Appendix C: June 5th, 2025 Workshop Presentation

Dear Reader,

Please find below slides presented at a June 5th, 2025 Workshop hosted by the Skagit Climate Science Consortium, Swinomish Indian Tribal Community, and Skagit River System Cooperative to look at preliminary results from flood modeling of the Skagit watershed. Invitations were extended to a broad range of people and entities including local, state, federal governments; quasi-governmental, tribal, non-governmental organizations with responsibilities or interests in understanding, planning for or taking actions in regard to flood risk reduction. The project and workshop objectives can be found in the slide deck.

The slides were not developed as a stand-alone product but to support a presentation. However, based on significant feedback from workshop participants to have access to the information prior to the estimated project report in early 2026, the project team (slide 8) has annotated the slides to improve their utility as an early product.

Please reach out to
Heather Spore; email: hspore@swinomish.nsn.us
Carol Macilroy; email: cmacilroy@gmail.com

If you have any questions, comments or feedback you'd like to share or need additional information.

Understanding
Current and Future Flood Risk
Through New Modeling Capabilities
Skagit River

June 5th, 2025

Presented to Skagit County community members and municipalities by the Swinomish Indian Tribal Community and the Skagit Climate Science Consortium on June 5, 2025.

Welcome and Overview

- Welcome and Introductions
- Project and Project Team overview
- Skagit Climate Science Consortium
- Today’s Workshop Agenda

Project: Overview and Objectives

- Develop an updated, accessible floodplain model from the Skagit delta to just upstream of Marblemount using up-to-date scientific information and data

- Build off past work, improve model resolution, expand geographic range, and incorporate coastal flooding and future climate projections

Project: Overview and Objectives

- Create a forum to:
    - Engage around technical products (model and model results)
- Document model assumptions and inputs, provide visuals of model results, and describe process
- Make model available for use/adaptation by others

Project: Overview and Objectives

- Governments, organizations and individuals determine if the model and continued conversations could provide benefit and how/if to move forward upon project completion.

Project Engagement Steps and Timing

Step	Timing
Initial Community Calls	Dec 2024 - Jan 2025
State/ Federal Focus Group; Local Govt Focus Group; Tribal Govt Focus Group; Agricultural Focus Group; Environmental / Social Focus Group	February
Additional Community Conversations and Feedback	March-May
Workshop: Understanding Current and Future Flood Risk in the Skagit River	June 5th
Additional Community Conversations and/or Another Workshop	July- October
Public Open House	Nov
Final Documentation, Model Publicly Available	Early 2026

Project Team

Heather Spore, MSc	*Swinomish Indian Tribal Community (funding recipient)*
Nora Kammer	*Skagit River System Cooperative*
Steve Moddemeyer	*Consultant to Skagit Climate Science Consortium*
Dr. Guillaume Mauger	*University of Washington Climate Impacts Group, consultant to Skagit Climate Science Consortium*
Dr. Alan Hamlet	*Notre Dame, consultant to Skagit Climate Science Consortium*
Carol Macilroy, BSc	*Consultant to Skagit Climate Science Consortium*
Kristin Kramer, PE	*Northwest Hydraulic Consultants (NHC)*
Vaughn Collins, PE, CFM	*Northwest Hydraulic Consultants (NHC)*

Acknowledgements

We would like to thank the following people and organizations for their support and contributions.

- Members of the Skagit community who took part in early conversations

- US Army Corps of Engineers, who provided the original model

SC^2 Mission

- ***Foster collaborative scientific research*** to understand the diverse and interrelated impacts of climate change from the Skagit headwaters to Puget Sound;
- ***Produce relevant climate-related products*** closely integrated with the Skagit community's needs and concerns;
- ***Serve as a conduit between Skagit communities and SC2 scientists*** to assist in the development of adaptation strategies.

SC^2
SKAGIT CLIMATE SCIENCE
CONSORTIUM

SC^2 Members

- NOAA, National Marine Fisheries Service
- National Park Service (retired)
- Notre Dame University, Civil and Engineering Department
- Padilla Bay Reserve
- Seattle City Light
- Seattle University, Civil and Environmental Engineering
- Swinomish Indian Tribal Community
- Skagit River System Cooperative
- United States Forest Service (retired)
- United States Geological Survey (USGS)

SC^2 Members

- UW, Climate Impacts Group
- UW, Environmental and Forest Sciences Department
- WSU Center for Sustaining Agriculture and Natural Resources
- WWU, Environmental Science Department
- WWU, Geology Department
- WWU, Marine and Coastal Science program

Broad Expertise

Engineering geologist and hydrogeologist: ground and surface water

Restoration ecologist

Applied marine ecologist

Forestry scientist

Civil engineer: landslides

Climate scientist: adaptation

Soil ecologist

Climate scientist: climate models

Estuarine ecologist

Hydrologist

Fishery and wildlife biologist

Population ecologist

Aquatic ecologist and ecotoxicologist

Civil engineer: flood infrastructure

Geomorphologist

Civil and environmental engineer

Glaciologist

Coastal and marine geologist

SKAGIT CLIMATE SCIENCE CONSORTIUM


REFINE
RESEARCH
INTEGRATE
COMMUNICATE
SC2
SKAGIT CLIMATE SCIENCE
CONSORTIUM
Community
TAKE ACTION

- Many significant studies and planning efforts have been done
- Several studies and efforts are ongoing and more are planned
- Hazards from flooding increase the risk for:
  - Loss of home/personal wealth
  - Failure of infrastructure and loss of dollars to repair/replace
  - Lingering losses to local commercial economy
  - Losses and damages to farming income, infrastructure and homes, livestock, crop and field,
  - Losses and damages to habitat and natural resources including salmon impacts like redd scour, siltation, stranding
  - Trauma to adults, children, elderly
  - Long-term impacts to community health for up to 20-years post disaster
- Flood control (dams, levees) can simplify and degrade salmon habitat
- Flood control actions can transfer risk
- There is the potential for a lot of water
- Fractured political landscape makes progress difficult

This project can contribute technically robust information to the complex flood risk reduction puzzle this community is working on.

Purpose of Today

- Share Skagit flooding and model overview and preliminary model results
- Create a forum where the model and model results can be explored, discussed and commented on

Outcomes for Today

- Project team has input from participants on:
  - Framing of flooding and climate change in the Skagit,
  - Model, and
  - Model results that contribute to refinement in products
- Participants meet someone new, hear a new perspective, consider what information would help them as they work to reduce flood risk and if these kinds of results are useful

Today’s Agenda

9:00-9:15	Welcome, Introductions and Project Overview
9:15-10:15	Session I: Skagit Watershed Flooding a Brief Overview
10:15-10:40	Session II: Model Overview
10:40-10:55	Break
10:55-12:15	Session III: Sedro-Woolley Upriver
12:15-1:00	Lunch
1:00-3:30	Session IV: Sedro-Woolley Downriver, Breaches, Coastal Flooding
3:30-4:00	Wrap-up and closing

Session I: Flooding in the Skagit Watershed Overview

Outline

A. Skagit Hydrology

B. Understanding Skagit Flooding

C. Climate Change Impacts

D. What Insights Can Flood Modeling Provide?

Take-aways:

- Reservoirs have a big impact on floods in the Skagit River. Still, 61% of the watershed is downstream of the dams, so they can't address all floods equally well.

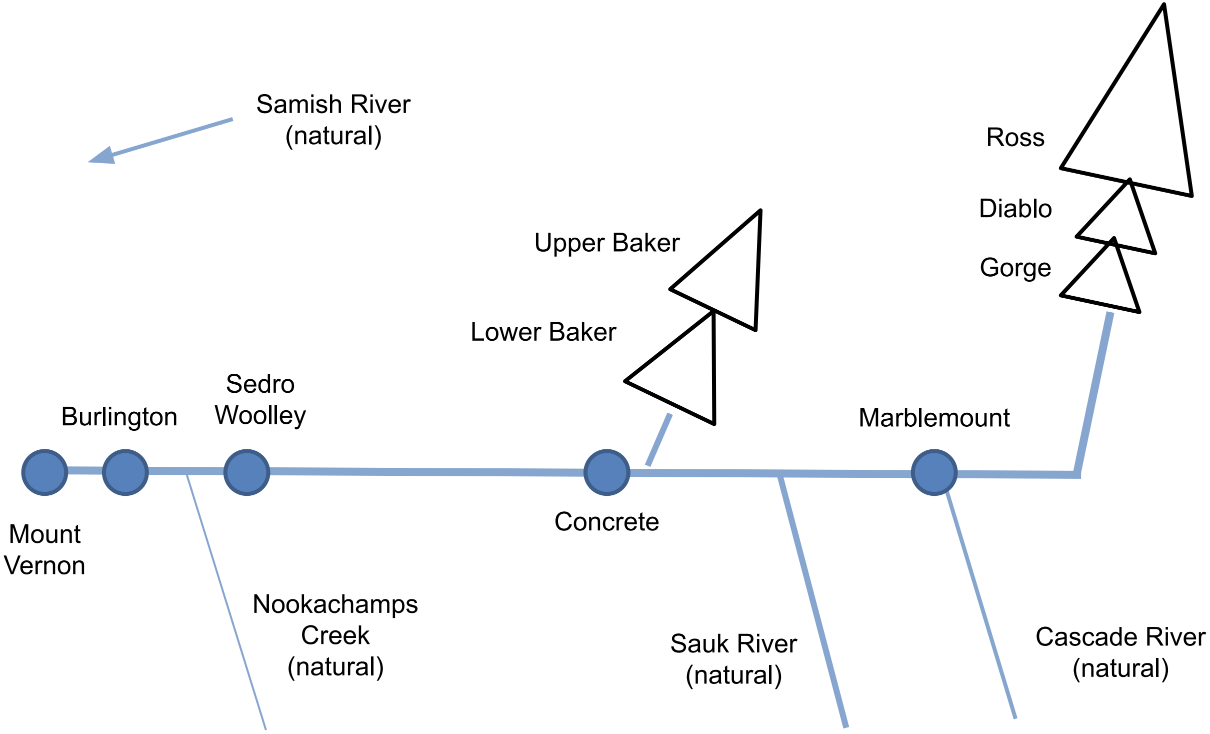
- Climate change will increase flood risk, primarily due to declining snowpack, heavier rain events, and sea level rise

- Models like the new Skagit flood model can explore what happens to flow velocity, stage, and inundation under various management approaches.

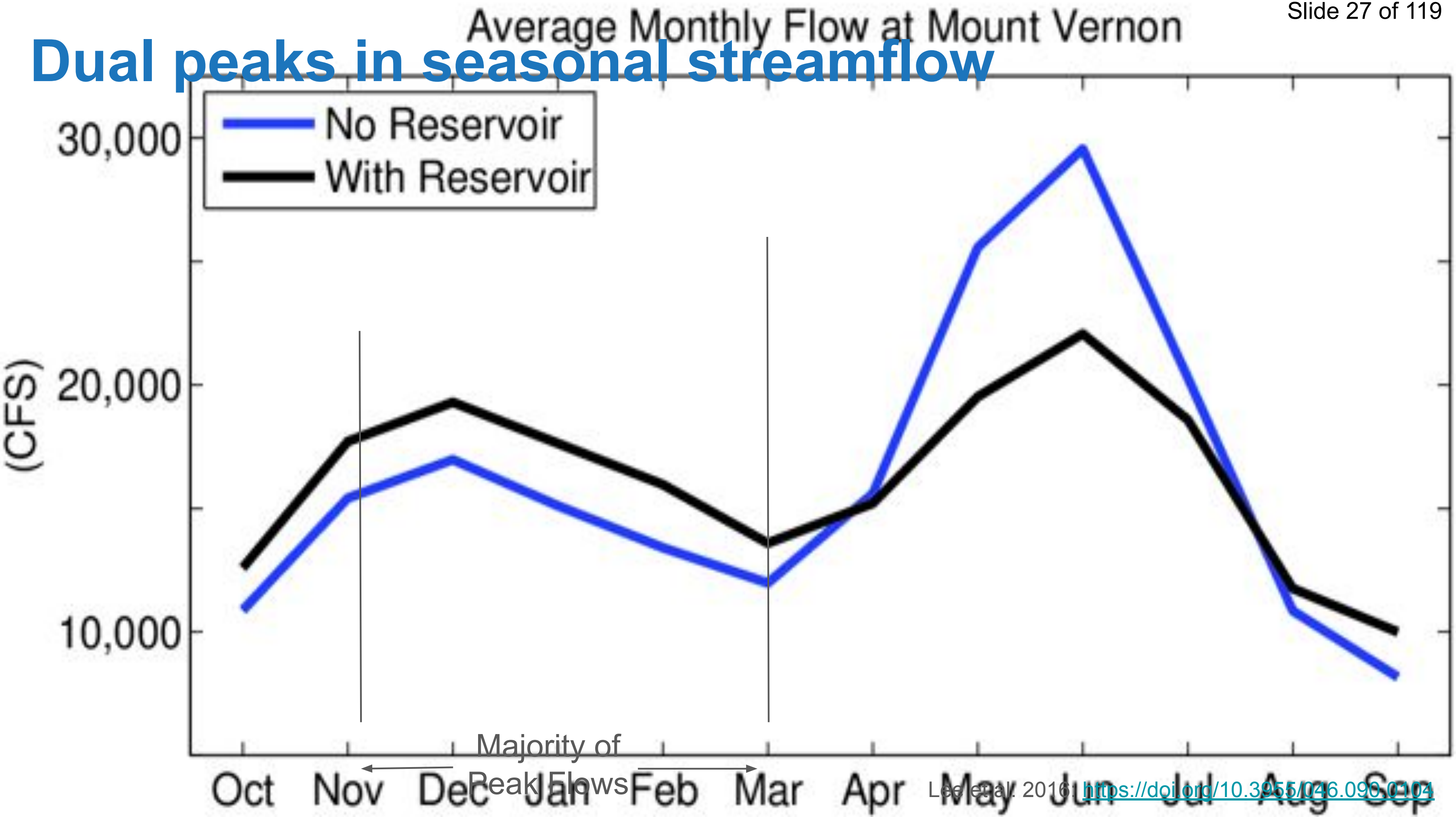
A) Skagit Hydrology

Source: Riedel, J., S. Sarrantonio, G. Seixas, C. Clement, 2020: Skagit River Geomorphology, Report to Seattle City Light, May

Schematic Diagram of the Skagit Basin



Dual peaks in seasonal streamflow



Lee et al. 2016: https://doi.org/10.3955/046.090.0104

Hydropower

https://flic.kr/p/2q1A6FY

Flood Control

https://flic.kr/p/rP2qW

Water Supply

https://www.skagitonians.org/blog/watertablemanagement

Ecosystems

https://flic.kr/p/9jdtky

Agriculture

Source: Brandon Parsons, American Rivers

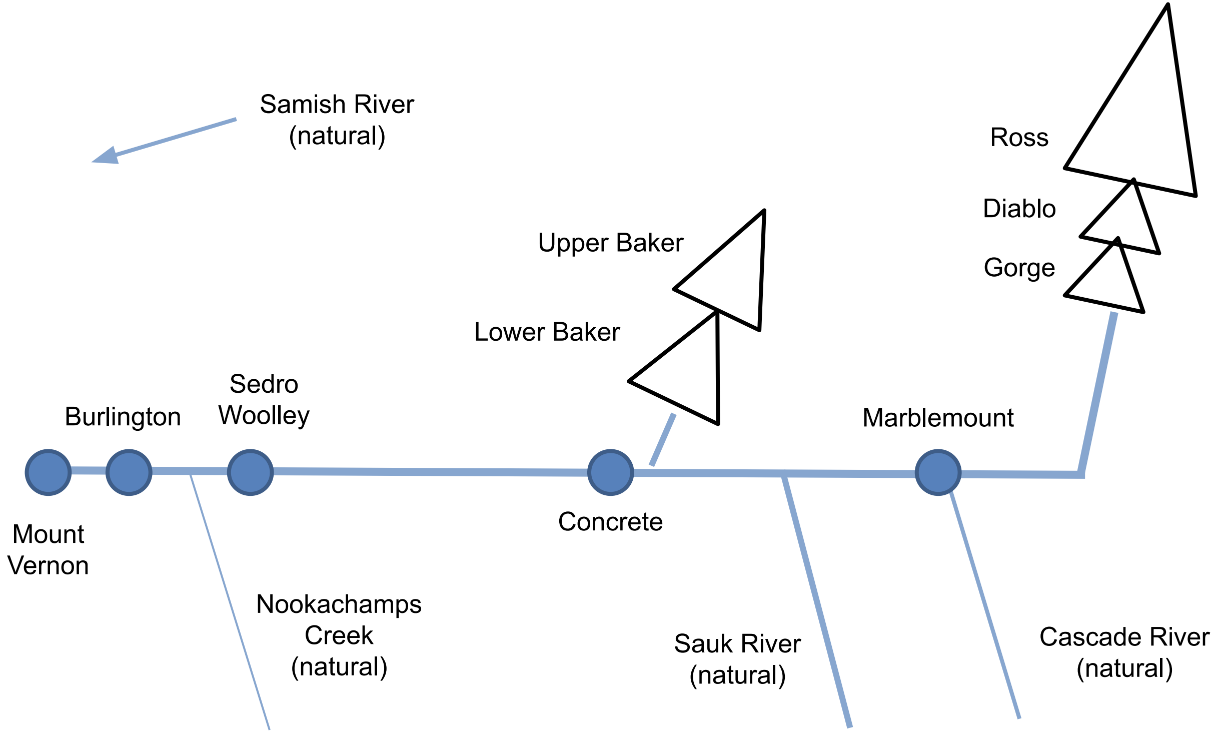
Recreation

Source: Alan Hamlet

B) Understanding Skagit Flooding

(schematic representation of the Skagit and Samish Rivers)

Role of Skagit Dams



Role of Skagit Dams

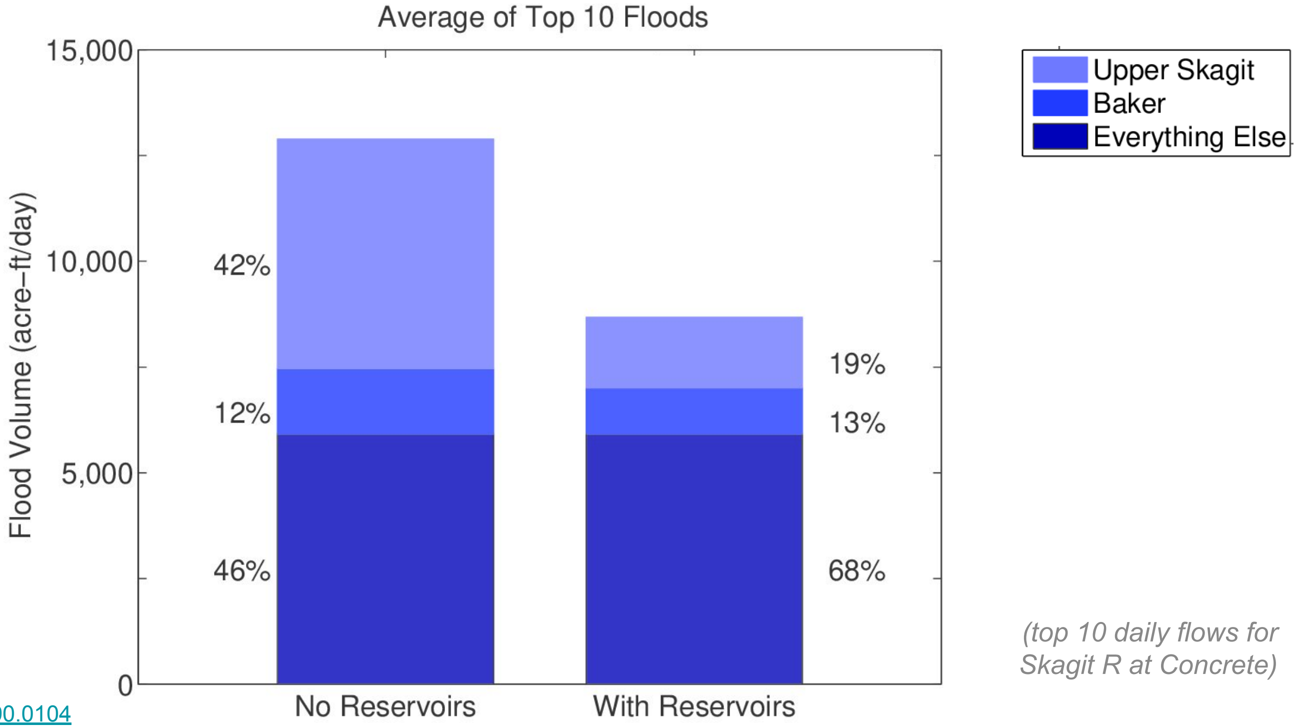
47% of Skagit basin area is above the dams

In other words:

53% of the basin is unaffected by the dams

Note: A previous version of this presentation had the percentages at 69%/31%. This is the area above Ross and Upper Baker dams, but does not include the area above Gorge, Diablo, and Lower Baker dams.

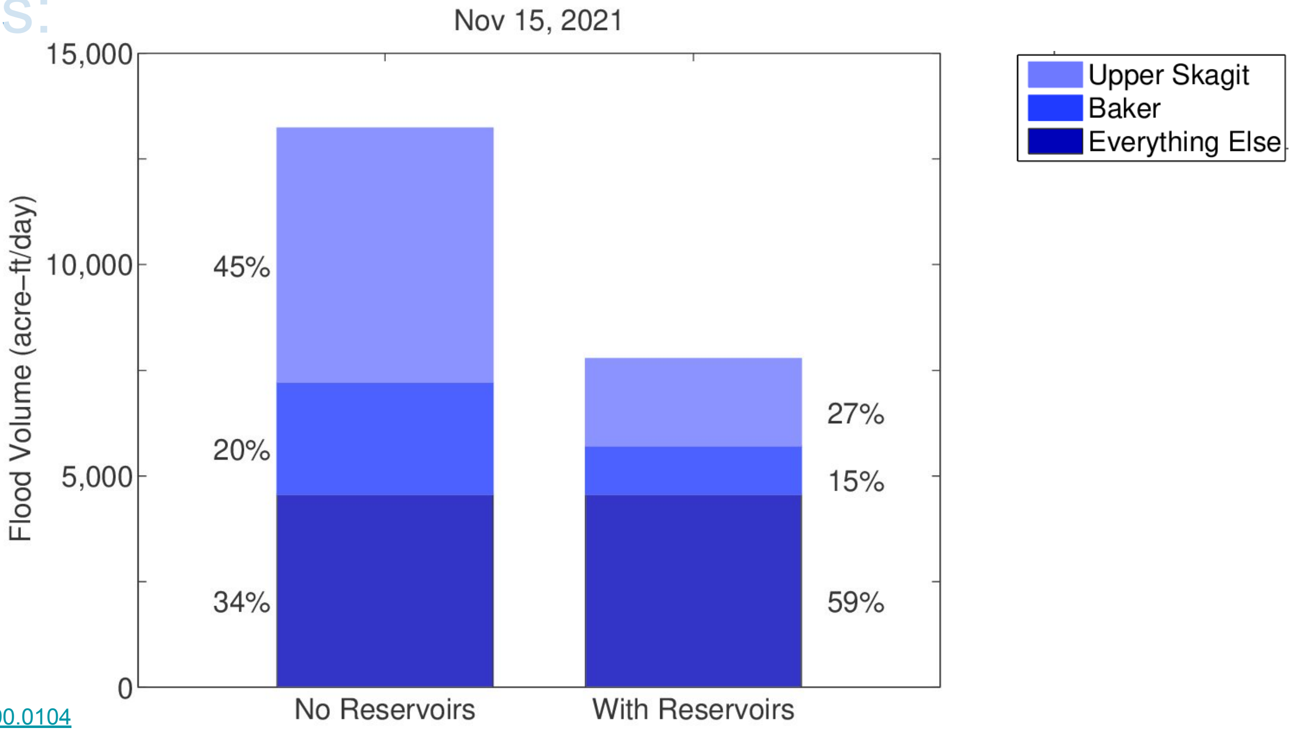
On average, across the top 10 Skagit floods, nearly half of the water comes from below the dams:



(top 10 daily flows for Skagit R at Concrete)

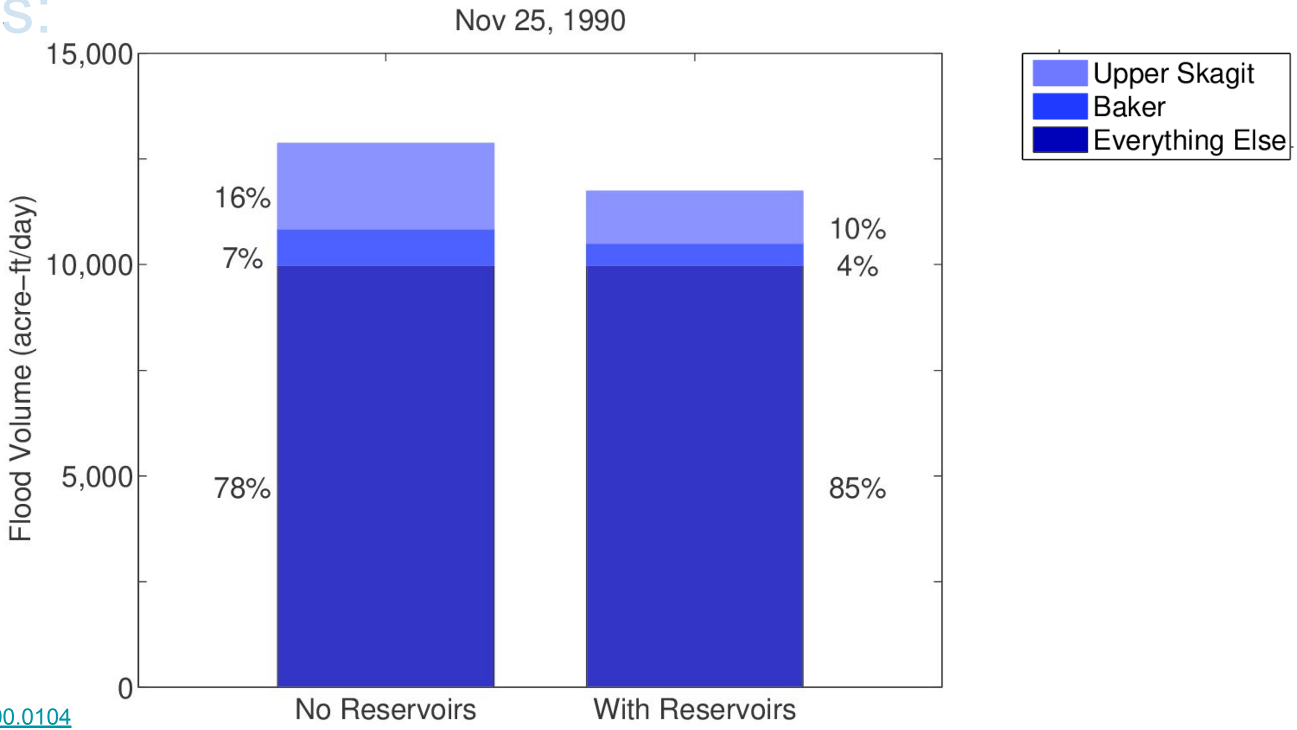
Lee et al. 2016
https://doi.org/10.3955/046.090.0104

In 2021, most of the flooding came from above the dams:



Lee et al. 2016
https://doi.org/10.3955/046.090.0104

In 1990, 78% of the flooding was not affected by the dams:



Lee et al. 2016
https://doi.org/10.3955/046.090.0104

What is a "100-year" Flood?

A flood that has a **1 in "100" chance** (or 1%) of occuring in any given year.

100-year flood

= 1% chance per year

= XX% chance in next 25 years

25-year flood

= 4% chance per year

10-year flood

= 10% chance per year

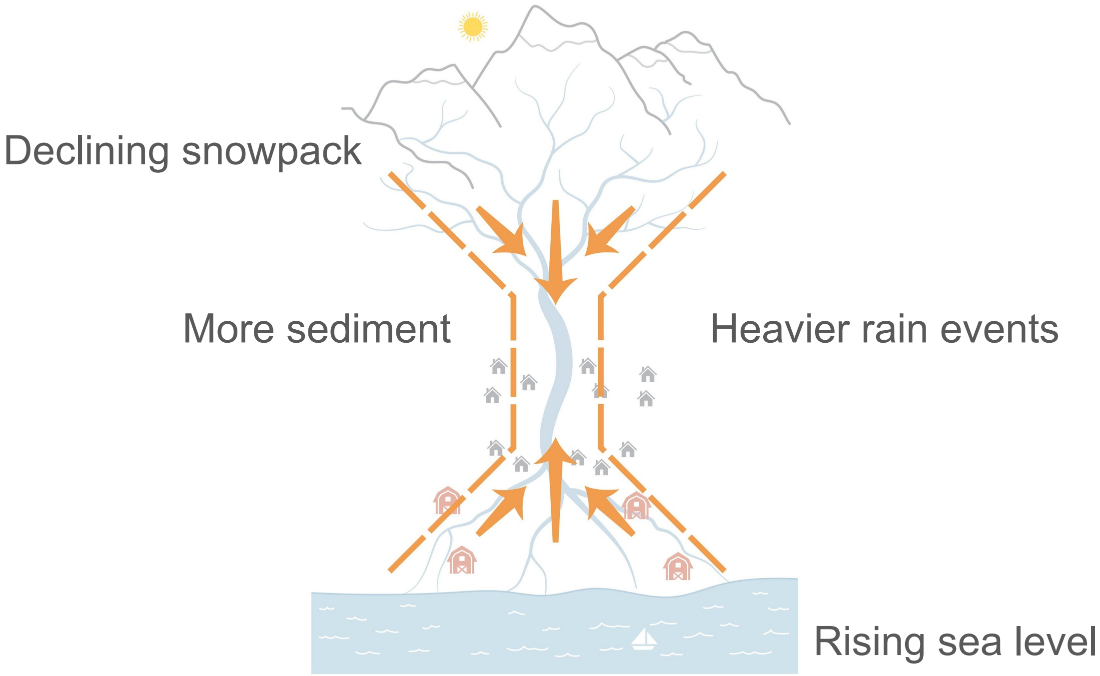
Under "**Existing Conditions**" we determine these floods based on today's climate conditions.

Under "**Future Conditions**" we use climate projections to understand how these floods could change by the **2040s or 2080s**.

This slide was not presented at the workshop but included based on feedback for clarification.

C) Climate Change Impacts

Changing Climate: Multiple Forces Combine



http://www.skagitclimatescience.org/events/educational-resources/

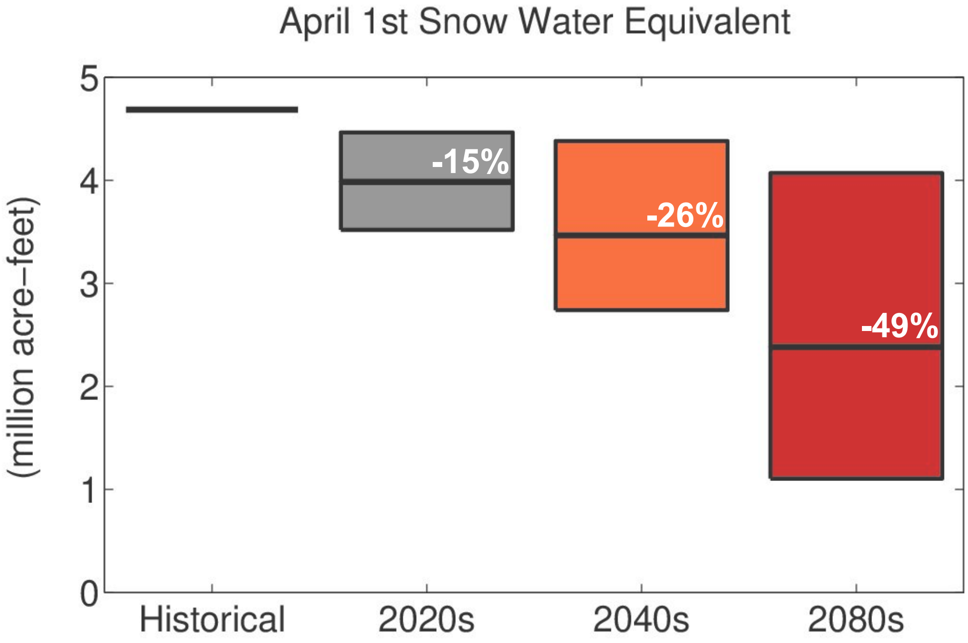
More Intense Heavy Rains

Heaviest rain events (top 1% daily) are projected to become **+22% more intense** by the 2080s (*range:* +5 to +34%).

based on a high-end greenhouse gas scenario (RCP 8.5)

Warner et al. 2015; https://doi.org/10.1175/JHM-D-14-0080.1

Accelerating Decreases in Snowpack



Hamlet et al. 2013; https://www.tandfonline.com/doi/full/10.1080/07055900.2013.819555

Schematic of a Cool Climate Flood

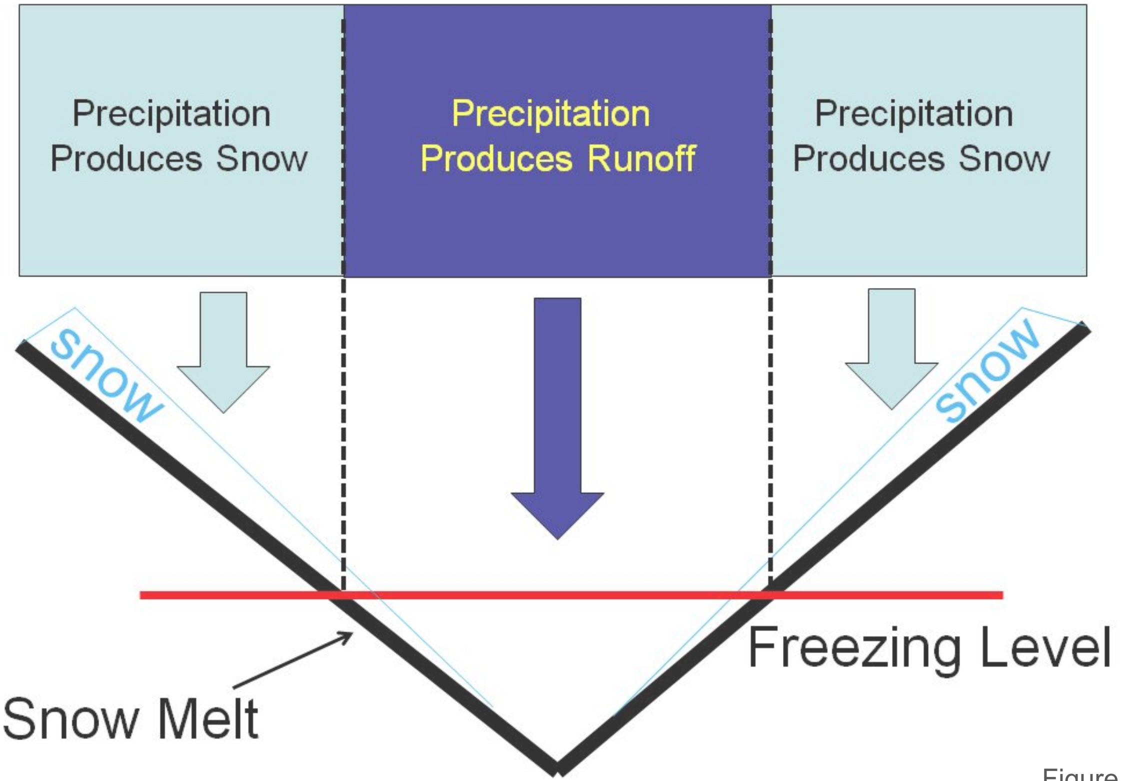


Figure credit: Alan Hamlet

Schematic of a Warm Climate Flood

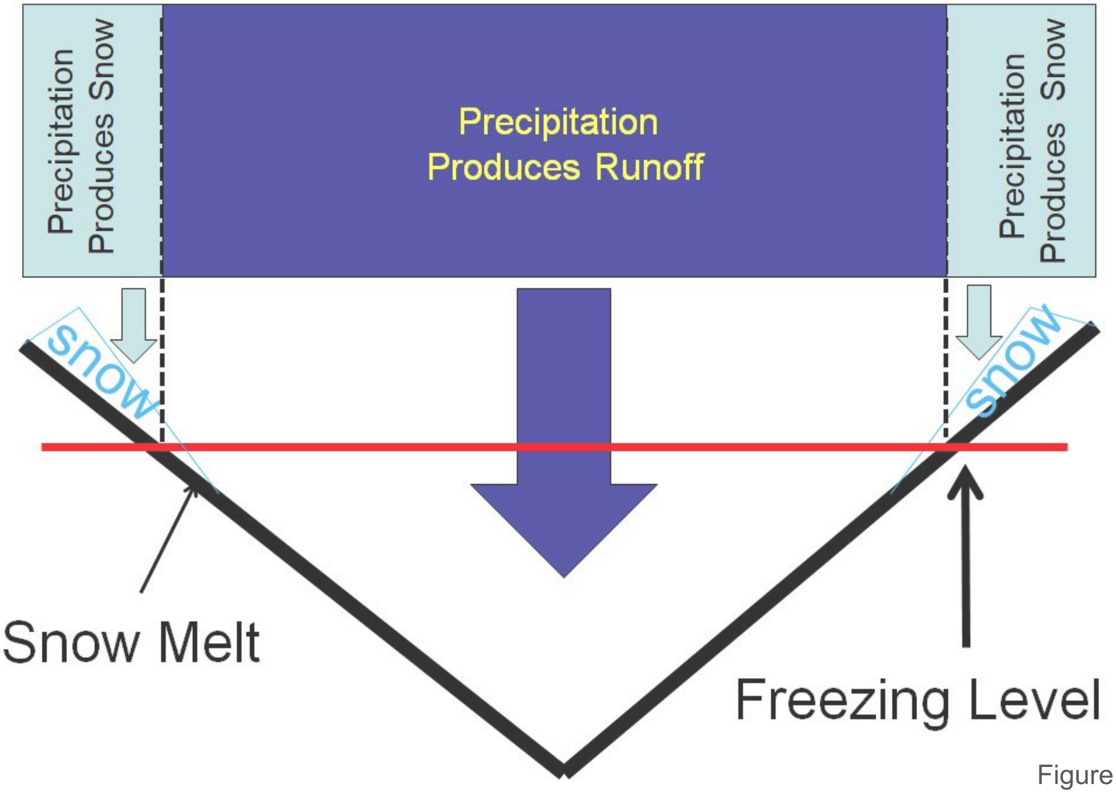
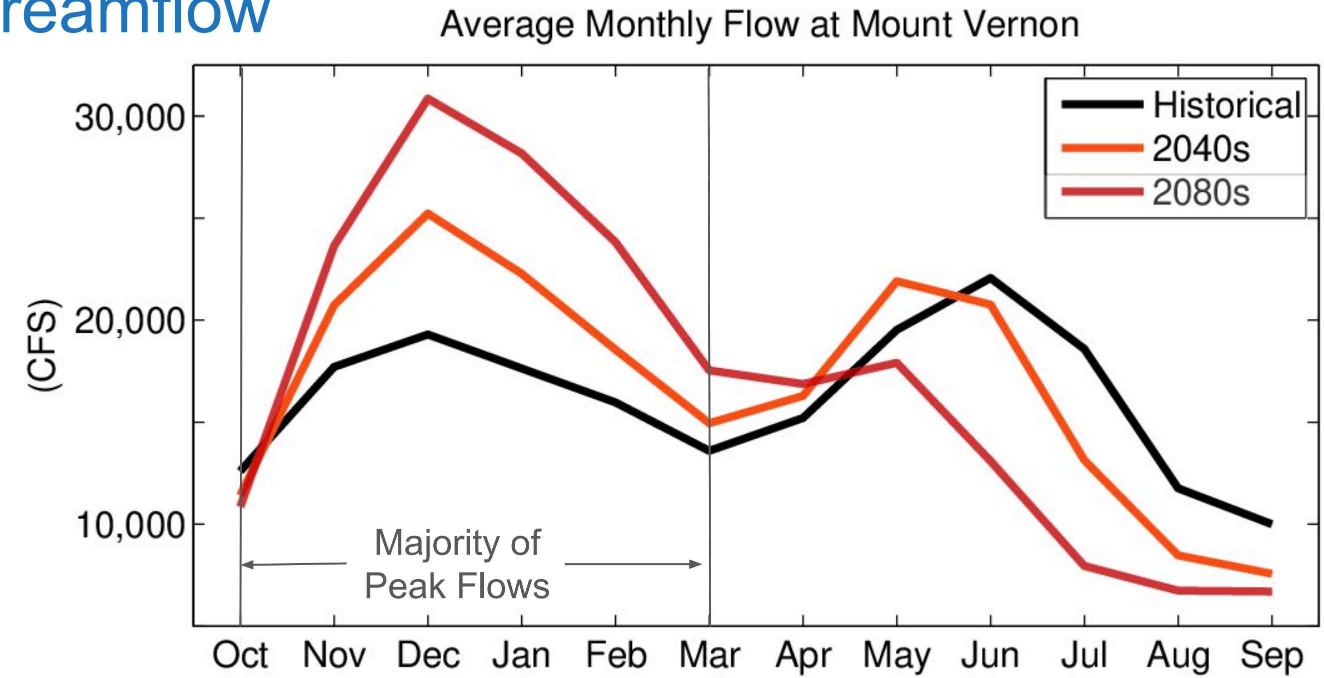


Figure credit: Alan Hamlet

Warmer Climate Shifts to a Winter Peak in Streamflow



ECHAM5 model projection, moderate A1B scenario; Lee et al. 2016: https://doi.org/10.3955/046.090.0104

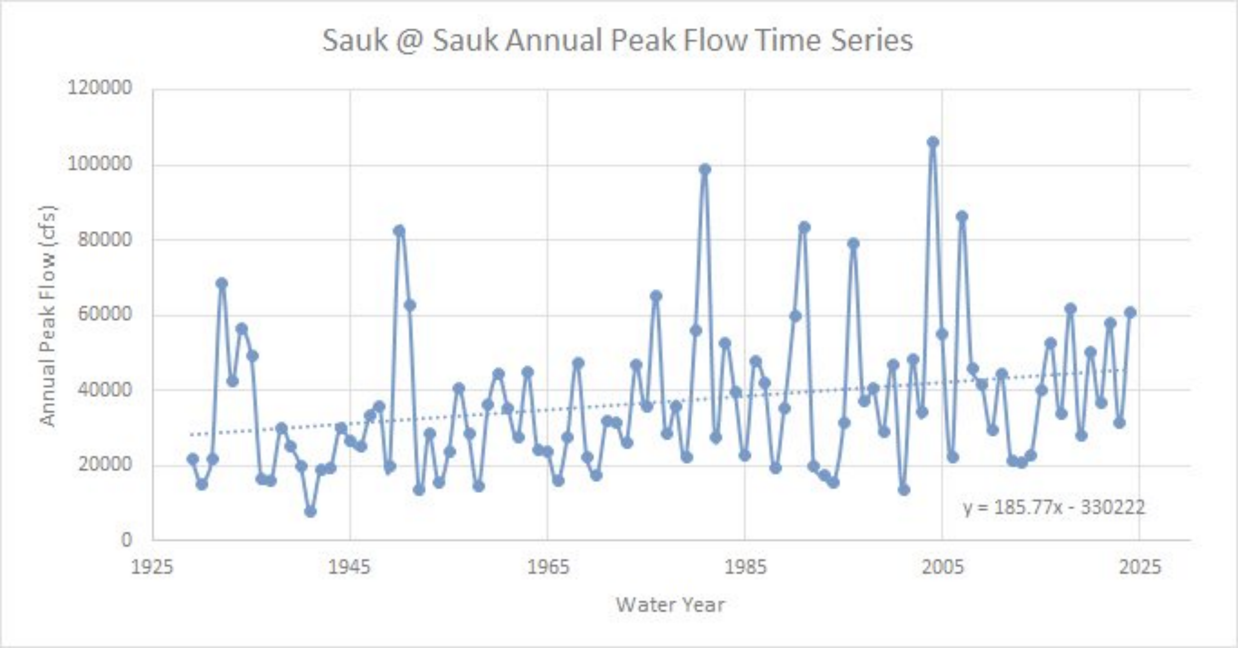
Result: Much Bigger Floods in the Future

At Mount Vernon, the 100-year regulated flood is projected to be 49% bigger, by the 2080s

Put another way: By the 2040s, today's "100-year event" will happen about every 20-25 years

Lee et al. 2016: https://doi.org/10.3955/046.090.0104

Sauk River peak flows (unregulated) have been increasing

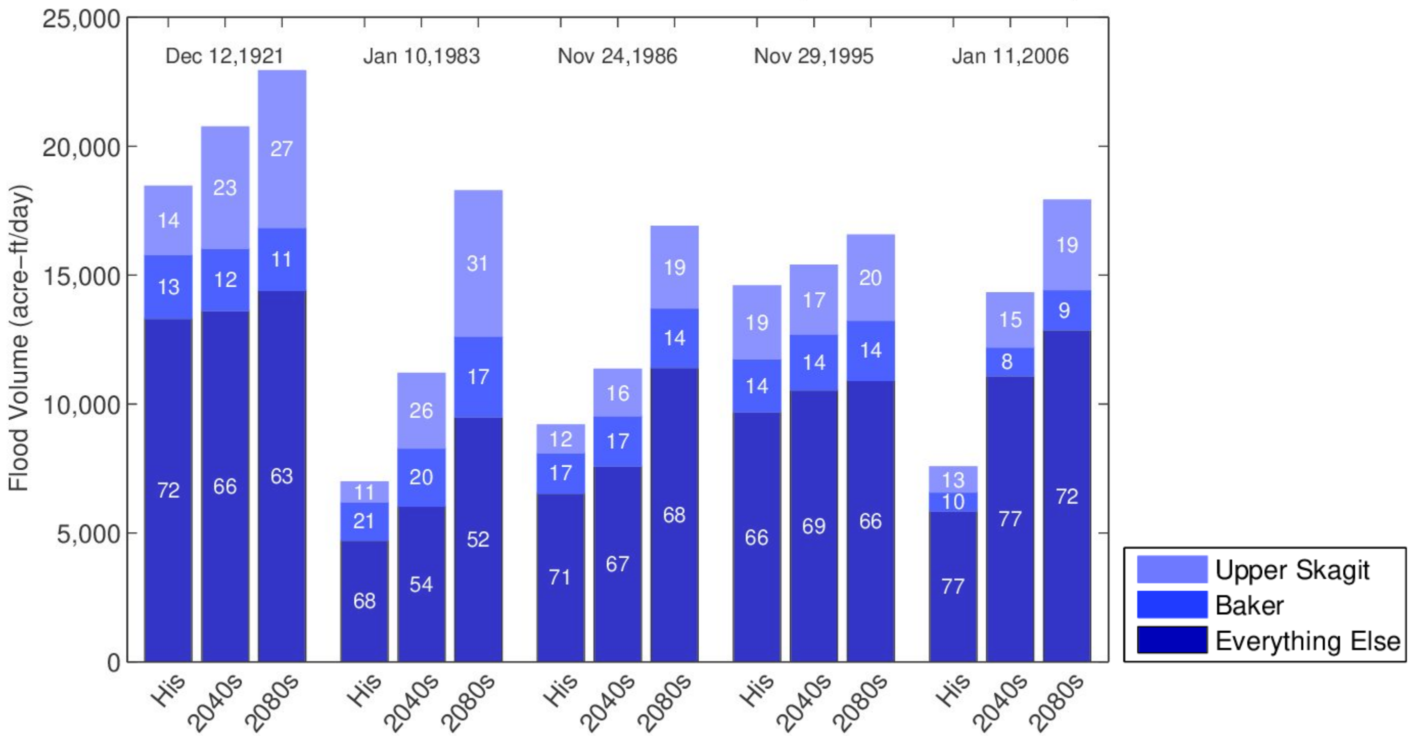


https://waterdata.usgs.gov/monitoring-location/USGS-12189500

Post-1975 mean is 38.8% higher than pre-1975 mean.

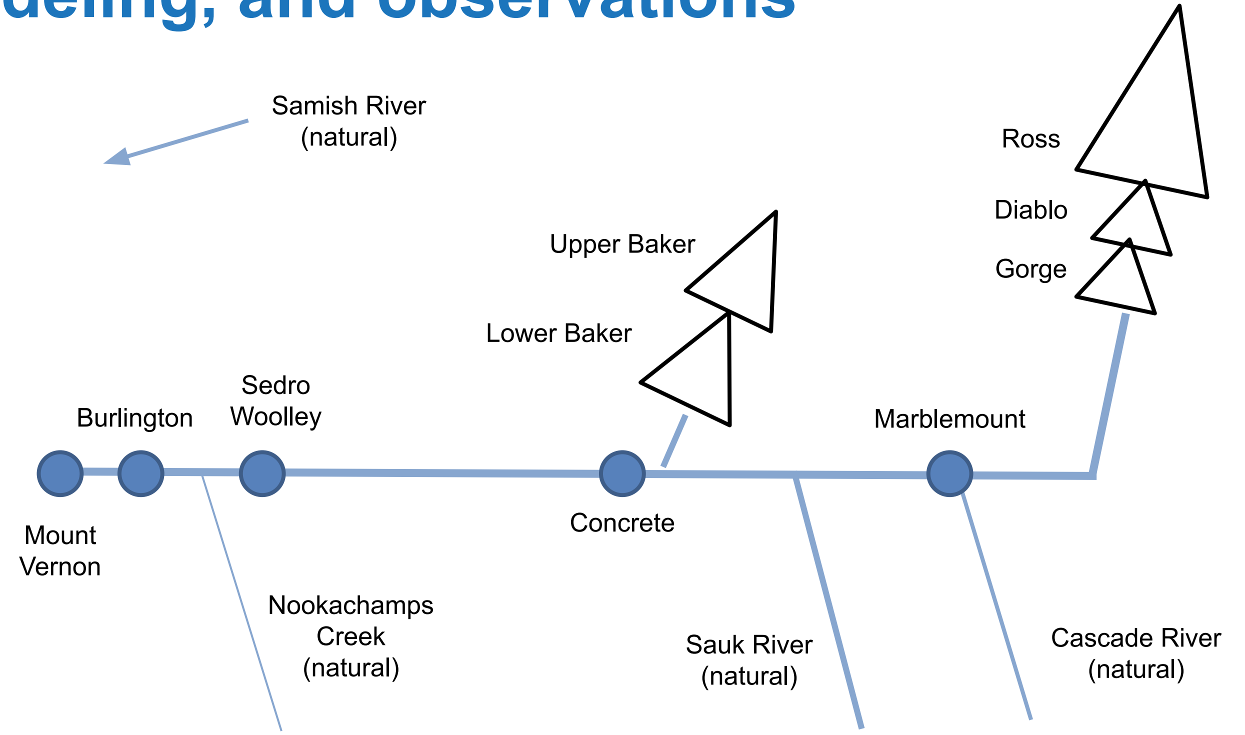
Of the seven highest annual peak flows, five have occurred since 1975.

Every flood is different



Lee et al. 2016: https://doi.org/10.3955/046.090.0104

Inputs to the flood model came from recent modeling, and observations



(schematic representation of the Skagit and Samish Rivers)

Model Inputs: *Current Conditions*

- **Peak river flows from the Skagit General Investigation**

- **Coastal “surge” estimates from NOAA tide gauges**

https://www.skagitcounty.net/Departments/PublicWorksSalmonRestoration/main.htm
https://tidesandcurrents.noaa.gov/

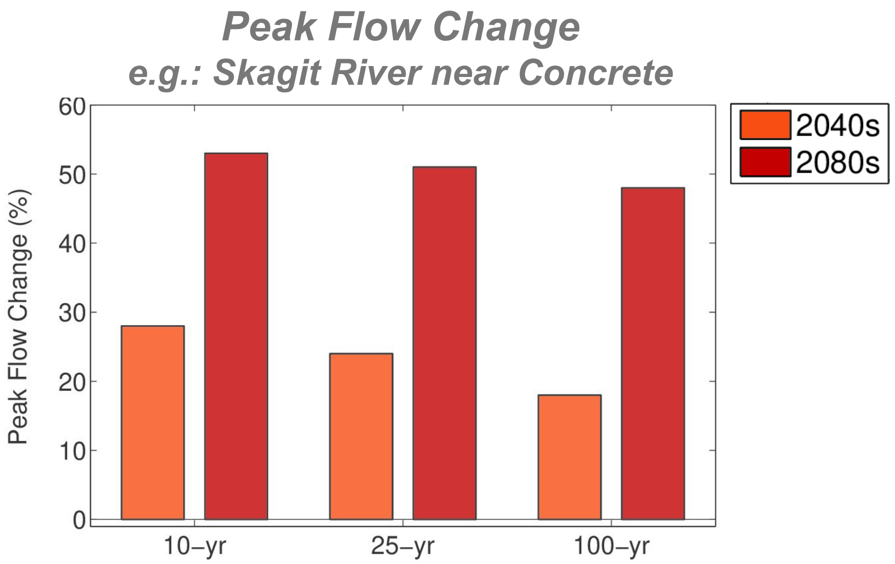
Model Inputs: *Future Conditions*

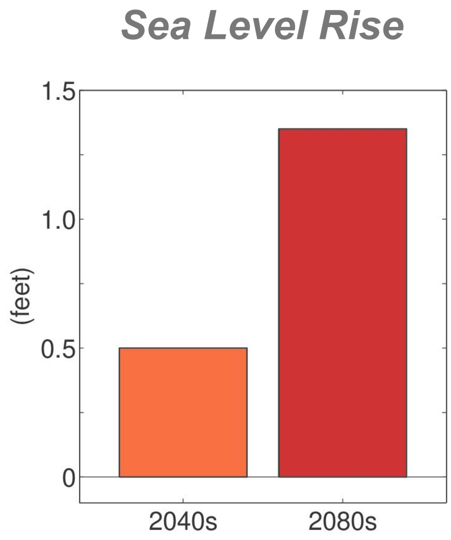
- We used projections for the 2040s and 2080s, in order to have an estimate of near-term and long-term changes.

- Projections are based on a middle-of-the road greenhouse gas scenario (“A1b”), in the range of what current research deems most likely.

- We selected the average projection for each time period, again because it is considered the most likely estimate of future conditions.

Model Inputs: *Future Conditions*



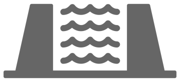


Streamflow: Lee et al. 2016, https://doi.org/10.3955/046.090.0104
Sea Level Rise: Miller et al. 2018, https://cig.uw.edu/projects/projected-sea-level-rise-for-washington-state-a-2018-assessment/

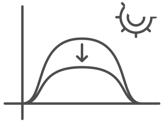
D) What Insights Can Flood Modeling Provide?

Big-Picture Approaches to Reduce Flood Impacts

1) **Contain the flow** *(levees, flood walls)*



2) **Flatten the peak** *(reservoirs, natural storage, levee and dike setbacks, forest mgmt, floodplain/wetland reconnection & restoration, etc.)*



3) **Divert water** *(bypass channel)*

4) **Live with flooding** *(flood preparation, elevate structures)*

Contain the Flow

1. Strengthen Conventional Infrastructure

US Army Corps of Engineers General Investigation (GI) Draft Environmental Impacts Statement (2013)

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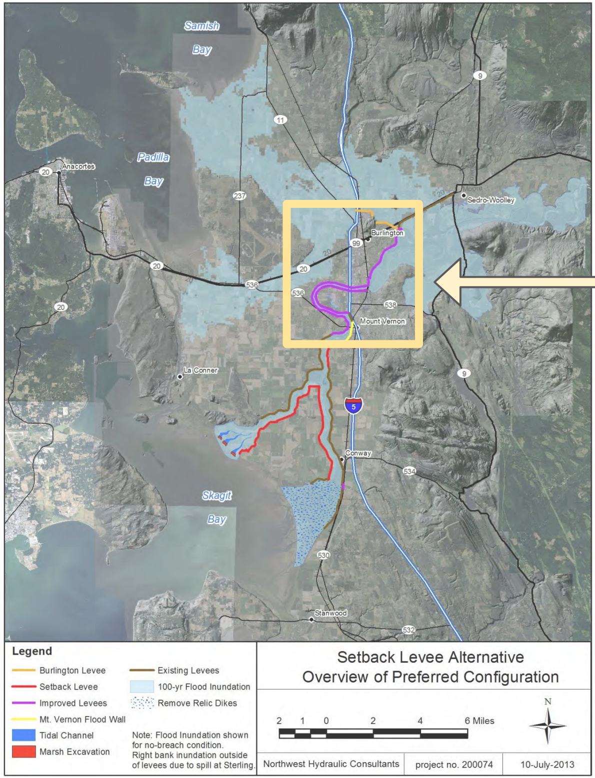


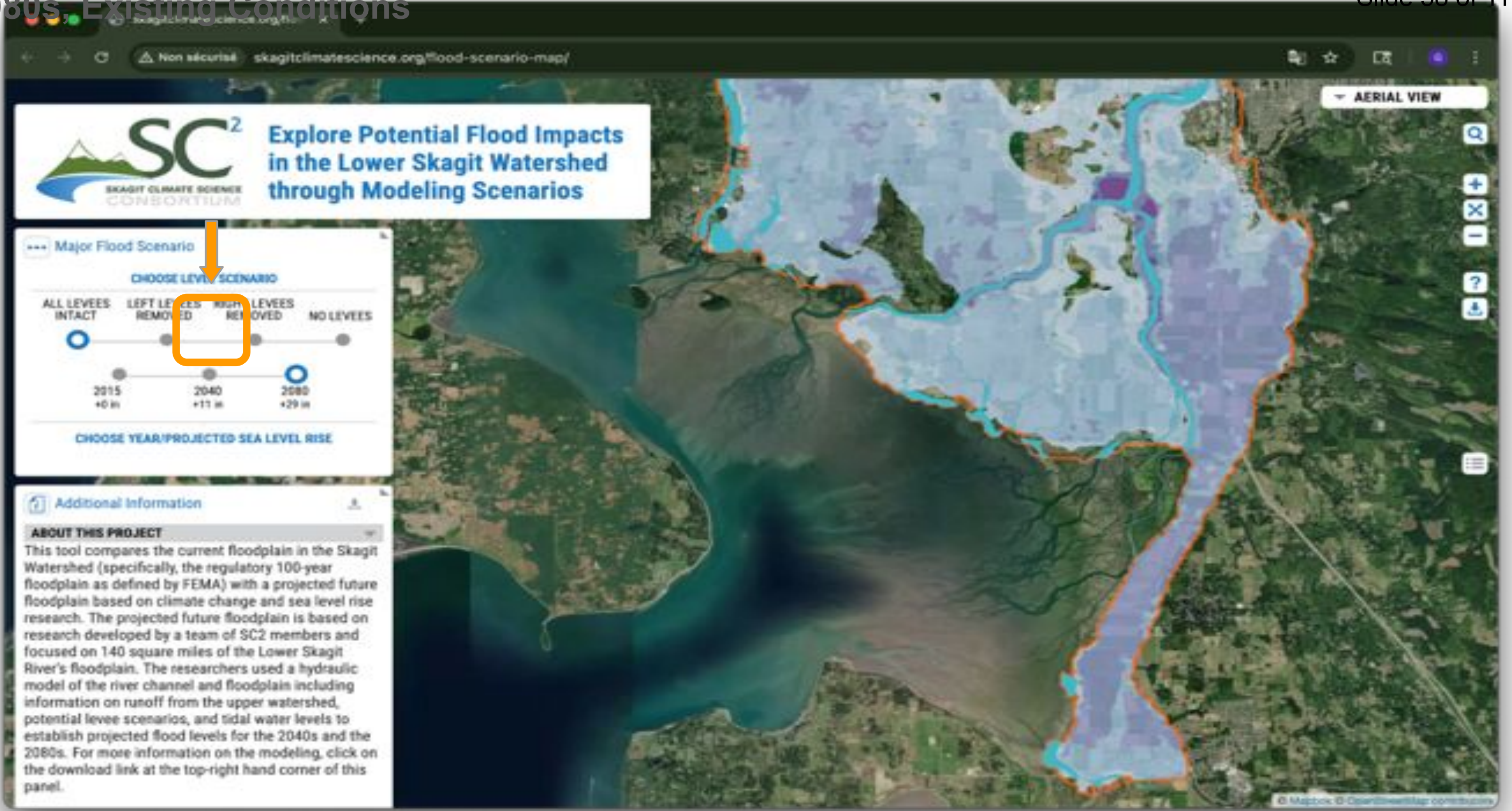
e.g.

Strengthen existing levees and dikes in known problem areas

Raise height of existing levees

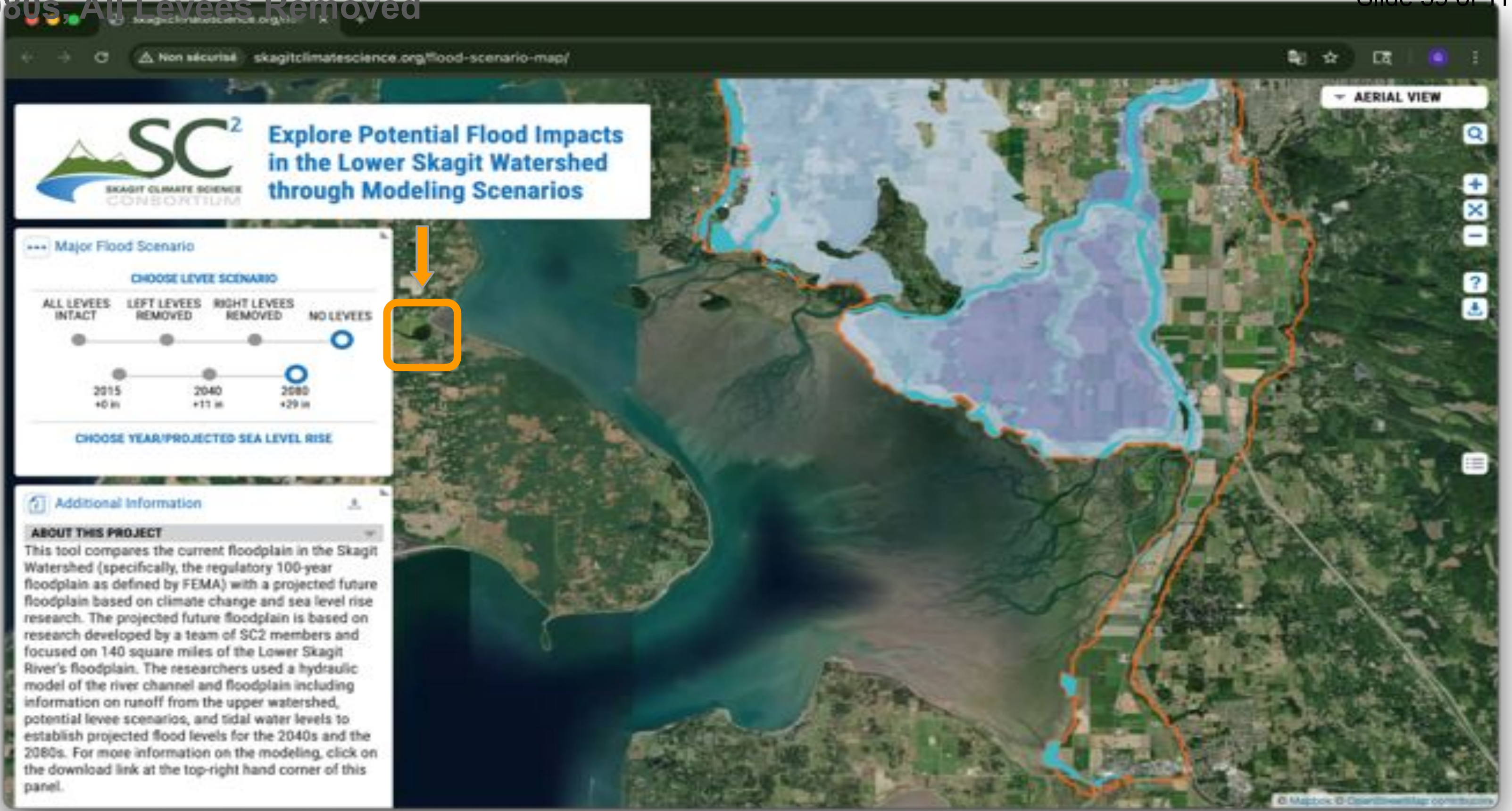
https://www.skagitcounty.net/Departments/PublicWorksSalmonRestoration/main.htm

2080s, Existing Conditions



http://www.skagitclimatescience.org/flood-scenario-map/

2080s, All Levees Removed



http://www.skagitclimatescience.org/flood-scenario-map/

2. “Flatten the curve”

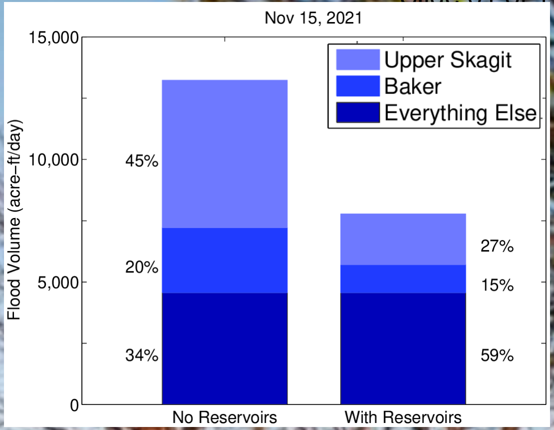
Examples:

- Dams hold back water during floods and release it later
  (alternative ‘rule curves’ may increase available flood storage earlier in the fall)
- Logjams and other changes to tributary channels can increase “roughness” and slow the flow.
- Setback levees give the river more room and provide more natural floodplain function and ecosystem resilience.

Example: Dams

Flatten the Curve

For the November 2021 floods, the water could have reached 8 feet higher in Mount Vernon without the dams.

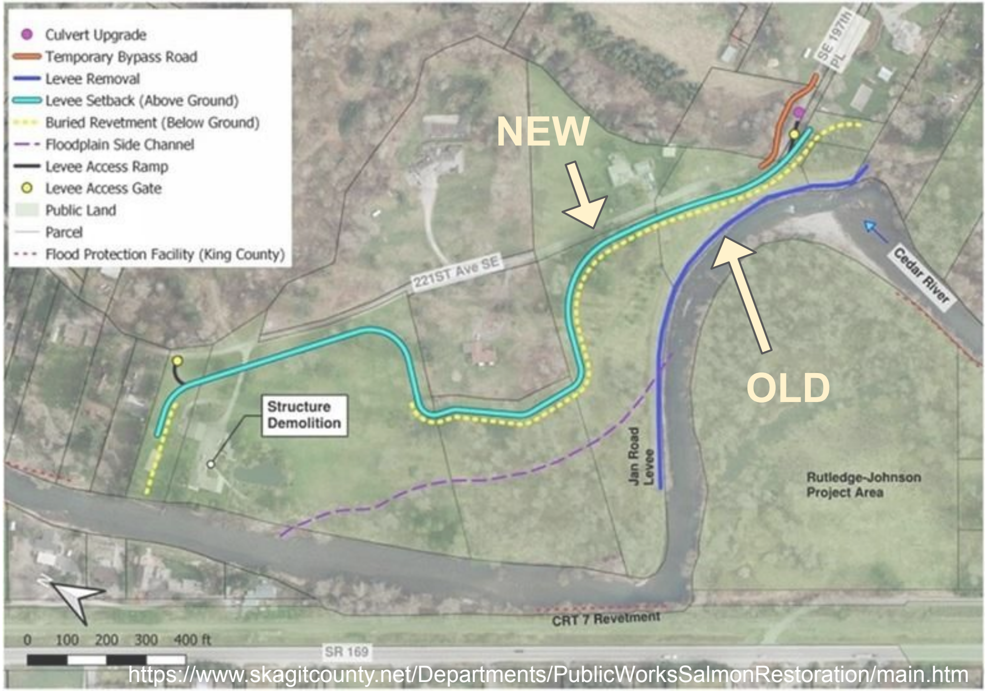


https://www.goskagit.com/news/local_news/mount-vernon-floodwall-does-the-job/article_c3908955-ca22-5d25-95de-caf4138ff333.html
https://www.heraldnet.com/northwest/feds-dams-helped-prevent-more-severe-skagit-river-flooding/

Example: Setback Levees

Setback levees let the river spread out, more like a natural floodplain, slowing the flow.

Can have ecosystem benefits through restoration of natural floodplain.



Example: King County
https://kingcounty.gov/en/dept/dnrp/nature-recreation/environment-ecology-conservation/flood-services/capital-projects-studies/jan-road-levee-setback

Example: Setback Levees in the Lower Basin

Setbacks were explored in the General Investigation study

Source:
US Army Corps of Engineers General Investigation (GI) Draft Environmental Impacts Statement (2013)

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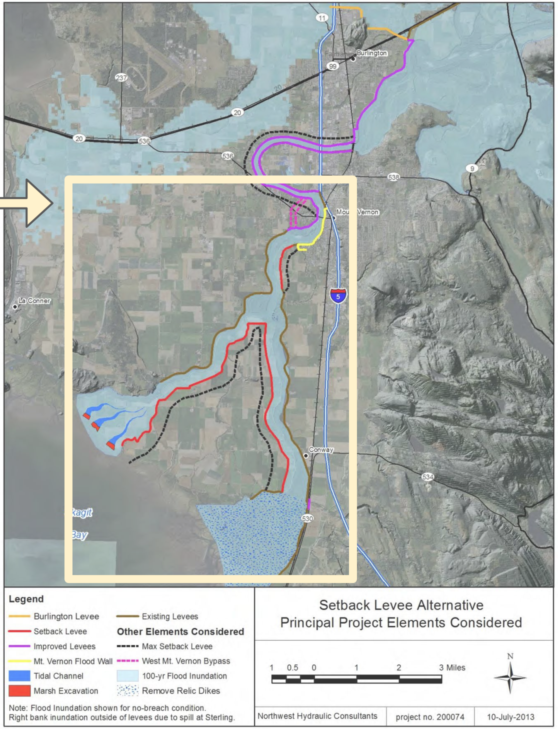
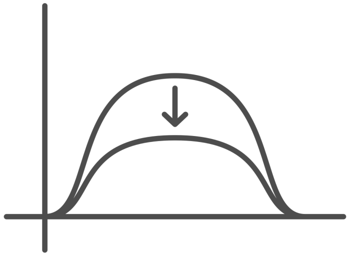


https://www.skagitcounty.net/Departments/PublicWorksSalmonRestoration/main.htm

3. Divert Water

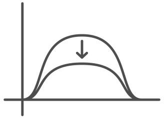
(bypass channel)

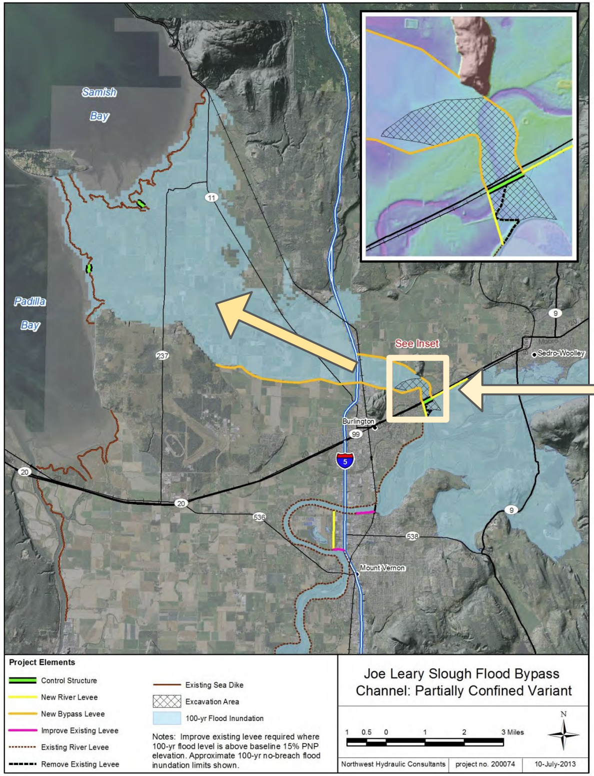


By diverting water, flow in the main stem is reduced.

The effects are comparable to a levee breach, except that the “where and when” are selected in advance.

Example Diversion: Joe Leary Slough





Source:
US Army Corps of Engineers General Investigation (GI) Draft Environmental Impacts Statement (2013)

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https://www.skagitcounty.net/Departments/PublicWorksSalmonRestoration/main.htm

By diverting water, flow in the main stem is reduced.

The effects are comparable to a levee breach, except that the “where and when” are selected in advance.

4. Live with flooding

(flood preparation, elevate structures)

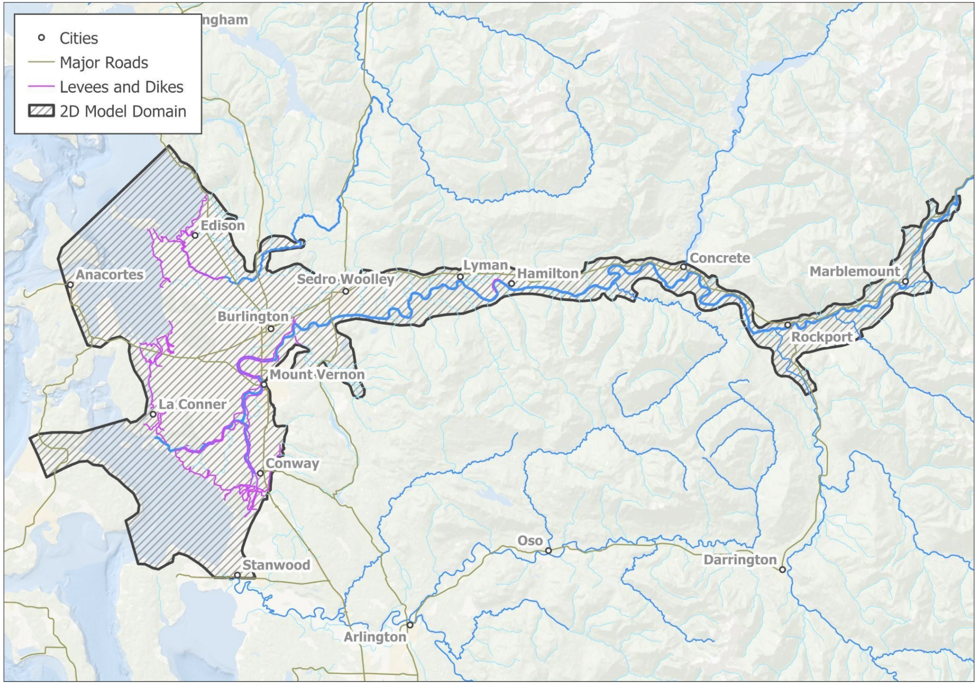
We have not included any examples for “live with flooding”. These are critical flood resilience strategies, but they often cannot be evaluated with the flood model we have developed.

Take-aways:

- Reservoirs have a big impact on floods in the Skagit River
- With 61% of the watershed downstream of dams, they can't address all floods equally well.
- Models project that today's 100-year flood will be happening every 20-25 years by mid-century
- We relied on recent modeling, and observations, to develop riverine and coastal inputs to the flood model
- Models like the new Skagit flood model can explore what happens to flow velocity, stage, and inundation under various management approaches.

Session II: Model Overview

New Skagit River Model



Parameter	Current Model (USACE)	New Model
Model Type	1D / 2D	Fully 2D
Bathymetry	1975	2022, 2014
Resolution	400 ft	50-200 ft
Skagit Bay, Samish Bay	Not included	Included
Samish River	Not included	Included

New Skagit River Model: Does Include

- ✓ New Bathymetry (2022, 2014)
- ✓ Incorporates recent levee strengthening and habitat projects
- ✓ Riverine flooding (current and future, 10-year, 25-year, 100-year)
- ✓ Levee breaches (6 locations, based on GI)
- ✓ Tides
- ✓ Coastal flooding (current and future)
- ✓ Flood depth, extent, and velocity
- ✓ Flood duration

New Skagit River Model: Does Not Include

- ✓ Sediment transport/deposition
- ✓ Debris build-up on bridges
- ✓ Future land-use/land cover
- ✓ Pump stations
- ✓ Sauk River (flow input included, but terrain is excluded from model)
- ✓ Soils, infiltration
- Saltwater intrusion
- Channel migration and avulsion
- Groundwater
- Local stormwater flooding

(✓= model has capacity to include in future work)

River Flood: Historical and Simulated Events

Recent Events at **Mount Vernon**

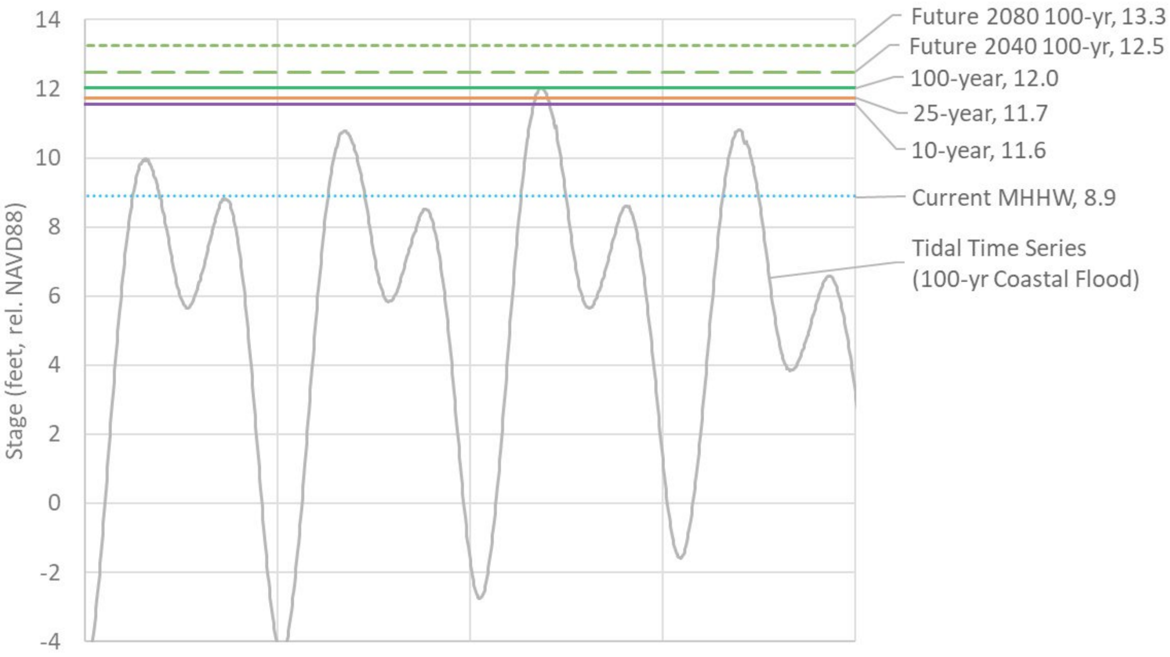
Event	Flow (cfs)	Stage (ft)
Nov 2021*	127,000	37.0
Nov 2006	138,000	33.9
Oct 2003*	135,000	36.2
Nov 1995*	141,000	37.3
Nov 1990	152,000	37.4

Existing (2013 GI) and Future Flows

Event	Flow at Sedro Woolley (cfs)	Flow at Mount Vernon (cfs)
10-year	133,000	119,000
25-year	170,000	150,000
100-year	236,000	171,000
Future 2080 100-year	314,000	176,000

**Model calibrated to USGS gages and High Water Marks*

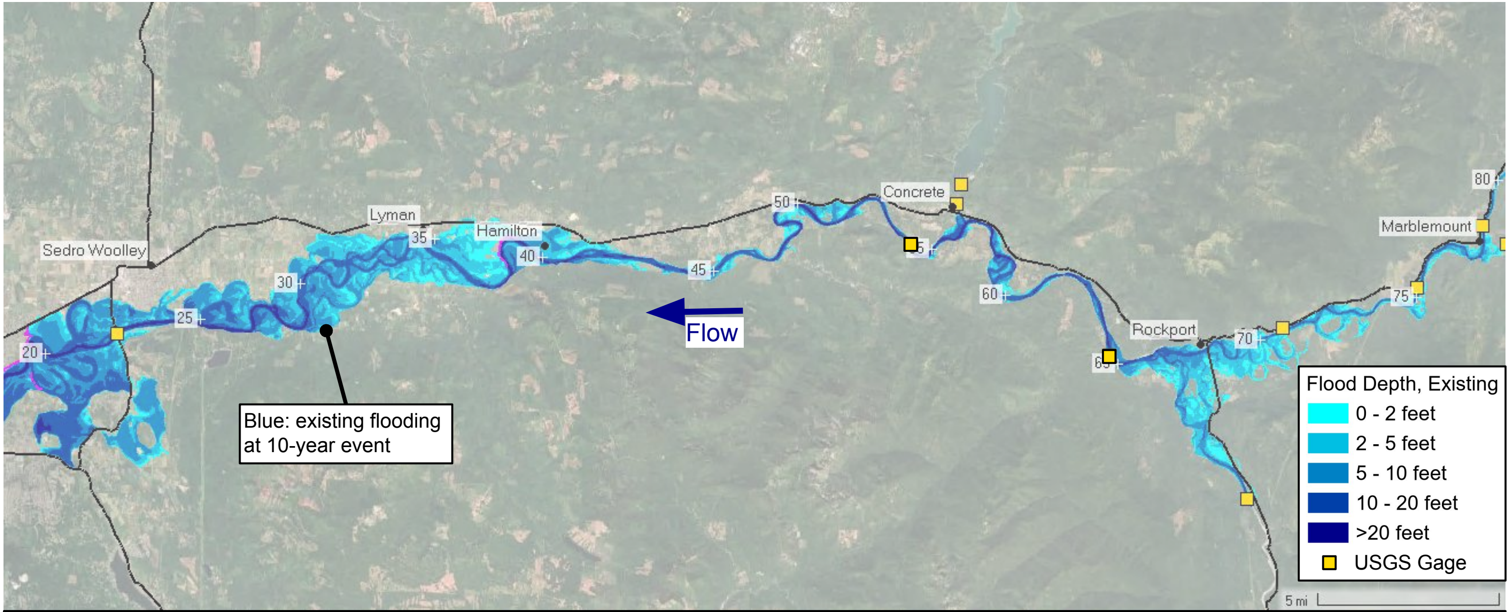
Coastal Flood: Tidal Elevations



Session III: Current and Future Conditions

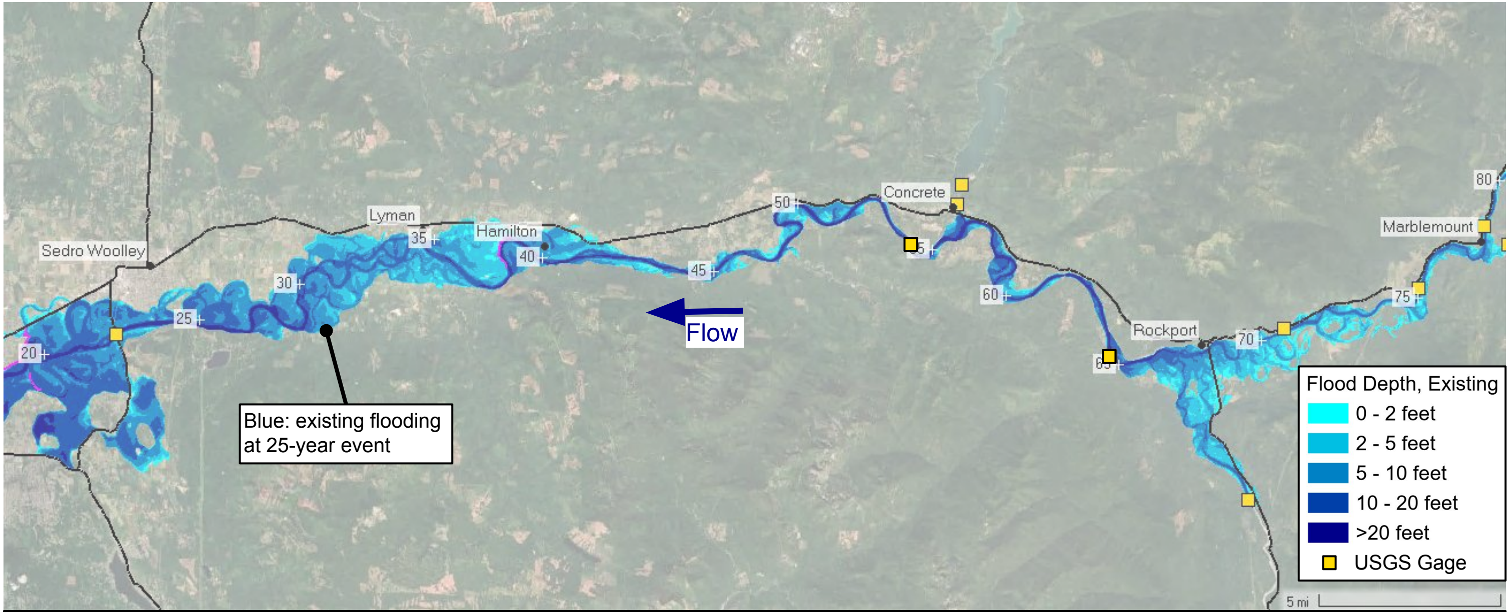
Sedro-Woolley Upriver

Upriver System: River Flood Overview



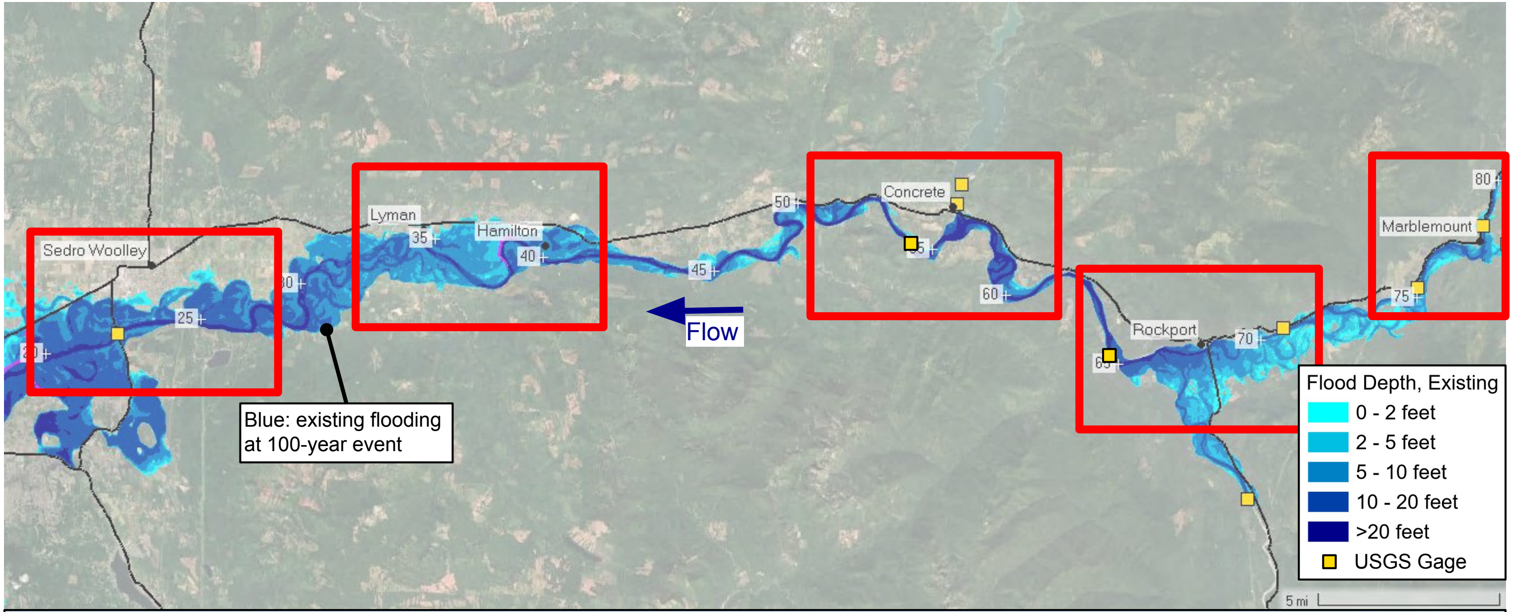
Existing: 10-year Flood

Upriver System: River Flood Overview



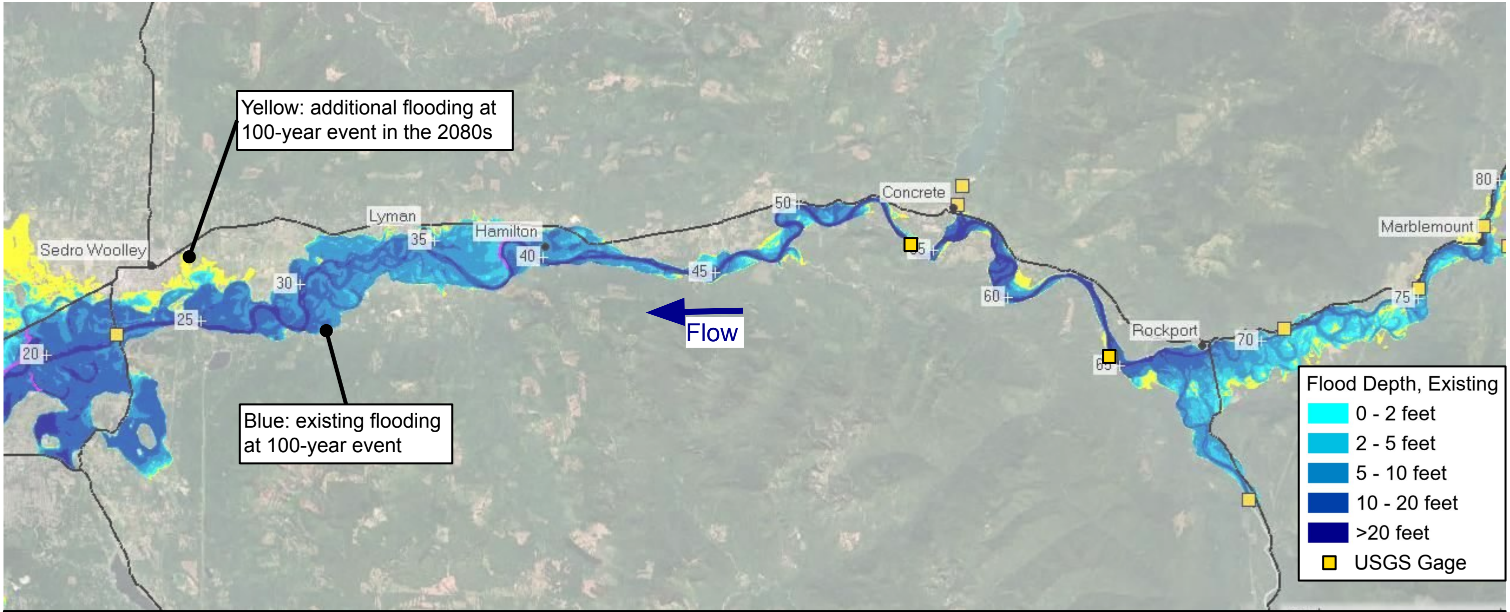
Existing: 25-year Flood

Upriver System: River Flood Overview



Existing: 100-year Flood

Upriver System: River Flood Overview

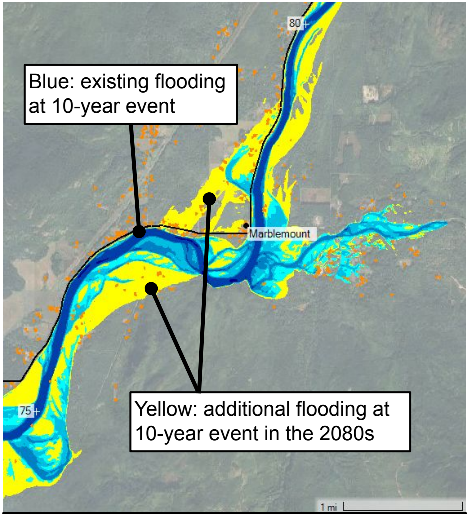


Existing and Future 2080s: 100-year Flood

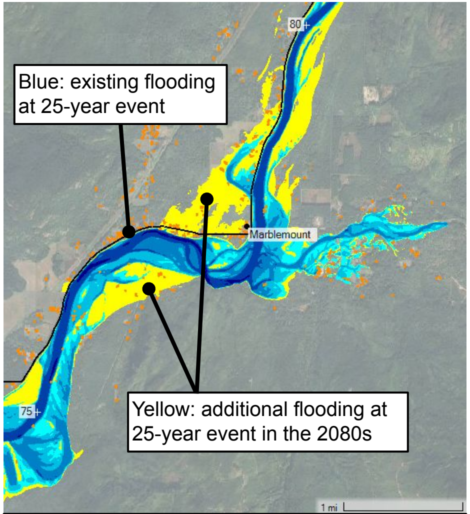
River Flood: Marblemount

Flood Depth, Existing
- 0 - 2 feet
- 2 - 5 feet
- 5 - 10 feet
- 10 - 20 feet
- >20 feet

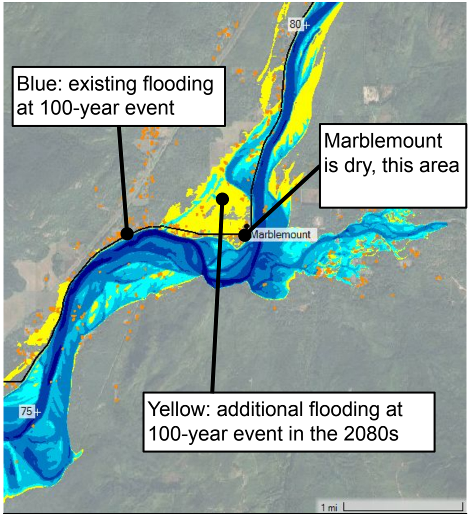
Additional flooding at XX-year event in the 2080s
Buildings



10-year



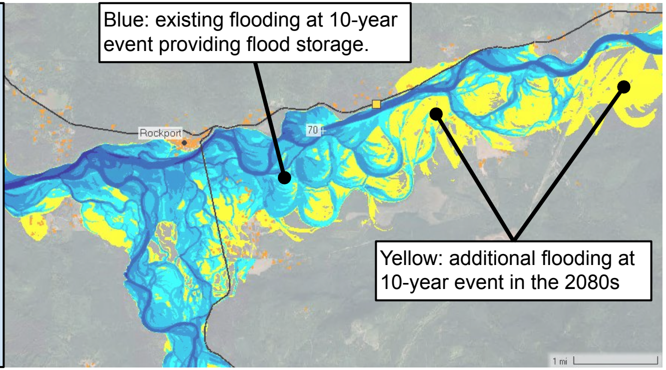
25-year



100-year

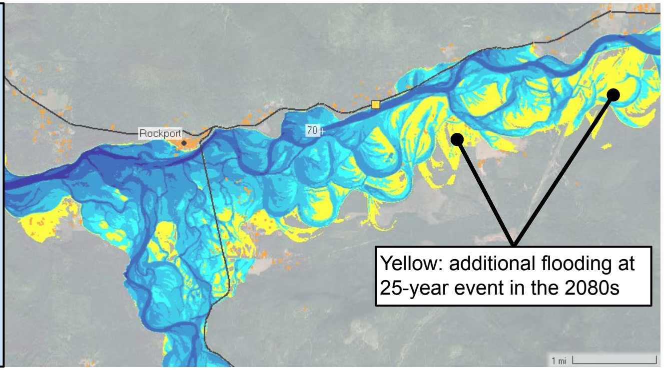
River Flood: Rockport

10-year

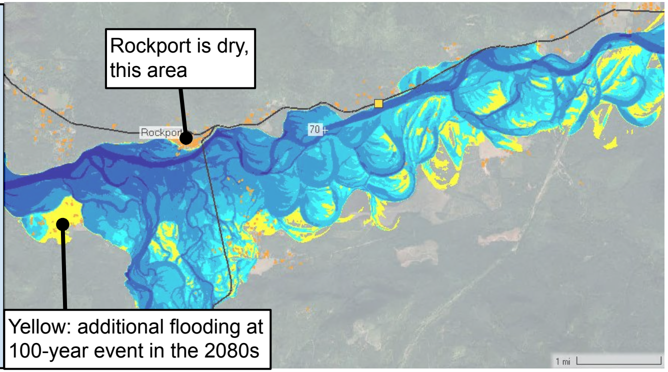


Flood Depth, Existing
- 0 - 2 feet
- 2 - 5 feet
- 5 - 10 feet
- 10 - 20 feet
- >20 feet
- Additional flooding at XX-year event in the 2080s
- Buildings

25-year

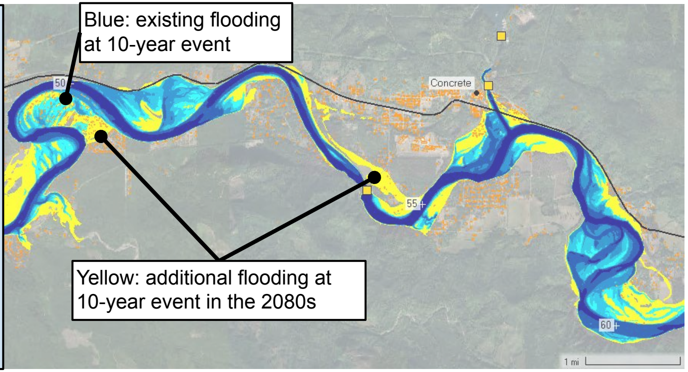


100-year



River Flood: Concrete

10-year

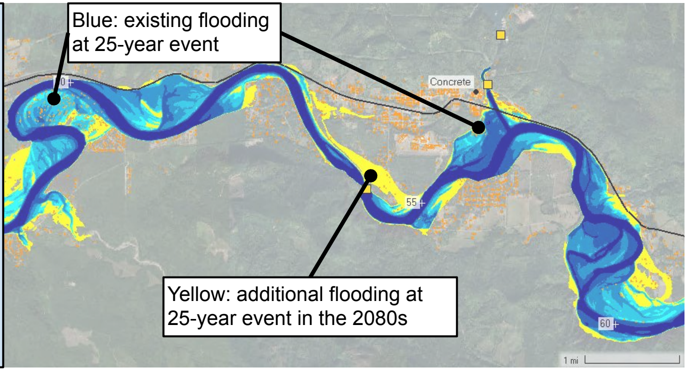


Flood Depth, Existing

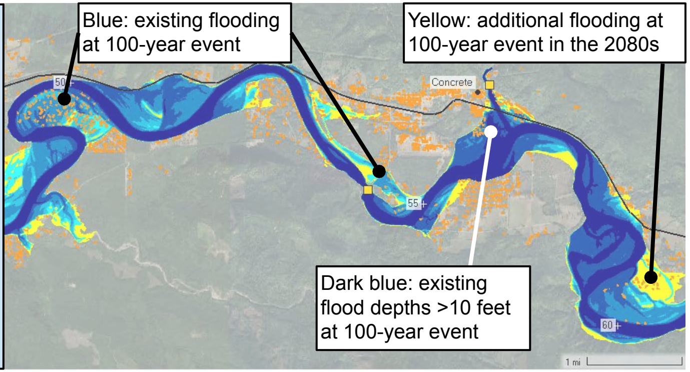
- 0 - 2 feet
- 2 - 5 feet
- 5 - 10 feet
- 10 - 20 feet
- >20 feet

- Additional flooding at XX-year event in the 2080s
- Buildings

25-year

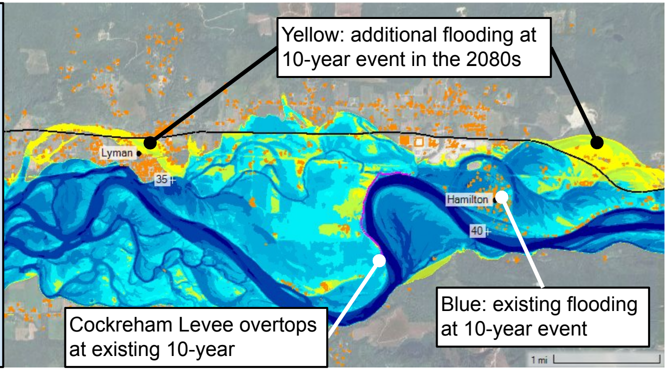


100-year



River Flood: Lyman, Hamilton

10-year

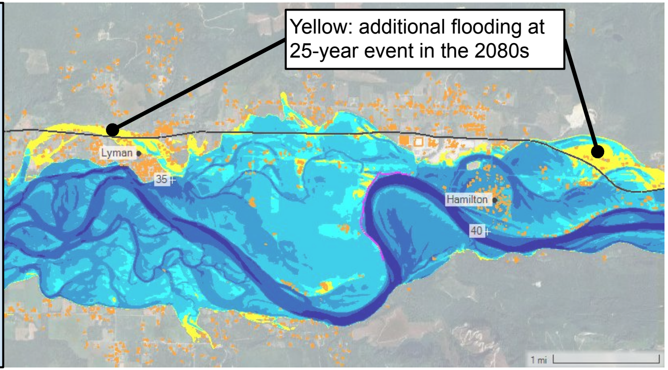


Flood Depth, Existing

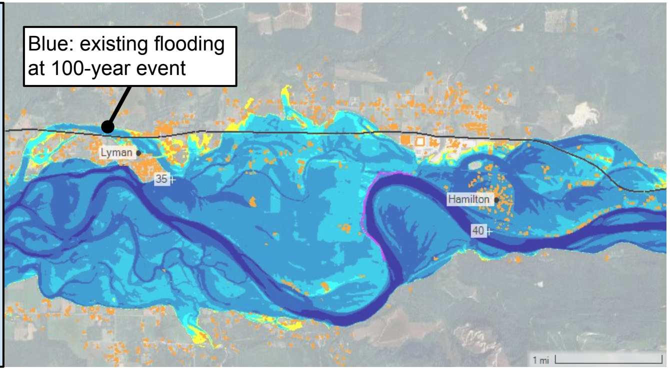
- 0 - 2 feet
- 2 - 5 feet
- 5 - 10 feet
- 10 - 20 feet
- >20 feet

- Additional flooding at XX-year event in the 2080s
- Buildings

25-year

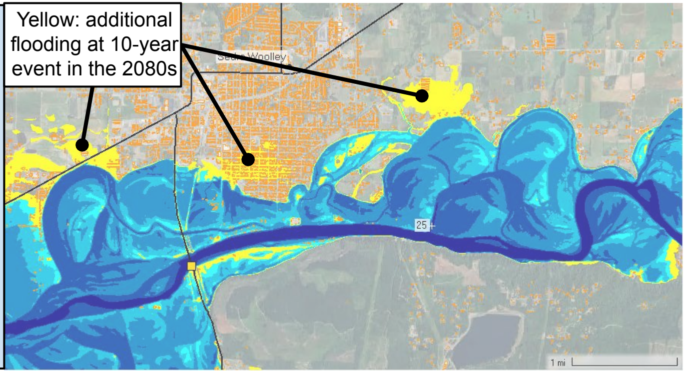


100-year



River Flood: Sedro-Woolley

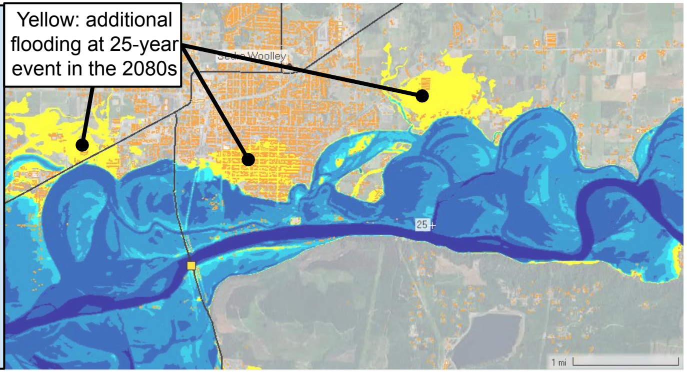
10-year



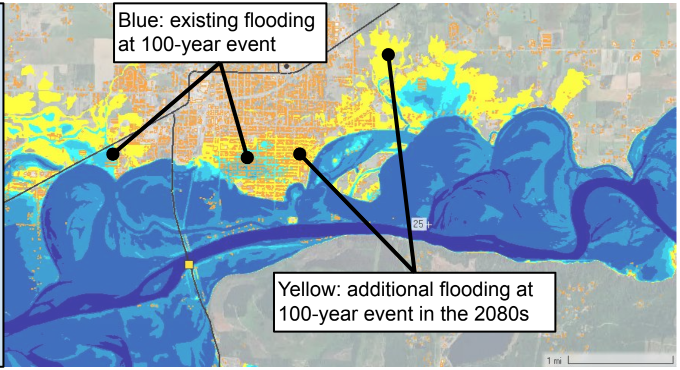
Flood Depth, Existing
- 0 - 2 feet
- 2 - 5 feet
- 5 - 10 feet
- 10 - 20 feet
- >20 feet

- Additional flooding at XX-year event in the 2080s
- Buildings

25-year



100-year



Discussion, Input and Reflection Questions

- What do you notice?
- Which specific areas or places do you have concerns about flooding and why?
- Are there potential opportunities or ways to turn challenges into opportunities that you see in these maps?
- Are there management approaches that particularly interest you in understanding their impacts, benefits, and/or implications for others?

LUNCH

Session III: Current and Future Conditions

Sedro-Woolley Downriver

Outline

A. Riverine Flood
  - Overview
  - 25-year and 100-year

B. Levee Breaches from GI study

C. Coastal Flood
  - Skagit Bay
  - Samish Bay and Padilla Bay

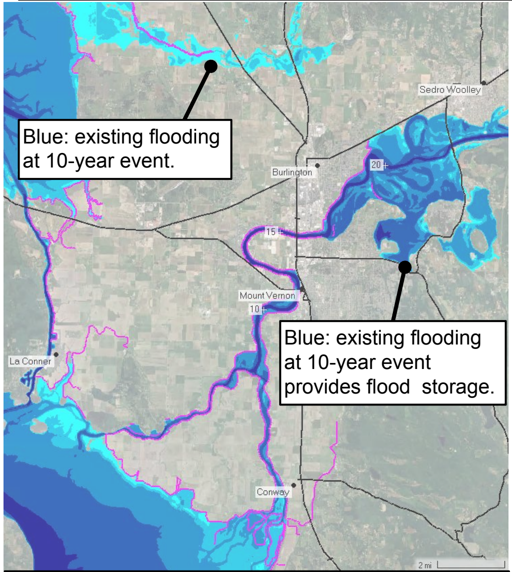
A) River Flood

River Flood Depths: Existing Climate Conditions

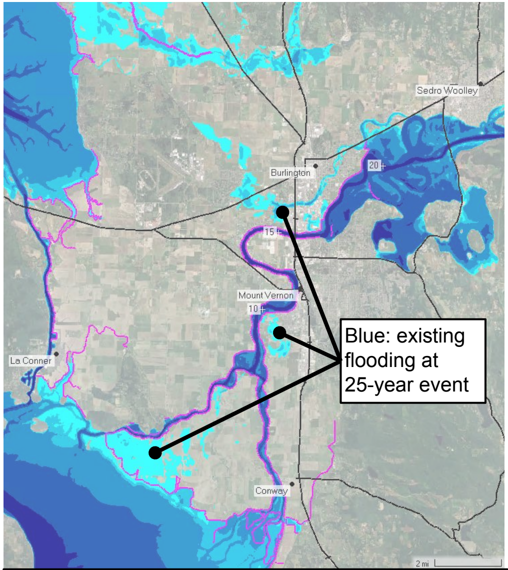
Assumptions: no breach occurs, tides are normal (no coastal flood)

Flood Depth, Existing
- 0 - 2 feet
- 2 - 5 feet
- 5 - 10 feet
- 10 - 20 feet
- >20 feet

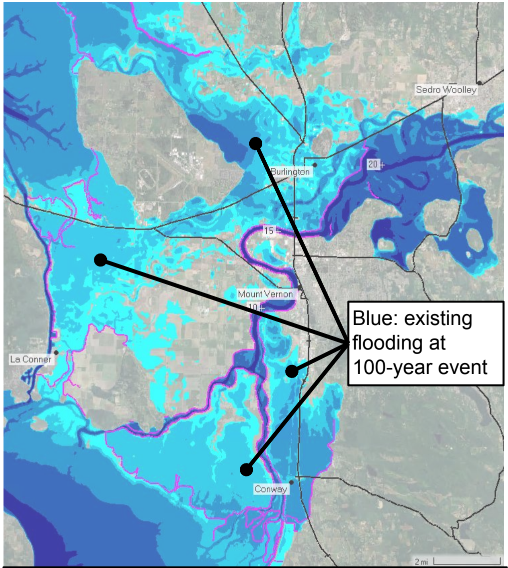
Levee or Dike



10-year



25-year

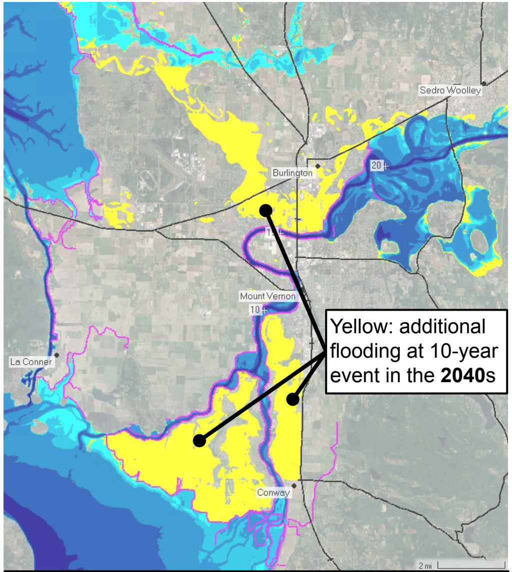


100-year

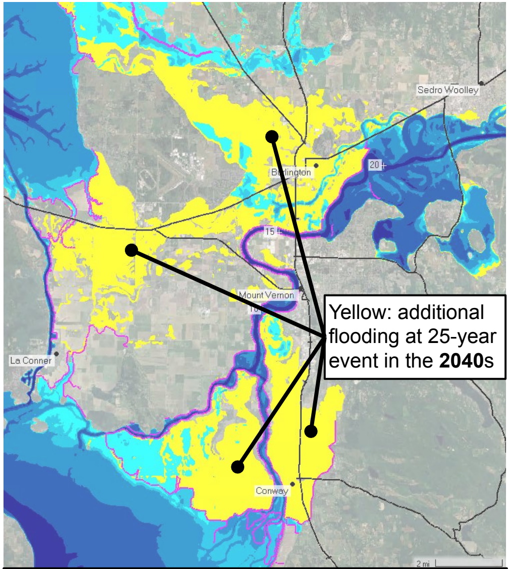
River Flood: 2040s Overview

Flood Depth, Existing
- 0 - 2 feet
- 2 - 5 feet
- 5 - 10 feet
- 10 - 20 feet
- >20 feet

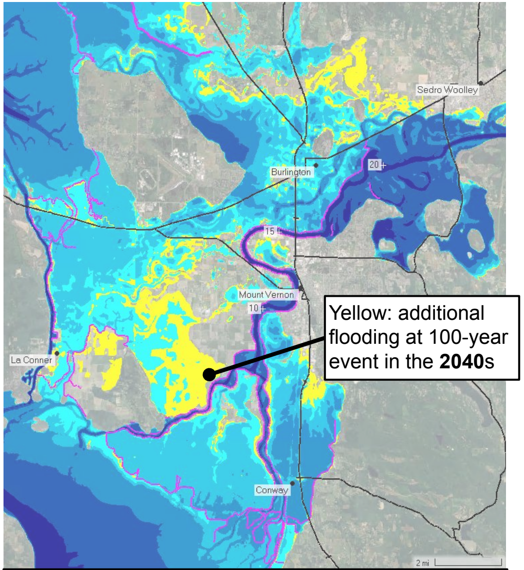
Additional flooding at XX-year event in the 2040s
Levee or Dike



10-year



25-year

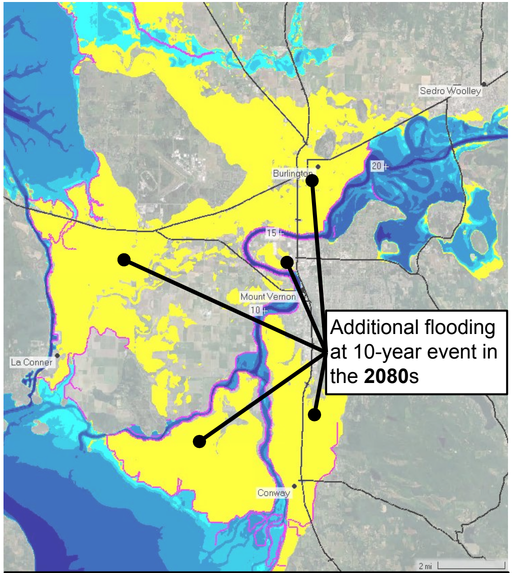


100-year

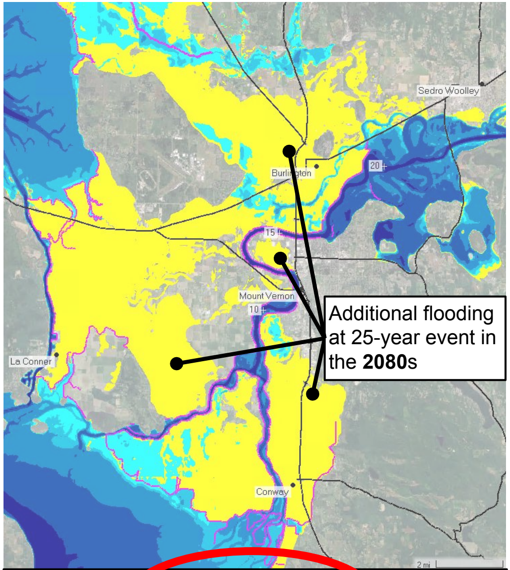
River Flood: 2080s Overview

Flood Depth, Existing
- 0 - 2 feet
- 2 - 5 feet
- 5 - 10 feet
- 10 - 20 feet
- >20 feet

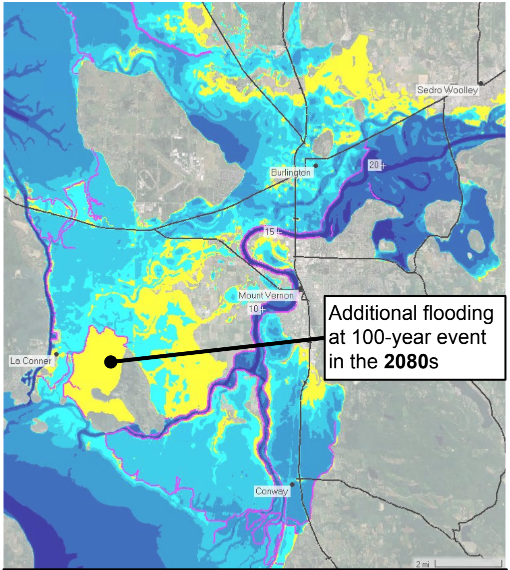
- Additional flooding at XX-year event in the 2080s
- Levee or Dike



10-year

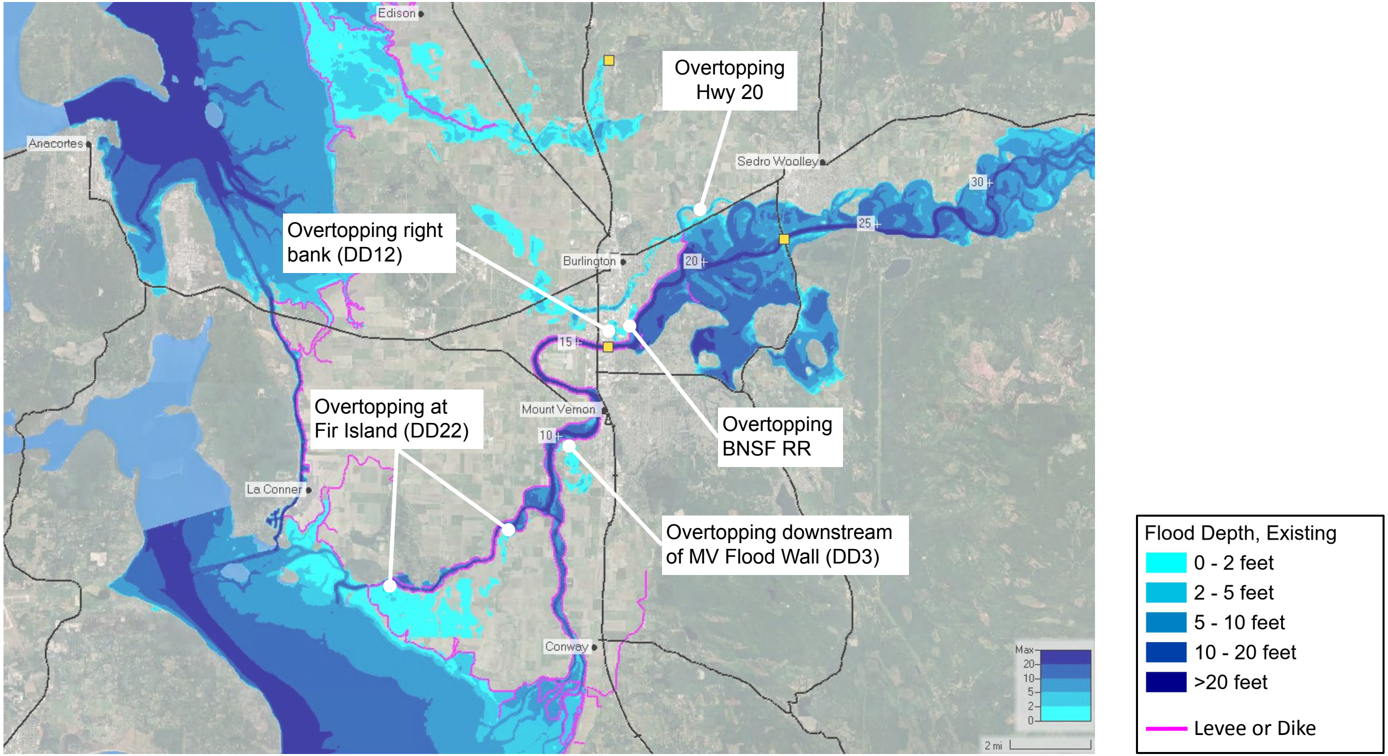


25-year

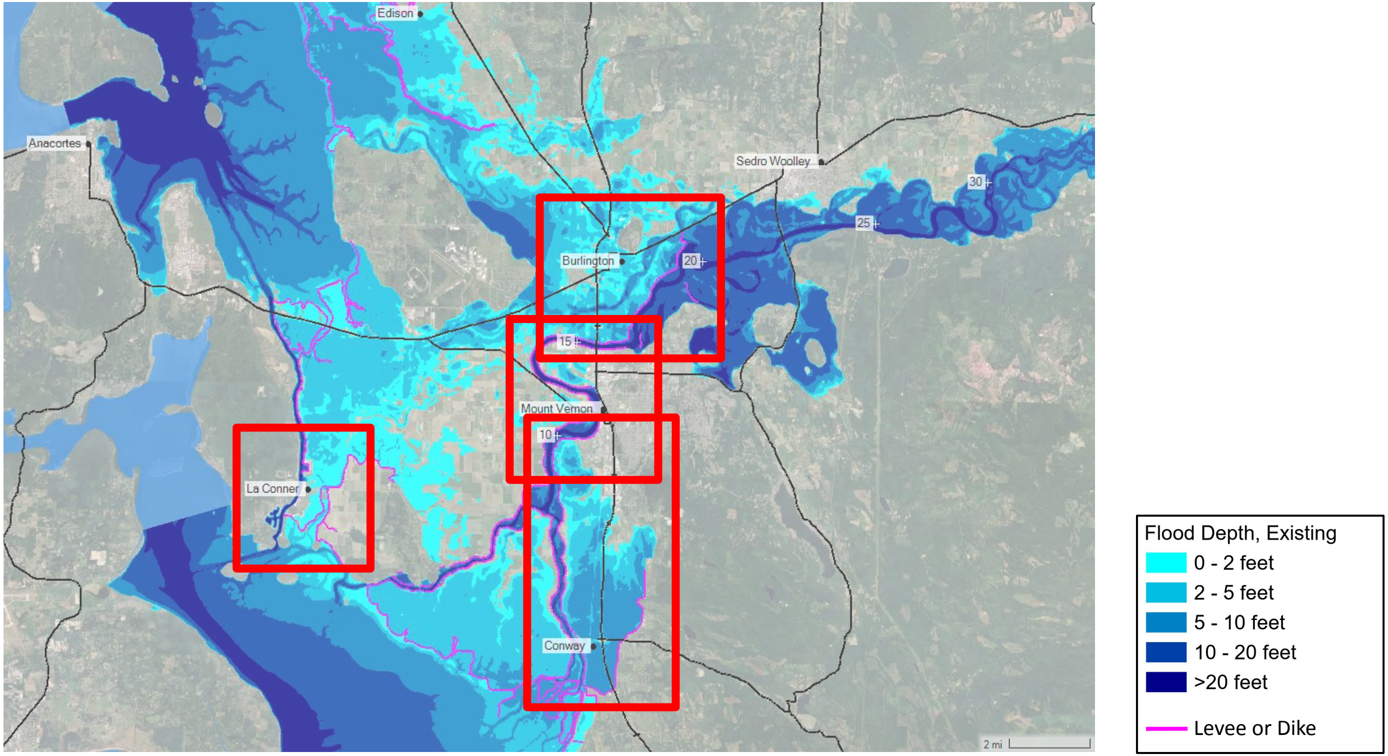


100-year

River Flood: Existing 25-year



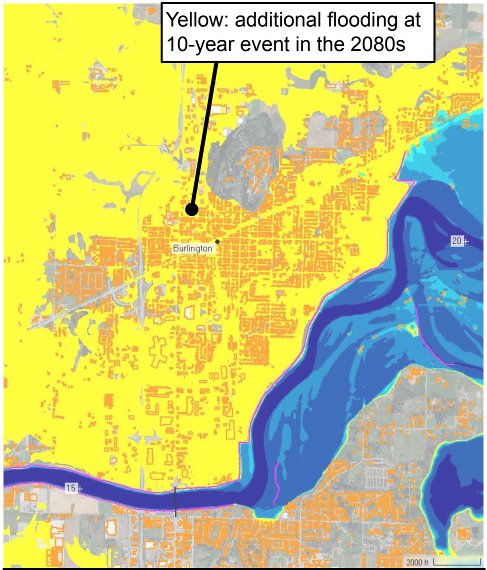
River Flood: Existing 100-year



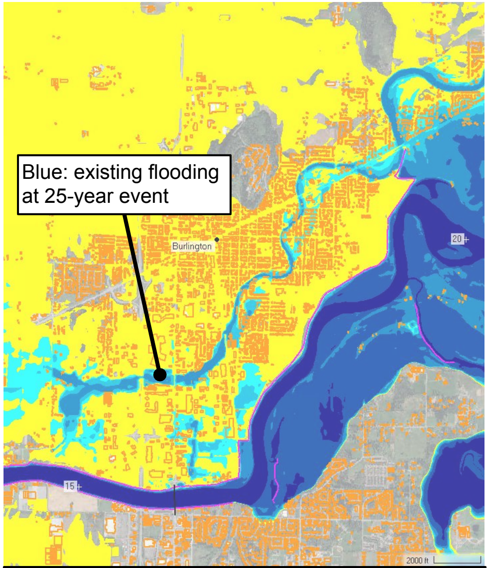
River Flood: Burlington

Flood Depth, Existing
- 0 - 2 feet
- 2 - 5 feet
- 5 - 10 feet
- 10 - 20 feet
- >20 feet

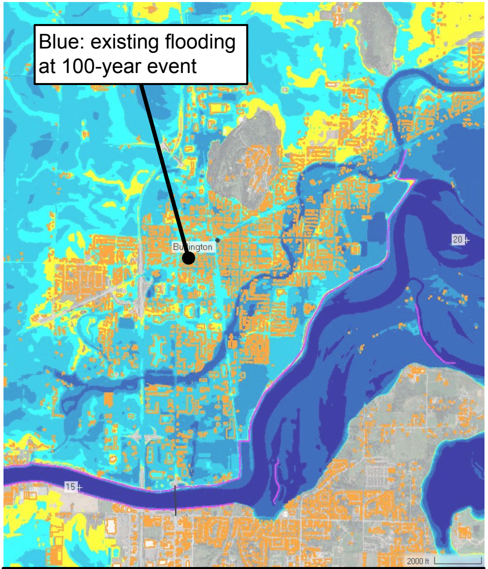
- Additional flooding at XX-year event in the 2080s
- Levee or Dike
- Buildings



10-year



25-year



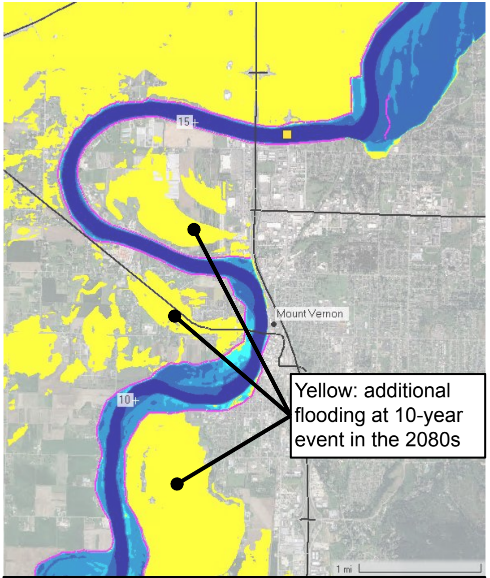
100-year

River Flood: Mount Vernon

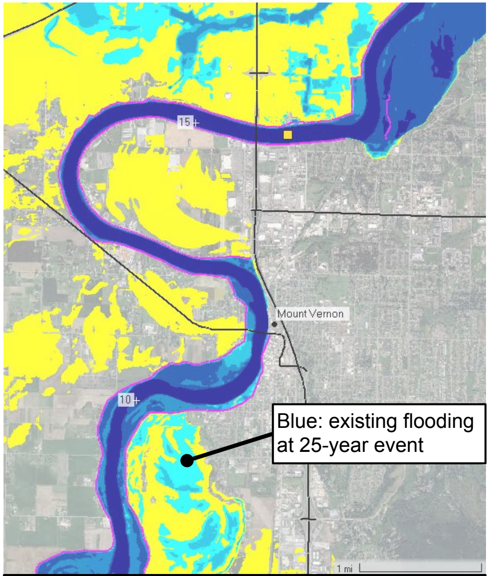
This slide was not presented at the workshop but included based on feedback.

Flood Depth, Existing
- 0 - 2 feet
- 2 - 5 feet
- 5 - 10 feet
- 10 - 20 feet
- >20 feet

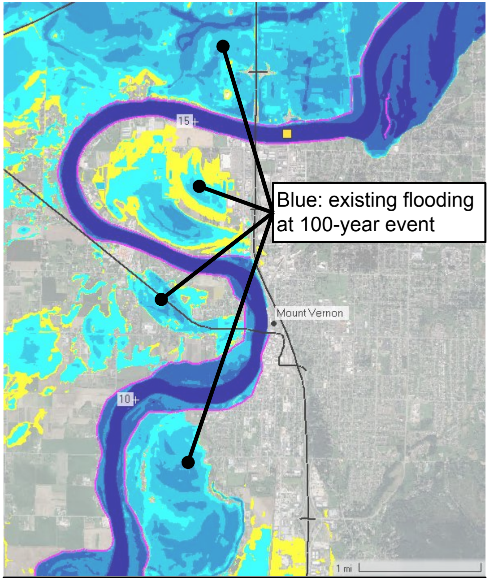
- Additional flooding at XX-year event in the 2080s
- Levee or Dike
- Buildings



10-year

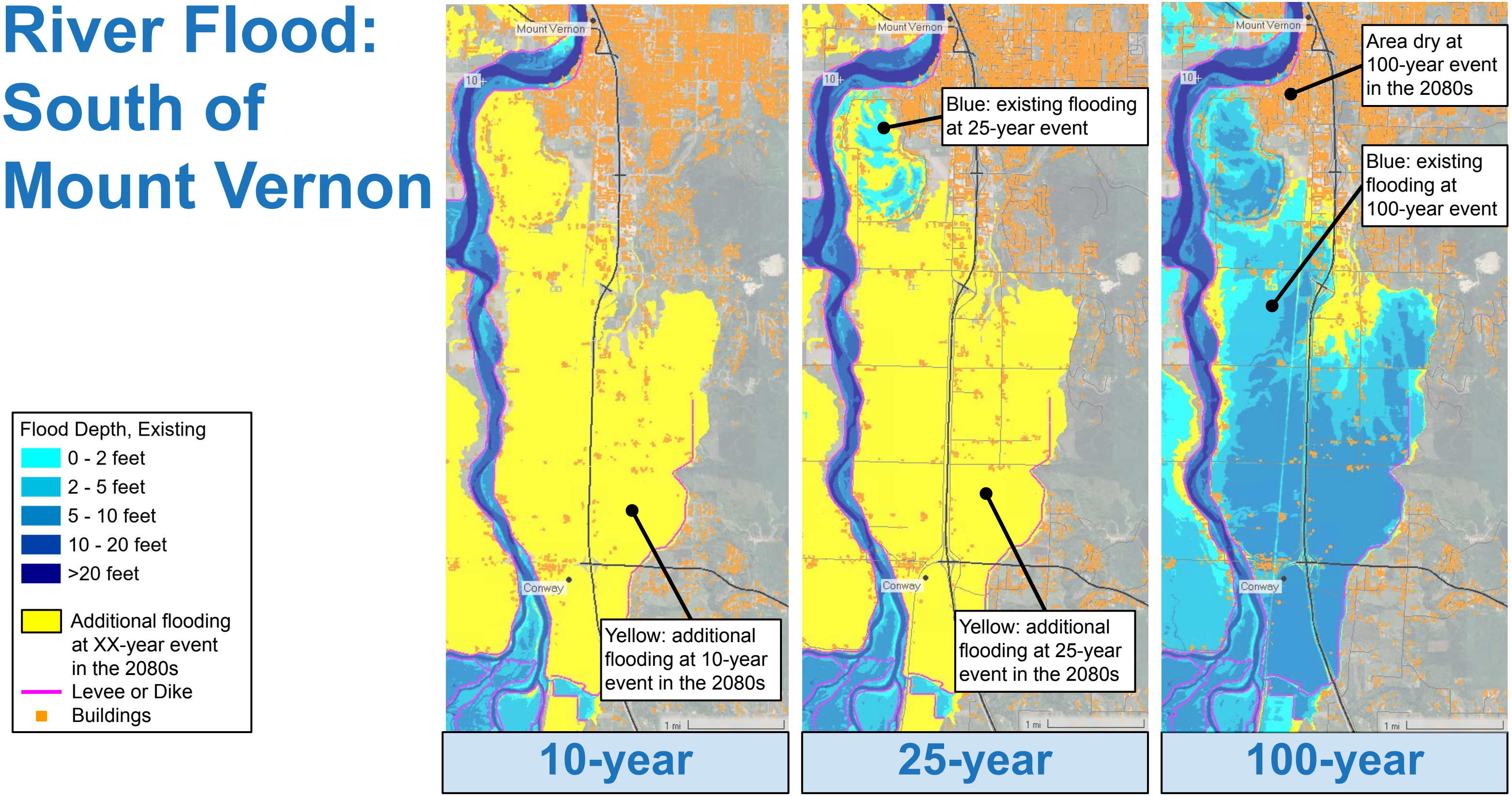


25-year



100-year

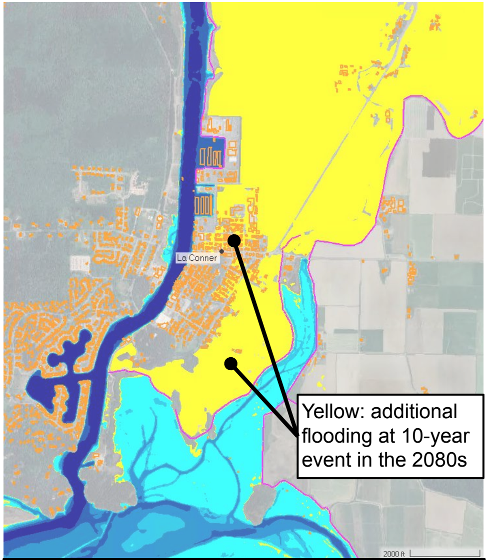
River Flood: South of Mount Vernon



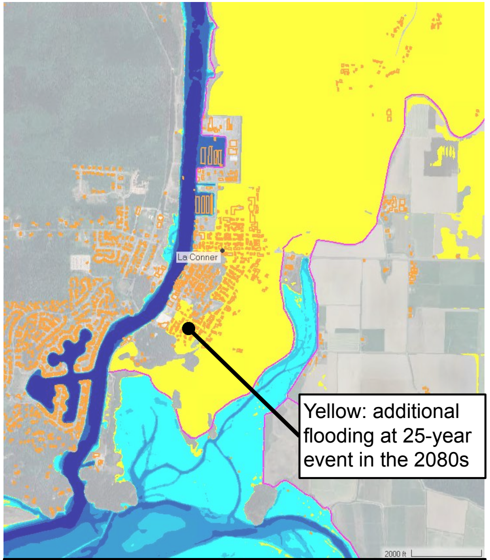
River Flood: La Conner

Flood Depth, Existing
- 0 - 2 feet
- 2 - 5 feet
- 5 - 10 feet
- 10 - 20 feet
- >20 feet

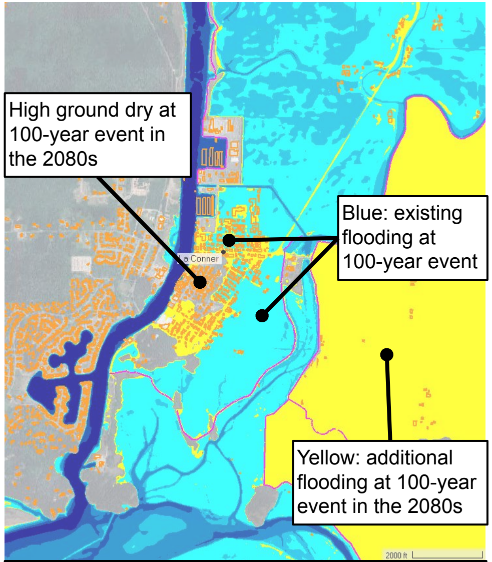
- Additional flooding at XX-year event in the 2080s
- Levee or Dike
- Buildings



10-year



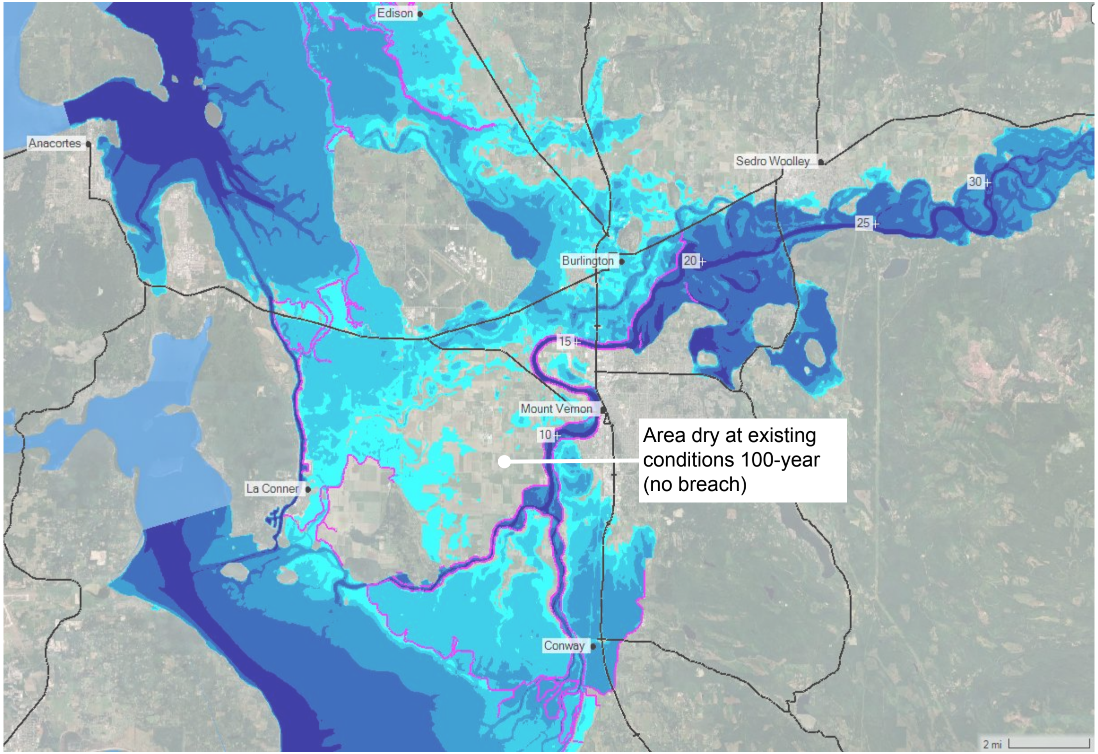
25-year



100-year

B) Levee Breach Scenarios based on Locations from the Skagit GI

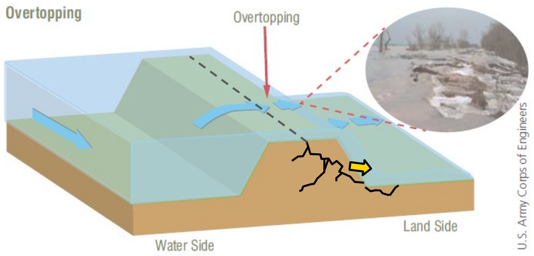
River Flood: Existing 100-year

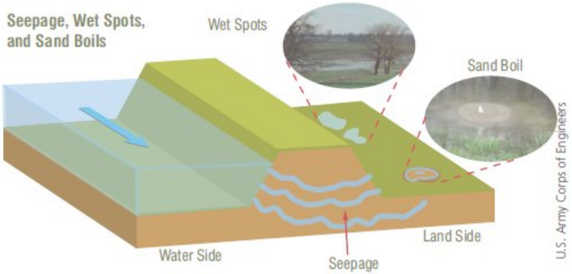


Flood Depth, Existing
- 0 - 2 feet
- 2 - 5 feet
- 5 - 10 feet
- 10 - 20 feet
- >20 feet

Levee or Dike

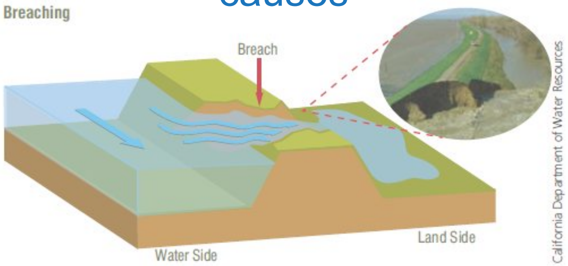
What Causes a Levee Breach?





Overtopping or **Piping**

causes



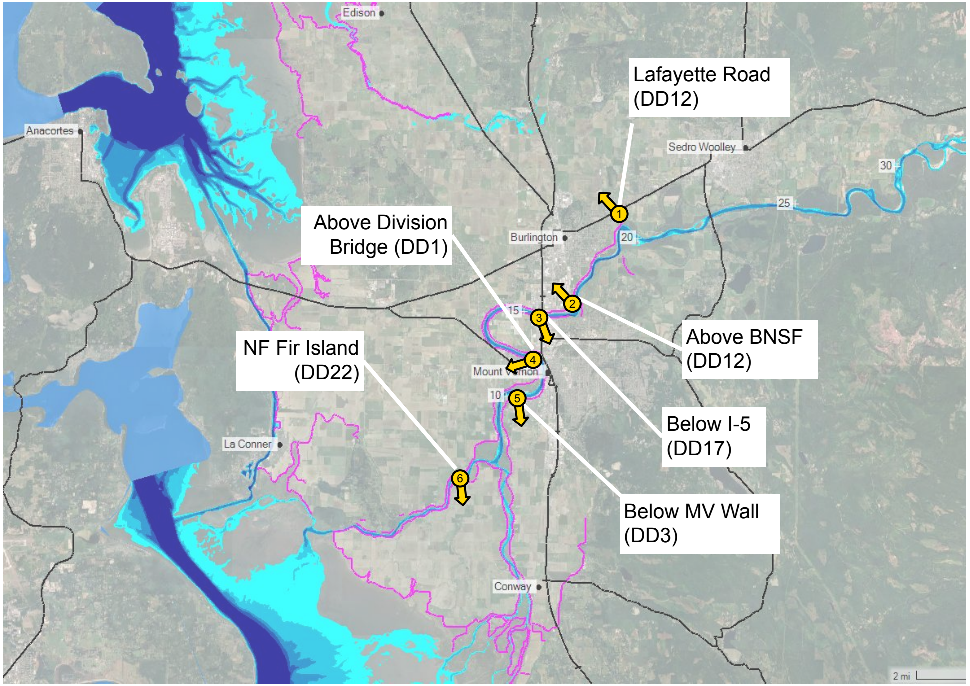
Breach

Summary of Skagit Levee System

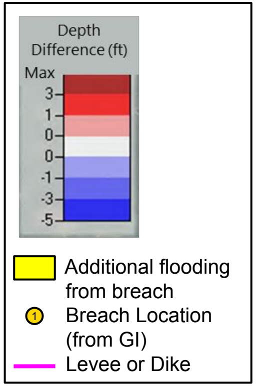
- Approximately 50 miles of levees
- Capacity to contain approximately a 20-year flood
- Overseen by diking districts; some co-managed with USACE in PL 84-99 program
- Recent levee strengthening projects

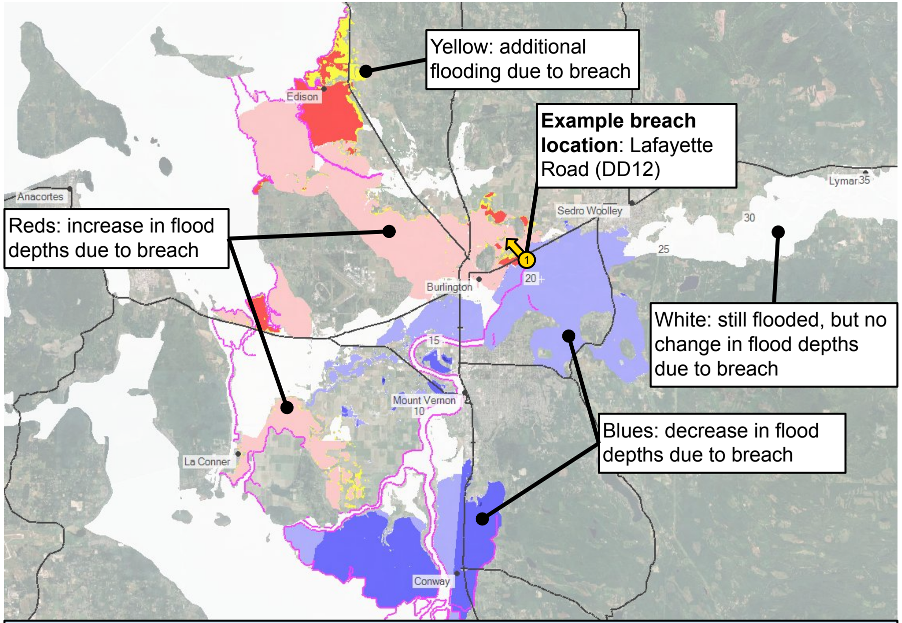
River Flood: 6 Levee Breach Locations from GI

Breach Location (from GI)
Levee or Dike



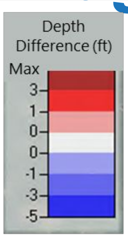
River Flood: Levee Breach at Lafayette Road





Levee Breach 100-year

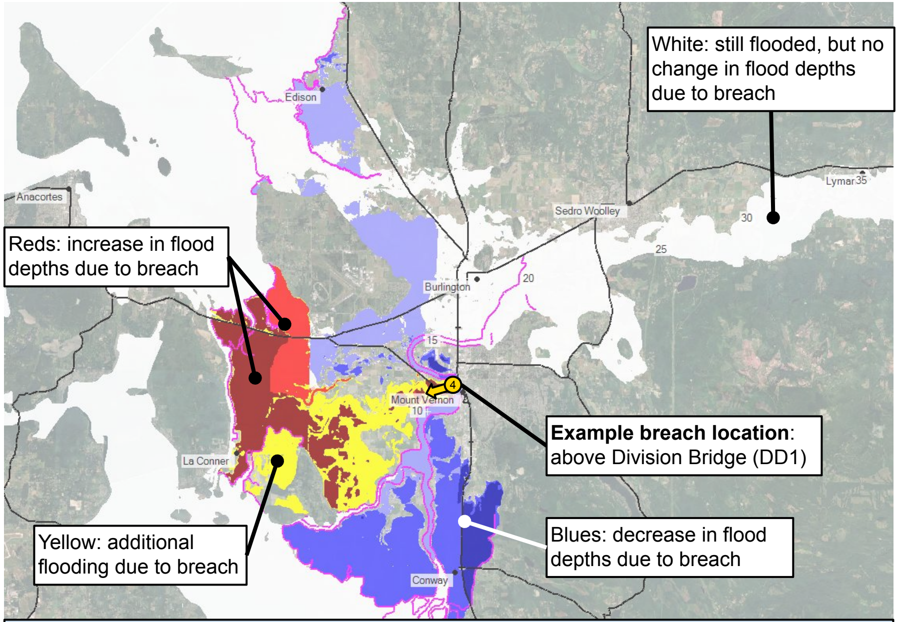
River Flood: Levee Breach at Division Street Bridge



Additional flooding from breach

Breach Location (from GI)

Levee or Dike



Levee Breach 100-year

Discussion, Input and Reflection Questions

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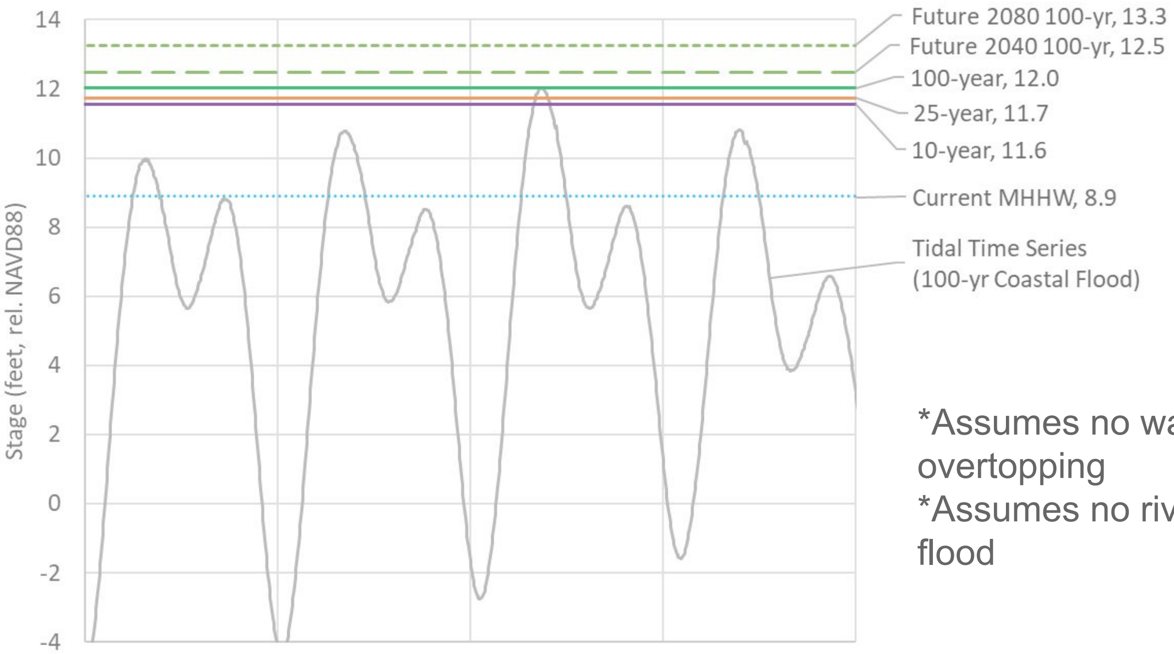
Break

C) Coastal Flood

Coastal Flooding: Tidal Stage



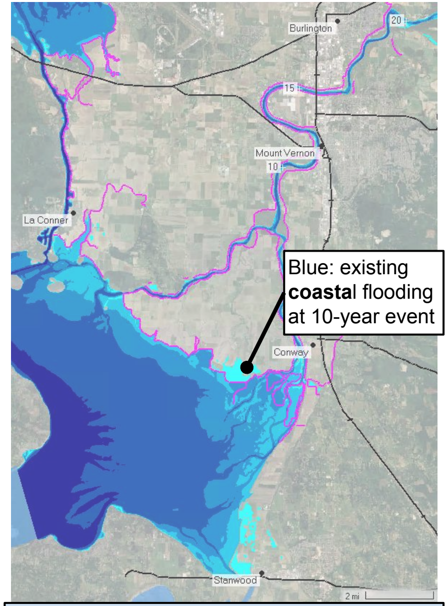
*Assumes no wave overtopping
*Assumes no river flood

Coastal Flood: Existing

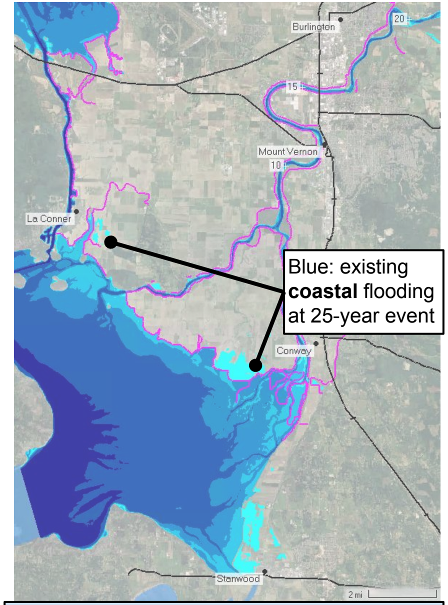
Skagit Bay

Flood Depth, Existing
- 0 - 2 feet
- 2 - 5 feet
- 5 - 10 feet
- 10 - 20 feet
- >20 feet

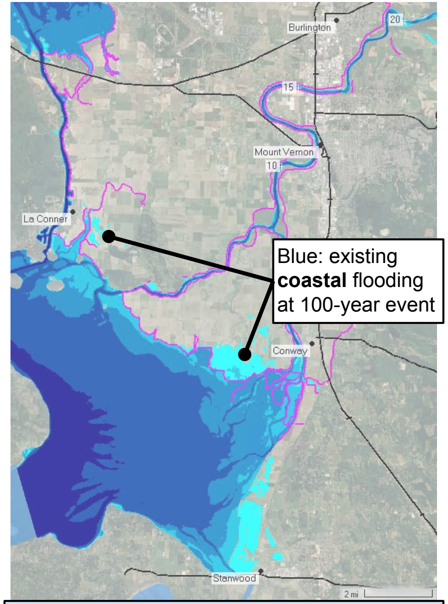
Levee or Dike



10-year



25-year



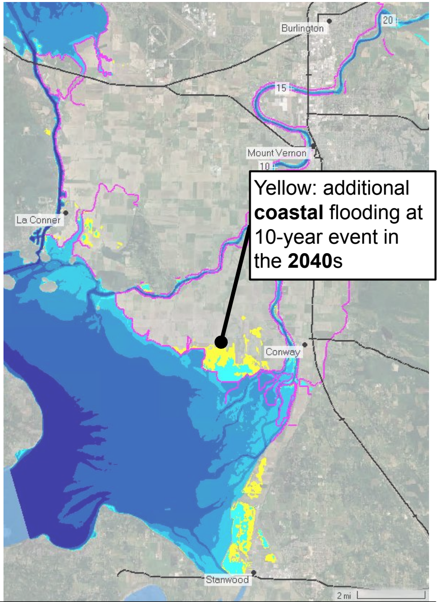
100-year

Coastal Flood: 2040s

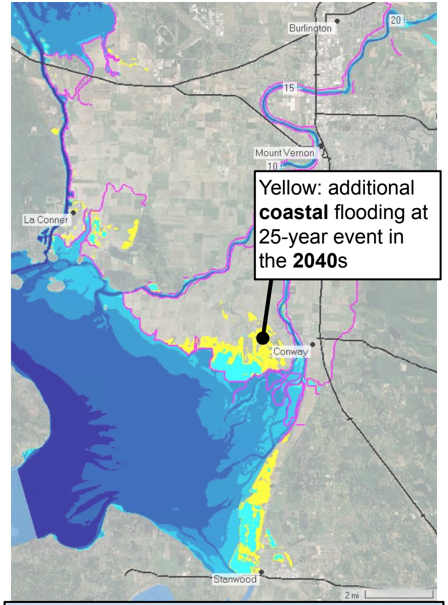
Skagit Bay

Flood Depth, Existing
- 0 - 2 feet
- 2 - 5 feet
- 5 - 10 feet
- 10 - 20 feet
- >20 feet

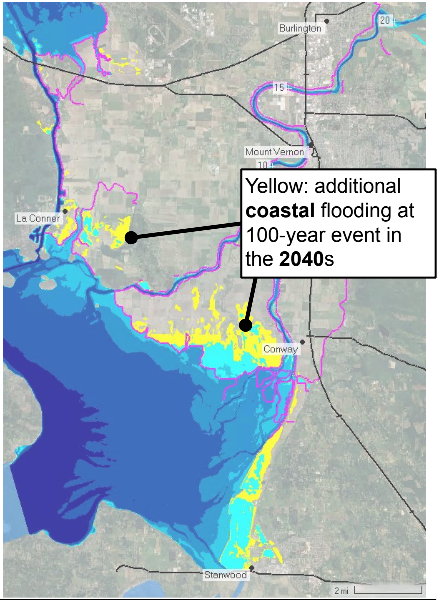
- Additional flooding at XX-year event in the 2040s
- Levee or Dike



10-year



25-year



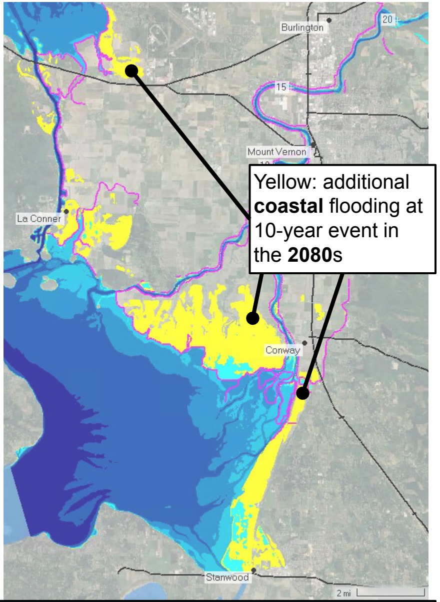
100-year

Coastal Flood: 2080s

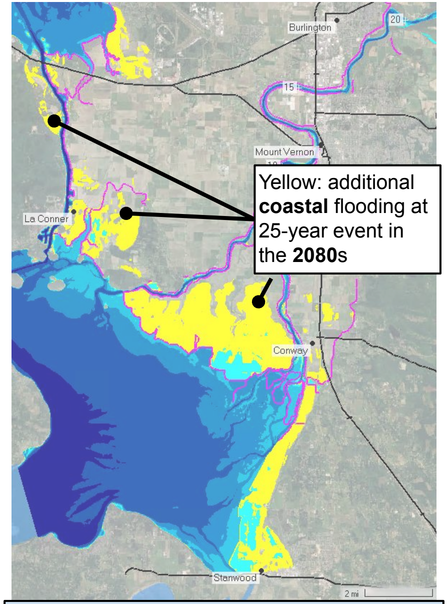
Skagit Bay

Flood Depth, Existing
- 0 - 2 feet
- 2 - 5 feet
- 5 - 10 feet
- 10 - 20 feet
- >20 feet

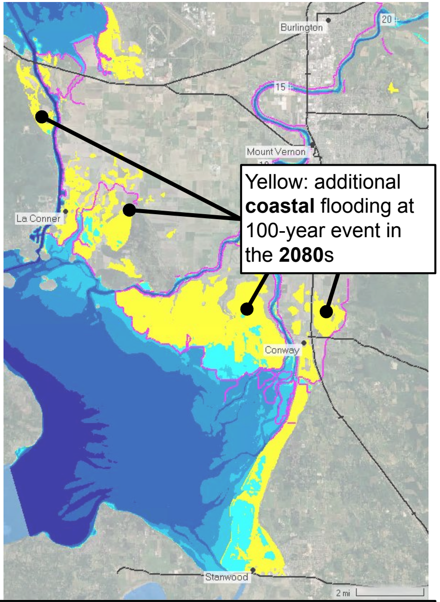
Additional flooding at XX-year event in the 2080s
Levee or Dike



10-year



25-year

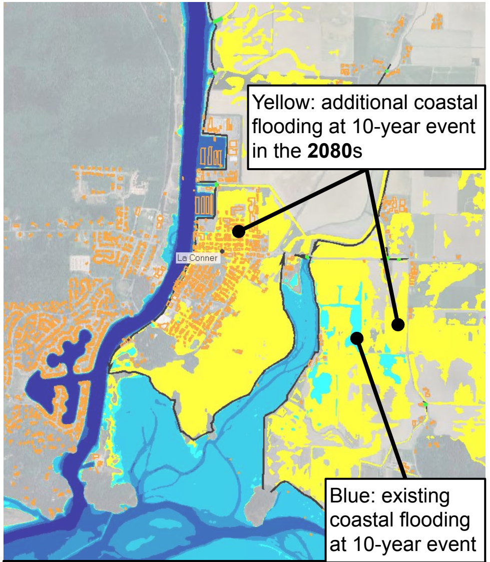


100-year

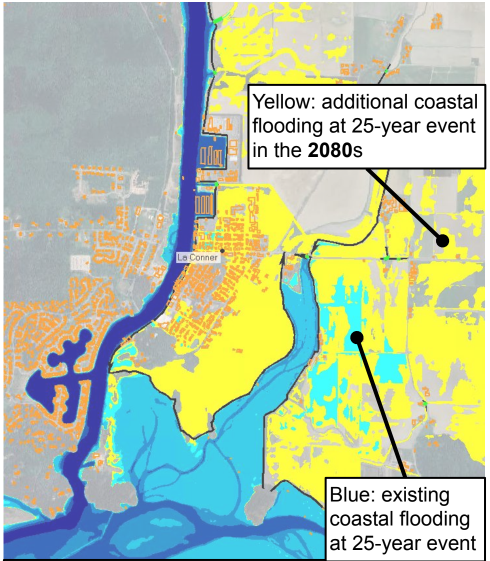
Coastal Flood: La Conner

Flood Depth, Existing
- 0 - 2 feet
- 2 - 5 feet
- 5 - 10 feet
- 10 - 20 feet
- >20 feet

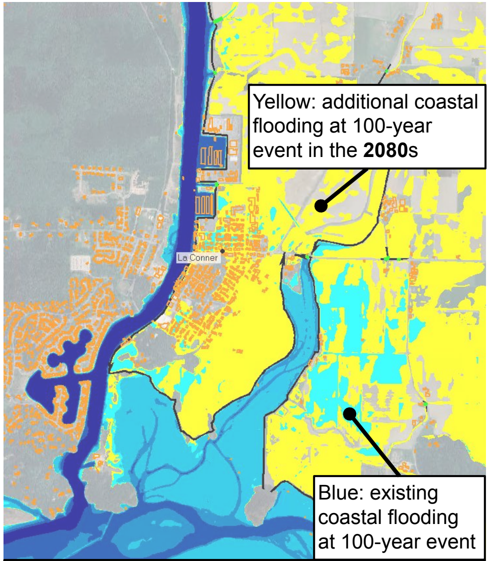
- Additional flooding at XX-year event in the 2080s
- Levee or Dike
- Buildings



10-year



25-year



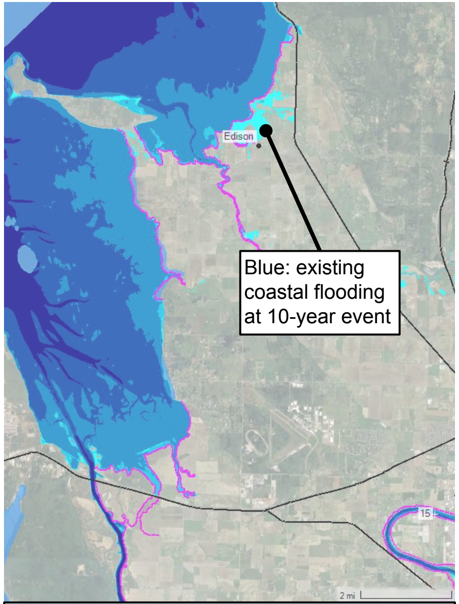
100-year

Coastal Flood: Existing

Padilla Bay and Samish Bay

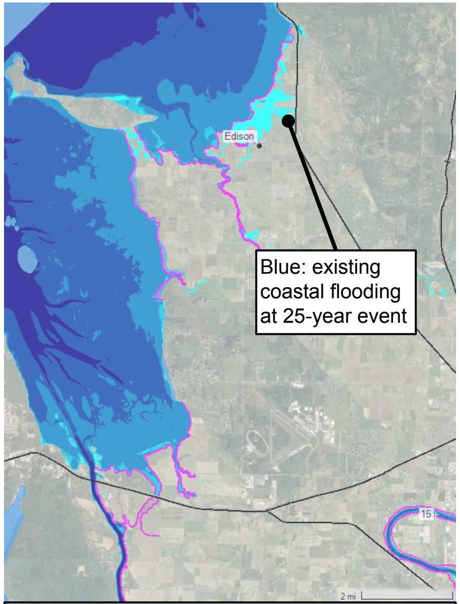
Flood Depth, Existing
- 0 - 2 feet
- 2 - 5 feet
- 5 - 10 feet
- 10 - 20 feet
- >20 feet

Levee or Dike



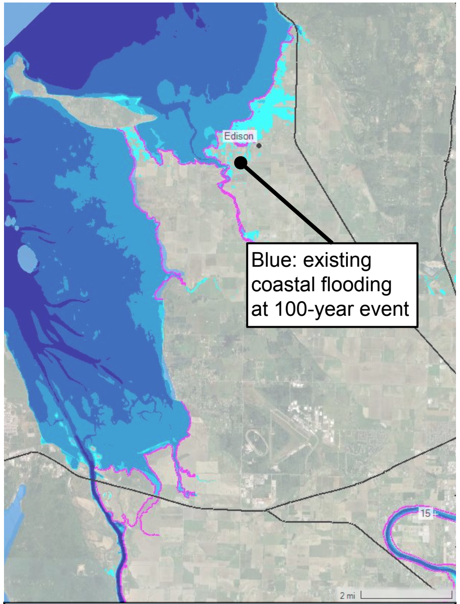
Blue: existing coastal flooding at 10-year event

10-year



Blue: existing coastal flooding at 25-year event

25-year



Blue: existing coastal flooding at 100-year event

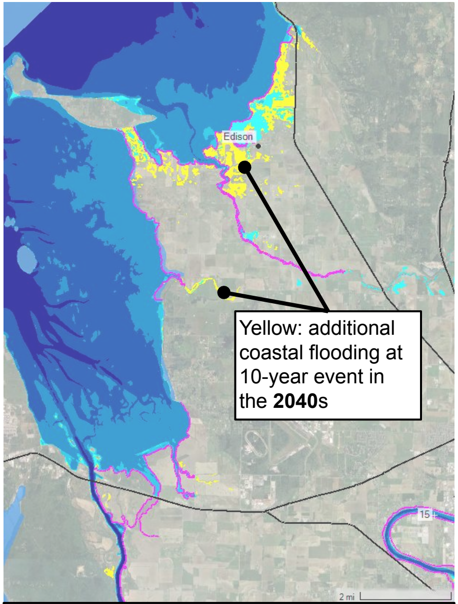
100-year

Coastal Flood: 2040s

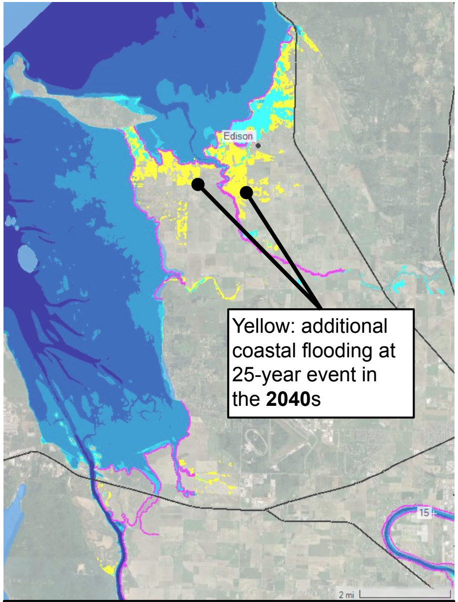
Padilla Bay and Samish Bay

Flood Depth, Existing
- 0 - 2 feet
- 2 - 5 feet
- 5 - 10 feet
- 10 - 20 feet
- >20 feet

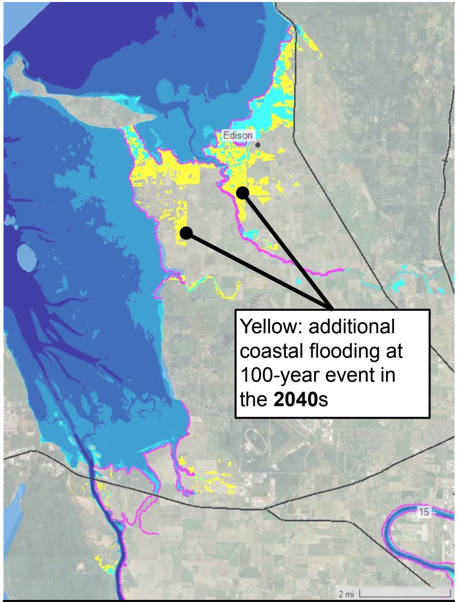
Additional flooding at XX-year event in the 2040s
Levee or Dike



10-year



25-year



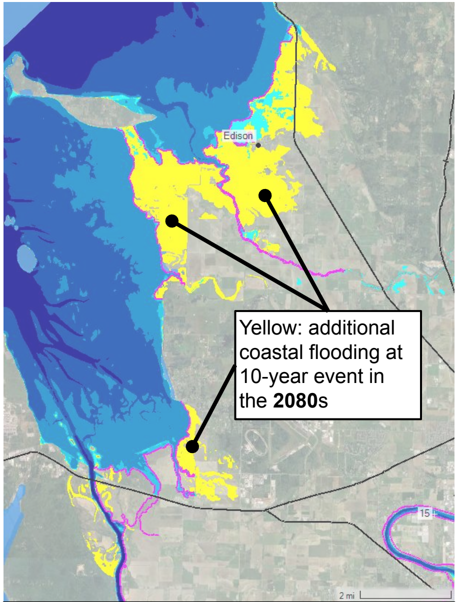
100-year

Coastal Flood: 2080s

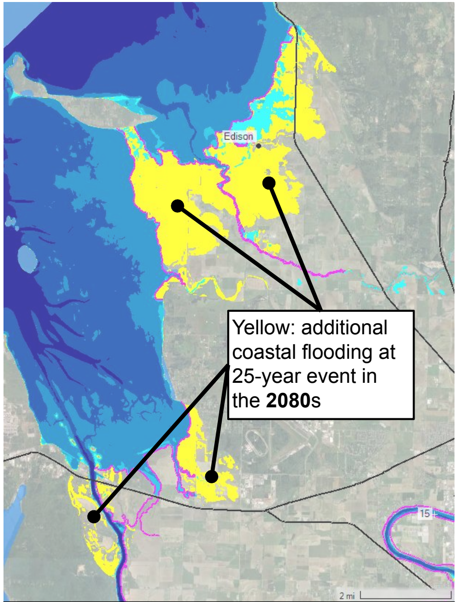
Padilla Bay and Samish Bay

Flood Depth, Existing
- 0 - 2 feet
- 2 - 5 feet
- 5 - 10 feet
- 10 - 20 feet
- >20 feet

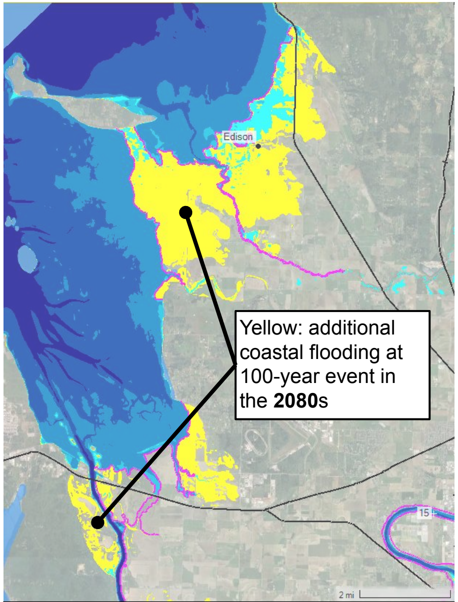
- Additional flooding at XX-year event in the 2080s
- Levee or Dike



10-year



25-year



100-year

Discussion, Input and Reflection Questions

- What do you notice?
- Which specific areas or places do you have concerns about flooding and why?
- Are there potential opportunities or ways to turn challenges into opportunities that you see in these maps?
- Are there management approaches that particularly interest you in understanding their impacts, benefits, and/or implications for others?

Questions?

Final Question

What meaning are you making of today?
Are there things you'd like to see furthered modeled or discussed in a group like this?

Project Engagement Steps and Timing

Step	Timing
Initial Community Calls	Dec 2024 - Jan 2025
Social / Local Govt / State/ Federal / Agriculture / Tribal	February
Additional Community Conversations and Feedback	March-May
Workshop: Understanding Current and Future Flood Risk in the Skagit River	June 5th
Additional Community Conversations and/or Another Workshop	July- October
Public Open House	Nov
Final Documentation, Model Publicly Available	Early 2026

THANK YOU!

Mount Vernon Slides
Updated by K. Kramer
January 20, 2026

River Flood: Historical and Simulated Events

Recent Events at **Mount Vernon**

Event	Flow (cfs)	Stage (ft)
Dec 2025	133,000	37.7
Nov 2021*	127,000	37.0
Nov 2006	138,000	33.9
Oct 2003*	135,000	36.2
Nov 1995*	141,000	37.3
Nov 1990	152,000	37.4

**Model calibrated to USGS gages and High Water Marks*

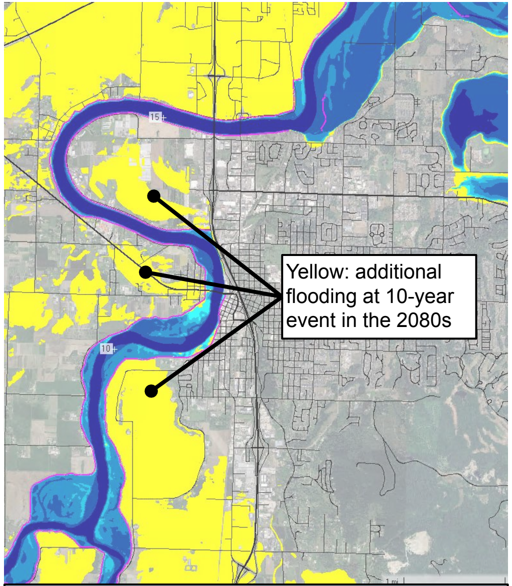
Existing (2013 GI) and Future Flows

Event	Flow at Sedro Woolley (cfs)	Flow at Mount Vernon (cfs)
10-year	133,000	119,000
25-year	170,000	150,000
100-year	236,000	171,000
Future 2080 100-year	314,000	176,000

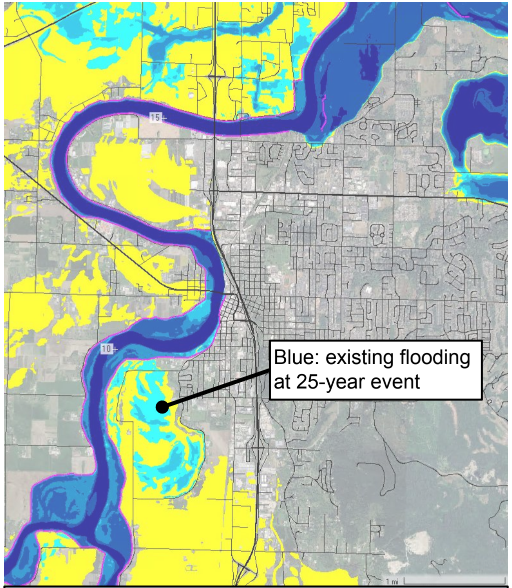
River Flood: Mount Vernon

Flood Depth, Existing
- 0 - 2 feet
- 2 - 5 feet
- 5 - 10 feet
- 10 - 20 feet
- >20 feet

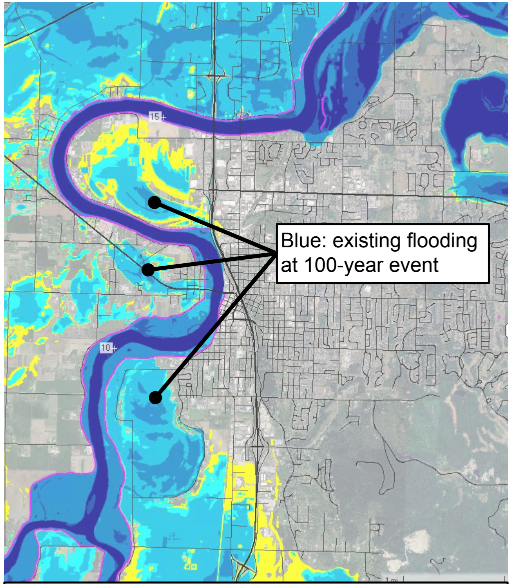
- Additional flooding at XX-year event in the 2080s
- Levee or Dike



10-year



25-year



100-year

River Flood: South of Mount Vernon