

Work of Wildfires Rapid Assessment 2021 Wildfires in Eastern Washington



Planning, Science, & Monitoring Section
Wildland Fire Advisory Committee | April 21, 2022



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Work of Wildfire Rapid Assessment Protocol

First all lands effort to quantify the work of wildfire across eastern WA in the context of the 20-Year Plan.

2021 pilot objectives:

- Assess the effects of wildfires on forest health and treatment need. Update landscape evaluations in DNR 20 YP planning areas.
- Evaluate relationships between wildfires and past treatments.
- Assess how fire managers utilized treatments to manage wildfires.
- Synthesize key lessons from the 2021 fire season with partners.

Build off existing efforts & programs: USFS, NPS, others



Work of Wildfire

Definition: The degree to which fire effects are consistent with science-based landscape resilience and wildfire risk reduction objectives.

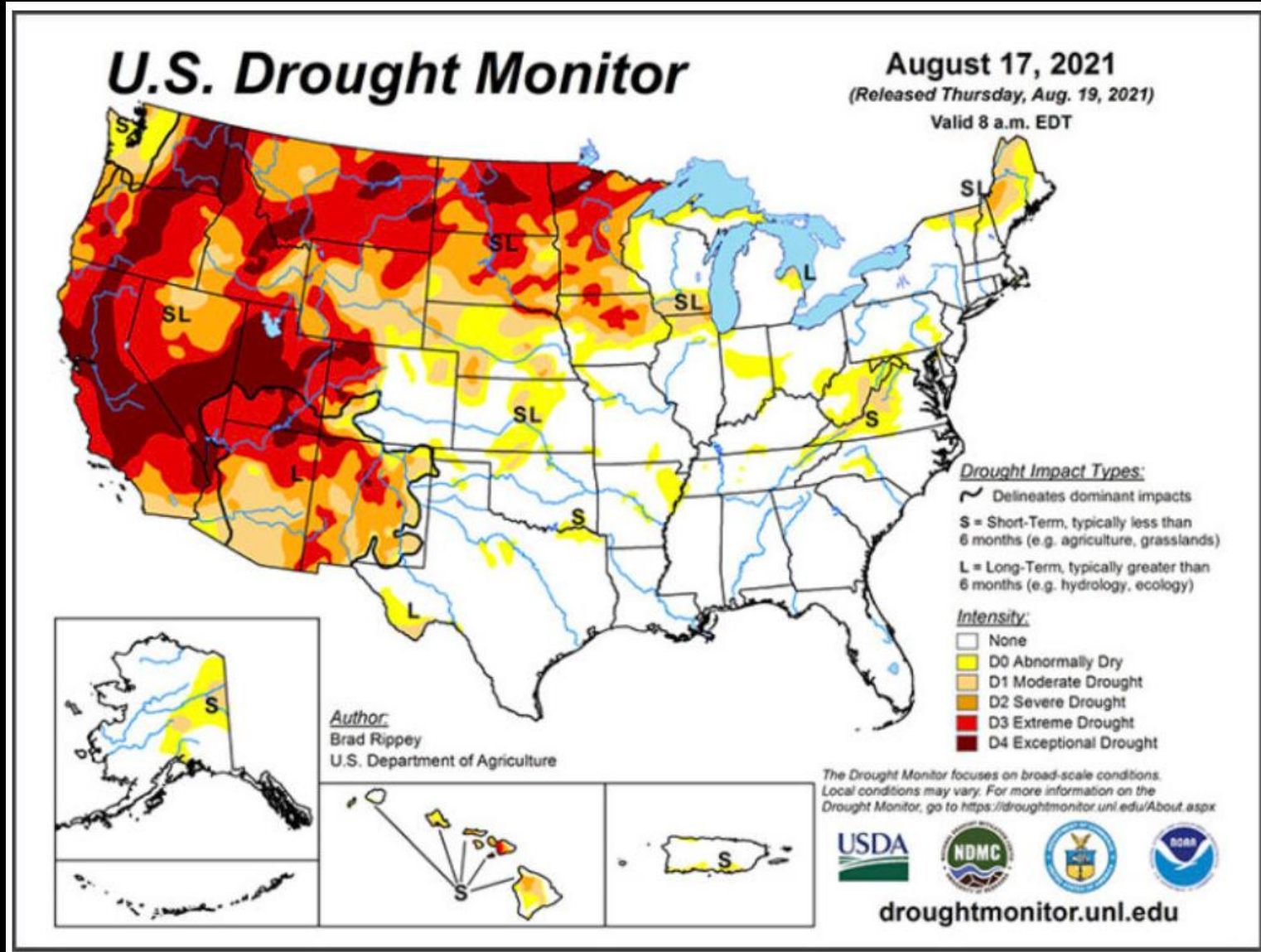
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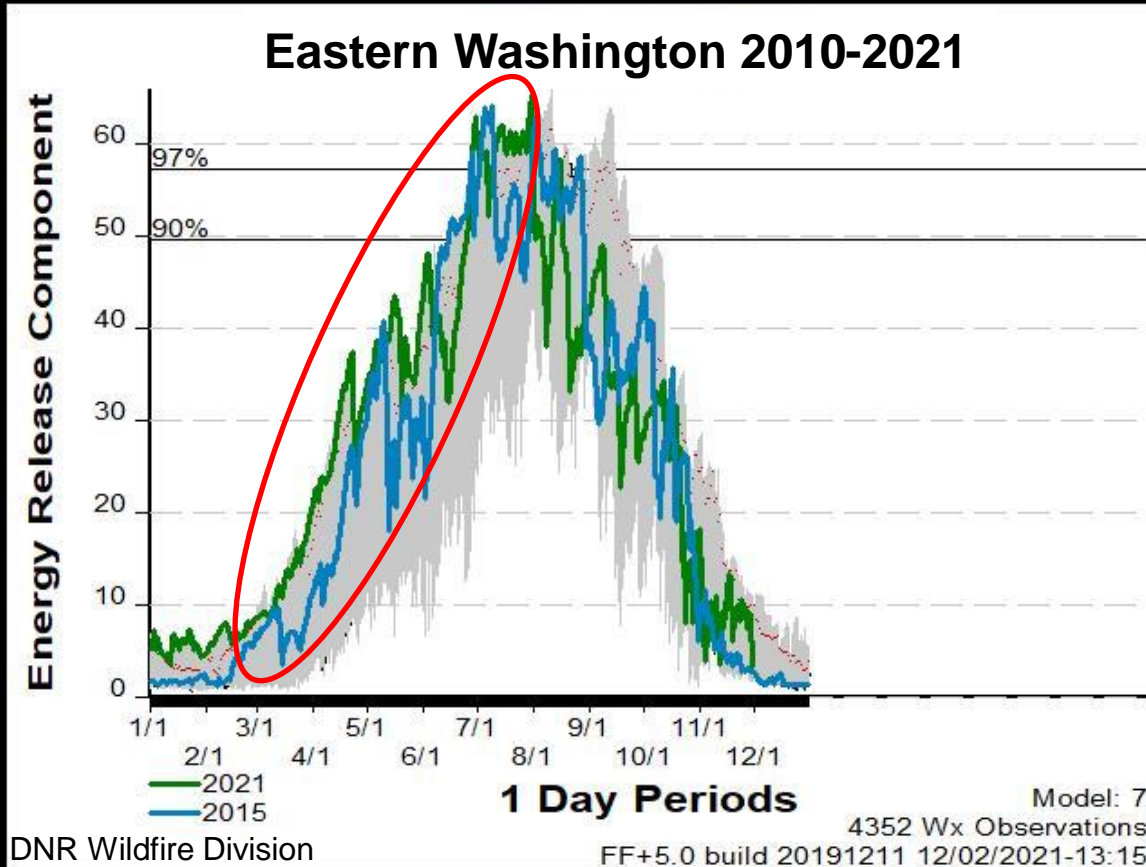


Challenges of the 2021 Fire Year



Challenges of the 2021 Fire Year

(Fire Danger Index)



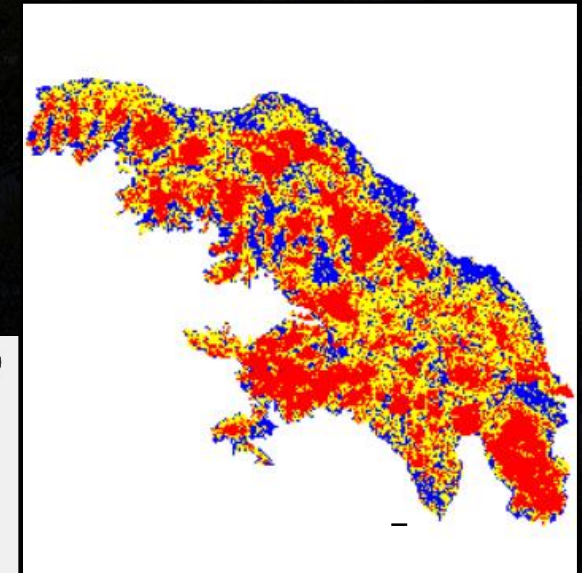
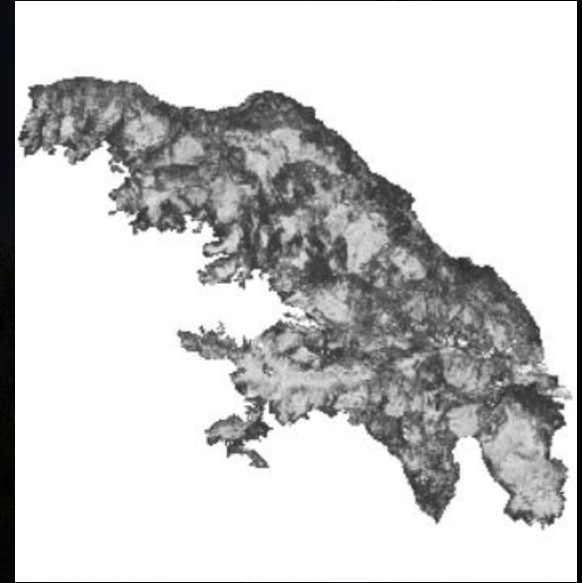
- Exceptional drought throughout the fire season.
- Widespread impacts on air quality, evacuations, and economy.
- Maxed out suppression resources and COVID challenges.

Courtesy Vaughn Cork, WA DNR

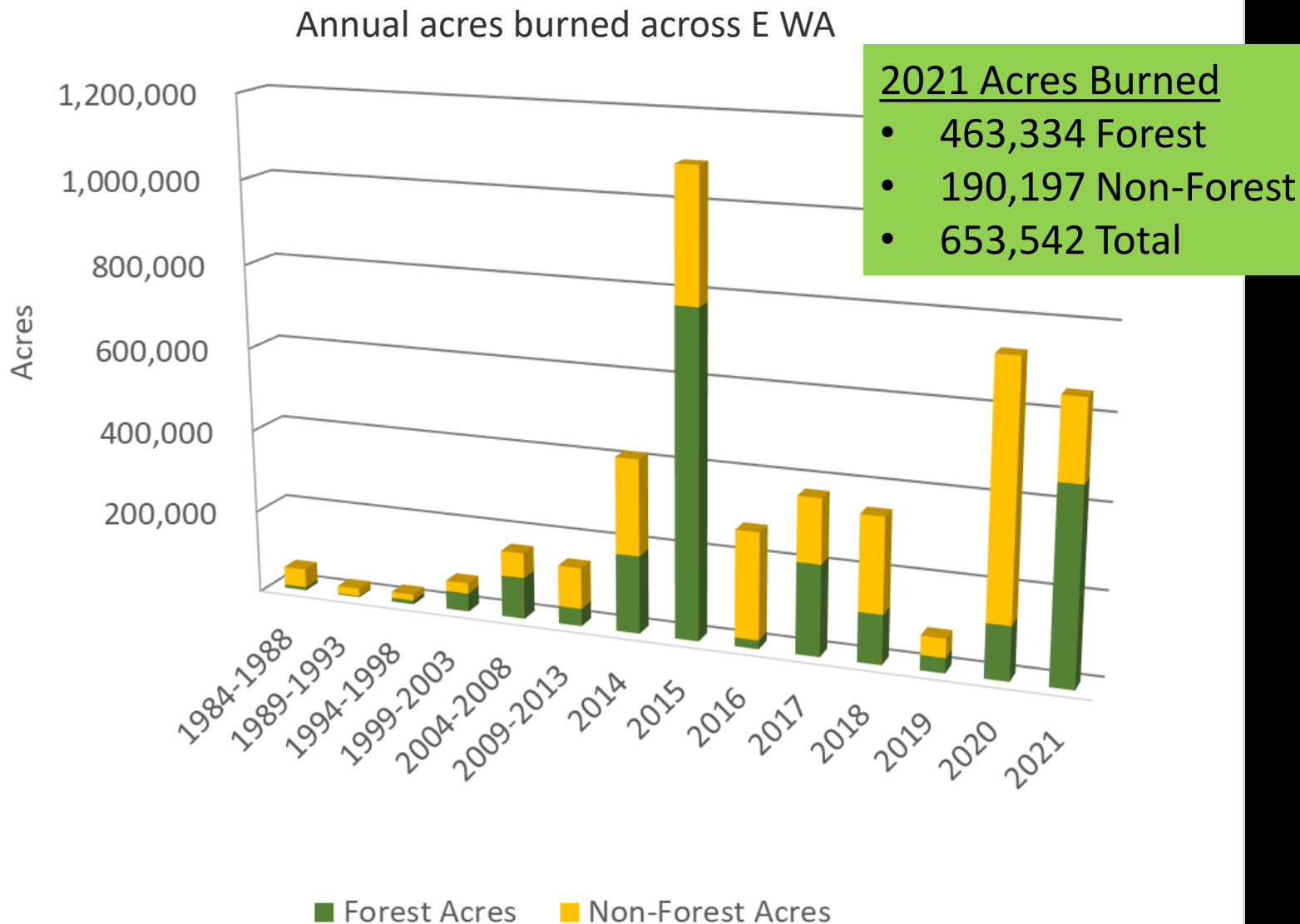


Fire Severity Mapping

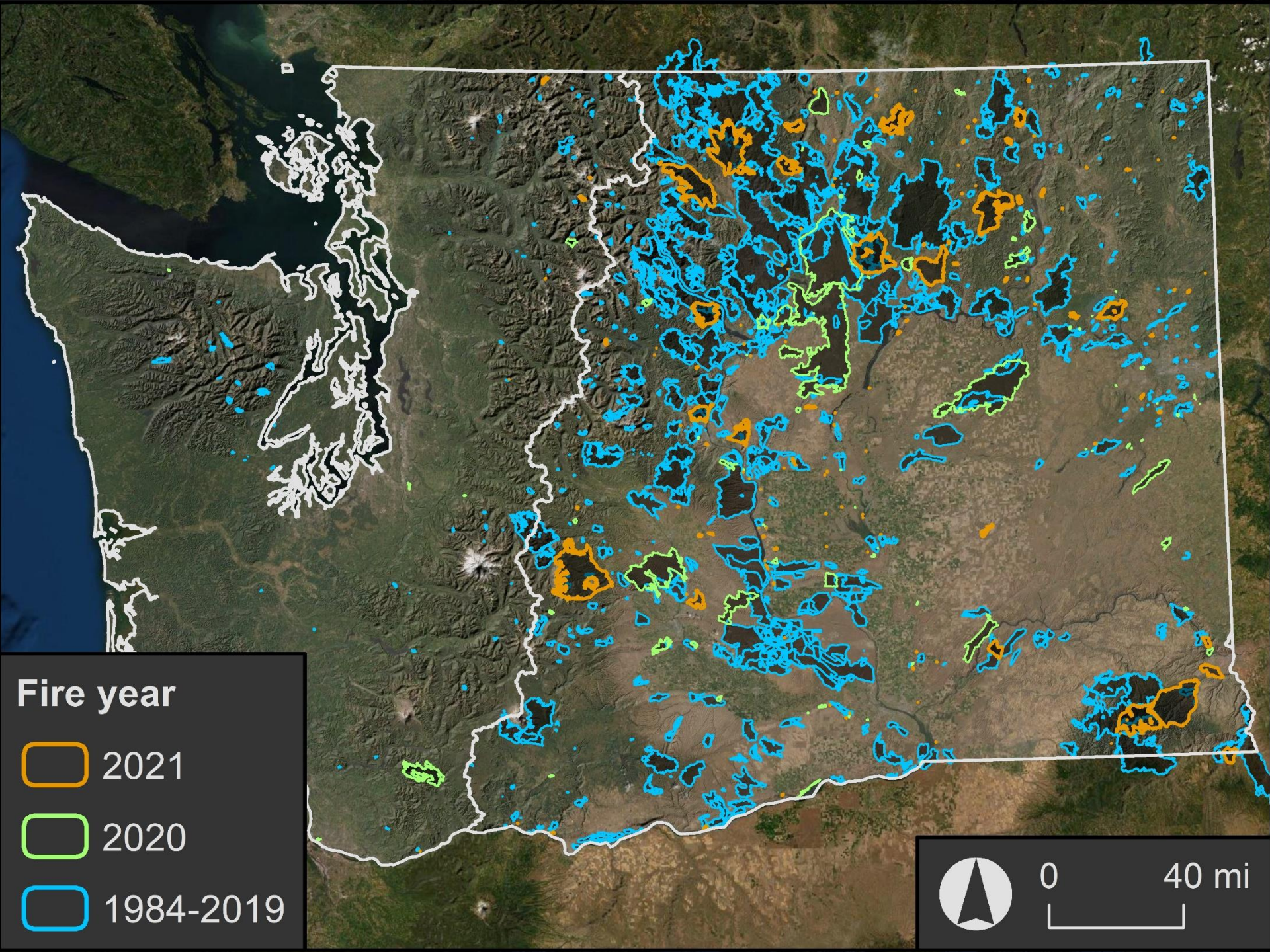
- Pre- and post-fire Satellite imagery (Sentinel).
- Classify greenness index (RdNBR) into low, moderate, or high severity based on thresholds from field plot observations of tree mortality.
- Methods from USFS Region 6.
- Preliminary severity: will derive again next year to capture increases from delayed mortality.



2021 Fire Year: Acres Burned



These data are preliminary and subject to change.



Fire year

2021

2020

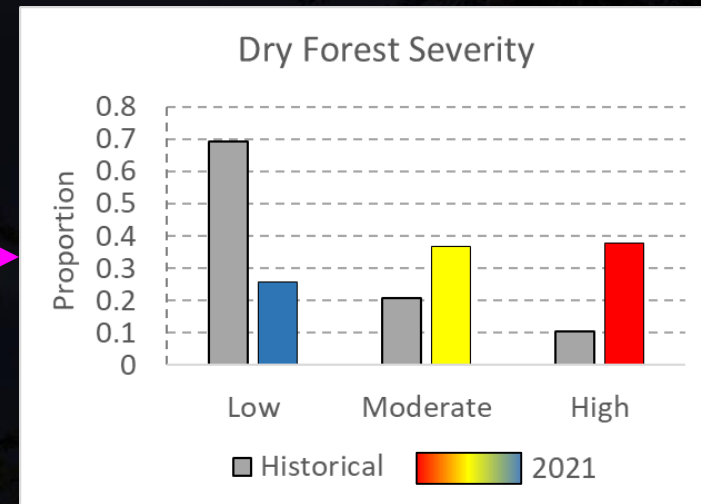
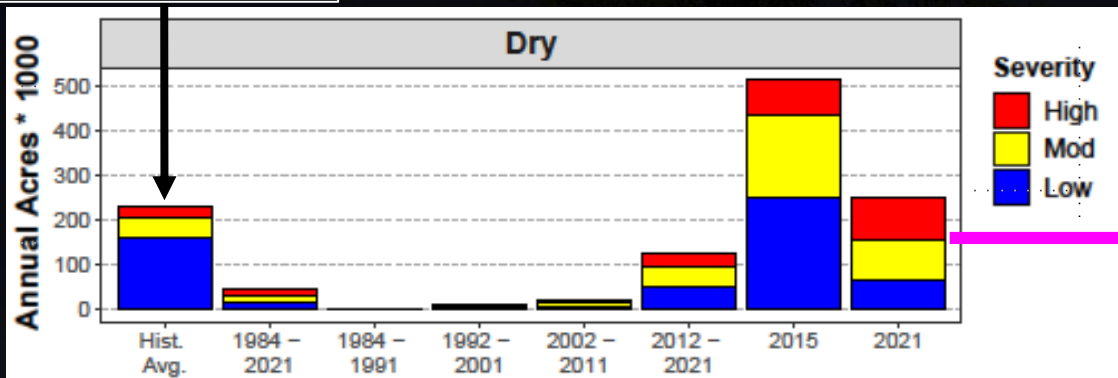
1984-2019



0 40 mi

2021 Fire Year: Severity

HRV from Landfire

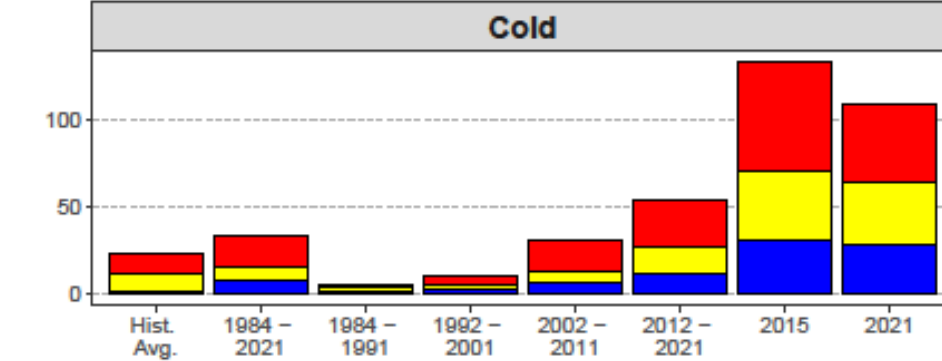
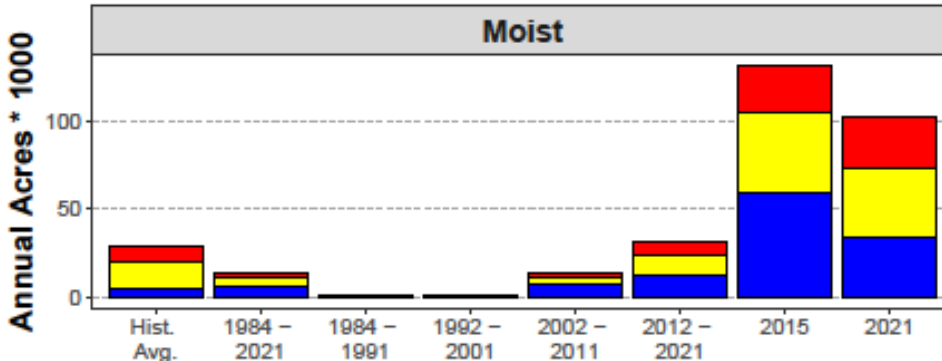
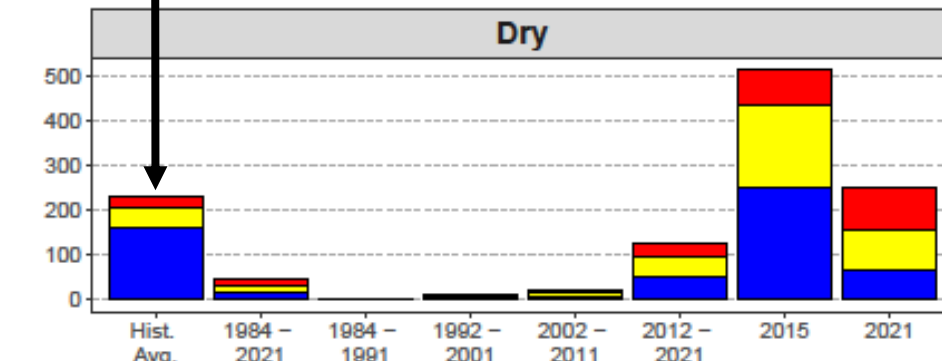


In dry forests, ~95,000 acres of high severity in 2021 vs. ~24,000 acres historically

These data are preliminary and will change due to delayed mortality other factors.

2021 Fire Year: Severity

HRV from Landfire



Forest	High	Moderate	Low	Total
Dry	95,000	93,000	64,000	252,000
Moist	30,000	39,000	34,000	103,000
Cold	46,000	35,000	28,000	109,000
Total	171,000	167,000	126,000	464,000

Severity
■ High
■ Mod
■ Low

In dry & moist forests: 230,000 acres of moderate & low (~220,000 historically)

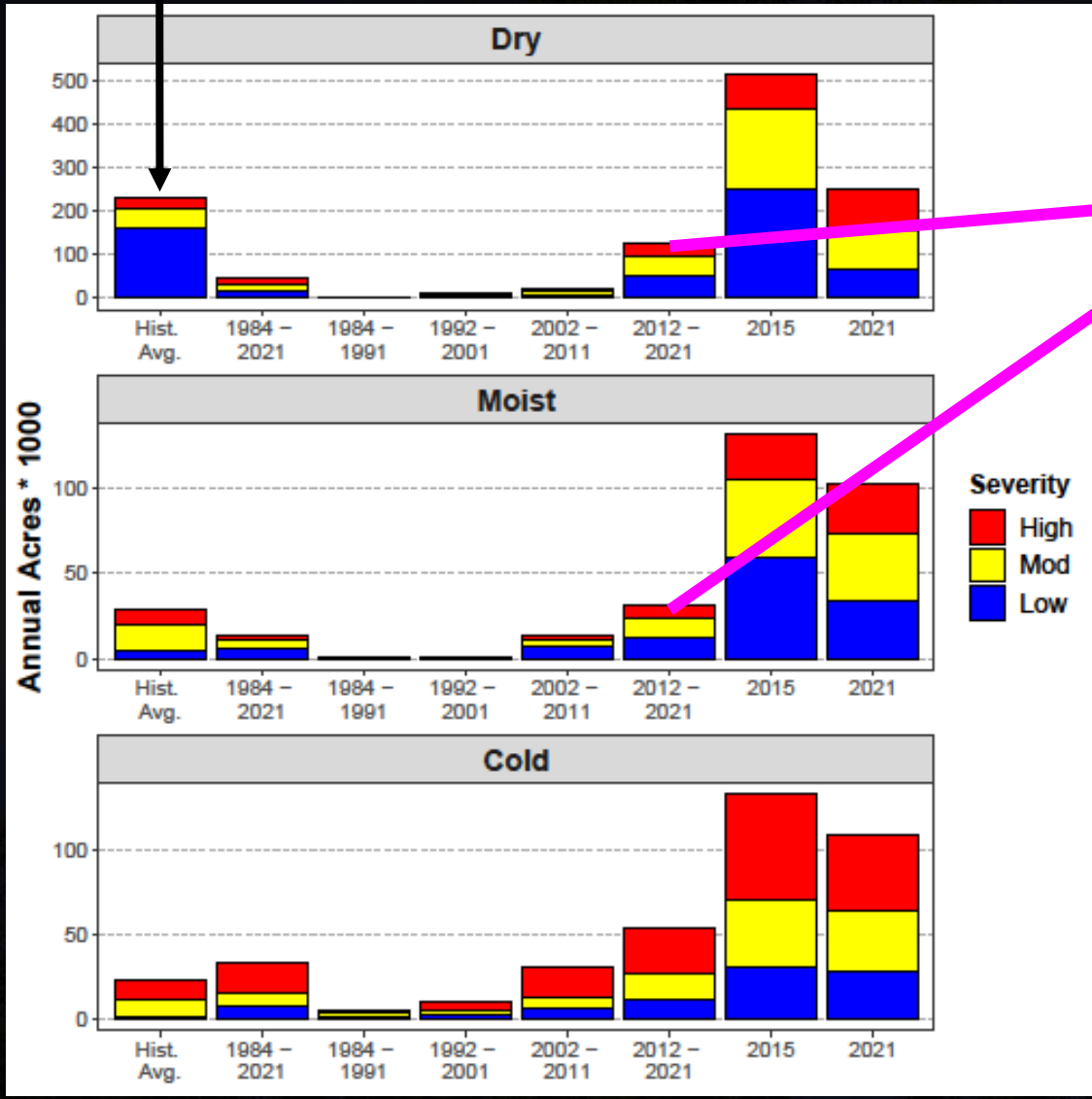
Treatments: 210,000 footprint acres over prior 4 years (2017-2020)

In cold forests: 109,000 total acres

These data are preliminary and will change due to delayed mortality other factors.

2021 Fire Year: Severity

HRV from Landfire



10-year average of acres burned is below estimated historical levels

These data are preliminary and will change due to delayed mortality other factors.

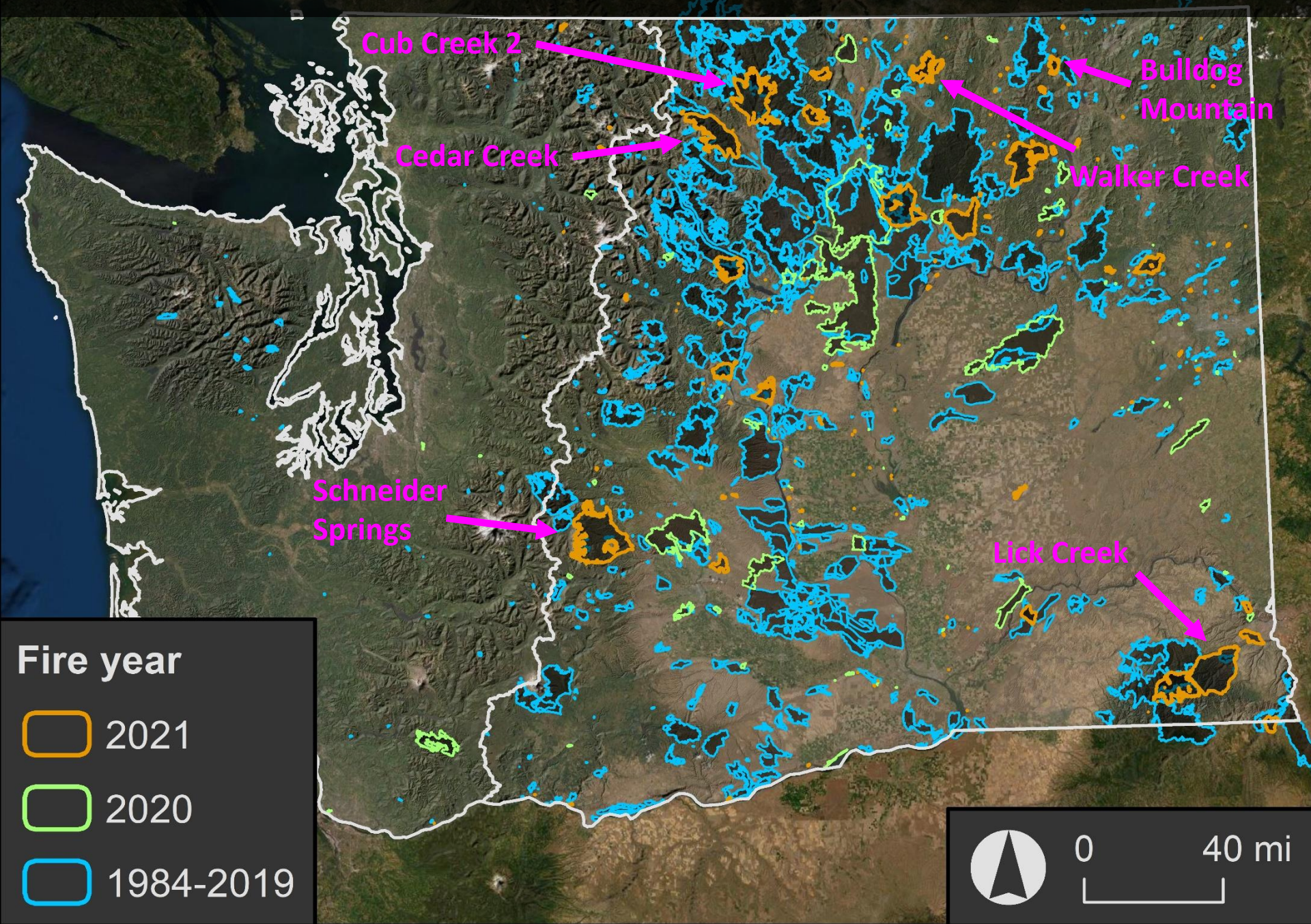
2021 Fire Year by Ownership

Forest Type	Severity	Federal	Tribal	DNR Trustlands	Small Private	Industrial	Other State	Unknown Other	Total
Dry	High	57,838	23,083	4,504	5,393	2,404	1,465	108	94,795
	Low-Mod.	96,624	32,971	13,833	9,536	1,733	1,960	237	156,895
Moist	High	26,988	1,567	415	306	83	250	28	29,637
	Low-Mod.	67,577	3,017	871	415	133	454	50	72,516
Cold	High	38,396	6,786	348	79	5	-	-	45,614
	Low-Mod.	50,752	11,824	1,120	188	5	-	-	63,888
Non Forest		50,817	65,387	10,985	32,832	906	17,884	11,387	190,197
Total		388,992	144,635	32,076	48,749	5,268	22,012	11,811	653,542

Economic objectives directly impacted

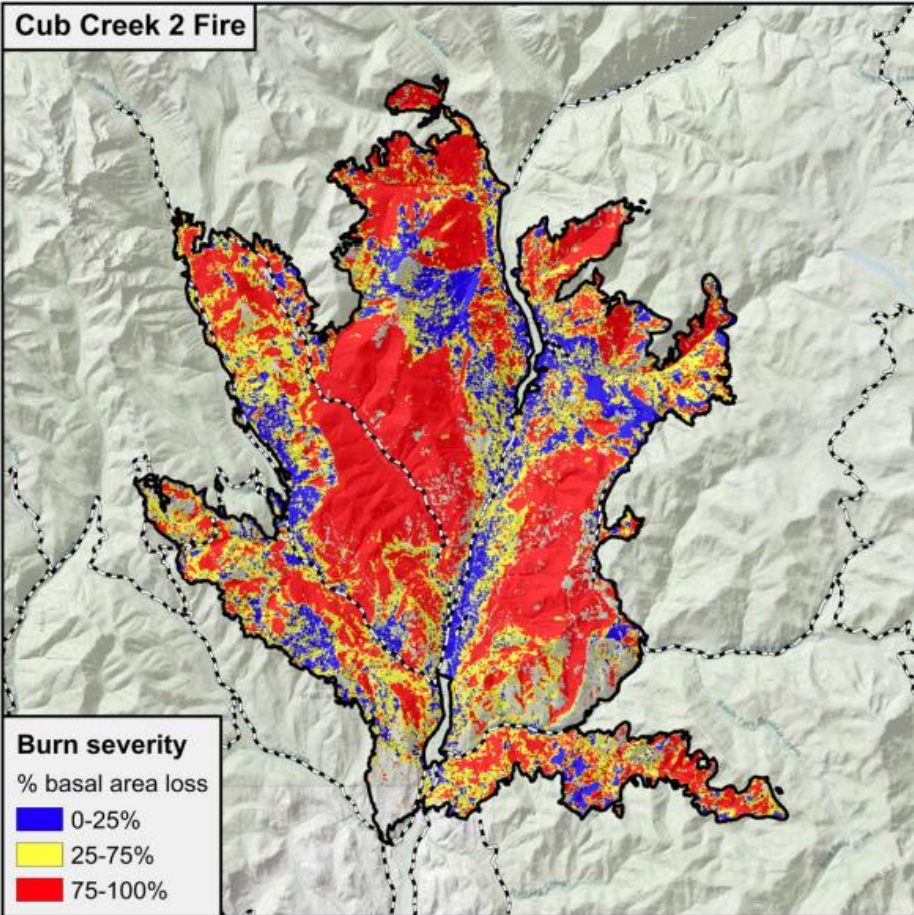
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Individual Fires

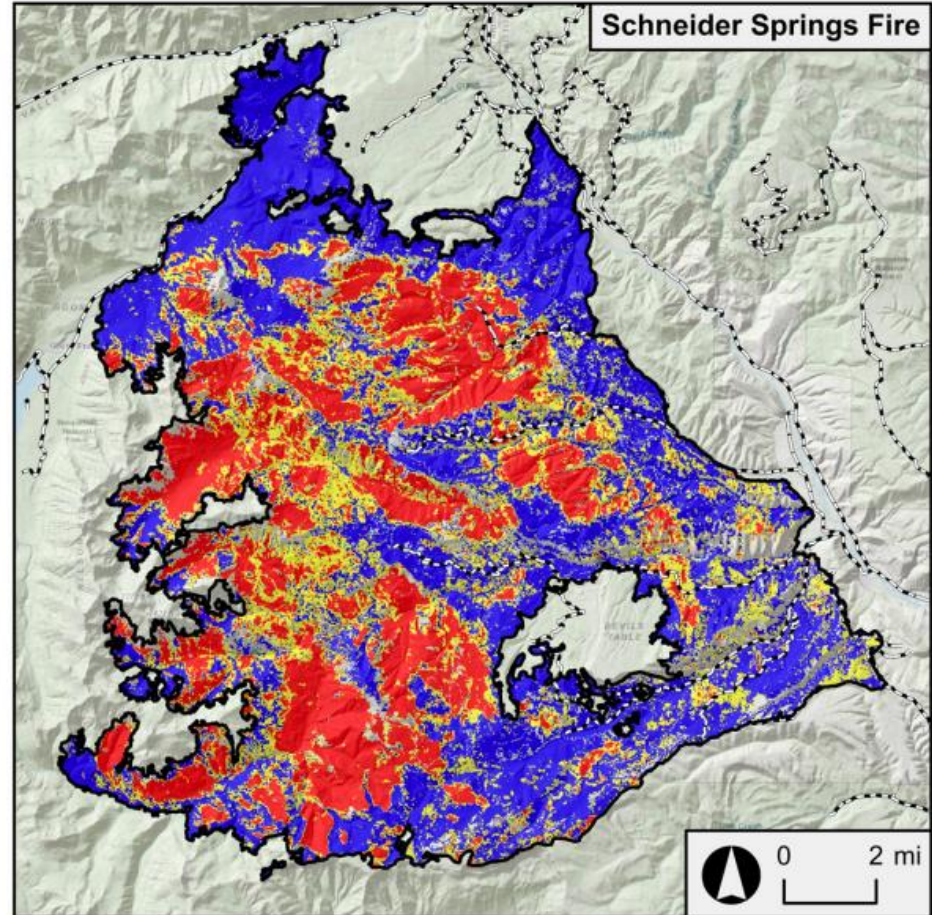


Individual Fires

Cub Creek 2 Fire



Schneider Springs Fire



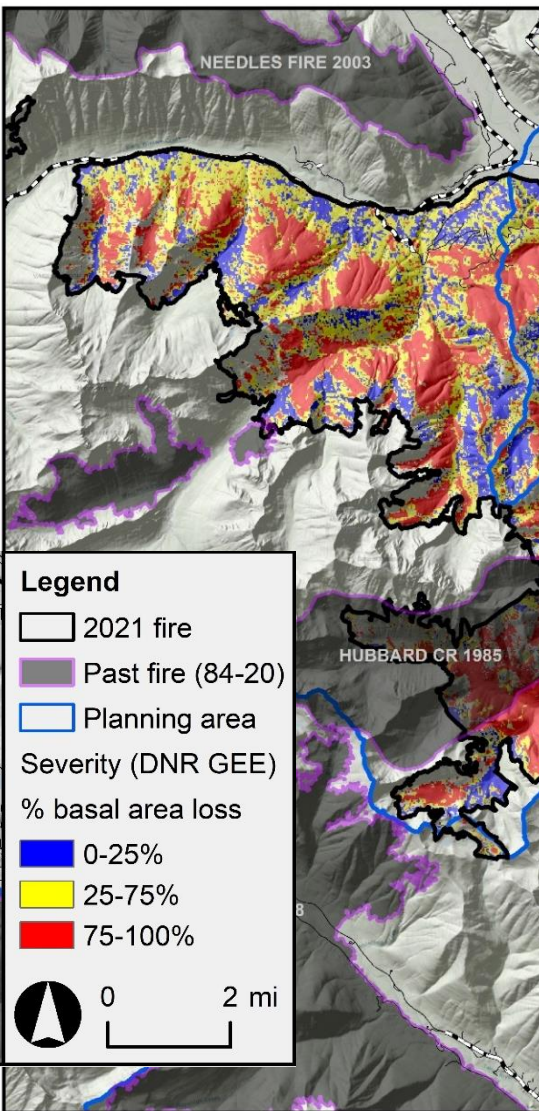
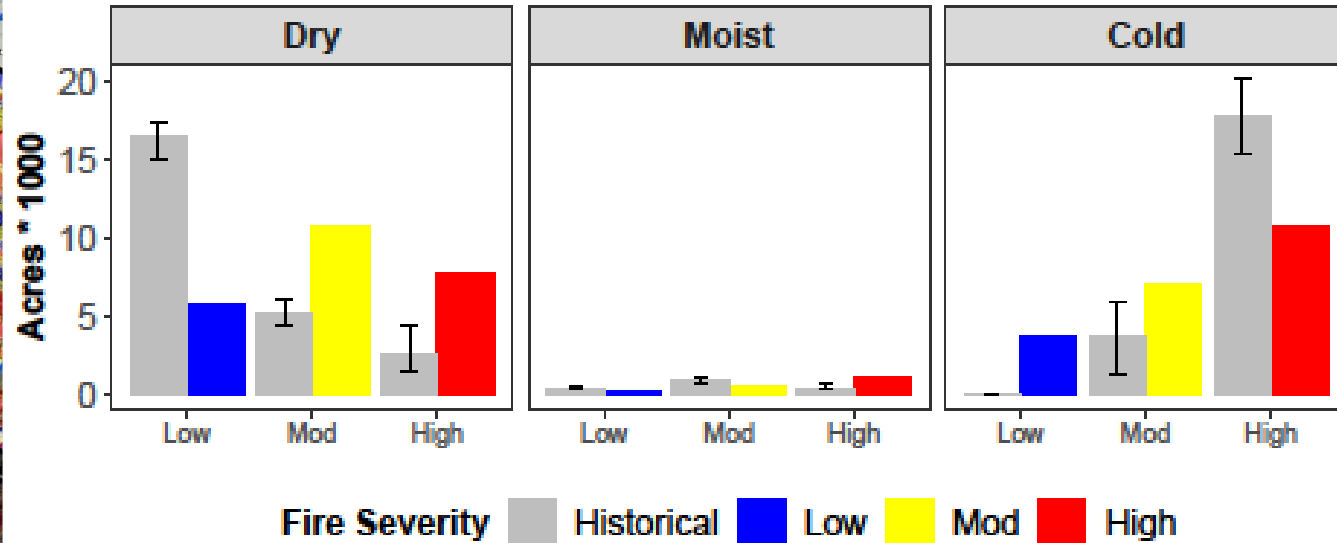
Bulldog Mountain Fire

- Planned for Rx fire treatment in SF Boulder EA.
- Wildfire accomplished treatment goals.
- Generally good work in difficult terrain & access.
- Fire weather was favorable; could have been a much bigger, hotter fire.



Cedar Creek

Total Acres: 55235 Forested Acres: 47586



More high severity fire in dry forests than historically

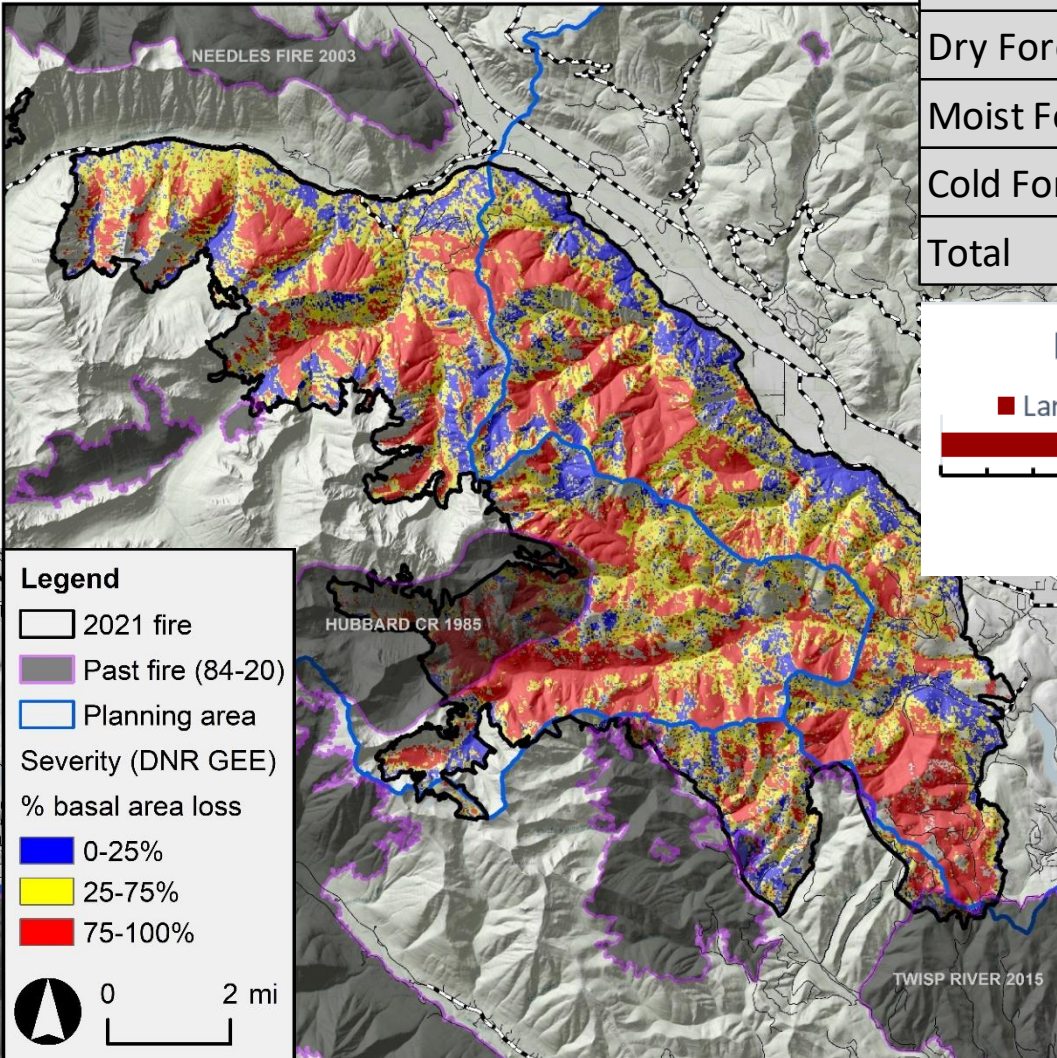
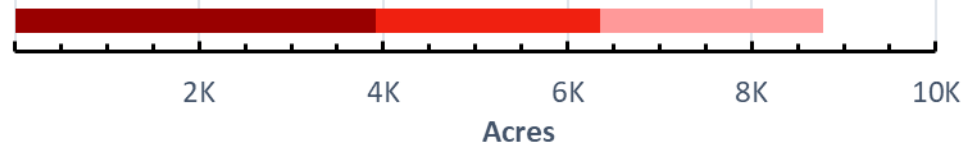
These data are preliminary and subject to change.

Cedar Creek

	High	Moderate	Low	Total
Dry Forest	8,000	11,000	6,000	25,000
Moist Forest	1,000	1,000	0	2,000
Cold Forest	11,000	7,000	4,000	22,000
Total	20,000	19,000	10,000	

High Severity Patch Sizes: Dry & Moist Forest

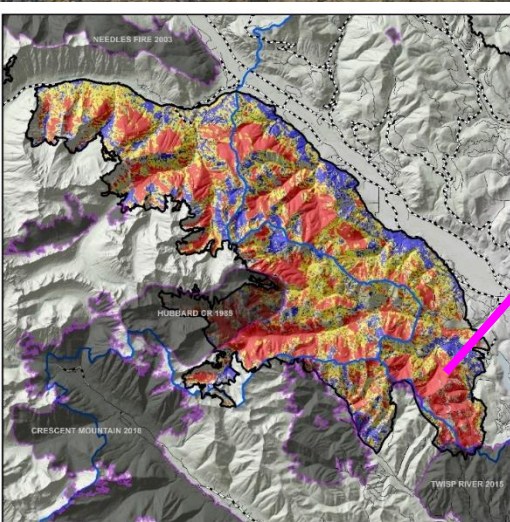
■ Large (>1000 ac)
 ■ Medium (100-1000 ac)
 ■ Small (< 100ac)



Large patches of HS Fire in Dry & Moist Forest

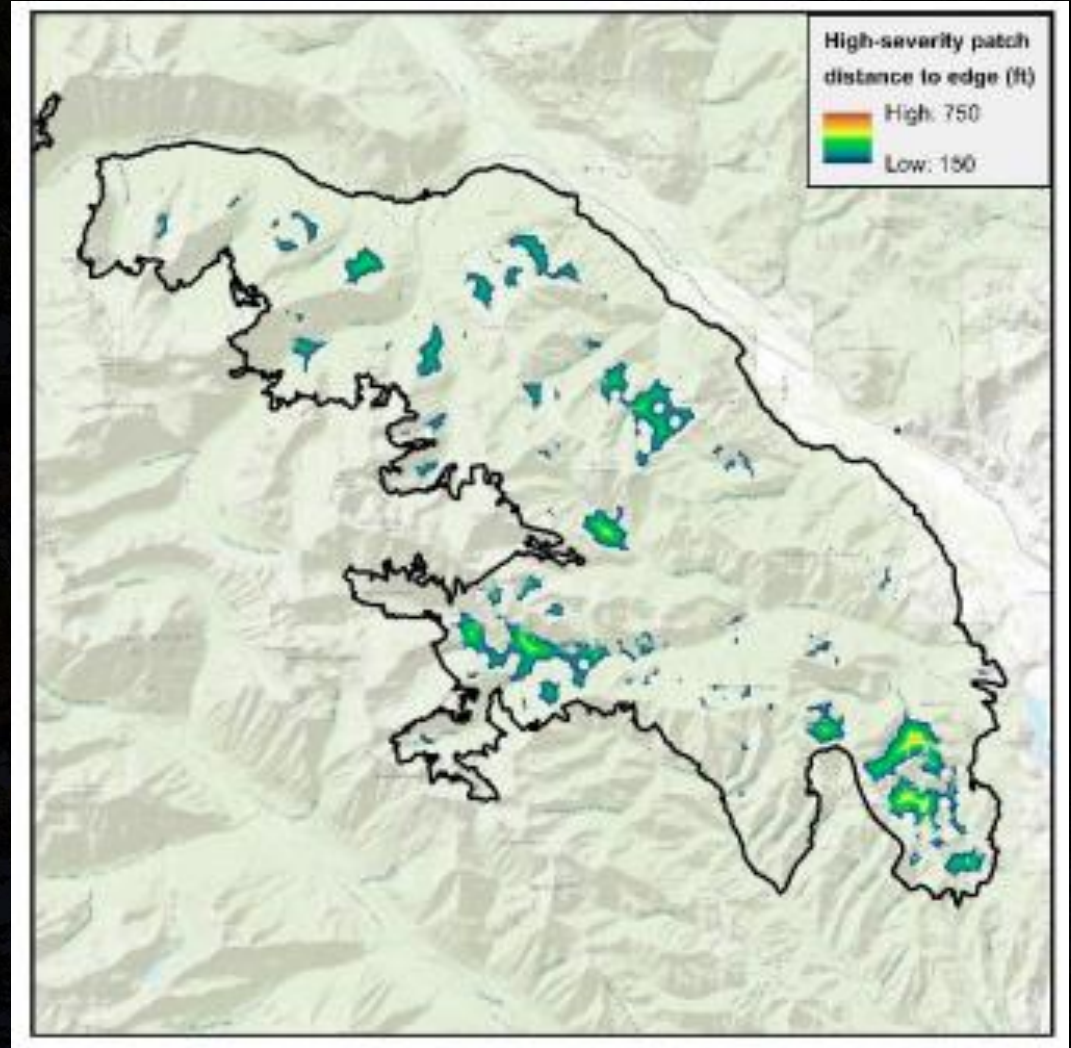
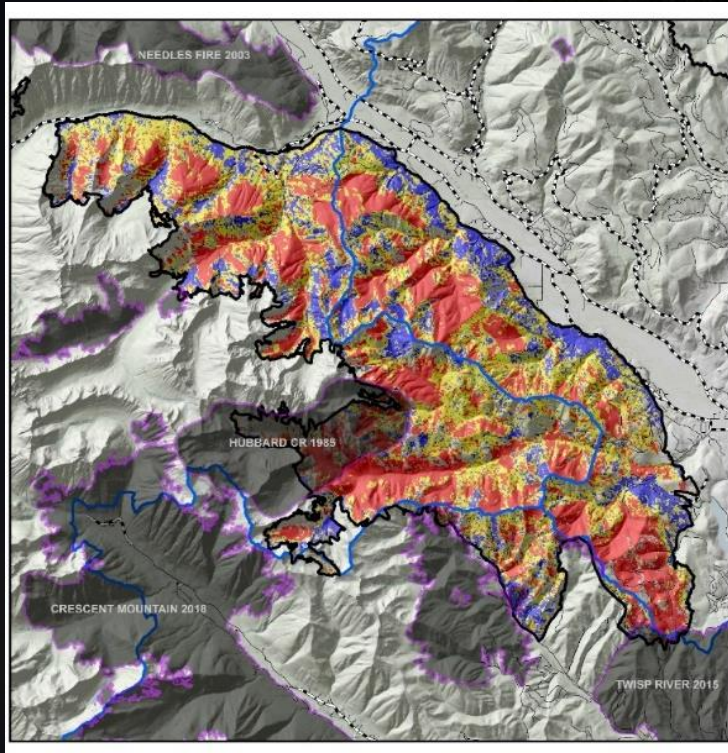
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Cedar Creek



8,800 acres of HS in dry & moist

Cedar Creek



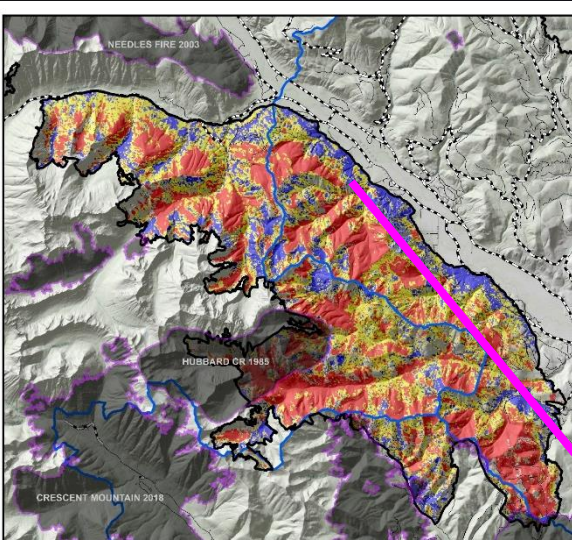
8,800 acres of HS in dry & moist

8% of burned forest >150m (500ft) from edge of high severity patch

➔ Potential seed source limitation

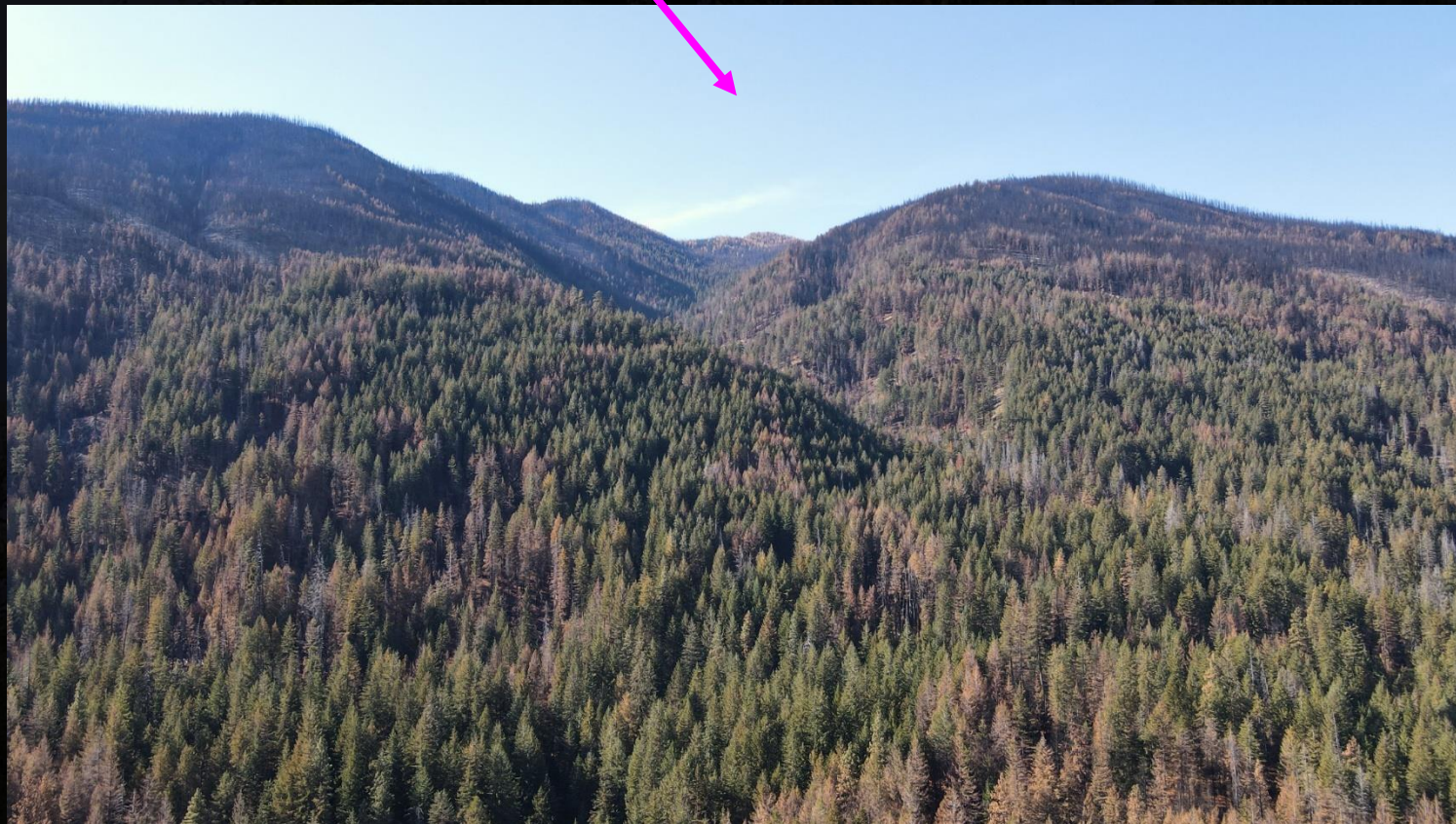
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Cedar Creek



Moderate-low severity:

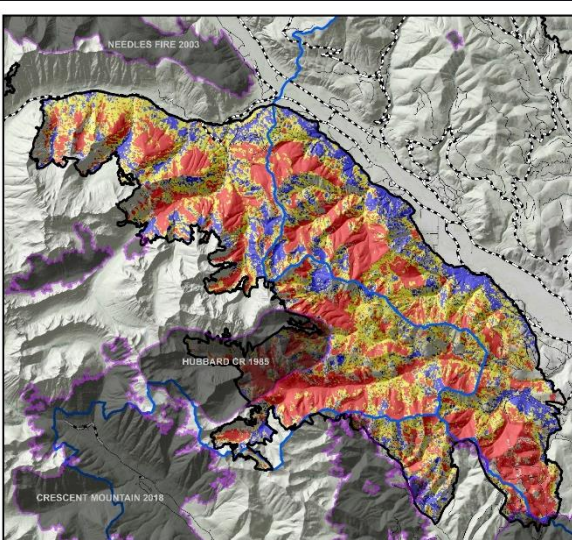
Forest	High	Moderate	Low
Dry	8,000	11,000	6,000
Moist	1,000	1,000	0
Cold	11,000	7,000	4,000
Total	20,000	19,000	10,000



Cedar Creek

Moderate-low severity

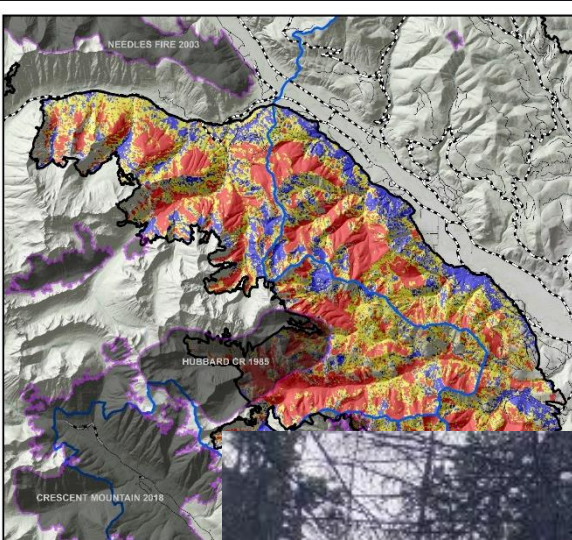
- Canopy thinned, perhaps not enough.
- Surface & ladder fuels reduced for 10-15+ years.
- Fuels will likely need treatment in future.



Cedar Creek

Moderate-low severity

- Canopy thinned, perhaps not enough.
- Surface & ladder fuels reduced for 10-15+ years.
- Fuels will likely need treatment in future.



8 years post fire

Cedar Creek

Old & Large tree component further reduced

Large Tree (>20" dbh)	High	Mod.	Low	Total
Acres	2,875	3,319	1,685	7,879

36% burned at high severity.



Cedar Creek

Fire severity within riparian buffers

Riparian Acres	High	Mod.	Low	Total
	1,978	1,967	1,065	5,010

Valentine Creek, Little Bridge Creek Drainage



Riparian area 5 years after the 2006 Tripod Fire



Cedar Creek



Snag & early-seral dependent species will benefit.



Landscape Evaluations

Diverse Landowner Objectives

HRV
Departure

Fire Risk
Assessment

Anticipated
Treatment
Needs

Habitat

Aquatics



TWISP RIVER PLANNING AREA LANDSCAPE EVALUATION SUMMARY (2020)

Table 1. Summary of forest health treatment needs (range represents low and high end of treatment need).

Forest conditions to treat		Treatment need (acres)	Current acres by major landowner*			
Type	Size class		USFS	Private	DNR-Trustlands	DFW
Dry Dense	Small	250 - 500	1,246	0	0	0
	Medium-Large	11,000 - 13,500	16,658	868	159	0
Moist Dense	Medium-Large	11,000 - 16,000	28,039	488	64	28
Dry + Moist Open	Medium-Large	3,750 - 6,500	9,538	170	22	0
Total		26,000 - 36,500	<i>*These are current acres, not targets</i>			
Anticipated treatment type		Noncommercial thin plus fuels treatment. May be fire only (prescribed or managed wildfire).				
		Commercial thin plus fuels treatment if access exists. May be noncommercial, fire only (prescribed or managed wildfire), or regeneration treatment.				
		Maintenance treatment: prescribed fire, managed wildfire, or mechanical fuels treatment. Target range corresponds to 50-75% of dry open and 25-50% of moist open forests.				

fire risk to forests, homes, and infrastructure.

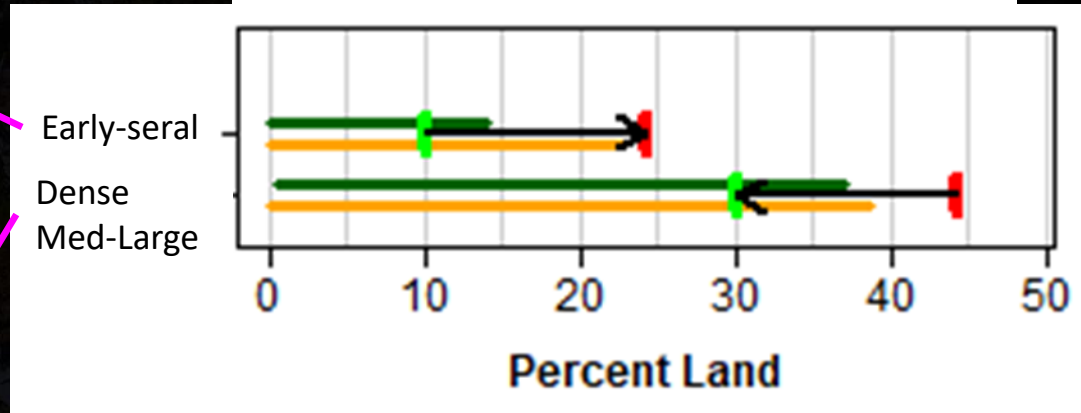
0 1 2 Miles Fire risk map has not been updated following the 2018 Crescent Fire.

Cedar Creek

Post-fire landscape evaluation: How did fire change landscape departure & treatment need?



Structure Class

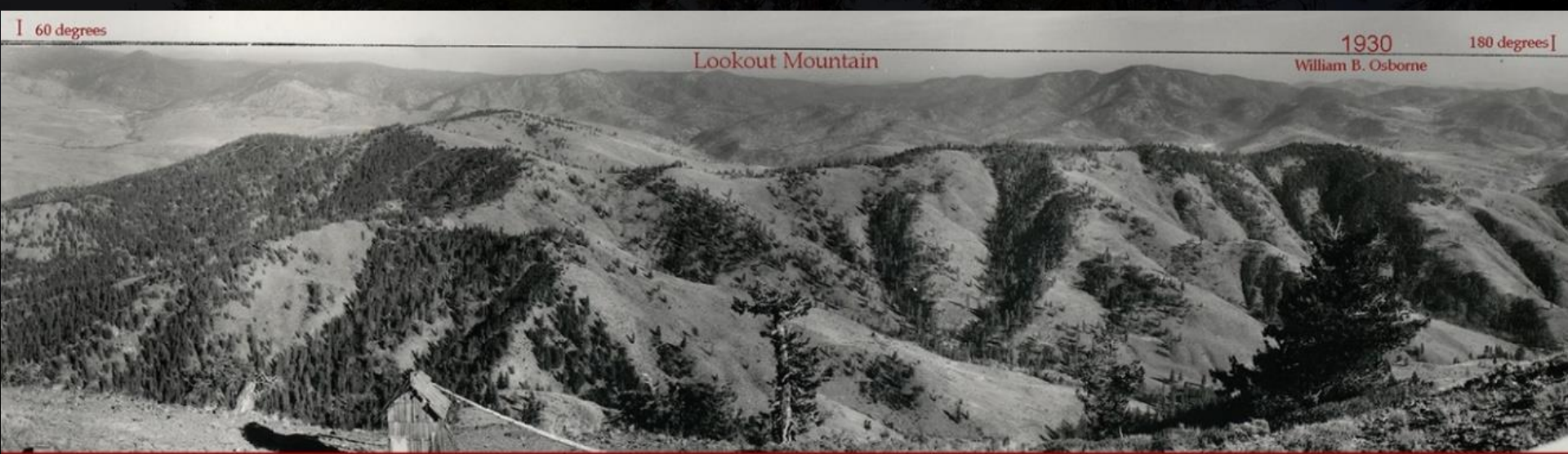


Twisp River Planning area: Little Bridge Creek Subwatershed

Early-seral forests (SI) is higher than the Historical & Future Ranges of Variation.

Cedar Creek

Restoring patchwork of forest, woodland, & grassland?



[60 degrees

Lookout Mountain

1930
William B. Osborne

180 degrees]

Twisp River

Increase in early-seral forest from multiple fires



Post-fire Management Treatment Framework & Prioritization

Short Term Veg Actions

High Severity



Climate Limited

Large Patches:
Dispersal Limited

Prefire Composition
Mismatch: Climate
Adaptation Need

Other >90% BA Loss

No Treatment
Or Salvage for Economic Recovery
Invasives Control

Salvage + Planting
Or Planting Only

Prioritization:
Higher soil burn severity
Drier veg types
Longer distance to seed source

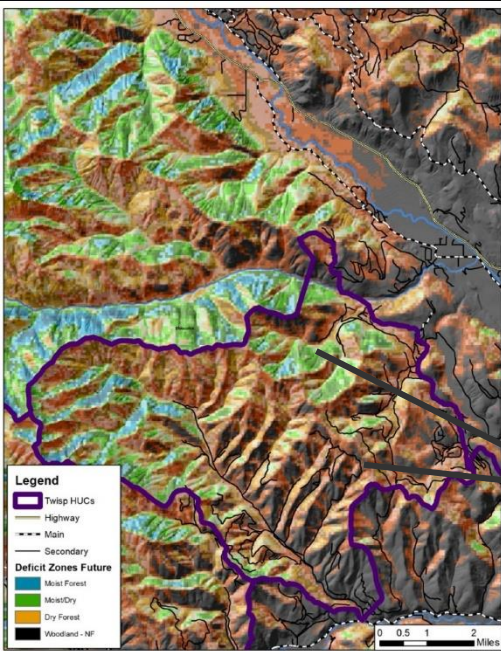
Operational overlay:
Distance to road
Slope & soils



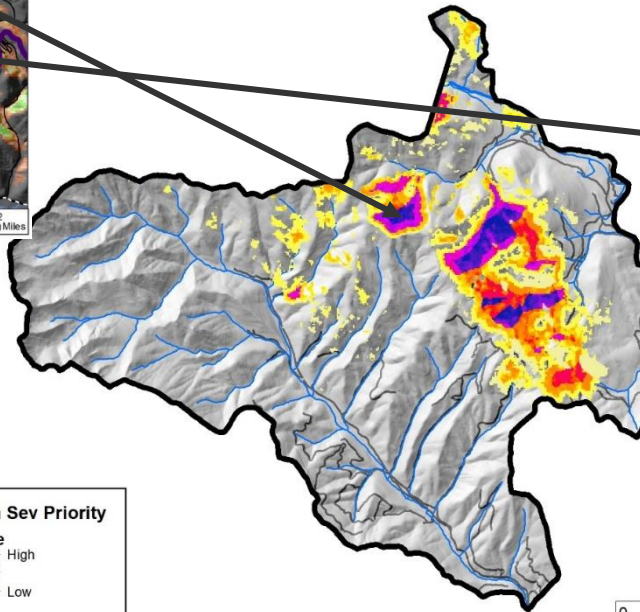
High Severity: Planting

Location & Prioritization

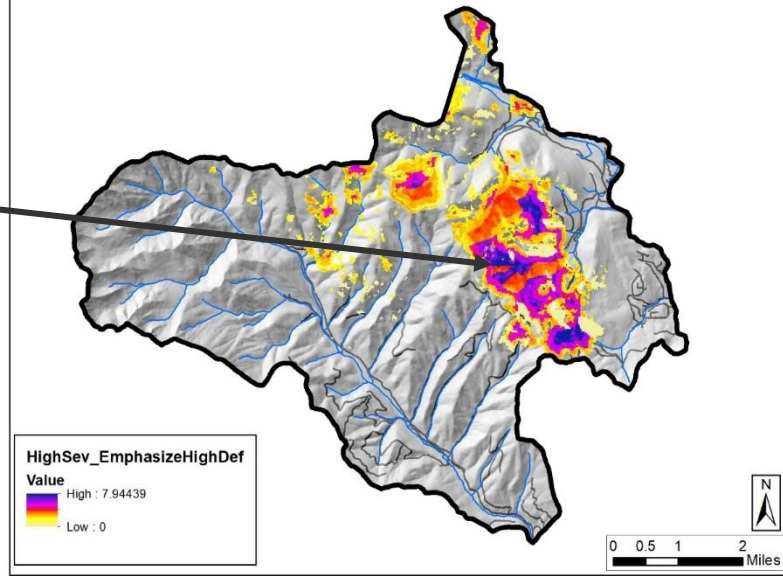
- Higher soil burn severity
- Longer distance to seed source
- Wetter or Drier veg types



**High Severity Prioritization
Low Deficit Emphasis**



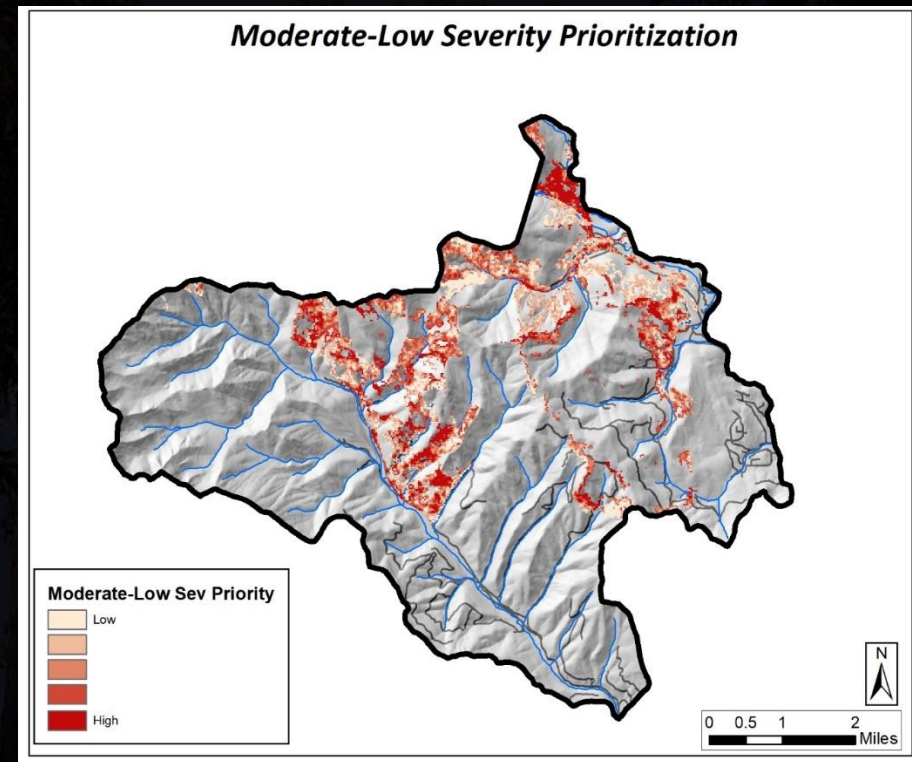
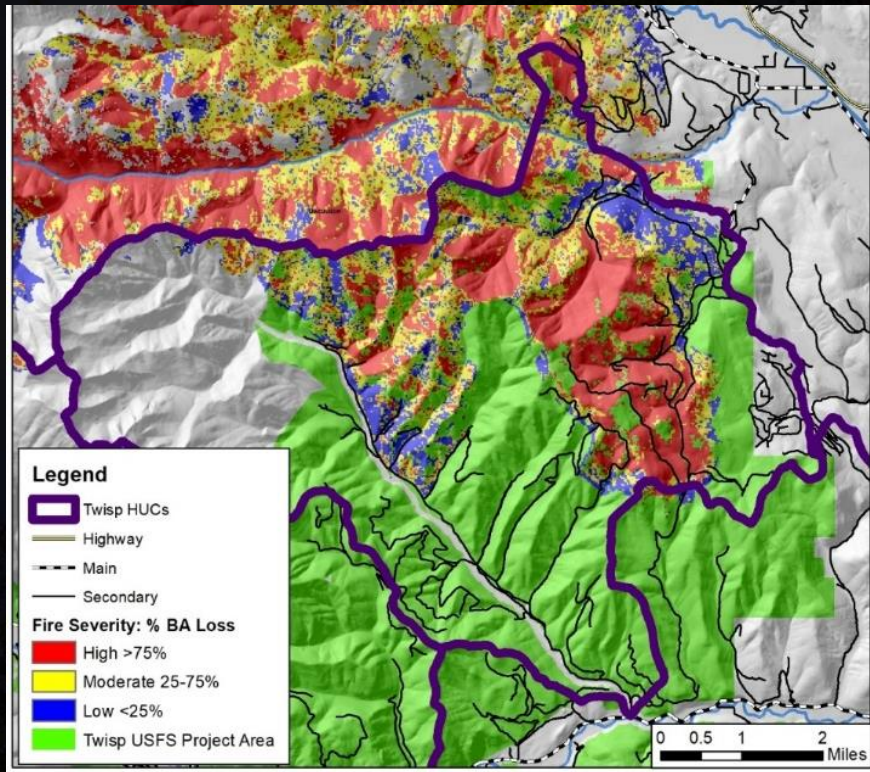
**High Severity Prioritization
High Deficit Emphasis**



Moderate-Low Severity: Finish the Job

Location & Prioritization

- Higher severity
- High pre-fire cover & composition mismatch
- Large trees
- Drier veg types



Post-fire Management Treatment Framework & Prioritization

Short Term Veg Actions

Low & Moderate Severity



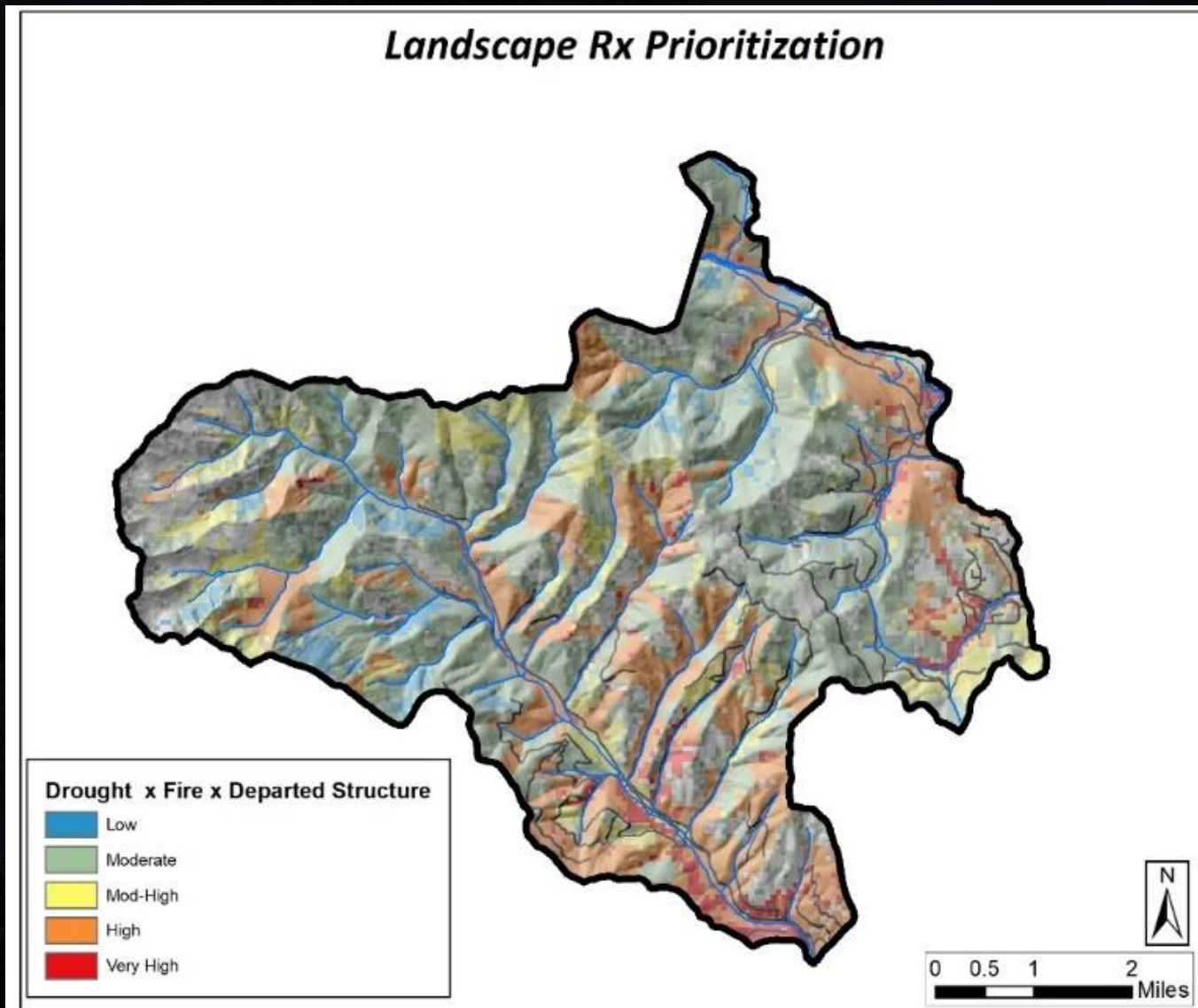
High Prefire Density

Composition Mismatch

Salvage + Green Tree Thin
Possible Planting
Prioritization:
Higher severity
Pre-fire composition mismatch
Large trees present
Proximity to sustainable large/complex
High pre-fire canopy. cover, esp. in dry forest

Remaining Landscape Treatment Need

Thinning and fuels treatments still needed, but ~3000 less than pre-fire



Evaluation of Treatments

1. Treatments burned at low, moderate, and high severity

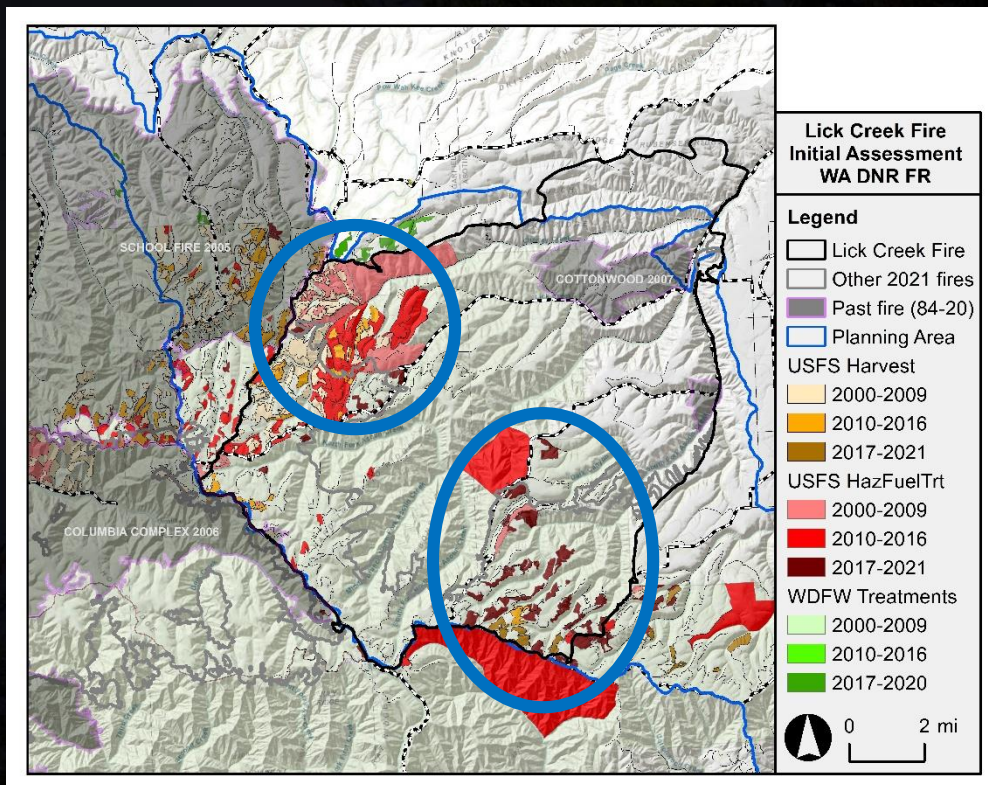
- Forest Structure
- Fuels
- Fire weather
- Topography



Evaluation of Treatments

2. Scale matters: in general, positive fire outcomes were more likely in locations with extensive treatments.

- Small, scattered treatments are less likely to be effective.
- Lick Creek and Schneider Springs had several success stories.



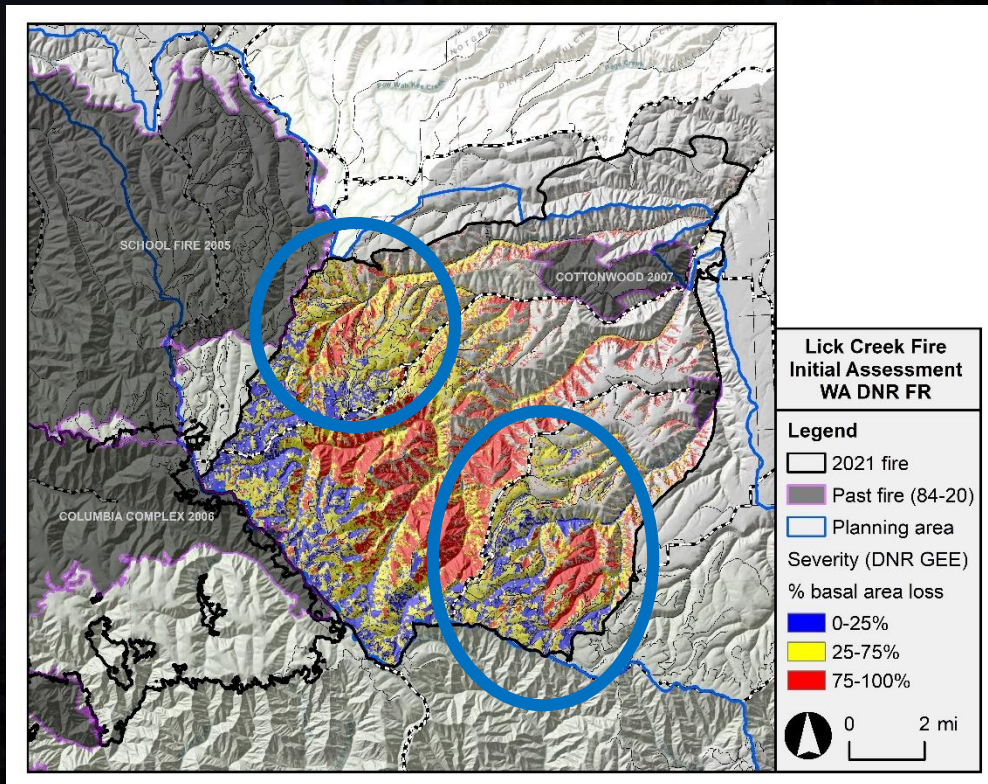
Treatments helped firefighters establish fire perimeter with low-intensity fire.



Evaluation of Treatments

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Evaluation of Treatments

3. Treating surface fuels increased chances of low-severity fire.



Bootleg Fire in South-Central Oregon. Photo: Steve Rondeau

Evaluation of Treatments

3. Treating surface fuels increased chances of low-severity fire.

- Treatments without Rx fire or piling & burning burned at high severity in many cases.



Bulldog Mountain Fire, Hot Dog Timber Sale: CNF

Photo: James Corvino



Cub Creek 2 Fire

Ramsey Unit: DFW

Evaluation of Treatments

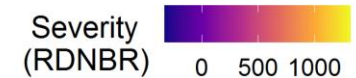
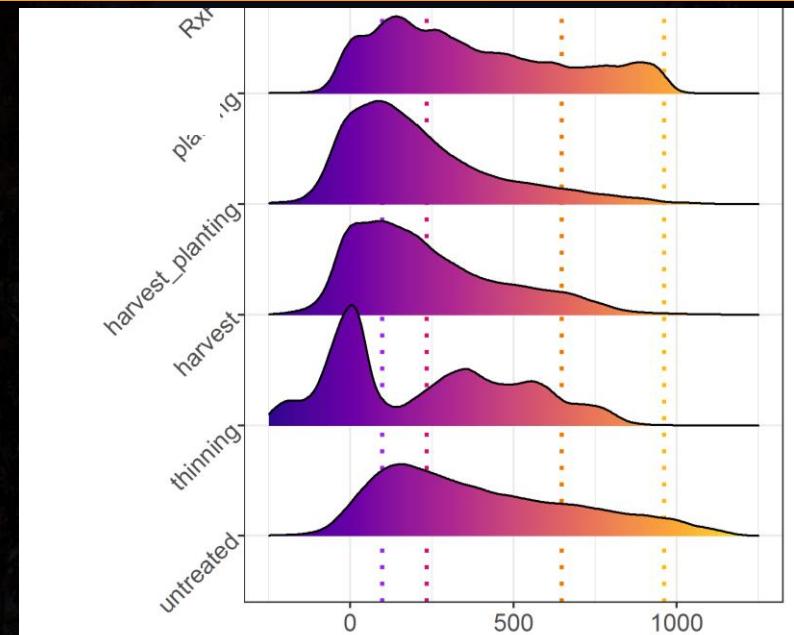
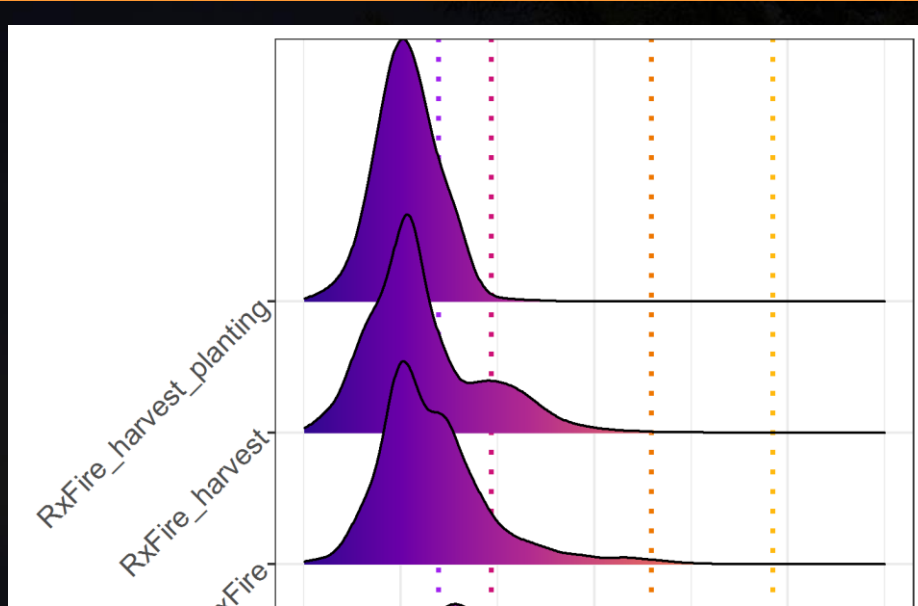


But low-severity in others:

Cedar Creek: DNR Virginia Ridge Unit 1

Evaluation of Treatments

Rx fire is the most effective treatment to reduce surface fuels & fire severity, Roll of the dice if surface fuels aren't treated after a mechanical treatment.



Contents lists available at [ScienceDirect](https://www.sciencedirect.com)

Forest Ecology and Management

journal homepage: www.elsevier.com/locate/foreco



Previous wildfires and management treatments moderate subsequent fire severity

C. Alina Cansler^{a,*}, Van R. Kane^a, Paul F. Hessburg^{a,b}, Jonathan T. Kane^a, Sean M. A. Jeronimo^{a,c}, James A. Lutz^d, Nicholas A. Povak^e, Derek J. Churchill^f, Andrew J. Larson^g

^a School of Environmental and Forest Sciences, University of Washington, Box 352100, Seattle, WA 98195-2100, United States

Evaluation of Treatments

3. Treating surface fuels increased chances of low-severity fire.

But mechanical only treatments generally burned at lower severity compared with adjacent untreated areas.



Cedar Creek
DNR Virginia Ridge Unit 2

Cedar Creek
Adjacent Unit



Treatments and Fire Operations



Improve
Forest Health



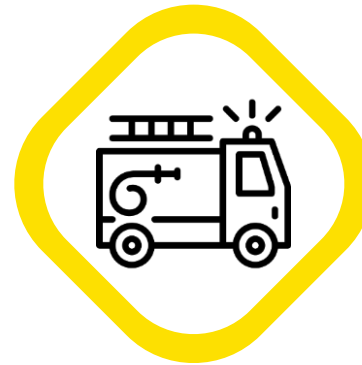
Benefit Fire
Operations

Forest health treatments
with dual benefit

Treatments and Fire Operations



Improve Forest
Health?



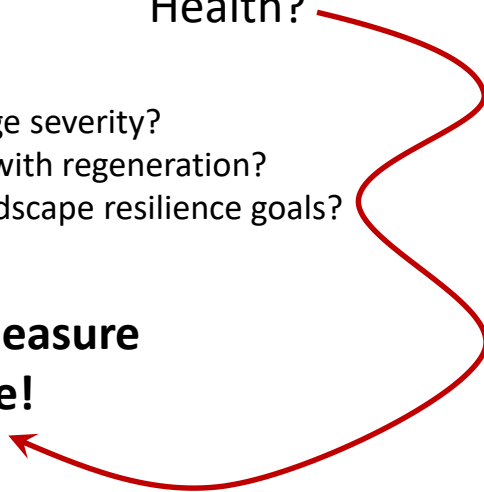
Benefit Fire
Operations?

Did the treatment change severity?

Did the treatment help with regeneration?

Are we closer to our landscape resilience goals?

**We can measure
these!**



Treatments and Fire Operations



Improve Forest
Health?

Did the treatment change severity?
Did the treatment help with regeneration?
Are we closer to our landscape resilience goals?

**We can measure
these!**



Benefit Fire
Operations?

What kind of fire behavior you observed?
Did the treatment provide a benefit?
If not, what needs to happen differently?

Treatments and Fire Operations



Improve Forest Health?

Did the treatment change severity?
Did the treatment help with regeneration?
Are we closer to our landscape resilience goals?

We can measure these!



Benefit Fire Operations?

What kind of fire behavior you observed?
Did the treatment provide a benefit?
If not, what needs to happen differently?

We can document and learn about these!

Why are we doing this?

- Understand how we're doing
- Understand why, when a treatment does not benefit operations
- Communicate why it matters and what was at stake
- Bring this information into our institutional knowledge so that it can serve us and be built upon



First approach: Specific & Off-Season

We're telling stories about a specific fire and a specific interaction with a specific treatment.
Several months after the fact.



Done remotely

Can cover multiple fires and interactions within a fire

Cheap(er)



Identifying & accessing actors

Memory fades/influenced by overall incident

Second approach: Specific & On-Season

We're telling these specific stories but interviewers are on the ground working specific events and interviews are conducted (almost) immediately after the fire-treatment interaction occurred.



Access to key actors

Ripe memories

Additional context on the incident that we don't get 3 months later



Embedding folks in IMT – who/what role?

Cherry picking - Coordinating fires/treatments

Time commitment and cost

Third approach: General & Off-Season

We're painting a picture (broad strokes) of how operations uses treatments. Questions are about the totality of experiences during one's career and not one specific fire.



Access to more actors
Willingness to talk
Multi-agency



General interviews
Can't be tied to specific fires/years/geographies
Limited management implications

This is a pilot. Bear with us.



Key Takeaways

- **2021 was a big fire year with a wide range of both “positive” and “negative” outcomes.**
 - Fires affected 460k acres of forest.
 - Despite the recent increase in acres burned, the 10-year average is below estimated historical levels.
 - 2021 fires had widespread socio-economic impacts and varied outcomes in terms of forest health objectives.
- **Many 2021 fires were uncharacteristically severe.**
 - Many medium and large patches of high-severity fire in dry and moist forest: 85k acres.
 - Loss of large trees, management options, & economic impacts.
 - Severity will increase with delayed mortality.
- **2021 wildfires likely accomplished some treatment objectives across 230k acres.**
 - Low & moderate severity fire: reduces density & fuels, buys us time, and will need future treatment.
 - Small-medium patches of high-severity fire: restores shrublands, grasslands, & young forest.
 - **2021 fires “treated” similar area as mechanical & prescribed fire treatments in prior 4 years (2017-2020, 210k footprint acres).**
- **Better wildfire outcomes if we can treat a substantial portion of the landscapes first.**
 - Treatments lower fire severity, increase resilience, and give fire managers more options.
 - Prescribed fire or pile & burn → lower fire severity. Mechanical only → higher risk of tree mortality.
- **Fire management plays a major role in determining where fires support forest health goals.**
 - Dual benefit planning & treatments prior to fires (PODS, PCLs) increases opportunities for good outcomes.
 - **How can we manage future fires to get more positive & less negative work from wildfire?**

Outcomes and Next Steps

- Report summarizing 2021 fire year from a forest health & resilience perspective.
 - https://www.dnr.wa.gov/sites/default/files/publications/rp_workofwildfire2021_march2022.pdf
- Increase communication around what worked & lessons learned in 2021.
 - Highlight success stories where treatments worked.
 - Apply to treatment prioritization & design: treatment extent to change fire behavior?
- Partner engagement to define how to count wildfires in treatment targets.
 - “Good” vs. “bad” fire.
 - High-severity fire in dry, moist, & cold forest.
 - Quantify the need for future treatments.
- Refine rapid assessment for post-fire work in future years.
 - Pilot process for Walker Creek & Cedar Creek in 2021.
- Further analysis and work.
 - Synthesis of treatment effectiveness.
 - Explore the role of fire operations in fire outcomes: collect GIS data during fires.
 - Incorporate temporal aspect of fire season: major burn days & fire weather during those days.
 - Remote sensing of fire severity, including delayed tree mortality.
 - Risk of forest conversion (trailing edge forests).
 - Impacts of fires on aquatic systems, as well as amount of large tree, closed-canopy forests.

Thank you!

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