

Appendix E:

Resilience projects and next steps for Baker Bay

Priority activities and suggested next steps	2
Detailed project descriptions	
1. Ilwaco shoreline flood protection	5
2. Ilwaco distributed stormwater management	8
3. Lower Wallacut River water management and flood adaptation	11
4. Chinook Hatchery and Houchen St. flood impacts reduction	14
5. Chinook shoreline erosion reduction and habitat enhancement	17
6. Ilwaco and Chinook (Pacific County) upland housing planning and development	20
Cross-cutting recommendations for sea level rise resilience	23

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 (Figure E.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 E.1, were identified for Baker Bay based on community input. Baker Bay resilience workshops led to the submission of 5 grant proposals in collaboration with local and regional partners. Three of these grants are specific to projects and are described below (#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 not yet heard about the success of these grants.

¹ See *Appendix B. Methods* and *Appendix D. General Adaptation Approaches for Baker 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.

BAKER BAY PROJECTS

1. Ilwaco shoreline flood protection
2. Ilwaco distributed stormwater management
3. Lower Wallacut River water management and flood adaptation
4. Chinook Hatchery and Houchen Street flood impacts reduction
5. Chinook shoreline erosion reduction and habitat enhancement
6. Ilwaco and Pacific County housing planning and upland acquisition



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

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

Baker Bay sea level rise resilience projects		
Activity	Support from project team ⁵	Key next step(s) ⁶
1. Ilwaco shoreline flood protection	Grant proposal for berm at marina only, unsuccessful (via Port of Ilwaco, 2021)	Identify a competitive funding strategy to assess alternatives, incorporate public input, design, and implement this project
2. Ilwaco distributed stormwater management	Green stormwater infrastructure being installed at Port of Ilwaco (via LCEP); grant proposal to Washington State Department of Commerce’s 2024 Salmon Recovery Through Local Planning program (via City of Ilwaco) ⁷	Secure funds to analyze existing conditions, assess alternatives in coordination with community members, design relevant distributed stormwater management, and implement stormwater management through projects, planning, or otherwise.
3. Lower Wallacut River water management and flood adaptation	Ongoing coordination with Pacific County’s Sea Level Rise Vulnerability Assessment , Phases 1 and 2, and City of Ilwaco’s Sea Level Rise Vulnerability Assessment	Identify a competitive funding strategy and submit funding proposal(s) to analyze existing conditions, assess alternatives in coordination with community members, design relevant synergistic project components, and implement preferred project components through projects, and planning.
4. Chinook Hatchery and Houchen Street flood impacts reduction	Initial coordination with Sea Resources, Inc. personnel.	Identify a competitive funding strategy and timeline to analyze existing conditions, assess alternatives in coordination with adjacent landowners and regulators, and develop a project design.
5. Chinook shoreline erosion reduction and habitat enhancement	Grant proposals submitted to the US Army Corps of Engineers’ 2023 Section 165(a) Pilot Program for Small or Disadvantaged Communities program and National Fish and Wildlife Foundation’s 2024 National Coastal Resilience Fund (via Port of Chinook and PCD, respectively) ⁸	Secure funds to analyze existing conditions, coordinate with community members and landowners to identify goals and concerns, assess potential alternatives, and develop initial design to inform permitting discussions
6. Ilwaco and Chinook (Pacific County) upland housing planning and development	None	Develop a working group to - among other tasks - conduct local, state, and federal outreach to gauge public interest and potential pathways to acquiring and developing uplands for housing. This could inform a work plan and feasibility assessment so the City and/or County can better understand opportunities and constraints for this work. This could also identify a dedicated lead organization.

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. Ilwaco shoreline flood protection



Adaptive capacity

Motivation for adaptation:

Past interest from Port of Ilwaco; economic benefits

High

Access to resources:

Past grant unsuccessful due to low benefit-cost ratio

Low

Authority to implement adaptation decisions:

Port owns majority of project footprint; no in-water work expected

High

Ability to learn and innovate:

Collaborative design for public space; ongoing City sea level rise study

High

This project supports these local priorities:

Infrastructure

Water Access

Social Spaces

Housing

Suggested next steps

Project lead (likely **Port of Ilwaco or City of Ilwaco**) should:

- Decide if/when to address this issue.
- Solicit technical assistance as needed from consultant(s), the Washington State COHORT, and/or others.
- Identify a competitive funding strategy to assess alternatives, incorporate public input, design, and implement this project, potentially combined with stormwater management in downtown Ilwaco (see separate project description).
- Submit funding proposal(s) and continue toward implementation.

Port of Ilwaco tenants and shoreline property owners should:

- Document previous and ongoing flooding issues and impacts, and share this information with the Port, the City, and/or Pacific Conservation District for use with funding proposals.

City of Ilwaco (and consultants) should:

- Use their ongoing sea level rise vulnerability assessment to better characterize and map expected flooding and sea level rise impacts to the marina and downtown areas, and how this relates to groundwater levels and precipitation/stormwater.

Who ⁹	Port of Ilwaco (suggested project lead) , Port of Ilwaco tenants, City of Ilwaco, shoreline property owners, TBD technical assistance providers ¹⁰
What	Installation of flood protection berm or other flood-adaptive features along Port of Ilwaco Marina, potentially extending to Cooks Hill.
When	Near-term with future necessity: This project would manage flooding that already occurs occasionally. Flooding is expected to increase in frequency and magnitude with sea level rise and future weather conditions.
Why	High waters associated with king tides occasionally impact the port and the adjacent shoreline. Participants cited the economic and cultural significance of mitigating flooding around the Marina and downtown roads. This supports local values and priorities: infrastructure, housing, social spaces, and water access.
How	This project is likely to happen if funding can be secured , based on adaptive capacity criteria: <ul style="list-style-type: none"> ● Motivation for adaptation: The Port has already expressed interest in this concept in the past. This would address present and future hazards issues, would improve local economic viability, and could be designed as an amenity at the marina.¹¹ ● Access to resources: Identification of a funding source(s) for design and implementation is a priority need. The Port’s 2020 proposal to FEMA’s BRIC program was not successful due to a low benefit-cost ratio, but FEMA has since revised their methods to be more equitable. ● Authority to implement adaptation decisions: The Port owns the majority of the project area, and has the authority to implement this project if funding is available. Permitting is not expected to be a significant barrier. ● Ability to learn and innovate: <ul style="list-style-type: none"> ○ The City of Ilwaco is conducting a sea level rise vulnerability assessment (2024-25), which can refine the scope/need for a flood protection berm. ○ The berm could be altered to accommodate future conditions as needed. ○ As one of the most economically significant places in Pacific County, there is an opportunity to improve a popular public space at Port of Ilwaco Marina by working with current tenants, visitors, and others already connected to the site. <p><u>Suggested next steps:</u></p> <ul style="list-style-type: none"> ● Project lead (likely Port of Ilwaco or City of Ilwaco) should: <ul style="list-style-type: none"> ○ Decide if/when to address this issue. ○ Solicit technical assistance as needed from consultant(s), the Washington State COHORT,¹² and/or others.

⁹ “Who” describes likely project partners that are directly affected and would be necessary to advance this work. This does not include regulatory agencies, funding organizations, supporting organizations, or other entities not directly affected. The Chinook Indian Nation was regularly mentioned as an interested party for multiple projects, but not with regard to a specific role.

¹⁰ For example: private consultants, CREST (Columbia River Estuary Study Taskforce), Washington State COHORT (Coastal Hazards Organizational Resilience Team), Pacific Conservation District, and/or others.

¹¹ Participants noted the design must be aesthetically pleasing along the marina, and the berm must be low enough to neither block views nor disconnect Port tenants from the water. The design must address underground utilities.

¹² The COHORT (Coastal Hazards Organizational Resilience Team) is made up of staff from Washington State Emergency Management Division, Department of Ecology, Washington Sea Grant, and WSU Extension. The COHORT aims to collaborate with coastal communities to address current and future challenges arising from changing coastal systems: www.wacoastalnetwork.com/cohort

- **Identify a competitive funding strategy to assess alternatives, incorporate public input, design, and implement this project**, potentially combined with stormwater management in downtown Ilwaco (see separate project description).
- Submit funding proposal(s) and continue toward implementation.
- Port of Ilwaco tenants and shoreline property owners should document previous and ongoing flooding issues and impacts, and share this information with the Port, the City, and/or Pacific Conservation District for use with funding proposals.¹³
- City of Ilwaco should:
 - Use their ongoing sea level rise vulnerability assessment to better characterize and map expected flooding and sea level rise impacts to the marina and downtown areas, and how this relates to groundwater levels and precipitation/stormwater.

¹³ Flooding and king tide photographs can be easily shared via the MyCoast app: www.mycoast.org/wa
Appendix E, Baker Bay and Grays Bay: 2024 Sea Level Rise Resilience Strategy

2. Ilwaco stormwater management

Upland drainage area:
slow and store stormwater before it runs downhill

Lowland (downtown) drainage area:
slow and store stormwater before it runs to drainage ditch

Port of Ilwaco drainage area:
slow and store stormwater before it runs into bay/marina
currently in development with Lower Columbia Estuary Partnership, primarily for water quality

City of Ilwaco (suggested lead)
Local landowners and residents
Local businesses
Port of Ilwaco

EXAMPLE STORMWATER SWALE

Stormwater runoff compounds tidal flooding, and increased rainfall will combine with higher future tides to exacerbate current problems.

Green stormwater infrastructure integrated into public space and private properties across town, to **slow, store, and evapotranspire rainwater where it falls:**

- bioswales
- rain gardens
- increased urban tree canopy
- other community-sourced ideas

Adaptive capacity

Motivation for adaptation:

Relies on willingness of landowners; Port already implementing GSI

Medium

Access to resources:

Multiple applicable funding sources; grant currently in development.

Medium

Authority to implement adaptation decisions:

Private landowners, City, and Port can each lead distributed projects

High

Ability to learn and innovate:

Small distributed projects can be modified with new learnings

High

This project supports these local priorities:



Suggested next steps

Project lead (likely **City of Ilwaco**) should:

- Use the City's ongoing sea level rise vulnerability assessment to better characterize and map expected flooding and sea level rise impacts to the marina and downtown areas, and how this relates to groundwater levels and precipitation/stormwater.
- Submit funding proposal(s) and continue toward implementation.
- Once funds are secured, analyze existing conditions, assess alternatives in coordination with community members, design relevant distributed stormwater management, and implement stormwater management through projects, planning, or otherwise.

City of Ilwaco residents and property owners should:

- Document previous and ongoing flooding issues and impacts, and share this information with the Port, the City, and/or Pacific Conservation District for use with funding proposals.
- Attend City of Ilwaco's TBD public workshops and educational activities to inform stormwater design and planning, if grant funds are secured.

Who	City of Ilwaco (suggested project lead) ; Port of Ilwaco, residents, landowners, businesses, and other organizations in downtown Ilwaco and the Vandalia neighborhood; TBD technical assistance provider(s)
What	Distributed stormwater infrastructure across Ilwaco and the Vandalia neighborhood (such as swales, rain gardens, and other green stormwater infrastructure spread across strategic areas of town).
When	Near-term with future necessity: This project would help manage flooding that already occurs occasionally, affecting roads, homes, businesses, and other infrastructure. Flooding is expected to increase in frequency and magnitude with sea level rise and future weather conditions. This project may assist the <i>Ilwaco shoreline flood impacts reduction</i> project.
Why	Storm events regularly cause nuisance flooding across low-lying areas in the City of Ilwaco, affecting residences, roadways, and more. This is compounded by high tides. Distributed stormwater management would manage stormwater where it falls. This can slow and store stormwater, reduce reliance on centralized infrastructure (e.g. drainage ditches which are at max capacity), and reduce the compounding impact of high tides and sea level rise on local flooding. This supports local values and priorities: infrastructure, housing, and social spaces.
How	This project is likely to happen if funds and community support are confirmed , based on adaptive capacity criteria: <ul style="list-style-type: none"> ● Motivation for adaptation: Distributed stormwater management’s success relies on the willingness of public and private entities to incorporate water management on their properties, so additional outreach is needed across the community. Initial signs are positive: <ul style="list-style-type: none"> ○ Residents have reached out to the project team highlighting nuisance flooding. ○ The Port of Ilwaco has initiated design and construction of distributed stormwater infrastructure across their parking lots, with favorable community reception.¹⁴ ○ On Port property, planned construction of the Dylan Jude Harrell Community Center has elicited concerns from community members regarding flooding, which could be alleviated through this approach. ○ The City has previously invested in neighborhood-scale water management, signaling willingness to take on focused projects. ● Access to resources: Funds are not on-hand for this work but there are multiple funding sources that may be applicable. The project team has worked with the City of Ilwaco to submit one grant proposal for this work, and is awaiting selection of grant recipients.¹⁵ ● Authority to implement adaptation decisions: Private property owners, City of Ilwaco, and other landowners should have authority to implement green stormwater infrastructure if motivation and funds are available. Permitting is not expected to be a significant barrier. ● Ability to learn and innovate: The City of Ilwaco is conducting a sea level rise vulnerability assessment (2024-25), which can refine the scope/need for green stormwater infrastructure. The Port of Ilwaco’s in-development stormwater infrastructure also provides

¹⁴ <https://www.estuarypartnership.org/our-work/stormwater-projects/baker-bay-stormwater-project>

¹⁵ Salmon Recovery Planning grant through Washington State Department of Commerce, in order to advance planning, outreach, education, and project development for green stormwater infrastructure: <https://bit.ly/4aRidHT>. The proposed project would conduct community workshops and educational programs about stormwater management and urban tree canopy functions, using public input to guide code and plan updates that incentivize distributed green stormwater infrastructure. The project would also assist the City of Ilwaco Parks Department and Public Works to advance stormwater management projects. Other funds may be available via Washington State Department of Ecology, US EPA, or otherwise.

an opportunity to iteratively learn about infrastructure functionality and community perceptions. The Lower Columbia Estuary Partnership (partners on the Port's current stormwater management project) recently created a stormwater Project Manager position which may be able to support this work if funds/time are available. Distributed stormwater infrastructure is smaller and easier to modify than centralized stormwater infrastructure, allowing it to be reworked to accommodate future conditions as needed.

Suggested next steps:

- Project lead (likely City of Ilwaco) should:
 - Decide if/when to address this issue [COMPLETE].
 - Solicit technical assistance as needed from consultant(s), the Washington State COHORT, and/or others [COMPLETE].
 - Identify a competitive funding strategy to take next steps [COMPLETE].
 - Submit funding proposal(s) and continue toward implementation [COMPLETE].
 - Once funds are secured, **analyze existing conditions, assess alternatives in coordination with community members, design relevant distributed stormwater management, and implement stormwater management through projects, planning, or otherwise.**
 - Use the City's ongoing sea level rise vulnerability assessment to better characterize and map expected flooding and sea level rise impacts to the marina and downtown areas, and how this relates to groundwater levels and precipitation/stormwater.
- City of Ilwaco residents and property owners should:
 - document previous and ongoing flooding issues and impacts, and share this information with the Port, the City, and/or Pacific Conservation District for use with funding proposals.¹⁶
 - Attend City of Ilwaco's TBD public workshops and educational activities to inform stormwater design and planning, if grant funds are secured.

¹⁶ Flooding and king tide photographs can be easily shared via the MyCoast app: www.mycoast.org/wa
Appendix E, Baker Bay and Grays Bay: 2024 Sea Level Rise Resilience Strategy

3. Lower Wallacut River water management and flood adaptation

Pacific County (suggested project lead)
 City of Ilwaco
 Local landowners and residents
 Port of Ilwaco
 PUD #2
 Columbia Land Trust
 WA State DOT
 WA Department of Fish and Wildlife

If they are willing, **work with surrounding landowners to temporarily store and slow stormwater** in the floodplain, reducing compound flooding from rain and high tides

Floodproof homes, manage stormwater where it falls via swales, etc. **ensure new development is flood-resistant**

Stormwater runoff compounds tidal flooding, and increased rainfall will combine with higher future tides to exacerbate current problems. Both need to be addressed to reduce flood impacts along the Lower Wallacut River.

A muted tidal regulator (a type of tide gate) at the Stringtown Road river crossing can **limit tidal inundation of the neighborhood, allowing projects to focus on managing stormwater.**

EXAMPLE
STORMWATER SWALE

EXAMPLE
MUTED TIDAL REGULATOR

Adaptive capacity

Motivation for adaptation:

Existing issues impact many parties; complex approach requires coordination and planning

Medium

Access to resources:

High cost but likely competitive for grants; limited capacity at County

Medium

Authority to implement adaptation decisions:

Relies on support of multiple landowners

Medium

Ability to learn and innovate:

Multiple sub-projects can inform each other iteratively

High

This project supports these local priorities:



Suggested next steps

Project lead (likely **Pacific County or City of Ilwaco**) should:

- Use the City's ongoing sea level rise vulnerability assessment to better characterize and map expected flooding and sea level rise impacts to the marina and downtown areas, and how this relates to groundwater levels and precipitation/stormwater.
- Decide if/when to address this issue.
- Solicit technical assistance as needed from consultant(s), the Washington State COHORT, and/or others.
- Identify a competitive funding strategy and submit funding proposal(s) to analyze existing conditions, assess alternatives in coordination with community members, design relevant synergistic project components.
- Implement preferred project design, preferably in a phased approach that starts with muted tidal regulator and adds stormwater management as needed.

Lower Wallacut River residents and landowners should:

- Port of Ilwaco tenants and shoreline property owners should document previous and ongoing flooding issues and impacts, and share this information with the Port, the City, and/or Pacific Conservation District for use with funding proposals.

Who	City of Ilwaco, Pacific County¹⁷ (suggested project leads) , PUD #2, Port of Ilwaco, residents and landowners in/around the Vandalia neighborhood, Columbia Land Trust, WSDOT, WDFW
What	Assess and implement improved water management to reduce flood impacts along the lower Wallacut River around the Vandalia neighborhood, likely including culvert replacement, floodproofing homes, distributed stormwater management, and nature-based storage of flood waters.
When	Near-term with future necessity: This project would help manage flooding that already occurs occasionally, affecting roads, homes, and other infrastructure. Flooding is expected to increase in frequency and magnitude with sea level rise and future weather conditions.
Why	<p>Combined storm events and high tides regularly cause disruptive nuisance flooding across Ilwaco's Vandalia neighborhood,, affecting residences, roadways, Port of Ilwaco Airport, and more. Culvert replacement has been a priority for the County. Distributed stormwater management and nature-based flood water storage can slow and store stormwater, reduce reliance on centralized infrastructure (e.g. culverts), and reduce the compounding impact of high tides and sea level rise on local flooding.¹⁸ Since this historic wetland is naturally flood-prone, floodproofing of homes will likely be necessary alongside development regulations to reduce future hazards risk.¹⁹</p> <p>This supports local values and priorities: housing, agricultural viability, habitat, and infrastructure.</p>
How	<p>This project is likely to happen if funds and community support are secured, and if there is a local jurisdiction or other organization to lead this work, based on adaptive capacity criteria:</p> <ul style="list-style-type: none"> ● Motivation for adaptation: Recurring flooding of this area has been noted in workshops, with one resident and City Councilmember expressing interest in developing solutions. Due to the large number of private landowners in this area, project success would likely depend on their degree of motivation and interest in TBD project designs. ● Access to resources: While the County and WDFW have been working for years to replace failing culverts here, the high cost of culvert replacement and lack of capacity at Pacific County Public Works has limited progress. By focusing on addressing flooding across a larger area than the culverts alone, this project may provide more benefits and be more competitive for funding.²⁰ ● Authority to implement adaptation decisions This work would rely on the support of multiple landowners, who would all have authority to implement components of this project. Early and regular communication with them is required to better understand local issues and ensure their needs are met through the project. ● Ability to learn and innovate: More detail is needed to better understand flooding dynamics, local needs, and opportunities for multi-benefit solutions. This will greatly inform project design in service of a collaborative durable solution. The City of Ilwaco's Sea Level Rise Vulnerability Assessment and pending grant proposal to develop a distributed stormwater management strategy can inform this project. <p><u>Suggested next steps:</u></p> <ul style="list-style-type: none"> ● Project lead (likely Pacific County or City of Ilwaco) should: <ul style="list-style-type: none"> ○ Decide if/when to address this issue.

¹⁷ Specifically Pacific County Public Works

¹⁸ See separate project #2. Ilwaco distributed stormwater management

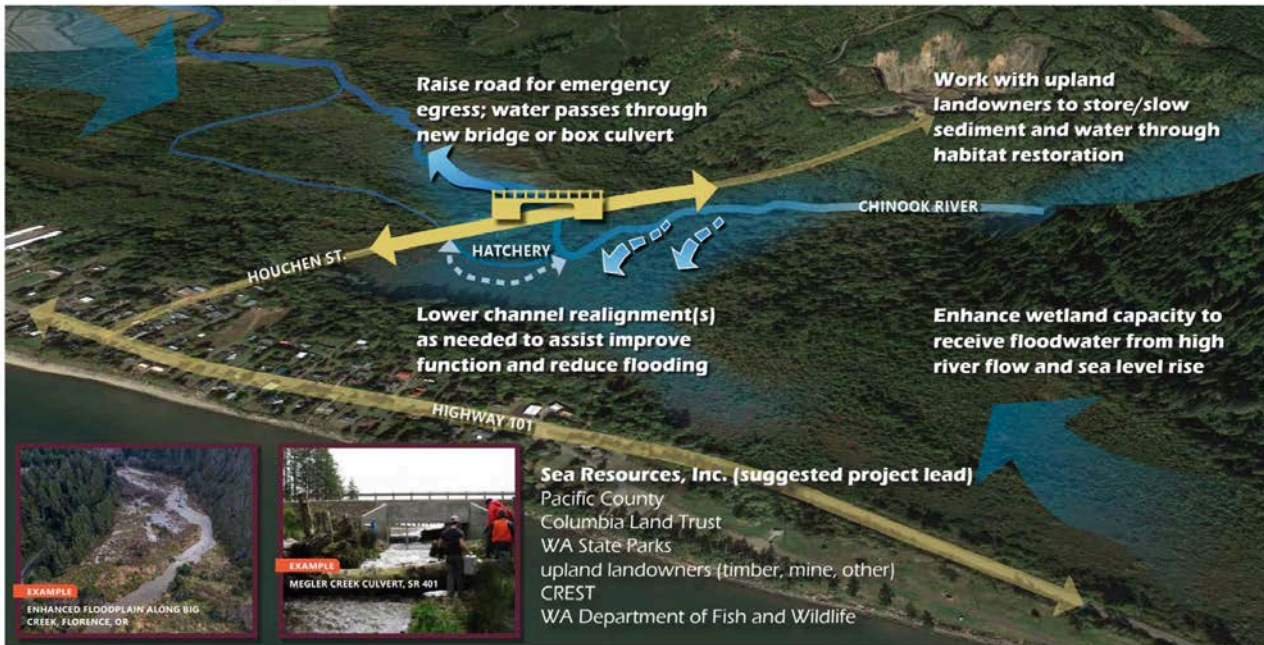
¹⁹ See separate project #6. Ilwaco and Chinook (Pacific County) upland housing planning and development

²⁰ Workshop participants suggested funding via US Department of Transportation, FEMA, HUD, or otherwise. National Fish and Wildlife Foundation may also be a viable funding source, as they funded these workshops and this report.

- Solicit technical assistance as needed from consultant(s), the Washington State COHORT, and/or others.
 - **Identify a competitive funding strategy and submit funding proposal(s) to analyze existing conditions, assess alternatives in coordination with community members, design relevant synergistic project components, and implement preferred project components through projects, and planning.**
 - Use the City's ongoing sea level rise vulnerability assessment to better characterize and map expected flooding and sea level rise impacts to the marina and downtown areas, and how this relates to groundwater levels and precipitation/stormwater.
- Residents and landowners should:
 - Port of Ilwaco tenants and shoreline property owners should document previous and ongoing flooding issues and impacts, and share this information with the Port, the City, and/or Pacific Conservation District for use with funding proposals.²¹

²¹ Flooding and king tide photographs can be easily shared via the MyCoast app: www.mycoast.org/wa
Appendix E, Baker Bay and Grays Bay: 2024 Sea Level Rise Resilience Strategy

4. Chinook Hatchery and Houchen St. flood impacts reduction



Adaptive capacity

Motivation for adaptation:

Sea Resources actively looking for solution(s); historic community asset

High

Access to resources:

Small volunteer-based organization; likely competitive for grants

Medium

Authority to implement adaptation decisions:

Relies on multiple large landowners; collaborative solution possible

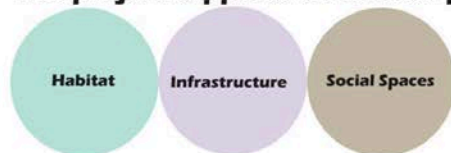
Medium

Ability to learn and innovate:

Hydrological/ecological assessments needed; group can learn together

High

This project supports these local priorities:



Suggested next steps

Project lead (likely **Sea Resources, Inc.**) should:

- Use the County's ongoing sea level rise vulnerability assessment to better characterize and map expected flooding and sea level rise impacts to the area, and how this relates to groundwater levels and precipitation/stormwater.
- Coordinate with adjacent landowners and technical assistance provider(s) to identify a competitive funding strategy
- Submit funding proposal(s) to analyze existing conditions, assess alternatives in coordination with adjacent landowners and regulators, and develop a project design.
- Implement preferred project design.

Adjacent landowners and land managers (e.g. **Columbia Land Trust, WA State Parks, Pacific County Public Works**) should:

- Consider their long-term goals for land/water management, what habitat restoration and flood reduction projects they would support, and how this relates to collaborative land management across multiple properties.

Who	Sea Resources, Inc (suggested project lead) , Pacific County, ²² Columbia Land Trust, upland landowners (timber, mine, others), CREST, ²³ WA Department of Fish and Wildlife, ²⁴ WA State Parks
What	<p>Coordination across landowners to manage Chinook River and reduce impacts from flooding and sedimentation, including potential raising of Houchen Street, flood adaptation for Chinook Hatchery, and upstream restoration.</p> <p>Participants highlighted the significance of long-term planning for the hatchery to promote long-term sustainability of salmon populations, local infrastructure, and local heritage. This could involve local education opportunities such as community science researching habitat changes' impacts.</p>
When	Near-term with future necessity: This project would help manage flooding that already occurs occasionally, affecting roads and hatchery infrastructure. Flooding is expected to increase in frequency and magnitude with sea level rise and future weather conditions. Future precipitation events may exacerbate ongoing sediment movement in the river.
Why	<p>Storm events regularly cause disruptive, nuisance flooding at the Chinook Hatchery and on Houchen Street, affecting homes and infrastructure (including the primary upland evacuation route from Chinook). This is compounded by high tides which can back up water of the Chinook River and associated wetlands. Future flooding is expected to be higher and more frequent. Addressing Hatchery and road flooding will likely require coordination across upland properties in order to manage water and sediment. The Hatchery has strong ties to community heritage.</p> <p>This supports local values and priorities: social spaces, infrastructure, and habitat.</p>
How	<p>This project is likely to happen if funds are secured and if landowners can develop a mutually-beneficial work plan, based on adaptive capacity criteria:</p> <ul style="list-style-type: none"> ● Motivation for adaptation: <ul style="list-style-type: none"> ○ Sea Resources Inc. is very interested to address flooding of their Chinook Hatchery and Houchen Street. They are also actively renovating the hatchery with hydrological assessment of the Chinook River in order to better understand why flooding and sedimentation are occurring, and if there are mu ○ As the state's oldest hatchery with long-running educational programs and partnerships, there is likely much public support for work assisting the Chinook Hatchery. ○ Most adjacent landowners (Columbia Land Trust, WA State Parks, private parties) are not affected by flooding but may be interested to collaborate if this work can advance restoration of the Chinook River alongside other public benefits. ● Access to resources: Sea Resources is a small organization with limited capacity to lead this work, which would involve ongoing collaboration and project assessments before any physical work could happen. Pacific Conservation District has been requested to assist with these issues but has limited capacity to lead the project currently. If a collaborative approach is pursued, this project is expected to be competitive for state or federal funding due to the restoration, community infrastructure, and educational programming that it would

²² Specifically Pacific County Public Works and Emergency Management Agency

²³ Technical service providers such as CREST are usually omitted from the “Who” section, but here they have conducted past restoration work in the area.

²⁴ Involved via technical assistance to hatchery and restoration work, rather than solely as a regulatory agency.

support.²⁵

- **Authority to implement adaptation decisions:** This work would rely on the support of multiple landowners, who would all have authority to implement components of this project. Early and regular communication with them is required to better understand issues and ensure their needs are met through the project. If common visions for the project are collaboratively developed, this project is expected to be implementable.
- **Ability to learn and innovate:** Initial steps might involve assessments to inform collaborative management of the river. By bringing together multiple stakeholders, innovative action and group co-learning may be more likely.

Suggested next steps:

- Project lead (likely Sea Resources) should:
 - Decide if/when to address this issue [COMPLETE.]
 - Solicit technical assistance as needed from consultant(s), the Washington State COHORT, and/or others [COMPLETE].
 - **Identify a competitive funding strategy and timeline to analyze existing conditions, assess alternatives in coordination with adjacent landowners and regulators, and develop a project design.**
 - Implement preferred project components.
 - Use the County's ongoing sea level rise vulnerability assessment to better characterize and map expected flooding and sea level rise impacts to the area, and how this relates to groundwater levels and precipitation/stormwater.
- Adjacent landowners and land managers (e.g. Columbia Land Trust, WA State Parks, Pacific County Public Works) should consider their long-term goals for land/water management, what habitat restoration and flood reduction projects they would support, and how this relates to collaborative land management across multiple properties.

²⁵ See Washington Coast Restoration and Resilience Initiative and National Fish and Wildlife Foundation's National Coastal Resilience Fund.

5. Chinook shoreline erosion reduction and habitat enhancement



Adaptive capacity

Motivation for adaptation:

Ongoing issues; previous project success; multi-organizational interest

High

Access to resources:

Limited local capacity for coordination; two grant proposals in review

Medium

Authority to implement adaptation decisions:

Requires landowner support ; significant permitting hurdles

Low

Ability to learn and innovate:

Existing project = prototype to learn from; adaptive management likely

High

This project supports these local priorities:



Suggested next steps

Project lead (likely **Port of Chinook**) should:

- Submit funding proposal(s) [COMPLETE]
- Once funding is secured, analyze existing conditions, coordinate with community members and landowners to identify goals and concerns, assess potential alternatives, and develop initial design to inform permitting discussions.
- Conduct engineering and modeling to understand long-term costs, effectiveness, and maintenance requirements.
- Identify which sources of dredged material are clean enough for in-water or shoreline placement.
- Continue regular coordination with shoreline stakeholders throughout project design, implementation, and lifecycle.

Chinook shoreline residents and property owners should:

- Document previous and ongoing erosion and/or accretion, impacts, and various species's presence along the shoreline (such as shorebirds, fish, or otherwise).
- Share this information with the Ports and/or Pacific Conservation District for use with funding proposals.

Who	Ports of Chinook and Ilwaco, Pacific County,²⁶ Pacific Conservation District²⁷ (suggested project leads), shoreline residents/businesses and landowners, Columbia Land Trust, CREST, ²⁸ WSDOT, WA State Parks, US Army Corps of Engineers ²⁹
What	Install a nature-based erosion reduction project along the Chinook shoreline, using natural materials such as cobble, large wood, sand (possibly via beneficial use of dredged material), and native plants.
When	Near-term with future necessity: This project would help manage erosion that already occurs occasionally, affecting public and private shorelines. Erosion is expected to increase in magnitude and frequency, and may spread to new areas with sea level rise and future weather conditions. This may also lead to flooding of homes and infrastructure.
Why	Erosion is ongoing and is expected to increase. Hardened shorelines reflect wave energy to adjacent areas and can exacerbate erosion elsewhere. This project would use natural materials to absorb wave energy and rebuild habitat along the shoreline, informed by a previous nature-based erosion reduction by Pacific Conservation District. ³⁰ This may also limit septic system damage and impacts to water quality. This supports local values and priorities: social spaces, infrastructure, water access, and habitat.
How	This project is likely to happen if funds and community support are confirmed , based on adaptive capacity criteria: <ul style="list-style-type: none"> ● Motivation for adaptation: <ul style="list-style-type: none"> ○ Some landowners have already initiated erosion reduction activities, while others have shown interest in additional work along their shoreline. County agencies, state agencies, and NGO landowners have expressed interest in this work.³¹ ○ Needed repair of “hard” protections is a burden for permitting and slows adaptation. ● Access to resources: <ul style="list-style-type: none"> ○ The project team has worked with the Port of Chinook (via Port of Ilwaco) to submit two grant proposals for this work, and is awaiting selection of grant recipients.³² ○ Limited local staff to lead outreach and coordination. Pacific Conservation District would be funded to be a local outreach lead with the above grant. Consultants or other non-local technical service providers could do much of the early work (such as sediment modeling, habitat analysis, etc.). ○ There are some concerns about the long-term cost of this work, as compared to its effectiveness. ● Authority to implement adaptation decisions:

²⁶ Specifically Pacific County Public Works

²⁷ Pacific Conservation District is usually considered a technical service provider and omitted from “Who” descriptions, but has led previous work along this shoreline.

²⁸ Technical service providers such as CREST are usually omitted from the “Who” section, but here they have conducted past restoration work in the area.

²⁹ Regarding the Corps’ waterways management and how their actions may affect the Chinook shoreline. Regulatory organizations are not listed in the “Who” category unless they play a larger role.

³⁰ <https://wacoastalnetwork.com/chinook-shoreline-stabilization/>

³¹ Letters of support for a grant were received from Port of Chinook, WSDOT, Columbia Land Trust, Pacific County Emergency Management Agency, and Washington State Department of Ecology.

³² US Army Corps of Engineers’ Section 165(a) Pilot Program for Disadvantaged Communities (Fall 2023) and National Fish and Wildlife Foundation’s National Coastal Resilience Fund (Spring 2024). The proposed project would conduct community/stakeholder outreach, initial shoreline analysis and alternatives assessment to determine project feasibility, and 30% design in order to pursue funds for final design and permitting.

- This project’s scale requires coordination across multiple shoreline landowners and jurisdictions. Previous work and support for grant proposals indicates that many landowners would support this project, but there are information gaps regarding near-term and long-term costs, effectiveness, and maintenance requirements.
- There are significant hurdles to permit shoreline treatments and dredged material placement, though soft shoreline treatments (e.g. dynamic revetments, large woody debris, other) are more likely to be permitted and funded than hardened shorelines (e.g. riprap). Depending on its design, this project will likely be complex to permit as it would involve in-water work and reuse of dredged material.
- **Ability to learn and innovate:**
 - Some landowners have already initiated a variety of erosion reduction activities. “Soft” nature-based approaches have been implemented successfully here without creating erosion on adjacent shorelines (as riprap and other hard armoring can do). Observation and communication about existing shorelines’ functions can assist community awareness, stakeholder support, and project design.
 - Nature-based shoreline treatments allow for ongoing adaptive management.
 - Modeling and monitoring would likely be required to design and implement this project. This can inform adaptive management and other project adjustments, and also be incorporated into local educational initiatives).³³

Suggested next steps:

- Project lead (likely Ports of Chinook and Ilwaco) should:
 - Decide if/when to address this issue [COMPLETE].
 - Solicit technical assistance as needed from consultant(s), the Washington State COHORT, and/or others [COMPLETE].
 - Identify a competitive funding strategy to take initial steps [COMPLETE].
 - Submit funding proposal(s) and continue toward implementation [COMPLETE].
 - **Once funding is secured, analyze existing conditions, coordinate with community members and landowners to identify goals and concerns, assess potential alternatives, and develop initial design to inform permitting discussions.**
 - Conduct engineering and modeling to understand long-term costs, effectiveness, and maintenance requirements. Ensure this assessment is done in coordination with local shoreline landowners and managers.
 - Identify which sources of dredged material are clean enough for in-water or shoreline placement.
 - Continue regular coordination with shoreline stakeholders throughout project design, implementation, and lifecycle.
- Chinook shoreline residents and property owners should:
 - Document previous and ongoing erosion and/or accretion, impacts, and various species’s presence along the shoreline (such as shorebirds, fish, or otherwise).
 - Share this information with the Ports and/or Pacific Conservation District.
- Pacific County should:
 - Consider whether to develop a pilot project for nature-based erosion reduction along Chinook County Park. A smaller project in this area would be easier to fund and could demonstrate the effectiveness of the nature-based solution for adjacent landowners and managers.

³³ See Sea Resources, Inc.’s educational programs and project #4 in this report.

6. Ilwaco and Chinook (Pacific County) upland housing development



Adaptive capacity

Motivation for adaptation:

Widespread interest; low expectations; supports tsunami safety

Medium

Access to resources:

Limited capacity for leadership; significant cost barrier to implement

Low

Authority to implement adaptation decisions:

Success depends on private landowners and real estate market

Low

Ability to learn and innovate:

Can learn from coastal Tribes moving upland and share with others

High

This project supports these local priorities:



Suggested next steps

Pacific County and/or City of Ilwaco should:

- Build upon University of Washington's recent housing studies for Pacific County, with focus on development safe from coastal hazards
- Develop a working group to - among other tasks - conduct local, state, and federal outreach to gauge public interest and potential pathways to acquiring and developing uplands for housing. This could inform a work plan and feasibility assessment so the City and/or County can better understand opportunities and constraints for this work. This could also identify a dedicated lead organization.
- In the near term, develop codes and incentives for increased density in non-hazard prone areas, low-impact development (LIDs), and upland development, with a focus on affordable or workforce housing.
- In the near-term, focus on small-scale pilot projects to acquire uplands for housing that is affordable/accessible and resilient. Relevant updates to codes and planning documents can assist this. Pilot projects could focus on potentially relocating Chinook Hatchery facilities upstream and/or providing upland housing for City of Ilwaco.

Private developers, landowners, or investors should:

- Consider if they are interested in this project, contact the City/County.

Local newspapers and interested organizations should:

- Include ongoing inquiries into this topic, to raise awareness, gauge public interest, and inform multi-benefit approaches. This could start by sharing results of this workshop series.

Who	City of Ilwaco. Pacific County³⁴ (suggested project leads) , PUD #2, local floodplain residents and landowners, upland landowners (timber, other), private investors, housing advocacy organizations, ³⁵ WA Department of Fish and Wildlife, ³⁶ Chinook Indian Nation
What	Develop hazard-resilient housing in uplands through pilot projects, long-term coordination, affordability, and policy.
When	Near-term with future necessity, through incremental steps: Much of Pacific County’s housing lies at low hazard-prone elevations. Portions of these areas currently are disrupted by nuisance flooding, which is expected to occur more often and with higher waters in the future.
Why	<p>Much of Pacific County’s housing lies at low hazard-prone elevations. While much of Pacific County is covered in hills, ridges, and ravines, most of this land is used for commercial timber harvest. Pacific County is in the midst of a housing crisis, and affordability and accessibility of homes is of utmost concern for community viability - particularly workforce housing. Upland housing development provides a logical and long-term opportunity to support community resilience, with potential for ecological restoration and hazards reduction in lowlands that become depopulated.</p> <p>Housing creation is important to sustain Pacific County’s workforce and livability. Participants cited concerns about low-income housing development in hazard-prone areas, which would expose the most vulnerable residents to hazards.</p> <p>This supports local values and priorities: housing, social (recreational) spaces, infrastructure, and habitat.</p>
How	<p>This project is likely to happen if sustained funding, local leadership, and community support are available, based on adaptive capacity criteria:</p> <ul style="list-style-type: none"> ● Motivation for adaptation: <ul style="list-style-type: none"> ○ Workshop participants expressed consistent interest in this work but motivation was low due to expectations that it was unlikely to happen. Developing City and/or County codes that encourage density in non-hazard prone areas, low-impact development (LIDs), and upland development could be possible in the near-term. ○ Acquisition and development of uplands would require a significant amount of public support, funding, and dedication to advance this work over a long period of time. Public support and leadership would need to endure while various other local issues remain as priorities. ○ This project could provide tsunami safe havens, bringing additional partners. ○ Pacific County is in the midst of a housing crisis, and affordability of homes is of utmost concern for community viability. This provides a mechanism for housing provision. ○ The City of Ilwaco has already purchased an upland community forest for drinking water security, showing interest in taking ownership of lands for public benefit. ● Access to resources: <ul style="list-style-type: none"> ○ Developing City and/or County codes that encourage density, low-impact development (LIDs), and upland development could be possible in the near-term with WA State planning grants or otherwise.

³⁴ Specifically Pacific County Department of Community Development, Economic Development Council, Emergency Management, and Public Works

³⁵ For example, Peninsula Poverty Response

³⁶ As flood prone housing is replaced by upland housing, WDFW may benefit from new habitat restoration opportunities. As such, they may be able to support the initial work to scope upland housing opportunities. Regulatory organizations are not listed in the “Who” category unless they play a larger role.

- Initial outreach, work plan development, and feasibility assessment could be fundable via WA State planning grants or otherwise.
- Upland development would require a significant amount of funding to acquire land, develop infrastructure, construct homes, and take other necessary steps. Acquisition of funds would require ongoing coordination across project partners, state and federal agencies, and others. FEMA, Washington State Emergency Management Division, and Department of Ecology may be valuable resources for connecting to funds for lowland buyouts and upland acquisition/development. Funds/action from private developers, landowners, and investors may be necessary.
- **Authority to implement adaptation decisions:** The success of this project depends largely on the actions of others in line with a common goal (residents, upland landowners, City/County officials and departments, funding programs, and others). Much of this may boil down to access to funds and upland landowners' willingness to sell.
- **Ability to learn and innovate:** Multiple Tribes along the Washington coast have initiated upland move/expansion projects. Their efforts provide examples to learn from.³⁷ This project would be the first non-Tribal community in Washington State to expand upland as a hazards resilience effort, which would garner state support and provide learnings for other communities.

Suggested next steps:

- Pacific County and/or City of Ilwaco should:
 - Build upon University of Washington's recent housing needs assessment for Pacific County, with focus on upland development away from coastal hazards risk.³⁸
 - **Develop a working group to - among other tasks - conduct local, state, and federal outreach to gauge public interest and potential pathways to acquiring and developing uplands for housing. This could inform a work plan and feasibility assessment to better understand opportunities and constraints for this work. This could also identify a dedicated lead organization.**
 - In the near term, develop codes and incentives for increased density in non-hazard prone areas, low-impact development (LIDs), and upland development, with a focus on affordable or workforce housing.
 - In the near-term, focus on small-scale pilot projects to acquire uplands for housing that is affordable/accessible and resilient. Relevant updates to codes and planning documents can assist this. Pilot projects could focus on potentially relocating Chinook Hatchery facilities upstream and/or providing upland housing for Ilwaco.³⁹
- Local newspapers and interested advocacy or outreach organizations should include ongoing inquiries into this topic, to raise awareness, gauge public interest, and inform multi-benefit approaches. This could start by sharing results of this workshop series.

³⁷ Participants recognized that both short-term and long-term strategies are needed for community and ecological resilience. Short-term approaches may involve flood mitigation efforts discussed elsewhere in this report. In the long-run, participants suggest that a relocation plan is necessary for some areas, but would be difficult to fund in the short-run. Such large relocation projects will need to provide incentives for people to move, such as desirable road access, infrastructure, utilities, and permitting. Continuous community outreach would be necessary to engage and inform the community about the long-term economic impacts from sea level rise, and opportunities that can come from upland development.

³⁸ <https://lcy.be.uw.edu/pacific-county-2022-2023/>

³⁹ Upland moves were mentioned by workshop participants for these projects (#1, 2, 3, and 4 in this report), noting there needs to be strategic communication planning and public outreach to clearly describe relocation concepts to the public, making it understandable and approachable. Additional community meetings are needed to understand local views.

Cross-cutting recommendations for sea level rise resilience

When these six Baker Bay sea level resilience projects' adaptive capacities are viewed side-by-side (Figure E.2), we see that resources and authority are all limiting factors for most projects (6/6 and 4/6, respectively). Motivation is a limiting factor for 3 of 6 projects.

When we look at the number of times that each organization was suggested as a key project participant for Baker Bay projects (Figure E.3), we see that landowners, residents, City of Ilwaco, Pacific County, Port of Ilwaco, and Columbia Land Trust 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 residents and landowners (including private upland and lowland landowners, Columbia Land Trust, WA State Parks, WA Department of Fish and Wildlife), and support multi-benefit resilience project development. Relationships across these organizations is likely to lead to increased motivation for action, access to resources, and authority to implement resilience actions.
- Local jurisdictions and special districts (City of Ilwaco, Pacific County, and Port of Ilwaco) should make sure to engage with Columbia Land Trust during any long-range planning or other large-scale 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.

Baker Bay projects	Motivation	Resources	Authority	Innovation
1. Ilwaco shoreline flood protection	likely to happen	low likelihood or requires significant effort	likely to happen	likely to happen
2. Ilwaco distributed stormwater management	likely to happen	somewhat likely	likely to happen	likely to happen
3. Lower Wallacut River water management and flood adaptation	likely to happen	somewhat likely	likely to happen	likely to happen
4. Chinook Hatchery and Houchen Street flood impacts reduction	likely to happen	somewhat likely	likely to happen	likely to happen
5. Chinook shoreline erosion reduction and habitat enhancement	likely to happen	somewhat likely	low likelihood or requires significant effort	likely to happen
6. Ilwaco and Chinook (Pacific County) upland housing planning and development	somewhat likely	low likelihood or requires significant effort	low likelihood or requires significant effort	likely to happen

likely to happen

somewhat likely

low likelihood or requires significant effort

Figure E.2. Adaptive capacity across six Baker Bay sea level rise resilience projects.



Figure E.3. Groups or organizations arranged according to the amount of times they were listed as a Baker 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.