Extremes in Fire – The Intersection of Climate, Fuels, and People

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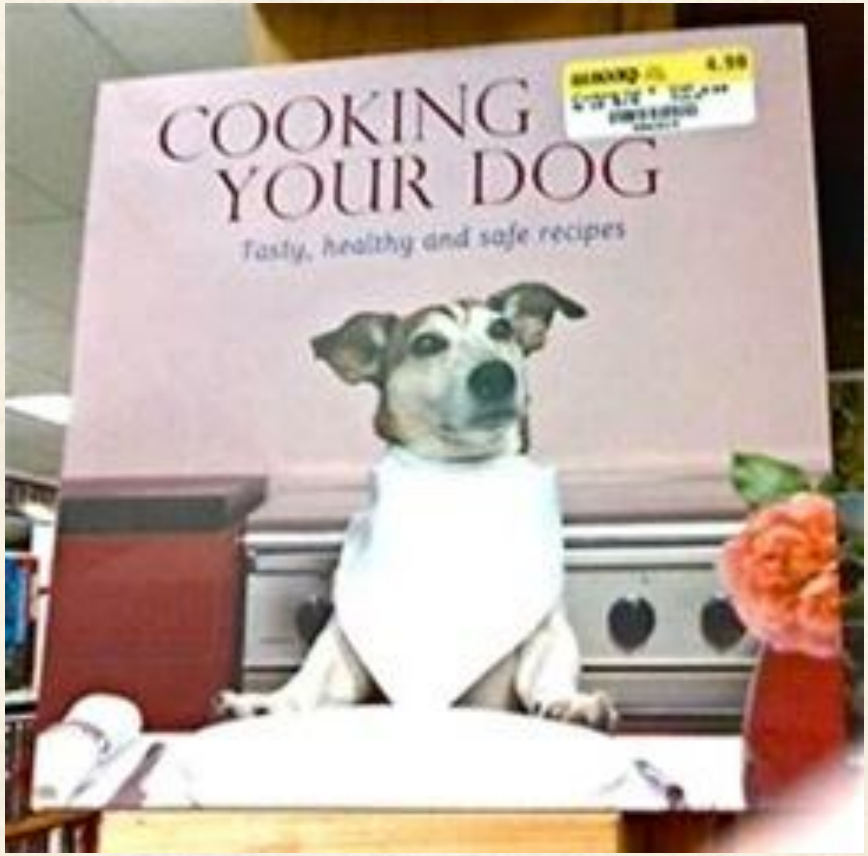
With support from Tim Sexton and the USFS RD&A Team

Wildland Fire Canada 2014 Halifax, NS 8 Oct 2014

Desert Research Institute

CLIMATE ECOSYSTEM FIRE APPLICATIONS

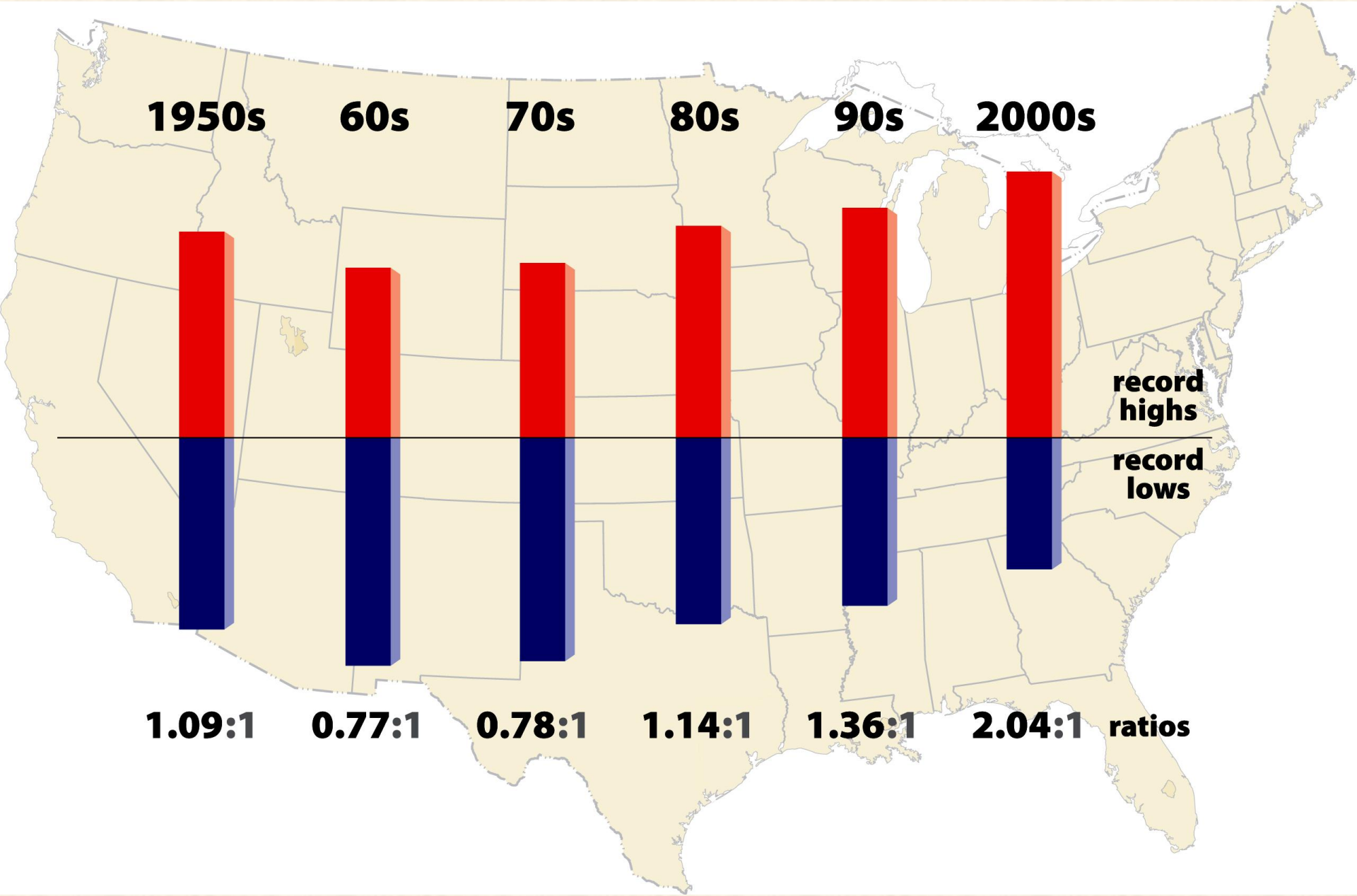


The need for complete information

Shaping factors of fire extremes

- Climate; weather extremes
- Historical management practices
- Current land use activities and expectations

Shaping factors of fire extremes - climate



Shaping factors of fire extremes - people

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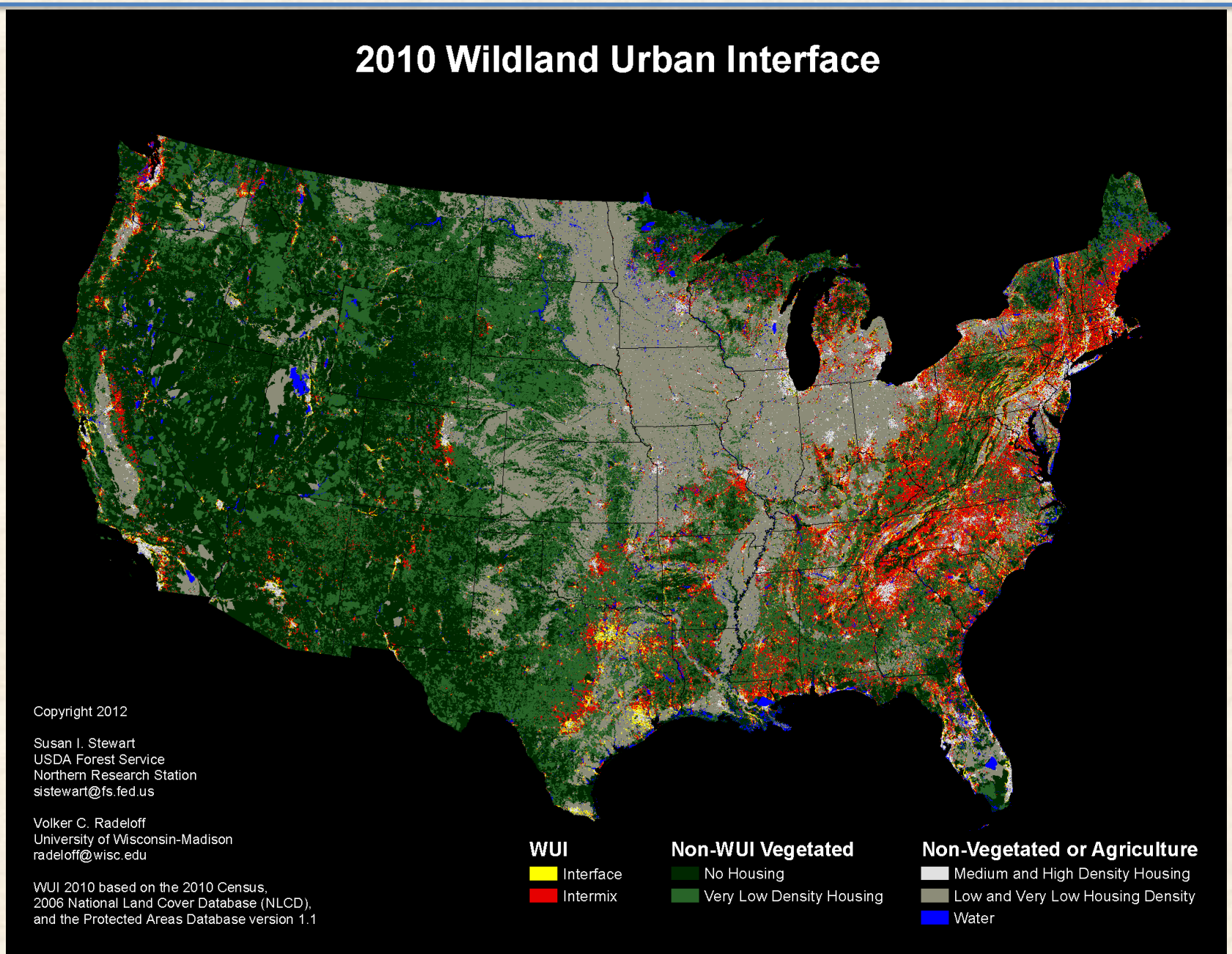
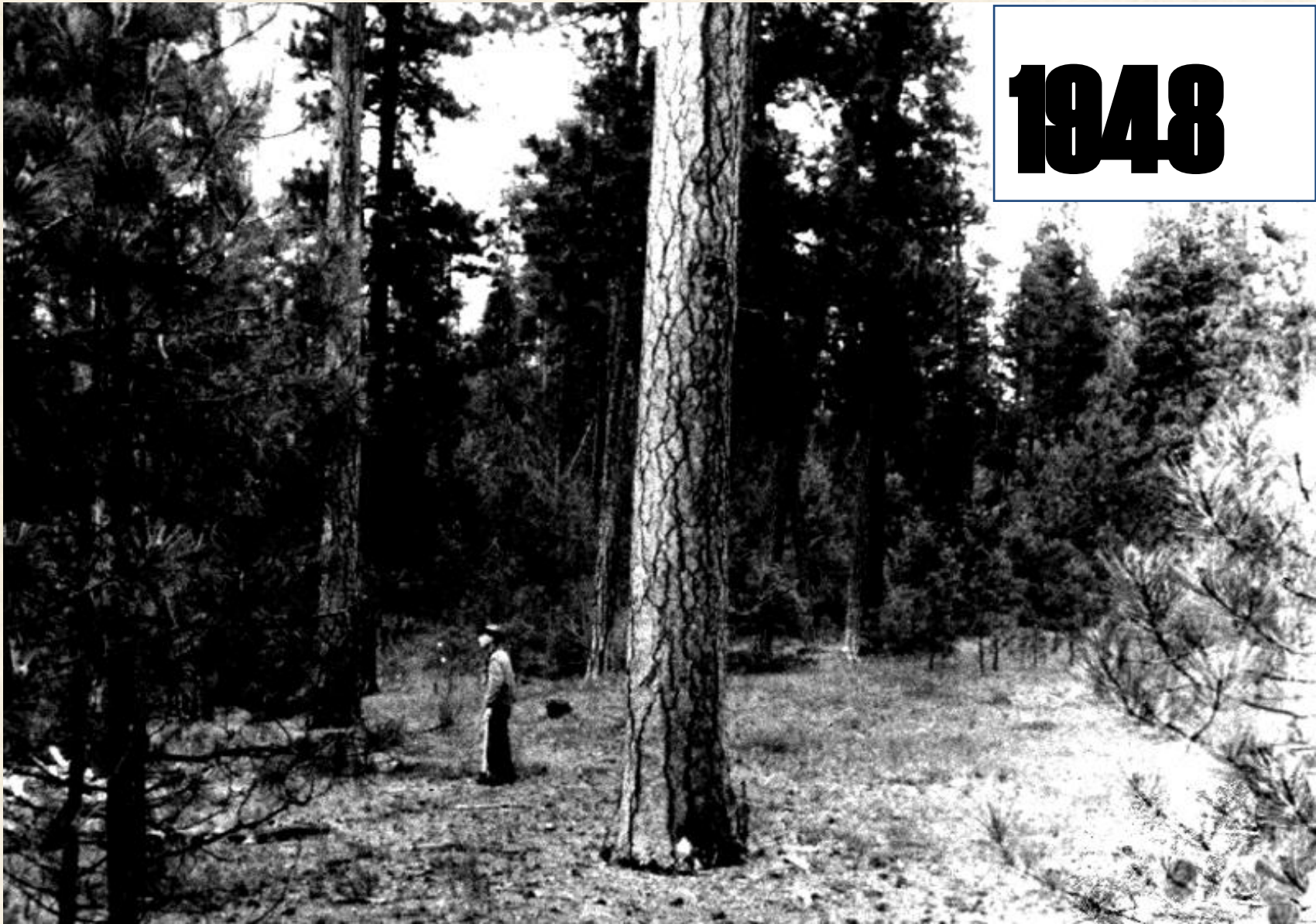


Shaping factors of fire extremes - fuels

Shaping factors of fire extremes - fuels



Shaping factors of fire extremes - fuels

Motivation

"I've never seen fire act like that before"

- Is wildfire behavior becoming more extreme (i.e., outside historical boundaries of extreme fire behavior?
- Should firefighters be surprised by "extreme" wildfire behavior (it is outside of historic behavior)?
- Are they surprised when maybe they should not be (a lack of situational awareness around specific climatological and fuel driven conditions)?
- Are wildland fire fighter perceptions of what is extreme wildfire behavior shifting?

Methodological Dilemma

- Defining what are extreme fires—in part biophysical data, but how to do so from human perspective—highly subjective
- Using traditional quantitative methodologies (i.e., survey techniques)
  - Capturing an adequate survey population/sample
  - Questions on the value of using a Likert type scale for this topic—issues of lack of context, opinion oriented

Methodological Dilemma

- Traditional qualitative methodologies (case studies, focus groups, interviews) also have limitations—how easily or **can** the data and conclusions be extrapolated beyond the events included in the study?

Methodology

An approach developed by Cognitive Edge, Sensemaker

- Sensemaker works by prompting people to tell a brief story or narrative, and then answer a series of questions about the context surrounding the story
- Data gathering can take several formats, but most efficient is use of web portal, smartphone or tablet app
- Sensemaker software can handle unlimited data points

Methodology

- The quantity of answers allow for quantitative and visual analysis of the data, and the ability to examine the original narrative for further contextual understanding
- Has the potential to provide sufficient data to offer explanatory power to identify trends across fire management agencies and geographies

Comparison of Approaches

Cognitive Edge

- Numbers have context
- Uses stories to elicit information
- Uses indirect questions to prompt stories
- Cognitive edge methods and tools look for patterns in stories and use visualization to present alternative and diverse points of view

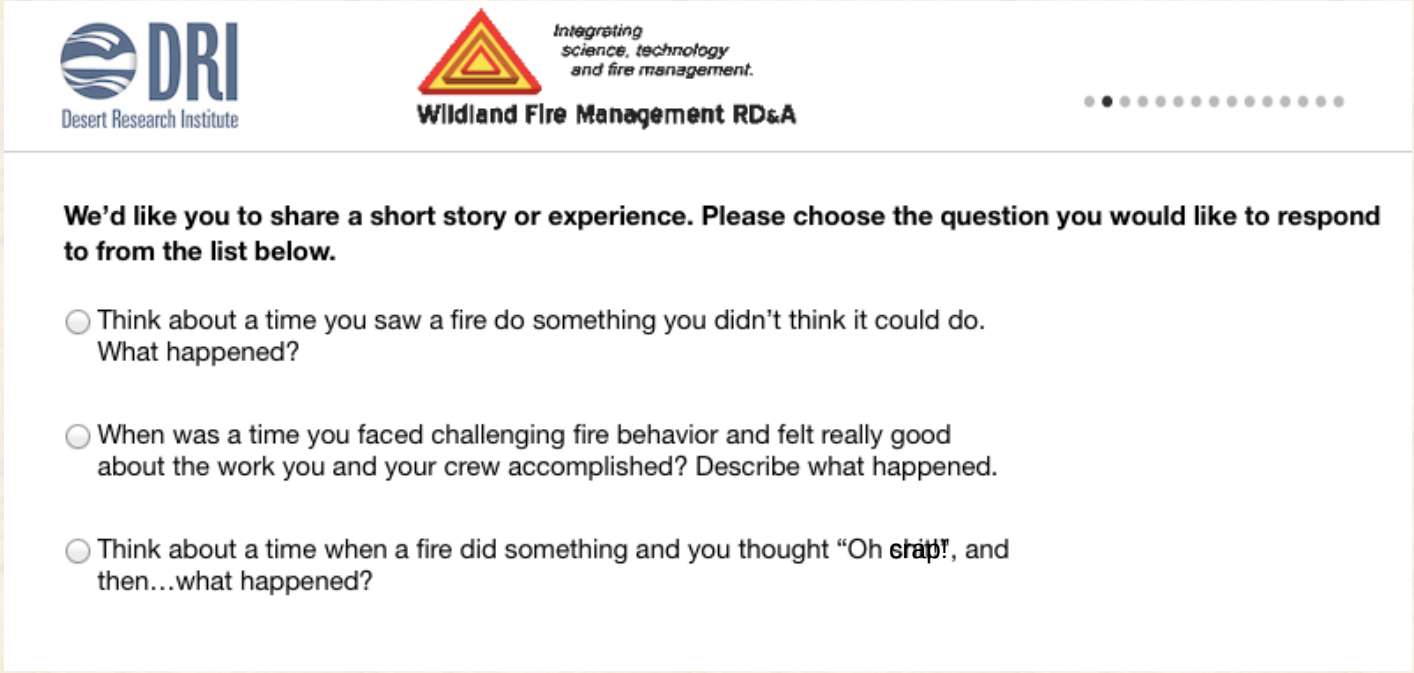
Survey Methods

- No context for stories
- Asks for opinions
- Uses direct questions that are often expected

(Adapted from cognitive edge materials)

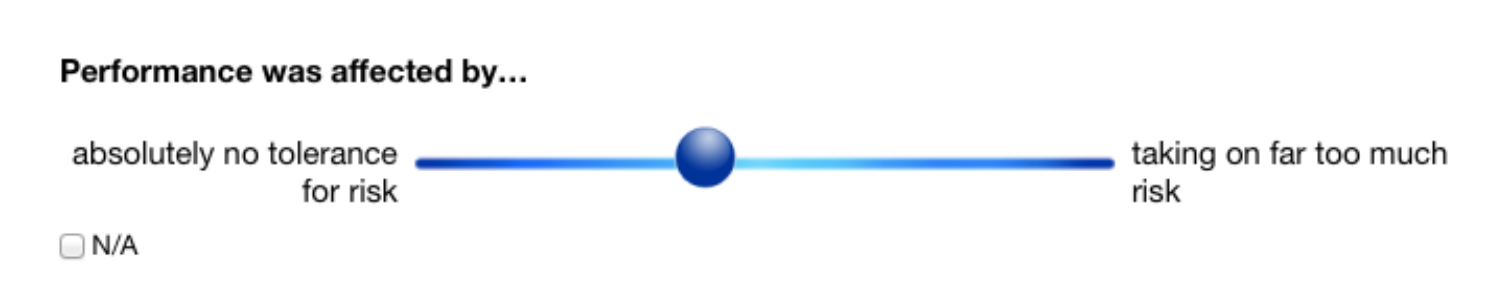
The Narrative

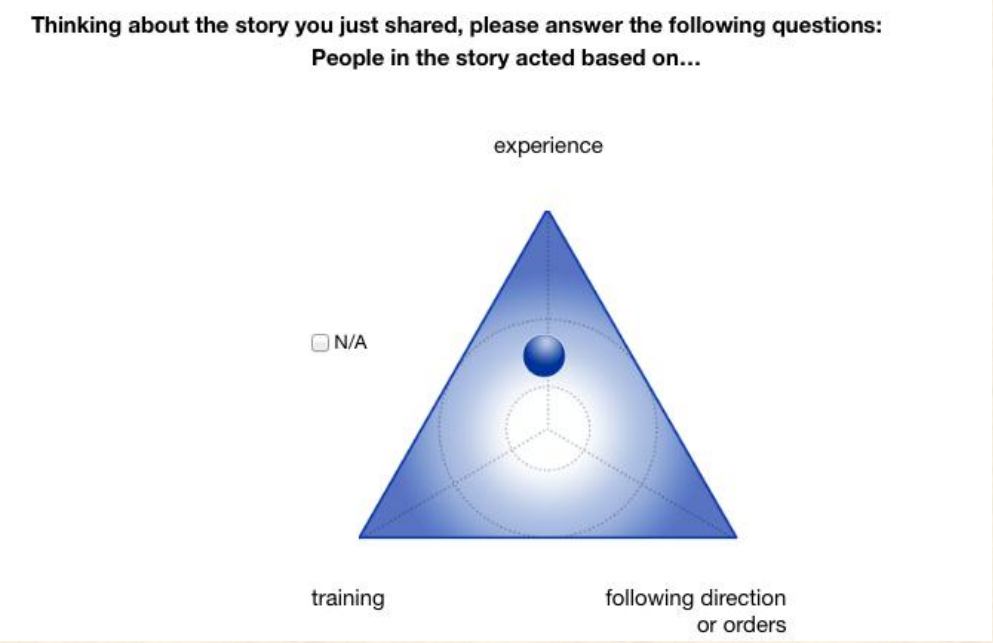
Signification Framework: NOT a survey— starts with micro-narrative story prompt:



The Narrative

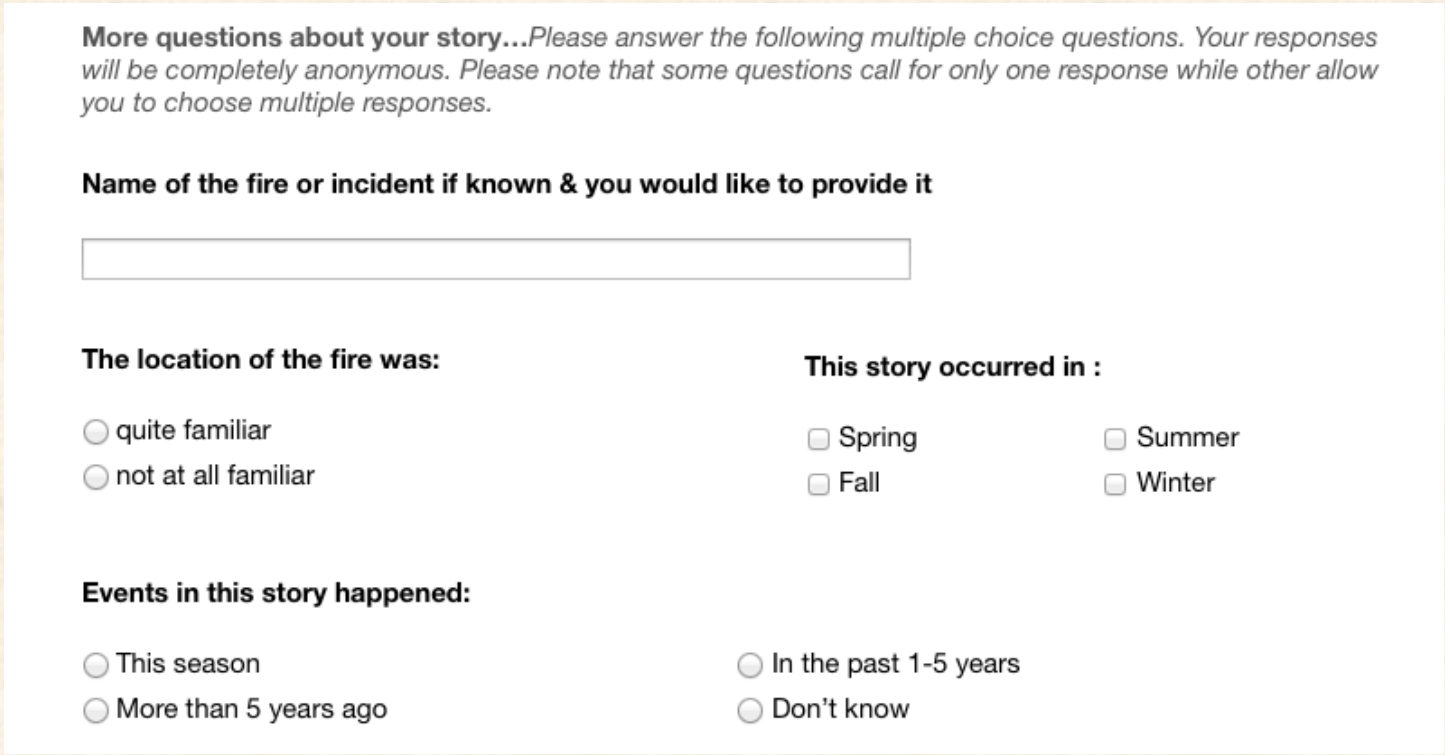
Signification Framework: Uses triads and dyad questions—not a scale.





The Narrative

Signification Framework: “sticky” questions to facilitate data analysis—visual and statistical.



More questions about your story…*Please answer the following multiple choice questions. Your responses will be completely anonymous. Please note that some questions call for only one response while other allow you to choose multiple responses.*

Name of the fire or incident if known & you would like to provide it

The location of the fire was:

- ○ quite familiar
- ○ not at all familiar

This story occurred in :

- ☐ Spring
- ☐ Summer
- ☐ Fall
- ☐ Winter

Events in this story happened:

- ○ This season
- ○ More than 5 years ago
- ○ In the past 1-5 years
- ○ Don’t know

The Narrative

Analysis

- Preliminary analysis will use visual graphics of the data and statistical correlational analysis.

(from Cognitive Edge materials)

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Themes of how these lessons are considered successful

e.g., Experience, training, command

(from Cognitive Edge materials)

Climate, weather and fuels

- Gather events/wildfires from firefighter accounts and FBAN narratives
  - Obtain dates, times, and locations
  - What happened of consequence?
- Gather data
  - In situ surface observations
  - Atmospheric gridded data
  - Fire danger (NFDRS)
  - Climate data (drought indices)

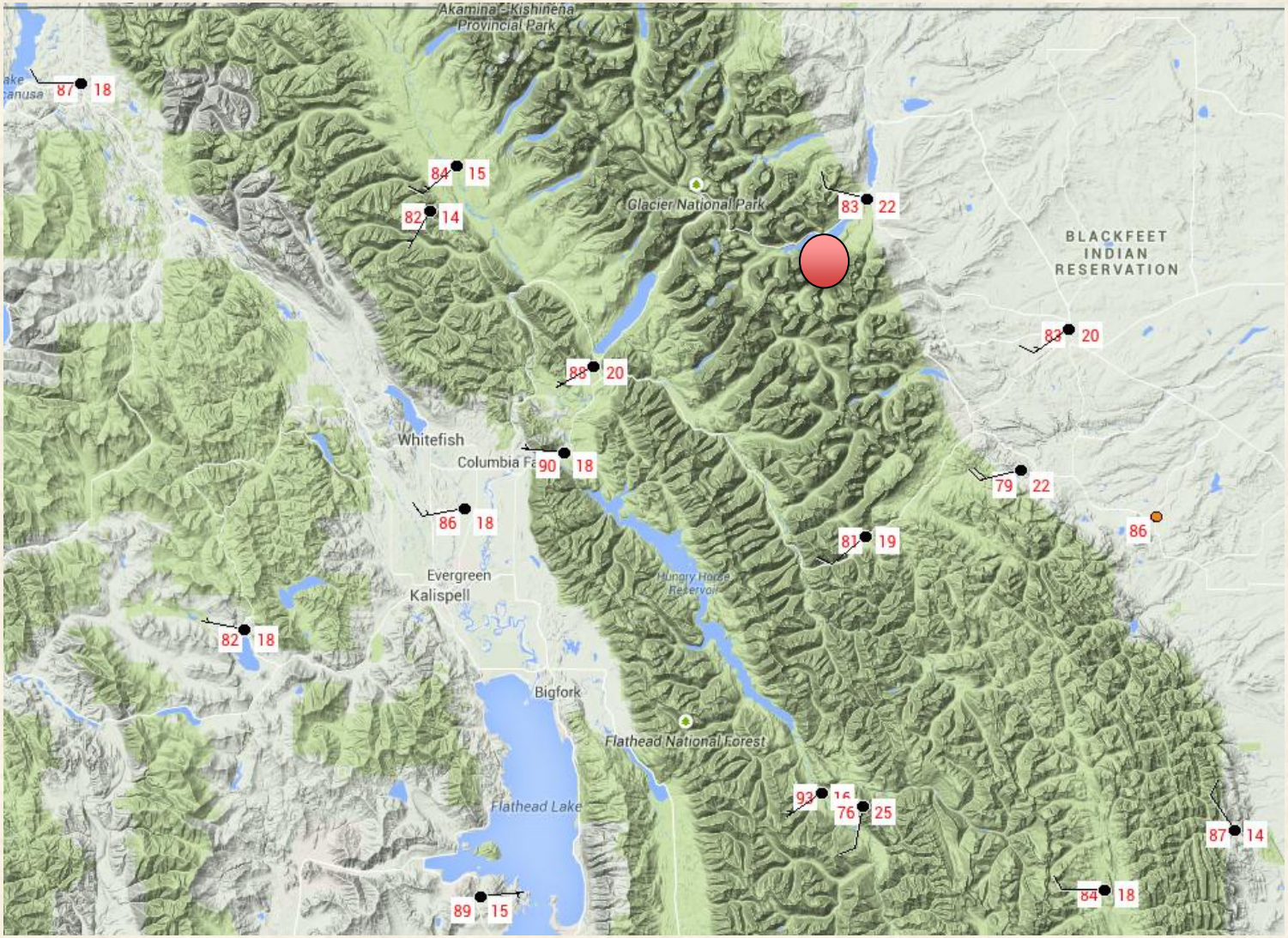
Climate, weather and fuels (example)

Eagle Ridge Fire July 28-31, 2006

- On east side of Glacier National Park, W/SW of St. Mary
- Made a significant run from evening of July 29 to morning of July 30, burning approximately 22,000 acres
- FBAN: good example of all factors within fire behavior triangle (fuels, weather, topography) aligning to create extreme fire behavior

Climate, weather and fuels (example)

Eagle Ridge fire 29 July 2006 23 UTC



Climate, weather and fuels (example)

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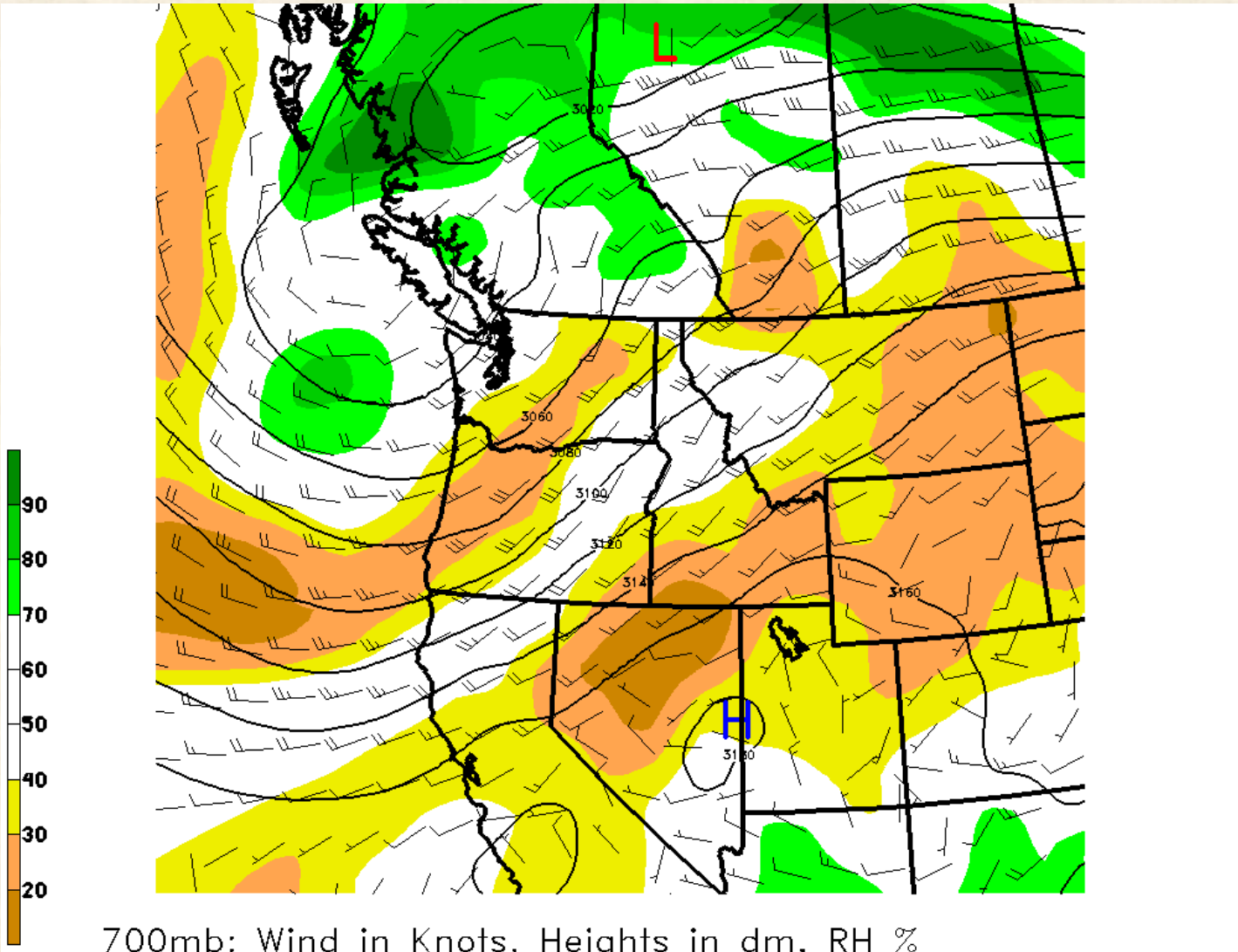
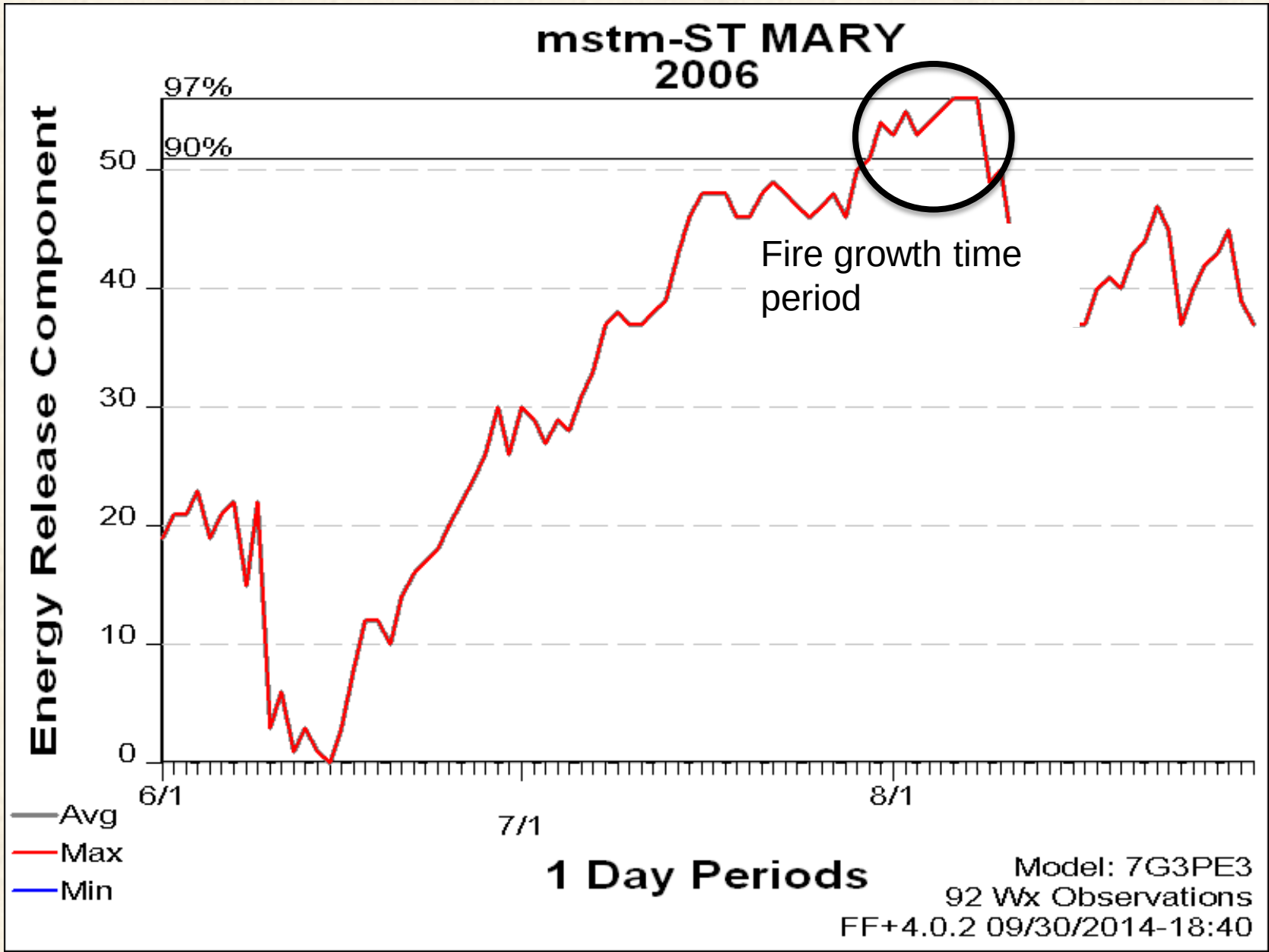
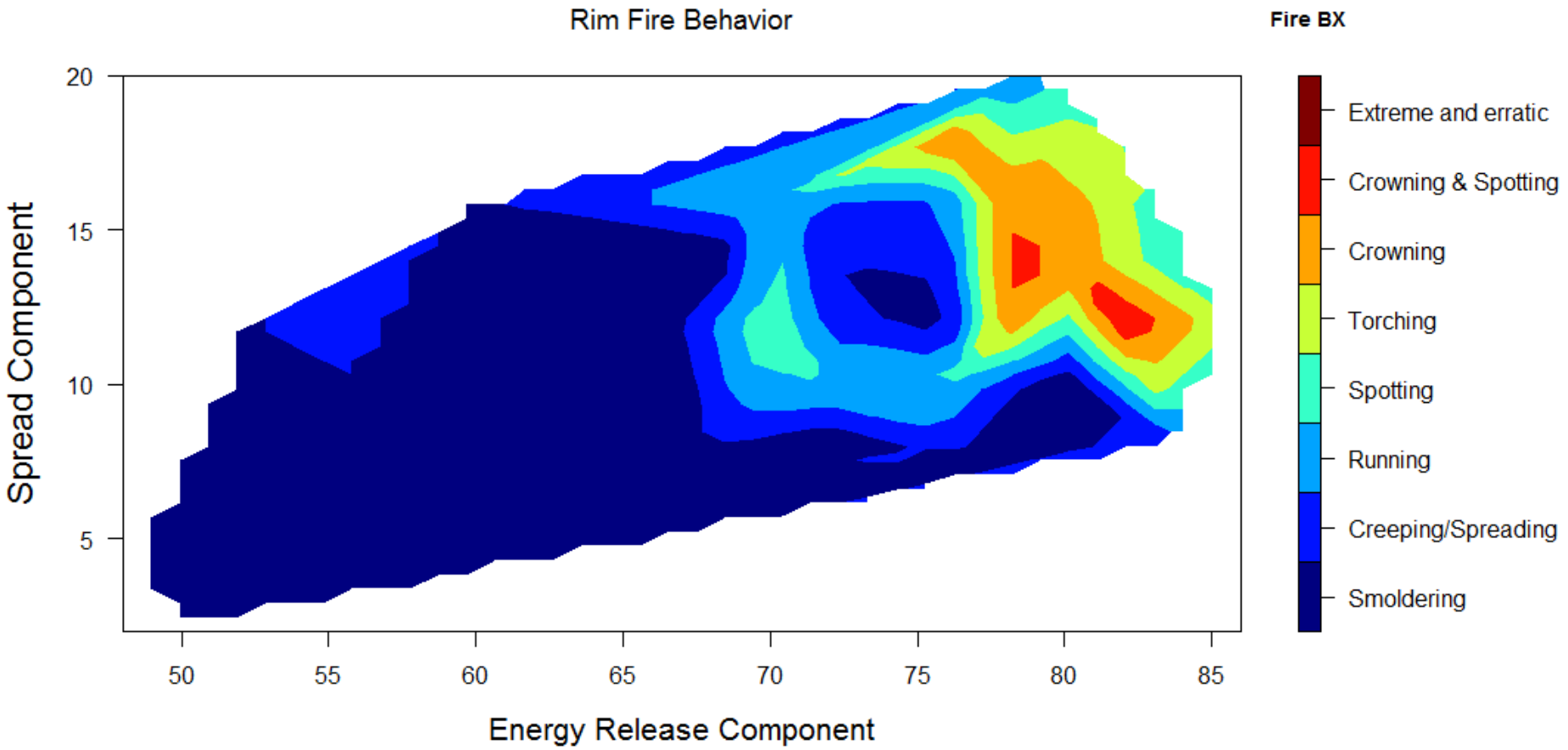


700mb: Wind in Knots, Heights in dm, RH %

Climate, weather and fuels (example)



Climate, weather and fuels (example)



Source: Matt Jolly, USFS

Current Project Status

- Preliminary question framework development and testing was completed in late June, 2014
- Data collection started in July 2014 and currently, is planned to continue until Nov. 30th, 2014
- Approximately 75-100 stories have been gathered using the data collection web portal and through individual collection, with a goal of 500 micro-stories
- On an individual level, there has been a great deal of interest and support in the wildland fire community

Current Project Status

- Workshop with wildfire experts will assess preliminary data and develop narrative for trends and relevant findings in January/February 2015
- Final report will all assess use of methodology in the fire community, Spring 2015

Cheers From Reno!

Fire near Tim's house