The Gorst Creek Watershed White Paper

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ACRONYMS

Ecology	Washington State Department of Ecology
EPA	U.S. Environmental Protection Agency
UGA	Urban Growth Area
WDFW	Washington Department of Fish and Wildlife

USING PUGET SOUND WATERSHED CHARACTERIZATION TO SUPPORT LOCAL LAND USE PLANNING: A CASE STUDY—THE GORST CREEK WATERSHED[1]

In 2010, the City of Bremerton received a grant from the U.S. Environmental Protection Agency (EPA) to support use of the Puget Sound Watershed Characterization as the basis for considering existing conditions from a landscape and ecological process perspective and how zoning and development standards could be modified, within the Gorst Creek Watershed, to recognize landscape and ecological processes. The Puget Sound Watershed Characterization is an analytical framework developed by the Washington State Department of Ecology (Ecology) that provides the basis for understanding the relative value of areas on the landscape (called "assessment units" for water flow processes), water quality, and habitat within the Gorst Creek Watershed (Stanley et al. 2012). Washington Department of Fish and Wildlife (WDFW) collaborated on this project and provided data and analysis to support the habitat assessments.

Based on the analysis provided by the Puget Sound Watershed Characterization, the City was able to plan for future growth in a way that preserves, protects, and restores natural systems, habitats, and species, while at the same time identifying areas that are more suitable for additional development and growth. Protecting and restoring areas that are important to maintaining water flow and habitat will save time and money in the long term within the watershed. These benefits accrue because fully functioning natural systems contribute significantly to reduced flooding and erosion, and support water flows and water quality important to people, wildlife, and aquatic species. Additionally, understanding where development can occur at the least environmental cost creates certainty for local jurisdictions seeking to accommodate growth, and for developers seeking to minimize time and costs associated with permitting development.

The purpose of this white paper is to use the Gorst Creek Watershed Characterization project as an example of how to apply the analytical framework to inform land use planning at the local level. Applying the watershed characterization's analytical framework consists of the following steps:

1) Identify the project's purpose
2) Choose the appropriate scale of analysis
3) Evaluate model results
4) Identify the predominant land use within the focus areas
5) Develop a robust public process to educate stakeholders about results of the analysis
6) Refine the management zones based on model results and local data

WHY GORST CREEK WATERSHED IS IMPORTANT:

The Gorst Creek Watershed is significant for several reasons:

- Public ownership and management of the forest land in the central portion of the watershed has protected water flow processes, which remain in relatively good condition, with respect to other portions of the landscape.
- Gorst Creek and its tributaries, including Sinclair Inlet at the mouth of Gorst Creek, support trout and anadromous salmonids and their habitat.

[1] Note: This white paper relies on two primary sources: Gorst Creek Watershed Characterization Report (Parametrix 2012) and the Puget Sound Characterization, Volume 1: The Water Resource Assessments (Water Flow and Water Quality), Ecology Publication #11-06-016 (Stanley et al. 2012), of which the author of this white paper is a co-author. The sections of this white paper based on Stanley et al. (2012) were primarily written by the author of this white paper.

- The Gorst Creek Watershed is described as "one of the largest and most productive watersheds in the east WRIA-15 subregion" in the 2003 Kitsap Salmonid Refugia Report (May and Peterson 2003).
- Jarstad Creek has the greatest value for salmonid conservation in the watershed (May and Peterson 2003).
- Heins Creek is rated "generally good" for habitat conditions (May and Peterson 2003).
- Gorst Creek, above river mile 1.0, rated 23rd of 95 salmonid refugia areas scored within Kitsap County (May and Peterson 2003).
- The estuary (Sinclair Inlet) supports waterfowl, shorebirds, great blue herons, and bald eagles, and is an important rearing and refuge area for juvenile Chinook salmon.
- The forested area that comprises the north and central portion of the Gorst Creek Watershed is publicly owned, and lies within a contiguous area that also contains Green Mountain and Tahuya State Forest. Taken together, this area comprises the largest open-space block in the Puget Trough Ecoregion of the Puget Sound Basin.
- The Kitsap County Comprehensive Plan has identified this area as an urban growth area (UGA) and assigned it to Bremerton. Bremerton plans to annex the area in the near term.
- Sewers were recently installed in the UGA. This will facilitate development that has been otherwise prevented over the long term.

While the Gorst Creek Watershed contains significant natural resources, it is also an area that is anticipated to develop over the next several decades.

HOW ARE THE WATERSHED CHARACTERIZATION RESULTS APPLIED?

The results of watershed characterization provide a readily accessible spatial integration of the condition of watershed processes across a selected watershed (such as Gorst Creek), a Water Resource Inventory Area (WRIA), or the entire region. These results can then be used to address two fundamental questions: (1) ***where on the landscape or within a watershed*** should management actions be focused, and (2) ***what types of actions*** would likely be most appropriate, be they restoration, protection, conservation, or development, given the historical ecological functions and likely current state of those functions based on the environmental constraints and problems[2] already present? Figure 1 illustrates how the characterization results might be applied, depending on the project's purpose and the scale of analysis.

[2] For example, in a heavily urbanized watershed, removal of existing impervious surface (a constraint) to address erosive flows (the problem) in a potential stream restoration project may not be feasible.

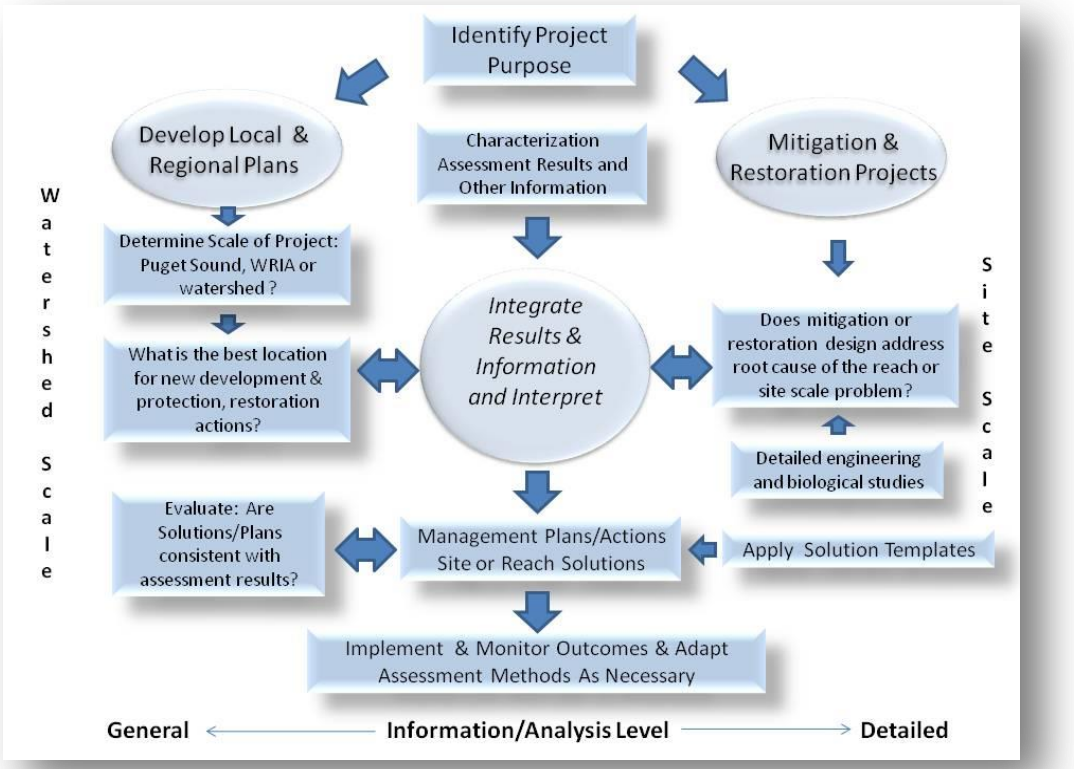


Figure 1. Flow diagram for applying assessment results within the analysis framework.

Source: Stanley et al. (2012)

The primary use of information from the assessments is to guide projects such as comprehensive planning, which occur at the watershed scale and require a "general level" of information and analysis (the left-hand side of Figure 1). At these spatial scales, the assessments indicate where it is most appropriate to restore, protect, conserve, or develop. The assessments can also inform decisions regarding site-level projects (the right-hand side of Figure 1) involving mitigation and restoration projects, by providing essential information on a landscape context. Site-level projects must take into account conditions at larger spatial scales and determine the "root cause" of environmental problems and impacts being addressed at the site or reach scale.

Regardless of project intent, the landscape is broken into discrete landscape groups (Mountainous, Lowland, Coastal), and then, in turn, broken into smaller units, called "assessment units" by the model. Because the individual assessment units are typically several square miles in area, "where to focus" cannot be defined more precisely without additional information. Similarly, guidance on "what to do" will commonly require additional site-specific information that is not included in the characterization datasets. The analysis framework provided here, however, offers a systematic approach to reduce the universe of "do all things, everywhere" to a more tractable set of actions that have a high likelihood of improving watershed health.

The following steps, following the framework illustrated in Figure 1, are recommended for making use of the watershed characterization results. The Gorst Creek Watershed, located in Kitsap County, and more particularly within the Gorst UGA, is used as an example of how to apply the characterization results.

Step 1. Identify the project's purpose.

The watershed characterization results are most useful in two broad arenas: (a) identifying priority areas for management attention (active restoration, proactive management through land use planning, or designation for future population growth given relative resource insensitivity to land use change); and (b) identifying likely beneficial actions for particular areas already selected by other decision-making processes. A typical example of the former is how to allocate regional restoration funds; of the latter, framing the range of likely effective actions to be subsequently developed in a sub-watershed plan in response to regulatory or citizen concerns.

In addition, the watershed characterization results can be used by site-scale projects (mitigation and restoration) to help evaluate whether the project is addressing "root causes" of environmental problems. Of course, such an evaluation also requires more detailed analysis and information at the site scale, which is not provided by the assessment results.

Example: *The primary motivation for the Gorst Creek Watershed Characterization (WRIA 15, City of Bremerton) was:*

1) *Assist in developing a watershed-based management plan for the freshwater and terrestrial portions of the watershed; and*
2) *Identify the best areas for protection, conservation, restoration, and development.*
3) *Facilitate development in the best areas by incentivizing growth in those areas while requiring significantly higher protection standards in areas identified for protection and conservation to discourage development there.*

The main intent was to use the watershed characterization results to provide science-based information to the City of Bremerton and Kitsap County's land use plans and regulations. The specific objectives were to identify areas within the watershed to restore, protect, and conserve, and on which development could be focused with the least amount of additional environmental impact. The results are also being used to guide the types of protective and mitigation strategies that are likely to be most appropriate and effective in each of these areas. For example, the watershed characterization results, supplemented by literature on urban stream buffers, were used to establish proposed buffers (in the form of a management overlay on top of other regulations) to the lower reaches of Gorst Creek.

Step 2. Choose the appropriate scale of analysis.

If the project's purpose is for developing local or regional plans (left side of Figure 1), then it must be determined if the work being done is within a WRIA context, a single jurisdiction, or part of an initiative for an entire region. In the case of the first (and commonly the second) scale, the WRIA-specific results are most appropriate; project-specific analysis boundaries may also be required. If the latter scale (i.e., whole region) is appropriate, then the results from the entire Puget Sound region are more relevant. Clearly, in the case of Gorst Creek, this area represents a sub-area within a WRIA.

The scale of analysis (including any larger spatial scales that should be considered to provide adequate context) must be determined by the scale of the issues and the availability of sufficient (and sufficiently detailed) data.

Example: *The City of Bremerton requires information on the best places to develop, protect, and restore for only a single watershed. Therefore, the analysis was scaled to this single watershed, which is 6,570 acres (10.3 square miles) in area (Figure 2). This required 21 newly defined assessment units (i.e., smaller than those already available through the characterization) following the procedures described in Appendix B of Stanley et al. (2012 as revised in 2013).*

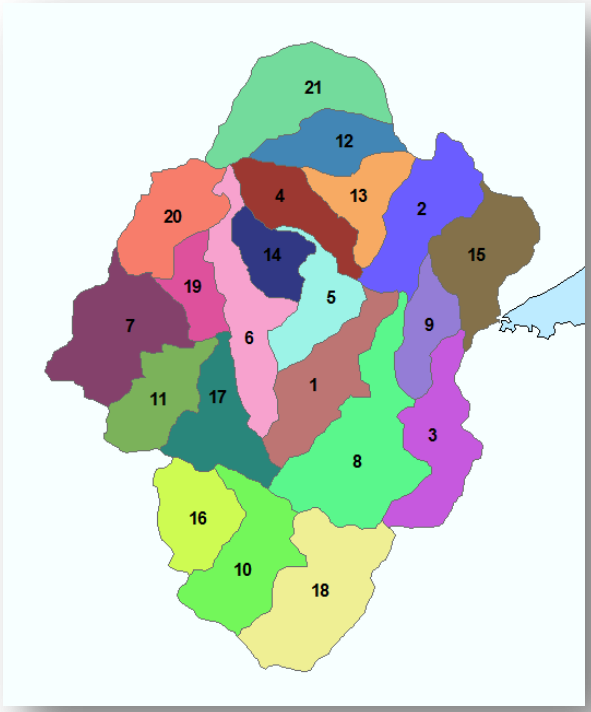


Figure 2. Assessment Units for Gorst Creek Watershed.

Step 3. Evaluate model results.

The overarching recommendations provided by the water-flow assessments are expressed through the mapped results of applying the management matrix, as described in Stanley et al. (2012) and reproduced below in Figure 3.

Figure 3, presented in the color code used by the management matrix, answers the question: "What is the most appropriate management strategy for an assessment unit?" This step requires identifying broad and spatially coherent "management zones," based on the mapped results of integrated water-flow assessments.

Example: *Based on the assessment results for the individual water flow components (delivery, storage, recharge, and discharge) in the Gorst Creek Watershed, assessment units display spatial patterns that suggest an overall distribution of regions broadly suited for restoration, protection, and development. Figure 4 presents those results, and the broadly defined management zones that were revealed by the characterization results in the Gorst Creek Watershed.*

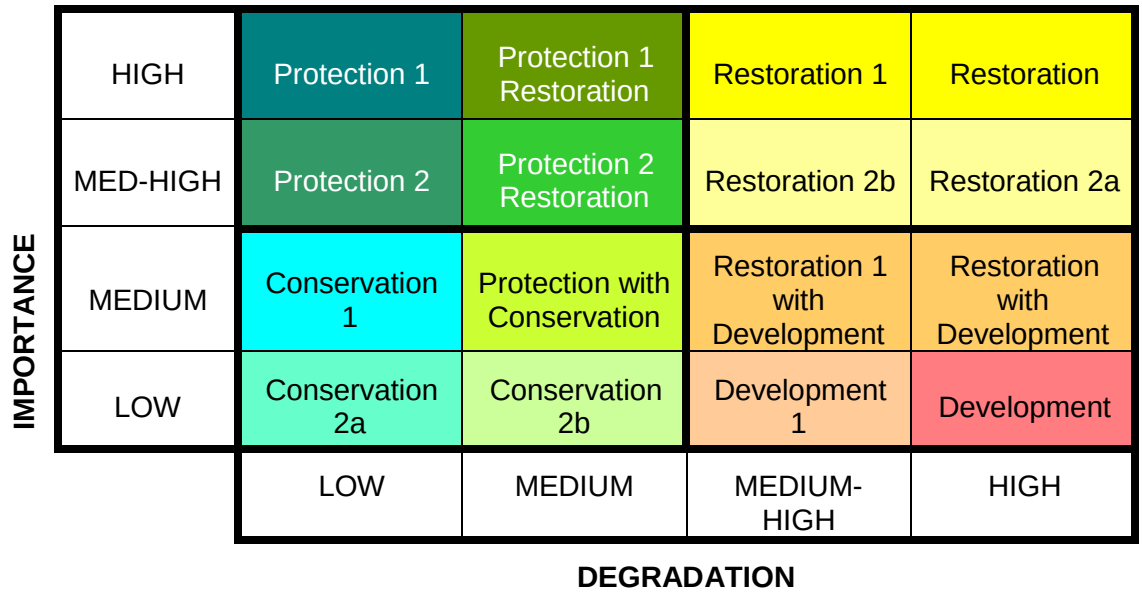


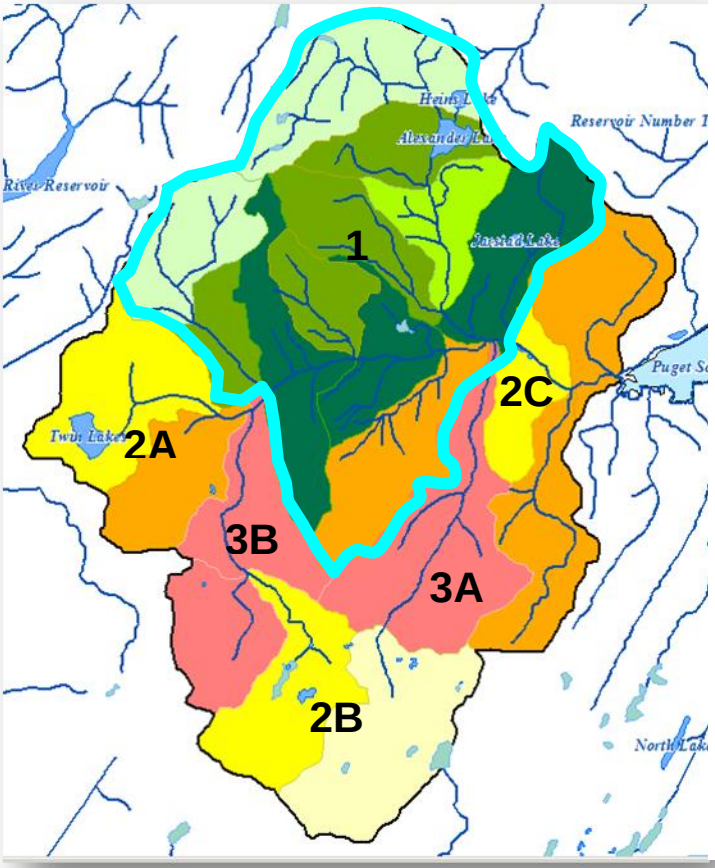
Figure 3. Management Matrix (Stanley et al. 2012)

At this point in making use of the watershed characterization results, the purpose (Step 1) of the analysis determines the next steps to be taken. If the primary purpose is to develop local and regional plans, then the product of Step 3 may be all that is required. Elements of the following steps (Step 4, identify predominant land use, and Step 5, refine management zones) may provide some additional guidance, but the primary contribution of the characterization to planning is largely complete at this stage. If, however, the purpose of the analysis is not only to define but also to address environmental problems, then following the steps below in their entirety will typically provide additional value.

Step 4. Identify the predominant land use within the focus areas (from Step 3).

This can be done by referring to the land cover maps that are part of the underlying characterization data. For the purposes of using the characterization results, the recommended categories are quite broad (termed "forest lands," "rural lands," "agricultural lands," and "urban/suburban"), reflecting an equally broad discrimination of the types of typical degradation conditions associated with these human activities and the types of remedial actions that are most suited to the associated land uses. Analogous to Step 3, any single assessment unit almost always encompasses multiple land uses. Particular management actions should always be targeted to specific land uses at whatever scale they actually exist, but the characterization results are too coarse to reflect this common fact.

Example: *In the Gorst Creek Watershed, forests predominate in the northern portion and a combination of forest and rural residential uses predominates in the southern portion. Agriculture is not a significant land use within the watershed. Thus, the solutions (Step 5) emphasize forestry and rural residential land use types.*



1 Protection Zone (Green). This area is key to recharge and discharge processes for Gorst Greek. Permitted uses must preserve forest cover and not result in conversion.

2. Restoration Zone (Yellow). Lower intensity uses.

A – Restore recharge, discharge, and delivery process, limit urban development, maintain in open space uses.

B – Residential uses but protect/restore storage functions of wetlands.
C – Restore recharge/discharge processes using LID measures.

3. Development Zone (Pink & Orange). Moderate to higher intensity urban uses.

A – Protect against erosion & sediment export with adequate setbacks, buffers & vegetation cover. Cluster development
B – Restore stream corridor; cluster development.

Figure 4. Overall Management Zones within Gorst Creek Watershed

Step 5. Develop a robust public process to educate stakeholders about results of the analysis

The result of this process may restrict or inhibit development in some areas not conventionally considered under local critical areas ordinances. This could be perceived by landowners and the general public as an infringement on property rights if handled improperly. In response to this, the City organized an extensive public involvement program to allow stakeholders to weigh in on the guiding principles of the land use planning effort. Clear explanations of the science behind the development of the management zones, combined with discussions of salmon and restoration issues created a consensus on the value of presevation and enhancement of the environment as an over-arching goal for the effort.

Following from a series of public workshops over a 14-month period, the City was surprised and pleased that the public helped craft a Preferred Alternative that incorporated land use and environmental features that were the most environmentally friendly of the alternatives studied in draft EIS. The City found that using a process based on science created a team focus on making good land use decisions between the regulatory agencies, City and County staff, local tribes an the public at large. The Preferred Alternative was the basis for the policies and regulations in the Subarea Plan including a Gorst Creek Management

Overlay promoting riparian and stream enhancement in exchange for development incentives and Low Intensity Waterfront commercial and Low Intensity Mixed Use zones promoting less impervious surfaces.

Step 6. Refine the management zones based on model results and local data

By aggregating assessment units, both by the model output (recommended management strategy from the management matrix in Figure 4 above) as well as local land use, general categories of management actions can be identified within the watershed. Figure 4 illustrates the management zones and proposed strategies within these management zones in the Gorst Creek Watershed.

Generally, the recommendation is to protect the north-central portion of the watershed, the tributaries, and the estuary, while allowing for additional growth and development in the south and southeastern portions of the watershed, subject to existing protection measures and best management practices. Specific details on the integrated results are provided in the Gorst Creek Watershed Characterization Report (Parametrix 2012 as amended in 2013). These results provide high-level guidance, which was used by the City of Bremerton and Kitsap County in developing a planned action environmental impact statement, Watershed Framework policies, and a Gorst Subarea Plan as the City seeks to establish the groundwork for planning growth, while at the same time protecting and conserving the significant natural resources of the Gorst Creek Watershed.

SUMMARY

Application and use of the Puget Sound Watershed Characterization is an important component in integrating the consideration of the effects of driving landscape processes related to water flow, water quality, and habitat assessment models. The six basic steps of application should be followed:

1) Identify the project's purpose
2) Choose the appropriate scale of analysis
3) Evaluate model results
4) Identify the predominant land use within the focus areas
5) Develop a robust public process to educate stakeholders about results of the analysis
6) Refine the management zones based on model results and local data

This information can then be used as the basis for developing local land use policies that allow for the protection, conservation, and preservation of significant resources, while steering development towards areas that can more readily accept development without exacerbating environmental conditions.

While the habitat assessment models were not completed during the Gorst Creek Watershed Characterization, habitat data and analysis were provided by WDFW to inform the overall management strategies for habitat protection in the watershed (Parametrix 2012). Since that time, WDFW and Ecology have published Volume 2 of the Puget Sound Watershed Characterization Project (Wilhere et al. 2013).

Taken together, Volumes 1 and 2 of the Puget Sound Watershed Characterization, when used as the basis for establishing local land use policies, zoning, and development standards, provide enhanced protection and restoration to significant natural resources, while at the same time identifying areas for additional development within Puget Sound.

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