



CHAPTER 3

The 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 will base 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 2017, Thurston County 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 30 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 Hazards 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 customer 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 Permit Assistance 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 participation on 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 2012 Flood Hazards Mitigation Plan (2012 FHMP), the 2017 All Hazards Mitigation Plan for the Thurston Region, and the Thurston County Comprehensive Plan for guidance.

While maintaining the intent of several of the 2012 FHMP’s goals the FPC rewrote and reorganized the goals. They also made substantial revisions to the objectives to better reflect the needs of flood mitigation activities currently underway or will be implemented over the next decade. Lastly, the 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.



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 FPC considered a range of actions, including the categories recommended by the National Flood Insurance Program’s Community Rating System (shown in the next section). In addition to new initiatives, some initiatives carried over in their original form from the 2012 FHMP because they require additional work, and some were modified to suit present needs. The chapter also contains a list of Initiatives identified in the 2012 FHMP that were either completed or not selected for inclusion in this plan.

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

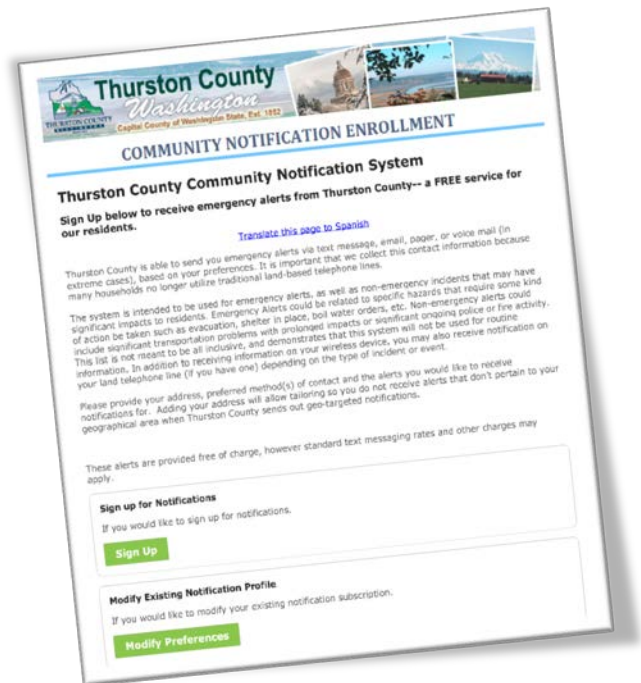
¹ 2017. FEMA. Community Rating System Coordinator's Manual. Page 510-20.

3. **Natural Resource Protection** activities preserve or restore natural areas or the natural functions of floodplain and watershed areas. They are implemented by a 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 FCP 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. The general parameters:

- **Short Term** – to be completed in 1 to 5 years
- **Long Term**—to be completed 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 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 an iterative numerical ranking process where each member identified and ranked their top five. The individual results were combined and tallied. The FPC repeated the process twice discussed as a group to reach a final score, and then ranked the initiatives based on their score. The initiative with the lowest score ranks first and the highest score ranks fifth. These initiatives are identified in Table 3.1.

3.3 Thurston County Flood Mitigation Initiatives – Current Adopted

The plan contains 20 active mitigation initiatives. Ten initiatives transferred from the 2012 FHMP, seven are modified versions of one or more initiatives from the 2012 FHMP or other plans, and three are new. The initiative's identification numbers are new, but the mitigation details note their original source identification for reference.

The mitigation initiatives will require 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	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 plan, design, and construct signs, and identify routes for people to reach safe places.								
1	Dam Failure Evacuation Planning and Response	Medium	n/a	In progress	Medium	High	2017-2021, Short term	Emergency Services, Public Information
2	Flood Detours and Response Planning	High	n/a	In progress	Medium	Medium	2017 – 2021, 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	3	Ongoing	High	High	2017 – 2030, Long term	Natural Resource Protection, Structural
4	Road Repair and Reconstruction Flood Mitigation Program	High	5	Ongoing	High	High	2017 – 2030, Long term	Property Protection, Natural Resource Protection
Mapping, Data Collection, and Data Protocols: Seven initiatives support improving the community's knowledge of how, when, and where flooding occurs. Additional data 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, Modeling, and Evaluation Program	Medium	4	In progress	Medium	Medium	2017-2021, Ongoing	Prevention, Emergency Services
6	HAZUS – Flood Model Development and Maintenance Program	Low	n/a	Ongoing	Medium	Low	2017-2021, Short term	Prevention, Public Information

ID	Title	Priority	Top 5 Rank	Status	Cost	Benefit Rating	Timeline	CRS Category
7	Risk Map Land Use and Development Regulation Review and Revisions	High	n/a	In progress	Low	Medium	2017-2021	Prevention, Public Information
8	Flood Map Refinement and Access	Low	n/a	In Progress	Medium	Low	2017-2021	Prevention, Public Information
9	Flood Map and Data Storage and Retrieval Program	Medium	n/a	In progress	Low	Low	2017-2021	Prevention
10	River Channel Migration Zone and Habitat Mapping Program	Medium	n/a	Ongoing	Low	Low	2017-2021, Short term, Ongoing	Prevention
11	Building Inventory and Mapping Program	Medium	n/a	Ongoing	Low	Low	2017-2021, 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	1	Ongoing	High	High	2017-2030, Long term, Ongoing	Prevention, Property Protection
13	Debris and Sediment Inspection and Flood Hazard Reduction Program	Medium	n/a	New - No Progress	Medium	High	2017-2021, 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	n/a	Ongoing	High	Medium	2017-2030, Long-term, Ongoing	Prevention, Natural Resource Protection, Structural
15	Riparian Flood Control and Habitat Reforestation Project	Medium	n/a	New - No Progress	High	Medium	2017-2030, 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	2	New - No Progress	Low	Medium	2017-2019, Short term	Prevention
17	Community Rating System Program	High	n/a	Ongoing	Medium	Medium	Ongoing	Prevention, Public Information
18	Thurston Climate Adaptation Plan Evaluation and Plan Integration	Medium	n/a	New - No Progress	Low	Low	2018-2021, Short-term	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	2017-2021, Ongoing	Public Information
20	Flood Website Development	High	n/a	In progress	Low	Low	2017-2019, Short term	Public Information

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 and sign evacuation routes and develop and train for 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.</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 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: 2017-2021, Short term</p> <p>Leads: Emergency Services, Public Works, Sheriff’s Office, Central Services – Geo Data</p> <p>Cost Estimate: Medium</p> <p>Funding Source: Grants, Local Funds</p> <p>Origin of Initiative: FMI-23, 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 and is finalizing an evacuation plan for the Nisqually River.</p>		

ID Number: 2**Priority:** High**Top Five Rank:** n/a**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:** 2017 – 2021, Short term**Leads:** Emergency Management, Public Works, Central Services – Geo Data**Cost Estimate:** Medium**Funding Source:** Grants, Local Funds**Origin of Initiative:** FMI-25, 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.

ID Number: 3**Priority:** High**Top Five Rank:** 3**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:** 2017 – 2030, Long term**Leads:** Resource Stewardship, Public Works**Cost Estimate:** High**Funding Source:** Grants, Local Funds**Origin of Initiative:** FMI-11, 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.

ID Number: 4**Priority:** High**Top Five Rank:** 5**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:** 2017 – 2030, Long term**Leads:** Resource Stewardship, Public Works**Cost Estimate:** High**Funding Source:** Grants, Local Funds**Origin of Initiative:** FMI-24, 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.

ID Number: 5**Priority:** Medium**Top Five Rank:** 4**Initiative Title:** Flood Data Collection, 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 Thurston County's flood prediction and forecast modeling capabilities for all types of flooding, including the impacts of climate change.

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 hydrolic data. Updated LIDAR data will improve hydrolic 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:** 2017-2021, Ongoing**Leads:** Resource Stewardship, Emergency Management**Cost Estimate:** Medium**Funding Source:** Grants, Local Funds**Origin of Initiative:** FMI-9, 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 to 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.

ID Number: 6**Priority:** Low**Top Five Rank:** n/a

Initiative Title: HAZUS – 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 HAZUS-Flood model using local data to support flood planning activities.

Rationale: HAZUS flood scenario loss estimates will support hazard mitigation and response planning activities and can assist the county in evaluating its mitigation strategies.

Benefit Rating: Low

Status: Ongoing

Timeline: 2017-2021, Short term

Leads: Emergency Services, Central Services – Geo Data

Cost Estimate: Medium

Funding Source: Grants, Local Funds

Origin of Initiative: FMI-14, 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.

ID Number: 7	Priority: High	Top Five Rank: n/a
<p>Initiative Title: Risk Map Land Use and Development Regulation Review and Revisions</p>		
<p>Type of Activity: Mapping, Data Collection, and Data Protocols</p>		
<p>CRS Category: Prevention, Public Information</p>		
<p>Relates to Plan Goals and Objectives: 1g,2c,2f</p>		
<p>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.</p>		
<p>Rationale: The expansion or reduction of the 100-year floodplain will have implications for near-and long-term land use activities in Thurston County.</p>		
<p>Benefit Rating: Medium</p>		
<p>Status: In progress</p>		
<p>Timeline: 2017-2021</p>		
<p>Leads: Resource Stewardship</p>		
<p>Cost Estimate: Low</p>		
<p>Funding Source: Local Funds</p>		
<p>Origin of Initiative: New Initiative - Adapted from TC-FH-10, 2017 Hazards Mitigation Plan</p>		
<p>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.</p>		

ID Number: 8**Priority:** Low**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: Low**Status:** In Progress**Timeline:** 2017-2021**Leads:** FEMA, State Ecology, Resource Stewardship, Public Works, Central Services-GeoData Center, Storm and Surface Water Utility**Cost Estimate:** Medium**Funding Source:** Grants, Local Funds**Origin of Initiative:** New Initiative - Adapted from TC-FH-7, 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.

ID Number: 9	Priority: Medium	Top Five Rank: n/a
<p>Initiative Title: Flood Map and Data Storage and Retrieval Program</p>		
<p>Type of Activity: Mapping, Data Collection, and Data Protocols</p>		
<p>CRS Category: Prevention</p>		
<p>Relates to Plan Goals and Objectives: 2b,2f,2h,3a</p>		
<p>Action: Develop protocols to document previous flood events including data, imagery, losses, and other information about conditions that contribute to flooding.</p>		
<p>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.</p>		
<p>Benefit Rating: Low</p>		
<p>Status: In progress</p>		
<p>Timeline: 2017-2021</p>		
<p>Leads: Emergency Services, Central Services - GeoData, local governments, and Thurston Regional Planning Council</p>		
<p>Cost Estimate: Low</p>		
<p>Funding Source: Grants, Local Funds</p>		
<p>Origin of Initiative: New Initiative - Adapted from TC-FH-9, 2017 Hazards Mitigation Plan</p>		
<p>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.</p>		

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 up to date maps for the channel migration zones for all rivers in the region and the extent of high quality riparian habitat.

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: 2017-2021, Short term, Ongoing

Leads: Resource Stewardship, Central Services – Geo Data, Public Works, Storm and Surface Water Utility

Cost Estimate: Low

Funding Source: Local funds

Origin of Initiative: FMI-26

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.

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: 2017-2021, Short term, Ongoing		
Leads: Thurston County Assessors Office, Central Services - Thurston GeoData		
Cost Estimate: Low		
Funding Source: Grants and Local Funds		
Origin of Initiative: New Initiative, 2017 Flood Plan Update		
Progress and Implementation Status: This initiative was introduced in the 2017 Flood Plan update. There is no progress to report.		

ID Number: 12**Priority:** High**Top Five Rank:** 1

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: Formalize 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: 2017-2030, Long term, Ongoing

Leads: Resource Stewardship, Central Services, Emergency Services, Storm and Surface Water Utility

Cost Estimate: High

Funding Source: Grants, Local Funds

Origin of Initiative: FMI-1

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.

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 and channel migration zones to monitor and document debris and sediment accumulation 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.		
Benefit Rating: High		
Status: New - No Progress		
Timeline: 2017-2021, Short-term		
Leads: Public Works, Resource Stewardship, Emergency Services		
Cost Estimate: Medium		
Funding Source: Local Funds		
Origin of Initiative: New Initiative, 2017 Flood Plan Update		
Progress and Implementation Status: This initiative was introduced in the 2017 Flood Plan update. There is no progress to report.		

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:** 2017-2030, Long-term, Ongoing**Leads:** Resource Stewardship, Public Works, Storm and Surface Water Utility, Thurston Conservation District**Cost Estimate:** Low**Funding Source:** Grants, Local Funds

Origin of Initiative: New Initiative. Adapted from FMI-3 and merged with activities from FMI 18, FMI-20, FMI-28, FMI-31, 2012 FHMP and from TC-FH-11 and TC-FH-18, 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 and is working to update its Shoreline Master Plan in 2017.

ID Number: 15	Priority: Medium	Top Five Rank: n/a
<p>Initiative Title: Riparian Flood Control and Habitat Reforestation Project</p>		
<p>Type of Activity: Natural Functions and Ecosystem Services</p>		
<p>CRS Category: Prevention, Natural Resource Protection</p>		
<p>Relates to Plan Goals and Objectives: 2d,4a,4b,4c</p>		
<p>Action: Formalize 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.</p>		
<p>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.</p>		
<p>Benefit Rating: Medium</p>		
<p>Status: New - No Progress</p>		
<p>Timeline: 2017-2030, Long term</p>		
<p>Leads: Resource Stewardship, Public Works, Thurston Conservation District</p>		
<p>Cost Estimate: High</p>		
<p>Funding Source: Grants, Local Funds, Partnerships</p>		
<p>Origin of Initiative: New Initiative - Adapted from TC-FH-17, 2017 Hazards Mitigation Plan</p>		
<p>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 totally approximately \$26.2 million (Nisqually WRIA, \$17 million; Deschutes WRIA, \$6.5 million; Kennedy-Goldsborough WRIA, \$547,000; and Chehalis WRIsAs, \$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.</p>		

ID Number: 16**Priority:** High**Top Five Rank:** 2**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:** 2017-2019, Short term

Leads: Thurston County Manager, Department and Division Directors, Resource Stewardship, Emergency Services, Public Works, Storm and Surface Water Utility, Board of County Commissioners

Cost Estimate: Low**Funding Source:** Local funds

Origin of Initiative: New Initiative - Adapted from FMI-7 and FMI-17, 2012 FHMP

Progress and Implementation Status: This initiative was introduced in the 2017 Flood Plan update. There is no progress to report.

ID Number: 17	Priority: High	Top Five Rank: n/a
<p>Initiative Title: Community Rating System Program</p>		
<p>Type of Activity: Finance, Implementation, and Coordination</p>		
<p>CRS Category: Prevention, Public Information</p>		
<p>Relates to Plan Goals and Objectives: 2c,2e,2f,2h</p>		
<p>Action: Strive to maintain a Class 5 or better Community Rating System (CRS) classification as a means of reducing flood risks.</p>		
<p>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.</p>		
<p>Benefit Rating: Medium</p>		
<p>Status: Ongoing</p>		
<p>Timeline: Ongoing</p>		
<p>Leads: Resource Stewardship, Storm and Surface Water Utility, Emergency Services, Public Works</p>		
<p>Cost Estimate: Medium</p>		
<p>Funding Source: Local funds</p>		
<p>Origin of Initiative: FMI-5</p>		
<p>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 2018. The 2017 Flood Plan Update is a prerequisite for maintaining a Class 5 or better rating.</p>		

ID Number: 18**Priority:** Medium**Top Five Rank:** n/a

Initiative Title: Thurston Climate Adaptation Plan Evaluation and Plan 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 and incorporate them into the Flood Hazards Mitigation Plan and other appropriate county 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: 2018-2021, Short-term

Leads: Resource Stewardship, Storm and Surface Water Utility, Emergency Services, Public Works, Thurston Regional Planning Council, and other jurisdictions and stakeholders

Cost Estimate: Low

Funding Source: Local funds

Origin of Initiative: New Initiative, 2017 Flood Plan Update

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.

ID Number: 19	Priority: Medium	Top Five Rank: n/a
<p>Initiative Title: Flood Hazard Education and Hazard Reduction Public Outreach Strategy</p>		
<p>Type of Activity: Public Education and Awareness</p>		
<p>CRS Category: Public Information</p>		
<p>Relates to Plan Goals and Objectives: 5a,5c,5e,6a,6b,6d</p>		
<p>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.</p>		
<p>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.</p>		
<p>Benefit Rating: Low</p>		
<p>Status: Ongoing</p>		
<p>Timeline: 2017-2021, Ongoing</p>		
<p>Leads: Resource Stewardship, Storm and Surface Water Utility, Emergency Services, Public Works, Central Services</p>		
<p>Cost Estimate: Low</p>		
<p>Funding Source: Grants, Local funds</p>		
<p>Origin of Initiative: FMI-2</p>		
<p>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.</p>		

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: Revise Thurston County's website to consolidate all flood-related information and contents to improve accessibility. Expand the use of interactive tools such as GIS story maps 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:** 2017-2019, Short term**Leads:** Resource Stewardship, Storm and Surface Water Utility, Emergency Services, Public Works, Central Services**Cost Estimate:** Low**Funding Source:** Grants, Local funds**Origin of Initiative:** New Initiative - Adapted from FMI-19, 2012 FHMP

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

3.3.2 Mitigation Initiatives - Completed and Removed

During the plan update process, the Plan Development Team and the FPC reviewed the 32 flood mitigation initiatives from the 2012 FHMP. Of the 13 initiatives removed from the county’s current strategy, six are complete. Six were adapted and incorporated into new mitigation initiatives, and one is no longer relevant as it is satisfied by other planning tasks. The adopted mitigation strategy no longer includes these initiatives. They are presented here to document progress and revisions to the county’s mitigation strategy since the 2012 FHMP was adopted.

ID Number: FMI-3	Priority: High	Status: Removed
CRS Category: Natural Resource Protection		
Action: Continue a conservative approach to woody debris management and maintenance, using state- or county-established best management practices.		
Evaluation: Replaced by Initiative 14		
ID Number: FMI-4	Priority: High	Status: Removed
CRS Category: Prevention, Property Protection, Public Education and Awareness		
Action: Continue to maintain compliance and good standing with the programmatic requirements of the National Flood Insurance Program.		
Evaluation: Replaced by Initiative 14		
ID Number: FMI-10	Priority: High	Status: Complete
CRS Category: Prevention		
Action: Complete an inventory of all publicly maintained stormwater facilities.		
Evaluation: This task was completed. Initiative 3 will fulfill the next phase.		

ID Number: FMI-12	Priority: High	Status: Complete
<p>CRS Category: Prevention</p> <p>Action: Utilizing the best available data, science and technology, enhance the existing flood notification program, striving to identify a notification protocol within systems that have real-time flood threat recognition capability.</p> <p>Evaluation: Thurston County's Alert Sense Notification System has fulfilled this task.</p>		
ID Number: FMI-20	Priority: High	Status: Removed
<p>CRS Category: Natural Resource Protection</p> <p>Action: Continue to pursue/maintain Thurston County floodplain management program compliance with the National Marine Fisheries Service biological opinion regarding the National Flood Insurance Program.</p> <p>Evaluation: Replaced by Initiative 14</p>		
ID Number: FMI-21	Priority: High	Status: Complete
<p>CRS Category: Emergency Services</p> <p>Action: Establish a link between the Thurston County Flood Hazard Mitigation Plan and the Natural Hazards Mitigation Plan for the Thurston Region. The Flood Hazard Mitigation Plan will become the flood hazard component of the Natural Hazards Mitigation Plan upon its next update. All future updates to the two plans will occur on the same planning cycle upon plan integration.</p> <p>Evaluation: The Hazards Mitigation Plan for the Thurston Region was adopted by Thurston County in July 2017, so this initiative is no longer relevant.</p>		

ID Number: FMI-22	Priority: High	Status: Complete
<p>CRS Category: Prevention</p> <p>Action: Obtain digital data and create GIS maps of the flood inundation from possible failures of the Skookumchuck Dam on the Skookumchuck River and the Alder and LaGrande Dams on the Nisqually River. Using this data, assess the risk associated with these facilities utilizing the best available data and science.</p> <p>Evaluation: The “Dam Break Analysis and Inundation Mapping for the Skookumchuck Dam” was updated using digital topographic data provided by Thurston County in 2013. Tacoma Power updated their dam failure report for Alder Dam on the Nisqually River in 2014. Thurston County has obtained the GIS data for both watersheds. This initiative is complete and Initiative 1 will fulfill subsequent related actions.</p>		
ID Number: FMI-27	Priority: Medium	Status: Complete
<p>CRS Category: Prevention</p> <p>Action: FMI-27—To support initiative # FMI-1, undertake a study of identified repetitive flood loss areas to determine the following: 1 Repetitive losses not captured by flood insurance data; 2 Causes of the repetitive flooding; 3 Assets impacted by the repetitive flooding (this would include assets such as livestock, out-buildings and rescue costs not already identified by FEMA); and 4 Possible alternatives to remediate the repetitive flooding</p> <p>Evaluation: Replaced by Initiative 12. A repetitive loss analysis report was completed in 2015. RLA is updated annually.</p>		
ID Number: FMI-28	Priority: High	Status: Removed
<p>CRS Category: Prevention, Natural Resource Protection</p> <p>Action: Revise shoreline regulations to encourage shoreline protective structures to be bioengineered.</p> <p>Evaluation: Replaced by Initiative 14</p>		

ID Number: FMI-29	Priority: High	Status: Removed
<p>CRS Category: Prevention</p> <p>Action: Review the recommendations of adopted stormwater drainage basin plans to determine which ones are still relevant for implementation.</p> <p>Evaluation: Replaced by Initiative 14</p>		
ID Number: FMI-30	Priority: High	Status: Removed
<p>CRS Category: Prevention</p> <p>Action: Prepare new drainage basin plans for the high groundwater areas.</p> <p>Evaluation: Will be fulfilled by other county planning activities.</p>		
ID Number: FMI-31	Priority: Medium	Status: Removed
<p>CRS Category: Natural Resource Protection</p> <p>Action: To support implementation of the Thurston County Critical Areas Ordinance, encourage research that establishes best management practices for bioengineering and other techniques that provide streambank protection and improve fisheries through the use of large woody debris. Support local demonstration projects that could support such research.</p> <p>Evaluation: Replaced by Initiative 14</p>		
ID Number: FMI-32	Priority: Medium	Status: Complete
<p>CRS Category: Prevention</p> <p>Action: Where feasible, consider the adoption of appropriate higher regulatory standards (including but not limited to freeboard, comp storage, lower substantial damage thresholds, setbacks and fill restrictions) as means to reduce future flood risk and support a no-adverse-impact philosophy of floodplain management.</p> <p>Evaluation: Thurston County has adopted higher regulatory standards for freeboard, storage, damage thresholds, setbacks, and fill as outlined in the Critical Areas Ordinance and Thurston County Code.</p>		

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 Regional Planning Council (TRPC) guided the FPC's update of Thurston County's Mitigation Strategy. This included resources that led to and supported the development of the mitigation initiative review and selection process including:

- Updated Risk Assessment
- Flood Hazard delineation maps
- Population, employment, key assets, and other land use hazard exposure analysis tables
- An online GIS “story map” of local infrastructure and assets impacted by hazards
- Updated draft copy of the plan's Goals and Objectives
- A copy of the 2012 FHMP
- The “Flood” section from FEMA's “Mitigation Ideas: A Resource for Reducing Risk to Natural Hazards”
- A copy of Thurston County's initiatives from its 2017 Hazards Mitigation Plan for the Thurston Region (adopted June, 2017)

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 and the Plan Development Team evaluated the county's 2012 FHMP to ascertain what progress has been completed. The FPC also considered and selected new mitigation initiatives as part of the plan update. 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 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 FPC with a list of what could be considered to reduce risk of the flood hazard within the planning area. The 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

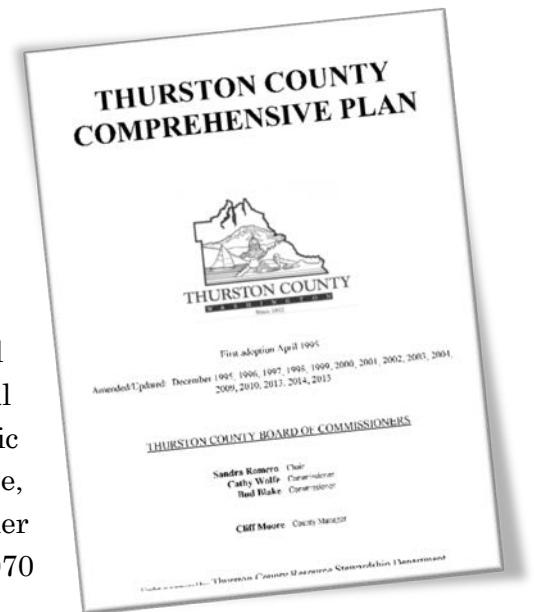
Personal Scale	Corporate Scale	Government Scale
<ol style="list-style-type: none"> 1. Buy flood insurance 2. Develop household mitigation plan, such as retrofit savings, communication capability with outside, 72-hour self-sufficiency during and after an event 	<ol style="list-style-type: none"> 1. Keep 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 plan development team reviewed Thurston County’s existing plans, policies, codes, work 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 (Comp 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 Comp Plan’s importance. The plan must address 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).



The Comp plan references flooding prominently in Chapter 9, Natural Environment:

- *Wetlands are recognized for cleansing stormwater, mitigating flooding, and improving water quality as well as many other ecosystem services. (Section II, Background, Part A. Environmental Features)*
- *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. (Part C, Natural Hazards)

- *Policies and actions are specified for: A. Geologic hazard areas; B. Groundwater and aquifer recharge areas; C. Surface water; D. Frequently flooded areas; E. Important Fish, Wildlife, and Plant Habitat; F. Greenspaces; G. County parks, recreation, and open space; and H. Air Quality. (Section III Goals, Objectives, and Policies)*

Policy language pertaining to reducing flood losses is most prominently addressed in the excerpt below from Chapter 9, Section D 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. The county should 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. The county should 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. The county should 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. The county should minimize disruption of long-term stream channel migration processes that allow formation of essential habitat features by prohibiting construction of new structures in channel migration zones and minimizing streambank stabilization.

5. The county should actively participate in the multi-jurisdictional flood hazard reduction efforts within the Chehalis River Basin.

6. The county should regulate uses in and around areas where groundwater periodically surfaces as necessary to avoid property damage and protect groundwater quality.

7. The county should maintain the county's enrollment in the Community Rating System through the National Flood Insurance Program.

ACTION NEEDS:

1. Review and amend as necessary the frequently flooded areas section of the Critical Area regulations at least every five years to reflect best available science, relevant new information, the results of project monitoring and evaluation, and cumulative impact assessments of current and planned future land and resource uses within and near frequently flooded areas.

2. Map floodways, floodplains, channel migration zones and areas subject to high groundwater flooding with the greatest degree of accuracy possible.

3. Install and maintain flood elevation poles and gauges along major rivers and within designated groundwater flood hazard areas.

4. Create maps depicting projected flood inundation from possible failure of the Skookumchuck Dam on the Skookumchuck River and the Alder and La Grande dams on the Nisqually River.

5. Develop management programs to avoid or minimize flooding risks for existing and future land uses. This could include a range of measures including regulation and compensation for the removal of structures subject to frequent flooding.

6. Prioritize properties in the floodplain to purchase in the event federal money becomes available for that purpose.

7. Prioritize residences in the 100-year floodplain that the county would help elevate if state or federal monies become available for that purpose.

8. Identify structures and properties subject to repeated flooding that are not already listed by FEMA.

Discussion: The FPC reviewed Chapter 9 Section D contents for updating the flood plan's goals and objectives. The Comp Plan highlights the natural benefits of flooding and addresses hazard risks to life and property. The plan includes a foundational goal, policies, and 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 Section D remain relevant, however significant work has been performed on Action 4 so the FPC updated this section in the plan. More information related to this action is documented as completed later in this chapter (FMI-22). Other minor references about the county's CRS rating in Section II Part C can be updated.

The Comp Plan can be more supportive of flood management strategies by acknowledging the need to increase the county's understanding of climate change impacts and possible adaptation strategies for future flood conditions within the planning area. Additional plans with recommendations have emerged since the 2012 FHMP was adopted which warrant an evaluation for incorporation into Section D and perhaps other sections in the Comp Plan. Examples of such efforts include the 2017 Hazards Mitigation Plan for the Thurston Region, recommendations from Sustainable Thurston, and the recommendations of the pending Thurston Region Climate Adaptation Plan (included in Initiative 19). The county can address these minor changes through the annual Comp 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 2015 edition of national model codes with some amendments. The Washington State Energy Code and Ventilation and Indoor Air Quality Code were also adopted by the council. The 2015 codes went into effect as the Washington model code on July 1, 2016. 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. 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 new 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.



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 2015, 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 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.*

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) (20.20A) 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 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. As this comprehensive review was recently completed, the plan development team did not identify any further amendments or modifications to Thurston County’s zoning code as part of this plan update.

3.4.5 Stormwater Regulations

Surface water runoff from new development is regulated for Thurston County through Ordinance No. 14265, and memorialized in TCC *Title 15 Public Works, Chapter 15.05 – Thurston County Stormwater Standards*, which adopts the 2016 Thurston County Drainage Design and Erosion Control Manual (DDECM). The manual has 11 core requirements. All 11 core requirements, including flow control, are applicable to any project that add 5,000 or more square feet of new impervious surface, converts more than $\frac{3}{4}$ acre of native vegetation to lawn or landscape, or that converts more than 2.5 acres of native vegetation to pasture.



The flow control standard uses a requires an applicant to match flows and flow durations from 50 percent of the two-year storm event to the 50-year event. The flow control standard also requires that post development flows match the historical forested condition rather than the pre-project condition. This usually results in lower flows from the site if the site had been cleared or had other uses prior to the present project. Smaller projects that do not meet the thresholds listed above are required to implement on-site measures such as dispersion and infiltration. In most cases, these measures result in little to no additional runoff from the site compared to pre-project conditions.

Discussion: The DDECM is a comprehensive stormwater management manual whose use is required within those areas of the County subject to the National Pollution Discharge Elimination System (NPDES)

Municipal Permit. Thurston County also enforces the use of the manual in areas outside the NPDES boundary to remain compliant with Title 15.05. The DDECM requires projects to implement measures so that the flows to streams are not increased due to new construction. This protects streams and riparian habitat from further degradation. The flow and flow duration matching component means that new development does not add additional water to streams and rivers at rates and timing significantly different from natural conditions, thus reducing the risk of flooding because of new development.

3.5 Property Protection Assistance Activities

Thurston County Emergency Services and Resource Stewardship 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.

Most recently Thurston County reached agreement with the Chehalis Flood Authority on a process to identify structures for elevation. Twelve structures in the Chehalis River watershed are 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 own 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 this plan update, the FPC discussed the county's past efforts and the importance of such property protection programs and recommends 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.



Photo courtesy of The Olympian.

3.6 Emergency Services Activities

In 2016, Thurston County launched a Community Notification System capable of sending emergency alerts via text message, email, pager, 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 in the 2016 Flood Bulletin, through the Hazards Mitigation Plan public comment period, through press releases, social media, and during the first public meeting for the flood plan update.

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-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 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 and maintained by Thurston County. It is eligible for federal PL 84-99 Rehabilitation Program funding. It was last inspected in March 2011.

Within the inundation area, there are 7 insurable commercial buildings on 2 parcels and 45 residential parcels with building values worth \$5,000 or more. There are sixteen single family residences, of which eight are mobile or manufactured homes. The City of Lacey owns a water well with two small structures.

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

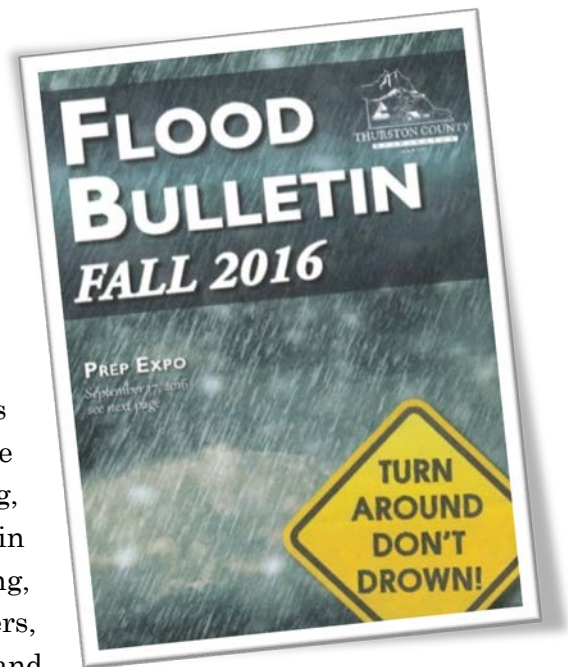
refuges or islands for protecting livestock during flood events, but current regulations allow the construction of critter pads (ramped, elevated platforms) if a structure doesn't obstruct or alter the flow of floodwaters.

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 8,000 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, are working to 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 will host a Risk MAP workshop to inform the greater region about flood hazards. FEMA prepared a draft Risk Report for staff review at the time this plan was being finalized.
- **Hazards Mitigation Plan Update:** In 2014-2017, Thurston County participated in a multi-jurisdictional Hazards Mitigation Plan update process. 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 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 provide the owners with more specific guidance on how to reduce flood damage. The county notifies potentially affected property owners with letters and offers on-site technical assistance visits to supply site-specific guidance.
- **Map Your Neighborhood (MYN):** Thurston County Emergency Management offers the MYN program to help neighborhoods prepare for disasters. Volunteers participate in this program to learn what steps to take to secure their home and neighborhood. The program emphasizes teamwork to evaluate and inventory neighborhood resources to cope with emergencies when first responders may not be able to immediately respond during major disaster 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. The FPC recommends Initiative 21, Flood Website Development, to increase accessibility, centralization, and ease of use of online flood information resources, including map tools and staff contacts.