



HABITAT AND FLOOD CAPACITY CREATION PROJECT BACKGROUND AND OVERVIEW

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EXECUTIVE SUMMARY

The Habitat and Flood Capacity Creation Project is exploring sediment removal as a potential short-term strategy for enhancing degraded river habitat and reducing the risk of damage from moderate flood events. Pierce County has participated in many sediment studies over the past several decades. Since 2009, these studies have concentrated on potential sediment removal applications for flood control and habitat creation.

The Habitat and Flood Capacity Creation Project's goals are to:

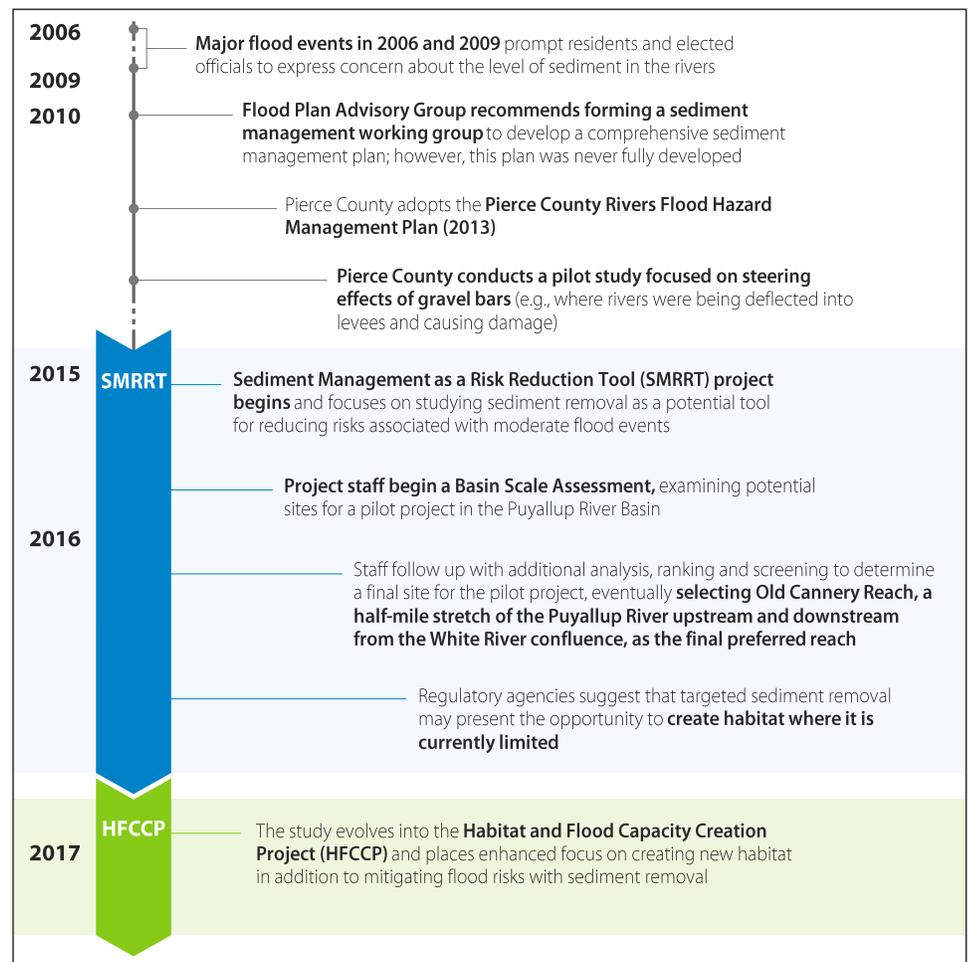
- Create new habitat
- Improve channel capacity for flood risk reduction
- Minimize and avoid impacts to the extent possible
- Incorporate learning from other sediment removal projects

Currently, project staff are working to clarify planning, permitting and design for a pilot sediment removal project along an approximately half-mile reach of the Puyallup River. Staff will then monitor the effectiveness of the project to better plan and inform potential future efforts.

PROJECT BACKGROUND

Significant floods in the 1990s, including the record 1996 event, forced Pierce County to consider new sediment management projects to restore flood capacity in the overall Puyallup River system. However, with more restrictive environmental regulations the historical practice of removing sediment from the rivers was halted, resulting in a build-up of sediment and increased flooding. Most notably, Pierce County was impacted by major flood events in November 2006 and January 2009. Following the 2009 flood, citizens expressed concern about the amount of sediment in rivers and the role it played in contributing to flooding. In response to their concerns, Pierce County and the Flood Plan Advisory Group began to study and explore the potential for incorporating sediment management as a strategy for reducing flood risks.

Figure 1 Pierce County Sediment Management Project Flow



Since 2010, various efforts in Pierce County have sought to study if sediment management could be incorporated as a flood risk reduction tool. A more detailed timeline of Pierce County's sediment management studies is highlighted in **Figure 1**.

Why is sediment management needed?

Mount Rainier provides the Puyallup, White and Carbon rivers with an extraordinary and constant supply of sediment. In fact, the annual sediment load for the Puyallup River is approximately 980,000 tons per year—the third largest in the Puget Sound basin. In addition, these sediment loads are expected to increase as glaciers on Mount Rainier retreat.

Most sediment transport occurs during high-water events. As more development increases stormwater runoff, and as intense and frequent storms become more common, these high-water events are happening more often.



Major flood events in 2006 and 2009 led to citizens expressing concern about the level of sediment in rivers.

Where could sediment management be helpful in reducing flood risks?

Managing flood risks in Pierce County is very complex. The County's Flood Hazard Management Plan has several long-term flood management strategies that work to reduce flood risks over many years. Examples of these strategies include:

- Coordinated land use and development policies with cities and towns
- Maintenance and management of existing flood risk-reduction infrastructure (such as levees and revetments)
- Floodplain acquisition and buyouts
- Levee and revetment setbacks
- County Code requirements that ensure new projects do not contribute to increased flood heights (i.e., zero-rise requirements)

In some places, short-term flood risk reduction measures are needed to supplement these long-term efforts. Sediment management is one such short-term strategy that may help reduce flood risks in areas where:

- It is not feasible to build a setback levee
- Levees are already present on both sides of the river
- Critical infrastructure, properties or buildings are adjacent to the river and at risk of flooding
- Sediment accumulation has reduced the capacity of the river, resulting in increased flood risk

Sediment management is only one short-term flood risk-reduction strategy, intended to be one of a suite of tools that could help to reduce risks from moderate flood events. Because moderate flood events occur more frequently, reducing associated risks may have substantial benefits to surrounding communities and the environment by ultimately resulting in less flood damage, expense, and repairs.

How could sediment removal create habitat?

In addition to protecting public safety, sediment removal could present the opportunity to create habitat where none currently exists or is degraded.

Complex river habitats contribute to a healthier, more natural environment for fish. Stream reaches with large-scale accumulation of sediments often display low complexity and lack habitat features that support diverse fish populations at their



This stretch of the Carbon River shows low habitat complexity and high sediment loads.

various life stages. Sediment removal provides the opportunity to add and restore complexity to rivers and expand floodplain areas. In addition, new habitat can be created by constructing back-bar channels and potentially incorporating large woody debris and other features that create refuge for fish. Additional habitat complexity could help to increase a watershed's overall fish productivity.



This stretch of the White River shows complexity and high habitat diversity.

HABITAT AND FLOOD CAPACITY CREATION PROJECT GOALS AND APPROACH

The Habitat and Flood Capacity Creation Project is a fact-finding pilot project to determine whether targeted sediment removal is an appropriate and cost-effective way to simultaneously improve fish habitat and reduce flood risk. In addition, the project seeks to measure the feasibility of permitting a sediment removal program in Washington, as well as determine if the approach is transferrable to other locations. The project builds from work completed as part of the Sediment Management as a Risk Reduction Tool project.

Project goals

The Habitat and Flood Capacity Creation Project seeks to answer the question: **Is sediment removal an effective method for localized flood hazard risk reduction during moderate flood events in the Puyallup River basin, and can a sediment removal project be designed to measurably improve habitat and reduce flood risk at the same time?**

Enhancing habitat while reducing flood risks is a challenging balance to strike, and the study design process will work to meet both project goals. In addition, the project team is working to further develop plans/design, obtain all necessary permits to complete the project, and – finally – monitor the effectiveness of sediment removal to inform future projects.

What will the Habitat and Flood Capacity Creation Project seek to do?

1. **Create** new habitat
2. **Improve** channel capacity for flood risk reduction
3. **Minimize and avoid impacts** to the extent possible
4. **Incorporate** learning from other sediment removal projects

Project approach

The project, originally called the Sediment Management as a Risk Reduction Tool project, was designed to be completed over three phases:

- **Phase 1 (2015)** – Gather existing information and identify gaps in data
- **Phase 2 (2016 - 2017)** – Build models and analyze information, select a preferred study site, prepare 30 percent design drawings demonstrating two alternatives at the preferred study site, and complete draft discipline reports for environmental documentation
- **Phase 3 (2017, planned)** – Conduct additional design to incorporate habitat creation and improvement features; complete discipline reports; prepare and submit federal, state and local permit application packages; and continue outreach with regulatory agencies, Tribes, stakeholders and communities

SELECTING A PREFERRED REACH

To accomplish the dual goals of the Habitat and Flood Capacity Creation Project, it was important to choose a suitable project site. Members of the project team looked for a stretch of river in the Puyallup basin that met the following criteria:

- Experienced flooding during moderate events
- Had nearby at-risk population
- Had nearby at-risk infrastructure
- Had large-scale accumulation of sediments
- Was stable enough to likely allow a period of monitoring following sediment removal before additional sediments were deposited

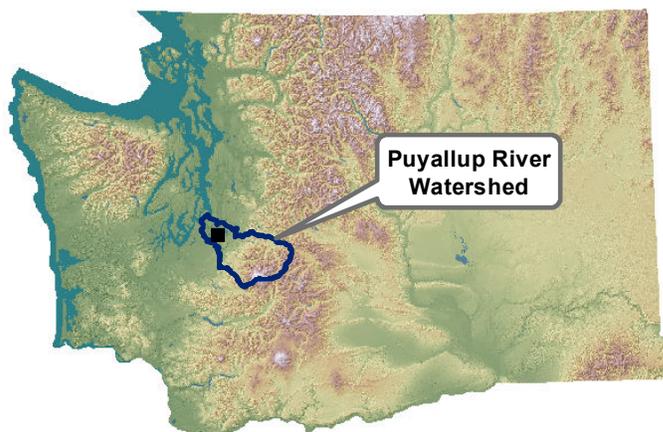
The project team engaged in a nearly one-year-long process throughout 2016 to select a site that best met the above criteria:

Step 1: The project team analyzed 41 miles of Pierce County managed river system as part of a basin scale assessment to look for where rivers were depositing and storing sediment. Using U.S. Geological Survey cross-sections showing accumulation trends, the team looked for river reaches that showed the greatest average accumulation to further investigate.

Step 2: The initial assessment identified 12 reaches for further consideration. The project team scored each of these reaches using a selection matrix that considered geomorphologic, hydraulic, sediment,

fisheries and land use/social disciplines. Technical attributes for each of the 12 reaches were scored using existing, publicly-available data and models. Scores for each reach were normalized to remove any bias resulting from the number of criteria within disciplines, ensuring that no single discipline would be more heavily weighted. This scoring process was used to narrow the sites down to six potential options for further study.

Step 3: The project team conducted field surveys on the six most promising reaches to better characterize existing conditions. They also performed preliminary modeling to determine what flood levels would overtop existing levees—this helped determine which river reaches could benefit the most from sediment removal. The same disciplines noted in Step 2 were scored and normalized.





Old Cannery Reach is between river mile 10.1 and 10.75. It includes the Confluence Bar and the Upstream Bar near the confluence of the White and Puyallup rivers.

Step 4: Two finalist reaches underwent a final pro/con analysis that incorporated wetlands/wildlife, geology/soils/groundwater and hazardous materials considerations. The project team conducted further analysis of technical and social disciplines already noted in Step 1. In addition, they collected bathymetry (water depth) measurements to inform hydraulic modeling used to evaluate sediment transport and geomorphic processes.

Step 5: The project team developed two conceptual sediment removal scenarios for each of the two final reaches. These scenarios helped to demonstrate how much sediment it may be necessary to remove to reduce flood risk.

The reach that scored highest in the final analysis is an approximately half-mile stretch of the Puyallup River between the cities of Puyallup and Sumner. This stretch, including a confluence bar and an upstream bar near the confluence of the Puyallup and White rivers, is known as Old Cannery Reach.

Characteristics of Old Cannery Reach

Some characteristics that made Old Cannery Reach the strongest candidate include its greater level of

nearby population and infrastructure, current lack of existing spawning populations of Endangered Species Act-listed species, lack of abundant or high-quality fish habitat, and slower pace of sediment accrual. The area also appears to be fairly stable in terms of sediment transport, which makes it a good reach for post-construction monitoring and evaluation.

However, the selection process identified that there is a higher likelihood of encountering contaminated material during sediment removal at Old Cannery Reach, due to the site's proximity to a former landfill and other potential sources of contamination. Initial sediment characterization at the site indicated that contaminants were present, but at concentrations below levels that would necessitate further evaluation.

Old Cannery Reach lacks high-quality habitat features. The pilot project is not a permanent solution for improving habitat, but it will improve complexity until longer-term solutions can be completed. Features currently lacking in this reach that may be improved by removing sediments include:

- **Holding pools:** There are currently no large holding pools, and pool/riffle complexes are lacking as a result of the confined channel.

- **Rearing habitat:** There are little to no resting areas for young fish as a result of the high water velocity. There are also no alcoves, side channels or large woody debris. With very little overhanging vegetation along the banks, there is less available shade, leaf litter fall and nutrients.

- **Spawning habitat:** The existing sediment size in the main channel is too large, and smaller sediments are not accessible to fish during spawning season.



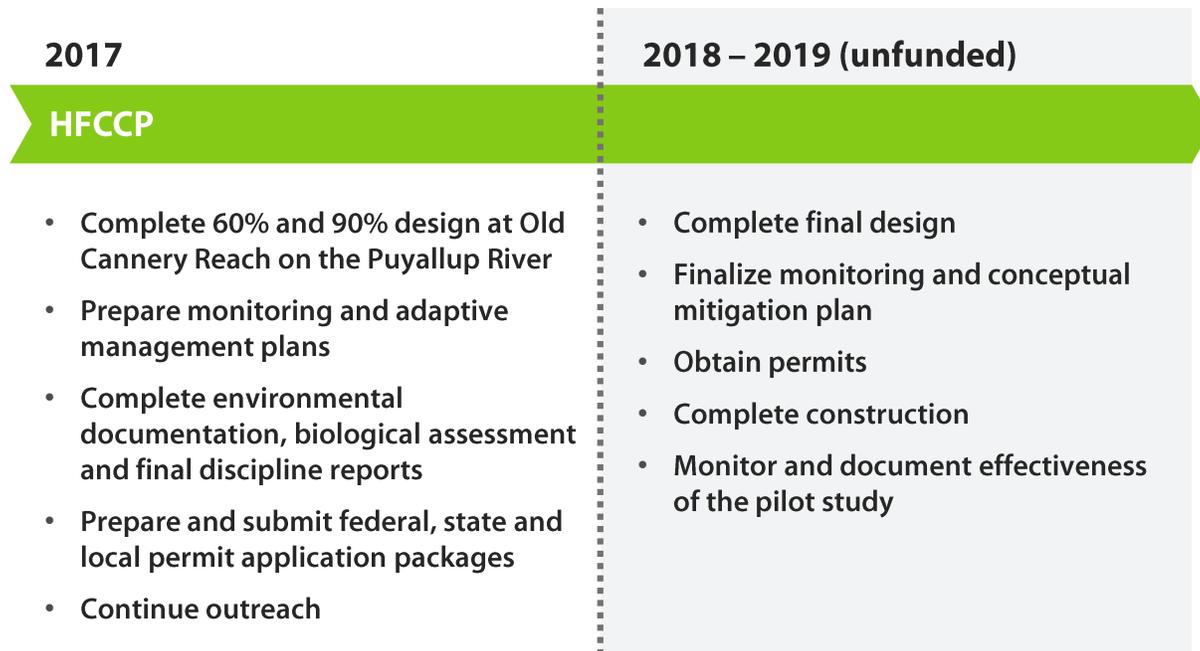
Riparian cover and low velocity alcoves that provide habitat for juvenile fish are lacking at Old Cannery Reach.



The Puyallup River flows quickly at Old Cannery Reach, even during periods of low flow. This makes for an inhospitable environment for juvenile fish.

NEXT STEPS

In the coming years, Pierce County will continue project planning, permitting and design activities at Old Cannery Reach. Anticipated next steps include:



Pierce County staff members are available to provide presentations about this project at local city councils and other community meetings upon request.

If you have any questions, or if you would like to schedule a presentation, please contact Angela Angove, Project Manager, at aangove@co.pierce.wa.us or at 253-798-2460.