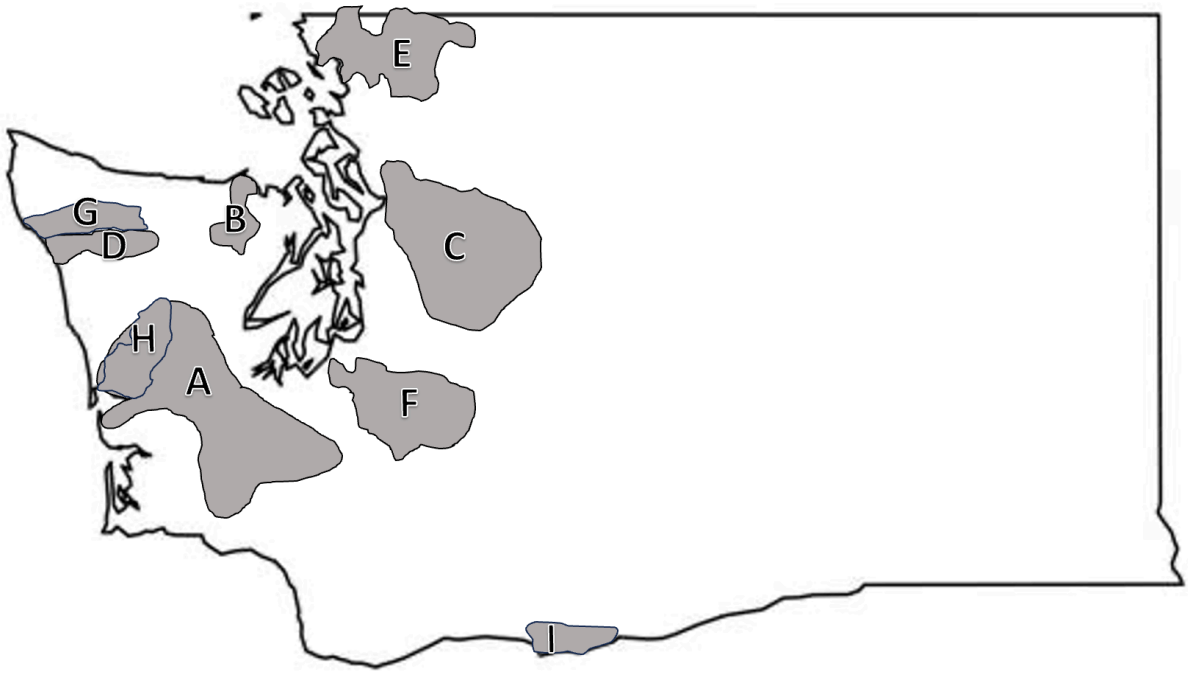
Case Studies Relevant to Watershed/Basin-wide Planning and Implementation



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SCAN ME

A. Chehalis Basin Strategy

Region/Location: Grays Harbor, Lewis, and Thurston Counties, , SW Washington	**Hazards Addressed:** Flooding, erosion, habitat degradation **Time:** 2012-present (ongoing)

Description: The Chehalis Basin Strategy is a WA State program managed through WA Dep. of Ecology to develop Master Plans and Comprehensive Flood Hazard Management. The partners work with landowners to plan and implement projects to minimize flood damage, slow erosion, restore aquatic habitat, and prepare for more frequent and catastrophic flooding.

Specific Adaptation Actions:

- Studies and modeling of flood reduction and restoration strategies
- Planning Effort
- Elevation of roads and levee
- Pump station rebuilds and pipe redirection
- Construction and improvement of bridges, culverts, dikes, and fish passage
- Farm pads and home elevations
- Rootwad, log, and boulder revetments to address erosion
- Reconnect wetlands to the river
- Construction of flood storage basin
- Land acquisition/habitat expansion;
- Invasive plant species control and native plants planted
- Correction of fish passage barriers
- Early flood warning system

Lessons Learned/Stakeholder Testimony: Collaboration = Success

Project Lead/Team: Multiple cities, counties, ports, conservation districts; local flood control districts; local landowners; County Commissioners; the Confederated Tribes of the Chehalis Reservation; Ducks Unlimited; Capitol Land Trust; WA Department of Fish and Wildlife; WA State Conservation Commission.

Funding Source/Budget: WA State Funding/$152 million invested so far (~$39.8M for completed projects, ~$112.5M for active projects, ~$3.88M for proposed projects). Typical project cost is $250,000 - $2,000,000.

Pictures: Bank stabilization (The Chronicle), Flood control/slowing (Grays Harbor Conservation District)

Website: https://chehalisbasinstrategy.com/

B. Dungeness River Floodplain Project

Region/Location: Clallam County, Olympic Peninsula **Category:** Basin-wide planning/implementation	**Hazards Addressed:** Flooding, Habitat Degradation

Description: This project reconnects the river to >175 acres of the river's historic floodplain. Floodplain restoration design provides the river with areas to meander, store sediment, create stable side channels, and spread out and slow down during floods. This results in reduced flood risk, reduced peak high energy flow, and expanded habitat for salmon and other fish/wildlife species.

Specific Adaptation Actions:

- Removal and relocation of setback levees
- Removal/relocation of roads and trestle
- Lengthening of 4 bridges
- River channel realignment
- Floodplain reforestation, restoration, and marsh reconnection
- Removal/relocation of bulkheads
- Log revetment

Lessons Learned/Stakeholder Testimony: Petitions were presented to the Board of County Commissioners, requesting that the new levee be developed as a recreational trail instead of a road

Project Lead/Team: North Olympic Land Trust (Clallam County, Jamestown S'Klallam Tribe)

Funding Source/Budget: Washington Wildlife and Recreation Program (WWRP) grant: $379,235.00, Applicant Match: $176,588.00

Pictures: Left: Before

Right: After the restoration effort

Website:

1. https://wildliferecreation.org/projects/dungeness-river-watershed-restoration/
2. https://www.clallamcountywa.gov/DocumentCenter/View/401/Lower-Dungeness-River-Estuarine-and-Floodplain-Restoration---April-8-2015-PDF
3. https://www.clallamcountywa.gov/184/Dungeness-Floodplain-Restoration
4. https://srp.rco.wa.gov/project/180/3093

C. King County's Fish, Farm and Flood

Region/Location: King County, Puget Sound

Category: Basin-wide planning/implementation

Hazards Addressed: Flooding, Agriculture, Salmon Habitat

Description: Series of projects to implement watershed-wide implementation plans to protect and enhance farmland, restore salmon and habitat, and reduce flood risks to residents and infrastructure.

Specific Adaptation Actions:

- Improvement of levees and culverts
- Improve drainage and irrigation
- Elevation of of homes and farm pads
- Assess flood-safe road access
- Create riparian buffer management plan
- Flood monitoring system
- Establish routine management of drainage infrastructure (ditches, tiles, floodgates, pumps)
- Permanently protect some land for farm use and ecological restoration.
- Salmon Recovery Plan

Lessons Learned/Stakeholder Testimony: Important to have a standard operating procedure for King County and partners to clearly communicate about floodplain management

Project Lead/Team: King County with many partners including King County Agriculture Commission, Conservation Districts, WA Department of Fish and Wildlife, WA State Department of Ecology, WA State Department of Ag.

Funding Source/Budget: ?

Picture: Left: Tolt San Scouci Floodplain Restoration Right: Restored mouth of Cherry Creek

Websites:

1. https://kingcounty.gov/~/media/services/environment/watersheds/snoqualmie-skykomish/snoqualmie-fish-farm-flood/FishFarmFloodBooklet.ashx?la=en
2. https://kingcounty.gov/en/legacy/services/environment/watersheds/snoqualmie-skykomish/fish-farms-flooding

D. Middle Hoh River Resilience Plan

Region/Location: Clallam County, Olympic Peninsula **Category:** basin-wide planning/implementation	**Hazards Addressed:** Flooding, bank erosion, habitat degradation, road access, landslides **Time:** 2020 - present **(**ongoing?)

Description: This project lays out recommendations for improving resiliency for the river's ecosystem and human communities, and provides a structure for future communications and decision making. The plan identifies flood and erosion risks to residents, infrastructure and habitat and details appropriate and necessary measures that can be taken to reduce those risks, while allowing the Hoh River and its floodplain space to support healthy, self-sustaining salmon and wildlife populations.

Specific Adaptation Actions:

- Designate conservation easements
- Land acquisition
- Develop and implement county plan for new development in geologically safe areas outside of resiliency corridor
- Relocation of roads outside of resiliency corridor where possible
- Restore forested and riparian area
- Log jams and large wood placement

Lessons Learned/Stakeholder Testimony:

Project Lead/Team: Jefferson County

Funding Source/Budget: Washington Coast Restoration and Resiliency Initiative (WCRRI)

Pictures: Credit: Draft Middle Hoh River Resiliency Plan 2021

Website: 1. https://www.coastsalmonpartnership.org/document_library/middle-hoh-river-resiliency-plan/
2. https://co.jefferson.wa.us/1427/13520/Hoh-River-Resiliency-Plan

E. Nooksack River flood management

Region/Location: Whatcom County, Puget Sound **Category:** basin-wide planning/implementation	**Hazards Addressed:** Flooding **Time:** 1995 - 2017

Description: The lower Nooksack River starts at the confluence of the three upper forks near Deming and flows downstream to Bellingham Bay. The lower river experiences the most severe damages during flood events and has been the focus for several comprehensive planning efforts.

Specific Adaptation Actions:

- Sediment Management Studies
- Hydrologic & Hydraulic Analyses
- Geomorphic investigations
- Rasing road and constructing/raising bridges
- Remove old levee
- Levee setback extension
- River diversion
- Land acquisition

Project Lead/Team: Whatcom County Flood Control District

Lessons Learned/Stakeholder Testimony:

Funding Source/Budget: Washington State Recreation and Conservation Office, Estuary and Salmon Restoration Program

Picture: Nooksack River flooding (Our Wild Puget Sound)

Website: https://www.whatcomcounty.us/2572/Completed-Plans-Nooksack-River

F. Puyallup/White/Carbon Rivers: Floodplains for the Future

Region/Location: King + Pierce Counties, Puget Sound **Category:** basin-wide planning/implementation	**Hazards Addressed:** Flooding, erosion, property loss, road access, habitat degradation **Time:** 2013 - present (ongoing)

Description: Series of projects that seeks to implement a long term vision to improve salmon habitat, protect communities and infrastructure from flooding, and preserve agricultural lands in the Puyallup Watershed.

Specific Adaptation Actions:

- Construction, removal and improvement of setback levees
- Engineered logjams and setback wooden bio-revetments for road protection
- Conservation easements
- Flood gate replacements
- Property acquisition
- Creek and riparian restoration
- Removing partial fish passage barriers
- Demolition of derelict buildings
- Floodplain reconnection
- Restore floodplain forests

Lessons Learned/Stakeholder Testimony: The success is attributed to the dedication and collaboration of several partners.

Project Lead/Team: Floodplains by Design, conservation districts, local and tribal governmental agencies, Ports, Salmon Enhancement Group, The Nature Conservancy, UW Climate Impacts Group, Washington Farmland Trust, WA Department of Ecology

Funding Source/Budget: $71,060,258 total investments. Examples of the funding sources: Pierce County, Salmon Recovery Funding Board (SRFB), Estuary and Salmon Restoration Program (ESRP), Floodplains by Design.Please see more info at: https://floodplainsforthefuture.org/monitoring-progress/financial-investments/

Pictures: Credit: South Prairie Creek Restoration Project

Before (2013)

After (2021)

Website: https://floodplainsforthefuture.org/projects/

G. Quillayute River Project

Region/Location: Clallam County, Olympic Peninsula **Category:** reach-scale flooding/erosion/avulsion mitigation	**Hazards Addressed:** Flooding, habitat loss, erosion, water access **Time:** 2020 - Present

Description: Restoration actions in the first 2 miles of the Quillayute River to protect the village of La Push from risks of avulsions and flooding, restore floodplain connectivity, improve habitat, address erosion of roads and Thunder Field in La Push, WA. Actions include log jams to stabilize riverbank, constructing a boat launch for tribal fisherman, and excavation of side channels for high flows..

Specific Adaptation Actions:

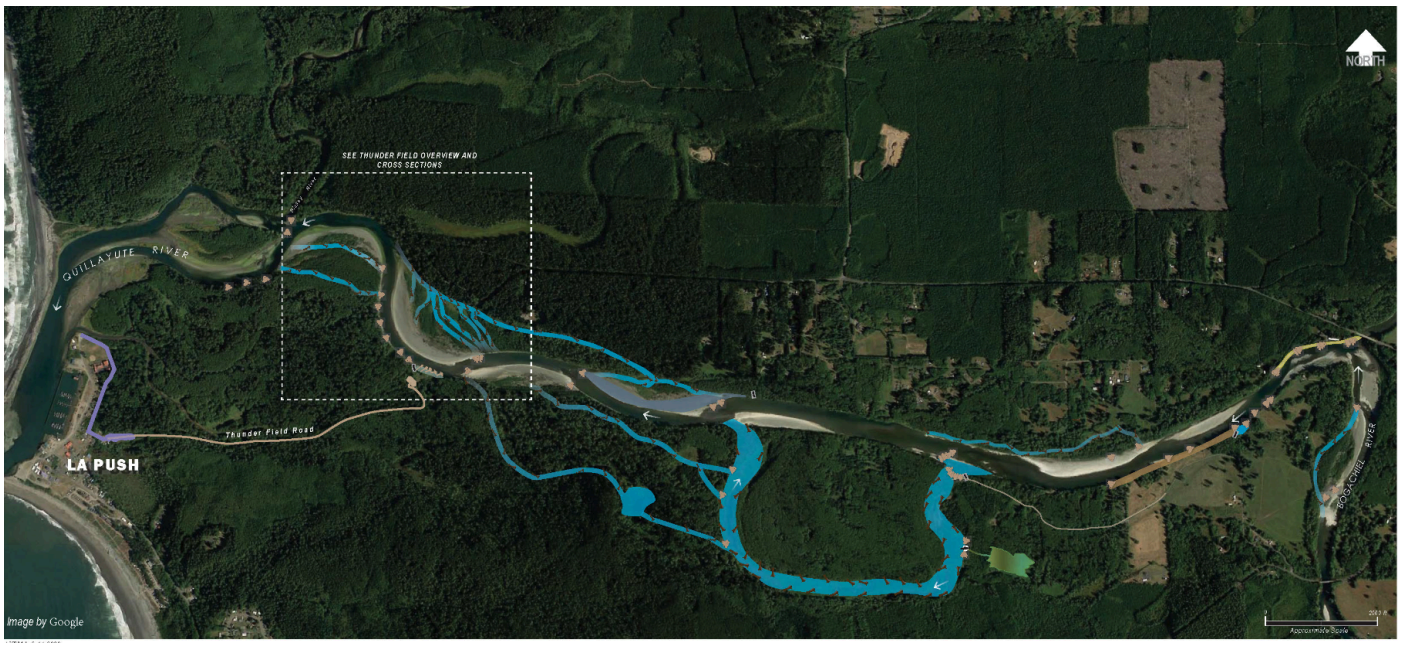
- deformable log jams with a minor log revetment to stabilize riverbank
- constructing a boat launch to provide easier access for tribal fisherman
- excavation of side channels for high flows and to provide off-channel habitat
- Planting riparian vegetation
- Road draining system improvements

Lessons Learned/Stakeholder Testimony:

Project Lead/Team: Quileute Tribe

Funding Source/Budget: RCO-WA Coast Rst Resiliency Project ($2,044,466) and Quileute Tribe ($515,700)

Pictures: Credit: https://srp.rco.wa.gov/project/100/82690



Website:https://srp.rco.wa.gov/project/100/82690

H. Timberworks Flood Resiliency Plan (Aberdeen)

Region/Location: Grays Harbor County, SW Washington **Category:** Basin-wide planning/implementation	**Hazards Addressed:** Flooding **Time:** 2015 - present

Description: The Cities of Aberdeen and Hoquiam coordinated to develop a basin-wide Coastal Resiliency Master Plan along with a plan to build a protective levee system. The Master Plan is developed based on a community-based planning process that aims to identify multiple benefit projects that can reduce flood risk, promote community development, improve fish habitat, and increase public open space and recreation opportunities. The Master Plan will take into account the influence from the Chehalis, Wishkah, and Hoquiam watersheds.

Specific Adaptation Actions:

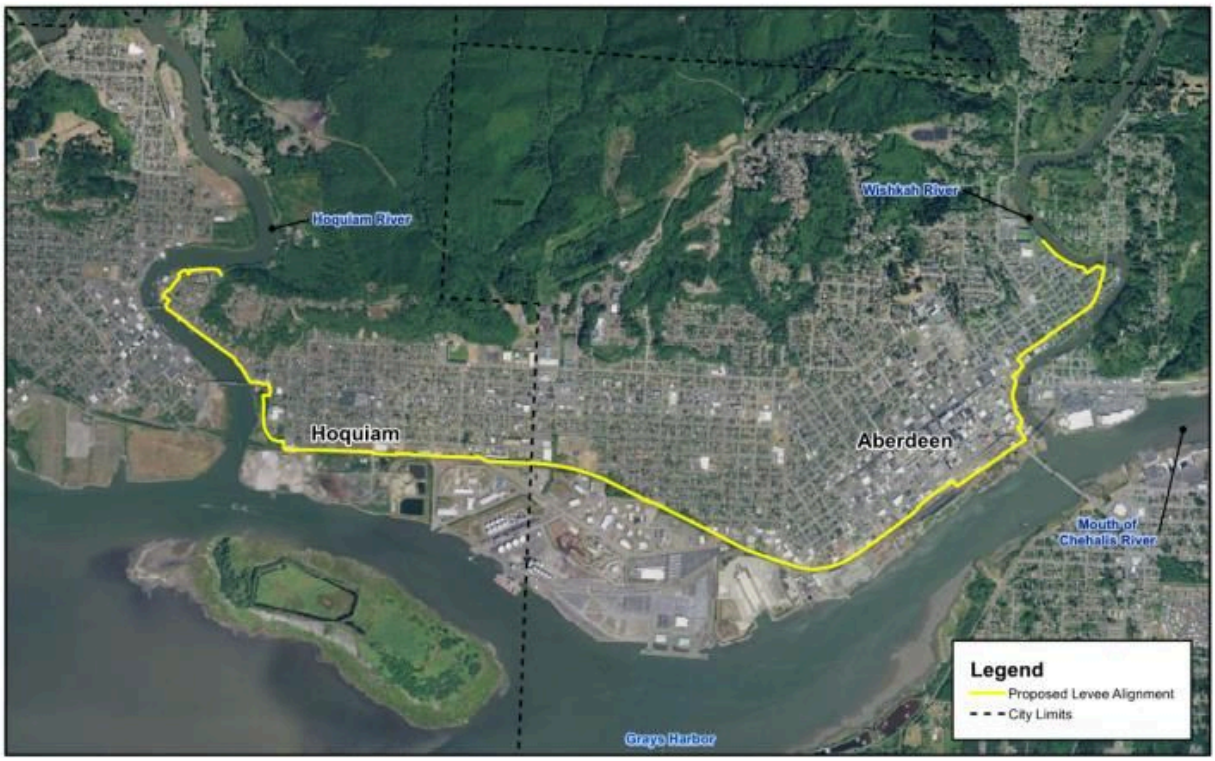
- Coordinated, interlocal coastal resiliency planning
- Watershed management Master Plan
- Community-focused design
- Building new levees
- Create pump stations
- Habitat restoration

Lessons Learned/Stakeholder Testimony:

Project Lead/Team: The City of Aberdeen, Department of Public Works

Funding Sources/Budget: $250,000 by Grays Harbor County Commissioners in Nov 2015 to develop Timberworks Master Plan; $50M from FEMA; $17M State Funding (from Dept. of Ecology office of Chehalis Basin)

Picture:



Website: https://www.ezview.wa.gov/site/alias__1938/overview/36741/overview.aspx

I. Steigerwald Floodplain Reconnection Project

Region/Location: Clark County, Washington **Category:** Multi-organization Coordination/Watershed-wide planning	**Hazards Addressed:** flooding **Time:** 2019 - 2022

Description: Steigerwald Lake is a US Fish & Wildlife Service National Wildlife Refuge situated along the banks of the Columbia River. The collaborative Steigerwald Reconnection Project reconnected 965 acres of Columbia River floodplain, resulting in reduced flood risk, improved habitat for fish and wildlife, and created new trails for recreation.

Specific Adaptation Actions:

- Removal of levees
- Reconnection floodplain with the river
- Raised SR-14 to bring it to Columbia's River 500 year flood state
- Built setback levee to protect certain areas, while allowing the wildlife refuge to be reconnected to the river.

Lessons Learned/Stakeholder Testimony: Successfully removed existing levees to reconnect the refuge with the river, while significantly reducing flood risk.

Project Lead/Team: Lower Columbia Estuary Partnership. Partners: Bonneville Power Administration, Burlington Northern Santa Fe Railroad, Camas School District, City of Camas, City of Washougal, Columbia Gorge Refuge Stewards, Friends of the Columbia Gorge, Port of Camas-Washougal, US Army Corps of Engineers, US Fish & Wildlife Service, Washington Department of Transportation, Washougal School District

Funding Source/Budget: BPA, WA Ecology Floodplains by Design, NFWF, USFWS, BEF

Pictures: Aerial view of Steigerwald in 2016 with the plan (credit: The estuarine partnership)

Website: https://www.estuarypartnership.org/our-work/habitat-restoration/steigerwald-reconnection-project

J. Snohomish County's Sustainable Lands Strategy

Region/Location: Snohomish County, Puget Sound **Category:** Basin-wide planning/implementation	**Hazards Addressed:** Flooding, Agriculture, Salmon Habitat **Time:** 2010 - present

Description: The floodplains of Snohomish County are facing complex challenges with competing needs among farmers, tribal community, and restoration efforts. In 2010, Snohomish County Executive and the Snohomish County Council launched the Sustainable Lands Strategy (SLS) to bring together Tribes and farmers to find common solutions that could support a balance on the landscape for salmon recovery, agricultural resilience, and floodplain connectivity. SLS is a voluntary table with an inclusive decision-making structure.

Specific Adaptation Actions:

- Collaborative land use planning
- Emphasize common goals of healthy and sustainable landscape for all
- Prioritize projects based on unique priorities and needs for each region
- Multi-benefits project
- Dikes removal
- Floodplain reconnection
- Habitat restoration and salmon recovery plan
- Agricultural conservation easement

Lessons Learned/Stakeholder Testimony: The key behind the SLS is to develop understanding, relationships, and strategies among stakeholders to create and achieve a shared vision and beneficial outcomes for the watershed.

Project Lead/Team: Puget Sound Partnership, Washington State Conservation Commission, Washington Department of Fish and Wildlife, Snohomish County, and the Tulalip and Stillaguamish Tribes

Funding Source/Budget: ?

Picture: Collaborative land use management to restore buffer zone while protecting agricultural land (Note:Credit: farmfishflood.org)

Websites:
https://farmfishflood.org/

K. Sacramento River Weir and Bypass

Region/Location: Sacramento, CA **Category:** Basin-wide planning/implementation	**Hazards Addressed:** Flooding **Time:** 2016 - present

Description: The state of CA approved the Sacramento and Yolo Bypass systems as part of the Sacramento River Flood Control Project in 1911. Congress then authorized the U.S. Army Corps of Engineers (USACE) to construct the remainder of the project in 1917. The weir and bypass system protects the city of Sacramento by allowing up to 80% of the excess water to flow through to the Yolo Bypass. Since 2020, the state is working to increase weir size and widen the bypass to increase capacity.

Specific Adaptation Actions:

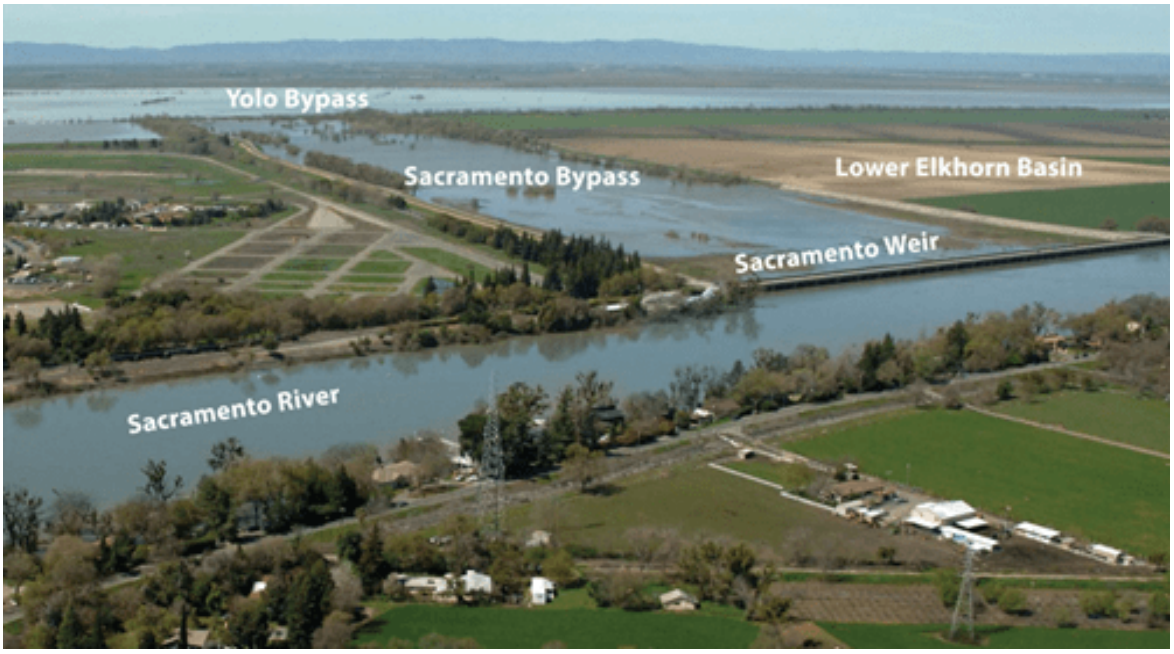
- Watershed-wide planning
- Nature-based solution by creating interconnected high flow bypass systemsSeepage cutoff walls
- Improved and new setback levees
- Upgrading existing weirs and bypass to increase capacity
- 5 miles of levee stabilization
- Ecological restoration

Lessons Learned/Stakeholder Testimony: By carefully planned interconnecting bypass, the system can take up to 80% of the excess water. Bypass areas also become wildlife-refuge.

Funding Sources: USACE, Federal, State funding. ARCF16 in 2016. The Bipartisan Budget Act fully funded nearly $1.8 billion in 2023.

Project Lead/Team: USACE and the State of CA, Central Valley Flood Protection Board, California Department of Water Resources, and the Sacramento Area Flood Control Agency

Pictures: The Sacramento Bypass and Weir System (Source: California Department of Water Resources)



Website: https://www.safca.org/projects/sacramento-weir-and-bypass/

L. Napa River Flood Protection Project

Region/Location: Napa, CA **Category:** Basin-wide planning/implementation	**Hazards Addressed:** Flooding, Ecological Degradation **Time:** 1998 - 2012

Description: In the 1990s, a coalition of more than 30 governmental and community organizations worked together to develop a set of “Living River Principles” to guide the development of a regional flood protection plan along Napa River, CA. The Napa River Flood Protection Project utilizes nature-based solutions and engineering methods that protects the City of Napa while restoring the ecological health of the Napa River.

Specific Adaptation Actions:

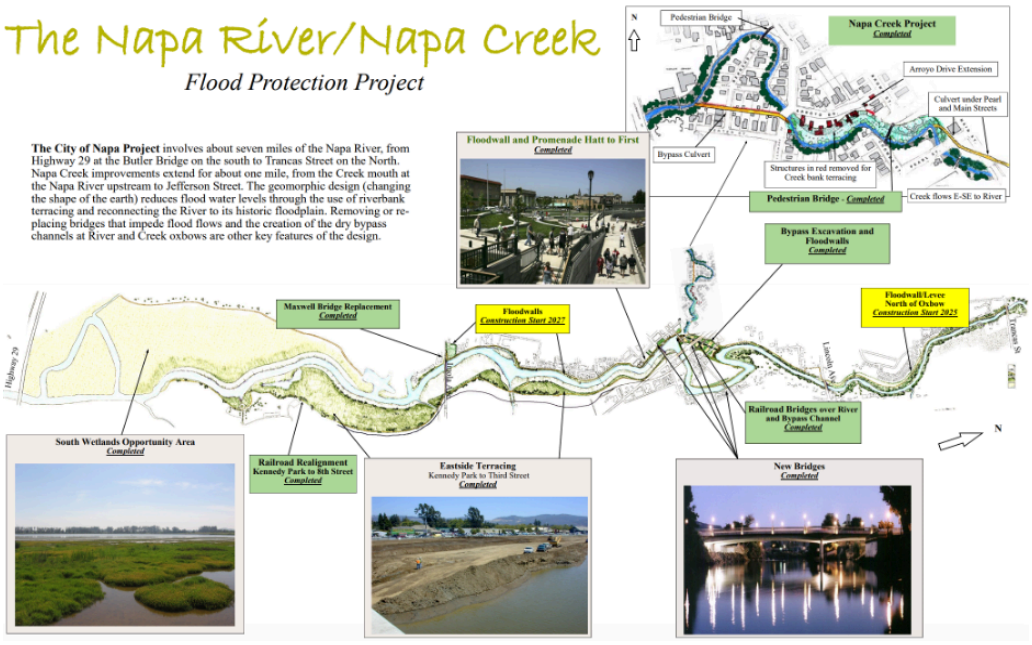
- Reconnect the river to its historic floodplain
- Restore 75% of historic wetlands
- Allowing the river to meander
- Create a highflow bypass
- Bridge improvement
- Removal and improvement of dikes, levees, and floodwalls.
- Continuous fish and riparian corridor
- Create recreational trails to connect to existing trail systems.

Lessons Learned/Stakeholder Testimony: The project expanded the capacity of the river channel through the City of Napa by 13,000 cfs to 43,000 cfs to accommodate the 100-year flood. Annual flooding damage in the area is >$26M, so the high $550M cost is worth it in the long run. Created thousands of temporary jobs.

Funding Sources/Budget: $550M from various sources, including EPA Clean Water State Revolving Fund (CWSRF)

Project Lead/Team: City of Napa; Napa River Flood Flood Control and Conservation District

Pictures: Napa River Flood Protection Project (credit: The County of Napa)



Website:
https://www.landscapeperformance.org/case-study-briefs/napa-river-flood-protection-project-1998-2012

M. Tillamook Southern Flow Corridor (SFC) Project

Region/Location: Tillamook County, OR **Category:** Basin-wide planning/implementation	**Hazards Addressed:** Flooding, Coho salmon habitat degradation **Time:** Early 2000s -

Description: Flooding occurred frequently in the lower Trask, Tillamook, and Wilson river floodplains, including damages to U.S. highway 101. The area lost over $60M from 1996 - 2000. SFC performed thorough community-engaged analysis of various options, as highlighted in the FEMA report in 2015. In 2017 the SFC project was completed with the landowners-preferred option, which helps restore salmon habitat and decrease flooding. Further analysis by NOAA in 2021 also shows many benefits from the implementation of this project.

Specific Adaptation Actions:

- Environmental impact assessment
- Options and alternatives analysis
- Removal of 6.9 miles of existing levees and modify 2.8 mis of levees.
- Land acquisition as flow eastment Restoration of tidal channel and 443 acres of tidal wetlands
- Contaminant clean-up

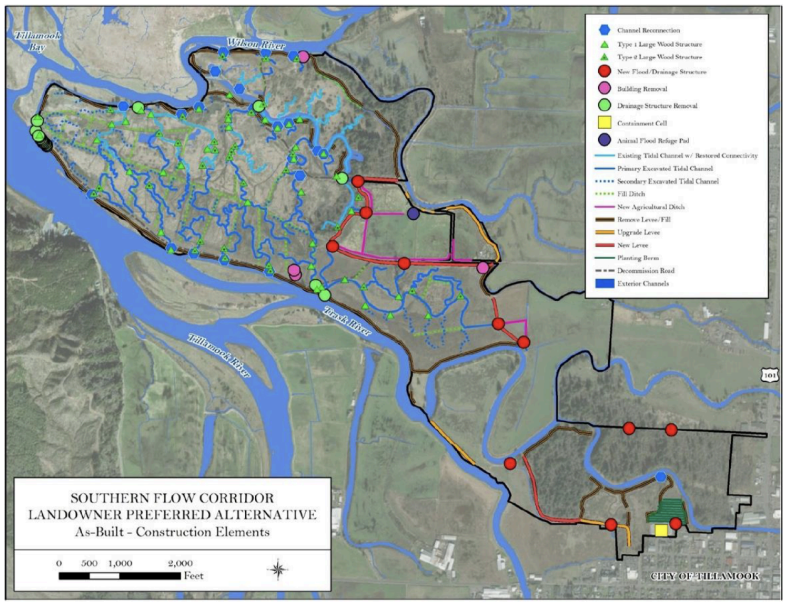
Lessons Learned/Stakeholder Testimony: Initially, the community thought dredging is the right solution to reduce flooding. Further studies, with funding from FEMA and various sources, helped to show that dredging would not be effective. These studies also provide additional options for the community.

Funding Sources/Budget: $11,172,955 from a variety of state offices, federal agencies (FEMA, NOAA), NGOs, and private funding sources.

Project Lead/Team: Tillamook County, OR

Pictures: Southern Flow Corridor Landowner Preferred Alternative (Allen, 2018 and NOAA, 2021)

Website:
https://repository.library.noaa.gov/view/noaa/33876
https://www.fema.gov/case-study/southern-flow-corridor-flood-reduction-and-habitat-restoration-project



N.Additional Resources and Examples

Document: Wright, C.W. 2021. Synthesis of Integrated Floodplain Management in Selected Puget Sound River Deltas. University of Washington Tacoma, Puget Sound Institute.

Description: This synthesis provides comparative analysis of various existing integrated floodplain management projects in the Puget Sound region.

Website: https://www.eopugetsound.org/sites/default/files/features/resources/PSI_IFM_Synthesis_10.2021.pdf

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Project Name: WECAN (North Cove - Tokeland)

Description: WECAN and their partners tested nature-based erosion control solutions by placing cobbles and wood along chronically eroding shore in North Cove, Tokeland to absorb wave energy. Wave energy redistributes these materials across the beach, which helps rebuild the beach and dune system. The project highlights 1) the importance of using natural processes to our own advantage; 2) The needs of adaptive management according to how the solutions interact with the shoreline; and 3) the necessity of multi-agency collaboration.

Website:
https://wacoastalnetwork.com/north-cove-dynamic-revetment/

Project Name: Skagit Delta Farms, Fish and Flood Initiative

Description: The Farms, Fish and Flood Initiative (3FI) is a collaboration among several state, federal, and local agencies to “create and advance mutually beneficial strategies that support the long-term variability of agriculture and salmon while reducing the risks of destructive flood.” By working at a landscape level, representatives from conservation and agricultural interests have agreed to a common agenda and established partnerships that can bring about breakthroughs in estuary restoration, flood risk reduction and farmland protection in a way that supports multiple community interests. Negotiations over the course of seven years resulted in the development of agreements, engaging factions, and building trust and relationships even on contentious issues in the watershed.

Website:
1:https://nepatlas.pugetsoundinfo.wa.gov/Activity/Detail/348
2:https://www.washingtonnature.org/fieldnotes/farms-fish-flood-initiative-where-are-you
https://www.whatcomcounty.us/DocumentCenter/View/33766/Skagit-HDM_FLIP_20180412?bidId=

Project Name: Lower Columbia Solutions Group (LCSG)

Description: The Lower Columbia Solutions Group (LCSG) is a bi-state (WA and OR), interagency collaboration that helps coordinate policy, projects and research related to dredge material disposal and sediment management with focuses on finding sustainable solutions that integrate economic, social and environmental objectives. LCSG aims to increase the beneficial use of dredge sediment at the Mouth of the Columbia River to help protect shipping channel jetties, coastal beaches and nearshore habitats from erosion while avoiding and minimizing adverse environmental, resources, and navigation safety effects.

Website: https://lowercolumbiasolutions.org/
