Toward a Natural Resources Asset Management Plan for Kitsap County
Workshop #2 Agenda

Date: July 17, 2023, 11:00-1:00 pm PT
Goals: Discuss the KNRAMP Implementation Plan approach, asset management approaches to natural resources, and options for setting DLOS for pilot watersheds.

11:00 am	**Welcome and Introductions** – Dana Stefan and Elizabeth McManus (Ross Strategic, Facilitators)
11:10 am	**Initial Draft of the KNRAMP Implementation Plan** • Review the Implementation Plan Outline • Gather feedback on the revised definitions • Share initial considerations for the two pilot watersheds • Discuss adaptive management approach for KNRAMP
11:50 am	**Asset Management Application to Natural Resources** • Update on asset management approaches for natural resources memo and next steps
12:05 pm	**Initial Options for Setting DLOS For Pilots** • Review attributes, objectives, and targets for each asset • Discuss attribute targets versus wide ranging asset goals • Review current LOS within pilot watersheds • Discuss science based desired levels of service for pilot watersheds • Gather feedback and input on DLOS for pilots
12:45 pm	**Updates from Partners** • Suquamish Tribe • Port Gamble S'Klallam Tribe • Kitsap County
12:55 pm	**Wrap-up and Next Steps**
1:00 pm	**Adjourn**

ASSET MANAGEMENT APPROACHES WITHIN KITSAP COUNTY

Memo summarizing structures, programs, and asset management processes within Kitsap County (Agreement KC-124-23 Task 6.1b)

Background

Kitsap County actively manages forests, streams, and shorelines through policies, programs, and projects. Aiming to take a more proactive and comprehensive approach to monitoring, protecting, and improving natural resources, and to inform long-term decision-making and priority-setting, the County is working to develop a Natural Resources Asset Management Program (KNRAMP).

To better understand the existing asset management approaches within Kitsap County and how they are integrating within current policies and structures, Kitsap County Department of Community Development (DCD), supported by Washington Conservation Action (WCA) and Ross Strategic, held a series of conversations with the following Kitsap County divisions: Parks, Stormwater, Roads, Solid Waste, Facilities, and the DCD leadership and planning team. These conversations were helpful to identify elements that may be relevant for KNRAMP.

This memo summarizes the asset management approaches within Kitsap County and includes considerations for integrating a natural resources asset management program into the existing County structures. The memo will support the development of an Implementation Plan for KNRAMP to inform next steps.

Working Definitions

The following KNRAMP working definitions were shared with the Kitsap County divisions to support the discussions. These definitions will be further refined in coordination with the KNRAMP core team.

- ***Asset management*** refers to treating the components of the public infrastructure system as assets within the public trust to be stewarded by the local government.
- ***Levels of Service (LOS)*** are measures of quality used to indicate how well natural assets are functioning. This project is defining the levels of service provided by streams, forests and marine shorelines, and establishing level of service standards for them similar to the level of service standards used in capital facilities planning. Methodologies used for calculating Level of Service are based on best available science, per RCW.70A.172, and may require revision over time as additional or improved data become available.
- ***Baseline levels of services –*** Baseline functional condition of natural assets based on existing data. KNRAMP will look at existing and relevant datasets within and outside the County.
- ***Level of Service Standards*** are adopted by the County and set the minimum acceptable functionality of an asset. In determining adopted standards for each asset or place, several factors will be considered, including social aspects and baseline data, informing what would be an acceptable and feasible minimum service level for an asset. These would be officially adopted by the County (used to inform funding priorities).
- ***Desired levels of service*** – Long-term goal and preferred outcome for the level of service to be provided by a natural asset (still to be established). These may be variable across the county – meaning there may be different desired levels of service in different places. In determining desired levels of service for each place, several factors will be considered, including social aspects, baseline data, scientific data informing what would be an appropriate/feasible level of service, and priority areas for the County and its tribal partners.

Asset Management Efforts

Asset management within Kitsap County is formalized for grey/built infrastructure like roads and parks facilities. Some divisions manage green infrastructure as part of their existing plans though there is not a dedicated asset management plan for natural resources, e.g., Parks, Stormwater, DCD Divisions. Overall, there is significant interest within the county for a more proactive management of natural resources given that some divisions manage and/or their activities have implications for green assets, both man-made and natural resources. Some examples include:

- Parks lands that are not intended for recreation but rather restoration and maintenance. About 80% of lands that Parks owns are natural resource management lands not intended for recreation.
- Stormwater assets such as bioretention and detention ponds, outfalls, and catch basins.
- Solid waste as it relates to litter prevention and downstream effects.

There are multiple ongoing efforts that are taking place across the county to develop asset management programs.

- The Stormwater Division recently received a grant to create an asset management program that will allow the division to identify the baseline for the current assets, create appropriate policies and processes, and generate annual reports with asset life expectancy[1].
- The Solid Waste Division held some early conversations about a potential asset management program and found the structure of the Capital Facilities Plan to be useful in guiding conversations as the Plan identifies the mission, goals, policy objectives, and recommended strategies. The Roads division is currently working on updating its 6-Year Transportation Improvement Program (TIP). The division uses the Kitsap County Public Works Transportation Project Evaluation System (2017) to guide its asset management approach that describes the project identification, scoring, ranking, and prioritization process, which ultimately informs the selection of transportation projects for funding in the TIP.
- The Parks Division will use the Capital Facilities Plan to inform management of its park facilities mainly related to grey infrastructure and recreation; the Division does not have a dedicated asset management plan for its natural resources.

Asset management across Kitsap County

Kitsap County Division	Status of asset management approaches		
	Currently in place	Under development	Under consideration
DCD – KNRAMP		●	
Facilities	●[2]		
Parks		●[3]	
Roads	●[4]		
Solid Waste			●
Stormwater		●[5]	

[1] Stormwater Division – Three-year Strategic Plan
[2] The Comprehensive Plan Update for 2023 will include a list of the facilities/buildings and the level of service.
[3] The future Capital Facilities Plan and PROS Plan Update will include information about asset management for the Parks Division as it relates to grey infrastructure only.
[4] The Transportation Improvement Program (TIP) for the Roads Division is currently under development. The division also uses the Kitsap County Public Works Transportation Project Evaluation System (2017) to guide its asset management approach.
[5] Ecology grant recently awarded to the Stormwater Division to develop an asset management plan.

Process for Establishing Baseline Asset Conditions

Establishing the baseline (current) conditions of assets often requires observation from the field coupled with data from existing local, state, and federal databases. The field data is generated through regular inspections, where dedicated resources for inspection activities already exist, or through volunteers; one division noted that citizen science efforts could potentially be explored in the future to help with monitoring. Even if data gathering may be an intense process, it was noted that there are synergies and opportunities for data sharing across divisions given the overlap in some areas.

As part of the monitoring process, divisions look at different characteristics of the assets. For example, roads start degrading the day they are constructed, and the Roads division is developing 'degradation scenarios' based on factors such as built date and pavement material. The Stormwater Division is taking a similar approach as part of their current work on an asset management plan, with the Division planning to develop a framework on asset replacement and life expectancy, looking at characteristics such as age and type of pipe materials.

Level of Service Determination

The LOS is the report of the condition and performance of the asset. The LOS helps identify the areas that are in need of restoration and maintenance and determine actions based on the available budget. The LOS can be calculated based on the existing data and observation.

Divisions highlighted that defining LOS is a complex process and differs depending on multiple factors, such as type of asset, contextual factors, and geographic area. Not all divisions have LOS formally defined and most of them are using the current policies that guide their operations to inform the LOS. LOS standards can vary across different geographies, urban vs rural areas, and even across similar types of assets with different built date. Divisions highlighted that for some assets for example, some areas might accept a level C or D before an asset is considered below a level of service standard. The Facilities Division indicated that, given the diverse age of the Kitsap County buildings and different needs for maintenance, they may need to determine the LOS per building.

The Stormwater Division is just starting to develop LOS weights and metrics for prioritization.

Some divisions like Roads have the LOS and a rating system included in current policies. For example, Roads identifies hundreds of projects through internal monitoring/expertise and public engagement that are then scored and narrowed down to a priority list for the year. The division has about twenty categories to be scored with points. Roads have LOS pavement condition scores of 100-0 (100 is perfect condition) and placed into A-F ratings. For example, a road with a score of 100-80 is in good condition, while if it reaches 50-40 it may need to be rehabilitated. Once assessed, the priority list of projects goes to the Commissioners for approval and further input on project prioritization and balancing (budget and regional equity).

With regards to natural resources, it was noted that current permit processes are built around goals of no net loss, and achieving a net ecological gain is currently not required by code. When impacting critical areas or their buffers in particular, permit applicants are required to demonstrate mitigation sequencing that includes efforts to avoid and minimize impacts before considering compensatory mitigation for unavoidable impacts.

Prioritization Criteria to Determine Maintenance or Restoration

Several factors are considered when monitoring and prioritizing an asset for maintenance or restoration, including:

- Basin size (e.g., for stormwater)

- Population and houses served (e.g., for roads)
- Proximity to critical facilities such as hospitals or schools. If an intersection is failing and is next to a culvert that needs replacement, it may get more points because of proximity to each other.
- Improvement of the overall network (e.g., fish passage barrier removal, roundabouts, sidewalk/bike lanes)
- For roads in particular: Traffic counts, bus networks, school locations, and contact with the Fire Marshall are documented to understand what routes have alternative access or should be prioritized. One main consideration is a yearly collision analysis, with areas of highest collisions for vehicles over a past 5-year period.
- Funding availability: particularly for habitat restoration projects on the transportation network that ranked highly and obtained funding through a habitat grant
- Geographical diversity: selected projects should not all be grouped in one area. Usually, the three districts in Kitsap County are monitored (south, central, and north).

Monitoring, Maintenance, and Reporting

Regular monitoring is important to understand if preservation or mitigation efforts are performing to the extent they should. Divisions noted that frequency of monitoring varies, but problematic assets are looked at more often. Some divisions are starting to collaborate on certain monitoring aspects to leverage existing resources, e.g., stormwater and roads. Some examples of monitoring efforts from divisions include:

- For Stormwater, the goal is to maintain each catch basin once, sometimes twice, each year. Stormwater produces an annual report for the Department of Ecology on maintenance, number of facilities maintained, complaints from constituents, responses to concerns, and inspections (including by DCD). While their permits require an 80% maintenance rate, usually 100% full maintenance is met.
- DCD noted that certain types of compensatory mitigation require a monitoring plan with a one-, three-, and five-year timeline.

Public Engagement Approach

Divisions noted that public engagement is crucial to understand customer demand, including suggestions for areas that may need to be elevated for maintenance and restoration. Roads, for example, is gathering public input through public engagement when developing their list of priority assets for the year.

Potential Areas Where KNRAMP Could Be Helpful

The divisions indicated the following areas where there are synergies across departments and divisions or KNRAMP could help, for further exploration:

- Identification of natural assets and areas with high ecological value is needed to have a clearer path for protection, management, and investment of natural resources. Examples include:
    - Public requests for reclassifications of property zoning was open from August to September 2022 as part of the County's Comprehensive Plan Update process. Proposals were reviewed for potential inclusion in land-use alternatives. One alternative focused on increasing density within Urban Growth Areas while another focused on dispersed growth and expansion of Urban Growth Areas. A number of parcels proposed for reclassification consisted of critical areas, shorelines, intact tree canopy cover, wetlands, and other ecologically valuable assets. Currently, each request is reviewed at a parcel-by-parcel scale. The goals is to plan for natural asset at a larger scale the same way planning is done for land use and growth.
    - Land use designations and zoning will be integrated into all parks. Port Gamble took the first step at this. Natural areas will be identified to understand what the land can take. For example, wetland

buffers will be designated as natural areas and only limited passive recreation such as a small trail for educational purposes may be allowed in that area. An example of a land use designation would be a natural or passive recreation area. Active recreation areas would be more appropriate in upland areas.

- Looking at the hydrography aspects of natural resources from a watershed perspective would also be helpful for current stormwater management efforts.
- Monitoring shorelines would be helpful for Parks management of their natural resource areas, especially as more shorelines are acquired and shoreline erosion issues occur.
- Overall monitoring of water quality and downstream effects would be helpful.
- KNRAMP will be helpful to monitor the effectiveness of development regulations, e.g., if the County adopts a tree protection ordinance, KNRAMP could be used to assess levels of service in urban tree canopy.
- There is potential to integrate habitat restoration as part of the annual scoring analysis for roads. Culverts are assets and there has been high interest in fish passage barrier removals. Public Works is working to incorporate WDFW culvert inspection data fields into inspections (e.g., stream type, annual/perennial, barrier, fish presence).

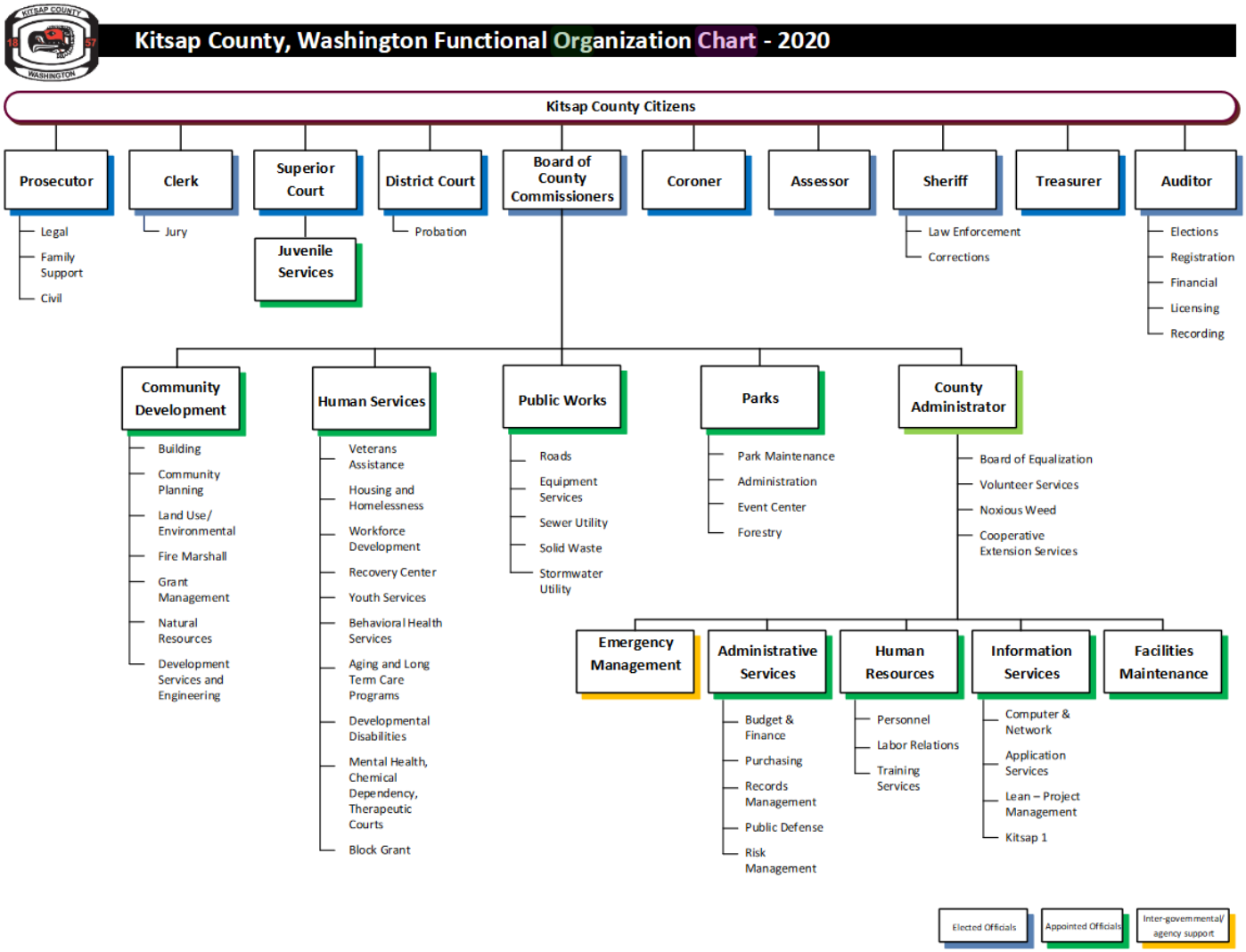
Policies and Programs that Guide Current Formal or Informal Asset Management Approaches

- Public Works: Includes Stormwater, Solid Waste, and Roads divisions.
- Stormwater:
    - They use stormwater National Pollutant Discharge Elimination System (NPDES) phase 2 permitting requirements as a guiding policy to maintain infrastructure, and to base reports on.
    - There is a Stormwater Drainage Code that is Title 12 of the Kitsap County Code that lays out information on the Stormwater Management Program, permits, maintenance, and more.
    - Water as a Resource Policy is a direct policy to integrate from Kitsap County.
    - They use Cartegraph to ensure they meet permit requirements.
    - They integrate guidelines and directives of the Kitsap County Comprehensive Plan.
    - Many facilities are built with permitting through DCD.
    - They have a 2023-2028 Stormwater Capital Facilities Plan
- Solid Waste
    - They follow the 2022-2027 Solid Waste Capital Facilities Plan, which is part of the Kitsap County Capital Facilities Plan, that addresses capacity, repairs, and improvements to Solid Waste facilities. There is a proposed 2023-2028 Solid Waste Capital Facilities Plan.
    - The Solid and Hazardous Waste Management Plan recommends strategies to manage solid waste.
    - The Litter Control Program has tracked resources through Cartegraph.
- Roads
    - The Kitsap County Public Works Transportation Evaluation System is used for the selection of projects for funding in the County's Transportation Improvement Program . The TIP is a six-year program that prioritizes capital construction projects.
    - Inspection ratings were developed in the 1990s based on Federal Highway Administration (FHWA) criteria, which is still used along with additional criteria.
    - Other management plans related to public works and roads include:
        - Kitsap County Non-Motorized Facility Plan
        - Road Maintenance and Operations Division maintains and preserves roads with the use of the Pavement Preservation Program, the Vegetation Management Program, Herbicide Spraying, the Snow and Ice Removal Program, and the Green Sweep Program. They follow Title 136 WAC and RCW 36.82.070.

- Parks:
    - The main guides Parks uses are:
        - The Parks, Recreation, and Open Space Plan (PROS Plan) provides a six-year and twenty-year vision for the County's park system, as well as the steps needed for developing and improving park facilities, the development and acquisition for new park facilities, and expanding recreational opportunities.
        - The Capital Facilities Plan is used for the grey infrastructure managed by Parks.
        - Parks is moving towards transferring from the Brightly asset management software to the Public Works/DCD platform which is Cartegraph.
    - Other management guides and policies used by Parks include:
        - Coulter Creek Park Draft Resources Management Plan
        - Forest Stewardship Plan
        - Newberry Hill Master Plan
        - Mushroom Harvest Policy Resolution
        - Kitsap County Integrated Forest Stewardship Policy
        - Forest Practices Illustrated

- DCD:
    - They use the Kitsap County Code (including Title 19 on Critical Areas and Title 22 on the Shoreline Master Program) and the Kitsap County Comprehensive Plan to guide policies.
    - Water as a resource
- Facilities:
    - Chapter 11 Capital Facilities Plan within the Kitsap County Comprehensive Plan.

Appendix 1


Kitsap County, Washington Functional Organization Chart - 2020
Kitsap County Citizens
Prosecutor
Legal
Family Support
Civil
Clerk
Jury
Superior Court
Juvenile Services
District Court
Probation
Board of County Commissioners
Coroner
Assessor
Sheriff
Law Enforcement
Corrections
Treasurer
Auditor
Elections
Registration
Financial
Licensing
Recording
Community Development
Building
Community Planning
Land Use/ Environmental
Fire Marshall
Grant Management
Natural Resources
Development Services and Engineering
Human Services
Veterans Assistance
Housing and Homelessness
Workforce Development
Recovery Center
Youth Services
Behavioral Health Services
Aging and Long Term Care Programs
Developmental Disabilities
Mental Health, Chemical Dependency, Therapeutic Courts
Block Grant
Public Works
Roads
Equipment Services
Sewer Utility
Solid Waste
Stormwater Utility
Parks
Park Maintenance
Administration
Event Center
Forestry
County Administrator
Board of Equalization
Volunteer Services
Noxious Weed
Cooperative Extension Services
Emergency Management
Administrative Services
Budget & Finance
Purchasing
Records Management
Public Defense
Risk Management
Human Resources
Personnel
Labor Relations
Training Services
Information Services
Computer & Network
Application Services
Lean – Project Management
Kitsap 1
Facilities Maintenance
Elected Officials
Appointed Officials
Inter-governmental/ agency support

KNRAMP Toward a Natural Asset Management Plan for Kitsap County Workshop 2 Summary

Date: 7/17/23

Attendees: Alison O'Sullivan (Suquamish Tribe), Steve Todd (Suquamish Tribe), Marla Powers (Port Gamble S'Klallam Tribe), Julie Raymond (Port Gamble S'Klallam Tribe), Brittany Gordon (Kitsap County), Kirvie Mesebeluu-Yobech (Kitsap County), Ryan Huffman (Kitsap County), Jim Rogers (Kitsap County), Aaron Bartleson (Kitsap County), Adam Brown (Kitsap County) Aaron Nix (Kitsap County), Shawn Alire (Kitsap County), Victoria Lehto (Kitsap County), Sierra Kross (Kitsap County), Robinson Low (WA Conservation Action), Rein Attemann (WA Conservation Action), Dana Stefan (Ross Strategic), Casey Hart (Ross Strategic)

Next Steps

- A final memo describing the asset management approaches currently in use in Kitsap County programs such as Parks and Transportation will be shared with the core team, for reference.
- A document on KNRAMP history particularly selection of natural assets and asset attributes for the initial program focus will be shared with Core Team.
- A draft memo on how asset management approaches currently in use in Kitsap County might be applied to natural resources asset management will be shared with the core team, for review.
- A draft memo describing science-based options for establishing DLOS for the initial suite of natural assets (forests, shorelines, streams) will be refined and shared with the Core Team for review.
- A draft outline of a Natural Resources Asset Management Program Implementation Plan will be updated shared with the core team, for further review/input.
- Urban and rural asset management will be differentiated with consideration of ways to create levels to separate different assets based on their geographical setting. Ryan Huffman and Robinson Low will further discuss a rating scale.
- The Core Team will engage in discussions on setting interim DLOS for pilot watersheds.
- Definitions related to natural asset management will continue to be refined:
    - Kitsap County will have an internal meeting to refine definitions. Anyone from the Core Team is welcome to join the meeting.
    - Jim Rogers will work on examples to help explain the differences and relationships between the different LOS's.
    - Ryan Huffman and Brittany Gordon will define gray and green infrastructure.
    - More discussion will occur about, and examples will be provided on, the definition of DLOS and minimum acceptable LOS standard. There also will be more discussion whether they would be developed congruently.
- Core Team members should send any resources, comments, suggestions, or questions about setting interim DLOS for the pilot watersheds to Robinson Low (robinson@waconservationaction.org).
- The core team will reconvene for an additional two workshops this year. The next workshop will be on October 4th, 10am-12pm and will discuss the updated draft Implementation Plan, interim DLOS in pilot watersheds, and a draft public engagement approach.

- Individual conversations will be scheduled with the Suquamish Tribe and the Port Gamble to prepare for and discuss the October 4th Workshop.

Review of 2023 Milestones

Dana Stefan reviewed the 2023 milestones. New Core Team members should reach out if they need future Core Team workshop invites or information forwarded. Core Team members did not have any comments or questions.

Initial Draft of the KNRAMP Implementation Plan

Dana Stefan presented the outline of the draft Implementation Plan. Suggestions for how KNRAMP can be implemented have been developed based on input from feedback from Kitsap County departments and the KNRAMP Core Team, and research on existing County asset management processes. A first draft of the Implementation Plan will be distributed for Core Team review shortly. Core Team members had no comments or questions.

KRAMP Revised Definitions

KNRAMP definitions were revised based on feedback from the May workshop to be more specific and align more closely with how natural resources would be managed. Brittany Gordon reviewed new and revised definitions and the group provided feedback on the following:

- **Green vs. gray infrastructure:** Gray and green infrastructure need to be further clarified and distinguished. Gray infrastructure is any traditional infrastructure that has more of a development impact and moves, not absorbs water. Green infrastructure are systems that use or mimic natural features to manage storm/wastewater to enhance natural process (e.g. rain garden). There are debates on what can be considered green infrastructure.
    - Per the 2021 Kitsap County Stormwater Design Manual (SDM), Low Impact Development is a term used to describe this general strategy of using green infrastructure.
    - Ryan Huffman shared the image below from the Environmental Protection Agency (EPA) to help show the difference between gray (left) and green (right) infrastructure:

(Source: EPA)

- **Desired Level of Service (DLOS):** This definition needs more refining. Built management does not have an aspirational goal like KNRAMP and has a "floor" level that assets need to function at. The Core Team will look at the Comprehensive Plan objectives to coordinate with developing DLOS and LOS policies and objectives.
    - Core Team members agreed it would be ideal for KNRAMP to follow the Comprehensive Plan five-year revision timeline, have a short-term and long-term action plan to reach DLOS, and show how well the long-term goal is being achieved at the five-year marks.
- **Minimum Acceptable LOS Standard (MLOS):** Core Team members were initially confused why adding MLOS (along with having LOS and DLOS) would be helpful rather than having only LOS and DLOS. In transportation, not all roads meet or have implementation mechanisms to reach a desired LOS. Therefore, the jurisdiction sometimes adapts a lower LOS. A lower than MLOS standard may cause confusion.
    - Brittany Gordon responded that recovery of assets will happen incrementally. A minimum acceptable LOS provides an incremental first threshold to ensure focus on assets to meet a minimum standard before focusing on raising other assets from an acceptable to desired LOS. There may be too large a stretch to raise assets up to DLOS that an obtainable middle step would be helpful. Brittany also noted that transportation is different because there is no incentive to go beyond their LOS, unlike natural assets, which should continue to be improved after reaching the LOS standard. A MLOS will be useful for prioritization and will act as a trigger to indicate when restoration is needed.
    - Jim Rodgers added that if two assets are both at a LOS but one is lower than another, a MLOS can distinguish the lower asset to prioritize limited funding.
    - It is important to not encourage or cause MLOS to be lower than the existing LOS. However, the MLOS standard may be higher than the current conditions (e.g. Ostrich Creek has poor water quality and needs restoration).
- **LOS Metrics:** Visuals will be refined based on this discussion.

Key Discussion Takeaways:

- Kitsap County will have an internal meeting to refine definitions further. Core Team members are welcome to join the meeting.
- Jim Rogers will work on examples to help explain differences and relationships between the different LOS's.
- Ryan Huffman and Brittany Gordon will define gray and green infrastructure.
- Core Team members agree with the definition of DLOS and overall support including MLOS as a definition. There needs to be more discussion and examples on this.

Initial Objectives of Pilots

Dana Stefan reviewed the objectives of the Big Beef and Chico Creek watershed pilots. There will be ongoing coordination with the Suquamish Tribe and Port Gamble S'Klallam Tribe staff in the next few months to define DLOS for these projects. The group had no initial comments or clarifications.

Initial Discussion – Adaptive Management Approach

The Core Team had an initial discussion on an adaptive management approach for KNRAMP. Brittany Gordon discussed how the County will have to update data frequently, as well as determine a process for assessing, vetting, and determining acceptable data. Considering maps (e.g. stormwater heat or wetland maps) will also be important. Core Team members noted:

- A key to adaptation is evaluation, good data, and regular monitoring.
- Updating KRNAMP and data sets every five years would align with the Comprehensive Plan updates. These five-year updates can consider changes and adjustments to setting LOS, DLOS, and MLOS if needed.
- Additional assets such as wetlands may be built into the framework over time.
- Ensure lessons learned from evaluations are integrated into future evaluations.
- New scientific studies can be considered in adaptive management, including considerations for what is important for the health of streams and shorelines. For example, if a DLOS for a water quality attribute is established under the Benthic Index of Biotic Integrity (B-IBI) framework, and it is later learned that there is another problem occurring, the questions should be posed: does B-IBI capture that additional problem, and if not, how should it be accounted for? How should new information be incorporated into decision making as new issues emerge in data overtime?
- Adaptive management will reconsider strategies and priorities (e.g. altering LOS). After identifying strategies and implementing projects, hopefully LOS improved. If not, why? How should adaptive management occur and prioritizations be considered to make necessary changes?

Asset Management Application to Natural Resources

Dana Stefan provided an update of the memo under development that discusses asset management application to natural resources, which includes but is not limited to how asset conditions are being defined, considerations for prioritizing actions, conditions for monitoring and adaptive management, and considerations for establishing DLOS and MLOS. The memo makes connections with the Comprehensive and Capital Facilities Plans. The memo will be shared with the KNRAMP Core Team for review. Core Team members had no questions regarding this topic.

Initial Options for Setting DLOS for Pilots

Robinson Low presented on initial options for setting DLOS for pilots. He recapped the history of how current KNRAMP assets, asset attributes, and DLOS options were selected. The final list of asset attributes is tailored to Kitsap County but can be updated in the future and can be used by other jurisdictions. Robinson reviewed potential LOS metrics, objectives, and targets for streams, forests, and shorelines. He reviewed the pilot watershed maps with current condition rating scores and LOS provided by assets (the maps do not depict where to prioritize restoration). There is a continued need to think about broad range, high level goals for LOS, how to best set them, and what desired outcomes are (e.g. for salmon recovery, shellfish, overall ecosystem health). Core Team members discussed:

Urban vs. Rural Assets:

- Core Team members are concerned that urban areas are rated currently providing the lowest levels of service and are at risk of being deemed expendable. LOS in urban areas tend to fall as development increases. However natural areas within urban areas can provide a lot of function for people in Cites and should take higher priority to ensure people living in urban environments have easy access to natural areas. There should be a way to provide urban areas with a chance at restoration and to create alignment with rural areas, including prioritizing urban projects.
- Rural and urban areas should use differing asset evaluations. The same parameters may be used but with different rating systems.
- Evaluations should consider that most urban streams historically had salmon runs.
- Flooding is a natural part of the stream system. Flood control functions of streams become more important when there is an intersection of urban and rural streams. LOS standards set higher in the watershed may have a downstream effect. Core Team members are interested in learning more how different level of service standards could affect different parts of a watershed.
- Urban areas likely will have a focus on restoration and recovery while rural areas likely will focus on protection and conservation. Once KNRAMP is tested in pilot watersheds, rating systems can be adjusted to update DLOS goals appropriate to different parts of the watershed.
- Urban versus rural streams is an example of why MLOS will be useful. If there is a minimum acceptable LOS as an incremental standard, there is a more attainable first step and encouragement to prioritize challenging urban streams, especially in justifying funding.
- Cartegraph can be updated to flag urban and rural areas, to allow asset management rating adjust appropriately and accurately.
- Dana Stefan noted that the next Core Team Workshop can include a discussion with examples of how ratings could apply to rural vs. urban areas. Ryan Huffman and Robinson Low can discuss rating scale in preparation for the next workshop.

Asset Connectivity

- DLOS, MLOS, and LOS need to be science driven and DLOS and MLOS should be developed congruently.
- Forest contiguity is important and needs more research. In Kitsap County wildlife are vulnerable to running into humans and development due to a lack of east-west corridors. These corridors should be increased. Also consider patch size and percent cover to help from a protection and conservation perspective. Consider the questions: how contiguous is the forest and does a large percentage patch of forest indicate anything different than numerous small patches in terms of ecosystem health? Should connectivity as a broadscale LOS be focused on?

- Core members expressed concern in setting DLOS based on existing LOS. This would imply lower functioning assets may end up with lower DLOS if based on a percentage of the existing LOS. This could be an interim strategy (increase x percentage over y years), but this should not drive DLOS.
- More research needs to be done on how assets provide ecosystem services for humans (e.g. how much forests our population need).
- Ryan Huffman shared a detailed description on classifications, grouping, and categorization to better calculate asset's LOS scores:

Beavers

Including an attribute for beavers or beavers under a riparian watershed attribute would be beneficial. Watersheds have varying carrying capacity for beavers. Some are at or beyond carrying capacity. A lack of east/west wildlife corridors impacts their ability to move to other watersheds. Beaver analogs are not a perfect solution. Providing education is helpful.

Updates from Partners

- Suquamish Tribe:
    - A fish passage barrier assessment will help fill existing data gaps to have a better understanding of where there are artificial fish passage barriers.
    - An important project is providing an assessment of riparian and floodplain conditions related to forest cover, large woody debris inputs to streams and wetlands, and temperature regulation, and connectivity of stream systems.
    - The Tribe is restarting a year's work of forage fish surveys to document spawning of species in upper intertidal shoreline areas. The Tribe has been involved in this since 2017.
    - The Tribe has been following the rezone work and has submitted opposing comments.
- Port Gamble S'Klallam Tribe
    - The Tribe is working on the Master Plan. They are learning about different plans on the reservation and adjacent areas to coordinate between departments to move work forward, make improvements, and obtain funding faster and better.
    - The Tribe attended the John Roads project rezoning meeting, are following the case closely, and submitted a letter of opposition for rezoning. Commissioners will be making a decision at the end of the month.
- Kitsap County
    - The Stormwater Division and Public Works received a grant for developing an asset management plan. They are starting an RFQ process later this year.
    - Kitsap County is receiving a grant for a new stormwater park in central Kitsap County to be constructed in 2024.
    - Kitsap County continues to work on a Comprehensive Plan Update. There will be a new climate change goals/policies element instead of incorporating the content into existing chapters.
    - The County is preparing for critical areas ordinance working group meetings. They are reviewing the best available science for the five critical areas. They are doing a gaps analysis of documents and code update work.
    - Kitsap County reminds that an email was sent with the WRIA 15 Restoration and Enhancement Plan. County staff are going through and making comments related to

Kitsap County sponsored or overlapping projects. This is an opportunity to provide comments to RCO and SRFB before SRFB approves or denies the plan in September.

Resources Shared

- 2021 Kitsap County Stormwater Design Manual (SDM), Low Impact Development.
- Images in this summary were provided by Ryan Huffman.

Kitsap Natural Resources Asset Management Program

Core Team Workshop #2

July 17, 2023, 11:00-1:00 pm

Welcome – Agenda & Goals

Goals: Discuss the KNRAMP Implementation Plan approach, asset management approaches to natural resources, and options for setting DLOS for pilot projects.

Time	Agenda Item
11:00 AM	Welcome and Introductions
11:10 AM	Initial Draft of the KNRAMP Implementation Plan • Review the Implementation Plan Outline • Gather feedback on the revised definitions • Share initial considerations for the two pilots • Discuss adaptive management approach
12:00 PM	Asset Management Application to Natural Resources • Update on asset management approaches for natural resources memo and next steps
12:15 PM	Initial Options for setting DLOS for Pilots • Review attributes, objectives, and targets for each asset • Review current LOS within pilot watersheds • Discuss attribute targets versus wide ranging asset goals and application to pilot watersheds • Gather feedback and input on DLOS for pilots

Welcome – Agenda

Time	Agenda Item
12:45 PM	Updates from partners • Suquamish Tribe • Port Gamble S'Klallam Tribe • Kitsap County
12:55 PM	Wrap-up and Next Steps
1:00 PM	Adjourn

2023 Milestones

Initial Activities

- Setting up 2023 grant extension and NEP funding
- Identifying asset management approaches across Kitsap County through conversations with County divisions
- Developing memo with asset management approaches across Kitsap County
- Developing initial outline for KNRAMP Implementation Plan for discussion with the core team

Workshop 1

Timeframe: May 3

Discuss

- Asset management approaches across Kitsap County
- KNRAMP Implementation Plan Components
- KNRAMP working definitions
- KNRAMP pilots: initial discussion and scope

Next Steps

- Develop initial draft KNRAMP Implementation Plan
- Update asset management memo with application to natural resources
- Research science-based options for setting DLOS

Workshop 2

Timeframe: July 17

Discuss

- Initial draft KNRAMP Implementation Plan
- Asset management application to natural resources
- Initial options for setting DLOS for pilots

Next Steps

- Update draft KNRAMP implementation plan
- Refine memo with science-based options for DLOS
- Engage with core team on setting interim DLOS for pilot watersheds

Workshop 3

Timeframe: October 4

Discuss

- Updated draft KNRAMP Implementation Plan
- Interim DLOS in pilot watersheds
- Draft public engagement approach

Next steps

- Finalize KNRAMP implementation plan
- Mapping application with interim DLOS across County
- Finalize public engagement plan
- Draft lessons learned memo and County review process

Workshop 4

Timeframe: November 20

Discuss

- Final KNRAMP Implementation Plan
- Final public engagement plan
- Mapping application with interim DLOS across County
- Lessons learned memo and County review process
- KNRAMP pilots: next steps

Next Steps

- Final lessons learned and next steps

Final Products

- KNRAMP Implementation Plan
- Asset Management Approaches across Kitsap County
- Asset management approaches for natural resources
- Science-based options for interim DLOS for pilot watersheds
- Mapping Application With Interim DLOS Across County
- Final Lessons Learned And Next Steps

KNRAMP Implementation Plan

Reminder - KNRAMP Implementation Plan outline

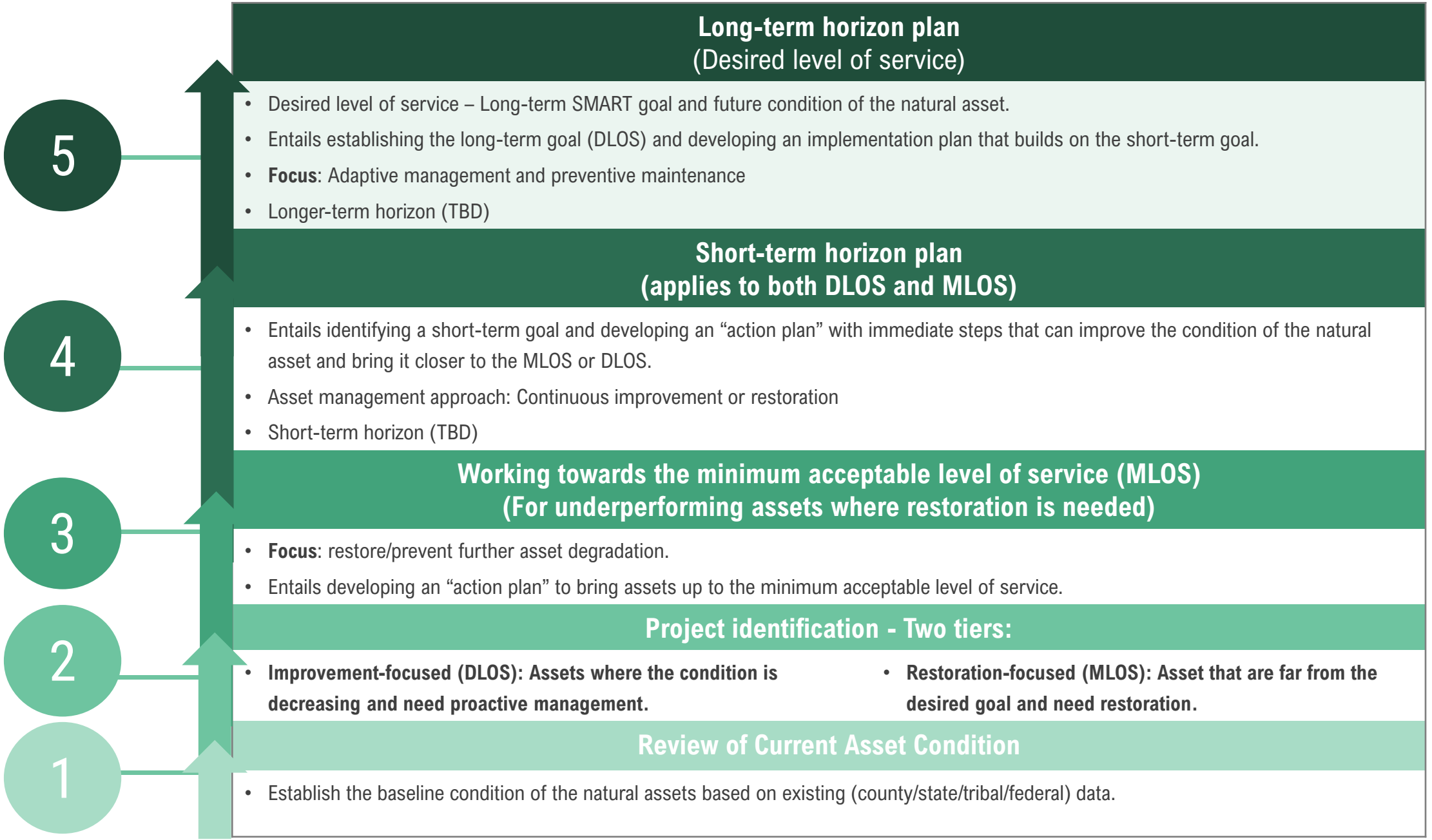
- KNRAMP Vision: Develop the vision statement and key goals.
- Definitions: Refine KNRAMP concepts and definitions.
- Asset management options with application to natural resources.
    - Options based on conversations with Kitsap County divisions and the core team, and additional research.
    - Asset management efforts across Kitsap County.
    - LOS determination.
    - Options for prioritization criteria for natural resources.
    - Monitoring and maintenance options, including opportunities for data sharing.
    - Potential application areas where KNRAMP would be helpful.
- Options and strategies to integrate KNRAMP within the County based on existing structures and policies.
    - Options heard through conversations with the County divisions and additional discussions with DCD.
- Objectives and process to develop the KNRAMP pilots.
    - Scope to be further discussed with the core team and the parties leading the pilots.
- Next steps for KNRAMP implementation
    - Clarity on decision-making to implement KNRAMP

Implementation Plan – Revised Definitions for KNRAMP

New Terms and Definitions related to KNRAMP

- ***Natural resources asset management*** refers to treating natural assets as green infrastructure that should be managed with the same consideration to costs of services and investment priorities as grey infrastructure. In addition to their intrinsic and ecosystem services values, oftentimes natural resources can supply the same services that municipal infrastructure provides; when natural resources are managed properly, municipalities can avoid new costly development of grey infrastructure.
- ***Desired Level of Service (DLoS)*** describes an aspirational goal for the condition and function of a natural asset. The natural resources asset management program will define DLoS for natural assets based on existing County/state/federal policies and long-term goals related to natural resources management and climate adaptation and once established the DLoS will inform capital and other planning exercises and restoration project priorities for natural assets. DLoS can be different for different types of natural assets and for the same types natural assets in different parts of the County. For example, the DLoS for a shoreline in a relatively undeveloped part of the County might be different than the DLoS for a developed shoreline in a developed area. This is a new term for natural resource asset management.
- ***Minimum Acceptable Level of Service (MLoS)*** describes the minimum acceptable condition and function for a natural asset. Like DLoS, the MLoS can be different for different types of natural assets and for the same types of natural assets in different parts of the County. The MLoS for natural assets will be determined based on current county policies and priorities. Methodologies used for determining MLoS are based on best available science, per RCW.70A.172, and may require revision over time as additional or improved data become available. The main use of the MLoS is to indicate when action is more urgently needed to restore/prevent further asset degradation. It is a new term for natural resources asset management.
- ***Levels of service metrics*** is a rating scale used to compare asset condition and performance to program goals. In its first implementation phase, KNRAMP is defining levels of service metrics for streams, forests and marine shorelines based on current and future needs, and assessing and recording the current condition of natural assets using the rating scale.

Working towards a desired levels of service



Implementation Plan – Questions and Feedback Revised definitions

- What observations do you have regarding the revised working definitions for KNRAMP?
- Are there any aspects where further refinements would make these definitions clearer?

Implementation Plan – Initial objectives of Pilots

- Big Beef Creek
- Chico Creek

The pilots are meant to:

- Explore methods for setting interim Desired Levels of Service and for determining where different Desired Levels of Service should apply.
- Gather lessons learned that will inform broader KNRAMP implementation in the County.

Next steps:

- Ongoing coordination with Suquamish Tribe and Port Gamble S'Klallam Tribe staff in the next months

Implementation Plan – Initial considerations for pilot watersheds
Key reflections heard from initial conversations

- It is important to accurately represent LOS of assets (e.g., shorelines and streams) on the Cartegraph maps with consideration to Tribal values and land use.
- Consider overlaying KNRAMP LOS scoring with land use and zoning.
- Ensure descriptions and maps are depicted carefully to be used as intended. Consider providing maps integrating DLOS considerations for the two watersheds.
- Adapt approaches based on the pilot watersheds' different geographies (e.g., steeper headwaters vs flat plateau).

Initial discussion - Adaptive Management Approach

KNRAMP will be adaptively managed over time to ensure it addresses the County's long-term goals related to climate adaptation, growth, and preservation of natural resources' functions.

- When you think about adaptive management, what are the program or implementation elements that we need to pay attention to?
- What strategies should be considered to adaptively manage KNRAMP?
- How do we make sure that lessons learned from initial KNRAMP implementation are being integrated in future phases?

Asset Management Application to Natural Resources

Asset Management Application to Natural Resources

- **Memo under development covering among others:**
  - Defining current asset conditions, levels of service, and KNRAMP connections with the Comprehensive Plan and capital facilities plans
  - Considerations for establishing DLoS and MLoS
  - Considerations for prioritizing actions and closing gaps between current and future levels of service
  - Considerations for monitoring conditions and adaptively managing the program

- **Next steps:** Share the draft memo with the KNRAMP Core Team for review.

Initial Options for Setting DLOS for Pilots

- Forests
- Streams
- Shorelines

Initial List of Potential Attributes

STREAMS

Ecosystem Services

- Species (e.g., beaver presence, salmon presence)
- Recreation/trail systems
- Capacity
- Productivity (e.g., fish/salmon produced)
- Other species

Potential Attributes

a. Water quality:
- Temperature
- Pollutants
- Chemistry
- Dissolved Oxygen (DO)

a. Flow regime (instead of flow rate)
- Low flow chart
- Peak flow chart
- Lower band of the stream that is vulnerable to the sea water rise

a. Habitat:
- Gravel size
- Woody structures
- Poll riffle
- Gradient
- Stream cover
- Benthic Index of Biotic Integrity (B-IBI) (rapid habitat assessment results – potential way to evaluate this attribute, but also an indicator for other attributes)

a. Riparian vegetation condition
- Shade
- Woody recruitment
- Canopy cover
- Species composition (e.g., invasive species)
- Understory & composition
- Buffer width
- Forest age
- Protection status (e.g., status of land - open for development, under DNR's management, under a conservation easement, etc.)
- Impervious cover in riparian zone
- Soils: infiltration capacity, (not BBCD classes, if it's an older wood), if it's a healthy layer

SHORELINE

Ecosystem services

- Shellfish
- Fish-seafood
- Forage fish production
- Feed web
- Recreation: walking and swimming, boating
- Public access
- View
- Archaeological resource: Storage about scientific information about people that lived here
- Harvesting fiber, seaweed: plants used for eating,
- Birds, bird migration
- Recreation
- Tourism
- Sediment supply (supporting service). Forage fish would be considered a supportive service because of the link to orcas.
- Climate resiliency
- Fish migration, shallow water
- Variability of sediments in beaches / beach comparison variability (related to sediment sorting)

Attributes

a. Water quality:
- Fecal coliform
- Turbidity
- PAHs
- Nutrients
- Toxics
- PH

b. Tidal regime
- Sea level rise
- Orientation
- Fetch
- Storm surge (shorter term)

c. Riparian condition:
- Development proximity
- All the attributes list identified for streams

d. Habitat:
- Woody structures
- Active drift accumulation
- Armoring
- Water structures (e.g., docks, floats)
- Sediment size
- Aquatic vegetation
- Development proximity
- Disturbance regime
- Drift cell
- Feeder bluff

e. Species:
- Forage fish
- Commercial and recreational shellfish beds (attribute is presence of recreational harvesting)

FOREST

Ecosystem Services

- Flood prevention
- Flood regulation
- Flood detention
- Carbon sequestration
- Wildlife
- Wild plants
- Recreational
- Hunting
- Heritage
- View - aesthetic + cover up effect/view shade / trees mask the sight of development
- Sustainable Forest products
- Climate resilience
- Water filtering
- Air quality
- Temperature regulation
- Wind break
- Humidity regime
- Soil erosion/stability

Attributes

a. Hydrologic maturity
b. Stand age and complexity (may include the understory)
c. Species composition
d. Soil development (including wooden debris)
e. Understory species specificity (including plant association groups)
f. Terrestrial habitat
g. Migratory corridors
h. Contiguous land (including wildlife corridors)
i. Microtopography (including pit-and-mound topography)
j. Microclimate
k. Extent, intactness, edge effects
l. Disturbance
m. Disease, pests, wildfire

Initial Options for Setting DLOS for Pilots

Review of Assets and Attributes

Asset	Attribute
Forest	F1 – Percent forest cover
	F2 – Percent late successional stage
Streams	S1 – Percent forest cover
	S2 – Aggregated B-IBI score
	S3 – Fecal coliform bacteria levels
	S4 – Fish passage barrier presence or absence
Marine Shorelines	M1 – Percent shoreline armor
	M2 – Percent forest cover
	M3 – Shellfish Growing Area classification status

Level of Service Metrics – Forests

Asset	Attribute
Forest	F1 – Percent forest cover
	F2 – Percent late successional stage

Attribute	Indicator	Condition Rating				
		0	1	2	3	4
F1. Forest cover	% forest cover in MU	<40%	41%-55%	56%-70%	71%-85%	>85%
F2. Succession class	% late succession in MU	<1%	1-25%	26-50%	51-75%	>75%

Level of Service Metrics – Streams

Asset	Attribute
Streams	S1 – Percent forest cover
	S2 – Aggregated B-IBI score
	S3 – Fecal coliform bacteria levels
	S4 – Fish passage barrier presence or absence

Attribute	Indicator	Condition Rating				
		0	1	2	3	4
S1. Riparian vegetation	% forest cover in MU	<40%	41%-55%	56%-70%	71%-85%	>85%
S2. Biological condition (B-IBI)	Aggregated B-IBI score for stream	≤20	21-40	41-60	61-80	81-100
S3. Water Quality	Performance of stream against bacteria standard	Fails standard	NA	Meets first, fails second	NA	Meets standard
S4. Fish passage	Barrier presence/ absence in MU	NA	Yes	NA	NA	No

Level of Service Metrics – Shorelines

Asset	Attribute
Marine Shorelines	M1 – Percent shoreline armor
	M2 – Percent forest cover
	M3 – Shellfish Growing Area classification status

Attribute	Indicator	Condition Rating				
		0	1	2	3	4
M1. Shoreline armor	% armor in MU	>75%	51-75%	26-50%	1-25%	<1%
M2. Riparian vegetation	% forest cover in MU	<40%	41%-55%	56%-70%	71%-85%	>85%
M3. Water quality	SGA classification status in MU	Prohibited	Prohibited & cond./appr.	Conditional	Conditional & appr.	Approved

Level of Service Objectives and Targets

Objective F1. Maintain or increase forest cover across the county	
• Target F1.1. Maintain tree cover in all **primary watersheds** where currently above 65%	% forest cover
• Target F1.2. Increase tree cover to at least 65% in **primary watersheds** where below	% forest cover
• Target F1.3. Increase tree canopy cover in **urban areas** where below 40% by at least 10%	% forest cover

Objective S1. Restore riparian areas of streams and prevent loss of riparian forest cover within 204ft of streams, or one site potential tree height.	
• Target S1.1. Restore riparian areas to a minimum of 70% forest cover where below, focusing on increasing shade to reduce stream temperatures	% tree cover
• Target S1.2. Protect riparian areas with high forest cover	% tree cover
• Target S1.3. Increase riparian forest cover in urbanized streams units by at least 10%, focusing on increasing shade to reduce stream temperatures	% tree cover

Objective M1. Protect and restore natural shoreline processes	
• Target M1.1. Prevent new armoring of natural marine and estuarine shorelines	% armor
• Target M1.2. Remove or soften armor on priority marine shorelines and estuaries (i.e., reduce armor by 20% in drift cells with feeder bluffs)	% armor

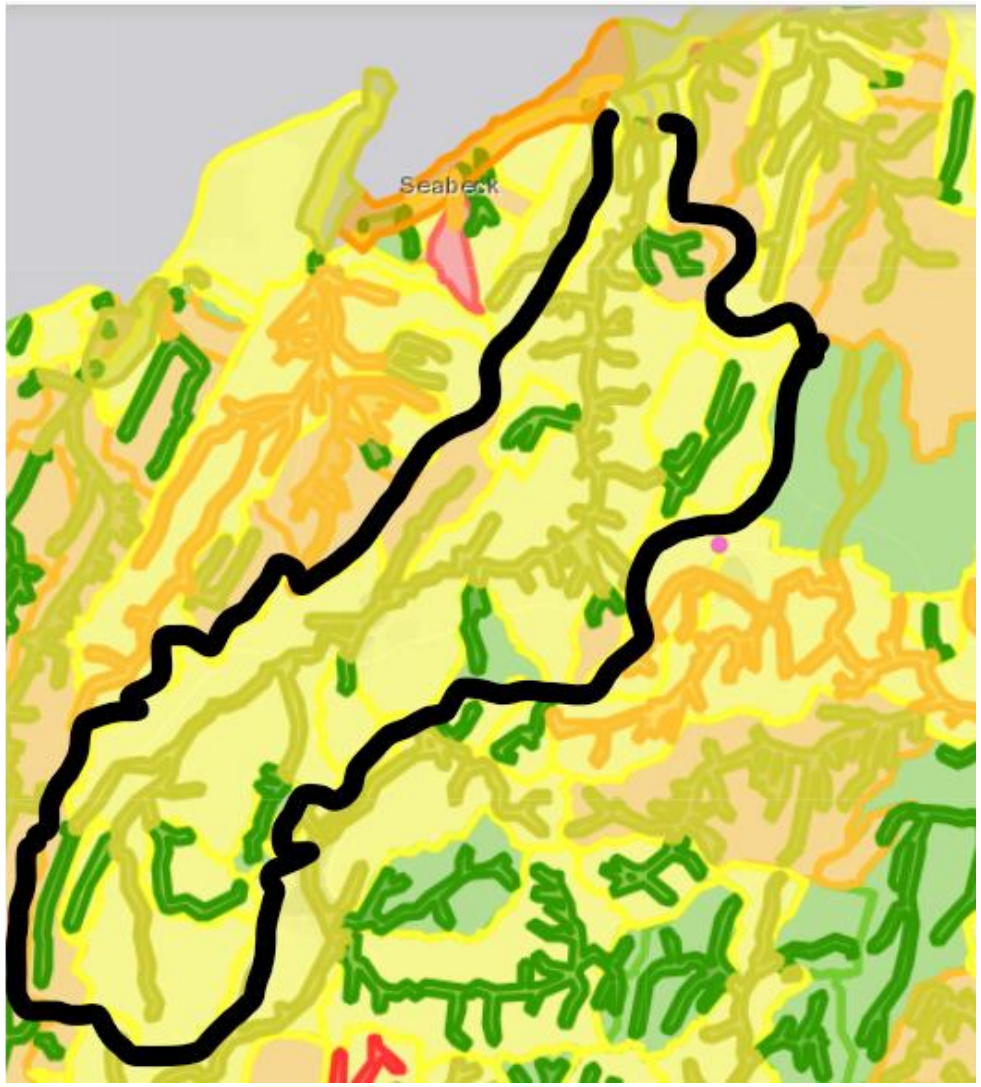
Initial Options for Setting DLOS for Pilots Discussion

- Forests
  - Forest management units in primary watersheds **outside of UGAs** should have a condition rating score of 4.
  - Forest management units **within UGAs** should have condition rating score of 2-3

- Streams
  - Streams that currently have, or historically had, salmon runs should have a condition rating score of 3 or 4.
  - **Urban streams** should have a condition rating score of at least 2/2.5.
  - Longer streams that connect to upland forest should have a condition rating score of 3 or 4.

- Shorelines
  - Shoreline management units that are **adjacent to salmon bearing streams** should have a condition rating score of 3 or 4.
  - Shoreline management units with **feeder bluffs** should have condition rating score of 3 or 4.
  - Shoreline management units with current, or historical, **shellfish harvesting areas** should have a condition rating score of 3 or 4.
  - Shoreline management units with feeder bluffs should have a 4-rating score for **shoreline armoring**.

Big Beef Creek Pilot Watershed



Big Beef Creek Watershed

Forests – based on percent forest cover and percent late successional class.

Condition Rating Score	Overall Level of Service Provided by Asset	Number of MU's
High (3-4)	75-100%	2
Medium (2-3)	50-75%	8
Low (1-2)	25-50%	4
Very Low (0-1)	0-25%	0

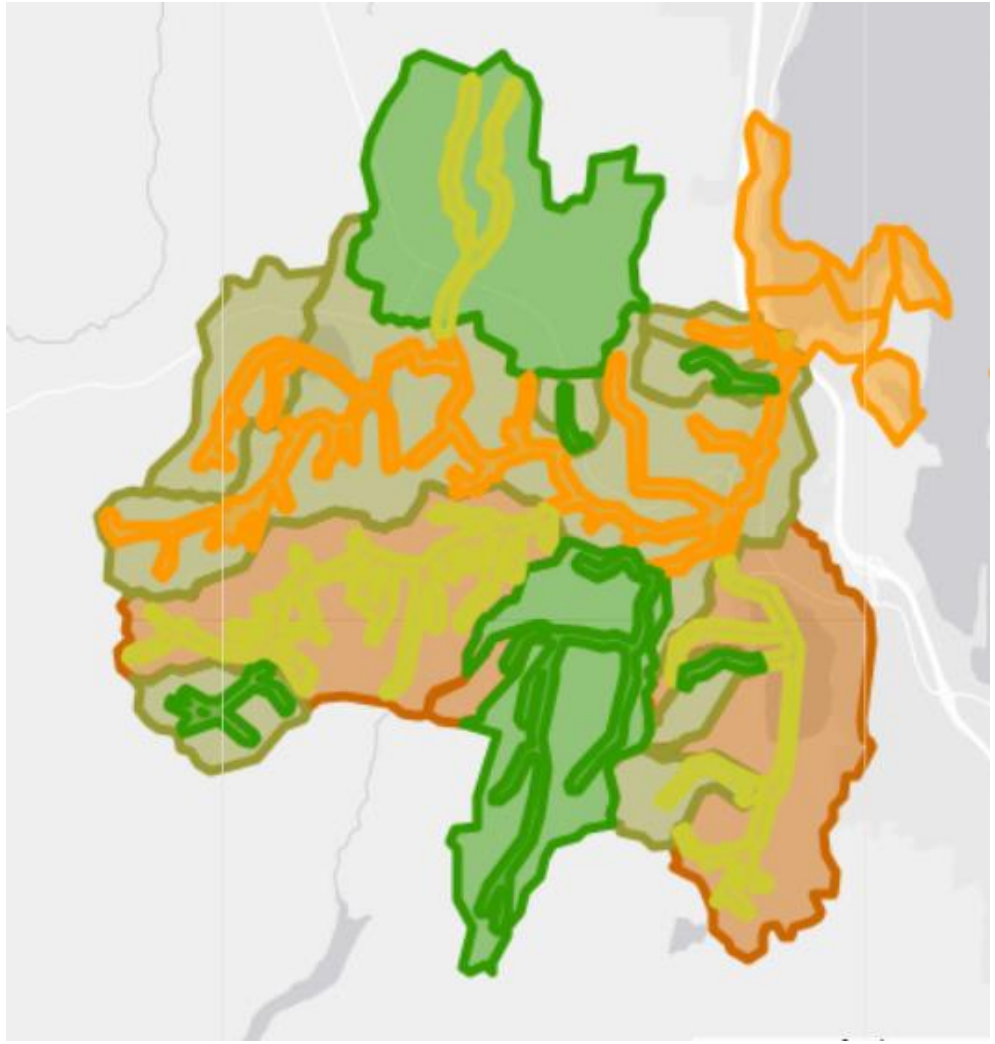
Streams -- – based on percent forest cover in the riparian zone, B-IBI score, water quality, and presence of fish passage barriers.

Condition Rating Score	Overall Level of Service Provided by Asset	Number of MU's
High (3-4)	75-100%	12
Medium (2-3)	50-75%	2
Low (1-2)	25-50%	0
Very Low (0-1)	0-25%	0

Shorelines -- – based on percent armoring, percent forest cover, shellfish growing area restrictions.

Condition Rating Score	Overall Level of Service Provided by Asset	Number of MU's
High (3-4)	75-100%	0
Medium (2-3)	50-75%	2
Low (1-2)	25-50%	1
Very Low (0-1)	0-25%	0

Chico Creek Pilot Watershed



Chico Creek Watershed

Forests – based on percent forest cover and percent late successional class.

Condition Rating Score	Overall Level of Service Provided by Asset	Number of MU's
High (3-4)	75-100%	2
Medium (2-3)	50-75%	8
Low (1-2)	25-50%	4
Very Low (0-1)	0-25%	0

Streams – based on percent forest cover in the riparian zone, B-IBI score, water quality, and presence of fish passage barriers.

Condition Rating Score	Overall Level of Service Provided by Asset	Number of MU's
High (3-4)	75-100%	6
Medium (2-3)	50-75%	5
Low (1-2)	25-50%	3
Very Low (0-1)	0-25%	0

Shorelines – based on percent armoring, percent forest cover, shellfish growing area restrictions.

Condition Rating Score	Overall Level of Service Provided by Asset	Number of MU's
High (3-4)	75-100%	0
Medium (2-3)	50-75%	0
Low (1-2)	25-50%	2
Very Low (0-1)	0-25%	0

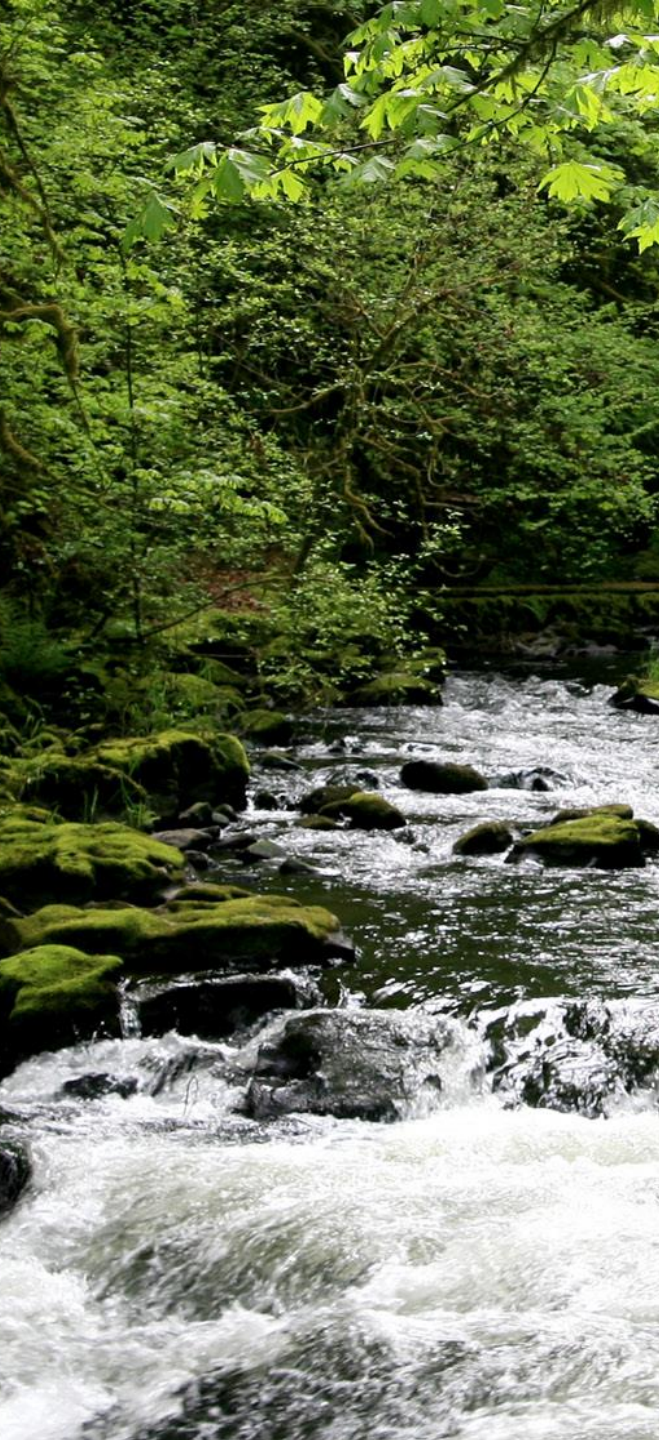
Initial Options for Setting DLOS for Pilots
Discussion

- What are some broad scale DLoS goals you have for the project?
- Do you feel the Targets or large scale goals for DLoS are more effective for achieving overall project outcomes?

- What do desired levels of service look like for the pilot watersheds?
    - How do you feel we should prioritize the work that needs to be done in the pilot watersheds?

- Should DLoS and MLoS be developed together for consistency?

- If you think of anything else, or need more time to digest feel free to email questions/comments/suggestions to robinson@waconservationaction.org



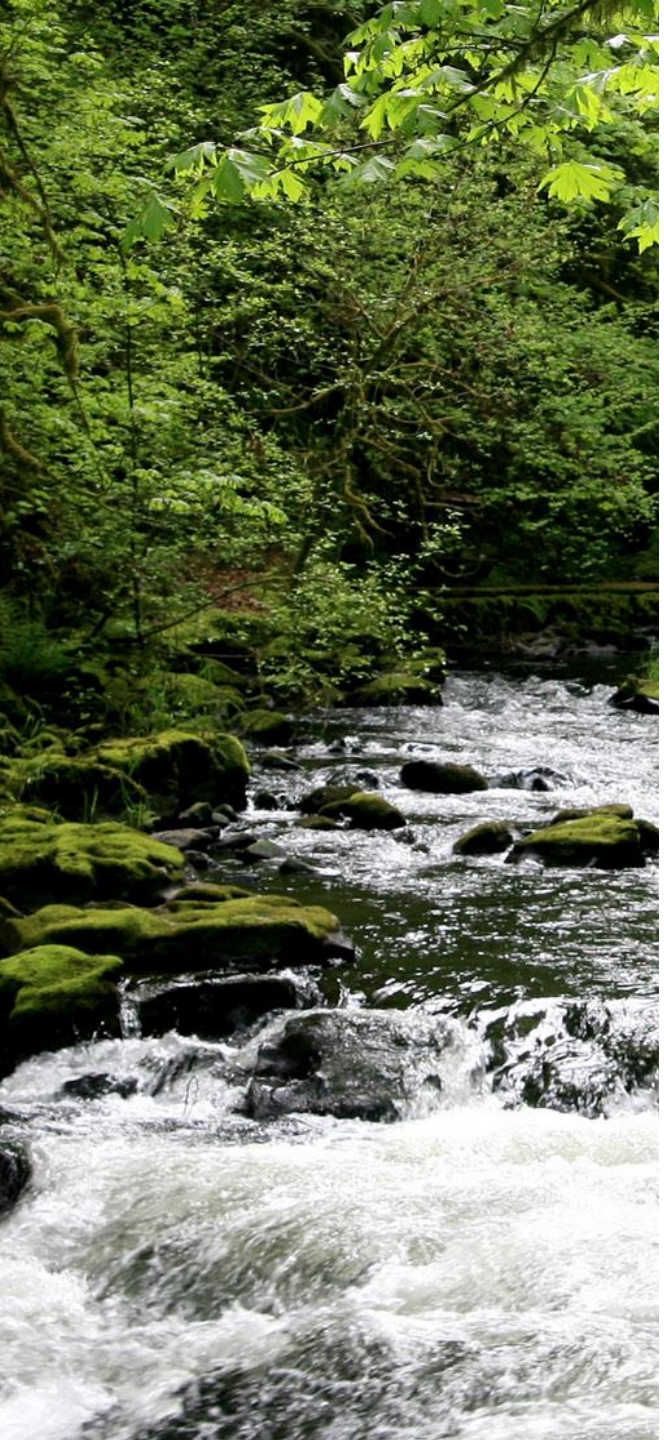
Core Team Updates

- Suquamish Tribe
- Port Gamble S'Klallam Tribe
- Kitsap County

Updates from Partners

Discussion Topics:

- Suquamish Tribe
- Port Gamble S'Klallam Tribe
- Kitsap County



Next Steps

Next Steps

- Next Workshop in October
- Update draft KNRAMP implementation plan
- Develop memo with science-based options for DLOS
- Engage with core team on setting interim DLOS for pilot watersheds
- Finalize Asset Management Application to Natural Resources Memo

History of Attribute Development for Kitsap Natural Resources Asset Management

(updated 7/12/23)

Contents

Final Set of Attributes for Forests, Streams, and Shorelines

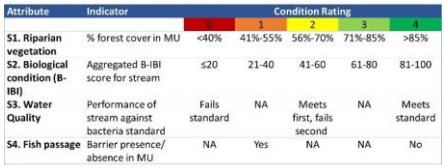
Attribute development has spanned the five-year period from 2018 through 2022 through strong collaboration by staff from Kitsap County, Suquamish Tribe, Port Gamble S'Klallam Tribe, and Washington Environmental Council/Ross Strategic. The sections below provide a history of their development. No single attribute defines ecosystem services, and hundreds of attributes could quantify some aspect of ecosystem services. In summary, the Core Team identified an optimal set of attributes to balance the need for key ecosystem characteristics that measure ecosystem structures that are proxies for ecosystem function with the need for simplicity and feasibility to ensure a durable Kitsap Natural Resources Asset Management Program. These have been tailored to the conditions of Kitsap County but are not exclusive to Kitsap County and could be adopted by other jurisdictions. Table 1 briefly describes why each was selected.

Table 1 – Final set of attributes used to quantify the ecosystem services provided by forests, streams, and shorelines

Asset	Attribute	Why (briefly…)
Forest	F1 – Percent forest cover	Percent forest cover is strongly correlated with multiple land cover metrics, including impervious cover, disturbance, and more. Forests regulate water flow, including retaining water to recharge aquifers and preventing downstream flooding.
	F2 – Percent late successional stage	Older forests provide greater ecosystem services overall, including provisioning salmon but also providing cultural resources for both Tribes.
Streams	S1 – Percent forest cover	Forest cover in riparian areas is strongly correlated with multiple stream health measures, including peak summer water temperature, large woody debris, pool/riffle characteristics, and more. Healthy riparian areas are core to provisioning salmon.
	S2 – Aggregated B-IBI score	The Benthic Index of Biological Integrity reflects a variety of stressors and conditions within watersheds.
	S3 – Fecal coliform bacteria levels	Kitsap County measures fecal coliform levels in streams throughout the County as an indicator of overall water quality. High levels of fecal coliform bacteria impact recreational use of waterways and impair downstream shellfish beds.
	S4 – Fish passage barrier presence or absence	Even if habitat is good, if anadromous fish cannot move upstream and downstream, then the watershed cannot provision salmon and other fish. The presence of these keystone species was identified as the core driver for multiple attribute selection.
Marine shorelines	M1 – Percent shoreline armor	Shoreline armoring of sensitive areas such as forage fish habitat and feeder bluffs strongly impacts the quantity and quality of habitat

		available for salmon and other species important to people who use and enjoy marine resources, including Tribes.
	M2 – Percent forest cover	Similar to freshwater habitats, intact marine shoreline forest cover is highly correlated with other indicators of shoreline health, including large woody debris and substrate.
	M3 – Shellfish Growing Area classification status	Shellfish harvesting provides critical economic, cultural, and recreational resources throughout the region. SGA status integrates a large set of information, including water quality monitoring and risk of future pollution.

Attribute	Indicator	Condition Rating				
		0	1	2	3	4
F1. Forest cover	% forest cover in MU	<40%	41%-55%	56%-70%	71%-85%	>85%
F2. Succession class	% late succession in MU	<1%	1-25%	26-50%	51-75%	>75%



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S3. Water Quality	Performance of stream against bacteria standard	Fails standard	NA	Meets first, fails second	NA	Meets standard
S4. Fish passage	Barrier presence/ absence in MU	NA	Yes	NA	NA	No

Attribute	Indicator	Condition Rating				
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M1. Shoreline armor	% armor in MU	>75%	51-75%	26-50%	1-25%	<1%
M2. Riparian vegetation	% forest cover in MU	<40%	41%-55%	56%-70%	71%-85%	>85%
M3. Water quality	SGA classification status in MU	Prohibited	Prohibited & cond./appr.	Conditional	Conditional & appr.	Approved

Securing Funding

In 2016, Kitsap County staff developed a Near-term Action proposal submitted to the Habitat Strategic Initiative of the Puget Sound National Estuary Program (NEP). The approach involved quantifying the ecosystem services of various natural resources in Kitsap County through financially valuing forests, wetlands, and other ecosystem components for values such as flood protection. NEP criteria prioritized shovel-ready restoration projects rather than efforts that would take years to establish. Mindy Roberts, then working for the Department of Ecology, was one of the proposal reviewers and scored the application highly.

In 2018, Washington Environmental Council secured funding from a national-scale consortium of water philanthropies for a pilot approach to adapting Kitsap County's proposal idea. In developing the application, representatives from Kitsap County, the Suquamish Tribe, and Port Gamble S'Klallam Tribe collaborated to retool the approach away from a financial valuation and toward an approach that is used for gray infrastructure, called the level of service provided by natural resources. All three organizations provided letters of support and began meeting regularly to vet the ideas. Kitsap County was selected as

representative of other jurisdictions in the Puget Sound region, with a range of land covers from forested to rural to urban, and also a jurisdiction that is large enough to innovate yet not so large that its approaches would not be affordable by other jurisdictions.

Meanwhile, Kitsap County applied for NEP funding in 2019 for its part of the work to set up what is now KNRAMP. The Stormwater Strategic Initiative funded the work.

2018 and 2019 – Early Steps

Year 1 Activities and Year 1 Report

The Core Team, consisting of Kitsap County, Suquamish Tribe, Port Gamble S'Klallam Tribe, and Washington Environmental Council (with Ross Strategic as a contractor to WEC) met regularly to first identify which natural assets to focus on initially. From the outset, Kitsap County required a pragmatic approach that used existing County resources, vetted and stewarded high-quality data sources that would be updated regularly, and an approach that would integrate into the County's Cartegraph system. The Suquamish Tribe and Port Gamble S'Klallam Tribe required an effective approach to maintain and increase the provisioning of salmon throughout the County and particularly their Usual and Accustomed fishing and shellfishing areas. From the Year 1 report:

> *"The Suquamish Tribe highlighted that their tribal values are strongly connected to the use of natural resources. Looking at places that are used by tribes for their cultural, economic, and recreational activities would help identify the areas that are important to them and need to be maintained and/or restored to meet Tribal Treaty Rights. The Port Gamble S'Klallam Tribe reinforced that the program needed to take a comprehensive approach to natural resource management in order to be successful. They suggested considering a strategy that would prioritize key watersheds as well as incorporate a way to maximize conservation values to avoid development in areas critical for ecosystem services."*

The Year 1 report summarizes the earliest project concepts and activities. An early task was to research what other jurisdictions had approached a formal natural resources asset management program. While the report included three case studies from Seattle, Shoreline, and Gibson (BC), there were no easily adaptable systems that met the needs of Kitsap County. Seattle's approach used a cost/benefit analysis to include the values of ecosystem services into Thornton Creek decisionmaking. Shoreline used a level of service frame for incorporating natural assets into its Surface Water Master Plan, including public input on what matters most to them. Gibson, BC, proved the closest in concept to what Kitsap County envisioned, using a natural asset (its aquifer) to complement its gray asset (reservoir) after a series of costly infrastructure failures. The Year 1 report also included an overview of County and State policies that would benefit from a natural resources asset management program, including the Water as a Resource policy previously adopted by the County.

In fall 2018, WEC and Ross interviewed 14 organizations (Table X) to report on the research to date and solicit feedback on the opportunities and challenges of establishing a natural resources asset management program. There was general interest in a system that would incorporate ecosystem services more effectively into planning and budgeting processes and to support the County's environmental needs. Themes emerged around the need to develop a program that would be sustainable and

measurable. One of the benefits identified was being able to communicate with the public on why investments are needed, and that supported a general shift in thinking about natural resources as “must haves” that are vital to human and economic well being. The interviews also identified the need to move beyond “no net loss” goals to restoration and resiliency. Interviewees recommended to focus on the "net ecological benefit" when defining levels of ecosystem services. One interviewee mentioned that “as the region and population grows, “no net loss” will not be enough and policy-makers should be thinking about a “net gain” approach in the future.” The opportunities included:

- Raising awareness and visibility about the value of ecosystems
- Raising awareness and visibility about the value of ecosystems
- Making a shift in paradigm: From natural resources to public services
- Facilitating further implementation of current environmental regulations

The interviews also provided ideas for attributes (Figure __).

Table X

Name	Organization
Karla Boughton, Planning and Economic Development Director	City of Poulsbo
Allison Satter, Senior Planner	City of Bremerton
Dave Greetham, Senior Planner Christy Carr, Manager for the City's Shoreline Master Program update	City of Bainbridge Island
Nick Bond, Community Development Director	City of Port Orchard
Chris May, Stormwater Manager	Kitsap County Public Works
Hansi Hals, Natural Resources Department Director	Jamestown S'Klallam Tribe
Scott Brewer, Executive Director	Hood Canal Coordinating Council
Cynthia Rossi, Habitat Protection Program Manager	Point No Point Treaty Council
Bob Hunter, General Manager	Kitsap Public Utilities District
Alison O'Sullivan, Biologist Tom Ostrom, Salmon Recovery Coordinator	Suquamish Tribe
Paul McCollum, Natural Resources Director Roma Call, Environmental Program Manager	Port Gamble S'Klallam Tribe
Dave Ward, Planning and Environmental Programs Manager David Nash, GIS Analyst	Kitsap County Department of Community Development
Jonathan Decker, Conservation Director	Great Peninsula Conservancy
Randy Middaugh, Principal Planner	Planning and Development Services, Snohomish County

Suggested levels of ecosystem services to be provided by streams, forests, and marine shorelines	
Streams & freshwater systems	• Water quality, including availability of clean water, presence of litter, and water contamination (e.g., using bacteria as a proxy for human influence on streams) • Water temperature • Sediment quality, including excess sediment • Man-made barriers or damages • Instream flow • Level of water infiltration • Filtering/treatment capacity of riparian areas and wetlands • Buffering/storage capacity of wetlands and floodplains (e.g., in high rainfall events) • Water for human consumption and enjoyment (flows) • Water for fish production (flows) • Quality and quantity of water habitat, including ensuring habitat streams are classified correctly • Type of biodiversity supported (e.g., presence/absence of fish), including salmon recovery • Food returns, including areas fit for fishing • Stormwater impact, including ensuring appropriate stormwater treatment to limit impact on streams • Vegetation around the streams, including removing invasive species • Watershed health
	• Number of days a year the County gets rainfall • Rainfall impact on streams
Forests	• Forest maintenance • Forest diversity (e.g., number of seed trees, availability of medicinal plants) and categories (e.g., mountain forests, etc.) • Flora and fauna/species diversity, lifecycle, and conservation efforts (e.g., salmon recovery planning) • Soil maintenance as part of the forests ecosystems services in order to manage waterflows effectively • The ability of the forest to capture carbon • The ability of a forest to provide a good level of air quality, including ensuring nitrogen dioxide emissions are limited and that the nitrogen dioxide air quality standard is met. • Number of parks and recreation areas in urban environments • Health of green infrastructure and rain gardens • Current areas with ecological restauration work • Areas closed to the public in the last years • Hunt control • Hydrologic maturity of forests • Forest attributes that are resilient to climate change and carbon reduction • Potential for aquifer recharge
Marine shorelines	• Type of biodiversity supported, including availability of fish • Accessibility to marine shorelines for harvest and recreational activities • Food returns • Level of contamination and pollution, including number of areas closed for shellfish harvest due to marine shoreline contamination • Sediment quality, including excess sediment • Shoreline changes in the last years, including level of degradation • Man-made barriers or damages • Presence of forage fish

Figure YY – initial list of attributes from fall 2018 interviews

The Year 1 report summarized potential attributes to define the levels of service provided by forests, streams, and shorelines in Kitsap County (see Appendix 4), options for developing a composite index based on discrete measurable attributes, as well as how the system could be set up by the County. From the Year 1 report:

> *"The goal was to discern if there were particular indicators that serve as 'master switches' for getting at ecosystem function. While the examples were grounded in science and existing environmental standards, the thresholds were discretionary. Eventually, where to delineate level of service thresholds will be a policy decision informed by science and public and stakeholder input. In addition to individual indicators, WEC also presented a strategy that would examine levels of service through aggregating geospatial data. This exercise was a starting place for identifying priority ecosystem services and determining a tiered structure for evaluating the functioning of natural assets."*

Two important themes were identified: (1) water quality to support salmon and (2) attributes that would indicate whether or not the management of Critical Areas was meeting needs. The Core Team recognized early on that data sources will evolve over time and that as the system is implemented in Kitsap County,

adaptive management will be needed. Figure 1 reflects the earliest thinking on the adaptive management system:

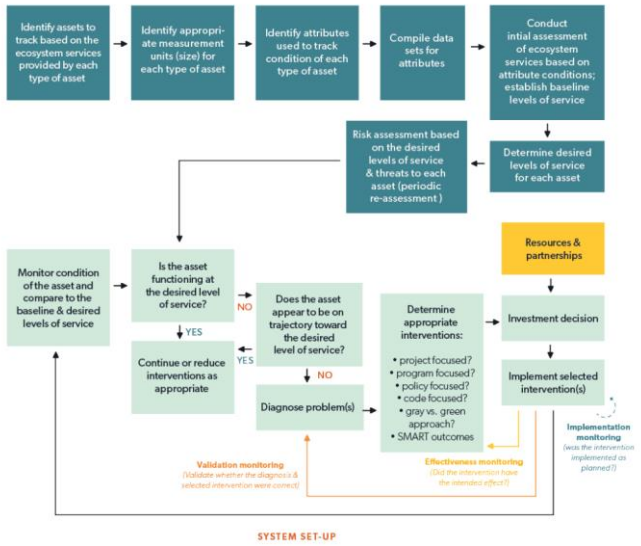


Figure 2 presents the naming convention adopted in Year 1 of the project. Each ecosystem component has an infinite number of potential indicators of ecosystem value, and no widely accepted set of indicators used in management. The Core Team reviewed the science behind ecosystem services of each component and compiled an initial set of attributes. However, not all data had stewarded data sources that provided comprehensive data across the entire County. Further, many attributes were highly correlated with other indicators. Therefore, the Core Team narrowed the list to principle attributes. From the Year 1 report: "*Indicators of ecosystem service function can also be thought of as the key components or attributes of an asset that determine its ability to maintain, create or depreciate the value of a system overtime (Figure 6). In other words, principle attributes describe enough of the quality of the ecosystem for land managers to make informed decisions about when and how to best intervene to best protect ecosystem services. These attributes can also be identified and translated into spatial data that can be monitored and evaluated over time*."

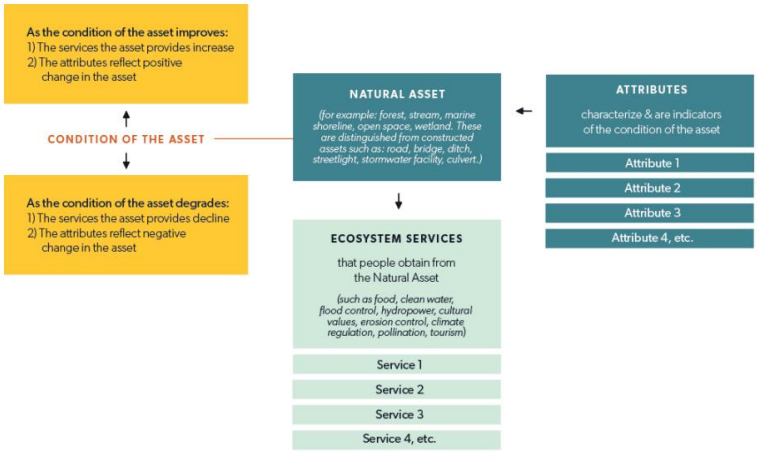


Figure 2 – Terminology adopted for KNRAMP.

The Year 1 report also initiated the analogy of using roadway management levels of service, based on attributes such as the volume to capacity of a road, pavement characteristics, and other measured indicators.

How to pay for the priority work needed has been a core part of the work since the first year. The Year 1 report included a detailed Funding and Finance Memo that was later converted to a Tableau application accessible on WCA's website.

Initially the Core Team began developing one Ecosystem Service Function across all of the assets. However, different attributes were needed to define the ecosystem services of forests, streams, and shorelines, and this idea was modified to identify one composite indicator composed of a small number of attributes for each of the asset classes. The Core Team identified multiple data sources (see Figure 3) relevant to just forests yet found that simply combining percent forest cover and vegetation height, both in upland and riparian areas, explained most of the variability in function. Parameters such as ground slope were considered, but given that slope is not something that the County could alter over time, it was dropped from further consideration to focus on attributes with more direct controls through human interventions.

Table 7. *Examples of Types of Data for Western Washington that can be built into a landscape assessment of Ecosystem Service Function*

Raster Data (Coarse Filter)

- National Land Cover Database (NLCD)
- NLCD Imperviousness
- NLCD USFS Tree Canopy
- LANDFIRE (Existing Vegetation, Biological Site Potential, Existing Vegetation Height)
- USDA Gridded Soil Survey Geographic (gSSURGO) Database
- NOAA Coastal Change Analysis Program (C-CAP)
- USGS Digital Elevation Map (DEM)

Vector Data (Fine Filter)

- WA DNR Forest Practices Applications
- WA DNR Orphaned and Abandoned Roads
- WA DNR Habitat Conservation Plan Areas
- WA DNR Managed Lands
- WA DNR Site Class
- WA DNR Rare Plants
- WA DNR Stream Temperature Class
- WA DNR ShoreZone Inventory (Dunegrass, Eelgrass, Nonfloating Kelp, Salt Marsh, Surfgrass, Substrate, Modification, Shoreline Type)
- WA DNR Soils
- WA DOT Public Roads & Highways
- WA DOT Fish Passage Inventory
- WA ECY Tribal Usual and Accustomed Areas
- WA ECY Watershed Boundaries
- WA COM Urban Growth Areas
- NOAA Sea Level Rise
- USGS National Hydrography (Streams, Rivers, Lakes and Wetlands)
- USGS Biodiversity Information Serving Our Nation (BISON) Species Occurrence
- Kitsap County Building Footprints
- Kitsap County Tax Parcels
- Kitsap County Geological Hazard Areas
- National Conservation Easement Database
- Cornell Lab of Ornithology eBird Species Occurrence

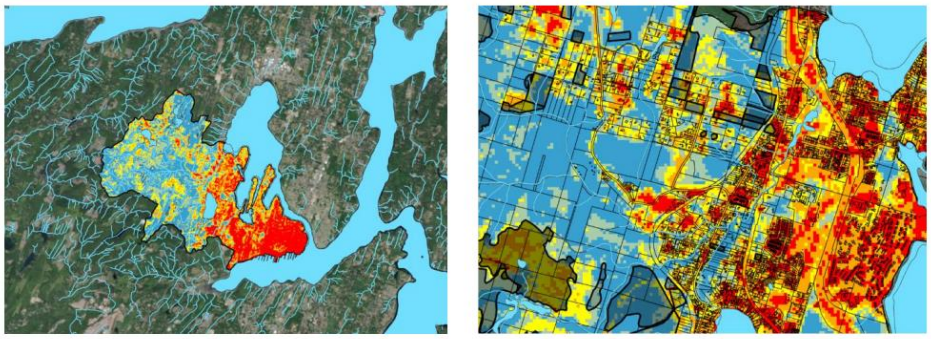


Figure 7. *Visual Index of Ecosystem Service Potential in Chico Creek*

Data availability was a significant determinant in the early selection of parameters. Table 9 from the Year 1 report summarized data availability for remote-sensing based information sources alongside what could be developed through a field survey. Given the County's needs for a pragmatic approach, field surveys were not considered a reliable component for a sustainable program.

FORESTS

Indicator	Data Source/ Survey Practice	Spatial Data	Field Survey
Canopy Cover	NLCD; Leaf Area Index		
Stand Age	LANDFIRE (Existing Vegetation Height); Site Index, DBH measurement, Basal Area Calculation, Tree Coring		
Complexity	Basal Area Calculation		
Species Composition	LANDFIRE (Biophysical Setting); Plot Species Survey		
Coarse Woody Debris	Plot survey		
Understory Species	LANDFIRE (Biophysical Setting); Plot Species Survey		
Pit & Mound	Plot Survey		
Microclimate	Plot Survey		
Area Extent	NLCD, CCAP		
Connectivity	NLCD, CCAP		
Disturbance Regime	USFS Aerial Forest Health Survey, Forest Practices Applications		
Wildlife Species Presence	BISON, eBird; Field Survey		

Available
Somewhat Available
Not Available

STREAMS AND RIPARIAN AREAS

Indicator	Data Source/ Survey Practice	Spatial Data	Field Survey
Canopy Cover	NLCD; Leaf Area Index		
Woody Recruitment	LANDFIRE (Existing Vegetation Height); Stream Survey		
Invasive Species Presence	Field Survey		
Species Composition	LANDFIRE (Biophysical Setting); Plot Species Survey		
Coarse Woody Debris	Plot survey		
Buffer Width	Forest Practices Applications; Forest Practices Review		
Shade	NLCD; Plot Survey		
Stand Age	LANDFIRE (Existing Vegetation Height); Site Index, DBH measurement, Basal Area Calculation, Tree Coring		
Percent Impervious Cover	NLCD		
Soils	USGS Soil Survey		
Wildlife Species Presence	BISON, eBird, GBIF; Field Survey		

SHORELINES

Indicator	Data Source/ Survey Practice	Spatial Data	Field Survey
Water Quality	NorWeST Stream Temperature database; Water quality testing		
Fetch	Geospatial measurement		
Storm Surge	National Storm Surge Zones Map		
Orientation	Geospatial Measurement		
Sea Level Rise Potential	NOAA Sea level Rise, Digital Elevation Map		
Drift Accumulation	Plot Survey		
Armoring	ShoreZone Inventory		
Overwater Structures	ShoreZone Inventory		
Substrate type	USGS Soil Survey		
Aquatic Vegetation	ShoreZone Inventory		
Proximity of Development	NLCD, Zoning, UGA		
Wildlife Species Presence	BISON, eBird, NOAA Protected Areas		

In April 2019, the Core Team held a workshop to compile the overall list of potential attributes that provided provisioning, regulating, supportive, or cultural services (Figure __).

STREAMS

Ecosystem Services

- Species (e.g., beaver presence, salmon presence)
- Recreation/trail systems
- Capacity
- Productivity (e.g., fish/salmon produced)
- Other species

Potential Attributes

a. Water quality:
   - Temperature
   - Pollutants
   - Chemistry
   - Dissolved Oxygen (DO)

b. Flow regime (instead of flow rate)
   - Low flow chart
   - Peak flow chart
   - Lower band of the stream that is vulnerable to the sea water rise

c. Habitat:
   - Gravel size
   - Woody structures
   - Poll riffle
   - Gradient
   - Stream cover
   - Benthic Index of Biotic Integrity (B-IBI) (rapid habitat assessment results – potential way to evaluate this attribute, but also an indicator for other attributes)

d. Riparian vegetation condition
   - Shade
   - Woody recruitment
   - Canopy cover
   - Species composition (e.g., invasive species)
   - Understory & composition
   - Buffer width
   - Forest age
   - Protection status (e.g., status of land - open for development, under DNR's management, under a conservation easement, etc.)
   - Impervious cover in riparian zone
   - Soils: infiltration capacity, (not BBCD classes, if it's an older wood), if it's a healthy layer

SHORELINE

Ecosystem services

- Shellfish
- Fish-seafood
- Forage fish production
- Feed web
- Recreation: walking and swimming, boating
- Public access
- View
- Archaeological resource: Storage about scientific information about people that lived here
- Harvesting fiber, seaweed: plants used for eating,
- Birds, bird migration
- Recreation
- Tourism
- Sediment supply (supporting service). Forage fish would be considered a supportive service because of the link to orcas.
- Climate resiliency
- Fish migration, shallow water
- Variability of sediments in beaches / beach comparison variability (related to sediment sorting)

Attributes

a. Water quality:
   1. Fecal coliform
   2. Turbidity
   3. PAHs
   4. Nutrients
   5. Toxics
   6. PH

b. Tidal regime
   1. Sea level rise
   2. Orientation
   3. Fetch
   4. Storm surge (shorter term)

c. Riparian condition:
   1. Development proximity
   2. All the attributes list identified for streams

d. Habitat:
   1. Woody structures
   2. Active drift accumulation
   3. Armoring
   4. Water structures (e.g., docks, floats)
   5. Sediment size
   6. Aquatic vegetation
   7. Development proximity
   8. Disturbance regime
   9. Drift cell
   10. Feeder bluff

e. Species:

1. Forage fish
2. Commercial and recreational shellfish beds (attribute is presence of recreational harvesting)

FOREST

Ecosystem Services

- Flood prevention
- Flood regulation
- Flood detention
- Carbon sequestration
- Wildlife
- Wild plants
- Recreational
- Hunting
- Heritage
- View - aesthetic + cover up effect/view shade / trees mask the sight of development
- Sustainable Forest products
- Climate resilience
- Water filtering
- Air quality
- Temperature regulation
- Wind break
- Humidity regime
- Soil erosion/stability

Attributes

a. Hydrologic maturity
b. Stand age and complexity (may include the understory)
c. Species composition
d. Soil development (including wooden debris)
e. Understory species specificity (including plant association groups)
f. Terrestrial habitat
g. Migratory corridors
h. Contiguous land (including wildlife corridors)
i. Microtopography (including pit-and-mound topography)
j. Microclimate
k. Extent, intactness, edge effects
l. Disturbance
m. Disease, pests, wildfire

These were further researched and in January 2019, WEC proposed an initial subset of attributes (see Year 1 report) for discussion purposes. Canopy cover has been maintained throughout the project as a principle attribute. Percent impervious cover ____. Clean Water Act 303(d) listings for fecal coliform bacteria ___. Aggregated land cover index ___. The feedback from this initial set of attributes shaped all future attribute identification and vetting.

Impervious Surface Thresholds

Rating	Impervious surfaces threshold	Level of Service
A	<5%	Land cover is forested/ has wetlands
B	5% - 10%	Land cover has light development
C	10% - 25%	Land cover is significantly developed
D	<25%	Land cover is heavily developed

Total Impervious Surface

Rating	Total Impervious and Pervious Surface Area	Level of Service (Total recharge)
A	<5%	Full recharge
B	<20%	Most recharge
C	<50%	Some recharge
D	<75%	Inadequate recharge

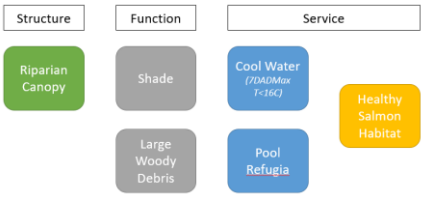
Clean Water Act Section 303(d) listings for fecal coliform bacteria

Rating	Number of 303(d) Listings for fecal coliform bacteria within a Watershed	Level of Service (Clean Water)
A	<1	All waters safe for Extraordinary or primary contact
B	1-3	Majority waters safe for Extraordinary or primary contact
C	3-5	Some waters safe for Primary contact recreation
D	<5	Inadequate access to safe waters

Fecal Coliform

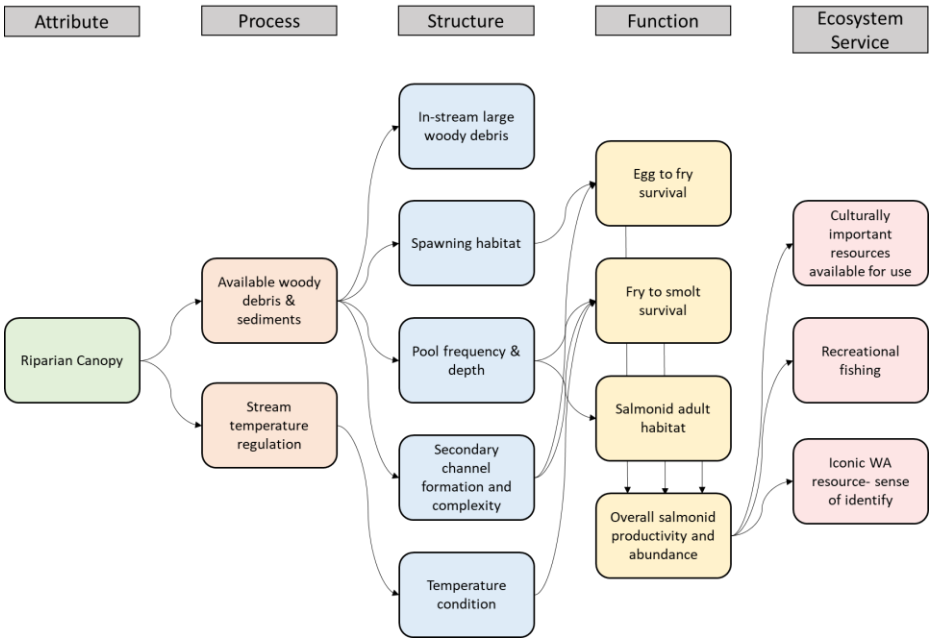
Rating	% Urban Lands	Level of Service (Number of Organisms)
D	>32% (based on linear relationship between %urban lands and fecal coliform concentrations in Chico Creek)	>100 org/100mL and 10% samples are >200 org/100mL fecal coliform – likely does not provide safe access for primary contact recreation
C	17-23%	<60 org/100 mL and 10% samples are <100 org/100mL – may provides safe access for primary contact recreation
B	13-17%	<40 org/100 mL and 10% samples are <75 org/100mL – likely provides safe access for primary contact recreation
A	<13%	<25 org/100 mL and 10 % samples are <50 org/100mL – most likely provides safe access for primary contact recreation and a significant margin of safety below water quality standards

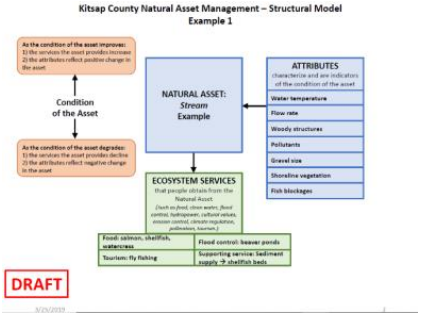
A key concept is that a mappable and measurable structural attribute (canopy cover) had to be directly connected to core functions and ecosystem services, such as in Figure __. In this example, some streams have temperature monitoring data that could be used to calculate the 7-day average of the daily maximum temperature needed to determine compliance with the state water quality standards. In general, cooler water temperatures are associated with higher canopy cover. Canopy cover also provides an indicator or other habitat parameters that are important to healthy salmon habitat, such as large woody debris counts. The Department of Ecology conducts temperature Total Maximum Daily Load studies for rivers and streams that are too hot. Every single study has confirmed that increasing riparian cover would decrease peak temperatures. However, each study requires multiple years of data collection and complex numerical modeling to confirm what could be argued as the basic need even without that level of scientific study. Canopy cover is an example of a principle attribute that is a proxy for many different structures and functions associated with healthy salmon habitat.

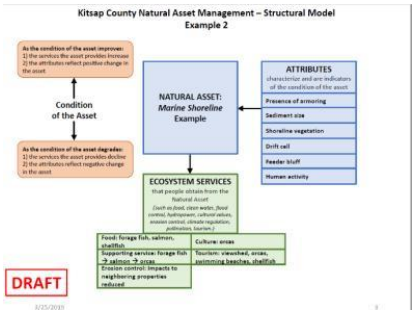


Riparian forest cover and peak summer stream temperature

Rating	Forest Cover (example: could be defined as cover within a particular distance from stream centerlines)	Level of Service (Temperature degrees C)
A	80-100%	7DADMax <16 – cool water that fully meets the needs of salmon
B	60-80%	16-17.5 – cool water that partially meets the needs of salmon
C	40-60%	17.5-22 – warm water that does not meet the needs of salmon
D	<40%	>22 – warm water that approaches lethal levels for salmon survival







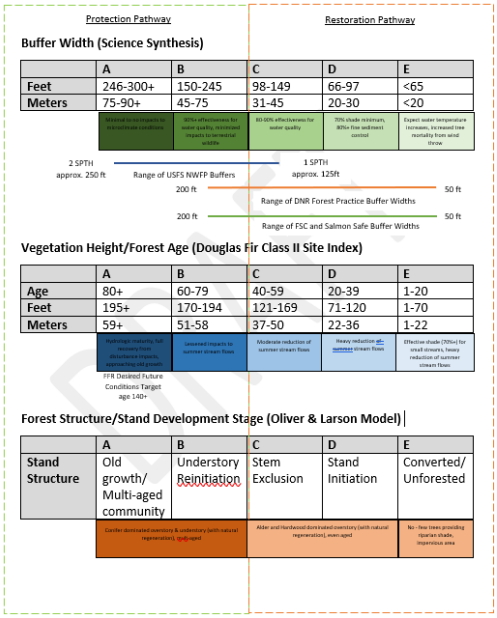
2019-2020 – Draft Attributes and Frameworks

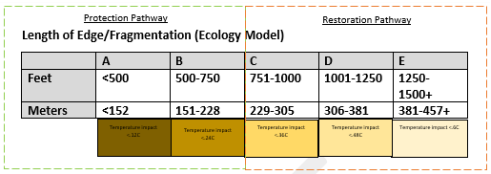
The initial work in 2018 and 2019 focused on identifying asset classes, then worked through examples of how a management system would be set up on a small set of potential attributes primarily for forest cover, both upland and riparian. Subsequently, the Core Team expanded to early work on shorelines attributes, then sequentially developed images of what different definitions of levels of service would look like at the County level. The early days of the pandemic also coincided with the tragic death of a Core Team member and one of the County's lead developers, David Nash. Because some of his work could not be recovered, in later years the Core Team had to reassess the attributes and the definitions of management units – the two-dimensional areas used to break up the County into workable segments.

Literature Review for Stream Asset

In December 2019, WEC completed a literature review of 23 peer-reviewed journal articles, six scientific synthesizes, two voluntary management standards, four Best Available Science reviews commissioned by Puget Sound area local governments, and one TMDL to inform levels of service related to canopy cover. These were selected from a larger set of literature because they covered geographies comparable to those present in Kitsap County. This resulted in a subset of attributes as well as breaks between levels of service for streams to place the areas within five different tiers based on those attributes.

At the time, buffer width was one attribute that had been considered. However, the County shifted this to a set width around streams in which to identify the levels of service for the stream segments. A combination of vegetation height and stand age was recommended based on the Douglas Fir Class II Site Index. The Oliver & Larson Model was used to define tiers in forest structure and stand development. Finally, the Ecology Model was used to define tiers in forest fragmentation.





January 2020 – Initial Mapping of Forest and Stream Attributes for Feedback

Intact buffer width was still one of the potential attributes going into the January 2020 workshop. The ensuing discussion involved how to automatically delineate intact width using available raster imagery and then determine whether the intact buffer fell within one of the five tiers developed from the literature. Because that would have involved significant visual interpretation on a watershed-by-watershed basis, the buffer width was dropped as an attribute. Instead, a buffered stream polygon with a width of ___ feet to either side of the stream centerline was adopted as the area in which to map and measure the other attributes, including percent forest cover (see Figure __). This was based on WDFW information for 200-year site potential tree heights (Riparian Ecosystems, Vol. 2: Management Recommendations, May 2018 public review draft, Amy Windrope, Timothy Quinn, Keith Folkerts, and Terra Rentz, A Priority Habitat and Species Document of the Washington Department of Fish and Wildlife, Olympia, WA).

Forest ecosystem services were initially presented using a hexagonal grid to explore the attributes that could be derived from the Landfire data source (see Figure __). (This was later modified to an orthogonal grid with a cell size of __ by __.) County-wide LiDAR data were used to determine vegetation height.

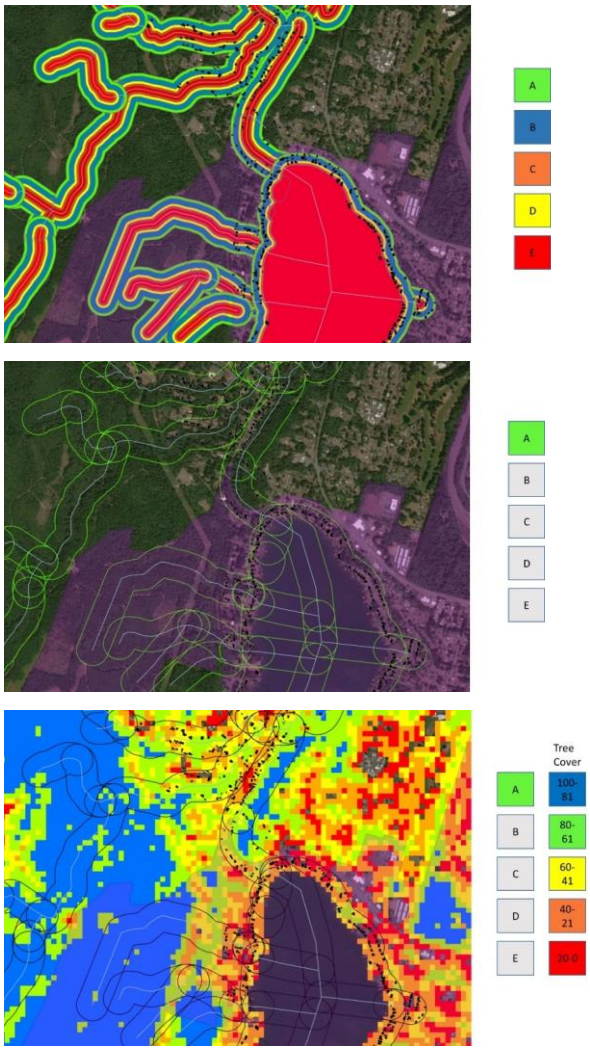
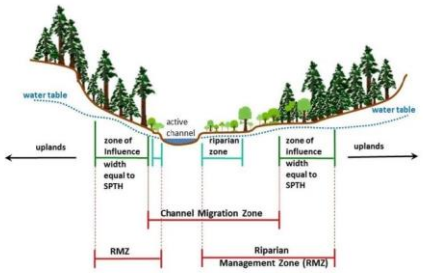


Figure __. Options for evaluating attributes within a buffered stream centerline.



Generalize diagram of the riparian ecosystem as defined in Chapter 1 Volume 1. The zone of influence—portions of terrestrial ecosystems that significantly influence exchanges of energy and matter with aquatic ecosystems—starts at the edge of the stream channel or CMZ. The width of the zone of influence is equal to the Site-Potential Tree Height

Figure __. Riparian conceptual drawing used to define polygon widths.

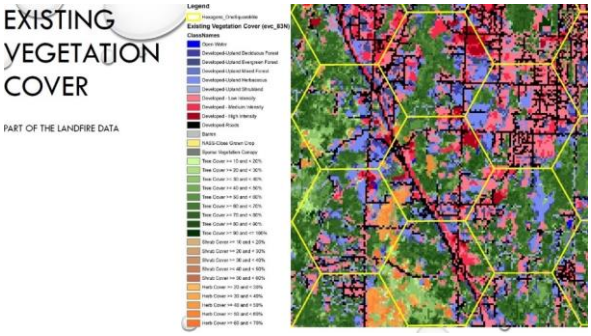


Figure __.

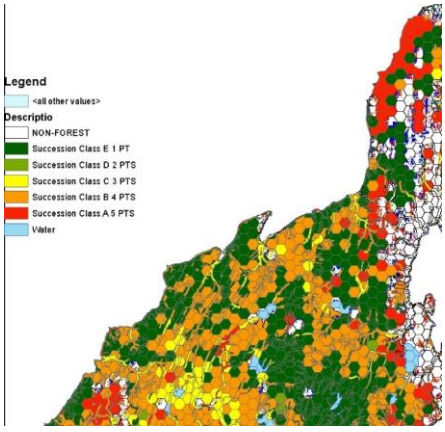


Figure __.

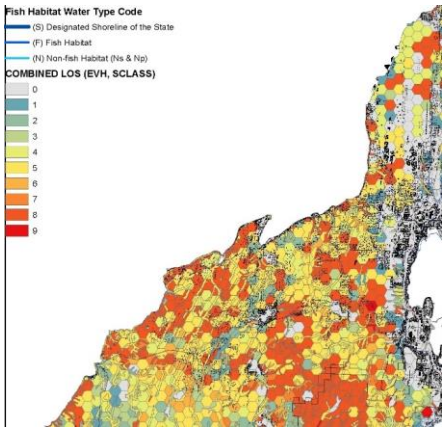


Figure __. LandFire data with combination of vegetation height and site class.

Figure __. Options for upland forest attributes.

2020 – Initial Attributes for Shorelines

As the forest and streams attributes progressed, we began identifying potential attributes to describe the ecosystem services provided by shorelines. These were presented in January 2020 for discussion. The management unit was further refined beginning April 2020, where the Core Team adopted drift cells as the fundamental size of the shoreline management units.

Marine Shorelines Level of Service Concepts

Armoring of feeder bluffs-

LOS	A	B	C	D	E
Management	No Armoring	Soft shore armoring		Hard armoring	
Ecosystem Services	Forage fish spawning			Species decline/absent	
	Eelgrass beds			Habitat decline/absent	
	Kelp beds			Habitat decline/absent	
	Fine sediment			No fine sediment	
	Erosion control			Erosion	

Overwater structures-

LOS	A	B	C	D	E
Management	No overwater structures	Fish friendly docks		Many overwater structures	
Ecosystem Services	Forage fish spawning			Species decline/absent	
	Eelgrass beds			Habitat decline	
	Kelp beds			Habitat decline	

Marine riparian buffer and nearshore structure setback-

LOS	A	B	C	D	E
Management	Buffer and setback			Buffer, no setback	No buffer or setback
Ecosystem Services	LWD present			LWD absent	
	Shellfish harvestable			High levels of bacteria	

Marine riparian buffer-

LOS	A	B	C	D	E
Management	Large buffer	Medium buffer		Small buffer	No buffer
Ecosystem Services	Forage fish spawning			Species decline/absent	
	LWD present			LWD low or absent	
	Adequate temperature for fish			Inadequate temperature for fish	
	Shellfish harvestable			High levels of bacteria	

Nearshore structure setback-

LOS	A	B	C	D	E
Management	Large setback	Medium setback		Small setback	No setback
Ecosystem Services	Forage fish spawning			Species decline/absent	
	LWD present			LWD low or absent	
	Adequate temperature for fish			Inadequate temperature for fish	
	Shellfish harvestable			High levels of bacteria	

2021-2022 – Refining Management Units and Attributes

After Kitsap County received additional NEP funding, they brought on additional staff to help develop the assets and the framework within the County (Matthew Medina and Ryan Huffman). The Core Team continued to meet regularly to refine management units and attributes and to begin setting targets through 2022.

March 2021 Workshop to Refine Management Units

In March 2021, the Core Team met to refine the management units to be used to characterize ecosystem services for forests, streams, and shorelines. The criteria included:

- Minimize the time required to design units
- Other jurisdictions can easily implement method or adopt units
- Users can interpret data/results easily using management unit framework
- Minimize the time required to update and maintain units
- Ensure units are compatible with attribute data and other spatial analysis tools

Figures __, __, and __ present the proposed management units for shorelines, streams, and forests respectively. Shoreline management units are defined as 400 ft landward and seaward to the 10-meter bathymetric contour and used the Nearshore Geospatial Framework and Beach Strategies. Stream polygons were based on one site-potential tree height for a 200-year old Douglas fir (204 ft) from the stream centerline based on USGS' National Hydrography data layer. A fundamental change was made to the upland forest management units. The hexagons could be grouped to approximate watershed boundaries but did not line up accurately. Because the project focuses on provisioning salmon, the Core Team decided to shift away from the hexagons to a catchment basis instead.

In addition, the Core Team revisited the full list of potential attributes for each asset class (see Figures _, __, and __), and identified a subset that would describe the range of conditions present within Kitsap County, directly or indirectly indicate the level of health of different ecosystem structures or functions, and have durable and reliable data stewards who will update the information periodically in the future to reassess progress. Figures __ through __ summarize the attributes as well as a specific measurable indicator, data source, and example ecosystem services. Overall, these resonated strongly with the Core Team, which then discussed ways of combining different attributes into a combined level of service for each attribute. County staff urged that this must be the simplest possible set of attributes that describes range of conditions to make its adoption feasible for the County.

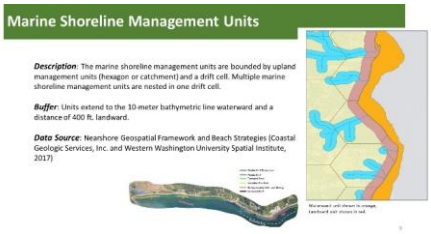


Figure __. Riparian management units

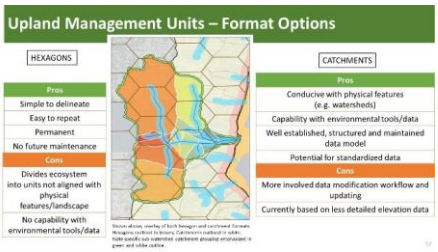
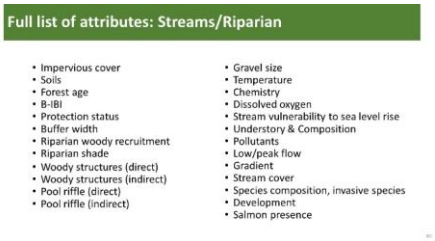


Figure __. Forest management unit options



Full list of attributes: Upland Forests

- Connectivity, contiguous habitat, migratory corridors
- Disturbance (e.g., disease, pests, wildfire)
- Forest age - existing vegetation height (EVH)
- Edge effects, fragmentation, patchiness
- Forest canopy cover (EVC)
- Hydrologic maturity
- Impervious surfaces
- Invasive species presence
- Microclimate
- Micro-topography (pit & mound)
- Plant association groups and understory species
- Road density
- Soils and coarse woody debris
- Biodiversity
- Stand development, complexity, succession stage
- Wildlife species presence and habitat
- Slope

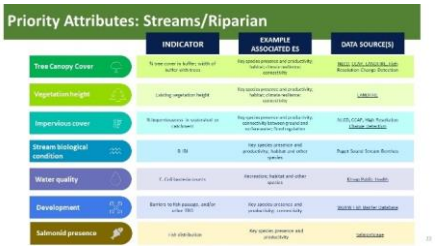
Figure

Priority Attributes: Marine Shorelines

Priority Attributes: Marine Shorelines

	INDICATOR	EXAMPLE ASSOCIATED ES	DATA SOURCE(S)
Shoreline armoring			
Riparian vegetation			
Water quality			
Submerged vegetation			
Forage fish			

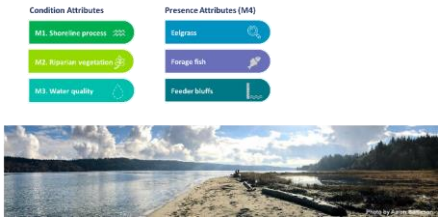
Priority Attributes: Streams/Riparian

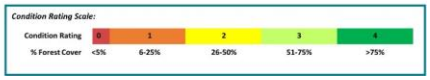


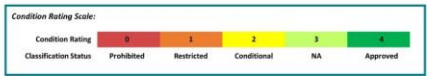
May 2021 Workshop Focused on Shorelines

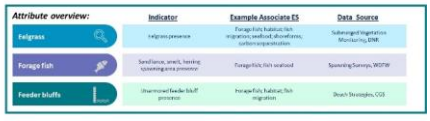
The Core Team evaluated the initial previews of management units and attributes for the County. Due to the use of drift cells, a few units were very long. The presence or absence of key species had been consistently identified as core to assessing the ecosystem services provided by shorelines. One update involved grouping multiple species into a single metric as key species present or absent (see Figure __), reducing the total number of attributes to four. The workshop also vetted the numerical breaks used to define different tiers of health and switched to a zero to four scale (See Figures __, __, and __). Finally, the workshop also combined the three structural attributes (%armoring in drift cell, %forest cover in riparian zone, and shellfish growing area water quality classification status) with the presence of three key conditions (eelgrass presence, sand lance / smelt / herring spawning area, and unarmored feeder bluff presence) for provisioning ecosystem services.

Attributes of Shorelines – Updated









Method 1: Arithmetic mean $LOS_1 = \left(\frac{M1 + M2 + M3}{3}\right) + \sum M4$

Method 2: Geometric mean $LOS_2 = \sqrt[3]{M1 * M2 * M3} + \sum M4$

Qualitative description of LOS

Description	LOS Score
Very low:	0
Low:	>0 and ≤2
Medium:	>2 and <4
High:	≥4

June 2021 Workshop Focused on Streams

The Core Team met again to preview the revised stream management units and initial levels of service for the various attributes. The management units used a set 204-ft buffer of the stream centerline, and confluences were used to divide into smaller units that reflect stream order (Figure __). The eight original attributes were reworked into five overall attributes summarized in Figure __ and detailed in Figures __ through __. The workshop also revisited how to establish desired levels of service, including options such as the City of Shoreline, which solicited input from its residents. The Core Team agreed with the overall direction and had some suggestions for tuning some of the definitions, including the need to provide more information on the quality of fish habitat. Imperviousness was identified as a secondary attribute that could be deprioritized. The B-IBI is a good overall indicator but not one that could be directly managed but would respond indirectly to other management actions.

- Catchment stream segment buffered 204 ft.
- Grouping of adjacent catchment streams segments by Shreve's stream ordering method
- Grouped less than 100 catchment acres are combined with adjacent downstream groupings

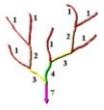
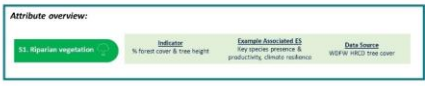
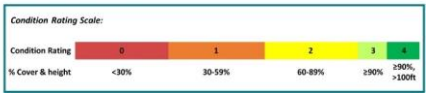
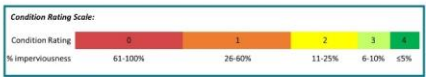


Figure __.

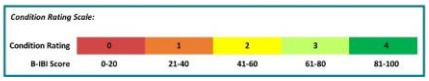

Attribute overview:
S1. Riparian vegetation
Indicator
% forest cover & tree height
Example Associated ES
Key species presence & productivity, climate resilience
Data Source
WDFW HRCD tree cover


Condition Rating Scale:
Condition Rating
0
1
2
3
4
% Cover & height
<30%
30-59%
60-89%
≥90%
≥90%, >100ft

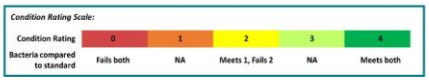

Attribute overview:
S2. Imperviousness
Indicator
% imperviousness in sub-watershed
Example Associate ES
Key species presence & productivity, habitat
Data Source
NOAA Coastal Change Analysis Program


Condition Rating Scale:
Condition Rating
0
1
2
3
4
% imperviousness
61-100%
26-60%
11-25%
6-10%
≤5%

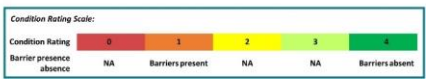

Attribute overview:
S3. Biological condition
Indicator
Average app.regional B-IBI scores
Example Associate ES
Key species, other species, habitat
Data Source
Puget Sound Stream Benthos


Condition Rating Scale:
Condition Rating
0
1
2
3
4
B-IBI Score
0-20
21-40
41-60
61-80
81-100


Attribute overview:
S4. Water quality
Indicator
Coliform bacteria county compared to standard
Example Associate ES
Recreation, water supply
Data Source
Kitsap Public Health


Condition Rating Scale:
Condition Rating
0
1
2
3
4
Bacteria compared to standard
Fails both
NA
Meets 1, Fails 2
NA
Meets both


Attribute overview:
S5. Fish passage
Indicator
Barrier presence/absence
Example Associate ES
Key species, connectivity
Data Source
WDFW


Condition Rating Scale:
Condition Rating
0
1
2
3
4
Barrier presence absence
NA
Barriers present
NA
NA
Barriers absent

Arithmetic Mean = $\frac{S1+S2+S3+S4+S5}{5}$

Qualitative description of LOS

Description	LOS Score
Very low:	0-1
Low:	≥1-2
Medium:	≥2-3
High:	≥3-4

July 2021 Workshop Focused on Forests

The Core Team revisited the upland forest management units and previewed the attributes and overall level of service across the County. To refine the ecosystem services, the Core Team returned to the priorities from the June 2020 workshop with key organizations in Kitsap County to select water regulation (aquifer recharge, flood mitigation, water filtering), wildlife habitat and climate resilience. County and WEC staff found that forest cover, vegetation height, and impervious cover were highly correlated, and simplified the March 2021 list to three attributes highly influential on water regulation, wildlife habitat, and climate resilience (see Figure __), with specific values for each attribute. Feedback included the need to represent the importance of upland forests to Tribes in addition to provisioning salmon, succession classes were important and could have other data sources, and the name of the third attribute as "disturbance" could be improved.

In addition to previewing cross the County, the Core Team previewed the results in the Big Beef Creek and Chico Creek watersheds to compare with the Tribes' deep knowledge of those systems. Finally, the workshop included a discussion of what could drive establishing a geographically varying desired level of service, such as a north-south wildlife corridor in the middle of the peninsula, maintaining and restoring good habitat in North Kitsap, and recovering urban tree canopy in Silverdale.

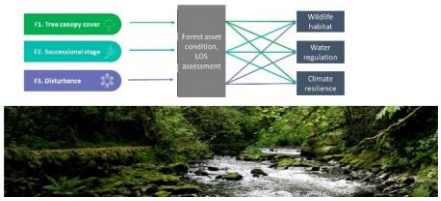


Figure __

Attribute overview:

F1. Tree Canopy Cover	Indicator	Example Associated ES	Data Source
	% canopy cover	Water regulation, habitat, climate resilience, temperature regulation	HRCD 2017

Condition Rating Scale:

Condition Rating	0	1	2	3	4
% Cover	<40%	40-59%	60-79%	80-89%	≥90%

Attribute overview:

F2. Succession Stage	Indicator	Example Associate ES	Data Source
	% late succession forest	Water regulation, habitat, climate resilience, species and plant presence	USGS LANDFIRE

Condition Rating Scale:

Condition Rating	0	1	2	3	4
% late stage	<1%	1-25%	26-50%	51-75%	>75%

Attribute overview:

F3. Disturbance	Indicator	Example Associate ES	Data Source
	Presence of observed tree death/defoliation	Water regulation, climate resilience, species and plant presence	DNR/USFS

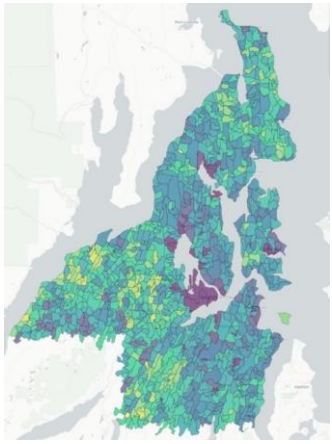
Condition Rating Scale:

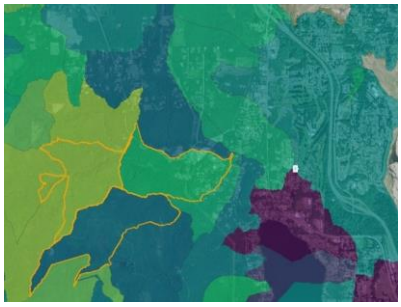
Condition Rating	0	1	2	3	4
Observed tree death/defoliation	NA	Present	NA	NA	Absent

Quantitative LOS metric Arithmetic Mean = $\frac{F1 + F2 + F2}{3}$

Qualitative description of LOS

Description	LOS Score
Very low:	0-1
Low:	≥1-2
Medium:	≥2-3
High:	≥3-4





September 2021 Workshop Updates to Levels of Service

The workshop reported on updates to the forest and stream management units to represent hydrologic stream network connectivity. The management units for several of the very long units in North Kitsap were divided into smaller reaches. The group concurred with the updates to the management units. Based on feedback from the previous three workshops, the attributes were further simplified and data sources and analysis methods were refined. For forests and streams, the Core Team discussed switching to NHD for all catchment units.

Attributes for shorelines evolved in three ways: (1) the shoreline riparian vegetation classification was updated to align with that from forests and streams, (2) the marine water quality attribute was refined to address management units with more than one adjacent Shellfish Growing Area classifications, and the presence of key conditions for eelgrass, forage fish, and feeder bluffs was removed from the LOS calculation though continued to be tracked in asset management as response variables over time. Figure __ presents the updated condition ratings. For marine shorelines, the key priority ecosystem services include:

- Forage fish and food web
- Nearshore habitat (e.g., shallow water, eelgrass, and kelp)
- Sediment supply
- Shellfish and seafood
- Climate resilience

The stream attributes evolved in four ways in response to feedback (Figure __): (1) riparian vegetation was changed to align with forests and height was dropped, (2) biological condition and coliform bacteria counts were aggregated to management units, (3) fish distribution was added, and (4) impervious cover were dropped. Figure __ presents the updated condition ratings. The priority ecosystem services include:

- Key species presence and productivity (e.g., salmon)
- Ground and surface water supply
- Stream flow regulation
- Habitat

Forest attributes evolved in __ ways in response to feedback (Figure __): (1) lakes and ponds were removed from the area calculations as including them inadvertently decreased the forest level of service, (2) the forest condition scale was updated slightly, and (3) the disturbance attribute was eliminated as repetitious with forest cover and the lack of ability to distinguish between natural disturbance and declines in forest health, although observations of pests and disease were retained within KNRAMP for future reference. Figure __ presents the updated condition ratings. The priority ecosystem services remained as previously:

- Water cycle regulation (e.g., infiltration, retention, filtering pollutants)
- Wildlife habitat
- Climate resilience

Finally, the Core Team discussed the process by which to set desired levels of service, including by consulting targets in existing programs, such as a standard one site potential tree height and decreased forest loss in the Puget Sound Vital Signs. The Core Team did not agree with slowing the decline as a goal for Kitsap and wants to move toward a net increase from current levels. The Core Team also recommended looking at how Public Works establishes targets for gray infrastructure as a road map fo setting targets for natural resources.

Attribute	Indicator	Condition Rating				
		0	1	2	3	4
M1. Shoreline armor	% armor in MU	>75%	51-75%	26-50%	1-25%	<1%
M2. Riparian vegetation	% forest cover in MU	<40%	41%-55%	56%-70%	71%-85%	>85%
M3. Water quality	SGA classification status in MU	Prohibited	Prohibited & cond./appr.	Condition al	Condition al & appr.	Approved

S1. Riparian vegetation

- Updated data and condition rating scale to align with stream and forest assessment - no heights

S2. Biological condition

- Updated input data was manually aggregated to management units

S3. Water quality

- Data was manually aggregated by to management units

Fish Distribution

- Added

Impervious cover

- Dropped

Attribute	Indicator	Condition Rating				
		0	1	2	3	4
S1. Riparian vegetation	% forest cover in MU	<40%	41%-55%	56%-70%	71%-85%	>85%
S2. Biological condition (B-IBI)	Aggregated B-IBI score for stream	≤20	21-40	41-60	61-80	81-100
S3. Water Quality	Performance of stream against bacteria standard	Fails standard	NA	Meets first, fails second	NA	Meets standard
S4. Fish passage	Barrier presence/ absence in MU	NA	Yes	NA	NA	No

!

F1. Forest cover

F2. Successional stage

F1. Forest cover

- Updated condition rating scale
- Removed lake and pond area from estimates

F3. Disturbance

- Removed from LOS metric – hard to differentiate between natural disturbance and indicator of declining forest health, cover loss may capture
- Retained observations of pest/disease in each MU

Attribute	Indicator	Condition Rating				
		0	1	2	3	4
F1. Forest cover	% forest cover in MU	<40%	41%-55%	56%-70%	71%-85%	>85%
F2. Succession class	% late succession in MU	<1%	1-25%	26-50%	51-75%	>75%

November 2021 Workshop to Develop Desired Levels of Service

Once the management units and attributes were set, the Core Team devoted several workshops to developing desired levels of service for each of the three asset types. The County uses targets for open space based on population, stormwater infrastructure based on permits, and roadways based on maximum volume to capacity ratio. The Core Team agreed that desired LOS needs to be specific and quantifiable to guide action, measure progress, and keep track of goals. Desired LOS needs to be geographically based and include both long-term and near-term goals. The County and WEC reviewed several existing County and regional documents:

- Kitsap County:
    - Comprehensive Plan and Capital Facilities Plan
    - Water as a Resource Policy
    - Integrated Forest Stewardship Policy
    - Countywide Planning Policies
- Puget Sound:
    - NWIFC Habitat Strategy
    - Puget Sound Partnership - 2020 Vital Sign Targets
    - Puget Sound Partnership - Desired Recovery Outcomes
    - Puget Sound Regional Council - Regional Open Space Conservation Plan
    - Puget Sound Regional Council - Vision 2050
- Kitsap Peninsula:
    - West Central LIO and HCCC Ecosystem Recovery Plans
    - WRIA 15 Watershed Plan
    - East Kitsap DIP Steelhead Recovery Plan

This culminated in a framework for goals, objectives, targets, and metrics (Figure __). The Core Team discussed initial objectives and metrics for forests (Figure __), streams (Figure __), and shorelines (Figure __). Overall the Core Team agreed that the structure provided enough flexibility to incorporate elements of the Comprehensive Plan and meshed with the 20-year and 6-year timelines in the plan. The objectives should be tailored to specific geographies, such as watersheds and inside and outside of Urban Growth Areas (UGAs). The County identified that other divisions of County government should be engaged on the work and to gain insight from their processes. Finally, the details of feedback on specific objectives and targets are included in Tables __ through __.

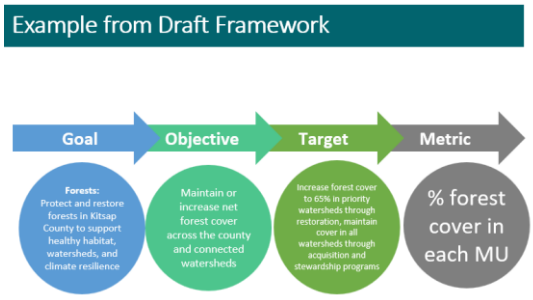


Figure __.

Forest Desired Levels of Service

LOS Goal: Protect and restore forests in Kitsap County to support healthy habitat, watersheds, and climate resilience

LOS Description	Geographies	Time	LOS Metric	Example References
Objective F1. Maintain or increase net forest cover across the county and connected watersheds	Countywide and connected watersheds	20+ yrs.	Forest cover (F1)	PSP Desired Recovery Outcomes PSRC Open Space Plan West Central Ecosystem Recovery Plan (ERP)
• **Target F1.1.** Increase forest cover to 65% in priority watersheds through restoration, maintain cover in all watersheds through acquisition and stewardship programs	Increase: Barker, Blackjack, Chico Maintain: Countywide	20+ yrs.	Forest cover (F1)	Steelhead recovery plan
• **Target F1.2.** Achieve open space LOS standard (71.1 acres/1,000) by acquiring priority forest land for permanent protection	See County and Regional Open Space Plans	20+ yrs.	Data gap	Capital Facilities Plans Regional Open Space Plan
• **Target F1.3.** Enhance urban tree canopy where low	Urban areas, health disparities analysis	6 yrs.	Forest cover (F1)	Vision 2050
Objective F2. Protect late succession forest stands and manage forests to increase hydrologic maturity	Countywide	20+ yrs.	Succession class (F2)	Steelhead Recovery Plan Vision 2050
• **Target F2.1.** Identify and increase acreage of older forests under permanent protection	Management units with late succession forest	6 yrs.	Succession class (F2), but data gaps	Open Space Plan
• **Target F2.2.** Manage forest owned by Kitsap County to enhance structural complexity and composition	County forests	6 yrs.	Data gaps	Kitsap Forest Stewardship Policy

Figure __.

Stream Desired Levels of Service

LOS Goal: Improve watershed health, habitat, and water quality to support healthy fish populations and clean and abundant water

LOS Description	Geographies	Time	LOS Metric	Example References
Objective S1. Restore riparian areas of streams and prevent loss of riparian forest cover within 204ft of streams, or one site potential tree height.	Countywide	20 yrs.	Riparian vegetation (S1)	Riparian management recommendations
• **Target S1.1.** Increase riparian forest cover to >70% throughout county	Countywide, and/or focus on Blackjack, Chico, Clear, Curley, Gorst, Grovers; Hood Canal?	20 yrs.	Riparian vegetation (S1)	Steelhead Plan (note the plan does not specify a cover target)
• **Target S1.2.** Manage riparian forests to support growth of large, mature trees	Countywide	20 yrs.	Data gap	NWIFC habitat strategy
Objective S2. Improve stream habitat to support instream biological communities	Countywide	20 yrs.	B-IBI (S2)	PSP DRO
• **Target S2.1.** Improve B-IBI scores to a minimum of "good"	Streams where currently below targets	6 yrs.	B-IBI (S2)	PSP Vital sign target
Objective S3. Reduce pollution in streams to protect water quality from headwaters to Puget Sound		20+ yrs.	WQ standard (S3)	
• **Target S3.1.** All streams meeting WQ standards for 95% of the year	Countywide	6 yrs.	WQ standard (S3)	
Objective S4. Remove, retrofit, or manage culverts, dams, and other infrastructure to ensure fish passage and functional downstream habitat	Countywide		Fish passage (S4)	PSP DRO
• **Target S4.1.** Steelhead can access 100% of historically accessible habitat in priority drainages	Blackjack, Chico, Curley, Clear, Gorst, Grovers; Hood canal?	20+ yrs.	Data gap	Steelhead Plan

Figure __.

Shoreline Desired Levels of Service

LOS Goal: Improve water quality and natural shoreline and nearshore functions to support healthy habitat, abundant fish populations, and opportunities for shellfish harvest

LOS Description	Geographic Focus	Time	LOS Metric	Example References
Objective M1. Restore natural shoreline processes by reducing impacts of shoreline armor and development	Countywide	20+ yrs.	Shoreline armor (M1)	PSP Desired Recovery Outcomes, Vision 2050
• **Target M1.1.** Prevent new armoring of natural marine and estuarine shorelines	Drift cells with <25% armor	20+ yrs.	Shoreline armor (M1)	PSP Desired Recovery Outcome
• **Target M1.2.** Remove or soften armor on priority marine shorelines and estuaries through Shore Friendly and other approaches	Armored shorelines throughout the County; initial focus on feeder bluffs	20+ yrs.	NA	PSP Desired Recovery Outcome, West Central ERP
Objective M2. Restore shoreline riparian vegetation to natural conditions wherever possible	Countywide	20+ yrs.	Forest cover (M2)	Vision 2050
• **Target M2.1.** Shoreline riparian forest cover maintained or increased to at least 70% cover through forest restoration	Increase in drift cells with cover <70%	20+ yrs.	Forest cover (M2)	HCCC ERP (not a specific target)
Objective M3. Address pollution and contamination so shorelines are safe for harvesting shellfish	Countywide	20+ yrs.	SGA Status (M3)	PSP Vital Signs (increase acreage)
• **Target M3.1.** Re-open conditional and prohibited commercial shellfish growing areas using the PIC program and other approaches	Chico Bay, other immediate priorities?	6 yrs.	SGA Status (M3)	PSP Desired Recovery Outcomes, HCCC ERP, West Central ERP
• **Target M3.2.** Maintain approved areas through ongoing monitoring and existing programs	Approved growing areas countywide	6 yrs.	SGA Status (M3)	PSP Desired Recovery Outcomes
Objective M4. Protect important ecosystem components and assess possibilities for setting targets	Drift cells with forage fish, eelgrass, kelp, feeder bluffs	6 yrs.	Presence attributes, but note data gaps	NA
• **Target M4.1.** Sites with increasing eelgrass area outnumber sites with declining eelgrass area	Countywide	6 yrs.	Eelgrass presence, but data gaps	PSP Target Setting Process
• **Target M4.2.** Increase area of high-quality forage fish spawning habitat	Countywide	6 yrs.	Data gap	Steelhead Recovery Plan
• **Target M4.3.** Identify areas where historical kelp forests have been lost, research drivers, and opportunities for recovery	Countywide	6 yrs.	Data gap	

Figure __.

Table __. Feedback on

LOS Description	Geographies	Time	LOS Metric	Example References
Objective F1. Maintain or increase net forest cover across the county and connected watersheds **Comments:** • F1 - Forest cover and open space have similar functions, is there a distinction between the two? Important to think about if forest cover is actually forest or open space • Need to go back to the data and figure out where we are at - at the watershed scale (F1) • For net cover - focus on keeping older and more mature forests, avoid losing forest and then replanting elsewhere – which could be net maintain but would lose function. Importance of landscape scale targets. • Want to flag the headwater wetland areas. Watersheds get carved up – need to think about the wet areas in general, not just a watershed. Want to call that out if thinking about looking at open space on the landscape and where development occurs	Countywide and connected watersheds	20+ yrs.	Forest cover (F1)	PSP Desired Recovery Outcomes PSRC Open Space Plan West Central Ecosystem Recovery Plan (ERP)
• **Target F1.1.** Increase forest cover to 65% in priority watersheds through restoration, maintain cover in all watersheds through acquisition and stewardship programs **Comments:** • Target F1.1 and others: a challenge is that some areas are managed for forest harvest. Because our watersheds are small, maintaining forest cover can be difficult. • Target F1.1 - Referring to maximum hard surface requirements may help set vegetation retention targets • For F1.1 - split targets into increasing and maintenance watershed • Agree that F1.1 should be split into separate goals for maintaining and enhancing forest cover. These goals may apply to different areas, and require different tools and incentives • F1.1. – the target on maintaining cover in all watersheds – core team needs grapple with urban vs. rural standards for targets. Try to look code requirements for open space and tree retention to guide the target. Get leery we would be successful in urban areas at maintaining cover. Consistent with GMA and growth within UGAs, maintaining cover in urban areas may not be realistic. Thinking about code requirements in urban areas – for example,	Increase: Barker, Blackjack, Chico Maintain: Countywide	20+ yrs.	Forest cover (F1)	Steelhead recovery plan

Poulsbo has tree retention in the code - 25% tree retention at the site if being developed. • Need to think about scale – watersheds could make sense for DLOS.				
• **Target F1.2.** Achieve open space LOS standard (71.1 acres/1,000) by acquiring priority forest land for permanent protection **Comments:** • Kitsap county open space has targets that are different for urban and rural - like the open space target • F1.2 – focus on headwater wetlands between watersheds • Target F1.2 is great, but almost seems to define a specific strategy or tactic within the broader category of maintaining forest cover. • Want to understand the rationale for the open space number	See County and Regional Open Space Plans	20+ yrs.	Data gap	Capital Facilities Plans Regional Open Space Plan
• **Target F1.3.** Enhance urban tree canopy where low **Comments:** • F1.3 - consider review of local codes to inform target https://www.codepublishing.com/WA/Poulsbo/html/Poulsbo18/Poulsbo18180.html#18.180.030 Tree Retention Requirement: At least twenty-five percent of the existing trees which are ten inches in diameter or greater measured four feet six inches above grade, and meet the priorities in subsection A of this section, shall be retained. • For 1.3 - specific targets that address what counts as "low," prioritizing % cover in low-income and overburdened communities • F1.3 Target tree canopy cover enhancement in urban areas where critical habitat is mapped • Regarding low canopy - recognize that urban areas contain important natural assets, including freshwater and nearshore habitat	Urban areas, health disparities analysis	6 yrs.	Forest cover (F1)	Vision 2050
Objective F2. Protect late succession forest stands and manage forests to increase hydrologic maturity **Comments:** • F2 - for hydrologic maturity, could also include groundwater recharge as an objective in F2 – target could be certain soil classes with forest conducive for recharge. • For F2 - also include long-term targets (20 year as well as 6 year) within both targets • Need to better understand the data gaps related to F2 - can be hard to define	Countywide	20+ yrs.	Succession class (F2)	Steelhead Recovery Plan Vision 2050
• **Target F2.1.** Identify and increase acreage of older forests under permanent protection	Management units with late succession forest	6 yrs.	Succession class	Open Space Plan

			(F2), but data gaps	
• **Target F2.2.** Manage forest owned by Kitsap County to enhance structural complexity and composition **Comments:** • F2.2 is a great goal, would likely require relying on field data rather than geospatial data. Creating a policy or management plan to encourage this could be a non-quantitative metric.	County forests	6 yrs.	Data gaps	Kitsap Forest Stewardship Policy
General feedback: • Geography is important – think about watersheds and which are predominately urban vs rural and what is feasible. Watershed scale is beneficial for many objectives • Take a look at the Parks, Recreation and open space plan to inform objectives - https://www.kitsapgov.com/parks/Documents/PROSPlan2018.pdf • For all - as process evolves, include columns for needed resources, estimated costs, and data sources for metrics • Regarding vegetation retention requirements and hard surface thresholds, these are site level development standards or regulations. I think it's important for us to think at a landscape level and not at a site/parcel level. Really should be focusing on improving or protecting functions, for example at the scale of the Chico Creek watershed. • Agree about thinking about landscape scale. But creates a challenge for targets, may need to be at the highest level to maintain or increase. But then could have sub-scale.				

Table __. Feedback on streams

LOS Description	Geographies	Time	LOS Metric	Example References
Objective F1. Maintain or increase net forest cover across the county and connected watersheds **Comments:** • F1 - Forest cover and open space have similar functions, is there a distinction between the two? Important to think about if forest cover is actually forest or open space • Need to go back to the data and figure out where we are at - at the watershed scale (F1)	Countywide and connected watersheds	20+ yrs.	Forest cover (F1)	PSP Desired Recovery Outcomes PSRC Open Space Plan West Central Ecosystem Recovery Plan (ERP)

• For net cover - focus on keeping older and more mature forests, avoid losing forest and then replanting elsewhere – which could be net maintain but would lose function. Importance of landscape scale targets. • Want to flag the headwater wetland areas. Watersheds get carved up – need to think about the wet areas in general, not just a watershed. Want to call that out if thinking about looking at open space on the landscape and where development occurs				
• **Target F1.1.** Increase forest cover to 65% in priority watersheds through restoration, maintain cover in all watersheds through acquisition and stewardship programs **Comments:** • Target F1.1 and others: a challenge is that some areas are managed for forest harvest. Because our watersheds are small, maintaining forest cover can be difficult. • Target F1.1 - Referring to maximum hard surface requirements may help set vegetation retention targets • For F1.1 - split targets into increasing and maintenance watershed • Agree that F1.1 should be split into separate goals for maintaining and enhancing forest cover. These goals may apply to different areas, and require different tools and incentives • F1.1. – the target on maintaining cover in all watersheds – core team needs grapple with urban vs. rural standards for targets. Try to look code requirements for open space and tree retention to guide the target. Get leery we would be successful in urban areas at maintaining cover. Consistent with GMA and growth within UGAs, maintaining cover in urban areas may not be realistic. Thinking about code requirements in urban areas – for example, Poulsbo has tree retention in the code - 25% tree retention at the site if being developed. • Need to think about scale – watersheds could make sense for DLOS.	Increase: Barker, Blackjack, Chico Maintain: Countywide	20+ yrs.	Forest cover (F1)	Steelhead recovery plan
• **Target F1.2.** Achieve open space LOS standard (71.1 acres/1,000) by acquiring priority forest land for permanent protection **Comments:** • Kitsap county open space has targets that are different for urban and rural - like the open space target • F1.2 – focus on headwater wetlands between watersheds • Target F1.2 is great, but almost seems to define a specific strategy or tactic within the broader category of maintaining forest cover. • Want to understand the rationale for the open space number	See County and Regional Open Space Plans	20+ yrs.	Data gap	Capital Facilities Plans Regional Open Space Plan

• **Target F1.3.** Enhance urban tree canopy where low **Comments:** • F1.3 - consider review of local codes to inform target https://www.codepublishing.com/WA/Poulsbo/html/Poulsbo18/Poulsbo18180.html#18.180.030 Tree Retention Requirement: At least twenty-five percent of the existing trees which are ten inches in diameter or greater measured four feet six inches above grade, and meet the priorities in subsection A of this section, shall be retained. • For 1.3 - specific targets that address what counts as "low," prioritizing % cover in low-income and overburdened communities • F1.3 Target tree canopy cover enhancement in urban areas where critical habitat is mapped • Regarding low canopy - recognize that urban areas contain important natural assets, including freshwater and nearshore habitat	Urban areas, health disparities analysis	6 yrs.	Forest cover (F1)	Vision 2050
Objective F2. Protect late succession forest stands and manage forests to increase hydrologic maturity **Comments:** • F2 - for hydrologic maturity, could also include groundwater recharge as an objective in F2 – target could be certain soil classes with forest conducive for recharge. • For F2 - also include long-term targets (20 year as well as 6 year) within both targets • Need to better understand the data gaps related to F2 - can be hard to define	Countywide	20+ yrs.	Succession class (F2)	Steelhead Recovery Plan Vision 2050
• **Target F2.1.** Identify and increase acreage of older forests under permanent protection	Management units with late succession forest	6 yrs.	Succession class (F2), but data gaps	Open Space Plan
• **Target F2.2.** Manage forest owned by Kitsap County to enhance structural complexity and composition **Comments:** • F2.2 is a great goal, would likely require relying on field data rather than geospatial data. Creating a policy or management plan to encourage this could be a non-quantitative metric.	County forests	6 yrs.	Data gaps	Kitsap Forest Stewardship Policy
General feedback: • Geography is important – think about watersheds and which are predominately urban vs rural and what is feasible. Watershed scale is beneficial for many objectives				

• Take a look at the Parks, Recreation and open space plan to inform objectives - https://www.kitsapgov.com/parks/Documents/PROSPlan2018.pdf • For all - as process evolves, include columns for needed resources, estimated costs, and data sources for metrics • Regarding vegetation retention requirements and hard surface thresholds, these are site level development standards or regulations. I think it's important for us to think at a landscape level and not at a site/parcel level. Really should be focusing on improving or protecting functions, for example at the scale of the Chico Creek watershed. • Agree about thinking about landscape scale. But creates a challenge for targets, may need to be at the highest level to maintain or increase. But then could have sub-scale.				

Table __. Feedback on shorelines

LOS Description	Geographic Focus	Time	LOS Metric	Example References
Objective M1. Restore natural shoreline processes by reducing impacts of shoreline armor and development **Comments:** • M1 - Maintain setbacks to avoid armoring and allow natural bluff recession. Adequate setbacks are important and play into this objective.	Countywide	20+ yrs.	Shoreline armor (M1)	PSP Desired Recovery Outcomes, Vision 2050
• **Target M1.1.** Prevent new armoring of natural marine and estuarine shorelines **Comments:** • For M1.1 Review exemptions for building new armor and overall regulations that allow for this. Focus on setbacks. • The Vital Sign target for armor focuses on no net increase of shoreline armor - recently reporting success in more armor coming out than going in, but still new armor going in. so if this is the reality, need to think about M1.1 and how to achieve goals	Drift cells with <25% armor	20+ yrs.	Shoreline armor (M1)	PSP Desired Recovery Outcome
• **Target M1.2.** Remove or soften armor on priority marine shorelines and estuaries through Shore Friendly and other approaches	Armored shorelines throughout the County; initial focus on feeder bluffs	20+ yrs.	NA	PSP Desired Recovery Outcome, West Central ERP
Objective M2. Restore shoreline riparian vegetation to natural conditions wherever possible **Comments;**	Countywide	20+ yrs.	Forest cover (M2)	Vision 2050

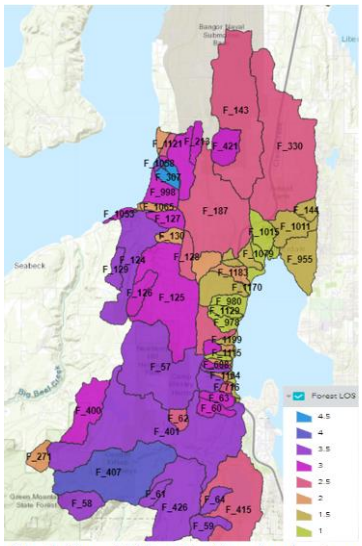
• Objective M2 - how can this be related to SMP shoreline designations?				
• **Target M2.1.** Shoreline riparian forest cover maintained or increased to at least 70% cover through forest restoration	Increase in drift cells with cover <70%	20+ yrs.	Forest cover (M2)	HCCC ERP (not a specific target)
Objective M3. Address pollution and contamination so shorelines are safe for harvesting shellfish	Countywide	20+ yrs.	SGA Status (M3)	PSP Vital Signs (increase acreage)
• **Target M3.1.** Re-open conditional and prohibited commercial shellfish growing areas using the PIC program and other approaches	Chico Bay, other immediate priorities?	6 yrs.	SGA Status (M3)	PSP Desired Recovery Outcomes, HCCC ERP, West Central ERP
• **Target M3.2.** Maintain approved areas through ongoing monitoring and existing programs	Approved growing areas countywide	6 yrs.	SGA Status (M3)	PSP Desired Recovery Outcomes
Objective M4. Protect important ecosystem components and assess possibilities for setting targets	Drift cells with forage fish, eelgrass, kelp, feeder bluffs	6 yrs.	Presence attributes, but note data gaps	NA
• **Target M4.1.** Sites with increasing eelgrass area outnumber sites with declining eelgrass area **Comments:** • Target M4.1 - East Kitsap has one of the better data sets of eelgrass condition and change. This has been a partnership of DNR and ST. Should ID funds for LTM.	Countywide	6 yrs.	Eelgrass presence, but data gaps	PSP Target Setting Process
• **Target M4.2.** Increase area of high-quality forage fish spawning habitat	Countywide	6 yrs.	Data gap	Steelhead Recovery Plan
• **Target M4.3.** Identify areas where historical kelp forests have been lost, research drivers, and opportunities for recovery **Comments:** • Support ongoing research	Countywide	6 yrs.	Data gap	
General feedback: • Need all to have strategies or take them out. Need to have this convo – strategies will be a mix of things that fall into a capital facility plans and better, more effective regulations.				

January 2022 Workshop on Refining Framework

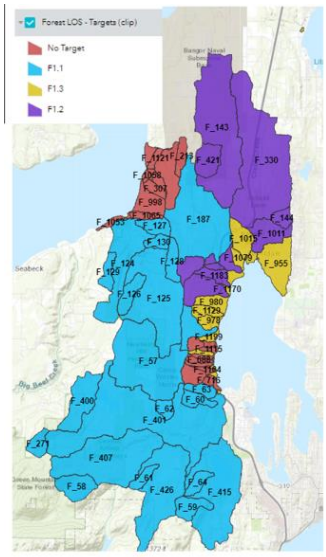
The next workshop focused on forests and specific targets as well as the policies, programs, and projects needed to close gaps between the desired LOS and current LOS and priority areas for actions. Central Kitsap was used as an example of the current LOS (Figure __) and what types of future conditions would be of highest priority. The draft targets for forest attributes would vary geographically, maintaining high forest cover in the primary watersheds that already maintain >65% forest cover, increase to at least 65% for other watersheds outside of UGAs, and increase forest cover by at least 10% within UGAs. Proposed targets:

- F1.1. Maintain tree cover in all primary watersheds
- F1.2. Increase tree cover to at least 65% in primary watersheds where below
- F1.3. Increase tree canopy cover in urban areas where below 40% by at least 10%
- F1.4. (Not applied)
- F2. Maintain % late succession

Feedback from partners was that the Chico Creek watershed may also need a target to increase forest cover in some areas, and that the +10% target for the urban watersheds seemed reasonable.



Map 1: Current LOS metrics (based on forest cover and succession class)



Map 2: LOS targets applied to MUs

April 2022 Workshop for Shoreline Targets and Update on Comprehensive Plan

Several potential targets for the three shoreline attributes were discussed, as well as targets for the three key conditions that had been previously removed from the LOS calculation (see Figure __). The workshop also included potential interventions to close the gaps between the desired and current LOS (Figure __). The Core Team also discussed that some geographies would require actions earlier to protect and restore ecosystem services, and that these priorities could focus on the needs of the Port Gamble S'Klallam Tribe and Suquamish Tribe initially. Specific geographies include Big Beef Creek and adjoining shorelines, Port Gamble Bay, and Liberty Bay.

Feedback from the Core Team concurred with the targets for Objective M1, suggested prioritizing restoration near the mouths of small streams, and noted that illegal armoring projects exist and likely will accelerate with sea level rise. For objective M2, feedback was that strategies and actions should plan for red alder decline in some areas. Objective M3 on growing areas remains of high importance to both Tribes and also elevates the importance of growing areas within the County. For the key areas grouped as M4, the Core Team noted that additional information will come on eelgrass and kelp beds.

Possible Level of Service Targets	Indicator	Target Overview	Current Conditions
Objective M1. Protect and restore natural shoreline processes			
Target M1.1. Prevent new armoring of natural marine and estuarine shorelines	% armor	Protect/ Maintain	175 MUs with armor (avg. 55%), 25 MUs with no armor
Target M1.2. Remove or soften existing armor that is impacting marine shoreline and estuary processes (e.g., reduce armor by 20% in drift cells with feeder bluffs)	% armor	Restore/ Reduce	~15 units have 100% of the sediment source armored (Port Orchard, Liberty Bay, others)
Target M1.3. Improve compliance with buffer and setback regulations and other measures to allow for natural bluff recession	*No indicator in KNRAMP*	*NA*	*NA*

Possible Level of Service Targets	Indicator	Target Overview	Current Conditions
Objective M2. Protect and restore marine shoreline vegetation			
• Target M2.1. Restore shoreline riparian areas to a minimum of 70% forest cover in less developed drift cells	% tree cover	Restore/Increase	117 MUs below 70% and less developed
• Target M2.2. Protect shoreline riparian vegetation in areas with high forest cover	% tree cover	Protect/Maintain	57 MUs at or above 70%
• Target M2.3. Increase riparian forest cover in developed drift cells by at least 10%	% tree cover	Restore/Increase	26 MUs in more developed areas, avg 23% tree cover

Possible Level of Service Targets	Indicator	Target Overview	Current Conditions*
Objective M3. Address pollution and contamination so shorelines are safe for shellfish harvest			
• Target M3.1. Open conditional and prohibited commercial shellfish growing areas	SGA status	Restore/ Increase	82 MUs majority conditional or prohibited
• Target M3.2. Maintain status of approved shellfish growing areas	SGA status	Protect/ Maintain	73 MUs majority approved

Shoreline desired LOS: Marine shorelines in Kitsap county support healthy habitat, abundant fish populations, and opportunities for shellfish harvest.

- Target M4.1. Sites with increasing eelgrass area outnumber sites with declining eelgrass area
- Target M4.2. Increase area of high-quality forage fish spawning habitat
- Target M4.3. Identify areas where historical kelp forests have been lost, research drivers, and opportunities for recovery

Figure __.

Interventions – Example strategies, actions, etc.

Marine Shoreline Attribute	Example Strategies	Example Actions
M1: Shoreline Armoring	Expand Shore Friendly Kitsap's pace and scale	Increase technical assistance (e.g. geotech)
M2: Riparian Forest Cover	Incentives, assistance, and outreach to shoreline riparian landowners	See AA for riparian actions, consider those most appropriate for marine shorelines in Kitsap County
M3: Shellfish Growing Areas	Support Pollution Identification and Correction (PIC) Programs, Shellfish Protection Districts	Ongoing need to fund and implement these programs, including outreach, inspections, implementing BMPs
M4: Eelgrass, Forage Fish, Kelp	Support the state and tribes monitoring efforts	Coordinate w/ monitoring groups to evaluate trends and adaptively manage priorities and actions

Sources: PSP Implementation Strategies, Kitsap Water as a Resource Policy (2020), WSPER, HCCC, WRIA 15 WREC (2021), etc.

Figure __.

May 2022 Workshop on Stream Targets

The Core Team explored targets for each of the four objectives listed in Figures __ through __. The feedback was that the workshop attendees wanted additional time to review and digest the materials though they looked like a good start.

DRAFT goal and objectives for stream LOS

LOS Goal: Improve watershed health, habitat, and water quality to support healthy fish populations and clean and abundant water

- Objective S1: Restore riparian areas of streams and prevent loss of riparian forest cover within one site potential tree height
- Objective S2: Improve instream habitat conditions
- Objective S3: Reduce pollution in streams to protect water quality from headwaters to Puget Sound
- Objective S4: Remove, retrofit, or manage culverts, dams, and other infrastructure to ensure fish passage and functional downstream habitat

Possible LOS Targets for Streams

S1: Protect and restore riparian forests

- Target S1.1. Restore riparian areas in non-urbanized stream units to a minimum of 70% forest cover, focusing on increasing shade to reduce stream temperatures.
- Target S1.2. Protect riparian vegetation in riparian areas with high forest cover
- Target S1.3. Increase riparian forest cover in urbanized streams units by at least 10%, focusing on increasing shade to reduce stream temperatures.
- *Target 1.3. Manage riparian forests to support growth of large, mature trees

S2: Improve instream habitat conditions

- Target S2.1. B-IBI scores are at minimum "good" throughout the county
- *Target S2.2. Monitor and improve instream habitat characteristics (e.g., channel complexity, floodplain connectivity, wood, pools, shade, etc.) to support salmonid survival

S3: Reduce pollution and protect water quality

- Target S3.1. All streams meeting WQ standards for 95% of the year
- *Target S3.2. Reduce salmonid exposure to 6PPD quinone

S4: Fish passage

- Target S4.1. Salmonids can access 100% of historically accessible habitat

Possible Level of Service Targets	Indicator	Target Overview	Current Conditions
Target S2.1. B-IBI scores are at minimum "good" throughout the county	B-IBI	Restore/ Increase	154 MUs "maintain" 79 MUs "increase"
Target S2.2. Monitor and improve instream habitat characteristics (e.g., channel complexity, floodplain connectivity, wood, pools, shade, etc.) to support salmonid survival	*No indicator in KNRAMP*	Protect/ Maintain	NA

Possible Level of Service Targets	Indicator	Target Overview	Current Conditions
Target S3.1. All streams meeting WQ standards for 95% of the year	KPH WQ Monitoring	Restore/ Improve	136 stream units not meeting both parts of the standard
Target S3.2. Reduce salmonid exposure to 6PPD quinone	*No indicator in KNRAMP*	Restore/ Reduce	NA

Possible Level of Service Targets	Indicator	Target Overview	Current Conditions
Target S4.1. Salmonids can access 100% of historically accessible habitat	Fish passage barriers	Restore/ Increase	252 MUs with barriers

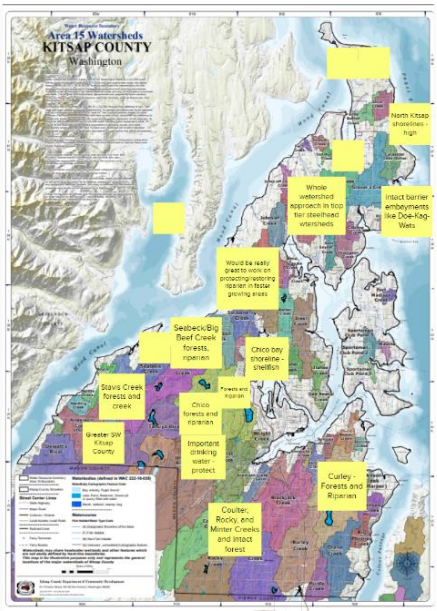
Figure __.

	Intervention
S1 – Riparian forests	• Acquire areas with important and/or high-quality riparian habitat
	• Restore riparian vegetation on publicly owned lands and/or through public-partnerships, particularly focusing on temperature impacts
	• Provide incentives to landowners to set aside and restore riparian reserves and technical support for restoration
	• Include a new riparian standard in County policies and regulations and/or review and amend existing regulations to boost riparian protection and restoration
	• Support local efforts to establish riparian plant propagation programs
	• Participate in efforts to assess and monitor riparian habitat conditions (statewide effort?)
	• Outreach to owners of parcels with riparian areas, steep slopes (i.e., difficult to develop) to promote TDR
S2 – B-IBI	• Continue support for the implementation of SMAP and other stormwater control and treatment efforts
	• Riparian habitat restoration (see above)
	• Incentive programs for LID and stream restoration on private lands
	• More in-depth review of Kitsap streams with low B-IBI to identify and address specific pressures and stressors
S3 – Water quality	• Continue support for KPH and Clean Water Kitsap water quality monitoring and reporting
	• Outreach and education campaigns in watersheds where sampling indicates fecal pollution problems
	• Continue and accelerate securing grant and loan funding to replace failing septic and other sources
S4 – Fish passage	• Increase the pace of barrier removal projects by collaborating with county divisions, state agencies, Tribes, and private landowners to remove barriers

Figure __. Potential interventions for meeting targets for streams.

August 2022 Workshop on Risks to and Goals for Natural Assets

To inform the development of desired levels of service and priority interventions, the Core Team discussed the various threats to forests, streams, and shorelines in Kitsap County. In a group exercise, the Core Team identified development as a key threat, along with climate change, nonpoint source pollution, and surface water withdrawals. The group also identified specific geographies of particular concern (Figure __).



Initial Potential Attributes (from Year 1)

Attribute	Data	Direct/Indirect	Influence	Spatial scale	Temporal scale	Structure/ Cumulative	Solutions available	Finance/Costs/ Benefits	Implementation / Complexity	Recommendation
STREAMS										
Gravel size	Sporadic data from NGOs, tribe, universities	Not directly changeable; %fines increases with development	Medium	Reach 100s m	Years/decades (seasonal impact to salmon)	Structural measurement Impacts from developed land, sand & gravel facilities	Construction and Sand & Gravel general permits Stormwater controls Gravel roads		Enforcing existing laws (construction runoff, sand and gravel permits) straightforward Programmatic land use controls	Consider, but as an explanatory variable
Riparian shade	Derivable from available GIS data; limitation on pixel size	Direct	High							Keep / very high
Temperature	None to some FIN- Few sampling stations in Kitsap (mostly in SW), sampled once a month every 5th sampling season	Not directly changeable	High		- Some interventions would show improvements within a longer timescale -seasonal changes	Measurable, but influenced by other structures on the landscape	Riparian habitat restoration,		Enforcing laws, environmental design guidelines, restoration, habitat conservation	Highly limited by data, but very important for salmon habitat, management efforts seem feasible
Pollutants	None to some PIC Program WQ reports	Not directly changeable	High			"	Enforcement of TMDLs and NPDES permits, LID standards, stormwater design guidelines,	Some programs already funded for this work		"

Attribute	Data	Direct/Indirect	Influence	Spatial scale	Temporal scale	Structure/ Cumulative	Solutions available	Finance/Costs/ Benefits	Implementation / Complexity	Recommendation
Chemistry	None to some/site specific Sparse DOE FIN	Not directly changeable	High		-seasonal changes, weathering events	"				"
Dissolved Oxygen	None to some/site specific	Not directly changeable	High		-seasonal changes	"				"
Low/peak flow	None to some KPUD flow gage and precipitation gage	Not directly changeable	High		-seasonal changes	"	Riparian habitat/erosion/flood control, water usage/infrastructure		Very complex/ Hirst decision	"
Lower band of the stream that is vulnerable to seawater rise	Topography, lidar data at county Barriers (roads, culverts) at tribes, DFW Sea level rise projections at universities	Not directly manageable; response to SLR, presence of barriers = directly controllable	Low	Reach – 100s m	Years/decade for SLR Years for barriers	--	Barrier removal	Projects expensive but opening up best habitat is effective	Straightforward on how	Drop – not clear why this is on list
Woody Structures	Tribes, DFW, NGOs, universities have data though not compiled	Direct – LWD jams	High	10s to 100sm	Years	Structure	Yes – place jams	Costly relative to planting trees and aging	Straightforward; we do this	Keep and distinguish restoration practice of adding LWD jams and keeping or planting riparian vegetation
Woody structures		Indirect – riparian vegetation	High	100s – 1000s m	Decades	Cumulative effect of natural aging	Yes – grow riparian vegetation	Cheap to plant but benefit not for decades; climate	Straightforward technically. Politically hard for private property and	

Commented [MR1]: Melia working on these

Attribute	Data	Direct/Indirect	Influence	Spatial scale	Temporal scale	Structure/ Cumulative	Solutions available	Finance/Costs/ Benefits	Implementation / Complexity	Recommendation
								change will change species	systemic approaches	for natural recruitment
Pool riffle	Academia, NGOs collect sporadically and not centralized	Direct – LWD jams for forced pool/riffle structures	High	10s to 100sm	Years	Structure	Yes – place jams	Costly relative to planting trees and aging	Straightforward; we do this	Tightly coupled with LWD jams because Kitsap is predominantly (wood) forced pool-riffle structures; better to use wood directly?
Pool riffle		Indirect – natural recruitment of LWD	High	100s – 1000s m	Decades	Cumulative effect of natural aging	Yes – grow riparian vegetation	Cheap to plant but benefit not for decades; climate change will change species	Straightforward technically. Politically hard for private property and systemic approaches	
Gradient	Derived from topography; centralized and high-quality data (but not good at reach scale)	Explanatory only; we can't change gradient except at the reach scale	Low (on its own)	100s – 1000s m	Geologic time scales	Results from geologic-scale processes	No	Not applicable	Not applicable	Drop – we can only change gradient at the local scale
Stream cover										
BiBi	County Stream Team	Indirect	High – indicator of biological integrity	100s – 1000s m	Years	Cumulative effects of disturbance	Mixed – generally know good habitat practices	(general habitat practices)	Complex and long timing but we know what to do	Keep; hard to diagnose and sporadically available but highly influential
Stream cover										
Species compositi										

Attribute	Data	Direct/Indirect	Influence	Spatial scale	Temporal scale	Structure/ Cumulative	Solutions available	Finance/Costs/ Benefits	Implementation / Complexity	Recommendation
on (i.e. invasives)										
Woody recruitment (Riparian)	% Canopy cover (NLCD), plot survey	Indirect	Medium	Plot/Acre	Long	Cumulative	Log drop, forest management			
Understory & Composition	Vegetative community (Land Fire/Natureserv), plot surey	Indirect	Low	Stand	Long	Cumulative	Forest management, planting			
Buffer width	GIS Buffer Tool, Land Cover data	Direct	High	Ft, linear measurement	Intermediate	Structure	Regulatory, incentive			
Forest Age	Vegetation Height (LandFire), FIA data (GNN analysis), Forest Inventory	Direct	High	Stand	Intermediate	Structure	Forest management, planting			
Protection status	Protected Lands database (various)	Direct	High	Acre	Long	?	Easements, acquisition			
Impervious cover	Land Cover	Direct	High	%/acre	Intermediate	Structure	Stormwater BMPs			
Soils	USGS	Direct	High	Extent/Depth	Long	Structure	N/A			
SHORELINES										
Development proximity	Derivable from GIS data	Direct	High				Regulatory			
Forage fish	Mapped beaches with relative	Not directly changeable; strong	High			Measurable/	Removing or replacing with soft shore options;	Incentive programs available,	Cumulative impacts from other attributes;	

Attribute	Data	Direct/Indirect	Influence	Spatial scale	Temporal scale	Structure/ Cumulative	Solutions available	Finance/Costs/ Benefits	Implementation / Complexity	Recommendation
	importance from DFW, tribes, county	explanatory variable; impacted by development with geographic sideboards				Cumulative impacts from multiple attributes	slope and gravel size not directly changeable; planting riparian vegetation	long term more payoff for armoring solutions; replanting cheap with long term payoffs	unique life histories with seasonal and physical habitat variation	
Armoring	ShoreZone inventory (DNR) (Total miles and percent modified)	Direct	High		Years; seasonal considerations for micro-climate impacts	Structure	Removing or replacing with soft shore options; regulatory, incentive	Incentive programs available, long term more payoff	Technical assistance available for armoring removal/replacement; complicated social barriers, community led efforts for planting	
Water Structures	WA Geospatial Open Data Portal- DNR	Direct	High	Out to MLLW?	Years- Seasonal considerations for species impact	Structure	Removing or replacing with low impact design; regulatory; incentive		Social barriers; Enforcement complications with HPA, etc.	
Feeder bluff	WA Coastal Atlas Ecology	Indirect	High	Out to MLLW?	Years- decades	Mappable / Cumulative impacts from development, wave energy, etc.	Development pathway, restoration pathway	Upfront costs for restoration efforts, but long term pay off	Social barriers	
Drift Cell	Mapped within nearshore data	Indirect- sediment transport	Medium for ES, but important in relation	More of a spatial scale considera	Years- decades	Structure	More for monitoring for change over time rather than			

Attribute	Data	Direct/Indirect	Influence	Spatial scale	Temporal scale	Structure/ Cumulative	Solutions available	Finance/Costs/ Benefits	Implementation / Complexity	Recommendation
			to other attributes	tion than a stand alone attribute			mitigating? Different solutions depending on impacts to drift cell?			
Aquatic vegetation	ShoreZone Inventory (DNR) (eelgrass, floating kelp, non-floating kelp, sargassum)/ Marine vegetation atlas	Direct	High (habitat, water quality, etc)		Short-long for different aspects	Structure-cumulative impacts from multiple attributes	Transplanting (DNR working on seagrass); regulatory & restoration pathway	Relatively cheap	Enforcement complications with HPA, etc.; many active restoration efforts; DNR aquatic leasing/ co-managers	
Woody Structures	Mapped in different studies; Ecology's Coastal zone mapping & erosion monitoring	Direct (artificial placement) and indirect (Riparian condition/stream influence)	High		Years (placement) decades (riparian condition	Structure (placement) Cumulative (riparian condition)	Placement of planting/ riparian restoration overall	Cheap to plant in riparian, but then payoff longterm, placement?	Placement is simple, riparian planting/restoration has social barriers	
Fecal coliform	Ecology beach closure mapping; Ecology Marine water column and sediment supply, PIC program	Direct- treatment/wastewater Indirect- filtration from vegetation/species; runoff management	High		Infrastructure breech- immediate	Structure, but influenced by other attributes	Regulatory and treatment/infrastructure pathways, GI	PIC program funded	PIC program active	
pH	DOT Ferry data- Ecology	Indirect- carbon emission, upwelling; Direct	High		Seasonal variability	^^	Regulatory, restoration, infrastructure, GI			

Attribute	Data	Direct/Indirect	Influence	Spatial scale	Temporal scale	Structure/ Cumulative	Solutions available	Finance/Costs/ Benefits	Implementation / Complexity	Recommendation
		wastewater, runoff management								
Toxics	Ecology Marine water column and sediment data (Kitsap?)		High			^^	^^			
Nutrients	^^					^^	^^			
PAHs										
Sea Level Rise	UW SLR assessment and projections/ WA coastal resiliency project	Indirect	High		Long	Projection can be made, influenced by multiple attributes	Armoring and habitat restoration, resiliency adaptation/preparedness		Complex	
Fetch										
Shellfish beds	PIC program- Ecology beach closure data	Indirect	High			Location and presence absence mappable; cumulative effects from other attributes	Same as water quality attributes ^^	Programs already in place	Programs already in place	
Exposure class	ShoreZone Inventory (DNR)	Medium	Informative for getting at species/habitat & armoring guidance				Monitoring helpful for informing other attributes			

Attribute	Data	Direct/Indirect	Influence	Spatial scale	Temporal scale	Structure/ Cumulative	Solutions available	Finance/Costs/ Benefits	Implementation / Complexity	Recommendation
Substrate type	ShoreZone Inventory (DNR)	Medium	Informative for getting at species/habitat				^^			
Riparian vegetation	Can get at partially through armoring data; maybe local data, tribes?	Direct	High			Structure, but has cumulative impacts	Planting; similar to armoring considerations	^^ see armoring	^^ see armoring	

Thinking About the Pilot Watersheds

One of the key elements of this phase of the KNRAMP program is to pilot development of Desired Levels of Service (DLoS) for two pilot watersheds: Chico Creek (suggested by the Suquamish Tribe) and Big Beef Creek (suggested by the Port Gamble S'Kllallam Tribe). In previous phases of the project the Core Team selected a set of natural assets which would be the initial focus for KNRAMP (streams, forests, and shorelines), selected the two pilot watersheds, developed maps of the current status of natural assets in the watersheds, and gathered some initial information from tribal partners about where in the watersheds different natural assets are most important to Tribes and what that could imply for development of DLoS. Screenshots of these maps and their current status will be shared with you for reference.

During the current phase of the project, we hope to work with the Core Team and broader tribal engagement to add to and refine (as needed) information on where in the watersheds different natural assets are most important to Tribes and to set Desired Levels of Service for each natural asset throughout the watershed. The intention of the pilots is to explore methods for setting interim Desired Levels of Service and for determining where different Desired Levels of Service should apply. As part of their work on the project, WCA is developing a memo on potential methods to set Desired Levels of Service and we will go through that memo and discuss it at the Core Team workshop next week. We also are describing the pilot projects in the KNRAMP Implementation plan, which is due in October 2023. We'll go through the draft Implementation Plan at the Core Team workshop next week too.

In our conversation on Monday, July 10, we want to talk about the pilot process and get your initial thoughts. The purpose of this input is to help us develop the KNRAMP project Implementation Plan section that describes the process and role of the pilot projects; this information also could be used by WCA as they develop their document on potential methods to establish DLoS. As a first step, we are interested in your thoughts on the following.

1. We have been thinking that the following types of questions could be helpful in working together to establish DLoS for natural assets in the pilot watersheds. What do you think? Are there additional/different questions that would be helpful?
    - What services or other interactions with natural assets are most important to you in the watershed or provide you with the most benefit? Are you comfortable with the term Desired Level of Service or would you prefer another term such as healthy natural environment or something else?
    - When you look at the map showing the current status of natural assets in the watershed and think about what is most important to you, where in the watershed is it important to improve levels of service for different natural assets? Where is it most important to maintain current levels of service?
    - What are your goals for the natural assets in the watershed and what improvements are of the highest priority for the Tribe? Do you have time horizons associated with these goals? How do you envision the pilot watersheds improving from their current condition because of KNRAMP?
    - Do you have any existing standards or benchmarks that you use to determine whether the natural assets are meeting your needs? For example, what does healthy foraging look like for you? What are foraging goals for forests?

- What sorts of plans or programs do you have in place or participate in (e.g., salmon recovery plans) that help describe work needed for natural assets in the watersheds? How can we best use these plans in the pilot projects?
- How do you monitor natural assets in the watershed? Are monitoring methods expected or desired to change in the future and if so, why?
- Are there any challenges to monitoring or analyzing data that should be taken into consideration?
- What is the extent of the watershed for you? Are you comfortable with the term watershed or is it U&A (usual and accustomed lands) or a different term?

2. When you think about establishing Desired Levels of Service for natural assets in the pilot watersheds and the types of questions listed above, who else from the Tribe should be engaged in the process?
3. Do you have any thoughts on the appropriate methods of engagement or particular questions that engagement should focus on for different people/groups within the Tribe?
4. We would like to complete the process of establishing DLoS in the pilot watersheds by October 2023. What are your thoughts on that timing? How much time should we plan for engagement within the Tribe?
5. What else is on your mind as we think about starting the process for the pilot watersheds?