

Performing Natural Hazards Risk Assessments



FEMA Region 10 Mitigation Planning Program Coffee Break Webinar Series

May 26, 2017

Amanda Siok, FEMA Region 10 Mitigation Planner
Brett Holt, FEMA Region 10 Mitigation Planning Program Manager
Matt Williams, DOGAMI, Geohazards Analyst



Housekeeping

- Attendees may be muted to reduce background noise
- Please do NOT put your phone on “hold”, it plays the hold music for everyone else on this call.
 - If you have to step away, mute your phone or hang up and rejoin the call later.
- To increase efficiency and so that we can end on time,
 - Use “Q&A” feature to ask a question
 - Q & A will be open for 10 minutes following the training

CFM Continuing Education

- For full credit (1 CEC) you must be attentive and participate in the polls and activities
- Credit eligibility is based on attendance and participation
- STARR reports to ASFPM once per month for the previous month
- If eligible, you will receive a Certificate of Attendance via email that you can forward to other agencies

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Objectives

At the end of this webinar, participants will be able to:

- Understand risk assessment terminology
- Recognize hazards and community assets
- Determine potential losses to vulnerable community assets

Mitigation

Mitigation is the reduction or elimination of long-term risk to human life and property from hazards



Emergency Management Activities

Mitigation Increases Resiliency



What is a Risk Assessment?

- Process that collects information and assigns values to risks to:
 - Identify or compare courses of action
 - Develop priorities
 - Inform decision making



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Risk Assessment Requirements

- a description of the type, location, and extent of all natural hazards in the planning area
- information on previous occurrences and the probability of future events for EACH jurisdiction
- a description of each identified hazard's impact for EACH jurisdiction
- a summary of the vulnerability for EACH jurisdiction

Local Mitigation Plan Review Guide

October 1, 2011



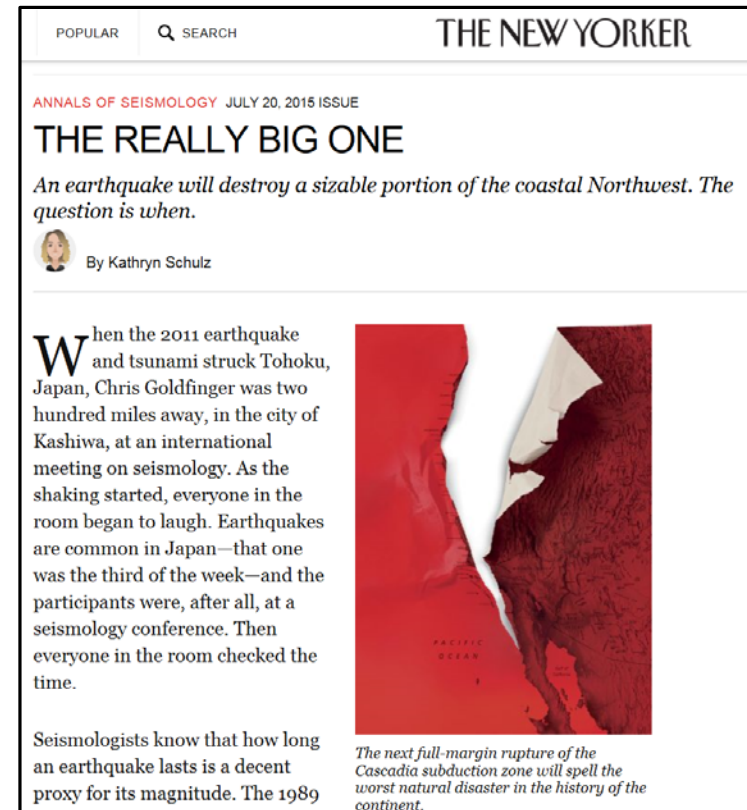
FEMA

Steps to Assess Risk

1. Describe Hazards
2. Identify Community Assets
3. Analyze Risks
4. Summarize Vulnerability

PLAN UPDATES

- Changes in hazards (disaster declarations)
- Changes in community assets

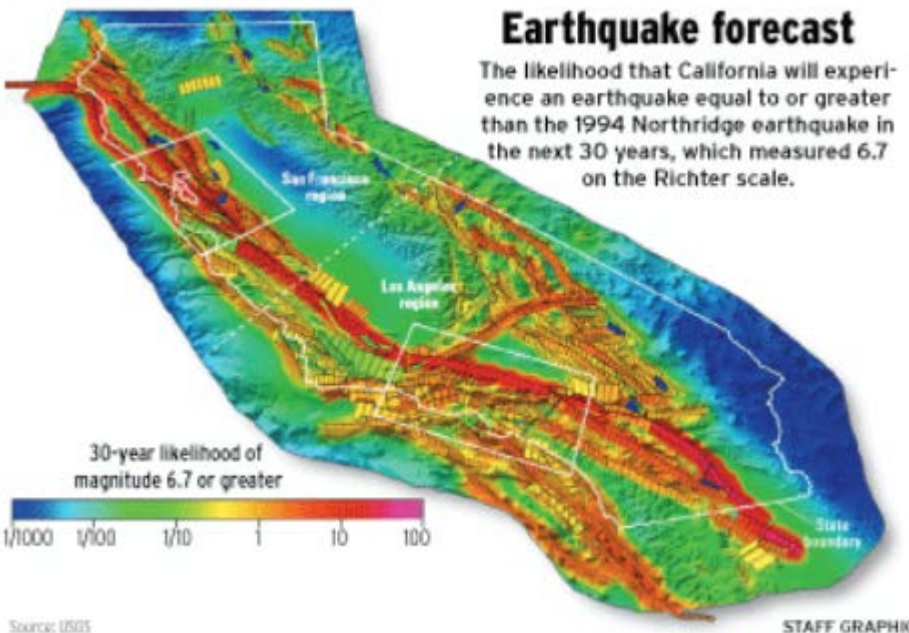


1. Hazard Description

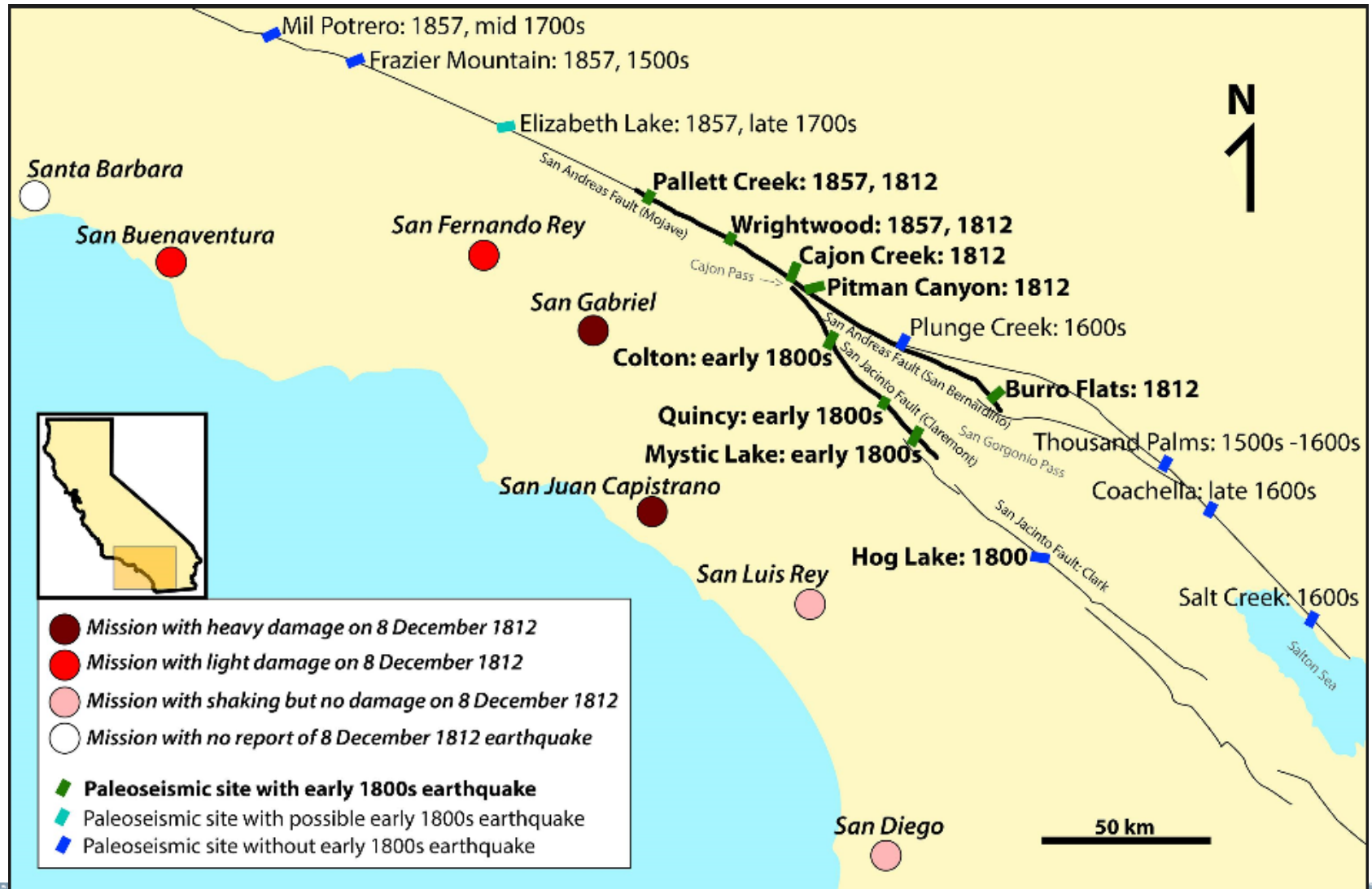


Elements B1 & B2

- Location: geographic area
- Extent: Strength or magnitude
- Previous Occurrences: describe extent and impact
- Probability of Future Events-likelihood of occurring in the future



Hazard Map



Hazard Narrative: Marion Co, OR

The landslide area within Marion County identified by the State Engineering Geologist is located on the west-facing slope of the Salem Hills and in the Cascades. The slides in this area have developed on steep slopes of soils originating from the marine sedimentary bedrock units. Landslides also occur in the canyon of Abiqua Creek about five miles east of Silverton and along the slopes of the Little North Fork of the Santiam River. In these areas, the slides are developed in deeply weathered tuffs of the Mehama Volcanics. Landslides may also occur in the clay soils overlying the Columbia River Basalt in the Salem Hills area and in the Waldo Hills-Silverton Hills area, if slopes are artificially oversteepened. Steep slopes associated with landslide activity areas are themselves a deterrent to high density development. The landslides or debris flows, (mudslides), may affect buildings, roads, and utilities. Landslides are one of the most widespread and damaging natural hazards in Oregon.

Climate Change

- May not be a hazard in and of itself
- May change the characteristics of the hazards that currently affect the planning area
- Climate Adaptation strategies may complement other hazard mitigation strategies

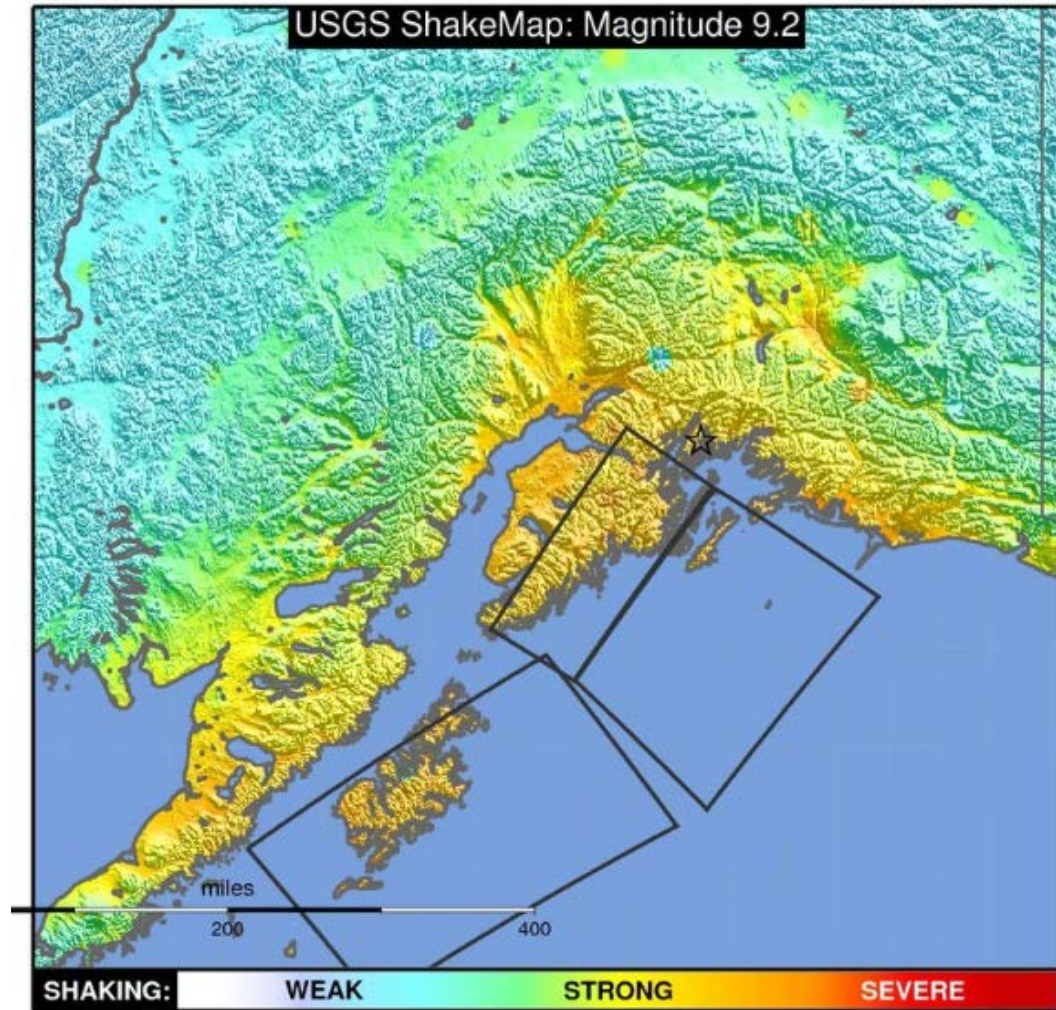


Example: Jefferson County, WA

Table CC-1 - Climate Change Predictions for the North Olympic Peninsula ¹⁵		
Climate Changes ¹	Observed Changes	
Temperature Averages (for Pacific Northwest)	Warmed 1.3°F (1895-2011)	
Temperature Extremes	Increase in nighttime heat events.	
Precipitation Averages (for Pacific Northwest)	No significant change in amount; region wide decrease in snowpack and glaciers.	
Precipitation Extremes	Ambiguous	
Future Sea Level Rise⁴ (probability that mean sea level will reach or exceed ____ feet at a given year)	Neah Bay	50% chance of ≥ 0.3 feet (2050) and ≥ 1.3 feet (2100) 5% chance of ≥ 0.7 feet (2050) and ≥ 2.7 feet (2100)
	Clallam Bay/Seki	50% chance of ≥ 0.3 feet (2050) and ≥ 1.3 feet (2100) 5% chance of ≥ 0.7 feet (2050) and ≥ 2.7 feet (2100)
	Port Angeles	50% chance of ≥ 0.6 feet (2050) and ≥ 1.9 feet (2100) 5% chance of ≥ 0.9 feet (2050) and ≥ 3.3 feet (2100)
	Port Townsend	50% chance of ≥ 0.9 feet (2050) and ≥ 2.4 feet (2100) 5% chance of ≥ 1.2 feet (2050) and ≥ 3.9 feet (2100)
Future Annual Coastal Flood Elevation⁵ (probability that mean sea level will reach or exceed ____ feet in a given year)	Neah Bay	50% chance of ≥ 3.5 feet (2050) and ≥ 4.5 feet (2100) 5% chance of ≥ 4.4 feet (2050) and ≥ 6.2 feet (2100)
	Clallam Bay/Seki	50% chance of ≥ 3.5 feet (2050) and ≥ 4.5 feet (2100) 5% chance of ≥ 4.4 feet (2050) and ≥ 6.2 feet (2100)
	Port Angeles	50% chance of ≥ 2.6 feet (2050) and ≥ 3.9 feet (2100) 5% chance of ≥ 3.5 feet (2050) and ≥ 5.5 feet (2100)
	Port Townsend	50% chance of ≥ 2.9 feet (2050) and ≥ 4.5 feet (2100) 5% chance of ≥ 3.8 feet (2050) and ≥ 6.1 feet (2100)

Sources of Hazard Information

- State Hazard Mitigation Plan
- Disaster declarations
 - SHELDUS
- Hazard-related reports/plans
- State agencies
 - DNR, Emergency Management, Land Use
 - Agency Viewers
- Federal Agencies
 - USGS ShakeMaps
 - FEMA Flood Maps
 - NOAA Weather Data
- Planning team and stakeholders
- Local records (newspaper, chamber of commerce, local historical society)



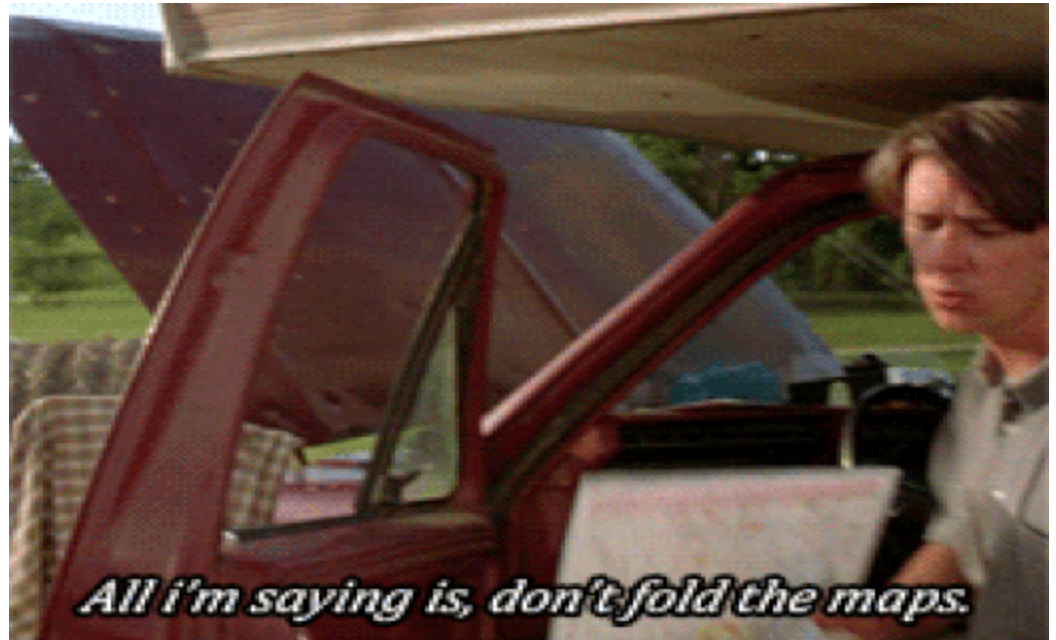
Get to know your GIS Staff

- Assessors Data
- Building Footprints
- Building Types/Construction
- Year Built
- Planned Development
- Hazard Layers
- Past Events
- Evacuation Routes



POLL #2

- Do you know how to use GIS?
- Do you have GIS on your computer
- Do you have GIS Staff?
 - If Yes, Do you know them?



2. Identify Community Assets

Now that you know where the hazards are, **WHAT IS AT RISK** to them?

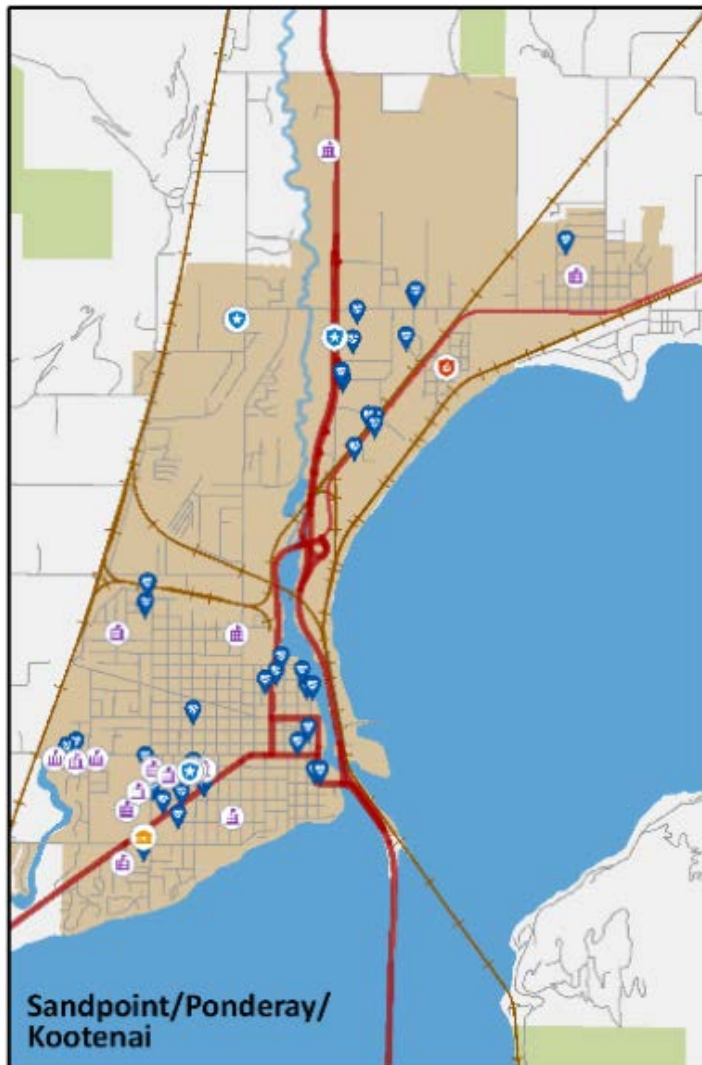
Things to consider:

- Critical infrastructure
- Essential Facilities
- Cultural/Historical Significance
- Natural Resources
- Economic Drivers
- Population



Critical Infrastructure & Essential Facilities

- Example from Bonner County, Idaho HMP
- HSIP Gold Dataset



Source: ESRI; US Census TIGER/Line; HSIP Gold 2013, INSIDE Idaho; Idaho Department of Water Resources

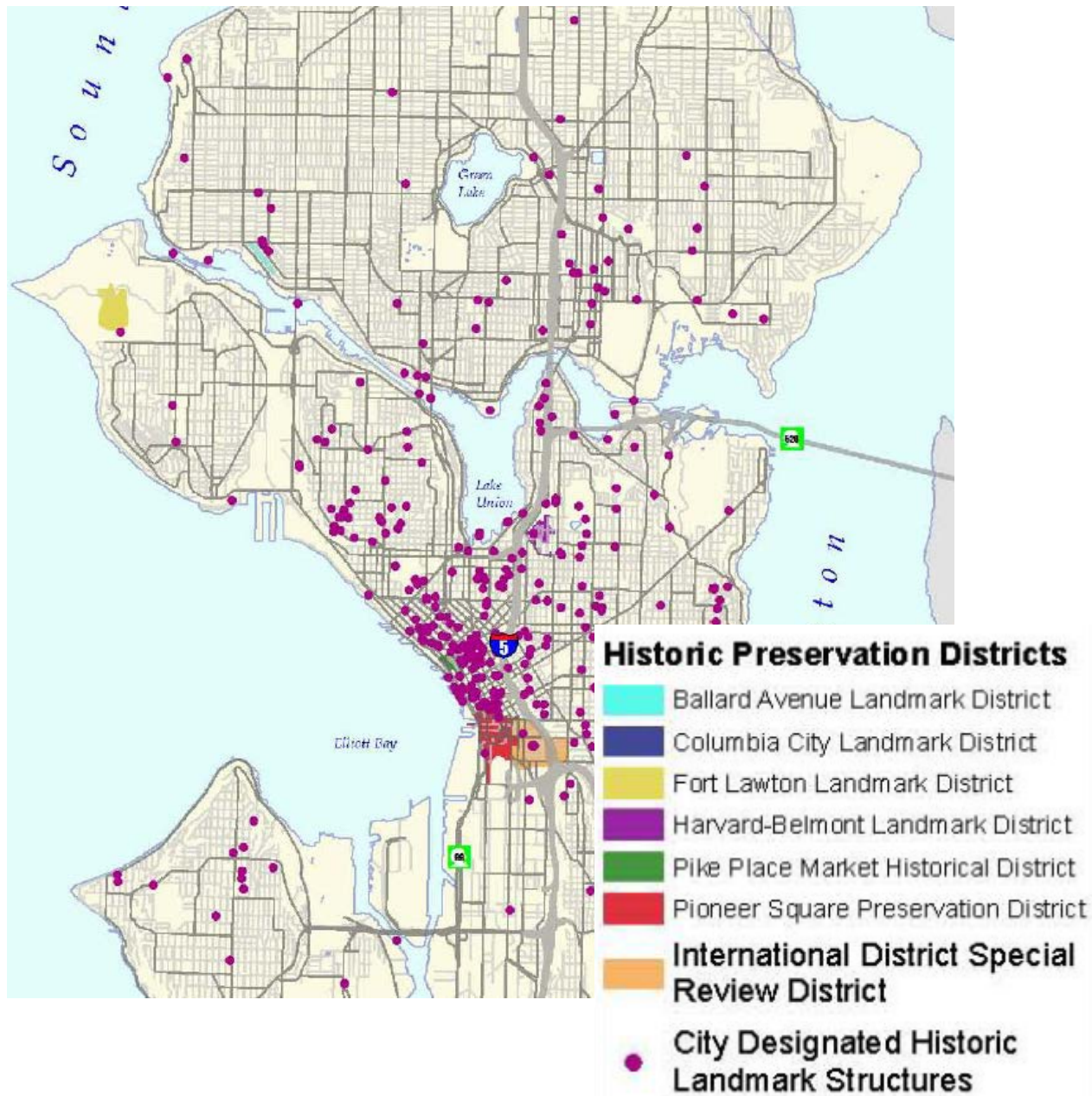
Projection: NAD 1983 State Plane Idaho West FIPS 1103 US Feet

Prepared by the Hazards and Climate Impacts Research Group
Tim Frazier, Alexander Peterson,
Shannon Grumbly, Elizabeth Boyden



Historical Significance

- Example from City of Seattle Hazard Mitigation Plan
- Constructed prior to building codes
- “Satellite areas” with higher concentrations of people.
- Recovery Goals



Map 2.3: Culturally Sensitive Sites – The following map illustrates where each of the culturally sensitive sites is located. They are labeled on the map by numbers that correspond with their assigned identification names, which are listed in Table 2.1, Culturally Sensitive Sites.

Table 2.1:

Culturally Sensitive Sites –

The following lists the culturally sensitive sites by their assigned identification names.

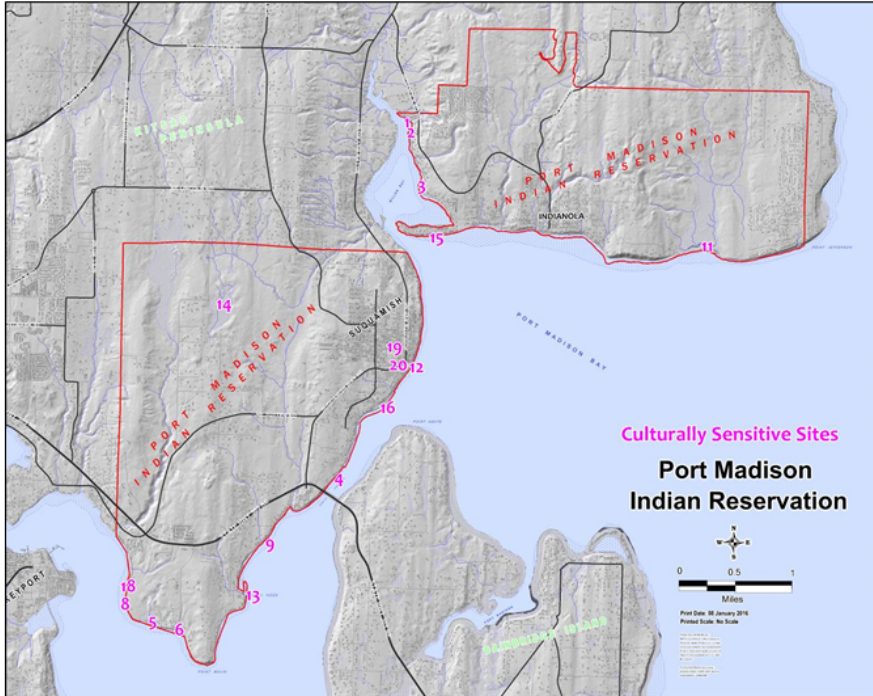


Table 2.1: Culturally Sensitive Sites

Site ID Number	Resource Description
1	Archaeological Site 45KP32 - Shell Midden
2	Archaeological Site 45KP33 - Shell Midden
3	Archaeological Site 45KP34 - Shell Midden
4	Archaeological Site 45KP40 - Shell Midden
5	Archaeological Site 45KP41 - Shell Midden

Cultural Significance

- Example from the Suquamish Tribe's Hazard Mitigation Plan
- Archaeological Sites
- Sacred Sites
- Culturally Sensitive Areas
- Petroglyphs
- Gathering places

Natural Resources



Population & Economic Drivers



You've identified the critical infrastructure in your planning area,
WHAT HAPPENS TO IT during an event?



3. Analyze Risks

Element B3

- Evaluate vulnerable assets and estimate potential impacts and losses
- For each hazard (evaluate vulnerable assets, assess potential impacts, estimate future losses)

Risk Assessment: Nome, AK

- Damage to shoreline protection infrastructure
- Damage to coastal highways and roads
- Damage to water and septic systems
- Damage to bridges
- Damage to power distribution systems
- Damage to fuel storage tanks
- Fuel spills
- Property damage

Table 7 Hazard Magnitude/Severity Criteria.

Magnitude / Severity	Criteria
4 - Catastrophic	<ul style="list-style-type: none">• Multiple deaths.• Complete shutdown of facilities for 30 or more days.• More than 50 percent of property is severely damaged.
3 - Critical	<ul style="list-style-type: none">• Injuries and/or illnesses result in permanent disability.• Complete shutdown of critical facilities for at least two weeks.• More than 25 percent of property is severely damaged.
2 - Limited	<ul style="list-style-type: none">• Injuries and/or illnesses do not result in permanent disability.• Complete shutdown of critical facilities for more than one week.• More than 10 percent of property is severely damaged.
1 - Negligible	<ul style="list-style-type: none">• Less than 10 percent of property is severely damaged.

RiskMAP

Increasing Resilience Together

Risk MAP can
do this analysis
for you!

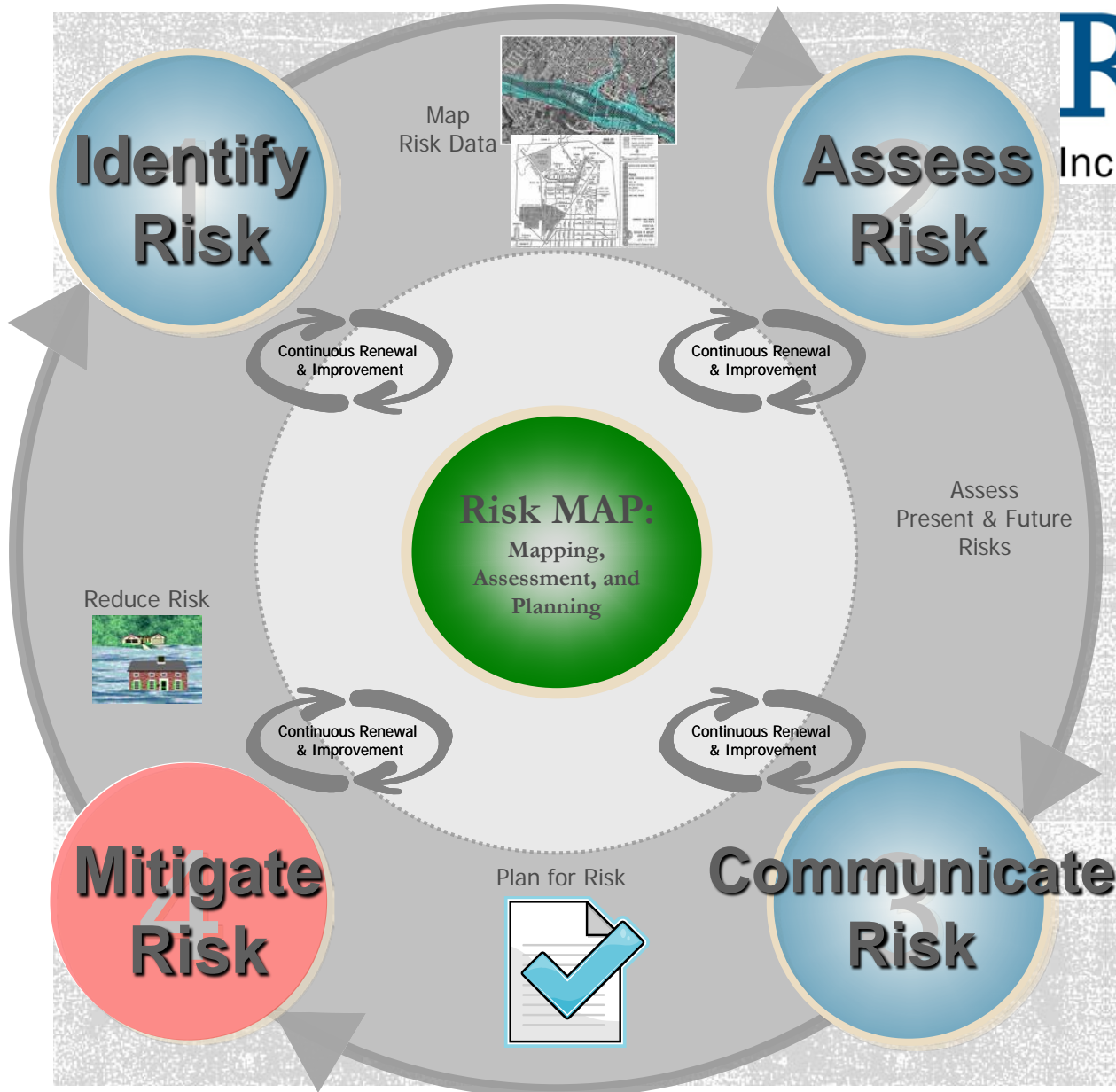
State Risk MAP Coordinators

Alaska: Sally Russell Cox
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Idaho: Ryan McDaniel
rmcdaniel@imd.idaho.gov

Oregon: David Lentzner
David.Lentzner@state.or.us

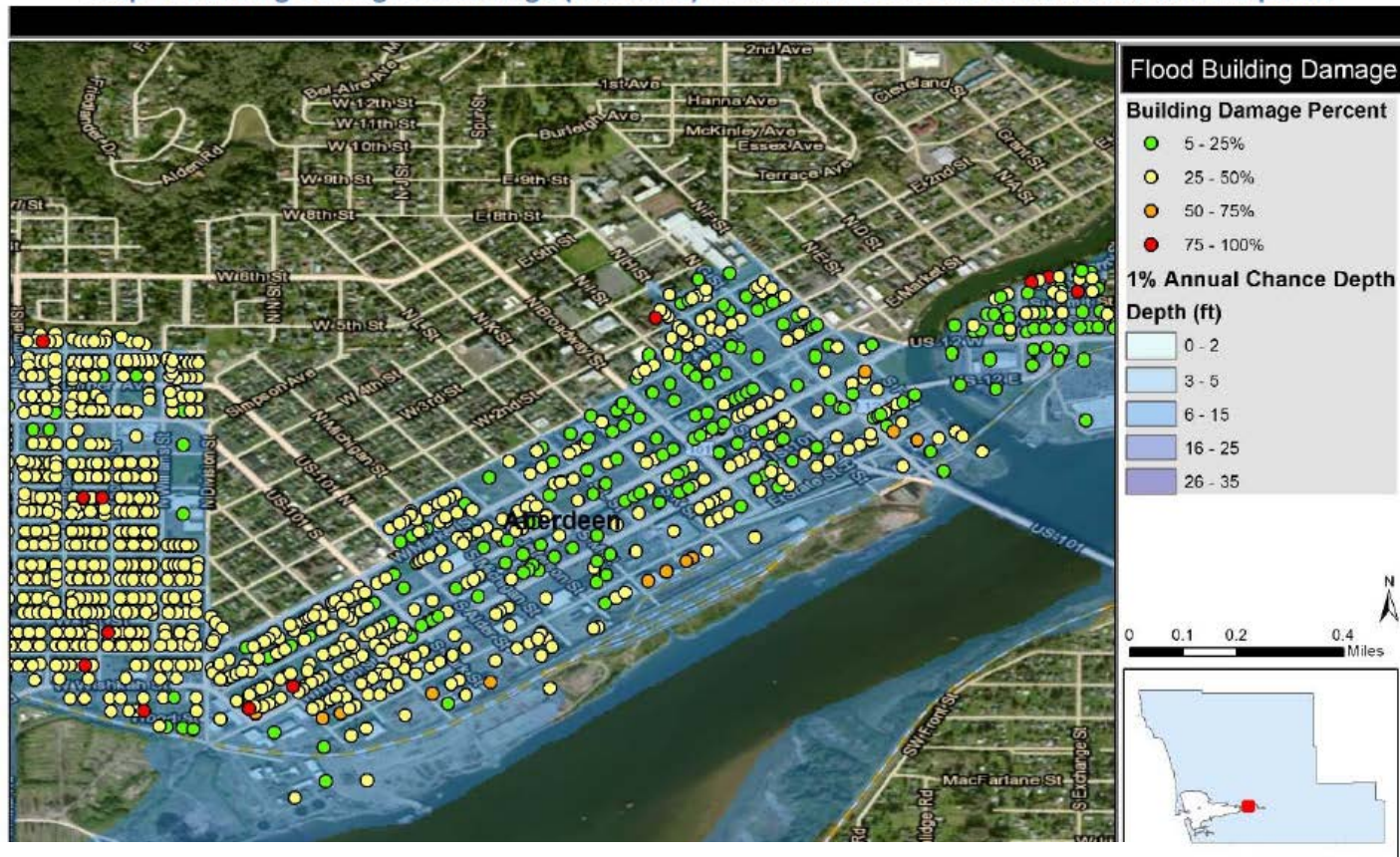
Washington: Jerry Franklin
JFRA461@ECY.WA.GOV



Using Hazus: Earthquake, Flood, Tsunami

- Free Loss-Estimation Software
- Data Intensive

Map 4: Building Damage Percentage (loss ratio) in and near the Cities of Aberdeen and Hoquiam

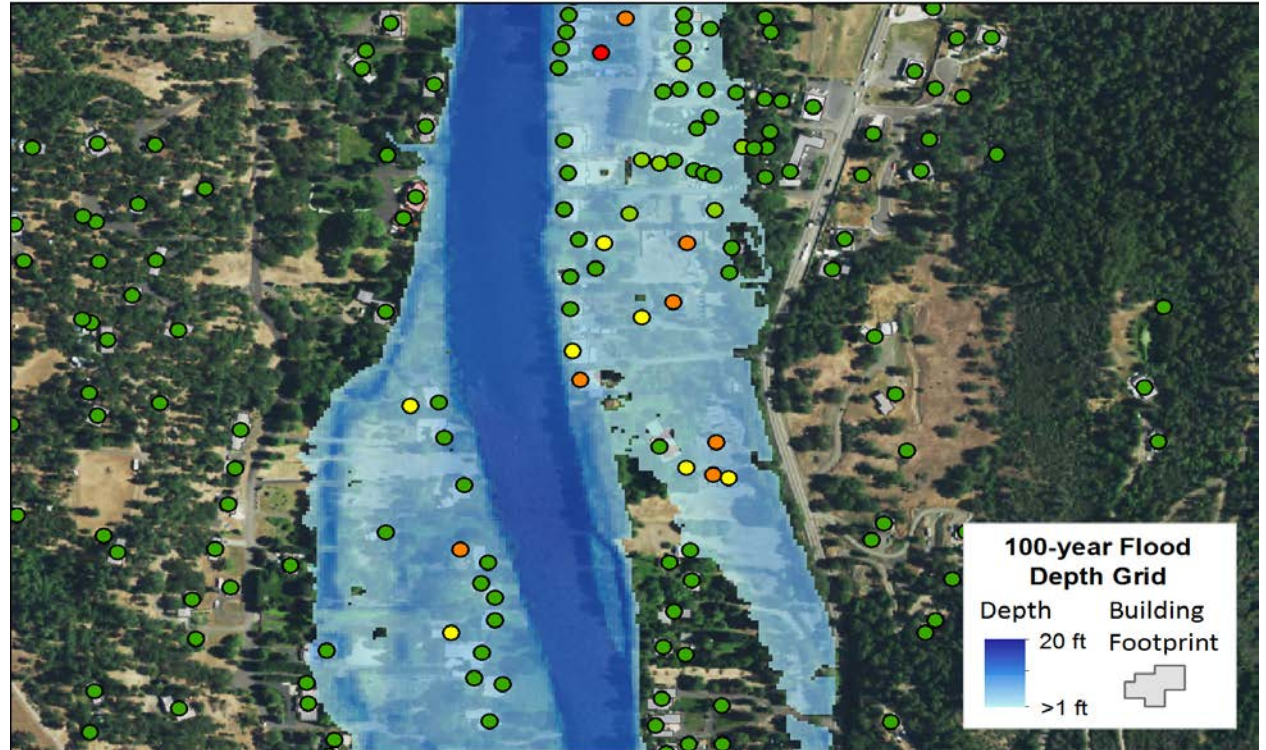


Cost	Contents	Occupancy	Building Type	Year Built	# of Stories	Found- ation	Design Level

Disclaimer: The estimates of impacts illustrated on this map were produced using FEMA's HAZUS software and the USGS's ShakeMap ground motions. There are uncertainties inherent in any loss estimation technique; therefore, there may be significant differences between the modeled results and actual losses following a specific earthquake. The location data provided by Washington Department of Natural Resources.

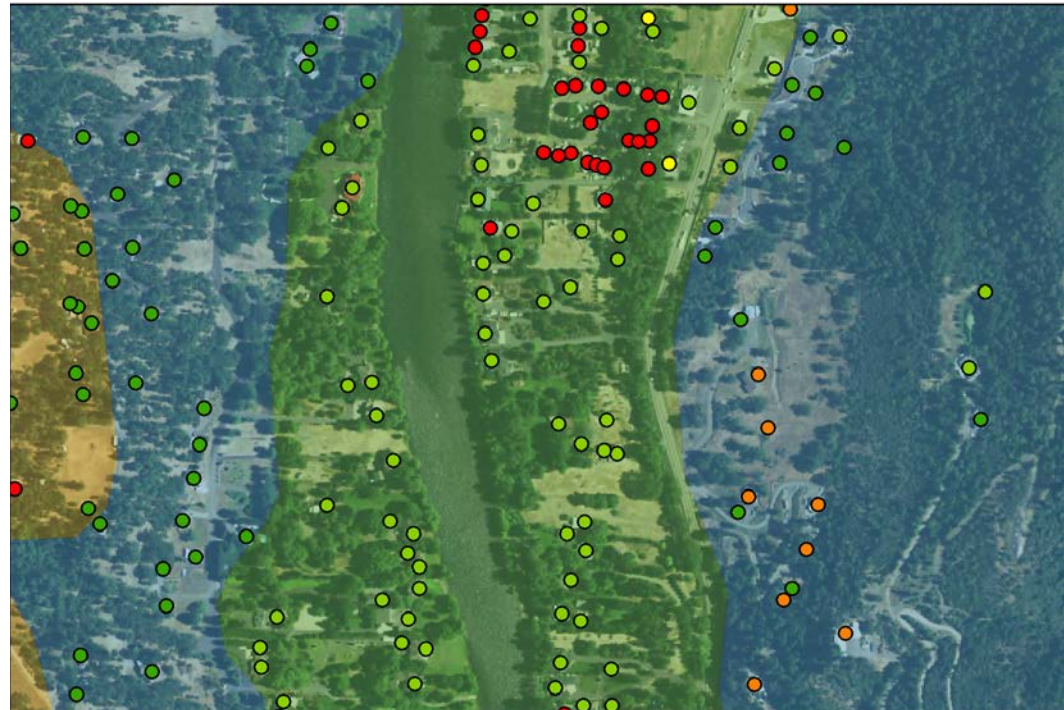
Flood

- Damage functions or curves for Occupancy Type
- Depth of flooding the factor for determining loss
- UDF methodology
- Presence of basement
- First floor height



Earthquake

- Damage functions or curves for Building Type
- Probabilistic vs. Deterministic
- Ground failure (4) and ground shaking (4) factors for determining loss
- UDF methodology
- Design Level (Seismic Building Code)
- Displaced population formula



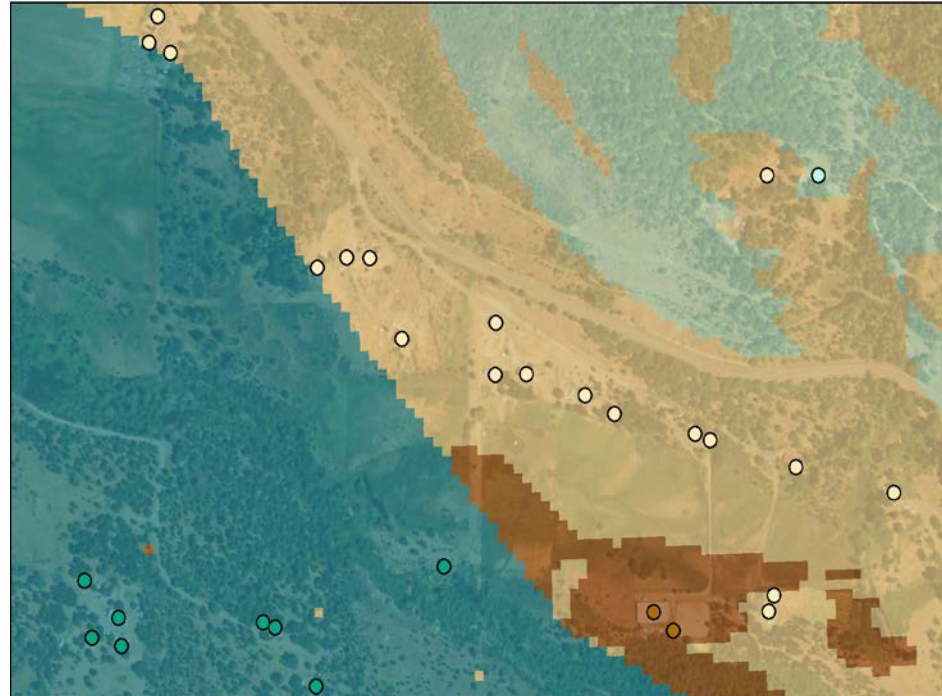
Historical Analysis

- Basis for Hazus damage functions
- Provides a baseline (compare actual w/ theoretical)
- Highwater marks (Vernonia example)
- Existing landslides
- Past Earthquake/Tsunami



Exposure Analysis

- Determination of whether an asset, infrastructure, individual, etc. is within or outside of a given hazard zone.
- Provides a quick and broad look at the level of risk for a particular hazard
- Reported as sum of total asset value exposed or number of people exposed
- Careful not to use “Damage” when describing
- Effectiveness varies between hazard types



Scenario Analysis

- Provides a range of possibilities
- Recurrence intervals (events)
- Comparing events provides clarity to levels of risk
- Flood (10, 50, 100, 500 year)
- Tsunami (SM – XXL)



4. Summarize Results:

Example: Ada County, ID

- Purpose: to help the community understand the greatest risks facing the planning area

Table 14-12. Potential Damage to Buildings in High Wildfire Risk Areas

	Building Count	Assessed Value	10% Damage	30% Damage	50% Damage
Boise	2,806	\$1,609,977,275	\$160,997,728	\$482,993,183	\$804,988,638
Eagle	0	\$0	\$0	\$0	\$0
Garden City	0	\$0	\$0	\$0	\$0
Kuna	0	\$0	\$0	\$0	\$0
Meridian	0	\$0	\$0	\$0	\$0
Star	0	\$0	\$0	\$0	\$0
Unincorporated	591	\$398,804,908	\$39,880,491	\$119,641,472	\$199,402,454
Total	3,397	\$2,008,782,183	\$200,878,219	\$602,634,655	\$1,004,391,092

4. Summarize Results:

Example: Ada County, ID

- Purpose: to help the community understand the greatest risks facing the planning area

14.9 ISSUES

The major issues for wildfire are the following:

- Public education and outreach to people living in or near the fire hazard zones should include information about and assistance with mitigation activities such as defensible space and advance identification of evacuation routes and safe zones.
- Wildfires could cause landslides as a secondary natural hazard.
- Climate change could affect the wildfire hazard.
- Future growth into interface areas should continue to be managed.
- Area fire districts need to continue to train on wildland-urban interface events.
- Vegetation management activities would include enhancement through expansion of the target areas as well as additional resources.
- Regional consistency is needed for higher building code standards such as residential sprinkler requirements and prohibitive combustible roof standards.
- Additional fire department water supply is needed in high risk wildfire areas.
- A buildable-lands analysis that looks at vacant lands and their designated land use would be a valuable tool in helping decision-makers make wise decisions about future development.

Develop Problem Statements

- Location of problem
- Cause and contributing factors creating the problem
- Significance of impacts
- Who is impacted (if applicable)

Example:

Newberg City recently annexed the South Woods area located in the wildland-urban interface. The City's land use and building codes do not address wildfire hazard areas. Future development in South Woods will increase vulnerability to wildfires.

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Review Learning Objectives

At the end of this webinar, participants will be able to:

- Understand risk assessment terminology
- Recognize hazards and community assets
- Determine potential losses to vulnerable community assets

Resources

- Local Mitigation Planning Handbook
<http://www.fema.gov/library/viewRecord.do?id=7209>
- Mitigation Planning Coffee Break: [Webinar specific resources](#)
- USGS ShakeMaps: <https://earthquake.usgs.gov/data/shakemap/>
- FEMA Flood Map Service Center: <https://msc.fema.gov/portal>
- NOAA Tsunami Maps: http://nctr.pmel.noaa.gov/hazard_assessment.html
- SHELDUS: <http://hvri.geog.sc.edu/SHELDUS/>
- Hazus: <https://www.fema.gov/hazus>



Integrating Natural Hazard Mitigation Plans and Community Wildfire Protection Plans

Joining us are representatives from Idaho Department of Lands and Idaho Emergency Management who have developed a process in Idaho to work with communities in plan integration, as well as a plan review process between the two state agencies.

Joining us will be...

- Susan Cleverley, Idaho State Hazard Mitigation Officer
- Tyre Holfeltz, Idaho Department of Lands



NEXT MONTH

June 23, 2017

10am-11am

Registration information on
the STARR site

Email all of you information
on registration

- **January:** *Introduction to Mitigation Planning*
- **February:** *Building the Mitigation Planning Team*
- **March:** *Effective Public Engagement in Mitigation Planning*
- **April:** *Developing FEMA Mitigation Planning Grants*
- **May:** *Performing Natural Hazard Risk Assessments*
- **June:** *Integrating Natural Hazard Mitigation Plans and Community Wildfire Protection Plans*
- **July:** *Developing Natural Hazard Mitigation Strategies*
- **August:** *Climate Adaptation and Mitigation Planning*
- **September:** *Tribal Mitigation Planning*
- **October:** *Addressing Social Equity through Mitigation Planning*
- **November:** *Integrating Natural Hazard Mitigation Plans into Local Comprehensive Plans*
- **December:** *Bringing the Mitigation Plan to Life*



2017 FEMA REGION 10 COFFEE BREAK CALENDAR

Dalles, Oregon

- Hosted by Oregon Emergency Management
- June 21-22
- Registration now open

Anchorage, Alaska

- Hosted by Alaska Division of Homeland Security & Emergency Management
- September 21-22
- Registration announced in Summer 2017

Lynnwood, Washington

- Hosted by FEMA Region 10 Office
- October 24-25
- Registration announced Summer 2017

Region 10 In-Person Training

2017 Schedule

G-318: Mitigation Planning
Workshop



FEMA REGION 10 MITIGATION PLANNING TEAM

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