

# Whatcom Climate Vulnerability Assessment and Shoreline Management Solutions

## Whatcom County Council

### Climate Action and Natural Resources Committee

February 6, 2024



Photo: Inside Whatcom County Fire District 17 Station, Sandy Point -King Tide Event, 2022

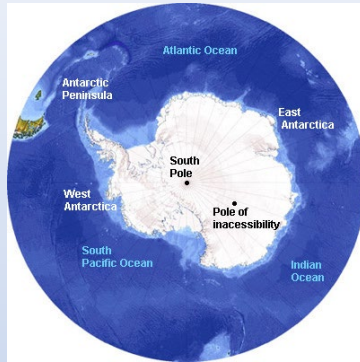
# Agenda

- Science & Projections
- Phase I Assessment (complete)
- Phase II Assessment (initiating)
- Comprehensive Plan & Land Use
- Council Discussion and Next Steps

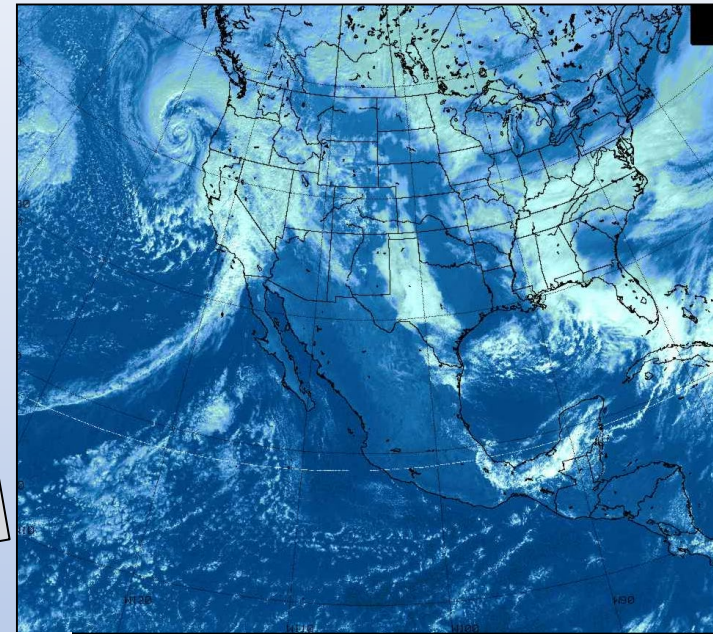


Photo: Exterior Whatcom County Fire District 17 Station, Sandy Point - King Tide Event 2022

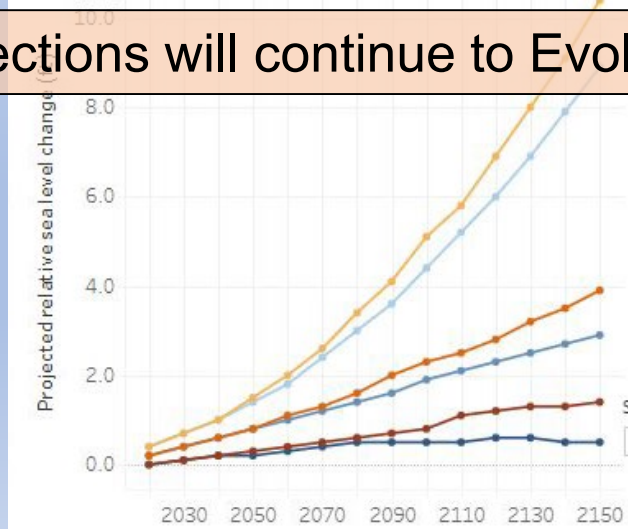
# Sea Level Rise and Flood Uncertainty



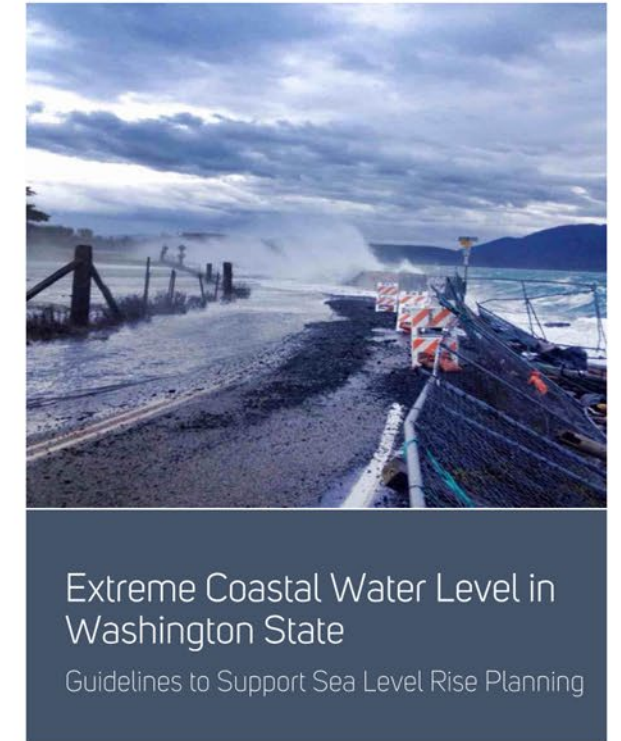
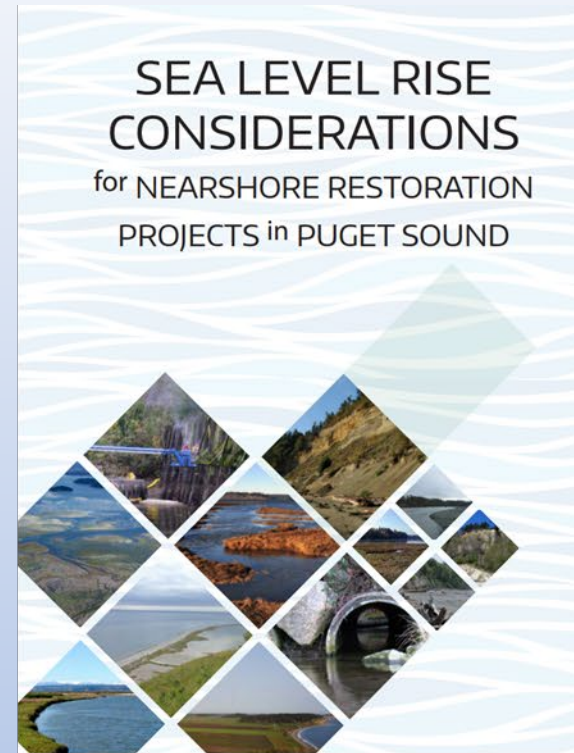
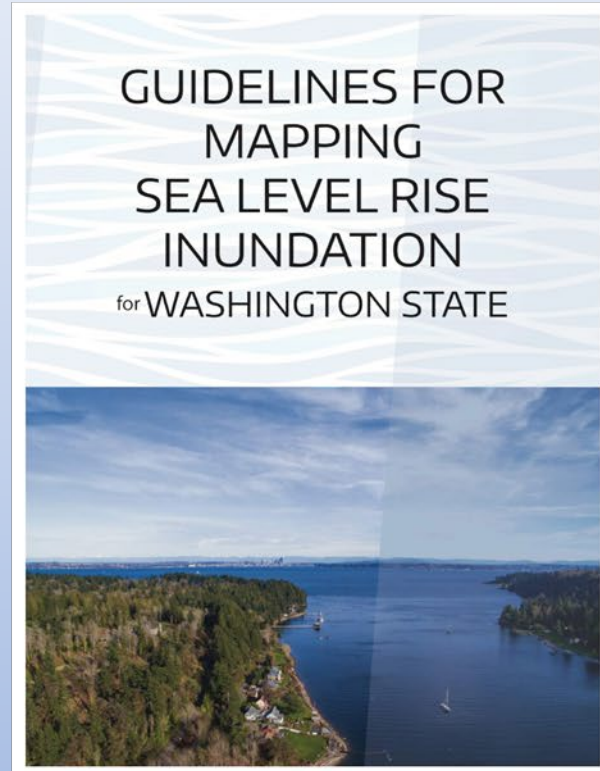
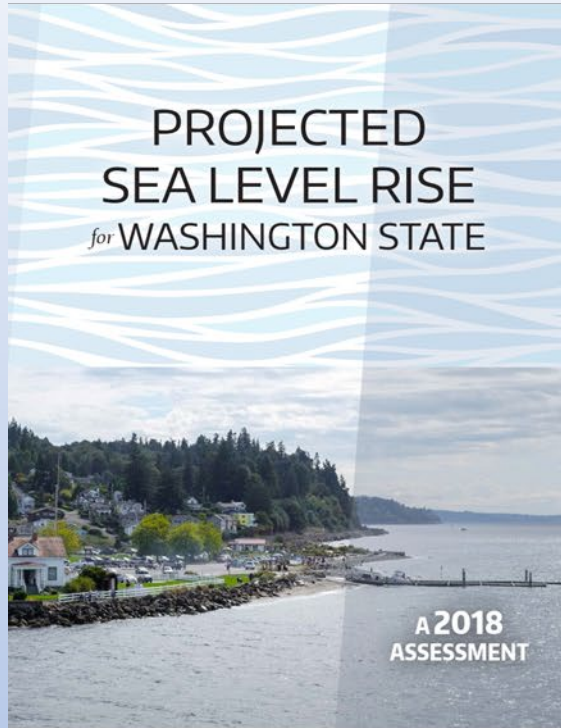
Uncertainty related to Antarctica, Greenland, Arctic Tundra, Greenhouse Gas Emissions, Global weather patterns, and other climate impacts



Projections will continue to Evolve



# Technical Resources available to inform Sea Level Rise Planning



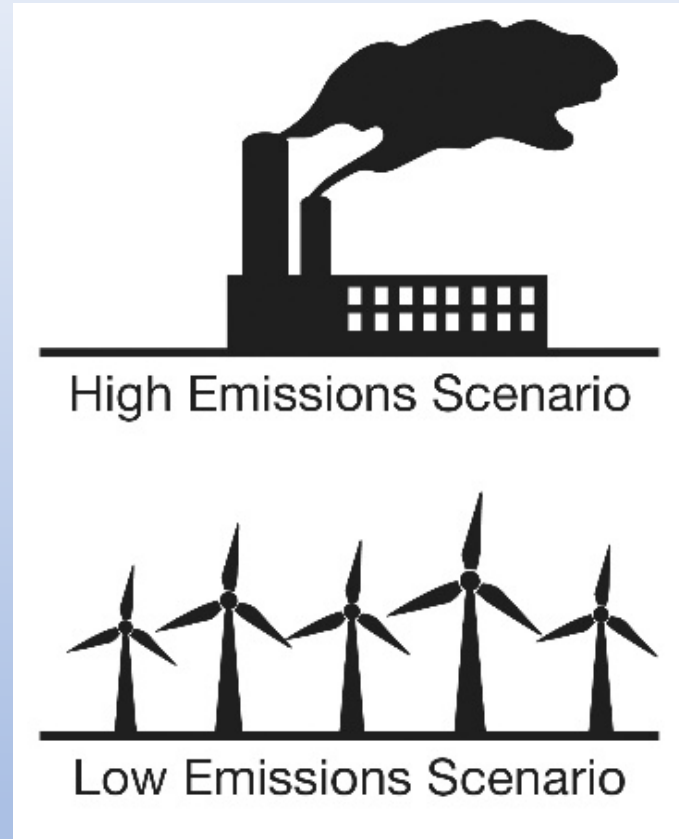
- [https://cig.uw.edu/wp-content/uploads/sites/2/2019/07/SLR-Report-Miller-et-al-2018-updated-07\\_2019.pdf](https://cig.uw.edu/wp-content/uploads/sites/2/2019/07/SLR-Report-Miller-et-al-2018-updated-07_2019.pdf)
- [CIG-SLR-GIS-guidelines-FINAL-compressed.pdf \(uw.edu\)](#)
- [Raymondetal SLR Restoration 2018 Compressed.pdf \(uw.edu\)](#)
- [Extreme Coastal Water Level in Washington State \(uw.edu\)](#)

# Greenhouse Gas Emissions

- Greenhouse Gas Scenarios
  - RCP 8.5 = “Business as usual”
  - RCP 4.5 = Some emissions reductions

*RCP stands for Representation Concentration Pathways, i.e. changes in atmospheric greenhouse gases*

- Level of risk or likelihood
  - Percent of models that predict SLR will exceed the projection
  - E.g., 1% risk means only 1% of models show a higher amount of SLR than the projection





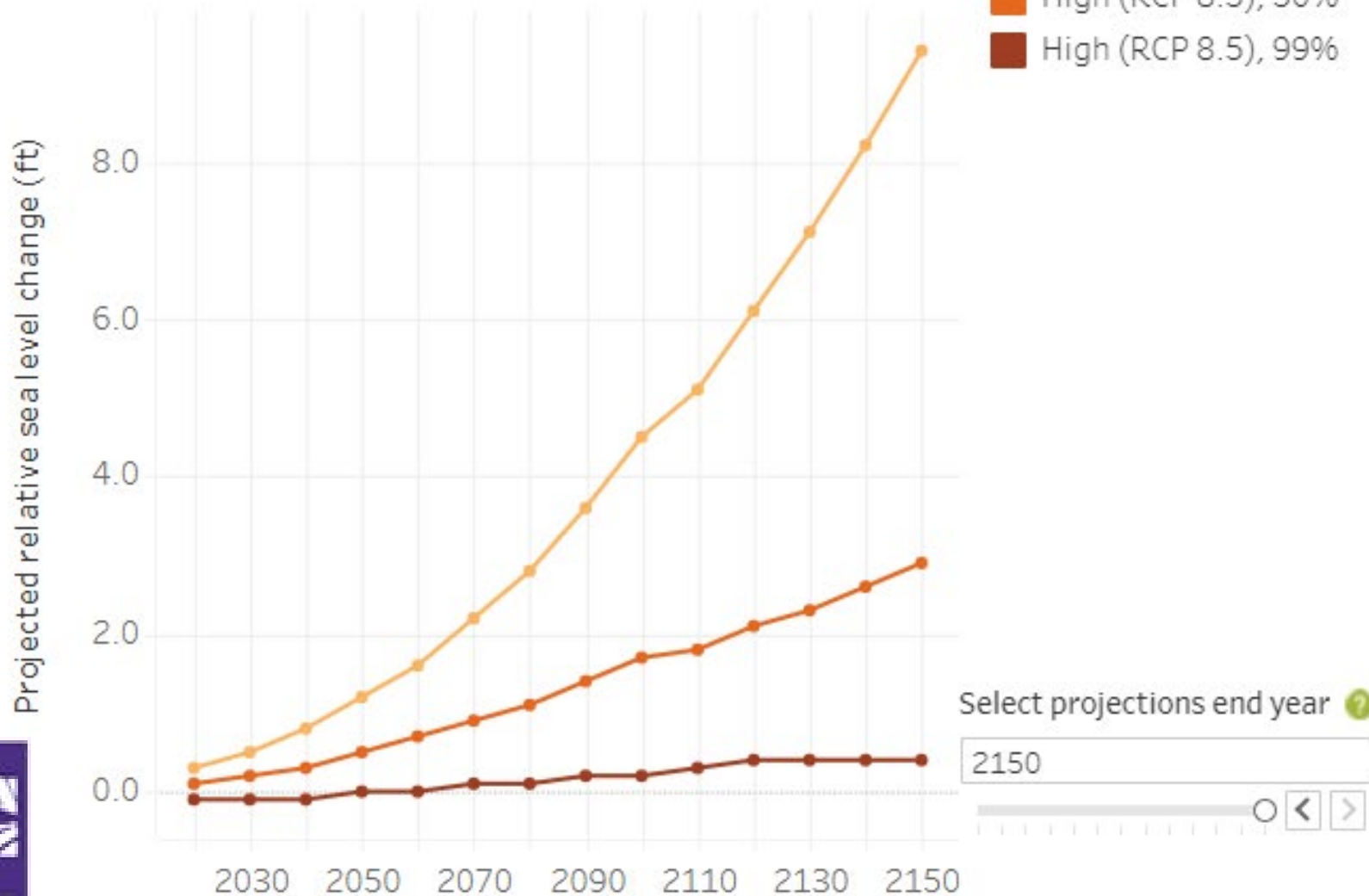
## RSLR for Selected Location

Projected changes relative to the average sea level over 1991-2009.

*Hover for details.*

Scenario, Likelihood

- High (RCP 8.5), 1%
- High (RCP 8.5), 50%
- High (RCP 8.5), 99%



University of Washington  
Climate Impacts Group

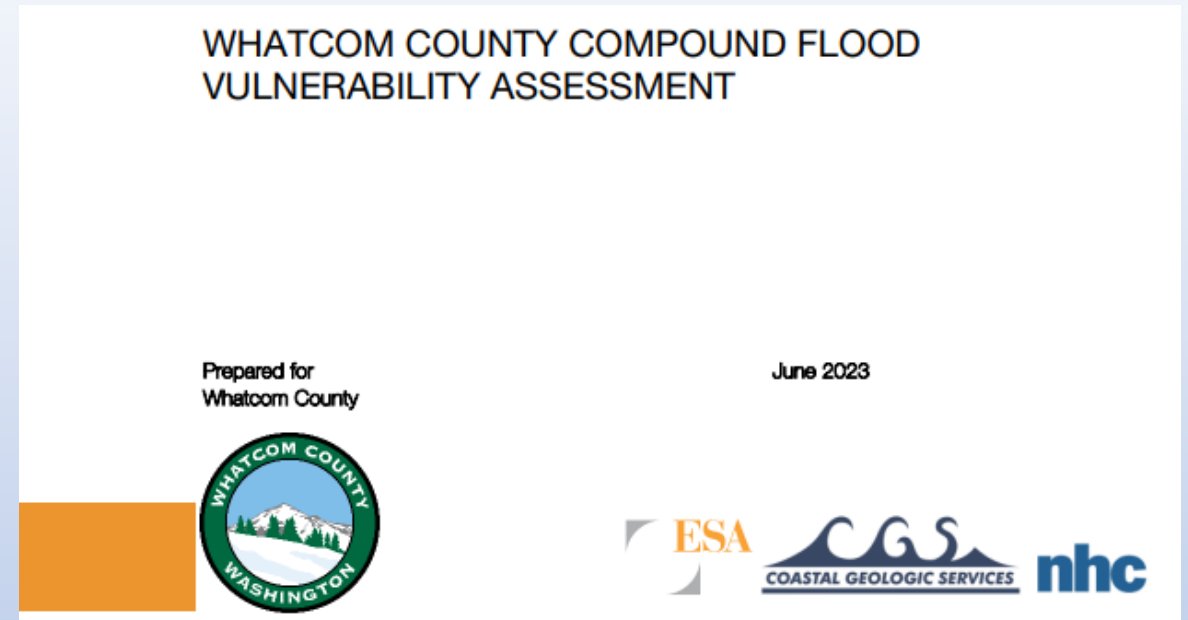


<https://cig.uw.edu/projects/interactive-sea-level-rise-data-visualizations/>

# Phase I Vulnerability Assessment Completed – June 2023

## Included:

- Mapped selected sea level rise and compound flood scenarios
- Exposure analysis for entire marine shoreline and lower Nooksack shoreline
- Completed vulnerability assessments for Sandy Point and Birch Bay
- Compiled adaptation strategies and actions from local and regional climate plans



County landing page

[Climate Change Risks | Whatcom County, WA - Official Website](#)

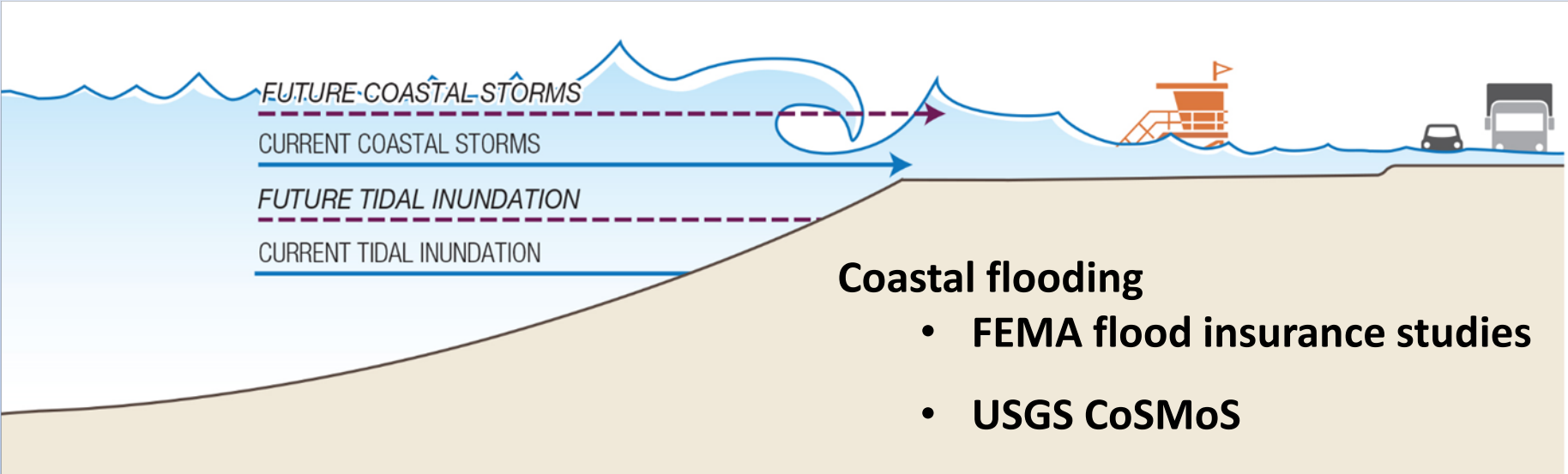
Phase I assessment report

[Whatcom County Compound Flood Vulnerability Assessment](#)

Interactive Map Viewer

["Draft" Sea Level Rise Compound Flooding Web Mapping Application \(arcgis.com\)](#)

# Coastal Storm = tides + storm surge + waves



NOTE: Sea, tide, and storm surge levels are for illustrative purposes only and do not depict actual or projected levels.

<https://www.usgs.gov/centers/pcmssc/science/ps-cosmos-puget-sound-coastal-storm-modeling-system#overview>

**Map sea level rise and flood hazards throughout Whatcom County**



# Hazards: Compound Flooding = Coastal + Riverine Flooding

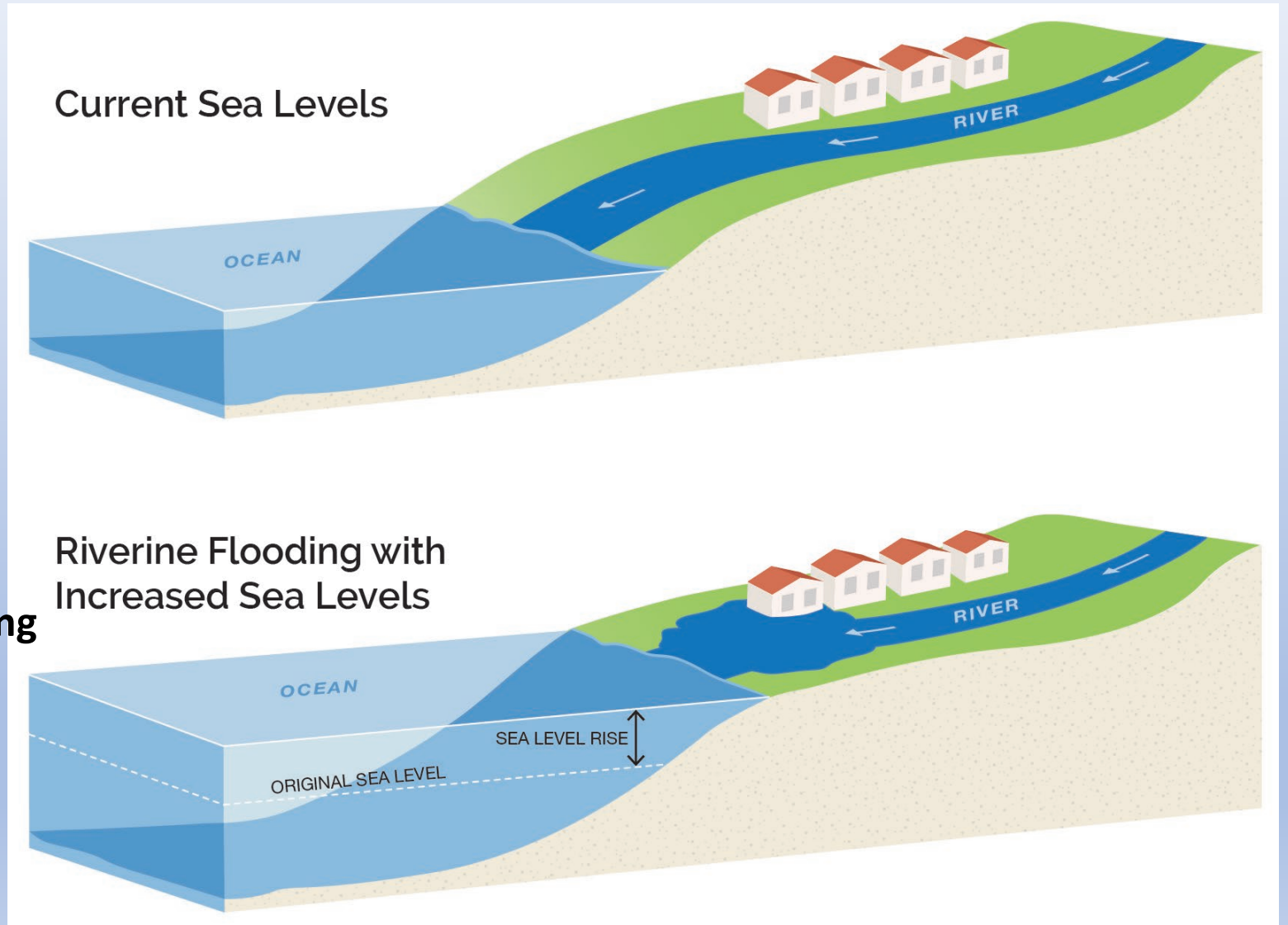
## Coastal flooding

- FEMA flood insurance studies
- USGS CoSMoS

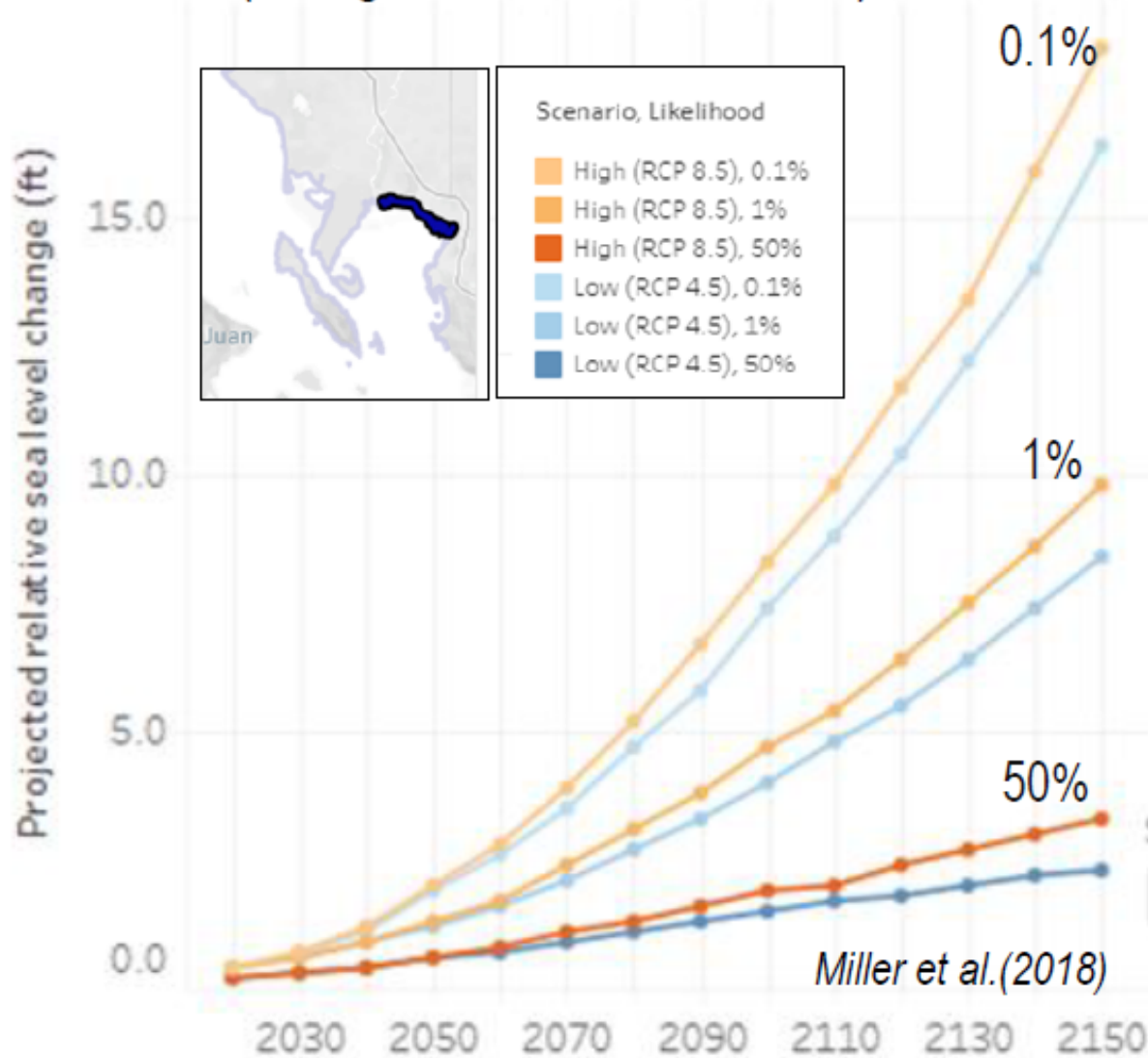
And

## Riverine flooding

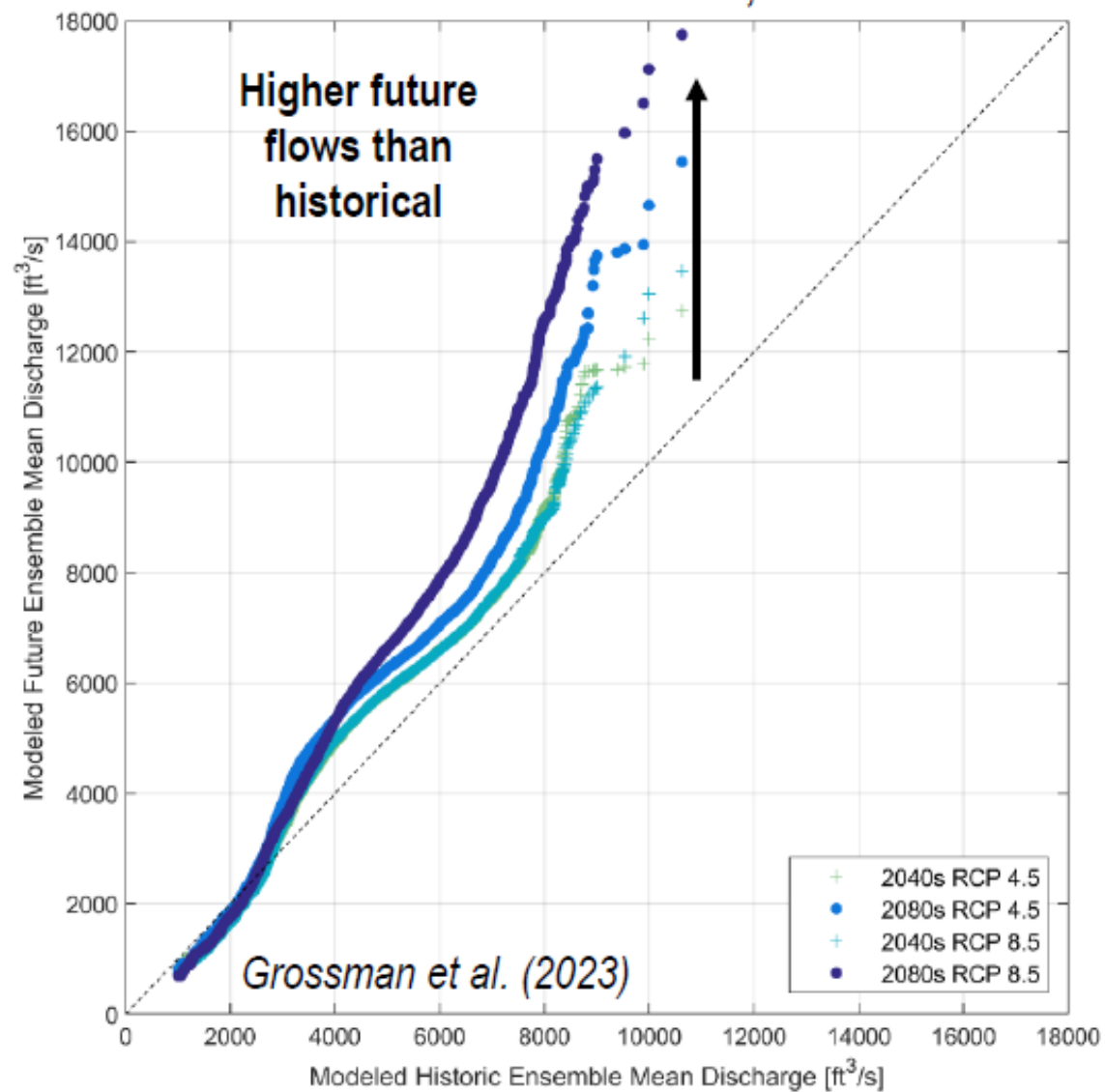
- USGS Lower Nooksack River Modeling
- FEMA flood insurance studies



### Projected Sea Level Rise (Bellingham-Nooksack River delta)



### Projected Changes in Stream Discharge Nooksack River at Ferndale, WA



# Whatcom County Sea Level Rise Scenarios

- Address scientific uncertainty with scenario planning
- Consider multiple scenarios that provide “bookends” or possible range
- For Whatcom County:
  - RCP 8.5 “Business as usual”
  - King Tides: 0.8 and 3.3 ft of SLR
  - 20-25 year event: 0.8 and 3.3 ft of SLR
  - 100-year coastal event: 0 and 6.6 ft of SLR (most extreme)

	UW CIG Projections		CoSMoS Scenarios	
Anticipated Timeline	Probability of Exceedance by this Date		Sea-Level Rise (ft)	Coastal Return Period
Now	N/A	N/A	0	100-year
Short-term	10% or less by 2030-2050	50% by 2060	0.8	King Tide
				20-year
Mid-term	10% or less by 2070-2120	50% by 2150	3.3	King Tide
				20-year
Long-term	1% or less by 2090-2120	5% by 2150	6.6	100-year

# Hazard Mapping Summary: Coastal

- Today's 100-year coastal storm (think FEMA maps) will occur...
  - every 20 years by 2040-2060 (0.8 ft SLR)
  - every year by 2080-2100 (3.3 ft SLR)



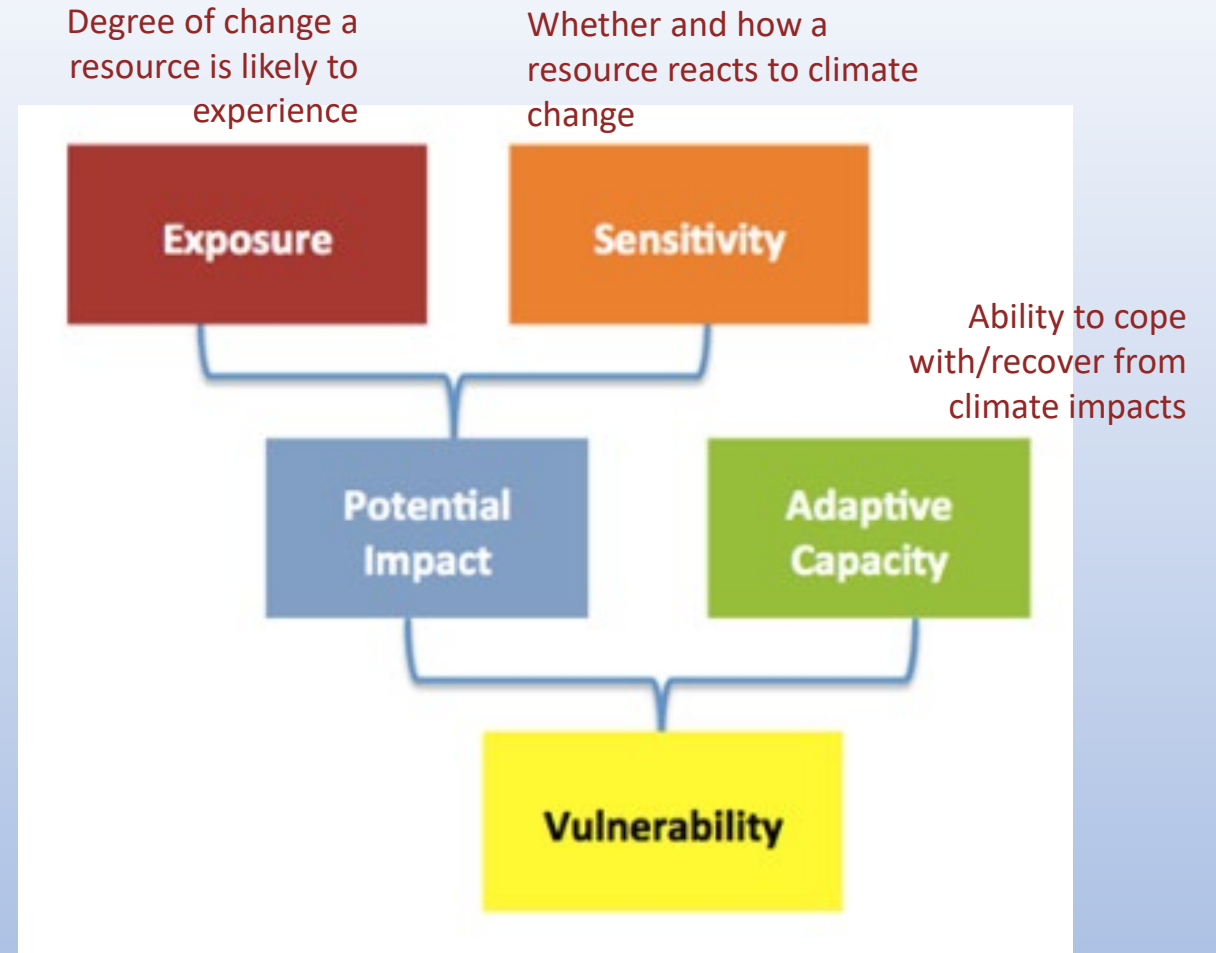
# 100-year Coastal Storm with 6.6 feet of SLR



# Defining Vulnerability

IPCC 2007

Vulnerability is the degree to which a resource is susceptible to and unable to cope with adverse impacts of climate change.



$$\text{Vulnerability} = (\text{Exposure} + \text{Sensitivity}) - \text{Adaptive Capacity}$$

# Most Vulnerable Assets: Sandy Point

Asset Category	Asset	Potential Exposure to Hazard	Sensitivity to Hazard	Adaptive Capacity of Asset	Vulnerability
Structures	Fire Station	High	High	Medium	High
Roads	Sucia Dr Saltspring Dr	High	High	High	Medium-High
Natural Resources	Kelp and eelgrass beds Beaches Wetlands Freshwater pond (Agate Lake)	Medium	High	Low	Medium-High
Recreation	Parks Sandy Point Gardens	High	High	Medium	Medium-High

# Phase II Vulnerability Assessment

March 2024 – June 2025

## SHORELANDS SHORELINE PLANNING COMPETITIVE AGREEMENT

### Tasks:

#### 1. Complete Marine Vulnerability Assessments

- a) Complete vulnerability assessment for entire marine shoreline
- b) Develop detailed erosion analysis, focusing on marine bluffs, based on future sea levels and storm surge impacts

#### 2. Complete Riverine Vulnerability Assessment

- a) Complete vulnerability assessment for current and projected riverine floodplain up to Deming, including the Everson Overflow to Sumas and the Canadian Border



# Phase II Vulnerability Assessment

March 2024 – June 2025

## SHORELANDS SHORELINE PLANNING COMPETITIVE AGREEMENT

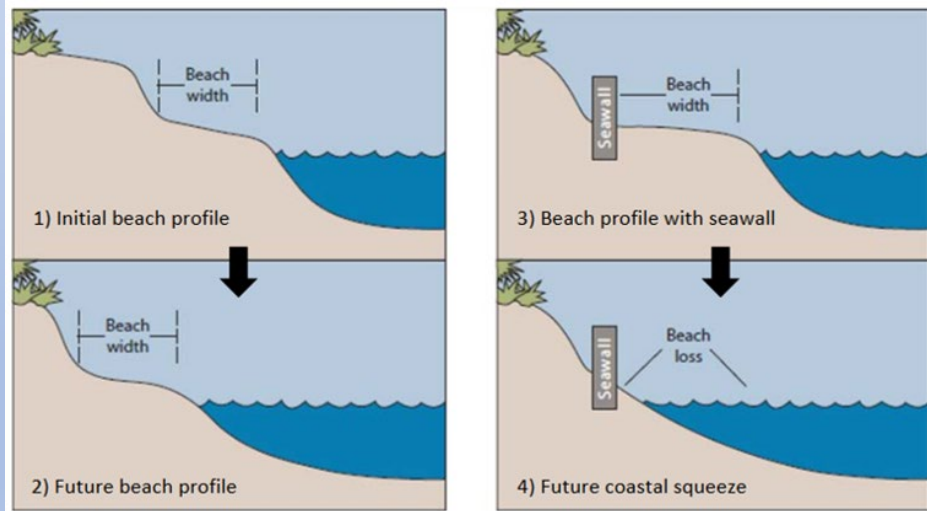
### Tasks:

3. Develop pilot adaptation plan for one vulnerable community and develop adaptation strategies that can apply across climate impact zones (areas projected to experience increased effects of sea level rise and storm surge)
4. Analyze Comprehensive Plan policies, the Shoreline Management Program, zoning and subdivision codes, critical areas regulations, & other land use and building codes to develop a prioritized list of recommend changes – also look at public infrastructure

# Example Adaptation Strategies

## Non-Structural Measures

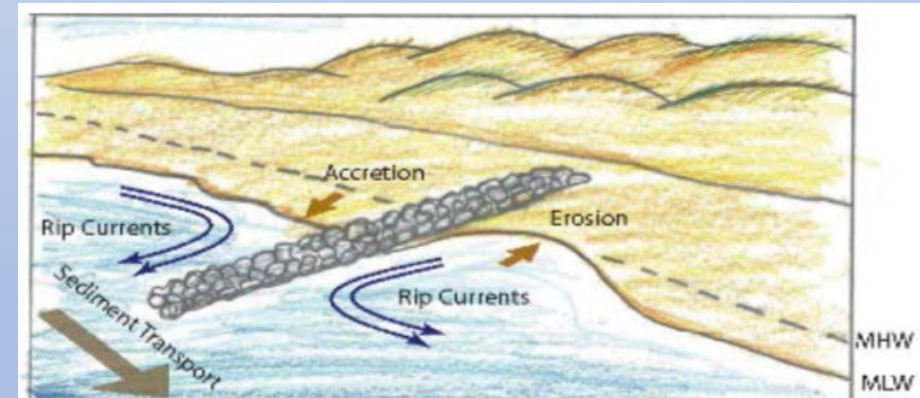
1. Beach Nourishment
2. Habitat Restoration
3. Coastal Bluff Erosion Best Management Practices (BMP)
4. Managed Retreat



SOURCE: California Coastal Commission, 2018

## Structural Measures

1. Beach Retention Structures: Groins or Breakwaters
2. Shoreline Protection Devices
3. Elevating or Waterproofing Structures and Infrastructure
4. Elevating Property Grades



SOURCE: ESA



# Climate-Related Tasks in Comp Plan Update

## Countywide Planning Policies

- Review Countywide Planning Policies for consistency with the GMA's new Climate Change and Resiliency goal (RCW 36.70A.020(14))

## Comp Plan - Land Use Updates

- Environmental justice
- Reduce/mitigate sea level rise and flood risks

## Comp Plan New Climate Change & Resiliency Element

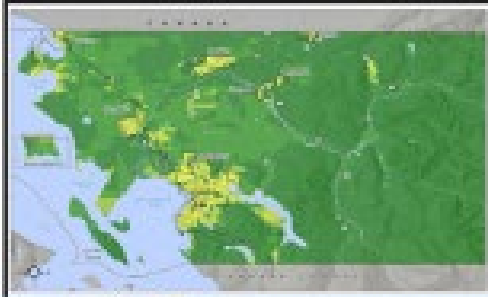
- Resiliency sub-element



Photo from Birch Bay – Jan 2022 - Credit: Teresa McKinnon

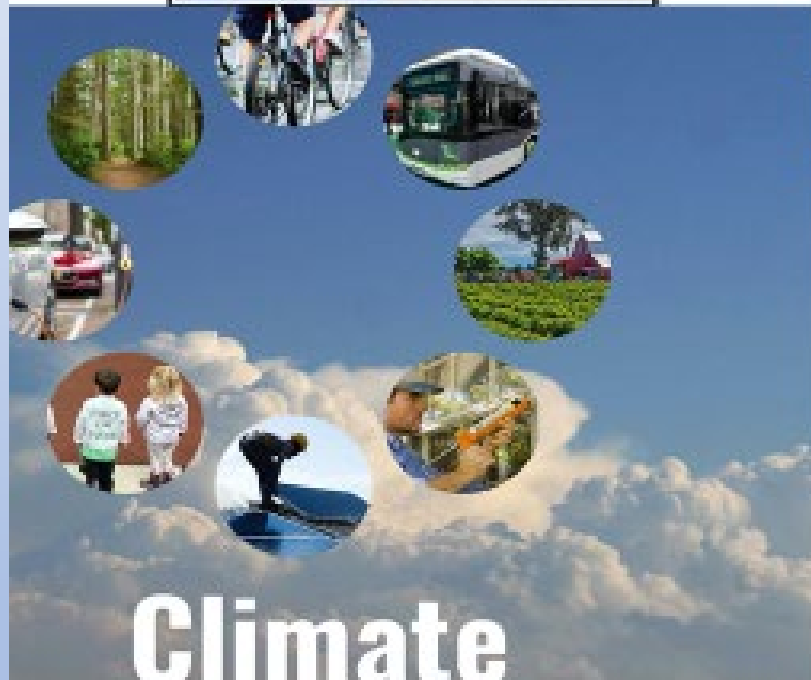


# Whatcom County Natural Hazards Mitigation Plan



## WHATCOM COUNTY COMPOUND FLOOD VULNERABILITY ASSESSMENT

Prepared for  
Whatcom County



# Climate Action Plan

November 9, 2021  
Adopted by Whatcom County Council via Resolution 2021-049



The Sandy Point Fire Station



We strengthen communities

## Climate Element Planning Guidance

GROWTH  
MANAGEMENT  
SERVICES

# Development Regulations & Other Plans

After review/approval of new Comp Plan policies -update development regulations & other public infrastructure plans

- Zoning
- Critical Areas Ordinance
- Shoreline Master Program
- Subdivision Regulations
- Development Standards
- Building Codes
- Transportation Improvement Plan
- Capital Facilities Plan
- Natural Hazard Mitigation Plan

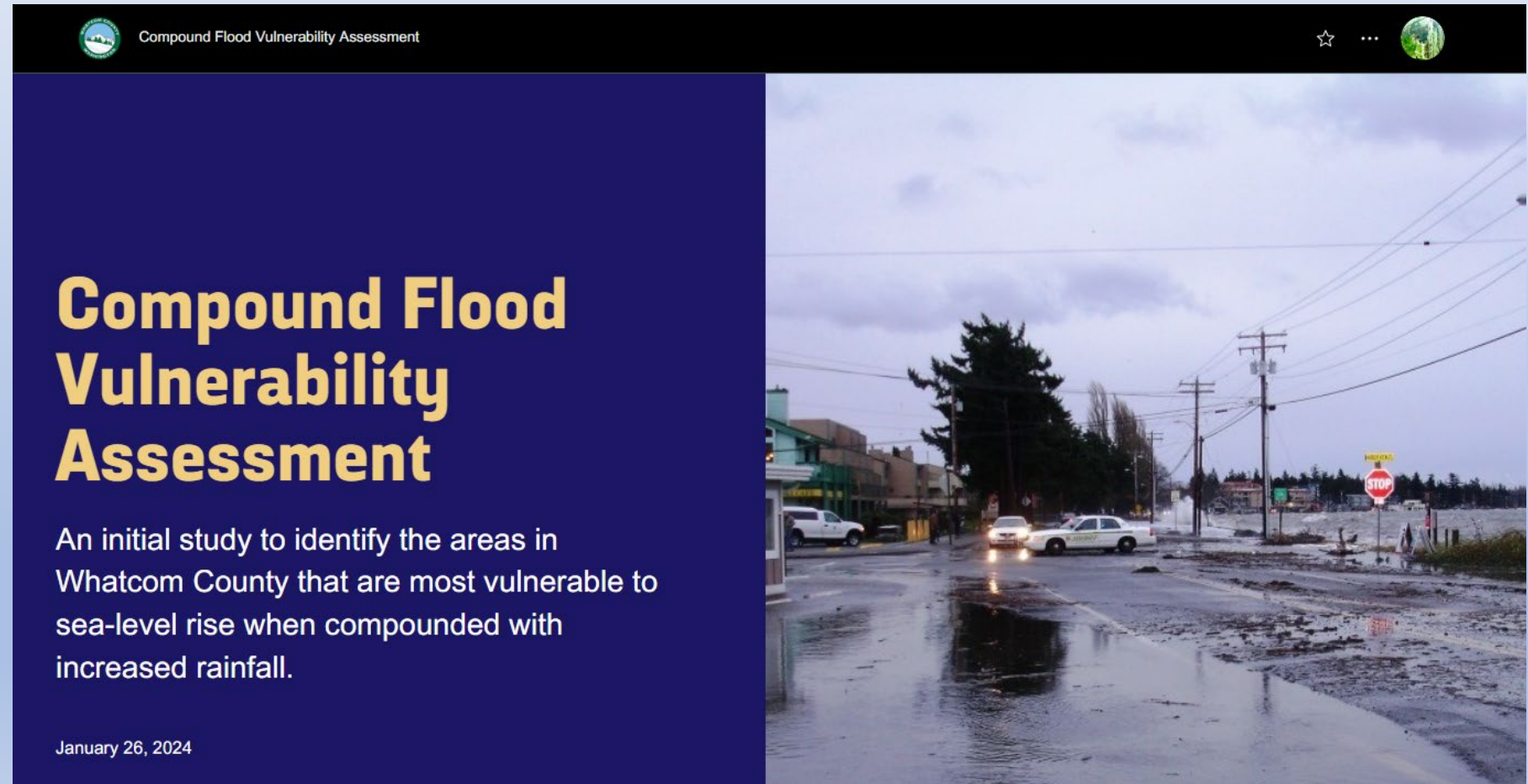


Sandy Point storm event in 2000

# Questions?

[Compound Flood Vulnerability Assessment \(arcgis.com\)](https://storymaps.arcgis.com/stories/1a4ab6ea76d74f03b71ca78d020c4334)

<https://storymaps.arcgis.com/stories/1a4ab6ea76d74f03b71ca78d020c4334>



The screenshot shows the top portion of an ArcGIS StoryMap. The header bar is black and contains a circular logo on the left, the text 'Compound Flood Vulnerability Assessment' in the center, and a star icon, a three-dot menu icon, and a globe icon on the right. Below the header, the main content area is split into two sections. On the left is a dark blue vertical panel with white and yellow text. On the right is a wide photograph of a flooded street at dusk or dawn. The street is covered in water, with a white car and a white SUV visible. In the background, there are buildings, trees, and utility poles. A red stop sign is visible on the right side of the street.

**Compound Flood Vulnerability Assessment**

An initial study to identify the areas in Whatcom County that are most vulnerable to sea-level rise when compounded with increased rainfall.

January 26, 2024