



ECOSYSTEM RECOVERY PLAN

Draft Effective Date:

December 29, 2016

CREDIT AND ACKNOWLEDGEMENTS

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Suquamish Tribe, for the time staff biologist Tom Ostrom spent in writing this Plan;

Kitsap County, for the time staff Kathy Peters and Kirvie Mesebeluu-Yobech spent in writing this Plan; and

All the jurisdictions, entities, and organizations that spent time discussing and reviewing the content in this Plan.

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The contents of this document do not necessarily reflect the views and policies of the Environmental Protection Agency, nor does mention of trade names or commercial products constitute endorsement or recommendation for use.

ACRONYMS

| EPA | Environmental Protection Agency |
|-------|---|
| EPRP | Ecosystem Protection and Recovery Plan |
| GMA | Growth Management Act |
| LIO | Local Integrating Organization |
| NEP | National Estuary Program |
| NTA | Near Term Action |
| PIC | Pollution Identification and Correction |
| PSP | Puget Sound Partnership |
| PSPA | Puget Sound Pressure Assessment |
| SEPA | State Environmental Policy Act |
| SITTs | Strategic Initiative Transition Teams |
| SMA | Shoreline Management Act |
| TMDL | Total Maximum Daily Load |
| UGA | Urban Growth Area |
| WRIA | Water Resource Inventory Area |
| WS | Watershed |

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EXECUTIVE SUMMARY

The key goals of long-term planning for ecosystem recovery are to:

Ensure that funding is targeted at the highest priority local actions; and

Coordinate recovery actions across local areas and the region.

To advance these goals, the U.S. Environmental Protection Agency (EPA) is supporting the development of 5-year Ecosystem Recovery Plans and associated 2-year Implementation Plans by the Puget Sound region's Local Integrating Organizations (LIOs). This focused, strategic recovery planning will achieve the following:

A roadmap for local ecosystem strategic efforts that focuses recovery planning and actions on the highest priority recovery needs;

Coordination with existing related recovery efforts (salmon recovery planning, for example);

Consistency (in terminology, structure, and content) of local plans with the Puget Sound Action Agenda so that LIO priorities inform regional decision making and sequencing of recovery actions;

A rigorous, defensible process that will identify the highest priority recovery strategies in each LIO area, thus helping to direct limited funding to where it will be most effective;

A longer-term, durable strategic framework from which local Near Term Actions (NTAs) to be included in the Puget Sound Action Agenda can be developed; and

An accounting of existing work underway to improve the health of the LIO area and identify gaps where work is needed.

The West Central LIO identified three ecosystem components as the top priorities around which to strategize our ecosystem recovery. The strategies and actions comprising the Recovery Plan are designed to improve and protect the health of these components through restoration, protection, and/or mitigation strategies that reduce pressures on the ecosystem.



Watersheds, Forests, Riparian Areas, and the Built Environment



Shellfish Growing Areas



Submerged Aquatic Vegetation

Based on these Ecosystem Components, the LIO identified 13 priority Pressures, which characterize human actions or natural processes that cause stress on the ecosystem. The LIO indicated these pressures (in no ranked order):

- Roads and Railroads
- Shipping Lanes and Dredged Waterways
- Logging & Wood Harvesting
- War, Civil Unrest, & Military Exercises
- Abstraction of Groundwater
- Marine Levees, Floodgates, & Tidegates
- Freshwater Shoreline Infrastructure

- Marine Shoreline Infrastructure
- Sewer (Domestic & Municipal Wastewater)
- Onsite Sewage Systems
- Oil Spills
- Agriculture & Forestry Effluents
- Runoff from development

The LIO developed Conceptual Models for the 13 priority Pressures to distinguish the root causes of the stressors and intervention points at which recovery strategies would be most effective. Fifty four recovery strategies were identified during this exercise. The Working Group identified 16 priority strategies; and by combining like strategies, generated **9 priority recovery strategies** which were then scored and prioritized according to Potential Impact, Feasibility and Readiness for Implementation.

- 1. Freshwater and land-based restoration
- 2. Pollution identification and correction, spill response, and stormwater-related management, education and training
- 3. Manage urban stormwater and runoff
- 4. Protect and conserve ecologically important land

- 5. Grassroots stewardship
- 6. Marine restoration
- 7. Mitigate problems caused by development
- 8. Regulatory compliance
- 9. Water conservation

Throughout the development of the Recovery Plan, several gaps, barriers, and needs emerged:

- There is need for more baseline data and current and historic status of indicators;
- Regulatory programs are not always consistent with recovery goals;
- Not all local strategies are found in Puget Sound Partnership's database;
- The overall focus on process and planning diminishes capacity needed for implementation;
- There remains a disconnect between regional planning and LIOs;
- Diffuse salmon recovery projects are not always integrated in LIO planning process; and
- Not all NTAs lined up with recovery strategies due to timeframe of developing the Recovery Plan. The recovery strategies identified through the Recovery Plan will be used in the development of new NTAs in 2017/18.

Adaptive Management Framework describes the iterative process intended to be used early and often during planning and other project and program stages. It reflects similar management and decision making procedures used by member jurisdictions to plan, implement and monitor recovery efforts.

RECOVERY PLAN STATUS

The Draft Ecosystem Recovery Plan has been approved for submission to Puget Sound Partnership (PSP) by the Executive Committee on September 29th, 2016. Comments and suggested revisions have been incorporated through December, when the final draft will be submitted.

NEXT STEPS

The West Central LIO Working Group and Executive Committee have vetted and approved the Ecosystem Recovery Plan throughout the process of developing it. As a living document intended to reflect local priorities for ecosystem recovery, further revisions will be made as recommended by Working Group and approved by Executive Committee at any time throughout the year.

The West Central LIO will prepare a communications tool that helps the Executive Committee, Working Group members and local partners to describe the content of the Recovery Plan and its relevance to current and future recovery efforts in Puget Sound. This communications tool will also be used to help staff and volunteers involved in recovery efforts to understand and appreciate their contribution to recovery at the regional scale.

The West Central LIO will continue to implement recovery projects after the plan is submitted to the Puget Sound Partnership (PSP). Many of these projects are supported by the National Estuary Program as Puget Sound Action Agenda Near Term Actions.

LESSONS LEARNED

Through the development of the Ecosystem Recovery Plan, the West Central LIO identified common factors and priorities that influence ongoing recovery efforts. These factors are found throughout the recovery plan:

- Members of the West Central LIO are motivated by a deep commitment to restoring the health of Puget Sound which extends beyond the prevention of further ecological damage to the restoration of historic levels of vitality and environmental health;
- There is need for capacity and funding to support robust baseline data and monitoring which track the impact of recovery efforts, both near- and long- term;
- It is critical to streamline planning, funding and reporting processes in order to invest needed capacity and resources in recovery efforts; and
- Confronting increasing population density, poor soils and proximity to shoreline, the West Central Action Area faces unique challenges in the treatment of wastewater. Due to the immediate and extensive impact of pollution on Puget Sound, the LIO has emphasized the urgency of developing solutions for wastewater treatment, particularly with regard to the Urban Growth Area, recognizing that state statutes and regulations do not agree with current environmental goals and population estimates.

PARTICIPANTS

The table below shows the members of the project team who led the development of products in this report. In addition, members of the advisory, technical and decision-making bodies who are collectively responsible for the content and implementation of the LIO Ecosystem Recovery Plan are also listed.

Table 1. LIO Participants

| Organizational Partner | Role(s) |
|---------------------------|--------------------------------------|
| All Ports Group | Working Group |
| City of Bainbridge Island | Executive Committee Working Group |
| City of Bremerton | Executive Committee Working Group |
| City of Gig Harbor | Executive Committee |

| Organizational Partner | Role(s) |
|--|--|
| | Working Group |
| City of Port Orchard | Executive Committee Working Group |
| City of Poulsbo | Executive Committee Working Group |
| The Clear Creek Trail | Working Group |
| Great Peninsula Conservancy | Working Group |
| Kitsap Conservation District | Working Group |
| Kitsap County | Executive Committee Working Group Steering Committee |
| Kitsap Environmental Education Programs/ECONet | Working Group |
| Kitsap Maritime Heritage Foundation | Working Group |
| Kitsap/Pierce Home Builders' Association | Working Group |
| Kitsap Public Health District | Working Group |
| Kitsap Public Utilities District | Working Group |
| Naval Base Kitsap | Working Group |
| North Kitsap School District | Working Group |
| Pierce County | Executive Committee Working Group |
| Pope Resources | Working Group |
| Port of Bremerton | Working Group |

| Organizational Partner | Role(s) |
|---|--|
| Port Gamble S'Klallam Tribe | Executive Committee Working Group |
| Port of Poulsbo | Working Group |
| Puget Sound Restoration Fund | Working Group |
| The Salmon Center | Working Group |
| Stillwaters Environmental Center | Working Group |
| Suquamish Tribe | Executive Committee Working Group Steering Committee |
| University of Washington—Washington Sea Grant | Working Group |
| Washington Department of Health | Working Group |
| Washington State University Extension—Kitsap | Working Group |
| West Sound Watersheds Council | Working Group |

ECOSYSTEM RECOVERY PLAN REVIEW AND APPROVAL STATUS

LIO PLAN DEVELOPMENT AND DECISION MAKING PROCESS

To develop this plan, the West Central LIO used information from:

The Puget Sound Pressure Assessment for West Central LIO;

The West Sound Chinook recovery chapter;

West Central LIO Early Elements;

Local Near-Term Actions; and

Restoration Programs and Public Works Projects of Organizational Partners.

LIO ECOSYSTEM RECOVERY PLAN REVIEW AND APPROVAL

<u>Executive Committee</u>: Elected official from each of the nine member jurisdictions

Working Group: Staff from each jurisdiction plus staff from Naval Base Kitsap, several non-governmental organizations, and education & outreach professionals

Steering Committee: LIO Coordination Team, staff for the Chair and Vice Chair, technical expert, and Ecosystem Recovery Coordinator

| ERP Section | February | March | April | May | June | July | August | September |
|-------------|------------|-------------------|---------|--------------|---------------|----------------|----------------|---------------|
| Vision | | Preliminarily | | | | | | |
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| Identify | | | | Drafted by | Ranked by | Recommended | | |
| recovery | | | | Steering | Working | to Exec Comte | | |
| strategies | | | | Comte V | Group 🔍 | V | | |
| Adaptive | | | | | | Drafted by | Confirmed by | Recommended |
| mgmt. | | | | | | Steering Comte | Working Group | to Exec Comte |
| procedure | | | | | | V | | 1 |
| Gaps, | | | | | | Drafted by | Confirmed by | Recommended |
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| | | | | | | | Group | |

Table 2. Recovery Plan Review and Approval

1.0 LIO OVERVIEW

LIO OVERVIEW AND STRUCTURE

The West Central LIO is one of nine LIOs created by the Puget Sound Partnership. The West Central LIO addresses ecosystem issues on the east side of the Kitsap Peninsula in Washington State. This area, known as the Action Area, includes nine jurisdictions (counties, cities and tribes) that make up the Executive Committee.

EXECUTIVE COMMITTEE

The Executive Committee meets several times a year to assess the recommendations of the Working Group. Current members of the Executive Committee include:

- Chairman Leonard Forsman, Chair (Suquamish Tribe)
- Commissioner Charlotte Garrido, Vice Chair (Kitsap County)
- Mayor Val Tollefson (City of Bainbridge Island)
- Mayor Patty Lent (City of Bremerton)
- Mayor Jill Guernsey (City of Gig Harbor)
- Mayor Becky Erickson (City of Poulsbo)
- Mayor Rob Putaansuu (City of Port Orchard)
- Chairman Jeromy Sullivan (Port Gamble S'Klallam Tribe)
- Barbara Ann Smolko (Pierce County)

WORKING GROUP

The Working Group is divided into sub-groups that address the three priorities in the PSP's regional plan to protect Puget Sound. The three sub-groups focus on water quality for shellfish, stormwater and salmon habitat, respectively.

The Working Group is comprised of members representing nine jurisdictions in the Action Area and relevant community based organizations:

- City of Bainbridge Island
- Bainbridge Land Trust
- City of Bremerton

- City of Gig Harbor
- Great Peninsula Conservancy
- Kitsap Conservation District
- Kitsap Maritime Heritage Foundation
- Kitsap Public Health District
- Kitsap Surface & Stormwater Management
- Naval Base Kitsap
- Pierce County
- City of Port Orchard
- Puget Sound Restoration Fund
- City of Poulsbo
- Squaxin Island Tribe
- Suquamish Tribe
- Washington Department of Health

VISION FOR LIO AND ECOSYSTEM RECOVERY PLAN

Vision for the West Central LIO:

The West Central LIO works to preserve vital nearshore habitat in the Puget Sound by protecting and enhancing freshwater quality, lowland forests and streams, inlets and bays, and nearshore beaches.

Vision for the West Central LIO's Ecosystem Recovery Plan:

The West Central LIO's ecosystem recovery plan will coordinate and implement strategies and actions for critical Puget Sound protection, restoration and community awareness.

GEOGRAPHIC AND CULTURAL CONTEXT IN THE LIO AREA

The West Central LIO covers land in the geographic center of the Puget Sound basin. West Central Puget Sound¹ occupies the geographic center of the Puget Sound basin. With over 220 miles of shoreline and extensive bluffs, estuaries, protected bays, harbors, and lagoons, the area's most prominent feature is its expanse of nearshore reaches. Bluffs and small streams along the coastline provide a supply of sediment that drifts along the shore, building beaches and forming spits, lagoons, deltas, and tide flats. Bainbridge Island, approximately 5 miles wide by 10 miles long, is one of the largest islands in Puget Sound and has 53 miles of shoreline. Agate Passage, Port Washington Narrows, and Rich Passage are characterized by high currents due to the circulation of Puget Sound tides through these narrow openings.

Streams originate from lakes, groundwater discharge, or headwater wetlands that often contribute flow to multiple watersheds. These unique lowland freshwater ecosystems are highly productive habitat for salmon and trout.

The history of the LIO geography is completely connected to Puget Sound and is the heartland of Suquamish Ancestral Territory. The Suquamish and their ancestors have occupied the region for the past 14,000 years. Important Suquamish leaders in the early historic period such as Kitsap, Challicum, and Seattle, controlled extended Suquamish families who occupied more than 15 winter villages. The major Suquamish winter village was at Old Man House on the shoreline of Agate Passage at d'suq'wub, meaning "clear salt water" in Lushootseed. The Suquamish name translates into "people of the clear salt water." Old Man House was occupied for over 5,000 years with a historic period cedar plank longhouse. The Port Madison Indian Reservation, straddling Miller Bay between the communities of Suquamish and Indianola, is the center of the Suquamish culture.

Incorporated cities in the area include Bainbridge Island, Port Orchard, Poulsbo, Bremerton, and Gig Harbor. Bremerton is the largest city in the area, with a population of more than 39,000. These five cities began as dock locations for the historic Puget Sound "Mosquito Fleet," which consisted of small steamers and



¹ Water Resource Inventory Area (WRIA) 15

West Central LIO Ecosystem Recovery Plan – Draft December 29, 2016

sternwheelers that carried passengers and cargo up and down Puget Sound prior to bridges and state-run ferries. Businesses, homes, and eventually roads were all located close to the shorelines of Puget Sound. Gig Harbor and Poulsbo were also home to cod and salmon fishing fleets.

The area's port districts are important as centers for commerce and military installations and as critical hubs for marine transportation. More than half of the 23 million annual passengers on the Washington State Ferries (WSF) system travel between the area and the greater Seattle metropolitan area. Eagle Harbor on Bainbridge Island hosts the WSF maintenance and repair facility. Bridges at Agate Passage and the Tacoma Narrows link the Action Area by road to the rest of Puget Sound. Recreational vessels are moored throughout the Area, with over 2,000 permanent and transient slips. Other recreational amenities of the region include several state and local parks used for camping, boat launching, beach walking, hiking, bird watching, swimming, picnicking, shellfishing, and kayaking.

The U.S. military presence in the Action Area began in 1891, and since that time the area has played a pivotal role in military operations in several wars and conflicts. Naval Base Kitsap has facilities at Bremerton, Keyport, and Manchester, and is the Action Area's largest employer.

This area constitutes almost half of the nearshore habitat in the Central Basin of Puget Sound. This habitat includes dozens of embayments, including open coastal inlets and estuaries, bluffed back beaches, and the only rocky coastline in the central Puget Sound basin. The subtidal and intertidal portions of the Action Area support some of the densest and highest quality wild stock geoduck clam fisheries in the world. The area has 90 streams used by wild populations of chum, coho, steelhead, and cutthroat trout. The shoreline provides refuge, food, and rearing areas for other juvenile salmon, including Puget Sound Chinook and Hood Canal summer chum, as they enter Puget Sound from larger rivers on the eastern shore and Hood Canal. Much of the nearshore is used for spawning by native marine fishes including Pacific herring, surf smelt, and Pacific sand lance. Commercial, recreational, and tribal shellfish activity is prominent along most of area's shorelines. Hatchery programs operated by the Suquamish Tribe at Gorst and Grovers Creek provide salmon harvest opportunities for tribal and non-tribal commercial, recreational, and subsistence fishers.

A history of commercial, industrial, and military activities, including ship building, left toxic contaminated sites encompassing those at Eagle Harbor, Keyport, Dyes Inlet, Sinclair Inlet, and Manchester. Many sites are being remediated as part of state and federal clean-up processes.

Many people move to the area because of its rural feel, and the majority of residents choose to live outside of the incorporated cities. This can cause a change in existing rural and forestland to an urban/suburban landscape, resulting in fragmented or degraded habitat. The population is expected to continue growing in a pattern similar to the rest of Puget Sound. The increased population will require additional drinking water and on-site and municipal wastewater systems, and since they depend almost exclusively on groundwater supplies for all residential, commercial, and industrial needs, key aquifer recharge areas need to be protected. An urbanizing landscape

will also increase stormwater runoff, which threatens water quality, patterns of streamflow, and the availability of groundwater for human use. Stormwater has also been noted as a vector for pathogens, which have closed shellfish harvesting in some bays in the Action Area.

2.0 PRIORITY VITAL SIGNS, ECOSYSTEM COMPONENTS, AND GOALS FOR THE LIO

Ecosystem Components are the focus of the recovery effort. Each LIO identified the priority Vital Signs, Human Wellbeing and Ecosystem Components, and LIO- specific goals for their Action Area; and where possible and appropriate, LIOs identified the contribution of their goals toward the regional recovery targets. The strategies and actions in the Recovery Plan are designed to improve and protect the integrity of Components either through restoration, protection, or mitigation strategies that reduce pressures on the ecosystem.

For a glossary of the terms used throughout this plan, see Appendix A.

The West Central LIO identified three Ecosystem Components as the top priority around which to orient this Ecosystem Recovery Plan. The LIO started that process by identifying the ecological species and functions that are important to the health of the West Central Action Area, bearing in mind its unique attributes, while also considering the Puget Sound-wide ecological functions to which it contributes.

After identifying the important ecological species and functions, the Steering Committee organized the various Components into categories. It was evident that there were three general categories around which the Ecosystem Components were organized: watersheds, forests, and riparian areas; shellfish beds; and nearshore habitat including submerged aquatic vegetation. These became the initial three priority Ecosystem Components.

The Steering Committee then shared those three categories, with their associated Components, with the Working Group. The Working Group agreed, and added other Components within each category to help explain the extent of their importance. Additionally, the Working Group noted the following important points.

The West Central Action Area consists entirely of lowlands without snowpack or large rivers contributing to the aquifers. The Working Group discussed how to encompass the importance of stormwater into the Components, and bifurcated that conversation into clean stormwater that filters naturally into the ground replenishing aquifers, and dirty, untreated stormwater that is negative due to the human impacts.

The Working Group wanted to acknowledge the historical importance of clean rainfall replenishing this area's groundwater while also recognizing that urban stormwater management is critical for that rainfall to continue to serve its purpose. This concept is captured by the "hydrology" and "groundwater" associated Components under the first Ecosystem Component.

The reader may note that there are duplicate associated Components across the Ecosystem Components (e.g., freshwater quality and rockfish). This is intentional with the Working Group's acknowledgement that in an ecosystem, everything affects everything else at some point.

Finally, the Working Group recommended these Ecosystem Components to the Executive Committee, who added:

"The built environment" to the first Component to acknowledge the important human aspects of the ecosystem.

"Shellfish beds" was changed to "shellfish growing areas" to better encompass all the shellfish that are important to protect and restore in this part of the Sound.

Once the Ecosystem Components had been identified, several technical staff from the Working Group collaborated with the Steering Committee to develop goal statements for each Component. Ecosystem Components incorporate different ecosystem elements, and therefore compelled the development of several goal statements for each Component. Specific, Measurable, Achievable, Results-Oriented, and Time-Bound (SMART) goals were developed using information from the Department of Health. There is an outstanding need to gather baseline data and monitoring information from which to assign goals. In turn, a reference to setting baselines in each set of goals was added.

SUMMARY OF COMPONENTS, VITAL SIGNS AND GOALS FOR THE LIO AREA

| ECOSYSTEM | DESCRIPTION OF | GOALS AND/OR CONTRIBUTION TOWARD VITAL SIGN TARGET | RELATED VITAL |
|---|---|---|--|
| COMPONENT | COMPONENT | | SIGNS |
| Watersheds, Forests, Riparian Areas, and the Built Environment | Floodplains, Hydrology, Freshwater Quality And Habitat, Watershed Connectivity, Groundwater | Goal: WC.1A Maintain and protect the natural hydrologic cycle Incorporate water reuse for groundwater aquifer recharge Generate public outreach and education materials regarding reclaimed water and its role in preserving the hydrologic cycle Goal: WC.1B Ensure consistent compliance with regulations in order to meet goals for environmental standards | Land Cover Chinook (salmonids) Summer Stream Flows Freshwater Quality Floodplains Drinking Water |

Table 3. Ecosystem Components, Vital Signs and Goals

| ECOSYSTEM COMPONENT | DESCRIPTION OF COMPONENT | GOALS AND/OR CONTRIBUTION TOWARD VITAL SIGN TARGET | RELATED VITAL SIGNS | |
|------------------------|---|--|---|--|
| | | Local regulations: ensure comprehensive plans, Shoreline Master Programs, critical area ordinances, and low-impact development best management practices are implemented State and federal regulations: implement state surface water quality standards and the Clean Water Act Goal: WC.1C Establish baseline data and identify achievable benchmarks, then establish numeric targets for: Increasing the net number of stream miles accessible to | | |
| | | Increasing the net number of stream times accessible to anadromous fish Decreasing percentage of net impervious cover and increasing percentage of net tree canopy Increasing the number of hours of outdoor recreation reported by residents Ongoing data collection for efficacy, quality, and volume of reclaimed water Decreasing net extraction of groundwater | | |
| Shellfish Growing | Marine Water And Freshwater Quality, Nearshore Habitat, Rockfish | Marine Water And Freshwater Quality, Nearshore Habitat, Rockfish | Goal: WC.2A Establish a baseline for existing conditions and implement data collection to assess the impact of stormwater and wastewater on shellfish growing areas Goal: WC.2B Reduce the amount of direct untreated stormwater and wastewater discharging to inlets and bays in our Action Area | Shellfish Beds Marine Water Quality Freshwater Quality Swimming Beaches |
| Areas | | Goal: WC.2C Re-open prohibited commercial shellfish growing areas and increase regional harvest opportunities | Onsite Sewage Systems Economic Vitality | |

| ECOSYSTEM COMPONENT | DESCRIPTION OF COMPONENT | GOALS AND/OR CONTRIBUTION TOWARD VITAL SIGN TARGET | RELATED VITAL SIGNS |
|--|--|---|---|
| | | Goal: WC.2D Restore native oyster habitat in order to provide ecosystem services, support salmon recovery, and increase resilience to ocean acidification | Chinook (salmonids) |
| Nearshore Habitat & Submerged Aquatic Vegetation | Embayments [Protected Estuaries And Lagoons], Stream Deltas, Eelgrass, Bull Kelp Beds, Forage Fish, Salmonids, Marine Riparian Zones, Native Shellfish Growing Areas, Rockfish | Goal: WC.3A Establish baseline, then set numeric targets to protect or restore nearshore habitat: Protect or restore salt marshes, embayments and estuaries Protect or restore submerged aquatic vegetation, including bull kelp beds and native eelgrass in order to improve nearshore habitat for multiple fish and invertebrate species and to help mitigate ocean acidification conditions Goal: WC.3B Establish baseline, then set numeric goals to reduce shoreline infrastructure: Reduce net shoreline armoring Replace shoreline infrastructure with soft shore equivalent (selected forage fish populations and ecological diversity) Goal: WC.3C Establish baseline, then establish numeric goal for: Area and depth distribution of submerged aquatic vegetation Delineate all drift cells in the action area | Shoreline Armoring Estuaries Chinook (salmonids) Eelgrass Herring |

| ECOSYSTEM | DESCRIPTION OF | GOALS AND/OR CONTRIBUTION TOWARD VITAL SIGN TARGET | RELATED VITAL |
|-----------|----------------|---|---------------|
| COMPONENT | COMPONENT | | SIGNS |
| | | Map locations and conditions of nearshore landforms following Puget Sound Nearshore Ecosystem Restoration Program geomorphic classification Systematically identify, update, and map all forage fish spawning beaches Impact reduced flow from treatment plant outfalls on marine biota | |

Based on an overview of the Partnership's Vital Signs for human health and quality of life provided by Skadi Von Reis from the Puget Sound Institute, the Working Group identified Human Wellbeing Vital Signs most relevant to the West Central Action Area. They first brainstormed ecosystem services that intact, functioning ecosystems and species provide, and that can benefit people. Based on these ecosystem services, the Working Group identified related Human Wellbeing Vital Signs. The Executive Committee noted that some Vital Signs affecting ecosystems and those affecting human wellbeing may be in competition, for example the impact of human activity and development on coastal beaches. The Executive Committee also supported the importance and complexity of good governance in ecosystem recovery.

Table 4. Ecosystem Services and Human Wellbeing Vital Signs

| ECOSYSTEM SERVICE | HUMAN WELLBEING VITAL SIGNS |
|--|-----------------------------|
| Water filtration | Drinking Water |
| Water storage | Drinking Water |
| Habitat | Local Foods |
| | Sense of Place |
| Outdoor recreation (kayaking, swimming, physical health) | Sense of Place |
| | Outdoor Activity |
| Aesthetics | Sense of Place |
| Cultural value/heritage | Cultural Wellbeing |

| ECOSYSTEM SERVICE | HUMAN WELLBEING VITAL SIGNS |
|-----------------------|-----------------------------|
| Pathogens reduction | Drinking Water |
| | Local Foods |
| | Outdoor Activity |
| | Shellfish Beds |
| Food sources | Local Foods |
| | Cultural Wellbeing |
| | Economic Vitality |
| | Sense of Place |
| Commercial harvesting | Economic Vitality |

3.0 KEY PRESSURES IN THE LIO AREA

Pressures are the human actions or natural processes that give rise to stress on the ecosystem, but may provide benefits to humans. By understanding the Pressures and their underlying sources and stressors, the LIO can better define the context in which it is working and where intervention is needed to make progress on recovery.

The West Central LIO Steering Committee identified 13 priority Pressures by comparing highly rated Sources and Stressors in the Puget Sound Pressures Assessment (both regional and Action Area specific) to local priority Sources of Pressures and associated "parking lot" Pressures (pressures not highlighted in the Early Elements Miradi file but known to be important to the local area). The Steering Committee recognized that four of the "very high" Pressures were similar to each other and found it would be more logical locally to combine those into one broad Pressure. The list of "very high" sources of Pressures (in no ranked order) follows:

- Roads and Railroads
- Shipping Lanes and Dredged Waterways
- Logging & Wood Harvesting
- War, Civil Unrest, & Military Exercises
- Abstraction of Groundwater
- Marine Levees, Floodgates, & Tidegates
- Freshwater Shoreline Infrastructure
- Marine Shoreline Infrastructure
- Sewer (Domestic & Municipal Wastewater)

- Onsite Sewage Systems
- Oil Spills
- Agriculture & Forestry Effluents
- Runoff from development, including
 - Residential and Commercial Lands
 - o Industry
 - Housing & Urban Areas
 - o Commercial & Industrial Areas, Including Ports

The Working Group was asked to comment on this list of Pressures and to address whether this list accurately represents the priority Pressures on the West Central Action Area.

Working Group members inquired about the term "abstraction," when it refers to extraction of groundwater. It was noted that the terms used are consistent with PSP terminology, which used data and models from international sources. Using PSP terminology will help maintain consistency of Ecosystem Recovery Plans across Puget Sound.

Working Group members highlighted that the list of Pressures do not reflect the persisting impact of historical habitat loss. In PSP terms, habitat loss is considered a "stressor," which describes the direct cause of impact to the ecosystem, as opposed to a "Pressure," which describes human activities resulting in stress to the environment. The Working Group concluded that despite not being considered a "Pressure" in PSP terminology, the importance and urgency of addressing habitat degradation must be upheld as a priority.

Similarly, Working Group members stressed the importance of articulating climate change as a major concern due to critical implications for all Ecosystem Components and the Recovery Strategies used. Climate Change must be recognized as a concern that relates to all listed Pressures as it was not clearly exhibited through the Puget Sound Pressures Assessment and resulting taxonomies that generated the Pressures below.

For a list of Pressure sources and Stressors of concern in the LIO, see Appendix B.

Table 5. Pressures and their relationship to Vital Signs and components in the LIO area.

| Threat Name | Chinook Salmon | Eelgrass | Estuaries | Floodplains | Freshwater Quality | Herring | Land Cover | Marine Sediment Quality | Marine Water Quality | SSO | Shoreline Armoring | Summer Stream Flows | Swimming Beaches | Toxics in Fish |
|--|----------------|----------|-----------|-------------|-----------------------|---------|------------|-------------------------------|-------------------------|-----|-----------------------|------------------------|---------------------|----------------|
| Abstraction of Groundwater | Х | | | | | | | | | | | X | | |
| Agriculture and Forestry Effluents | | | | | X | | | | Х | | | | | |
| Commercial and Industrial Areas (including ports) | x | x | X | Х | Х | | Х | | Х | x | Х | х | | |
| Housing and Urban Areas | Х | Х | Х | Х | Х | | Х | | Х | Х | Х | Х | | |
| Industrial Runoff | Х | Х | Х | Х | Х | | Х | | Х | Х | Х | Х | | |
| Logging and Wood Harvesting | Х | | | | X | | X | | | | | Х | | |
| Marine Shoreline Infrastructure | X | X | X | | | X | | | | | | | | |
| OSS - Domestic and Commercial Wastewater to Onsite Sewage Systems (OSS) | | | | | Х | | | Х | | | | | | |
| Roads and Railroads | Х | X | Х | Х | | X | X | | | | | Х | | |

| Threat Name | Chinook Salmon | Eelgrass | Estuaries | Floodplains | Freshwater Quality | Herring | Land Cover | Marine Sediment Quality | Marine Water Quality | SSO | Shoreline Armoring | Summer Stream Flows | Swimming Beaches | Toxics in Fish |
|--|----------------|----------|-----------|-------------|-----------------------|---------|------------|-------------------------------|-------------------------|-----|-----------------------|------------------------|---------------------|----------------|
| (including culverts) | | | | | | | | | | | | | | |
| Runoff from Residential and Commercial Lands | Х | х | х | Х | х | | х | | Х | X | х | X | | |
| Sewer - Domestic and Municipal Wastewater to Sewer | | | | | х | | | | Х | | | | | |
| Shipping Lanes and Dredged Waterways | х | x | | | | Х | | | Х | | | | | |
| War, Civil Unrest, and Military Exercises | | | | | | Х | Х | Х | | | | | | Х |
| Marine Levees, Floodgates, Tidegates | х | | х | | | Х | Х | | | | | | | |
| Freshwater Shoreline Infrastructure Oil Spills | X | X | X | X | X | x | | | x | | Х | Х | X | |

4.0 CURRENT CONTEXT IN THE LIO AREA

ECOSYSTEM RECOVERY CONTEXT AND CONCEPTUAL MODELS IN THE LIO AREA

Understanding the current context within which the LIO operates will contribute to development of a more successful recovery plan. (Note that the term "situation analysis" is often used to refer to a conceptual model and related description of the recovery context, but for simplicity this section will only refer to Conceptual Models.) Conceptual Models help build a common understanding of the impact of ecological, social, economic, cultural, political and institutional systems.

For definitions of common terms used in this section, see the glossary (Appendix A). For a complete set of conceptual models and associated descriptions, see Appendix C.

The Steering Committee developed Conceptual Models for all 13 priority Pressures in order to demonstrate the ecological, social, economic, cultural, political and institutional systems within which the LIO operates. Through this exercise, the Steering Committee comprehensively catalogued the major factors (indirect threats and opportunities) that cause the Pressures to persist. The Conceptual Models mapped out the root causes of the Pressures, and intervention points where recovery strategies would be most effective. This exercise pinpointed 54 strategies, which the Working Group was asked to discuss, identifying the highest priorities to highlight in the Ecosystem Recovery Plan.

In small groups, the Working Group established 16 priorities, and by merging similar ones, generated nine broad priority strategies. These were then scored according to the following considerations: Potential Impact, Feasibility, and Readiness for Implementation.

Some Working Group members expressed concern about scoring strategies based on varying knowledge levels, but all Working Group members were encouraged to participate in scoring based on their familiarity and unique expertise with West Central LIO Action Area.

The Working Group highlighted the importance of striving beyond reducing negative impacts on Puget Sound health and protecting what healthy ecosystems remain. They emphasized that ecosystem recovery must measure work toward <u>net</u> improvements in water conservation and recovery.

The LIO's 13 priority Pressures are described below:

ABSTRACTION OF GROUNDWATER: Pumping or other extraction of ground water

AGRICULTURE AND FORESTRY EFFLUENTS: Water-borne pollutants from agriculture, siliviculture, and aquaculture systems that include nutrients, toxic chemicals and/or sediments plus the effects of these pollutants on the site applied. This class also includes pollutants added by bio-solids, herbicide, and pesticide application. Examples: nutrient loading from fertilizer run-off, manure from

feedlots, nutrients from aquaculture, etc.; soil erosion from overgrazing, increased run-off and hence sedimentation due to conversion of forests to agricultural lands, etc.; herbicide run-off from orchards, etc.

FRESHWATER SHORELINE INFRASTRUCTURE: Armoring of freshwater shorelines and overwater structures that alter, destroy, and disturb habitats and species via a non-consumptive use, including industrial, commercial, and recreational marinas, ports and shipyards.

LOGGING AND WOOD HARVESTING: Harvesting trees and other woody vegetation for timber, fiber, or fuel. This includes subsistence scale use and large scale use, both of which can have intentional and unintentional effects on target and non-target species. Consider the specific product(s) harvested and the method used e.g., clear cutting of hardwoods, selective commercial logging, pulp or woodchip operations, fuel wood collection, etc.

MARINE LEVEES, FLOODGATES, TIDEGATES: Levees & tidegates along marine water systems to manage or exclude marine water into the freshwater system. Impacts associated with levees and tidegates include conversion or degradation of habitat, altered hydrology, and altered connectivity.

MARINE SHORELINE INFRASTRUCTURE: Armoring of marine shorelines and overwater structures that alter, destroy, and disturb habitats and species via a non-consumptive use, including industrial, commercial, and recreational marinas, ports and shipyards.

OIL SPILLS: Accidental, episodic, or potentially catastrophic spill of oil and hazardous waste in aquatic and terrestrial environments. This class includes oil spills from pipelines, vessels, marine terminals, and industrial facilities.

ONSITE SEWAGE SYSTEMS: Discharges from Onsite Sewage Systems (OSS). This class includes sewage and leachates (nutrients, toxic chemicals and/or sediment) from residences and commercial facilities not connected to a municipal system (septic, small private systems, and everything with a drain field).

ROADS AND RAILROADS (INCLUDING CULVERTS): Surface transport on roadways and dedicated tracks. Examples: highways, secondary roads, primitive roads, logging roads, bridges & causeways, fencing associated with roads, freight/passenger/mining railroads, etc.

RUNOFF FROM DEVELOPMENT: Includes four sources described below:

Commercial and Industrial Areas – Factories and other commercial centers. Shipyards and airports fall into this class. Examples: military bases, factories, stand-alone shopping centers, office parks, power plants, train yards, ship yards, ports, airports, landfills, etc.

Industrial Runoff – Introduction of exotic or excess material into hydrologic system due to surface water loading and runoff from industrial lands. This class includes runoff from industrial facilities and lands.

Runoff from commercial and residential lands – Introduction of exotic or excess material into hydrologic system due to surface water loading and runoff from the built environment. This class includes runoff from commercial and residential lands, transportation facilities and corridors, as well as hull-cleaning and other pollution from marina infrastructure and land-based boat maintenance practices (i.e. NPDES regulated activities that occur in marinas and shipyards).

Housing and urban areas – Human cities, towns, and settlements including non-housing development typically integrated with housing. This class dovetails with 1.2 Commercial and Industrial Areas (including ports). Examples: urban areas, suburbs, villages, ranchettes, vacation homes, shopping areas, offices, schools, hospitals, land reclamation or expanding human habitation that causes habitat conversion or degradation in riverine, estuary and coastal areas, etc.

SEWER (DOMESTIC AND MUNICIPAL WASTEWATER): Discharges from municipal Wastewater Treatment Plants (WWTPs) into hydrologic systems. This class includes water-borne sewage that includes nutrients, pathogens, toxic chemicals, and sediments. Discharges from combined sewer overflows CSOs are included here.

SHIPPING LANES AND DREDGED WATERWAYS: Transportation in freshwater and ocean waterways. This class includes vessel traffic as well as dredging and other activities that maintain shipping lanes. Wastewater discharge and ballast water from tugs and non-military cargo vessels is also included here. Ballast water is a significant vector for invasive species introduction. Examples: canals, shipping lanes, whale-watching routes, wakes from cargo ships, etc.

WAR, CIVIL UNREST, & MILITARY EXERCISES: Actions by formal or paramilitary forces without a permanent footprint. This class focuses on military activities that have a large impact on natural habitats, but are not permanently restricted to a single area. It also includes wastewater discharged from military vessels. Examples: armed conflict, mine fields, tanks & other military vehicles, training exercises & ranges, defoliation, munitions testing, etc.

5.0 OUR STRATEGIES AND ACTIONS

After our LIO described the situation in which we are operating and what we want to achieve, we next considered the types of actions that need to occur. Good strategic planning involves determining where and how our LIO will take action—as well as where our LIO will not take action.

To document and test assumptions about how specific strategies and actions are intended to effect change in the ecosystem, our LIO developed theories of change associated with specific strategies or suites of strategies in the form of results chains. Results chains help to build shared understanding of the context within which local recovery occurs. They help our LIO explain the logic behind recovery strategies to determine if recovery efforts are likely to achieve near-term objectives and longer-term goals. Results chains also provide a structure for assessing the effectiveness of specific actions and for redirecting efforts if a specific action is determined to be ineffective. In addition, our LIO can use the results chains to identify how future development of local Near Term Actions for the Puget Sound Action Agenda align with regional priorities.

It was noted that NTAs were chosen and ranked before priority strategies were determined, so they do not directly correlate. For example, there are currently no NTAs addressing abstraction of groundwater despite that it has been identified as a priority pressure.

Strategies and descriptions of associated theories of change are summarized below. Results chains and definitions of common terms used in this section are available in Appendix D.

SUMMARY OF LIO STRATEGIES

The West Central LIO Steering Committee began identifying strategies by developing conceptual models for each pressure source. More than 50 strategies were identified through this exercise. The strategies were then translated from local language to corresponding regional substrategies in the Puget Sound Action Agenda. Local strategies that do not have comparable regional substrategies were kept in local verbiage and documented in the planning process.

The Steering Committee presented all strategies to the Working Group, who then used a two-step prioritization process to narrow the list of over 50 strategies to a ranked list of sixteen strategies. Several of the sixteen strategies were lumped together to create nine priority recovery strategies for the West Central LIO.

The Working Group recommended the recovery strategies to the Executive Committee. The Executive Committee generally agreed with the recommendations, though asked that the strategies not be presented as a ranked list (from 1 to 9) but as equally important recovery strategies that need to be addressed.

Table 6 lists the recovery strategies currently identified in the LIO area. *ID indicates the 2016 Action Agenda substrategy number. Combined substrategies are in the same gray shade. See Appendix C: Conceptual Models for complete list of local strategies derived from conceptual models.

Table 6. Strategies included in the LIO Recovery Plan.

| *ID | Recovery Strategy | Description |
|------|--|--|
| 2.2 | Implement and maintain priority freshwater and terrestrial restoration projects (streams, lakes, wetlands, etc.) | Support the coordination of efforts to undertake and maintain restoration projects in freshwater and terrestrial habitats. This strategy supports the improvement of data and information to prioritize and accelerate the repair and replacement of culverts and other structural barriers in anadromous zones; prevention of new freshwater armoring; removal of existing freshwater armoring where feasible; and restoration of riparian areas. Provide incentives and assistance such as direct and indirect financial incentives, technical assistance, and conservation leasing to encourage the implementation of freshwater restoration projects. |
| 21.4 | Develop and implement local and tribal pollution identification and correction programs | Improve freshwater quality and marine water quality through the implementation of local pollution identification and correction (PIC) programs that determine the cause and source of water pollution in specific watersheds and ensure corrective actions are taken. Provide source identification sampling, site inspection, technical assistance, and financial support to correct identified source of pollution. Conduct consistent, long-term, ambient water quality monitoring to prioritize projects and evaluate action effectiveness. Coordinate outreach about proposed PIC projects and results to increase community awareness, participation, and support. |
| 10.5 | Provide focused stormwater-related education and training | Provide information, education, and training on stormwater specific issues to a variety of audiences. Develop and implement stormwater education programs for residents and businesses. |
| 20.2 | Strengthen and integrate spill response readiness of the state, tribes, and local governments | Strengthen and integrate spill response plans and readiness of state, tribes, and local governments. Provide education and outreach to communities about spill (oil, etc.) response and best management practices. |

| 10.1 | Manage urban runoff and stormwater at the basin and watershed scale | Support the development of watershed plans based on watershed characterization data that include land use planning and stormwater planning and management. Use watershed plans to prioritize and fund water quality and water quantity retrofits. Align regulations with watershed plans. Support collaborative work with Naval Base Kitsap to improve and implement the Integrated Natural Resources Plan(s) to address runoff from commercial and industrial areas (e.g. shipyard). |
|------|---|---|
| 4.2 | Provide infrastructure & incentives within UGAs accommodate new & re- development | Provide infrastructure and incentives to accommodate redevelopment within designated urban growth areas. |
| 1.1 | Identify & prioritize areas for protection, restoration, or development | Use accurate and updated data to identify, assess, and prioritize areas for protection, restoration, or low impact development. Includes identifying fish passage barriers, nearshore structural barriers, freshwater structural barriers, derelict roads and railroads, areas suitable for retrofits or redevelopment, and critical areas. |
| 2.1 | Protect and conserve ecologically important lands at risk of conversion | Support programs and efforts to protect and conserve ecologically important lands and intact habitats at risk of conversion. |
| 26.3 | Enable and encourage residents to take informed stewardship actions addressing infiltration, pollution reduction, habitat improvement forest cover, soil development, critical areas, reductions in shoreline armoring | Enable and encourage residents to take informed stewardship actions addressing infiltration, pollution reduction, habitat improvement, forest cover, soil development, critical areas, reductions in shoreline armoring, and other actions for the recovery of Puget Sound. |

| 26.5 | Enhance resources to sustain and expand effective behavior change and volunteer programs | Support the sustainability and expansion of effective behavior change and volunteer programs with demonstrated and measurable outcomes that support ecosystem recovery priorities in the West Central action area and Puget Sound as a whole. |
|------|--|---|
| 17.2 | Implement and maintain priority marine restoration projects | Identify and implement priority marine restoration projects to restore shoreline habitats and priority areas such as feeder bluffs, pocket estuaries, inlets, bays, and shellfish and eelgrass beds. Remove shoreline armoring, fish passage barriers, and other structural impediments to restore nearshore processes and habitat. Support stewardship programs, encourage education and outreach, and offer restoration incentives (in technical assistance and financial assistance). |
| 10.3 | Fix problems caused by development | Fix problems from existing development through structural retrofits, regular and enhanced maintenance, and redevelopment policies and activities. Assess maintenance needs and life-cycle strategies for existing stormwater and wastewater infrastructure and prioritize replacement needs. Retrofit existing drainage ditches, older buildings and facilities, and roads and lots. Create and implement innovative approaches to promote retrofit programs on private property. |
| 9.6 | Increase compliance with and enforcement of environmental laws, regulations, and permits | Increase compliance with and enforcement of environmental laws, regulations, and permits to ensure conservation and protection of natural resources. Includes enforcement of the Critical Areas Ordinance, Shoreline Management Act, Clean Water Act, etc. |
| 11.2 | Ensure compliance with regulatory programs designed to reduce, control, or eliminate pollution from working farms | Support programs that address water pollution from farming activities by reducing and eliminating nutrient and bacteria discharges into surface water and leaching into groundwater. Provide technical assistance and incentives to promote compliance with regulatory programs designed to reduce, control, or eliminate pollution from working farms. |

| 7.2 | Decrease the amount of water withdrawn or diverted and per capita water use | Support conservation actions to decrease water withdrawal, diversion, and per capita use. Key pressures include overuse of water in (non-regulated) exempt residential wells, commercial use for irrigation, and industrial use at shipyards and other large facilities. |
|-----|---|---|
| 7.1 | Update instream flow rules to encourage conservation | Enhance instream flow rules and regulations to encourage and promote conservation of water. |

6.0 THEORIES OF CHANGE

This section describes theories of change documenting our assumptions about how strategies and actions are intended to help reduce pressures and achieve our ecosystem and human wellbeing recovery goals. Results chains illustrating the cause and effect relationships linking action implementation to desired intermediate and long-term results are included in Appendix D. Common terms used in this section are defined in the Glossary (Appendix A) and in Appendix D.

Theory of Change: 10.1 Manage Urban Runoff at the Basin and Watershed Scale

This strategy supports the development and implementation of watershed plans to manage urban runoff in order to improve water quality and preserve healthy watersheds. This strategy supports the effort to align local regulations with watershed plans. It also support collaborative work with Naval Base Kitsap to improve and implement the Integrated Natural Resources Plan(s) to address runoff from commercial and industrial areas (e.g. shipyard).

Actions

| ID | NEAR TERM ACTION | DESCRIPTION |
|-----------|---|---|
| 2016-0018 | Liberty Bay Bioretention and LID Program | Construct bioretention cells at priority locations in the City of Poulsbo, commercial and residential areas. |
| 2016-0017 | South Fork Dogfish Creek Restoration, Design Phase | Design for: restoration of stream channel, replacement of culvert, and construction of stormwater treatment facility. |

Theory of Change: 10.3 Fix Problems Caused By Development (Structural Upgrades; Regular and Enhanced Maintenance)

This strategy is intended to address problems (i.e. from stormwater, wastewater, roads, etc.) from existing developments through structural retrofits and regular and enhanced maintenance. It also supports work to assess maintenance needs and life-cycle strategies for existing stormwater and wastewater infrastructure and prioritize replacement needs. Retrofit existing drainage ditches, older buildings and facilities, and roads and lots. Create and implement innovative approaches to promote retrofit programs on private property.

Actions

| ID | NEAR TERM ACTION | DESCRIPTION |
|-----------|---|--|
| 2016-0234 | Harper Estuary Bridge | Construct a bridge to replace an undersized culvert and road at Harper Estuary. |
| 2016-0196 | West Central Nearshore Restoration Prioritization and Armor Removal | Analyze, prioritize, and implement nearshore habitats projects for protection, restoration, and armor removal in the West Central Action Area. |
| 2016-0201 | Donkey Creek Basin Habitat Management Plan | Develop a habitat management plan to protect the ecological quality of the Donkey Creek drainage basin and the associated salmon run. |
| 2016-0275 | Liberty and Miller Bay Working Farms' Water Pollution and Control Project | Shellfish growing areas in Liberty & Miller Bays are impacted by farming activities. Technical assistance from Kitsap Conservation District will help farmers identify what activities create risk & implement BMPs to reduce & control pollution. |
| 2016-0018 | Liberty Bay Bioretention and LID Program | Construct bioretention cells at priority locations in the City of Poulsbo, commercial and residential areas. |
| 2016-0017 | South Fork Dogfish Creek Restoration, Design Phase | Design for: restoration of stream channel, replacement of culvert, and construction of stormwater treatment facility. |
| 2016-0233 | Chico Creek Culvert (Golf Club Hill Road) and Floodplain Restoration | Replace a triple box culvert at Golf Club Hill Road (Chico Creek) with a bridge sized to meet stream simulation standards. Restore associated floodplains as designed with the proposed bridge. |
| 2016-0200 | Crescent Creek Culvert Daylighting Project Phase 2 | Building from the feasibility study to evaluate fish passage, tidal hydrology, and estuarine function, design and permit a new culvert or bridge structure. |
| ID | NEAR TERM ACTION | DESCRIPTION |
|-----------|---|---|
| 2016-0276 | City of Port Orchard Annapolis Creek Fish Passage Enhancement | The City of Port Orchard proposes to replace a culvert that is partially blocking fish passage near the mouth of Annapolis Creek. Replacing this culvert with an engineered box culvert eliminates the barrier and improves the pocket estuary near the mouth of the creek. |
| | South Dyes Inlet Wastewater Facility | Proposed by City of Bremerton but did not make it in time for the 2016 AA Implementation Plan |

Theory of Change: 2.2 Implement and Maintain Priority Freshwater and Terrestrial Restoration Projects

This strategy will result in the development and implementation of priority freshwater projects. Freshwater restoration projects also include those referenced in the West Sound Watersheds Council 4 Year Plan. This strategy supports work to:

- Replace or remove structural barriers in freshwater habitats including culverts, dikes, dams, and similar structures.
- Improve data and information to prioritize and accelerate riparian restoration and protection.
- Implement restoration of riparian areas.
- Improve data and information to prioritize and accelerate removal of structural barriers.
- Implement prioritized structural barrier removals.

| ID | NEAR TERM ACTION | DESCRIPTION |
|-----------|---|---|
| 2016-0017 | South Fork Dogfish Creek Restoration, Design Phase | Design for: restoration of stream channel, replacement of culvert, and construction of stormwater treatment facility. |

| ID | NEAR TERM ACTION | DESCRIPTION |
|-----------|--|---|
| 2016-0233 | Chico Creek Culvert (Golf Club Hill Road) and Floodplain Restoration | Replace a triple box culvert at Golf Club Hill Road (Chico Creek) with a bridge sized to meet stream simulation standards. Restore associated floodplains as designed with the proposed bridge. |

Theory of Change: 21.4 Develop and Implement Local and Tribal Pollution Identification Correction (Pic) Programs;

This strategy supports the development and implementation of pollution, identification, and correction programs in the West Central action area – in counties, cities, and in tribal jurisdictions. This strategy is bundled with two other strategies: **Theory of Change: 10.5 Provide Stormwater-Related Education and Training** and **20.2 Strengthen and Integrate Spill Response Readiness of the State**, **Tribes, and Local Government**. Together, these strategies complement and leverage work to address water quality and minimize pollution sources to protect Puget Sound's marine and fresh water health.

Actions

| ID | NEAR TERM ACTION | DESCRIPTION |
|-----------|---|---|
| 2016-0237 | Kitsap County Shoreline Monitoring Program (PIC) | Implement a county wide marine shoreline monitoring program to maintain the status of open shellfish beds classified as "approved" or "conditionally approved in Kitsap County. |

10.5 Provide Focused Stormwater-related Education, Training, and Assistance

This strategy supports programs that provide education, outreach, and assistance in stormwater specific issues.

| ID | NEAR TERM ACTION | DESCRIPTION |
|-----------|--|---|
| 2016-0358 | West Central Outreach and Behavior Change Plan with Kitsap Environmental Education Programs/Kitsap ECO Net | Develop a coordinated environmental education, outreach, and behavior change plan that addresses regional priorities and vital signs. |

20.2 Strengthen and integrate spill response readiness of the state, tribes, and local government

No Actions

Theory of Change: 26.3 Enable and Encourage Stewardship Actions

This strategy supports programs that enable and encourage residents to take informed stewardship actions to protect and restore Puget Sound. This strategy is bundled with Strategy **26.5 Enhance resources to sustain and expand effective behavior change and volunteer programs.**

26.5 Enhance Resource to Sustain and Expand Effective Behavior Change and Volunteer Programs

This strategy supports efforts intended to enhance and sustain natural resources through volunteer programs and expand behavior change campaigns.

| ID | NEAR TERM ACTION | DESCRIPTION |
|-----------|--|---|
| 2016-0358 | West Central Outreach and Behavior Change Plan with Kitsap Environmental | Develop a coordinated environmental education, outreach, and behavior change plan that addresses regional priorities and vital signs. |

| ID | NEAR TERM ACTION | DESCRIPTION |
|-----------|--|--|
| | Education Programs/Kitsap ECO Net | |
| 2016-0275 | Liberty & Miller Bay Working Farms Water Pollution and Control Project | Shellfish growing areas in Liberty & Miller Bays are impacted by farming activities. Technical assistance from Kitsap Conservation District will help farmers identify what activities create risk & implement BMPs to reduce & control pollution. |
| 2016-0056 | Active Shellfish Upgrades in Miller Bay by Restoring Olympia Oysters | Puget Sound Restoration Fund's proposal combines a 2-acre native oyster bed restoration project with revitalized access to shellfish resources and improved estuary function in order to strengthen existing efforts to upgrade 275 acres of shellfish beds in Miller Bay. |

Theory of Change: 4.2 Infrastructure and Incentives within UGAs Accommodate New and Re-Development

This strategy supports actions to provide infrastructure and incentives in urban growth areas to accommodate new and redevelopment. This strategy is bundled with **2.1 Protect and Conserve Ecologically Important Lands at Risk of Conversion** and **1.1 Identify and Prioritize Areas for Protection, Restoration, or Development**. Together, these strategies promote the protection of ecologically important habitats and areas.

| ID | NEAR TERM ACTION | DESCRIPTION |
|-----------|---|--|
| 2016-0018 | Liberty Bay Bioretention and LID Program | Construct bioretention cells at priority locations in the City of Poulsbo, commercial and residential areas. |

| ID | NEAR TERM ACTION | DESCRIPTION |
|----|---|--|
| | South Dyes Inlet Wastewater Facility | Provide wastewater collection system extensions into areas where septic systems are the current form of wastewater collection and treatment. |

2.1 Protect and Conserve Ecologically Important Lands at Risk of Conversion

This strategy supports the implementation of projects and programs to protect and conserve ecologically important lands, watersheds, and nearshore areas.

| ID | NEAR TERM ACTION | DESCRIPTION |
|-----------|--|---|
| 2016-0201 | Donkey Creek Basin Habitat Management Plan | Develop a habitat management plan to protect the ecological quality of the Donkey Creek drainage basin and the associated salmon run. |
| 2016-0243 | West Central Intrinsic Modeling for Steelhead | Update intrinsic potential modeling for steelhead in the West Central LIO with high resolution topography. |
| 2016-0060 | West Sound Eelgrass Monitoring Program | Continue implementation of a monitoring plan to document the current status of eelgrass along the east Kitsap nearshore. |
| 2016-1237 | Strategic West Central Water Type + eDNA Assessment | Collect and analyze eDNA samples to determine presence/absence of species of interest (including Chinook and steelhead) in prioritized West Central sub-basins and expand water type assessments to include basins in the West Central Action Area. |

| ID | NEAR TERM ACTION | DESCRIPTION |
|-----------|---|--|
| 2016-0192 | Natural Resources Asset Management Plan | Create a natural resources asset management program to assist local government fiscal, permitting and management decisions to improve citizen awareness of ecosystem services. |
| 2016-0062 | East Kitsap Steelhead Recovery Plan Development | Develop a recovery plan chapter for the East Kitsap demographically independent population of Puget Sound steelhead. |
| 2016-0190 | Climate Change Vulnerability Assessment and Adaptation Plan | Identify key resources (natural and infrastructure), the expected impacts from climate change, and create an adaptation plan for each resource. |

1.1 Identify and Prioritize Areas for Protection, Restoration, or Development

This strategy supports efforts to identify and prioritize areas and habitats for protection and restoration, and areas suitable for low impact development.

| ID | NEAR TERM ACTION | DESCRIPTION |
|-----------|--|--|
| 2016-0060 | West Sound Eelgrass Monitoring Program | Continue implementation of a monitoring plan to document the current status of eelgrass along the east Kitsap nearshore. |
| 2016-0062 | East Kitsap Steelhead Recovery Plan Development | Develop a recovery plan chapter for the East Kitsap demographically independent population of Puget Sound steelhead. |

| ID | NEAR TERM ACTION | DESCRIPTION |
|-----------|---|---|
| 2016-0190 | Climate Change Vulnerability Assessment and Adaptation Plan | Identify key resources (natural and infrastructure), the expected impacts from climate change, and create an adaptation plan for each resource. |
| 2016-0201 | Donkey Creek Basin Habitat Management Plan | Develop a habitat management plan to protect the ecological quality of the Donkey Creek drainage basin and the associated salmon run. |
| 2016-0243 | West Central Intrinsic Modeling for Steelhead | Update intrinsic potential modeling for steelhead in the West Central LIO with high resolution topography. |
| 2016-0245 | West Central LiDAR data collection | Update LiDAR data collection to better define habitat and subsequent protection and development areas. |
| 2016-0192 | Natural Resources Asset Management Plan | Create a natural resources asset management program to assist local government fiscal, permitting and management decisions to improve citizen awareness of ecosystem services. |
| 2016-1237 | Strategic West Central Water Type + eDNA Assessment | Collect and analyze eDNA samples to determine presence/absence of species of interest (including Chinook and steelhead) in prioritized West Central sub-basins and expand water type assessments to include basins in the West Central Action Area. |

Strategy 26.3 Enable and encourage residents to take informed stewardship actions addressing infiltration, pollution reduction, habitat improvement, forest cover, soil development, critical areas, reductions in shoreline armoring, and other actions intended to recover the health of Puget Sound; is added to the Theory of Change 4.2 to highlight the importance of outreach and education to landowners.

Theory of Change: 7.2 Decrease Water Withdrawal, Diversion, Per Capita Water Use;

This strategy supports conservation actions to decrease water withdrawal, diversion, and per capita use. This strategy is bundled with **7.1 Update Instream Flow Rules to Encourage Conservation**. Together, these strategies intend to protect and maintain water resources in the West Central action area.

No Actions

Theory of Change: 9.6 Increase Compliance with and Enforcement of Environmental Laws, Regulations, and Permits

This strategy supports programs that promote compliance with and enforcement of environmental laws and regulations to ensure conservation and protection of natural resources. This strategy is bundled with **11.2 Ensure Compliance with Regulatory Programs Designed to Reduce, Control or Eliminate Pollution form Working Farms.**

Actions

| ID | NEAR TERM ACTION | DESCRIPTION |
|-----------|---|--|
| 2016-0196 | West Central Nearshore Restoration Prioritization and Armor Removal | Analyze, prioritize, and implement nearshore habitats projects for protection, restoration, and armor removal in the West Central Action Area. |

11.2 Ensure compliance with regulatory programs designed to reduce, control or eliminate pollution from working farms and provide incentives

This strategy supports efforts and programs to ensure compliance with regulations needed to manage and prevent water pollution from farming activities. This effort intends to reduce and eliminate nutrient and bacteria discharges into surface water and to minimize these from leaching into groundwater. [Working farms are places, both large and small, where agricultural activities occur.]

Actions

| ID | NEAR TERM ACTION | DESCRIPTION |
|-----------|--|--|
| 2016-0275 | Liberty & Miller Bay Working Farms Water Pollution and Control Project | Shellfish growing areas in Liberty & Miller Bays are impacted by farming activities. Technical assistance from Kitsap Conservation District will help farmers identify what activities create risk & implement BMPs to reduce & control pollution. |

Theory of Change: 17.2 Implement and Maintain Priority Marine Restoration Projects

This strategy intends to restore and maintain priority marine habitats and areas such as feeder bluffs, pocket estuaries, inlets, bays, and shellfish and eelgrass beds.

| ID | NEAR TERM ACTION | DESCRIPTION |
|-----------|---|---|
| 2016-0196 | West Central Nearshore Restoration Prioritization and Armor Removal | Analyze, prioritize, and implement nearshore habitats projects for protection, restoration, and armor removal in the West Central Action Area. |
| 2016-0234 | Harper Estuary Bridge | Construct a bridge to replace an undersized culvert and road at Harper Estuary. |
| 2016-0276 | City of Port Orchard Annapolis Creek Fish Passage Enhancement | The City proposes to replace a culvert that is partially blocking fish passage near the mouth of Annapolis Creek. Replacing this culvert with an engineered box culvert eliminates the barrier and improves the pocket estuary near the mouth of the creek. |
| 2016-0200 | Crescent Creek Culvert Daylighting Project Phase 2 | Building from the feasibility study to evaluate fish passage, tidal hydrology, and estuarine function, design and permit a new culvert or bridge structure. |

| ID | NEAR TERM ACTION | DESCRIPTION |
|-----------|--|--|
| 2016-0056 | Active Shellfish Upgrades in Miller Bay by Restoring Olympia Oysters | Puget Sound Restoration Fund's proposal combines a 2-acre native oyster bed restoration project with revitalized access to shellfish resources and improved estuary function in order to strengthen existing efforts to upgrade 275 acres of shellfish beds in Miller Bay. |

Strategy 26.3 Enable and encourage residents to take informed stewardship actions addressing infiltration, pollution reduction, habitat improvement, forest cover, soil development, critical areas, reductions in shoreline armoring, and specific actions for the recovery of Puget Sound was added to Theory of Change 17.2 to highlight the importance of outreach and education.

7.0 GAPS/BARRIERS/NEEDS

Gaps, Barriers and Needs Assessment include those that the LIO would like to be considered for legislative requests, Biennial Science Work Plan, by the Management Conference, etc.

Table 7. Barriers

| Barriers to Implementation of | Detailed Description of Barrier | Resources needed to overcome (technical, |
|---|--|--|
| Recovery Strategies | | capacity, political) |
| Lack of time and funding to collect and analyze data to inform baselines and numeric goals | Goals require clear baseline data in order to set targets and benchmarks | Further research, data collection and analysis by local jurisdictions, tribes and LIO partners State, local, tribal, and federal coordination and sharing of information and resources |
| Capital and non-capital (regulatory) programs not always consistent with recovery | For example, permitting of bulkhead installation and wastewater treatment in context of UGA demonstrate misalignment between regulatory requirements and ecosystem recovery | Advocacy by LIO, local jurisdictions, partners and concerned citizens to alter regulatory programs in alignment with recovery |

| Some local strategies were not found in PSP's results chains work (Miradi) | For example, "D5.5 Enhancing resources to sustain behavior change and volunteer programs" | SI Leads' participation in local planning LIO capacity to participate in SIAT |
|---|--|--|
| Overall focus on process and planning detracts from the capacity needed to implement actions | For example, the process required to fund and report NTAs, and Recovery Planning | PSP minimize procedural requirements for process and planning Good governance – policy- and decision- makers focus on recovery, not process, as end goal Communication from PSP about expectations of LIOs |
| Climate change poses quickly shifting environmental conditions | As environmental conditions rapidly change, political and environmental priorities may shift in response, making it difficult to anticipate obstacles to completion | Strong advocacy by LIO and partners directed at regional and state decision makers to address political and environmental causes of climate change, as well as urgent response therefore |

Table 8. Gaps

| Gap of Resources/Capacity Required | Detailed Description of Gap | Resources needed to fill (technical, capacity, political) |
|---|---|---|
| The current status of indicators is unknown (i.e. Our vision is limited by not knowing what we've lost historically) | Lack of historical information about ecosystem health for all ecosystem components and indicators | Data and technical research should be shared between academia, local jurisdictions, tribes, agencies and organizations—project managers and technical staff would reach out for information needed Robust baseline data from academic institutions and state/regional organizations State, local, tribal, federal coordination and sharing of information and resources |

| Disconnect between regional planning and LIOs | For example, Ecosystem Recovery Plans should be integrated with comprehensive plans | Policy and decision makers (at regional and state agencies and planning commissions) integrate recovery plans at comprehensive planning level Continued involvement of elected officials More coordination with and/or participation from Navy, WSDOT, KC Public Works, WSWC |
|---|---|---|
| Local salmon recovery not well integrated in LIO planning process | For example, there is lack of coordination with Salmon Recovery Council regarding ecosystem recovery planning and NTA implementation | Involvement of citizen groups and community-based orgs Support for ECONet to participate in WG |
| Not all 2016 NTAs line up with priority Recovery Strategies | Due to sequence of Recovery Planning and submittal of NTA proposals, current NTAs are not precisely aligned with all priority strategies identified through the development of this Recovery Plan | The recovery strategies identified through the Recovery Plan will be used by the LIO in the development of new NTAs in 2017/18. |

8.0 ADAPTIVE MANAGEMENT PROCEDURE

Adaptive Management is an iterative process intended to be used early and often during planning and other project and program stages to:

- Raise key questions for managers, governmental, and non-governmental entities regarding the optimum approach for achieving recovery and protection goals;
- Design ways to answer those questions and address major gaps and barriers; and
- Incorporate new data and other relevant information into decision making to improve ecosystem recovery program design and implementation.

The West Central LIO acknowledges that many systems are currently in place to manage and monitor recovery projects, and that the Adaptive Management Framework below serves primarily as a guide.

Adaptive Management Framework

- 1. Develop local indicators based on priority ecosystem components and local vision statements;
 - Integrate monitoring into project proposals and management
 - Build on PSP targets and indicators
 - Establish monitoring guidelines at various scales—to evaluate project effectiveness, environmental impact on the Action Area, and progress toward implementation of the recovery plan at a regional scale
- 2. Establish baselines that can quantify and validate goals
 - Review goals against baseline data
 - Set numeric criteria
- 3. Establish protocols and data standards for collecting information
 - Use Miradi as tool

<<Iterate #2 and #3>>

- 4. Develop robust data set
 - Collection and analysis of data
 - Collect information relevant to expected outcome
- 5. Monitor ecosystem conditions
 - Measure cumulative effect of actions
- 6. Establish quantitative criteria for meeting goals
 - Based on the data, follow different paths

<<Iterate #5 and #6>>

- 7. Review data, revise actions based on data
 - Data should trigger prescribed series of actions. For example, Total Maximum Daily Load (TMDL), as a program of Department of Ecology, triggers a series of actions in conjunction with a monitoring plan, which eventually results in delisting.
 - Similarly, improve/adjust goals based on baseline information
- 8. Identify resources and capacity needed
- 9. Address gaps and barriers
- 10. Track and communicate progress toward appropriate Vital Signs
 - Via NTA updates
 - Via updates to Ecosystem Recovery Plan
- 11. Accountability for checking outcomes

• Review Recovery Plan on annual basis to evaluate progress toward Goals, and to update or revise the plan to maintain consistency with actual results and priorities

The West Central LIO Working Group and Executive Committee have vetted and approved the Ecosystem Recovery Plan throughout the process of developing it. As a living document intended to reflect local priorities for ecosystem recovery, further revisions will be made as recommended by Working Group and approved by Executive Committee at any time throughout the year.

REFERENCES

To develop this plan, the West Central LIO used information from:

The Puget Sound Pressure Assessment, and specifically the assessment specific to the West Sound region;

The West Sound Chinook recovery chapter;

West Central LIO Early Elements;

Near-Term Actions; and

Restoration Programs and Public Works Projects of Organizational Partners

APPENDICES

A. Glossary B. Pressure Sources and Stressors of Concern in the LIO

- C. Conceptual Models
- D. Results Chains

Appendix A: Glossary

<u>Action:</u> A specific action focused on delivery of a specific outcome or output associated with a desired result. Actions include capital projects (e.g. restoration and acquisition), program development or implementation, education and outreach, research, etc. Actions can be completed on a near-term (i.e. 2 years or less) or longer-term time scale. LIOs will insert 2016 NTAs on the results chain.

<u>Conceptual Models</u> are used to describe underlying causes and contextual relationships that contribute to pressures (human actions or natural processes that give rise to stress on the ecosystem, but also may provide benefits to people). They are typically described for each priority pressure as opposed to being organized by component or Vital Sign. They can also be used to identify positive factors and opportunities that would be desirable to maintain or strengthen with strategies and actions.

<u>Contributing Factors</u> is a general term used to describe the multiple types of factors that lead to the creation of pressures on the ecosystem and human wellbeing. They can include negative factors, also known as root causes or drivers, or enabling conditions that are allowing a problem to persist. They can also include positive factors and opportunities that the LIO might want to enhance. Most factors can be associated with one or more stakeholders – individuals, groups, communities or institutions – that have an interest in and are affected by some aspect of the ecosystem. Understanding the relationship between different types of factors and people's interests is important for developing effective strategies.

<u>Ecological Components</u> - Ecological Components (Components) are the things (beyond human wellbeing) the LIO cares about conserving. They can be individual species, habitat types, ecological processes, or ecosystems chosen to encompass the full breadth of conservation objectives for the LIO geography. Components can be consistent with Puget Sound Vital Signs (e.g. Estuaries or Chinook) or, if LIO interests are not well captured by PSP's adopted Vital Signs, they can go beyond the scope of the Vital Signs (e.g. Small Tributaries or Steelhead). They should be representative of the priority biophysical parts of the ecosystem the LIO would like to recover.

Goal: A goal is a desired future condition of a habitat, species, or attribute of human wellbeing.

<u>Human Wellbeing components</u> are the priority aspects of human wellbeing directly related to the health of the natural environment that the LIO would like to protect. This can include human wellbeing related to physical and psychological health, economic health, or social and cultural health. For example, an LIO might be particularly interested in protecting or restoring Cultural Traditions associated with fishing, shellfishing or farming. As with ecological components, human wellbeing components could be totally consistent with the Puget Sound Vital Signs (e.g. Harvestable Shellfish Beds) or they could go beyond the scope of the Vital Signs (e.g. Flood Safety).

<u>Intermediate results</u>: Intermediate results are the expected changes following the implementation of a strategy or action that are necessary steps toward achieving the desired future status and goals.

<u>Objectives</u>: Objectives are the desired outcomes for critical intermediate results, or interim goals. Objectives are identified for a subset of intermediate results in a results chain. Like goals, a good objective is results-oriented, measurable, time limited, specific, and practical. LIOs should consider objectives as interim measurements of progress towards goals and include the 2020 timeframe as well as subsequent 2 or 5 year timeframes.

<u>Pressures</u>. Human actions or natural processes that give rise to stress on the ecosystem, but also may provide benefits to humans.

<u>Source</u>. Sources are defined as human activities or natural processes that have caused, are causing, or may cause the destruction, degradation, and/or impairment of Vital Signs, ecosystem components or human wellbeing components. Sources include the cause of stress (e.g., residential and commercial development) and associated <u>stressors</u> (e.g., habitat conversion due to development). Sources deliver stressors directly to ecosystem components.

<u>Strategy</u>: A strategy is a bundle of actions that, when combined, are intended to achieve a common goal. Strategies are intended to mitigate pressures or their underlying conditions and root causes, restore ecosystems or species populations, or provide capacity to achieve goals. Strategies include one or more actions (capital projects, programs, etc.) and are designed to achieve specific outcomes, objectives, and goals.

<u>Stressors</u>. Stressors represent the ecological effects of sources or the proximate cause of change in the Puget Sound ecosystem. They can also be thought of as the biophysical factors that are altered by pressure sources. Examples of stressors include land conversion due to development, altered flows due to climate change, shoreline hardening, or shading of shallow water habitat.

<u>Vital Signs</u> Puget Sound Vital Signs are used to track and report on the status of the ecosystem and progress toward establishing a healthy Puget Sound, as defined by the Partnership's six goals. Each vital sign includes one or more indicators of the health of the Sound and associated qualitative or numerical recovery targets for the year 2020. Vital Signs can address priority ecological and human components of Puget Sound (e.g. Estuaries and Local Foods, respectively) or priority pressures that need to be reduced to recover the Sound (e.g. Shoreline Armoring and Onsite Sewage Systems). The Vital Signs are representative of Puget Sound ecosystems and human wellbeing and are not intended to address all aspects of Puget Sound health.

Appendix B: Pressure Sources and Stressors of Concern in the LIO

The table below describes Pressure Sources that are of high importance to the West Central Action Area. Pressure Sources refer to human activities or natural processes that have caused, are causing, or may cause the destruction, degradation, and/or impairment of Vital Signs, Ecosystem Components or Human Wellbeing Components. Sources include the cause of stress (e.g., residential and commercial development) and associated stressors (e.g., habitat conversion due to development). Sources deliver stressors directly to ecosystem components.

| Pressure Source | Description |
|------------------------------------|--|
| Abstraction of Groundwater | Pumping or other extraction of ground water |
| Agriculture and Forestry Effluents | Water-borne pollutants from agricultural, silivicultural, and aquaculture systems that include nutrients, toxic chemicals and/or sediments including the effects of these pollutants on the site where they are applied This class also includes pollutants added by biosolids, herbicide, and pesticide application. Wind erosion of agricultural sediments or smoke from forest fires goes in 9.5 Air-Borne Pollutants. Examples: nutrient loading from fertilizer run-off, manure from feedlots, nutrients from aquaculture, etc.; soil erosion from overgrazing, increased run-off and hence sedimentation due to conversion of forests to agricultural lands, etc.; herbicide run-off from orchards, etc. |
| Industrial Runoff | Introduction of exotic or excess material into hydrologic system due to surface water loading and runoff from industrial lands This class includes runoff from industrial facilities and lands. Runoff from other lands (residential and commercial) goes in 9.1.2. Loading from septic systems (OSS) goes in 9.1.1.2, combined sewer overflows (CSOs) goes in 9.1.1.1, runoff from other activities (e.g. agriculture, timber harvest) goes in 9.3, and industrial runoff goes in 9.2.4. |

| Commercial and Industrial Areas (including ports) | Factories and other commercial centers Shipyards and airports fall into this class, whereas shipping lanes and flight paths fall under 4. Transportation & Service Corridors. Overwater structures and shoreline armoring associated with marinas and ports full under 7 Natural System Modifications. Water use and dams are also covered under 7 Natural System Modifications. For runoff and other pollution associated with commercial and industrial areas, see 9. Pollution. Examples: military bases, factories, stand-alone shopping centers, office parks, power plants, train yards, ship yards, ports, airports, landfills, etc. |
|---|--|
| Runoff from Residential and Commercial Lands | Introduction of exotic or excess material into hydrologic system due to surface water loading and runoff from the built environment This class includes runoff from commercial and residential lands, transportation facilities and corridors, as well as hull-cleaning and other pollution from marina infrastructure and land-based boat maintenance practices (i.e. NPDES regulated activities that occur in marinas and shipyards). Loading from septic systems (OSS) goes in 9.1.1.2, combined sewer overflows (CSOs) goes in 9.1.1.1, runoff from other activities (e.g. agriculture, timber harvest) goes in 9.3, and industrial runoff goes in 9.2.4. |
| Housing and Urban Areas | Human cities, towns, and settlements including non-housing development typically integrated with housing This class dovetails with 1.2 Commercial and Industrial Areas (including ports). As a general rule, however, if people live in the development, it should fall into this source class. This class does not include transportation and utility infrastructure, water use, shoreline armoring and overwater structures, or runoff and other pollution associated with any developed areas (see 4, 7, and 9). Examples: urban areas, suburbs, villages, ranchettes, vacation homes, shopping areas, offices, schools, hospitals, land reclamation or expanding human habitation that causes habitat conversion or degradation in riverine, estuary and coastal areas, etc. |
| Roads and Railroads (including culverts) | Surface transport on roadways and dedicated tracks Off-road vehicles are treated in the appropriate category in 6. Human Intrusions & Disturbance. If there are small roads associated with a major utility line, they belong in 4.2 Utility & Service Lines. Examples: highways, secondary roads, primitive roads, logging roads, bridges & causeways, fencing associated with roads, freight/passenger/mining railroads, etc. |

| Shipping Lanes and Dredged Waterways | Transport on and in freshwater and ocean waterways. This class includes vessel traffic as well as dredging and other activities that maintain shipping lanes. Wastewater discharge from tugs and non-military cargo vessels is also included here. Anchor damage from dive boats belongs in 6.1 Recreational Activities. Oil spills from ships should go in 9.2 Industrial & Military Effluents. Examples: canals, shipping lanes, whale-watching routes, wakes from cargo ships, etc. |
|---|--|
| Logging and Wood Harvesting | Harvesting trees and other woody vegetation for timber, fiber, or fuel. This includes subsistence scale use and large scale use, both of which can have intentional and unintentional effects on target and non-target species. Felling trees to clear agricultural land goes in the appropriate category in 2. Agriculture & Aquaculture. If it is a few timber species that are planted on a rotation cycle, it belongs in 2.2 Wood & Pulp Plantations. If it is multiple species or enrichment plantings in a quasi-natural system, it belongs here. Consider the specific product(s) harvested and the method used e.g., clear cutting of hardwoods, selective commercial logging, pulp or woodchip operations, fuel wood collection, etc. |
| War, Civil Unrest, and Military Exercises | Actions by formal or paramilitary forces without a permanent footprint This class focuses on military activities that have a large impact on natural habitats, but are not permanently restricted to a single area. It also includes wastewater discharged from military vessels. Development and operation of permanent military bases should go under 1.2 Commercial & Industrial Areas. Examples: armed conflict, mine fields, tanks & other military vehicles, training exercises & ranges, defoliation, munitions testing, etc. |
| Marine Levees, Floodgates, Tidegates | Levees & tidegates along marine water systems to manage or exclude marine water into the freshwater system Impacts associated with levees and tidegates include conversion or degradation of habitat, altered hydrology, and altered connectivity |
| Freshwater Shoreline Infrastructure | Armoring of freshwater shorelines and overwater structures that alter, destroy, and disturb habitats and species via a non-consumptive use, including industrial, commercial, and recreational marinas, ports and shipyards. Runoff from impervious surfaces or other water pollution should go in 9.1. |
| Marine Shoreline Infrastructure | Armoring of marine shorelines and overwater structures that alter, destroy, and disturb habitats and species via a non-consumptive use, including industrial, commercial, and recreational marinas, ports and shipyards. Runoff from impervious surfaces or other water pollution should go in 9.1. |

| Sewer - Domestic and Municipal Wastewater | Discharges from municipal WWTPs into hydrologic systems This class includes water- |
|---|--|
| to Sewer | borne sewage that includes nutrients, pathogens, toxic chemicals, and sediments. |
| | Discharges from combined sewer overflows CSOs are included here. Onsite sewage |
| | systems (OSS) go in 9.1.1.2. This class does not include wastewater discharged from |
| | recreational and other vessels (see 4.3, 6.1 and 6.2), or biosolids applied in terrestrial |
| | environments (see 9.3). |
| OSS - Domestic and Commercial Wastewater | Discharges from Onsite Sewage Systems (OSS) This class includes sewage and leachates |
| to Onsite Sewage Systems (OSS) | (nutrients, toxic chemicals and/or sediment) from residences and commercial facilities |
| | not connected to a municipal system (septic, small private systems, and everything |
| | with a drain field). |
| Oil Spills | Accidental, episodic, or potentially catastrophic spill of oil and hazardous waste in |
| | aquatic and terrestrial environments This class includes oil spills from pipelines, |
| | vessels, marine terminals, and industrial facilities. It does not include chronic or other |
| | frequent, smaller pollution events related to normal operations of vehicles, vessels, etc. |
| | (see 9.1.2) |

The table below describes Stressors that are of high importance to the West Central Action Area. Stressors refer to the ecological effects of sources or the proximate cause of change in the Puget Sound ecosystem. They can also be thought of as the biophysical factors that are altered by pressure sources. Examples of stressors include land conversion due to development, altered flows due to climate change, shoreline hardening, or shading of shallow water habitat.

| ID | Stressor (Biophysical Factor) | Description |
|-----|--|---|
| 1.1 | Conversion of land cover for residential, commercial, and industrial use | Conversion of land cover to one dominated by residential, commercial, and/or industrial development. This stressor has to do with the reduction in extent and quality of habitat due to conversion. In the terrestrial and nearshore environments sources include residential and commercial development; in the marine environment consider conversion for marinas and other marine uses. Agriculture and aquaculture (see 01.2) and dredging (see 01.3) are assessed separately. Stress associated with disturbance due to human activities (including in developed areas) is addressed separately (see 07). Terrestrial habitat fragmentation (see 02), shoreline hardening (see 03), and barriers to terrestrial animal movement and migration (see 06) are addressed as separate stressors. Pollution impacts are assessed through separate stressors (see 22 through 23). Note that conversion can be step-wise process where, for example, native forest land is converted to managed forests which are then under stress for further conversion to agriculture or residential and commercial development. |
| 1.3 | Conversion of land cover for transportation & utilities | Conversion of land cover to one dominated by transportation and service corridors. This stressor has to do with the reduction in extent and quality of habitat due to conversion, including conversion by dredging. Stress associated with disturbance due to human activities (including in developed areas) is addressed separately (see 07). Terrestrial habitat fragmentation (see 02), shoreline hardening (see 03), and barriers to terrestrial animal movement and migration (see 06) are addressed as separate stressors. Pollution impacts are assessed through separate stressors (see 22 through 23). |

| 2 | Terrestrial habitat fragmentation | Division of contiguous habitat into smaller discontiguous patches or different habitat types. Sources of this stressor include development of lands for agriculture, residential, commercial, or industrial uses, or roads and utility corridors. Expressions of this stressor will depend on the endpoint one is assessing. For example, bobcat and certain small passerine birds may have minimum patch size requirements on the order of 25 ha and 3 ha, respectively. Landscapes in which habitat patches are predominantly smaller than these minimums are unlikely to support these species. Disturbance due to human activities (see 07) and habitat conversion (see 01) are evaluated as separate stressors. |
|-----|---|--|
| 3 | Shoreline hardening | Change of shoreline habitat or features to conditions that reduce habitat extent and/or disrupt shoreline processes. The primary source of this stressor is the construction of shoreline infrastructure that produces a hard linear surface along the beach or stream bank to reduce erosion (e.g., sea walls, revetments, rip-rap, and rock piles. Habitat conversion for residential, commercial and industrial development and other uses is evaluated separately (see 01). |
| 5.2 | Culverts and other fish passage barriers | Structures other than dams that block or impede movements and migrations of fish and other aquatic animals. Includes structures in, along-side, and across water bodies. This stressor is intended to evaluate only effects on fish and other aquatic species; effects on flow regulation (see 12) and physical processes (see 13) are evaluated separately. Fish passage barriers created by dams are evaluated as separate stressors (see 05.1). |
| 7.1 | Terrestrial and freshwater species disturbance in human dominated areas | Alteration in the feeding, breeding, or resting behaviors of fish or wildlife due to human presence or activities associated with landscapes dominated by man-made structures, such as light and sound disturbances associated with developed areas. Includes artifacts and debris associated with human activities, except pollution impacts are evaluated through separate stressors (see V through W). |
| 7.2 | Terrestrial and freshwater species disturbance in natural landscapes | Alteration in the feeding, breeding, or resting behaviors of fish or wildlife and adverse impacts on plant communities due to human presence or activities in more natural landscapes such as disturbance associated with recreation and vehicle traffic on forest roads. Includes artifacts and debris associated with human activities, except pollution impacts are assessed through separate stressors (see V through W). |

| 8 | Species disturbance - marine | Alteration in the feeding, breeding, or resting behaviors of marine birds, fish, or other aquatic species due to human presence or activities (e.g., recreation, vessel traffic, military exercises) or artifacts and debris associated with activities except pollution impacts (see 22 through 23) and derelict fishing gear (see 09) are assessed through separate stressors. |
|------|---|--|
| 10.1 | Altered peak flows from land cover change | Altered peak flows into and in surface waters related to changes in land cover and the associated surface hardening and associated impacts such as changes in sediment and debris delivery. Stress from pollution impacts is evaluated separately (see 22 through 23). Altered peak flow from climate change is evaluated separately (see 10.2) |
| 11.1 | Altered low flows from land cover change | Reduction of low flows in surface waters related to changes in land cover and the associated surface hardening and changes in hydrology. Other reductions of low flows are evaluated separately (see K2 and K3) |
| 11.3 | Altered low flows from withdrawals | Reduction of low flows in surface waters related to water withdrawals for human use and consumption. Other reductions of low flows are evaluated separately (see K1 and K2) |
| 13.1 | In channel structural barriers to water, sediment, debris flows | Structures that block or restrict movement of water, sediment, or debris flow in the river or stream channel and associated impacts such as changes in sediment and debris delivery. These structures may also be barriers to movement and migration of fish and aquatic animals, this stress is evaluated separately see 05.2. Impacts associated with dams also are evaluated separately (see 05.1 and 12). |
| 13.2 | Other structural barriers to water, sediment, debris flows | Structures that block or restrict movement of water, sediment, or debris flow into the floodplain, such as levees and associated impacts such as changes in sediment and debris delivery. These structures may also be barriers to movement and migration of fish and aquatic animals, this stress is evaluated separately see 05.2. Impacts associated with dams also are evaluated separately (see 05.1 and 12). |
| 16.1 | Timber harvest | Removal of timber for human use. The strong expression of this stressor is clear cutting. Stress from harvest of other types of plants is evaluated separately (see P2). Stress associated with disturbance is evaluated separately (see G2). |

| 19.1 | Spread of disease and parasites to native species | Introduction, spread, or amplification of disease or parasites from human and animal waste, aquaculture, or non-native species to native species. This is meant to assess the effects of diseases and parasites that affecting species other than humans; diseases affecting humans is evaluated separately (see S2). |
|------|--|--|
| 19.2 | Introduction, spread, or amplification of human pathogens | Introduction, spread, or amplification of disease-causing or parasitic organisms to humans. Sources of this stressor include release human and animal waste. This is intended to evaluate effects on humans due to, for example, degradation in water quality and the associated degradation in the quality of aquatic species, such as shellfish, consumed by people. |
| 21.2 | Non-point source, persistent toxic chemicals in aquatic systems | Presence or loading of persistent toxics from non-point sources, such as runoff from developed areas and roads, including from historic (legacy) sources and small (less than 10 gallons) spill events. Sources of this stressor include activities that contribute pollutants to surface water runoff, including that discharged through stormwater conveyance systems. Stress from point sources is evaluated separately, see 21.1. |
| 22.2 | Non-point source, non-persistent toxic chemicals in aquatic systems | Presence or loading of non-persistent toxics from non-point sources, such as runoff from developed areas and roads, including from historic (legacy) sources and small (less than 10 gallons) spill events. Sources of this stressor include activities that contribute pollutants to surface water runoff, including that discharged through stormwater conveyance systems. Stress from point sources is evaluated separately (see 22.1). |
| 23 | Large spills | Spills of large amounts of oil & hazardous substances, greater than 100 gallons. Sources include large oil spills from large events related to vessels (including derelict vessels), road and rail traffic, pipelines, and industrial facilities. Stress from smaller more routine spills and releases such as those that might occur at gas stations and marinas is evaluated separately (see 21 and 22). |
| 24.2 | Non-point source conventional water pollutants | Presence or loading of nutrients, sediment, turbidity and oxygen demanding substances from non-point sources. Sources of this stressor include activities that contribute pollutants, including that discharged through stormwater conveyance systems. Stress from point sources (see 24.1) and temperature changes (see 24.3) are evaluated separately. |
| 24.3 | Changes in water temperature from local causes | Changes in water temperature. Changes in temperature of marine water from human- caused climate change (see 26.4) is evaluated separately. |

| 26.1 | Changing air temperature | Changes in air temperature resulting from increased greenhouse gas concentrations in atmosphere. This is a proximate agent on terrestrial species and a source of other stressors. Stress associated with changing water temperature (see 24.3) and changes in air temperature associated with the built environment (see 07.1) are evaluated separately. |
|------|---|---|
| | Lower lake levels | |
| | Impact to wetland systems | |
| | Flow velocity causes scouring | |
| | Point Source, persistent toxic chemicals in aquatic systems | |
| | Point source, non-persistent toxic chemicals in aquatic systems | |
| | Point source, conventional water pollutants | |
| | Disturbance of submerged aquatic vegetation (SAV) | |
| | Flow regulation - prevention of flood flows | |

Appendix C: Conceptual Models and Recovery Strategies

Conceptual Model Key:























West Central LIO Ecosystem Recovery Plan – Draft December 29, 2016




Draft Local Strategies and Associated Pressure Source

| Pressures | Strategies ("draft" local strategies) | |
|---|--|--|
| Abstraction of Groundwater | Conservation of water | |
| | Reclaim water | |
| | Require metering to regulate use wells | |
| Agriculture and Forestry Effluents | Implement BMPs for stormwater and drainage | |
| | Implement programs that provide technical assistance to prevent polluted runoff | |
| | Regulate clearcutting with permits | |
| Commercial and Industrial Areas (including ports) | Improve and implement the INRP (Integrated Natural Resources Plan) by Naval Base Kitsap | |
| Industrial Runoff | Increase density within existing UGAs | |
| | Increase funding for education and training for stormwater facilities Operations and Maintenance | |
| | Protect critical areas (including buffer zone) | |
| | Require flow control BMPs for new drainage ditches | |
| | Require LID for all new development | |
| | Retrofit existing drainage ditches | |
| | Retrofit older buildings | |
| | Retrofit roads and lots, include LID | |
| Freshwater Shoreline Infrastructure | Encourage agencies to change culture | |
| | Enforce Critical Areas Ordinance (CAOs) | |
| | Identify and prioritize freshwater armor to remove | |
| | Identify and remove fish passage barriers | |
| | Prevent new freshwater armoring | |
| | Remove existing freshwater armoring | |
| | Review potential changes in RCW | |
| Housing and Urban Areas | Implement Low Impact Development | |
| | Implement solid waste reduction programs | |

| | Implement Water Conservation Programs | |
|--------------------------------------|--|--|
| | Protect and preserve intact habitat with fee simple acquisition and conservation | |
| | easements Purchase of development rights for critical habitats and sensitive areas | |
| | | |
| | Recharge aquifers with reclaimed wastewater | |
| | See Logging and Wood Harvesting | |
| | See OSS - Domestic and Municipal Wastewater to Onsite Sewage Systems (OSS) | |
| | See Runoff from residential and commercial lands | |
| | Use UGAs to concentrate growth away from critical areas | |
| Logging and Wood Harvesting | Enforce CAOs | |
| | Enforce riparian rules | |
| | Fee simple acquisition or conservation easement | |
| | Improve mapping of wetlands | |
| | Improve riparian rules | |
| | Improve stream type mapping | |
| | Improve wetland rules | |
| | Regulatory agencies and jurisdictions adopt accurate maps | |
| | Require permits for clearcutting | |
| | Strictly follow and prioritize setbacks from Critical Areas | |
| Marine Levees, Floodgates, Tidegates | Develop a strategy for how to setback levees or otherwise move tidegates | |
| | Develop an acquisition strategy for land in floodzones | |
| | Inventory all land/habitat affected by levees and tidegates | |
| | Prevent development in floodzones | |
| | Remove shoreline armoring | |
| | Review response to NOAA floodzones BiOp for permitting development in floodzones | |
| | Tide gate retrofits | |
| Marine Shoreline Infrastructure | Change RCW (Rules and Regulations) | |
| | Create programs to acquire Shoreline Development Rights | |
| | Create/Test program to remove armoring or preserve shorelines | |

| | Education and Outreach for Community Marina Facilities (ports?) | |
|--|---|--|
| | Encourage agencies to change culture | |
| | Encourage corps to increase jurisdiction to high tide | |
| | Encourage Ecology to be more consistent in reviewing SMPs | |
| | Encourage more public marinas to densify docks | |
| | NMFS to lower threshold for adverse modifications | |
| | Permitting staff needs consistent oversight and training for SMP | |
| Oil Spills | Better inspections and enforcement | |
| | Clean Marina Washington Program | |
| | Develop DOE compliance program for Best Management Practices (BMPs) | |
| | Education and outreach to community on spill prevention | |
| | Fed, state, and local agencies and vessel owners have plans in place for rapid spill response | |
| | Increase & encourage public transit options | |
| | More education and training opportunities | |
| | Safer vessel design | |
| | State and Fed govts implement severe penalties (NRDA) | |
| | Vessels required by Ecology to have spill prevention plans | |
| OSS - Domestic and Commercial Wastewater to Onsite Sewage Systems (OSS) | Expand PIC program to all watersheds | |
| | Implement programs with financial incentives to repair or replace failing OSS | |
| | Increase funds for sewer hookup within UGAs | |
| Roads and Railroads (including culverts) | Create strategy for road ends | |
| | Determine areas for retrofits | |
| | Identify fish passage barriers | |
| | Improve non-motorized transportation accessibility | |
| | Improve public transit (times and routes) | |
| | Increase livable, walkable developments | |
| | Inventory derelict and under-used roads | |

| | Move roads away from wetlands and estuaries | | |
|---|--|--|--|
| | Reduce culverts or crossings in anadromous zones | | |
| | Remove derelict and under-used roads | | |
| | Repair or replace culverts or crossings in anadromous zones | | |
| | Require mitigation for new road development (related to BMPs) | | |
| | Retrofit and include LID | | |
| | See strategies for land development | | |
| Runoff from Residential and Commercial Lands | Build new roads and parking lots to LID standards | | |
| | Enforce Integrated Natural Resources Plan (Navy Base Kitsap) | | |
| | Include flow control for new ditches | | |
| | Increase density within existing UGA | | |
| | Increase funds and education for stormwater facilities | | |
| | Increase vegetation maturity outside UGA | | |
| | Increase vegetative maturity outside UGA | | |
| | Protect critical areas within UGA (including buffers) | | |
| | Require LID for all new developments | | |
| | Retrofit existing drainage ditches | | |
| | Retrofit older buildings and facilities | | |
| | Retrofit roads and lots, include LID | | |
| Sewer - Domestic and Municipal Wastewater to Sewer | Install Combined Sewer Overflows treatment plants | | |
| | Repair or replace infrastructure | | |
| | Retrofit filtration systems at WWTPs | | |
| | Separate sewer and storm pipes | | |
| Shipping Lanes and Dredged Waterways | Establish communication with USCG vessel traffic service | | |
| | Evaluate speed restrictions in West Central LIO | | |
| | Gather baseline data on frequency of large waves caused by ships | | |
| | Identify where dredging occurs in LIO | | |

| | Learn from Rich Passage Study | |
|---|---|--|
| | See strategies for vessel pollution - oil and sewer | |
| | Work to coordinate dredge spoils use | |
| War, Civil Unrest, and Military Exercises | Better INRP (Integrated Natural Resource Plan) by Naval Base Kitsap | |
| | Cap or remove toxic sediments | |
| | Consistent enforcement of permitting process | |

Final Recovery Strategies

| ID* | West Central LIO Recovery Strategies |
|----------------------|--|
| 2.2 | Implement and maintain priority freshwater and terrestrial restoration projects (streams, lakes, wetlands, etc.) |
| 21.4 10.5 20.2 | Develop and implement PIC programs; Provide stormwater-related education and training; Strengthen and integrate spill response readiness of the state, tribes, and local government. |
| 10.1 | Manage urban runoff and stormwater at the basin and watershed scale. |
| 4.2 1.1 2.1 | Infrastructure & incentives within UGAs accommodate new & re-development; Identify & prioritize areas for protection, restoration, or development; Protect and conserve ecologically important lands at risk of conversion. |
| 26.3 26.5 | Enable and encourage residents to take informed stewardship actions addressing infiltration, pollution reduction, habitat improvement forest cover, soil development, critical areas, reductions in shoreline armoring; Enhance resources to sustain and expand effective behavior change and volunteer programs that support Action Agenda priorities and that have demonstrated, measurable outcomes. |
| 17.2 | Implement and maintain priority marine restoration projects. |
| 10.3 | Fix problems caused by development. |
| 9.6 11.2 | Increase compliance with and enforcement of environmental laws, regulations, and permits; Ensure compliance with regulatory programs designed to reduce, control, or eliminate pollution from working farms. |
| 7.2, 7.1 | Decrease water withdrawal, diversion, per capita water use; Update instream flow rules to encourage conservation. |

Appendix D: Results Chains

<u>Results chains</u>: Articulated theories of change associated with a strategy action or suite of actions. They comprise cause and effect chains showing the relationship between desired intermediate results, pressure reduction results, and ecosystem components or Vital Signs that will be affected by the action(s).

Results Chains Key:













Local strategy for Oniste Sewage Systems Expand PIC program to all watersheds

10.5 (C2.5) Provide stormwater-related education and training

(C8.2) Fed, state, and local agencies and vessel owners have plans n place for rapid spill response





4.2 (A4.2) Provide infrastructure and incentives to accomodate new and re-development within urban growth areas

Housing and urban areas - Use UGAs to concentrate growth away from critical areas

> Industrial runoff - Increase density within existing UGAs

Onsite Sewage Systems - Increase funds for sewer hookup within UGAs

(A2.1) Protect and conserve ecologically important lands at risk of conversion

Housing and urban areas - Protect and preserve intact habitat with fee simple acquisition and conservation easements







| 11.2 (| (C3.2) |
|--------|--------|
|--------|--------|

Implement programs that provide technical assistance to prevent polluted runoff (Agricultural and forestry effluents)



