# LIO - ISLAND
# ECOSYSTEM RECOVERY PLAN

EFFECTIVE DATE: JUNE 20, 2017

## CREDIT AND ACKNOWLEDGEMENTS

We acknowledge and thank the following entities for their support and engagement in this project:

- Suzanna Stoike, PSP Ecosystem Recovery Coordinator, for her leadership in bridging the local –regional perspectives to support the ILIO partners in developing the Island Ecosystem Recovery Plan (ERP);
- Kari Stiles, PSP Science Team Lead, for her active role in connecting local priorities to the broader regional priorities and her attentiveness to the technical support needed to complete the elements of the Plan;
- The Island LIO Executive Committee's guidance and support for the recovery plan process;
- The Island LIO Technical Committee members and watershed partner's for their enduring dedication and patience in developing the elements of the ERP; and
- The Puget Sound Partnership for offering trainings, guidance and support.

This project has been funded in part by the United States Environmental Protection Agency under Assistance Agreement # 2015-01 and #2017-21 to Island County.

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.

## TABLE OF CONTENTS

# EXECUTIVE SUMMARY

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

• Ensure that funding is directed to the highest priority local actions

• Coordinate recovery actions across local areas and the region

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

• Provide a course for local ecosystem strategic efforts that focuses recovery planning and actions on the highest priority recovery needs,

• Build on and work in coordination with existing related recovery efforts (salmon recovery planning, for example),

• Ensure 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,

• Result from a rigorous, defensible process that will identify the highest priority recovery strategies in each LIO area and inform where to direct limited funding to be most effective,

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

• Provide accountability for existing work underway to improve the health of the LIO area and identify gaps where work is needed.

## NEXT STEPS

The Island Local Integrating Organization (ILIO) Technical Committee (TC) and Executive Committee (EC) approved the final ILIO Ecosystem Recovery Plan (ERP) in May of 2016 following public comment. The TC and EC will meet annually to review projects' status and success and progress toward recovery goals to foster an improved learning cycle. Changes to new or revised ecosystem components, targets, pressures,

stressors or strategies are fully vetted and documented through updates to the ERP and Miradi database annually by the ILIO Coordinator. The adaptive management process will support the most effective and efficient recovery and protection efforts in Island watershed by measuring project performance and refining the learning and decision-making processes accordingly.

## LESSONS LEARNED

The ILIO will improve the adaptive management process for the 2016 NTAs by including project effectiveness monitoring to evaluate impact on ecosystem components and vital signs identified in the Puget Sound Action Agenda. With improved data on ecosystem indicators, particularly nearshore indicators, the ILIO will be better equipped to measure progress towards meeting goals and objectives, and to fund and guide projects based on effectiveness. The ILIO TC will review monitoring data and make recommendations on new indicators or strategies as well as potential alternative policies or projects. The ILIO will encourage project sponsors to share lessons learned throughout project implementation and after projects have been completed to better inform adaptive management.

# PARTICIPANTS

## PROJECT TEAM

Table 1 lists the project team members who took lead in developing the products summarized in this LIO Ecosystem Recovery Plan.

**Table 1. Project Team**

| GIVEN NAME | SURNAME | ORGANIZATION | POSITION | ROLE(S) |
|---|---|---|---|---|
| Lori | Clark | Island County Department of Natural Resources | ILIO Coordinator | Team Leader |
| Dawn | Pucci | Island County Department of Natural Resources | Lead Entity Coordinator | Team Member |
| Keith | Higman | Island County Public Health | Public Health Director | Team Member |
| Nathan | Howard | Island County Planning Department | Long Range Planner | Team Member |
| Rob | Hallbauer | Whidbey Island Conservation District | Natural Resource Planner | Team Member |
| Todd | Zackey | Tulalip Tribes | Program Manager | Team Member |
| Stan | Walsh | Skagit River System Cooperative | Environmental Services Manager | Team Member |
| Barbara | Bennett | Marine Resources Committee | Outreach Liaison | Team Member |
| Terica | Ginther | Volunteer - ILIO Technical Committee | Business/Port Representative | Team Member |
| Jill | Wood | Island County Environmental Health | Environmental Health Director | Team Member |
| John | Lovie | Water Resources Advisory Committee | WRAC Volunteer | Team Member |
| Matt | Zupich | Island County Department of Natural Resources | Water Quality Specialist | Team Member |
| Stephanie | Croan | Island County Department of Natural Resources | Water Quality Specialist | Team Member |

# ECOSYSTEM RECOVERY PLAN REVIEW AND APPROVAL STATUS

## LIO PLAN DEVELOPMENT AND DECISION MAKING PROCESS

All elements of the ILIO Ecosystem Recovery Plan (ERP) were developed in collaboration with ILIO Technical Committee (TC) members and advisors and vetted and approved by the Executive Committee (EC). An Open Standards process was applied utilizing the decision making guidance from the Puget Sound Partnership (PSP) and the Puget Sound Pressure Assessment (Anderson, et al. 2014) (PSPA 2014).

## LIO ECOSYSTEM RECOVERY DRAFT PLAN REVIEW AND APPROVAL

| REVIEWER/APPROVER | REVIEWED | APPROVED |
|---|---|---|
| Island LIO Executive Committee | 8/24/16 | 8/24/16 |
| Island LIO Technical Committee | 8/9/16 | 8/9/16 |

## LIO ECOSYSTEM RECOVERY FINAL PLAN REVIEW AND APPROVAL

| REVIEWER/APPROVER | REVIEWED | APPROVED |
|---|---|---|
| Island LIO Executive Committee | 05/24/17 | 5/24/17 |
| Island LIO Technical Committee | 04/19/17 | 04/19/17 |

# 1.0 LIO OVERVIEW

## LIO OVERVIEW AND STRUCTURE

The Island Local Integrating Organization (ILIO) formed in 2011 to coordinate and prioritize ecosystem recovery efforts in the Island watershed. The mission of the ILIO is to achieve ecosystem recovery and improve resilience for the Island watershed through collaboration between multiple stakeholders. The ILIO weaves together strengths of existing watershed groups, tribes, and government agencies to facilitate and integrate environmental project development, planning and implementation. The ILIO is comprised of an Executive Committee (EC) made up of elected officials from the watershed as well as tribal representatives, and a Technical Committee (TC) staffed by an LIO coordinator. The ILIO serves as a synergistic network committed to implementing priority projects, expanding upon successes and opportunities, and aligning existing watershed efforts to achieve identified ecosystem recovery and protection goals.

## VISION FOR LIO AND ECOSYSTEM RECOVERY PLAN

Island LIO leverages the strengths of its recovery partners to maximize effectiveness of ecosystem recovery investments, protect and enhance our watershed, and ensure a resilient future that promises natural resource equity for generations to come. ILIO stakeholders collaborate to develop a regionally significant, science-based recovery plan that selects the most effective strategies and integrates local ecosystem priorities, social values, and economic goals to protect and enhance vital habitats. The ILIO evaluates progress and adaptively manages its Ecosystem Recovery Plan (ILIO ERP) to ensure recovery efforts are successful. The ILIO ERP will provide a framework for making sound decisions on ecosystem recovery and guide priority strategies for Island watershed to be aligned with the goals which contribute to Puget Sound recovery efforts.

## GEOGRAPHIC AND CULTURAL CONTEXT IN THE LIO AREA

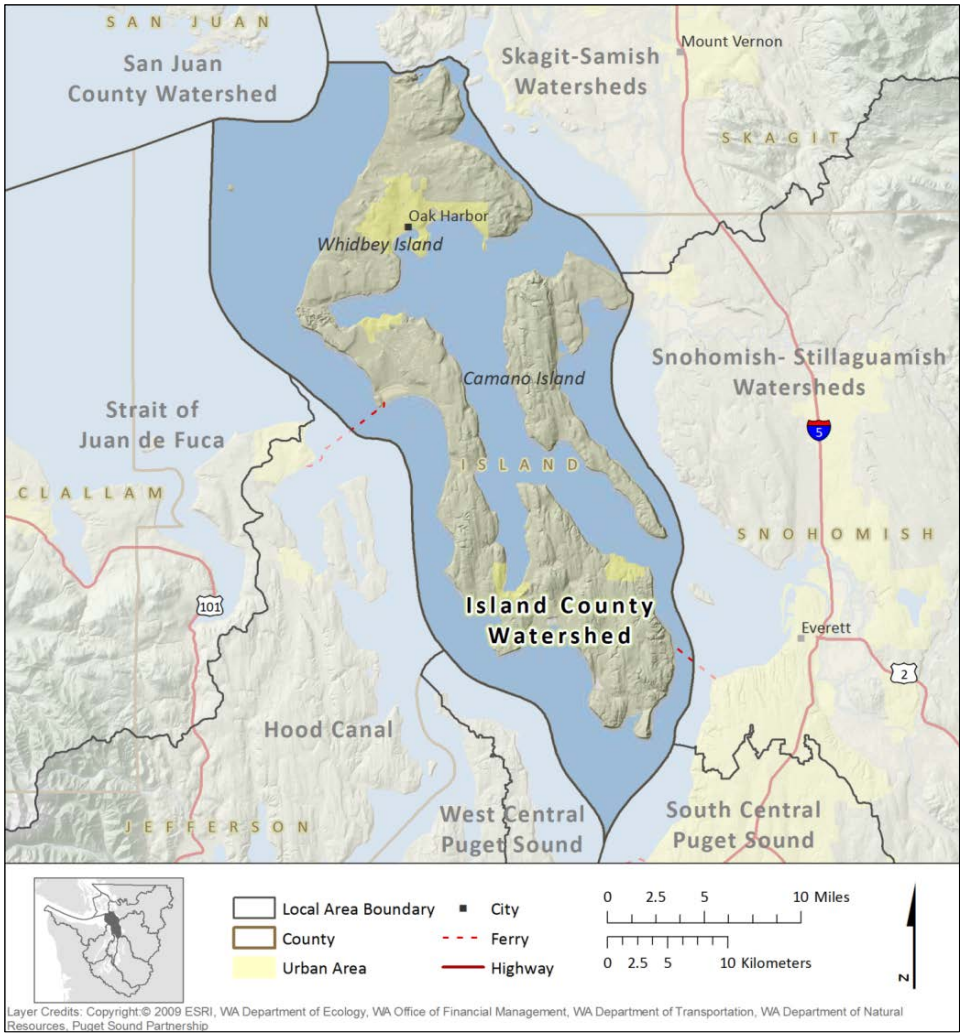


**Figure 1. Map of Island Local Integrating Organization**

## PHYSICAL DESCRIPTION

The Island watershed is located in the heart of Puget Sound, just west of the Snohomish, Skagit, and Stillaguamish river deltas. The watershed comprises all of Island County, which includes the two major islands of Whidbey and Camano as well as seven smaller islands: Kalamut, Minor, Deception, Baby, Ben Ure, Strawberry, and Smith. Deception Pass is a 182-foot-high bridge joining the north end of Whidbey Island to the mainland via Fidalgo Island. Whidbey Island is also connected to the mainland by two very popular ferry routes: the Coupeville-Port Townsend ferry, just south of Coupeville, and the Clinton-Mukilteo ferry at the south end of the island. Camano Island connects by bridge to the mainland at Stanwood in Snohomish County.

Whidbey Island, the largest island in Puget Sound, is approximately 37 miles long and 169 square miles in area and is surrounded by 143 miles of marine shoreline. Camano Island is approximately 16 miles long, 40 square miles in area, edged by 52 miles of marine shoreline. The County also has fresh surface water resources, including five small lakes on Whidbey Island and one small lake on Camano Island, along with numerous relatively small coastal streams and associated wetlands.

## BIOLOGICAL DESCRIPTION

Island County stands at the gateway to two major water bodies. To the west, Island County includes a portion of Admiralty Inlet, the mouth of Puget Sound, through which the vast majority of tides and currents entering and leaving Puget Sound must pass. The islands also flank Skagit Bay and Port Susan to the east where the Skagit River (the second largest river basin in the state) and the Stillaguamish River empty into Puget Sound. These rivers are very important to the salmon that run between the Cascade Mountains and the Pacific Ocean, and a great deal of attention is currently focused on restoring their delta areas to facilitate salmon recovery. Island County differs from other Western Washington counties because it lacks rivers and most of the streams are very small coastal streams, only a few of which have perennial flow. The relatively steep and rolling topography, lack of snow pack, and porous soils coupled with the limited land area in each basin or watershed and variable rainfall rates results in many seasonal, shallow-channeled streams.

Island County is located adjacent to some the most productive river estuaries in Puget Sound, including the Skagit, Stillaguamish, and Snohomish. These highly productive areas along with the numerous bays and smaller estuaries located along Island County's marine shorelines

make Island County an important foraging and sheltering area for many fish and wildlife species. The proximity to these rivers and their delta environments provides essential nearshore habitat for migrating juvenile salmonids as well as for their forage fish prey.

Precipitation is important to Island County because most of the county's drinking water comes from aquifers that are recharged only by rainfall. Due to the rain-shadow effect of the Olympic Peninsula Mountains, areas of Island County vary in precipitation from approximately 20 inches to 40 inches annually. The rain shadow effect is most pronounced around Ebey's Landing, Coupeville, and Penn Cove on Whidbey Island. To the south and north of this area on Whidbey Island, and to the east on Camano Island, the rain shadow effect reduces, with annual precipitation levels at or above 30 inches for most areas of the county. Soils are glaciated, consisting of stratified sand, gravel, and some clay. Glacial upland soils, gravelly and sandy drift and till, cover approximately 75 percent of Island County. Most soils in Island County drain well. Gravelly, sandy-loam and loamy-sand soil types are common.

Climate and geology have combined to make Island County a beautiful place to live and an important collection of habitats for the many species that reside in or migrate through the Puget Sound region. Situated at the north end of Puget Sound, Island County has a relatively cool and moist climate that is conducive to the development of dense coniferous forests on land and a rich and diverse sea life.

Island County was covered with dense forest before European settlement in the late 1800s and early 1900s, except for some smaller areas of prairie grassland (Ness et al., 1958). Most prairie areas were converted to agriculture, but relatively large, continuous areas of native conifer and deciduous forests remain in some areas of Island County. Old growth and mature forest stands are located in Deception Pass State Park on the north end of Whidbey Island. Wetlands are found throughout Island County and include unique habitats such as bogs, estuaries, and coastal lagoons.

The shorelines surrounding the islands are characterized by steep bluffs extending from sea level to the plateau. Numerous steep ravines cut through the landscape, and there are several larger basins where streams flow through wider valleys before reaching the shoreline. Much of the shoreline offers periodic enclosed refuge in locations of moderate and high energy seas. Many shorelines also include beach areas and eelgrass meadows ideal for forage fish. The shoreline processes of feeder bluffs, including nearshore sediment transit, are critical to supporting these shoreline habitats. The biological communities and physical habitats in the Island watershed provide important support to nearby relict salmon

populations and nursery grounds.  They are also important for species protected under the Endangered Species Act, including Chinook salmon, Orca whale, and bull trout.

Important fish species found in this area include Coho salmon, pink salmon, Pacific hake, rockfish, Pacific cod, and herring. Island watershed is a valuable migratory area for marine mammals as well. A small group of gray whales spend spring and summer feeding on ghost shrimp and tubeworms offshore of southern Whidbey and Camano Islands and the eastern side of Port Susan. Commercial and residential shellfish harvesting takes place on the east side of Whidbey Island and Samish Bay for mussels, clams, and oysters. There are also commercial and recreational fisheries for shrimp and Dungeness crab throughout the watershed. Important marine bird populations reside on the islands, including a population of over 1,000 pigeon guillemots.

Chinook populations that originate in watersheds throughout southern and central parts of Puget Sound depend on shoreline and nearshore areas for refuge and feeding, as juveniles head out to the ocean, and as adults return to spawn. Juvenile salmon feed on forage fish, insects and other food in the nearshore to grow large and strong enough to weather the ocean conditions they will face as adults. Forage fish are an important link in the marine food web because they transfer energy from primary and secondary producers, such as plankton, to top predators such as seabirds and larger fish. Suitable beaches in this area are historical spawning habitats for two types of forage fish (sand lance and surf smelt) while a third (Pacific herring) spawn directly onto the lush vegetation in the many intertidal eelgrass beds.

Island County has over 200 miles of freshwater and saltwater shorelines that are both privately and publicly owned. Nearly 80% of the parcels that make up the county's shorelines are developed or slated for residential development. According to Washington State Department of Natural Resources' shore zone data, approximately 25% of the Puget Sound shoreline has been modified and more than 60% of the area's coastal lagoons have been isolated from natural tidal processes. Of the remaining identified high-value shoreline areas, many—including Arrowhead Marsh, Harrington, and Race Lagoons—are held under private ownership. Working with and creating incentives for private landowners will be vital for future shoreline habitat protection and restoration (Washington DNR 2017).

Several collaborative efforts have been made to protect some of the critical nearshore habitat. The northern portion of Port Susan is owned by The Nature Conservancy and is one of the largest privately owned marine nature preserves in the world. Island County has designated the entire

western portion of Port Susan as a marine stewardship area. Several other land trusts and conservancy organizations are working to protect habitat and farmland in the Island LIO watershed. This area also has 57 publicly owned beaches and 22 privately owned beaches that allow some public use. In recent years, Naval Air Station Whidbey Island has undertaken tidal lagoon restoration activities in Crescent Harbor.

Further discussion on the overall critical nature of this area's ecosystem can be found in local governing documents and plans such as the WRIA 6 Salmon Recovery Plan and Shoreline Master Plan.

### JURISDICTIONAL STATUS

Island LIO is a community partnership charged with maintaining the sustainable use of water resources while protecting habitat, the environment, and human health. Island LIO's efforts are aligned with the Puget Sound Partnership's (PSP) science-based Action Agenda, and focused on ecosystem protection and recovery within the Island watershed. Island County serves as the fiduciary agent for the Island LIO.

### SOCIO-ECONOMIC DESCRIPTION

There are a number of state parks in Island Watershed, including five on Whidbey Island and two on Camano Island. Whidbey Island also contains Ebey's Landing National Historical Reserve, managed by the National Park Service; and the Smith & Minor Islands Aquatic Reserve lies just west of North Whidbey. At the request of the Island County Marine Resources Committee, the County Board of Commissioners in 2003 designated the waters of Admiralty Inlet, Saratoga Passage, and Port Susan as educational "marine stewardship areas." Already a popular place for outdoor enthusiasts, Island County is continuing to develop a system of trails on Whidbey Island for hiking, biking, and horseback riding. Sightseers from around the world flock to the 182-foot-high Deception Pass Bridge to witness one of the Northwest's most picturesque marine vistas and watch the drama of powerful tidal currents rushing through the narrow channel connecting the Strait of Juan de Fuca to Saratoga Passage. There is also a water trail for kayaks and other small non-motorized vessels that continues to be developed by state and community partners.

Camano Island is an unincorporated area and is included as part of the Stanwood-Camano School District. Whidbey Island includes the incorporated cities/towns of Oak Harbor, Coupeville, and Langley, and has three school districts, three port districts, and two parks/recreation districts. There are also several diking and drainage districts on both Islands. While Island County is a popular place to retire, there are many

important employment opportunities and modest growth potential for the area. The Naval Air Station Whidbey Island, near Oak Harbor, employs approximately 10,000 workers and constitutes approximately 88% of all economic activity (Washington Association of Counties 2016). Other large employers in Island Watershed include Nichols Brothers Boat Builders, Whidbey General Hospital, Whidbey Telecom, Whidbey Island Bank, and Island County government. There are also a significant number of workers who live within but are employed outside of Island Watershed. Many workers commute to the Boeing/Paine Field employment center, while others are able to work remotely via high-speed Internet connections. Tourism is also important to the local economy.

Beginning in the fall of 2017, the ILIO will be working on developing human health and wellbeing vital sign indicators to identify the relationship between overall life satisfaction and engagement with the natural environment. Environment-specific social indicator groups will be evaluated to measure the impact that natural environment contributes to overall wellbeing and life satisfaction (Biedenweg, et al 2017). Aligning these human-focused categories of vital sign targets will highlight opportunities for ILIO ecosystem recovery projects with a broader stakeholder benefits.

### HUMAN POPULATION

About 80,000 people currently reside in Island County (State of Washington OFM 2015). The median population projection for 2036 is almost 91 thousand (a 13% increase), which is about half the expected increase for the Puget Sound metropolitan region (Island County Community Health Planning Community Health Assessment 2015) (Puget Sound Regional Council Regional Population Forecasts 2014).

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

Components are the focus of the recovery effort. Each LIO identified the priority Vital Signs, human wellbeing components, and ecosystem components for their LIO area. The strategies and actions comprising the recovery plan are designed to improve or protect the health of components either through restoration strategies or protection or mitigation strategies that reduce pressures on the ecosystem. LIO-specific goals were identified for components and, where possible and appropriate, LIOs identified the contribution toward the regional recovery targets.

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

The ILIO worked closely with the PSP Ecosystem Recovery Coordinator and the PSP Science and Evaluation team to create goals in support of the regional recovery targets. The creation of local goals was limited to the available data for establishing short and long-term targets. To be most effective at measuring progress towards recovery efforts, local and regional monitoring data needs improvement and better collaboration. The Biennial Science Work Plan needs to include nearshore metrics for juvenile Chinook and sustainable funding needs to be in place for local monitoring and for better collaboration with regional partners on data sharing. Many of the ecosystem components and related vital signs have output that can vary drastically, and they have pressures and influences outside of Island watershed which makes them difficult to correlate with local actions and strategies. With improved data on ecosystem indicators, particularly nearshore indicators, the ILIO will have better information to measure progress towards the local and regional goals and targets.

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

**Table 3. Ecosystem components, Vital Signs and goals**

| ECOSYSTEM COMPONENT | STATUS OF COMPONENT | DESCRIPTION OF COMPONENT | GOALS AND/OR CONTRIBUTION TOWARD VITAL SIGN TARGET | RELATED VITAL SIGNS |
|---|---|---|---|---|
| Chinook and other listed | Common indicators for juvenile Chinook under development | Recovery goal is mainly focused on juvenile salmonids that frequent the nearshore | Goal: Juvenile salmonid improvement<br>• No reduction/loss of | CHINOOK |

| ECOSYSTEM COMPONENT | STATUS OF COMPONENT | DESCRIPTION OF COMPONENT | GOALS AND/OR CONTRIBUTION TOWARD VITAL SIGN TARGET | RELATED VITAL SIGNS |
|---|---|---|---|---|
| species | | environment, small streams and pocket estuaries | estuarine wetland area (acres).<br>• Acres of fish accessible estuarine habitats (estuaries and tidally influenced small streams) | |
| Eelgrass & Kelp Beds | WA DNR estimates that 63% of Island County shoreline has eelgrass and 10% has floating kelp (2000). | Intertidal nearshore environment includes eelgrass and kelp; both of these native marine plants serve as a food source and refuge for many important species of birds, fish, crabs, forage fish, salmon and shellfish; these subaquatic plants are monitored in Island watershed as an indicator of changing ocean conditions. | Goal: By 2020, maintain or increase extent (acres) in eelgrass and kelp beds. | EELGRASS |
| Forage Fish | Indicators for forage fish under development | Island County shorelines have the largest area of documented forage fish (herring, sand lance and surf smelt) spawning habitat in Puget Sound. These species utilize the nearshore environment, including the intertidal zone, for spawning and rearing, and are an important pray source of salmonids. | Goal: Presence/absence- Maintain, or measurable increase, of forage fish species (herring, surf smelt & sand lance) documented beaches by 2020. | HERRING<br><br>SHORELINE ARMORING |
| Freshwater quality | 23% freshwater quality baseline samples score 80 or above on the Water Quality Index (2015). | (1) 72% of the residents have ground water wells that serve as their primary source of drinking water thus surface water infiltration impacts are critical to protecting this water source. (2) Island County is comprised of islands that drain into Puget Sound via predominantly small streams. | Goal: By 2020, increase the number of water quality baseline samples that score 80 or above on the Water Quality Index from 23% (2015) to 45%. | FRESHWATER QUALITY |
| Marine water quality | Island County has 60 303(d) listed marine areas (2016). | With 204 miles of shoreline, Island County has a significant impact on Puget Sound through surface water runoff. This component is linked directly with the Freshwater Quality ecosystem component. | Goal: 303(d) marine water status - By 2020 improve 303(d) status of marine waterbodies by improving the freshwater inputs. Improve 10 freshwater 303(d) listings. | MARINE WATER QUALITY |

| ECOSYSTEM COMPONENT | STATUS OF COMPONENT | DESCRIPTION OF COMPONENT | GOALS AND/OR CONTRIBUTION TOWARD VITAL SIGN TARGET | RELATED VITAL SIGNS |
|---|---|---|---|---|
| | | | | |
| Pocket estuaries & Estuarine Wetlands | Baseline data for pocket estuaries and estuarine wetlands is under development<br><br>Island County currently has 53.8 miles (24.7%) armored shoreline (2016). | The pocket estuaries in Island County are prime rearing habitat for juvenile ESA-listed Chinook salmon as they transition from the freshwater stage in their natal estuaries and enter into the ocean stages of their life cycle. | Goal: By 2020 no reduction/loss of estuarine wetland area (acres).<br>• No new armoring in estuarine wetlands.<br>• Establish baseline data for acres fish accessible estuarine habitats (estuaries and tidally influenced small streams). | ESTUARIES<br><br>SHORELINE ARMORING |
| Residential Shellfish | As of July 2015, Island County had 20,195 acres of total classified shellfish beds, with 15,198 acres approved, 1,418 acres conditionally approved, and 3,579 acres prohibited for shellfish harvesting.<br><br>70% of Island County residents have onsite sewage systems. O&M is a measurable indicator for evaluating acres of harvestable shellfish bed status. The current O&M compliance rate for Island County is 20%. | Island County beaches support significant shellfish resources which are a popular place for recreational and tribal shellfish harvest. | Goal: Harvestable Shellfish Beds By 2020, see no further down-grades of IC shellfish beds and increase harvestable shellfish acres. | LOCAL FOODS<br>ONSITE SEWAGE |
| Shellfish | As of July 2015, Island County had 20,195 acres total classified shellfish beds, with 15,198 acres approved, 1,418 acres conditionally approved, and 3,579 acres prohibited for shellfish harvesting. | Island County beaches support significant shellfish resources which are a popular place for recreational and tribal shellfish harvest. | Goal: Harvestable Shellfish Beds<br>By 2020, see no further down-grades of Island County harvestable shellfish beds and increase harvestable shellfish acres. | SHELLFISH<br><br>LOCAL FOODS<br><br>ONSITE SEWAGE |

| ECOSYSTEM COMPONENT | STATUS OF COMPONENT | DESCRIPTION OF COMPONENT | GOALS AND/OR CONTRIBUTION TOWARD VITAL SIGN TARGET | RELATED VITAL SIGNS |
|---|---|---|---|---|
| | 70% of Island County residents have onsite sewage systems. O&M is a measurable indicator for evaluating acres of harvestable shellfish bed status. The current O&M compliance rate for Island County is 20%. | | | |

ILIO selected three Human Health and Wellbeing Vital Signs (HHWB) to support the integration of human wellbeing throughout the planning and evaluation stages of local and regional recovery. **Onsite Sewage**, **Shoreline Armoring** and **Recreational Shellfish Beds** were chosen as HHWB Vital Signs to best align the goals and targets for recovery efforts in Island watershed. The ILIO will integrate more HHWB Vital Signs as PSP better defines data sources and identifies indicators, goals and cumulative impacts of HHWB Vital Signs for future planning purposes.

**Table 4. Human wellbeing components, Vital Signs and goals**

| HUMAN WELLBEING COMPONENT | STATUS OF COMPONENT | DESCRIPTION OF COMPONENT | GOALS AND/OR CONTRIBUTION TOWARD VS TARGET | RELATED VITAL SIGNS |
|---|---|---|---|---|
| Onsite Sewage | 70% of Island County residents have onsite sewage systems. O&M is a measurable indicator for evaluating acres of harvestable shellfish bed status. The current O&M compliance rate for Island County is 20%. | We care about freshwater quality to protect our drinking water source. 70% of Island County residents have onsite sewage systems. O&M is a measurable indicator for evaluating acres of harvestable shellfish bed status. | Goal: By 2020, see no further down-grades of IC shellfish beds and increase harvestable shellfish acres. | LOCAL FOODS<br><br>SHELLFISH |

| HUMAN WELLBEING COMPONENT | STATUS OF COMPONENT | DESCRIPTION OF COMPONENT | GOALS AND/OR CONTRIBUTION TOWARD VS TARGET | RELATED VITAL SIGNS |
|---|---|---|---|---|
| Recreational Shellfish Beds | As of July 2015, Island County had 20,195 acres of total classified shellfish beds, with 15,198 acres approved, 1,418 acres conditionally approved, and 3,579 acres prohibited for shellfish harvesting. | Intended to capture recreational shellfish harvesting. Island County residents value recreational shellfish harvest as an important part of Island life. | Goal: By 2020, see no further down-grades of IC shellfish beds and increase harvestable shellfish acres. As of July 2015, Island County had 20,195 acres total classified shellfish beds, with 15,198 acres approved, 1,418 acres conditionally approved, and 3,579 acres prohibited for recreational shellfish harvest. | LOCAL FOODS |

## 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 also may provide benefits to humans. By understanding the pressures and the underlying sources and stressors, our LIO can better define the context we are working within and where we need to intervene to make progress on recovery.

Ecosystem recovery efforts in Island County are primarily focused on pressures that are related to the nearshore and marine environments. Selection of the priority pressures began with consideration to the highest priority ecosystem components for protection in the watershed. An assessment of vulnerability was conducted based on the relationship of what attribute (source) is negatively impacting (stressor) these priority ecosystem components. ILIO prioritized the regionally classified pressures most relevant to Island watershed using an Open Standards approach to develop a vulnerability assessment (scope, severity, and irreversibility) based on the relationship between the ecosystem components and the associated pressures. The approach provided context for recovering and preserving biodiversity in Island watershed to better prioritize the most important stressors/pressures and affected ecosystem components in the watershed.

For the FFY2016 NTA development process, the ILIO used the decision making guidance from PSP to re-evaluate the pressures which were selected in FFY2012 in relation to the priority stressors identified in the Puget Sound Pressure Assessment (PSPA 2014, Anderson, et al. 2014). The Puget Sound Pressure Assessment (PSPA) was utilized to identify the priority stressors on our natural systems and habitats. The PSPA highlights the most important, science-based stressors and vulnerabilities in the Puget Sound by biogeographical regions. ILIO analyzed the critical elements of the PSPA and identified large spills and climate change as missing pressures being addressed by our partners. Intrinsic vulnerabilities between stressors and species/habitat endpoints were scored and summed across the endpoints. Considering the ecosystem components of highest priority and observing the relationship between the stressors and pressures on these components outlined in the PSPA, the ILIO identified the areas that had not been previously addressed with approaches to ecosystem recovery in the watershed: **large spills (e.g. oil)** and **climate change**.

Runoff from Residential & Commercial Lands was selected as a very high pressure because this is the main source of the known stressors to Island County's freshwater quality, marine water quality, and shellfish and Chinook habitat. Chemical pollution in aquatic systems, non-point source conventional water pollutants, and changes in water temperature from local causes are also associated with runoff from the built environment. Reducing the pressure from runoff from residential and commercial lands will improve water quality (marine and fresh), thereby protecting small stream Chinook habitat and protecting shellfish resources.

Marine shoreline infrastructure was selected as a very high pressure because of the significant stress that armoring and overwater structures have on essential nearshore and marine habitats. Island County has approximately 214 miles of shoreline which includes estuaries, nearshore habitat and feeder bluffs. This ecosystem component is a significant focus for local ecosystem recovery efforts in the Island watershed. Several important studies have documented juvenile salmon use of nearshore and estuary habitats along Island shorelines (Timm 2017). Removing hard armoring from beaches restores the natural drift cell sediment process by accessing available sediment sources such as feeder bluffs, sediment movement along transportation zones and sediment deposition in accretion zones. These natural processes build and restore the natural beach habitat needed for forage fish spawning and rearing. Strategies to increase beach habitat for forage fish (herring) spawning and rearing will improve the survival of salmonids and other fish species that rely on this food source. Additionally, shellfish beds and subaquatic vegetation will benefit via natural drift cell processes that move and deposit sediment in the intertidal areas.

Roads, Railroads and Utility & Service Lines (including culverts) were identified as high pressures for the Island watershed because of the stress that conversion of land cover for transportation and utilities, displacement by non-native species, altered peak and low flows, culverts and other fish passage barriers have on many priority ecosystem components (Chinook, marine water quality, freshwater quality, shellfish, and estuaries). For this pressure source, ILIO focuses on replacing fish passage barriers to improve passage for ESA-listed juvenile Chinook and steelhead, as well as coho and chum salmon. According to the Small Streams Report, Chinook fry utilize the small streams in Island County for rearing and refuge (Beamer et al., 2013). Allowing passage for salmonids will allow access to this critical habitat supporting Chinook recovery. Extreme stream flow variability would also be improved with culvert improvements, increasing freshwater and marine water quality for estuaries and shellfish.

Marine Water Levees and Tidegates are identified as a high pressure in Island County because of the stress these features pose on coastal wetlands (floodplains), Chinook and estuaries. These structures alter the hydrology by blocking the natural marine and sediment transport process and prevent these habitats from being productive and contributing to ecosystem health. Most of the marine tidegates in Island watershed are providing protection from tidal inundation for valued homes and agricultural lands. Coastal wetlands are critical habitat for regional and local ecosystem recovery; however, these restoration efforts are typically not supported because of the perceived impacts to the current land uses behind tidegates. By selecting this pressure source, the ILIO committed to fostering the political and community support needed to implement projects that remove or restructure marine tidegates and increase coastal wetland habitat in our watershed.

The Agricultural & Forestry Effluents pressure source was selected as a priority due to the non-point source pollution that can result from agricultural and forestry practices, causing stress to shellfish, freshwater quality, marine water quality, forage fish, Chinook salmon and estuaries. Island County supports a multitude of smaller farms scattered throughout our watershed only a few large scale commercial agricultural practices. Strategies to ensure implementation of proper best management practices on these agricultural lands will reduce runoff into freshwater and marine

water protecting our shellfish and estuaries. Island County proactively addresses the management of agriculture and forestry practices through the Shoreline Master Plan and the Critical Area's Ordinance to eliminate or mitigate pressures on ecosystem components.

*Oil and hazardous spills* was selected as a high pressure by the ILIO because of the severe effects these spills can have on Chinook, shellfish, herring, estuaries, eelgrass, and marine water quality. The ILIO strategies for this pressure are focused on oil spill response to minimize the impacts to our nearshore and marine habitats from large spills. Recognizing the need for a regional strategy, the San Juan, Whatcom, Island and Strait LIOs are collaborating on vessel traffic and oil spill preparedness, prevention, and response strategies. The strategies and approaches discussed are not finalized. The ILIO partners will continue to develop strategies for this pressure over the next few years.

*Effects of Climate Change* was added as a high pressure for the FY2016 NTA development process. This pressure was identified by the PSPA as a high pressure with changing ocean condition, altered peak and/or low flows in freshwater systems, and sea level rise as the main stressors to all of the ILIO ecosystem components. The ILIO identifies this pressure as Effects of Climate Change, as opposed to the PSP pressure source *Airborne Pollutants* because the ILIO partners determined that the effect on priority components was a result of the stressors from climate change effects as opposed to the airborne pollutants themselves (including acid rain, excess nitrogen deposition and radioactive fallout). Island County participates in Washington Sea Grant's National Oceanic and Atmospheric Administration's Office for Coastal Management-funded project as a pilot study focus area to evaluate localized sea level rise projections and models and how best to utilize the data to make sound decisions in community planning.

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.**

| Pressure | Chinook Salmon | Eelgrass & Kelp | Estuaries | Shellfish | Forage Fish | Marine Water Quality | Fresh-water Quality | Estuaries |
|---|---|---|---|---|---|---|---|---|
| Effects of climate Change | X | X | X | X | X | X | X | X |
| Marine Levees, Tide gates and Floodgates | X | X | X | X | X | | | X |
| Roads and railroads (including culverts) | X | | X | | | X | X | X |
| Runoff from residential and | X | | | X | | X | X | |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| commercial lands | | | | | | | | |
| Oil and Hazardous Spills | X | X | X | X | X | X | | X |
| Marine shoreline infrastructure | X | X | X | X | X | | | |
| Agricultural and forestry effluence | X | | X | X | X | X | 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 context within which the LIO is operating including the ecological, social, economic, cultural, political and institutional systems that affect the things the LIO cares about.
For definitions of common terms used in this section, see the glossary (Appendix A). For a complete set of conceptual models and associated descriptions of the current context in the LIO, see Appendix C.

## HABITAT PROTECTION & RECOVERY CONCEPTUAL MODEL

### *Description*

Improvement of ESA listed salmon species in Puget Sound requires not only recovery actions in the freshwater streams and rivers where salmon spawn, but also in the estuaries, shorelines and marine waters.  Juvenile salmonids (including Chinook) use the small streams of Island County for habitat at a much higher rate than previously assumed (Beamer, et al. 2013). The ILIO directly supports the PSP Vital Sign for Chinook salmon with the caveat that recovery goals are mainly focused on juvenile salmonids that frequent the nearshore environment, small streams, and pocket estuaries. The ILIO also supports the WRIA 6 recovery vision of restoring diverse salmon populations so that humans and fish may live in balance. A recent literature synthesis pertaining to nearshore habitats of new research and monitoring conducted between 2005 and 2016, with an addendum specific to WRIA 6, discussed the importance of water quality, temperature, marine and freshwater connectivity (Timm 2017).

The Island LIO partners focus Chinook protection and recovery strategies on the protection of functioning fish habitat in streams, and in their pocket estuaries and also the nearshore marine environment. Pocket estuaries in Island County are prime rearing habitat for juvenile ESA-listed Chinook salmon as they transition from the freshwater stage in their natal estuaries and enter into the ocean stages of their life cycle. Supporting

this life stage is extremely important to the survival of Chinook and other salmon species, making estuaries and small coastal streams a high priority in the WRIA 6 Salmon Recovery Plan.

It is estimated that 80% of historical Whidbey Basin pocket estuary habitat has been lost and no longer accessible to juvenile Chinook and other salmonids (SRSC and WDFW, 2005, and Beamer et al, 2003). The pocket estuaries in the Island watershed are not located in the river deltas, but rather in small, non-natal coastal lagoons, salt marshes and mud flats. These habitats are utilized by juvenile salmonids as they adjust from the fresh water habitat in natal streams/rivers to the saline, marine waters of Puget Sound. WRIA's high geographic priority on protecting these pocket estuaries and nearshore beaches with proximity to the large rivers draining into the east side of the Whidbey Basin is consistent with study findings indicating that salmonid fish using these habitats derive from the large rivers. Culverts and other fish passage barriers are a stressor on ESA-listed Chinook, steelhead, Coho, and chum salmon. Since habitat connectivity is critical to juvenile salmonids for access pocket estuaries and lagoon habitats, ILIO partners focus restoration on connectivity improvements. Barrier assessments were completed to identify and map culverts blocking fish-bearing streams and inform future culvert replacement or restoration potential in Island County. The ILIO expects to continue this work in the high priority geographic areas and continue to secure funding to replace or restore priority culverts. The ILIO strongly encourages early collaboration with communities on initiating projects on public and private lands to ensure project success.

Island County's intertidal nearshore environment includes two important native marine plant species; eelgrass and kelp, which serve as a food source and refuge for many important species of birds, fish, crabs, forage fish, salmon and shellfish. These subaquatic plant species are monitored in Island watershed as an indicator of changing ocean conditions. Many spawning beaches and eelgrass beds in Island watershed are used by forage fish (surf smelt, sand lance and herring) on which salmonids feed. Juvenile salmon find shelter in extensive eelgrass beds from both predators and high-energy marine environments. The ILIO target for eelgrass includes reducing the over-water structures to foster healthy subaquatic vegetation habitat in the intertidal zone.

Shoreline armoring is a significant stressor on both salmonids and forage fish in Island watershed. ILIO partners support the Shore Friendly (social marketing) campaign to prevent future hard armoring of shorelines, remove hard armoring and encourage more natural shorelines focusing on beaches with feeder bluffs in Island County. The Shore Friendly project will continue through 2018 and ILIO partners will continue to collaborate on hard armor removal and prevention on both public and private lands along the shorelines of Island County.

One major pressure to the marine ecosystems includes oil spills along the maritime transportation waterway. The ILIO is collaborating with San Juan, Whatcom, Island and Strait LIO partners to develop strategies for vessel traffic and oil spill preparedness, prevention, and response strategies to reduce impacts to the marine environment.

## SHORELINE INFRASTRUCTURE CONCEPTUAL MODEL

### *Description*

The islands of the watershed make up approximately 214 miles of beach habitat, much of which is essential for herring, surf smelt and sand lance, (which are a primary food source for salmonids) as well as important intertidal and subtidal habitat. Island County shorelines have the second greatest portion of parcels with documented forage fish spawning habitat Puget Sound-wide (Coastal Geologic Services Inc., 2014). These species utilize the nearshore environment for spawning and rearing, and are an important prey source of salmonids. The ILIO partners focus recovery efforts for forage fish, sand lance and surf smelt that reside in the intertidal zone, which requires different protection and recovery strategies. The ILIO broadened this vital sign to include all three forage fish species relevant to the watershed for recovering the habitat for forage fish spawning and rearing. The ILIO shoreline infrastructure strategies are aimed to protect the intertidal and subtidal habitats to maintain or enhance the 63% of Island County shoreline which has eelgrass and the 10% which has floating kelp (Washington State Department of Natural Resources 2000).

Shoreline armoring (marine shoreline infrastructure) is considered the greatest pressure on forage fish and intertidal and subtidal habitat in Island County. Armoring causes erosion and changes the sediment composition from the sandy beaches that forage fish need for spawning/rearing to a rockier shoreline not hospitable to these species. Additionally, the armored shoreline parcels alter the natural sediment transport along the shoreline preventing nourishment of beaches.  Island County has an abundance of actively eroding feeder bluffs. In a natural system, these feeder fluffs nourish and maintain habitats productive to forage fish and salmonids. Removing hard armoring from beaches restores the sediment supply process from feeder bluffs and prevents further erosion to the beach. Strategies to increase beach habitat for subaquatic vegetation will improve the survival of salmonids and other ESA-listed fish species that rely on forage fish, protect shellfish beds, and improve coastal resiliency along Island County shorelines. Shoreline armoring is a significant stressor to forage fish. ILIO partners focus on preventing future hard armoring of

shorelines and encouraging soft shore protection alternatives in Island County. Partners also have implemented armor removal projects, focusing on beaches with feeder bluffs.

## SURFACE WATER RUNOFF CONCEPTUAL MODEL

### *Description*

The watershed comprises all of Island County, and includes 9 separate islands: Whidbey, Camano, Kalamut, Minor, Deception, Baby, Ben Ure, Strawberry, and Smith, where all basins drain into Puget Sound. Only two of the County's islands are populated: Whidbey and Camano. All land uses in this watershed have a potential to impact fresh water quality which can be a threat to clean, reliable sources of drinking water, as well as marine water quality via surface water discharge. The community, both residential and commercial, relies on clean marine water for fishing, beach recreation, shell fishing, and water sports. There are many factors, such as climate change, inflow from nearby rivers, off-shore ocean conditions that affect marine water quality surrounding the shoreline but cannot be addressed through local action. The ILIO partners focus on strategies to reduce surface water runoff impacts to marine and fresh water. These strategies attempt to reduce stressors caused by agricultural, residential and commercial land uses by preventing or reducing non-point source pollution and changes in water temperature to protect freshwater quality, marine water quality, shellfish, Chinook and other ESA listed species.

Island County beaches support significant shellfish resources and are also popular places for recreational and tribal shellfish harvest. Residents are accustomed to recreational shellfish harvest as a part of island life. One of the main attractions drawing people to move to or visit the islands is the ability to drive a short distance, take a walk out onto the beach at low tide and harvest fresh shellfish for dinner. As of July 2015, Island County had 20,195 acres total classified shellfish beds, with 15,198 acres approved, 1,418 acres conditionally approved, and 3,579 acres prohibited for recreational shellfish harvest (WA DOH 2015). The ILIO selected the shellfish vital sign as a priority to ensure our partners are collaborating on strategies to protect harvestable shellfish beds and working toward reopening shellfish beds that are closed due to degraded water quality.

The two main sources of contamination that ILIO partners focus on for reducing stress to shellfish from surface water runoff are agriculture effluents and on-site septic systems (OSS). Over 70% of residents in Island County have on-site septic systems (OSS). Failed on-site septic

systems are a significant stressor to shellfish beds in the Island watershed. Watershed partners and Near Term Action (NTA) owners focus actions on drainage basins with shellfish closures and 303(d) listed marine waters. Narrowing recovery efforts to waters on the 303(d) list is highly effective because these basins are known to exceed water quality standards.

ILIO partners have developed a more comprehensive monitoring program to identify pressures from all land uses. Surface water quality monitoring enables prioritization of resource and investment allocations toward restoration and recovery projects. Pollution Identification and Correction (PIC) programs include monitoring surface water to identify, target, and correct sources of surface water contamination typically associated with on-site septic system failure. Failing and malfunctioning septic systems are a significant stressor to shellfish beds in a watershed and the PIC model includes a comprehensive approach to achieving ecosystem recovery and human wellbeing outcomes.

## 5.0 OUR STRATEGIES AND ACTIONS

After ILIO 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, the ILIO 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 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, the ILIO 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.

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

Table 6 lists the recovery strategies currently identified in the LIO area. *ID indicates the source of the strategy: Action Agenda substrategy (##.#), Chinook strategy or new, LIO proposed strategy.

**Table 6. Strategies included in the LIO Recovery Plan.**

| ID* | RECOVERY STRATEGY | DESCRIPTION | COMMENTS |
|---|---|---|---|
| 21.4 | **21.4 (C9.4) Develop and implement local and tribal pollution identification and correction (PIC) programs** | This sub-strategy helps implement local pollution identification and correction programs that determine the causes and sources of water pollution in specific geographical areas, and ensures corrective actions are taken to address the pollution sources and protect Puget Sound marine and fresh water health.PIC programs with a high probability of success include the following essential elements:<br>• Consistent, long-term, ambient water quality monitoring to prioritize projects and evaluate action effectiveness.<br>• Coordinated outreach about proposed PIC projects and results to increase community awareness, participation, and support.<br>• Source identification sampling.<br>• Provision of information, site inspection, technical assistance, and financial support to correct identified sources of pollution.<br>• Effective enforcement capability. Enforcement is used when compliance efforts fail.<br>• Sustainable funding to maintain long-term stability of the program. | |
| 16.1 | **16.1 (B2.1) Permanently protect priority nearshore physical and ecological processes and habitat, including shorelines, migratory corridors, and vegetation, particularly in sensitive areas such as eelgrass beds and bluff backed beaches.** | This sub-strategy seeks to accelerate the implementation of priority projects that address problems identified for Puget Sound nearshore environments and move acquisition and restoration efforts forward.<br>• Eelgrass and bluff-backed beaches are provided as examples—they do not reflect an exhaustive list of sensitive habitats that warrant protection.<br>• Proposals should consider previous regional prioritization efforts (e.g.: Puget Sound Nearshore Ecosystem Restoration Program (PSNERP) Strategies for Nearshore Protection & Restoration)<br>Regional priorities:<br>• Implement a landscape level strategy (e.g.: drift cell, watershed) that integrates protection, restoration and enhancement opportunities. | |

| ID* | RECOVERY STRATEGY | DESCRIPTION | COMMENTS |
|---|---|---|---|
| | | • Conserve relatively intact shorelines that currently provide high value ecosystem services (e.g.: large sites with low levels of degradation).<br>• Improve data, planning, and stakeholder coordination important to inform landscape level (e.g.: drift cell) strategy development and implementation.<br>• Achieve multi-benefits, including resilience/adaptation to climate change. | |
| 6.1 | **6.1 (A6.1) Implement high priority projects identified in each salmon recovery watershed's 3 year work plan** | In submitting work under this sub-strategy, proposers should use the information developed for each watershed under Phase I of the Chinook monitoring and adaptive management effort, as well as updated project lists submitted to the Puget Sound Partnership in 2015. Additionally, see the Eligibility section of this solicitation: Not all salmon recovery projects should be submitted as NTAs. Actions should implement one or more of the priorities identified in the other sub-strategies. | |
| 2.2 | **2.2 (A2.2) Implement and maintain priority freshwater and terrestrial restoration projects** | This sub-strategy supports the continuation, expansion, and further coordination of programs to effectively encourage private landowners and industrial/commercial landowners to undertake and maintain restoration projects. It includes support for incentives and assistance, such as direct and indirect financial incentives, technical assistance, recognition/certification for products or operations, and conservation leasing. Structural barriers include culverts, dikes, dams, and similar structures.<br>• Improve data and information to prioritize and accelerate riparian restoration and protection.<br>• Implement restoration of riparian areas.<br>• Improve data and information to prioritize and accelerate removal of structural barriers.<br>• Implement prioritized structural barrier removals. | |
| 15.3 | **15.3 (B5.3) Prevent and rapidly respond to the introduction and spread of terrestrial and aquatic invasive species** | This sub-strategy is a priority only when supporting the implementation of another restoration or protection action. | |
| 10.4 | **10.4 (C2.4) Control sources of pollutants** | This sub-strategy includes local pollution and control programs, inspections, technical assistance, and enforcement. This sub-strategy is intended to identify, address, and reduce toxics, nutrients and pathogens.<br>• Promote source control and technical assistance programs at the local level.<br>• Reduce pollutants from on-site septic system sources; agriculture operations; and/or toxics from residential and commercial uses.<br>• Promote enforcement and compliance related to pollution source control. | |

| ID* | RECOVERY STRATEGY | DESCRIPTION | COMMENTS |
|---|---|---|---|
| 16.2 | **16.2 (B2.2) Implement prioritized nearshore and estuary restoration projects and accelerate projects on public lands** | This sub-strategy supports Sound-wide restoration, including on public lands where opportunities for acquisition, landowner negotiation, or access permission can often be implemented more quickly than similar projects on private lands and can provide models for future restoration efforts on other lands.<br>• Applies to both public and private lands.<br>• Estuary restoration targets cannot be met with existing public lands only. Projects on private lands and/or involving acquisition of private lands will be critical to meeting the targets.<br>• Proposals should build on previous regional prioritization efforts (e.g.: Estuary Implementation Strategy; Puget Sound Nearshore Ecosystem Restoration Program (PSNERP)).<br><br>Regional Priorities:<br>• Restore and enhance regionally lost (e.g.: big river estuaries) or declining nearshore habitats (e.g.: eelgrass) and provide for connectivity, as well as self-sustaining and resilient ecosystem services.<br>• Implement a landscape level strategy (e.g.: drift cell, watershed) that integrate protection, restoration, and enhancement opportunities.<br>• Undertake multi-benefit actions that promote collaboration between diverse stakeholders (e.g.: delta restoration and agricultural communities).<br>• Enhance ecosystem resilience to climate change (e.g.: sea level rise & ocean acidification).<br>• Investigate opportunities to acquire exceptional habitat at above-market value. | |
| 10.3 | **10.3 (C2.3) Fix problems caused by existing development (structural upgrades; regular and enhanced maintenance)** | This sub-strategy includes fixing problems from existing development through structural retrofits; ongoing regular maintenance and enhanced maintenance (e.g.: high efficiency street sweepers and system cleaning to remove legacy pollutants); and redevelopment policies and activities. Urban Centers are designated by cities and counties within the urban growth area in comprehensive land use plans to accommodate population growth under the Growth Management Act. The Puget Sound Regional Council has also identified urban centers in VISION 2040, the regional growth strategy for the four central Puget Sound counties and associated cities.<br>• Prioritize where retrofits occur.<br>• Provide infrastructure and incentives to accommodate re-development within designated Urban Centers in an urban growth areas (UGAs). | |

| ID* | RECOVERY STRATEGY | DESCRIPTION | COMMENTS |
|---|---|---|---|
| | | • Assess the maintenance needs and life-cycle strategies for existing stormwater infrastructure, and prioritize infrastructure replacement needs.<br>• Research, create and/or implement innovative approaches to promote retrofit programs on private property.<br>• Research, study and/or pilot legacy pollutant removal programs with the intent of filling data gaps. | |
| 19.1 | **19.1 (C7.1) Improve water quality to prevent downgrade and achieve upgrades of important current tribal, commercial and recreational shellfish harvesting areas** | This sub-strategy addresses regional and local programs that protect and improve water quality and control pollution, helping to prevent the degradation of healthy shellfish beds and to achieve upgrades of degraded shellfish beds. This sub-strategy can be used to address wastewater treatment plant (WWTP) upgrades, outfall changes, and other wastewater or stormwater infrastructure improvements or planning. Actions should focus on fecal coliform. | |
| 16.3 | **16.3 (B2.3) Remove armoring, and use soft armoring replacement or landward setbacks when armoring fails, needs repair, is non protective, and during redevelopment** | This sub-strategy supports efforts to remove armored shorelines and restore these areas, and to promote alternatives to hard-armoring, like soft-shore protection, landward setback of structures, and other techniques that reduce or prevent shoreline hardening. “Soft armoring” is more accurately described as “soft shore protection.” Specifically, it entails the use of indigenous materials such as gravel, sand, logs, and root masses in designs that have some degree of flexibility, mimicking natural process. More detailed information can be found in the 2014 Marine Shoreline Design Guidelines.<br>• Build on and/or implement recommendations from previous studies, including the Marine Shoreline Design Guidelines, Puget Sound Nearshore Ecosystem Restoration Program (PSNRP), Social Marketing Strategy to Reduce Armoring Behavior on Puget Sound, and the Integrated Nearshore Priorities Tool.<br>• Actions that reflect a landscape level strategy (e.g.: drift cell) that integrates protection, restoration, and enhancement opportunities to maximize ecological function.<br>• Actions that focus on ecologically important feeder bluffs or private residential properties that will help serve as regional examples to influence regional shoreline landowner behavior.<br>• Target geographical areas where larger-scale restoration is feasible (either individually or cumulatively) and can yield measurable benefits to ecosystem process, structure, and function.<br>• Use innovative approaches to incentivize armor avoidance and soft shore protection techniques that help expand regional implementation. | |

| ID* | RECOVERY STRATEGY | DESCRIPTION | COMMENTS |
|---|---|---|---|
| 11.1 | **11.1 (C3.1) Target voluntary and incentive-based programs that help working farms contribute to Puget Sound recovery** | This sub-strategy addresses programs, guidelines, and technical assistance opportunities that help farmers identify potential pollution impacts from farming activities and implement best management practices (BMPs) to reduce, control, or eliminate pollution. Working farms are places, both large and small, where agricultural activities occur. | |
| 10.5 | **10.5 (C2.5) Provide focused stormwater-related education, training, and assistance** | This sub-strategy focuses on information, education, and training on stormwater-specific issues to be provided for multiple audiences.<br>Regional priorities: Design, develop and implement innovative stormwater education programs that target residents and businesses Promote stormwater education programs that are designed to be replicated across Puget Sound. | |

## 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: A2.2 IMPLEMENT AND MAINTAIN PRIORITY FRESHWATER AND TERRESTRIAL RESTORATION PROJECTS

### *Description*

ILIO partners developed recovery strategies focused on protecting and restoring critical nearshore habitat and pocket estuaries to reduce the stressors on priority ecosystem components and other important species (ESA-listed Chinook, steelhead, Coho, and chum salmon). Structural barriers alter the hydrology by blocking the natural marine and sediment transport process and prevent priority habitats from being productive. The ILIO partners are committed to fostering the political and community support needed to implement projects that remove or restructure marine tidegates and increase coastal wetland habitat where feasible.

### STRATEGY: 2.2 (A2.2) IMPLEMENT AND MAINTAIN PRIORITY FRESHWATER AND TERRESTRIAL RESTORATION PROJECTS

This sub-strategy supports the continuation, expansion, and further coordination of programs to effectively encourage private landowners and industrial/commercial landowners to undertake and maintain restoration projects. It includes support for incentives and assistance, such as direct and indirect financial incentives, technical assistance, recognition/certification for products or operations, and conservation leasing.
Structural barriers include 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.

### *Actions*

| ID | NEAR TERM ACTION | DESCRIPTION |
|---|---|---|
| 2016-0055 | Crescent Harbor Creek Restoration | Restore natural stream and floodplain processes, conditions, functions, and biological responses within lower Crescent Harbor Creek and the Crescent Harbor Salt Marsh, a 206 acre estuary restoration site |

| ID | NEAR TERM ACTION | DESCRIPTION |
|---|---|---|
| | | located at the mouth of Crescent Harbor Creek. |
| 2016-1216 | Kristoferson Creek Fish Passage Improvements | Correct two barriers at the mouth of Kristoferson Creek, Camano Island, thus improving access to rearing habitat for nonnatal juvenile Chinook salmon and steelhead and opening 1.6 miles of spawning and rearing access. |

## THEORY OF CHANGE: C2.3 FIX PROBLEMS CAUSED BY EXISTING DEVELOPMENT (STRUCTURAL UPGRADES; REGULAR AND ENHANCED MAINTENANCE)

***Description***

Existing development in Island watershed was identified as a high stressor on many of priority ecosystem components (Chinook, marine water quality, freshwater quality, shellfish, freshwater wetlands, and pocket estuaries and estuarine wetlands). ILIO partners aim to reduce the stressors from runoff with stormwater improvement projects. To reduce the impacts from marine tidegates and culverts ILIO partners work to replace fish passage barriers to improve passability for ESA-listed juvenile Chinook, steelhead, Coho and chum salmon.

### STRATEGY: 10.3 (C2.3) FIX PROBLEMS CAUSED BY EXISTING DEVELOPMENT (STRUCTURAL UPGRADES; REGULAR AND ENHANCED MAINTENANCE)

This sub-strategy includes fixing problems from existing development through structural retrofits; ongoing regular maintenance and enhanced maintenance (e.g. high efficiency street sweepers and system cleaning to remove legacy pollutants); and redevelopment policies and activities. Urban Centers are designated by cities and counties within the urban growth area in comprehensive land use plans to accommodate population growth under the Growth Management Act. The Puget Sound Regional Council has also identified urban centers in VISION 2040, the regional growth strategy for the four central Puget Sound counties and associated cities.

- Prioritize where retrofits occur.
- Provide infrastructure and incentives to accommodate re-development within designated Urban Centers in urban growth areas (UGAs).
- Assess the maintenance needs and life-cycle strategies for existing stormwater infrastructure, and prioritize infrastructure replacement needs.
- Research, create and/or implement innovative approaches to promote retrofit programs on private property
- Research, study and/or pilot legacy pollutant removal programs with the intent of filling data gaps.

***Actions***

| ID | NEAR TERM ACTION | DESCRIPTION |
|---|---|---|
| C2.3.ISL8 | Implement a Small Farm Water Quality | The project included water quality treatment technology (for example grassy swales, filter strips, |

| ID | NEAR TERM ACTION | DESCRIPTION |
|---|---|---|
| 2012-2014 | Improvement Project in Ebey's Prairie. | phytoremediation) and landowner farm practices (ex. manure management, filter strips) to reduce non-point stormwater pollution. |
| C2.3.ISL12 2014-2016 | Identify, map, and prioritize blocked and failing culverts and replace one to two priority culverts using fish-friendly passage designs. | Fish-blocking culverts are negatively affect flood risk, scouring, erosion, landslides, water quality. Island County will map all existing culverts noting which are blocked and failing, and will create a prioritization schedule for replacing these culverts. |
| 2016-0120 | Oak Harbor Marina Stormwater Improvement Project | The removal of approx. 700' of the current storm drain that flows directly into the bay with a natural filtering system. Increase the launch ramp angle to reduce pollutants from vehicles that have to be submerged to launch a vessel. |
| 2016-0337 | Ebey's Prairie Watershed Stormwater Remediation | Design and construction of a stormwater collection, conveyance, and transfer to an irrigation pond for use during the dry season. |
| 2016-1216 | Kristoferson Creek Fish Passage Improvements | This project will correct two barriers at the mouth of Kristoferson Creek, Camano Island, improving access to rearing habitat for non-natal juvenile Chinook salmon and steelhead, and opening 1.6 miles of spawning and rearing access. |

## THEORY OF CHANGE: A6.1 IMPLEMENT HIGH PRIORITY PROJECTS IDENTIFIED IN EACH SALMON RECOVERY WATERSHED'S 4 YEAR WORK PLAN

***Description***

Culverts and other fish passage barriers were identified as a significant stressor on priority ecosystem components and other important species (ESA-listed Chinook, steelhead, Coho, and chum salmon) in Island watershed. ILIO partners have developed targeted actions to reduce these stressors to reach recovery goals and protect and restore habitat. In 2013, barrier assessments were completed to identify and map culverts blocking fish-bearing streams and inform prioritization for future culvert replacement or restoration potential in Island County. The ILIO partners continue to secure funding to replace or restore the priority culverts and increase habitat for salmonids.

Restoring tidal inundation to pocket estuaries or tidal wetlands remains a high priority for the Island watershed. ILIO partners have one active project under the A6.1ISL6 (2012) which aims to integrate stakeholders into the development stages of restoration alternatives consideration in a high priority area.

The ILIO followed the PSP guidance for active SRFB/PSAR projects included in the list of projects that are "adopted by reference" into the 2016 Action Agenda. NTA 2016-1216 Kristoferson Creek Fish Passage Improvements was included in the ILIO 5-year ERP as one of the adopted by reference projects.

### STRATEGY: 6.1 (A6.1) IMPLEMENT HIGH PRIORITY PROJECTS IDENTIFIED IN EACH SALMON RECOVERY WATERSHED'S 3 YEAR WORK PLAN

In submitting work under this sub-strategy, sponsors should use the information developed for each watershed under Phase I of the Chinook monitoring and adaptive management (M&AM) effort, as well as updated project lists submitted to the Puget Sound Partnership in 2016.

***Actions***

| ID | NEAR TERM ACTION | DESCRIPTION |
|---|---|---|
| A6.1.ISL | Identify, Map and Prioritize Blocked and | Fish-blocking culverts are negatively affect flood risk, scouring, erosion, landslides, water quality. Island |

| ID | NEAR TERM ACTION | DESCRIPTION |
|---|---|---|
| 2012 | Failing Culverts. | County will map all existing culverts noting which are blocked and failing, and will create a prioritization schedule for replacing these culverts. |
| A6.1.ISL6 2014 | Restore tidal inundation. | Island County will restore tidal inundation to one or more isolated pocket estuaries or tidal wetlands. The project selected will address either poor design or malfunctioning tidegates to improve habitat for juvenile salmon. |
| A6.1.ISL6 2012 | Restore tidal inundation | Island County will restore tidal inundation to one or more isolated pocket estuaries or tidal wetlands. The project selected will address either poor design or malfunctioning tidegates to improve habitat for juvenile salmon. |
| 2016-1216 | Kristoferson Creek Fish Passage Improvements | This project will correct two barriers at the mouth of Kristoferson Creek, Camano Island, improving access to rearing habitat for non-natal juvenile Chinook salmon and steelhead, and opening 1.6 miles of spawning and rearing access. |
| 2016-0059 | Camano Island State Park Restoration Public Involvement | Support Outreach Efforts to design restoration of fish access and natural tidal conditions, functions, and biological responses within a 4.5 acre historic pocket estuary within Camano Island State Park |

## THEORY OF CHANGE: B 2.2 IMPLEMENT PRIORITIZED NEARSHORE AND ESTUARY RESTORATION PROJECTS AND ACCELERATE PROJECTS ON PUBLIC LANDS

***Description***

Focusing nearshore and estuary restoration project recovery strategies on public lands bring more public awareness about the importance and benefits of habitat restoration. ILIO partners' projects in high use areas offer unique outreach opportunities to engage the public on ecosystem recovery in the Island watershed and fosters support for project implementation and increased stewardship.

### STRATEGY: 16.2 (B2.2) IMPLEMENT PRIORITIZED NEARSHORE AND ESTUARY RESTORATION PROJECTS AND ACCELERATE PROJECTS ON PUBLIC LANDS

This sub-strategy supports Sound-wide restoration, including on public lands where opportunities for acquisition, landowner negotiation, or access permission can often be implemented more quickly than similar projects on private lands, and can provide models for future restoration efforts on other lands.

- Applies to both public and private lands.
- Estuary restoration targets cannot be met with existing public lands only. Projects on private lands and/or involving acquisition of private lands will be critical to meeting the targets.
- Proposals should build on previous regional prioritization efforts (e.g. Estuary Implementation Strategy; Puget Sound Nearshore Ecosystem Restoration Program (PSNERP)).

Regional Priorities:

- Restore and enhance regionally lost (e.g. big river estuaries) or declining nearshore habitats (e.g. eelgrass) and provide for connectivity, as well as self-sustaining and resilient ecosystem services.
- Implement a landscape level strategy (e.g. drift cell, watershed) that integrates protection, restoration, and enhancement opportunities.
- Undertake multi-benefit actions that promote collaboration between diverse stakeholders (e.g. delta restoration and agricultural communities).

- Enhance ecosystem resilience to climate change (e.g. sea level rise & ocean acidification).
- Investigate opportunities to acquire exceptional habitat at above-market value.

***Actions***

| ID | NEAR TERM ACTION | DESCRIPTION |
|---|---|---|
| 2016-0121 | Oak Harbor Marina Water Shading Reduction Project | This project will consist of the removal and disposal of covered moorage roofs, support structures, 21 dock fingers and 10 pile on D and E docks. Approximately 46,000 ft 2 of shading will be removed. |
| 2016-0059 | Camano Island State Park Restoration Public Involvement | Support Outreach Efforts to design restoration of fish access and natural tidal conditions, functions, and biological responses within a 4.5 acre historic pocket estuary within Camano Island State Park |
| 2016-0085 | Cornet Bay Pier Retrofit | NWSF will remove armoring and creosoted pilings at the Marine Maintenance Pier at Cornet Bay and replace 85 feet of solid decking with slatted decking to increase light to the intertidal. |

## THEORY OF CHANGE: B2.1 PERMANENTLY PROTECT PRIORITY NEARSHORE PHYSICAL AND ECOLOGICAL PROCESSES AND HABITAT, INCLUDING SHORELINES, MIGRATORY CORRIDORS, AND VEGETATION, PARTICULARLY IN SENSITIVE AREAS SUCH AS EELGRASS BEDS AND BLUFF BACKED BEACHES.

***Description***

The Island LIO partners prioritize bluff-backed beaches as a nearshore habitat for protection. These actively eroding feeder bluffs nourish and maintain habitats productive to forage fish and salmonids. Removing hard armoring from bluff-backed beaches restores the natural sediment supply process and supports the natural beach habitat needed for forage fish spawning and rearing improving the survival of salmonids and other fish species that rely on this food source.

### STRATEGY: 16.1 (B2.1) PERMANENTLY PROTECT PRIORITY NEARSHORE PHYSICAL AND ECOLOGICAL PROCESSES AND HABITAT, INCLUDING SHORELINES, MIGRATORY CORRIDORS, AND VEGETATION, PARTICULARLY IN SENSITIVE AREAS SUCH AS EELGRASS BEDS AND BLUFF BACKED BEACHES.

This sub-strategy seeks to accelerate the implementation of priority projects that address problems identified for Puget Sound nearshore environments and move acquisition and restoration efforts forward.

- Eelgrass and bluff-backed beaches are provided as examples—they do not reflect an exhaustive list of sensitive habitats that warrant protection.
- Proposals should consider previous regional prioritization efforts (e.g.: Puget Sound Nearshore Ecosystem Restoration Program (PSNERP) Strategies for Nearshore Protection & Restoration)

Regional priorities:

- Implement a landscape level strategy (e.g.: drift cell, watershed) that integrates protection, restoration and enhancement opportunities.
- Conserve relatively intact shorelines that currently provide high value ecosystem services (e.g.: large sites with low levels of degradation).
- Improve data, planning, and stakeholder coordination important to inform landscape level (e.g.: drift cell) strategy development and implementation.
- Achieve multi-benefits, including resilience/adaptation to climate change.

***Actions***

| ID | NEAR TERM ACTION | DESCRIPTION |
|---|---|---|
| 2016-0058 | Possession Sound Nearshore Protection | The WCLT proposes to purchase and permanently protect 10 acres of estuarine intertidal wetlands and 37 acres of mature forested upland with 2,800 feet of feeder bluffs, and restore degraded portions by creosote removal and invasive species control. |

## THEORY OF CHANGE: B2.3 REMOVE ARMORING, AND USE SOFT ARMORING REPLACEMENT OR LANDWARD SETBACKS WHEN ARMORING FAILS, NEEDS REPAIR, IS NON PROTECTIVE, AND DURING REDEVELOPMENT

***Description***

Shoreline armoring was identified as the greatest pressure on forage fish and intertidal and subtidal habitat in Island County. Armoring causes erosion and changes the sediment composition from the sandy beaches that forage fish need for spawning/rearing to a rockier shoreline not hospitable to these species. Additionally, the armored shoreline parcels alter the natural sediment transport along the shoreline preventing nourishment of beaches. ILIO partners are implementing a social marketing campaign to prevent hard armoring of shorelines and armor removal projects, focusing on beaches with feeder bluffs.

### STRATEGY: 16.3 (B2.3) REMOVE ARMORING, AND USE SOFT ARMORING REPLACEMENT OR LANDWARD SETBACKS WHERE ARMORNING IS NECESSARY, WHEN ARMORING FAILS, NEEDS REPAIR, IS NON PROTECTIVE, AND DURING REDEVELOPMENT

This sub-strategy supports efforts to remove armored shorelines and restore these areas, and to promote alternatives to hard-armoring, like soft-shore protection, landward setback of structures, and other techniques that reduce or prevent shoreline hardening. “Soft armoring” is more accurately described as “soft shore protection.” Specifically, it entails the use of indigenous materials such as gravel, sand, logs, and root masses in designs that have some degree of flexibility, mimicking natural process. More detailed information can be found in the 2014 Marine Shoreline Design Guidelines.

- Build on and/or implement recommendations from previous studies, including the Marine Shoreline Design Guidelines, Puget Sound Nearshore Ecosystem Restoration Program (PSNRP), Social Marketing Strategy to Reduce Armoring Behavior on Puget Sound, and the Integrated Nearshore Priorities Tool.
- Actions that reflect a landscape level strategy (e.g.: drift cell) that integrates protection, restoration, and enhancement opportunities to maximize ecological function.
- Actions that focus on ecologically important feeder bluffs or private residential properties that will help serve as regional examples to influence regional shoreline landowner behavior.

• Target geographical areas where larger-scale restoration is feasible (either individually or cumulatively) and can yield measurable benefits to ecosystem process, structure, and function.

• Use innovative approaches to incentivize armor avoidance and soft shore protection techniques that help expand regional implementation.

***Actions***

| ID | NEAR TERM ACTION | DESCRIPTION |
|---|---|---|
| B.2.3.ISL4 2012 | Armor Avoidance and Alternatives to Hardshore Armoring Program | This effort will address two target audiences, Island County permitting staff and shoreline property owners. Education, outreach and behavior change strategies will be used. Island County will engage its permitting staff and shoreline property owners in an extensive education and outreach campaign to meet its target of decreasing the use of shore armor and soft-shore protection. The campaign will utilize appropriate behavior change strategies and technical/scientific data to support changes within the community. |
| B.2.3.ISL5 2012 | Program for Shoreline Armoring Removal and Softshore Protection. | Develop a program for education & behavior change on shoreline armoring in Island County. Social marketing will be applied to program development. Financial incentives (i.e. free site visits from experts, and grants for cost share, design, permitting, etc.) will be offered to implement armor removal and possibly install soft shore protection. This program will include monitoring beach ecosystem health on removal and conversion projects (from hard shore to soft shore) to provide justification. |
| B2.3.ISL4 2014 | Decrease the use of shoreline armor, or in those instances where armor is absolutely necessary, increase the utilization of soft shore protection to address shoreline protection concerns. | This effort will address two target audiences, Island County permitting staff and shoreline property owners. Education, outreach and behavior change strategies will be used. Island County will engage its permitting staff and shoreline property owners in an extensive education and outreach campaign to meet its target of decreasing the use of shore armor and soft-shore protection. The campaign will utilize appropriate behavior change strategies and technical/scientific data to support changes within the community. |
| B2.3.ISL5 2014 | Remove hard shore armor and, where feasible, replace with soft shore protection where erosion control is needed to protect houses. | Develop a program for education & behavior change on shoreline armoring in Island County. Social marketing will be applied to program development. Financial incentives (i.e. free site visits from experts, and grants for cost share, design, permitting, etc.) will be offered to implement armor removal and possibly install soft shore protection. This program will include monitoring beach ecosystem health on removal and conversion projects (from hard shore to soft shore) to provide justification. |
| 2016-0122 | Oak Harbor Marina Beach Soft Armoring Project | This project will consist of removing approx. 1100' of the current shoreline armoring (riprap, and rocks), and installing soft armoring. The new soft armoring may consist of indigenous materials such as plants, gravel, sand, logs and root masses. |
| 2016-0088 | Maylor's Point Feeder Bluff Armoring Removal | Remove 1500 feet of armoring on US Navy owned feeder bluff at Maylor's Point in Island County. |

| ID | NEAR TERM ACTION | DESCRIPTION |
|---|---|---|
| 2016-0090 | Seahorse Siesta Feeder Bluff Armor Removal | Remove 136 feet of armor (in the form of an old barge and 70-100 cubic yards of vertical concrete wall) from the toe of a high feeder bluff at the Seahorse Siesta Community Beach in Langley, Island County. |

## THEORY OF CHANGE: B5.3 PREVENT AND RAPIDLY RESPOND TO THE INTRODUCTION AND SPREAD OF TERRESTRIAL AND AQUATIC INVASIVE SPECIES

### *Description*

Invasive species are considered a significant stressor to habitat in Island watershed. ILIO partners have implemented invasive species management and removal projects in coastal communities improving estuarine habitat. Invasive species are a stressor to coastal and upland wetlands and pocket estuaries. ILIO had invasive species as a priority pressure for the FY2012 and FY2014 Action Agenda because it is a significant problem in the watershed that needs a consistent and effective approach. For FY2016, invasive species were removed from the pressure source list and added to stressors.

### STRATEGY: 15.3 (B5.3) PREVENT AND RAPIDLY RESPOND TO THE INTRODUCTION AND SPREAD OF TERRESTRIAL AND AQUATIC INVASIVE SPECIES

This sub-strategy is a priority only when supporting the implementation of another restoration or protection action.

### *Actions*

| ID | NEAR TERM ACTION | DESCRIPTION |
|---|---|---|
| B5.3.ISL112012 | Weed Eradication Program | Assess and create management plan for invasive species in Island County. Increase property owner's awareness about invasive species of concern, control methods for specific plants, and their legal obligations to control regulated species. Increase acreage native vegetation restoration. |
| B5.3.ISL112014 | Implement a noxious and invasive weed eradication program. | Assess and create management plan for invasive species in Island County. Increase property owner's awareness about invasive species of concern, control methods for specific plants, and their legal obligations to control regulated species. Increase acreage native vegetation restoration. |
| 2016-0057 | Crockett Lake Invasive Species Removal | Remove invasive species at Crockett Lake and restore native plant communities. Project covers 460 acres and targets hairy willow-herb and poison hemlock, which have spread fast and are threatening the health of this critically important wetland. |

## THEORY OF CHANGE: C2.5 PROVIDE FOCUSED STORMWATER-RELATED EDUCATION, TRAINING, AND ASSISTANCE

***Description***

Due to island geography, all basins drain into the marine waters of Puget Sound. Strategies to reduce the stressors caused by agricultural, residential and commercial land uses are to prevent or reduce non-point source pollution and changes in water temperature. ILIO partners have implemented projects to provide technical assistance and incentive programs.

### STRATEGY: 10.5 (C2.5) PROVIDE FOCUSED STORMWATER-RELATED EDUCATION, TRAINING, AND ASSISTANCE

This sub-strategy focuses on information, education, and training on stormwater-specific issues to be provided for multiple audiences.

Regional priorities:

- Design, develop and implement innovative stormwater education programs that target residents and businesses
- Promote stormwater education programs that are designed to be replicated across Puget Sound.

***Actions***

| ID | NEAR TERM ACTION | DESCRIPTION |
|---|---|---|
| C2.5.ISL9 2012-2014 | Implementation of Stormwater Technical Assistance and Incentive Programs | Island County will implement a stormwater retrofit program to target private properties. The program will include designing and conducting workshops for landowners and providing incentives for compliance (incentives may include cost sharing for rain gardens, no-cost engineering). |
| 2016-0155 | Livingston Watershed Agricultural and Residential Stormwater best Management Practices Implementation | This project provides community education and outreach, technical assistance, and cost-share funding for voluntary stormwater and agricultural best management practices. |
| 2016-0299 | Crescent Creek Watershed Technical Assistance and Best Management Practices Implementation. | This project will deliver water quality technical assistance to landowners within the Crescent Creek watershed, and provide design and implementation of water quality BMP's on their land. |
| 2016-0323 | Maxwelton Watershed Water Quality Outreach and Best Management Practice Implementation | This project will deliver water quality technical assistance to landowners within the Maxwelton watershed, and provide BMP design and implementation for implementation offwater quality practices on their land. |

| ID | NEAR TERM ACTION | DESCRIPTION |
|---|---|---|
| 2016-0329 | Penn Cove Watershed Stormwater Technical Assistance and Best Management Practice Implementation | This project will deliver water quality technical assistance to landowners within the Penn Cove watershed, and provide BMP design and implementation for implementation offwater quality practices on their land. |

## THEORY OF CHANGE: C3.1 TARGET VOLUNTARY AND INCENTIVE-BASED PROGRAMS THAT HELP WORKING FARMS CONTRIBUTE TO PUGET SOUND RECOVERY

***Description***

ILIO Conservation District partners leverage funding to provide cost share opportunities to local farmers for installing best management practices and to implement technical assistance programs and incentives to encourage BMPs on agricultural lands to reduce the nutrient and fecal loading into Puget Sound.

### STRATEGY: 11.1 (C3.1) TARGET VOLUNTARY AND INCENTIVE-BASED PROGRAMS THAT HELP WORKING FARMS CONTRIBUTE TO PUGET SOUND RECOVERY

This sub-strategy addresses programs, guidelines, and technical assistance opportunities that help farmers identify potential pollution impacts from farming activities and implement best management practices (BMPs) to reduce, control, or eliminate pollution.

Working farms are places, both large and small, where agricultural activities occur.

***Actions***

| ID | NEAR TERM ACTION | DESCRIPTION |
|---|---|---|
| C3.1.ISL8 2014-2016 | Implement a small farm water quality improvement project in Ebey's Prairie. | The project will include water quality treatment technology (e.g., grassy swales, filter strips, phytoremediation) and landowner farm practices (e.g., manure management, filter strips) to reduce non-point stormwater pollution. |

## THEORY OF CHANGE: C7.1 IMPROVE WATER QUALITY TO PREVENT DOWNGRADE AND ACHIEVE UPGRADES OF IMPORTANT CURRENT TRIBAL, COMMERCIAL AND RECREATIONAL SHELLFISH HARVESTING AREAS

### *Description*

The ILIO partners focus on reducing surface water runoff pressures from agricultural, residential and commercial land uses to reduce stressors to commercial and residential shellfish. Water quality monitoring data collected by the County is utilized to prioritize projects in the watershed to watersheds which have known water quality exceedances.

## STRATEGY: 19.1 (C7.1) IMPROVE WATER QUALITY TO PREVENT DOWNGRADE AND ACHIEVE UPGRADES OF IMPORTANT CURRENT TRIBAL, COMMERCIAL AND RECREATIONAL SHELLFISH HARVESTING AREAS

This sub-strategy addresses regional and local programs that protect and improve water quality and control pollution, helping to prevent the degradation of healthy shellfish beds and to achieve upgrades of degraded shellfish beds.

This sub-strategy can be used to address wastewater treatment plant (WWTP) upgrades, outfall changes, and other wastewater or stormwater infrastructure improvements or planning.

Actions focus on fecal coliform.

### *Actions*

| ID | NEAR TERM ACTION | DESCRIPTION |
|---|---|---|
| C7.1.ISL10 2012 | Develop and Implement a Stormwater Monitoring Program | Island County will enhance its stormwater monitoring program to address stormwater discharges from the built environment. The monitoring is intended to focus community attention on source identification and key areas of concern. Based on the monitoring data, technical assistance will be provided to landowners. |

## THEORY OF CHANGE: C9.4 DEVELOP AND IMPLEMENT LOCAL AND TRIBAL POLLUTION IDENTIFICATION AND CORRECTION (PIC) PROGRAMS

***Description***

ILIO partners have focused on developing a Pollution Identification and Correction (PIC) to investigate sources of pollution and correct the problem to reduce pressures from all land uses. Our partners use source identification to locate potential on-site septic systems failures, which are a significant stressor on shellfish beds in the watershed, to direct compliance assessments. The PIC model includes a comprehensive approach to achieving ecosystem and human wellbeing outcomes.

### STRATEGY: 21.4 (C9.4) DEVELOP AND IMPLEMENT LOCAL AND TRIBAL POLLUTION IDENTIFICATION AND CORRECTION (PIC) PROGRAMS

This sub-strategy helps implement local pollution identification and correction programs that determine the causes and sources of water pollution in specific geographical areas, and ensures corrective actions are taken to address the pollution sources and protect Puget Sound marine and fresh water health.

PIC programs with a high probability of success include the following essential elements:

- Consistent, long-term, ambient water quality monitoring to prioritize projects and evaluate action effectiveness.
- Coordinated outreach about proposed PIC projects and results to increase community awareness, participation, and support.
- Source identification sampling.
- Provision of information, site inspection, technical assistance, and financial support to correct identified sources of pollution.
- Effective enforcement capability. Enforcement is used when compliance efforts fail.
- Sustainable funding to maintain long-term stability of the program.

***Actions***

| ID | NEAR TERM ACTION | DESCRIPTION |
|---|---|---|

| ID | NEAR TERM ACTION | DESCRIPTION |
|---|---|---|
| 2016-0105 | Island County Pollution Identification and Correction Program | This NTA supports Phase 2 of the Pollution Identification and Correction (PIC) program in Island County. Program work includes conducting bacteria source identification in target watersheds with known surface water quality exceedances. |

## THEORY OF CHANGE: C2.4 CONTROL SOURCES OF POLLUTANTS

***Description of Control sources of pollutants theory of change***

ILIO partners implement projects that provide technical assistance and incentive programs to reduce stormwater contamination through the use of best management practices on both private and public lands. Some of the ILIO NTAs address the agricultural effluent stressors and others address the residential and commercial stressors to reduce toxics into the surface water runoff.

### STRATEGY: 10.4 (C2.4) CONTROL SOURCES OF POLLUTANTS

This sub-strategy includes local pollution and control programs, inspections, technical assistance, and enforcement and is intended to identify, address, and reduce toxics, nutrients and pathogens.

- Promote source control and technical assistance programs at the local level.
- Reduce pollutants from on-site septic system sources; agriculture operations; and/or toxics from residential and commercial uses.
- Promote enforcement and compliance related to pollution source control.

***Actions***

| ID | NEAR TERM ACTION | DESCRIPTION |
|---|---|---|
| 2016-0337 | Ebey's Prairie Watershed Stormwater Remediation | Design and construction of a stormwater collection, conveyance, and transfer to an irrigation pond for use during the dry season. |
| 2016-0299 | Crescent Creek Watershed Technical Assistance and Best Management Practices Implementation. | This project will deliver water quality technical assistance to landowners within the Crescent Creek watershed, and provide design and implementation of water quality BMP's on their land. |
| 2016-0323 | Maxwelton Watershed Water Quality Outreach and Best Management Practice Implementation | This project will deliver water quality technical assistance to landowners within the Maxwelton watershed, and provide BMP design and implementation for implementation offwater quality practices on their land. |
| 2016-0329 | Penn Cove Watershed Stormwater Technical Assistance and Best Management Practice Implementation | This project will deliver water quality technical assistance to landowners within the Penn Cove watershed, and provide BMP design and implementation for implementation offwater quality practices on their land. |

## 5.0 GAPS, BARRIERS AND NEEDS

LIOs were asked to identify barriers, gaps and resource needs as they relate to ecosystem recovery planning. These include both local and regional gaps, barriers and needs and are summarized in Table 10.

**Table 10. Barriers to accomplishing ecosystem recovery in the Island LIO area.**

| Barrier | Detailed Description | Resources Needed to Overcome (technical, capacity, political) |
|---|---|---|
| Regional support for Oil and Hazardous Spills | Oil and hazardous spills was selected as a high pressure by the ILIO because of the severe effects these spills can have on Chinook, shellfish, herring, estuaries, eelgrass, and marine water quality. The ILIO strategies for this pressure are focused on oil spill response to minimize the impacts to our nearshore and marine habitats from large spills. | Technical capacity and political support needed including support for maintaining and enforcing the Magnuson Amendment http://www.seattletimes.com/opinion/the-salish-sea-is-still-not-safe-from-oil-risks/ Regional support to assure that State and Federal entities with responsibilities and/ or opportunities to participate in addressing oil spills coordinate their mandates, take advantage of local knowledge and leverage PSP archives and policies to advance the work. |
| Marine Water Quality | The PSP target for the Marine Water Quality vital sign is related to dissolved oxygen levels | DOH dissolved oxygen data. Technical support is needed to establish a better metric for this target. |
| Herring | The ILIO goal to maintain, or measurable increase, in forage fish species (herring, surf smelt & sand lance) is for presence/absence since the species are influenced by outside factors. To adaptively manage the ecosystem recovery plan, regional monitoring would be more effective. | Regional support for forage fish monitoring. |
| Chinook | ILIO targets for chinook are in support of juvenile salmonid abundance. The PSP vital sign for chinook is not supportive of the local actions to protect habitat for juvenile salmonids although this habitat is critical for Chinook abundance. | Biennial Science Work Plan should include nearshore metrics for juvenile Chinook. |
| **Gap** | **Detailed Description** | **Resources Needed to Overcome (technical, capacity, political)** |
| Funding | | |
| Community Engagement | The ILIO recognizes the importance of community engagement in the development stage of the Ecosystem Recovery Plan and will | Capacity and political support are needed for community engagement in the ERP planning |

| | | |
|---|---|---|
| | work to incorporate this element into future iterations of the ERP. | process. |
| Nearshore Indicator Monitoring | To establish meaningful targets and goals, the ILIO partners need sustainable funding for local monitoring. | Funding for local monitoring and for better collaboration with regional partners on data sharing. Assessments should be included as funded elements of grants for all projects. |
| Process, planning and reporting requirements | Capacity to implement actions is limited by process, planning and reporting requirements. | Lessen the burden from process, planning and reporting requirements to allow for more project implementation.<br>Stay consistent with a process to allow strategic planning and adaptive management. |
| Research | | |
| Chinook component | Biennial Science Work Plan should include nearshore metrics for juvenile Chinook. | Technical support for regional criteria for nearshore monitoring. |
| Pocket estuaries & Estuarine Wetlands Components | Both are contributing to the health of the estuary vital sign, but not to the target for Estuaries. The Estuary target is for major river deltas ("land returned to tidal flooding in deltas"). | Estuaries target should be more inclusive to support smaller estuarine wetlands which are important to the survivability and abundance of salmonids. |
| NTA proposal information | Encourage presentations and/or site visits for NTA projects (ex. SRFB project proposal site visits/presentations) | Funding & support needed. |
| Recovery Planning | | |
| Regional NTA development | 2016 NTA development process failed to integrate lead agencies and larger regional NTA projects into local processes. This led to missed opportunities for fruitful collaboration and a misunderstanding of real versus envisioned partnerships. | Regional and local project integration, efforts to combine similar projects under regional partnerships could be more efficient and mutually beneficial to both large and small stakeholders. |
| Effects of Climate Change | This pressure was identified by the PSPA as a high pressure with changing ocean condition, altered peak and/or low flows in freshwater systems, and sea level rise as the main stressors to all of the ILIO ecosystem components. The ILIO distinguished this pressure, Effects of Climate Change; as opposed to the PSP pressure source Airborne Pollutants. The partners determined that the pressure on our priority components was actually a result of the stressors from the effects of climate change, as opposed to the airborne pollutants themselves (including acid rain, excess nitrogen deposition and radioactive fallout). | Consider taxonomy revision around Climate Change impacts including strategies for community resilience (especially for coastal communities).<br>Support for community engagement in climate change impact mitigation especially coastal community resilience. |
| Cost Effectiveness | Criteria for ranking NTAs are qualitative, rather than quantitative and encourage the selection of projects which are feasible and politically acceptable but which may not deliver the best return in terms of ecosystem recovery for dollars spent. | Support monitoring and data gathering and adjust criteria to include a quantitative measures. |

# 6.0 ADAPTIVE MANAGEMENT

Adaptive management is an iterative process intended to be used early and often during planning and other project and program stages in order to: 1) raise key questions for managers, governmental, and non-governmental entities regarding the optimum approach for achieving recovery goals; 2) design ways to answer those questions and address major issues; and 3) incorporate new monitoring data and other relevant information into decision making to improve salmon recovery program design and implementation. Adaptive management can help address questions about how to make progress and attain our recovery goals, as well as identify the impact of proposed actions. Adaptive management allows for flexibility to be incorporated into design and implementation due to uncertainty and the need to adjust based on future conditions.

## ADAPTIVE MANAGEMENT IN THE ILIO

The ILIO incorporates an adaptive management process into ecosystem recovery planning and implementation to inform complex decision-making and ensure partners are making most effective and efficient use of recovery funding in Island watershed. The ILIO partners are committed to incorporating new, relevant data into ecosystem recovery planning and effectiveness monitoring to gauge success in current strategies being implemented. This iterative process is intended to:

- Provide the ILIO Executive Committee with information that enables refinement of the approaches to restore and protect natural resources and habitats
- Delineate a pathway for managing gaps and barriers, and
- Incorporate new data, interdisciplinary experience and other relevant information into decision making to improve ecosystem recovery program design and implementation.

Adaptive management has been used by the ILIO to modify and refine elements of the Ecosystem Recovery Plan (ERP) and to evaluate the goals and targets established by the ILIO and the success of Near Term Action (NTA) project implementation. Looking ahead, the ILIO will continue to improve the adaptive management process to be strategic in planning, policy, and implementation efforts.

**1. ILIO Partnerships**

The ILIO represents the Island County watershed. It was officially recognized by the Puget Sound Partnership's Leadership Council in 2011. The Island LIO has two contributing committees: an Executive Committee and a Technical Committee. The ILIO Coordinator facilitates both committees.

The Executive Committee (EC) is comprised of elected officials representing Island County political subdivisions from the watershed and tribal representatives. The Executive Committee includes representatives from the following entities:

Island County Council of Governments

- Island County Commissioner District 1
- Island County Commissioner District 2
- Island County Commissioner District 3
- City of Langley – Mayor
- Town of Coupeville – Mayor
- City of Oak Harbor – Mayor
- Port District of Coupeville – Port Commissioner (as appointed by commissioners)
- Port District of South Whidbey – Port Commissioner (as appointed by commissioners)

Participating Local Tribal Governments

- Tulalip Tribes – Tribal Representative
- Swinomish Tribe – Tribal Representative

The Island LIO Technical Committee (TC) represents local watershed groups, Tribal representatives, stakeholders and ecosystem recovery partners. The TC provides recommendations to the EC on strategic direction, priority setting, funding concepts, and other issues of mutual interest. The TC is informed by the work of local and regional groups and County and technical advisors. The ILIO partners are committed to maintaining the sustainable use of water resources while protecting habitat, environment, and human health.

The Technical Committee members include representatives from the following entities:

- Island County Public Health
- Island County Public Works
- Island County Planning and Community Development
- City of Oak Harbor
- City of Langley
- Town of Coupeville
- Tulalip Tribes
- Swinomish Tribe (via Skagit River System Cooperative)
- Island County Marine Resource Committee
- Island County Water Resource Advisory Committee
- WRIA 6 Salmon Recovery Lead Entity
- Business/ports
- Whidbey ECO-Net (education/outreach)
- Conservation districts

All elements of ecosystem recovery planning and Near Term Actions (NTA) review and evaluation, scoring and selection process are developed by the ILIO TC and then vetted and approved by the ILIO EC. The ILIO Coordinator moves the recommendations up from the TC for consideration by the EC. The EC makes all ILIO decisions, sets strategic policy direction, and establishes priorities and funding concepts. When there is no consensus at the EC level, the ILIO Coordinator takes comments back to the TC for evaluation and revisions to be reconsidered.

**2. Conceptualize/ Frame Strategies**

Ecosystem recovery planning in Island watershed began with establishing the priority ecosystem components, pressures and stressors of concern. The ILIO utilized *The Guidance for Structuring, Selecting and Prioritizing Near Term Actions for Improved Ecosystem Outcomes for 2016* (Anderson, et al. 2014) as a framework for the 2-year Implementation Plan and the FY2016 NTA development process.

The Puget Sound Pressure Assessment (PSPA, 2014) was utilized to evaluate gaps in the ILIO 2012 and 2014 pressures and stressors evaluated with ecosystem vulnerability, and to refine the priority of stressors on our natural systems and habitats. Through a series of monthly meetings, workshops, consultations with technical advisors, and online surveys, the ILIO TC followed this guidance to select the Pressures, Ecosystem Components, Vital Signs and Targets for the 2016 planning and NTA development process.

The ILIO also incorporated interdisciplinary opinions by soliciting technical experts from relevant fields to develop ecosystem component recovery targets for Island watershed and to provide guidance reviewing candidate NTAs. The ILIO works closely with the Water Resource Inventory Area (WRIA) 6 Lead Entity Coordinator to ensure that salmon recovery and habitat protection/restoration goals for the watershed are accurately represented in the planning process.

Miradi was utilized to develop conceptual models built with the established priority Pressures, Ecosystem Components, Vital Signs and Targets. The dialogue in developing the conceptual models identified the underlying causes and contextual relationships contributing to the highest priority pressures in Island watershed. The models also helped outline monitoring metrics that would be useful in tracking trigger points for adaptive management decisions. Mapping out possible approaches to address the priority pressures highlighted gaps that existed in the 2014 recovery strategies and created a better understanding with partners of the current ecological and socio-political context in the watershed and the goals to measure progress. Alternative strategies were identified and incorporated into the ecosystem recovery plan.

### 3. Plan Actions & Monitoring

The ILIO utilizes monitoring data from technical partners to adaptively manage the ecosystem recovery work in the watershed and identify the impact of both implemented and proposed recovery and protection actions. Below is a list of monitoring work that is integrated into the ILIO adaptive management process.

| **Organization** | **Monitoring Data** | **How data is used to adaptively manage resources** (effectiveness, pressure abatement, and status and trends) |
|---|---|---|

| | | |
|---|---|---|
| Island County Department of Natural Resources, Surface Water Quality Monitoring Program | Surface water quality | Watershed prioritization for water quality improvement projects |
| Island County Marine Resources Committee | Seining - juvenile salmonids | Population status (abundance) in specific geographic areas. |
| | Eelgrass & Kelp | Population status (abundance) in specific geographic areas. |
| Island County Sound Water Stewards | Forage fish | Population status (presence/absence) in specific geographic areas. |
| Island County Planning & Community Development | Beach (elevation, sediment, vegetation) | Project effectiveness and status (quality and quantity) in specific geographic areas. |
| Island County Environmental Health | Shoreline infrastructure (armored / unarmored shoreline (ft)) | Status and trends |
| WA Department of Health | On-site septic systems | Status and trends and watershed prioritization |
| | Marine water quality | Status and trends and prioritization |
| WA Department of Ecology | Shellfish harvest (ac) | Status and trends and watershed prioritization |
| | Water Quality Assessment (303 D listed water bodies) | Status and trends and prioritization |

These data sources were used for evaluating successes of the 2014 NTAs and also in selecting priority projects for NTA consideration for the 2016 NTA development process. The Miradi conceptual models provide the basis for selection of parameters to monitor for effectiveness, pressure abatement, and status and trends. Surface and marine water quality data drives prioritization around natural resources and habitat protection.

Some of the monitoring data (i.e. seining, kelp, eelgrass, and forage fish) cannot be effectively used to adaptively manage for project effectiveness. It is used by ILIO partners to observe species response to activities and to support regional monitoring efforts. These populations vary too much and have outside pressures and influences outside of Island watershed therefore there cannot be any direct correlations with abundance with any local actions. The Salmon Recovery Technical and Citizens Committee will be updating the WRIA 6 Salmon Recovery Plan

with goals and common indicators. The ILIO ERP will be updated with this best available science to reflect accurate targets and goals for the nearshore environment.

The ILIO currently utilizes the smartsheet tracking tool to monitor progress towards ecosystem recovery goals. The monitoring component of adaptive management in the watershed is limited to the current data sources available for evaluation. Status and trend information is available for the water quality monitoring data; however, some of the shared available data are not kept current in this analysis which limits the ability to utilize the data for adaptive management. The current adaptive management system only reports on success related to specific targets assigned in the NTA development process.

### 4. Analyze, Implement & Adapt

Island watershed has complex and dynamic habitat and ecosystem components. Restoration actions are evaluated for success and failure in an effort to learn from our investments and alter strategies to become more effective and to be better stewards of the natural resources in the watershed. The ILIO partners are engaged in applying the limited resources available for restoration in the most effective and efficient recovery actions. There is a shared interest and responsibility in the watershed to improve our understanding of how to design, implement, and manage projects to meet the ecosystem recovery goals. Mismanaged or failed projects can threaten public support for protection and restoration in the watershed and have, sometimes, left the misunderstanding of mismanaged state or federal funding. A transparent adaptive management process will inform improvements to future projects and efforts and increase public support for ecosystem recovery planning and future protection and restoration projects.

The ILIO will improve the adaptive management process by including project effectiveness monitoring to evaluate ecosystem component and vital sign targets identified in the Puget Sound Partnership Action Agenda. With improved data on ecosystem indicators, particularly nearshore indicators, the ILIO will be better equipped to measure progress toward meeting goals and objectives and respond with decision-making on project effectiveness. The ILIO TC will review monitoring data related to goals and targets and make recommendations, when needed, on new indicators

or strategies and on impacts of alternative policies and projects. The ILIO will also encourage project sponsors to share lessons learned throughout and after projects have been completed to better inform adaptive management strategies.

Partners have identified short-term goals and a systematic approach to track project performance. As projects are implemented, these goals will be incorporated into tracking ILIO successes toward ecosystem recovery, both locally and regionally. Short-term goals may also be utilized to track and communicate progress between the ILIO and the project sponsors. These short-term goals will be utilized as triggers for accountability and adapting strategies. The ILIO TC may use these triggers to make recommendations to the EC to enhance project performance, provide alternative strategies, or require additional monitoring to better assess progress for the recovery actions.

The ILIO TC and EC will meet annually to review project status and success toward recovery goals to foster an improved learning cycle. Changes to new or revised ecosystem components, targets, pressures, stressors or strategies are fully vetted and documented through updates to the ERP annually by the ILIO Coordinator. The adaptive management process will support the most effective and efficient recovery and protection efforts in Island watershed by measuring project performance and refining the learning and decision-making processes accordingly.

## REFERENCES


Anderson, R,. Schwartz, M., and Williamson, M., 2014. Guidance for Structuring, Selecting and Prioritizing Near Term Actions for Improved Ecosystem Outcomes for 2016.

Beamer, E.M., McBride, A., Greene, C., Henderson, R., Hood, G., Wolf, K., Larsen, K., Rice, C., and Fresh, K., 2005. Delta and Nearshore Restoration for the Recovery of Wild Skagit River Chinook Salmon: Linking Estuary Restoration to Wild Chinook Salmon Populations. Appendix to the Skagit Chinook Recovery Plan.

Beamer, E.M., Zackey, W.T., Marks, D., Teel, D., Kuligowski, D., and Henderson, R., 2013. Juvenile Chinook Salmon Rearing in Small Non-natal Streams Draining Into the Whidbey Basin.

Biedenweg, Kelly, Scott, Ryan P., Scott, and Tyler A., 2017. How Does Engaging With Nature Relate to Life Satisfaction? Demonstrating the Link Between Environment-specific Social Experiences and Life Satisfaction. *Journal of Environmental Psychology.*

Coastal Geologic Services, Inc. 2014. Puget Sound Shoreline Parcel Segmentation Report. Available at http://wdfw.wa.gov.grants/ps_marine_nearshore/files/parcel_segmentation.pdf.

Timm, Raymond, 2017. Cramer Fish Sciences. WRIA 6 Marine Nearshore Literature Review and Response to Questions.

Island County Community Health Planning, 2015. *2015 Community Health Assessment.* Available at *http://www.islandcounty.net/commissioners/boh/2015/documents/072115CHA2015_QualitativeDataPlan.pdf*

Ness, A.O., and C.G. Richins. 1958. Soil survey of Island County, Washington. U.S. Department of Agriculture, Soil Conservation Service.

Puget Sound Regional Council Regional, 2016. Population Forecasts. Available at www.psrc.org/data/forecasts , accessed March 2016.

Puget Sound Partnership, 2014. Puget Sound Pressures Assessment.

Skagit River System Cooperative & Washington Department of Fish and Wildlife. 2005. Skagit Chinook Recovery Plan. Available at www.sharedsalmonstrategy.org/ or www.skagitcoop.org/ , accessed April 2016.

State of Washington, Office of Financial Management, 2016, *2015 Population Trends,* accessed March 2016.

Washington Association of Counties, 2016. Island County Transportation Metrics. Available at http://www.wsacmetrics.org/island-county.html , accessed April 2016.

Washington State Department of Health, 2015. Shellfish Harvest Area Information by County, July 2015. Available at: http://wdfw.wa.gov/fishing/shellfish/ .

Washington Department of Natural Resources, 2017. Nearshore Habitat Inventory. Available at http://www.dnr.wa.gov/programs-and-services/aquatics/aquatic-science/nearshore-habitat-inventory , accessed January 2017.

WRIA 6. Multi-Species Salmon Recovery Plan. Island County. May 2005. Available at https://www.islandcountywa.gov/Health/DNR/Pages/Salmon-Recovery-Planning.aspx , accessed January 2017.

## APPENDICES

A. Glossary

B. Pressure Sources and Stressors of Concern in the LIO

C. Conceptual Models

D. Results Chains