INTERACTIVE MAPPING TOOL SUMMARY

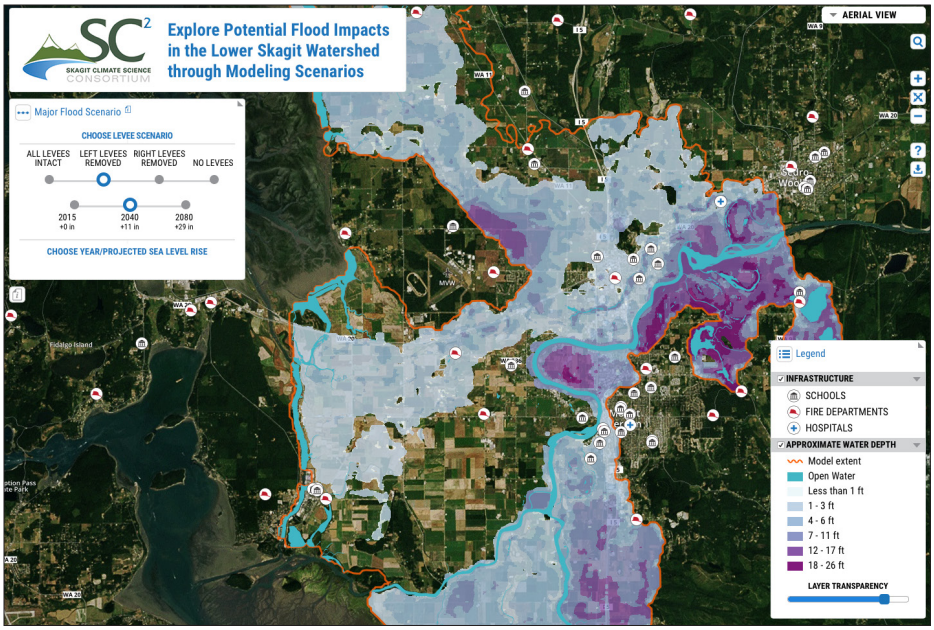
BACKGROUND

The Skagit Climate Science Consortium (SC^2) interactive webmap ("Explore Flooding in the Skagit Watershed through Modeled Scenarios") allows users to compare the current floodplain in the Skagit Watershed (specifically, the regulatory floodplain as defined by the Federal Emergency Management Agency (FEMA)—often referred to as the 100-Year Floodplain) with a projected future floodplain based on climate change and sea level rise research.

The projected future floodplain is based on research developed by a team of SC^2 members from Notre Dame University, the University of Washington, Western Washington University, and the U.S. Geological Survey (USGS). The researchers were investigating how flooding in the Skagit River could be affected by a changing climate. The research focused on 140 square miles of the Lower Skagit River's floodplain, from the town of Concrete to Puget Sound.

SC^2 researchers used a hydraulic model (see explanation in blue box) of the Skagit River channel and floodplain to establish the projected future floodplain. The SC^2 hydraulic model uses the same basic methods as those used by FEMA when defining the regulatory floodplain. Like FEMA's regulatory floodplain, the SC^2 model uses a simplified version of the actual channel and floodplain topography, so it is best used to compare existing modeled flood conditions with projected future conditions. The web map allows you to look at several projected scenarios, including projections for the 2040s and 2080s as well as projections with and without levee failures.

To explore the interactive mapping tool, visit our website at: www.skagitclimatescience.org.



WHAT IS THE 100-YEAR FLOODPLAIN?

Both the FEMA regulatory floodplain and the projected future floodplain show something that floodplain managers call the **100-Year Floodplain**. The 100-year floodplain (also known as the Special Flood Hazard Area or Base Floodplain) is used to regulate development in floodplain areas and to set rates for flood insurance. It is defined as the area that has a 1 percent annual chance of flooding (i.e., once every 100 years). This may sound infrequent, but **a home in the 100-year floodplain has a 26 percent chance of flooding over the course of a 30-year mortgage**. Additionally, floodplain managers across Puget Sound have noticed that 100-year floods are happening more frequently than they have in the past (due to a variety of factors). And, as described below, climate change projections for the Skagit show that today's infrequent floods are the future's common floods. That is why we have chosen to use the term "major flood" instead of "100-year flood."

WHAT IS A HYDRAULIC MODEL?

Hydraulics is the study of fluid in motion. In the case of flood modeling, hydraulics is used to understand how water will flow through the river channel. A hydraulic model is a computer simulation that takes into account:

- The hydrology of the watershed (how much rain falls, where, and how it "runs off" into the river)
- Cross sections of the river showing how much area there is to carry the water through the river channel
- Characteristics of the river, such as its slope and the location and sizes of structures

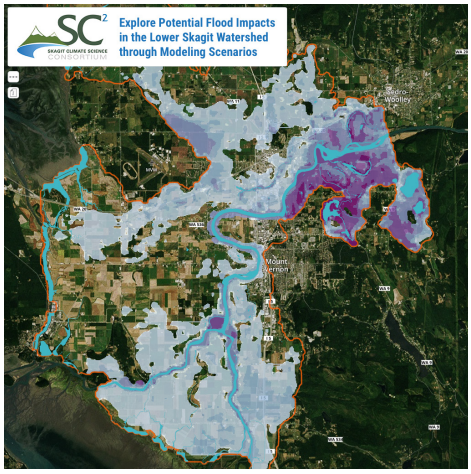
In order to investigate how climate change will affect flooding, the SC^2 model included:

1. Runoff from the upper basin. SC^2 scientists used climate simulations incorporating information specific to the Pacific Northwest to determine how peak runoff events may be different in the future. Runoff is the term for rainwater and melted snow draining into a stream or river.
2. Levee scenarios. The current levee system may fail or be overtopped during a flood event. The model was run to see what would happen if the levees remain intact or if one side or the other gives way. A composite of all of the runs was also compiled which may be the best way to think about risk across the delta, since we don't know which levees will remain and which will fail in any given event.
3. Puget Sound tidal water levels. Flood extent and duration for the lowest portion of the Skagit Delta depends on the tidal level of Puget Sound. When Puget Sound is higher, it is harder for floodwaters to drain, and they are more likely to back up onto the floodplain. Future tidal water levels were based on estimates of Sea Level Rise from a recent National Academy of Sciences report that covers the western United States.

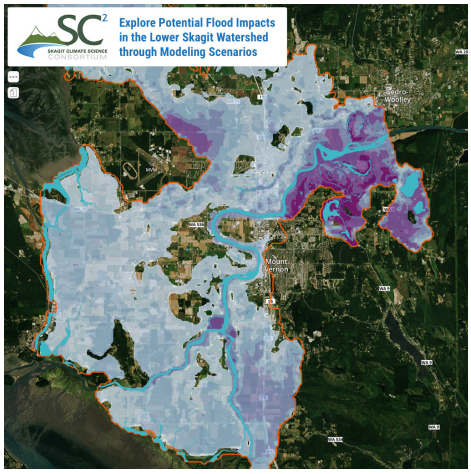
This model does have several drawbacks, which SC^2 hopes to continue to improve over time. It based on six-year-old FEMA data, and channel characteristics have changed. The spatial resolution also lacks detail in key areas. The model simulates a large area, so it is intended to capture overall risks. Therefore, its usefulness may be limited when looking at specific locations (such as a house or an individual building) especially on the edges. Areas not shown as being inundated could receive waters or stay dry.

Some key findings of this research include:

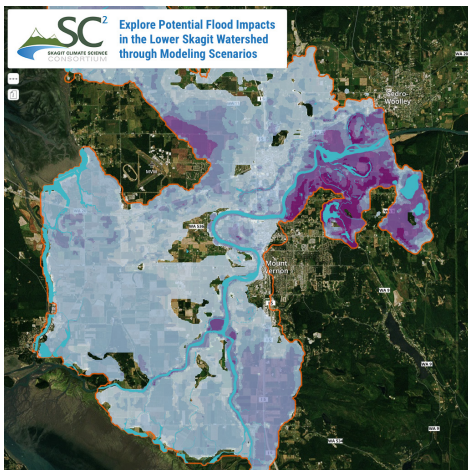
1. Increases in runoff volume will be substantial. Major floods (the 100-year flood) are expected to increase by 14 percent by 2040 and 32 percent by 2080.
2. The dams do not have the capacity to hold the increased runoff.
3. Sea level rise influences water levels and flood areas.
4. Increased runoff will increase the extent of the floodplain in a major flood. Assuming levees remain intact, the floodplain in 2040 will be 37.5 square miles larger than it is today. By 2080, it will be 49 square miles larger than it is today.
5. The increases in runoff mean that flows that are infrequent today will become more common in the future.
6. Increases in depth of flooding are modest.



FEMA 100-Year Flood (all levees intact)



2040s 100-Year Flood (all levees intact)



2080s 100-Year Flood (all levees intact)

The Skagit Climate Science Consortium (SC^2)
SC^2 is a nonprofit 501c(3) organization consisting of scientists working with local people to assess, plan, and adapt to climate related impacts. Composed of research scientists from universities and federal, municipal, and tribal governments and agencies working in the Skagit basin, SC^2 members seek to understand how the landscape, plants, animals and people may be affected by changes in the patterns of rain, snow, temperature, storms and tides.

www.skagitclimatescience.org

Visit our website to learn more about who we are, what we do, and the various resources we can provide.

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