

IGNITING IMPACT: ADVANCING FIRE WEATHER DSS

NOAA • GSL • CIRA

A Strategic Brief on Fire Partners' Fire Weather Needs

NWS forecasters remain the gold standard. In a national survey of 475 fire professionals and 19 focus groups, NWS local office products achieved a 7/7 median utility score. Your work is essential for the fire community! However, as fire environments grow more complex, partners are seeking deeper operational integration to help them manage increasing risk and resource decisions. This brief identifies key opportunities to evolve NWS support—from optimizing data delivery to strengthening the collaborative trust that validates your warnings.

Below are 10 recommendations for advancing Fire Weather DSS. To explore the data, partner feedback, and visual evidence supporting each action, click on the interactive links below.

84%

Partners who integrate your products into their workflow.

75%

Partners who want the “marginal” RFW issued rather than missing the event.

31%

Trust premium gained when partners participate in the fuel verification process before a RFW is issued.

1

PARTNER PRODUCT PREFERENCES 🔗

Consult with your local fire partners to identify exactly which products they lean on most. Pinpointing regional and role-based preferences ensures your work reaches the right desks.

6

TRUST IN RFW'S 🔗

Use social media to provide context and humanize the forecast. Trust is built through consistent professional interaction and a shared understanding of the fire environment.

2

CORE TACTICAL DRIVERS 🔗

Maintain a primary focus on high-confidence updates for Wind Speed and Relative Humidity. These are the highest rated information priorities across the fire cycle.

7

PROBABILISTIC RISK VISUALS 🔗

Integrate visual probabilities into briefings rather than relying on text alone. Combining graphics with text bridges the gap between simple notification and deep risk analysis.

3

72-HOUR PLANNING PATHWAY 🔗

Use early-stage products (Fire Weather Watch, AFD, FWF) to signal the likelihood and timing of an RFW 48-72 hours in advance, synchronizing guidance with partner resource cycles.

8

PDS RFW'S 🔗

Explore the implementation of tiered messaging or “Particularly Dangerous Situation” headers during high-end events to help your partners pinpoint catastrophic events.

4

HIGH-TOUCH RELATIONSHIPS 🔗

Increase communication across all channels, particularly messaging platforms (e.g. Slack), to deliver critical nuggets- the *why* and the *change*-outside of formal briefing cycles.

9

FRAMING WIND PROBABILITIES 🔗

Pair high-percentage (90%) quantitative probabilities with wider wind ranges to provide your partners with defensible data for resource decisions.

5

COLLABORATIVE FUEL VERIFICATION 🔗

Consult with your fire partners on the current fuel environment before product issuance. Incorporating their ground-truth data increases product buy-in and operational relevance.

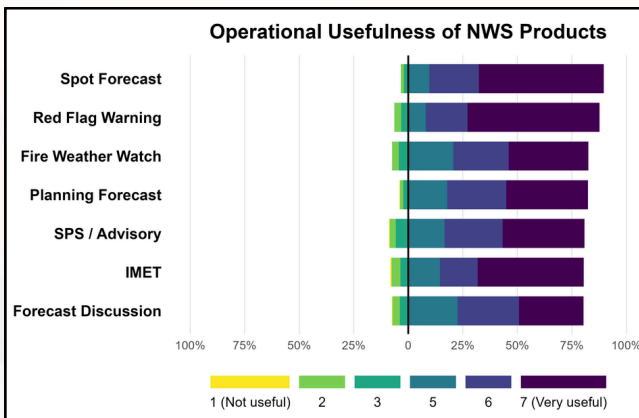
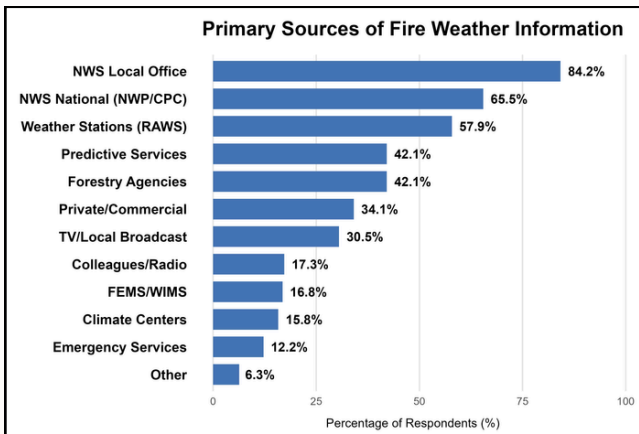
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MARGINAL RFW ISSUANCE DISCRETION 🔗

Exercise forecaster discretion to lean toward RFW issuance when conditions are near-criteria. Labeling these as “marginal” provides partners the administrative cover needed to scale up.

1 The Multi-Source Ecosystem: NWS as the Anchor

Fire partners are highly proactive, independent researchers. While they cross-reference various platforms, the NWS remains the gold standard and primary driver for their tactical workflows.



- **The Foundational Source.** The NWS Local Office is partners' primary information source, with 84.2% incorporating local briefings into their daily operations. On a usefulness scale, NWS products as a whole received a perfect median score of 7/7.
- **High-Utility Favorites.** While the entire product suite is valued, Spot Forecasts and Red Flag Warnings (RFWs) stand out as the most essential tools, receiving the highest utility ratings from respondents.
- **Regional and Role Signatures.** Utility isn't one-size-fits-all. Western region partners show a deeper reliance on NWS products as a whole, particularly IMET support, while Emergency Managers show high utility for Fire Weather Watches/RFWs compared to other roles. Technical roles like FBANs lean heavily into technical outputs like Forecast Discussions, helping them understand the "why" behind your conclusions.

"I personally depend on the discussion more than anything... I like hearing... about why they're coming up with their conclusions."

— FMO, Missoula, MT

RECOMMENDATION

Fire professionals use a variety of sources but value NWS products above all others. Because this value is tied to specific roles and locations, take the time to learn which products and information your local partners lean on most. The data is a huge *kudos* to NWS forecasters: your work is seen as a high-benefit, indispensable part of fire operations.

2 The Core Baseline: Consistent Meteorological Priorities

Fire partners rely on a remarkably stable set of core variables. While situational needs change, their primary information requirements remain fixed from planning through suppression.

- **Consistent Operational Drivers.** Partners focus on core atmospheric drivers throughout an event lifecycle. Regardless of increasing incident complexity, Wind Speed and Relative Humidity remain the essential, primary metrics that partners rely on for operational decisions.
- **The Hand-off.** While RH and wind speed remain top priorities, the focus on secondary variables shifts as the threat matures. Fuel Conditions dominate long-range planning (4–7 days out), but for ongoing incidents, the focus pivots to Wind Direction Shifts (rise to #2 priority).

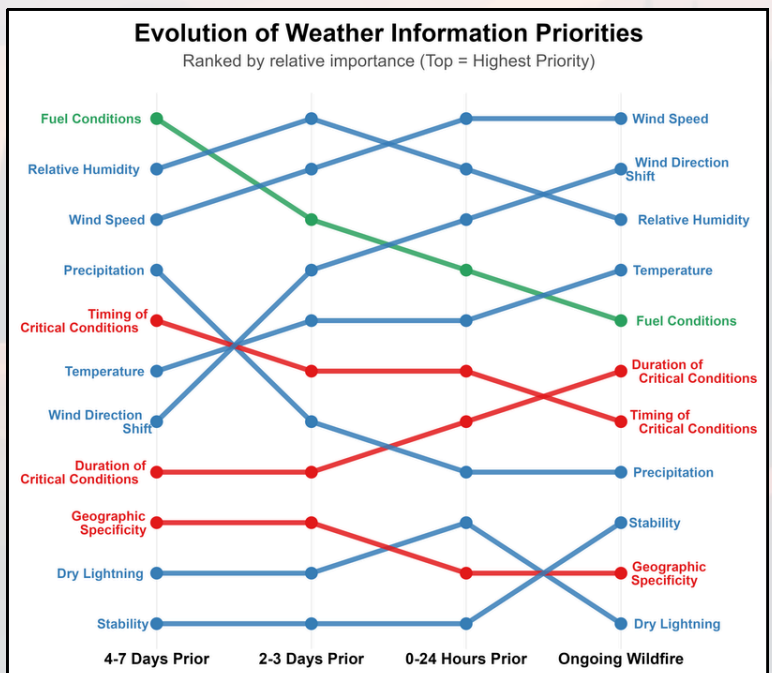
"As long as wind speed and relative humidity are present, I'm okay."

— Survey response to open-ended question about information gaps

Blue = Meteorological Components
Green = Fuel Conditions
Red = Timing, Duration, & Geography

RECOMMENDATION

Prioritize providing high-confidence updates on core variables (Wind/RH) above all else. Your greatest value is in providing maximum reliability for the variables that drive partners' primary safety and tactical decisions.



3 The Lead-Time Gap: Timing the Decision Window

There is a distinct mismatch between the traditional NWS issuance cycle and the administrative decision window fire partners must operate within.

- **The 72-Hour Decision Window.** Current RFW issuance timelines (12–24 hours) can support tactical decisions, yet fire partners operate on administrative resource cycles that close much earlier (*see partner decision timeline below*). There is an unmet demand for high-confidence guidance 2–3 days in advance to justify the budget, staffing, and pre-positioning.
- **The Trend is the Tool.** Partners are moving away from "Yes/No" binaries in favor of seeing meteorological trends. Understanding the *progression* toward critical thresholds allows them to justify administrative actions before the criteria are officially met.



"It would be a derelict in duty for us to wait until we see, oh, there's a fire weather watch today, let's react to that. We should know that that's going to happen days before it happens."
— Forester, Morehead City, NC

"I think we honestly all live about 72 hours ahead... when that triggers to a red flag personally I think we're already geared up for it."
— FMO, Missoula, MT

RECOMMENDATION

Prioritize trend information in early-stage products. Use the Fire Weather Watch, Forecast Discussions, and Fire Planning Forecasts to explicitly state the likelihood of a future RFW and the projected timing. Providing this pathway to a warning 72 hours out allows NWS guidance to be more effectively integrated into longer-range resource and budget decisions.

4 Communication Demand: The Shift to High-Touch Relationships

Partners are signaling a major shift in how they want to interact with their local NWS office, moving away from "one-way" information delivery.

- **The Surge in Frequency.** Across the board, your partners are looking for more than a static forecast; they want a continuous operational dialogue. There is an unmet demand across all modes of communication (*see heatmap*).
- **The Rise of Direct Access.** Messaging platforms (e.g., Slack) represent the largest potential for growth. Partners are moving toward on-demand digital updates that allow for quick, situational clarifications outside of formal briefings.
- **Combatting Messaging Fatigue.** Partners report that critical tactical nuances can be buried in dense text products, leading to "glance-and-go" behavior. There is a clear demand for high-impact takeaways—specifically the *why* and the *change*—delivered via concise bullets that immediately highlight the most significant operational shifts.

Change in Demand for NWS Interaction				
Blue = Want More Contact Red = Want Less Contact				
	0	1-2	3-5	>5
Social Media	-4.7%	-2.5%	2.8%	4.4%
Non-Live Briefings	-10.4%	-3%	6.7%	6.8%
Messaging Channels	-24.5%	1.4%	14.8%	8.2%
Live Briefings	-15.2%	-0.1%	6.5%	8.7%
Direct Conversation	-13.6%	-3.8%	9.3%	8.1%
	0	1-2	3-5	>5
Interactions per Fire Season				

Calculated as preferred contact % - actual contact %. Positive values—in blue—represent unmet demand, signaling where partners desire more frequent interaction.

RECOMMENDATION

Evolve toward a tactical partnership by prioritizing active, two-way communication. Utilize messaging channels and direct engagement to meet the growing demand for high-frequency, high-touch communication. Combat messaging fatigue by delivering critical nuggets of information - the *why* and the *change* - outside of formal briefing cycles.

5 The Red Flag Warning: More than a Product

Even though RFWs are often issued after partners make initial administrative decisions, they are highly valued tools for confirmation, validation, communication, and overall situational awareness.

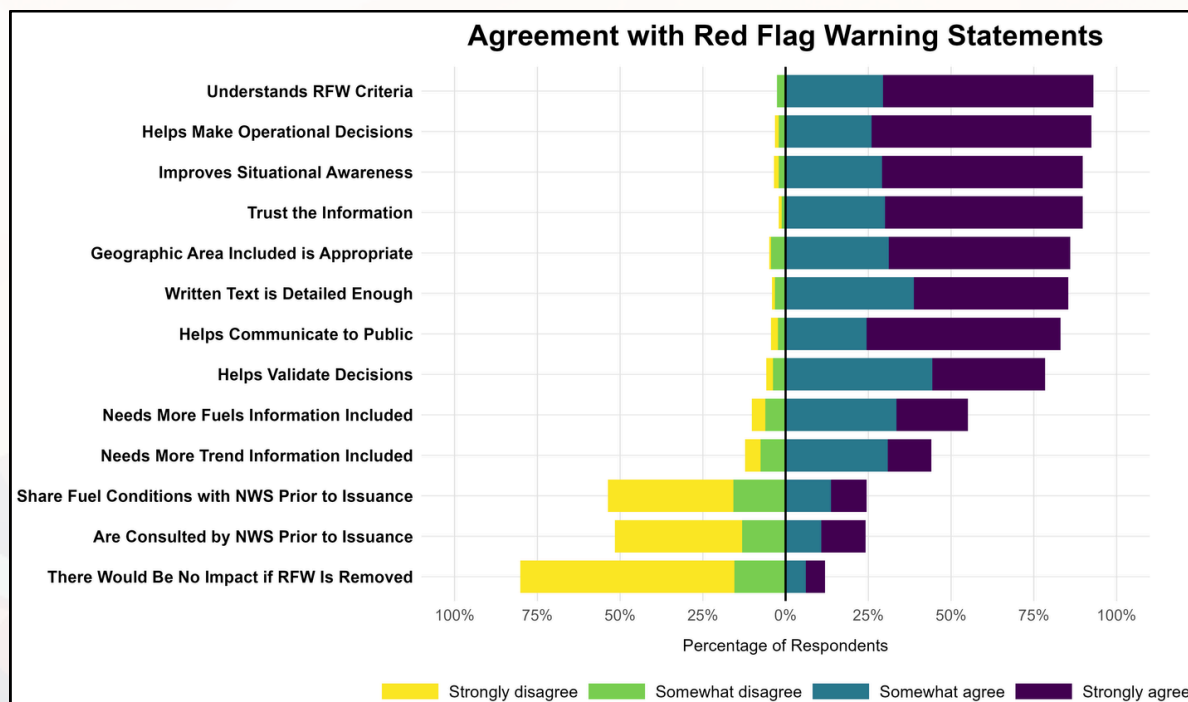
- **Political and Public Justification.** The RFW provides the "NWS Credibility" needed to justify increased staffing costs and to back up fire-prevention messaging to the public. It validates a partner's decision to scale up operations.
- **High Utility, Clear Criteria.** Partners overwhelmingly understand and trust RFW criteria (only 2% expressed distrust). They find the geographic areas appropriate and the text detailed enough for tactical use.
- **Fuels: The "Gatekeeper" Disconnect.** Fuel information is a primary criterion for RFW issuance, yet a gap exists: most partners do not share fuel conditions with WFOs prior to RFW issuance.
- **Improving the Product.** While highly valued, partners agree that Fire Weather Watches and RFWs would be significantly improved by consistently incorporating more fuel-specific information and trend data.

"We don't need it necessarily to recognize the situation [is] developing, but I will tell you as soon as you put a... NWS product name to it, it seems to carry more weight... our partners will listen."

— **Emergency Manager, Wichita, KS**

"I've had many times we still have snow on the ground and we'll get a fire weather watch. That means nothing to us at that point because there's no exposed fuels out there."

— **FMO, Duluth, MN**



RECOMMENDATION

If you don't already, consult with your local fire partners on the current fuel environment to ensure the Fire Weather Watch/RFW are grounded in local reality. Using their ground-truth data in your text increases the buy-in and operational relevance of the product.

6 The Trust Equation: Building Confidence in Your Warnings

Trust is a product of contemporary communication and collaboration, not professional tenure or geography.

- **Engagement Over Tenure.** Data shows that trust in RFWs is not dictated by a partner's years of experience or their specific NWS region. Instead, trust is an earned outcome of active participation—driven by frequent communication and collaborative fuel verification.
- **Social Media = Trust.** Frequent social media interaction increases trust in RFWs by **34%**. Using these platforms to humanize the data and provide updates builds a stronger baseline of credibility.
- **Fuel Verification.** Partners who share fuel data before RFW issuance are **31%** more likely to trust the final product. Engaging partners in the "ground-truth" validation ensures the product is co-produced rather than just delivered.

RECOMMENDATION

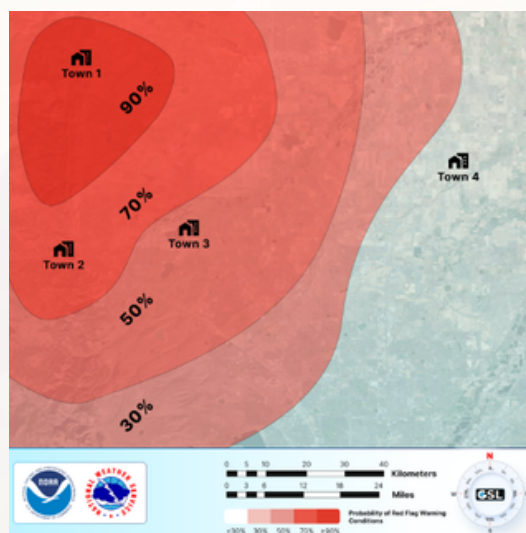
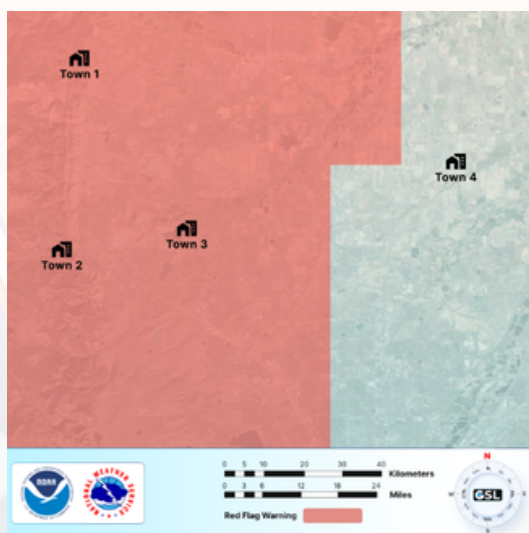
Use social media to provide context and humanize the forecast. Consult with your partners to understand the fuelscape. Trust in RFWs is built through engagement, not just accuracy.

7

The Future is Probabilistic: Moving Beyond “Yes/No” Weather

Fire partners are signaling a readiness to move away from binary forecasts in favor of more nuanced risk communication. While the “Yes/No” model is familiar, seeing probabilistic data in action significantly shifts the preference.

- **The Visual Pivot.** Initial focus groups revealed hesitation toward probabilities, with partners favoring “yes/no” simplicity. However, the survey proved that seeing is believing; when presented with a head-to-head visual comparison (*examples to the right*), the verdict flipped. Partners rated the probabilistic prototype as more useful for managing risk and capturing critical operational context.
- **Text and Graphics: Better Together.** 78% of partners prefer to see probabilistic information delivered as a combination of text and graphics. This format ensures the data can be quickly scanned in the field while maintaining the technical depth needed for planning.
- **Widespread Demand.** Support for integration of probabilistic information is high across the entire product suite, particularly in core products like RFWs (76%) and Fire Weather Watches (66%), as well as Special Weather Statements (63%) and Spot Forecasts (61%).



RECOMMENDATION

Integrate probabilities into NWS products where applicable, especially in visual briefings. The *visual* is key—don't just describe the odds; show them. Use text and graphics together to bridge the gap between simple notification and deep risk analysis.

8

The PDS Red Flag: Signaling Extreme Risk

While the standard RFW is a trusted staple, there is a clear appetite for a tiered approach when conditions transition from “critical” to “catastrophic.”

- **The Verdict on PDS.** Over 70% of partners believe it would be helpful to have a “Particularly Dangerous Situation” (PDS) designation for RFWs. This support is consistent across all regions, roles, and experience levels.
- **The Naming Convention.** Sentiment toward the PDS label is largely positive: 58% of respondents like the name, while 27% are neutral. Roughly 15% do not like the terminology, suggesting that while the majority find it effective, a small portion of the community prefers alternatives like “Extreme RFW” or “Black Flag.”
- **Urgency and Attention.** Partners who favor the PDS label indicate that it effectively grabs attention and signals a level of urgency that a standard RFW might not convey during an exceptionally rare event.
- **A Move Toward Graded Risk.** Support for PDS suggests that fire weather communication is moving away from a binary “Yes/No” model and toward a more nuanced approach that helps partners prioritize the highest-risk days.

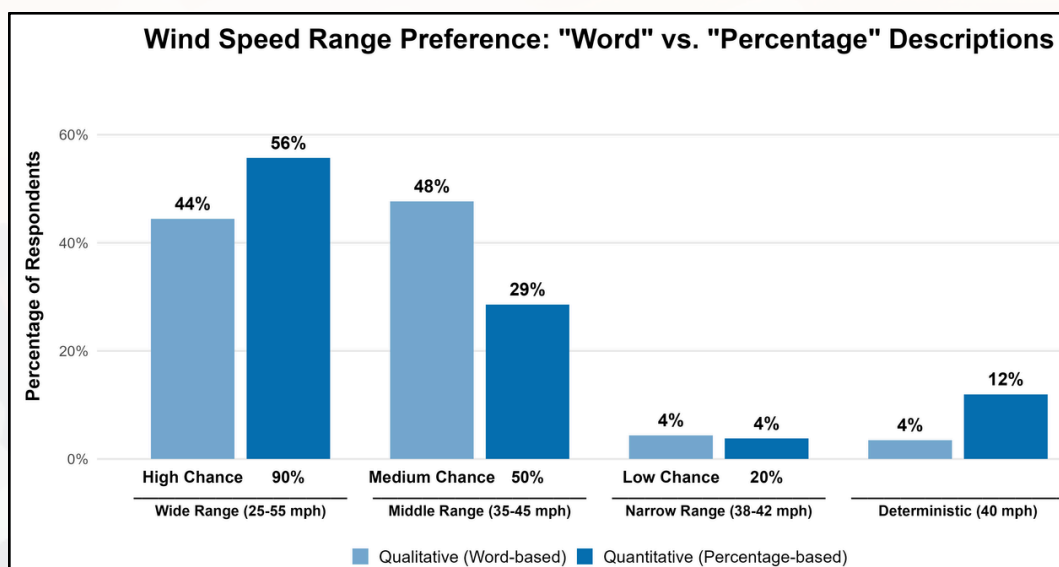
RECOMMENDATION

Explore the implementation of tiered messaging or PDS headers during high-end events. Partners are signaling that they want the NWS to help them filter the noise by clearly identifying the most dangerous days of the season.

9 Framing the Odds: Quantitative vs. Qualitative Uncertainty in Wind Forecasts

How uncertainty is framed alters how fire partners perceive the reliability of a forecast. Moving from words to numbers doesn't just change the format—it changes the decision-making logic.

- **The Framing Effect.** Introducing hard percentages creates a shift in preference. Preference for a Wide Range (25–55 mph) jumped by 12% when it was labeled as a "90% chance" rather than a "High chance." For high-stakes planning, a "90%" figure acts as a more concrete, defensible threshold, leading partners to prioritize high confidence over a narrow, precise range.
- **The 50% Collapse.** While "Medium Chance" is a popular choice in word-based forecasts (48%), partners' preference for that same range collapses to 29% when labeled as a "50% chance." Operationally, 50/50 odds are perceived as no better than a coin flip; when faced with this uncertainty, users often abandon the middle ground for either the security of the 90% range or the simplicity of a single-value forecast (e.g. "40 mph").
- **The Deterministic Drift.** Preference for a deterministic forecast tripled in the quantitative format. When presented with specific low (20% chance) to medium (50% chance) probabilities, some users may find the data cognitively taxing or operationally unhelpful and revert to the simplicity of a single-value forecast, even knowing it lacks nuance.



RECOMMENDATION

To maximize the utility of probabilistic tools, lead with high-percentage (90%) quantitative probabilities coupled with wider ranges; this gives partners the defensible data they need to justify resource moves. For middle-tier probabilities, consider utilizing qualitative descriptors (e.g., "Moderate Chance") to prevent users from abandoning the data in favor of a deterministic mindset.

10 The Borderline Case: Navigating the "Grey Area"

Should you warn when RFW criteria are only marginally met? The consensus among partners favors the issuance of a warning, provided the uncertainty is communicated clearly.

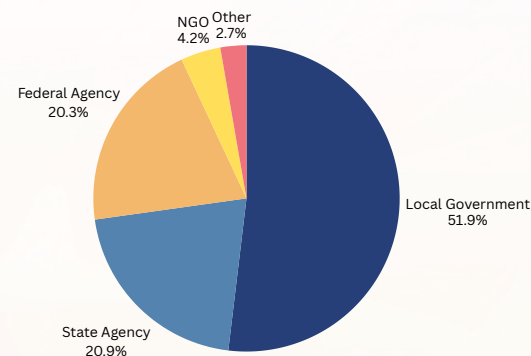
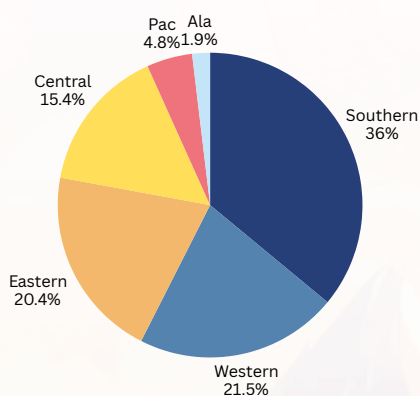
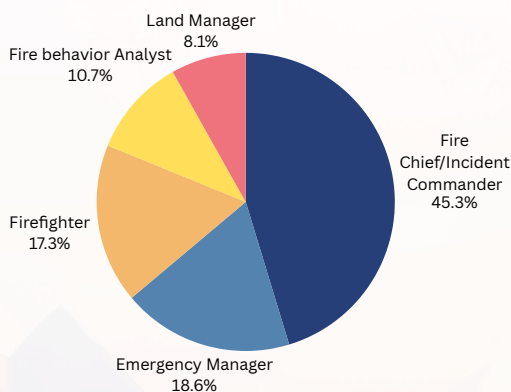
- **Priority on Coverage.** 75% of partners would rather have an RFW issued when criteria are marginal than not have one issued at all. They prioritize the precautionary value of being warned over the risk of an unwarned event.
- **The "Marginal" Label.** The most popular strategy is to issue the RFW but clearly label it as a "borderline" or "marginal" case within the text or briefing.
- **Role-Based Thresholds.** Risk tolerance varies by position. Emergency Managers are 9x more likely to want a warning in borderline cases than tactical roles like Firefighters, who may be more concerned with the resource fatigue caused by warnings that don't materialize into major events.

RECOMMENDATION

If you don't already, consider exercising forecaster discretion to lean toward issuance when conditions are near-criteria. Use your briefings to provide the necessary nuance—labeling a warning as "marginal" maintains your technical credibility while providing partners the administrative cover they need to scale up operations.

Behind the Data: A Multi-Phase Effort

This project wasn't done in a vacuum. It started in the summer of 2024 with 19 focus groups, where I sat down with 85 NWS fire partners to understand the 'why' behind their decisions. That qualitative groundwork led to a national survey that captured the voices of 475 fire professionals— demographics of the survey respondents are included below, including the *top 5* participating roles, NWS region representation, and organization type.



Want more details?

This brief provides a strategic overview, but the full research paper offers much more. One peer-reviewed paper on the focus group results is currently available (QR code), with several others currently in development. Contact me if you are interested in the survey questions and additional findings!



SCAN ME

Looking for localized insights?

The national trends tell a big story, but the local nuances are where operations happen. If enough participants selected your specific WFO, I am happy to work with you 1-on-1 to help you better understand your specific partners' needs and how these perspectives apply to your local operations.

THANK YOU

A huge thank you to the 24 WFOs who collaborated on this work! The findings in this brief are a direct reflection of that joint effort to bridge the gap between the forecast desk and the fire line.

ABOUT ME

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