. We deliver weather briefings to support aviation resources being dispatched across the region, and also provide real-time weather updates to assist in ongoing wildland firefighting efforts. We value the strong relationship we've built with the Prescott Dispatch Center and look forward to continuing our support in 2025!

# On-Site w/ Partners (continued)

## Tribal Partners

NWS Flagstaff continued work to improve flood services with our tribal partners this year. We attended after action flood meetings in Window Rock, AZ, and met with partners of the Navajo Nation Emergency Management department and Canyon de Chelly National Park in Chinle. We surveyed damage from the spring flooding of 2023 and established new flood stages for the Chinle area. NWS Flagstaff also made multiple visits to the Hopi village of Monekopi to participate in Emergency Action Plan meetings that aim to assist in the tribe's flood preparedness and response efforts.



NWS Flagstaff hydro team Carter Humphreys and Megan Taylor, NWS Phoenix Service Hydrologist Mike Schaffner, Navajo Nation Emergency Management, Chinle Fire Department, and Canyon de Chelly National Monument Chief Ranger.



# Focus on Forecasting: Ensemble & Probabilistic Forecasting

Carter Humphreys & Paige Konieczny, Meteorologists

## What is Ensemble Forecasting?

Have you ever wondered what we mean when we reference 'multiple model solutions' or say that 'half the clusters suggest this solution' in our forecast discussions? This terminology refers to ensemble forecasting. Unlike a deterministic forecast, which is the output from a single model, an ensemble forecast shows a range of potential outcomes generated by multiple different models or model runs.

For instance, instead of relying on a single run of the Global Forecast System (GFS) to determine a forecast, we can use the Global Ensemble Forecast System (GEFS), which provides 30 possible outcomes for an event. These 30 ensemble members can be clustered by grouping similar conditions, allowing us to analyze a wider range of possible outcomes.

As an example, in the case of an upcoming winter storm, a single GFS run might predict over a foot of snow in Flagstaff. However, the GEFS might show the majority of its members clustered around a different storm track and only a handful of members showing a significant snow storm. This indicates the uncertainty that is present in the forecast—valuable information that a single deterministic model cannot provide.

Ultimately, ensemble forecasting enables meteorologists to deliver more comprehensive and actionable insights to decision-makers. By understanding the spread of possible scenarios and identifying trends, we can better pinpoint the most likely outcomes and communicate the associated risks effectively.

## What is Probabilistic Forecasting?

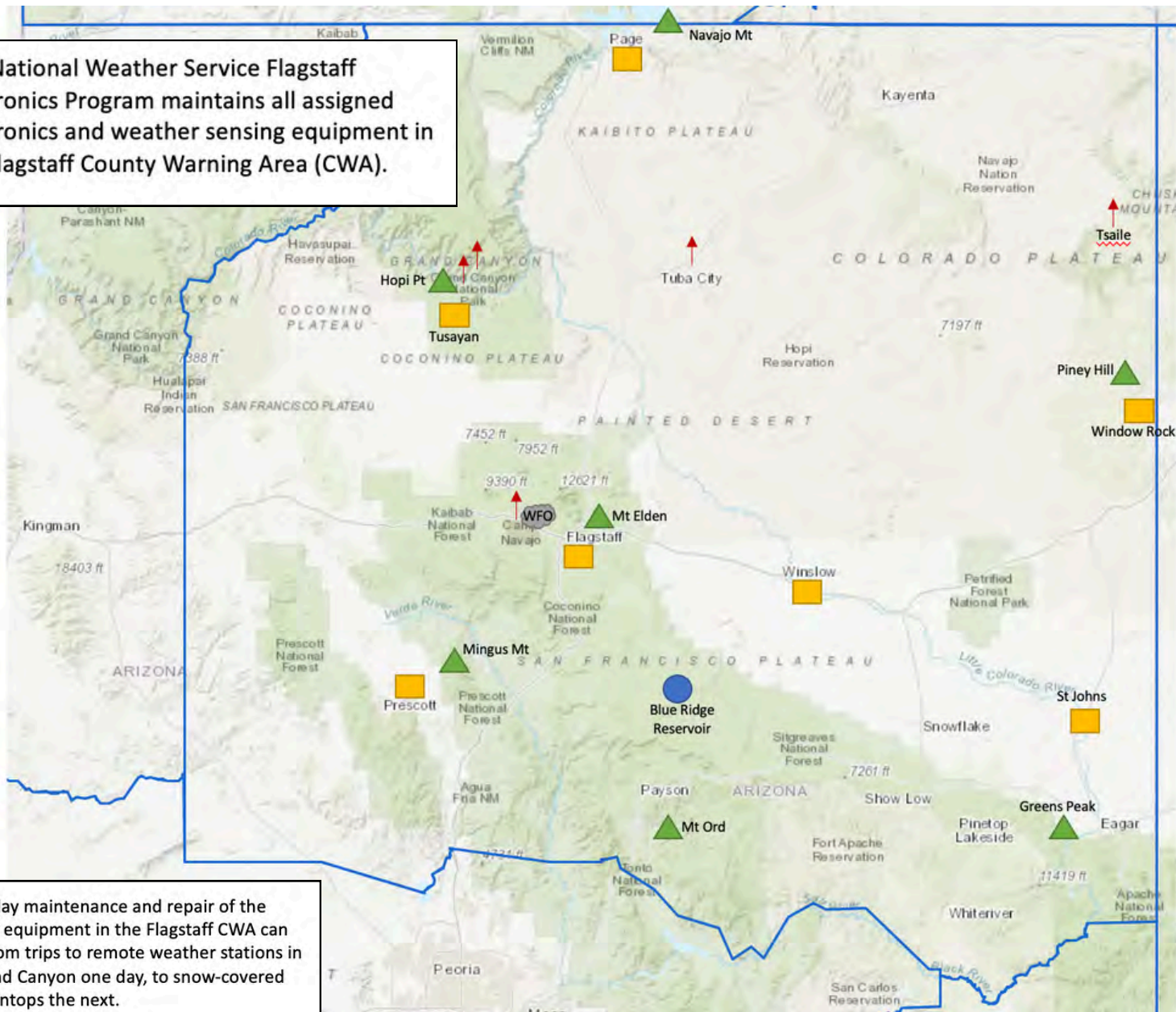
If you prefer a data-driven approach, probabilistic forecasting might be exactly what you're looking for. Unlike deterministic forecasts, which provide a single predicted outcome—such as '5 inches of snow is expected'—probabilistic forecasting gives a range of possibilities along with the likelihood of occurring. For example, instead of just saying, '5 inches of snow is expected,' a probabilistic forecast might be that, 'There is an 85% chance of 5 inches of snow and a 15% chance of 10 or more inches of snow.' This provides additional context around the range of potential outcomes, offering a better understanding of uncertainty and risk associated with an event.

Probabilistic forecasts are particularly valuable for assessing worst-case scenarios or planning based on the probability of specific impacts. For instance, an emergency manager might use probabilistic data to prepare for higher-end snowfall amounts when the chances of extreme accumulation are non-negligible, ensuring readiness for the most impactful outcomes.









# Working Behind the Scenes: Electronics Program

The National Weather Service Flagstaff Electronics Program maintains all assigned electronics and weather sensing equipment in the Flagstaff County Warning Area (CWA).



Day-to-day maintenance and repair of the weather equipment in the Flagstaff CWA can range from trips to remote weather stations in the Grand Canyon one day, to snow-covered mountaintops the next.

- 
**Doppler Weather Radar**  
 Obtains information based upon reflected energy from objects (rain, snowflakes, hail, bugs, birds, etc.)
- 
**Automated Surface Observing Systems**  
 Weather stations that collect real-time surface weather observations for forecasting and aviation safety
- 
**NOAA Weather Radio Sites**  
 Radio transmitters that broadcast continuous weather information and emergency alerts to a specific geographic area
- 
**Upper Air**  
 Provides critical data about the atmosphere above the Earth's surface. Used for tracking weather systems and predicting severe weather
- 
**Portable Weather Stations**  
 Weather stations that collect real-time surface weather observations
- 
**CWA Boundary**

## Electronics Program Mission:

To maintain all assigned electronics and weather sensing equipment in the Flagstaff County Warning Area (CWA).



# Observational Program

## Evan LaGuardia, Observations Program Leader

Hello! My name is Evan LaGuardia and I am the new Observations Program Leader (OPL) here at NWS Flagstaff. Since Larry Dooley's retirement back in May 2024, I have been put in charge of both the [Cooperative Observer](#) (COOP) and [Upper Air](#) (UA) programs at NWS Flagstaff, overseeing the office's observational network and ensuring the accuracy and integrity of surface and upper-air observations for forecasting and analysis.

At Reno, I learned how to manage the UA program and work with the COOP program. After spending a little over 4 years at the Reno office, I was offered the opportunity to move to NWS Flagstaff in May 2021. While being a meteorologist here, I worked alongside Larry, learning how to effectively run and manage the office's COOP program.



Larry Dooley and Evan LaGuardia checking COOP equipment in northern Arizona, spring 2024.

For those who do not know me, I wanted to provide you with a bit of background of myself. I am originally from New Jersey and received my Bachelor's Degree in Meteorology from Rutgers University in May 2016. In February 2017, my wife and I moved across the country to Reno, NV where I began my Weather Service career as a meteorologist at NWS WFO Reno.

Since October 2024, I am fortunate now to be able to fully dedicate my time to the awesome COOP observers of northern Arizona who share the same passion for the program as I do. Both the COOP and UA programs are extremely important and one of a kind that many around the nation rely on for climate and weather data.

Outside of work, my wife and I, along with our pup Penny, enjoy exploring northern Arizona, traveling, trying new restaurants, and cooking new foods.

*(Continued next page)*

# Observational Program (continued)

I'm happy to say that we had another successful year in regards to the COOP and UA programs at NWS Flagstaff in 2024. Out of 55 COOP stations across northern Arizona, roughly 95% of them have reported temperature and/or precipitation data each month, on time, with very little quality corrections needed. The automatic rain gauge at Ash Fork has been relocated with a new observer taking over the duties as of July and a COOP station in Sedona has been established as of June, which has been out of commission since 2011.

In March, we had the privilege of awarding two prestigious COOP awards to two of our most dedicated observers across the country; Cookie and Clay Overson receiving the John Campanius Holm Award for providing accurate, timely, and dependable weather observations to the National Weather Service for 45 years from Saint Johns as well as the Kieckhefer Family from Prescott, receiving the Family Heritage Award for 75 years of dedication to the COOP program. A nice luncheon at the office was provided to the awardees, including a meet and greet with the NWS Western Region Director, Dr. Grant Cooper.

As for the UA program, this year's 12 month average performance score was 296 out of 300, making us the 18th highest score out of 90 UA sites across the country. We have improved significantly compared to last year with an average annual score of 288. Scores are based on the quality of data, any missed flights, and the timing of data received. The Upper Air observers here at NWS Flagstaff continue to do a fantastic job each day (braving the rain, snow, wind, and extreme cold) and it shows!

I look forward to another great year for the observational program here at NWS Flagstaff with even more improvements to come!

- Evan



Ash Fork FPR-E Auto Rain Gauge COOP Site



Petrified Forest National Park COOP Site



Grand Canyon National Park North Rim COOP Site



Twin Arrows COOP Site



# Looking Ahead: Goals for 2025

The National Weather Service (NWS) is rapidly evolving, with a primary focus on enhancing partner support and engagement as our resources allow. In 2024, we made significant strides in this area, and we are committed to continuing this work in 2025.

What does this mean for you? It means a greater emphasis on building closer, more frequent communication – whether in person or virtually – so that we can better serve your needs. You can expect regular updates from us during significant weather events through our partner support emails. Additionally, we are dedicated to providing opportunities for direct interaction when necessary, ensuring that we're always accessible and responsive to your concerns.

As part of our evolution, the NWS is also expanding its approach to forecasting by integrating more probabilistic methods. We recognize that it is not just the discrete forecast that is valuable to you, but also understanding the level of confidence we have in our forecasts. This includes providing insight into potential "worst-case scenarios" and the probability of reaching specific weather thresholds. Our tools are allowing us to explore these probabilities with increasing accuracy, and we are excited to share the advantages of probabilistic forecasting with you in the near future. Our goal is to provide you with actionable information to support your decision-making, helping you prepare for a range of potential outcomes.

As we move forward, we remain committed to providing high-quality, timely, and impactful weather information to you. We're looking forward to 2025 and beyond!

*Brian*





# New Staff / New Roles

## Welcome to the FGZ TEAM

### Ryan Bernhart -

Ryan is a meteorologist who started here in December 2024. He graduated from Northern Arizona University (NAU) with a degree in Environmental Engineering, then completed his meteorology coursework at Arizona State University (ASU). He previously worked at the National Weather Service Glasgow, Montana office from 2020 to 2024. Ryan's hobbies include hiking and bicycling as well as spending time with his wife and two golden retrievers.



### Robert Rickey -

Robert is the Science Operations Officer (SOO) at our office in Flagstaff, and started in this role in the spring of 2024. Previously, Robert was our Information Technology Officer (ITO). He graduated from Arizona State University with a bachelor's degree in Geography/Climatology and received a master's degree in Applied Meteorology from Mississippi State University.



Robert's hobbies include snowboarding and weightlifting. He is also an Incident Meteorologist (IMET), so he oftentimes deploys to provide onsite weather support for large wildfires.

### Evan LaGuardia -

Evan is the new Observations Program Leader (OPL) at our office in Flagstaff, overseeing the office's observational network and ensuring the accuracy and integrity of surface and upper-air observations for forecasting and analysis. He officially started in this role in October 2024, however, has been involved with the office's observations program since May 2021.



Previously, Evan was a Meteorologist at our office with the main focus on forecasting. He graduated from Rutgers University in New Jersey with a degree in Atmospheric Science. Evan's hobbies include traveling, cooking, hiking, and even has begun to learn how to play the piano.

### Jesse Finnicum -

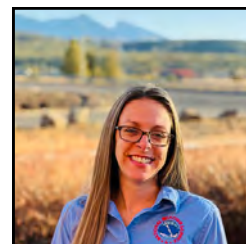
Jesse graduated from National University with a Bachelor's degree in Information Technology Management. He is new to NOAA / NWS and has joined us as the Information Technology Officer (ITO) at our office in Flagstaff. He is a veteran NAVY Electronic Technician (ET) that served on a frigate, USS Ford (FFG-54) out of Everett, WA.



As a civilian, Jesse worked as an IT project manager at Marine Corps Air Ground Combat Center (MCAGCC) Twentynine Palms, CA and as an IT systems administrator at the United States Naval Observatory (USNO) Flagstaff Station. He enjoys hiking, fishing, snowboarding, building digital pinball machines, and cooking.

### Megan Taylor -

Megan is Flagstaff's Warning Coordination Meteorologist (WCM) and began this new role in November 2024. She has a Bachelor of Science degree in Meteorology from St. Cloud State University (St. Cloud, MN). Megan has been with the NWS Flagstaff since 2010, having worked as both a general and lead forecaster.



Prior to Flagstaff, Megan worked with the NWS offices in Grand Junction, CO and the Twin Cities, MN. After moving to the southwest, she quickly fell in love with the beauty and outdoor adventure. Outside of work, she can mostly be found spending time with her family, hiking, and enjoying delicious food!

### Weather Forecast Office (WFO) Flagstaff (FGZ) Staff

(effective December 31, 2024)

Brian Klimowski	Meteorologist-in-Charge (MIC)
Megan Taylor **	Warning Coordination Meteorologist (WCM)
Robert (Rob) Rickey **	Science Operations Officer (SOO)
David (Dave) Olson	Electronic Systems Analyst (ESA)
Jesse Finnicum *	Information Technology Officer (ITO)
Evan LaGuardia **	Observation Program Leader (OPL)
Jeremy Johnson	Electronics Technician (ET)
Krista Ames-Cook	Administrative Support Assistant (ASA)
METEOROLOGISTS:	
Ben Peterson	Lead Forecaster
Darren McCollum	Lead Forecaster
Justin Johndrow	Lead Forecaster
Valerie Meola	Lead Forecaster
Mark Stubblefield	Forecaster
Ryan Bernhart *	Forecaster
Carter Humphreys	Forecaster
Paige Konieczny	Forecaster

Source: <https://www.weather.gov/fgz/staff>

\* = Joined Flagstaff office during 2024

\*\* = New Role at Flagstaff office during 2024

