Wind Shift!

Chronicles of the Fire Weather Testbed

Issue 1.0: November 2025 fwt@noaa.gov https://gsl.noaa.gov/gsl/fire_weather/testbeds

Why the Wind Shift?

The mission of the Fire Weather Testbed (FWT), housed at the NOAA Global Systems Laboratory, is to improve fire weather forecasts and decision support through an operations-to-research-to-operations (O2R2O)-focused approach. This summary report-back shares our recent activities, major highlights, publications, and upcoming evaluations and assessments with the community who make this work possible.

Meteorologists, fire managers, and developers participating in the FWT evaluation in June 2024 at GSL. Utilizing these techniques during the 14 March 2025 Oklahoma Firestorm, the NWS and emergency managers issued Fire Warnings within 12 minutes of receiving a hot spot notification.

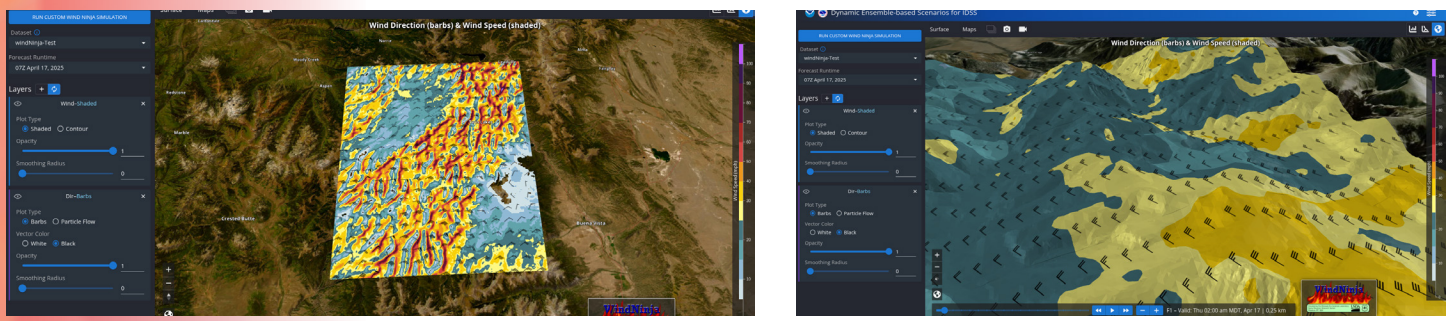
Completed FWT Evaluations

In May 2025, we hosted a one-day virtual evaluation of the Next Generation Fire System (an automated satellite-based fire detection algorithm). Six Predictive Services subject matter experts, including meteorologists, intelligence coordinators, and a fire management specialist, participated in a live demonstration within their operational environment. They provided feedback on how the system integrates into their workflows and suggested ways to enhance the tool's operational capabilities. Stay tuned for the report release (early 2026).

Our comprehensive report on "Fire Weather Testbed Evaluations #002–004: An End-to-End Evaluation of NOAA's Emerging Wildland Fire Detection and Warning Capabilities" is now available on the NOAA Institutional Repository. This multi-part evaluation provided training, testing, professional development, and networking opportunities for participants representing four state fire agencies, NWS meteorologists, Predictive Services, product developers, subject matter experts, and GSL/CIRA staff. A summary paper was also published in the Bulletin of the American Meteorological Society.

Ongoing FWT Evaluations

The FWT Evaluation Team of **Dr. Laura McMeeking**, **Kyle Thiem**, and **Dr. Ansley Baring**, are conducting three interconnected evaluations this year to assess and advance the utility of the U.S. Forest Service's WindNinja model with the new capability to run and visualize WindNinja in DESI for automated spot weather forecasts. WindNinja is a diagnostic tool that downscales wind forecasts from operational weather prediction models (3+ km) to fine scales (100–300 m). By better simulating winds in complex terrain where vegetation and thermal heating play important roles, WindNinja enhances the capabilities NWS forecasters to provide spot forecasts to support tactical decision making on incidents such as wildfires, chemical spills, and parades.



250 m WindNinja output in the Colorado Rockies visualized in DESI. Credit: J. Drucker

The three WindNinja evaluations will focus on:
1) Quantitative Verification: Determining the quantitative value added by WindNinja compared to base model forecasts and identifying optimal configurations.
2) Qualitative Assessment: Assessing forecast usability and workflows within DESI.
3) Automated Spot Forecast Guidance: Evaluating the operational utility of WindNinja guidance for spot forecast requests in partnership with the NWS Operations Proving Ground.

National Blend of Models Evaluation
A diary-based evaluation is ongoing to assess the operational utility, interpretability, and perceived value of the developmental NBM v5.0 probabilistic fire weather elements (percentiles, exceedances, and joint probabilities) and to understand their impact on forecasters' decision-making processes and confidence in various fire weather contexts. The evaluation includes a verification component to quantify known NBM biases in fire weather-relevant variables such as relative humidity and winds.

User Needs Assessment

The User Needs Assessment Team (UNAT) of **Dr. Emily Wells and Dr. Benjamin Hatchett** continues to engage core partners to guide fire weather research and product development. Ongoing activities include:

1) The UNAT conducted 10 semi-structured interviews with Tribal environmental professionals to learn about their data and communications needs relating to extreme weather, adaptation planning, and overall emergency response. The manuscript has been submitted for journal publication.
2) The UNAT completed semi-structured interviews with 19 Utility Meteorologists across the U.S. servicing 28 states and over 56 million customers (~140 million people). Interviews focused on weather and information needs during the timeline leading up to and following de-energization ("PSPS") events.
3) In 2026, the UNAT will form a Fire Weather User Needs Advisory Board. Users include fire analysts, meteorologists, and practitioners in prescribed fire, wildfire suppression, air quality, and postfire hazards.
4) A manuscript defining "Good Fire Weather", or weather that allows readily managable wildland fire to meet objectives and yields predominantly beneficial fire effects, is nearing submission for journal publication.

Highlights From FWT Collaborators

Dr. Stephanie Hoekstra, a Research Associate in the Decision Support Research and Evaluation (DSRE) Branch of GSL and core research partner of the FWT, submitted a manuscript based on 19 focus groups with nationwide fire professionals regarding their operational use of NWS fire weather products. She also recently collected over 470 survey responses to expand on this research. Questions were developed collaboratively between the FWT, UNAT, and DSRE teams.

Dr. Shadya Davis, a former NOAA/GSL DSRE/FWT postdoctoral researcher and current assistant research professor at the University of South Carolina, has finalized a report on the product and informational needs of prescribed fire practitioners across the U.S. It will be available through the University of Colorado Boulder's Natural Hazards Center website when published.

Dr. Rochelle Worsnop, Research Physical Scientist at NOAA's Physical Science Laboratory, is leading a collaborative effort with the FWT, the USFS, and The Nature Conservancy to characterize synoptic–to–local–scale weather conditions during prescribed fires in Northern California over the past ~15 years.

In case you missed it...

Our evaluation of the National Severe Storm Laboratory's Warn-on-Forecast System (WoFS) for Smoke is available on the NOAA Institutional Repository [Read the report here].