EP Curves to Help Inform Prioritization (Experimental)

- An exceedance probability (EP) graph allows you to compare fires relative to one another using the DRAFT August 2017 PNW quantitative wildfire risk assessment combined with an FSPro run.
- From the risk assessment, we obtain a location and list of values that warrant protection (i.e., highly valued resources and assets [HVRAs]).
- FSPro tells us what is the probability of a fire reaching the HVRAs within a given time (e.g., 7 days).
- This product can be used by a local unit (e.g., Umpqua NF), area command, GACC, MAC, and Region to help inform execs and prioritization.

- For feedback or questions contact Rick Stratton (rdstratton@fs.fed.us)

*special thanks to Brian Maier (OWF), Jim Edmonds (SORO), and Joe Scott (Pyrologix)

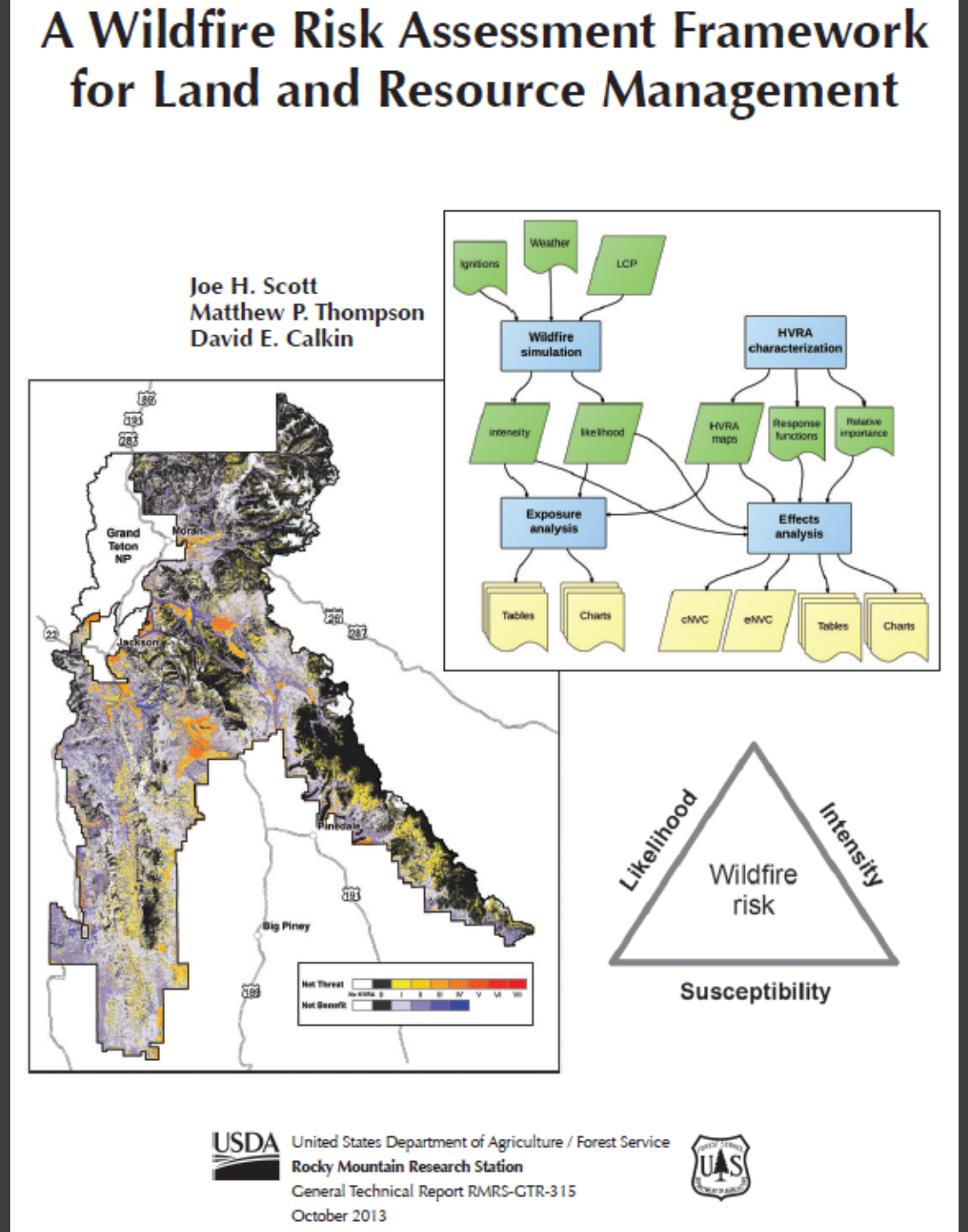
RMAT
RISK MANAGEMENT ASSISTANCE TEAM

Background: What is risk and why use analytics?

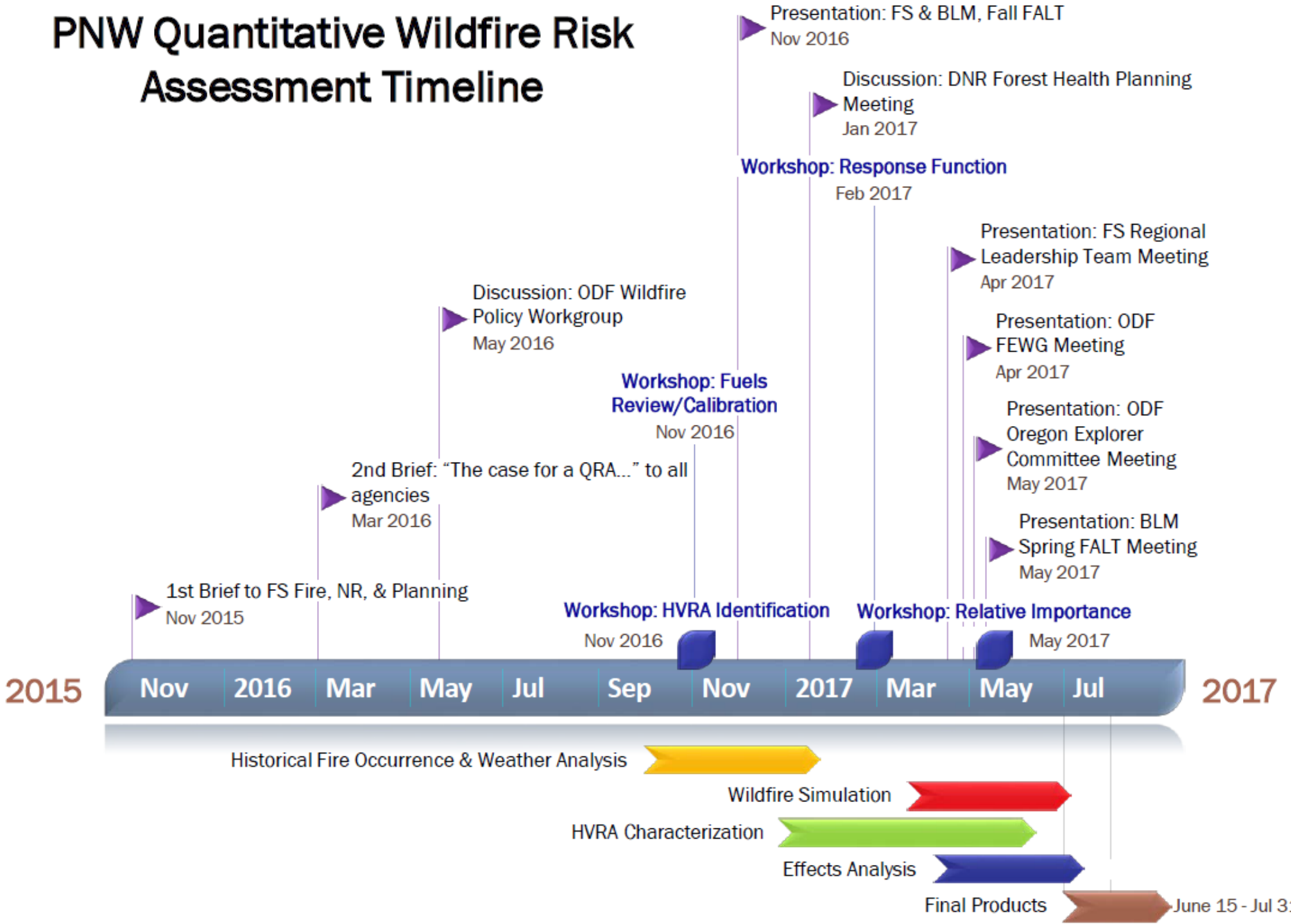
- Risk = probability x consequence (loss or benefit)
- "Sound risk management is a foundation for all fire management activities"*
  - 1995 FWFM & Program Review*
  - 2009 Wildland Fire Policy
  - National Cohesive Strategy
  - U.S Forest Service FSM 5100
  - BLM Manual Section 9211
- 2017 Direction to Wildland Fire Leadership from Secretary of Agriculture & Interior to the 5 Federal Agencies:

> We will also continue to integrate science and technology into all of our firefighting and to capitalize on other advancements to better inform and support our firefighting capabilities.

- The PNW risk assessment is based on Joe Scott's framework GTR (2013).
- Three of the foundational goals of PNW risk assessment were to be (1) all lands, (2) an interagency effort, and (3) produce a product that would be immediately used in planning and large fire support.



PNW Quantitative Wildfire Risk Assessment Timeline

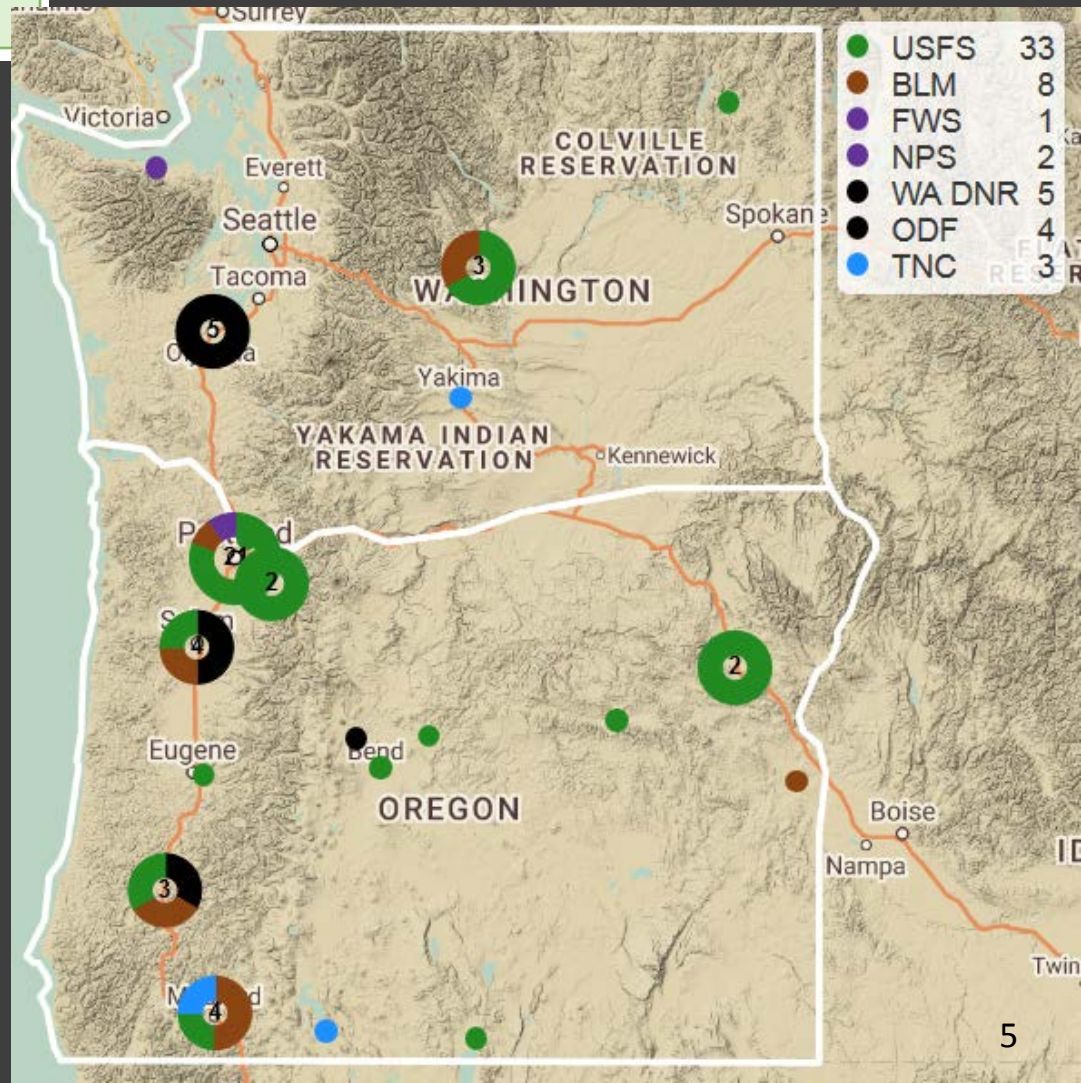


- ✓ **Fuel Data Review (LANDFIRE 2014): Nov. 2-3, 2016**
- ✓ **Highly Valued Resources & Assets (HVRA): Nov. 4, 2016**
- ✓ **Response Functions (response of values to fire, both positive & negative): Feb 27- March 1, 2017**
- ✓ **Relative Importance Ranking (Line officers & a few key resource specialists): May 16, 2017**

4 Workshops held; ALL attendee locations shown below

Fuels Calibration Workshop Attendees (Nov. 2-3, 2016)

Name	Position	Agency
Jena Volpe	Fire Ecologist	BLM
Todd Gregory	AFMO OPS	BLM
Mike Powell	Fire Analyst	NPS
Todd Rankin	FMO	NPS
Boone Zimmerlee	Stewardship Forester	ODF
Teresa Z Alcock	Fire Program Analyst	ODF
Pat Skrip	Staff Forester	ODF / DFPA
Julie Gilbertson-Day	Spatial Analyst	Pyrologix
Joe Scott	Owner	Pyrologix
Brett Fay	Regional Fire Director	US Fish and Wildlife Service
Morgan Pence	Sub regional fire planner	USFS
Rick Stratton	SORO Fire Planner	USFS
Dana Skelly	Deputy Fire Staff-Fuels	USFS
Ben Curtis	Deputy Fire Staff Officer	USFS
Steve Ziel	FBAN	USFS
Alex Enna	Forest Fuels Program Manager (Detailed)	USFS
Mark Johnson	Fire Planner	USFS
Justin Sharpe	Fire Planner	USFS
Clint Albertson	Fire Planner	USFS
Brian Maier	fire planner	USFS
Maximillian Wahlberg	Regional Analyst	USFS Regional Office
Aleksandar Dozic	GIS	WADNR
David Grant	Fire Regulations specialist	WADNR



PNW QWRA Highly Valued Resources & Assets (6-3-2017)

Assets

Human habitation
Communication sites
Transmission lines, high and low voltage
Railroads
Interstates and state highways
Recreation, high and low development
Ski areas
Historic structures
Seed orchards
Sawmills

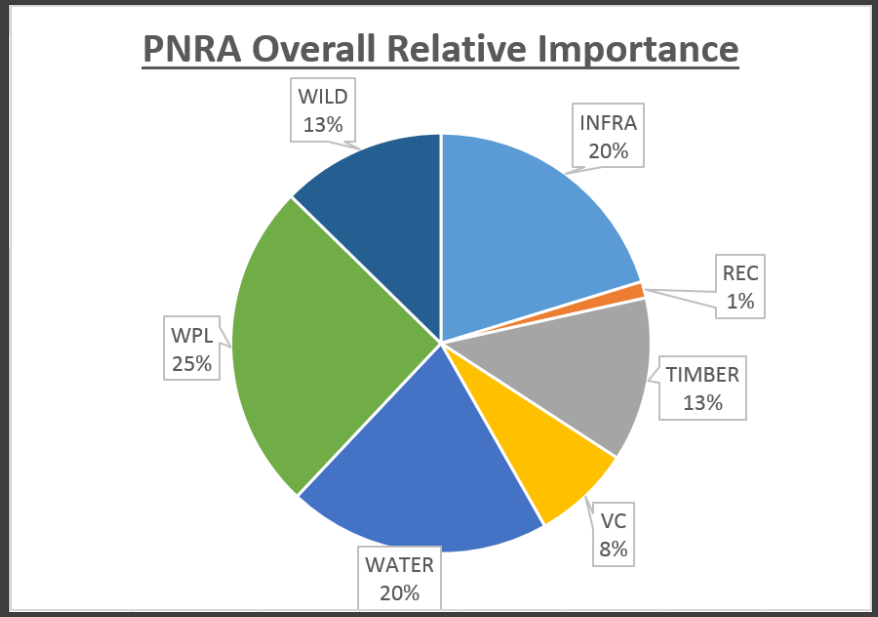
Resources

Timber
Municipal watersheds
Vegetation departure
Bull trout
Chinook and Coho Salmon
Steelhead
Marbled Murrelet
Northern spotted owl
Sage grouse

- Each of these HVRAs respond differently to fire, some positively and others negatively. Response functions are developed by resource specialists, range from -100 (very negative) to +100, and by flame length (FIL1 = 0 to 2 ft., FIL2 = 2 to 4ft., etc.).

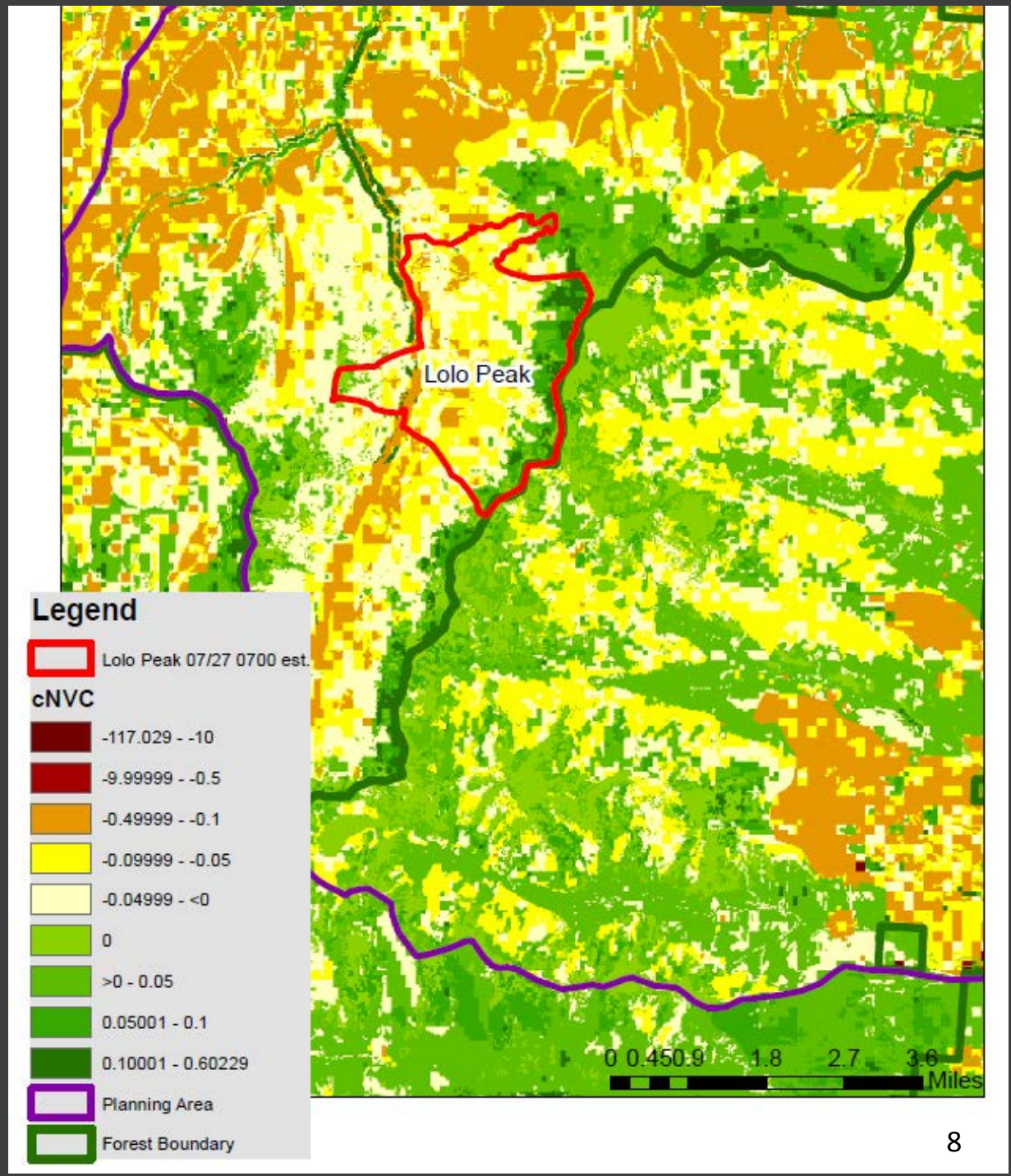
HVRA	Sub-HVRA	Covariate	FIL1	FIL2	FIL3	FIL4	FIL5	FIL6	spark
INFRA	Cell towers		-10	-20	-40	-60	-80	-90	
INFRA	Electric transmission lines		20	20	0	-20	-60	-80	
INFRA	FS Repeaters		-10	-20	-40	-60	-80	-90	
INFRA	Wooden bridges		-40	-50	-60	-70	-80	-90	
INFRA	Other comm sites		-10	-20	-40	-60	-80	-90	

- All HVRAs were assigned a relative importance by an interagency group of line officers and weighted by abundance.



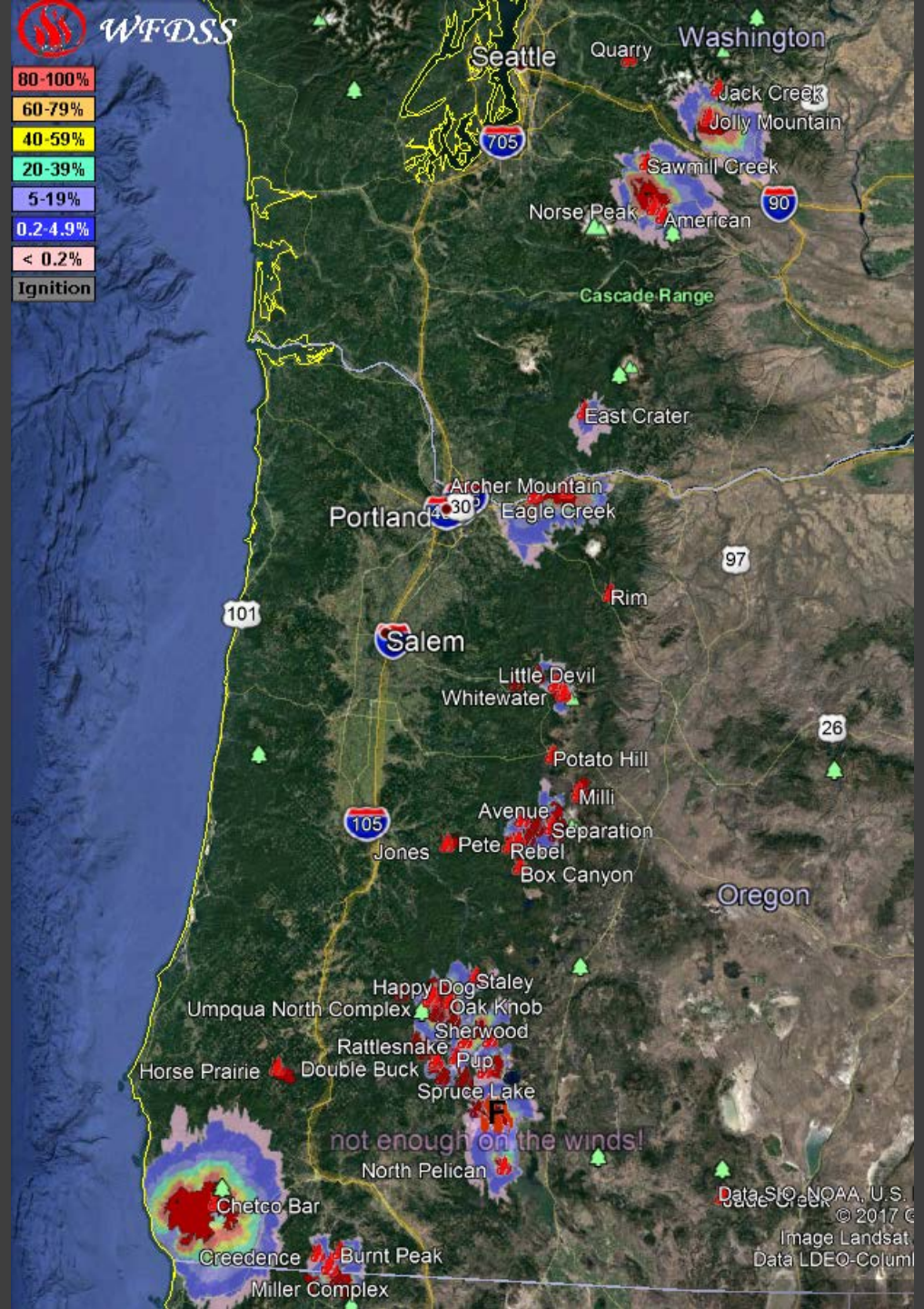
Conditional net value change (cNVC)

- This is THE risk map from a regional risk assessment in R1; it displays a single color at each pixel representing if the cell burns what the consequence would be—a benefit or loss.
- A positive change is in green (benefit);
- A negative change is in yellow, orange, or red (loss).
- The colors are an aggregate of ALL assets and resources and their response to a distribution of flame lengths from millions of large fires over tens of thousands of fire seasons.

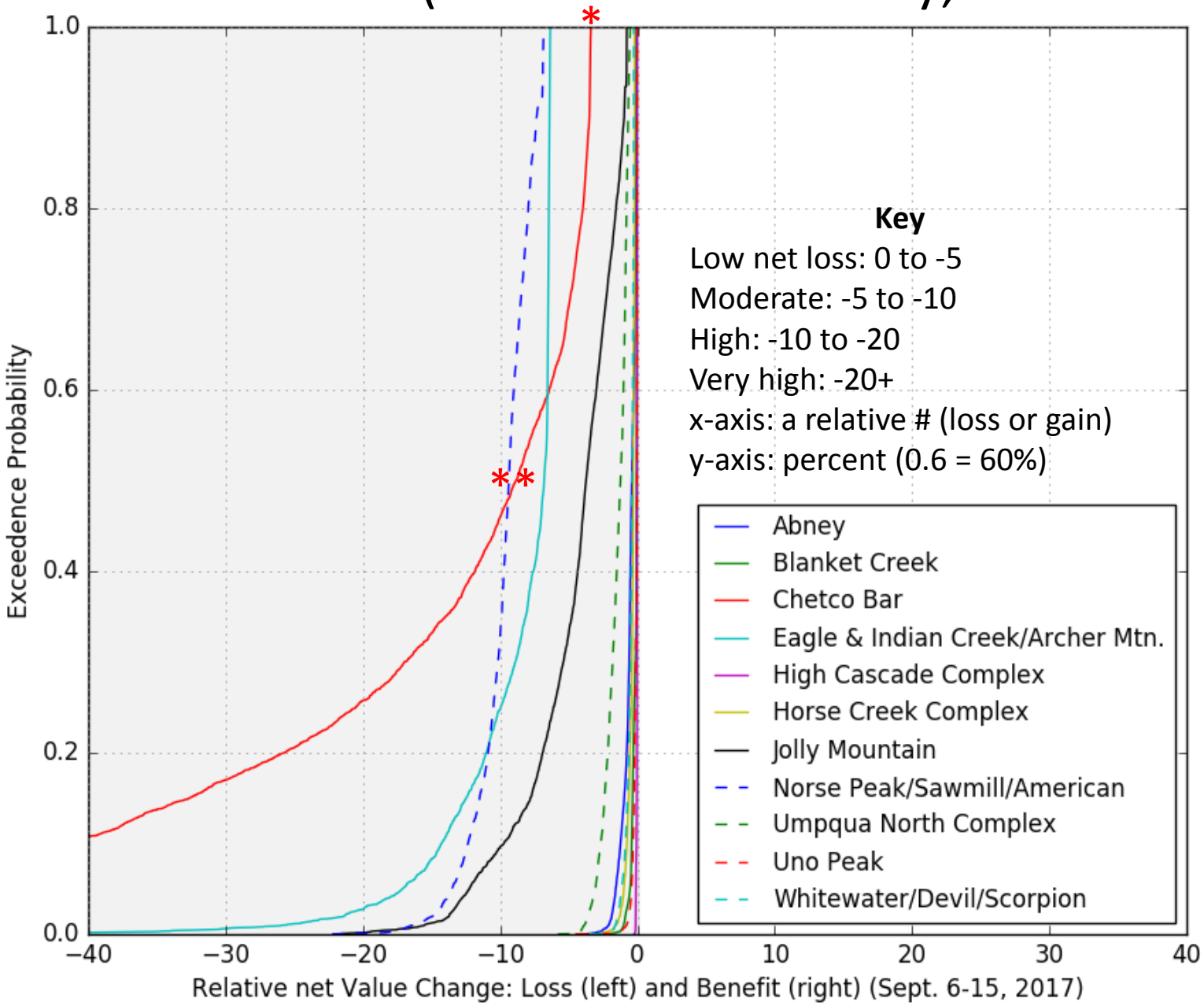


FSPro (Fire Spread Probability)

- 10-day run (Sept. 6-15)
- 4 days of forecast (includes the cooler temps, higher RHs, and possible precip)
- 3,000 fires modeled from last know position of the fire (from IR flight or satellite)
- 8 analysts
- ~25 fires simulated
- Includes previous fires & current containment lines
- For each of the 3K fires an overall cNVC is calculated for each ending perimeter and fire; then it is graphed.
- Assumes NO SUPPRESSION



Relative net Loss (Assets & Timber only; Scaled to 40)



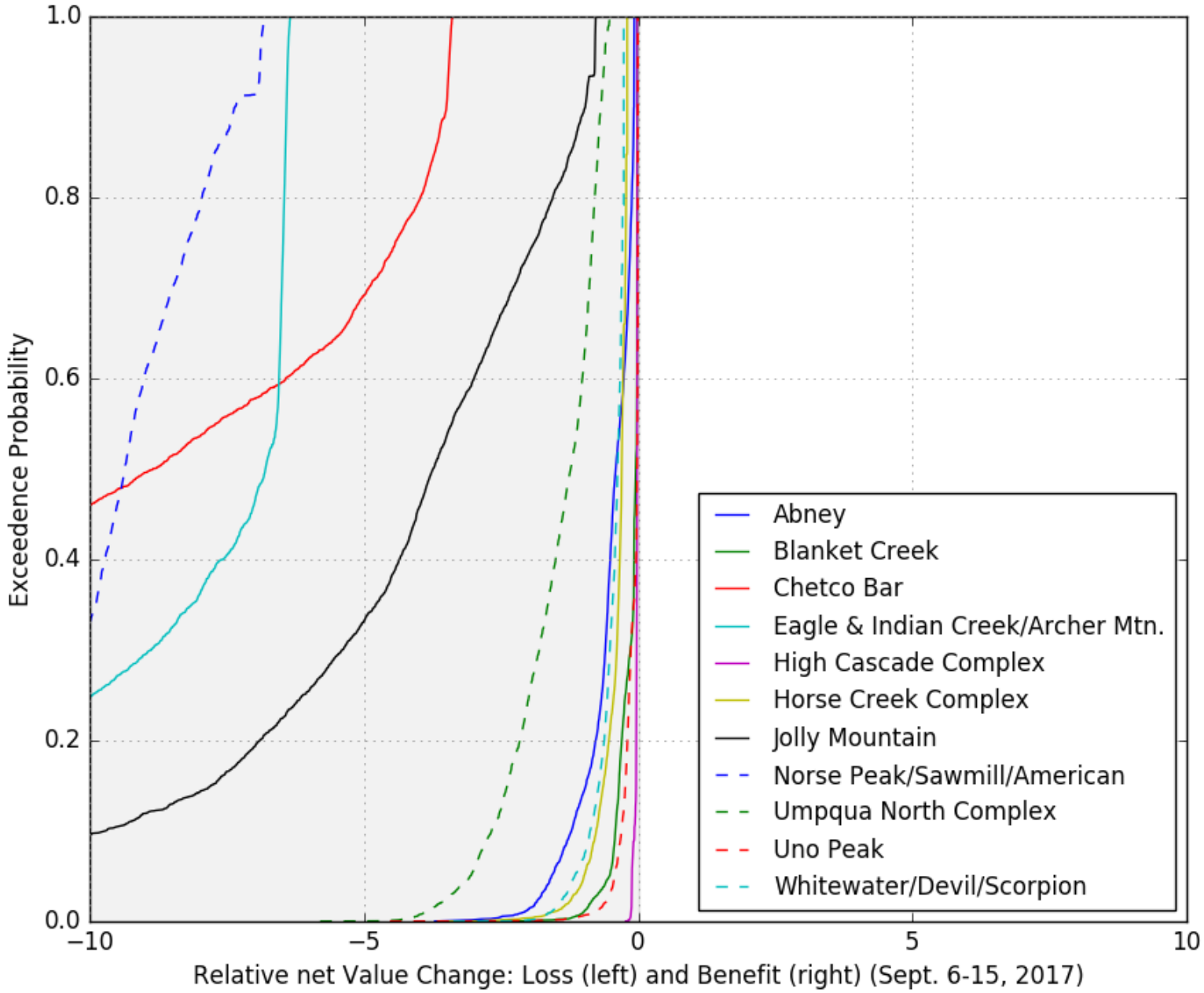
How to interpret the curves

- First, a NET + response is on the right and a net negative is on the left. That does not mean there are some benefits on the fire—just that the OVERALL net outcome is negative. Since most assets and timber respond *negatively* to fire, all of the curves are on the left (a loss).

- Start here*, note Norse Peak and Eagle Creek have the highest immediate probability for loss. HOWEVER, see how Chetco exceeds both of these fires eventually and goes on to have a VERY negative let loss? (an example of a low probability, high consequence outcome). These tails are those blue and pink bands on the FSPro runs (i.e., the rare events).

- Chetco Bar is predicted to be 100% mildly negative, but the loss doubles at about 50% (-2.5 vs. -5)**—so the likelihood of Chetco exceeding a value of -10 is 50%, or saying it a different way, in the next 10-days there is a 50/50 chance Chetco will realize a high net loss.

Relative net Loss (Assets & Timber only; Scaled to 10)



EP Curve Ranking

- Priority based on predicted OVERALL net loss to ASSETS and TIMBER for the next 10 days.

1. Chetco Bar
2. Eagle & Indian Creek/Archer Mtn.
3. Norse Peak/American/Sawmill
4. Jolly Mountain
5. Umpqua North Complex
6. Abney, Whitewater/Devil/Scorpion, and Horse Creek Complex
7. Uno, Blanket, and High Cascade Complex