Identifying Wildfire Risk Using Geospatial Technology

Transforming Landscape Data into Practical Wildfire Risk Insights

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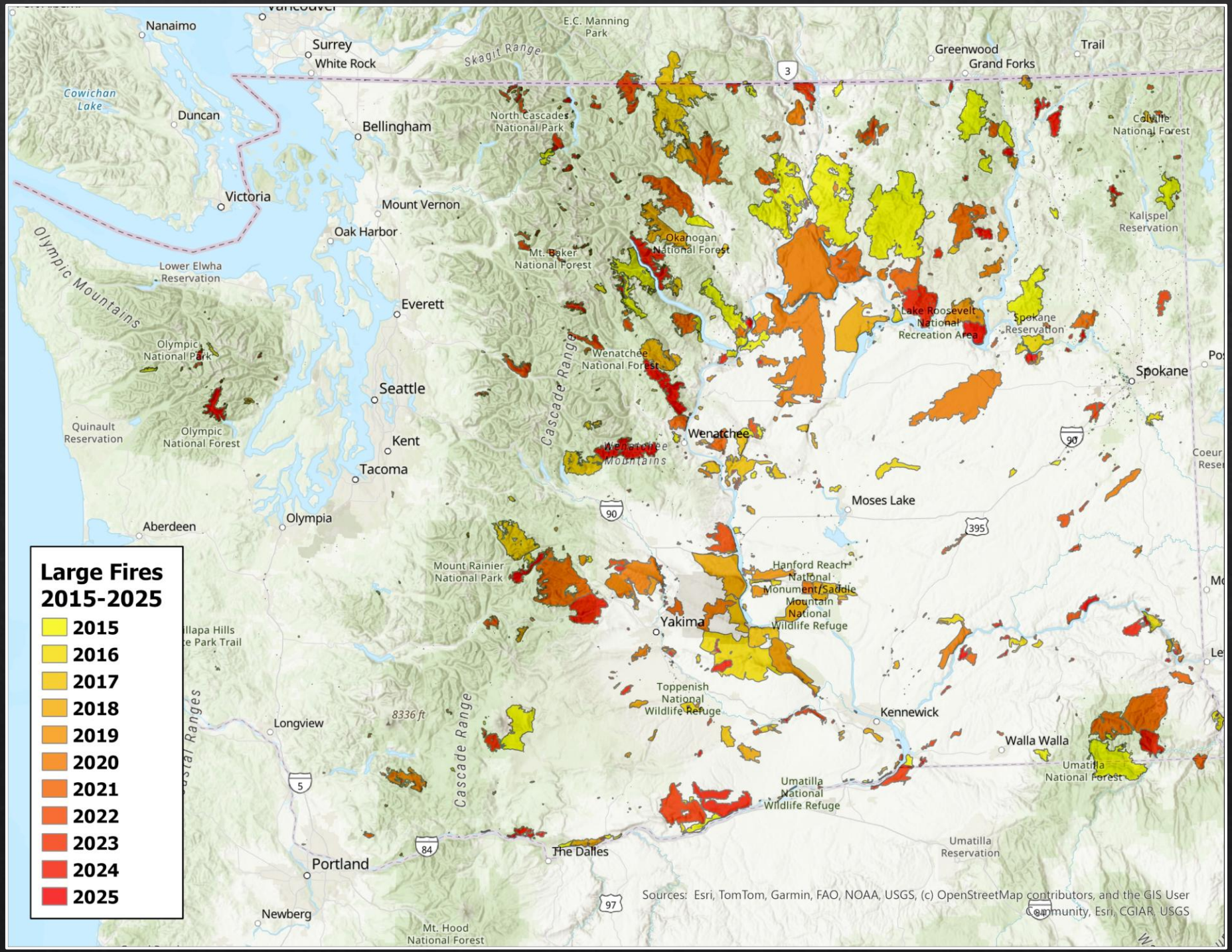
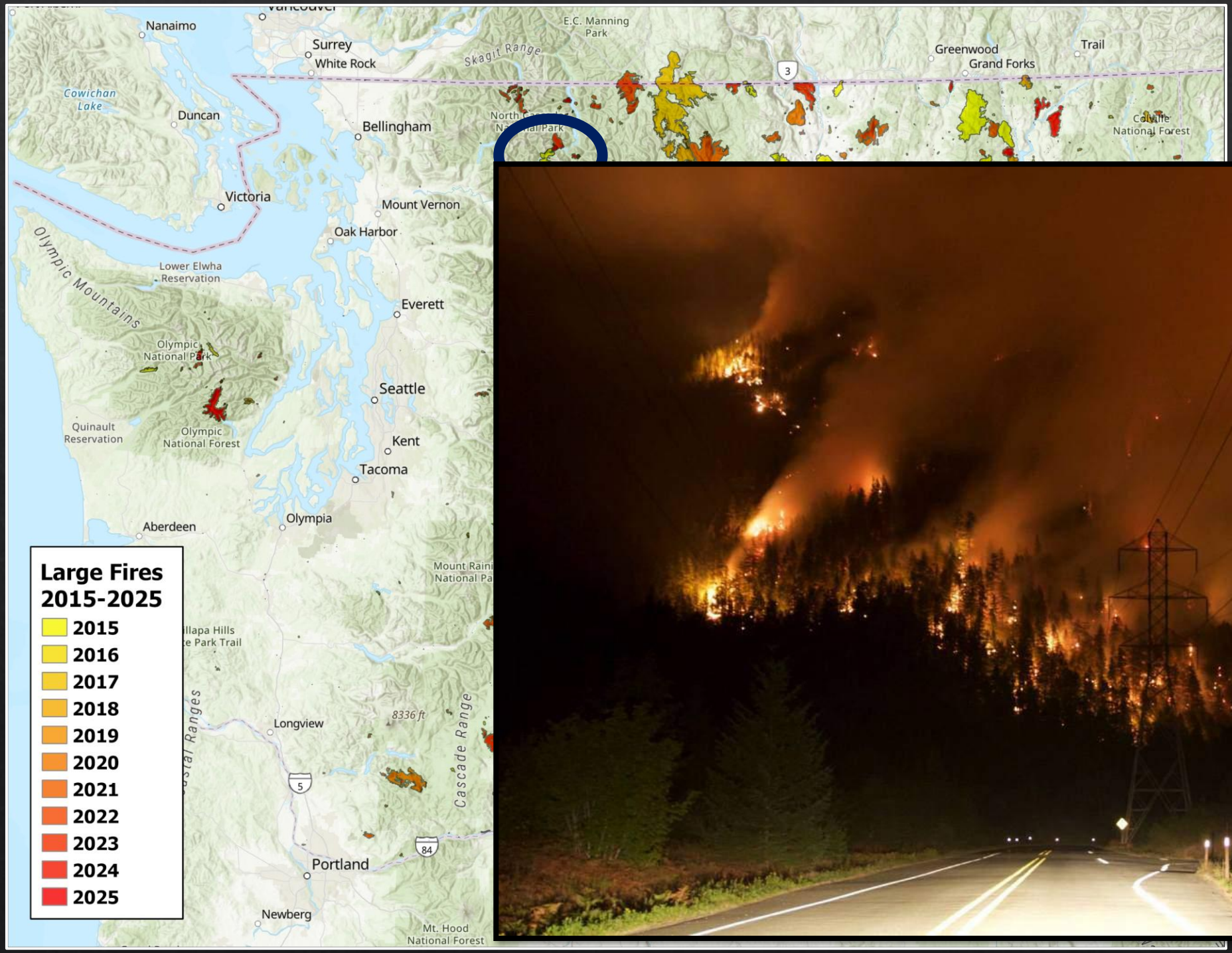
The Issue: Escalating Wildfire Risk

- Increase in temperatures, drought and accumulated fuels
- Expansion of Wildland Urban Interface (WUI)
- How do agencies (land managers, fire professionals, municipalities, utilities) identify and mitigate risks to infrastructure, natural resources, and community safety?

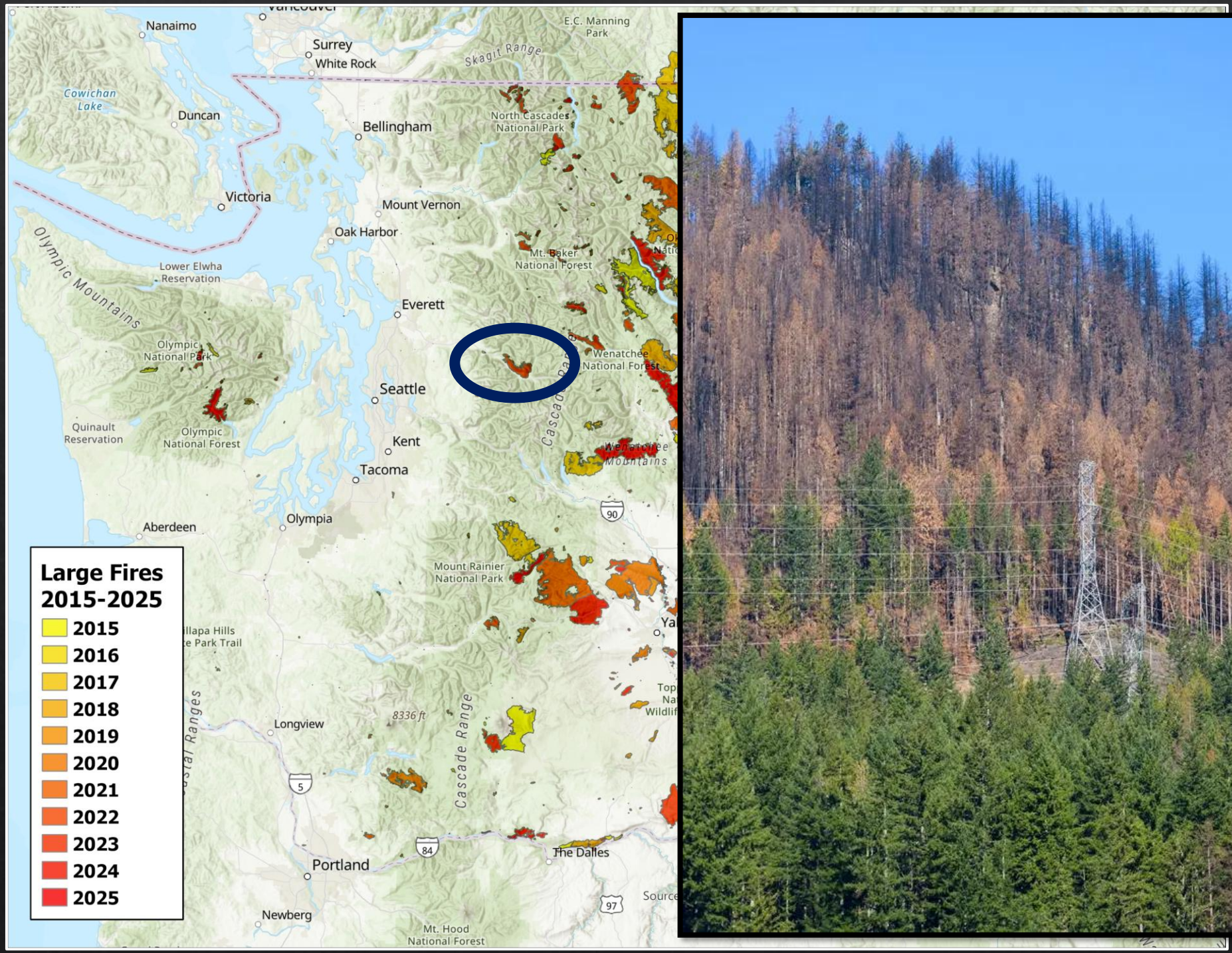
Large Fires 2015-2025 WA DNR

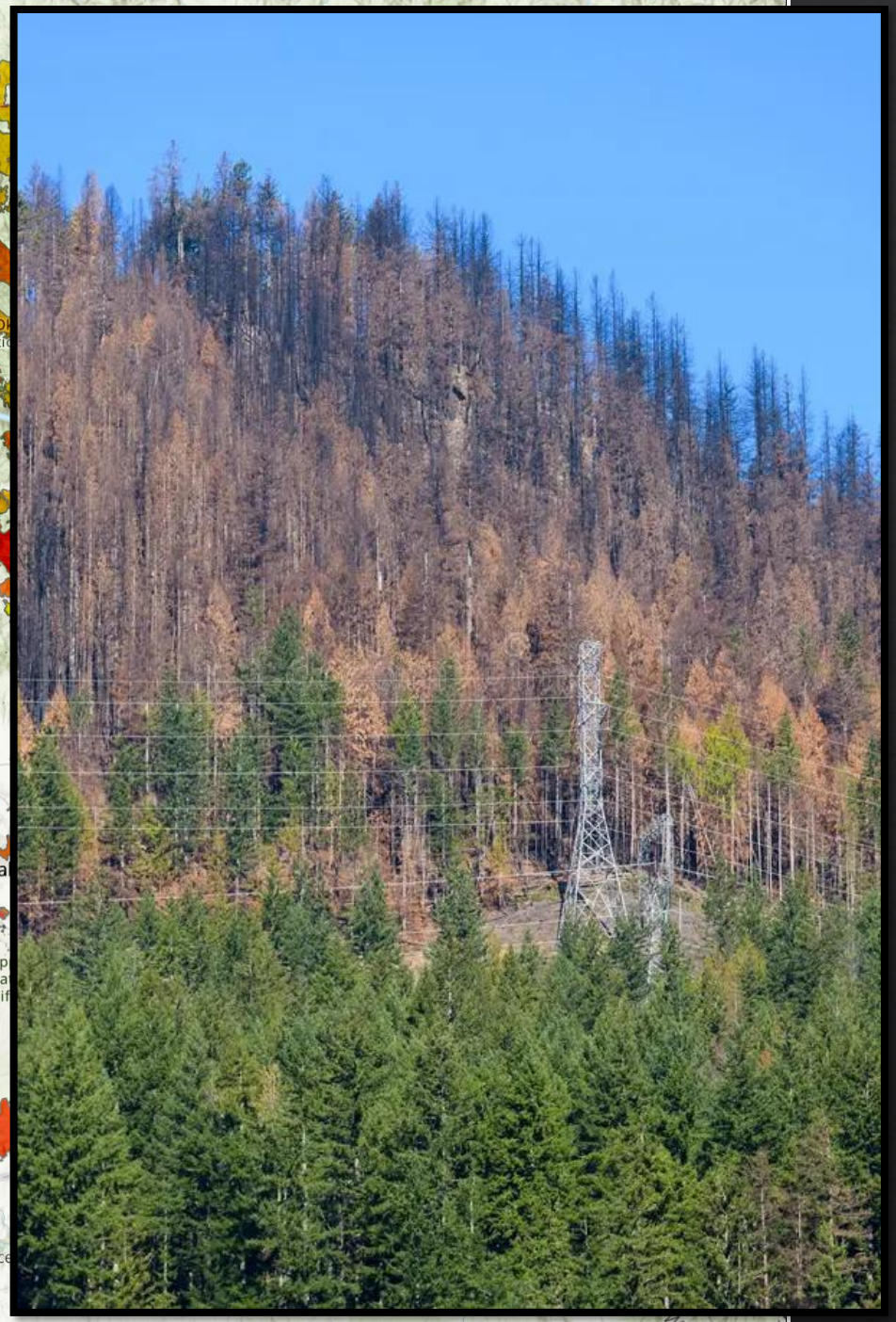


Goodell Fire 2015

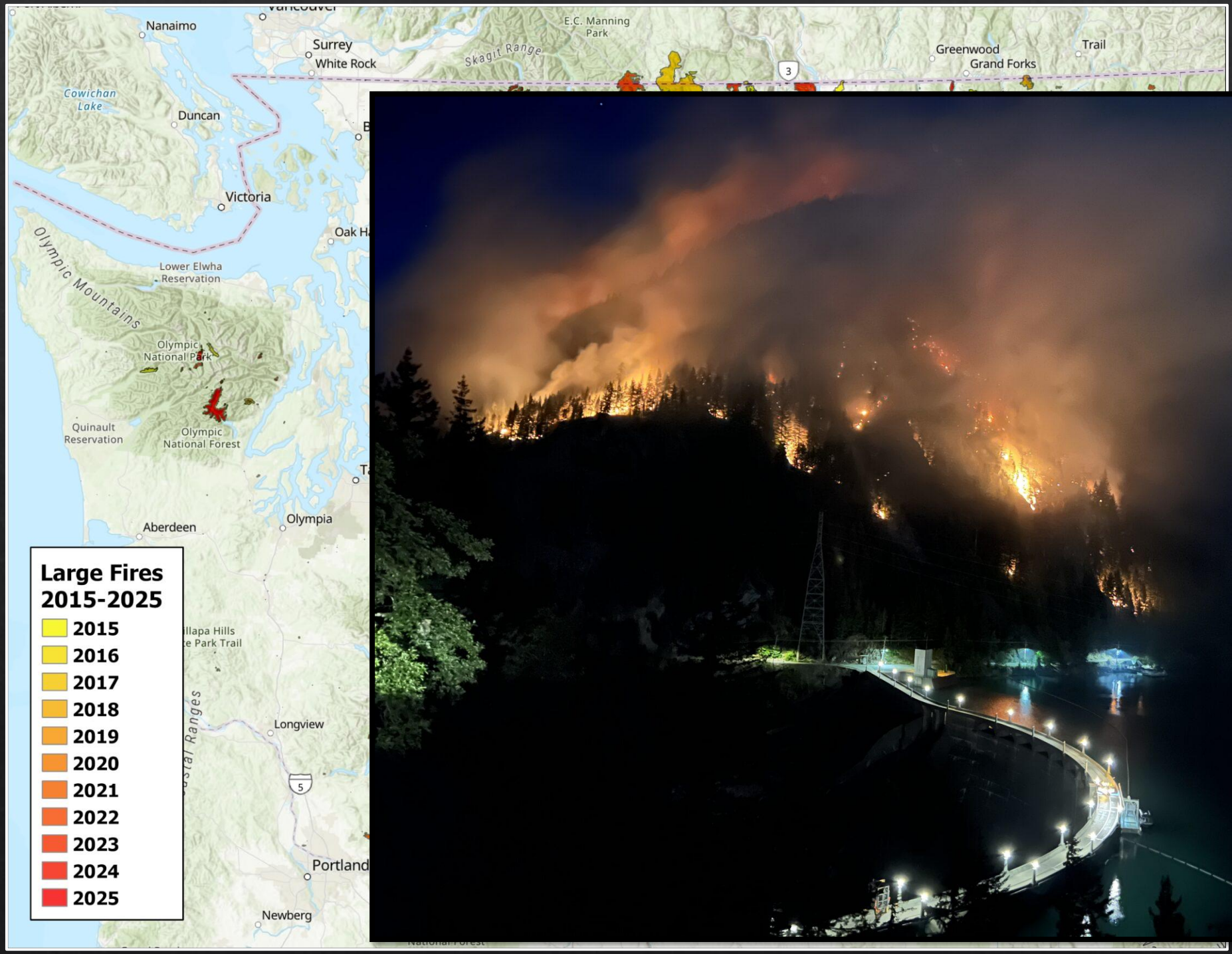


Bolt Creek Fire 2022



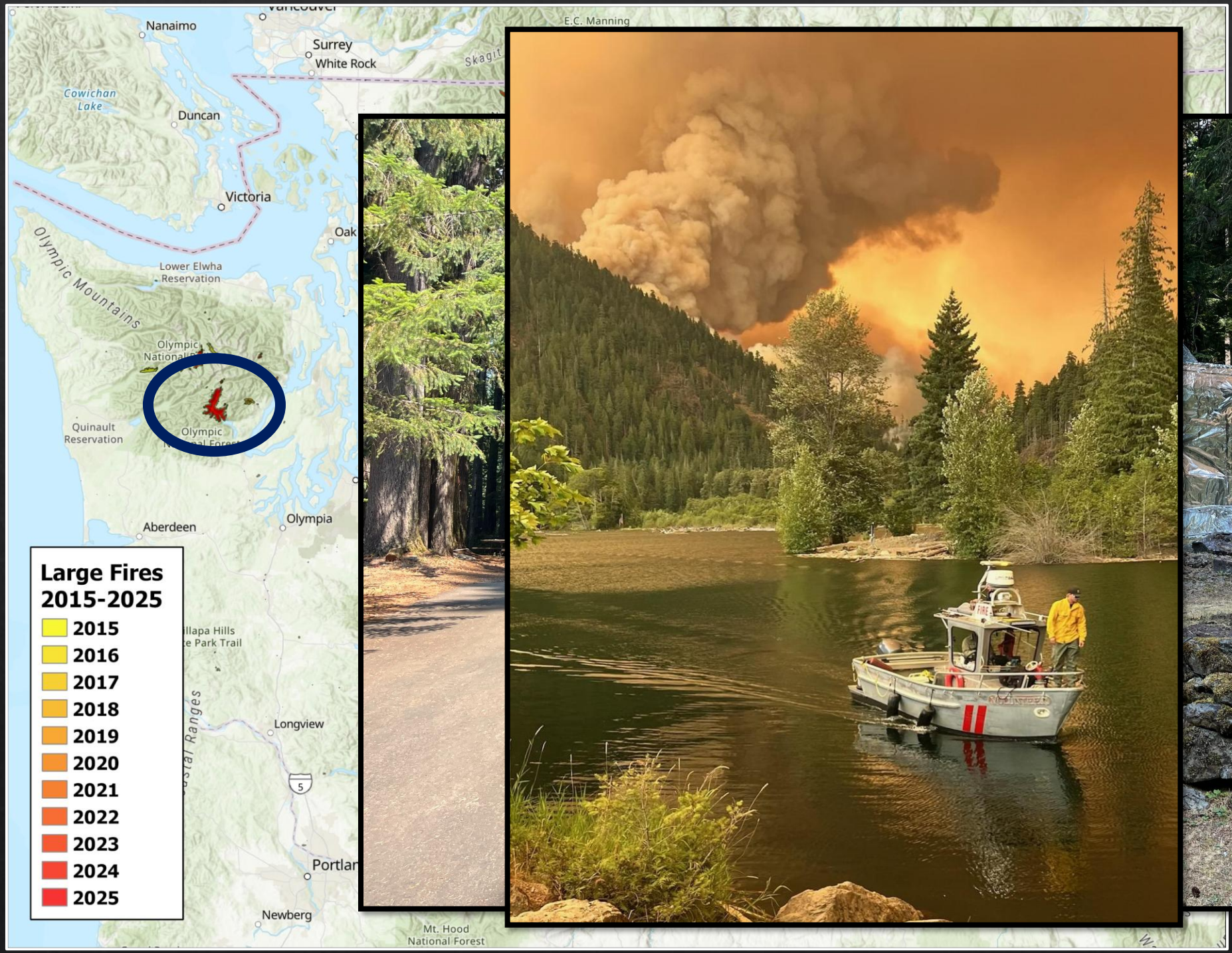


Sourdough Fire 2023



Pioneer Fire 2024

Bear Gulch Fire 2025

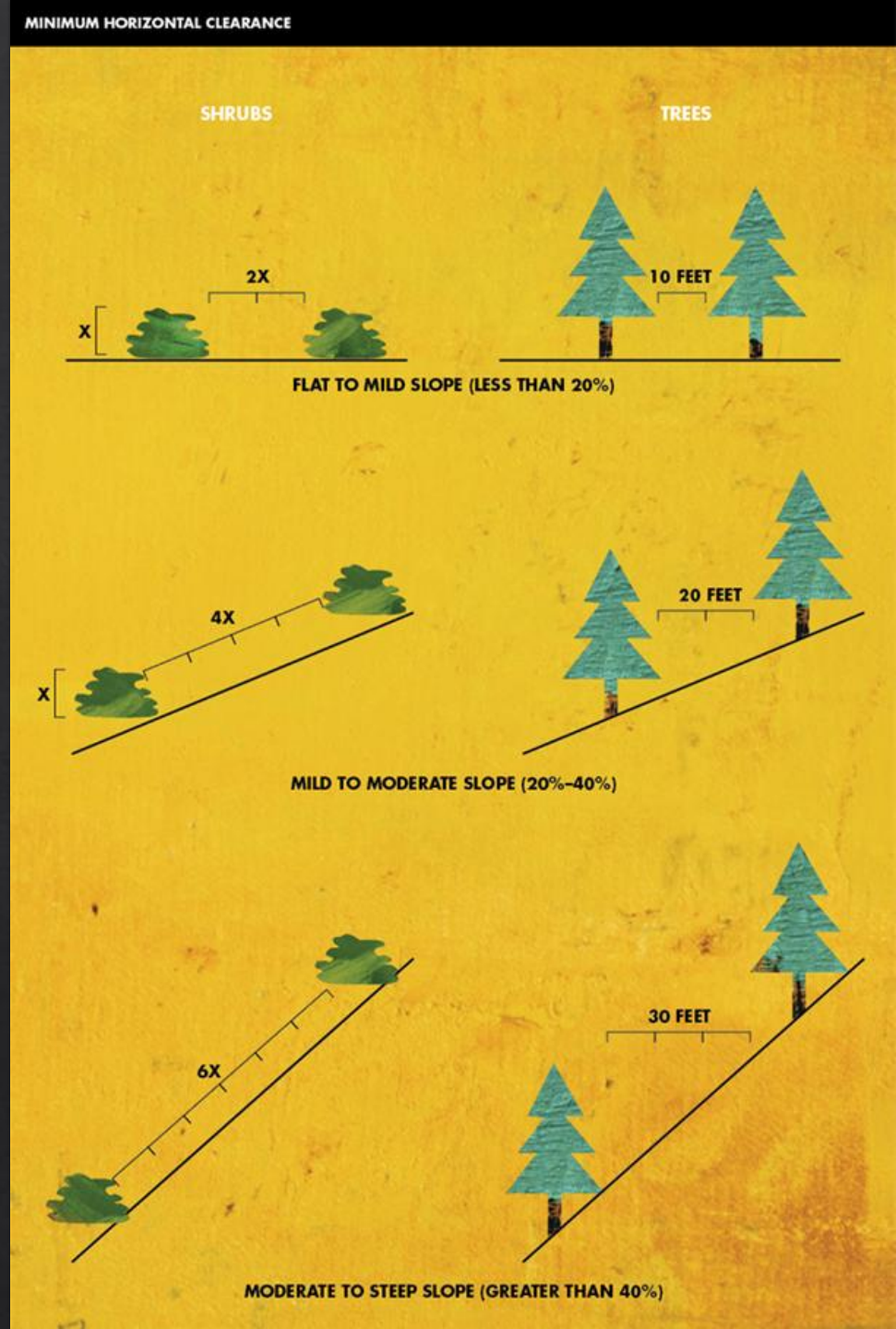


Understanding the Landscape

- **Vegetation**, **topography**, and **fuel conditions** are critical factors in fire risk.
- **Aerial Lidar** and **aerial imagery** provide detailed assessments of these factors to quantify wildfire risk, prioritize treatments, and identify vulnerabilities in the community.

Risk Factors in the Landscape

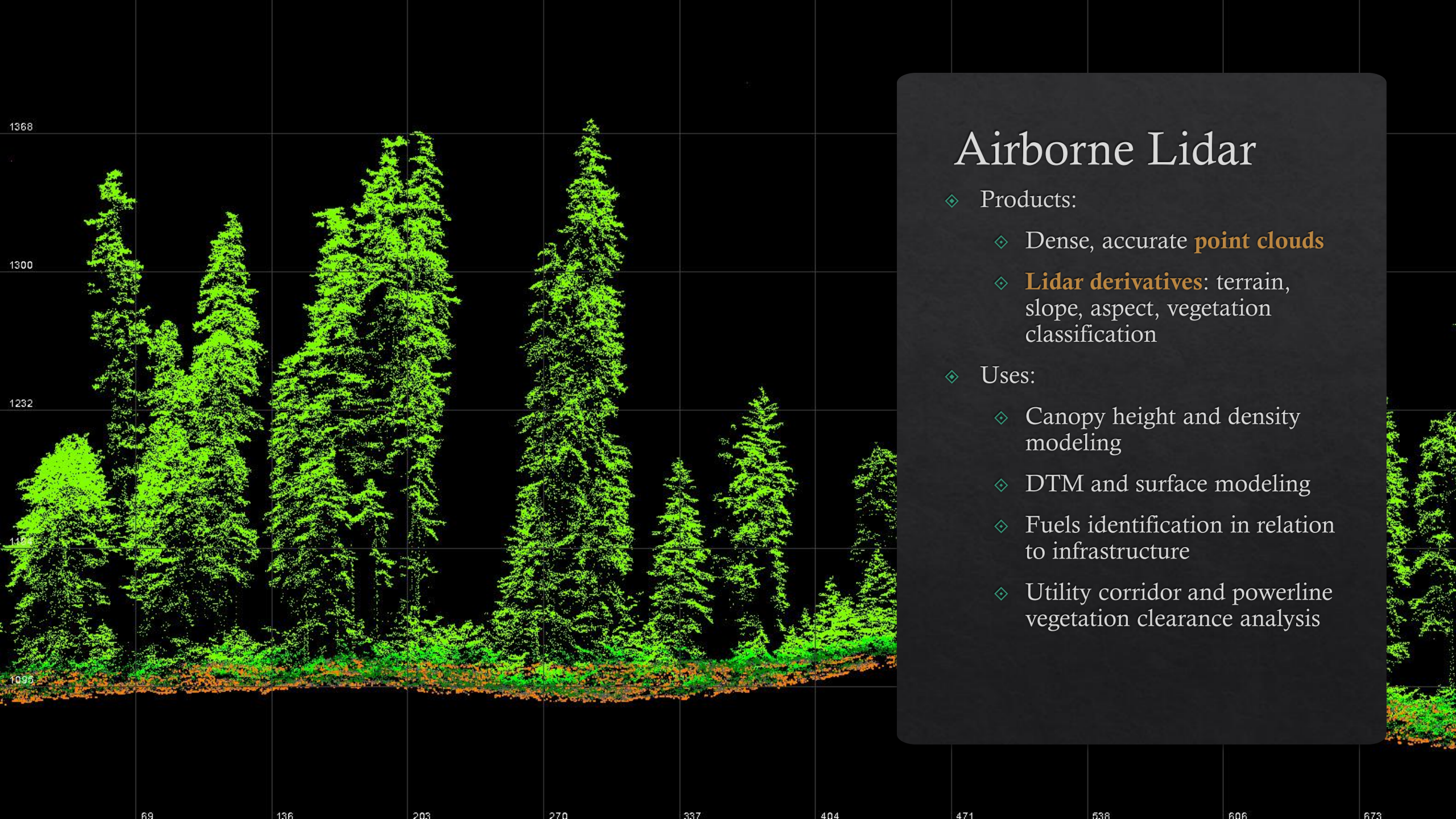
- Fuels
- Slope
- Aspect
- Terrain
- Where do these higher risk areas intersect with human development?



Credit: Cal Fire

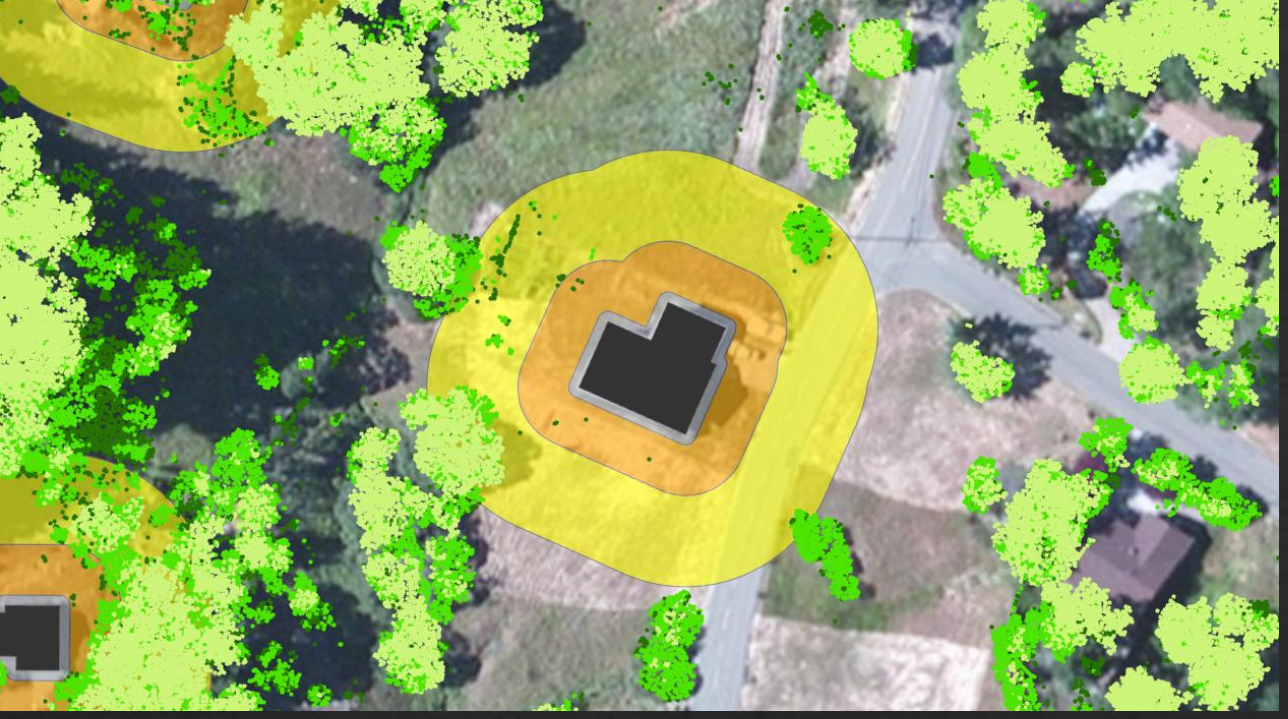
Aerial Imagery

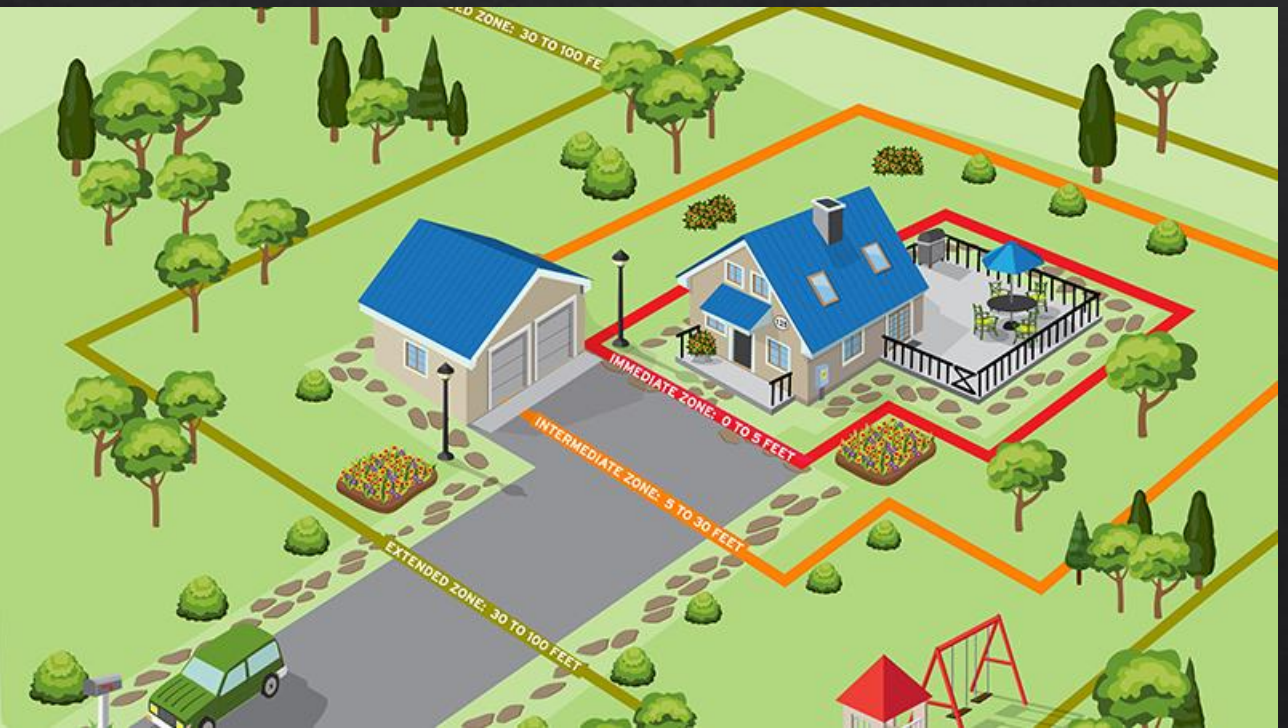
- Fixed-wing aircraft equipped with high resolution RGB and near infrared cameras
  - Produces:
    - High accuracy **orthomosaics**
    - **Feature data** (structures, transportation, utilities)
  - Uses:
    - Infrastructure and utility mapping
    - Canopy condition monitoring
    - Burn scar mapping
    - Change detection
    - Verification of Lidar classification



Airborne Lidar

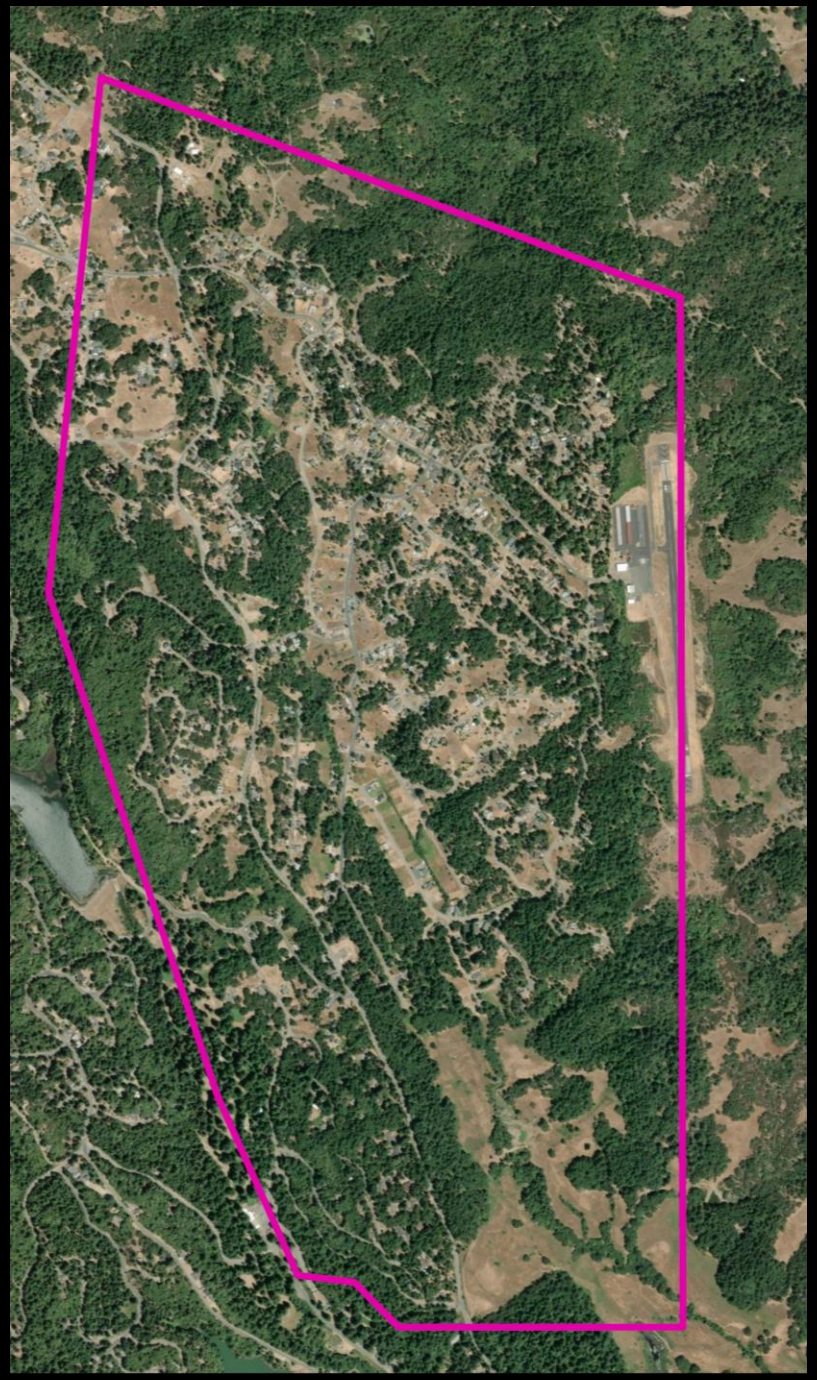
- Products:
  - Dense, accurate **point clouds**
  - **Lidar derivatives**: terrain, slope, aspect, vegetation classification
- Uses:
  - Canopy height and density modeling
  - DTM and surface modeling
  - Fuels identification in relation to infrastructure
  - Utility corridor and powerline vegetation clearance analysis

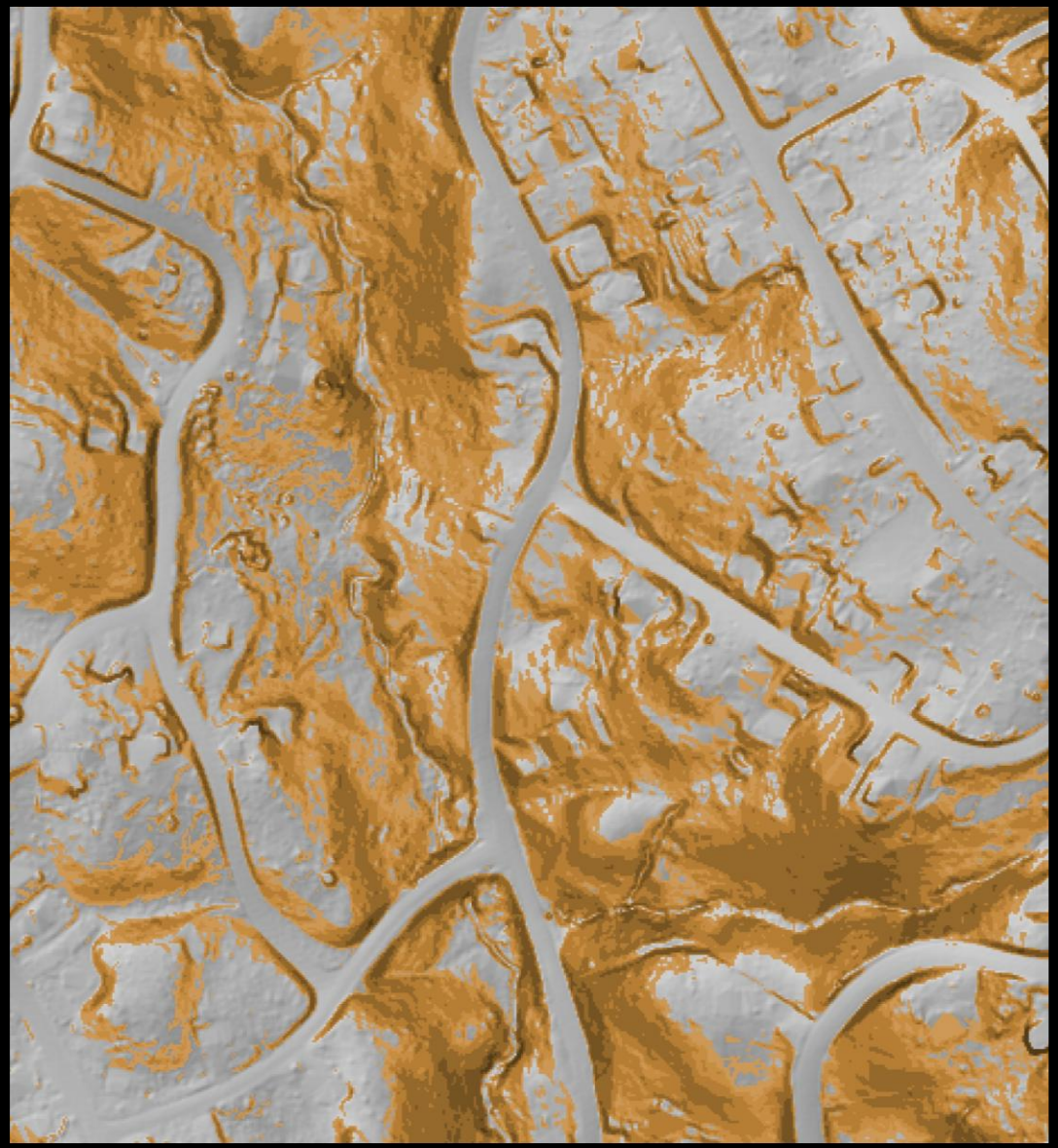




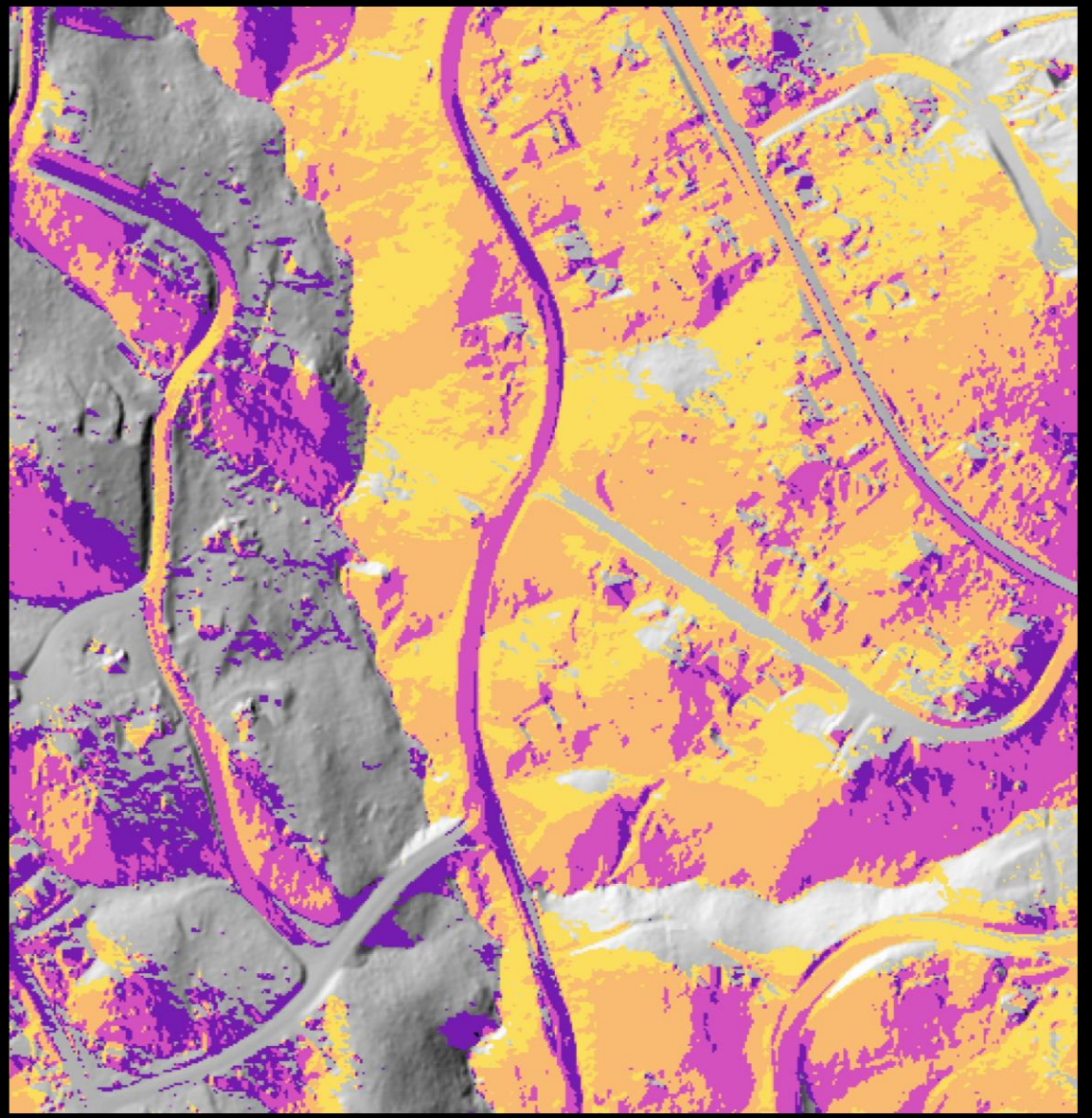
GIS Integration and Analysis

- Products:
  - **Raster and vector base layers** (features, terrain-based rasters, vegetation polygons and grids)
  - **Spatial analyses** (buffer, intersections, etc.)
  - **Point Clouds** (vegetation segmented, etc.)
- Uses:
  - Fuels mapping and mitigation
  - Fire spread modeling inputs
  - Defensible space planning
  - Change detection

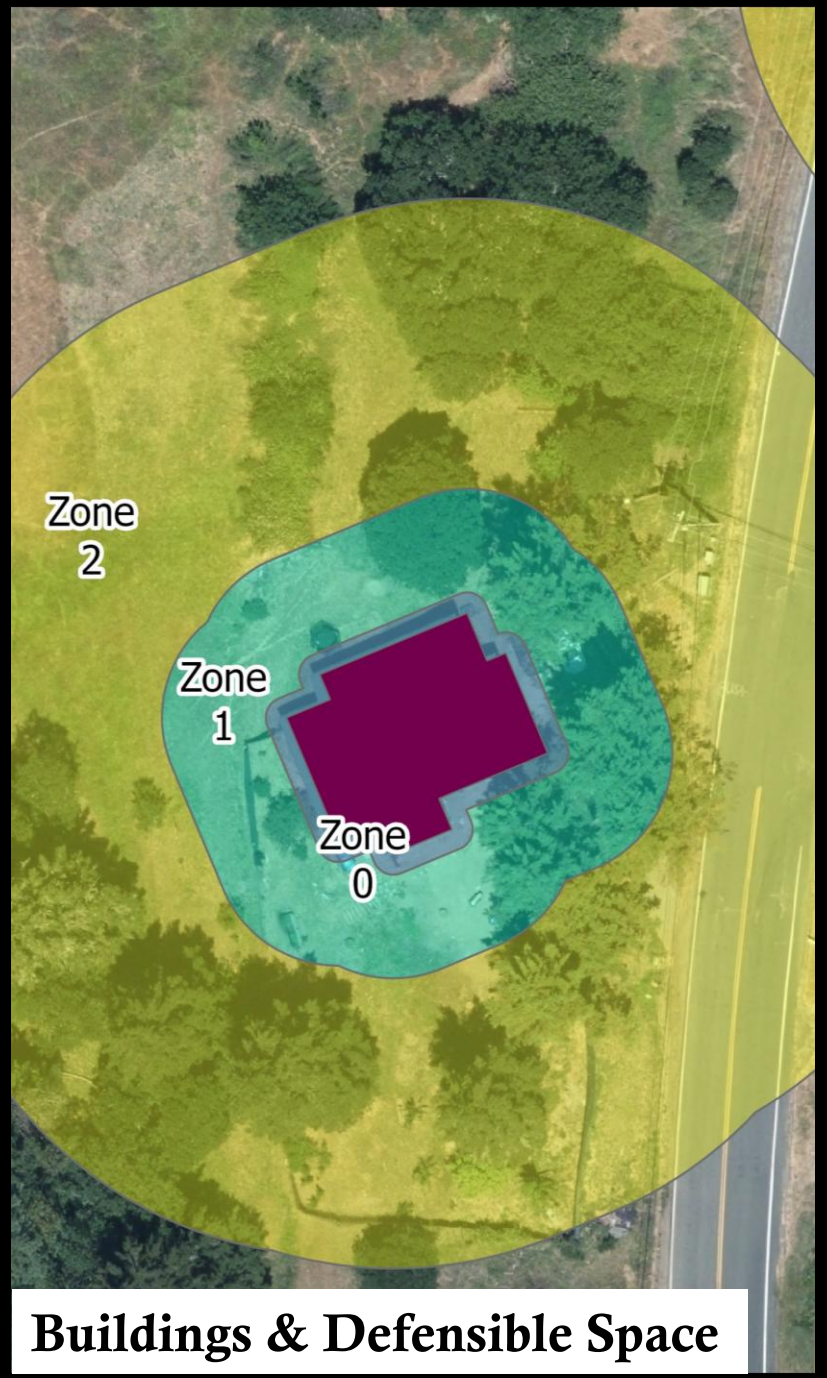




Slope >20%

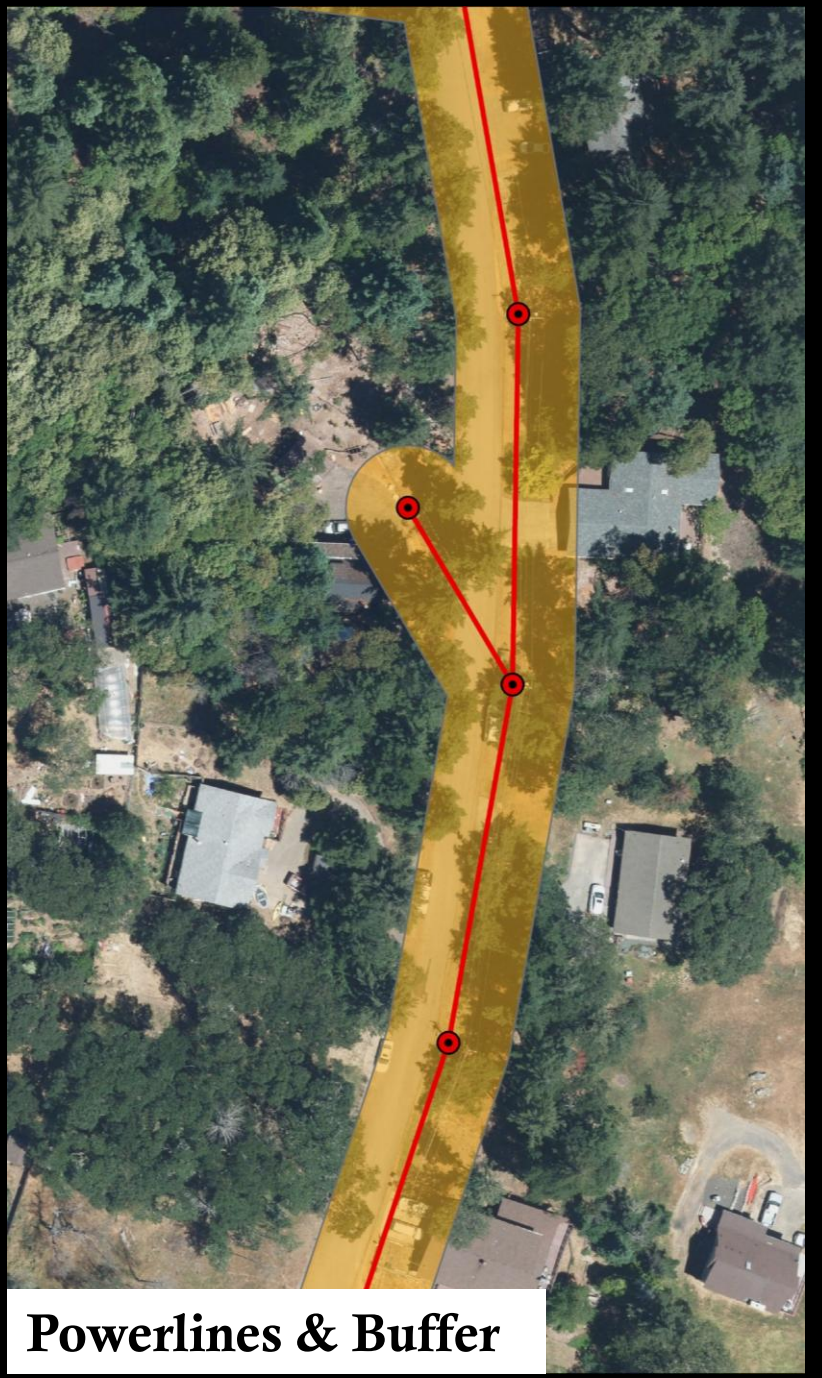


SE→W Aspect



Buildings & Defensible Space

Evacuation Route & Buffer



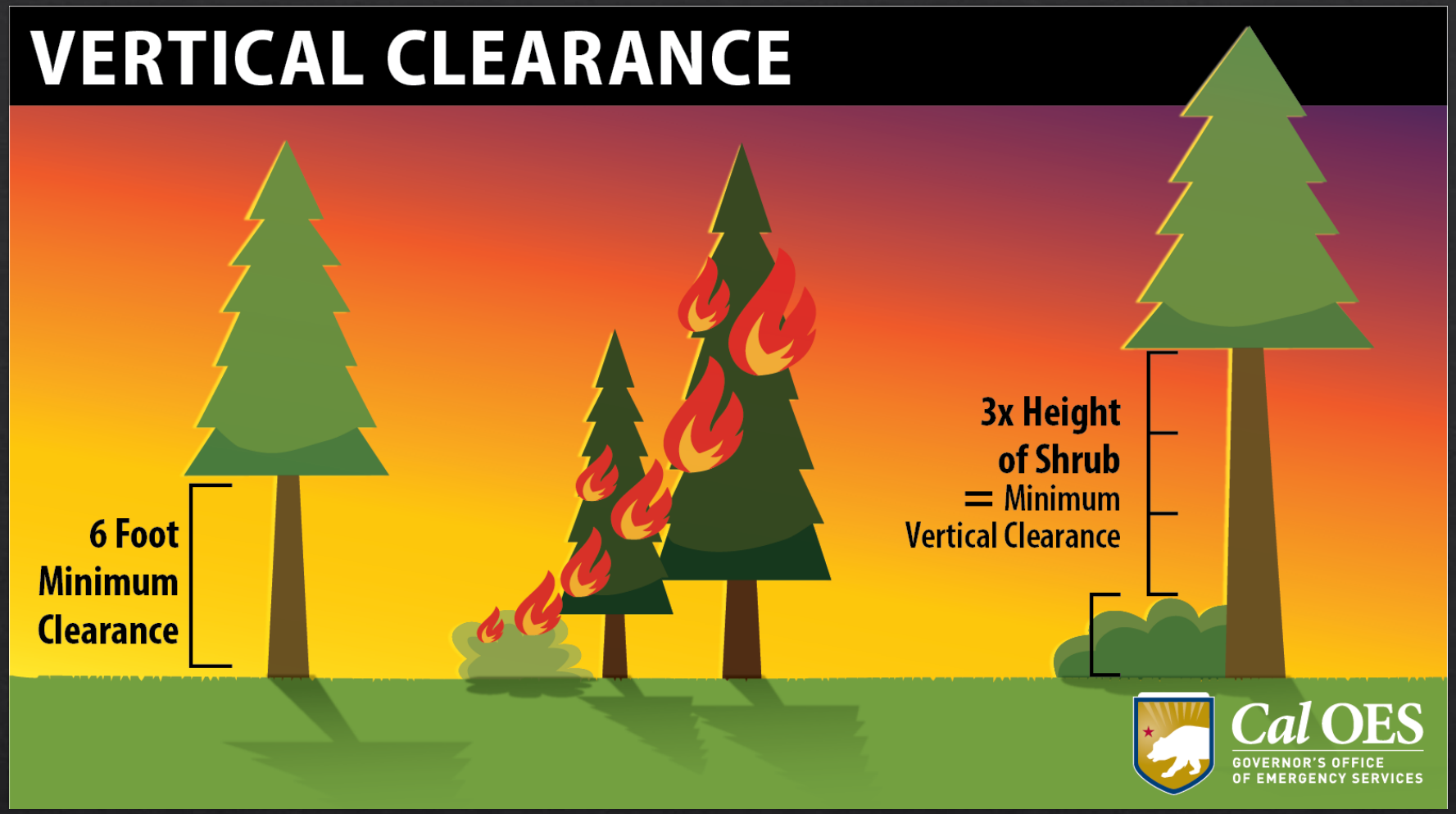
Powerlines & Buffer

Lidar

- Approximately 40 ppsm
- Classified into ground, buildings, 3 vegetation classes
- Classified using macros with manual cleanup and QC using ortho imagery

Profile Viewing

Video



Ladder Fuels

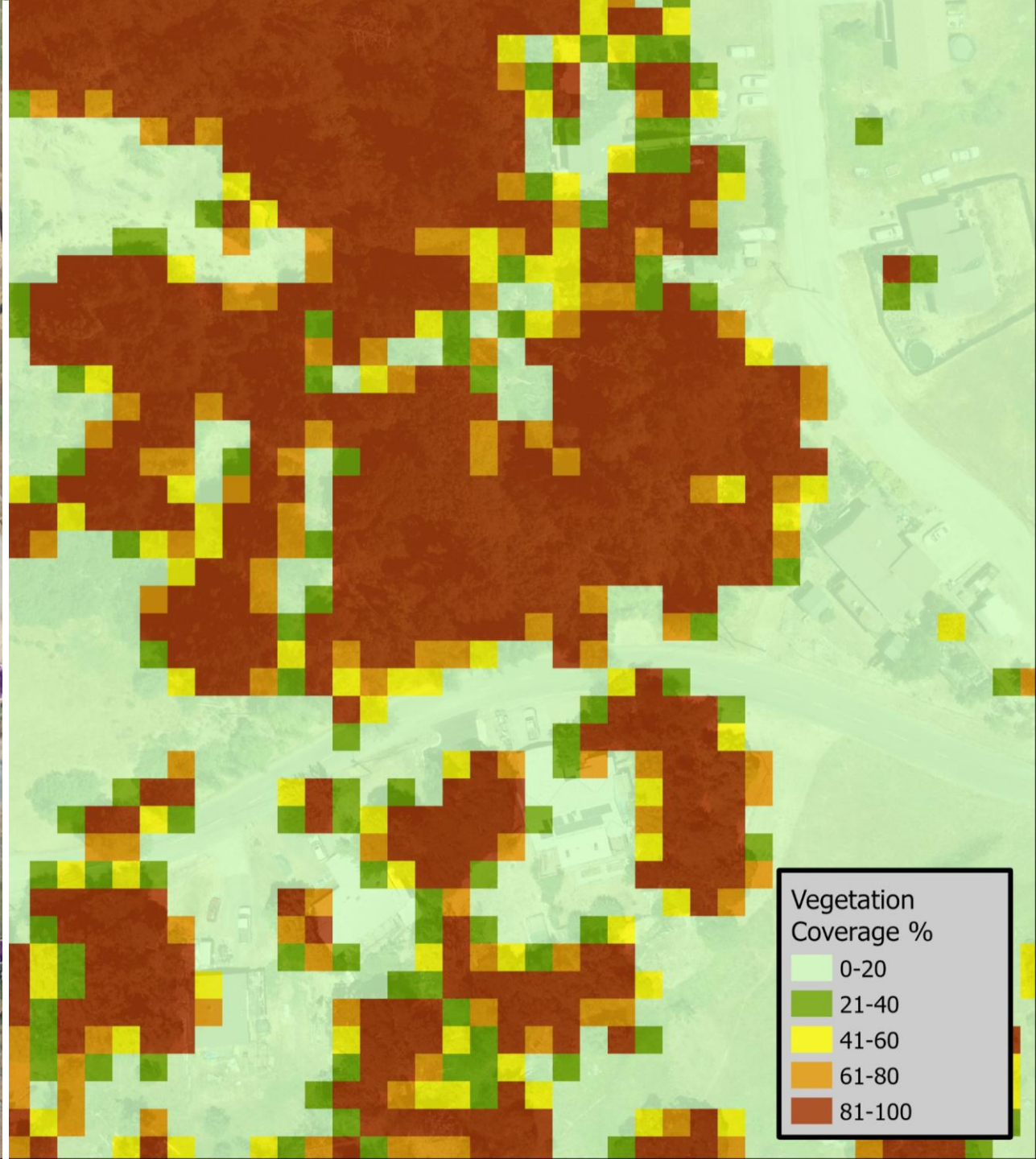
A pathway for the fire to climb into higher canopy or into the upper stories of buildings.

Canopy Polygons

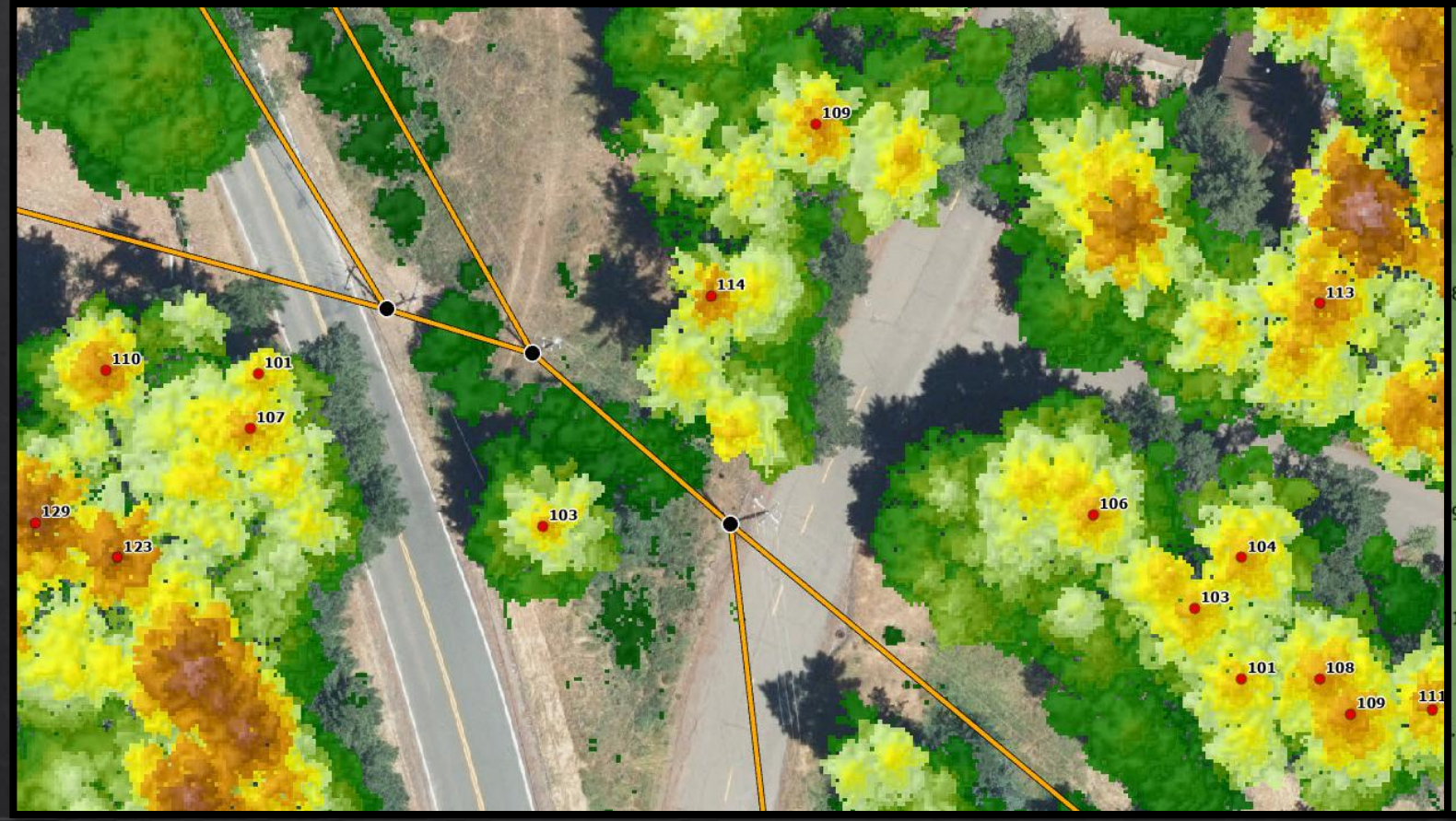
- Low (0-6 ft)
  - Least accurate
  - Requires most cleaning
- Medium (6-15 feet)
- High (15+ feet)

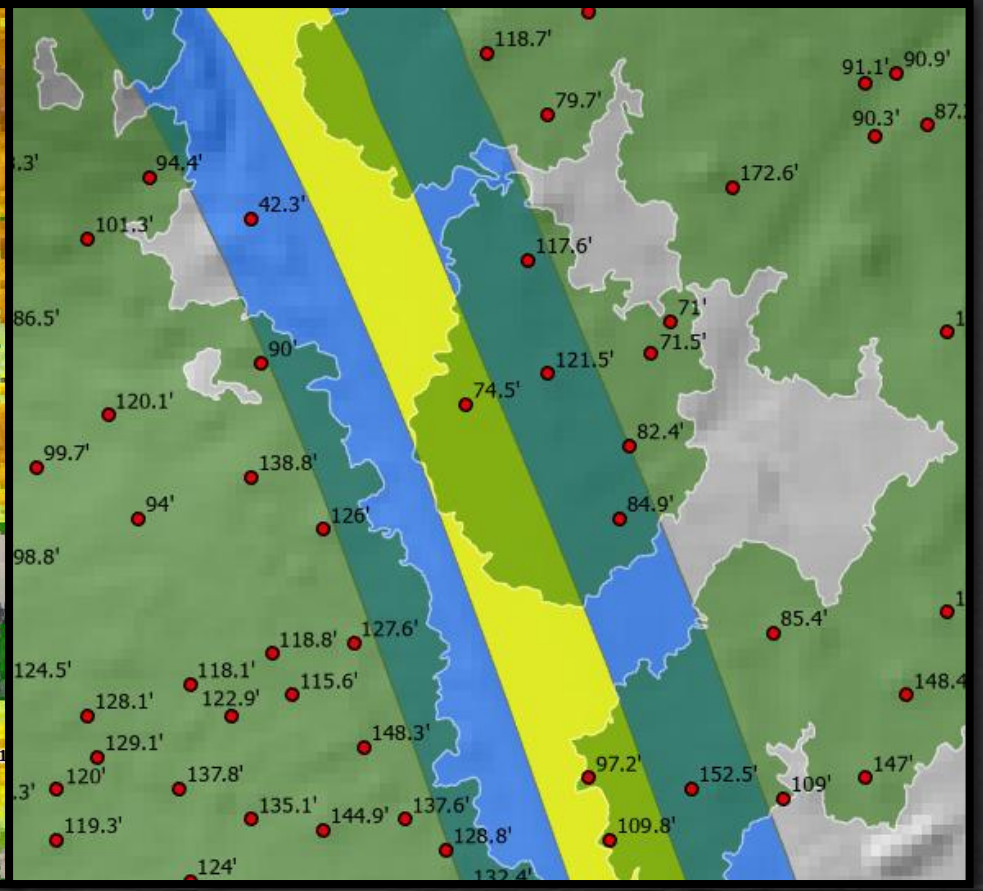
Vegetation Metrics: Raster or Vector

- Canopy Polygons (fuels classification and defensible space analysis)
- Canopy Height (used for fuels modeling)
- Canopy Density (fuels assessment)
- Individual Tree Heights




Video

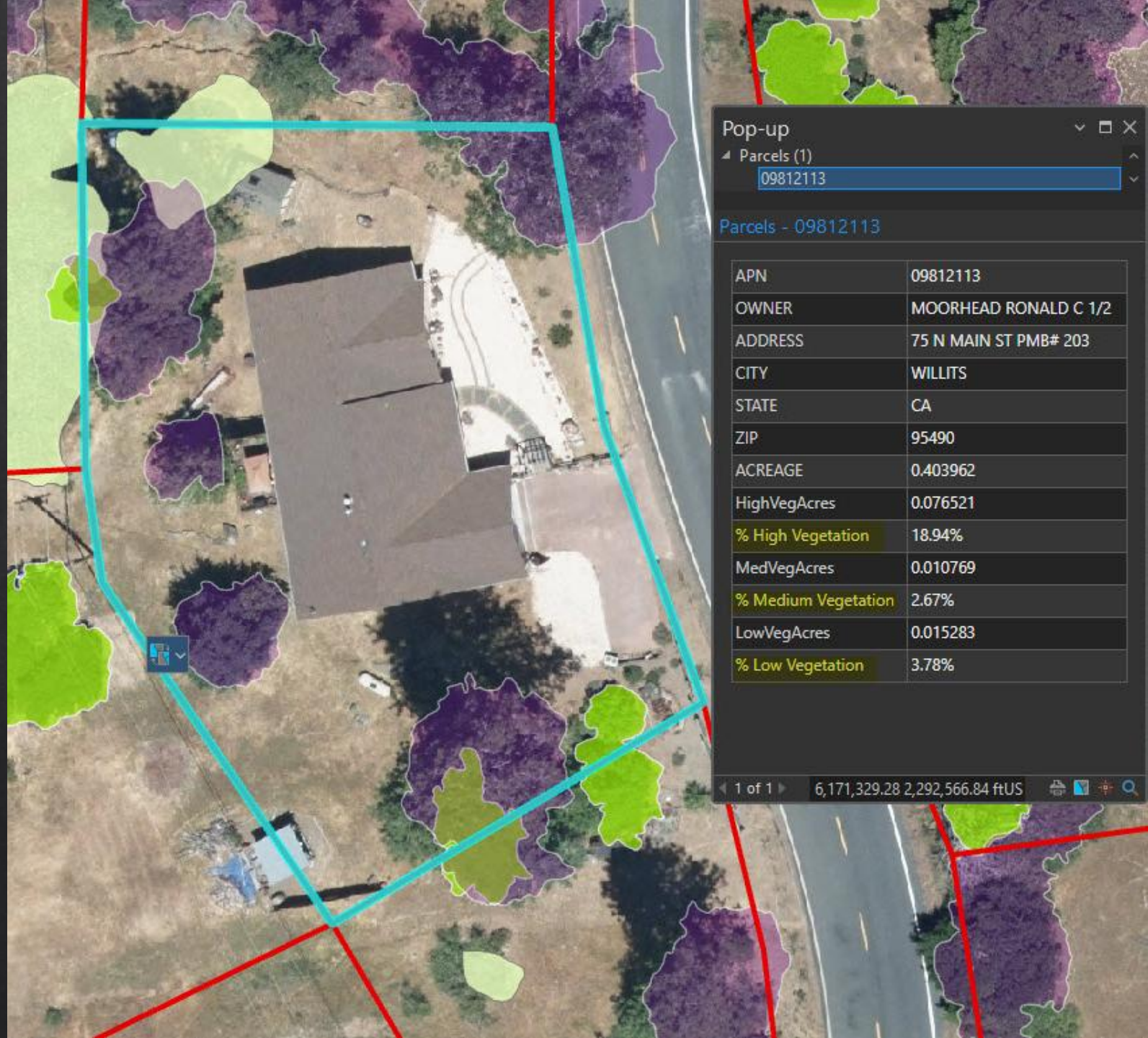




Where Do Fuels Meet Infrastructure?


Video

How do we make this data accessible to users and decision makers?



What's next?

- Dynamic maps in the hand of decision-makers and homeowners in the wildland urban interface
- Community Wildfire Protection Plans
- FEMA Hazard Mitigation Plans

Questions?

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Typical Deliverables

Raster Products

- Bare Earth DEM (ground surface)
- Slope (key factor influencing wildfire spread)
- Aspect (supports analysis of solar exposure/moisture content of vegetation and soils)
- Highest Hit (vertical vegetation structure)
- Canopy Height (used for fuels modeling)
- Canopy Density (fuels assessment)
- Intensity (forest health assessments)

3D Vector Products

- Roofline polygons (structure risk assessment)
- Road polygons (access and evacuation exposure)
- Canopy polygons (fuels classification and defensible space analysis)
- Individual tree heights (identify hazard trees)
- Power lines and poles (vegetation encroachment evaluation)
- Contours

What's next?

- Local Funding/Partnering possibilities:
  - Forestry/Natural Resources departments
  - Community Development departments
  - Fire Protection districts
  - Private Developers
  - Utility Districts
  - Conservation Districts
  - Tribal agencies
- Federal and State Funding possibilities:
  - Community Wildfire Defense grants
  - Wildland Urban Interface (WUI) Grant Program
  - Coalitions and Collaboratives AIM Grants
  - FEMA's Hazard Mitigation Assistance grant programs
  - State specific funding (i.e. WA DNR, CAL FIRE, etc.)