

Thurston County Watershed Characterization



A Guide for Local Planners



This project has been funded in part by the United States Environmental Protection Agency under assistance agreement (Grant #WS-96073601) to Thurston County's Water Resources Program. The contents of this document do not necessarily reflect the views and policies of the Environmental Protection Agency, nor does mention of trade names or commercial products constitute endorsement or recommendation for use.

October 2012

Acknowledgments

We would like to acknowledge the Environmental Protection Agency (EPA) for providing the grant funds under contract WS-96073601-0 to complete this important work for Thurston County and the South Puget Sound, with special mention of EPA staff Krista Mendelman, Melissa Whitaker, Evelyn Holtzendorf, and Tony Fournier for their invaluable guidance and support to assure Thurston County's success on this project.

We also want to acknowledge Derek Booth, Ph.D, Rich Horner, Ph.D., and Dave Montgomery, Ph.D., for their thorough peer review and comments on the Methodology to assure a scientifically rigorous document that meets the best available science standards. Additionally, we want to thank Stephen Stanley and Susan Grigsby, both with Washington State Department Ecology (Ecology) for their continued support of Thurston County's work and the use of their "Planner's Guide" template.

And lastly, we want to acknowledge Dick Gersib, Washington State Department of Transportation (WSDOT) (formally employed with Ecology) for his continued persistence and vision of management of our natural resources at a watershed scale.

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Publication and Contact Information

This document is available on Thurston County's website at <http://www.co.thurston.wa.us/waterresources/chara/chara-home.html>

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Contents

Introduction	1
Who should use the watershed characterization assessment information?	2
What planning processes can the watershed characterization assessment support?.....	2
What is a watershed characterization?	3
How can planners use the watershed characterization results to guide land use policy?.....	4
What are the watershed characterizations results not appropriate for?.....	6
How have the watershed characterization results been used so far?.....	6
Where can I see results for my watershed?	7
What data sets are used in the watershed characterization assessment?	7
Where can I get information on processes not evaluated by the watershed characterization assessment?	7
How do I get help interpreting and applying the watershed characterization assessment in my watersheds?.....	8
References	8

List of Figures

Figure 1. Drainage Analysis Units Ecological Function in the McLane Creek Study Area	2
Figure 2. Example of Potential Actions to Correct Water Quality Problems in the Totten and Eld Inlets... 5	5
Figure 3. Examples of restoration opportunities in the Deschutes Watershed	5
Figure 4. An example of potential actions to prevent lowland flooding in the Deschutes Watershed.....	6

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Introduction

Watershed-based methods will be most effective when the approach is driven by landscape needs and conditions rather than an individual site needs. This is because the success of a restoration project will vary depending not only on the level of disturbance (anthropogenic or natural) of the site but also the landscape within which the site resides (NRC 1992).

Local governments can benefit from watershed landscape information as they develop land use plans, designations, regulations, and development standards.. The Thurston County watershed characterization project provides this information for planners in Thurston County and other surrounding local governments for use as a tool in their planning efforts. .

Watershed characterization establishes a framework to identify science-based data that enables “informed solutions” and actions to address the impairment of ecological processes in the watershed. One method for conducting this characterization is outlined in *Methodology to a Watershed Based Approach to Clean Water and Natural Resource Management*. It is available at <http://www.co.thurston.wa.us/waterresources/chara/chara-home.html>.

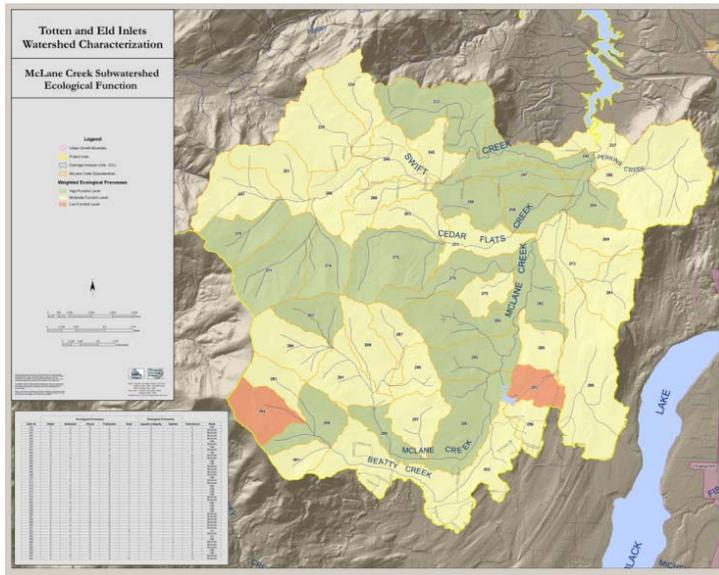
Thurston County has completed three watershed characterization studies: Henderson Inlet; Totten and Eld Inlets; and the Deschutes River. A fourth study, the Nisqually River watershed characterization is expected to be completed by July 1, 2013.

The results of the Thurston County watershed characterizations include information on five upland ecological processes, as well as the current condition of natural resource sites, and habitat fragmentation. The assessment of ecological processes and wetlands, riparian areas, and floodplains, within the context of their location in the landscape will provide scientific information to guide sound planning decisions.

The goal of watershed characterization is to identify areas within each watershed that are more suitable for:

- Restoration actions;
- Protection; and
- Higher intensity development.

This assessment produces “watershed management” maps of drainage analysis units (DAU) showing locations where restoration actions are more likely to succeed (yellow DAUs) and will provide the greatest environmental lift (benefit) of ecological function in the watershed. Each DAU is an area of approximately 0.25 square miles, which is evaluated within the watershed characterization and assigned one of three designations: Properly Functioning (green), At Risk (yellow), and Not Properly Functioning (red). The natural resource areas located in green DAUs should be targeted for preservation, and natural resource sites within the red DAUs represent natural resource sites that would provide the least environmental lift if restored. Figure 1 details the DAUs that are properly functioning, at risk, and not properly functioning in the McLane Creek study area.



Planners can also evaluate known problems in the watershed within the context of the watershed characterization maps. The characterization of the upland areas of a watershed may help identify specific land use and development practices that have contributed to the ecological function of the DAU, and thus could identify appropriate actions to address specific problems or protect areas of high ecological value.

Figure 1. Drainage Analysis Units Ecological Function in the McLane Creek Study Area

In combination with other available data, watershed characterization information provides an ecosystem perspective of the ecological functions and processes to support watershed-level planning and the development of land use policies and decisions.

Below is general information on the watershed characterization assessment process and how it can be used. Additional detail on watershed characterizations can be found in the *Methodology to a Watershed Based Approach to Clean Water and Natural Resource Management*. It is available at <http://www.co.thurston.wa.us/waterresources/chara/chara-home.html>

Who should use the watershed characterization assessment information?

Information from the watershed characterization assessment could be used by local planners, resource managers, and land use and planning consultants. The information should be evaluated and applied to local plans with the assistance of technical experts familiar with watershed characterizations. These might include a geomorphologist, hydrologist, landscape ecologist, and a wildlife and fisheries biologist.

What planning processes can the watershed characterization assessment support?

Potential applications of completed watershed characterizations include comprehensive plans, Shoreline Master Program (SMP) updates, and Critical Areas Ordinances (CAOs). Additionally, they can be helpful in structuring regulatory or policy approaches at the sub-watershed scale.

For example, a planner might target the DAUs that are properly functioning on the watershed management map to support the need to protect critical areas. Protection could occur through

updates to Critical Areas Ordinances, public outreach and education, and/or incentive programs.

The watershed characterization results can also be used to target restoration actions in an At Risk (yellow) DAU to prevent further degradation, with the ultimate goal of attaining a Properly Functioning DAU (green) status. Whereas Not Properly Functioning DAUs (red) may be the best place to create a higher density development vs investing limited resources where there would be little to no environmental lift.

For a more complete list of potential uses, visit <http://www.co.thurston.wa.us/waterresources/chara/chara-home.html> and click on Part V.

What is a watershed characterization?

Watershed characterization is a **relative comparison** of areas within a larger study area or watershed that are better suited for management actions to support ecological function and processes. The study area is further delineated into “drainage analysis units” (DAUs). The DAUs are approximately 0.25 square miles (160 acres) depending on the actual topography as determined by using 2002 LiDAR with ESRI ARC-HYDRO.

The goal is to analyze and identify the ecological processes and natural resources that maintain a functioning watershed, and to identify how anthropogenic (human) activity has impacted those processes within the study area. The five physical processes and one biological element focused on in this work are listed below.

Physical processes:

- Movement of water
- Movement of large wood
- Movement of sediment
- Movement of Pollutant and nutrients
- Movement of heat

Biological elements:

- Upland habitat connectivity

The alteration of these core processes and elements by human activities results in a change in how a site functions. These processes and elements operate over large spatial and temporal scales and have typically not been assessed when evaluating site specific development and natural resource restoration activities. Watershed characterizations evaluate the potential natural resource restoration success in the context of its location on the landscape.

Thurston County’s framework included the following steps:

1. Define the appropriate spatial scales to be used in watershed characterization;
2. Compile land use/landcover information for pre-development and current conditions;
3. Develop an understanding of the ecological processes within drainages occurring in the study area, identify key drivers for those ecological processes, and begin to understand how past and present land use has altered ecological processes;
4. Characterize the general condition of ecological processes within the largest acceptable landscape scale; and

5. Identify landscape areas and analyze degradation to priority ecological processes under current conditions.

The focus of this work is to identify natural resource sites (i.e., wetlands, riparian areas, and floodplains) that can be restored with a high probability of success given their location in the landscape. The outputs of this work can be used as a first screening tool to evaluate natural resource restoration opportunities and to rank preservation sites for conservation purchases.

How can planners use the watershed characterization results to guide land use policy?

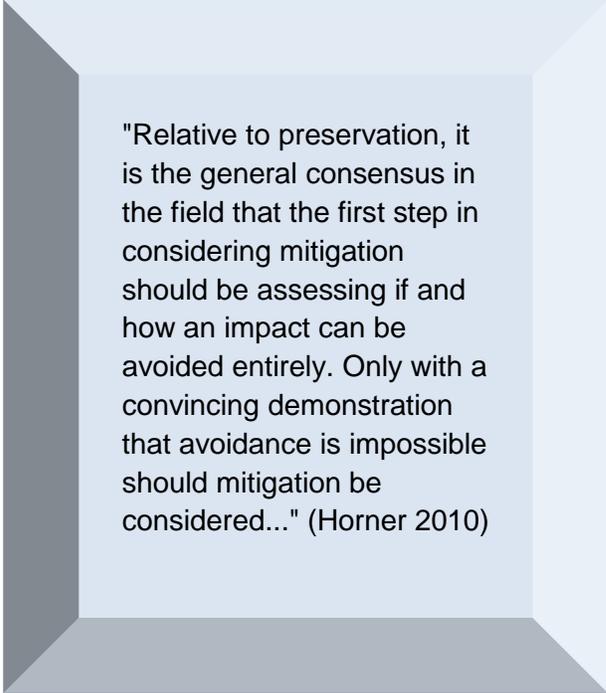
The watershed characterization assessment produces a database and GIS maps that planners can use to guide a watershed based management framework. Actions identified in the framework should support ongoing watershed management goals.

The outputs of the watershed characterization work include multiple GIS generated maps that detail the ecological function of the five processes in each DAU and the function level of natural resource sites within that DAU. There are multiple attributes used to determine DAU function level and status of natural resource sites. All the attributes are attached to the GIS files for reference and also available in an Excel format.

Planners can query the output files to determine the highest ranked restoration sites or sites that are ranked high for preservation. Planners can also utilize the data to assess proposed development actions and whether those actions could be mitigated through identified restoration actions on site, or at an approved compensatory mitigation site that would provide a greater environmental lift.

By combining the results from the importance and degradation models, planners can see how each DAU ranks relative to all the other DAUs; which ones are more important for various elements of the ecological processes, and which ones are least and most impaired.

For example, consider a watershed with a water quality problem of high temperatures and low dissolved oxygen levels in conjunction with nitrogen loading from different land uses. This may suggest restoration of depressional wetlands since they can provide substantial reduction of nitrogen through the denitrification process. Since the watershed characterization identifies high priority wetlands restoration sites, these sites could be further evaluated for restoration to reduce nitrogen loading in the watershed. Figure 2 and Figure 3 provides examples of restoration opportunities to address water quality problems.



"Relative to preservation, it is the general consensus in the field that the first step in considering mitigation should be assessing if and how an impact can be avoided entirely. Only with a convincing demonstration that avoidance is impossible should mitigation be considered..." (Horner 2010)



Figure 2. Example of Potential Actions to Correct Water Quality Problems identified in Eld Inlet



Figure 3. Examples of restoration opportunities in the Deschutes Watershed

Similarly, if a watershed had lowland flooding during rain on snow events, planners might focus on areas that are important for water delivery in the mountainous uplands. They also might look at areas that are important for water, pollutant, and sediment storage in the lowland DAUs, particularly those located downstream of water delivery areas. Figure 4 depicts examples of potential actions to correct lowland flooding during rain on snow events by restoring wetlands in the mid-reach of the Deschutes Watershed.

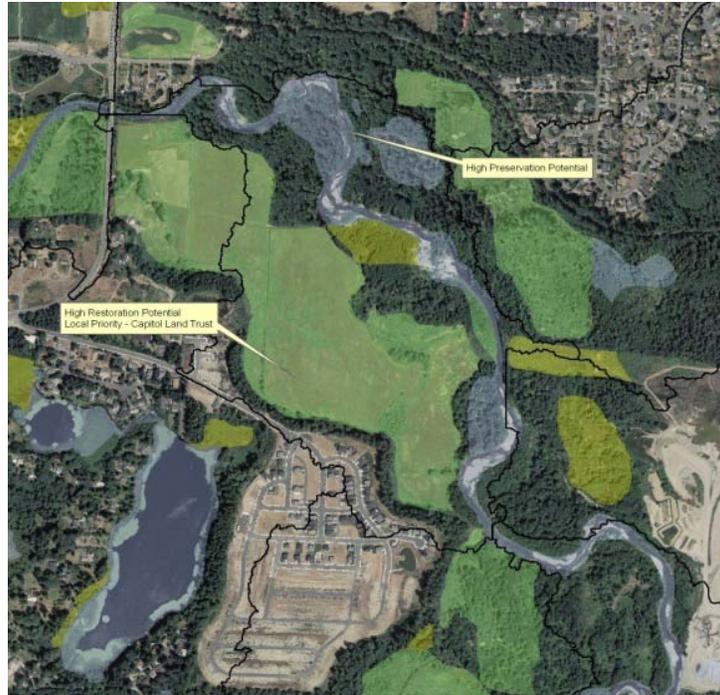


Figure 4. An example of potential actions to prevent lowland flooding in the Deschutes Watershed

Assessment of ecosystem-wide processes is required by the Shoreline Master Program Guidelines. The watershed characterization outputs can be used to identify areas appropriate for restoration and protection in the associated restoration plan. And, because all of the watersheds around Puget Sound are being assessed by the Department of Ecology and Fish and Wildlife, the results can be used by regional planners to understand how watersheds relate to one another and to create a better overall strategy for Puget Sound recovery and restoration.

What are the watershed characterizations results not appropriate for?

The results are most appropriate for local watershed-level planning. The assessment uses coarse scale data that covers Puget Sound drainages in Thurston County. While the watershed characterization identifies natural resource sites for restoration and preservation, further evaluation of the sites are required, to make decisions about a specific site. For example, while the results can help planners identify the best location for mitigation within a watershed, they will not be detailed enough to identify the specific amount and type of mitigation needed for a particular project.

How have the watershed characterization results been used so far?

The Thurston County watershed characterization results have been used to: support stream restoration grant funding applications; in the selection of a potential restoration sites in the Deschutes Watershed for a pilot compensatory mitigation In Lieu Fee program; and most

recently, to identify and prioritize projects for inclusion in the Water Resource Program future capital facilities program.

Where can I see results for my watershed?

The Thurston County watershed characterization main web page provides links to the Henderson Inlet, the Totten and Eld Inlets, and the Deschutes Watershed characterization results: <http://www.co.thurston.wa.us/waterresources/chara/chara-home.html>.

Thurston County staffs goal is to make all GIS data available via the internet by the end of the calendar year 2013. However, please contact us if you would like the data prior to the internet posting (please refer to the earlier listed basin studies).

What data sets are used in the watershed characterization assessment?

The watershed characterization uses readily available data from the Thurston County and other agency databases covering the geographical area of Thurston County including:

- 10-m SPOT satellite data available from the Astrium GeoInformation Services: www.astrium-geo.com/.
- The DAUs are also developed by GeoData staff using 2002 and 2011 LiDAR and ESRI's ARC-HYDRO.

Sources of GIS data available from various federal, state, and tribal governments include:

- Geology, slope stability and rain-on-snow areas are from the Washington State Department of Natural Resources;
- Soils data is from the US Department of Agriculture Soil database;
- Stream attributes are from the Salmon and Steelhead Habitat Inventory Assessment Program;
- Water quality data from the Washington State Department of Ecology.

Where can I get information on processes not evaluated by the watershed characterization assessment?

There are numerous sources of additional information including the following:

- The Puget Sound Nearshore Partnership has data at several scales on the types of changes to the nearshore environment, available at www.pugetsoundnearshore.org.
- The Washington Department of Fish and Wildlife EcoRegional Assessments provide systematic analysis of habitat and species information combined with data on human impacts within an ecoregion. These can help planners identify relatively intact habitats that, if conserved, will help to sustain the ecoregion's biodiversity into the future. EcoRegional assessments are available at www.biodiversity.wa.gov/ecoregions.

- The SSHIAP Salmon Scape interface provides data layers on hydrography, fish distribution, salmonid stock inventory, barriers to fish passage, habitat characteristics such as stream gradient, and Ecosystem Diagnosis and Treatment model output. They are available at www.wdfw.wa.gov—search on “SSHIAP.”
- Ecology maintains listings of impaired waters and related information on plans to restore and recovery water bodies at www.ecy.wa.gov—search on “water quality assessments.”
- Ecology provides a clearing house of WRIA resource and planning documents including ambient monitoring stations and results at www.ecy.wa.gov—search on “my watershed.”
- Slide prone area data. The Department of Natural Resources maintains data on landslides and areas that may be prone to landslides. Two data sets are available, landslides at a 1:24000 scale and the DNR’s Forest Practices Landslide Inventory. Go to www.dnr.wa.gov and search on “landslide” or “forest practices landslide inventory.”

How do I get help interpreting and applying the watershed characterization assessment in my watersheds?

Specialists on the watershed characterization assessment have presented to various groups and are available to meet and discuss the watershed characterization methods and the outputs of the work with any interested group.

If you would like additional information on how your planning area might use the results of the watershed characterization project, or how to conduct a watershed characterization in your watersheds, please contact Barb Wood at woodba@co.thurston.wa.us.

References

- National Research Council. 1992. Restoration of aquatic ecosystems. National Academy Press, Washington, D. C.
- Horner, R. 2010. Review of Thurston County’s “Methodology to a Watershed Based Approach to Federal and State Clean Water Act Regulations”. Submitted to Thurston County Department of Resource Stewardship.