

Thurston County Flood Hazard Mitigation Plan

DRAFT



THURSTON COUNTY

WASHINGTON

SINCE 1852

Date, 2025
Prepared by Thurston County

EXECUTIVE SUMMARY

The Problem

Flooding in Thurston County is common, and on an annual average basis is the costliest natural hazard that afflicts residents, businesses, and the county government. Between 1962 and 2024, Thurston County has received 12 federal disaster declarations due to flooding. (FEMA, 2024) Total countywide flood damage estimates between 1960 and 2016 exceeded \$206 million (CEMHS, 2024). The February 1996 flood cost uninsured private property owners in Thurston County losses exceeding \$22 million. Statewide, the Federal Emergency Management Agency (FEMA) provided over \$72 million in aid to flood victims, businesses, and local governments for the December 2007 floods and over \$12.8 million in assistance for the January 2009 floods. Minor flood events occur annually in Thurston County.

The Solution

Of the four stages of the disaster management cycle – mitigation, preparedness, response, and recovery – only mitigation directly eliminates losses. The other stages all occur in reaction to or anticipation of impacts from flood disaster events. Hazard mitigation planning identifies and prioritizes sustained measures that, if enacted, will reduce or eliminate long-term risk to people and property. In the long term, mitigation measures reduce personal loss, save lives, and reduce the cost to local, state, and federal governments for responding to and recovering from recurrent or unusual flood events.

A mitigation strategy involves activities such as planning, policy changes, building codes, development regulations, land use zoning, programs, projects, and other actions that can eliminate or reduce the impacts of flood hazards within Thurston County. The responsibility for hazard mitigation lies with many, including private property owners, business, industry, and local, state, and federal government.

Recognizing that no one solution can mitigate flood hazards, planning provides a mechanism to identify the best alternatives within the capabilities of the county. A flood mitigation plan achieves the following planning objectives to reduce the risks associated with flooding:

- Confirming that activities are reviewed and implemented so that local problems are addressed by appropriate and efficient solutions.
- Leveraging flood mitigation initiatives with other community goals and activities, preventing conflicts and reducing the cost of implementing each initiative.
- Coordinating local activities with federal, state and regional programs.
- Educating residents on the hazards, loss reduction measures, and natural and beneficial functions of their floodplains.

- Building community support for mitigation initiative priorities.
- Fulfilling planning requirements for obtaining state or federal grant funding.
- Implementing floodplain management and mitigation activities through an action plan with specific tasks, staff assignments, and deadlines.

The Thurston County Flood Hazard Mitigation Plan (FHMP) identifies 20 mitigation initiatives, chosen through a facilitated process focused on meeting these objectives.

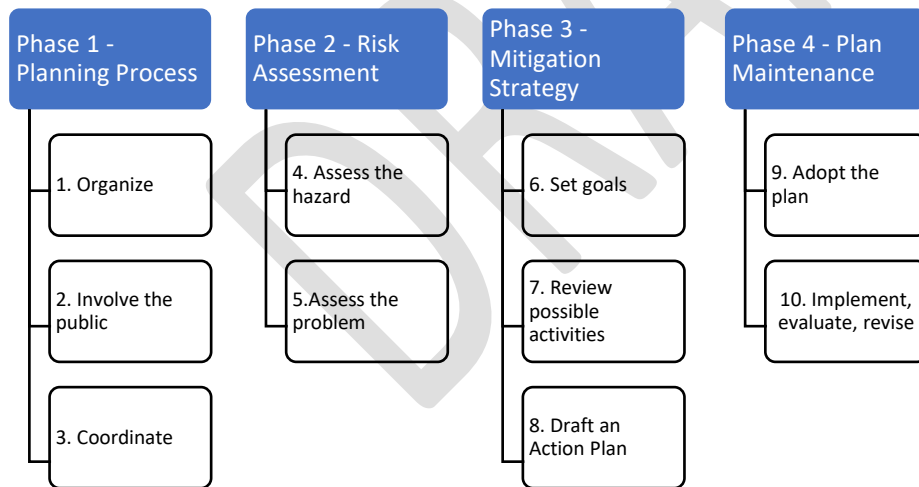
Community Rating System Benefits

The National Flood Insurance Program’s (NFIP) Community Rating System (CRS) offers benefits in the form of reduced flood insurance premiums for communities that meet minimum floodplain management requirements. Thurston County exceeds the minimum CRS planning requirements, earning a Class 2 rating. This plan is a prerequisite for Thurston County to maintain its status as one of the nation’s top-rated CRS communities.

Plan Development Methodology

Development of the FHMP included four phases (Figure ES.1).

Figure ES.1: Plan Development Methodology



Phase 1: Planning Process

To oversee the development of the plan, the county assembled a 12-member Flood Planning Committee (FPC), consisting of county staff, community members, and other stakeholders in the planning area. A Plan Development team consisting of key county staff was assembled to provide technical support to the FPC. Full coordination with other jurisdictions, regional stakeholders, and state and federal agencies involved in flood hazard mitigation occurred for the update of this plan. A public engagement strategy centered on the project website, public

meetings, social media, and public outreach. A comprehensive review of existing plans and programs was performed that can support flood hazard mitigation. Detailed information about the planning process is documented in Chapter 4.

Phase 2: Risk Assessment

The risk assessment is the process of measuring the potential loss of life, personal injury, economic injury and property damage resulting from flooding. This process assesses the vulnerability of people, buildings, and infrastructure to natural hazards. It focuses on these parameters:

- Hazard identification and profiling
- The impact of hazards on physical, social and economic assets
- Vulnerability identification
- Estimates of the cost of damage

The flood hazard risk assessment for this mitigation plan meets the requirements outlined in Chapter 44 of the Code of Federal Regulations as well as the CRS requirements for assessment of flood hazards. Detailed information about the county's flood risk assessment is documented in Chapter 2.

Phase 3: Mitigation Strategy

The FPC's key function was to review and revise the plan's goals and objectives. They also reviewed the county's 2017 FHMP mitigation initiatives and considered new initiatives to update the mitigation strategy. The FPC was involved in reviewing, updating, and prioritizing the mitigation initiatives and updating the draft action plan. The action plan identifies the leads, timeline, and funding sources for implementing the mitigation initiatives. The Plan Development Team assembled the updated plan using the outcomes of phases 1-3. The updated plan conforms with the CRS Coordinator's Manual Section 510 10-Step Planning Process (see Appendix B). The flood mitigation strategy and this plan's recommendations are documented in Chapter 3.

Phase 4: Plan Maintenance

The Thurston County Board of Commissioners will adopt the plan by October 15, 2025. Chapter 5 includes a maintenance schedule for ensuring the plan remains an active and relevant document. The FPC agrees to maintain its standing and meet annually to review progress on the action plan and advise Thurston County of any changes or revisions to the plan. County staff will prepare a report that documents:

1. Summary of any flood hazard events that occurred during the reporting period and the impact of these events on the planning area

2. Review of mitigation success stories
3. Review of continuing public involvement
4. Brief discussion about why targeted strategies were not completed
5. Re-evaluation of the action plan to determine if the timeline for identified projects needs to be amended (such as changing a long-term project to a short-term one because of new funding)
6. Recommendations for new projects or adjustments to existing mitigation initiatives
7. Review of grant opportunities and other funding options
8. Impact of any other planning programs or initiatives that involve hazard mitigation

Plan Goals and Objectives

The six goals in this plan address important aspects of comprehensive flood management:

- Reducing vulnerability for people and property
- Committing resources to cost effective flood management activities
- Maintaining continuity of operations during flood emergencies
- Protecting the environment
- Providing public education and information sharing
- Coordinating the plan, including public involvement

Each identified mitigation initiative meets one or more objectives. The six goals and thirty corresponding objectives are as follows:

1. **Reduce the county's vulnerabilities to flooding to protect people and essential facilities and to reduce property losses**
 - a. Maintain a regionally coordinated emergency alert notification system that sends timely all-hazard warnings to affected populations
 - b. Identify and sign evacuation routes for areas of the county hardest hit by flooding and road closures
 - c. Train and equip emergency service providers to effectively respond to flood hazard events
 - d. Minimize the number of structures and infrastructure in hazard prone locations
 - e. Safeguard objects or places that have cultural or historical significance

- f. Maintain and upgrade at risk transportation facilities, utilities, and other essential buildings and infrastructure to withstand the disruptive and damaging effects of flood hazards
- g. Enforce ordinances and development regulations and prohibit development and other activities to prevent the creation of new flood hazards or shifting of existing flood hazards elsewhere

2. Commit resources to cost-effective flood management and hazard mitigation activities

- a. Identify a team of county staff to manage and implement flood management and flood hazard reduction activities
 - b. Collect and analyze data, including data and information on the effects of climate change, to increase understanding of conditions that contribute to flood hazards, and examine strategies to minimize their impacts
 - c. Create a comprehensive flood mitigation strategy and pursue funding to manage and implement priority projects
 - d. Evaluate practical opportunities to leverage new public and private projects to afford protective measures to surrounding properties with pre-existing flood risks
 - e. Participate in the National Flood Insurance Program including its Community Rating System
 - f. Maintain up to date maps of floodways, floodplains, channel migration zones, and areas subject to high groundwater flooding
 - g. Participate in federal, state, and local all-hazards workshops, programs, and exercises
- Update the Flood Hazard Mitigation Plan and develop and maintain flood response and emergency action plans

3. Maintain essential county government services during emergencies

- a. Identify, document, and train from lessons learned from previous events and exercises
- b. Train existing county staff to provide additional backup functions for key staff who leave primary duties to provide flood response activities
- c. Identify contingency funding measures for personnel working overtime during major hazard events

4. Restore, enhance, and protect the flood conveyance and ecological functions of channel migration zones, floodways, and floodplains

- a. Retain the natural flood water conveyance functions of channel migration zones, floodways, and floodplains through compatible land uses
- b. Avoid habitat degradation from any development or hazard mitigation activities in channel migration zones, floodways, and floodplains and fully mitigate habitat impacts where impacts are unavoidable
- c. Prioritize flood mitigation projects that enhance habitat for aquatic species

5. Educate and inform residents and businesses to act to minimize their flood risks

- a. Improve community access to county flood information and to staff who are members of the flood management team
- b. Make flood hazard maps accessible and user friendly, both online and in print at the Building Development Center
- c. Provide a variety of flood education materials to educate people about the risks of flooding and steps they can take to prevent losses
- d. Assess needs and provide educational resources to accommodate flood disaster preparedness for special needs individuals or populations within the county
- e. Inform residents to take precautions to become self-reliant for a minimum of 72 hours during a flood disaster

6. Bring the community together to make Thurston County resilient to flood hazards

- a. Continue Thurston County's participation with the Chehalis River Basin Flood Authority
- b. Coordinate and provide leadership in the hazard mitigation planning process among local, tribal, state, and federal government partners
- c. Train and plan for sheltering, evacuation needs, and coordination of volunteer assistance efforts with local, state, and federal emergency management partner agencies and non-government disaster relief organizations
- d. Conduct broad outreach activities to engage all sectors of the community in the hazards mitigation planning process

Mitigation Initiatives

The flood hazard mitigation action plan is a key element of this plan. By implementing the action plan, Thurston County can strive to become flood disaster-resilient. The action plan includes an assessment of the capabilities of the county to implement hazard mitigation initiatives, a review of alternatives, a prioritization schedule, and a mitigation strategy that identifies the following:

- Title
- Priority
- Type of activity
- CRS category
- Goals and objectives addressed
- Action
- Rationale
- Benefit Rating
- Status
- Timeline
- Leads
- Cost estimate
- Funding source
- Origin of initiative
- Progress and implementation Status

The plan contains 20 mitigation initiatives require coordination among the county departments charged with their implementation. The initiatives – sorted into seven types of activities – represent the initiatives’ general categories and help organize and communicate the general direction of the strategy. The ranking lists the top 5 mitigation initiatives identified by the 2025 FPC. Detailed information about the mitigation strategy is documented in Chapter 3. Table ES.1 summarizes the Thurston County flood mitigation initiatives.

Table ES.1 Summary of Thurston County Flood Mitigation Initiatives

ID	Title	Priority	Top 5 Rank	Status	Cost	Benefit Rating	Timeline	CRS Category
Emergency Planning, Notification, and Evacuation and Detour Routes: Two initiatives expand efforts to notify and provide instructions to affected populations of imminent threats from catastrophic dam failure or flood events. The projects will continue to identify and prepare evacuation procedures and detour routes for people to reach safe places.								
1	Dam Failure Evacuation Planning and Response	Medium	n/a	In progress	Medium	High	2025-2030, Short-term	Emergency Services, Public Information
2	Flood Detours and Response Planning	High	1	In progress	Medium	Medium	2025 – 2030, Short-term	Emergency Services, Public Information
Infrastructure: Two initiatives will replace, repair, or reconstruct public infrastructure including stream culverts, bridges, and roads. The projects will minimize flood impacts, address public safety, improve transportation mobility, and enhance aquatic habitat.								
3	Stream Culvert Replacement Flood Mitigation Program	High	n/a	Ongoing	High	High	2025 – 2035, Long-term	Natural Resource Protection, Structural
4	Road Repair and Reconstruction Flood Mitigation Program	High	n/a	In progress	High	High	2025 – 2035, Long-term	Property Protection, Natural Resource Protection
Mapping, Data Collection, Data Sharing, and Data Protocols: Seven initiatives support improving the community's knowledge of how, when, and where flooding occurs. Additional and improved data collection and sharing procedures enhances the county's ability to accurately forecast the location and extent of high groundwater flooding, understand the impacts of climate change, identify structures at risk, and map hazard areas. These initiatives also establish protocols for documenting historic flood conditions, archiving data and maps, and improving processes to make the data accessible to county staff, community members, and other stakeholders.								
5	Flood Data Collection, Sharing, Modeling, and Evaluation Program	Medium	n/a	Ongoing	Medium	Medium	2025-2035, Ongoing	Prevention, Emergency Services
6	Flood Model Development and Maintenance Program	Low	n/a	In progress	Medium	Low	2025-2030, Short-term	Prevention, Public Information
7	Risk Map Land Use and Development Regulation Review and Revisions	High	5	In progress	Low	Medium	2025-2030, Short-term	Prevention, Public Information
8	Flood Map Refinement and Access	High	n/a	In Progress	Medium	Medium	2025-2030, Short-term	Prevention, Public Information
9	Flood Map and Data Storage and Retrieval Program	Medium	n/a	In progress	Low	Low	2025-2030, Short-term	Prevention
10	River Channel Migration Zone and Habitat Mapping Program	Medium	n/a	Ongoing	Low	Low	2025-2030, Short-term, Ongoing	Prevention
11	Building Inventory and Mapping Program	Medium	n/a	Ongoing	Low	Low	2025-2030, Short-term, Ongoing	Prevention
Flood Hazard Reduction: Two initiatives will develop and formalize programs to prevent future property losses. One will evaluate, prioritize, and fund candidate structures for elevation, relocation, or acquisition. The other consists of an inspection program to monitor and remove excess debris accumulation in stream channels that compound flood problems into public assets or private property.								
12	Vulnerable Structures and Repetitive Loss Mitigation Program	High	4	Ongoing	High	High	2025-2035, Long-term, Ongoing	Prevention, Property Protection
13	Debris and Sediment Inspection and Flood Hazard Reduction Program	Medium	n/a	New - No Progress	Medium	High	2025-2030, Short-term	Prevention, Property Protection, Natural Resource Protection,

ID	Title	Priority	Top 5 Rank	Status	Cost	Benefit Rating	Timeline	CRS Category
Emergency Services								
Natural Functions and Ecosystem Services: Two initiatives protect and restore natural floodplain functions and enhance aquatic and riparian habitat.								
14	Floodplain Restoration and Reconnection	Medium	n/a	Ongoing	High	Medium	2025-2035, Long-term, Ongoing	Prevention, Natural Resource Protection, Structural
15	Riparian Flood Control and Habitat Reforestation Project	Medium	n/a	New - No Progress	High	Medium	2025-2035, Long-term	Prevention, Natural Resource Protection
Finance, Implementation, and Coordination: Three initiatives will evaluate and implement opportunities to effectively fund the initiatives in this plan, to manage and coordinate the county's various flood management work programs across all involved departments, and to coordinate with external stakeholders.								
16	Comprehensive Flood Program Finance Strategy	High	3	New - No Progress	Low	Medium	2025-2030, Short-term	Prevention
17	Community Rating System Program	High	2	Ongoing	Medium	Medium	2025-2035, Ongoing	Prevention, Public Information
18	Thurston Climate Plan Evaluation and Integration	Medium	n/a	New - No Progress	Low	Low	2025-2035, Long-term, Ongoing	Prevention
Public Education and Awareness: Two initiatives will improve public access to information and engage affected residents and businesses about flood risks, flood prevention, county flood ordinances and regulations, flood insurance, and other resources.								
19	Flood Hazard Education and Hazard Reduction Public Outreach Strategy	Medium	n/a	Ongoing	Low	Low	2025-2035, Ongoing	Public Information
20	Flood Website Development	High	n/a	In progress	Low	Low	2025-2030, Short-term, Ongoing	Public Information

Implementation

Implementing the recommendations of this plan requires time and resources. The plan reflects an adaptive management approach, providing recommendations and review protocols to evaluate changes in conditions after the plan is adopted. The true measure of the plan's success will be its ability to adapt to the ever-changing climate of hazard mitigation.

Funding resources are always evolving, as are programs based on state or federal mandates. Thurston County has a long-standing tradition of proactively responding to issues that may impact its citizens and this is reflected in the development of this plan. The county's floodplain management programs and policies are well established and have maintained the flood risk at a steady level without increase. This plan will help maintain this tradition. It identifies a strategy for implementation based on available and potential resources. Most important, the county developed this plan with extensive public input and engagement opportunities.

References

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Source: Thurston Regional Planning Council (TRPC)

CHAPTER 1

Introduction

1.0 Flooding will Persist, but Disasters and Hazards can be Avoided

This is the fourth edition of the Thurston County Flood Hazard Mitigation Plan. It is produced to address the adverse impacts of flooding, the most prevalent natural hazard that affects the county. The plan is the result of a 10-Step planning process to identify long- and short-term strategies to reduce or alleviate the loss of life, personal injury, property damage, and environmental impacts that can result from flooding. These strategies include planning, policy changes, programs, projects, and other activities that can mitigate the impacts of floods. The responsibility for flood hazard mitigation lies with many, including private property owners, business, industry, and local, state and federal government. This plan specifically covers unincorporated Thurston County.

What's the difference between preparedness, response, and mitigation?

Using flood as an example...

Preparedness: activities such as planning or staging of supplies or personnel in anticipation of an emergency. Preparedness involves rescue training, maintaining equipment, and procuring supplies - knowing that response efforts will be necessary in the future.

Response: actions taken during an emergency to protect life and property such as sandbagging, performing rescue or evacuation operations, pumping water to protect assets, or providing emergency shelters to displaced residents.

Mitigation: actions that reduce the demand for preparedness and response activities by minimizing the impacts of flooding. Mitigation activities may include elevating or removing structures in areas that periodically experience flooding. Mitigation can also regulate future development in areas that are prone to flooding and thereby prevent future losses.

When hazards affect areas that are undeveloped or uninhabited by people, destruction may occur within the natural environment, but such events are rarely characterized as disasters. When floods adversely affect developed areas, the impacts to the safety and security of people, property, and infrastructure can be great. Such floods often lead to a state of emergency, force evacuations, and result in a Federal Disaster Declaration. Thurston County has received multiple disaster declarations (FEMA, 2024):

- Between 1965 and 2024, Thurston County received 28 federal disaster declarations.
- 12 declarations were attributed to flood-category disasters.
-
- As of 2024, 25 counties in Washington State have experienced 20 or more disaster declarations.
- Thurston County has the 7th highest rate of declarations in the state.

Recovery from prolonged disruptions are costly to communities, the state, and the federal government. Hazard mitigation attempts to break the disaster cycle by identifying and implementing sustained actions that eliminate long-term risks to life and property.

To learn more about the plan's mitigation strategy read:

CHAPTER 3 Mitigation Strategy: Goals, Objectives, and Initiatives

1.1 Flood Hazards in the Pacific Northwest

Washington State's pronounced mountainous terrain and immediacy to the vast Pacific Ocean strongly influences the dynamics of Thurston County's weather and hydrologic cycle. Western Washington frequently experiences intense seasonal precipitation events known as atmospheric rivers. A strong atmospheric river can transport a column of water vapor roughly equivalent to 7.5 to 15 times the average flow of water at the mouth of the Mississippi River (NOAA, 2024a) and is the source of between 30 and 50 percent of the West Coast's annual precipitation. (Dettinger, 2013) Thurston County's major rivers and streams can swell from prolonged precipitation events.



Source: TRPC

Back to back years of higher than normal precipitation or extreme storm events also contributes to groundwater

flooding, a less-known but widespread problem in Thurston County. High groundwater flooding is particularly problematic in areas with glacial till deposits, where water tables rise, and standing water accumulates with no outlets to readily drain to.

The future climate of the Puget Sound Region is forecast to experience warmer and wetter winters and a change in the timing of the region's hydrological cycle. Climate change is likely to generate more frequent and intense storms, resulting in more frequent flooding throughout the lowlands. As high tides combine with sea-level rise, lower elevation coastal areas are likely to experience more frequent episodic flooding.

To learn more about flood hazards view:
CHAPTER 2 Risk Assessment

1.2 Flood Mitigation Programs

Numerous state and federal programs and regulations promote flood hazard mitigation planning. Notable among these are two programs of the Federal Emergency Management Agency (FEMA): the National Flood Insurance Program (NFIP) and the Community Rating System (CRS). These programs provide benefits in the form of reduced flood insurance costs for communities that meet minimum requirements for floodplain management. Thurston County participates in both the NFIP and the CRS.

COMMON FLOOD TERMS AND ACRONYMS

This plan uses several technical terms and acronyms, including:

NFIP	National Flood Insurance Program
FEMA	The Federal Emergency Management Agency, part of the Department of Homeland Security. Thurston County is located in FEMA Region X which covers Alaska, Idaho, Oregon, and Washington.
CRS	Community Rating System
FIRM	Flood Insurance Rate Map; published by FEMA and provided to communities
SFHA	Special Flood Hazard Area; the floodplain delineated on the FIRM as A Zones and V Zones. Thurston County designates other SFHAs not covered by FEMA.

The county prepared flood hazard mitigation plans since 1999. Given the many changes in land development, new data, and other conditions since then, as well as evolving local, state and federal regulations and programs, the county updates its flood plan as a current tool for flood preparedness and flood hazard mitigation. Elements and strategies in this plan were selected because they meet various state or federal program requirements as well as the needs of Thurston County and the people who live, work, and spend time here.

This plan identifies resources, information, and strategies for reducing risk from flood hazards. It will help guide and coordinate mitigation activities. The plan was developed to meet these objectives:

- Meet the needs of Thurston County as well as state and federal requirements
- Meet planning requirements under the CRS program to allow Thurston County to maintain its CRS rating.
- Coordinate existing plans and programs so that high-priority initiatives and projects to mitigate possible disaster impacts are funded and implemented
- Create a linkage between the flood hazard mitigation plan and established plans of Thurston County so that they can work together to achieve successful mitigation

All residents and businesses of Thurston County are the ultimate beneficiaries of this plan. Participation in development of the plan by key stakeholders helped ensure that outcomes

will be mutually beneficial. The plan's goals and recommendations can lay groundwork for the development and implementation of local mitigation activities and partnerships.

1.3 Community Rating System (CRS) Participation Benefits

The priority for this plan is to benefit residents, businesses, the environment, and the economy of Thurston County by providing protection against the hazards posed by potential flooding. In addition, the county developed the plan to follow as closely as feasible to the guidelines for flood planning by FEMA for the CRS Program and by Washington State for the Flood Control Assistance Account Program (FCAAP).

CRS is a national program developed by FEMA to establish creditable criteria for community activities and programs that go beyond the minimum requirements for participation in FEMA's National Flood Insurance Program (NFIP). CRS has 19 credited activities. Among these is the development of a comprehensive floodplain management plan. In addition to developing a flood plan, Thurston County annually certifies to the Insurance Services Office (ISO), a FEMA designee, that validates that flood mitigation programs are still in place. Verification site visits occur every 3 to 5 years and are a comprehensive review, by the ISO, of the county's various flood management efforts within each of the following activities:

- Mapping and flood data
- Managing new development to minimize future flood damage
- Reducing flood losses to existing development
- Improving emergency preparedness and response
- Implementing public information activities

Credit is awarded to CRS communities based on their demonstrated level of effort. A rating of 1 through 10 is assigned to a community based on its overall credit calculation and its achievement of certain prerequisites with 1 being the best and 10 meeting the basic CRS enrollment requirements. For class ratings 9 through 1, a five percent accumulative discount is applied to flood insurance premium holders within the community for each class achieved. In October 2016, Thurston County documented sufficient credit and met the minimum prerequisites to achieve a Class 2 rating. There are only nine Class 2 or better communities in the nation, three of which are King, Pierce, and Thurston County (FEMA, 2024).

Thurston County's Class 2 rating entitles flood insurance policy holders in the FEMA 100-year Special Flood Hazard Areas (SFHA) a 40 percent discount on their premiums and a 10 percent discount applicable to all other flood policies. According to NFIP data, Thurston County's enrollment in CRS has resulted in the following flood insurance savings:

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- Total Annual Savings for all Thurston County: \$372, 397
- Average Annual Policy for all Thurston County: \$615
- Average Annual Savings per Policy: \$409



Source: TRPC

1.4 Community Rating System Steps for Comprehensive Floodplain Management Planning

Developing a comprehensive floodplain management plan is among the activities that a community must complete to earn CRS credits toward reduced flood insurance rates. To earn such credit, the community's plan must include at least one item from each of 10 steps specified in the 2017 National Flood Insurance Program Community Rating System's Coordinator's Manual (see Appendix B for details):

- Phase I – Planning Process:
 - Step 1, Organize
 - Step 2, Involve the public
 - Step 3, Coordinate
- Phase II – Risk Assessment:
 - Step 4, Assess the hazard
 - Step 5, Assess the problem
- Phase III – Mitigation Strategy:
 - Step 6, Set goals
 - Step 7, Review possible activities
 - Step 8, Draft an action plan
- Phase IV – Plan maintenance:
 - Step 9, Adopt the plan
 - Step 10, Implement, evaluate and revise

For more information about these planning steps, see:

CHAPTER 4 Plan Development Process

1.5 Plan Organization

This flood hazard mitigation plan is organized into 7 Chapters:

- Chapter 1 Introduction
- Chapter 2 Flood Risk Assessment
- Chapter 3 Mitigation Strategy: Goals, Objectives, and Initiatives
- Chapter 4 Plan Process and Development
- Chapter 5 Plan Implementation and Maintenance
- Chapter 6 Community Profile
- Chapter 7 Capability Assessment

The appendices provided at the end of the plan include information or explanations to support the main content of the plan:

- Appendix A Glossary
- Appendix B CRS Planning Requirements
- Appendix C Public Outreach Information
- Appendix D Annual Progress Report Template
- Appendix E Maps

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Source: Thurston Regional Planning Council (TRPC)

CHAPTER 2

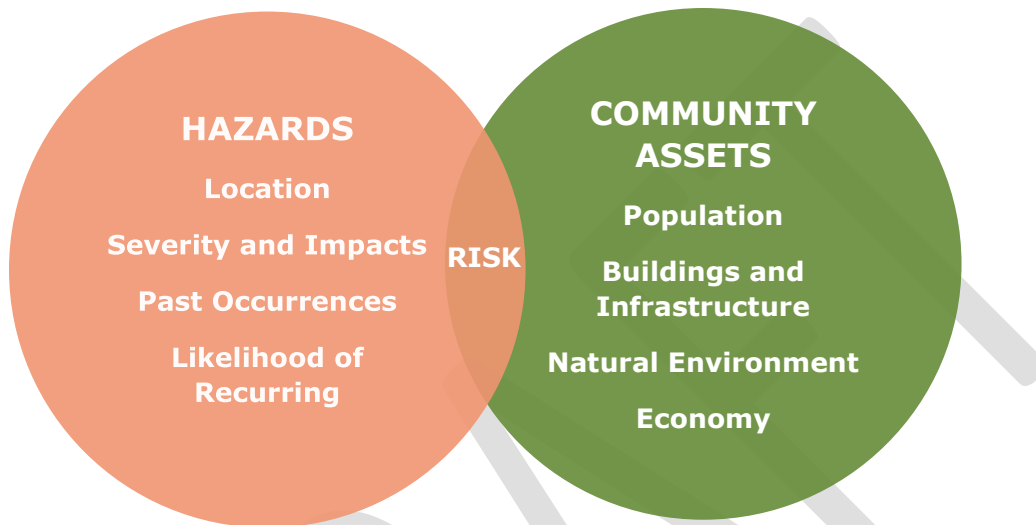
Flood Risk Assessment

2.1 Introduction

The Federal Emergency Management Agency (FEMA) states, “Risk, for the purpose of hazard mitigation planning, is the potential for damage, loss, or other impacts created by the interaction of hazards with community assets” (Figure 2.1). The risk assessment provides the factual basis for Thurston County’s flood mitigation strategy presented in Chapter 3. This chapter offers information about the type of flooding, location, extent, severity, probability of occurrence, and previous occurrences to familiarize readers with Thurston County’s most common or likely problems. Estimates of flood losses are also provided to characterize the county’s vulnerability to flooding. The Hazards Mitigation Plan for the Thurston Region (TRPC, 2023) covers additional natural hazards and threats to Thurston County, including earthquakes, landslides, severe weather, tsunamis, volcanic lahar, wildfires, and additional

hazard assessments on dam failure, floods, and sea level rise. While many of these hazards can influence flood risk within Thurston County, this flood plan focuses on the primary flood risk sources and causes within the region.

Figure 2.1: Community risk from hazards (FEMA Local Mitigation Planning Handbook).



2.1.1 Federal Disaster Declarations

Communities subject to emergencies resulting from hazards supply the first line of defense. The federal government issues disaster declarations under the Stafford Act when local and state government combined response capabilities cannot address major emergencies. Federal declarations activate a variety of federal funding programs to assist communities, businesses, and individuals with recovery. The declaration triggers the Disaster Mitigation Act, which provides hazard mitigation assistance grants to states – a chief source of funding for developing hazard mitigation plans and mitigation projects. Washington state has received 65 major federal disaster declarations since 1956 (FEMA, 2024).

Thurston County has received 28 flood-related major disaster declarations (Table 2.1) since 1965. Flooding in the county is common, and on an annual average basis, is the costliest natural hazard. The February 1996 flood alone cost uninsured private property owners in Thurston County losses of more than \$22 million. Statewide, FEMA provided over \$72 million in aid to flood victims, businesses, and local governments for the December 2007 floods and over \$12.8 million for the January 2009 floods.

Table 2.1: Thurston County Federal Disaster Declarations, 1965 to 2024

Disaster Number	Declaration Date	Incident Type	Title
196	May-1965	Earthquake	Earthquake
322	Feb-1972	Flood	Severe storms & flooding
328	Mar-1972	Flood	Heavy rains & flooding
414	Jan-1974	Flood	Severe storms, snowmelt & flooding
492	Dec-1975	Flood	Severe storms & flooding
545	Dec-1977	Flood	Severe storms, mudslides, & flooding
623	May-1980	Volcano	Volcanic eruption, Mt. St. Helens
852	Jan-1990	Flood	Severe storms & flooding
883	Nov-1990	Flood	Severe storms & flooding
981	Mar-1993	Severe Storm(s)	Severe storms & high wind
1079	Jan-1996	Severe Storm(s)	Severe storms, high wind, and flooding
1100	Feb-1996	Flood	High winds, severe storms and flooding
1159	Jan-1997	Severe Storm(s)	Severe winter storms, land & mudslides, flooding
1172	Apr-1997	Flood	Heavy rains, snow melt, flooding, land & mud slides
1361	Mar-2001	Earthquake	Earthquake
1499	Nov-2003	Severe Storm(s)	Severe storms and flooding
1671	Dec-2006	Severe Storm(s)	Severe storms, flooding, landslides, and mudslides
1682	Feb-2007	Severe Storm(s)	Severe winter storm, landslides, and mudslides
1734	Dec-2007	Severe Storm(s)	Severe storms, flooding, landslides, and mudslides
1817	Jan-2009	Flood	Severe winter storm, landslides, mudslides, and flooding
1825	Mar-2009	Severe Storm(s)	Severe winter storm and record and near record snow
4056	Mar-2012	Severe Storm(s)	Severe winter storm, flooding, landslides, and mudslides
4539	Apr-2020	Flood	Severe storms, flooding, landslides, and mudslides
5359	Sep-2020	Fire	Bordeaux Road Fire
4650	Mar-2022	Flood	Severe winter storms, snowstorms, straight-line winds, flooding

Source: FEMA “Disaster Declarations Summary” 2024, Full data list available through FEMA.gov.

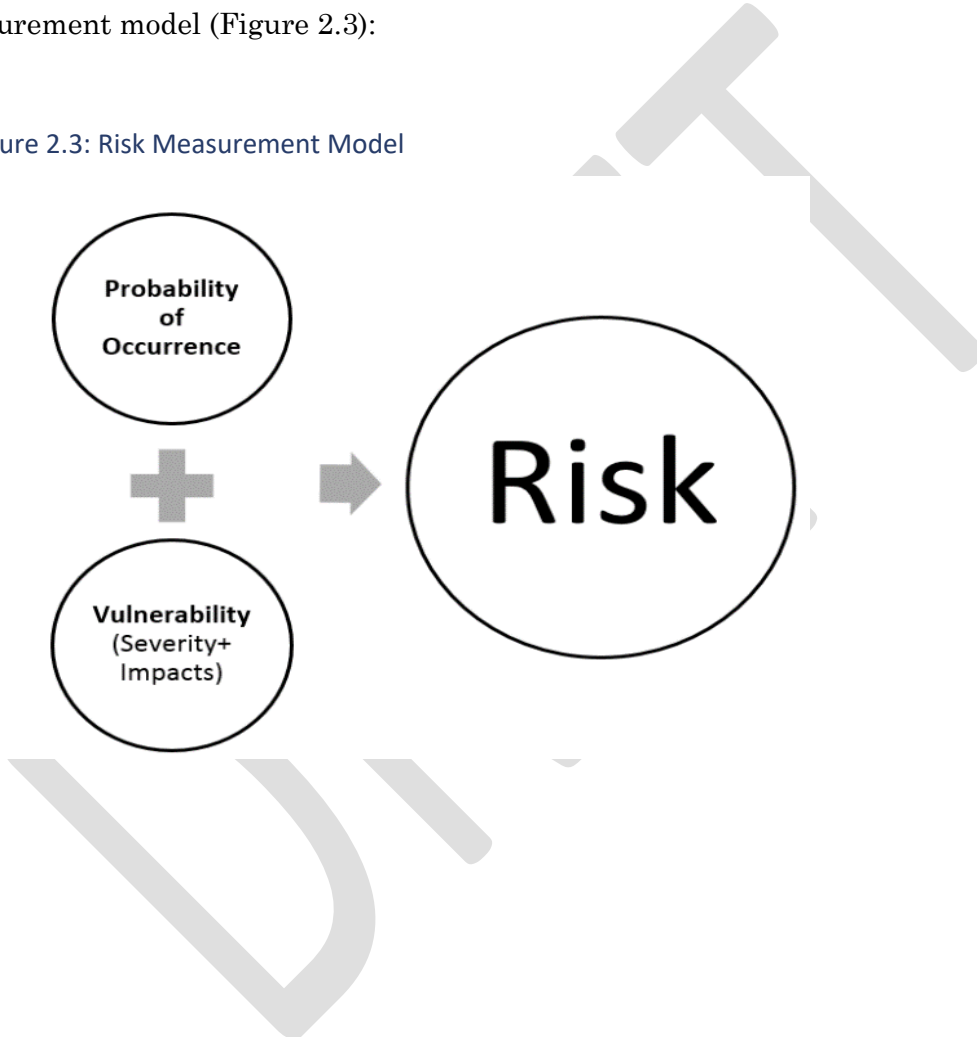
The number and frequency of federal disaster declarations affecting Thurston County paint a picture of the risks that natural hazards pose. These statistics highlight the frequency of major natural disasters in the county (FEMA, 2024):

- Between 1965 and 2024, Thurston County received 28 federal disaster declarations.
- As of 2024, 25 counties in Washington experienced 20 or more disaster declarations. Thurston, Jefferson, and Clallam counties tie for having the tenth highest rate of declarations in the state.

2.1.2 Risk Assessment Definitions

The Thurston County Flood Hazard Mitigation Plan (FHMP) uses a subjective risk measurement process based on Thurston County's Hazard Inventory and Vulnerability Assessment (HIVA). This methodology rates elements of each hazard's risk characteristics using the descriptors high, moderate, and low. These descriptors are applied to the hazards' probability of occurrence, vulnerability, and overall risk. An overview of this risk measurement model (Figure 2.3):

Figure 2.3: Risk Measurement Model



Risk Rating: A description (high, moderate, or low) of the subjective estimate of the combination of any given hazard’s probability of occurrence and the region’s vulnerability to the hazard.

- High – Strong potential for a disaster of major proportions.
- Moderate – Medium potential for a disaster of less than major proportions.
- Low – Little potential for a disaster.

Probability of Occurrence: A description (high, moderate, or low) of the probability of a hazard impacting Thurston County within the next 25 years.

- High – Great likelihood that a hazardous event will occur within the next 25 years.
- Moderate – Medium likelihood that a hazardous event will occur within the next 25 years.
- Low – Little likelihood that a hazardous event will occur within the next 25 years.

Vulnerability: A description (high, moderate, or low) of the potential impact a hazard could have on Thurston County. Vulnerability can be expressed as a combination of the severity of a hazard’s effect and its consequential impacts to the community. It considers the population, property, commerce, infrastructure, and services at risk relative to the entire county.

- High – The total population, property, commerce, infrastructure, and services of the county are uniformly exposed to the effects of a hazard of potentially great magnitude. In a worst-case scenario, there could be a disaster of major to catastrophic proportions.

- Moderate – The total population, property, commerce, infrastructure, and services of the county are exposed to the effects of a hazard of moderate influence; or the total population, property, commerce, infrastructure, and services of the county are exposed to the effects of a hazard of moderate influence, but not all to the same degree; or an important segment of the county’s population, property, commerce, infrastructure, and services are exposed to the effects of a hazard. In a worst-case scenario, a disaster could be moderate to major, but not catastrophic, proportions.
- Low – A limited area or segment of population, property, commerce, infrastructure, or service is exposed to the effects of a hazard. In a worst-case scenario, there could be a disaster of minor to moderate proportions.

2.2 Hazard Identification

In general, a flood is a temporary condition in which a normally dry area of land or infrastructure is inundated by excess standing or flowing water. Floods can occur at any time or season. The hazard profile individually addresses six principal sources of flooding with the potential to impact Thurston County:

- Riverine (river and stream)
- Groundwater
- Tidal
- Urban
- Lake
- Dam Failure

2.2.1 Riverine Flooding

Rivers and their floodplains are dynamic systems that perform important ecological functions, benefitting both wildlife and humans. Attempts to control floods by altering the physical characteristics of rivers and floodplains with dams, levees, or other flood structural projects, result in the loss, alteration, or significant reduction in the intrinsic ecological benefits these systems offer.

Flooding is a natural function of rivers, with their effects supporting productivity of wildlife and potentially increasing the fertility of farmlands within floodplains. Communities must balance the need to preserve the natural functions of floodplains with the need to protect property and human activities. Understanding how, when, and where to expect flood impacts is a first step in developing a mitigation strategy to minimize losses from floods and to protect the environment.

Riverine flooding occurs when excess flow and volume of water crests a river channel's normal capacity. Floodwaters consequently inundate areas within the river's floodway, floodplain, and other low lying areas that may not be mapped as flood hazard areas.



Source: TRPC

2.2.1.1 Cause of Riverine Flooding

Two to three days of prolonged rainfall, averaging two to five inches per day, a rapidly melting snowpack, or a combination of these conditions trigger riverine floods. The actual duration and rainfall amount needed to cause flooding depends on the initial condition of the river or stream and groundwater and runoff conditions. The Nisqually River's and the Chehalis River's extensive watersheds are subject to events outside the county that influence flooding downstream in the county.

The county continues to analyze stream flow and precipitation gauge data from its own network of monitoring stations, as well as the National Weather Service and United States Geological Survey (USGS) data. This research provides clues about the types of precipitation patterns that trigger small stream, riverine, and shallow groundwater basin flooding here. Initial findings reveal that six precipitation patterns appear to affect flood events of Thurston County rivers and shallow groundwater basins. These heavy rainfall scenarios have occurred within the last few decades (1998-2024) – some more than once. The precipitation patterns also correlate with larger river flood events. The previous five decades of the Olympia rainfall record show only one, two, or three of the identified scenarios per decade. Table 2.2 shows examples of the precipitation patterns that cause major flood events on stream and rivers.

Table 2.2: Six Rainfall Patterns that Influence Puget Sound Stream Flooding in Thurston County

Pattern	Description	Example
1	Early or late wet season rainfall (greater than 3-inch daily storm events) in October (Horton Overland Flow) or prolonged, above average rain in October or March and April	October 20, 2003: 4.14" storm event; October 2, 1981: 3.56" storm event; September – early October 2013 (September record rainfall); March –April 2016 (prolonged well above average rainfall); October –November 2016 (October record rainfall; November prolonged well-above average)
2	Five or six consecutive days of greater than 1-inch storm events punctuated by a greater than 2.5-inch storm event in the same series	November 2, 2006, 1.08" November 3, 2006, 1.02" November 4, 2006, 1.5" November 5, 2006, 1.88" November 6, 2006, 4.31" November 7, 2006, 1.02"
3	Two or more consecutive days of greater than 2-inch daily storm events	2007: December 2, 2.2"; December 3, 3.19"
4	Greater than 4-inch daily storm events (high landslide potential)	January 7, 2009, 4.82 inches November 6, 2006, 4.31 inches October 20, 2003, 4.14 inches November 19, 1962, 4.25 inches
5	Three or more consecutive months of at or greater than 11-inch monthly totals (larger potential for ground water flooding in key basins)	November, 1998: 14.74" December, 1998: 12.75" January, 1999: 12.31" February, 1999: 15.49"
6	A greater than 15-inch monthly total	November, 2006, 19.68" February, 1999, 15.5" November, 1998, 15.28" November, 1990, 15.06" November, 1964, 15.00" November, 1962, 15" January, 1953, 19.84"

Source: Thurston County Water and Climate Planning Division

2.2.1.2 Severity

Many factors influence the severity of riverine flooding such as the pre-existing condition of the ground water saturation levels, the topography and size of the watershed, freezing level, and the influence of human activity on the landscape (total amount of impervious surface, stormwater management, dam operations or failures, and other large-scale land uses such as logging). Thurston County Emergency Management issues three levels of flood severity to monitor flood stages and notify the public:

- **Minor flooding (or flood stage):** A river exceeds bank-full conditions at one or more locations, generally flooding fields and forests. Some roads may be covered but passable. There may be increased erosion of some river banks.
- **Moderate flooding:** Individual residential structures are threatened and evacuation is recommended for selected properties. Some roads may be closed. Moderate damage may be experienced.
- **Major flooding:** Neighborhoods and communities are threatened and evacuation is recommended for residents living on specified streets, in specified communities or neighborhoods, or along specified stretches of river. Major thoroughfares may be closed and major damage is expected.

Thurston County Emergency Management identifies flood severity thresholds based on stream flow rates and gauge heights for the Deschutes, Chehalis, Nisqually, and Skookumchuck rivers using select gauges in the region. Rivers are dynamic and all channels are subject to dimensional changes over time due to factors such as sediment and coarse woody debris deposition, and channel migration and braiding. Therefore, a direct comparison of flood events between years or decades for any given river based on flood gauge heights will vary.

The principal factors affecting flood damage are flood depth and velocity. The deeper and faster flood flows become, the greater the potential for damage and adverse impacts. Shallow flooding with high velocities is also capable of causing damage, as is deep flooding with slow velocity. This is especially true when a channel migrates over a broad floodplain, redirecting high velocity flows and transporting debris and sediment. Flood severity is often evaluated by examining peak discharges.

Table 2.3 lists peak flows FEMA uses to map the floodplains of the planning area.

Table 2.3: Summary of Peak Discharges of Streams and Rivers within Thurston County

Source	Location	Drainage area (sq. mi.)	Discharge (Cubic Feet/Second)			
			10-Year	50-Year	100-Year	500-Year
Black River	At County limits	124	2,820a	4,100a	4,940a	6,790
	Downstream of confluence with Beaver Creek	99	1,550	2,220	2,490	3,200
	Downstream of confluence with Waddell Creek	58.7	1,250	1,770	2,000	2,560
Chehalis River	U.S. Geological Survey Gauge #12027500 near Grand Mound	895	38,600	50,100	55,000	66,600
Deschutes River	Downstream of Henderson Blvd.	160	5,990	7,960	8,800	10,800
	Upstream of confluence with Spurgeon Creek	127	5,630	7,450	8,230	10,100
	At Vail Loop Rd, Crossing	89.8	4,950	6,500	7,150	8,690
	Upstream of confluence with Mitchell Creek	44.1	2,690	3,590	3,980	4,900
	Upstream of limit of detailed study	33.3	2,120	2,860	3,180	3,930
Nisqually River	At Mouth	711	21,500	29,000	33,000	45,000
	Upstream of confluence with Horn Creek	488	21,000	28,000	32,000	44,000
	Upstream of Confluence with Tanwax Creek	446	20,500	27,000	31,000	43,000
Percival Creek	At Sapp Rd., SW	1.8	94	128	145	180
	At 54th Ave., SW	0.5	33	45	50	62
Scatter Creek	Scatter Creek Tributary - At confluence with Scatter Creek	6.4	212	293	330	415
	Scatter Creek Tributary - At State Route 507	10.3	66	90	102	126
Skookumchuck River	At State Route 507	113	6,990	9,100	9,980	12,100
	Upstream of confluence with Thompson Creek	65.9	5,790	7,440	8,110	9,700
Woodland Creek	At Pleasant Glade Rd., NE	24.6	151	205	228	284
Yelm Creek	From 1st St to Centralia Canal	11.2	220	310	350	445
	From 103rd Ave to 1st S.	9.8	200	285	325	410
	Upstream end of study reach, to 103rd Ave.	9.3	185	265	300	375

a= Includes effect of overflow from Chehalis River

Source: Thurston County Water and Climate Planning Division

2.2.1.3 Frequency of Riverine Floods

Floods are commonly described as having a 10-, 50-, 100-, and 500-year recurrence interval, meaning that floods of these magnitudes have (respectively) a 10-, 2-, 1-, or 0.2-percent

chance of occurring in any given year. The frequency and severity of flooding are measured using a discharge probability, which is the probability that a certain river discharge (flow) level will be equaled or exceeded each year. Flood studies use historical records to determine the probability of occurrence for the different discharge levels. The flood frequency equals 100 divided by the discharge probability. For example, the 100-year discharge has a 1 percent chance of being equaled or exceeded in any given year. The “annual flood” is the greatest flood event expected in a typical year.

FEMA, the NFIP, and other agencies use the extent of flooding associated with a 1 percent annual probability of occurrence (the base flood or 100-year flood) as the regulatory boundary. Also, referred to as the Special Flood Hazard Area (SFHA), this boundary supplies a convenient tool for assessing vulnerability and risk in flood-prone communities. Many communities’ maps show the extent and likely depth of flooding for the base flood. Corresponding water-surface elevations describe the elevation of water resulting from a given discharge level – one of the most important factors used in estimating flood damage.

These measurements reflect statistical averages only; it is possible for two or more rare floods (with a 100-year or higher recurrence interval) to occur within a short period. Assigning recurrence intervals to historical floods on different rivers can help indicate the intensity of a storm over a large area. For example, the 1996 flood event exceeded the flood with 100-year recurrence interval on the Chehalis River, while the recurrence interval of that event for tributaries to the Chehalis such as the Skookumchuck River was determined to be 75 years.

Recent history shows that Thurston County can expect an average of one episode of minor river flooding each winter. Large, damaging floods typically occur every two to five years. Major, damaging riverine and groundwater floods occur countywide every 10-15 years on average. Urban portions of the county annually experience nuisance flooding related to stormwater drainage issues.

2.2.1.4 Warning Times

Thurston County Emergency Management uses the National Weather Service Advanced Hydrologic Prediction Service, as well as the Northwest River Forecast Center, to monitor river flood gauges during severe storm events. The river gauge forecast graphs provide a forecast time when a river will reach flood stage. Emergency Management monitors this information to notify the community of potential flooding and provide additional information to prepare community members to respond.

In 2016, Thurston County implemented an emergency alert notification system that informs community members before a river reaches flood stage. The county will also use this system to notify residents about potential for groundwater flooding and other hazards.

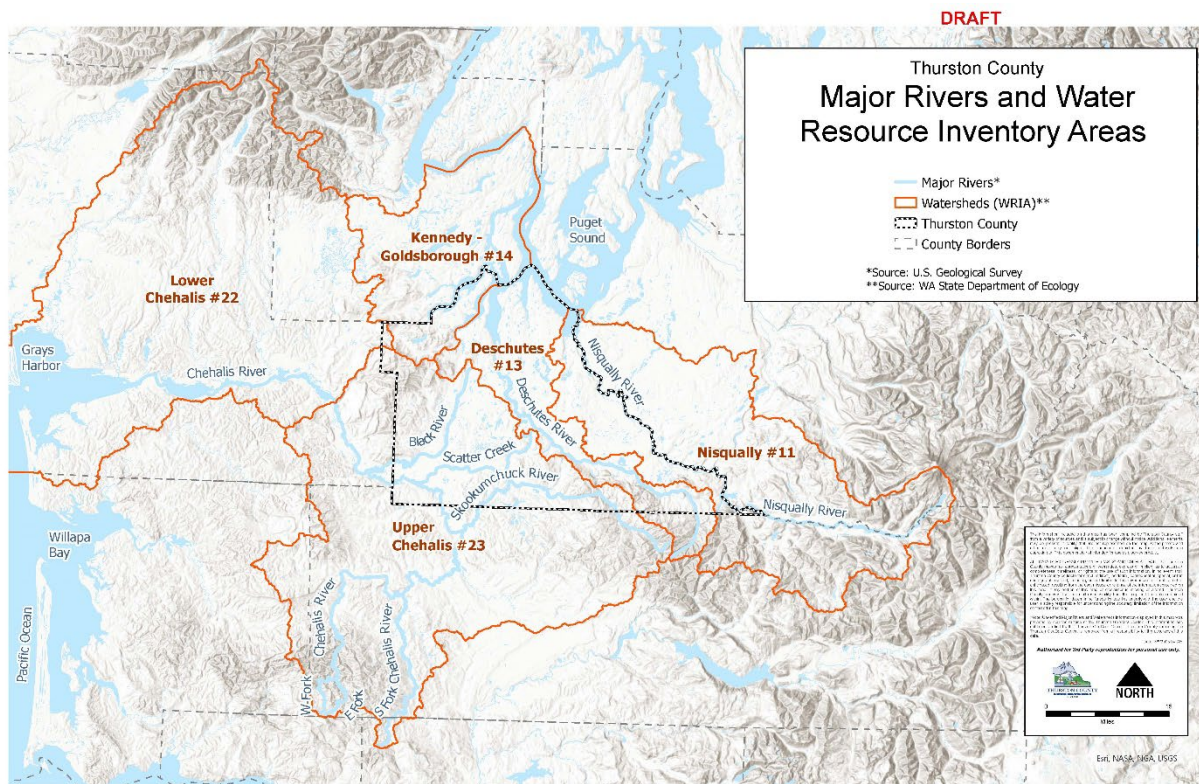
2.2.1.5 Sources of Riverine Floods

Six rivers in Thurston County (Map 2.1) experience episodic flooding: 1) Black; 2) Chehalis; 3) Deschutes; 4) Nisqually; 5) Scatter Creek; and 6) Skookumchuck. All but the Nisqually are lowland rivers fed primarily by watershed precipitation and groundwater flows. FEMA has mapped the SFHA for each river (Map 2.2). Although not a major river, Scatter Creek also has a designated high risk flood zone and has historically produced major floodwaters in southwest Thurston County. The next sections describe the six river systems and their flood stages within the planning area. Map 2.3 identifies the Watershed boundaries within Thurston County.



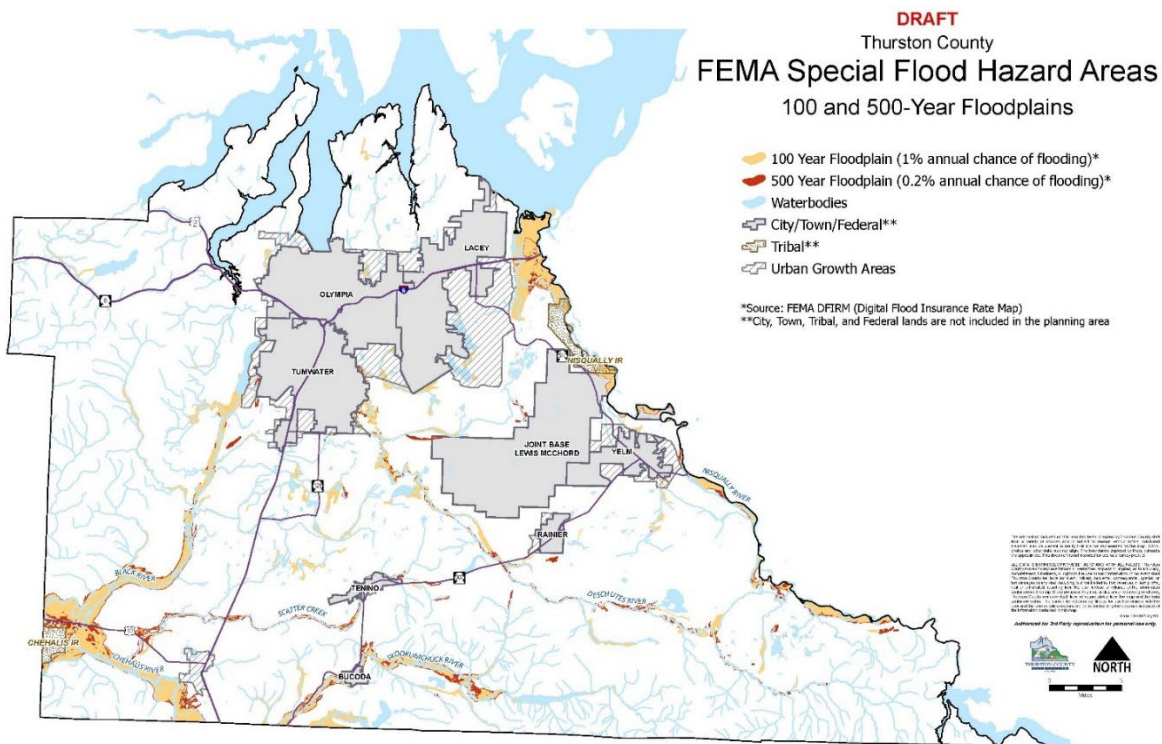
Source: TRPC

Map 2.1: Thurston County Major Rivers and Watershed Resource Inventory Areas



Source: Thurston County GeoData. See Appendix E for Full-Size Maps.

Map 2.2: FEMA Special Flood Hazard Areas (100-Year)



Source: Thurston County GeoData. See Appendix E for Full-Size Maps.

Flood Definitions

Floodplain: A strip of relatively smooth land bordering a stream, built of sediment carried by the stream and dropped in the slack water beyond the influence of the swiftest current.

100-Year Floodplain: Lands which are subject to a 1 percent chance of flooding in any year. These areas are mapped as the "A" zone on the Flood Insurance Rate Maps (FIRM) of FEMA.

500-Year Floodplain: Lands which are subject to a 0.2 percent chance of flooding in any year. These areas are mapped as the "B" zone on the FIRM of FEMA.

Flood Stage: The stage at which overflow of the natural streambanks begins to cause damage in the reach in which the elevation is measured. Flood stages for each USGS gauging station are usually provided by the National Weather Service.

Floodway: "Regulatory Floodway" means the channel of a river or other watercourse and the adjacent land areas that must be reserved to discharge the base flood without cumulatively increasing the water surface elevation more than a designated height.

Special Flood Hazard Area (SFHA): The land area covered by the floodwaters of the base flood is the Special Flood Hazard Area (SFHA) on National Flood Insurance Program (NFIP) maps. The SFHA is the area where the National Flood Insurance Program's floodplain management regulations must be enforced and where the mandatory purchase of flood insurance applies. The SFHA includes Zones A, AO, AH, A1-30, AE, A99, AR, AR/A1-30, AR/AE, AR/AO, AR/AH, AR/A, VO, V1-30, VE, and V.

1) Black River Basin

The Black River – generally slow flowing with a broad floodplain – drains southwest from the south end of Black Lake into the Chehalis River near Oakville in Grays Harbor County. The Black River drainage is approximately 144 square miles, with 105 square miles in Thurston County. Most flooding along the main stem of the river is inundation flooding with low-velocity floodwaters.

The Black River drainage basin is divided into two parts. The west half drains the Capitol Forest area. The main tributaries in this section include Dempsey, Waddell, and Mima creeks. This area ranges in elevation from 2,659 feet at Capitol Peak to 200 feet at the Black River valley floor. The basin is subject to high-intensity, short-duration rain events that can produce flash flooding in these creeks. In general, snowmelt alone does not cause flooding in this area, however snow can compound it.

The east half drains the relatively flat area south of Tumwater, west of Offutt Lake, and north of Tenino. The elevation difference here is approximately 200 feet. The Salmon and Beaver creeks and Bloom Ditch are the main streams that drain this basin. These very slow-flowing water systems tend to cause inundation flooding with no velocity. This side of the basin is susceptible to high-groundwater flooding during periods of extended rain.

Because of its flat topography, the Black River is also susceptible to flooding by waters backing up from the Chehalis River. This appears to be the situation when flooding on the Chehalis River is concurrent with high tides along the coast.

Black River Flood Stage Impacts

In April 2005, the Washington State Department of Ecology established a river gauging station on the Black River where it crosses U.S. Highway 12 at River Mile 2. Unlike the gauging stations on the Chehalis at Prather Road Bridge and at Porter, this gauge has not been rated and is not modeled to forecast flood levels. Table 2.4 reflects Thurston County Emergency Management's summary for flood stages at this river gauge.

Table 2.4: Black River Flood Stages and Historic Crests

Flood Stage	Gauge Height	Conditions and Previous Years of Occurrence
Action	6 Feet	At 6 feet, residents should be aware that the river is likely to flood. 2006, 2007, 2009, 2010, 2011, 2012, 2015
Flood	8 Feet	At 8 feet, the Black River has reached flood stage; the river will spill out of its banks into nearby fields and woods with limited water over a few spots on local roads. 2006, 2007, 2010, 2011, 2015
Moderate	10 Feet	At 10 feet, moderate flooding will occur. This stage corresponds to 15.5 feet at the Prather Road Bridge on the Chehalis River. At this level, the Chehalis River in Thurston County will flood several roads in Independence Valley with swiftly moving water, including U.S. Highway 12 and James, Independence, Moon and Anderson Roads. Floodwaters will cut off access to and from the Chehalis Reservation and inundate nearby farmlands. Some residential structures may be threatened. 2006, 2007, 2015
Major	12 Feet	Major flooding occurs when the Black River reaches 12 feet. During the December 2007 flood, the gauge on the Black River recorded a stage of 14.5 feet. 2007

Source: USGS, NOAA

2) Chehalis River Basin

The 174-mile long Chehalis River emerges from three forks in remote forest lands in Lewis and Pacific counties. The river is divided into two watersheds, the Upper Chehalis (WRIA #23) and the Lower Chehalis (WRIA #22). The Chehalis River grows at the confluence of the West Fork Chehalis River and East Fork Chehalis River. From there, the Chehalis flows north and east, collecting tributary streams that drain the Willapa Hills and other lowland mountains in southwestern Lewis County. The South Fork Chehalis River joins the main river a few miles west of the Chehalis city limits. The Newaukum River joins the Chehalis River at Chehalis, after which the river turns north, flowing by the City of Centralia, where the Skookumchuck River joins. Beyond Centralia, the Chehalis River flows north and west for a nine-mile course through the southwestern corner of Thurston County.

The Chehalis River flows into Thurston County (WRIA #23) approximately two miles west of Interstate 5 and flows north toward Grand Mound where it drains the Michigan Hill area and receives water from Prairie Creek and Scatter Creek. The river courses west through largely undeveloped rural lowlands scattered with small farms and gentle sloping forested hills. The river continues west and passes through the Confederated Tribes of the Chehalis Reservation before entering Grays Harbor County where it joins the mouth of the Black River.



Source: TRPC

Beyond Thurston County, the Chehalis River continues northwest, joining the tributaries of the Satsop and Wynoochee rivers near the City of Montesano. The Chehalis River becomes increasingly affected by tides beyond this location and gradually widens into the Grays Harbor estuary where it is joined by several other rivers, becoming Grays Harbor.

Due to its large drainage area, the Chehalis River tends to rise slowly over a long period. Thurston County Emergency Management describes the three common scenarios for flooding on the Chehalis River within Thurston County:

- The most predictable scenario for the Chehalis occurs when rains fall over all southwestern Washington and all regional rivers and streams rise.
- The Chehalis can also experience flooding when there is little or no rain in Thurston or Grays Harbor counties, but heavy rain in Lewis and Pacific counties. This causes flooding to occur later than normal.
- Flooding also occurs when heavy rain falls in Grays Harbor County, but not in Thurston or Lewis counties. Feeder streams can then fill the Chehalis and cause water to “back up” into Thurston County.

Chehalis River Flood Stage Impacts

The flood of record is 20.23 feet from December 4, 2007. Widespread, severe flooding throughout the basin was experienced. Table 2.5 summarizes the flood impacts based on the Chehalis River flood stages at the gauge near Grand Mound at Prather Road Bridge, River Mile 59.9.

Table 2.5: Chehalis River Flood Stages and Historic Crests

Flood Stage	Gauge Height and Discharge	Conditions and Previous Years of Occurrence
Action	12.2 Feet or 16,600 CFS	At 12.2 feet, the Chehalis River will locally spill out of its banks into nearby fields and over a few roads. 1933, 1936, 1943, 1945, 1946, 1948, 1949, 1953, 1954, 1955, 1956, 1964, 1966, 1980, 1983, 1984, 2003, 2009, 2011, 2012, 2013, 2014, 2015, 2017, 2022
Flood	14 or 22,900 CFS	At 14 feet, the Chehalis River will flood several roads in Independence Valley, including James Road, Independence Road and Moon Road. Flood waters will also cover nearby farm lands. 1933, 1937, 1939, 1941, 1945, 1946, 1947, 1948, 1949, 1950, 1954, 1955, 1956, 1957, 1958, 1959, 1960, 1961, 1963, 1964, 1965, 1966, 1967, 1968, 1970, 1971, 1972, 1974, 1975, 1980, 1981, 1982, 1983, 1986, 1989, 1990, 1992, 1995, 1997, 1998, 1999, 2001, 2002, 2003, 2004, 2005, 2006, 2007, 2010, 2011, 2012, 2014, 2015
Moderate	15.5 Feet or 29,600 CFS	At 15.5 feet, the Chehalis River will flood several roads in Independence Valley with swiftly moving water, including SR-12 and James, Independence, Moon and Anderson Roads. Floodwaters will cut off access to and from the Chehalis Reservation and inundate nearby farm lands. Some residential structures may be threatened. 1934, 1936, 1949, 1953, 1954, 1955, 1962, 1964, 1966, 1970, 1976, 1977, 1982, 1986, 1987, 1994, 1996, 1997, 1999, 2001, 2006, 2015, 2016, 2017, 2019, 2021
Major	17 Feet or 38,800 CFS	At 17 feet, the Chehalis River will cause major flooding, inundating roads and farm lands in Independence Valley. Deep and swift floodwaters will cover SR-12 and James, Independence and Moon Roads. Flooding will occur all along the river, including headwaters, tributaries and other streams within and near the Chehalis River Basin. 1935, 1937, 1951, 1971, 1972, 1974, 1975, 1986, 1990, 1991, 1994, 1995, 1996, 1998, 1999, 2007, 2009, 2015, 2022

Source: USGS, NOAA. In May of 2018, reporting of river height for Chehalis gauge changed from staff gauge height to elevation. For the purposes of this report, data were converted to staff gauge per USGS instructions.

3) Deschutes River Basin

The Deschutes River is a 53-mile-long lowland river that gives rise within Mt. Baker-Snoqualmie National Forest in north Lewis County. The river is in the Deschutes Watershed (WRIA #13). The Deschutes lies west of the Nisqually River and flows in a parallel pattern. The Deschutes is the fastest rising and falling river in the county, responding quickly to local rainfall and runoff. The river's watershed encompasses a great majority of the land area for the cities of Lacey, Olympia, and Tumwater. As the Deschutes River enters the Tumwater Urban Growth Area and the City of Tumwater, the river bank and surrounding land use become more developed, with several residences in the Tumwater Valley around the periphery of the Tumwater Golf Course. A riprap bank and additional hard banking channels the river through the Tumwater Valley Golf Course and parts of Tumwater Falls Park before

it discharges into Capitol Lake near the Historic Olympia Brewery in Tumwater, just south of Interstate 5.

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Capitol Lake is an artificial lake formed by a small dam at the north end of the lake in downtown Olympia. Washington State Department of Enterprise Services regulates the dam, which creates a freshwater lake to complement the Capitol Campus. Percival Creek joins the Deschutes River in Capitol Lake's central basin, near Marathon Park, just north of Interstate 5. When the tides and lake water level conditions permit the opening of the dam's radial gate, Capitol Lake drains into Budd Inlet.



Source: TRPC

Sediments carried down river are slowly accumulating on the lake bottom and effectively decreasing the lake's capacity. In 2022, restoration of the estuary that existed before the dam was chosen by the Washington State Department of Enterprise Services as a long-term approach to managing the site and improving water quality and aquatic and terrestrial habitats. The Deschutes Estuary Restoration Project is planned to restore 260 acres of estuarine and salt-marsh habitat by the 2030s and will remove the existing dam and current form of Capitol Lake.

Deschutes River Flood Stage Impacts

The flood of record is 17.01 from January 9, 1990. Table 2.6 summarizes the flood impacts based on Deschutes River flood stages at the Rainier Vail Loop Bridge Gauge, River Mile 25.9.

Table 2.6: Deschutes River Flood Stages and Historic Crests

Flood Stage	Gauge Height and Discharge	Conditions and Previous Years of Occurrence
Action	9 Feet or 2,570 CFS	At 9 feet, the Deschutes River locally spills over its banks into low fields and forested lands, mainly along Vail Cutoff Road and Reichel Road. 1949, 1950, 1951, 1952, 1953, 1954, 1955, 1956, 1957, 1958, 1959, 1960, 1961, 1962, 1964, 1965, 1966, 1967, 1968, 1970, 1972, 1974, 1975, 1977, 1979, 1982, 1989, 1990, 1991, 1992, 1994, 1995, 1996, 1997, 1998, 1999, 2001, 2002, 2007, 2009, 2011, 2015, 2017, 2022
Flood	11 or 3,950 CFS	At 11 feet, the Deschutes River will flood downstream in Tumwater Valley, including the golf course. Minor flooding will also occur in several residential areas, mainly Cougar Mountain and Driftwood Valley. Many roads and farm lands will also be flooded. 1949, 1953, 1955, 1957, 1960, 1962, 1963, 1964, 1966, 1967, 1970, 1971, 1972, 1975, 1977, 1982, 1987, 1988, 1990, 1994, 1996, 1997, 1998, 2001, 2003, 2006, 2011, 2012, 2014, 2015, 2021
Moderate	13.5 Feet or 5,970 CFS	At 13.5 feet, the Deschutes River will flood residential areas, especially Cougar Mountain, Driftwood Valley and Falling Horseshoe. Downstream flooding will occur in areas of Tumwater Valley, including the golf course. Many roads and farm lands will also be flooded. 1991, 1996, 1998, 2007, 2009, 2017, 2022
Major	15 Feet or 7,330 CFS	At 15 feet, the Deschutes River will cause major flooding, with swift and deep water flooding roads, farmlands and the residential areas of Cougar Mountain, Driftwood Valley, Falling Horseshoe and areas downstream in the Tumwater Valley. Flooding will occur all along the river including headwaters, tributaries and other streams within and near the Deschutes River Basin. 1972, 1974, 1990, 1996

Source: USGS, NOAA

4) The Nisqually River

The Nisqually River is the only river system within Thurston County fed primarily by melting snowpack and glacial ice. This 80-mile river is located within the Nisqually Watershed (WRIA #11). The river's headwaters begin on the southwestern slope of Mount Rainier at the base of the Nisqually Glacier in Mount Rainier National Park in Pierce County. The river flows west along the Pierce and Lewis County line until constrained by the Alder Dam; nearly halfway (river mile 44.2) to the river mouth at the Puget Sound. From Alder

Reservoir, the Nisqually River forms a natural border for approximately 48 miles between Pierce and Thurston counties.

According to the dam inventory report (Department of Ecology, 2023), Alder Dam is a 330-foot high concrete arch dam with a crest length of 1,550 feet, with a spillway designed for a maximum discharge of 85,000 cubic feet per second (cfs). Alder Reservoir is about seven miles long with a 3,065-acre surface area and a 214,500-acre-foot total storage capacity. The LaGrande Dam, a gravity structure 217 feet high and a crest length of 710 feet, is 1.7 miles downstream from Alder Dam. The dam's spillway was designed for a maximum discharge of 88,000 cfs. The LaGrande Reservoir provides a total storage capacity of 2,676 acre-feet. Tacoma Power (a division of Tacoma Public Utilities) operates both dams for hydroelectric power generation. The reservoirs of both dams are relatively small and Tacoma Power is not required to provide flood control, and operates in accordance with its Federal Energy Regulatory Commission (FERC) license. Even so, Tacoma Power lowers the elevation of the lake, when possible, during winter months to enable some capture of high water inflows from rainstorms and snow melt, but the reservoirs' limited storage capacity is not intended for flood control, and is not meant to prevent downstream flooding. Tacoma Power has agreed to notify Thurston County Emergency Management departments when discharge levels reach specified levels, to allow sufficient time for emergency notification to communities downstream.

The Nisqually River resumes a mostly natural unrestricted flow as it traverses northwest away from the LaGrande Dam. The river courses past scattered residences in unincorporated Thurston County before it passes the communities of McKenna, Yelm, the Nisqually Pines neighborhood, the Nisqually Indian Reservation, and the undeveloped range lands of Joint Base Lewis-McChord. Several small farms and residences are in the Nisqually Valley in the vicinity around Interstate 5 and Old Pacific Highway. The river enters the Puget Sound near the Billy Frank Jr. Nisqually National Wildlife Refuge.

Nisqually River flooding relates largely to the amount of water released from Alder and LaGrande dams. Feeder streams such as Ohop, Yelm, and Tanwax creeks also influence flooding, as do high tides in the Nisqually Delta. Conservation efforts including dike removal and revegetation work were completed to restore ecological functions of the Nisqually Estuary. It is unknown how this restoration will affect floods in the lower reaches of the river, as major flooding has not occurred since this work was completed.

Nisqually River Flood Stage Impacts

The flood of record is 17.13 feet from February 8, 1996. The National Weather Service issues a flood warning for the Nisqually River when forecast models indicate the river will reach a stage of 10 feet or higher at the McKenna gauge at river mile 21.8. Table 2.7 summarizes the flood impacts based on Nisqually River flood stages at the McKenna gauge at river mile 21.8.

Table 2.7: Nisqually River Flood Stages and Historic Crests

Flood Stage	Gauge Height and Discharge	Conditions and Previous Years of Occurrence
Action	8 Feet or 9,970 CFS	At 8 feet, residents should be aware that the river is likely to flood. 1967, 2011, 2014, 2021
Flood	10 or 14,700 CFS	At 10 feet, the Nisqually River will flood at the lower end near the mouth. High tide levels on Puget Sound may increase the amount of flooding. The Nisqually River will also spill over its banks between LaGrande and McKenna. 1951, 1953, 1955, 1959, 1961, 1964, 1977, 1980, 1982, 1990, 1991, 1994, 1995, 1997, 2003, 2006, 2009, 2015, 2020
Moderate	13 Feet or 23,300 CFS	At 13 feet, the Nisqually River will flood from LaGrande downstream through McKenna to the mouth. Swift waters will flood roads, farms and some residential areas, including the residential care facility in McKenna. Erosion will likely damage properties along river banks. 1991, 1996, 1998, 2007, 2009
Major	14 Feet or 26,500 CFS	At 14 feet, the Nisqually River will cause major flooding from LaGrande downstream through McKenna to the mouth. Deep and swift waters will flood roads, farms and residential areas, including the residential care facility in McKenna. Erosion may cause severe damage. Flooding will occur all along the river, including headwaters, tributaries and other streams within and near the Nisqually River Basin. 1972, 1974, 1990, 1996

Source: NOAA

5) Scatter Creek

Located in the Upper Chehalis Watershed (WRIA #23), Scatter Creek is approximately 20 miles long with an additional 9.5 miles of tributaries. The creek flows west-southwest from McIntosh Lake, east of Tenino, to the Chehalis River near Rochester.

The creek crosses lands chiefly composed of highly porous glacial outwash materials. After Scatter Creek passes through the City of Tenino, the river flows through mostly undeveloped small farmland with scattered residences through unincorporated Thurston County. The lower end of the creek passes through the Grand Mound area which is scattered with residences and light industrial plants and businesses. Significant reaches of the creek, both upstream and downstream of the fish farm, remain dry during the summer.

The Scatter Creek Aquifer system is like a “propped up bathtub” that feeds into the Chehalis (a high ground water gradient and velocity). Ground water flooding in Scatter Creek impacts the municipal well field which is shallow – only 90 feet below ground surface. Even in years when the Chehalis does not flood, the ground water comes to ground surface at the well field. Also, the LIDAR data reveals Scatter Creek as large ancestral flood channels, so the stream itself does not seem to overbank as dynamically as a normal floodplain in the upgradient

areas. The river just follows the larger ancestral ‘scours’ (Thurston County Water Resources, 2009).

Thurston County has monitored stream flow in Scatter Creek at James Road since 2008. However, prior to this, no permanent long-term stream flow gauges existed on this creek, so little is known about its long-term hydrography. In addition, very little flood history data is published for this riverine system. The 2003 Scatter Creek Habitat Conservation Plan states that from 1993 to 1999, the wet season flows typically ranged from 80 to 400 cfs, with less frequent peaks in the range of 400 to 1,400 cfs. The maximum mean daily discharge during this period was 1,362 cfs on February 14, 1996 (historically a very wet year, coinciding with record flood levels for the Skookumchuck River).

The Scatter Creek Habitat Conservation Plan includes the following passage regarding flood flows (Parametrix, 2003):

...About 50 percent of the basin delivers stormflow runoff to the valley bottom from the hill portions of the basin. This flow is mostly delivered from seven tributary creeks that enter Scatter Creek and elevated groundwater return flow. If stormflow runoff enters from the tributaries after a dry summer, it takes a while to fill the local groundwater and channel areas. Stormflow onto wet basin conditions creates the largest stormflow peaks. There are insufficient years of recorded flows on Scatter Creek to determine the relationship between flood frequency and magnitude.

In 1996, Scatter Creek experienced major flooding, covering several county roads along its westward flow including Old Highway 99, Sargent Road, 183rd Avenue, State Route 12, and Denmark Street (Thurston County Development Services, 2009).

6) The Skookumchuck River Basin

The Skookumchuck River is 43-miles-long with headwaters originating within Mt. Baker-Snoqualmie National Forest in north Lewis County. Located in the Upper Chehalis Watershed (WRIA #23), the river is arch-shaped and arcs upward into Thurston County for nearly 26 miles before it returns to Lewis County. The river flows northwest into Thurston County through commercial forest lands with relatively steep forested valley slopes. The Skookumchuck Dam, located about 10 miles east and upstream from the Town of Bucoda, constrains the river as it traverses west. The dam – a rolled earthfill embankment with a crest length of 1,320 feet and a height of 195 feet – has a gross storage capacity of 35,000 acre-feet. The dam’s spillway, an ungated concrete ogee section 130 feet long, can pass the Probable Maximum Flood of 32,500 cubic feet per second (cfs) (TransAlta, 2007). TransAlta operates the dam, with a primary function to provide a controlled release of cooling water at the Centralia Power Plant in Lewis County, set to close in 2025 according to TransAlta.

The Skookumchuck River emerges from the reservoir and passes through a relatively flat open valley comprised of scattered small farms and residences. As the river bends south

toward Lewis County, the valley narrows as the river flows through the Town of Bucoda. The river winds along the eastern edge of the town's core developed area. From here, the river flows southwest and runs roughly parallel with State Route 507 into Lewis County. The river continues south until it enters the more densely populated City of Centralia. The Skookumchuck River drains into the Chehalis River, in Centralia, just west of Interstate 5 and south of Harrison Avenue.

Skookumchuck River Flood Stage Impacts

The flood of record is 17.87 feet from February 8, 1996. The National Weather Service issues a flood warning for the Skookumchuck River when forecasts indicate that the river will reach a stage of 13.5 feet at the gauge near Bucoda. Table 2.8 summarizes the flood impacts based on Skookumchuck River flood stages at the gauge four miles downstream from Bucoda.

Table 2.8: Skookumchuck River Flood Stages and Historic Crests.

Flood Stage	Gauge Height and Discharge	Conditions and Previous Years of Occurrence
Action	11.5 Feet or 2,750 CFS	At 11.5 feet, residents should be aware that the river is likely to flood. 1968, 1970, 1972, 1977, 1980, 1982, 1986, 1987, 1994, 1997, 1998, 2001, 2006, 2007, 2010, 2012, 2014, 2018
Flood	13.5 Feet	At 13.5 feet, the Skookumchuck River will flood a few roads and low pasture lands near Bucoda. 1968, 1972, 1974, 1975, 1976, 1982, 1983, 1986, 1994, 1995, 1996, 1998, 1999, 2001, 2002, 2004, 2005, 2006, 2007, 2011, 2018, 2020
Moderate	15 Feet or 5,500 CFS	At 15 feet, the Skookumchuck River will flood several residential and business areas around Bucoda. Flood waters will cover many roads. 1971, 1972, 1974, 1975, 1977, 1986, 1987, 1990, 1991, 1995, 1996, 1998, 1999, 2001, 2003, 2006, 2014, 2015, 2017, 2021
Major	17 Feet or 8,650	At 17 feet, the Skookumchuck River will cause major flooding in the Bucoda area, with deep and swift flood waters inundating residential and business areas and numerous roads. Flooding will occur all along the river, including headwaters, tributaries and other streams within and near the Skookumchuck River Basin. 1990, 1996, 2009

Source: USGS, NOAA. In May of 2018, reporting of river height for Skookumchuck gauge changed from staff gauge height to elevation. For the purposes of this report, data were converted to staff gauge as per USGS instructions.

2.2.1.6 Riverine Flood Impacts

Floods kill people in the United States every year. People caught unprepared and isolated by swift moving or flash flood waters can die from drowning, hypothermia, or trauma. The February 1996 floods caused nine deaths in the Pacific Northwest. Fortunately, advances in weather forecasting technology and hydrologic modeling produce accurate flood stage forecasts that provide communities with timely information. Radio broadcasts, television news, websites, social media, and telephone and simple text alert systems can provide residents of flood prone properties timely notification to safeguard belongings or evacuate.

While Thurston County has not experienced any flood-related fatalities in recent years, the 1996 flood involved rescue operations for 300 people. The December 2007 flood also involved rescue efforts for 36 individuals in and around the Rochester community. People with disabilities, elderly individuals, and people lacking transportation are vulnerable to floods as they may require assistance to evacuate or lack a safe place to take temporary shelter.

Fast rising flood waters can also eliminate the opportunity to provide for the safety of livestock, wildlife, and pets. Floods kill more than just humans, causing additional economic, ecological, and emotional hardship. Health risks may also arise without proper disposal of animal carcasses.

Major and moderate flooding frequently inundate low lying roads around Thurston County, resulting in area-wide transportation disruptions. Flooding has closed both State Route 12 and Interstate 5 multiple times. As flood waters recede, woody debris and other objects left behind can pose hazards to travelers. Electric, gas, water, and communication utilities are also subject to damage and disruption.

Swift moving flood waters can damage or destroy bridges, roads, and railroads. Flood waters also erode streams and river banks and cause loss of wildlife and habitat. Slow moving flood waters can also significantly damage buildings and mechanical equipment. Inundation and sediment deposits can be extensive and require costly clean up and repairs to homes and buildings. Flood waters also damage or destroy vehicles and mechanical equipment. Homeowners are particularly hard hit due to the loss of shelter, furniture, bedding, clothing, household appliances, food, and other personal items. If not properly abated, sanitation problems can arise from contaminated wells, fouled septic systems, and mold growth.

Flood damage renders homes and businesses unsafe for occupancy, displacing individuals and families, and necessitating alternative housing and shelters for extended periods. The cleanup and recovery period is stressful for flood victims and disrupts their normal activities of daily living. Children miss school days and business owners lose revenue. People recovering from floods may lose income absent emergency leave from their employer.

Despite its many adverse impacts, river flooding is a natural process that can also benefit a variety of wildlife and natural resources. Flood waters can force rivers to change their course. The natural processes of erosion, stream braiding, sediment deposits, and channel migration are critical to the long-term viability of fish and wildlife habitat. The formation of oxbow lakes can support avian, mammalian, and amphibian populations. Deposits of gravel and sediments can foster the growth of alders, willows, and other vegetation and establish new riparian habitat. Trees that fall into rivers from bank erosion can entangle with other trees and coarse woody debris to form fish habitat. Flood deposition of upland sediments can enhance the fertility of valley floors and further support both native vegetation and agriculture.

2.2.1.7 Probability of Occurrence

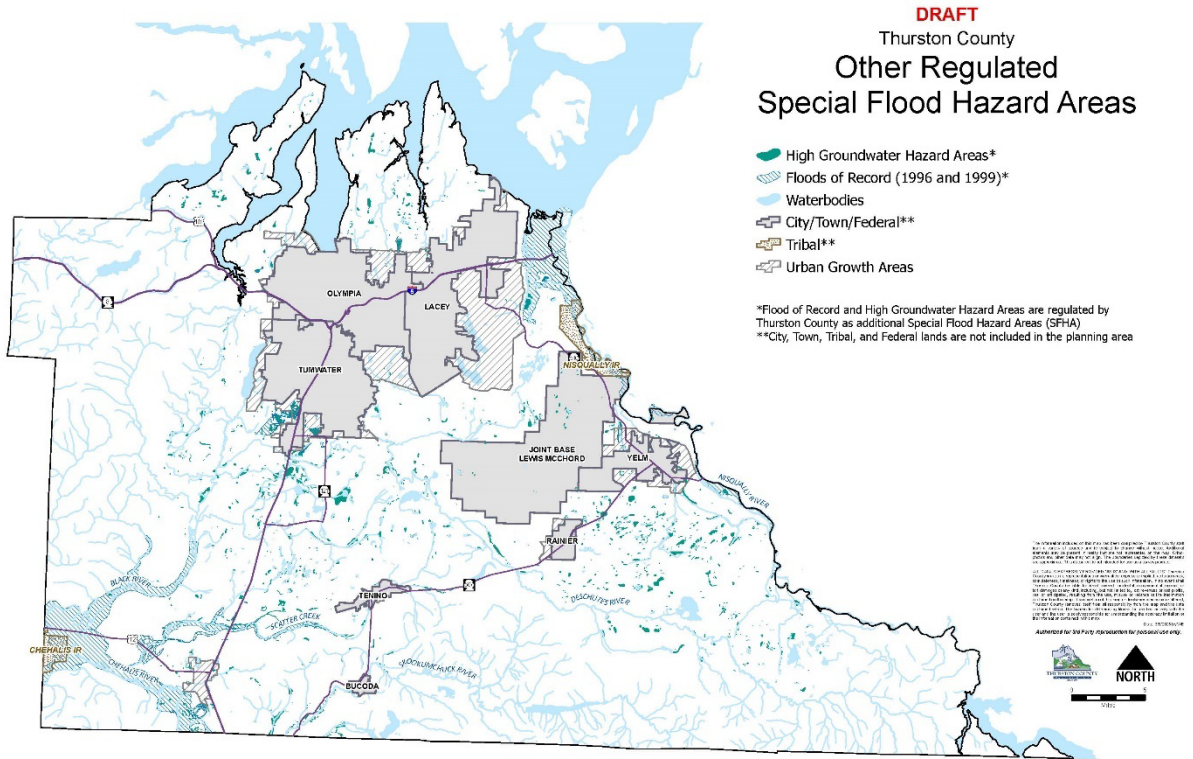
Because rivers and streams cause nuisance flooding annually, and major riverine flooding occurs about every two to five years in Thurston County, there is a high probability of occurrence.

2.2.2 Groundwater Flooding

Groundwater flooding occurs when there is a high-water table and persistent heavy rains in an area where an upper, thin layer of permeable soils overlays an impermeable layer of hard pan. As the ground absorbs more and more rainwater, the groundwater table rises and causes flooding where it is higher than the surface of the ground.

Late wet season precipitation patterns seem to produce the most significant effect on groundwater flooding and deep seated landslide susceptibility. Saturation of the subsurface soils peaks in March and any additional rainfall during this natural high water mark tends to rapidly overwhelm the remaining horizontal groundwater flow component in near-saturated soils (Thurston County Water Resources, 2017). [Map 2.4](#) shows high groundwater hazard areas in Thurston County.

Map 2.4: Thurston County Other Regulated Special Flood Hazard Areas



Source: Thurston County GeoData. See Appendix E for Full-Size Maps.

2.2.2.1 Modes of Groundwater Flooding in Thurston County

Combined local and National Oceanic and Atmospheric Administration data reveal two types of weather patterns that trigger groundwater flood events:

Type 1: Intense – Short Duration Successional Storms: These storms are composed of long atmospheric river systems driven by the Pacific jet stream that draw sub-tropical moisture from the Pacific Ocean and release abundant rainfall as they reach land in the Pacific Northwest. They are characterized by warmer than normal temperatures and intense steady rainfall. Groundwater flooding occurs with two separate but successive storm events within a month, or if an atmospheric river system arrives later in the season after normal winter rains have “primed” the groundwater levels to near maximum. Normal high groundwater levels occur in mid- to late March, so if an atmospheric river system coincides with this normal peak, the capacity of the soils is exceeded and groundwater flooding occurs. This pattern appears to be increasing in frequency and intensity. Type 1 storm events also contribute to urban and stream flooding and landslides.

Type 2: Persistent Low-intensity Precipitation Pattern: This weather pattern is less common, but produces similar ground water flooding effects and is characterized by weeks of persistent low intensity daily rainfall measuring less than an inch per day that gradually topples the groundwater table. In most cases, this weather pattern causes more widespread flooding throughout the county, both in areas that routinely flood and in those not generally susceptible to groundwater flooding. The county has only experienced this pattern four times in the last two decades – in 2002-2003, 2006-2007, 2015-2016, and 2021-2022. In both instances, groundwater flooding was widespread and included areas not previously identified as susceptible to routine groundwater flooding. This implies that Type 2 events generate more widespread flooding than Type 1 events.

2.2.2.2 Severity

Historically, groundwater flooding has been most severe in the second and subsequent years of consecutive wet years. The U.S. Army Corps of Engineer's post event report on the winter storm of 1996-1997 suggests the frequency of a groundwater flooding disaster is probably on the order of every 25 years. The 1996-1997 event was the first widespread groundwater flood event since 1972 and the worst on record until the winter of 1998-1999, which is now the "event of record." This event set the benchmark for high groundwater flood hazard requirements implemented by Thurston County.

2.2.2.3 Extent

Nearly 10 square miles or 6,654 acres in unincorporated Thurston County are within high groundwater hazard areas. Areas that experience such flooding are scattered throughout the lowlands in Thurston County (Map 2.4), but it is most prevalent around the western and southern end of the Olympia Regional Airport, near Littlerock Road, and south of Tumwater along Case Road. Although groundwater flooding occurs sporadically throughout Thurston County, the geologic conditions present in the Salmon Creek Basin south of Tumwater create the "worst case scenario" for such flooding.

Since areas of high groundwater are relatively flat, flood waters can remain standing for several months, resembling ponds or lake-like conditions. The Salmon Creek Basin experienced significant flooding in 1999, resulting in contiguous bodies of standing flood waters ranging from small puddles to 113 acres. Depths ranged from near ground surface to over 12 feet. The volume of flood water above the surface of the ground in the basin was equivalent to 603 football fields covered with four feet of water. This amount combined with the volume of groundwater below the surface at the septic drain field level would be equal to 977 football fields or 28,655 acre feet.

Since 1999, the Salmon Creek basin has experienced floods four more times, though none as severe as in 1999. Climate change predictions of increasing storm frequency and intensity in the Puget Sound region (Mauger et al., 2015) coupled with population increases in the county, may continue to bring people and floods ever closer together in developing areas. Other affected areas are in the Scatter Creek/lower Black River system near Grand Mound and Rochester, eastern portions of the Lacey Urban Growth Area (UGA), Beaver Creek, the Spurgeon Creek systems, and in the Yelm UGA. The Salmon Creek Comprehensive Drainage Basin Plan (2004) provides a detailed description of the conditions that contribute to high groundwater flooding for this basin.

2.2.2.4 Impacts

In general, the damaging effects of groundwater flooding resemble those of riverine flooding. Traffic disruption may result from road closures. Homes may be inundated if they are not elevated above flood levels. Even if a home is elevated above floodwaters, crawl spaces and basements are subject to flooding. Deep water may surround the properties and make it

nearly impossible to access and exit without a boat or makeshift elevated walkway. Septic tanks can become fouled and wells can be rendered useless from contamination. Underground utilities, drainage facilities, and storage tanks are also susceptible to damage from groundwater flooding. In many ways, groundwater flooding impacts can be difficult to mitigate because of limited options. For example, sandbagging and pumping have little effect on this type of flooding. Temporary relocation or evacuation of affected areas is often the best option.

2.2.2.5 Probability of Occurrence

Statistically, the U.S. Army Corps of Engineers (Corps) estimated an approximately 70 percent chance that the county will equal or exceed the 1996-1997 flooding at least once during a 30-year mortgage cycle. The Corps previously estimated that the frequency of a groundwater flooding disaster in Thurston County is probably on the order of every 25 years. Although not as frequent as riverine flooding, this recurrence rate is a high probability of occurrence. Detailed studies of climate trends by the University of Washington and others indicate that the Corps may be overly optimistic in their recurrence interval. In the past decade, the incidence and frequency of large rainfall events has increased, and climate models indicate that this trend may be here to stay.

2.2.3 Tidal Flooding

Spring tides, the highest tides during any month, occur with each full and new moon. When these coincide with a northerly wind piling water in south Puget Sound, tidal flooding can occur. Tidal flooding can also occur without the effect of storm surge. The tides can also enhance flooding in delta areas when rivers or creeks are at or near flood stage.

2.2.3.1 Severity

Puget Sound marine flooding by itself does not produce major flooding in the region. However, such flooding will become more frequent and present more adverse impacts in the second half of the 21st Century as sea levels rise. The Climate Change discussion provides more information on the impacts of sea level rise in downtown Olympia and unincorporated Thurston County.

2.2.3.2 Extent

The downtown Olympia waterfront, including Port of Olympia properties, face the greatest risk from tidal flooding. Localized flooding is common along 4th and 5th Avenues near the isthmus between Capitol Lake and Budd Inlet and nuisance tidal flooding occurs downtown at 17 feet above the mean tide level. Low-lying farmlands in the Nisqually Valley and along McLane Creek near Mud Bay are at risk. Tidal flood impacts are also a concern in delta areas when rivers are at flood stage and high tide exacerbates the situation. Sea level rise will increase the extent of inundation during tidal flooding.



Source: TRPC

2.2.3.3 Impacts

During extreme high tide events, low lying areas are vulnerable to marine flooding. Numerous downtown Olympia stormwater outfalls to Budd Inlet lack valves or flood gates and will back up, causing stormwater drains to overflow. Flood waters disrupt traffic, limit access to properties, and can interrupt business. This problem is worse during heavy rain events, increasing the extent of flooding in areas of downtown. Storm surge from wind can result in more extensive inundation. Tidal flooding generally subsides as tides recede. Presently, tidal floods are short, often lasting only one to two hours.

High tides influence the timing of dam water release from Capitol Lake near 5th Avenue in downtown Olympia. During the re-construction of portions of Heritage Park, an earthen berm was installed around the north and eastern perimeter of Heritage Park to prevent major flood waters from flowing into downtown from Capitol Lake. However, if the Deschutes River experiences major flooding and a high tide prohibits discharge of lake water into Budd Inlet, floodwaters could crest the lake bank at the southeast end of the north basin and flow into downtown Olympia along the utility road between the Capitol Campus Steam Plant and Water Street. Such flood conditions have not occurred since the berm was constructed.

2.2.3.4 Probability of Occurrence

Olympia experiences nuisance tidal flooding one to two times a year. Sea level rise will increase the frequency of tidal floods.

2.2.4 Urban Flooding

Urban flooding occurs when excess precipitation is not readily absorbed by the ground and stormwater runoff exceeds stormwater facilities' capacity to safely convey and divert water within suburban and urban environments. As a result, streets, parking lots, homes, and businesses may experience localized flooding.

Excess water flowing from impervious surfaces during heavy rainfall or melting snow over a short period is the most common cause of urban flooding. Leaves, branches, snow or ice, and other debris that clog stormwater



Source: TRPC

drains compound the problem. Other forms of urban flooding occur in residential neighborhoods constructed with insufficient stormwater conveyance capacity. Until flooding reveals the problem, residents or municipalities may be unaware of deficient drainage systems in newer developments. New urban development or neighborhoods with faulty stormwater systems may adversely impact adjacent neighborhoods that previously did not experience stormwater flooding.

2.2.4.1 Severity

In general, properties impacted by urban flooding are not widespread and flood conditions are often localized. However, the impacts to transportation networks can be great. Downtown Olympia is vulnerable to urban flooding when extreme high tides coincide with persistent heavy rainfall and major flooding on the Deschutes River. The Olympia Transit Center in Downtown Olympia also remains at risk of flooding, which would impact public transportation access and timelines during flood events. The city can easily mitigate some stormwater flooding through regular cleaning and maintenance of stormwater conveyance systems. In 2019, the City of Olympia, LOTT Clean Water Alliance, and Port of Olympia collaborated to create the Olympia Sea Level Rise Response Plan to coordinate long-term strategies and plans for infrastructure and flooding response (City of Olympia, 2019)

2.2.4.2 Extent

Minor stormwater flooding occurs throughout developed areas in Thurston County, but urban flooding is most prevalent in west and downtown Olympia.

2.2.4.3 Impacts

The impacts of urban flooding on homes, buildings, and utilities are similar to riverine and high groundwater flooding. Standing water can damage buildings and their contents. Excess stormwater flows can overwhelm urban creeks and cause washouts and landslides along steep slopes. Deep standing or flowing water over roads can result in moderate to major traffic disruptions affecting thousands of motorists, bicyclists, and pedestrians during peak daily travel periods. Floodwaters can cause power disruptions or disable traffic signal controllers. Engine failure can strand motorists in their cars in deep water.

2.2.4.4 Probability of Occurrence

Minor to moderate urban flooding occurs annually in some areas of the county due to plugged drains or other conditions.

2.2.5 Lake Flooding

Surface elevations are currently monitored for two lakes in Thurston County: Lake St. Clair and Long Lake. These lakes are monitored for water levels due to the potential for high water to impact significant numbers of residents who live along the shores and because they have unique geologic, topographic, recreational, or natural resource features that are of great interest to residents who live around them.

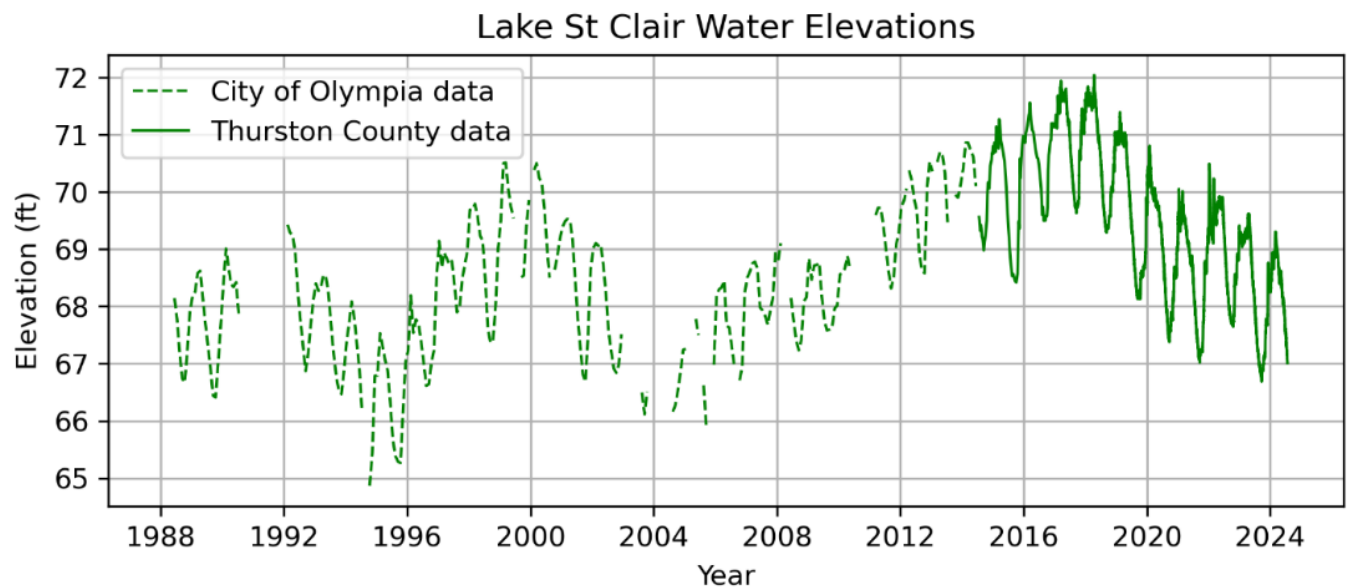
2.2.5.1 Severity

The severity of flooding varies between the three monitored lakes but the general trend over recent years has been an increased maximum lake elevation during the peak of the rainy season. These higher maximum lake levels have impacted lake residents primarily through damage to landscaping along the lake edge, damage to lakeside structures such as docks, boathouses, and bulkheads and in limited cases has resulted in some flooding of residential structures.

2.2.5.2 Extent

The recent trend of increased rainfall during the winter months has impacted Lake St. Clair most significantly due to its unique natural characteristics. Lake St. Clair has no surface outlet and drains only to groundwater and through evapotranspiration. In addition to these natural characteristics, an irrigation water right on Eaton Creek, the sole tributary to Lake St. Clair, for the Whispering Firs (former Shoepfer Farm) was retired in 2004 as mitigation for the City of Olympia’s new McAllister wellfield. This likely resulted in an increased flow into the lake. Figure 2.3 appears to support this as the observable upward trend in average lake elevations correlates with the timing the water right was retired.

Figure 2.4: Lake St. Clair Water Elevations



Source: Thurston County Water and Climate Planning Division. 2024.

Notes: Thurston County began taking automated measurements at a stilling well at Lake St. Clair in July 2014. Previous to this, data was taken by the City of Olympia Public Works, primarily as manual measurements at a staff gauge, and from a stilling well for January 2008 – March 2012. Data indicates the lake has an annual cycle, rising beginning in October and lowering beginning in April, at a normal range of about 2 ft. Starting in 2004, the lake experienced a rising trend of about 1/3 ft per year, peaking at 72 ft in April 2017, then returning to more baseline levels by 2020.

Long Lake's elevation has also risen during recent winters. However, Long Lake has a surface outlet as well as a sizeable groundwater component that enables water to more readily infiltrate.

Black Lake has also experienced a rise in average maximum water elevation during recent winters. The only surface outflow from Black Lake is a man-made ditch (Black Lake Ditch) which actively drains the uppermost four or five feet of lake surface north to the Puget Sound. This drainage ditch is prone to obstructions, primarily from beaver dams which regularly occlude the ditch, resulting in substantial, rapid rises in lake level. The dams are routinely maintained by the Thurston County Stormwater Utility to prevent flooding of residents along the lakeshore. Black Lake also receives flow from a large wetland complex south of the lake which also feeds the Black River.

2.2.5.3 Impacts

These higher maximum lake levels have impacted lake residents primarily through damage to landscaping along the lake edge, damage to lakeside structures such as docks, boathouses, and bulkheads and in limited cases has resulted in some flooding of residential structures.

On Lake St. Clair, higher lake water elevations have resulted in longer periods of boat speed restrictions to minimize shoreline erosion and damage to private property. The speed restrictions impact recreational opportunities for both lake residents as well as other community members who access the lake.

2.2.5.4 Probability of Occurrence

There is a trend in rising lake elevations in the winter months during the last two decades. Long term climate models predict wetter and warmer winters for the Puget Sound Region suggesting that lake levels may be higher than historic averages.

2.2.6 Dam Failure

The Washington State Department of Ecology Dam Safety Office database identifies 38 dams that are in or adjacent to Thurston County. Many serve more than one purpose, such as hydroelectric power generation, irrigation, and recreation. Natural events such as flooding, overtopping, or earthquake can cause dam failures, but most failures result from human error such as poor construction, operation, deferred maintenance, or repair needs. Dam failure effects are highly variable, depending on the dam, the amount of water stored behind the dam, the current stream flow, and the size and proximity of the downstream population. Many dam failures have occurred in Washington over the last 40 years, but none have been in or affected Thurston County. No Thurston County dams operate specifically for flood control purposes. According to the Hazards Mitigation Plan for the Thurston Region, dam failure is characterized by the sudden, rapid, and uncontrolled release of impounded water, threatening lives and property (TRPC, 2024).

2.2.6.1 Severity

Washington State’s Downstream Hazard Classification system for dams assigns a hazard rating of “Low,” “Significant,” or “High” for areas at risk of economic loss and environmental damage should a dam fail. In and adjacent to Thurston County, most dams are rated low, a few are rated significant, and six are rated high (Hazard Category 1A, 1B, or 1C) according to the 2023 update to the Inventory of Dams Report. The major high hazard dams are Alder and La Grande Dams on the Nisqually River and the Skookumchuck Dam on the Skookumchuck River (Table 2.9). Failure of some of these dams could affect a population of 300 or more, inundate major transportation routes and industries, and result in long-term effects on water quality and wildlife. The high hazard dams in Thurston County used for electrical power generation are licensed by the Federal Energy Regulatory Commission. Accordingly, they are inspected regularly and staffed 24 hours a day.

Table 2.9: High Hazard Dams in or Adjacent to Thurston County

Dam	River or Stream	Storage (acre-foot)	Hazard Class
Alder Dam	Nisqually River (Alder Lake)	214,500	1A – High, greater than 300 lives at risk
Berger Dam	Scatter Creek	55	1C – High, from 7 to 30 lives at risk
La Grande Dam	Nisqually River (La Grande Reservoir)	2,676	1B – High, from 31 to 300 lives at risk
Skookumchuck Dam	Skookumchuck River (Skookumchuck Reservoir)	35,000	1A – High, greater than 300 lives at risk

SPSCC Stormwater Pond F	Percival Creek (Off-stream)	10	1C – High, from 7 to 30 lives at risk
Windsor Waterski Pond (Also known as Rainier Lake Dam)	Nisqually River	100	1C – High, from 7 to 30 lives at risk

Source: Department of Ecology “Inventory of Dams Report” 2023.

Of the high-hazard dams, the Berger, SPSCC, Windsor, and Skookumchuck Dam are earthen structures. La Grande and Alder are both concrete. These 6 dams are primarily regulated by the Federal Energy Regulatory Committee (FERC) or the Washington Department of Ecology. All are expected to be well-maintained and comply with current dam safety regulations. Therefore, barring a natural disaster or terrorist action, the Hazards Mitigation Plan for the Thurston Region assigned a low risk rating for dam failure in Thurston County (TRPC, 2024).

2.2.6.2 Extent

For high hazard dams, inundation mapping for these facilities exist as part of the dam operators’ emergency action plans. However, security concerns limit the ability to publish the maps. Thurston County Emergency Management possesses copies of the inundation maps for each dam. Copies of the inundation maps and Emergency Action Plans can be requested from individual dam owners by interested parties, but are not available through Thurston County (TRPC, 2024).

Thurston County has assessed dam failure risk and inundation areas for the three major dams to determine which properties might be affected by a dam failure (Table 2.10). These dams are the greatest risk to the population and regional assets based on site and construction characteristics. Approximately 4,400 community members reside in the dam failure inundation areas of the Alder, La Grande, and Skookumchuck dams, including 94% of Bucoda’s population (TRPC, 2024).

Table 2.10: Select Dams in Thurston County Assessed for Catastrophic Dam Failures

Dam	River or Stream	Affected Downstream Area
Alder Dam	Nisqually River (Alder Lake)	McKenna, Yelm, Nisqually Tribal Lands
La Grande Dam	Nisqually River	McKenna, Yelm, Nisqually Tribal Lands
Skookumchuck Dam	Skookumchuck River	Bucoda

Source: Hazards Mitigation Plan for the Thurston Region, 2024.

2.2.6.3 Impacts

Major dam failure causes many effects: loss of life; destruction of homes and property; damage to roads, bridges, power lines and other infrastructure; loss of power generation and flood control capabilities; disruption of fish stock and spawning beds; and the erosion of stream and river banks. Impacts spread past residential and infrastructure damage, and can harm environmental and cultural resources for inundated communities, such as the Nisqually and Chehalis traditional cultural areas and resources. Impacted residents would possibly be displaced and need emergency shelter, and evacuation strategies will be important to ensuring proper evacuation and notification time. Over 1,500 residences are located within the dam failure inundation areas (TRPC, 2024). The failure of a high hazard dam would threaten a small but important segment of Thurston County, suggesting moderate vulnerability, despite the high consequences that could arise from the low probability situation of dam failure. According to the Hazards Mitigation Plan for the Thurston Region, a catastrophic dam failure is designated as unlikely to occur within 100 years, keeping the countywide risk assessment at a low category (TRPC, 2024).

2.3 Effects of Climate Change

Thurston County and city residents responded that climate change was one of the highest rated hazards of concern in the “Thurston County communities Natural Hazards and Resiliency Survey” (TRPC, 2022). Climate change is expected to impact flood conditions in Thurston County primarily on two fronts - hydrology and sea-level rise.

In 2016, the Thurston Regional Planning Council used a U.S. Environmental Protection Agency grant to produce a climate change vulnerability assessment (TRPC, 2016) that described how the Puget Sound region’s climate has changed historically, how it is projected to change over the 21st century, and how such changes affect the vulnerability of the county’s built and natural assets. The assessment’s main source of data was a 2015 report from the University of Washington’s Climate Impacts Group - State of Knowledge: Climate Change in Puget Sound.

The UW report, which downscaled global climate models and focused on the “low” and “high” emissions scenarios used by the Intergovernmental Panel on Climate Change (IPCC), concluded there is no discernable historical trend in precipitation across the Puget Sound region, which averaged about 78 inches of rain annually (Thurston County averaged 51 inches) during the latter half of the 20th century (Mauger, et al., 2015). While the region’s annual precipitation volume is not projected to change significantly this



Source: TRPC

century, the seasonal volumes are: Summers will generally be hotter and drier, while winters will be warmer and wetter (TRPC, 2016). Added to this, Thurston County’s precipitation could come in more frequent and intense rainfall events with the potential to cause flooding and erosion that harms people, plants and animals. The frequency of the Puget Sound region’s heaviest 24-hour precipitation events (top 1 percent) is projected to more than triple by the late century (occurring about seven days a year by the 2080s, per a “high” greenhouse gas emissions scenario, compared to two days per year historically), according modeling (Mauger et al., 2015).

As hydrology changes, what is currently considered a 100-year flood may strike more often, leaving many communities at greater risk. Thurston County will need to retrofit ponds, pipes, culverts and other stormwater infrastructure designed for historic levels of rainfall.

As stream volumes and velocities change during cooler months, erosion patterns are also projected to change, altering channel shapes and depths, increasing sedimentation behind dams, and affecting fish and wildlife habitat and water quality (TRPC, 2016). Conversely, hotter, drier summers are projected to increase the frequency and intensity of wildfires, which could degrade the stability of steep slopes and riparian areas, making them more vulnerable to erosion when the rains return. In 2018, Thurston County adopted the Thurston Climate Adaptation Plan, and approved the Thurston Climate Mitigation Plan in 2020. For the 2025 Comprehensive Plan update, Thurston County added a new Climate Element that considers climate change impacts and vulnerability in Thurston County and includes goals and policies based on the previous climate plans, relevant regulations and policies, and additional climate directives supported within the county. In 2024, the Thurston County Climate Change Vulnerability Assessment was published as a technical appendix to the Thurston County Comprehensive Plan. The 2024 Vulnerability Assessment coincided with earlier projections for drier summers, wetter winters, and more intense and frequent extreme precipitation events, affecting flood conditions.

2.3.1 Hydrology

As future winters become warmer, more winter precipitation is projected to fall as rain instead of snow in Thurston County’s highlands and adjacent areas of Lewis and Pierce counties (TRPC, 2016). This would reduce the depth and duration of mountain snowpack and extent of Mount Rainier’s glaciers, as well as alter the timing and volume of runoff that affects streamflow and groundwater levels.

The Nisqually River, which begins on the flanks of Mount Rainier and drains into Puget Sound, is projected to shift from a mixed rain-and-snow watershed (i.e., a watershed that receives 10-40 percent of its precipitation as snow) to a rain-dominant watershed (i.e., a watershed that gets less than 10 percent of its precipitation as snow) by the end of the 21st century (Mauger, et al., 2015). Thurston County’s other Puget Sound-draining watersheds – Deschutes and Kennedy-Goldsborough – would remain rain-dominant systems.



Source: TRPC

According to the USGS National Climate Change Viewer (Alder & Hostetler, 2013), Thurston County's annual average snowfall is projected to decrease by just two-tenths of an inch by the 2050s and become virtually nonexistent by the end of the 21st century. This figure is small because all of Thurston County is less than 3,000 feet above sea level (TRPC, 2016). In most years, there is little or no snowfall nor sustained snowpack outside of the county's higher-elevation forestlands (e.g., Capitol State Forest and Alder Lake area).

April 1 is considered the date of "peak snowpack" in Pacific Northwest highlands. Historically, peak snowpack is about 20-30 inches within the highland area that includes Thurston County's Alder Lake (the reservoir behind Alder Dam) and the southwestern flank of Mount Rainier within Lewis and Pierce counties. For the 2080s, peak snowpack would decline 80-90 percent in this area for the low emissions scenario and 90-100 percent for the high scenario (TRPC, 2016). The length of the snow season in southeastern Thurston County and surrounding highlands also would decline significantly per both scenarios.

Dams are designed partly based on assumptions about a river's flow behavior, expressed as hydrographs. Changes in weather patterns can have significant effects on the hydrograph used for the design of a dam. If the hydrograph changes, it is conceivable that the dam can lose some or all its designed margin of safety, also known as freeboard.

If freeboard is reduced, dam operators may be forced to release increased flows earlier in a storm cycle to maintain required margins of safety. Such early releases of flow can increase flood potential downstream. Throughout the western United States, communities downstream of dams are already experiencing increases in streamflow caused by earlier releases from dams. Thurston County will need to maintain regular coordination with

Tacoma Power and TransAlta to monitor reservoir levels to ensure that sufficient margins of safety are maintained to prevent adverse outflow volumes.

Use of historical hydrologic data has long been the standard of practice for designing and operating water supply and flood protection projects. For example, historical data are used for flood forecasting models and to forecast snowmelt runoff for water supply. This method of forecasting assumes that the climate of the future will be similar to the period of historical record. However, the hydrologic record cannot be used to predict changes in frequency and severity of extreme climate events such as floods.

Going forward, model calibration or statistical relation development must happen more frequently, new forecast-based tools must be developed, and a standard of practice that explicitly considers climate change must be adopted. Climate change is already impacting water resources, and resource managers have observed the following:

- Historical hydrologic patterns can no longer be solely relied upon to forecast the water future.
- Precipitation and runoff patterns are changing, increasing the uncertainty for water supply and quality, flood management and ecosystem functions.
- Extreme weather events will become more frequent, necessitating improvement in flood protection and emergency response.
- Annual impacts from drought on agriculture, species' survival, and wildfire danger are more likely (TRPC, 2024).

2.3.2 Sea Level Rise

In the decades ahead, the Puget Sound Region is projected to experience continued, and possibly accelerated, sea-level rise as a result of melting ice sheets and warmer oceans. This may increase the frequency, depth, and duration of coastal flooding due to increased reach of tides and storm surges (Mauger et al., 2015). Sea-level rise may also exacerbate river flooding by slowing the flow of water into the Puget Sound in addition to increasing erosion, disrupting septic systems and wells, sedimentation, saltwater intrusion, and release of hazardous materials in impacted areas (TRPC, 2024). The information below was adapted from TRPC's 2016 and Thurston County's 2024 climate change vulnerability assessments (TRPC, 2016; Thurston County, 2024).

The global average sea level rose about 8 inches – roughly the same level recorded at the Seattle tidal gauge – during the 20th century (Mauger et al., 2015). The Puget Sound region's sea level is projected to rise another 24 inches (range: +4 to +56 inches) by the end of the 21st century, relative to 2000 (NRC, 2012). Levels could be higher or lower than this range, however, depending on the rate that the local coastline is subsiding or rising and the rate of polar ice melt. Sea level rise in Thurston County is expected to increase 2.2-2.3 feet by 2100 (Thurston County, 2024). Impacts from sea level rise in unincorporated Thurston County are

expected to be experienced primarily in the Nisqually Delta and Mud Bay areas (TRPC, 2024).

While most of Thurston County’s marine shoreline is stable, much of downtown Olympia is built atop fill that is subsiding by a few millimeters per decade (TRPC, 2016). Thus, City of Olympia engineers project that sea-level rise in this area will be 11 inches greater than in surrounding areas by the end of the century. In 2019, the City of Olympia, Port of Olympia, and LOTT Clean Water Alliance developed the Olympia Sea Level Rise Response Plan. Projections for the “most likely” scenario in Olympia estimate 32 to 36 inches of sea level rise by 2100. The City of Olympia’s Sea Level Rise Flood Damage Reduction ordinance (OMC 16.80) regulates development in areas projected to be impacted by flooding due to sea level rise (City of Olympia, 2019)

In addition to potentially disrupting commerce and damaging public and private property, coastal flooding poses temporary safety risks (e.g., inhibiting the movement of emergency service vehicles), as well as long-term health risks (e.g., mobilizing toxic chemicals amid former industrial sites and inundating sewer infrastructure). Impacts to the LOTT Clean Water Alliance facility in Budd Inlet could also overwhelm water treatment (TRPC, 2024).

Low-lying sections of Interstate 5 and U.S. Route 101 are also vulnerable to the combined effects of flooding and sea-level rise, according to a Washington Department of Transportation vulnerability assessment of transportation infrastructure (WSDOT, 2011). These highways are critical to ensuring the movement of commercial trucks, commuter cars, emergency service vehicles, and other automobiles within and through the Thurston County region. Smaller transportation routes could also be impacted or damaged, reducing mobility within the community and disrupting commutes, school routes, and economic transportation during hazardous events (TRPC, 2024).

McAllister Creek occasionally floods I-5 on- and off-ramps south of the Billy Frank Jr. Nisqually National Wildlife Refuge (area of Milepost 114), and flooding would occur more frequently as sea levels rise (WSDOT, 2011). Similarly, along U.S. Route 101, as it crosses Mud Bay west of Olympia, water currently backs up in culverts and floods the highway’s median during high tides. There is the potential for water to flood travel lanes temporarily due to sea-level rise (WSDOT, 2011).

2.4 Flood Historical Occurrences and Impacts

Several major floods have impacted the Thurston Region over the last three decades. Describing the effects and damages from the most significant events highlights the region’s vulnerability to floods and the extent of their damage. Past floods serve as useful reminders to communities to develop strategies to mitigate, prepare, and respond to future floods. Table 2.11 identifies the top 10 historic crests for the Nisqually, Deschutes, Skookumchuck, and Chehalis rivers:

Table 2.11: Top Ten Historic Crests for Thurston County Rivers

Rank	NISQUALLY AT MCKENNA		DESCHUTES NEAR RAINIER		SKOOKUMCHUCK NEAR BUCODA		CHEHALIS NEAR GRAND MOUND	
	Gauge Height	Date	Gauge Height	Date	Gauge Height	Date	Gauge Height	Date
1	17.13	02/08/1996	17.01	01/09/1990	17.87	02/08/1996	20.23	12/04/2007
2	13.00	01/29/1965	15.74	02/08/1996	17.84	1/7/2022	19.98	02/09/1996
3	12.39	12/26/1980	15.68	01/15/1974	17.72	1/8/2009	19.34	01/10/1990
4	12.38	12/12/1955	15.28	01/21/1972	17.33	1/10/1990	18.41	11/25/1986
5	12.22	02/07/2020	14.29	12/29/1996	17.23	11/25/1990	18.39	12/29/1937
6	11.78	11/23/1959	14.10	01/08/2009	16.82	1/21/1972	18.21	01/21/1972
7	11.31	01/10/1990	13.75	12/03/2007	16.76	12/30/1996	18.18	01/08/2009
8	11.30	02/11/1951	13.66	04/05/1991	16.6	12/9/2015	18.18	01/08/2022
9	11.14	04/05/1991	13.55	11/26/1998	16.28	2/10/2017	18.12	11/25/1990
10	11.04	12/10/1953	13.52	02/09/2017	16.18	12/2/1977	17.73	12/05/1975

Source: Thurston County Water and Climate Planning Division

December 26, 2021 – January 15, 2022, DR 4650: Severe Winter Storms, Straight-Line Winds, and Flooding

In late December 2021, a winter storm brought snow and ice to Thurston County. There was increased Public Works activity, including plowing, sanding, and road closures. Cold temperatures elongated the duration of the storm's impact.

Following the freezing weather, on January 6th 2022 Thurston County's Emergency Coordination Center (ECC) was activated due to forecasted major flooding on the Chehalis and Skookumchuck Rivers. On January 7, The Chehalis River near Grand Mound crested at 145.21 feet and the Skookumchuck River near Bucoda crested at 215.99 feet, the second highest historic crests for both river gauges.

Evacuation advisements were issued for residents in affected areas. The Thurston County Dive Rescue Team responded to calls in Thurston County that included floodwater rescue and evacuations from homes and vehicles on flooded roadways. The greatest damage occurred in the Rochester and Grand Mound areas. Thurston County provided vouchers for flood debris disposal, water testing kits, and flood safety information packets to affected residents during the aftermath of the flooding. 35 county roads were closed due to impacts. Residents reported over \$556, 000 in uninsured losses (TRPC, 2024). U.S. Interstate 5 was temporarily closed due to hazardous conditions.

January 20 – February 10, 2020, DR 4539: Severe Storms, Flooding, Landslides, and Mudslides

A period of abnormally wet weather began in late December 2019 and persisted through early February across the Pacific Northwest. From January 20-February 10 an area of strong, persistent low pressure over the eastern Pacific generated a series of strong atmospheric river events that hit in quick succession resulting in overlapping significant impacts. Water vapor transport into Washington State was 200-250% of normal during this period. These events

led to widespread sustained river and urban flooding and significant compounding impacts across Washington State. In summary, 25 major rivers reached flood stage at least once in addition to ungauged waterways and urban areas that experienced significant flooding and wind damage.

Alongside severe storms and heavy rainfall in Thurston County, Tacoma Power increased dam flow due to the above average water flows on the Nisqually River. Tacoma Power alerted of a release of 12,000 cubic feet per second (cfs) on February 5, and 17,000 cfs on February 6 (historical averages for discharge at LaGrande Dam are around 2,000 cubic feet per second in early February). The combination of persistent wet weather and the increased dam flow led to an evacuation advisory on Thursday February 6 until February 9, affecting approximately 400 homes and over 700 people. Rescue teams were dispatched to protect human and animal lives. (Thurston County Emergency Management, 2020; NWS, 2020)

The American Red Cross opened a shelter at the Gwinwood Camp and Conference Center in Lacey available to those affected by the evacuation advisory. The Thurston County Sheriff's Office and Lacey Fire staged swift water teams to assist with evacuations and rescue residents and animals. Roads affected by the flooding included 6th Avenue Southeast, Durgin Road Southeast, Hayko Lane Southeast, and Riverside Drive Southeast. Multiple roadways within Thurston County were closed until conditions improved (EMC, 2020). The Washington Department of Fish and Wildlife and the Nisqually Indian Tribe also experienced damage to fishery infrastructure, resulting in financial, environmental, and cultural adverse impacts (EMC, 2020).

United Way of Thurston County activated its Emergency Assistance Fund for displaced residents directly impacted by the flooding. Over \$750,000 of uninsured losses to residents' homes were reported.

January 6-16, 2009, Federal Disaster 1817: Severe Winter Storms, Landslides, Mudslides, and Flooding

An atmospheric river storm raised temperatures and dropped heavy rains throughout Western Washington following one of the worst Pacific Northwest snow storms in decades. Severe flooding occurred throughout Western Washington, including the Chehalis, Skookumchuck, Deschutes, Nisqually, and Black rivers. The Skookumchuck River crested at 17.72 feet on January 8, making it the second worst flood in the river's recorded history. The Chehalis River crested at 18.18 feet near Grand Mound causing major flooding in the Chehalis River Basin only 13 months after the December 2007 floods.

Interstate 5 was closed for 20 miles for nearly two days. State Route 12, State Route 8, and Highway 101 were also closed for a period, some for multiple days. During the height of the flood event, 49 county roads were closed. Over 200 homes were isolated in the Bald Hills Road/Clearwood area, likely over 100 in the Rochester, Grand Mound, and Gate communities, and likely another 50 homes had access issues in the area around Bucoda.

Damages to homes throughout Thurston County were estimated at \$3 million. Damage was concentrated in and around the town of Bucoda, the Rochester community, and along the Deschutes River outside of Yelm. Damages to public facilities and roads around Thurston County and the overtime cost for city and county officials to respond to the flooding cost \$2.5 million.

Volunteer firefighters went door to door in Bucoda warning residents of imminent flooding before floodwaters swallowed a nine-block stretch of the town (the town's worst flood event since 1996). Residents were forced to evacuate and a Thurston County dive team was deployed to assist residents. At least two households required rescue assistance. One home was identified as too dangerous to inhabit and 12 homes were deemed moderately damaged and only accessible during the daytime. The Intersection of 3rd Avenue and North Nenant Street incurred damages exceeding \$12,000. Extensive road damage along five blocks of Market Street also occurred. At least one municipal well was forced to shut down due to possible contamination. The town-owned RV park restroom was also contaminated by floodwaters and required extensive clean up.

On January 8, the City of Lacey shut down two streets for the first time in at least nine years due to urban flooding. Crews closed Rainier Road at the south end of city limits around the Burlington Northern Santa Fe (BNSF) railroad trestle. The city also closed 32nd Avenue Northeast off Marvin Road in the Hawks Prairie area. The heavy rains entering the sewer system in Olympia forced the LOTT Alliance to discharge 6.3 million gallons of partially treated wastewater from its Budd Inlet Sewer Treatment Plant via its emergency outfall at the Fiddlehead Marina.

December 1-7, 2007, Federal Disaster 1734: Severe Winter Storms, Flooding, Landslides, and Mudslides

Snow followed by a "Pineapple Express" on December 2 and 3 caused major flooding throughout southwest Washington. Heavy rainfall and melting snow resulted in record flooding on the Chehalis River, which crested at 20.23 feet, six feet over flood stage at the Grand Mound gauge. Some sites in the Willapa Hills area collected 14 to 18 inches of rain over the two-day period. Widespread flooding occurred in southwest Thurston County heavily impacting the Rochester community, Grand Mound, and the Independence Valley area. Lewis County was especially hard hit, particularly around the cities of Centralia and Chehalis and the farms around Adna and the Boisfort Valley.

The Deschutes and Black rivers also rose above their banks. The Deschutes River crested 2.75 feet above flood stage near Rainier and flooded residential areas and the Tumwater Valley. The region also experienced stream and urban flooding and flash flood conditions in the Capitol Forest, resulting in washouts and landslides.

On December 4, Rochester Fire Department developed a command post for evacuation and rescue. They partnered with the Thurston County Sheriff's Office Dive Team, local search and rescue volunteer groups, and the Washington State National Guard and rescued 63 people – 17 by helicopter. Nearly 300 people were rescued or forced to evacuate in Lewis County – some seeking refuge in local area shelters. Thurston County opened a flood relief center at the Rochester Community Center to assist affected residents.



Source: TRPC

Thurston County documented 44 county roads and bridges that closed from storm and flood damage. The county and cities carried out round-the-clock road repair and maintenance. Estimates reflect that over 400 homes in the area were affected by the road closures in the southwest Thurston County. Interstate 5 closed for 20 miles between Chehalis and Grand Mound for five days. Some portions of Interstate 5 were covered with 10 feet of water. The Washington State Department of Transportation estimated that the closure resulted in \$47 million in lost economic output statewide (WSDOT, 2008). Additional closures along Highway 101 and Highway 8 disrupted traffic for thousands of people who live or work in Thurston County, or who were passing through. A railroad bridge over the Nisqually River suffered significant damage due to debris collection against the bridge, resulting in a disruption of statewide rail traffic. West coast rail traffic was also shut down for several days due to flooding.

Nearly 10 inches of rain fell on the City of Olympia's west side resulting in the worst urban flooding ever experienced in that area. On December 3, 2007 during the morning peak commute period, the west side of Olympia experienced major traffic backups for hours due to road closures. One of the highest traffic volume intersections in the region, Cooper Point Road and Black Lake Boulevard off Highway 101, experienced major flooding resulting in permanent damage to the signal controller. Several motorists attempted to drive through the water only to become stranded and forced to abandon their vehicles. Some vehicles were eventually completely submerged. Inundation forced the closure of the Percival Creek Bridge on Cooper Point Road. Several businesses on Olympia's west side were affected by floodwaters and power outages. Puget Sound Energy turned off power as a safety precaution requiring businesses to temporarily close. The Woodshed, a furniture retailer, lost their entire inventory to three feet of water. Replacement cost was estimated at \$250,000.



Source: TRPC

On December 3, the enormous volume of rainfall and runoff caused LOTT Clean Water Alliance's Budd Inlet Sewer Treatment Plant to discharge untreated wastewater into Budd Inlet. At its peak, an estimated 1 million gallons per hour bypassed treatment processes and was sent through the emergency outfall near Fiddlehead Marina. After the flooding, many wells and water supplies were contaminated and non-functional in the unincorporated areas of the county. Public health advisories were issued to flood affected areas to inform the public to boil their water or consume only bottled water.

Preliminary cost estimates for the response, preventive measures, and the damage to public facilities exceeded \$4.6 million throughout Thurston County. In many ways, the dollar figures reported for response costs only reflect a fraction of the actual response costs to local governments. For example, the estimates may not include volunteers, such as the local fire districts' volunteer firefighters who provided emergency response. Damage to Thurston County roads and bridges for non-federal aid routes was \$2.7 million. Three sites of federal aid roads incurred over \$32,000 in damages.

For this disaster, nearly 267 Thurston County residents applied to FEMA for assistance with over \$6 million claims in property damages. FEMA awarded \$544,928 in aid and the Small Business Administration granted \$1.7 million to 30 homeowners and 2 businesses (Thurston County Emergency Management, 2007).

October 15-23, 2003, Federal Disaster 1499: Severe Storms and Flooding

At least 11 people reported flood damage within Thurston County, with at least two structures possibly incurring damage exceeding their replacement value. Thurston County was not seriously impacted by this storm event and received a disaster declaration because it bordered counties that experienced more severe flooding (Mason, Pierce, and Grays Harbor counties).

February 1999 High Ground Water Flooding

Higher than normal rainfall caused major groundwater flooding and urban stormwater flooding throughout Thurston County and its communities. Although no federal disaster was issued, major flooding affected over 200 properties in Lacey, Olympia, Tumwater, and Thurston County.

December 1996 (Federal Disaster 1159) to February 1997 Winter Storm and Flooding

1996 was the third wettest year of the 20th Century. December was especially wet, receiving over twice its normal monthly rainfall. During this time:

- 200 homes countywide were flooded

- 200 drinking water wells were contaminated
- Septic system failures occurred throughout the county
- Response and recovery efforts cost Thurston County government over \$340,000
- Response, recovery, and repair costs for other government entities and utilities exceeded \$750,000
- Private property owners incurred over \$1.75 million in uninsured losses

February 1996, Federal Disaster 1100: Flooding

The February 1996 flood is one of the most devastating floods on record for Thurston County. Every major river and stream crested their banks. Record flooding occurred on the Nisqually River near McKenna when the river crested at 17.13 feet, seven feet over flood stage on February 8, 1996. Record flooding also occurred on the Skookumchuck River near Bucoda when the river crested at 17.87 feet, four feet over flood stage. Major flooding also occurred on the Deschutes and Chehalis rivers. The 1996 flood resulted in the following impacts:

- Tacoma Power performed an emergency release from Alder and LaGrande dams, compounding downstream flooding in the Nisqually River Valley
- Of the over 350 homes inspected, 190 were declared uninhabitable
- 47 homes were destroyed in the Nisqually Valley
- Over two dozen homes were destroyed elsewhere
- Nearly 1,000 people evacuated their homes
- 300 people required rescuing
- The Mounts Road bridge was destroyed
- The Town of McKenna flooded, reducing inbound or outbound traffic in the north county to I-5
- More than 300 sections of the county road system were damaged
- Wa He Lut, a contract U.S. Bureau of Indian Affairs School, was destroyed by the Nisqually River
- Interstate 5 was closed at the Lewis County line
- The main north-south railroad line at the Pierce County line was closed
- Response and recovery efforts cost Thurston County government over \$2 million
- Response, recovery, and repair costs for other government entities and utilities exceeded \$20 million
- Private property owners incurred over \$22 million in uninsured losses.

January 1990, Federal Disaster 852: Severe Storm and Flooding

The Deschutes River at Rainier crested at 17.01 feet, six feet over flood stage – setting the flood record. Major flooding also occurred on the Nisqually, Deschutes, Skookumchuck, and Chehalis rivers. The Thurston Region experienced the following impacts:

- Flood waters in Lewis County killed two people
- Interstate 5 closed for several days between Chehalis and Thurston County
- 83 elderly residents from the Nisqually Valley Care Center in McKenna were evacuated to a Red Cross Shelter at the Yelm High School gymnasium
- Floodwaters reached four feet deep on Bucoda streets and prompted nearly 600 residents to evacuate; one elderly man died from natural causes during the evacuation
- Lowland Nisqually Valley residents were urged to evacuate their homes
- Portions of downtown Olympia experienced urban flooding

2.5 Flood Hazard Exposure Analysis

2.5.1 HAZUS Estimates of Flood Losses

Computer models can simulate flood scenarios to estimate potential property losses and other impacts to communities. The HAZUS Flood Model is a standardized tool using Geographical Information System (GIS) technology to estimate physical, economic, and social impacts of disasters using a variety of data inputs. FEMA Region X performed an level 2 analysis using local data provided by Thurston County and Thurston Regional Planning Council to develop the county’s flood model. Loss estimates were derived for 10-, 25-, 50-, 100-, and 500-year flood scenarios. For these, scenarios, debris generation, sheltering requirements, building exposure, and building losses are presented (FEMA, 2016; FEMA, 2025). The 2025 report differed from the 2016 HAZUS report, due to FEMA program changes and data availability.

2.5.1.1 Debris Generation

HAZUS provides an estimate of the total debris generated by floods. The 500-year flood event – the most wide-spread flood scenario – generates the most debris. HAZUS breaks the debris generation estimates into three categories:

- Finish (dry wall, flooring, insulation, etc.)
- Structure (framing, walls, exterior cladding)
- Foundation (concrete slabs, concrete block or other foundation)

Table 2.12 summarizes debris generation for the Chehalis Basin, Deschutes Basin, coastal SFHA, and countywide.

Table 2.12: HAZUS Estimates of Debris Generation by Flood Scenario (in tons)

Category	Flood Event	Chehalis	Coastal	Countywide*	Deschutes
Finish	0.2 Percent	1967.22	N/A	N/A	1211.87
	1 Percent	1556.28	626.31	5094.64	995.48
	2 Percent	1418.81	N/A	N/A	905.74
	4 Percent	1368.81	N/A	N/A	807.61
	10 Percent	790.96	N/A	N/A	684.8
Structure	0.2 Percent	1240.07	N/A	N/A	164.48
	1 Percent	700.96	544.4	1713.68	113.12
	2 Percent	578.69	N/A	N/A	96.57
	4 Percent	537.42	N/A	N/A	81.46
	10 PERCENT	255.95	N/A	N/A	64.84
Foundation	0.2 Percent	1618.28	N/A	N/A	277.54
	1 Percent	1027.56	449.28	2489.01	203.02
	2 Percent	886.61	N/A	N/A	178.09
	4 Percent	838.36	N/A	N/A	153.76
	10 Percent	432.79	N/A	N/A	126.65
Grand Total	0.2 Percent	4825.61	N/A	N/A	1653.9
	1 Percent	3284.85	1620.1	9297.38	1311.65
	2 Percent	2884.07	N/A	N/A	1180.36
	4 Percent	2744.58	N/A	N/A	1042.9
	10 Percent	1479.66	N/A	N/A	876.34

*Countywide refers to a modeled scenario with all SFHAs combined in the county

Source: FEMA Region X, 2016

Table 2.13 HAZUS Estimates of Debris Generation by Community (in tons)

Community	Finish	Structure	Foundation	Total
Town Of Bucoda	177.5	21.65	52.73	251.88
City Of Lacey	15.49	0.07	0.19	15.75
City Of Olympia	159.4	48.41	39.69	247.5
City Of Rainier	1.28	0.21	0.52	2.01
City Of Tenino	21.35	0.71	0.75	22.81
City Of Tumwater	89.99	1.04	2.22	93.25
City Of Yelm	34.36	1.72	3.95	40.03
Confederated Tribes Of The Chehalis Reservation	122.81	23.39	40.16	186.36
Nisqually Indian Tribe	100.26	11.17	12.04	123.47
Squaxin Island Tribe	0	0	0	0
Unincorporated Thurston County	1752.84	423.4	713.85	2890.09
Total	2475.28	531.77	866.1	3873.15

Source: FEMA Region X, 2025

2.5.1.2 Shelter Requirements

Table 2.13 provides the HAZUS estimates of the number of people who are displaced by flooding and may require short-term sheltering.

Table 2.14: HAZUS Estimates of Displaced People and Sheltering Needs by Flood Event

	Flood Event	Chehalis	Coastal	Countywide*	Deschutes
Displaced Population	0.2 Percent	1705	N/A	N/A	1323
	1 Percent	1503	412	6552	1230
	2 Percent	1423	N/A	N/A	1158
	4 Percent	1356	N/A	N/A	1069
	10 Percent	979	N/A	N/A	957
Short-Term Sheltering	0.2 Percent	1090	N/A	N/A	892
	1 Percent	901	274	4041	812
	2 Percent	822	N/A	N/A	755
	4 Percent	766	N/A	N/A	679
	10 Percent	439	N/A	N/A	594

*Countywide Refers To A Modeled Scenario With All SFHAs Combined In The County

Source: FEMA Region X, 2016

Table 2.15: HAZUS Estimates of Displaced People and Sheltering Needs by Jurisdiction

Community	Displaced Population	Short-Term Sheltering
Town Of Bucoda	394	29
City Of Lacey	478	184
City Of Olympia	1001	444
City Of Rainier	4	4
City Of Tenino	75	35
City Of Tumwater	233	133
City Of Yelm	271	23
Confederated Tribes Of The Chehalis Reservation	94	3
Nisqually Indian Tribe	137	5
Squaxin Island Tribe	0	0
Thurston County, Unincorporated Areas	5,018	879
Total	7,705	1,739

Source: FEMA Region X, 2025

2.5.1.3 Building Exposure

Table 2.14 provides the Thurston County GeoData estimates of the number of buildings exposed to floods. Countywide, approximately 5,000 buildings are in the 100-year, Zones A, AE, and VE Special Flood Hazard Areas.

Table 2.16: Estimates of Buildings in Special Flood Hazard Areas

Community	Buildings In 100 Year SFHA	Buildings In Zones A	Buildings In Zone AE	Buildings In Zone VE
Bucoda	203	203	0	0

Chehalis Reservation	0	0	0	0
Lacey	16	2	14	0
Nisqually Reservation	6	2	6	0
Olympia	123	55	56	12
Rainier	0	0	0	0
Tenino	5	0	5	0
Tumwater	39	1	38	0
Yelm	51	0	51	0
Unincorporated Thurston County	2,528	365	2,058	135

Note: Buildings Identified In A Special Flood Hazard Area By Using Parcel Centroids. Effective Special Flood Hazard Area Data Used Inland. Preliminary Special Flood Hazard Area Data Used For Coastal Flood Zones.

Source: Thurston County GeoData, 2025

2.5.1.4 Building Value Loss

HAZUS calculates estimates of the economic loss of buildings and their contents due to damage from flooding. Table 2.15 provides a summary of losses, by jurisdiction for the 10-, 25-, 50-, 100-, and 500-year flood scenarios.

Table 2.17: HAZUS Estimates of Building Losses by Flood Event

Community	Count	Total Value	0.2% ANNUAL CHANCE FLOOD		1% ANNUAL CHANCE FLOOD		2% ANNUAL CHANCE FLOOD		4% ANNUAL CHANCE FLOOD		10% ANNUAL CHANCE FLOOD	
			Loss Value	Loss Ratio	Loss Value	Loss Ratio	Loss Value	Loss Ratio	Loss Value	Loss Ratio	Loss Value	Loss Ratio
Bucoda	115	7.48	1.52	20.30%	1.34	17.80%	1.09	14.60%	1.09	14.60%	0.27	3.60%
Chehalis Reservation	5	0.29	0.01	4.10%	---	---	---	---	---	---	---	---
Lacey	1	0.25	---	---	0.03	10.40%	---	---	---	---	---	---
Nisqually Reservation	2	0.32	---	---	0.03	9.50%	---	---	---	---	---	---
Olympia	251	244.33	---	---	26.31	10.80%	---	---	---	---	---	---
Rainier	0	---	---	---	---	---	---	---	---	---	---	---
Tenino	0	---	---	---	---	---	---	---	---	---	---	---
Tumwater	18	12.98	0.98	7.50%	0.36	2.70%	0.04	0.30%	0.02	0.20%	0	0.00%
Yelm	8	1.46	---	---	0.09	6.40%	---	---	---	---	---	---
Unincorporated Thurston County	802	95.71	9.36	9.80%	12.18	12.70%	4.23	4.40%	3.75	3.90%	1.33	1.40%

Note: Values are expressed in millions of dollars. Dollar losses are reported, as well as a loss ratio, which is calculated as the total building losses/total building value. The loss values are for building and contents only; additional damages to infrastructure are not captured in this table.

Source: FEMA Region X, 2016

2.5.1.5 Sea Level Rise Loss Estimates

The economic loss of buildings and their contents due to damage from sea level rise are calculated by the computer loss estimation tool, HAZUS. In 2016 FEMA Region X performed a surrogate sea-level rise loss analysis using the draft Thurston County coastal flood zone data and created plus one-foot, two-foot, and three-foot above base flood elevation scenarios. Table 2.16 gives a summary of losses for jurisdictions in Thurston County with marine shorelines.

Table 2.18: HAZUS Draft Coastal Flood Hazard Value Loss

Community	Count	Buildings Total Value	1% Annual Chance Flood		1% Annual Chance Flood (+1 Foot)		1% Annual Chance Flood (+2 Feet)		1% Annual Chance Flood (+3 Feet)	
			Loss Value	Loss Ratio (%)	Loss Value	Loss Ratio (%)	Loss Value	Loss Ratio (%)	Loss Value	Loss Ratio (%)

Olympia	109	\$131,995,350	\$4,064,673	3.1	\$11,265,635	8.5	\$20,748,349	15.7	\$27,941,363	21.2
Tumwater	1	\$201,600	\$1,210	0.6	\$11,228	5.6	\$27,549	13.7	\$40,749	20.2
Unincorporated Thurston County	32	\$8,116,050	\$1,460,933	18.0	\$2,060,400	25.4	\$2,375,549	29.3	\$2,691,797	33.2
Total	142	\$140,313,000	\$5,526,815	3.9	\$13,337,262	9.5	\$23,151,447	16.5	\$30,673,909	21.9

Source: FEMA Region X, 2016

In 2025, FEMA Region X conducted an analysis on value, content, and building loss estimates for Thurston County communities. Tables 2.19 and 2.20 give summaries of these losses, in dollars, for each community.

Table 2.19: Estimated Total Values, Losses, and Loss Ratio by Community

Community	Total Value	Loss Value (buildings and contents)	Loss Ratio (%)
Town of Bucoda	174,611,000	8,075,000	4.6
City of Lacey	20,642,143,000	10,889,000	0.05
City of Olympia	23,218,953,000	434,488,000	1.9
City of Rainier	903,320,000	80,000	0.01
City of Tenino	1,162,360,000	1,937,000	0.2
City of Tumwater	13,239,983,000	19,890,000	0.2
City of Yelm	3,464,616,000	5,536,000	0.2
Confederated Tribes of the Chehalis Reservation	117,608,000	5,709,000	4.9
Nisqually Indian Tribe	428,474,000	17,964,000	4.2
Squaxin Island Tribe	51,160,000	0	0
Thurston County, Unincorporated Areas	55,903,826,000	637,939,000	1.1
Total	119,307,054,000	1,142,507,000	1.0

Source: FEMA Region X, 2025

Table 2.20: Estimated Total Content Loss, Total Building Loss, and Total Loss by Community

Community	Total Content Losses	Total Building Losses	Total Losses (including economic loss)
Town of Bucoda	4,078,000	3,997,000	15,915,000
City of Lacey	5,137,000	5,752,000	20,389,000
City of Olympia	309,891,000	124,597,000	3,034,770,000
City of Rainier	32,000	48,000	189,000
City of Tenino	1,177,000	760,000	3,553,000
City of Tumwater	13002000	6,888,000	70,513,000
City of Yelm	3,622,000	1,914,000	20,965,000

Confederated Tribes of the Chehalis Reservation	2,781,000	2,928,000	6,868,000
Nisqually Indian Tribe	10,365,000	7,599,000	28,617,000
Squaxin Island Tribe	0	0	0
Thurston County, Unincorporated Areas	305,127,000	332,812,000	1,011,896,000
Total	655,212,000	487,295,000	4,213,675,000

Source: FEMA Region X, 2025

2.5.2 GIS Hazard Exposure Analysis

The flood hazard exposure analysis used the most current data available including the FEMA 100-Year SFHA. This included the most current Digital Flood Insurance Rate Map for Thurston County at the time of analysis. It was augmented with the most current flood hazard areas provided by FEMA as well as the most current draft coastal zone flood data (Map 2.2). The analysis also incorporates Thurston County's High Groundwater Hazard Area as well as the Floods of Record (1996 and 1999, Map 2.4). Portions of Thurston County's other special flood hazard areas overlap with the FEMA 100-Year SFHA. Thurston County GeoData staff performed a flood hazard exposure analysis within unincorporated Thurston County. This information is summarized by watershed in Tables 2.17 through 2.21.

2.5.2.1 Flood Hazard Areas

Approximately 33,258 acres of the unincorporated county are in the FEMA 100-Year SFHA. Thurston County has mapped over 5,700 acres that are subject to high groundwater flooding and another 14,154 that are areas identified as flood of record. When combined, over 39,118 acres or approximately 10% percent of the county is within the high groundwater hazard area, floods of record areas, or 100-year flood hazard area.

Since adoption of the 2012 FHMP, FEMA has continued to update flood hazard area maps. Table 2.17 shows total acreage of SFHAs by watershed.

Table 2.17: Area in Flood Hazard, Unincorporated Thurston County

Watershed	Total Area (Acres)	100-Year SFHA	High Groundwater *	Flood of Record*	Area in SFHA	% in SFHA
Budd Inlet	8,737	826	76	5	900	10.3
Deschutes River: Lower	14,237	1,960	213	5	2,020	14.2
Deschutes River: Middle	29,225	2,672	330	0	2,879	9.9
Deschutes River: Upper	22,488	279	14	0	294	1.3

Eld Inlet	22,888	411	147	15	539	2.4
Henderson Inlet	19,683	1,041	236	72	1,277	6.5
McAllister Creek	12,908	2,350	204	1,874	2,546	19.7
Nisqually	52,883	5,223	1,268	1,938	6,348	12.0
Nisqually Reach	3,906	35	9	0	42	1.1
Totten Inlet	20,387	801	104	0	904	4.4
Black River	78,067	8,353	1,949	4,832	10,198	13.1
Chehalis River	45,569	4,663	910	5,418	6,413	14.1
Skookumchuck River	55,578	4,720	293	0	4,834	8.7
West Capitol Forest	19,456	0	0	0	0	0.0
Unincorporated Area						
Urban Growth Area	19,000	1,346	346	314	1,711	9.0
Rural	386,860	31,911	5,406	13,840	37,407	9.7
Total	405,860	33,258	5,752	14,154	39,118	9.6

Source: FEMA, Thurston County GeoData. "FEMA 100-Year SFHA" are the Special Flood Hazard Areas subject to inundation by the 1% annual chance of flood. It includes the draft updates to coastal flood hazards. Thurston County's regulated Special Flood Hazard Areas (SFHA) include those areas mapped as high groundwater hazard areas and floods of record. This analysis excludes federal lands, tribal reservations, and incorporated areas. Portions of Thurston County's High groundwater hazard and flood of record areas overlap with the FEMA 100-Year SFHA. The values in the "Area in SFHA" account for the overlap and do not double count the acreage.

2.5.2.2 Housing and Population

Housing

Approximately 2,763 homes (4.8 percent of total) are vulnerable to flooding in unincorporated Thurston County (Tables 2.18 and 2.19). The Skookumchuck River watershed has the highest percentage of homes vulnerable to flooding in the FEMA 100-Year Special Flood Hazard Area. **1,266** homes are vulnerable to flooding by other flood hazard areas regulated by Thurston County, **such as high groundwater hazard areas** and floods of record.

Table 2.18: Dwellings Units Vulnerable to Flooding, Unincorporated Thurston County, 2024 & 2045

FEMA 100-Year SFHA	2024			2045		
	Total Dwellings	Vulnerable to Flooding Number	%	Total Dwellings	Vulnerable to Flooding Number	%
Watershed						
Budd Inlet	3,950	36	0.9	5,721	50	0.9
Deschutes River: Lower	6,069	86	1.4	6,707	158	2.4
Deschutes River: Middle	2,914	138	4.7	3,514	155	4.4
Deschutes River: Upper	76	6	7.9	109	7	6.5
Eld Inlet	4,388	20	0.5	5,025	25	0.5
Henderson Inlet	10,977	22	0.2	16,188	25	0.2
McAllister Creek	7,288	328	4.5	8,895	348	3.9

Nisqually	5,805	270	4.7	6,779	287	4.2
Nisqually Reach	1,628	0	0.0	1,728	0	0.0
Totten Inlet	1,507	5	0.3	1,793	7	0.4
Black River	7,068	291	4.1	9,372	326	3.5
Chehalis River	4,845	160	3.3	6,025	173	2.9
Skookumchuck River	675	135	20.0	963	150	15.6
West Capitol Forest	10	0	0.0	12	0	0.0
Unincorporated Area						
Urban Growth Area	21,360	112	0.5	30,787	189	0.6
Rural	36,119	1,385	3.8	42,417	1,523	3.6
Total	57,479	1,497	2.6	73,203	1,712	2.3

Source: Thurston County GeoData, TRPC. Dwellings are considered vulnerable if more than 50% of parcel is in a flood hazard area. "FEMA 100-Year SFHA" are the Special Flood Hazard Areas subject to inundation by the 1% annual chance of flood. This analysis excludes federal lands, tribal reservations, and incorporated areas.

Table 2.19: Dwellings Units Vulnerable to Flooding, Unincorporated Thurston County, 2024 & 2045 Continued

County Other Special Flood Hazard Areas	2024			2045		
	Total Dwellings	Vulnerable to Flooding Number	Percent	Total Dwellings	Vulnerable to Flooding Number	Percent
Watershed						
Budd Inlet	3,950	3	0.1%	5,721	3	0.1%
Deschutes River: Lower	6,069	4	0.1%	6,707	4	0.1%
Deschutes River: Middle	2,914	,	0.0%	3,514	1	0.0%
Deschutes River: Upper	76	0	0.0%	109	0	0.0%
Eld Inlet	4,388	6	0.1%	5,025	6	0.1%
Henderson Inlet	10,977	18	0.2%	16,188	19	0.1%
McAllister Creek	7,288	169	2.3%	8,895	178	2.0%
Nisqually	5,805	317	5.5%	6,779	322	4.8%
Nisqually Reach	1,628	0	0.0%	1,728	0	0.0%
Totten Inlet	1,507	1	0.1%	1,793	1	0.1%
Black River	7,068	390	5.5%	9,372	447	4.8%
Chehalis River	4,845	353	7.3%	6,025	381	6.3%
Skookumchuck River	675	4	0.6%	963	4	0.4%
West Capitol Forest	10	0	0.0%	12	0	0.0%
Unincorporated Area						
Urban Growth Area	21,360	60	0.3%	30,787	79	0.3%
		120			1,28	
Rural	36,119	6	3.3%	42,417	8	3.0%
Total	57,479	1,266	2.2%	73,203	1,367	1.9%

Source: Thurston County GeoData, TRPC. Dwellings are considered vulnerable if more than 50% of parcel is in a flood hazard area. "FEMA 100-Year SFHA" are the Special Flood Hazard Areas subject to inundation by the 1% annual chance of flood. Thurston County's other regulated Special Flood Hazard Areas include high groundwater hazard areas and areas of floods of record. This analysis excludes federal lands, tribal reservations, and incorporated areas.

2.5.2.3 Property

Estimates of the region's structures and their contents in the flood hazard area are summarized in Tables 2.20 through 2.23. These tables provide an estimate of the existing structures and contents which may be at risk to flooding. Thurston County GeoData reviewed the amount of dwelling units and non-residential buildings within the special flood hazard areas in unincorporated Thurston County. Approximately 483 non-residential buildings are considered vulnerable to flooding from the 100-year special flood hazard area (7.3 percent of buildings assessed). An additional 674 non-residential buildings are considered vulnerable to other county regulated special flood hazard areas (10.1 percent of structures).

The estimated value of at-risk residential property is over \$511 million in 2025 dollars (approximately \$285 million for 100-year floodplain and \$226 million for other county-regulated special flood hazard areas). Commercial/Industrial value at risk is approximately \$20 million, Natural Resource/Open Space is over \$69 million, and Government is over \$197 million.

Table 2.20: Non-residential Buildings Vulnerable to Flooding, Unincorporated Thurston County, 2024

FEMA 100-Year SFHA	Vulnerable Buildings			Total Vulnerable Buildings	Total Buildings	% Vulnerable to Flooding
	Commercial/Industrial	Natural Resource/Open Space	Government			
Watershed						
Budd Inlet	2	1	3	6	306	2.0
Deschutes River: Lower	1	5	0	6	315	1.9
Deschutes River: Middle	0	13	0	13	425	3.1
Deschutes River: Upper	0	1	0	1	21	4.8
Eld Inlet	1	0	0	1	376	0.3
Henderson Inlet	0	2	1	2	760	0.3
McAllister Creek	7	78	17	102	375	27.2
Nisqually	4	40	21	65	1016	6.4
Nisqually Reach	3	4	0	7	71	9.9
Totten Inlet	0	3	0	3	141	2.1
Black River	4	81	10	95	1301	7.3
Chehalis River	0	132	0	132	1295	10.2
Skookumchuck River	2	51	2	55	244	22.5
West Capitol Forest	0	0	0	0	16	0.0
Unincorporated Area						
Urban Growth Area	2	5	0	7	1002	0.7%
Rural	20	404	52	476	5649	8.4%
Total	22	409	52	483	6651	7.3%

Source: Thurston County, FEMA 2024 EagleView Change Detection, using building footprints. Buildings are considered vulnerable if any portion of it is in a flood hazard. "FEMA 100-Year SFHA" are the Special Flood Hazard Areas subject to inundation by the 1% annual chance of flood.

Table 2.21: Non-residential Buildings Vulnerable to Flooding, Unincorporated Thurston County, 2024 Continued

County Other Special Flood Hazard Areas	Vulnerable to Flooding				Total Vulnerable Buildings	Total Buildings	% Vulnerable to Flooding
	Commercial / Industrial	Natural Resource/ Open Space	Government				
Watershed							
Budd Inlet	0	0	0		0	306	0.0%
Deschutes River: Lower	0	0	0		0	315	0.0%
Deschutes River: Middle	0	3	0		3	425	0.7%
Deschutes River: Upper	0	0	0		0	21	0.0%
Eld Inlet	0	1	0		1	376	0.3%
Henderson Inlet	0	1	1		2	760	0.3%
McAllister Creek	10	69	15		94	375	25.1%
Nisqually	1	61	21		83	1016	8.2%
Nisqually Reach	0	0	0		0	71	0.0%
Totten Inlet	0	0	0		0	141	0.0%
Black River	10	147	9		166	1301	12.8%
Chehalis River	1	320	5		326	1295	25.2%
Skookumchuck River	0	1	0		1	244	0.4%
West Capitol Forest	0	0	0		0	16	0.0%
Unincorporated Area							
Urban Growth Area	2	18	1		21	1002	2.1
Rural	20	583	50		653	5649	11.6
Total	22	601	51		674	6651	10.1%

Source: Thurston County, FEMA 2024 EagleView Change Detection, using building footprints. Buildings are considered vulnerable if any portion of it is in a flood hazard. Thurston County’s regulated other Special Flood Hazard Areas include those areas mapped as high groundwater hazard areas and floods of record. Analysis excludes federal lands, tribal reservations, and incorporated areas.

Table 2.22: Value of Buildings Vulnerable to Flooding (in Thousands of Dollars), Unincorporated Thurston County 100-Year Floodplain, 2025

100-Year Floodplain	Natural/ Open Space Government				Total Value	% Vulnerable to Flooding
	Residential	Commercial/ Industrial				
Watershed						
Budd Inlet	12,293	0	296	18	12,607	0.8
Deschutes River: Lower	28,542	0	1,731	0	30,273	1.5
Deschutes River: Middle	28,553	0	2,867	1,052	32,472	3.7
Deschutes River: Upper	817	0	246	0	1,063	9.1
Eld Inlet	7,181	0	485	35	7,701	0.3
Henderson Inlet	6,274	0	16	0	6,290	0.2
McAllister Creek	51,201	6,962	6,206	9,566	73,935	3.1
Nisqually	38,080	0	3,657	9,662	51,398	3.1
Nisqually Reach	0	0	0	0	0	0.0
Totten Inlet	1,309	0	0	81	1,390	0.2
Black River	58,264	2,227	10,257	1,907	72,655	3.1
Chehalis River	29,192	0	6,545	77,551	113,288	7.9
Skookumchuck River	23,766	74	3,157	497	27,494	15.0
West Capitol Forest	0	0	0	0	0	0.0
Unincorporated Area						

Urban Growth Area	32,756	0	2,468	0	35,223	0.5
Rural	252,717	9,262	32,995	100,369	395,343	3.0
Total	285,472	9,262	35,463	100,369	430,567	2.2%

Source: Thurston County Assessor's Office 2025, Thurston County GeoData, FEMA

Note: Building values are derived from the parcel building value, as determined by the Thurston County Assessor's Office. Buildings are considered vulnerable if more than 50% of parcel is in a flood hazard. "FEMA 100-Year SFHA" are the Special Flood Hazard Areas subject to inundation by the 1% annual chance of flood. Analysis excludes federal lands, tribal reservations, and incorporated areas. NATURAL/OS = Natural Resource/Open Space lands.

Table 2.23: Value of Buildings Vulnerable to Flooding (in Thousands of Dollars), Unincorporated Thurston County "Other" Special Flood Hazard Areas, 2025

County Other Special Flood Hazard Areas	Residential	Commercial/Industrial	Natural/Open Space	Government	Total Value	% in SFHA
Watershed						
Budd Inlet	106	0	455	0	561	0.0%
Deschutes River: Lower	738	0	0	0	738	0.0%
Deschutes River: Middle	219	0	0	0	219	0.0%
Deschutes River: Upper	0	0	0	0	0	0.0%
Eld Inlet	1,484	0	0	0	1,484	0.1%
Henderson Inlet	4,962	0	0	0	4,962	0.1%
McAllister Creek	24,044	6,962	6,646	8,311	45,962	1.9%
Nisqually	48,586	0	1,789	9,630	60,004	3.6%
Nisqually Reach	0	0	0	0	0	0.0%
Totten Inlet	0	0	665	0	665	0.1%
Black River	71,879	4,369	13,290	1,197	90,735	3.9%
Chehalis River	74,255	29	10,868	77,551	162,703	11.3%
Skookumchuck River	282	0	74	0	356	0.2%
West Capitol Forest	0	0	0	0	0	0.0%
Unincorporated Area						
Urban Growth Area	10,315	0	305	0	10,620	0.2%
Rural	216,240	11,360	33,480	96,688	357,768	2.7%
Total	226,554	11,360	33,786	96,688	368,388	1.8%

Source: Thurston County Assessor's Office 2025, Thurston County GeoData, FEMA

Note: Building values are derived from the parcel building value, as determined by the Thurston County Assessor's Office. Buildings are considered vulnerable if more than 50% of parcel is in a flood hazard. "FEMA 100-Year SFHA" are the Special Flood Hazard Areas subject to inundation by the 1% annual chance of flood. Thurston County's regulated "other" Special Flood Hazard Areas include those areas mapped as high groundwater hazard areas and floods of record. Analysis excludes federal lands, tribal reservations, and incorporated areas. Analysis excludes federal lands, tribal reservations, and incorporated areas. NATURAL/OS = Natural Resource/Open Space lands.

2.5.2.4 Economy

Flooding impacts the community's economy through damage to businesses, utilities, and other infrastructure, and disruption to travel. Section "2.4 Flood Historical Occurrences and Impacts" documents some of the economic impacts of past flood events in Thurston County.

Estimates of impacts of flooding on the region's businesses and employment are summarized in Tables 2.24 and 2.25. Approximately 265 businesses and 700 jobs are estimated to be vulnerable to flooding from the 100-year floodplain in unincorporated Thurston County. This represents 2.4 percent of businesses and 2.9 percent of employees. An additional 150 businesses and 440 employees are vulnerable to flooding by other county-regulated flood hazards (1.3 percent and 1.7 percent of total, respectively).

Table 2.24: Economic Vulnerability to Flooding, Unincorporated Thurston County

100-Year Floodplain Watershed	BUSINESSES			EMPLOYEES		
	Total Businesses	Vulnerable to Flooding		Total Employees	Vulnerable to Flooding	
		Number	Percent		Number	Percent
Budd Inlet	895	16	1.8%	1,510	30	2.0%
Deschutes River: Lower	1,094	18	1.6%	2,100	20	0.9%
Deschutes River: Middle	417	20	4.8%	930	30	3.1%
Deschutes River: Upper	8	0	0.0%	20	< 5	5.1%
Eld Inlet	1,024	13	1.3%	3,030	10	0.3%
Henderson Inlet	2,043	23	1.1%	5,020	20	0.3%
McAllister Creek	1,057	36	3.4%	2,690	30	1.2%
Nisqually	1,433	39	2.7%	2,230	160	7.2%
Nisqually Reach	283	2	0.7%	380	< 5	0.0%
Totten Inlet	379	3	0.8%	520	10	1.1%
Black River	1,463	32	2.2%	3,650	90	2.5%
Chehalis River	1,003	48	4.8%	3,070	280	9.3%
Skookumchuck River	123	15	12.2%	340	70	21.3%
West Capitol Forest	2	0	0.0%	10	< 5	0.0%
Unincorporated Area						
Urban Growth Area	3,293	32	1.0%	9,700	< 50	0.3%
Rural	7,931	233	2.9%	15,700	700	4.5%
Total	11,224	265	2.4%	25,500	700	2.9%

Source: WA Department of Revenue, TRPC Population and Employment Forecast work programs. Employment is considered vulnerable if more than 50% of parcel is in flood hazard. "100-Year Floodplains" are the Special Flood Hazard Areas subject to inundation by the 1% annual chance of flood. Includes the draft updates to coastal flood hazards. Thurston County's regulated Special Flood Hazard Areas include those areas mapped as high groundwater hazard areas and floods of record. Analysis excludes federal lands, tribal reservations, and incorporated areas.

Table 2.25: Economic Vulnerability to Flooding, Unincorporated Thurston County Continued

County Other Special Flood Hazard Areas Watershed	BUSINESSES			EMPLOYEES		
	Total Businesses	Vulnerable to Flooding		Total Employees	Vulnerable to Flooding	
		Number	Percent		Number	Percent
Budd Inlet	895	0	0.0%	1,510	< 5	0.2%
Deschutes River: Lower	1,094	0	0.0%	2,100	< 5	0.0%
Deschutes River: Middle	417	2	0.5%	930	< 5	0.0%
Deschutes River: Upper	8	0	0.0%	20	< 5	0.0%
Eld Inlet	1,024	0	0.0%	3,030	< 5	0.0%
Henderson Inlet	2,043	9	0.4%	5,020	< 5	0.1%
McAllister Creek	1,057	37	3.5%	2,690	220	8.1%
Nisqually	1,433	27	1.9%	2,230	40	1.6%
Nisqually Reach	283	0	0.0%	380	< 5	0.0%
Totten Inlet	379	0	0.0%	520	< 5	0.0%
Black River	1,463	56	3.8%	3,650	140	3.8%
Chehalis River	1,003	19	1.9%	3,070	40	1.3%
Skookumchuck River	123	0	0.0%	340	< 5	0.1%

West Capitol Forest	2	0	0.0%	10	< 5	0.0%
Unincorporated Area						
Urban Growth Area	3,293	8	0.2%	9,700	20	0.2%
Rural	7,931	142	1.8%	15,700	420	2.7%
Total	11,224	150	1.3%	25,500	440	1.7%

Source: WA Department of Revenue, TRPC Population and Employment Forecast work programs. Employment is considered vulnerable if more than 50% of parcel is in flood hazard. "100-Year Floodplains" are the Special Flood Hazard Areas subject to inundation by the 1% annual chance of flood. Includes the draft updates to coastal flood hazards. Thurston County's regulated Special Flood Hazard Areas include those areas mapped as high groundwater hazard areas and floods of record. Analysis excludes federal lands, tribal reservations, and incorporated areas.

2.5.2.5 Essential Facilities and Infrastructure

Flooding can destroy or damage facilities critical for responding to emergency events and for maintaining a safe environment and public order. These include communications, electrical generation and transmission, natural gas transmission, water storage and purification and pumping facilities, sewage treatment, hospitals, and police and fire stations. In addition, floods can seriously disrupt the transportation network.

Specific information on the location of essential facilities and infrastructure is housed with Thurston County Emergency Management. Essential facilities include both public and private facilities. Table 2.26 lists the type and number of essential facilities located in the flood hazard area.

1) Essential Facilities

The 2024 Hazards Mitigation Plan for the Thurston Region identified 1,277 critical facilities in Thurston County (Table 2.26).

Table 2.26: Essential Facilities Vulnerable to Flooding, Unincorporated Thurston County

	Total Facilities	Vulnerable to Flooding	
		100-Year Floodplain	SFHAs
Medical Care Facilities			
Adult Family Home	57	0	0
Dentist	9	0	0
Primary Care	3	0	0
Government Facilities			
Fairgrounds	25	0	0
Fire Service	43	2	1
Government Services	13	2	0
Public Education	31	1	0
Public Higher Education	54	0	0
Public Works	11	0	2
Solid Waste	7	0	0
Transit	1	0	0
Utilities	114	6	1

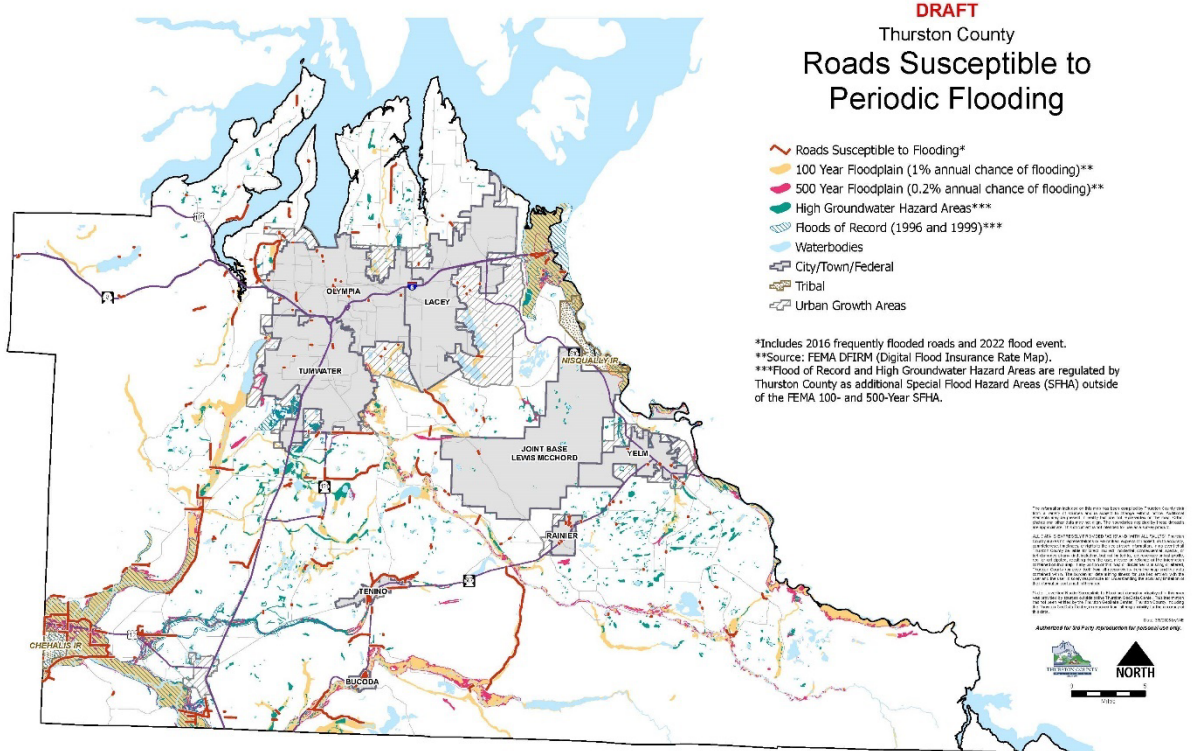
Source: Thurston County GeoData 2025.

Note: "100-Year Floodplains" are the Special Flood Hazard Areas subject to inundation by the 1% annual chance of flood. Thurston County's regulated Special Flood Hazard Areas include those areas mapped as high groundwater hazard areas and floods of record. Analysis excludes federal lands, tribal reservations, and incorporated areas. Essential facilities not in the planning area were omitted from this table.

2) Transportation Infrastructure

In 2025, Thurston County GeoData and Public Works identified 90 miles of roads and highways that are vulnerable to flooding. Approximately 23 miles are on county-owned facilities (Map 2.5). Major routes that are vulnerable include low-lying sections of Interstate 5 through the Nisqually River Delta and U.S. Highway 101 over Mud Bay Road.

Map 2.5: Roads Susceptible to Periodic Flooding



Source: Thurston County GeoData. See Appendix E for Full-Size Maps.

2.5.3 Other Hazard Assessments

2.5.3.1 Vulnerable Populations

Over 30,000 people in Thurston County live below the poverty level, according to the 2023 American Community Survey. Nearly 17 percent of the population has some form of disability and 4.3 percent speak English less than “very well” according to the 2019-2023 American Community Survey. Local social service agencies note that people tend to underreport these categories. Chapter 6 Community Profile includes additional data about population, poverty level, race, disability, language, and homelessness.

2.5.3.2 Development Trends

Thurston County is one of the fastest growing counties in Washington, with over 76,000 new residents expected between 2024 and 2045 (TRPC). According to TRPC projections, 24,523 new homes are expected in unincorporated Thurston County by 2040, with 297 built on parcels partially containing FEMA 100-year SFHA and 109 on parcels with Thurston County’s other SFHA (Table 2.19). The total number of dwellings on parcels with FEMA or other County-SFHA is expected to decrease by 2040, from 3.6 percent to 3.0 percent. Development will be required to follow all applicable standards and regulations for development in flood hazard areas and frequently flooded areas.

2.5.3.3 Life Safety

Disaster events generate peak demand for emergency services through the TCOMM 9-1-1 dispatch center. Such demand often exceeds local response capacity. When this occurs, local emergency managers develop the basis for the Board of County Commissioners to declare a state of emergency.

Flooding can cause people to become stranded, injured, or possibly killed. It will impact people who are not prepared, who do not regard or receive evacuation notices, or who have special needs that may make them dependent on others. In such situations, people who inadvertently end up in harm’s way create emergencies that invariably result in a dispatch of law enforcement, fire fighters, emergency medical services, public works, or sometimes boat or helicopter rescue. Such incidents can also place fire fighters and rescue workers at risk while attempting to help others.

On the 2017 *Thurston County Flood Hazards Community Survey*, 29 respondents answered that they would need to rely on emergency responders by calling 9-1-1 to receive aid during a flood event to help ensure their safety or to evacuate (see Chapter 4 for complete survey results). Perhaps the greatest flood threat to life safety in Thurston County is flooding over roads and highways. Closed roads delay or prevent the arrival time of emergency first responders to people in need of care. A flooded road may be unknown to a responding unit until they encounter it while en route to an incident. Response time is one of the key indicators for survivability in emergency medical situations and some rural areas of unincorporated Thurston County are remote or have limited alternative routes. Flooded roads, bridges, and culverts can be mitigated to some extent through design and reconstruction. However, such projects are expensive and transportation revenues are limited.

Thurston County addresses these issues through mitigation initiatives 1, 2, 3, and 4 in Chapter 3.

Public education and preparedness is also a key factor to reducing people's risks. Encouraging people to identify threats, follow evacuation warnings, and take steps for self-reliance in major flood events can minimize their exposure to flood



Source: TRPC

threats. Preparedness also reduces demands on emergency responders and allows them to focus on vulnerable segments of the population and people who have special needs. Certain groups may face challenges receiving preparedness or evacuation information due to language barriers, access to a permanent address or internet access. Mitigation initiatives will perform flood hazard education and hazard reduction public outreach efforts to improve community resilience to major flood events.

2.5.3.4 Public Health and Safety

Floods and their aftermath present threats to public health and safety. Floodwater is generally contaminated by a variety of pollutants including human waste and a variety of hazardous materials. This was evidenced by health and environmental tests carried out on floodwaters in New Orleans during and after Hurricane Katrina. The tests revealed bacteria and lead hazards to human health, and the public was warned to avoid exposure to the

contaminated water. The following health and safety risks are commonly associated with flood events:

- **Unsafe food** – Floodwaters contain disease-causing bacteria, dirt, oil, human and animal wastes, and farm and industrial chemicals. They carry away whatever lies on the ground and upstream. Their contact with food items, including food crops in agricultural lands, can make that food unsafe to eat and hazardous to human health. Power failures caused by floods damage stored food. Refrigerated and frozen foods are affected during the outage periods, and should be carefully monitored and examined prior to consumption. Foods inside cardboard, plastic bags, jars, bottles, and paper packaging are subject to disposal if contaminated by floodwaters. Even though the packages do not appear to be wet, they may have mold contamination and will deteriorate rapidly. Additional sanitization steps and food safety practices are crucial especially after possible floodwater contamination.
- **Contaminated drinking and washing water and poor sanitation** – Flooding impairs clean water sources with pollutants . Direct and indirect contact with the contaminants – whether through direct consumption, vector insects such as mosquitos and flies, unclean hands, or dirty plates and utensils – can result in waterborne illnesses and life-threatening infectious disease. The pollutants can also saturate into the groundwater or infiltrate into sanitary sewer lines through the ground. Wastewater treatment plants, if flooded and caused to malfunction, can be overloaded with polluted runoff waters and sewage beyond their operating capacity, resulting in emergency discharge of raw sewage to receiving waters and nearby low-lying areas. Private wells can be contaminated or damaged severely by floodwaters, while on-site sewage systems can become a cause of infection and illnesses if they are broken or overflow. Lack of potable water sources coupled with lack of adequate sewage treatment, can lead to disease outbreaks, including life-threatening cholera, typhoid, dysentery and some forms of hepatitis. The key to preventing a health catastrophe is basic hygiene available from clean and safe water and sanitation.
- **Mosquitoes and animals** – Prolonged rainfall and floods provide new breeding grounds for mosquitoes – wet areas and stagnant pools – and can lead to an increase in the number of mosquito-borne diseases such as malaria and dengue and West Nile fevers. Rats and other rodents and wild animals also can carry viruses and diseases.

- **Molds and mildews** – Excessive exposure to molds and mildews can cause flood victims – especially those with allergies and asthma – to contract upper respiratory diseases and to trigger cold-like symptoms such as sore throat, watery eyes, wheezing and dizziness. Molds can spread within 24 to 48 hours in wet and damp areas of buildings and homes that have not been cleaned after flooding.



Source: TRPC

- Very small mold spores can be easily inhaled by humans and, in large enough quantities, cause allergic reactions, asthma episodes, and other respiratory problems. Infants, children, elderly people and pregnant women are considered most vulnerable to mold-induced health problems.
- **Carbon monoxide poisoning** – Carbon monoxide poisoning is as a potential hazard after major floods. Carbon monoxide can be found in combustion fumes, such as those generated by small gasoline engines, stoves, generators, lanterns and gas ranges, or by burning charcoal or wood. In the event of power outages following floods, flood victims tend to use alternative sources of fuels for heating, cooling, or cooking inside enclosed or partly enclosed houses, garages, or buildings without an adequate level of air ventilation. Carbon monoxide builds up from these sources and poisons the people and animals inside.
 - **Hazards when reentering and cleaning flooded homes and buildings** – Flooded buildings can pose significant health hazards after floodwaters recede. Electrical power systems, including fallen power lines, can become hazardous. People should avoid turning on or off the main power while standing in water. Gas leaks from pipelines or propane tanks can trigger fires and explosions when entering and cleaning damaged buildings or working to restore utility services. Flood debris – such as broken bottles, wood, stones and walls – may cause wounds and injuries when workers are removing contaminated mud and cleaning damaged buildings. Extreme caution must be used with possible chemical hazards during flood recovery. Containers of hazardous chemicals, including pesticides, insecticides, fertilizers, car batteries, propane tanks and other industrial chemicals, may be hidden or buried under flood debris. A health hazard can also occur when hazardous dust and mold in ducts, fans and ventilators of air-conditioning and heating equipment are circulated through a building and inhaled by those engaged in cleanup and restoration.

- **Mental stress and fatigue** – Individuals may experience mental stress or fatigue from exposure to the adverse effects of flooding including injuries, death, loss of possessions, and disruption to normal life. The expense and effort required to repair flood-damaged homes places severe financial and psychological burdens on the people affected, especially for the unprepared and uninsured. Post-flood recovery – especially when it becomes prolonged – can cause mental disorders, anxiety, anger, depression, lethargy, hyperactivity, sleeplessness, and, in an extreme case, suicide. Behavior changes may also occur in children such as an increase in bed-wetting and aggression. There is also a long-term concern among the affected that their homes can be flooded again in the future.

While flooding can impact all demographics of a community, certain groups like renters may face additional impacts of flooding such as displacement, but without financial support that property owners may have access to through flood insurance. When assisting in flood event preparation and mitigation, it's important for local agencies to consider access and support for residents and business owners who do not own their buildings or housing. Members of the community without housing are also impacted by flooding, as they may also have to evacuate, and may not have the resources to relocate safely. Thurston County participates in the Hazardous Weather Taskforce, a multi-agency coalition to plan for and provide services to unsheltered community members during normal and extreme weather events. The Hazardous Weather Response Plan for Unsheltered Thurston County Residents (HWRP) was last updated for 2022-2023 and organizes with community partners to provide support for public health in times of weather emergencies.

Documentation of these types of impacts within the planning area is limited for Thurston County except where noted in the preceding Flood Historical Impacts and Occurrences section. Current loss estimation models such as HAZUS are not equipped to measure public health impacts. The best level of mitigation for these impacts is to be aware that they can occur, educate the public on prevention, and be prepared to deal with these vulnerabilities in responding to flood events. Thurston County Emergency Management, Public Health and Social Services, and other county departments, and community non-governmental organizations have offered services and resources to assist people in need following major flood events.

2.5.3.5 Water and Sewer Infrastructure

Water and sewer systems can be affected by flooding. Floodwaters can back up drainage systems, causing localized flooding. Culverts can be blocked by debris from flood events, also causing localized urban flooding. Floodwaters can get into drinking water supplies, causing contamination. Sewer systems can back up, causing wastewater to spill into homes, neighborhoods, rivers and streams. Drinking water, water in habitats, and waters that

supply agriculture and aquaculture can be impacted by floodwaters and overflowing sewer systems, spreading contamination and pollution.

2.5.3.6 Levees

There are no FEMA accredited levees within the planning area. There is a single non-certified levee along the Nisqually River that provides minor flood protection to developed properties. See Chapter 3 section 3.7 for details about this levee.

2.6 National Flood Insurance Claims

Homeowner and renter hazard insurance typically do not cover flood damage. Federally regulated or insured lenders require flood insurance on mortgaged properties that are in areas at high risk of flooding. The National Flood Insurance Program (NFIP) reduces the impacts of flooding on both private and public structures. FEMA reports that more than 20 percent of flood claims come from properties outside the high-risk flood zone. Thurston County itself does not own any structures that have or require flood insurance coverage under the National Flood Insurance Program.

Thurston County is a participant in the National Flood Insurance Program. According to FEMA, there are 787 (596 in unincorporated Thurston County) private flood insurance policies in effect that combined, provide over \$224 million in insurance coverage in unincorporated Thurston County ().

Between 1977 and 2024, Thurston County policy holders have been paid for 303 claims (FEMA, 2025). These 303 were had a combined total of over \$2 million from NFIP claim payments . 1996 and 2007 experienced the costliest destruction from floods with 77 and 45 claims made, respectively.

Table 2.27: Summary of National Flood Insurance Program Premiums, Policies, and Claims in Unincorporated Thurston County

Flood Zone Classification	Policies in Force	Premium	Insurance in Force	Number of Closed Paid Losses	\$ of Closed Paid Losses	Adjustment Expense
A01-30 and AE	115	\$86,557	\$24,032,100	76	\$1,768,152.69	\$64,320.00
A	143	\$118,779	\$4,011,500	47	\$820,763.10	\$33,292.28
AO	0	\$0	\$0	0	\$0.00	\$0.00
AH	0	\$0	\$0	0	\$0.00	\$0.00
AR	0	\$0	\$0	0	\$0.00	\$0.00
A99	0	\$0	\$0	0	\$0.00	\$0.00
V01-30 and VE	0	\$0	\$0	0	\$0.00	\$0.00
V Zones	10	\$26,711	\$2,021,400	0	\$0.00	\$0.00
D Zones	0	\$0	\$0	0	\$0.00	\$0.00
B, C, and X						
Standard	142	\$68,806	\$38,417,100	25	\$295,975.83	\$12,600.00
Preferred	295	\$109,685	\$84,779,000	35	\$545,812.40	\$29,300.39
Total	705	\$410,538	\$173,261,100	183	\$3,430,702.00	\$139,512.00

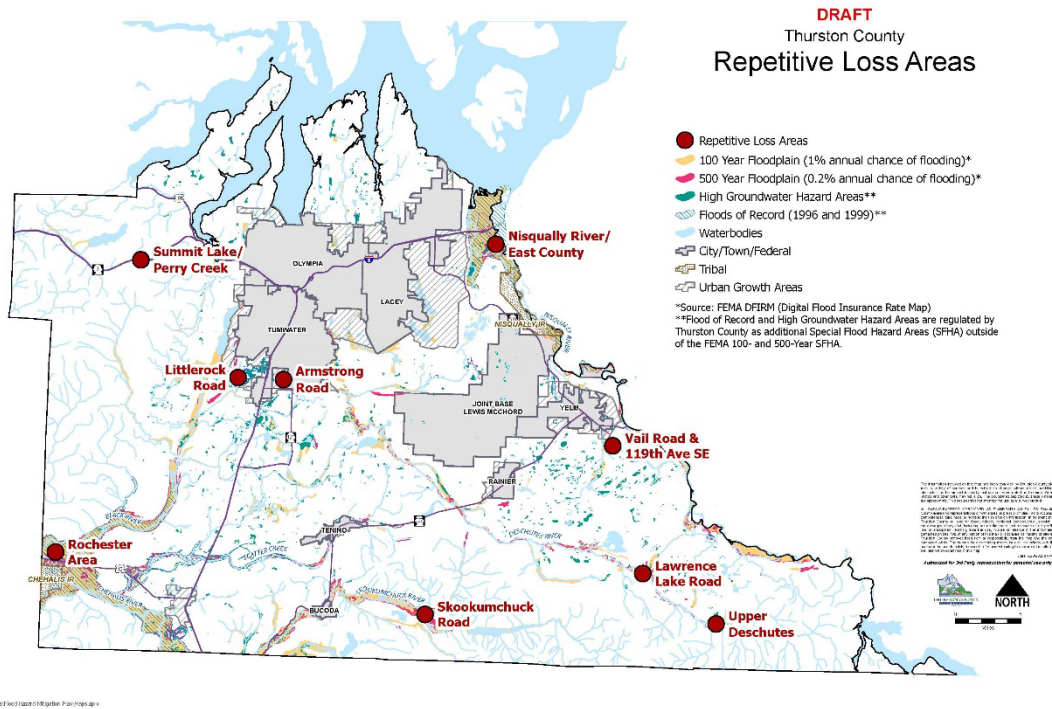
Source: FEMA

Table 2.28 Total NFIP Claims in Thurston County, 1980-2024

Year	NFIP Claims	Total Paid (\$USD)
1980	5	48,466
1981	1	13,922
1982	1	4,107
1986	1	
1987	1	4,015
1990	36	254,865
1991	2	15,253
1993	1	78,542
1994	1	
1995	7	160,800
1996	77	1,787,694
1997	7	21,014
1998	3	4,895
1999	14	120,947
2001	1	3,559
2006	2	9,599
2007	45	1,357,344
2009	36	420,778
2010	1	17,410
2012	2	32,805
2014	1	
2015	10	94,908
2016	2	10,948
2017	4	63,437
2020	20	1,121,147
2022	22	828,563
Total	303	\$2,119,003

Source: FEMA, Floodsmart.gov “Historical NFIP Claims Information and Trends”, Thurston County. 2025

Map 2.6: Repetitive Loss Areas



Source: Thurston County GeoData. See Appendix E for Full-Size Maps.

2.7 Repetitive Loss Properties

According to FEMA, a Repetitive Loss (RL) property is any insurable building for which two or more claims of more than \$1,000 were paid by the NFIP within any rolling 10-year period, since 1978. A RL property may or may not be currently insured by the NFIP. According to FEMA, there are presently over 200,000 RL properties nationwide (FEMA, 2025). FEMA places an emphasis on RL structures because they strain the National Flood Insurance Fund. In fact, the RL properties are the biggest draw on the fund. FEMA has paid billions of dollars in claims for RL properties. RL properties not only increase the NFIP’s annual losses and the need for borrowing; but they drain funds needed to prepare for catastrophic events. Community leaders and residents are also concerned with the

RL problem because residents' lives are disrupted and may be threatened by the continual flooding. The primary objective of the RL properties strategy is to eliminate or reduce the damage to property and the disruption to life caused by repeated flooding of the same properties.

2.7.1 Repetitive Loss Area Analysis

Since 2015, Thurston County has performed an annual Repetitive Loss Area (RLA) analysis. As of 2025, there are 21 unmitigated insured RL properties in unincorporated Thurston County located in 9 RLAs. The RLA analysis includes a combination of GIS analysis and site visits when necessary to identify properties that may be subject to similar flood conditions near the existing RL properties. The 2025 RLA analysis identified over 550 parcels with characteristics that indicate they may be at risk for repetitive flooding based on proximity.

The 21 unmitigated insured RL properties are grouped in various parts of the county (Map 2.6). Most of the RLAs were close to rivers or streams and within or adjacent to the 100-year (1 percent) FEMA floodplain. However, three of the RLAs were in or near mapped high groundwater hazard areas. One RLA was adjacent to a creek where the floodplain is not delineated. Table 2.29 summarizes the RLA analysis.

Table 2.29 Summary of 2025 Repetitive Loss Area Analysis

RLA	Insured RL	Potential RL
Summit Lake/Perry Creek	1	21
Nisqually River/East County	4	131
Littlerock Road	1	58
Armstrong Road	2	64
Rochester Area	2	28
Lawrence Lake Road	7	127
Upper Deschutes	1	24
Skookumchuck Road	1	41
Vail Road & 119 th Avenue SE	2	62
Totals	21	556

Source: Thurston County GeoData

Note: Potential Repetitive Loss (Potential RL) parcels identified based on proximity to existing Insured Repetitive Loss (Insured RL) properties with similar mapped flood hazard areas.

2.7.1.1 Summit Lake/Perry Creek

This RLA is in northwestern Thurston County and is adjacent to Perry Creek (see Map 2.6). It has one repetitive loss property. The 2025 analysis identified twenty-one additional properties as at potential risk of repetitive flooding based on their proximity to flood areas and similar site characteristics such as elevation. The creek is located between Washington State Route 8 and hills to the south. The land rises quickly to the south and many of the structures in this area are up on the first bench and it appears they are not susceptible to flooding. The structures adjacent to the creek appear to be on slabs or low foundations which make them susceptible to flooding.

Properties that lie within flood hazard areas (1 percent floodplain or high groundwater hazard areas) receive a copy of the Thurston County Flood Bulletin by mail every fall before the rainy season as a part of the Thurston County Emergency Management outreach. Since the floodplain has not been delineated for this creek, the owners and residents of the area do not receive the flood bulletin. A separate letter was prepared for this area in 2025 to notify residents of potential flood risks as well as mitigation and preparation tips and flood insurance information.

2.7.1.2 Nisqually River/East County

This RLA is in northeastern Thurston County and lies within the Nisqually River 1 percent floodplain. It has four repetitive loss properties. The analysis identified 131 additional properties as at potential risk of repetitive flooding. The structures in the RLA are on slabs or low foundations which make them susceptible to flooding.



2.7.1.3 Littlerock Road

This RLA is in central Thurston County and lies west of Interstate 5, within the Salmon Creek High Groundwater Hazard (HGW) area. It is one of two RLAs that are affected by high ground water. It has one repetitive loss property. The analysis identified 58 additional properties as potentially at risk of repetitive flooding. The structures in the RLA are on slabs or low foundations which make them susceptible to flooding.

One property owner pointed out that a ditch was dug after the last flood event to alleviate flooding. It is unclear if this measure is effective in this area since the flooding is caused by a high ground water table.

2.7.1.4 Armstrong Road

This RLA is in central Thurston County and lies east of Interstate 5, within the Salmon Creek High Groundwater Hazard (HGW) area or the Salmon Creek HGW 300' buffer area. It is one of two RLAs that are affected by high ground water. It has two repetitive loss properties. The analysis identified 64 additional properties as at potential risk of repetitive flooding. The structures in the RLA are on slabs or low foundations and several structures had daylight basements which make them susceptible to flooding. These homes could be protected by using temporary barriers, such as sandbags, across the entrances during flood events in addition to sump pumps.

2.7.1.5 Rochester Area

This RLA is in southwest Thurston County and lies within the Chehalis River and Black River 100-year and 500-year floodplains. The land here is very flat and is near the confluence of the Chehalis and Black rivers. It has two repetitive loss properties. The analysis identified



Source: TRPC

28 additional properties as at potential risk of repetitive flooding. The properties are more spread out than in other RLAs because of the agricultural nature of the valley, i.e., large fields with few structures. The structures in the RLA are on slabs or low foundations which make them susceptible to flooding.

2.7.1.6 Lawrence Lake

This RLA is in southeast Thurston County and lies within the Deschutes River 1 percent floodplain. It straddles both sides of the river and has seven repetitive loss properties. The analysis identified 127 additional properties as potentially at risk of repetitive flooding. The structures in the RLA are on slabs or low foundations which make them susceptible to flooding.

2.7.1.7 Skookumchuck Road

This RLA is in southern Thurston County adjacent to the Skookumchuck River, east of the town of Bucoda. The analysis identified 1 repetitive loss property, and 41 properties potentially at risk of repetitive flooding.

2.7.1.8 Upper Deschutes

This RLA is in eastern Thurston County and lies within the Deschutes River one percent floodplain. It has one repetitive loss property. The analysis identified 24 additional properties as at risk of repetitive flooding. The structures in the RLA are on slabs or low foundations which make them susceptible to flooding.

2.7.1.9 Vail Road and 119th Avenue SE

This RLA in central eastern Thurston County includes two repetitive loss properties. Analysis of the area identified 62 additional properties potentially at risk of repetitive flooding. Natural drainage bisects the area as well as adjacent properties and the houses on nearby parcels are built on a bench. The areas lie adjacent to an existing floodway and High Groundwater Hazard Areas, and contain lower elevation portions that could be more susceptible to flooding.

2.7.2 RLA Communication and Mitigation Information

As part of the Thurston County flood area outreach efforts, every property owner within a RLA receives an annual targeted outreach letter to notify the property owner that they are within a RLA and articulates specific actions they can take to mitigate flooding. For those RL properties not within a SFHA, a copy of the Thurston County Flood Bulletin – part of the county’s annual flood outreach program, is linked with the outreach letter. The Flood Bulletin is mailed every fall to all property owners whose property is within a SFHA or dam inundation zone before the onset of the region’s winter rains. Over 10,000 addresses were mailed the 2024 Flood Bulletin.

Mitigation for these areas includes acquisition, relocation, raising vital equipment or structures above the flood level, creating openings in foundation walls to allow water to freely flow during a flood, building and installing flood shields for doors and other openings, installing sump pumps in crawl spaces and basements, and storing hazardous materials above areas prone to flooding.

2.7.3 Conclusion

The flooding in the Thurston County RLAs is caused by two modes of action, surface flooding from creeks and rivers and flooding from high groundwater levels. Except for the Perry Creek/Summit Lake RLA, the underlying cause of flooding in RLA’s is that these structures were built within areas that are now designated as either a High Groundwater (HGW) Hazard Area or are within a Special Flood Hazard Area or 500-year floodplain. From a property owner’s perspective, stream and riverine flooding is easier to see and understand than the high groundwater flooding associated with the HGW Hazard Areas. Thurston County monitors the groundwater levels in the HGW areas and posts updates on its website monthly. In 2017, a real time groundwater level monitoring system was installed in one groundwater well. Current groundwater level data is available on the county’s website. In 2026, Thurston County will be publishing an interactive water resources dashboard that will include water quality and groundwater data, available to the public.

Historic aerial photos show that there were more structures in the Nisqually River/East County RLA along the river at one time. The structures were removed sometime between 1996 and 2000. Purchasing property, removing the structures, and doing riparian restoration might be an option for other properties in this and other areas. However, this type of mitigation would require more public involvement because of the loss of affordable housing options and possible environmental justice issues. More information about the RLA analysis can be obtained from Thurston County GeoData.



Source: TRPC

2.7.4 Repetitive Loss Areas Recommendations

Thurston County will continue to monitor the RLA properties identified and initiate or continue the following actions related to these areas:

- Annually review the Repetitive Loss Area analysis and update the areas based on any changes to structures, changes in the SFHA or HGW Hazard Area boundaries, and other factors.
- Continue efforts to reach out to the RL properties to discuss options for minimizing the future potential damage due to flooding.
- Conduct outreach to the RLA properties to encourage them to purchase flood insurance.
- Include RLA properties as the highest priority for relocation and acquisition as grant or other funding becomes available.
- Continue the annual outreach project to the RL areas as required by the CRS program.
- In the event of a flooding incident during any given year, conduct a site visit to the repetitive loss areas to confirm the area analysis and determine if properties should be considered for removal from the RLA or additional properties should be added to each RLA.

2.7.5 Current and Future Repetitive Loss Area

RL properties in Thurston County received payments totaling \$879,287.80 between 1978 and 2017. Thurston County receives annual reports of repetitive losses and performs analysis of the areas for additional potential RL properties. According to FEMA, as of 2025 there are 22 unmitigated RL properties within unincorporated Thurston County.

2.8 Flood Impacts on the Environment

Flooding can impact the environment in negative ways – especially when human development is factored in. Migrating fish can wash over streambanks and dikes and into flooded roads and fields. Oily road runoff and hazardous materials can be swept up by flood waters and then wash into waterways and seep into farm fields. Bridge abutments and levees, as well as logjams from timber harvesting, can exacerbate streambank erosion and cause rivers to migrate into non-natural courses.

Many species of mammals, birds, reptiles, amphibians and fish are dependent upon riparian streambanks, as well as streams, wetlands and marshes – which, collectively, provide important ecosystem services beyond habitat. A 2012 analysis by the Tacoma-based firm Earth Economics estimated the per-acre dollar value of wetlands, riparian buffers, and other types of land cover within Thurston County (Table 2.31). The analysis factored in a wide range of ecosystem services not typically quantified in traditional economic cost-benefit analyses (e.g., erosion control, water regulation and wildlife habitat).



Source: TRPC

Table 2.31: Low & High Dollar-Per-Acre Estimates for Land Cover Type in Thurston County

Ecosystem Services	Freshwater Marsh		Wetland		Riparian Buffer (Forest)		Riparian Buffer (Wetland)		Riparian Buffer (Shrub)	
	Low	High	Low	High	Low	High	Low	High	Low	High
Aesthetic and Recreational	95	864	2	4,641	40	173			239	1,169
Biological Control										
Disturbance Regulation	2,052	2,052	18	8,579	8	254				
Erosion Control										
Food Provision			63	9,373						
Gas & Climate Regulation	47	513	2	774					99	990
Habitat Refugium & Nursery			100	13,561	11	1,540				
Nutrient Cycling										
Pollination										
Raw Materials	6	7	2,816	2,816						
Science & Education										
Soil Formation										
Waste Treatment			76	19,117						
Water Regulation			148	17,351			40	197		
Water Supply	63	167	10	33,968	5	2,268	182	182		
Medicinal Resources							12	395		
TOTAL	2,263	3,602	3,236	110,180	64	4,235	234	774	338	2,159

**Figures rounded to nearest dollar; Source: Flores et al, 2012 (Earth Economics report)*
Source: Earth Economics, 2012.

Note: Dollar per acre estimates are based on conditions at the time of the report and may not reflect current values.

Changes in hydrologic conditions, as well as human disturbance of riparian areas, can alter the plant community and thus reduce vital access to food, shelter and water:

- Mammals depend upon a supply of water to survive. Riparian communities have a greater diversity and structure of vegetation than other upland areas. Beavers and muskrats are now recolonizing irrigation and drainage ditches and fallow farm fields, which are often converted wetlands. As residences are built in rural areas, there is an increasing concern with beaver dams causing flooding of low-lying areas and abandoned farm ditches being filled in, which can lead to localized flooding.
- A great number of birds are associated with riparian areas. They swim, dive, feed along the shoreline, or snatch food from above. The Puget Sound, rivers, lakes, and wetlands are important feeding and resting areas for migratory and resident waterfowl. Some species (e.g., Canada geese) have become adapted to changes to shoreline environments.

- Amphibians and reptiles are some of the least common wildlife in riparian areas. However, some threatened species, such as the western pond turtle and the Oregon spotted frog, are known to inhabit Thurston County’s waterways and wetlands.
- Fish habitat throughout Thurston County varies widely based on natural conditions and human influence. While salmonids prefer clear, free-flowing streams, other species, such as the Olympic mudminnow, inhabit the calm, backwater areas of sloughs and wetlands. Many ditches were dug throughout the county to make low, wet ground better for farming. As the water drained away and the wetlands were converted to farm fields, natural stream conditions were altered throughout. Agriculture along many rivers extends to the water’s edge, and smaller side channels have been tilled to drain better. Within developing areas, small streams were replaced by pipes and wetlands were filled in to support urban development.
- Thurston County agriculture and aquaculture producers rely on a healthy environment. Flooding can bring pollution into waterways and environments, contaminating oyster beds and grazing fields, as well as destroying crops.

Protection of these biological resources is important to Thurston County. Equipped with planning tools and data, Thurston County is establishing a diverse inventory of preserve and conservation areas that maintain the natural and beneficial functions of the floodplain. This is occurring through proactive land use regulations, and property acquisitions that are identifying critical habitat to be preserved. The combination of these two tools is resulting in a floodplain that is predominantly free of high-density development. Parks and preserve areas that promote the natural and beneficial functions of floodplains include the following:

- Woodland Creek Wetlands Preserve
- Black River-Mima Prairie Glacial Heritage Preserve
- Johnson Point Wetlands Preserve
- Black River Natural Area.

In January 2023, Thurston County began implementing a countywide multi-species Habitat Conservation Plan (HCP). The county obtained an Incidental Take Permit (ITP) pursuant to 10(a)(2)(B) of the federal Endangered Species Act. This permit is proposed to cover most development permits and county capital facility projects. It has a 30-year duration and addresses impacts on species covered in the HCP.

Federally listed prairie and wetland-associated species which are covered in the HCP include:

- *Rana pretiosa* (Oregon spotted frog) - listed as Threatened in 2014
- *Euphydryas editha taylori* (Taylor’s checkerspot butterfly) – listed as Endangered in 2013
- *Pooecetes gramineus affinis* (Oregon Vesper Sparrow) - under review for listing as of 2024

- *Thomomys mazama pugetensis* (Olympia pocket gopher), *T. m. tumuli* (Tenino pocket gopher), and *yelmensis* (Yelm pocket gopher) - listed in 2014 as Threatened

Development regulations to protect critical areas, habitat, and species are included in the Critical Areas Ordinance (Title 24 of the Thurston County Code). The U.S. Fish and Wildlife Service and National Marine Fisheries Service provide information on animal and plant species listed under the Federal Endangered Species Act.

Federally listed and federal candidate species listed in the Habitat Conservation Plan are covered in Titles 24 and 17 of the Thurston County Code. The Thurston County Shoreline Master Program (SMP) outlines policies to protect shorelines and nearby areas as required by the Washington State Shoreline Management Act (SMA).

2.9 Flood Risk Assessment Summary

The history of major flooding within Thurston County clearly demonstrates a high probability of occurrence. The December 2007 and January 2009 floods were not as costly as the February 1996 flood, but suggest that the region remains vulnerable to flood impacts. Because approximately 10 percent of the county’s land area, population, and valuation is exposed, a moderate vulnerability is assigned. The combined frequency of flooding, the potential for simultaneous flood events, and the historic records of recurrent damaging floods, lead to an overall high risk rating for the entire planning area.

Tidal flooding currently poses little risk within the entire planning area. It is a primary focus for the City of Olympia and a narrow band of shoreline for portions of unincorporated Thurston County. However, climate change is likely to increase the risk of urban flooding as existing stormwater management systems may be insufficient to handle more intense future precipitation events.

Table 2.32: Risk Assessment for Flood Types in Thurston County

Flood Type	Probability of Occurrence	Vulnerability	Risk
Riverine	High	Moderate	High
Groundwater	High	Moderate	High
Tidal	Moderate	Low	Low
Urban	High	Moderate	Moderate
Dam Failure	Low	Moderate	Moderate
Lake	High	Low	Low

Source: Thurston County Water and Climate Planning Division

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Source: Thurston Regional Planning Council (TRPC)

CHAPTER 3

Mitigation Strategy: Goals, Objectives, and Initiatives

3.0 Introduction

The mitigation strategy is this plan’s call to action, serving as the blueprint for reducing losses and impacts from the flood hazards identified in the risk assessment. Thurston County bases its mitigation strategies on the overarching principles of the plan’s goals. The objectives supply a range of measurable steps that can meet the goals. The plan’s mitigation initiatives are specific prioritized projects and activities that Thurston County commits to implementing as a long-term investment in building and maintaining a stronger, more flood disaster resilient community. Together the goals, objectives, and initiatives form Thurston County’s mitigation strategy.



This plan works in conjunction with other county flood goals and policies that promote hazard reduction and protect floodplain functions contained in the Thurston County Comprehensive Plan. The Critical Areas Ordinance and other Thurston County Codes establish standards that guide growth and limit development in environmentally sensitive areas. In 2023, Thurston County updated and adopted the Hazards Mitigation Plan for the Thurston Region which also includes a mitigation strategy for flooding and addresses earthquakes, wildfire, landslides, severe storms, and volcanic activity.

3.1 Goals and Objectives

The goals translate the plan's Guiding Policies (Chapter 4) into an outcome-based framework for flood hazard mitigation decision-making. The objectives define actions or results that can be translated into measurable terms and specific assignments for implementation. The six goals in this plan address important aspects of comprehensive flood management:

- Reducing vulnerability for people and property
- Committing resources to cost effective flood management activities
- Maintaining continuity of operations during flood emergencies
- Protecting the environment
- Providing public education and information sharing
- Coordinating the plan, including public involvement.

Each mitigation initiative identified meets one or more objectives. The six goals and thirty corresponding objectives are as follows:

- 1. Reduce the county’s vulnerabilities to flooding to protect people and essential facilities and to reduce property losses**
 - a. Maintain a regionally coordinated emergency alert notification system that sends timely all-hazard warnings to affected populations
 - b. Identify and sign evacuation routes for areas of the county hardest hit by flooding and road closures
 - c. Train and equip emergency service providers to effectively respond to flood hazard events
 - d. Minimize the number of structures and infrastructure in hazard prone locations
 - e. Safeguard objects or places that have cultural or historical significance
 - f. Maintain and upgrade at risk transportation facilities, utilities, and other essential buildings and infrastructure to withstand the disruptive and damaging effects of flood hazards
 - g. Enforce ordinances and development regulations and prohibit development and other activities to prevent the creation of new flood hazards or shifting of existing flood hazards elsewhere
- 2. Commit resources to cost-effective flood management and hazard mitigation activities**
 - a. Identify a team of county staff to manage and implement flood management and flood hazard reduction activities
 - b. Collect and analyze data, including data and information on the effects of climate change, to increase understanding of conditions that contribute to flood hazards, and examine strategies to minimize their impacts
 - c. Create a comprehensive flood mitigation strategy and pursue funding to manage and implement priority projects
 - d. Evaluate practical opportunities to leverage new public and private projects to afford protective measures to surrounding properties with pre-existing flood risks
 - e. Participate in the National Flood Insurance Program including its Community Rating System
 - f. Maintain up to date maps of floodways, floodplains, channel migration zones, and areas subject to high groundwater flooding
 - g. Participate in federal, state, and local all-hazards workshops, programs, and exercises
 - h. Update the Flood Hazard Mitigation Plan and develop and maintain flood response and emergency action plans
- 3. Maintain essential county government services during emergencies**

- a. Identify, document, and train from lessons learned from previous events and exercises
 - b. Train existing county staff to provide additional backup functions for key staff who leave primary duties to provide flood response activities
 - c. Identify contingency funding measures for personnel working overtime during major hazard events
- 4. Restore, enhance, and protect the flood conveyance and ecological functions of channel migration zones, floodways, and floodplains**
- a. Retain the natural flood water conveyance functions of channel migration zones, floodways, and floodplains through compatible land uses
 - b. Avoid habitat degradation from any development or hazard mitigation activities in channel migration zones, floodways, and floodplains and fully mitigate habitat impacts where impacts are unavoidable
 - c. Prioritize flood mitigation projects that enhance habitat for aquatic species
- 5. Educate and inform residents and businesses to act to minimize their flood risks**
- a. Improve community access to county flood information and to staff who are members of the flood management team
 - b. Make flood hazard maps accessible and user friendly, both online and in print at the Building Development Center
 - c. Provide a variety of flood education materials to educate people about the risks of flooding and steps they can take to prevent losses
 - d. Assess needs and provide educational resources to accommodate flood disaster preparedness for special needs individuals or populations within the county
 - e. Inform residents to take precautions to become self-reliant for a minimum of 72 hours during a flood disaster
- 6. Bring the community together to make Thurston County resilient to flood hazards**
- a. Continue Thurston County's participation with the Chehalis River Basin Flood Authority
 - b. Coordinate and provide leadership in the hazard mitigation planning process among local, tribal, state, and federal government partners
 - c. Train and plan for sheltering, evacuation needs, and coordination of volunteer assistance efforts with local, state, and federal emergency management partner agencies and non-government disaster relief organizations
 - d. Conduct broad outreach activities to engage all sectors of the community in the hazards mitigation planning process

3.1.1 Revisions to Goals and Objectives

During the plan update process, the Flood Planning Committee (FPC) desired goals that clearly state Thurston County’s intent to overcome past, current, and future flood risks and impacts. During the goal review and revision process, the FPC referred to the 2017 Flood Hazard Mitigation Plan (2017 FHMP), the Hazards Mitigation Plan for the Thurston Region, and the Thurston County Comprehensive Plan for guidance.

The 2025 FPC maintained the existing FHMP goals. The FPC made small revisions to the objectives to better reflect the ”customer” to “community”, update the name of the permitting center, and improve phrasing. Previously, the 2017 FPC wanted to create a direct link between the objectives and the goals. To highlight this connection, the format of the goals and objectives are revised, with objectives listed directly under each corresponding goal rather than on a separate list. The 2025 FPC maintained this formatting.



Source: TRPC

3.2 Mitigation Initiatives

The mitigation initiatives establish this plan’s call to action. The mitigation initiatives form the basis of Thurston County’s comprehensive flood program management activities for the next five years and beyond. When implemented, each activity will have a long-term sustained effect on reducing the loss of life and property from flooding.

The mitigation initiatives consist of unique projects or activities that Thurston County identified through the plan update process. The initiatives were selected through the mitigation alternatives evaluation process described in Chapter 4. The 2025 and previous committees considered a range of actions, including the categories recommended by the National Flood Insurance Program's Community Rating System (shown in the next section). The 2025 Flood Planning Committee largely supported the 2017 initiatives in the action plan, with some revisions and updates.

3.2.1 Mitigation Categories

The National Flood Insurance Program's Community Rating System (CRS) identifies six categories of activities that communities should evaluate for inclusion in their strategy to reduce flood hazards and protect the natural functions of rivers, channels, floodways, and floodplains. Each of the plan's initiatives fits into one or more of these six categories¹.

1. **Preventive** activities keep flood problems from getting worse. The use and development of flood-prone areas is limited through planning, land acquisition, or regulation. They are usually administered by building, zoning, planning, and/or code enforcement offices:
 - Floodplain mapping and data
 - Planning and zoning
 - Open space preservation
 - Stormwater management
 - Floodplain regulations
 - Drainage system maintenance
 - Erosion setbacks
 - Building codes
2. **Property Protection** activities are usually undertaken by property owners on a building-by-building or parcel basis.
 - Relocation
 - Acquisition
 - Building elevation
 - Retrofitting
 - Sewer backup protection
 - Insurance
3. **Natural Resource Protection** activities preserve or restore natural areas or the natural functions of floodplain and watershed areas. They are implemented by a

¹ 2017. FEMA. Community Rating System Coordinator's Manual.

variety of agencies, primarily parks, recreation, or conservation agencies or organizations.

- Wetlands protection
 - Erosion and sediment control
 - Natural area preservation
 - Natural area restoration
 - Water quality improvement
 - Coastal barrier protection
 - Environmental corridors
 - Natural functions protection
4. **Emergency Services** measures are taken during an emergency to minimize its impact. These measures are usually the responsibility of city or county emergency management staff and the owners or operators of major or critical facilities.
- Hazard threat recognition
 - Hazard warning
 - Hazard response operations
 - Critical facilities protection
 - Health and safety maintenance
 - Post-disaster mitigation actions
5. **Structural Projects** keep flood waters away from an area with a levee, reservoir, or other flood control measure. They are usually designed by engineers and managed or maintained by public works staff. In general, Thurston County does not permit, own, or operate structural projects that alter, impede, or control the natural flow of floodwaters. However, Thurston County does construct, maintain, and replace stormwater infrastructure such as stream culverts that may contribute to flood reduction.
- Reservoirs recognition
 - Levees/floodwalls
 - Diversions
 - Channel modifications
 - Storm drain improvements
6. **Public information** activities advise property owners, potential property owners, and visitors about the hazards, ways to protect people and property from the hazards, and the natural and beneficial functions of local floodplains. They are usually implemented by a public information office.
- Map information

- Outreach projects
- Real estate disclosure
- Library
- Technical assistance
- Environmental education

3.2.2 Mitigation Initiative Implementation Details

The county's flood mitigation initiatives will require significant investments in planning, design, and construction, and may take years to complete. The desired outcomes of this plan are that Thurston County:

- Achieve a greater awareness of its flood risks
- Develop a list of practical mitigation activities that are eligible for federal mitigation grants and other funding program
- Implement cost effective mitigation activities that increase resiliency to flooding and protect the environment

Achieving these results depends on several factors that influence a project's readiness to proceed. Each mitigation initiative was evaluated and assigned values for cost, timeline, benefit rating, and priority. In addition, the FPC identified five of the initiatives as the county's top priorities. The definition and values of these factors:

Cost

The total cost is perhaps the greatest limiting factor in implementing a project. Almost every other factor relates to the amount of funding a project requires to achieve intended outcomes. Cost ratings are defined as follows:

- **High** – Existing funding will not cover the cost of the project over its expected duration; implementation will require new revenue through an alternative source (for example, bonds, grants, and utility fee increases)
- **Medium** – The project could be implemented with existing funding but implementation will require a re-apportionment of the budget or a budget amendment, or the cost of the project would have to be spread over multiple years
- **Low** – The project could be funded under the existing budget. The project is part of, or can be part of an ongoing existing program within the duration of the project

Timeline

The timeline reflects the period in which the county desires to implement a mitigation initiative. Timelines are influenced by the availability of funding, the complexity of the project, and the available resources available to implement. For some initiatives, specific

years are noted. Some efforts are ongoing, but updates to the programs or initiatives are expected to be added on during the general timeline estimates. The general parameters:

- **Short Term** – to be completed or begun in 1 to 5 years
- **Long Term** – to be completed and/or maintained in greater than 5 years
- **Ongoing** – currently being funded and implemented under existing programs

Benefit Rating

A subjective benefit review was performed for each mitigation initiative in this plan. The 2025 FPC recommended updating Initiative #8 (Flood Map Refinement and Access) to go from a 2017 “Low” Benefit Rating to a “Medium” Benefit Rating, as well as changing the initiative from a “Low” to “High” priority within the plan.

The benefit ratings are as follows:

- **High** – Project will provide an immediate reduction of risk exposure for life and property
- **Medium** – Project will have a long-term impact on the reduction of risk exposure for life and property, or project will provide an immediate reduction in the risk exposure for property
- **Low** – Long-term benefits of the project are difficult to quantify in the short term

Priority

The order in which the county will implement the mitigation initiatives will depend on the availability, eligibility criteria, and competitiveness of grant programs, as well as changing hazard conditions, and ongoing county budget needs. The FPC discussed each mitigation initiative and reach consensus on its priority. Each initiative was assigned a priority using the following criteria:

- **High** – A project that meets multiple objectives and has funding secured or meets eligibility requirements for a grant program. The key factors for high priority projects: a high or medium benefit rating and the benefits exceed the costs of implementation.
- **Medium** – A project that meets goals and objectives, is grant eligible, but which is unfunded. The key factors for medium priority projects: a medium benefit rating and the benefits exceed the cost.
- **Low** – A project that will mitigate the risk of a hazard, but the benefits of the project are difficult to quantify in the short term. The key factors for low priority projects: a low to medium benefit rating and a medium to high cost to implement. Funding is not secure and may not be eligible for FEMA grant funding. Low priority projects may be eligible for grant funding from other programs.

Top Five Mitigation Initiatives

The FPC selected the five highest priority mitigation initiatives and prioritized them 1 (highest priority) through 5 (fifth priority). The FPC used a numerical ranking process where each member identified and ranked their top five. The individual results were combined and tallied. The FPC identified initiatives 2, 17, 16, 12, and 7 as the five highest priority initiatives.

Community members were also asked to rank their top 5 initiatives in the online survey published in June 2025. Community survey rankings were provided to the Board of County Commissioners.

3.3 Thurston County Flood Mitigation Initiatives

The plan contains 20 active mitigation initiatives. All initiatives were supported for continuation in the 2025 action plan from the 2017 action plan, with revisions and updates as recommended by the 2025 Flood Planning committee.

The mitigation initiatives will require continued coordination among the county departments charged with their implementation. The initiatives are sorted into seven types of activities. These activities are representative of the initiatives general categories and help organize and communicate the general direction of the strategy. The Thurston County flood mitigation initiatives are summarized in Table 3.1.

Table 3.1 Summary of Thurston County Flood Mitigation Initiatives

ID	Title	Priority	Top 5 Rank FPC	Status	Cost	Benefit Rating	Timeline	CRS Category
Emergency Planning, Notification, and Evacuation and Detour Routes: Two initiatives expand efforts to notify and provide instructions to affected populations of imminent threats from catastrophic dam failure or flood events. The projects will continue to identify and prepare evacuation procedures and detour routes for people to reach safe places.								
1	Dam Failure Evacuation Planning and Response	Medium		In progress	Medium	High	2025-2030, Short-term	Emergency Services, Public Information
2	Flood Detours and Response Planning	High	1	In progress	Medium	Medium	2025 – 2030, Short-term	Emergency Services, Public Information
Infrastructure: Two initiatives will replace, repair, or reconstruct public infrastructure including stream culverts, bridges, and roads. The projects will minimize flood impacts, address public safety, improve transportation mobility, and enhance aquatic habitat.								
3	Stream Culvert Replacement Flood Mitigation Program	High	n/a	Ongoing	High	High	2025 – 2035, Long-term	Natural Resource Protection, Structural
4	Road Repair and Reconstruction Flood Mitigation Program	High	n/a	In progress	High	High	2025 – 2035, Long-term	Property Protection, Natural Resource Protection

Mapping, Data Collection, Data Sharing, and Data Protocols: Seven initiatives support improving the community’s knowledge of how, when, and where flooding occurs. Additional and improved data collection and sharing procedures enhances the county’s ability to accurately forecast the location and extent of high

ID	Title	Priority	Top 5 Rank FPC	Status	Cost	Benefit Rating	Timeline	CRS Category
groundwater flooding, understand the impacts of climate change, identify structures at risk, and map hazard areas. These initiatives also establish protocols for documenting historic flood conditions, archiving data and maps, and improving processes to make the data accessible to county staff, community members, and other stakeholders.								
5	Flood Data Collection, Sharing, Modeling, and Evaluation Program	Medium		Ongoing	Medium	Medium	2025-2035, Ongoing	Prevention, Emergency Services
6	Flood Model Development and Maintenance Program	Low		In progress	Medium	Low	2025-2030, Short-term	Prevention, Public Information
7	Risk Map Land Use and Development Regulation Review and Revisions	High	5	In progress	Low	Medium	2025-2030, Short-term	Prevention, Public Information
8	Flood Map Refinement and Access	High		In Progress	Medium	Medium	2025-2030, Short-term	Prevention, Public Information
9	Flood Map and Data Storage and Retrieval Program	Medium		In progress	Low	Low	2025-2030, Short-term	Prevention
10	River Channel Migration Zone and Habitat Mapping Program	Medium		Ongoing	Low	Low	2025-2030, Short-term, Ongoing	Prevention
11	Building Inventory and Mapping Program	Medium		Ongoing	Low	Low	2025-2030, Short-term, Ongoing	Prevention
Flood Hazard Reduction: Two initiatives will develop and formalize programs to prevent future property losses. One will evaluate, prioritize, and fund candidate structures for elevation, relocation, or acquisition. The other consists of an inspection program to monitor and remove excess debris accumulation in stream channels that compound flood problems into public assets or private property.								
12	Vulnerable Structures and Repetitive Loss Mitigation Program	High	4	Ongoing	High	High	2025-2035, Long-term, Ongoing	Prevention, Property Protection
13	Debris and Sediment Inspection and Flood Hazard Reduction Program	Medium		New - No Progress	Medium	High	2025-2030, Short-term	Prevention, Property Protection, Natural Resource Protection, Emergency Services
Natural Functions and Ecosystem Services: Two initiatives protect and restore natural floodplain functions and enhance aquatic and riparian habitat.								
14	Floodplain Restoration and Reconnection	Medium		Ongoing	High	Medium	2025-2035, Long-term, Ongoing	Prevention, Natural Resource Protection, Structural
15	Riparian Flood Control and Habitat Reforestation Project	Medium		New - No Progress	High	Medium	2025-2035, Long-term	Prevention, Natural Resource Protection
Finance, Implementation, and Coordination: Three initiatives will evaluate and implement opportunities to effectively fund the initiatives in this plan, to manage and coordinate the county's various flood management work programs across all involved departments, and to coordinate with external stakeholders.								
16	Comprehensive Flood Program Finance Strategy	High	3	New - No Progress	Low	Medium	2025-2030, Short-term	Prevention
17	Community Rating System Program	High	2	Ongoing	Medium	Medium	2025-2035 Ongoing	Prevention, Public Information
18	Thurston Climate Plan Evaluation and Integration	Medium		New - No Progress	Low	Low	2025-2035, Long-term, Ongoing	Prevention
Public Education and Awareness: Two initiatives will improve public access to information and engage affected residents and businesses about flood risks, flood prevention, county flood ordinances and regulations, flood insurance, and other resources.								

ID	Title	Priority	Top 5 Rank FPC	Status	Cost	Benefit Rating	Timeline	CRS Category
19	Flood Hazard Education and Hazard Reduction Public Outreach Strategy	Medium		Ongoing	Low	Low	2025-2035, Ongoing	Public Information
20	Flood Website Development	High		In progress	Low	Low	2025-2030, Short-term	Public Information

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3.3.1 Mitigation Initiative Details

ID Number: 1	Priority: Medium	Top Five Rank: n/a
<p>Initiative Title: Dam Failure Evacuation Planning and Response</p>		
<p>Type of Activity: Emergency Planning, Notification, and Evacuation and Detour Routes</p>		
<p>CRS Category: Emergency Services, Public Information</p>		
<p>Relates to Plan Goals and Objectives: 1a,1b,1c,6c</p>		
<p>Action: Identify potential evacuation routes and prepare and maintain evacuation procedures for communities downstream from the Nisqually, Yelm, and Skookumchuck hydroelectric project dams. Develop and implement a public outreach strategy to inform affected residents and businesses about routes and procedures. Develop and implement communication procedures to collaborate with dam facility operators in flood preparation and mitigation processes.</p>		
<p>Rationale: Washington State Department of Ecology identifies three high hazard dams in Thurston County that pose a major risk to downstream populations in the event of a catastrophic failure. Thurston County will continue coordinate with the dam operators and other stakeholders to identify evacuation routes and safe zones for people within the inundation areas. Procedures for securing the affected area and for allowing evacuees to return to their homes must be established.</p>		
<p>Benefit Rating: High</p>		
<p>Status: In progress</p>		
<p>Timeline: 2025-2030, Short-term</p>		
<p>Leads: Emergency Management, Public Works, Sheriff's Office, Central Services – GeoData</p>		
<p>Cost Estimate: Medium</p>		
<p>Funding Source: Grants, Local Funds</p>		
<p>Origin of Initiative: Adapted from 2012 FHMP</p>		
<p>Progress and Implementation Status: Thurston County developed general recommendations for evacuation destinations for communities in the inundation zones, and continues to disseminate that information to residents. The county established a notification plan with TransAlta for the Skookumchuck River dam. 2024 Update: The county continues to meet with dam and public utility authorities to plan for evacuation routes, messaging, signage, and other dam failure response topics.</p>		

ID Number: 2**Priority:** High**Top Five Rank:** 1**Initiative Title:** Flood Detours and Response Planning**Type of Activity:** Emergency Planning, Notification, and Evacuation and Detour Routes**CRS Category:** Emergency Services, Public Information**Relates to Plan Goals and Objectives:** 1b,2h,5c

Action: Identify detour routes for areas subject to frequent flood-related closures. Update emergency plans, create operational procedures, and provide public information and outreach resources to execute the detours when needed.

Rationale: Twenty-seven road segments within the county are periodically closed due to flooding. The county developed a spatial database of these locations and will identify suitable routes to enable safe travel around areas subject to flooding.

Benefit Rating: Medium**Status:** In progress**Timeline:** 2025 - 2030, Short-term**Leads:** Emergency Management, Public Works, Central Services – GeoData**Cost Estimate:** Medium**Funding Source:** Grants, Local Funds**Origin of Initiative:** Adapted from 2012 FHMP

Progress and Implementation Status: Thurston County has reached an agreement with Weyerhaeuser Company providing an emergency southeast flood detour route through Weyerhaeuser property. The county needs to address additional areas.

2024 Update: Thurston County Water and Climate Planning Division developed a prototype model to forecast when and where flooding is likely to occur. This tool could predict potential road inundation areas and inform public notifications about transportation route disruptions. Staff from Community Planning, Emergency Management, and GeoData have met to discuss the feasibility to operationalize a flood forecasting model for roadways. Due to the prohibitive cost of moving data into a Linear Referencing System, no further action has been taken at this time.

Public Works updated the Debris Management Plan in March 2023, which includes planning and operations activities for response to flood-related debris in roadways.

Ongoing efforts continue to increase enrollment in the TC Alert system and to prepare template messaging for public outreach on emergencies including flooding.

ID Number: 3**Priority:** High**Top Five Rank:** n/a**Initiative Title:** Stream Culvert Replacement Flood Mitigation Program**Type of Activity:** Infrastructure**CRS Category:** Natural Resource Protection, Structural**Relates to Plan Goals and Objectives:** 1f,4a,4c**Action:** Continue culvert replacement throughout the county for flood reduction, hazard avoidance, and to mitigate fish passage barriers. Replacement will occur as funds become available.**Rationale:** Numerous culverts in the county are inadequate or functionally obsolete for storm and surface water conditions which contribute to or compound flooding and fish passage barriers. Thurston County developed a comprehensive stormwater facilities database to prioritize culvert replacement with larger culverts or bridges to match project selection criteria from various grants and funding programs. New and replacement culverts should be designed to accommodate higher peak flows associated with more frequent and intense precipitation events and to enhance aquatic habitats.**Benefit Rating:** High**Status:** Ongoing**Timeline:** 2025 – 2035, Long-term**Leads:** Community Planning & Economic Development, Public Works**Cost Estimate:** High**Funding Source:** Grants, Local Funds**Origin of Initiative:** 2012 FHMP**Progress and Implementation Status:** Thurston County has completed an inventory of all publicly maintained stormwater facilities and established an asset management system to track maintenance. Thurston County Storm and Surface Water Utility and Public Works coordinate to replace priority culverts for aquatic species and habitat protection and flood hazard reduction. 2024 Update: Construction began July 2024 to replace the temporary culvert at Country Club Road NW and Green Cove Creek. The original culvert was a known fish barrier planned for future replacement but began to collapse. It was slip-lined as an emergency repair to maintain streamflow, protect the public, roadway, and utilities, and maintain access for residents until it could be permanently replaced. A new 150-foot bridge will replace the temporary culvert and remove the fish barrier which will result in enhanced fish passage, salmon recovery, and improvements to the overall health of the stream ecosystem.

ID Number: 4**Priority:** High**Top Five Rank:** n/a**Initiative Title:** Road Repair and Reconstruction Flood Mitigation Program**Type of Activity:** Infrastructure**CRS Category:** Property Protection, Natural Resource Protection**Relates to Plan Goals and Objectives:** 1f,4a,4c**Action:** Prioritize the repair or replacement of roads and bridges that close during flood events. Upgrade these facilities as funds become available.**Rationale:** The county has approximately 27 road segments that experience problems with flood impacts. Some roads are subject to damage from inundation and erosion. Road closures impact operations, cause traffic delays, delay emergency response times, and cause financial impacts to surrounding businesses.**Benefit Rating:** High**Status:** Ongoing**Timeline:** 2025 – 2035, Long-term**Leads:** Community Planning & Economic Development, Public Works**Cost Estimate:** High**Funding Source:** Grants, Local Funds**Origin of Initiative:** 2012 FHMP**Progress and Implementation Status:** The Thurston Regional Planning Council developed a countywide spatial database of frequently flooded roads. This data and the maps will be used to evaluate, prioritize, and program projects for construction.

2024 Update: There has been no progress towards this initiative during the current reporting period, however Thurston County Public Works continues to prioritize roads and bridges that have frequent maintenance callouts, which include closures due to flooding. Funding options to reduce flood impacts will continue to be explored for the upgrade of these facilities.

ID Number: 5**Priority:** Medium**Top Five Rank:** n/a**Initiative Title:** Flood Data Collection, Sharing, Modeling, and Evaluation Program**Type of Activity:** Mapping, Data Collection, and Data Protocols**CRS Category:** Prevention, Emergency Services**Relates to Plan Goals and Objectives:** 1a,2b

Action: Expand and maintain Thurston County's flood prediction and forecast modeling capabilities for all types of flooding, including the impacts of climate change. Develop and implement data sharing and communication processes with the public and stakeholders such as dam facility operators and neighboring jurisdictions.

Rationale: Thurston County has a comprehensive surface and groundwater monitoring program and is expanding its number of monitoring stations and gauges. There are numerous private and provincial data gauges that may contribute additional hydrologic data. Updated LIDAR data will improve hydrologic modeling efforts, particularly for assessing high groundwater flooding. Maintaining and expanding investments in this program will support flood hazard identification, flood threat recognition and warning, risk assessment revisions, climate change adaptation strategies, land use evaluation, and hazard mitigation planning for all sources of flooding.

Benefit Rating: Medium**Status:** In progress**Timeline:** 2025-2035, Ongoing**Leads:** Community Planning & Economic Development, Emergency Management**Cost Estimate:** Medium**Funding Source:** Grants, Local Funds**Origin of Initiative:** 2012 FHMP

Progress and Implementation Status: Hydrologic data from county monitoring locations are used to develop predictive models for stream flow, aquifer levels, and lake elevations. In the past year, Thurston County hired a new hydrogeologist and invested in additional groundwater and surface water modeling software capabilities. The county is also developing a comprehensive monitoring program data base that will make data analysis, accessibility, and presentation easier. Plans are being implemented to expand the environmental monitoring program to include additional stream and groundwater monitoring, and weather stations in strategic locations throughout the county to support better flood prediction and monitor high groundwater conditions. The county will also continue to evaluate flood prediction and forecast modeling opportunities and look for funding opportunities. Additional monitoring is necessary for high groundwater, lake, and riverine flooding and the effects of climate change on the frequency and severity of flooding throughout the county.

2024 Update: Thurston County continued performing its ongoing data collection, monitoring, and analysis activities as reported in the 2022-2023 Annual report with two additional activities for the 2023 - 2024 performance period:

1. Climate data analysis work to forecast future flooding and climate conditions is currently under way in cooperation with the UW Climate Impacts Group and the State Climatologist. Analysis work includes county Ambient Program rivers and lakes data, compared with field data and forecasting done by the USGS, University of Washington Climate Impacts Group (this will continue to be the focus for the WRS II Hydrologist for Water year 2025).
2. Working with a consultant to update the Western Washington Hydrologic Model stormwater model to include future climate impacts models to predict stormwater impacts under various climate change models.

ID Number: 6**Priority:** Low**Top Five Rank:** n/a**Initiative Title:** Flood Model Development and Maintenance Program**Type of Activity:** Mapping, Data Collection, and Data Protocols**CRS Category:** Prevention, Public Information**Relates to Plan Goals and Objectives:** 2b,2g,2h**Action:** Maintain and operate an in-house GIS flood model using best available science and local data to support flood planning activities.**Rationale:** Flood scenario estimates and modeling will support hazard mitigation and response planning activities and can assist the county in evaluating its mitigation strategies.**Benefit Rating:** Low**Status:** Ongoing**Timeline:** 2025-2030, Short-term**Leads:** Emergency Management, Central Services – GeoData**Cost Estimate:** Medium**Funding Source:** Grants, Local Funds**Origin of Initiative:** Adapted from 2012 FHMP**Progress and Implementation Status:** Thurston County Emergency Management worked with FEMA under the RISK MAP program to update the building stock and critical facility data in the HAZUS-MH program. Depth grids were developed for the Marine Coast Areas and Deschutes Watershed in 2013/2014, and grids for the Lower Chehalis and Nisqually due to complete in Spring 2017 and Winter 2017 respectively. Department managers need to discuss how to assign, train, and support county personnel to sustain HAZUS model capabilities.

2024 Update:

HAZUS is a FEMA recommended risk analysis and loss estimation GIS-based software tool.

Thurston County has not pursued creating in house HAZUS-MH modeling capacity due to the level of effort and the highly specialized application and minimal usage of the tools.

ID Number: 7**Priority:** High**Top Five Rank:** 5**Initiative Title:** RiskMAP Land Use and Development Regulation Review and Revisions**Type of Activity:** Mapping, Data Collection, and Data Protocols**CRS Category:** Prevention, Public Information**Relates to Plan Goals and Objectives:** 1g,2c,2f

Action: Evaluate land use and development regulations accounting for changes to special flood hazard areas resulting from FEMA's Risk Map process and the county's flood studies. Consider appropriate watershed-specific revisions to zoning, development codes, and the Critical Areas Ordinance to refine flood hazard reduction strategies.

Rationale: The expansion or reduction of the 100-year floodplain will have implications for near- and long-term land use activities in Thurston County.

Benefit Rating: Medium**Status:** In progress**Timeline:** 2025-2030, Shortterm**Leads:** Community Planning & Economic Development**Cost Estimate:** Low**Funding Source:** Local Funds**Origin of Initiative:** Adapted from 2017 Hazards Mitigation Plan

Progress and Implementation Status: Several 100-year floodplains for Thurston County have not been updated. The Deschutes River floodplains have been remodeled and remapped and included in the Comprehensive Plan update in 2016 from the FEMA Risk Map process. The Marine Coastal floodplains and Lower Chehalis River, including the Skookumchuck and lower Black Rivers and Scatter Creek, are underway with the RISK Map program. The Nisqually River is scheduled to be updated in 2018. The Comprehensive Plan will include all floodplain revisions.

2024 Update: Thurston County has completed the Shoreline Master Program (SMP) update and it is under review with the Washington State Department of Ecology. This plan is updating shoreline designations and their development standards to comport with the state's most recent requirements and best available science.

ID Number: 8**Priority:** High**Top Five Rank:** n/a**Initiative Title:** Flood Map Refinement and Access**Type of Activity:** Mapping, Data Collection, and Data Protocols**CRS Category:** Prevention, Public Information**Relates to Plan Goals and Objectives:** 2f

Action: Update and maintain digital floodplain maps for all rivers, streams, lakes, high groundwater hazard areas, and flood of record areas. Make these maps available online.

Rationale: Thurston County amended its Floodplain Ordinance to require consideration of aerial photos that depict the extent of the “flood of record.” The Critical Areas Ordinance relies on officially adopted floodplain map. After the aerial topography project is complete, Thurston County will develop new flood maps based on the new United States Geological Survey (USGS) protocol contained in “Updating Flood Inundation Maps Effectively,” as amended or updated. Remapping will likely be performed in the following order: Nisqually, Deschutes, Skookumchuck, Chehalis, and Black River.

Benefit Rating: Medium**Status:** In Progress**Timeline:** 2025-2030, Short-term**Leads:** FEMA, State Ecology, Community Planning & Economic Development, Public Works, Central Services-GeoData Center**Cost Estimate:** Medium**Funding Source:** Grants, Local Funds**Origin of Initiative:** Adapted from 2017 Hazards Mitigation Plan

Progress and Implementation Status: Thurston County continues to work with the State Department of Ecology and (Federal Emergency Management Agency (FEMA) Region 10 on the RISK Map program to remodel and remap floodplains in Thurston County. To date, the Deschutes River is complete. Final floodplain maps will be adopted in 2016. Preliminary maps were created for the marine coastal shoreline and are currently in review. The Lower Chehalis watershed is underway and completion is anticipated in late 2017 or early 2018. The Nisqually River project is expected to start in 2018. Thurston County captures high water elevation marks during flood events and manages development to the FEMA 100-year floodplain or the documented high water level plus two feet, or whichever is greater. Thurston County is also updating its high groundwater flooding map.

2024 Update: Thurston County has complied with FEMA DFIRM updates and approving them for its special flood hazard area regulatory review and administration. On June 24, 2022, FEMA released a preliminary DFIRM and Flood Insurance Study for 40 Lakes in unincorporated Thurston County. The analyses included survey, hydrology, and flood risk products. A letter of final determination was issued on May 8, 2024. Thurston GeoData updated the county’s GIS database with the new DFIRM maps.

ID Number: 9**Priority:** Medium**Top Five Rank:** n/a**Initiative Title:** Flood Map and Data Storage and Retrieval Program**Type of Activity:** Mapping, Data Collection, and Data Protocols**CRS Category:** Prevention**Relates to Plan Goals and Objectives:** 2b,2f,2h,3a

Action: Develop interdepartmental coordination procedures and protocols to document previous flood events including data, imagery, losses, and other information about conditions that contribute to flooding.

Rationale: Thurston County needs a system to maintain digital archives of all flood inundation maps. A comprehensive flood data management system will support the evaluation of repetitive losses and other National Flood Insurance Program and Community Rating System needs.

Benefit Rating: Low**Status:** In progress**Timeline:** 2025-2030, Short-term

Leads: Emergency Management, Central Services - GeoData, local governments, and Thurston Regional Planning Council

Cost Estimate: Low**Funding Source:** Grants, Local Funds**Origin of Initiative:** Adapted from 2017 Hazards Mitigation Plan

Progress and Implementation Status: The county is reviewing and evaluating technologies for field data collection, mapping display and analysis, and data storage. However, material on historical flood loss has not been organized. GIS maps for critical facilities and repetitive loss structures were prepared for the 2017 Hazard Mitigation Plan. Thurston County documents high water marks from floods online at <http://www.co.thurston.wa.us/permitting/flood/flood-photos.html>.
2024 Update: Work is ongoing. Thurston County continues to collect data as flood events occur. GeoData is evaluating contracting needs for aerial imagery and analytics to be able to request data collection flights on call during flood events. The County will be evaluating its strategy for updating data.

ID Number: 10**Priority:** Medium**Top Five Rank:** n/a**Initiative Title:** River Channel Migration Zone and Habitat Mapping Program**Type of Activity:** Mapping, Data Collection, and Data Protocols**CRS Category:** Prevention**Relates to Plan Goals and Objectives:** 2f,4c

Action: Maintain updated maps for the channel migration zones for all rivers in the region and the extent of high quality riparian habitat. Develop mapping protocol for selecting riparian habitat based on best available science.

Rationale: Mapping the channel migration zones, potential hazardous features, natural features, and riparian habitat provides a useful database for evaluating hazard reduction and habitat restoration projects.

Benefit Rating: Low**Status:** Ongoing**Timeline:** 2025-2030, Short-term, Ongoing**Leads:** Community Planning & Economic Development, Central Services – GeoData, Public Works**Cost Estimate:** Low**Funding Source:** Local funds**Origin of Initiative:** 2012 FHMP

Progress and Implementation Status: High quality riparian habitat data has been compiled for the Henderson Inlet, Deschutes, Totten/Eld Inlet, and the Nisqually River basins. Channel migration mapping has been conducted and refinement of the mapping is ongoing. The historic meander belt has been mapped for the Deschutes River. GIS mapping of similar channel migration zones will be needed for the Black, Chehalis, Skookumchuck, and Nisqually Rivers, with an update for the Deschutes River using the same methodology.

2024 Update: High quality (QL1) LiDAR is available for all of Thurston County (captured in 2017 and 2021). Washington Department of Natural Resources issued new high-quality LiDAR for all of Thurston County in 2025. This new data could be leveraged to map Channel Migration Zones if resources were allocated to the effort and prioritized by an identified county department sponsor. The work could be contracted out or performed in house, appropriately staffed.

ID Number: 11**Priority:** Medium**Top Five Rank:** n/a**Initiative Title:** Building Inventory and Mapping Program**Type of Activity:** Mapping, Data Collection, and Data Protocols**CRS Category:** Prevention**Relates to Plan Goals and Objectives:** 2b,2e,2f**Action:** Update and maintain the Thurston County building footprint database to account for all existing structures such as homes, commercial buildings, barns, and other structures of value.**Rationale:** The county needs a reliable and accurate database of all building structures in the county to conduct a thorough risk assessment, develop a mitigation strategy, conduct public outreach, and other planning needs. The existing building footprint database is incomplete and is updated sporadically. This initiative will committ resources to complete, update, and maintain this useful data on a regular schedule.**Benefit Rating:** Low**Status:** Ongoing**Timeline:** 2025-2030, Short-term, Ongoing**Leads:** Thurston County Assessors Office, Central Services - GeoData**Cost Estimate:** Low**Funding Source:** Grants and Local Funds**Origin of Initiative:** 2017 FHMP**Progress and Implementation Status:** This initiative was introduced in the 2017 Flood Plan update.

2024 Update: 2024 building footprint data is available (product of Thurston County's contractor's, Eagle View, flights), but the data has not been processed to create a database to support countywide data needs. Thurston GeoData must develop a strategy to build the data layer and incorporate the tool into its enterprise data program. The plan needs to include a process for making the data available and having a database maintenance program. Funding is available to perform this work, but the tasks required to perform this project are currently not scheduled on GeoData's work program.

ID Number: 12**Priority:** High**Top Five Rank:** 4**Initiative Title:** Vulnerable Structures and Repetitive Loss Mitigation Program**Type of Activity:** Flood Hazard Reduction**CRS Category:** Prevention, Property Protection**Relates to Plan Goals and Objectives:** 1d,2c,2d,2e

Action: Coordinate and partner with supporting agencies and organizations to create and maintain a program to evaluate repetitive flood claim loss properties and other structures subject to repetitive flooding as candidate projects for elevation, relocation, or buyout. Develop project cost estimates and a finance strategy for priority projects, and evaluate a long-term implementation plan. Develop processes to partner with candidate property owners to inform them about the program's opportunities and benefits. Implement projects as funds become available.

Rationale: Thurston County has successfully pursued opportunities to mitigate properties subject to frequent flooding, but need a more deliberate and concerted effort to track and monitor grant opportunities and project delivery to account for personnel changes and department restructuring.

Benefit Rating: High**Status:** Ongoing**Timeline:** 2025-2035, Long-term, Ongoing**Leads:** Community Planning & Economic Development, Central Services, Emergency Management, Storm and Surface Water Utility**Cost Estimate:** High**Funding Source:** Grants, Local Funds**Origin of Initiative:** 2012 FHMP

Progress and Implementation Status: County staff has compiled a list of properties as potential candidates for elevation, relocation, or buyout. This list includes repetitive loss properties and other properties identified through past inspections, post-flooding evaluations, and individual inquiries. In 2016, a grant request was made through the Chehalis Flood Authority to elevate 12 houses and buy 8 properties. A study by the Chehalis Flood Authority for the Chehalis and Skookumchuck River basins identified 300 lots for future buyout or elevation. As additional funding is identified efforts will continue to mitigate at risk properties. As additional information becomes available, the county will add new properties to the list.

2024 Update: The number of flood repetitive loss properties in Thurston County decreased from 23 to 21 since the last reporting period. Thurston County has made no progress on this initiative due to funding and staffing constraints. However, Thurston County staff have provided consultation to three homeowners who are pursuing home elevation projects. Between 2023 and 2024 one of three privately funded projects was completed.

ID Number: 13**Priority:** Medium**Top Five Rank:** n/a**Initiative Title:** Debris and Sediment Inspection and Flood Hazard Reduction Program**Type of Activity:** Flood Hazard Reduction**CRS Category:** Prevention, Property Protection, Natural Resource Protection, Emergency Services**Relates to Plan Goals and Objectives:** 1d,1e,1f,1g

Action: Develop and implement a program to periodically inspect floodways, channel migration zones, drainage ditches, and other floodwater conveyance areas to monitor and document debris, sediment accumulation, and excess vegetation and to detect and respond to potential flood hazards, especially in areas that experience recurring flood problems.

Rationale: Accumulation of debris results in flood impacts to public and private property. Periodic inspections and coordination with property owners may identify and respond to potential flood risks before they threaten property or public safety. Thurston County has removed debris and beaver dams and performed vegetation control, but not in a proactive programmatic manner. This initiative will establish procedures and schedules for routine inspections and clearing.

Benefit Rating: High**Status:** New - No Progress**Timeline:** 2025-2030, Short-term**Leads:** Public Works, Community Planning & Economic Development, Emergency Management**Cost Estimate:** Medium**Funding Source:** Local Funds**Origin of Initiative:** 2017 FHMP

Progress and Implementation Status: This initiative was introduced in the 2017 Flood Plan update.

2024 Update: No changes to the County's inspection procedures have occurred since the last reporting period. Staff continue to inspect county infrastructure including ponds, pipes, ditches, etc. but have not expanded the effort to natural drainages, except for a few selected problem locations with a history of beaver or other debris activity. Updated high resolution LiDAR imagery will assist staff with identifying high priority areas for remedial actions.

County staff believe this initiative should be evaluated and revised during the FHMP update so that field inspections are systematically identified by a data driven and evidenced based process to prioritize areas that are more likely to experience flooding. This approach will make better use of staff time and produce greater flood risk reduction outcomes. The initiative is being considered for inclusion/update in the FHMP.

ID Number: 14**Priority:** Medium**Top Five Rank:** n/a**Initiative Title:** Floodplain Restoration and Reconnection**Type of Activity:** Natural Functions and Ecosystem Services**CRS Category:** Prevention, Natural Resource Protection, Structural**Relates to Plan Goals and Objectives:** 2d,4a,4b,4c

Action: Protect and connect aquatic habitat and flood ecosystem services through a variety of flood plain management activities to comply with the National Marine Fisheries Service Biological Opinion regarding the National Flood Insurance Program: 1. Research best practices with large woody debris management and other bioengineering methods to stabilize streambanks, improve channel conditions, and enhance fish and wildlife habitat; 2. Revise shoreline regulations, as appropriate, to permit bioengineering methods; 3. Convert flood acquisition properties to open space.

Rationale: Flooding is a natural process and restoring flood storage capacity in floodplains can benefit farmlands and aquatic species habitat.

Benefit Rating: Medium**Status:** Ongoing**Timeline:** 2025-2035, Long-term, Ongoing**Leads:** Community Planning & Economic Development, Public Works, Storm and Surface Water Utility, Thurston Conservation District**Cost Estimate:** Low**Funding Source:** Grants, Local Funds**Origin of Initiative:** Adapted from 2012 FHMP and 2017 Hazards Mitigation Plan

Progress and Implementation Status: The Shoreline Master Program and Critical Areas Ordinance includes preferences for bioengineering and other natural protection measures when activities are approved. Letters of support have been sent to local lead entities for salmon recovery and other organizations engaged in such work. Woody debris management and maintenance is addressed in the Thurston County Shoreline Master Plan and Critical Areas Ordinance. The County adopted a Critical Areas Ordinance in 2013.

2024 Update: No significant progress has been made since the last reporting period. NOAA's biological opinion requires Endangered Species Act (ESA) habitat protection compliance in jurisdictions that contain waterways that drain to the Puget Sound. The Center for Biological Diversity has submitted a petition to the National Marine Fisheries Services (NMFS) to add coastal Chinook to the federal Threatened and Endangered Species list. If NMFS lists this species, then NOAA may extend the Puget Sound Biological Opinion to the Chehalis River and other coastal rivers, or it might create a brand-new Biological Opinion to expand protection to salmon species in waterways that flow to the Pacific Ocean.

Thurston County is partnering with the City of Tumwater, WRIA 13 Lead Entity, and other stakeholders on a Washington Dept. of Ecology Floodplains by Design grant proposal for the Deschutes Watershed. The proposal will decrease flooding impacts to downstream properties by slowing the water and spreading out the flow, allowing for water to infiltrate into the ground. This is done by reconnecting historic floodplain and off-channels with the river, restoring wetlands that have been impacted by development, and preserving property that will allow for floodwater storage during high flow events. Each of these actions will reduce impacts on riverfront property owners and flooding in the City of Olympia. The county finished its update to the Shoreline Management Program in 2024, and it remains under Department of Ecology control.

ID Number: 15**Priority:** Medium**Top Five Rank:** n/a**Initiative Title:** Riparian Flood Control and Habitat Reforestation Project**Type of Activity:** Natural Functions and Ecosystem Services**CRS Category:** Prevention, Natural Resource Protection**Relates to Plan Goals and Objectives:** 2d,4a,4b,4c

Action: Formalize and maintain a program with landowners and other stakeholders to reforest corridors along river and stream shorelines where they can provide flood protection benefits and enhance riparian habitat.

Rationale: Reestablishing a forested edge along river and stream shorelines is an important long-term project to restore floodplain functions and enhance riparian habitat. The success of the program will rely on public and private partnerships to overcome the challenges of land access, voluntary agreements, and funding.

Benefit Rating: Medium**Status:** New - No Progress**Timeline:** 2025-2035, Long-term**Leads:** Community Planning & Economic Development, Public Works, Thurston Conservation District**Cost Estimate:** High**Funding Source:** Grants, Local Funds, Partnerships**Origin of Initiative:** Adapted from 2017 Hazards Mitigation Plan

Progress and Implementation Status: Since 1999, Thurston County has engaged with the watershed based salmon recovery projects sponsored by the Salmon Recovery Funding Board (SRFB). This accounted for 80 projects totaling approximately \$26.2 million (Nisqually WRIA, \$17 million; Deschutes WRIA, \$6.5 million; Kennedy-Goldsborough WRIA, \$547,000; and Chehalis WRIs, \$2.1 million). The county needed to undertake some data collection efforts before on the ground activities. Riparian restoration activities will likely increase in the future as the restoration standards are better understood, and more property owners understand the financial and environmental benefits. In 2016 Thurston County provided support to the Nisqually Land Trust's "Watershed By Design" grant application for restoration and enhancement projects on the middle and upper Nisqually River. These projects will help restore salmon habitat, reduce sedimentation rates, help slow channel migration, and reduce flooding impacts.

2024 Update: The county used a National Estuaries Program grant to develop a program of incentives for voluntary riparian restoration. The grant enabled Thurston County to implement five pilot projects to restore private lands that were in agricultural use or part of a single-family residential lot.

Additionally, the county is partnering with Thurston Conservation District to implement agricultural conservation practices, such as riparian restoration as part the Voluntary Stewardship Program. Program performance metrics will be captured in the upcoming five-year monitoring report that was completed in July 2024.

ID Number: 16**Priority:** High**Top Five Rank:** 3**Initiative Title:** Comprehensive Flood Program Finance Strategy**Type of Activity:** Finance, Implementation, and Coordination**CRS Category:** Prevention**Relates to Plan Goals and Objectives:** 2c,3b,3c**Action:** Pursue a coordinated interdepartmental approach to evaluate and implement a finance strategy for the county's flood management programs and projects.**Rationale:** Flood program activities are spread across several county departments and are managed by a handful of experienced staff. Current departmental budgets and staff structuring may limit the county's ability to achieve its flood plan goals and objectives. Department directors and key staff should evaluate funding options to leverage department budgets and explore management strategies to establish effective oversight of programs. This will help the county satisfy both the requirements of the National Flood Insurance Program's Community Rating System and the priority activities identified in this plan's mitigation strategy.**Benefit Rating:** Medium**Status:** New - No Progress**Timeline:** 2025-2030, Short-term**Leads:** Thurston County Manager, Department and Division Directors, Community Planning & Economic Development, Emergency Management, Public Works, Storm and Surface Water Utility, Board of County Commissioners**Cost Estimate:** Low**Funding Source:** Local funds**Origin of Initiative:** Adapted from 2012 FHMP**Progress and Implementation Status:** This initiative was introduced in the 2017 Flood Plan update.

2024 Update: Interdepartmental discussions are ongoing about improving communication and workflow to support the county's flood management activities.

Thurston County received a Phase 1 Washington Department of Commerce grant for Integrated Watershed Planning in August 2024. The two-year grant is intended to augment inter-coordination on water-related issues. The grant is mainly focused on salmon recovery but also includes frameworks for unified watershed-wide planning initiatives across departments and agencies. The county plans to pursue the Phase 2 grant for implementation of initiatives identified in Phase 1.

ID Number: 17**Priority:** High**Top Five Rank:** 2**Initiative Title:** Community Rating System Program**Type of Activity:** Finance, Implementation, and Coordination**CRS Category:** Prevention, Public Information**Relates to Plan Goals and Objectives:** 2c,2e,2f,2h**Action:** Strive to maintain a Class 5 or better Community Rating System (CRS) classification as a means of reducing flood risks.**Rationale:** The CRS Program specifies a wide range of comprehensive floodplain management activities that reduce flood hazards and protect natural floodplain functions. This credit-based program awards a 1 (highest) through 10 (lowest) rating to communities based on their demonstrated level of effort. In 2016, Thurston County received a Class 2 rating. This rating entitles flood insurance policy holders in the 100-year floodplain to a 40% discount on their insurance premium.**Benefit Rating:** Medium**Status:** Ongoing**Timeline:** Ongoing**Leads:** Community Planning & Economic Development, Storm and Surface Water Utility, Emergency Management, Public Works**Cost Estimate:** Medium**Funding Source:** Local funds**Origin of Initiative:** 2012 FHMP**Progress and Implementation Status:** Thurston County enrolled in the CRS Program in 2000. It initially received a Class 5 rating. The county became a Class 2 community in October 2016. The next verification site visit is scheduled for 2025. The Flood Plan Update is a prerequisite for maintaining a Class 5 or better rating.

2024 Update: Thurston County is currently rated as a Class 2 CRS community. The CRS Program recertification was successfully completed in 2024. The County successfully maintained a Class 2 rating.

ID Number: 18**Priority:** Medium**Top Five Rank:** n/a**Initiative Title:** Thurston Climate Plan Evaluation and Integration**Type of Activity:** Finance, Implementation, and Coordination**CRS Category:** Prevention**Relates to Plan Goals and Objectives:** 6b

Action: Evaluate the priority flood hazard adaptation actions from the Thurston Climate Adaptation Plan, Thurston Climate Mitigation Plan, and the Thurston County Comprehensive Plan and incorporate them into the Flood Hazard Mitigation Plan and other appropriate BoCC-accepted plans.

Rationale: Climate change is projected to alter Western Washington's hydrological cycle. Future winters will be warmer and wetter, resulting in more frequent and intense precipitation events. This will cause more frequent stream/river and high groundwater flooding. Sea level rise will contribute to more extended and deeper coastal flooding. Thurston County will need to take steps to adapt to changing conditions and mitigate climate induced flood hazards.

Benefit Rating: Low**Status:** New - No Progress**Timeline:** Ongoing

Leads: Community Planning & Economic Development, Storm and Surface Water Utility, Emergency Management, Public Works, Thurston Regional Planning Council, and other jurisdictions and stakeholders

Cost Estimate: Low**Funding Source:** Local funds**Origin of Initiative:** 2017 FHMP

Progress and Implementation Status: Thurston County is a partner to a multi-stakeholder planning process to develop a Climate Adaptation Plan for the Thurston Region. Slated for adoption by Thurston Regional Planning Council in early 2018, this plan will present a range of actions for the county and other communities to implement to offset risks and achieve long-term community goals for both the built and natural environments. Following adoption, the actions will be evaluated and incorporated into relevant plans, where appropriate.

2024 Update: The County updated its Shoreline Master Program in 2024. Information from the relevant climate plans and reports are veing implemented in the draft Thurston Comprehensive Plan in 2025.

The Washington State Legislature amended the state's Growth Management Act (GMA) in 2023 to require comprehensive plans to include a resiliency strategy to reduce natural hazard risks induced by climate change, including flood hazards. A new climate chapter is currently being drafted to be included in the final adoption of the Plan update in 2025. Key items will be incorporated into development codes, as required by the Growth Management Act.

ID Number: 19**Priority:** Medium**Top Five Rank:** n/a**Initiative Title:** Flood Hazard Education and Hazard Reduction Public Outreach Strategy**Type of Activity:** Public Education and Awareness**CRS Category:** Public Information**Relates to Plan Goals and Objectives:** 5a,5c,5e,6a,6b,6d

Action: Continue to develop and implement an annual public outreach campaign to maintain flood risk awareness and improve peoples' understanding of resources and capabilities within the county. This includes activities for both broad audiences and direct contact with property owners affected by flooding.

Rationale: Ongoing public outreach and education for flood hazard mitigation activities is necessary to engage and inform all sectors of the community to become more disaster resilient. Messaging will focus on opportunities for households, businesses, and employers to minimize losses from flood hazards that threaten the county.

Benefit Rating: Low**Status:** Ongoing**Timeline:** 2025-2035, Ongoing**Leads:** Community Planning & Economic Development, Storm and Surface Water Utility, Emergency Management, Public Works, Central Services**Cost Estimate:** Low**Funding Source:** Grants, Local funds**Origin of Initiative:** 2012 FHMP

Progress and Implementation Status: The County continues to disseminate flood risk information: through the website; targeted mailings to realtors, lenders, and insurance agencies; mailing the annual Flood Bulletin Newsletter to properties in flood hazard areas; notifications to repetitive loss properties; press releases to local media; and personal interaction through technical visits, phone calls, permit counter inquiries, and during the permit application and/or review process. The annual Emergency Preparedness Expo and the Risk Map process provide additional opportunities for community engagement with county staff, and other public and private partners. 2024 Update: Thurston County Emergency Management coordinates the design and distribution of the annual Flood Bulletin. In September 2024, the bulletin was mailed to 10,843 residents who live in the 100-year floodplain, a high groundwater area, or a flood of record area. The bulletin is available at all TRL branches, distributed at outreach events, and is posted online each year. The Board of County Commissioners is schedule to issue a Flood Awareness Week Proclamation on October 15, 2024.

TCEM continues to perform community outreach to increase enrollment in the TC Alert system and to prepare template messaging for public notification for emergencies including dam failure evacuation. Subscriber promotion activities include public engagement at community events such as the TC Fair and the Preparedness Expo. Electronic billboards along I5 near Grand Mound and on Old Pacific Highway near Reservation Road promote TC Alert and offer a way for residents to sign up from their phones. Public education and awareness are ongoing actions.

ID Number: 20**Priority:** High**Top Five Rank:** n/a**Initiative Title:** Flood Website Development**Type of Activity:** Public Education and Awareness**CRS Category:** Public Information**Relates to Plan Goals and Objectives:** 5a,5b,5c,5d,6d

Action: Continue to revise and update Thurston County’s website to consolidate or coordinate all flood-related information and contents to improve accessibility. Expand the use of interactive tools and newer technology such as GIS story maps and interactive dashboards with flood data and other relevant information.

Rationale: Flood information on the county's website is spread across several departments and is not effectively cross-linked, making it confusing and difficult to access. This initiative will consolidate all flood related information to a single centralized website and provide cross-reference links to other department webpages where appropriate.

Benefit Rating: Low**Status:** In progress**Timeline:** 2025-2030, Short-term

Leads: Community Planning & Economic Development, Storm and Surface Water Utility, Emergency Management, Public Works, Central Services

Cost Estimate: Low**Funding Source:** Grants, Local funds**Origin of Initiative:** Adapted 2012 FHMP

Progress and Implementation Status: This initiative was introduced in the 2017 Flood Plan update. Thurston County began to evaluate its web content management system, the organizational structure of content, and design.

2024 Update: Recent improvements to the county’s website make searching for flood content significantly faster, and the format of the delivered search items makes it easier for users to quickly scan for the information they’re looking for.

A search of the word “flood” brings up 29 items, including news releases or announcements from past 24 months of efforts or initiatives around flooding which gives insight into the county’s investment of time and effort in public outreach.

Most flood-related content has been updated to reflect all code and grammatical changes, however, the consolidation efforts have not moved forward significantly, possibly due to staff turnover, and project prioritization by the elected Board of County Commissioners, etc.

Nonetheless, vital emergency, insurance, flood map locations, flood reporting information, flood programs and permit process details are maintained, easy to find and up to date.

3.3.2 Mitigation Initiatives – Completed, Updated, or Removed

During the 2024 Annual Review, county staff identified that no initiatives had been fully completed, but that many had continued progress or ongoing work. During the 2025 plan update process, the Plan Development Team and the FPC reviewed the 20 flood mitigation initiatives from the 2017 FHMP. No Mitigation Initiatives were removed, but all timelines were updated, and some initiatives had revisions to improve their impact.

3.3.3 Identification and Preparation of Mitigation Initiatives

Much of this plan is devoted to describing the hazard mitigation planning process, identifying and describing how flood hazards threaten the community, and assessing the vulnerabilities or risks from impacts of these hazards. This information serves as the foundation for informing and developing a mitigation strategy. Thurston County staff guided the 2025 FPC's update of Thurston County's Mitigation Strategy. This included resources that led to and supported the development and review of the mitigation initiative and selection process including:

- Updated Risk Assessment
- Flood Hazard delineation maps
- Population, employment, key assets, and other land use hazard exposure analysis tables
- Updated draft copy of the plan's Goals and Objectives
- A copy of the 2017 FHMP
- A copy of Thurston County's initiatives from its 2023 Hazards Mitigation Plan for the Thurston Region (approved by FEMA February, 2024)

Mitigation Strategy Alternatives Evaluation

A broad range of activities are necessary to avoid or reduce the impacts of flooding on people, property, the environment, and the economy. Prior to selecting the recommended mitigation strategy presented earlier in this chapter, the FPC evaluated the county's existing FHMP to ascertain what progress has been completed. To facilitate this process, the FPC reviewed a wide range of possible activities to address flood problems and work programs to administer comprehensive flood management activities. This review allowed the county to focus on cost effective mitigation initiatives that if implemented, will eliminate long-term risks to life and property.

The same catalog of flood hazard mitigation alternatives developed in the 2012 FHMP offers a broad range of alternatives to be considered for use in the planning area. The catalogs in Table 3.2 through 3.5, present alternatives categorized in two ways:

1. By what the alternative would do:

- Manipulate a hazard
 - Reduce exposure to a hazard
 - Reduce vulnerability to a hazard
 - Increase the ability to respond to or be prepared for a hazard
2. By who would have responsibility for implementation:
- Individuals
 - Businesses
 - Government

The 2017 FPC selected flood hazard mitigation initiatives from among the alternatives presented in the catalogs, as well as resources previously mentioned. The catalogs provide a baseline of mitigation alternatives backed by a planning process, consistent with the goals and objectives, and within the capabilities of Thurston County to implement. However, some of these actions may not be feasible based on the County's selection criteria. The catalog equipped the 2017 FPC with a list of what could be considered to reduce risk of the flood hazard within the planning area. The 2017 FPC identified all actions for the adopted mitigation strategy based on the selection criteria identified in this section. Initiatives included in the catalog not selected by the county in the action plan were not selected based on:

- The action is not feasible
- The action is already being implemented
- There was an apparently more cost-effective alternative
- The action did not have public or political support

Table 3.2 Mitigation Alternatives to Manipulate the Flood Hazard

Personal Scale	Corporate Scale	Government Scale
<ol style="list-style-type: none"> 1. Clear stormwater drains and culverts 2. Institute low-impact development techniques on property 	<ol style="list-style-type: none"> 1. Clear stormwater drains and culverts 2. Institute low-impact development techniques on property 	<ol style="list-style-type: none"> 1. Maintain drainage system 2. Institute low-impact development techniques on property 3. Use dredging, levee construction, and regional retention areas 4. Implement structural flood control, levees, channelization, or revetments. 5. Employ stormwater management regulations and master planning 6. Acquire vacant land or promote open space uses in developing watersheds to control increases in runoff 7. Maintain/restore natural floodplain functions

Table 3.3 Mitigation Alternatives to Reduce Exposure to the Flood Hazard

Personal Scale	Corporate Scale	Government Scale
<ol style="list-style-type: none"> 1. Locate outside of hazard area 2. Elevate utilities above base flood elevation 3. Institute low impact development techniques on property 	<ol style="list-style-type: none"> 1. Locate business critical facilities or functions outside hazard area 2. Institute low impact development techniques on property 	<ol style="list-style-type: none"> 1. Locate or relocate critical facilities outside of hazard area 2. Acquire or relocate identified repetitive loss properties 3. Promote open space uses in identified high hazard areas via techniques such as: planned unit developments, easements, setbacks, greenways, sensitive area tracks 4. Adopt land development criteria such as planned unit developments, density transfers, clustering 5. Institute low impact development techniques on property 6. Acquire vacant land or promote open space uses in developing watersheds to control increases in runoff

Table 3.4 Mitigation Alternatives to Reduce Vulnerability to the Flood Hazard

Personal Scale	Corporate Scale	Government Scale
<ol style="list-style-type: none"> 1. Retrofit structures (elevate structures above base flood elevation) 2. Elevate items within house above base flood elevation 3. Build new homes above base flood elevation 4. Flood-proof existing structures 	<ol style="list-style-type: none"> 1. Build redundancy for critical functions or retrofit critical buildings 2. Provide flood-proofing measures when new critical infrastructure must be in floodplains 	<ol style="list-style-type: none"> 1. Harden infrastructure, bridge replacement program 2. Provide redundancy for critical functions and infrastructure 3. Adopt appropriate regulatory standards, such as: increased freeboard standards, cumulative substantial improvement or damage, lower substantial damage threshold; compensatory storage, non-conversion deed restrictions 4. Augment existing regulations to account for the impacts of Climate Change 5. Implement stormwater management regulations and master planning. 6. Adopt "no-adverse impact" floodplain management policies that strive to not increase the flood risk on downstream communities

Table 3.5 Mitigation Alternatives to Increase Preparation or Response Capability

Personal Scale	Corporate Scale	Government Scale
<ol style="list-style-type: none"> 1. Buy flood insurance 2. Develop household mitigation plan, such as retrofit savings, communication capability with outside, 72-hour self-sufficiency during and after an event 	<ol style="list-style-type: none"> 1. Keep cash reserves for reconstruction 2. Support and implement hazard disclosure for the sale/re-sale of property in identified risk zones 3. Solicit cost-sharing through partnerships with other stakeholders on projects with multiple benefits 4. Develop a flood response plan 	<ol style="list-style-type: none"> 1. Produce better hazard maps 2. Provide technical information and guidance 3. Enact tools to help manage development in hazard areas (stronger controls, tax incentives, and information) 4. Incorporate retrofitting or replacement of critical system elements in capital improvement plan 5. Develop strategy to take advantage of post-disaster opportunities 6. Warehouse critical infrastructure components 7. Develop and adopt a continuity of operations plan 8. Consider participation in the Community Rating System 9. Maintain existing data and gather new data needed to define risks and vulnerability 10. Train emergency responders 11. Identify critical facilities/infrastructure that require early notification during flood responses 12. Create a dam/levee failure response plan 13. Enhance flood threat recognition capability 14. Create a building and elevation inventory of structures in the floodplain 15. Develop and implement a public information strategy 16. Charge a hazard mitigation fee 17. Integrate floodplain management policies into other planning mechanisms within the planning area 18. Consider the probable impacts of climate change on the risk associated with the flood hazard 19. Consider the residual risk associated with structural flood control in future land use decisions 20. Enforce National Flood Insurance Program 21. Adopt a Stormwater Management Master Plan 22. Create flood hazard identification maps that reflect future conditions including the probable impacts from climate change

3.4 Regulatory Activities

The FPC reviewed Thurston County’s existing plans, policies, codes, programs, and administrative approaches to flood management. Floodplain protections and flood hazard avoidance measures are integrated throughout Thurston County Code, plans, and policies. This section summarizes preventive activities within Thurston County’s regulatory activities and discusses opportunities to amend current plans and practices or propose mitigation activities, where appropriate.

3.4.1 Thurston County Comprehensive Plan

The Thurston County Comprehensive Plan is the core planning- and decision-making tool for the Board of County Commissioners and staff. It includes broad goals, objectives, policies, long-term actions, and standards that guide community development among other major community issues. The Washington State Growth Management Act (GMA) establishes the Comprehensive Plan’s importance. The plan addresses multiple elements including land use, housing, capital facilities planning, utilities, rural development, transportation, economic development, parks, open space, recreation, sub-area plans, and other optional elements (RCW 36.70A.070 and RCW 36.70A.080). In 2023, HB 1181 added climate change and resiliency element to the required elements for certain jurisdictions, including Thurston County. As of 2025, the county has completed a new draft climate chapter, creating draft policies and goals for reducing greenhouse gas emissions and improving community resilience to climate change impacts. The final adoption date is expected in December 2025.

The Comprehensive Plan references flooding prominently in Chapter 4, “Environment, Recreation, and Open Space” and Chapter 2, “Climate”:

- *Wetlands are recognized for cleansing stormwater, mitigating flooding, and improving water quality as well as many other ecosystem services. (Section III, Part A. Critical Areas)*
- *Information about the extent of the county’s flood plains, historic flood impacts, and the county’s participation in the Community Rating System. This section provides the background for the county’s regulations to control development in proximity to flood hazard areas to avoid property damage and prevent groundwater contamination. (Section IV, Part A. Flood Hazards)*
- *Policies and actions are specified for: Geologic hazard areas; Groundwater and aquifer recharge areas; Surface water; Frequently flooded areas; Forest resources; Important Fish, Wildlife, and Plant Habitat; Natural hazards; Wildlife corridors and open and greenspaces; County parks, recreation, and open space; Air Quality; and Management approaches. (Section VI Goals, Objectives, and Policies)*

Policy language pertaining to reducing flood losses is most prominently addressed in the excerpt below from the 2025 draft of the Environment, Recreation, and Open Space Chapter, section on Frequently Flooded Areas:

GOAL: protect life and structures from flood hazards and retain the flood storage, transmission capacity, and habitat value of floodplains.

OBJECTIVE: To provide the highest degree of flood protection at the least cost.

POLICIES:

- 1. Provide the highest degree of flood protection at the least cost through identification and accommodation of natural flooding and channel migration processes that pose hazards to life or property. Protection and management should be based on best available science and cumulative impact assessments of existing and planned future land and resource uses within the floodplains, channel migration zones, and watersheds.*
- 2. Prohibit development and emplacement of fill in floodways and floodplains, except to the minimum extent necessary to accommodate public infrastructure and utilities that cannot be accommodated elsewhere and to stabilize channels against erosion in order to protect existing agricultural lands, public roads and bridges, public infrastructure, utilities and significant private structures, and to achieve habitat enhancement. Any development in the floodways should be designed to avoid habitat degradation. Stream bank stabilization, if necessary, should be of a type that maintains or enhances habitat functions. Rip-rap and other hard armoring should only be used if there is no effective alternative, based on sound engineering principles, to protect existing structures or public facilities.*
- 3. Provide for land uses such as forestry, open space, public recreation, existing agriculture and water-dependent uses in areas subject to river flooding to minimize risks to life and structures and help retain or enhance habitat functions. Other uses and development in the floodplain should be restricted to minimize public safety risks (e.g., through compensating design features) and loss of habitat function.*
- 4. Minimize existing and continued degradation of long-term stream channel migration processes that allow formation of essential habitat features by evaluating existing land use patterns, prohibiting construction of new structures in channel migration zones through programmatic and regulatory approaches, and by minimizing streambank stabilization.*
- 5. Actively participate in the multi-jurisdictional flood hazard reduction efforts within the Chehalis River Basin.*
- 6. Identify and prioritize resources that protect socially vulnerable and underserved communities that often suffer the greatest losses during natural disasters such as flood hazards.*
- 7. Maintain the county's enrollment in the Community Rating System through the National Flood Insurance Program.*

Additional policy language pertaining to flooding is found in the draft 2025 Climate Element of the Comprehensive Plan. Final policy language is expected to be adopted in December 2025.

Discussion: The 2025 draft Chapter 4 and Chapter 2 contents were available for review for updating the flood plan’s goals and objectives. The Comprehensive Plan highlights the natural benefits of flooding and addresses hazard risks to life and property. The plan includes a foundational goal, policies, and implementation plan actions for managing flooding in Thurston County, that in their present form, are useful for reducing future flood losses. The policies and most of the actions in Chapter 4 remain relevant. More information related to this action is documented as completed later in this chapter (FMI-22).

The 2025 Comprehensive Plan Climate Element update draft is more supportive of flood management strategies by acknowledging the need to increasing the county’s understanding of climate change impacts and possible mitigation and resilience strategies for future flood conditions within the planning area. Additional plans with recommendations have emerged since the 2017 FHMP was adopted which warrant an evaluation for incorporation such as the 2023 Hazards Mitigation Plan for the Thurston Region, recommendations from Sustainable Thurston, the 2020 Thurston Climate Mitigation Plan, and the recommendations of the 2018 Thurston Region Climate Adaptation Plan (included in Initiative 19). The county can address these minor changes through the Comprehensive Plan amendment process.

3.4.2 Building and Construction Code

Current building codes provide a strong line of defense for protecting new development from future flood events. Washington State’s building codes are mandatory for residential and commercial buildings, statewide. The Washington State Building Code Council adopted the 2021 edition of national model codes with some amendments. The 2021 Washington State Energy Code was also adopted by the council. The 2021 codes went into effect as the Washington model code on March 15, 2024. Hazard loss avoidance is intrinsic with adoption of and compliance with appropriate building codes.

Thurston County Code (TCC) *Title 14 – Buildings and Construction, Chapter 14.38 – Development in Flood Hazard Areas*, provides specific regulations pertaining to new construction and modifications to existing structures in Thurston County’s regulated special flood hazard areas including the FEMA 100-year special flood hazard area, Thurston County’s high groundwater hazard areas, and areas within the highest known flood of record.

The county’s building code, with respect to flooding, is robust. The code does not permit flood proofing measures for any type of structures. Construction standards are established for anchoring, construction materials and methods, accessory structures, utilities, subdivision proposals, and fill. The code also provides sufficient standards for construction, flood protection measures, setbacks, and elevation standards for residential, accessory buildings, agricultural structures, non-residential, manufactured homes, and recreational vehicle sites located in special flood hazard areas. These standards are established for various flood zones and floodways. The code also sufficiently outlines administrative processes for obtaining permits and requesting appeals and variances.

Discussion: Thurston County’s building code is a critical tool for maintaining public safety and requiring flood protection measures to reduce losses. The code is intended to minimize losses due to flood conditions by:

1. Requiring that uses vulnerable to floods be provided with flood protection at the time of initial construction;
2. Restricting or prohibiting uses which are dangerous to human health, safety or property in times of flood, or cause increased flood heights or velocities;
3. Controlling filling, grading, dredging and other development which may increase flood damage;
4. Controlling the alteration of natural floodplains, stream channels and natural protective barriers which help accommodate or channel floodwaters; and
5. Alerting individuals to lands which are in areas of special flood hazard.

The code allows for exceptions and variances to allow for agricultural flood sanctuaries, correcting existing violations of state or local health, sanitary, or safety code specifications to assure safe living conditions as well as alterations of a structure listed on the National Historic Register.

No specific code amendments are necessary now. Future data collected by Initiative 5 will improve Thurston County’s understanding of areas subject to high groundwater flooding

which could result in future amendments to the building code. Initiative 7, a 2017 activity identified by the FPC, establishes the need to review updated flood insurance rate maps from FEMA's Risk Map Process to determine if any changes to maps should require changes to the county's building code.



Source: TRPC

3.4.3 Critical Areas Ordinance – Frequently Flooded Areas and Wetlands Protection

The 1990 Washington State Growth Management Act (RCW Chapter 36.70A) mandates that local jurisdictions adopt land use ordinances using best available science to protect the following critical areas:

- Wetlands
- Critical aquifer recharge areas
- Fish and wildlife habitat conservation areas
- Frequently flooded areas
- Geologically hazardous areas

TCC Title 24, Thurston County's Critical Areas Ordinance (CAO) is perhaps the strongest regulatory tool for avoiding flood losses. Last amended in 2023, the general provisions include requirements that activities within critical areas avoid impacts and cause no net loss of

critical area functions. Additional provisions require property owners to grant access to the county or designee for inspecting and monitoring sites that are proposed for development. Provisions also provide for property assessment relief as a result of restrictions placed on the property.

TCC *Chapter 24.20 Frequently Flooded Areas*, augments the development standards in Chapter 14.38 Development in Flood Hazard Areas. The primary purposes of this chapter is to (excerpt):

- *Identify areas affected by natural flooding and stream channel migration and minimize the amount of development at risk in such areas to protect human life and safety; minimize damage to homes and places of business; minimize business interruptions; avoid or minimize damage to public facilities and utilities including, but not limited to, water and gas mains, electric, telephone and sewer lines, roads and bridges; and to minimize the expenditure of public funds for flood control projects, rescue and relief efforts and repair of flood damage.*
- *Preserve natural flood control by retaining the capacity of floodways to pass floodwaters and associated debris and by retaining the capacity of floodplains to store flood waters.*
- *Restrict structures, facilities, flood loss reduction measures (including, but not limited to, hard armoring and stream channelization), grading, dredging, filling and other development in areas subject to flooding that could displace flood carrying capacity or increase flood heights or velocities.*
- *Protect the quality and quantity of water sustaining humans, fish, shellfish and wildlife by avoiding or minimizing siltation and pollution associated with flooding. This includes, but is not limited to, prohibiting or restricting uses in flood prone areas that pose significant risks to water quality when they are inundated.*
- *Minimize disruption of stream channel migration that forms fish and wildlife habitat by minimizing streambank stabilization and construction of new structures that would be affected by stream channel migration.*
- *Maintain the linkages of the stream to the nutrient reserves in its floodplains.*
- *Regulate frequently flooded areas as a critical area, pursuant to RCW 36.70A.030.*

The ordinance establishes standards for the delineation and approval of high groundwater flood hazard areas and channel migration hazard areas and map amendments for these areas. Section 24.20.070 – Standards and Allowable Uses and Activities specifies a comprehensive list of allowable land uses and activities for residential, commercial, industrial, agricultural, open space, recreation, clearing, grading, filling, roads, bridges, utilities, vegetation control, and other types of uses in frequently flooded areas and channel migration hazard areas. Notably, new residential is not permitted in the 100-Year SFHA.

The CAO sets the standards for the protection of wetlands in TCC *Chapter 24.30 – Wetlands*. The intent of this chapter is to (excerpt):

- *Achieve no net loss of wetlands and minimize adverse impacts.*
- *Maintain wetland and buffer functions, such as, but not limited to, cleansing surface water, storing and conveying floodwater and providing fish and wildlife habitat, by avoiding or, where that is not possible, minimizing and mitigating impacts to wetlands and their buffers.*
- *Establish wetland buffers based on the wetland's functions and values, sensitivity to impacts, rarity, whether it is replaceable, and site conditions.*
- *Provide for uses and activities in wetlands and associated buffers that have negligible impacts on such areas and provide for other uses that must be in wetlands or buffers in a way that will avoid or minimize potential impacts.*
- *Provide for mitigation of impacts to wetlands and their buffers.*

TCC *Section 24.30.045 – Wetland buffers – Standard width* establishes buffers to protect habitat and quality and TCC *Section 24.30.050 – Wetland buffers – Reduced width* establishes measures to mitigate impacts to wetlands from lighting, noise, toxic runoff, stormwater runoff, change in water regime, pets and human disturbance, dust, and disruptions to habitat connectivity. TCC *Section 24.30.065 – Wetland buffers – Tree protection* identifies standards for tree protection. TCC *Section 24.30.070 – Wetland mitigation* establishes standards for wetland mitigation and TCC *Section 24.30.085* addresses allowable uses in wetlands and buffers and related restrictions. This chapter specifies standards for agricultural activity and equipment, biosolids application, boating facilities, bridge and culvert replacement, clearing and grading, drilling, enhancement and restoration, recreational uses, intensive uses, landscaping and gardening maintenance, mineral extraction, sewage disposal systems, reclaimed water, trails, roads, railroads, slope stabilization, stormwater facilities, utility lines, wells, vegetation removal, noxious and aquatic weeds, and water dependent uses.

TCC *Chapter 24.55 – Subdivision in Critical Areas* regulates standards for subdivisions in flood hazard areas. The standards prohibit subdivisions that are located wholly within critical areas. TCC *Section 24.55.040* establish that subdivisions must be located to minimize flood damage without structural flood protection, and shall not exacerbate geologic hazards.

Additional wetlands and aquatic habitat protection standards are included in the CAO in TCC *Chapter 24.25 – Fish and Wildlife Habitat Conservation Areas*. The purpose of this section is to (excerpt):

- a. *Protect habitat and healthy functioning ecosystems to support viable populations of priority and locally important fish, wildlife, and plants in Thurston County.*
- b. *Preserve the functions and values of locally important habitat.*

- c. *Protect the functions and values of priority habitats such as, but not limited to, prairies, Oregon white oak, and riparian areas along streams and marine waters.*
- d. *Protect the function and values of marine habitats, including shellfish beds harvested for commercial use or personal consumption.*
- e. *Provide for connectivity among fish and wildlife habitats.*
- f. *Ensure compliance and coordination with applicable federal and state protections.*

Discussion: Thurston County’s CAO establishes some of the strongest floodplain, flood hazard areas, and wetlands protection regulatory standards in Washington State. The current standards prevent future losses by restricting additional development from occurring in areas that frequently flood. The plan development team’s review did not discover any standards that warrant revision.

3.4.4 Zoning and other Thurston County Codes

Thurston County’s land use codes that afford protection of floodplain functions and benefits and protection of people and property from flood hazards are predominantly located in the Critical Areas Ordinance. The county’s zoning code and other codes provide additional standards that contribute to reducing flood losses and protecting critical areas by limiting rural residential density and maintaining open space.

- *TCC Title 18 – Platting and Subdivisions, Chapter 18.47 – Open Space*, permits up to 50 percent of an open space requirement may be satisfied by wetlands, wetland buffers, and other critical areas.
- In *TCC Title 20- Zoning*, R 1/20 (20.09B) and R 1/10 (20.09C) are zones specified to reduce development in environmentally sensitive areas (R 1/10 addresses the flood-prone Salmon Creek Basin).
- In RR 1/5 (20.09) and RRR 1/5 (20.09A) zones, density calculations subtract critical areas, including 100-year floodplain and high groundwater hazard areas. This effectively reduces development density in flood-prone areas.
- Planned Residential Development (PRD) (20.30) and Planned Rural Residential Development (PRRD) (20.30A) standards provide incentives for setting aside land and encouraging that this include environmentally sensitive areas (wetlands and other critical areas, stormwater facilities)
- *TCC Chapter 20.32 – Open space* provides open space standards, including that at least 30% of land dedicated for open space shall be maintained in a natural condition (such as naturally functioning floodplain).
- There are standards similar to those described above in the county’s Urban Growth Area Codes: UGA Lacey Zoning (Title 21), Tumwater UGA Zoning (Title 22), and Olympia UGA Zoning (Title 23).

Discussion: In December 2016, Thurston County completed a comprehensive 2-year review and adopted amendments to various codes and regulations to make Low Impact Development (LID) the preferred and common approach to development. LID is a stormwater management strategy designed to minimize impervious surfaces, maximize native vegetation retention, and filter stormwater on site as much as possible. In 2018 and 2020, Ordinances 15648, 15905, and 15946 were adopted to amend TCC 14.38 and CAO to increase the County's National Flood Insurance Program compliance and heighten flood protection regulations. The plan development team did not identify any further amendments or modifications to Thurston County's zoning code as part of this plan update.

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3.4.5 Stormwater Control Regulations

Surface water runoff from new development is regulated for Thurston County through Ordinance No. 16141, and memorialized in TCC *Title 15 Public Works, Chapter 15.05 – Thurston County Stormwater Standards*, which adopts the 2022 Thurston County Drainage Design and Erosion Control Manual (DDECM). The manual has 11 core requirements. Not all 11 core requirements apply to every new development or redevelopment project. The applicability varies depending on the project type and size.



Source: TRPC

When applicable, the flow control standard requires stormwater discharges to match developed discharge durations to pre-developed durations from 50 percent of the two-year storm event to the 50-year event. The pre-developed condition shall forested condition unless reasonable, historic information indicates the site was prairie prior to pre-European settlement, or the discharge goes directly or indirectly into a flow control-exempt receiving water, including saltwater bodies. Projects not required to meet the flow control standard may still be required to implement measures to infiltrate, disperse, and retain stormwater runoff on-site to the maximum extent feasible without causing flooding or erosion. The project's compliance options depend on the amount of improvements proposed, project location, size of the parcel the project is located on, and whether or not the project is flow control exempt. In most cases, these measures result in little to no additional runoff from the site compared to pre-project conditions.

Discussion: The DDECM, a far-reaching stormwater management manual, is required within those areas of the County subject to the Washington State Department of Ecology-issued Western Washington Phase II Municipal Stormwater Permit (Permit). Thurston County also requires use of the manual in areas outside the permit-regulated boundary to remain compliant with Title 15.05 as well as the Federal Safe Drinking Water Act Underground Injection Control Regulations. The DDECM requires projects to implement control measures so that the flows to streams are not increased due to new development or redevelopment. This protects streams and riparian habitat from further flow-related degradation. The flow and flow duration matching component means that new development and redevelopment does not add additional water to streams and rivers at rates and timing

significantly different from pre-European settlement landcover conditions, thus reducing the risk of flooding because of new development and redevelopment.

3.5 Property Protection Assistance Activities

Thurston County Emergency Management and Community Planning & Economic Development play a lead role in identifying suitable homes and other structures for elevation, relocation, removal, or acquisition based on their risk for flood damage. The county has focused its efforts on securing grants to elevate homes within the floodplain that are away from high velocity flows, or in areas of high groundwater flooding. These programs are a partnership between the county and the individual home owners. The county may require homeowners to pay a share of the cost of the project, which is often a match requirement of the grant. More frequently, grants awarded to the county cover the homeowner's expenses.

Following the 1995/1996 Nisqually River flooding, approximately 120 residences required structural inspections to determine the extent of damage and occupancy. Of these, approximately 50-60 homes were deemed fit for occupancy, but would benefit from having their first-floor level elevated. In 1998, the Thurston County Housing Authority obtained a State Community Development Block Grant to elevate four residences in unincorporated Thurston County. In 2008, Thurston County obtained a State Community Development Block Grant to elevate up to 35 residences in the Chehalis River basin in the unincorporated areas of the county.

Thurston County reached an agreement with the Chehalis Flood Authority on a process to identify structures for elevation. Twelve structures in the Chehalis River watershed were scheduled for elevation during the 2017-2019 grant cycle. Additional analysis completed on the Skookumchuck River and Scatter Creek identified an additional 224 homes that may benefit from elevation activities, but funding has not been secured.

The county also responds to properties threatened by other flood hazards. In December 2015 and March 2016, Thurston County secured funding from a state grant to demolish and remove two homes and structures threatened by migrating river channels along the Deschutes and the Nisqually Rivers. Both properties were at risk of river flooding and embankment erosion. The original owners still owned the property; however, their deeds prohibit future improvements to the properties. As such, they will remain open space, in perpetuity. The county was proactive in securing the funding for these projects. Had the funding not been acquired, the rivers may have destroyed the homes and the debris may have entered the river channel and impacted properties downstream.

Discussion: Thurston County has secured grants for assisting homeowners with flood elevation and protection projects, but the projects are performed in an opportunistic fashion.

Aside from some grant criteria, the county has not established or approved criteria for prioritizing projects. During the 2017 plan update, the FPC discussed the county's past efforts and the importance of such property protection programs and recommended Initiative 12, Vulnerable Structures and Repetitive Loss Mitigation Program, to formalize the county's efforts to identify and prioritize candidate properties and to develop cost estimates and a finance strategy to implement projects. A more formal program with consistent staffing could result in more elevated homes and further reduce future losses.



Source: The Olympian

3.6 Emergency Services Activities

In 2016, Thurston County launched a Community Notification System, now known as Thurston Community Alert (TC Alert), capable of sending emergency alerts via text message, email, or voicemail. Community members may voluntarily subscribe to receive emergency messages related to specific hazards such as flooding that may require actions such as evacuation, boil water orders, or other information. Thurston County Emergency Management monitors the National Weather Service (NWS) forecasts, participates in, and hosts NWS inclement weather briefings. The county also monitors USGS river gages which provide real time and forecast levels. River gage data for the major rivers in Thurston County are also accessible on Thurston County's website. As conditions warrant, Thurston County issues flood warning alerts to subscribers. The county can also send emergency messages to non-subscriber cellphone users within designated narrow- or wide-geographical areas identified by local emergency managers. The Community Notification System was used during the 2016/2017 winter season to warn residents of rising rivers that approached flood stage. Thurston County has notified the community about the availability of the system

through annual Flood Bulletins, the Hazards Mitigation Plan public comment period, press releases, social media, a dedicated webpage, and during public meetings.

Thurston County Emergency Management coordinates with the three high hazard dam operators (hydroelectric projects) annually to coordinate operational information updates and train on emergency notification procedures for catastrophic dam failure scenarios. These efforts help fulfill portions of the 2012 FHMP's mitigation initiatives, FMI-13, FMI-18, FMI-22, and FMI-23 (see completed and removed initiatives presented earlier in this chapter for more information).

Thurston County Emergency Management coordinates sandbag supply distribution efforts with Public Works and partners with the Fire Districts to identify and place supplies for affected residents and businesses throughout affected areas of the county. Thurston County's website includes information on the county's sandbagging priorities, their appropriate applications, and instructions for filling and placing sandbags and pumping.

Discussion: The development of the Community Notification system fulfills a major component of Initiative FMI-12 originally included in the 2012 FHMP. The FPC discussed the life and safety importance of notifying residents and signing county roads with evacuation routes and flood detour routes. While the alert notification system is crucial, additional signage and public information is necessary to direct traffic during an emergency and could lead to reducing injuries and possibly deaths in the event of catastrophic dam failure. Initiatives 1 and 2 will provide additional public information and route information concerning emergency evacuations or flood detour routes. Initiative 4 addresses reconstruction of transportation facilities that are subject to frequent flooding.

3.7 Structural Projects

Structural projects such as reservoirs, dikes, levees, floodwalls, dams, diversions, and channel modifications designed to protect areas from floodwaters are generally prohibited by Thurston County regulations. The county owns a single non-federal levee on the left bank of the Nisqually River between River Miles 3.5 and 3.8 in Thurston County. An inspection report (on file with the Thurston County Stormwater Utility) performed by the U.S. Army Corp of Engineers in 1976 indicates that the levee was constructed by private interest in the 1960s. It is constructed of earth fill with riprap armoring on the shoreline.

The levee suffered slope and toe loss during late November, early December 1995, and early February 1996 flood events. In response to these events, the county performed repairs to the levee and purchased most of the residential structures along the levee and converted the area to open space.

The levee provides protection for up to a 10-year flood event with one-foot of freeboard. It was not factored into the development of the SFHA for the Nisqually River. The inundation area for levee failure would be the same as the SFHA. The levee is inspected by the Army Corps of Engineers (USACE) and is maintained by Thurston County Public Works. It is eligible for federal PL 84-99 Rehabilitation Program funding. It was last inspected in December 2024, with a minimally acceptable rating according to the Levee Inspection Report by USACE.

If the levee is overtopped, it is estimated to cause \$100,000 in property damage and impact 5 structures within the inundation area, according to the USACE National Levee Database.

Aside from this levee, Thurston County does not own or operate any type of structural facility whose primary function is flood control. The county's regulations generally prohibit projects that impede the natural flow and migration of streams, rivers, and floodwater in flood plains. This plan does not include any projects or recommendations for engineered structural projects as a means of flood control.

Thurston County Public Works and the Storm and Surface Water Utility evaluate stream culverts for replacement if they are undersized and contribute to flooding or are a barrier to fish passage. Thurston County permits the bioengineering of stream channels with coarse or large woody debris to prevent stream bank erosion and enhance fish and wildlife habitat. These types of projects generally don't fall into the traditional category of structural projects as defined by the National Flood Insurance Program.

Discussion: The FPC did not consider any structural projects because no new projects have been identified or studies performed, to warrant including such projects in this plan. Thurston County regulations generally prohibit such projects and other protective measures would be evaluated before resorting to structural projects. The FPC discussed the need to supply options for farmers and ranchers to create elevated refuges or islands for protecting livestock during flood events, but current regulations allow the construction of critter pads (ramped, elevated platforms) if a structure doesn't obstruct or alter the flow of floodwaters.

3.8 Public Information and Outreach Activities

Since adoption of the 2012 FHMP, the county has performed a variety of public information and outreach activities to inform the community about flood risks, flood insurance, county resources, and engagement in flood hazard mitigation planning:

- **Website:** Thurston County publishes and maintains information about flooding and county flood resources on its website. Online resources are available for development regulations, building requirements in Special Flood Hazard Areas, permit

requirements, Flood Insurance Rate Map, other SFHA maps, elevation certificates, locations of reference monuments, and frequently asked questions. Thurston County Emergency Management also publishes online information about river gages, sandbagging information, and links to other community resources.

- **Flood Bulletin:** Published every fall, the free bulletin is sent by mail to over 10,000 households and businesses that are in areas prone to flooding. The publication includes information about the types of flooding, natural flood plain functions, mapping, tracking area rivers, steps to prevent and protect flooding on private property, find information on flood risks, understand construction regulations, information about flood insurance, how to stay informed and sign up for the emergency notification system, preparation tips, evacuation information, and important flood contacts.
- **Emergency Preparedness Expo:** Thurston County Emergency Management in partnership with the Thurston County Emergency Management Council hosts an annual day-long expo to inform residents and businesses about emergency preparedness and public safety. Thurston County sets up a flood booth to allow community members to ascertain their flood risks based on special flood hazard area maps. County staff provides information about flood insurance and is on hand to answer questions about the type of development or land use activities permitted on their property.
- **Risk Mapping, Assessment and Planning:** Thurston County, in partnership with other local cities and the Federal Emergency Management Agency, update flood maps and provide tools to assist the community with reducing its flood and earthquake hazards. Thurston County has hosted a series of public meetings to solicit feedback on studies for the Deschutes River and Coastal Floodplains. In the fall of 2017, Thurston County and FEMA hosted a Risk MAP workshop to inform the greater region about flood hazards. In 2019, Thurston County held a public meeting in Rochester to review the Special Flood Hazard Area.
- **Hazards Mitigation Plan Update:** In 2023, Thurston County adopted an update to the multi-jurisdictional Hazards Mitigation Plan for the Thurston Region . This plan included public outreach activities including a GIS Hazards Story Map, several public meetings, a project website, press releases, news article, and social media.
- **Executive Seminars for Disaster Recovery:** Thurston County Emergency Management in partnership with the Emergency Management Council hosted a series of workshops to engage elected officials, city managers, department directors, and emergency planners on topics such as hazards, emergency management, or disaster recovery planning. These workshops are intended to strengthen local government relationships and prioritize recovery planning efforts in the region. The first workshop

focused on Thurston County flood hazards and mitigation planning. Neighboring jurisdictions are among the county's most important public stakeholders.

- **Repetitive Loss Area Analysis and Community Outreach:** Thurston County performs an annual analysis of repetitive loss areas to identify properties susceptible to repetitive flooding and provides the community members with more specific guidance on how to reduce flood damage. The county notifies potentially affected property owners or residents with letters and offers on-site technical assistance visits to supply site-specific guidance.
- **Community Planning Public Engagement:** Community Planning staff have developed more intensive work with the public through their Education and Outreach team, focusing on attending community events, such as cultural fests, holiday events, and even farmer's markets to meet the public where they are more willing to be. Staff attend with flyers and engagement materials about community planning, including the CRS and Flood Hazard Mitigation Plan. Staff have also used social media to increase connection opportunities to members of the public who are less likely to be at in-person events.

Discussion: Thurston County performs a variety of flood public information resources and services. The FPC observed that while there are many ongoing flood education and outreach activities, most are coordinated and publicized by a single department and may benefit from greater inter-departmental coordination. Recent updates to the county website have improved the search function and ease of access to multiple sources of vital flood information within the county, but consolidation efforts would further improve public access to flood information.

References

Thurston County Drainage Design and Erosion Control Manual (DDECM)

Hazard Mitigation Plan for the Thurston Region. 2023. Thurston Regional Planning Council,

Thurston County Comprehensive Plan. 2025. Thurston County.

DRAFT



Source: Thurston Regional Planning Council (TRPC) 2017 Flood Planning Committee Meeting

CHAPTER 4

Plan Process and Development

4.0 Introduction

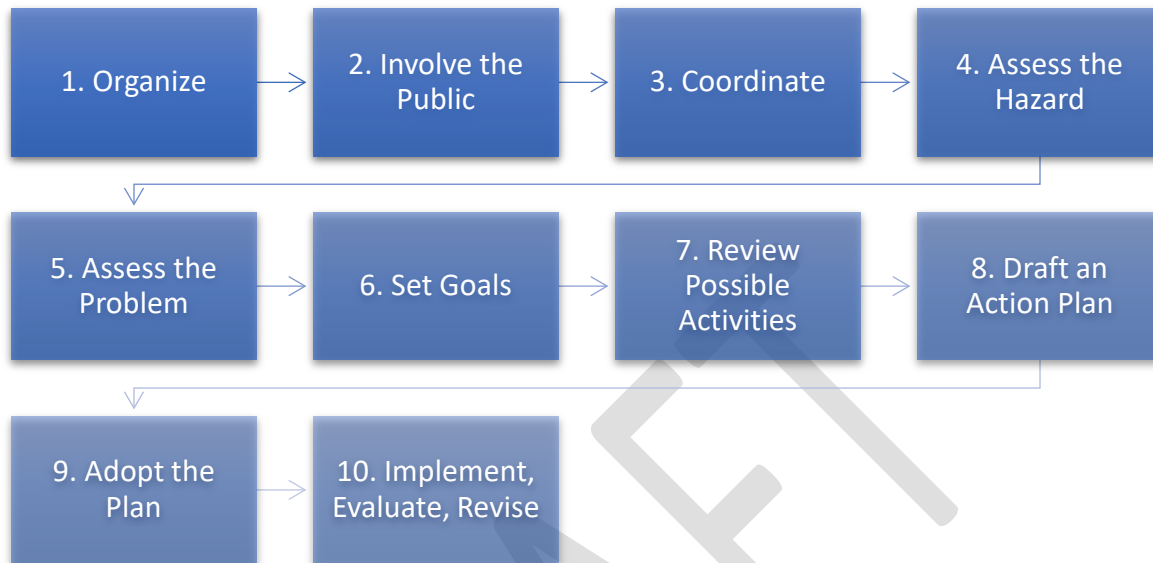
Chapter 4 describes the process for developing this plan, including who was involved and how it was prepared. It documents public engagement activities and describes how the Flood Planning Committee (FPC) helped to shape the plan.

4.0.1 Planning Process Overview

This plan was prepared following the Community Rating System (CRS) 10-Step planning process outlined in Section 510, Floodplain Management Planning, in FEMA's 2017 CRS Coordinator's Manual. Figure 4.1 illustrates how Thurston County performed the steps. The CRS planning process offers Thurston County a systematic approach to engage the community and build support to develop an effective flood mitigation strategy and fulfill CRS

participation requirements. The CRS planning process is similar to the Disaster Mitigation Act planning requirements in 44 CFR Section 201.6 for all-hazards mitigation plans.

Figure 4.1: Overview of 10-Step Community Rating System Planning Process



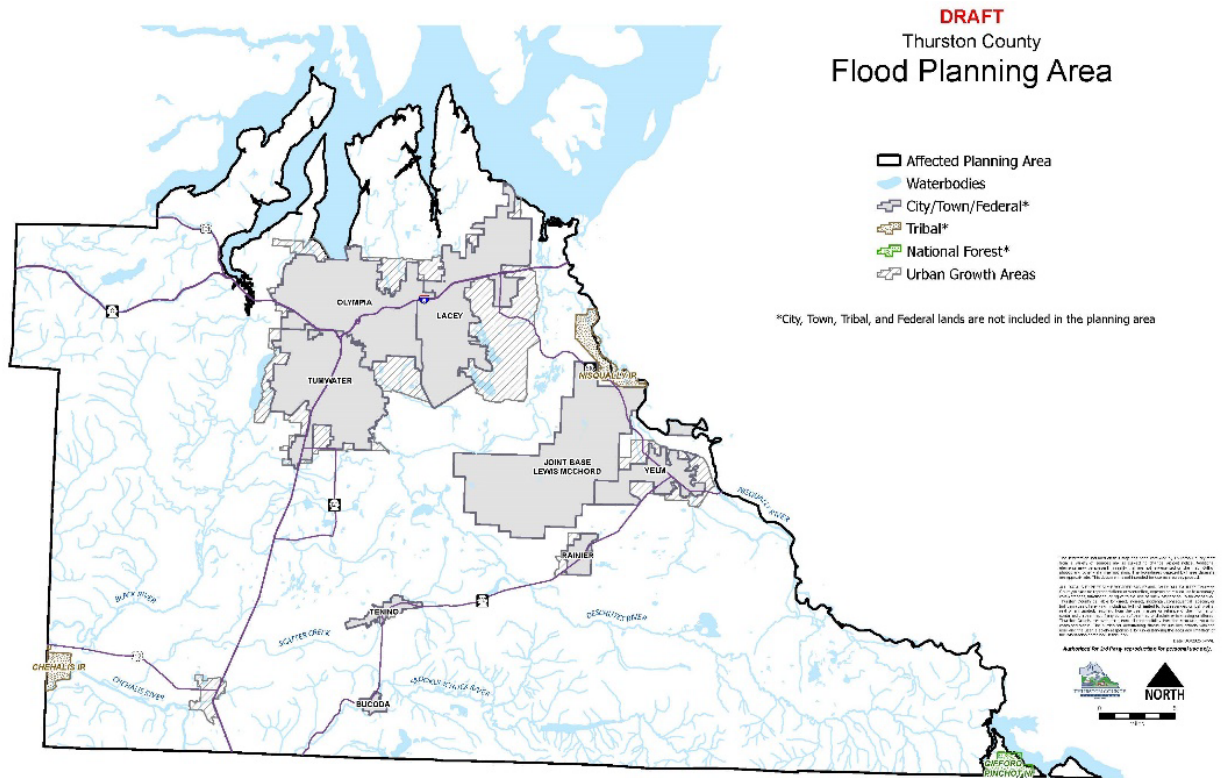
4.0.2 Plan Funding

Thurston County Storm and Surface Water Utility, a part of the Water Resources Division of the Public Works Department funded this plan update with Thurston County Community Planning and Economic Development staff led the update, process, and Flood Planning Committee. For the 2025 update to the Flood Hazard Mitigation Plan, Thurston County Community Planning and Economic Development managed the plan update process.

4.0.3 The Planning Area

The Thurston County Flood Hazard Mitigation Plan covers all of Thurston County. However, the plan only has jurisdiction over the unincorporated portions Thurston County, including the urban growth areas. It also does not address federal lands such as the Department of the Interior (Billy Frank Jr. Nisqually National Wildlife Refuge and its units) or Department of Defense (Joint Base Lewis-McChord). Neither does it address Tribal owned lands of the Nisqually Indian Reservation or the Confederated Tribes of the Chehalis Reservation. The mitigation initiatives only affect unincorporated areas of the county, unless otherwise noted in the details of the mitigation initiatives in Chapter 3. The areas shown in white on Map 4-1 illustrate the affected planning area.

Map 4-1: Flood Planning Area



Source: Thurston County GeoData. See Appendix E for Full-Size Maps.

4.1 Guiding Principles

The Guiding Principles reflect Thurston County’s flood planning values and continuing commitment to making the county a safer and more flood resilient community. These principles were originally carried over from the 2012 Flood Hazard Mitigation Plan (2012 FHMP) and guided those involved with this plan update. They drove the development of the plan by explaining the importance of educating and engaging the public about flood hazards, how the plan supports local decision making, complies with federal requirements, encourages coordination across jurisdictions, and identifies actions to reduce losses. Both the FPC and staff adhered to these principles throughout the plan update process. The five guiding principles are:

1. **Provide a methodical approach to flood hazard planning that can integrate with other planning mechanisms that enhance or support floodplain management** – The process identifies vulnerabilities to future flood events and proposes a range of mitigation initiatives necessary to avoid or minimize those vulnerabilities. Each step in the planning process builds upon the previous, providing a high level of assurance that each of the mitigation initiatives proposed by the FPC has a valid basis and priority for implementation.
2. **Enhance the public’s awareness and understanding of the flood hazard** – This plan contains data and information that can be used to enhance public awareness of the flood hazards that threaten the county. This information offers community members an understanding of each recent flood event’s significance, and how the hazards are likely to impact or threaten the public health and safety, vitality of businesses, and the future operations of important institutions. The process provided opportunities for public involvement and information. This plan update reached out to neighboring municipalities, special districts, other relevant stakeholders, as well as state, federal, and tribal governments.
3. **Create a decision-making tool for policy and decision makers** – This plan provides basic information needed by managers and leaders of Thurston County government, business and industry, community associations, and other key institutions and organizations to take actions to address vulnerabilities to future floods. It also introduces specific projects and programs that are needed to eliminate or minimize those vulnerabilities. The mitigation actions in this plan were reviewed by the FPC to assess their benefits and costs, and were prioritized for implementation.
4. **Promote compliance with state and federal program requirements** – At a minimum, local hazard mitigation plans must satisfactorily comply with the federal requirements in 44 CFR Section 201.6 to receive federal mitigation assistance program grants. This plan must also receive the credit necessary and meet the basic CRS planning requirements for Thurston County to maintain a Class 5 or better rating.

5. **Ensure inter-jurisdictional coordination on all floodplain management activities** – The planning process aims to ensure that the county coordinates with other organizations and governmental agencies to review and coordinate proposals for mitigation initiatives. This approach creates a high level of confidence that the initiatives proposed by Thurston County will, when implemented, be compatible with the interests of adjacent jurisdictions and unlikely to duplicate or interfere with other’s mitigation initiatives.

4.2 The Flood Planning Committee (FPC)

The county formed the Flood Planning Committee (FPC) to shape the development of this plan. The FPC was charged with providing Thurston County guidance and advice on the following planning steps:

- Step 4 – Assess the hazard
- Step 5 – Assess the problem
- Step 6 – Set goals
- Step 7 – Review possible activities
- Step 8 – Draft an action plan

With six of its members representing the community, the FPC is a major component of the plan’s public outreach strategy. Early in the planning process, FPC guidelines were established that identify the committee’s composition, purpose, and expectations.

Candidates for FPC membership were contacted and recruited to obtain representation from across the community. The FPC is composed of community members, other stakeholders from within the planning area, and key Thurston County staff (Table 4.1). Four of the FPC members served in a steering committee role on previous FHMP planning processes.

Table 4.1 FPC Members

NAME	ROLE	AFFILIATION
Howard Glastetter	Community Representative	Community Member: Nisqually Area
Calvin Bray	Stakeholder	Chehalis Tribe
Kat Dickey	Stakeholder	Office of the Chehalis Basin ECY
Tris Carlson	Community Representative	Community Member: NE Thurston County; Aquaculture
George Walter	Stakeholder	Nisqually Tribe
Lorraine Barnette	Community Representative	Community Member: Rochester Area
Amelia Schwartz, Project Lead	Associate Planner, CRS Coordinator	Thurston County Community Planning
Mark Biever	Water Resources Specialist III, Water Resources	Thurston County
Tim Rubert/Abbie Adams	Building Services Manager, Senior Planner, Permitting/Inspection	Thurston County Community Planning
Miriam Villacian	Senior Planner, Community Engagement	Thurston County Community Planning
Emily Schoendorf	Hazard Mitigation and Recovery Coordinator	Thurston County Emergency Services
Shannon Peterson	Water Resources Utility Planner	Thurston County Public Works

2025 Thurston County Flood Plan Committee Members

4.2.1 FPC Meetings

The 2025 FPC convened five meetings between January and May 2025 (Table 4.2), at the Thurston County Atrium, as well as virtually. All meetings were open to the public and the meeting schedule was published in advance on the project website and shared at the first public meeting on January 28, 2025. Each meeting provided opportunities for public comment, in addition to the public comment portal accessible through the plan webpage. Throughout the planning process, correspondence with the workgroup members was maintained by email and all the meeting agendas, materials, and meeting notes were posted on the project website.

The FPC was actively engaged throughout the planning process and provided direction to shape the Goals and Objectives, , and the Mitigation Strategies, including establishing the 2025 priority of the plan’s initiatives, and updating the draft action plan.

Table 4.2: 2025 FPC Meetings

Meeting	Date	Agenda Topics
1	January 28	Introductions, Overview of Planning Process, FPC Guidelines, Meeting Schedule. Group Discussion: "Assess the Hazard"
2	February 25	Group Discussion: "Assess the Problem"
3	March 25	Group Discussion: "Set Goals"
4	April 22	Group Discussion: "Review Possible Activities" and Action Plan Review
5	May 27	Group Discussion: "Draft an Action Plan" and Prioritization

4.3 The Plan Development Team (PDT)

A team of Thurston County staff led the development and update of this plan (Table 4.3). The PDT was responsible for overall plan development including project management, interjurisdictional coordination, production, draft review, and public outreach activities. It was also involved with the technical elements of the plan including research, data collection and analysis, and mapping.

Thurston County Water and Climate Planning Thurston County Water and Climate Planning Team is a division within the Community Planning Department. The team performs a wide array of activities to protect the health of streams, lakes, and the Puget Sound including:

- Provides technical assistance and other services to the community on a variety of flooding issues.
- Develops and maintains data and modeling programs that enable the county to assess its flood risks and inform its development regulations.
- Assists planners with data necessary to assess flood-prone areas and develop models to predict flood levels.

Assists in developing climate models used to determine flood risks for stormwater facilities and predict changes in climate that may affect timing and severity of floods. Assists county departments with engineering design for culverts and stormwater infrastructure.

Provides weather, groundwater, and surface water data to aid in flood tracking, stormwater design, and habitat management.

Thurston County Community Planning

Thurston County's Community Planning Department oversees all county current- and long-range planning activities including permitting, housing and community development, zoning, building codes, habitat conservation plans, and code enforcement. Its mission is to plan for sustainable land use and development within the unincorporated areas of Thurston County so that residential and business communities can thrive within a healthy

To learn more about CRS categories, read:

Chapter 3: Mitigation Strategy: Goals, Objectives, and Initiatives

environment. Because of its responsibility for land use permitting and comprehensive planning these two divisions of the Community Planning Department plays a key role in supporting the county's participation in flood hazard mitigation including:

- Oversee all permitting and land use activities in the county's special flood hazard areas.
- Code enforcement
- Maintaining flood maps and elevation certificates.
- Interaction with the public at the permit assistance center and in ongoing planning project public meetings, the RISK MAP process, and other community events.
- Coordinating CRS verification and recertification documentation and processes.

Community Planning staff represent expertise in these flood hazard mitigation categories: preventive measures, property protection, and natural resource protection.

Thurston County Emergency Services

The Emergency Management division of Emergency Services oversees all emergency management functions for the county, with primary responsibility for mitigation, preparedness, response, and recovery planning and coordination activities. Thurston County Emergency Management plays a lead role in coordinating flood mitigation activities for unincorporated Thurston County and serves as the county's primary applicant for federal mitigation grant programs. The division is responsible for monitoring flood conditions and notifying the public about emergencies. Emergency Management has coordinated county efforts to acquire, elevate, or relocate structures impacted by flooding. The division has coordinated Thurston County's participation in the RISK MAP process, plans and coordinates the Thurston County Emergency Preparedness Expo, and publishes and distributes the annual Thurston County Flood Bulletin. For these activities, Emergency Management is a key partner in the county's flood hazard mitigation and CRS programs. Emergency Management staff offer expertise in multiple flood mitigation categories: property protection, emergency services, and public information.

Thurston County Public Works

The Thurston County Public Works Department (PWD) consists of multiple divisions that support floodplain management activities in the county including engineering design, and construction of the county's public infrastructure; property acquisition; surveying; and road maintenance and operations. The Development Review division of PWD is responsible for inspecting all land use projects to ensure compliance with the county's Road Standards, Drainage Design and Erosion Control Manual, Utility Ordinances, grading requirements of the Building Code, and other county ordinances. The maintenance, repair, and reconstruction of county roads, bridges, and culverts is a major component of reducing flood problems and is essential for providing safe routes for people, goods, and services 24 hours a day, seven days

a week. PWD also maintains and develops parks and recreation facilities; partners with the Thurston County Sheriff's Office for coordinating road closures, detour routes, and evacuation orders; takes a lead role in removing emergency debris following a disaster and maintaining the county's single levee on the Nisqually River. PWD staff provides expertise for the following flood hazard mitigation categories: property protection, natural resource protection, emergency services, and structural projects.

Table 4.3 2025 PDT Members

The PDT project leads from Thurston County coordinated throughout the plan review process to organize the FPC and meeting agendas, prepare for public outreach, review data resources, and coordinate the development activities of the draft and final plan.

MEMBER	TITLE	DEPARTMENT
Ashley Arai	Director	Community Planning & Economic Development
Mark Biever	Water Resources Specialist III	Community Planning & Economic Development
Jade Cooley	Water Resources Specialist II	Community Planning & Economic Development
Kevin Hansen	Hydrogeologist	Community Planning & Economic Development
Tim Rubert	Building Services Supervisor	Community Planning & Economic Development
Larry Schaffner	NPDES Coordinator	Community Planning & Economic Development
Emily Schoendorf	Emergency Management Coordinator	Emergency Services
Amelia Schwartz	Associate Planner, CRS Coordinator	Community Planning & Economic Development

4.4 Coordination with Planning Partners

4.4.1 Partner Contacts and Notifications

Opportunities for involvement in the planning process were extended to neighboring communities, local and regional agencies involved in flood hazard mitigation, agencies with authority to regulate development, businesses, and other private and nonprofit interests (CRS Step 3). At the beginning of the planning process, the Thurston County Community Planning department updated the public website and created a public StoryMap to inform stakeholders and the public about the upcoming plan update process. Planning staff also reached out to inform stakeholders about joining the FPC in 2025. The partners were invited to attend the public meetings, provided a link to the project website, and encouraged them to contact the lead project staff to share ideas, concerns, or information and data that would support the county's flood plan. The partners were also invited to review and submit comments on the draft plan. During the plan update process the public webpages were updated, and email communications were sent directly to stakeholder agencies and organizations (Figure 4.1) and to a email list of subscribers that was publicly available to join.

Figure 4.1 Flood Plan Coordination Partners

Tribal Partners

- Confederated Tribes of the Chehalis Reservation
- The Nisqually Indian Tribe
- The Squaxin Island Tribe

Regional Partners

- Black Hills Audubon Society
- Capital Land Trust
- The Chehalis River Basin Flood Authority
- Office of the Chehalis Basin
- Chehalis Basin Partnership
- League of Women Voters of Thurston County
- The Nisqually Land Trust
- The Nisqually River Council
- Sierra Club - South-Sound-Group
- South Puget Sound Salmon Enhancement Group
- South Sound Military Community Partnership
- Thurston Conservation District
- Thurston Regional Planning Council
- Habitat for Humanity
- Thurston Climate Action Council
- Rochester Organization of Families

Business, Economic Development, and Utility Partners

-
- Olympia Master Builders
- Port of Olympia
- Tacoma Public Utilities
- Thurston County Public Utilities District #1
- Thurston County Realtors Association
- TransAlta USA Inc.
- Intercity Transit
- LOTT Clean Water Alliance
- Thurston County Economic Development Council
- Puget Sound Regional Council
- Puget Sound Energy
- Grand Mound - Rochester Chamber of Commerce

Federal Partners

- Federal Emergency Management Agency Region X
-
- Joint Base Lewis-McChord
-

State Partners

- Washington State Department of Ecology
- Washington Fish and Wildlife
- Washington State Military Department – Emergency Management Division
- Washington State Department of Transportation

Neighboring Counties

- Grays Harbor County
- Lewis County
- Pierce County

Towns and Cities

- Town of Bucoda
- City of Lacey
- City of Olympia
- City of Rainier
- City of Tenino
- City of Tumwater
- City of Yelm
- City of Centralia

Fire Districts

- West Thurston Regional Fire Authority (Fire Districts 1 and 11)
- South East Thurston Regional Fire Authority (Fire Districts 2 and 4)
- Lacey Fire District
- McLane and Black Fire Districts (Fire Districts 5 and 9)
- East Olympia Fire District (Fire District 6)
- South Bay Fire District (Fire District 8)
- South Thurston Fire and EMS
- Griffin Fire District (Fire District 13)
- Bald Hills Fire District (District 17)
-

4.5 Public Involvement

Broad public participation in the planning process helps ensure that diverse points of view about the planning area's needs are considered and addressed. It also affords community members an opportunity to learn about:

- Floodplains and other flood zones, and if they might live in one
- Flood hazards, and how they may impact personal property and safety
- Steps individuals can take to protect their property and reduce their losses
- What types of land use activities and construction is permitted in areas that frequently flood
- Flood insurance, and who should acquire it

The near- and long-term resiliency of the community is important to people who live and work in Thurston County. Their involvement in the planning process helps shape the county's priorities and builds support for flood mitigation strategies. Thurston County engaged the public in a variety of ways including a project website, repetitive loss area letters to connect residents with flood information and resources, press releases and social media, an online interactive story map, public meetings, and an opportunity to review and comment on the draft plan before adoption. Beginning in 2024, Community Planning created informational flyers that were brought to community events and Planning Commission meetings to inform the public about the upcoming plan update.

4.5.1 Project Website and Social Media

Thurston County Community Planning developed a project website (<https://www.thurstoncountywa.gov/departments/community-planning-and-economic-development-cped/community-planning/cp-floods>) early in the planning process. It was maintained throughout the project. Website information and links included:

- Updates on project events
- Link to FPC meeting agendas, materials, and notes page
- Staff contact information
- Types of flooding and flood hazards
- CRS Program background information
- Links to Thurston County's flood resources including plans, studies, codes, and maps
- Flood survey and results
- Interactive story map
- Draft and Existing Plan
- Registration for project updates

- Road closure information
- Rainfall & water level data

The PDT coordinated with other planning partners to post project event details on social media. Social media sites provided opportunities to reach community members who typically don't follow local government planning activities. Facebook and Instagram were used to promote awareness of the update, and announcements for the public comment period.

4.5.2 Story Map

Community Planning developed an online Geographic Information Systems (GIS) story map for the flood plan update process. The story map walked viewers through the plan update, committee meetings, resources to review and comment on the draft plan, flood hazards in the county, setting up hazard alerts, and flood insurance discounts, as well as an interactive flood hazard map that users could operate to view the flood zones, floodways, and high groundwater hazard areas in the county.

4.5.3 Thurston County Flood Hazards Community Survey and Online Engagement

The community was encouraged to answer a 19-question online community flood hazards survey in 2017. The survey included questions about:

- Where people live and their experiences with flood impacts
- Concerns about flood hazards and future flooding
- Flood insurance coverage
- The CRS program
- Property protection
- Preparedness
- Need for special assistance during flood emergencies
- Preference for county flood mitigation activities
- Flood education and outreach

The survey results were published on the TRPC project website. Results were evaluated and shared with the members of the 2017 PDT to assess the community's understanding of flood hazards. The 2025 update included an open comment portal beginning in January 2025 for members of the public to submit comments or suggestions about the plan and flooding in Thurston County. The comment portal stayed open through the Board of County Commissioners review and decision in summer 2025.

4.5.4.1 Results

Three hundred and thirty (330) participants completed the 2017 survey. While not a statistically significant response rate, it does offer perspective on community members' understanding of flood hazards. All the survey comments are shown in Appendix C. The summary of results for the Thurston County Flood Hazards Community Survey follows.

DRAFT

Are you impacted by flooding in Thurston County?

High stream and river flows, high groundwater (temporary ponding) from heavy rains, and stormwater over roadways and urban areas are just a few of the sources of flooding in Thurston County that pose risks to people, property, and businesses.

Thurston County is updating its Flood Hazard Mitigation Plan. The plan will identify and prioritize long-term strategies to lessen the impacts of floods. We need to hear from residents and business owners about how flooding might affect you. The county's Flood Planning Committee wants to learn what you are doing and what you think the county should do to reduce flood hazards.

Please take a few minutes to answer the 19 questions that follow. Your participation is very important and will help shape the plan. No personal information is collected, so candid feedback is encouraged!

1. What watershed Do you live in?

	Outside City Limits	Inside City Limits	TOTAL	PERCENT
Black River	15	1	16	4.8
Budd Inlet	17	60	77	23.3
Chehalis River	13	0	13	3.9
Deschutes - Lower	13	25	38	11.5
Deschutes - Middle	3	0	3	0.9
Deschutes - Upper	0	1	1	0.3
Eld Inlet	16	1	17	5.2
Henderson Inlet	31	16	47	14.2
McAllister	61	7	68	20.6
Nisqually	25	6	31	9.4
Skookumchuck River	0	2	2	0.6
Totten Inlet	6	2	8	2.4
West Capitol Forest	2	0	2	0.6
Outside of Thurston County	2	0	2	0.6
Blank	5	0	5	1.5
TOTALS	209	121	330	100.0

2. Do you live in a floodplain or area that experiences flooding?

	PERCENT
Yes	24.4
No	57.3
Not sure	18.3
TOTAL	328

3. Do you own or operate a business, or work in an area that experiences flooding?

	PERCENT
Yes	10.4
No	86.6
Not sure	2.75
TOTAL	328

4. If you live or work in an area that is subject to flooding, how severe were the impacts to your property/business from past floods (consider the worst event you experienced)?

	PERCENT
My property does not flood	54.5
I'm aware my property/business may flood, but I haven't experienced any flooding yet	12.1
Minor	14.8
Moderate	13.8
Severe	4.8
TOTAL	290

5. Mark all flood impacts that you have experienced in Thurston County (select the best answer for each question).

Required to temporarily evacuate your home		PERCENT
Yes	7	2.6
No	241	87.8
Not yet, but I'm concerned that more severe flooding could cause this	26	9.5
TOTAL	274	
Required to temporarily close or suspend business		PERCENT
Yes	9	3.5
No	238	91.2
Not yet, but I'm concerned that more severe flooding could cause this	14	5.4
TOTAL	261	
Caused property damage		PERCENT
Yes	67	23.6
No	185	65.1
Not yet, but I'm concerned that more severe flooding could cause this	32	11.3
TOTAL	284	
Disrupted normal transportation patterns		PERCENT
Yes	95	33.9
No	153	54.6
Not yet, but I'm concerned that more severe flooding could cause this	32	11.4
TOTAL	280	

54 other comments were submitted (see Appendix C)

6. How concerned are you with each of the following flood types or flood-related hazards in Thurston County?

River Flooding		PERCENT	Groundwater Flooding		PERCENT
Not concerned	78	26.2	Not concerned	60	20.1
Somewhat concerned	145	49.5	Somewhat concerned	144	48.2
Very concerned	50	17.1	Very concerned	59	19.7
Extremely concerned	20	6.8	Extremely concerned	36	12.0
TOTAL	293		TOTAL	299	
Puget Sound Coastal Flooding		PERCENT	Urban/Stormwater Flooding		PERCENT
Not concerned	124	42.3	Not concerned	88	29.7
Somewhat concerned	113	38.7	Somewhat concerned	116	39.2
Very concerned	44	15.1	Very concerned	68	23.0
Extremely concerned	11	3.8	Extremely concerned	24	8.1
TOTAL	292		TOTAL	296	
Stream bank Flooding		PERCENT	Landslide Hazards		PERCENT
Not concerned	77	26.6	Not concerned	69	24.0
Somewhat concerned	125	43.3	Somewhat concerned	129	44.8
Very concerned	59	20.4	Very concerned	68	26.6
Extremely concerned	28	9.7	Extremely concerned	22	7.6
TOTAL	289		TOTAL	288	
Catastrophic dam failure		PERCENT			
Not concerned	156	55.3			
Somewhat concerned	80	28.4			
Very concerned	29	10.3			
Extremely concerned	17	6.0			
TOTAL	282				

7. Do you have flood insurance?

	PERCENT
Yes	10.4
No	78.6
Not sure	11.0
TOTAL	328

8. If you do NOT have flood insurance, why not? (mark all that apply)

		PERCENT
I don't need it, my property has never flooded	132	50.8%
I don't need it, my structures are located on high ground	138	53.1%
It is too expensive	47	18.1%
I'm not familiar with it/don't know about it	19	7.3%
I'm unable to obtain flood insurance	4	1.5%
I don't believe I qualify for coverage	16	6.2%
I believe it will negatively affect the value of my property	14	5.4%
TOTAL	260	

9. What is your awareness about Thurston County's work on reducing flood damage, resulting in a 40% percent reduction in flood insurance premiums for people in the 100-year flood plain and a 10% reduction for people living outside the 100-year plain?

		PERCENT
Unaware	239	77.9
Somewhat aware	49	16.0
Aware	14	4.6
Very aware	5	1.6
TOTAL	307	

10. How important is it to you that the county continues efforts to maintain a flood insurance discount for affected property owners?

		PERCENT
Very important	151	49.7
Important	115	37.8
Not important	38	12.5
TOTAL	304	

11. What have you done to protect your property from flooding (mark all that apply)?

		PERCENT
The valuables on my property are not affected by flooding	187	80.0
Elevated home	18	7.7
Raised, relocated, or protected heating, ventilation, and air conditioning systems	8	3.4
Raised, relocated, or protected electrical panel	11	4.7
Protected wellhouse/pumphouse equipment Installed	13	5.6
stormwater drainage improvements	39	16.7
Provided safe or elevated locations(s) for livestock and pets	13	5.6
TOTAL	234	

65 other comments were submitted (see Appendix C)

12. What do you do to prepare for flooding (mark all that apply)?

		PERCENT
The valuables on my property are not affected by flooding	178	73.4
I have sandbag supplies on hand	13	5.4
I have a pump to remove water from my crawlspace or basement	22	9.1
I have a backup generator for power outages	93	38.4
TOTAL	242	

32 other comments were submitted (see Appendix C)

13. Do you have a disability or other needs that will require you to receive assistance from others in the event of a major flood event?

		PERCENT
Yes	28	9.5
No	268	90.5
TOTAL	296	

14. Who can you rely on to provide aid during a flood event to help you ensure your safety or to evacuate (mark all that apply)?

		PERCENT
My property does not flood	179	60.5
I don't need any help	71	24.0
I can rely on nearby family	67	22.6
I can rely on neighbors	95	32.1
I will need to rely on emergency providers by calling 9-1-1	29	9.8
I don't have anyone I can rely on to help me during an emergency	8	2.7
Other (please describe)	22	7.4
TOTAL	296	

22 other comments were submitted (see Appendix C)

15. Think about potential future flood impacts to public or private infrastructure, services, or the environment. What do you believe is the level of risk for each of the following impacts around your neighborhood?

Disruption or damage to transportation infrastructure such as roads and bridges		PERCENT	Disruption or delays to fire, emergency medical service, or law enforcement response		PERCENT
Low risk	119	41.0	Low risk	127	44.1
Moderate risk	122	42.1	Moderate risk	113	39.2
Very High risk	49	16.9	Very High risk	48	16.7
TOTAL	290		TOTAL	288	
Disruption to schools, hospitals, and other essential facilities		PERCENT	Contamination of streams, rivers, wetlands, ponds, and lakes		PERCENT
Low risk	148	51.9	Low risk	70	23.7
Moderate risk	105	36.8	Moderate risk	129	43.7
Very High risk	32	11.2	Very High risk	96	32.5
TOTAL	285		TOTAL	295	
Interruption of or damage to wastewater treatment facilities or septic systems		PERCENT	Disruption of the supply and delivery of fuel, food, supplies, and other commodities		PERCENT
Low risk	92	31.4	Low risk	132	46.2
Moderate risk	123	42.0	Moderate risk	117	40.1
Very High risk	78	26.6	Very High risk	37	12.9
TOTAL	293		TOTAL	286	
Impacts to my neighbors' property		PERCENT			
Low risk	149	51.6			
Moderate risk	78	27.0			
Very High risk	62	21.5			
TOTAL	289				

15 other comments were submitted (see Appendix C)

16. What types of projects, programs, or services do you think Thurston County should be offering/performing to protect life and reduce property losses from flood hazards? Please rank each option as a high, medium, or low priority.

Identify and prepare suitable locations for emergency shelters for people who are flooded out of their homes		PERCENT	Upgrade roads, bridges, culverts, utilities, and stormwater facilities		PERCENT
Low	58	21.09	Low	27	9.82
Medium	131	47.64	Medium	106	38.55
High	86	31.27	High	142	51.64
TOTAL	275		TOTAL	275	
Protect ecological functions of landscapes and waterbodies to minimize impacts of flooding		PERCENT	Collect data and create maps for flood hazard areas to increase understanding and help protect against risks		PERCENT
Low	47	17.09	Low	32	11.55
Medium	101	36.73	Medium	133	48.01
High	127	46.18	High	112	40.43
TOTAL	275		TOTAL	277	
Modify zoning codes and development regulations to restrict certain development in flood prone areas		PERCENT	Purchase vulnerable properties and keep as open space		PERCENT
Low	43	15.69	Low	96	34.91
Medium	93	33.94	Medium	95	34.55
High	138	50.36	High	84	30.55
TOTAL	274		TOTAL	275	
Offer grant programs or incentives for property owners to elevate homes or protect other structures		PERCENT	Provide public education and resources to residents to enhance flood resiliency		PERCENT
Low	98	35.51	Low	44	16.06
Medium	123	44.57	Medium	119	43.43
High	55	19.93	High	111	40.51
TOTAL	276		TOTAL	274	

17 other comments were submitted (see Appendix C)

17. Do you read the Thurston County Flood Bulletin?

		PERCENT
Yes	77	26.7
No, because I don't receive it	186	64.6
No, because I don't have time	6	2.1
No, because it is not useful to me	19	6.6
TOTAL	288	

18. How useful is the Flood Bulletin to your household or business?			
General information about flood plains and the types of flooding		PERCENT	
Very useful	14	18.18	
Useful	53	68.83	
Not useful	7	9.09	
Don't know	3	3.90	
TOTAL	77		
Information about understanding your flood risks		PERCENT	
Very useful	9	12.0	
Useful	51	68.0	
Not useful	14	18.7	
Don't know	1	1.3	
TOTAL	75		
Information about staying informed about flooding		PERCENT	
Very useful	14	18.7	
Useful	51	68.0	
Not useful	9	12.0	
Don't know	1	1.33	
TOTAL	75		
Information about preparedness, planning, necessary supplies, and responding to floods		PERCENT	
Very useful	17	22.7	
Useful	42	56.0	
Not useful	13	17.3	
Don't know	3	4.0	
TOTAL	75		
Essential contact information		PERCENT	
Very useful	15	20.3	
Useful	44	59.5	
Not useful	9	12.2	
Don't know	3	8.1	
TOTAL	71		
Steps and tips to prevent flooding and protect property		PERCENT	
Very useful	11	14.67	
Useful	51	68.00	
Not useful	11	14.67	
Don't know	2	2.67	
TOTAL	75		
Information about flood insurance		PERCENT	
Very useful	10	13.5	
Useful	36	48.7	
Not useful	22	29.7	
Don't know	6	8.1	
TOTAL	74		
Information about subscribing to "AlertSense," the county's emergency alert and notification system		PERCENT	
Very useful	20	26.7	
Useful	34	45.3	
Not useful	14	18.7	
Don't know	7	9.3	
TOTAL	75		
Information about evacuating farm animals		PERCENT	
Very useful	7	9.6	
Useful	18	24.7	
Not useful	37	50.7	
Don't know	11	15.1	
TOTAL	73		

19. What else would you like to share about flood hazards in Thurston County?
98 other comments were submitted (see Appendix C)

4.6 Public Meetings

In addition to each meeting of the Flood Planning Committee being open to the public, Community Planning staff also attended to inform and engage the public at several community gatherings and public meetings before the planning process, including farmer's markets and community festivals, the Emergency Preparedness Expo, and the Planning Commission work sessions. Staff were available for questions or comments, and invited the public to engage with the upcoming plan update.

4.7 Final Draft Plan Public Review and Comments

In addition to the early drafts for the 2025 update and previously-adopted 2017 plan being available to the public starting online starting at the beginning of the planning process, Thurston County published a draft plan on the project website and the BoCC website for a two-week public comment period from 8:00 a.m. September 5 to 5:00 p.m. September 17, 2025. Public comment notifications were distributed by email, social media, and a press release. Copies were made available upon request. An online comment form with instructions and staff contact information accompanied the plan. Written public comments were accepted by comment form, email, or mail. Appendix C contains all comments received. County staff shared those comments with the Thurston County Board of County Commissioners, highlighting any changes to the draft plan made in response to comments.

4.8 Thurston County Board of County Commissioners Plan Review and Adoption Activities

To be updated after adoption.



Source: Thurston Regional Planning Council (TRPC)

CHAPTER 5

Plan Implementation and Maintenance

5.0 Keeping the Plan Current

Comprehensive flood hazard management strategies require continuous coordination and cooperation. To achieve the plan's goals and objectives, Thurston County's mitigation activities must keep pace with other plans, policies, funding opportunities, and changing conditions or emerging threats.

Science, technology, and best practices for creating disaster resilient communities are expanding. Thurston County has continued to update the Thurston County Flood Hazard Mitigation Plan since it was first adopted in 1999. The county continues to periodically review this plan to add or adjust flood mitigation strategy actions – to make the county stronger and safer. Partners to the plan will engage to evaluate accomplishments or shortcomings so the county can incorporate lessons learned into long-term mitigation strategies.

This chapter presents a plan maintenance process that includes: (Community Rating System Step 10):

- A section describing the method and schedule of monitoring, evaluating, and updating the mitigation plan over a 5-year cycle
- A process by which local governments incorporate the requirements of the mitigation plan into other planning mechanisms, when appropriate
- A discussion on how the community will continue public participation in the plan maintenance process.

The plan maintenance strategy outlines a formal process that will make the flood hazard mitigation plan an active and relevant document. This allows Thurston County to maintain its eligibility for applicable funding sources and achieves a Community Rating System (CRS) Class 4 or better rating. It includes a schedule for monitoring and evaluating the plan annually and producing an updated plan every five years. The strategy also describes how the county will integrate public participation throughout the plan maintenance and implementation process. It explains how the plan's mitigation strategies will be incorporated into existing planning mechanisms and programs, such as comprehensive land-use planning processes, capital improvement planning, and building code enforcement and implementation. The plan's format allows for section-by-section review and update when new data become available, resulting in a useful plan for policy makers and staff, and one that is clearly understood by the public.

5.1 Plan Implementation

The effectiveness of the flood hazard mitigation plan depends on its implementation and incorporation of its action items into existing local plans, policies and programs. Together, the action items in this plan provide a framework for activities that Thurston County can implement over the next 5 years. County staff and the Flood Planning Committee (FPC) established goals and objectives and prioritized mitigation initiatives they will implement through existing plans, policies, and programs.

While the Thurston County Community Planning & Economic Development Department will assume lead responsibility for overseeing the plan implementation and maintenance strategy, they will share the responsibility for plan implementation and evaluation among all departments identified as leads in Chapter 3's mitigation initiatives.

5.2 Flood Planning Committee (FPC)

The FPC acted as the primary advisory committee, overseeing the plan update and development, and making recommendations on key elements, including the risk assessment, mitigation strategy, and maintenance strategy. The 2017 FPC expressed the need for Thurston County to maintain some form of oversight committee with similar representation to continue serving an active role in the implementation and maintenance activities of this plan. In the plan maintenance strategy, the advisory committee will review the annual progress report and provide input to Thurston County on possible enhancements for consideration during the next update. Keeping the FPC intact will provide a head start on future updates.

For more information about the FPC's role, see:

CHAPTER 4 Plan Development Process

5.3 Annual Progress Report

At its annual meeting, the review committee will, at a minimum, evaluate progress of its individual action plan during a 12-month performance period. This review should be performed prior to Thurston County's annual CRS certification visit. This review should include:

1. Summary of any flood hazard events that occurred during the reporting period and the impact of these events on the planning area
2. Review of mitigation success stories
3. Review of continuing public involvement
4. Brief discussion about why targeted strategies were not completed

5. Re-evaluation of the action plan to determine if the timeline for identified projects needs to be amended (such as changing a long-term project to a short-term one because of new funding)
6. Recommendations for new projects or adjustments to existing mitigation initiatives
7. Review of grant opportunities and other funding options
8. Impact of any other planning programs or initiatives that involve hazard mitigation.

Appendix D contains a template for preparing a progress report. The review committee will provide feedback to Thurston County staff on items included in the template. County staff will then prepare a formal annual report on the progress of the plan. This report should be:

- Posted on the Thurston County’s website on the homepage dedicated to the Flood Hazard Mitigation Plan, flood regulations and information
- Presented to the Thurston County Board of County Commissioners (BOCC) to discuss the progress of mitigation initiatives implemented during the reporting period
- Provided as part of the CRS annual re-certification package

The CRS requires an annual recertification to be submitted by October 15 of every calendar year for which the community has not had a verification site visit. To meet this recertification timeline, county staff will strive to complete progress reports between June and September each year. (Annual progress reporting credited under CRS Step 10).

5.4 Plan Revisions

Thurston County staff may need to revise or amend this plan in the intervening years between the five-year plan update cycle to maintain CRS credit and meet the necessary prerequisites to maintain a Class 4 or better community rating. Other plan revisions may be necessary to better position the county for state or federal flood mitigation grant programs. Such updates may be the result of a review of this plan by FEMA, the Insurance Services Office, or the Washington State Department of Ecology, or the recommendations of the FPC or the Board of County Commissioners.

5.5 Plan Update

Thurston County will update the flood hazard mitigation plan on a 5-year cycle from the date of initial plan adoption (CRS Step 10). Certain triggers may accelerate the cycle to less than 5 years:

- A Presidential Disaster Declaration that impacts the planning area
- A hazard event that causes loss of life
- A comprehensive update of Thurston County Comprehensive Plan

- CRS re-certification requirements may dictate that the plan update in the 5th year be completed as part of the re-certification process and timeline, typically October 15th of each year.

Future updates will not develop a complete new flood hazard mitigation plan, but will, at a minimum, include specific elements:

- The FPC will convene the update process
- The hazard risk assessment will be reviewed and, if necessary, updated using best available information and technologies.

The action plan will be reviewed and revised to account for any initiatives completed, removed, or changed and to account for changes in the risk assessment or new policies identified under other planning mechanisms (such as the comprehensive plan).

- Regulatory agencies and planning partners will be invited to comment on the draft update.
- The public will have an opportunity to comment on the update prior to adoption
- The Thurston County Board of Commissioners will adopt the updated plan

The Thurston County Flood Hazard Mitigation Plan and the Hazards Mitigation Plan for the Thurston Region, are not on the same five-year cycle. Recognizing the challenges of the county being the lone CRS community participating in a multi-jurisdictional all hazards mitigation plan, the county will continue to evaluate options for ensuring the two plans are consistent and integrating the information from the two plans into each other.

5.5.1 Update Schedule

Flood hazard mitigation planning – a multi-step process – may take between one to two years to complete. County staff should take into account the time required to secure professional services and obtain Board authorization in their planning for future plan updates. If contract professional services are required, the consultant should be retained and the FPC re-activated at least 1-year prior to the target adoption date of October 15. This may require initiating RFP/RFQ processes and obtaining BOCC authorization at least 18 months before the target plan adoption date.

Flood plans are costly to produce. Local funding is scarce. Federal funding to update plans is highly competitive and often insufficient. Securing funding may take a year or more. The county needs to establish work programs and adopt budgets prior to starting work on a plan.



5.6 Continuing Public Involvement

Through its website and well-publicized progress reports, the county residents will continue to learn of the plan's progress. Mitigation Initiative 20 will continue to update the county's website and consolidate a variety of flood resources, creating a useful on-line destination with up to date helpful information. At a minimum, this strategy will include the use of local media outlets within the planning area. Thurston County will also engage the community in FEMA's Risk MAP process, the Emergency Preparedness Expos, the Thurston County Flood Bulletin, and through press releases and social media.

5.7 Incorporation into Other Planning Mechanisms

This plan's information on hazard, risk, vulnerability, and mitigation is based on the best science and technology available at the time. The Thurston County Comprehensive Plan

guides the development of the FHMP and works in parallel to increase the county's resiliency to flooding. Thurston County, through adoption of a comprehensive plan, a Critical Areas Ordinance, and zoning ordinances, plans for the impact and mitigation of flooding. The plan development process provides the opportunity to review and expand on policies in these planning mechanisms. These complementary documents work together to achieve the goal of reducing flood risk exposure. An update to a comprehensive plan may trigger an update to the flood hazard mitigation plan. Mitigation Initiatives 7 and 18 provide the basis for reviewing new data and information that can shape Thurston County's development standards and policies. Other planning processes and programs to be coordinated with the recommendations of the flood hazard mitigation plan can include:

- Hazards Mitigation Plan for the Thurston Region
- Climate Adaptation Plan for the Thurston Region
- Thurston Climate Mitigation Plan
- Thurston County Municipal Codes
- Thurston County Critical Areas Ordinance
- Emergency response plans
- Capital improvement programs
- Community design guidelines
- Stormwater management programs

Some action items do not need regulation. Instead, the county can implement these items through new educational programs, continued interagency coordination, and improved public participation. As relevant information becomes available from other planning mechanisms, the county will incorporate that information via the update process.



Source: Thurston Regional Planning Council (TRPC)

CHAPTER 6

Community Profile

6.0 Introduction

This chapter includes a condensed, but data rich, community profile to describe Thurston County’s geography, population and demographics, development trends, and economy. The county’s population, land use, infrastructure, economy, and government services are unique and provide a context for the portion of the population, community assets, and natural resources exposed to flood hazards. Since managing risk becomes more complex as population increases, the county’s land use authority can minimize new development from locating in flood-prone areas. A larger population results in more people potentially exposed to the effects of flooding. Such a population increase generates greater demand for law enforcement, fire services, public works, emergency management, and other local government and private sector services – especially during disaster events.

Developing strategies, coordinating resources, and increasing public awareness to reduce risk and prevent loss from future flood hazard events is critical to establishing and maintaining disaster resiliency and sustaining the economy.

6.1 Community Profile

6.1.1 Geography

Thurston County, located in Western Washington at the southern end of Puget Sound (see Map 6.1), is the 32nd largest county in the state with a total land area of approximately 734 square miles. While the county has long been part of the ancestral lands of multiple Indigenous Tribes, the county currently contains lands under jurisdiction of three Tribal nations including the Nisqually Indian Tribe's Reservation in the east and the Confederated Tribes of the Chehalis Reservation in the southwest. The Squaxin Indian Tribe's Reservation borders the county in the northwest. The largest U.S. government property is Joint Base Lewis-McChord (JBLM). It occupies a large tract that extends from Pierce County into central eastern Thurston County, and is subject to heavy military training and recreational use. Additional major U.S. government lands include a small area of Snoqualmie National Forest in the southeast corner of the county near Alder Lake and the U.S. Fish and Wildlife Billy Frank Jr. Nisqually National Wildlife Refuge and its Black River Unit. All Tribal and U.S. government lands are excluded from Thurston County's affected flood planning area.

Western Thurston County's Black Hills contains Capitol State Forest's nearly 100,000 acres. While approximately 86 percent of the county's land area is unincorporated and not in Urban Growth Areas, it includes seven cities and towns and two unincorporated communities:

- Town of Bucoda
- City of Lacey
- City of Olympia
- City of Rainier
- City of Tenino
- City of Tumwater
- City of Yelm
- Grand Mound Urban Growth Area (unincorporated)
- Rochester Community (unincorporated)

The county's topography ranges from coastal lowlands to prairie flatlands to the foothills of the Cascades, and plays into the incidence of landslides, floods, and earthquakes. Glacial activity from the county's geologic past left the land dotted with lakes. The northernmost boundary of the county is lined with the shoreline of Puget Sound, with Budd, Henderson, and Eld inlets exclusive to the county. Dana Passage separates Budd and Henderson inlets.

Totten Inlet divides Thurston and Mason counties, and the Nisqually River separates Thurston from Pierce County (see Map 6.2). In Thurston County, four local watersheds flow to the Pacific Ocean basin and five flow to Puget Sound basin. Approximately 43 percent of the county's waters flow into the Pacific Ocean and 57 percent drains to Puget Sound.

The northwest and southeast corners of the county are marked by the Black Hills and the Bald Hills ranging from 1,700 to 3,000-feet. Once thought to be the highest in the county, Larch Mountain and Capitol Peak, in the Black Hills, both exceed 2,650 feet. However, the United States Geological Survey (USGS) discovered that the highest points of elevation in the county are in the extreme southeast corner of the county near Alder Lake. Standing at 2,922 feet, Quiemuth Peak was named in 1993 by the Thurston County Historic Commission in recognition of former Nisqually Chief Quiemuth. Clam Mountain is the second highest point at 2,725 feet.



Source: TRPC

6.1.2 Climate

Thurston County has a marine climate with mild temperatures year-round. In the warmest months, the average high temperature ranges between 70 and 73 degrees. In the coldest months, high temperatures usually hover around 50 degrees (Table 6.1). Like most of Western Washington, Thurston County's weather is characterized by sunny summers and wet winters.

November through January are typically the wettest months of the year with average (mean) monthly rainfall of approximately 7.95 inches between 2013 and 2023. June through August averaged to .89 inches between 2013 and 2023 (Thurston County Water and Climate Planning Division, 2025).

The amount of rain that falls on Thurston County in any given year varies considerably throughout the county. This variation in precipitation across the landscape is significant and it is not typical of other Western Washington counties. It is a result of the county's location between the Olympic and the Cascade mountain ranges and our proximity to the Pacific Ocean and south of Puget Sound. Air currents deliver precipitation directly from the Pacific Ocean and when it encounters higher elevation terrain on the slopes of the Black Hills it begins to rain. Summit Lake in the northern Black Hills received an average annual rainfall of around 79 inches between 2013 and 2023. In contrast, Lake Lawrence south of the City of Yelm received only an average of approximately 37 inches (Thurston County Water and Climate Planning Division, 2025). There are some areas south of Olympia, such as Littlerock and Grand Mound that receive higher amounts of rain than the rest of the I-5 corridor, also due to small variations in terrain and wind patterns.

Table 6.1: Average 60-year Monthly High and Low Air Temperatures (in Fahrenheit)

Month	Average High	Average Low
January	50	27
February	50	31
March	52	36
April	58	41
May	65	46
June	70	52
July	73	57
August	73	57
September	67	50
October	59	40
November	54	32
December	50	26

Source: Olympia Regional Airport NOAA Weather Station. Minimum and Maximum daily averages were calculated by first finding the minimum and maximum daily average for each month 1965-2024, then taking the average of those values.

Table 6.2: Average 60-Year Monthly Rainfall vs. 2022-2024 Actual Rainfall

Month	60-Yr Average	2022	Departure from Avg	2023	Departure from Avg	2024	Departure from Avg
January	7.95	10.74	2.79	3.78	-4.17	9.22	1.27
February	5.29	2.29	-3	3.29	-2	6.1	0.81
March	5.38	6.18	0.8	4.14	-1.24	4.76	-0.62
April	3.63	4.83	1.2	6.65	3.02	2.84	-0.79
May	2.18	4.64	2.46	0.62	-1.56	1.62	-0.56
June	1.7	3.04	1.34	0.87	-0.83	2.46	0.76
July	0.64	0.09	-0.55	0.11	-0.53	0.23	-0.41
August	1.08	0.05	-1.03	0.87	-0.21	1.53	0.45
September	2.19	0.13	-2.06	2.52	0.33	2.05	-0.14
October	4.52	2.54	-1.98	3.67	-0.85	4.1	-0.42
November	7.99	8.07	0.08	6.74	-1.25	7.46	-0.53
December	8.27	8.44	0.17	11.16	2.89	11.24	2.97
Annual Total	50.82	51.04	0.22	44.42	-6.4	53.61	2.79

Source: Thurston County Water and Climate Planning Division, Olympia Regional Airport NOAA Weather Station

6.1.3 Population and Demographics

Thurston County has been one of the fastest growing counties in Washington State since the 1960s, consistently exceeding the state's overall rate of growth. Two factors drive population growth: net migration (people moving in minus people moving out) and natural increases (births minus deaths). Since 1960, in-migration has caused most of the growth. Between 2010 and 2024, an average of approximately 3,650 people moved to Thurston County per year (approximately 82 percent of total growth) according to the Washington State Office of Financial Management and TRPC. While much of this in-migration was likely due to the county's relatively stable economy, the increasing cost of living in the Seattle metropolitan area also played a role as individuals from the metropolitan area looked for ways to reduce escalating costs of living - particularly in housing.

Thurston Regional Planning Council's 2045 population forecast is 383,500, approximately 111,000 more people than lived in the county in 2016. Most future residents will live in the cities and urban growth areas, however the proportion of residents living in unincorporated Thurston County is projected to decrease about 5 percent between 2020 and 2045.

Some populations are at greater risk from hazard events such as floods because of decreased resources or physical abilities. Elderly people, for example, may be more likely to need additional assistance. Research shows that people living near or below the poverty line, elders (especially older single men), people with disabilities, women, children, ethnic minorities, and renters all experience – to some degree – more vulnerability to disasters than the general population (Saulnier et al., 2021; Donoghoe et al., 2023). These vulnerable populations may vary from the general population in risk perception, living conditions, access to information before, during and after a hazard event, capabilities during an event, and access to resources for post-disaster recovery.

Indicators of vulnerability – such as disability, age, poverty, and minority race and ethnicity – often overlap spatially and often in the geographically most vulnerable locations. Detailed spatial analysis to locate areas with higher concentrations of vulnerable community members would help to extend focused public outreach and education to these most vulnerable citizens.

Over 28,000 people in Thurston County live below the poverty level, according to TRPC. Between 1999 and 2023, this group increased by 0.9 percent. Approximately 15 percent of the population has some form of disability and 4.3 percent are reported as speaking English less than “very well.” Local social service agencies note that people tend to underreport these categories. Tables 6.1 through 6.7 show data on selected demographic characteristics of Thurston County residents including age, poverty, race, disability, language, and education. Maps 6.3 and 6.4 show estimates of county population density.

6.1.4 Housing

Historical trends in the number and type of housing units can be observed using decennial U.S. Census Bureau data. These data provide a glimpse of the changing nature of the county over time and the amount of development during the past 50 years. In 1960, Thurston County had 19,888 dwelling units in the cities, urban growth areas, and unincorporated county; since that time, the county has added approximately 110,000 dwelling units, according to TRPC. These units accounted for nearly 82 percent of the county's housing stock in 2010. Tables 6.7 through 6.11 summarize information about housing in Thurston County.

6.1.5 Development Trends

Trends in urbanization provide insight into changes in the county's physical environment over time. The urban landscape is composed of a variety of physical features, including distinctly urban characteristics, such as roads and buildings, and more natural features, such as trees and lawns. As urban landscapes become more predominant, built features replace natural and rural environments. These changes impact a variety of conditions, including the quality of storm and surface water.



Source: TRPC

The cities and the county issued over 11,500 residential construction permits between 2018 and 2023. Of these, over 9,800 were in the cities and urban growth areas and over 1,600 in the rural unincorporated county. Single family permits accounted for approximately 36 percent of permits, multi-family 60 percent, and manufactured housing 3 percent. Table 6.14 and Map 6.5 show housing permit data for this period.

Large-scale change detectable from satellite imagery indicates that approximately 12,200 acres of land were converted from forest, agricultural lands, or areas of grasslands and shrub vegetation to developed landscapes between 1992 and 2016 (TRPC, 2024). According to the 2021 Basin Conditions Report, 6.1% of land cover changed across Thurston County between 2006 and 2015. Causes of the change were primarily due to forestry, tree removal, development, and stream channel migration (TRPC, 2021). Basin or watershed conditions can be impacted by land cover change, altering their habitat or water quality.

Watersheds or basins with impervious land cover of less than 2 percent can be designated as “intact,” and basins with 2-10% impervious land cover are considered “sensitive”. As of 2016,

there were 42 Thurston County basins considered “intact” or “sensitive” between 0% and 10% coverage of impervious surfaces. Most of the rural basins in Thurston County fall under this threshold, although the Chehalis, Nisqually, and Black River basins contain impacted and even degraded areas. Several urban watersheds exceed this level, such as Budd Inlet, with areas considered degraded or very degraded. Basin conditions can be considered degraded with 25% - 40% impervious land cover, and highly degraded over 40% (TRPC, 2021).

Increases in urbanization link directly to increases in impervious surfaces. Parking lots, roof tops, and even compacted lawns all prevent water from returning to groundwater systems and lead to increased runoff. TRPC developed forecasts of impervious area and watershed impacts in the 2021 Basin Conditions Report (TRPC, 2021). While urban or built land cover data represent only one factor that influences stream health, this factor can be used as a prioritizing tool to develop watershed basin plans. Table 6.10 shows land cover and impervious areas by acres within Thurston County. Between 1992 and 2021 Thurston County has increased its impervious surface area by approximately 5,000 acres.



Source: TRPC

6.1.6 Economy

For many decades, Thurston County’s economy has linked with the budget of Washington State – as both an employer and a supplier of contractually-based economic activities. Historically, this kept the county’s unemployment rate several points below the statewide average. Government jobs employ approximately 25% of Thurston County workers (TRPC, 2025). With past declines in state government, the county has worked to expand economic diversity. A diverse economy builds community “immunity” – albeit, not completely – against recessionary forces, and increases the capacity for growing household incomes that supports a larger, more vibrant community. In the years ahead, the county can focus attention and investment in targeted industry clusters to increase local employment, stem

imports, and increase the amount of revenue collected and reinvested regionally. It can also take advantage of unique opportunities, including partnerships with regional neighbors, Joint Base Lewis McChord, and emerging businesses in the health, science, and technology fields.

6.1.7 Special Districts

Thurston County's numerous special districts provide a wide variety of services including cemetery, conservation, drainage, fire protection, library, parks, port, school, utility, and transportation benefit districts. In addition, several regional organizations provide community services or regulatory functions to Thurston and other member counties. Special districts serve as useful stakeholders to flood hazard mitigation, planning for both the perspectives they offer as well as the functional services they can contribute to disaster resiliency. Maps 6.6 and 6.7 show the school and fire district boundaries. Table 6.20 lists the special districts and other local government agencies within the county.

6.1.8 Transportation Network and Utilities

The county's highways, local roads, bridges, railroads, ports, and transit systems are crucial to people's daily lives, as well as to the long-term health of the county's economy.



Source: TRPC

Transportation infrastructure is vulnerable to the flood hazards described in Chapter 2, so several mitigation initiatives address strengthening the transportation system's operation and infrastructure. Map 6.8 shows the major components of the transportation system. Map 6.9 reflects existing and proposed private electricity and natural gas facilities.

6.1.9 Essential Facilities

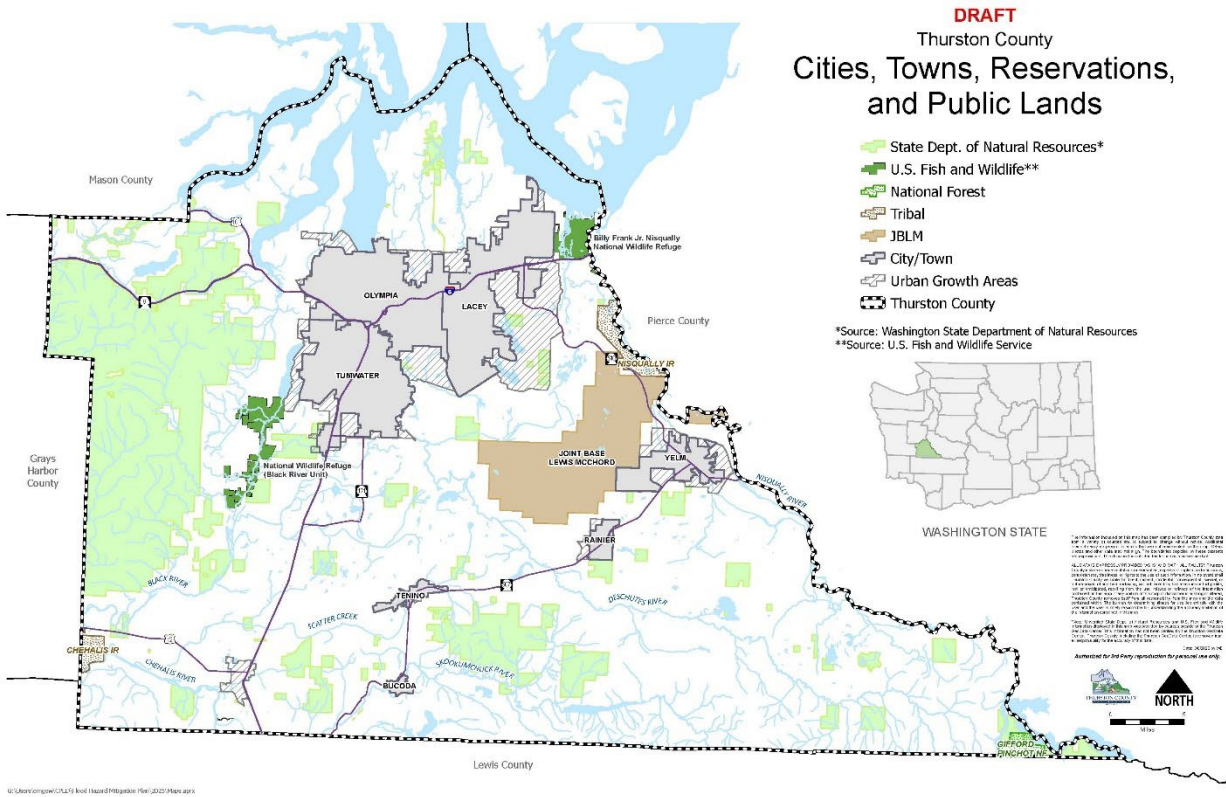
Based on the historical occurrence of natural hazards causing community impacts, floods are known to destroy or damage facilities critical for responding to the disaster and for maintaining a safe environment and public order. These include: communications installations; electrical generating and transmission facilities; water storage, purification, and pumping facilities; sewage treatment facilities; hospitals and health care clinics; police and fire stations, and schools. In addition, natural hazards can seriously disrupt the transportation network, knocking out bridges or damaging or blocking roads and highways, further isolating

resources. In a major disaster, almost all surface means of transportation within a community may be disrupted, particularly in the initial stages of the hazard event. All essential facilities in Thurston County are located within the storm hazard area.

Specific information on the location and type of facilities is maintained by Thurston County Emergency Management. Essential facilities include both public and private facilities. Table 6.21 lists the type and number of essential facilities located throughout the county. The type and quantity of essential facilities in the special flood hazard areas within the planning area is summarized on in Chapter 2.

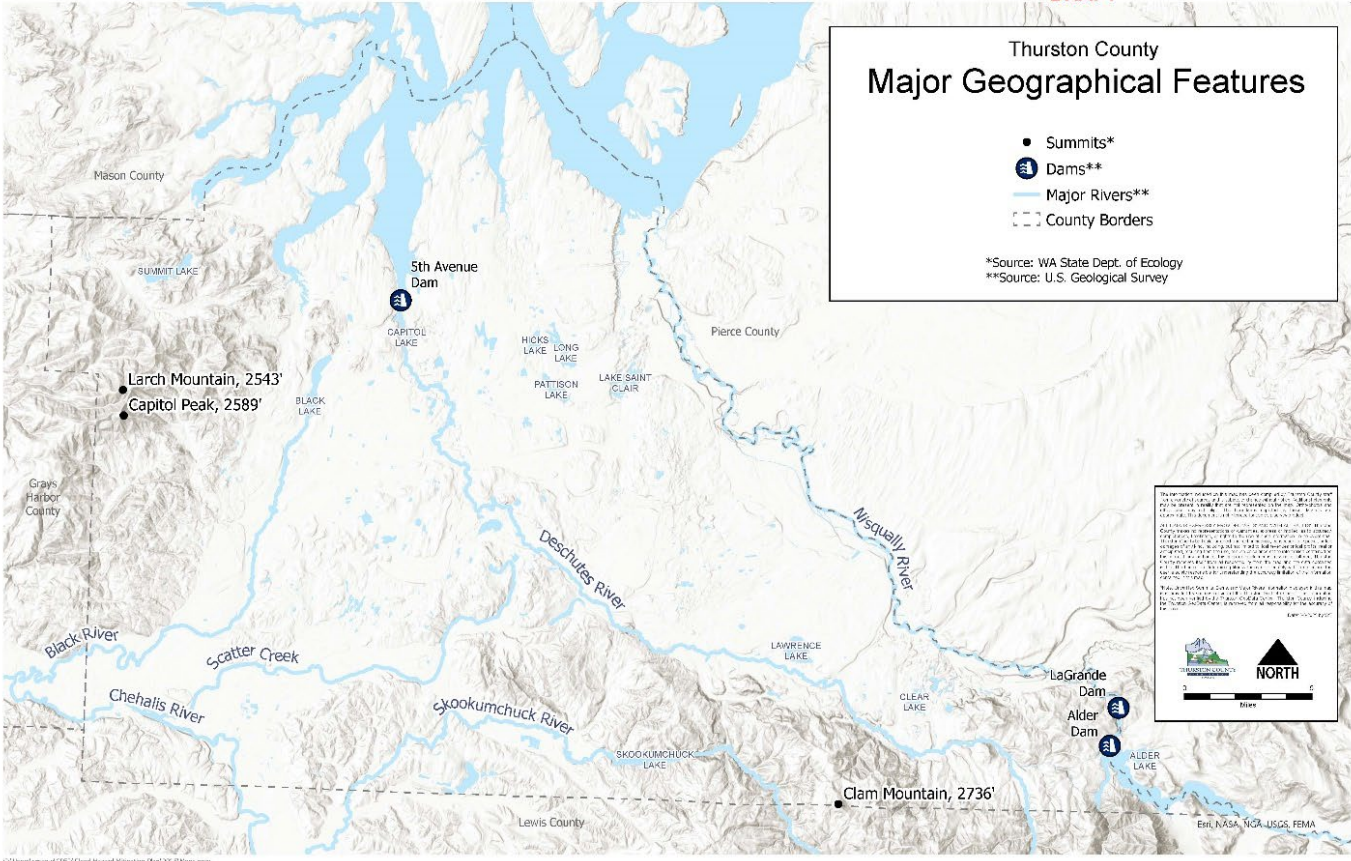
DRAFT

Map 6.1: Cities, Towns, Reservations, and Public Lands of Thurston County



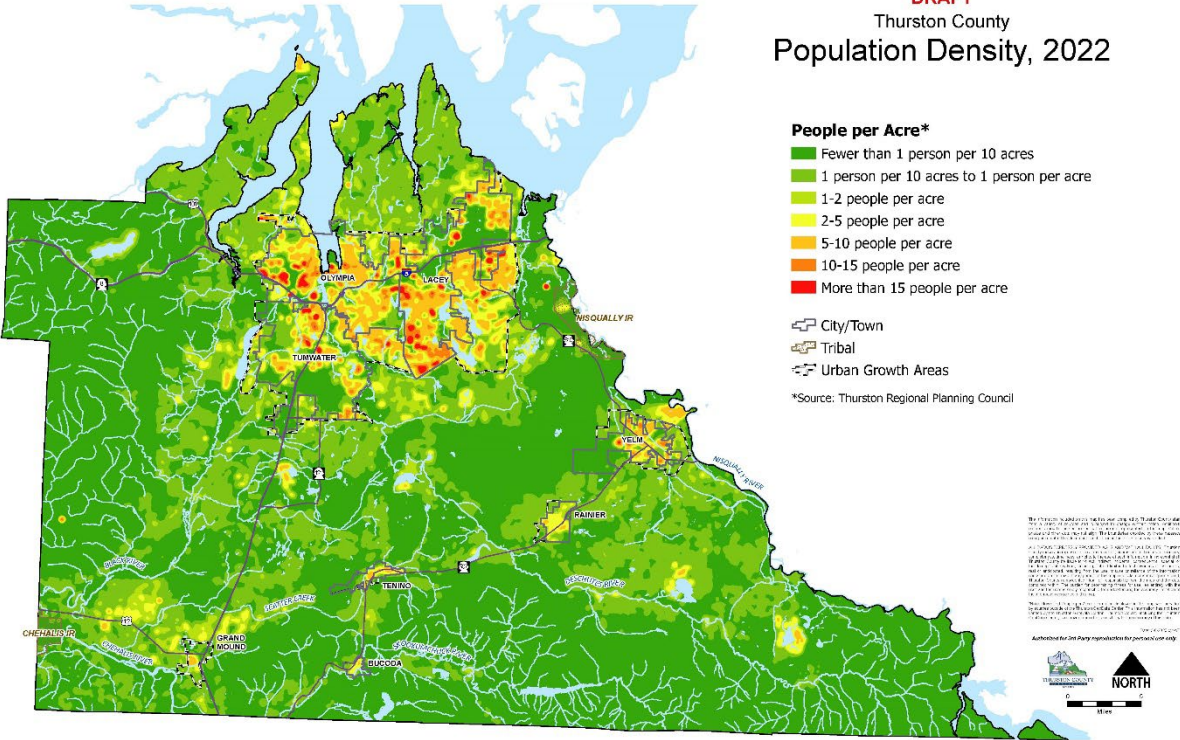
Source: Thurston County GeoData. See Appendix E for Full-Size Maps.

Map 6.2: Major Geographical Features of Thurston County



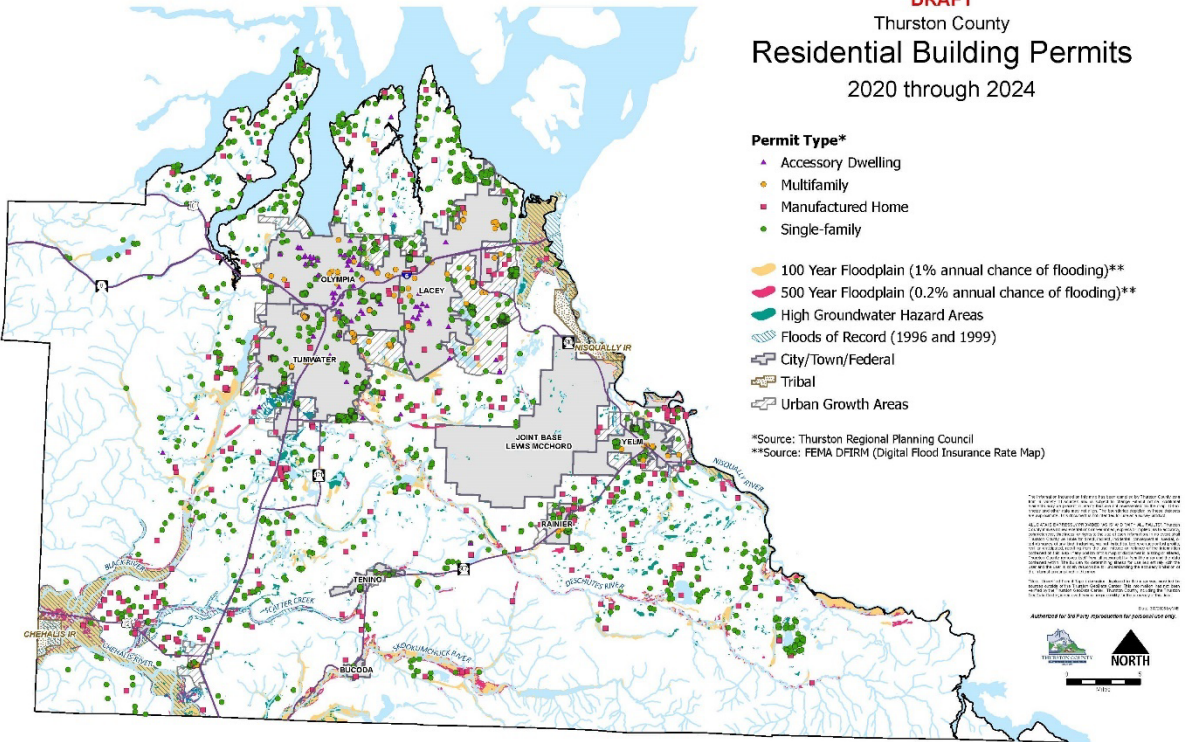
Source: Thurston County GeoData. See Appendix E for Full-Size Maps.

Map 6.3: Population Density, Thurston County 2022



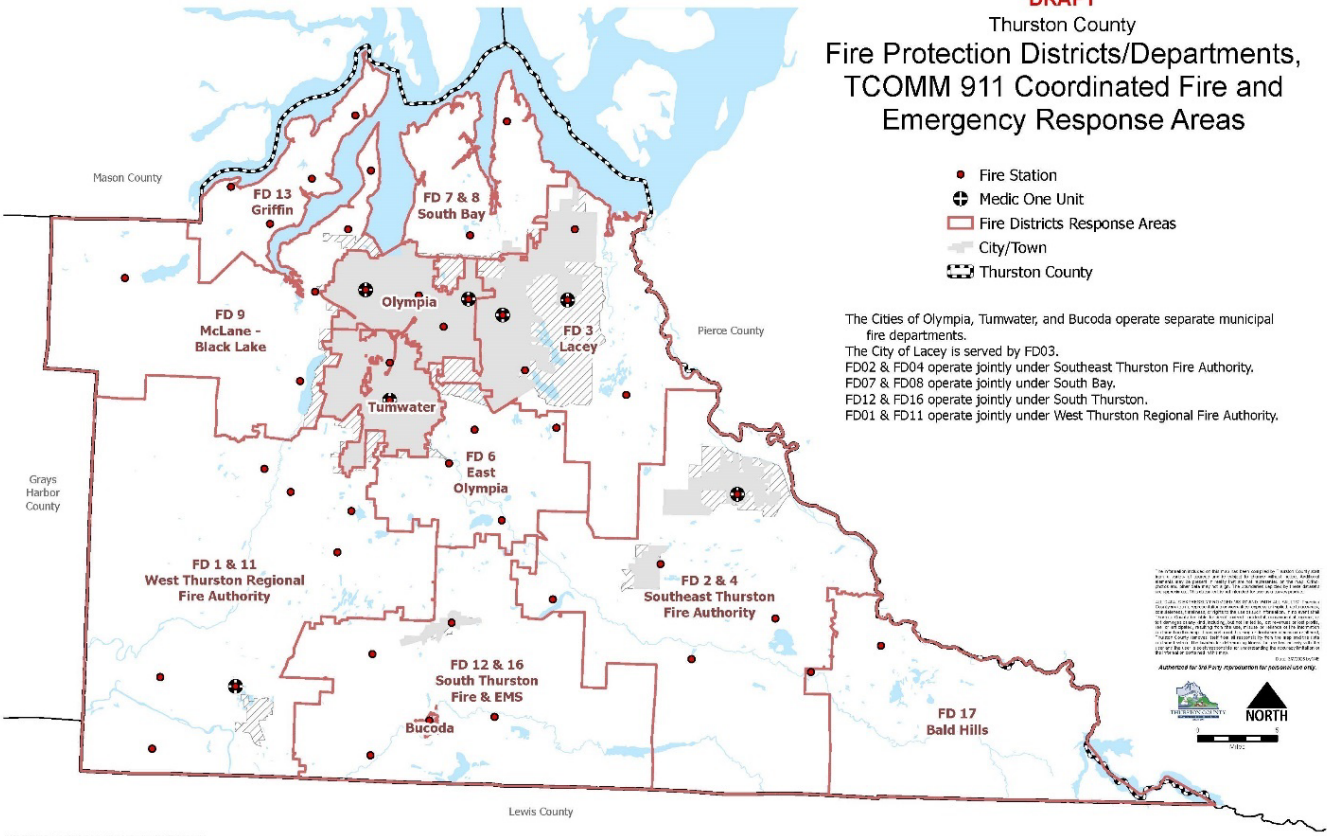
Source: Thurston County GeoData. See Appendix E for Full-Size Maps.

Map 6.5: Residential Building Permits in Thurston County, WA, 2020 through 2024



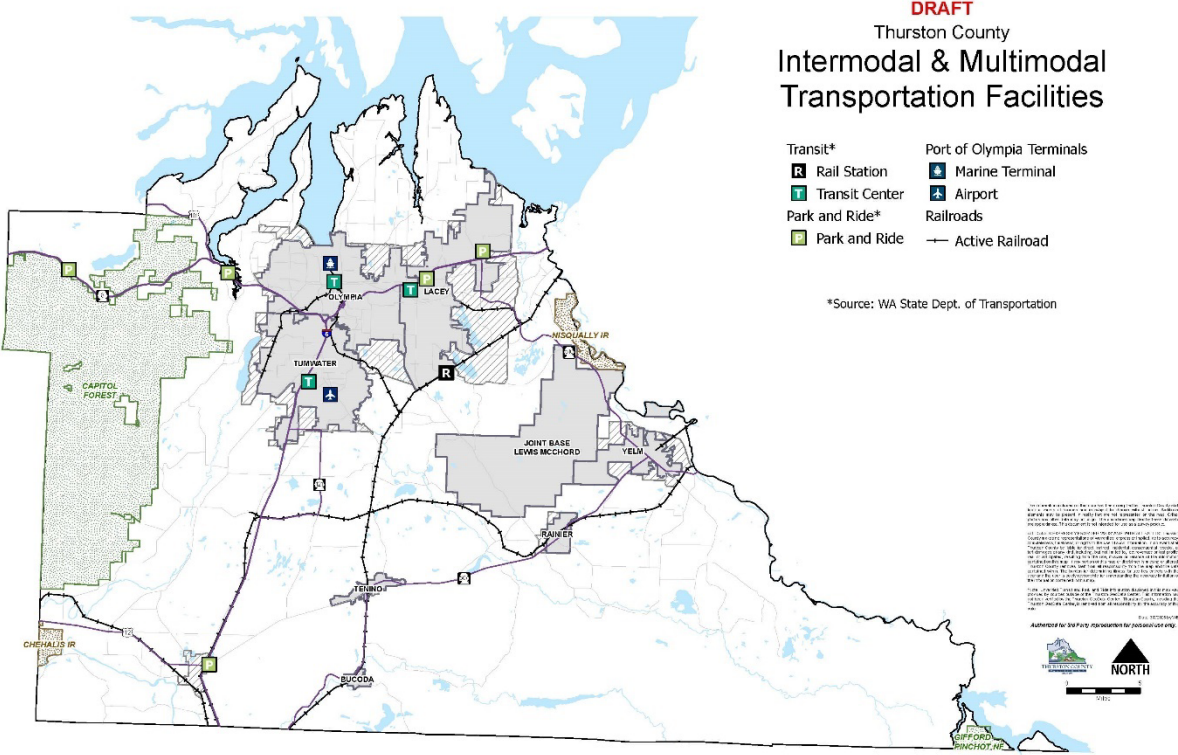
Source: Thurston County GeoData. See Appendix E for Full-Size Maps.

Map 6.7: Fire Protection Districts/Departments and Stations, Thurston County, WA



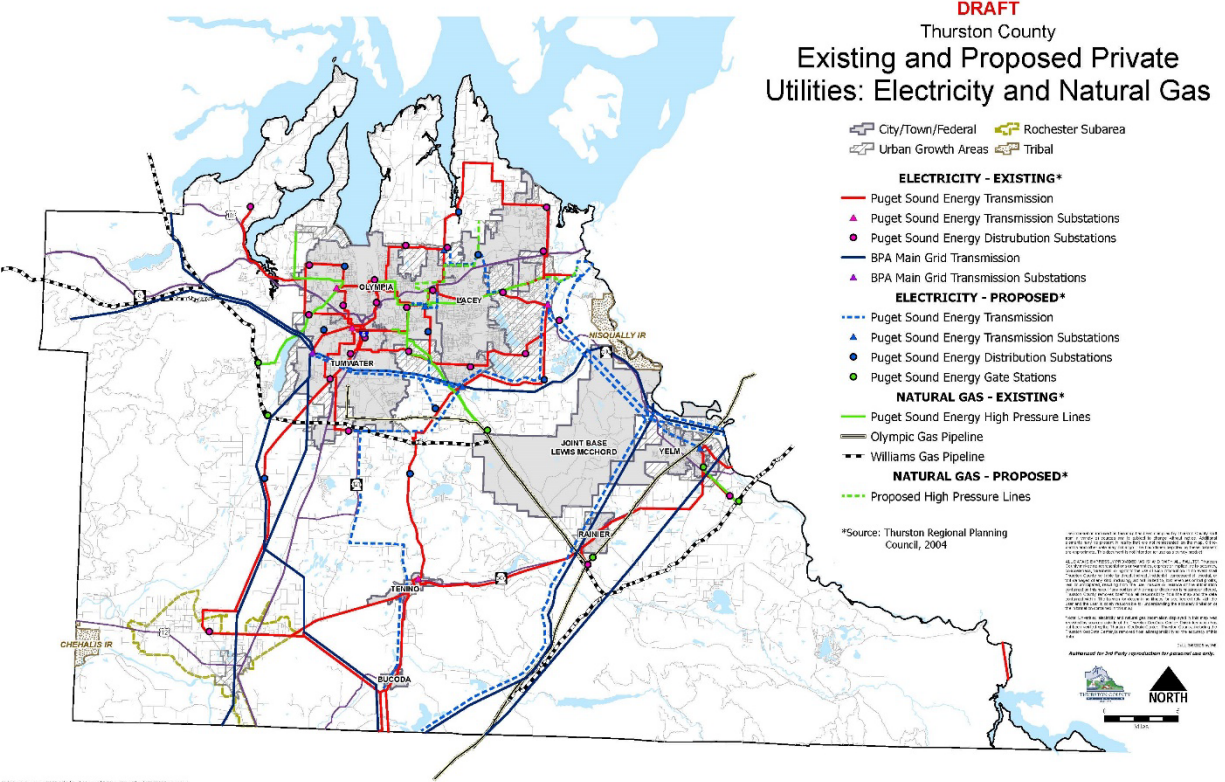
Source: Thurston County GeoData. See Appendix E for Full-Size Maps.

Map 6.8: Intermodal & Multimodal Transportation Facilities, Thurston County, WA



Source: Thurston County GeoData. See Appendix E for Full-Size Maps.

Map 6.9: Existing and Proposed Private Utilities: Electricity and Natural Gas



Source: Thurston County GeoData. See Appendix E for Full-Size Maps.

Table 6.3: Population Estimates and Forecast by Jurisdiction 2020 – 2045

Jurisdiction	Census Calibrated 2020	TRPC Estimate 2021	2022	2023	2024	TRPC Forecast 2045
Bucoda	600	595	610	620	620	800
Lacey	53,526	54,850	58,180	59,430	60,210	61,350
Lacey UGA	37,733	36,980	34,680	35,520	35,840	52,090
Olympia	55,382	55,960	56,370	56,900	57,450	72,040
Olympia UGA	12,703	12,130	12,160	12,100	13,410	15,610
Rainier	2,369	2,440	2,510	2,555	2,565	3,165
Rainier UGA	133	135	135	135	135	160
Tenino	1,870	2,010	2,030	2,045	2,070	2,795
Tenino UGA	26	15	15	15	15	45
Tumwater	25,573	26,050	26,360	27,100	27,470	37,380
Tumwater UGA	3,134	3,290	3,300	2,890	3,100	8,690
Yelm	10,617	10,640	10,680	10,770	10,880	25,930
Yelm UGA	1,514	1,545	1,545	1,540	1,505	1,630
Grand Mound UGA	1,358	1,225	1,270	1,270	1,260	2,745
Chehalis Reservation	58	50	50	50	50	65
Nisqually Reservation	715	595	600	630	625	930
Total Cities	149,937	152,545	156,740	159,420	161,265	203,440
Total UGAs	56,601	55,320	53,100	53,470	55,270	80,980
Total Reservations	773	645	650	680	675	990
Rural Unincorporated County	87,482	89,290	90,010	89,830	89,790	98,090
Thurston County Total	294,793	297,800	300,500	303,400	307,000	383,500

Source: Thurston Regional Planning Council, Small Area Population Estimates and Population and Employment Forecast. Reservation lands estimates are for Thurston County portion only.

Table 6.4: Individuals Below Poverty Level, by Jurisdiction, 2009-2023

Jurisdiction	2009-2013 Average	2014-2018 Average	2019-2023 Average
Bucoda	113	276	147
Lacey	4,574	4,675	6178
Olympia	7,330	8,300	8108
Rainier	166	380	338
Tenino	292	288	241
Tumwater	1,881	2,164	2046
Yelm	1,489	881	573
Thurston County	29,545	29,718	28,292

Source: Thurston Regional Planning Council, Population Below Poverty Level. Estimates reflect jurisdictional boundaries, except for Reservations, which are estimated for trust lands as a whole.

Table 6.5: Population by Race and Ethnicity, by Jurisdiction, 2020

	Bucoda	Lacey	Olympia	Rainier	Tenino	Tumwater	Yelm	Thurston County	Total Cities	Total Unincorporated
Person of Color	102	21,204	15,983	487	385	6,797	3,476	86,808	48,434	38,374
White/Non-Hispanic	498	32,322	39,622	1,882	1,485	18,553	7,141	207,985	101,503	106,482
American Indian & Alaska Native*	9	663	690	30	32	328	206	4,458	1,958	2,500
Asian*	4	4,859	3745	47	23	1372	387	17,268	10,437	6,831
Black/African American*	2	3,135	1,759	22	18	681	360	9,403	5,977	3,426
Native Hawaiian & Pacific Islander*	3	1,352	367	16	2	189	240	3,347	2,169	1,178
Other Race*	13	2,411	1762	60	61	606	394	10,359	5,307	5,052
Two or More Races*	49	7,035	6,230	225	206	2,988	1436	34,160	18,169	15,991
Hispanic or Latino of Any Race	43	6,764	5,059	192	148	2,203	1,275	29,024	15,684	13,340
Total	600	53,526	55,605	2,369	1,870	25,350	10,617	294,793	149,937	144,856

Source: Thurston Regional Planning Council, Population by Race and Hispanic Origin, by Jurisdiction, 2020. This data was summarized from U.S. Decennial Census data, where respondents identify Hispanic or Latino origin separately from race, and can be of any race.

Table 6.6: Population with a Disability, by Jurisdiction 2019 – 2023 Average

Jurisdiction	With a Disability	Without a Disability
Bucoda	154	357
Lacey	9,150	45,359
Olympia	9,389	45,021

Rainier	558	1,925
Tenino	322	1,592
Tumwater	3,406	22,573
Yelm	1,370	8,267
Thurston County	43,831	244,916
Chehalis Reservation	128	473
Nisqually Reservation	103	409

Source: Thurston Regional Planning Council, U.S. Census Bureau: American Community Survey

Table 6.7: Ability to Speak English, By Jurisdiction, 2019 – 2023 Average

	Bucoda	Lacey	Olympia	Rainier	Tenino	Tumwater	Yelm	Thurston County	Chehalis Reservation	Nisqually Reservation
Ability to Speak English										
Speak English Only	472	43,571	45,991	2,231	1,724	23,429	8,632	245,957	553	475
Speak English "very well"	6	6,483	4,428	89	70	1,244	900	22,400	25	15
Speak English less than "very well"	3	3,732	2,308	4	43	671	368	12,144	10	3
% Speak English Less than "very well"	0.6%	6.9%	4.4%	0.2%	2.3%	2.6%	3.7%	4.3%	1.7%	0.6%
Total Population Age 5 Years and Older	481	53,786	52,727	2,324	1,837	25,344	9,900	280,501	588	493

Source: Thurston Regional Planning Council, U.S. Census Bureau: American Community Survey

Table 6.8: Thurston County Homeless Census Counts, 2006-2024

Year	COUNTY POINT-IN-TIME COUNT			Total
	Sheltered	Transitional	Unsheltered	
2006	156	163	122	441
2007	249	143	187	579
2008	168	100	194	462
2009	323	203	219	745
2010	181	432	363	976
2011	95	204	267	566
2012	167	377	164	708
2013	113	321	230	664
2014	172	147	257	576
2015	158	155	163	476
2016	223	174	189	586
2017	242	166	171	579
2018	333	182	320	835
2019	236	170	394	800
2020	295	159	541	995

2021	266	49	346	661
2022	253	50	437	740
2023	400	47	417	864
2024	242	166	171	579

Source: Thurston Regional Planning Council and Thurston County, Point-in-time Homeless Count

Table 6.9: Housing Estimates and Forecast, by Jurisdiction, 2020 – 2045

Jurisdiction	Census	TRPC Estimate				TRPC Forecast			
	2020	2021	2022	2023	2024	2030	2035	2040	2045
Bucoda	241	250	255	255	255	315	335	355	375
Lacey	22,039	22,120	23,490	24,390	24,980	26,380	27,180	27,840	28,410
Lacey UGA	14,565	14,550	13,650	14,180	14,400	18,580	19,760	21,030	22,320
Lacey Total	36,604	36,670	37,140	38,570	39,380	44,960	46,940	48,870	50,730
Olympia	25,642	25,860	26,220	26,540	26,750	32,120	34,630	36,580	38,290
Olympia UGA	5,093	5,060	5,060	5,080	5,790	5,690	5,890	6,290	6,740
Olympia Total	30,735	30,920	31,280	31,620	32,540	37,810	40,520	42,870	45,030
Rainier	850	920	920	940	950	1,130	1,210	1,380	1,420
Rainier UGA	54	50	50	50	50	60	60	65	75
Rainier Total	904	970	970	990	1,000	1,190	1,270	1,445	1,495
Tenino	780	815	815	825	835	1,055	1,180	1,275	1,300
Tenino UGA	5	5	5	5	5	5	5	5	15
Tenino Total	785	820	820	830	840	1,060	1,185	1,280	1,315
Tumwater	10,847	11,260	11,720	11,970	12,280	14,930	16,190	17,160	17,740
Tumwater UGA	1,427	1,390	1,390	1,210	1,300	2,800	3,320	3,660	3,730
Tumwater Total	12,274	12,650	13,110	13,180	13,580	17,730	19,510	20,820	21,470
Yelm	3,455	3,350	3,570	3,710	3,860	7,100	8,700	10,090	10,970
Yelm UGA	516	530	530	530	530	540	550	560	650
Yelm Total	3,971	3,880	4,100	4,240	4,390	7,640	9,250	10,650	11,620
Grand Mound UGA	424	450	470	475	470	600	675	720	735
Total Cities	63,854	64,570	66,980	68,630	69,910	83,040	89,440	94,670	98,500
Total UGAs	22,084	22,030	21,160	21,530	22,540	28,280	30,260	32,320	34,270
Rural Unincorporated County	35,260	35,880	36,070	36,230	36,430	39,040	40,470	41,700	42,680

Jurisdiction	Census	TRPC Estimate				TRPC Forecast			
	2020	2021	2022	2023	2024	2030	2035	2040	2045
Thurston County Total	121,438	122,800	124,500	126,700	129,200	150,700	160,500	169,000	175,800

Source: Thurston Regional Planning Council, 2025. Estimates are for April 1 of each year, and reflect the specific city limits on that date. Totals may not add up precisely due to rounding of estimates. Some changes may be due to expected annexation from county to city jurisdiction. TRPC's most recent forecast was completed before 2020 Census data were released and in some cases underestimated growth. Estimates for Tribal reservations are for the Thurston County portion of reservation only.

Table 6.10: Land Cover and Impervious Area in Thurston County, 1992 - 2021

NOAA C-CAP Land Cover	Acres						
	1992	1996	2001	2006	2011	2016	2021
High Intensity Developed	2,991	3,127	3,200	3,626	3,985	4,012	4,479
Medium Intensity Developed	10,143	10,959	11,324	12,753	13,794	13,882	14,609
Low Intensity Developed	37,121	39,214	40,092	41,105	42,902	42,923	42,964
Developed Open Space	15,327	16,441	17,096	17,024	18,380	18,404	18,207
Cultivated	793	800	791	708	523	777	786
Pasture/Hay	44,788	47,634	48,178	48,156	47,351	46,953	46,924
Grassland	32,854	27,860	16,954	18,016	23,536	22,162	15,801
Deciduous Forest	27,043	25,012	25,685	25,053	25,081	23,946	23,383
Evergreen Forest	172,369	170,555	171,028	159,993	151,771	160,233	180,781
Mixed Forest	58,234	52,914	50,928	49,255	47,327	45,735	45,261
Scrub/Shrub	32,843	40,301	46,027	56,321	56,796	53,601	41,540
Palustrine Forested Wetland	12,508	12,474	12,455	12,443	12,421	12,393	12,374
Palustrine Scrub/Shrub Wetland	7,509	7,535	7,811	8,278	8,191	8,191	8,193
Palustrine Emergent Wetland	6,528	6,812	6,579	6,078	6,138	6,200	6,290
Estuarine Forested Wetland	0	0	0	0	0	0	0
Estuarine Scrub/Shrub Wetland	0	0	0	0	0	0	0
Estuarine Emergent Wetland	248	248	246	246	246	246	238
Unconsolidated Shore	675	538	498	447	451	453	450
Bare Land	2,793	2,177	5,669	4,848	5,493	4,323	2,171
Water	6,415	6,576	6,615	6,826	6,744	6,696	6,679

Palustrine Aquatic Bed	283	290	290	291	336	336	334
Estuarine Aquatic Bed	2	2	2	2	2	2	2
Snow/Ice	0	0	0	0	0	0	0
Total	471,467	471,467	471,467	471,467	471,467	471,467	471,467
Total Developed	65,582	69,741	71,712	74,507	79,062	79,221	80,259
Total Cultivated or Pasture/Hay	45,581	48,434	48,969	48,863	47,874	47,730	47,710
Total Forest	257,646	248,482	247,641	234,301	224,178	229,914	249,425
Total Grassland or Scrub/Shrub	65,697	68,161	62,980	74,337	80,332	75,762	57,342
Total Wetland, Shore, or Bare Land	36,961	36,650	40,165	39,458	40,021	38,839	36,731
	1991	1996	2001	2006	2011	2016	2021
Impervious Acres			25,426	27,347	28,486	29,417	30,234
Percent Impervious			5.5%	5.9%	6.1%	6.3%	6.5%

Source: Thurston Regional Planning Council, 2025. NOAA C-CAP; National Land Cover Database.

Table 6.11: Special Districts, Local Government Agencies in Thurston County

<p>Cemetery Districts Thurston County Cemetery District No. 1 Thurston County Cemetery District No. 2</p> <p>Conservation Districts Thurston Conservation District</p> <p>Drainage Districts Chambers Lake Drainage District No. 03 Zenkner Valley Drainage District No. 07</p> <p>Emergency Dispatch TCOMM 9-1-1</p> <p>Fire Protection Districts West Thurston Regional Fire Authority 01 SE Thurston Fire Authority Lacey Fire District 03 East Olympia Fire District 06 South Bay Fire District 08 McLane – Black Lake Fire District 09 South Thurston Fire & EMS 12 Griffin Fire District 13 Bald Hills Fire District 17</p> <p>Lake Management Districts</p>	<p>Park Districts Grand Mound Rochester Parks and Recreation District No. 2</p> <p>Tanglewilde Park and Recreation District No. 1</p> <p>Port Districts Port of Olympia</p> <p>Public Transportation Benefit Area Intercity Transit</p> <p>School Districts Centralia School District Griffin School District No. 324 North Thurston Public Schools Olympia School District No. 111 Rainier School District No. 307 Rochester School District No. 401 Tenino School District No. 402 Tumwater School District No. 33 Yelm Community School District No. 2</p> <p>Transportation and Utility Districts LOTT Clean Water Alliance Thurston Public Utility District</p> <p>Regional Agencies</p>
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Long Lake (Thurston County)	Capitol Region Educational Services District 113
Lawrence Lake (Thurston County)	Housing Authority of Thurston County
	Lewis - Mason - Thurston Area Agency On Aging
Special Lake Districts	Olympic Region Clean Air Agency
Black Lake Special District	Timberland Regional Library
	Thurston Regional Planning Council

Source: Thurston County GeoData, Thurston County Auditor 2025

Table 6.12 Essential Facilities in Unincorporated Thurston County

FACILITY TYPE	TOTAL FACILITIES	IN 100-YEAR SFHA	IN OTHER SFHAS
Medical Care			
Adult Family Home	57	0	0
Dentist	9	0	0
Primary Care	3	0	0
Government			
Fairgrounds	25	0	0
Fire Service	43	2	1
Government Services	13	2	0
Public Education	31	1	0
Public Higher Education	54	0	0
Public Works	11	0	2
Solid Waste	7	0	0
Transit	1	0	0
Utilities	114	6	1
Transportation (Centerline Miles)			
Roads	2,210	90	
Intercity Transit Routes	157		
Rural Transit Routes	96		

Source: Thurston County GeoData 2025

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Source: Thurston Regional Planning Council (TRPC)

CHAPTER 7

Capability Assessment

Federal, state, and local laws, ordinances, and plans can support or impact the flood mitigation initiatives identified in Chapter 3. Development of this plan included a review and incorporation – if appropriate – of existing plans, studies, reports, and technical information. This chapter describes the major relevant laws, plans, and mitigation resources.

7.1 Federal

7.1.1 Disaster Mitigation Act of 2000

The federal Disaster Mitigation Act (DMA) of 2000 (Public Law 106-390) provides the legal basis for Federal Emergency Management Agency (FEMA) mitigation planning

requirements for state, local, and tribal governments as a condition of mitigation grant assistance. The DMA amended the Robert T. Stafford Disaster Relief and Emergency Assistance Act by replacing previous mitigation planning provisions with new requirements that emphasize the need for planning entities to coordinate mitigation planning and implementation efforts. The law added incentives for increased coordination and integration of mitigation activities at the state level by establishing two levels of state plans. The DMA also created a new requirement for local mitigation plans, and authorized up to 7 percent of Hazard Mitigation Grant Program funds to be available for development of state, local, and tribal mitigation plans. Chapter 1 provides additional information about the DMA and its grant programs.

The Thurston region was among the first in Washington State to adopt a multi-jurisdictional hazard mitigation plan. Thurston County adopted the 4th edition of the Hazards Mitigation Plan for the Thurston Region in 2024. The plan demonstrates the county's compliance with the DMA and with conducting a continuous, comprehensive, and coordinated approach to hazards mitigation planning.

7.1.2 FEMA Flood Mapping and Risk MAP

FEMA conducts Flood Insurance Studies (FIS) to prepare Flood Insurance Rate Maps (FIRMs) that delineate flood hazard zones and to establish Base Flood Elevations (BFEs) in the United States. This is part of FEMA's regulatory mapping program. FEMA also provides supplemental mapping and flood risk information through the Risk MAP program. Because of the importance of understanding the nation's coastal flood risk, FEMA initiated coastal flood risk studies for the populated coastline as part of its Risk MAP effort.

Thurston County and FEMA completed a FIS and Risk MAP project for the Deschutes River basin in 2016, and the County adopted the remodeled and remapped floodway and floodplains into its Critical Area Ordinance in September 2016. Updated flood maps for the Deschutes basin were accepted in 2024 for the City of Olympia (FEMA, 2024).

The second FIS and Risk MAP project for the county was the mapping of the marine coastal flood zones. This FIS and Risk MAP assessment was started in 2013. The first set were revised to align more closely with the neighboring Mason and Pierce counties. This project was completed in 2018, using new LiDAR and modeling software (FEMA, 2024).

The county's third FIS and Risk MAP assessment project addresses the Lower Chehalis Watershed. This assessment includes the Chehalis, Skookumchuck, Black River, and Scatter Creek. While the initial scoping meeting occurred in March 2010, funding issues held up work until 2016. The most recent map revision became effective in 2020.

The Nisqually lower River Basin had flood maps last revised in 2023 and 2024. The map revision included a restudy of waterways within the watershed in 2020.

Updated study information can be found in the FEMA Flood Insurance Study for Thurston County, Washington and Incorporated Areas (FEMA, 2024)

7.1.3 National Flood Insurance Program

The National Flood Insurance Program (NFIP) makes federally backed flood insurance available to homeowners, renters, and business owners in participating communities in exchange for communities enacting floodplain regulations. For most participating communities, FEMA prepared a detailed Flood Insurance Study. The study presents water surface elevations for floods of various magnitudes, including the 1 percent annual chance flood (100-year flood) and the 0.2 percent annual chance flood (the 500-year flood). Flood Insurance Rate Maps (FIRMS) show base flood elevations and boundaries of the 100- and 500-year floodplains, and serve as the principal tool for identifying the extent and location of the flood hazard. FIRMs, the most detailed and consistent data source available, represent the minimum area of oversight under some community's floodplain management programs.



Participants in the NFIP must, at a minimum, regulate development in floodplain areas in accordance with NFIP criteria. Before issuing a permit to build in a floodplain, participating jurisdictions must meet three criteria:

- New buildings and those undergoing substantial improvements must, at a minimum, be elevated to protect against damage by the 100-year flood.
- New floodplain development must not aggravate existing flood problems or increase damage to other properties.
- New floodplain development must exercise a reasonable and prudent effort to reduce its adverse impacts on threatened salmonid species.

To learn more about the county's NFIP standing and repetitive loss properties, view:

CHAPTER 2 Risk Assessment

Thurston County entered the NFIP in 1982, and the first Thurston County FIRM was issued December 1, 1982. Structures permitted or built in the planning area before that date are called “pre-FIRM” structures, and structures built afterward are called “post-FIRM,” with insurance rates different for each. Post-FIRM properties are eligible for reduced flood insurance

rates. Such structures are less vulnerable to flooding since they were constructed under regulations and codes that lead to decreased vulnerability. Properties built before a FIRM is adopted are more vulnerable to flooding because they do not meet code or are in hazardous areas.

7.1.4 The Community Rating System (CRS)

The CRS is a voluntary program within the NFIP that encourages floodplain management activities that exceed the minimum NFIP requirements. Flood insurance premiums are discounted to reflect the lowered flood risk resulting from community actions to meet the CRS goals of reducing flood losses, facilitating accurate insurance rating, and promoting awareness of flood insurance.

For participating communities, flood insurance premium rates are discounted in increments of 5 percent. For example, a Class 1 community would receive a 45 percent premium discount, and a Class 9 community would receive a 5 percent discount. (Class 10 communities meet the minimum requirements and receive no discount). The CRS classes for local communities are based on 18 creditable activities in specific categories:

- Mapping and flood data
- Managing new development to minimize future flood damage
- Reducing flood losses to existing development
- Improving emergency preparedness and response
- Implementing public information activities

CRS activities can help save lives and reduce property damage. Communities participating in the CRS represent a significant portion of the nation's flood risk, with over 66 percent of the NFIP's policy base in these communities. Communities receiving premium discounts through the CRS range from small to large and represent a broad mixture of flood risks, including both coastal and riverine flood risks.

Enrolled since 2000, Thurston County is the only community within the planning area that participates in the CRS program. Thurston County received a Class 2 community rating (previously a Class 4) by FEMA in November 2016. This rating entitles property owners to a 40 percent discount on flood insurance.

The County's Class 2 rating is primarily due to its flood management program, land use and zoning regulations, and public education and outreach activities. Together these programs reduce flood damage, which results in a reduction in insurance premiums. To maintain this rating, the county must complete an annual recertification and a re-verification visit every three years. This Flood Hazard Mitigation Plan (FHMP) accounts for a portion of the county's CRS credit and is a prerequisite for becoming a Class 4 or better community.

7.1.5 Endangered Species Act

Enacted in 1973, the federal Endangered Species Act (ESA) intends to conserve species facing depletion or extinction and the ecosystems that support them. The act sets forth a process for determining which species are threatened and endangered and requires conservation of the critical habitat in which those species live. The ESA provides broad protection for species of fish, wildlife, and plants listed as threatened or endangered. Provisions are made for listing species, as well as for recovery plans and the designation of critical habitat for listed species. The ESA outlines procedures for federal agencies to follow when taking actions that may jeopardize listed species. The procedures also include exceptions and exemptions. This enabling legislation for the Convention on International Trade in Endangered Species of Wild Fauna and Flora includes criminal and civil penalties violations of the ESA and the Convention.

Federal agencies must seek to conserve endangered and threatened species and use their authorities in furtherance of the ESA's purposes. The ESA defines three fundamental terms:

- **Endangered** means that a species of fish, animal, or plant is “in danger of extinction throughout all or a significant portion of its range.” (For salmon and other vertebrate species, this may include subspecies and distinct population segments.)
- **Threatened** means that a species “is likely to become endangered within the foreseeable future.” Regulations may be less restrictive for threatened species than for endangered species.
- **Critical habitat** means “specific geographical areas that are...essential for the conservation and management of a listed species, whether occupied by the species or not.”

The following five sections of the ESA supply information critical to understanding the act:

- **Section 4: Listing of a Species**—The National Oceanic and Atmospheric Administration Fisheries Service (NOAA Fisheries) is responsible for listing marine species; the U.S. Fish and Wildlife Service is responsible for listing terrestrial and freshwater aquatic species. The agencies may initiate reviews for listings, or citizens

may petition for them. A listing must be made “solely on the basis of the best scientific and commercial data available.” After a listing is proposed, agencies solicit comment and conduct further scientific reviews for 12 to 18 months, after which they must decide if the listing is warranted. Economic impacts cannot be considered in this decision, but it may include an evaluation of the adequacy of local and state protections. Critical habitat for the species may be designated at the time of listing.

- **Section 7: Consultation**—Federal agencies must ensure that any action they authorize, fund, or carry out is not likely to jeopardize the continued existence of a listed or proposed species or adversely modify its critical habitat. This includes private and public actions that require a federal permit. Once a final listing is made, non-federal actions are subject to the same review, termed a “consultation.” If the listing agency finds that an action will “take” a species, it must propose mitigations or “reasonable and prudent” alternatives to the action; if the proponent rejects these, the action cannot proceed.
- **Section 9: Prohibition of Take**—It is unlawful to “take” an endangered species, including killing or injuring it or modifying its habitat in a way that interferes with essential behavioral patterns, including breeding, feeding, or sheltering.
- **Section 10: Permitted Take**—Through voluntary agreements with the federal government that provide protections to an endangered species, a non-federal applicant may commit a take that would otherwise be prohibited if it is incidental to an otherwise lawful activity (such as developing land or building a road). These agreements often take the form of a “Habitat Conservation Plan.”
- **Section 11: Citizen Lawsuits**—Civil actions initiated by any citizen can require the listing agency to enforce the ESA’s prohibition of taking or to meet the requirements of the consultation process.

With the listing of salmon and trout species as threatened or endangered, the ESA impacts most of the Pacific Coast states. Although some areas have been more impacted than others due to the known presence of listed species, the entire region has been impacted by mandates, programs, and policies based on the presumption of the presence of listed species. Most West Coast jurisdictions must now consider the impact of their programs on habitat. Thurston County communities are also affected by the ESA listing of prairie species including the Mazama, Olympia, Tenino, and Roy Prairie pocket gophers, the Oregon spotted frog, and the Taylor’s checkerspot butterfly. Affected communities within the planning area are currently developing Habitat Conservation Plans to protect these species and their habitats. Thurston County adopted its own Habitat Conservation Plan (HCP) in 2022 that covers both federal and local requirements. The Thurston County HCP is a mitigation plan to replace lost habitat from development, while simplifying the permitting process.

7.1.6 The Clean Water Act

The federal Clean Water Act (CWA) employs regulatory and non-regulatory tools to reduce direct pollutant discharges into waterways, finance municipal wastewater treatment facilities, and manage polluted runoff. These tools are employed to achieve the broader goal of restoring and maintaining the chemical, physical, and biological integrity of the nation's surface waters so that they can support "the protection and propagation of fish, shellfish, and wildlife and recreation in and on the water."

Evolution of CWA programs included a shift from a program-by-program, source-by-source, pollutant-by-pollutant approach to more holistic watershed-based strategies. The watershed approach places equal emphasis on protecting healthy waters and restoring impaired ones and addresses a full array of issues, not just those subject to CWA regulatory authority. Stakeholder involvement in the development and implementation of strategies for achieving and maintaining water quality and other environmental goals is a hallmark of this approach.

7.2 State

7.2.1 Washington State Enhanced Hazard Mitigation Plan

The Washington State Enhanced Hazard Mitigation Plan (2023) provides guidance for hazard mitigation throughout Washington. The plan identifies hazard mitigation goals, objectives, actions and initiatives for state government to reduce injury and damage from natural hazards. By meeting federal requirements for an enhanced state plan (44 CFR parts 201), the plan allows the state to seek significantly higher funding from the Hazard Mitigation Grant Program following presidential declared disasters (up to 20 percent of eligible disaster expenditures vs. 15 percent with a standard plan).

7.2.2 Washington State Floodplain Management Law

Washington's floodplain management law (Revised Code of Washington (RCW) 86.16, implemented through Washington Administrative Code (WAC) 173-158) states that prevention of flood damage is a matter of statewide public concern and places regulatory control with the Department of Ecology. Floodplain management literature, including FEMA's national assessment, cites RCW 86.16 as one of the nation's first and strongest. A 1978 major challenge to the law – *Maple Leaf Investors Inc. v. Department of Ecology* – is cited in legal references to floodplain management issues. The court upheld the law, declaring that denial of a permit to build residential structures in the floodway is a valid exercise of police power and did not constitute a taking. RCW Chapter 86.12 (Flood Control

by Counties) authorizes county governments to levy taxes, condemn properties, and undertake flood control activities directed toward a public purpose.

7.2.3 Flood Control Assistance Account Program

The state of Washington passed its first Flood Control Maintenance Program in 1951. In 1984, RCW 86.26 (State Participation in Flood Control Maintenance) established the Flood Control Assistance Account Program (FCAAP), which provides funding for local flood hazard management (FCAAP rules: WAC 173-145). The Washington State Department of Ecology (Ecology) distributes FCAAP matching grants to cities, counties, Tribes, and other special districts responsible for flood control. This is one of the few state programs in the U.S. that provides grant funding to local governments for floodplain management.

To be eligible for FCAAP assistance, flood hazard management activities must be approved by Ecology in consultation with the Washington State Department of Fish and Wildlife. The appropriate local authority must have completed and adopted or be in the process of preparing a comprehensive flood hazard management plan to receive FCAAP flood damage reduction project funds. This policy evolved through years of the Flood Control Maintenance Program and early years of FCAAP in response to the observation that poor management in one part of a watershed may cause flooding problems in another.

Local jurisdictions must participate in the NFIP and be a member in good standing to qualify for an FCAAP grant. As of 2025, there is a \$500,000 grant award limit per county. Jurisdictions must include matching funds, 25% for planning projects, and 20% for emergency flood response projects. FCAAP can also be used for the community outreach projects, for flood mapping, and for flood warning systems and risk communications.

The county is currently in compliance and good standing with the FCAAP program. Some mitigation initiatives identified in this plan may be eligible for funding under FCAAP. FCAAP funds can be used as matching funds for some types of mitigation projects funded under the FEMA Hazard Mitigation Grant Program.

7.2.4 Shoreline Management Act

The 1971 Shoreline Management Act (RCW 90.58) was enacted to manage and protect the shorelines of the state by regulating development in the shoreline area. The act intends to prevent the “inherent harm in an uncoordinated and piecemeal development of the state’s shorelines.” Covered areas include: The Pacific Ocean and Puget Sound shorelines; the Strait of Juan de Fuca; rivers, streams, and lakes above a certain size; and the wetlands associated with these shorelines.

Shoreline management activities “implement policies and regulations to help protect water quality for our marine waters, lakes and stream systems; increase protection of lives and property from flood and landslide damage; protect critical habitat as well as fish and wildlife; promote recreational opportunities in shoreline areas.” Often these policies and programs complement or are critical in mitigation programs for communities.

7.2.5 Growth Management Act

The 1990 Washington State Growth Management Act (RCW Chapter 36.70A) mandates that local jurisdictions adopt land use ordinances to protect the following critical areas:

- Wetlands
- Critical aquifer recharge areas
- Fish and wildlife habitat conservation areas
- Frequently flooded areas
- Geologically hazardous areas

The Growth Management Act regulates development in these areas, and therefore can affect hazard vulnerability and exposure at the local level. More information about the Growth Management Act is in Chapter 3.

7.2.6 Washington State Building Code

With respect to growth and new development, adhering to the most current building codes can provide a community’s greatest line of defense in avoiding future disaster losses. Washington State’s building codes are mandatory for residential and commercial buildings, statewide. The Washington State Building Code Council adopted both the 2021 editions of national model codes with some amendments, and the Washington State Energy Code and Ventilation and Indoor Air Quality Code. The 2021 codes went into effect as the Washington model code on March 15, 2024. Hazard loss avoidance is intrinsic with adoption of and compliance with appropriate building codes. More information about Thurston County’s Building Codes is in Chapter 3.

7.2.7 Comprehensive Emergency Management Planning

Washington’s Comprehensive Emergency Management Planning law (RCW 38.52) establishes parameters to ensure that the state’s preparations will be adequate to deal with disasters. It ensures the administration of state and federal programs providing disaster relief to individuals and ensures adequate support for search and rescue operations. The law also:

- Provides for emergency management by the state, and authorizes the creation of local organizations for emergency management in political subdivisions of the state.

- Confers emergency powers upon the governor and upon the executive heads of political subdivisions of the state.
- Provides for the rendering of mutual aid among political subdivisions of the state and with other states and for cooperation with the federal government with respect to the carrying out of emergency management functions.
- Provides a means of compensating emergency management workers who may suffer any injury or death, who suffer economic harm including personal property damage or loss, or who incur expenses for transportation, telephone or other methods of communication, and the use of personal supplies as a result of participation in emergency management activities.
- Provides programs, with intergovernmental cooperation, to educate and train the public to be prepared for emergencies.

This law requires that emergency management functions of the state and its political subdivisions coordinate to the maximum extent possible with comparable functions of the federal government, agencies of other states and localities, and of private agencies of every type.



Source: TRPC

WAC 118-30-060(1) requires each emergency management organization or joint emergency management organization to base its comprehensive emergency management plan on a hazard analysis. WAC 118-30-060(1) defines a hazard analysis as “a written assessment of reasonably foreseeable natural, human-caused, and technological emergencies and disasters to which a political subdivision is vulnerable.”

The Washington State Comprehensive Emergency Management Plan (CEMP) was last updated in August 2024, providing a framework for statewide emergency management coordination, prevention, mitigation, and response activities.

7.2.8 Watershed Management Act

Washington’s Watershed Management Act of 1997 encourages local communities to develop plans for protecting local water resources and habitat, since they know their own regions best. The Department of Ecology established Water Resource Inventory Areas (WRIAs), dividing the state into 62 WRIAs, each loosely drawn around a natural watershed or group of watersheds.

7.2.9 State Environmental Policy Act

The Legislature enacted the State Environmental Policy Act (SEPA) in 1971 to provide a regulatory framework for state and local agencies to address environmental issues in their decisions. The act provides information to agencies, applicants, and the public to encourage the development of environmentally sound proposals. The environmental review process involves identifying and evaluating probable environmental impacts and developing mitigation measures to reduce adverse impacts.

Modeled after the National Environmental Policy Act, SEPA ensures the consideration of environmental values during decision making by state and local agencies. When the act was adopted, the Legislature identified four primary purposes:

1. To declare state policy which will encourage productive and enjoyable harmony between people and the environment.
2. To promote efforts which will prevent or eliminate damage to the environment.
3. To stimulate the health and welfare of people.
4. To enrich the understanding of the ecological systems and natural resources important to the state and nation.

The law requires local governments to:

- Utilize a systematic, interdisciplinary approach that ensures the integrated use of natural and social sciences and the environmental design arts in planning and decision making that may affect the environment.

- Ensure that environmental amenities and values are given appropriate consideration in decision making along with economic and technical considerations.

Local agencies may use SEPA in combination with their own critical area regulations to provide a robust approach to environmental protection and hazard avoidance. Thurston County, for example, uses SEPA to fill gaps in local regulations related to mitigating hazards. Communities that take the SEPA process seriously can use it to improve their mitigation efforts. A checklist helps communities determine the environmental impact of a proposed development. SEPA review requirements may apply to certain mitigation actions identified in this plan.

7.2.10 Underground Injection Control Program

The Washington State Department of Ecology administers the Underground Injection Control (UIC) program to protect groundwater by regulating the discharge of fluids from UIC injection wells. The UIC program, authorized by the Federal Safe Drinking Water Act, is administered under Title 40 Code of Federal Regulations (CFR). Chapter 173-218 WAC governs the regulatory authority for UIC wells in Washington State. UIC wells must either receive a program rule authorization or a state waste discharge permit in order to operate. This means that UIC wells do not require a permit if they do not endanger underground sources of drinking water and they comply with UIC program requirements. In Washington State most injection wells, mainly dry wells, are used to manage stormwater and urban flooding from roads, parking areas, and roofs where infiltration is feasible.

7.3 Local

7.3.1 Comprehensive Plans

Local agency Comprehensive plans form the cornerstone of community growth and development. They guide a county or city's physical development and identify transportation and other public facilities needed to meet the needs of population growth. These plans serve as the framework for zoning and other development regulations, which must be consistent with comprehensive plans. A thorough review of Thurston County's Comprehensive Plan is in Chapter 3.

7.3.2 Emergency Management Plan

The Comprehensive Emergency Management Plan (CEMP) is Thurston County's all-hazards emergency management plan. The plan includes a Basic Plan and fourteen Emergency Support Function (ESF) Annexes updated in 2021. The CEMP is consistent with the Washington State Comprehensive Emergency Management Plan and the federal-level National Response Framework (NRF). The basic plan and its annexes address prevention and mitigation, preparedness, response, and recovery activities. The county's

Comprehensive Emergency Management Plan is reviewed and updated on a four-year cycle. In accordance with this policy, the basic plan and all ESF annexes are currently being updated, with adoption expected in 2025. This plan, and the state's approval, is a requirement for recognition of a jurisdiction's emergency management program under RCW 38.52. The county and incorporated cities and towns must have a state approved CEMP or be covered under another jurisdiction's plan. More information about Thurston County's emergency service activities is in Chapter 3.

7.3.3 Critical Areas Ordinance

Washington's Growth Management Act requires local governments to protect five types of critical areas: important fish and wildlife habitat areas, wetlands, critical aquifer recharge areas, frequently flooded areas, and geologically hazardous areas, such as bluffs. Thurston County's critical areas regulations respond to that law, regulating how development and redevelopment can safely occur on lands that contain critical areas. On July 24, 2012, the Board of County Commissioners adopted Ordinance No. 14773 amending the Thurston County Critical Areas Ordinance and other related chapters of the Thurston County Code. A thorough review of Thurston County's Critical Areas Ordinance is in Chapter 3.

7.3.4 Municipal Stormwater Permits

Stormwater management is an effective tool to control stormwater flooding. Under the Clean Water Act and the State of Washington Water Pollution Control Law, Washington State Department of Ecology (Ecology) regulates the issuance of municipal stormwater permits to local governments. The stormwater permits regulate a jurisdiction's ability to discharge stormwater into waters of the state, including streams, rivers, lakes, groundwaters, and marine waters. Thurston County, Lacey, Olympia, Tumwater, and Yelm are among the communities regulated under the Western Washington Phase II Municipal Stormwater Permit. Secondary permittees in Thurston County include the Evergreen State College, Washington State Department of Enterprise Services, and the Port of Olympia. Permit obligation include adopting and implementing a stormwater management manual equivalent to Ecology's *Stormwater Management Manual for Western Washington*. This includes making Low Impact Development (LID) the preferred and commonly used approach to site development where feasible. LID involve stormwater and land use strategies that emphasizes conservation, use of onsite natural features, site planning, and distributed stormwater management practices. Additional information about Thurston County's stormwater management regulations is in Chapter 3.

7.3.5 Shoreline Master Program

In 1972, the Shoreline Management Act (RCW 90.58) was approved by the voters of the State of Washington. This law regulates the development and use of certain river, lake and marine shorelines within the State. A part of this law requires local governments (cities

and counties) to adopt local Shoreline Master Programs (SMP's). The overall goal of the Shoreline Management Act (SMA) is to “prevent the inherent harm in an uncoordinated and piecemeal development of the state’s shorelines.” The act is designed to provide for three broad polices: (1) protect shoreline natural resources and ecological functions, (2) reserve shorelines for water dependent and associated water-related uses, and (3) promote public access.

The Act provides for regulation of shoreline development and use in two principal ways. First, it requires that each local Shoreline Master Program contain policies and regulations which define permitted uses and activities. All development activity within shoreline jurisdiction must be consistent with the Master Program, hence these policies and regulations. In one respect, the Master Program is like a comprehensive plan for shorelines because it contains goals and policies, and in another respect it is similar to a zoning code which contains specific performance standards and regulations.

The second way the Act regulates shoreline activities is by requiring permits for certain types of development or use. Compliance with the permit requirements is in addition to the need to comply with the program regulations. Thus, even if a person does not have to obtain a permit for a project, the proposed project still must comply with the regulations.

In addition to a letter of exemption for developments not required to get shoreline permits there are 3 shoreline permit types. The 3 permits are Shoreline Substantial Development Permit, Shoreline Conditional Use Permit, and Shoreline Variance permit. Each have their own conditions and requirements to meet under the SMP.

A major component of the SMP is a shoreline inventory. The inventory categorizes the shoreline into different shoreline environments based on criteria including type of habitat, ecological functions, surrounding land use, and zoning. In 2023, Thurston County adopted the most recent draft update of the Thurston County Shoreline Master Program. Thurston County adopted the Draft Shoreline Master Program in December 2023, but the update remains under review by the Washington Department of Ecology as of May 2025.

In the 2023 SMP for the Thurston Region, shorelines regulated under the SMA were designated as one of the following shoreline environments:

- Natural
- Urban Conservancy
- Rural Conservancy
- Shoreline Residential
- Aquatic

The type of permit required is based on the proposed use or development, in conjunction with the shoreline environment designation where it's proposed.

7.3.6 WRIA Planning

Although Washington's Watershed Management Act does not require planning, Thurston County and local governments have undertaken related planning activities, with technical and financial support from Ecology. Thurston County has participated in watershed planning for four WRIsAs:

- Nisqually River Watershed (WRIA 11)
- Deschutes Watershed (WRIA 13)
- Kennedy-Goldsborough Watershed (WRIA 14)
- Upper and Lower Chehalis River Watershed (WRIsAs 22 and 23)

7.3.7 School District Bonds

Under the authority of the Superintendent of Public Instruction, school districts may issue bonds for major and minor structural additions to buildings, facilities, structures, and sites (RCW 28A.525). Replacing aging school buildings with newer, modern facilities, constructed with current building codes, is at its core, a practice in hazard mitigation. While Thurston County does not have authority to issue school district bonds, school districts may voluntarily designate a facility such as a gymnasium, cafeteria, or portable classroom as emergency shelters (if they don't interfere with their primary function of student education) due to their strength and emergency provisions such as electrical backup systems, kitchens, and restrooms with shower facilities.

7.4 Regional Planning

7.4.1 The Emergency Management Council of Thurston County

The Emergency Management Council (EMC) was created in 1993 and renewed in 2013 via an interlocal agreement to coordinate emergency management activities with the county, cities, and tribes. The ten-member council includes the emergency management representatives from Thurston County, the Town of Bucoda, the cities of Lacey, Olympia, Rainier, Tenino, Tumwater, and Yelm, the Confederated Tribes of the Chehalis Reservation, and the Nisqually Indian Tribe. The Council convenes monthly and regularly invites a variety of stakeholders and subject matter experts to address a wide array of issues related to emergency preparedness, response, recovery, and mitigation. The EMC also lends their expertise as the steering committee for the [Hazards Mitigation Plan for the Thurston Region](#).

The EMC has hosted numerous Executive Disaster Recovery Seminars to engage community leaders and to enhance their awareness of regional activities such as hazards mitigation and catastrophic disaster recovery planning. Previously, the EMC convened a countywide seminar on floods and winter storms in Thurston County. Elected officials and department directors from jurisdictions across the county attended the seminar to learn more about Thurston County's most prevalent natural hazard.

7.4.2 Thurston Regional Planning Council

Thurston County is an original member of the Thurston Regional Planning Council (TRPC), a council of governments established in 1967. TRPC fosters the region's livability through collaborative, informed planning. It carries out regionally focused plans and studies on topics such as transportation, growth management, and environmental quality. Decision-makers from 23 jurisdictions and organizations in Thurston County make up the council, which meets monthly to address challenges related to the region's growth.

TRPC also provides information and education regarding the region and its emerging planning issues. Regional statistics, trends, analyses, and maps provide a basis for planning and decision-making on both the regional and local levels. A variety of council-sponsored community forums relating to regional planning help to educate and promote public participation and dialogue. TRPC's major planning efforts touch nearly every community in the county:

Creating Places Preserving Spaces: A Sustainable Development Plan for the Thurston Region

The Sustainable Thurston project began in early 2011 with a simple question for the Thurston Region's quarter-million residents: How do you want your community to look, function, and feel in 2035? Online and in person, thousands of engaged residents helped the *Sustainable Thurston Task Force* craft a regional vision of sustainable development that encompasses land use, housing, energy, transportation, food, health, public safety, and other interconnected issues. This community conversation identified a vision for a vibrant, healthy, and resilient future, as well as the actions and responsibilities to achieve it: www.trpc.org/259/Sustainable-Thurston.

Sustainable Thurston identified several goals and corresponding actions to achieve the region's vision. Two goals specifically addressed public safety:

- Public Safety Goal 1: Provide emergency services in a dependable and efficient way to meet the dynamic needs of a diverse society.
- Public Safety Goal 2: Create a resilient region by improving disaster preparedness, response, and recovery efforts as well as by expanding public safety education.

The plan also includes seventeen actions to support creating disaster resilient communities:

ID	ACTION
PS-2.01	Fund an update to the region's FEMA approved hazard mitigation plan every five years.
PS-2.02	Encourage local governments, tribes, schools, special-purpose district, and major private employers, such as hospitals, to participate in a regional risk-assessment process and adopt local plans.
PS-2.03	Identify cost-effective mitigation actions that provide all sectors of the community protection from disaster events.
PS-2.04	Consider emergency facilities in community planning and permitting.
PS-2.05	Prioritize relationship building among public safety agencies and other entities to leverage response capacities during disaster events.
PS-2.06	Participate in regional emergency exercises and recovery planning processes.
PS-2.07	Convene recovery committees immediately after a disaster to prioritize restoration of vital public safety facilities and other essential community assets.
PS-2.08	Train personnel in best practices following lessons learned.
PS-2.09	Build residents' capacity to mitigate hazards. This includes urging residents: to install and maintain fire extinguishers and smoke and carbon monoxide detectors in every living space; to reduce fire fuels around living structures in wildland-urban interface areas; to perform seismic stabilization retrofits of older homes; and in remote, hard-to-reach areas to install fire sprinkler systems.
PS-2.10	Build residents' capacity to respond to and recover from hazards. This entails: broadly publicizing the locations and descriptions of community disaster shelters to all sectors of the community; encouraging residents to stock rations, medications, backup heating, and emergency supplies to maintain self-sufficiency for at least 72 hours, preferably seven to ten days; and, building relationships among neighbors to leverage skills and resources to assist those in need when public safety services are overextended during a disaster (e.g., build upon the successes of community education and outreach activities like Thurston County's Crime Watch and Map Your Neighborhood programs).
PS-2.11	Enhance local government awareness of the risks of transporting hazardous materials via pipeline, road, rail, marine, and air routes through the region.
PS-2.12	Increase support for hazardous materials inspection, planning, management, and disposal.
PS-2.13	Establish trusting relations with private utility companies to maintain awareness of community risks from major gas and electrical distribution systems.
PS-2.14	Ensure that adequate response contingencies are in place to swiftly address hazardous materials release.
PS-2.15	Jurisdictions with adopted hazard-mitigation plans should actively pursue funding opportunities to implement their highest-priority mitigation actions.
PS-2.16	Coordinate on strategies for containing urban wildfires.
PS-2.17	Expand the eligibility of Federal Emergency Management Agency (FEMA) mitigation grant programs to allow replacement of aging structures (i.e. facilities such as water reservoirs, fire stations, transportation facilities, emergency coordination shelters, and buildings used as emergency shelters that are better suited to serve communities in the future.)

Thurston Climate Adaptation Plan

The Thurston Climate Adaptation Plan (TCAP) was published in 2018. TRPC led the effort, using a National Estuary Program (NEP) grant to develop the plan. Thurston County and Earth Economics contributed to the design and drafting of the adaptation plan, along with many additional stakeholders and advisory contributors. The plan contains 91 adaptation action recommendations across multiple sectors to improve regional resiliency and adaptative capacity.

Thurston Climate Mitigation Plan

The Thurston Climate Mitigation Plan (TCMP) was developed in 2020 as a collaborative effort between community stakeholders and partners, Thurston County, Lacey, Olympia, Tumwater, and TRPC. The TCMP includes a list of strategies and actions intended to decrease greenhouse gas emissions and reach reduction targets. Thurston County Board of County Commissioners passed Resolution No. 15983 in 2021, declaring a Climate Emergency, and recognized that climate mitigation would require quick action, as well as long-term commitment to reduce and prepare for climate change impacts.

7.5 Local Flood Plans and Studies Review

County staff reviewed existing plans, studies, and reports on flood-related issues from around the Thurston Region (CRS Step 3). This section provides a summary of each document that was reviewed and its contributions in preparation of the FHMP. Additional data sources are listed in the reference sections of individual plan chapters.

More information about Thurston County plans and ordinances is in:

CHAPTER 3 The Mitigation Strategy: Goals, Objectives, and Initiatives

Ecosystem Service Valuation of Thurston County

This 2012 technical report estimates the dollar value of Thurston County's natural capital, also known as ecosystem services, including water storage capacity (flood storage) and erosion control of wetlands, forests and other areas. The document's author, Earth Economics, estimated the dollar-per-acre value of such ecosystem services based on market cost, cost avoidance, and replacement cost. This technical report's Flood Protection section (pg. 17) is incorporated in the FHMP in Chapter 2, section 2.8 Flood Impacts to the Environment. The section notes, in qualitative terms, the ecosystem services that floodplains provide. The technical report could supplement this information and help educate residents about how forests, wetlands and other areas help store water and mitigate flooding – services with quantifiable dollar values (tables starting on pg. 26). This technical report also notes historic floods and related damage costs.

A similar assessment for Thurston County has not been re-studied, and any future use of the existing report should recognize the significant increases in assessed property values, due to inflation and changing housing and land costs since the 2012 report.

City of Olympia Sea Level Rise Plan

In 2019, the City of Olympia, LOTT Clean Water Alliance, and Port of Olympia collaborated to create the Olympia Sea Level Rise Response Plan to coordinate long-term strategies and plans for infrastructure and flooding response. The plan is referenced and was reviewed for information in Chapter 2, section 2.2.

Thurston Regional Planning Council Vulnerability Assessment 2016

This technical report identifies how climate change exacerbates coastal (Section 4.1) and inland flooding (Section 6.2) and affects the vulnerability of built and natural assets (estuaries, roads, bridges, buildings, farms, etc.) in Thurston County. The document uses FEMA modeling to show in maps projected sea-level rise impacts on coastal areas of the county. The document also uses University of Washington Climate Impacts Group modeling to show (in watershed maps and text) the projected increases in major rainfall event frequency and intensity, runoff, streamflow and other factors that affect flooding.

This technical report's Section 4.1: Sea-Level Rise and Section 6.2: Floods & Landslides. Information about Thurston County's flood hazard vulnerability (sources [tidal, urban, riverine, etc.], locations and trends) is incorporated into the FHMP in Chapter 2, section 2.3 Effects of Climate Change.

Thurston County Climate Change Vulnerability Assessment 2024

The 2024 Climate Vulnerability Assessment was developed as a technical appendix to the first Climate Element for the Thurston County Comprehensive Plan. The assessment reviewed multiple sectors of Thurston County and how they may be affected by climate change related impacts. The study reviewed public health, ecosystems and water resources, infrastructure, land use planning, and economic characteristics and vulnerabilities. Results from the assessment were used in Chapter 2, section 2.3 Effects of Climate Change.

Hazards Mitigation Plan for the Thurston Region

This multi-jurisdiction plan identifies and profiles Thurston County hazards for storms, earthquakes, floods, landslides, wildfires, volcanism, other hazards, including the effects of climate change. Hazard profiles (including historic events and related damage costs), identifies vulnerabilities, and estimates the cost of damages and the cost that can be avoided through mitigation. The plan also identifies mitigation goals, objectives and countywide mitigation initiatives. The latest update was adopted by Thurston County in 2024.

The all hazards plan's goals, objectives and countywide mitigation initiatives were referenced by the Flood Planning Committee during the review and development of the FHMP's Goals and Objectives and the development of the mitigation strategy in Chapter 3. The flood hazard profile formed the basis of the development of the FHMP's risk assessment in Chapter 2. The flood hazard exposure analysis and methodology were adapted from the hazards mitigation plan.

Deschutes River Land Use Analysis: Current Conditions Report

This technical report, prepared by Thurston County and the Thurston Regional Planning Council, analyzes water quality risks for the Deschutes River Watershed (WRIA 13). The report's Section 2 discusses the watershed's geology, including the water infiltration rates of soils (pg. 16); this section also describes the characteristics (slope gradient, wetland type, lakes, frequently flooded areas) within the watershed's smaller basins. Section 3 includes detailed water flow assessments for each basin (starting on pg. 55). Each assessment includes a recommendation for the level of land development that should occur.

The general information about the Deschutes Watershed further supports WRIA Planning. The Deschutes plan's basin-level assessments are a useful document for Thurston County, but have more detail than what is needed for the FHMP.

Basin Evaluation and Management Strategies For Thurston County WRIAs 13 and 14

This technical report, prepared by Thurston County and the Thurston Regional Planning Council, identifies strategies that local jurisdictions could use to accommodate future population growth while protecting water quality and quantity in WRIAs 13 and 14. The

report references previous studies that show urbanization leads to changes in the hydrological cycle, mainly as a result of increased runoff, more impervious surfaces, and less vegetative cover. Impacts of such changes include flooding (pgs. 9, 10, 32). The report also recommends broad strategies that can be used to help protect water quality and quantity, including clustering development, requiring tree-retention practices at development sites, and utilizing low-impact development (LID).

The technical report's information about the links between flooding and land development (impervious surfaces and vegetation removal) while useful to water quality, does not new information to expand the FHMP's risk assessment or mitigation strategy.

Thurston County Critical Areas Ordinance

Thurston County amended the Critical Areas Ordinance (CAO) in 2012; this document was referenced only briefly in the 2013 flood plan (on pages 2-3 and 4-7). Chapter 24.20 applies to frequently flooded areas and 100-year channel migration hazard areas. The purposes of this section include: Identify areas affected by natural flooding and stream channel migration and minimize the amount of development at risk in such areas in order to protect human life and safety; minimize damage to homes and places of business; minimize business interruptions; avoid or minimize damage to public facilities and utilities.

The chapter also defines technical terms such as base flood elevation, no-development zones, and high groundwater flood areas, and references several maps: high groundwater flood area; river, marine, lake and coastal flood hazards; channel migration hazard areas.

A detailed review of the CAO is included in Chapter 3. It highlights Thurston County's development standards to protect public safety and environmentally sensitive areas.

Flood Insurance Study 53067CV001F for Thurston County and Incorporated Areas

FEMA updated their FIS report for Thurston County to include the newest relevant community and study information that impact flood hazard designations and planning. The report details the studies, methodologies, and use for the study information. The updated flood maps that result from these studies is replicated throughout the plan, including new data to the plan maps and study details.

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APPENDIX A

Glossary

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Acronyms

CIG—Climate Impacts Group

CIP—Capital Improvement Plan

CRS—Community Rating System

DHS—Department of Homeland Security

DMA —Disaster Mitigation Act

ECC—Thurston County Emergency Coordination Center

ECY—Washington State Department of Ecology

EMC—Thurston County Emergency Management Council

EPA—U.S. Environmental Protection Agency

ESA—Endangered Species Act

FEMA—Federal Emergency Management Agency

FERC—Federal Energy Regulatory Commission

FIRM—Flood Insurance Rate Map

FIS—Flood Insurance Study

GIS—Geographic Information System

HAZUS-MH—Hazards, United States-Multi Hazard

HIVA—Hazard Inventory and Vulnerability Assessment

HMGP—Hazard Mitigation Grant Program

HVRI—Hazards Vulnerability & Research Institute

IBC—International Building Code

IPCC—Intergovernmental Panel on Climate Change

IRC—International Residential Code

LIDAR—Light Detection and Ranging

NFIP—National Flood Insurance Program

NOAA—National Oceanic and Atmospheric Administration

NRC—National Research Council

NWS—National Weather Service

SFHA—Special Flood Hazard Area

TRPC—Thurston Regional Planning Council

UGA—Urban Growth Area

USGS—United States Geological Survey

WAEMD—Washington State Emergency Management Division

WRIA—Water Resource Inventory Area

WSDOT—Washington State Department of Transportation

Definitions

100-Year Flood: The term “100-year flood” can be misleading. The 100-year flood does not necessarily occur once every 100 years. Rather, it is the flood that has a 1 percent chance of being equaled or exceeded in any given year. Thus, the 100-year flood could occur more than once in a relatively short period of time. The Federal Emergency Management Agency (FEMA) defines it as the 1 percent annual chance flood, which is now the standard definition used by most federal and state agencies and by the National Flood Insurance Program.

Acre-Foot: An acre-foot is the amount of water it takes to cover 1 acre to a depth of 1 foot. This measure is used to describe the quantity of storage in a water reservoir. An acre-foot is a unit of volume. One acre foot equals 7,758 barrels; 325,829 gallons; or 43,560 cubic feet. An average household of four will use approximately 1 acre-foot of water per year.

Asset: An asset is any man-made or natural feature that has value, including, but not limited to, people; buildings; infrastructure, such as bridges, roads, sewers, and water systems; lifelines, such as electricity and communication resources; and environmental, cultural, or recreational features such as parks, wetlands, and landmarks.

Base Flood: The flood having a 1% chance of being equaled or exceeded in any given year, also known as the “100-year” or “1% chance” flood. The base flood is a statistical concept used to ensure that all properties subject to the National Flood Insurance Program are protected to the same degree against flooding.

Basin: A basin is the area within which all surface water—whether from rainfall, snowmelt, springs, or other sources—flows to a single water body or watercourse. The boundary of a river basin is defined by natural topography, such as hills, mountains, and ridges. Basins are also referred to as “watersheds” and “drainage basins.”

Benefit: A benefit is a net project outcome and is usually defined in monetary terms. Benefits may include direct and indirect effects. For the purposes of benefit-cost analysis of proposed mitigation initiatives, benefits are limited to specific, measurable, risk reduction factors, including reduction in expected property losses (buildings, contents, and functions) and protection of human life.

Benefit/Cost Analysis: A benefit/cost analysis is a systematic, quantitative method of comparing projected benefits to projected costs of a project or policy. It is used as a measure of cost effectiveness.

Building: A building is defined as a structure that is walled and roofed, principally aboveground, and permanently fixed to a site. The term includes manufactured homes on permanent foundations on which the wheels and axles carry no weight.

Capability Assessment: A capability assessment provides a description and analysis of a community’s current capacity to address threats associated with flooding. The assessment includes two components: an inventory of an agency’s mission, programs, and policies, and an analysis of its capacity to carry them out. A capability assessment is an integral part of the planning process in which a community’s actions to reduce losses are identified, reviewed, and analyzed, and the framework for implementation is identified.

Community Rating System (CRS): The CRS is a voluntary program under the NFIP that rewards participating communities (provides incentives) for exceeding the minimum requirements of the NFIP and completing activities that reduce flood hazard risk by providing flood insurance premium discounts.

Critical Area: An area defined by state or local regulations as deserving special protection because of unique natural features or its value as habitat for a wide range of species of flora and fauna. A sensitive/critical area is usually subject to more restrictive development regulations.

Drainage Basin: A basin is the area within which all surface water—whether from rainfall, snowmelt, springs or other sources—flows to a single water body or watercourse. The boundary of a river basin is defined by natural topography, such as hills, mountains and ridges. Drainage basins are also referred to as **watersheds** or **basins**.

Economically Disadvantaged Populations: Households with household incomes of \$15,000 or less.

Essential/Critical Facility: An essential or critical facility is one that is deemed vital to the Thurston County planning area’s ability to provide essential services while protecting life and property. A critical facility may be a system or an asset, either physical or virtual, the loss of which would have a profound impact on the security, economy, public health or safety, environment, or any combination of thereof, across the planning area. For the purposes of the Thurston County Flood Hazard Mitigation Plan, the following types of systems and assets are defined as critical facilities:

- Police stations, fire stations, paramedic stations, emergency vehicle and equipment storage facilities, and emergency operations and communications centers needed for disaster response before, during, and after hazard events.
- Public and private utilities and infrastructure vital to maintaining or restoring normal services to areas damaged by hazard events. These include water (potable, wastewater, storm water, drainage and irrigation), utilities (transmission and distribution facilities for natural gas, power, geothermal) and communications (land-based telephone, cell phone, the internet emergency broadcast facilities and emergency radios).
- Public gathering places that could be utilized as evacuation centers during large scale disasters.
- Hospitals, extended care facilities, urgent care facilities and housing that may contain occupants not sufficiently mobile to avoid death or injury during a hazard event
- Transportation systems that convey vital supplies and services to, through and throughout the community. These include roads, bridges, railways, airports and pipelines
- Government and educational facilities central to governance and quality of life along with response and recovery actions taken because of a hazard event

- Structures or facilities that produce, use, or store highly volatile, flammable, explosive, toxic, and/or water-reactive materials.
- Infrastructure designed to help safely convey high water events from the event source to the perimeter of the planning area including but not limited to; dams, revetments and stormwater drainage facilities.
- Debris management and solid waste facilities

Exposure: Exposure is defined as the number and dollar value of assets considered to be at risk during the occurrence of a specific hazard.

Extent: The extent is the size of an area affected by a hazard.

Flash Flood: A flash flood occurs with little or no warning when water levels rise at an extremely fast rate

Flood Insurance Rate Map (FIRM): FIRMs are the official maps on which the Federal Emergency Management Agency (FEMA) has delineated the Special Flood Hazard Area.

Flood Insurance Study: A report published by the Federal Insurance and Mitigation Administration for a community in conjunction with the community's Flood Insurance rate Map. The study contains such background data as the base flood discharges and water surface elevations that were used to prepare the FIRM. In most cases, a community FIRM with detailed mapping will have a corresponding flood insurance study.

Floodplain: Any land area susceptible to being inundated by flood waters from any source. A flood insurance rate map identifies most, but not necessarily all, of a community's floodplain as the Special Flood Hazard Area.

Floodway: Floodways are areas within a floodplain that are reserved for conveying flood discharge without increasing the base flood elevation more than 1 foot. Generally speaking, no development is allowed in floodways, as any structures located there would block the flow of floodwaters.

Floodway Fringe: Floodway fringe areas are in the floodplain but outside of the floodway. Some development is generally allowed in these areas, with a variety of restrictions. On maps that have identified and delineated a floodway, this would be the area beyond the floodway boundary that can be subject to different regulations.

Freeboard: Freeboard is the margin of safety added to the base flood elevation.

Frequency: For the purposes of this plan, frequency refers to how often a hazard of specific magnitude, duration, and/or extent is expected to occur on average. Statistically, a hazard with a 100-year frequency is expected to occur about once every 100 years on average and has a 1 percent chance of occurring any given year. Frequency reliability varies depending on the type of hazard considered.

Goal: A goal is a general guideline that explains what is to be achieved. Goals are usually broad-based, long-term, policy-type statements and represent global visions. Goals help define the benefits that a plan is trying to achieve. The success of a flood hazard mitigation plan is measured by the degree to which its goals have been met (that is, by the actual benefits in terms of actual hazard mitigation).

Geographic Information System (GIS): GIS is a computer software application that relates data regarding physical and other features on the earth to a database for mapping and analysis.

Hazard: A hazard is a source of potential danger or adverse condition that could harm people and/or cause property damage.

Hazard Mitigation Grant Program (HMGP): Authorized under Section 202 of the Robert T. Stafford Disaster Relief and Emergency Assistance Act, the HMGP is administered by FEMA and provides grants to states, tribes, and local governments to implement hazard mitigation initiatives after a major disaster declaration. The purpose of the program is to reduce the loss of life and property due to disasters and to enable mitigation activities to be implemented as a community recovers from a disaster

Hazards U.S. Multi-Hazard (HAZUS-MH) Loss Estimation Program: HAZUS-MH is a GIS-based program used to support the development of risk assessments as required under the DMA. The HAZUS-MH software program assesses risk in a quantitative manner to estimate damage and losses associated with natural hazards. HAZUS-MH is FEMA's nationally applicable, standardized methodology and software program and contains modules for estimating potential losses from earthquakes, floods, and wind hazards. HAZUS-MH has also been used to assess vulnerability (exposure) for other hazards.

High Groundwater flooding: A type of flooding that occurs when there is a high-water table and persistent heavy rains. The situation is caused in areas where an upper, thin layer of permeable soils overlies an impermeable layer of hard pan. As the ground absorbs more and more rain water, the groundwater table rises and shows itself as flooding in areas where the land surface is below the water table. The 1998-1999 flood is the groundwater flood of record

Hydraulics: Hydraulics is the branch of science or engineering that addresses fluids (especially water) in motion in rivers or canals, works and machinery for conducting or raising water, the use of water as a prime mover, and other fluid-related areas.

Hydrology: Hydrology is the analysis of waters of the earth. For example, a flood discharge estimate is developed by conducting a hydrologic study.

Intensity: For the purposes of this plan, intensity refers to the measure of the effects of a hazard. For example, heavy precipitation intensity is a measure of the amount of rain that falls within a specified period of time.

Inventory: The assets identified in a study region comprise an inventory. Inventories include assets that could be lost when a disaster occurs and community resources are at risk. Assets include people, buildings, transportation, and other valued community resources.

Local Government: Any county, municipality, city, town, township, public authority, school district, special district, intrastate district, council of governments (regardless of whether the council of governments is incorporated as a nonprofit corporation under State law), regional or interstate government entity, or agency or instrumentality of a local government; any Indian tribe or authorized tribal organization, or Alaska Native village or organization; and any rural community, unincorporated town or village, or other public entity.

Mitigation: A preventive action that can be taken in advance of an event that will reduce or eliminate the risk to life or property.

Mitigation Initiatives: Mitigation initiatives are specific actions to achieve goals and objectives that minimize the effects from a disaster and reduce the loss of life and property.

Objective: For the purposes of this plan, an objective is defined as a short-term aim that, when combined with other objectives, forms a strategy or course of action to meet a goal. Unlike goals, objectives are specific and measurable.

Preparedness: Preparedness refers to actions that strengthen the capability of government, citizens, and communities to respond to disasters.

Presidential Disaster Declaration: These declarations are typically made for events that cause more damage than state and local governments and resources can handle without federal government assistance. Generally, no specific dollar loss threshold has been established for such declarations. A Presidential Disaster Declaration puts into motion long-term federal recovery programs, some of which are matched by state programs, designed to help disaster victims, businesses, and public entities.

Probability of Occurrence: The probability of occurrence is a statistical measure or estimate of the likelihood that a hazard will occur. This probability is generally based on past hazard events in the area and a forecast of events that could occur in the future. A probability factor based on yearly values of occurrence is used to estimate probability of occurrence.

Repetitive Loss Property: Any NFIP-insured property that, since 1978 and regardless of any changes of ownership during that period, has experienced:

- Four or more paid flood losses exceeding \$1000.00; or
- Two paid flood losses exceeding \$1000.00 within any 10-year period since 1978 or
- Three or more paid losses that equal or exceed the current value of the insured property.

Return Period (or Mean Return Period): This term refers to the average period in years between occurrences of a hazard (equal to the inverse of the annual frequency of occurrence).

Riverine: Of or produced by a river. Riverine floodplains have readily identifiable channels. Floodway maps can only be prepared for riverine floodplains.

Risk: Risk is the estimated impact that a hazard would have on people, services, facilities, and structures in a community. Risk measures the likelihood of a hazard occurring and resulting in an adverse condition that causes injury or damage. Risk is often expressed in relative terms such as a high, moderate, or low likelihood of sustaining damage above a threshold due to occurrence of a specific type of hazard. Risk also can be expressed in terms of potential monetary losses associated with the intensity of the hazard.

Risk Assessment: Risk assessment is the process of measuring potential loss of life, personal injury, economic injury, and property damage resulting from hazards. This process assesses the vulnerability of people, buildings, and infrastructure to hazards and focuses on (1) hazard identification; (2) impacts of hazards on physical, social, and economic assets; (3) vulnerability identification; and (4) estimates of the cost of damage or costs that could be avoided through mitigation.

Robert T. Stafford Act: The Robert T. Stafford Disaster Relief and Emergency Assistance Act, Public Law 100-107, was signed into law on November 23, 1988. This law amended the Disaster Relief Act of 1974, Public Law 93-288. The Stafford Act is the statutory authority for most federal disaster response activities, especially as they pertain to FEMA and its programs.

Special Flood Hazard Area: The base floodplain delineated on a Flood Insurance Rate Map. The SFHA is mapped as a Zone A in riverine situations and zone V in coastal situations. The SFHA may or may not encompass all a community's flood problems. Thurston County

regulates high groundwater hazard areas and flood of record areas as additional special flood hazard areas.

Special Needs Populations: Populations whose members may have additional needs before, during, and after an incident in functional areas, including but not limited to: maintaining independence, communication, transportation, supervision, and medical care. Individuals in need of additional response assistance may include those who have disabilities; who live in institutionalized settings; who are elderly; who are children; who are from diverse cultures; who have limited English proficiency or are non-English speaking; or who are transportation disadvantaged. Glossary, National Response Framework.

Stakeholder: Business leaders, civic groups, academia, non-profit organizations, major employers, managers of critical facilities, farmers, developers, special purpose districts, and others whose actions could impact hazard mitigation.

Stream Bank Erosion: Stream bank erosion is common along rivers, streams and drains where banks have been eroded, sloughed or undercut. However, it is important to remember that a stream is a dynamic and constantly changing system. It is natural for a stream to want to meander, so not all eroding banks are “bad” and in need of repair. Generally, stream bank erosion becomes a problem where development has limited the meandering nature of streams, where streams have been channelized, or where stream bank structures (like bridges, culverts, etc.) are located in places where they can actually cause damage to downstream areas. Stabilizing these areas can help protect watercourses from continued sedimentation, damage to adjacent land uses, control unwanted meander, and improvement of habitat for fish and wildlife.

Steep Slope: Different communities and agencies define it differently, depending on what it is being applied to, but generally a steep slope is a slope in which the percent slope equals or exceeds 25%. For this study, steep slope is defined as slopes greater than 33%.

Vulnerability: Vulnerability describes how exposed or susceptible an asset is to damage. Vulnerability depends on an asset’s construction, contents, and the economic value of its functions. Like indirect damage, the vulnerability of one element of the community is often related to the vulnerability of another. For example, many businesses depend on uninterrupted electrical power. Flooding of an electric substation would affect not only the substation itself but businesses as well. Often, indirect effects can be much more widespread and damaging than direct effects.

Watershed: A watershed is an area that drains down-gradient from areas of higher land to areas of lower land to the lowest point, a common drainage basin.

Zoning Ordinance: The zoning ordinance designates allowable land use and intensities for a local jurisdiction. Zoning ordinances consist of two components: a zoning text and a zoning map.

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APPENDIX B

Community Rating System (CRS) Planning Requirements

- CRS Coordinators Manual Section 510 Floodplain Management Planning
- CRS Flood Planning Requirements Check List

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CRS Coordinators Manual Section 510 Floodplain Management Planning

510 FLOODPLAIN MANAGEMENT PLANNING—Summary

Maximum credit: 762 points

512 Elements

- a. **Floodplain management planning (FMP)**: 382 points for a community-wide floodplain management plan that follows a 10-step planning process:
 - Step 1. Organize
 - Step 2. Involve the public
 - Step 3. Coordinate
 - Step 4. Assess the hazard
 - Step 5. Assess the problem
 - Step 6. Set goals
 - Step 7. Review possible activities
 - Step 8. Draft an action plan
 - Step 9. Adopt the plan
 - Step 10. Implement, evaluate, revise.
- b. **Repetitive loss area analysis (RLAA)**: 140 points for a detailed mitigation plan for a repetitive loss area.
- c. **Natural floodplain functions plan (NFP)**: 100 points for adopting plans that protect one or more natural functions within the community's Special Flood Hazard Area.
- d. **Substantial damage management plan (SDP)**: Up to 140 points for a community plan to prepare for substantial damage estimates and determinations after a flood.

Credit Criteria

Each element has a separate section discussing credit criteria.

Impact Adjustment

The impact adjustments for FMP and RLAA are described in separate sections. There is no impact adjustment for NFP.

Documentation Provided by the Community

Each element has a separate section describing needed documentation.

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510 FLOODPLAIN MANAGEMENT PLANNING

The OBJECTIVE of this activity is to credit the production of an overall strategy of programs, projects, and measures that will reduce the adverse impact of the hazard on the community and help meet other community needs.

511 Background

Too often flood protection decisions are made quickly, with inadequate or outdated information or without considering all possible mitigation alternatives or the consequences of those alternatives. As a result, the community's resources are not allocated most appropriately, flood problems may not be fully addressed, and natural floodplain functions may suffer.

To remedy this situation, a careful, systematic process of planning is recommended, and may be credited by this activity. The Community Rating System (CRS) does not specify what activities a plan must recommend; rather, it recognizes plans that have been prepared according to the standard planning process explained in this activity.

Benefits: A well-prepared plan will

- Identify existing and future flood-related hazards and their causes;
- Ensure that a comprehensive review of all possible activities and mitigation measures is conducted so that the most appropriate solutions will be implemented to address the hazard;
- Ensure that the recommended activities meet the goals and objectives of the community, are in coordination with land use and comprehensive planning, do not create conflicts with other activities, and are coordinated so that the costs of implementing individual activities are reduced;
- Ensure that the criteria used in community land use and development programs account for the hazards faced by existing and new development;
- Educate residents and property owners about the hazards, loss reduction measures, and the natural and beneficial functions of floodplains;
- Build public and political support for activities and projects that prevent new problems, reduce losses, and protect the natural and beneficial functions of floodplains; and
- Build a constituency that wants to see the plan's recommendations implemented.

Types of plans: This activity credits four kinds of plans:

- Floodplain management planning (FMP): The most credit is for the first element, a community-wide floodplain management plan, but the element can also credit multi-hazard mitigation plans, multi-jurisdictional floodplain management and hazard mitigation plans, and floodplain management plans prepared for the U.S. Army Corps of Engineers. Only one plan may receive credit under this element,

and plans may not be combined as appendices or credited by virtue of internal reference to another plan, because this element credits the process as well as the content of the planning document.

- Repetitive loss area analyses (RLAA): The second element credits more detailed, site-specific plans to reduce flood losses in repetitively flooded areas. It has a narrower scope than a floodplain management plan, and receives fewer credit points.
- Natural floodplain functions plan (NFP): The third element provides credit for plans that address natural floodplain functions in the community.
- Substantial damage management plan (SDP): The fourth element provides credit for plans that address substantial damage estimates and determinations.

A Category C repetitive loss community (defined in Section 502) must prepare either a FMP or RLAA area analysis that covers at least all of its repetitive loss areas.

Implementation: Credit is not provided for simply preparing a plan. Continued credit is dependent upon plan implementation. To maintain the credit for Activity 510, every year the community must evaluate its progress toward implementing the projects and programs in the plan, area analysis, or natural floodplain functions plan, and submit a report of that evaluation with its annual CRS recertification. It must update the background information and the recommendations in its floodplain management plans and repetitive loss area analyses at least every five years and in its natural floodplain functions plan(s) every 10 years.

By their very nature as overall guidance for a community's program, plans should be coordinated with other plans and programs as well as the activities of other agencies or offices that have authority over the same area. It is recommended that communities also contact state and regional offices and agencies to review their plans and planning criteria. For example, state planning agencies have requirements for some kinds of plans and state emergency management agencies may have additional elements they would like to see included in a mitigation plan.

NOTE: An ordinance is NOT a plan. *An ordinance sets standards for land development and other activities. Planning may include a review of land development standards and procedures, but it should also cover a much broader range of activities, as noted in Figure 510-4.*

Class 9 Prerequisite: A Category C repetitive loss community (see Section 502) must receive credit under EITHER Section 512.a, floodplain management planning (FMP), with full credit in planning Step 5(c) OR Section 512.b, repetitive loss area analysis (RLAA), with a plan that covers its repetitive loss areas.

512 Elements

Floodplain management planning (FMP)

The maximum credit for this element is 382 points.

FMP credit is provided for a community-wide floodplain management plan that was prepared by following a standard planning process. To receive any credit under this activity, the planning process must receive some credit under each of the 10 steps listed below. If the plan was approved by the Federal Emergency Management Agency (FEMA) as a multi-hazard mitigation plan and one step is missing, the mitigation plan may receive credit, but FMP credit will be limited to 50 points. If two steps are missing, there is no credit for a multi-hazard mitigation plan.

For some steps, such as Step 1, the community may show that it implemented at least one of the listed credit items. For other steps, specific items are required as a minimum. Required items are noted with “(REQUIRED)” after them.

FEMA’s multi-hazard mitigation planning regulations pursuant to the Disaster Mitigation Act of 2000 are explained at www.fema.gov/plan/mitplanning. The 10-step CRS planning process is consistent with those regulations, which identify four phases of hazard mitigation planning. The 10 CRS steps are aligned with the four phases of mitigation planning requirements in Table 510-1.

The CRS-credited planning process must follow the 10 steps. Although the plan document must discuss and document all 10 steps, the written plan does not need to be organized by these 10 steps. To document CRS credit, the community must identify where these steps were covered in its plan, using the CRS planning credit activity checklist (see Figure 510-1).

Documentation or discussion of all but Steps 3 and 9 must be presented in the plan document. Steps 3 and 9 may be in the plan document or they may be explained in a separate memo from the community or the plan’s author as explained in the documentation section at the end of each step. The community must update the plan at least every five years and document the update by October 1, five years after the plan was adopted.

Note: It is recommended that the planner review all state and FEMA planning program guidelines, including the CRS planning credit checklist for Activity 510. Doing so will ensure that the planning effort will meet all state, FEMA, and CRS criteria. It is the community’s option, but with proper planning, one plan document can fulfill the planning criteria of several FEMA and state programs.

Table 510-1. Planning steps for mitigation and for the CRS.		
Multi-hazard Mitigation Planning	CRS	Maximum
Phase I – Planning process		
§201.6(c)(1)	1. Organize	15
§201.6(b)(1)	2. Involve the public	120
§201.6(b)(2) & (3)	3. Coordinate	35
Phase II – Risk assessment		
§201.6(c)(2)(i)	4. Assess the hazard	35
§201.6(c)(2)(ii) & (iii)	5. Assess the problem	52
Phase III – Mitigation strategy		
§201.6(c)(3)(i)	6. Set goals	2
§201.6(c)(3)(ii)	7. Review possible activities	35
§201.6(c)(3)(iii)	8. Draft an action plan	60
Phase IV – Plan maintenance		
§201.6(c)(5)	9. Adopt the plan	2
§201.6(c)(4)	10. Implement, evaluate, revise	26
Total		382

512.a Floodplain management planning (FMP):	
<input checked="" type="checkbox"/>	(1) Attached is the floodplain management or hazard mitigation plan to be credited.
<input checked="" type="checkbox"/>	Check here if the plan was also approved by FEMA as a hazard mitigation plan
<input checked="" type="checkbox"/>	(2) This CRS planning credit worksheet, completed.
CRS Planning Step	Page/Section
Step 1. Organize to prepare the plan	
(a) Involvement of the office responsible for community planning	Ch. 6, p. 6-2
(b) Planning committee of department staff	Ch. 1, p. 1-3
(c) Process or committee formally created by the community's governing board	
<input checked="" type="checkbox"/>	(1) Mark the plan document to show how it was prepared and who was involved in the planning process. Show which people or offices implement which of the six mitigation categories.
<input type="checkbox"/>	(2) [For item 1.(c)] Attach a copy of the governing body's action or resolution.

Figure 510-1. An excerpt from a floodplain management planning credit checklist.

Credit Points for FMP

FMP = the total of points credited for Step 1 through Step 10, up to the maximum of 382 points

There are no credit formulae for this activity. The credits for each step are simply added together.

Note that the points listed (Step 1 to Step 10) are maximum possible points. The ISO/CRS Technical Reviewer may determine that one or more items do not warrant full credit.

Step 1. Organize to prepare the plan

The credit for this step is based on how the community organizes to prepare its floodplain management plan.

Credit Points for FMP Step 1

Credit for Step 1 is the total of the following points. (Maximum credit: 15 points)

- (a) 4 points, if the office responsible for the community's land use and comprehensive planning is actively involved in the floodplain management planning process. The "office" may be the community's planning or community development department, a consulting firm, or a regional planning agency, provided that it performs regular land use or comprehensive planning duties for the community. This office is usually not the floodplain management or mitigation planner or consultant, because the intention of this credit is to incorporate the floodplain management or mitigation plan into the rest of the community's planning activities. "Actively involved" means that staff regularly attend meetings, assist in the coordination (Step 3), and either write or review draft sections of the plan.
- (b) 9 points, if the planning process is conducted through a committee composed of staff from those community departments that implement or have expertise in the activities that will be reviewed in Step 7. One point is provided for each office represented. Divisions of departments can be counted as separate offices. For smaller communities with fewer departments, full credit is provided if the committee has representation from all offices with expertise in all six categories of activities credited in Step 7.

A planning committee is strongly recommended. By involving those who can contribute and will be most affected when the recommendations are carried out, the community will get a more realistic product that

Step 7 Categories

- Preventive measures (e.g., codes)
- Property protection (e.g., elevation)
- Natural resource protection
- Emergency services
- Structural flood control projects
- Public Information

Also see Figure 510-4.

will have a much better chance of being adopted and implemented. Community departments that could be represented on the committee include, but are not limited to

- Building department/code enforcement,
- Engineering,
- Land use planning/zoning,
- Public works,
- Emergency management/public safety,
- Public information,
- Environmental protection/public health,
- Parks/recreation,
- A city manager or council member, and
- Housing/community development.

If the planning committee includes representatives from the public and other stakeholders (with no attachment to local government), additional credit is provided in Step 2. Note that there is extra credit in Step 10 if the committee continues to meet after the plan is adopted in order to evaluate progress and recommend changes.

No credit is provided for the creation of a planning committee if the committee only meets once or twice. It must meet a sufficient number of times to involve the members in the following key steps of the planning process (e.g., at least one meeting on each step):

Step 4. Assess the hazard, Step 5. Assess the problem, Step 6. Set goals, Step 7. Review possible activities, and Step 8. Draft an action plan.

If the community wants credit for participating in a multi-jurisdictional floodplain management or hazard mitigation planning committee,

- The community must send at least two representatives to the planning committee;
- At least half of the community's representatives must attend all the meetings of the planning committee. In effect, there must be a quorum from each community. Remote attendance, e.g., via a webinar that allows for everyone to talk, is permissible; and
- CRS credit for the multi-jurisdictional planning committee will be based on the representation from offices that implement the activities in Step 7.

Examples

- a. A community has a planning committee with representatives from its planning, zoning, building, emergency management, code enforcement, and public works departments, as well as the city manager's public information person. There is no one at the community level that deals with natural floodplain functions. The community's committee would receive six points, one for each representative.
 - b. A county is preparing a multi-jurisdictional plan for the county and 10 participating cities. This planning committee has 30 members, including two from each city. Among the members are representatives of all six Step 7 categories, e.g., a city engineer, a city public works person, the county planner, and the county soil and water conservation district. The county's committee would receive the full nine points, provided there was a quorum from each community seeking credit.
- (c) 2 points, if the planning process and/or the committee are formally created or recognized by action of the community's governing body.

Two points are provided if the community's governing body (e.g., the city council) formally recognizes the planning process. The preferred method is a formal resolution that designates who is responsible for preparing the plan and specifies a completion deadline. If a committee credited under Step 1(b) or 2(a) is used, the resolution should identify the members and the chair (or how the chair is selected) and how staff support is provided.

If a community participates in a multi-jurisdictional committee, its governing body must act in order for the community to receive this credit. A city will not receive this credit for a county council resolution. Conversely, a city can receive this credit even if there is no county credit.

Step 2. Involve the public

The planning process must include an opportunity for the public to comment on the plan during its development and before its approval. Members of the public may be part of the planning committee created under Step 1 or they may be organized as a separate committee.

For this credit, the term "public" includes residents, businesses, property owners, and tenants in the floodplain and other known hazard areas as well as other stakeholders in the

community, such as developers and contractors, civic groups, environmental organizations, academia, non-profit organizations, major employers, and staff from other governmental agencies, such as a levee district, housing authority, Natural Resources Conservation Service, or the National Weather Service.

Members of an advisory body to the community that does not have any regulatory authority, such as a stormwater advisory board, can be counted as representatives of the public. Community employees and members of a regulatory body, such as a zoning board of appeals that makes final decisions, are not considered “public” or stakeholders and are counted as representatives of the community departments credited under Step 1(b).

As with staff, involving the public and stakeholders brings them fully into the planning process, provides input on the viability of options being considered, and helps them to become concerned about the outcome. The largest number of points is provided for Step 2(a) because a planning committee with public membership has the following advantages:

- The committee can be a forum to both educate the public and also provide a means for public input into the plan.
- The participants recognize that they are involved and will be more willing to commit themselves to the process.
- The participants can do some of the work, especially data gathering, thereby reducing the overall cost of preparing the plan.
- A committee can be an effective forum for discussing alternatives, debating goals and objectives, and matching the technical requirements of a program to local situations.
- The committee members will provide information on the plan and process to their respective constituencies.
- The participants gain a feeling of “ownership” of the plan and its recommendations, which helps build public support for it.
- Committee members form a constituency that will have a stake in ensuring that the plan is implemented.

Note that 50% of the maximum credit for this planning step is a prerequisite for Class 4 or better communities.

The most important partners to assist in the plan development are already within your community: local government officials, community planning and design professionals, business leaders, civic and volunteer groups, emergency services personnel, and interested residents.

... Ensuring that your team has an equitable and diverse representation will enhance your planning efforts and help build support for mitigation.

—*Planning for a Sustainable Future*, FEMA-364

Credit Points for FMP Step 2

The credit for this step is the total of the following points based on how the community involves the public during the planning process. (Maximum credit: 120 points)

- (a) Up to 60 points, if the planning process is conducted through a planning committee that includes members of the public and meets the following criteria:
- (1) If the committee includes community staff (e.g., the planning committee credited under Step 1(b)), then at least one-half of the members must be representatives of the public or stakeholders for full credit. The credit is prorated for lower levels of public or stakeholder representation. Note that receiving 50% of the maximum credit for this planning step is a prerequisite for Class 4 or better communities and item (a) is one-half of the credit for Step 2.
 - (2) It must meet a sufficient number of times to involve the members in the key steps of the planning process, i.e., it must meet the same meeting criteria specified in Step 1(b).
 - (3) All meetings must be open to the public and the meeting schedule must be publicly posted (e.g., on a website).
 - (4) If the community wants credit for participating in a multi-jurisdictional floodplain management or hazard mitigation planning committee, it must meet the criteria specified in Step 1(b).
 - (5) The formalities of organizing and naming the committee are not as important as the membership and the ability of all members to participate. For example, a community may augment an existing committee with an advisory body of stakeholders. Such an arrangement would be credited, provided the stakeholders were treated as full committee members during the meetings, i.e., they can speak up, vote, and receive all the materials that regular members do.

Note that this planning committee can be (and it is recommended that it be) the same committee that prepares a Program for Public Information under Activity 330 (Outreach Projects). The floodplain management plan document can also be or include the Program for Public Information document and/or the flood insurance coverage improvement plan credited under Activity 370 (Flood Insurance Promotion).

There is extra credit in Step 10 if the committee continues to meet after the plan is adopted in order to evaluate progress and recommend changes, provided that the committee continues to meet the above criteria. Such annual evaluations by a committee are required for some of the credits under Activities 330 and 370.

- (b) 15 points, if one or more public information meetings is held in the affected area(s) within the first two months of the planning process to obtain public input on the natural hazards, problems, and possible solutions. The meetings must be held separately from the planning committee meetings credited in item (1).

The intent of the public meeting(s) is to go out to the people to gather input. At a minimum, it must be separate from regular meetings of the planning committee or the

community's governing body. It is recommended that at least one of these public meetings be held in the affected neighborhoods.

- (c) 15 points, for holding one or more public meetings to obtain input on the recommended plan. The meeting(s) must be at the end of the planning process, at least two weeks before submittal of the recommended plan to the community's governing body.

Simply discussing the plan at a regular public meeting of the governing body, just before it is voted on, is not sufficient public input for CRS credit. To receive credit for this item, there must be at least one public meeting at the end of the planning process, at which the plan and its findings and recommendations are explained and people can ask questions and submit their comments for review, consideration, and potential modification of the plan. The CRS does not require public hearings. State and local laws take precedence, however. The community's legal counsel should determine if a public hearing is required.

- (d) 5 points, for each additional public information activity implemented to explain the planning process and encourage input to the planner or planning committee, up to a maximum of 30 points. Examples include, but are not limited to
- A website that explains the planning process and posts the time and place for its meetings, meeting agendas, status reports, and the draft plan, when it is ready for review.
 - Conducting a public webcast that explains the planning process and solicits input.
 - Questionnaires asking the public for information on their natural hazards, problems, and possible solutions. A questionnaire or survey that is sent to everyone in the floodplain or everyone in the community will receive double credit (10 points).
 - Outreach projects, such as those credited in Activity 330 (Outreach Projects), which explain the planning effort and seek comments. These could include brochures, mailers, booths at shopping malls, presentations at civic or neighborhood organizations, etc.

Step 3. Coordinate

Most communities' flood problems have been studied already. There are likely to be existing plans, studies, and reports on flooding that need to be reviewed. There also may be flood protection activities being considered or implemented by other agencies.

This planning step credits incorporating other plans and other agencies' efforts into the floodplain management plan. Other agencies and organizations must be contacted to determine if they have studies, plans, or information pertinent to the floodplain management plan; to determine if their programs or initiatives may affect the community's program; and to see if they could support the community's efforts.

Examples of “other agencies and organizations” include neighboring communities; local, regional, state, and federal agencies; and businesses, colleges, and other private and non-profit organizations affected by the hazards or involved in hazard mitigation or floodplain management.

This credit is for coordinating with other agencies and organizations, particularly those that are not represented on the planning committee credited under Step 1(b) or Step 2(a). No special additional coordination measures are needed for the agencies and organizations on the planning committee, but the planners may want to formally contact the directors and others for the record.

Note that community needs and goals typically are developed during comprehensive planning activities. These goals should be identified in this step, reviewed, and considered during the development of the floodplain management plan. They should be taken into account when the goals for the floodplain management plan are developed in Step 6.

Credit Points for FMP Step 3

The credit for this step is the total of the following points. To receive credit for this step, the coordination must include item (a). (Maximum credit: 35 points)

- (a) 5 points, if the planning includes a review of existing studies, reports, and technical information and of the community’s needs, goals, and plans for the area. (REQUIRED) Where the information from the existing studies and reports is used in the plan, the source(s) should be referenced.

This review needs to include a review of community needs and goals, past flood studies, disaster damage reports, natural areas plans, and other documents that will provide information for the planning process.

- (b) 30 points, for coordinating with agencies and organizations outside the community’s governmental structure. There is no credit for talking to other departments within the city or county government. For this credit, “coordinate” means to

- Contact the agency or organization and keep a record of the contact (a generic announcement or notice on a website is not sufficient);
- Ask for data or information related to the hazard;
- Ask if the agency or organization is doing anything that might affect flooding or properties in flood-prone areas; and
- Offer the agency or organization an opportunity to be involved in the planning effort, such as by attending a committee meeting or commenting on the draft plan.

One point is provided for each agency or organization that is contacted.

Two points are provided for meeting or having a telephone conversation with the agency or organization. Such a coordination meeting or conversation must be separate from attendance at a planning committee meeting.

Coordination with an agency can only be counted once. For example, if a letter to an agency results in a follow-up meeting or telephone conversation, the community receives two points.

Examples of such agencies and organizations include, but are not limited to

- Neighboring communities;
- Local and regional agencies involved in hazard mitigation activities;
- Stakeholder-type organizations that are not represented on the planning committee;
- Local drainage, levee, sanitary, and soil and water conservation districts;
- Regional and metropolitan planning agencies;
- State National Flood Insurance Program (NFIP) Coordinator;
- State water resources agency;
- State coastal zone management agency;
- State emergency management agency;
- FEMA Regional Office;
- National Weather Service;
- U.S. Army Corps of Engineers;
- Natural Resources Conservation Service;
- U.S. Bureau of Reclamation;
- U.S. Fish and Wildlife Service;
- National Oceanic and Atmospheric Administration;
- Native American tribes;
- American Red Cross;
- Local homebuilders association; and
- Local environmental groups.

If the community wants the plan to qualify as a multi-hazard mitigation plan, the plan must identify all stakeholders that are involved or given an opportunity to be involved in the planning process. At a minimum, stakeholders must include

- 1) Local and regional agencies involved in hazard mitigation activities,
- 2) Agencies that have the authority to regulate development, and
- 3) Neighboring communities.

An “opportunity to be involved in the planning process” means that the stakeholders are engaged or invited as participants and given the chance to provide input to affect the plan’s content.

—*Local Mitigation Plan Review Guide*, FEMA

Step 4. Assess the hazard

At this step in the planning process, the planner or committee reviews, analyzes, and summarizes data collected about the natural hazard(s) that the community faces. This step focuses on the sources, frequency, extent, and causes of flooding while Step 5 will address the impact of flooding on people, property, infrastructure, the local economy, and natural floodplain functions.

Under Step 3(a), the community gathers data about the flood hazard. This step involves reviewing, analyzing, and summarizing the data from existing flood studies, including the Flood Insurance Study, drainage problem studies, historical records, and the knowledge and experiences of the planning committee members.

For CRS credit, the community does not need to conduct studies to develop new flood data. However, if this process determines that new maps or data are needed, they should be described for credit under item (d).

The hazard assessment needs to describe the local flood hazard and not be a broad or generic discussion of flooding in general. It needs to discuss how often it floods, the locations of areas that flood, the depth of flooding, and the source or cause of the flooding. Because the most important readers are elected officials and flood-prone residents, the descriptions of the hazards should be in lay terms.

The CRS Community Self Assessment described in Section 240 can help with this step.

Credit Points for FMP Step 4

The credit for this step is the total of the following points based on what the community includes in its assessment of the hazard. (Maximum credit: 35 points)

- To receive CRS credit for this step, the plan must include a flood hazard assessment credited under item (1).
 - If the community is a Category B or C repetitive loss community (see Sections 502– 503), this step must cover all of its repetitive loss areas.
- (a) 15 points, for including an assessment of the flood hazard in the plan. (REQUIRED)
Flood hazard areas that require assessment include
- The Special Flood Hazard Area (SFHA) shown on the Flood Insurance Rate Map (FIRM),
 - Repetitive loss areas,
 - Areas not mapped on the FIRM that have flooded in the past, and
 - Other surface flooding identified in other studies.
- (1) 5 points, for a map of the flood hazard areas. Area maps are acceptable for multi- jurisdictional plans.
- (2) 5 points, for a description of the known flood hazards, including source of water, depth of flooding, velocities, and warning time.
- (3) 5 points, for a discussion of past floods.
- (b) 10 points, for including an assessment of less-frequent flood hazards in the plan. For this credit, the community must
- (1) Identify the hazard, including
- a. Preparing an inventory of levees that would result in a flood of developed areas if they failed or were overtopped during a flood, and/or
 - b. Preparing an inventory of dams that would result in a flood of developed areas if they failed, and/or

- c. Identifying any of the flood-related special hazards listed in Section 401 of the *CRS Coordinator's Manual* that may affect the community, and/or
 - d. Identifying the coastal A Zone, i.e., the area where wave heights during the 100 - year flood are between 1.5 and 3 feet;
- (2) Map the area(s) affected. (For planning purposes, an approximate affected area is sufficient. No new engineering studies are needed. Area maps are acceptable for multi-jurisdictional plans.) If an engineering study is conducted, it may receive credit under Activity 410; and
- (3) Summarize the hazard(s) in lay terms.

Note that, under Activities 620 (Levees) and 630 (Dams), items (b)(1)a and (b)(1)b are prerequisites for reaching Class 4 or better. Additional guidance on inventorying and mapping the areas affected by levee and dam failures can be found in Section 621.b and Section 631.b, respectively. It is recommended that communities incorporate these inventories into their floodplain management plans.

Item (a) is prorated if part of the “flood hazard” is missing, where applicable. For example, if the community is downstream of a dam, has a levee, and has a coastal A Zone, and the assessment includes only the dam failure hazard, the credit will be less than the full 10 points. If the community does not have a levee, it is reflected in the proration.

Two points are provided if the inventory is conducted and concludes that there are no levees, dams, or special flood-related hazards that threaten the community.

- (c) 5 points, if the assessment identifies areas likely to be flooded and flood problems that are likely to get worse in the future as a result of (1) changes in floodplain development and demographics, (2) development in the watershed, and (3) climate change or sea level rise. The credit is prorated if the assessment does not include all three types of changes.
- (d) 5 points, if the plan includes a description of the magnitude or severity, history, and probability of future events for other natural hazards, such as earthquakes, wildfires, or tornados. The plan should include all natural hazards that affect the community. At a minimum, it should include hazards identified by the state’s hazard mitigation plan.

NOTE: *To qualify as a multi-hazard mitigation plan, the plan must address ALL of the community’s flood and other natural hazards identified in the hazard assessment. Not only does an all-hazards plan help qualify for mitigation funds, but also it will better prepare the community for hazards other than flooding. It is common for communities to focus only on mitigation of flood problems because they occur more often. However, assessing the other hazards when preparing a flood plan can help address what can be done for all hazards, some of which may occur less frequently, but have a greater impact on the community.*

Step 5. Assess the problem

Flooding can be a natural and beneficial occurrence. A floodplain is only a problem area if human development (the built environment) gets in the way of, or exacerbates, the natural flooding process.

The previous step assessed the hazards facing the community. In this step, the community planners or planning committee members collect and summarize data on what is at risk. This step looks at the impact of those hazards on the community.

Note that 50% of the maximum credit for this planning step is a prerequisite for Class 4 or better communities.

Credit Points for FMP Step 5

The credit for this step is the total of the following points, based on what is included in the assessment of the vulnerability of the community to the hazards identified in the previous, hazard assessment, step. (Maximum credit: 52 points)

- To receive credit for this step, the assessment must include items (a) and (c). A plan for a Category B or a Category C repetitive loss community that does not include item (c) may still receive up to 50 points for the plan, provided that no other step is missed.
 - Each credited item must cover all relevant flood-related hazards identified in Step 4.
 - Each credited item must include a description and summary of the problem(s). Simply listing data, such as the names of the critical facilities or the number of flood insurance claims, does not suffice for credit—there must be description of the impact of flooding and what kinds of problems arise, not just raw data.
 - For a multi-jurisdictional plan, each item needs to be described for each community. Tables are acceptable to show the data by community, but there still needs to be a narrative description and summary of the problem(s).
- (a) 2 points, if the plan includes an overall summary of the jurisdiction’s vulnerability to each hazard identified in the hazard assessment (Step 4) and the impact on the community. (REQUIRED)
- (b) 25 points, if the plan includes a description of the impact that the hazards identified in the hazard assessment (Step 4) have on the features listed below:
- (1) 5 points, for life safety and the need for warning and evacuating residents and visitors.
 - (2) 5 points, for public health, including health hazards to individuals from flood waters and mold.
 - (3) 5 points, for critical facilities and infrastructure.
 - (4) 5 points, for the community’s economy and major employers.
 - (5) 5 points, for the number and types of affected buildings (e.g., residential, commercial, industrial, with or without basements, etc.). For this credit, the

assessment must include an inventory of all buildings owned by the community that are located in flood-prone areas and that identifies which buildings are insured for flood damage.

- (c) 5 points, if the assessment includes a review of historical damage to buildings, including all repetitive loss properties and all properties that have received flood insurance claims payments, and/or an estimate of the potential damage and dollar losses to vulnerable structures, including damage from mold and other flood-related hazards. Vulnerable structures must include all buildings within the community's defined repetitive loss area(s).

Communities must include repetitive loss areas in their problem assessment. (REQUIRED of Category B and C repetitive loss communities (see Sections 502–503))

In order to receive the full credit under item (c), the community reviews ALL the addresses of properties that have received flood insurance claims, not just the repetitive loss properties. Such a list is sent annually to all Category B and C repetitive loss CRS communities. Communities can request more recent lists through their FEMA Regional Office.

Data on building damage usually can be obtained from post-disaster damage assessment reports, flood insurance claims or disaster assistance data, and flood control studies.

Particularly in areas that have experienced little or no serious flooding in recent history, a Hazus-MH flood analysis can yield valuable information about the potential for flood damage and loss (Figure 510-2). For best results, the building/structure inventory data bases in Hazus-MH should be augmented with local input.

The Privacy Act

Flood insurance data about private property, including repetitive loss properties, are protected under the Privacy Act. Personally identifiable Information such as the names or addresses of specific properties, whether they are covered by flood insurance or not, whether they have received flood insurance claims, or the amounts of such claims may not be released outside of local government agencies or to the public or used for solicitation or other purposes. Such information should be marked "For internal use only. Protected by the Privacy Act of 1974."

General or aggregated information, such as total claims paid for a community or an area or data not connected to a particular property may be made public.



Hazus-MH is a software program that contains models for estimating potential losses from earthquakes, floods, and hurricane winds. It can be a great help in the Step 5 vulnerability assessment.

Hazus-MH uses geographic information system (GIS) software to map and display hazard data and the results of damage and economic loss estimates for buildings and infrastructure. It also allows users to estimate the impacts of hurricane winds, floods, and earthquakes on populations.

Copies of Hazus-MH are available at no charge from the FEMA Distribution Center. Users can request that a 60-day trial/evaluation copy of ESRI's ArcGIS software be sent with Hazus-MH. Users should be familiar with GIS software. Hazus training is available at FEMA's Emergency Management Institute and elsewhere. Information is at <http://www.fema.gov/hazus/>.

Figure 510-2. About Hazus-MH.

- (d) 5 points, if the assessment describes areas within the floodplain that provide natural functions, such as wetlands, riparian areas, sensitive areas, and habitat for rare or endangered species.

Along with flood protection, comprehensive floodplain management planning should review the unique natural features, natural areas, and other environmental and aesthetic attributes that may be present in the floodplain. Protecting and preserving these natural and beneficial floodplain functions yield flood protection benefits and also help integrate floodplain management efforts with other community goals and objectives.

This section should also review existing natural floodplain functions plans, such as those credited under Section 511.c.

- (e) 7 points, if the assessment includes a description of development, redevelopment, and population trends and a discussion of what the future brings for development and redevelopment in the community, the watershed, and natural resource areas.
- (f) 8 points, if the assessment includes a description of the impact of the future flooding conditions described in Step 4(c) on people, property, and natural floodplain functions.

Step 6. Set goals

The goals should set the context for the subsequent review of floodplain management activities and drafting of the action plan (Figure 510-3). They should incorporate or be consistent with other community goals for the affected areas. A multi-hazard mitigation plan should have goals that address all the major hazards that face the community.

Credit Points for FMP Step 6

The points for this step are provided if the plan includes a statement of the goals of the community's floodplain management or hazard mitigation program. The goals must address all flood-related problems identified in Step 5. (Maximum credit: 2 points)

Step 7. Review possible activities

At this step, the plan reviews different activities that could prevent or reduce the severity of the problems described in Step 5. This is a systematic review of a wide range of activities to ensure that all possible measures are explored, not just the traditional approaches of flood control, acquisition, and regulation of land use. The review, including the pros and cons of each activity, must be included in the plan document. Figure 510 -4 lists some of the types of activities that could be reviewed under each of the six credited categories.

***NOTE:** This review is separate from Step 8, the selection of projects and activities to pursue. It includes activities that may not be selected and explains why some activities may be appropriate for the community and its flooding conditions and why some may not be appropriate.*

The range of activities should be evaluated for each area affected. While some of them may be quickly eliminated as inappropriate, most deserve careful consideration, especially to ensure full understanding of their costs and benefits.

St. Tammany Parish, Louisiana, Multi-Hazard Mitigation Plan

1. Protect the lives and health of the Parish's residents from the dangers of natural hazards.
2. Ensure that public services and critical facilities operate during and after a disaster.
3. Ensure that adequate evacuation routes, streets, utilities and public and emergency communications are maintained and available during and after a disaster.
4. Protect homes and businesses from damage.
5. Use new infrastructure and development planning to reduce the impact of natural hazards.
6. Give special attention to repetitively flooded areas.

Gurnee, Illinois, Flood Mitigation Plan

1. Protect existing properties
 - a. Use the most effective approaches to protect buildings from flooding, including acquisition or relocation where warranted.
 - b. Enact and enforce regulatory measures that ensure that new development will not increase flood threats to existing properties.
 - c. Use appropriate measures to mitigate against the danger and damage posed by other natural hazards.
2. Protect health and safety
 - a. Advise everyone of the safety and health precautions to take against flooding and other natural hazards.
 - b. Improve traffic circulation, during floods and at other times.
 - c. Improve water quality and habitat.
 - d. Do something about the mosquitoes.
3. Improve the quality of life in Gurnee.
 - a. Preserve and improve the downtown core of businesses and services.
 - b. Ensure that current owners can maintain and improve their properties.
 - c. Use acquisition programs to expand open space and recreational opportunities.
 - d. Maintain an attractive riverfront and other public open spaces.
4. Ensure that public funds are used in the most efficient manner.
 - a. Prioritize mitigation projects, starting with those sites facing the greatest threat to life, health, and property.
 - b. Utilize public funding to protect public services and critical facilities.
 - c. Utilize public funding for those projects on private property where the benefits exceed the costs.
 - d. Maximize the use of outside sources of funding.
 - e. Maximize owner participation in mitigation efforts to protect their own properties.
 - f. Encourage property-owner self-protection measures.

Figure 510-3. Two examples of communities' statements of their goals.

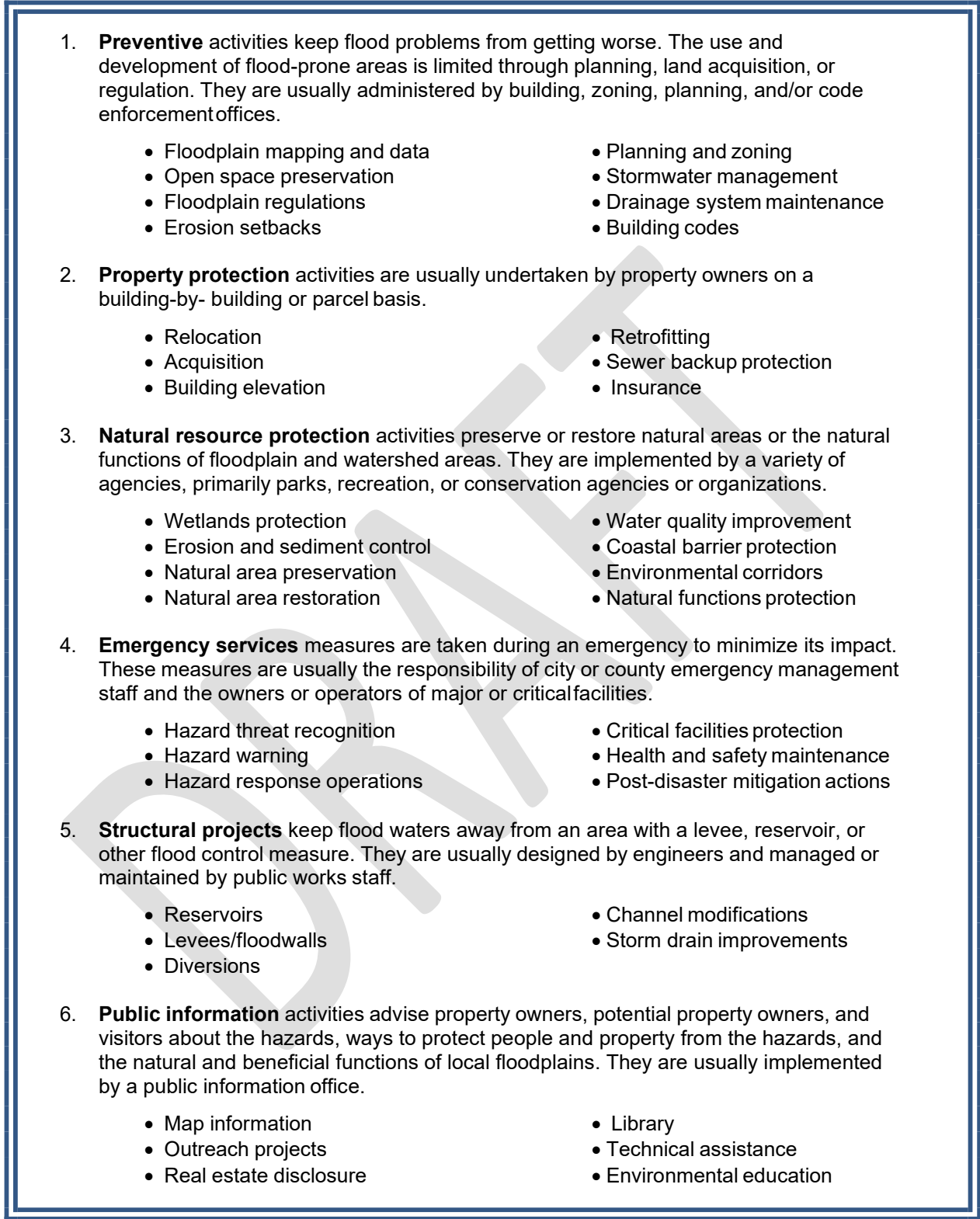


Figure 510-4. Categories of floodplain management activities.

Credit Points for FMP Step 7

The credit for this step is the total of the following points based on which floodplain management or hazard mitigation activities are reviewed in the plan. (Maximum credit: 35 points)

This step must describe those activities that were considered. There is no credit for simply listing the various types of projects under each credited category. For each activity, there must be a discussion of why the activity is or is not appropriate for the community and its flood problems.

For an activity that is determined to be appropriate,

- The discussion must also include community's capability to fund and implement the activity.
- If an activity is currently being implemented, the plan must note if it is achieving expectations and, if not, whether it should be modified.
- If the plan is an update of a previously credited plan, each activity recommended by the previous plan must be discussed, along with the status of implementation.

The discussion of each activity needs to be detailed enough to be useful to the lay reader.

Section (a) is required for any credit under this step.

(a) 5 points, if the plan reviews preventive activities, such as zoning, stormwater management regulations, building codes, subdivision ordinances, and preservation of open space, and the effectiveness of current regulatory and preventive standards and programs. (REQUIRED) For this credit, the review must include a discussion of the community's

- Comprehensive or land use plan,
- Building code,
- Zoning ordinance,
- Floodplain management regulations,
- Subdivision ordinance, and
- Stormwater management regulations.

The discussion must review

- How these tools can reduce future flood losses,
- The current standards in the community's plans and regulations, and
- Whether the community should adopt or revise such plans and regulations in light of the Step 5 problem assessment and the goals set in Step 6.

- (b) 5 points, if the plan reviews whether the community's floodplain management regulatory standards are sufficient for current and future conditions, as discussed under Steps 4(c) and 5(f).
- (c) 5 points, if the plan reviews property protection activities, such as acquisition, retrofitting, and flood insurance;
- (d) 5 points, if the plan reviews activities to protect the natural and beneficial functions of the floodplain, such as wetlands protection;
- (e) 5 points, if the plan reviews emergency services activities, such as warning and sandbagging;
- (f) 5 points, if the plan reviews structural projects, such as levees, reservoirs, and channel modifications; and
- (g) 5 points, if the plan reviews public information activities, such as outreach projects and environmental education programs.

Step 8. Draft an action plan

After the review of alternatives during Step 7, an action plan is drafted (Step 8) that selects and specifies those activities appropriate to the community's resources, hazards, and vulnerable properties. The community should strive for a balanced program, selecting measures from more than one category of floodplain management activity. In every case, the community should implement preventive activities both to keep its flood problems from getting worse and also to protect new construction from the effects of natural hazards.

There is no requirement that a floodplain management plan identify expensive or massive structural flood control projects. The plan must include activities that the community can be assured will be implemented through its own resources. If outside funding support is needed for some projects, the funding sources should be identified and researched to ensure that the projects are eligible and the community has a chance of receiving the funds. Many of the activities could receive CRS credit once they are implemented.

Note that 50% of the maximum credit for this planning step is a prerequisite for Class 4 or better communities.

Credit Points for FMP Step 8

The credit points are based on the range of actions that are recommended in the plan, subject to the criteria listed below. (Maximum credit: 60 points)

- For each recommendation, the action plan must identify
 - Who is responsible for implementing the action,
 - When it will be done, and
 - How it will be funded.

“When it will be done” can be specified in terms of a date, a set period of time after another action is complete, after the next flood, etc. “How it will be funded” could state that funding will be dependent on a grant, provided the project is eligible for the grant program.

- The actions must be prioritized. When prioritizing mitigation actions, the planners need to consider the benefits that would result from the mitigation actions and projects versus the cost of those actions. Note that this is not a requirement for a cost - benefit analysis for every action item. However, an economic evaluation is essential for selecting one or more actions from among many competing ones.
 - There must be an action item for each goal in Step 6. An example of this is in Figure 510-5.
 - Credit is provided for a recommendation on floodplain regulations, provided it recommends adopting or continuing a regulatory standard that exceeds the minimum requirements of the National Flood Insurance Program (NFIP). Simply continuing to meet the minimum criteria of the NFIP is not credited as an action item to improve the community’s floodplain management program.
 - If the plan calls for acquiring properties, there must be a discussion of how the project(s) will be managed and how the land will be used after it is acquired.
 - When a multi-jurisdictional plan is prepared, it must have action items from at least two of the six categories that directly benefit each community seeking CRS credit.
 - To qualify as a multi-hazard mitigation plan, the plan must include a “process by which local governments incorporate the requirements of the mitigation plan into other planning mechanisms such as comprehensive or capital improvement plans, when appropriate” (44 *CFR* §201.6(c)(4)(ii)). The action items that relate to preventive activities should clarify how this is done. For example, an action item could recommend that the next time the zoning ordinance is revised, flood and landslide hazard areas be considered when determining allowable uses.
- (a) 45 points, depending on how many categories are covered by the action items:
- (1) 10 points, if the action plan includes flood-related recommendations for activities from two of the six categories credited in Step 7; OR
 - (2) 20 points, if the action plan includes flood-related recommendations for activities from three of the six categories credited in Step 7; OR
 - (3) 30 points, if the action plan includes flood-related recommendations for activities from four of the six categories credited in Step 7; OR
 - (4) 45 points, if the action plan includes flood-related recommendations for activities from five of the six categories credited in Step 7.

Table 9-1. Action Items, Goals, and Recommendations							
Action Item	Goal 1. Protect critical facilities and utilities	Goal 2. Protect lives and health	Goal 3. Protect homes, businesses, and schools	Goal 4. Minimize the costs to the City and property owners	Goal 5. Ensure that new construction supports these goals	Chapter – Recommendation	Deadline
9.2. Administrative Action Items							
1. <i>Plan</i> adoption	X	X	X	X	X		5/31/07
2. Monitoring and reporting	X	X	X	X	X		9/30 each year
3. Community Rating System	X	X	X	X	X	4-3, 6-5, 7-3, 8-1 - 8-8	CRS visit
9.3. Program Action Items							
4. Levee improvements	X	X	X	X		4-1	Ongoing
5. Drainage improvements	X	X	X	X		4-2	8/31/08
6. Drainage system maintenance	X	X	X			4-3	CRS visit
7. Property protection funding	X	X	X	X		5-2, 5-3	8/31/07
8. Regulatory review	X		X		X	6-5	CRS visit
9. NFIP administration	X	X	X		X	6-2	After CAC
10. CFMs	X	X	X		X	6-2, 6-3	8/31/07
11. BCEGS	X	X	X		X	6-4	5/31/07
12. Flood response plan	X	X	X			7-1 – 7-4	Ongoing
9.4. Public Information Action Items							
13. Annual mailing		X	X		X	8-1, 8-2, 8-7, 8-8	Each Spring
14. Technical references		X	X		X	8-4, 8-5	CRS visit
15. Public information projects		X	X		X	4-4, 5-1, 6-1, 6-6, 7-4, 8-1 – 8-8	Ongoing
16. Public information messages		X	X		X	4-4, 5-1, 6-1, 6-6, 7-4, 8-1 – 8-8	Ongoing
<p>This table relates the 16 action items to the 5 goals of this Plan. The goals are stated in full on pages 3-6 and 9-1. The table also shows the relation between the action items and the recommendations at the end of chapters 4 – 8. For example action item 8, Regulatory Review, implements recommendation 6-5 at the end of chapter 6. The reviews need to be completed in time for the CRS verification visit, which will be in the second half of 2007.</p>							

**Figure 510-5. An excerpt from the City of Gretna,
Louisiana’s
Flood Hazard Mitigation Plan.**

- (b) 10 additional points are provided if the action plan establishes or revises post-disaster redevelopment and mitigation policies and procedures. These policies and procedures should account for the expected damage from a base flood or other disaster. For example, the action plan should identify the areas likely to be worst hit and the policies should determine whether they will be rebuilt if substantially damaged. Post-disaster mitigation procedures should assign responsibilities for public information, code enforcement, planning, and other efforts that encourage, mandate, and/or fund loss reduction activities.

Note that Activity 330 (Outreach Projects) provides credit for public information materials developed for use during and after a flood (Flood Response Preparations (FRP)). Preparation of those materials should be done when the other post-disaster policies and procedures are prepared.

- (c) 5 additional points are provided if the plan includes action items (other than public information activities) to mitigate the effects of the other natural hazards identified in the hazard assessment (Step 4, item (d)).

Step 9. Adopt the plan

The points for this step are provided if the plan and later amendments are officially adopted by the community's governing body. The plan must be an official plan of the community, not an internal staff proposal. "Adopted" means that there is a resolution or other formal document that is voted on by the community's governing body. A note in the minutes or passage via a consent agenda is not credited.

When a multi-jurisdictional plan is prepared, it must be adopted by the governing body of each community seeking CRS or multi-hazard mitigation plan credit.

Step 10. Implement, evaluate, and revise

To be useful, planning must be ongoing and plans must be dynamic. The plan should not sit on a shelf gathering dust once it is completed. Therefore, the community must have an evaluation and update process.

For CRS credit, plans must be implemented. No plan is perfect. As implementation proceeds, flaws will be discovered and changes will be needed. Not only can hazard conditions change but also goals and objectives may change. If a community is hit by a tornado, for example, the short-term action items may be changed to focus attention on the newly damaged areas in the SFHA.

Changes should be made in the action plan when opportunities arise to add new activities or complete some items ahead of schedule. The plan should also be revised if it is found that some activities cannot be completed on the original timetable. At a minimum, these types of changes must be made at the required 5-year update.

The key to this step is the annual evaluation report on progress in implementing the plan. Not only are annual evaluations required with the community's annual recertification, but also the process of conducting an annual evaluation gives the community a

framework for monitoring the plan's effectiveness and the community's progress in implementing it. Failure to submit the evaluation report with the community's annual recertification will result in loss of the planning credit (i.e., FMP = 0). This can cause a Category C repetitive loss community to revert to a Class 10.

Credit Points for FMP Step 10

The credit for this step is the total of the following points, based on how the community monitors and evaluates its plan. (Maximum credit: 26 points)

- The plan document must describe how, when, and by whom the plan will be monitored, evaluated, and revised. It is recommended that these items be included in the adoption resolution as well.
 - An annual evaluation report on progress towards plan implementation must be prepared at least once each year and submitted with the community's annual CRS recertification. The report must be submitted to the governing body, released to the media, and made available to the public.
 - If a community receives credit as a result of participation in a multi-jurisdictional plan that includes action items for each community, the annual evaluation report must cover those action items. This can be done either by a multi-jurisdictional planning committee or through separate submittals by each community. However, a community will not receive credit if it did not participate in the meeting at which the annual report was prepared. Therefore, the submittal needs to show who participated in the preparation of the report.
 - The community must update the plan at least every five years. The update is due by October 1, five years after the plan was adopted (see next section).
 - Step 10(b) provides credit if the planning committee does the evaluation and revision. If the committee does not continue to meet and report or if the committee membership no longer meets the credit criteria in Step 2(a), the community will not keep the committee credits under Steps 1(b) or 2(a).
- (a) 2 points, if the community has procedures for monitoring implementation, reviewing progress, and recommending revisions to the plan in an annual evaluation report. The report must be submitted to the governing body, released to the media, and made available to the public. (REQUIRED)
- (b) 24 points, if the annual evaluation report is prepared by the same planning committee that prepared the plan that is credited in Step 2(a) or by a successor committee with a similar membership that was created to replace the planning committee and charged with monitoring and evaluating implementation of the plan. The points are based on how frequently the committee meets, since more frequent meetings yield more progress toward implementing the plan. The committee must continue to meet the representation, quorum, and other criteria that determined the credit points under Step 2(a).
- (1) 6 points, if the committee meets only once a year.
 - (2) 12 points, if the committee meets twice a year.
 - (3) 24 points, if the committee meets at least quarterly.

Five-year Update

The community must submit a copy of its plan update at least every five years. The plan update will be reviewed for CRS credit according to the *Coordinator's Manual* currently in effect, not the version used when the community originally requested this credit. The update must include the following steps:

- (a) Steps 1 and 2: If the original planning process included a committee, then in order to keep the credit provided under Step 1(b) or Step 2(a), the update must be conducted by a committee that meets the criteria identified in those steps.
- (b) Step 2: If the original planning process received credit for a public meeting credited under Step 2, item (c), then to keep this credit the community must also conduct a public meeting that reviews and receives comments on the draft update.
- (c) Step 3, item (a): The update must include a review of new studies, reports, and technical information and of the community's needs, goals, and plans for the area that have been published since the plan was prepared.
- (d) Steps 4 and 5: The hazard and problem assessments must be reviewed and brought up to date. The assessments must account for
 - New floodplain or hazard mapping,
 - Annexation of flood-prone areas,
 - Additional repetitive loss properties,
 - Completed mitigation projects,
 - Increased development in the floodplain or watershed,
 - New flood control projects,
 - Lack of maintenance of flood control projects,
 - Major floods or other disasters that occurred since the plan was adopted, and
 - Any other change in flooding conditions and/or development exposed to flooding or the other hazards covered in the plan.
- (e) Step 6: The original plan's goals must be reviewed to determine if they are still appropriate, given the revisions to Steps 4 and 5.
- (f) Step 8: The action plan must be revised to account for projects that have been completed, dropped, or changed and for changes in the hazard and problem assessments, as appropriate.
- (g) Step 9: The update must be adopted by the community's governing body.

An annual evaluation report that includes these steps may qualify as the five-year update (but may not qualify as an update for a multi-hazard mitigation plan).

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DRAFT

CRS Flood Planning Requirements Check List

510 FLOODPLAIN MANAGEMENT PLANNING CHECKLIST

Community: _____

Enter name of plan here

511.a Floodplain Management Planning (FMP)

Credit Points: *Enter the section or page number of the plan where each credited item can be found.*

CRS Step	Section/Page	Item Score	Step Total
1. Organize to prepare the plan. (max:15)			
a. Involvement of Office Responsible for Community Planning (4)	_____		
b. Planning committee of department staff (9)	_____		
c. Process formally created by the community's governing board (2)	_____		0
2. Involve the public. (max: 120)			
a. Planning process conducted through a planning committee (60)	_____		
b. Public meetings held at the beginning of the planning process (15)	_____		
c. Public meeting held on draft plan (15)	_____		
d. Other public information activities to encourage input (Up to 30)	_____		0
3. Coordinate with other agencies. (max: 35)			
a. Review of existing studies and plans [REQUIRED] (5)	_____		
b. Coordinating with communities and other agencies (Up to 30)	_____		0
4. Assess the hazard. (max: 35)			
a. Plan includes an assessment of the flood hazard [REQUIRED] with:			
(1) A map of known flood hazards (5)	_____		
(2) A description of known flood hazard (5)	_____		
(3) A discussion of past floods (5)	_____		
b. Plan includes assessment of less frequent floods (10)	_____		
c. Plan includes assessment of areas likely to flood (5)	_____		
d. The plan describes other natural hazards [REQUIRED FOR DMA] (5)	_____		0
5. Assess the problem. (max: 52)			
a. Summary of each hazard identified in the hazard assessment and their community impact [REQUIRED] (2)	_____		
b. Description of the impact of the hazards on: (max: 25)			
(1) Life, safety, health, procedures for warning and evacuation (5)	_____		



APPENDIX C

Public Outreach Information

- C-1: 2024/2025 Update Flyer
- C-2: Community Planning Flood Webpage
- C-3: Flood Planning Committee Webpage
- C-4: Emergency Services Flooding Webpage
- C-5: GIS Story Map
- C-6: Social Media Post Example
- C-7: Plan Comment Form
- C-8: 2025 Public Comments
- C-9: 2025 Press Release
- C-10: 2025 Legal Notice
- C-11: 2017 Survey Questionnaire and Results



2025 Thurston County

Flood Hazard Mitigation Plan Update



The Flood Hazard Mitigation Plan

describes activities that can eliminate or reduce flood hazard impacts in Thurston County including:

- Planning.
- Policy changes.
- Building codes.
- Development regulations.
- Land use zoning.
- Programs.
- Projects.

We're updating the plan to meet federal requirements and ensure we have the most current data. A final draft is expected in 2025.

Proposed Changes

Changes to the plan are minor and will not change flood maps or regulations. Updates include adding newer data and minor corrections.

View the Current Plan

The 2017 plan is on our website. Go to ThurstonPlanning.org and search "Flood Plans".



C-2: Community Planning Flood Webpage

Home / Elected Offices and Departments / CPED - The Community Planning & Economic Development Department / Community Planning / Community Planning - Floods

Community Planning - Floods

Thurston County is working on an update to the Flood Hazard Mitigation Plan to be completed in 2025.

- [Click here to view the StoryMap and learn more about the plan.](#)
- [Submit a comment through our short survey.](#)
- [Sign up to receive project emails.](#)
- [Visit the Flood Planning Committee webpage.](#)
- [2017 Flood Hazard Mitigation Plan.](#)
- [View current comments on the Flood Hazard Mitigation Plan.](#)

County Flood Programs & Information

Floods are the most common natural hazard in Thurston County. Our average annual rainfall of 50 inches can lead to river, stream, and groundwater flooding. Many County departments provide programs and services to help citizens keep themselves, and their property safe. Find links to available information and programs below.

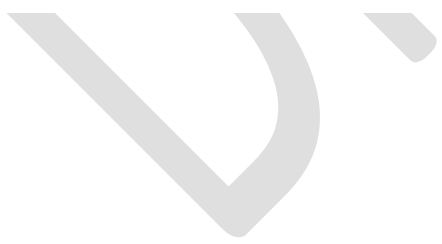
Emergency Alerts

Sign up to receive text or email alerts about hazardous conditions, including flooding.

- [Thurston County Community Alert System](#)

Flooding Links and Information

- County Flood Plans
- Development Regulations for Flood Hazard Areas
- Emergency Management
- Flood Insurance
- Flood Maps
- Public Health and Social Services
- Rainfall & Water Levels
- Road Closure Information - Public Works
- Shoreline Management & Natural Resources Program
- Water Resources and Water Planning



C-3: Flood Planning Committee Webpage

Home / Elected Offices and Departments / CPED - The Community Planning & Economic Development Department / Volunteer Citizen Advisory Groups
Thurston County Flood Planning Committee

- Volunteer Advisory Groups
- Agriculture Advisory Committee
- Building & Planning Permits
- Community Planning (Long-Range Planning)
- Fairgrounds & Event Center
- Master Gardener Program
- Volunteer Advisory Groups
 - Agriculture Advisory Committee
 - Fair Advisory Board
 - Flood Planning Committee**
 - Historic Commission
 - Planning Commission
 - Water Resources Advisory Board
- Contact Us

Thurston County Flood Planning Committee

The Flood Planning Committee is an advisory committee formed of county staff and public stakeholders, including members of the public and representatives of community organizations or agencies. The Committee assesses the Flood Hazard Mitigation Plan actions annually and reviews updates to the Flood Hazard Mitigation Plan.

Meetings to review the 2025 update to the Flood Hazard Mitigation Plan are held on the 4th Tuesdays of January - May 2025. Annual reviews for the Flood Plan actions are held in early fall. See below for past meeting details and materials.

The county is currently working on an update to the Flood Hazard Mitigation Plan to be completed in 2025.

- [Click here to view the StoryMap and learn more about the plan.](#)
- [Submit a comment through our short survey.](#)
- [View current comments on the Flood Hazard Mitigation Plan.](#)
- [Sign up to receive project emails.](#)
- [Visit the Community Planning - Floods page to view more flood information.](#)

Meeting Materials

- January 28, 2025
- February 25, 2025
- March 25, 2025
- April 22, 2025
- May 27, 2025

Documents

- [2024 Annual Report - Flood Hazard Mitigation Plan](#)
- [Existing 2017 Flood Hazard Mitigation Plan](#)
- [Hazard Mitigation Plan for the Thurston Region](#)

Draft Chapters Ready for Review

Draft chapters are not the final version, and are expected to be updated during the Flood Planning Committee and public review process. Tracked changes versions allow the public to see proposed changes and updates to the 2017 plan. Please provide comments through the [Thurston 2045 Flood Hazard Mitigation Plan survey link](#). Draft chapters and updated maps will be added after completing initial staff review.

- [Tracked Changes Version: Draft Executive Summary](#)
- [Tracked Changes Version: Draft Chapter 1, Introduction](#)
- [Tracked Changes Version: Draft Chapter 2, Flood Risk Assessment](#)
- [Tracked Changes Version: Draft Chapter 3, Mitigation Strategies](#)
- [Tracked Changes Version: Draft Chapter 4, Plan Process](#)
- [Tracked Changes Version: Draft Chapter 5, Implementation and Maintenance](#)
- [Tracked Changes Version: Draft Chapter 6, Community Profile](#)
- [Tracked Changes Version: Draft Chapter 7, Capability Assessment](#)
- [Tracked Changes Version: Draft Appendix A, Glossary](#)
- [Tracked Changes Version: Draft Appendix B, CRS Requirements](#)
- [New Appendix: Draft Appendix E, Maps](#)

C-4: Emergency Services Flooding Webpages

Thurston County Washington

Living in Thurston County | Doing Business in Thurston County | Elected Offices and Departments | Events | News

Emergency Management

Home / Elected Offices and Departments / Emergency Management / Hazards / Flood

Hazards

- Emergency Information
- Emergency Plans
- Emergency Preparedness Expo
- Get Prepared!
- Hazards
 - Earthquakes
 - Floods
 - High Ground Water
 - Flood Monuments
 - Hazardous Materials Release
 - Landslides
 - Severe Weather
 - Volcano
 - Wildfire
- Organizations and Committees
- River Flood Monitoring
- Senior and Elected Officials' Guide to Emergency Management
- Volunteer Opportunities

Floods

Of all natural hazards that affect Thurston County, floods are the costliest on an annual average basis. They can occur at any time of the year, and at any time of day or night, especially during the winter months. Most injuries and deaths occur when people are swept away by flood currents, and most property damage results from inundation by sediment-filled water.

Flooding can be caused by several days of prolonged rainfall, a rapidly melting snowpack, dam or levee failure, or a combination of these conditions. Four principal sources of flooding impact Thurston County: river and stream, groundwater, tidal and urban flooding. Each source of flooding can happen independently or simultaneously with each other during a single weather event.

In Thurston County, the five river systems most susceptible to significant flooding are the Nisqually, Chehalis, Deschutes, Skookumchuck, and Black rivers. Many of our county's lakes and other drainages are also susceptible to flooding as well.

[2024 Thurston County Flood Bulletin](#)
[River Flood Monitoring](#)

Prepare your property for flooding with sandbags

The use of sandbags is a centuries old, tried, and true method for mitigating flood impacts. For more information and procedures on submitting requests for sandbags, visit our [sandbagging information page](#).

Do you live in a Flood Hazard Zone? Learn more about the National Flood Insurance Program (NFIP) and Flood Insurance Rate Maps (FIRM)

The National Flood Insurance Program (NFIP) is a program managed by FEMA that provides flood insurance to property owners, renters and businesses located within designated Flood Hazard Zones. FEMA routinely partners with local officials to conduct flood risk map studies to develop and maintain Flood Insurance Rate Maps (FIRM) to assist communities with flood hazard preparedness.

You can visit FEMA's [Flood Map Service Center](#) for access to public flood hazard information produced in support of the National Flood Insurance Program. You can also visit FEMA's [Flood Insurance](#) website for more information on the NFIP and resources on obtaining flood insurance.

Questions about land use and development regulations in flood hazard zones? Visit our experts at Community Planning and Economic Development

Thurston County's Community Planning and Economic Development manages the implementation of development standards and restrictions on building in flood hazard areas. For more innovation on land use, permitting and elevations of homes within the flood hazard zone, visit their page on [Development Regulations in Flood Areas](#).

Additional Flood Resource Publications

- [Disinfecting your well in 5 easy steps](#) (PDF)

Thurston County Washington

Living in Thurston County | Doing Business in Thurston County | Elected Offices and Departments | Events | News

Home / Floods

Flood Information

River Flood Monitoring

You can see National Oceanic and Atmospheric Administration (NOAA) river level statistics and predictions by selecting from the list of rivers below.

Each river has one or more gauges monitoring water levels and has a description of where the gauge is located along the river. Refer to the gauge that is closest to the area you are interested in monitoring.

Next to each gauge graph is a chart summarizing flood levels and historical information.

[Click here to see a page showing all gauge graphs for quick reference.](#)

[Deschutes River](#)

[Skookumchuck River](#)

[Nisqually River](#)

[Black River](#)

[Chehalis River](#)

Note: Flood prediction is not an exact science. Although gauge readings and historical data are excellent forecasting tools, please remember that rivers continually change. There are also local factors that can contribute to flooding such as stream and creek discharge into a river, snowmelt and damming caused by fallen trees and other debris. Therefore, during flood situations floodplain residents should not rely solely on gauge readings and historical flood levels, but should keep an eye on the river and stay tuned to local media reports.

During flood situations, Thurston County Emergency Management posts additional information and media releases on its [emergency information](#) page.

Sandbags

Information on how to sandbag, locations to pick up sand and/or filled sandbags and release of liability form.

[2023 Flood Bulletin](#)

C-5: GIS Story Map



Thurston County Flood Hazard Mitigation Plan



Thurston County Flood Hazard Mitigation Plan

Thurston County is updating its Flood Hazard Mitigation Plan for 2025.

Thurston County Community Planning
July 16, 2024

Source: 2024-2025 FHMP StoryMap



Plan Update

What is the Flood Hazard Mitigation Plan?

The Flood Hazard Mitigation Plan (FHMP or "the plan") contains a review of Thurston County flood hazards and mitigation strategies to reduce and prepare for flooding impacts. The last update to the plan was in 2017.

Why is the county updating the plan?

- Incorporate new data
- Edit any mistakes
- Meet Community Rating System (CRS) requirements
- Promote flood hazard preparedness and CRS awareness within the community

Source: 2024-2025 FHMP StoryMap



Learn More

Follow the plan's progress and other flood information on the Thurston County webpages:

[Flood Plans](#)

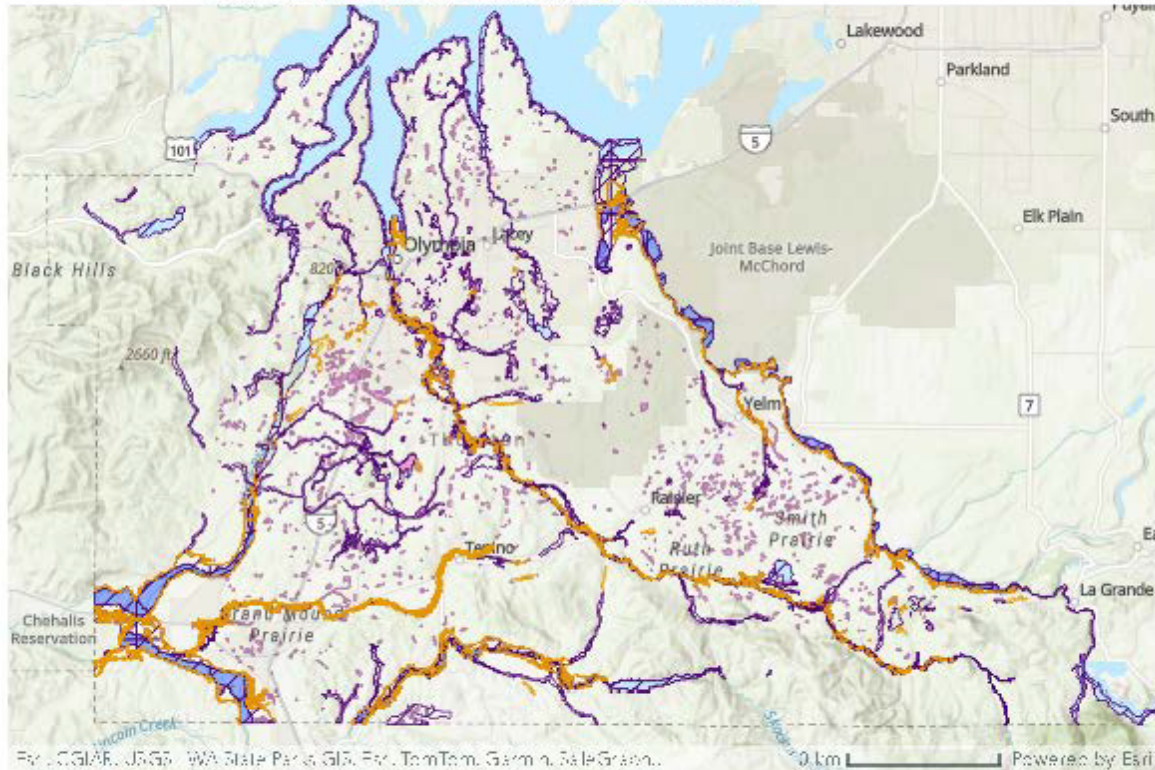
[Emergency Management Plans](#)

County staff are organizing a Flood Planning Committee for 2025. Committee members will include government and public stakeholders, and will meet approximately 5 times in 2025.

Meetings will be held every 4th Tuesday, January- May at 10am with a virtual attendance option for members and the public.

For more information on how to attend, please visit the [Flood Plans webpage](#) or email Amelia Schwartz at Amelia.Schwartz@co.thurston.wa.us.

To submit a comment to be reviewed by the Flood Plan Committee and county staff, please submit through the comment portal on the webpage: [Flood Plans](#)



Flood Hazards in Thurston County

Flooding in Thurston County is not only common, but is also the costliest natural hazard affecting residents, businesses, and the county government.

Zoom in on the map to see where flood hazards exist in Thurston County.

Definitions:

Floodplain: A strip of land next to a stream that's made of sediment and is prone to flooding.

100-Year Floodplain/Flood Zone: Land that has a 1 percent chance of flooding in a year.

500-Year Floodplain/Flood Zone: Land that has a 0.2 percent chance of flooding in a year.

Floodway: A river channel that takes the river water when it floods.

High Groundwater Hazard Areas: Area that floods because the soil type soaks up the water too slowly.

Flood Stage: The water level at which water has risen high enough to areas that are not normally covered by water. This is considered a flood event.

Special Flood Hazard Area (SFHA): The area where the National Flood Insurance Program (NFIP) enforces floodplain management regulations and where home and business owners must purchase flood insurance.

Flood Insurance: Often separate from home insurance, could be useful if your property is at risk of flooding. Flood insurance may be required in areas at high risk of flooding.

National Flood Insurance Program (NFIP): provides flood insurance to property owners, renters and businesses.

Community Rating System (CRS): a voluntary program that encourages community floodplain management practices that exceed the minimum requirements of the NFIP. Thurston County is one of the highest-classed communities in the nation.

Source: 2024-2025 FHMP StoryMap



Types of Flood Hazards

Riverine (river and stream) flooding occurs when more water enters a river or stream than it can hold.

Groundwater flooding occurs when the soil type soaks up the water too slowly.

Tidal flooding occurs when high tides join with storm surge to flood areas.

Urban flooding occurs when runoff exceeds infrastructure's ability to divert water within suburban and urban areas.

Lake flooding occurs when lake levels rise past their maximum high water level.

Dam Failure occurs when a dam fails to hold the water behind a dam.

Source: 2024-2025 FHMP StoryMap



Get Alerts

[Thurston County Community Alert System](#)

Sign up to receive free emergency alerts from Thurston County Alert System. TC Alert uses several types of alerts to warn the public of emergency and non-emergency incidents within Thurston County.

Current alert types include:

- Flooding
- Burn Bans
- Boil Notices

Source: 2024-2025 FHMP StoryMap



Flood Insurance Discounts

Get Flood Insurance: www.floodsmart.gov

Thurston County residents may be eligible for up to 40% off flood insurance thanks to the county's participation in the Community Rating System (CRS).

The CRS:

- Gives Thurston County credit for our flood management.
- Communities are rated from 1 (Best) to 10.
- Thurston County is one of only 7 Class 2 communities in the USA.
- Thurston County's involvement with the CRS program gives property owners a 40% flood insurance discount in the flood zone, and a 10% discount outside the flood zone.

Thank you!

More information can always be accessed on the [Community Flood Plans webpage](#).

- [Submit a comment through our short survey.](#)
- [Sign up to receive project emails.](#)
- [Visit the Flood Planning Committee webpage](#)

You can also reach out to Thurston County staff for questions and comments.

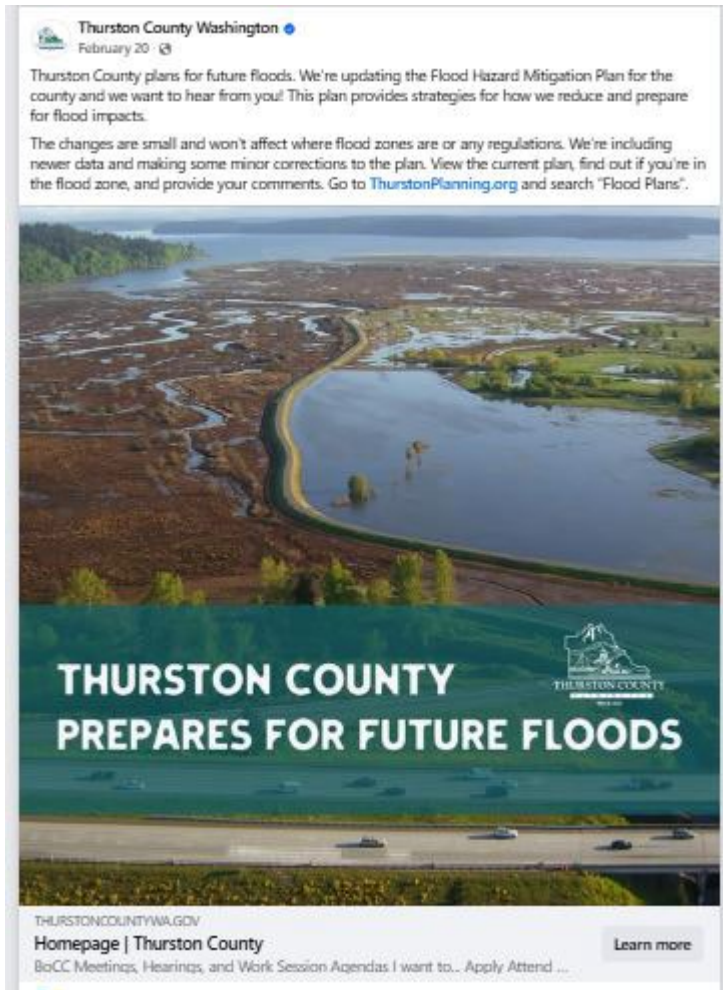
Amelia Schwartz | Associate Planner

Amelia.Schwartz@co.thurston.wa.us

Source: 2024-2025 FHMP StoryMap

DRAFT

C-6: Social Media Post Example



C-7: Plan Comment Form

EXIT



Thurston County Flood Hazard Mitigation Plan 2025 Comment Form

Welcome to the community survey for the Flood Hazard Mitigation Plan 2025 Update!

The Flood Hazard Mitigation Plan describes activities that can eliminate or reduce flood hazard impacts in Thurston County. Changes to the plan will not change flood maps or regulations. Updates include adding newer data and minor corrections.

Please visit the [project website](#) for more information and to view the current plan and upcoming drafts.

* 1. Name:

Test

* 2. Email Address

Test

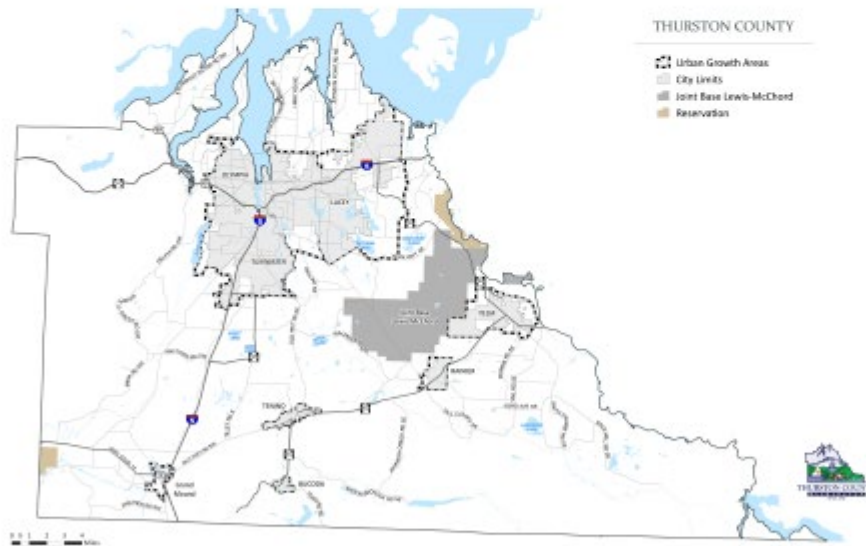
3. If you are commenting on behalf of an organization, please list:

Next



Thurston County Flood Hazard Mitigation Plan 2025 Comment Form

1. Please Click On The Area You Reside



Prev

Next



Thurston County Flood Hazard Mitigation Plan 2025 Comment Form

1. In your opinion, what are the top 5 mitigation initiatives listed in the 2025 Flood Hazard Mitigation Plan draft? ([Please see Chapter 3 for Mitigation Initiative Details](#))

* 2. Please provide any comments you have for the Thurston County Flood Hazard Mitigation Plan update

3. Submit additional information to be added to the record.

No file chosen

C-8: 2025 Public Comments

Thurston County sought comments of the Draft Flood Hazard Mitigation Plan from **January 2025 until the public comment period's conclusion with the Thurston County Board of County Commissioners' Public Hearing. Three comments were received as of June 16, 2025.** The comments are shown below.

2025 Written Submitted Comment

Alder Dam & Nisqually Valley Flood Avoidance Thurston County's Nisqually Valley had no Pineapple Express or Atmospheric River floods from Hawaii last fall / winter. Mother Nature sent last season's storms to California. However, we don't need to hope that our misery gets passed to other states to avoid it. This season, we did have one serious storm, but Mother Nature first provided us with a spring / summer season drought. The Alder Lake reservoir was 40 feet below capacity when the storm hit and simply absorbed the potential flood runoff. Thank you, Mother Nature! Most of the flooding in Nisqually Valley from severe storms is the result of how the Tacoma Power Utility (TPU) runs Alder Lake Dam. They have no flood mitigation responsibilities in their Federal Energy Regulatory Commission (FERC) license. TPU's goal is energy production. They attempt to keep the reservoir as full as possible, even in fall / winter. Often little action is taken even when the National Oceanic and Atmospheric Administration (NOAA) graphics <https://www.nwrfc.noaa.gov/river/station/flowplot/flowplot.cgi?ALRW1> predict a storm on the horizon. NOAA produces three graphs that predict Alder Lake flood dangers 10 days in advance, with increasing accuracy until the storm hits. Simple evasive actions by TPU, (e.g., running the La Grande generators below Alder Dam at the full capacity of 2,350 cubic feet a second (cfs) for a few days prior to a predicted storm), would easily lower the reservoir and avoid or strongly mitigate potential Nisqually floods. Paying close attention to these graphic predictions would allow simple protection of the valley below the dam. This is becoming an even bigger issue as the proposal to rebuild I-5 across the lower valley nears. This simple evasive action can be done at no financial disadvantage to TPU. Note from Howard Glastetter I have attached the above discussion of the excellent NOAA flood mitigation tool that monitors the Alder Lake dam reservoir. I've sent the above attachment to news media, as well as Tacoma Power, over the years. It is especially useful for Nisqually valley flood mitigation / prevention. I think this tool would impress the Fed folks that you will send the FHMP to. I feel that Tacoma Power management has been using it for flood mitigation for the last two years. I believe the Fed would be interested if this were in the report of our activity. At least 20 years ago, Thurston County emergency manager, Andrew Kinney, now retired, used the URL above to talk with TPU when the above URL showed flood danger from Alder Lake. This excellent tool has benefitted the county for decades, These graphics give an almost real-time view of activity at the reservoir. Ten days of history followed by ten days of forecast based on history, future weather forecasts and snowpack. This tool, when properly used, is an excellent flood deterrent that costs nothing. If used properly, which seems to have been the case recently, it could completely mitigate Nisqually River flooding. The forecast can signal the dam to run excess water through the Alder Dam and LaGrande generators in advance dangerous situations. The increased outflow will simply generate more electricity and not need to be dumped a few days later, contributing to downstream flooding. The above comment should, at least, be part of the report. The Fed needs to know there is a price to pay for gutting NOAA. The NOAA reservoir monitoring tool at Alder Dam is the best flood hazard monitoring tool Thurston County has. What else is there around the United States that will be unavailable from NOAA? Come this winter, we may see an

unexpected increase of natural disasters that could have been mitigated or prevented with current existing tools.

Nisqually Flood Issues By Howard Glastetter I am submitting a variation of previous comments I've sent to the county in the past. This document is tailored to the Thurston County Flood Hazard Mitigation Plan (FHMP) efforts. The county simply points out that we receive frequent flooding. This is not the result of an act of God. The two following topics address an easy solution to the unnecessary flooding experienced by valley folks. Alder Dam & Nisqually Valley Flood Avoidance Most of the flooding in Nisqually Valley from severe storms is the result of how the Tacoma Power Utility (TPU) runs Alder Lake Dam. They have no flood mitigation responsibilities in their Federal Energy Regulatory Commission (FERC) license. TPU's goal is energy production. They attempt to keep the reservoir as full as possible, even in fall / winter. Often, in the past, little action was taken even when the National Oceanic and Atmospheric Administration (NOAA) graphic, <https://www.nwrfc.noaa.gov/river/station/flowplot/flowplot.cgi?ALRW1> predicts a storm on the horizon. NOAA produces three graphs that predict Alder Lake flood dangers 10 days in advance, with increasing accuracy until the storm hits. Simple evasive actions by TPU, (e.g., running the La Grande generators below Alder Dam at the full capacity of 2,350 cubic feet a second (cfs) for a few days prior to a predicted storm), would easily lower the reservoir and avoid or strongly mitigate potential Nisqually floods. Paying close attention to these graphic predictions would allow simple protection of the valley below the dam. This is becoming an even bigger issue as the proposal to rebuild I-5 across the lower valley nears. This simple evasive action can be done at no financial disadvantage to TPU. Below is one of the three graphs produced last Friday that shows that Alder Lake level is predicted to rise TWENTY FEET by today's (02- 25-2025) meeting. This would be very serious if the reservoir was near capacity and no evasive action was being taken. Fortunately, the reservoir is full at 1207' feet. Another NOAA graph (not printed) also shows modest evasive action has started. Some Nisqually Flood History The above information has been sent to news media, TPU management, various local governments, and other groups. It shows how to protect assets below Alder Dam. Below is a short view of two reservoir levels that could have been mitigated but weren't. Also, is a view on one that was mitigated plus a flood that I sent an official complaint about to FERC. A 'net' flow of 10,000 cfs (Inflow 20,000 – 10,000 discharge = 10,000 net flow) will raise the reservoir 8' in 24 hours. This occurred on December 15, 2015, at the end of a drought year. The flood was exacerbated by attempting to top off the reservoir in early winter and by waiting too long to begin evasive action. This evasive action did not occur until the storm hit. The reservoir was 2' from capacity at the storm's end. Moderate flooding occurred along the whole river, because evasive action started too late and had to be more severe. The river shifted 65' to a new bed, undermining a home (out of the flood plain above Yelm) that was later demolished. Outflow from the Mashel tributary also contributed. The severe February 8, 1996 lower valley flood of record was the result of a forecasted three day storm. The reservoir was 17' below capacity when the storm hit. The river in the lower valley did not rise within its banks until a day and a half into the storm. TPU simply topped off the reservoir before beginning evasive action. This was devastating to the valley and did \$20,000,000 damage to TPU's La Grande facilities just below Alder Dam. The above and other floods could have been mitigated or even avoided, at no disadvantage to TPU. The most significant flood to hit the valley in recent years was the upper valley flood-of-record in November 2006. I recall, it was considered a 128-year event. It closed the entrance to Mount Rainer above Alder Lake for a year. The reservoir was 53' below capacity when the storm hit.

Eighteen inches of rain fell in 36 hours. The reservoir rose 37' to be 16' below capacity. If we condense the event to 24 hours, the reservoir would rise almost 25' in that time. This would calculate a net flow of 30,000 cfs. If TPU had been following their license to keep the reservoir above 10' below capacity through spring / summer, the river valley would have been devastated in 2006. However, the river stayed between the banks below Alder dam during that event. Interestingly, the Alder Lake Dam FERC license allows the reservoir to be 37' below capacity from Labor Day to Memorial Day. So, if an unusual extreme event is in the forecast, strong evasive action can begin 4 or 5 days before the forecasted storm hits. So, TPU can easily mitigate and even prevent flooding by using NOAA graphics, protecting their facilities and the rest of the valley at no personal disadvantage. There is further proof that TPU can strongly control Alder Lake Reservoir Levels. They did the opposite in the lead up to the February 7, 2020 flood. That winter was the second wettest in Western Washington history. In late January of 2020, TPU reduced outflow to raise pool level to near capacity. A second rainstorm followed and could not be mitigated, causing the above 2020 flood. I sent a complaint to the FERC. They eventually responded that TPU did not violate their license. (This was true, because they had no flood mitigation rules. However, TPU did have a FERC rule for summertime pool levels – that they ignored. The pool was “not to go lower than 10' below capacity from Memorial Day to Labor Day for recreational and fishery reasons”. They were normally 50' to 70' below. FERC must have noticed, because for the past five Labor Days they were within a very few feet of this rule. So, they are very capable of controlling pool levels. (For the Record, I think they are doing better mitigation in flood prevention the last couple years.) Conclusion I believe flooding below Alder Dam will be a thing of the past if TPU has reasonable flood mitigation FERC license responsibilities. February 20, 2025 - by Howard Glastetter howard.glastetter@comcast.net

I hope there is some discussion about the Tacoma Power Utility's lack of any Flood Mitigation rules in their 1998 FERC license. NOAA graphics give a 10-day warning of future dangers that should trigger mitigation.

C-9: 2025 Press Release

To be added upon scheduling of public hearing by BoCC.

C-10: 2025 Legal Notice

To be added upon scheduling of public hearing by BoCC.

C-11: 2017 Survey Open Responses

Questions 1-5 were focused on location and demographics data, including residence and workplace locations of respondents. Thurston Regional Planning Council conducted the 2017 survey, and retains records of questions and responses for review.

Question 5: Flood impacts that you have experienced in Thurston County.

#	Other (please describe)	Date
1	The rainy season brings high water levels to Lk. St. Clair, submerging the landing to my dock for nearly 6 months of the year. My shoreline has been eroding for the last several years, necessitating a block wall, to save a patio	6/29/2017 11:18 AM
2	The water is a foot-and-a-half above my bulkhead my lawn is underwater at my dock	6/28/2017 10:18 PM
3	It has impacted the water level on Lake St Clair and impacted how and when we are able to use the lake.	6/27/2017 9:00 PM
4	The continued increase in the water level in Lake Sinclair will flood my home by my estimate in the next 3 years unless the current trend changes	6/24/2017 6:14 AM
5	Property on Lake St Clair. Flooding is damaging docks and bulkhead. Flooding is causing property values to fall. Lake is not useful with 5 mph speeds all summer.	6/22/2017 10:26 PM
6	Due to the tree removal surrounding Capitol HS, wind has forced rain into my attic and under an exterior door on the western facing side of my home on Conger Ave NW. I mention this as the cyclonic action of aggressive wind patterns seem to blow easily above the open space left by this school athletic field arrangement at Capitol HS. The aggressive wind/rain action might be heightened by Budd Inlet and Eld Inlet that channel weather spiral pattern if the storm cycles in congruence to this treeless space above Capitol HS. And, as I have mentioned it, this did occur two years ago. I recognized it for what it was due to my experience with gale force winds while farming oysters on Willapa Bay, WA.	6/21/2017 10:22 PM
7	We do most of our shopping in Centralia-Chehalis	6/21/2017 1:56 PM
8	Lost shoreline on Lake St. Clair	6/20/2017 3:35 PM
9	Flooding on Offut lake rd	6/20/2017 12:18 PM
10	Erosion of our waterfront	6/19/2017 9:04 AM
11	I live along Lake St. Claire. The recent rise in the lake level caused by the closure of the McAllister Springs pumping station has flooded several homes along the lake and cause significant erosion issues with virtually every property along the lake. This is completely different from a flooding river. We are over half-way through June and the lake level remains near its historic high level. I have no confidence that the County has any plan (or even interest) in dealing with this problem. But the County certainly likes the revenues it receives from taxing our eroding lake front property.	6/19/2017 8:29 AM
12	I live on Lake St Clair which is experiencing record high water levels. Our house is not affected but our dock, bulkhead and lower property have been damaged.	6/18/2017 10:36 PM
13	I live on Lk St Clair, and my address is 10508 46th Ave SE, Olympia, 98513. I have never seen Lk St Clair as high as it goes this year. My dock has been lifted off the two poles that are holding it, the lake has gone over my bulkhead (never has it done this before), and into my shed that holds play equipment, etc that is on the lakefront near the bulkhead. There is still water on my grass inside the bulkhead on the north side of my property. It obviously has washed away land, as I can see where the water is coming from, and there has always been growth and land there for the nearly 32 years I have lived on the lake. I have not been able to get down to the lake to investigate what damage has been done inside the shed.	6/18/2017 5:05 PM
14	Loss of property which is now under water at my lakefront home. Water is over bulkhead, soil eroded from shoreline and dock was underwater until two weeks ago. Lost dock and shore to dock walkway. Willow tree at property edge is about four feet under water again this year, last year beavers chewed through bottom trunk. Lakeside water pump damaged again this year.	6/16/2017 1:57 PM
15	Lake water is flooding my yard causing erosion of soil and hindered accessing the lake safely, children could just tumble into the lake due to my yard sloping towards it and being under water.	6/16/2017 9:58 AM
16	Cannot use lake st claire ..drain field pollution and cannot get to dock	6/16/2017 8:41 AM
17	I have had seasonal flooding that is causing progressive structural damage to my home. In addition, that flooding has already damaged my heating system beyond repair. In the winter I survive by wood stove and space heaters. I cannot access outside portions of my home without using rubber boots, waders or a boat. This condition starts in the fall and continues until mid-summer. This historic flooding has increased in severity every year since approximately 2012.	6/16/2017 8:07 AM

18	I have lost the use of one third of my lake front property. The flooding has increased every year for the past six years causing major damage to my yard and property.	6/16/2017 6:38 AM
19	For many years we experienced a regular rise and fall of the lake (Lake St Claire). For the past 8 years we have experienced constant rise in the water level during the winter months. This year being the highest. Each year we have lost more of our vegetation and had damage to our property.	6/15/2017 7:17 PM
20	Property damage to dock, float and stairs. Erosion of land. Loss of land. Damage to trees.	6/15/2017 4:05 PM
21	Excessive water in Lake St. Clair has crested bulkhead and flooded yard.	6/15/2017 3:20 PM
22	Lake St. Clair has risen to the point where we can no longer use a segment of our property. We used to maintain the children's play apparatus there but that's no longer possible because it's now underwater.	6/15/2017 2:54 PM
23	Flooding last few years at Lake Saint Clair. Water over my bulkhead this year with erosion behind.	6/15/2017 2:21 PM
24	I live on Lake St Clair and the lake is flooding the basements on 2 of our properties. I have had to sand bag the area in front of the door to try and keep the water. Damage is being caused to the door and frame	6/15/2017 1:39 PM
25	Dramatic rise in Lake St. Clair Lake Levels over last 10 years - Shoreline erosion, dock damage, wetland habitat destruction.	6/15/2017 1:37 PM
26	I live on Lake St. Clair. The lake itself is flooding.	6/15/2017 10:41 AM
27	I am staff for Chehalis River Basin Flood Authority. Thurston County portion of the Basin has a history of sever flooding -- 1996, 2007, 2009.	6/7/2017 9:03 AM
28	Simply noted storm water ponds filled this year. If we did not have them, we would have had minor damage to homes immediately adjacent (ours is one).	6/4/2017 5:52 PM
29	Our home is situated behind a very large apartment complex being built at the intersection of Martin Way and Dutterow/Meridian. The contractor has built the ground up to the height of our backyard fence (4foot). We are concerned about runoff from that complex flooding the vents under our house.	6/3/2017 10:55 AM
30	Ground water flooding our field, parts of our yard & over drainfield area. As a precaution significantly reduced all water & septic use. Setting up pumps to discharge water away from house & shops. Water flooding into our shop approx 1 ft. Required raising vehicles, freezers and all other items off the floor.	6/2/2017 5:53 PM
31	Road Mugho floods.	6/2/2017 11:01 AM
32	Only minor flooding at traffic intersections	6/1/2017 8:27 AM
33	Neighbor sits in low spot; City of Lacey should not have approved property division and building permit for neighbor 30 years ago. It was against code at the time, but builder/owner twisted arms. Unethical decisions don't go away; problems are imposed on others.	6/1/2017 7:10 AM
34	my home flooded when city storm drains were covered in debris	6/1/2017 7:04 AM
35	Unfortunately our piece of property seems to be the onsite retention basin for our neighbors when it rains too much.	5/31/2017 9:27 PM
36	Live near Nisqually River but the flood in the 1990's did not reach my home although we were stranded since the roads were all underwater. Better planning by officials at the dam upriver would have prevented that flood.	5/31/2017 7:53 PM
37	Experienced increase in groundwater, runoff, and slope/landscape damage as a result of storm water culvert absence (where there should be)	5/31/2017 7:06 PM
38	Live in Jubilee Retirement Community. Not sure if that is a flood zone	5/31/2017 6:35 PM
39	Just moved here in the fall of 2015 & haven't noticed any flooding on the west side of the freeway from Marvin to South Bay where South Bay crests the hill.	5/31/2017 4:29 PM
40	FEMA says that I am in a flood plain next to the Chamber's Ditch, however I have not found anyone that says that the water has ever topped Chamber's ditch in my neighborhood and my house floor is 15' above the ditch. I am currently in the process of submitting a LOMA to get my home out of FEMA's high risk flood plain designation.	5/31/2017 4:21 PM

41	Cedar Flats area was severely impacted by the 2008 -2010	5/31/2017 3:33 PM
42	Flood level came up to about 4 feet from entering my garage - but then receded.	5/31/2017 3:30 PM
43	I have water rising through basement foundation caused by housing development near property. Mostly now controlled by retro sump system. Building code should have required sump system when house built in 1981.	5/31/2017 3:29 PM
44	Parking lot flooded.	5/31/2017 3:12 PM
45	Only floods in the pasture, no buildings	5/31/2017 3:09 PM
46	Beaver dams block outlet from Long Lake damaging my yard and dock, keeping my family and friends from using my dock. Intrusive, spurious, misguided regulations seem to prevent removing the beaver's hard work.	5/24/2017 11:40 AM
47	As a part of disaster preparedness -- I have not seen any maps showing inundation zones from a tsunami that could happen IF the Cascadia Subduction Zone every ruptures. I would LOVE to see models on this AND places that people can go to for shelter.	5/23/2017 9:29 PM
48	Our Pasture flooded. Neighbors septic tanks floated. Neighbors streets closed and homes inaccessible except by boat.	5/22/2017 9:57 PM
49	Our Pasture flooded. Neighbors septic tanks floated. Neighbors streets closed and homes inaccessible except by boat.	5/22/2017 9:56 PM
50	I expect my lower fields to flood and make adjustments. Let the baby duck grow in peace. My home and barns are on a bench above the flood zone	5/22/2017 5:43 PM
51	I live in Scottlake	5/21/2017 8:32 PM
52	received survey in mail, please remove our names from your list.	5/20/2017 2:47 PM
53	Represented buyers & sellers of properties that have experienced flood impacts, including the necessity of flood insurance at very high costs which though necessary can reduce property values & make properties unaffordable for buyers.	5/19/2017 10:14 AM
54	Minor inconvenience in travel and parking at work place	5/18/2017 3:03 PM

DRAFT

Question 6: How concerned are you with each of the following flood types or flood-related hazards throughout Thurston County?

#	Other (please describe)	Date
1	I am having trouble with the survey finally got to 2nd page of Questions, will make attempt to complete survey. Note page 1 Lake front home, lower level will be subject to flooding if lake level continues to rise. Data suggest lake could rise another 5-12 ft. this is emergency right now!	6/28/2017 9:18 PM
2	Level of Lake St. Clair rising at increased levels each of past 3 years. Continuation at this rate will definitely cause many homes, including ours, to flood.	6/27/2017 4:46 PM
3	The dam on the 5th Avenue Bridge needs to be removed so that the original estuary can be reclaimed. Removal of the 5th Avenue Bridge dam will reduce the threat of urban flooding at the basin of the Deschutes River.	6/25/2017 7:37 PM
4	Sea Level Rise related flooding in urbanized/downtown Olympia.	6/24/2017 8:23 PM
5	As previously described, I am concerned with spiral wind hitting my southern facing home front, off Conger Ave NW, from above Capitol HS due the drop in altitude and treeless space from the south west. The two channels of the Puget Sound; Bud Inlet and Eld Inlet are natural channels to offer high winds avenues for spiraling weather patterns.	6/21/2017 10:28 PM
6	I don't know what dam you're referring to.	6/21/2017 1:47 PM
7	I am extremely concerned about the high level of Lk St Clair and the damage it has done to numerous properties on the lake. Many have lost their yards to the water and have had to sandbag their homes in order to keep water out.	6/18/2017 5:09 PM
8	We live on Lake St Clair. Lake levels are at flooding levels damaging home, bank fronts, landscape and docks.	6/18/2017 8:03 AM
9	Lake st Clair flooding	6/16/2017 4:14 PM
10	Taxes for my property go up each year but damage and loss of my shoreline reduces potential sales.	6/16/2017 2:00 PM
11	The flooding that has already caused major damage at my home is affected by stormwater and (via inability to drain) coastal flooding.	6/16/2017 8:09 AM
12	I had a new bulkhead installed back in early 1992. The first time the lake water rose over the bulkhead was in 2010, and every year since it has gotten higher and higher, this year was a record high with two feet of water over my bulkhead flooding my entire yard for the past six months.	6/16/2017 6:54 AM
13	Lake St. Clair bank overflow damage to beach and yard.	6/15/2017 7:46 PM
14	There is a creek that is contributing to our water issues. If it wasn't adding to our lake problems, we would be in better shape.	6/15/2017 7:22 PM
15	Unable to use our lake front of our lake house at Lake St. Clair for 7 months this winter Nov-June	6/15/2017 3:42 PM
16	Excessive water in lake.	6/15/2017 3:24 PM
17	Lake St. Clair, drastic changes in higher lake level over last 4 years.	6/15/2017 2:43 PM
18	Lake saint Clair flooding property. I	6/15/2017 2:33 PM
19	Neighbor discarding toxic materials, such as roofing tiles, on lake bank. Neighbor periodically covering storm drains.	6/1/2017 7:15 AM
20	I expect there may be some flooding if we have a large earthquake or the mountain erupts, I am concerned about where to go if that happens. Need an escape route.	5/31/2017 7:57 PM
21	There was a news report saying that everything west of I-5 would be underwater if we had a tsunami. Is this accurate?	5/31/2017 6:40 PM
22	Freeway flooding	5/31/2017 6:21 PM
23	Allowing residential building in flood areas such as proposed use for Capitol center building.	5/31/2017 3:34 PM
24	Groundwater flooding affects us the most in the NE Salmon Creek Basin. Sea level rise is affecting downtown more, soon.	5/22/2017 10:03 PM
25	The lack of Capitol Lake dredging is reducing the State/City capacity to manage through Lake/Dam/High Tide events which causes flooding in the downtown that could be prevented with proper Lake Dredging.	5/21/2017 10:14 AM

Question 11: What have you done to protect your property from flooding?

#	Other (please describe)	Date
1	Sandbagged along the lake front to keep water out.	6/29/2017 11:00 AM
2	I have no usable land at the bottom of my steps at the lake. It's under 1 and 1/2 ft of water so to get to my deck I have to walk across about a 45 degree angle Hill about 30 ft to get to my deck and my dock	6/28/2017 10:28 PM
3	Simple fix, create outlet for lake so water can flow out of lake at the high water mark. Or stop the flow of water into the lake.	6/28/2017 9:45 PM
4	I live in an apartment so I am unaware of their current flood insurance and protection strategies.	6/28/2017 6:02 PM
5	We store nothing by the water. It has impacted our dock and bulcades.	6/27/2017 9:03 PM
6	Prior to recent lake level increases, we didn't have a need for any of the above. We are now thinking that by next year, if water depth increases, we will need to look at options.	6/27/2017 4:52 PM
7	Will have to raise bulkhead to contain lake water from continual flooding of land	6/26/2017 3:00 PM
8	I have not done anything yet but will this fall prior to the rainy season	6/24/2017 6:19 AM
9	buildings are higher.	6/22/2017 10:29 PM
10	Improved drainage of lower areas	6/22/2017 7:05 AM
11	I buried a 55 gallon ss barrel of food, water purfier, matches and placed a 700 pound cement stepping stone on top to keep it in the ground in my front yard.	6/21/2017 10:34 PM
12	property is sloped with home at higher point	6/21/2017 3:32 PM
13	Moved to a different location that has far better drainage.	6/21/2017 2:38 PM
14	When other areas are flooded and you can't get to a store due to high water or other, we always have enough supplies on hand for many days.....	6/21/2017 2:03 PM
15	None of the above	6/20/2017 3:41 PM
16	My home is located at an elevated level and is not at risk. My property, on the other hand, is slowly eroding due to wave action and historic high lake levels.	6/19/2017 8:33 AM
17	High lake levels are eroding our lower property and will weaken our dock piling sand our bulkhead	6/18/2017 10:41 PM
18	I did not realize there would be an issue, as I have lived here for nearly 32 years and never had any issues with the lake being this high - until this year.	6/18/2017 5:13 PM
19	Flooding from high water on Lake St. Clair has destroyed my front lawn. Two feet of lawn is gone. High water is washing the soil away.	6/18/2017 1:28 PM
20	None of these options do anything for me. My home on lake st Clair will only be saved if Olympia starts pumping more water from the well fields	6/16/2017 4:22 PM
21	lost 8 to 10 feet of my lawn	6/16/2017 11:23 AM
22	have moved what I can to higher ground as the lake continues to rise	6/16/2017 10:10 AM
23	I am unable to mitigate flood damage without changes to my home in the hundreds of thousands of dollars of investment.	6/16/2017 8:15 AM
24	Dock is under water - nothing can be done at this point to mitigate this problem.	6/15/2017 7:55 PM
25	Tried to put a temporary wood wall up to keep all the debris from the lake coming onto our property. This didn't work and thus we have had lake water with all that it brings with it 15' up on our property.	6/15/2017 7:27 PM
26	Unable to do any thing possible	6/15/2017 3:46 PM
27	Nothing available	6/15/2017 3:29 PM
28	up to this point lake water has not entered my crawl space, but another 6 inches and I will have to relocate a furnace located under the house.	6/15/2017 2:53 PM
29	Moved my dock on Lake St Claire	6/15/2017 2:37 PM
30	Elevated washer and dryer, hot water heater and shelving.	6/15/2017 1:42 PM
31	Soft armoring to prevent further lakeshore erosion. Dock reconstruction and relocation.	6/15/2017 1:41 PM
32	This is only the second year (2015-16, 2016-17) that my property has flooded, ever. The water went over our bulkhead retaining wall and onto our bottom lawn.	6/15/2017 10:45 AM
33	Nothing at this time; builder installed environmental options to help with water drainage, but I have not done anything specific yet - need info on what I need to do	6/10/2017 1:43 PM

34	Done the above in Thurston County as well installed flood vents in Bucoda.	6/7/2017 9:06 AM
35	Will check into relocating, possibly, water shut off valve. Electrical panel is safe in garage. Gas shut off should be checked too.	6/4/2017 6:02 PM
36	The house sits on highest part of property. Our shop/barn are only structures in flood prone areas. We raise all items in those areas up to prevent damage. Buildings are metal & concrete so \$\$ damage to those buildings.	6/2/2017 6:11 PM
37	INSTALLED SECOND SEA RISE BULKHEAD	6/2/2017 4:05 PM
38	NONE	6/2/2017 12:34 PM
39	Use sump pump	6/1/2017 7:06 PM
40	installed pump in my yard	6/1/2017 7:08 AM
41	Installed sump pump	6/1/2017 5:53 AM
42	We did install ourselves, some french drains outside our foundation, but our basement still, due to very high water table, does get wet when there is a couple days of very, very heavy rain. Basement does not flood, as we have a large floor drain but basement does get about about 2 inches of water ever fall/winter, depending on the amount of rain.	5/31/2017 11:54 PM
43	Installed french drains along structures.	5/31/2017 9:24 PM
44	Not in flood zone, designated wetland or designated wetland buffer zone.	5/31/2017 8:14 PM
45	I live in a rental mobile home in the Delta...I am only concerned about leaving the area with my valuables and my dog to get to a safe location	5/31/2017 8:08 PM
46	Considering groundwater diversion by curtain drain and/or dewatering well.	5/31/2017 7:11 PM
47	Emergency kit for evacuation	5/31/2017 7:07 PM
48	NA	5/31/2017 6:43 PM
49	None	5/31/2017 6:31 PM
50	Haven't really done anything	5/31/2017 5:19 PM
51	Live upstairs.	5/31/2017 4:57 PM
52	My property does not flood	5/31/2017 4:34 PM
53	I bought my home with flooding in mind and chose one that built on a properly sloped lot near the middle of a gently sloping hill	5/31/2017 4:12 PM
54	I have storm water drainage that was overwhelmed TWICE by county maintained culverts overflowing their boundaries.I have no control over that.	5/31/2017 3:36 PM
55	None of the above - we should not be having this problem - the storm drain in front of our house is not draining properly and is causing flooding during big rains.	5/31/2017 3:33 PM
56	built lofts in storage areas/barns. Built elevated wood sheds to protect it from floating away.	5/26/2017 8:47 PM
57	I am not in a flood plain area.	5/23/2017 3:56 PM
58	Neighbor dug a ditch from his home to the back pasture to prevent the house flooding in 1998. We bought that place. The ditch is still there.	5/22/2017 10:04 PM
59	On high ground.	5/22/2017 6:19 PM
60	Ecological restoration to increase flood water storage.	5/22/2017 10:52 AM
61	Elevated downtown comm'l properties.	5/21/2017 4:05 PM
62	Bought a home with a history of being above the flood mark.	5/19/2017 5:18 AM
63	Given my elevation and terrain, even the major flooding events (as in 2006) did not dramatically impact our property or valuables. Well house required a special focus but even that was minimal.	5/18/2017 3:09 PM
64	Build on areas that don't or rarely flood.	5/15/2017 9:05 PM
65	Installed a permanent sump pump. Raised part of the lawn with extra dirt. Did not replant grass on another part due to concerns -- which actually materialized: this year the flooding is worse than last year, and covered that same area again.	5/15/2017 7:48 PM

Question 12: What do you do to prepare for flooding?

#	Other (please describe)	Date
1	I hope this get resolved so this is not an issue.	6/28/2017 9:45 PM
2	I currently do not possess any flood materials.	6/28/2017 6:02 PM
3	Nothing	6/22/2017 8:40 AM
4	I have 16 kW solar, 1100 gallons of water tank containment, and 55 gallons of food stored in the cool earth.	6/21/2017 10:34 PM
5	Move livestock, drive one car beyond flood zone to be "walked" to.	6/21/2017 3:32 PM
6	If measures were taken to reduce the level of the lake, we would not have to worry about flooding.	6/18/2017 5:13 PM
7	Unable to do anything about the erosion. When the power boats come out in the summer it further destroys our land. Would love to build a breakwater but permits and cost is prohibitive.	6/18/2017 1:28 PM
8	I plan to raise the level of my bulkhead by 2-3 feet on my lakefront.	6/17/2017 8:34 AM
9	If the water continues to rise on lake st Clair my home will be lost	6/16/2017 4:22 PM
10	concrete blocks to retain water	6/16/2017 11:23 AM
11	I have no recourse if flooding gets worse. I am unable to sand-bag. My home would flood from under the floor boards.	6/16/2017 8:15 AM
12	Because of the flooding of the lower level of my yard I am forced to build a retaining wall this summer to prevent high water from eroding the bank in front of my home.	6/16/2017 7:19 AM
13	There is nothing that can be done to protect a dock except raise its level. I will wait to see if this high lake level is long term before I go to trouble and expense of raising the dock. I believe a major contributor to this problem is extreme amount of rainfall over the past couple of years. The problem will resolve when normal rainfall returns.	6/15/2017 7:55 PM
14	Move items to higher ground	6/15/2017 2:37 PM
15	Nothing	6/10/2017 1:43 PM
16	Operate web-based/email based flood warning system.	6/7/2017 9:06 AM
17	3 high discharge pumps with 200ft discharge hose to pump water to back pasture to keep water lowered around drainfield area, septic tank, well and shop areas. Installed berms in low areas at edges of property. We Limit water use, use laundry mat ect. Very cautious and proactive to prevent property damage.	6/2/2017 6:11 PM
18	NONE	6/2/2017 12:34 PM
19	Everything in our basement is off the basement floor.	5/31/2017 11:54 PM
20	Will have backup generator before too long.	5/31/2017 9:24 PM
21	I have a packed go-bag containing my important papers and photos etc. a couple sets of clothing and some emergency food and pet food. I keep a case of bottled water in the trunk of my car. If I have enough warning I can leave in just minutes. If not I will have to wait it out or die. I am 80 years old.	5/31/2017 8:08 PM
22	We get groundwater flooding in our crawl space when there are heavy rains. We intend to install a pump this summer.	5/31/2017 7:26 PM
23	Emergency kit for evacuation	5/31/2017 7:07 PM
24	Nothing	5/31/2017 6:31 PM
25	none	5/31/2017 5:19 PM
26	My property does not flood	5/31/2017 4:34 PM
27	we are hoping you will clear the drain pipe to fix this from happening again	5/31/2017 3:33 PM
28	Move things up into higher storage areas. Move cars off property.	5/26/2017 8:47 PM
29	I am not in a flood plain area.	5/23/2017 3:56 PM
30	On high ground.	5/22/2017 6:19 PM
31	Ensure water passages are clear and functioning as designed.	5/22/2017 10:52 AM
32	Have Backhoe	5/19/2017 2:40 PM

Question 14: Who can you rely on to provide aid during a flood event to help you ensure your safety or to evacuate?

#	Other (please describe)	Date
1	As far as I am able to tell, my property does not flood. I am most concerned about the street infrastructure around my property. Driving in times of heavy rain, the roads around me fill with water and this makes driving very scary.	6/28/2017 6:02 PM
2	I have solar to heat/boil water, heat home, electric blanket, refer; and a sludge hammer to break a 700 pound stepping stone holding a barrel of food from floating out of the ground.,	6/21/2017 10:34 PM
3	friends from afar, or just Olympia	6/21/2017 3:32 PM
4	Property doesn't "flood" but is affected by water flowing through it via the natural and human manipulated drainage in the area. We have had the crawl space fill with water several times since moving here. It drains off prior to any real damage being done.	6/21/2017 2:38 PM
5	My house is not in jeopardy, but the lakefront of my property is, which involves my dock and shed, and I have never had to be concerned about this for nearly 32 years.	6/18/2017 5:13 PM
6	The lake rises slowly	6/16/2017 4:22 PM
7	I will have to pay others to help in the building of the retaining wall .	6/16/2017 7:19 AM
8	Not personally affected. Only property.	6/15/2017 3:29 PM
9	I have friends that may help me	6/10/2017 7:50 AM
10	The only part of our property that might flood does not include buildings.	6/2/2017 9:42 AM
11	I have some friends who may be able to help.	5/31/2017 9:24 PM
12	The access to our property is on a road that is beside an area that subsided during the 2003 earthquake and we are concerned that the road may flood at some point	5/31/2017 8:40 PM
13	It depends on the situation. My family are all about an hour from me. I have neighbors who are in about the same situation as me but we would help each other as much as possible. If we can't get out emergency vehicles would not be able to get to us. Luckily we are not in a regular flood area.	5/31/2017 8:08 PM
14	We live in an area on Johnson Point that is unlikely to flood. However, in the future, coastal flooding could make the south end of Johnson Point impassable.	5/31/2017 7:26 PM
15	I am a block capt and 2wro for our map your neighborhood plan.	5/31/2017 6:43 PM
16	I keep food and water, in case of emergency.	5/31/2017 6:25 PM
17	My fiance would help assuming he could reach me	5/31/2017 5:05 PM
18	Congregation	5/31/2017 4:57 PM
19	The problem arises when all neighbors are affected.	5/31/2017 3:36 PM
20	Our neighborhood helps each other in floods and storms.	5/22/2017 10:04 PM
21	Staff that work at the facility.	5/20/2017 7:55 PM
22	Most dramatic issues has to do with livestock management to ensure their safety.	5/18/2017 3:09 PM

Question 15: Think about potential future flood impacts to public or private infrastructure, services, or the environment. What do you believe is the level of risk for each of the following impacts around your neighborhood?

#	Other (please describe)	Date
1	Houses are flooded. Soon septic systems will fail. Could contaminate the lake. Lots and Lots of \$ damages of docks and any lower buildings. Basements are flooded. Something needs to be done asap.	6/22/2017 10:29 PM
2	Cliff saturation	6/21/2017 10:15 PM
3	While we live in West Olympia off Harrison Avenue where we think flood damage to our property would be only minimal if at all, we have a boat moored at Swan Town Marina. In a bad case scenario, river and coastal flooding could make the 4th/5th Avenue bridges and roads to the marina inaccessible. We would be concerned about our boat, but we don't live on it - there are several people who do and in a bad/worse case scenario, they could have their access to town and emergency services blocked by flooding. I hope they and/or Swan Town Marina are completing this survey with their concerns.	6/21/2017 8:20 PM
4	I am not sure what impacts would be involved as we have never had to be concerned about this in the past.	6/18/2017 5:13 PM
5	Every property owner on lake st Clair has suffered some kind of property loss or damage	6/16/2017 4:22 PM
6	Additional flooding would isolate my immediate neighbors behind a flooded section of road.	6/16/2017 8:15 AM
7	The high water of the lake has caused major damage to property owners, not to mention the value of our homes	6/16/2017 7:19 AM
8	Parts of Lake St. Clair residences access is across a small bridge, that could be impacted by flooding.	6/15/2017 1:41 PM
9	Storm drain (private) on neighbor's property is not working to capacity. Result would be flood of private lane for 3 neighbors south of subject property.	6/1/2017 7:21 AM
10	Again it depends on the situation...we are not in a regular flood area but an earthquake or eruption would make a big difference.	5/31/2017 8:08 PM
11	My answers are related to future impacts from global warming.	5/31/2017 7:26 PM
12	Not sure hoping you can tell me what the risk is for floods to the jubilee retirement community in Lacey	5/31/2017 6:43 PM
13	Chehalis is eroding the bank near my property on 201st off Independence. If it breaks through, 201st may be affected/we might be stranded.	5/26/2017 8:47 PM
14	Moderate to high risk of livestock g	5/22/2017 10:04 PM
15	We have already experienced the impact of high water levels due to rainfall. The only road into and out of our neighborhood was destroyed in the storms of 06-07	5/18/2017 3:09 PM



Question 16: What types of projects, programs, or services do you think Thurston County should be offering/performing to protect life and reduce property losses from flood hazards?

#	Other (please describe)	Date
1	When the county decides to make changes in infrastructure without notice to those it impacts, then the county should be responsible for implementing corrections for damage they have caused.	6/26/2017 3:08 PM
2	support solar generation on individual homes as a manner to assure some electrical stability within our neighborhoods.	6/21/2017 10:36 PM
3	government cannot and could not help in all situations, people need to take responsibility for self because things could be pretty ugly during an extreme event.	6/21/2017 2:08 PM
4	They all seem reasonable and important.	6/20/2017 6:22 PM
5	Help us at lake St. Clair so the lake has an outlet restored!	6/19/2017 9:11 AM
6	Re-open McAllister Springs pumping station or otherwise provide an outlet for Lake St. Claire.	6/19/2017 8:35 AM
7	Immediate measures needs to be taken to reduce the level of Lk St Clair.	6/18/2017 5:15 PM
8	Please provide emergency flood relief to Lake St. Clair by de-watering the lake.	6/16/2017 8:22 AM
9	Find a way to lower Lake St. Clair.	6/15/2017 4:27 PM
10	Lower permit cost for bulkheads	6/15/2017 2:38 PM
11	It would be a great incentive to offer some sort of swag bag, item, etc. to folks for volunteering to keep storm drains clear, paint info about dumping anything down storm drains, etc. Any sort of small item as a gift makes folks feel appreciated. Just an incentive- I know it works for me!	6/3/2017 12:03 PM
12	Encourage other local governments to inspect and regulate private storm water drains.	6/1/2017 7:24 AM
13	Farmland in high risk locations should be left alone but the home and outbuildings could be elevated. No building permits for dense housing developments allowed in high risk areas Cleaning and clearing plant life from streams and rivers and planting of native trees and bushes to maintain the depth of the streambeds and prevent erosion on the banks.	5/31/2017 8:17 PM
14	The problem in our area is the tribe does not have to abide by county or state building codes. How do you fix that issue?	5/31/2017 3:13 PM
15	Require permeable parking lots on floodplains and nearby areas.	5/26/2017 8:49 PM
16	Dredge Capitol Lake to improve ability to manage Deschutes River Flood Stage storage during short periods of high King Tides to reduce risk of flooding downtown Olympia	5/21/2017 10:23 AM
17	Adopt zoning codes that require all property owners where a flood mitigation project has been constructed be required to grant access for maintenance activities	5/15/2017 4:28 PM

Question 19: What else would you like to share about flood hazards in Thurston County?

#	Responses	Date
1	FEMA map is incorrect	6/29/2017 1:38 PM
2	I'm a Lake St. Clair resident. Our bulkhead is flooded every year and it will eventually collapse. Neighbor's property is lower and sustains damage.	6/29/2017 1:19 PM
3	Thurston County needs to take measures "NOW" to undo what the State, County, & City of Olympia has done to affect the rise in water levels on Lake St Clair. Need to provide an outlet that was closed with the installation of Hwy 510, reduce the flow of water into the creek that flows into Lake St Clair, and encourage Lake St Clair Property owners to pump water out of the lake for watering lawns/gardens.	6/29/2017 11:05 AM
4	Let Lacey and Olympia Hughes Our Lake water from the aquifer so the lake will drain like normal. No no water Tuesdays that makes no sense when we have too much water at Lake st.clair it's higher than I've ever seen it in 10 years it's never come even halfway up my bulkhead the first six years I was here. Now it's one and a half feet over the top of the bulkhead that's about five feet higher they changed the way the water exited the lake and it's affected all of us.	6/28/2017 10:31 PM
5	I believe all of the criteria listed of the highest priority. I think articulate communication about level of risk and associated solutions is pivotal to a successful transitioning of infrastructure. Preparedness increases the level of resilience and confidence in a future of change.	6/28/2017 6:05 PM
6	Loss of land from high waters of Lake St Claire and the county raising property taxes.	6/27/2017 9:51 PM
7	Lake St. Clair water levels are at an all time high. The water levels have impacted properties and people. The lake can't be utilized as it once was. We don't have beaches that we once did. The area under the bridge had to be dredged years ago. The pendulum has completely swung. Now certain water crafts can't even get under the bridge due to the water height.	6/27/2017 9:06 PM
8	Lowering property taxes for land not useable as is underwater due to county's actions, but raising structural taxes when can't use all property involved is ridiculous. Our home is not worth what is was when purchased as losing land. Our flooding problems are the result of county's actions and should be remedied by them. Instead we are told must have numerous studies and is extremely expensive so not likely to be done. Yet, no studies were performed before they took this action to see how affective homeowners on Lake St. Claire.	6/26/2017 3:17 PM
9	Farmers and residents living along the river shorelines of the Deschutes River need information on how to avoid shore bank erosion. These residents need advice and shared-cost support programs to plant trees and shrubs along the riparian shore bank to cut back on erosion and bank failure. Livestock setbacks on the river banks are needed. Natural off-channel areas need to be enhanced to reduce heavy flows during rain events. Thurston County residents need information so that they can responsibly clean out their septic tanks on a regular basis. The many land owners with private unmetered wells need information on the importance of water conservation. Such land owners may not know how critical groundwater is to recharging cold steam flow within the warming Deschutes River watershed.	6/25/2017 7:58 PM
10	Flooding happens. When we permit people to build in flood-prone areas, we make the situation worse by creating a "moral hazard".	6/24/2017 8:38 PM
11	My flood insurance rates have increase. Substantially over the past 12 years, so I was only slightly aware of the supposed 40% reduction we have in this county	6/24/2017 6:24 AM
12	This is an emergency. something needs to be done asap. Lots of time for permits that we don't have. In emergencies sometime long studies cant take place. This should be treated as though. Find quick solution to lower the lake level asap.	6/22/2017 10:32 PM
13	urban flooding appears to often be affected by blocked stormwater drains, causing localized flooding at intersections that otherwise would not flood. Deputizing storm drain rangers (and recognizing their voluntary contributions) to keep those drains open could be a low-cost option to consider.	6/22/2017 10:11 AM

14	I believe it is inappropriate to offer flood insurance rate discounts for properties located in a flood plain. It almost seems that if there is a rate discount, you may make living in a flood plain more feasible rather than discouraging it. It seems like we should be focusing on how to move away from flood prone areas (even if there is only a 1% chance of flooding any given year), rather than offering assistance for those who CHOOSE to live there.	6/22/2017 9:50 AM
15	While we have not experienced any flood damage, we were mindful of how rain water collects on some of the streets. At our home, we changed the asphalt roadway/entrance to our garage to a brick lay-out, so that no water would collect in the driveway to our garage.	6/22/2017 8:45 AM
16	Round boats are useless and illogical for usage in flooded regions.	6/21/2017 10:37 PM
17	home location in section north and east of Henderson. I did not see a name.	6/21/2017 10:24 PM
18	Thanks for asking.	6/21/2017 8:23 PM
19	People should not be allowed to build on flood prone land and if they do, no person and no government should bail them out. I have lived in Thurston County my whole life and have seen so many people subdivide and build on wet land. It is ridiculous that anyone is allowed to do that.	6/21/2017 5:25 PM
20	I live on a property that does not flood. However I am concerned about flooding of the Deschutes River as well as several creeks in the area including Johnston Creek. I have these significantly flooded in the past. I am concerned about the new proposal to build a 51 unit wind farm on over 19,000 acres in the area. Clear cutting even sections of this land raises the issue of increased flooding and runoff into the Skookumchuck Reservoir, Baumgard Creek, Bloody Run, Fall Creek, Hospital Creek, Hull Creek, Johnston Creek and Pipeline Creek. How is the County planning to handle this?	6/21/2017 3:28 PM
21	Like the ant and grasshopper, you should prepare now when things are good, the time might or will come when it is too late to prepare. Keep enough food, fuel and other necessities on hand all the time.....	6/21/2017 2:12 PM
22	Since we are not in a flood area of Olympia (but conceivably our house could be some day), at this point I simply want express appreciation to Thurston County for conducting this survey.	6/21/2017 1:58 PM
23	The high water on Lake St. Clair is destroying our property's shoreline. We've already lost about 2 feet.	6/20/2017 3:43 PM
24	WE NEED HELP AT LAKE ST. CLAIR-OUR LAKE KEEPS RISING AND OUR WATERFRONTS ARE ERODING. PIECES OF LAND ARE BREAKING OFF AND FLOATING AROUND THE LAKE RANDOMLY. PLEASE HELP US SPECIFICALLY!	6/19/2017 9:13 AM
25	Hoping the county can complete studies and initiate plans that will help reduce flooding from lake st clair	6/18/2017 10:45 PM
26	Residents of Lk St Clair need to have the level of this lake become an immediate concern and make sure we do not have this issue again.	6/18/2017 5:16 PM
27	Boats that make waves that destroy property MUST be banned. The Fun for a few does not equal the damage it does to the many. We paid high prices for water front land. High water and boat wake take away the value of my property. Proper drainage of Lake St. Clair should be paramount. Control of water level is important to the wild life and residence. We have quality water management staff who need a budget to manage the water level. PLEASE PROTECT THE VALUE OF OUR PROPERTY. Don't let high water and boat that produce wake destroy our property. Thank you for asking.	6/18/2017 1:36 PM
28	Lake st clair has never been so elevated with flood water since the change of Mccalister springs water pumping was changed by city of Olympia. We need attention from county to prevent additional damage to our properties. Help us please	6/18/2017 8:08 AM
29	Flooding on Lake St. Clair is unique to Thurston County. While most of my neighbors are affected far more than I am, we all are needing to make adjustments to the new situation on the lake. Is this new higher water level permanent? Will it recede to what we consider to be normal levels? Do we all need to raise our bulkheads? Clearly more studies need to be done. If you look at maps of the lake from the 1930's, before Hwy 510 was built, you can see the lake extended further north, across Hwy 510. When the road was built that kettle was cut off and it dried up. If you look at modern satellite imagery you can clearly see that kettle, it currently is partially filled with shallow water. As we know, the lake does not have a natural outflow. Building a culvert that could be opened and closed would allow for a temporary water release to mitigate some of the high water.	6/17/2017 8:52 AM

30	Lake Sait Clair water level is raising at an alarming rate. Storm water and Eaton Creek can not continue to fill the lake at a rate faster than the aquifer can draw the lake down. Properties are flooding and homes are getting ruined due to the water level. We need help from the government to fix this issue.	6/16/2017 10:31 PM
31	We don't have years to develop a solution for Lake St. Clair flooding. Something must be done now. People have lost land and water has infiltrated homes. We cannot sell our properties with the high water levels. Erosion of our shoreline is increasing every year. If the water level continues to rise at the rate it did this past year, we may have only 2 years until the water is in our home.	6/16/2017 9:50 PM
32	Lake st Clair residents are slowly losing land and homes. I personally believe the city of Olympia could save us by pumping more water from the new well fields.	6/16/2017 4:26 PM
33	we need to open up outlets on Lake St Claire. Lots of water in and nothing going out	6/16/2017 11:26 AM
34	I would like to see the county take an active role in the lowering of the water in Lake Saint Clair.	6/16/2017 10:14 AM
35	WE are experiencing flooding. NOW. Have been FOR MONTHS. Our homes are damaged and being increasingly damaged. NOW. Today. This minute.	6/16/2017 8:24 AM
36	We have had lots of meetings and nothing positive has come from any of them. We would like to have some possible solutions to a very serious problems.	6/16/2017 7:27 AM
37	I'm very concerned with the water level of Lake St Clair.	6/15/2017 7:52 PM
38	Help lower Lake St. Clair. Lower property taxes WITHOUT raising out home values.	6/15/2017 4:29 PM
39	Open up McAllister springs so our water level on lake st Clair drops to normal	6/15/2017 4:25 PM
40	Figure out a system to divert water from Lake St Clair.	6/15/2017 3:58 PM
41	Your letter referred to reducing flood hazards? What are you doing to reduce flood hazards on Lake St Clair? This winter my yard is covered with water and totally destroyed. All landscaping is gone and plants are sitting in water dead, along with a tree that has died. I have fish and frogs in the front and side yard. My dock broke lose and is tied up to a tree with a rope. The water is under my deck and very close to flooding the house. I can not use the dock or get to the dock from my land. My property taxes have gone down and my home has been asset at \$53,000 more than the last assessment. This is very interesting I talked with a realtor and I can not even sale my home! This is nothing but a political move by the Thurston County for more money. I think the only thing that can help me is a civil suit against Thurston County. You issued the building permits and it is your responsibility to take care of the residents at Lake St. Clair.	6/15/2017 3:56 PM
42	Why are property taxes climbing with unusable property?	6/15/2017 3:50 PM
43	My wife has been coming to Lake St. Clair since the late 1940's and I have been coming since the late 1960's. We have never experienced lake levels like the last 4 to 5 years and each year of those the lake gets higher. It seems to be too much of a coincidence that County and City work on the McAllister wellhead has coincided with those rising lake levels. These Governments should be trying to find out why the lake has responded, contrary to the studies that they relied upon to justify the new intake location.	6/15/2017 3:13 PM
44	I feel the county is responsible for the flooding we are seeing on lake saint clair and they keep B.S. us on why our lake keeps flooding. I personally feel that our property taxes are being manipulated by the county to meet thier goals.	6/15/2017 2:47 PM
45	Because of bungled planning for the McCallister well field the property values on Lk St Claire have been negatively impacted. That's just not right.	6/15/2017 2:43 PM
46	A comprehensive review of the switch by the City of Olympia water supply from MaCallister Springs to the well system currently in use. This should be done by a third party not connected to any government agency, the Nisqually Tribe or any other group with an outside interest in the water levels on Lake Saint Clair.	6/15/2017 2:40 PM
47	Concern about the rising water on Lake StClair. Possibly putting in a culvert to keep the lake from getting any higher and maintain a level. It came to an all time height this winter and did do damage to certain properties. Time to prevent any further problems or damage.	6/15/2017 2:10 PM
48	Would like see the relaxation of building codes to allow for building a bulkhead in front of the property.	6/15/2017 1:44 PM

49	Focus has been on streams/rivers. Lake St. Clair is unique and not addressed in prior flood planning. There have been many studies and reports to date on this lake flooding issue with little or no county response to date.	6/15/2017 1:44 PM
50	The situation on Lake St. Clair is unique. Our lake level has been steadily increasing since 2008. The water level rise is at least partially the result of the City of Olympia relocating the source of their drinking water to the McAllister wellfield from the old McAllister Springs property. In doing so, they attained a water right up in the Eaton Creek drainage to increase the water flow into our basin which has no outlet. The city is not slated to pull the full water right's worth of water out of the ground via the wellfield for approx. 70 years. The mitigation that was required for them to attain that water right of 26 million gallons/day was the acquisition and retirement of the small water right in the Eaton Creek drainage. They executed that water right transfer 70 years too soon and as a result we have had at minimum, 1.5" of additional water rise in our basin annually for the last 11 years, amounting to a minimum lake level increase of 16.5". The result is that our lake is now flooded.	6/15/2017 10:51 AM
51	Thank you for fixing the area on Tilley Rd that used to constantly flood.	6/10/2017 5:18 PM
52	Nothing at this time. Thank you!!	6/10/2017 1:45 PM
53	More people need to be aware of the hazards for the future	6/10/2017 7:52 AM
54	n/a	6/7/2017 9:08 AM
55	DES has done a good job of utilizing the Capital Lake Tidal gate to minimize Deschutes River flooding. Capital Lake and the Dam should remain in place for flood control.	6/5/2017 12:03 PM
56	My property has not been affected by floods since we moved here in 2006 so I'm not overly concerned with anything flood related.	6/4/2017 9:18 PM
57	We have been dealing with groundwater flooding for a long time on our property. I strongly disagree with property on side and behind us getting permitted to build the new tumwater readiness center/armory behind us and future industrial buildings beside us. I believe it will cause significant damage to our property shifting all groundwater in our direction. The property is know wetland area & its all a case of government & big business getting free passes. Its all about money with the city of tumwater. They dont care about impact to homeowners.	6/2/2017 6:27 PM
58	Get your maps up to date and change so that they reflect reality. Don't classify properties that don't flood as being in a flood zone --- establish a mechanism to that property owners can get their properties out of the flood plain area.	6/2/2017 4:13 PM
59	I am frequently receiving emergency flood alerts on my mobile phone over the same band that delivers amber alerts. These come frequently and don't seem to correlate with any actual threats. I'm not sure where I can check to see if there are any threats and to which flood plain or if the messages are sent in error.	6/1/2017 11:08 PM
60	I think persons who purchase land/houses near rivers and flood prone areas should bear the costs of mitigating those impacts. And anybody who sells a home/land that has flooding risks/experience should be required to disclose that information to a purchaser. However I do support efforts to upgrade infrastructure to be able to handle flood conditions - extreme rainfall, etc.	6/1/2017 2:59 PM
61	My understanding is that cutting down our local forests and trees to increase housing is creating more runoff and making flooding more possible. Not a good idea.	6/1/2017 10:22 AM
62	Please limit growth in flood prone areas Please limit growth in general so that thurston county is not totally paved over There are already too many subdivisions There is too much degradation, deforested areas in the city and county which will result in soil erosion, flooding, and polluted streams, etc.	6/1/2017 10:15 AM
63	Nothing. New to Thurston County, so no experience with flood hazards.	6/1/2017 7:44 AM
64	keep up the good work. Great use of my Stormwater fees	6/1/2017 7:41 AM
65	Thank you for the survey and for continuing this vital service to residents.	6/1/2017 7:27 AM

66	My home is not in a flood area, but flooded because the city allowed a new housing area to be clearcut, paved and their waste water to be run into my neighborhoods water runoff. It was too much for the pipes to handle and a stormdrain was blocked. I think the city needs to not allow the clearcutting and paving of the natural way the water runs to the bay. And they need to make sure city storm drains are clear. They should also take responsibility for their actions that cause damage to peoples homes.	6/1/2017 7:14 AM
67	Developments/homes should not be built in flood plains. Sea level rise should be planned for. That Will absolutely be happening.	6/1/2017 6:39 AM
68	The biggest way I've been affected by flooding was when the Valley Athletic Club closes and we can't participate in activities there.	5/31/2017 10:00 PM
69	Not sure.	5/31/2017 9:51 PM
70	I know there are areas that flood EVERY year and still people want to build homes there. Do they think it will somehow just stop flooding? Some flooding is good for farms and forests but if people want to farm there they should be responsible for elevating their homes and keeping their animals safe. It should not be the responsibility of the county to make the flooding stop or to prevent damage from something that is a normal occurrence. On the other hand the county should not let environmentalists dictate what can or cannot be done to keep the rivers and streams running deep and clear. Maintaining the health of the streams on peoples property should be their responsibility and they should be allowed to deepen and maintain good plantings on the banks.	5/31/2017 8:28 PM
71	People who live in flood prone areas should expect problems at times, and should not rely on others to pay for damages.	5/31/2017 6:56 PM
72	I am not near waterfront, so I worry less about tides and streams rising. But with all our hills and culverts and bridges, and often only one route to take between here and there, I do worry about the effect on those roads and bridges from saturated ground under them. I saw what the 2001 earthquake did to 101 at Hy 8, because of seepage. There must be equally vulnerable places that are as yet undiscovered.	5/31/2017 5:50 PM
73	Road closures warnings would be important	5/31/2017 5:07 PM
74	I never heard of any of this before. If it wasn't for a bulletin on a neighborhood site, I would have never known about the survey or your organization, period.	5/31/2017 4:51 PM
75	Please advise FEMA on what areas are actual flood risks in Thurston County. Their latest remapping process feels like a money grab.	5/31/2017 4:25 PM
76	I've experienced first hand major flooding while living in Texas. The Memorial Weekend Flood in Wimberley, TX. We actually lived along the Blanco River where hundreds of homes were swept away and a few families sadly were too. I've been in flash flooding from Houston to Dallas and it is very very scary. Now back home in WA, we live close to the Deschutes River but not on it. Flooding is a MAJOR concern for us.	5/31/2017 4:19 PM
77	I've only been in this area for 1.5 years, so it's quite possible that I'm just blissfully ignorant. I've seen areas flooding in the spring, and it seems that the city was prepared for those areas to accumulate water. Are there things about flooding that I should know and don't?	5/31/2017 3:48 PM
78	We are on 4002 Morton Ct SE, Olympia My neighbor across the street tore out the grass and put bark in the strip of grass b/w the street and sidewalk. It has flooded during hard rains every since then b/c the bark clogs the drain pipe. Can you guys tell them they have to go back to grass? Or if this is not the case - why is our street flooding so severely? (Like 3 feet deep!)	5/31/2017 3:36 PM
79	Thurston Co. needs to tell Lewis Co. to stop filling in the Chehalis River flood plain. Thurston Co. needs to adopt an official position opposing any altering of the Chehalis River. Thurston Co. needs to make it clear that we will not support flood control dams on the Chehalis River. Thurston Co. needs to inform Lewis Co. that unless Lewis Co. stops permitting the filing of flood plain lands Thurston Co. will bring legal action to protect it's citizens living downriver from Lewis County.	5/31/2017 3:29 PM
80	Nothing to add; appreciate the chance to provide input.	5/31/2017 3:28 PM
81	Certain rivers seem to flood every year. Homes on those rivers in the flood plane should be on taller hills or elevated on poles.	5/31/2017 3:28 PM
82	I appreciate that the county is working to mitigate flooding and to educate residents about their hazards and how to manage them.	5/31/2017 3:19 PM

83	I'm glad restrictions on building in the floodplain are in place. We do need to protect floodplains and continue to make it possible to use them for agriculture, especially produce, less so for livestock.	5/26/2017 8:51 PM
84	If there are any maps regarding flooding due to tsunami and/or shelters that families can go to in emergencies -- could you please email them to me: melanie.a.kincaid@gmail.com. I have not heard of any disaster preparedness teams (volunteers who are trained in case of emergency to help neighbors) in Thurston County like they have in Portland (they provide training to local citizens to be able to respond effectively). If there is something like this that exists -- I would love to volunteer to be a part of a team! Please email me -- Thanks!	5/23/2017 9:39 PM
85	The level of Capitol Lake should continue to be managed by DES to mitigate potential downtown Olympia flooding during times of storm events (high Deschutes River flows) and high tides. This is a key reason for maintaining and improving Capitol Lake. Removing the dam would eliminate this benefit, and as rising sea levels due to global warming cause higher tide waters, the problems will only increase in the future.	5/21/2017 11:00 PM
86	I think the Tide Lock for Capitol Lake should remain in place as it is a deterrent to flooding in downtown Olympia and helps mitigate Sea level rise.	5/21/2017 7:24 PM
87	Without the tide lock the downtown community will experience costly flooding, frequently annually...	5/21/2017 4:08 PM
88	I think it is important for home owners to maintain the ditches and drainage around their home. The neighbor above me has a driveway drainage issue and a significant amount of rain water floods in front of my front door in my driveway. If the neighbor would maintain his driveway and roadside ditches it would direct this water where it is supposed to go. Educating people about the importance of maintaining their rain/water run off is imperative so things like this doesn't happen. Do you know where the water drains off your property? Is your water run off affecting your neighbor?	5/21/2017 3:45 PM
89	Downtown Olympia seems quite vulnerable due to sea rise from global warming. Keeping the 5th Avenue dam would help reduce the chances of catastrophic flooding in Downtown while more definitive measures are undertaken.	5/21/2017 2:18 PM
90	Given sea level rise and the decreased capacity of Capitol lake, the mixture of winter king tides and heavy runoff on the Deschutes increases potential for downtown flooding the transportation disruption. Therefor, dredging of the lake should be a high priority. Also, Budd Inlet shoreline is very vulnerable if the 5th ave. dam were removed and sediment reduced depth.	5/21/2017 1:07 PM
91	I think the greatest lack of understanding by the public is that Capitol Lake is a significant flood protection tool for Downtown Olympia that the State uses to manage High Flood Stage in the Deschutes River when the two hours of King Tidge coincide with the Flood Stage. Dredging Capitol Lake will provide a critical extra short term storage capacity to reduce King Tide damage and Sea Water Rise impacts on the Downtown Olympia Business District.	5/21/2017 10:26 AM
92	The State needs to dredge Capitol Lake which has not been done since 1986, and needs to continue to use the 5th Avenue tidelock to control water levels and prevent flooding of the North Capitol Campus and downtown Olympia.	5/21/2017 8:00 AM
93	flood insurance is expensive same with earth quake deductibles are to high	5/19/2017 6:59 PM
94	I think accurate info & mapping for areas at risk for flooding is very important. This can assist zoning decisions to be made carefully & can assist home buyers to properly evaluate potential future risks. Areas of high ground water should definitely be included in this data base.	5/19/2017 10:21 AM
95	Are there other "hazard" publications beyond flood specific issues produced by Thurston County? This is the first I've seen in the three years as a resident/ property owner in unincorporated Thurston.	5/17/2017 9:32 PM
96	The reduction in insurance premiums resulting from having a CRS rating and flood plan sounds nice but in effect it could be looked at as encouragement to continue with the status quo of building, living, and working in floodplains. It should be prohibitively more expensive to do those activities in a floodplain compared to outside a floodplain due to the costs incurred community wide when flooding happens. That would help to discourage this bad idea of placing investments, people, structures, etc, in areas that flood. Possibly consider a special tax or fee on properties that are located within floodplains as a way to fund buyouts or other flood control/prevention/mitigation projects. Everyone pays a stormwater fee, why not have the floodplain properties pay a floodplain fee?	5/17/2017 4:05 PM
97	Fix the roads!!!!	5/16/2017 8:50 AM
98	Do not build a dam on the Chehalis River but enhance tributary flood storage. This can achieve the same reduction in flooding without harming WAs last unlisted Chinook run.	5/15/2017 9:11 PM

APPENDIX D

Flood Hazards Mitigation Plan Annual Progress Report Template

Thurston County Staff will convene an annual meeting with the Flood Planning Committee and relevant staff to evaluate progress on the plan and identify appropriate revisions. A sample progress report template is provided to document this process.

- Flood Hazards Mitigation Plan Annual Progress Report Template

Flood Hazards Mitigation Plan Annual Progress Report Template

Thurston County, WA Flood Hazard Mitigation Plan Annual Progress Report

Reporting Period: *(Insert reporting period)*

Background

Thurston County developed a flood hazard mitigation plan to reduce risk from flooding by identifying resources, information, and strategies for risk reduction. To prepare the plan, Thurston County organized resources, assessed risks from flooding, developed planning goals and objectives, reviewed mitigation alternatives, and developed an action plan to address probable impacts from floods. Stafford Act. The plan can be viewed on-line at:

<https://www.thurstoncountywa.gov/departments/community-planning-and-economic-development-cped/community-planning/cp-floods>

Summary Overview of the Plan's Progress: The performance period for the Hazard Mitigation Plan became effective on <Insert Date>, with the final approval of the plan by FEMA. The initial performance period for this plan will be 5 years, with an anticipated update to the plan to occur before <Insert Date 5 Years From Effective Date>. As of this reporting period, the performance period for this plan is considered ___% complete. The Flood Hazard Mitigation Plan has targeted 20 flood hazard mitigation initiatives to be pursued during the 5-year performance period. As of the reporting period, the following overall progress can be reported:

- ___ out of ___ initiatives (___%) reported ongoing action toward completion.
- ___ out of ___ initiatives (___%) were reported as being complete.
- ___ out of ___ initiatives (___%) reported no action taken.

Purpose

This report provided an annual update on the implementation of the action plan identified in the Thurston County Flood Hazard Mitigation Plan. The objective is to ensure that there is a continuing and responsive planning process that will keep the Thurston County Flood Hazards Mitigation Plan responsive to the needs and capabilities of Thurston County and stakeholders. This report discusses the following:

- Flood events that have occurred within the last year
- Changes in risk exposure within the planning area (all of Thurston County)
- Mitigation success stories
- Review of the action plan
- Changes in capabilities that could impact plan implementation
- Recommendations for changes/enhancement.

DRAFT

Changes in Risk Exposure in the Planning Area

(Insert brief overview of any flood event in the planning area that changed the probability of occurrence of flooding as presented in the flood hazard mitigation plan)

Mitigation Success Stories

(Insert brief overview of mitigation accomplishments during the reporting period)

Review of the Action Plan

Table 2 reviews the action plan, reporting the status of each initiative. Reviewers of this report should refer to Chapter 3 in the Flood Hazards Mitigation Plan for descriptions and details of each mitigation initiative and the prioritization process.

Address the following in the “status” column of the following table:

- Was any element of the initiative carried out during the reporting period?
- If no action was completed, why?
- Is the timeline for implementation for the initiative still appropriate?
- If the initiative was completed, does it need to be changed or removed from the action plan?

TABLE 2. ACTION PLAN MATRIX				
Action Taken? (Yes or No)	Time Line	Priority	Status	Status (X, O,✓)
Initiative # __ —			[description]	
Initiative # __ —			[description]	
Initiative # __ —			[description]	
Initiative # __ —			[description]	
Initiative # __ —			[description]	
Initiative # __ —			[description]	
Initiative # __ —			[description]	
Initiative # __ —			[description]	

**TABLE 2.
ACTION PLAN MATRIX**

Action Taken? (Yes or No)	Time Line	Priority	Status	Status (X, O,✓)
Initiative #__ —			[description]	
Initiative #__ —			[description]	
Initiative #__ —			[description]	
Initiative #__ —			[description]	
Initiative #__ —			[description]	
Initiative #__ —			[description]	
Initiative #__ —			[description]	
Initiative #__ —			[description]	
Initiative #__ —			[description]	
Initiative #__ —			[description]	
Initiative #__ —			[description]	
Initiative #__ —			[description]	
Initiative #__ —			[description]	
Completion status legend: ✓ = Project Completed O = Action ongoing toward completion X = No progress at this time				

Changes That May Impact Implementation of the Plan

(Insert brief overview of any significant changes in the planning area that would have a profound impact on the implementation of the plan. Specify any changes in technical, regulatory and financial capabilities identified during the plan’s development)

Recommendations for Changes or Enhancements

Based on the review of this report by the Hazard Mitigation Plan Steering Committee, the following recommendations will be noted for future updates or revisions to the plan:

- _____
- _____
- _____
- _____
- _____
- _____

Public review notice: The contents of this report are subject to public disclosure. Copies of the report are provided to the Thurston County Board of County Commissioners and is posted on the Thurston County Flood Hazards Mitigation Plan website. Any questions or comments regarding the contents of this report should be directed to:

Staff Name and Title

CRS Coordinator

Thurston County, Department Title

3000 Pacific Ave SE, Olympia WA 98501

Phone - XXX-XXX-XXXX





email@co.thurston.wa.us

APPENDIX E

MAPS

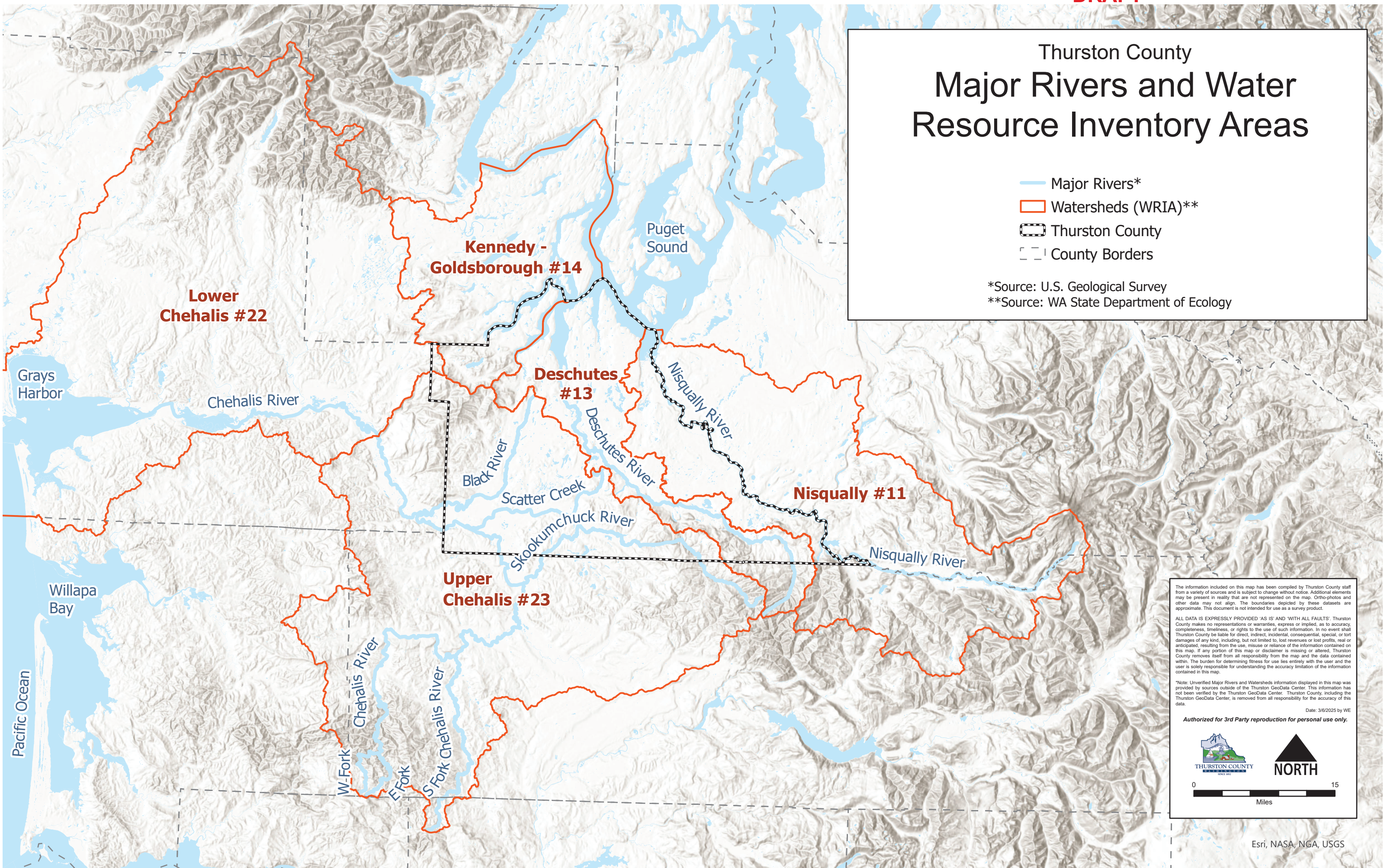
- Map 2.1: Major Rivers and Water Resource Inventory Areas
- Map 2.2: FEMA Special Flood Hazard Areas
- Map 2.3: Thurston County Watershed Boundaries
- Map 2.4: Other Regulated Special Flood Hazard Areas
- Map 2.5: Roads Susceptible to Periodic Flooding
- Map 2.6: Repetitive Loss Areas
- Map 4.1: Flood Planning Area
- Map 6.1: Cities, Towns, Reservations, and Public Lands
- Map 6.2: Major Geographical Features of of Thurston County
- Map 6.3: Population Density, 2022
- Map 6.4: Population Density, 2045
- Map 6.5: Residential Building Permits
- Map 6.6: Public Schools and School Districts
- Map 6.7: Fire Protection Districts, Departments, and Stations
- Map 6.8: Intermodal & Multimodal Transportation Facilities
- Map 6.9: Existing and Proposed Private Utilities

Thurston County Major Rivers and Water Resource Inventory Areas

-  Major Rivers*
-  Watersheds (WRIA)**
-  Thurston County
-  County Borders

*Source: U.S. Geological Survey

**Source: WA State Department of Ecology



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*Note: Unverified Major Rivers and Watersheds information displayed in this map was provided by sources outside of the Thurston GeoData Center. This information has not been verified by the Thurston GeoData Center. Thurston County, including the Thurston GeoData Center, is removed from all responsibility for the accuracy of this data.







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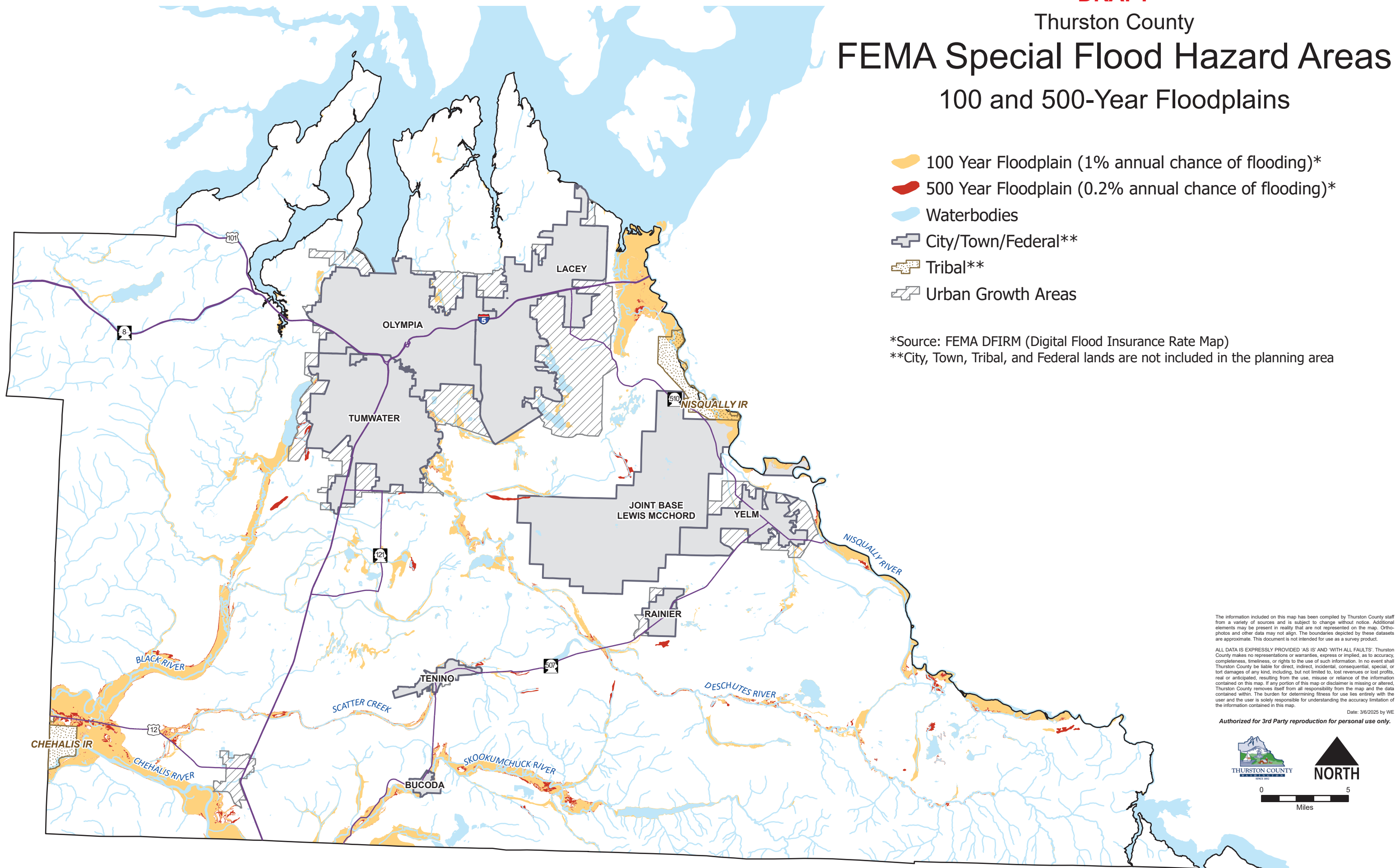
FEMA Special Flood Hazard Areas

100 and 500-Year Floodplains

-  100 Year Floodplain (1% annual chance of flooding)*
-  500 Year Floodplain (0.2% annual chance of flooding)*
-  Waterbodies
-  City/Town/Federal**
-  Tribal**
-  Urban Growth Areas

*Source: FEMA DFIRM (Digital Flood Insurance Rate Map)

**City, Town, Tribal, and Federal lands are not included in the planning area



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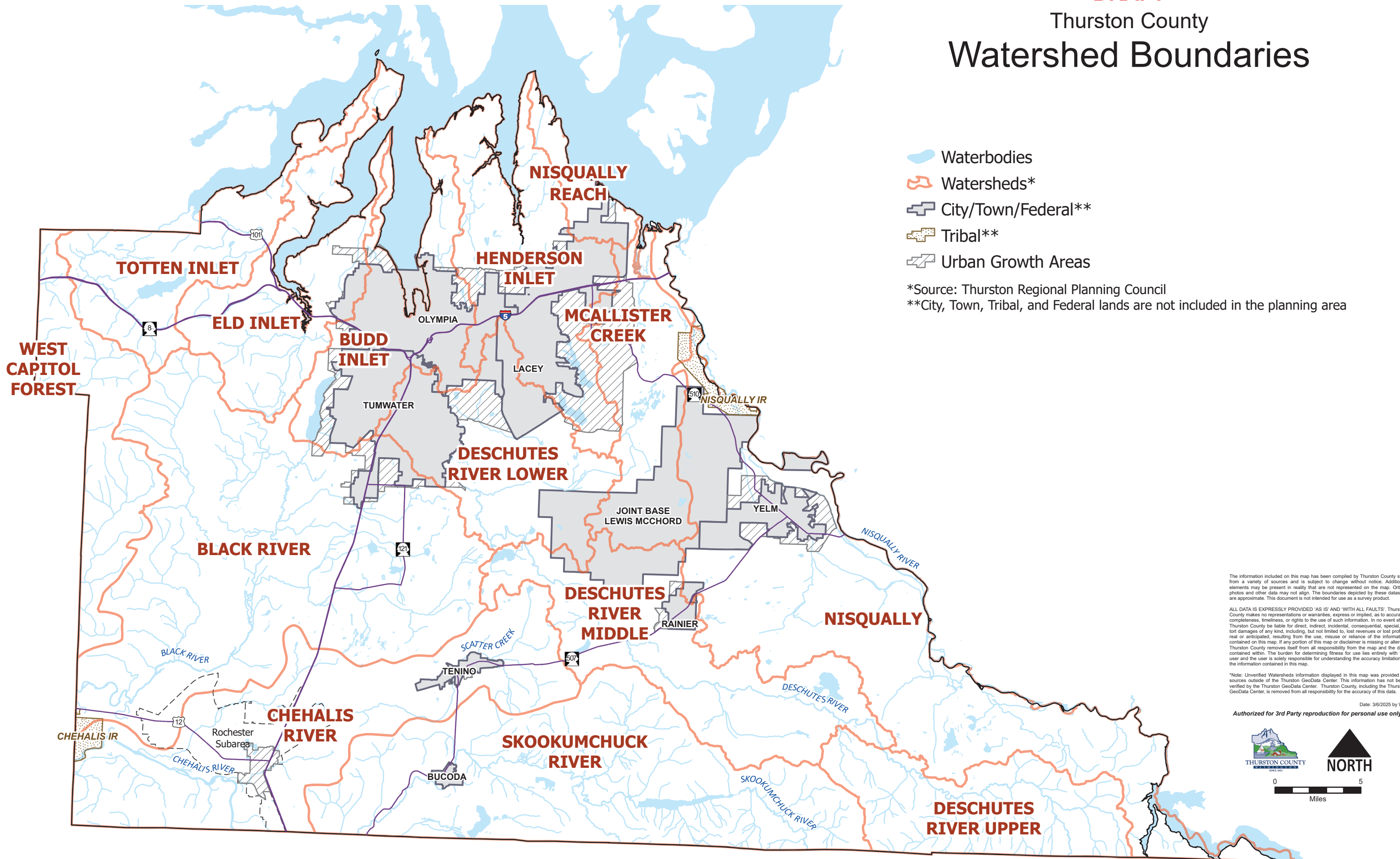
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Thurston County Watershed Boundaries



- Waterbodies
- Watersheds*
- City/Town/Federal**
- Tribal**
- Urban Growth Areas

*Source: Thurston Regional Planning Council
 **City, Town, Tribal, and Federal lands are not included in the planning area

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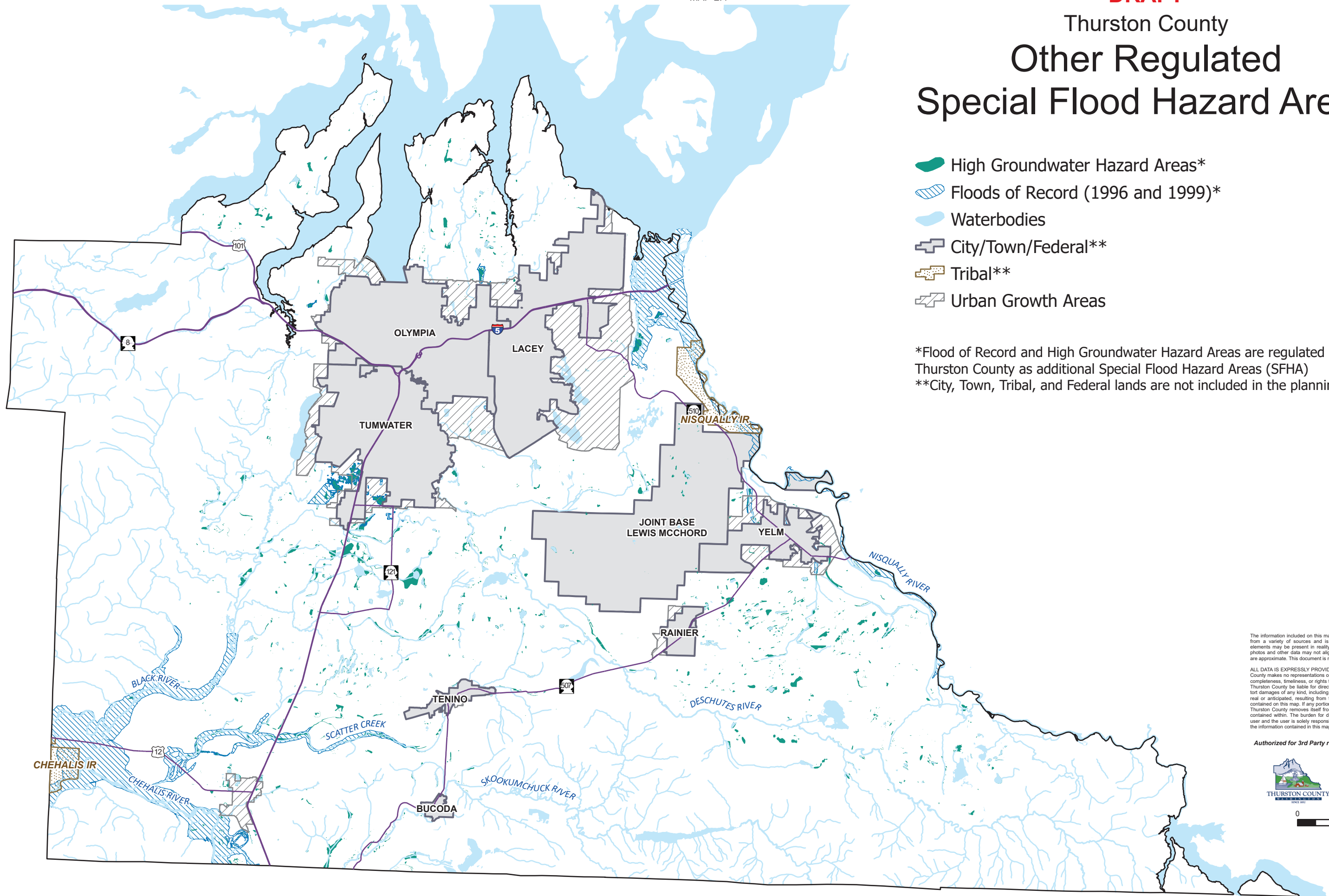
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Thurston County Other Regulated Special Flood Hazard Areas



- High Groundwater Hazard Areas*
- Floods of Record (1996 and 1999)*
- Waterbodies
- City/Town/Federal**
- Tribal**
- Urban Growth Areas

*Flood of Record and High Groundwater Hazard Areas are regulated by Thurston County as additional Special Flood Hazard Areas (SFHA)
 **City, Town, Tribal, and Federal lands are not included in the planning area

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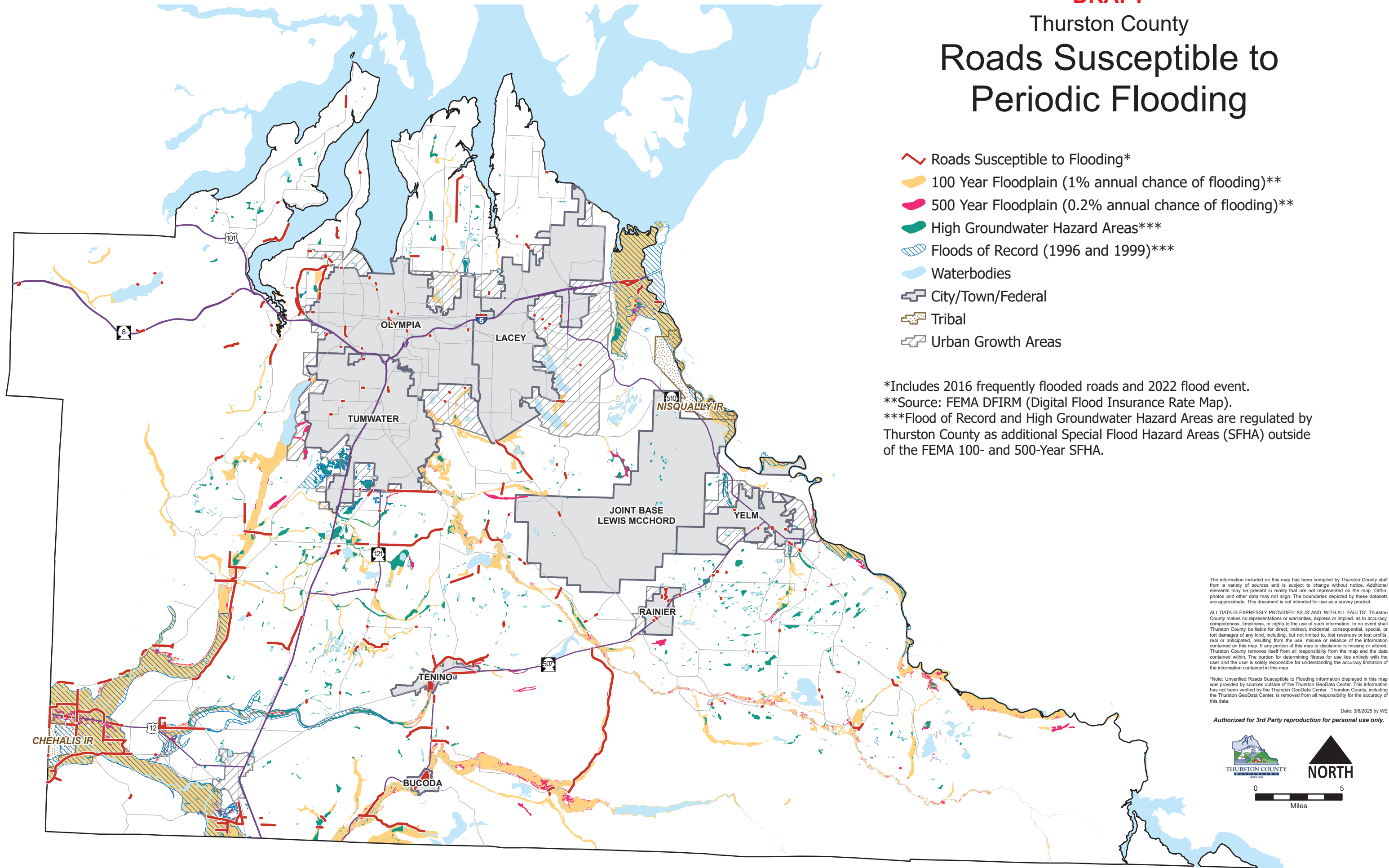
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Thurston County Roads Susceptible to Periodic Flooding



- Roads Susceptible to Flooding*
- 100 Year Floodplain (1% annual chance of flooding)**
- 500 Year Floodplain (0.2% annual chance of flooding)**
- High Groundwater Hazard Areas***
- Floods of Record (1996 and 1999)***
- Waterbodies
- City/Town/Federal
- Tribal
- Urban Growth Areas

*Includes 2016 frequently flooded roads and 2022 flood event.
 **Source: FEMA DFIRM (Digital Flood Insurance Rate Map).
 ***Flood of Record and High Groundwater Hazard Areas are regulated by Thurston County as additional Special Flood Hazard Areas (SFHA) outside of the FEMA 100- and 500-Year SFHA.

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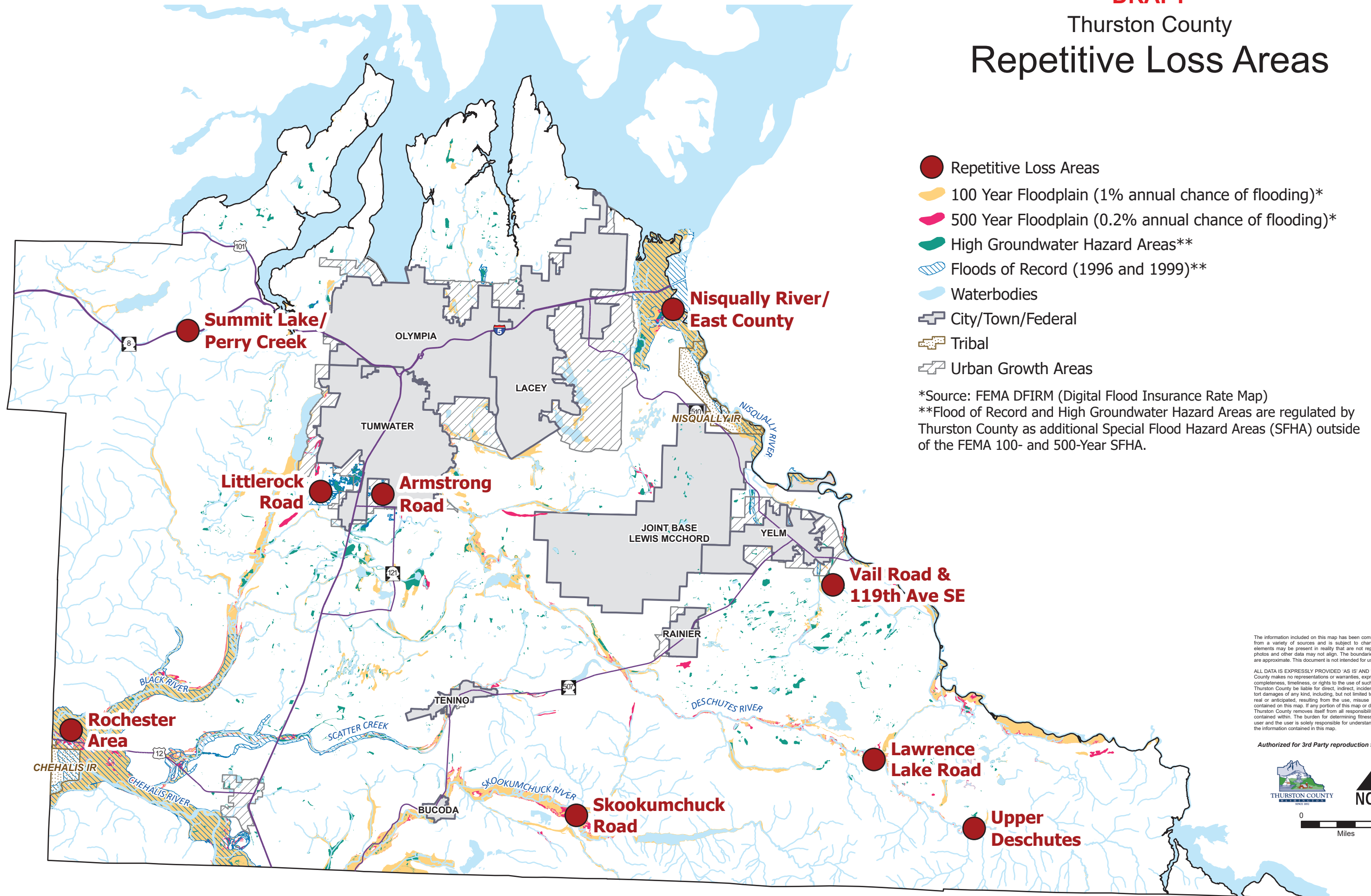
*Note: Unverified Roads Susceptible to Flooding information displayed in this map was provided by sources outside of the Thurston GeoData Center. This information has not been verified by the Thurston GeoData Center. Thurston County, including the Thurston GeoData Center, is removed from all responsibility for the accuracy of this data.

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Thurston County Repetitive Loss Areas



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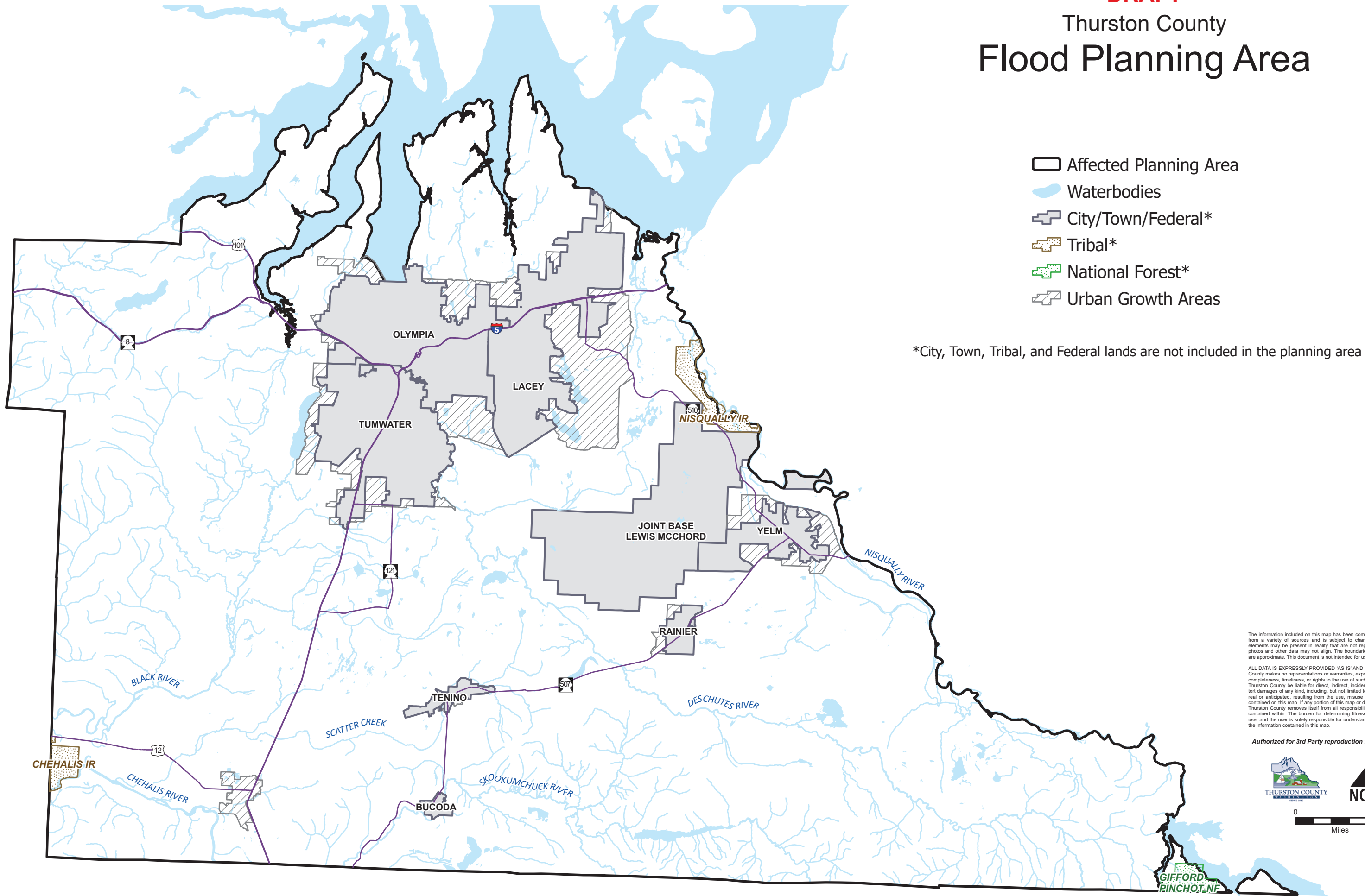
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Thurston County Flood Planning Area



- Affected Planning Area
- Waterbodies
- City/Town/Federal*
- Tribal*
- National Forest*
- Urban Growth Areas

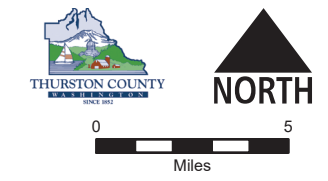
*City, Town, Tribal, and Federal lands are not included in the planning area

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Thurston County Cities, Towns, Reservations, and Public Lands

-  State Dept. of Natural Resources*
-  U.S. Fish and Wildlife**
-  National Forest
-  Tribal
-  JBLM
-  City/Town
-  Urban Growth Areas
-  Thurston County

*Source: Washington State Department of Natural Resources
 **Source: U.S. Fish and Wildlife Service



WASHINGTON STATE

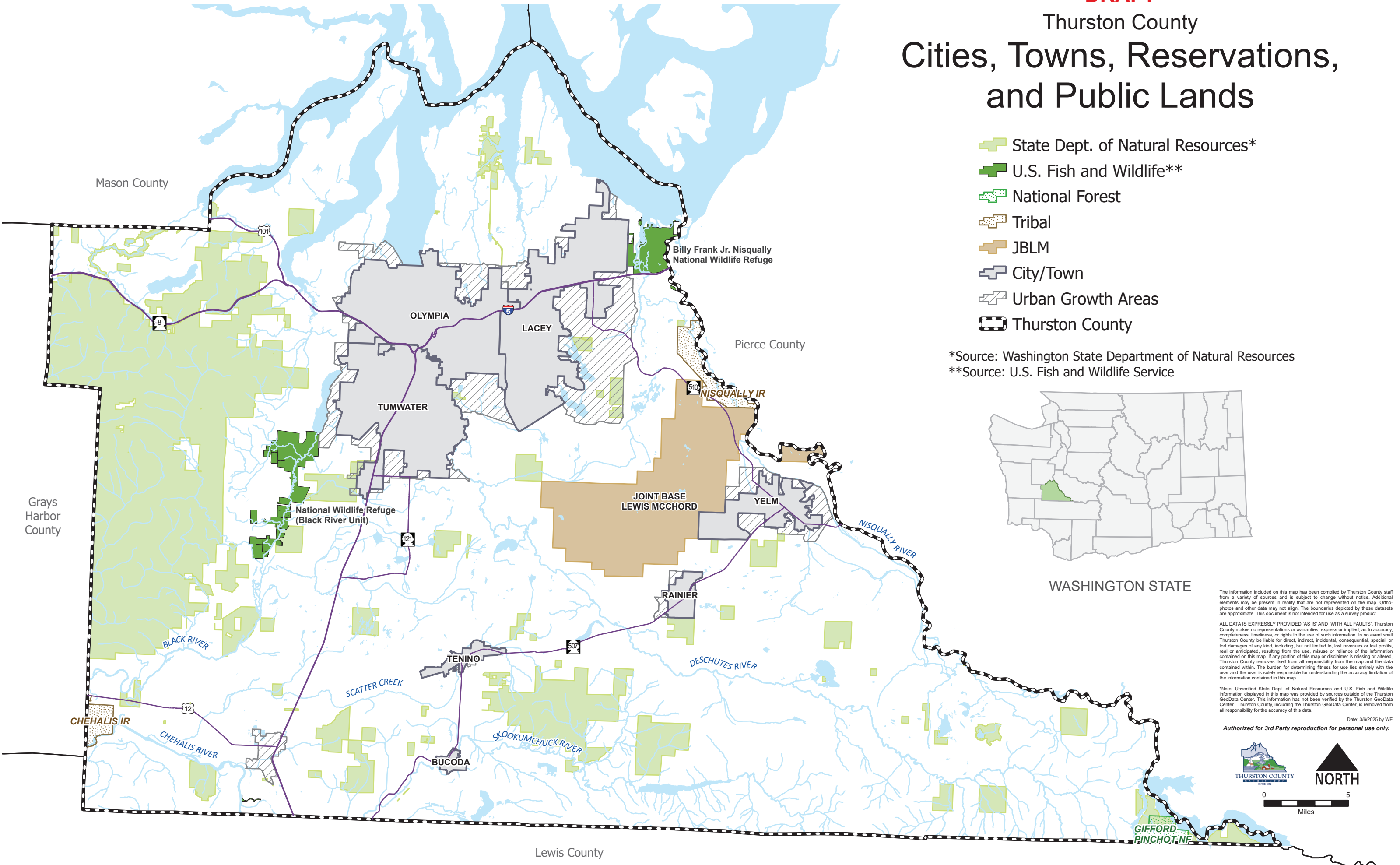
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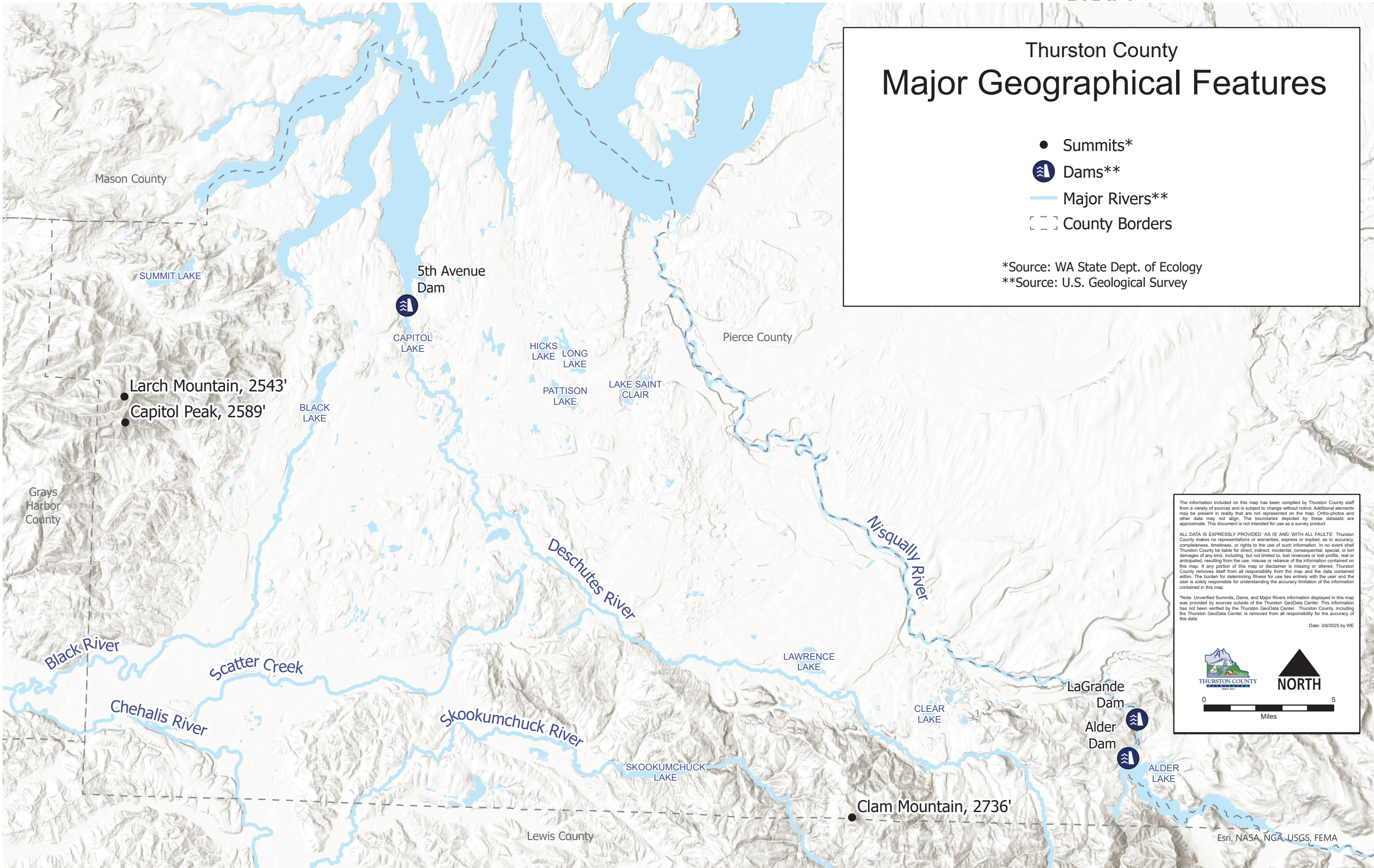
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Thurston County Major Geographical Features

- Summits*
- 🏰 Dams**
- Major Rivers**
- ⋮ County Borders

*Source: WA State Dept. of Ecology
 **Source: U.S. Geological Survey



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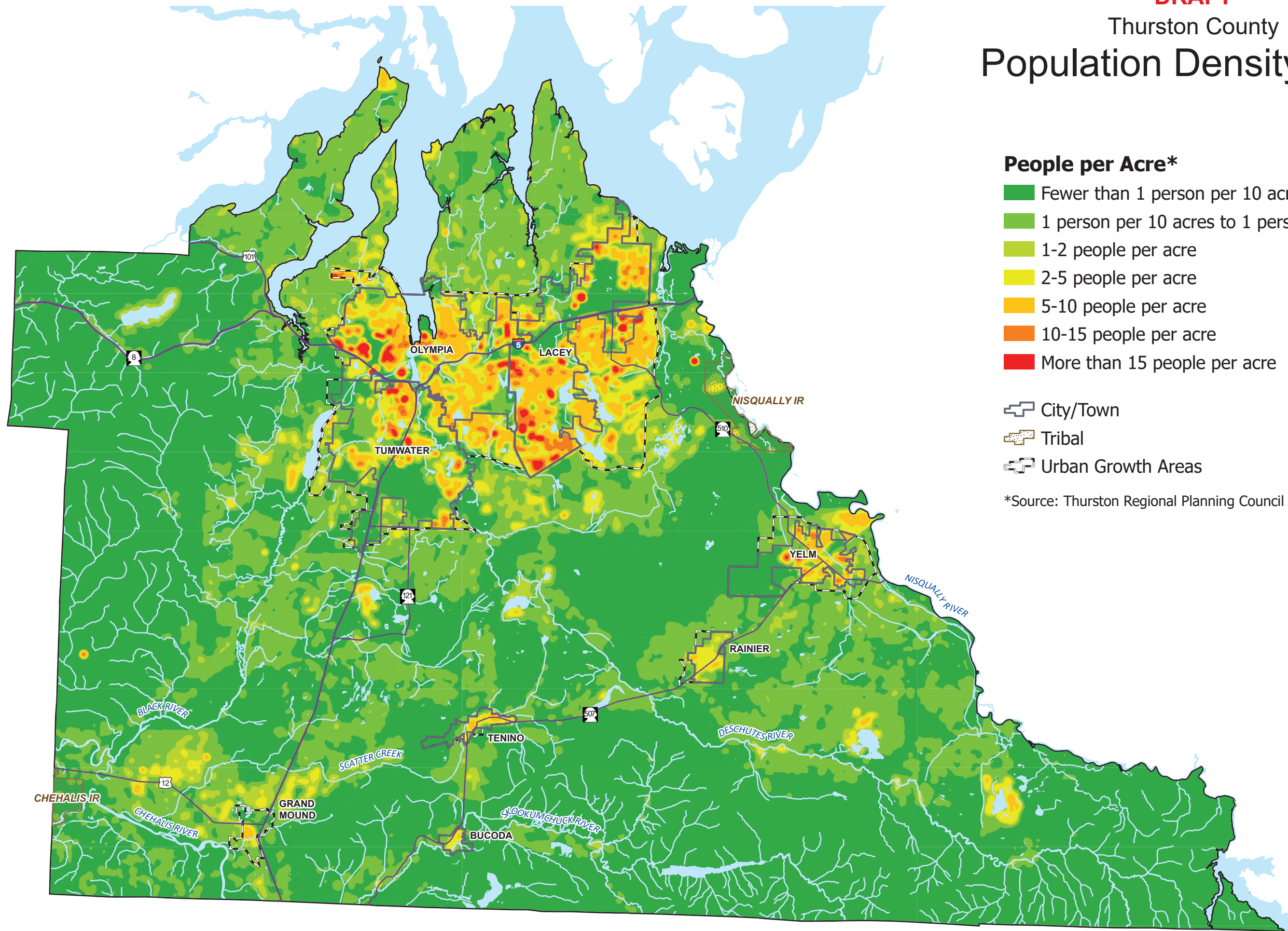
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Thurston County Population Density, 2022



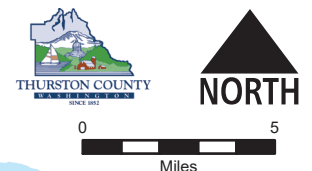
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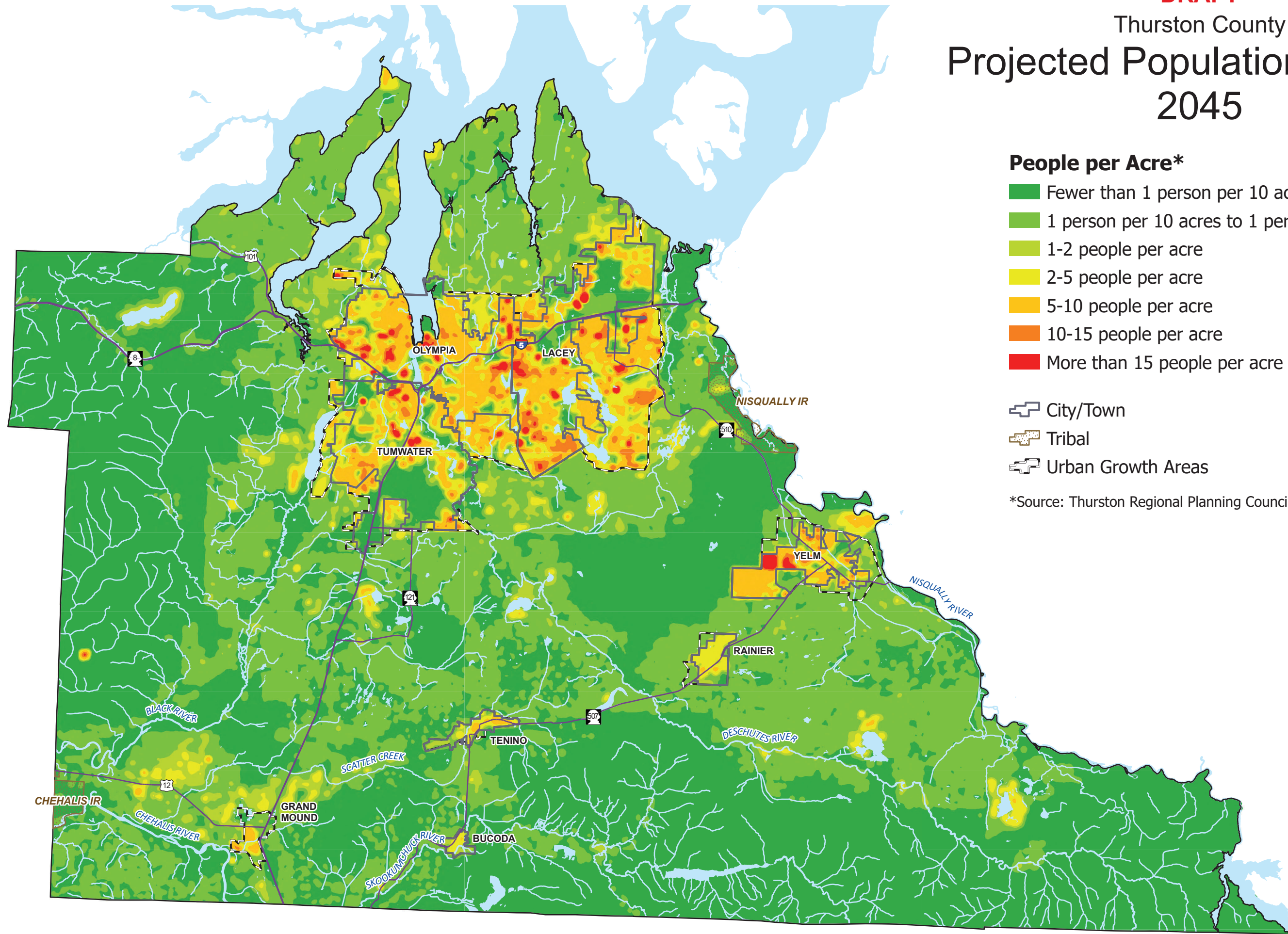
*Note: Unverified People per Acre information displayed in this map was provided by sources outside of the Thurston GeoData Center. This information has not been verified by the Thurston GeoData Center. Thurston County, including the Thurston GeoData Center, is removed from all responsibility for the accuracy of this data.

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Thurston County Projected Population Density, 2045



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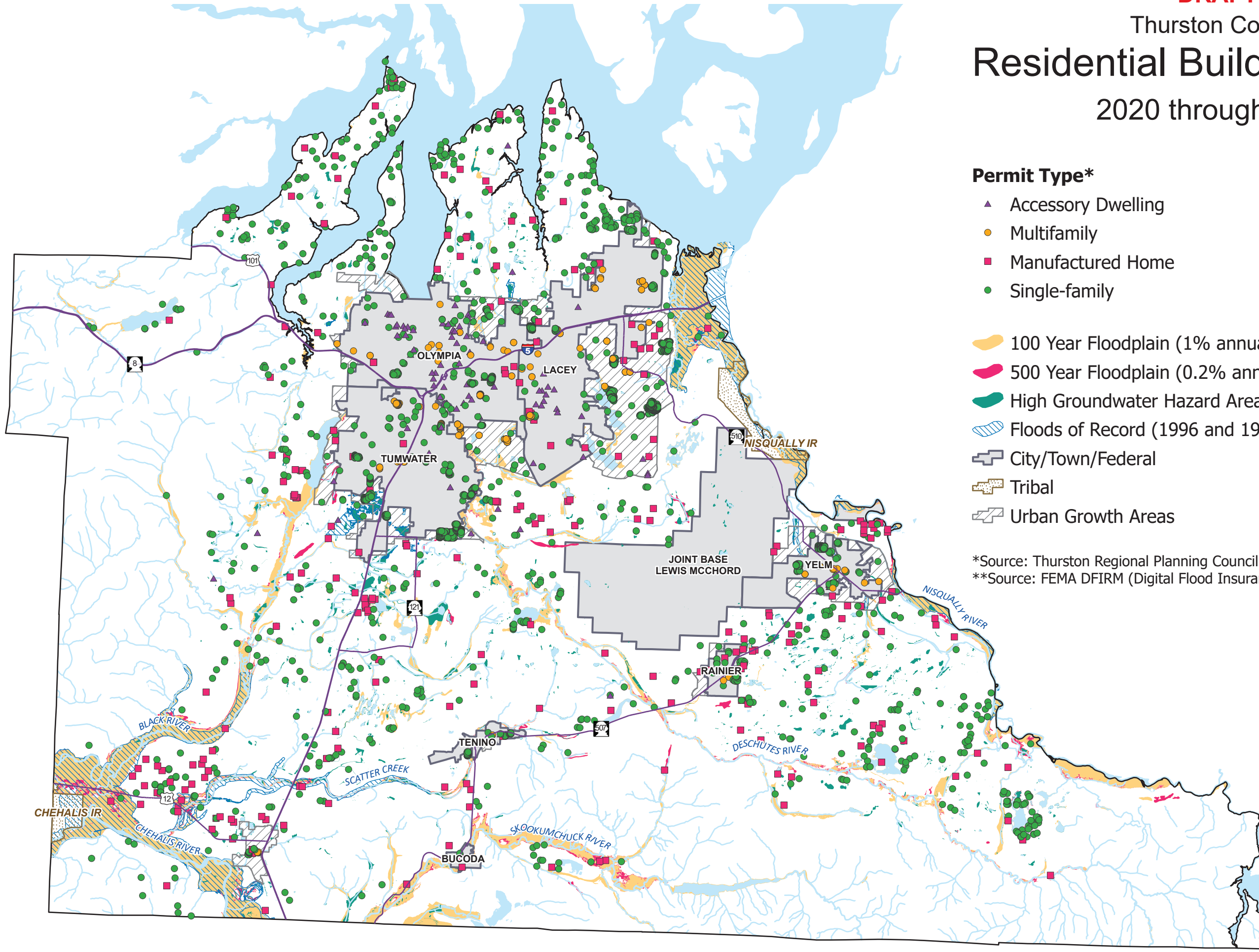
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Thurston County Residential Building Permits 2020 through 2024



Permit Type*

- ▲ Accessory Dwelling
- Multifamily
- Manufactured Home
- Single-family

- 100 Year Floodplain (1% annual chance of flooding)**
- 500 Year Floodplain (0.2% annual chance of flooding)**
- High Groundwater Hazard Areas
- Floods of Record (1996 and 1999)
- City/Town/Federal
- Tribal
- Urban Growth Areas

*Source: Thurston Regional Planning Council
 **Source: FEMA DFIRM (Digital Flood Insurance Rate Map)

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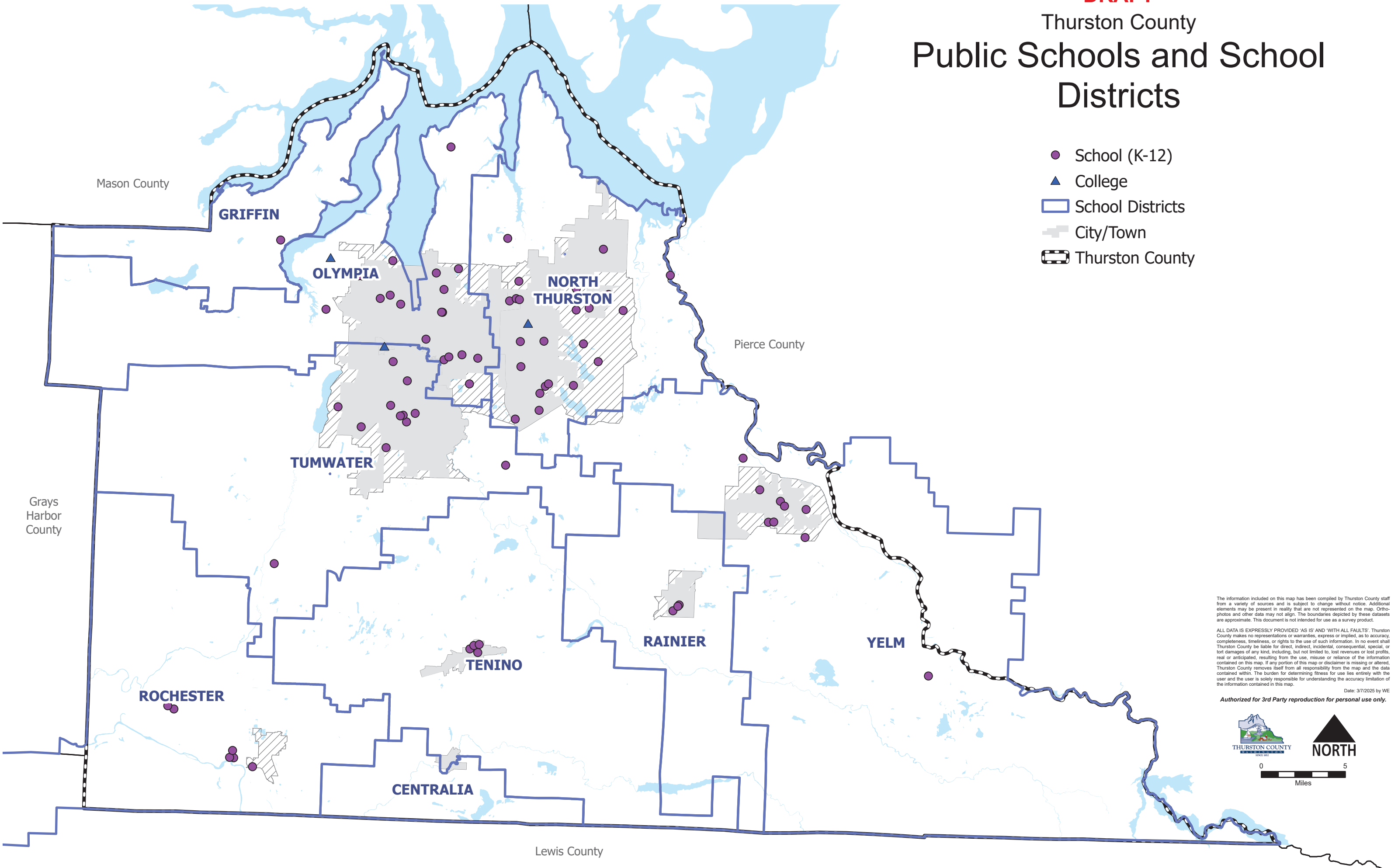
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Thurston County Public Schools and School Districts

- School (K-12)
- ▲ College
- ▭ School Districts
- ▨ City/Town
- ⬡ Thurston County



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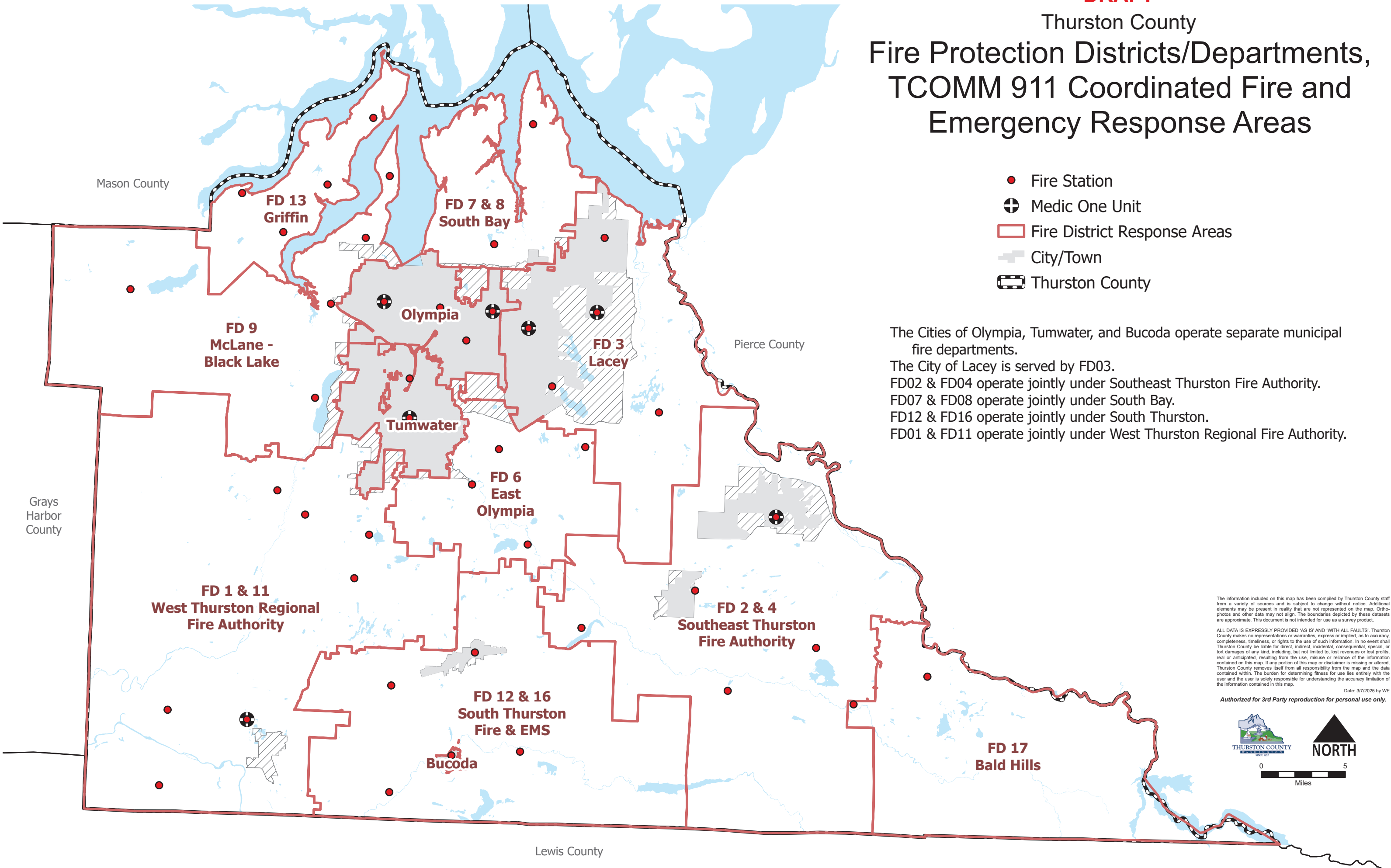
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Thurston County Fire Protection Districts/Departments, TCOMM 911 Coordinated Fire and Emergency Response Areas



- Fire Station
- ⊕ Medic One Unit
- ▭ Fire District Response Areas
- ▨ City/Town
- ▭ Thurston County

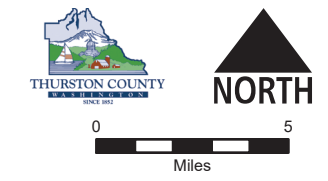
The Cities of Olympia, Tumwater, and Bucoda operate separate municipal fire departments.
 The City of Lacey is served by FD03.
 FD02 & FD04 operate jointly under Southeast Thurston Fire Authority.
 FD07 & FD08 operate jointly under South Bay.
 FD12 & FD16 operate jointly under South Thurston.
 FD01 & FD11 operate jointly under West Thurston Regional Fire Authority.

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Thurston County Intermodal & Multimodal Transportation Facilities

Transit*

- R** Rail Station
- T** Transit Center

Park and Ride*

- P** Park and Ride

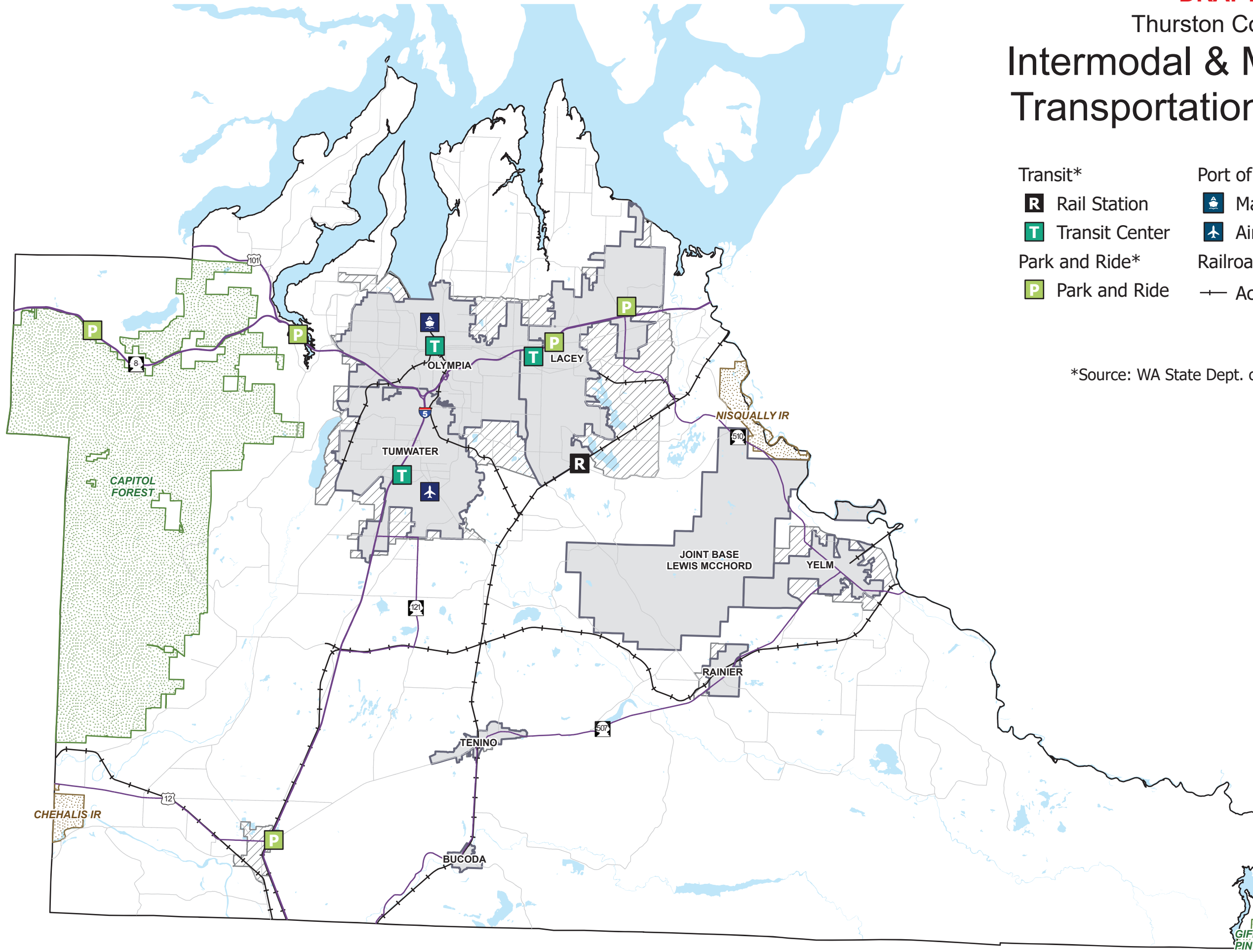
Port of Olympia Terminals

- Marine Terminal
- Airport

Railroads

- Active Railroad

*Source: WA State Dept. of Transportation

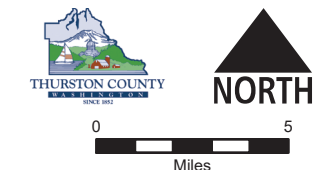


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


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Thurston County Existing and Proposed Private Utilities: Electricity and Natural Gas

-  City/Town/Federal
-  Urban Growth Areas
-  Rochester Subarea
-  Tribal




ELECTRICITY - EXISTING*

-  Puget Sound Energy Transmission
-  Puget Sound Energy Transmission Substations
-  Puget Sound Energy Distribution Substations
-  BPA Main Grid Transmission
-  BPA Main Grid Transmission Substations

ELECTRICITY - PROPOSED*

-  Puget Sound Energy Transmission
-  Puget Sound Energy Transmission Substations
-  Puget Sound Energy Distribution Substations
-  Puget Sound Energy Gate Stations

NATURAL GAS - EXISTING*

-  Puget Sound Energy High Pressure Lines
-  Olympic Gas Pipeline
-  Williams Gas Pipeline

NATURAL GAS - PROPOSED*

-  Proposed High Pressure Lines

*Source: Thurston Regional Planning Council, 2004

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