

Observed Fire Behavior and Deployed Mitigation Resources Related to Categorical Risk of SPC Fire Weather Outlooks

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Introduction

Using 15 years of wildfire data, this project will identify a statistical relationship among the categorical risks of SPC fire weather outlooks and fire spread rate (FSR) as well as the cost of fire suppression and personnel deployment. The resultant technology will provide real-time guidance on anticipated cost and magnitude of fire suppression resources for a wildfire scenario as statistically related to the forecasted categorical risk of SPC fire weather outlooks. It is anticipated that such technology will be of real value to fire managers and emergency managers to anticipate the amount and cost of resources to address a specific wildfire event.

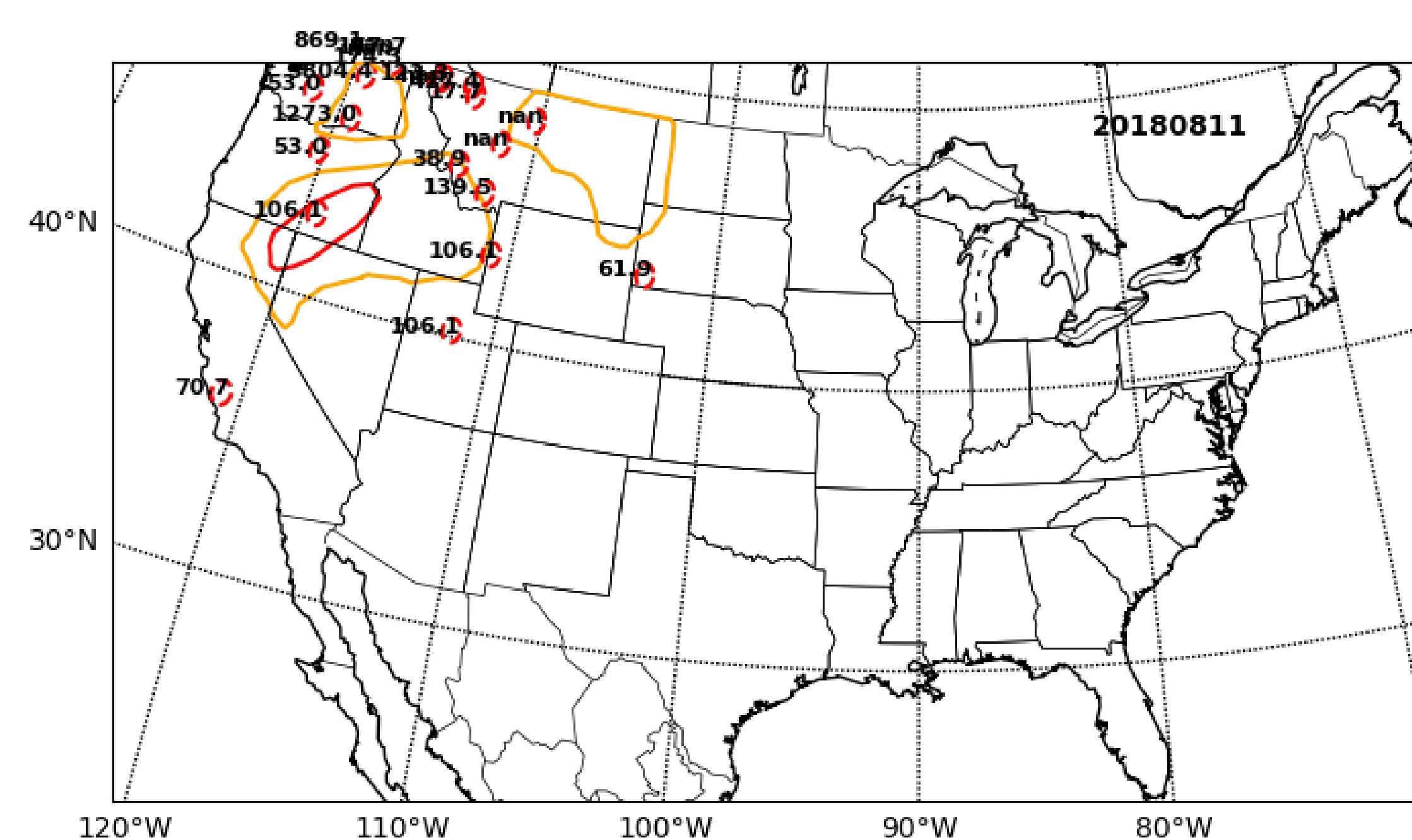
Wildfire Database

Wildfire dataset: ISC-20-PLUS

- Dataset consisting of an expansive list of data associated with specific wildfires including (and not limited to): fire spread rate (FSR), deployed personnel, equipment and mitigation costs.
- Included wildfires: 2% of all wildfires during 1999-2020 that represents 80% of total suppression costs for 22 year period.
- Available at: <https://doi.org/10.6084/m9.figshare.19858927.v3>
- St. Denis, Lise A.; Short, Karen C.; McConnell, Kathryn; Cook, Maxwell C.; Mietkiewicz, Nathan P.; Buckland, Mollie; Balch, Jennifer K. 2023. All-hazards dataset mined from the US National Incident Management System 1999-2020. *Scientific Data*. **10**: 112.

Step 1: Assemble Data

- For a past wildfire, identify corresponding forecast categorical risk of the SPC outlook, observed fire spread rate (FSR) and deployed mitigation resources (personnel, cost);
- Map outlook spatial area in a lat/lon framework;
- Identify wildfires occurring within outlook area and within +/-2 days of outlook 24-hr window (12z-12z).

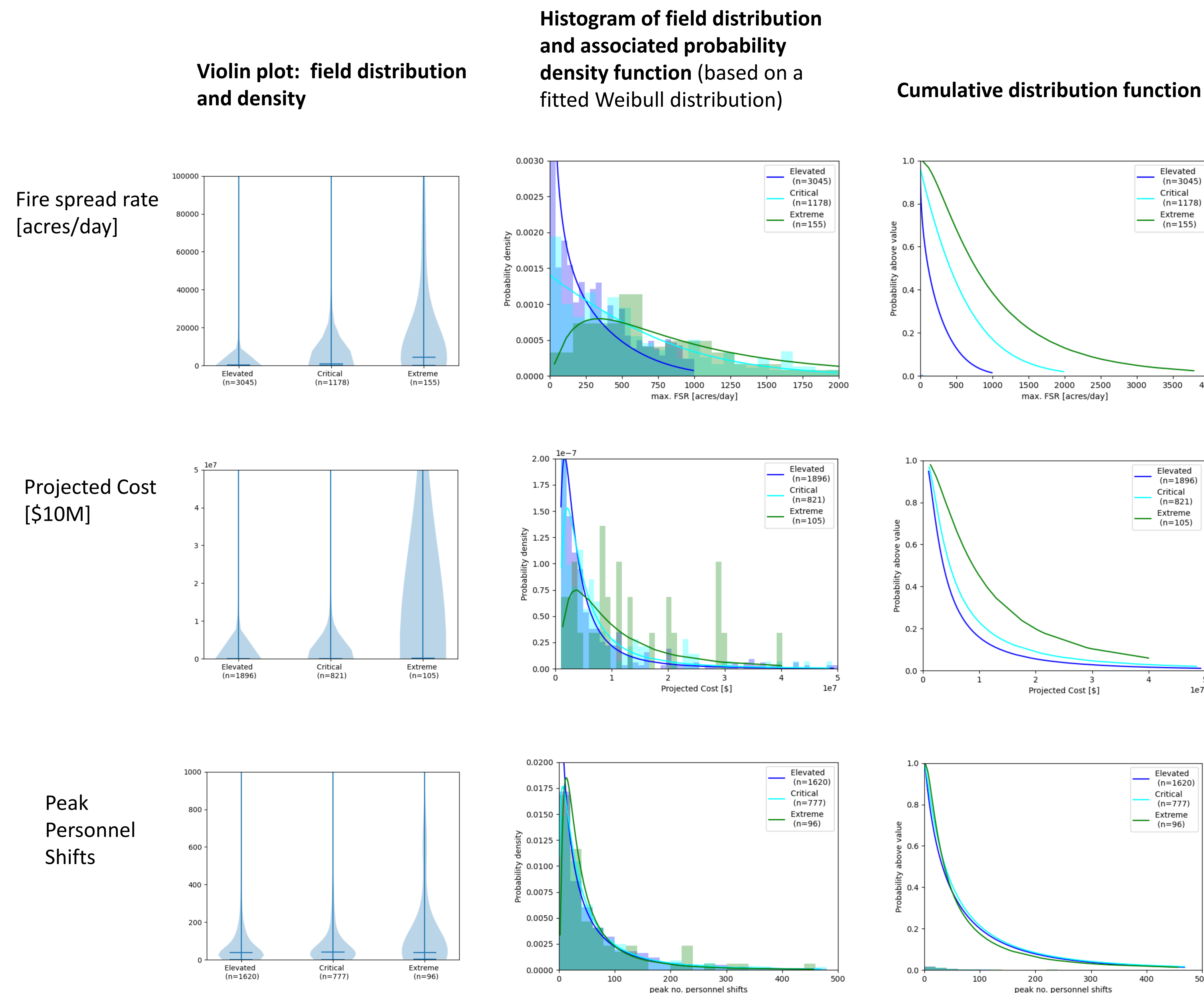


For an example case (2018-08-11), SPC fire weather outlook categorical risk (yellow contour: 'elevated', red contour: 'critical'); dashed circles show wildfires with FSR [acres/day]

SPC Fire Weather Outlook Risk Categories

- Elevated:** Elevated risk from forecast wind, RH, and temperatures
- Critical:** Critical risk from forecast wind, RH, and temperatures
- Extreme:** Extremely critical risk from forecast wind, RH, and temperatures

Step 2: Variable Statistics by Risk Category



Step 3: Data for Decision Making

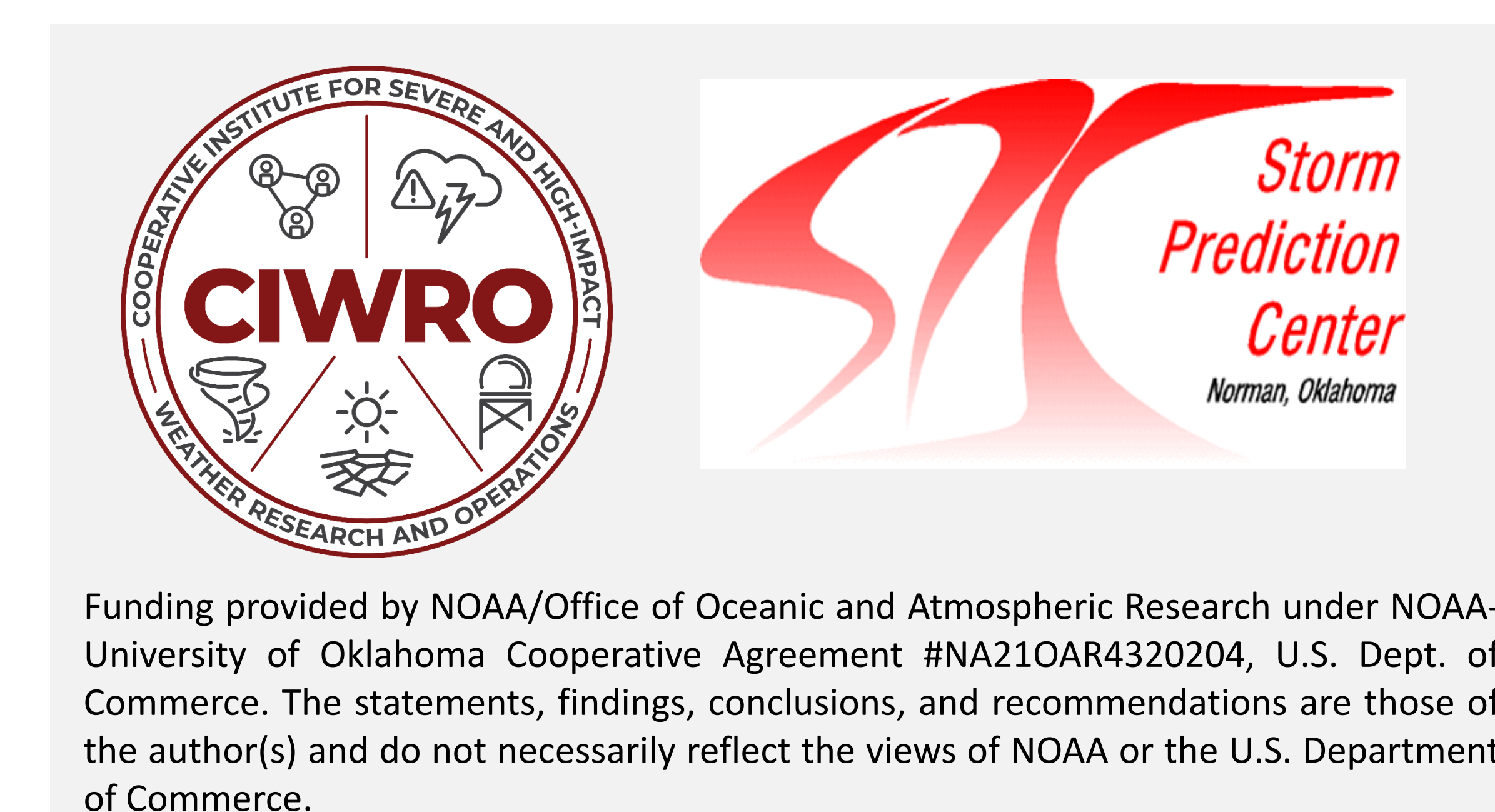
	Elevated	Critical	Extreme
Prob. > 2000 [acres/day]	0%	1.9%	13.0%
Prob. > 1000 [acres/day]	0.1%	17.1%	38.6%
Prob. > 500 [acres/day]	12.9%	43.3%	68.1%

	Elevated	Critical	Extreme
Prob. > \$20M	5.6%	8.9%	19.8%
Prob. > \$10M	15.8%	23.0%	45.1%
Prob. > \$5M	36.8%	48.0%	73.0%

	Elevated	Critical	Extreme
Prob. > 200 [people]	7.8%	8.4%	6.3%
Prob. > 100 [people]	20.0%	21.4%	17.4%
Prob. > 50 [people]	38.9%	41.1%	38.0%

Summary

- There is increased probability of higher fire spread rate with increased SPC outlook categorical risk.
- There is increased probability of higher projected cost with increased SPC outlook categorical risk.
- Peak personnel shifts per wildfire do not increase with higher SPC outlook categorical risk, likely due to an increase in number of events at higher categorical risk along with a finite number of personnel for deployment per wildfire.
- The cumulative distribution function curves provide guidance for anticipated fire spread rate and projected cost by forecasted outlook categorical risk.



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