WILDLAND FIRE

Hazard and Risk Mapping

WA Department of Natural Resources
Directed by Senate Bill 6120

GOAL

This is a listening session, with a goal of hearing perspectives, experiences, and ideas respectfully; we are not here to debate or make decisions at this meeting.

- **We will have information to share that we hope sets the stage for good discussion later.**
- **We want to learn from you and will take all input.**
- **Feel free to engage the presenters at the end of their presentations.**
- **At the end, there are two opportunities for input:**
  - **At the "Risk" discussion.**
  - **At the "Table Talk" looking at the hazard maps of the area.**

SESSION FORMAT

Project Overview – Angie Lane, Assistant Division Manager and Project Manager

Hazard Mapping Methodology and Examples - Matt Dehr, Meteorologist and Technical Advisory Team Lead

Neighborhood Aggregation and Examples – Brigit Hill, IT Data Management Lead

Risk Discussion – Angie Lane, Assistant Division Manager and Project Manager

Table Talks – All (break out into groups and review Hazard Maps together, providing feedback to the team for the next draft revision)

GROUND RULES

PARTICIPATION

- One person speaks at a time. Please keep comments brief and on topic (we only have two hours).
- Follow the facilitator's guidance on time limits and order of speakers.

RESPECT AND CONDUCT

- Treat all participants with respect and dignity, even if you disagree.
- No interruptions, side conversations, or personal attacks.
- Critique ideas, not people.

LISTENING

- Listen to understand, not to respond.
- Please avoid repeating points that have already been made.

SAFETY AND INCLUSION

- Use inclusive and appropriate language and avoid harassment.
- The facilitator may pause or redirect comments that violate these rules.

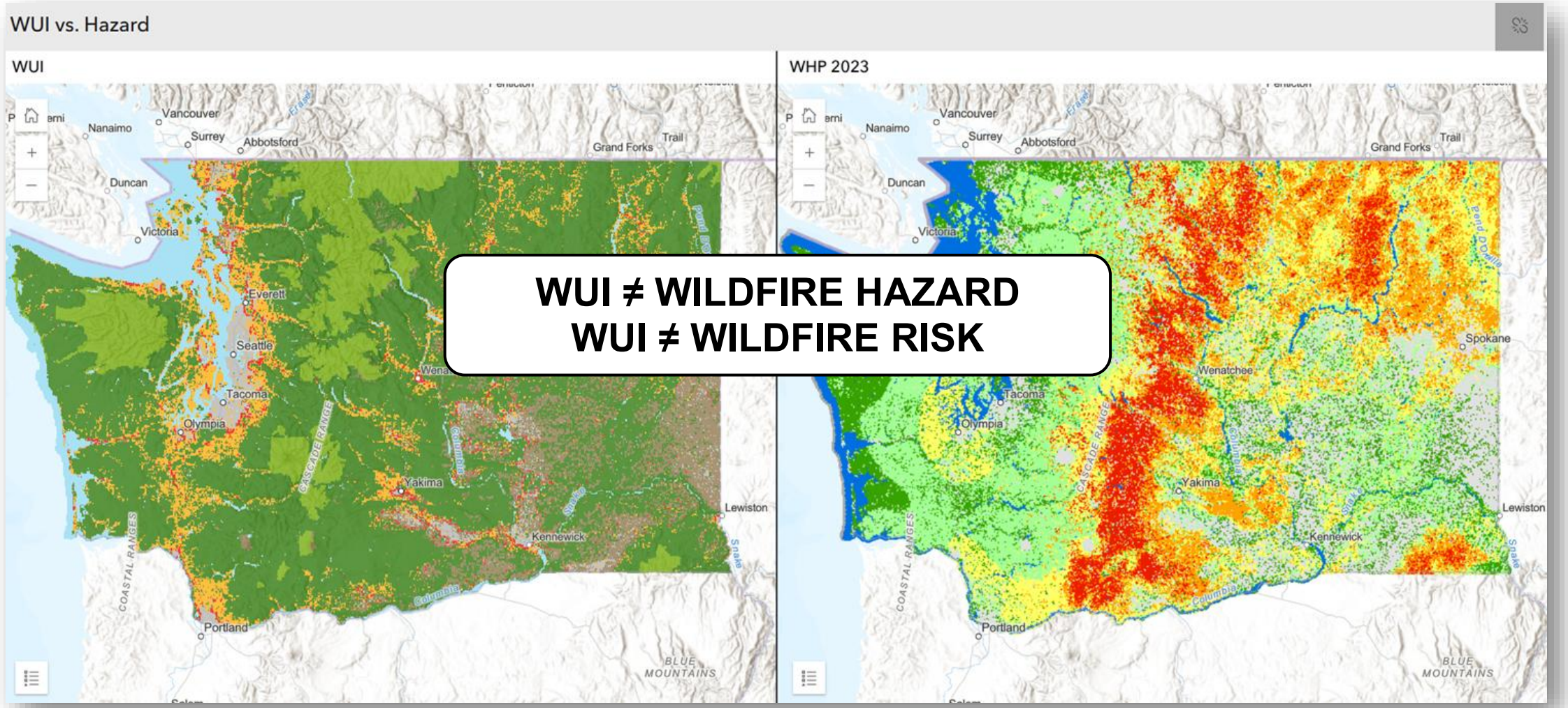
PROJECT OVERVIEW

The Washington State Department of Natural Resources (DNR) is leading the development of a Wildfire Hazard and Risk Mapping initiative, as directed by **Senate Bill 6120,** to enhance wildfire preparedness by identifying areas at risk and providing general hazard assessments.

This project will support communities, emergency responders, and policymakers in reducing wildfire impacts across Washington by creating accessible and standardized wildfire hazard and risk information.

A Steering Committee consisting of county fire marshals, insurance commissioners, and representatives of counties and cities across Washington provided guidance to DNR to best meet the needs of stakeholders across the state.

PROJECT OVERVIEW



KEY OUTCOMES

- **Statewide Wildfire Hazard Map** - DNR will develop and maintain a map that categorizes wildfire hazard levels (low, moderate, high, very high) across Washington.
- **Local-Level Wildfire Risk Maps** - Each county will have a base-level risk map to aid planning and response efforts.
- **Standardized Risk Mapping Criteria** - In collaboration with the State Fire Marshal's Office, DNR will establish clear criteria to assess and map wildfire risk at a local level.
- **Public Access to Data** - The finalized hazard and risk maps will be available on DNR's website, providing transparency and supporting mitigation planning.
- **Ongoing Updates** - Structured methodology will be established for updating the maps to reflect changing conditions and new data.

KEY QUESTIONS

How should hazard and risk be modeled?

What counts as “vulnerable resources or assets?”

How do local assessments feed into state maps?

How do we balance statewide consistency with local knowledge?

STEERING COMMITTEE

The Steering Committee convened in early 2025

MEETINGS FOCUSED ON:

- Bill requirements and project scope
- Shared glossary of terms (hazard, risk, WUI, etc.)
- Examples of potential methodology
- Reviewing draft approaches for hazard and risk maps
- Identifying communication and engagement needs

PROGRESS TO DATE:

- Consensus on key definitions
- Agreement on baseline mapping approach
- Draft structure for statewide and local-level maps
- Established path for incorporating local knowledge
- Draft Hazard Map completed

WHAT REMAINS:

- Consensus on risk mapping and valuable assets
- Work with local GIS personnel to gather data that could be used for risk mapping
- Finalize draft maps and upload tool to DNR website by July 1; open for last review and comment period by November 1
- Establish update cycle for maps

HOW INSURERS CONSIDER WILDFIRE RISK

- Insurers use large national and international data analytics companies combined with their own propriety models to evaluate wildfire risk. They do not use government maps.
- The Office of the Insurance Commissioner (OIC) annually surveys insurers to best understand current practices and policies.

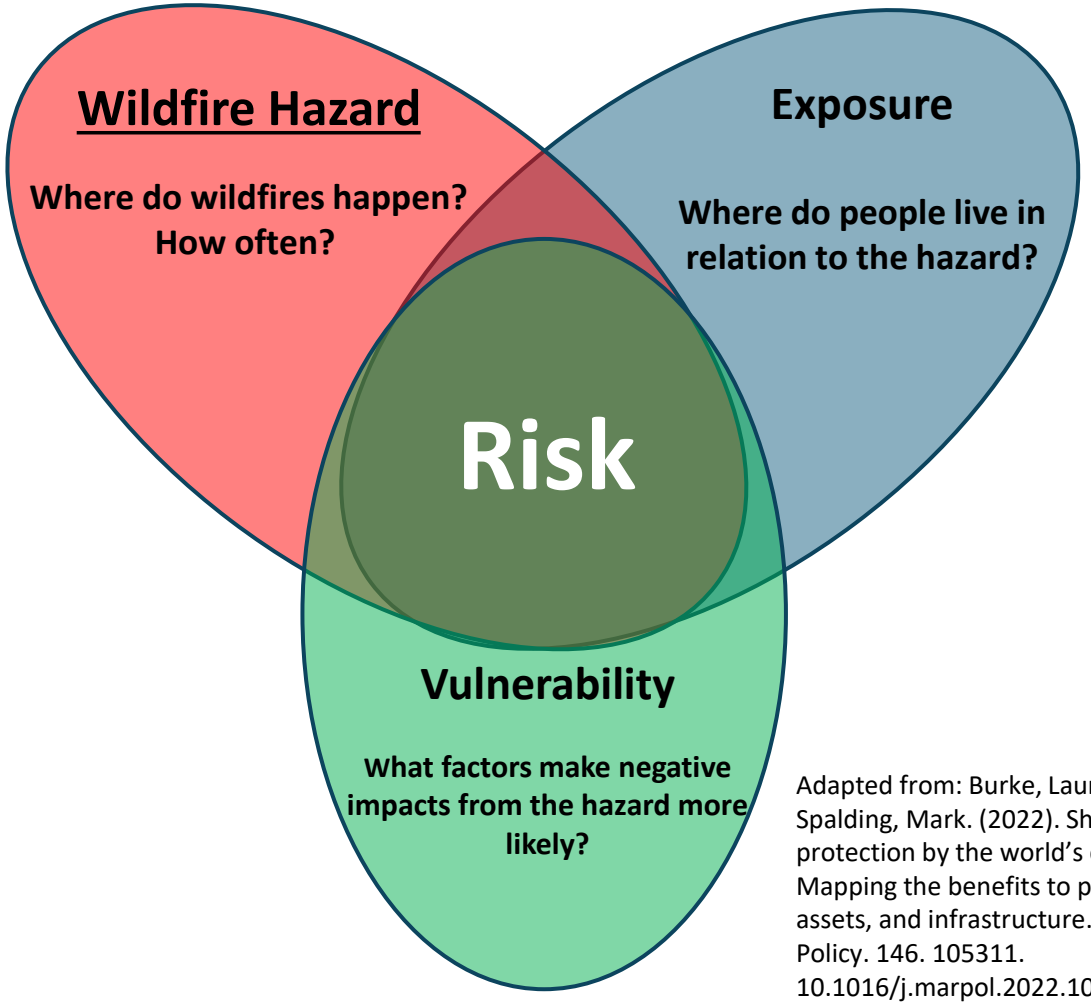
For questions, please contact David Forte, Senior Policy Advisor, OIC

david.forte@oic.wa.gov

Hazard Mapping Methodology and Examples

FSim: The Large Fire Simulator

- Developed by the USFS and in use since 2011
- Widely adopted for wildfire hazard and risk mapping projects
- Uses recent fire history and weather data to simulate 10,000-50,000 fire season iterations under current conditions



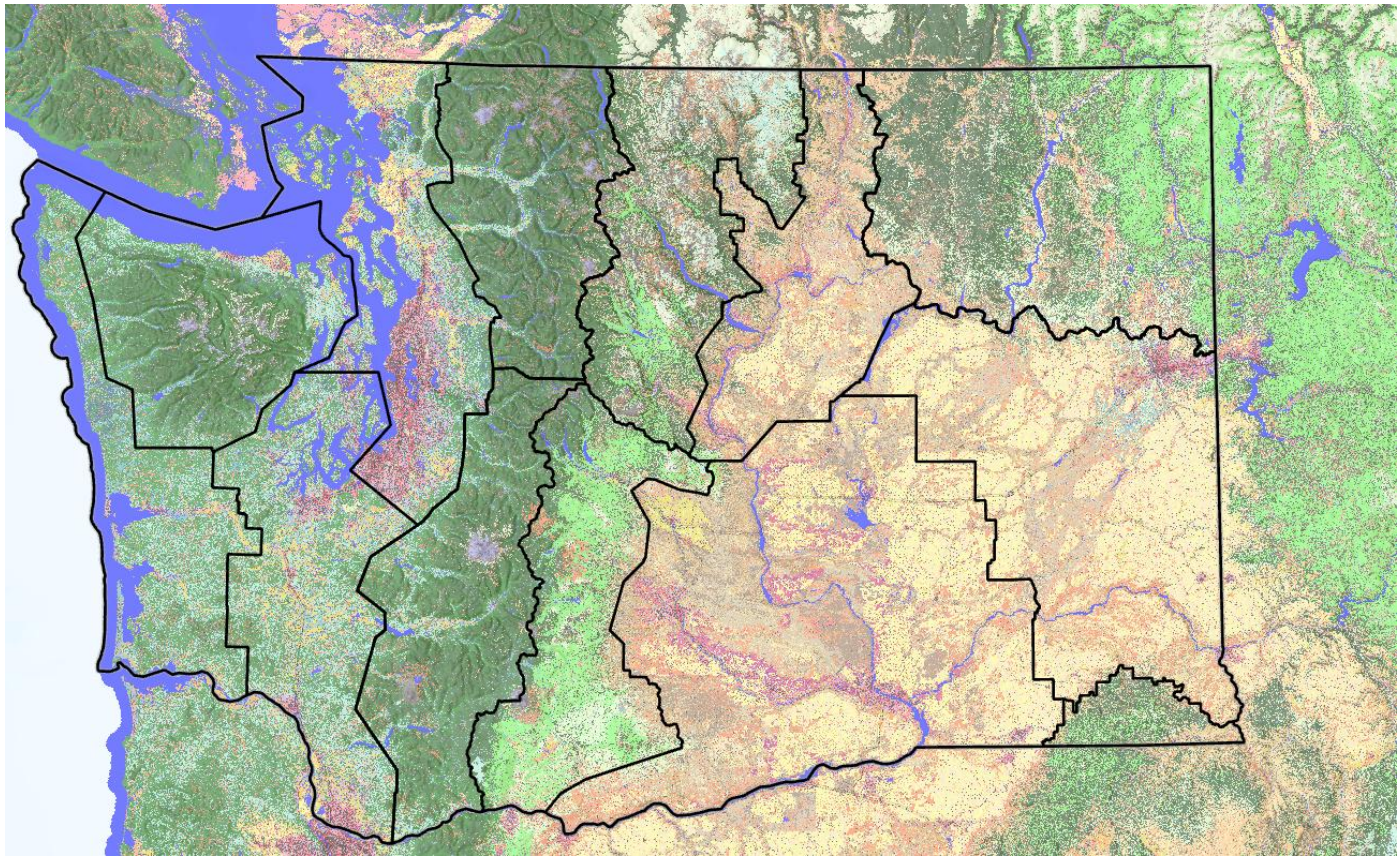
Adapted from: Burke, Lauretta & Spalding, Mark. (2022). Shoreline protection by the world's coral reefs: Mapping the benefits to people, assets, and infrastructure. Marine Policy. 146. 105311. 10.1016/j.marpol.2022.105311.

Graphic from PNW QWRA Methods & Results (Gilbertson-Day et. al, 2018)

Hazard Mapping Methodology and Examples

Inputs to the Model

- **Fuelscape**
  - When fires ignite, what vegetation and terrain do they encounter in each sub-region of the state?
  - The vegetation and terrain layer is ingested at 120-meter resolution, which corresponds to a pixel size of 3.55 acres
- **Historic Fire Occurrence Data**
  - Where do fires ignite on the landscape?
  - Highly detailed and accurate data is available back to 1992
- **Historic Weather and Fire Danger Data**
  - When fires ignite, what are the weather and fire danger conditions like in each sub-region of the state?
  - Excellent long-term weather and fire danger datasets available



Hazard Mapping Methodology and Examples

Outputs from the Model

1. Annual Burn Probability

How often does a pixel burn?

Adjective Rating	Annual Burn Probability
Very Low	0 - 0.05% (<1 in 2000)
Low	0.05 - 0.2% (>1 in 2000)
Moderate	0.2 - 1% (>1 in 500)
High	1 - 2% (>1 in 100)
Very High	>2% (>1 in 50)

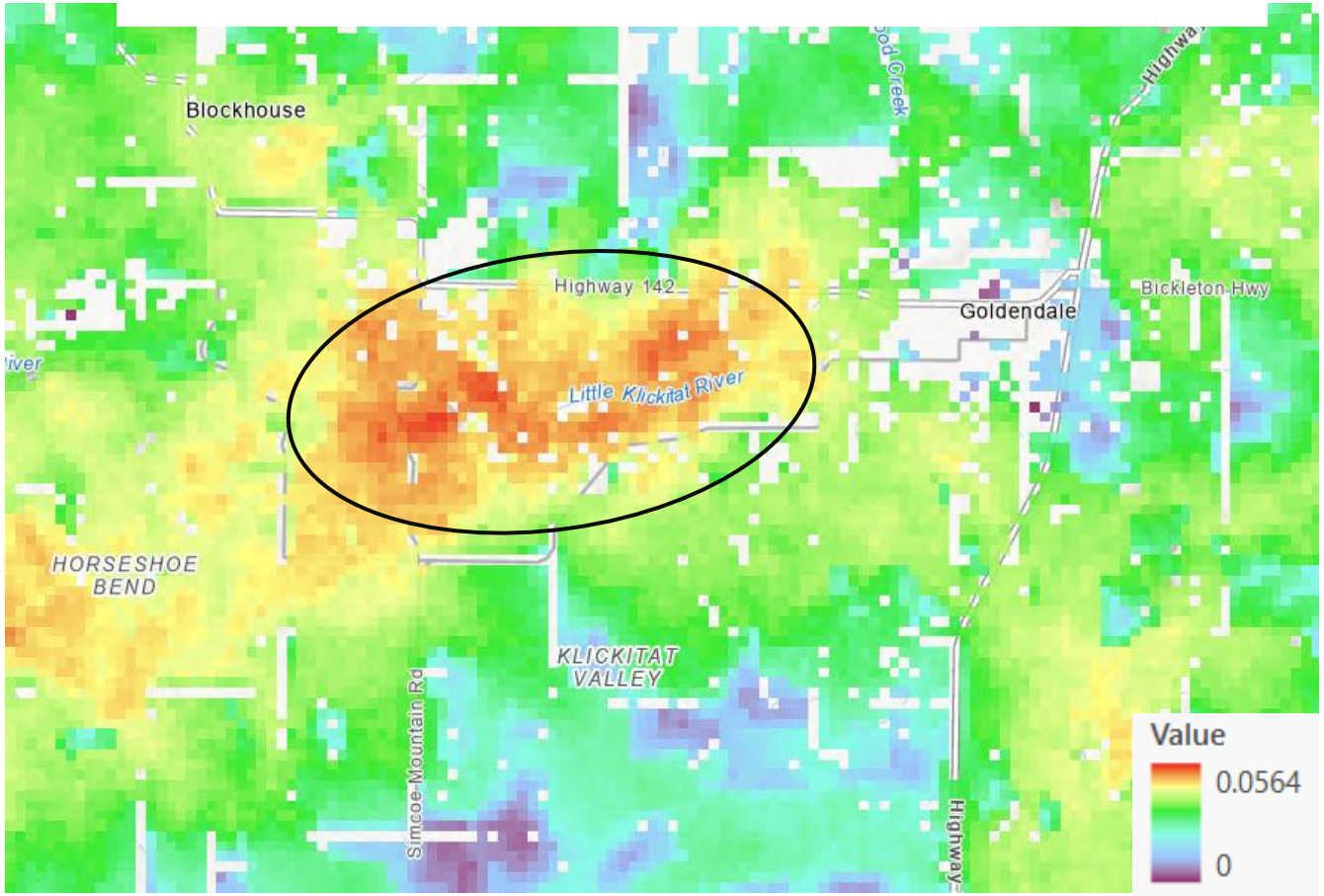
2. Conditional Fire Intensity Level

When a pixel does burn, how intense is the fire?

Fire Intensity Level (FIL)	1	2	3	4	5	6
Flame Length Range (feet)	0-2	2-4	4-6	6-8	8-12	12+

Tables from PNW QWRA Methods & Results (Gilbertson-Day et. al, 2018)

Raw Annual Burn Probability Output

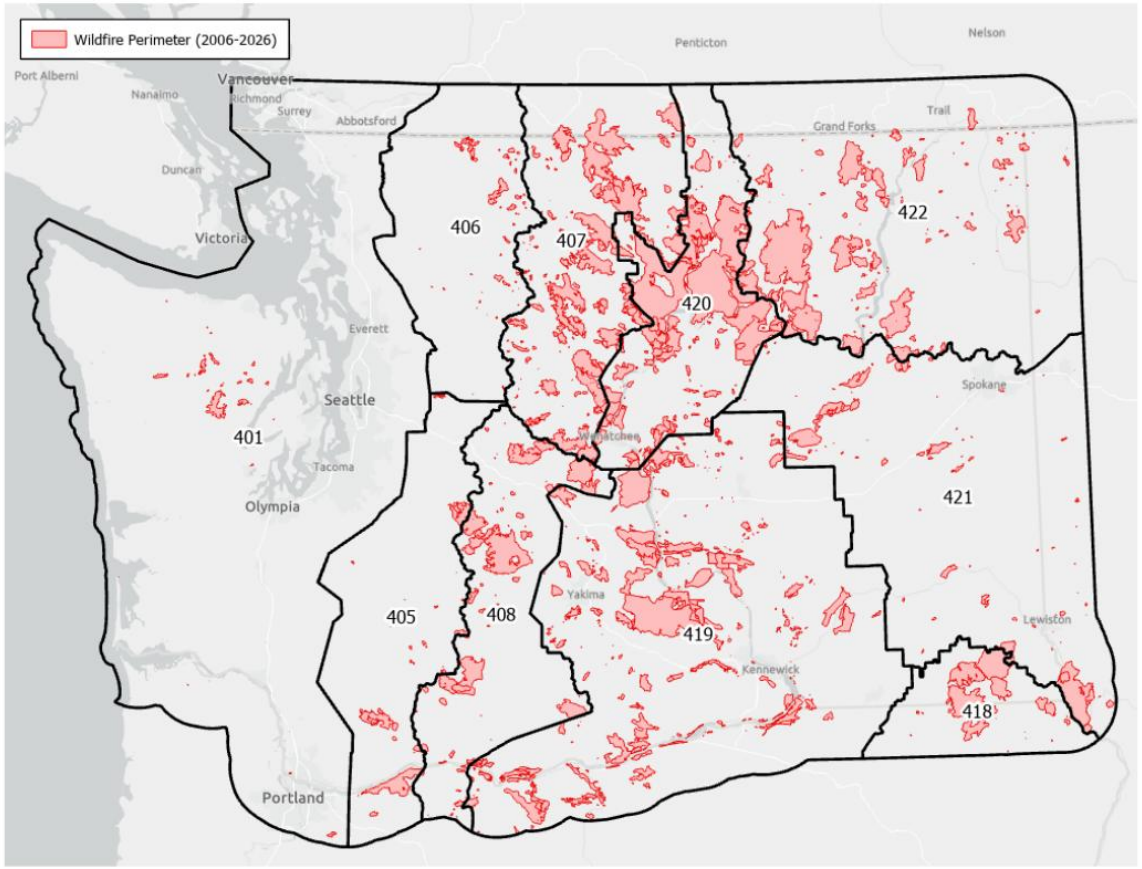


Example: Across a 10,000-season simulation, a pixel experiences a wildfire on 350 different occasions. The Annual Burn Probability of that pixel is 350/10,000 (.0350) or 3.5%.

Model Calibration – Adjusting to Meet Reality

Why use a model in the first place, instead of just historical observations?

- Wildfire data has become more reliable in the last 20-30 years, but the sample size is too small to make conclusions about burn probability at the local level. We need a larger sample size.
- By using a model, we can simulate a massive sample size of 10,000+ wildfire seasons using fire occurrence and weather data from just the past 20-30 years.
- The model output is then used to calculate meaningful statistics about burn probability at every location, not just where fires have occurred more recently.



Bottom Line

Using the full range of weather and fire danger conditions from the past 20-30 years, the model is built and calibrated to reveal where wildfires are most likely to occur within each subregion of the state.

Model Calibration – Adjusting to Meet Reality

We ***calibrate the model*** based on recent fire activity at the sub-regional level.

The calibration process gives us confidence that the model is generally simulating fires at the **proper size and frequency for that region**.

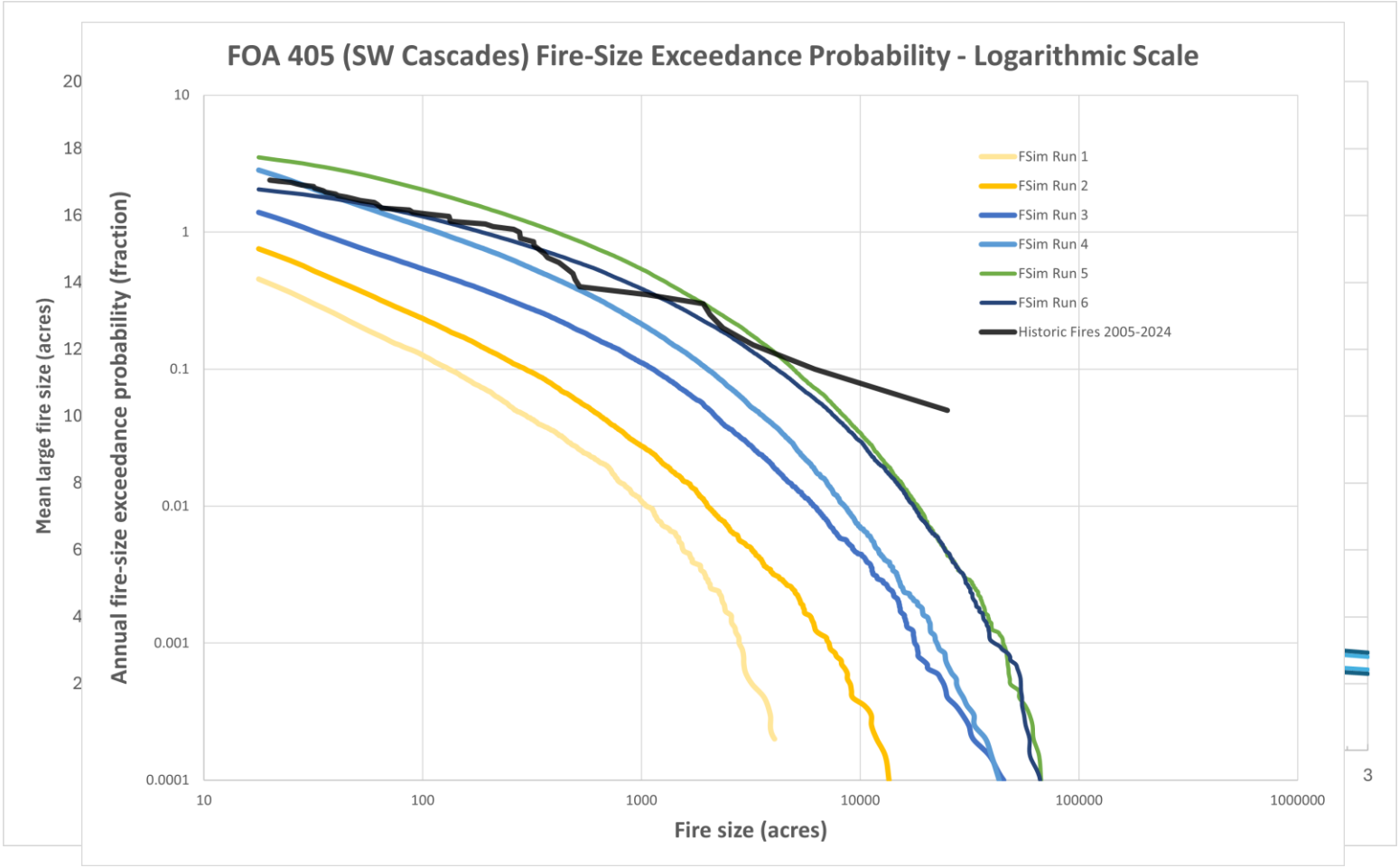
How does the calibration work?

For each Fire Occurrence Area (FOA), we:

1) Compare model results to recent wildfires (last 20 years), checking if distributions of fire size and frequency match.

2) If model results DO NOT MATCH recent wildfire sizes and frequency, tweak model inputs and re-run the model.

3) Repeat until model results MATCH recent wildfire sizes and frequency.



Neighborhood Aggregation and Examples

Goal: Apply hazard ratings at an appropriate scale to meet the logistical considerations of building code enforcement.

Solution: Create neighborhood boundaries that will be used to aggregate hazard from the input raster grid and assign the neighborhood a final hazard rating.

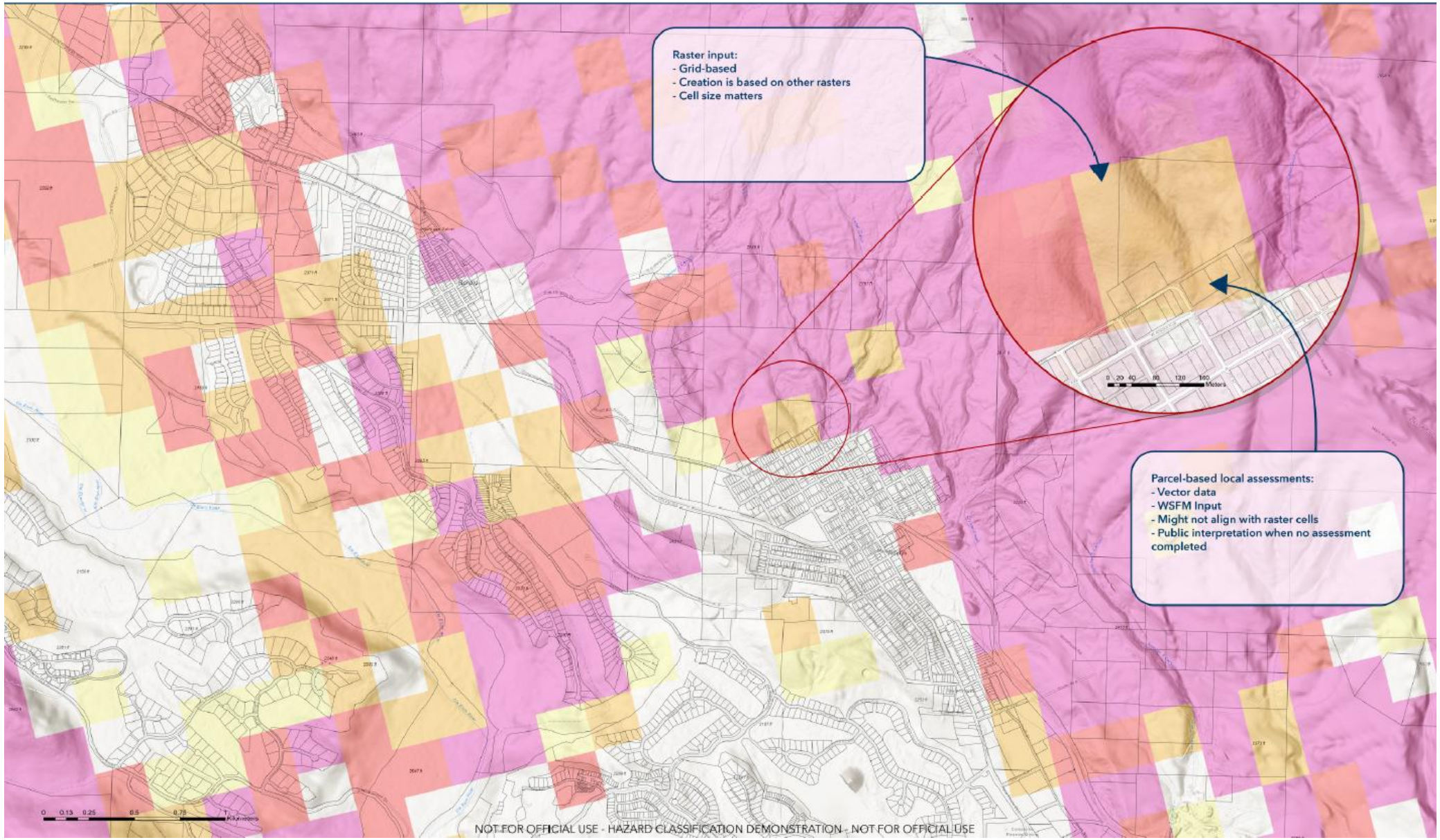
WILDFIRE

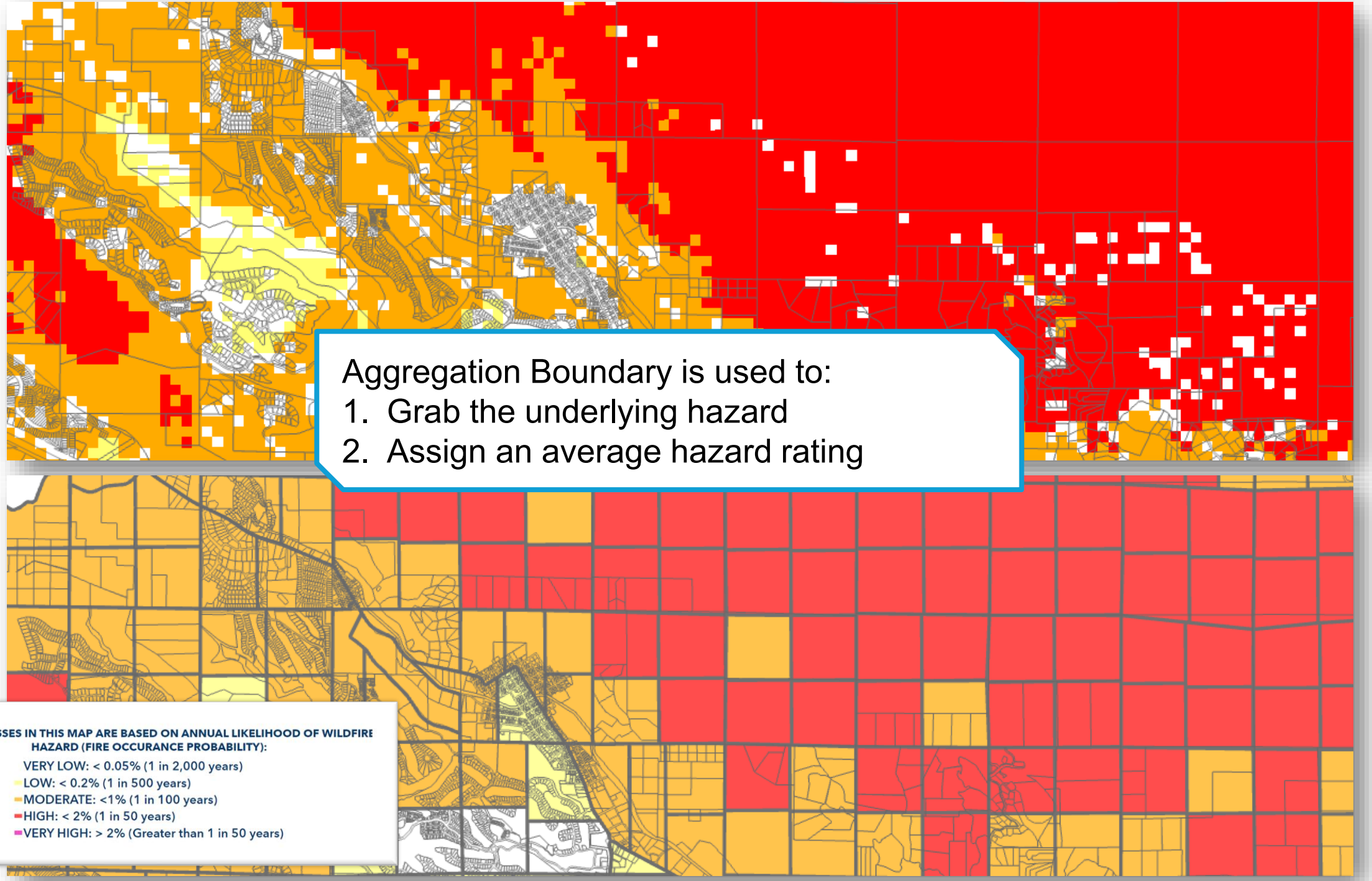
Raster vs. Local Parcel Assessment

Roslyn, WA Example

HAZARD CLASSES IN THIS MAP ARE BASED ON RETURN INTERVAL OF WILDFIRE HAZARD:

- VERY LOW (.0005): > 2000 year
- LOW (<.002): 500 - 2000 year
- MODERATE (<.01): 100- 500 year
- HIGH (<.02): 50 - 100 year
- VERY HIGH (>.02): < 50 year

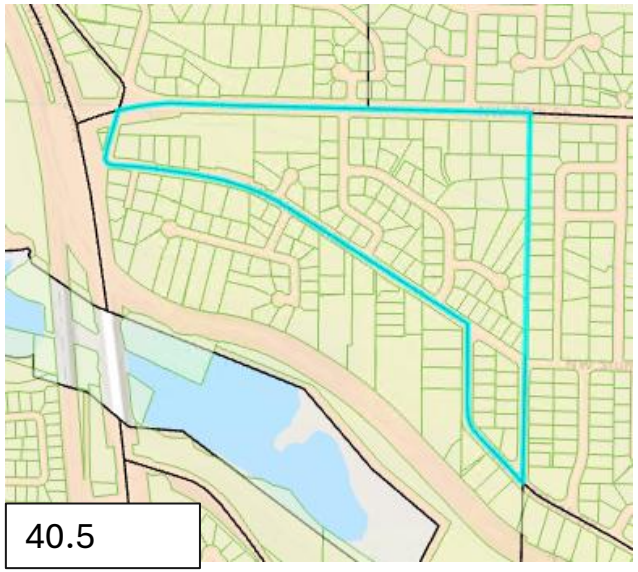


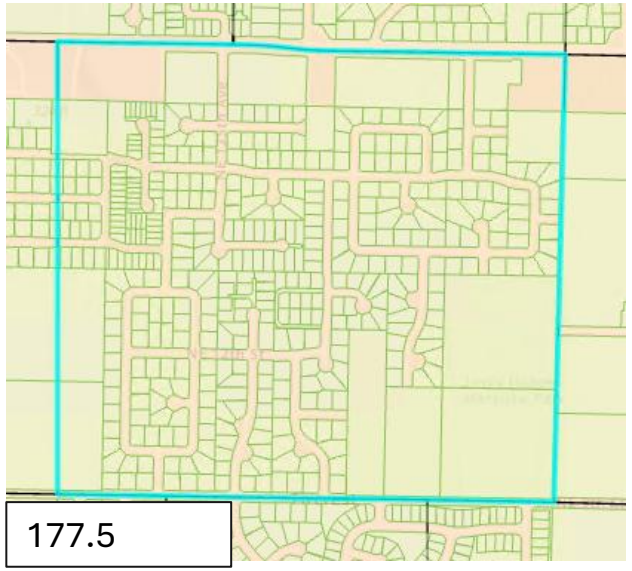

Aggregation Boundary is used to:
1. Grab the underlying hazard
2. Assign an average hazard rating
HAZARD CLASSES IN THIS MAP ARE BASED ON ANNUAL LIKELIHOOD OF WILDFIRE HAZARD (FIRE OCCURANCE PROBABILITY):
VERY LOW: < 0.05% (1 in 2,000 years)
LOW: < 0.2% (1 in 500 years)
MODERATE: <1% (1 in 100 years)
HIGH: < 2% (1 in 50 years)
VERY HIGH: > 2% (Greater than 1 in 50 years)

Neighborhood Aggregation: Baseline Units

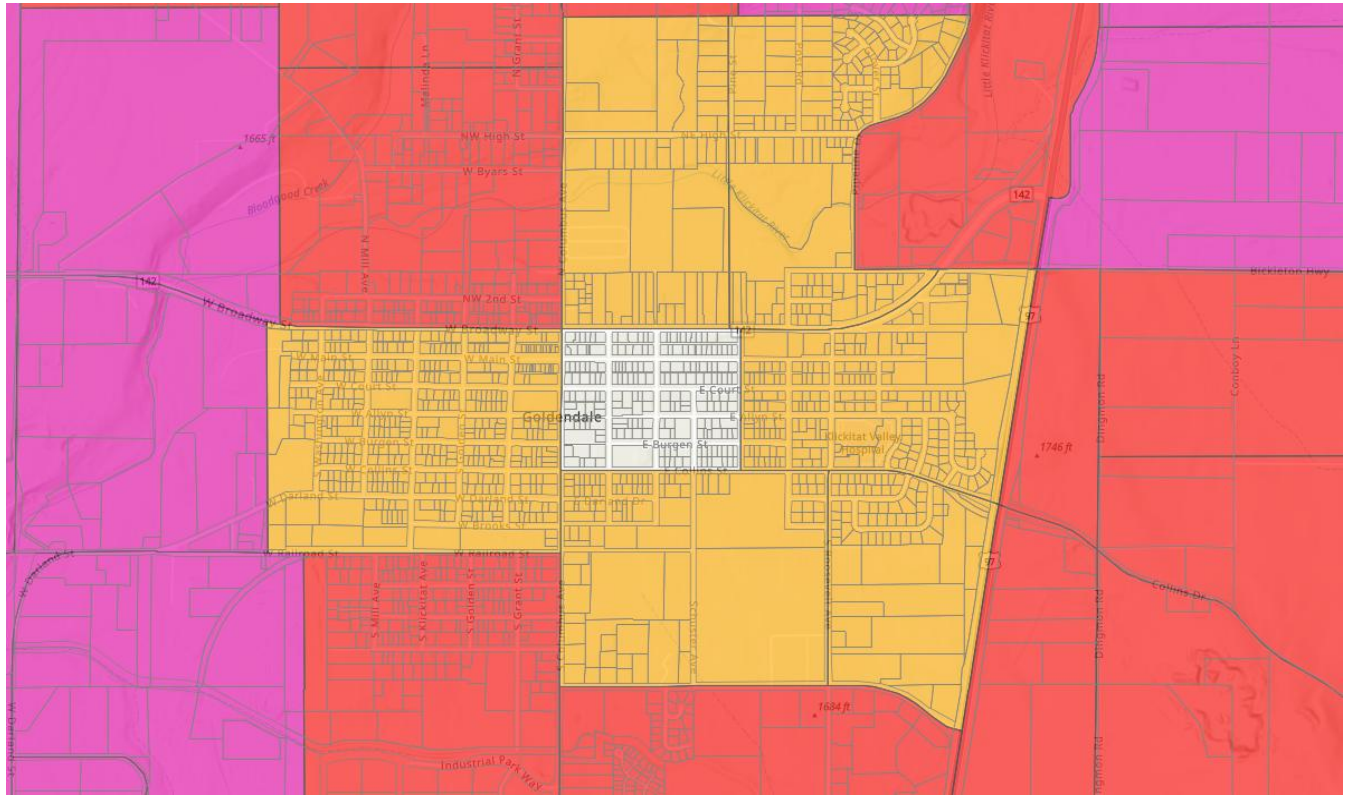
- Start with Public Land Survey System sections layer
- Slice sections up using major highways and roads
- Merge units that are below minimum size with adjacent units
- Split units that are too large in half until below maximum size

▪ Minimum: 40 acres (¼ ¼ Section) ▪ Maximum: 180 acres (~ ¼ Section)





Neighborhood Aggregation: Local Input and Next Steps



Local Input: DNR has created “baseline” Neighborhood Aggregation Unit Boundaries (NAUB). These are just a starting point. We want local jurisdictions to tell *us* what is a neighborhood in their area

Next Steps:

- Hear from local officials and YOU
- Develop a methodology to integrate local input for the NAUBs
- Replace our baseline NAUBs with local input NAUBs and re-run aggregation

Risk mapping and valuable assets

1. Define Risk
2. What are valuable assets with respect to community?
3. How vulnerable or at risk is your community to a large wildfire (100 acres or more)? What leads you to think that?
4. Do you know where to find more information about hazards in your area?
5. What kind of mitigation measures could you take around the community to reduce your risk to wildland fire?

Hazard Map Table Talk

1. Review map with the group
2. Do the ratings for the different areas make sense?
3. What else should DNR consider regarding the draft hazard map you are reviewing?
4. If you want to be contacted about future mapping updates, please make sure you indicated that on the sign in sheet provided during the meeting.

PROJECT WEBPAGE

https://dnr.wa.gov/wildfire-resources/wildfire-prevention/wildfire-hazard-and-risk-mapping

HAZARD MAP

https://wadnr.maps.arcgis.com/apps/instant/atlas/index.html?appid=2bcee713d95f4c4fa9b3a03f01ada2fc

Contact: Angie Lane, *Project Manager*

Assistant Division Manager

Plans and Information

WA DNR – Wildland Fire Management Division