How Likely is That Chance of Thunderstorms? A Study of How NWS WFOs use WEPs and What They Mean to the Public
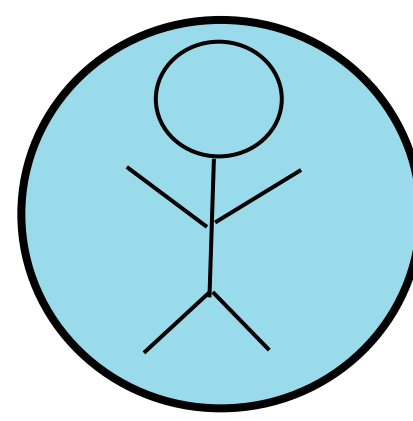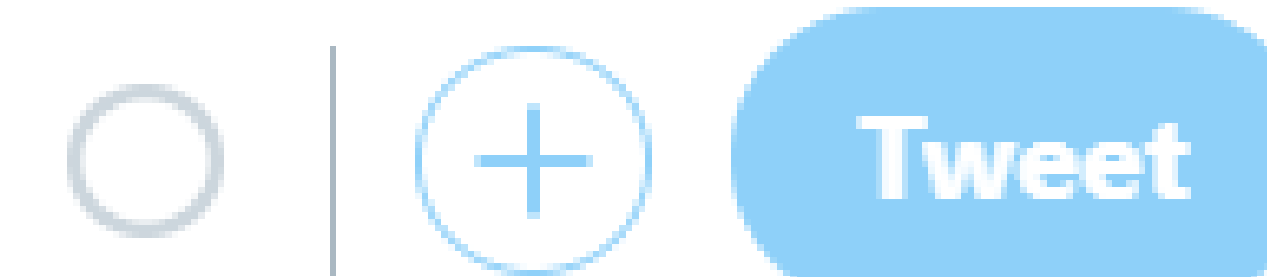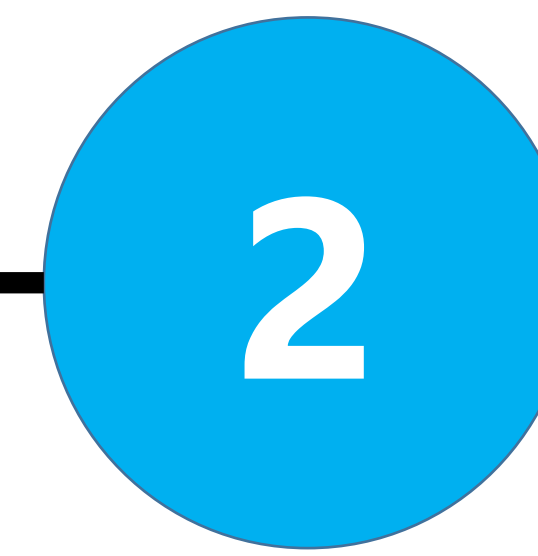
Hypothesis: NWS WFOs will use Twitter to communicate forecast probability using words *or* numbers, not a combination of both.

🖼 GIF 📊 ☺   ◯ | ⊕ | **Tweet**

Trends / Results ⚙

#Qualified

Top 10 Qualified WEPs

- "Low threat" was used **14.4%** of the time that a qualified WEP was used.

- A smaller variety of qualified WEPs were seen in the tweets, with 61 different examples coded.

#Unqualified

Top 10 Unqualified WEPs

- "Possible" was used **39.4%** of the time that an unqualified WEP was used. Since unqualified WEPs were more common than qualified, this makes "possible" the most commonly used WEP in the study.

- A larger variety of unqualified WEPs were seen in the tweets, with 79 different examples coded.
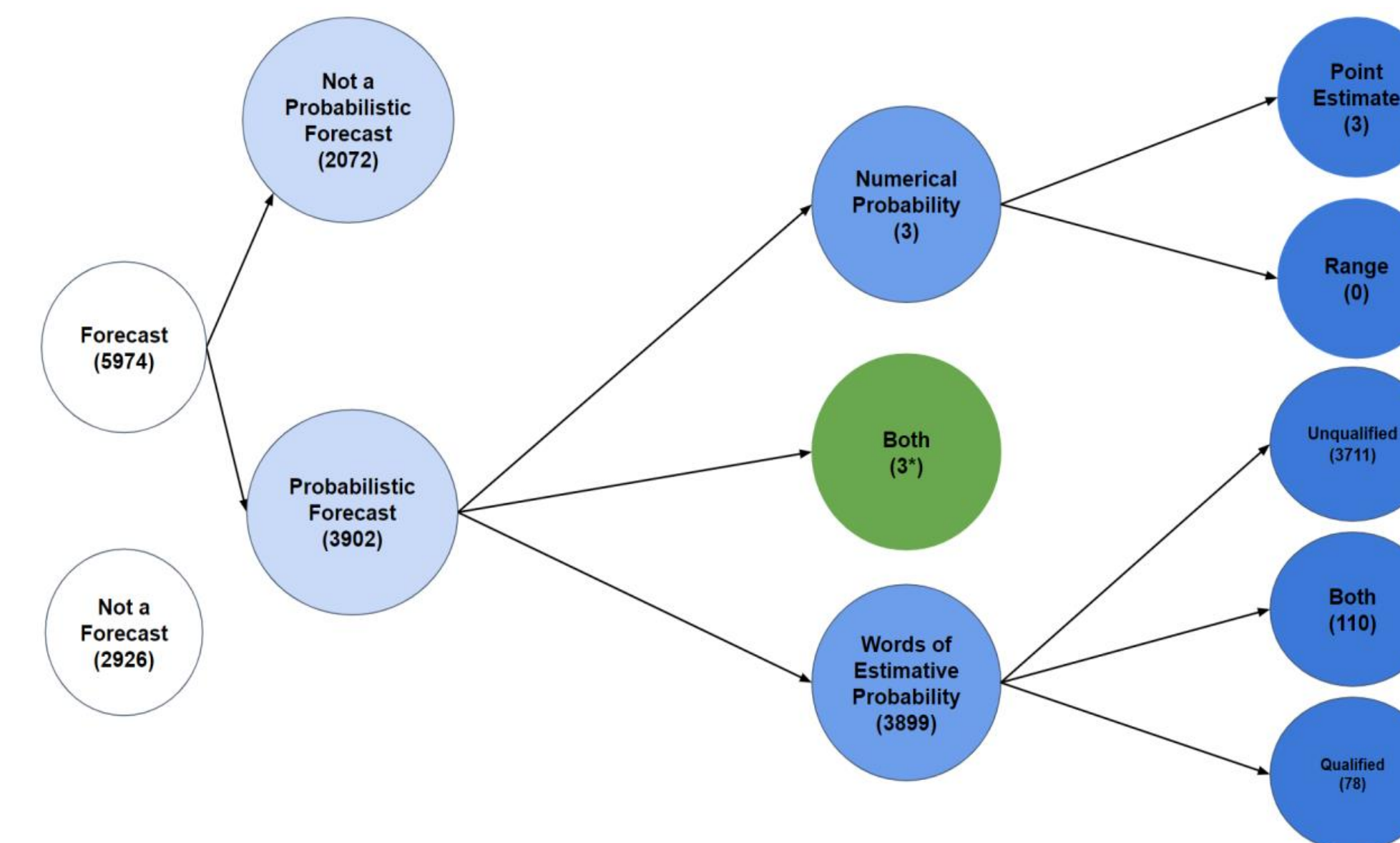
1 Introduction @previous_studies

Words of Estimative Probability (WEPs) are words that convey the likelihood of an event's occurrence. Researchers have expressed the difficulty in deriving precise meaning from WEPs, arguing that expressing probability using words is a poor way to convey confidence and that a combination of words and numerical estimates can lead to more consistency in people's interpretations. As the National Weather Service (NWS) moves towards communicating uncertainty probabilistically, **questions about how to best communicate uncertainty are becoming increasingly urgent**. This project looks at 1) how the NWS uses WEPs in Twitter messages to communicate probabilistic forecast information and 2) how the public interprets these WEPs.

#TotalPercentages

- Unqualified WEPs are used **48 times** more often than qualified WEPs.

- It is more common for a qualified WEP to be used with an unqualified WEP, rather than a qualified phrase standing alone.

2 Methods @how_it_works

- Database of 8900 severe weather-related tweets from 89 NWS WFOs were coded via the scheme shown.

While literature suggests categorizing probabilistic information into numerical, WEP, or both, we felt it appropriate to further distinguish between different types of WEPs. This decision was largely influenced by the drastic difference in totals of both qualified vs. unqualified, as well as the idea that qualified WEPs more concisely communicate forecast probability.

Forecast (5974) → Not a Probabilistic Forecast (2072)
Forecast (5974) → Probabilistic Forecast (3902)
Not a Forecast (2926)
Probabilistic Forecast (3902) → Numerical Probability (3), Both (3*), Words of Estimative Probability (3889)
Numerical Probability (3) → Point Estimate (3), Range (0)
Words of Estimative Probability (3889) → Unqualified (3711), Both (110), Qualified (78)

For more information on the distinction between qualified and unqualified WEPs:

- Results of two surveys distributed in 2018 and 2019 (WX18 and WX19) were analyzed, specifically in relation to how the public numerically interprets qualified (WX18) and unqualified WEPs (WX19).

#PublicSurveyResults

- Lower probability WEPs such as "very low" and "small" have a more narrow range of interpretation, implying that **higher probability words** such as "significant" and "good" may be **more difficult to interpret.**

- **Unqualified WEPs result in even less agreement** in interpretation by the public, which poses a significant problem considering **a large majority of WEPs used by NWS WFOs when communicating forecast uncertainty are unqualified.**

Example @how_to_code

> **NWS** @NWS ✓
> Strong to severe thunderstorms possible Friday afternoon and evening, mainly across the interior. Damaging winds possible, along with localized flash flooding and the low risk of an isolated tornado.

1. **Does the tweet communicate forecast information?** **YES**, the message focuses on storms that are forecast for Friday afternoon and evening.

2. **Is the forecast probabilistic?** **YES**, probability is communicated, the forecast is not stated deterministically, as a guarantee.

3. **Are WEPs used to communicate probability?** **YES**, probability is communicated with WEPs. No numerical estimates are used.

4. **Are the WEPs qualified or unqualified?** In this case, we have an example of **BOTH**. Therefore, we code two unqualified WEPs (possible, possible) – and one qualified WEP (low risk).
   → Both instances of "possible" are coded. One refers to the probability of strong to severe thunderstorms, while the other is referencing the damaging winds.
   → "Low risk" is coded because it is not a verbatim use of the specific SPC categories. It is considered qualified because "low" describes the magnitude of the risk.
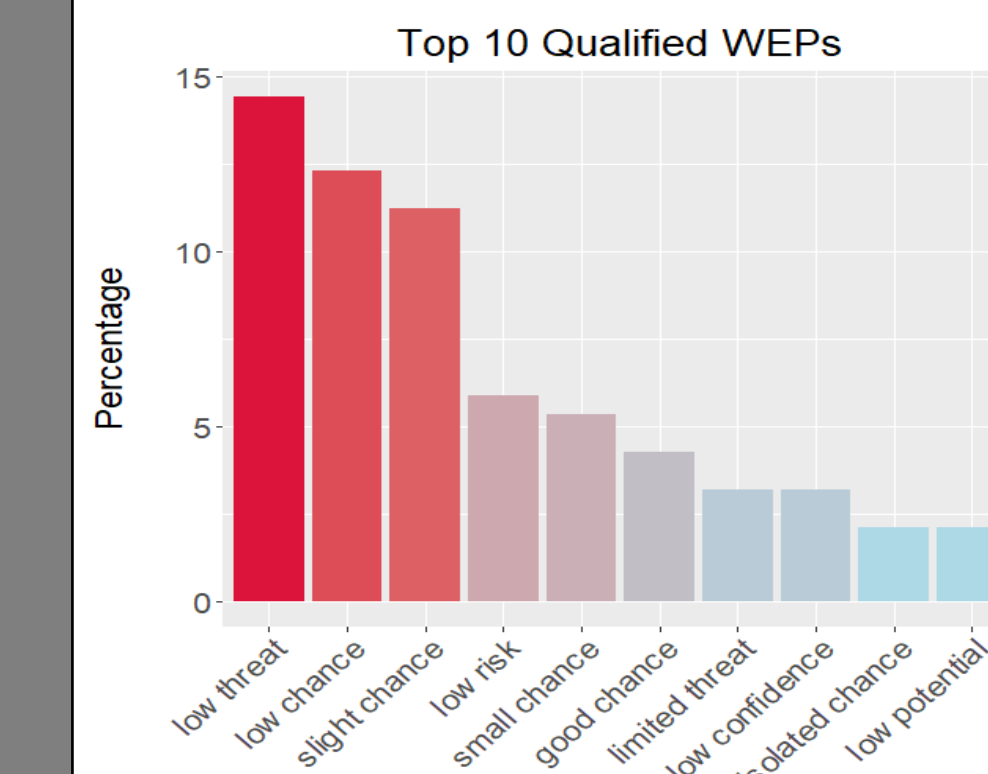
3 Conclusion @main_points

- While literature suggests that a combination of numbers and words is most effective in communicating probabilistic information, only **0.08%** of NWS tweets analyzed used this technique.

- The technique that was primarily used to communicate severe weather uncertainty was the use of unqualified WEPs, which tend to be interpreted less consistently by the public than qualified WEPs.

> Since both qualified and unqualified WEPs result in a wide range of numeric interpretation, using WEPs to communicate severe weather forecasts may be ineffective if the goal is for everyone to have the same understanding of possible risks and hazards.
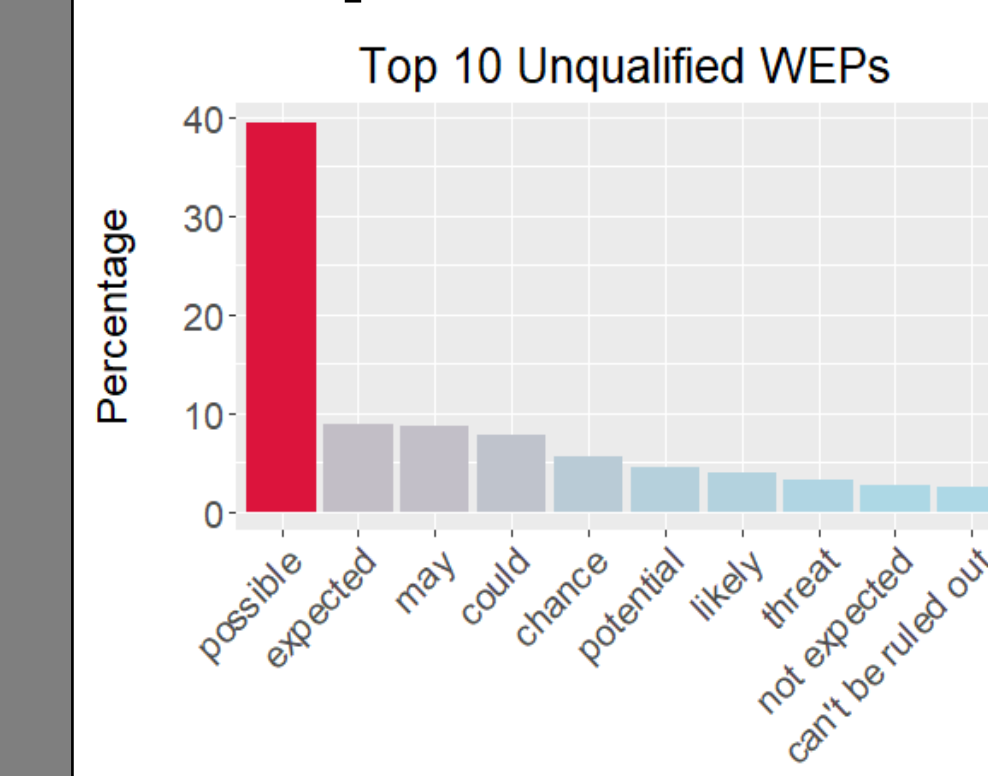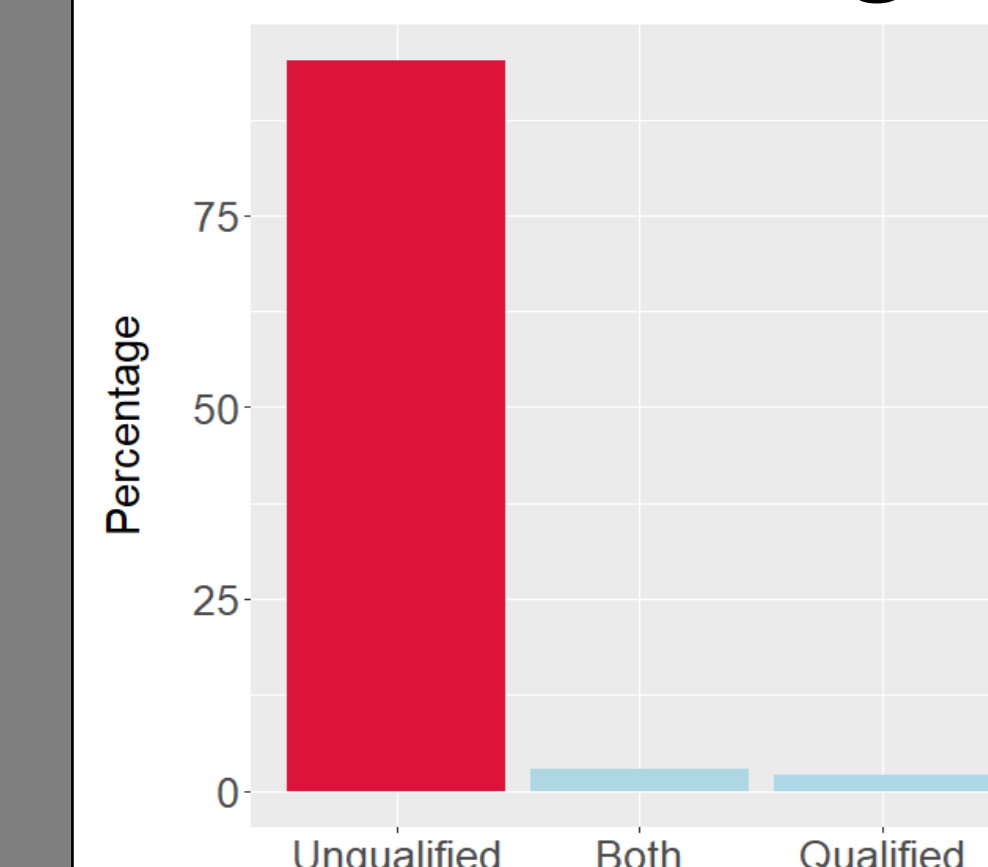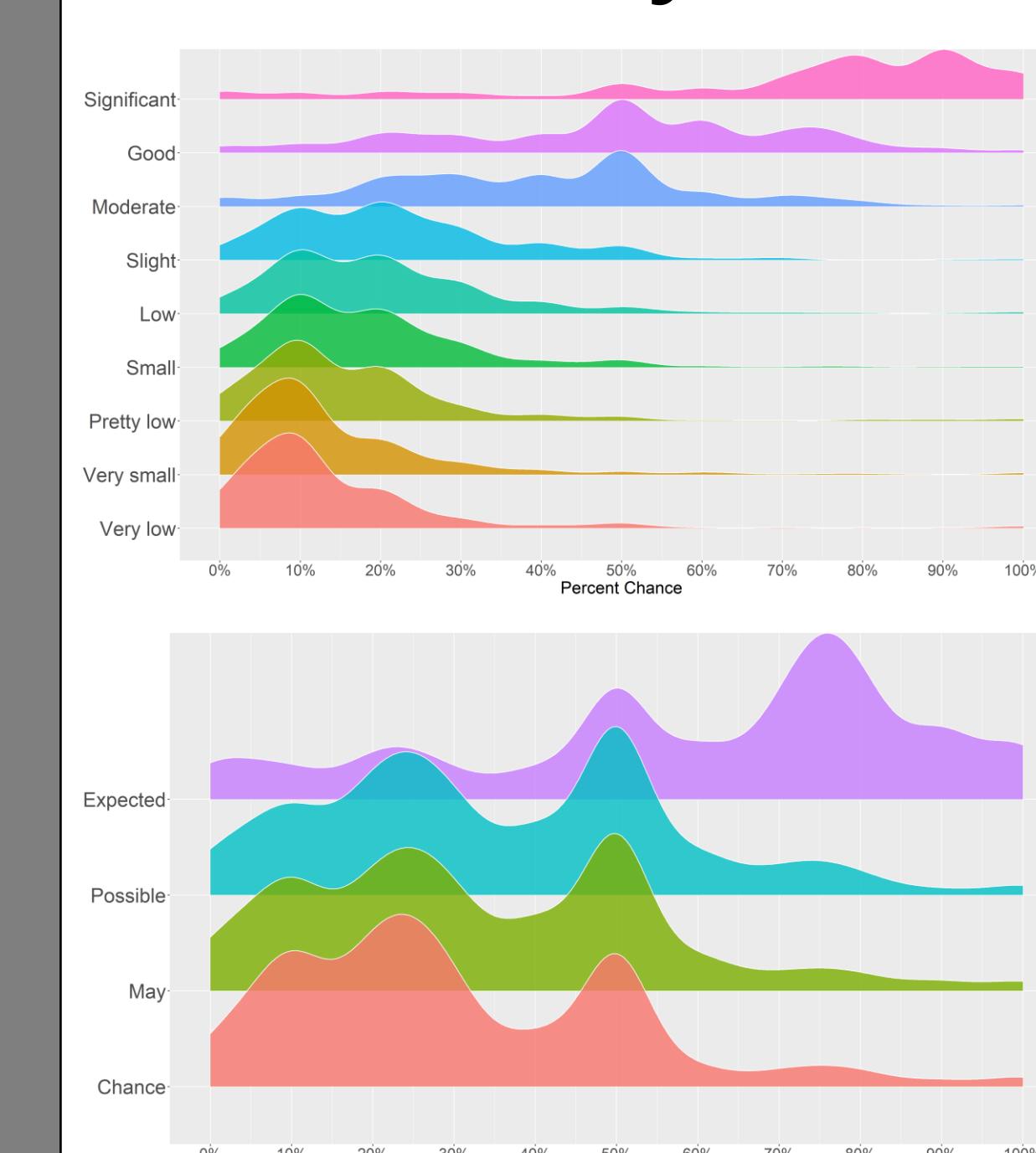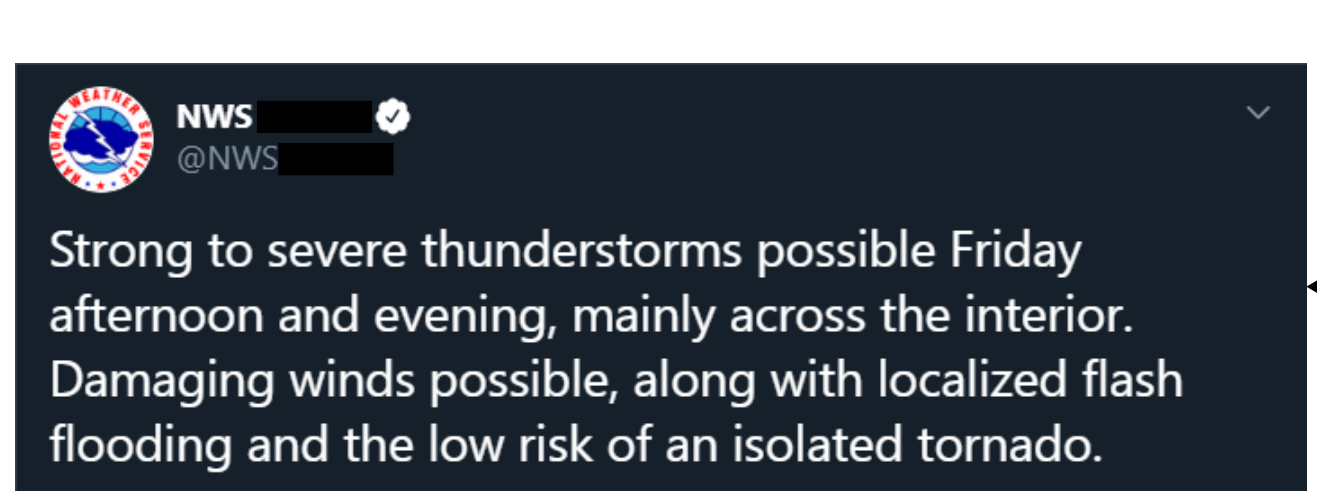
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