


# Rivers Flood Hazard Management Plan—Vol. II

2018 Update

Adopted November 6, 2018 Ordinance 2018-83

Pierce County

# Contents

VOLUME II PROGRESS REPORT ..... 1
Flood Plain Regulations, County, Cities, Towns, State and Local Agencies ..... 11
Potential Funding Sources for Flood Damage Reduction and Mitigation Projects update ..... 11
Puget Sound Acquisition and Restoration Fund (PSAR) ..... 11
Puget Sound Acquisition and Restoration Fund Large Capital Projects (PSAR Large Cap) ..... 11
Pierce County-WA Region 5 Hazard Mitigation Plan and Addendum update ..... 12
Appendix B ..... 1
Appendix C ..... 6
Appendix F ..... 16
Appendix G ..... 25
Appendix K ..... 38

# VOLUME II PROGRESS REPORT

## Appendix B Update

A project prioritization criteria was created in the 2013 to help prioritize projects for implementation. A status update has been provided to include additional information on the lower White River flood protection projects.

**PROJECT PRIORITIZATION RESULTS**

| | | #1 | #2 | #3 | #4 | #5 | #6 | #7 | #8 | | | #7 - Multiple Benefits | | | | #8 - Partnerships and Opportunity | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CIP# | Project Name/Location | Land Use | Severity of Impact | Area of Impact | Frequency | Project Effectiveness | Benefit-Cost Analysis | Mulitple Benefits | Partnerships and Opportunity | Total Score | Problem Area Reference | Habitat | Water Quality | Public Access | Total | Partner-ships/ Funding | Land Ownership | Project Readiness | Total | Sub-Total #1-4 | Sub-Total #5-8 |
| | Maximum Score | 20 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | **90** | | 4 | 4 | 2 | 10 | 4 | 3 | 3 | 10 | 50 | 40 |
| UP1 | Calistoga Setback Levee (RB RM 19.9- RM 21.3) | 17 | 6 | 6 | 9 | 7 | 6 | 7 | 8 | **66** | LROB#25 | 4 | 2 | 1 | **7** | 3 | 3 | 2 | **8** | 38 | 28 |
| **Complete** | Sumner WWTP Flood Wall (LB RM 10.4 - RM 10.6) | 15 | 8 | 10 | 2 | 8 | 9 | 4 | 9 | **65** | LROB#12 | 0 | 4 | 0 | **4** | 3 | 3 | 3 | **9** | 35 | 30 |
| LP1 | Tacoma WWTP Flood Wall (LB RM 2.9 - RM 3.1) | 18 | 8 | 10 | 1 | 7 | 10 | 4 | 7 | **65** | LROB#1 | 0 | 4 | 0 | **4** | 2 | 3 | 2 | **7** | 37 | 28 |
| LP4 | North Levee Rd Setback Levee (RB RM 2.8 - RM 8.15 (I-5 to SR161) | 16 | 8 | 8 | 1 | 7 | 8 | 8 | 5 | **61** | LROB#2 | 4 | 3 | 1 | **8** | 4 | 1 | 0 | **5** | 33 | 28 |
| UN2 | Upper Nisqually/Mt. Rainier National Park Revetment Retrofit/ELJs (RB RM 64.9 - RM 65.3) | 18 | 8 | 8 | 8 | 4 | 4 | 4 | 7 | **61** | CM#21 | 3 | 1 | 0 | **4** | 3 | 3 | 1 | **7** | 42 | 19 |
| LP5 | Puyallup WWTP Flood Wall (LB RM 6.8 - RM 6.9) | 15 | 8 | 10 | 3 | 8 | 6 | 4 | 6 | **60** | FSI#9 | 0 | 4 | 0 | **4** | 2 | 3 | 1 | **6** | 36 | 24 |
| C4 | Alward Rd Floodplain Acquisition and Setback Levee (LB 6.4-8.3) | 12 | 8 | 5 | 10 | 8 | 4 | 6 | 3 | **56** | **LROB#38**, PS#10 | 4 | 2 | 0 | **6** | 0 | 2 | 1 | **3** | 35 | 21 |
| MP1 | Rainier Manor/Riverwalk/Rivergrove and SR-410 Flood Wall and Levee (RB RM 10.6 - RM 11.8) | 13 | 7 | 7 | 9 | 8 | 5 | 0 | 6 | **55** | **LROB#13**, FSI#16 | 0 | 0 | 0 | **0** | 3 | 2 | 1 | **6** | 36 | 19 |
| LP2 | Clear Creek Acquisition/Levee (LB RM 2.9) | 11 | 9 | 6 | 10 | 6 | 5 | 5 | 1 | **53** | TBF#2, **PS#1** | 4 | 1 | 0 | **5** | 0 | 1 | 0 | **1** | 36 | 17 |
| LW1 | State St. FloodWall or Emergency Access (LB RM 0.2 - RM 0.3) | 17 | 4 | 4 | 9 | 8 | 6 | 2 | 3 | **53** | FSI#27 | 0 | 2 | 0 | **2** | 2 | 1 | 0 | **3** | 34 | 19 |
| **Project Removed from RFHMP - Outside of Pierce County** | SR-410 ELJs and Road Elevation (RB 43.5-43.8: WSDOT Problem Site 9, Milepost 41.4-42.0) | 15 | 8 | 8 | 4 | 6 | 5 | 1 | 6 | **53** | PS#9 | 1 | 0 | 0 | **1** | 1 | 3 | 2 | **6** | 35 | 18 |
| SP1 | S. Prairie Floodplain Acquisitions (RB RM1.6 - RM 3.5) | 12 | 8 | 4 | 8 | 10 | 4 | 3 | 4 | **53** | PS#11 | 2 | 1 | 0 | **3** | 0 | 2 | 2 | **4** | 32 | 21 |
| M1 | SR-161 Mashel River Bridge Scour and Slope Repair (LB RM 5.2 - RM 5.3 and RB RM 5.5) | 14 | 6 | 5 | 4 | 6 | 4 | 4 | 9 | **52** | CM#22 | 3 | 1 | 0 | **4** | 4 | 2 | 3 | **9** | 29 | 23 |
| LP3 | Oxbow Lake Flooding /Sewer Lift Station Protection (RB RM 5.0 and backwater area) | 17 | 3 | 7 | 1 | 9 | 6 | 3 | 5 | **51** | TBF#4 | 0 | 3 | 0 | **3** | 2 | 3 | 0 | **5** | 28 | 23 |
| MP2 | McCutcheon Rd & 96th St. E Road Baricade (RB RM 14.2 - RM 14.9) | 10 | 9 | 4 | 8 | 7 | 8 | 0 | 4 | **50** | LROB#17, **PS#5**, FSI#20 | 0 | 0 | 0 | **0** | 0 | 3 | 1 | **4** | 31 | 19 |
| MP4 | McCutcheon Rd & 128th St. E Levee Setback (LB/RB RM 16.7 - RM 17.3) | 10 | 9 | 5 | 8 | 7 | 3 | 7 | 1 | **50** | LROB#21, **PS#6** | 4 | 2 | 1 | **7** | 0 | 1 | 0 | **1** | 32 | 18 |
| UP6 | Puyallup River/Orville Rd Revetment and Riparian Habitat Restoration Project (LB RM 26.7 - RM 27.1) | 13 | 6 | 5 | 8 | 6 | 4 | 4 | 4 | **50** | CM#5 | 3 | 1 | 0 | **4** | 1 | 2 | 1 | **4** | 32 | 18 |
| UP4 | Orville Road Revetment at Kapowsin Creek (LB RM 26.2 - RM 26.4) | 13 | 6 | 5 | 6 | 6 | 6 | 0 | 8 | **50** | CM#4 | 0 | 0 | 0 | **0** | 4 | 2 | 2 | **8** | 30 | 20 |
| SP2 | S. Prairie Fire Station Flood Protection (LB RM 6.0) | 9 | 8 | 7 | 4 | 7 | 9 | 0 | 6 | **50** | FSI#42.2 | 0 | 0 | 0 | **0** | 2 | 3 | 1 | **6** | 28 | 22 |

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| CIP# | Project Name/Location | Land Use | Severity of Impact | Area of Impact | Frequency | Project Effectiveness | Benefit-Cost Analysis | Mulitple Benefits | Partnerships and Opportunity | Total Score | Problem Area Reference | | Habitat | Water Quality | Public Access | Total | Partner-ships/ Funding | Land Ownership | Project Readiness | Total | Sub-Total #1-4 | Sub-Total #5-8 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| UN1 | Nisqually Park Levee Protection (RB RM 64.3 - 64.9) | 14 | 8 | 5 | 8 | 4 | 4 | 4 | 3 | **50** | CM#21 | | 3 | 1 | 0 | **4** | 0 | 2 | 1 | **3** | 35 | 15 |
| UP5 | Orville Rd. Channel Migration Project (LB RM26.3 - RM 28.6) | 13 | 6 | 6 | 6 | 6 | 4 | 5 | 3 | **49** | CM#4-6, 8 | | 4 | 1 | 0 | **5** | 1 | 2 | 0 | **3** | 31 | 18 |
| UP4 | Neadham Rd Flooding/Channel Migration Protection (RB RM 25.3 - RM 27.0) | 9 | 8 | 4 | 6 | 9 | 6 | 5 | 2 | **49** | CM#3, **PS#7**, TBF#10 | | 4 | 1 | 0 | **5** | 0 | 1 | 1 | **2** | 27 | 22 |
| LP7 | Puyallup Executive Park (LB RM 9.1 - RM 9.25) | 11 | 5 | 5 | 9 | 7 | 9 | 0 | 2 | **48** | LROB#8 | | 0 | 0 | 0 | **0** | 0 | 2 | 0 | **2** | 30 | 18 |
| C2 | Carbon Levee Bank Stabilization/Flow Deflection and Coplar Cr. Backwater Improvements (LB RM 3.2 - RM 4.9) | 13 | 4 | 6 | 10 | 5 | 4 | 3 | 3 | **48** | **LROB#34**, TBF#16 | | 2 | 1 | 0 | **3** | 1 | 2 | 0 | **3** | 33 | 15 |
| C5 | Upper Carbon/Fairfax Rd Bank Stabilization (LB RM 22.4 - RM 24.0) | 13 | 8 | 4 | 8 | 5 | 3 | 2 | 5 | **48** | CM#14 | | 2 | 0 | 0 | **2** | 2 | 3 | 0 | **5** | 33 | 15 |
| C3 | Alward Rd Floodplain Acquisition (LB RM 6.0 - RM 6.4) | 11 | 3 | 4 | 8 | 10 | 5 | 2 | 4 | **47** | LROB#36 | | 1 | 1 | 0 | **2** | 1 | 1 | 2 | **4** | 26 | 21 |
| LW3 | Butte Ave Levee/Berm (RB RM 4.9 - RM 5.5) | 16 | 6 | 4 | 6 | 4 | 5 | 1 | 3 | **45** | LROB#31 | | 0 | 1 | 0 | **1** | 1 | 2 | 0 | **3** | 32 | 13 |
| C1 | Carbon Confluence Setback Levee (LB RM 0 - RM 0.4) | 15 | 4 | 5 | 4 | 7 | 2 | 6 | 2 | **45** | LROB#32 | | 4 | 2 | 0 | **6** | 0 | 2 | 0 | **2** | 28 | 17 |
| MN1 | McKenna Area Floodplain Acquisition (RB RM 21.6 - RM 22.0) | 12 | 8 | 6 | 4 | 8 | 2 | 2 | 3 | **45** | **PS#12**, FSI#43 | | 1 | 1 | 0 | **2** | 1 | 1 | 1 | **3** | 30 | 15 |
| LP6 | Tiffany's Skate Inn/Riverwalk Floodwall (RB RM 8.1 - RM 8.6) | 13 | 5 | 5 | 8 | 6 | 5 | 0 | 2 | **44** | **LROB#6**, FSI#12 | | 0 | 0 | 0 | **0** | 0 | 2 | 0 | **2** | 31 | 13 |
| LW2 | Lower White River Flood Protection (Restoration; 24th Street RM 2.5-RM 4.2) | 19 | 7 | 9 | 9 | 7 | 6.85 | 9 | 8 | **68** | FSI#28, SGBA#10 | | 4 | 4 | 1 | 9 | 4 | 3 | 1 | 8 | 9 | 8 |
| LW2 | Lower White River Flood Protection(Pacific Point Bar; RM 3.9-RM 4.5) | 19 | 6 | 9 | 7 | 10 | 6.85 | 7 | 7 | **65** | FSI#29, SGBA#14 | | 3 | 3 | 1 | 7 | 4 | 2 | 1 | 7 | 7 | 7 |
| LW2 | Lower White River Flood Protection (Left Bank Setback; RM 4.4-RM 4.9) | 9 | 5 | 4 | 9 | 9 | 6.85 | 5 | 6 | **47** | FSI#30, SGBA#15 | | 2 | 2 | 1 | 5 | 4 | 1 | 1 | 6 | 5 | 6 |
| **This project has received additional study by the City of Puyallup. The project needs to be re-evaluated using the project prioritization criteria** | | | | | | | | | | | | | | | | | | | | | | |
| LP8 | Linden Golf Course Oxbow Setback Levee (LB RM 9.6 -RM 10.5) | 6 | 4 | 4 | 9 | | | | | | LROB#9 | | | | | | | | | | 23 | |
| **Projects below had two or more options evaluated, but at this time the "No Action" option is proposed for the Flood Plan; future information about the problem or changed conditions would lead to a further evaluation of options** | | | | | | | | | | | | | | | | | | | | | | |
| LP9 | Rite Aid Flooding (LB 9.3-9.5) and Deer Cr Backwater Flooding (LB 9.4) | 9 | 4 | 5 | 9 | | | | | | **LROB#10**, TBF#7 | | | | | | | | | | 27 | |
| LP10 | Clarks Cr Home/Structure Elevation and Acquisition (LB 5.8) | 10 | 4 | 4 | 8 | | | | | | TBF#3 | | | | | | | | | | 26 | |
| MP5 | Bowman Hilton Mobile Home (LB 13.0-13.4) | 6 | 4 | 2 | 9 | | | | | | LROB#16 | | | | | | | | | | 21 | |
| MP6 | Riverside Dr. Setback Levee (LB 12.4-12.8) | 10 | 5 | 4 | 9 | | | | | | **LROB#14**, FSI#18 | | | | | | | | | | 28 | |
| MN2 | SR-507 Bridge Approach Protection/Bank Stabilization (RB 21.9) | 9 | 7 | 5 | 2 | | | | | | FSI#45 | | | | | | | | | | 23 | |
| UN3 | Kernahan Bridge Abutment Protection (RM 61.7) | 10 | 7 | 5 | 6 | | | | | | **CM#19**, FSI#46 | | | | | | | | | | 28 | |

CIP = Capital Improvement Project; RM = River Mile; RB/LB = Right/Left Bank; SR = State Route
CM = channel migration; FSI = flooding of structures and infrastructure; LROB = levee/revetment overtopping or breaching; PS = public safety/emergency rescue; TBF = tributary backwater flooding;
LP = Lower Puyallup; MP = Middle Puyallup; UP = Upper Puyallup; LW = Lower White; UW = Upper White; C = Carbon; SP = South Prairie; MN = Middle Nisqually; UN = Upper Nisqually; M = Mashel

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# APPENDIX C

The following three tables below include the names of those committee members that were a part of the 2018 Flood plan update. Without these key individuals, this plan update would not have been possible. A flood plan engagement process chart has also been developed to illustrate the plan update process.

| Pierce County Rivers Flood Hazard Management Plan Advisory Committee Members | |
|---|---|
| **First Name** | **Organization or Interest** |
| Doug Beagle | City of Sumner |
| Liz Bockstiegel | Washington Department of Fish and Wildlife |
| Gary Brackett | Business Association |
| Linda Burgess | Puyallup River Watershed Council/Pierce County Biodiversity Alliance |
| Mike Dahlem | City of Sumner |
| John Ernst Berry III | Puyallup Watershed Initiative |
| Hans Hunger | City of Puyallup |
| Jordan Jobe | Farming in the Floodplain Project Manager/ WSU Puyallup |
| Andrew Kinney | Thurston County Emergency Management |
| Russ Ladley | Puyallup Tribe |
| Loren Paschich | Drainage District #10/ Volunteer Clear Creek Farmers Association |
| Jordan Rash | Forterra |
| Patrick Reynolds | Muckleshoot Indian Tribe Fisheries Division |
| Richard Schroedel | Resident of Tacoma, Retired Pierce County Emergency Management |
| Taylor Shanaman | Tacoma -Pierce County Association of Realtors |
| Jennifer Stebbings | Port of Tacoma |
| Jeffree Stewart | Washington State Department of Ecology |
| Monica Walker | King County |
| Allen Zulauf | Resident of Puyallup |

| Pierce County Rivers Flood Hazard Management Plan Internal Planning Committee Members | |
|---|---|
| **First Name** | **Organization or Interest** |
| Angela Angove | Pierce County Surface Water Management |
| Debbie Bailey | Pierce County Department of Emergency Management |
| Randy Brake | Pierce County Surface Water Management |
| Dennis Dixon | Pierce County Surface Water Management |
| Todd Essman | Pierce County Surface Water Management |
| Tony Fantello | Pierce County Planning and Public Works |
| Mike Halliday | Pierce County Planning and Public Works |
| Johnny Mauger | Pierce County Surface Water Management |
| Anne-marie Marshall-Dody | Pierce County Surface Water Management |
| Melissa McFadden | Pierce County Surface Water Management |
| Tiffany O'Dell | Pierce County Planning and Land Services |
| Harold Smelt | Pierce County Surface Water Management |
| Jessica Stone | Pierce County Parks and Recreation Services |
| Erick Thompson | Pierce County Surface Water Management |
| Rob Wenman | Pierce County Surface Water Management |

| Pierce County Rivers Flood Hazard Management Plan Steering Committee Members | |
|---|---|
| **First Name** | **Organization or Interest** |
| Tony Fantello | Pierce County Surface Water Management |
| Kjris Lund | Executive Director for the Pierce County Flood Control Zone District |
| Anne-marie Marshall-Dody | Pierce County Surface Water Management |
| Melissa McFadden | Pierce County Surface Water Management |
| Harold Smelt | Pierce County Surface Water Management |

# Pierce County Rivers Flood Hazard Management Plan Engagement Process

Public Engagement

Input at Advisory Committee meetings

Virtual Open House participation

| Steering Committee | Internal Planning Committee | Advisory Committee | Flood Control Zone District Advisory Committee | Stakeholder Notification |
|---|---|---|---|---|
| Role<br><br>Guide planning process<br><br>Review/amend goals, objectives, and guiding principles from both committees<br>Guide decisions on countywide action plan<br><br>Guide through Council/Board process<br><br>Contribute data, projects, and other relevant information<br><br>Review draft | Role<br><br>Provide input on goals, objectives, and guiding principles<br><br>Review goals, objectives, and guiding principles from Advisory Committee<br><br>Contribute data, projects, and other relevant information<br><br>Review draft | Role<br><br>Provide input on goals, objectives, and guiding principles<br><br>Review goals, objectives, and guiding principles from Internal Planning Committee<br><br>Contribute data, projects, and other relevant information<br><br>Review draft | Role<br><br>Assist with the planning process<br><br>Contribute data, projects, and other relevant information<br><br>Attend Advisory Committee meetings<br><br>Review draft | Role<br><br>Notified of the plan update process and could attend or provide input on the draft plan at any time<br><br>Review draft |

| | | | | |
|---|---|---|---|---|
| Membership<br>SWM Management Team | Membership<br>SWM staff<br>DEM staff<br>Parks and Recreation staff | Membership<br>Muckleshoot Indian Tribe<br>Puyallup Tribe of Indians<br>Residents<br>State Agencies<br>Staff from participating cities<br>Private non-profits<br>Neighboring counties<br>Port of Tacoma<br>Association of Realtors | Membership<br>15 appointed members by the County Executive representing various cities, unincorporated Pierce County, Water Resource Inventory Areas, businesses, Port of Tacoma, Agriculture and/or Forestry Interest Organizations, and the Puyallup Tribe of Indians | Membership<br>Cascade Water Alliance<br>Washington State Department of Commerce<br>Thurston County Emergency Management<br>Union Pacific Rail |
| Meetings<br>4 meetings were held during the planning process, more as needed during the comment and adoption phase | Meetings<br>4 meetings were held, communication by email was used during the plan update process | Meetings<br>5 meetings were held, communication by email was also used during the plan update process | Meetings<br>Briefings were done during regularly scheduled FCZD Advisory Committee meetings | Notification<br>An email was sent out at the end of each month that provided information on what took place each month during the plan update process |

## Flood Plain Regulations, County, Cities, Towns, State and Local Agencies

Flood plain regulations for counties and cities have been updated since the 2010 analysis was completed. Pierce County recognizes that these changes have occurred and will include these updated regulations in the 2023 Flood plan update.

## Potential Funding Sources for Flood Damage Reduction and Mitigation Projects update

This grant program is offered in the fall of each odd numbered year. It funds large-scale river projects the emphasize the following values; reducing flood risk and damage, ecological restoration and preservation, climate change, tribal support and engagement, enhancing agriculture, creating partnerships and meeting community needs. SWM has received almost $10 million from this program since 2013 and is anticipating upwards of $7.5 million in 2018. These funds are used almost entirely for the Floodplains for the Future program which unites various stakeholders in Pierce County. This program has allowed Pierce County to exponentially expand the scope of the Clear Creek Floodplain Restoration and Acquisition project on the Puyallup River to include agriculture, habitat and flood risk reduction components. This program allows in-kind match which allows Pierce County to ask for larger amounts of grant funding, making this a dependent and successful source of funding for the Flood Plan.

## Puget Sound Acquisition and Restoration Fund (PSAR)

The Puget Sound Acquisition and Restoration program was created in 2007 to help implement the most important habitat protection and restoration priorities for Puget Sound. Funding is appropriated by the Legislature through the Salmon Recovery Funding Board. Pierce County has received over $1.5 million just in the 2015-2017 biennium and is anticipating almost $400,000 in the 2017-2019 biennium.

## Puget Sound Acquisition and Restoration Fund Large Capital Projects (PSAR Large Cap)

The Puget Sound Salmon Recovery Council and the Puget Sound Partnership are developed a grant program which funds high priority habitat acquisition and restoration capital projects. SWM has been continuously unsuccessful in applying for this program and has decided to postpone any further applications to this particular grant program as the cost of applying for such a large program greatly outweighs the benefit SWM has received from this program. PSAR Large Cap is under review by SRFB and could experience fundamental changes within

the next funding biennium. If the changes to the program increase likeliness of success, SWM will reexamine its decision to withhold applications in the future for large Flood Plan capital improvement projects.

## Pierce County-WA Region 5 Hazard Mitigation Plan and Addendum Update

FEMA funds three Hazard Mitigation Assistance (HMA) grant programs. Hazard mitigation measures are any sustainable action taken to reduce or eliminate long-term risk to people and property from future disasters. The Hazard Mitigation Grant Program (HMGP) is the longest running mitigation program. The HMGP supports cost-effective post-disaster projects from a Presidentially Declared Disaster. The Flood Mitigation Assistance (FMA) program provides grant funds for projects and planning that reduces or eliminates long-term risk of flood damage to structures insured under the National Flood Insurance Program (NFIP) on an annual basis. The Pre-Disaster Mitigation Grant Program (PDM) funds grants annually through a nationally competitive basis with the intent to reduce overall risk to the population and structures from future hazard events. The program awards planning and project grants and provides for public outreach opportunities to reduce future losses before disasters occur

In 2004 the Pierce County Department of Emergency Management implemented the planning process for the County's Hazard Mitigation Plan. The eighteen-month process called together County departments to identify their roles in providing and maintaining a disaster resilient county government. A Hazard Mitigation Committee (HMC) was formed including representatives of all Pierce County departments.

Each department identified its role in providing services and its capabilities to protect and preserve Pierce County. The departments listed their "critical infrastructure" and their locations, hazard maps were developed for each natural hazard risk. Departments then identified where their infrastructure was at risk. Mitigation Strategies were then developed to identify the steps necessary to protect and preserve the assets and/or services of each department in line with the goals of the Plan.

The Pierce County Hazard Mitigation Plan was adopted by the County Council in August 2004, and the County then became eligible for funding for disaster relief as well as "pre-disaster funds" for implementing the mitigation strategies of the Plan. Hazard Mitigation Grant Programs. The HMC was to meet annually to review the progress towards mitigation strategies and determine if changes to the Plan were necessary. Mitigation Plans must be reviewed, updated and adopted every five years to retain eligibility for these three grant funding programs.

In 2008, PC DEM undertook the update of the 2004 Plan. The initial effort was for each department to assess the progress made for each of their 2004 Mitigation Strategies, and

determine if other changes to their infrastructure listings were appropriate. One change obvious to the process was a change in the nomenclature from "critical infrastructure" to "infrastructure;" further, a determination was made to include only owned infrastructure for which the County would be responsible.

The new HMC determined the goals of the 2009 Plan update to be:

- Protect Life and Property;
- Ensure Emergency Services;
- Increase Public Preparedness;
- Establish and Strengthen Partnerships for Implementation;
- Preserve or Restore Natural Resources, and;
- Promote a Sustainable Economy

The partner departments identified their natural hazard risks to be the same as the 2004 Plan:

- Earthquake
- Volcano (lahar)
- Flood
- Severe Storms
- Landslide
- Tsunami
- WUI Fire

In addition to the mitigation strategies carried over from the 2004 Plan, new mitigation strategies were added to the update. These mitigation strategies provide a "game plan" for further action by each department.

Additionally, FEMA revised Plan elements to address the National Flood Insurance Plan and "repetitive loss" properties. When losses to properties occurred on an on-going basis and costs of assistance were in excess of 125% of the value, additional losses would not be compensated.

In 2006, PC DEM received a PDM planning grant to undertake a two and one-half year mitigation planning effort on behalf of other local jurisdictions (city and towns/fire districts/school districts/ utilities/special purpose districts). In 2008 the Region 5 Hazard Mitigation Plan was adopted as a "base plan" with 48 addenda plans representing jurisdictions across Pierce County. The Region 5 Plan, highly acclaimed by WA Emergency Management and FEMA, would be the "base plan" to which subsequent plans, including the Pierce County Hazard

Mitigation Plan, would be attached. The 2009 Pierce County Plan was adopted by the Pierce County Council on December 4, 2009.

In September 2008, PC DEM received HMPG grant money and added 12 new additional addendum plans to the Region 5 Hazard Mitigation Plan. The grant funding extended 3 years to September 2011. In June 2009, PC DEM received additional HMPG funding and added 8 new addendums. This grant funding extended two years to June 2011. The biggest change with the addition of these 20 new plans occurred with the Risk Section and integrating nine man-made and technological hazards with natural hazards. This allowed for mitigation planning beyond natural hazards and jurisdictions to reduce their vulnerability to man-made and technological disasters. The Region 5 Plan became the Region 5 All Hazard Mitigation Plan to embrace the addition of the man-made and technological hazards. The man-made and technological hazards addressed in the Region 5 Plans:

- Abandoned Mines
- Civil Disturbance
- Dam Failure
- Epidemic
- Energy Emergency
- Hazardous Materials
- Pipeline Hazard
- Terrorism
- Transportation Accidents

Multi-Care was awarded a HMGP planning grant in 2011 and PC DEM facilitated meetings for the development of an additional 8 mitigation plans from the medical sector. In December 2011 Pierce County was awarded a PDM grant in 2011 and the first "kick-off" meeting occurred in March 2012. WA-EMD and FEMA were somewhat confused with the Region 5 Mitigation Plan and the Pierce County Plan and it was agreed to bring the Pierce County Plan (Unincorporated Pierce County) under the Region 5 All Hazard Mitigation Plan as an addendum. This grant provided the funding to update the 2008-2013 Region 5 Mitigation Plan and 69 Addendum's. This update was scheduled to be completed by November 2013. An extension was granted to allow for earthquake and flood Hazus mapping of the 69 Addenda Plans. WA-EMD and FEMA approved the Region 5 All Hazard Mitigation Plan and 76 Addenda's (including the medical group) in December 2014 and the first jurisdiction to adopt their plan was February 9, 2015.

In September 2017, PC DEM applied for another HMGP grant to add an additional 3 mitigation plans which includes another city, utility and the Tacoma-Pierce County Health Department to the existing 76 plans. The City of Puyallup has also updated their mitigation plan in alignment with the Region 5 All Hazard Mitigation Plan bringing the total to 80 jurisdictional mitigation

addendums. In October 2017, PC DEM submitted a PDM grant to WA-EMD to update the Region 5 All Hazard Mitigation Plan and 80 jurisdictional addendums. This funding if the grant is awarded will be awarded in 2019 and the update and planning will occur during 2019.

Collaborative planning efforts to build community resiliency to disasters continues through mitigation efforts to reduce their vulnerability through these important mitigation grant programs.

# Appendix F

Appendix F has been updated with additional information included in the table along with an updated River Reach Management Strategies- Proposal map.

## Pierce County Rivers Flood Hazard Management Plan
## River Reach Management Strategies - Proposal

03/01/18

| River Segment | Downstream RM | Upstream RM | Bank (R, L) | Levee LOS (200-yr, 100-yr, Maintain Level of Protection (LOP), Maintain Prism) | Revetment LOS (Prevention design, Resistance design) | Non-structural approaches (acquisition, floodplain regulations) | Current Channel Conveyance Capacity (USGS, Aug. 2009) in cfs | Land Uses | Roads (local, arterial, highway, freeway) | Channel Gradient | River channel width | Salmonid Habitat and Use | Sediment Gradations and Bed Elevation Changes (1984-2009) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Lower Puyallup** | | | | | | | | | | | | | |
| Lower Puyallup | 0 | 10.3 10.4 | L, R | 200-year | Channel Migration Prevention | Floodplain Regs., Acquisition - repetitive loss properties | RM 0-5.9: 48,000-50,000; RM 5.9-10.4: 23,000-48,000 | RB - Port, Industrial, Manufacturing, Commercial, Residential (HDR and LDR), Agric.; LB - Resid., Agric., Comm., WWTP | RB - North Levee Road, I-5, local; LB - River Road (SR 162), local | 0.035-0.06 % | 350-700 feet (about 250 at P56, P58, P61, P62 and P56) | Juvenile Rearing; Marginal spawning by chum and pink (RM 5-10.4) | RM 0-8: Sand, RM 8-10.4: Gravel/sand; -0.5 to +2 feet bed change |
| **Middle Puyallup** | | | | | | | | | | | | | |
| Middle Puyallup | 10.3 10.4 | 12.0 (SR162) | L, R | 100-year | Channel Migration Resistance | Floodplain Regs., Acquisition | 14,000 to 32,500 | RB- HDR, LDR, Ag, Rec.; LB - Ag., MDR | SR 410, | 0.17-0.18% | 215-260 feet (about 377 at P74) | Juvenile Rearing; Limited spawning | Gravel/sand; -0.1 to +2 feet bed change |
| Middle Puyallup | 12.0 (SR162) | 15.6 (112th St Ct. E) | L, R | Maintain LOP | Channel Migration Resistance Design | Floodplain Regs., Acquisition | 17,000 to 32,500 | LB/RB - Ag, Rec, LDR, Edu | McCutcheon Rd. | 0.17-0.24% | 220-300 feet (about 206 at P79) | Juvenile Rearing; Some Chinook and steelhead spawning | Gravel/cobble/sand; -2 to +4 feet bed change |
| Middle Puyallup | 15.6 (112th St Ct. E) | 17.4 | L, R | No established level of service by Pierce Co. (levee along 153rd ave) | Maintain Channel Resistance Design | Floodplain Regs., Acquisition | 16,500 to 36,000 | LB/RB - Ag, LDR | | 0.22-0.25% | 240-300 feet | Juvenile Rearing; Some Chinook and steelhead spawning | Gravel/cobble/sand; -2 to +1.5 feet |
| **Upper Puyallup** | | | | | | | | | | | | | |
| Upper Puyallup | 17.4 | 19.4 (Orting City limit) | R | Maintain Prism | Channel Migration Resistance Design | Floodplain Regs. | 8,500 to 17,000 | RB- Rec, MDR, LDR, | 159th, 176th, | 0.16-0.32% | 130-240 feet | Juvenile Rearing; some spawning | Gravel/cobble/sand; 0 to +3.5 feet |
| Upper Puyallup | 19.4 (Orting City limit) | 22.5 (200th St. E.) | R | 100-year | N/A | Floodplain Regs. | 7,700 to 17,000 | RB - HDR, Educ., Ag., LDR | Washington Ave (SR 162) | 0.32-0.54% | 210-370 feet | Juvenile Rearing; some spawning | Gravel/cobble/sand; +1 to +4 feet |
| Upper Puyallup[1] | 17.4 | 18.5 | L | N/A | Channel Migration Resistance Design | Acquisition, Floodplain Regs. | ~~9,500~~ 9,100 to 14,500 | LB - MDR, Rec., Forest | ~~Orville Rd~~ residential | 0.16-0.24% | ~~180-240~~ 160- 850 feet | Juvenile Rearing; some spawning | Gravel/cobble/sand; 0 to +2 feet |
| Upper Puyallup | 18.5 | 19.1 | L | Valley Wall (no facilities) | Valley Wall (no facilities) | N/A | 9,000 to 17,000 | Forest | N/A | 0.24-0.32% | 175-240 feet | Juvenile Rearing; some spawning | Gravel/cobble/sand; +2 to +3.5 feet |
| Upper Puyallup | 19.1 (Horsehaven Creek) | 22.5 (200th St. E.) | L | Maintain Prism | N/A | Acquisition, Floodplain Regs. | 7,700 to 17,000 | LB - LDR, Ag. | 181st, 188th, | 0.32-0.75% | 130-370 feet | Juvenile Rearing; some spawning | Cobble/gravel/sand; +1 to +4 feet |
| Upper Puyallup | 22.5 (200th St. E.) | 28.6 (Champion Bridge) | L, R | Maintain Prism | Channel Migration Resistance Design | Acquisition/ Buyout, Floodplain Regs. | 6,000 to 17,000 | Forest, LDR, Ag. | Orting Kapowsin Hwy., Orville Rd. | 0.75-1.14% | 135-350 (about 460-690 at P137, P141, and P143) | Juvenile Rearing; some spawning | Cobble/gravel/sand/boulder; -0.5 to +7.5 feet |
| **Lower White** | | | | | | | | | | | | | |
| Lower White | 1.8 | 4.9 (Steward Road Bridge) | R | 100-year (where applicable) | Channel Migration Resistance Design | Floodplain Regs. | RM 0-2.0: 10,000-19,000; RM 2.0-5.5: 5,000-19,000 | LB- Ag.,Rec., Trans., Indust., WWTP; RB- Indust., Comm., LDR | Stewart Rd., 142nd Ave | 0.03-0.23% | 160-280 feet | Juvenile Rearing; Limited spawning | RM 0-1.8: Sand, -0.3 to +1.8 ft.; RM 1.8-5.5: Gravel/ cobble/sand; -0.2 to +6 feet |
| Lower White | 4.9 | 5.5 | R | Maintain current level of service | Channel Migration Resistance Design | | | | | | | | |
| Lower White | 4.9 | 5.5 | L | | | | | Replacement of Potelo w/ Countyline setback | | | | | |
| Lower White | 0 | 4.9 | L | N/A | Channel Migration Resistance Design | Floodplain Regs. | RM 0-2.0: 10,000-19,000; RM 2.0-5.5: 5,000-19,000 | LB- Ag.,Rec., Trans., Indust., WWTP; RB- Indust., Comm., LDR | Stewart Rd., 142nd Ave | 0.03-0.23% | 160-280 feet | Juvenile Rearing; Limited spawning | RM 0-1.8: Sand, -0.3 to +1.8 ft.; RM 1.8-5.5: Gravel/ cobble/sand; -0.2 to +6 feet |

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| River Segment | Downstream RM | Upstream RM | Bank (R, L) | Levee LOS (200-yr, 100-yr, Maintain Level of Protection (LOP), Maintain Prism) | Revetment LOS (Prevention design, Resistance design) | Non-structural approaches (acquisition, floodplain regulations) | Current Channel Conveyance Capacity (USGS, Aug. 2009) in cfs | Land Uses | Roads (local, arterial, highway, freeway) | Channel Gradient | River channel width | Salmonid Habitat and Use | Sediment Gradations and Bed Elevation Changes (1984-2009) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Lower White | 0 | 1.8 | R | N/A | Channel Migration Resistance Design | Floodplain Regs. | RM 0-2.0: 10,000-19,000; RM 2.0-5.5: 5,000-19,000 | LB- Ag.,Rec., Trans., Indust., WWTP; RB- Indust., Comm., LDR | Stewart Rd., 142nd Ave | 0.03-0.23% | 160-280 feet | Juvenile Rearing; Limited spawning | RM 0-1.8: Sand, -0.3 to +1.8 ft.; RM 1.8-5.5: Gravel/ cobble/sand; -0.2 to +6 feet |
| **Carbon** | | | | | | | | | | | | | |
| Carbon | 0 | 1.3 1.3 | R | Maintain Prism | N/A | Floodplain Regs., Acquis. | 15,000 to 23,000 | RB- Ag., LDR | Pioneer Way | 0.47% | 200-290 feet | Juvenile Rearing; spawning unknown | Gravel/cobble/sand; -0.7 to +0.3 feet |
| Carbon | 1.2 | 5.8 5.9 | R | Valley Wall (no facilities) | Valley Wall (no facilities) | N/A | 13,000 to 23,000 | Forest | Patterson Rd. | 0.46-1.12% | 160-420 feet; RM 4.0-6.0: 540-890 ft. | Juvenile Rearing; Extensive Chinook spawning | Cobble/gravel/sand; -0.3 to +4 feet |
| Carbon | 5.9 (SR 162) | 7.0 | R | Maintain Prism | Valley Wall (no facilities) | Acquisition, Floodplain Regs. | 2,500 to 15,000 | LDR, Forest | 176th, 184th, | 1.01-1.15% | 160-220 feet | Juvenile Rearing; some spawning | Cobble/gravel/sand; -1 to +4 feet |
| Carbon | 0 | 0.8 | L | Maintain Prism | N/A | Floodplain Regs., Acquis. | 15,000 to 19,000 | MDR | 188th, | 0.47% | 200-275 feet | | Gravel/cobble/sand; -0.7 to 0 feet |
| Carbon | 0.8 | 4.0 3.9 (Voight Creek) | L | 100-year | N/A | Floodplain Regs. | 19,000 to 23,000 | HDR, Ag., LDR | SR 162 | 0.47-0.60% | 200-420 feet; 890 feet at RM 3.5 | | Cobble/gravel/sand; -0.3 to +4 feet |
| Carbon | 4.0 3.9 (Voight Creek) | 8.3 | L | Maintain Prism | Channel Migration Resistance Design | Acquisition, Floodplain Regs. | 13,000 to 23,000 | LDR, Road | | 0.60-1.15% | 160-345 feet; RM 4.0-6.0: 540-760 ft. | | Gravel/cobble/sand; -1 to +4 feet |
| Carbon | 21.3 | 23.0 | L | N/A | Channel Migration Resistance Design - Pierce Co. Fairfax Rd. | N/A | N/A | Forest, Road | | | N/A | | N/A |
| **South Prairie** | | | | | | | | | | | | | |
| South Prairie | 0 | 6.5 | L, R | Maintain Prism | Channel Migration Resistance Design for County and WSDOT road/bridge revetments | Acquisition/ Buyout, Floodplain Regs. | N/A | RB- Rec., Ag., LDR; LB- Ag., LDR, Rec, Town | SR 162, South Prarie RD | | | Juvenile Rearing; Extensive Chinook and steelhead spawning | N/A |
| **Upper White** | | | | | | | | | | | | | |
| Upper White | 45.0 46.2 | 45.2 46.4 | R | Maintain Prism | Channel Migration Resistance Design | Floodplain Regs. | N/A | Ag., LDR, Forest | SR 410 | | | | N/A |
| **Greenwater** | | | | | | | | | | | | | |
| Greenwater | 0.7 | 0.7 | L | No established LOS by Pierce Co. | Channel Migration Resistance Design | | N/A | LDR | | | | | N/A |
| Greenwater | 0 | 4 | L | No established LOS by Pierce Co. | | Acquisition, Floodplain Regs. | N/A | LDR, Forest | | | | | N/A |
| **Middle Nisqually** | | | | | | | | | | | | | |
| Middle Nisqually | 20 | 26 | R | No established LOS by Pierce Co. | Channel Migration Resistance Design WSDOT bridge revetments (SR-507) | Acquisition, Floodplain Regs. | N/A | RB- Rec., LDR, Comm. Ag. | SR 507 | | | | N/A |
| **Upper Nisqually** | | | | | | | | | | | | | |
| Upper Nisqually | 50.2 (Alder Lake) | 64.5 64.2 | R | No established LOS by Pierce Co. | Tacoma Power and Kernahan Bridge revetment protection | Acquisition, Floodplain Regs. | N/A | RB- LDR, MDR, Rec., Ag. | Kernahan Rd. | | | No salmon access above Alder dam | N/A |
| Upper Nisqually | 64.5 64.2 | 65.05 (MRNP) 6 | R | Maintain Prism | N/A | Acquisition, Floodplain Regs. | N/A | RB- Rural Subdivision, Forest | | | | No salmon access above Alder dam | N/A |
| Upper Nisqually | 65.05 (MRNP) 65.1 | 65.4 65.3 | R | Maintain Prism | Channel Migration Prevention Design | N/A | N/A | RB- Rural Subdivision, Forest | SR 706 | | | No salmon access above Alder dam | N/A |
| **Mashel** | | | | | | | | | | | | | |

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| River Segment | Downstream RM | Upstream RM | Bank (R, L) | Levee LOS (200-yr, 100-yr, Maintain Level of Protection (LOP), Maintain Prism) | Revetment LOS (Prevention design, Resistance design) | Non-structural approaches (acquisition, floodplain regulations) | Current Channel Conveyance Capacity (USGS, Aug. 2009) in cfs | Land Uses | Roads (local, arterial, highway, freeway) | Channel Gradient | River channel width | Salmonid Habitat and Use | Sediment Gradations and Bed Elevation Changes (1984-2009) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Mashel | 0 | 7.2 | L, R | No established LOS by Pierce Co. | Channel Migration Resistance Design for County and WSDOT road/bridge revetments | Acquisition/ Buyout, Floodplain Regs. | N/A | Forest, LDR, MDR, WWTP | SR-161, Center Street | | | | N/A |

LOS = Level of Service; LOP = Level of Protection; RM = River Mile; R, L = Right, Left Bank; SR = State Route
Land Use: LDR, MDR, HDR = Low, Medium and High Density Residential; Comm. = Commercial; Ag. = Agriculture; WWTP = Wastewater Treatment Plant; Educ. and Rec. = Educational and Recreational Facilities
1 The South Fork alignment of the flood risk reduction facility was realigned via setback with a capital project resulting in increased channel capacity.

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Tacoma
Fife
Milton
Edgewood
Auburn
Sumner
Puyallup
Bonney Lake
Orting
Eatonville
King County
Pierce County
Thurston County
Lewis County
Puyallup River
White River
Nisqually River
Mashel River
South Prairie
Carbon River
Greenwater River

## Level Of Service

- River Mileposts
- No Level of Service Designated

**Levee**

- 100 Year
- 200 Year
- Maintain Level of Protection
- Maintain Prism

**Revetment**

- Protection Design
- Resistance Design

N

3/2/2018

The map features are approximate and are intended only to provide an indication of said feature. Additional areas that have not been mapped may be present. This is not a survey. The County assumes no liability for variations ascertained by actual survey. ALL DATA IS EXPRESSLY PROVIDED 'ASIS' AND 'WITH ALL FAULTS'. The County makes no warranty of fitness for a particular purpose.

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# Appendix G Update

A prioritization matrix was created in the 2013 to help prioritize the level of effort that will be expended on identified problems in the flood plan. A status update has been provided for some of the identified problems. Project scoring has also been updated for some problem descriptions along the Lower White.



*Figure 1: FHPA #20; Image of the completed culvert that was installed by the City of Sumner.*

| Pierce County Rivers Flood Hazard Management Plan<br>Problem Identification and Inventory Update | | | | |
|---|---|---|---|---|
| **LROB #** | **River Segment** | **Problem Description** | **Problem Description update** | **Information provided by** |
| **Levee/Revetment Overtopping or Breaching** | | | | |
| LROB #3 | Lower Puyallup | Settlement of levee at the Sha-dax restoration site above the culvert causes dip in levee/road | Project completed in 2014 | City of Fife |
| LROB #4 | Lower Puyallup | Flood levels nearly resulted in levee overtopping near 54th Ave E. in 2006 and 2009 (within 2 feet of overtopping). [Note: Concern that if flood waters overtop the levee on North Levee Road, erosion on the back side of the levee will contribute to worse levee breaching because it is unarmored.] | On-going maintenance | City of Fife |
| LROB #5 | Lower Puyallup | Flood levels nearly resulted in levee overtopping downstream of Freeman Road in 1996 (within 2-3 inches) and 2009 (within 2 feet); there has been sloughing of soil and vegetation below the road. [See note in LROB #4 above.] | On-going maintenance | City of Fife |
| LROB#19 | Middle Puyallup | Levee/revetment overtopping occurs during major flood events causing flooding to occur to property located along 151st Ave E and 116th St E. (extent of flooding impact on homes unknown) | Some repair work done on Left Bank in this area | Pierce County Planning and Public Works, Operations and Maintenance |
| LROB #31 | Lower White | Levee overtopping in this vicinity causes flooding of numerous private residential homes in King County and Pierce County, Corliss/Icon equipment yard, other commercial storage and warehouse properties, and Butte Avenue. | Hesco Wall installed. City of Pacific installed interim pump station. The city has initiated the design of a permanent pump station at Government Canal. | Pierce County Planning and Public Works, Operations and Maintenance |
| **Tributary Backwater Flooding** | | | | |
| TBF #2 | Lower Puyallup | Puyallup River high water levels during high flows causes Clear Creek to backwater, flooding numerous private properties and structures (approximately 400 acres), including mobile homes and single-family residences (occurred in 1996 and 2009; lesser flooding in 2006 due less localized flow in Clear Creek); Flows from Clear Creek drain through two 48-inch culverts (with tide gates) to the Puyallup River | One tide gate repaired by Planning Public Works in 2017 | Pierce County Planning and Public Works, Operations and Maintenance |

| | | | | |
|---|---|---|---|---|
| TBF #4 | Lower Puyallup | Oxbow Lake discharge to the Puyallup River backwaters during flood conditions when tide gate does not allow discharge to river, causing potential for flooding, including sanitary sewer pump station. Sedimentation prevents tide gate from opening. | In 2017, the City of Fife continued to work with the Puyallup Tribe on maintenance to remove sediment as needed. | City of Fife |
| TBF #12 | Lower White | Backwater from ditches causes localized flooding at Countyline ditch (RM 5.5), government ditch (RM 5.35) and Steward Rd. ditch (RM 4.9) [see also LROB#30] | City of Sumner has done some Hesco Wall construction south of Stewart, about 500' long. | Pierce County Planning and Public Works, Operations and Maintenance |
| TBF #15 | Carbon | Backwater flooding on Voights Creek Hatchery (1996, 2005, 2006, 2008, 2009) | Hatchery has been relocated | Pierce County Planning and Public Works, Operations and Maintenance |
| **Channel Migration Problem Areas** | | | | |
| CM#3 | Upper Puyallup | The right bank of the Puyallup River upstream of the Orville Road high bridge is experiencing channel migration into the forested area and towards Brooks Road East between RM 25.3 and 25.6; the Neadham Levee and upstream areas on the right bank of the Puyallup River has been impacted by channel migration during the Nov. 2006 and Nov. 2008 flood events and recent channel migration in November 2009. The levee has been repaired twice by the Corps of Engineers in the last 3 years and emergency work was done by Pierce County in Nov/Dec 2009. (approx. 20 homes affected). In 1996, Brooks Rd. E failed due to river undermining Brooks Rd. toe/embankment | Some maintenance & operations and capital work has been done to minimize flood damage until full buyout is complete. | Pierce County Planning and Public Works, Operations and Maintenance |
| **Flooding of Structures and Infrastructure (Roads/ Bridges)** | | | | |
| FSI#32/ FS#33 | Lower White | Flooding of 3 homes along Butte Ave near county line and flooding of commercial/industrial businesses and equipment (up to $10 million equipment damage in Jan. 2009) | King County completed the left bank setback in 2017. This has increased channel capacity in the White River. In past years the river bank would overtop at 5,000 cfs in Pacific. We have experienced flows of 6,500 cfs without overtopping. King County is working on the right bank setback levee. The City of Pacific has initiated the design of a permanent pump station at Government Canal. | City of Pacific |

| | | | | |
|---|---|---|---|---|
| **Sediment/Gravel Bar Accumulation** | | | | |
| SGBA #16 | Lower White | Gravel bar accumulation in Lower White River in vicinity of Pacific is reducing carrying capacity of the channel. 2009 Corps of Engineers study indicates capacity could be reduced to as low as 5500 cfs. | King County completed the left bank setback in 2017. This has increased channel capacity in the White River. In past years the river bank would overtop at 5,000 cfs in Pacific. We have experienced flows of 6,500 cfs without overtopping. King County is working on the right bank setback levee. The City of Pacific is working on a pump station on Government Canal. Gravel bar scalping would still be beneficial. | City of Pacific |
| **Facility Maintenance/Repair Needs** | | | | |
| FMR #1 | Lower Puyallup | Minor evidence of piping occurred through the levee at the Sha-dax Project upstream and downstream of the new culvert. [See LROB#3] | This project was completed by maintenance and operations | Pierce County Planning and Public Works, Operations and Maintenance |
| FMR #34 | Carbon | Ski Park Levee - This segment of the Carbon River has historically suffered the most significant damage during every large storm events since 1990 (Jan & Nov 1990, 1995, 1996, 2006, 2008 & 2009). Repair work has ranged from minor rehabilitation to completely reconstructing the levee prism. Typical damages entail toe and face scour and structure undermining. One house located at RM 6.0 was washed away during the Nov. 2006 flood event. Flood waters flowed over SR 162. Complete levee failure 7.0(2008), 6.0(2006), 6.4(2006, 1990)), 6.8(2006), 6.9(1996), 7.1(1996) | Maintenance has been performed, work is on-going | Pierce County Planning and Public Works, Operations and Maintenance |
| **Floodplain Development Regulations** | | | | |
| FDR #2 | Lower Puyallup | Development regulations in Fife require elevation of 1 foot above the base flood elevation and compensatory storage requirements for all new development. No development is allowed in the FEMA floodway (based on the DFIRM maps). There are no requirements to elevate roads. | City of Fife is currently using the 2017 DFIRMS's | City of Fife |

| | | | | |
|---|---|---|---|---|
| FDR #5 | Lower White | Zoning and development regulations in the City of Pacific require elevation above base flood elevation, zero-rise analysis and compensatory storage. Pacific regulates according to best available science (data) - draft FEMA maps; Regulations mostly equivalent to King County | The current FIRM maps do not show the Pierce County area to be within the flood plain. Property owners have been notified of a potential change in the future. | City of Pacific |
| **Fish Habitat Problem Areas** | | | | |
| FHPA #10 | Middle Puyallup | Levee and revetment construction cut-off floodplain from river channel, preventing off-channel rearing and refuge for salmonids and flood storage; Fennel Creek, a spawning stream for Chinook and chum also enters Puyallup River in this reach | Site has been protected, planted and allowed to naturally recover but no levee work has been performed. Levee setback may not be necessary due to site elevations and infrequent inundation. | Puyallup Tribal Fisheries |
| FHPA #19 | Lower White | Revetment construction cut-off floodplain from river channel, preventing off-channel rearing and refuge for salmonids and flood storage (left bank revetment along Sumner golf course) | New bridge by Pierce County and Sumner slated for 2022 will incorporate greater span and open up an additional 100' of channel width. | Puyallup Tribal Fisheries |
| FHPA #20 | Lower White | Fish passage barrier at 8th St. Creek inflow to White River; there is suitable coho spawning habitat upstream | Corrected-A new 12' Culvert and pedestrian bridge was installed by City of Sumner in 2013. | Puyallup Tribal Fisheries |
| **Public Access to Rivers** | | | | |
| PA #3 | Lower Puyallup | Lack of public access and trail along the river or nearby connecting Puyallup all-purpose trail along River Road at approx. RM 6.5 to the City of Tacoma | SR-167 has now been funded by the legislature | City of Fife |

| | River Segment | Down-stream RM | Upstream RM | Bank (R, L) | Problem Description | Possible Solution(s) | Source | LU1 | LU2 | Severity of Problem | Area of Impact | Frequency | Total | Notes |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **FSI#** | **Flooding of Structures and Infrastructure (Roads/Bridges)** | | | | | | | | | | | | | |
| FSI#1 | Lower Puyallup | 1.6 | 2.0 | L | High water surface elevations during floods in 1996, 2006 and 2009 threatened flooding of Tacoma central wastewater treatment plant (a critical facility). In 2009, sandbagging of facilities was necessary to prepare for possible flooding the plant, but this was judged to be inadequate. [LROB#1] | Construct 1500 ft x 6 ft. high floodwall surrounding the southern boundary of the WWTP; in the event of major flooding, this would protect the plant from becoming submerged with 3-5 feet of floodwater and sewage. | City of Tacoma | | | | | | | See score for problem in LROB#1 |
| FSI#2 | Lower Puyallup | 0.7 | 2.2 | L | Three bridges of concern in the Lower Puyallup are 11th Ave (RM 0.7), Lincoln Ave (RM 1.5) and Puyallup Ave. (RM 2.2) - concern is capacity and damage due to wood debris on piers | Need to analyze in more detail; might require replacement with clear span to prevent | City of Tacoma | 8 | 0 | 4 | 8 | 5 | **25** | LU1=Comm. road; LU2=0; S=minor/mod.; A=region; F=1 |
| FSI#3 | Lower Puyallup | 4.0 | 5.5 | R | Tacoma Power's Fife substation on 58th Ave (south of I-5) would be impacted by flooding (overtopping or breaching of levee in vicinity of RM 4.0-5.5) and need to be shut down at a water depth of ?? feet | TBD | City of Tacoma | 8 | 0 | 4 | 6 | 1 | **19** | LU1=public utility; LU2=0; S=minor/mod.; A=severe; F=0 |
| FSI#4 | Lower Puyallup | | | | Localized road flooding east of Puyallup River and north of I-5 caused by potential levee overtopping upstream at RM 3.1 left bank | | City of Tacoma | 7 | 0 | 3 | 5 | 4 | **19** | LU1=road; LU2=0; S=minor; A=mod.; F=1 |
| FSI#5 | Lower Puyallup | 3.5 | 4.1 | L | Flooding of Gay Rd. from Pioneer to Gratzer requires road closures (caused by backwatering of Clear Creek) | Possible solutions include (1) construction of a pump station, (2) buyout of homes and property, or (3) no action. [see also TBF#2] | Pierce County Roads | | | | | | | See score for problem in TBF#2 |
| FSI#6 | Lower Puyallup | 5.75 | 5.75 | L/R | The Milroy Bridge (Clarks Creek) that crosses the Puyallup River at 66th Avenue East was shown in the recent FEMA analysis as not meeting the modern minimum standard for vertical clearance required above the anticipated 100-year recurrence flood. Floating debris could hang up on the bridge, even if the levees hold, and the bridge could be damaged or destroyed. | Rebuild bridge at higher elevation or wait until replacement associated with Canyon Road crossing | City of Fife, Pierce County Roads | 8 | 0 | 4 | 4 | 4 | **20** | LU1=road; LU2=0; S=minor/mod.; A=mod.; F=1 |
| FSI#7 | Lower Puyallup | 2.9 | 6.9 | R | Potential critical facilities located in the regulatory 100-year floodplain include schools and police station; 54th Ave E. has a high risk of water over roadway flooding. | (1) Setback of North Levee Road, (2) gravel removal, or (3) possible raising of existing levee | City of Fife | 9 | 8 | 4 | 6 | 1 | **28** | LU1=critical; LU2=comm.; S=minor/mod.; A=city ctr.; F=0 |
| FSI#8 | Lower Puyallup | 6.8 | 6.9 | R | There has been limited crawl space flooding (2 homes) and water over roadway (48th St.) in the vicinity of Freeman Road. | | City of Fife | 5 | 4 | 3 | 2 | 4 | **18** | LU1=road; LU2=LDR; S=minor; A=local; F=1 |
| FSI#9 | Lower Puyallup | 6.8 | 6.9 | L | High water surface elevations during floods in the Puyallup River threaten flooding of Puyallup wastewater treatment plant (a critical facility). In 2009, pumps were used to prevent flooding of plant. | Possible 100-foot setback of North Levee Road levee and Freeman oxbow wetland setback may relieve some of the flooding conditions here | City of Puyallup | 10 | 5 | 8 | 10 | 3 | **36** | LU1=WWTP;LU2=road; S=severe; A=regional; F=1 |
| FSI#10 | Lower Puyallup | 8.2 | 8.2 | L | Levee overtopping causes flooding of North Meridian underpass to Fred Meyers [see also LROB#6] | Possible 100-foot setback of North Levee Road levee may relieve some of the flooding conditions here | City of Puyallup | | | | | | | See score for problem in LROB#6 |
| FSI#11 | Lower Puyallup | 8.1 | 8.2 | R | Levee overtopping causes flooding of the North Meridian-north shore underpass causing 4-5 feet of water depth [see also LROB#7] | Possible 100-foot setback of North Levee Road levee and changes due to SR 167 extension may relieve some of the flooding conditions here | City of Puyallup | | | | | | | See score for problem in LROB#7 |
| FSI#12 | Lower Puyallup | 8.2 | 8.3 | L | Levee overtopping causes flooding of Tiffany's skating rink (finished floor) | Possible 100-foot setback of North Levee Road levee may relieve some of the flooding conditions here | City of Puyallup | | | | | | | See score for problem in LROB#6 |
| FSI#13 | Lower Puyallup | 9.1 | 9.25 | L | Left bank levee overtopping causes flooding on the 1st floor of the E. Main St. "flash cube" building | Possible setback levees upstream (confluence and Golf course oxbow) and downstream (100-foot setback of North Levee Rd.) may relieve some of the flooding conditions at this site | City of Puyallup | | | | | | | See score for problem in LROB#8 |
| FSI#14 | Lower Puyallup | 9.1 | 9.1 | | SR-512 bridge at Pioneer - problems with large woody debris accumulaton and bed scour at two piers for SR-512 in Puyallup River | Maintenance and monitoring; debris removal after flood events | WSDOT | 9 | 0 | 3 | 4 | 8 | **24** | LU1=state hwy, LU2=none; S=minor; A=mod, F=3 |
| FSI#15 | Middle Puyallup | 10.4 | 10.6 | R | High water surface elevations during floods in the Puyallup and White Rivers threaten flooding of Sumner wastewater treatment plant (a critical facility). In 2009, flows came within 6 inches of flooding the plant. | Construction of a flood wall or ring structure or gravel removal | City of Sumner | | | | | | | See score for problem in LROB#12 |
| FSI#16 | Middle Puyallup | 10.8 | 11 | R | Right bank levee overtopping causes flooding of SR 410, which occurred in 1996, 2006, 2008 and 2009. Up to 3 feet of maximum depth during worst conditions. Flooding also occurs in adjacent area (Chestnut St. and Christina Dr.), causing water over roadways. | | City of Sumner, WSDOT | 9 | 5 | 6 | 8 | 8 | **36** | LU1=hwy.; LU2=road; S=severe; A=regional; F=3 |
| FSI#17 | Middle Puyallup | 11 | 11.5 | R | Flood events in 1996, 2006 and 2009 causing finished floor flooding of Rainier Manor (~50% of 73 homes) and the ground floor of the Rivergrove Apartments. Crawl space flooding occurred in Riverwalk condos. | Three possible solutions have been discussed to address this problem, including: (1) construction of a floodwall along the right bank levee, (2) construction of a setback levee along the left bank (Sumner Setback levee in feasibility report, RM 10.7-11.6), and (3) gravel removal. | City of Sumner, Public Input | | | | | | | See score for problem in LROB#13 |
| FSI#18 | Middle Puyallup | 12.6 | 12.8 | R | 76th St. E & 159th Ave E (off Riverside Drive) - During major flood events, Puyallup River floods road causing road closures (water over roadway, sediment deposits on roadway and infrastructure damage) | Road Closure | Pierce County Roads | | | | | | | See score for problem LROB#14 |
| FSI#19 | Middle Puyallup | 14.15 | 14.15 | L, R | 96th St. E from SR162 to McCutcheon Rd. closed in 1996 due to water over roadway on approaches to bridge; also woody debris buildup on piers | Road Closure; clean woody debris from piers after floods | Pierce County Roads | 6 | 0 | 3 | 4 | 6 | **19** | LU1=road; LU2=0; S=minor; A=mod.; F=2 |

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| | River Segment | Down-stream RM | Upstream RM | Bank (R, L) | Problem Description | Possible Solution(s) | Source | LU1 | LU2 | Severity of Problem | Area of Impact | Frequency | Total | Notes |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| FSI#20 | Middle Puyallup | 14.2 | 14.9 | R | McCutcheon Rd. E flooding between 96th St. E and Rhodes Lake Rd E - During major flood events, Puyallup River floods road causing road closures (water over roadway, sediment deposits on roadway and infrastructure damage) | Road Closure | Pierce County Roads | | | | | | | See score for problem LROB#17 |
| FSI#21 | Middle Puyallup | 16.7 | 16.7 | L, R | 128th St. E bridge - woody debris buildup on piers | Clean woody debris from piers after floods | Pierce County Roads | 8 | 0 | 4 | 4 | 6 | **22** | LU1=road; LU2=0; S=minor/mod.; A=mod.; F=2 |
| FSI#22 | Middle Puyallup | 16.7 | 17.3 | R | McCutcheon Rd. E flooding south of 128th St. E to dead end - road closure due to water over roadway | Road Closures | Pierce County Roads | | | | | | | See score for problem LROB#21 |
| FSI#23 | Upper Puyallup | 20.5 | 21.3 | R | Leach Rd. E, north of Calistoga bridge is subject to flooding and levee overtopping during flood events; sediment and debris buildup on road | Road Closure; follow-up maintenance | Pierce County Roads | 6 | 4 | 2 | 4 | 6 | **22** | LU1=road; LU2=0; S=inconvenience; A=mod.; F=2 |
| FSI#24 | Upper Puyallup | 21.3 | 21.3 | L, R | Calistoga Bridge is a constriction point for the river - concern about gravel deposition and floating large woody debris hitting underside of bridge during flood flows | | Pierce County Roads | 9 | 0 | 4 | 6 | 6 | **25** | LU1=road; LU2=0; S=minor/mod.; A=severe; F=2 |
| FSI#25 | Upper Puyallup | 25.4 | 26.7 | R | Needham Rd. E - During major flood events, Puyallup River overtops channel causing road closure, sediment deposits on roadway, road infrastructure damage, and property/house flooding | Road Closure; follow-up maintenance | Pierce County Roads | 8 | 4 | 4 | 4 | 9 | **29** | LU1=road; LU2=LDR; S=mod.; A=mod.; F=3 |
| FSI#26 | Lower White | 0.2 | 0.2 | R | Houston St. E under SR-410 has water over roadway (up to 2+ feet in depth) during flood event - closure from 129th Ave. Ct. E to Sumner city limits | Road Closure; follow-up maintenance | Pierce County Roads | 6 | 0 | 4 | 4 | 9 | **23** | LU1=road; LU2=LDR; S=mod.; A=mod.; F=3 |
| FSI#27 | Lower White | 0.2 | 0.2 | L | Flooding of State St. (access to Sumner wastewater treatment plant) | Place temporary flood control devices (e.g., sand bags, super sacks) | City of Sumner | 8 | 9 | 4 | 4 | 9 | **34** | LU1=sole access road; LU2=WWTP; S=mod.; A=mod.; F=>3 |
| FSI#28 | Lower White (24th Street Setback) | 2.5 | 4.2 | L | The White river is known to carry high sediment loads from glacier melt which settles out once it reaches the flat valley in Sumner. This has caused a high flood risk in the region. | The proposed restoration efforts will include installing large woody debris, side channels, and planting native trees that will provide habitat complexity and resources for wildlife. | City of Sumner | 9 | 10 | 7 | 9 | 9 | **44** | |
| FSI#28a | Lower White | 3.4 | 3.5 | L | Flooding of roadways at 24th St E. and 148th Ave. | Possible option to raise the low areas of the levee in this reach; need to review effects on opposite bank and floodplain. | City of Sumner | 5 | 0 | 4 | 4 | 6 | **19** | LU1=road; LU2=none; S=mod.; A=mod.; F=2 |
| FSI#29 | Lower White (Pacific Point Bar) | 3.9 | 4.5 | R | The White river is known to carry high sediment loads from glacier melt which settles out once it reaches the flat valley in Sumner. This has caused a high flood risk in the region. | Elements of this project include setback levees, side channels, back water alcove, channel roughening, engineering log jams, revetments, property acquisitions and other methods to create a more sustainable system. | City of Sumner | 10 | 9 | 6 | 9 | 7 | **41** | |
| FSI#29a | Lower White | 4.4 | 4.5 | R | Flooding of 4 houses on right bank, north of 16th St. E. | Possible option to raise the low areas of the levee in this reach; need to review effects on opposite bank and floodplain. | City of Sumner | | | | | | | see score from problem LROB#27 |
| FSI#30 | Lower White (Left Bank Setback) | 4.4 | 4.9 | L | The White river is known to carry high sediment loads from glacier melt which settles out once it reaches the flat valley in Sumner. This has caused a high flood risk in the region. | Elements of this project include setback levees, channel roughening, revetments, property acquisitions and other methods to create a more sustainable system. | City of Sumner | 6 | 3 | 5 | 4 | 9 | **27** | |
| FSI#31 | Lower White (Stewart Road Bridge) | 4.9 | | R/L | The White river is known to carry high sediment loads from glacier melt which settles out once it reaches the flat valley in Sumner. This has caused a high flood risk in the region. | Replace Stewart road bridge to accommodate traffic, improvementfish habitat and flooding impacts. | City of Sumner | 10 | 0 | 9 | 9 | 0 | **28** | |
| FSI#32 | Lower White | 4.8 | 5.5 | R | Flooding of 3 homes along Butte Ave near countyline and flooding of commercial/industrial businesses and equipment (up to $10 million equipment damage in Jan. 2009) | Possible option to raise the low areas of the levee in this reach; need to review effects on opposite bank and floodplain. | City of Pacific | | | | | | | see score from problem LROB#31 |
| FSI#33 | Lower White | 4.8 | 5.3 | R | Flooding of Butte Ave (collector road) - had to be closed in 2009 | | City of Pacific | | | | | | | see score from problem LROB#30 |
| FSI#34 | Lower White | 4.8 | 4.8 | R | Flooding of Stewart Rd. SE (low point of road ~ 150 feet) experience up to 3 foot depth of flooding in 2006 and 2009 | | City of Pacific | | | | | | | see score from problem LROB#30 |
| FSI#35 | Upper White | 48.9 | 48.9 | L, R | Crystal River Ranch Rd. bridge (there are two bridges) - old bridge has two piers in the river that accumulate large wood; new bridge has no intermediate river piers, but abutments are vulnerable to washout) | | Pierce County Roads | 8 | 5 | 4 | 5 | 2 | **24** | LU1=sole access road; LU2=HDR; S=mod.; A=mod.; F=0 |
| FSI#36 | Carbon River | 0.0 | 0.5 | R | McCutcheon Rd. closure on the right bank of the Carbon River near the mouth | Road Closure; follow-up maintenance | Pierce County Roads | | | | | | | see score from problem LROB#20 |
| FSI#37 | Carbon River | 4.2 | 5.8 | | SR-162 floods along Carbon River east of Orville Road | Road Closure; follow-up maintenance on road | WSDOT | 8 | 0 | 4 | 4 | 8 | **24** | LU1= state hwy, LU2=none; S=mod., A=mod; F=3 |
| FSI#38 | Carbon River | 6.3 | 6.5 | L | Carbon River overtops channel forcing road closure of Alward Rd. and infrastructure damage (off SR-162) - 6-12 inches of water over roadway | Road closure; Alward levee setback would reduce or eliminate flooding | Pierce County Roads | 8 | 0 | 4 | 4 | 4 | **20** | LU1=sole access road; LU2=0; S=mod.; A=mod.; F=1 |

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| | River Segment | Down-stream RM | Upstream RM | Bank (R, L) | Problem Description | Possible Solution(s) | Source | LU1 | LU2 | Severity of Problem | Area of Impact | Frequency | Total | Notes |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| FSI#39 | South Prairie Cr. | 0 | 3.8 | L, R | SR-162 floods in numerous locations forcing closure of road from Carbon River bridge to Soler Farm or Town of South Prairie; three bridges between RM 2.7 and 3.8 on South Prairie Creek are a problem due to large woody debris buildup on piers (#162/016, 162/017, 162/018) | Road Closure; follow-up maintenance on road and bridges | WSDOT | 8 | 0 | 4 | 4 | 8 | **24** | LU1= state hwy, LU2=none; S=mod., A=mod; F=3 |
| FSI#40 | South Prairie Cr. | 1.7 | 2.5 | L | South Prairie Carbon River Rd. E - During major flood events, South Prairie Creek overtops channel causing road closures (water over roadway, sediment deposits on roadway and infrastructure damage) - from SR 162 to 157th St. E | No proposed solution unless flood waters can be kept in creek channel | Pierce County Roads | | | | | | | see score from problem LROB#39 |
| FSI#41 | South Prairie Cr. | 3.3 | 3.4 | R | Kaperak Rd. E - During major flood events, South Prairie Creek overtops channel causing road closures (water over roadway, sediment deposits on roadway and infrastructure damage) - off SR 162 | No proposed solution unless flood waters can be kept in creek channel | Pierce County Roads | | | | | | | see score from problem LROB#41 |
| FSI#42 | South Prairie Cr. | 3.7 | 3.7 | R | Spring Site Rd. - During major flood events, South Prairie Creek overtops channel causing road closure (water over roadway, sediment deposits on roadway and infrastructure damage) - 100 feet north of SR 162 | No proposed solution unless flood waters can be kept in creek channel | Pierce County Roads | | | | | | | see score from problem LROB#41 |
| FSI#43 | South Prairie Cr. | 5.4 | 5.9 | R | South Prairie Rd. E - During major flood events, South Prairie Creek overtops channel causing road closure (water over roadway, sediment deposits on roadway and infrastructure damage) - from 246th Ave. Ct. E to SR-162 | No proposed solution unless flood waters can be kept in creek channel | Pierce County Roads | 7 | 0 | 4 | 4 | 6 | **21** | LU1=sole access road; LU2=0; S=mod.; A=mod.; F=2 |
| FSI#43 | South Prairie Cr. | 0 | 6.2 | R, L | Floods damage trails along South Prairie Creek, requiring repair | | S. Prairie Cr. AC member | 2 | 0 | 3 | 2 | 6 | **13** | LU1=trail/rec. ; LU2=0; S=mod.; A=mod.; F=2 |
| FSI#43.1 | South Prairie Cr. | 5.4 | 5.4 | L | Outfall from Town of S. Prairie WWTP becomes covered in sediment as a result of large flood events | Removal of sediment done by hand in July 2009; Need more reliable long-term solution | Town of South Prairie | 9 | 6 | 4 | 6 | 3 | **28** | LU1=WWTP; LU2=MDR; S=mod.; A=sev.; F=1 |
| FSI#43.2 | South Prairie Cr. | 6.0 | 6.0 | L | Town of South Prairie Fire Station floods when S. Prairie Creek jumps its bank upstream of SR-162 crossing (station also used as Emergency Mgt. Center); $36,000 in damage in Jan. 2009 | Possible construction of a berm around Fire Station | Town of South Prairie | 9 | 0 | 8 | 7 | 4 | **28** | LU1=Crit. Fac.; LU2=none; S=sev.; A=sev.; F=1 |
| FSI#44 | Middle Nisqually | 21.6 | 21.9 | R | Flooding of all local roads in McKenna area in mapped 100-year floodplain downstream of SR 507 on right bank of Nisqually River (occurred in 1996) | Road Closures | Pierce County Roads | | | | | | | see score from problem PS#12 |
| FSI#45 | Middle Nisqually | 21.6 | 21.9 | R | Flooding of McKenna in 1996 flood caused innundation of portions of 80 parcels and damaged numerous structures | Possible acquisition of remaining homes and structures most affected by flooding (100-year floodplain) | Pierce Co. Nisqually Basin Plan | | | | | | **30** | See Score for PS#12 |
| FSI#46 | Middle Nisqually | 21.9 | 21.9 | R | SR-507: 1996 flood took out SR-507 approach to bridge on Pierce County side resulting in 2 day closure of road; also ongoing scour and LWD accumulation on bridge #507/128 | | WSDOT | 9 | 0 | 7 | 9 | 2 | **27** | LU1= state hwy, LU2=none; S=sev., A=reg.; F=1 |
| FSI#47 | Upper Nisqually | 50.4 | 50.4 | R | The Elbe Sewer System (a sand septic system located at the confluence of the river and Alder Lake that serves the entire community of Elbe) and the historic Elbe church is at risk of flood damage | | Mt. Rainier Nat'l Park; Nisqually AC member | 9 | 6 | 5 | 5 | 2 | **27** | LU1=WWTP; LU2=comm.; S=mod., A=sev.; F=0 |
| FSI#48 | Upper Nisqually | 61.7 | 61.7 | L, R | Kernahan Bridge (aka Skate Bridge) - Due to recent flood events (2006, 2008, 2009), sediment and debris deposition is threatening the Kernahan bridge due to scour of the bridge ends and heavy material buildup under the bridge could cause a washout of the bridge; the bridge is the only access to safety for Lewis County residents in the winter months. In 1996, right bank abutment was washed out in Pierce County | | Pierce County SWM, Nisqually Advisory Committee Member | | | | | | | see score from problem CM#20 |
| FSI#49 | Mashel River | 5.5 | 5.5 | | SR-161 crossing (bridge #161/02) - bridge approached were eroded in 2008 flooding; needed to reinforce rip rap to prevent bridge failure | | WSDOT | 9 | 0 | 7 | 5 | 2 | **23** | LU1= state hwy, LU2=none; S=sev., A=mod; F=3 |
| FSI#50 | Mashel River | 6.3 | 6.3 | | Mashel River bridge (Center St. E and Alder Cutoff Rd. E - main issue is debris buildup on bridge piers on the edge of river | Maintain and remove large woody debris buildup after flood events; inspect bridge piers | Pierce County Roads | 8 | 0 | 4 | 4 | 6 | **22** | LU1=sole access road; LU2=0; S=mod.; A=mod.; F=2 |
| | | | | | | | | | | | | | | |
| **SGBA#** | **Sediment/Gravel Bar Accumulation** | | | | | | | | | | | | | |
| SGBA#1 | Lower Puyallup | 2.9 | 6.9 | R | Bed elevation increases in the Lower Puyallup River between Interstate-5 and Freeman Road are of concern due to reduced carrying capacity | Removal of fine sediment and gravel would temporarily increase the flood carrying capacity of the river channel through this reach | City of Fife, Pierce County River Maint. | | | | | | | see score from problem LROB#2 |
| SGBA#2 | Lower Puyallup | 5.0 | 5.2 | L | Gravel bar accumulation below left bank across from Fife in this reach is of concern to reduced capacity | Removal of fine sediment/gravel would temporarily increase the flood carrying capacity of the river through this reach | City of Fife | | | | | | | see score from problem LROB#2 |
| SGBA#3 | Lower Puyallup | 5.8 | 10.3 | | Bed elevation increases in the Lower Puyallup River upstream of Clarks Creek to confluence with White River of concern due to reduced carrying capacity | Removal of fine sediment and gravel would temporarily increase the flood carrying capacity of the river through this reach | City of Puyallup, Pierce County River Maint. | 9 | 7 | 6 | 6 | 1 | **29** | LU1=Comm., LU2=HDR; S=severe; A=severe; F=0 |
| SGBA#4 | Middle Puyallup | 10.3 | 10.7 | | Gravel bar accumulation in the Puyallup River from the confluence of the White River upstream to Main Ave. bridge | Gravel bar scalping would temporarily increase the flood carrying capacity of the river channel through this reach. Both the Golf Course and Sumner setback levees could create additional capacity in this stretch. | City of Puyallup | 7 | 4 | 4 | 2 | 1 | **18** | LU1=HDR, LU2=golf course; S=mod.; A=mod.; F=0 |

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| | River Segment | Down-stream RM | Upstream RM | Bank (R, L) | Problem Description | Possible Solution(s) | Source | LU1 | LU2 | Severity of Problem | Area of Impact | Frequency | Total | Notes |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| SGBA#5 | Middle Puyallup | 10.4 | 12.0 | R | A large gravel bar has formed along the right bank adjacent to Sumner's wastewater treatment plant that is causing flow constriction at the confluence of the White and Puyallup rivers. Constriction is having an upstream impact on river surface elevations and potential for flooding of River Grove and River Walk areas of Sumner and SR410, upstream to SR 162. | Gravel bar scalping would temporarily increase the flood carrying capacity of the river channel through this reach, benefitting the Sumner WWTP, residential areas and SR410. Estimated gravel quantity to be removed is XX,000 cubic yards. | City of Sumner, Public Input | | | | | | | see score from problem LROB#12 and 13 |
| SGBA#6 | Middle Puyallup | 12.2 | 17.4 | | Bed elevation increases in the Middle Puyallup River between the Cities of Sumner and Orting are a concern due to reduced carrying capacities. In some cases the gravel bars are causing the river to angle toward the levees increasing the risk of damage to the structures. | Gravel bar scalping would temporarily increase the flood carrying capacity of the river through this reach. Several setback projects in the Middle Puyallup would also increase flood carrying capacity including the Riverside, Sportsman, 116th, and Upper Puyallup setbacks. | Pierce County River Maint. | 4 | 4 | 4 | 4 | 6 | **22** | LU1=LDR, LU2=Agric.; S=mod.; A=mod.; F=2 |
| SGBA#7 | Upper Puyallup | 17.4 | 19.4 | | Bed elevation increases in the Upper Puyallup River downstream of the City of Orting are a concern due to reduced carrying capacities. In some cases the gravel bars are causing the river to angle toward the levees increasing the risk of damage to the structures. One specific bar near 116th Ave. E. causes levee overtopping and threaten homes in vicinity of Alderton/McMillin. | Gravel bar scalping would temporarily increase the flood carrying capacity of the river through this reach. The Hoursehaven setback project in the Upper Puyallup would also increases in flood carrying capacity. | Pierce County River Maint. | 6 | 4 | 4 | 2 | 6 | **22** | LU1=HDR, LU2=Agric.; S=mod.; A=local; F=2 |
| SGBA#8 | Upper Puyallup | 19.4 | 22 | | City of Orting has identified 61 different gravel bars along the city boundary | Gravel bar scalping would temporarily increase the flood carrying capacity of the river channel through this reach | City of Orting | 9 | 7 | 6 | 6 | 6 | **34** | LU1=school, LU2=HDR; S=mod./sev.; A=sev.; F=2 |
| SGBA#9 | Upper Puyallup | 22.5 | 28.4 | | Bed elevations increases in the Upper Puyallup River upstream and downstream of the City of Orting are a concern due to reduced carrying capacities. In some cases the gravel bars are causing the river to angle toward the levees increasing the risk of damage to the structures. | Gravel bar scalping would temporarily increase the flood carrying capacity of the river through this reach. Several setback project in the Upper Puyallup would also increases in flood carrying capacity including the 150th Street and the 190th Ave Setback Levees. | Pierce County River Maint. | 4 | 4 | 4 | 4 | 8 | **24** | LU1=LDR, LU2=Agric.; S=mod.; A=mod.; F=>3 |
| SGBA#10 | Lower White (24th Street Setback) | 2.5 | 4.2 | L | The White river is known to carry high sediment loads from glacier melt which settles out once it reaches the flat valley in Sumner. This has caused a high flood risk in the region. | The proposed restoration efforts will include installing large woody debris, side channels, and planting native trees that will provide habitat complexity and resources for wildlife. | City of Sumner | N/A | N/A | N/A | N/A | N/A | N/A | N/A |
| SGBA#11 | Lower White | 3.5 | 4.5 | | Gravel bar accumulation in the Lower White River from Dieringer flume to beginning of river meander at RM 4.5 | Gravel bar scalping would temporarily increase the flood carrying capacity of the river channel through this reach | City of Sumner | 7 | 4 | 5 | 5 | 4 | **25** | LU1=Ind., LU2=LDR.; S=mod./sev.; A=mod.; F=1 |
| SGBA#12 | Lower White | 4.9 | 5.5 | | Gravel bar accumulation in the Lower White River from Stewart Rd. crossing to Countyline. | Gravel bar scalping would temporarily increase the flood carrying capacity of the river channel through this reach | City of Sumner | 7 | 4 | 5 | 5 | 4 | **25** | LU1=Ind., LU2=LDR.; S=mod./sev.; A=mod.; F=1 |
| SGBA#13 | Lower White | 3.6 | 5.5 | | Concern about debris and log jams at three locations: (1) log jams between RM 5.0-5.5, (2) debris accumulation on Stewart Rd. bridge piers during flood events, and (3) log jam at golf course (RM 3.6-3.9) | | City of Sumner | 7 | 4 | 5 | 5 | 4 | **25** | LU1=Ind., LU2=LDR.; S=mod./sev.; A=mod.; F=1 |
| SGBA#14 | Lower White (Pacific Point Bar) | 3.9 | 4.5 | R | The White river is known to carry high sediment loads from glacier melt which settles out once it reaches the flat valley in Sumner. This has caused a high flood risk in the region. | Elements of this project include setback levees, side channels, back water alcove, channel roughening, engineering log jams, revetments, property acquisitions and other methods to create a more sustainable system. | City of Sumner | N/A | N/A | N/A | N/A | N/A | N/A | N/A |
| SGBA#15 | Lower White (Left Bank Setback) | 4.4 | 4.9 | L | The White river is known to carry high sediment loads from glacier melt which settles out once it reaches the flat valley in Sumner. This has caused a high flood risk in the region. | Elements of this project include setback levees, channel roughening, revetments, property acquisitions and other methods to create a more sustainable system. | City of Sumner | N/A | N/A | N/A | N/A | N/A | N/A | N/A |
| SGBA#16 | Lower White | 4.9 | 5.5 | R | Gravel bar accumulation in Lower White River in vicinity of Pacific is reducing carrying capacity of the channel. 2009 Corps of Engineers study indicates capacity could be reduced to as low as 5500 cfs | Gravel bar scalping would temporarily increase the flood carrying capacity of the river channel through this reach | City of Pacific, Pierce County River Maint. | 7 | 4 | 5 | 5 | 4 | **25** | LU1=Ind., LU2=LDR.; S=mod./sev.; A=mod.; F=1 |
| SGBA#17 | Lower White (Stewart Road Bridge) | 4.9 | | R/L | The White river is known to carry high sediment loads from glacier melt which settles out once it reaches the flat valley in Sumner. This has caused a high flood risk in the region. | Replace Stewart road bridge to accommodate traffic, improvementfish habitat and flooding impacts. | City of Sumner | 10 | 0 | 9 | 9 | 10 | **38** | |
| SGBA#18 | Carbon | 0.0 | 3.0 | | Masses of gravel and associated bars strewn along this segment. Gravel accumulations diminish the flood carrying capacity of the river contributing to overbank flow. Gravel bars have the added effect of steering the course of the river and contribute to and exacerbate levee damages. City of | Gravel bar scalping to help minimize steering effects. Another possible solution may be create gravel removal locations adjacent to future setback levees. | Pierce County River Maint., City of Orting | 6 | 4 | 3 | 2 | 6 | **21** | LU1=HDR, LU2=LDR.; S=minor/mod.; A=local; F=2 |
| SGBA#19 | Carbon | 3.0 | 5.9 | | Masses of gravel and associated bars strewn along this segment. Gravel accumulations diminish the flood carrying capacity of the river contributing to overbank flow. Gravel bars have the added effect of steering the course of the river and contribute to and exacerbate levee damages. | Same comments. However, this segment is considered sensitive salmon habitat and would likely make gravel removal very difficult to permit. Therefore, the setback levee option would likely be the best solution to provide space for the river to meander. | Pierce County River Maint. | 4 | 4 | 4 | 2 | 8 | **22** | LU1=LDR, LU2=Agric.; S=mod.; A=local; F=3 |
| SGBA#20 | Carbon | 5.9 | 8.3 | | Same comments. This segment has high bluffs along the right bank between RM's 7.0 and 8.0. The toe of the bluffs tend to experience significant erosion primarily during high water events that result in mass wasting contributing tons of soil and gravel to the river system. | Gravel bar scalping to help minimize steering effects. Another possible solution may be create gravel removal locations adjacent to future setback levees. | Pierce County River Maint. | 4 | 2 | 5 | 4 | 8 | **23** | LU1=LDR, LU2=Rec.; S=mod./sev.; A=mod.; F=3 |

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# Appendix K

Throughout the year, Pierce County sends notifications about flood insurance and flood risk to more than 19,000 addresses that are in the county's floodplains. The county also provides information on its website about flood insurance and flood preparedness. A property acquisition program is also on the website that focuses on specific neighborhoods where Pierce County is working with willing sellers to purchase their properties at fair market value. This appendix provides a brief overview of some of the methods of notification Pierce County has used over the years.

## Neadham Road Property Acquisition

### What's Happening

For several years, Pierce County has purchased properties on Neadham Road because of repetitive flooding in the neighborhood. Once the county has finished buying land, the next step will include setting levees back to allow the river more lateral movement and potentially reducing flood risk down river.

In 2016, the county continued purchasing properties from willing sellers using funds from Floodplains by Design and the Flood Control Zone District.

In 2015, nine homes were purchased using funds from the Floodplains by Design program. A grant from the Salmon Recovery Funding Board will allow the purchase of two more homes and some preliminary engineering for restoring the floodplain to the area.

Pierce County was allocated funding in the 2013-2015 Coordinated Investment Funding in the state budget to purchase homes in the flood hazard zone along Neadham Road, south of Orting.

Funding available at the time was about $3.3 million. This was only adequate to buy nine homes. The county's goal is to purchase all of the homes along Neadham Road as funds become available and allow the area to revert back to floodplain.

Existing flood protection facilities will be maintained as the acquisitions proceed. If a major flood severely damages these facilities, the county will assess the damage and decide how to proceed.

**Public Meeting About Property Acquisition on Neadham Road**
A public meeting was held Oct. 29, 2012, at Orting Lions Club, to give residents more information about the acquisition process. The following resources were shared at the meeting:

- Frequently Asked Questions
- Neadham Road Map: Properties identified for purchase highlighted
- Presentation

### Contact Us

Send a message


**Ingo Kuchta**
*Civil Engineer*
**Phone:** (253) 798-6165
**Fax:** (253) 798-7709

**Monday–Friday**
7:30 a.m.–4:00 p.m.

**Mailing Address:**
2702 S 42nd St, Ste 201
Tacoma, WA 98409-7322


Pierce County
Public Works and Utilities
Surface Water Management

**Questions?**
**(253) 798-2725**
pcwater@co.pierce.wa.us

## KEEPING YOU INFORMED

**We are accessing 266th Street to work on county property.**

This work is scheduled to begin July 1 until November 1.

Crews will be on site periodically during that time.

If you have questions or concerns please contact: Al Amirzehni, P.E. at (253) 798-4677.

**For project information, go to:**
**www.co.piercecounty.wa.us**
and click on
Public Works & Utilities

www.piercecountywa.org/swm




### Make a Plan

**Know your property's flood risk**
Contact your insurance agent or Pierce County's Public Works Department to learn your property's flood risk. Call (253) 798-2725 or go to: **piercecountywa.org/propertyfloodriskmap** and request a flood map.

**Buy flood insurance**
Flood insurance is peace of mind that can be very affordable.
- Homeowner's insurance is not an alternate to flood insurance
- Your agent can help you buy a flood insurance policy
- Flood insurance typically takes 30 days to become valid

For more information: **floodsmart.gov**

**Family Emergency Plan**
Your family's emergency plan doesn't need to be complicated, but it should include:
- Where your family will meet during an emergency
- At least two routes away from flooded or damaged areas
- Contact information for your family members and an out-of-state contact (see tear-off below)

For more information: **piercecountywa.org/plan**

**Prep your property**
- Keep storm drains clear of leaves and debris
- Dispose of fallen leaves and yard debris properly—in compost areas, gardens, or take to the landfill
- Direct downspouts away from your home or business and clear gutters of debris
- Know how to turn off power and gas during an emergency if you can do so safely

**Pierce County Alert**
Sign up for this free service to receive alerts to 10 different devices including cell phones, home phones, tablets and computers. You can receive notifications about emergencies that may impact you. Sign up at: **piercecountywa.org/alert**

Cover image: The 2008 flood of the Puyallup River was the most recent major flood for Pierce County. The flooding destroyed or damaged levees, private properties and businesses.

Below image: The White River, in 2009, flooded communities, including Pacific, displacing many households and causing thousands of dollars in damage.

### Build a Kit

You can't plan where you are going to be when a flood occurs, but you can be ready with a kit. Emergency kits are easy to setup, don't take much investment, and you can build as many as you need. The great bonus about having an emergency kit for flooding is that you can also use it for other disasters. Did someone say earthquake?

- During a major disaster first responders will not be able to respond immediately to every call for help
- Build a kit that will last for three to seven days
- Create an emergency kit for both your home and your car
- Basic items include: flashlights and First Aid kits
- Customize the kit for your needs including medications, toys or small activities for children and supplies for pets

Once these kits are in place, build or buy a kit for work and a grab-and-go bag under your bed in case trouble strikes in the middle of the night. For more information go to: **piercecountywa.org/kit**

### Help Others

Help neighbors get prepared before a disaster strikes. When you are prepared, you can help others in a disaster. Specifically, speak to friends and neighbors who have medical or mobility needs. Talk to them about how you can help them during a disaster.

Join a Pierce County Neighborhood Emergency Teams (PC NET). Neighbors form PC NET teams to help their neighborhood during a major disaster by providing: search and rescue, First Aid, sheltering, communications, damage assessment and pet care. To start a team go to: **piercecountywa.org/PCNET**.



Emergency Contact
Name _____
Phone _____
Name _____
Phone _____



## Alward Road Property Acquisition

### 177th/Alward Road Property Acquisition

Pierce County is working with property owners to purchase parcels in the flood hazard zone along 177th/Alward Road near Orting.

Current funding is limited to purchasing parcels. The county's goal is to purchase all of the properties along 177th/Alward Road, as funds become available. As of January 2018, the county has purchased 57 properties from willing sellers.

Existing flood protection facilities will be maintained as the acquisitions proceed. If a major flood severely damages these facilities, the county will assess the damage and decide how to proceed.

**Public Meeting About Property Acquisition on Alward Road**
A meeting about this project and the property acquisition process was held on Oct. 30, 2013, at Orting Middle School.

Meeting Presentation

### Contact Us

Send a message


**Ziad Farah**

**Monday–Friday**

**Mailing Address:**

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