Wildfire Risk Governance Committee (WRGC)

Initial Committee Meeting

September 28, 2022






Agenda

11:30 – 11:45	Review Charter, Purpose, Objectives, Meeting Frequency	Amy McCluskey
11:45 – 12:00	Proposed Changes to Fire Threat Conditions	Jon Connelly
12:00 – 12:30	Risk Tools Project Update (Technosylva) *Including Project Deliverables, Milestones, Key Decisions*	Kevin Benson / Steve Vanderburg
12:30 – 12:45	Ignition Reporting Requirements & Process	Kevin Benson
12:45 – 1:00	Forward Looking Projects/Topics	Amy McCluskey

Review of Charter

Purpose: Provide a recurring forum for wildfire risk stakeholders and decision-makers to review information and make informed decisions to support wildfire risk mitigation initiatives

Objectives:

1) Provide a venue for **clear, timely decision-making** regarding wildfire risk modeling and evaluation, mitigation initiatives, and program objectives and priorities

   Examples: Scope consideration or evolution of wildfire risk models; Definition of fire season for risk modeling; Approval of RSE methodology for system hardening projects

2) **Inform** stakeholders and decision-makers about program progress and completion of key milestones

   Examples: Tool release to operations/availability for decision-making of new applications; Updated risk modeling results; Planned updates to risk modeling tools; Completion of compliance milestones

3) **Consult** stakeholders for future planning guidance and high-level intent

   Examples: *Changes to balance of wildfire risk mitigation vs reliability/system performance; Need for new projects or tasks; Evaluation of long-term vision*

Meeting Cadence: Recurring monthly meeting (date TBD)
Meeting Length: 90 minutes (can be reduced based on agenda)

Review of Charter

*SMEs may be present based on meeting topics and agenda

Name	Position	Proposed Committee Role
Allen Berreth	VP, T&D Operations	Voting Member
Curtis Mansfield	SVP, Power Delivery	Executive Sponsor
Erik Brookhouse	VP, System Operations	Voting Member
Joshua Jones	VP, Asset Management & Business Transformation	Voting Member
Pete Singh	VP, Engineering & T&D Standards	Voting Member
Kevin Benson	Director, Asset Risk	Co-Chair
Christopher Walsh	Manager, Meteorology	Co-Chair
Carrie Laird	Managing Director, Power Delivery Support	Advisor
Eleonore Yotsov	Director, Emergency Management	Advisor
Megan Buckner	Director, Wildfire Program Delivery	Advisor
Tim Clark	Asst General Counsel	Advisor
Brian King	Director, Environmental & Vegetation Management	Advisor
Rohit Nair	Director, Engineering Standards & Grid Modernization	Advisor
Chris Spencer	Managing Director, RMP Ops	Advisor
Thomas Eide	Managing Director, PP Ops	Advisor
Melissa Swenson	Project Manager / Process Integration Manager	Meeting Minutes, Documentation, Agenda

Proposed Changes to Fire Threat Conditions

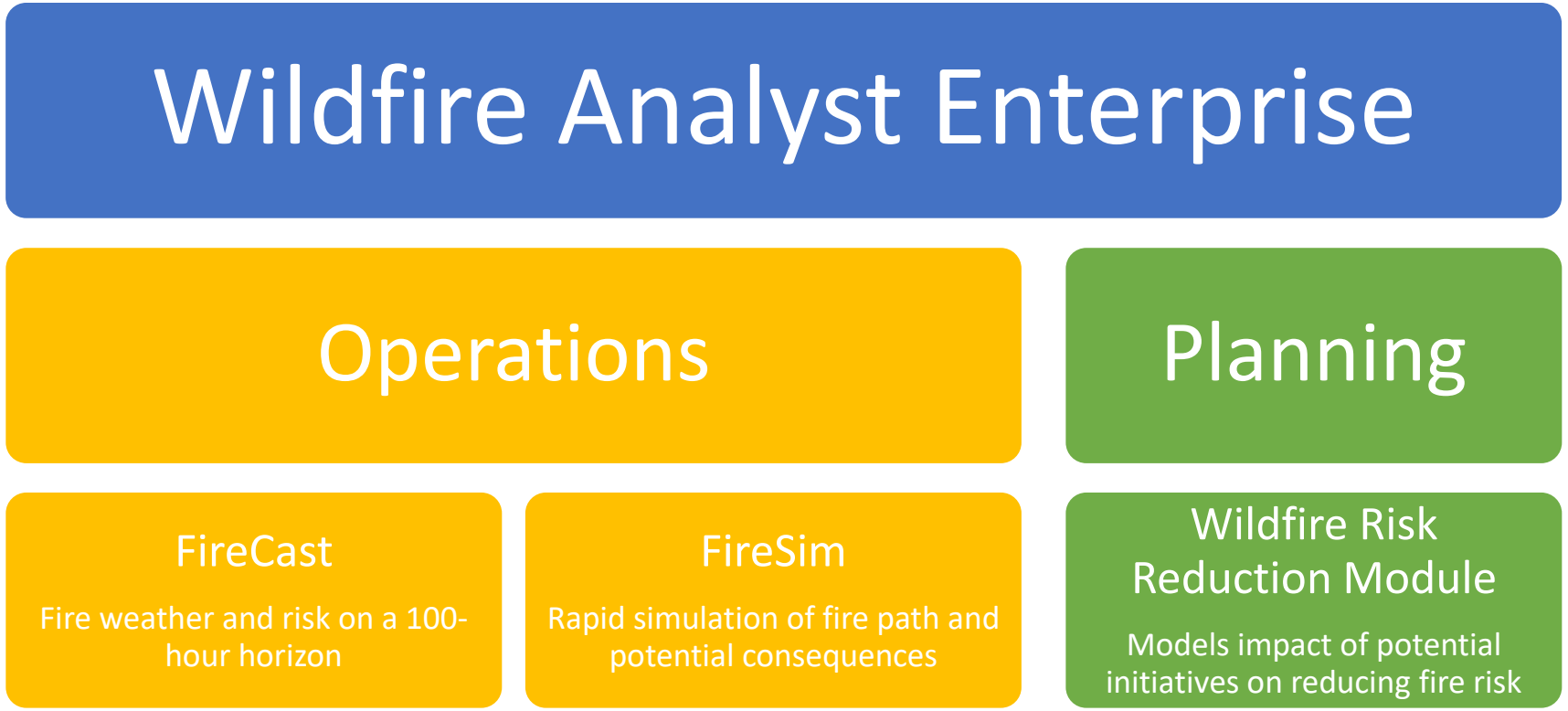
Objective: Inform to Ensure Alignment and Solicit Feedback on Proposed Changes

Risk Tools Project Update

Objective: Inform to Ensure Alignment & Understanding of the Full Project

Technosylva's suite of software tools support:

- Operational planning and decision-making
- Planning to mitigate risk of future wildfires



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WFA-E Modules	Subscriptions					
	Life and Dead Fuels Moisture Data Updating	Surface and Canopy Fuels	Woody & Herbaceous Live Fuels Data	WindNinja High Resolution Wind Modeling[1]	Building Loss Factor & WUI Vulnerability Analysis	Risk Associated with Value Exposure (RAVE)[2]
FireCast and FireSim	✓	✓	✓		✓	
Wildfire Risk Reduction Module (WRRM)	✓	✓	✓		✓	✓

1 Implementation on hold until evaluation of model completed by other California IOUs
2 Evaluating if RAVE should be implemented

Subscriptions are inputs to WFA modules and are integrated into the modules for seamless modeling.

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DELIVERABLES				SCOPE			SCHEDULE						
	MODEL	What Is Different When Completed?	Lead	Tool Implementation	Training	Documentation	Requirements	Development	Testing	Training	Documentation	Operational	Update Needed for WMP Filing
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	FireCast		TS	❖	❖	❖				Oct 2022	Oct 2022	Nov 2022	Dec 2022
	Fire Potential Index (FPI) Model		TS		❖	❖		Oct 2022	Nov 2022	Nov 2022	Mar 2023	Mar 2023	Dec 2022
	Fragility Curves		TS			❖							
	Contemporary Fire Model		PAC			❖						Apr 2023	
PROJECT PLANNING	Wildfire Risk Model (WRRM) – Release 1 (CA, WA, OR)	Project Selection & Prioritization	TS	❖	❖	❖	Sept 2022						
	Wildfire Risk Model (WRRM) – Release 2 (UT)	Project Selection & Prioritization	TS	❖	❖	❖	Sept 2022						
	Risk Spend Efficiency (RSE) Model	RSE Calculations for Filings / GRC Testimony	PAC			❖	Nov 2022						
	Public Safety Power Shutoff (PSPS) Impact Tool		PAC			❖	Nov 2022						
	Localized Risk Assessment Model (LRAM)		PAC			❖							

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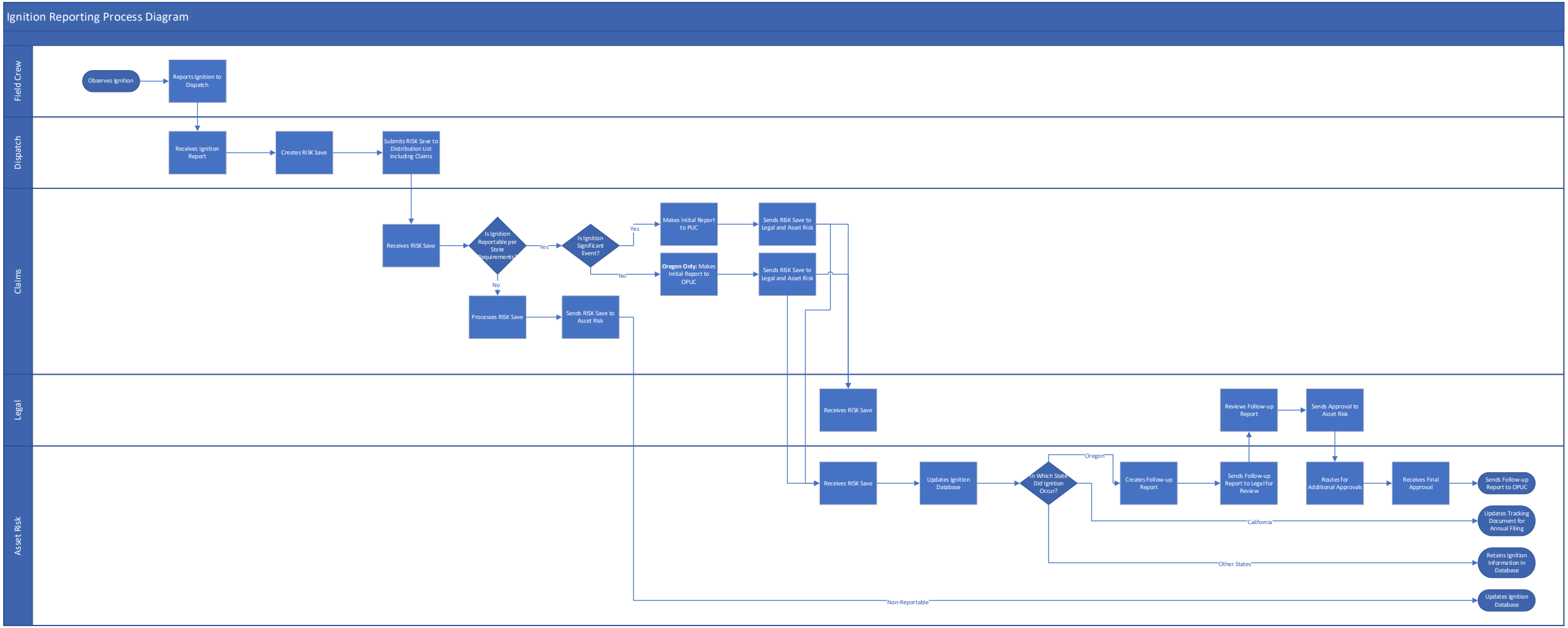
Objective: Inform to Ensure Alignment & Understanding of the Full Project

- Fire Weather Day Selection ("Worst Weather Days") Methodology
  - Improved methodology for selecting representative fire weather days based on lessons learned by other IOUs
  - Includes worst case fire weather days and selection of "typical" fire weather conditions
  - More comprehensive input data set to reflect increasing occurrence of destructive fires outside of extreme fire weather (Bootleg Fire, Dunsmuir PSPS)
  - Service territory grouped into operating areas based on weather patterns
  - Common weather day selection process applied to each operating area:
    - Based on fuel susceptibility, potential wildfire spread due to weather conditions, and wind gusts correlated to outages
    - Weather days are plotted and grouped into clusters
    - Top 50 worst weather days always included
    - Sample of weather days in each cluster also selected

Ignition Reporting Requirements & Process

Objective: Inform to Ensure Alignment and Solicit Feedback on Proposed Changes



Forward Looking Projects / Topics

Objective: Solicit Feedback on Proposed Projects / Topics / Next Meeting

- Proposed Topics:
  - Evaluation of Baseline Risk Mapping in 2023
  - Overview of Technosylva Products: Capabilities, Intended Business Use
  - Service Territory Selection for Technosylva
- Meeting Frequency / Next Meeting
- Feedback on Structure / Content /Attendees

WILDFIRE SAFETY & ASSET MANAGEMENT

WILDFIRE SAFETY

ASSET RISK

ASSET MANAGEMENT

Thank You!

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Wildfire Risk Governance Committee
September 28, 2022

Attendees: Kevin Benson, Allen Bereth, Tim Clark, Jon Connelly , Curtis Mansfield, Amy McCluskey, Steve Vanderberg,

1. Review Charter, Purpose, Objectives, Meeting Frequency
- Meeting is a point for clear, timely decision making
- Inform, and also tee up discussion for areas that we value your insight
- Vegetation Management attendance as needed
- Do not have engineering or operations presence on the Committee. This is due a focus on risk modeling and risk tools vs. Action being taking in the field. Will continue to monitor for decisions or broader that discussions that need their perspective

2. Proposed Changes to Fire Threat Conditions
- Oregon has new requirements on how to classify fire threat conditions
    - Requirement to correct imminent fire threat immediately.
    - Requirement to correct heightened fire threat within 180 days
- Proposal is to increase number of fire threat conditions from 63 to 73 of 239 conditions. Birds nest is now a new specific condition instead a sub-condition
- Discussion that fire threat assessment a two part question:
    - Is it in a category of condition that creates an imminent or heightened fire risk
    - Is it in a location that creates an imminent or heightened fire risk
- Longer term-can fire threats be visualized in Gizmo
- Need a process to identify conditions, evaluate, and remediate as appropriate within the required timeframe

3. Risk Tools Project Update (Technosylva)
- Shared the high level and will share more information in future meetings
- ireCast and FireSim is now operational
- Question if RAVE can model timber impacts. It can, and discussing how that can be implemented
- Property value question: how to integrate value question without focusing of property values that may advantage or disadvantage some populations. Building loss factor and impacts on commercial facilities and timbers may show
- Question: Does RAVE take into account population density/people in a household, will ask Technosylva
- Want to understand what is different as each of the models is rolled out and use the meeting time to do an overview of each of the model and how they all fit together
- Fire Weather Days Selection: Critical Component of WRRM. The how we're implementing something slightly different than California IOUs based on lessons learned. Do have the ability to review, refine and update the model. There is and need a process to update the fire days on a regular cadence
- How granular is the fire weather day? It's the days in each operating area. While the same methodology is used, breaking it up into the operating area ensures that due to the size to the service territory across multiple states high risk days in some operational areas are lost because of the size of the territory.

4. Ignition Reporting Requirements & Process Kevin Benson
- Hold for next meeting

5. Forward Looking Projects/Topics
- Meetings should continue. Start monthly and eventually will transition to quarterly

- Updates as needed at the extended monthly staff meeting to bring the rest of the team up to speed

6. Future Topics

- Ignition Reporting Requirements
- Fire threat conditions process
- RAVE Model, including timber discussion
- Baseline risk mapping
- Fire Weather Days selection and the transition to a probabilistic model vs. relative risk

Wildfire Risk Governance Committee (WRGC)






Agenda

11:00 – 11:05	Review Meeting Topics & Agenda	Kevin Benson
11:05 – 11:15	Wildfire Model Implementation Update	Kevin Benson
11:15 – 11:45	Update on Changes to Fire Threat Conditions	Jon Connelly
11:45 – 12:20	Wildfire Risk Modeling Overview	Kevin Benson
12:20 – 12:30	Forward Looking Projects/Topics	Amy McCluskey

Wildfire Model Implementation Update

Objective: Inform on Project Status

Technosylva Business Integration Schedule As of November 30, 2022

					Deliverables		Scope		Schedule						
	Priority	Model	What is Different When Completed?	Lead	Tool Implementation	Documentation	Requirements	Development	Testing	Training	Documentation	Operational	Program Handoff for WMP
Planning	1	Wildfire Risk Model (WRRM)	Project Selection & Prioritization	TS	❖	❖	✓	➢	➢	Dec	➢	Dec	Dec
	2	Risk Spend Efficiency (RSE) Model – Planning	Project selection and prioritization for wildfire mitigation efforts	PAC		❖					Dec		Dec
		Risk Spend Efficiency (RSE) Model v2- With WRRM integration	Leverage WRRM for project selection and prioritization for wildfire mitigation efforts	PAC	❖	❖	Jan	Feb	Mar	Apr	Apr	May	Jun
	5	Public Safety Power Shutoff (PSPS) Impact Tool	Understand potential impacts of a PSPS and how mitigations could reduce the need	PAC	❖	❖	Mar	Mar	May	May	May	Jun	Jun
	8	Localized Fire Risk Assessment Model (LRAM)	LRAM will be phased out pending comparison of capabilities to WRRM	PAC		❖					Jan		Feb
		Annual Mitigation Selection Planning Process	Updated process to select mitigation efforts using new tools	PAC		❖	Dec		Jan	Jan	Feb	Feb	Mar
Operations	3	FireSim (WFA-E)	Simulation to forecast the potential fire behavior and spread from as little as one hour to up to a 96-hour period	TS		❖					➢	✓	Dec
	4	FireCast (WFA-E)	Ability to perform daily wildfire simulations daily across the service territory to assess the fire risk	TS		❖					➢	✓	Dec
	6	Fire Potential Index (FPI) Model	Evolution of District Fire Risk Assessment to provide more automation	TS	❖	❖			➢	Mar	➢	Mar	Mar
	7	Contemporary Fire Risk Model (component of LRAM)	LRAM will be phased out pending comparison of capabilities to WFA-E	PAC		❖					Jan		Feb
	9	Fragility Curves	Updated fragility curves for operating areas covered by WFA-E	TS		❖						Apr	
		Annual Process Review and Update	New Process in place to update assets, configurations and other information to keep models current	PAC		❖	Apr		May	May	May	May	Jun

PAC= PacifiCorp TS=Technosylva ❖ In Scope ➢ Started ✓ Complete

Update on Changes to Fire Threat Conditions

Objective: Inform to Ensure Alignment and Solicit Feedback on Proposed Program Plan

Wildfire Risk Modeling Business Context

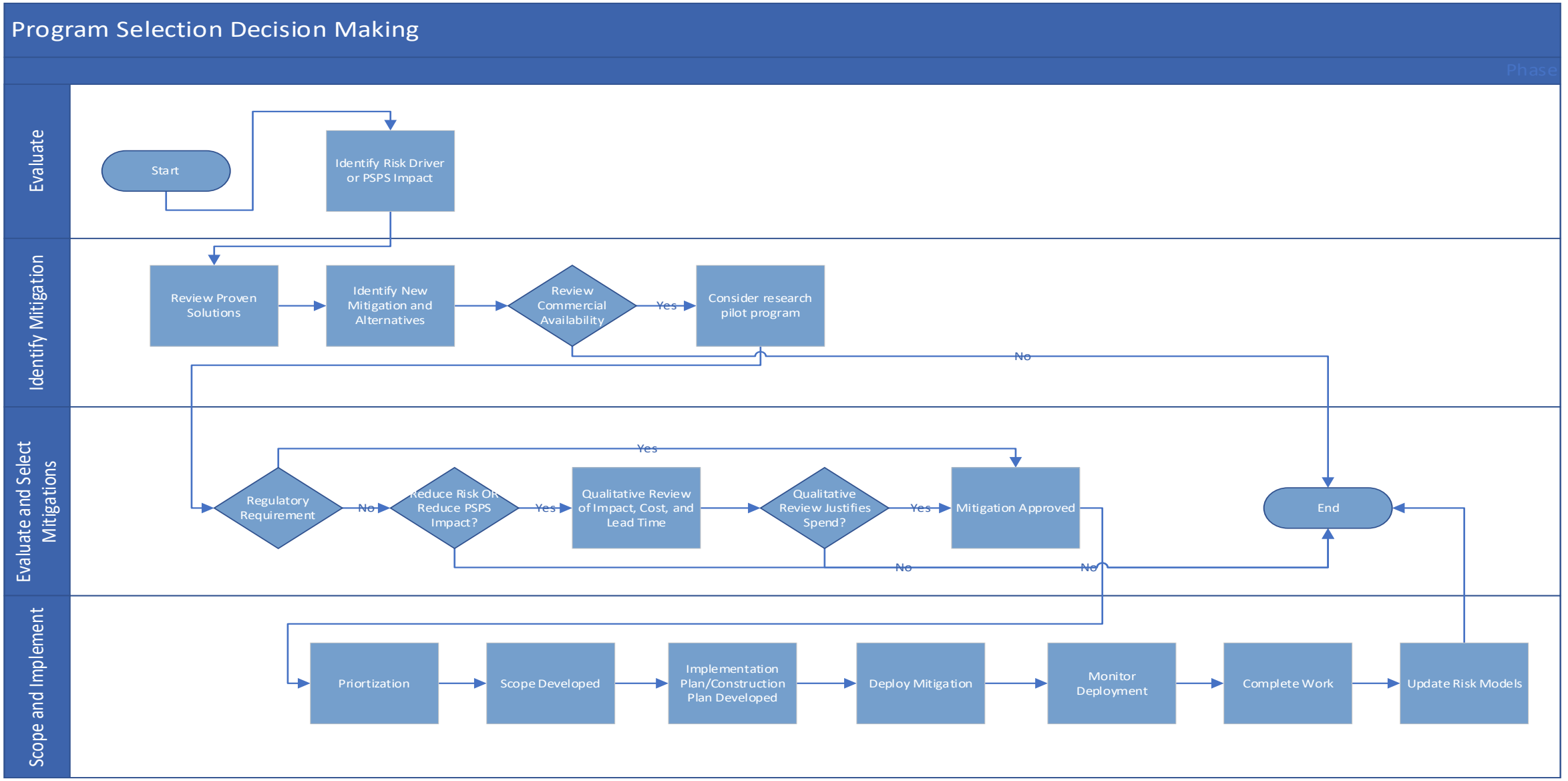
Objective: Inform to Ensure Alignment and Solicit Feedback on Proposed Program Plan

Business Objective: Validated Risk-Spend Efficiency (RSE) model for all wildfire mitigation initiatives for project selection and prioritization by September 2023

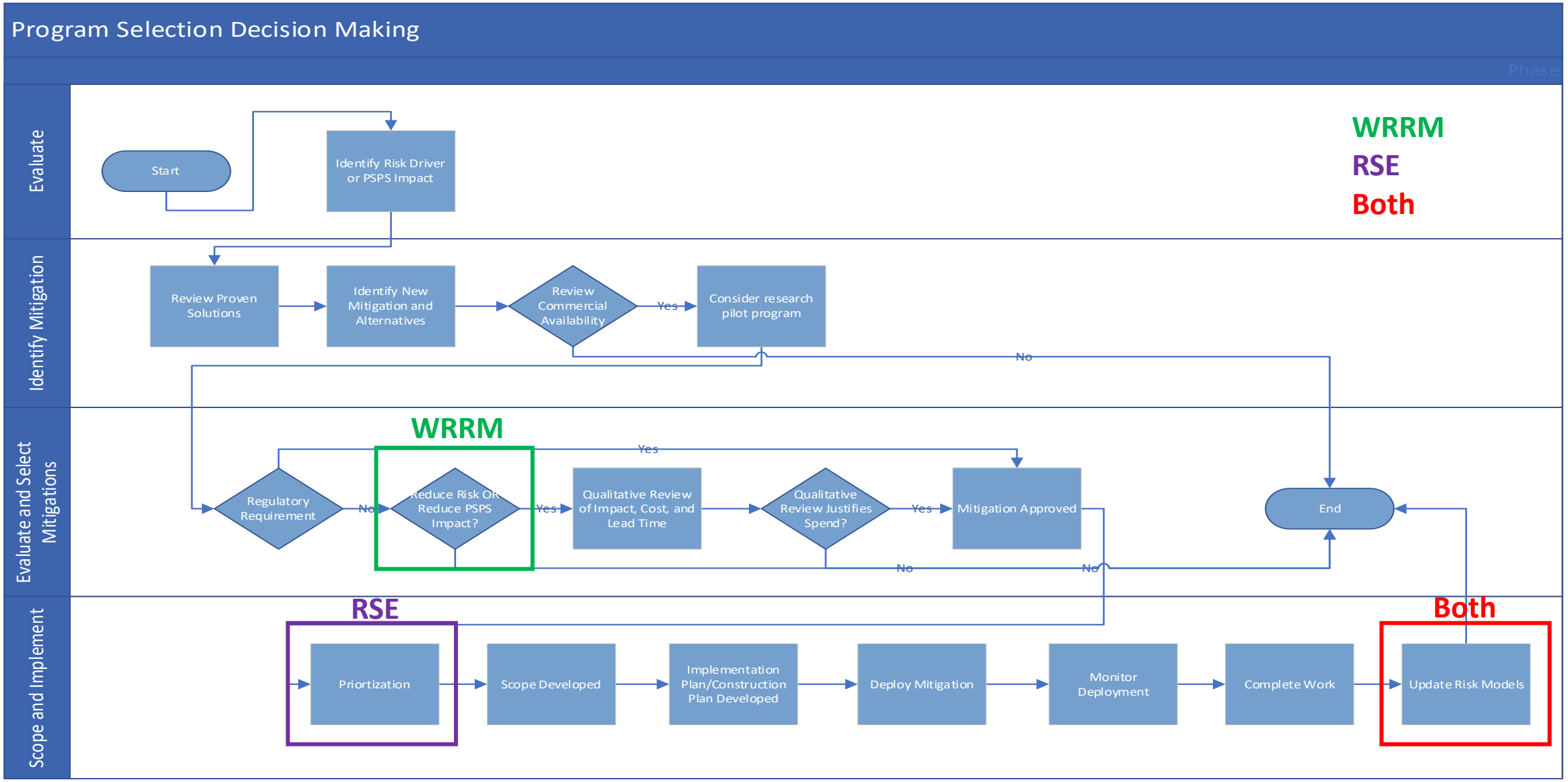
Basis:

- Business prudence to optimize wildfire mitigation programs for effectiveness and cost efficiency
- Regulatory requirements for WMP
- Foundational modeling capability for other programs including system performance/reliability planning

Wildfire Mitigation Process Overview



Wildfire Mitigation Process Overview



Wildfire Risk Modeling – WRRM

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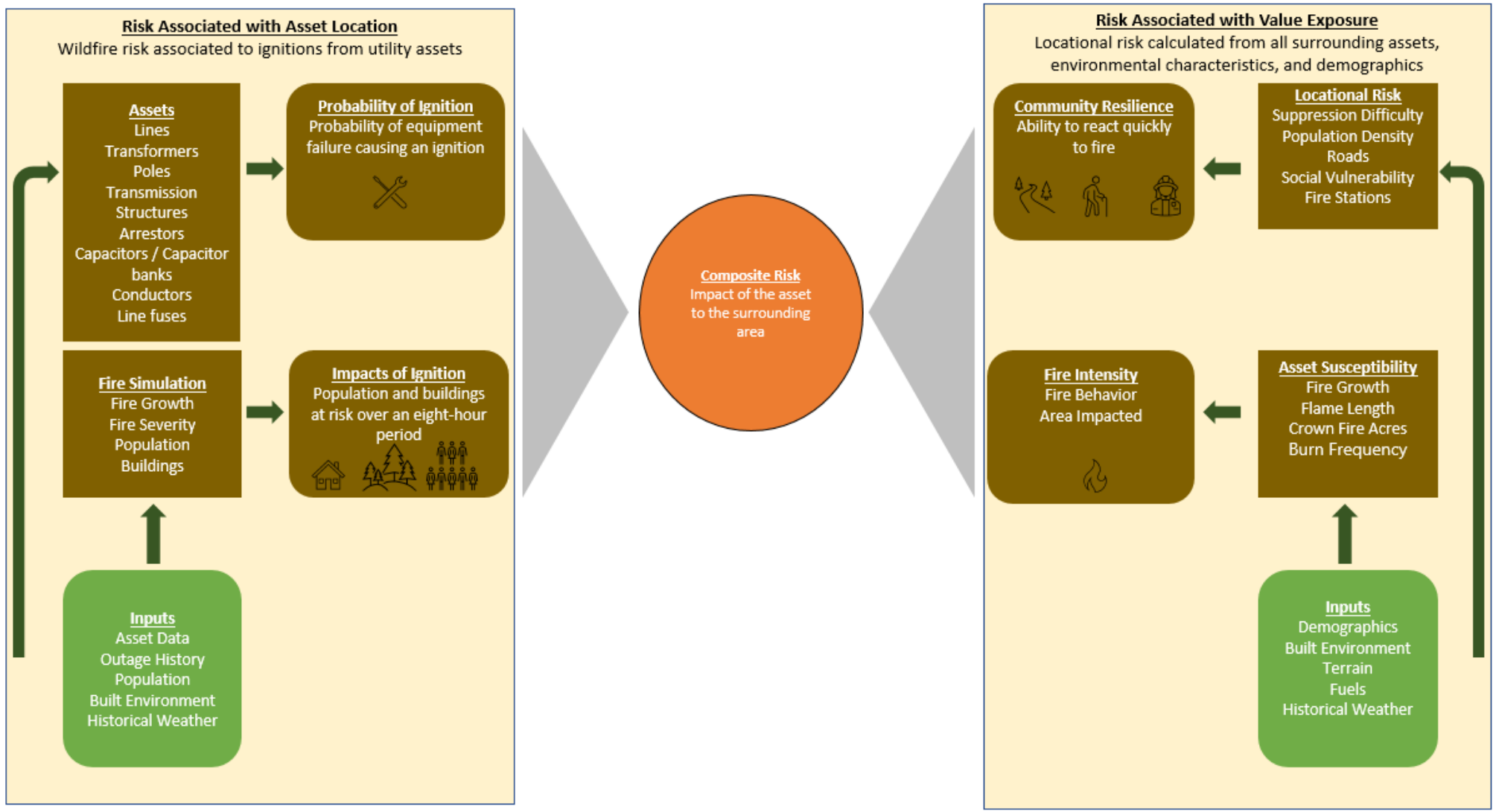

Wildfire Risk Modeling –RSE (high-level summary)

- **How do we validate Technosylva output and calculate mitigation effectiveness?**

Step 1: Validate WRRM Output

- ❑ ***How do we know the composite risk scores/locations from WRRM are actual areas of concern?***
- ❑ **Answer = Historical Data**
- Use historical fire ignition data from PacifiCorp and compare them to WRRM output…did fires occur/near there in the past?
- Take real-world data from PacifiCorp (where a fire did occur and cause issues) and see if WRRM highlighted this area as a concern

Step 2: Mitigation Effectiveness?

- ❑ ***How do we calculate or quantify mitigation effort effectiveness?***
- ❑ **Answer = Historical Data + Other Utilities + Models**
- Evaluate mitigation efforts used by the company and other utilities and perform a “before and after” analysis
- **Future work**: Develop a predictive model which can output a mitigation effort based on location specific considerations (partnering with Technosylva)

Wildfire Risk Modeling –RSE (high-level)

Step 1: RSE Inputs

- ❑ **WRRM composite risk score**
  - RAIL and RAVE combined risk scores
- ❑ **Project Location**
  - Another output from WRRM
- ❑ **Estimated Cost of Mitigation Effort**
  - Company or estimate based on other utilities

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Step 2: Prioritization and Cost

- ❑ **Prioritize Location**
  - Based on WRRM output and SME input
- ❑ **Prioritize Mitigation Type + Cost**
  - Determine best type of mitigation for that location and estimated cost
- ❑ **Finalize Priority (RSE)**
  - Based on the above, output a finalized, cost-effective mitigation priority for each location

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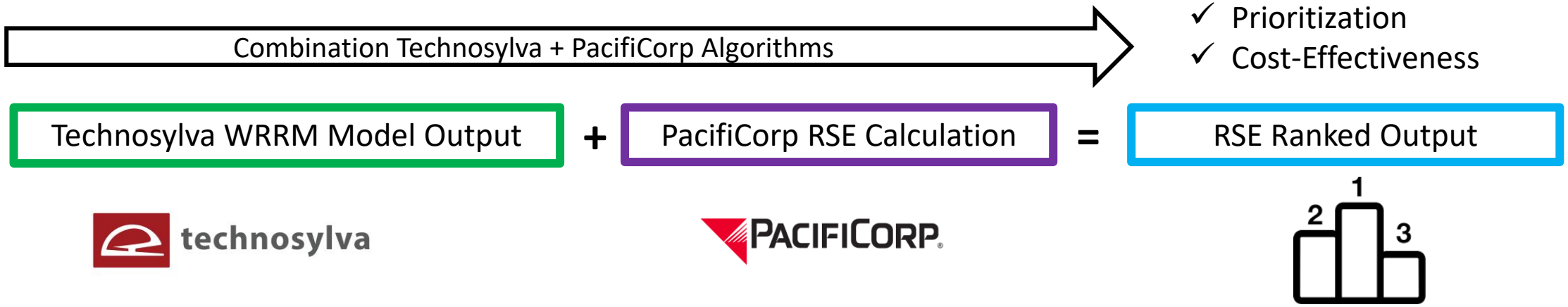
Step 3: Outputs

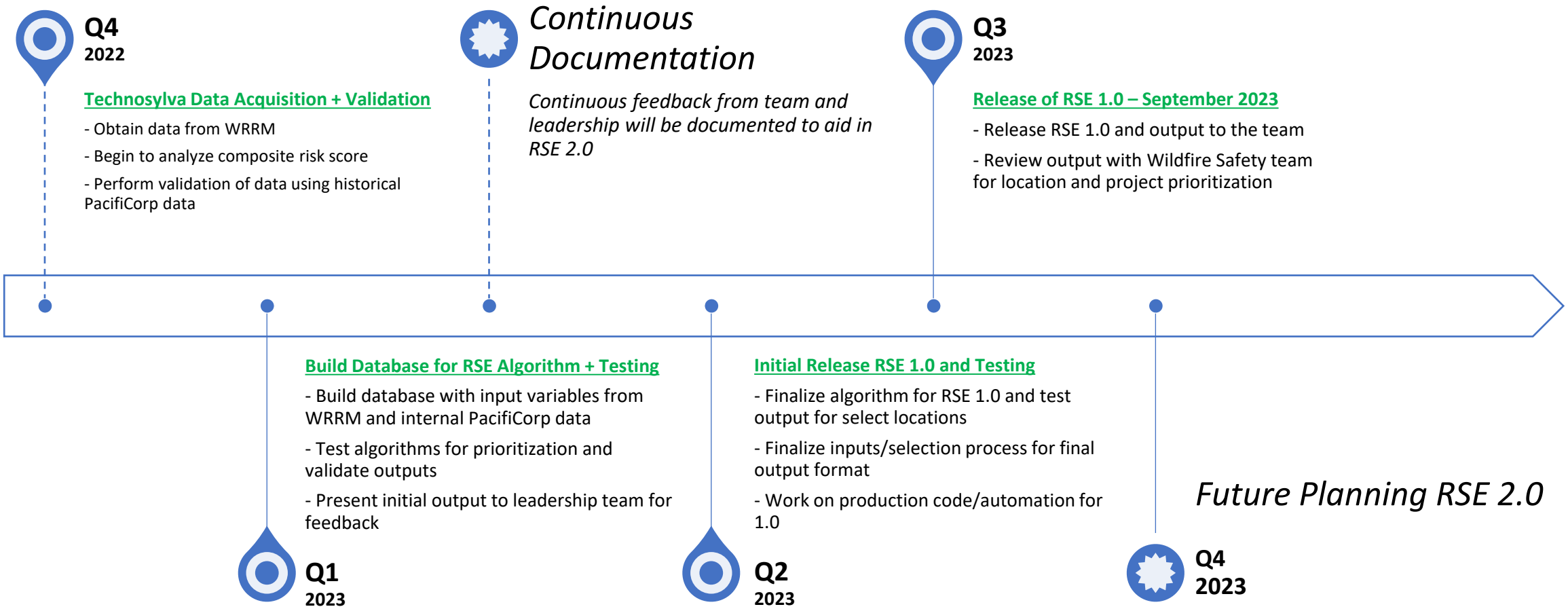
- ✓ Ranked effectiveness for each mitigation by location
- ✓ Ranked RSE for each mitigation by location
- ✓ **Future**: Model predictions for each mitigation type by location

Wildfire Risk Modeling –RSE (high-level summary)

- **RSE High-Level Summary**
  - We are taking the **output** of a vendor model (Technosylva) and combining it with internal mitigation/cost effectiveness algorithms to provide a ranked list of mitigation efforts based on location
  - This will allow us to utilize the expertise of Technosylva along with our internal calculations/algorithms to prioritize mitigation locations and ensure cost-effectiveness



Wildfire Risk Modeling Plan of Action & Milestones



Forward Looking Projects / Topics

Objective: Solicit Feedback on Proposed Projects / Topics / Next Meeting

- Proposed Topics:
  - Timeline and Next Steps for FHCA Updates (January)
  - Service Territory Selection for Technosylva (January)
  - Technosylva (RAVE, RAIL): Intended Business Use, Assumptions/Decisions (February)
  - FPI and Fragility Curves (February)
- Meeting Frequency / Next Meeting
- Feedback on Structure / Content / Attendees

WILDFIRE SAFETY & ASSET MANAGEMENT

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Thank You!

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Meeting Notes
Wildfire Risk Governance Committee
October 12, 2023

Attending: Kevin Benson, Allen Berreth, Megan Buckner, Curtis Mansfield, Amy McCluskey, Chris Spencer, Erik Brookhouse, Jordan Pino, Thomas Riese Alex Vaz, Jon Connelly, Yesh Suryadevara, Tim Clark, Carrie Laird, Jeff Keyser

Absent: Steve Vanderburg, Elenore Yostov, Jordan Popham

1. Approach to FHCA mapping
- Used the composite risk scores from FireSight (previously called WRRM)
- Worked with Meteorology to validate the areas based on the knowledge of fire science
- No removal of current FHCA areas
2. Proposed Maps:
- Class 3 in California and Oregon generally aligns well with current maps
- Expansion in Utah, new FHCA in Wyoming
- Class 2: Substantial growth in Utah, new areas in Idaho and Wyoming
3. Questions:
- How does modeling align with California IOUs and risk scores?
  General approach is aligned. Differences on probability of failure (PoF), large California IOUs rely on internally built models, PAC is using Technosylva PoF models that are part of the FireSight model which are good for best practices. Looking at a potential project to consider in house capability.
- When the FireSight model says “value” is that a dollar value?
  No dollar values are assigned. "Value" in this context means "feature on the landscape that could be damaged by wildfire."
- Is timber considered in the model?
  It is not included currently. Evaluating if it should be included
- The difference in acres burned and buildings damaged in classes does not seem that large.
  The buildings and acres are average, not a worst case. Also, the buffers will include areas that may be lower risk as they are further away from the area of consequence.
- Do the models account for recent burns?
  The models use 2030 fuels assuming growth from recent fires
- Are the classes distinct?
  Yes, they are
- How were urbanized areas defined:
  Per US Census: "an urban area must encompass at least 5,000 people or at least 2,000 housing units”. Census data was used to identify the urban areas.
- Is suppression difficult considered in the FHCA maps?
  The RAVE model used as part of the FireSight calculation considers fire station density.
- Why do some locations do not see Class 2 between Class 1 and Class 3 areas?
  Primarily a function of the buffer. The buffer extends 10,000 meters and a Class 3 area with its buffer may cover what would be a Class 2 area without the buffer.
- Why was a 10,000-meter buffer selected?

Modeled smaller buffers of 2,000-meter, 5,000 meter and 8,000 meters. Based on feedback from Meteorology and their experience of wildfire science, they selected 10,000 meters. Want to keep a consistent buffer.
Also, the risk changes along the circuits due to asset type and conditions in the area

4. Feedback:

- Need to understand the impacts of the map on current and pending litigation.
- Need to be able to discuss why some areas are in Class 1 when they are adjacent to a burn scar or adjacent to a Class 3 area.
- What are the implications for recovery with adding new areas or removal or areas that were previously in a class
- Impacts are on vegetation management and asset inspection programs
- Is a buffer needed and how large does it need to be?

5. Next Steps

- Provide data on the break classes and the max impacts
- Provide detail on the math behind the areas
- Provide data on FHCA areas by state
- Show impact of removal of urbanized areas (how many and size of area)
- Show how reported fires align with classes
- Schedule meeting week for deep dive
- Provide class view at the circuit level (no buffer)

Wildfire Risk Governance Committee (WRGC)

December 1, 2022






Agenda

11:00 – 11:05 Review Meeting Topics & Agenda *Kevin Benson*

11:05 – 11:15 Technosylva Implementation Progress Update *Kevin Benson*

11:15 – 11:45 Update on Changes to Fire Threat Conditions *Jon Connelly*

11:45 – 12:20 Fire Risk Modeling Strategy Overview *Kevin Benson*

12:20 – 12:30 Forward Looking Projects/Topics *Amy McCluskey*

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Amy McCluskey	Mng Dir, Wildfire Safety & Asset Management	Advisor
Tim Clark	Asst General Counsel	Advisor
Brian King	Director, Environmental & Vegetation Mgmt	Advisor (Optional, TBD)
Melissa Swenson	Project Manager / Process Integration Manager	Meeting Minutes, Documentation, Agenda

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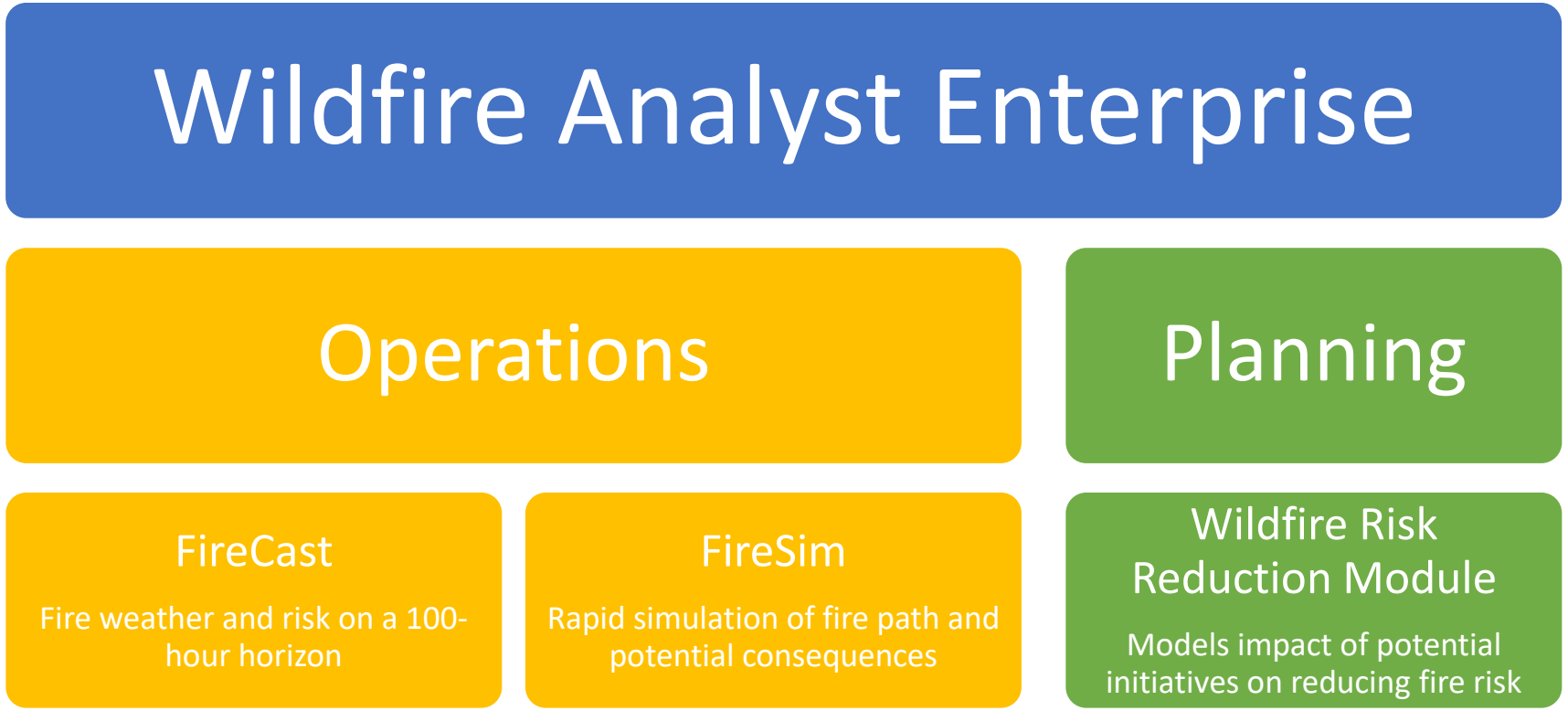

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	Wildfire Risk Model (WRRM) – Web Application	Project Selection & Prioritization	TS	❖	❖	❖	Sept 2022						
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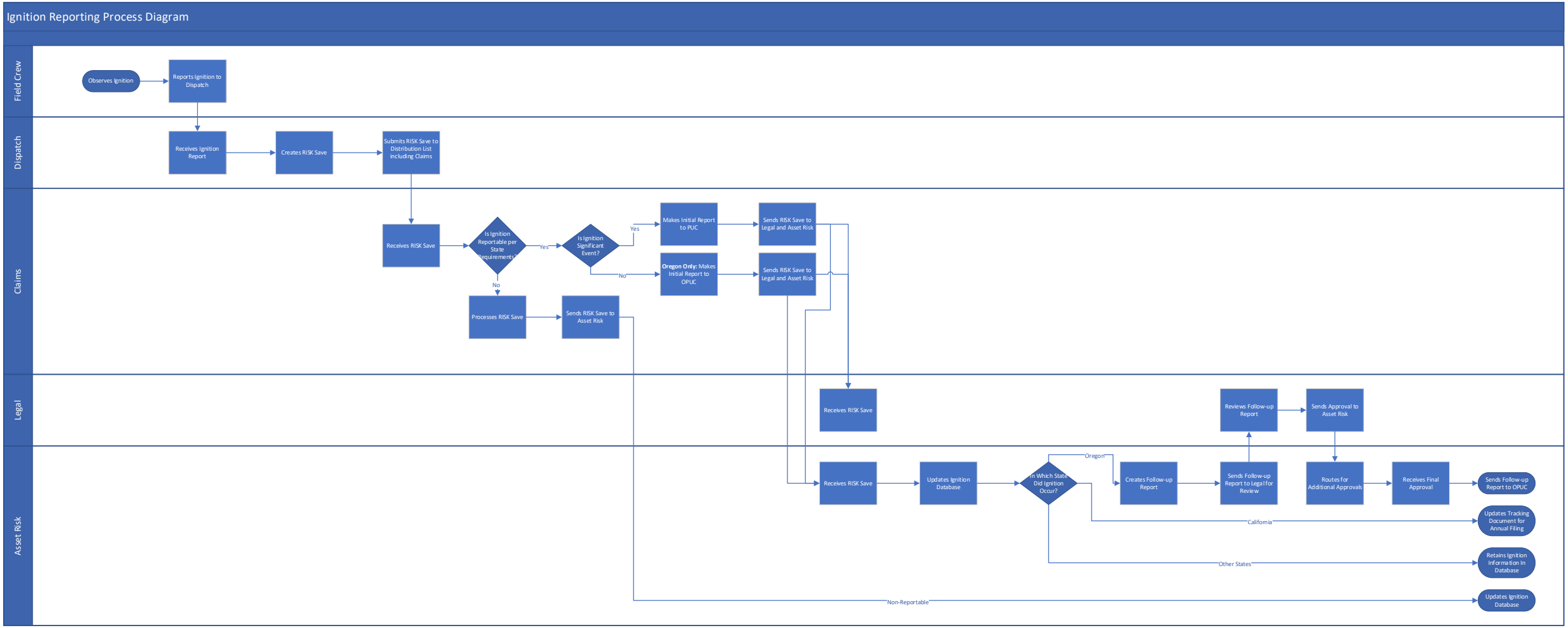

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WILDFIRE SAFETY & ASSET MANAGEMENT

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Meeting Notes
Wildfire Risk Governance Committee
December 1, 2022

Attending: Kevin Benson, Allen Berreth, Eric Brookhouse, Tim Clark, Jon Connelly, Vivian du Pont, Curtis Mansfield, Amy McCluskey, Jordan Pino, Steve Vanderburg, Elenore Yotsov

1. Wildfire Models Implementation Update

- Risk Spend Efficiency (RSE) is yellow for the initial implementation due to late start, will be back on track next month as the team is up to speed and working on it. Beginning with covered conductor pilot will expand from there
    - Question: Will RSE include underground? Not at implementation, but will expand to include underground
    - RSE will enable PacifiCorp to compare possible mitigations for an area and identify which is most effective relative to the cost
- New work: Updating of business processes to tie the planning tools together. The plan is to use the new tools in the process in 2023 for selection of 2024 projects. The new tools will not change the planning process much, but will bring more rigor to the process
- PSPS impact tool: Planning tool like the Wildfire Risk Reduction Module (WRRM) to identify areas of highest risk of a PSPS, meets CA OEIS requirement to have a combined Wildfire and PSPS risk for planning but also serves a business purpose to support identification and prioritization of mitigation efforts.
- Fire Potential Index: This tool is an operational tool to evolve the inputs to the daily District Fire Index Report. Technosylva is developing and after they deliver the initial version, Meteorology will review the model and potentially adjust it before implementing for the start of 2023 wildfire season

2. Update to changes in Fire Threat Conditions

- Oregon has new requirements on how to classify fire threat conditions
    - Requirement to correct imminent fire threat immediately-No change.
    - Requirement to correct heightened fire threat within 180 days-Change from prior rule of 12 months
- Number of imminent fire threat conditions has increased from 63 to 73 of 239 conditions
- For consistency, PacifiCorp will implement the same classifications and remediation timeline across all states
- Approach to remediating known issues with implementation of new rules:
    - Any issues discovered before September 8, 2022, will continue their current timeline
    - Issues discovered after September 8 are subject to the new timeline

3. Wildfire Risk Modeling Overview

- WRRM implementation will enable compliance with CA OEIS guidelines and meet requirements for OR and UT WMPs and supports business need to make sure work is optimized and efficient
    - Q1: Using WRRM data and RSE pilot and integration of WRRM into pilot
    - RAIL and RAVE. will provide more nuance and precision of the impact of a fire in a community

    - WRRM currently doesn't perform scenario modeling of the effectiveness of mitigations, there is request to Technosylva to build this in WRRM as a future development
- The RSE model will be an internally developed solution to rank the potential mitigations based on effectiveness relative to cost. Ultimately want to transition this to the solution Technosylva is building to have them provide the support
- Asset Team will build a wildfire incident database to track the incidents and aggregate it with information from other sources. Also changing process to go beyond compliance reporting to comprehensive tracking of ignition incidents. Will need coordination and cooperation of field teams to help collect that data.

4. Action Items:

- Future meeting topics:
    - Deep dive into Fire Prediction Index inputs
    - Public Safety Power Shutoff inputs and weightings
    - Weightings in WRRM for RAVE and RAIL
    - Analysis and update on HCFA's
- Curtis and Amy to discuss Utah fire threat conditions
- Governance Committee asked to receive one-page program schedule on a regular basis and as tools are implemented, updates on business results
- Monitor for changes in regulatory relief for wildfire mitigation. While regulators have not placed a limit on the amount to fund for wildfire mitigation, all projects are subject to prudency review by regulators

Wildfire Risk Governance Committee (WRGC)






Agenda

11:00 – 11:05	Review Meeting Topics & Agenda	Kevin Benson
11:05 – 11:15	Wildfire Risk Project Status	Melissa Swenson
11:15 – 11:45	FHCA Updates	Jordan Pino
11:45 – 12:15	Risk Modeling Service Territory Selection	Kevin Benson
12:15 – 12:30	Future Topics & Feedback	Kevin Benson

Wildfire Model Implementation Update

	Deliverables			Scope		Schedule						
	Model	What Is Different When Completed?	Lead	Tool Implementation	Documentation	Requirements	Development	Testing	Training	Documentation	Operational	Program Handoff for WMP
Planning	Wildfire Risk Model (WRRM)	Project Selection & Prioritization	TS	❖	❖	✓	✓	✓	✓	➢	✓	Mar
	Risk Spend Efficiency (RSE) Model	Leverage WRRM for project selection and prioritization for wildfire mitigation efforts	PAC	❖	❖	✓	➢	Apr	Aug	Aug	Sep	Sep
	Public Safety Power Shutoff (PSPS) Risk Assessment Solution	Understand potential impacts of a PSPS and how mitigations could reduce the need	PAC	❖	❖	Mar	Mar	May	May	May	Jun	Jun
	FHCA Assessment	Subject to regulatory approval, changes in FHCA areas across PacifiCorp's operating areas.	PAC		❖	Feb	Mar	May	Jun	Jun	Jun	Jun
	Localized Fire Risk Assessment Model (LRAM)	LRAM will be phased out pending comparison of capabilities to WRRM	PAC		❖					➢	Feb	Feb
	Annual Mitigation Selection Planning Process	Updated process to select mitigation efforts using new tools	PAC		❖	➢				Feb	Feb	Mar
Operations	FireSim (WFA-E)	Simulation to forecast the potential fire behavior and spread from as little as one hour to up to a 96-hour period	TS		❖					➢	✓	Feb
	FireCast (WFA-E)	Ability to perform daily wildfire simulations daily across the service territory to assess the fire risk	TS		❖					➢	✓	Feb
	Fire Potential Index (FPI) Model	Evolution of District Fire Risk Assessment to provide more automation	TS	❖	❖			➢	Mar	➢	Mar	Mar
	Public Safety Power Shutoff Thresholds	Dramatically reduce/eliminate wildfire risk in PacifiCorp's Northern California service territory	PAC		❖					➢		Feb
	Fragility Curves	Updated fragility curves for operating areas covered by WFA	TS		❖		✓	➢			Apr	
	Annual Process Review and Update	Process in place to update assets, configurations and other information to keep models current	PAC		❖	Apr		May	May	May	May	Jun

PAC= PacifiCorp TS=Technosylva ❖ In Scope ➢ Started ✓ Complete

HFCA and HFTD + Risk – Overview of Task

Objective: Review outputs from the Wildfire Risk Reduction Model (WRRM) compared to current FHCAs to identify potential new high-risk areas and *inform on project scope and timeline for questions and feedback.*

- In addition to analyzing FHCA (defined by PacifiCorp) in relation to risk, we also explore WRRM outputs compared to **Tier 2/3 High Fire Threat Districts** (HFTDs) in California.

- Important Acronyms:
  - **F**ire **H**igh **C**onsequence **A**rea (FHCA) – defined by PacifiCorp
  - **H**igh **F**ire **T**hreat **D**istrict (HFTD) – defined by state of California
  - **W**ildfire **R**isk **R**eduction **M**odel (WRRM)

Overview of Current OR FHCA with WRRM Output

Note: *Maps for illustrative purposes only. Dark map is meant to show distribution circuit risk.*

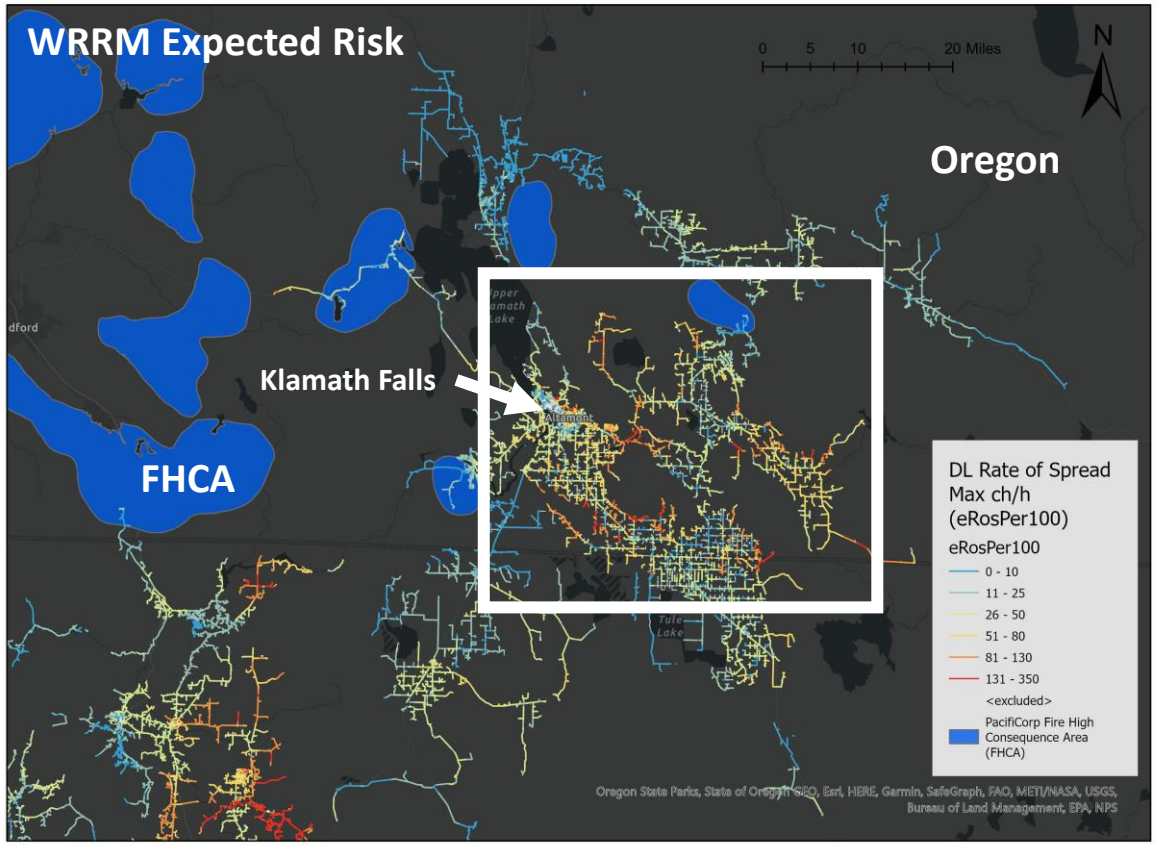


Figure 1: WRRM output (rate of spread) for distribution circuits with current FHCA areas overlain.

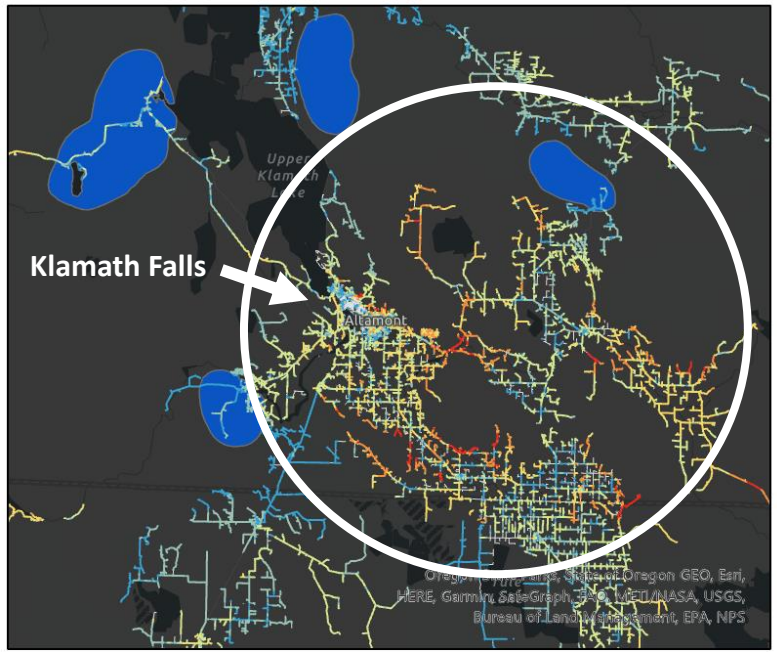


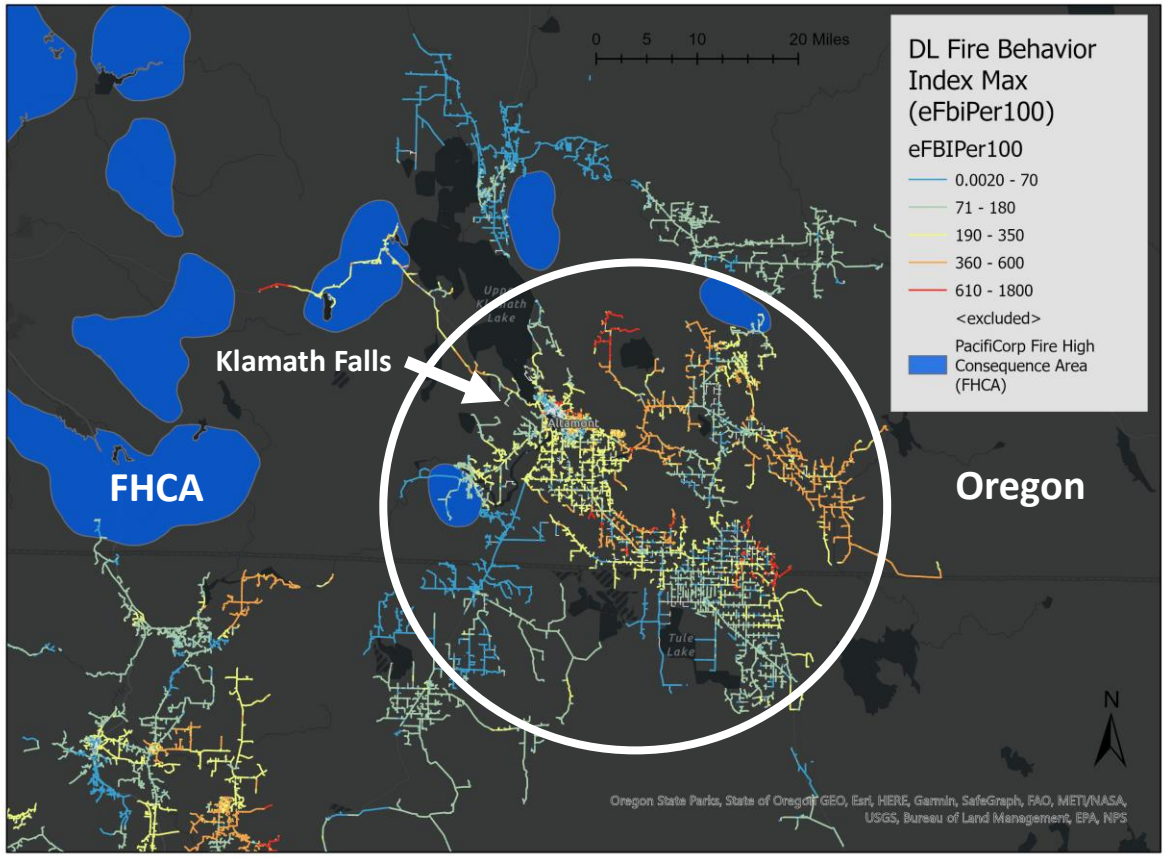
Figure 2: Zoomed in version showing high rate of spread for circuits outside FHCA.

- WRRM output for rate of spread shows areas that are high risk but not in current FHCA.
- **Although theses maps are showing rate of spread, there are other variables we are going to consider when updating the maps.**

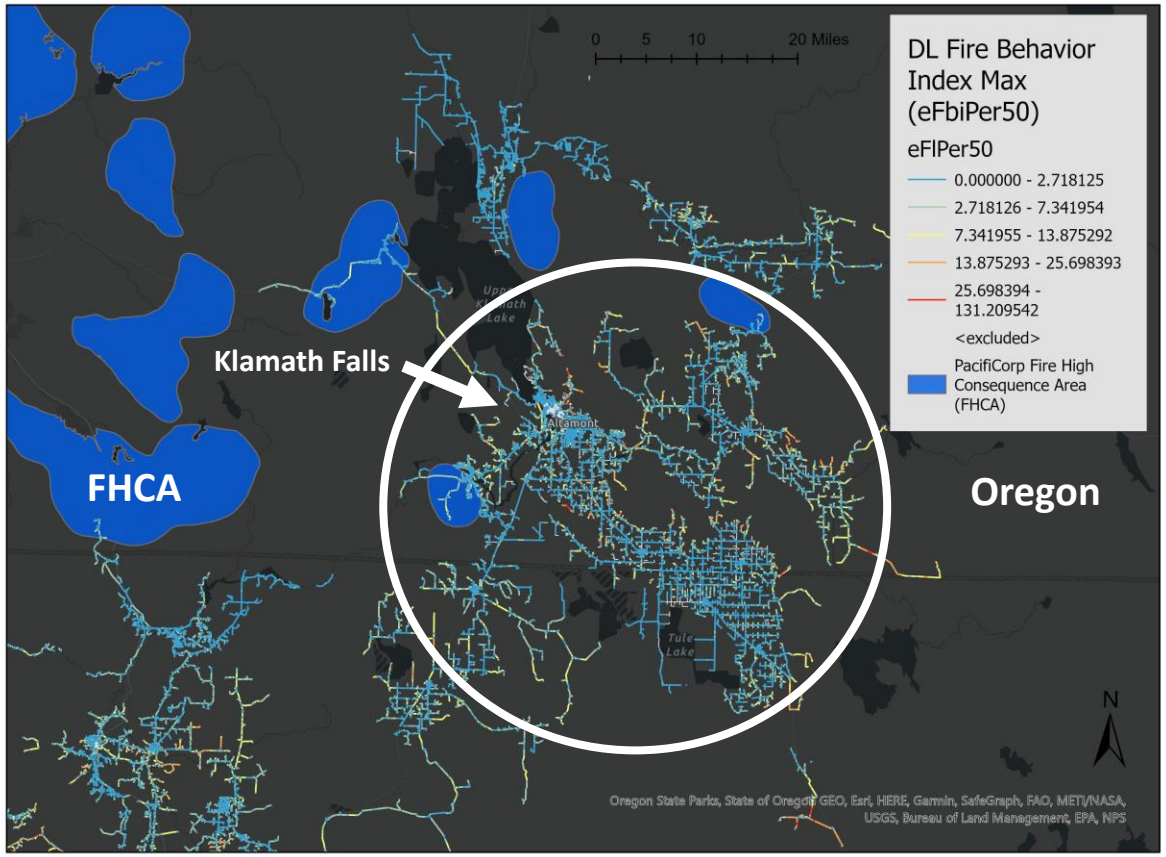
Risk Changing with Percentiles (shows varying levels of risk)

Note: *Maps for illustrative purposes only. Dark map is meant to show distribution circuit risk.*

Fire Behavior Index (99th Percentile – Worst Case Scenario)



Fire Behavior Index (50th Percentile – "Average" Scenario)



Risk Changing with Percentiles (shows varying levels of risk)

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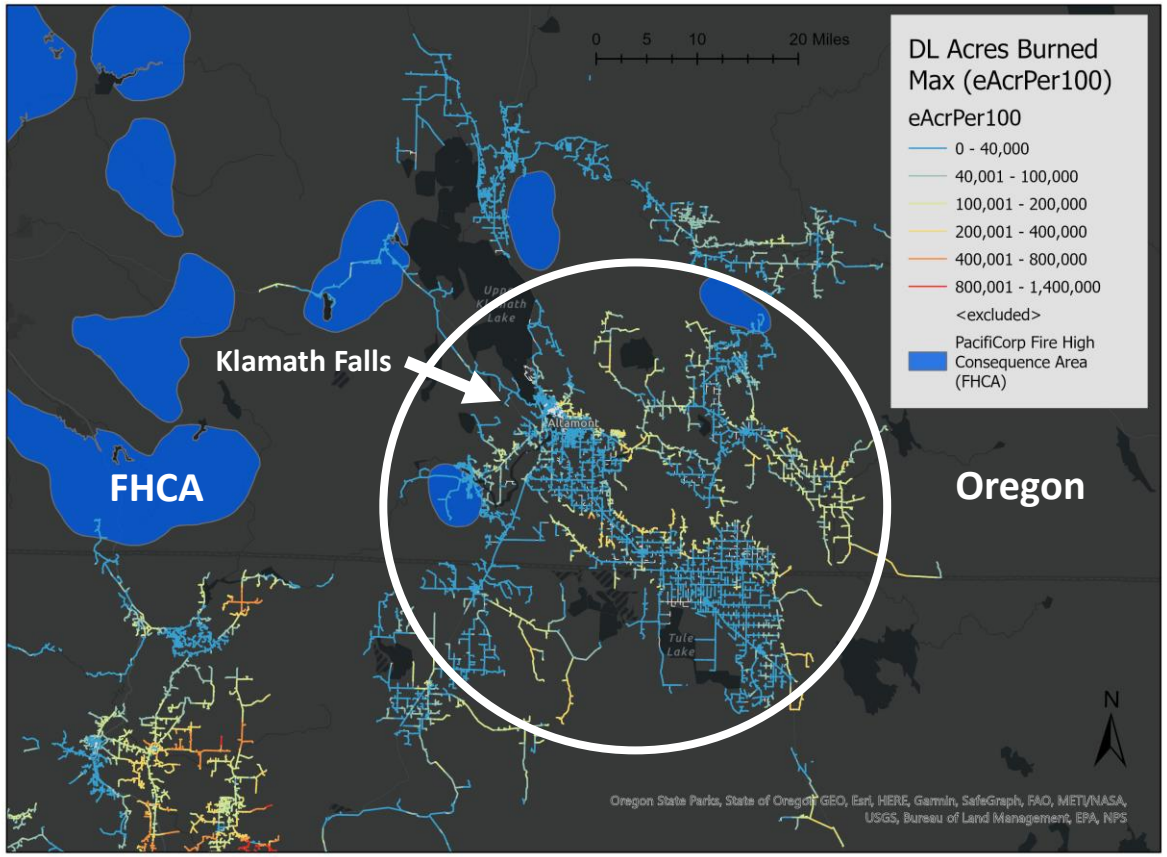
Acres Burned (99th Percentile – Worst Case Scenario)



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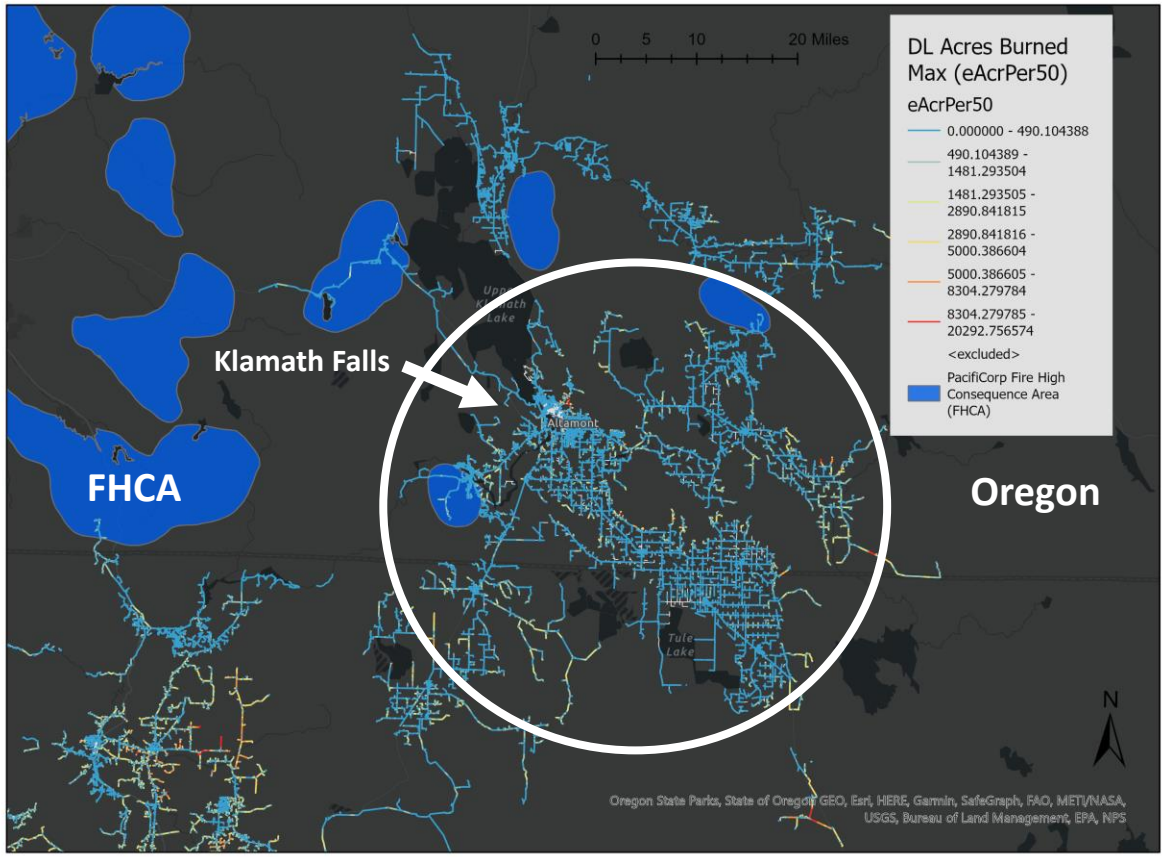


Overview of Current CA HFTD with WRRM Output

Note: *Maps for illustrative purposes only. Dark map is meant to show distribution circuit risk.*

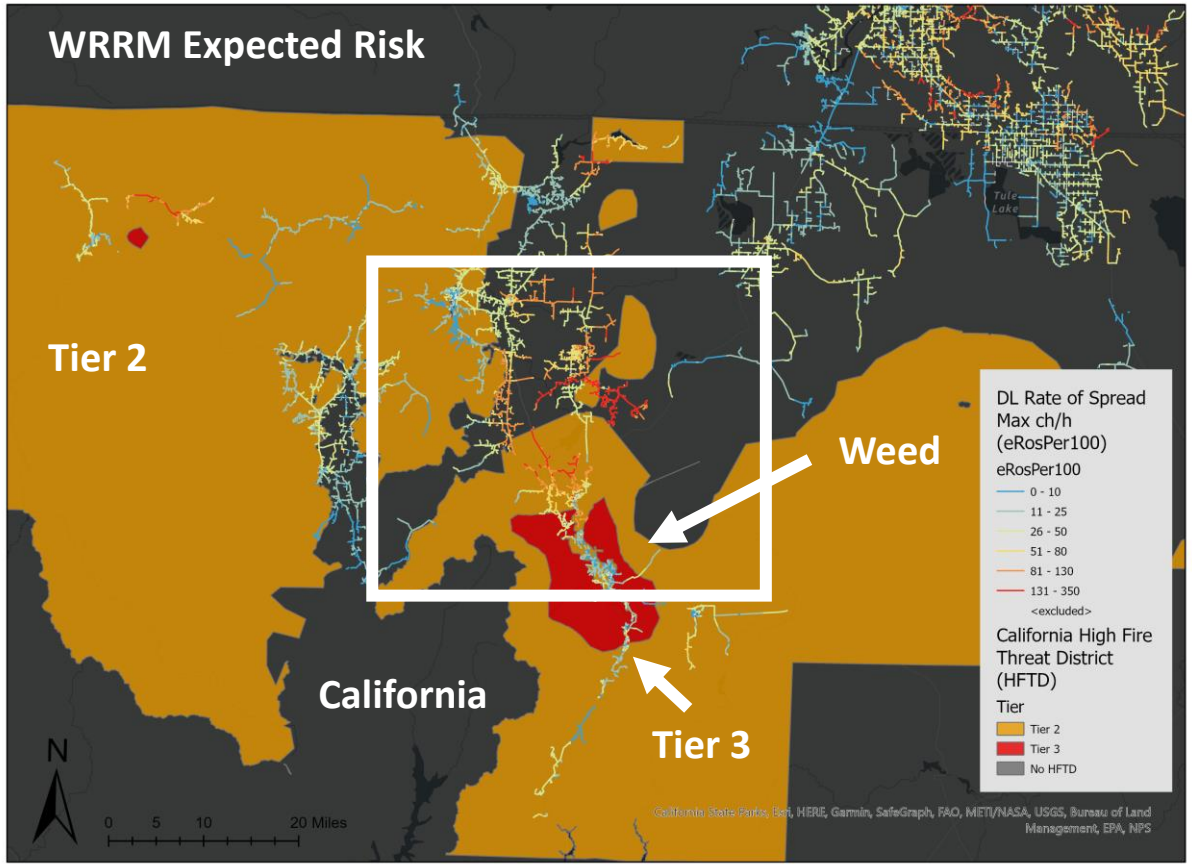


Figure 1: WRRM output (rate of spread) for distribution circuits with current HFTD areas overlain.

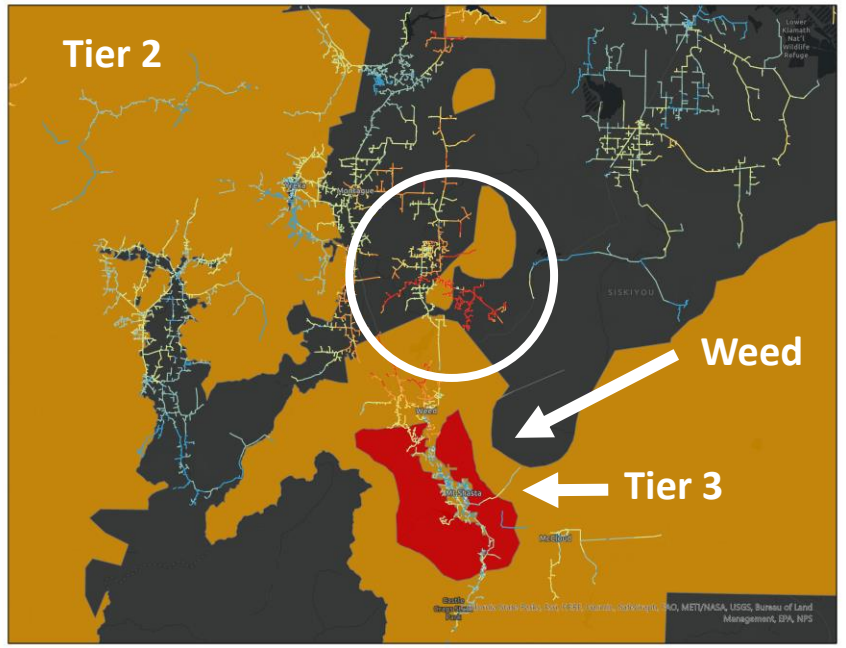


Figure 2: Zoomed in version showing high rate of spread for circuits outside HFTD.

- WRRM output for rate of spread shows areas that are high risk but not in HFTDs.
- **Further analysis required to determine where FHCA should be added to supplement HFTDs.**

Changes & Next Steps

The FHCA map update plan includes **understanding how best to use** the output of WRRM.

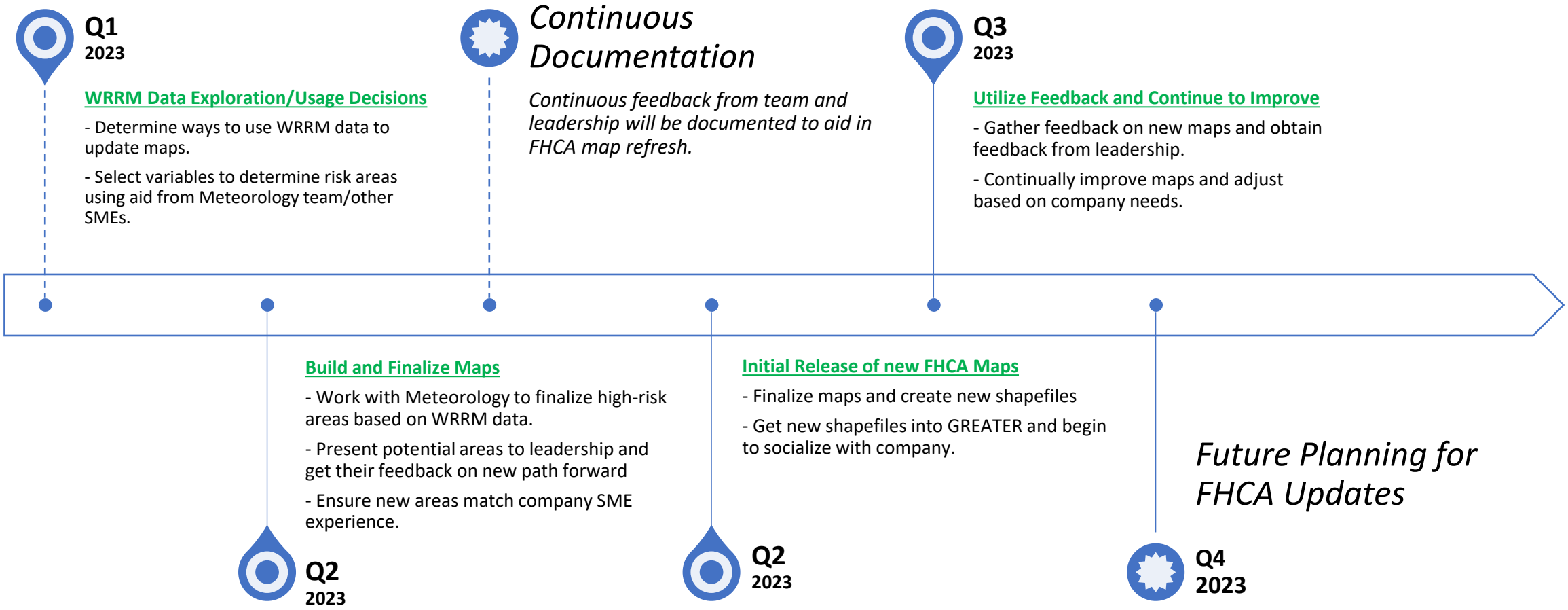
What is different with this FHCA update?

- ✓ We expect to expand the FHCA in Oregon and California.
- ✓ This will aid vegetation management, inspections, and other functions better target risky areas.
- ✓ WRRM data now allows map refresh to be done **internally**.
- ✓ Leverages WRRM to ensure consistency of calculations and methodologies used to identify areas of high wildfire risk for planning and regulatory filings.

Next Steps:

- ✓ Deep dive into the WRRM data and determine the variables needed for the map refresh.
- ✓ Evaluate developing FHCA in remaining states.

FHCA High-Level Timeline



PacifiCorp WRRM Domain Analysis – Overview of Task

Objective: Inform on Project Scope and Timeline for Questions and Feedback

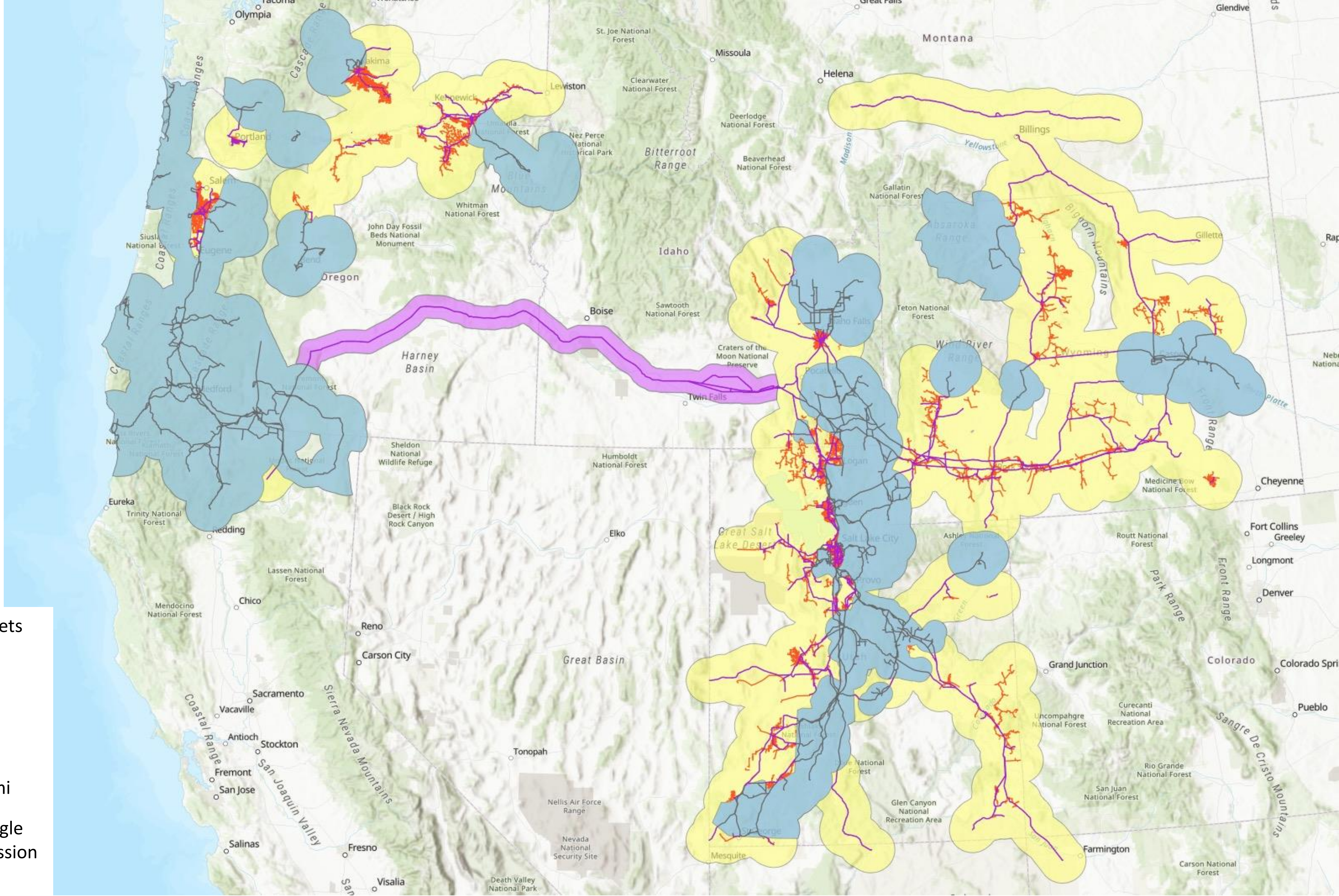
Project Objective: Determine new areas to include in Technosylva WRRM analysis for additional risk assessment

Options:

1) **Analyze new areas in 2023.** Use a 10-mile buffer around assets to analyze new areas in all 6 states that are not urban cores.
2) **Analyze new areas over two years.** Use a 10-mile buffer to analyze OR, CA, and UT in 2023. In 2024, analyze WA, ID, and WY. For both phases, exclude assets in urban cores.

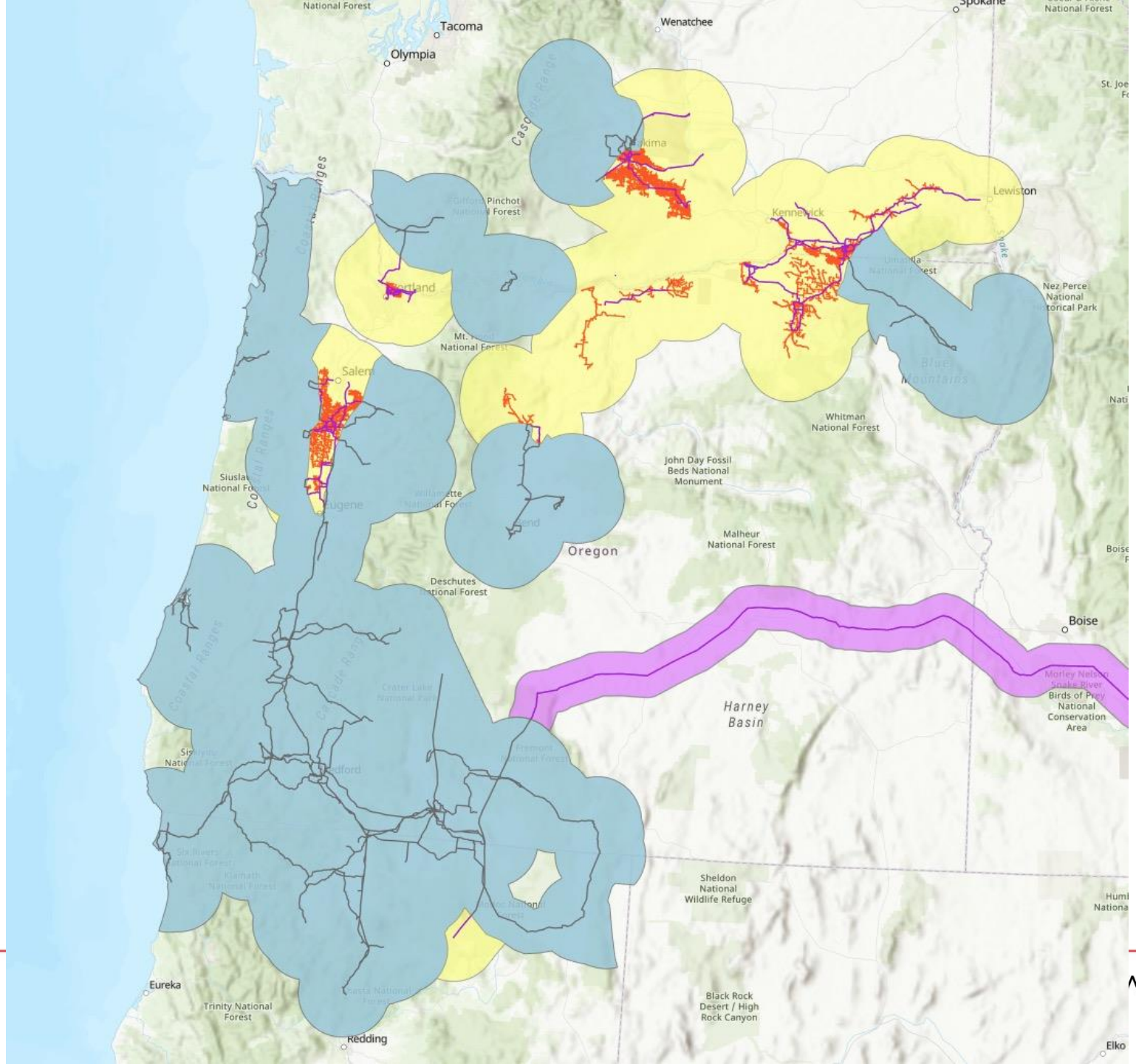
Based on results of the risk modeling, **identify areas to include/exclude in future model runs or expand buffer to 20-miles** consistent with previous modeling.

PacifiCorp


Olympia
Yakima
Kennewick
Lewiston
Portland
Salem
Eugene
Bend
Oregon
Medford
Eureka
Redding
Chico
Reno
Carson City
Sacramento
Vacaville
Antioch
Stockton
Fremont
San Jose
Salinas
Fresno
Visalia
Tonopah
Harney Basin
Boise
Twin Falls
Idaho
Pocatello
Idaho Falls
Logan
Salt Lake City
Provo
Elko
Great Basin
Mesquite
St. George
Missoula
Helena
Montana
Billings
Gillette
Casper
Wyoming
Cheyenne
Fort Collins
Greeley
Longmont
Denver
Grand Junction
Colorado
Colorado Springs
Pueblo
Farmington
Glendive
Bitterroot Range
Blue Mountains
Bighorn Mountains
Absaroka Range
Wind River Range
Great Salt Lake Desert
Coastal Range
Sierra Nevada Mountains
San Joaquin Valley
Front Range
Park Range
Sangre De Cristo Mountains
Sheldon National Wildlife Refuge
Black Rock Desert / High Rock Canyon
Humboldt National Forest
Nellis Air Force Range
Nevada National Security Site
Death Valley National Park
Glen Canyon National Recreation Area
Craters of the Moon National Preserve
Sawtooth National Forest
Teton National Forest
Medicine Bow National Forest
Routt National Forest
Whitman National Forest
John Day Fossil Beds National Monument
Lassen National Forest
Mendocino National Forest
Trinity National Forest
Curecanti National Recreation Area
Uncompahgre National Forest
Rio Grande National Forest
San Juan National Forest
Carson National Forest
Gallatin National Forest
Beaverhead National Forest
Deerlodge National Forest
Clearwater National Forest
St. Joe National Forest
Nez Perce National Historical Park

- Existing domain assets
- New Transmission
- New Distribution
- Current domain
- New Domain – 20 mi
- New domain for single connecting transmission line

Pacific Power



- Existing domain assets
- New Transmission
- New Distribution
- Current domain
- New Domain – 20 mi
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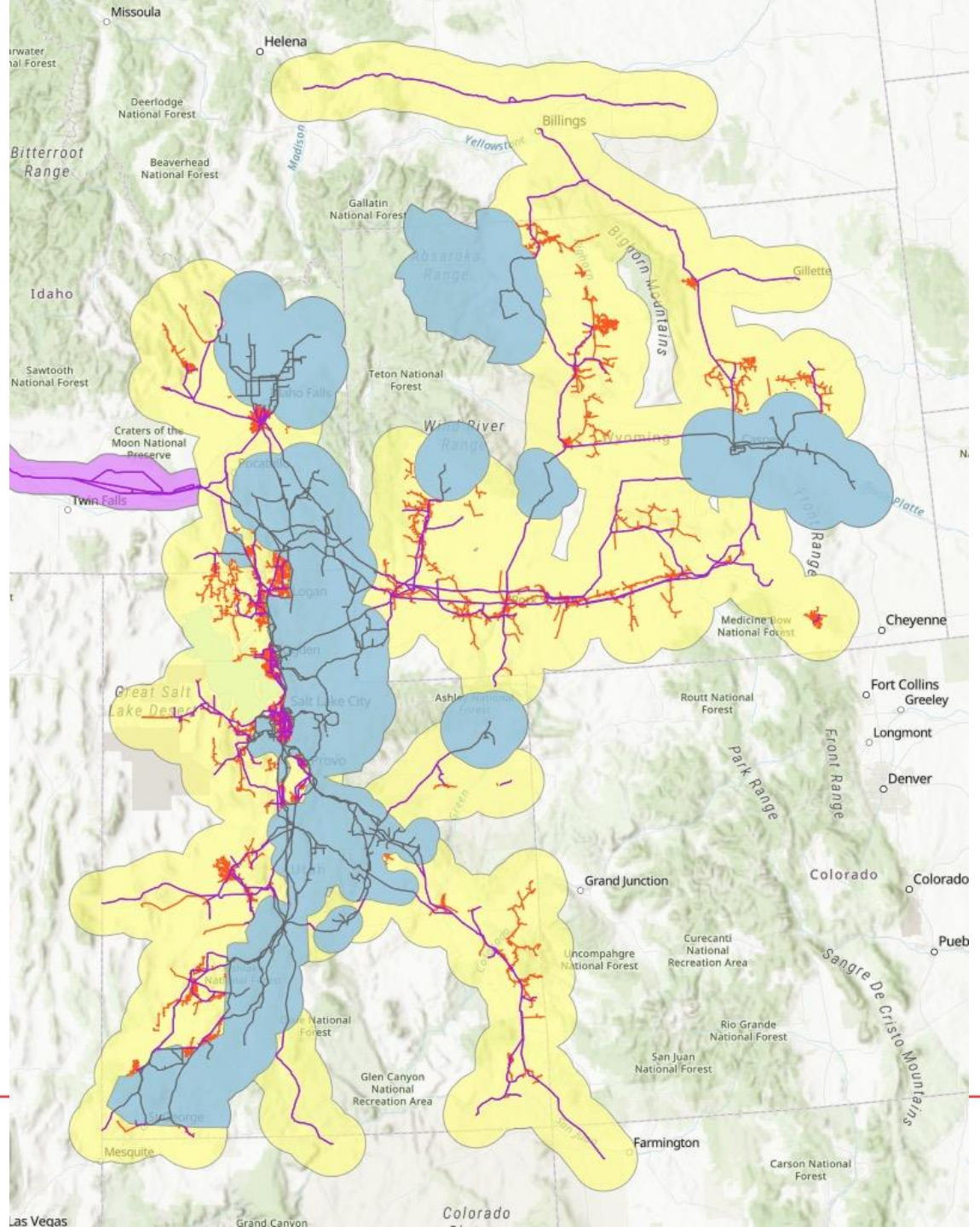
Rocky Mountain Power



- Existing domain assets
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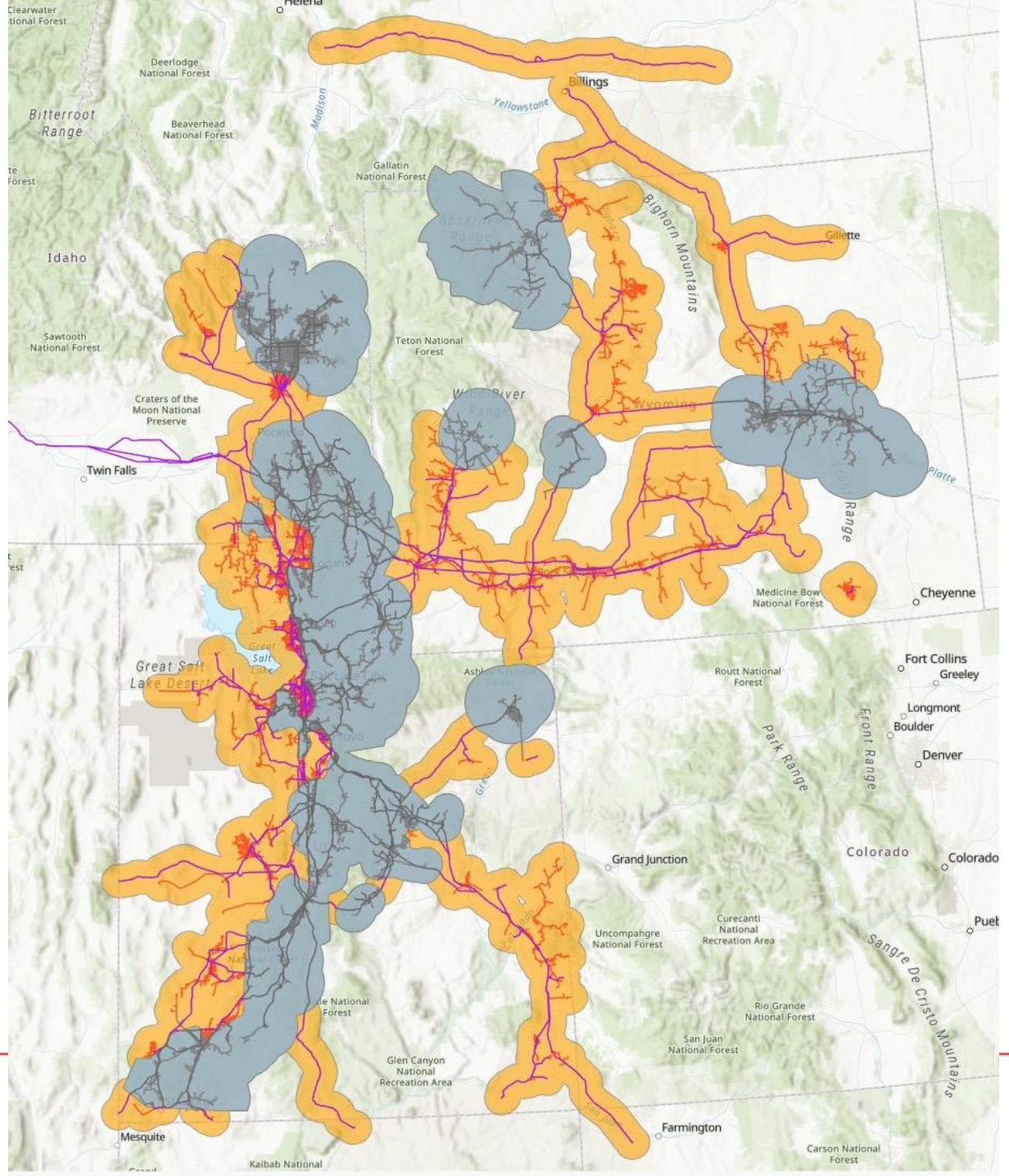
Rocky Mountain Power



- Existing domain assets
- New Transmission
- New Distribution
- Current domain
- New Domain – 10 mi
- New domain for single connecting transmission line

PacifiCorp WRRM Domain Analysis – Cost Overview

Objective: Inform on Project Costs and Solicit Feedback

Pacific Power – Summary of Costs

Product	2022 Domain	2023 Domain	2022 Fee	2023 Fee	Difference	% Increase
Pacific Power – 20-mile buffer of new assets						
WRRM	56,662	79,628 (41%)	$594,951	$836,098	$241,147	41%
RAVE			$297,475	$418,049	$120,574	41%
Fuels			$297,475	$418,049	$120,574	41%
LFM			$118,990	$167,220	$48,230	41%
					$530,525	

PacifiCorp WRRM Domain Analysis – Cost Overview

Objective: Inform on Project Costs and Solicit Feedback

Rocky Mountain Power – Summary of Costs

Product	2022 Domain	2023 Domain	2022 Fee	2023 Fee	Difference	% Increase
Rocky Mountain Power – 20-mile buffer of new assets						
WRRM	51,305	174,879 (241%)	$538,703	$1,836,230	$1,297,527	241%
RAVE			$269,351	$918,115	$648,764	241%
Fuels			$269,351	$918,115	$648,764	241%
LFM			$107,741	$367,246	$259,505	241%
					$2,854,560	

Forward Looking Projects / Topics

Objective: Solicit Feedback on Proposed Projects / Topics / Next Meeting

- Proposed Topics:
  - ~~Timeline and Next Steps for FHCA Updates (January)~~
  - ~~Service Territory Selection for Technosylva (January)~~
  - INFORM: PSPS threshold evaluation (February)
    - Wildfire Risk
    - Outage Risk
    - Overlap with EFR and Overall Risk Mitigation
  - INFORM/DECISION: FPI and Fragility Curves (February)
    - FPI Historical Analysis & Climatology
    - FPI Operations Integration (District Fire Risk updates, Dashboards)
    - Fragility Curve Operations Integration
  - Service Territory Selection Follow-up (February)
  - Technosylva WRRM (RAIL, RAVE) Demo (March)
  - RSE: Assumptions/Decisions, Intended Business Use (March)
- Meeting Frequency / Next Meeting
- Feedback on Structure / Content / Attendees

WILDFIRE SAFETY & ASSET MANAGEMENT

WILDFIRE SAFETY

ASSET RISK

ASSET MANAGEMENT

Thank You!

PACIFICORP

Meeting Notes
Wildfire Risk Governance Committee
January 30, 2023

Attending: Kevin Benson, Allen Berreth, Eric Brookhouse, Tim Clark, Vivian du Pont, Curtis Mansfield, Amy McCluskey, Jordan Pino, Chris Spencer, Steve Vanderburg, Nora Yotsov

1. Wildfire Risk Project Status
    - Wildfire Risk Reduction (WRRM): Received expected and conditional risk data for California by the end of December. This information is already being used. Expect the location risk and remaining data for the other areas in February
    - Risk Spend Efficiency (RSE): Had planned a pilot on covered conductor cable for 2022. Have refocused to fully implement RSE in 2023. Providing an example of the proposed RSE approach in the California WMP to demonstrate progress and alignment with other California's IOU's RSE approach
    - Fire High Consequence Area (FHCA) Refresh: This is a new workstream
    - PSPS Threshold. This is a new workstream to recommend PSPS thresholds for the 2023 wildfire season and is due by the end of February.
      Question: Does Meteorology have what they need to perform the analysis and for the threshold recommendation?
      Answer: Meteorology has some of what is needed, including using the WRRM data, but are working through workarounds for the some of the data. The PSPS data will inform the Fire Potential Index (FPI) thresholds, and both PSPS and FPI recommendations will come back to the WRGC for approval
2. FHCA Update.
    - Map refresh for FHCAs and look at HFTD's in CA.
    - As stated in Oregon WMP, implementing a five-year cycle to assess FHCA areas every five years
    - Plan on using WRRM and attributes in WRRM to identify where there FHCA should be adjusted
    - Feedback:
        - This FHCA refresh needs to cover all of PacifiCorp's service territory
        - Currently, the FHCA relies a lot on wind events that can trigger PSPS, with WRRM, can also see scenarios where there may be ignition risk outside of high wind events that may trigger EFR scenarios
        - In California, look for areas PacifiCorp would want to include in HFCA in addition to what California has identified as HTFD
        - What are the risks of doing the analysis in house as opposed to outsourcing as has been done in the past? Is there a corporate liability?
        - What do other utilities do? How do we make sure what we're doing is comparable to what was done before or consistent with other utilities. PG&E does something similar using HFTD as starting place and then look at areas along the edges where there may be risk. Results are reviewed by

consultant and a university PG&E has partnered with to make sure it meets standards.
    - Will any changes need to be integrated into CPUC's GO-95 standards? These are very tied to HFTD map.
    - When will any changes be considered final and when do they need to be implemented in the field for inspection and mitigation programs. For example, if FHCA's are approved in June, do the changes need to be implemented operationally in July for things like vegetation management.
    - Question should maps reflect more than just wind driven events (ex: low probability, high-impact events like SVI, egress etc.)
    - Some states like Oregon require state agency engagement, make sure this requirement isn't missed in the schedule
- Next Steps:
    - Integration of 3rd party review into schedule
    - Build into schedule regulatory requirements for agency or public engagement (See example from Portland General in Oregon)
    - Clarify with Legal on operational timeline to implement changes in FHCAs in field programs
    - Clarify PacifiCorp's liability if the analysis is performed in-house vs. outsourced to a third party
    - Clarify if any changes need to be implemented in GO-95 standards

4. Risk Modeling Service Territory Selection

- In first phase of WRRM, implemented in areas with the highest risk. Leadership asked for analysis of potentially expanding the domain of WRRM to cover more area across the states
- WRRM is precursor to identifying FHCA in states like Wyoming and Idaho
- Technosylva has provided analysis of cost to add additional area to WRRM with two scenarios:
    - 20-mile buffer around service territory
    - 10-mile buffer around service territory
- Tentative recommendation is a 10-mile buffer with some strategic carve outs for areas like Portland where the wildfire risk is low due to built environment and significant underground service
- Questions and Feedback
    - Question what's the capital/O&M split. Unknown currently.
    - Need breakdown of new areas by state, amount increase
    - If this were to be phased in, what are the risks?
- Next Steps:
    - Consult with Accounting and Finance on Capital/O&M split of proposed work
    - Consult with Legal on risks of implemented in a phased approach vs. all at once
    - Provide breakdown of costs by state

5. Feedback for Next Meeting

- Add Tom Eide to meeting invitation
- Make future meetings 90 minutes

- WRRM overview at next meeting
- Bring back to the WRGC proposed RAVE weightings
- PSPS Threshold presentation at next meeting

Wildfire Risk Governance Committee (WRGC)






Agenda

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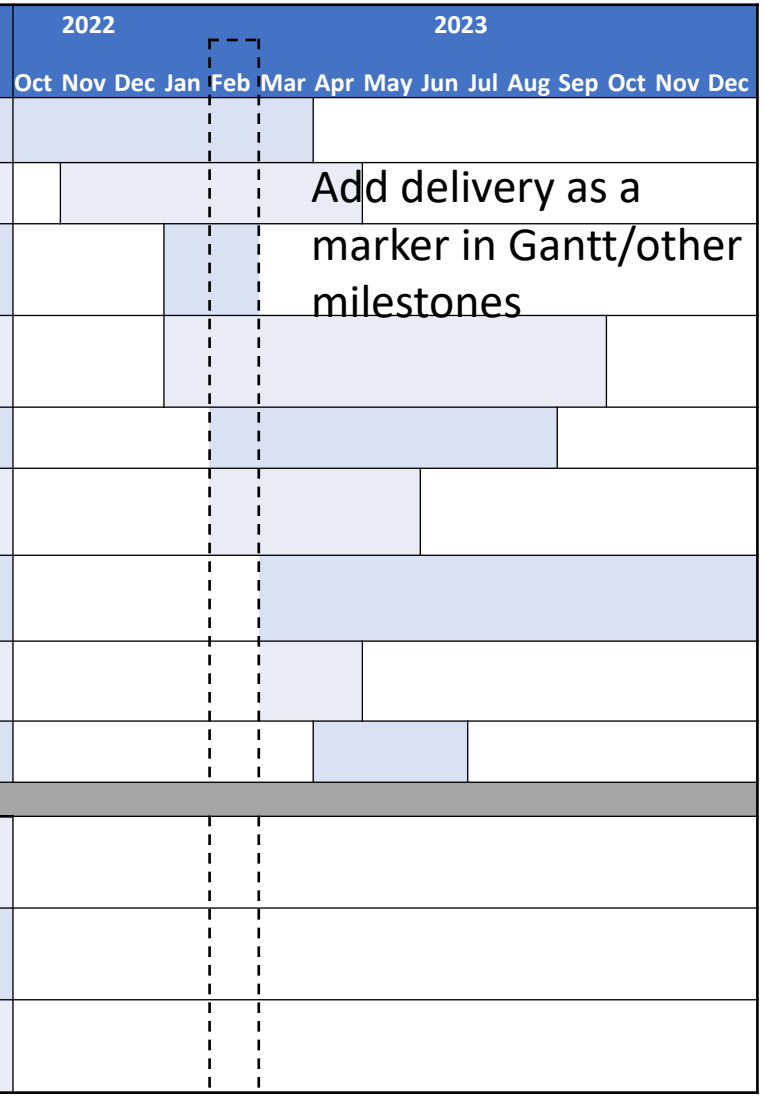
11:15 – 11:45	FPI and Fragility Curves	Steve Vanderburg
11:45 – 12:15	PSPS Threshold Evaluation	Steve Vanderburg
12:15 – 12:30	Future Topics & Feedback	Kevin Benson

Wildfire Risk Analytics Project Status

Status	Workstreams	What Is Different When Completed?	Current Stage
	Fire Potential Index (FPI) Model	Evolution of District Fire Risk Assessment to provide more automation	Testing
	Fragility Curves	Updated fragility curves for operating areas covered by WFA-E	Testing
	Public Safety Power Shutoff Thresholds	Reduction in wildfire risk in PacifiCorp's Northern California service territory with increased PSPS frequency and size	Testing
	Risk Spend Efficiency (RSE) Model	RSE applied to wildfire mitigation project selection and prioritization per OEIS guidelines	Requirements
	FHCA Assessment	Expected increase in FHCA across PacifiCorp service territory	Planning
	Annual Planning Model Updates	Process in place to update assets, configurations, and other information to keep planning models current	Requirements
	Public Safety Power Shutoff (PSPS) Risk Assessment Solution	Technical solution to understand potential impacts of a PSPS and how mitigations could reduce the consequences	Planning
	Annual Mitigation Selection Planning Process	Updated process to integrate new planning tools to support selection of mitigation programs and projects	Planning
	Localized Fire Risk Assessment Model (LRAM)	LRAM will be phased out with transition to WRRM	Ready to Execute
Operational			
N/A	Wildfire Risk Model (WRRM)	Support project selection and prioritization with quantified risk information	Operational
N/A	FireSim (WFA-E)	Simulation to forecast the potential fire behavior and spread from as little as one hour to up to a 96-hour period	Operational
N/A	FireCast (WFA-E)	Ability to perform daily wildfire simulations daily across the service territory to assess the fire risk	Operational



Fire Potential Index – Overview

Objective: Provide an Overview of FPI, Next Steps, and Project Timeline

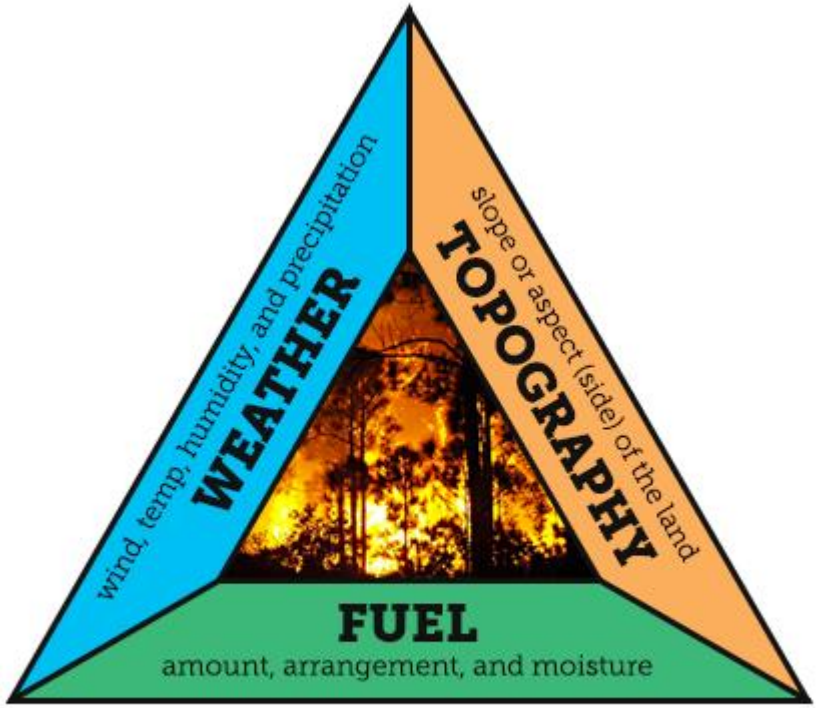
- **What is the FPI?**
  - Quantifies fire potential across the territory (hourly & daily timescales)
  - ~1km resolution (hexel-based)

- **What are the FPI inputs?**
  - Fuel complexity (Technosylva)
  - Terrain complexity (Technosylva)
  - Fuel moisture (Technosylva & PacifiCorp WRF)
  - Weather (PacifiCorp WRF)

- **How was the FPI trained and calibrated?**
  - Satellite-based wildfire data from 2012-2022
  - 2 million points analyzed (300 billion calculations)

- **What are the FPI values and categories?**

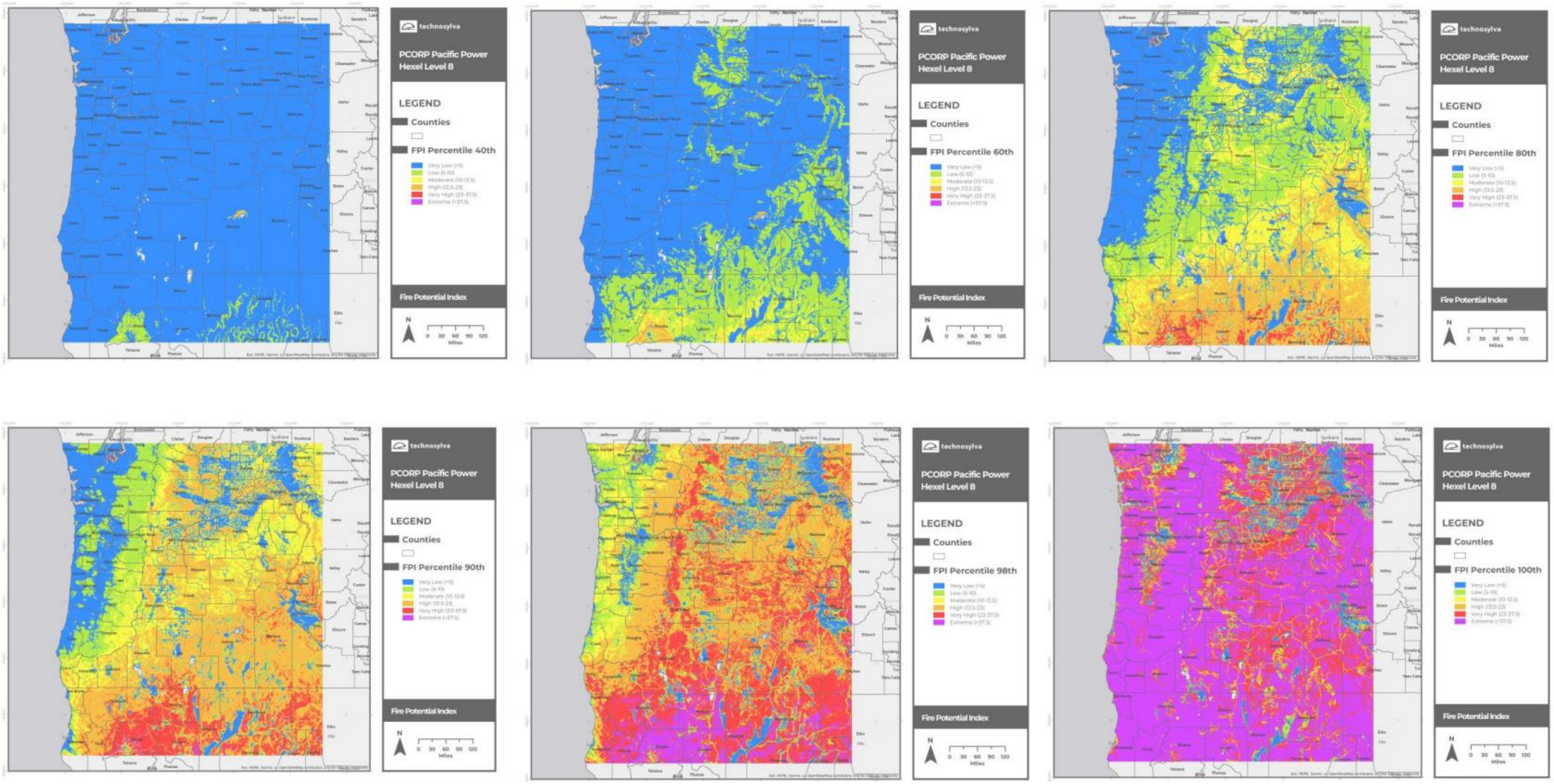
Very Low (< 5)	Low (5-10)	Moderate (10-13.5)	High (13.5-23)	Very High (23-37.5)	Extreme (>37.5)



Fire Behavior Triangle

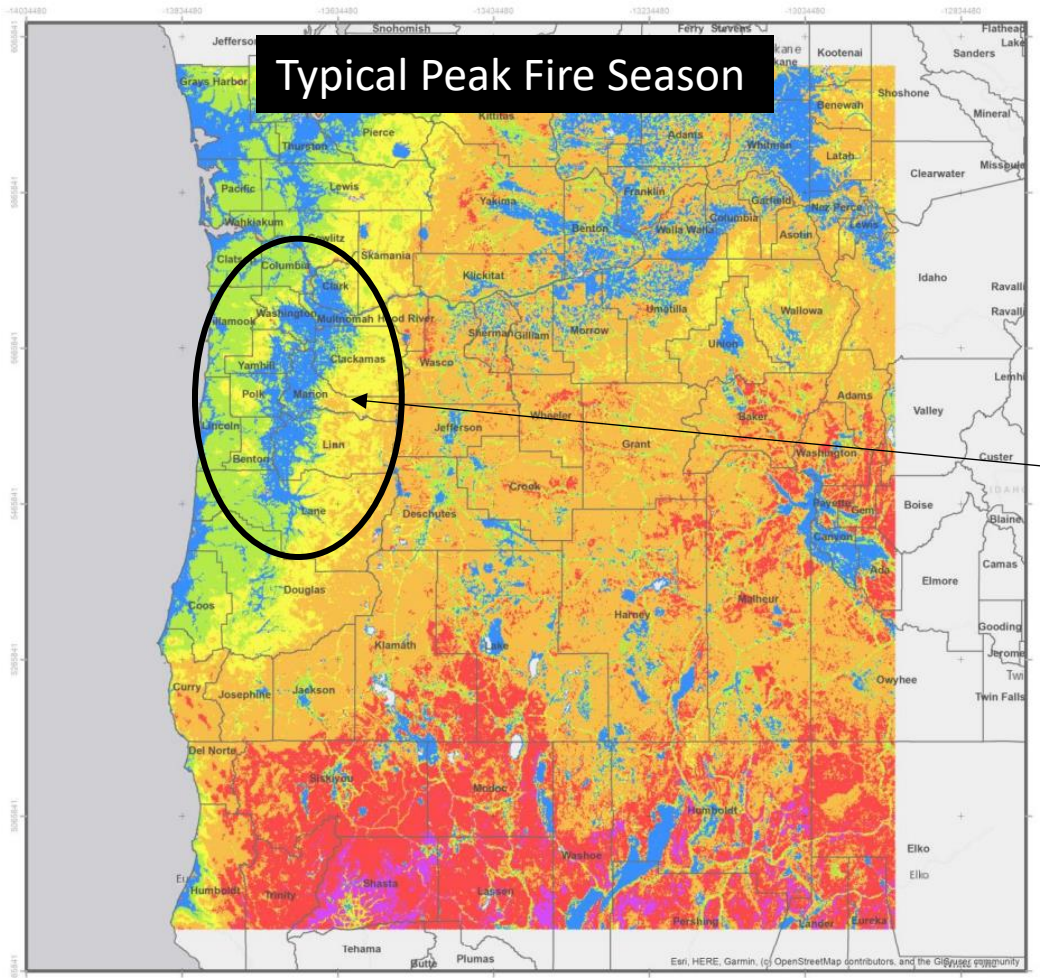
Fire Potential Index – Climatology & Case Studies

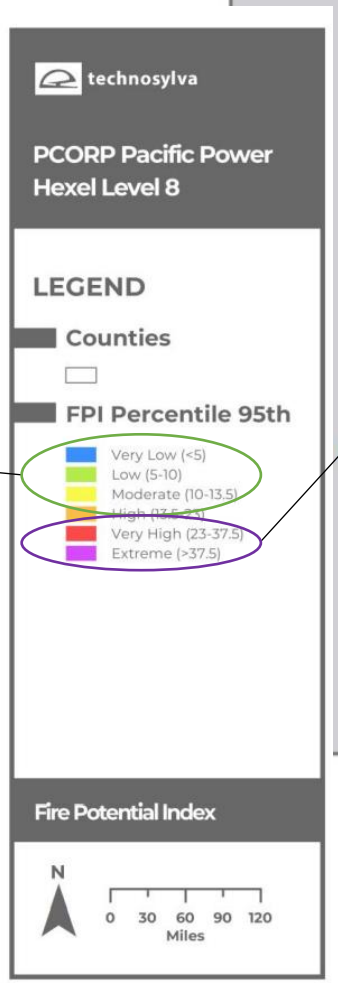
Objective: Provide an Overview of FPI, Next Steps, and Project Timeline

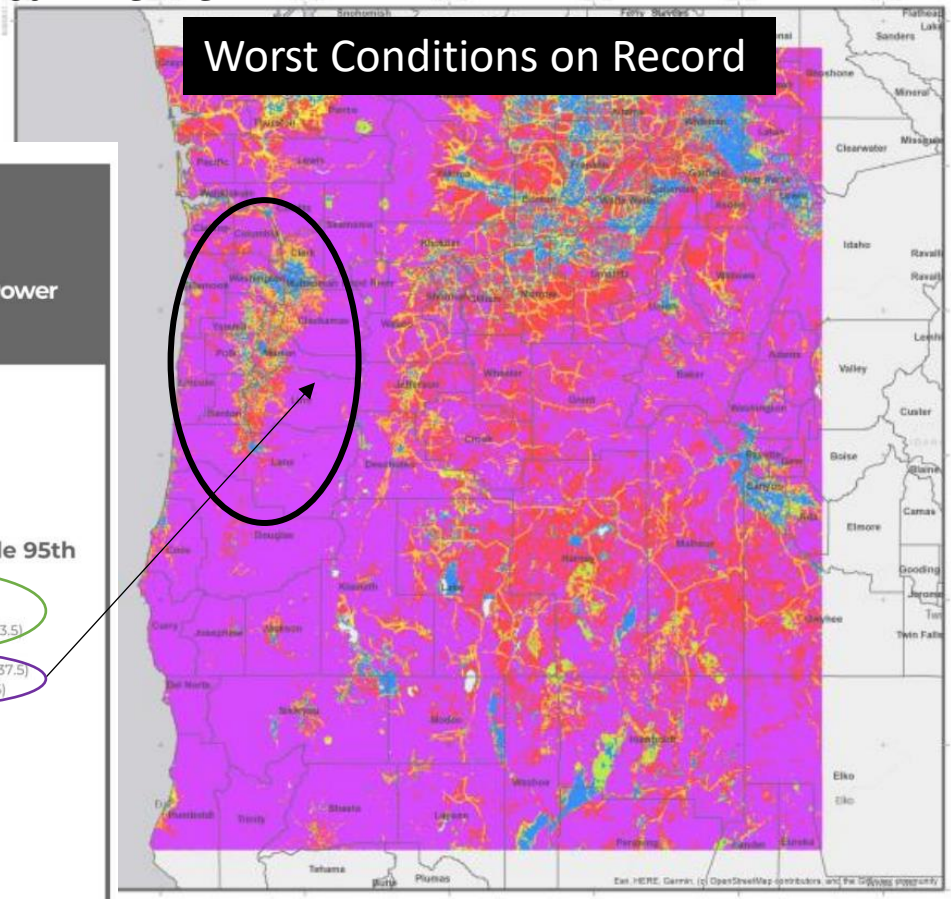


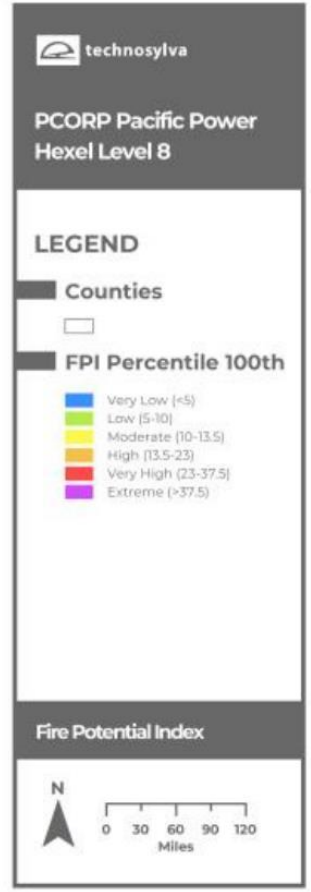
Fire Potential Index – Climatology & Case Studies

Objective: Provide an Overview of FPI, Next Steps, and Project Timeline







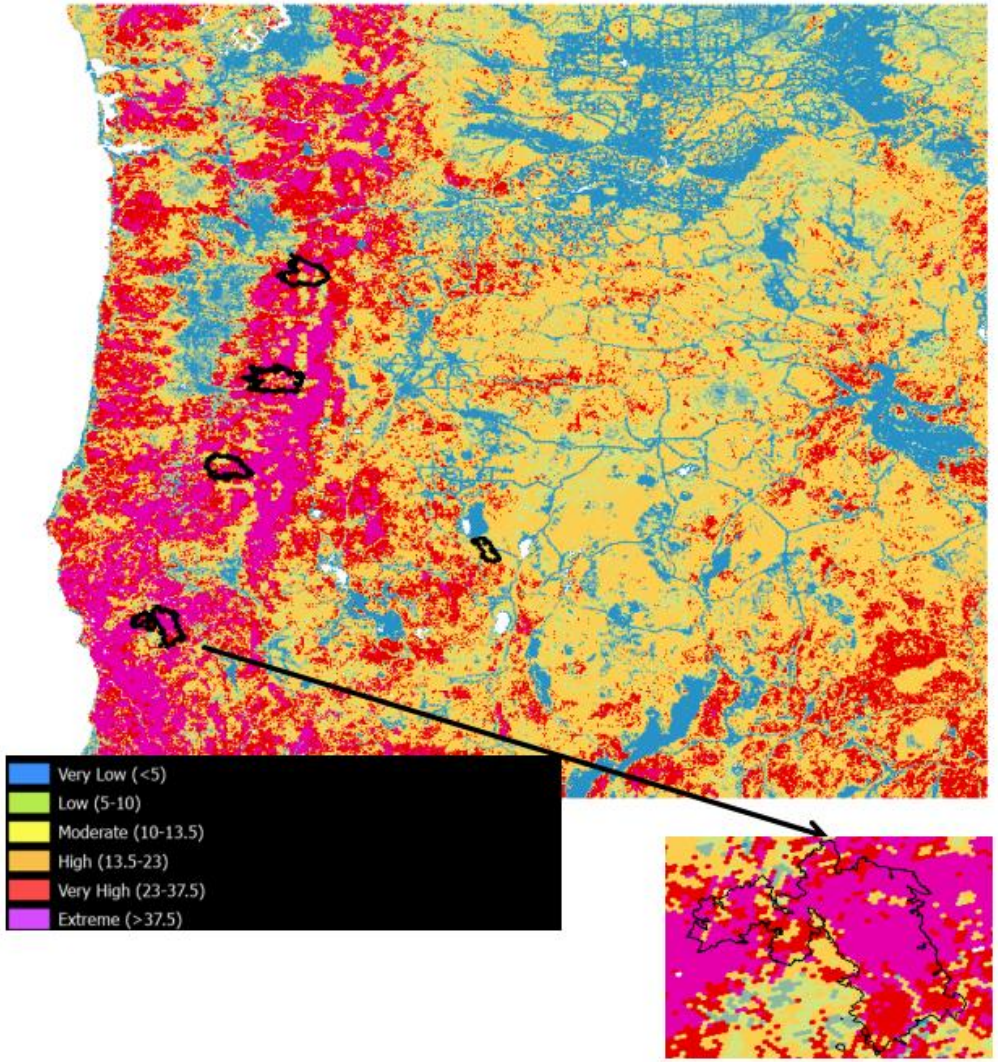


Climatological Risk vs Real-Time Risk

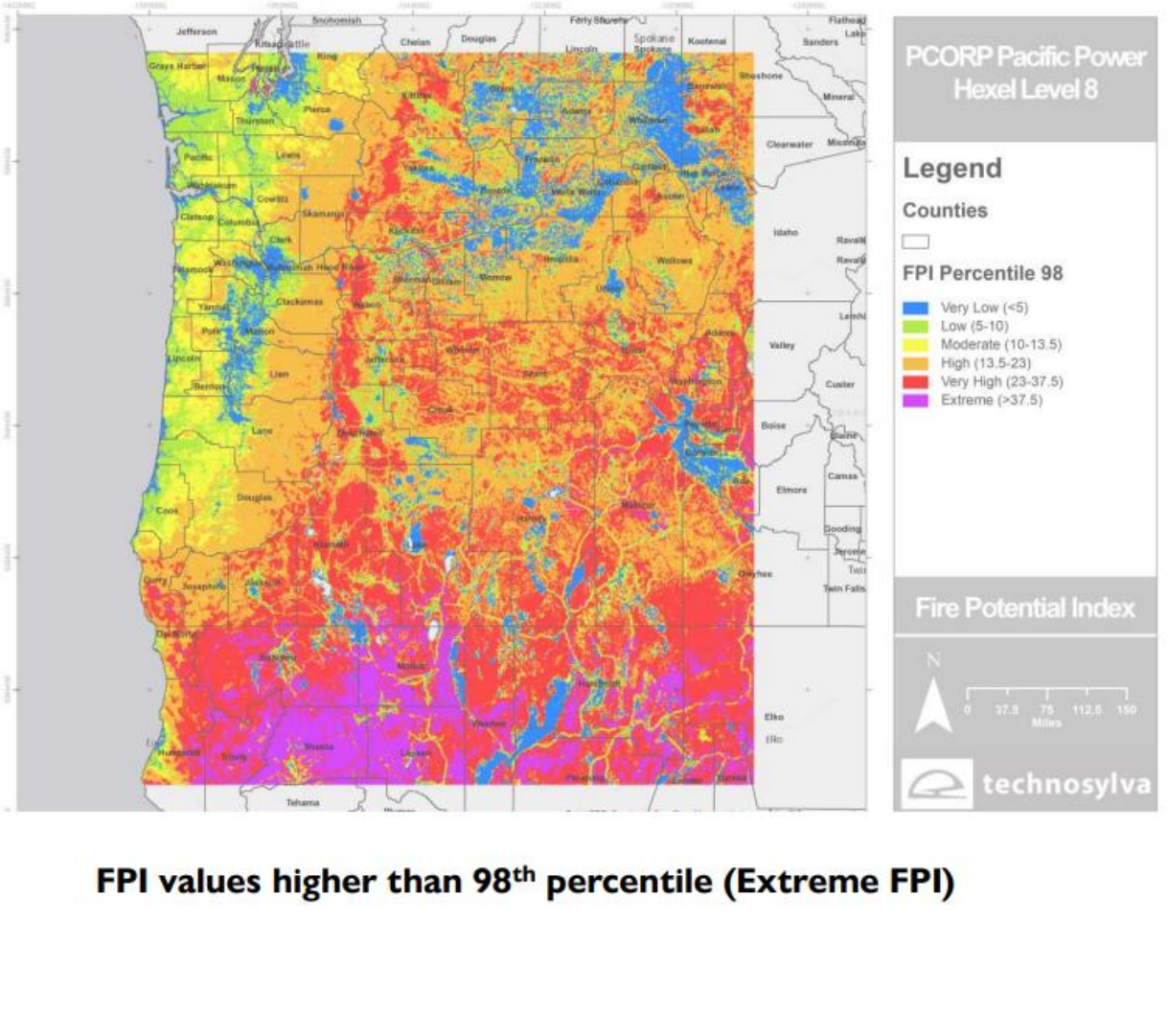
FPI Values on High Fire Activity Days – September 8, 2020

Slater fire

— FPI Values (3pm)



— Percentile 98th



FPI values higher than 98th percentile (Extreme FPI)

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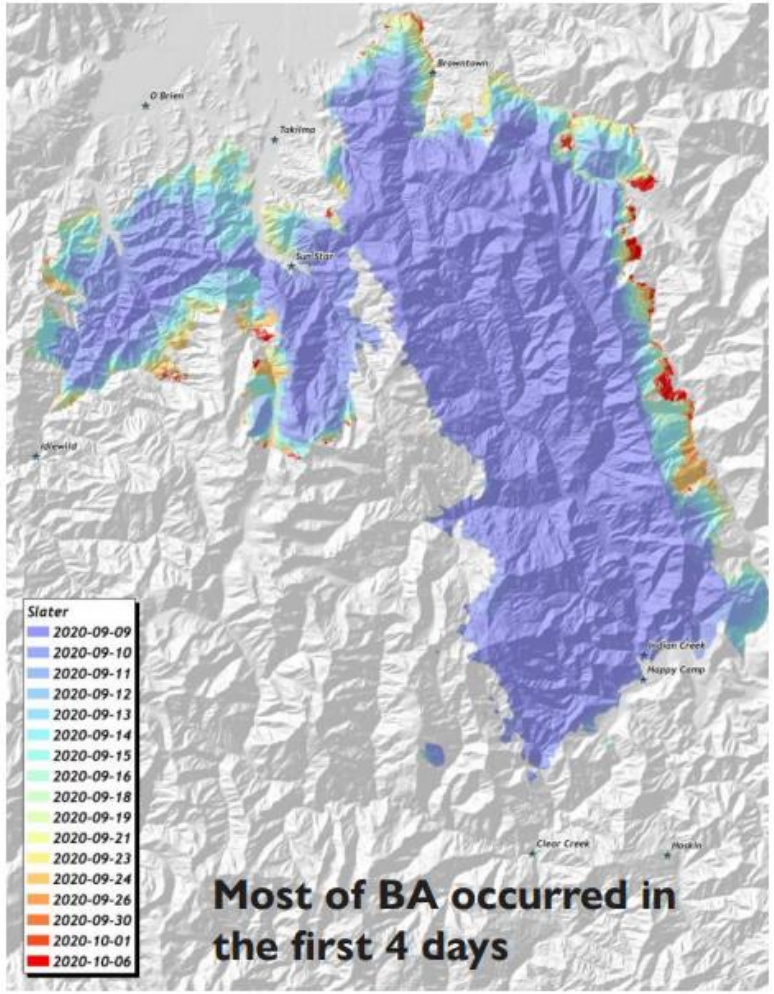
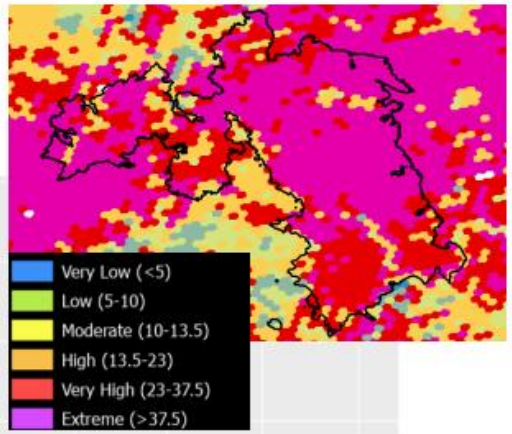
FPI Values on High Fire Activity Days – September 8, 2020

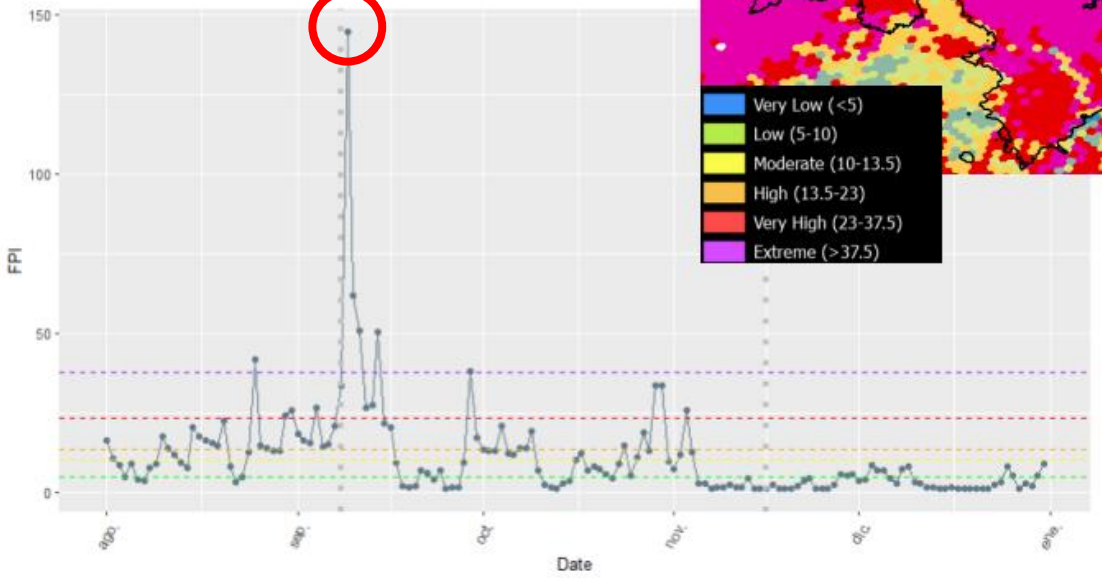
Slater fire

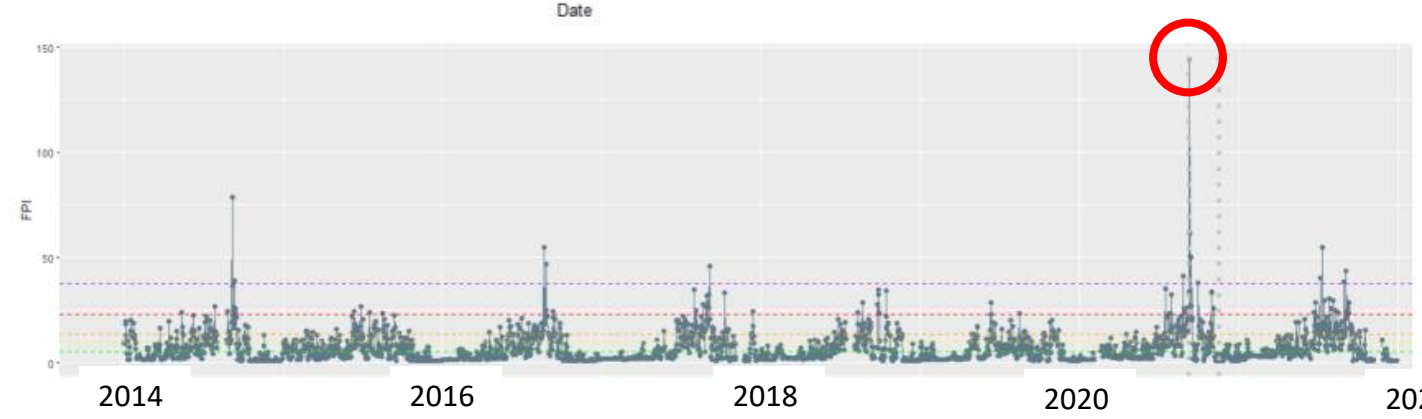
— Fire progression



— Percentile 98th







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Fire Potential Index - District Fire Risk Assessment & Role of FPI

Objective: Provide an Overview of FPI, Next Steps, and Project Timeline

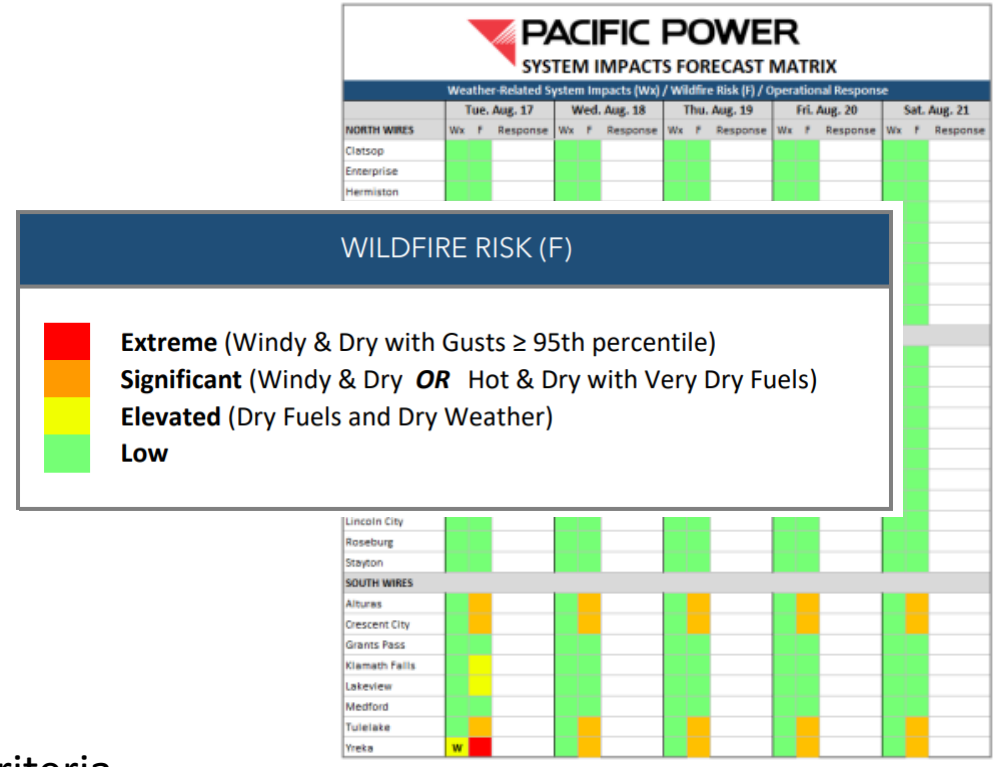
PacifiCorp Wildfire Risk	GACC 7-Day Significant Fire Potential	Fuels Considerations	Wind Gust Considerations
Little to No Wildfire Risk	Low or Little to No Risk		
Elevated Wildfire Risk	Low or Moderate	Dry	
Significant Wildfire Risk	Moderate	Very Dry	
	High Risk*	Dry or Very Dry	Max Gusts < 95th Percentile
Extreme Wildfire Risk	High Risk*	Dry or Very Dry	Max Gusts ≥ 95th Percentile

* Excludes Lightning or Recreation High Risk triggers

PacifiCorp Fuels	100-hr Dead Fuel Moisture	1000-hr Dead Fuel Moisture	Energy Release Component
Dry	Near or Below Average*		Near or Above Average*
Very Dry	≤ 10th Percentile	≤ 10th Percentile	≥ 90th Percentile

*Relative to the average fire season values for a given location

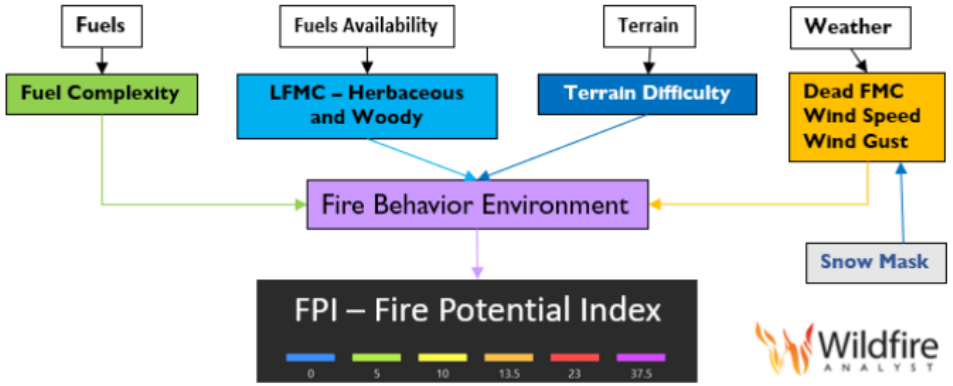
Current Model →



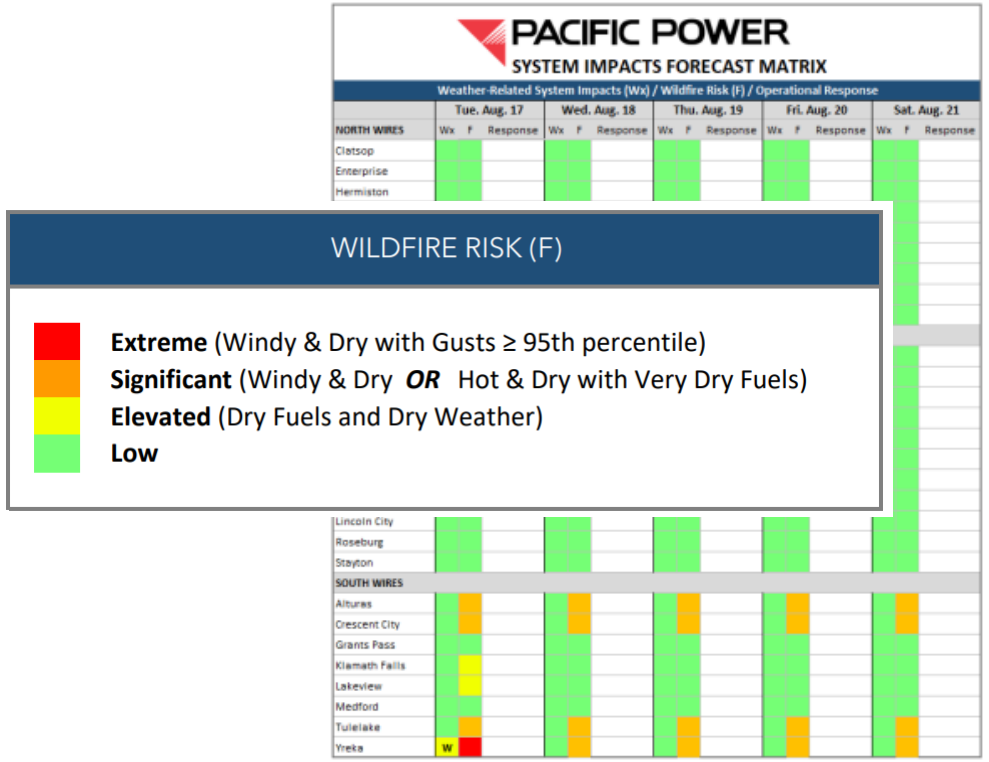
- **Risks associated with the current approach**
  - Reliance on external agencies with widely different objectives and criteria
  - Data quality issues, data availability issues, data resolution issues

Fire Potential Index - District Fire Risk Assessment & Role of FPI

Objective: Provide an Overview of FPI, Next Steps, and Project Timeline



Future Model



- **Benefits associated with the future approach**
  - Quantifies the wildfire risk in alignment with utility goals and objectives
  - Resolves data quality, data availability, and data resolution issues
  - Does not require retraining control center, field, etc.

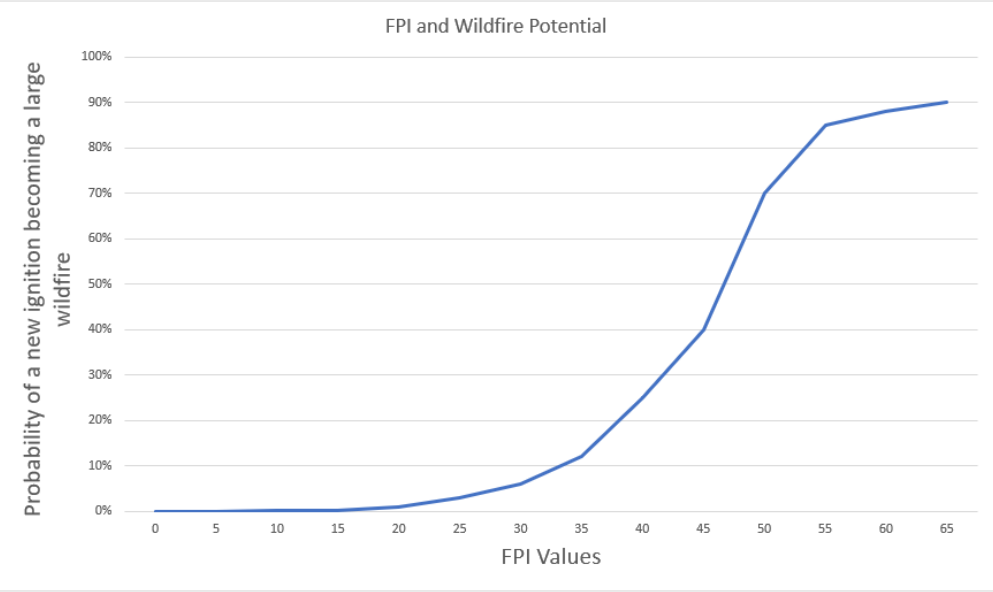
Fire Potential Index – Next Steps

Objective: Provide an Overview of FPI, Next Steps, and Project Timeline

- **Technosylva is finalizing an analysis of 400 wildfires and FPI**
  - This is the final step needed to translate FPI into a probabilistic wildfire forecast

- **Set FPI thresholds for District Fire Potential**
  - Current 6-level FPI does not match our 4-level District Fire Risk
  - Results of wildfire analysis will be used to determine the thresholds

Example using hypothetical data for illustrative purposes only



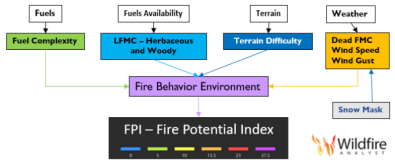
FPI	District Fire Risk
Very Low (< 5)	Low
Low (5-10)	
Moderate (10-13.5)	Elevated
High (13.5-23)	
Very High (23-37.5)	Significant
Extreme (>37.5)	Extreme

Fire Potential Index – Timeline

Objective: Provide an Overview of FPI, Next Steps, and Project Timeline

January 2023

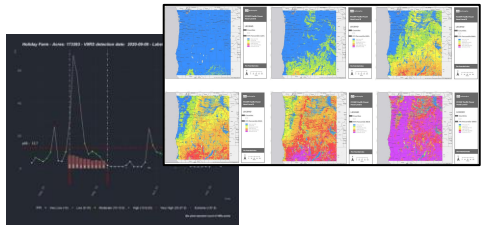
Build & Refine FPI Model



February 2023

Build Climatology and Finalize Analysis

- 300 billion calculations, 2-million-point locations, 6 times / day, 2013 to Present



March 2023

District Fire Risk Inputs updated

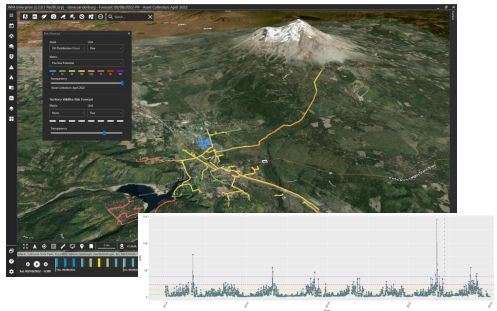
FPI categories	FPI value	FPI percentile
Very Low	< 5	<60
Low	5-10	60-80
Moderate	10-13.5	80-85
High	13.5-23	85-95
Very High	23-37.5	95-99
Extreme	> 37.5	>99

WILDFIRE RISK (F)

Extreme (Windy & Dry with Gusts ≥ 95th percentile)
Significant (Windy & Dry ***OR*** Hot & Dry with Very Dry Fuels)
Elevated (Dry Fuels and Dry Weather)
Low

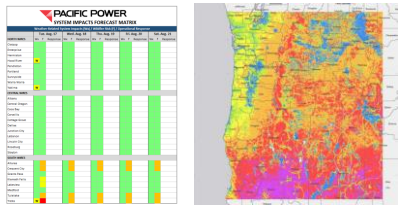
April 2023

FPI Deployed to WFA-E for Operational Use



Fire Season 2023

FPI Operational and In-Use



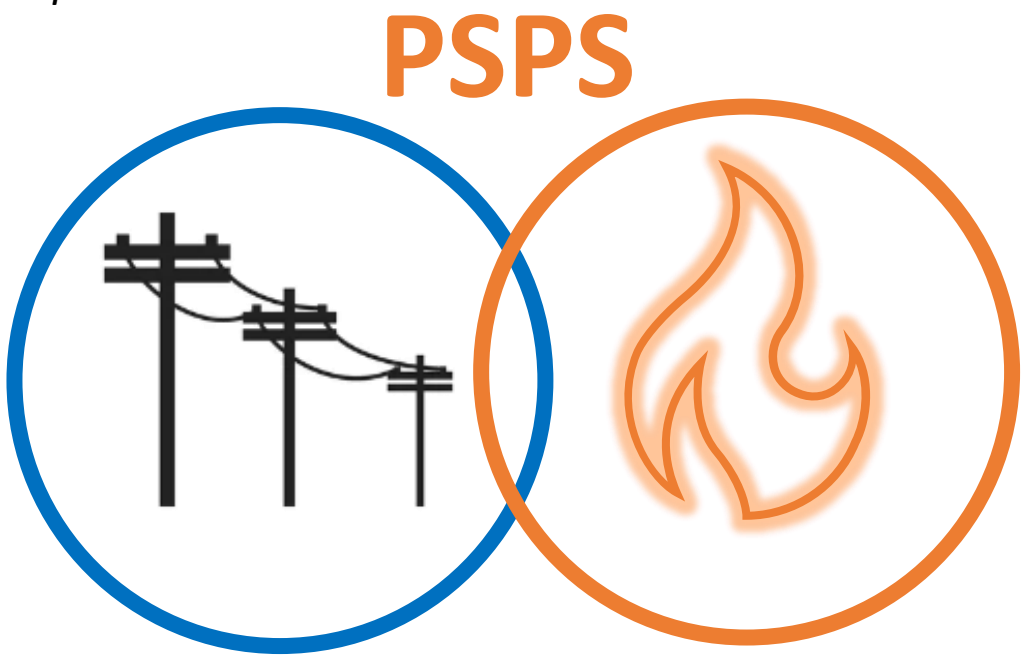
Q4 2023

Utilize Feedback and Continue to Improve

- Validate FPI performance and gather feedback on new dashboards.
- Compare FPI performance to new in-house Modified Hot-Dry-Windy Index
- Continually improve FPI and adjust based on company needs.

PSPS – New Tools, Threshold evaluation, and Evolution

Objective: Provide an Overview PSPS Threshold Reviews and Next Steps



- **Wildfire Risk Assessment**
  - Fire Potential Index (Technosylva)
  - Modified Hot-Dry-Windy Index (PacifiCorp)
  - Wildfire Analyst-Enterprise (Technosylva)

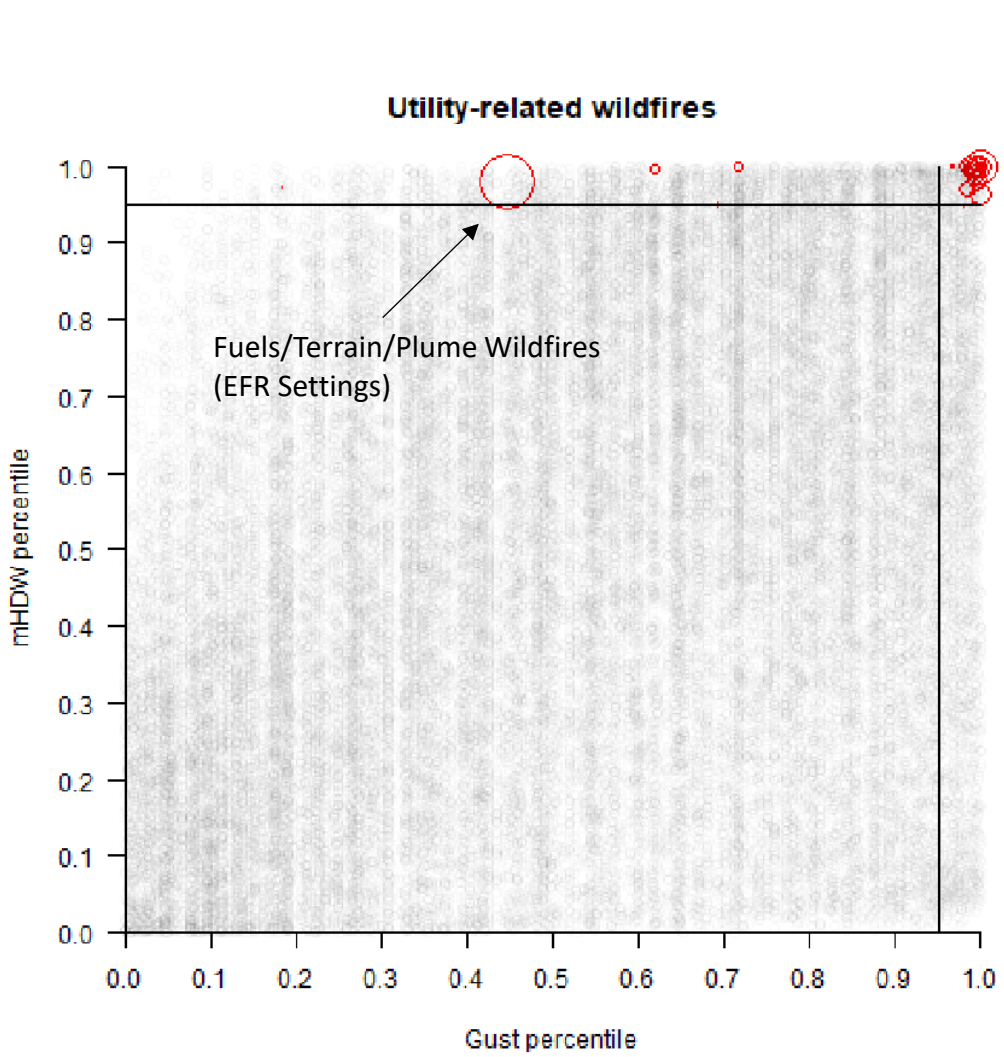
- **Outage Risk Assessment**
  - Wind-Related Outage Forecasting
    - Fragility Curves (Technosylva & PacifiCorp)
    - Outage Modeling (PacifiCorp)

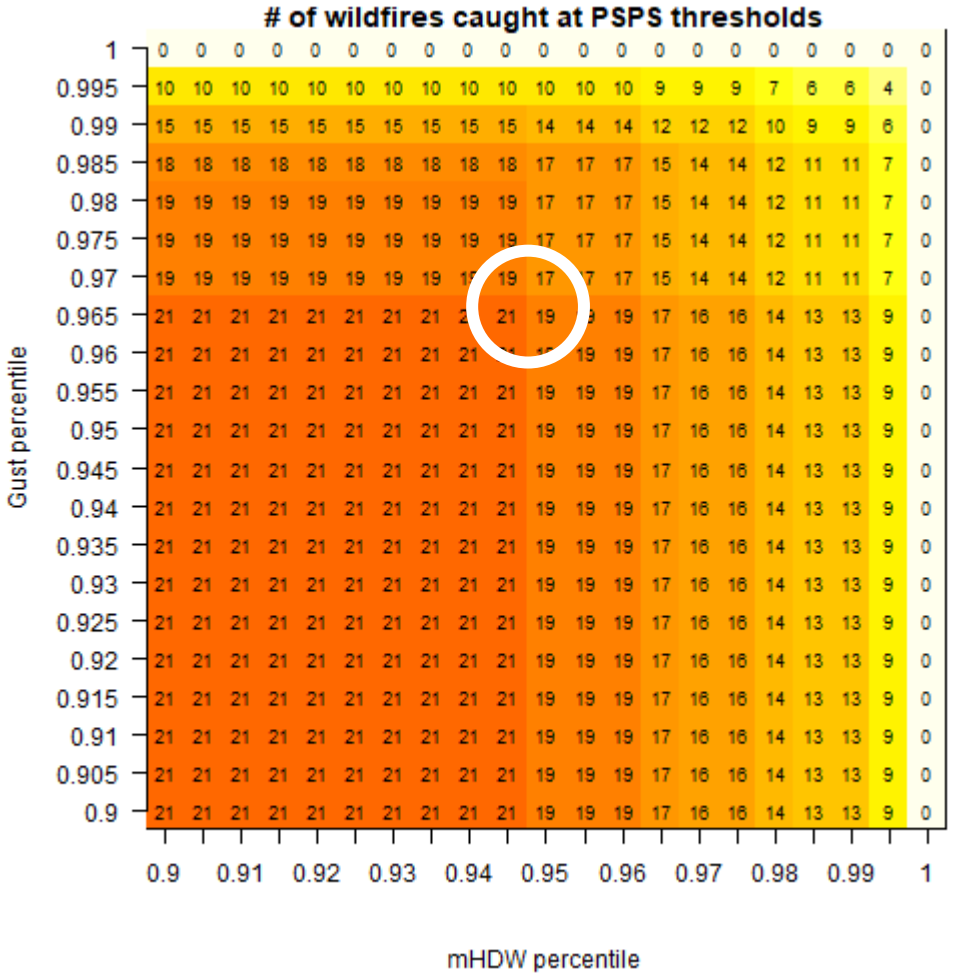
- **Fuels, Terrain, & Plume-Driven Wildfires (EFR Scenario)**
  - Significant or Extreme FPI and mHDWI
  - Normal Outage Risk (low)

- **Wind-Driven Wildfires (EFR & PSPS Scenario)**
  - Extreme FPI and mHDWI
  - Above-Normal Outage Risk

PSPS – Modified Hot-Dry-Windy Index (mHDWI)

Objective: Provide an Overview PSPS Threshold Reviews and Next Steps

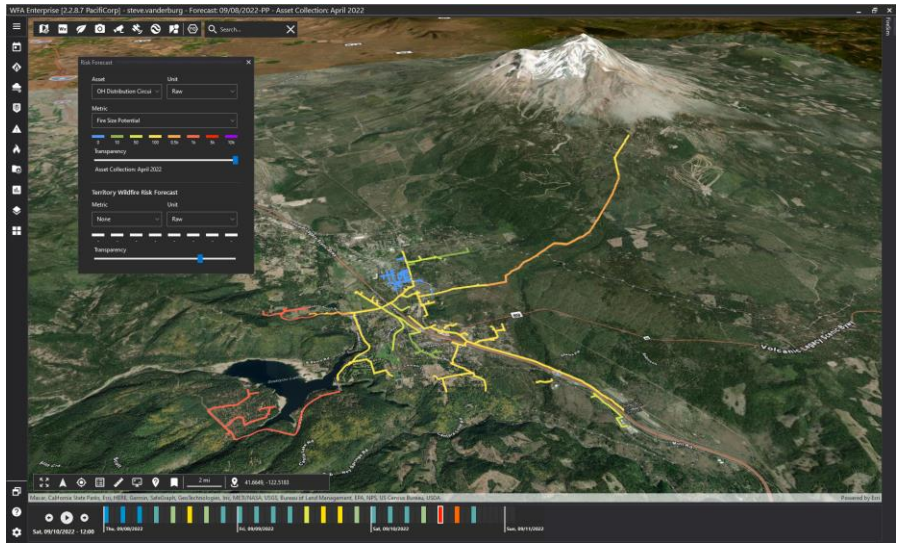


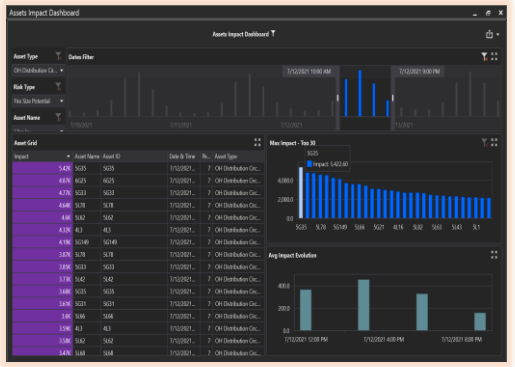


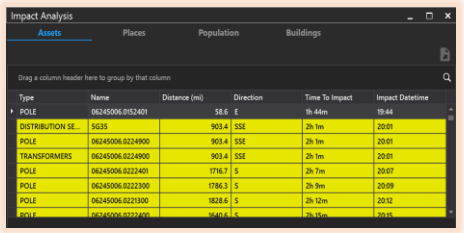
PSPS – Technosylva Tools (WFA-E, FPI, WRRM)

Objective: Provide an Overview PSPS Threshold Reviews and Next Steps

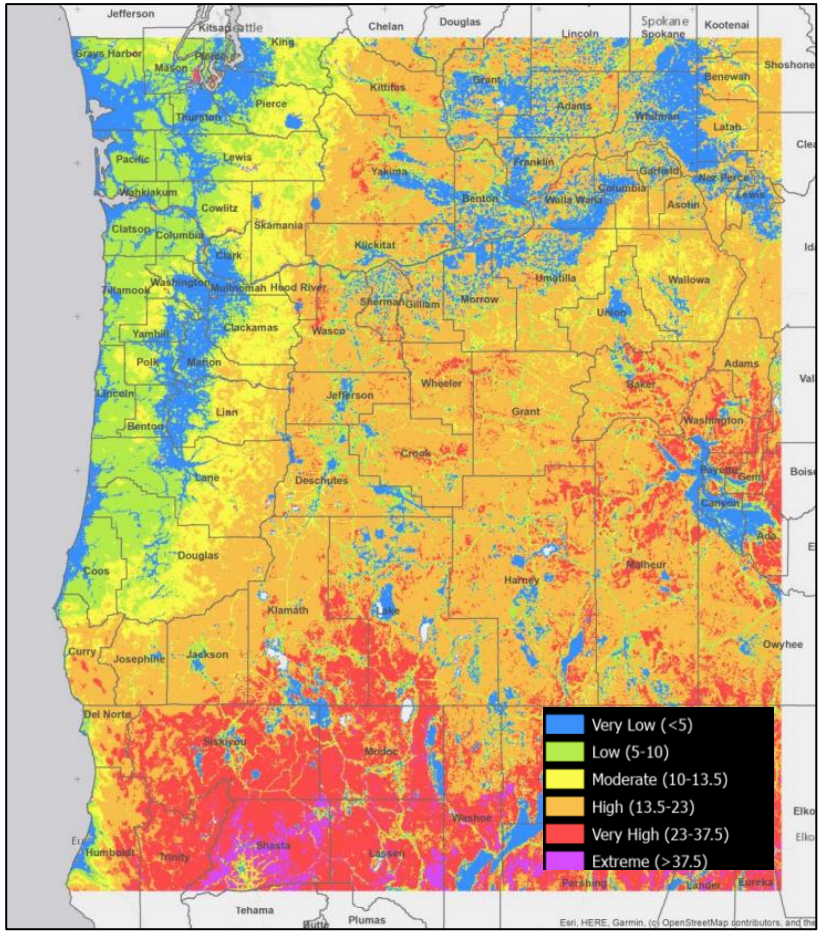
FireCast

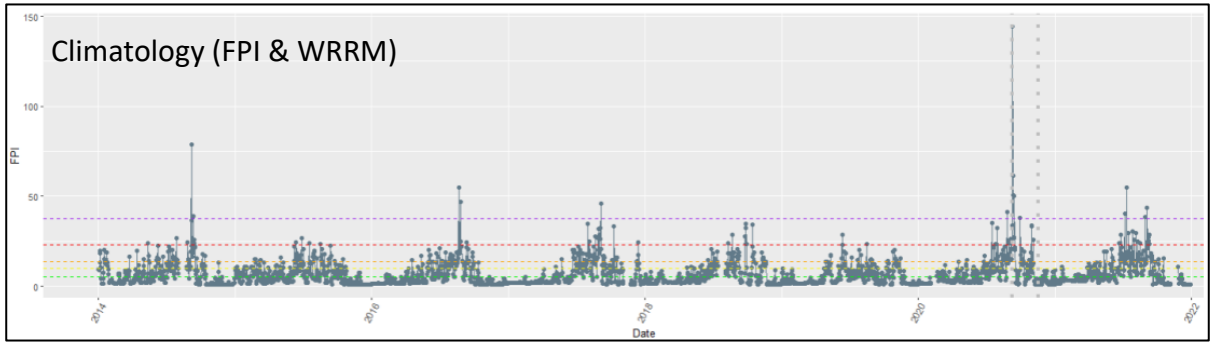






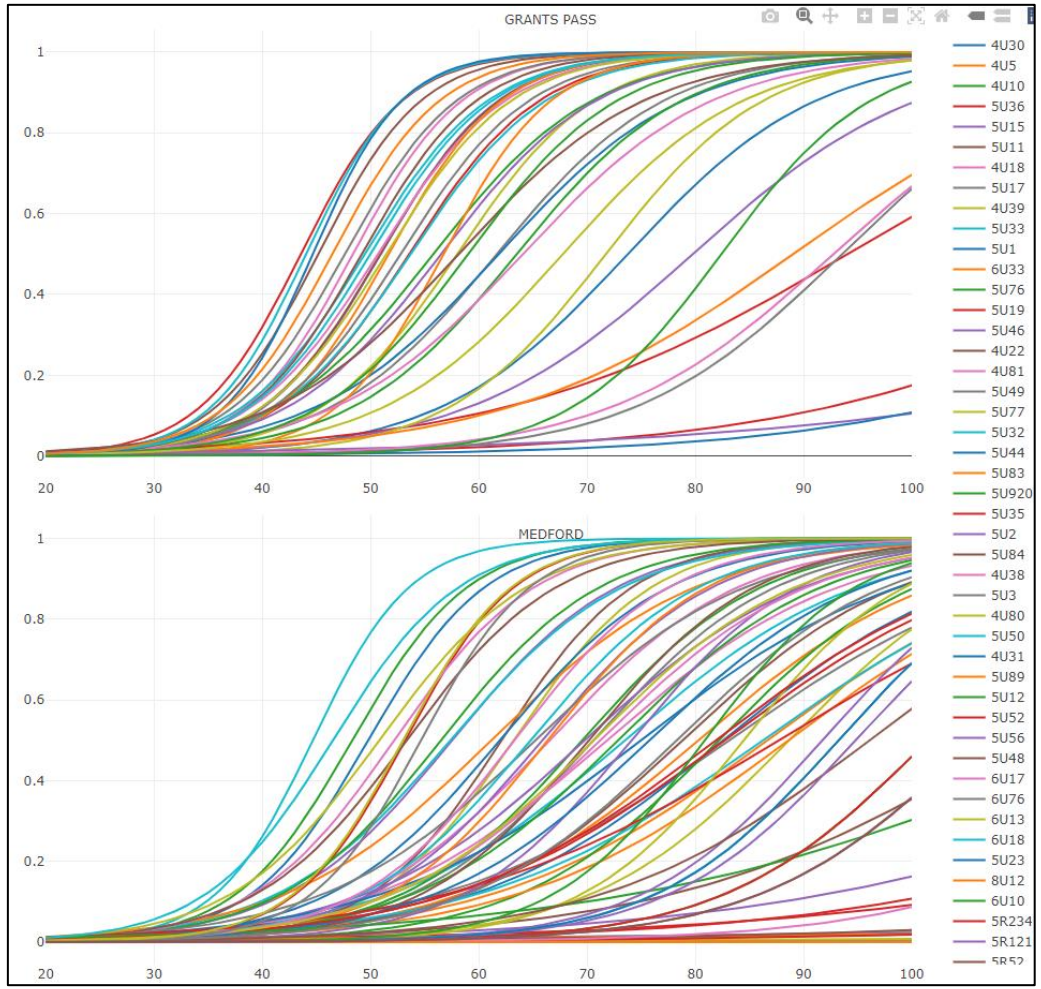
Fire Potential Index

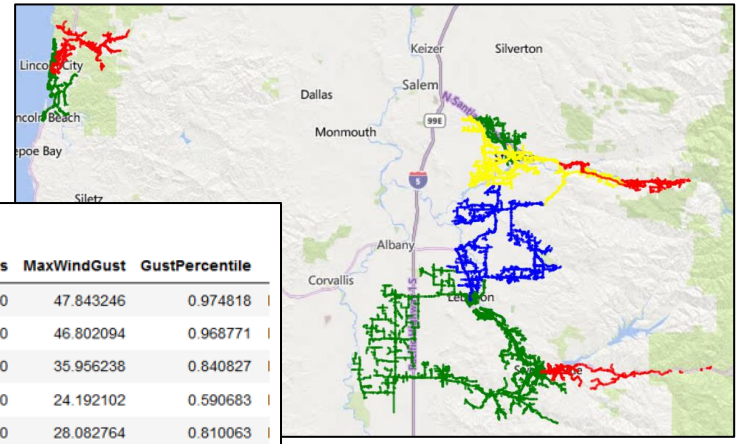




PSPS – Fragility Curves and Outage Prediction

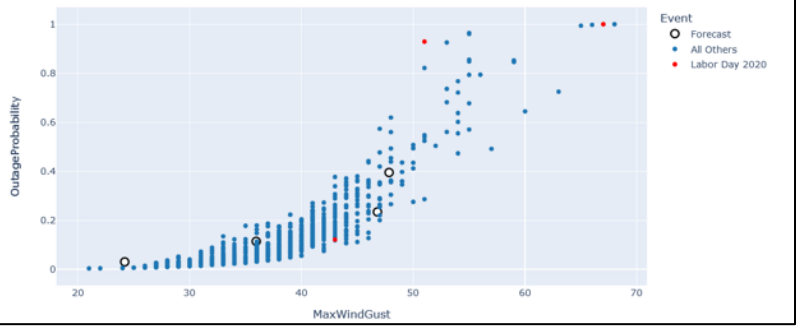
Objective: Provide an Overview PSPS Threshold Reviews and Next Steps





Lincoln City

Substation	Circuit	Date	OutageProbability	TrueOutages	MaxWindGust	GustPercentile
DEVILS LAKE	4A316	2022-09-10	0.395050	0.0	47.843246	0.974818
DEVILS LAKE	4A316	2022-09-09	0.234157	0.0	46.802094	0.968771
DEVILS LAKE	4A316	2022-09-07	0.113870	0.0	35.956238	0.840827
DEVILS LAKE	4A316	2022-09-08	0.030269	0.0	24.192102	0.590683
DEVILS LAKE	4A338	2022-09-07	0.029346	0.0	28.082764	0.810063
DEVILS LAKE	4A338	2022-09-10	0.028837	0.0	31.089878	0.873964
DEVILS LAKE	4A312	2022-09-07	0.017088	0.0	31.802469	0.836259
WECOMA BEACH	7A354	2022-09-07	0.014912	0.0	31.802469	0.716535



PSPS – Outstanding Questions

Objective: Provide an Overview PSPS Threshold Reviews and Next Steps

- **Should PSPS wind threshold vary from circuit to circuit based on the following:**
  - Circuit health (age, condition, recent outage history)?
  - Circuit sensitivity to wind-related outages (fragility curve results)?
  - Tree density (forest vs rangelands vs shrublands vs oak savannah)?
  - Outage probability thresholds?

- **Should PSPS wind threshold vary depending on the severity of the wildfire risk?**
  - Do wind thresholds decrease as wildfire risk increases?

- **Should there be a "must exceed" and "will not exceed" wind gust threshold?**
  - Is there a maximum wind gust threshold for operating OH lines during wildfire risk?
  - Is there a minimum speed required to initiate PSPS?

- **How do we incorporate probability of failure, probability of ignition, & wildfire consequence?**
  - Event-specific PSPS circuit list?
  - Real-time PSPS decision?

- **Are there circumstances that allow for PSPS during thunderstorm events?**
  - If so, how do we deal with the 48 to 72-hour notification (massive challenge)?

PSPS – Next Steps

Objective: Provide an Overview PSPS Threshold Reviews and Next Steps

- **Wildfire Risk Assessment**
  - Further analysis of mHDWI using a much more comprehensive wildfire history
  - Leverage WRRM, mHDWI, and FPI analysis to identify locations on the landscape where anomalous wildfires are possible

- **Outage Risk Assessment**
  - Continue to build and test various outage prediction models
  - Expand outage analysis beyond weather / vegetation causes

- **PSPS vs EFR Settings**
  - Find balance - Risk reduction vs diminishing returns
  - Additional risk quantification and analysis

- **Establish a new PSPS Circuit Forecast Template**
  - Continue to evaluate and improve forecast process
  - Continue to evaluate and improve delivery process

Forward Looking Projects / Topics

Objective: Solicit Feedback on Proposed Projects / Topics / Next Meeting

- Proposed Topics:
  - DECISION: Service Territory Selection Follow-up (March)
    - Detailed Cost Breakdown by State and Cap/Exp
    - Finalized recommendation based on initial feedback (10-mile buffer for review in 2024 for all remaining areas excluding urban cores)
    - Business use/how we'll use it (project planning, FHCA review)
  - INFORM: Technosylva RAIL, RAVE Demo & Weighting Factors (March)
  - INFORM: RSE: Assumptions, Intended Business Use (March)
- Meeting Frequency / Next Meeting
- Feedback on Structure / Content / Attendees

WILDFIRE SAFETY & ASSET MANAGEMENT

WILDFIRE SAFETY

ASSET RISK

ASSET MANAGEMENT

Thank You!

PACIFICORP

Meeting Notes
Wildfire Risk Governance Committee
February 24, 2023

Attending: Kevin Benson, Allen Berreth, Tim Clark, Curtis Mansfield, Amy McCluskey, Jordan Pino, Chris Spencer, Steve Vanderburg

1. Wildfire Risk Project Status
    - FPI and PSPS Threshold: Being discussed at this meeting
    - Fragility Curves: Question of scope of fragility curve work:
        - It is asset specific: type and location. OH T&D assets are modeled
2. Open question of the scope of the assets is it FHCA only or are they modeled for the entire service territory. Fire Potential Index (FPI)
    - Working with Technosylva to develop a FPI that is automated. The benefit of this model is a consistent calculation that is not reliant on external agencies with different criteria and objectives
    - Model considers fuel and terrain complexity, fuel moisture and weather conditions to come up with a FPI score that can be run multiple times a day
    - FPI scores and associated levels are the same across the service territory
    - The FPI will be an input to the District Fire Risk, which will remain the same.
    - The District Fire Index and the Fire Risk Levels reflected there will not change, and PacifiCorp's response based on the Fire Risk Levels will not change
    - Next Steps:
        - Complete modeling of 400 historic fires inside and outside of PacifiCorp's service territory for FPI calibration
        - Set the FPI thresholds
        - After wildfire season evaluate model performance and identity opportunities to refine the model
3. PSPS Thresholds
    - Overview of the considerations going into the PSPS threshold review.
    - For 2023 wildfire season, there will likely be an initial recommendation with more in-depth analysis for proposed changes in future wildfire seasons
    - Next Steps:
        - Recommend thresholds for 2023 wildfire season
4. Feedback for Next Meeting
    - Avoid examples using 2020 as the example year. While all the examples were created in 2022-2023 for building the current models, this may raise questions from external parties.
    - Action: Kevin will follow up and clarify with Technosylva scope of fragility curve work: Entire service territory or FHCA only

Wildfire Risk Governance Committee (WRGC)





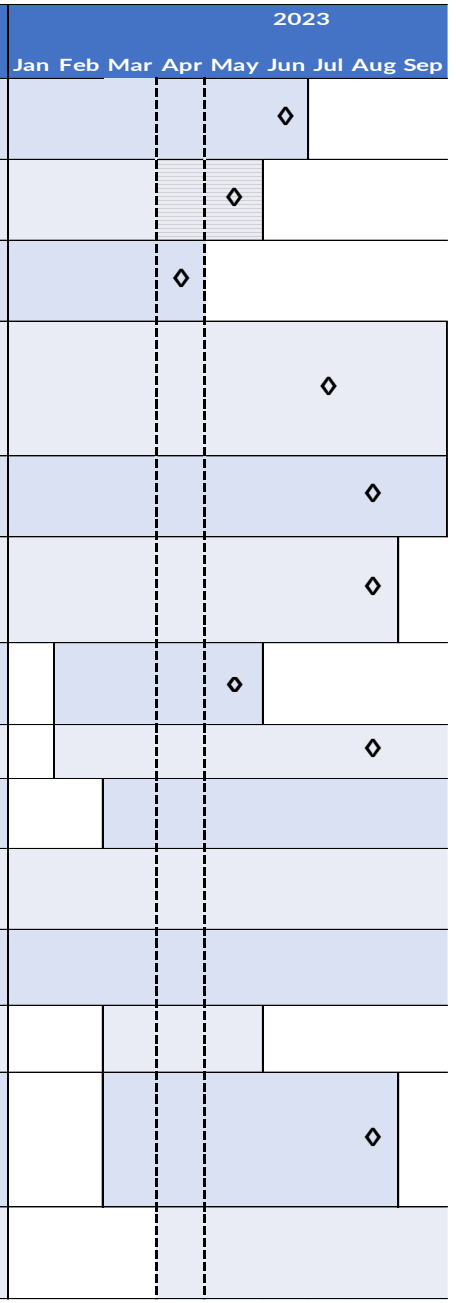

Agenda

15:30 – 15:35	Review Meeting Topics & Agenda	Kevin Benson
15:35 – 15:45	Wildfire Risk Analytics Project Status	Melissa Swenson
~~15:45 – 15:55~~	~~Fragility Curve Follow-up~~	~~Kevin Benson~~
15:55 – 16:05	Service Territory (WRRM Domain) Selection Follow-up	Kevin Benson
16:05 – 16:50	WRRM (RAIL/RAVE) 101 & Next Steps	Jordan Pino
16:50 – 17:00	Future Topics & Feedback	Kevin Benson






Status	Planning/ Operations	Initiative	What Is Different When Completed?	Scope	Current Stage	Reason for Yellow/Red Status
1	O	Updates to Internal and External Situational Awareness Websites	Improved user experience, enhanced maps and information for customers, partners, and employees	Entire Service Territory	Development	N/A
2	O	Fire Potential Index (FPI) Model	Evolution of District Fire Risk Assessment to provide more automation	Entire Service Territory	Testing	Delays due to data clean up and modeling additional scenarios to improve outputs.
3	O	Public Safety Power Shutoff Thresholds	Dramatically reduce/eliminate wildfire risk in PacifiCorp's Northern California service territory	FHCA	Testing	N/A
4	P/O	30 Year WRF Reanalysis	Hourly record of WRF weather and NFDRS outputs from Jan. 1991 to Dec. 2021 at a 2km horizontal resolution to use in WFA-E and other modeling	Entire Service Territory	Development & Testing	Monitoring for any slippage in processing schedule-reanalysis is complete, post-processing is underway. Coordinating data handoff from ADS to Technosylva.
5	P	Risk Spend Efficiency (RSE) Model	Dramatically reduce/eliminate wildfire risk in PacifiCorp's Northern California service territory	FHCA	Requirements	N/A
6	P	Expansion of Service Territory Modeled in WRRM	WRRM modeling of wildfire risk covers the majority of PacifiCorp's service territory, not just areas currently identified as at high risk of wildfire.	Entire Service Territory	Planning	N/A
7	P	Annual Planning Model Updates	Process in place to update assets, configurations and other information to keep planning models current	FHCA	Testing	N/A
8	P/O	FHCA Assessment	Updates to FHCA areas across PacifiCorp's operating areas.	Entire Service Territory	Planning	N/A
9	P	Public Safety Power Shutoff (PSPS) Risk Assessment Solution	Technical solution to understand potential impacts of a PSPS and how mitigations could reduce the consequences	FHCA	Planning	N/A
10	O	WRF Ensemble	Strategically sub-select GEFS members to initialize a multi-member WRF Ensemble deterministic weather forecasts	Entire Service Territory	Development	N/A
11	O	GEFS Self Organizing Maps (SOMs) Ensemble Forecast Tool	Build historical SOM node array using ERA5 Reanalysis. Build an automated GEFS SOM node association framework and forecast tool	Entire Service Territory	Development	N/A
12	P	Annual Mitigation Selection Planning Process	Updated process to integrate new planning tools to support selection of mitigation programs and projects	FHCA	Planning	Delayed start for data review and process familarization.
13	O	Data Lake for Wildfire and Weather Data	Historical and daily forecast data and conditions accessible to other departments in PacifiCorp and BHE for departments to use data and build models and machine learning tools with.	Entire Service Territory	Planning	N/A
14	O	Bias-corrected WRF Forecast	Machine learning models to bias correct the WRF forecast for Pacific Power Weather Stations, RAWS, and other relevant weather stations.	Entire Service Territory	Execution	N/A



WRRM Service Territory Selection

Objective: Present recommended WRRM domain expansion including costs for feedback

Project Objective: Determine new areas to include in Technosylva WRRM analysis for additional risk assessment

Recommendation:

1) **Analyze new areas in 2023.** Use a 10-mile buffer around assets to analyze new areas in all 6 states that are not urban cores.

Alternative:

2) **Analyze new areas over two years.** Use a 10-mile buffer to analyze OR, CA, and UT in 2023. In 2024, analyze WA, ID, and WY. For both phases, exclude assets in urban cores.

Based on results of the risk modeling, **identify areas to include/exclude in future model runs or expand buffer to 20-miles** consistent with previous modeling.

WRRM Service Territory Selection – Cost Overview

Objective: Present recommended WRRM domain expansion including costs for feedback

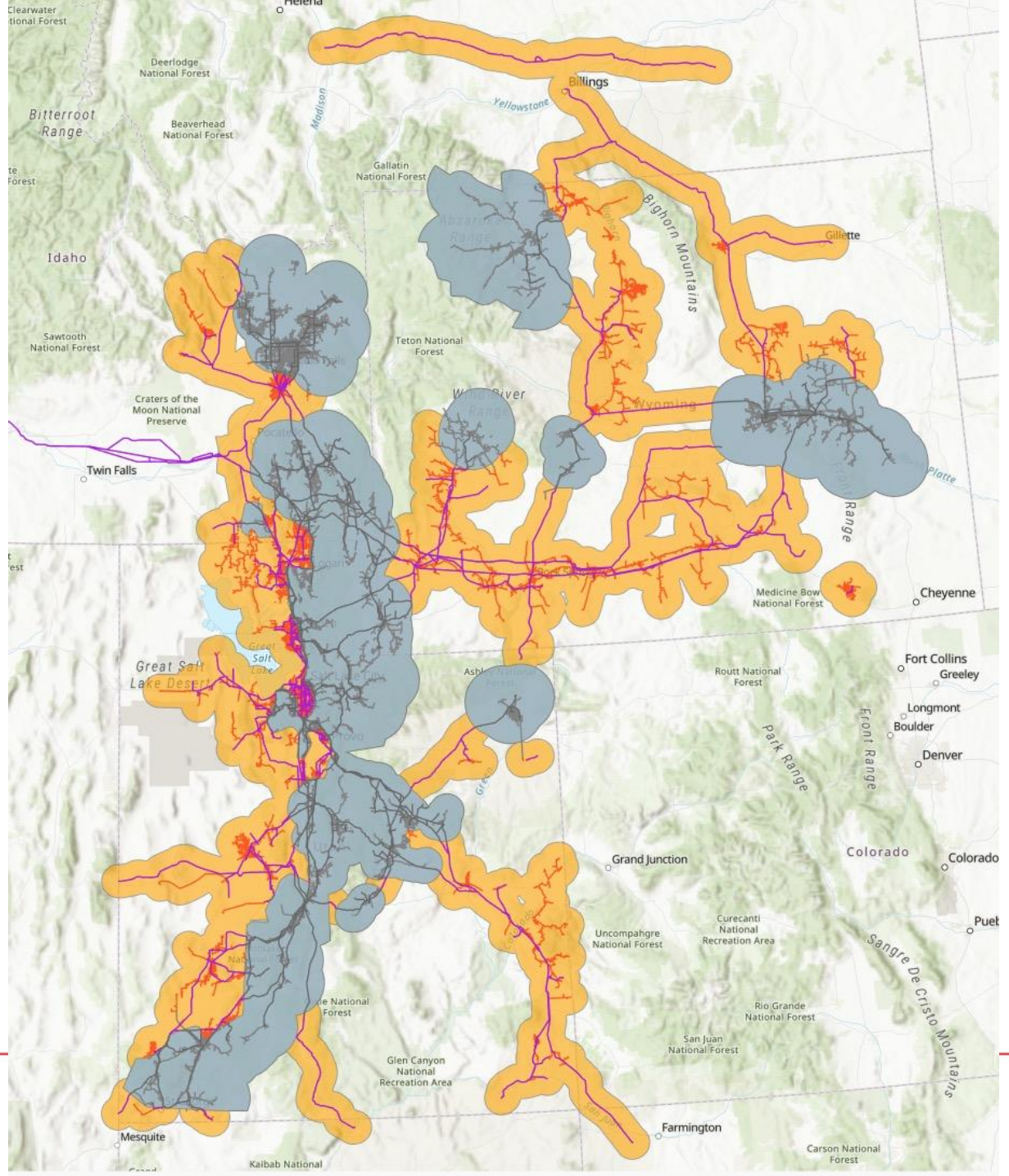
Product	2022 Fee	2023 Fee	Difference
Total Costs - 10-mile buffer of new assets			
WRRM	$538,703	$1,699,051	$1,160,348
RAVE	$269,351	$906,160	$636,809
Fuels	$269,351	$906,160	$636,809
LFM	$107,741	$453,080	$345,339
Total	**$1,185,146**	**$3,964,451**	**$2,779,305**

Breakdown by State		
State	**Allocation**	**Spend**
California	2%	$85,632
Oregon	28%	$1,109,650
Washington	8%	$308,831
Idaho	5%	$217,252
Utah	44%	$1,725,726
Wyoming	13%	$516,172
FERC	0.03%	$1,189
Total	**100%**	**$3,964,451***

Breakdown by Capital & Expense		
	Capital	**Expense**
Total	$0M	$3.96M*

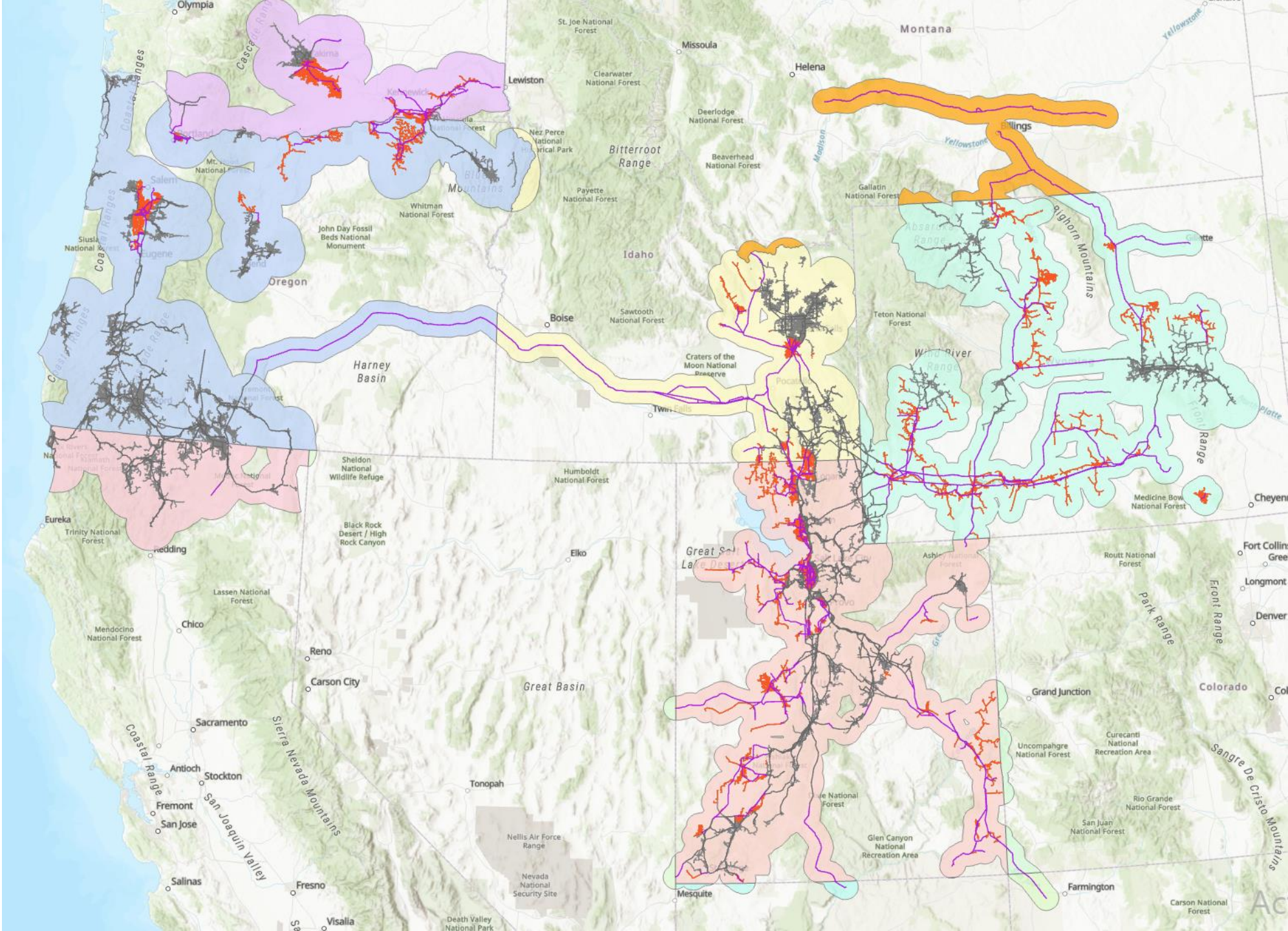
*Incremental $2.78M

Rocky Mountain Power



- Existing domain assets
- New Transmission
- New Distribution
- Current domain
- New Domain – 10 mi
- New domain for single connecting transmission line

PacifiCorp
10 Mile Domain by State



Existing domain assets

New Transmission

New Distribution

Domain areas by state are shown in arbitrary colors for delineation

Wildfire Risk Reduction Model (WRRM) 101

Objective: Provide an overview of the Wildfire Risk Reduction Model (WRRM) and its components for a better understanding of how Asset Risk will use it and to clear up any lingering questions on the model.

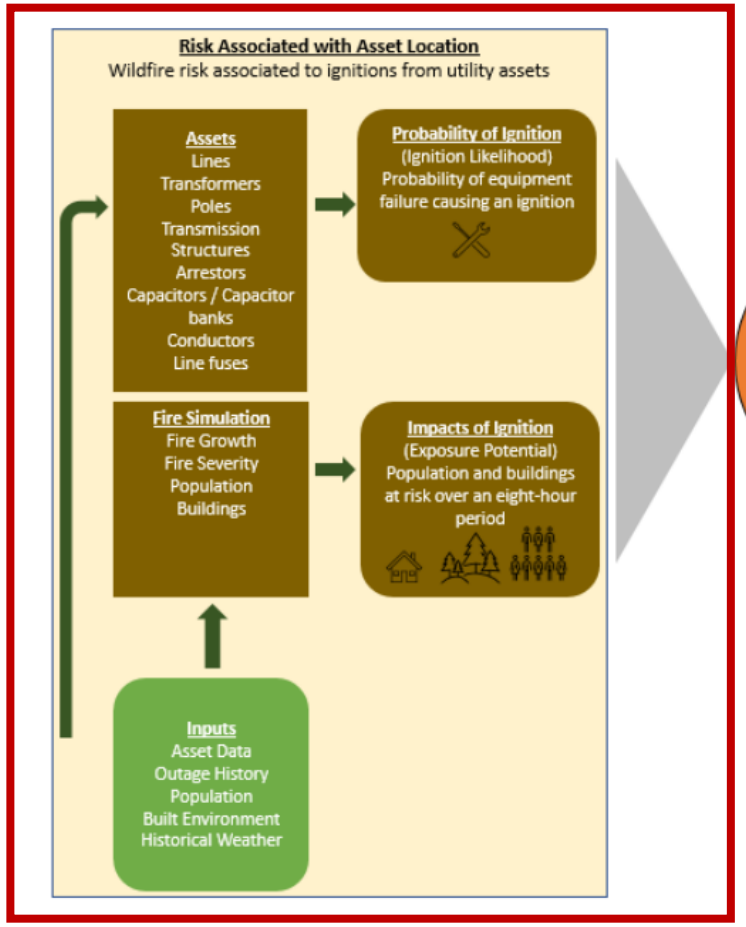
- Below is a list of topics we will cover regarding WRRM:

❑ **Important Topics**:

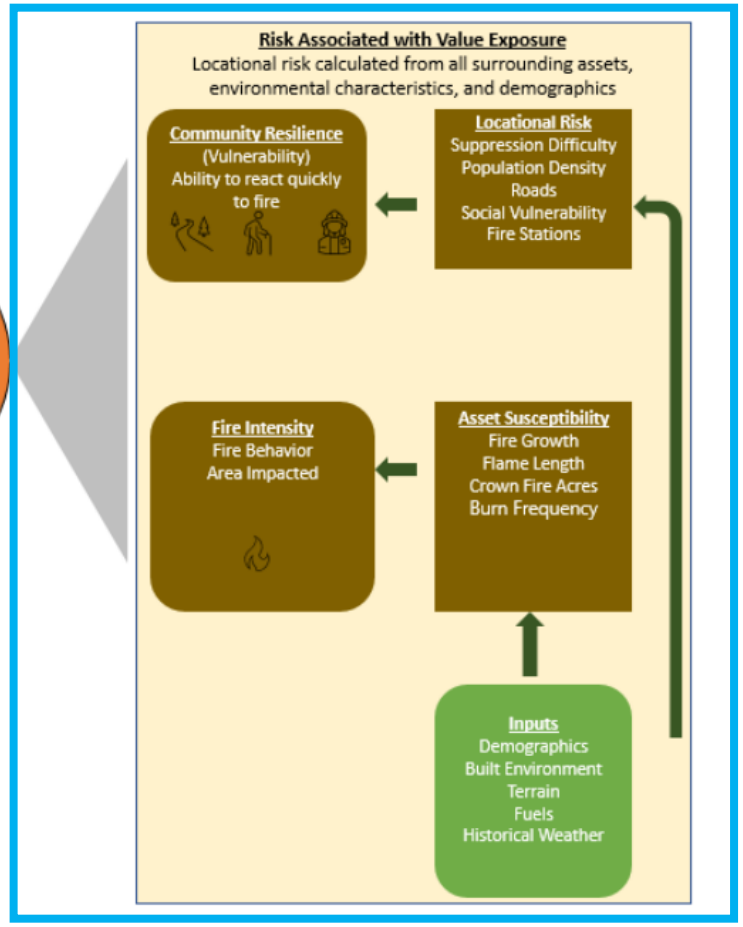
- What is WRRM (RAIL + RAVE)? What are its components?
- How does it ingest our data to output risk?
- What are the output variables? What does it look like?
- WRRM Percentiles

RAIL and RAVE – Major Components

Risk Associated with Ignition Location (RAIL)



Risk Associated with Value Exposure (RAVE)



❑ WRRM Components:

- **RAIL** = Asset Ignition Risk
- **RAVE** = Community & Environmental Risk
- **Composite** = RAIL + RAVE

❑ Why do we need both?

- **Need to know ignition risk <u>AND</u> community & environmental risk to obtain the most robust picture of overall risk.**

What exactly *is* RAIL? What are its components?

RAIL

Overview: The Risk Associated with Ignition Location (RAIL) is a detailed analysis [model] of utility wildfire risk using **historical weather data**, **wildfire simulations**, and **outage analytics**.

❑ Main components of RAIL:

- (1) **W**eather **R**esearch & **F**orecasting (WRF) Historical Weather Data
- (2) Wildfire Spread Simulations
- (3) Outage Analytics [**P**robability **o**f **F**ailure (POF) + **P**robability **o**f **I**gnition (POI)]

- Final output is a **conditional** and **expected** risk for each circuit segment and transformer.

Expected Risk (Circuit Segments)

** For Illustrative Purposes Only. **

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What did PacifiCorp provide Technosylva?

- GIS Asset Data (Shapefiles + Attribute Tables)
- Historic Outage Data + Risk Drivers
- Historic Ignition Data

** We will go through each component to ensure adequate understanding. **

(1) WRF Weather Simulations

Helpful Reminder:

WRF = **W**eather **R**esearch and **F**orecasting

Overview: The first component of RAIL is the WRF Historic Weather Simulations.

❑ Why do we need historical weather simulations?

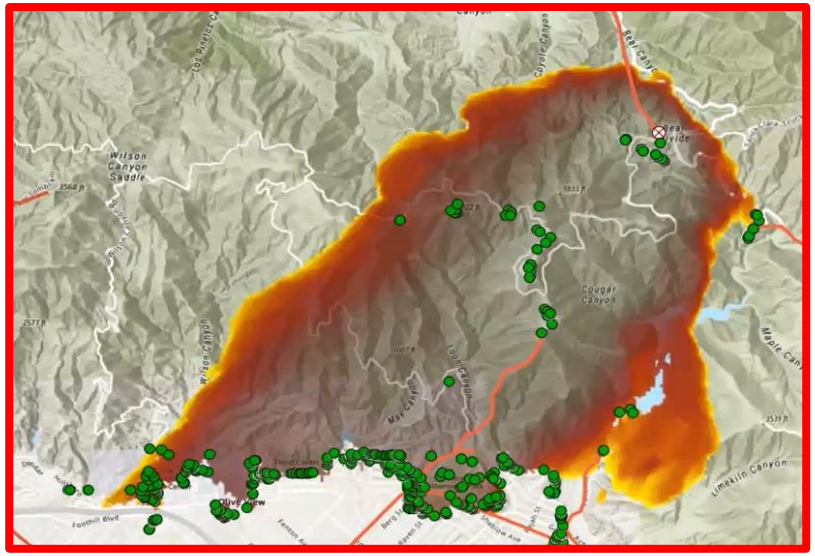
- To ensure all possible fire weather conditions are accounted for.
- **Ignition points** are assigned along each circuit for the simulations.
- Hundreds of simulations are run at each ignition point.
- Important weather variables include **wind speed** and **wind gust**.
- Focus is not only on most extreme days and includes other fire weather days.

technosylva

What are ignition points exactly?

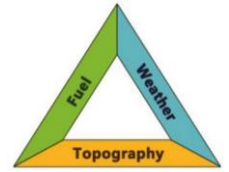
- Points assigned every 100 m along circuits.
- Used for weather simulation initiation.
- Used for wildfire spread model initiation.

WRF Simulation + Ignition Points



** For Illustrative Purposes Only. **

(2) Wildfire Spread Simulations



RAIL

Overview: The second component of RAIL is the Wildfire Spread Simulations and consequence-based risk metrics.

❑ What are the wildfire spread simulations used for?

- To calculate the consequences at each ignition point *should* a fire occur.
- **Ignition points** are used as initiation for simulations.
- Each simulation is eight (8) hours long.
- Output is consequence-based risk metrics (Table 1).
- Since there are multiple weather simulations, statistical values are needed.
  - ➢ Percentile Values (0, 20, 40, 50, 60, 80, 90, 95, 98, 100)

Best Weather Days (Low Wind, Wet) ⟷ **Worst Weather Days (Dry, Windy, Hot)**

Table 1: Consequence-Based Risk Metrics

Risk Metric:	Description:
Acres Burned	Number of Acres Burned
Population Impacted	Population Count Impacted
Buildings Threatened	Number of Buildings Threatened
Buildings Destroyed	Number of Buildings Destroyed
Fire Behavior Index	Fire Behavior Index
Rate of Spread	66 Feet/Hour
Flame Length	Feet

This is what we term **CONDITIONAL** risk.

(3) Outage Analytics

RAIL

Overview: The third component of RAIL is Outage Analytics (to calculate the POF and POI components).

❑ **Why do we need to know POF and POI? What are they?**

Probability of Failure (POF):
Definition: Probability that a failure results in a **spark** or **burning** material on the ground.
Methodology: Model predicts hourly failure based on wind and asset [outage] data across all circuits.

+

Probability of Ignition (POI):
Definition: Probability that burning material will create a wildfire that **needs suppression**.
Methodology: Uses fuel, fuel dryness, and wind to estimate the probability of a fire starting from ignition source.

How does it all come together?

RAIL

Overview: Components (1), (2), and (3) all come together to create the **expected risk** for each asset.

(1) WRF Weather Simulations + **(2) Wildfire Spread Simulations** = **Consequence-Based Risk** (*i.e.* buildings destroyed; population impacted….)

Expected Risk (Circuit Segments)

= **(3) Outage Analytics** → CR * POF * POI

** For Illustrative Purposes Only. **

<u>Helpful Reminder</u>:

- **WRF** = **W**eather **R**esearch and **F**orecasting
- **CR** = Consequence-Based Risk
- **POF** = Probability of Failure
- **POI** = Probability of Ignition

This is what we term **<u>EXPECTED</u>** risk.

What exactly *is* RAVE? What are its components?

RAVE

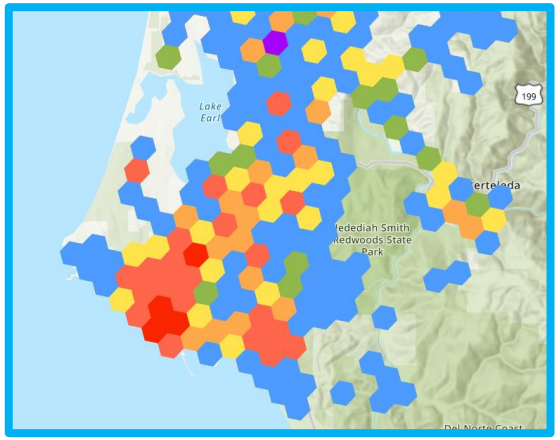
Overview: The **R**isk **A**ssociated with **V**alue **E**xposure (RAVE) is a detailed analysis of utility wildfire risk using **local characteristics** and **community attributes**.

❑ **Main components of RAIL:**

- (1) Locational Risk Factors (Table 1).
- (2) Community Risk Factors (Table 1).

- Final output is in the form of "plexels".

RAVE Output: Plexels



** For Illustrative Purposes Only. **

Table 1: RAVE Locational Risk Factors

Variable:	Description:
Total Road Miles	Total Miles (Major + Minor)
Fuel Model Majority	Majority Fuel in Each Plexel
Building Density	Building Density per Plexel
Number of Buildings	Number of Building per Plexel
Population Count	Population Count per Plexel
Fire Station Density	Density of Fire Stations
Terrain Difficulty Index	Terrain Difficulty per Plexel
Disability Population	Disability Population Ratio
Poverty Population	Poverty Population Ratio
Senior Population	Senior Population Ratio
Years Since Last Fire	Years Since Last Fire per Plexel

Forward Looking Projects / Topics

Objective: Solicit Feedback on Proposed Projects / Topics / Next Meeting

- Proposed Topics:
  - ~~DECISION: Service Territory Selection Follow-up (April)~~
    - ~~Detailed Cost Breakdown by State and Cap/Exp~~
    - ~~Finalized recommendation based on initial feedback (10-mile buffer for review in 2024 for all remaining areas excluding urban cores)~~
    - ~~Business use/how we'll use it (project planning, FHCA review)~~
  - ~~INFORM: WRRM (RAIL/RAVE) 101 & Next Steps (April)~~
  - DECISION: WRRM Output – Proposed Business Use (April)
  - INFORM: RSE – Methodology and Planned Business Use (May)
- Meeting Frequency / Next Meeting
- Feedback on Structure / Content / Attendees

WILDFIRE SAFETY & ASSET MANAGEMENT

WILDFIRE SAFETY

ASSET RISK

ASSET MANAGEMENT

Thank You!

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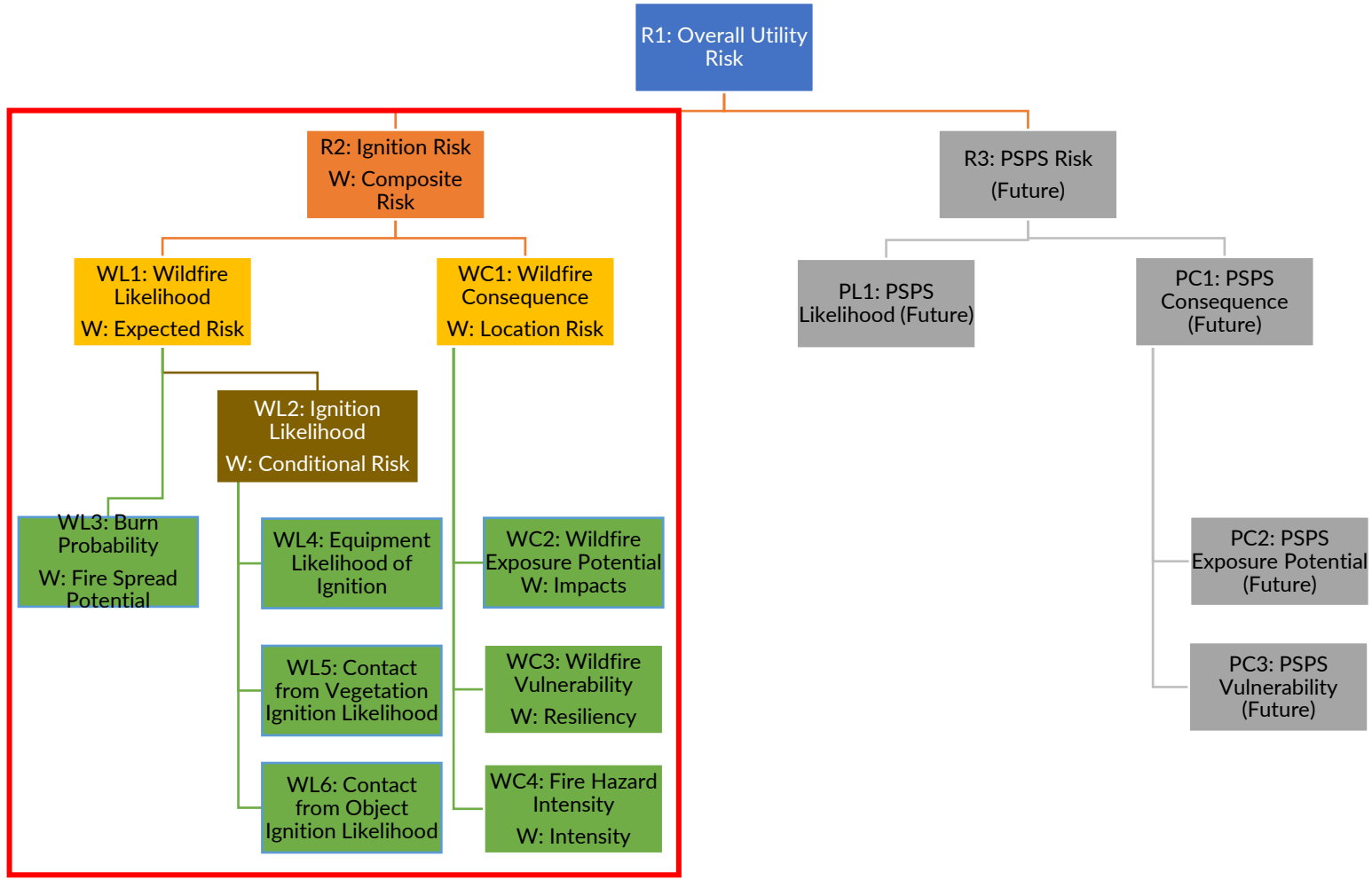
WRRM in the Risk Framework

Wildfire Risk Reduction Module (WRRM), focuses on the Ignition Risk side of the Risk Model. WRRM considers utility specific information such as asset types, materials and age in conjunction with location specific information identify the wildfire likelihood and consequence.

Utility calculation of community vulnerability to wildfire and PSPS is an expectation of OEIS.



"R1:, WL1:, WC1," etc. from 2023 California WMP.
"W" is corresponding WRRM terminology

Meeting Notes
Wildfire Risk Governance Committee
April 10, 2023

Attending: Kevin Benson, Allen Berreth, Tim Clark, Vivian DuPont, Amy McCluskey, Jordan Pino, Chris Spencer, Elenore Yostov

1. Wildfire Risk Project Status
    - FPI: Late due to data clean up and some additional refinements. Steve talking with Technosylva this week about status. Backup plan in place to calculate district fire risk if FPI is not done by the start of wildfire season
    - Weather Research and Forecast (WRF) Reanalysis. Monitoring due to the amount of data to process and the dependency of the 2024 WRRM planning on the data. ADS has completed processing and is coordinating with Technosylva to handoff the data the week of April 17. Once there is confirmation the data is handed off and there are no issues, the status will change from yellow to green
    - Annual planning process. Slow start but talking with Planners about what information they need and what attributes are helpful for them.
2. Fragility Curves:
    - Held until next meeting
3. WRRM Domain Expansion
    - Provided breakdown by state of the incremental cost of the expansion of the domain
    - The expansion is all expense, there is no additional development required this is about additional data
    - Feedback from Allen is to move forward with expanding the domain
    - Action: Follow up if BHE line in Northern Montana is included in domain expansion.
    - Action: Follow up with Jeff Vickers of how much of the expanded domain is covered through regulatory wildfire deferrals and how much is an incremental expense that Allen needs to address in his budget
4. WRRM 101
    - Question: How does Technosylva use the asset information provided (age, materials, etc.) in calculations?
      A: Will follow up with Technosylva
    - Question: What are the variables that can be used to weigh different priorities due to the unique characteristics of the service territory?
      A: Conditional Risk (Ignition Likelihood) has no variables that the utility can weight. This is where the Probability of Failure and Probability of Ignition calculations are. WRRM assumes that the Conditional Risk is equal to 1, there's a 100% probability of ignition. The Expected Risk (Wildfire Likelihood) and Conditional Risk (Wildfire Consequence) are where there are variables that the utility can weight to reflect the characteristics of their service territory

- Question: There is historic weather information used in RAVE and RAIL, how are they different or the same?
  A: Will follow up with Technosylva
- Question: Does RAVE include any fire characteristics, how are they used and is there any potential overlap with RAIL?
  A: Will follow up with Technosylva
- Question, does WRRM show the potential risk reduction of possible mitigations?
  A: WRRM specifically does not, it shows what the current risk is. WFA-E has a planning module Technosylva is reactivating to support mitigation modeling and RSE. Technosylva built the module, but other utilities already had other homegrown solutions for risk planning. This work is part of the RSE implementation.
- Question: How does what is in WRRM align with what the large California utilities are doing?
  A: The WRRM modeling assumes an eight hour burn period, talking with Technosylva about expanding to a 24-hour period that aligns with what other IOUS are doing.
- Next meeting: Present options for weightings

5. Future Meetings
   - Invite Jeff Vickers and Tom Eide to meetings
   - Deep dive into RSE, FHCA Assessment, and PSPS Risk Assessment Solution

Wildfire Risk Governance Committee (WRGC)






Agenda

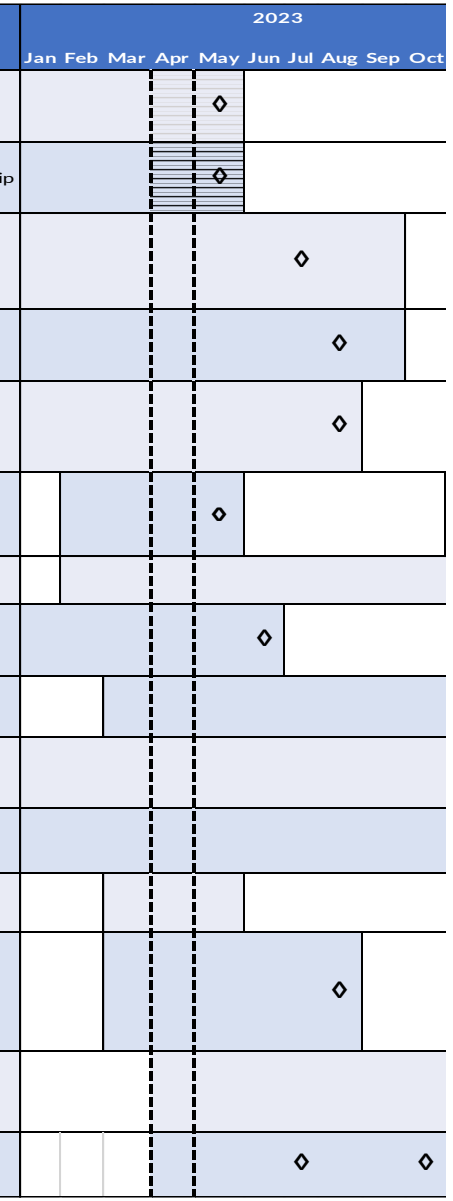
15:30 – 15:35	Review Meeting Topics & Agenda	Jordan Pino
15:35 – 15:45	Wildfire Risk Analytics Project Status	Melissa Swenson
15:45 – 16:50	WRRM: RAIL/RAVE Weightings	Jordan Pino
16:50 – 17:00	Future Topics & Feedback	Jordan Pino



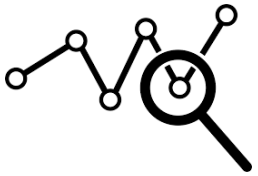



Schedule

Status	Planning/ Operations	Initiative	What Is Different When Completed?	Scope	Current Stage	Reason for Yellow/Red Status
1	O	Fire Potential Index (FPI) Model	Evolution of District Fire Risk Assessment to provide more automation	Entire Service Territory	Testing	Delays due to data clean up and modeling additional scenarios to improve outputs.
2	O	Public Safety Power Shutoff Thresholds	Dramatically reduce/eliminate wildfire risk in PacifiCorp's Northern California service territory	FHCA	Testing	Still discussing thresolds with leadership
3	P/O	30 Year WRF Reanalysis	Hourly record of WRF weather and NFDRS outputs from Jan. 1991 to Dec. 2021 at a 2km horizontal resolution to use in WFA-E and other modeling	Entire Service Territory	Development & Testing	30 year reanalysis delviered to PacifiCorp and Technosylva
4	P	Risk Spend Efficiency (RSE) Model	Dramatically reduce/eliminate wildfire risk in PacifiCorp's Northern California service territory	FHCA	Requirements	N/A
5	P	Expansion of Service Territory Modeled in WRRM	WRRM modeling of wildfire risk covers the majority of PacifiCorp's service territory, not just areas currently identified as at high risk of wildfire.	Entire Service Territory	Planning	N/A
6	P	Annual Planning Model Updates	Process in place to update assets, configurations and other information to keep planning models current	FHCA	Testing	Pulling delivery of PacifiCorp data forward to end of April to mitigate risk of processing taking longer than planned.
7	P/O	FHCA Assessment	Updates to FHCA areas across PacifiCorp's operating areas.	Entire Service Territory	Planning	Delay in beginning analysis to prepare RFP
8	O	Updates to Internal and External Situational Awareness Websites	Improved user experience, enhanced maps and information for customers, partners, and employees	Entire Service Territory	Development	N/A
8	P	Public Safety Power Shutoff (PSPS) Risk Assessment Solution	Technical solution to understand potential impacts of a PSPS and how mitigations could reduce the consequences	FHCA	Planning	N/A
9	O	WRF Ensemble	Strategically sub-select GEFS members to initialize a multi-member WRF Ensemble deterministic weather forecasts	Entire Service Territory	Development	N/A
10	O	GEFS Self Organizing Maps (SOMs) Ensemble Forecast Tool	Build historical SOM node array using ERA5 Reanalysis. Build an automated GEFS SOM node association framework and forecast tool	Entire Service Territory	Development	N/A
11	P	Annual Mitigation Selection Planning Process	Updated process to integrate new planning tools to support selection of mitigation programs and projects	FHCA	Planning	Delayed start for data review and process familarization.
12	O	Data Lake for Wildfire and Weather Data	Historical and daily forecast data and conditions accessible to other departments in PacifiCorp and BHE for departments to use data and build models and machine learning tools with.	Entire Service Territory	Planning	N/A
13	O	Bias-corrected WRF Forecast	Machine learning models to bias correct the WRF forecast for Pacific Power Weather Stations, RAWS, and other relevant weather stations.	Entire Service Territory	Execution	N/A
14	O	Quarterly Update of Asset Data	FireCast and FireSim has the current asset information to model risk for situational awareness	Entire Service Territory	Planning	N/A



WRRM Composite Risk Score



Objective: Review proposed WRRM composite risk score methodology and weightings for approval and discussion with Asset Risk team. Once agreement is finalized, we will calculate composite scores.

- In addition to providing the proposed methodology and weightings, we will discuss the important items below:

❑ **Important Topics**:

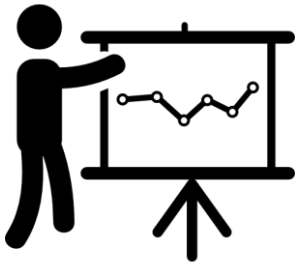
- Justification for methodologies/weightings [how do we provide solid justification to leadership].
- Maintaining consistency with the composite score [proposed methodology includes a few different composites].
- Ensure alignment and understanding of the composite score methodologies and weightings.

Why do we need a composite score?

Overview: Why do we need a composite risk score? Why not just use output from RAIL or RAVE separately?

❑ **Support for a Composite Score**:

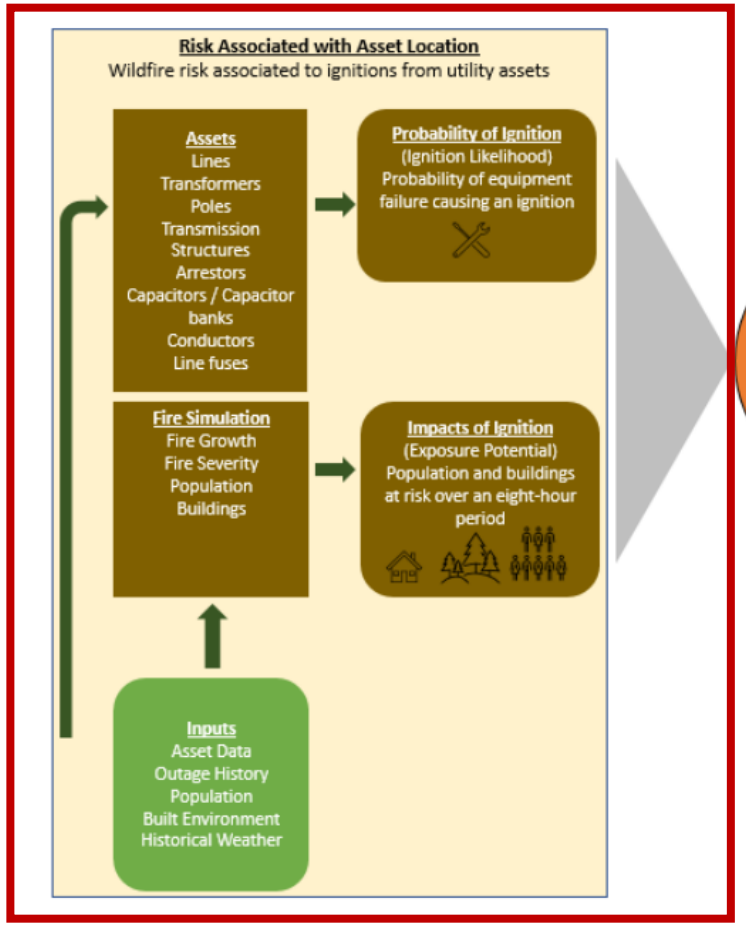
- Regulatory compliance with CA WMP risk scoring requirements.
- Individual components from WRRM are *less user friendly*! What variable do I use? Which percentile?
- A single component from WRRM is less informative than a composite [missing the "whole" story].
- Asset Risk needs a single number to rank circuit segments and assets.
- Simplicity and consistency!



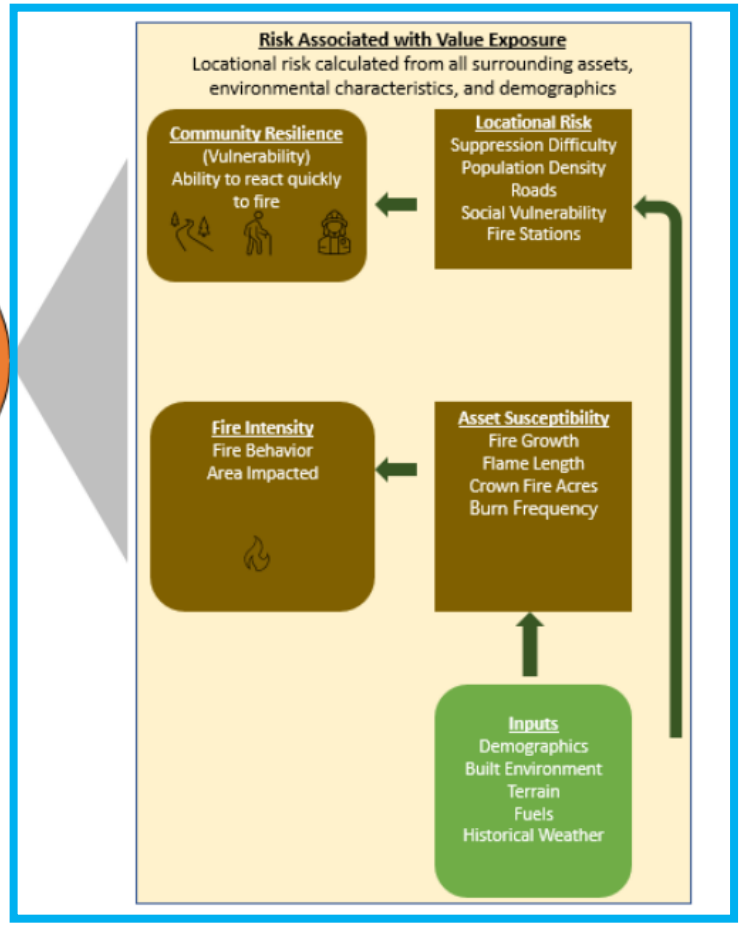
WRRM = Wildfire Risk Reduction Model
RAIL = Risk Associated with Ignition Likelihood
RAVE = Risk Associated with Value Exposure

RAIL and RAVE – Major Components

Risk Associated with Ignition Location (RAIL)



Risk Associated with Value Exposure (RAVE)



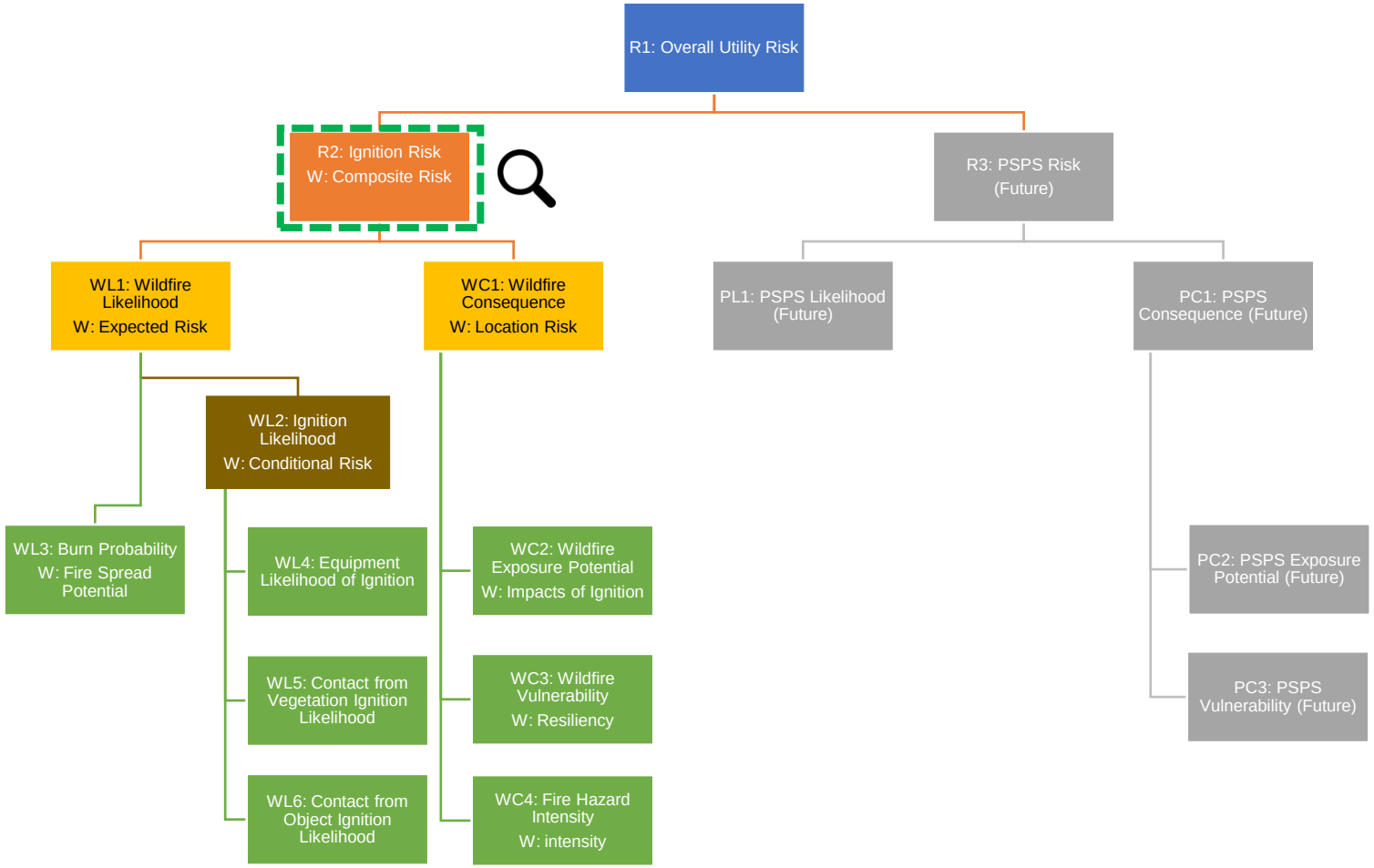
❑ WRRM Components:

- **RAIL** = Asset Ignition Risk
- **RAVE** = Community & Environmental Risk
- **Composite** = RAIL + RAVE

❑ Why do we need both?

- **Need to know ignition risk <u>AND</u> community & environmental risk to obtain the most robust picture of overall risk.**

Why do we need a composite score?



- **PacifiCorp's Risk Framework:**
  - OEIS requires every utility to have a risk framework in place that addresses key components of wildfire risk.
  - The composite risk score we will focus on is **R2: Ignition Risk** (Composite Risk).

R2: Ignition Risk
W: Composite Risk

OEIS = Office of Energy Infrastructure Safety

Hazard Risk | Intermediate Risk | Fundamental Risk | Pending

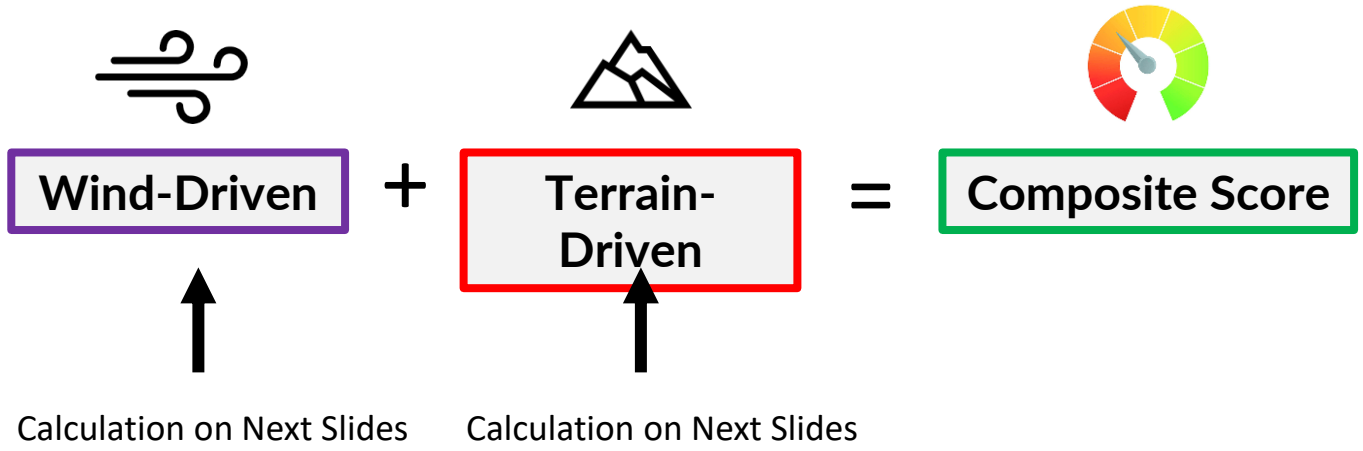
Proposed Composite Score

We will get into the "why" of splitting up risk between wind-driven and terrain driven!

Overview: The proposed composite score combines wind-driven and terrain-driven risk together to create a more robust picture of risk.

❑ **Proposed Composite Score**:

- Wind-Driven Risk Calculation
- Terrain-Driven Calculation
- ✓ Final Composite Score



*** **PRELIMINARY** – CURRENTLY VALIDATING! ***

Why do we need wind-driven and terrain-driven components?

Overview: We need to distinguish between the two for our overall risk calculation because they each contain a unique set of characteristics.

❑ **Wildfire Type Descriptions**:

Category:	Wind-Driven Wildfires:	Fuel/Terrain-Driven Wildfires:
Locational Risk:	More likely in areas subject to PSPS	Confined to areas of complex fuels and terrain with difficult access
Frequency	Some years have none; others several	Annually during peak fire season
Event Duration	1-3 days per event	Can persist several weeks or months
Outage Risk	Wind-driven and relatively predictable	Difficult to predict
Consequence	Immediately catastrophic	May be catastrophic over time

*** **PRELIMINARY** – CURRENTLY VALIDATING! ***

Wind-Driven + Terrain-Driven Further Support

Overview: We also need different types of scores because they each capture different types risks and situations.

❑ **Wildfire Type Support [why wind-driven and terrain-driven components]**:

- Both are necessary to aid in the mitigation *prioritization*.
- Secondary uses are to help get the *type* of mitigation correct.

❑ **Examples of Various Risk Scenarios [examples *only*; do not reflect actual situations]:**

- **Siskiyou Mountains** – high risk of terrain-driven fires annually for several weeks or months.
- **Weed, CA** – low risk of terrain-driven fires but high risk of wind-driven (frequent windy days + dry fuels).
- **Astoria, OR** – lower risk of fuel and wind-driven risk as conditions occur less often.

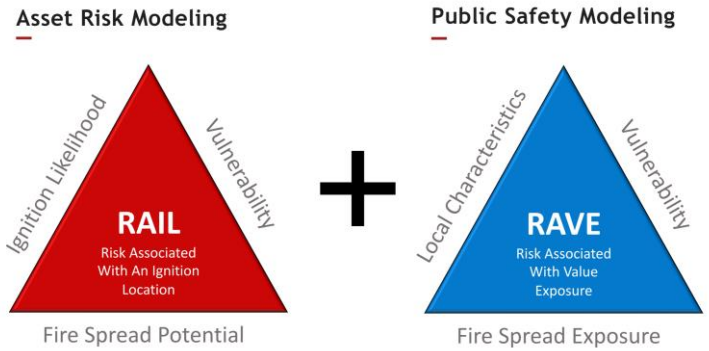
***** NOT an all-inclusive list! *****

Structure of the Composite Score

Overview: The structure of the composite score includes input from WRRM, split into two "categories". It also includes weightings based on which variables we think may have more impact than others.

❑ **Notes on Composite Score**:

- Variables are obtained via our WRRM model [variables will be normalized].
- Weights add up to 100%.
- Weights are determined using model output + SME input [utility benchmarking].
- We will focus on the 90th and 98th percentiles in terms of variables.



Risk Associated with Ignition Location (RAIL) Component

Variable 1(Weight; %) + Variable 2(Weight; %)….

+

Risk Associated with Value Exposure (RAVE) Component

Variable 1(Weight; %) + Variable 2(Weight; %)….

*** **PRELIMINARY** – CURRENTLY VALIDATING! ***

Proposed "Wind-Driven" Score Components

Wind-Driven

Overview: We propose the wind-driven composite score below which includes variables and weights determined through SME input.

How did we decide on these variables/weights?

- Subject Matter Expertise (SME) within PacifiCorp.
- Benchmarking with other CA IOUs.

❑ **Components**:

- The below composite score is what we are terming the "wind-driven" composite.

Risk Associated with Ignition Location (RAIL) Component (80%)

RAIL Inputs:	Percentile:	Weight (%):
Rate of Spread *	95	30%
Population Impacted *	95	25%
Buildings Destroyed *	95	25%

+

Risk Associated with Value Exposure (RAVE) Component (20%)

RAVE Inputs:	Percentile:	Weight (%):
Terrain Difficulty Index	-	10%
Disability Population	-	5%
Poverty Population	-	5%

** = PG&E, SCE and SDG&E utilized variable.*

*** **PRELIMINARY** – CURRENTLY VALIDATING! ***

Proposed "Terrain-Driven" Score Components

Terrain-Driven

Overview: We propose the terrain-driven composite score below which includes variables and weights determined through SME input.

How did we decide on these variables/weights?

- Subject Matter Expertise (SME) within PacifiCorp.
- Benchmarking with other CA IOUs.

❑ Components:

- The below composite score is what we are terming the "terrain-driven" composite.

Risk Associated with Ignition Location (RAIL) Component (60%)

RAIL Inputs:	Percentile:	Weight (%):
Fire Behavior Index	95	20%
Fire Size Potential	95	20%
Flame Length *	95	20%

+

Risk Associated with Value Exposure (RAVE) Component (40%)

RAVE Inputs:	Percentile:	Weight (%):
Terrain Difficulty Index	-	25%
Fire Station Density	-	10%
Fuel Model Majority	-	5%

** = PG&E utilized variable.*

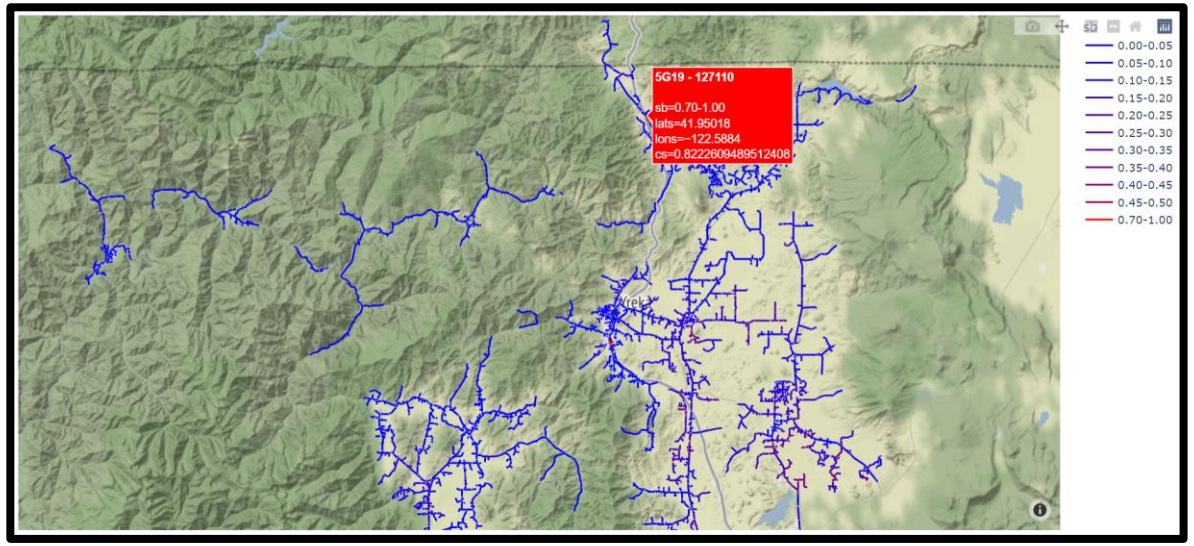
*** **PRELIMINARY** – CURRENTLY VALIDATING! ***

What have we done so far?

Overview: We have begun developing a composite risk score tool that calculates the risk for each circuit segment. This tool is preliminary and is being used for validation.

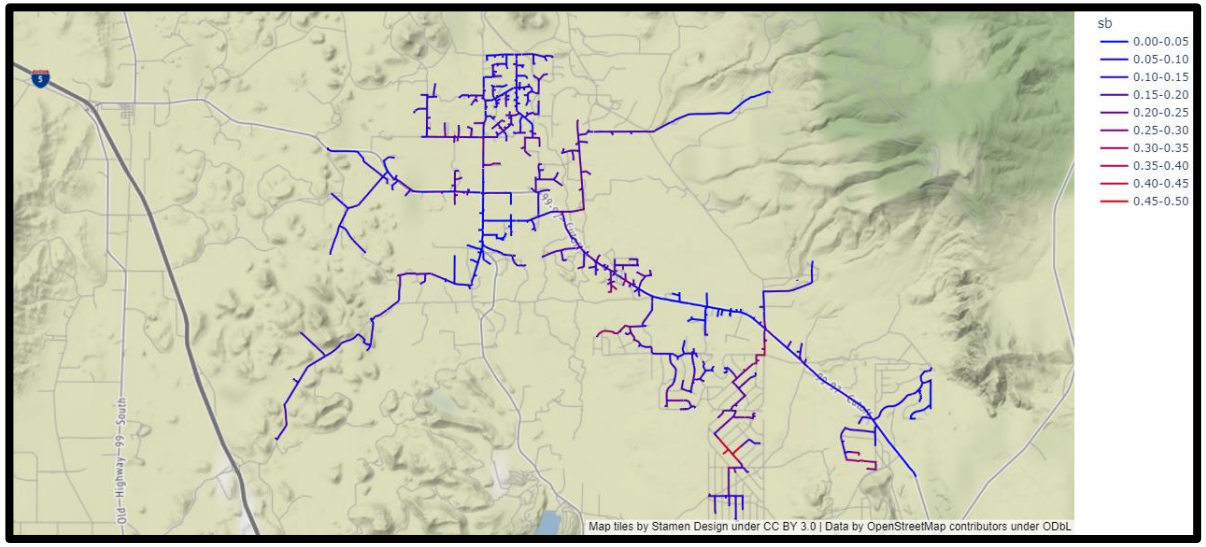
❑ **Preliminary Composite Calculation Tool**:

Preliminary Composite Score Calculation



** For illustrative purposes only! **

Preliminary Composite Score Calculation



** For illustrative purposes only! **

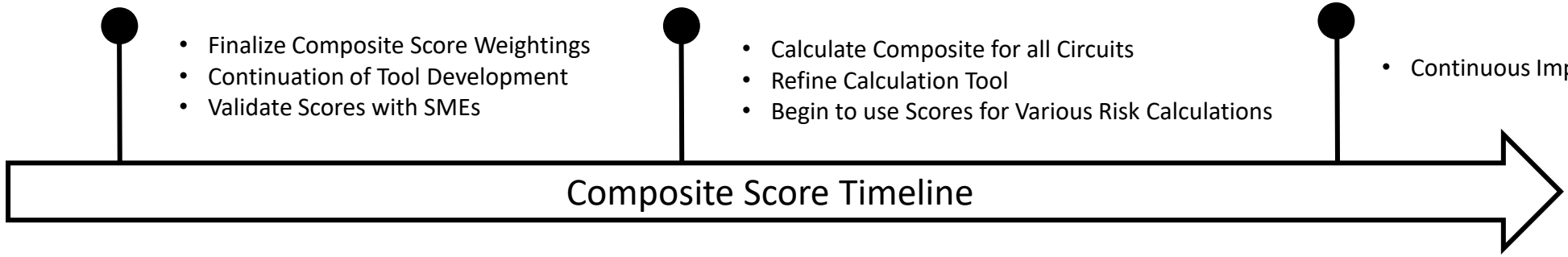
**** **PRELIMINARY** – CURRENTLY VALIDATING! ****

Next Steps and Timeline:

Overview: Our next step is to continue to improve and work on the composite score methodology and test varying weighting scenarios.

❑ **Future Tasks**:

- Continue discussions with other utilities and SMEs on potential composite scores.
- Composite scores will be utilized for our RSE calculations [used to identify areas of highest overall risk].



Forward Looking Projects / Topics

Objective: Solicit Feedback on Proposed Projects / Topics / Next Meeting

- Proposed Topics:
  - ~~DECISION: WRRM Output – Proposed Business Use (April)~~
  - INFORM: RSE – Methodology and Planned Business Use (May)
  - INFORM: FHCA Refresh Methodology (May/June)
  - INFORM: PSPS Risk Assessment Solution (June)
- Meeting Frequency / Next Meeting
- Feedback on Structure / Content / Attendees

WILDFIRE SAFETY & ASSET MANAGEMENT

WILDFIRE SAFETY

ASSET RISK

ASSET MANAGEMENT

Thank You!

PACIFICORP

Meeting Notes
Wildfire Risk Governance Committee
April 27, 2023

Attending: Kevin Benson, Allen Berreth, Erik Brookhouse, Curtis Mansfield, Robert Marshall, Amy McCluskey, Jordan Pino, Jordan Popham, Thomas Riese, Chris Spencer, Steve Vanderburg, Elenore Yostov

1. Wildfire Risk Project Status
    - FPI: The FPI is part of a WFA-E release for all Technosylva's clients that is currently in testing with a scheduled release date of May 17. PacifiCorp has requested the district fire data in file format to begin using the data to support daily District Fire Risk.
    - Weather Research and Forecast (WRF) Reanalysis. Now green as the 30-year WRF was delivered to Technosylva and PacifiCorp
    - PSPS Operational thresholds. The WRF Reanalysis completion will support the analysis of this work to get to resolution
    - FHCA: Slow start, but should get back to green in May when contractor is onboarded who will support the analysis
    - PacifiCorp had a meeting Wednesday with Technosylva to raise issues about and slipping schedules and inability to deliver on time. Technosylva recognizes they are not meeting the increased workload and are staffing up, relooking at processes and the customer journey. Discussion does not need to escalate to an executive level discussion but will monitor and report back in a month on performance.
2. WRRM Weightings and Attributes. Note: <u>All examples in the slide deck are illustrative</u>
    - Proposal is to calculate the Ignition Risk (in WRRM, the Composite Risk) separately for wind-driven and terrain-driven fire events. Goal by modeling for both types of events is to see where the risk is for each.
        - Wind driven events can happen across the entire service territory and may happen more frequently but are typically shorter duration. An example is Weed, California which has a history of wind driven fires, but the fuels are light and flashy and are not typically the driver of fires.
        - Terrain driven events may not be as frequent but may have an overall longer exposure and the impacts to population may not be seen in an eight-hour period. An example is the Siskiyou Mountains, where the terrain is steep, and heavily forested. Wind can be a consideration, but it is typically terrain and fuels that will drive a fire in this area.
    - Each type of fire event has different variables with weightings to derive their composite risk. Each circuit will have a score for each type of event.
    - RAIL variables proposed to be modeled at the 95^{th} percentile of risk
    - RAVE variables have no percentile as they are fixed variables not affected by weather conditions

- Questions:
    - Is Terrain Difficulty Index relative to locations in PacifiCorp's service territory only?
    - Is PacifiCorp talking with other utilities about the variables and weightings?
      A: Have not had discussion with other IOUs yet. Initially have reviewed what IOUs have submitted in their WMPs to understand the variables and weightings they are using. Once PacifiCorp has composite examples, will reach to other IOUs to discuss approaches.
- Next Steps:
    - Model composite risk examples using the proposed variables and weightings for wind and terrain driven events
    - Return to the WRGC with the examples and decision

3. Future Meetings
    - Deep dive into RSE, FHCA Assessment, and PSPS Risk Assessment Solution

Wildfire Risk Governance Committee (WRGC)






Agenda

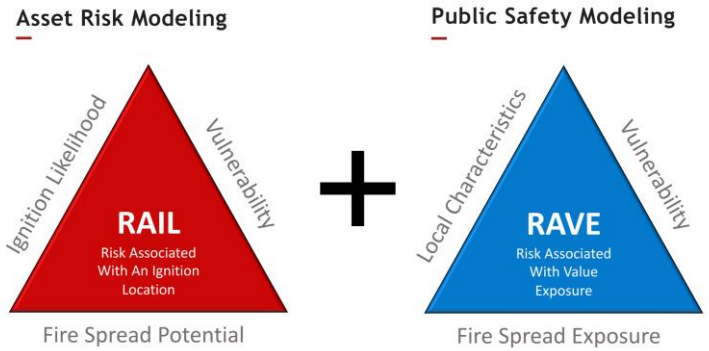
15:30-15:35	Review Meeting Topic Agenda	Kevin Benson
	~~Inform: PSPS and District Fire Risk~~	~~Steve Vanderburg~~
15:35-16:20	Decision: Composite Risk Score	Jordan Pino
16:20-16:25	Schedule & Technosylva Delivery Update	Melissa Swenson
16:25-16:35	Action Item Follow-up	Multiple
16:35-16:40	Meeting Closeout	Kevin Benson






Structure of the Composite Score **[Review]**

Overview: The structure of the composite score includes input from WRRM, split into two "categories". It also includes weightings based on which variables we think may have more impact than others.



❑ **Notes on Composite Score**:

- Variables are obtained via our WRRM model [variables will be normalized].
- Weights add up to 100%.
- Weights are determined using model output + SME input [utility benchmarking].
- We will focus on the 90th and 98th percentiles in terms of variables.

Risk Associated with Ignition Location (RAIL) Component

Variable 1(Weight; %) + Variable 2(Weight; %)….

+

Risk Associated with Value Exposure (RAVE) Component

Variable 1(Weight; %) + Variable 2(Weight; %)….

*** **PRELIMINARY** – CURRENTLY VALIDATING! ***

Proposed "Wind-Driven" Score Components

Wind-Driven

Overview: We propose the wind-driven composite score below which includes variables and weights determined through SME input.

How did we decide on these variables/weights?

- Subject Matter Expertise (SME) within PacifiCorp.
- Benchmarking with other CA IOUs.

❑ Components:

- The below composite score is what we are terming the "wind-driven" composite.

Risk Associated with Ignition Location (RAIL) Component (80%)

RAIL Inputs:	Percentile:	Weight (%):
Rate of Spread *	95	30%
Population Impacted *	95	25%
Buildings Destroyed *	95	25%

+

Risk Associated with Value Exposure (RAVE) Component (20%)

RAVE Inputs:	Percentile:	Weight (%):
Terrain Difficulty Index	N/A	10%
Disability Population	N/A	5%
Poverty Population	N/A	5%

** = PG&E, SCE and SDG&E utilized variable.*

** N/A = not applicable (RAVE variables do NOT contain percentiles).*

*** **PRELIMINARY** – CURRENTLY VALIDATING! ***

Proposed "Terrain-Driven" Score Components

Terrain-Driven

Overview: We propose the terrain-driven composite score below which includes variables and weights determined through SME input.

❑ **Components**:

- The below composite score is what we are terming the "terrain-driven" composite.

Risk Associated with Ignition Location (RAIL) Component (60%)

RAIL Inputs:	Percentile:	Weight (%):
Fire Behavior Index	95	20%
Fire Size Potential	95	20%
Flame Length *	95	20%

+

Risk Associated with Value Exposure (RAVE) Component (40%)

RAVE Inputs:	Percentile:	Weight (%):
Terrain Difficulty Index	N/A	25%
Fire Station Density	N/A	10%
Fuel Model Majority	N/A	5%

** = PG&E utilized variable.*

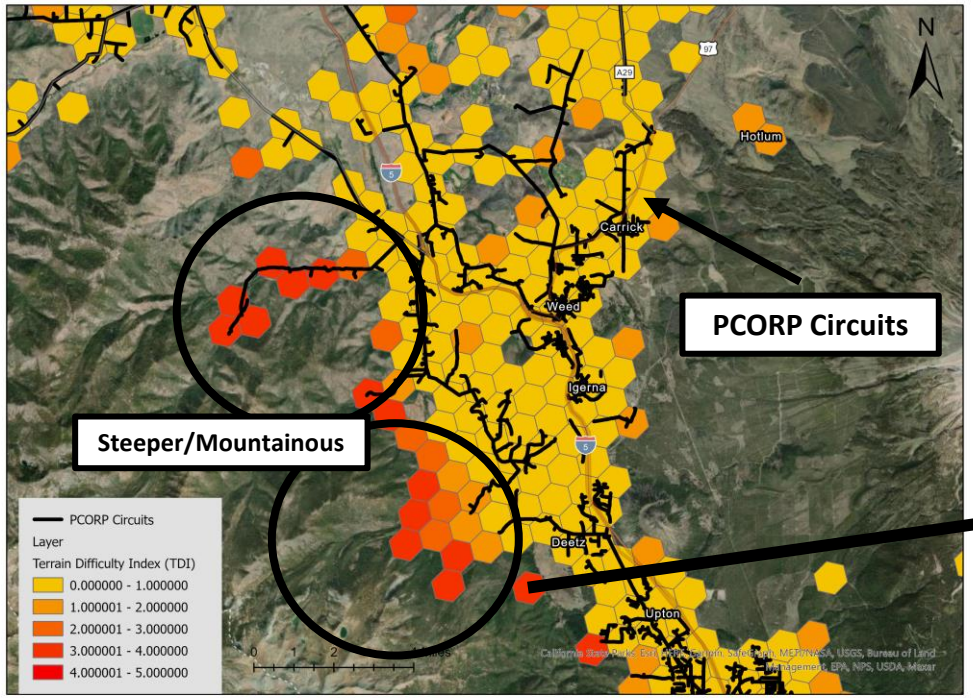
** N/A = not applicable (RAVE variables do NOT contain percentiles).*

*** **PRELIMINARY** – CURRENTLY VALIDATING! ***

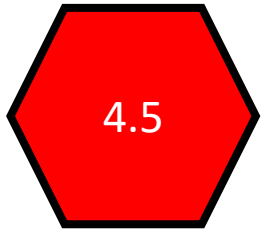
RAVE Variable Visualization

Overview: Visualize some of the RAVE variables to increase understanding of how these differ from the RAIL variables.

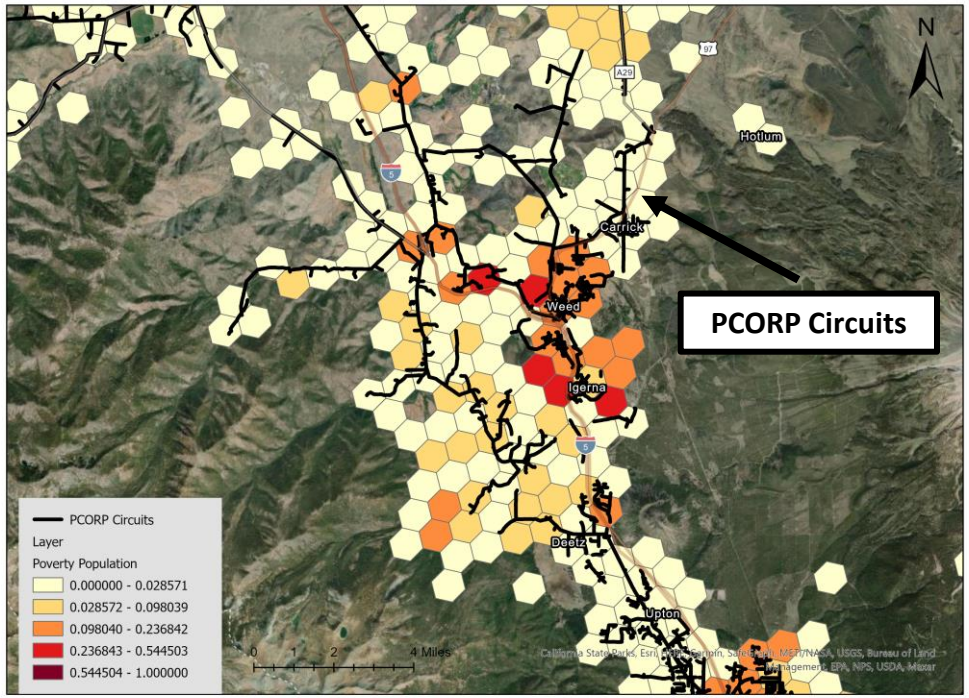
Terrain Difficulty Index (range = 0 – 5.00)



- Each “plexel” contains a value.
- RAVE variables are “static” meaning they don’t change in the modeling.
- RAVE variables are updated as new source data is released.



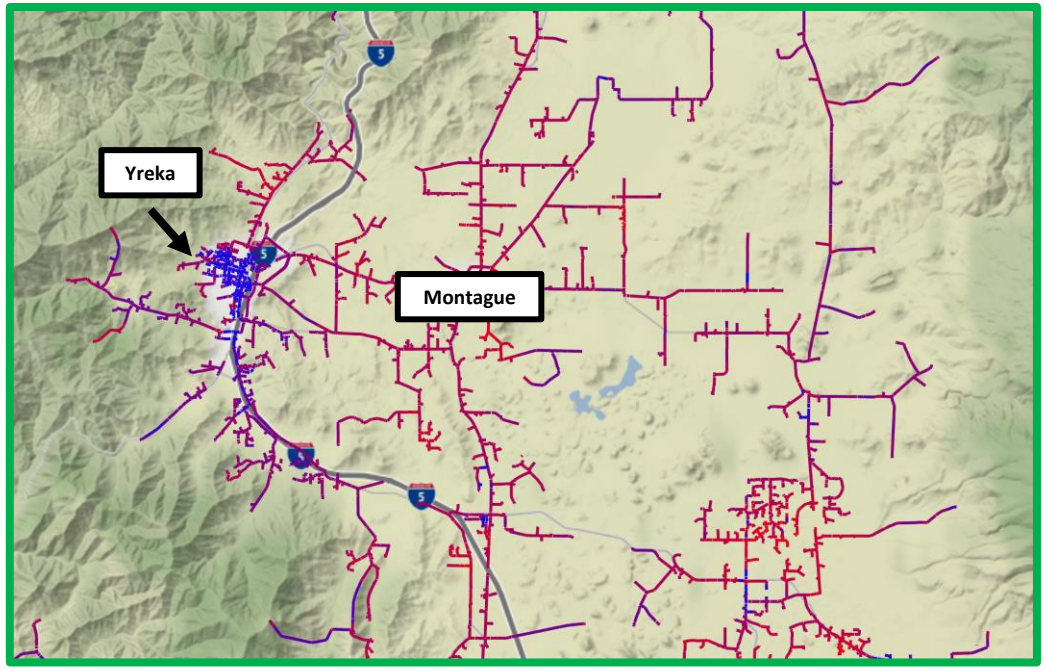
Poverty Population (range = 0 – 1.00)



Composite Score: Conditional vs. Expected

Overview: Cover the transition from conditional risk to expected risk and how they differ.

Conditional Risk (POI and POF = 1)



General Wildfire Risk

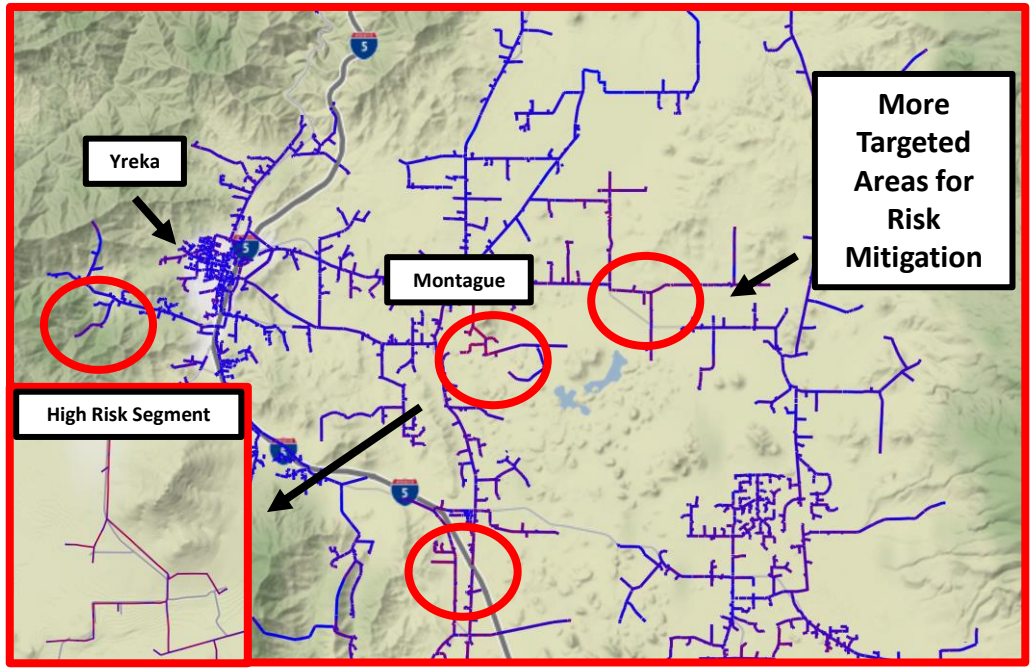
Composite Score

- 0.0-0.1
- 0.1-0.2
- 0.2-0.3
- 0.3-0.4
- 0.4-0.5
- 0.5-0.6
- 0.6-0.7
- 0.7-0.8
- 0.8-0.9
- 0.9-1.0

Low Risk

High Risk

Expected Risk (POI and POF = calculated)



Asset Ignition Wildfire Risk

Schedule Update

Status	Planning/ Operations	Initiative	What Is Different When Completed?	Scope	Current Stage	Reason for Yellow/Red Status	2023 Apr	May	Jun	Jul	Aug	Sep	Oct	Nov
1	O	Fire Potential Index (FPI) Model	Evolution of District Fire Risk Assessment to provide more automation	Entire Service Territory	Testing	Functionality part of WFA-E release for Technosylva's clients that is in testing with a scheduled release May 24. As a workaround, data received to support district fire risk work.		◊						
2	O	Public Safety Power Shutoff Thresholds	Dramatically reduce/eliminate wildfire risk in PacifiCorp's Northern California service territory	FHCA	Testing	Still discussing thresholds with leadership.		◊						
3	P/O	30 Year WRF Reanalysis	Hourly record of WRF weather and NFDRS outputs from Jan. 1991 to Dec. 2021 at a 2km horizontal resolution to use in WFA-E and other modeling	Entire Service Territory	Integrating	30 year reanalysis delivered to PacifiCorp and Technosylva				◊				
4	P	Risk Spend Efficiency (RSE) Model	Dramatically reduce/eliminate wildfire risk in PacifiCorp's Northern California service territory	FHCA	Development	N/A					◊			
5	P	Expansion of Service Territory Modeled in WRRM	WRRM modeling of wildfire risk covers the majority of PacifiCorp's service territory, not just areas currently identified as at high risk of wildfire.	Entire Service Territory	Planning	Delay in final decision, due to seeking clarity on split between deferred costs and incremental costs.					◊			
6	P	Annual Planning Model Updates	Process in place to update assets, configurations and other information to keep planning models current	FHCA	Development	N/A		◊						
7	P/O	FHCA Assessment	Updates to FHCA areas across PacifiCorp's operating areas.	Entire Service Territory	Requirements	N/A								◊
8	O	Updates to Internal and External Situational Awareness Websites	Improved user experience, enhanced maps and information for customers, partners, and employees	Entire Service Territory	Development	N/A			◊					
9	P	Public Safety Power Shutoff (PSPS) Risk Assessment Solution	Technical solution to understand potential impacts of a PSPS and how mitigations could reduce the consequences	FHCA	Requirements	N/A			◊					
10	O	WRF Ensemble	Strategically sub-select GEFS members to initialize a multi-member WRF Ensemble deterministic weather forecasts	Entire Service Territory	Development	N/A								◊
11	O	GEFS Self Organizing Maps (SOMs) Ensemble Forecast Tool	Build historical SOM node array using ERA5 Reanalysis. Build an automated GEFS SOM node association framework and forecast tool	Entire Service Territory	Development	N/A								◊
12	P	Annual Mitigation Selection Planning Process	Updated process to integrate new planning tools to support selection of mitigation programs and projects	FHCA	Planning	Delayed start for data review and process familiarization.								
13	O	Data Lake for Wildfire and Weather Data	Historical and daily forecast data and conditions accessible to other departments in PacifiCorp and BHE for departments to use data and build models and machine learning tools with.	Entire Service Territory	Execution	N/A					◊			
14	O	Bias-corrected WRF Forecast	Machine learning models to bias correct the WRF forecast for Pacific Power Weather Stations, RAWS, and other relevant weather stations.	Entire Service Territory	Execution	N/A								
15	O	Quarterly Update of Asset Data	FireCast and FireSim has the current asset information to model risk for situational awareness	Entire Service Territory	Planning	N/A				◊			◊	

Technosylva Delivery Update

April 26 Meeting

- Company is experiencing growing pains, not enough staffing to meet the workload
- With new CEO, looking at processes and structure to make sure they can deliver
- Brought in a consultant to support looking at processes and the customer journey
- Bringing on new staffing, include a new project manager
- Looking at implementing change control processes to manage requests
- PacifiCorp requested communication of delivery delays to support reprioritization
- Standing agenda item at monthly team meeting to determine if escalation is needed

Deliverable	Due Date	Met
Delivery of FPI Data	May 5	Delivered May 3
Delivery of Updated WRRM Data	~~May 5~~ ~~May 15~~ May 23	Delayed due to issues discovered in QA regarding 2020 burn scars and the fuel models.
WRRM Dashboard Development Schedule	May 5	Delivered May 5
WFA-E Dashboard Release with FPI	~~May 17~~ May 24	Delayed due to QA resource availability

Action Item Follow Ups

Detailed update in June

Assigned to	Title	Description	Update
Kevin Benson	WRRM Domain Expansion Cost Breakdown	Clarification of how much of the proposed WRRM domain expansion is covered through regulatory deferrals and how much is incremental O&M	Finalized incremental cost impact to budget with Scott L sent via separate email to Allen on 5/22/23.
Kevin Benson	BHE Line in Northern Montana and WRRM Domain	Clarify if BHE transmission line in Montana is included in domain expansion.	BHE US Transmission line not included in expanded domain. Can be added using the asset information we can request from BHE US Transmission.
Steve Vanderburg	Fragility Curve Scope	What is the scope covered by the fragility curve analysis: FHCA only or all areas	
Jordan Pino	How Technosylva uses asset information	Clarify how asset information such as age and materials are used in risk calculations	To be provided by Technosylva by 5/26 to brief during June WRGC meeting.
Jordan Pino	WRF Data in WRRM	How is the historic weather information used in RAVE and RAIL, how are they different or the same?	Historic weather information is *not* used in RAVE (we are using the static, locational variables within RAVE).
Jordan Pino	Terrain Difficulty Index in WRRM	Is the Terrain Difficulty Index in WRRM relative to within PacifiCorp's service territory or a broader view?	Answer on previous slide.
Jordan Pino	Outreach to IOUS on Composite Scores	What is the feedback from other IOUs on how they selected the variables for their Ignition/Composite Risk calculation?	Currently in progress (IOU contacts confirmed and meetings in scheduling phase).

Forward Looking Projects / Topics

Objective: Solicit Feedback on Proposed Projects / Topics / Next Meeting

- Proposed Topics:
  - ~~DECISION: WRRM Output/Composite Risk Scores Proposed Business Use (May)~~
  - INFORM: RSE – Methodology and Planned Business Use (June)
  - INFORM: FHCA Refresh Methodology (June/July)
  - INFORM: PSPS Risk Assessment Solution (July)
- Meeting Frequency / Next Meeting
- Feedback on Structure / Content / Attendees

WILDFIRE SAFETY & ASSET MANAGEMENT

WILDFIRE SAFETY

ASSET RISK

ASSET MANAGEMENT

Thank You!

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WILDFIRE SAFETY & ASSET MANAGEMENT

WILDFIRE SAFETY

ASSET RISK

ASSET MANAGEMENT

Appendix

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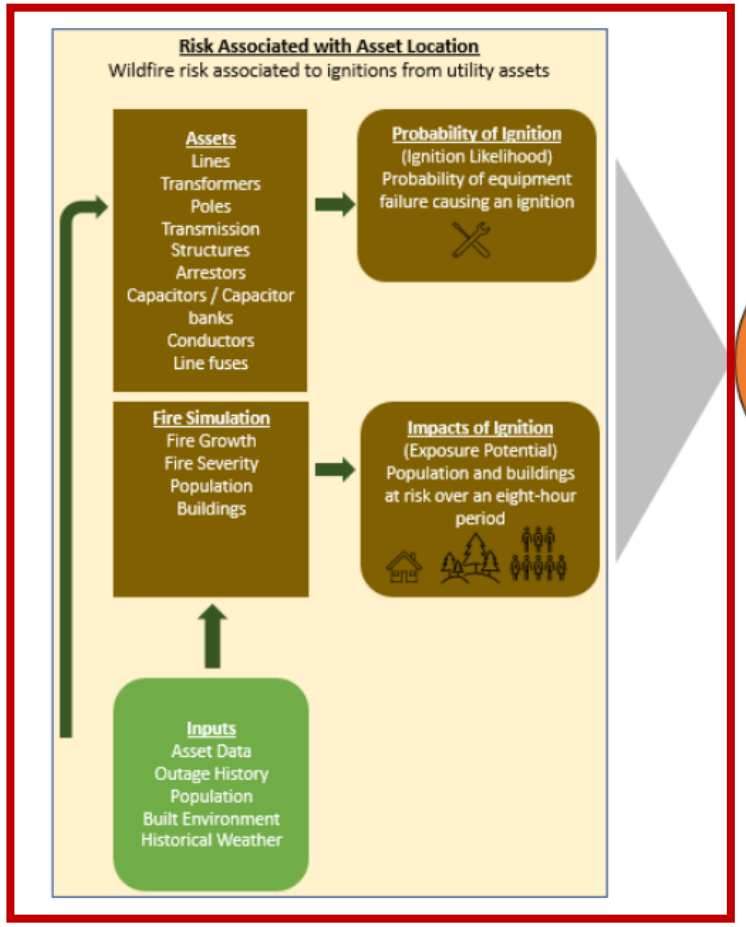
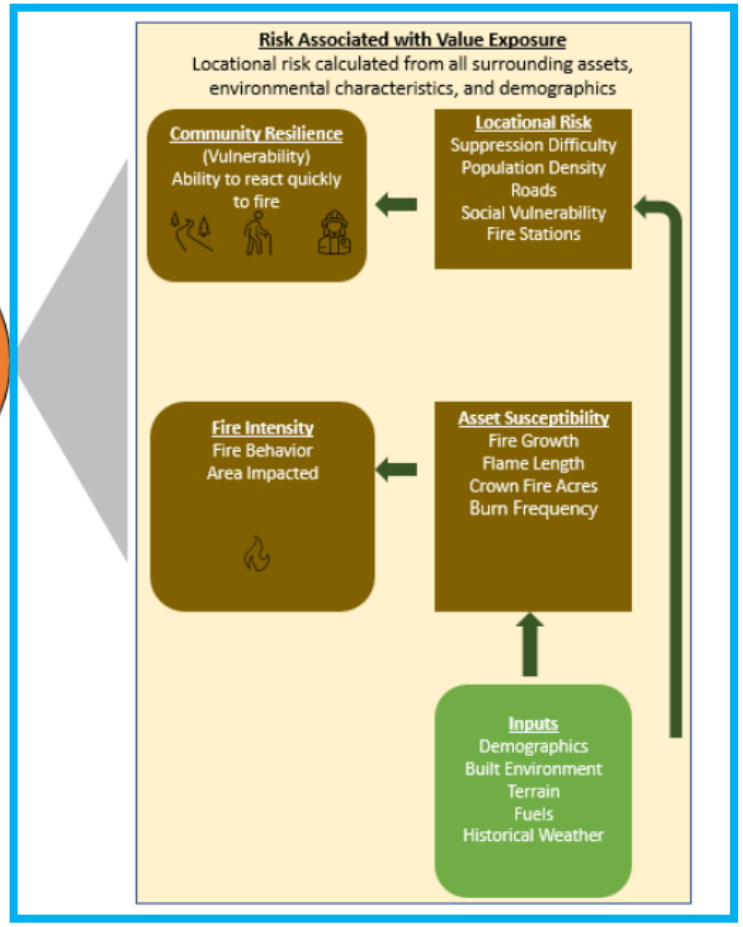
RAIL and RAVE – Major Components

Risk Associated with Ignition Location (RAIL)



Risk Associated with Value Exposure (RAVE)



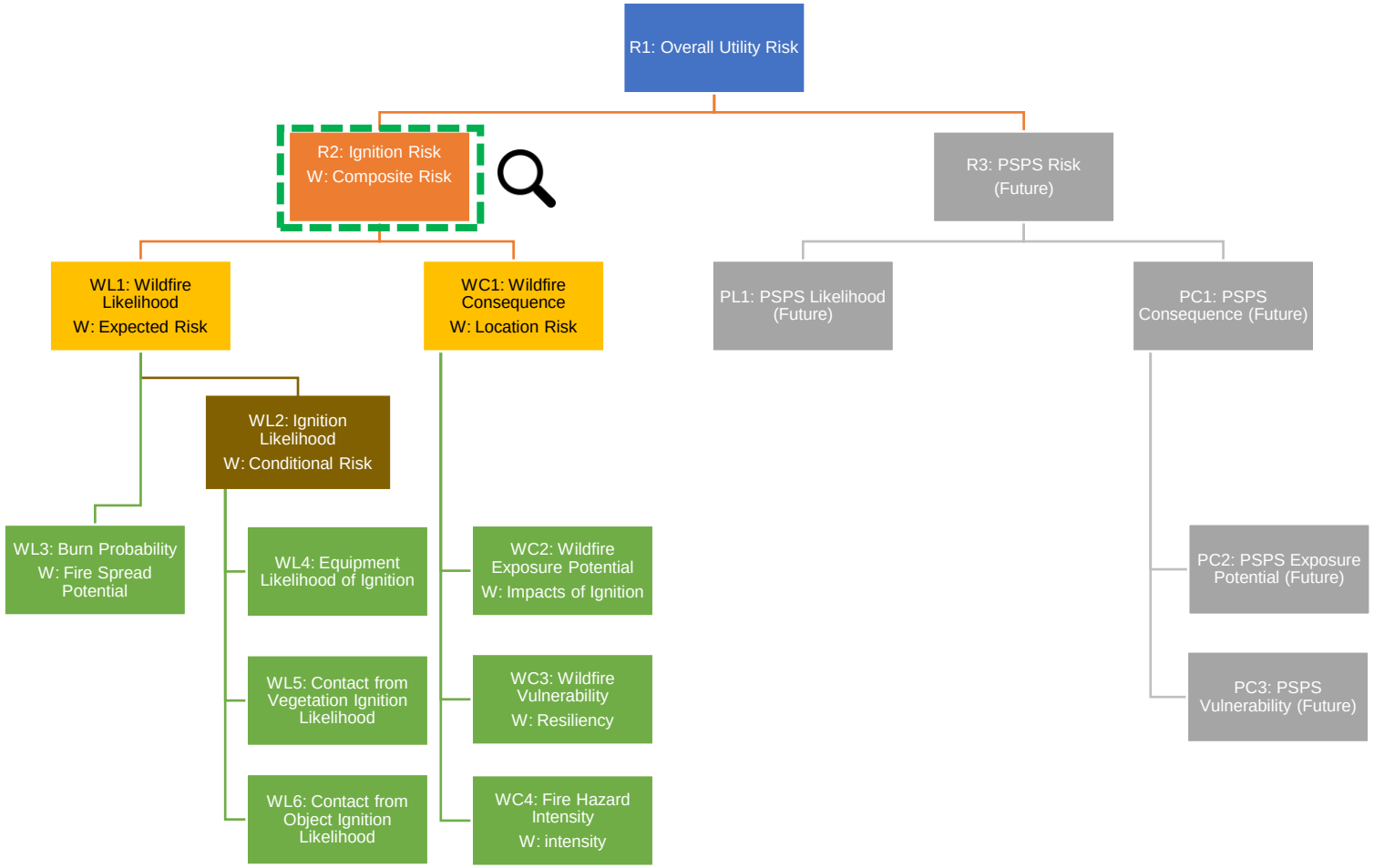
❑ WRRM Components:

- **RAIL** = Asset Ignition Risk
- **RAVE** = Community & Environmental Risk
- **Composite** = RAIL + RAVE

❑ Why do we need both?

- **Need to know ignition risk <u>AND</u> community & environmental risk to obtain the most robust picture of overall risk.**

Why do we need a composite score?



- **PacifiCorp's Risk Framework:**
  - OEIS requires every utility to have a risk framework in place that addresses key components of wildfire risk.
  - The composite risk score we will focus on is **R2: Ignition Risk** (Composite Risk).

R2: Ignition Risk
W: Composite Risk

OEIS = Office of Energy Infrastructure Safety

Hazard Risk | Intermediate Risk | Fundamental Risk | Pending

Terrain Difficulty Index (TDI) Categories

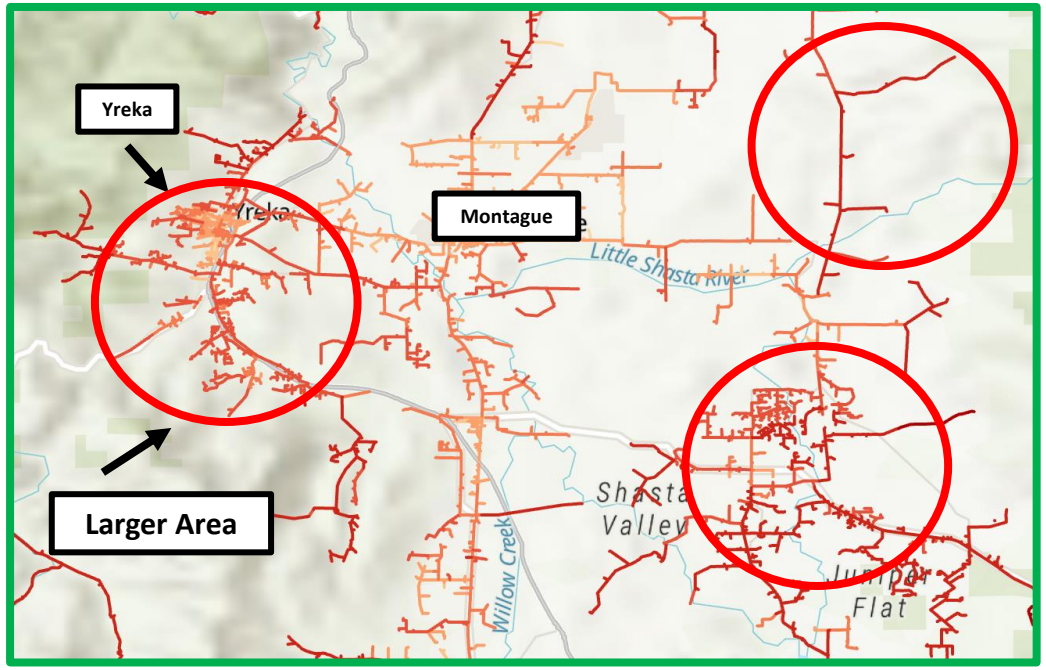
TDI Categories	TDI description	Operational Implications
1- Very low	No accessibility limitations to the firefighting resources, allowing quick deployment of wildfire suppression ground resources.	Terrain conditions are suitable for any kind of attack. There might be some restrictions in WUI areas due to the constraints of heavy equipment use.
2- Low	High density of tracks and paths. Terrain conditions allow the deployment of wildfire suppression ground resources.	Direct and indirect attack strategies and tactics can be implemented without restrictions.
3- Intermediate	Roads and tracks are slightly more difficult to access and terrain is mildly difficult with increasing slopes.	Direct and indirect attack strategies and tactics are possible but there may be potential reductions in resource performance and deployment time.
4- High	Low density of roads/tracks in the area. Difficult terrain access with limitations to ground travel.	Terrain with restrictions for heavy equipment. Implementation of tactics on the ground can be delayed due to increased travel time.
5- Extreme	Very low density of tracks/roads to support strategies. Highly complex terrain conditions including high-slope areas limit the use of heavy equipment.	Very complex terrain for any kind of attack strategies except for aerial operations. High probability safety might be compromised.

Composite Score: LRAM vs. WRRM

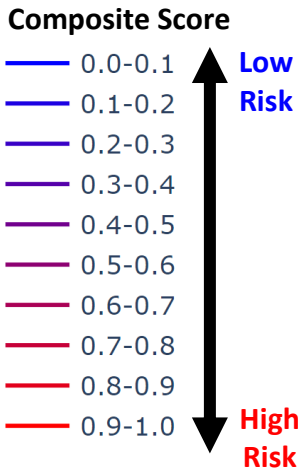
Note: Given the differences in methodologies between the two, a direct comparison is not possible.

Overview: Cover how the new composite using WRRM compares to the old model (Localized Risk Assessment Model; LRAM).

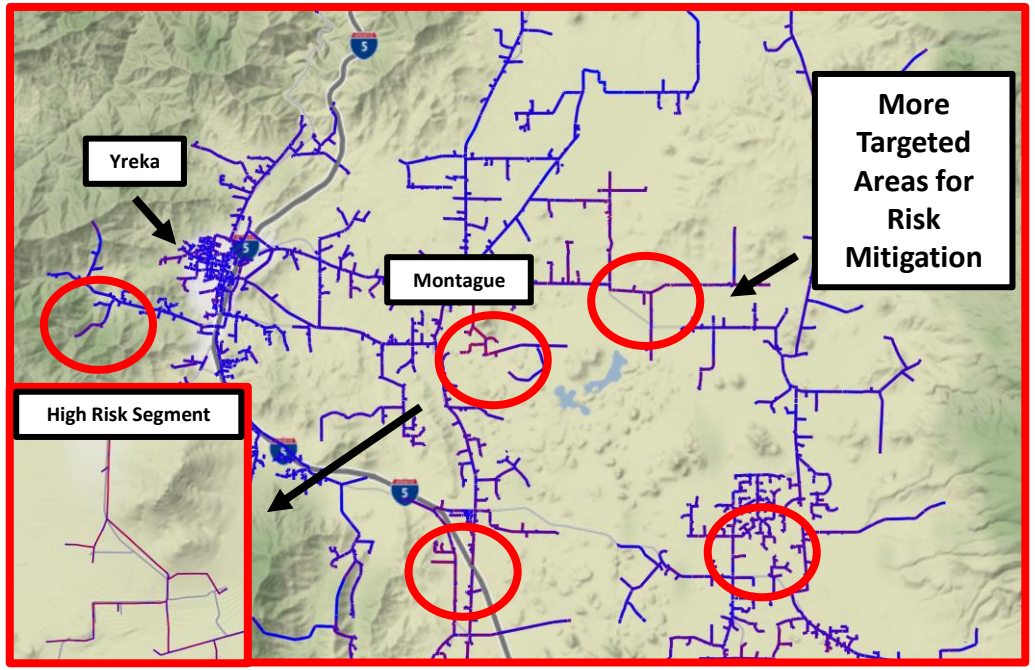
Localized Risk Assessment Model (LMRM)



LRAM Combined Score



Expected Risk (POI and POF = calculated)



Asset Ignition Wildfire Risk

WRRM (expected) does not eliminate risk (bluer areas) but provides a more targeted approach.

Meeting Notes
Wildfire Risk Governance Committee
May 23, 2023

Attending: Kevin Benson, Allen Berreth, Megan Buckner, Tim Clark, Vivian du Pont, Curtis Mansfield, Amy McCluskey, Jordan Pino, Steve Vanderburg, Jeff Vickers, Elenore Yostov

1. Operational PSPS and FPI
    - No update at this meeting. For PSPS Meteorology is working through the data and performing QA/QC.
    - FPI analysis going through district by district validating the data, and still on track to have final recommendations by June 1. FPI testing in WFA-A is running smoothly, was due to release May 23, but Technosylva did not receive the latest WRF data from PacifiCorp due to a data center outage. Once they receive that data, they will do one final run and then move into production.
    - Direction from WRGC is to not wait until the June 19 meeting if the information is ready earlier and to schedule a one-off meeting to review the results.
2. WRRM Composite Risk Score
    - Looking for confirmation that the selected variables and weighting are the direction PacifiCorp wants to go.
    - The objective of the weightings and variables selected is to get an accurate picture of the risk and consequence.
    - Recap: Proposed approach is to have a composite risk for wind-driven fire risk and composite risk for terrain-driven fire risk that combined create one composite risk.
      Composite Risk=CR_{TD}+CR_{WD}
      Where CR=Composite Risk, TD=Terrain Driven, and WD=Wind Driven
      With these three variables PacifiCorp can see the areas at highest risk and the driver of the risk to determine the appropriate mitigation
    - Used subject matter expertise to test hypothesis of weightings against conditions seen in the field
    - Questions/Feedback:
      Q: WRRM has multiple attributes that can be used, what are the ones not included in the RAIL/RAVE calculations?
      A: Will provide a list of all the attributes in WRRM including ones included in indices. Also note that an index like the Fire Potential Index (FPI) in a combination of attributes to create the index.
      Q: Why does the Terrain Difficulty Index (TDI) have different weightings have a for wind vs terrain driven events?
      A: Due to the expected behavior of the fire, in a wind-driven fire the terrain will have an impact but not as much as in a terrain-driven fire where the type of terrain impacts fire growth and ability to suppress
      Q: What is the sensitivity analysis for the weightings?

A: Will provide an overview at the next WRGC
Q: How do the weightings and attributes align with other IOUs are doing?
A: Benchmarked what other utilities use as inputs to weightings and are scheduling meetings for June. Important to note that attributes and weightings should reflect the unique characteristics of its service territory and not necessarily be identical to the other IOUSs
Q: What is Technosylva providing for weightings and attributes and risk calculations and what is PacifiCorp providing?
A: Technosylva provides the attribute and risk score for each attribute. PacifiCorp decides what attributes to use, the percentile (if appropriate) and weighting to use for each attribute.
Q: What information did Technosylva use to help with Probability of Ignition and Probability of Failure calculations?
A: PacifiCorp provided approximately eight years of outage history and three years of ignition history to Technosylva. For 2024 planning, PacifiCorp provided 20 years of outage history and updated ignition history (through April 2023).
Q: For the next WRGC want to see sensitivity analysis as well as one example of how the wind and terrain driven inputs affect one circuit/location

3. Schedule Update
    - Reviewed workstream schedule.
        - FPI will move from yellow to green once the issue with the weather data discussed in item #1 above is resolved and Technosylva can complete testing.
        - PSPS will be closed as the 2023 thresholds are set
        - Discussed Technosylva delivery concerns and what is being done to manage the issues. Have seen an increase in communication and they have delivered part of the WRRM data due May 22 and expect to deliver the remaining data May 23 or 24.
4. Action Item Update
    - See slide for updates
    - On transmission line in Montana included in WRRM domain. The PacifiCorp transmission lines in Montana are included in the WRRM domain. Unclear what specific BHE line Chris Whitaker was referencing, Kevin to follow up with Chris to clarify and resolve.
    - Fragility Curves. All the circuits in WFA-E have a fragility curve associated with them, still need clarification on what other areas are currently covered. Scoping meeting held to determine plan to continue developing fragility curves and maintaining them.
      Request at next meeting to walk through progression of % of service territory currently covered by WFA-E, WRRM and Fragility Curve analysis, what the timeline is to continue to build out coverage, if any.

Wildfire Risk Governance Committee (WRGC)






Agenda

14:00-14:05	Review Meeting Topic Agenda	Kevin Benson
14:05-14:45	WRRM Composite Circuit Example/Sensitivity Analysis	Jordan Pino
14:45-14:55	Inform: Schedule Update	Melissa Swenson
14:55-15:10	Inform: Action Item Follow-up	Multiple
15:10-15:15	Discuss: Future Meeting Topics	Kevin Benson
15:15-15:20	Meeting Closeout	Kevin Benson






Wind-Driven/Terrain-Driven Score Components **[Review]**

Overview: Review components of the wind-driven and terrain-driven scores.

Terrain

Risk Associated with Ignition Location (RAIL) Component (60%)

RAIL Inputs:	Percentile:	Weight (%):
Fire Behavior Index	95	20%
Fire Size Potential	95	20%
Flame Length *	95	20%

+

Risk Associated with Value Exposure (RAVE) Component (40%)

RAVE Inputs:	Percentile:	Weight (%):
Terrain Difficulty Index	N/A	25%
Fire Station Density	N/A	10%
Fuel Model Majority	N/A	5%

Wind

Risk Associated with Ignition Location (RAIL) Component (80%)

RAIL Inputs:	Percentile:	Weight (%):
Rate of Spread *	95	30%
Population Impacted *	95	25%
Buildings Destroyed *	95	25%

+

Risk Associated with Value Exposure (RAVE) Component (20%)

RAVE Inputs:	Percentile:	Weight (%):
Terrain Difficulty Index	N/A	10%
Disability Population	N/A	5%
Poverty Population	N/A	5%

** = PG&E, SCE and SDG&E utilized variable.*

** N/A = not applicable (RAVE variables do NOT contain percentiles).*

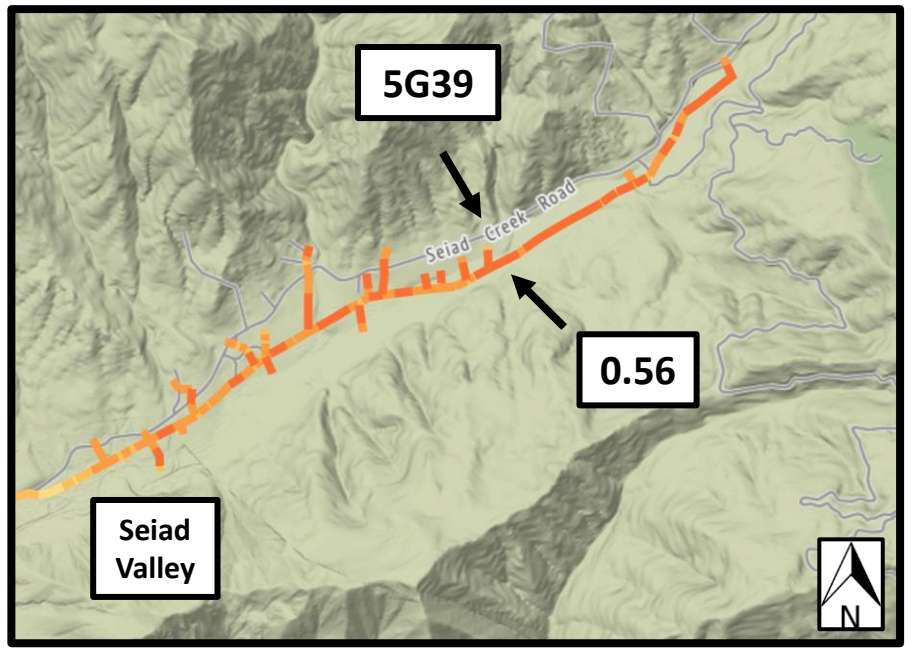
**** **PRELIMINARY** – CURRENTLY VALIDATING! ****

Wind-Driven/Terrain-Driven Circuit Example

Terrain-Driven 5G39

Objective: Provide an example using one circuit of how the wind-driven and terrain driven composite scores affect the risk.

Terrain-Driven Risk – 5G39

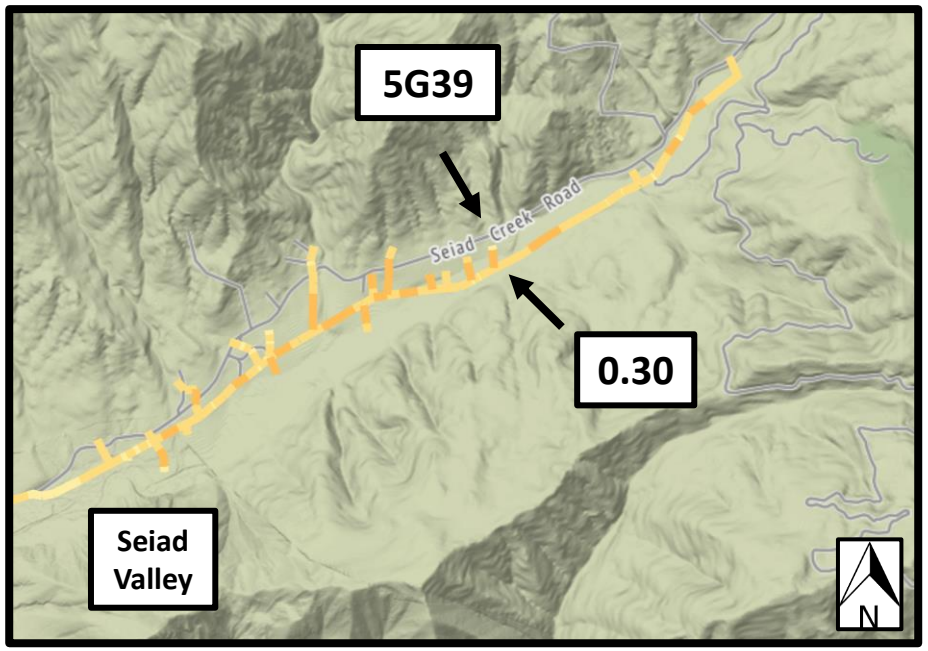


** For illustrative purposes only.*

Composite Score

0.0-0.1	Low Risk
0.1-0.2	
0.2-0.3	
0.3-0.4	
0.4-0.5	
0.5-0.6	
0.6-0.7	
0.7-0.8	
0.8-0.9	
0.9-1.0	High Risk

Wind-Driven Risk – 5G39



** For illustrative purposes only.*

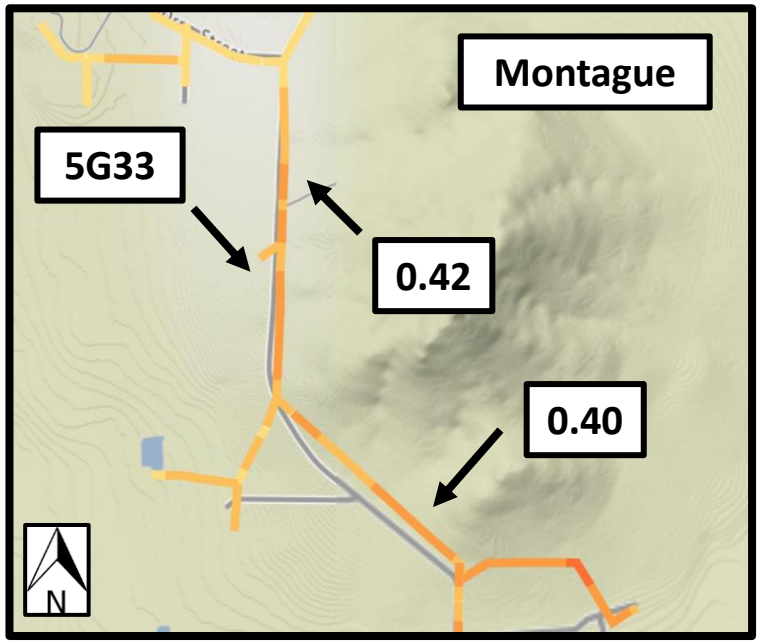
*** **PRELIMINARY** – CURRENTLY VALIDATING! ***

Wind-Driven/Terrain-Driven Circuit Example

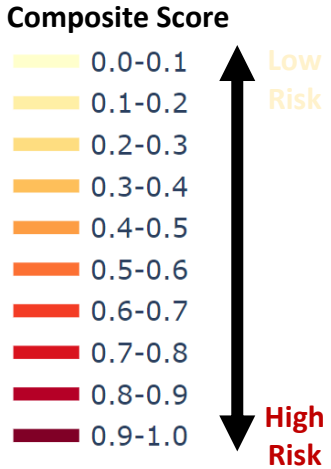
Wind-Driven 5G33

Objective: Provide an example using one circuit of how the wind-driven and terrain driven composite scores affect the risk.

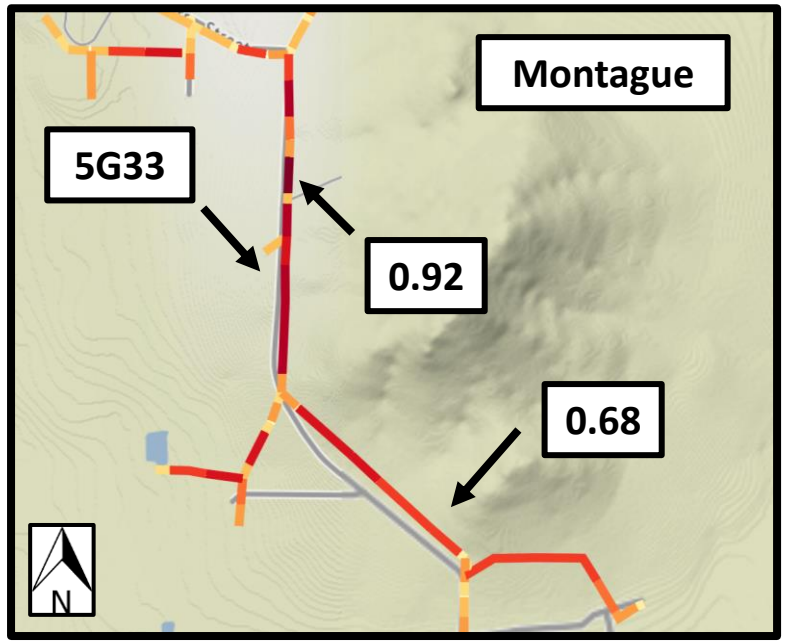
Terrain-Driven Risk – 5G33



** For illustrative purposes only.*



Wind-Driven Risk – 5G33



** For illustrative purposes only.*

*** **PRELIMINARY** – CURRENTLY VALIDATING! ***

Wind-Driven/Terrain-Driven Circuit Example

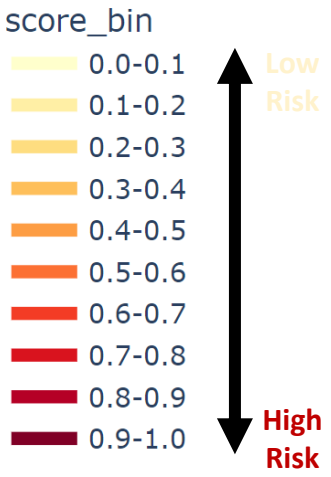
Key Points

Overview: Per the previous examples, we can see that that the wind-driven and terrain-driven scores demonstrate patterns consistent with the area they're located in.

❑ Notes on Scores:

- Circuits in mountainous areas demonstrate higher risk with the **terrain-driven** score/variables.
- Circuits in flatter; wind-prone areas demonstrate higher with the **wind-driven** score/variables.
- This validates the approach used to split up the risk via these two components.

Circuit:	Location:	Wind-Driven Score:	Terrain-Driven Score:
5G39	Seiad Valley (mountainous)	• 0.30	✓ **0.56**
5G33	Montague (valley)	✓ **0.92**	• 0.42



*** **PRELIMINARY** – CURRENTLY VALIDATING! ***

Sensitivity Analysis – Terrain-Driven Score

Scenario # 1

Objective: In this sensitivity analysis, we adjust default weights and record the change in score for an example circuit.

Terrain

Risk Associated with Ignition Location (RAIL) Component (60%)

RAIL Inputs:	Percentile:	Weight (%):
Fire Behavior Index	95	20% **(+10%)**
Fire Size Potential	95	20% **(-10%)**
Flame Length *	95	20% **(-5%)**

** = PG&E utilized variable.*

+

Risk Associated with Value Exposure (RAVE) Component (40%)

RAVE Inputs:	Percentile:	Weight (%):
Terrain Difficulty Index	N/A	25% **(+10)**
Fire Station Density	N/A	10% **(-5%)**
Fuel Model Majority	N/A	5%

** N/A = not applicable (RAVE variables do NOT contain percentiles).*

Terrain-Driven 5G39

- Segment Score (default weights) = 0.56
- Segment Score (new weights) = 0.58
- Difference = **+0.02**

What does this mean?

- Small changes in weights do not cause significant change in risk.
- Larger, more extreme changes cause changes in risk.

*** **PRELIMINARY** – CURRENTLY VALIDATING! ***

Sensitivity Analysis – Wind-Driven Score

Scenario # 2

Objective: In this sensitivity analysis, we adjust default weights and record the change in score for an example circuit.

Wind

Risk Associated with Ignition Location (RAIL) Component (60%)

RAIL Inputs:	Percentile:	Weight (%):
Rate of Spread *	95	30% **(-10%)**
Population Impacted *	95	25% **(+10%)**
Buildings Destroyed *	95	25% **(-10%)**

** = PG&E, SCE and SDG&E utilized variable.*

+

Risk Associated with Value Exposure (RAVE) Component (40%)

RAVE Inputs:	Percentile:	Weight (%):
Terrain Difficulty Index	N/A	10% **(+10%)**
Disability Population	N/A	5%
Poverty Population	N/A	5%

** N/A = not applicable (RAVE variables do NOT contain percentiles).*

Terrain-Driven 5G33

- Segment Score (default weights) = 0.92
- Segment Score (new weights) = 0.99
- Difference = **+0.07**

What does this mean?

- Small changes in weights do not cause significant change in risk.
- Larger, more extreme changes cause changes in risk.

*** **PRELIMINARY** – CURRENTLY VALIDATING! ***

Sensitivity Analysis – Wind-Driven Score

Scenario # 3

Objective: In this sensitivity analysis, we adjust default weights and record the change in score for an example circuit.

Wind

Risk Associated with Ignition Location (RAIL) Component (60%)

RAIL Inputs:	Percentile:	Weight (%):
Rate of Spread *	95	30% **(+20%)**
Population Impacted *	95	25% **(-15%)**
Buildings Destroyed *	95	25% **(-15%)**

** = PG&E, SCE and SDG&E utilized variable.*

+

Risk Associated with Value Exposure (RAVE) Component (40%)

RAVE Inputs:	Percentile:	Weight (%):
Terrain Difficulty Index	N/A	10% **(+10%)**
Disability Population	N/A	5%
Poverty Population	N/A	5%

** N/A = not applicable (RAVE variables do NOT contain percentiles).*

Terrain-Driven 5G33

- Segment Score (default weights) = 0.92
- Segment Score (new weights) = 0.69
- Difference = **-0.23**

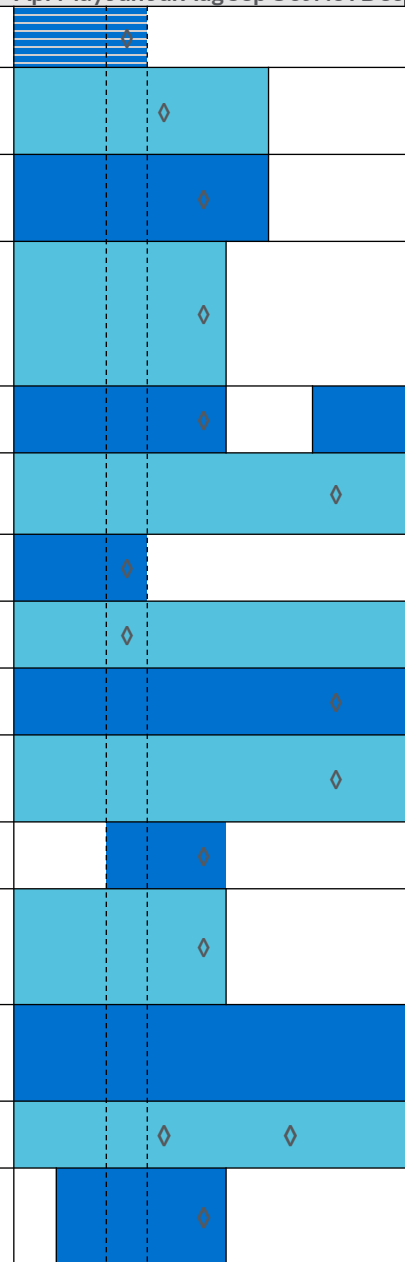
What does this mean?

- Small changes in weights do not cause significant change in risk.
- Larger, more extreme changes cause changes in risk.

*** **PRELIMINARY** – CURRENTLY VALIDATING! ***

Schedule Update

	Planning/ Operations	Initiative	What Is Different When Completed?	Scope	Current Stage	Reason for Yellow/Red Status
1	O	Fire Potential Index (FPI) Model	Evolution of District Fire Risk Assessment to provide more automation	Entire Service Territory	Implemented	FPI went live June 8.
2	P/O	30 Year WRF Reanalysis	Hourly record of WRF weather and NFDRS outputs from Jan. 1991 to Dec. 2021 at a 2km horizontal resolution to use in WFA-E and other modeling	Entire Service Territory	Integrating	N/A
3	P	Risk Spend Efficiency (RSE) Model	This will implement RSE modeling to support identification of mitigations and their risk reduction benefit relative to cost.	FHCA	Development	N/A
4	P	Expansion of Service Territory Modeled in WRRM	WRRM modeling of wildfire risk covers most of PacifiCorp's service territory.	Entire Service Territory	Planning	Decision in late May to expand domain has made the timeline for the MSA amendment and PO issuance very short. Risk is a delay in start of processing data and slippage of scheduled date of when data will be received.
5	P	Annual Planning Model Updates	Process in place to update assets, configurations, and other information to keep planning models current	Service Territory	Development	N/A
6	P/O	FHCA Assessment	Updates to FHCA areas across PacifiCorp's operating areas.	Service Territory	Requirements	No response from initial list of consultants identified, now expanding search.
7	O	Updates to Internal and External Situational Awareness Websites	Improved user experience, enhanced maps and information for customers, partners, and employees	Service Territory	Development	N/A
8	P	Public Safety Power Shutoff (PSPS) Risk Assessment Solution	Implementation of a solution to calculate the PSPS likelihood and consequence to support planning processes.	California	Requirements	N/A
9	O	WRF Ensemble	Strategically sub-select GEFS members to initialize a multi-member WRF Ensemble deterministic weather forecasts	Service Territory	Development	N/A
10	O	GEFS Self Organizing Maps (SOMs) Ensemble Forecast Tool	Build historical SOM node array using ERA5 Reanalysis. Build an automated GEFS SOM node association framework and forecast tool	Service Territory	Development	N/A
11	P	Annual Mitigation Selection Planning Process	Updated process to integrate new planning tools to support selection of mitigation programs and projects	FHCA	Planning	N/A
12	O	Data Lake for Wildfire and Weather Data	Historical and daily forecast data and conditions accessible to other departments in PacifiCorp and BHE for departments to use data and build models and machine learning tools with.	Service Territory	Execution	N/A
13	O	Bias-corrected WRF Forecast	Machine learning models to bias correct the WRF forecast for Pacific Power Weather Stations, RAWS, and other relevant weather stations.	Service Territory	Execution	N/A
14	O	Quarterly Update of Asset Data	FireCast and FireSim has the current asset information to model risk for situational awareness	Service Territory	Planning	N/A
15	P	Implement Planning Module in WFA-E	Implementation of Planning Module in WFA-E to leverage WRRM and RSE data to compare possible mitigations at specific locations.	Service Territory	Development	N/A



Action Item Follow Ups

Assigned to	Title	Description	**Update**
Steve Vanderburg	FPI Thresholds	Recommend thresholds for FPI	Analysis still in progress on thresholds
Kevin Benson	Fragility Curve Scope	What is the scope covered by the fragility curve analysis: FHCA only or all areas	
Jordan Pino	Outreach to IOUs on Composite Scores	What is the feedback from other IOUs on how they selected the variables for their Ignition/Composite Risk calculation	
Jordan Pino	What are the attributes in WRRM that can be used for modeling risk	What are the attributes in WRRM that can be used for modeling risk, and which ones were not included in the attribute weightings and what attributes are being included in indices like the FPI	See slide 15 in the Appendix
Jordan Pino	Sensitivity Analysis for WRRM Weightings	What is the sensitivity analysis for the WRRM weightings and how they are weighted between wind and terrain and within the specific scenarios	See previous slides.
Jordan Pino	WRRM Domain Coverage	Walkthrough of the WRRM coverage of service territory and circuits.	Information will be provided at July WRGC

Forward Looking Projects / Topics

Objective: Solicit Feedback on Proposed Projects / Topics / Next Meeting

- Proposed Topics:
  - DECISION: FPI Thresholds (TBD)
  - INFORM: RSE – Methodology and Planned Business Use (July)
  - INFORM: FHCA Refresh Methodology (July)
  - INFORM: PSPS Risk Assessment Solution (July)
- Meeting Frequency / Next Meeting
- Feedback on Structure / Content / Attendees

WILDFIRE SAFETY & ASSET MANAGEMENT

WILDFIRE SAFETY

ASSET RISK

ASSET MANAGEMENT

Thank You!

PACIFICORP

WILDFIRE SAFETY & ASSET MANAGEMENT

WILDFIRE SAFETY

ASSET RISK

ASSET MANAGEMENT

Appendix

PACIFICORP

RAIL + RAVE Variables Available

RAIL RAVE

Overview: Review of RAIL + RAVE variables used in composite score.

Table 1: RAIL Variables

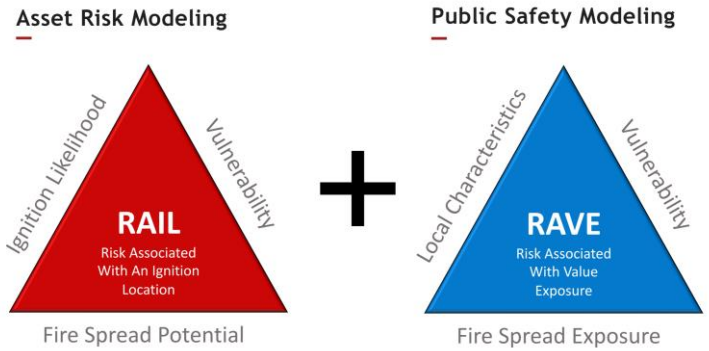
Risk Metric:	Description:	Composite?
Acres Burned	Number of Acres Burned	-
Population Impacted	Population Count Impacted	✓ YES
Buildings Threatened	Number of Buildings Threatened	-
Buildings Destroyed	Number of Buildings Destroyed	✓ YES
Fire Behavior Index	Fire Behavior Index	✓ YES
Rate of Spread	66 Feet/Hour	✓ YES
Flame Length	Feet	✓ YES

Table 2: RAVE Variables

Variable:	Description:	Composite?
Total Road Miles	Total Miles (Major + Minor)	-
Fuel Model Majority	Majority Fuel in Each Plexel	✓ YES
Building Density	Building Density per Plexel	-
Number of Buildings	Number of Building per Plexel	-
Population Count	Population Count per Plexel	-
Fire Station Density	Density of Fire Stations	✓ YES
Terrain Difficulty Index	Terrain Difficulty per Plexel	✓ YES
Disability Population	Disability Population Ratio	✓ YES
Poverty Population	Poverty Population Ratio	✓ YES
Senior Population	Senior Population Ratio	-
Years Since Last Fire	Years Since Last Fire per Plexel	-

Structure of the Composite Score **[Review]**

Overview: The structure of the composite score includes input from WRRM, split into two "categories". It also includes weightings based on which variables we think may have more impact than others.



❑ **Notes on Composite Score**:

- Variables are obtained via our WRRM model [variables will be normalized].
- Weights add up to 100%.
- Weights are determined using model output + SME input [utility benchmarking].
- We will focus on the 90th and 98th percentiles in terms of variables.

Risk Associated with Ignition Location (RAIL) Component

Variable 1(Weight; %) + Variable 2(Weight; %)….

+

Risk Associated with Value Exposure (RAVE) Component

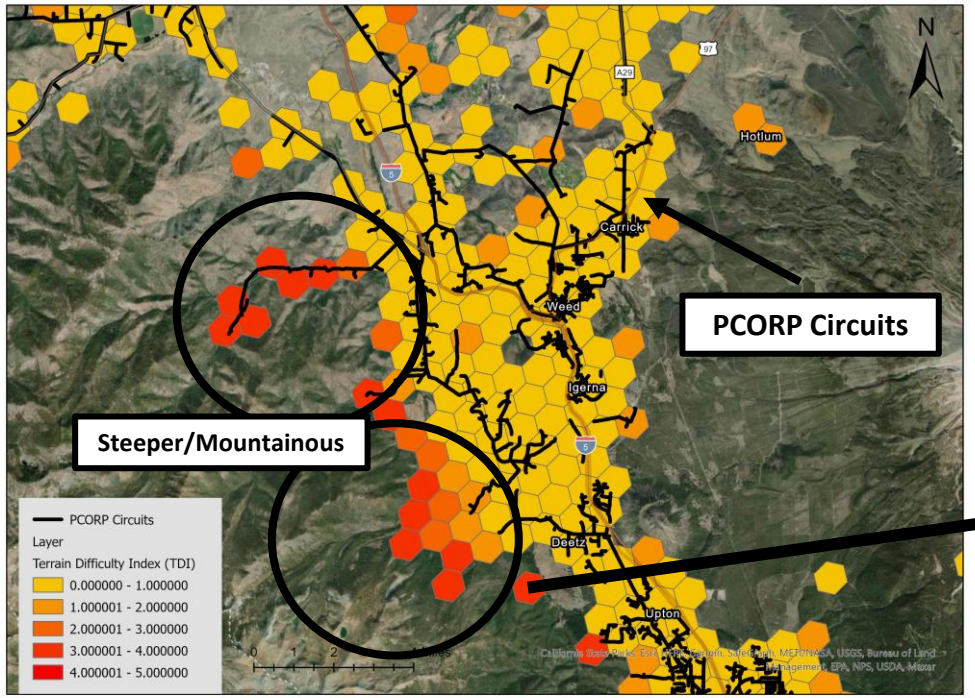
Variable 1(Weight; %) + Variable 2(Weight; %)….

*** **PRELIMINARY** – CURRENTLY VALIDATING! ***

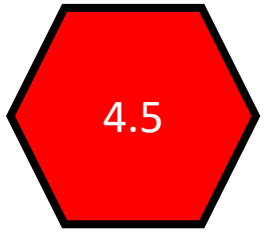
RAVE Variable Visualization

Overview: Visualize some of the RAVE variables to increase understanding of how these differ from the RAIL variables.

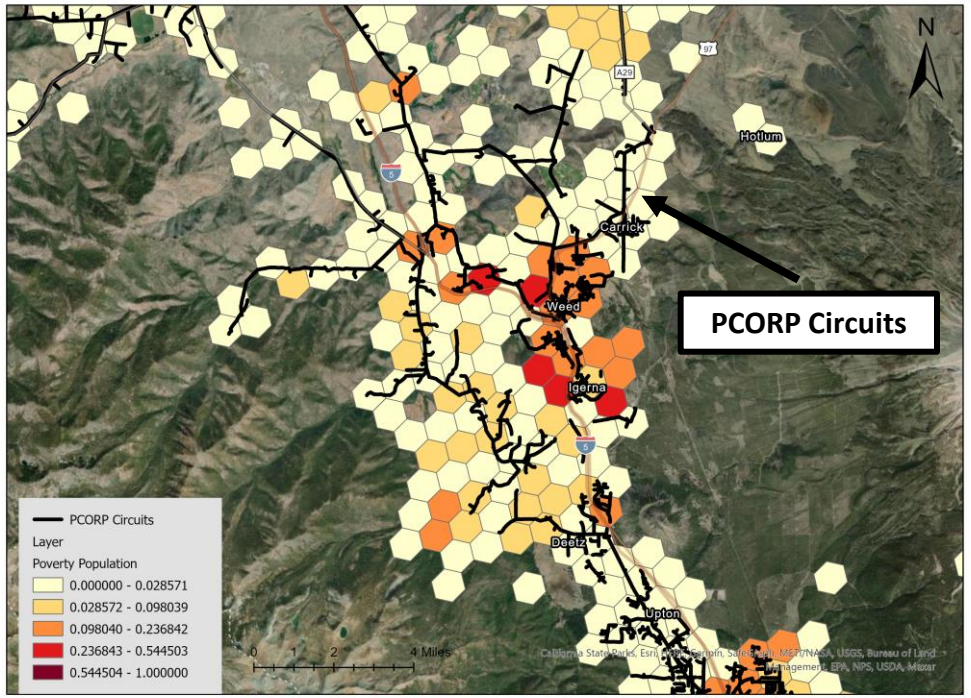
Terrain Difficulty Index (range = 0 – 5.00)



- Each “plexel” contains a value.
- RAVE variables are “static” meaning they don’t change in the modeling.
- RAVE variables are updated as new source data is released.



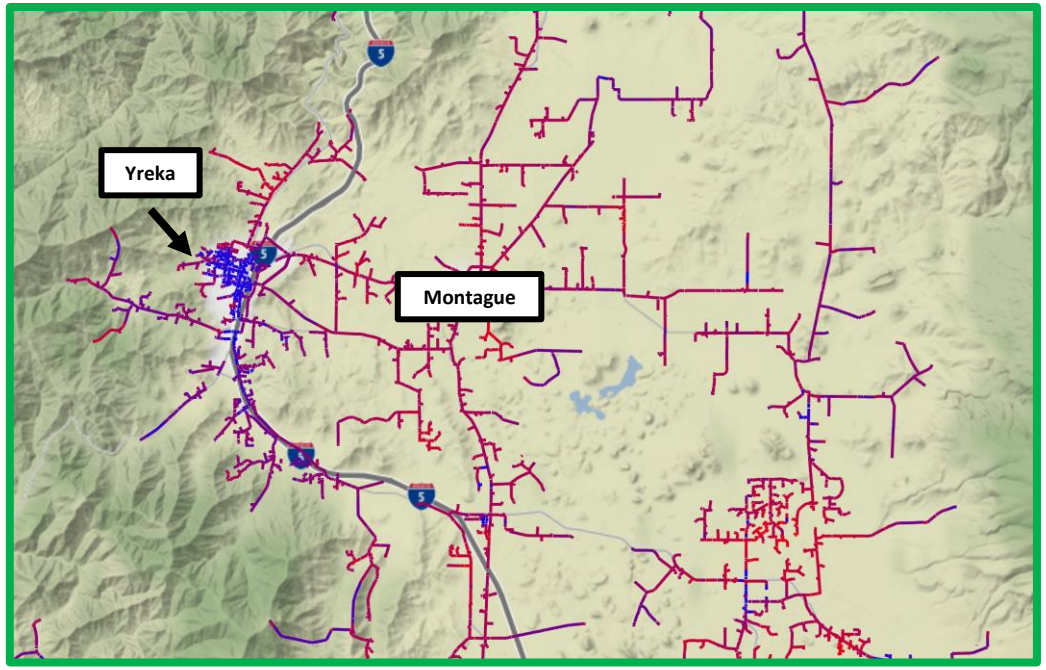
Poverty Population (range = 0 – 1.00)



Composite Score: Conditional vs. Expected

Overview: Cover the transition from conditional risk to expected risk and how they differ.

Conditional Risk (POI and POF = 1)



General Wildfire Risk

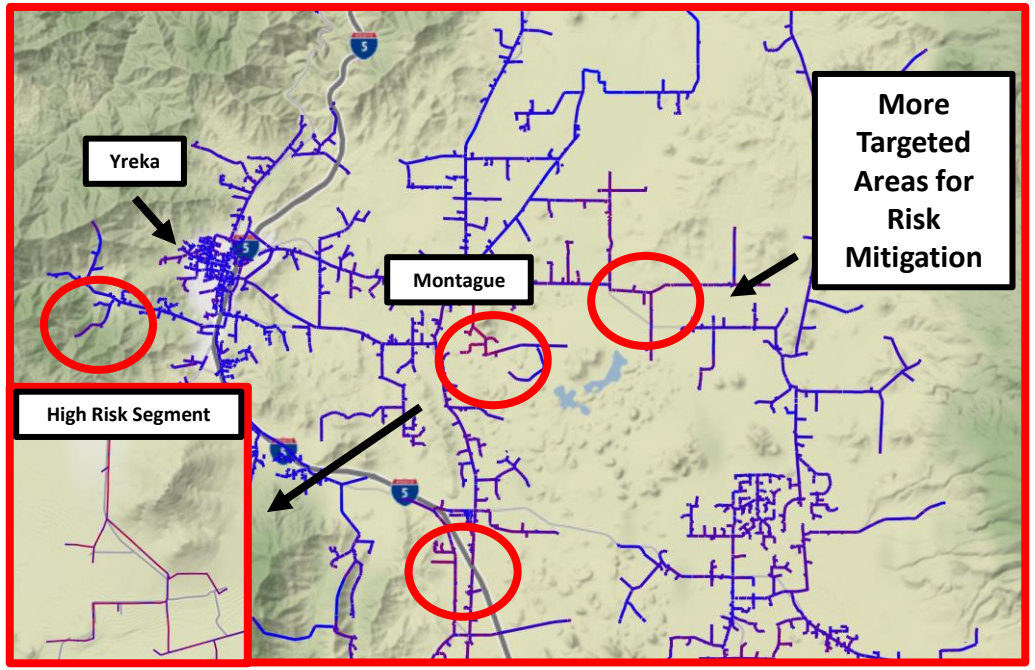
Composite Score

- 0.0-0.1
- 0.1-0.2
- 0.2-0.3
- 0.3-0.4
- 0.4-0.5
- 0.5-0.6
- 0.6-0.7
- 0.7-0.8
- 0.8-0.9
- 0.9-1.0

Low Risk

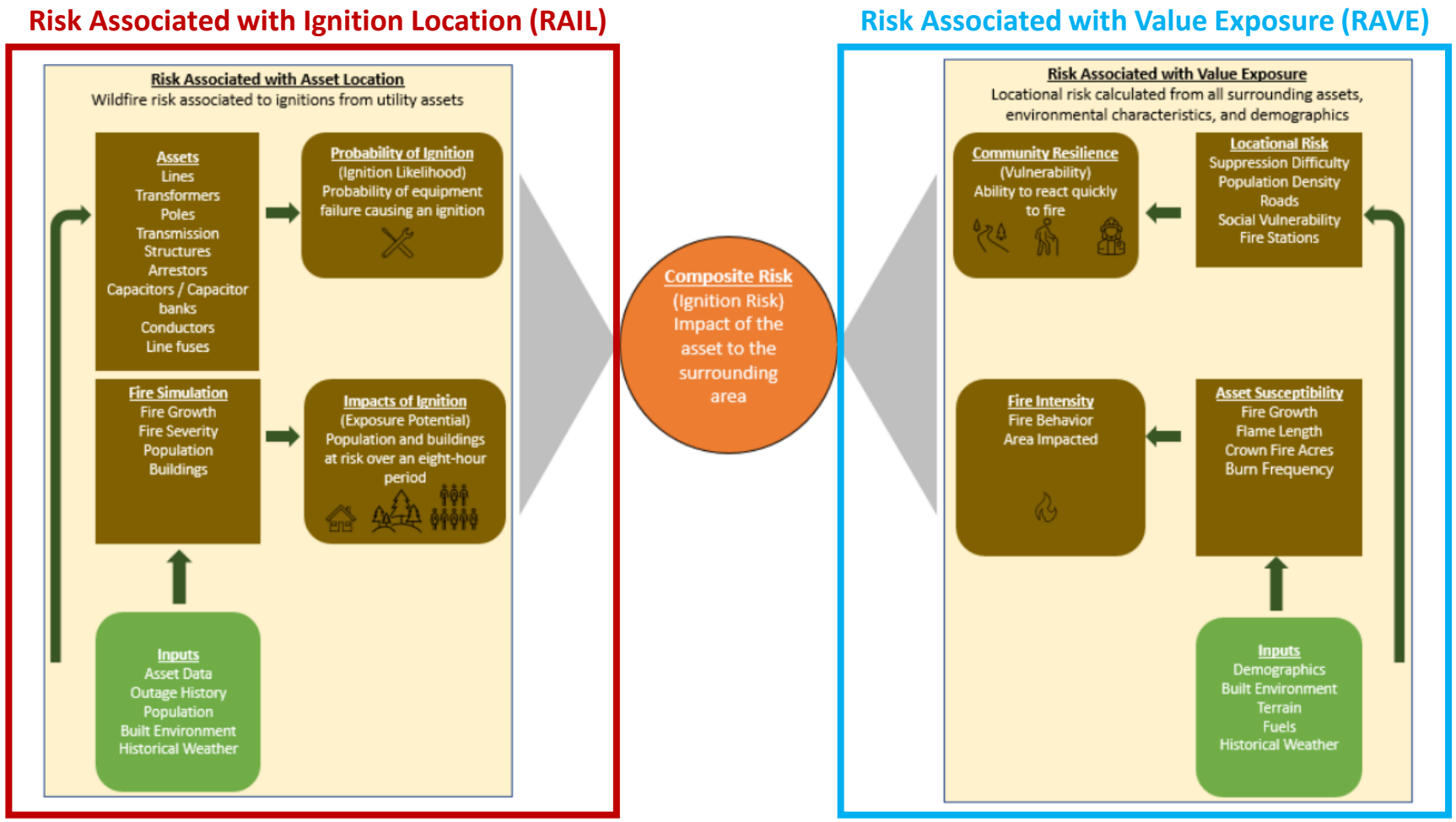
High Risk

Expected Risk (POI and POF = calculated)



Asset Ignition Wildfire Risk

RAIL and RAVE – Major Components



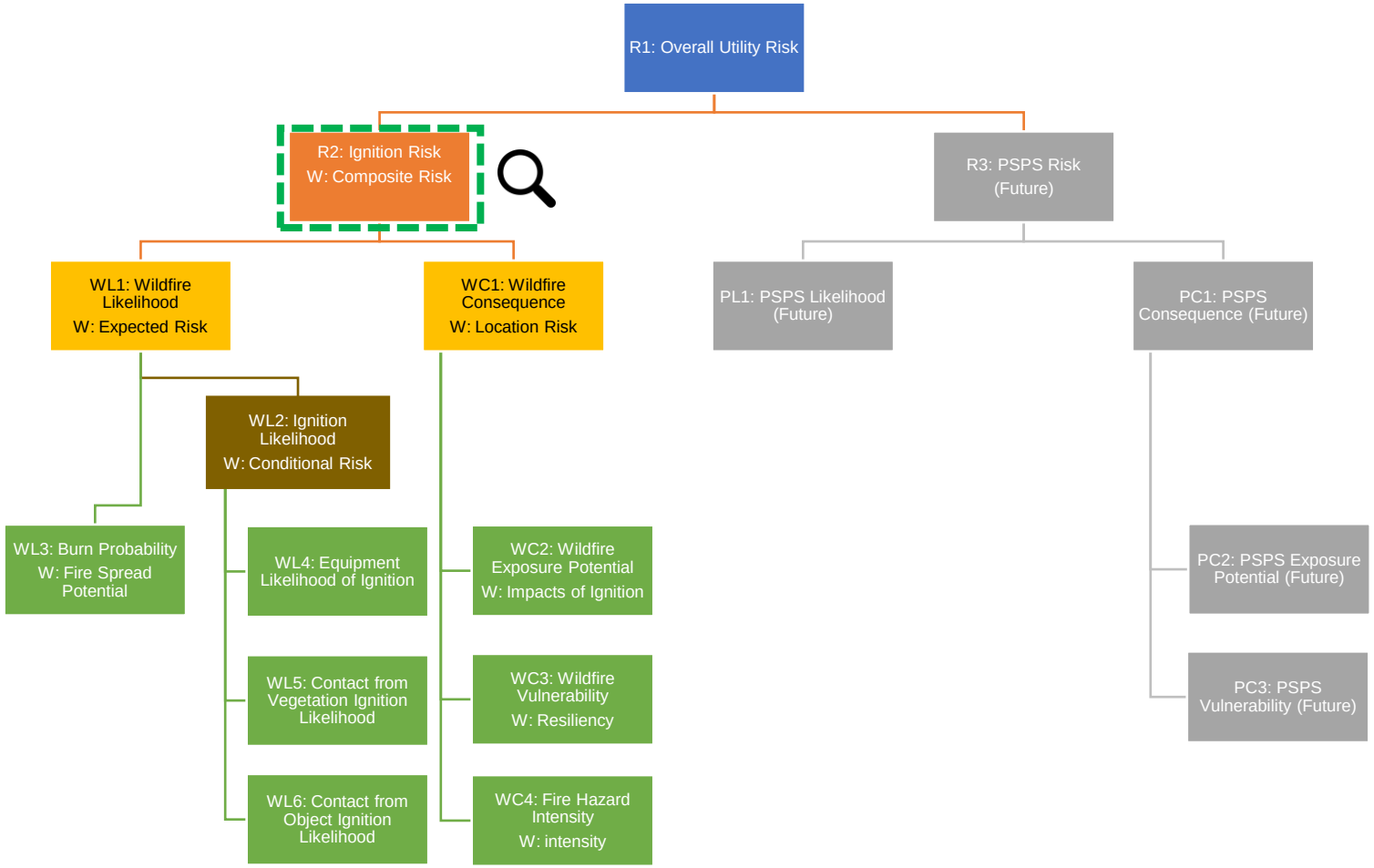
❑ WRRM Components:

- **RAIL** = Asset Ignition Risk
- **RAVE** = Community & Environmental Risk
- **Composite** = RAIL + RAVE

❑ Why do we need both?

- **Need to know ignition risk <u>AND</u> community & environmental risk to obtain the most robust picture of overall risk.**

Why do we need a composite score?



- **PacifiCorp's Risk Framework:**
  - OEIS requires every utility to have a risk framework in place that addresses key components of wildfire risk.
  - The composite risk score we will focus on is **R2: Ignition Risk** (Composite Risk).

R2: Ignition Risk
W: Composite Risk

OEIS = Office of Energy Infrastructure Safety

Hazard Risk | Intermediate Risk | Fundamental Risk | Pending

Terrain Difficulty Index (TDI) Categories

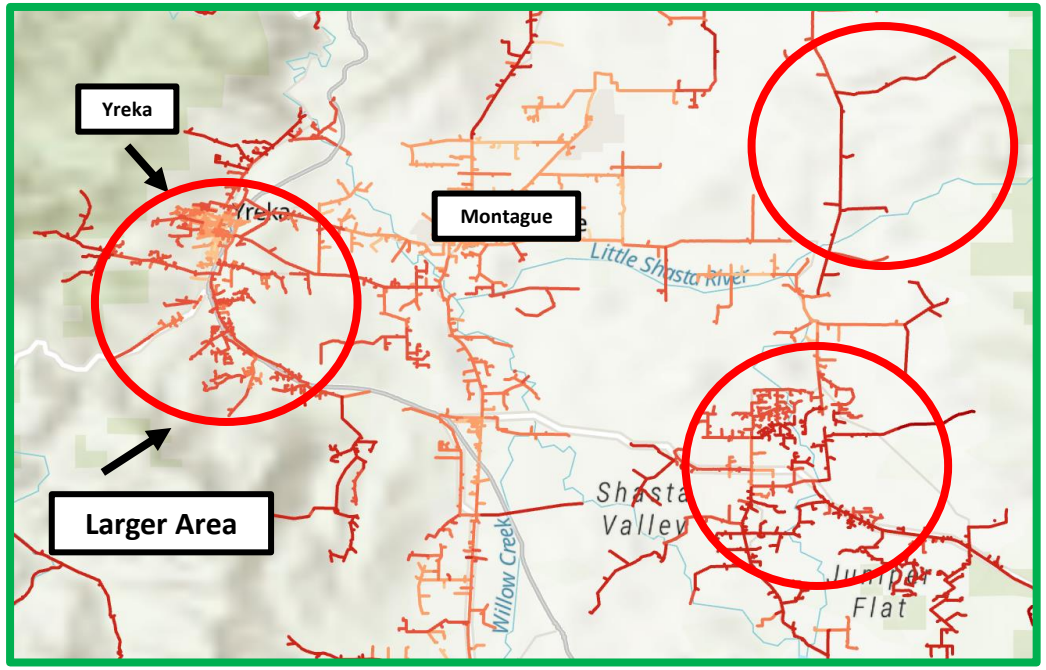
TDI Categories	TDI description	Operational Implications
1- Very low	No accessibility limitations to the firefighting resources, allowing quick deployment of wildfire suppression ground resources.	Terrain conditions are suitable for any kind of attack. There might be some restrictions in WUI areas due to the constraints of heavy equipment use.
2- Low	High density of tracks and paths. Terrain conditions allow the deployment of wildfire suppression ground resources.	Direct and indirect attack strategies and tactics can be implemented without restrictions.
3- Intermediate	Roads and tracks are slightly more difficult to access and terrain is mildly difficult with increasing slopes.	Direct and indirect attack strategies and tactics are possible but there may be potential reductions in resource performance and deployment time.
4- High	Low density of roads/tracks in the area. Difficult terrain access with limitations to ground travel.	Terrain with restrictions for heavy equipment. Implementation of tactics on the ground can be delayed due to increased travel time.
5- Extreme	Very low density of tracks/roads to support strategies. Highly complex terrain conditions including high-slope areas limit the use of heavy equipment.	Very complex terrain for any kind of attack strategies except for aerial operations. High probability safety might be compromised.

Composite Score: LRAM vs. WRRM

Note: Given the differences in methodologies between the two, a direct comparison is not possible.

Overview: Cover how the new composite using WRRM compares to the old model (Localized Risk Assessment Model; LRAM).

Localized Risk Assessment Model (LMRM)

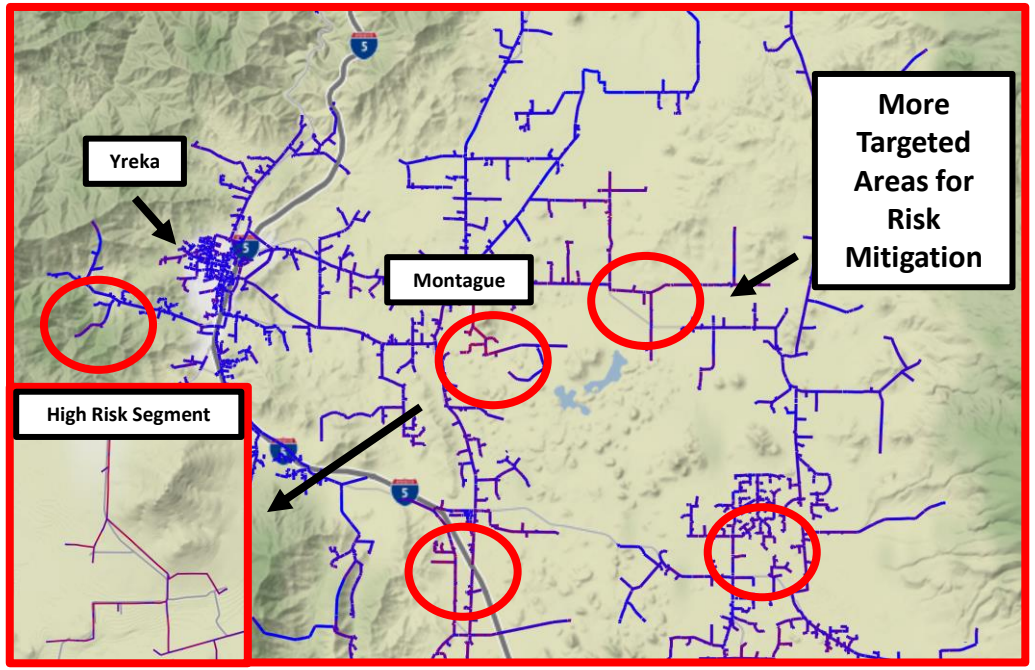


LRAM Combined Score

Composite Score

0.0-0.1	Low Risk
0.1-0.2	
0.2-0.3	
0.3-0.4	
0.4-0.5	
0.5-0.6	
0.6-0.7	
0.7-0.8	
0.8-0.9	
0.9-1.0	High Risk

Expected Risk (POI and POF = calculated)



Asset Ignition Wildfire Risk

WRRM (expected) does <u>not</u> eliminate risk (bluer areas) but provides a more <u>targeted</u> approach.

Meeting Notes
Wildfire Risk Governance Committee
June 19, 2023

Attending: Kevin Benson, Allen Berreth, Eric Brookhouse, Megan Buckner, Tim Clark, Vivian du Pont, Carrie Laird, Robbie Marshall, Amy McCluskey, Jordan Pino, Steve Vanderburg, Elenore Yostov

1. WRRM Weighting Examples
   - Provided examples of two circuits: one in a mountainous area and one in a flat area and showed the composite risk scores for wind and terrain driven scenarios for both. In both scenarios the scores work as expected the area in the mountains has a higher terrain-driven risk and the area in the flatter area has a higher wind-driven risk.
   - Questions/Feedback:
     Q: What does the percentile mean?
     A: For weather, the percentile is at the district level.
     Q: Where is the risk calculated?
     A: Risk is calculated at the ignition point
     Action: How is the risk score created and calculated?
2. Sensitivity Analysis
   - Asset Risk ran sensitivity analysis to see how the composite risk score shift when the weightings change
   - In general, if there are modest changes to the weightings, the overall composite risk score does not shift significantly
   - If there are substantial changes to the weightings, there are significant shifts to the overall composite score
   - **Decision:** Allen Berreth approved the WRRM composite risk weightings as seen below.
   - Action Item:
     - Document sensitivity analysis performed, and number of scenarios run
3. Schedule Update
   - FPI: Went live June 8 in WFA-E and is working. Web dashboard will go live soon and will move WFA-E from desktop to web-based solution
   - FHCA: Yellow because of challenge of finding third party vendor, RFP has not been issued because there is only one prospective vendor in the system and guidance from Procurement is not to sole source.
     - Last week had a call with one prospective bidder who wanted more info before signing up with Jaggaer
     - Have expended outreach to a next ring of potential consultants who do not have direct experience with
     - Impact to delay in securing a third-party reviewer:

        - No regulatory requirement to perform a third-party reviewer but doing this to help support results and validate process and provide confidence to regulators that the work was performed according to best practices.
        - Question of when to implement maps for operational purposes
    - Still on schedule to have draft maps ready for internal review by end of July
- WRRM analysis: The remaining 2022 WRRM data was delivered at the end of May.
- WRRM Domain Expansion: Confirmed that fragility curve analysis is in scope for the domain expansion

4. Action Item Update
    - Fragility curves: Currently cover the areas covered in WFA-E. Confirmed that fragility curve analysis is in scope with domain expansion
    - IOU Outreach on Composite Risk: Have scheduled some meetings, which have been rescheduled due to meeting conflicts

Approved: WRRM Composite Score Attributes and Weightings

Wind-Driven/Terrain-Driven Score Components **[Review]**

Overview: Review components of the wind-driven and terrain-driven scores.

Risk Associated with Ignition Location (RAIL) Component (60%)

RAIL Inputs:	Percentile:	Weight (%):
Fire Behavior Index	95	20%
Fire Size Potential	95	20%
Flame Length *	95	20%

+

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Wind

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+

Risk Associated with Value Exposure (RAVE) Component (20%)

RAVE Inputs:	Percentile:	Weight (%):
Terrain Difficulty Index	N/A	10%
Disability Population	N/A	5%
Poverty Population	N/A	5%

** N/A = not applicable (RAVE variables do NOT contain percentiles).*

Meeting Notes
Wildfire Risk Governance Committee
July 18, 2023

Attending: Kevin Benson, Allen Berreth, Megan Buckner, Vivian du Pont, Curtis Mansfield, Robbie Marshall, Amy McCluskey, Chris Spencer, Steve Vanderburg, Elenore Yostov

Absent: Erik Brookhouse, Tim Clark, Carrie Laird, Jordan Pino

1. District Fire Risk
   - Changes to District Fire Risk are now operational and being used in the daily report.
   - Shift to using the modified Hot Dry Windy Index as the key indicator of wildfire risk. It is modified by including the Energy Release Component (ERC) in the assessment. It also accounts for differences in terrain (complex fuels and terrain vs. grasslands) and the fire risk in those areas.
   - In comparing the outputs of the mHWDI to publicly available tools from the National Geographic Area Coordination Center (GACC), it is working well and aligning with the levels of risk from the public sources.
   - Questions:
     Q: Does the current fire data get integrated into the tools?
     A: Technosylva performs regular updates to include new wildfires and perimeters in their modeling.
   - Action Items:
     - Kevin to follow up on location of PACRAT server and stability concerns.
2. FHCA Update
   - Shared process for developing maps and validating approach. Plan to do a sensitivity analysis to apply a buffer around assets consistently across the service territory.
   - Using the combined composite risk score (terrain + wind driven) to identify the locations of elevated risk.
   - Have an internal cross-functional team review proposed map boundaries and recommend adjustments.
   - Documenting approach and analysis
   - Questions:
     Q: Is FHCA a legacy artifact given operational direction to focus on circuits of concern?
     A: It is not a legacy artifact, still identifies where the areas of risk are for additional hardening, inspection, and other activities. The circuits of concern should be integrated into the FHCA analysis.
     Q: Will there be tiering?
     A: No answer at this point.
   - Feedback on approach:
     - Direction to accelerate timeline to have all the maps completed in 2023. This is a change from the plan to have California and Oregon complete in 2023 and the remaining states in 2024.

    - Is there a way to show the FHCA from wind driven events, and terrain driven events in an overlay to see where the specific risks are.
    - Include representatives from Engineering, Vegetation Management, and Operations in review sessions.
    - Acceptable to not have a third party reviewer if one is not secured in RFP.
    - Consider having a feedback loop from the field in 2024 to gather information from the field to adjust the FHCA as needed.
    - If there is tiering, consider if tiering is the right name for it given the specific definitions for Tiers in California
- Actions:
    - Kevin to communicate revised schedule to WRGC before the August 23 WRGC meeting.

3. Schedule Update
    - WRRM data processing begins July 19 with the expanded domain. Are monitoring as the MSA contract extension work has begun and do not want that to be a barrier to moving forward. Procurement and Legal engaged in the discussions.
    - FHCA currently yellow due to concerns about procuring a third party reviewer. If the reviewer is no longer a dependency, this may change to more positive trajectory at next WRGC.
    - Update to website. Slowed due to contract expiring in 2022 and slower than planned process to get new contract signed.

Wildfire Risk Governance Committee (WRGC)






Agenda

14:30-14:35	Review Meeting Topic Agenda	Kevin Benson
14:35-15:15	Inform: District Fire Risk Update	Steve Vanderburg
15:15-15:45	Inform: FHCA Update Methodology	Jordan Pino
15:45-15:55	Inform: Schedule Update	Melissa Swenson
15:55-16:00	Discuss: Future Meeting Topics	Kevin Benson
15:55-16:00	Meeting Closeout	Kevin Benson






District Fire Risk Update

PACIFIC POWER SYSTEM IMPACTS FORECAST MATRIX

WEATHER-RELATED OUTAGE POTENTIAL (Wx) and WILDFIRE RISK (F)

NORTH WIRES		7/13 (Thu) Wx	F	CIRC	CUST	Response	7/14 (Fri) Wx	F	7/15 (Sat) Wx	F	7/16 (Sun) Wx	F	7/17 (Mon) Wx	F
Clatsop Area	Clatsop													
Enterprise Area	Enterprise			1	18	EFR								
Hood River Area	Hood River			3	3,576	EFR								
Pendleton Area	Hermiston			1	536	EFR, GP								
	Pendleton			2	845	EFR								
Portland Area	Portland													
Walla Walla Area	Walla Walla			2	480	EFR								
Yakima Area	Sunnyside			2	325	EFR								
	Yakima			3	1,652	EFR								
CENTRAL WIRES														
Albany Area	Albany													
	Corvallis			3	2,520	EFR								
	Cottage Grove			1	1,540	EFR								
	Dallas			5	4,279	EFR								
	Junction City			1	309	EFR								
	Lebanon			6	6,918	EFR								
	Stayton			2	2,145	EFR								
Bend Area	Bend			2	470	EFR								
	Madras			1	385	EFR								
	Prineville			1	353	EFR								
	Redmond			1	367	EFR								
Coos Bay Area	Coos Bay													
Lincoln City Area	Lincoln City													
Roseburg Area	Roseburg			31	26,606	EFR								
SOUTH WIRES														
Crescent City Area	Crescent City													
Grants Pass Area	Grants Pass			25	33,717	EFR								
Klamath Falls Area	Alturas			1	1,389	EFR								
	Klamath Falls													
	Lakeview													
	Tulelake													
Medford Area	Medford			22	22,029	EFR								
Yreka Area	Mt. Shasta			9	4,215	EFR								
	Yreka			16	8,885	EFR								

PacifiCorp Emergency Response Summary

PACIFIC POWER OPERATIONAL RESPONSE

ECC NOT ACTIVATED | DOC NOT ACTIVATED

TOTAL CIRCUITS IN EFR SETTINGS:	TOTAL POTENTIALLY IMPACTED CUSTOMERS:	RESPONSE OVERVIEW:
141	123,559	
CIRCUITS AT RISK OF PSPS:	TOTAL CUSTOMERS AT RISK OF PSPS:	
0	0	

ROCKY MOUNTAIN POWER OPERATIONAL RESPONSE

ECC NOT ACTIVATED | DOC NOT ACTIVATED

TOTAL CIRCUITS IN EFR SETTINGS:	TOTAL POTENTIALLY IMPACTED CUSTOMERS:	RESPONSE OVERVIEW:
27	12,024	
CIRCUITS AT RISK OF PSPS:	TOTAL CUSTOMERS AT RISK OF PSPS:	
0	0	

HYDRO OPERATIONAL RESPONSE

DOC NOT ACTIVATED

RESPONSE OVERVIEW:

WEATHER-RELATED OUTAGE POTENTIAL (Wx)

OUTAGE POTENTIAL

- Widespread Outages with Extended Restoration
- Scattered to Widespread Outages
- Isolated to Scattered Outages
- No System Impacts Expected

WEATHER-RELATED HAZARDS

- L - Thunderstorms *(Lightning, Hail, Wind)*
- W - Wind
- F - Flooding
- I - Freezing Rain and Ice
- S - Snow

WILDFIRE RISK (F)

- **Extreme Wildfire Risk**
- **Significant Wildfire Risk**
- **Elevated Wildfire Risk**
- **Low Wildfire Risk**
- **Non-Fire Season**

OPERATIONAL RESPONSE

AP	Air Patrol
GP	Ground Patrol
EFR	Elevate Fire Risk Settings
ECC	ECC Activated
T	Transmission
D	Distribution

ECC / DOC

Department Operations Center (DOC) - A tactical function, provides coordination point for a department's for response activities during major incidents normally established prior to an ECC activation.

Emergency Coordination Center (ECC) - A strategic and support function, provides operational guidance and support to one or more DOC activations. Also reports current situational information to the Executive Policy Group.

ROCKY MOUNTAIN POWER SYSTEM IMPACTS FORECAST MATRIX

WEATHER-RELATED OUTAGE POTENTIAL (Wx) and WILDFIRE RISK (F)

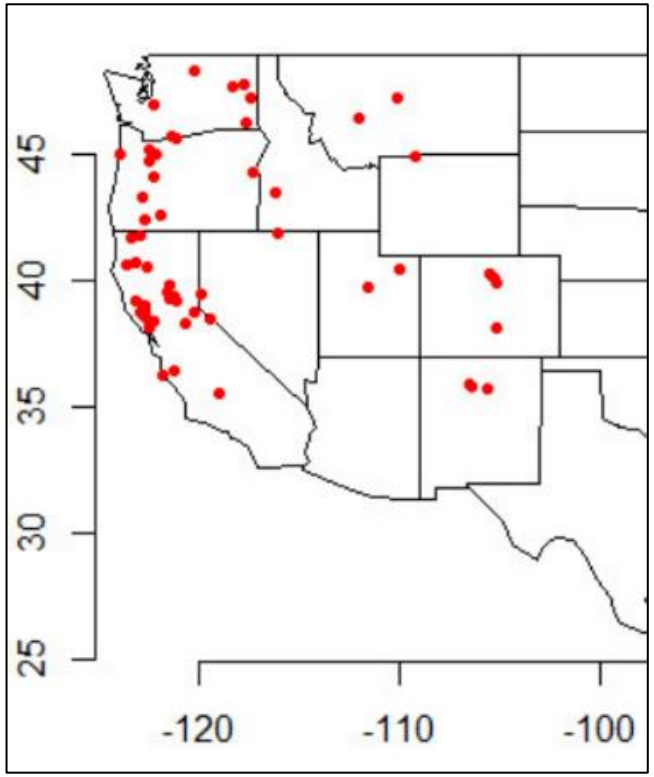
WYOMING WIRES		7/13 (Thu) Wx	F	CIRC	CUST	Response	7/14 (Fri) Wx	F	7/15 (Sat) Wx	F	7/16 (Sun) Wx	F	7/17 (Mon) Wx	F
Casper Area	Buffalo													
	Casper													
Cody Area	Cody													
	Lovell													
Douglas Area	Douglas													
Evanston Area	Evanston													
	Kemmerer													
Laramie Area	Laramie													
Pinedale Area	Big Piney													
	Pinedale													
Rawlins Area	Rawlins													
Riverton Area	Lander													
	Riverton													
Rock Springs Area	Rock Springs													
Worland Area	Greybull													
	Thermopolis													
	Worland													
NORTHERN UTAH AND IDAHO WIRES														
Idaho Power Area	Idaho Power													
Lava Area	Lava													
Montpelier Area	Laketown													
	Montpelier													
Ogden Area	Ogden													
Preston Area	Malad													
	Preston													
Rexburg Area	Mud Lake													
	Rexburg													
Shelley Area	Shelley													
Smithfield Area	Smithfield													
Tremonton Area	Tremonton													
CENTRAL UTAH WIRES														
Jordan Valley Area	Jordan Valley													
Layton Area	Layton													
SLC Metro Area	SLC Metro													
Tooele Area	Tooele													
SOUTH UTAH WIRES														
American Fork Area	American Fork													
Cedar City Area	Cedar City													
Delta Area	Delta													
Dixie Area	Dixie			7	5,403	EFR								
	Enterprise Valley			1	185	EFR								
Eagle Mtn. Area	Eagle Mtn.													
Milford Area	Milford													
Moab Area	Blanding			4	570	EFR								
	Moab			3	2,566	EFR								
Park City Area	Park City													
Price Area	Emery			2	603	EFR								
	Price			3	912	EFR								
Richfield Area	Gunnison													
	Moroni													
	Panguitch			2	936	EFR								
	Richfield			3	18	EFR								
Santaquin Area	Santaquin													
Vernal Area	Vernal			2	831	EFR								

Overview: The modified Hot-Dry-Windy index has become an adopted input for the daily District Fire Risk assessment provided in the daily threat matrix

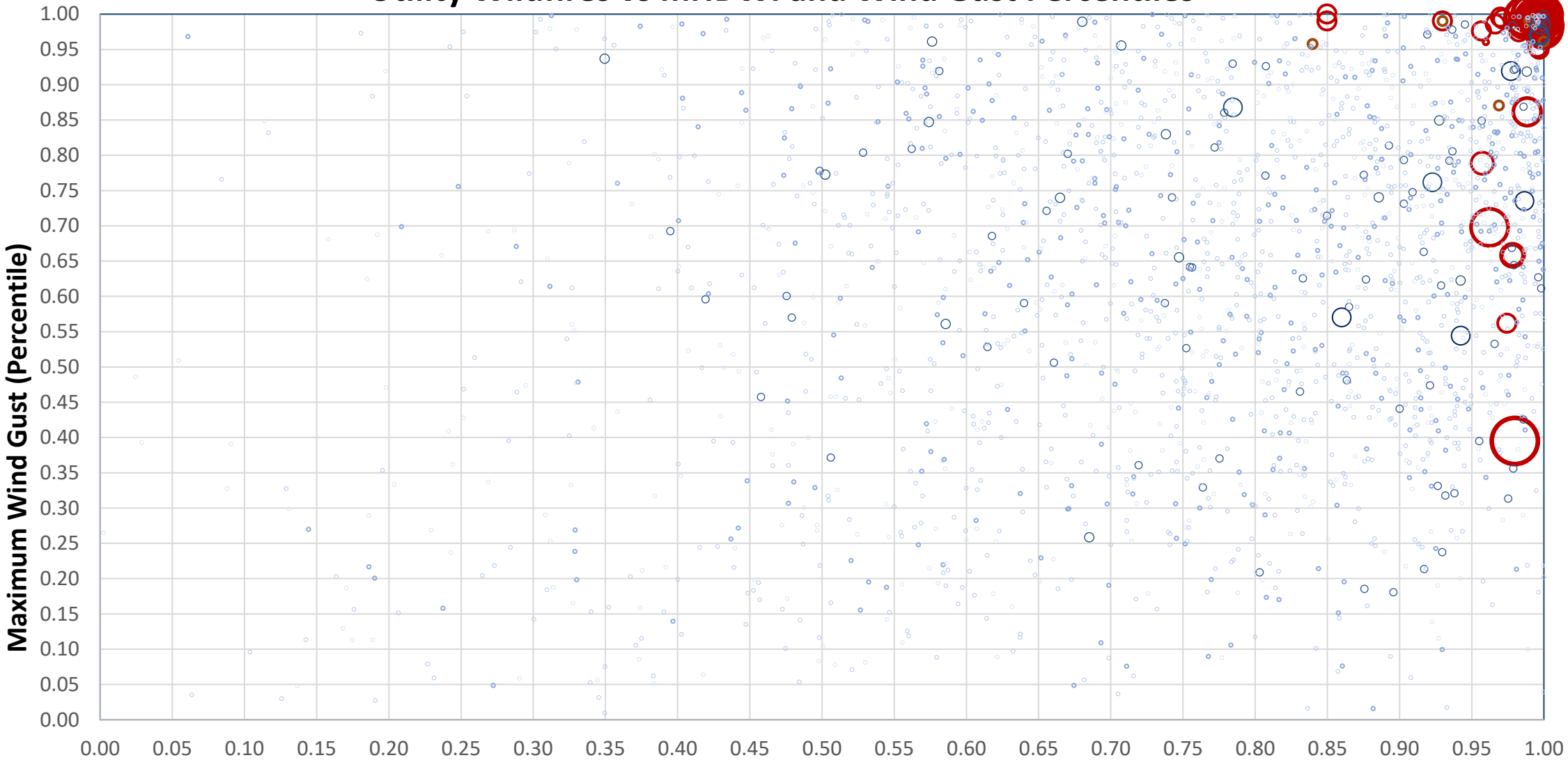
❑ mHDWI methodology

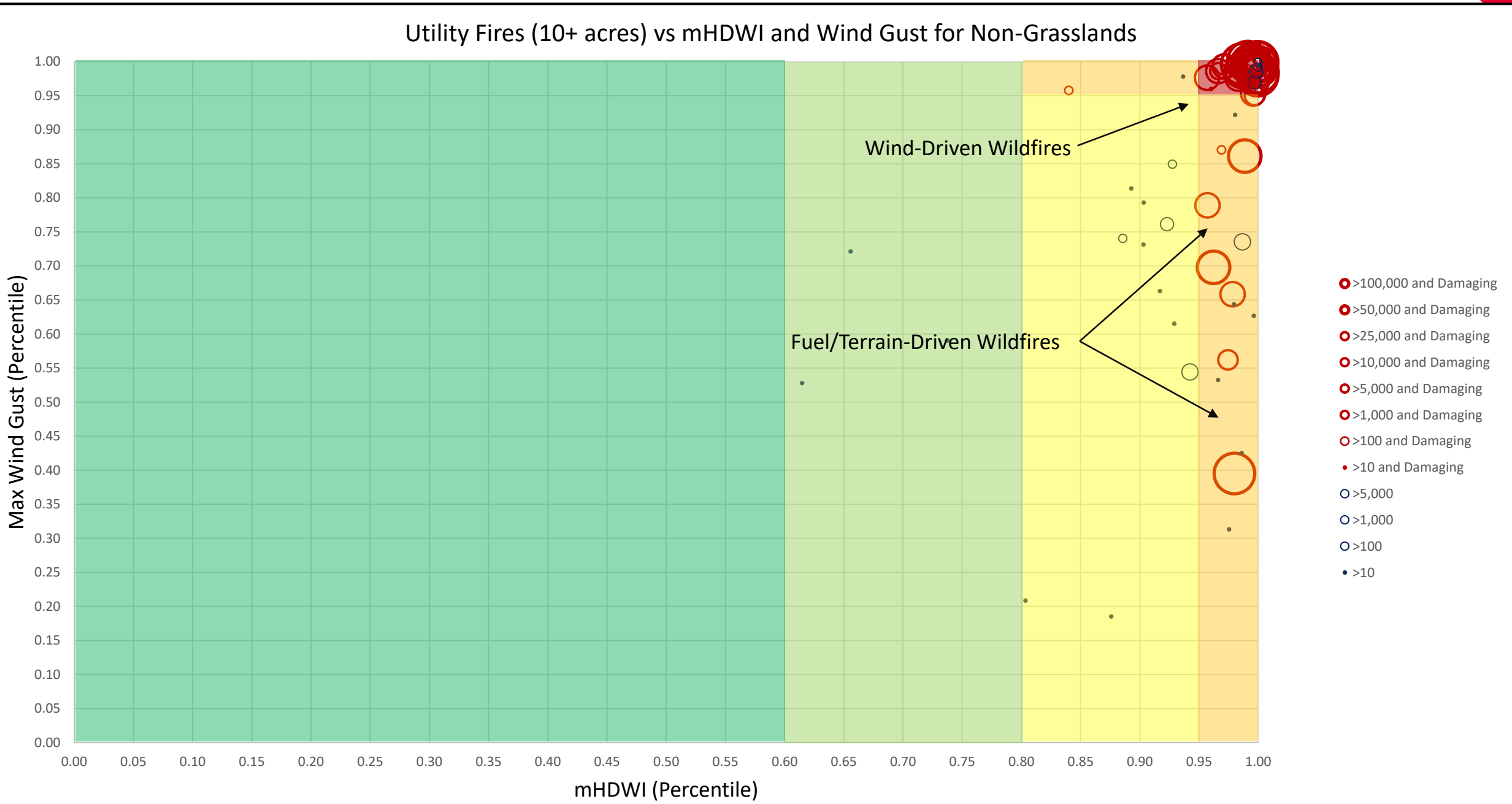
1. Create a mHDWI climatology using PacifiCorp WRF Reanalysis
2. Analyze mHDWI for 2,000+ known or suspected powerline-caused wildfires across the WRF domain (1991-2021)
    1. Fires greater than 1,000 acres regardless of damage
    2. Fires of any size that burned at least one structure or resulted in a fatality
    3. Analyze all PG&E reportable ignitions (2014-2019)
    4. Analyze PCORP Fire Database (2020-2021)
3. Separate all fires > 10 acres into either grassland/rangeland fires and non-grassland/rangeland fires
4. Develop new mHDWI inputs for District Fire Risk Assessment

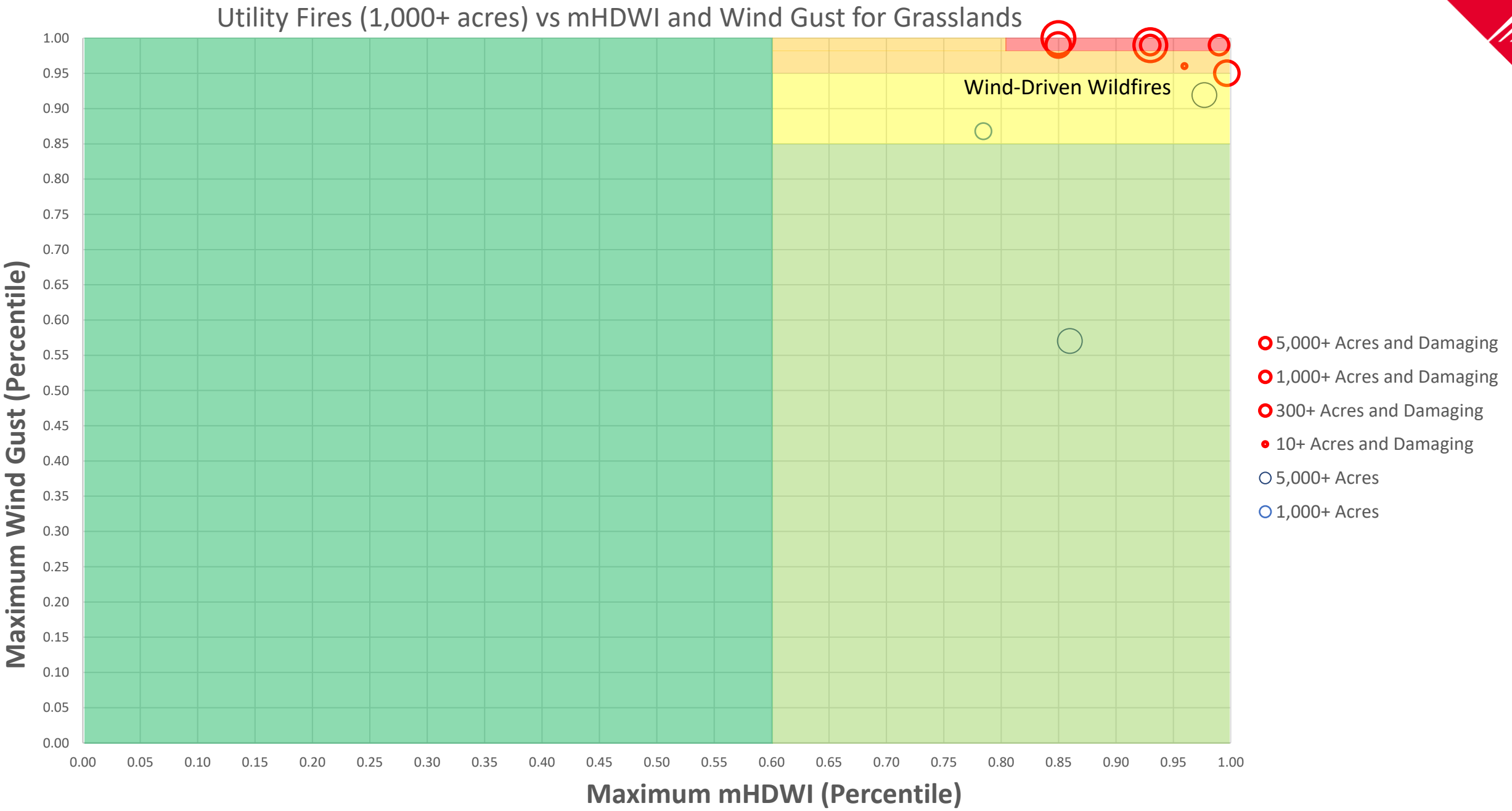
Damaging wildfires (1991-2021)



Utility Wildfires vs mHDWI and Wind Gust Percentiles




Utility Fires (10+ acres) vs mHDWI and Wind Gust for Non-Grasslands
Max Wind Gust (Percentile)
mHDWI (Percentile)
Wind-Driven Wildfires
Fuel/Terrain-Driven Wildfires
>100,000 and Damaging
>50,000 and Damaging
>25,000 and Damaging
>10,000 and Damaging
>5,000 and Damaging
>1,000 and Damaging
>100 and Damaging
>10 and Damaging
>5,000
>1,000
>100
>10


Utility Fires (1,000+ acres) vs mHDWI and Wind Gust for Grasslands
Wind-Driven Wildfires
Maximum Wind Gust (Percentile)
Maximum mHDWI (Percentile)
1.00
0.95
0.90
0.85
0.80
0.75
0.70
0.65
0.60
0.55
0.50
0.45
0.40
0.35
0.30
0.25
0.20
0.15
0.10
0.05
0.00
0.00 0.05 0.10 0.15 0.20 0.25 0.30 0.35 0.40 0.45 0.50 0.55 0.60 0.65 0.70 0.75 0.80 0.85 0.90 0.95 1.00
5,000+ Acres and Damaging
1,000+ Acres and Damaging
300+ Acres and Damaging
10+ Acres and Damaging
5,000+ Acres
1,000+ Acres

District Fire Risk Update

Overview: New inputs are separated into two categories: Grass / Rangelands and Complex Fuel / Terrain.

1. Overwhelming majority of the total acres burned and damages occurred in Complex Fuel / Terrain
    1. mHDWI and consequential wildfires are well-correlated
    2. Fuel/Terrain fires occur with mHDWI > 0.95
    3. Wind-driven occur with mHDWI > 0.95 and Gust > 0.95
2. Far fewer wildfires of consequence in grasslands
    1. Assuming grass is cured, max gust percentile is most strongly correlated with wildfires of consequence
    2. Research continues toward developing a separate mHDWI for grasslands
3. Will continue to leverage GACC forecasts as a District Fire Risk input for the 2023 fire season

Complex Fuel / Terrain

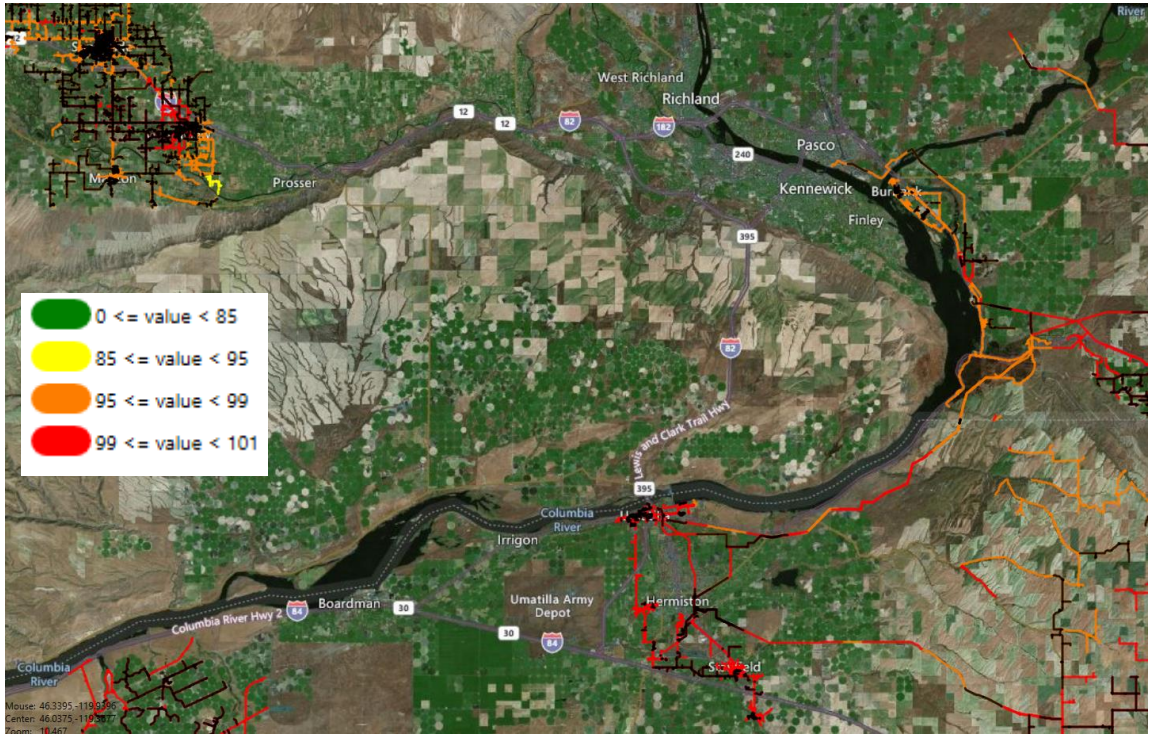
PacifiCorp Wildfire Risk	GACC 7-Day Significant Fire Potential	Modified Hot-Dry-Windy	Max Wind Gust
Non-Fire Season	Little to No Risk		
Low Wildfire Risk	Low or Moderate	< 0.80	
Elevated Wildfire Risk	Low or Moderate	≥ 0.80	
Significant Wildfire Risk	Moderate or High Risk	≥ 0.95	
	Moderate or High Risk	≥ 0.80	≥ 0.95*
Extreme Wildfire Risk	Moderate or High Risk	≥ 0.95	≥ 0.95*

Grasslands / Rangelands

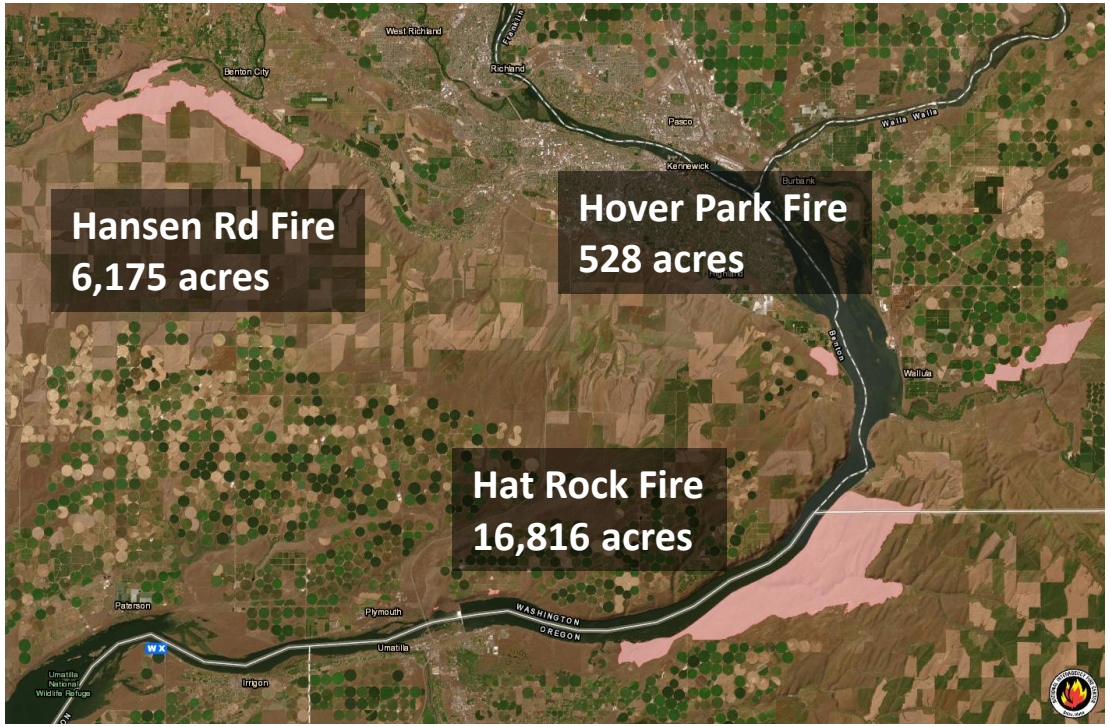
PacifiCorp Wildfire Risk	GACC 7-Day Significant Fire Potential	Grasses	Max Wind Gust
Non-Fire Season	Little to No Risk	Green	
Low Wildfire Risk	Low or Greater	Cured	< 0.85
Elevated Wildfire Risk	Low or Greater	Cured	≥ 0.85*
Significant Wildfire Risk	Moderate or High Risk	Cured	≥ 0.95*
Extreme Wildfire Risk	Moderate or High Risk	Cured	≥ 0.99*

June 13, 2023: PACW North Wires – Hermiston, Pendleton, Walla Walla, Yakima, Sunnyside – Grasslands / Rangelands

WRF Wind Gust Forecast



Wildfire Perimeters



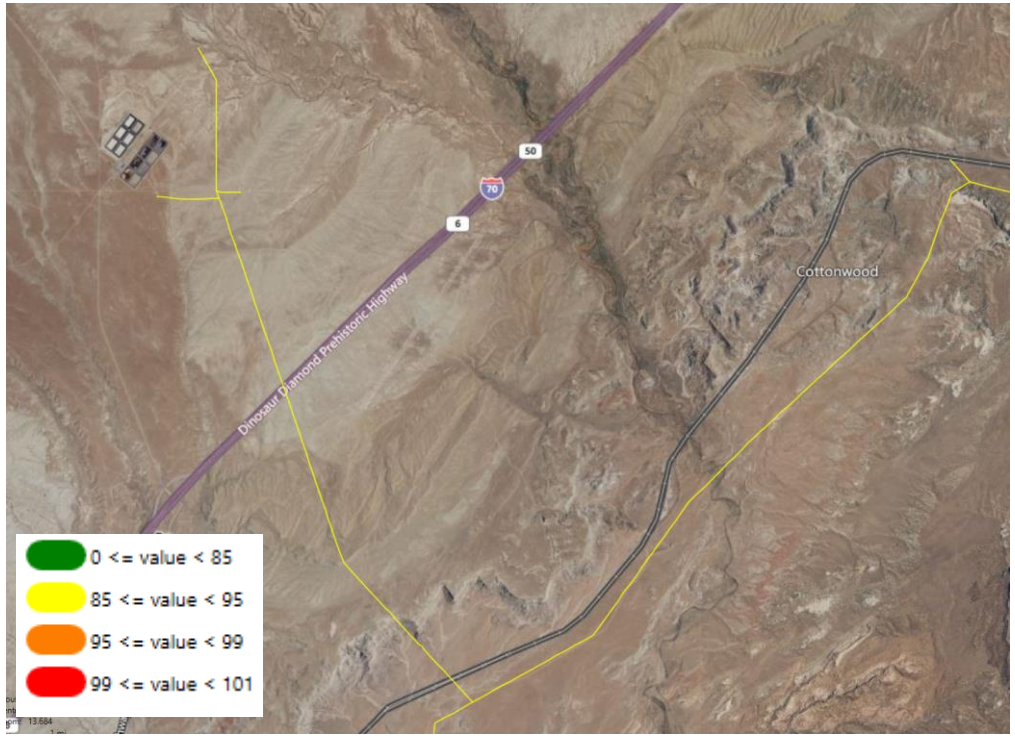
Guidance for Rangelands & Grasslands

PacifiCorp Wildfire Risk	GACC 7-Day Significant Fire Potential	Grasses	Max Wind Gust
Non-Fire Season	Little to No Risk	Green	
Low Wildfire Risk	Low or Greater	Cured	< 0.85
Elevated Wildfire Risk	Low or Greater	Cured	≥ 0.85*
Significant Wildfire Risk	Moderate or High Risk	Cured	≥ 0.95*
Extreme Wildfire Risk	Moderate or High Risk	Cured	≥ 0.99*

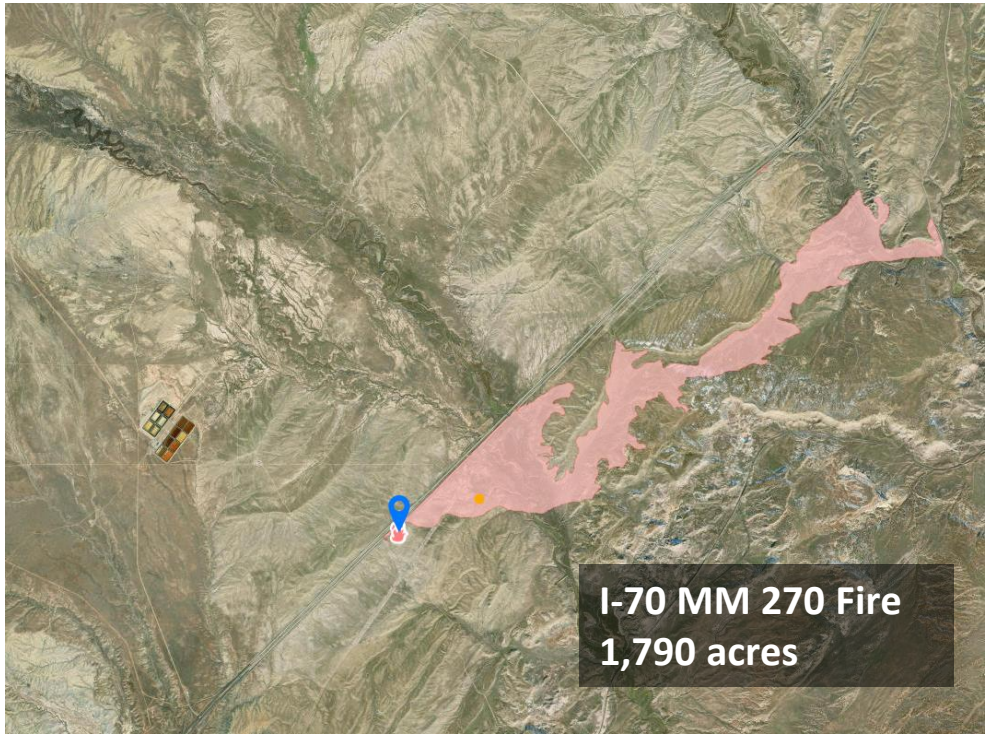
- Extreme Wildfire Risk
  - Grasses Cured / Max Gusts ≥ 0.99
  - Only day in 2023 so far that met the new criteria for Extreme Wildfire Risk
- Several wind-driven wildfires occurred in the grasslands threatening hundreds of structures

July 10, 2023: PACE South Wires – Moab – Grasslands / Rangelands (Desert)

WRF Wind Gust Forecast



Wildfire Perimeters



Guidance for Rangelands & Grasslands

PacifiCorp Wildfire Risk	GACC 7-Day Significant Fire Potential	Grasses	Max Wind Gust
Non-Fire Season	Little to No Risk	Green	
Low Wildfire Risk	Low or Greater	Cured	< 0.85
Elevated Wildfire Risk	Low or Greater	Cured	≥ 0.85*
Significant Wildfire Risk	Moderate or High Risk	Cured	≥ 0.95*
Extreme Wildfire Risk	Moderate or High Risk	Cured	≥ 0.99*

- Elevated Wildfire Risk
  - Grasses Cured / Max Gusts ≥ 0.85
- Wind-driven wildfire in low-density fuels

District Fire Risk Update

Challenges:

1. GREATER / PACRAT is a single point of failure
    1. Unable to view mHDWI when PACRAT / GREATER experiences interruptions
    2. Backup solutions include the BHE Data Lake (late 2023) and Technosylva's WFA-E (2024)
    3. Primary reason why the GACC forecast remains an input into the District Fire Risk
2. Circuits of Concern
    1. Updated FHCA mapping effort should alleviate current challenges associated with picking circuits of concern
    2. WUI circuits of concern are uniquely challenging
    3. Grassland threat vs non-grassland threat for districts like Cedar City and Yakima
3. Fuels conflict during shoulder seasons
    1. Future enhancements planned to incorporate greenness of the grasses (NDVI) and live fuel moisture
        - Currently listed as an "additional consideration" in PAC1000

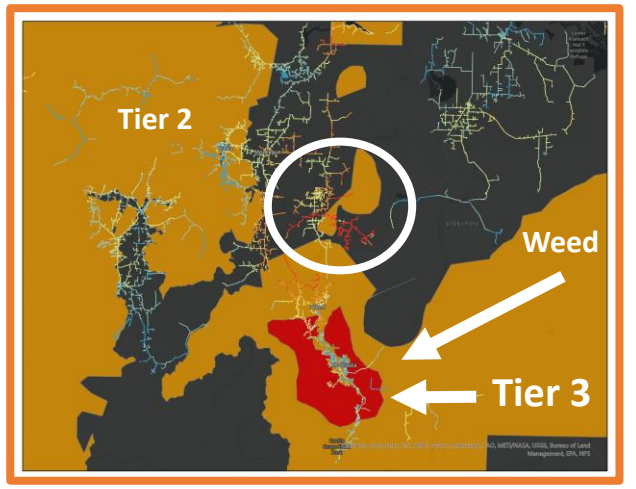
FHCA Update

PacifiCorp

Analysis Overview

❑ FHCA Map Refresh Methodology (high-level):

1. Calculate Composite Score per Circuit[1].
2. Create a buffer around each circuit to capture risk in surrounding areas.
3. Compare current FHCA (REAX) maps with composite score/buffers.
4. Expand or detract areas based on new composite score/buffer.



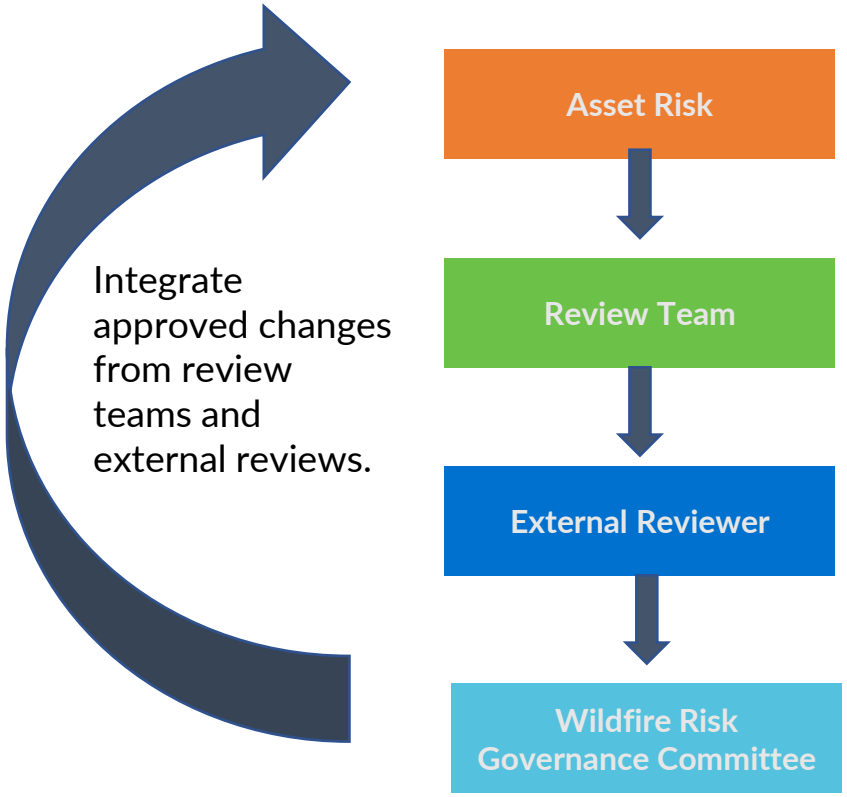
For Illustrative purposes only.

***Table 1**: Overview of two methodologies.*

Steps to Risk for Map Areas:	REAX (2018):	Composite Score (2023):
1. Fire Weather Climatology	✓	✓
2. Fire Spread Model	✓	✓
3. Use Risk to Generate Maps	Manual Analysis of Steps 1 + 2.	Composite Score (includes variables not in REAX).
4. Adjustment of Map Areas	Manual adjustment.	Automated Adjustments via Spatial Software.

[1] *REAX utilized population impacted and property, which our composite captures + more variables.*

FHCA Review Process



Develop criteria and create maps. Integrate approved changes into the maps.

Review proposed map and apply their knowledge of on-the ground conditions to recommend changes.

Review the draft maps and approach.

Review the final proposed maps with the integrated changes and approve the maps for implementation and/or submittal for regulatory approval.

FHCA Review Committee

Key Points

Overview: Form a committee to review the new FHCA maps internally *before* sending them out to the third party. This committee will consist of internal SMEs and other relevant parties.

❑ SME Committee:

***Table 1**: Overview of potential members[1].*

Name:	Department:	Expertise:	Operating Company:
Kevin Schiedler	Wildfire Safety	Mitigation Planning	Pacific Power
Daniel Botieff	Wildfire Safety	Mitigation Planning	Pacific Power
Steve Vanderburg	Meteorology	Meteorology/Wildfire	Both
Jon Connelly	Asset Management	Asset Management	Pacific Power
Alex Vaz	Asset Management	Asset Management	Rocky Mountain Power
Megan Buckner	Wildfire Mitigation	WMP & reporting	Both
Tim Clark	Legal	Law and regulation	Both

[1]*List of 7/12/23 – additional members may be added.*

FHCA Review Committee Roles/Participation

Key Points

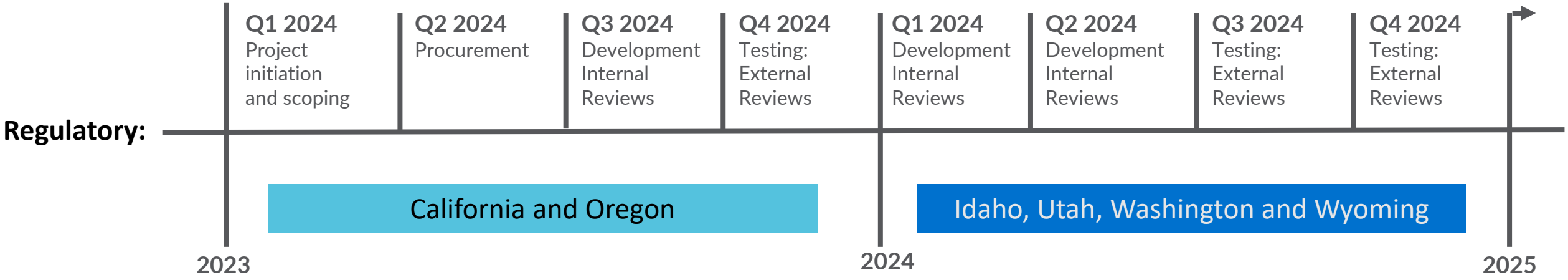
Overview: Compile outcomes from the committee and define specific areas of review to determine what we're asking for.

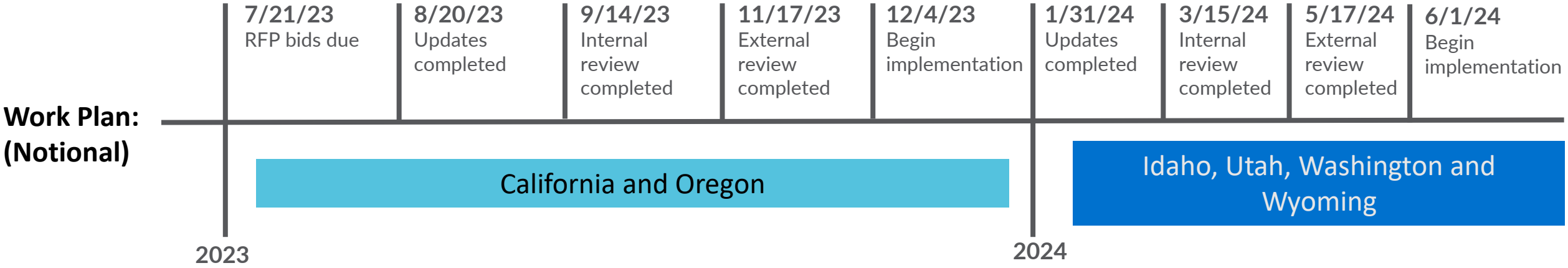
❑ **Outcomes:**

❖Analyze the maps and answer the following:

- Based on your experience and expertise, do these areas generally align with what you expect?
- Is the historical risk captured in these areas?
- Are there any areas you're surprised to see included in an FHCA?
- Any areas you think should be included?
- Any potential issues with the areas you see that could come up based on your SME?

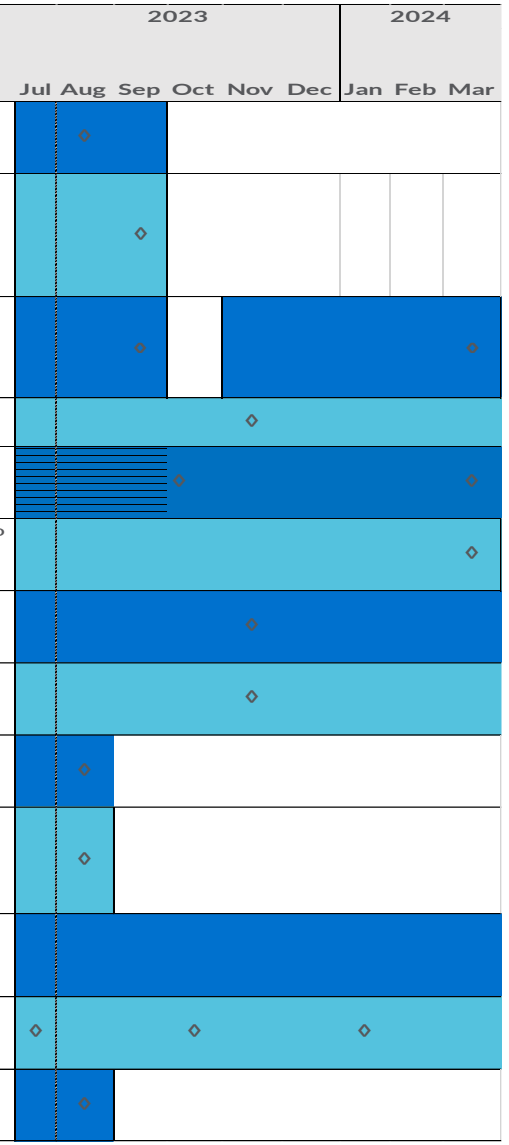
FHCA Timelines





Schedule Update

Status	Planning/ Operations	Initiative	What Is Different When Completed?	Scope	Current Stage	Reason for Yellow/Amber Status
1	P	Risk Spend Efficiency (RSE) Model	This will implement RSE modeling to support identification of mitigations and their risk reduction benefit relative to	FHCA	Development	N/A
2	P	Expansion of Service Territory Modeled in WRRM	WRRM modeling of wildfire risk covers most of PacifiCorp's service territory.	Entire Service Territory	Development	Domain expansion work continuing, but managing MSA discussions to minimize impacts to domain expansion work. Coordinating with Procurement and Legal
3	P	Annual Planning Model Updates	Process in place to update assets, configurations, and other information to keep planning models current	Service Territory	Development	Delivery date has shifted from August to September due to decision to model 24 hours of risk instead of eight hours. This change increases data processing time.
4	P/O	FHCA Assessment	Updates to FHCA areas across PacifiCorp's operating areas.	Service Territory	Requirements	RFP issued late which may impact the scheduled completion of the 2023 work.'
5	O	Updates to Internal and External Situational Awareness Websites	Improved user experience, enhanced maps and information for customers, partners, and employees	Service Territory	Development	Contract lapsed and negotiations are still underway. Contract delay has delayed SOW development and execution of
6	P	Public Safety Power Shutoff (PSPS) Risk Assessment Solution	Implementation of a solution to calculate the PSPS likelihood and consequence to support planning processes.	California	Requirements	Monitoring for resource constraints due to competing priorities such as operational and regulatory data requests.
7	O	WRF Ensemble	Strategically sub-select GEFS members to initialize a multi-member WRF Ensemble deterministic weather	Service Territory	Development	N/A
8	O	GEFS Self Organizing Maps (SOMs) Ensemble Forecast Tool	Build historical SOM node array using ERA5 Reanalysis. Build an automated GEFS SOM node association framework	Service Territory	Development	N/A
9	P	Annual Mitigation Selection Planning Process	Updated process to integrate new planning tools to support selection of mitigation programs and projects	FHCA	Planning	N/A
10	O	Data Lake for Wildfire and Weather Data	Historical and daily forecast data and conditions accessible to other departments in PacifiCorp and BHE for departments to use data, build models, and machine learning tools with	Service Territory	Execution	N/A
11	O	Bias-corrected WRF Forecast	Machine learning models to bias correct the WRF forecast for Pacific Power Weather Stations, RAWS, and other relevant weather stations.	Service Territory	Execution	N/A
12	O	Quarterly Update of Asset Data	FireCast and FireSim has the current asset information to model risk for situational awareness	Service Territory	Planning	N/A
13	P	Implement Planning Module in WFA-E	Implementation of Planning Module in WFA-E to leverage WRRM and RSE data to compare possible mitigations at	Service Territory	Development	N/A



Forward Looking Projects / Topics

Objective: Solicit Feedback on Proposed Projects / Topics / Next Meeting

- Proposed Topics:
  - INFORM: RSE – Methodology and Planned Business Use (August)
  - INFORM: PSPS Risk Assessment Solution (August)
  - INFORM: Updated Fire Incident Tracking Process & Tool (September)
- Meeting Frequency / Next Meeting
- Feedback on Structure / Content / Attendees

WILDFIRE SAFETY & ASSET MANAGEMENT

WILDFIRE SAFETY

ASSET RISK

ASSET MANAGEMENT

Thank You!

PACIFICORP

WILDFIRE SAFETY & ASSET MANAGEMENT

WILDFIRE SAFETY

ASSET RISK

ASSET MANAGEMENT

Appendix

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Action Item Follow Ups

Assigned to	Title	Description	Decision/Resolution
Steve Vanderburg	FPI Thresholds	Recommend thresholds for FPI	
Jordan Pino	Outreach to IOUs on Composite Scores	What is the feedback from other IOUs on how they selected the variables for their Ignition/Composite Risk calculation	Meetings scheduled.
Jordan Pino	Risk Calculations	Provide an overview of how the risk scores are created and calculated	See slide in Appendix.
Jordan Pino	Sensitivity Analysis Documentation	Document analysis performed for sensitivity analysis and number of scenarios run	Documentation complete/figure creation in progress.
Kevin Benson	WRRM Domain Growth	Current and future coverage of the Service Territory in WRRM	

WRRM Service Territory Coverage

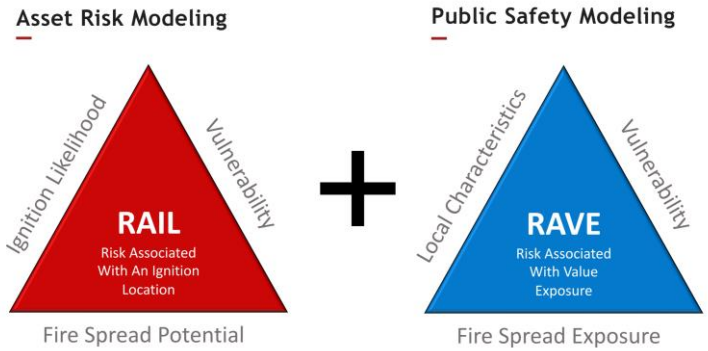
% of Service Territory Covered in WRRM						
Date	California	Oregon	Idaho	Utah	Washington	Wyoming
January 2023			0%	0%	0%	0%
May 2023						
September 2023						

What is not covered in WRRM Analysis:

- <Etc>
- <Etc)

Wind-Driven

WRRM Risk Score Calculation



❑ Example Calculation: Segment FID 83334

➢ Wind-Driven Score:

windscore = (0.4 * **0.77098**) + (0.25 * **0.10056**) + (0.25 * **0.06164**) + (0.10 * **0.4**) + (0.05 * **0.05994**) + (0.05 * **0.06347**) = **0.40**

- Rate of Spread (95th percentile)
- Population Impacted (95th percentile)
- Buildings Destroyed (95th percentile)
- Terrain Difficulty Index
- Disabled Population
- Poverty Population

Risk Associated with Ignition Location (RAIL) Component

(Variable 1 * Weight; %) + (Variable 2 * Weight; %)..

+

Risk Associated with Value Exposure (RAVE) Component

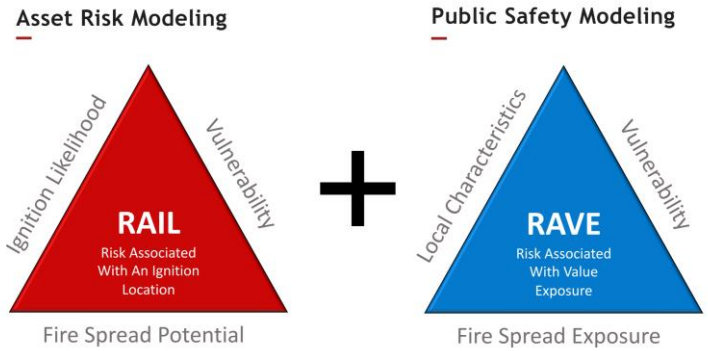
(Variable 1 * Weight; %) + (Variable 2 * Weight; %)..

** Note: Values are scaled between 0 and 1.*

RAIL **RAVE** **Weight**

Terrain-Driven

WRRM Risk Score Calculation



❑ Example Calculation: Segment FID 83334

➢ Terrain-Driven Score:

terrainscore = (0.20 * **0.77099**) + (0.20 * **0.74099**) + (0.20 * **0.2**) + (0.25 * **0.5**) + (0.10 * **0.71226**) + (0.05 * **0.95956**) = **0.59**

- **0.77099** → Fire Behavior Index (95th percentile)
- **0.74099** → Fire Size Potential (95th percentile)
- **0.2** → Flame Length (95th percentile)
- **0.5** → Terrain Difficulty Index
- **0.71226** → Fire Station Density
- **0.95956** → Fuel Model Majority

Risk Associated with Ignition Location (RAIL) Component

(Variable 1 * Weight; %) + (Variable 2 * Weight; %)..

+

Risk Associated with Value Exposure (RAVE) Component

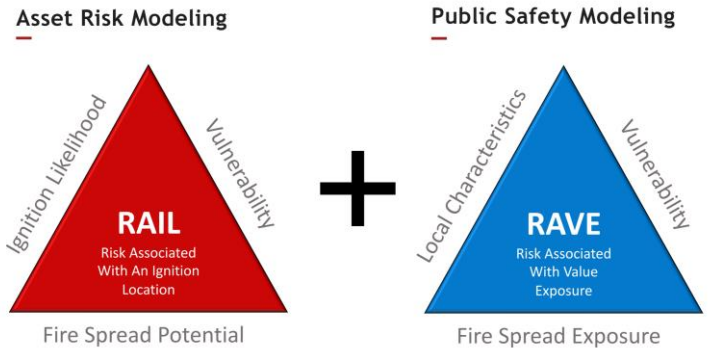
(Variable 1 * Weight; %) + (Variable 2 * Weight; %)..

** Note: Values are scaled between 0 and 1.*

RAIL	RAVE	Weight

Final Score

WRRM Risk Score Calculation



❑ Example Calculation: Segment FID 83334

➢ **Final Composite Score:**

- Next, we scale each of the scores to a 0-to-1 scale by dividing by the largest score across all circuit segments.
- The logic here is again to prevent one score from dominating the composite and to allow for comparison.

windscore = segment score / max segment score

0.40 / 0.67 = 0.60

terrainscore = segment score / max segment score

0.59 / 0.80 = 0.74

Final Composite Score:

windscore + ***terrainscore***

0.60 + 0.74 = 1.34

Composite = segment score / max segment score

1.34 / 1.58 = **0.85**

** Note: Values are scaled between 0 and 1.*

RAIL	RAVE	Weight

Wind-Driven/Terrain-Driven Score Components **[Review]**

Overview: Review components of the wind-driven and terrain-driven scores.

Terrain

Risk Associated with Ignition Location (RAIL) Component (60%)

RAIL Inputs:	Percentile:	Weight (%):
Fire Behavior Index	95	20%
Fire Size Potential	95	20%
Flame Length *	95	20%

+

Risk Associated with Value Exposure (RAVE) Component (40%)

RAVE Inputs:	Percentile:	Weight (%):
Terrain Difficulty Index	N/A	25%
Fire Station Density	N/A	10%
Fuel Model Majority	N/A	5%

Wind

Risk Associated with Ignition Location (RAIL) Component (80%)

RAIL Inputs:	Percentile:	Weight (%):
Rate of Spread *	95	30%
Population Impacted *	95	25%
Buildings Destroyed *	95	25%

+

Risk Associated with Value Exposure (RAVE) Component (20%)

RAVE Inputs:	Percentile:	Weight (%):
Terrain Difficulty Index	N/A	10%
Disability Population	N/A	5%
Poverty Population	N/A	5%

** = PG&E, SCE and SDG&E utilized variable.*

** N/A = not applicable (RAVE variables do NOT contain percentiles).*

Approved at June 19, 2023 WRGC

RAIL + RAVE Variables Available

RAIL RAVE

Overview: Review of RAIL + RAVE variables used in composite score.

Table 1: RAIL Variables

Risk Metric:	Description:	Composite?
Acres Burned	Number of Acres Burned	-
Population Impacted	Population Count Impacted	✓ YES
Buildings Threatened	Number of Buildings Threatened	-
Buildings Destroyed	Number of Buildings Destroyed	✓ YES
Fire Behavior Index	Fire Behavior Index	✓ YES
Rate of Spread	66 Feet/Hour	✓ YES
Flame Length	Feet	✓ YES

Table 2: RAVE Variables

Variable:	Description:	Composite?
Total Road Miles	Total Miles (Major + Minor)	-
Fuel Model Majority	Majority Fuel in Each Plexel	✓ YES
Building Density	Building Density per Plexel	-
Number of Buildings	Number of Building per Plexel	-
Population Count	Population Count per Plexel	-
Fire Station Density	Density of Fire Stations	✓ YES
Terrain Difficulty Index	Terrain Difficulty per Plexel	✓ YES
Disability Population	Disability Population Ratio	✓ YES
Poverty Population	Poverty Population Ratio	✓ YES
Senior Population	Senior Population Ratio	-
Years Since Last Fire	Years Since Last Fire per Plexel	-

Meeting Notes
Wildfire Risk Governance Committee
September 6, 2023

Attending: Kevin Benson, Allen Berreth, Megan Buckner, Curtis Mansfield, Amy McCluskey, Chris Spencer, Steve Vanderburg, Elenore Yotsov, Erik Brookhouse, Jordan Pino, Dan Botieff, Thomas Riese, Robbie Marshall, Jordan Popham
Absent: Vivian du Pont, Tim Clark

1. RSE Update

- FireSight is a tool that Technosylva developed that enables modeling of different mitigations on a circuit and the expected risk reduction and RSE of the mitigation.
- FireSight is currently in testing and validating the effectiveness calculations
- RSE will be calculated behind the scenes in FireSight. The calculation will be:

$$RSE = \frac{\text{NPV (Risk Reduced)}}{\text{NPV (Cost)}}$$

- The effectiveness calculations of different mitigations are based on what Technosylva is seeing across the utility industry, which includes information from PacifiCorp on asset type, outage history, and ignition incidents
- Costs and mitigation life were also provided by PacifiCorp for mitigations. It is important to note that the costs are an <u>average</u> cost.
- Walked through an example of how RSE will be calculated using covered conductor as the example mitigation.
- Asset Risk and Planning working on building rubric to model mitigations by complexity of effort and have different costs
- Planning is using the composite risk data provided by Asset Risk to identify the circuits where mitigation is needed. This will inform what mitigations are selected, but other considerations are also considered such as terrain (ex: undergrounding through granite)
- Planning expects to use FireSight and the RSE calculations to help scope out projects. It is important to note that the RSE number is not the only consideration when determining which mitigation will be implemented. There are other considerations such as permitting, terrain, etc. that are also considered.
- Questions:
    - Question: Why is the effectiveness of covered conductor at 60%?

      Answer: This is an average effectiveness based on the experiences of other utilities. Also, it is important to recognize that this is an average, meaning there is a range of effectiveness based on conditions where the covered conductor is installed. In California, the Joint IOU working group is working on analyzing the effectiveness of covered conduction.
    - Question: What does risk reduction calculation include?

      Answer: In the example, acres was used. But PacifiCorp will use Composite Risk score in FireSight which includes variety of attributes such as acres, buildings damaged, population at risk etc.
    - Question: Is the RSE calculation using project costs only or a lifecycle costs (project + ongoing operational costs)?

      Answer: It is using project costs only.
    - Question: What is the unit for the risk score?

      Answer: It is unitless, it represents the reduction of risk, underneath the score can be showing different attributes that have changes because of the mitigation

    - Question: Can mitigations be stacked, for example covered conduction + vegetation management?

  Answer: At this point, its single mitigation application, but will ask Technosylva where that is on their development roadmap

    - Question: How often will mitigations be updated?

  Answer: Expect to update mitigations annually with updated costs and information on asset information such as materials and outage history before and after the mitigation. This will help continually refine the effectiveness calculations. There is no need to wait to begin using FireSight to model mitigation risk reduction once it goes live

- Action Items:
    - Share mitigations, effectiveness, and source of calculation with WRGC
    - Share what other utilities are going regarding effectiveness, including vegetation management

2. Fire Incident Reporting

- Evolving fire incident tracking and reporting to move from a manual process to one that has more analytics and ability to perform trend analysis on where incidents are happening
- Developing a form for crews to capture key information on the incident with a focus on reporting the event information without speculation of the cause
- Working to develop tracking and analytics in Foundry to use the inputs for trend analysis
- Expect to implement the process and tool by the beginning of 2024 wildfire season.
- Legal is engaged in reviewing the forms and training
- Questions:
    - Question: Is there a way to know if an ignition was missed/not reported?
      Answer: Unclear. Brainstorming with the team if there are ways to capture the information through public sources
    - Question: Has the team talked with other utilities about what they are doing? PG&E has good analytics when in meetings, what are they doing?
      Answer: Will reach out to PG&E and see what can be learned

3. Delivery Update:

- FireSight: Slight slip in go live from August, but still moving forward
- WRRM Domain Expansion: Technosylva is working on processing the data and expects to deliver it in September as planned. Proposed MSA has been redlined by PacifiCorp and will go back to Technosylva next week. Joe Paul is the legal reviewer on the agreement
- FHCA assessment: Yellow due to accelerated schedule. Reviewed approach and draft maps with Tim Clark and Megan Buckner this week and received feedback from them on what questions to anticipate.
- PSPS Risk Assessment Solution: Yellow due to resourcing and prioritization. Asset Risk now has a resource assignment so this should change to green shortly.

4. Future Meetings

- Add Oregon Seasonal Outlook as a discussion by the November meeting

Wildfire Risk Governance Committee (WRGC)






Agenda

14:00 – 14:05	Review Meeting Topic Agenda	Kevin Benson
14:05 – 15:10	Inform: RSE	Jordan Pino/Dan Botieff
15:10 – 15:20	Delivery Status Review	Melissa Swenson
15:20 – 15:30	Discuss: Future Meeting Topics & Closeout	Kevin Benson






Inform: RSE

PacifiCorp

Risk Spend Efficiency (RSE) – Overview

Objective: provide an update on the risk spend efficiency (RSE) methodology and show how the scores will be used for projection selection, scoping, and prioritization.

- Partnering with Technosylva, they have developed a tool called **FireSight** which will allow the team to test different mitigation strategies and output a risk spend efficiency/store projects (**screenshots of tool later**).

- Important Acronyms/Terms:
  - **R**isk **S**pend **E**fficiency (RSE) = score output to aid in determining appropriate mitigation to reduce risk and maximize cost.
  - **F**ire**S**ight = application developed by Technosylva to view/play with different mitigations/output RSE values.

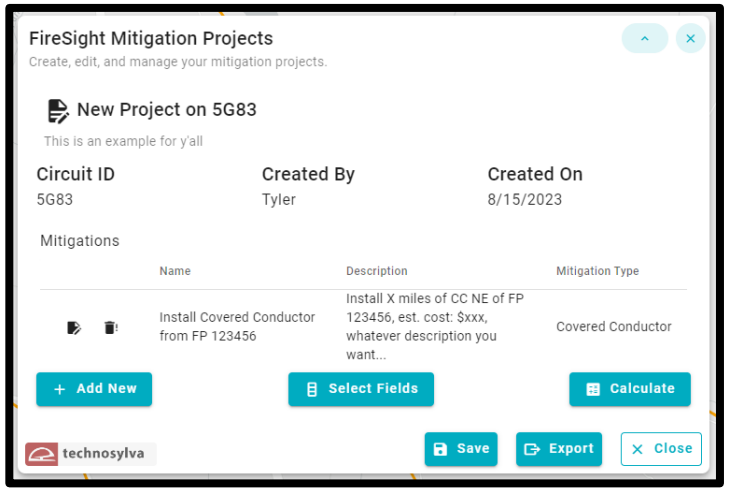


***Figure 1**: FireSight screenshot.*

Risk Spend Efficiency (RSE) – Methodology

Overview: the risk spend efficiency (RSE) values are calculated using a number of inputs.

- The equation for RSE is below:

$$\text{RSE} = \frac{\text{NPV(Risk Reduced)}}{\text{NPV(Cost)}}$$

$$\text{Risk Reduction} = (Risk_b - Risk_m)$$

$Risk_b$ = baseline risk (no mitigation).

$Risk_m$ = mitigated risk with **effectiveness** (key limitations on next slide).

Cost = provided by PacifiCorp SMEs (key limitations on next slide).

❑ **Example Calculation:**

- **Circuit** = 5G23 (~ 96 miles)
- **Mitigation** = Covered Conductor
- **Risk** = acres burned
- **Cost** (per mile) = $770,000 (from PacifiCorp SMEs)

$Risk_b$ = 2,221 Cost = $770,000 x 96 (miles)
($73,920,000)

$Risk_m$ = 1,245

Risk Reduction = 15,919.86

- **RSE** = 15919.86 / 73.92 = **215**

Risk Spend Efficiency (RSE) – Assumptions + Limitations

Overview: there are key assumptions and limitations in the RSE calculations presently. They are listed below:

1. **Mitigation Effectiveness**: effectiveness involves multiple assumptions and may be based heavily on subject matter expertise and data availability.
   - ✓ We have a plan in place to address this limitation (next slide).

2. **Costs**: variations in costs are influenced heavily by factors like labor availability, resources, legal constraints, and environmental challenges.
   - ✓ We have a plan in place to address this limitation (next slide).

3. **Useful Life**: the longevity of a mitigation's benefit requires certain assumptions.

Risk Spend Efficiency (RSE) – Future Effectiveness + Costs

Overview: to better capture effectiveness and cost inputs associated with RSE, we plan to further refine assumptions to better capture variations and thus increase the overall accuracy of RSE.

(1) Effectiveness[1] Value Improvements

- ✓ **Risk Driver Reductions**
  - Gather historic outage data before/after a mitigation installation to better quantify effectiveness.
  - Separate effectiveness for each mitigation based on risk drivers (*e.g.*, vegetation contact vs. wind outage).
- ✓ **Discussion with Subject Matter Experts**
  - Work with internal SMEs to refine effectiveness assumptions.
  - Continue benchmarking with other IOUs

(2) Mitigation Cost Value Improvements

- ✓ **Capture Avoided O&M costs such as Vegetation Management and Enhanced Maintenance/Inspections**
- ✓ **Compare Full-Life Cycle Costs with/without Hardening**
- ✓ **Create Mitigation Cost "Buckets"**
  - Capture unique complexity costs associated with certain mitigations.

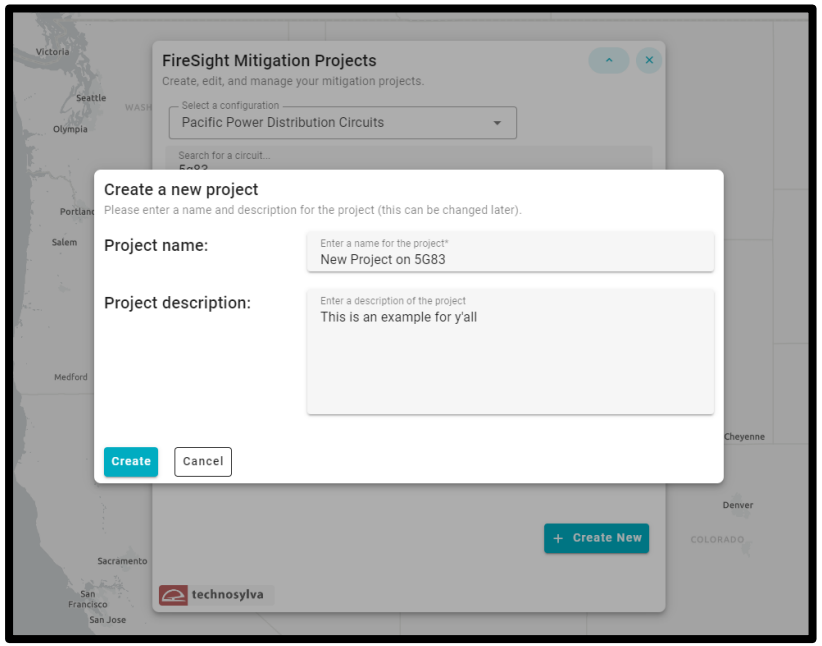
[1]*Current effectiveness is estimated/assumed based on best available information and benchmarking with other utilities.*

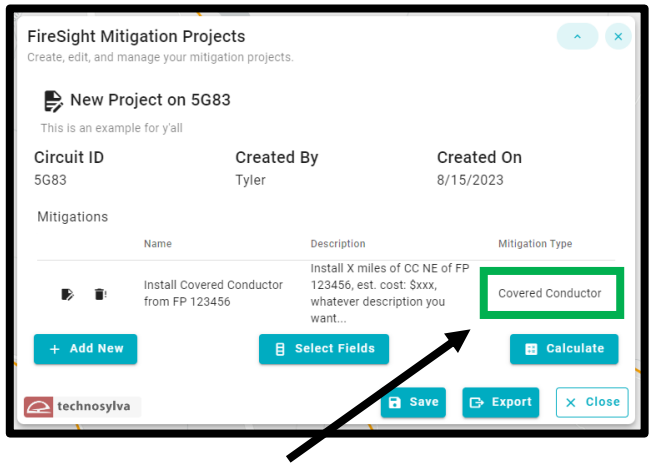
Risk Spend Efficiency (RSE) – FireSight

Tool not available yet, in testing.

Overview: FireSight is an application developed by Technosylva to visualize risk across our territory and for user selected mitigation projects and their corresponding RSE values/risk reduction.

Create New Mitigation Project





Select the Mitigation

Select WRRM Variable(s) to Perform Effectiveness On

technosylva

Power Delivery Wildfire Scoping Framework

Framework Owner: Dan Botieff, Wildfire Safety

The **Power Delivery Wildfire Mitigation Scoping Framework** will leverage a consistent approach in alignment with the system-wide risk assessment methodology but ensure stakeholder input and a holistic view of investment

This Framework Requires that Projects Scopes:

- Mitigate wildfire risk
- Consider input from all stakeholders
- Align with the risk-assessment methodology
- Are clearly documented with stakeholder sign-off
- Are constructable
- Are prioritized based on risk as much as practical
- Align with regulatory filings / recovery strategy

Consistent Framework ≠ Identical Answer

PacifiCorp Wildfire Line Rebuild Scoping Process

Process Owner: Dan Botieff, Wildfire Safety

GENERAL TIMELINE – 1 MONTH (50 LINE-MILES/MONTH (AVG.)

WRRM Analytics Out to Engineering

Day 1 — Scope Development

Week 1

Week 2 (SCOPING MTG) — Scope Review

Week 3 — Final Project Scoping Package

Week 4

Asset Risk

WRRM Tool

- FHCA Map
- Risk Drivers
- Proposed Mitigation Projects
- Prioritization
- Expected Effectiveness / RSE Goal
- Asset Data

Confirm

Wildfire Safety Eng. Scoping

Develop High Level Scope / Documentation For Review

Form 068F or 349F
Circuit Map & .KMZ Map

DEEP DIVE NEXT SLIDE

Scope Revisions

Scoping Review

ONE 4-HOUR MEETING PER MONTH

Operations — Area Planning — Field Engineering

50 line-miles / month (avg.)

Scope Approved

Approved Project

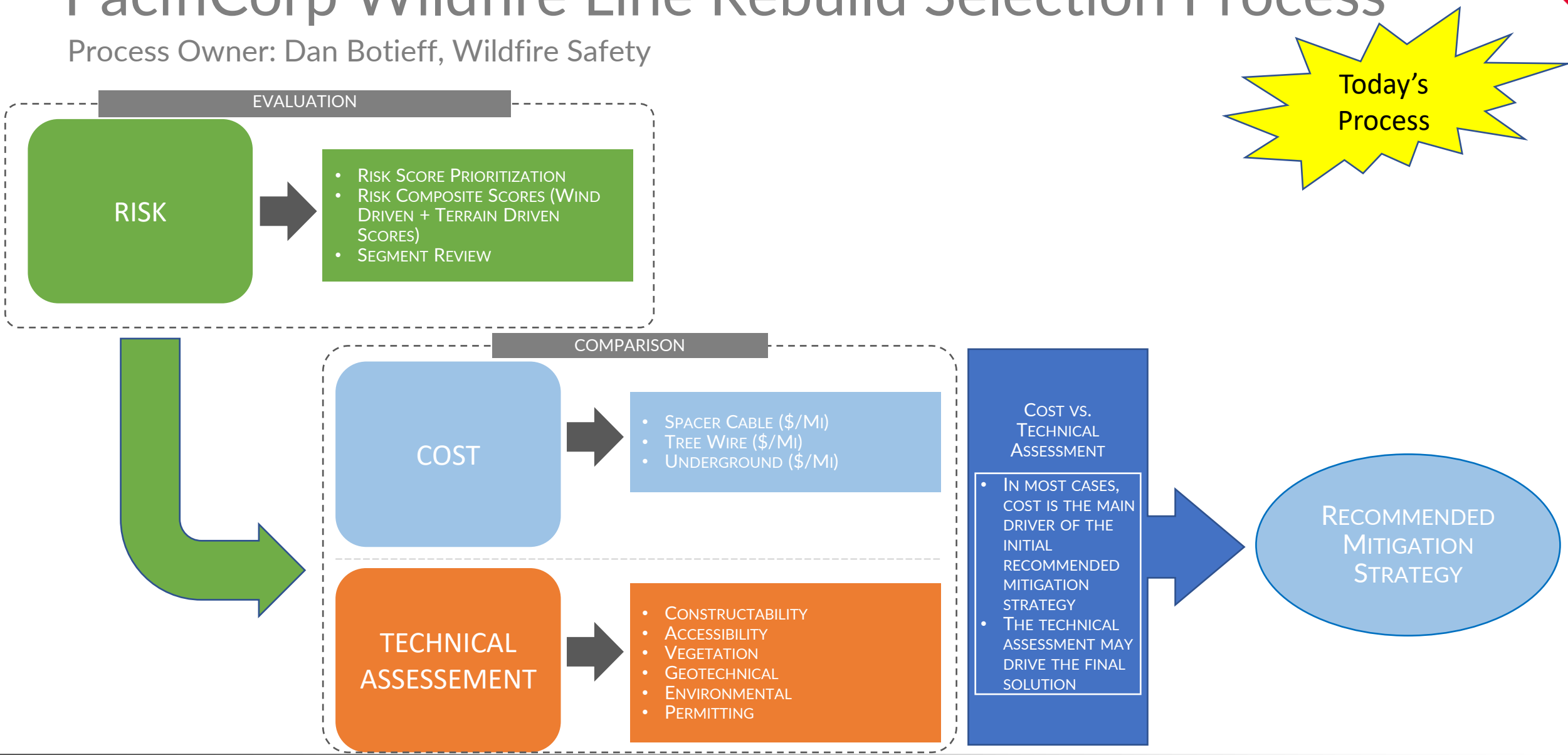
Develop Project Scoping Package For External Contractor

PMO

WS Engineering Scoping Package

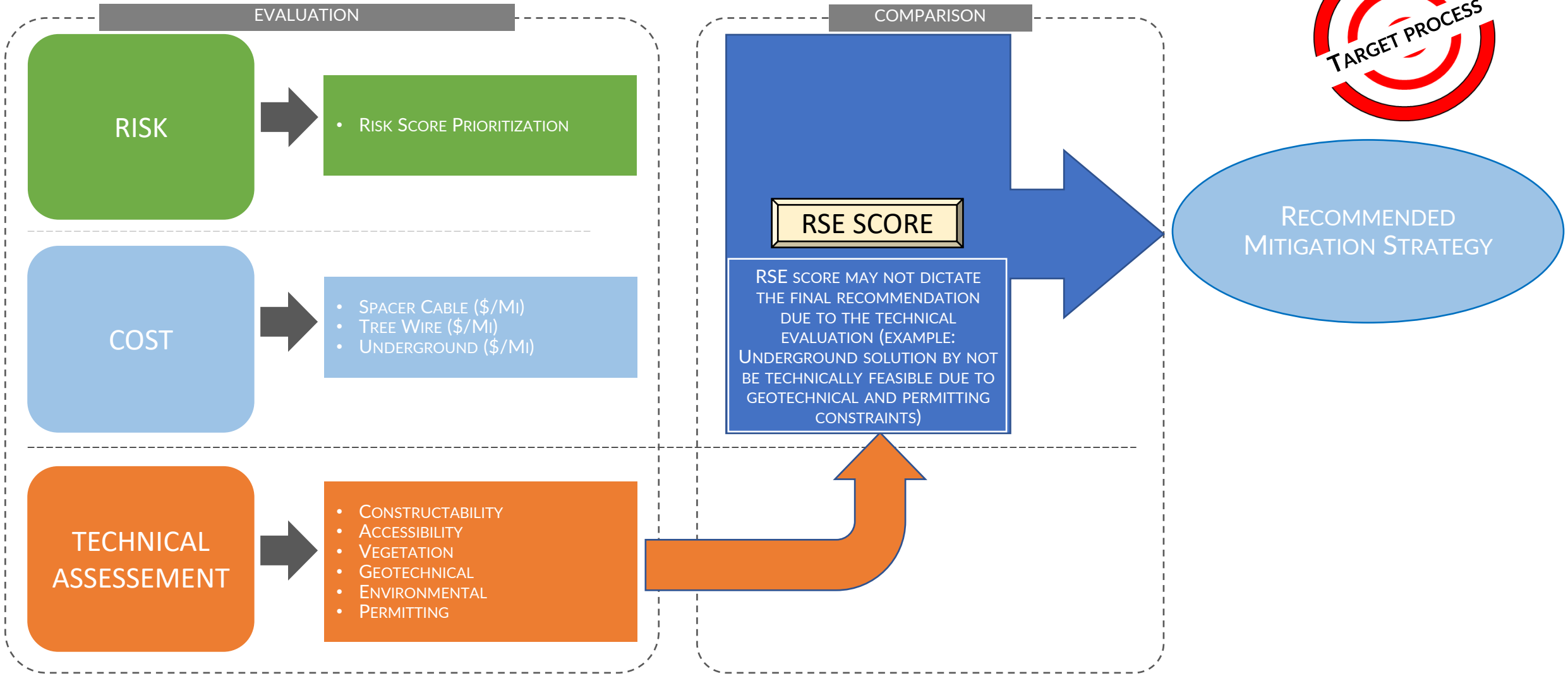
PacifiCorp Wildfire Line Rebuild Selection Process

Process Owner: Dan Botieff, Wildfire Safety



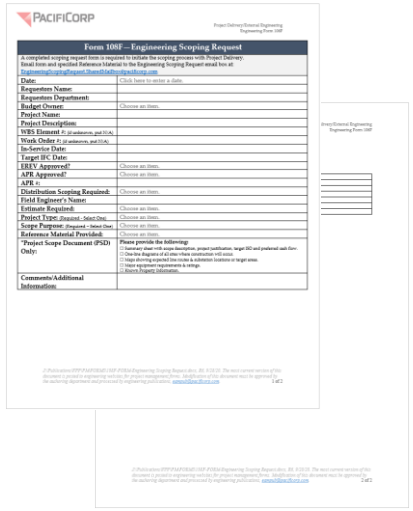
PacifiCorp Wildfire Line Rebuild Selection Process

Process Owner: Dan Botieff, Wildfire Safety

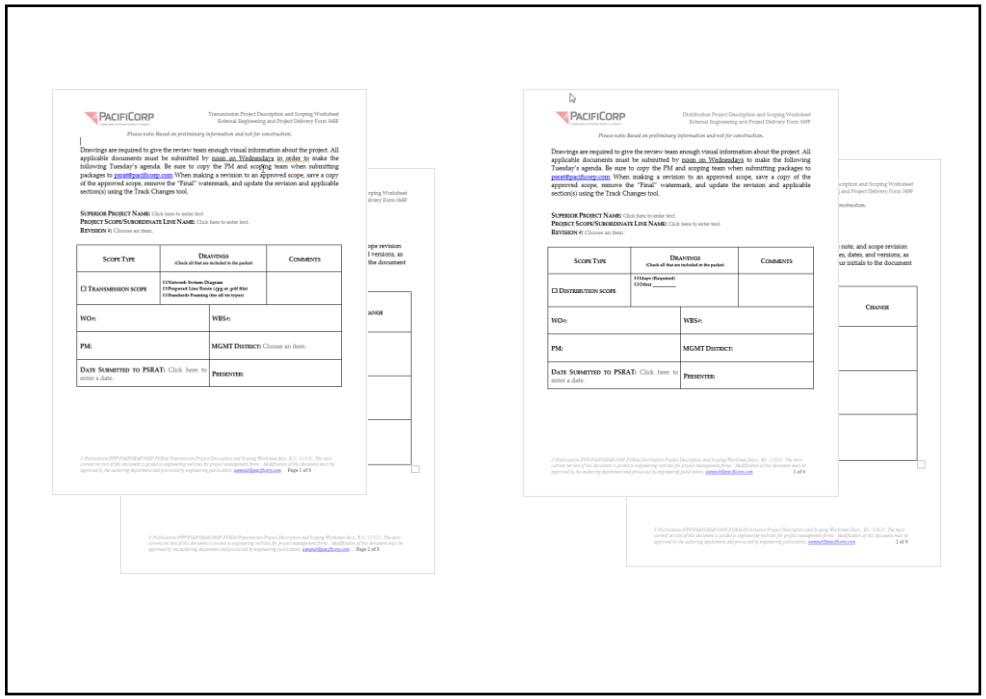


PacifiCorp Wildfire Line Rebuild Scoping Documentation

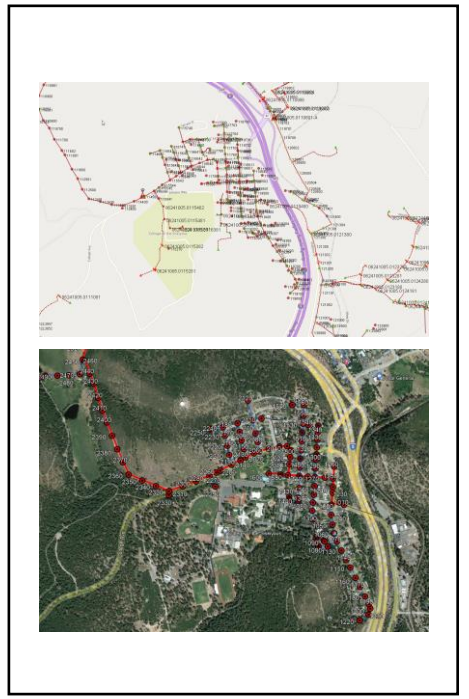
Process Owner: Dan Botieff, Wildfire Safety



FORM 068F (TRANSMISSION ONLY) OR FORM 349F (DISTRIBUTION WITH OTHER DISCIPLINES)

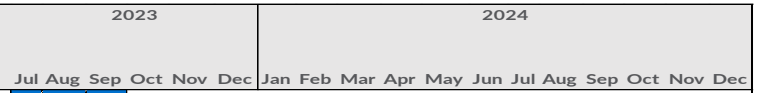


FORMS WITH CIRCUIT MAP AND .KMZ FILE



Schedule Update

Status	Planning/ Operations	Initiative	What Is Different When Completed?	Scope	Current Stage	Reason for Yellow/Amber Status
1	P	FireSight, including Risk Spend Efficiency (RSE) Model	This will implement planning module, to support identification of mitigations and their risk reduction benefit relative to	FHCA	Development	N/A
2	P	Expansion of Service Territory Modeled in WRRM	WRRM modeling of wildfire risk covers most of PacifiCorp's service territory.	Entire Service Territory	Development	Yellow due to discussions to update the Technosylva MSA. Have received assurances from Technosylva the domain expansion is being processed and there will be no interruption in service, but will continue to monitor.
3	P	Annual Planning Model Updates	Process in place to update assets, configurations, and other information to keep planning models current	Service Territory	Development	Delivery date has shifted from August to September due to decision to model 24 hours of risk instead of eight hours. This change increases data processing time.
4	P/O	FHCA Assessment	Updates to FHCA areas across PacifiCorp's operating areas.	Service Territory	Requirements	Per guidance from WRGC, have revised schedule to deliver all maps with minimal reviews in Q4 2023. Planning for additional map release in 2024 to reflect feedback from internal stakeholders as maps are used. Project remains yellow due to accelerated 2023 schedule and risks of limited reviews.
5	O	Updates to Internal and External Situational Awareness Websites	Improved user experience, enhanced maps and information for customers, partners, and employees	Service Territory	Development	Contract lapsed and negotiations are still underway. Contract delay has delayed SOW development and execution of planned work.
6	P	Public Safety Power Shutoff (PSPS) Risk Assessment Solution	Implementation of a solution to calculate the PSPS likelihood and consequence to support planning processes.	California	Requirements	Monitoring for resource constraints due to competing priorities such as operational and regulatory data requests.
7	O	WRF Ensemble	Strategically sub-select GEFS members to initialize a multi-member WRF Ensemble deterministic weather	Service Territory	Development	N/A
8	O	GEFS Self Organizing Maps (SOMs) Ensemble Forecast Tool	Build historical SOM node array using ERA5 Reanalysis. Build an automated GEFS SOM node association framework	Service Territory	Development	N/A
9	P	Annual Mitigation Selection Planning Process	Updated process to integrate new planning tools to support selection of mitigation programs and projects	FHCA	Planning	N/A
10	O	Data Lake for Wildfire and Weather Data	Historical and daily forecast data and conditions accessible to other departments in PacifiCorp and BHE for departments to use data, build models, and machine learning tools with	Service Territory	Execution	N/A
11	O	Bias-corrected WRF Forecast	Machine learning models to bias correct the WRF forecast for Pacific Power Weather Stations, RAWS, and other relevant weather stations.	Service Territory	Execution	N/A
12	O	Quarterly Update of Asset Data	FireCast and FireSim has the current asset information to model risk for situational awareness	Service Territory	Planning	N/A
13	P	Implement Fire Incident Tracking Database	Centralized solution and standardized process to track fire incidents	Service Territory	Planning	N/A



Forward Looking Projects / Topics

Objective: Solicit Feedback on Proposed Projects / Topics / Next Meeting

- Proposed Topics:
  - ~~INFORM: RSE – Methodology and Planned Business Use (August)~~
  - INFORM: FHCA Map Updates (September)
  - INFORM: Updated Fire Incident Tracking Process & Tool (September/October)
  - INFORM: Terrain/Fuel Type, Circuits of Concern, and FHCA Zones/Tiers/Areas (October)
  - INFORM: PSPS Risk Model (October)
- Meeting Frequency / Next Meeting
- Feedback on Structure / Content / Attendees

WILDFIRE SAFETY & ASSET MANAGEMENT

WILDFIRE SAFETY

ASSET RISK

ASSET MANAGEMENT

Thank You!

PACIFICORP

WILDFIRE SAFETY & ASSET MANAGEMENT

WILDFIRE SAFETY

ASSET RISK

ASSET MANAGEMENT

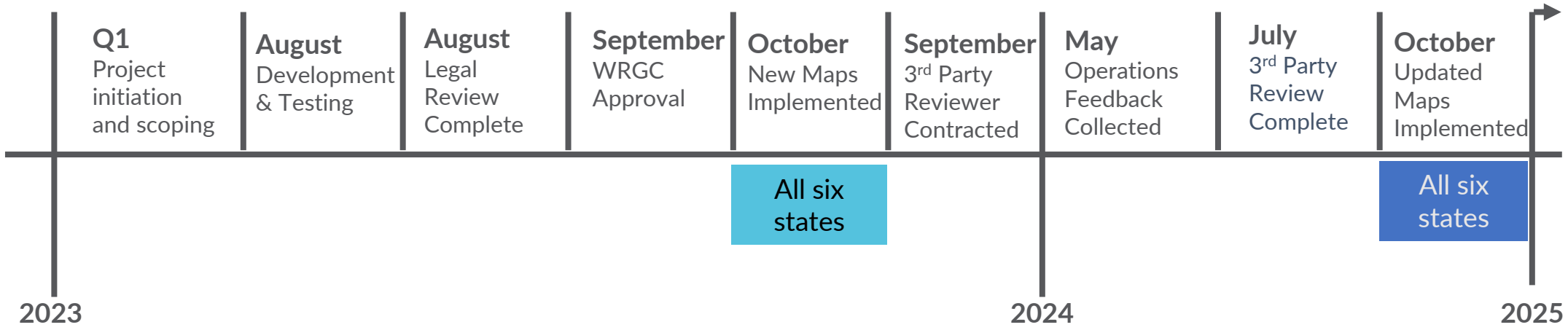
Appendix

PACIFICORP

FHCA Timeline Update

PacifiCorp

Revised FHCA Schedule



Revised FHCA schedule reflects direction from WRGC to accelerate implementation of maps for all six states to 2023.
This revised approach will implement maps in 2023 with minimal review with feedback solicited from operations for potential adjustments in 2024.

Meeting Notes
Wildfire Risk Governance Committee
October 24, 2023

Attending: Kevin Benson, Allen Berreth, Megan Buckner, Amy McCluskey, Chris Spencer, Jordan Pino, Alex Vaz, Robbie Marshall, Yesh Suryadevara, Tim Clark, Steve Vanderburg, Thomas Eide

1. Update on Approach Based on Feedback from October 12 Meeting:
    - Reduced buffer to 50 feet. This aligns with utility right of way
    - With change in approach to buffer, removal of urbanized areas and removal of bodies of water is unnecessary
    - No change to composite risk calculation or level of granularity
    - No chain to selecting a circuit segment for inclusion in a FHCA class: Wind Driven or Fuels/Terrain Driven composite score meets the threshold
    - No change to class thresholds
    - The numbers of circuits, line miles etc. are still being run. It takes approximately 17 days to run.
2. Reminders of approach:
    - Focus is on the consequence of the fire
    - Consequence is based on an 8-hour simulation of the wildfire
    - Consequences presented in the slide are a range
3. Results of modeling
    - Seeing in the distribution curves where the consequences are climbing and then flattening out. When the data crunching is complete for 50-foot buffers, expect to see the steep climb move to the left
    - With the initial proposed 10,000-meter buffer a lot of circuits and areas that do not meet the threshold. With a 50-foot buffer, the FHCA aligns more closely with where the system risk is.
    - FHCA area shifts from large swathes or area to more linear view. This is consistent with how some of the California utilities are mapping their areas of risk
4. Business Decisions to Consider
    - How to address circuits that have segments that difference in FHCA class or are not in a FHCA class. Is the entire circuit moved up to the highest class on the circuit or address at a lower level?
    - Is 0.45 the appropriate lower boundary for FHCA classes? This is a risk tolerance consideration for leadership.
5. Questions:
    - Are the consequences presented the boundaries to define a class or represent the results of the modeling?
      They represent the results of the modeling
    - What is the unit of measure for rate of spread?
      The unit of measure is chains. 1 chain=66 feet. 1mph=88 chains
    - Should a circuit move in and out of a risk class i.e.: Go from Class 3 to Class 2 and back to Class 3 as it moves through terrain?

There may be some cases where this happens, but based on the composite risk attributes and weightings may not happen often

- Is UG circuit included or excluded?
  Model included UG circuits
- How does the FHCA compare to Circuits of Concern?
  Can do comparison, but important to remember that FHCA and Circuits of Concern are looking at different things:
  Circuits of Concern looks at any circuit that under any conditions could have a risk of ignition. This is used for daily operations as Meteorology reviews the forecast to quickly identify the circuits that could be a concern based on the conditions.
  FHCA represents long term risk and consequence under certain weather conditions.
- Why are there areas where there have been catastrophic fires that are not in the FHCA?
  The FHCA is intended to identify where the area of highest risk area is, with the recognition that there is risk across much of PacifiCorp's service territory. An analogy is "Tornado Alley" in the middle of the United States is where tornados are most frequent and most severe, it does not mean that tornados will not occur in other locations, simply that the alley is where the most risk is. The FHCA is similar in identifying where the area of highest risk is.
  The FHCA is intended to identify the areas of risk under certain conditions to help prioritize mitigation planning.
- Who decides if the FHCA maps and classes are approved?
  It is a PacifiCorp leadership decision

6. Next Steps:
   - Update breakpoints and curves with 50 boot buffer results
   - Update asset statistics / breakdown
   - "Rounding Up" asset options for operational decision making
   - Provide data on overlap with Existing FHCA
   - Overlap (or lack thereof) with previous fire history / events
   - Plot with previous ignitions reported / known
   - Provide idea of scaling program costs for increase in FHCA
   - List of circuits to compare circuits of concern with circuits in each FHCA class
   - Send updated draft maps to attendees. Attendees to review and provide feedback

Wildfire Risk Governance Committee (WRGC)






Agenda

15:00 – 15:05	Review Meeting Agenda	Kevin Benson
15:05 – 16:00	Inform: RSE	Jordan Pino/Dan Botieff
16:00 – 16:40	Inform: Fire Incident Tracking/Reporting	Kevin Benson
16:40 – 16:50	Delivery Status Review	Melissa Swenson
16:40 – 16:50	Future Meeting Topics & Closeout	Kevin Benson






Inform: RSE

PacifiCorp

Risk Spend Efficiency (RSE) – Overview

Objective: provide an update on the risk spend efficiency (RSE) methodology and show how the scores will be used in real-time by the team.

- Partnering with Technosylva, they have developed a tool called **FireSight** which will allow the team to test different mitigation strategies and output a risk spend efficiency/store projects (**screenshots of tool later**).

- Important Acronyms/Terms:
  - **R**isk **S**pend **E**fficiency (RSE)
  - **F**ire**S**ight = application developed by Technosylva to view/play with different mitigations/output RSE values.

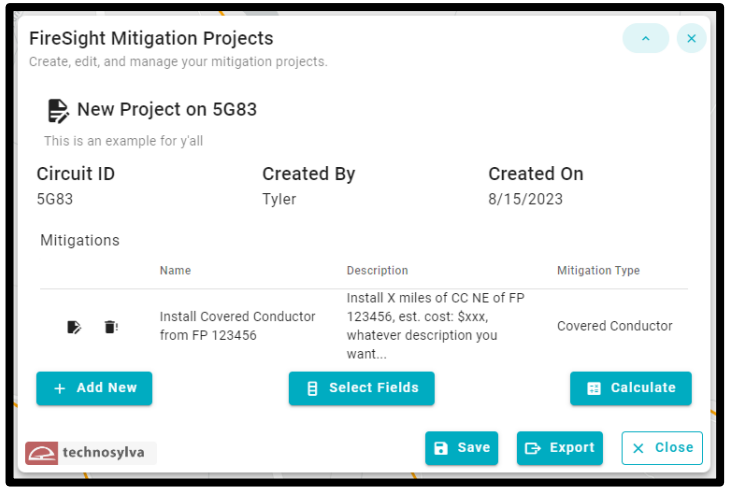


***Figure 1**: FireSight screenshot.*

Risk Spend Efficiency (RSE) – Methodology (illustrative example)

Overview: the risk spend efficiency (RSE) values are calculated using a number of inputs.

- The equation for RSE is below:

$$\text{RSE} = \frac{\text{NPV(Risk Reduced)}}{\text{NPV(Cost)}}$$

$$\text{Risk Reduction} = (Risk_b - Risk_m)$$

$Risk_b$ = baseline risk (no mitigation).

$Risk_m$ = mitigated risk with **effectiveness** (key limitations on next slide).

Cost = provided by PacifiCorp SMEs (key limitations on next slide).

❑ **Example Calculation:**

- **Circuit** = 5G23 (~ 96 miles); Yreka
- **Mitigation** = Covered Conductor (60% effectiveness)
- **Risk** = acres burned
- **Cost** (per mile) = $770,000 (from PacifiCorp SMEs)

$Risk_b$ = 2,221 Cost = $770,000 x 96 (miles) ($73,920,000)

$Risk_m$ = 1,332

Risk Reduction = 15,919.86

- **RSE** = 15919.86 / 73.92 = **215**

Risk Spend Efficiency (RSE) – Assumptions + Limitations

Overview: there are certain key assumptions and limitations in the RSE calculations presently. They are listed below:

1. **Mitigation Effectiveness**: effectiveness involves multiple assumptions and may be based heavily on subject matter expertise and data availability.
   - ✓ We have a plan in place to tackle this limitation (next slide).
2. **Costs**: variations in costs are influenced heavily by factors like labor availability, resources, legal, and environmental challenges.
   - ✓ We have a plan in place to tackle this limitation (next slide).
3. **Useful Life**: the longevity of a mitigation's benefit requires certain assumptions.

Risk Spend Efficiency (RSE) – Future Effectiveness + Costs

Overview: in order to better capture effectiveness and cost inputs associated with RSE, we plan to increase their robustness to better capture their variations and thus increase the overall accuracy of RSE.

(1) Effectiveness[1] Value Improvements

- ✓ **Risk Driver Reductions**
  - Gather historic outage data before/after a mitigation installation to better quantify effectiveness.
  - Separate effectiveness for each mitigation based on risk drivers (for example, vegetation contact vs wind outage).
- ✓ **Internal Discussions with Subject Matter Experts**
  - Work with internal SMEs to refine effectiveness assumptions.

(2) Mitigation Cost Value Improvements

- ✓ **Capture Avoided O&M, VM, Enhanced Maintenance/Inspections**
- ✓ **Compare Full-Life Cycle Costs w/without Hardening**
- ✓ **Create Mitigation Cost "Buckets"**
  - Capture unique environmental costs associated with certain mitigations.

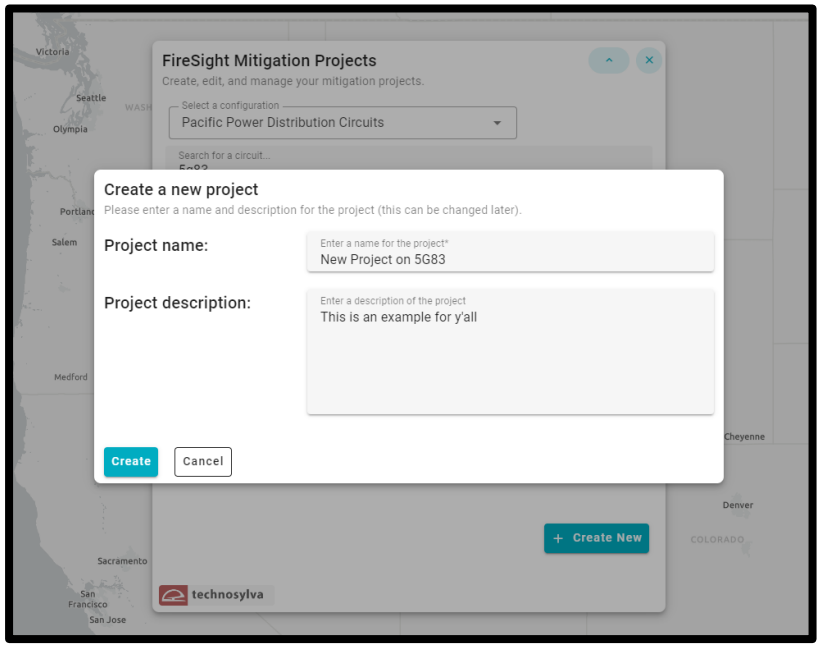
[1]*Current effectiveness is estimated/assumed based on best available information and benchmarking with other utilities.*

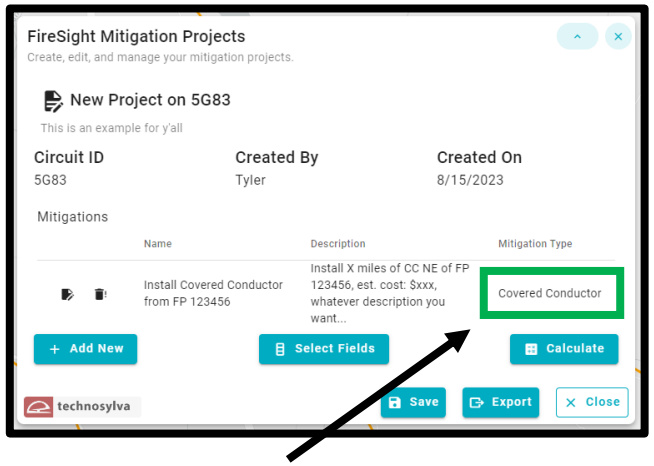
Risk Spend Efficiency (RSE) – FireSight

Tool not available to us yet, in testing.

Overview: FireSight is an application developed by Technosylva to visualize risk across our territory and to select mitigation projects and their corresponding RSE values/risk reduction.

Create New Mitigation Project





Select the Mitigation

Select WRRM Variable(s) to Perform Effectiveness On

technosylva

Power Delivery Wildfire Scoping Framework

Framework Owner: Dan Botieff, Wildfire Safety

The **Power Delivery Wildfire Mitigation Scoping Framework** will leverage a consistent approach in alignment with the system-wide risk assessment methodology but ensure stakeholder input and a holistic view of investment

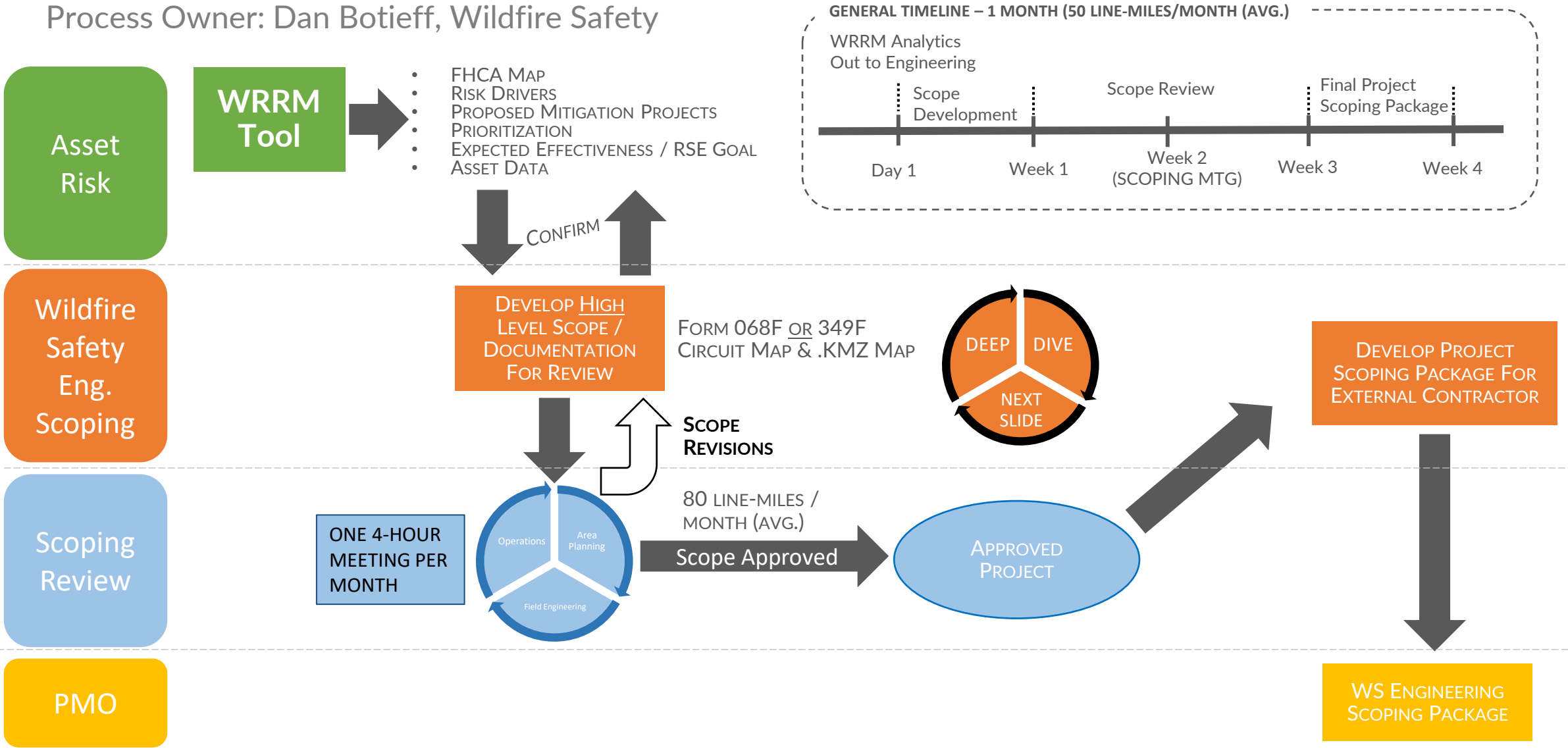
This Framework Requires that Projects Scopes:

- Mitigate wildfire risk
- Consider input from all stakeholders
- Align with the risk-assessment methodology
- Are clearly documented with stakeholder sign-off
- Are constructable
- Are prioritized based on risk as much as practical
- Align with regulatory filings / recovery strategy

Consistent Framework ≠ Identical Answer

PacifiCorp Wildfire Line Rebuild Scoping Process

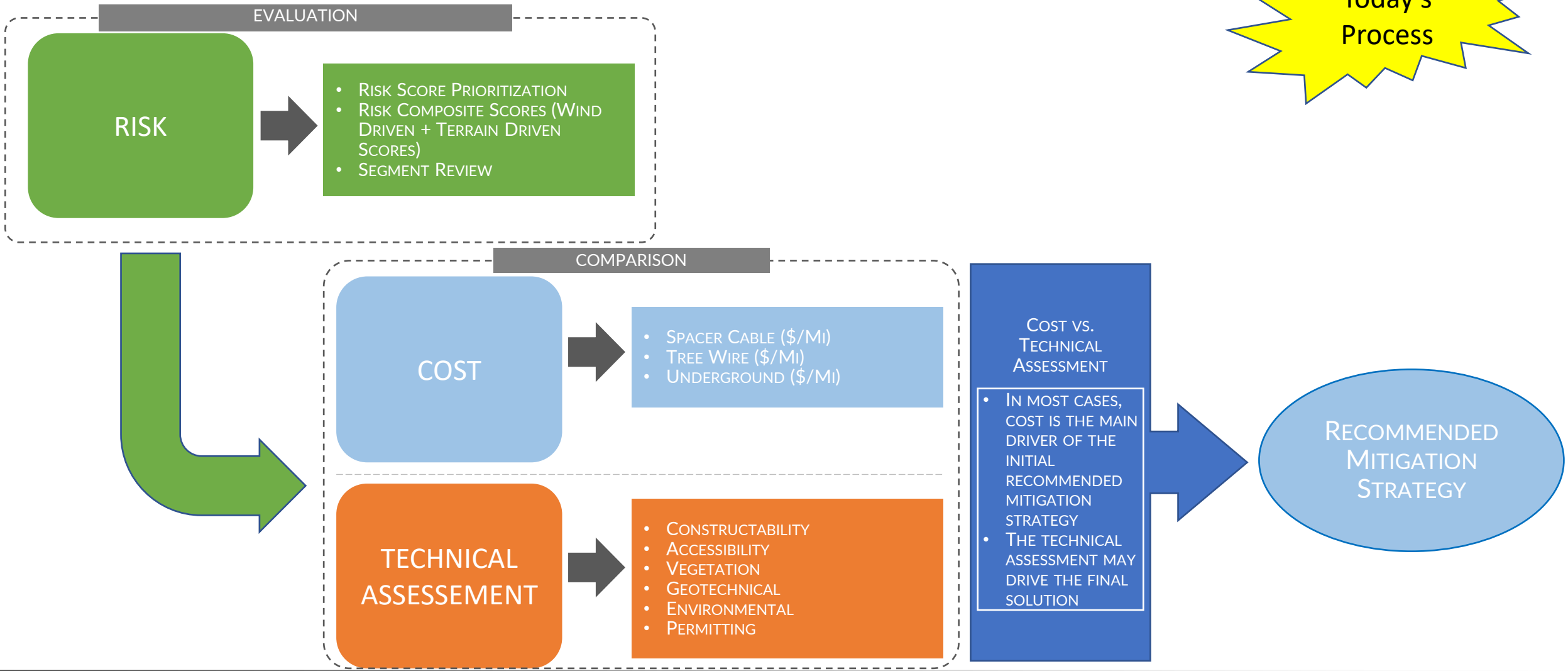
Process Owner: Dan Botieff, Wildfire Safety



PacifiCorp Wildfire Line Rebuild Selection Process

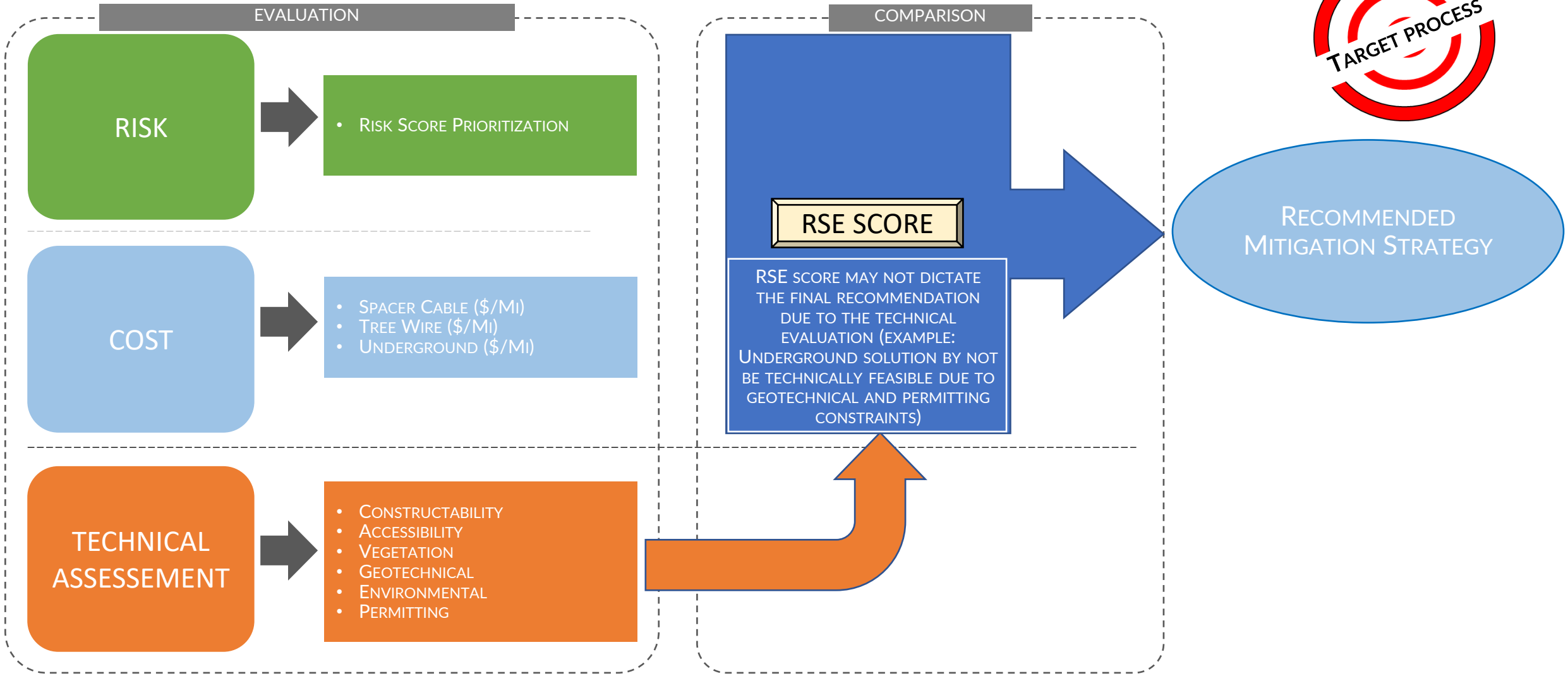
Process Owner: Dan Botieff, Wildfire Safety

Today's Process



PacifiCorp Wildfire Line Rebuild Selection Process

Process Owner: Dan Botieff, Wildfire Safety

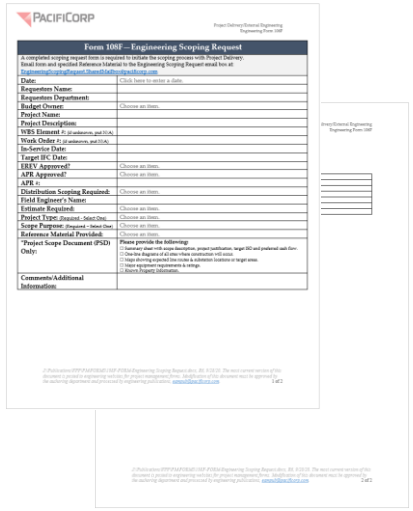


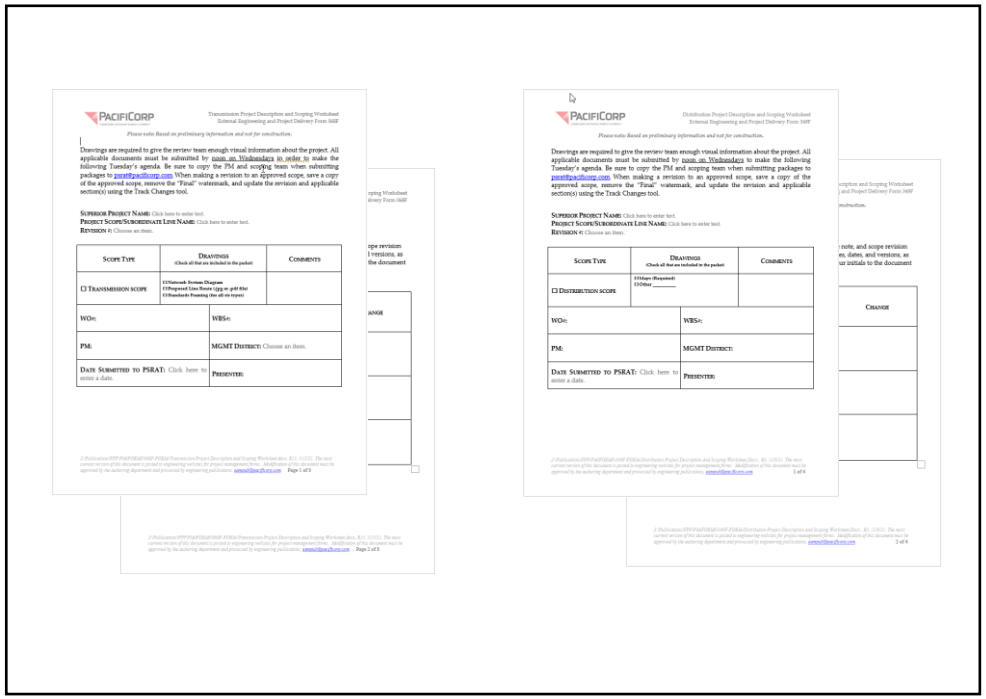
PacifiCorp Wildfire Line Rebuild Scoping Documentation

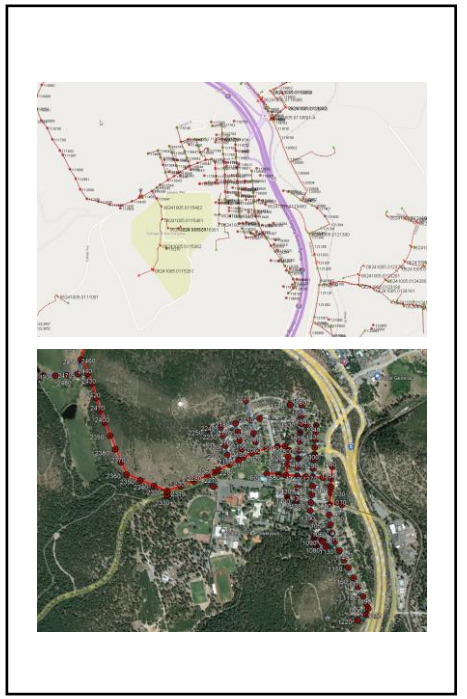
Process Owner: Dan Botieff, Wildfire Safety

FORM 068F (TRANSMISSION ONLY) OR FORM 349F (DISTRIBUTION WITH OTHER DISCIPLINES)

FORMS WITH CIRCUIT MAP AND .KMZ FILE







Updated Fire Incident Reporting

PacifiCorp

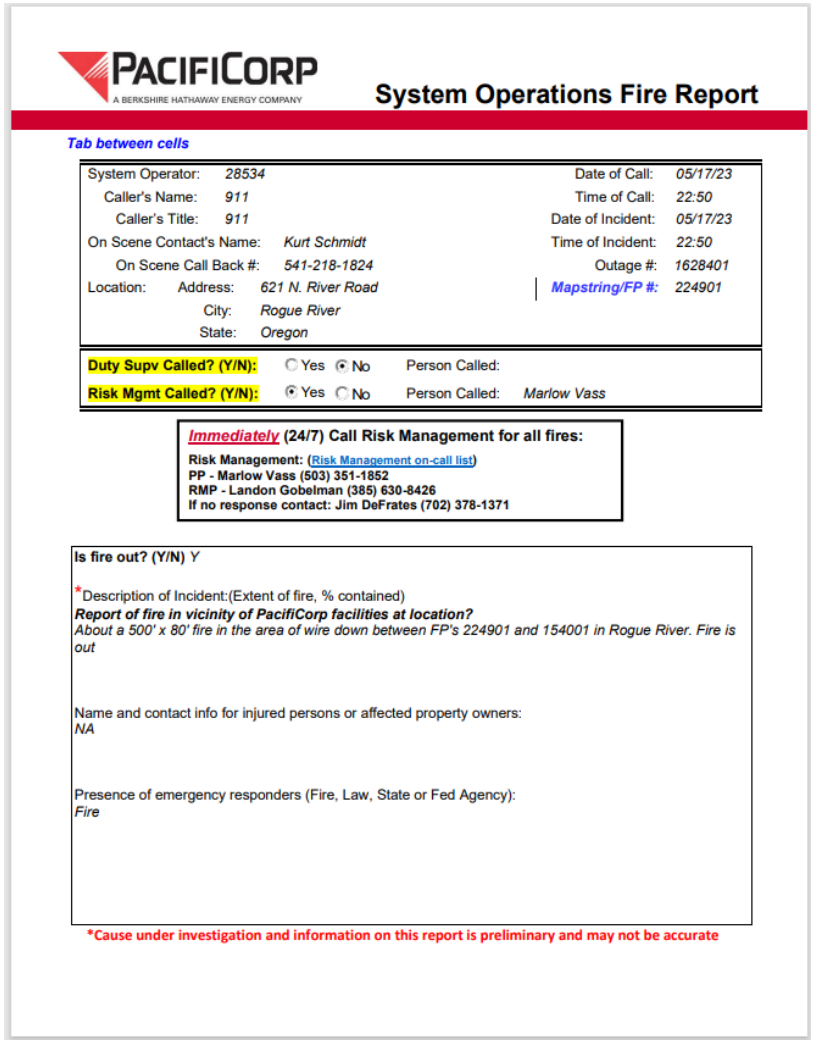
Fire Incident Tracking and Reporting

Business Objective: Process improvement to streamline and obtain additional information for quality reporting and internal tracking

Basis:

- Current process relies on manual data collection and follow-up with individuals
- Information on existing forms is commonly incomplete or ambiguous
- Data collected through existing process insufficient for regulatory reporting and internal analysis for risk mitigation
- Current file library not useful for data analysis

Current Reporting Process



PACIFICORP
A BERKSHIRE HATHAWAY ENERGY COMPANY

System Operations Fire Report

Tab between cells

System Operator:	28534	Date of Call:	05/17/23
Caller's Name:	911	Time of Call:	22:50
Caller's Title:	911	Date of Incident:	05/17/23
On Scene Contact's Name:	Kurt Schmidt	Time of Incident:	22:50
On Scene Call Back #:	541-218-1824	Outage #:	1628401
Location: Address:	621 N. River Road	Mapstring/FP #:	224901
City:	Rogue River		
State:	Oregon		

Duty Supv Called? (Y/N): ○ Yes ◉ No Person Called:

Risk Mgmt Called? (Y/N): ◉ Yes ○ No Person Called: *Marlow Vass*

Immediately **(24/7) Call Risk Management for all fires:**

Risk Management: (Risk Management on-call list)
PP - Marlow Vass (503) 351-1852
RMP - Landon Gobelman (385) 630-8426
If no response contact: Jim DeFrates (702) 378-1371

Is fire out? (Y/N) *Y*

*Description of Incident:(Extent of fire, % contained)
Report of fire in vicinity of PacifiCorp facilities at location?
About a 500' x 80' fire in the area of wire down between FP's 224901 and 154001 in Rogue River. Fire is out

Name and contact info for injured persons or affected property owners:
NA

Presence of emergency responders (Fire, Law, State or Fed Agency):
Fire

***Cause under investigation and information on this report is preliminary and may not be accurate**

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System Operations Fire Report

EMAIL _Risk Save

- Current form that is received for a majority of fires
- Risk Save is occasionally submitted along with the Wildfire Incident Report and/or data points form for OR fires
- Minimal information provided

Current Reporting Process

PACIFICORP | Pacific Power / Rocky Mountain Power

Wildfire Incident Report

Employee Name:	Employee P#:	Date:
Kurt Schmidt	**P29338**	**07/08/2023**

Fire Out?	Employee Call Back Number	Facility Location Reference
YES	**(541) 761-3423**	**01336005.297709**

Approximate Size of Fire

100 percent contained

Fire Response Situation

1920 Cloverlawn
Removed balloon from line , 10' Burnt circle in lawn

Incident GPS Location

Lat/Long: ,
Accuracy: m
Altitude: m

Report Delivered To

SmartForms_GRP@PacifiCorp.com
GPOpsMgrs@pacificorp.com
RiskManagementClaims@PacifiCorp.com

*Cause under investigation and information on this report is preliminary and may not be accurate.

Photo 1

- Minimal information provided
- Occasionally received in addition to the Risk Save

Current Reporting Process

Fire Data:

(Information contained in report is preliminary and may not be accurate, investigation completed at the direction of legal counsel)

Name/Location of Fire: Milton Freewater OR 85032 Hwy 11

Information from contact: spoke with Struckmeier

Risk Save completed? Yes

County: Umatilla

Trans or Distribution: Distribution circuit

Associated voltage: 12kv

Equipment potentially involved with ignition (OH, Pad mount) Subsurface): OH service neutral found down, he didn't know why, didn't know if it was associated with the small fire, it's along the hwy, could have been related to something from a vehicle, but all he found was small fire burned and suppressed and they had to fix the neutral on the ground, he didn't find anything to show why the neutral was on the ground, nor did he know if the wire caused the fire or was the victim of it.

Suspected initiating cause: Fire, from the controlled burn reported on Risk Save but the comments above indicate other opinions. He didn't know what started it, it was in the brush, and not farm land, near brush and beside a creek.

Object comment:

Equipment Failure: primary neutral

Facility contacted: n/a fell to the ground

Contributing factors: 60 cloudy, no rain mentioned

Fire size: small 10ft x 30ft fire

Who detected fire/reported the fire (public, customer, fire dept., employee):

Origin land use: Hwy

Material at origin (grass, trees, building, bushes, gravel, concrete, other, unknown): brush

Suppressed by (customer/public, fire agency, self-extinguished, utility, unknown): fire dept, unknown which one fire dept, local fire, either Umatilla Co or City of Milton Freewater

Fire investigation by: No Investigating agency:

Photos or Smart form? Yes he said he will look for the report.

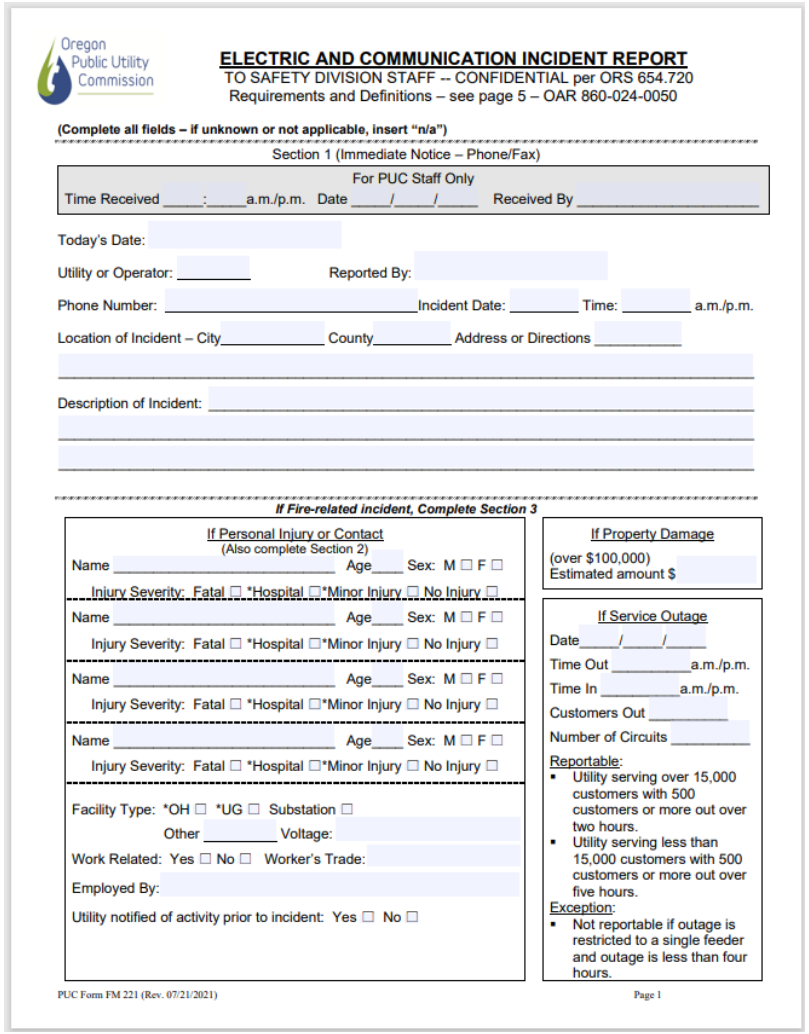
Weather observations: cloudy, no rain.

Reminder to fill out Smart Form!

- Includes additional information
- Only provided for larger fires in Oregon
- Not uniform in responses/comments

Current Reporting Process

FM-221 OR Incident Reporting Form



Oregon Public Utility Commission

ELECTRIC AND COMMUNICATION INCIDENT REPORT
TO SAFETY DIVISION STAFF -- CONFIDENTIAL per ORS 654.720
Requirements and Definitions – see page 5 – OAR 860-024-0050

(Complete all fields – if unknown or not applicable, insert "n/a")

Section 1 (Immediate Notice – Phone/Fax)

For PUC Staff Only
Time Received ____:____a.m./p.m. Date ____/____/____ Received By _____

Today's Date:

Utility or Operator: _____ Reported By:

Phone Number: _____ Incident Date: _____ Time: _____ a.m./p.m.

Location of Incident – City_____ County_____ Address or Directions _____

Description of Incident:

If Fire-related incident, Complete Section 3

If Personal Injury or Contact
(Also complete Section 2)

Name _____ Age____ Sex: M ☐ F ☐
Injury Severity: Fatal ☐ *Hospital ☐*Minor Injury ☐ No Injury ☐

Name _____ Age____ Sex: M ☐ F ☐
Injury Severity: Fatal ☐ *Hospital ☐*Minor Injury ☐ No Injury ☐

Name _____ Age____ Sex: M ☐ F ☐
Injury Severity: Fatal ☐ *Hospital ☐*Minor Injury ☐ No Injury ☐

Name _____ Age____ Sex: M ☐ F ☐
Injury Severity: Fatal ☐ *Hospital ☐*Minor Injury ☐ No Injury ☐

Facility Type: *OH ☐ *UG ☐ Substation ☐
Other _____ Voltage:
Work Related: Yes ☐ No ☐ Worker's Trade:
Employed By:
Utility notified of activity prior to incident: Yes ☐ No ☐

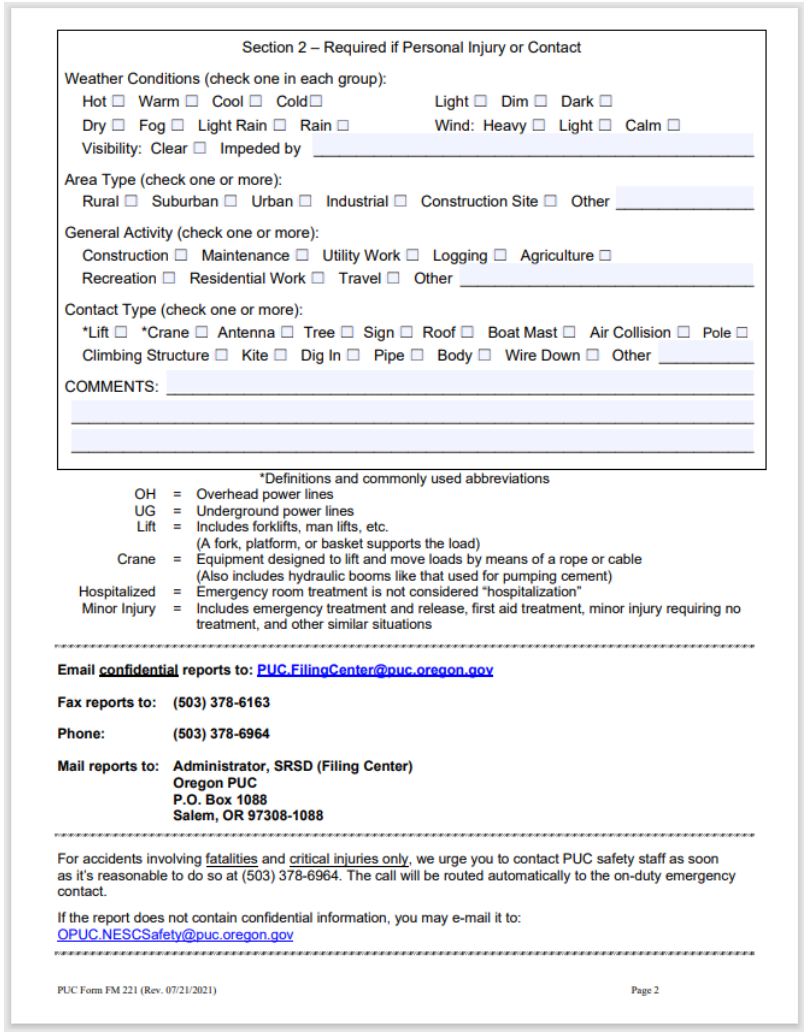
If Property Damage
(over $100,000)
Estimated amount $

If Service Outage
Date____/____/____
Time Out _____a.m./p.m.
Time In _____a.m./p.m.
Customers Out _____
Number of Circuits _____

Reportable:
- Utility serving over 15,000 customers with 500 customers or more out over two hours.
- Utility serving less than 15,000 customers with 500 customers or more out over five hours.

Exception:
- Not reportable if outage is restricted to a single feeder and outage is less than four hours.

PUC Form FM 221 (Rev. 07/21/2021) Page 1



Section 2 – Required if Personal Injury or Contact

Weather Conditions (check one in each group):
Hot ☐ Warm ☐ Cool ☐ Cold☐ Light ☐ Dim ☐ Dark ☐
Dry ☐ Fog ☐ Light Rain ☐ Rain ☐ Wind: Heavy ☐ Light ☐ Calm ☐
Visibility: Clear ☐ Impeded by _____

Area Type (check one or more):
Rural ☐ Suburban ☐ Urban ☐ Industrial ☐ Construction Site ☐ Other _____

General Activity (check one or more):
Construction ☐ Maintenance ☐ Utility Work ☐ Logging ☐ Agriculture ☐
Recreation ☐ Residential Work ☐ Travel ☐ Other _____

Contact Type (check one or more):
*Lift ☐ *Crane ☐ Antenna ☐ Tree ☐ Sign ☐ Roof ☐ Boat Mast ☐ Air Collision ☐ Pole ☐
Climbing Structure ☐ Kite ☐ Dig In ☐ Pipe ☐ Body ☐ Wire Down ☐ Other _____

COMMENTS: _____

*Definitions and commonly used abbreviations

OH	=	Overhead power lines
UG	=	Underground power lines
Lift	=	Includes forklifts, man lifts, etc. (A fork, platform, or basket supports the load)
Crane	=	Equipment designed to lift and move loads by means of a rope or cable (Also includes hydraulic booms like that used for pumping cement)
Hospitalized	=	Emergency room treatment is not considered "hospitalization"
Minor Injury	=	Includes emergency treatment and release, first aid treatment, minor injury requiring no treatment, and other similar situations

Email confidential reports to: PUC.FilingCenter@puc.oregon.gov

Fax reports to: **(503) 378-6163**

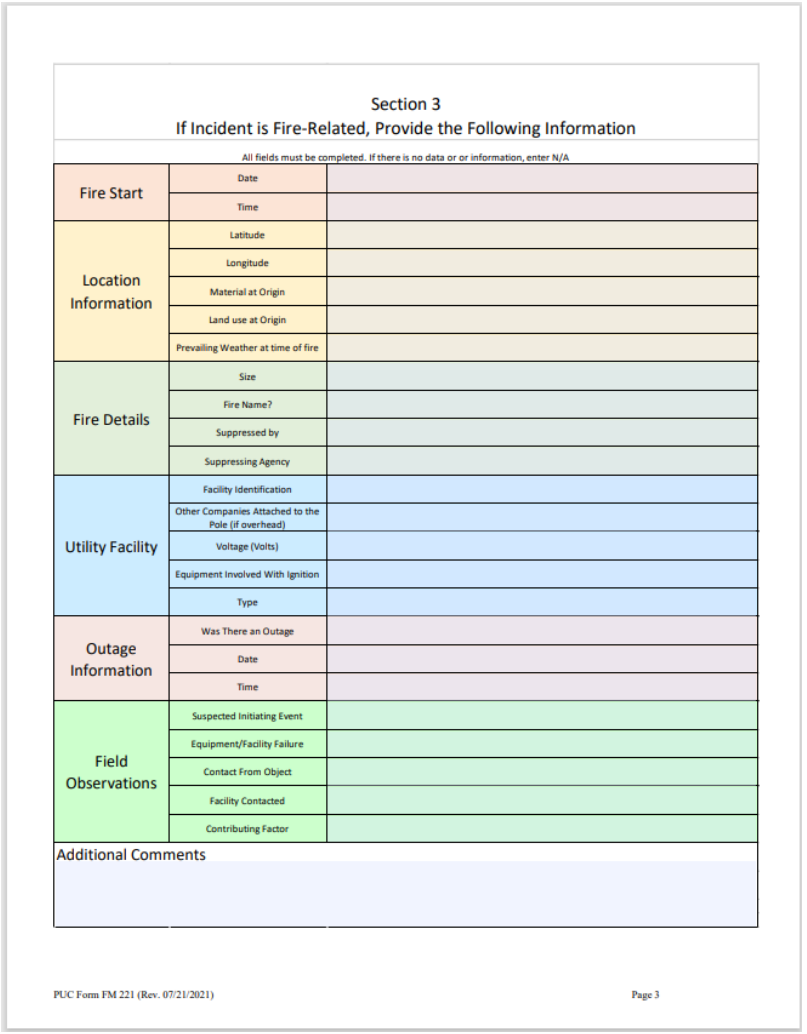
Phone: **(503) 378-6964**

Mail reports to: **Administrator, SRSD (Filing Center)**
Oregon PUC
P.O. Box 1088
Salem, OR 97308-1088

For accidents involving fatalities and critical injuries only, we urge you to contact PUC safety staff as soon as it's reasonable to do so at (503) 378-6964. The call will be routed automatically to the on-duty emergency contact.

If the report does not contain confidential information, you may e-mail it to:
OPUC.NESCSafety@puc.oregon.gov

PUC Form FM 221 (Rev. 07/21/2021) Page 2



Section 3
If Incident is Fire-Related, Provide the Following Information

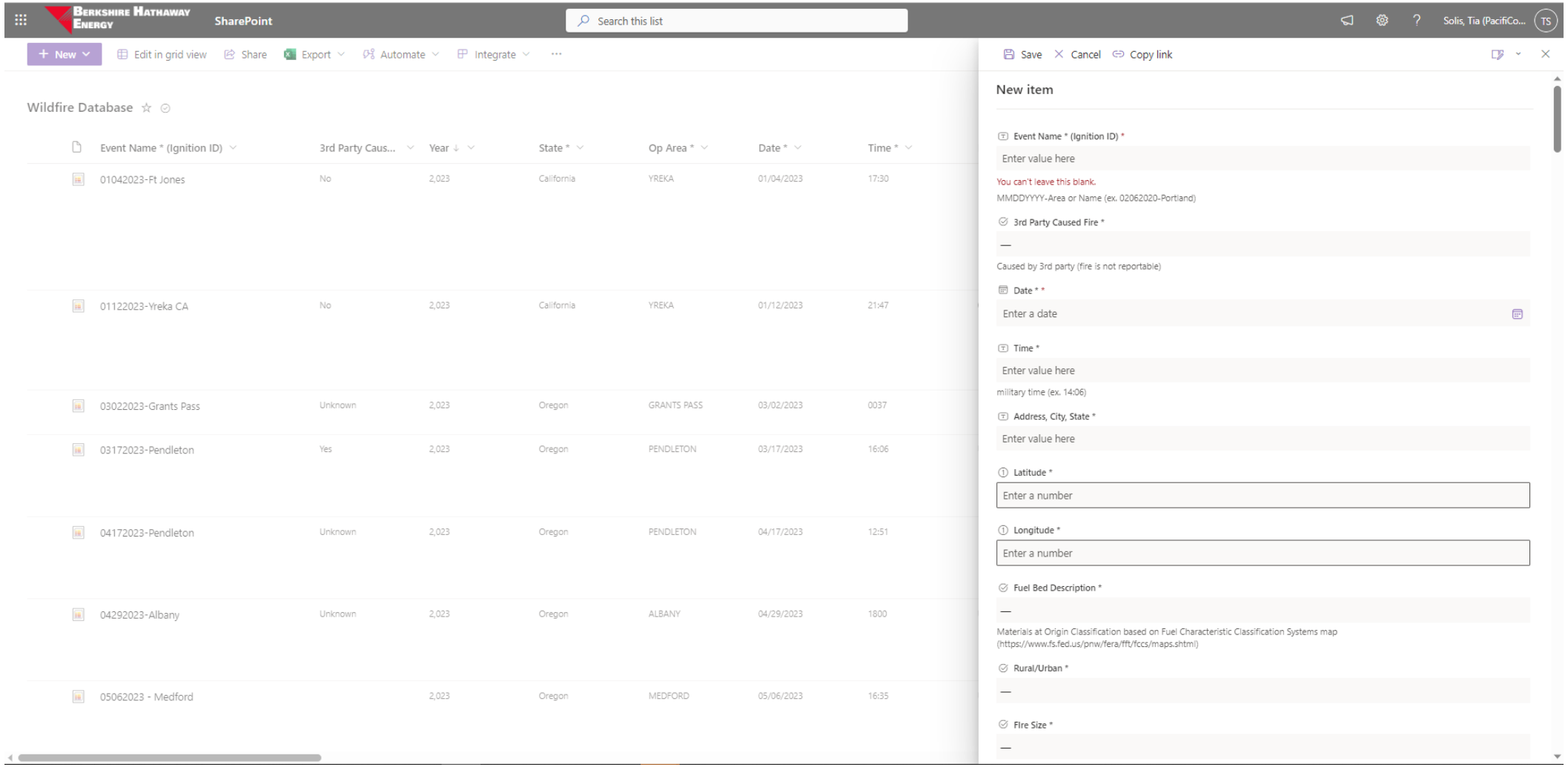
All fields must be completed. If there is no data or or information, enter N/A

Fire Start	Date	
	Time	
Location Information	Latitude	
	Longitude	
	Material at Origin	
	Land use at Origin	
	Prevailing Weather at time of fire	
Fire Details	Size	
	Fire Name?	
	Suppressed by	
	Suppressing Agency	
Utility Facility	Facility Identification	
	Other Companies Attached to the Pole (if overhead)	
	Voltage (Volts)	
	Equipment Involved With Ignition	
	Type	
Outage Information	Was There an Outage	
	Date	
	Time	
Field Observations	Suspected Initiating Event	
	Equipment/Facility Failure	
	Contact From Object	
	Facility Contacted	
	Contributing Factor	

Additional Comments

PUC Form FM 221 (Rev. 07/21/2021) Page 3

Current Tracking Process



Updates & Next Steps

People

Training, leadership updates

Action Items:

- Publish one-page training (Quick Reference Guide) for process step owners
- Perform ILT (recorded for WBT) on overall process and regulatory requirements
- Report project status during future WRGC meetings

Process

Documentation, quality control

Action Items:

- Publish process documentation
- Publish job aids
- Assign and confirm ownership of process steps
- Conduct quarterly audits of new fire incident data
- Develop process to include fire incident analysis in wildfire mitigation programs and models
- Continue process reviews for future improvement

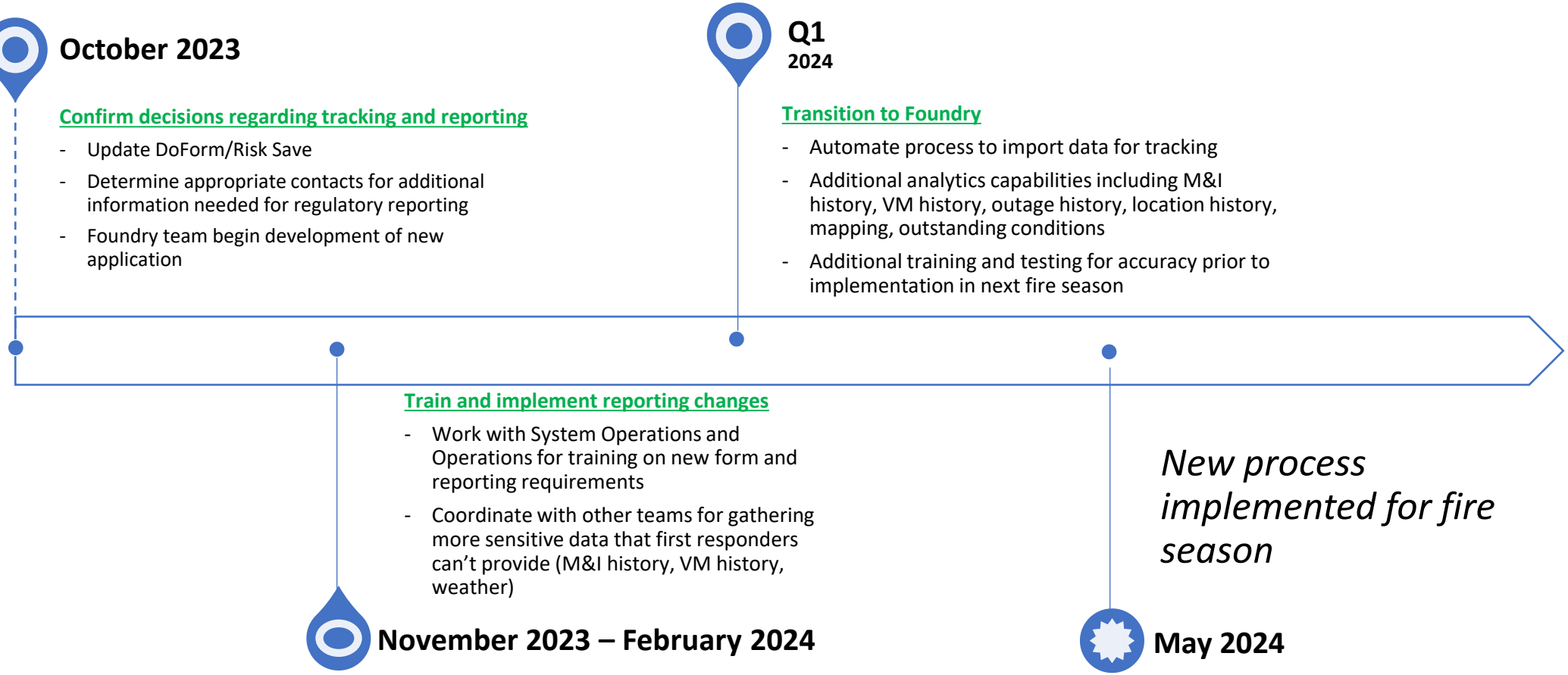
Technology

Updated forms, new analytics tool

Action Items:

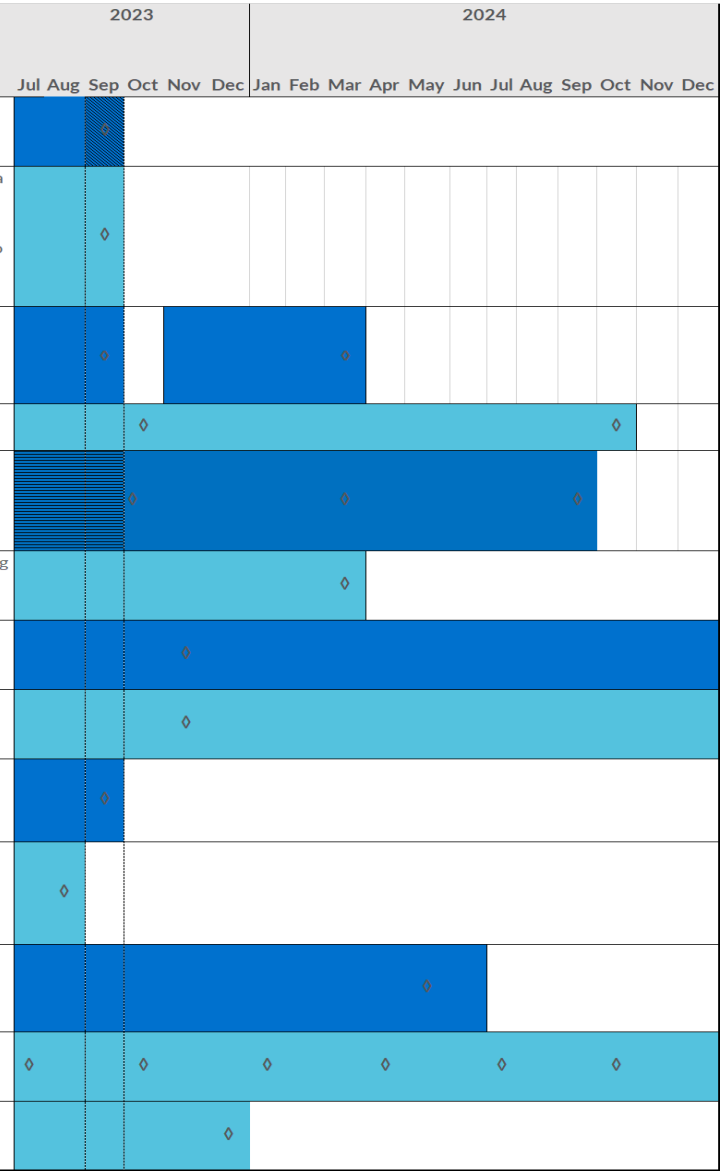
- Update and consolidate DoForm/Risk Save
- Deploy new Fire Incident Analytics Tool (FIAT) in Foundry
- Conduct periodic reviews for feedback and improvement

Fire Incident Tracking and Reporting



Delivery Status Review

Status	Planning/ Operations	Initiative	What Is Different When Completed?	Scope	Current Stage	Reason for Yellow/Amber Status
1	P	FireSight, including Risk Spend Efficiency (RSE) Model	This will implement planning module, to support identification of mitigations and their risk reduction benefit relative to	FHCA	Testing	Delay in go live due to issues found during testing.
2	P	Expansion of Service Territory Modeled in WRRM	WRRM modeling of wildfire risk covers most of PacifiCorp's service territory.	Entire Service Territory	Testing	Yellow due to discussions to update the Technosylva MSA. Have received assurances from Technosylva the domain expansion is being processed and there will be no interruption in service, but will continue to monitor.
3	P	Annual Planning Model Updates	Process in place to update assets, configurations, and other information to keep planning models current	Service Territory	Testing	Delivery date has shifted from August to September due to decision to model 24 hours of risk instead of eight hours. This change increases data processing time.
4	P/O	FHCA Assessment	Updates to FHCA areas across PacifiCorp's operating areas.	Service Territory	Testing	Project remains yellow due to accelerated 2023 schedule and risks of limited reviews.
5	O	Updates to Internal and External Situational Awareness Websites	Improved user experience, enhanced maps and information for customers, partners, and employees	Service Territory	Development	Contract lapsed and negotiations are still underway. Contract delay has delayed SOW development and execution of planned work.
6	P	Public Safety Power Shutoff (PSPS) Risk Assessment Solution	Implementation of a solution to calculate the PSPS likelihood and consequence to support planning processes.	California	Development	Monitoring for resource constraints due to competing priorities such as operational and regulatory data requests.
7	O	WRF Ensemble	Strategically sub-select GEFS members to initialize a multi-member WRF Ensemble deterministic weather	Service Territory	Development	N/A
8	O	GEFS Self Organizing Maps (SOMs) Ensemble Forecast Tool	Build historical SOM node array using ERA5 Reanalysis. Build an automated GEFS SOM node association framework	Service Territory	Development	N/A
9	P	Annual Mitigation Selection Planning Process	Updated process to integrate new planning tools to support selection of mitigation programs and projects	FHCA	Planning	N/A
10	O	Data Lake for Wildfire and Weather Data	Historical and daily forecast data and conditions accessible to other departments in PacifiCorp and BHE for departments to use data, build models, and machine learning tools with	Service Territory	Execution	N/A
11	O	Bias-corrected WRF Forecast	Machine learning models to bias correct the WRF forecast for Pacific Power Weather Stations, RAWS, and other relevant weather stations.	Service Territory	Execution	N/A
12	O	Quarterly Update of Asset Data	FireCast and FireSim has the current asset information to model risk for situational awareness	Service Territory	Planning	N/A
13	P	Implement Fire Incident Tracking Database	Centralized solution and standardized process to track fire incidents	Service Territory	Planning	N/A



Forward Looking Projects / Topics

Objective: Solicit Feedback on Proposed Projects / Topics / Next Meeting

- Proposed Topics:
  - ~~INFORM: RSE – Methodology and Planned Business Use (September)~~
  - ~~INFORM: Updated Fire Incident Tracking Process & Tool (September)~~
  - INFORM: FHCA Map Updates (October)
  - INFORM: Terrain/Fuel Type, Circuits of Concern, and FHCA Zones/Tiers/Areas (October)
  - INFORM: PSPS Risk Assessment Solution (October/November)
  - INFORM: PSPS Seasonal Outlook for Oregon (October/November)
- Meeting Frequency / Next Meeting
- Feedback on Structure / Content / Attendees

WILDFIRE SAFETY & ASSET MANAGEMENT

WILDFIRE SAFETY

ASSET RISK

ASSET MANAGEMENT

Thank You!

PACIFICORP

WILDFIRE SAFETY & ASSET MANAGEMENT

WILDFIRE SAFETY

ASSET RISK

ASSET MANAGEMENT

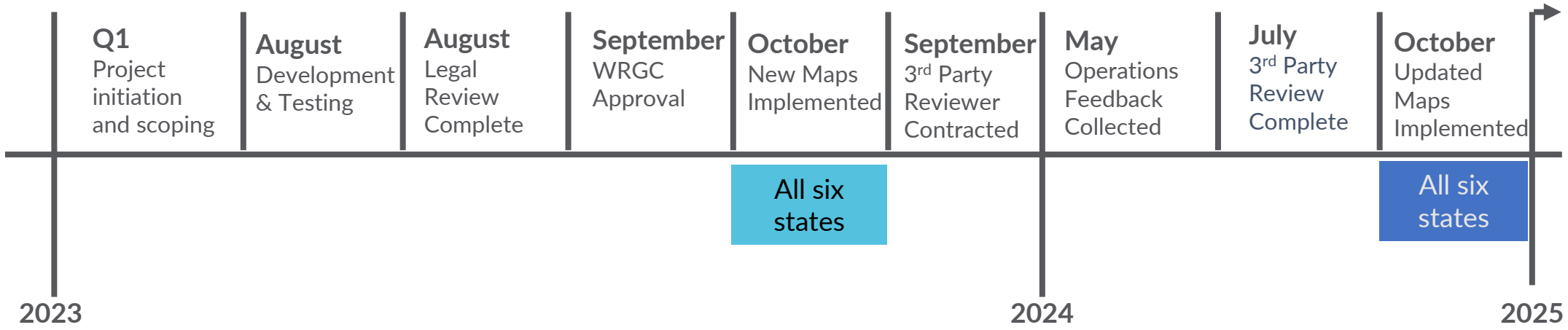
Appendix

PACIFICORP

FHCA Timeline Update

PacifiCorp

Revised FHCA Schedule



Revised FHCA schedule reflects direction from WRGC to accelerate implementation of maps for all six states to 2023.
This revised approach will implement maps in 2023 with minimal review with feedback solicited from operations for potential adjustments in 2024.

Meeting Notes
Wildfire Risk Governance Committee
October 30, 2023

Attending: Kevin Benson, Allen Berreth, Eric Brookhouse, Megan Buckner, Tim Clark, Jon Connelly, Thomas Eide, Robbie Marshall, Amy McCluskey, Jordan Pino, Alex Vaz, Steve Vanderburg

Meeting Slides: W

1. FHCA Map Refresh
   - Reminder of approach taken:
     - Model 50-foot buffers
     - Worst case scenarios presented are based on simulation of eight-hour impacts
     - In developing the FHCAs, focus is on the consequence of a fire
   - Review of alignment of FHCA classes to fire incidents by class.
     - 404 fire incidents in ignition tracking database
     - 35% of the incidents are in the proposed FHCA areas
     - There is a tight correlation of ignitions within the proposed FHCA
   - Results of aggregation of circuits: Approach to round up a circuit to the highest FHCA class at any point along the circuit.
     - Still working on numbers showing the amount of upshifting that is happening (ex: Moving from Class 1->Class 3
     - Discussion:
       - Should lower risk areas be treated as higher risk? It may make sense if there is a lower risk area sandwiched between higher risk areas (ex: circuit segments), but treating an entire circuit as higher risk may not make sense (ex: the ends of a circuit are not in a FHCA)
       - Need to capture transmission lines and FHCA
2. Business Implementation
   - Approach
     - Not all programs will have the same approach to implementation
     - Wildfire Mitigation Program Delivery will work with impacted workgroups to understand current process and unit cost
     - Impacts will include not only the field people who perform the field work but also the resources who plan and package the work
   - Assumptions
     - Grid hardening projects will use the composite risk scores on circuits and circuits segments to identify the circuits that need mitigation
     - Engineers will need business rules (updated one-pager) for consistency
3. Delivery Status Review
   - FireSight (previously WRRM) data delivery, including domain expansion
     - Technosylva is doing the data analysis and checking the results
     - Informed PacifiCorp that delivery of data will be held until the new MSA is completed

    - The MSA has been escalated to BHE who has assigned Legal and Procurement resources to work with Technosylva to finalize the agreement. BHE is moving very quickly and expects to have redlines resolved by November 3.
- FHCA Refresh. In yellow due to expectation of delivering maps by end of October. This work is still ongoing.

4. Questions:

   Q: What does the 50-foot buffer mean for transmission lines?

   A: The 50-foot buffer reflects the right of way and how the fires are modeled in FireSight where the size of the fire area is not universal. The buffer size of the FHCA does not abdicate good business judgment regarding vegetation management and asset inspection

   Q: Why are only 35% of actual ignitions in the FHCA?

   A: The FHCAs are based on the consequence of an ignition and assume that an ignition will occur. This means that 100% of the historical ignitions will not be in a FHCA.

   Q: With aggregation, are there areas close to substations or in developed areas that are in the FHCA?

   A: In general, these areas circuits are not in the FHCA, however, there are some situations where substations or developed areas are in a FHCA because the location presents a risk

   Q: The customer count seems low compared to the increase in line miles in the proposed FHCA?

   A: This is due to the change in the total FHCA area. The 2018 maps have a two-kilometer buffer that will include more area and customers compared to a 50-foot buffer.

   Q: Why does the map still show breaks in the circuit in Utah?

   A: The maps have not been updated to reflect the rounding approach

5. Action Items:
   - Provide data on the line miles that would get added to a FHCA that do not meet the FHCA threshold if the circuits are rounded up to the highest FHCA class along
   - How to discuss the differences and alignment between the 2018 model and the 2023 model and what the thresholds for inclusion are different.
   - Provide unit cost impacts aligned to FHCA areas. Standardize unit costs to cost p/mile for consistency
   - Add transmission pole clearing to impacts

Meeting Notes
Wildfire Risk Governance Committee
December 6, 2023

Attending: Kevin Benson, Allen Berreth, Megan Buckner, Tim Clark, Robbie Marshall, Amy McCluskey, Jordan Pino, Alex Vaz, Chris Spencer

1. FHCA Map Refresh
    - In partnership with GIS have mapped the composite risk scores to one-mile square grids. These one-mile GIS grids are used by the departments the perform inspections and vegetation management to plan and perform their work.
    - In each grid, the highest composite risk score is used to determine if the gird is in an FHCA
    - Recommendation from Asset Risk is that the FHCA be set at 0.65 threshold with a single FHCA area. The 0.65 is the threshold for the Class 2 areas. Also presented data on 0.70 and 0.75 thresholds for discussion.
    - In this scenario, the Class 1 (0.45-0.64) discussed at prior meetings will not be in a FHCA
2. Discussion
    - Need to consider how to address areas with consequential fires that have happened are not in the FHCA.
    - Need to consider how to address the FHCA being set at 0.65 and excluding the Class 1 areas. If the class 1 areas are excluded from the FHCA, recognize that there is still risk there, and that there are mitigations that happen during events such as EFR settings and PSPS to help address the risk
3. Questions

Q: Are there cases where an eligible circuit in a corner of a grid means the entire grid is in a FHCA?
A: There are, but this is not necessarily a new situation. The current FHCA used the same grid so it may pick up similar edge cases.
Q: Why the change from the 50-foot buffer to the grid?
A: There is a system constraint that the one-mile grid in GIS is used for vegetation management and inspections.
Q: What is happening with the current FHCA?
A: Any areas that are in the current FHCA will stay in the new FHCA. Asset Risk will work on a process in 2024 to determine how to remove areas from the FHCA.
Q: How is the alignment of the proposed FHCA to the current FHCA?
A: The Class 3 areas alignment generally with the current FHCA.
Q: What is the alignment of FHCA to fire locations?
A: In general, good alignment, but also recognize the limitation of current tracking processes and that some fires on the map are not wildfires and or significant wildfires.
Q: Does the composite risk data cover all the service territory?
A: The data covers the current FHCA, and some other areas identified by Subject Matter Experts. The expanded domain data will be used for the 2024 update.

4. Action Items:
    - Identify overlap in current and new FHCA (line miles)
    - Definitions of catastrophic fires from other utilities and agencies

- Identify the probability of the worst-case scenario in the FHCA areas at 0.45, 0.65, 0.70, and 0.75
- Quantify the frequency of worst weather days in the Class 1 areas.

Wildfire Risk Governance Committee (WRGC)






October 30, 2023

PacifiCorp

Agenda

14:30-14:35	Review Meeting Agenda	Kevin Benson
14:35-15:30	FHCA Map Updates	Kevin Benson
15:30-15:45	FHCA Implementation	Megan Buckner
15:45-15:55	Delivery Status Review	Melissa Swenson
15:55-16:00	Future Meeting Topics & Closeout	Kevin Benson



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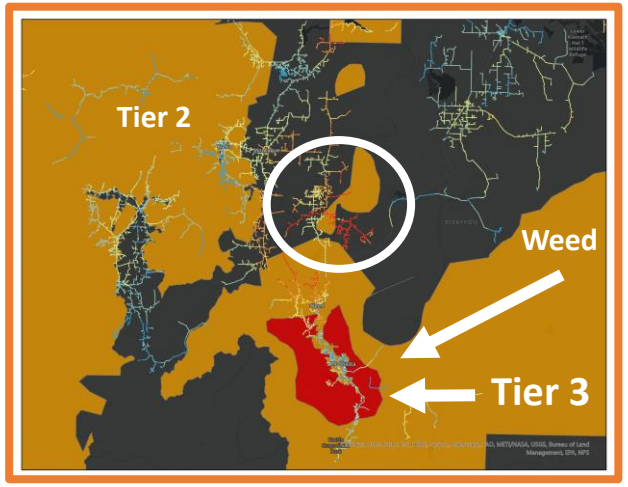
FHCA Updates

PacifiCorp

How Did We Create the New FHCA?

FHCA Map Refresh Methodology:

1. Assume ignition occurs and calculate wind and terrain risk scores per segment.
2. Apply 50’ buffer around each segment and assign highest class from model to each area.
3. **Decision:** Use segment level, ZOP level, or circuit level FHCA designations



For Illustrative purposes only.

Steps to Create Map Areas:	REAX (2018):	Risk Score (2023):
1. Fire Weather Climatology	✓	✓
2. Fire Spread Model	✓	✓
3. Use Risk to Generate Maps	Manual analysis of Steps 1 + 2	Terrain/Wind risk scores[1]
4. Adjustment of Map Areas	Manual adjustment	Automated adjustments via spatial software

FHCA are an input to be used with wildfire risk scores and engineering judgement for mitigation planning

[1] REAX utilized population impacted and property, which our composite captures + more variables.

What Does Each Class Mean?

Class Score Ranges

Class	Wind/Terrain Score Range:
I	0.45 – 0.64
II	0.65 – 0.84
III	0.85 – 1.00

***8-Hour* Worst Case Fire Impacts**

Class	Buildings Destroyed	Rate of Spread	Acres Burned:
I	0-162	1-139	2-16,357
II	0-148	11-139	37-17,966
III	0-174	20-126	168-20,472

- Scores are risk percentiles:
  - .45 means class I covers top 55% of consequential fires
  - .65 for class II covers top 35%
  - .85 for class III covers top 15%

- Consequence/Impact ≠ Fire Size
- **8-hour** fire simulation impacts
- Real fire impacts likely to be larger subject to fire suppression/initial attack

Fire Incident Overlap Statistics

Fire Incident Statistics

Overview: Tables below present spatial statistics for the Fire Incidents.

Statistic:	PP:	RMP:	PacifiCorp:	PP:	RMP:	PacifiCorp:	PP:	RMP:	PacifiCorp:
Number of Fires	40	14	**54**	47	10	**57**	30	3	**33**
Percentage of Total (404)	10%	4%	**13%**	12%	3%	**14%**	7%	0.7%	**8%**

- ✓ There were a total of **404** fires in the Fire Incident database.
- ✓ The fire incidents were plotted with the FHCA Classes (50 ft. buffers) to calculate fire incidents that intersect with the buffered areas.
- ✓ These are counts where the fires overlapped directly within the 50 ft. buffers. There may be other fires just outside the buffer.

Class I | Class II | Class III

FHCA Methodology for Circuit Aggregation

Overview: The schematic below demonstrates how circuit miles were calculated for each Class.

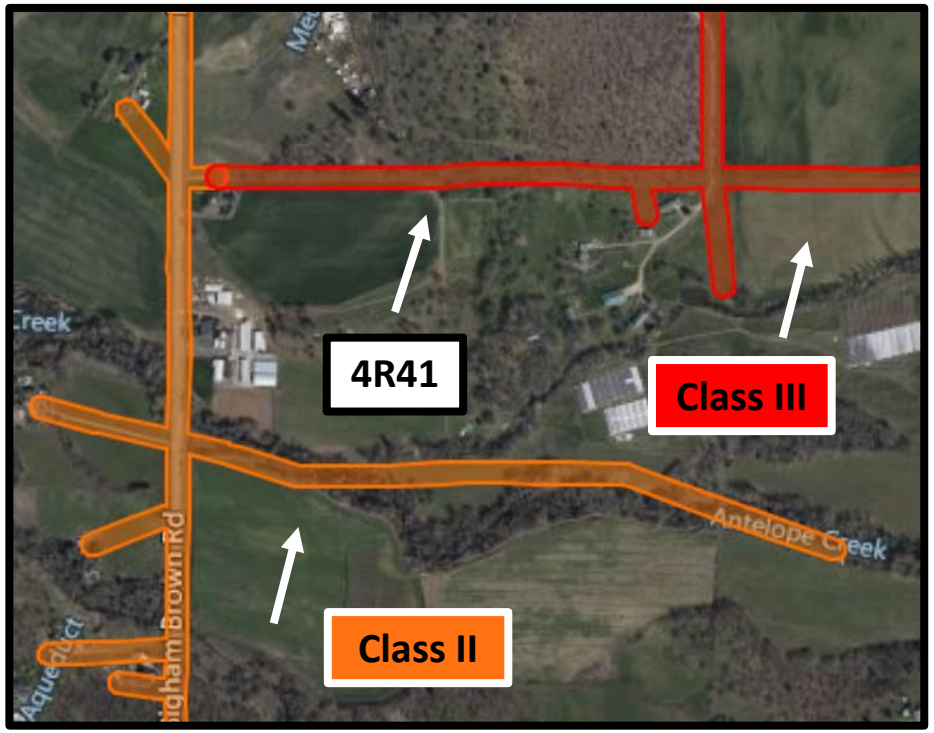


Figure 1: 4R41 shown as an example of a circuit spanning multiple classes.

❑ **Example Calculation:**

- **Circuit** = 4R41 (~ 162 miles)
- **Class II** = 25 miles
- **Class III** = 18 miles
- **Total Mileage Assigned** = 162 Miles Class III

- **Potential Con**: Inflation of circuit miles in each class (since we're assigning all miles to the higher Class)

FHCA Map Review – Circuit Level Aggregation

FHCA Spatial Statistics – PacifiCorp

Classes – PacifiCorp

Overview: Tables below present spatial statistics for PacifiCorp.

Statistic:	Class I:	Class II:	Class III:
% of circuit miles (Distribution)	9%	9%	4%
% of territory in FHCA Class	21%	27%	6%
Customer Count	20,303	26,057	9,157
Circuit Count	413	370	146
Circuit Miles (Distribution)	5,647	6,162	2,823
Number of Poles (Distribution)	109,110	123,352	55,572
Number of Transformers	36,948	45,737	22,019
Circuit Miles (Transmission)	355	320	212
Number of Poles (Transmission)	241	207	76
Underbuilt Pole Count	5,404	5,124	3,461

FHCA Circuit Aggregation – Class I

Class I – PacifiCorp (all states)

Overview: Tables below present spatial statistics for Class I.

Statistic:	Total:	CA:	OR:	WA:	UT:	ID:	WY:
% of circuit miles (Distribution)	-	14%	10%	10%	4%	13%	12%
Customer Count	20,303	1,668	6,777	1,735	5,595	3,152	1,376
Circuit Count	413	29	111	30	127	60	56
Circuit Miles (Distribution)	5,647	444	2047	404	881	816	1,055
Number of Poles (Distribution)	109,110	8,696	38,678	8,869	18,445	15,399	19,023
Number of Transformers	36,948	2,885	14,628	3,788	5,920	4,951	4,776
Circuit Miles (Transmission)	355	52	136	13	71	51	32
Number of Poles (Transmission)	241	24	69	8	74	38	28
Underbuilt Pole Count	5,404	955	2,175	177	841	811	445

FHCA Circuit Aggregation – Class II

Class II – PacifiCorp (all states)

Overview: Tables below present spatial statistics for Class II.

Statistic:	Total:	CA:	OR:	WA:	UT:	ID:	WY:
% of circuit miles (Distribution)	-	23%	17%	3%	4%	4%	9%
Customer Count	26,057	3,133	13,927	366	6,567	760	1,304
Circuit Count	370	40	136	11	145	9	29
Circuit Miles (Distribution)	6,162	722	3,250	124	1,047	248	771
Number of Poles (Distribution)	123,352	14,690	64,329	2,456	22,777	4,607	14,493
Number of Transformers	45,737	4,600	26,567	1,003	7,903	1,312	4,352
Circuit Miles (Transmission)	320	57	171	12	56	10	14
Number of Poles (Transmission)	207	17	57	3	90	18	22
Underbuilt Pole Count	5,124	1,021	2,815	240	709	140	199

FHCA Circuit Aggregation – Class III

Class III – PacifiCorp (all states)

Overview: Tables below present spatial statistics for Class III.

Statistic:	Total:	CA:	OR:	WA:	UT:	ID:	WY:
% of circuit miles (Distribution)	-	25%	7%	-	8%	-	0.9%
Customer Count	9,157	2,914	4,014	-	1,985	-	244
Circuit Count	146	32	47	-	58	-	9
Circuit Miles (Distribution)	2,823	781	1467	-	495	-	80
Number of Poles (Distribution)	55,572	15,548	28,133	-	10,139	-	1,752
Number of Transformers	22,019	5,159	12,716	-	3,443	-	701
Circuit Miles (Transmission)	212	97	85	-	24	-	6
Number of Poles (Transmission)	61	10	21	-	24	-	6
Underbuilt Pole Count	3,461	1,764	1,322	-	271	-	104

Analysis Next Steps

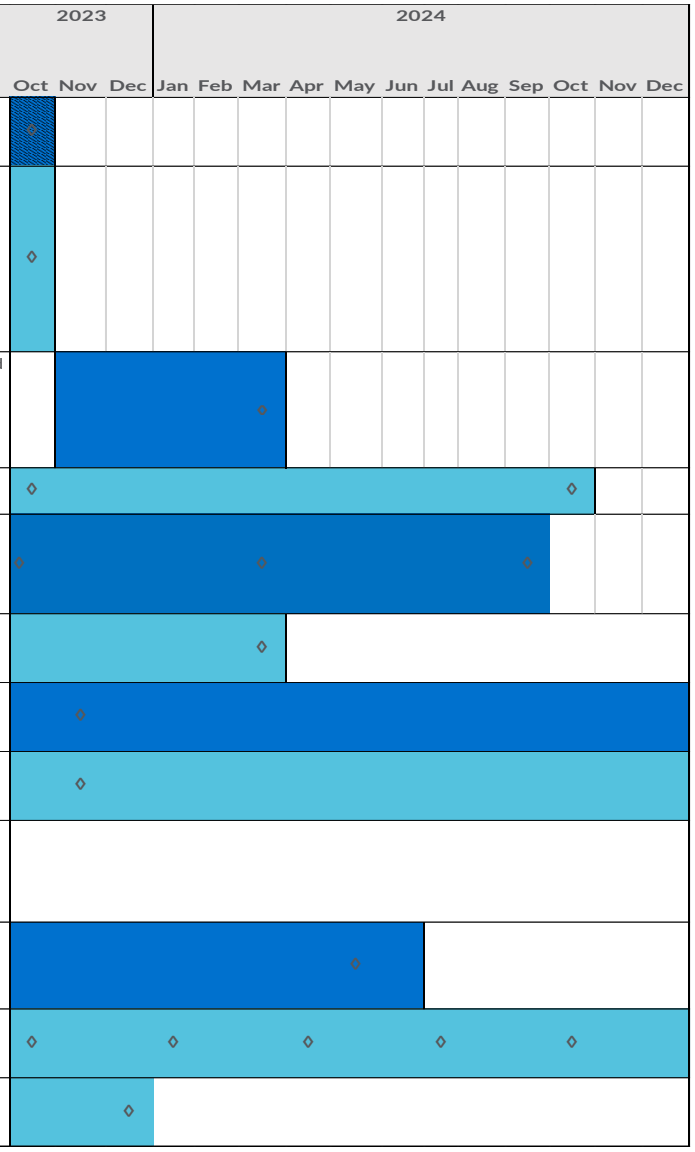
Action Item	Action	Estimated Delivery Date	Assigned to
Rough order of magnitude estimate of incremental costs for mitigation programs	Share estimate of wildfire mitigation program cost increases based on new FHCA	10/30	Megan Buckner
Overlap with existing FHCA	Calculate various asset and customer statistics within existing FHCA and new FHCA	11/3	Jordan Pino
List of circuits of concern and circuits in FHCA	Share list of circuits of concern and circuits in FHCA class with each methodology for comparison	11/3	Steve Vanderburg Jordan Pino
Distribution Curves	Create graphs showing distribution curves for each methodology	11/6	Jordan Pino
Segment Level Asset Data	Calculate various asset and customer statistics with FHCA assigned at segment level	11/6	Yuichiro Miyata
ZOP Level Asset Data	Calculate various asset and customer statistics with FHCA assigned at ZOP level	11/6	Yuichiro Miyata
% of Circuit Line Miles	Calculate % of line miles for each FHCA class for each aggregation methodology	11/6	Yuichiro Miyata
GREATER projects with FHCA with segment, ZOP, and circuit level aggregation	Share GREATER projects with FHCA mapped using each aggregation methodology for review	11/9	Jordan Pino

FHCA Implementation

PacifiCorp

Delivery Status Review

Status	Planning/ Operations	Initiative	What Is Different When Completed?	Scope	Current Stage	Reason for Yellow/Amber Status
1	P	FireSight, including Risk Spend Efficiency (RSE) Model	This will implement planning module, to support identification of mitigations and their risk reduction benefit relative to	FHCA	Testing	On track for delivery by end of October. No impacts to delivery from MSA discussions.
2	P	Expansion of Service Territory Modeled in FireSight (WRRM)	FireSight modeling of wildfire risk covers most of PacifiCorp's service territory.	Entire Service Territory	Testing	The domain expansion is being processed and on track to be completed by end of October, Technosylva has informed PacifiCorp delivery is on hold until new MSA is resolved. BHE Procurement and Legal have prioritized resolving MSA and are reviewing redlines and engaging with Technosylva to complete the new MSA by October 31.
3	P	Annual Planning Model Updates	Process in place to update assets, configurations, and other information to keep planning models current	Service Territory	Testing	Data is being processed and on track to be completed by end of October, Technosylva has informed PacifiCorp delivery is on hold until new MSA is resolved. BHE Procurement and Legal have prioritized resolving MSA and are reviewing redlines
4	P/O	FHCA Assessment	Updates to FHCA areas across PacifiCorp's operating areas.	Service Territory	Testing	Yellow due to amount of analysis and data processing.
5	O	Updates to Internal and External Situational Awareness Websites	Improved user experience, enhanced maps and information for customers, partners, and employees	Service Territory	Development	
6	P	Public Safety Power Shutoff (PSPS) Risk Assessment Solution	Implementation of a solution to calculate the PSPS likelihood and consequence to support planning processes.	California	Development	
7	O	WRF Ensemble	Strategically sub-select GEFS members to initialize a multi-member WRF Ensemble deterministic weather	Service Territory	Development	N/A
8	O	GEFS Self Organizing Maps (SOMs) Ensemble Forecast Tool	Build historical SOM node array using ERA5 Reanalysis. Build an automated GEFS SOM node association framework	Service Territory	Development	N/A
9	O	Data Lake for Wildfire and Weather Data	Historical and daily forecast data and conditions accessible to other departments in PacifiCorp and BHE for departments to use data, build models, and machine learning tools with	Service Territory	Execution	N/A
10	O	Bias-corrected WRF Forecast	Machine learning models to bias correct the WRF forecast for Pacific Power Weather Stations, RAWS, and other relevant weather stations.	Service Territory	Execution	N/A
11	O	Quarterly Update of Asset Data	FireCast and FireSim has the current asset information to model risk for situational awareness	Service Territory	Planning	N/A
12	P	Implement Fire Incident Tracking Database	Centralized solution and standardized process to track fire incidents	Service Territory	Execution	N/A



Forward Looking Projects / Topics

Objective: Solicit Feedback on Proposed Projects / Topics / Next Meeting

- Proposed Topics:
  - INFORM: FHCA Map Updates (October)
  - INFORM: Terrain/Fuel Type, Circuits of Concern, and FHCA Zones/Tiers/Areas (November)
  - INFORM: PSPS Seasonal Outlook for Oregon (November)
  - INFORM: PSPS Risk Calculations (November/December)
- Meeting Frequency / Next Meeting
- Feedback on Structure / Content / Attendees

WILDFIRE SAFETY & ASSET MANAGEMENT

WILDFIRE SAFETY

ASSET RISK

ASSET MANAGEMENT

Thank You!

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WILDFIRE SAFETY & ASSET MANAGEMENT

WILDFIRE SAFETY

ASSET RISK

ASSET MANAGEMENT

Appendix

PACIFICORP

Action Item Update

Title	Action	Update	Assigned to
Outreach to IOUS on Composite Scores	Compare PacifiCorp risk scoring to other IOUs for ignition and utility risk calculations		Jordan Pino
Sensitivity Analysis Documentation	Document analysis performed for sensitivity analysis and number of scenarios run		Jordan Pino
Mitigations and Effectivness Scores	Share mitigations, effectiveness percentages, and sources/benchmarks		Jordan Pino
Benchmarking/Lessons Learned on Effectiveness	Share lessons learned from utilities on effectiveness scores		Jordan Pino
Utility Lessons Learned on Incident Tracking	Share lessons learned from utilities on incident tracking analytics		Kevin Benson
Seasonal Outlook Forecast	Share seasonal forecast outlook for Oregon. This forecast is a request from OPUC as part of the corrective action plan		Steve Vanderburg

FHCA and Circuits of Concern

PacifiCorp

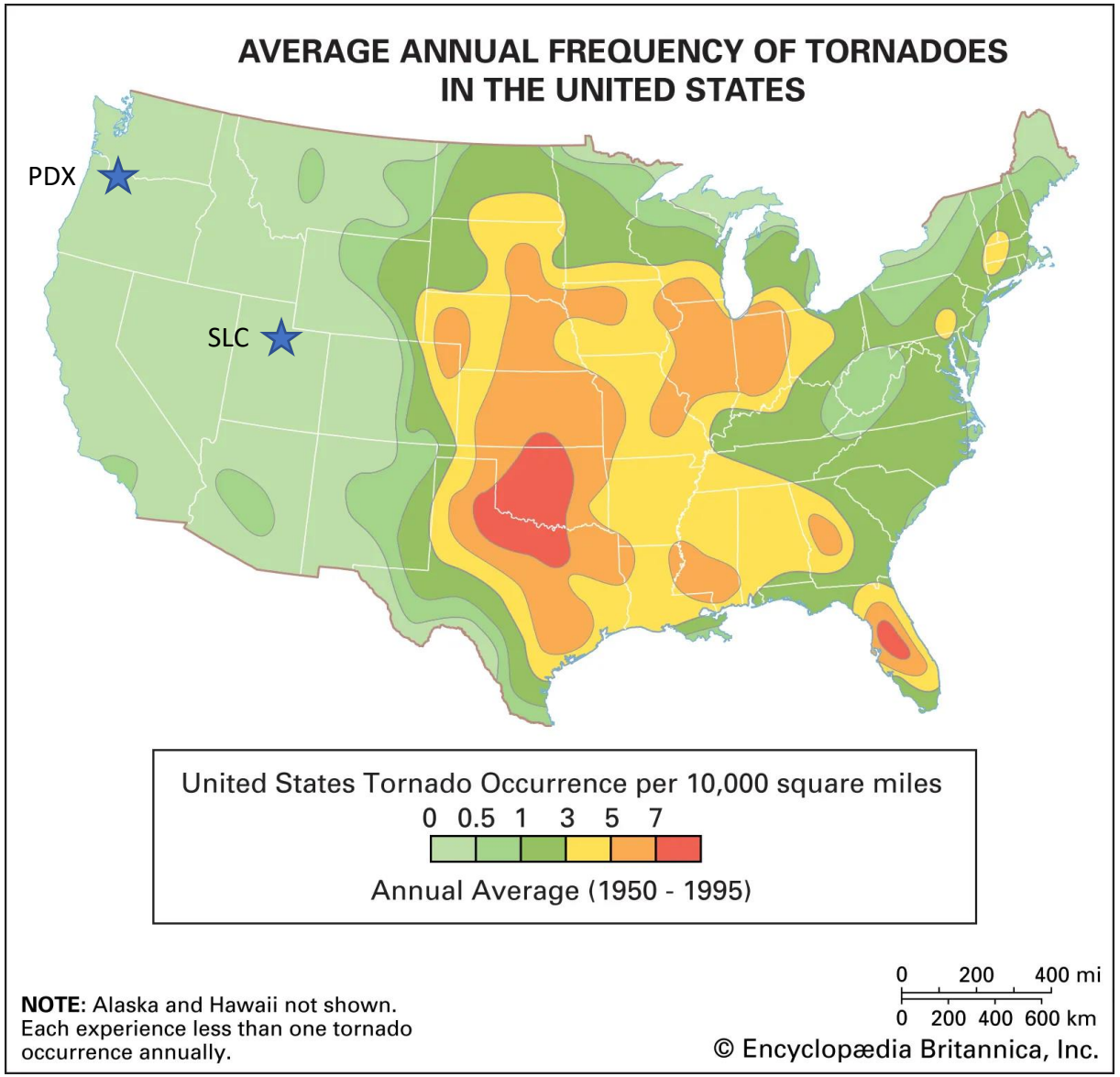
FHCA vs Circuits of Concern

FHCA

Circuits of Concern

Climate vs Weather

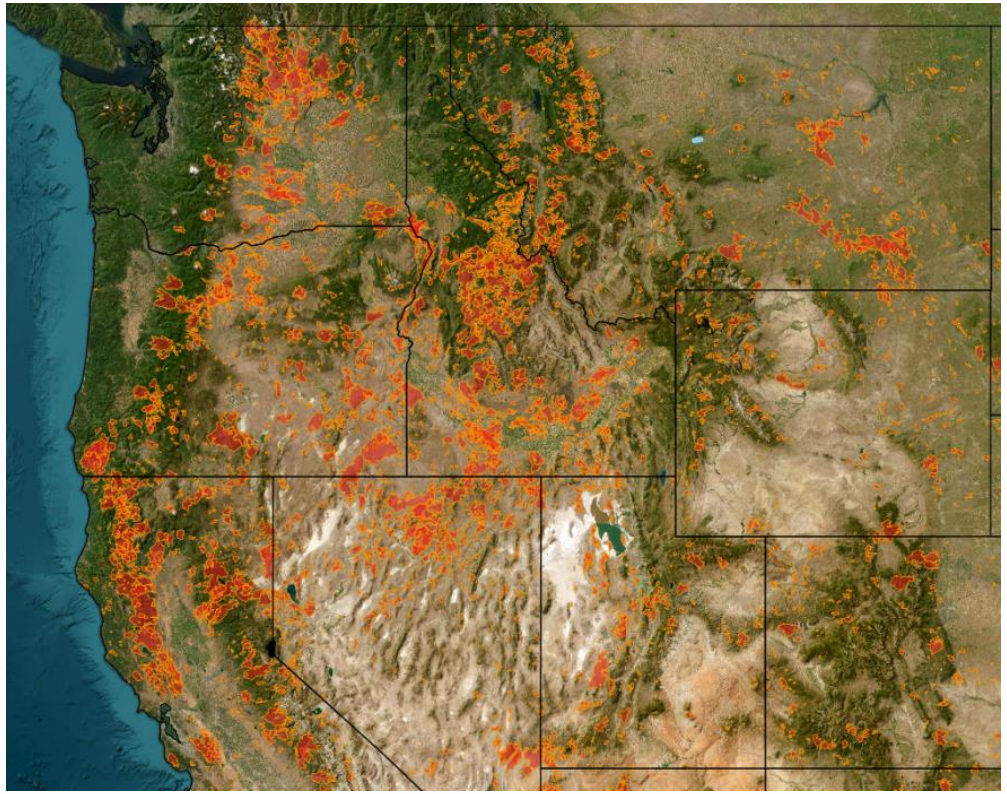
- Portland, OR – April 5, 1972: An F3 tornado traveled 9 miles, killed 6 people, and injured 300 others.
- Salt Lake City, UT – August 11, 1999: An F2 tornado traveled 4 miles, killed 1 person, and injured 80 others.
- Both locations are among the U.S. cities with the lowest annual tornado risk in the country, yet both cities experienced highly consequential tornadoes.
- PDX and SLC would not necessarily be prioritized for new tornado mitigation efforts ahead of cities that are much higher risk - (think FHCA) – but should still be prepared for a tornados (think Circuits of Concern)

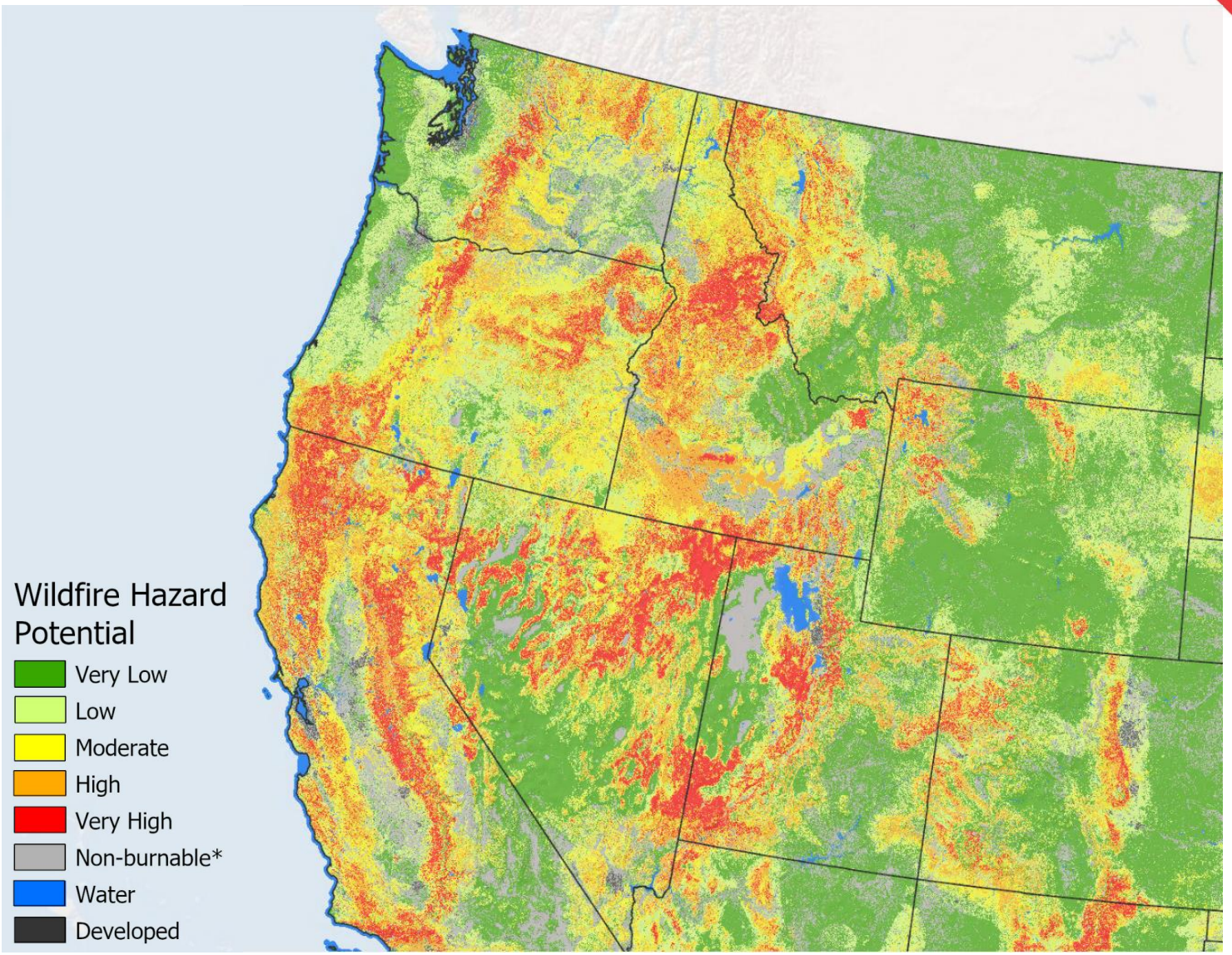


Climate vs Weather

- Wildfires are most frequent in the high & very high hazard potential areas, but still do occur in areas of low and very low risk.

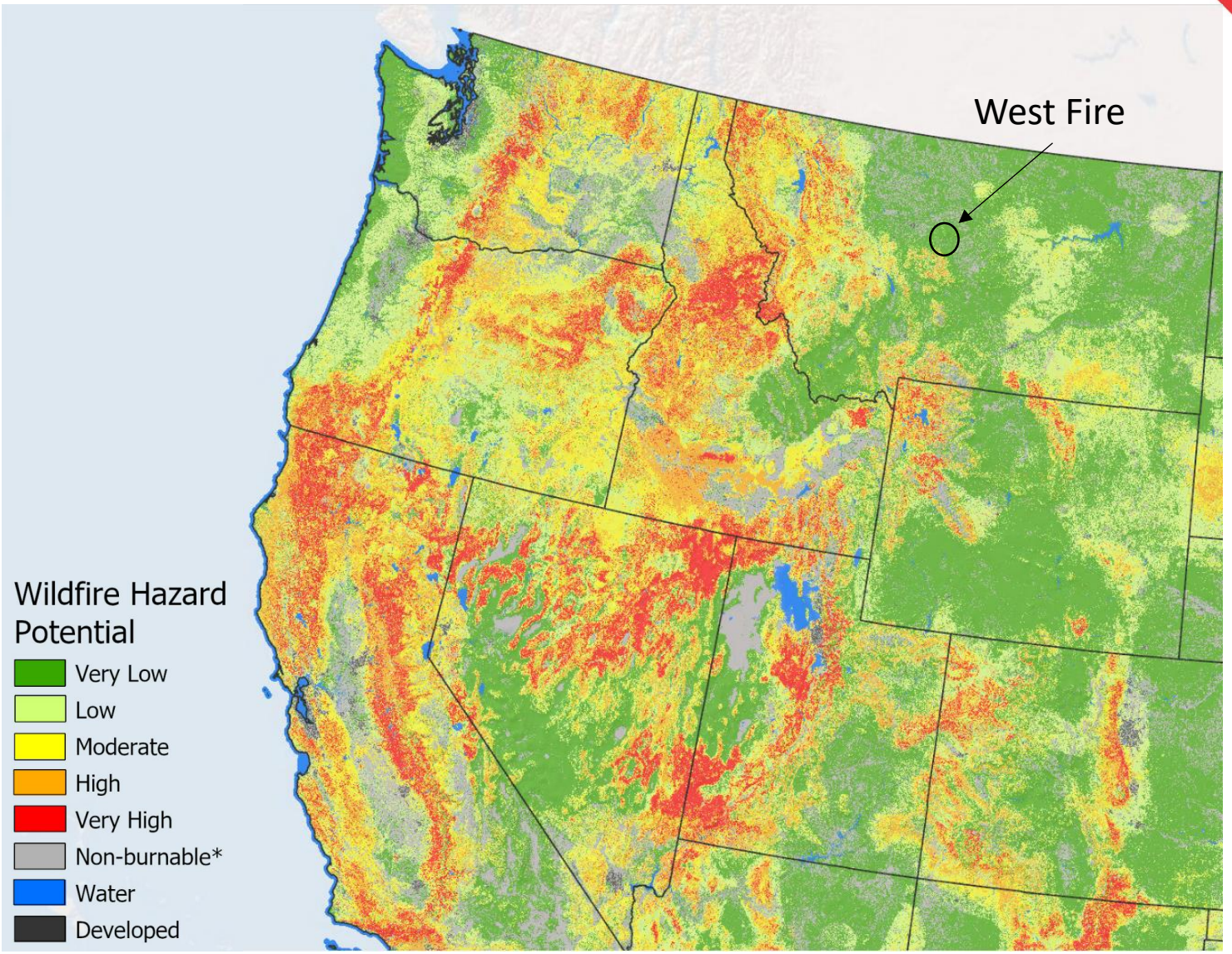
Wildfire Perimeters 2000-2021





Climate vs Weather

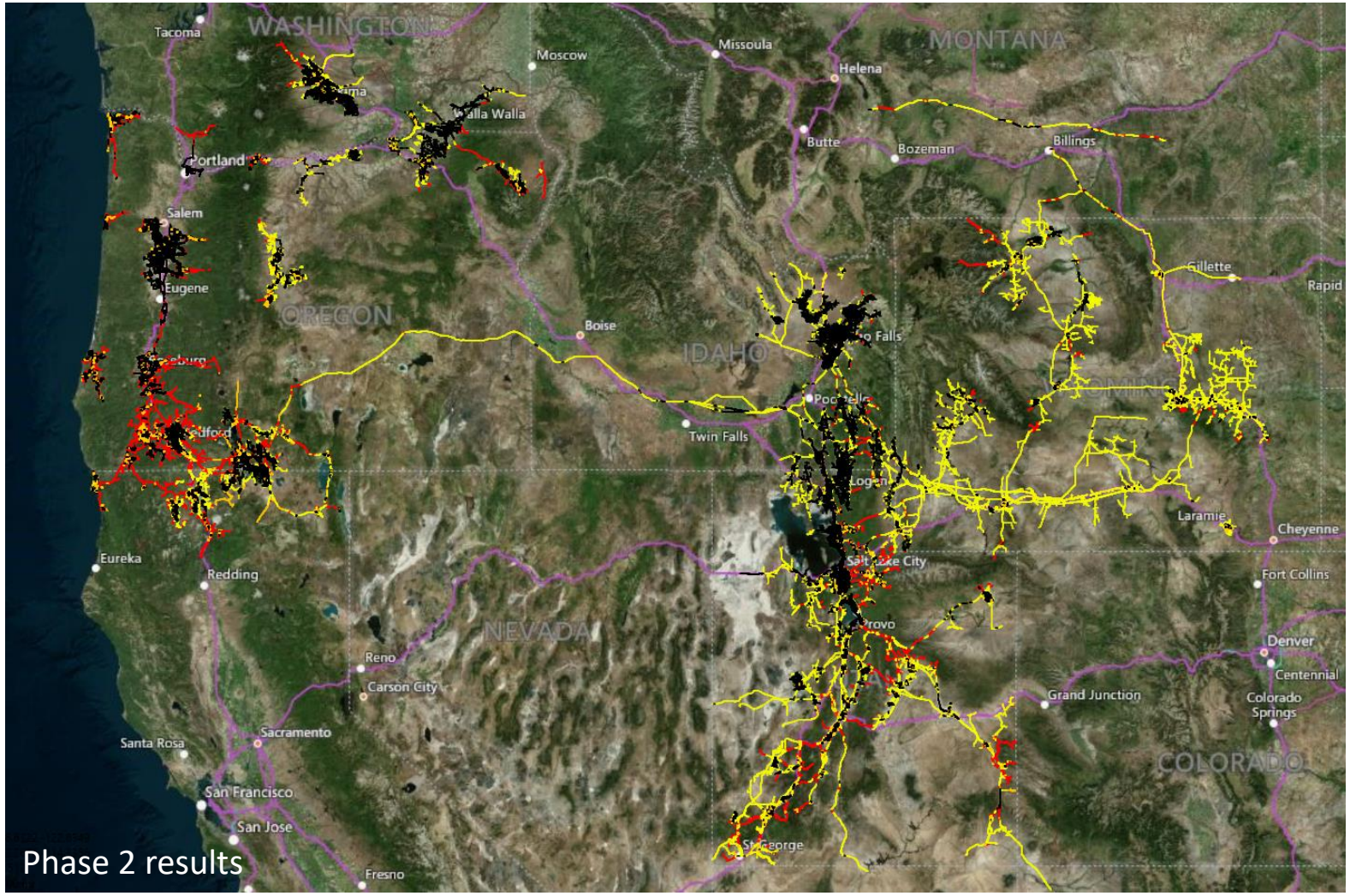
- Denton, MT – Nov 30, 2021: The “West Wind” grassland fire burned 10,000+ acres and damaged or destroyed nearly 50 structures.
- The West Wind Fire occurred in an area with “Very Low” Wildfire Hazard Potential.



Circuits of Concern

- **Definition:** Any circuit or circuit segment that could spark a wildfire under the right conditions, regardless of climatological risk, relative risk, frequency of occurrence, or magnitude of consequence.

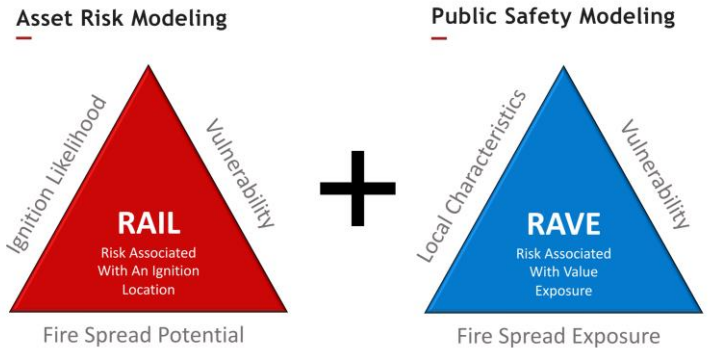
- **Phase 1:** Circuits of concern identified through a review of satellite imagery, LRAM data, and topographic maps by PacifiCorp meteorologists. – In place for the 2023 fire season
- **Phase 2:** 30m NLCD land cover data was mapped to each circuit ZOP. Additional logic was applied to combine individual land cover categories into like bins. – Recently completed
- **Phase 3:** PacifiCorp meteorologists to perform a review of the ZOP-level land cover classifications, edit as necessary, and finalize changes for use in the 2024 fire season. – To be complete end of Q1 2024



Phase 2 results

Structure of the Composite Score **[Review]**

Overview: The structure of the composite score includes input from WRRM, split into two "categories". It also includes weightings based on which variables we think may have more impact than others.



❑ **Notes on Composite Score**:

- Variables are obtained via our WRRM model [variables will be normalized].
- Weights add up to 100%.
- Weights are determined using model output + SME input [utility benchmarking].
- We will focus on the 90th and 98th percentiles in terms of variables.

Risk Associated with Ignition Location (RAIL) Component

Variable 1(Weight; %) + Variable 2(Weight; %)….

+

Risk Associated with Value Exposure (RAVE) Component

Variable 1(Weight; %) + Variable 2(Weight; %)….

*** **PRELIMINARY** – CURRENTLY VALIDATING! ***

How Does PacifiCorp Define Consequence?

Fire Size ≠ Consequence/Impact

Terrain

Risk Associated with Ignition Location (RAIL) Component (60%)

RAIL Inputs:	Percentile:	Weight (%):
Fire Behavior Index	95	20%
Fire Size Potential	95	20%
Flame Length	95	20%

+

Risk Associated with Value Exposure (RAVE) Component (40%)

RAVE Inputs:	Percentile:	Weight (%):
Terrain Difficulty Index	N/A	25%
Fire Station Density	N/A	10%
Fuel Model Majority	N/A	5%

Wind

Risk Associated with Ignition Location (RAIL) Component (80%)

RAIL Inputs:	Percentile:	Weight (%):
Rate of Spread	95	30%
Population Impacted	95	25%
Buildings Destroyed	95	25%

+

Risk Associated with Value Exposure (RAVE) Component (20%)

RAVE Inputs:	Percentile:	Weight (%):
Terrain Difficulty Index	N/A	10%
Disability Population	N/A	5%
Poverty Population	N/A	5%

** = PG&E, SCE and SDG&E utilized variable.*

** N/A = not applicable (RAVE variables do NOT contain percentiles).*

RAIL + RAVE Variables Available

RAIL RAVE

Overview: Review of RAIL + RAVE variables used in composite score.

Table 1: RAIL Variables

Risk Metric:	Description:	Composite?
Acres Burned	Number of Acres Burned	-
Population Impacted	Population Count Impacted	✓ YES
Buildings Threatened	Number of Buildings Threatened	-
Buildings Destroyed	Number of Buildings Destroyed	✓ YES
Fire Behavior Index	Fire Behavior Index	✓ YES
Rate of Spread	66 Feet/Hour	✓ YES
Flame Length	Feet	✓ YES

Table 2: RAVE Variables

Variable:	Description:	Composite?
Total Road Miles	Total Miles (Major + Minor)	-
Fuel Model Majority	Majority Fuel in Each Plexel	✓ YES
Building Density	Building Density per Plexel	-
Number of Buildings	Number of Building per Plexel	-
Population Count	Population Count per Plexel	-
Fire Station Density	Density of Fire Stations	✓ YES
Terrain Difficulty Index	Terrain Difficulty per Plexel	✓ YES
Disability Population	Disability Population Ratio	✓ YES
Poverty Population	Poverty Population Ratio	✓ YES
Senior Population	Senior Population Ratio	-
Years Since Last Fire	Years Since Last Fire per Plexel	-

FHCA Spatial Statistics – PacifiCorp

Classes – PacifiCorp

Overview: Tables below present spatial statistics for PacifiCorp.

Statistic:	PP:	RMP:	PacifiCorp:	PP:	RMP:	PacifiCorp:	PP:	RMP:	PacifiCorp:
% of circuit miles (Distribution)	11%	7%	**9%**	15%	5%	**9%**	8%	1%	**4%**
% of territory in FHCA Class	0.16	0.05	**0.21**	0.23	0.04	**0.27**	0.04	0.02	**0.06**
Customer Count	10,180	10,123	**20,303**	17,426	8,631	**26,057**	6,928	2,229	**9,157**
Circuit Count	170	243	**413**	187	183	**370**	79	67	**146**
Circuit Miles (Distribution)	2,895	2,752	**5,647**	4,096	2,066	**6,162**	2,248	575	**2,823**
Number of Poles (Distribution)	56,243	52,867	**109,110**	81,475	41,877	**123,352**	43,681	11,891	**55,572**
Number of Transformers	21,301	15,647	**36,948**	32,170	13,567	**45,737**	17,875	4,144	**22,019**
Circuit Miles (Transmission)	201	154	**355**	240	80	**320**	182	30	**212**
Number of Poles (Transmission)	101	140	**241**	77	130	**207**	31	45	**76**
Underbuilt Pole Count	3,307	2,097	**5,404**	4,076	1,048	**5,124**	3,086	375	**3,461**

Class I | Class II | Class III

Meeting Notes
Wildfire Risk Governance Committee
December 20, 2023

Attending: Kevin Benson, Allen Berreth, Tim Clark, Curt Mansfield, Amy McCluskey, Jordan Pino, Chris Spencer, Steve Vanderburg , Alex Vaz, Chris Walsh, Nore Yotsov

1. FHCA Refresh
    - Presented the recommended approach for the FHCA:

Description	In New FHCA	Notes
FHCA created in 2018	✓	No circuits from the 2018 FHCA were removed from the new FHCA.
Wind and/or Fuel/Terrain Risk Score 0.85≥	✓	
Areas of Interest I: Wind and/or Fuel/Terrain Risk Score 0.65-0.84		In 2024, Pacific Power will evaluate if these areas should be included in the FHCA beginning in 2025.
Areas of Interest II: Wind and/or Fuel/Terrain Risk Score 0.45-0.64		In 2025, Pacific Power will evaluate if these areas should be included in the FHCA beginning in 2026.

    - The approach for the Areas of Interest is to engage with local experts and agencies to assess if they should be included in the FHCA and if they should be included add them in for field implementation in 2025 and 2026
    - The areas identified in the above table are where the 80% of impactful fires (over 5,000 acres) are most likely to happen based on the modeling. This does not mean that that fires can occur in other locations.
    - Implementation Considerations
        - Once the new FHCA is established vegetation management and asset inspections and corrections will need to meet regulatory requirements.
    - Regulatory Considerations
        - Under Oregon Administrative Rules (OARs) do the Areas of Interest meet the criteria for being an area identified as a heightened risk of wildfire and are subject to the same inspection and vegetation management requirements as the FHCA? There will likely be discussions with the OPUC regarding this question and the potential impacts on customers.
    - Questions:
        - Q: What is the possibility to pull a list of the circuits that in the FHCA?
          A: This will require GIS help to do. Asset Management and Vegetation Management don't need the list to perform their analysis.
    - Decision: The proposed new FHCA (2018 FHCA and areas with Wind and/or Fuel/Terrain Risk Score 0.85≥ is approved.
2. Schedule Update

- FireSight data and Domain expansion are in yellow due. With the MSA execution the Purchase Req has been issued and accepted by Technosylva. Concern that the data was due to be completed in September and has slipped to December. Ask in 2024 schedule for Technosylva to assess the effort it takes to run the entire service territory for 8 and 24 hours and be realistic about the delivery schedule
- FHCA work will move back to green with the approval, and the 2024 schedule will be revised to reflect the new work identified
- New on the list are seasonal PSPS outlook and the Circuit Level Forecast that are in planning

3. Future Topics
   - PSPS Risk Model
   - Risk scores, circuits of concern, FHCA
   - PSPS Seasonal Outlook
4. Action Items
   - Model and provide to Allen what percent of impactful fires happen in the new FHCA
   - By state, identify how much of the 2018 FHCA does not meet the 0.85≥ threshold
   - Calculate the incremental change from the 2018 FHCA to the 2023 FHCA by state: line miles, facilities etc.
   - Provide the totals and incremental changes to Asset Management and Vegetation Management to identify incremental impacts and how they plan to implement in 2024

Wildfire Risk Governance Committee (WRGC)

December 6, 2023






PacifiCorp

Agenda

15:00-15:05	Review Meeting Agenda	Kevin Benson
15:05-16:15	FHCA Map Updates	Kevin Benson
16:05-16:20	Seasonal PSPS Outlook	Megan Buckner
16:20-16:25	Delivery Status Review	Melissa Swenson
16:25-16:30	Future Meeting Topics & Closeout	Kevin Benson






PACIFICORP

FHCA Spatial Statistics – 1-Mile Grid Methodology

Method:	Class Roll-up:	Output:	Notes:
▪ **1-Mile Grid**	Yes	✓ Statistics (tabular) ✓ GREATER Layer ➢ Distribution ➢ Transmission	• PacifiCorp uses a 1-mile grid for program management and planning. The wildfire risk score data was intersected with the grid and the higher class taken.

FHCA Classes Overview/Support – Class Breaks (PacifiCorp)

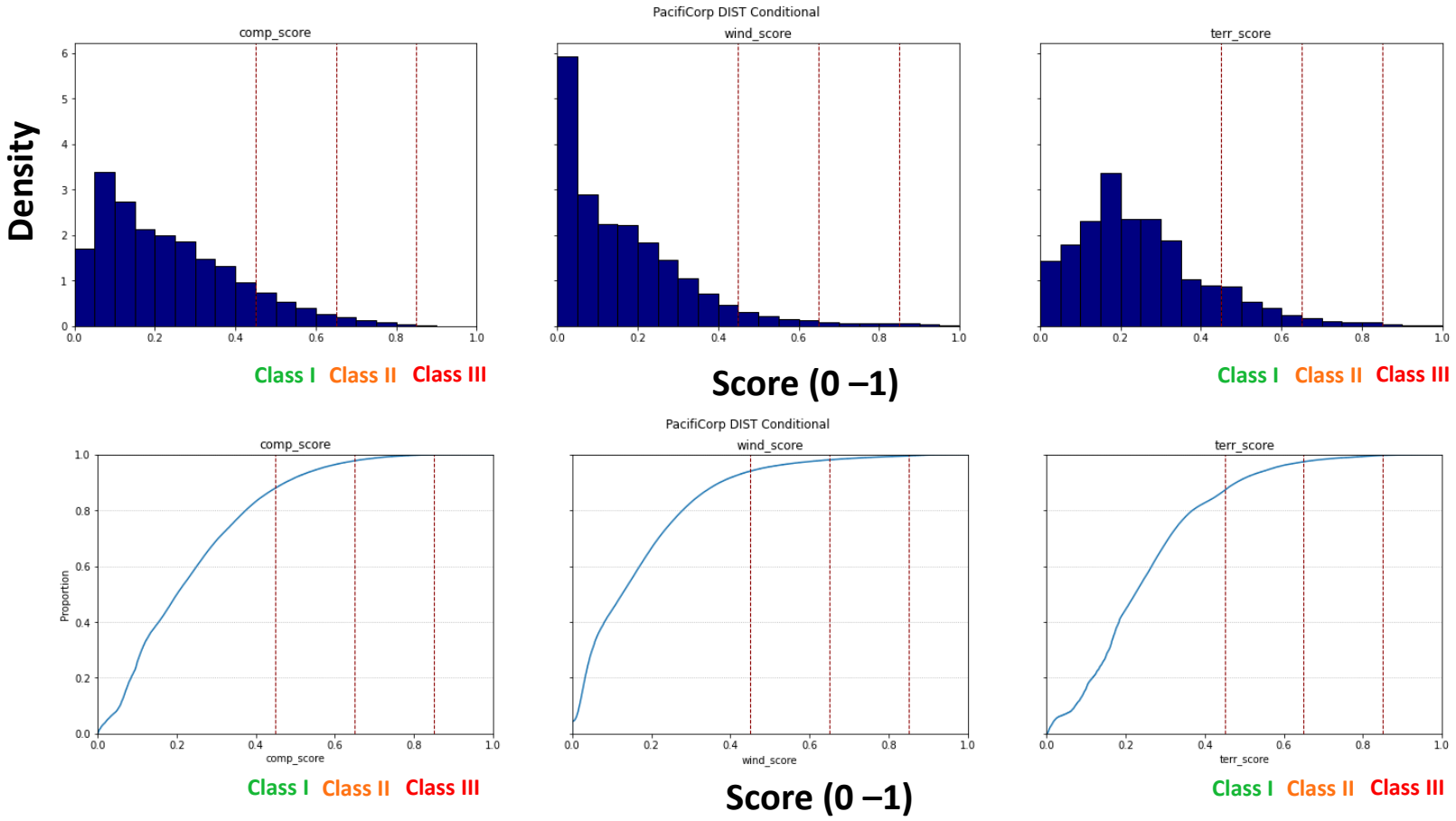
PacifiCorp Wide – 1-Mile Grid

Table 1: Overview of class score ranges.

Class:	Wind/Terrain Score Range:
I	0.45 – 0.64
II	0.64 – 0.84
III	0.85 – 1.00

Table 2: WRRM Variables Ranges across PacifiCorp per Class for the 100th percentile.

Class:	Buildings Destroyed (range):	Rate of Spread (range):	Acres Burned (range):
I	0-105	0-177	0-13,142
II	0-156	0-123	0-16,151
III	0-175	0-139	0-20,473



FHCA Spatial Statistics – PacifiCorp

Classes – PacifiCorp
Aggregation: 1-Mile Grid

Overview: Tables below present spatial statistics for PacifiCorp.

Statistic:	PP:	RMP:	PacifiCorp:	PP:	RMP:	PacifiCorp:	PP:	RMP:	PacifiCorp:
% of circuit miles (Distribution)	16%	14%	**15%**	25%	14%	**18%**	15%	0.5%	**0.09%**
% of territory in FHCA Class	5%	3%	**8%**	9%	2%	**11%**	5%	0.6%	**6%**
Customer Count	109,491	96,628	**206,119**	138,814	122,032	**260,846**	73,904	61,157	**135,061**
Circuit Count	240	342	**582**	279	332	**611**	140	154	**294**
Circuit Miles (Distribution)	4,377	5,383	**9,760**	6,875	5,286	**12,161**	4,060	2,023	**6,083**
Number of Poles (Distribution)	89,515	92,883	**182,398**	137,814	85,251	**223,065**	76,654	34,877	**111,531**
Number of Transformers	38,918	34,842	**73,760**	59,731	38,648	**98,379**	35,887	16,989	**52,876**
Circuit Miles (Transmission)	424	952	**1,376**	1,160	1,557	**2,717**	744	747	**1,491**
Number of Poles (Transmission)	88	182	**270**	116	233	**349**	65	128	**193**
Underbuilt Pole Count	3,657	2,922	**6,579**	6,056	2,148	**8,204**	5,202	831	**6,033**

FHCA Spatial Statistics – PacifiCorp

Classes – PacifiCorp
Aggregation: 1-Mile Grid

Overview: Tables below present spatial statistics for PacifiCorp.

Statistic:	PP:	RMP:	PacifiCorp:	PP:	RMP:	PacifiCorp:	PP:	RMP:	PacifiCorp:
% of circuit miles (Distribution)	16%	14%	**15%**	25%	14%	**18%**	15%	0.5%	**0.09%**
% of territory in FHCA Class	5%	3%	**8%**	9%	2%	**11%**	5%	0.6%	**6%**
Customer Count	109,491	96,628	**206,119**	138,814	122,032	**260,846**	73,904	61,157	**135,061**
Circuit Count	240	342	**582**	279	332	**611**	140	154	**294**
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Underbuilt Pole Count	3,657	2,922	**6,579**	6,056	2,148	**8,204**	5,202	831	**6,033**

Class I | Class II | Class III

Cumulative FHCA Statistics

Classes – PacifiCorp
Aggregation: 1-Mile Grid

	Class II	Potential FHCA Thresholds			Class III
	0.65	0.7	0.75	0.8	0.85
Statistic:	PacifiCorp:	PacifiCorp:	PacifiCorp:	PacifiCorp:	PacifiCorp:
% of circuit miles (Distribution)	18%	14%	9%	5%	0.1%
% of territory in FHCA Class	11%	9%	6%	4%	6%
Customer Count	260,846	229,400	197,954	166,507	135,061
Circuit Count	611	532	453	373	294
Circuit Miles (Distribution)	12,161	10,642	9,122	7,603	6,083
Number of Poles (Distribution)	223,065	195,182	167,298	139,415	111,531
Number of Transformers	98,379	87,003	75,628	64,252	52,876
Circuit Miles (Transmission)	2,717	2,411	2,104	1,798	1,491
Number of Poles (Transmission)	349	310	271	232	193
Underbuilt Pole Count	8,204	7,661	7,119	6,576	6,033

FHCA Map Demo

FHCA Next Steps

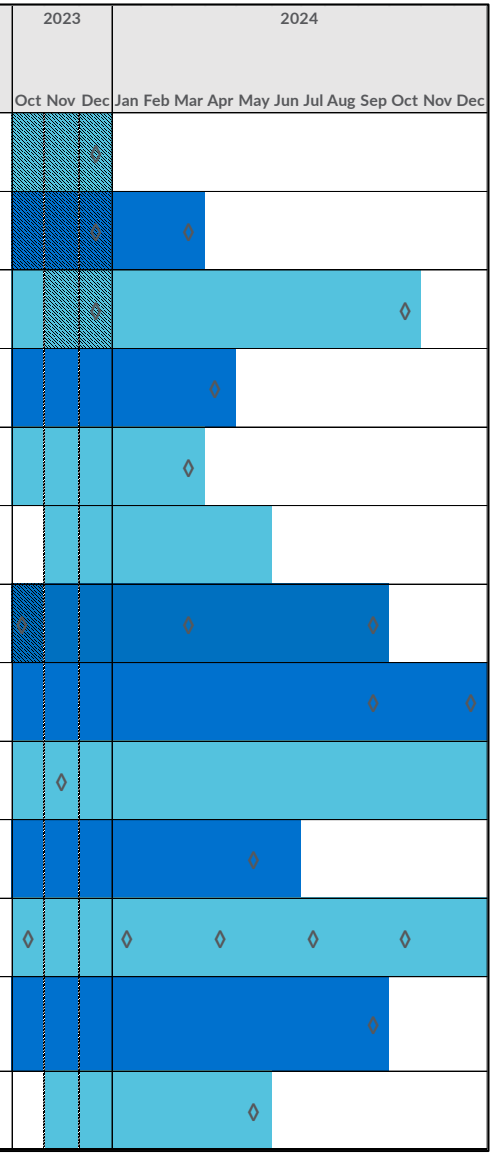
Action Item	Action	Estimated Delivery Date	Assigned to
Rough order of magnitude estimate of incremental costs for mitigation programs	Share estimate of wildfire mitigation program cost increases based on new FHCA	TBD	Megan Buckner
% of Circuit Line Miles	Calculate % of line miles for each FHCA class for each aggregation methodology	12/6	Yuichiro Miyata
GREATER projects with new FHCA	Share GREATER projects with FHCA mapped to 1-mile grid	12/6	Jordan Pino
Distribution Curves	Create graphs showing distribution curves for each methodology	12/6	Jordan Pino
Overlap with existing FHCA	Calculate various asset and customer statistics within existing FHCA and new FHCA	12/13	Jordan Pino
List of circuits of concern and circuits in FHCA	Share list of circuits of concern and circuits in FHCA class with each methodology for comparison	12/13	Steve Vanderburg Jordan Pino
Initiate program planning	Wildfire mitigation program managers begin planning for implementation of new FHCA maps	TBD	Megan Buckner

Complete

In progress

Delivery Status Review

Status	Planning/ Operations	Initiative	What Is Different When Completed?	Current Stage	Reason for Yellow/Amber Status
	P	Expansion of Service Territory Modeled in FireSight (WRRM)	FireSight modeling of wildfire risk covers most of PacifiCorp's service territory.	Testing	Domain expansion processing is near completion. MSA with Technosylva is now executed.
	P	Annual Planning Model Updat	Process in place to update assets, configurations, and other information to keep planning models current.	Testing	Data processing is near completion. MSA with Technosylva is now executed.
	P	FHCA Assessment	Updates to FHCA areas across PacifiCorp's operating areas.	Review	Orange due to time to review and approve proposed changes.
	P	Implement Fire Incident Tracking Database	Centralized solution and standardized process to track fire incidents	Execution	N/A
	P	Public Safety Power Shutoff (PSPS) Risk Assessment Solution	Implementation of a solution to calculate the PSPS likelihood and consequence to support planning processes.	Execution	N/A
	P	Risk Spend Efficiency (RSE) Model Refresh	Process to review and update estimated effectiveness of identified mitigations and update the RSE calculation.	Planning	N/A
	O	Updates to Internal and External Situational Awareness Websites	Improved user experience, enhanced maps and information for customers, partners, and employees	Execution	N/A
	O	WRF Ensemble	Strategically sub-select GEFS members to initialize a multi-member WRF Ensemble deterministic weather forecasts	Execution	N/A
	O	GEFS Self Organizing Maps (SOMs) Ensemble Forecast Tool	Build historical SOM node array using ERA5 Reanalysis. Build an automated GEFS SOM node association framework and forecast	Execution	N/A
	O	Bias-corrected WRF Forecast	Machine learning models to bias correct the WRF forecast for Pacific Power Weather Stations, RAWS, and other relevant weather stations.	Execution	N/A
	O	Quarterly Update of Asset Data	FireCast and FireSim has the current asset information to model risk for situational awareness	Execution	N/A
	O	Seasonal PSPS Circuit Forecast Map	PacifiCorp will have a seasonal fire risk outlook map that the company can communicate to its public safety partners on a set cadence.	Planning	N/A
	O	Circuit Level Forecast	Ability in WFA-E to forecast at the circuit level to support situational awareness.	Planning	N/A



Forward Looking Projects / Topics

Objective: Solicit Feedback on Proposed Projects / Topics / Next Meeting

- Proposed Topics:
  - INFORM: FHCA Map Updates (December)
  - INFORM: Terrain/Fuel Type, Circuits of Concern, and FHCA Zones/Tiers/Areas (December)
  - INFORM: PSPS Seasonal Outlook for Oregon (December)
  - INFORM: PSPS Risk Calculations (December/January)
- Meeting Frequency / Next Meeting
- Feedback on Structure / Content / Attendees

WILDFIRE SAFETY & ASSET MANAGEMENT

WILDFIRE SAFETY

ASSET RISK

ASSET MANAGEMENT

Thank You!

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WILDFIRE SAFETY & ASSET MANAGEMENT

WILDFIRE SAFETY

ASSET RISK

ASSET MANAGEMENT

Appendix

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FHCA Spatial Statistics – PacifiCorp

Classes – PacifiCorp
Aggregation: 1-Mile Grid

	0.3			0.25			0.2		
Statistic:	**PP:**	**RMP:**	**PacifiCorp:**	**PP:**	**RMP:**	**PacifiCorp:**	**PP:**	**RMP:**	**PacifiCorp:**
% of circuit miles (Distribution)	38%	11%	**14%**	35%	8%	**9%**	33%	4%	**5%**
% of territory in FHCA Class	12%	2%	**15%**	10%	2%	**12%**	8%	1%	**10%**
Customer Count	196,491	167,970	**364,461**	180,263	152,752	**333,015**	164,036	137,533	**301,568**
Circuit Count	384	442	**826**	350	397	**747**	315	353	**667**
Circuit Miles (Distribution)	10,231	6,493	**16,725**	9,528	5,678	**15,205**	8,824	4,862	**13,686**
Number of Poles (Distribution)	199,178	107,535	**306,713**	183,888	94,941	**278,829**	168,598	82,348	**250,946**
Number of Transformers	89,657	50,222	**139,879**	83,696	44,808	**128,504**	77,735	39,393	**117,128**
Circuit Miles (Transmission)	1,800	2,102	**3,902**	1,696	1,899	**3,595**	1,592	1,697	**3,289**
Number of Poles (Transmission)	168	335	**503**	156	309	**464**	143	282	**425**
Underbuilt Pole Count	11,045	2,650	**13,694**	10,831	2,321	**13,152**	10,618	1,991	**12,609**

FHCA Spatial Statistics – Class I

Class I – PacifiCorp (all states)
Aggregation: 1-Mile Grid

Overview: Tables below present spatial statistics for Class I.

Statistic:	CA:	OR:	WA:	UT:	ID:	WY:
% of circuit miles (Distribution)	18%	16%	16%	9%	24%	21%
% of territory in FHCA Class	2%	6%	8%	1%	10%	3%
Customer Count	8,446	87,525	13,520	54,777	18,950	22,901
Circuit Count	29	177	34	198	77	67
Circuit Miles (Distribution)	567	3,149	661	2,035	1,489	1,859
Number of Poles (Distribution)	11,657	63,284	14,574	35,419	25,342	32,122
Number of Transformers	4,155	28,075	6,688	16,015	9,536	9,291
Circuit Miles (Transmission)	85	293	46	466	312	174
Number of Poles (Transmission)	15	64	9	111	37	34
Underbuilt Pole Count	1,062	2,430	165	1,130	1,033	759

FHCA Spatial Statistics – Class II

Class II – PacifiCorp (all states)
Aggregation: 1-Mile Grid

Overview: Tables below present spatial statistics for Class II.

Statistic:	CA:	OR:	WA:	UT:	ID:	WY:
% of circuit miles (Distribution)	32%	28%	10%	14%	0.09%	16%
% of territory in FHCA Class	5%	10%	5%	2%	4%	2%
Customer Count	14,882	113,704	10,228	93,978	5,651	22,403
Circuit Count	49	195	35	244	33	55
Circuit Miles (Distribution)	1,021	5,429	425	3,353	532	1,401
Number of Poles (Distribution)	20,638	108,002	9,174	52,045	7,803	25,403
Number of Transformers	6,722	48,227	4,782	27,277	3,021	8,350
Circuit Miles (Transmission)	121	953	86	1,055	315	187
Number of Poles (Transmission)	22	78	16	160	34	39
Underbuilt Pole Count	1,325	4,177	554	1,435	276	437

FHCA Spatial Statistics – Class III

Class III – PacifiCorp (all states)
Aggregation: 1-Mile Grid

Overview: Tables below present spatial statistics for Class III.

Statistic:	CA:	OR:	WA:	UT:	ID:	WY:
% of circuit miles (Distribution)	39%	14%	-	0.07%	-	0.03%
% of territory in FHCA Class	6%	5%	-	1%	-	0.15%
Customer Count	17,227	56,677	-	48,888	-	12,269
Circuit Count	45	95	-	138	-	16
Circuit Miles (Distribution)	1,216	2,844	-	1,724	-	299
Number of Poles (Distribution)	22,424	54,230	-	27,784	-	7,093
Number of Transformers	8,470	27,417	-	13,824	-	3,165
Circuit Miles (Transmission)	300	444	-	721	-	26
Number of Poles (Transmission)	21	44	-	116	-	12
Underbuilt Pole Count	2,551	2,651	-	610	-	221

FHCA Spatial Statistics – Current FHCA/HFTD

Overview: Tables below present spatial statistics for the current FHCAs (old; 2018).

Statistic:	CA – Tier 2:	CA – Tier 3:	OR:	WA:	UT:
% of territory in FHCA/HFTD Class	62	1	14	4	2
Customer Count	18,575	1,188	48,295	466	44,606
Circuit Count	52	8	94	1	113
Circuit Miles (Distribution)	1,117	95	3,275	23	1,609
Number of Poles (Distribution)	19,357	1,061	56,504	561	13,058
Number of Transformers	8,227	664	29,546	190	11,699
Circuit Miles (Transmission)	321	23	413	0	221
Number of Poles (Transmission)	24	2	35	0	39
Underbuilt Pole Count	2,117	206	2,353	0	664

Old FHCA/HFTD Spatial Statistics

Old FHCA/HFTD

Overview: Tables below present spatial statistics for our old FHCA/HFTD areas.

Area:	Wind Score Min:	Wind Score Max:	Wind Score Mean:	Terrain Score Min:	Terrain Score Max:	Terrain Score Mean:
Old FHCA – Pacific Power (Distribution)	0.0	0.90	**0.25**	0.0	0.99	**0.42**
Old FHCA – Pacific Power (Transmission)	0.0	0.77	**0.17**	0.0	1.00	**0.33**
HFTD – Pacific Power (Distribution)	0.0	1.00	**0.28**	0.0	1.00	**0.40**
HFTD – Pacific Power (Transmission)	0.0	0.91	**0.18**	0.0	0.99	**0.28**
Old FHCA Rocky Mountain Power (Distribution)	0.0	0.98	**0.27**	0.0	0.97	**0.34**
Old FHCA Rocky Mountain Power (Transmission)	0.0	1.00	**0.19**	0.0	0.99	**0.25**

Action Item Update

Title	Action	Update	Assigned to
Outreach to IOUS on Composite Scores	Compare PacifiCorp risk scoring to other IOUs for ignition and utility risk calculations		Jordan Pino
Sensitivity Analysis Documentation	Document analysis performed for sensitivity analysis and number of scenarios run		Jordan Pino
Mitigations and Effectivness Scores	Share mitigations, effectiveness percentages, and sources/benchmarks		Jordan Pino
Benchmarking/Lessons Learned on Effectiveness	Share lessons learned from utilities on effectiveness scores		Jordan Pino
Utility Lessons Learned on Incident Tracking	Share lessons learned from utilities on incident tracking analytics		Kevin Benson
Seasonal Outlook Forecast	Share seasonal forecast outlook for Oregon. This forecast is a request from OPUC as part of the corrective action plan	Development underway	Steve Vanderburg

Seasonal PSPS Outlook

Wildfire Risk Governance Committee (WRGC)






December 20, 2023

PacifiCorp

Agenda

15:00-15:05	Review Meeting Agenda	Kevin Benson
15:05-16:15	FHCA Map Updates	Kevin Benson
16:15-16:25	Delivery Status Review	Melissa Swenson
16:25-16:30	Future Meeting Topics & Closeout	Kevin Benson






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FHCA – Decision

Overall Decision: Authorization of phased implementation of new FHCA for mitigation planning, regulatory filings, and internal/external communications

Components:

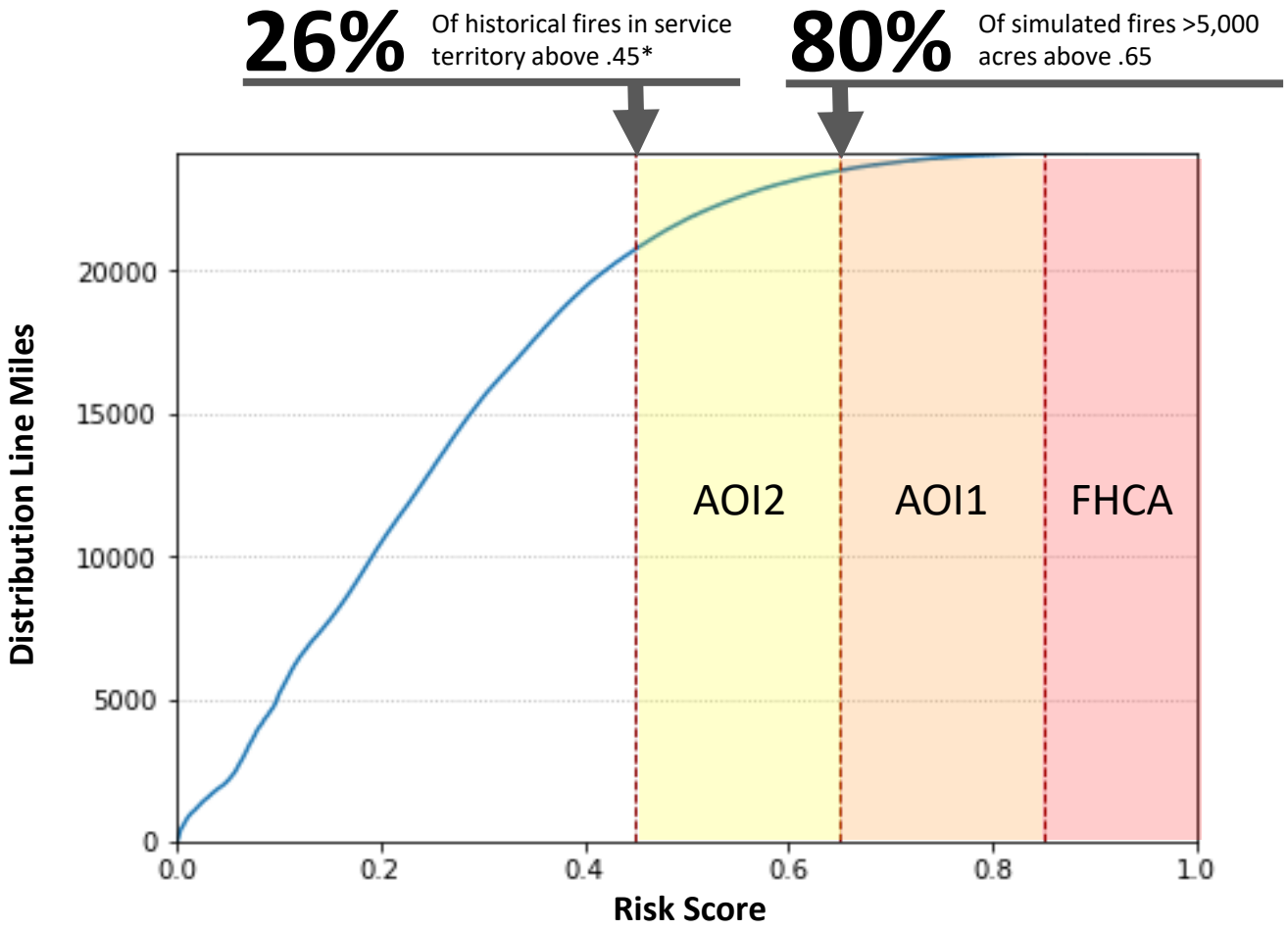
1) Approval of **thresholds** for FHCA, AOI1, and AOI2*
2) Approval of **timeline** for phased implementation
3) Approval to include in OR WMP filed in December 2023 and future **regulatory filings**
4) Approval to **share** the FHCA, AOI1, and AOI2* maps and data internally and externally

*Final naming convention pending

FHCA Overview

All values approximate		Evaluation Timeline		
		2024	2025	2026
	Existing FHCA	**New FHCA**	**2024+ AOI1**	**2025+ AOI2**
% of Risk	-	15%	35%	55%
Total Distribution Line Miles	6,119	8,257	18,409	27,641
% of Total Distribution Line Miles	9%	13%	28%	42%
Total Transmission Line Miles	981	1,680	4,151	5,475
Total Line Miles	7,100	9,937	22,560	33,116

% of Risk: The 15/35/55% most impactful simulated fires based on our wind and terrain risk scores

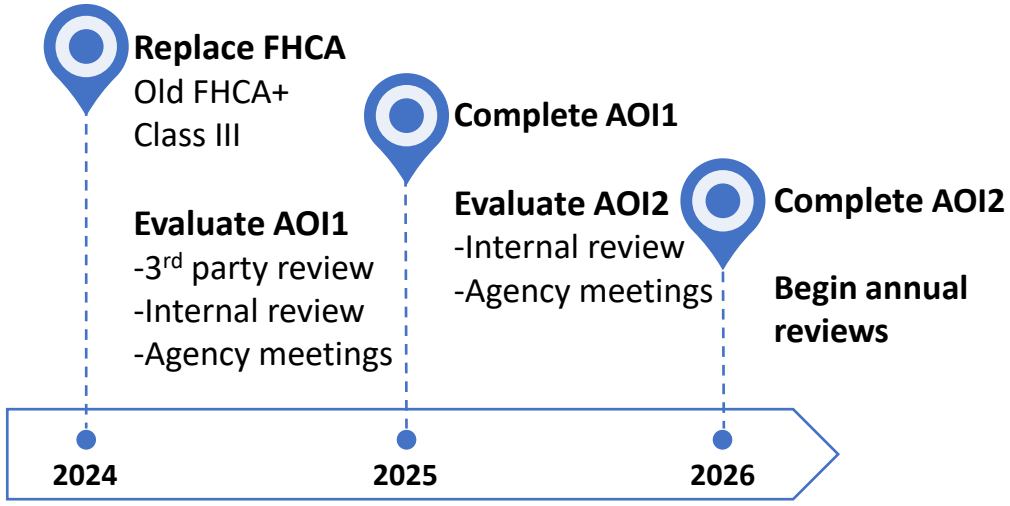


*Includes 10 of 13 high interest fire incidents

FHCA – Methodology & Timeline

Analytical Findings:

- Data analysis **confirms that large, destructive wildfires can occur anywhere** in service territory under the right conditions
- Acres burned, buildings destroyed, etc. **vary across risk scores**, but **trend upward with risk**
- **Risk modeling alone cannot answer** the question of what FHCA thresholds to set
- Must account for **intended business implementation and feasibility**



Evaluation Notes

- PacifiCorp uses a **1-mile grid** for program management and planning. **Wind and terrain wildfire risk scores** were intersected with the grid and the **higher class assigned**.
- **Class III and existing FHCA were combined** into the **new FHCA** for implementation **beginning in 2024.**
- **Class II** is designated "**Area of Interest 1"** for **evaluation** beginning in **2024.**
- **Class I** is designated the **"Area of Interest 2"** for **evaluation** beginning in **2025.**

Business Notes:

- Phased approach ensures **limited resources are allocated to highest risk areas**
- **Retains existing FHCA** until process for removing areas is formalized
- Timeline allows for additional **internal SME review**, **third-party validation**, and **engagement with agency stakeholders and regulators**
- **FHCA will expand** over time
- **FHCA will change** with model updates and new data

FHCA Demo

FHCA – Decision

Overall Decision: Authorization of phased implementation of new FHCA for mitigation planning, regulatory filings, and internal/external communications

Components:

1) Approval of **thresholds** for FHCA, AOI1, and AOI2*
2) Approval of **timeline** for phased implementation
3) Approval to include in OR WMP filed in December 2023 and future **regulatory filings**
4) Approval to **share** the FHCA, AOI1, and AOI2* maps and data internally and externally

*Final naming convention pending

FHCA Next Steps

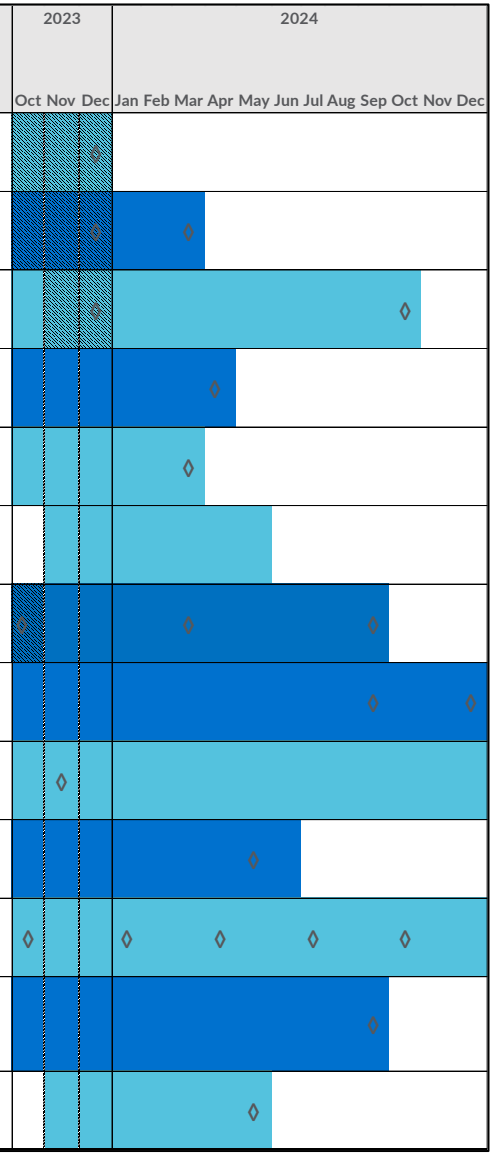
	Action Item	Action	Estimated Delivery Date	Assigned to
	Rough order of magnitude estimate of incremental costs for mitigation programs	Share estimate of wildfire mitigation program cost increases based on new FHCA	TBD	Megan Buckner
	% of Circuit Line Miles	Calculate % of line miles for each FHCA class for each aggregation methodology	12/6	Yuichiro Miyata
	GREATER projects with new FHCA	Share GREATER projects with FHCA mapped to 1-mile grid	12/6	Jordan Pino
	Distribution Curves	Create graphs showing distribution curves for each methodology	12/6	Jordan Pino
	Overlap with existing FHCA	Calculate various asset and customer statistics within existing FHCA and new FHCA	12/13	Jordan Pino
	List of circuits of concern and circuits in FHCA	Share list of circuits of concern and circuits in FHCA class with each methodology for comparison	12/13	Steve Vanderburg Jordan Pino
	Initiate program planning	Wildfire mitigation program managers begin planning for implementation of new FHCA maps	TBD	Megan Buckner

 Complete

 In progress

Delivery Status Review

Status	Planning/ Operations	Initiative	What Is Different When Completed?	Current Stage	Reason for Yellow/Amber Status
	P	Expansion of Service Territory Modeled in FireSight (WRRM)	FireSight modeling of wildfire risk covers most of PacifiCorp's service territory.	Testing	Domain expansion processing is near completion. MSA with Technosylva is now executed.
	P	Annual Planning Model Updat	Process in place to update assets, configurations, and other information to keep planning models current.	Testing	Data processing is near completion. MSA with Technosylva is now executed.
	P	FHCA Assessment	Updates to FHCA areas across PacifiCorp's operating areas.	Review	Orange due to time to review and approve proposed changes.
	P	Implement Fire Incident Tracking Database	Centralized solution and standardized process to track fire incidents	Execution	N/A
	P	Public Safety Power Shutoff (PSPS) Risk Assessment Solution	Implementation of a solution to calculate the PSPS likelihood and consequence to support planning processes.	Execution	N/A
	P	Risk Spend Efficiency (RSE) Model Refresh	Process to review and update estimated effectiveness of identified mitigations and update the RSE calculation.	Planning	N/A
	O	Updates to Internal and External Situational Awareness Websites	Improved user experience, enhanced maps and information for customers, partners, and employees	Execution	N/A
	O	WRF Ensemble	Strategically sub-select GEFS members to initialize a multi-member WRF Ensemble deterministic weather forecasts	Execution	N/A
	O	GEFS Self Organizing Maps (SOMs) Ensemble Forecast Tool	Build historical SOM node array using ERA5 Reanalysis. Build an automated GEFS SOM node association framework and forecast	Execution	N/A
	O	Bias-corrected WRF Forecast	Machine learning models to bias correct the WRF forecast for Pacific Power Weather Stations, RAWS, and other relevant weather stations.	Execution	N/A
	O	Quarterly Update of Asset Data	FireCast and FireSim has the current asset information to model risk for situational awareness	Execution	N/A
	O	Seasonal PSPS Circuit Forecast Map	PacifiCorp will have a seasonal fire risk outlook map that the company can communicate to its public safety partners on a set cadence.	Planning	N/A
	O	Circuit Level Forecast	Ability in WFA-E to forecast at the circuit level to support situational awareness.	Planning	N/A



Forward Looking Projects / Topics

Objective: Solicit Feedback on Proposed Projects / Topics / Next Meeting

- Proposed Topics:
  - INFORM: FHCA Map Updates (February)
  - INFORM: Terrain/Fuel Type, Circuits of Concern, Risk Scores, and FHCA (February)
  - INFORM: Wildfire Mitigation Portfolio Management (February)
  - INFORM: PSPS Seasonal Outlook for Oregon (March)
  - INFORM: PSPS Risk Calculations (March)
  - INFORM: Updated Wildfire Risk Scores (April)
- Meeting Frequency / Next Meeting
- Feedback on Structure / Content / Attendees

WILDFIRE SAFETY & ASSET MANAGEMENT

WILDFIRE SAFETY

ASSET RISK

ASSET MANAGEMENT

Thank You!

PACIFICORP

WILDFIRE SAFETY & ASSET MANAGEMENT

WILDFIRE SAFETY

ASSET RISK

ASSET MANAGEMENT

Appendix

PACIFICORP

Wind-Driven/Terrain-Driven Score Components **[Review]**

Overview: Review components of the wind-driven and terrain-driven scores.

Terrain

Risk Associated with Ignition Location (RAIL) Component (60%)

RAIL Inputs:	Percentile:	Weight (%):
Fire Behavior Index	95	20%
Fire Size Potential	95	20%
Flame Length *	95	20%

+

Risk Associated with Value Exposure (RAVE) Component (40%)

RAVE Inputs:	Percentile:	Weight (%):
Terrain Difficulty Index	N/A	25%
Fire Station Density	N/A	10%
Fuel Model Majority	N/A	5%

Wind

Risk Associated with Ignition Location (RAIL) Component (80%)

RAIL Inputs:	Percentile:	Weight (%):
Rate of Spread *	95	30%
Population Impacted *	95	25%
Buildings Destroyed *	95	25%

+

Risk Associated with Value Exposure (RAVE) Component (20%)

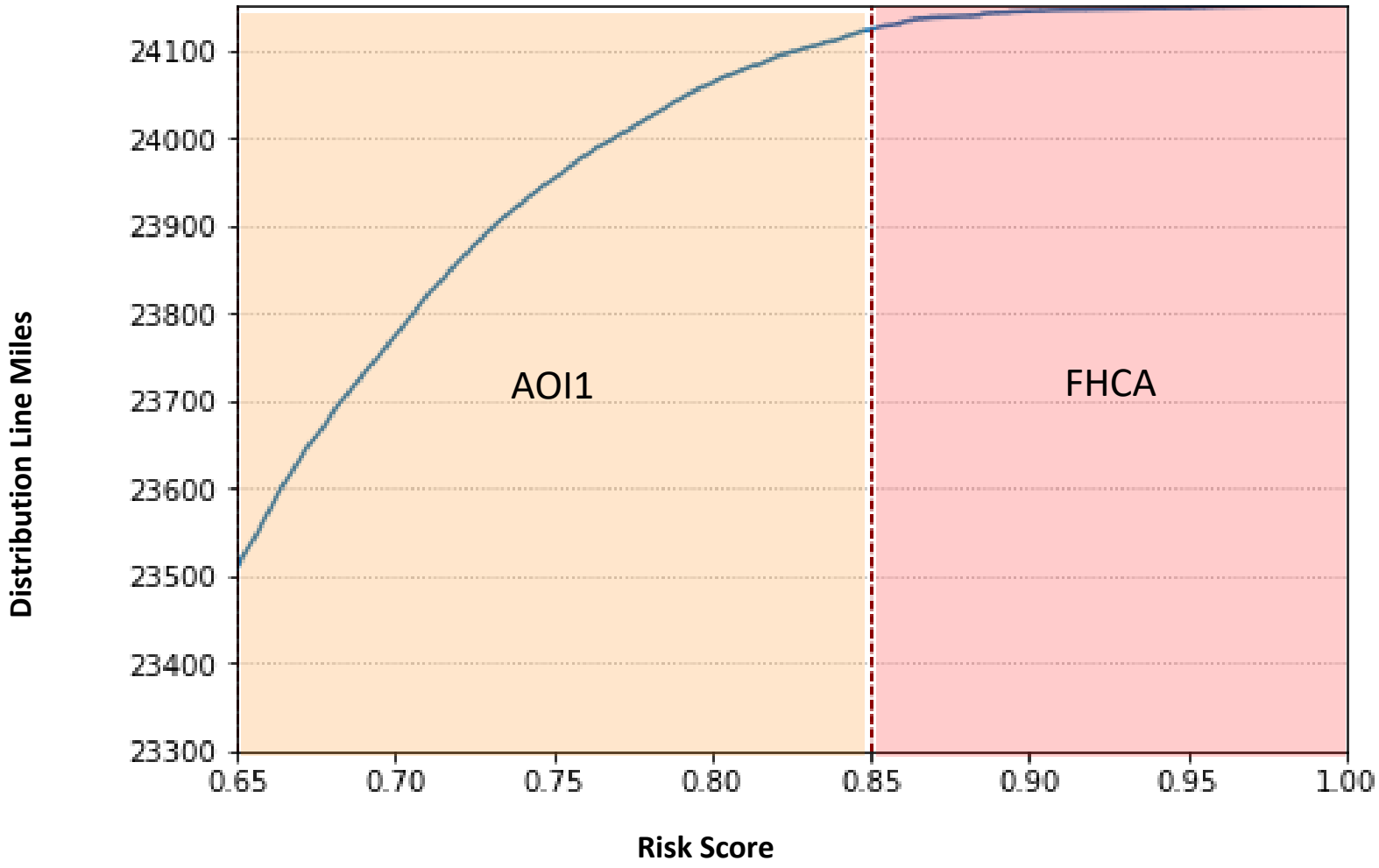
RAVE Inputs:	Percentile:	Weight (%):
Terrain Difficulty Index	N/A	10%
Disability Population	N/A	5%
Poverty Population	N/A	5%

** = PG&E, SCE and SDG&E utilized variable.*

** N/A = not applicable (RAVE variables do NOT contain percentiles).*

**** **PRELIMINARY** – CURRENTLY VALIDATING! ****

FHCA Overview



FHCA Classes Overview/Support – Class Breaks (PacifiCorp)

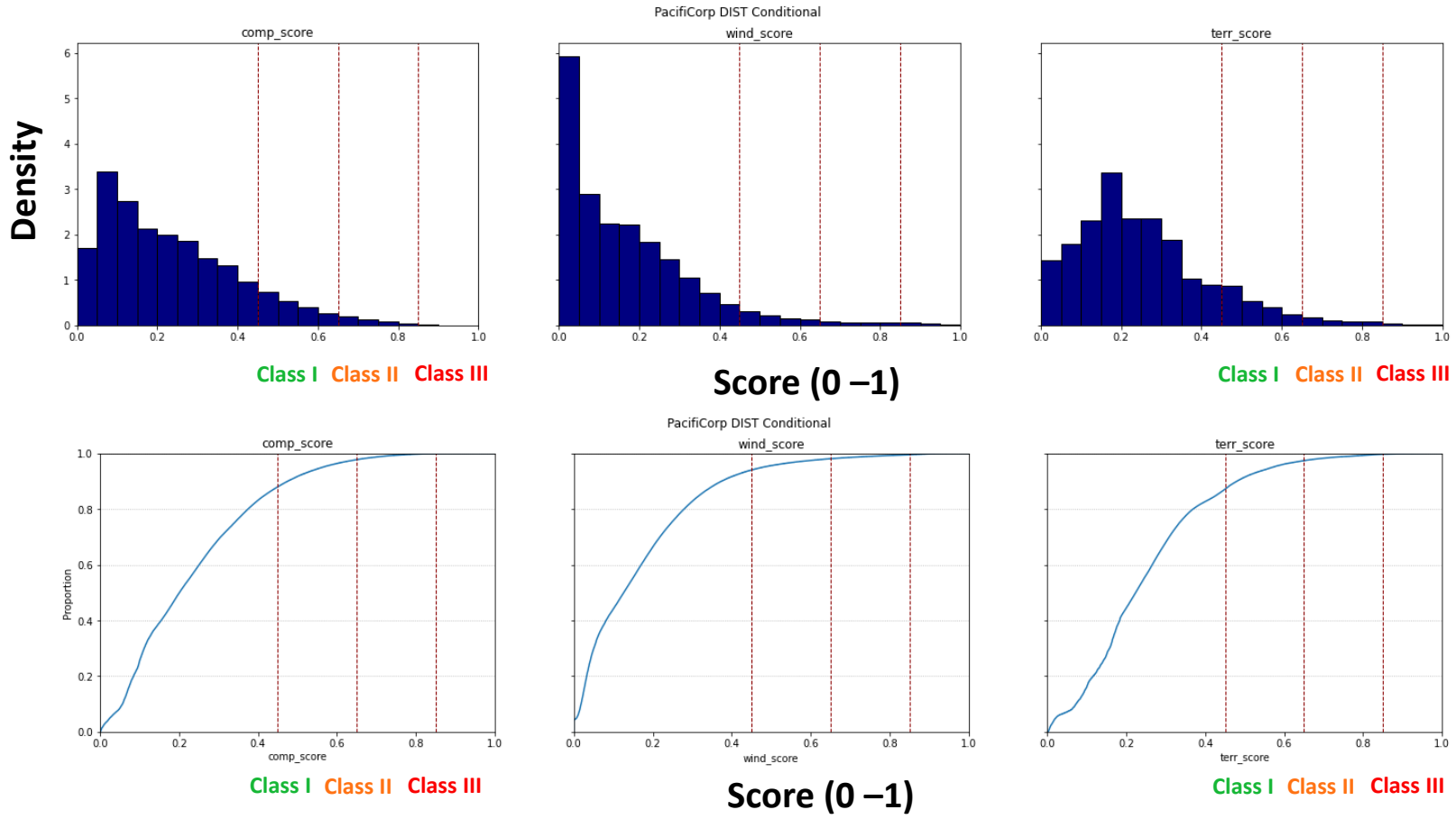
PacifiCorp Wide – 1-Mile Grid

Table 1: Overview of class score ranges.

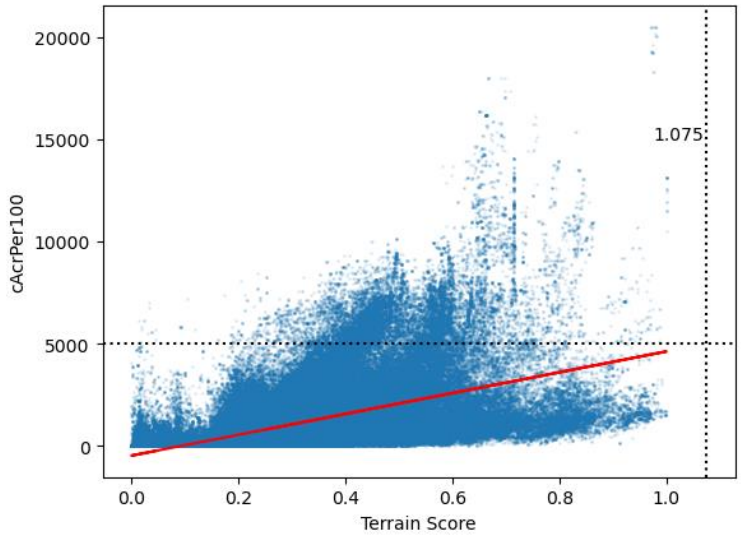
Class:	Wind/Terrain Score Range:
I	0.45 – 0.64
II	0.64 – 0.84
III	0.85 – 1.00

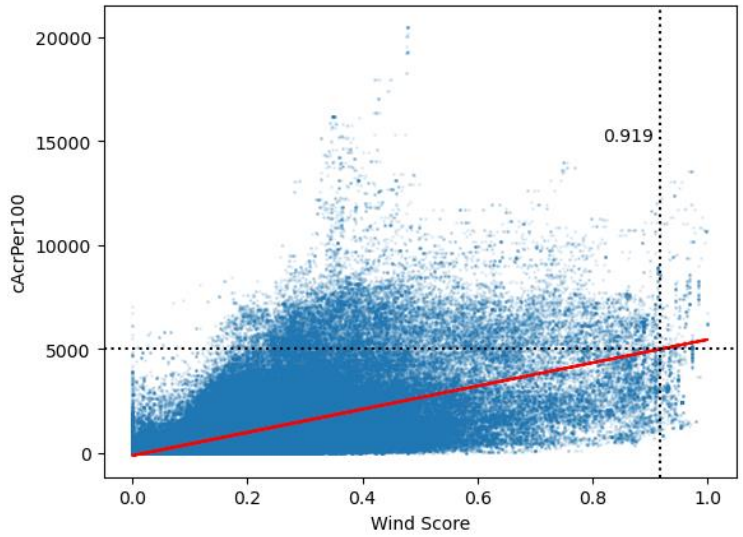
Table 2: WRRM Variables Ranges across PacifiCorp per Class for the 100th percentile.

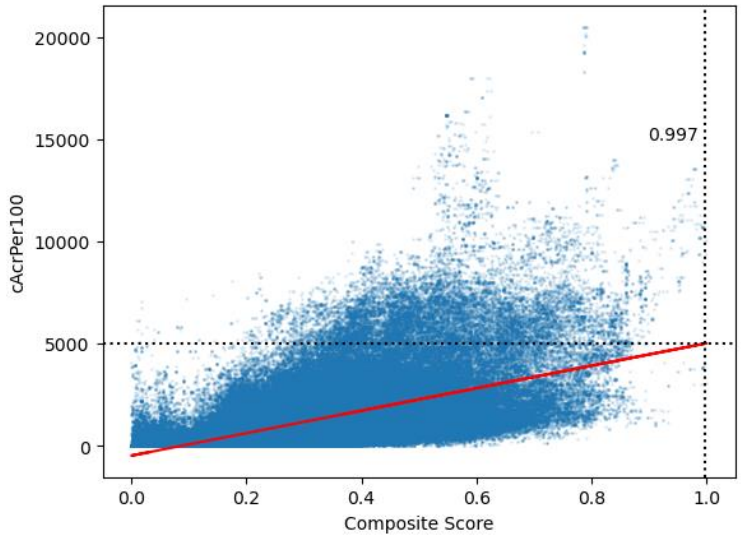
Class:	Buildings Destroyed (range):	Rate of Spread (range):	Acres Burned (range):
I	0-105	0-177	0-13,142
II	0-156	0-123	0-16,151
III	0-175	0-139	0-20,473



FHCA Data Deep Dive – Acres Burned (8 hours)



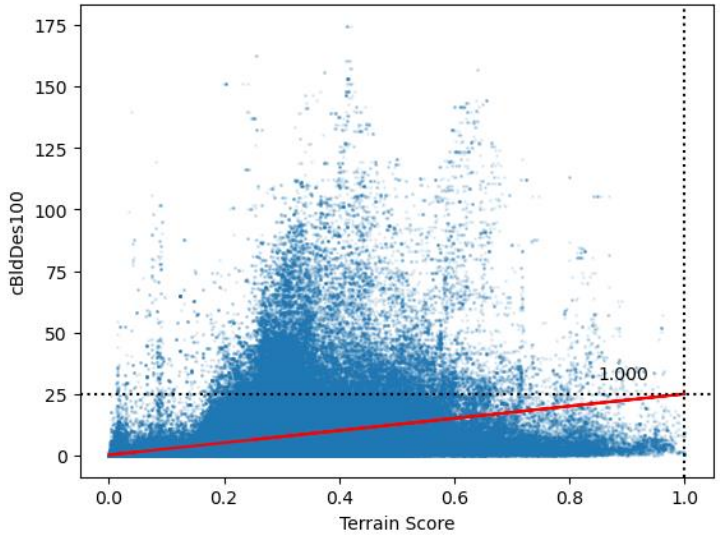


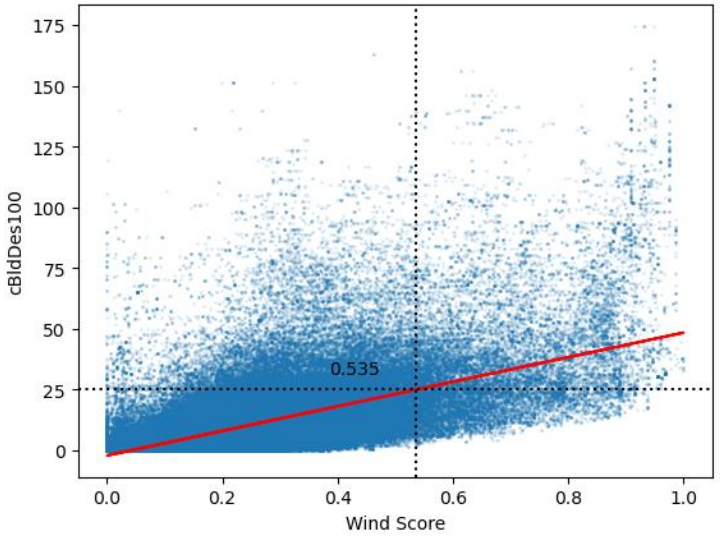


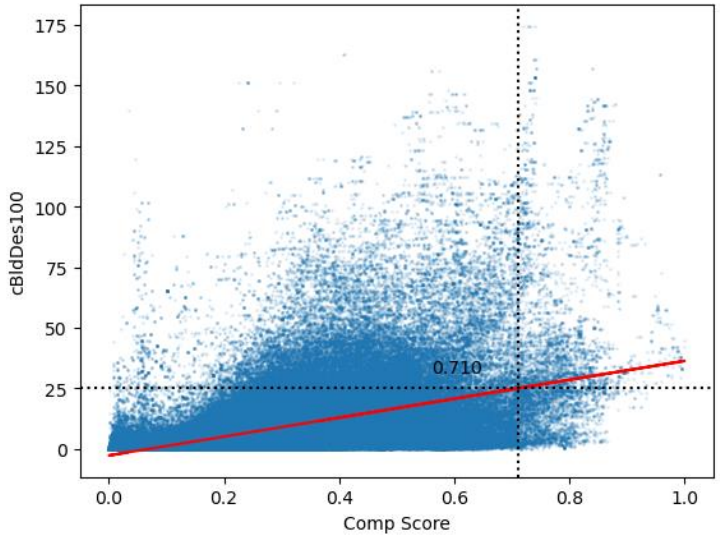
Score	**Threshold**
Composite	0.6803
Wind	0.6514
Terrain	0.6170

These risk scores capture 80% of fires >=5,000 acres

FHCA Data Deep Dive – Building Destroyed (8 hours)







FHCA Data Deep Dive – Historical Fire Activity

Of 23,447 reported wildfires within the PacifiCorp service territory since 2003:

Area:	Count (PacifiCorp):	% of total (PacifiCorp):
Area of Interest 2	1,515	6%
Area of Interest 1	2,101	9%
FHCA (Class III + Current FHCA)	2,547	11%

FHCA Spatial Statistics – Current FHCA/HFTD

Overview: Tables below present spatial statistics for the current FHCAs (old; 2018).

Statistic:	CA – Tier 2:	CA – Tier 3:	OR:	WA:	UT:
% of territory in FHCA/HFTD Class	62	1	14	4	2
Customer Count	18,575	1,188	48,295	466	44,606
Circuit Count	52	8	94	1	113
Circuit Miles (Distribution)	1,117	95	3,275	23	1,609
Number of Poles (Distribution)	19,357	1,061	56,504	561	13,058
Number of Transformers	8,227	664	29,546	190	11,699
Circuit Miles (Transmission)	321	23	413	0	221
Number of Poles (Transmission)	24	2	35	0	39
Underbuilt Pole Count	2,117	206	2,353	0	664

FHCA Total Spatial Statistics – FHCA

Overview: Tables below present **total** spatial statistics for FHCA.

Statistic:	CA:	OR:	WA:	UT:	ID:	WY:	Total:
% of circuit miles (Distribution)	17%	22%	1%	13%	-	3%	13%
% of territory in FHCA Class	3%	15%	4%	3%	-	<1%	
Customer Count	6,557	77,512	467	89,760	-	12,269	186,565
Circuit Count	20	133	1	220	-	16	390
Circuit Miles (Distribution)	534	4,277	23	3,124	-	299	8,257
Number of Poles (Distribution)	11,490	77,228	570	37,732	-	7,093	134,113
Number of Transformers	3,539	39,585	189	23,998	-	3,165	70,476
Circuit Miles (Transmission)	120	643	-	891	-	26	1,680
Number of Poles (Transmission)	16	56	-	137	-	12	221
Underbuilt Pole Count	1,088	3,618	-	1,200	-	221	6,127

FHCA Incremental Spatial Statistics – FHCA

Overview: Tables below present **incremental** spatial statistics for FHCA.

Statistic:	CA:	OR:	WA:	UT:	ID:	WY:	Total:
% of circuit miles (Distribution)	17%	5%	-	6%	-	3%	5%
% of territory in FHCA Class	3%	1%	-	0.6%	-	0.20%	-
Customer Count	6557	29217	-	45154	-	12269	93197
Circuit Count	20	39	-	107	-	16	182
Circuit Miles (Distribution)	534	1002	-	1515	-	299	3350
Number of Poles (Distribution)	11490	20724	-	24674	-	7093	63981
Number of Transformers	3539	10039	-	12299	-	3165	29042
Circuit Miles (Transmission)	120	230	-	670	-	26	1046
Number of Poles (Transmission)	16	21	-	98	-	12	147
Underbuilt Pole Count	1088	1265	-	536	-	221	3110

FHCA Total Spatial Statistics – AOI1

Overview: Tables below present **total** spatial statistics for AOI1.

Statistic:	CA:	OR:	WA:	UT:	ID:	WY:	Total:
% of circuit miles (Distribution)	22%	22%	10%	12%	9%	16%	15%
% of territory in FHCA Class	4%	9%	5%	2%	4%	2%	
Customer Count	9,965	97,374	10,229	78,499	5,656	22,412	224,135
Circuit Count	38	187	35	216	33	55	564
Circuit Miles (Distribution)	701	4,303	425	2,789	532	1,402	10,152
Number of Poles (Distribution)	14,065	88,972	9,174	45,687	7,803	25,403	191,104
Number of Transformers	4,344	38,006	4,783	22,915	3,021	8,353	81,422
Circuit Miles (Transmission)	75	838	86	970	315	187	2,471
Number of Poles (Transmission)	14	72	16	150	34	39	325
Underbuilt Pole Count	811	3,330	554	1,249	276	437	6,657

FHCA Total Spatial Statistics – AOI2

Overview: Tables below present **total** spatial statistics for AOI2.

Statistic:	CA:	OR:	WA:	UT:	ID:	WY:	Total:
% of circuit miles (Distribution)	14%	15%	15%	8%	24%	21%	14%
% of territory in FHCA Class	2%	6%	7%	1%	10%	<1%	
Customer Count	5,251	84,726	13,087	48,359	18,959	22,920	193,302
Circuit Count	20	171	34	178	77	67	547
Circuit Miles (Distribution)	452	2,977	637	1,816	1,490	1,859	9,232
Number of Poles (Distribution)	9,325	60,097	14,018	33,867	25,354	32,128	174,789
Number of Transformers	2,941	26,664	6,507	14,996	9,560	9,295	69,463
Circuit Miles (Transmission)	62	287	46	443	312	174	1,324
Number of Poles (Transmission)	11	64	9	107	37	34	262
Underbuilt Pole Count	849	2,393	165	908	1,033	758	6,106