No Net Loss of Ecological Function
Guiding Questions and Summary Examples

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Introduction and Purpose

Almost 40 years ago the Washington State Legislature identified a "*clear and urgent demand for a planned, rational, and concerted effort, jointly performed by federal, state, and local governments, to prevent the inherent harm in an uncoordinated and piecemeal development of the state's shorelines*." Since then, local governments have worked to put the broad policies of the Shoreline Management Act into practical terms through the development and implementation of Shoreline Master Programs. In 2003, Department of Ecology (Ecology) specified that "no net loss" (NNL) of ecological function is the state standard for local Shoreline Master Program (SMP) updates. Ecology recently updated their SMP Handbook to provide additional guidance on how to achieve no net loss and now requires that each jurisdiction write a summary report describing how their SMP meets the state standard. On the surface, preparing a summary report is a relatively straightforward exercise, but achieving no net loss of ecosystem functions in the face of continued growth and degradation continues to prove challenging.

Local governments must employ strategic, focused and creative thinking throughout the entire SMP update process and during implementation in order to have a complete and compelling NNL strategy. This paper builds on Ecology's guidance and provides an overarching logic path to help local governments evaluate the effects that various policy decisions may have in terms of meeting the NNL standard. A consistent path for local governments to evaluate and implement the no net loss standard will also enable the state to standardize its review of local efforts in approving and tracking local SMPs.

The SMP update process is complex and local planners can become inundated with data, citizen and policy direction, and a myriad of technical tasks. To assist shoreline managers in staying focused, this paper provides a set of guiding questions and hypothetical examples of how the questions could be applied in order to identify management decisions, structure the detailed work of the SMP update, and document decisions and strategies for the NNL summary report.

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Current Shoreline Master Program Efforts to Address No Net Loss

Local governments have been implementing shoreline management programs based on the well-established model of avoid-minimize-mitigate for environmental protection. The so-called 'mitigation sequence' first directs development to avoid impacts, to minimize those that cannot be avoided and as a last result to mitigate any remaining impacts. There is widespread belief that this sequence alone is not sufficient for local governments to achieve no net loss of ecological function because it does not account for continued degradation from past changes, illegal actions and other losses that fall outside of traditional government jurisdiction or capacity. The integration of restoration plans into the avoid-minimize-mitigate model is one tool counterbalancing the continued loss of ecological function. Ideally restoration should increase the level of ecological function, not simply offset additional or ongoing effects of development.

Most of the recently completed SMP updates provide only a qualitative assessment of how their recommendations will result in no net loss and a broad assertion that restoration plans will make up the difference. Most do not describe a quantitative connection between the types of expected losses and the benefit of restoration. Local governments generally have not selected indicators of ecological function nor set spatially specific baselines against which SMP effectiveness can be measured over time. While the Puget Sound Partnership and the Puget Sound Nearshore Ecosystem Restoration Program have been working to establish measures at the regional scale, these indicators have not yet been tied to the local SMP update process. The authors of this paper believe that the use of indicators along with a more strategic assessment of ecological changes can enhance a local jurisdiction's ability to develop and implement a program that achieves the state's no net loss standard.

Guiding Questions

To navigate the complexity of a Shoreline Master Program update and be able to synthesize all the technical and policy work into a summary report demonstrating no net loss of ecosystem function, it is helpful to have a structure of guiding questions. It is important to Ecology that local governments describe how their SMP achieves NNL in the summary report showing how the different phases of the update process were integrated to reach the conclusion that the state standard has been met. The questions below are offered as a resource for local and state government staff. The questions are intended for use throughout the process - from the start of the SMP update through to the final approval by Ecology. The hypothetical examples described later in the paper illustrate how these guiding questions can facilitate the NNL analysis.

1. Which indicators best represent the existing ecological functions affected by SMP policies and regulations in your jurisdiction?
2. What are the baseline conditions for the chosen indicators? Are there restoration/recovery goals for either the chosen indicator or the functions the indicator represents?
3. What conditions and factors affect the current status of the indicator/functions (i.e., land-use, ownership, historic conditions, natural processes)?
4. What activities under SMP jurisdiction threaten ecological functions? Are there activities outside the SMP jurisdiction that need to be considered?
5. How do existing SMP policies and regulations avoid, minimize and mitigate impacts to ecological functions? What new approaches are needed?

6. What additional losses are likely to occur due to actions such as unregulated activities, exempt developments, continued degradation from existing development and illegal actions?
7. How are these additional losses offset to achieve a final outcome of no net loss? How does the SMP contribute toward reaching restoration or recovery goals?

Relationship of Questions to Ecology Grant Requirements

Although the questions are intended for use throughout the SMP process, the bulk of the work to answer each question correlates to the phases of the update required by Ecology's grant agreement with the local government as shown below:

- Questions 1, 2, and 3: Inventory and Characterization
- Questions 4, 5 and some of 6: Cumulative Impacts Assessment
- Question 6: Restoration Plan
- Summary of Responses to Questions 1-6: No Net Loss Summary Report

Choosing Indicators

The selection of indicators and establishment of baseline conditions is a critical step for local governments. Ecology has completed a set of indicators available in their new SMP guidance on NNL that may be useful to local governments and achieve the criteria below. Additional work by Kramer, Clancy and MacIlroy called the *No Net Loss Framework* (2010) may also assist planners as they pick indicators and set baseline conditions. To be useful for government decision-makers the indicators should be:

- Measurable and/or already being measured;
- Linked to specific SMP decisions; and
- Consistent or complementary to other regional efforts such as Puget Sound Partnership or Puget Sound Nearshore Ecosystem Restoration Program.

Hypothetical Examples

The following examples are a hypothetical application of the guiding questions stated above. The hypothetical examples are designed to be a part of a no net loss summary report, yet they do not represent a full NNL summary report in that they do not address all aspects of the SMP.

The examples assume the analytical work to determine if no net loss has been achieved was conducted through the shoreline inventory and characterization, cumulative impact assessment, the restoration plan and the development of SMP policies and regulations. The summary report is a synthesis of the analytical work once the jurisdiction has completed the tasks of the SMP process and is confident in their product.

Floodplain Function in "Livelihood County"

1. Which indicators best represent the existing ecological functions affected by SMP policies and regulations in your jurisdiction related to floodplain function?

   Ecological Functions of a Floodplain: A functioning floodplain provides a variety of ecological functions including: water quality (removal of toxics, sediment, phosphorous and pathogens through adsorption, filtration and retention); removal of nitrogen through denitrification; temperature regulation; water quantity (water storage and flow regulation and reduction in downstream flooding); habitat (formation of habitat structure from large woody debris, vegetation communities and sediment type/channel configuration that support aquatic life).

   Suitable Indicators (based on Ecology's Guidance): A suitable indicator for floodplain function is a measurement of the area available for natural flooding not constrained by flood control and other structures like houses that reduce floodplain connectivity and flood storage capacity. In Livelihood County, this indicator can be annually tracked through the issuance of building permits and can feed into regional assessments of Puget Sound health by the Puget Sound Partnership.

2. What are the baseline conditions for the chosen indicators? Are there restoration/recovery goals for the chosen indicator or functions the indicator represents? What conditions and factors affect the current status of the indicator/functions (i.e. land-use, ownership, historic conditions, natural processes)?

   Conditions and Factors Affecting Current Status: The inventory and characterization work showed that in Livelihood County there are three major river systems. The upper reaches of the rivers are designated as wilderness or are in state and private forestland. These areas are outside of the jurisdiction of the SMP and are regulated by state and federal regulations. There are no flood control facilities and few residential structures. The County zoning restricts lot size to one house per 40 acres limiting impacts from developments and sub-divisions. These upper reaches of the rivers are expected to remain in forest management for the 20 year planning horizon of the SMP and it is the assumption of the local government that state laws are achieving no net loss in these areas.

   Baseline Conditions for Floodplain Storage: In the lower reaches of the three rivers there are a series of flood control facilities. Levees comprise 60 percent of the length of the three rivers combined (60 miles of shoreline). In the areas unconstrained by levees (40 miles of shoreline) the current baseline condition for flood storage capacity is approximately 39,600 acre-feet. This assumes the average home and associated development results in a loss of 1 acre-foot of flood storage per site and there are approximately 400 homes in the

unconstrained areas.[2] There are approximately 40,000 acre-feet of storage possible in the unconstrained sections of the three rivers. The amount of flood storage lost in the areas already constrained by levees was not calculated.

Restoration/Recovery Goals: The salmon recovery plan states that approximately 80 miles of the lower reach shoreline miles must be connected to the floodplain to restore habitat to the levels necessary to achieve sustainable runs of Chinook and recover the population under the Endangered Species Act. This means an increase of 40 miles in addition to the current 40 miles of unconstrained and connected floodplain. The plan also calls for actions that increase flood storage.

3. What activities under SMP jurisdiction threaten ecological functions? Are there activities outside the SMP jurisdiction that need to be considered?

   The characterization process in Livelihood County showed that the activities that threaten flood storage include development of roads, infrastructure, levees, or buildings in a manner that impedes the river's ability to flood or connect to side channel habitats. The inventory and characterization work determined that in the lower reaches of the rivers of the county there has been increased growth resulting in increased pressure to sub-divide and develop the floodplain for residential use. Specifically, 300 of the 400 homes in this area have been developed in the last 10 years. Additional lands remain in the floodplain at risk of sub-division.

4. How do existing SMP policies and regulations avoid, minimize and mitigate impacts to ecological functions? What new approaches are needed?

   The proposed SMP update contains policies and regulations that require a conditional use permit for any new levees in the unconstrained sections of the rivers, prohibit new building lots from being created in the 100-year floodplain and require existing building lots within the 100 year floodplain to mitigate any loss of flood storage to the greatest degree practical. The proposed SMP will limit new roads in the floodplain unless there is an over-riding public safety or health issue. Where possible, existing roads will be maintained in a manner that improves or maintains ecosystem function. The policies and regulations of the proposed SMP update are consistent with the "state Floodplain Manual" and consequently will substantially avoid and minimize future impacts to flood storage.

5. What additional losses are likely to occur due to actions such as unregulated activities, exempt developments, continued degradation from existing development and illegal actions?

   Livelihood County determined in their SMP that unregulated development or illegal activities will not occur at a level significant enough to affect flood storage. This conclusion was based on a survey of the effectiveness of protection programs (Law, Abiding 2009). The county determined there will be continued loss of function from the existing 400 homes

[2] These homes are mostly built or renovated to meet federal and local flood protection standards.

and accounted for this loss as part of setting the baseline condition for SMP update. The inventory showed there are 1,000 undeveloped or underdeveloped lots in the unconstrained floodplain areas of the three rivers. It will not be possible to fully avoid all impacts from the development of these lots through SMP policies and regulations. Due to findings in the shoreline characterization it is anticipated that if these existing lots were developed the loss of flood storage will be approximately 1,000 acre-feet.

6. How are these additional losses to be offset to achieve a final outcome of no net loss? How does the SMP contribute toward reaching restoration or recovery goals?

   The restoration plan shows that Livelihood County's flood control plan calls for a total of 40 miles of levee removal and setback along the three rivers. These projects will provide approximately 40,000 acre-feet of new storage capacity. The removal and setback of levees will be done in a manner that also provides natural water quality treatment, and the creation of riparian habitat for the long-term recruitment of large woody material and other benefits. These actions will offset the 1,000 acre-foot loss projected through the characterization to occur through the development of new homes as well as the 400 acre-foot loss resulting from existing homes. As shown in the restoration plan, this will contribute 40 new miles of unconstrained river mileage toward the 80-mile goal described in the Salmon Recovery Plan. By ensuring the protection of the 40 unconstrained river miles from further levee constraints and strategically limiting development and new infrastructure in flood storage areas, the SMP protects baseline floodplain functions and sets the county up to achieve its Salmon Recovery Plan goal for floodplains.

Marine and Freshwater Riparian Vegetation in "Livelihood County"

1. Which indicators best represent the existing ecological functions affected by SMP policies and regulations in your jurisdiction for marine and freshwater riparian vegetation?

   Ecological Functions of Marine and Freshwater Riparian Vegetation: A functioning system of marine, freshwater and lacustrine riparian vegetation provides a variety of ecological functions depending on locale. These include: water quality (sediment, phosphorus and toxic filtration, conversion, and/or retention); temperature regulation; water quantity (flow regulation); habitat and food web (input of organics, prey base, and large woody debris contribution); and habitat structure for species' life needs (rearing, foraging, protection, etc.).

   Suitable Indicators (based on Ecology's Guidance): A suitable indicator for a functioning marine, riverine and lacustrine environment is a linear measurement of mature native riparian vegetation of a given width (buffer width) or percent cover of different vegetation classes. Livelihood County chose this indicator because it can be annually evaluated through aerial surveys and can feed into regional assessments of Puget Sound health by the Puget Sound Partnership.

2. What are the baseline conditions for the chosen indicators? Are there restoration/recovery goals for the chosen indicator or functions the indicator represents? What conditions and

factors affect the current status of the indicator/functions (i.e. land-use, ownership, historic conditions, natural processes)?

Conditions and Factors Affecting Current Status: The inventory and characterization showed that the upper reaches of the three rivers are designated as wilderness or are in state and private forestland. These areas are outside of the jurisdiction of the SMP and are regulated by state and federal regulations. The lower portion of the river is mixed agriculture, urban growth area and residential. Lands in existing agricultural use are exempt from SMP requirements and are regulated by state regulations. The local government is under the assumption that state and federal laws governing these lands will achieve no net loss of function in these reaches. The inventory showed that in Livelihood County there are 100 miles of riverine shoreline, 30 miles of marine shoreline and 20 miles of lake shoreline under SMP jurisdiction.

Baseline Condition of Marine and Freshwater Riparian Areas: Of the 150 miles of shoreline under SMP jurisdiction 70 miles have a vegetative width of 150 feet or greater of mature native riparian vegetation and 80 miles have a more narrow width or no cover at all. The areas with the most intact riparian vegetation (contiguous lengths of mature vegetation) are in the middle section of the Fish River, lower reaches of Trout Creek, river miles 10 to 20 on the Grays River and marine drift cells 760 -780.

Restoration/Recovery Goals: The Salmon Recovery Plan identifies that 120 miles of intact riparian habitat under County jurisdiction are necessary to maintain sustainable runs and recover Chinook.

3. What activities under SMP jurisdiction threaten ecological functions? Are there activities outside the SMP jurisdiction that need to be considered?

   The inventory and characterization showed that the main threats to riparian loss are: new residential development, redevelopment, sub-standard lots development, natural river migration and illegal and non-regulated activities.

4. How do existing SMP policies and regulations avoid, minimize and mitigate impacts to ecological functions? What new approaches are needed?

   The County's proposed SMP update incorporates in policy and regulation the practices recommended by the state Aquatic Guidelines. See Table 1 below:

Table 1

Riparian Vegetation	• Promote off-site mitigation to address cumulative impacts using the restoration component of the shoreline master program	Yes. The SMP promotes off-site mitigation and the restoration plan identifies numerous mitigation/restoration opportunities.
	• Identify riparian protection areas that support existing functions through no-touch buffers in undeveloped areas and enhancement and mitigation requirements related to expansions or redevelopment of developed areas	Yes. The SMP requires buffers 150 feet on all marine and river shorelines. Buffers must remain well-vegetated.
	• Require site surveys of existing conditions including vegetation function analysis	Yes. SMP requires site specific studies and mitigation for most all development actions.
	• Protect riparian areas and require mitigation for lost habitat elements such as trees, logs, and boulders	Yes, as noted above.

In additional to the regulations described above, the proposed SMP will require the retention of native vegetation buffers in new development that range from 100 to 250 feet. A minimum of 100 feet is required in areas where the primary concern is water quality. In areas where the full set of ecological functions is present a buffer of 250 feet is required. In addition to the buffer requirements, the county in partnership with two nonprofit land trusts has prioritized riparian areas along the Fish River and marine drift cell reaches 770 -780 for acquisition and permanent open space use. The County also has a technical assistance program for property owners to help them protect and enjoy their property while maintaining mature riparian vegetation. This is complimented by a tax incentive program that rewards property owners who commit to long-term conservation of the riparian areas on their properties.

The combination of best management practices, regulations, education and incentives are expected to protect the ecological functions provided by mature riparian vegetated corridors.

5. What additional losses are likely to occur due to actions such as unregulated activities, exempt developments, continued degradation from existing development and illegal actions?

   There will be unavoidable impacts from unregulated and illegal activities. In a survey conducted as part of the shoreline inventory, the county found that property owners tend to cut, thin and replace native riparian vegetation. In surveying 20 miles of riparian vegetation the county found a loss of 15 percent over a twenty-year period due to landowner activities and a 20 percent loss of riparian cover due to river migration. With 70 miles of intact vegetation this would result roughly in a 10 mile loss of functioning habitat (at 150 feet of width) over the 20 year life of the SMP from human activities and 14 miles from river migration.

6. How are these additional losses offset to achieve a final outcome of no net loss? How does the SMP contribute toward reaching restoration or recovery goals?

   To address this continued impact to the County's riparian health the restoration plan calls for an aggressive program of riparian restoration in four areas: along each of the three major rivers and sections of the marine shoreline. This program would annually plant native species on 2 miles of river and marine shorelines in the County. The program will restore 40 miles of riparian habitat over 20 years for a net gain of 16 miles after taking into account the expected losses. Thus the SMP will contribute approximately 86 miles of riparian habitat to the overall goal in the Salmon Recovery plan of 120 miles.

The authors of this paper hope that in reading the examples above the reader is able to discern where they were confident in Livelihood County's approach, where they had concerns about the county's methodology, strategy or conclusions and where they would determine the approach was either too restrictive or not restrictive enough to achieve no net loss of function. The authors believe the type of information provided in response to the questions is a beginning place for local discussion, state and local dialogue and ultimate Ecology decision-making.

Additional Actions Needed to Improve No Net Loss Support for Local Government Success

The examples above illustrate how local governments could describe their strategies and the results of their SMP update relative to achieving the state's standard for no net loss in a tangible and measurable way. We assume this level of analysis can be done now with existing resources. However, for local governments to improve the certainty and transparency of their strategies to achieve no net loss additional actions are necessary:

- All local governments use a standard set of indicators with the flexibility to add additional indicators as needed;
- Funding for monitoring programs to collect information about the indicators at both the local and regional scales;
- Guidance on how to best mitigate losses to ecological function in a manner that achieves no net loss;
- Standardized methodologies for how to establish baseline conditions for indicators; and

- Guidance on how to determine future risk of losses caused by illegal activities, predictable natural phenomenon like river migration, unregulated activities, etc.

Conclusion

The no net loss summary statement report now required by Ecology is an important tool for local and state governments as well as recovery and restoration partners to understand the predicted or likely ecological results from an SMP update process. Incorporating local and regional ecosystem goals with the SMP update with the state requirement to summarize the achievement of no net loss can provide the public and decision-makers a stronger sense of what is to be gained or lost from implementation of new policies and regulations. Establishing baseline conditions and then conducting analyses relative to specific, even if imperfect, indicators forces thinking on how to measure success and track results through implementation.

A successful strategy for achieving no net loss must engage citizens and decision-makers in a manner that inspires constructive dialogue and action. Decision-makers and the public have been told about the resources that have been lost, the vision for Puget Sound health, and how the SMP will contribute to their quality of life, sense of place and general wellbeing. However, decision-makers and the public would better be able to use the information if it was quantifiable, spatially specific, and logically connected. The hypothetical examples contained in this paper are intended to show how the guiding questions can be used to take the conceptual term, no net loss, and turn it into a substantive, measurable and meaningful description about a place. The examples also demonstrate how we can talk about shoreline management issues in a manner that motivates citizens and decision-makers to make the hard choices and balance the needs of the community and requirements of the state.

The analysis and summary need to result in a clear and concise statement that is compelling and inspiring to government officials and staff, the local community and especially shoreline property owners as they plan for their future. Achieving clarity and simplicity for an SMP is not an easy task. Good guidance and examples are necessary if local governments are to succeed. The authors hope this set of questions and examples fosters thinking and discussion that moves the Puget Sound region closer to achieving no net loss in a manner that builds understanding of the SMPs critical and specific contribution to Puget Sound health.