

Appendix H: Resilience projects and next steps for Grays Bay

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Priority activities and suggested next steps

Through interviews, conversations, and community workshops, community members and partners identified several priority project concepts.¹ The project team was able to assist these projects in various ways described below. This appendix describes these projects and suggests next steps.

This project list is neither an exhaustive list of activities that can support coastal resilience in the region, nor is it a prioritized list. This project list is a collection of near-term projects to advance long-term coastal resilience in the region, which can support resilience across the bay as an interrelated network of projects (Fig. H.1).

Each of the suggested projects is introduced with graphics from Workshop 4 (an overview graphic, adaptive capacity summary, local resilience principles related to the project, and suggested next steps summary). Each project is then described in more detail with information pulled from workshops and other discussions:

- **Who** is a likely project lead or partner?²
- **What** is this project, in short?
- **When** will this be relevant?
- **Why** is this relevant?
- **How** may this project happen? (adaptive capacity and suggested next steps)

Each project's **How** section analyzes **adaptive capacity**, or the ability of the "system" (community, organizations, and ecosystem) to adapt in the way described.³ We use four criteria to better understand the adaptive capacity:

- Motivation for adaptation: are the affected/involved parties likely to support this work?
- Access to resources: what resources would help advance this work, and how accessible are they?
- Authority to implement adaptation decisions: do project partners have the authority to take action?
- Ability to learn and innovate: Are project partners able to address information gaps, adjust the project as new learnings are acquired, and take advantage of emerging opportunities/ideas that were not originally planned for?

These criteria are color-coded green (likely to happen), yellow (somewhat likely to happen), and red (low likelihood of happening or requires significant effort) This analysis informs **suggested next steps** for projects.

Six potential projects, shown in Table H.1, were identified for Grays Bay based on community input. Grays Bay resilience workshops led to the submission of five grant proposals in collaboration with local and regional partners. Three of these grants are specific to projects and are described below (#1, #2, and #5), while two grants cover the entire area and are not described below.⁴ At the time of writing, the project team and partners have only heard about the success of one of these grants (for project #2).

¹ See *Appendix B. Methods* and *Appendix G. General Adaptation Approaches for Grays Bay*.

² The "who" row identifies likely partners in this work. This leaves out organizations that we expect to be involved to some degree in all projects: regulatory agencies, technical support providers (such as contractors, Pacific Conservation District, or WA Sea Grant), and Tribes (Chinook Indian Nation for both bays, and the Cowlitz Tribe for Grays River).

³ Adapted from unpublished presentation (2021), Arun Agrawal and Clark Gibson (Enchantment and Disenchantment: The Role of Community in Natural Resource Conservation, 1999), and the Aspen Institute's Rural Economic Policy Program (Measuring Community Capacity Building: A Workbook-in-Progress for Rural Communities, 2009)

⁴ One proposal to NOAA's 2024 Effects of Sea Level Rise program, "Enhancing Columbia River Inter-Tribal Fish Commission's (CRITFC) Ocean/Estuary Modeling Efforts for Coastal Resilience and Habitat Restoration in the Columbia River Estuary" via CRITFC, and another proposal to NOAA's 2024 Climate Resilience Regional Challenge, "The Columbia River Estuary Flood Adaptation Partnership" via CREST. Both would assist modeling and ongoing community engagement to develop projects.



Figure H.1. Conceptual map of Grays Bay projects identified and supported through this work, with circles showing their relative geographic scales

Table H.1. Community-prioritized resilience projects, support from project team, and suggested next steps.

Grays Bay sea level rise resilience projects		
Activity	Support from project team ⁵	Key next step(s) ⁶
1. Grays River dredging to reduce flood impacts	Grant proposal submitted to the US Army Corps of Engineers' 2023 Section 165(a) Pilot Program for Small or Disadvantaged Communities program; ⁷ connected community members and Pacific Northwest National Labs (PNNL) researchers to better understand dredging feasibility through hydrodynamic modeling	Work with US Army Corps and others to conduct relevant studies and economic assessments to determine feasibility of dredging
2. Grays River: coordinated flood impacts reduction projects across watershed	Successful grant proposal to WA State COHORT (via Wahkiakum County Marine Resources Committee and Port District #2)	Create a webpage with existing documents and project updates. Conduct educational events to better understand watershed processes, and how other communities have dealt with similar issues. In the near-term, this could be supported by Wahkiakum County Marine Resource Committee's coastal resilience outreach activities.
3. Grays River gages	Assisted interested parties to connect with Washington State Department of Ecology staff and begin conversations to identify preferred gage types and locations	Based on existing conversations, prioritize gages/locations within a phased funding strategy. Continue to lead conversation and update interested parties about funding opportunities and other gage-related developments/needs.
4. Grays River modeling	Assisted PNNL researchers to begin modeling community priorities	Continue PNNL's existing modeling efforts with multiple opportunities for community input. Adjust expectations as needed to reflect community priorities.
5. Deep River navigation channel dredging	Grant proposal submitted to the US Army Corps of Engineers' 2023 Section 165(a) Pilot Program for Small or Disadvantaged Communities program ⁸	Work with US Army Corps and others to conduct relevant studies and economic assessments to determine feasibility of dredging
6. Deep River: coordinated flood impacts reduction projects across watershed	Successful grant proposal to WA State COHORT (via Wahkiakum County Marine Resources Committee and Port District #2)	Identify a CREST point of contact or project lead to assist with flood impacts reduction (especially upgrade/repair of tide gates and drainage improvements behind dikes. Continue to attend local events

⁵ Project scoping, relationship-building, and other workshop-related activities not included here. The project team also helped the Columbia River Estuary Study Taskforce (CREST) and the Columbia River Inter-Tribal Fish Commission (CRITFC) to write grants to NOAA. These grants would continue sea level rise modeling, local resilience project support, and related outreach across Baker and Grays Bays, which should support all of these projects.

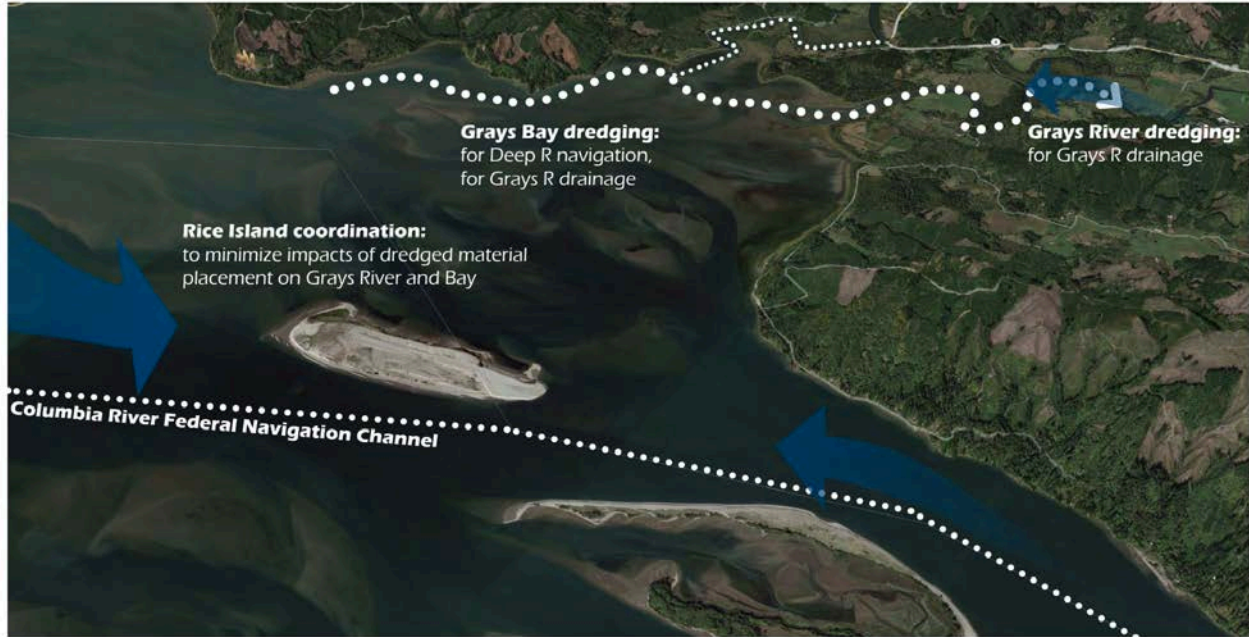
⁶ See below for additional next steps

⁷ At time of publication, proposals were still being reviewed

⁸ At time of publication, proposals were still being reviewed

1. Grays River dredging to reduce flood impacts

Wahkiakum County (suggested project lead),
 Port District No. 2,
 WA Department of Fish and Wildlife,
 State of Washington,
 US Army Corps of Engineers



Adaptive capacity

Motivation for adaptation:

Strong community priority, with some objections

High

Access to resources:

Expensive; requires studies and likely maintenance; proposal to US Army Corps in review

Low

Authority to implement adaptation decisions:

Tough permitting; reliance on US Army Corps to conduct all work

Low

Ability to learn and innovate:

Necessary study of hydrology and habitats can inform other efforts

Medium

This project supports these local priorities:



Suggested next steps

Wahkiakum County should:

- Submit funding/assistance proposal to US Army Corps [COMPLETE]
- Work with US Army Corps and others to conduct relevant studies and economic assessments to determine feasibility of dredging
- Conduct State and Federal advocacy and fundraising for next steps
- Pursue additional approaches to reduce flood impacts and their underlying causes across Grays River watershed, in case dredging does not prove successful on its own.

WA Department of Fish and Wildlife should:

- Conduct studies about potential impacts to species/habitats of concern (or aggregate existing studies), and communicate results to interested parties.
- Communicate permitting requirements and concerns to interested parties.

US Army Corps of Engineers should:

- Lead a focused conversation with state agencies and elected officials from Wahkiakum County and Grays River Flood Control District. This would outline the steps required for dredging and relevant hurdles/opportunities.

Who	Wahkiakum County (suggested project lead) , Port District No. 2, WA Department of Fish and Wildlife, State of Washington, US Army Corps of Engineers
What	Ongoing dredging of Grays Bay and/or Grays River for flood reduction and navigation. This could include removal of sediments and/or gravel from Grays River, removal of sediment from Grays Bay, coordination with US Army Corps to characterize and minimize impacts of Columbia River Navigation Channel maintenance on Grays River and Grays Bay sedimentation, and/or otherwise pending further assessments.
When	Near-term with future necessity: This project could help manage flooding that already occurs occasionally, affecting roads, farms, homes, and other infrastructure. Flooding is expected to increase in frequency and magnitude with sea level rise and future weather conditions.
Why	<p>Many community members and other interested parties described increasing sedimentation and gravel deposition on the lower Grays River over recent decades, with gravel bars advancing downstream from the Gorley Springs area to further downstream than historically known (e.g. past Altoona-Pillar Rock Bridge). Previous gravel mining or dredging efforts were conducted by the County or residents, with spoils being sold, used for construction of dikes and roads, or otherwise, while also reducing the river's bed elevation and reducing flooding. Today, dredging or gravel mining by local entities is unlikely to be permitted. There is much local hope that the US Army Corps of Engineers (USACE) will be able to dredge the lower Grays River and Grays Bay, and that dredging will allow flood waters to flow out more quickly, reduce flood water height or stage, and improve navigation for watercraft.</p> <p>This supports local values and priorities: infrastructure, land use, historic character, and social spaces.</p>
How	<p>This project is likely to happen if funds and community support are confirmed, based on adaptive capacity criteria:</p> <ul style="list-style-type: none"> ● Motivation for adaptation: A majority of workshop participants were enthusiastic about this project. A minority of participants did not support this project, however. ● Access to resources: This work would likely be led by the US Army Corps of Engineers. Local project supporters are unlikely to have the resources required without USACE partnership. ● Authority to implement adaptation decisions: This work would occur in both state and federal waterways, and is expected to require significant environmental review and federal leadership. While workshop participants have suggested potential ecological benefits, regulatory agencies have voiced concerns regarding impacts to lamprey and other species of concern. ● Ability to learn and innovate: While dredging would likely need to occur more than once, this is a costly activity with limited opportunities to innovate based on learnings from previous work. If water levels are monitored upstream in flood-prone areas, this may be able to inform other flood adaptation efforts. <p>Actions Taken: The USACE notified the project team of their Section 165(a) Pilot Program for Water Resources Projects for Small or Disadvantaged Communities funding/partnership opportunity, which is a competitive program for the USACE to fully fund small water resources projects.⁹ The team</p>

⁹ https://www.usace.army.mil/Missions/Civil-Works/Project-Planning/Legislative-Links/wrda_2020/

assisted Wahkiakum County Commissioner Gene Strong to craft and submit a proposal to the USACE in October 2023.

While this proposal has regularly been described as “the dredging proposal,” it is not this direct: discussion with USACE’s Portland District staff highlighted initial steps required before dredging could be identified as a preferred alternative and then implemented. The resulting proposal, titled “Grays River and Grays Bay Flood Reduction Project” would see the U.S. Army Corps of Engineers conduct a study to characterize flooding causes in the lower Grays River (including characterization of sediment sources and movement in the river and Grays Bay), identify and assess alternative actions to address flooding (including dredging), and implement prioritized solutions.

At time of writing, no determination of funding had been received from the USACE.

Suggested next steps:

- Wahkiakum County should:
 - Submit funding/assistance proposal to USACE [COMPLETE].
 - Work with USACE and others to conduct relevant studies and economic assessments to determine feasibility of dredging.
 - Pursue additional partnerships¹⁰ and funding sources¹¹ to advance initial steps of flood impacts risk reduction (including dredging), in ways that do not require USACE but could support their potential future involvement: characterize sediment sources and movement, characterize specific flooding causes and their interactions, identify and assess alternative actions to address flooding, and other necessary steps.
 - Leverage Wahkiakum County’s 2024 Comprehensive Flood Hazards Mitigation Plan to access funds such as Washington State Department of Ecology’s Flood Control Assistance Account Program.
 - Engage with USACE through multi-stakeholder forums such as Lower Columbia Solutions Group¹² or other programs related to Beneficial Use of Dredged Material (BUDM), build relationships through multiple staff and local knowledge-holders, find common goals and leverage these to meet local needs.
 - Conduct State and Federal advocacy and fundraising for next steps.
 - Pursue additional approaches to reduce flood impacts and their underlying causes across Grays River watershed, in case dredging does not prove successful on its own. Alternative approaches may be able to assist flood impacts reduction on their own or in tandem with dredging. If dredging proves feasible, these alternative approaches can provide additional flood reduction and lower recurring dredging maintenance costs. See Grays Bay project #2, “Grays Bay Watershed-Wide Coordination”.
- WA Department of Fish and Wildlife should:
 - Conduct studies about potential impacts to species/habitats of concern (or aggregate existing studies), and communicate results to interested parties.
 - Communicate permitting requirements and concerns to interested parties.
- US Army Corps of Engineers should:
 - Lead a focused conversation with state agencies and elected officials from

¹⁰ With engineers and/or research and modeling organizations such as PNNL or Columbia River Inter-Tribal Fish Commission’s (CRITFC) [Coastal Margin Observation & Prediction program \(CMOP\)](#).

¹¹ For example, [FEMA’s Cooperating Technical Partners program](#) or Ecology’s [Flood Control Assistance Account Program](#), which is related to the County’s 2024 Comprehensive Floodplain Hazard Management Plan update. .

¹² <https://lowercolumbiasolutions.org/>

Wahkiakum County and Grays River Flood Control District. This would outline the steps required for dredging and relevant hurdles/opportunities.

Additional considerations:

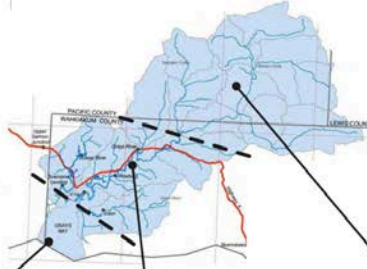
- Dredging is related to:
 - Grays Bay-area sediment management coordination, including potential interactions between the federal Columbia River Navigation Channel, Rice Island and other dredged materials disposal sites, and Grays Bay (see project #2 in this report).
 - Dredging of lower Deep River (see project #5 in this report).

2. Grays River: watershed-wide coordination

Flood impacts reduction is tied to factors across the watershed. A regular action-oriented community forum can ensure that actions are synergistic with related efforts and communicated to interest parties (see Willapa Erosion Control Action Now - WECAN).

Studies, prototype projects, and information/insight-sharing will be critical to affecting large-scale change through smaller projects.

Key organizations by subregion:
(does not include all partners, or regulators)



All key organizations would be regularly involved in outreach, fundraising, project developments, and group coordination. Participation by agencies will ensure permissible work that builds relationships.

***As the only key organization in all subregions, Wahkiakum County is the logical lead coordinator. Subregion-specific leads may be different than the County.

Grays Bay:
Wahkiakum County***
Port District No. 2
US Army Corps
WA State
OR State

Lower Grays River:
Private landowners
Columbia Land Trust
Grays River Grange
Grays River Flood Control District
Wahkiakum Conservation District
Wahkiakum County***
Washington State DOT

Upper Grays River:
Timber landowners
Columbia Land Trust
Pacific County
Wahkiakum Conservation District
Wahkiakum County***
WA Dept. of Natural Resources
Cowlitz Tribe

Adaptive capacity

Motivation for adaptation:

Many efforts already occurring; addresses priority issues



Access to resources:

Costly but competitive for grants; leadership needed; studies exist



Authority to implement adaptation decisions:

TBD distributed projects can focus on interested landowners

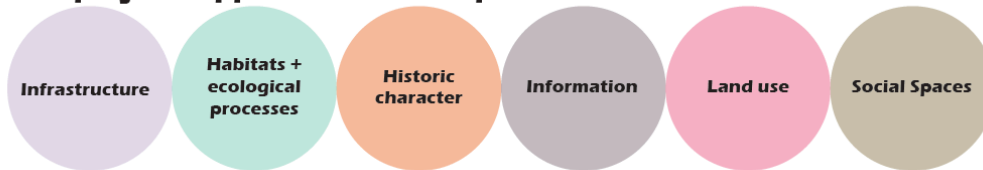


Ability to learn and innovate:

Can learn from existing studies and examples elsewhere; potential for prototypes + revision



This project supports these local priorities:



Suggested next steps

Wahkiakum County should:

- Create a webpage with existing documents and project updates
- Conduct educational events to better understand watershed processes, and how other communities have dealt with similar issues. In the near-term, this could be supported by Wahkiakum County Marine Resource Committee's coastal resilience outreach activities.
- Designate a paid individual and/or department as a point of contact for Grays River flood-related issues. Host a regular action-oriented watershed-wide forum for project participants and interested parties to develop projects + learn together

Columbia Land Trust, WA Department of Natural Resources, Cowlitz Tribe, and Wahkiakum County could:

- Create project briefs about their planned and/or ongoing work in the upper watershed to include on the County's TBD webpage.
- Continue to attend local events and Flood Control District meetings.

Grays River Flood Control District should:

- Continue to address localized flood issues (e.g. tide gates, culverts).
- Consider multiple approaches to address flood issues at larger scales that involve coordination across multiple partners.

Who	<p>Key organizations by subregion (does not include all partners, or regulators)</p> <ul style="list-style-type: none"> ● <u>Grays Bay</u>: Wahkiakum County*, Port District No. 2, US Army Corps, WA State, OR State ● <u>Lower Grays River</u>: Private landowners, Columbia Land Trust, Grays River Grange, Grays River Flood Control District, Wahkiakum Conservation District, Wahkiakum County*, Washington State DOT ● <u>Upper Grays River</u>: Timber landowners, Columbia Land Trust, Pacific County, Wahkiakum Conservation District, Wahkiakum County*, WA Dept. of Natural Resources, Cowlitz Tribe <p>*As the only key organization in all 3 subregions, Wahkiakum County is the logical lead coordinator. Subregion-specific leads may be different from the County.</p>
What	<p>A regular action-oriented community forum to ensure that actions to reduce flood impacts across the watershed are synergistic with related efforts and communicated to interest parties.¹³</p> <p>Ongoing project implementation, adaptive management, and education via studies, information/insight-sharing across the watershed and with case studies elsewhere¹⁴, prototype projects, and larger-scale multi-phase projects. Ensure that studies and plans lead to results and/or build community support, not “studies for studies’ sake.”</p> <p>Monitoring-based projects can support adaptive management of these projects as new information is learned. In turn, projects will be more likely to be permissible and fundable, and smaller-scale lower-cost prototype efforts can test and refine ideas before they are implemented at a large scale.</p> <p>All key organizations would be regularly involved in outreach, fundraising, project developments, and group coordination. Participation by agencies will ensure permissible work that builds relationships.</p> <p>Delineate strategic subregions of the watershed based on management regimes and relevant environments/processes/issues. Focus on specific project approaches for each subregion, involving coordination with other subregions’ activities. Focus initial water management efforts on areas that have already been identified for habitat recovery¹⁵ in order to more readily access funds for designing and implementing multi-benefit actions. Transitions between subregions and specific projects are critical focus areas for a successful approach to flood reduction and additional benefits.</p>
When	<p>Near-term with future necessity: This project would help manage flooding that already occurs occasionally, affecting roads, homes, farms, and other infrastructure. Flooding is expected to increase in frequency and magnitude with sea level rise and future weather conditions.</p>
Why	<p>Flood impacts reduction is tied to factors across the watershed. A regular action-oriented community forum can ensure that actions are synergistic with related efforts and communicated to interested parties (see Willapa Erosion Control Action Now - WECAN¹⁶).</p> <p>Studies, prototype projects, and information/insight-sharing will be critical to affecting large-scale</p>

¹³ This could be similar to the Wahkiakum County Restoration and Conservation Working Group, although with a smaller geography, more regular meetings, and a process to identify tangible mutually-agreed-upon goals

¹⁴ See *Appendix I. Case Studies Relevant to Watershed/Basin-wide Planning and Implementation*. The project team has already initiated conversations with participants in some of these case studies. Lessons learned from case studies can inform strategies for funding and implementing projects, and generate local dialogue via speakers (standalone or as part of a series), field trips (locally or beyond), film screenings, or otherwise.

¹⁵ e.g. “Tier 1 reaches” from page 3-13 of the Northwest Power and Conservation Council’s DRAFT Lower Columbia Salmon and Steelhead Recovery Plan, 2004: https://www.nwcouncil.org/sites/default/files/MP_Vol_II_Ch_03_Grays.pdf

¹⁶ <https://wacoastalnetwork.com/local-projects/wecan/>

	<p>change through projects that are distributed throughout the watershed. Large-scale projects (e.g. dredging, high-flow bypasses, flood storage areas) still may play a role alongside other efforts. This will require a mix of projects that deliver near-term and long-term results¹⁷, and as such will involve multiple generations of organizational staff and community members. Educational opportunities and community-wide (“K-to-gray”) educational activities could benefit this work.</p> <p>Throughout the project, community members mentioned land use and upland forestry practices as a major issue exacerbating flooding. Timber harvest practices on privately-owned lands have caused increased erosion on those lands and sedimentation within the downstream depositional reaches of streams and rivers. This sedimentation results in decreased capacity of those waterbodies to absorb river flows - both tributary and Columbia River, which in turn increases flooding to nearby areas. Historically, high river flows would have deposited sediment onto the floodplains, when the river overtopped its banks - allowing the valley bottoms to naturally accrete sediment. However, levees and dikes built to protect infrastructure, farms, and local communities have cut off these sedimentation processes. Ironically, lands located behind levees and dikes are frequently subsiding from the lack of sediment supply, which in turn exacerbates local flooding problems. Meanwhile, sediment settles out within low gradient, slow velocity sections of the streams, rivers, and bays, building up over time and reducing the capacity of the waterbody (e.g. lower Grays River) to convey water downstream.</p> <p>Without resolving the issue of eroding lands in the upland areas of the watersheds, this cycle is bound to continue and intensify, becoming more problematic as storm events become more intense and frequent and Columbia River tides increase with rising sea levels. Timber companies were not directly engaged through this project’s engagement and workshops.</p> <p>This supports location-specific values and priorities along the Grays River at:</p> <ul style="list-style-type: none"> ● Fossil Creek downstream to the Covered Bridge: information, habitats and ecological processes, infrastructure, and land use. ● Loop Rd at Hull Creek: infrastructure, habitats and ecological processes, historic character, and social spaces. ● Altoona-Pillar Rock Rd: land use, infrastructure, and habitats and ecological processes. ● Seal Creek at SR 4: land use, infrastructure, and historic character. ● Grays River watershed: land use, infrastructure, historic character, social spaces, habitats and ecological processes (and information¹⁸).
How	<p>This project is likely to happen if funds and community support are confirmed, based on adaptive capacity criteria:</p> <ul style="list-style-type: none"> ● Motivation for adaptation: This project addresses multiple priority issues. Many flood impacts reduction efforts are already occurring across Grays Bay, lower Grays River, and upper Grays River, involving multiple proposed project partners. ● Access to resources: <ul style="list-style-type: none"> ○ It will be costly to conduct work across this large geography, yet it will be competitive for many grants. ○ A diversified funding strategy will be needed. ○ Ongoing dedicated leadership will be needed.

¹⁷ For example, WDFW could explore repair and improvement of Grays River boat launch at Rosburg Hall, which is a community asset that is also a location for a potential additional stream gage. This is an opportunity to build trust and pilot approaches to reducing sedimentation on a small scale, improve public space and aquatic access, generate community buy-in and build trust, and connect people to ongoing gage monitoring of the river.

¹⁸ Authors’ note: During workshop 2, “Information” was not selected as a key value or resilience principle for this area. However, increased access to usable information is an extremely valuable product of watershed-wide coordination.

- While more information is needed to assess, understand, and justify projects, there are multiple existing studies that can inform this project’s initial steps. Hydraulic modeling of Grays Bay and lower Grays River are currently being developed by PNNL.
- Authority to implement adaptation decisions: TBD distributed projects can focus on interested landowners.
- Ability to learn and innovate: Can learn from existing studies and examples elsewhere; potential for prototypes and revision¹⁹.

Actions taken:

The project team worked with the Wahkiakum County Marine Resources Committee and Wahkiakum County Port District #2 to write a successful grant proposal to the Washington State COHORT (Coastal Hazards Organizational Resilience Team, via Washington State legislative funding), in order to take next steps on project #2, Grays River watershed-wide coordination via outreach and educational opportunities (e.g. learning about case studies and visiting related project sites). Work is currently starting.

Suggested next steps:

- Project lead (Wahkiakum County) should:
 - Create a webpage with existing documents and project updates. Request FEMA to digitize Flood Insurance Rate Maps, host them online, and update these as needed for modern use.
 - Conduct educational events to better understand watershed processes, and how other communities have dealt with similar issues. In the near-term, this could be supported by Wahkiakum County Marine Resource Committee’s coastal resilience outreach activities.
 - Leverage Wahkiakum County’s 2024 Comprehensive Flood Hazards Mitigation Plan to access funds such as Washington State Department of Ecology’s Flood Control Assistance Account Program.
 - Designate a paid individual and/or department as a point of contact for Grays River flood-related issues. Host a regular action oriented watershed-wide forum for project participants and interested parties to develop projects and learn together.
- Columbia Land Trust, WA Department of Natural Resources, Cowlitz Tribe, and Wahkiakum County could:
 - Create project briefs about their planned and/or ongoing work in the upper watershed to include on the County’s TBD webpage.
 - Continue to attend local events and Flood Control District meetings.
- Grays River Flood Control District should:
 - Continue to address localized flood issues (e.g. tide gates, culverts).
 - Continue to assess condition and needs of local infrastructure, and ensure landowners’ permissions to share this information when relevant for collaborative projects.
 - Consider multiple approaches to address flood issues at larger scales that involve coordination across multiple partners.
 - Consider whether easements over infrastructure are possible in order to access public funds for repairs and other work.

¹⁹ See WECAN in footnote 17

- Work with property owners and other land managers to document flooding impacts²⁰ and communicate these metrics with a designated Wahkiakum County representative and news media.
- Work with landowners to consider what trade-offs would be acceptable in order to reduce flood impacts.
- State and federal agencies should:
 - Identify a point of contact for collaboration with the watershed-wide forum, in order to ensure accurate information is available, trust is built, funding opportunities are leveraged, and agency-supported activities are advanced.
- All partners could:
 - Explore potential funding to sustain this forum and specific projects that are developed through it.
 - Identify how to engage productively with private timber land owners, state agencies, and federal agencies.
 - Engage with the Corps through multi-stakeholder forums such as Lower Columbia Solutions Group or other programs related to Beneficial Use of Dredged Material (BUDM), build relationships through multiple staff and local knowledge-holders, find common goals and leverage these to meet local needs.
 - Refer landowners and managers to this forum before they initiate projects, in order to ensure they are acting in coordination with adjacent areas and leveraging available funds and information.
 - Identify locations where multiple adjacent parcel owners are interested to reduce flooding through nature-based approaches, and create test cases to demonstrate how these can work. Monitor and communicate results, and adjust approaches accordingly through adaptive management. Multi-parcel approaches may be more likely to reduce flood impacts, and are likely to be competitive for funding if they also can address habitat considerations. Multiple funding sources may be appropriate for this work.
 - Continue to engage with the Washington State COHORT (Coastal Hazards Organizational Resilience Team²¹).
 - Build relationships with county permitting and planning departments, WDFW habitat biologists and permitting staff, WA State Department of Ecology permitting staff, US Army Corps of Engineers permitting staff, and Tribal departments or leaders interested in these topics.
 - Document tangible impacts from flooding in measurable terms, and clearly communicate these impacts to funders, media, and others.
 - Coordinate monitoring efforts across the entire watershed.
 - Develop an easily-referenced acronym for the group. For example, “Grays River Engagement for Everyone’s Needs” (GREEN), “Onward, Grays River Enhancement!” (OGRE), or “Getting Over Our Differences: Grays River Infrastructure, Ecology, and Floods” (GOOD GRIEF). This would preferably be something motivational and created by the group.
 - Ensure public visibility: some of this work may already be happening, but interested parties may not be aware of activities or their results. Broad support and awareness for this work is necessary for landowner coordination and otherwise.

²⁰ Measurable impacts may include costs, lost property acreage, miles of at-risk critical infrastructure, number of residents unable to use emergency routes during flood events, miles/acres/percentages of degraded habitat, or how often major flood events occur.

²¹ <https://wacoastalnetwork.com/cohort/>

3. Grays River monitoring via stream gages



Adaptive capacity

Motivation for adaptation:

Supports local priorities; uncertain which gage(s) to prioritize

Medium

Access to resources:

Limited funding sources for ongoing operations/maintenance

Low

Authority to implement adaptation decisions:

Gage(s) installation, operations/maintenance, and website are possible

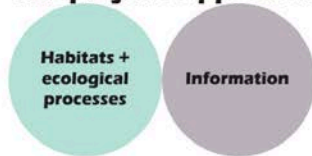
High

Ability to learn and innovate:

Assists emergency preparedness; informs watershed-wide coordination and modeling to reduce flood impacts

High

This project supports these local priorities:



Suggested next steps

Columbia Land Trust should:

- Update vertical elevation info for Covered Bridge gage [COMPLETE]
- Collaborate with Grays River Flood Control District on public outreach in support of emergency preparedness.
- Based on existing conversations, prioritize gages/locations within a phased funding strategy. Continue to lead conversation and update interested parties about funding opportunities and other gage-related developments/needs.
- Once funding is secured, collaborate with PNNL to develop new ratings for sediment and flow. Ensure gages are used for local benefit.

Grays River Flood Control District should:

- Conduct outreach to ensure that locals know how to access and read gage data (including 2024 recalibration of the Covered Bridge gage's elevation datum), in service of emergency preparedness and in collaboration with Columbia Land Trust.
- Communicate to the public how new gages can improve understandings of watershed processes and inform enduring flood impacts reduction projects.

WA Department of Ecology should:

- Continue to host gage data online and advise on gage strategy

Wahkiakum County should:

- Continue to fund the Covered Bridge gage, and explore additional funding opportunities for expanding gaging to reduce flood impacts.

Who	Columbia Land Trust (suggested project lead) , Grays River Flood Control District, WA Department of Ecology, Wahkiakum County, Pacific Northwest National Lab (PNNL)
What	<p>Update Grays River data collection to assist emergency management and modeling to reduce watershed-wide flood impacts. Potential gage locations include Altoona-Pillar Rock Bridge, Grays River Covered Bridge, and the upper watershed. Additional suggested project components include community engagement to assist the use of gage data and emergency preparedness.</p> <p>Build on existing collaborative conversations and efforts to update Grays River data collection (such as 2024's Covered Bridge gage elevation calibration) to assist emergency management and modeling to reduce watershed-wide flood impacts. A community outreach effort will assist use of gage data and emergency preparedness, whether with existing gage or for future gaging updates.</p> <p>See notes below this chart, from Columbia Land Trust's most recent email communication (at the time of writing) to the group of organizations and individuals discussing gage updates.</p>
When	Near-term with opportunity to reduce gage data collection (and costs) once rating curves have been developed for stream discharge, turbidity, or other dynamics of interest.
Why	<p>This project would inform emergency management as well as modeling which can inform multiple other activities (see projects #1 and #2).</p> <p>During a 2023 meeting of the Grays River Habitat Enhancement District (now Grays River Flood Control District, or GRFCD), there was discussion of the Grays River stream flow monitoring station (Grays River gage) located at the Grays River Covered Bridge.²² Some participants raised questions about the gage's operations and calibration. The project team connected with Washington State Department of Ecology's (Ecology) Hydrologist who manages the gage, who provided an in-person presentation about the gage at one of GRFCD's following meetings.</p> <p>During this meeting, attendees showed interest to:</p> <ul style="list-style-type: none"> ● <u>Upgrade the Grays River gage to measure additional variables, such as discharge.</u> The gage currently only measures the river's stage (water level height). ● <u>Create vertical elevation references for the gage's water level readings.</u> The gage is currently based on an arbitrary datum rather than a reference system which can relate elevations to the Earth's surface (e.g. NAVD88), meaning its readings are not connected to other real-life elevations (e.g mean sea level). ● <u>Provide water level/flow information for downriver locations,</u> particularly at Altoona-Pillar Rock Bridge due to regular road closures from flooding. ● <u>Produce a hydrodynamic map of the area to show potential flooding hotspots.</u> There was interest to understand flooding (how much and how long) across the lower Grays River valley depending on a combination of factors: Grays River water levels and discharge rates, Columbia River backwaters flowing up the Grays River, and tidal exchange.

²² Data available online at [WA Department of Ecology's Grays River at Covered Bridge streamflow gage](#) and [National Weather Service Flood Forecast for the Grays River](#)

	<p>Ongoing discussions produced additional insights from interested parties, along with survey results, shared below this chart.</p> <p>This supports local values and priorities: information, habitats and ecological processes.</p>
How	<p>This project is likely to happen if funds and community support are confirmed, based on adaptive capacity criteria:</p> <ul style="list-style-type: none"> ● Motivation for adaptation: Multiple organizations came together to refine the gaging needs, how gages would assist flood reduction work, and how to fund them. However, there was no clear consensus on which gages to prioritize due to limited funding on-hand. ● Access to resources: While the overall cost for the gages' installation and maintenance is less expensive than many projects, funding for these activities has been hard to find. ● Authority to implement adaptation decisions: Gage(s) installation, operations/maintenance, website, and outreach are all possible. ● Ability to learn and innovate: <ul style="list-style-type: none"> ○ Assists emergency preparedness; informs watershed-wide coordination and modeling to reduce flood impacts. ○ The gages will provide information useful to watershed modeling, assessments, and project development. While some gages may just be necessary for ~5 years in order to develop baseline data for modeling flow and sediment dynamics, the continued use of the gages may provide useful information. ○ This could connect to other educational programs such as lamprey monitoring with schools, as evidenced by past Wahkiakum High School environmental education programs funded by Wahkiakum County Marine Resources Committees. <p><u>Actions taken:</u></p> <ul style="list-style-type: none"> ● <i>Upgrade the Grays River gage</i> <ul style="list-style-type: none"> ○ Several meetings occurred to identify desired gage upgrades, costs, and potential funding strategies, involving Wahkiakum County, GRFCD, Columbia Land Trust (CLT), local residents, Ecology, Pacific Northwest National Lab (PNNL), WSU Extension Wahkiakum County, the project team, and others. Below this table, see Columbia Land Trust's most recent email communication (at the time of publication) to the group of organizations and individuals discussing gage updates, who had recently been surveyed about their priorities. ○ Several grant programs were pursued but did not result in any grant proposals, since the group determined that installation of the new gage features should not occur before a long-term gage operations and maintenance funding plan was developed, via a contract with Ecology. At the time of writing, neither the County, GRFCD, nor CLT were able to fund long-term operations and maintenance of gage upgrades, and few grants were found which could fund gage installation or maintenance. ● <i>Create vertical elevation references for the gage</i> <ul style="list-style-type: none"> ○ In March 2024, the stage values from the gage were converted to elevation above sea level on both the Ecology and NWS websites. This is due to coordination between CLT, Wahkiakum County, and Ecology to convert the reference elevation

from an arbitrary datum to the NAVD88 datum. Ecology's and National Weather Service's websites reflect these changes.

- *Provide water level data for downriver locations*
 - As part of gage upgrade discussions (#1 above), potential stage, flow, and turbidity gages were discussed and priced out for placement at Altoona-Pillar Rock Bridge.
- *Produce a hydrodynamic map of the area*
 - PNNL has been developing a hydrodynamic model of the Grays River watershed and lower Columbia River. PNNL staff attended the project team's workshops and coordinated with the project team to model community-prioritized flood adaptation actions and presented initial modeling results at the fourth Grays Bay workshop. PNNL's modeling work will continue beyond the timeline of this Bay to Bay project.

Suggested next steps:

- Columbia Land Trust should:
 - Update vertical elevation info for Covered Bridge gage [COMPLETE].
 - Collaborate with Grays River Flood Control District on public outreach in support of emergency preparedness.
 - Based on existing conversations, prioritize gages/locations within a phased funding strategy. Continue to lead conversation and update interested parties about funding opportunities and other gage-related developments/needs.
 - Explore additional funding sources²³ for installation and long-term operations (separately or together) of stream gages. Information from these gages will assist understanding of hydrodynamics and sedimentation processes in the Grays River watershed, informing design of effective flood impacts mitigation strategies.
 - For gage-related grant proposals, identify planned scope of work, project leads, and other necessary details as soon as possible. This information can then be used for rapid grant proposals with limited turnaround time, such as those triggered by emergency events.
 - Once funding is secured, collaborate with PNNL to develop new ratings for sediment and flow. Ensure gages are used for local benefit.
- Grays River Flood Control District should:
 - Conduct outreach to ensure that locals know how to access and read gage data (including 2024 recalibration of the Covered Bridge gage's elevation datum), in service of emergency preparedness and in collaboration with Columbia Land Trust.
 - Communicate to the public how new gages can improve understanding of watershed processes and inform flood impacts reduction projects.
- WA Department of Ecology should:
 - Continue to host gage data online and advise on gage strategy.
- Wahkiakum County should:
 - Continue to fund the Covered Bridge gage, and explore additional funding opportunities for expanding gaging to reduce flood impacts.

²³ For example, USDA's [Rapid Response to Extreme Weather](#) program (post-disaster) or Wahkiakum County's ".09 fund." The latter program is generated from sales taxes and has been used to address similar flood-related issues in Grays Harbor County.

From Columbia Land Trust's most recent email communication (at the time of publication) to the group of organizations and individuals discussing gage updates, who had recently been surveyed about their priorities:

Generalizations of the Survey

1. Currently the Covered Bridge stage gauge is the priority for survey respondents.
2. The Covered Bridge gauge is used primarily to monitor flooding and for flood preparation with over 50% of respondents prioritizing the gauge for this use (see Q.10 stating that residents and emergency services are the biggest beneficiaries).
3. There is clear support for the Covered Bridge to add a flow gauge. [COSTS: O&M \$10,000 annually]
4. There is additional support for a stage gauge at Altoona-Pillar Rock Road Bridge [COST: Equipment & Install - \$20,000; O&M: \$10,000 annually] and an upper watershed rain gauge [COST: E&I - \$16,000; O&M \$7,000].
5. Sediment information is desired but does not appear as important as the other priorities.
6. Funding contributions identified by survey respondents:
 1. Grays River Flood Control District (3 mentions)
 2. USGS (3 mentions; It is unlikely that USGS will fund gauges themselves, they charge to set up gauging arrays like Dept. of Ecology, however, their expenses are believed to be higher)
 3. Grants [from here down each received 2 mentions]
 4. USACE
 5. County (already funds the stage gauge at the Covered Bridge location)
 6. Columbia Land Trust

At a minimum there is support for adding flow back to the Covered Bridge gauge data collection regime. Assuming the county will fund the stage gauge at \$10,000 annually, additional partners would be needed to fund the additional expenses \$10,000 O&M annually. With a collaborative approach we can likely fund this effort locally.

Covered Bridge flow and Altoona-Pillar Rock Bridge stage costs for Year 1 are \$40,000 total. This group would need to identify an additional \$30,000 to fund this effort in Year 1 and an additional \$20,000 annually for O&M for both locations. This could improve flood warnings for folks below the Covered Bridge within the watershed. If all three priorities (CB: Flow; AB: Stage, UW: Rain) were implemented there would be a need to generate additional funds in the amount of \$63,000 for the equipment, installation, and annual operating expenses for Year 1 and fundraise for the additional O&M funds in the amount of \$27,000 annually.

Sensor Location/ Type	Costs			
	Equipment	Install	Annual O&M	Year 1 Costs
Covered Bridge				
Stage	Existing	n/a	\$10,000	
Flow Rating	Existing	n/a	\$10,000	
Turbidity - Sediment	\$5,000	\$5,000	\$23,000	
Rain	\$1,000	\$500	\$2,000	
Subtotal	\$6,000	\$5,500	\$45,000	\$56,500
Altoona-Pillar Rock Bridge				
Stage	\$10,000	\$10,000	\$10,000	
Flow Rating	above	above	\$10,000	
ADVM – Flow & Sediment	\$15,000	\$5,000	\$23,000	
Subtotal	\$25,000	\$15,000	\$43,000	\$83,000
Upper Watershed				
Rain	\$8,000	\$8,000	\$7,000	\$23,000

4. Grays River modeling

Modeling can use existing information to predict results of specific changes or actions. This can assist project designs, permitting, and ensuring proposed work will be effective. Modeling has occurred in the Grays River for years, but has not been responsive to community priorities or been widely communicated.

Pacific Northwest National Lab (PNNL, suggested project lead)
 Columbia Land Trust
 Columbia River Estuary Study Taskforce (CREST)
 Columbia River Inter-Tribal Fish Commission's Coastal Margin Observation Platform (CRITFC CMOP)
 Lower Columbia River Estuary Partnership (LCEP)
 Washington Sea Grant
 WSU Extension Wahkiakum County
 All interested parties (co-produce model to ensure it is useful)

Variable inputs to model (actual or potential conditions):
 Rainfall + runoff
 Sediment load
 Geology + slope
 Change in tree cover or land use
 Impacts of ongoing upstream restoration
 Proposed flood impacts reduction projects
 Proposed restoration projects
 Sea level rise
 Columbia River flows
 Other questions TBD...

Model results (maps or other data):
 Expected water levels
 Flooded/dry areas
 Expected sediment levels
 Habitat impacts
 Costs and benefits of projects
 Other useful information TBD...

Adaptive capacity

Motivation for adaptation:

Historical disconnection between modeling and local priorities/projects

Low

Access to resources:

Existing funds; 2 grants in review; competitive for funds if collaborative

High

Authority to implement adaptation decisions:

Occurs primarily on computers; interested parties can guide modeling

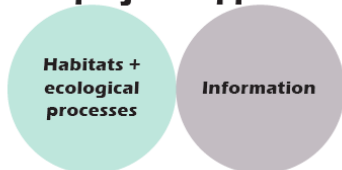
High

Ability to learn and innovate:

Provides better understanding of risks + project feasibility

High

This project supports these local priorities:



Suggested next steps

PNNL should:

- Continue existing modeling efforts with multiple opportunities for community input. Adjust expectations as needed to reflect community priorities.
- Produce an easily-digestible set of hydrodynamic maps showing flooding hotspots, for use in ongoing conversations.

Research partners with modeling and mapping capabilities (**CREST, CRITFC CMOP, LCEP, PNNL**) could:

- Continue existing modeling efforts in coordination with community input, reflecting community priorities.
- Ensure that existing and new modeling activities are coordinated with other research partners' efforts, have a robust outreach component, and will tangibly advance projects for local benefit.

Washington Sea Grant and/or WSU Extension Wahkiakum County should:

- Assist public communication about modeling efforts, while assisting modelers to incorporate community perspectives.

Local interested parties should:

- Continue to join conversations about modeling.
- Learn about ways that modeling has assisted flood impacts reduction projects elsewhere. Communicate your ideas to modelers who may be more focused on research than outreach.

Who	Pacific Northwest National Lab (PNNL, suggested project lead) , Columbia Land Trust, Columbia River Estuary Study Taskforce (CREST), Columbia River Inter-Tribal Fish Commission’s Coastal Margin Observation Platform (CRITFC CMOP), Lower Columbia River Estuary Partnership (LCEP), Washington Sea Grant, WSU Extension Wahkiakum County, all interested parties (co-produce model to ensure it is useful)
What	PNNL collaboration received funding to create a hydrodynamic model in this area to illustrate SLR impacts and the effectiveness of different mitigation strategies. Suggested project components include continually providing an avenue for incorporating community priorities, questions, and ideas into existing and future modeling efforts for Grays River and ensuring the model information is widely communicated in service of project advancement and other decision-making.
When	Near-term with broader use-cases: This project would help interested parties to better understand existing and future water levels across the Grays River watershed, and would help vet potential flood impacts reduction projects.
Why	<p>Modeling can be useful in project development, funding proposals, and permitting. This allows interested parties to glimpse how proposed actions may affect flooding, without having to actually implement on-the-ground projects.</p> <p>Ongoing collaboration with the PNNL hydrodynamic model (and other models) can help interested parties recommend next steps and better understand feasibility. Additional funding is likely necessary to improve the model(s) and conduct supporting research. Interested parties must ensure that studies and modeling leads to results and/or builds community support, not merely producing “studies for studies’ sake.”</p> <p>Because of a very large split in community’s perspectives and perceptions about different flood impacts reduction efforts, there is a need for a continuation of community engagement about modeling various alternatives.</p> <p>This supports local values and priorities: information, habitats and ecological processes.</p>
How	<p>This project is likely to happen if funds and community support are confirmed, based on adaptive capacity criteria:</p> <ul style="list-style-type: none"> ● Motivation for adaptation: Modeling and other research is generally understood as necessary to understand the system, but it has not yet resulted in well-known or well-communicated benefits to the local community: there is a historical disconnection between modeling and local priorities/projects. Residents want to see clear steps toward action. ● Access to resources: There are existing funds for PNNL to continue their current modeling and community engagement efforts. There are 2 grants in review²⁴ to continue and advance these modeling efforts. This project is likely competitive for funds if it remains a collaborative process. ● Authority to implement adaptation decisions: Modeling occurs primarily on computers and as such requires no permits; interested parties can guide modeling. ● Ability to learn and innovate: Modeling provides better understanding of risks and project

²⁴ Both to NOAA, under separate funding programs

feasibility, and can be updated as needed with new learnings.

Actions taken:

- PNNL has been developing a hydrodynamic model of the Grays River watershed and lower Columbia River. PNNL staff attended the project team’s workshops and coordinated with the project team to model community-prioritized flood adaptation actions and presented initial modeling results at the fourth Grays Bay workshop. PNNL’s modeling work will continue beyond the timeline of this Bay to Bay project.
- The project team also helped the Columbia River Estuary Study Taskforce (CREST) and the Columbia River Inter-Tribal Fish Commission (CRITFC) to write separate grants to NOAA. These grants would continue sea level rise modeling, local resilience project support, and related outreach across Baker and Grays Bays.

Suggested next steps:

- PNNL should:
 - Continue existing modeling efforts with multiple opportunities for community input. Adjust expectations as needed to reflect community priorities.
 - Produce an easily-digestible set of hydrodynamic maps showing flooding hotspots, for use in ongoing conversations.
- Research partners with modeling and mapping capabilities (CREST, CRITFC CMOP, LCEP, PNNL) could:
 - Continue existing modeling efforts in coordination with community input, reflecting community priorities.
 - Ensure that existing and new modeling activities are coordinated with other research partners’ efforts, have a robust outreach component, and will tangibly advance projects for local benefit.
- Washington Sea Grant and/or WSU Extension Wahkiakum County should:
 - Assist public communication about modeling efforts, while assisting modelers to incorporate community perspectives.
- Local interested parties should:
 - Continue to join conversations about modeling.
 - Learn about ways that modeling has assisted flood impacts reduction projects elsewhere. Communicate your ideas to modelers who may be more focused on research than outreach.

5. Deep River dredging for navigation

Wahkiakum County (suggested project lead),
 WA Department of Fish and Wildlife,
 US Army Corps of Engineers,
 Port District No. 2,
 State of Washington



Adaptive capacity

Motivation for adaptation:
 Strong community priority

High

Access to resources:

Expensive; requires studies and likely maintenance; proposal to US Army Corps in review

Low

Authority to implement adaptation decisions:

Tough permitting; reliance on US Army Corps to conduct all work; reliance on economic development at Miller Landing

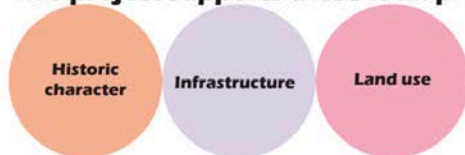
Low

Ability to learn and innovate:

Necessary study of hydrology and habitats can inform other efforts

Medium

This project supports these local priorities:



Suggested next steps

Wahkiakum County should:

- Submit funding/assistance proposal to US Army Corps [COMPLETE]
- Work with US Army Corps and others to conduct relevant studies and economic assessments to determine feasibility of dredging
- Conduct State and Federal advocacy and fundraising for next steps
- Ensure that economic development initiatives will be successful by addressing other needs for success
- Pursue additional approaches to reduce flood impacts and their underlying causes across Deep River watershed, in case dredging does not prove successful on its own.

WA Department of Fish and Wildlife should:

- Conduct studies about potential impacts to species/habitats of concern (or aggregate existing studies), and communicate results to interested parties.
- Communicate permitting requirements and concerns to interested parties.

US Army Corps of Engineers should:

- Lead a focused conversation with state agencies and elected officials from Wahkiakum County. This would outline the steps required for dredging and relevant hurdles/opportunities.

Who	Wahkiakum County (suggested project lead) , Port District No. 2, WA Department of Fish and Wildlife, State of Washington, US Army Corps of Engineers
What	Suggested project components include dredging Deep River for commercial and recreational access, and coordinating with dredging entities to minimize impacts of dredged materials placement on Grays River and Bay with Rice Island.
When	Near-term with future necessity: This project could help manage flooding that already occurs occasionally, affecting roads, farms, homes, and other infrastructure. Flooding is expected to increase in frequency and magnitude with sea level rise and future weather conditions. Improved economic viability of the Deep River area may have additional benefits.
Why	<p>Many community members and other interested parties described increasing sedimentation and along the lower Deep River, largely attributed to timber land management. This has reduced navigability of the river, in turn affecting the local economy and use of WDFW's Deep River boat launch.</p> <p>This supports local values and priorities: infrastructure, land use, and historic character.</p>
How	<p>This project is likely to happen if funds and community support are confirmed, based on adaptive capacity criteria:</p> <ul style="list-style-type: none"> • Motivation for adaptation: A majority of workshop participants were enthusiastic about this project. A minority of participants did not support this project, however. • Access to resources: This work would likely be led by the US Army Corps of Engineers. Local project supporters are unlikely to have the resources required without USACE partnership. This project is expected to bring economic benefits to the area. • Authority to implement adaptation decisions: This work would occur in both state and federal waterways, and is expected to require significant environmental review and federal leadership. While workshop participants have suggested potential ecological benefits, regulatory agencies have voiced concerns regarding impacts to lamprey and other species of concern. • Ability to learn and innovate: While dredging would likely need to occur more than once, this is a costly activity with limited opportunities to innovate based on learnings from previous work. Studies of hydrology and habitats will likely be required, and can inform other efforts across the watershed. If water levels are monitored upstream in flood-prone areas, this may also be able to inform other flood adaptation efforts. <p><u>Actions Taken:</u> USACE notified the project team of their Section 165(a) Pilot Program for Water Resources Projects for Small or Disadvantaged Communities funding/partnership opportunity, which is a competitive program for the USACE to fully fund small water resources projects.²⁵ The team assisted Wahkiakum County Commissioner Gene Strong to craft and submit a proposal to USACE in October 2023 to dredge Deep River for navigation purposes. At time of writing, no determination of funding had been received from USACE.</p> <p><u>Suggested next steps:</u></p> <ul style="list-style-type: none"> • Wahkiakum County should:

²⁵ https://www.usace.army.mil/Missions/Civil-Works/Project-Planning/Legislative-Links/wrda_2020/
Appendix H, Baker Bay and Grays Bay: 2024 Sea Level Rise Resilience Strategy

	<ul style="list-style-type: none"> ○ Submit funding/assistance proposal to USACE [COMPLETE]. ○ Work with USACE and others to conduct relevant studies and economic assessments to determine feasibility of dredging. <ul style="list-style-type: none"> ■ Pursue additional partnerships²⁶ and funding sources²⁷ to advance initial steps of flood impacts risk reduction (including dredging), in ways that do not require USACE but could support their potential future involvement: characterize sediment sources and movement, characterize specific flooding causes and their interactions, identify and assess alternative actions to address flooding, and other necessary steps. ■ Leverage Wahkiakum County’s 2024 Comprehensive Flood Hazards Mitigation Plan to access funds such as Washington State Department of Ecology’s Flood Control Assistance Account Program. ■ Identify additional business interests or other parties which would use the waterway in a manner which would require maintenance dredging. ■ Develop alternative land-based uses for water-dependent commercial sites as backup. If dredging proves infeasible, these uses can remain and generate revenues. If dredging proves feasible, these uses can supplement revenues and public interface opportunities for water-dependent activities. ○ Engage with the Corps through multi-stakeholder forums such as Lower Columbia Solutions Group²⁸ or other programs related to Beneficial Use of Dredged Material (BUDM), build relationships through multiple staff and local knowledge-holders, find common goals and leverage these to meet local needs. ○ Conduct State and Federal advocacy and fundraising for next steps. ○ Pursue additional approaches to reduce flood impacts and their underlying causes across Grays River watershed, in case dredging does not prove successful on its own. Alternative approaches may be able to assist flood impacts reduction on their own or in tandem with dredging. If dredging proves feasible, these alternative approaches can provide additional flood reduction and lower recurring dredging maintenance costs. See Grays Bay project #2, “Grays Bay Watershed-Wide Coordination”. <ul style="list-style-type: none"> ● WA Department of Fish and Wildlife should: <ul style="list-style-type: none"> ○ Conduct studies about potential impacts to species/habitats of concern (or aggregate existing studies), and communicate results to interested parties. ○ Communicate permitting requirements and concerns to interested parties. ● US Army Corps of Engineers should: <ul style="list-style-type: none"> ○ Lead a focused conversation with state agencies and elected officials from Wahkiakum County and Grays River Flood Control District. This would outline the steps required for dredging and relevant hurdles/opportunities.
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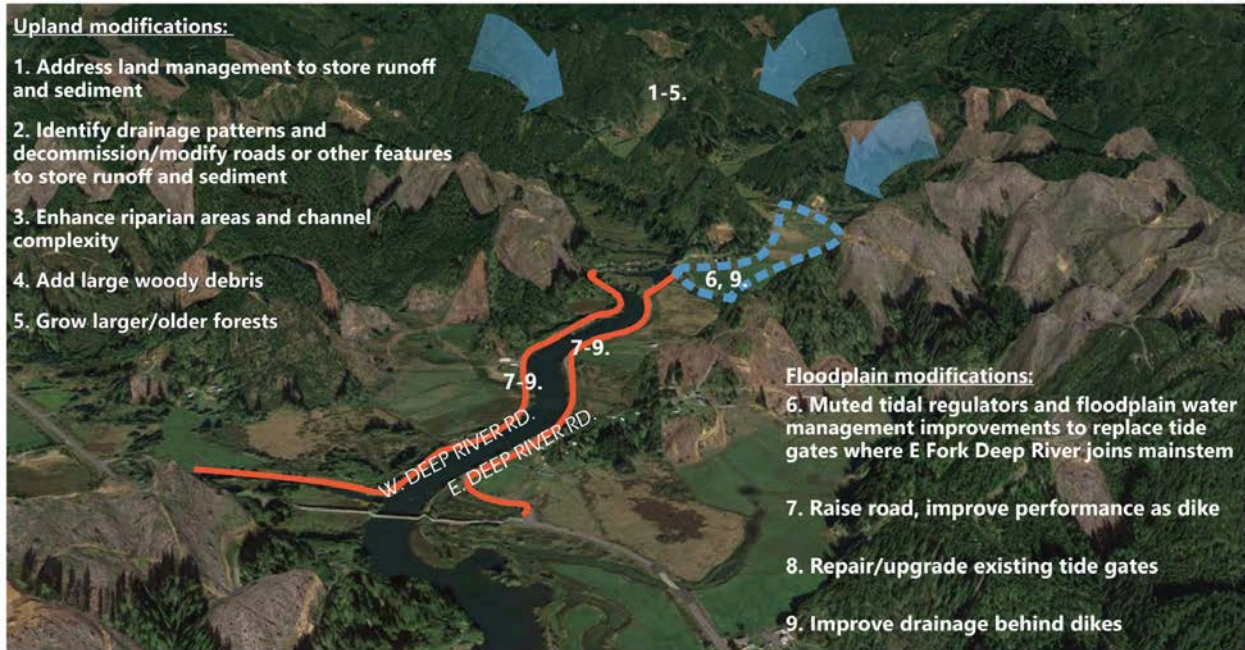
²⁶ With engineers and/or research and modeling organizations such as PNNL or Columbia River Inter-Tribal Fish Commission’s (CRITFC) [Coastal Margin Observation & Prediction program \(CMOP\)](#).

²⁷ For example, [FEMA’s Cooperating Technical Partners program](#) or Ecology’s [Flood Control Assistance Account Program](#), which is related to the County’s 2024 Comprehensive Floodplain Hazard Management Plan update. .

²⁸ <https://lowercolumbiasolutions.org/>

6. Deep River: watershed-wide coordination

CREST (suggested project lead), Timber landowners,
Private Landowners, Columbia Land Trust,
Wahkiakum County, Grays River Grange



Adaptive capacity

Motivation for adaptation:

Some efforts already occurring which may address bulk of flooding; addresses both underlying causes and small-scale projects

High

Access to resources:

Costly and private parcel projects may not be competitive for grants; leadership needed; limited studies exist

Low

Authority to implement adaptation decisions:

TBD distributed projects can focus on interested landowners

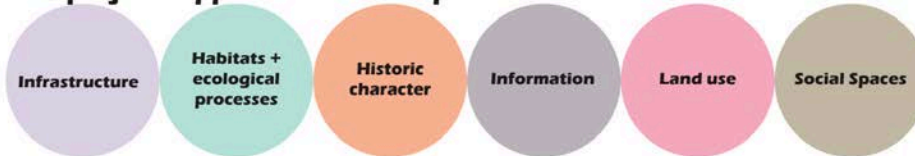
Medium

Ability to learn and innovate:

Can learn from existing studies and examples elsewhere; potential for prototypes + revision

High

This project supports these local priorities:



Suggested next steps

CREST should:

- Create project briefs about their planned and/or ongoing work at the East Deep River Road culverts to share at public meetings and on a project webpage.
- Identify a point of contact or project lead to assist with flood impacts reduction (especially upgrade/repair of tide gates and drainage improvements behind dikes. Continue to attend local events.

Wahkiakum County should:

- Assist CREST and landowners to hold regular conversations about Deep River flooding issues.
- Assist CREST and landowners to connect with timber landowners in order to address upland impacts on lowland flooding.

Local residents and landowners should:

- Continue to collaborate with CREST to address flood issues.
- Consider multiple approaches to address flood issues at larger scales that involve coordination across multiple partners.
- Consider whether formation of a Deep River Flood Control District would be a valuable and effective way to address flooding

Who	CREST (suggested project lead) , private landowners, ²⁹ Wahkiakum County, Timber landowners, Columbia Land Trust, Grays River Grange
What	<p>Suggested project components incorporate both upland modifications and floodplain modifications. CREST has successfully built strong relationships in the Deep River area based on ongoing work, however the key staff member who led CREST's efforts is no longer with them. Ongoing work will require trust-building and continual engagement by new CREST staff in order to proceed in a similar fashion.</p> <p>Potential upland modifications which received positive workshop response include:</p> <ul style="list-style-type: none"> ● addressing land management to store runoff and sediment; ● identifying drainage patterns and decommissioning/modifying roads or other features to store runoff and sediment; ● enhancing riparian areas and channel complexity; ● adding large woody debris; and ● growing larger/older forests. <p>Potential floodplain modifications include:</p> <ul style="list-style-type: none"> ● improvements to road crossings (e.g. installation of muted tidal regulators) and floodplain water management to replace tide gates where East Fork Deep River joins the mainstem; ● raising the road to improve its performance as a dike; ● replacing/upgrading existing tide gates; and ● improving drainage behind the dikes. <p>A regular action-oriented community forum can ensure that actions to reduce flood impacts across the watershed are synergistic with related efforts and communicated to interest parties, while exploring options not listed above.³⁰ See Grays Bay project #2 (Grays River watershed-wide coordination) for additional insights on collaborative management and development of synergistic projects.</p>
When	Near-term with future necessity: This project would help manage flooding that already occurs occasionally, affecting roads, homes, farms, and other infrastructure. Flooding is expected to increase in frequency and magnitude with sea level rise and future weather conditions.
Why	<p>Storm events regularly cause nuisance flooding across low-lying areas of Deep River. Anecdotally this is exacerbated by upland forest management practices which increase lowland flooding and sedimentation. Much local flooding can be attributed to rainfall, as many flooded areas are behind dikes or tide gates.</p> <p>Throughout the project, community members mentioned land use and upland forestry practices as a major issue exacerbating flooding. Timber harvest practices on privately-owned lands have caused increased erosion on those lands and sedimentation within the downstream depositional reaches of streams and rivers. This sedimentation results in decreased capacity of those waterbodies to absorb river flows - both tributary and Columbia River, which in turn increases flooding to nearby areas. Historically, high river flows would have deposited sediment onto the floodplains, when the river overtopped its banks - allowing the valley bottoms to naturally accrete sediment. However, levees and dikes built to protect infrastructure, farms, and local communities have cut off these sedimentation processes. Ironically, lands located behind levees and dikes are frequently subsiding from the lack of sediment supply, which in turn exacerbates local flooding problems. Meanwhile, sediment settles out within low gradient, slow velocity sections of the</p>

²⁹ Including Real Property Rights Advisory Group

³⁰ This could be similar to the Wahkiakum County Restoration and Conservation Working Group, although with a smaller geography, more regular meetings, and a process to identify tangible mutually-agreed-upon goals

	<p>streams, rivers, and bays, building up over time and reducing the capacity of the waterbody (e.g. lower Deep River) to convey water downstream.</p> <p>Without resolving the issue of eroding lands in the upland areas of the watersheds, this cycle is bound to continue and intensify, becoming more problematic as storm events become more intense and frequent and Columbia River tides increase with rising sea levels. Timber companies were not directly engaged through this project’s engagement and workshops.</p> <p>This supports local values and priorities: infrastructure, land use, historic character, social spaces, information, and habitats and ecological processes.</p>
How	<p>This project is likely to happen if funds and community support are confirmed, based on adaptive capacity criteria:</p> <ul style="list-style-type: none"> ● Motivation for adaptation: Some efforts already occurring which may address bulk of flooding; addresses both underlying causes and small-scale projects. ● Access to resources: Costly and private parcel projects may not be competitive for grants; leadership needed; limited studies exist. The Deep River watershed shares some characteristics with the Grays River watershed, but it has less available research to build from. There is no County special district to assist with flood control in Deep River, manage funding, and support collaborative conversations. Without a public entity to work through, it may be harder to find grant funds unless flooding impacts public infrastructure and/or has high ecological value. While CREST is still involved, the departure of key staff is a setback. ● Authority to implement adaptation decisions: TBD distributed projects can focus on interested landowners. ● Ability to learn and innovate: Due to the limited amount of research on the Deep River watershed, there is much information that can inform successful adaptation efforts. Interested parties can also learn from case studies elsewhere. Potential for collaborative modeling and pilot projects can allow for adaptive management to inform successful efforts. <p><u>Actions taken:</u> The project team worked with the Wahkiakum County Marine Resources Committee and Wahkiakum County Port District #2 to write a successful grant proposal to the Washington State COHORT (Coastal Hazards Organizational Resilience Team, via Washington State legislative funding), in order to take next steps on project #2, Grays River watershed-wide coordination via outreach and educational opportunities (e.g. learning about case studies and visiting related project sites). Work is currently starting.</p> <p><u>Suggested next steps:</u></p> <ul style="list-style-type: none"> ● CREST should: <ul style="list-style-type: none"> ○ Create project briefs about their planned and/or ongoing work at the East Deep River Road culverts to share at public meetings and on a project webpage. ○ Identify a point of contact or project lead to assist with flood impacts reduction (especially upgrade/repair of tide gates and drainage improvements behind dikes. ○ Continue to attend local events. ● Wahkiakum County should: <ul style="list-style-type: none"> ○ Assist CREST and landowners to hold regular conversations about Deep River flooding issues. ○ Assist CREST and landowners to connect with timber landowners in order to address upland impacts on lowland flooding.

- Local residents and landowners should:
 - Continue to collaborate with CREST to address flood issues.
 - Consider multiple approaches to address flood issues at larger scales that involve coordination across multiple partners.
 - Consider whether formation of a Deep River Flood Control District would be a valuable and effective way to address flooding.
 - Build a relationship with Jason Smith at CREST to advance this work in light of Tracy Hruska's absence.

- State and federal agencies should:
 - Identify a point of contact for collaboration with the watershed-wide forum, in order to ensure accurate information is available, trust is built, funding opportunities are leveraged, and agency-supported activities are advanced.

- All partners could:
 - Explore potential funding to sustain this forum and specific projects that are developed through it.
 - Identify how to engage productively with private timber land owners, state agencies, and federal agencies.
 - Engage with the Corps through multi-stakeholder forums such as Lower Columbia Solutions Group or other programs related to Beneficial Use of Dredged Material (BUDM), build relationships through multiple staff and local knowledge-holders, find common goals and leverage these to meet local needs.
 - Refer landowners and managers to this forum before they initiate projects, in order to ensure they are acting in coordination with adjacent areas and leveraging available funds and information.
 - Identify locations where multiple adjacent parcel owners are interested to reduce flooding through nature-based approaches, and create test cases to demonstrate how these can work. Monitor and communicate results, and adjust approaches accordingly through adaptive management. Multi-parcel approaches may be more likely to reduce flood impacts, and are likely to be competitive for funding if they also can address habitat considerations. Multiple funding sources may be appropriate for this work.
 - Continue to engage with the Washington State COHORT (Coastal Hazards Organizational Resilience Team³¹).
 - Build relationships with county permitting and planning departments, WDFW habitat biologists and permitting staff, WA State Department of Ecology permitting staff, US Army Corps of Engineers permitting staff, and Tribal departments or leaders interested in these topics.
 - Document tangible impacts from flooding in measurable terms, and clearly communicate these impacts to funders, media, and others.
 - Coordinate monitoring efforts across the entire watershed.
 - Ensure public visibility: some of this work may already be happening, but interested parties may not be aware of activities or their results. Broad support and awareness for this work is necessary for landowner coordination and otherwise.

³¹ <https://wacoastalnetwork.com/cohort/>

Cross-cutting recommendations for sea level rise resilience

When these six Grays Bay sea level resilience projects' adaptive capacities are viewed side-by-side (Fig. H.2), we see that resources and authority are all limiting factors for most projects (5/6 and 4/6, respectively). Motivation is high for most projects (4/6).

When we look at the number of times that each organization was suggested as a key project participant for Grays Bay projects (Fig. H.3), we see that Wahkiakum County, Columbia Land Trust, Port District #2, the State of Washington, and the US Army Corps of Engineers are all part of the majority of resilience projects identified through workshops.

Resulting recommendations include:

- Regular communication regarding hazards, habitat changes, and land use across Baker Bay could build relationships between key entities: Wahkiakum County, Columbia Land Trust, and Port District #2. While private landowners (both residential and timber land owners) are key parts of ecological processes related to flooding in the Grays Bay area, coordination between the County, Land Trust, and Port offers an opportunity to engage these private groups and develop collaborative resilience projects. Relationships across these organizations and Washington State agencies is likely to lead to increased access to resources and authority to implement resilience actions.
- Local jurisdictions and special districts (Wahkiakum County, Port District #2, Grays River Flood Control District, and Wahkiakum Conservation District) should make sure to engage with Columbia Land Trust about opportunities to collaborate on day-to-day activities as well as large-scale or long-range activities. Columbia Land Trust should ensure that their activities accommodate local needs and priorities, also.
- Collaborative approaches and large funding is necessary for all of these projects. Lessons learned from emerging projects should be shared across project partners, perhaps through a continued resilience forum. Washington State agencies can provide assistance, and should be involved at an early stage. This can also assist early-stage determinations of feasibility for projects that have much community support but limited likelihood of being permitted, in order to develop more feasible projects.
- State and federal elected officials are key to unlocking funding for complex projects involving watershed-wide coordination and federal navigation channel operations. They are also likely to have an audience with the US Army Corps of Engineers. Local interested parties would benefit from understanding pathways to working with the US Army Corps, as well as the Corps' limitations.
- Due to the scale and complexity of several of these projects, they will continue to involve multiple generations. While ongoing research may be necessary, it is also necessary that local and regional education programming allows youth and today's interested parties to learn about hydrologic processes and floodplain functions; case studies and their lessons learned from projects of interest (including field visits); local activities, projects, and culture throughout local watersheds; and ever-changing socio-ecological dynamics.
- While potential projects and plans may abound, there are also realistic concerns about unexpected impacts from policy and land use change on surrounding residents. This could be addressed through legal/policy inquiry, education and outreach campaigns, and/or pilot projects.³²

³² For example, there are concerns around Grays Bay regarding properties being newly regulated by the County's Shoreline Master Program if restoration actions occur next door. Additional inquiry seems necessary to understand whether land that becomes within 200' of a shoreline due to new restoration or water management work is subject to shoreline regulations, and how this may limit use of property.

	Motivation	Resources	Authority	Innovation
Grays Bay projects				
1. Grays River dredging to reduce flood impacts	likely to happen	low likelihood or requires significant effort	low likelihood or requires significant effort	somewhat likely
2. Grays River: coordinated flood impacts reduction projects across watershed	likely to happen	somewhat likely	somewhat likely	likely to happen
3. Grays River gages	somewhat likely	low likelihood or requires significant effort	likely to happen	likely to happen
4. Grays River modeling	low likelihood or requires significant effort	likely to happen	likely to happen	likely to happen
5. Deep River navigation channel dredging	likely to happen	low likelihood or requires significant effort	low likelihood or requires significant effort	somewhat likely
6. Deep River: coordinated flood impacts reduction projects across watershed	likely to happen	low likelihood or requires significant effort	somewhat likely	likely to happen

likely to happen
somewhat likely
low likelihood or requires significant effort

Figure H.2. Adaptive capacity across six Grays Bay sea level rise resilience projects.



Figure H.3. Groups or organizations arranged according to the amount of times they were listed as a Grays Bay project partner. Groups with suggested involvement in five projects are at the top, descending to groups with suggested involvement in one project at the bottom. This does not include regulatory roles, technical service providers, or other interested parties.