Appendix B: Maps

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What Is Included in This Appendix

This appendix contains map bundles for Upriver Flooding (Marblemount to Sedro-Woolley), Lower River Flooding (Sedro-Woolley to Skagit, Padilla and Samish bays), Coastal Flooding, and Dike Failure Scenarios.

Each of these map bundles has a map showing results for the entire map bundle area and then more zoomed in maps for key population centers. Maps include: flood depths, flood hazard (depth and velocity), and duration. For dike failure scenarios, a depth difference map is also included.

FLOOD FREQUENCIES

Floods are described in terms of "flood frequencies"; in this report we provide results for the 10–, 25–, 100– year events. As described in the report, this terminology can be confusing because it makes it sound like a flood event will only happen once in a given timeframe. In fact, the "10–year event" is a shorthand way to describe a flood event that has a 10% probability (or 1 in 10 chance) of occurring in any given year. Similarly, a 25–year event has a 4% chance of occurring in any given year, and a 100–year flood event has a 1% chance of occurring in any given year.

CLIMATE CHANGE

Climate change is projected to result in larger and more frequent floods. For example, models project that today's 1% annual chance event will become about a 4–5% chance event by midcentury. To help the reader understand how flood risk is changing, this report uses the common terminology of 10–, 25–, and 100–year flood frequencies combined with different timeframes: historic, 2040s and 2080s.

FLOOD DEPTH MAPS

Flood depth maps show the depth and extent of flooding for specific locations and events.

DEPTH–VELOCITY HAZARD MAPS

Depth-velocity hazard maps show the danger posed by flood waters. Based on both water depth and velocity, the maps show the likely risk for children, adults, vehicles, and structures. These maps do not include secondary hazards such as erosion, avulsion, landslides or debris flows.

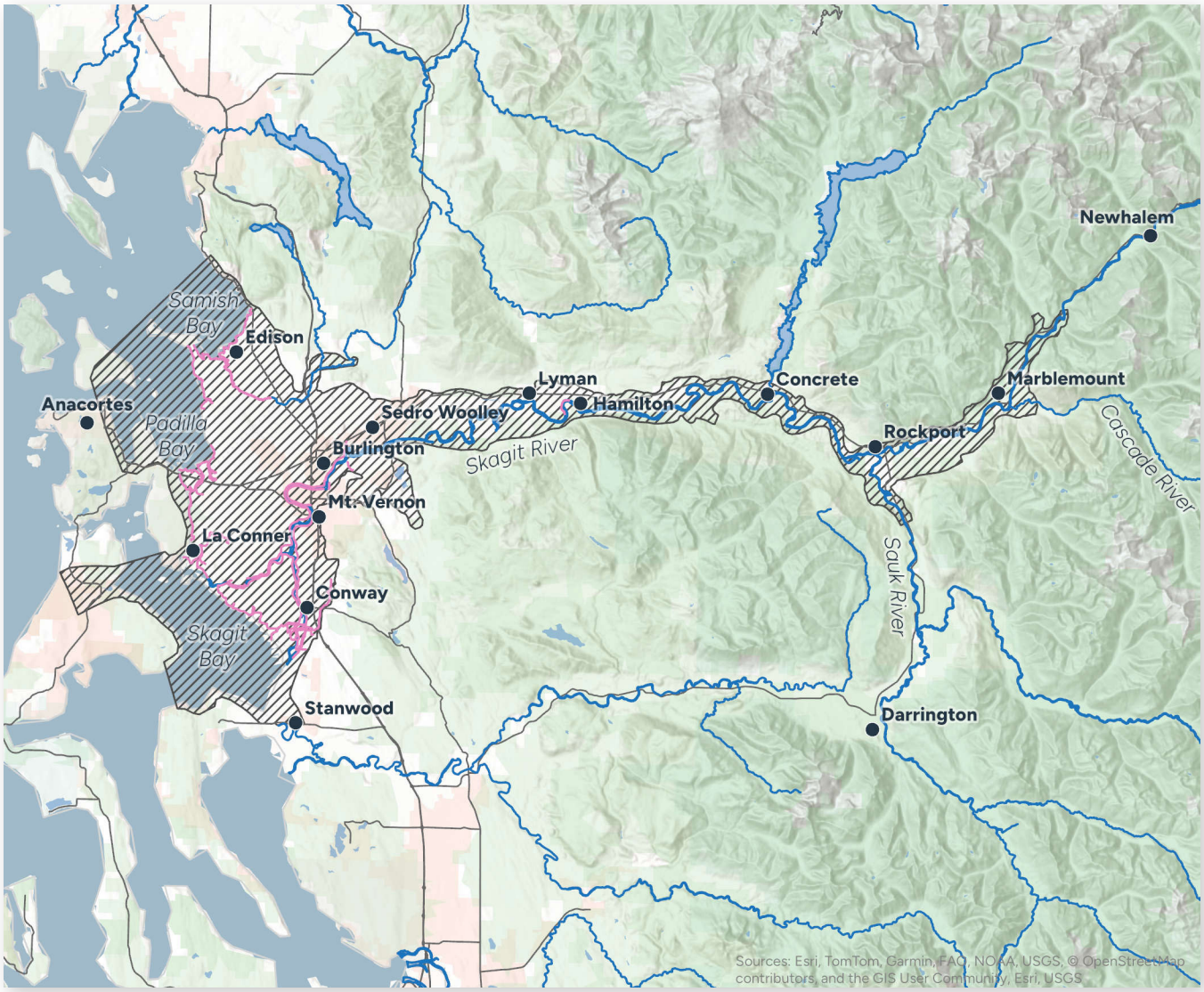
DURATION MAPS

Duration maps show the amount of time a location is flooded. This can be important for understanding the impacts on buildings, roads, dikes, emergency response, livestock, and many other important aspects of flood risk.

Disclaimer

These maps are products of the hydraulic model detailed in Appendix A. They are provided without any warranty of performance or fitness for a particular purpose. They should not be depended upon as a sole source of information as they illustrate potential scales of flooding rather than exact locations and do not account for real-time changes like erosion, dike failures, events that are larger than those modeled, or other factors. Maps should be used at your own risk. A reference section at the end contains data sources for map products.

Skagit River System Overview

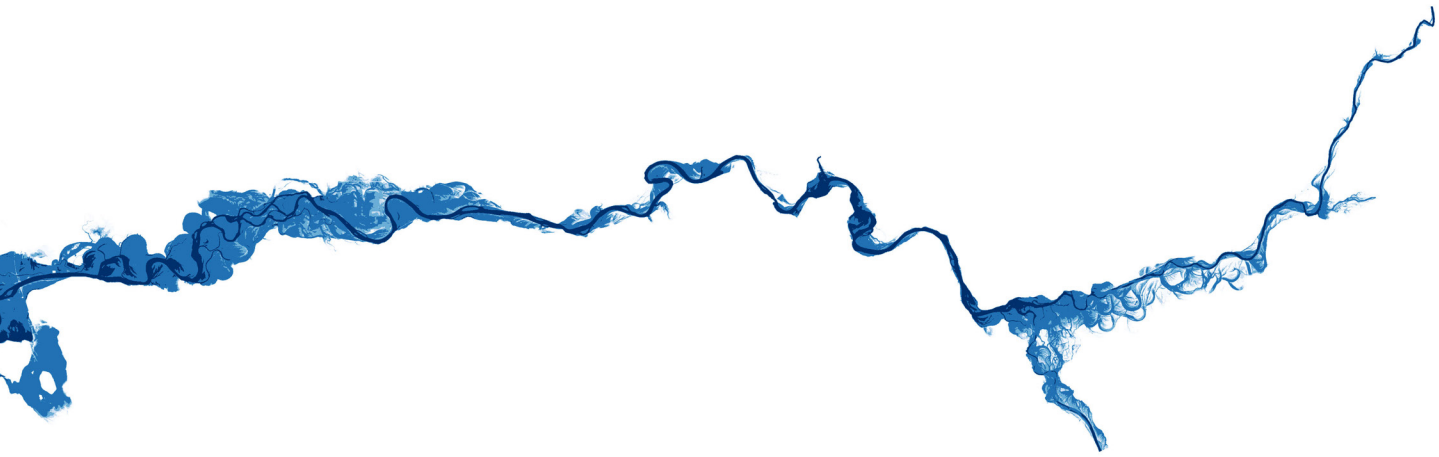


Hydraulic Model Domain

Maps included in Appendix B are products of the 2–D hydraulic model described in Appendix A. This map shows the model domain. The hatching shows that the model extends into Skagit, Padilla and Samish Bays in order to simulate coastal flooding. Water flowing into the model domain during flood events – from the Baker River, Upper Skagit River, Sauk River, and many smaller tributaries – are all included, even though the hydraulic model simulations are confined to the Skagit River floodplains.

- Cities
- Major Roads
- Rivers
- Dike or Coastal Dike
- 2D Model Domain

0 2.5 5 10 Miles



Upriver Flooding Maps

This map bundle shows Skagit River flood model results for areas just upstream of Marblemount downstream to Sedro-Woolley.

This set includes an overview map of the area and zoomed-in map areas for Marblemount, Concrete, Rockport, Hamilton, Lyman, and Sedro-Woolley and the unincorporated communities of Corkindale, Rockport, Van Horn, and Cape Horn. Full context for these maps can be found in the full *Understanding Current and Future Skagit Flood Risk Through New Modeling Capabilities* report and specific details on the hydraulic model that created these maps can be found in Appendix A. Flood animations for select locations can be found at the Skagit Climate Science Consortium website.

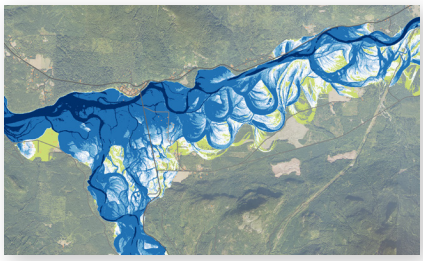
These maps are products of the hydraulic model detailed in Appendix A. They are provided without any warranty of performance or fitness for a particular purpose. They should not be depended upon as a sole source of information as they illustrate potential scales of flooding rather than exact locations and do not account for real-time changes like erosion, dike failures, larger-than-modeled events, or other factors. Maps should be used at your own risk.

How to Read Upriver Flooding Maps

What These Maps Show

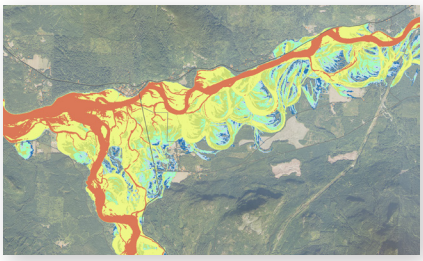
For all maps, the background is based on an aerial image (USDA 2023) and structures are shown as orange rectangles (Microsoft 2022). Pink lines, if present, show dike locations (Skagit County 2022), and dark gray lines show major transportation routes (WSDOT 2008, Skagit County 2019). The river channel itself may change colors depending on the map, but is the darkest shading in all maps.

FLOOD DEPTH MAPS



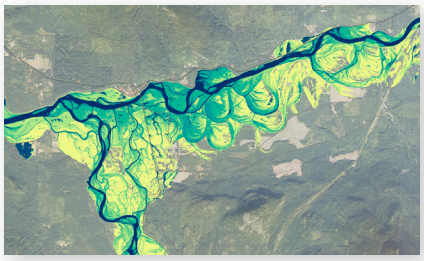
These maps are organized into sets of three, showing results for Historic (top), 2040s (middle), and 2080s (bottom) flood magnitudes. Each set of maps shows the model results for a specific flood frequency: 10-year, 25-year, and 100-year. Maps show the depth of flooding in shades of blue, where darker blue indicates deeper water and lighter blue indicates shallower water. In order to see how flooding is projected to change in the future, the Historic and 2040s maps also show the estimated extent of the 2080s flood in bright green. There is no bright green shading for the 2080s map because the map is already showing the depth and extent of the 2080s flood. All three maps are at the same scale.

DEPTH-VELOCITY HAZARD MAPS



These maps show depth-velocity hazards for a historic 100-year event. Only the historic results are shown; maps for the 2040s or 2080s are not included. The hazard classifications shown in the key were assigned based on a standard international practice (AIDR, 2017) and grouped into six hazard ratings. The hazard mapping is based on clearwater hazards and does not account for secondary hazards such as shoreline and fluvial geomorphic hazards (e.g., erosion, avulsion, debris flows, alluvial fan, etc.). Colors show when water poses a risk to children, adults, vehicles, and structures due to depth, velocity, or a combination of the two.

DURATION MAPS



These maps show the amount of time, in days, that each location is inundated during a historic 100-year flood event and do not include flows estimated for the 2040s or 2080s. Duration is shown in shades ranging from dark blue to yellow, with darker shading indicating a longer duration, and lighter shading indicating a shorter duration of flooding.

Overview Map





Flood Depth (ft)
- 0–1.5
- 1.5–3
- 3–5
- 5–15
- >15

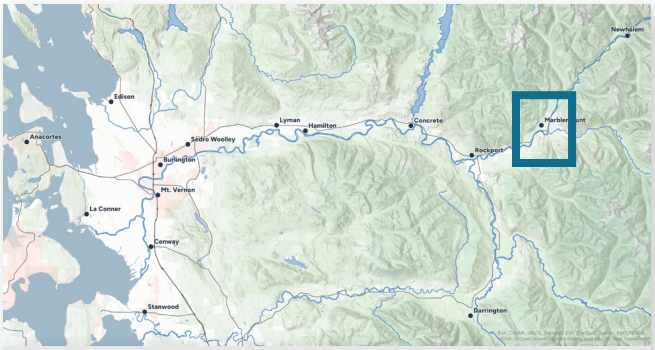
2080's flood extent for shown event

Buildings

0 2.5 5 Miles

Marblemount | 10 Year Flood





Flood Depth (ft)

- 0–1.5
- 1.5–3
- 3–5
- 5–15
- >15

2080's flood extent for shown event

Buildings

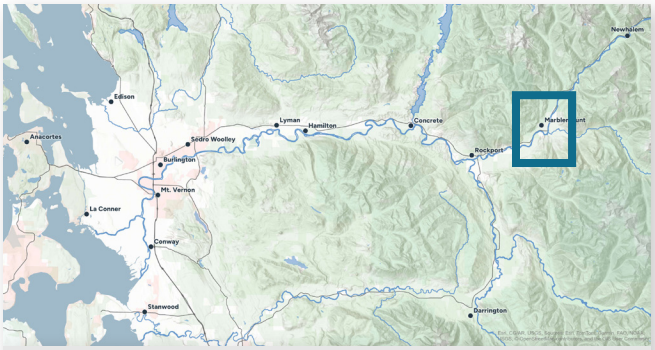
0 0.5 1 Miles





Marblemount | 25 Year Flood





Flood Depth (ft)

- 0–1.5
- 1.5–3
- 3–5
- 5–15
- >15

2080's flood extent for shown event

Buildings

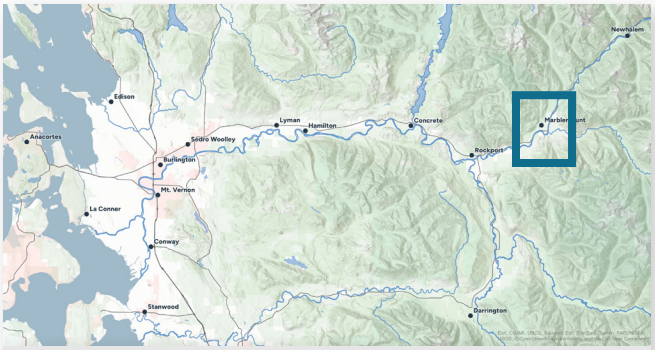
0 0.5 1 Miles





Marblemount | 100 Year Flood





Flood Depth (ft)

- 0–1.5
- 1.5–3
- 3–5
- 5–15
- >15

2080's flood extent for shown event

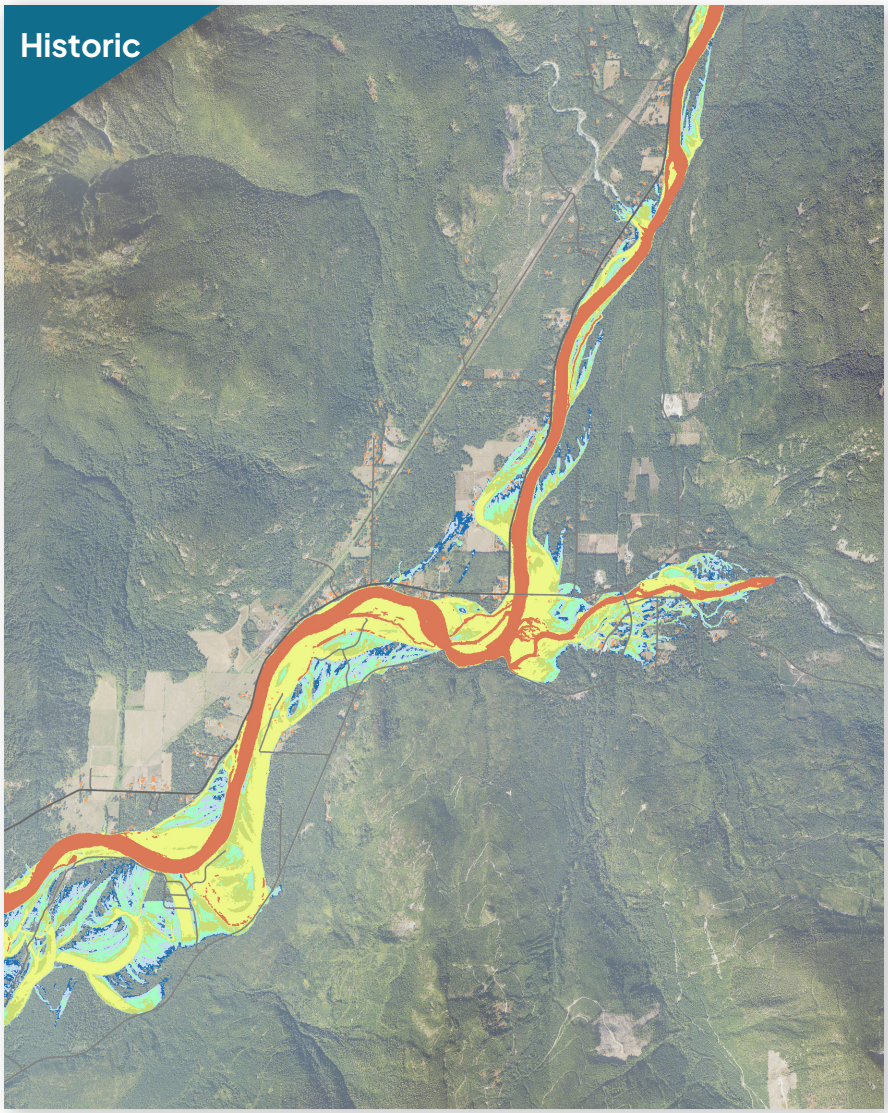
Buildings

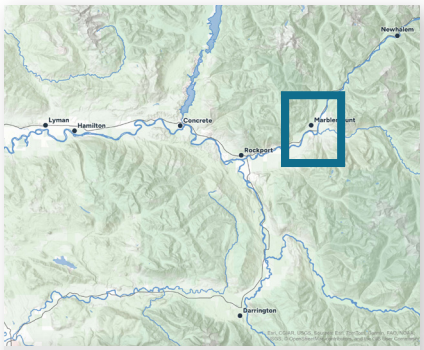
0 0.5 1 Miles





Marblemount | Depth-Velocity Hazard





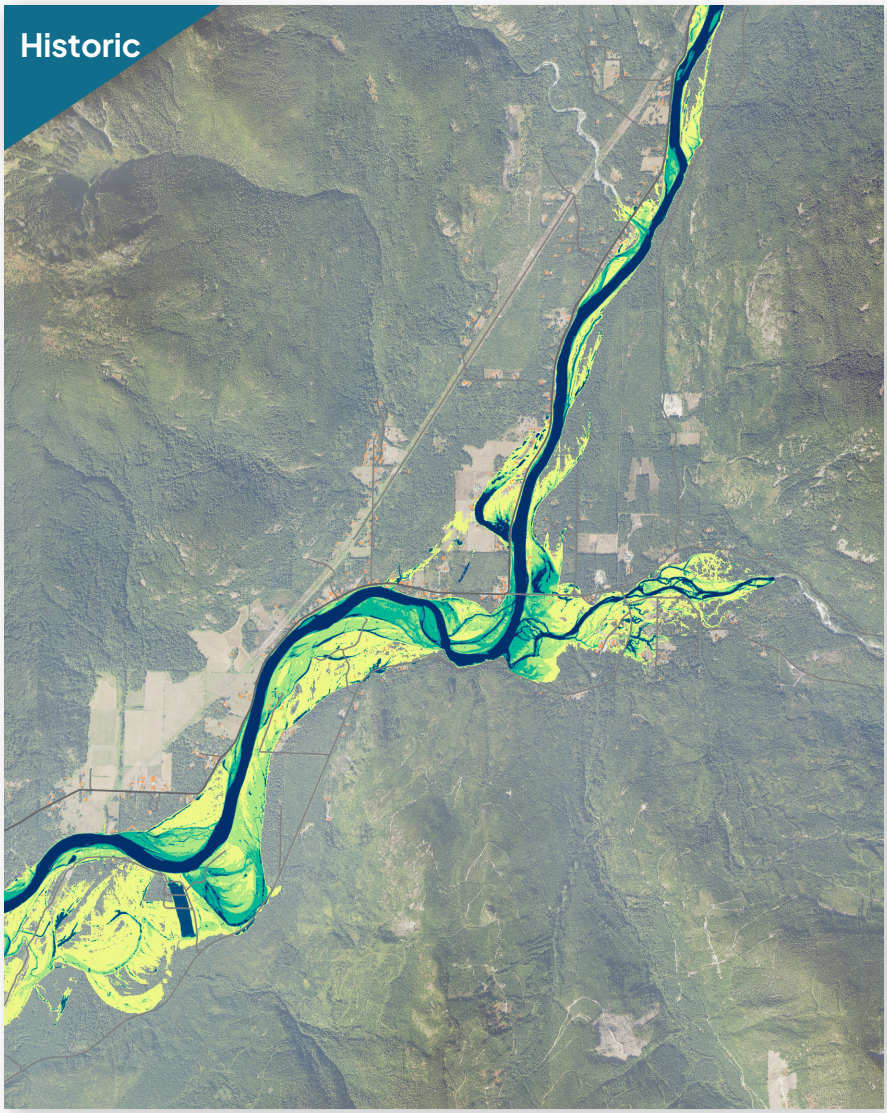
Descriptions for Flood Hazard Rating Mapping (AIDR, 2017)

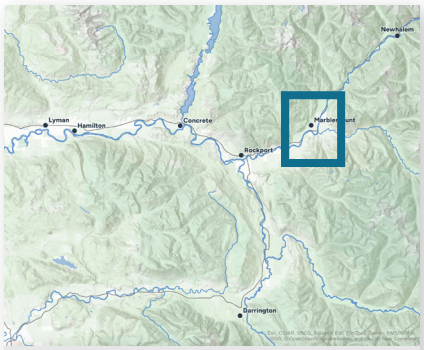
- Generally safe for vehicles, people, and buildings
- Unsafe for small vehicles
- Unsafe for vehicles, children, and the elderly
- Unsafe for vehicles and people
- Unsafe for vehicles and people. All building types vulnerable to structural damage.
- Unsafe for vehicles and people. All building types considered vulnerable to failure.

Buildings

0 0.5 1 Miles

Marblemount | Duration





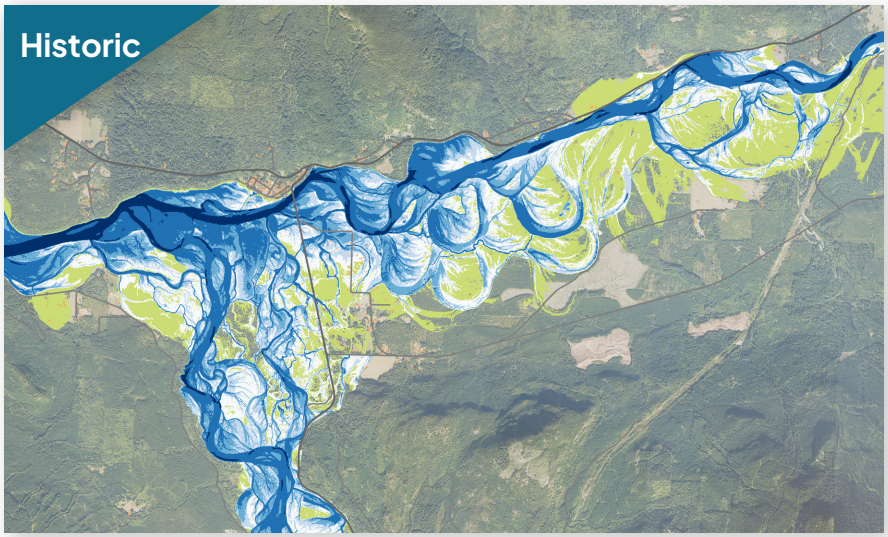
Duration (days)

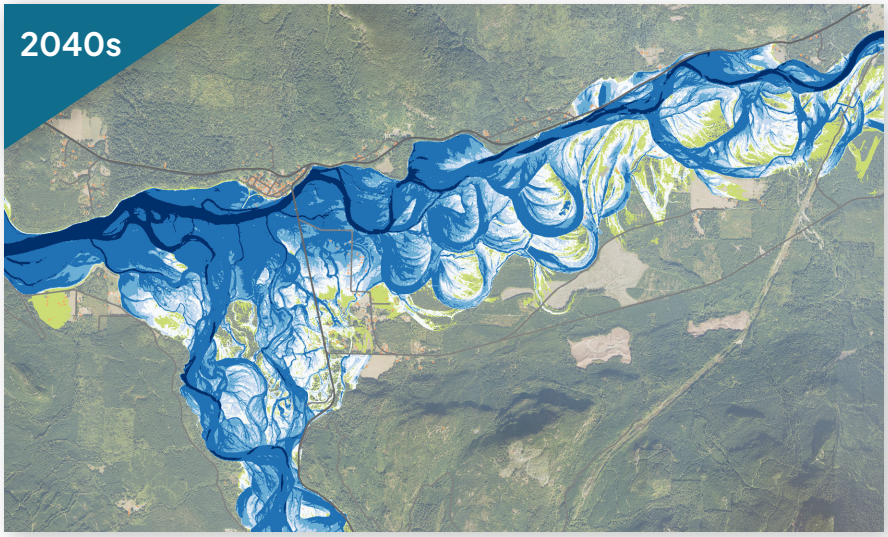
- 0 - 2
- 2 - 5
- 5 - 8
- 8 - 10
- 10 - 15
- 15 - 20
- 20 - 25
- 25 - 30
- >30

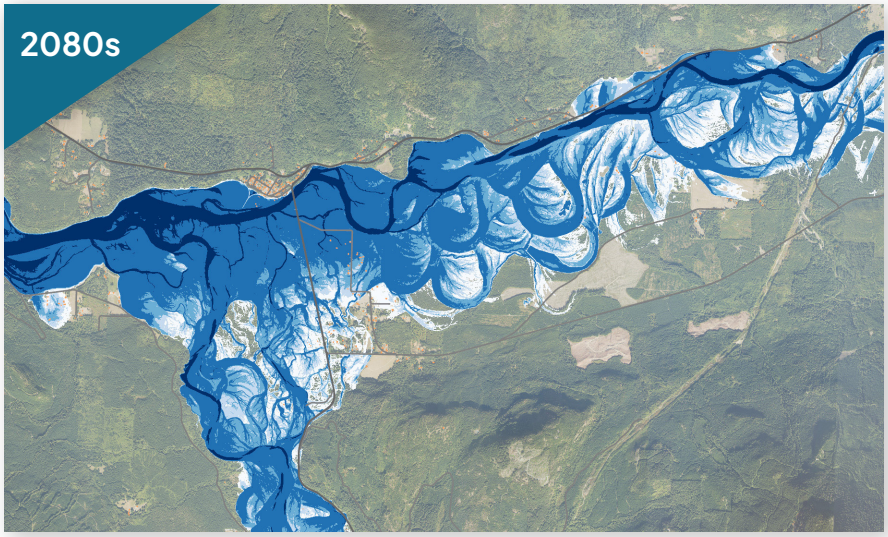
Buildings

0 0.5 1 Miles

Rockport | 10 Year Flood









Flood Depth (ft)

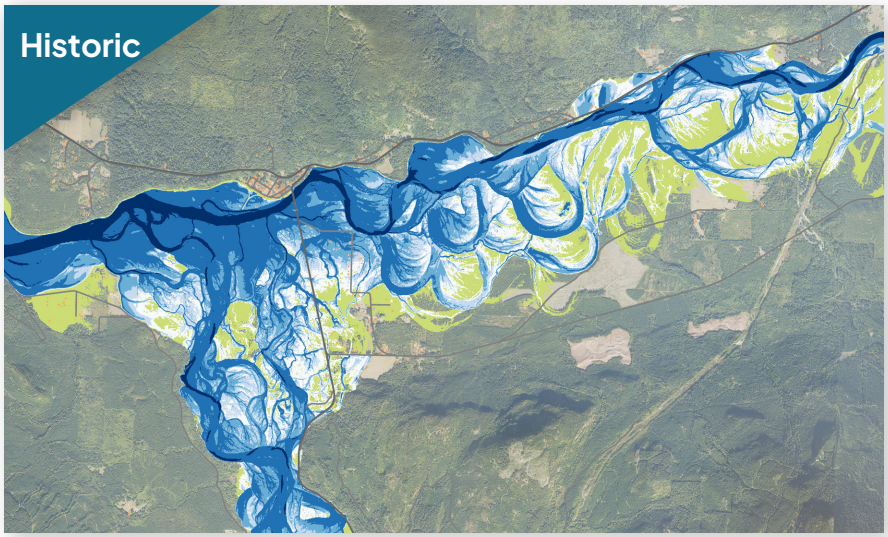
- 0–1.5
- 1.5–3
- 3–5
- 5–15
- >15

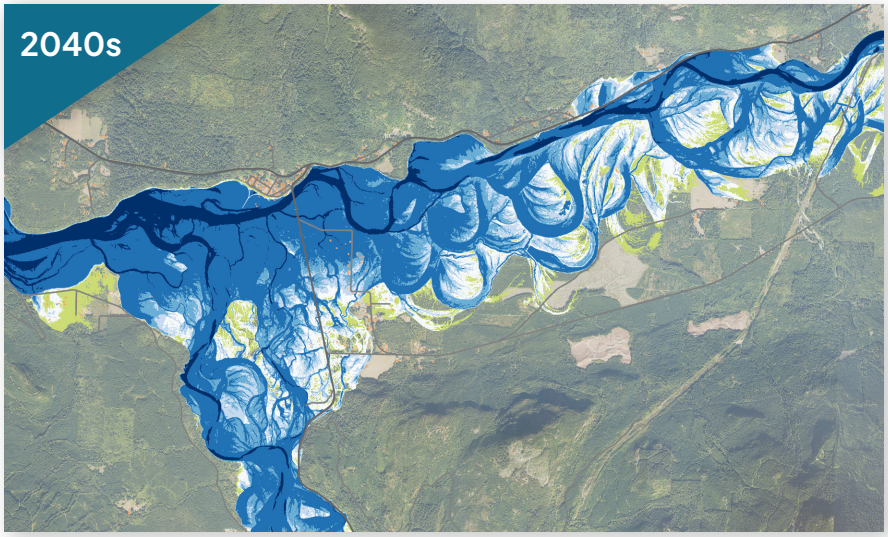
2080's flood extent for shown event

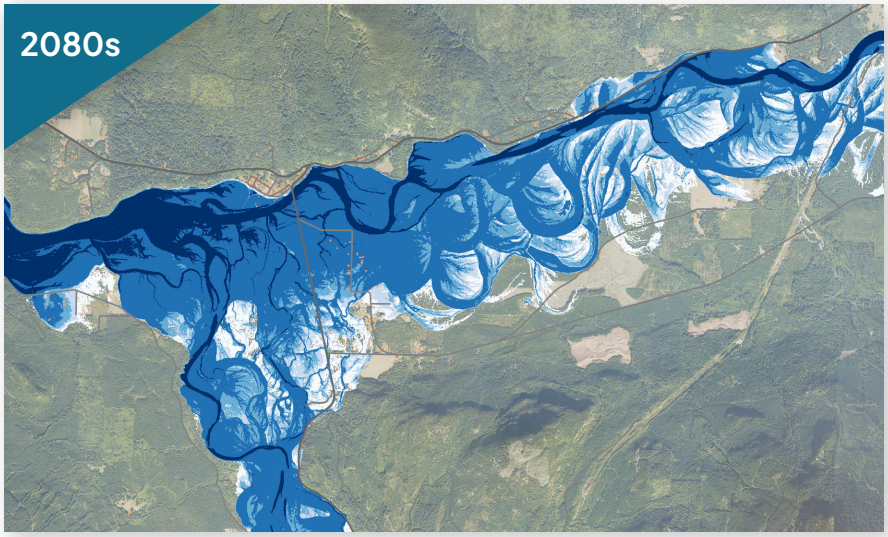
Buildings

0 0.5 1 Miles

Rockport | 25 Year Flood









Flood Depth (ft)

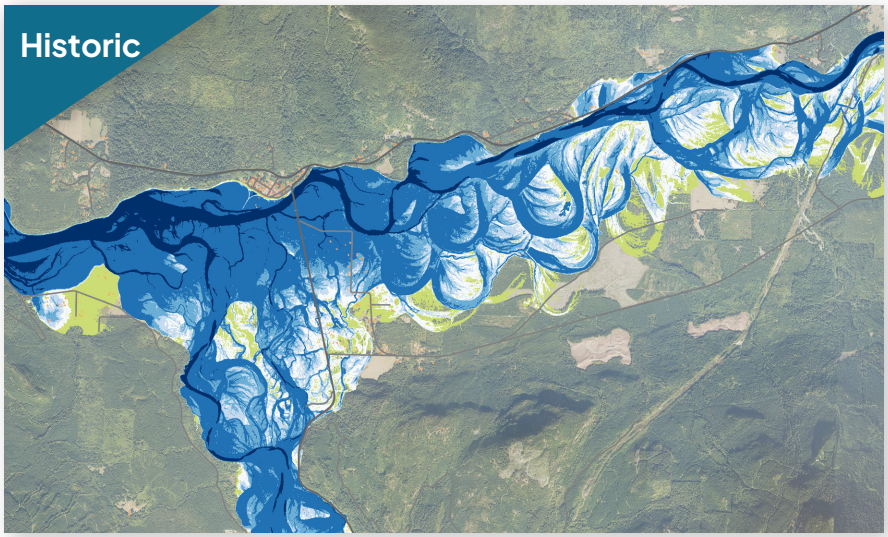
- 0–1.5
- 1.5–3
- 3–5
- 5–15
- >15

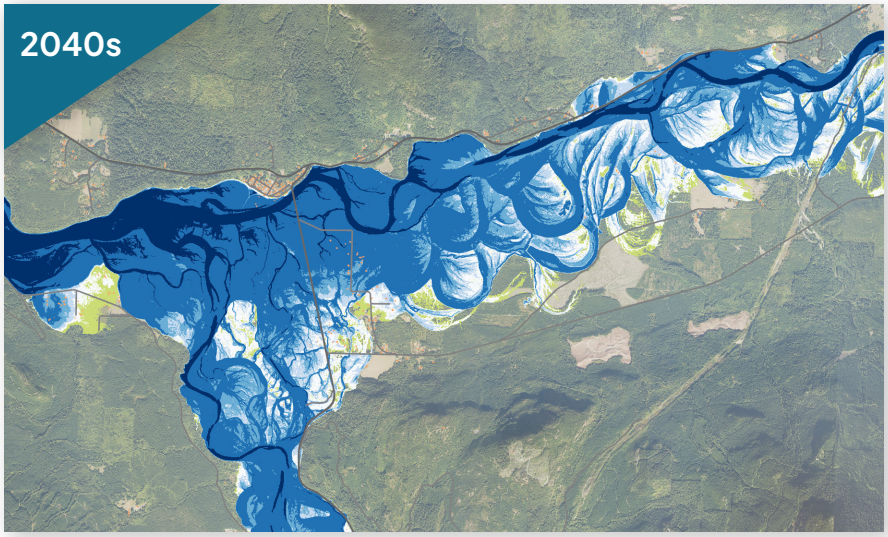
2080's flood extent for shown event

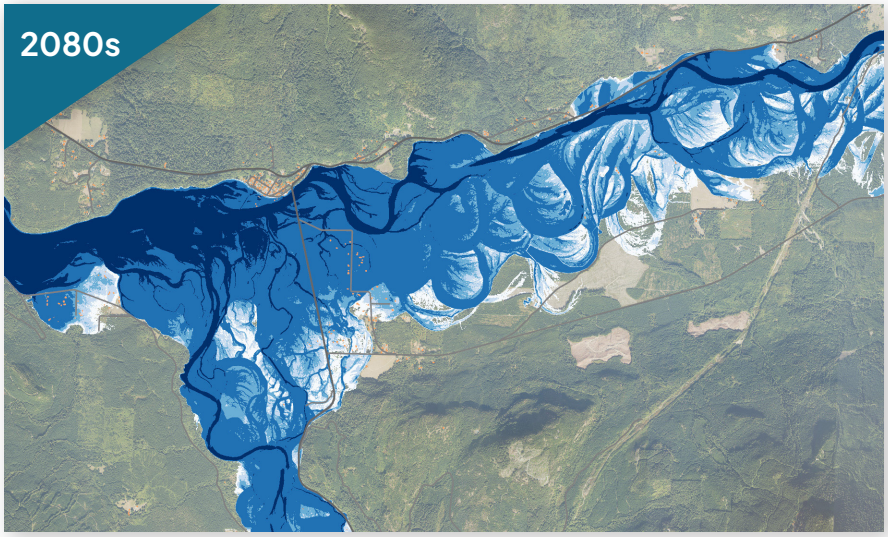
Buildings

0 0.5 1 Miles

Rockport | 100 Year Flood









Flood Depth (ft)

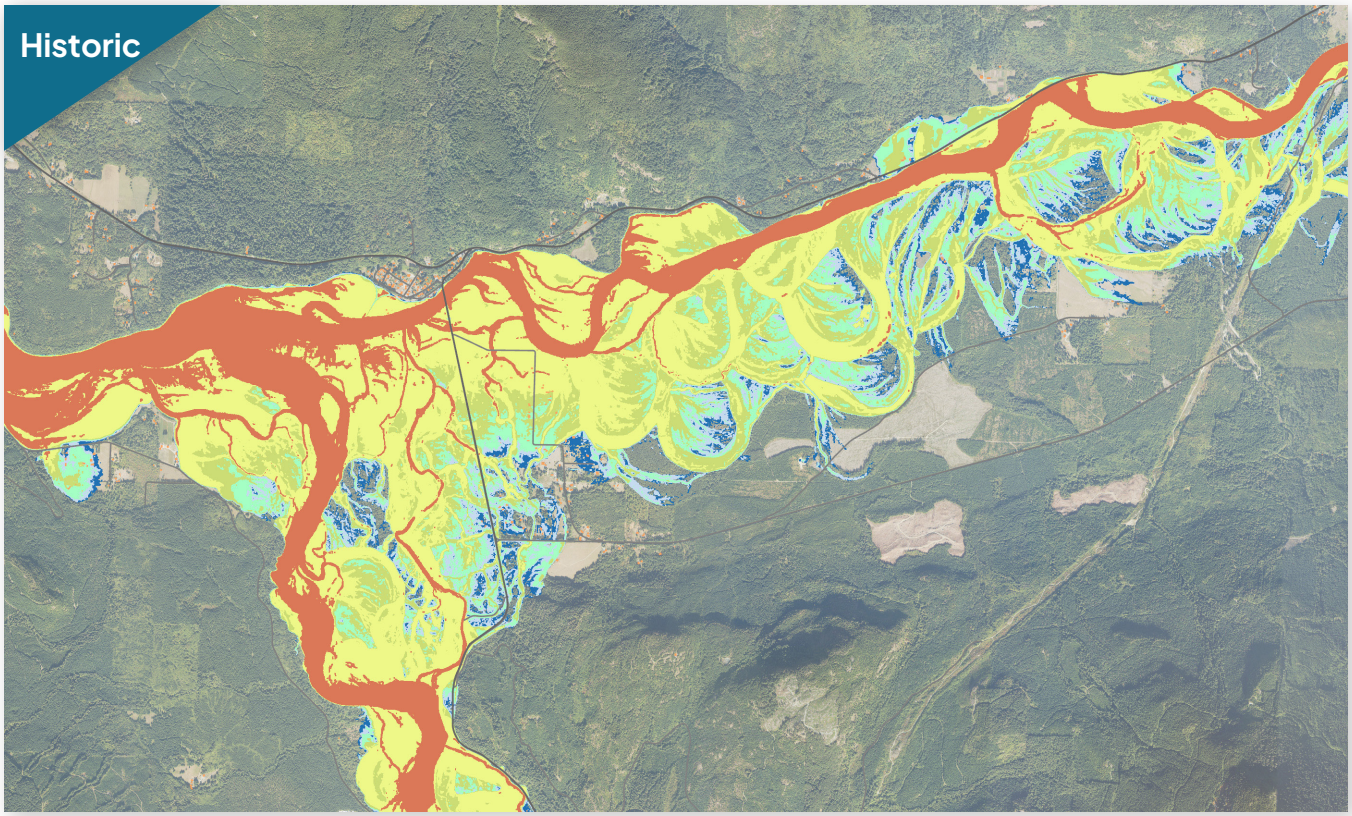
- 0–1.5
- 1.5–3
- 3–5
- 5–15
- >15

2080's flood extent for shown event

Buildings

0 0.5 1 Miles

Rockport | Depth-Velocity Hazard





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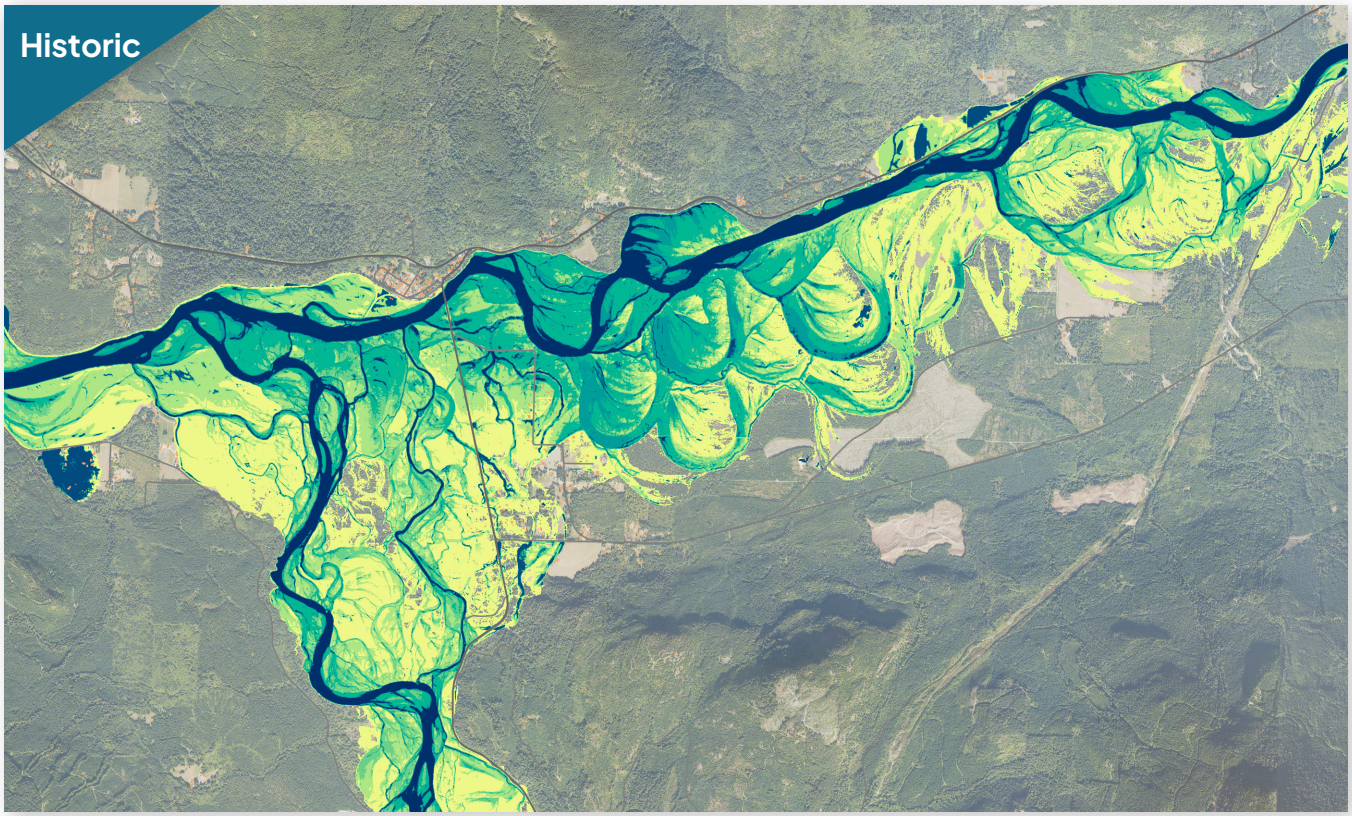
- Unsafe for vehicles, children, and the elderly
- Unsafe for vehicles and people
- Unsafe for vehicles and people. All building types vulnerable to structural damage.
- Unsafe for vehicles and people. All building types considered vulnerable to failure.

Buildings

0 0.5 1 Miles

Rockport | Duration





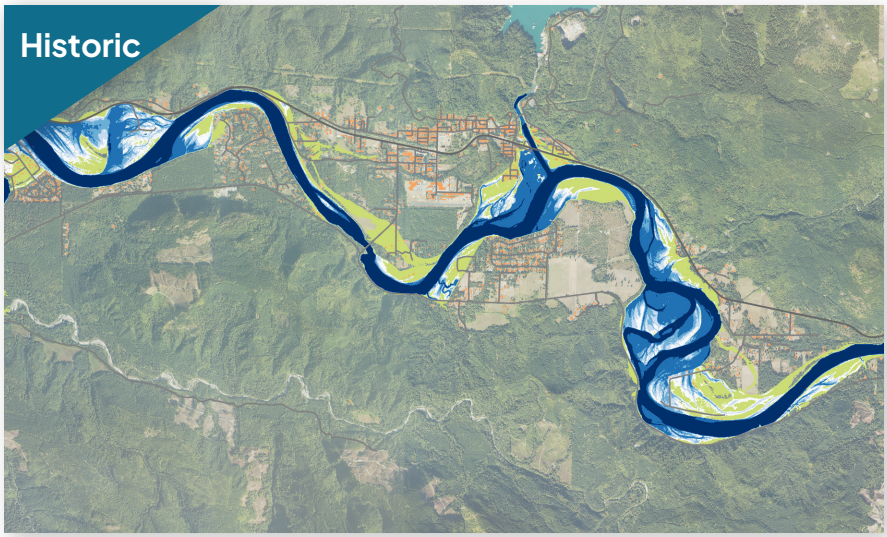
Duration (days)

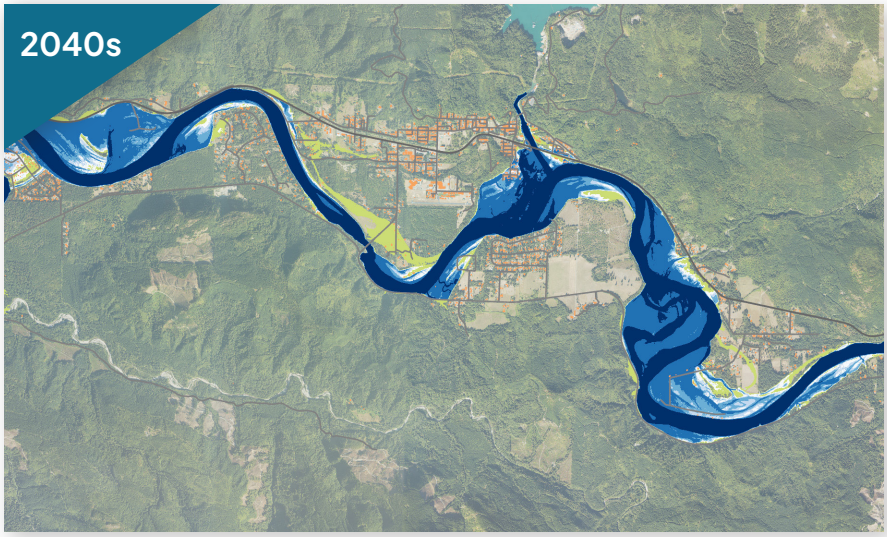
- 0 - 2
- 2 - 5
- 5 - 8
- 8 - 10
- 10 - 15
- 15 - 20
- 20 - 25
- 25 - 30
- >30

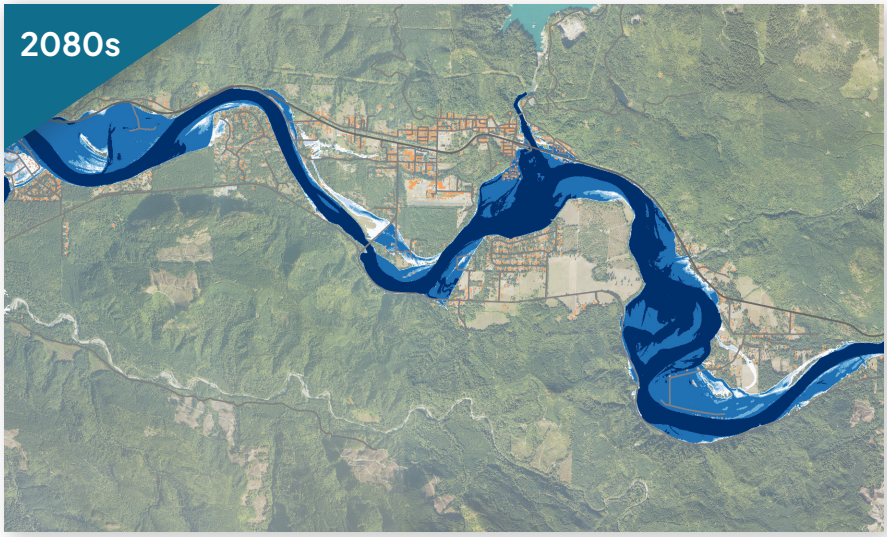
Buildings

0 0.5 1 Miles

Concrete | 10 Year Flood









Flood Depth (ft)

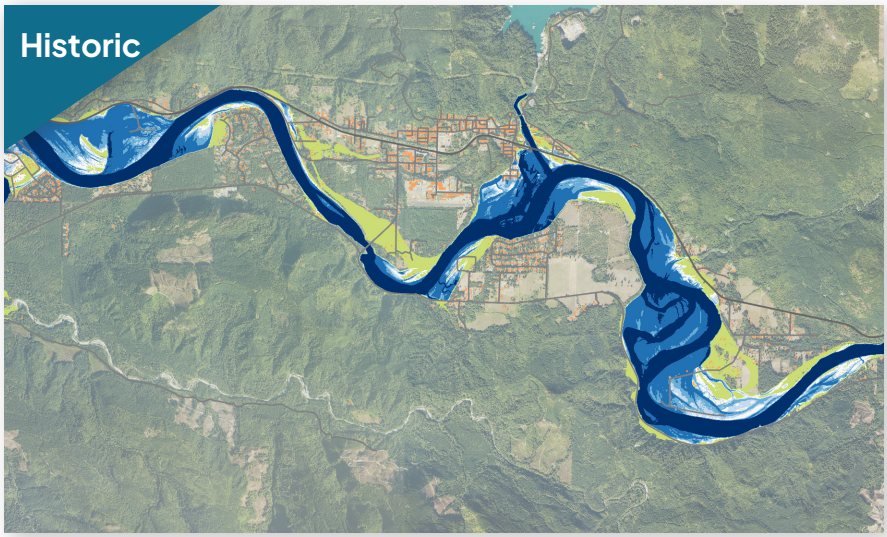
- 0–1.5
- 1.5–3
- 3–5
- 5–15
- >15

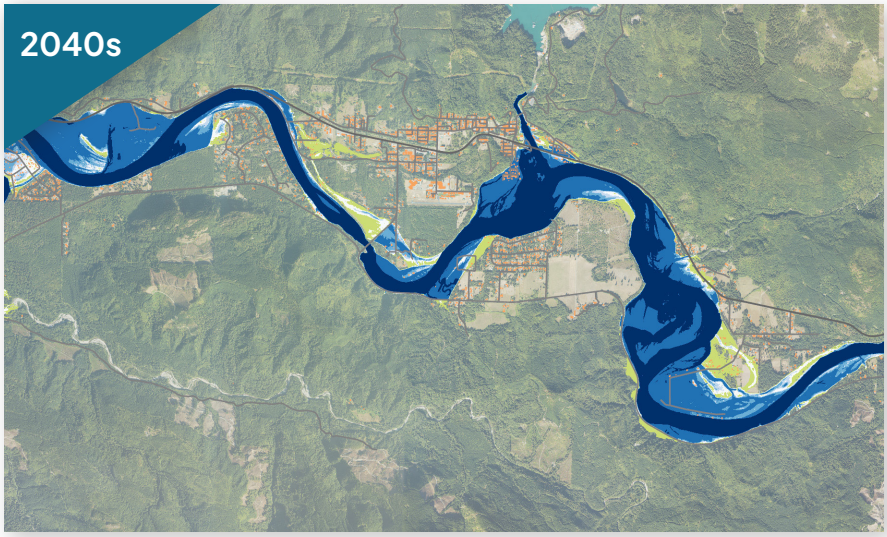
2080's flood extent for shown event

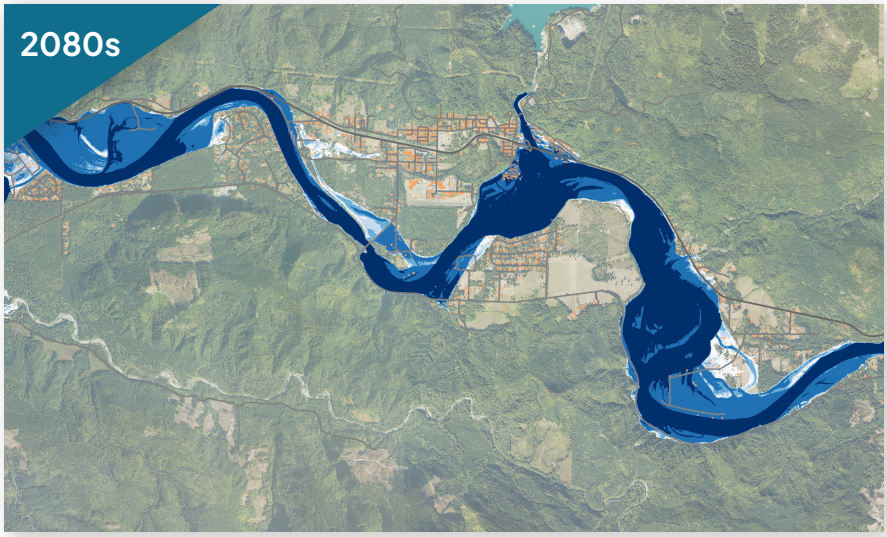
Buildings

0 0.5 1 Miles

Concrete | 25 Year Flood









Flood Depth (ft)

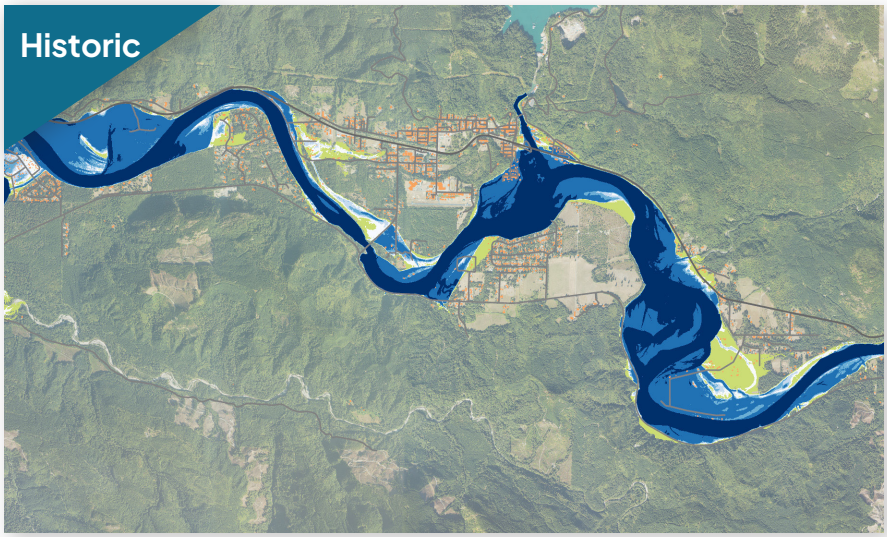
- 0–1.5
- 1.5–3
- 3–5
- 5–15
- >15

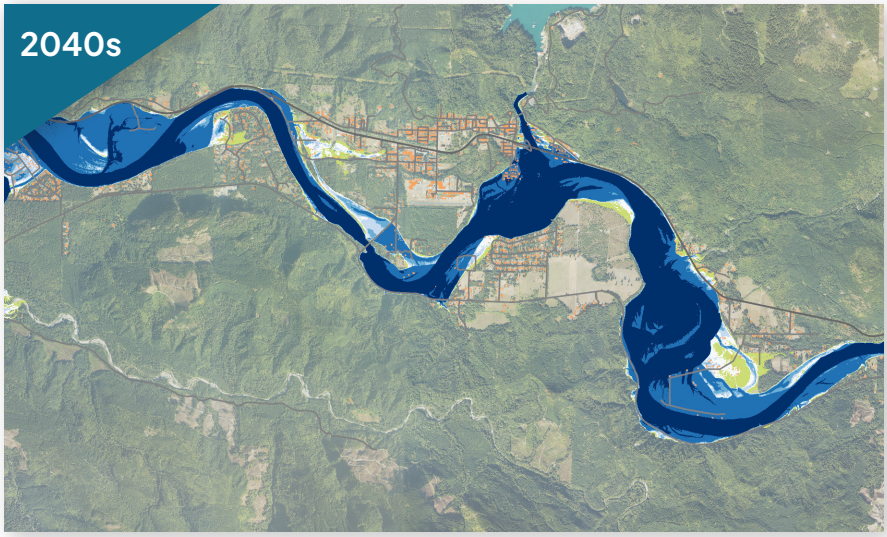
2080's flood extent for shown event

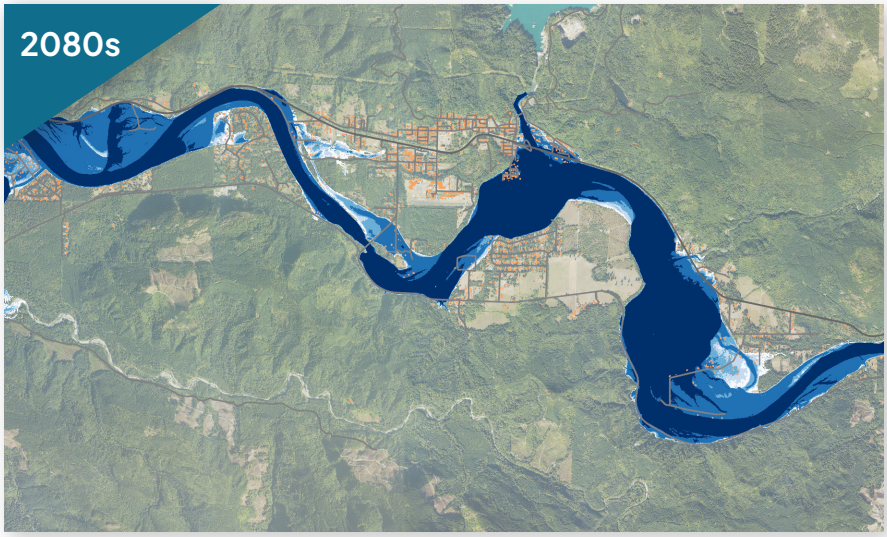
Buildings

0 0.5 1 Miles

Concrete | 100 Year Flood









Flood Depth (ft)

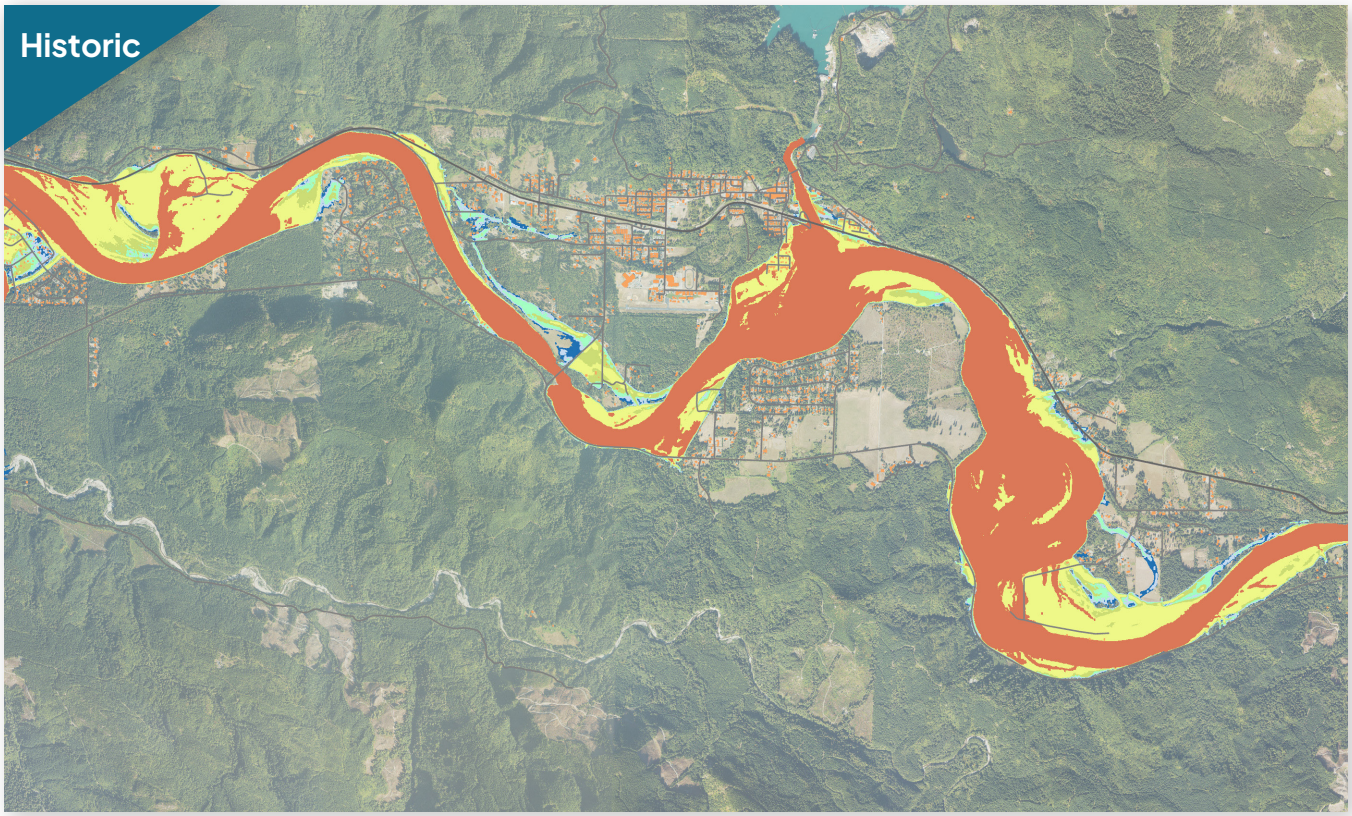
- 0–1.5
- 1.5–3
- 3–5
- 5–15
- >15

2080's flood extent for shown event

Buildings

0 0.5 1 Miles

Concrete | Depth-Velocity Hazard





Descriptions for Flood Hazard Rating Mapping (AIDR, 2017)

- Generally safe for vehicles, people, and buildings
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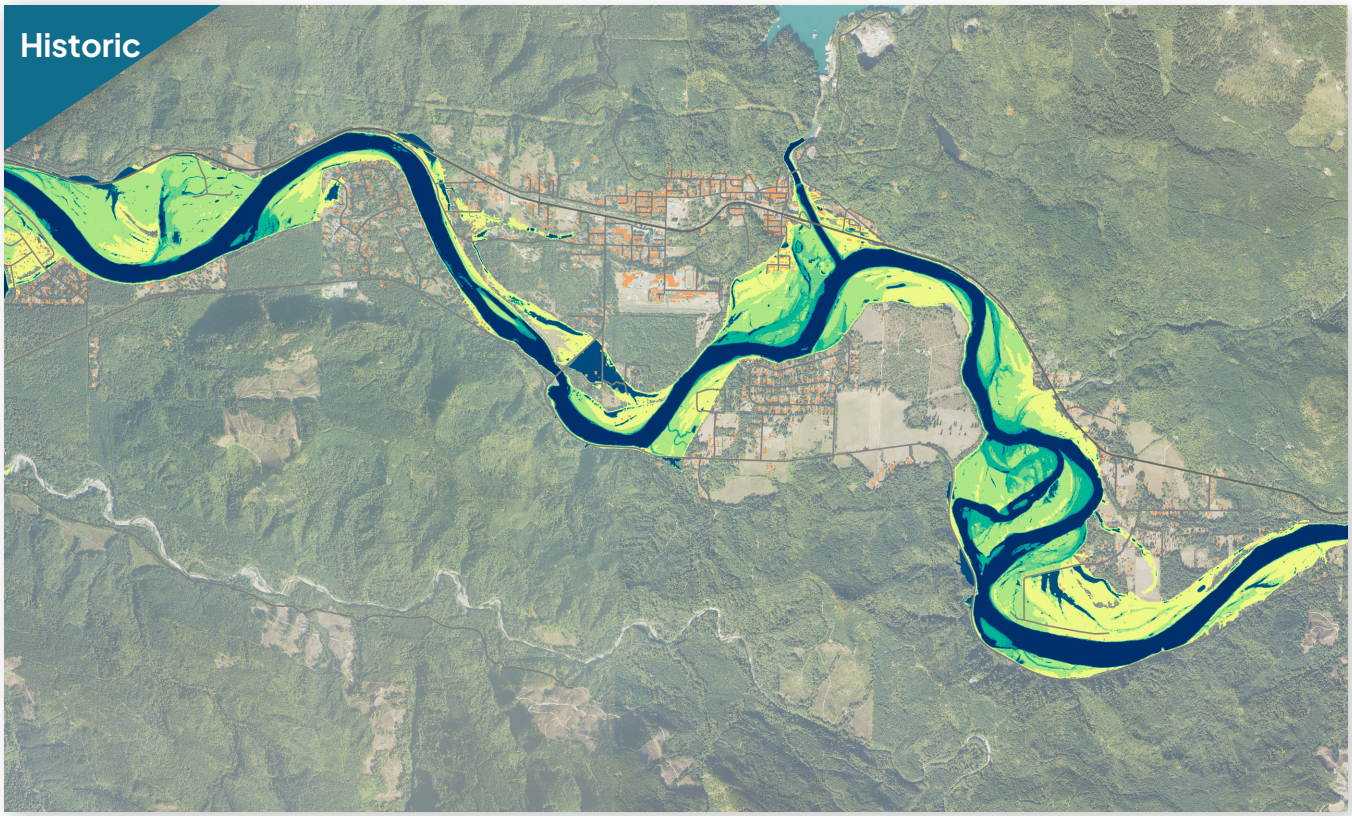
- Unsafe for vehicles, children, and the elderly
- Unsafe for vehicles and people
- Unsafe for vehicles and people. All building types vulnerable to structural damage.
- Unsafe for vehicles and people. All building types considered vulnerable to failure.

Buildings

0 0.5 1 Miles

Concrete | Duration





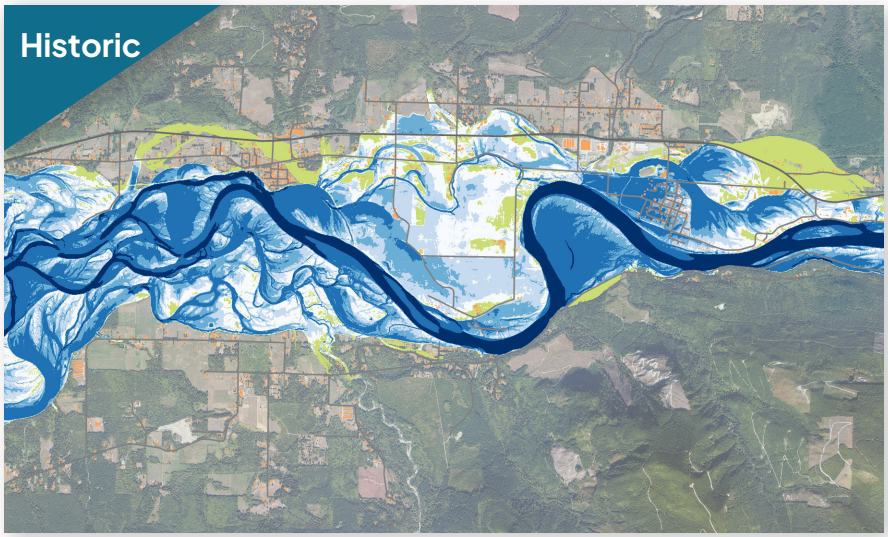
Duration (days)

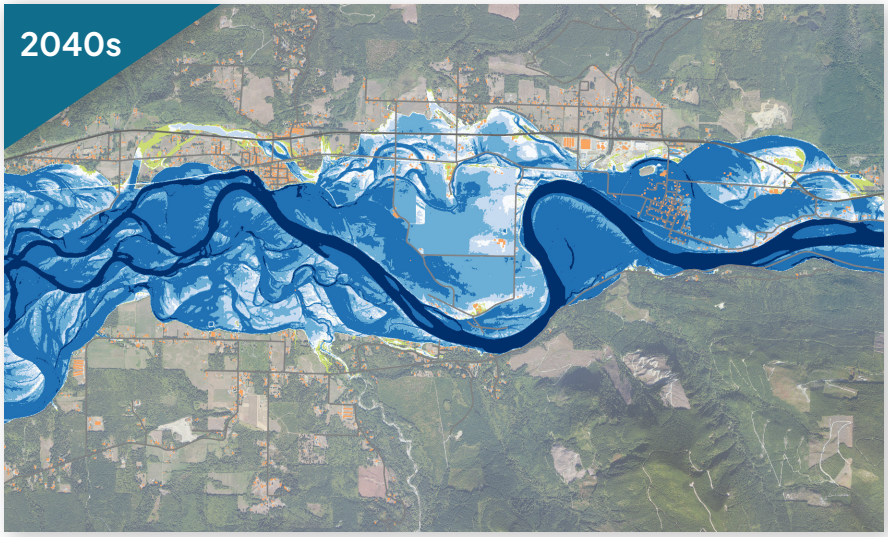
- 0 - 2
- 2 - 5
- 5 - 8
- 8 - 10
- 10 - 15
- 15 - 20
- 20 - 25
- 25 - 30
- >30

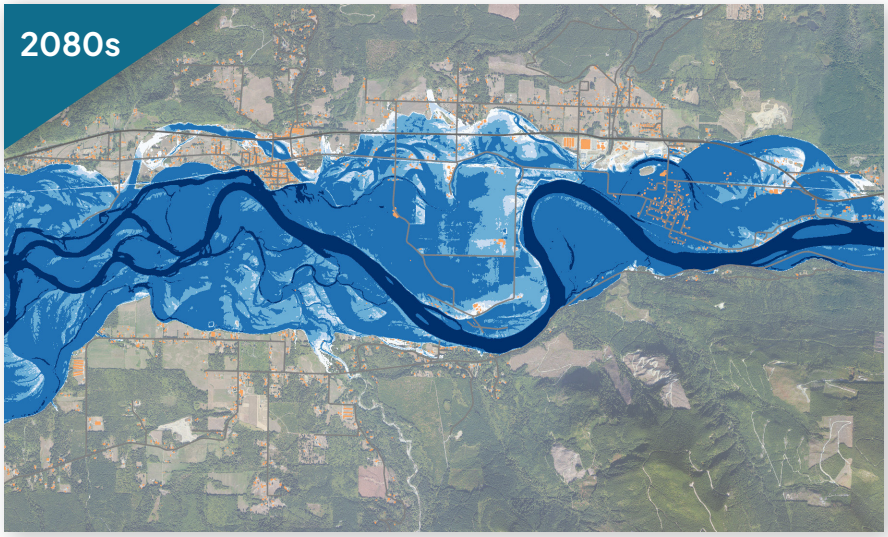
Buildings

0 0.5 1 Miles

Lyman and Hamilton | 10 Year Flood









Flood Depth (ft)

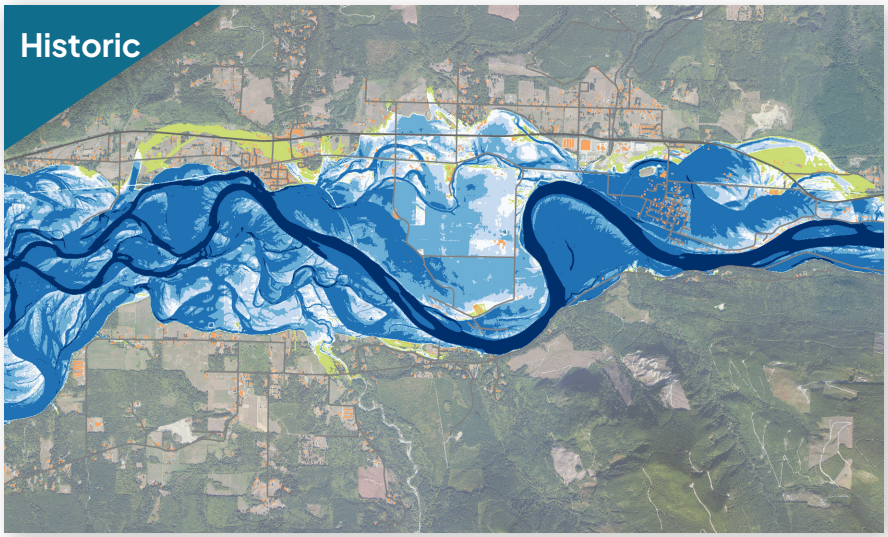
- 0–1.5
- 1.5–3
- 3–5
- 5–15
- >15

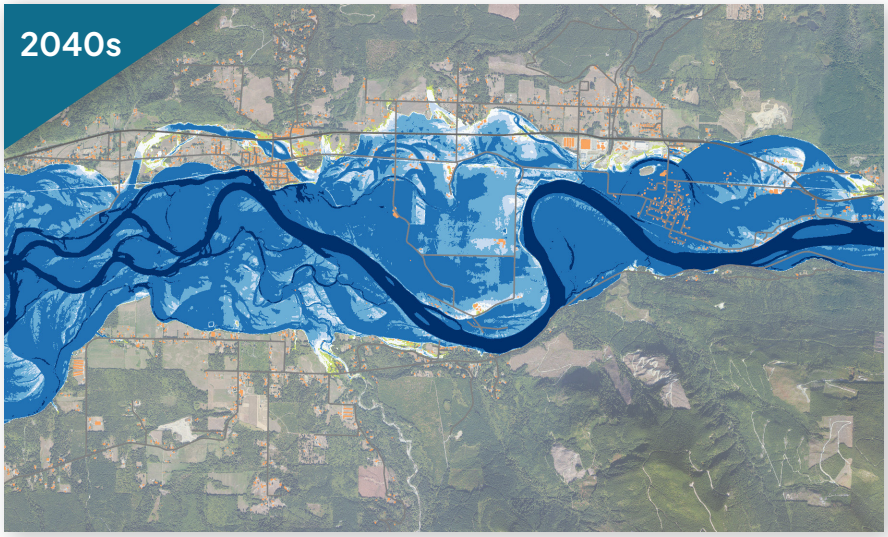
2080's flood extent for shown event

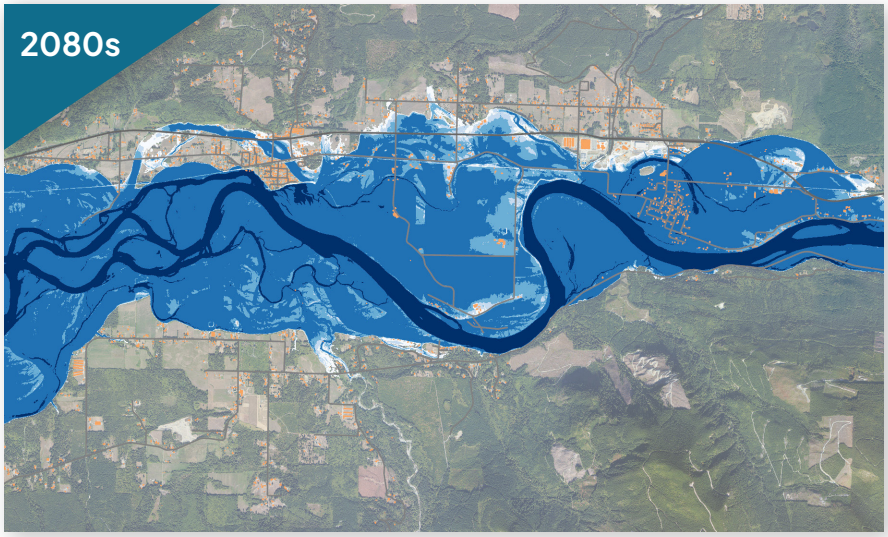
Buildings

0 0.5 1 Miles

Lyman and Hamilton | 25 Year Flood









Flood Depth (ft)

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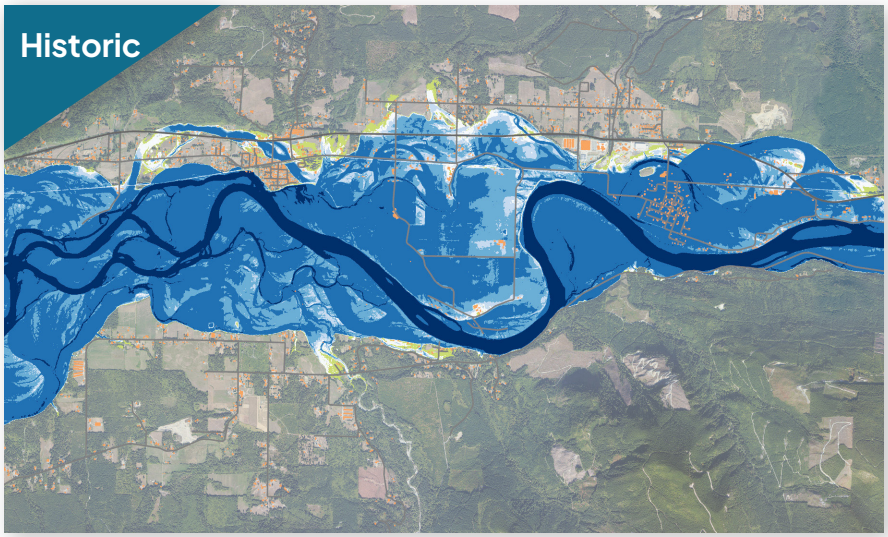
- 3–5
- 5–15
- >15

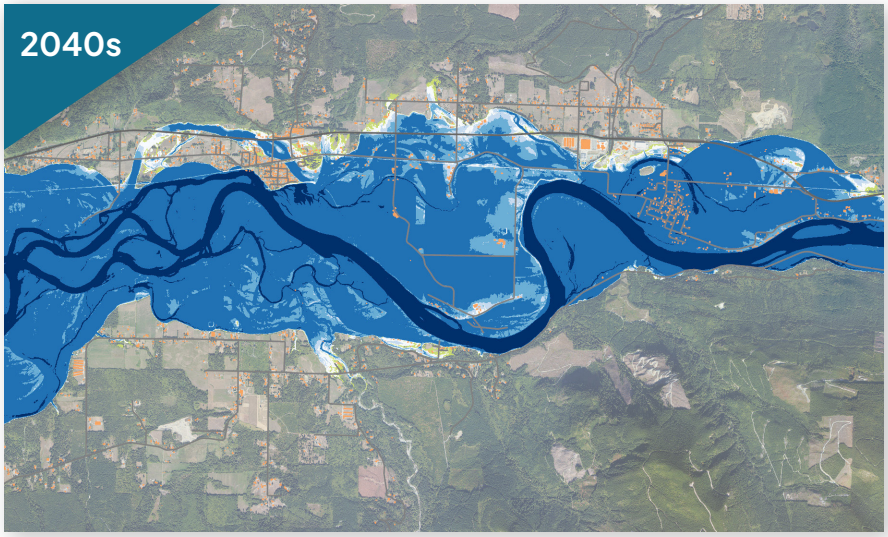
2080's flood extent for shown event

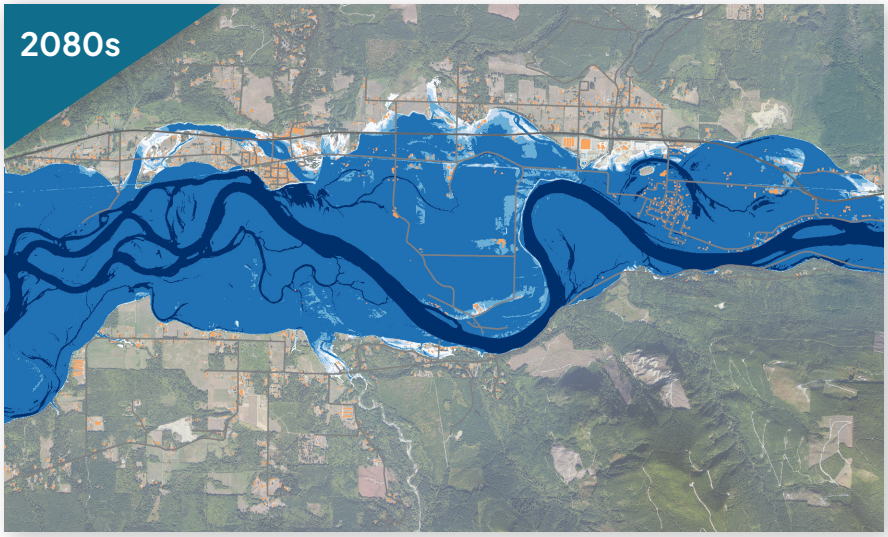
Buildings

0 0.5 1 Miles

Lyman and Hamilton | 100 Year Flood









Flood Depth (ft)

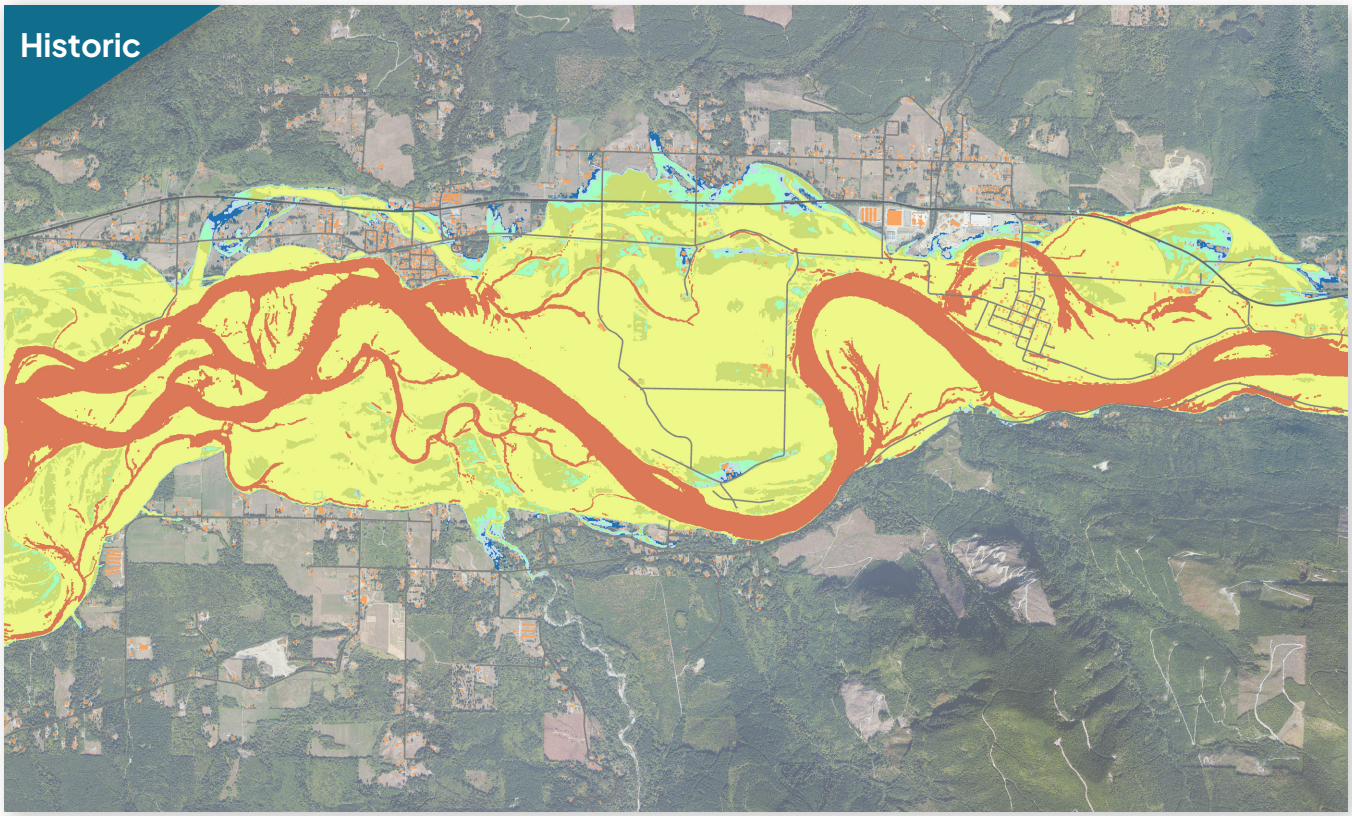
- 0–1.5
- 1.5–3
- 3–5
- 5–15
- >15

2080's flood extent for shown event

Buildings

0 0.5 1 Miles

Lyman and Hamilton | Depth-Velocity Hazard





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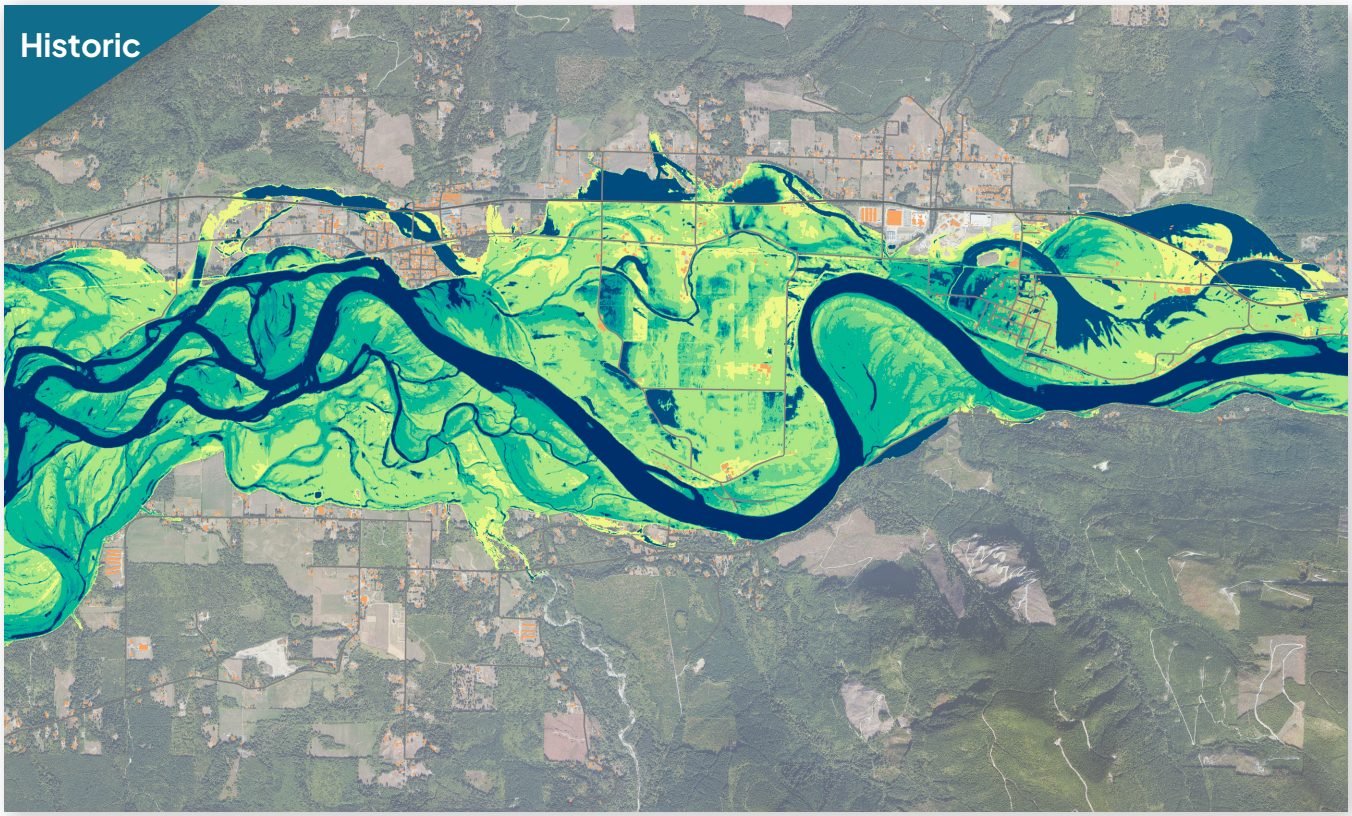
Buildings

0 0.5 1 Miles

Lyman and Hamilton | Duration





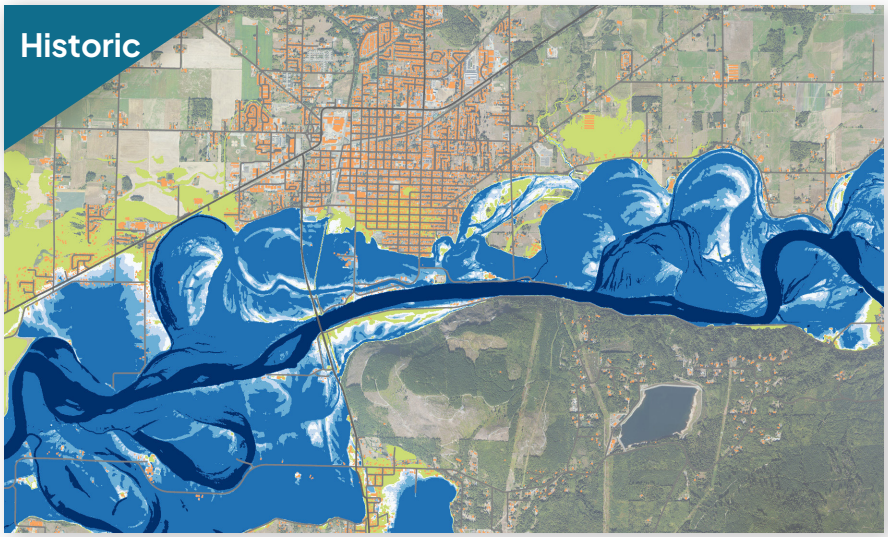
Duration (days)

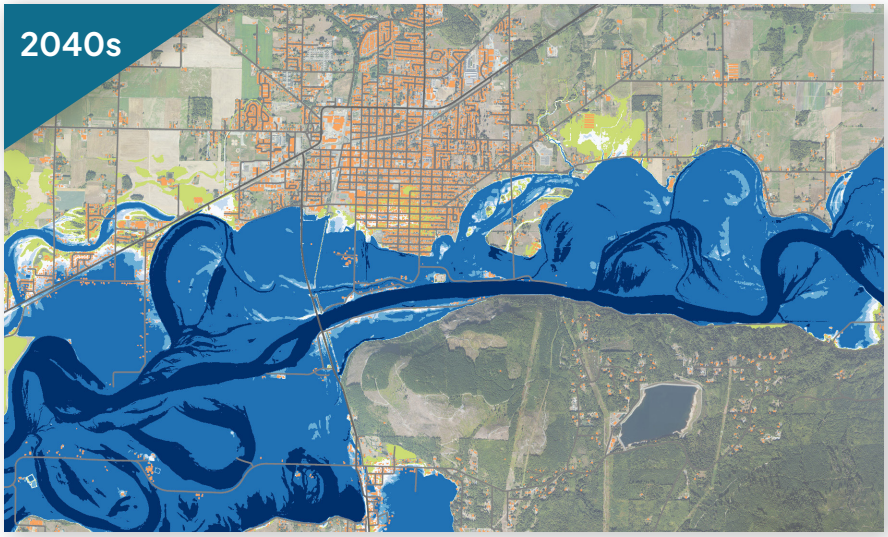
- 0 - 2
- 2 - 5
- 5 - 8
- 8 - 10
- 10 - 15
- 15 - 20
- 20 - 25
- 25 - 30
- >30

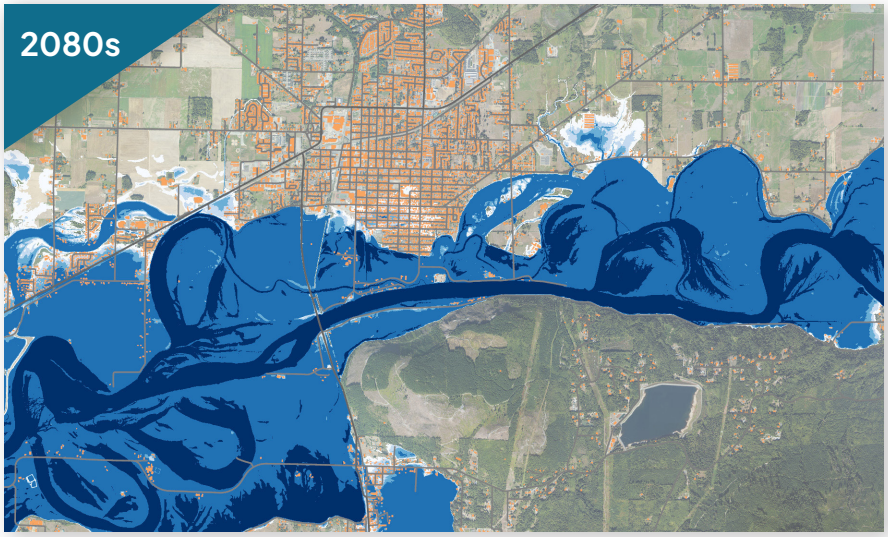
Buildings

0 0.5 1 Miles

Sedro-Woolley | 10 Year Flood









Flood Depth (ft)

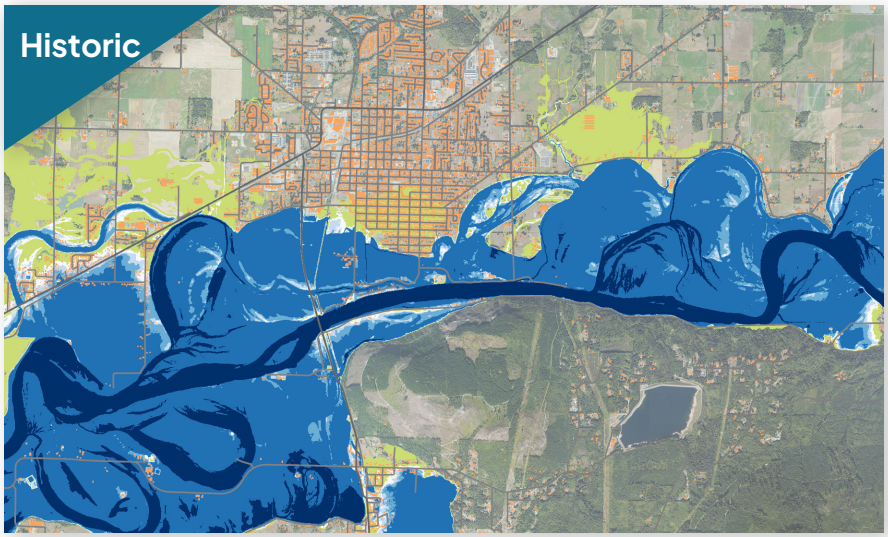
- 0–1.5
- 1.5–3
- 3–5
- 5–15
- >15

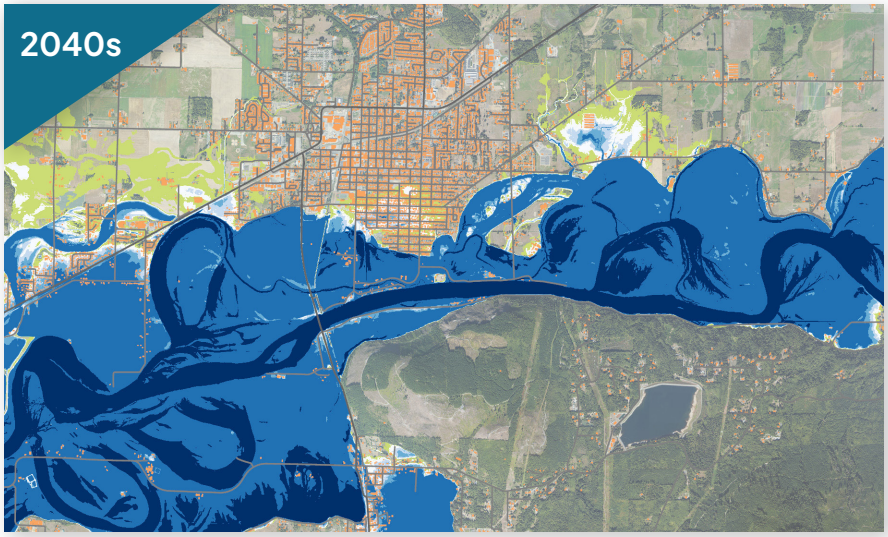
2080's flood extent for shown event

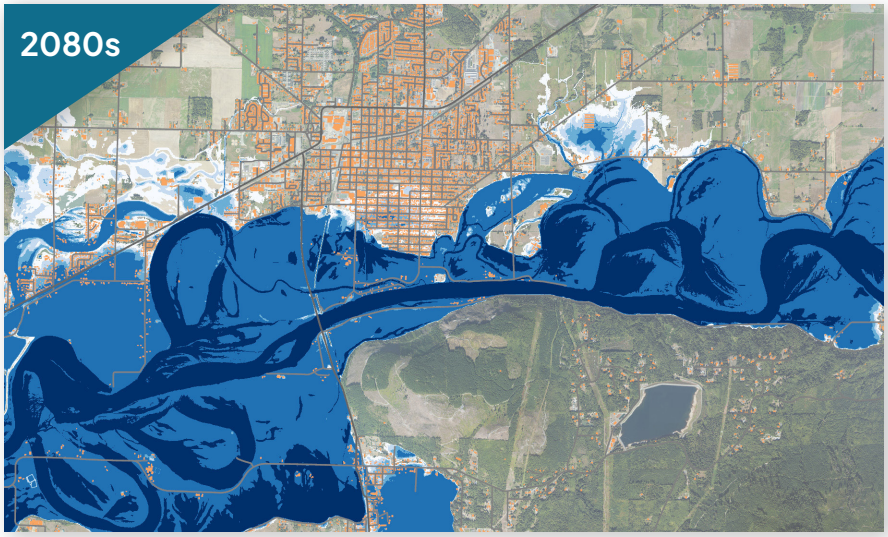
Buildings

0 0.5 1 Miles

Sedro-Woolley | 25 Year Flood









Flood Depth (ft)

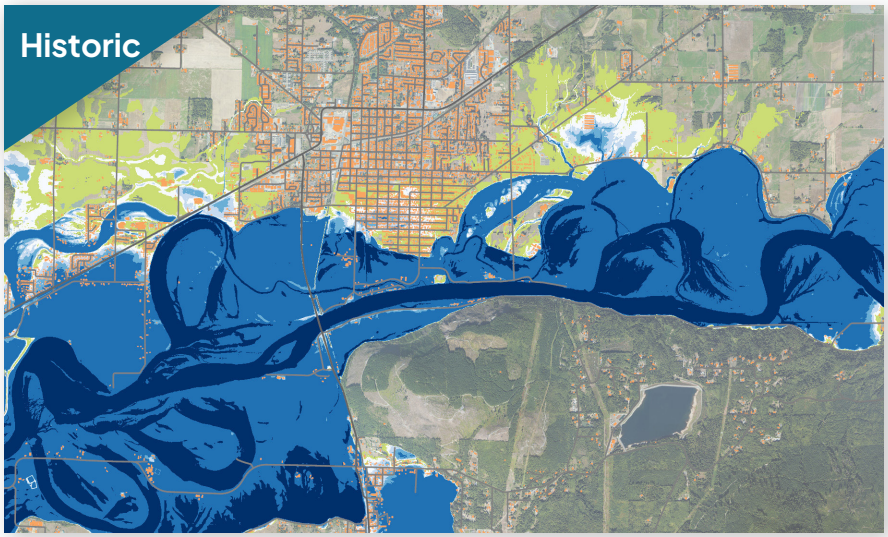
- 0–1.5
- 1.5–3
- 3–5
- 5–15
- >15

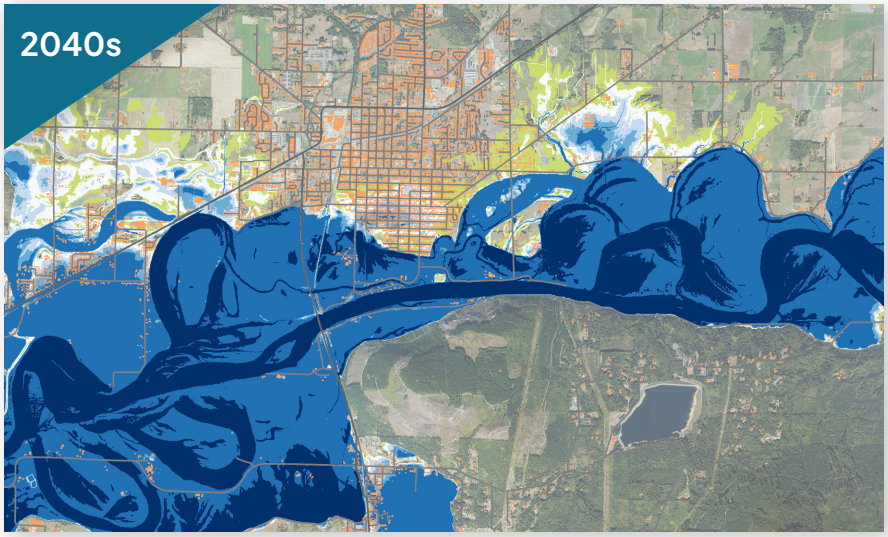
2080's flood extent for shown event

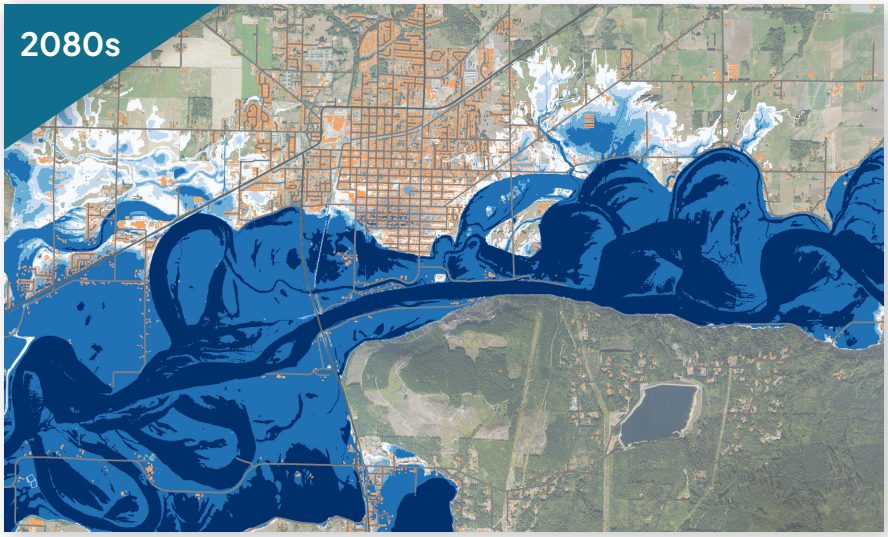
Buildings

0 0.5 1 Miles

Sedro-Woolley | 100 Year Flood









Flood Depth (ft)

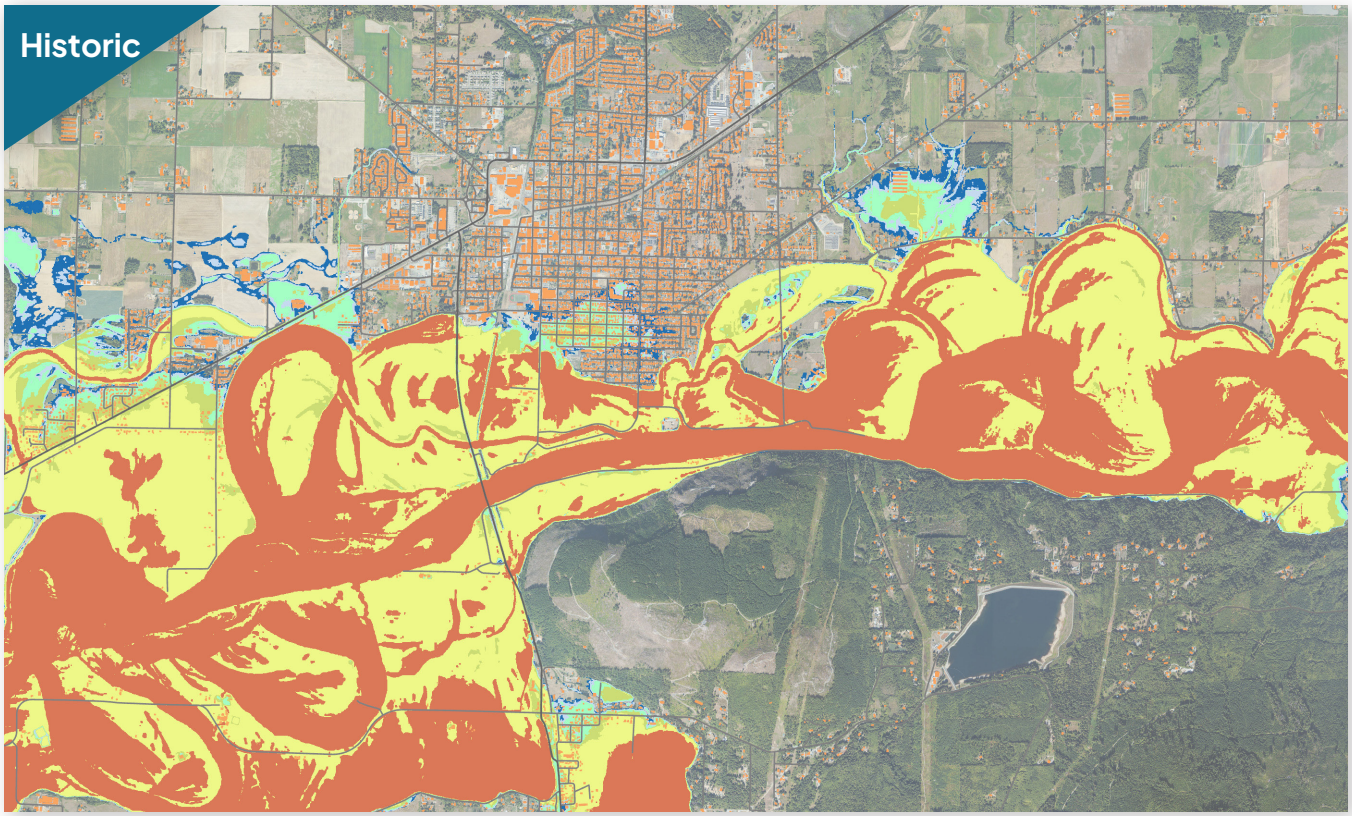
- 0–1.5
- 1.5–3
- 3–5
- 5–15
- >15

2080's flood extent for shown event

Buildings

0 0.5 1 Miles

Sedro-Woolley | Depth-Velocity Hazard





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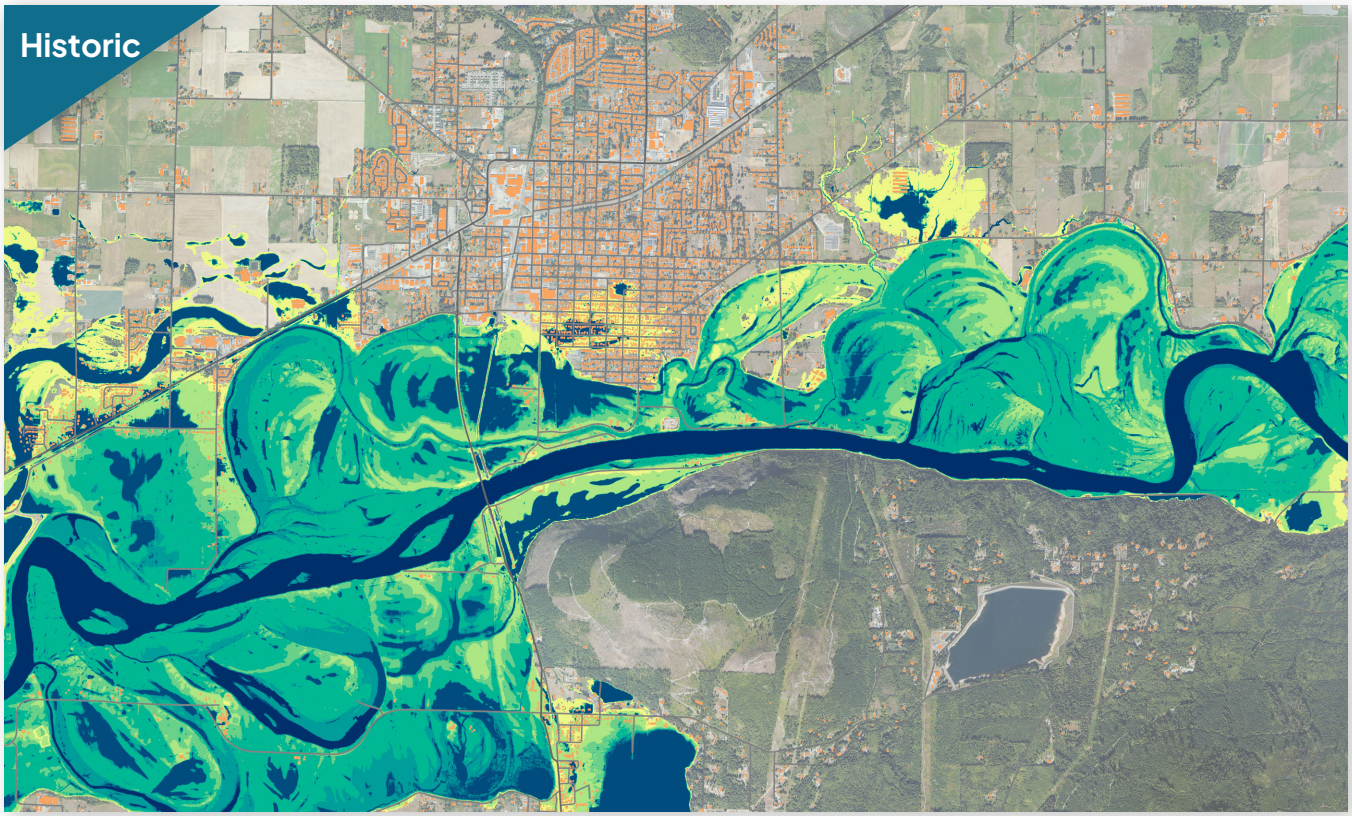
Buildings

0 0.5 1 Miles

Sedro-Woolley | Duration



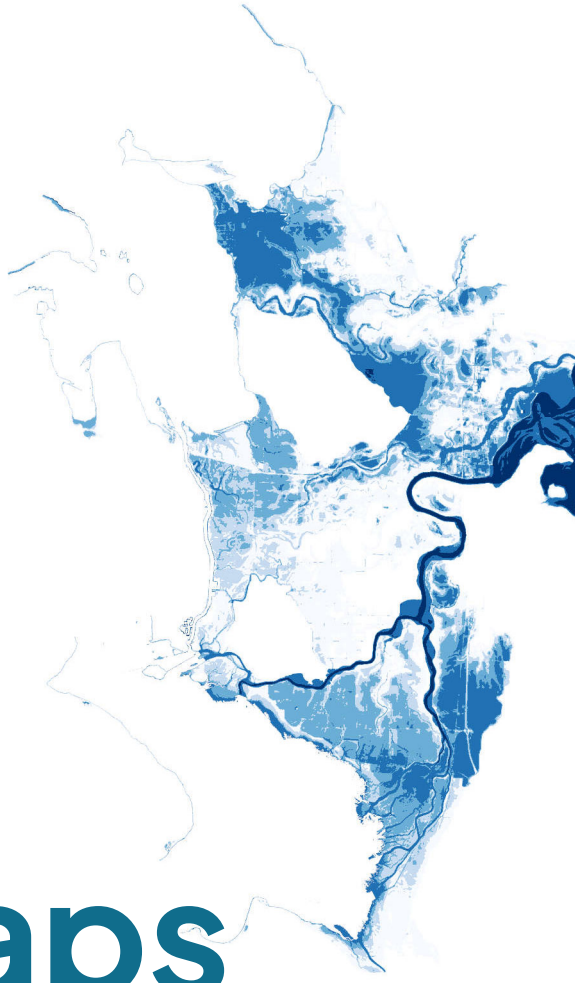


Duration (days)

- 0 - 2
- 2 - 5
- 5 - 8
- 8 - 10
- 10 - 15
- 15 - 20
- 20 - 25
- 25 - 30
- >30

Buildings

0 0.5 1 Miles



Lower River Flooding Maps

This map bundle shows Skagit River flood model results for areas downstream of Sedro-Woolley.

This set includes an overview map of the area and zoomed-in map areas for the cities of Burlington and Mount Vernon, the town of La Conner, the Swinomish Reservation and the unincorporated communities of Conway, Bow, and Edison. Full context for these maps can be found in the full *Understanding Current and Future Skagit Flood Risk Through New Modeling Capabilities* report and specific details on the hydraulic model that created these maps can be found in Appendix A. Flood animations for select locations can be found at the Skagit Climate Science Consortium website.

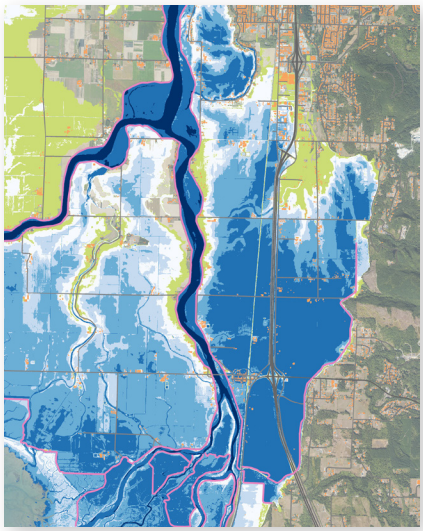
These maps are products of the hydraulic model detailed in Appendix A. They are provided without any warranty of performance or fitness for a particular purpose. They should not be depended upon as a sole source of information as they illustrate potential scales of flooding rather than exact locations and do not account for real-time changes like erosion, dike failures, larger than modeled events, or other factors. Maps should be used at your own risk.

How to Read Lower River Flooding Maps

What These Maps Show

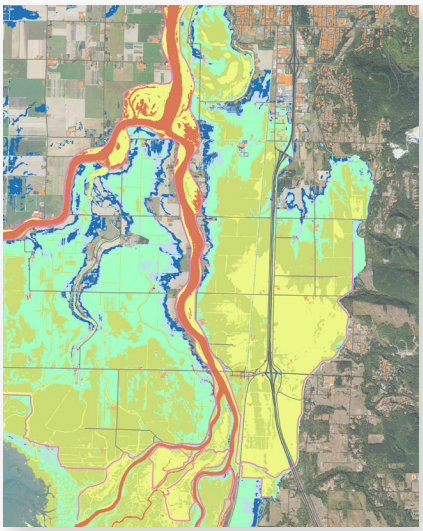
For all maps, the background is based on an aerial image (USDA 2023) and structures are shown as orange rectangles (Microsoft 2022). Pink lines, if present, show dike locations (Skagit County 2022), and dark gray lines show major transportation routes (WSDOT 2008, Skagit County 2019). The river channel itself may change colors depending on the map, but is the darkest shading in all maps.

FLOOD DEPTH MAPS



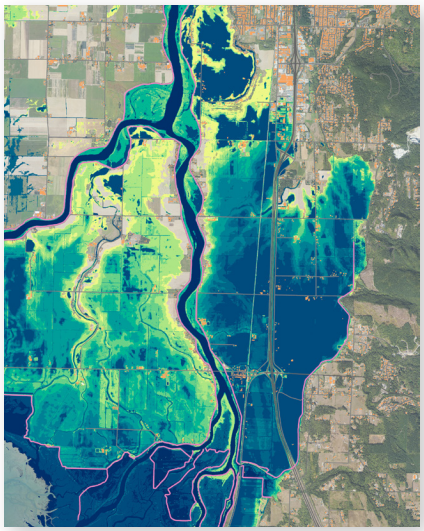
These maps are organized into sets of three, showing results for Historic (top), 2040s (middle), and 2080s (bottom) flood magnitudes. Each set of maps shows the model results for a specific flood frequency: 10-year, 25-year, and 100-year. Maps show the depth of flooding in shades of blue, where darker blue indicates deeper water and lighter blue indicates shallower water. In order to see how flooding is projected to change in the future, the Historic and 2040s maps also show the estimated extent of the 2080s flood in bright green. There is no bright green shading for the 2080s map because the map is already showing the depth and extent of the 2080s flood. All three maps are at the same scale.

DEPTH-VELOCITY HAZARD MAPS



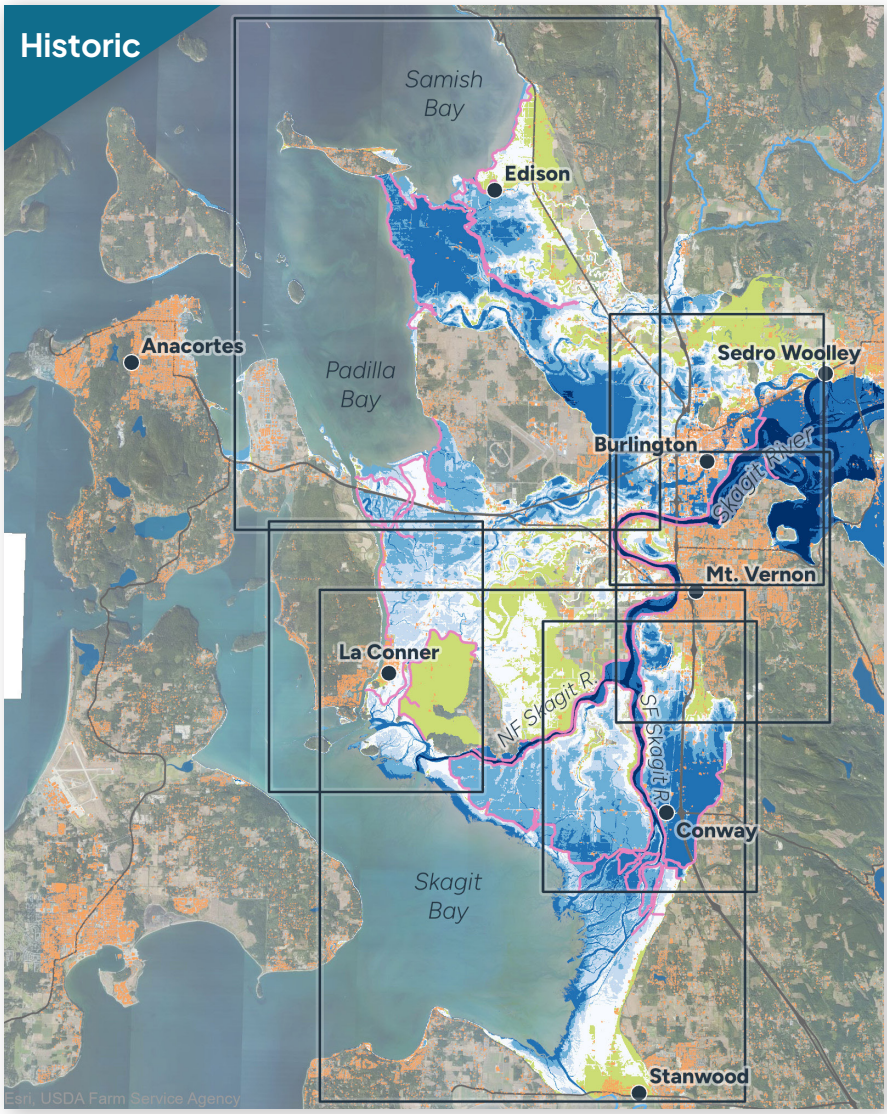
These maps show depth-velocity hazards for a historic 100-year event. Only the historic results are shown; maps for the 2040s or 2080s are not included. The hazard classifications shown in the key were assigned based on a standard international practice (AIDR, 2017) and grouped into six hazard ratings. The hazard mapping is based on clearwater hazards and does not account for secondary hazards such as shoreline and fluvial geomorphic hazards (e.g., erosion, avulsion, debris flows, alluvial fan, etc.). Colors show when water poses a risk to children, adults, vehicles, and structures due to depth, velocity, or a combination of the two.

DURATION MAPS



These maps show the amount of time, in days, that each location is inundated during a historic 100-year flood event and do not include flows estimated for the 2040s or 2080s. Duration is shown in shades ranging from dark blue to yellow, with darker shading indicating a longer duration, and lighter shading indicating a shorter duration of flooding.

Overview Map





Flood Depth (ft)

- 0–1.5
- 1.5–3
- 3–5
- 5–15
- >15

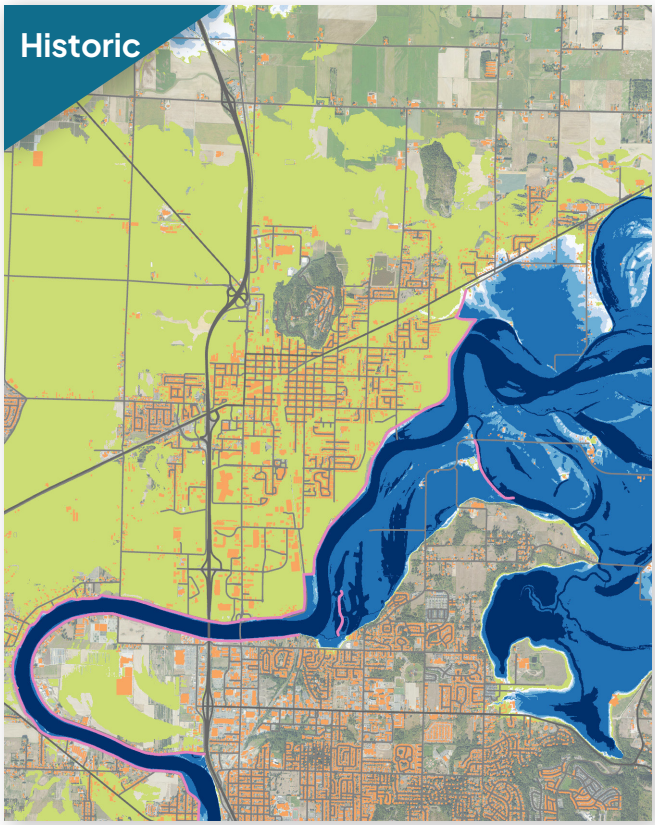
2080's flood extent for shown event

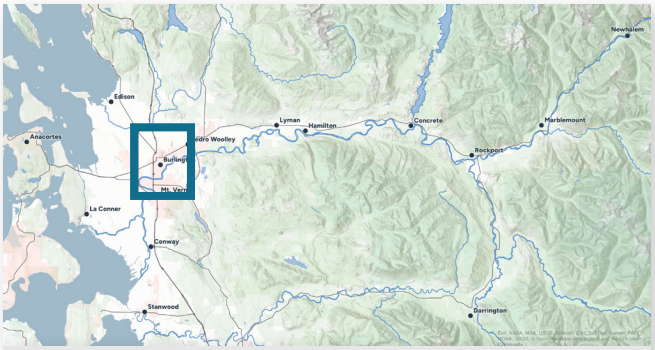
Buildings

Dike or Coastal Dike

0 2.5 5 Miles

Burlington | 10 Year Flood





Flood Depth (ft)

- 0–1.5
- 1.5–3
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- >15

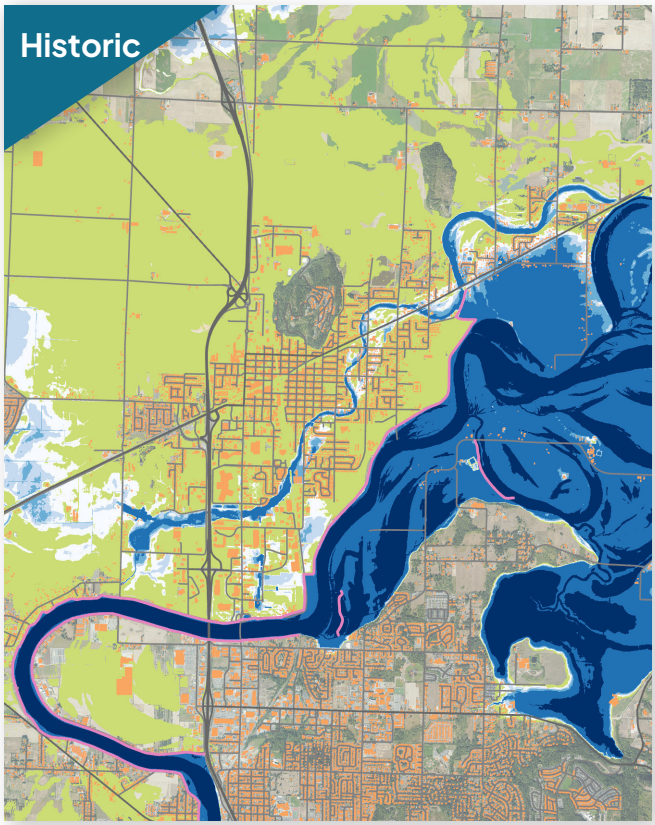
- 2080's flood extent for shown event
- Buildings
- Dike or Coastal Dike

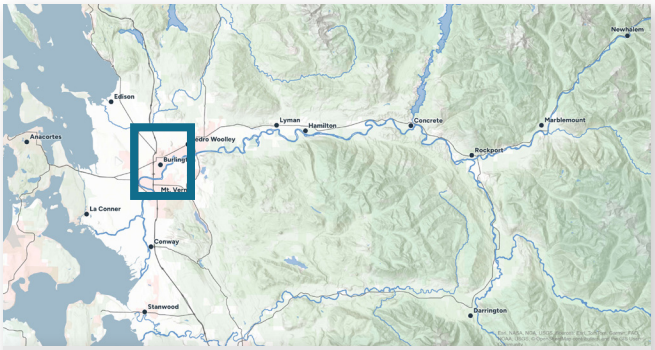
0 0.5 1 Miles





Burlington | 25 Year Flood





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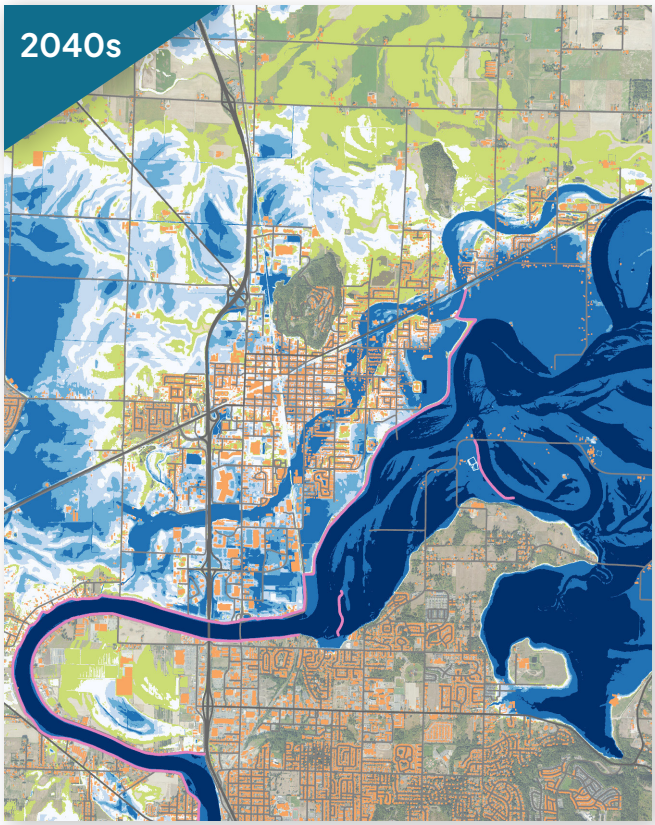
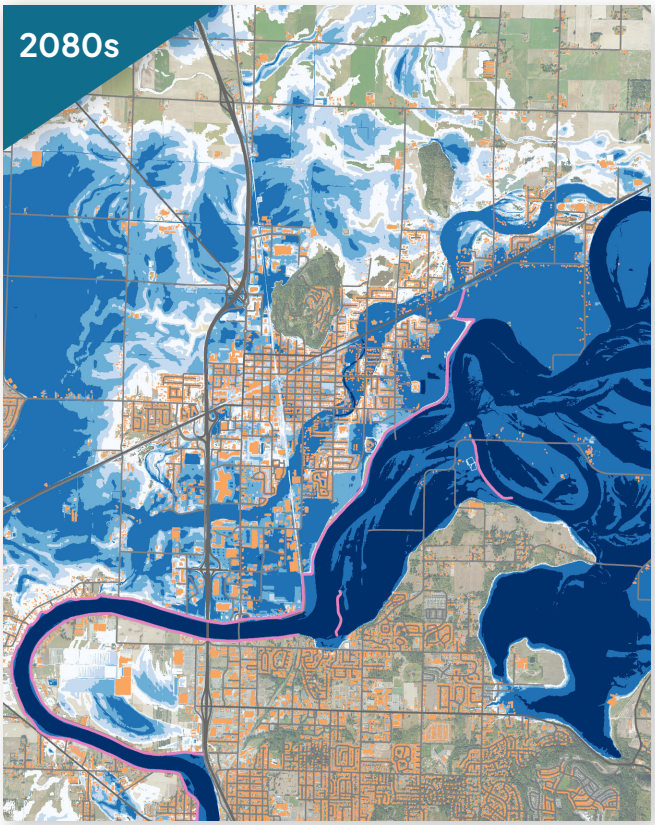
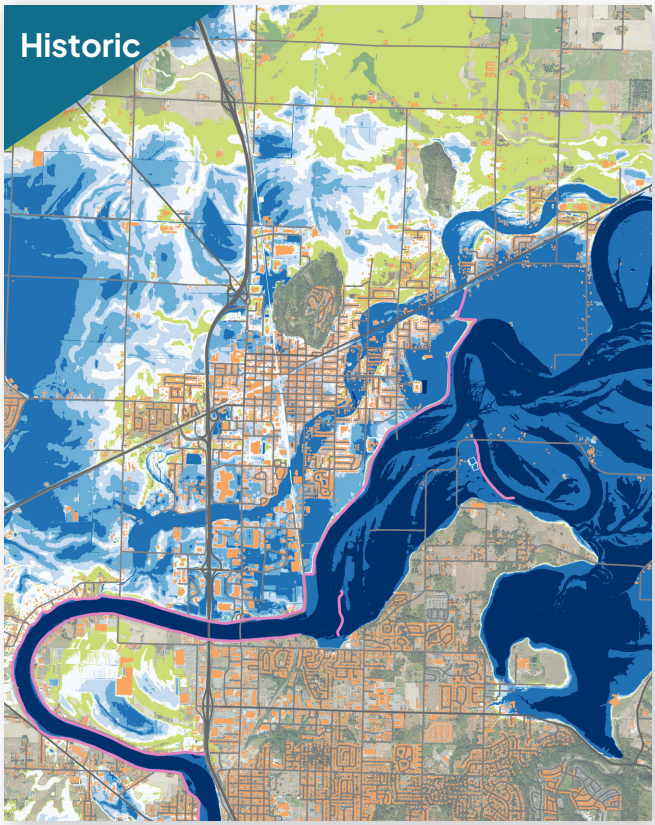
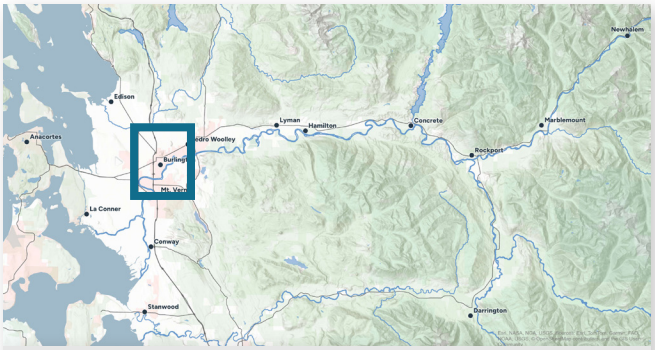




Burlington | 100 Year Flood





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- 0–1.5
- 1.5–3
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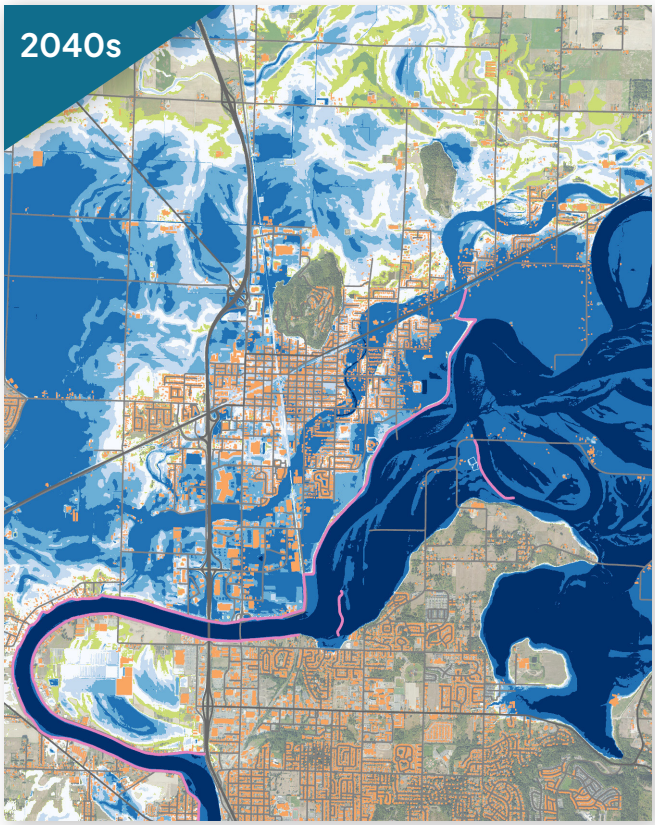
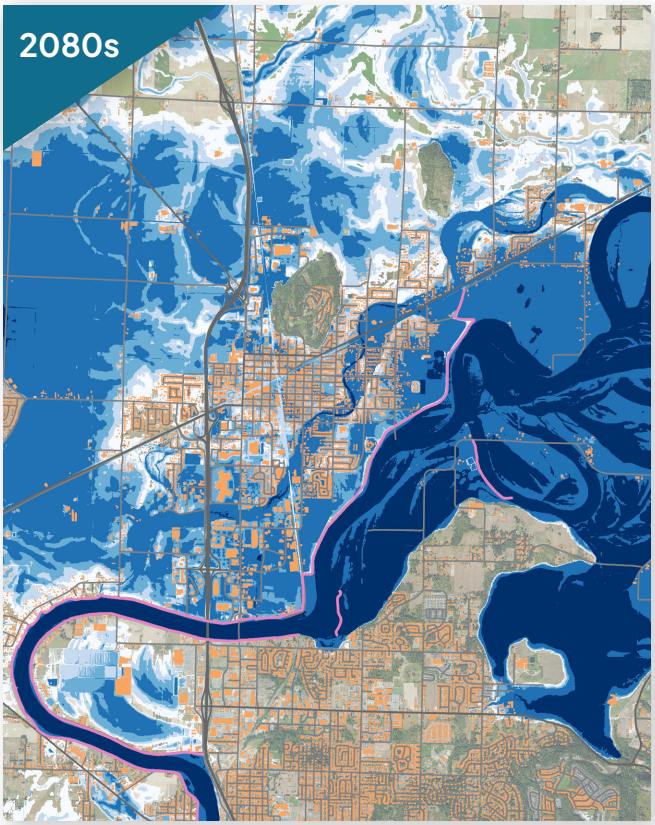
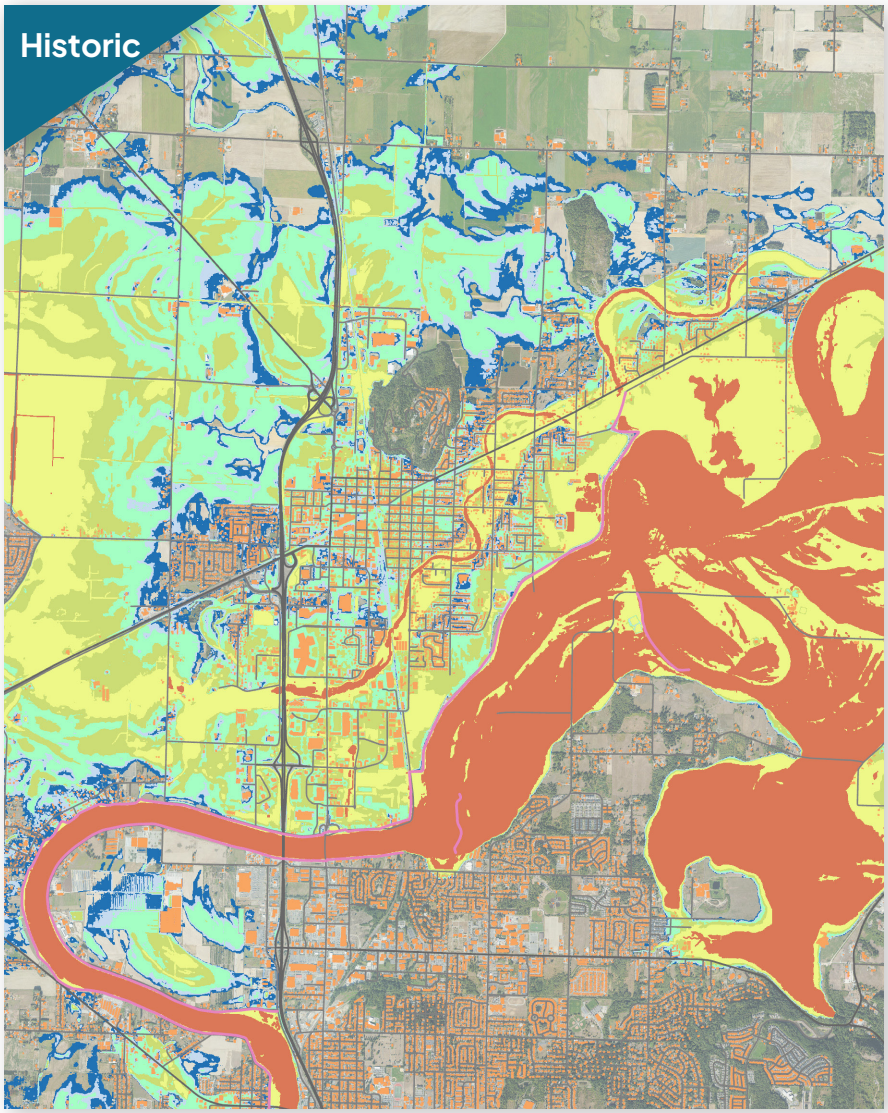
- Buildings
- Dike or Coastal Dike

0 0.5 1 Miles





Burlington | Depth-Velocity Hazard





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- Buildings
- Dike or Coastal Dike

0 0.5 1 Miles

Burlington | Duration





Duration (days)

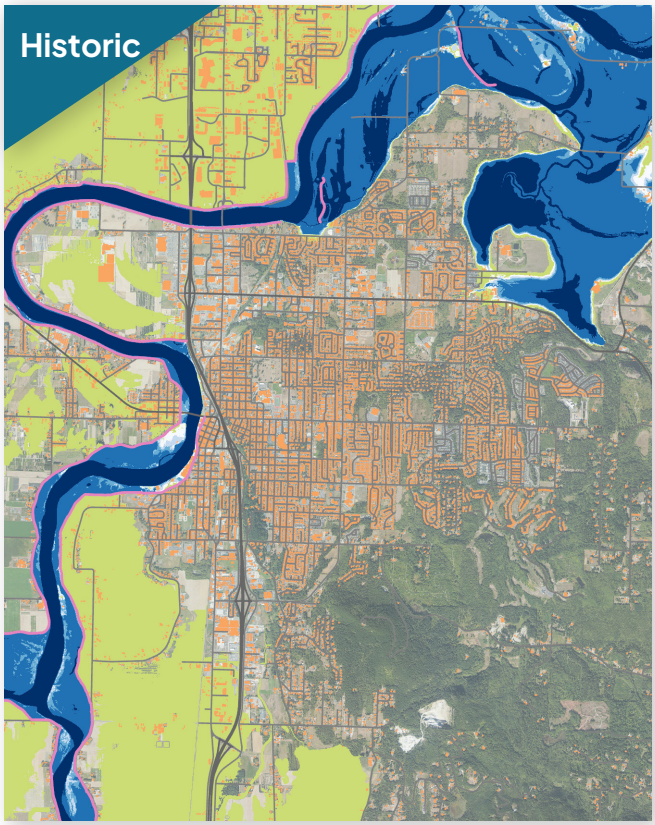
- 0 - 2
- 2 - 5
- 5 - 8
- 8 - 10
- 10 - 15
- 15 - 20
- 20 - 25
- 25 - 30
- >30

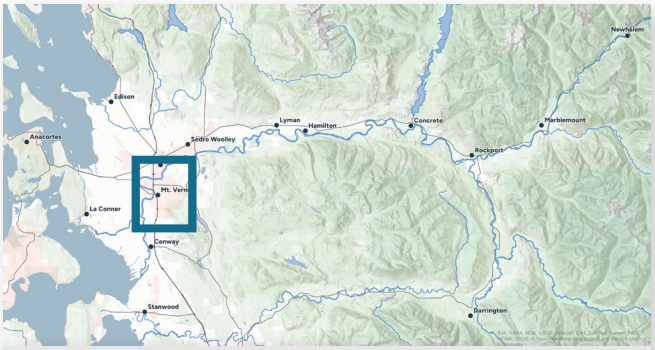
Buildings

Dike or Coastal Dike

0 0.5 1 Miles

Mount Vernon | 10 Year Flood





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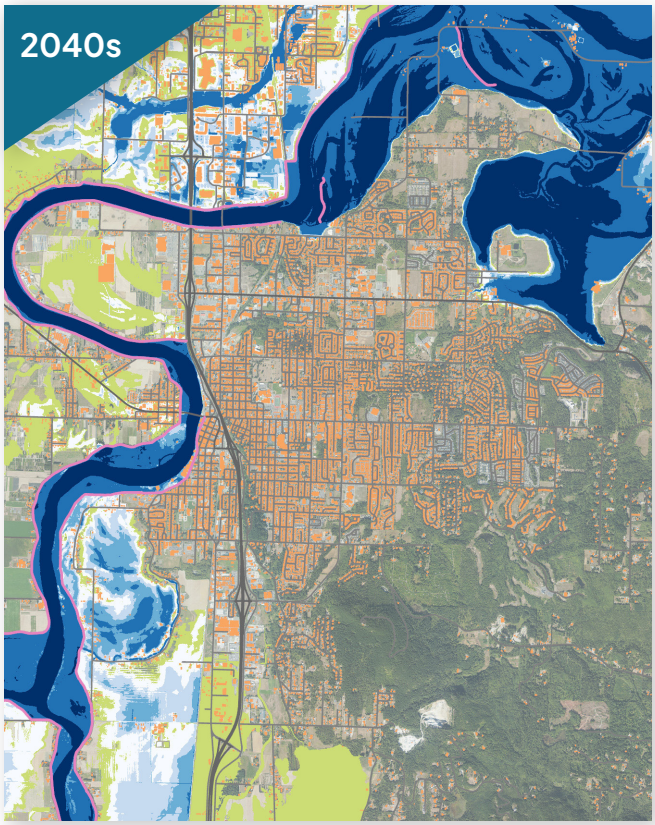
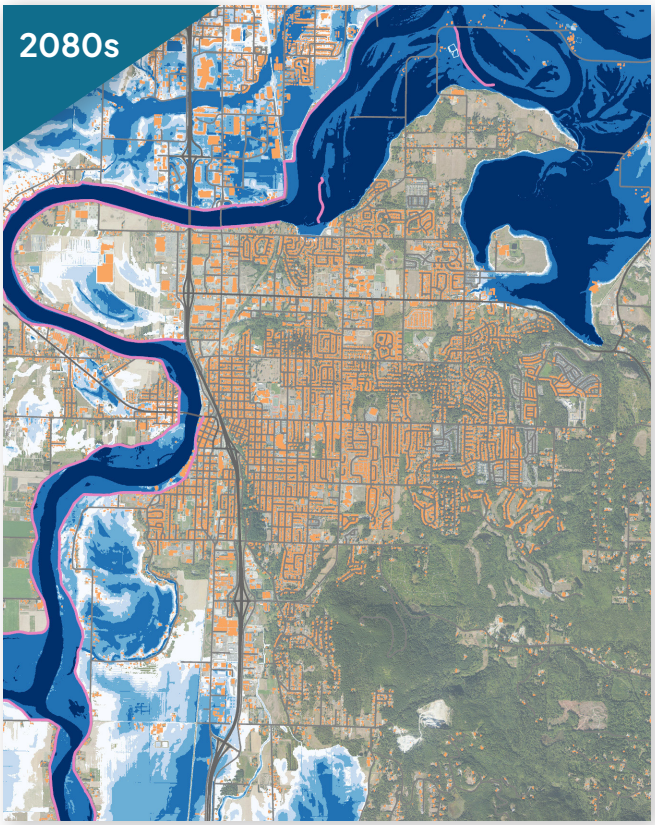
- 0–1.5
- 1.5–3
- 3–5
- 5–15
- >15

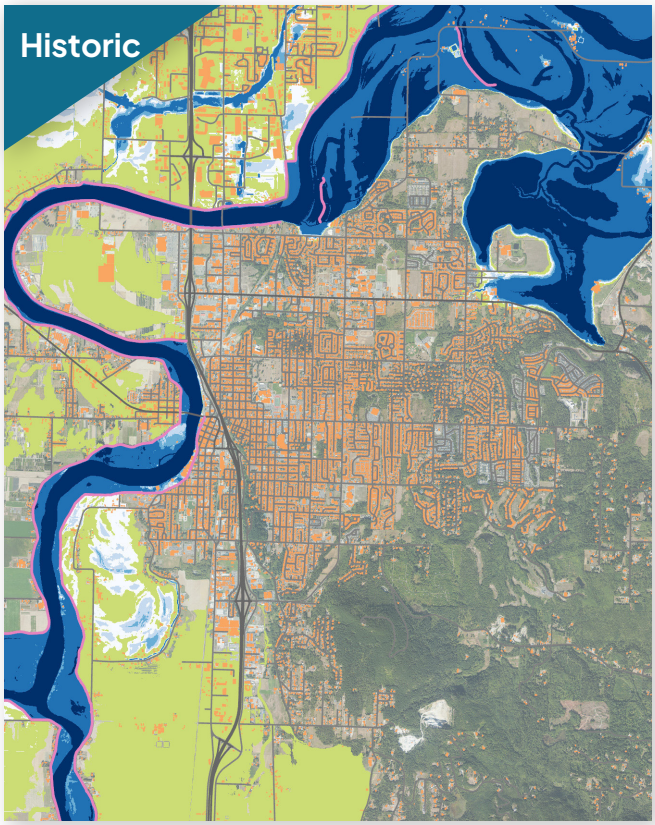
- 2080's flood extent for shown event
- Buildings
- Dike or Coastal Dike

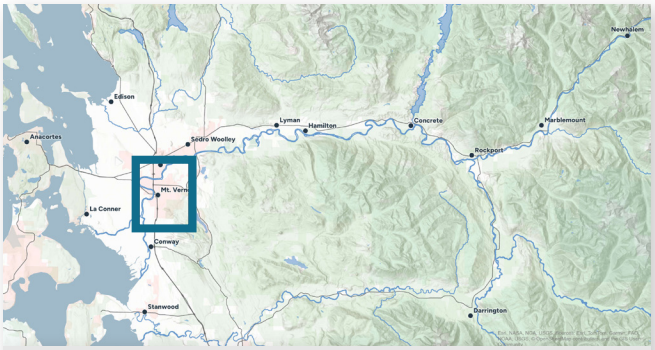
0 0.5 1 Miles





Mount Vernon | 25 Year Flood



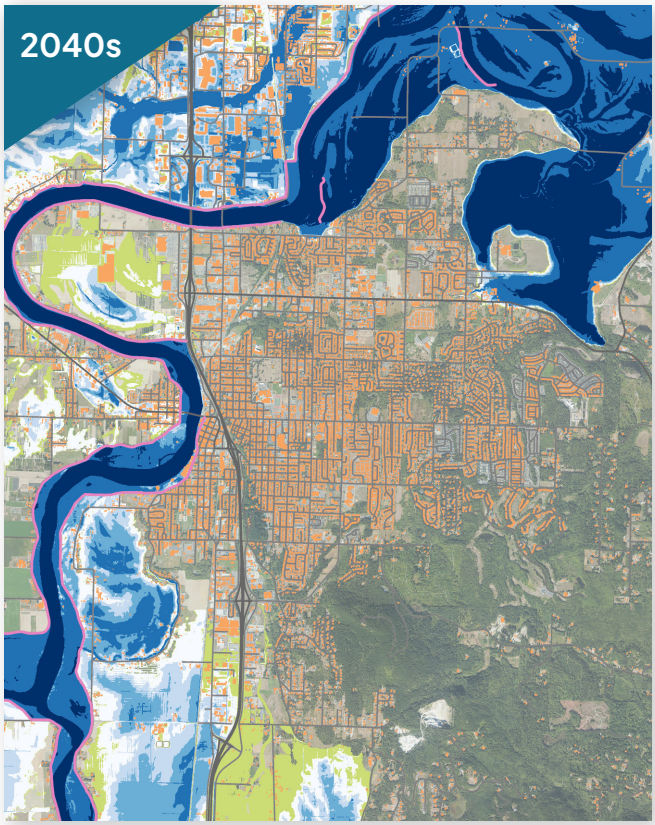


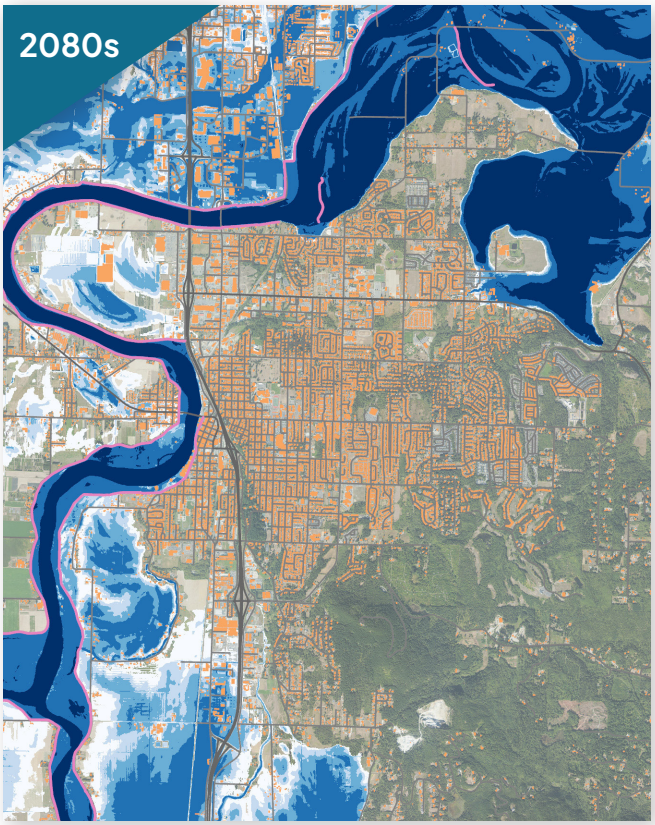
Flood Depth (ft)

- 0–1.5
- 1.5–3
- 3–5
- 5–15
- >15

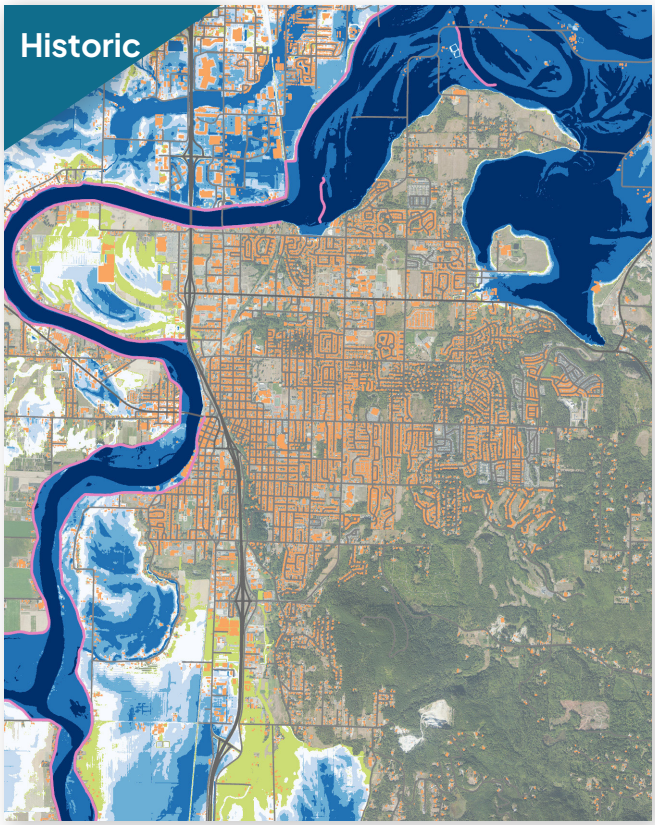
- 2080's flood extent for shown event
- Buildings
- Dike or Coastal Dike

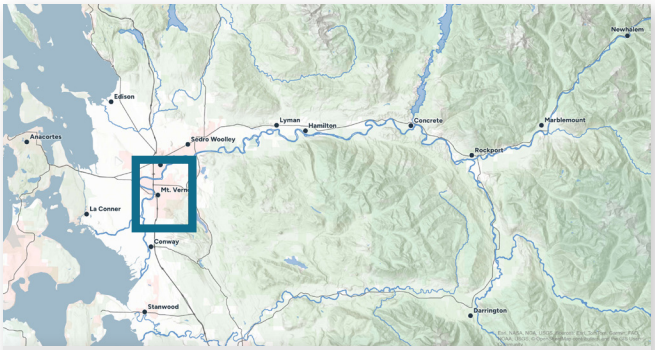
0 0.5 1 Miles





Mount Vernon | 100 Year Flood





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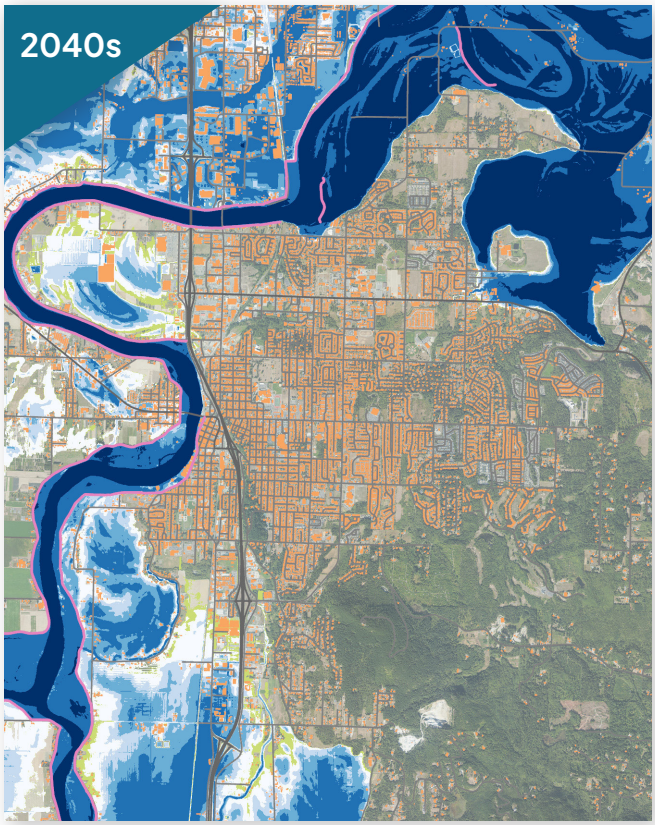
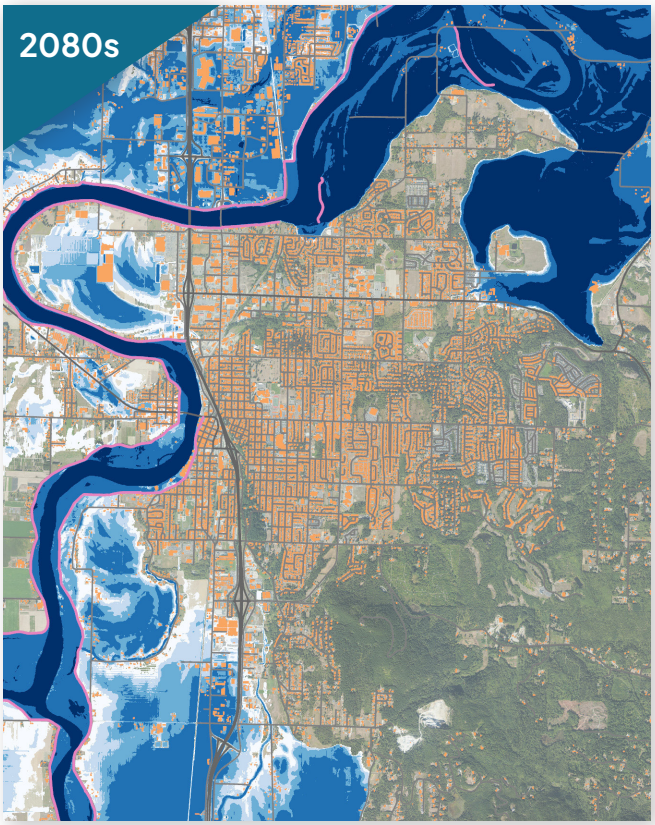
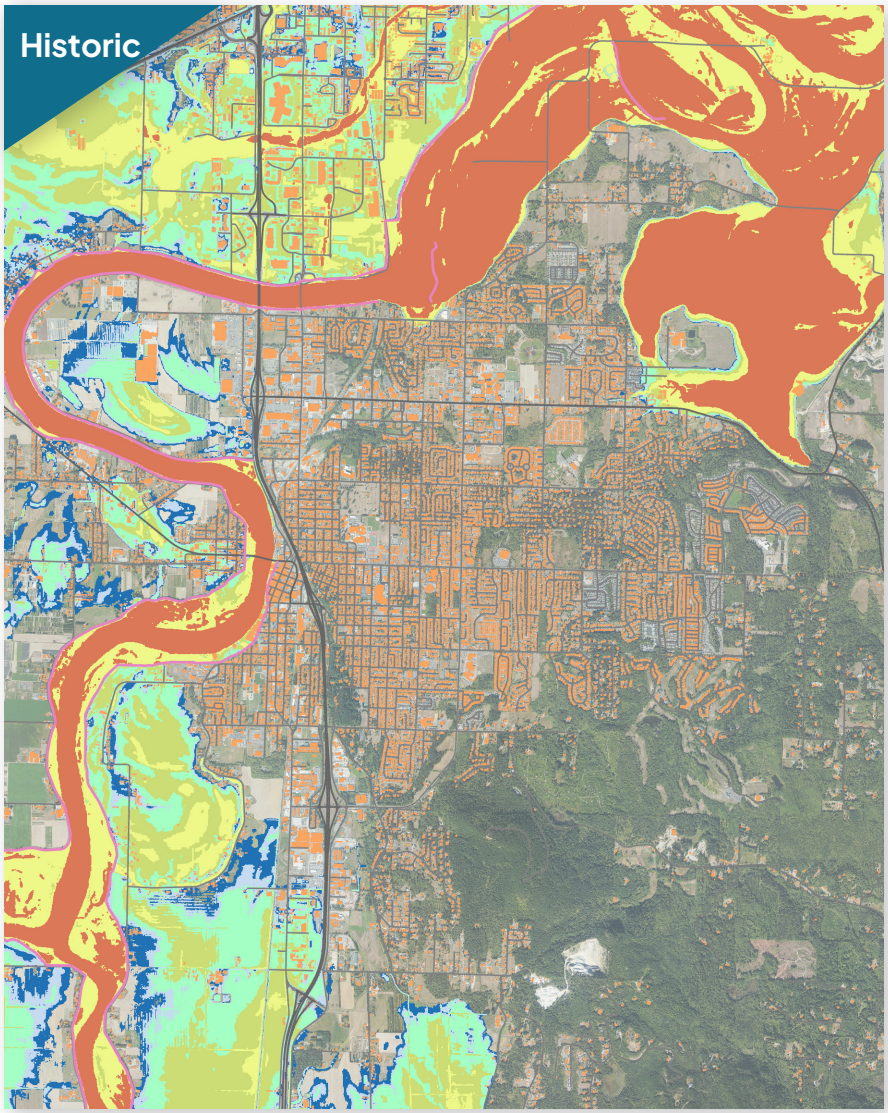
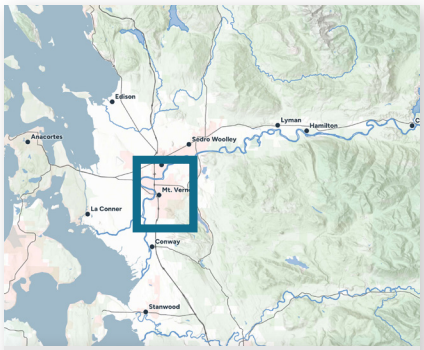




Mount Vernon | Depth-Velocity Hazard





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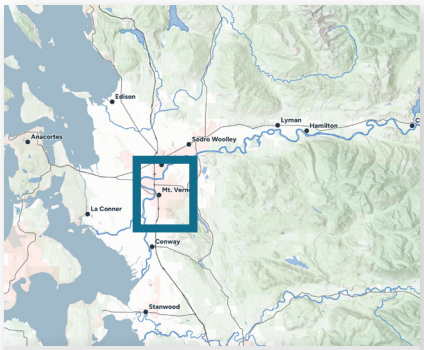
Buildings

Dike or Coastal Dike

0 0.5 1 Miles

Mount Vernon | Duration





Duration (days)

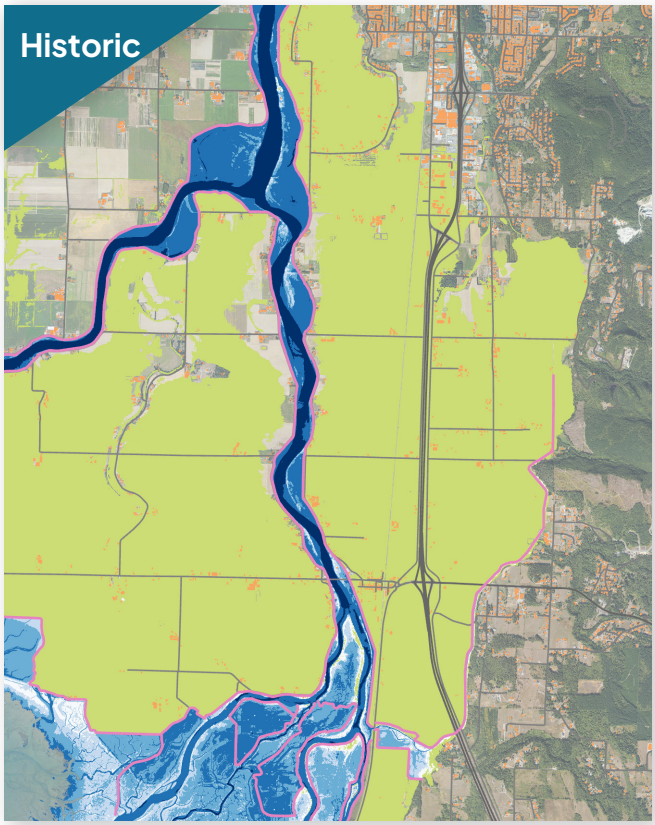
- 0 - 2
- 2 - 5
- 5 - 8
- 8 - 10
- 10 - 15
- 15 - 20
- 20 - 25
- 25 - 30
- >30

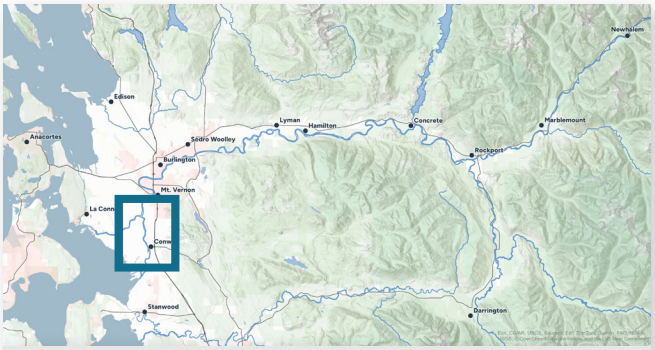
Buildings

Dike or Coastal Dike

0 0.5 1 Miles

Conway | 10 Year Flood





Flood Depth (ft)

- 0–1.5
- 1.5–3
- 3–5
- 5–15
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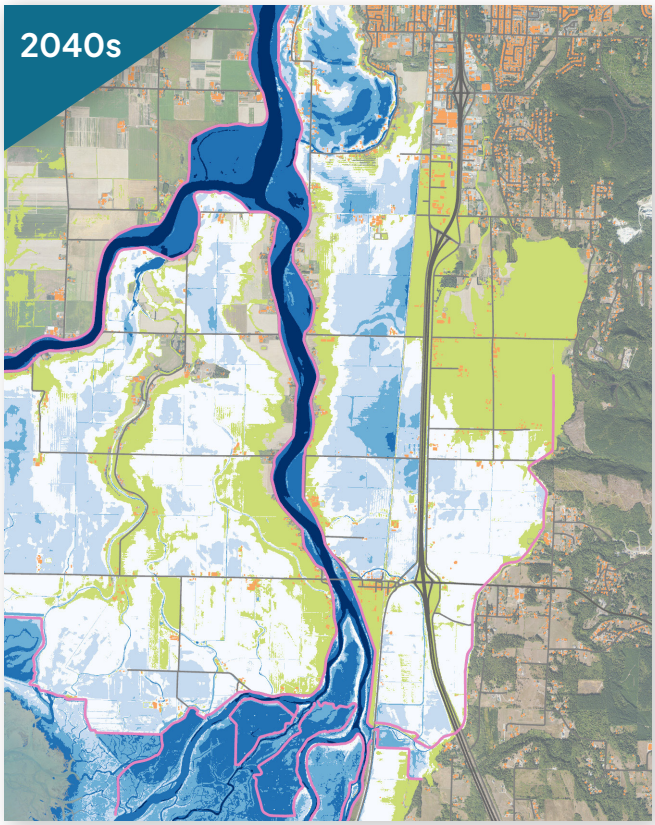
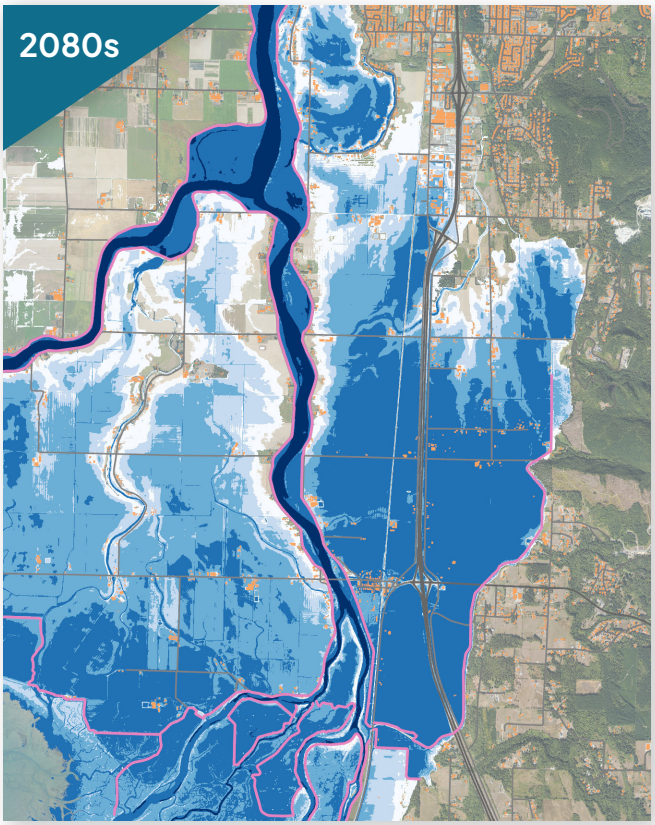
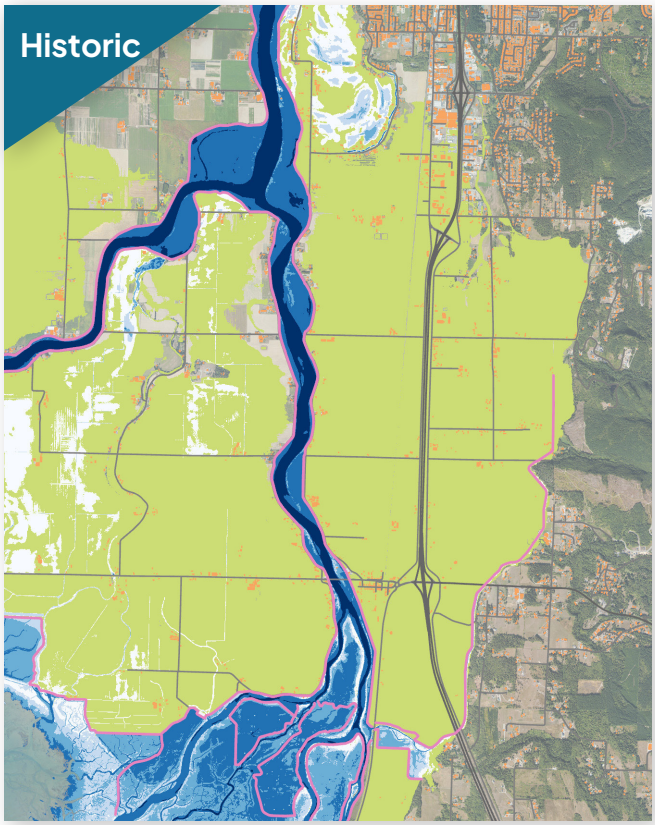
- Buildings
- Dike or Coastal Dike

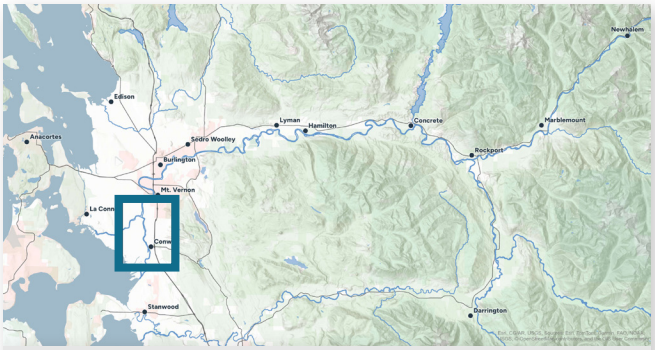
0 0.5 1 Miles





Conway | 25 Year Flood





Flood Depth (ft)

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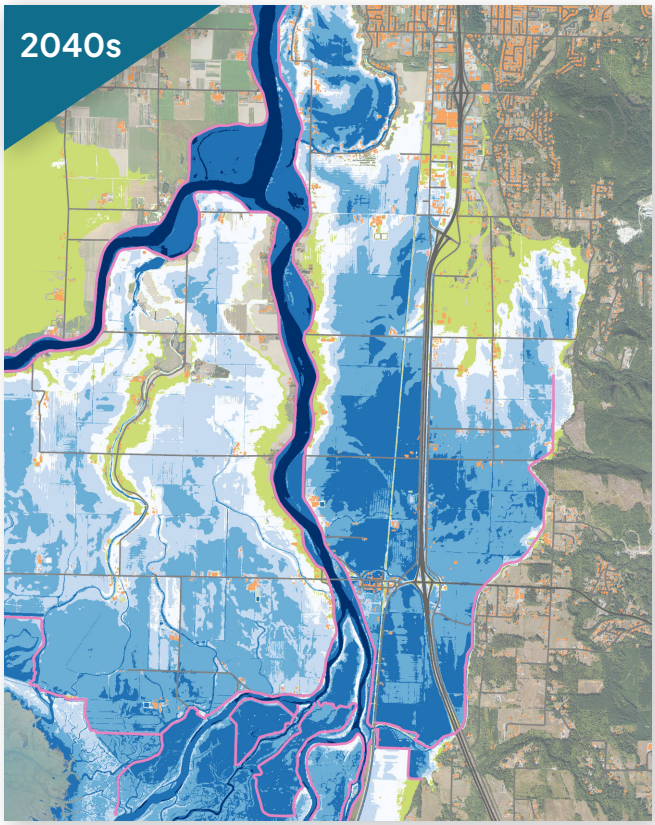
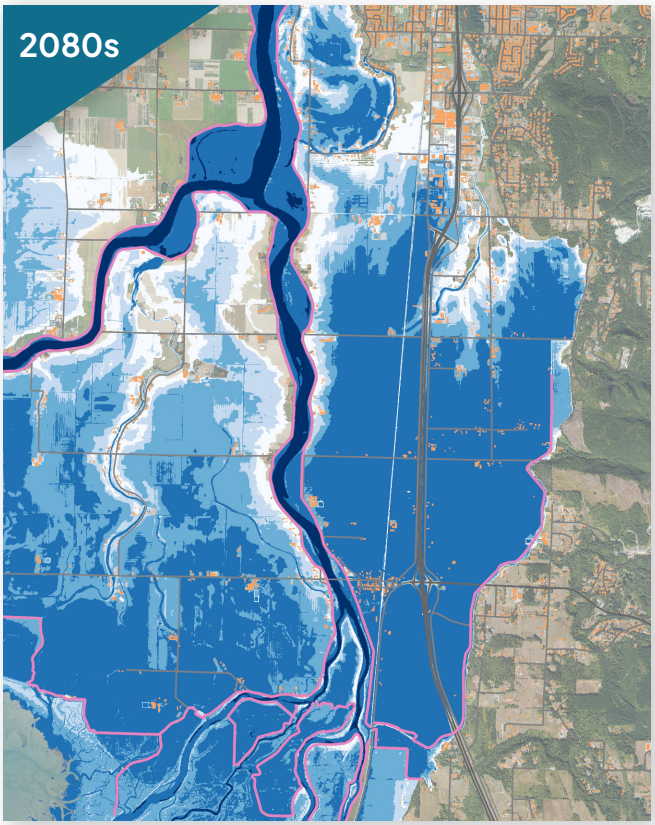
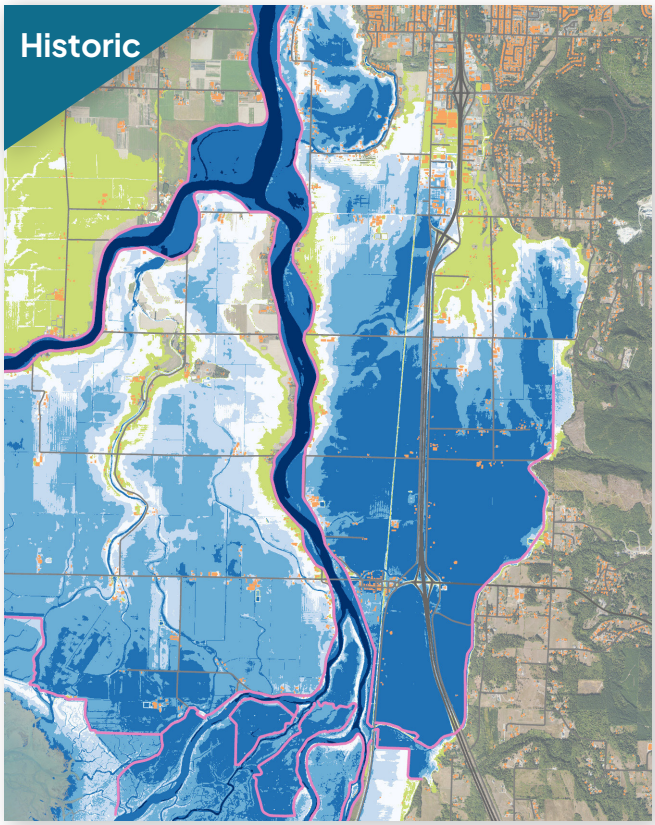
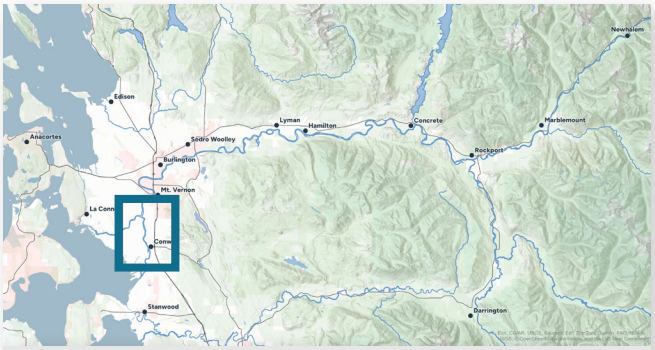




Conway | 100 Year Flood





Flood Depth (ft)

- 0–1.5
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- 5–15
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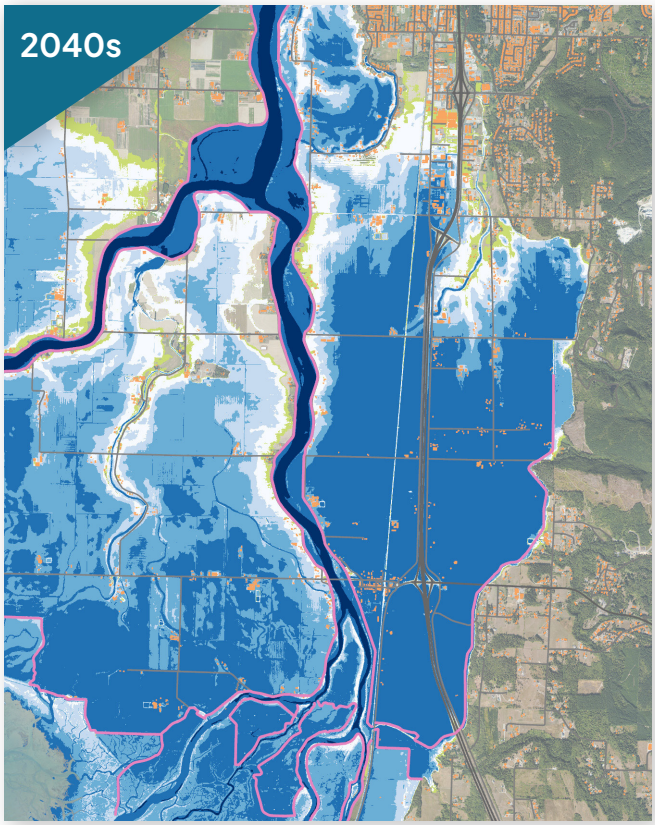
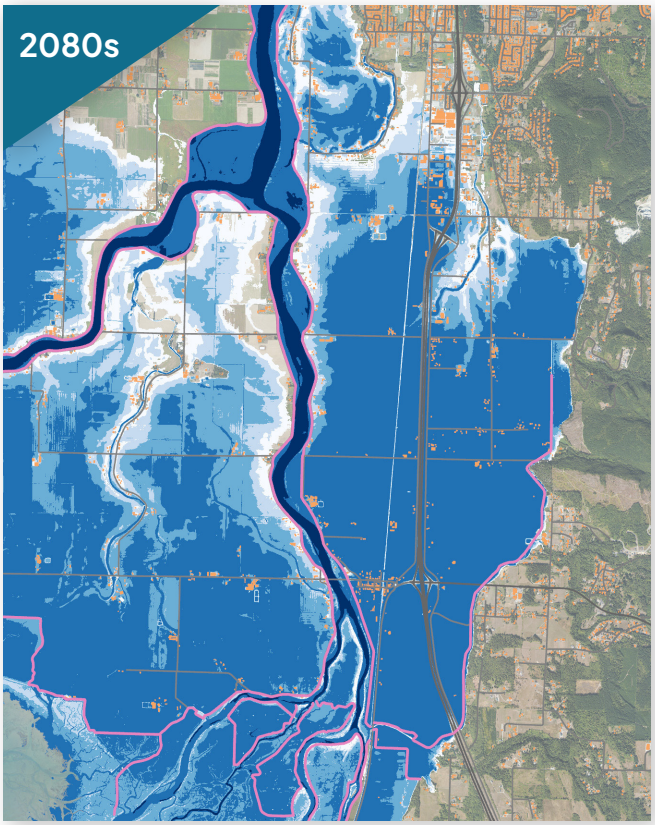
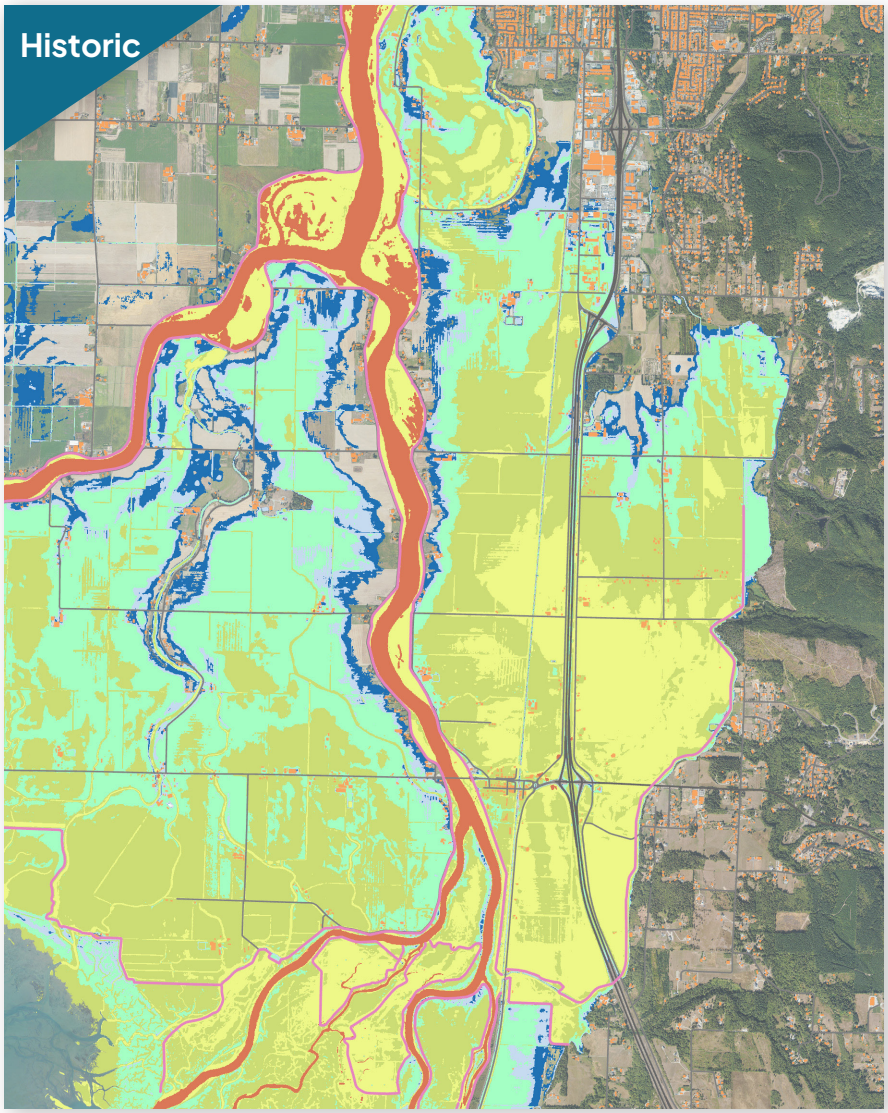
- 2080's flood extent for shown event
- Buildings
- Dike or Coastal Dike

0 0.5 1 Miles





Conway | Depth-Velocity Hazard





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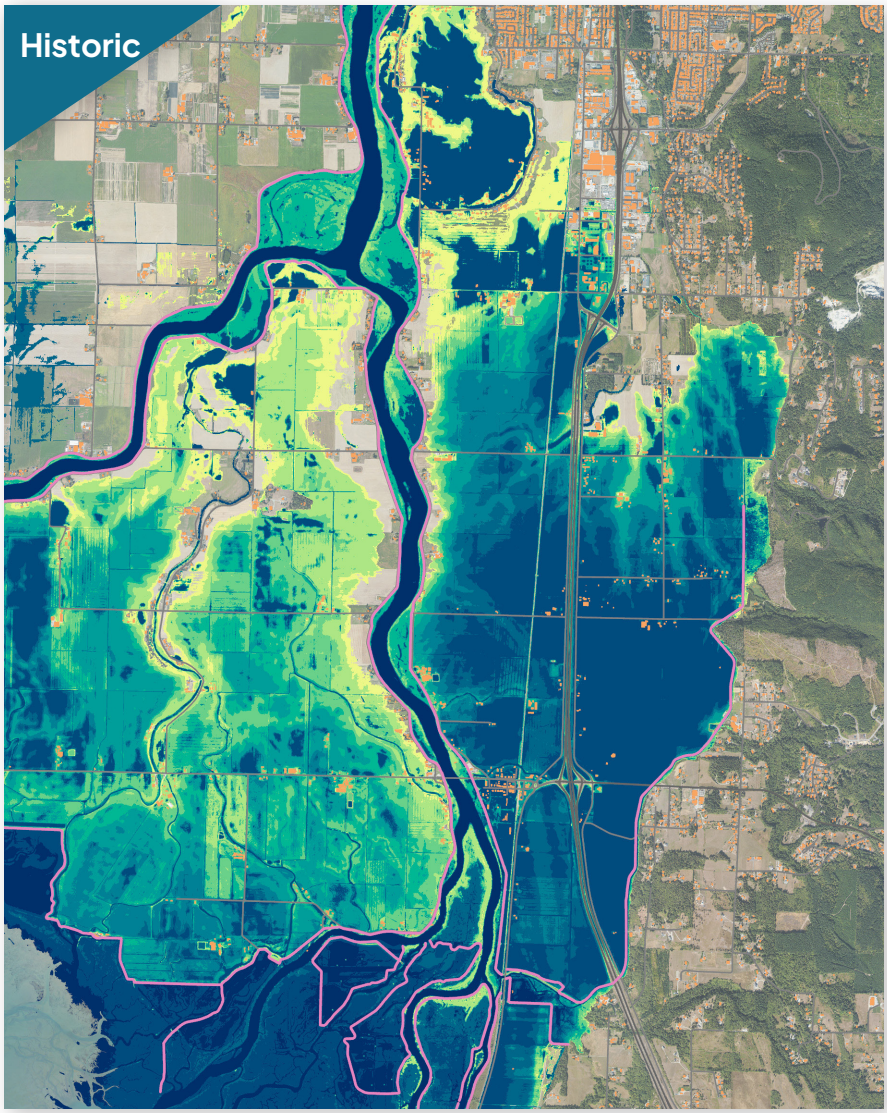
- Buildings
- Dike or Coastal Dike

0 0.5 1 Miles

Conway | Duration





Duration (days)

- 0 - 2
- 2 - 5
- 5 - 8
- 8 - 10
- 10 - 15
- 15 - 20
- 20 - 25
- 25 - 30
- >30

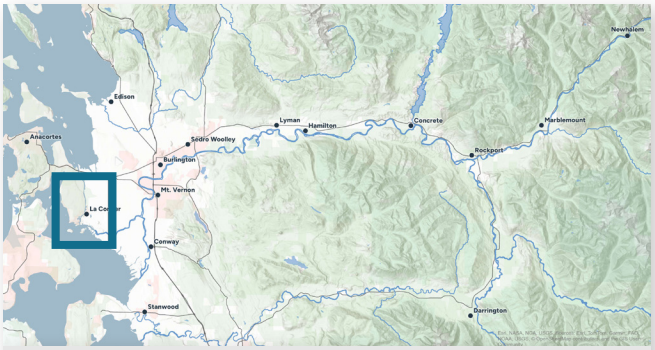
Buildings

Dike or Coastal Dike

0 0.5 1 Miles

La Conner | 10 Year Flood





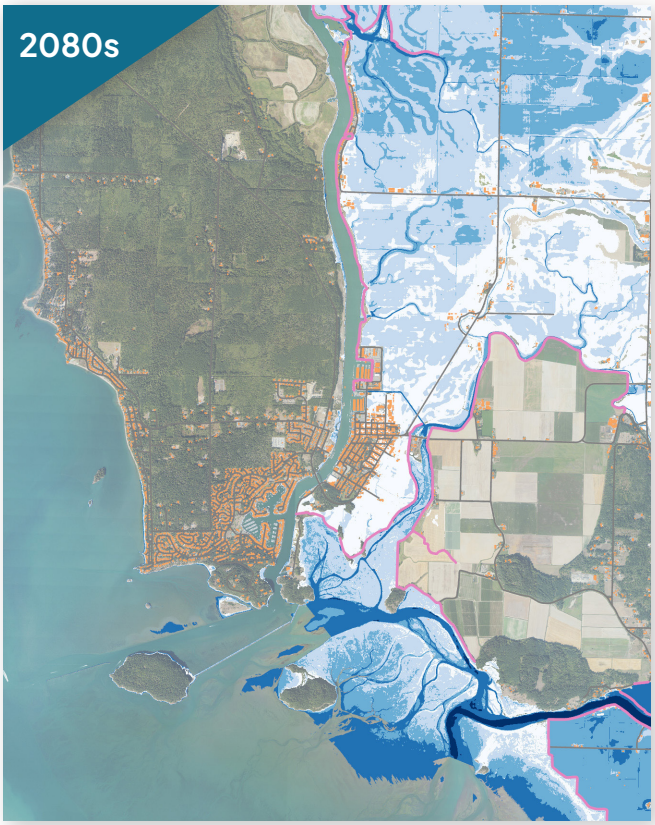
Flood Depth (ft)

- 0–1.5
- 1.5–3
- 3–5
- 5–15
- >15

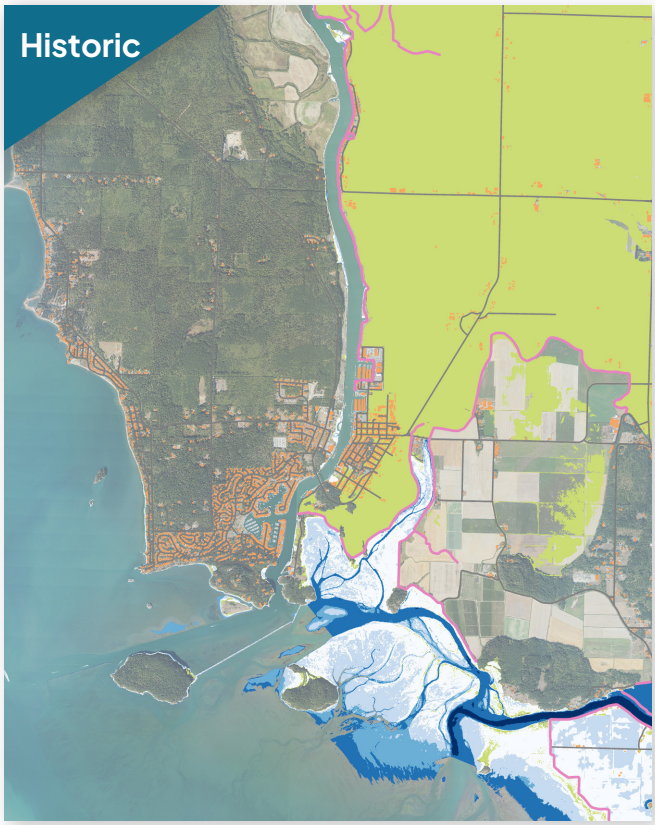
- 2080's flood extent for shown event
- Buildings
- Dike or Coastal Dike

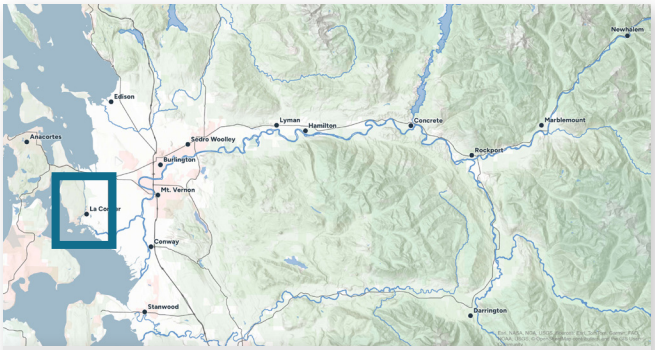
0 0.5 1 Miles





La Conner | 25 Year Flood





Flood Depth (ft)

- 0–1.5
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- 2080's flood extent for shown event
- Buildings
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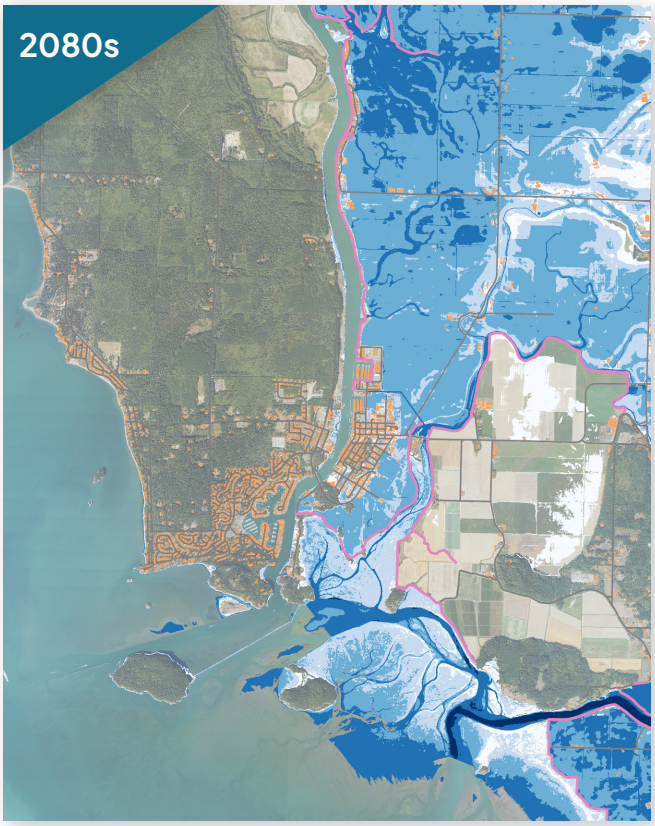
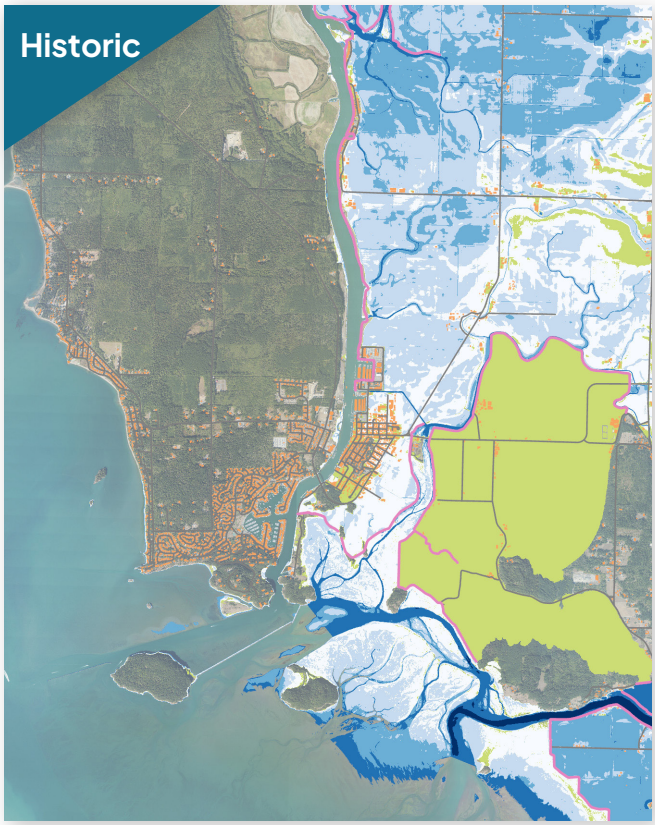
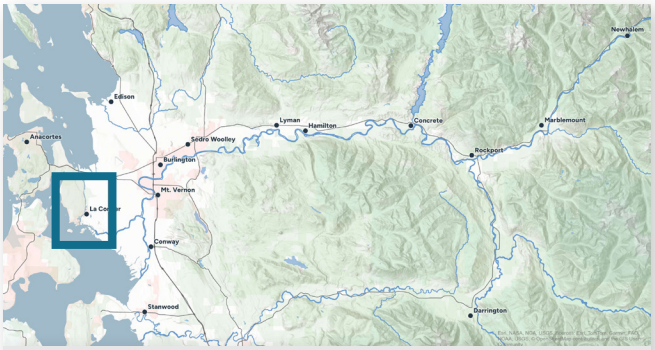
0 0.5 1 Miles





La Conner | 100 Year Flood





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- Buildings
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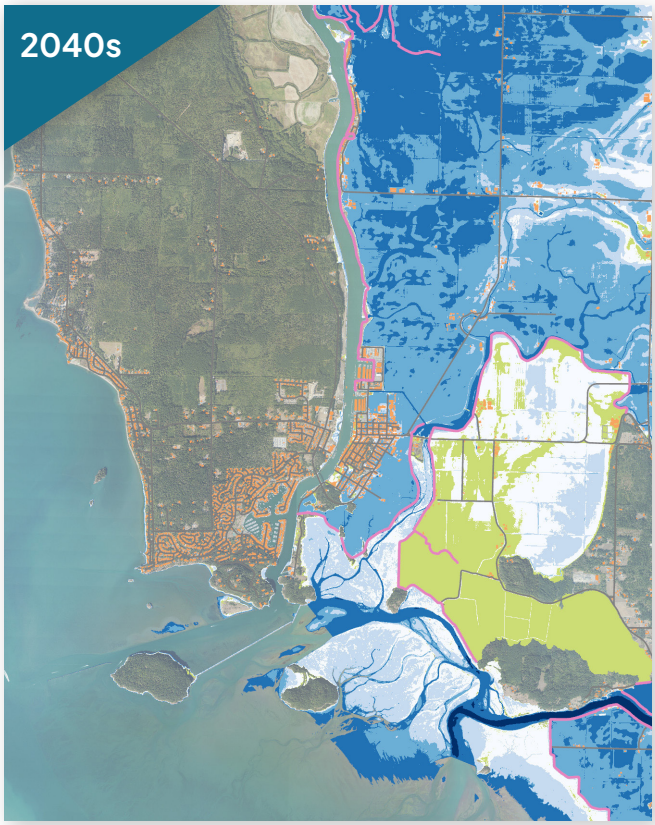
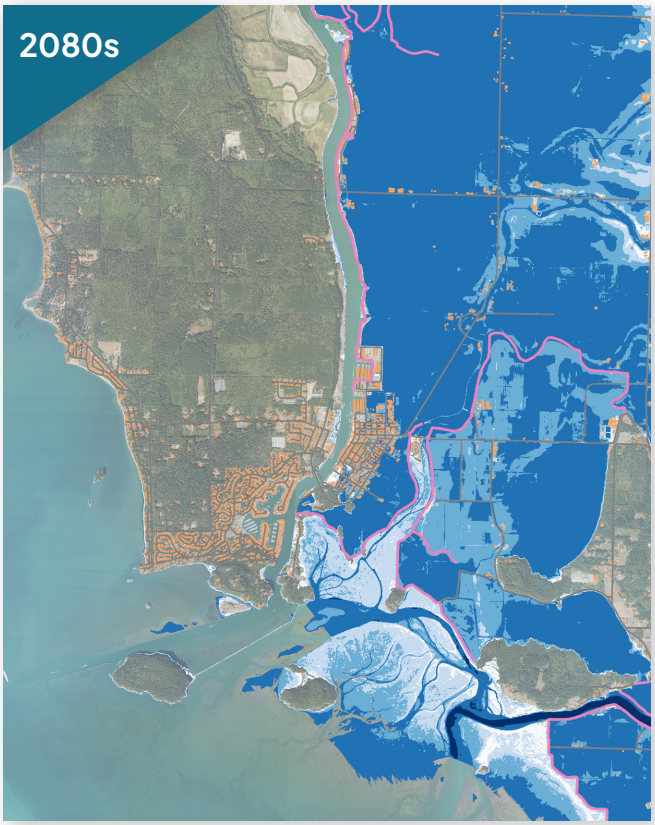
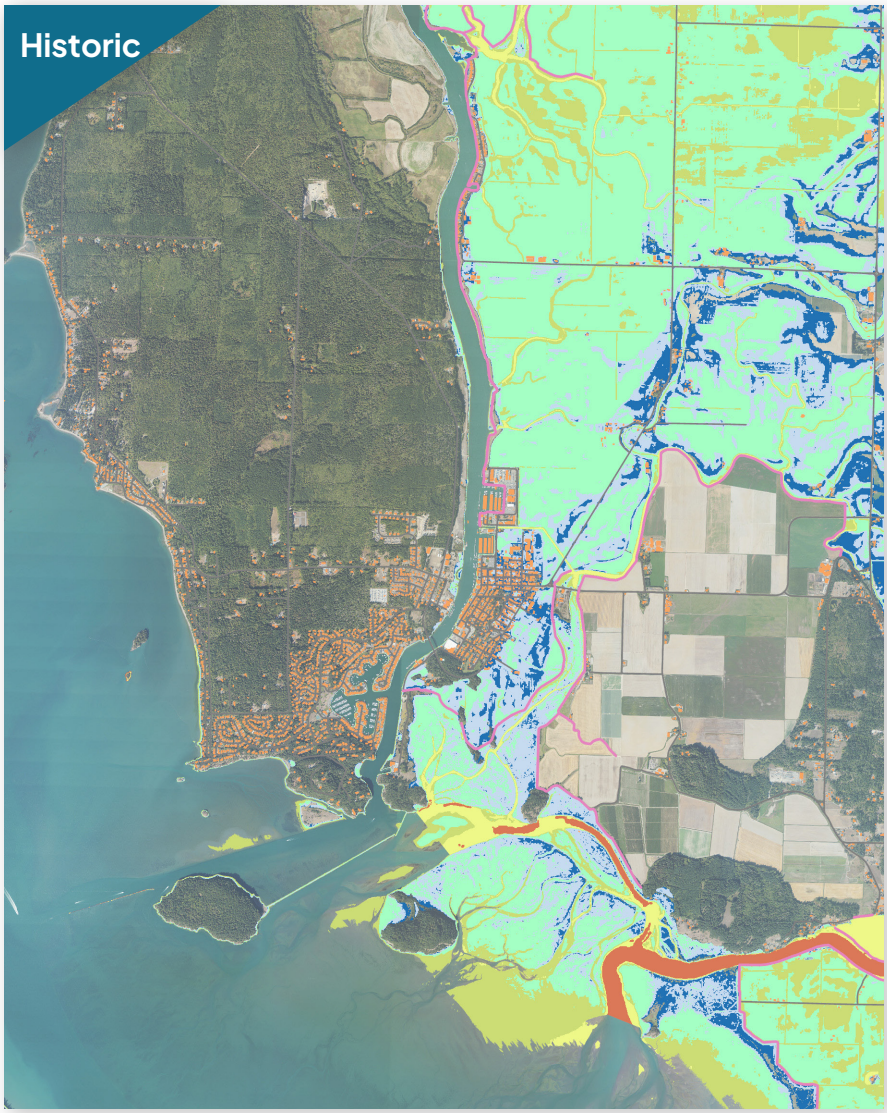




La Conner | Depth-Velocity Hazard





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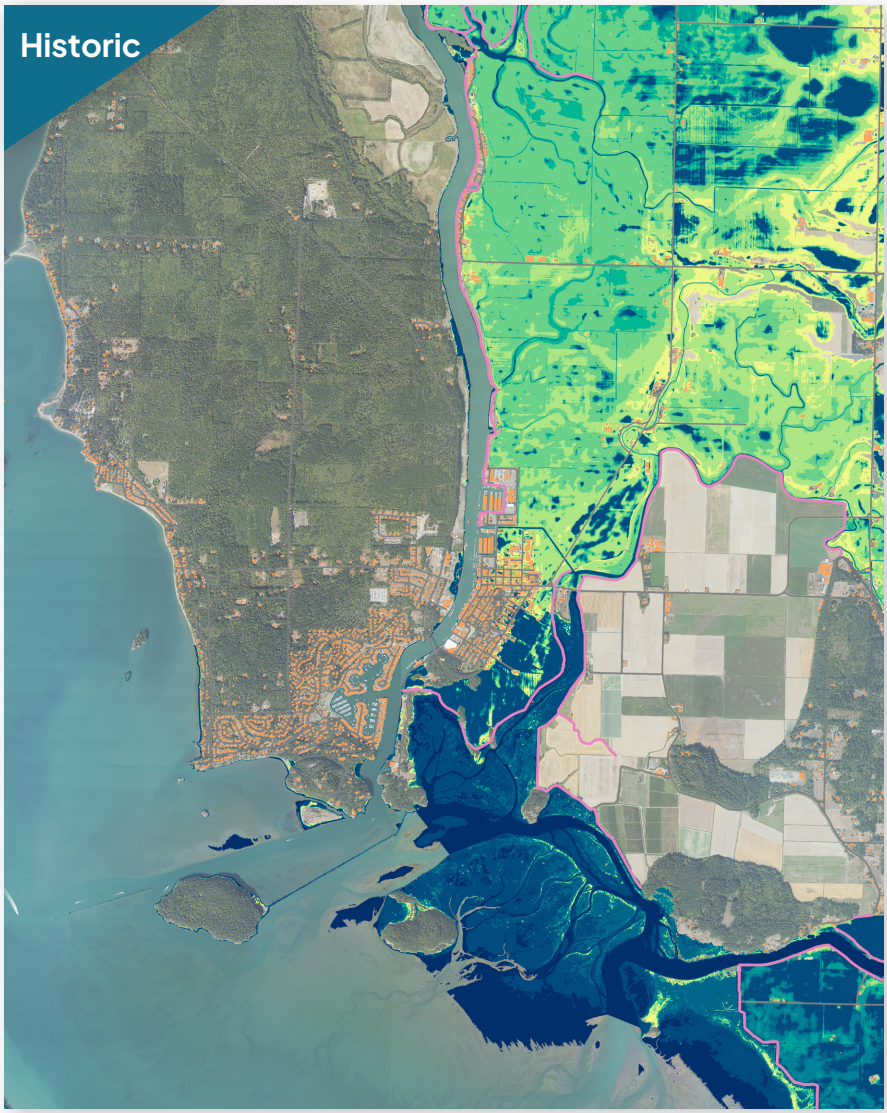
0 0.5 1 Miles

La Conner | Duration





Duration (days)

- 0 - 2
- 2 - 5
- 5 - 8
- 8 - 10
- 10 - 15
- 15 - 20
- 20 - 25
- 25 - 30
- >30

Buildings

Dike or Coastal Dike

0 0.5 1 Miles

Padilla and Samish Bays | 10 Year





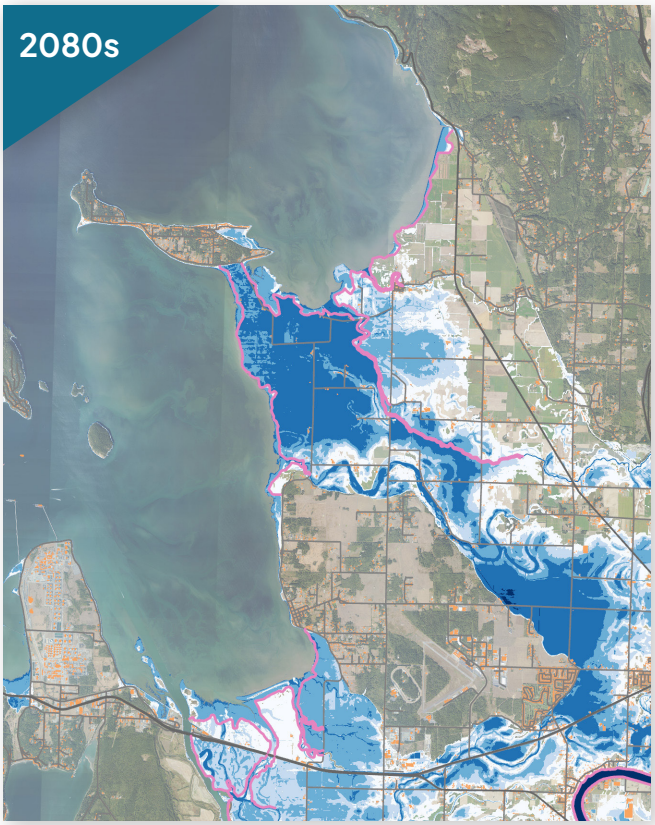
Flood Depth (ft)

- 0–1.5
- 1.5–3
- 3–5
- 5–15
- >15

- 2080's flood extent for shown event
- Buildings
- Dike or Coastal Dike

0 1 2 Miles





Padilla and Samish Bays | 25 Year





Flood Depth (ft)

- 0–1.5
- 1.5–3
- 3–5
- 5–15
- >15

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- Buildings
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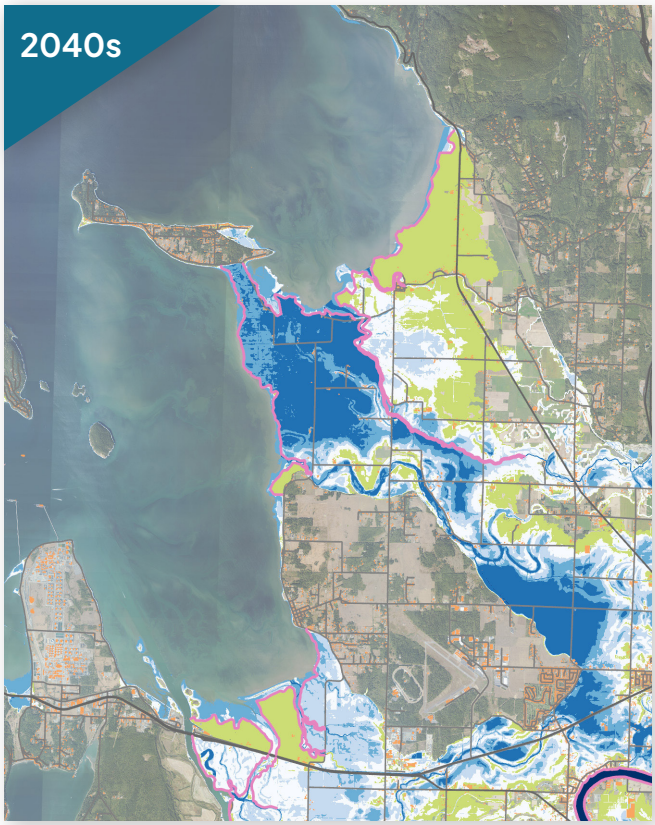
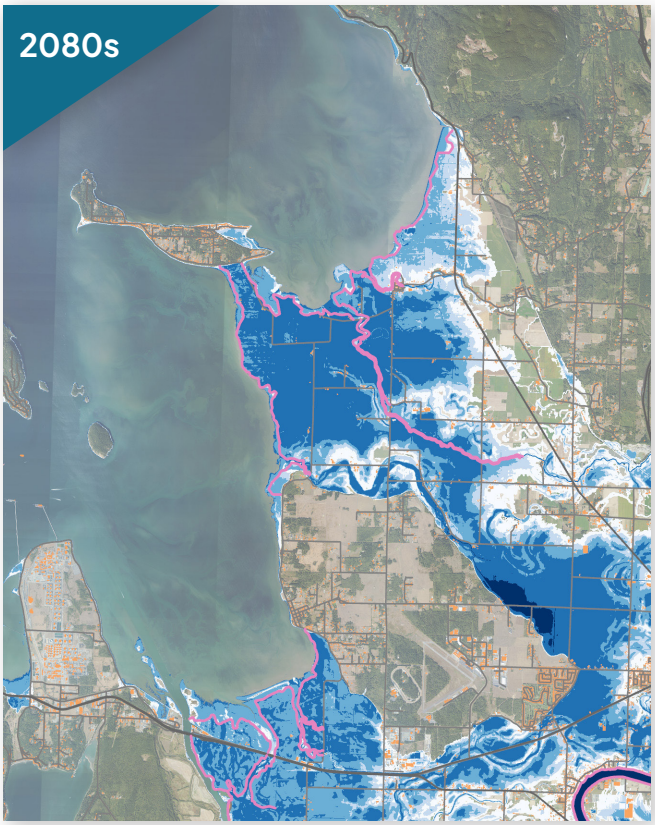
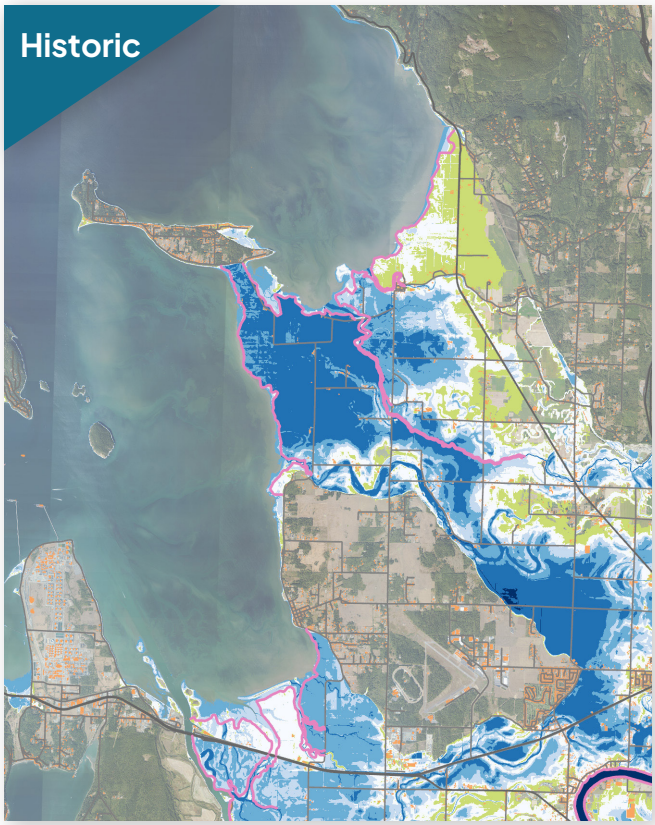
0 1 2 Miles





Padilla and Samish Bays | 100 Year





Flood Depth (ft)

- 0–1.5
- 1.5–3
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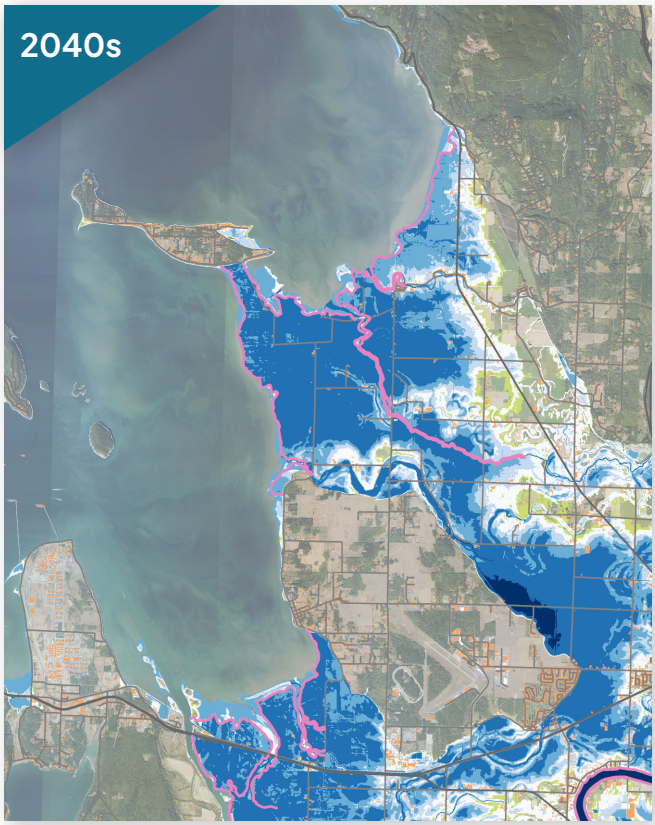
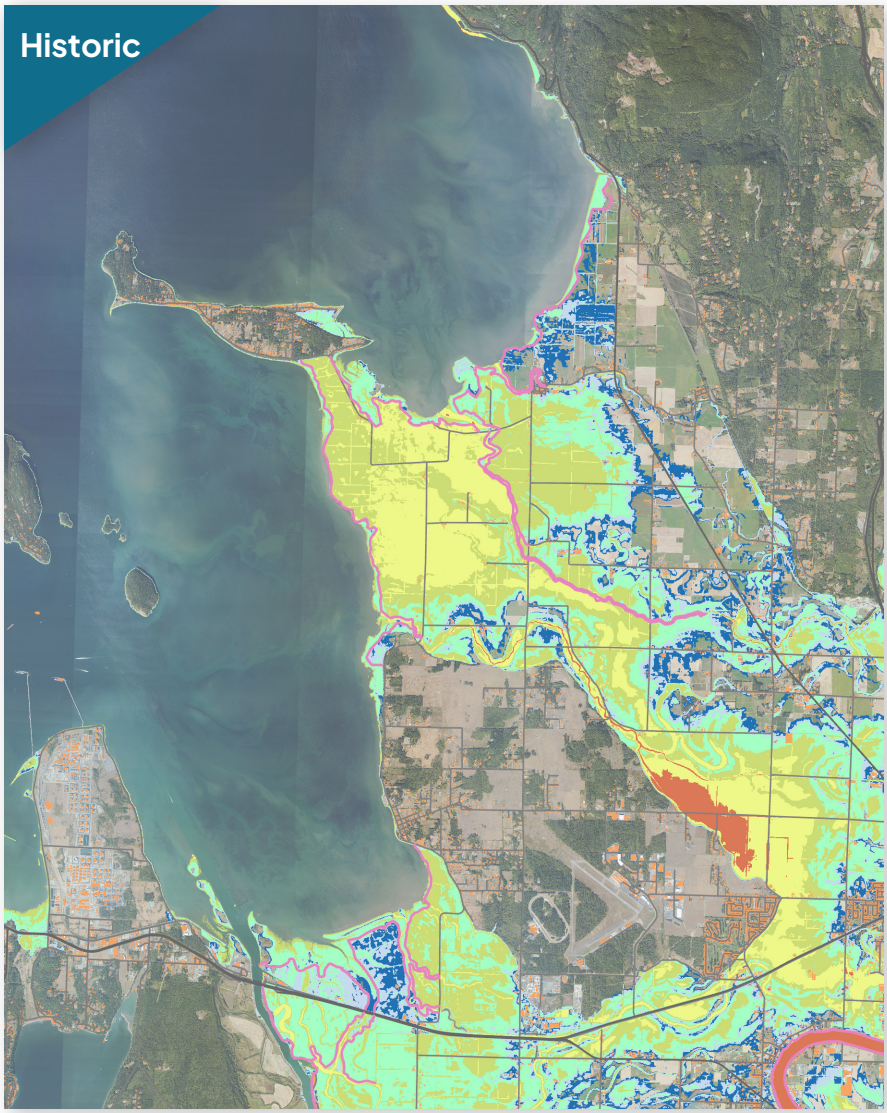
- Dike or Coastal Dike

0 1 2 Miles





Padilla and Samish Bays | Depth-Velocity Hazard





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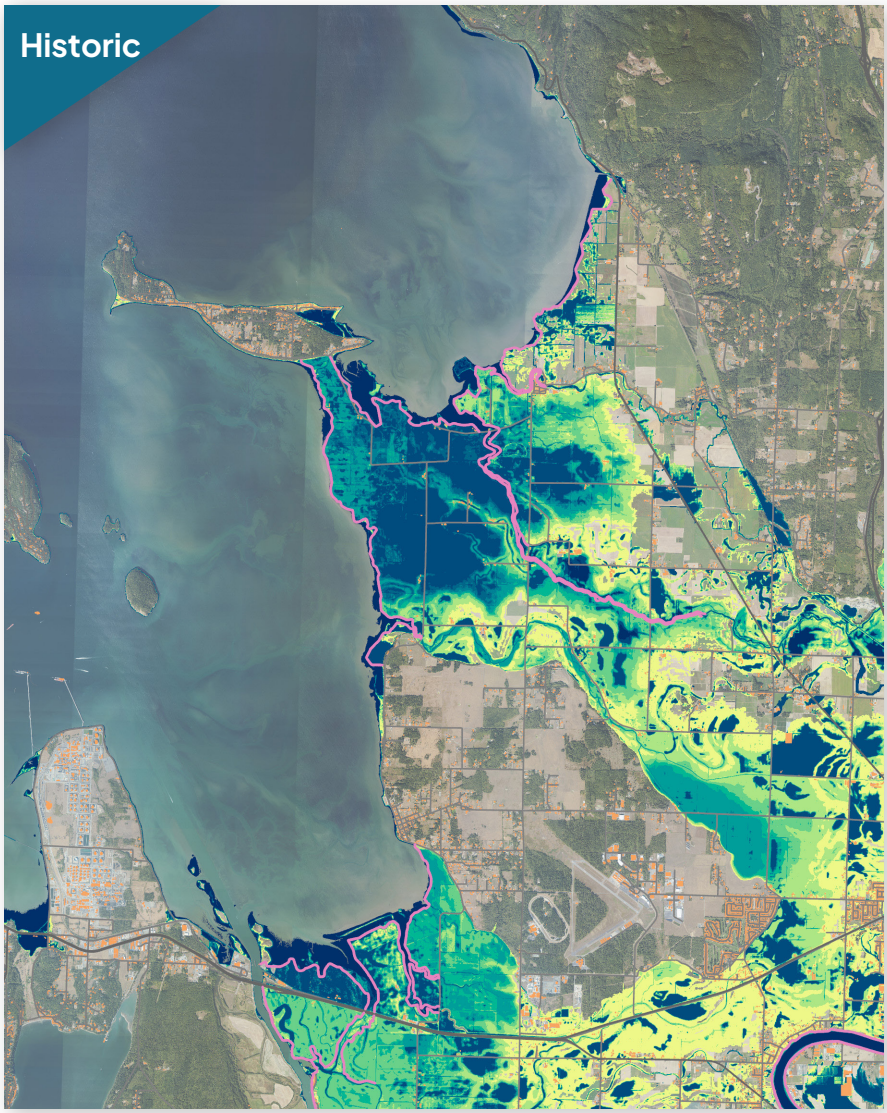
- Dike or Coastal Dike

0 1 2 Miles

Padilla and Samish Bays | Duration





Duration (days)

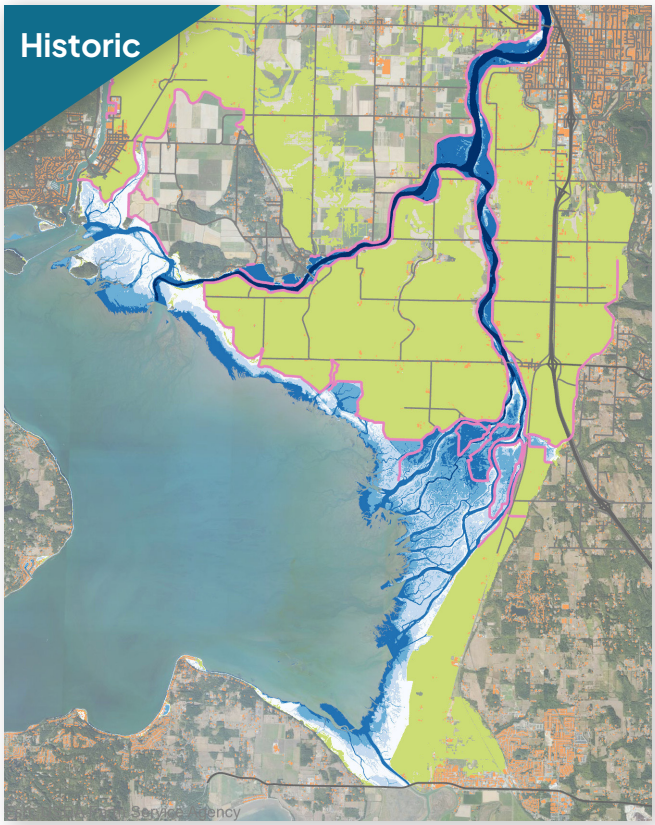
- 0 - 2
- 2 - 5
- 5 - 8
- 8 - 10
- 10 - 15
- 15 - 20
- 20 - 25
- 25 - 30
- >30

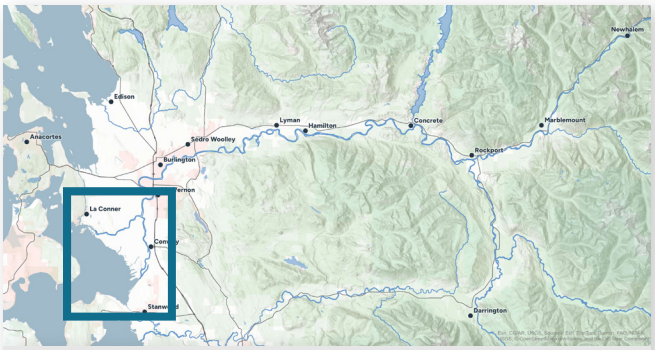
Buildings

Dike or Coastal Dike

0 1 2 Miles

Skagit Bay | 10 Year Flood



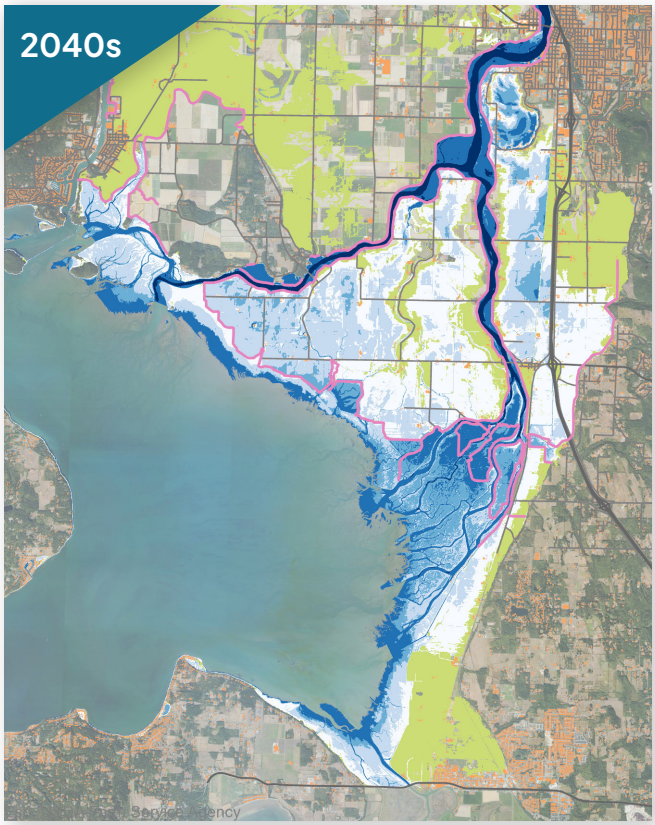


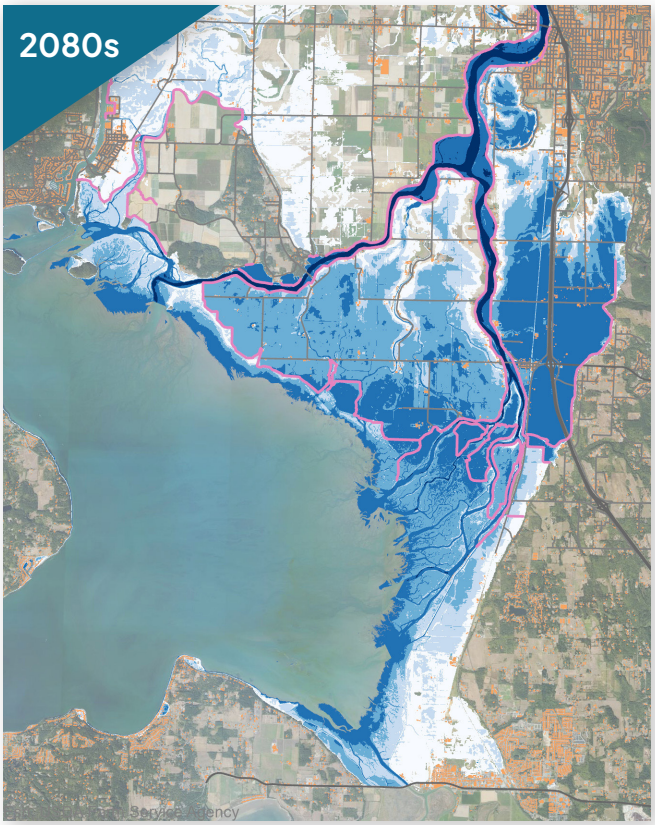
Flood Depth (ft)

- 0–1.5
- 1.5–3
- 3–5
- 5–15
- >15

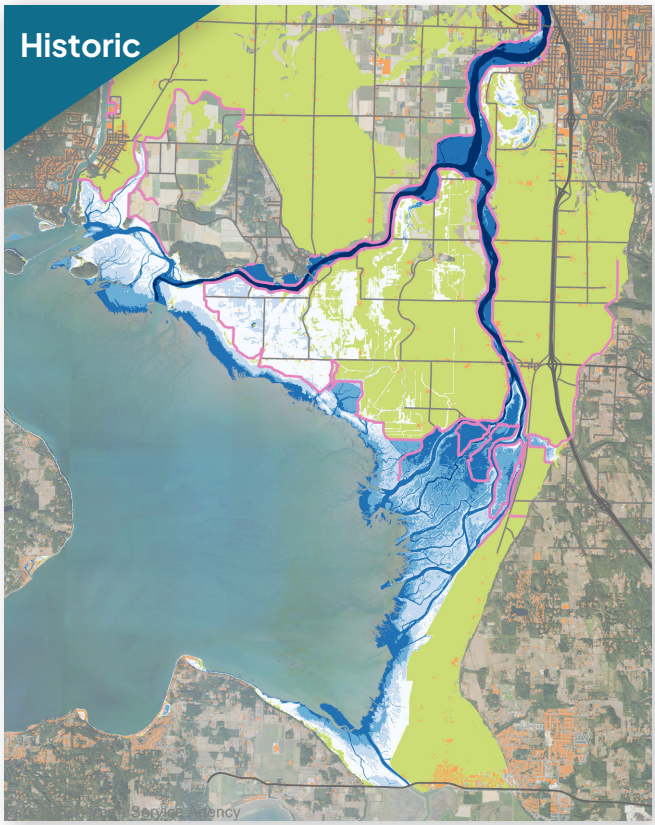
- 2080's flood extent for shown event
- Buildings
- Dike or Coastal Dike

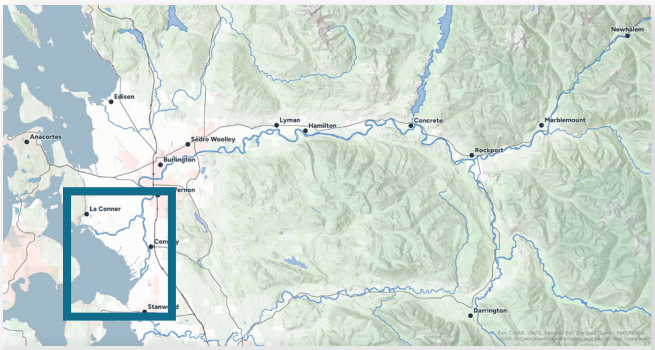
0 1 2 Miles





Skagit Bay | 25 Year Flood





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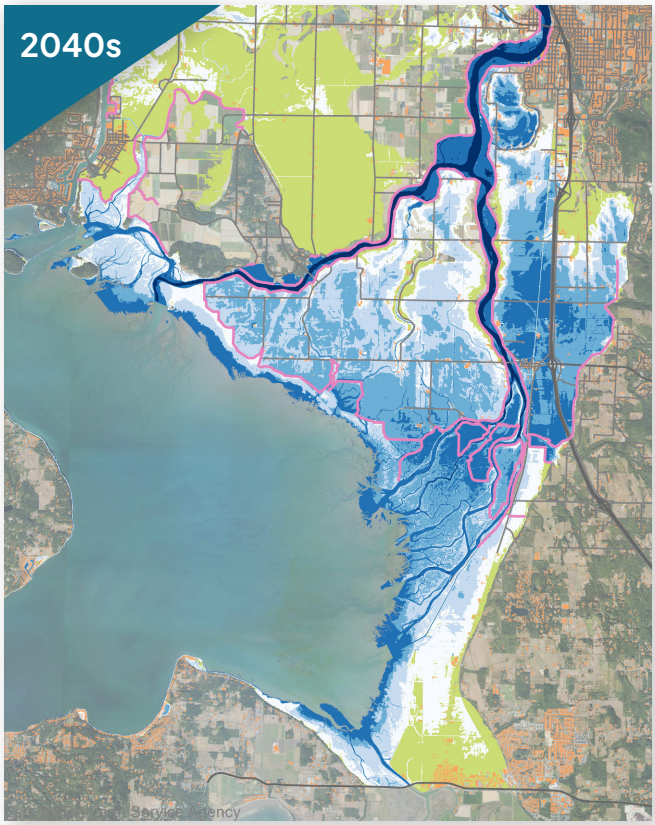
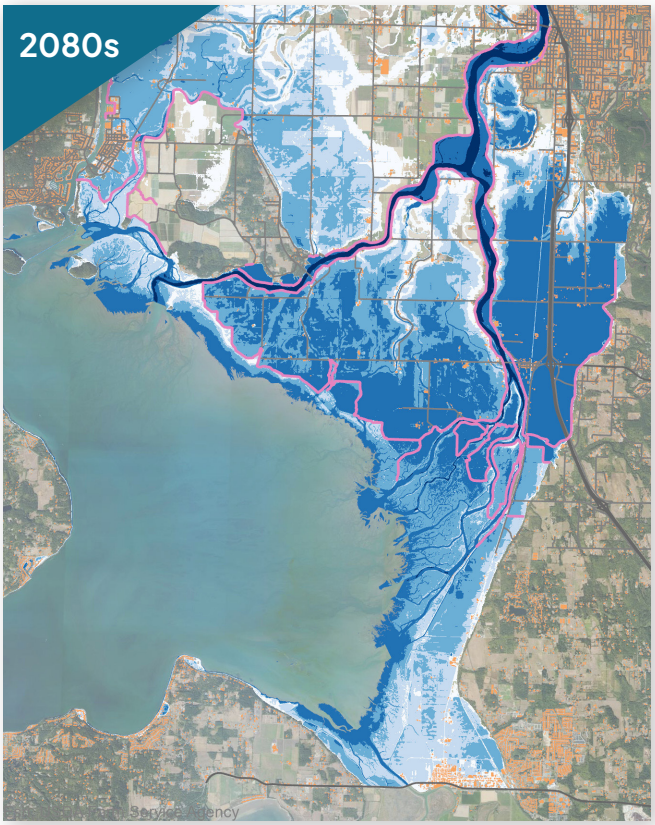
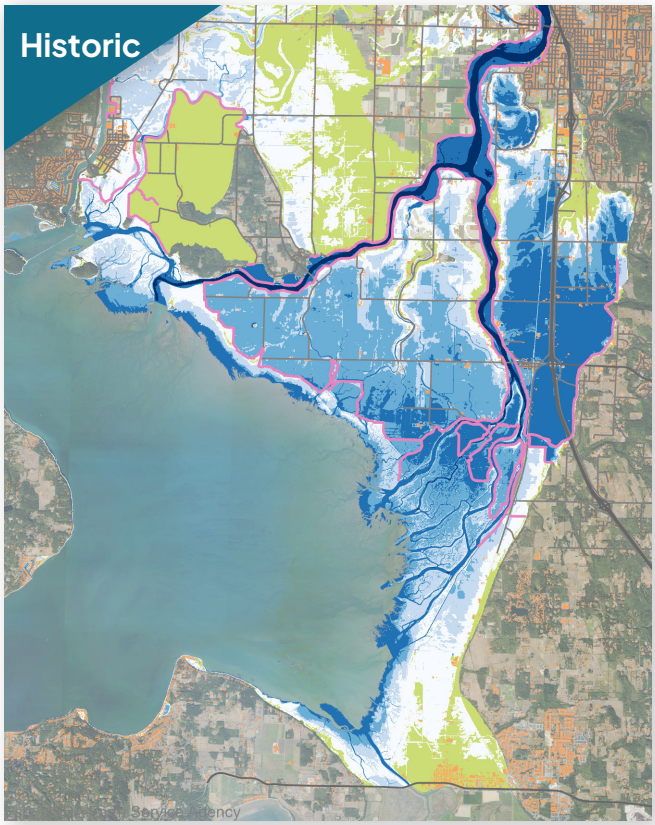
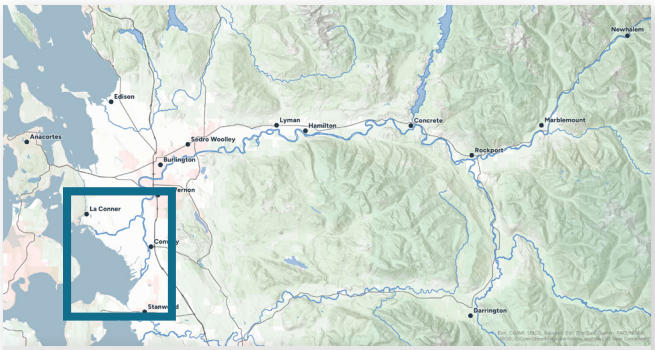




Skagit Bay | 100 Year Flood





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- Buildings
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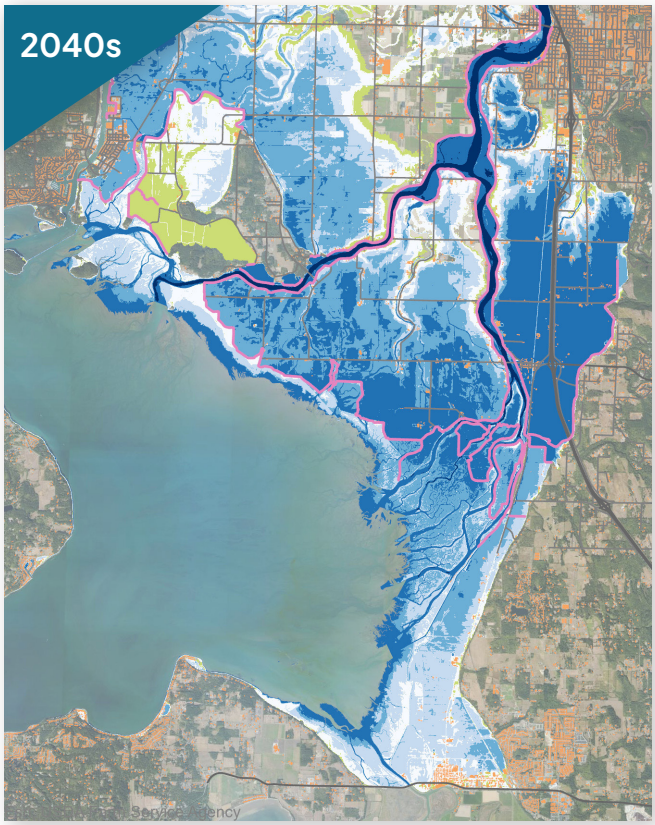
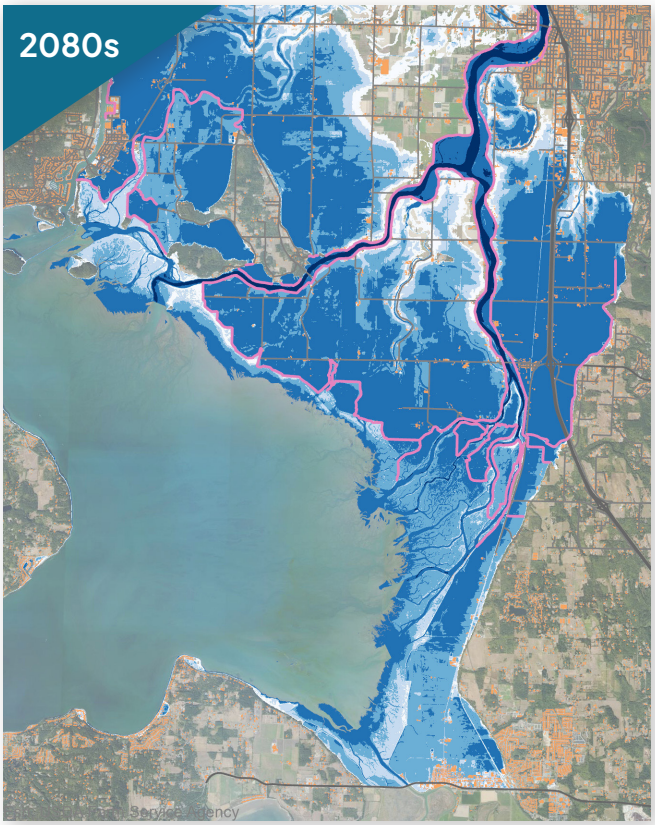
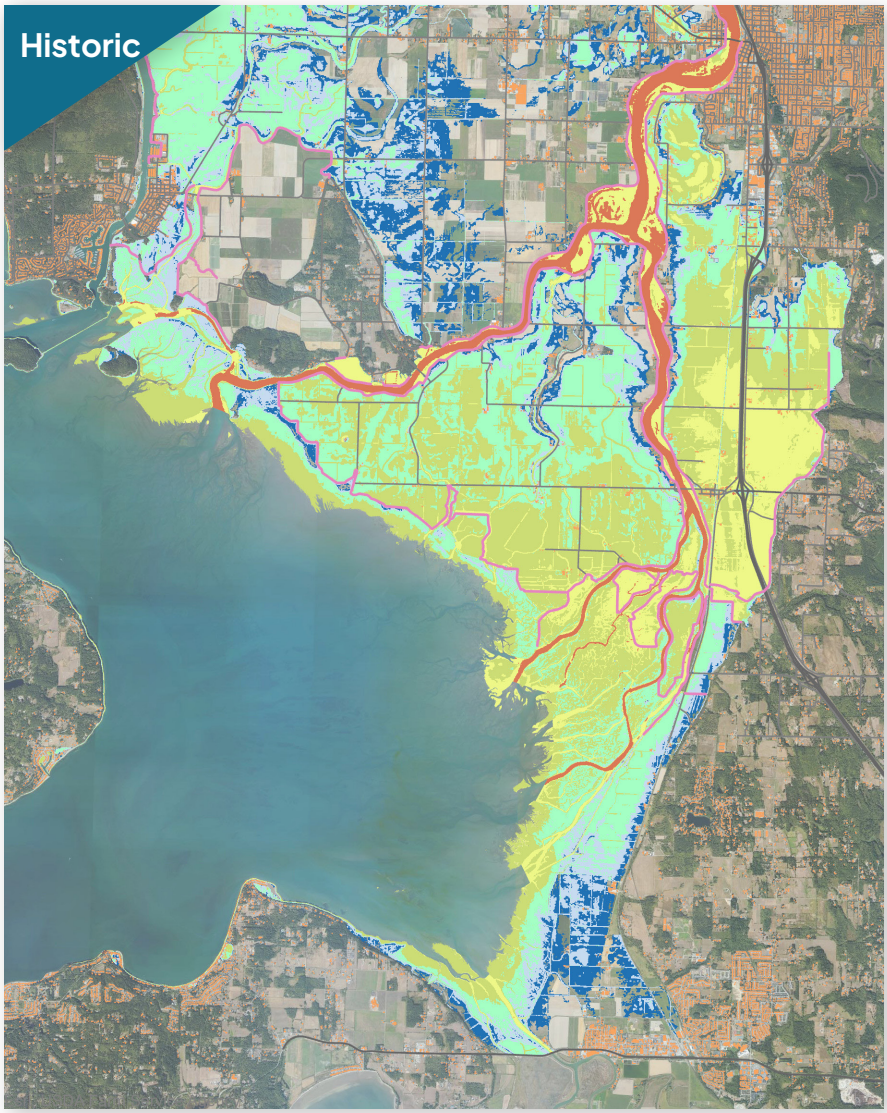
0 1 2 Miles





Skagit Bay | Depth-Velocity Hazard





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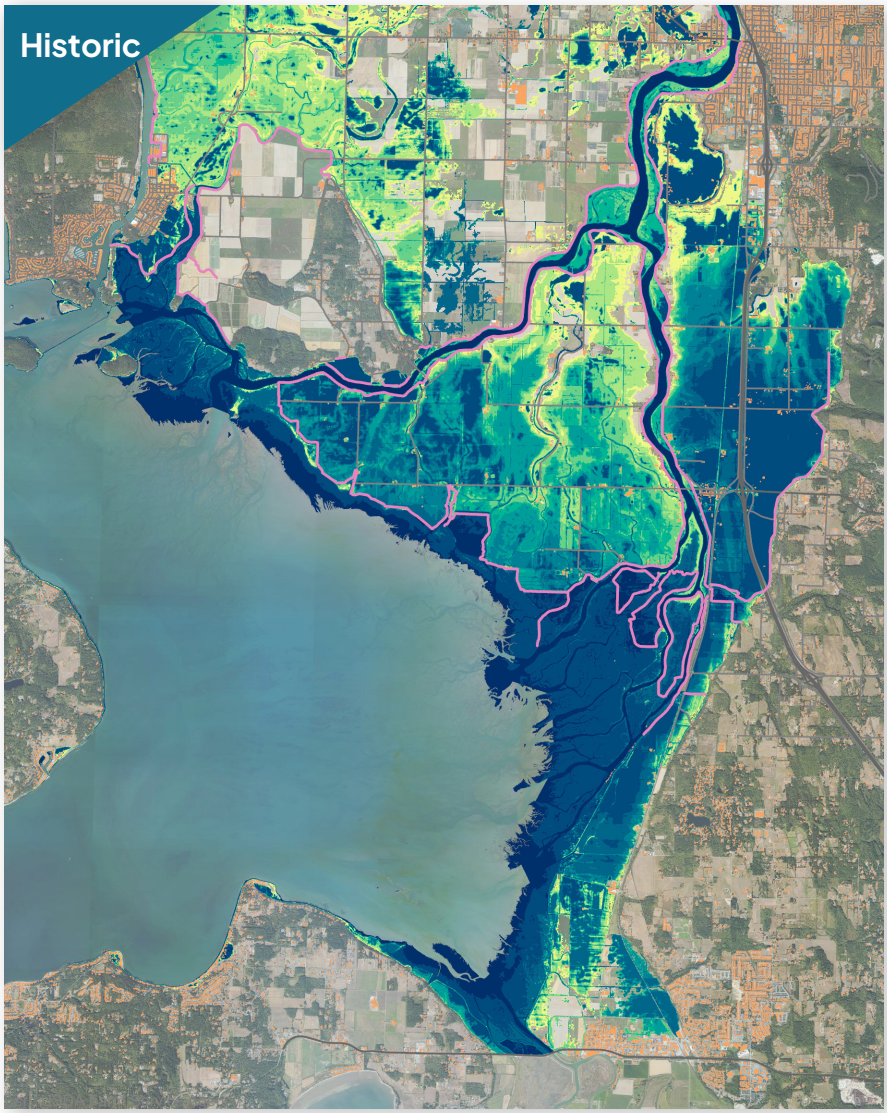
- Buildings
- Dike or Coastal Dike

0 1 2 Miles

Skagit Bay | Duration





Duration (days)

- 0 - 2
- 2 - 5
- 5 - 8
- 8 - 10
- 10 - 15
- 15 - 20
- 20 - 25
- 25 - 30
- >30

Buildings

Dike or Coastal Dike

0 1 2 Miles



Coastal Flooding Maps

This map bundle shows coastal flooding results for Skagit River areas along Skagit Bay, Swinomish Channel, Padilla Bay, and Samish Bay.

This set includes an overview map of the area and zoomed-in map areas for Padilla and Samish Bays, La Conner, and Skagit Bay. Background information on coastal flooding and climate change can be found in the full *Understanding Current and Future Skagit Flood Risk Through New Modeling Capabilities* report and specific details on the hydraulic model that created these maps can be found in Appendix A. Animations for select locations can be found at the Skagit Climate Science Consortium website.

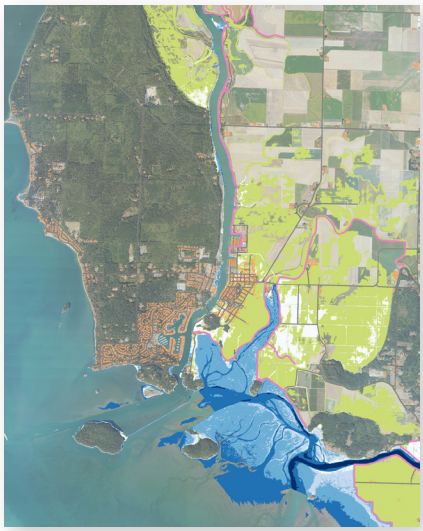
These maps are products of the hydraulic model detailed in Appendix A. They are provided without any warranty of performance or fitness for a particular purpose. They should not be depended upon as a sole source of information as they illustrate potential scales of flooding rather than exact locations and do not account for real-time changes like erosion, dike failures, larger than modeled events, or other factors. Maps should be used at your own risk.

How to Read Coastal Flooding Maps

What These Maps Show

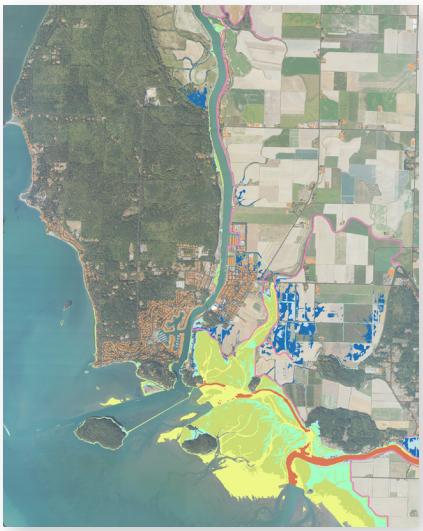
For all maps, the background is based on aerial imagery (USDA 2023). Structures are shown as orange rectangles (Microsoft 2022). Pink lines, if present, show dike or coastal dike locations (Skagit County 2022), and dark gray lines show major transportation routes (WSDOT 2008, Skagit County 2019). Dark blue lines show rivers on the overview maps. Coastal model results are shown for areas above the mean tide line.

FLOOD DEPTH MAPS



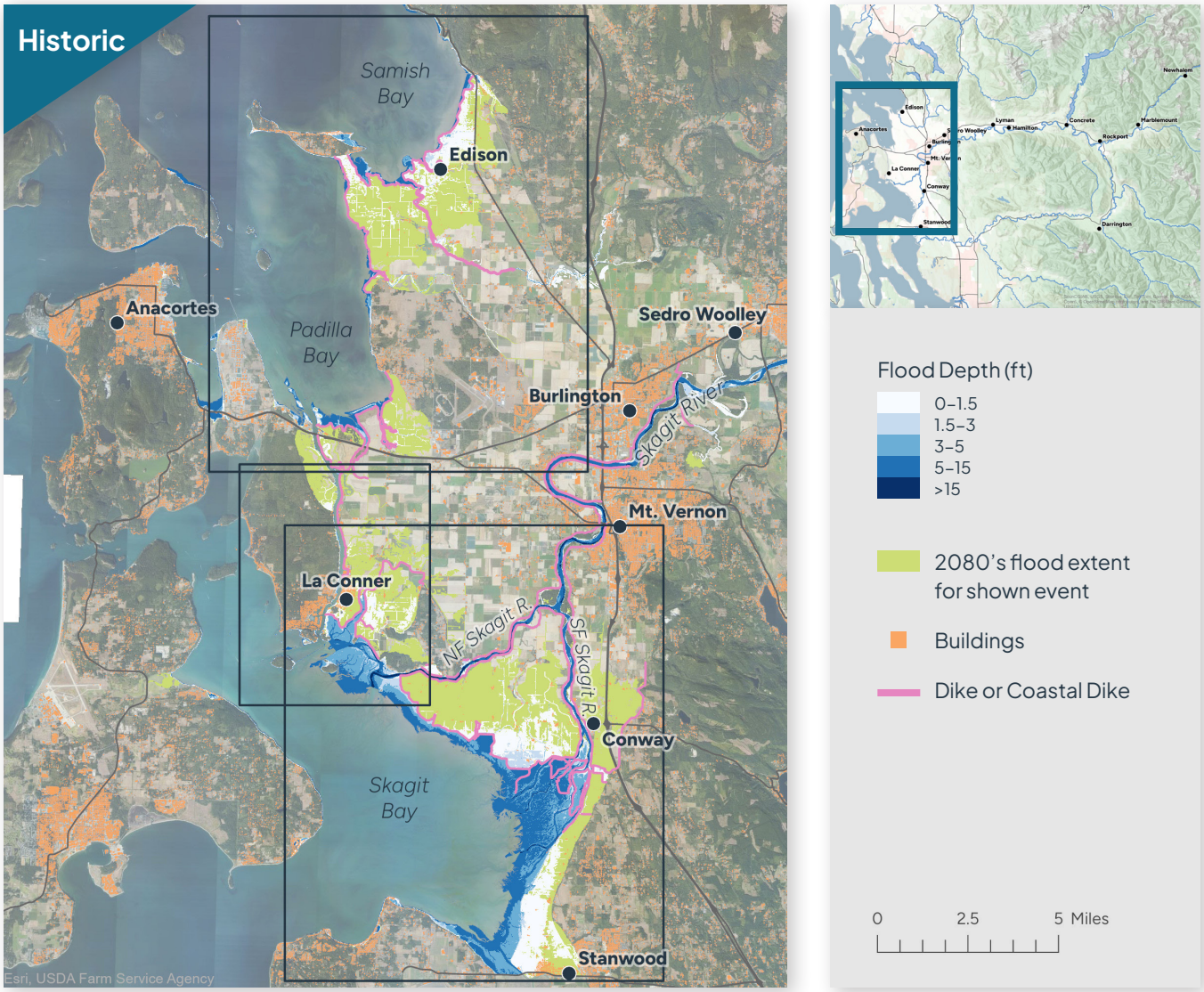
These maps are organized into sets of three, showing results for Historic (top), 2040s (middle), and 2080s (bottom) flood magnitudes. Each set of maps shows the model results for a specific flood frequency: 10-year, 25-year, and 100-year. Maps show the depth of coastal flooding in shades of blue, where darker blue indicates deeper water and lighter blue indicates shallower water. In order to see how coastal flooding is projected to change in the future, the Historic and 2040s maps also show the estimated extent of the 2080s flood in bright green. There is no bright green shading for the 2080s map because the map is already showing the depth and extent of the 2080s flood. All three maps are at the same scale.

DEPTH-VELOCITY HAZARD MAPS



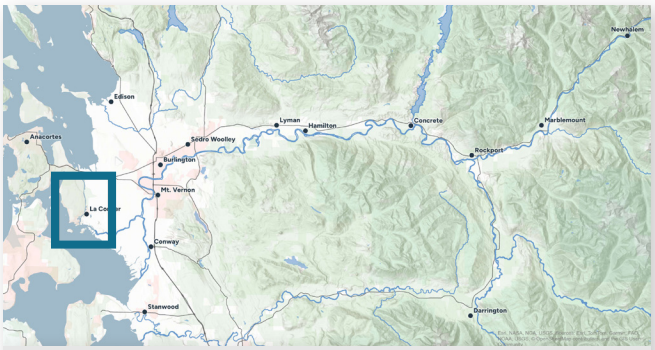
These maps show depth-velocity hazards for a historic 100-year event. Only the historic results are shown; maps for the 2040s or 2080s are not included. The hazard classifications shown in the key were assigned based on a standard international practice (AIDR, 2017) and grouped into six hazard ratings. The hazard mapping is based on clearwater hazards and does not account for secondary hazards such as geomorphic hazards (e.g., erosion, debris flows, etc.). In addition, the hazard categories were developed for riverine flooding, and may not apply as readily to coastal flood risks. Colors show when water poses a risk to children, adults, vehicles, and structures due to depth, water velocity or a combination of the two.

Overview Map



La Conner | 10 Year Flood





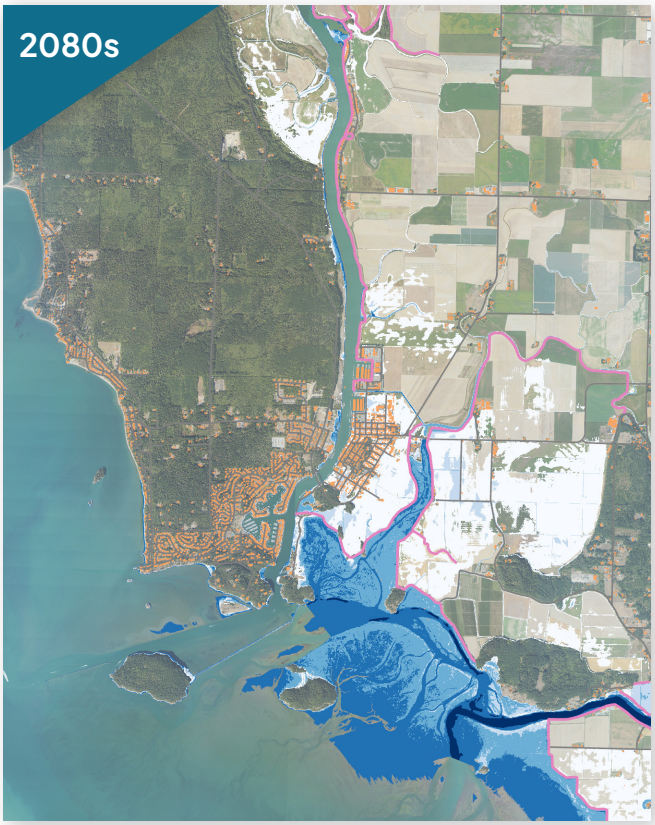
Flood Depth (ft)

- 0–1.5
- 1.5–3
- 3–5
- 5–15
- >15

- 2080's flood extent for shown event
- Buildings
- Dike or Coastal Dike

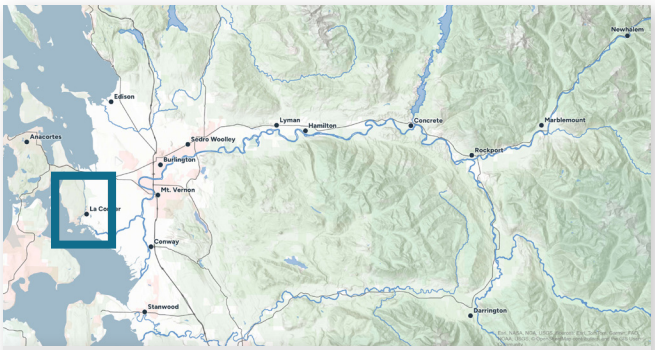
0 0.5 1 Miles





La Conner | 25 Year Flood





Flood Depth (ft)

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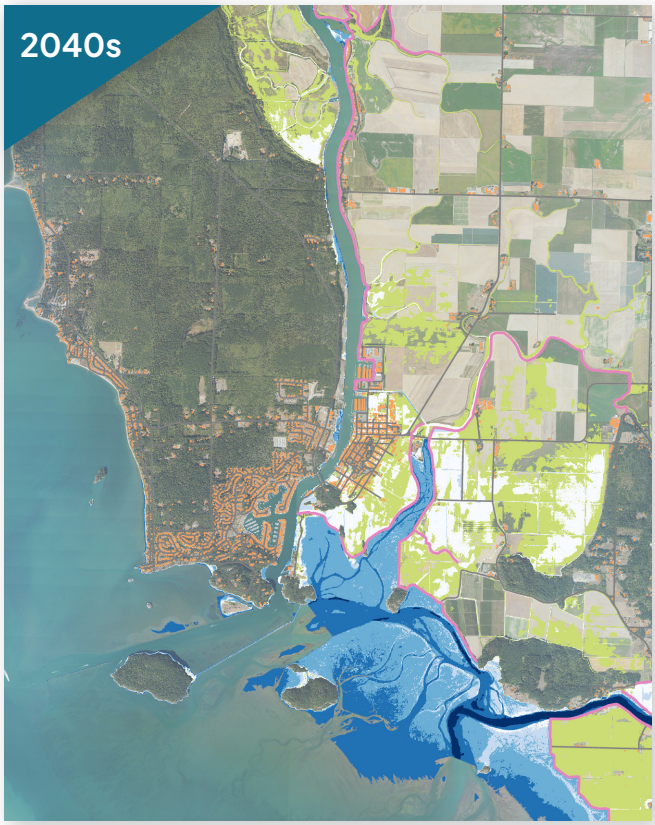
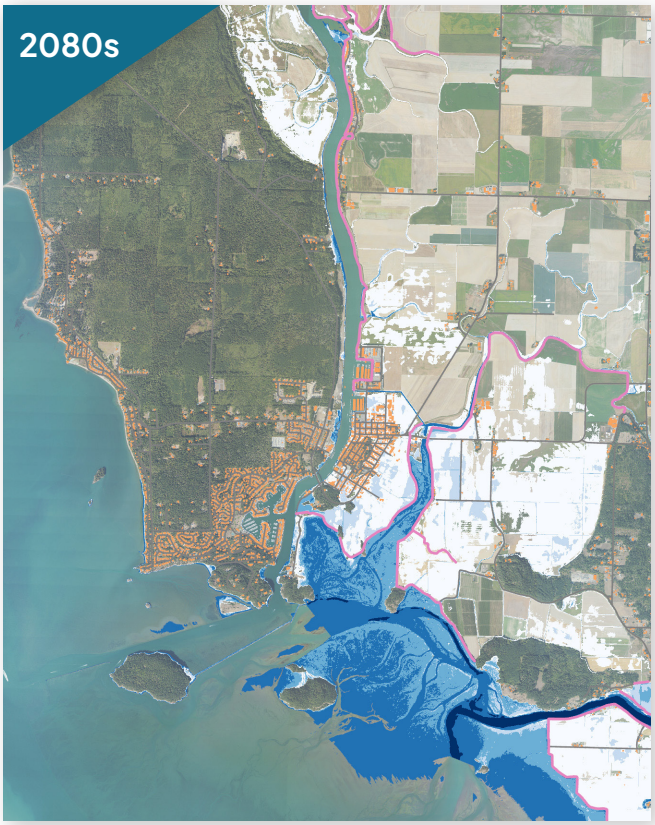
- 1.5–3
- 3–5
- 5–15
- >15

- 2080's flood extent for shown event
- Buildings
- Dike or Coastal Dike

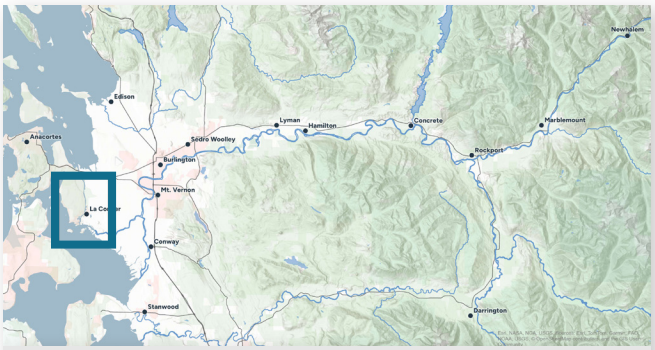
0 0.5 1 Miles





La Conner | 100 Year Flood





Flood Depth (ft)

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- Buildings
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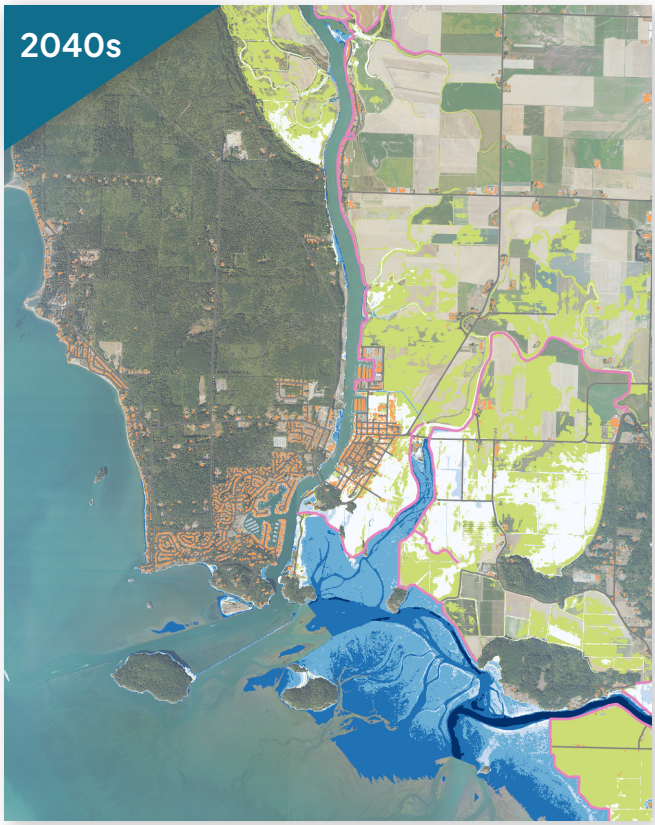
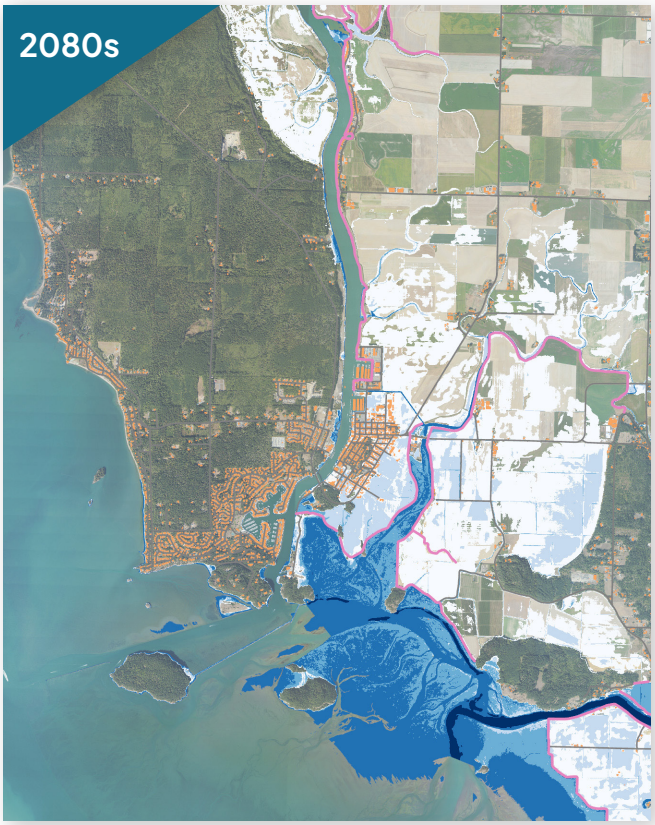
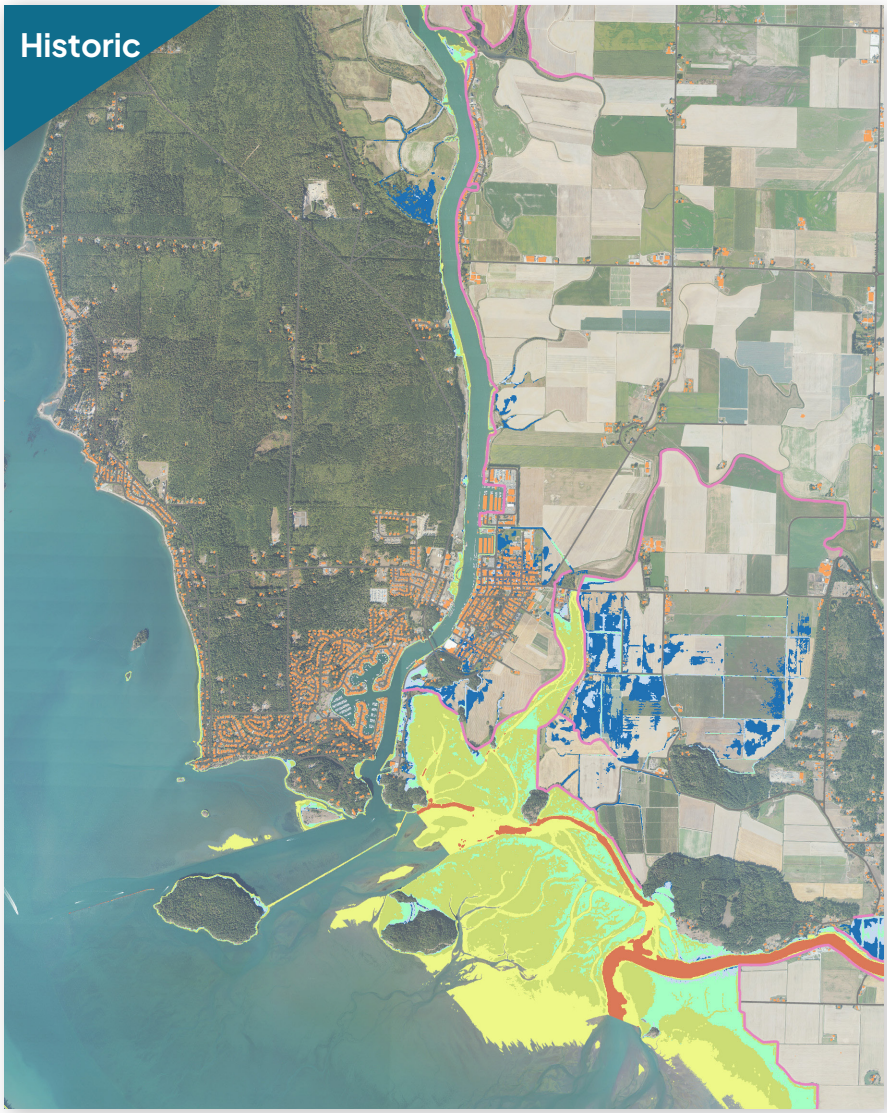
0 0.5 1 Miles





La Conner | Depth-Velocity Hazard





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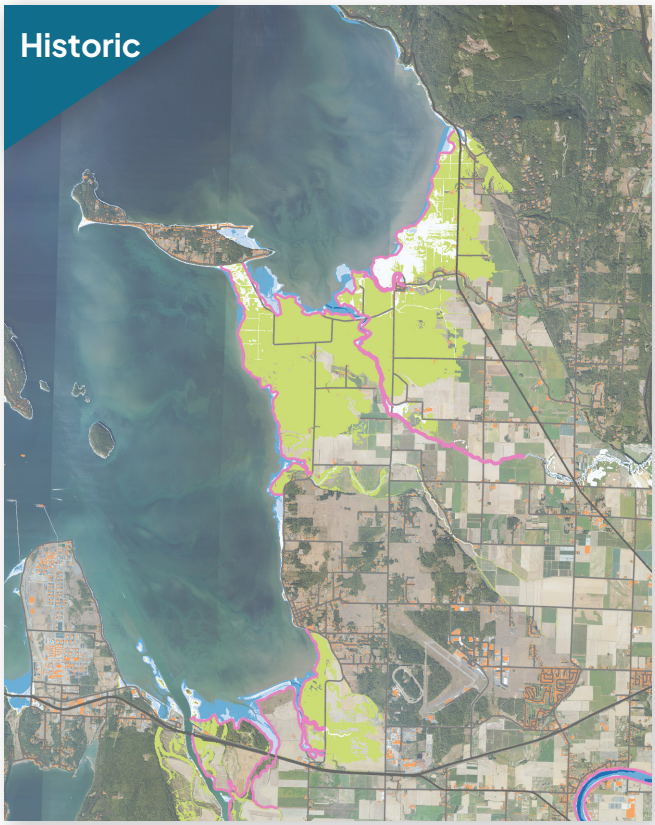
- Buildings
- Dike or Coastal Dike

0 0.5 1 Miles

Padilla and Samish Bays | 10 Year





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- 0–1.5
- 1.5–3
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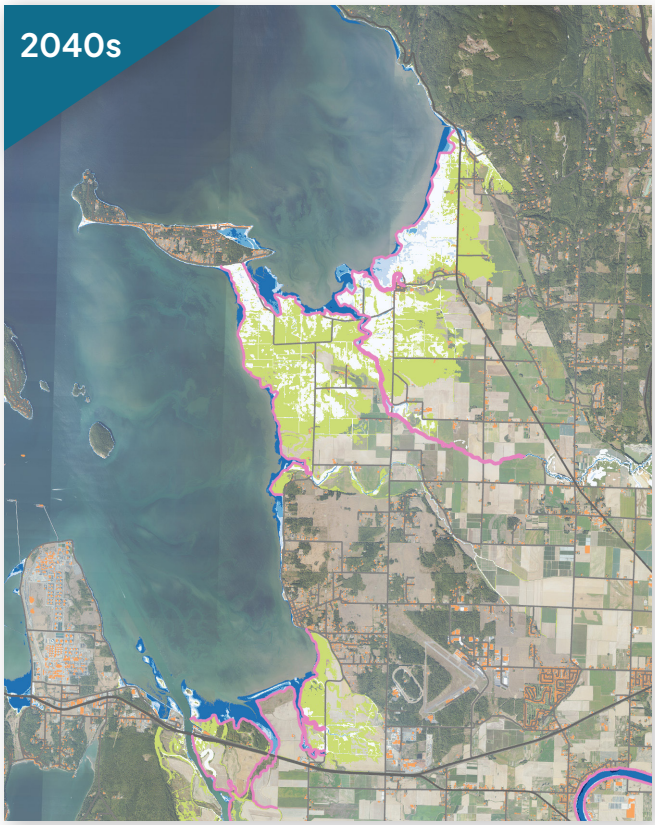
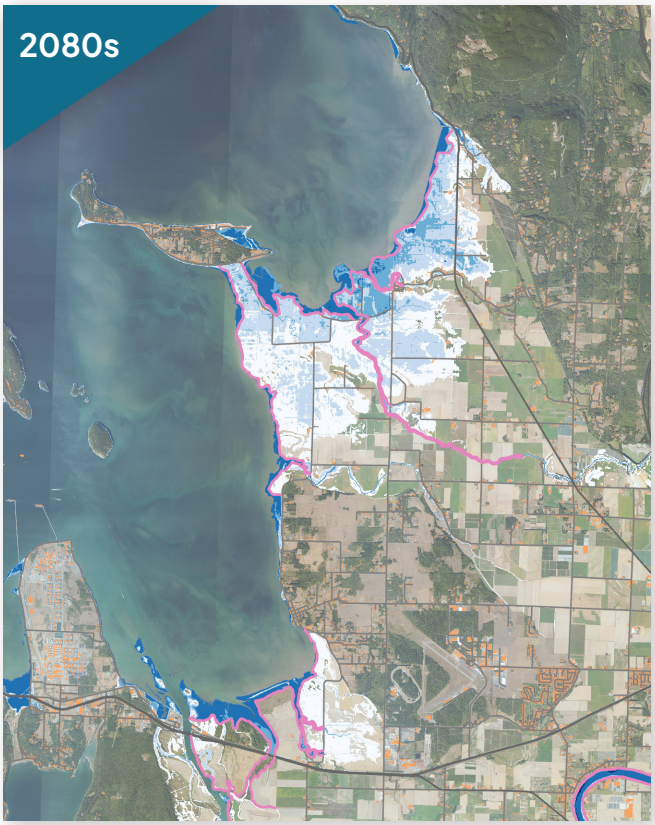
- 5–15
- >15

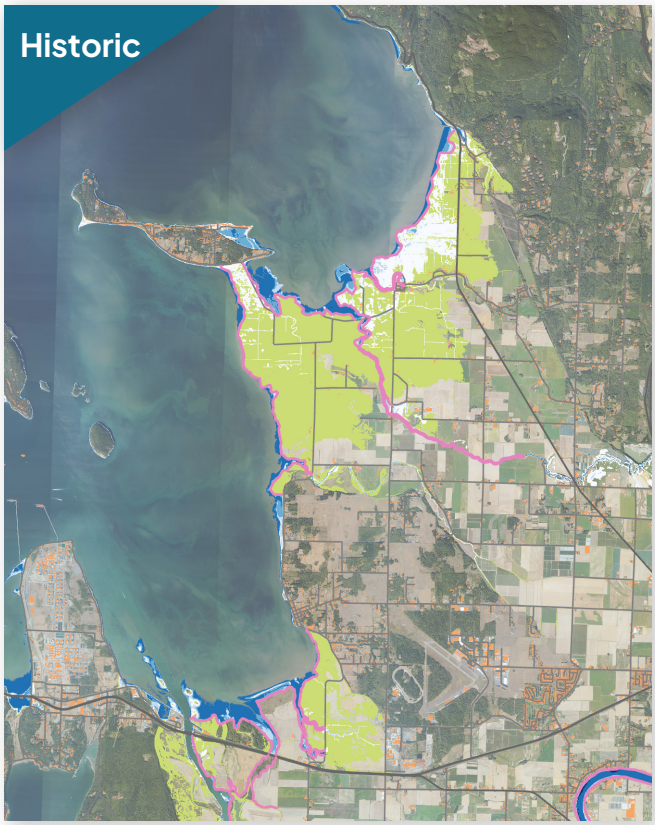
- 2080's flood extent for shown event
- Buildings
- Dike or Coastal Dike

0 1 2 Miles





Padilla and Samish Bays | 25 Year





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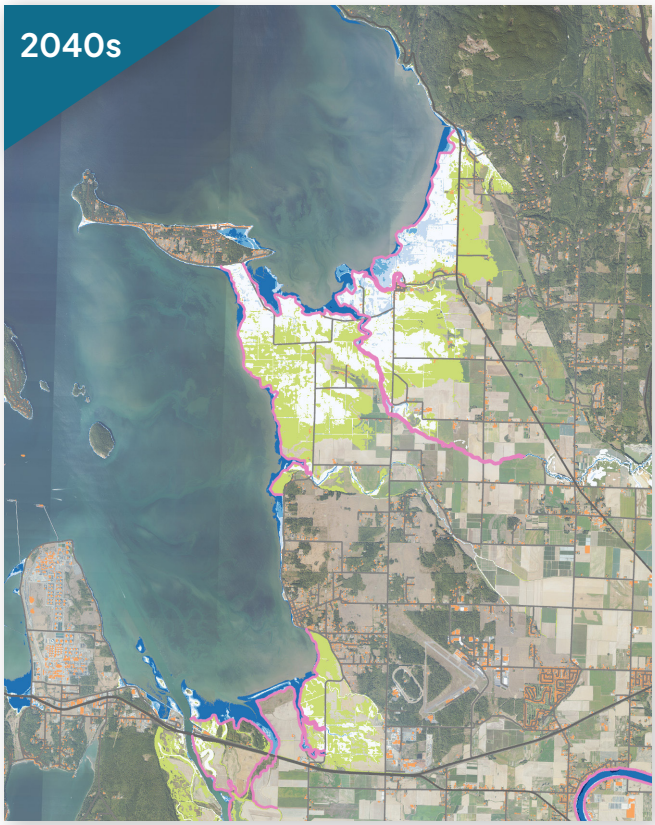
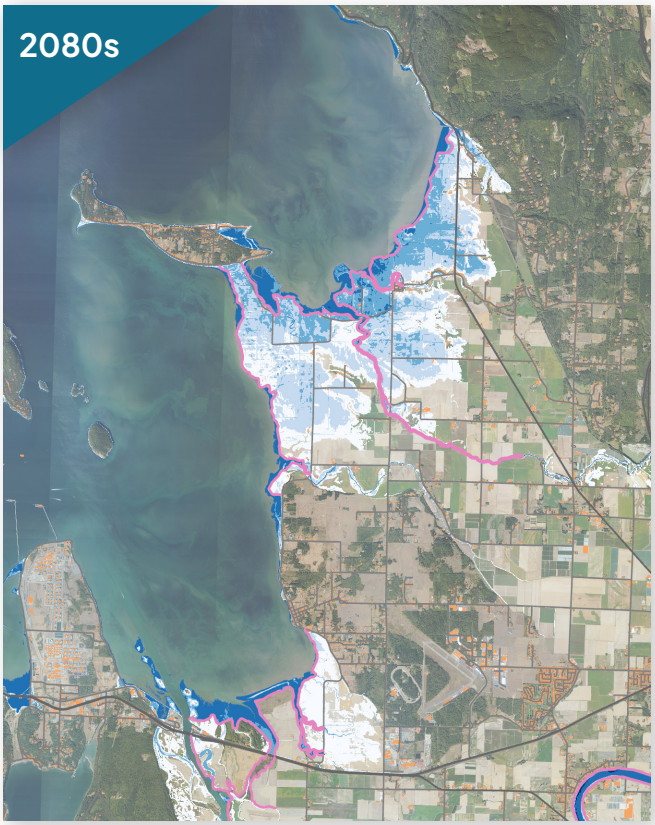
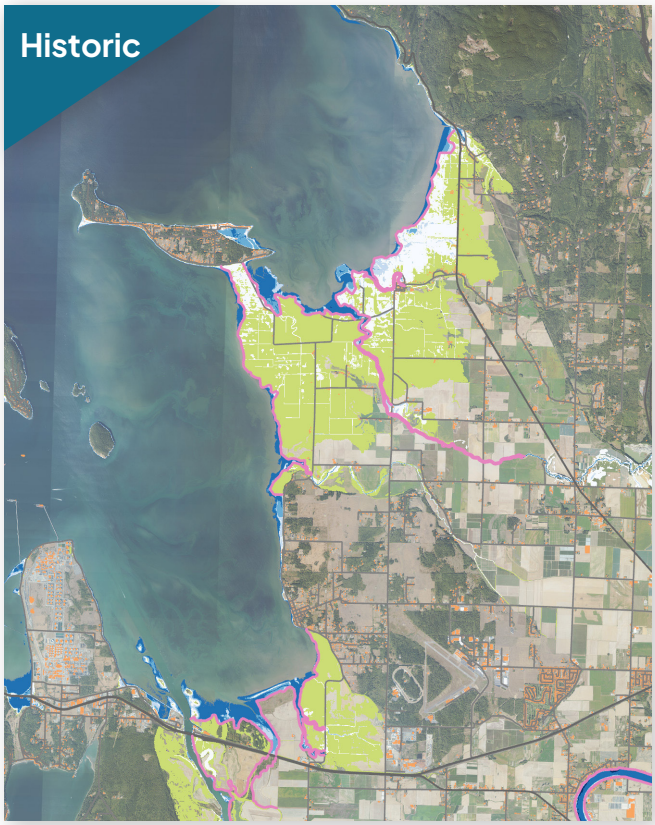
0 1 2 Miles





Padilla and Samish Bays | 100 Year





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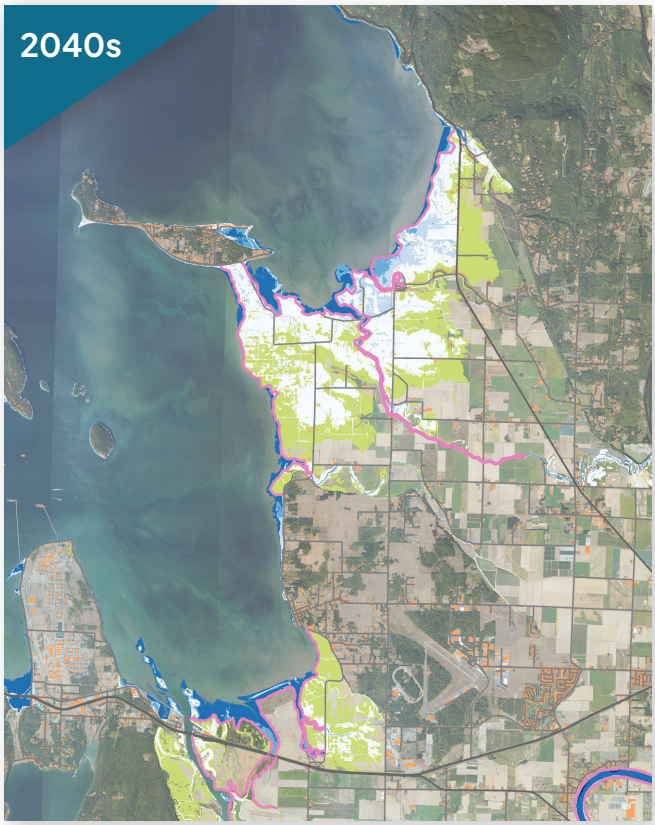
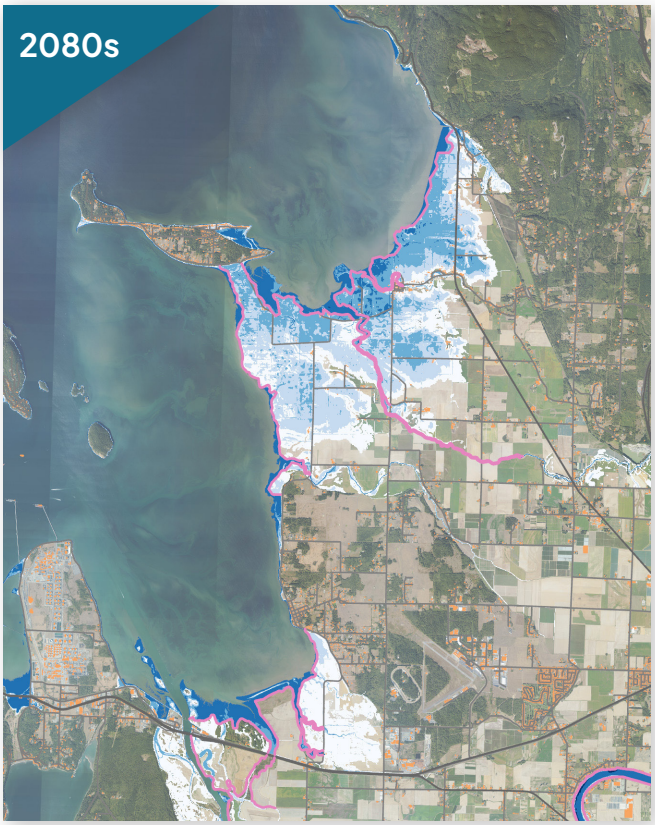
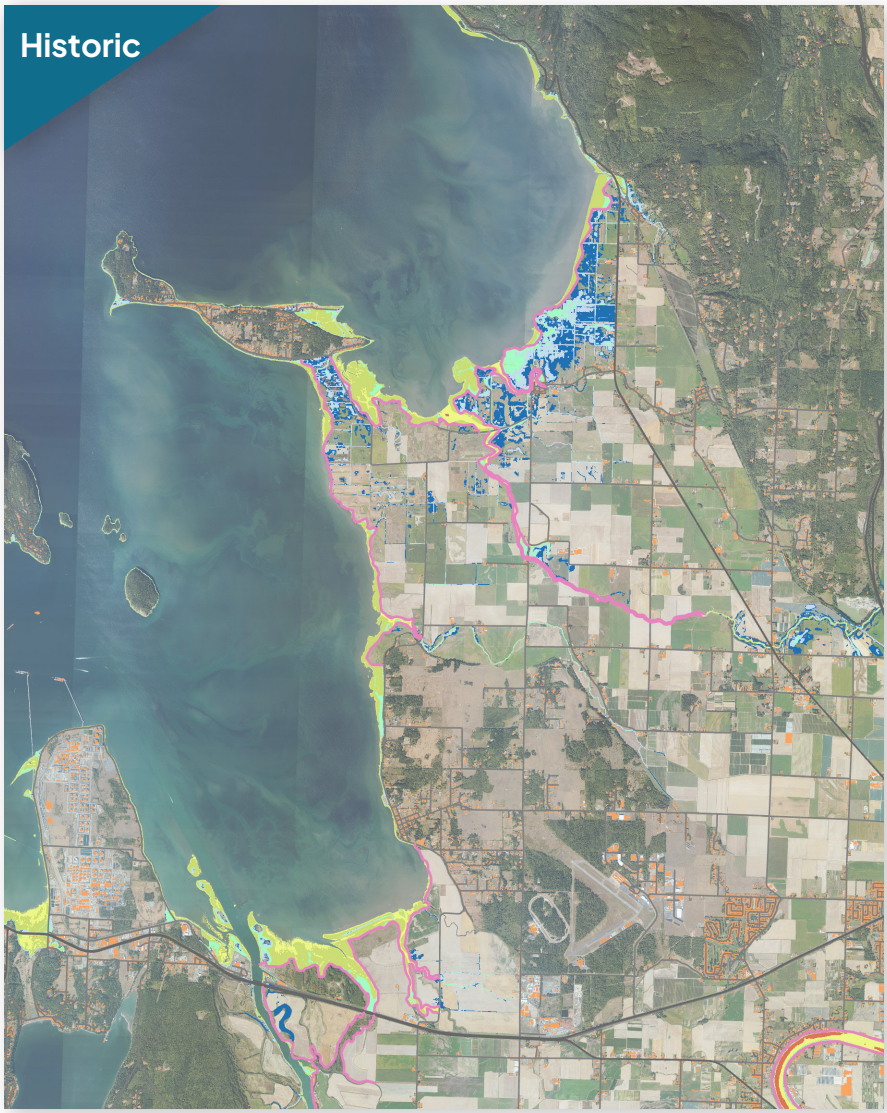




Padilla and Samish Bays | Depth-Velocity Hazard





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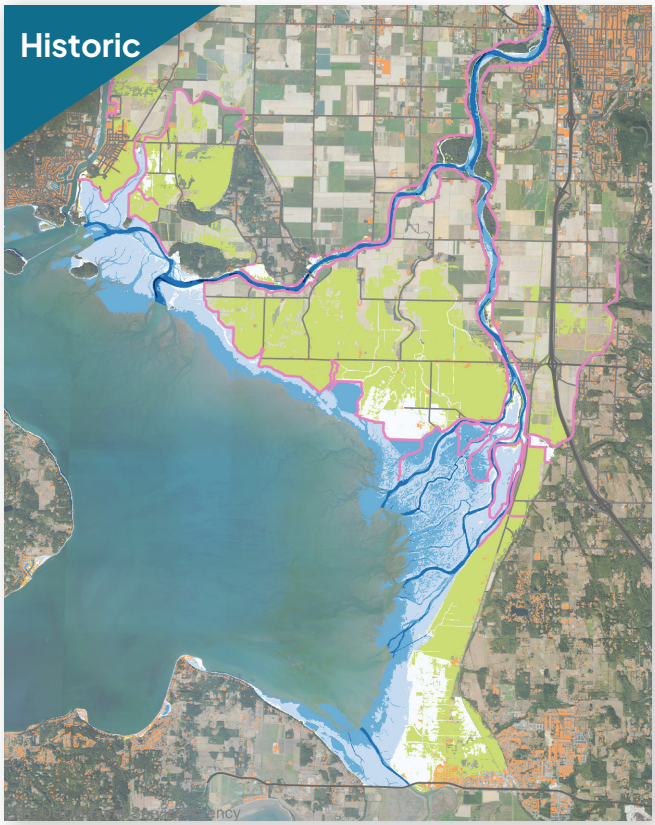
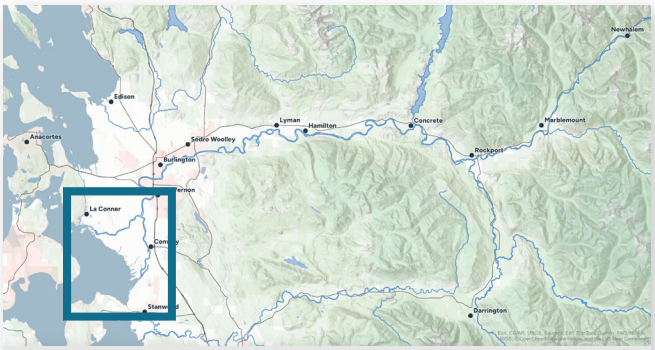
0 1 2 Miles

Skagit Bay | 10 Year Flood





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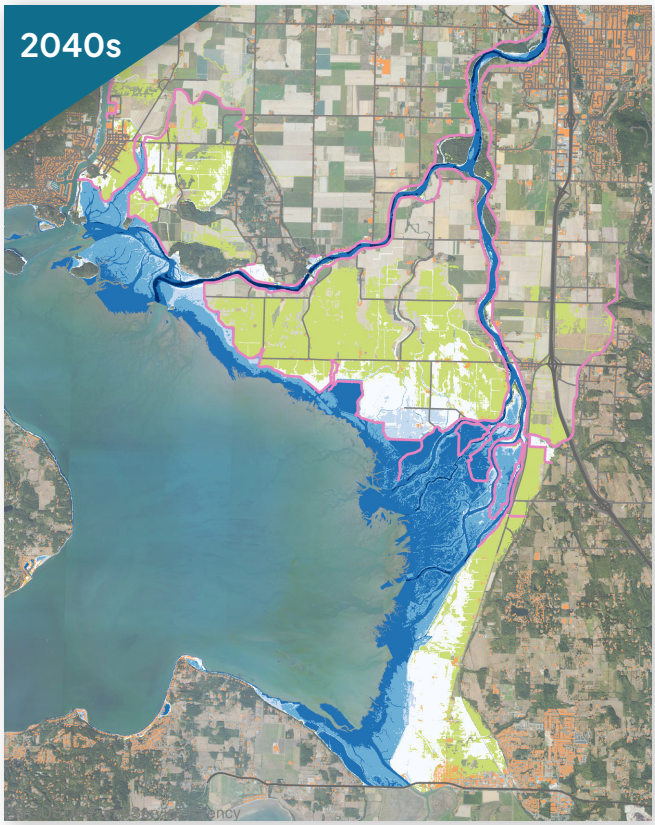
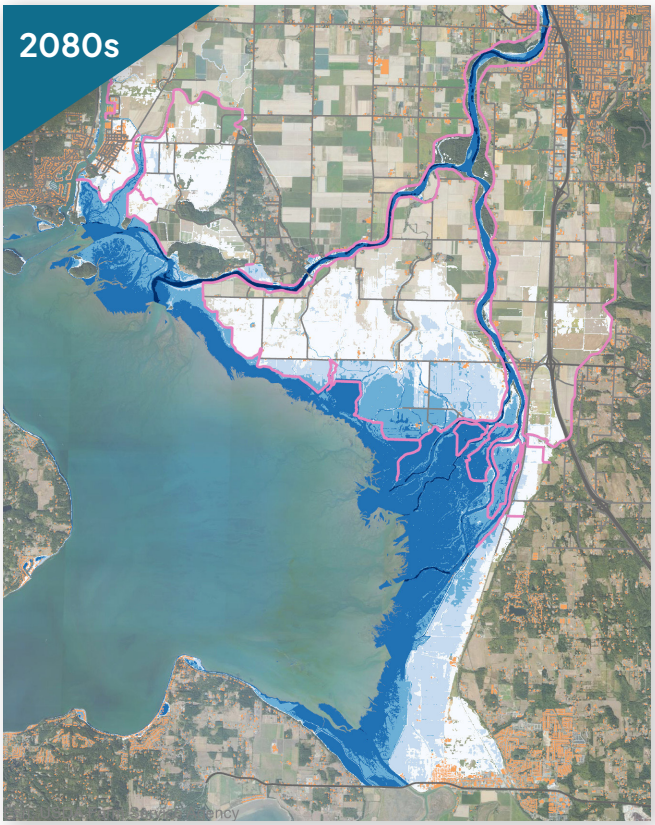
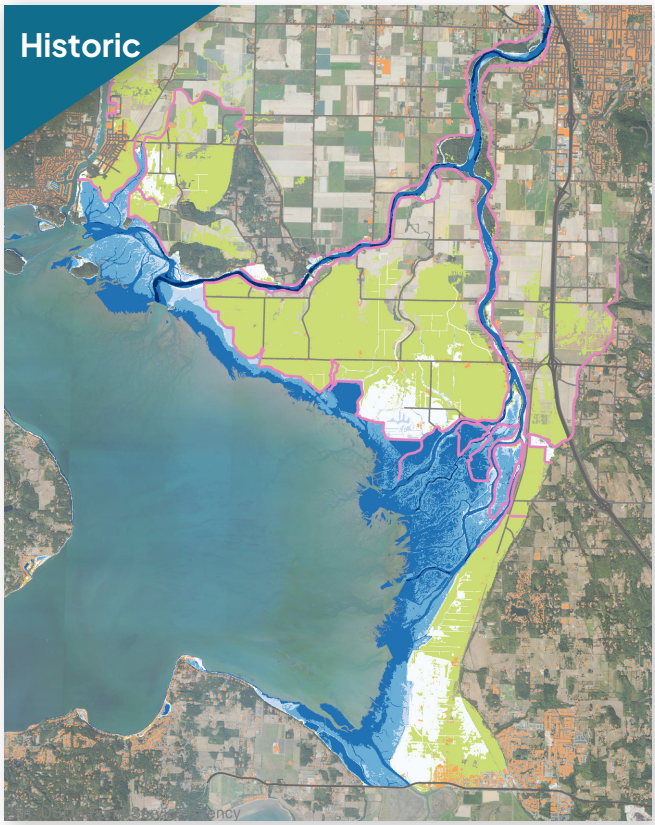
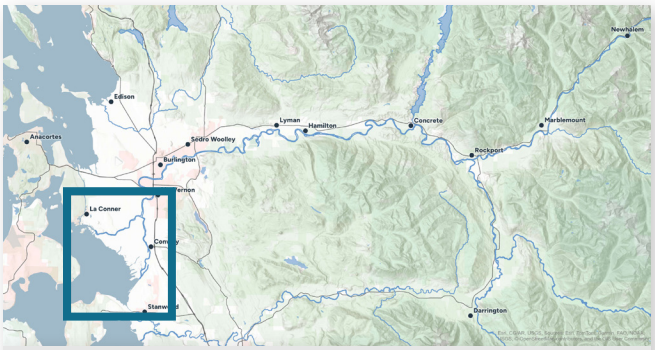




Skagit Bay | 25 Year Flood





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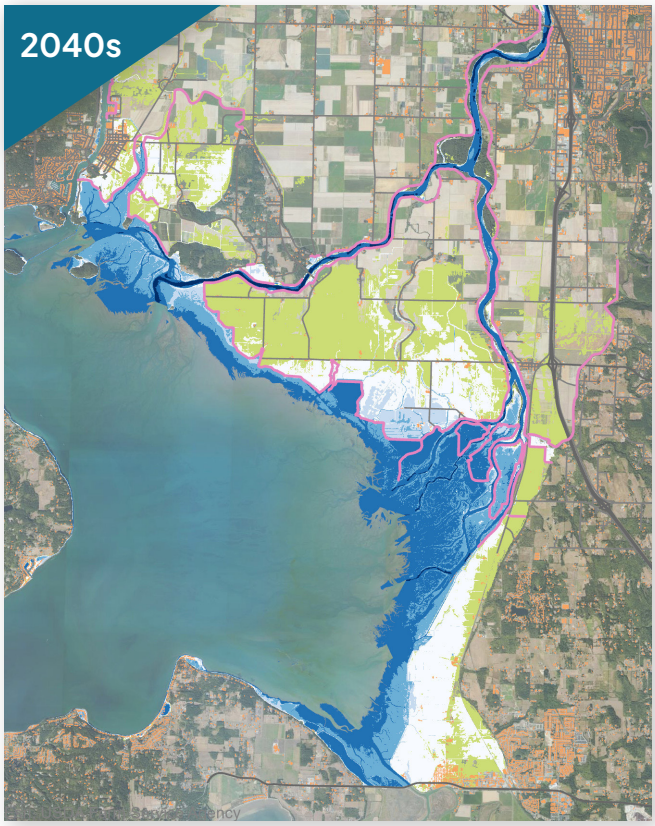
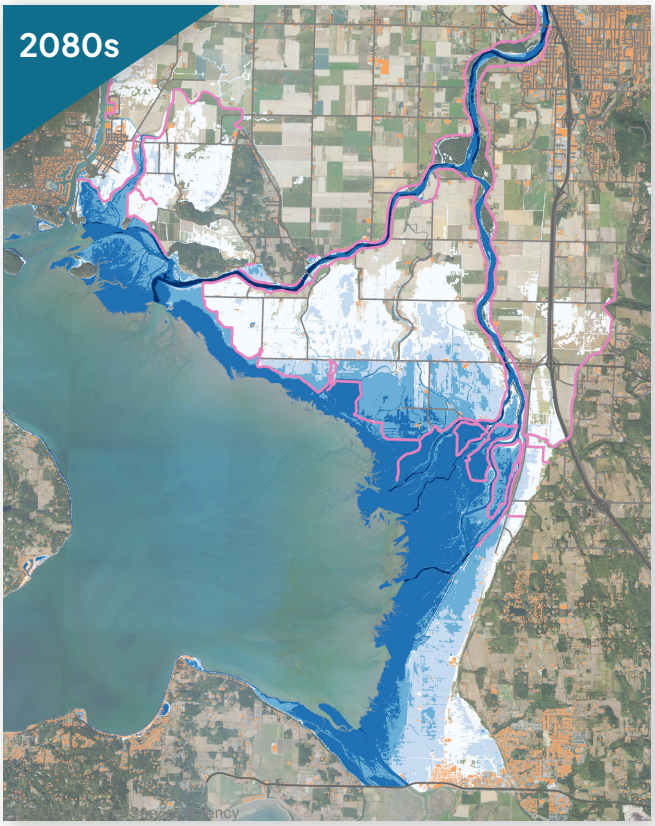
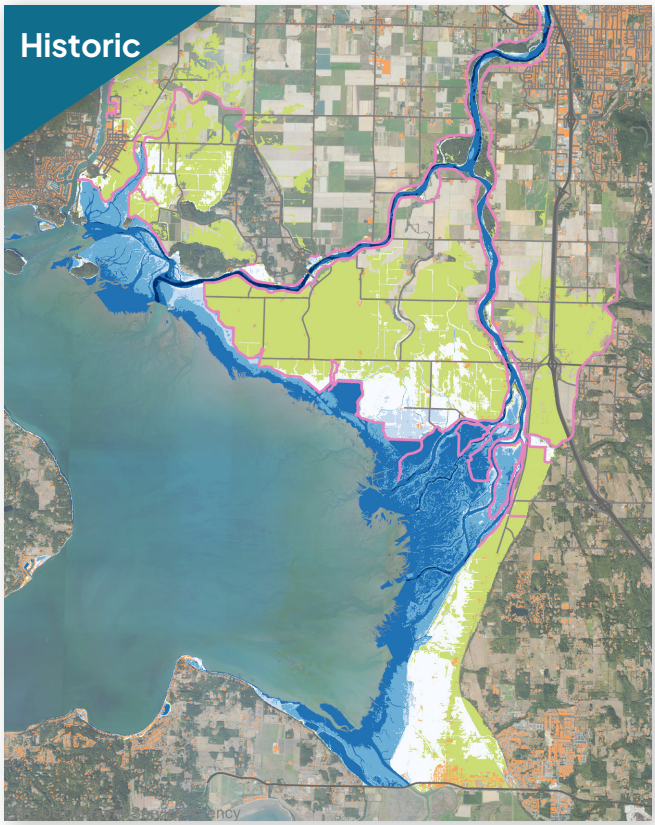
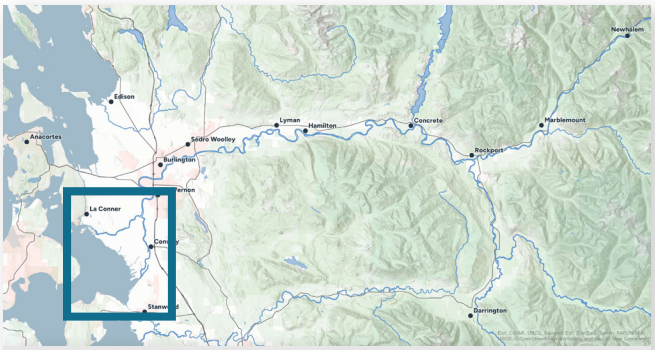




Skagit Bay | 100 Year Flood



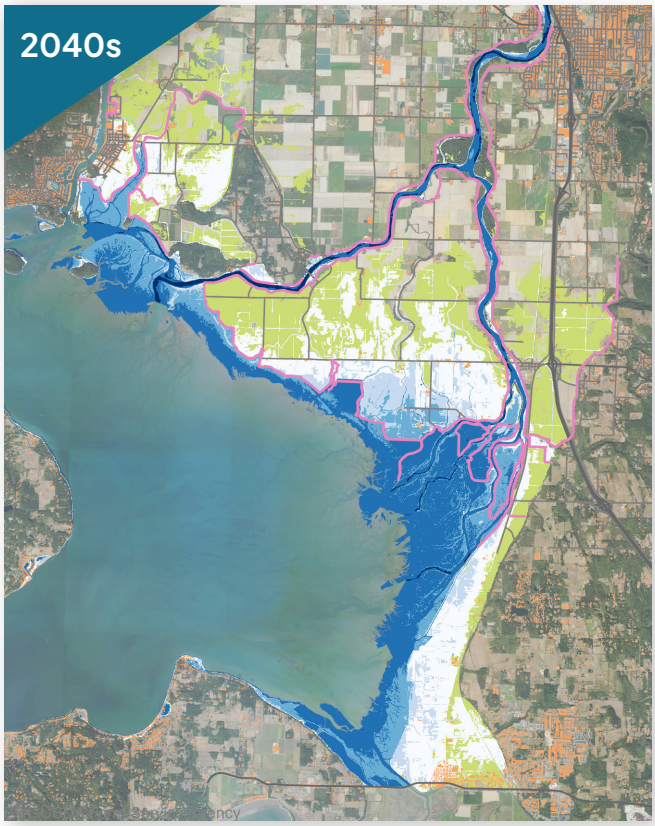


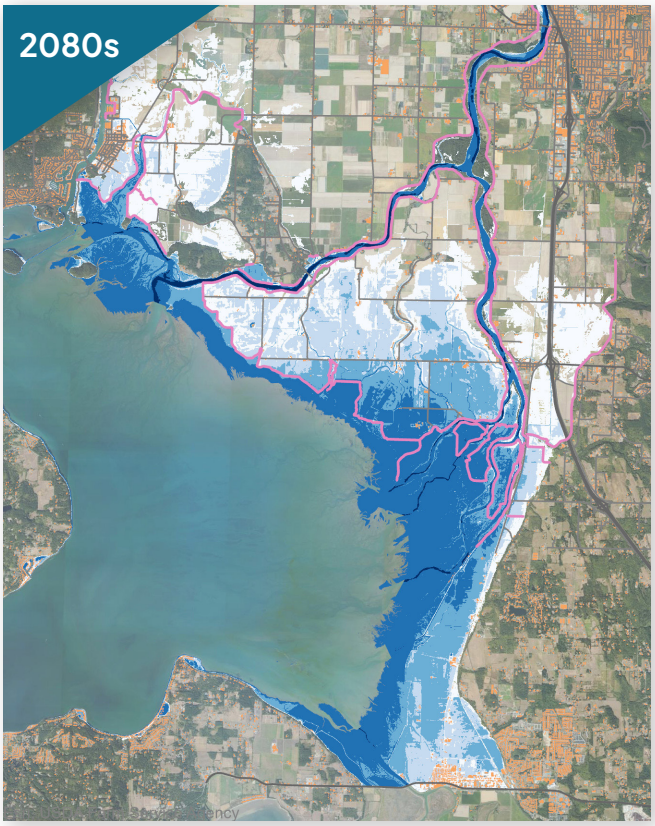
Flood Depth (ft)

- 0–1.5
- 1.5–3
- 3–5
- 5–15
- >15

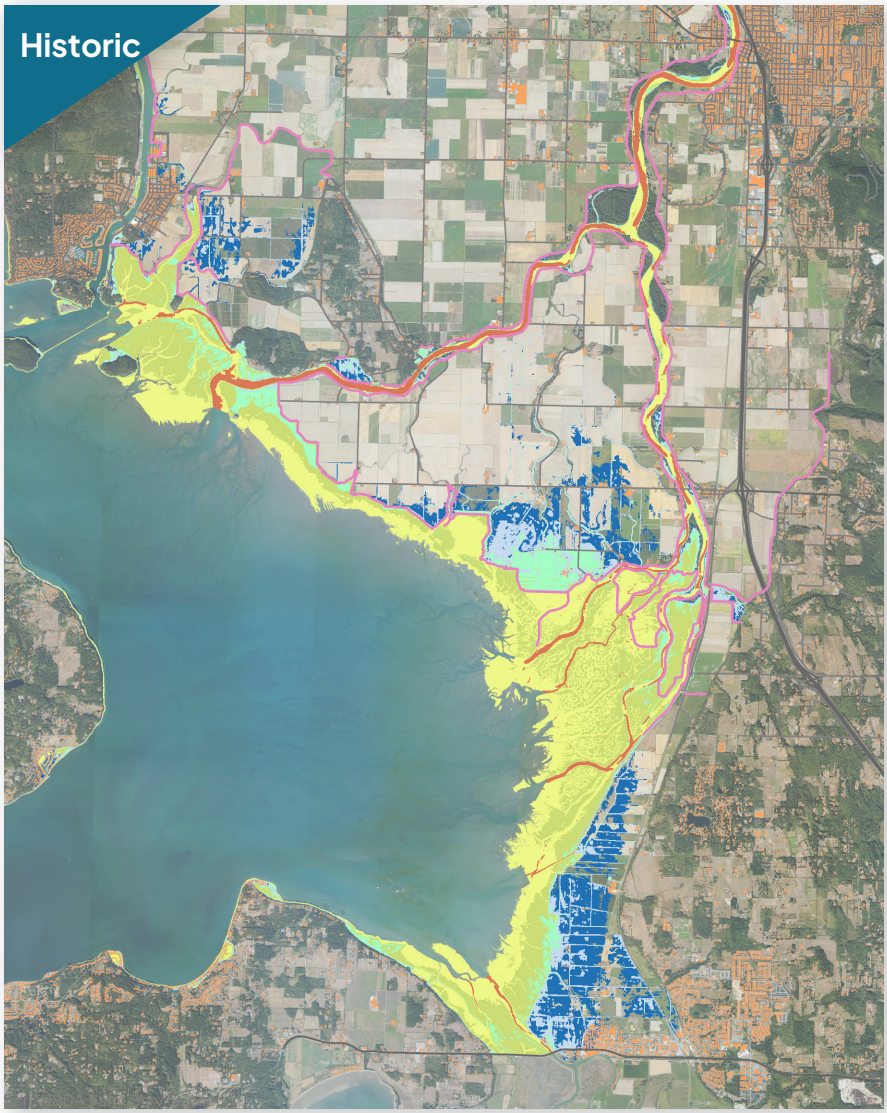
- 2080's flood extent for shown event
- Buildings
- Dike or Coastal Dike

0 1 2 Miles





Skagit Bay | Depth-Velocity Hazard





Descriptions for Flood Hazard Rating Mapping (AIDR, 2017)

- Generally safe for vehicles, people, and buildings
- Unsafe for small vehicles
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- Unsafe for vehicles and people
- Unsafe for vehicles and people. All building types vulnerable to structural damage.
- Unsafe for vehicles and people. All building types considered vulnerable to failure.
- Buildings
- Dike or Coastal Dike

0 1 2 Miles

Dike Failure Scenarios

This map bundle shows the results of dike failure scenarios for Sedro-Woolley downstream to Puget Sound.

There are six dike failure scenarios, all of which were initially developed for the Draft Skagit Basin General Investigation Study (USACE, 2014). All dike failure maps are based on the river flooding simulations. Although coastal flooding could result in dike failures, the six scenarios that we are examining are unlikely to be affected by coastal floods. This set includes an overview map of this area and zoomed-in map areas for Lafayette Road, Above BNSF Bridge, Below I-5 Bridge, Below Mount Vernon flood wall, Above Division Bridge, and North Fork Fir Island. Full context for these maps can be found in the full *Understanding Current and Future Skagit Flood Risk Through New Modeling Capabilities* report and specific details on the hydraulic model that created these maps can be found in Appendix A. Animations for select locations can be found at the Skagit Climate Science Consortium website.

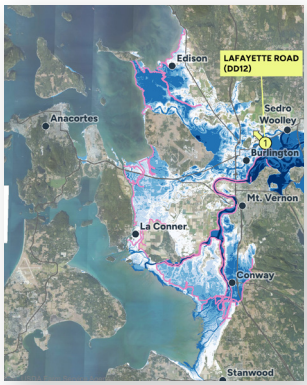
These maps are products of the hydraulic model detailed in Appendix A. They are provided without any warranty of performance or fitness for a particular purpose. They should not be depended upon as a sole source of information as they illustrate potential scales of flooding rather than exact locations and do not account for real-time changes like erosion, dike failures, larger than modeled events, or other factors. Maps should be used at your own risk.

How to Read Dike Failure Scenario Maps

What These Maps Show

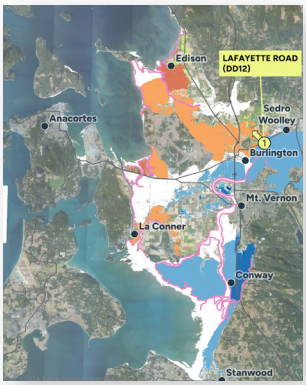
For all maps, the background is based on aerial imagery (USDA 2023). Structures are shown as orange rectangles (Microsoft 2022). Pink lines, if present, show dike or coastal dike locations (Skagit County 2022), and dark gray lines show major transportation routes (WSDOT 2008, Skagit County 2019). Dark blue lines show rivers on the overview maps.

FLOOD DEPTH MAPS



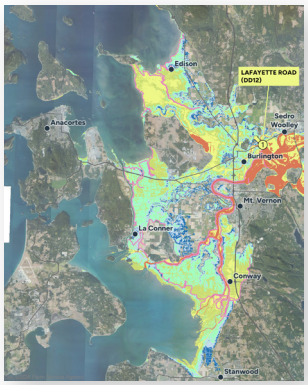
These maps show flood depths for each dike failure scenario. Maps highlight the location of the assumed failure with a green numbered circle. A green arrow shows the direction of the failure (right bank or left bank). Maps show the depth of flooding in shades of blue, where darker blue indicates deeper water and lighter blue indicates shallower water. Dikes or coastal dikes are shown in pink.

DEPTH DIFFERENCE MAPS



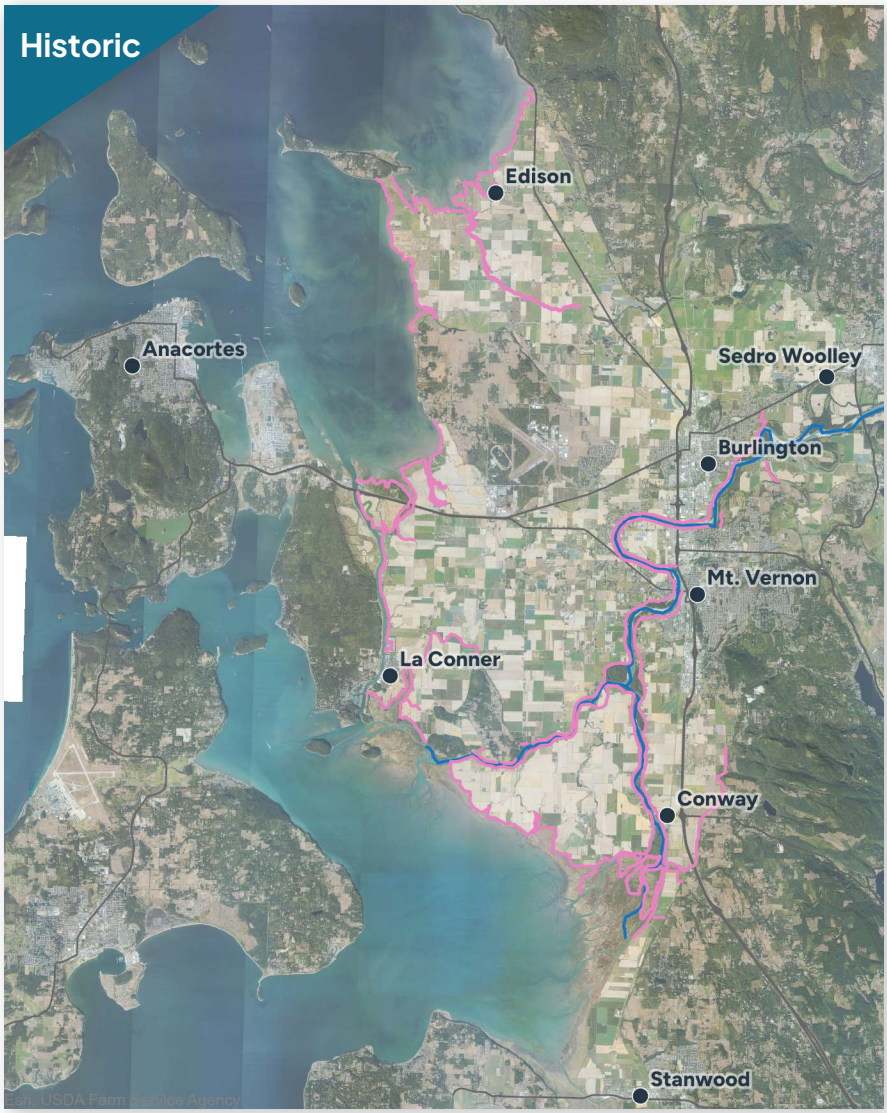
These maps show the difference in flood depth for a dike failure during the historic 100-year flood, relative to the "no failure" scenario. Differences are shown in shades of red when the dike failure flood depth is greater than the no failure scenario and shades of blue when the dike failure flood depth is less. White denotes areas with no change in flood depths between the failure and no failure scenarios. Light green shading highlights areas that are flooded in the dike failure scenario but not in the no failure scenario.

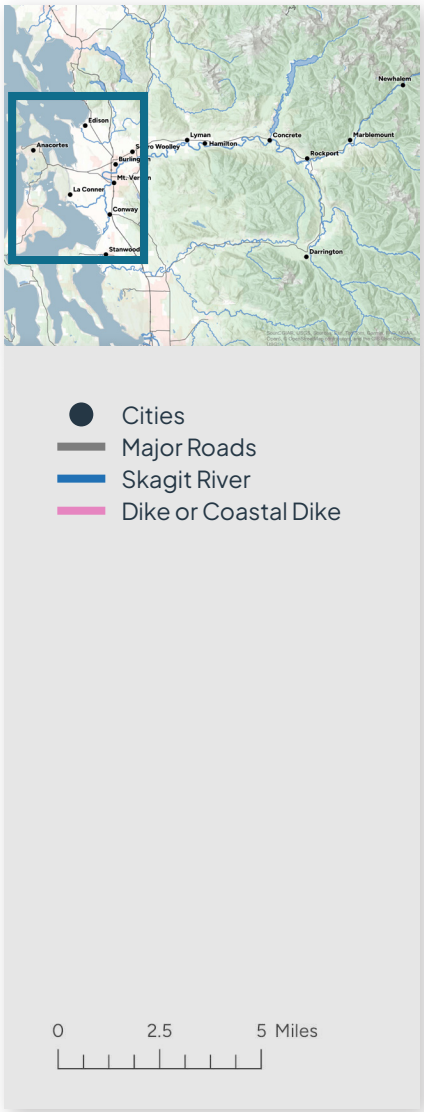
DEPTH-VELOCITY HAZARD MAPS



These maps show depth-velocity hazards for a historic 100-year event associated with a dike failure scenario. The hazard classifications shown in the key were assigned based on a standard international practice (AIDR, 2017) and grouped into six hazard ratings. The hazard mapping is based on clearwater hazards and does not account for secondary hazards such as geomorphic hazards (e.g., erosion, avulsion, debris flows, alluvial fan, etc.). Colors show when water poses a risk to children, adults, vehicles, and structures due to depth, velocity or a combination of the two, where darker blue indicates lower hazard classifications and yellows/oranges indicate the highest hazard classifications.

Overview Map

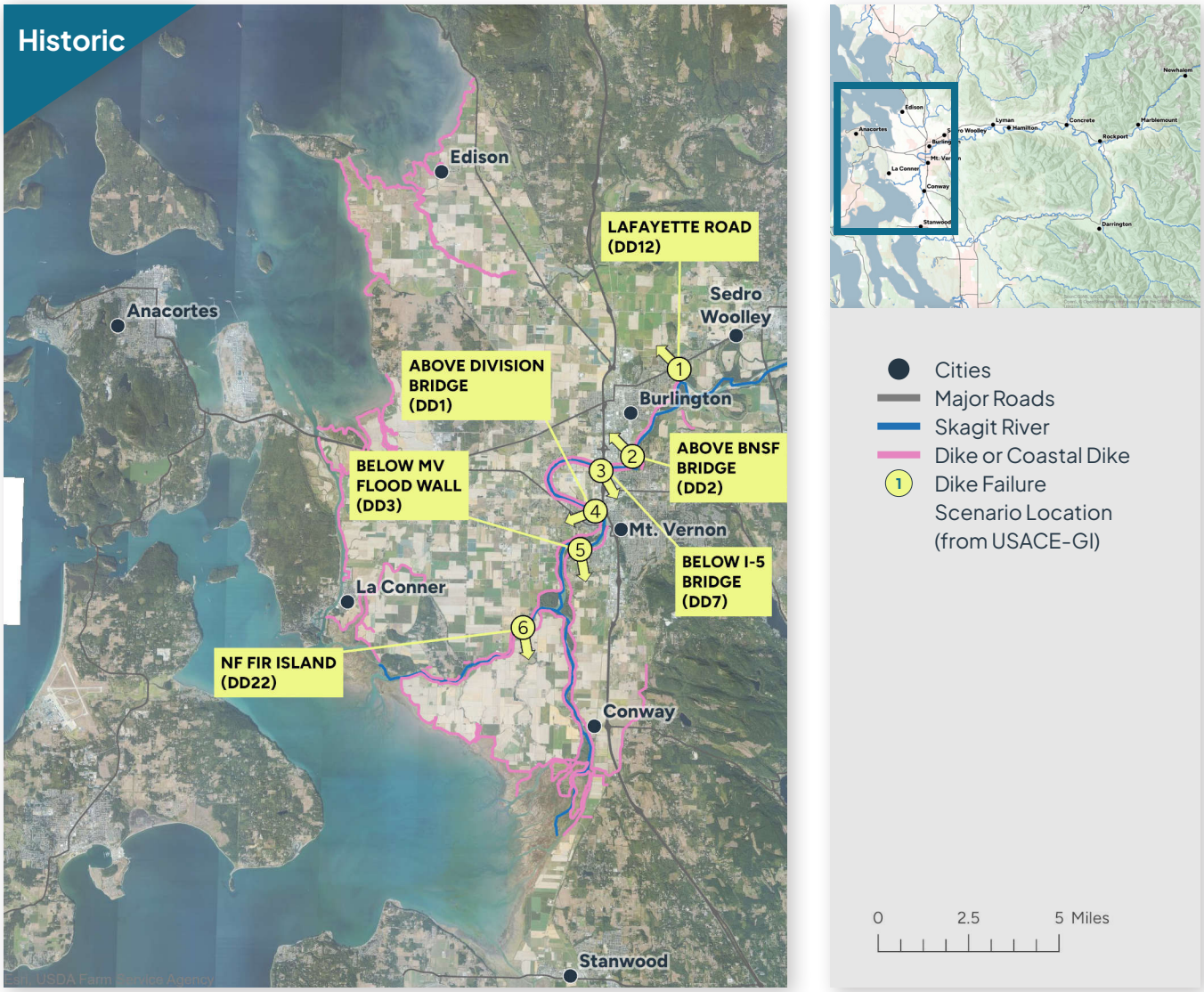




LIKELIHOOD OF A DIKE FAILURE IN A 100-YEAR HISTORIC OR FUTURE FLOOD EVENT

Flood maps, including those shown above, are often based on simulations in which all infrastructure – including dikes and coastal dikes – remains intact. Flood waters can overtop structures in these simulations, but they do not cause failures. In reality, dikes can fail even when they are not overtopped, and dike failure is a risk during Skagit floods. Understanding how flooding might evolve under different dike failure scenarios is an important part of evaluating flood risks. This map bundle provides six examples of failure scenarios in different parts of the lower Skagit system to explore how significantly a failure can affect flood depths and depth-velocity hazards.

Failure Locations (from USACE-GI)

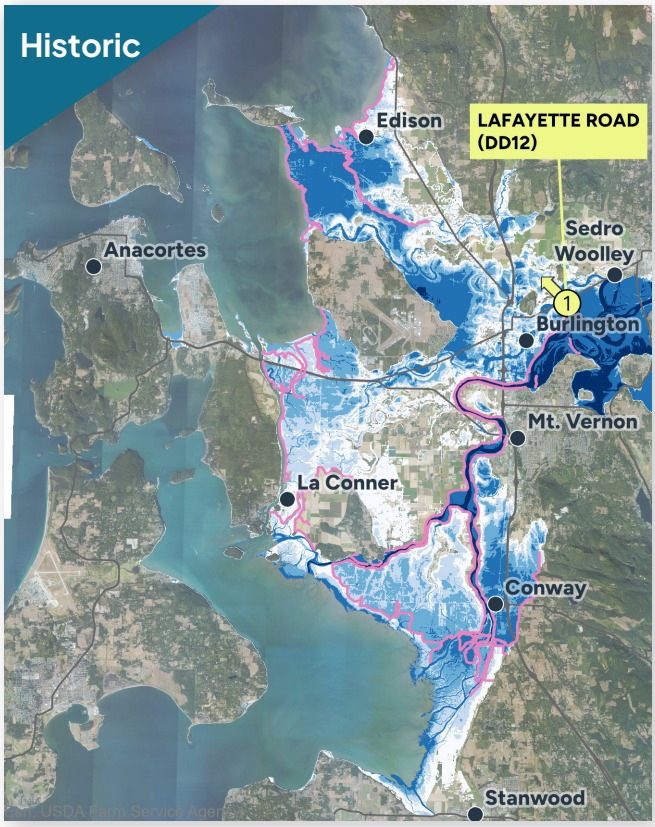


SIX SELECTED DIKE FAILURE SCENARIOS

This map shows the location of the six dike failure scenarios used to develop the depth, depth difference and depth-velocity hazard map products. The arrows show the direction (right bank or left bank) of the failure. The locations of these selected failures are not meant to imply that failures could only occur in these locations nor that they will necessarily occur in these locations. The locations were chosen to be representative of the consequences of failures at different locations along the river and occurring on different sides of the river. The six scenarios were selected for the Draft Skagit Basin General Investigation Study (USACE, 2014).

Lafayette Road

FLOOD DEPTH



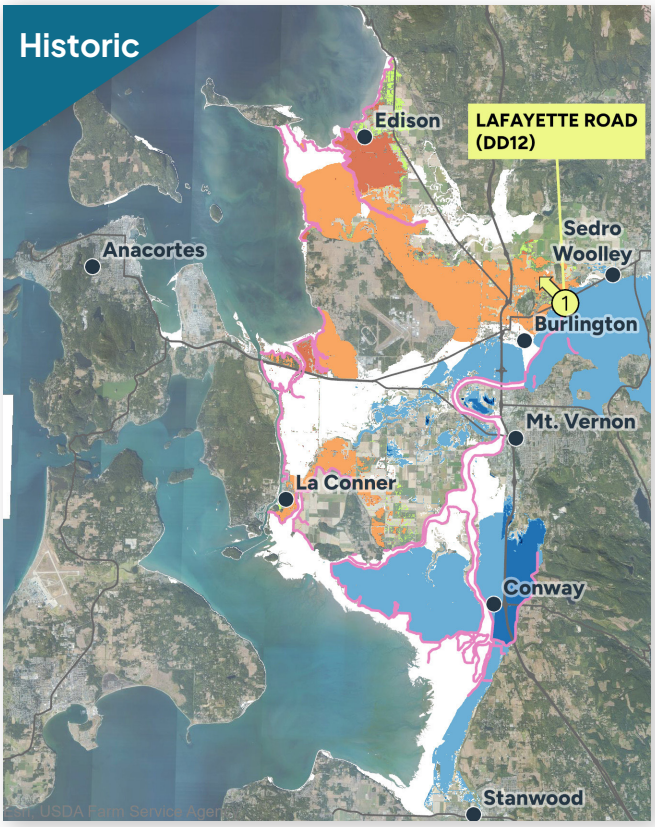
Flood Depth (ft)
- 0–1.5
- 1.5–3
- 3–5
- 5–15
- >15

0 2.5 5 Miles

Dike or Coastal Dike

1 Dike Failure Scenario Location (from USACE-GI)

DEPTH DIFFERENCE



Depth Difference (ft)
- -5 - -2
- -2 - -1
- -1 - 0
- 0
- 0 - 1
- 1 - 2
- 2 - 5
- 5–10

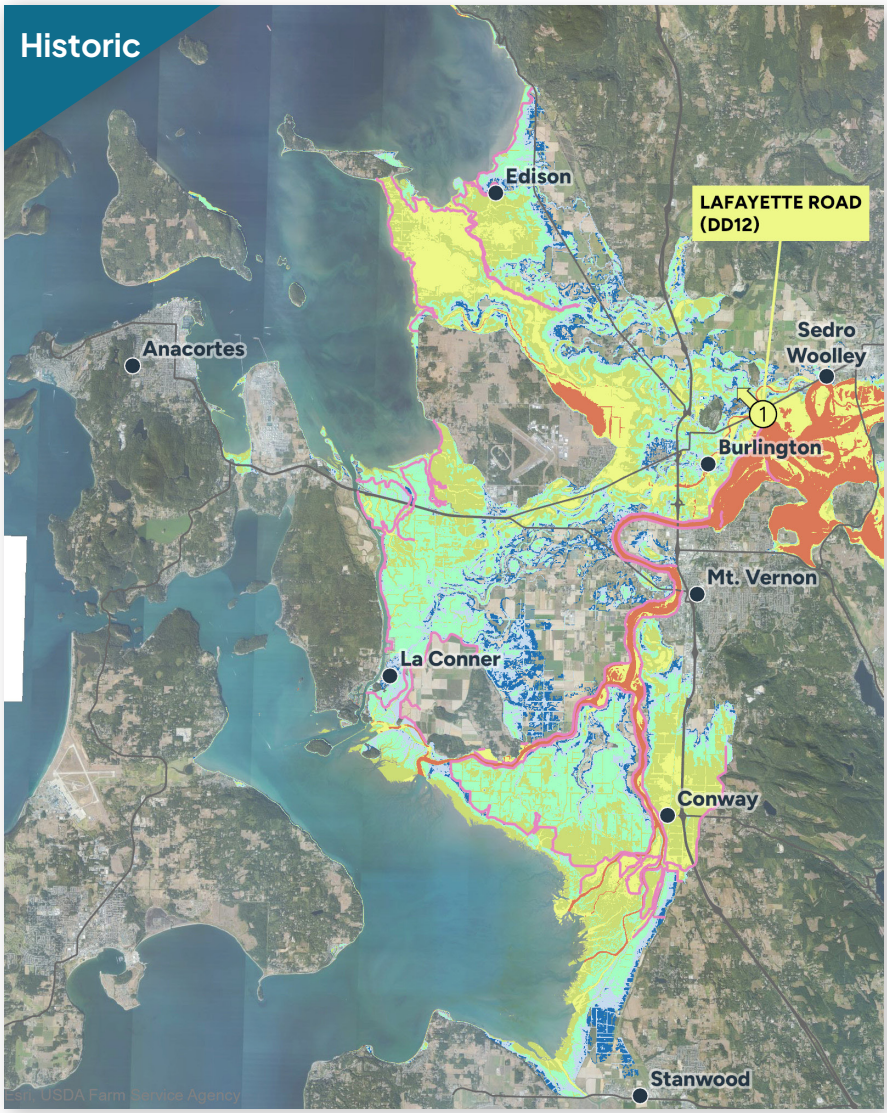
Additional flooding from dike failure

Dike or Coastal Dike

1 Dike Failure Scenario Location (from USACE-GI)

Lafayette Road

DEPTH-VELOCITY HAZARD



Descriptions for Flood Hazard Rating Mapping (AIDR, 2017)

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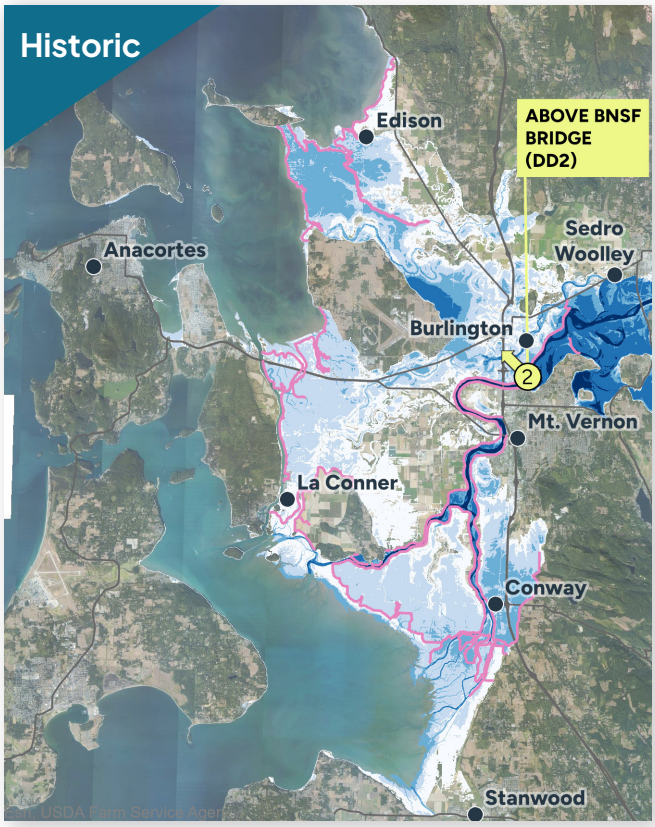
- Unsafe for vehicles and people. All building types considered vulnerable to failure.
- Dike or Coastal Dike
- (1) Dike Failure Scenario Location (from USACE-GI)

0 2.5 5 Miles

Above BNSF Bridge

FLOOD DEPTH



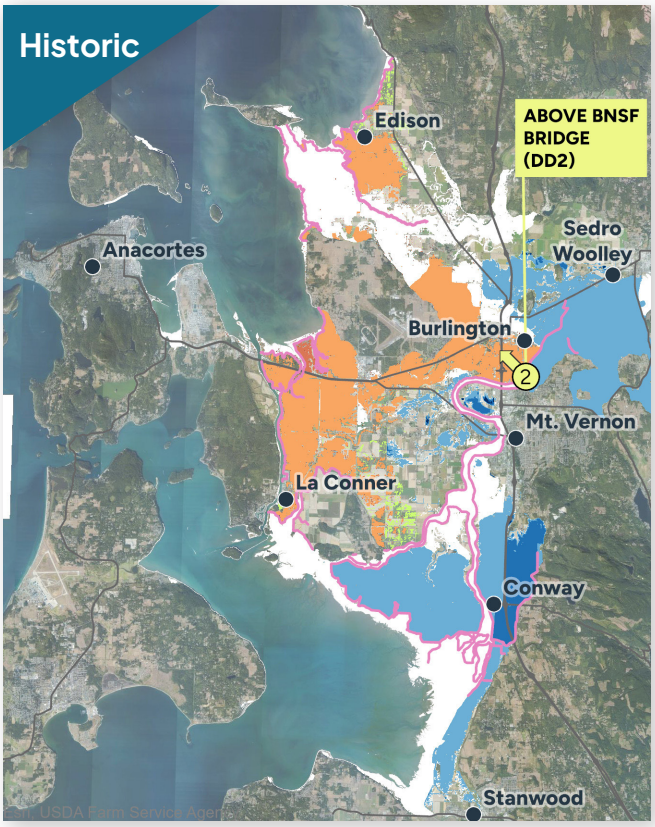
Flood Depth (ft)
- 0–1.5
- 1.5–3
- 3–5
- 5–15
- >15

0 2.5 5 Miles

Dike or Coastal Dike

2 Dike Failure Scenario Location (from USACE-GI)

DEPTH DIFFERENCE



Depth Difference (ft)
- -5 - -2
- -2 - -1
- -1 - 0
- 0
- 0 - 1
- 1 - 2
- 2 - 5
- 5–10

Additional flooding from dike failure

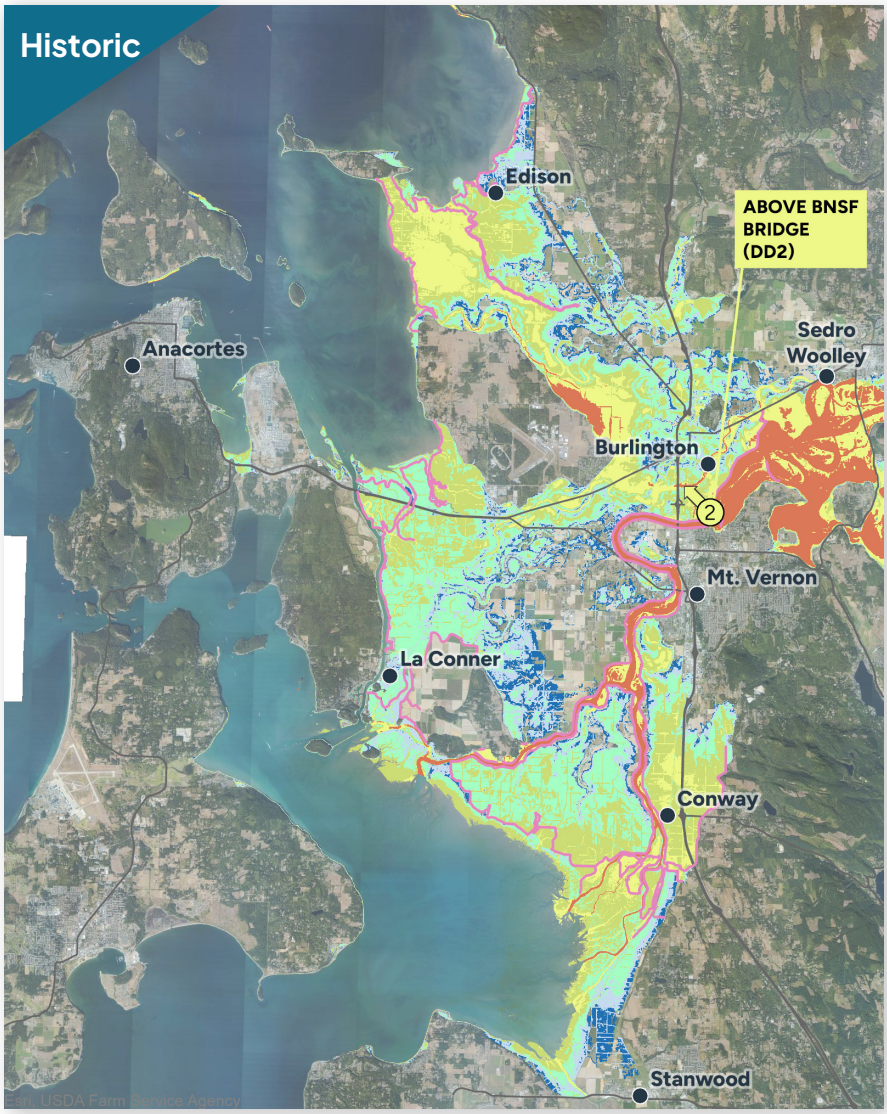
Dike or Coastal Dike

2 Dike Failure Scenario Location (from USACE-GI)

DIKE FAILURE SCENARIOS

Above BNSF Bridge

DEPTH-VELOCITY HAZARD



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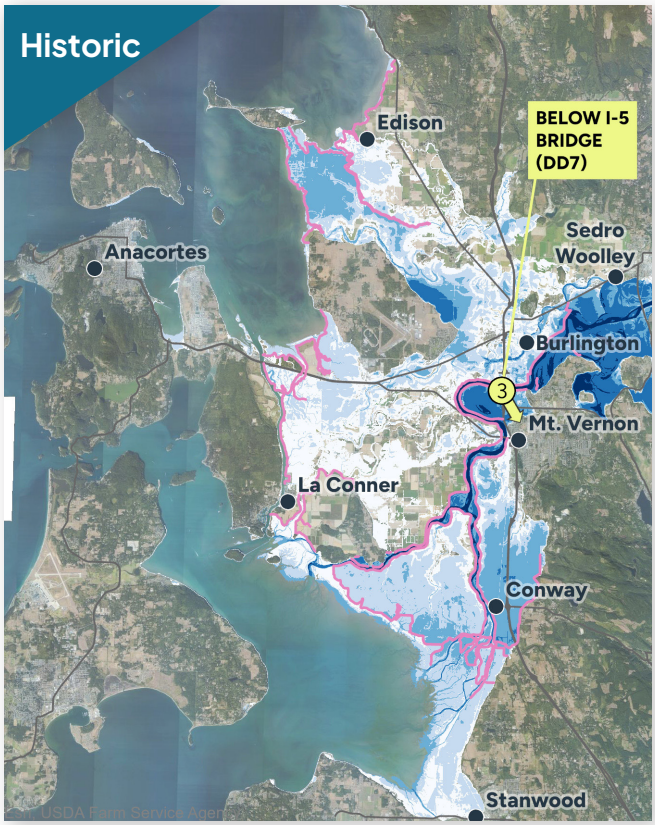
- Dike or Coastal Dike
- (2) Dike Failure Scenario Location (from USACE-GI)

0 2.5 5 Miles

DIKE FAILURE SCENARIOS

Below I-5 Bridge

FLOOD DEPTH



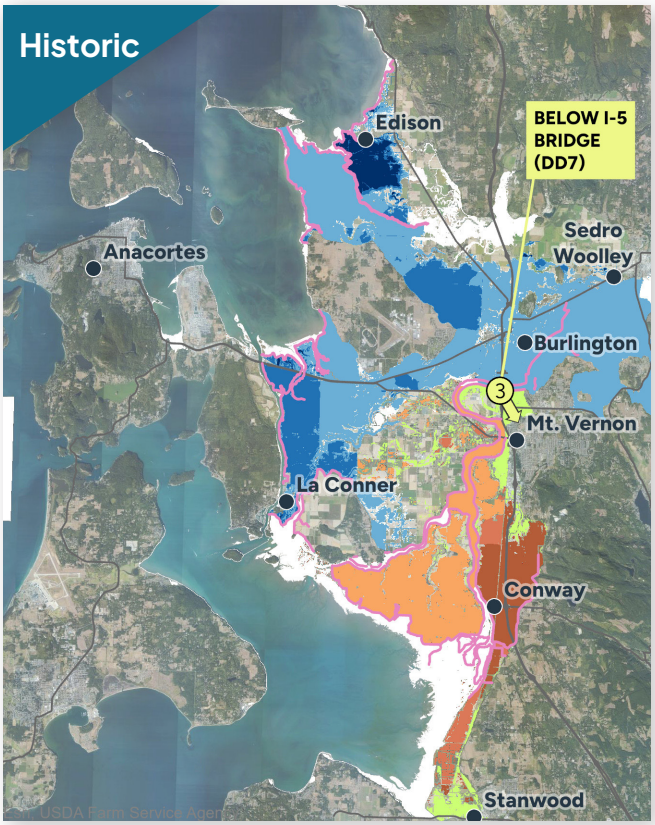
Flood Depth (ft)
- 0–1.5
- 1.5–3
- 3–5
- 5–15
- >15

0 2.5 5 Miles

Dike or Coastal Dike

3 Dike Failure Scenario Location (from USACE-GI)

DEPTH DIFFERENCE



Depth Difference (ft)
- -5 - -2
- -2 - -1
- -1 - 0
- 0
- 0 - 1
- 1 - 2
- 2 - 5
- 5–10

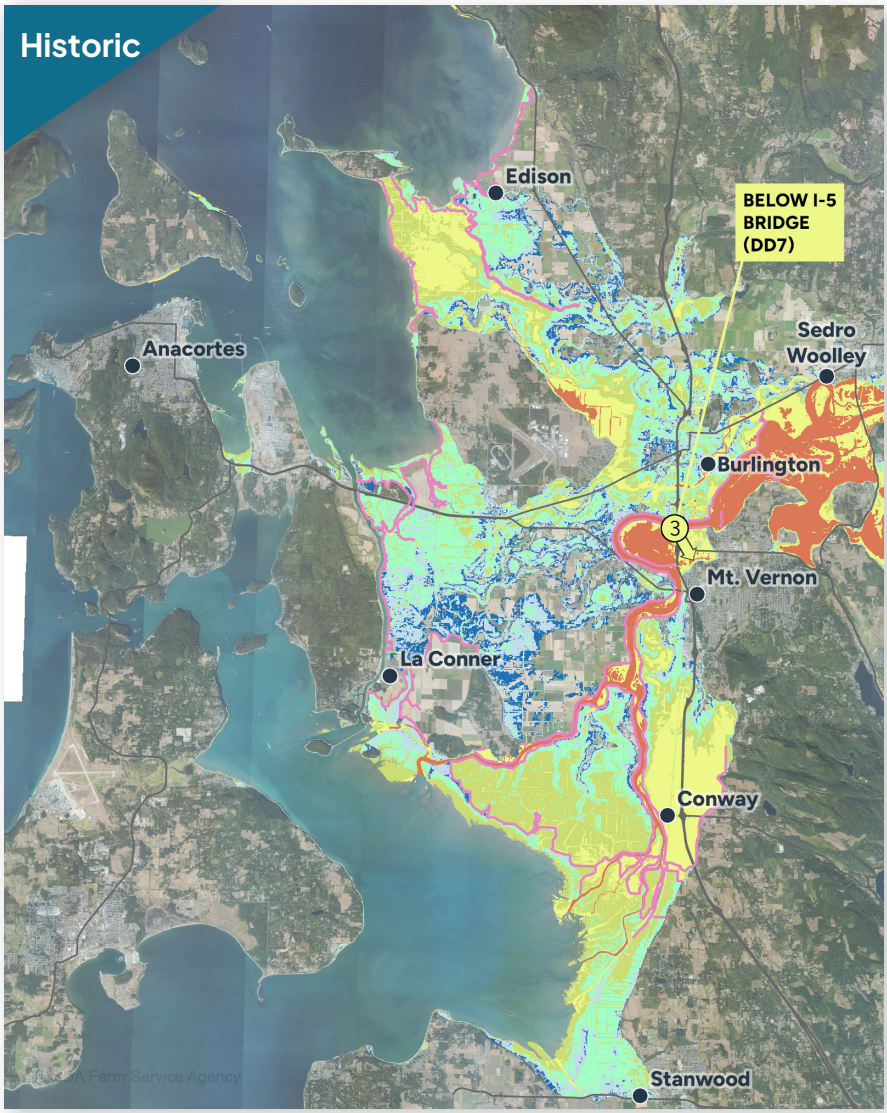
Additional flooding from dike failure

Dike or Coastal Dike

3 Dike Failure Scenario Location (from USACE-GI)

Below I-5 Bridge

DEPTH-VELOCITY HAZARD



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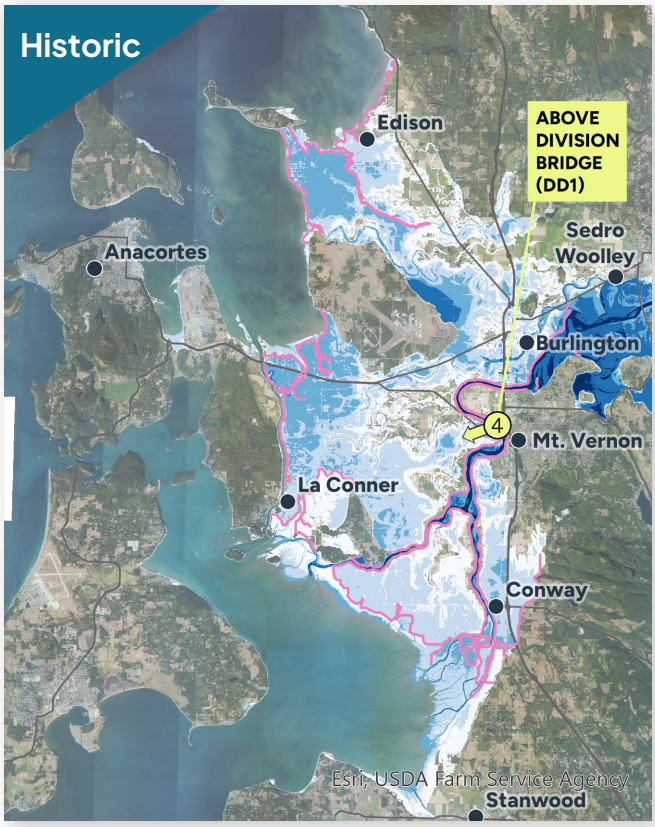
- Unsafe for vehicles and people. All building types considered vulnerable to failure.
- Dike or Coastal Dike
- (3) Dike Failure Scenario Location (from USACE-GI)

0 2.5 5 Miles

DIKE FAILURE SCENARIOS

Above Division Bridge

FLOOD DEPTH



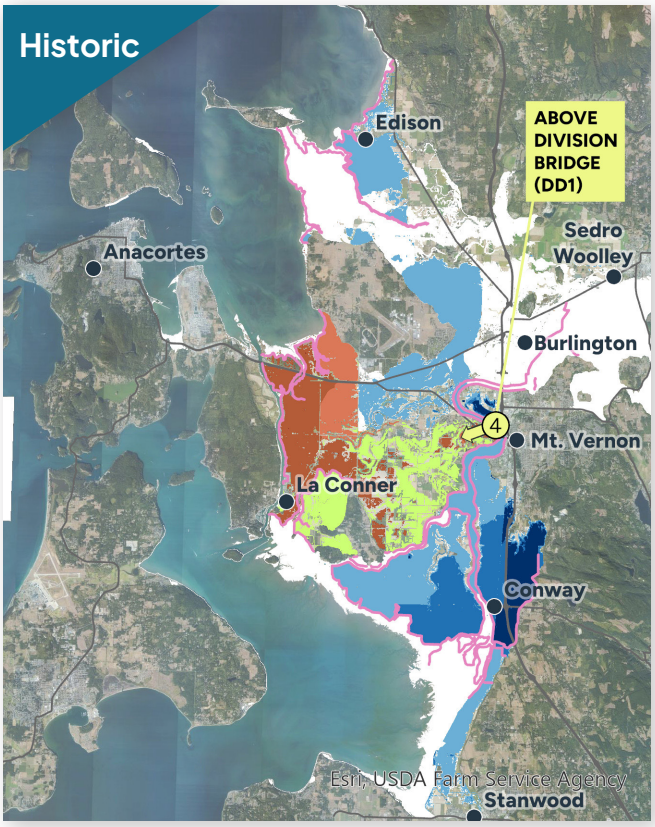
Flood Depth (ft)
- 0–1.5
- 1.5–3
- 3–5
- 5–15
- >15

0 2.5 5 Miles

Dike or Coastal Dike

4 Dike Failure Scenario Location (from USACE-GI)

DEPTH DIFFERENCE



Depth Difference (ft)
- -5 - -2
- -2 - -1
- -1 - 0
- 0
- 0 - 1
- 1 - 2
- 2 - 5
- 5–10

Additional flooding from dike failure

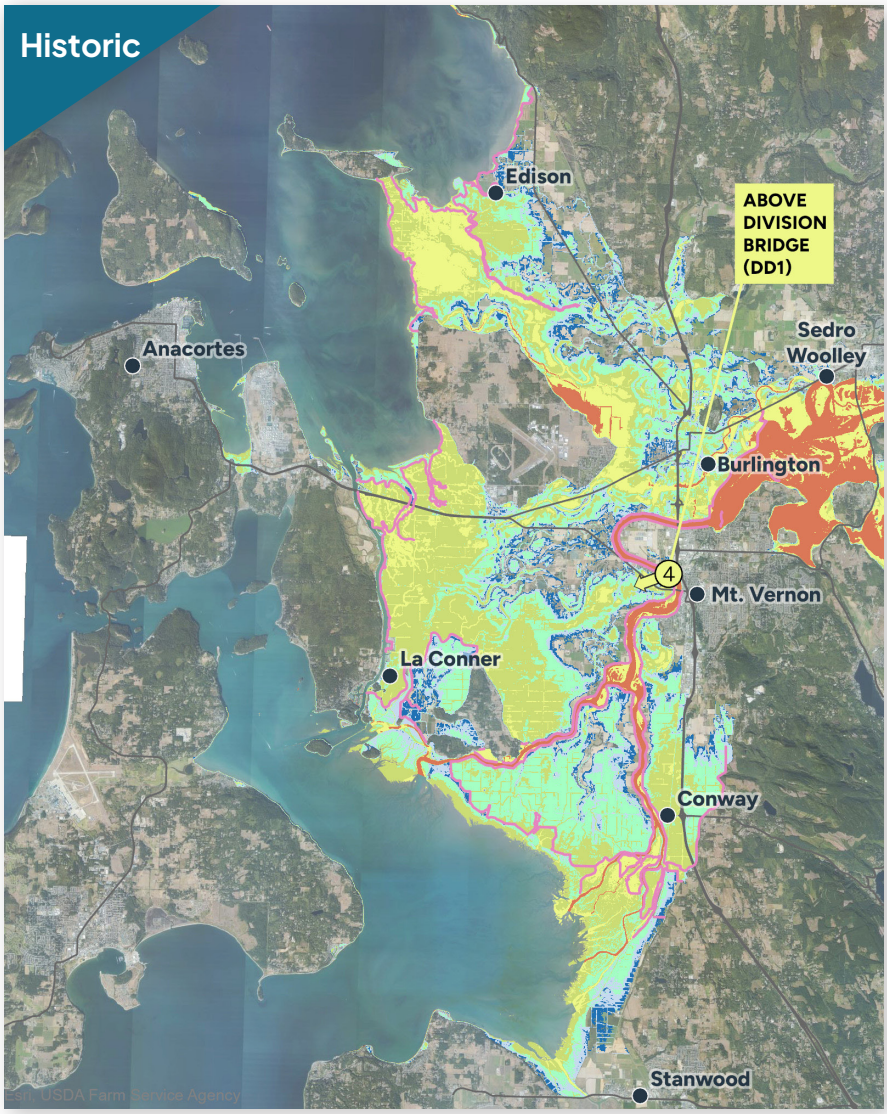
Dike or Coastal Dike

4 Dike Failure Scenario Location (from USACE-GI)

DIKE FAILURE SCENARIOS

Above Division Bridge

DEPTH-VELOCITY HAZARD



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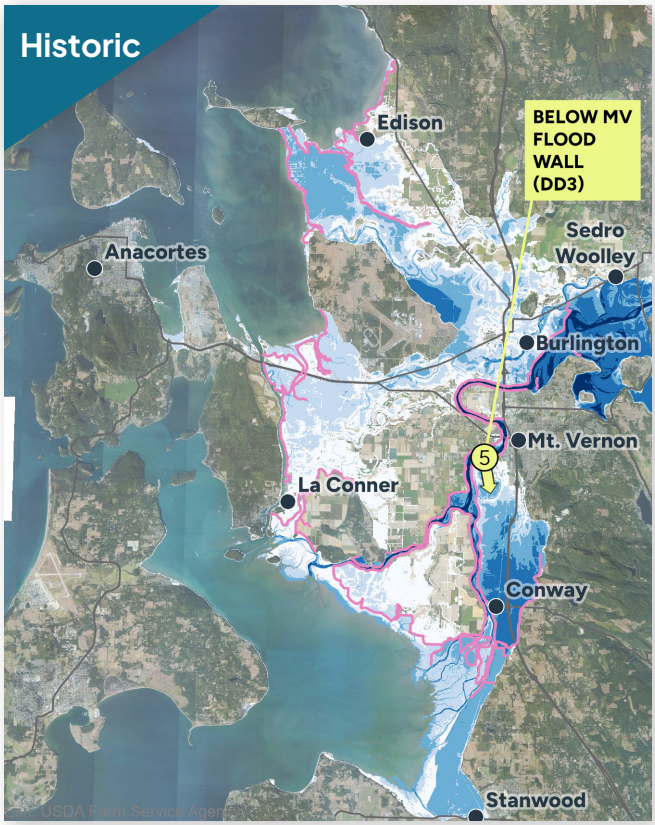
- Dike or Coastal Dike
- 4 Dike Failure Scenario Location (from USACE-GI)

0 2.5 5 Miles

DIKE FAILURE SCENARIOS

Below Mount Vernon Flood Wall

FLOOD DEPTH



Flood Depth (ft)

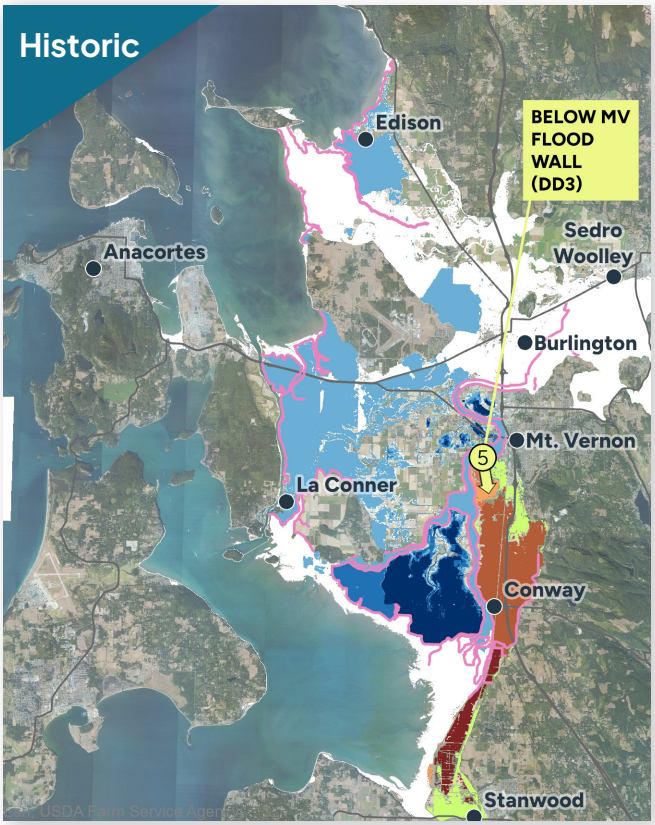
- 0–1.5
- 1.5–3
- 3–5
- 5–15
- >15

0 2.5 5 Miles

Dike or Coastal Dike

5 Dike Failure Scenario Location (from USACE-GI)

DEPTH DIFFERENCE



Depth Difference (ft)

- -5 - -2
- -2 - -1
- -1 - 0
- 0
- 0 - 1
- 1 - 2
- 2 - 5
- 5–10

Additional flooding from dike failure

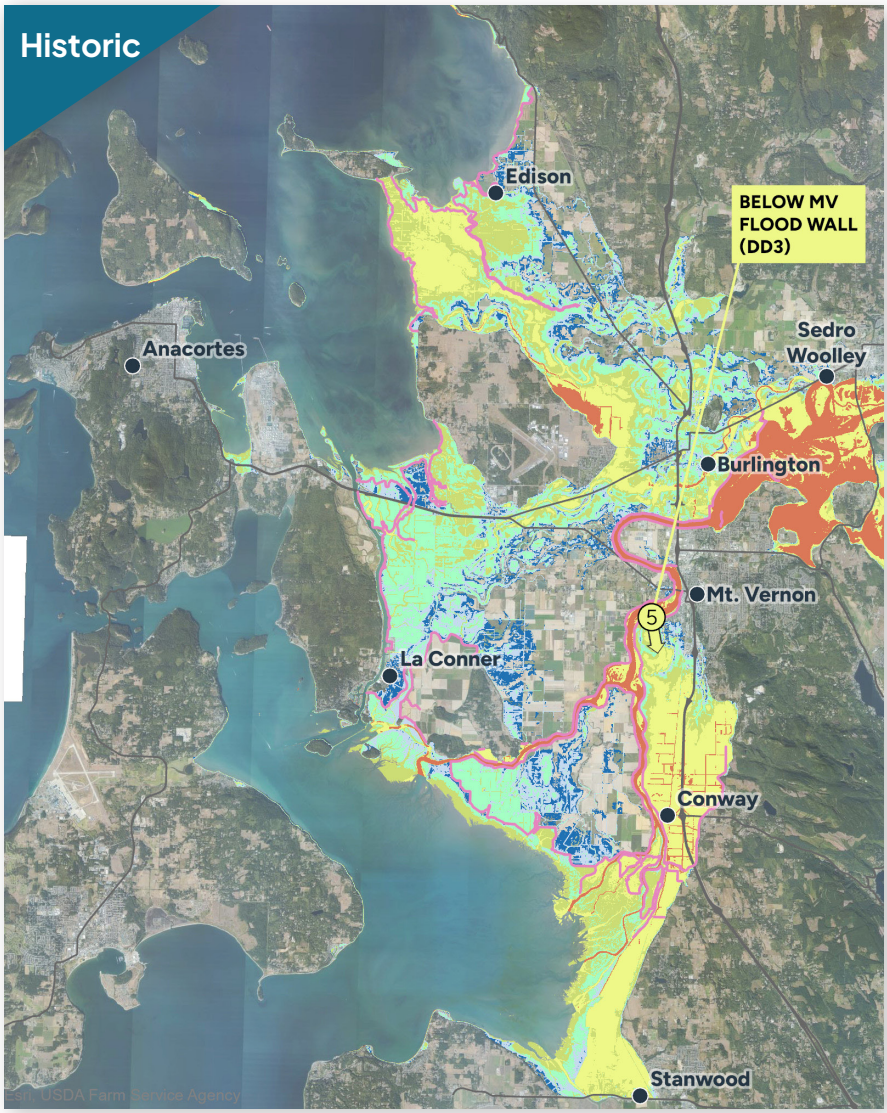
Dike or Coastal Dike

5 Dike Failure Scenario Location (from USACE-GI)

DIKE FAILURE SCENARIOS

Below Mount Vernon Flood Wall

DEPTH-VELOCITY HAZARD



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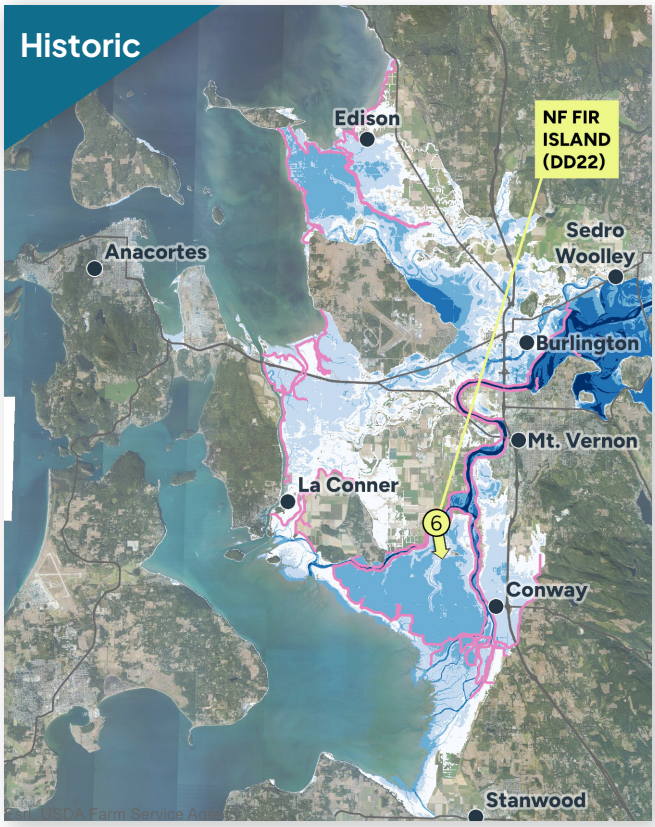
- Dike or Coastal Dike
- 5 Dike Failure Scenario Location (from USACE-GI)

0 2.5 5 Miles

NF Fir Island

FLOOD DEPTH



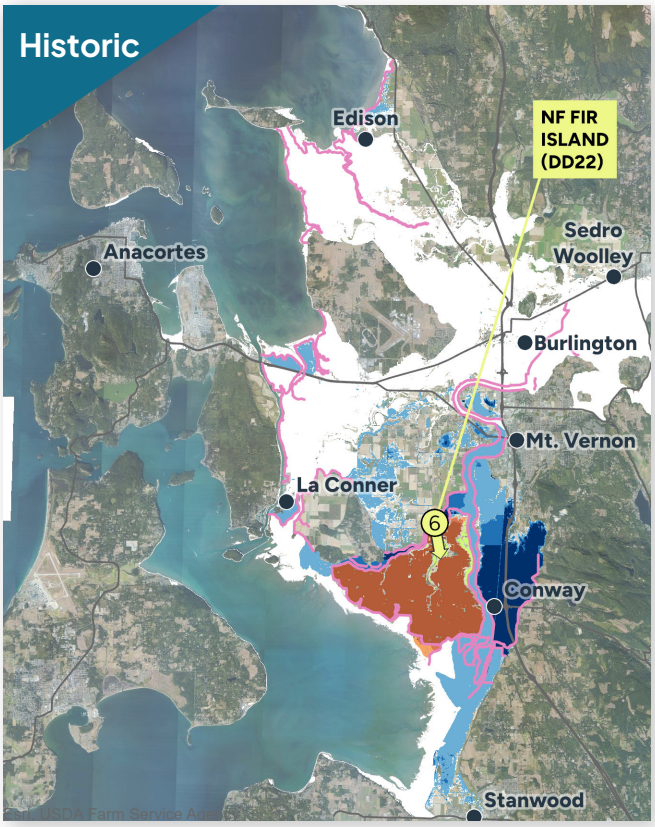
Flood Depth (ft)
- 0–1.5
- 1.5–3
- 3–5
- 5–15
- >15

0 2.5 5 Miles

Dike or Coastal Dike

6 Dike Failure Scenario Location (from USACE-GI)

DEPTH DIFFERENCE



Depth Difference (ft)
- -5 - -2
- -2 - -1
- -1 - 0
- 0
- 0 - 1
- 1 - 2
- 2 - 5
- 5–10

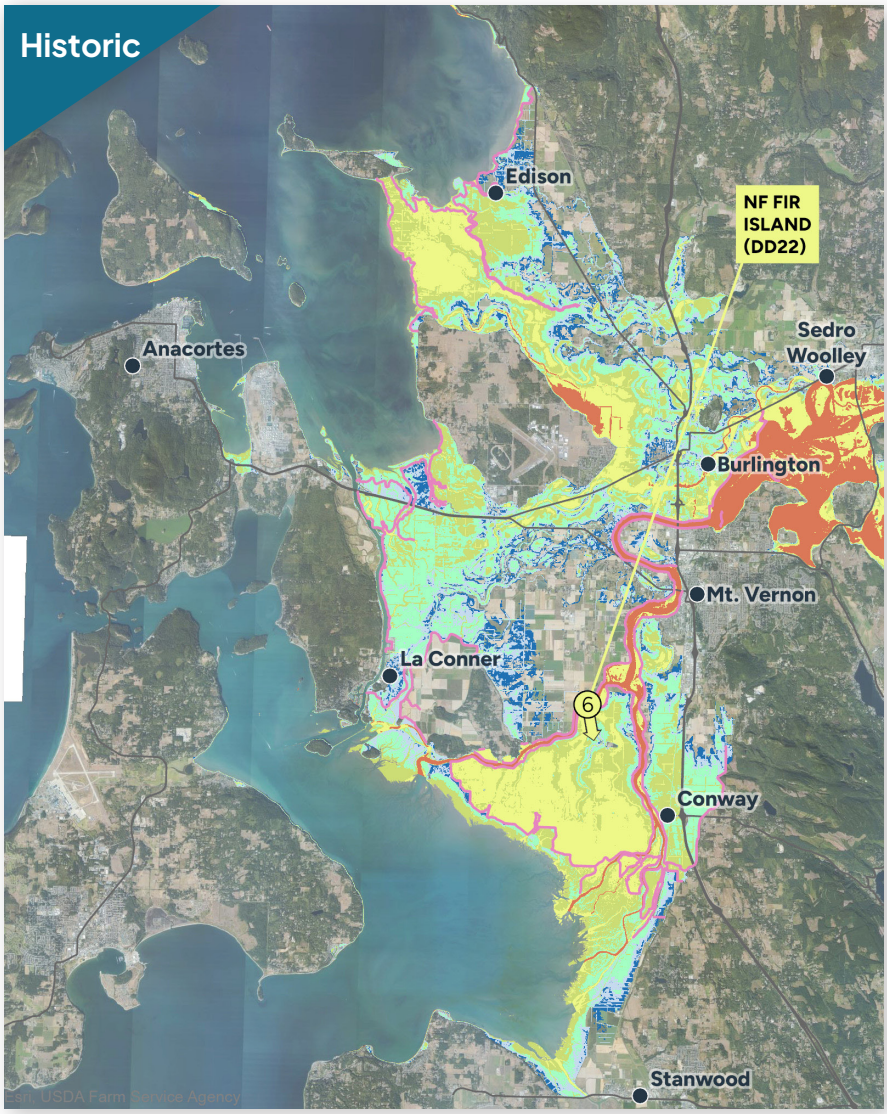
Additional flooding from dike failure

Dike or Coastal Dike

6 Dike Failure Scenario Location (from USACE-GI)

NF Fir Island

DEPTH-VELOCITY HAZARD



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- 6 Dike Failure Scenario Location (from USACE-GI)

0 2.5 5 Miles

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