

Draft 2026 CIAC Work Plan

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INTRODUCTORY NOTE

The Skagit County Board of County Commissioners (BoCC) established the Skagit County Climate Impact Advisory Committee (“CIAC”) by County Ordinance No. 20250013 on December 15, 2025, codified at Skagit County Code (“SCC”) Chapter 2.22. SCC 2.22.030(9) provides that “[t]he Board may from time to time direct the CIAC to prioritize analysis and recommendation regarding emerging scientific questions within the County’s jurisdiction, authority or direct responsibility.”

On March 10, 2026, the Board wrote to the CIAC requesting advice on certain matters, specifically prioritizing work to define probabilities for specific questions related to riverine flooding and sea level rise, seeking “an initial progress report by year end 2026.” Answering these questions is a significant task that will require coordinated and sustained technical work. Consistent with the CIAC’s mandate and adopting ordinance, addressing the questions posed by the Board’s March 10, 2026 letter is the CIAC’s current focus.

At the same time, we face other significant climate impacts “within the scope of the County’s jurisdiction, authority and direct responsibilities” such as drought and landslides. As discussed during the initial CIAC meetings, climate impact on water availability and tributary low flows is also a significant issue for our community. Skagit County’s Comprehensive Plan has intergenerationally centered the protection of both Skagit farmland and Skagit agriculture, which cannot remain viable in a warming climate without a stable and reliable irrigation water supply. In the past, the Board has advocated for a reasonable uninterrupted water right for Delta irrigators, citing the Skagit County Comprehensive Plan. The CIAC has also identified the potential for climate change to increase the likelihood of landslides, which could impact Skagit County and also potentially exacerbate other natural hazards such as river flooding.

For the remainder of 2026, the CIAC will focus on the following key topics.

- Background Understanding
- Greenhouse Gas Emissions Scenarios
- Sea Level Rise and Coastal Flood Hazards, Groundwater Flooding, Saltwater Intrusion
- River Flood Hazards
- Climate Resiliency Case Studies
- Communications Plan

Background Understanding

There are *many* existing studies, tools, and guidance documents related to climate change and *many* technical experts. These range from broad international studies to downscaled studies and tools specific to Skagit County. The CIAC will work to develop a shared understanding of the literature and will establish protocols to guide how the Committee will collectively identify and utilize existing studies and input.

The intent is that CIAC members will be knowledgeable about the existing (relevant) tools and studies that can help project how climate change may change the magnitude and frequency of coastal and river flooding natural hazards in Skagit County and how these changes might affect human populations, industry, critical infrastructure, and the natural environment.

First, CIAC members will become familiar with the Skagit County Hazard Mitigation Plan (HMP). This plan uses FEMA methods to assess a variety of hazards including natural hazards, risks, and vulnerabilities and is regularly reviewed and updated.

FEMA defines natural hazards as natural events that threaten lives, property, and other assets. Natural hazards in Skagit County include coastal floods, river floods, tsunamis, volcanos, wildfire, drought, landslides, and earthquakes and can be characterized in terms of probability of occurrence, geographic extent, severity / magnitude. Through the lens of the HMP, climate change is not a natural hazard, rather, it may lead to increased or decreased natural hazards.

Per the BoCC's March 10, 2026 letter, this group has been asked to initially focus on coastal and river flood hazards in the Skagit and Samish deltas. The purpose of the CIAC is to characterize how these two natural hazards may change under different climate scenarios and characterize how these changes may result in increased risks to the built and natural environments. (Potential Speaker: Julie de Losada, Skagit County DEM Chief).

Second, CIAC members will develop a baseline understanding of the floodplain, human populations and industry, and critical infrastructure (transportation and utility corridors, schools, WWTP, fire stations etc.) that are at risk from coastal and river flooding. It is also important for CIAC members to possess a clear understanding as to how existing flood risk reduction infrastructure such as dikes and levees are used in Skagit County to reduce risks associated with natural hazards and how that infrastructure interacts with natural systems and natural processes. (Potential Speakers Jenna Friebel, Drainage Consortium; Chad Kruger, WSU Director, Center for Sustaining Agriculture & Natural Resources, WDFW/Tribes.)

Third, CIAC members will develop an understanding of Skagit County government and its place as a political subdivision of the State of Washington along with the roles and functions of the relevant County Departments that have a primary role in addressing and responding to natural

hazards; the types of public policy decisions the County makes; and the time horizons on which those decisions are made.

Greenhouse Gas Emission Scenarios

Background

The IPCC has developed projections for global emissions scenarios as a way to describe possible futures for greenhouse gas emissions based on different socioeconomic pathways, policy choices, and technological developments. These models simulate future temperature, precipitation, and other climate variables based on different assumptions about CO₂ and other greenhouse gases emissions on different time horizons. They can be used to characterize the range of possible future scenarios for the purposes of understanding risk and to guide policy. In many instances, including Washington State, these global models have been downscaled to help governments plan for climate related risks.

Action Items

The CIAC will review the United Nations Intergovernmental Panel on Climate Change (IPCC), US State Department, and Washington State Climate Resilience Plans and summarize global emissions scenarios and recommendations. CIAC members will discuss and agree on a recommendation to the BoCC regarding the global emission scenarios most appropriate for the purposes of this Committee. The CIAC recommendation will be documented in a memo to the BoCC. If the Committee identifies other sources of information about emissions scenarios or needs additional guidance, the cCommittee will work together to identify and solicit key technical expertise.

Intergovernmental Panel on Climate Change

IPCC has information about global emissions scenarios [Emissions Scenarios — IPCC](#). This source will be cross-referenced to identify major shifts in climate science and will be used to anchor CIAC recommendations.

US Department of State: Climate Adaptation and Resilience Plan

The US Department of State Climate Adaptation and Resilience Plan 2024-2027 also has information about global emissions scenarios and adaptation strategies. [U.S. Department of State 2024-2027 Climate Adaptation Plan](#). This source will be cross-referenced to identify major shifts in climate science and will be used to anchor CIAC recommendations.

Washington State Climate Resilience Strategy

Washington has developed a [Washington State Climate Resilience Strategy](#) that includes several appendices with detailed information about climate projections by region, resilient work, plans, and strategies and links to technical resources. This plan will be the primary foundation for CIAC recommendations.

Sea Level Rise

Background

Sea level rise (SLR) is likely to have a variety of different impacts to Skagit County. These impacts include increased coastal flood hazards, damage to coastal infrastructure, changes and degradation of natural ecosystems and habitats, saltwater intrusion in wells and low-lying areas, and high groundwater tables. SLR impacts are worsened by weather events that are exacerbated by climate change. The CIAC will consider both influences in evaluating risks and impacts associated coastal flooding and damage.

Coastal flood hazards are characterized through an evaluation of coastal flood events (king tides, storm surge, etc.). The frequency, duration, and magnitude of these coastal flood events is predicted to change under a variety of global emission scenarios due to a combination of sea level rise and increases in frequency and magnitude of severe weather events.

Risks from coastal flooding are characterized as the risk to people, roads, rail lines, utilities and natural habitat and ecosystems under different hazard scenarios. The severity of risks can be best characterized by warning time duration, and magnitude of impact to the population, land, or damaged structures.

Skagit County has already experienced impacts from coastal flooding events that include temporary inundation and damage to low-lying land, roads and dikes. The CIAC has preliminarily identified the following sources of information pertaining to coastal flood hazards, sea level rise (SLR) predictions, and potential risks:

National Oceanic and Atmospheric Administration

NOAA provides a tool for coastal modeling ([Coastal Flood Exposure Mapper](#)) that evaluates coastal flood risks under different climate scenarios and includes estimates of risk based on critical facilities and populations. It does not appear to account for the existence of marine dikes. This information is also linked to the Washington Coastal Hazards Resilience Network [Washington Coastal Hazards Resilience Network |](#)

United States Geologic Survey

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USGS has developed an on-line tool called Hazard Exposure Reporting and Analytics, which includes a module for coastal flooding risk tool ([HERA Flood Tool](#)). This tool has been launched for Whatcom, King, and Pierce County, but not yet active for Skagit County. This model includes assumptions about SLR based on several emissions scenarios. This tool has a much better user interface than the NOAA tool and also characterizes risks for different scenarios.

Department of Ecology

Department of ecology has developed maps of inundation due to sea level rise [Coastal Atlas - Map](#). This tool does not appear to account for the existence of the marine dikes.

UW Salish Sea Modeling Center

The Salish Sea Model center has a complex hydrodynamic model of the Salish Sea, which has been downscaled and applied to site specific analysis in the lower Skagit River, Skagit Bay, Swinomish Channel and Padilla Bay [Salish Sea Modeling Center](#). This model includes recommendations about Relative SLR (RSLR) based on several emissions scenarios. This model does not have a web-based user interface and may be expensive to run. It also does not have an integrated system to evaluate risks.

UW Climate Impact Group

UW CIG has published predictions for RSLR for several emissions scenarios, but no associated coastal models or risk assessment tools [Interactive Sea Level Rise Data Visualizations](#)

Recent Project Specific Studies

There are several project specific analyses conducted in the Skagit by a variety of entities related to coastal flooding hazards under climate scenarios. Here is a high-level summary:

Fisher Slough Estuary Restoration Project, Fir Island Farm Estuary Restoration Project, Wiley Slough Levee Repair Projects, Headquarters Unit / Deepwater Slough Phase 2 Estuary Restoration Project, Swinomish Tribal Community Flood Study, McGlenn Jetty, Skagit Hydrodynamic Model Project, Samish Isthmus Restoration Project. All of these studies have methods and recommendations about how best to characterize coastal flooding hazards under different emission scenarios at a project / local level. These reports could be reviewed, and methods/recommendations could be summarized.

Saltwater intrusion and groundwater flooding associated with SLR predictions are also concerns under future climate scenarios. Impacts are not broadly understood or documented and are related to specific site conditions that vary throughout the Skagit and Samish deltas.

Action Items

The CIAC will form a Technical Subcommittee to review background information, data sources and assumptions built into existing tools, data gaps; characterize coastal flooding hazards; and develop draft recommendations about the best tools to characterize coastal flood hazards. The CIAC will seek technical information from other respected organizations that have already done extensive reviews or source materials and can provide documents or presentations on their findings. (Potential Resources: University of Washington Climate Impacts Group, Washington Coastal Hazards Resilience Network, and others.)

If needed, the CIAC Technical Subcommittee will reach out to recognized technical experts on relevant topics and may invite technical experts to meet with the full CIAC to address questions and provide technical opinions. The goal of the CIAC Technical Subcommittee is to prepare a draft recommendation for the full CIAC by the October 2026 meeting, with the goal of a consensus report to the Board by year end 2026 as it pertains to coastal storm hazards, saltwater intrusion, and high groundwater tables.

As an initial matter, the Committee identified the following technical experts:

Eric Grossman, Research Geologist, USGS Pacific Coastal and Marine Science Center

John Rybczyk, Western Washington University,

Tarang Khangaonkar, Director Salish Sea Modeling Center

River Flood Hazards

Background

River flood hazards are characterized through an evaluation of weather events (atmospheric rivers, etc.). River floods are evaluated using hydrologic models that predict how much runoff (volume of water) and the peak flow that would be generated by a specific storm event, based on a variety of parameters such as duration, rainfall intensity, temperature, and snow conditions. All of these are predicted to change under a variety of global emissions scenarios.

Estimates of runoff are used as input parameters for hydraulic models, which predict inundation depth, velocity, geographic extent, and duration of flooding based on information about river/floodplain bathymetry. The output from hydraulic models can be used to evaluate risks to roads, populations, key public infrastructure and habitat.

Hydrology – Hazard Characterization

Gaining a better understanding as to how greenhouse gas emissions scenarios will affect the frequency, peak runoff rate, and total volume of runoff associated with atmospheric rivers is one of the most challenging tasks presented by the Board's March 10, 2026 letter.

River flood hazards are generally characterized as a peak stage; which is measured by the U.S. Geological Survey (USGS) gages at both the Concrete and Mount Vernon gages. Statistical analysis of these peaks is then converted into a predicted return frequency or annual probability and then extrapolated to predict larger floods like the 100-year and 500-year events. This type of analysis does not include global emissions forecasts and their implications to changing intensity, frequency or duration of events, and relies entirely on the historic record, although it is certain that the climate has changed during this period of record.

Hydrologic models can also be used to predict flood peaks and volumes by manipulating input parameters such as precipitation intensity, duration, and geographic extent, soil and vegetation conditions, snow conditions, and temperature. Output from hydrologic modeling can be used to predict future return frequencies. These predictions are based about assumptions and are often presented with ranges to represent the error, which can be large if there is little or no field data to support model parameters and.

There are several potential sources of information that pertain to hydrologic modeling in the Skagit watershed. The CIAC has identified the some key studies / sources of information and have attached copies of the studies referenced.

USGS

Data is available for the Mount Vernon daily data dates back to 1940, and continuous data (15-minute interval) is available starting in 1988. The USGS has performed statistical analysis of these data and has a variety of available results. This data could be used to predict return frequency of specific flood events.

Corps GI Study, 2014 Technical Appendix

The Corps GI study includes a frequency analysis of historic floods at the Concrete and Mount Vernon USGS gages using both hypothetical (unregulated hydrographs) and historic observations and data. It appears that this study also used regression analysis to develop recommendations.

Salathe et al 2014. Estimates of Twenty-First-Century Flood Risk in the Pacific Northwest Based on Regional Climate Model Simulations

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Warner et al 2015. Changes in Winter Atmospheric Rivers along the North American West Coast in CMIP5 Climate Models

Lee et al 2016. Impacts of Climate Change on Regulated Streamflow, Hydrologic Extremes, Hydropower Production, and Sediment Discharge in the Skagit River Basin

Bandaragoda, et al 2019. Hydrology, Stream Temperature, and Sediment Impacts of Climate Change in the Sauk River Basin

2024 Anchor QEA. Review of Recent Atmospheric River Research That is Relevant to Skagit Basin Flooding

Hydraulic Modeling – Risk Characterization

Over the years, several entities have developed, modified and improved hydraulic models of the Skagit River and its floodplain. Table 1 summarizes the models developed for the Skagit River downstream of Sedro-Woolley, which is the area of focus defined by the Board’s March 10, 2026 letter.

Table 1. Summary of Skagit River Hydraulic Models below Sedro-Woolley

Study Name	Model Source / Year	Model Type
Skagit River General Investigation	Corps, 2014	1D HEC-RAS Flod-2D
Draft Skagit Flood Insurance Study	2008	Flo-2D
Skagit River Corps Water Management System	Corps 2022	Combined 1D / 2D HEC-RAS models
Skagit River Delta Flood Drainage Project	NHC, 2023b	2D HEC-RAS
Maddox Creek / Big Ditch Alternative Analysis	NHC, 2020	2D HEC-RAS
Old Hwy. 99 Thomas Creek Bridge	NHC, 2025	2D HEC-RAS
McGlenn Island Jetty Project	Corps 2022	
Skagit Hydrodynamic Model Project	PNNL	FV-COM model
SITC/SRSC/SCSC Skagit River Flood Study	NHC, 2026	HEC-RAS

Source: personal communication with Northwest Hydraulic Consultants.

Action Items

The CIAC will form a Technical Subcommittee to review background information, data sources and assumptions built into existing tools, data gaps; characterize future hydrology; and develop draft recommendations about the best tools to characterize the magnitude and probability of future flood events. If needed, the CIAC Technical Subcommittee will reach out to technical experts and may invite technical experts to meet with the full CIAC to address questions and provide technical opinions. The goal of the CIAC Technical Subcommittee is to prepare a draft recommendation for the full CIAC by the October 2026 meeting, with the goal of a consensus report to the Board by year end 2026.

The Technical Committee will review the sources of information and studies below and present a recommendation to the full Committee.

As an initial matter, the Committee identified the following technical experts to assist in this discussion:

Guillaume Mauger, State Climatologist

Reid Wolcott and Brent Bower, NOAA/National Weather Service

This may include additional outreach out to USGS, Northwest River Forecast Center, Washington State Climate Office, and University of Washington Climate Impact Group to better understand potential studies of evaluations of current and future hydrology.

It is expected that the 2026 NHC model, which has been at least partially validated for the 2025 flood, will be the most up-to-date and comprehensive, 3-D hydraulic model available to evaluate flood risks downstream of Sedro-Woolley.

Once there is consensus around hydrologic scenarios and once the 2026 model has been made publicly available, which is expected in late summer 2026, the Technical Committee will revisit this element of the work plan and identify appropriate next steps.

Portfolio of Award-Winning Climate Resiliency Projects

Local communities around the world are responding to climate change in a variety of ways to improve the long-term health and resiliency of their built and natural environments in ways that reflect their local values and culture. These actions are often grant funded and many have won national and international awards for excellence.

The CIAC will work together to assemble a portfolio of award-winning climate resiliency projects from other areas of the state, country and world to better understand the types of actions other communities are taking to adapt to climate change. Specifically, the CIAC will focus on actions

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implemented by other communities that face similar challenges and will initially focus on actions related to coastal and river flooding.

Communication Plan

The goal of the CIAC is to improve transparency and awareness about natural hazards, and how these are predicted to change in the future. CIAC members believe it is important to work with key entities in the County to ensure our community is knowledgeable about current coastal and flooding risks and how these may change in the future.

CIAC members will conduct informal surveys to better understand how our community learns about natural hazards and the extent to which a changing climate might increase risks in the future. Based on this understanding CIAC members will work together to identify ways to improve community understanding and awareness.

Anticipated 2026 Potential Speaker / Topic Schedule

Meeting Date	Potential Speaker / Topic
Jun. 3, 2026	Complete Work Plan, Review Greenhouse Gas Scenarios, Establish Technical Committee
Jul. 1, 2026	Julie de Losada, DEM
Aug. 5, 2026	Jenna Friebel, Existing Flood Risk Infrastructure TBD, Existing Natural Resources
Sep. 2, 2026	TBD, Skagit County Public Works, Planning, Policy
Oct. 7, 2026	TBD, Technical Committee Update / Technical Expert(s)
Nov. 4, 2026	TBD, Technical Committee Update / Technical Expert(s)
Dec. 2, 2026	TBD, Technical Committee Update / Technical Expert(s)
2027 TBD	

Additional Natural Hazards and Potential Future Issues

Skagit County will be affected by climate change in ways beyond riverine and coastal flooding, although many of these risks are related to riverine and coastal events. The CIAC will work with the Board to raise awareness and make recommendations about other factors such as landslides, wildfire, and water supply/drought that may impact the County and its responsibilities. Following the initial work that is the focus of this plan, the CIAC will keep an active list of additional topics for future investigations and research. These priorities will be reviewed in creating a work plan for 2027.

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Reduced water supply due to warming temperatures and shrinking glaciers is a topic we have already identified, which has particular importance given Skagit County Comprehensive Plan's central focus on the protection of farmland and farming. Reduced water supply also impacts fish migration and spawning, which is being addressed by other programs but needs to be considered.

Another topic potential topic to address is landslides. Climate induced changes in storms that cause river flooding also trigger slope failures and debris flows. It is too simplistic to relate landslide risk only as a function of storm intensity. Another critically important threshold is antecedent soil moisture from prior rainfall, especially when it occurs within a specific time period prior to the larger storm. Landslides and flooding and post-wildfire conditions interact in ways that compound risk. Slope failures deliver large pulses of sediment into stream channels, raising riverbeds, reducing channel capacity and increasing local river stages. They can also dam channels temporarily, creating debris flows.

Slope failures mix sediment and debris into the water volume, causing a "Bulking Factor" that is not accounted for in standard culvert sizing, typically based on clear-water hydraulics. This means many culverts and stream crossings in the Cascade foothills are more vulnerable to failure during landslide-affected flood events than their design specifications suggest.

There has been some work done that looks at how climate change could amplify landslide hazard through more intense precipitation events, a rising snow line (expanding the rain-on-snow zone into steeper terrain), glacier retreat exposing loose sediment, and increasing wildfire extent (post-fire slopes are dramatically more prone to debris flows for several years).

At the direction of the BoCC, the CIAC would coordinate the following tasks:

- Delineate landslide risk areas based on the mode of failure and stream delivery potential
- Describe how and which slope failure variables are expected to respond to climate change
- Develop county/area relationships between these variables and landslide probability
- Assess how changes in landslide probability could meaningfully translate to flooding impacts
- Outline a monitoring plan that would inform future decision metrics
- Atmospheric river frequency and intensity
- Post-wildfire terrain exposure

The following technical work would be useful to this end:

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- Keck, J., Strauch, R., Cristea, N., et al. (2025). *Could Climate Change Decrease Landslide Hazard in Snow-Dominated Mountainous Regions? Insights From a Distributed Hydrology-Shallow Landslide Model of the North Cascades, USA*. Water Resources Research.

Applied a distributed hydrology–landslide model to the North Cascades and found increasing shallow landslide hazard in the rain-dominated and transitional elevation zones that characterize much of our watershed.

- Strauch, R., Istanbuluoglu, E., & Riedel, J. (2019). *A new approach to mapping landslide hazards: a probabilistic integration of empirical and physically based models in the North Cascades of Washington, USA*. Natural Hazards and Earth System Sciences, 19, 2477–2495.

A nod to Jon Reidel here. This team developed a probabilistic hazard mapping approach validated specifically in the North Cascades National Park Complex.

- Washington Geological Survey (WGS) Landslide Hazards Program

After the December 2025 atmospheric river, the WGS activated a Geologic Hazards Clearinghouse with field teams documenting landslides specifically in Skagit, Whatcom, and Snohomish counties. Scroll to the bottom of the page for a map.

<https://dnr.wa.gov/washington-geological-survey/geologic-hazards-and-environment/washington-geologic-hazards-clearinghouse>

Experts we could invite to brief the Committee

- Kate Mickelson, L.E.G. — Landslide Hazards Program Manager, WA Geological Survey/DNR (kate.mickelson@dnr.wa.gov). Leads statewide mapping and emergency response; has been directly involved in Skagit County landslide events.

- Tricia Sears — Geologic Planning Liaison, WA DNR (tricia.sears@dnr.wa.gov). Her role is specifically to connect WGS expertise with county planning.

- Dr. Erkan Istanbuluoglu — Professor, UW Civil & Environmental Engineering. PI on the NSF project explicitly modeling landslide-flood coupling on the Skagit River.

- Dr. Ronda Strauch — Climate Adaptation Advisor, Seattle City Light; PhD UW. Developed the North Cascades landslide probability model most applicable to our watershed.

- Dr. David Montgomery — Professor, UW Earth & Space Sciences; MacArthur Fellow. Leading PNW geomorphologist with a strong record of engaging public and policy audiences on landslide risk.

