

Guidance on Locating Mitigation Banks Using a Landscape-Based Approach

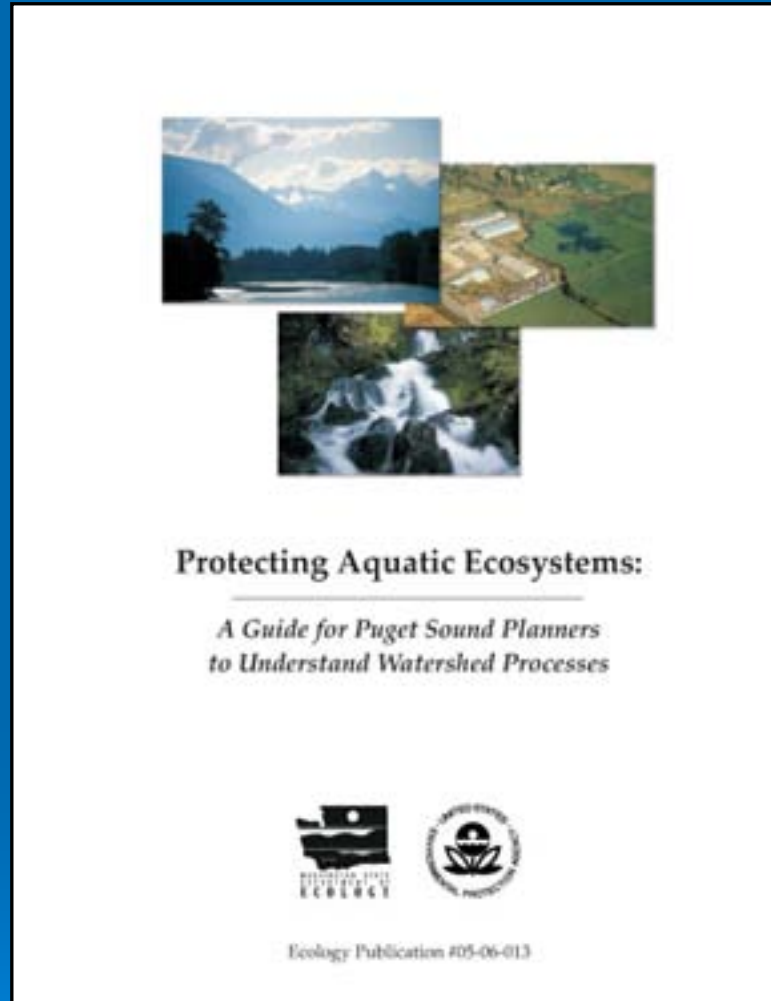
May 2007





This Guidance is offered by the MBRT as one possible method for locating wetland mitigation banks using a landscape-based approach.

MBRT Guidance is based on:



Outline for MBRT Guidance

- Overview
- Background
- Methods & Scoring
Questionnaire

OVERVIEW



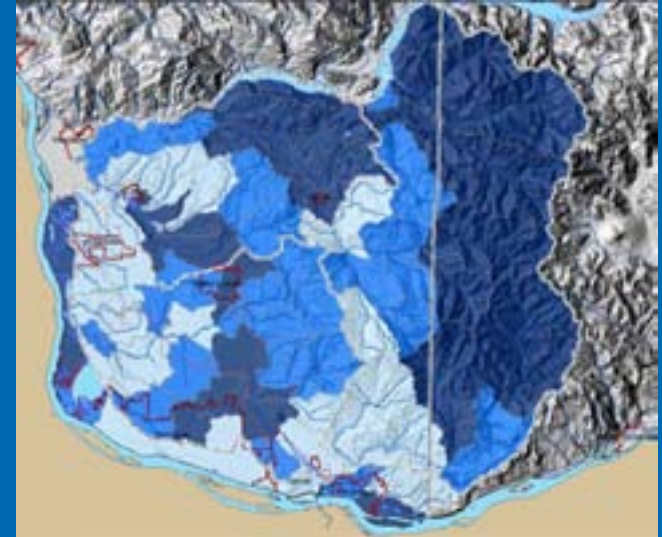
Overview of MBRT Guidance

Visually based using existing maps and a scoring questionnaire

Precipitation Type

Wetlands & Floodplain
Map

Alterations



Scoring Questionnaire

Scenario 1 – West of Cascades		
Rainfall Zone	Description	Score
Footfalls	500 ft to 2000 ft elevation	3
Transition	Area between coastal areas and footfalls. Typically, low elevation, relatively flat topography with small to large river valleys.	2
Coastal	Area within 5 miles of the marine shoreline	1

Scenario 2 – Columbia Basin (East of Cascades)		
Rainfall Zone	Description	Score
Footfalls	Area on periphery of Columbia Basin (20 to 30 inches/yr)	3
Transition	From footfalls to central Basin areas (10 to 20 inches per year)	2
Central Basin	Less than 10 inches/yr	1

What this Guidance Will Do

Will help you to identify at the watershed scale:

1. Areas on the landscape that are important or key for maintaining water flow processes
2. Areas that have been most and least altered by development
3. Areas that should be prioritized for restoration and protection

Overview of MBRT Guidance

- This Guidance is not a substitute for a full characterization of watershed processes, but it is adequate for the purposes of determining the most appropriate areas for mitigation banks.
- If a full watershed characterization has been done for the area you are interested in, it is preferable to use that.

BACKGROUND



Background

Factors Affecting Wetland Functions:

- The functions that wetlands perform are controlled by environmental factors that occur in the broader landscape as well as within the wetland.
- Important factors in controlling wetland structure and functions include climate, geomorphology, the source of water, the movement of water, and others.
- These factors directly affect wetland functions, but also can have indirect influences by affecting secondary factors such as sediment, nutrients, salts, toxic contaminants, soils, and the connections between different ecosystems.
- The scale of the surrounding area that influences a wetland's functions can vary from a small sub-basin for a headwater slope wetland to the entire watershed of a large river system for a riverine wetland.

Background (cont.)

Alterations to Landscape Processes Affect Wetlands:

- Much of the landscape surrounding wetlands, as well as the wetlands themselves have been altered, most significantly in urban areas.
- Changes in water and sediment movement, nutrient cycling and other landscape processes that affect wetlands are due to increases in impervious surface, loss of forest, channelization of streams and rivers, filling of wetlands, and other land use changes.
- As key processes are altered, wetland functions are commonly lost or degraded.
- It is important to understand and consider these changes in landscape processes in making decisions about how to best manage, protect, restore, and mitigate for wetlands.

Background (cont.)

Role of Wetland Restoration:

- The consequences of alterations such as increased flooding and erosion, may be partially addressed by strategically locating wetland restoration or mitigation projects, including wetland mitigation banks, so that they restore or enhance wetland functions that are in short supply and/or are of critical importance in a given watershed or drainage basin.
- In doing so, it is important to understand which ecological processes are most important in affecting the health of the aquatic ecosystems in the area, which have been altered, and what role wetland restoration can play in restoring ecological processes and replacing lost wetland functions.

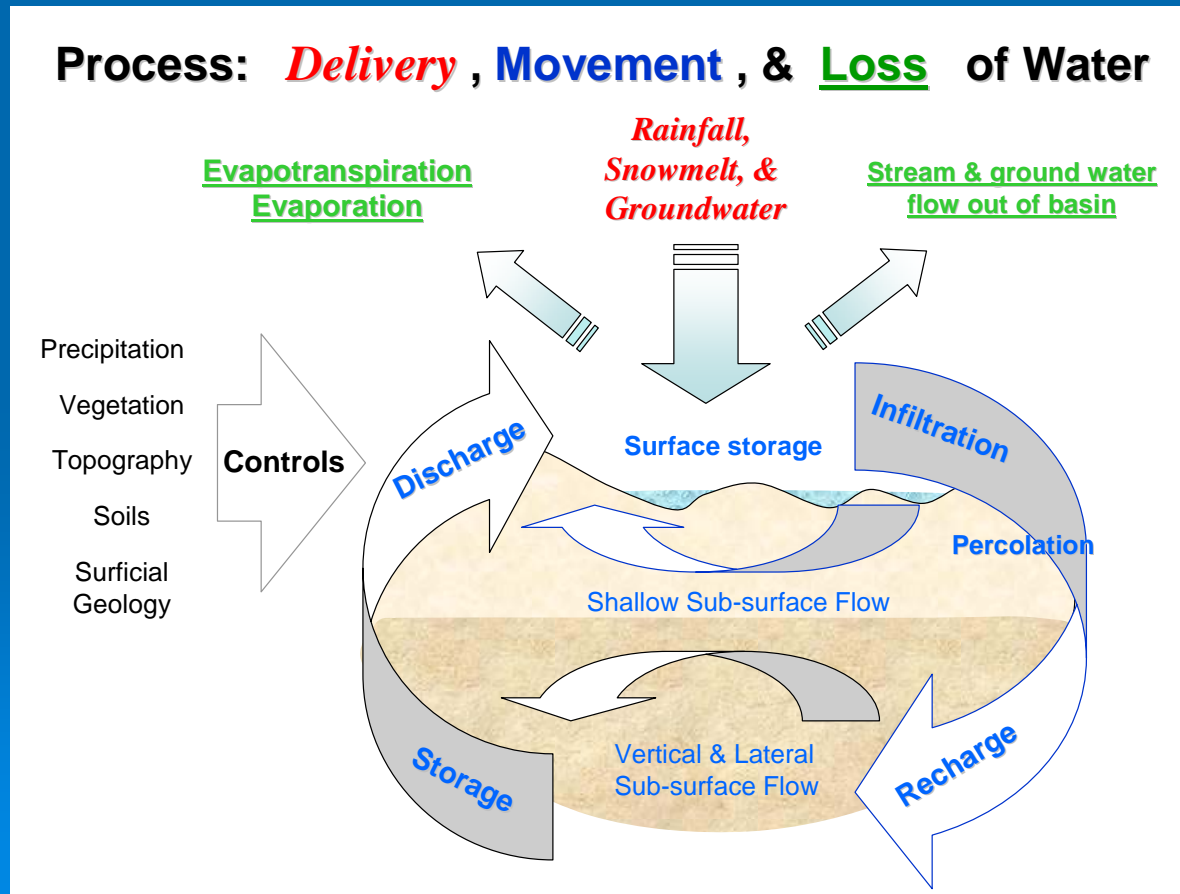
Background (cont.)

Using a Landscape Approach to Locate Mitigation Banks:

- Mitigation bank site selection should integrate a landscape perspective that incorporates information about the processes that provide the basis for wetland functions, as well as information on the wetlands and associated aquatic ecosystems in the watershed or drainage basin that is being assessed.
- This Guidance is one method that uses this type of information to locate broad areas in which restoration is most advisable from a landscape perspective.
- Bottom Line: Mitigation banks should be located in areas where restoration makes the most ecological sense.

How Water Moves Through a Watershed

Since the main focus of this analysis is the hydrologic processes in a watershed, it is important to understand how those processes interact. For more information on this, refer to *Protecting Aquatic Ecosystems: A Guide for Puget Sound Planners to Understand Watershed Processes* (Ecology Publication #05-06-013).



METHODS & SCORING QUESTIONNAIRE



Methods

Step 1 – Define analysis area (typically are comparing a number of sub-basins)

Step 2 – Identify and Map Key Process Areas

Step 3 – Identify and Map Types of Alterations

Step 4 – Locate areas for restoration and protection



Incorporate Results into Site Selection
Criteria for Your Mitigation Bank

Step 1 - Define Analysis Area

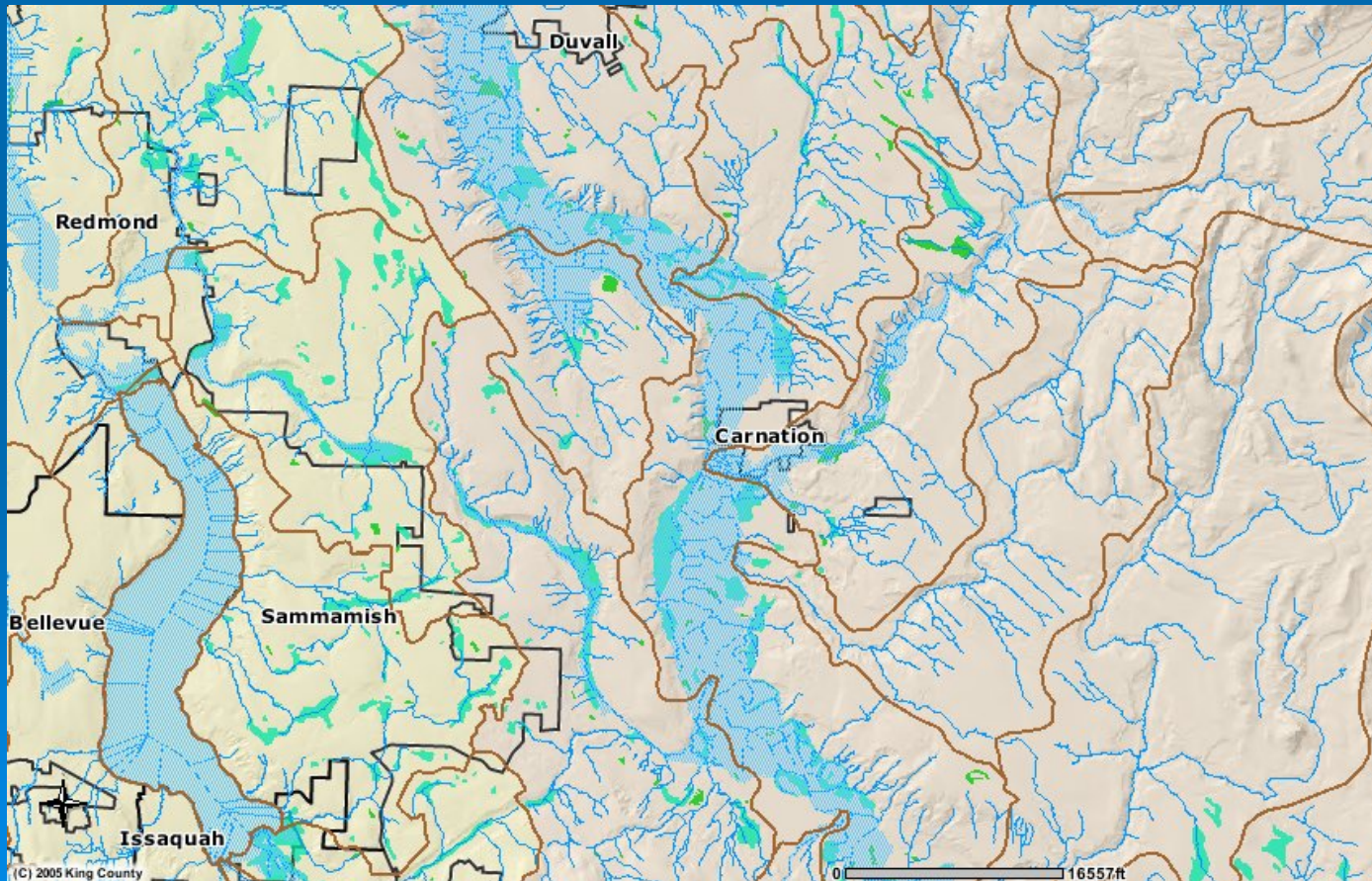
The first step is to define the broad area in which you wish to understand the watershed processes.

What is the general area you are considering for locating a mitigation bank?



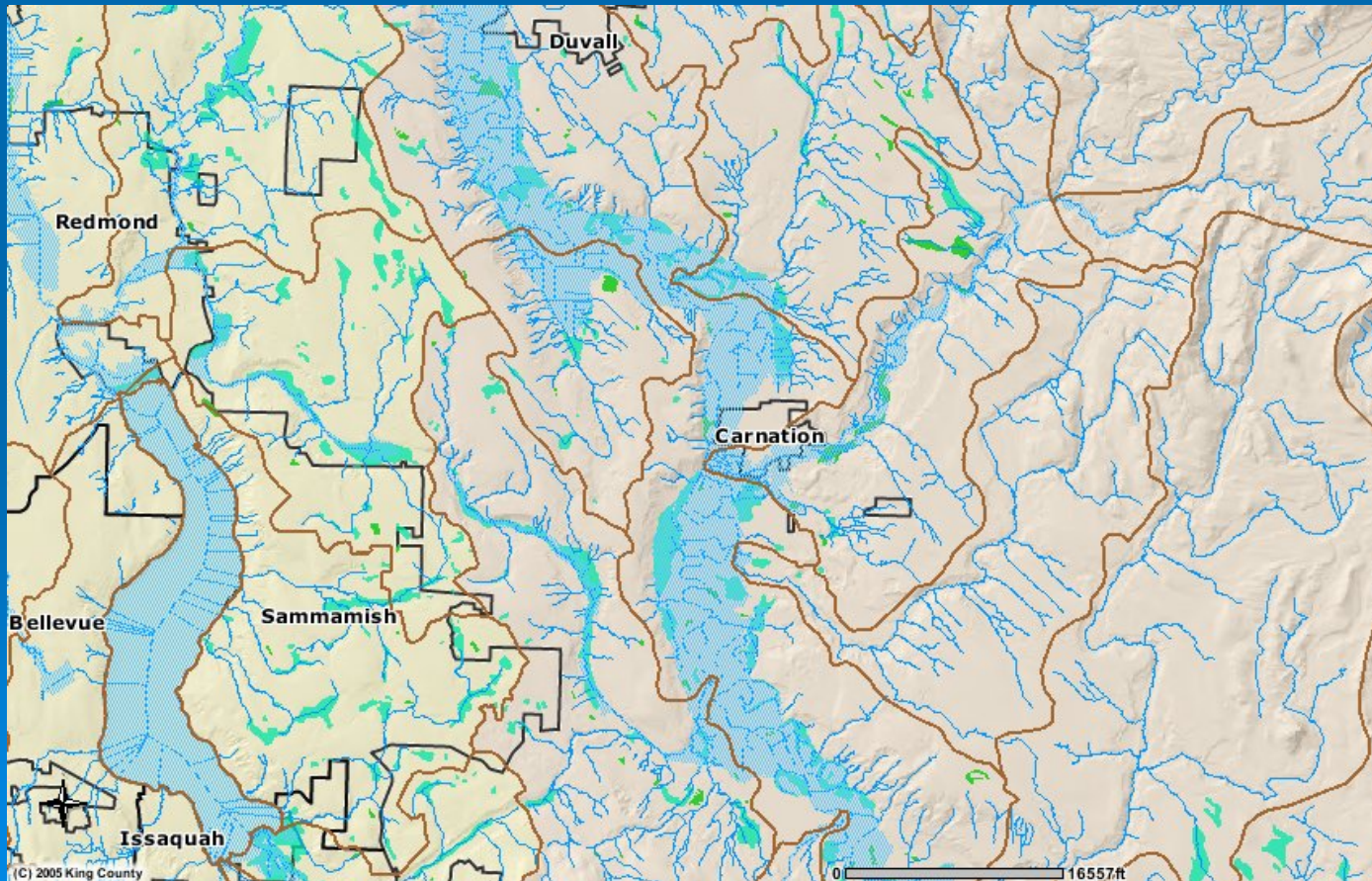
Step 1 – Define Analysis Area

- Select one or more of the major watersheds in your area of interest and then compare the sub-basins within the major watershed.



Example of Step 1 – Define Analysis Area

- You are looking for a banking site in either the Bellevue, Redmond or Carnation Area
- Use existing watershed boundary maps ([IMAP](#))



Step 2 – Characterize & Map Key Areas

To understand the hydrologic processes in a watershed, the following key areas are identified:

A. Precipitation Delivery Type

- Snow dominated, rain on snow, rain

B. Surface Storage - areas with wetlands and floodplains

C. Subsurface Movement – areas with moderate to high permeability

Step 2A – Identify Precipitation Delivery Types

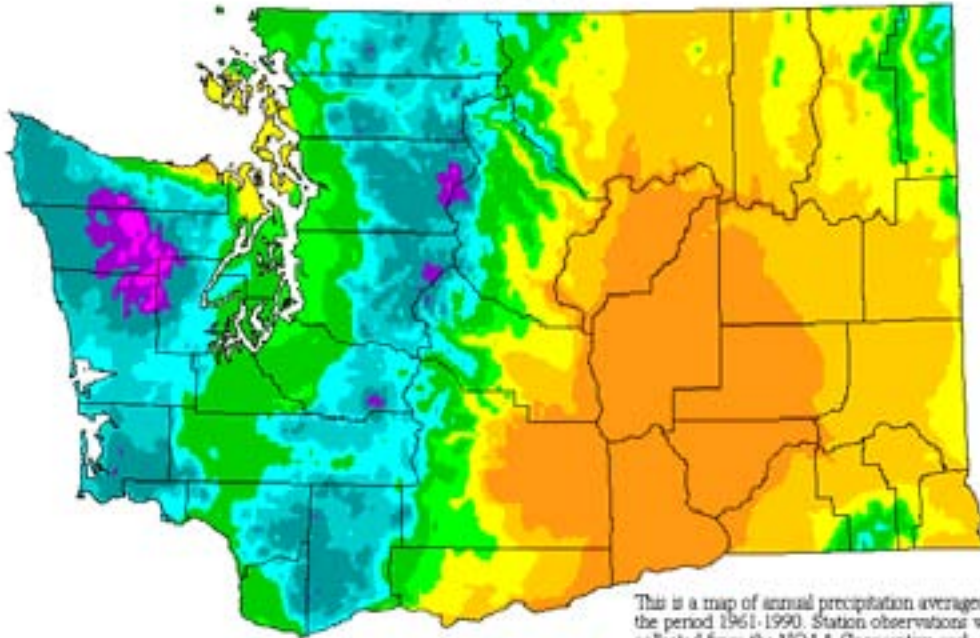
Enter a score for the sub-basins in your study area using detailed precipitation data, and/or general precipitation maps.

Scenario 1 – West of Cascades . Which of the following zones best describes your sub-basin?		
Rainfall Zone	Description	Score
Foothills	40 inches + . Typically greater than 500 ft to 2000 ft elevation	3
Transition	30 to 40 inches per year. Areas between coastal areas and foothills. Typically, low elevation, relatively flat topography with small to large river valleys.	2
Coastal	Less than 30 inches. Areas within 5 miles of the marine shoreline	1
Scenario 2 – Columbia Basin (East of Cascades) – Which of following zones best describes your sub-basin?		
Rainfall Zone	Description	Score
Foothills	Area on periphery of Columbia Basin (20 to 30 inches/yr)	3
Transition	From foothills to central Basin areas (10 to 20 inches per year)	2
Central Basin	Less than 10 inches/yr	1

Precipitation Map & Data Link

Average Annual Precipitation

Washington



This is a map of annual precipitation averaged over the period 1961-1990. Station observations were collected from the NOAA Cooperative and USDA-NRCS Snotel networks, plus other state and local networks. The PRISM modeling system was used to create the gridded estimates from which this map was made. The size of each grid pixel is approximately 4x4 km. Support was provided by the NRCS Water and Climate Center.

Legend (in inches)

Under 10	60 to 80
10 to 20	80 to 100
20 to 30	100 to 140
30 to 40	140 to 180
40 to 60	Above 180

For information on the PRISM modeling system, visit the SCAS web site at <http://www.ccc.orst.edu/prism>

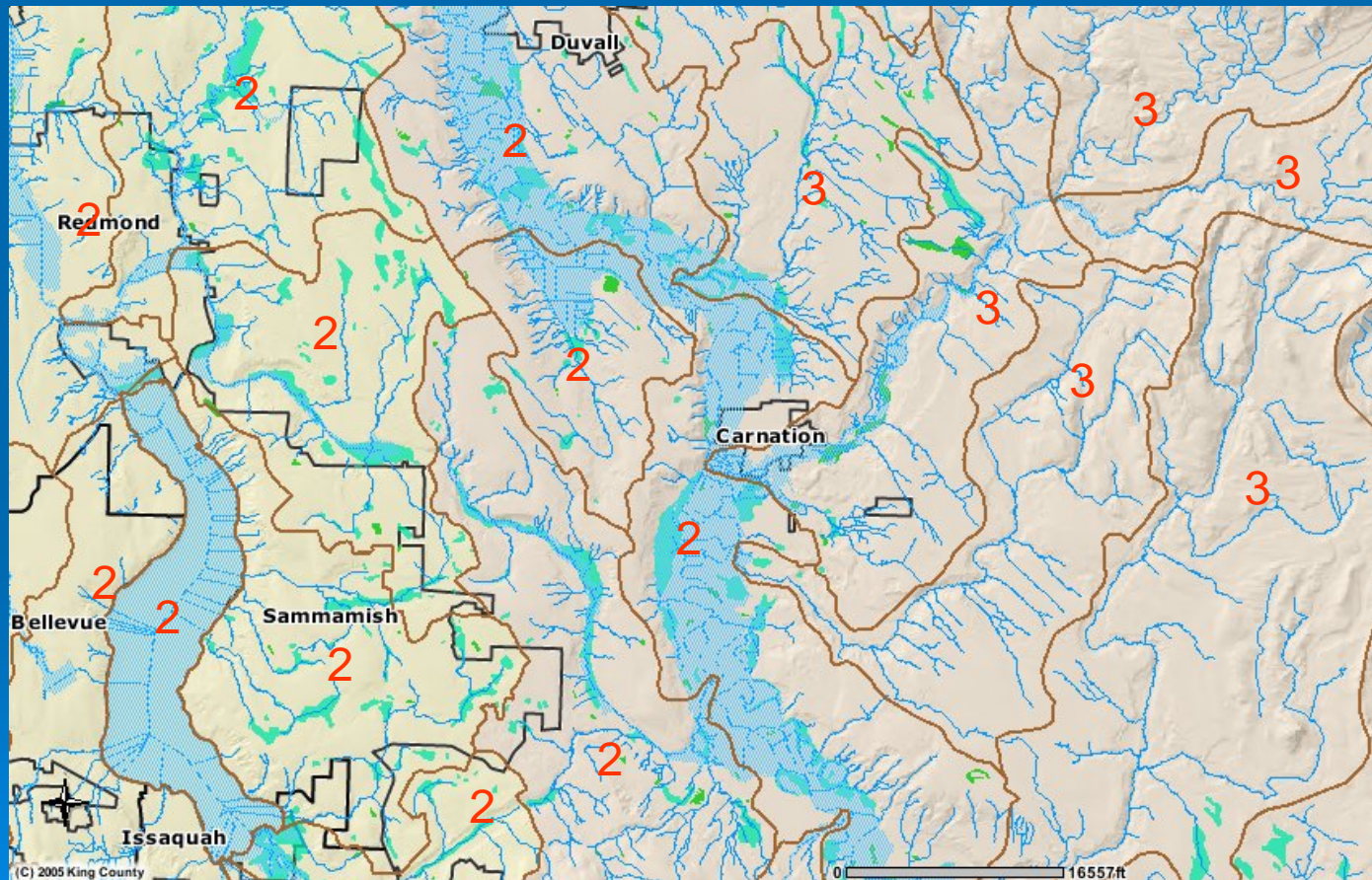
The latest PRISM digital data sets created by the SCAS can be obtained from the Climate Source at <http://www.climate-source.com>

Copyright 2000 by Spatial Climate Analysis Service,
Oregon State University

You can use this map or you can obtain precipitation data for most of the state at specific geographic points at the following site:

<http://www.atmos.washington.edu/marka/wa.normals.html>

Example of Step 2A – Score Precipitation and Delivery Types Using precipitation data

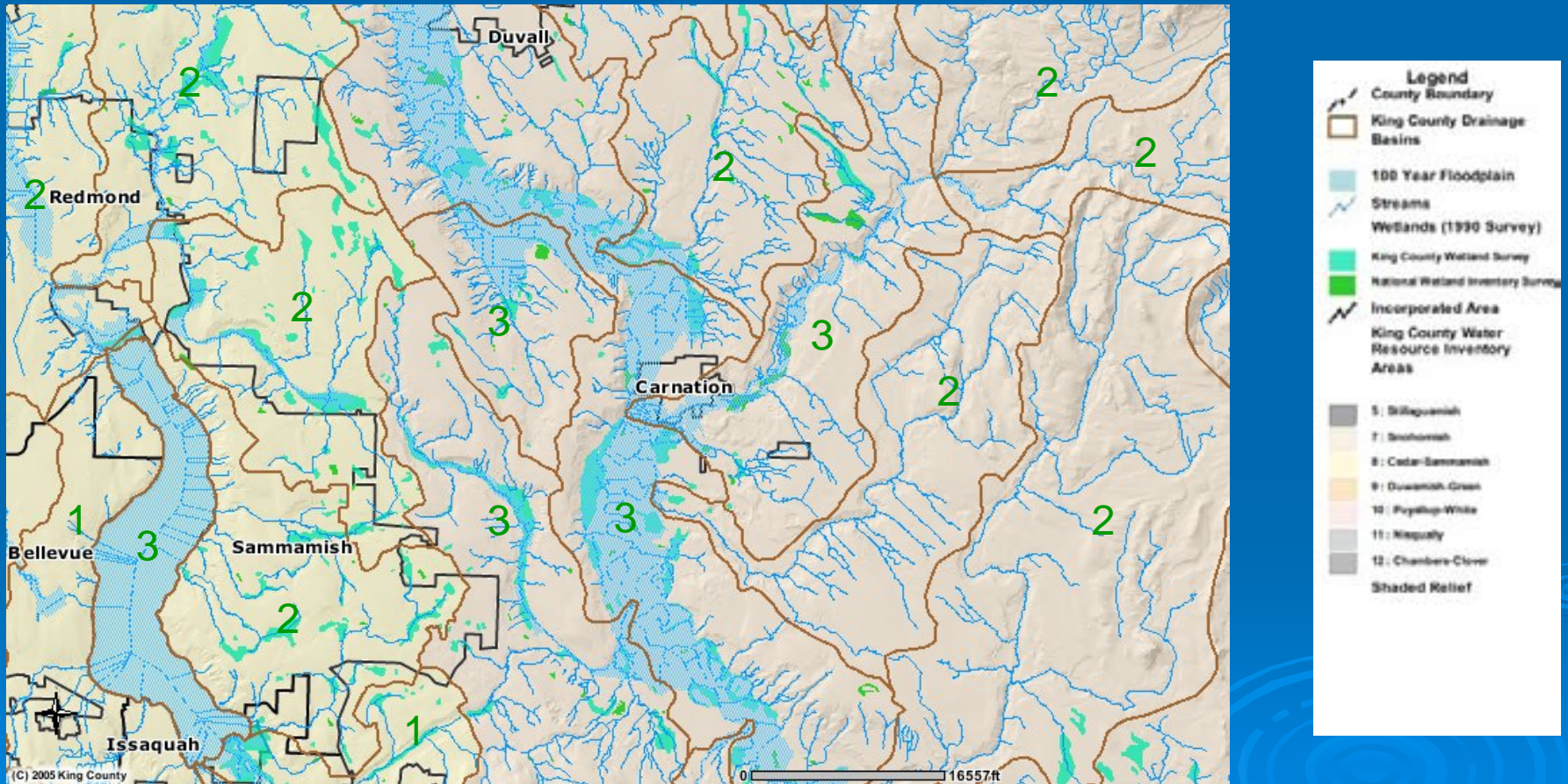


Step 2B Score Surface Storage Wetlands + Floodplains + Lakes

Apply the following table to score sub-basins in any portion of the state. Rate wetlands, lakes and floodplains together.

Question - which of following statements best describes your sub-basin?	Score
The estimated area of the sub-basin with wetlands, floodplains and lakes is less than 5%	1
The estimated area of the sub-basin with wetlands, floodplains and lakes is 5 to 20%	2
The estimated area of the sub-basin with wetlands, floodplains and lakes is greater than 20%	3

Example of Step 2B – Score Using Wetland/Floodplain data



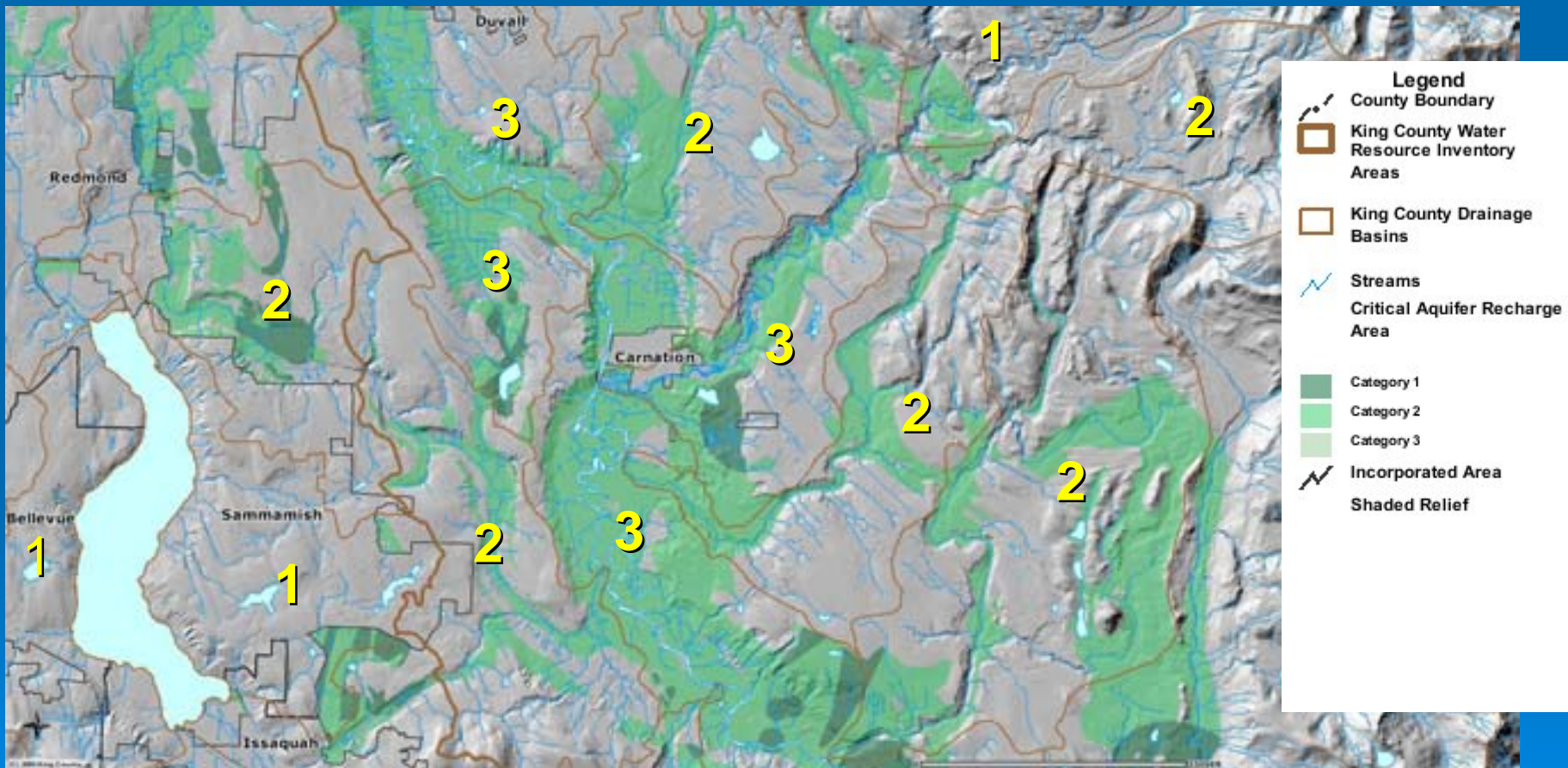
Visually estimate area covered by streams, wetlands (green), floodplains and lakes (blue)

Step 2C Identify Subsurface Storage

Use Critical Aquifer Recharge Area (CARA) maps as indicator for subsurface storage.

Subsurface Movement Score from Critical Aquifer Recharge Areas (CARA) Maps	
Question – which statement best describes your sub-basin?	Score
No CARA present in sub-basin	0
The relative area of the sub-basin in CARA is 1% to 10%	1
The relative area of the sub-basin in CARA is >10% to 50%	2
The relative area of the sub-basin in CARA is >50%	3

Example of Step 2C - Identify Subsurface Storage Using CARA Data

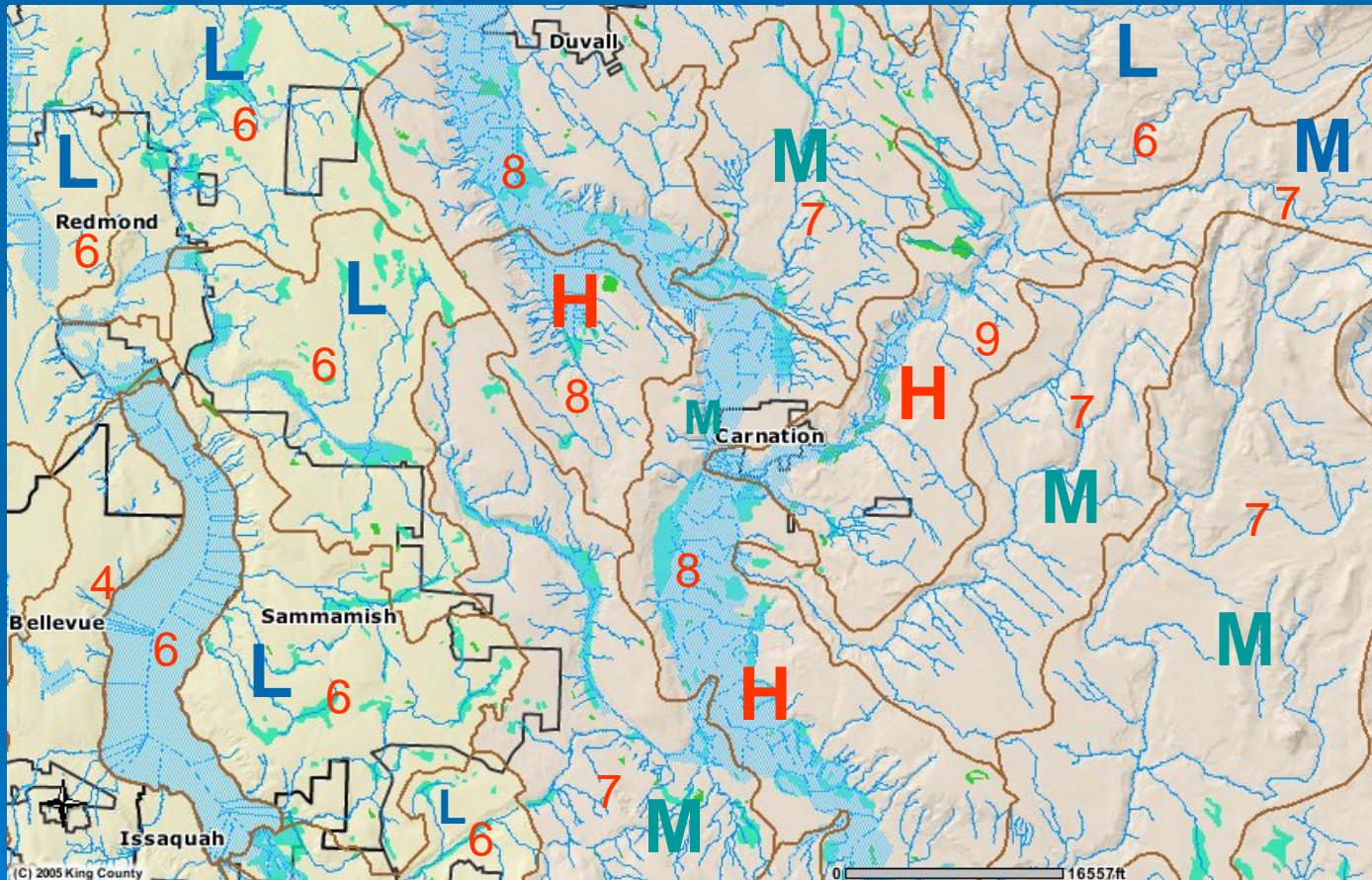


Step 2D – Determine Key Areas & Relative Importance

Total the scores for each sub-basin within your study area. Those with the highest scores are those areas that are most important for hydrologic functions.

Scoring Buckets should be based on the range of scores (highest and lowest score) in your study area – divide range into 3 equal buckets

Example of Total Score for Determining Key Areas and Relative Importance



Take range of scores and divide by 3 to get H, M, and L buckets: $9-4=5$; $5/3=1.6$ You need to round-up to the next integer when assigning bucket intervals. Thus L = 4 to 6, M = 7 H = 8 to 9

Step 3 – Determine Areas of Alteration

The areas with the greatest extent of alteration to water flow processes are those that have:

- The least forest cover
- The highest degree of urbanization
- The greatest extent of impervious surface cover

Step 3 Determine Relative Level of Alteration

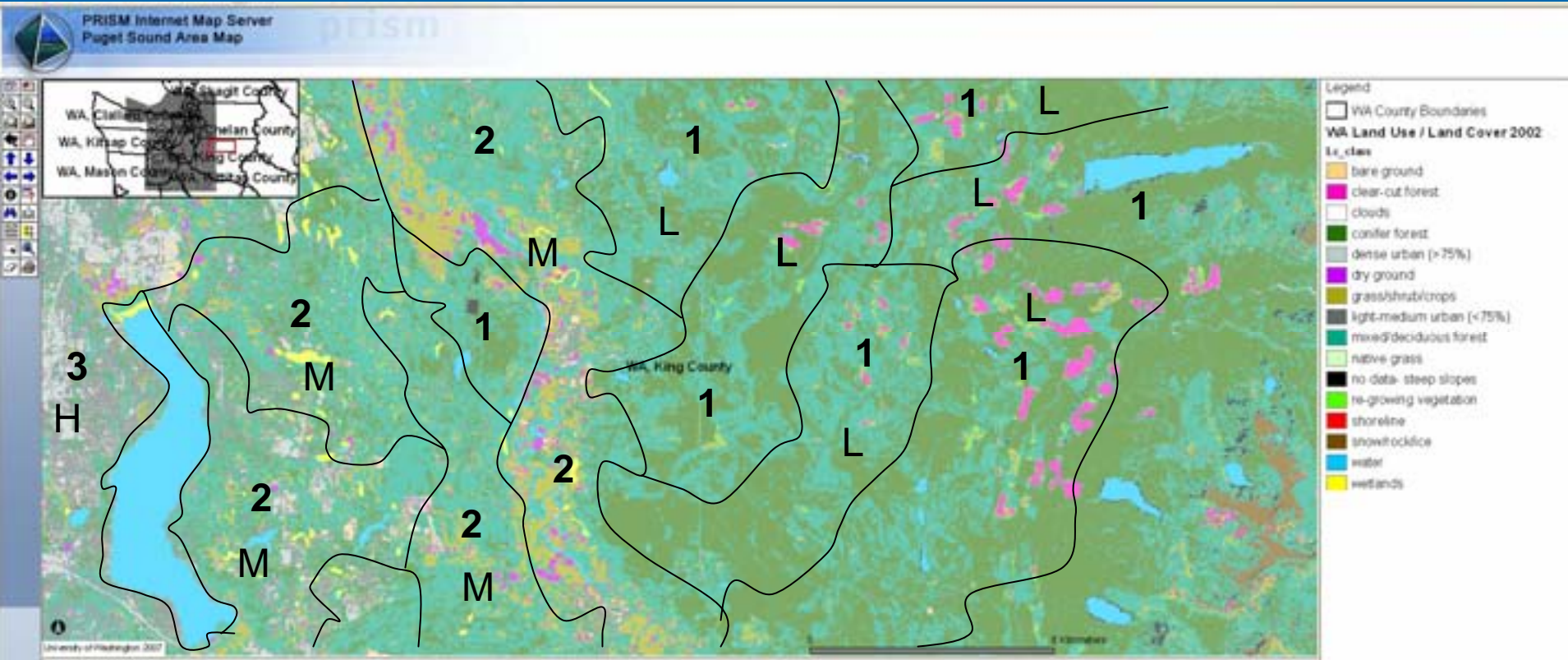
Rate each sub-basin for alteration based on the following table:

Alteration to Water Flow Processes	
Question – Which statement best describes the sub-basin?	Score
The sub-basin is predominately forested	1
The sub-basin is predominately non-forested and non-impervious surface (e.g., agriculture)	2
The sub-basin is predominately urban uses (high impervious surface)	3

The scores 1, 2 and 3 correspond to a low, medium and high level of alteration on the alteration map

Example of Step 3 - Determine Relative Level of Alteration

Using [PRISM's Interactive Mapper](#)

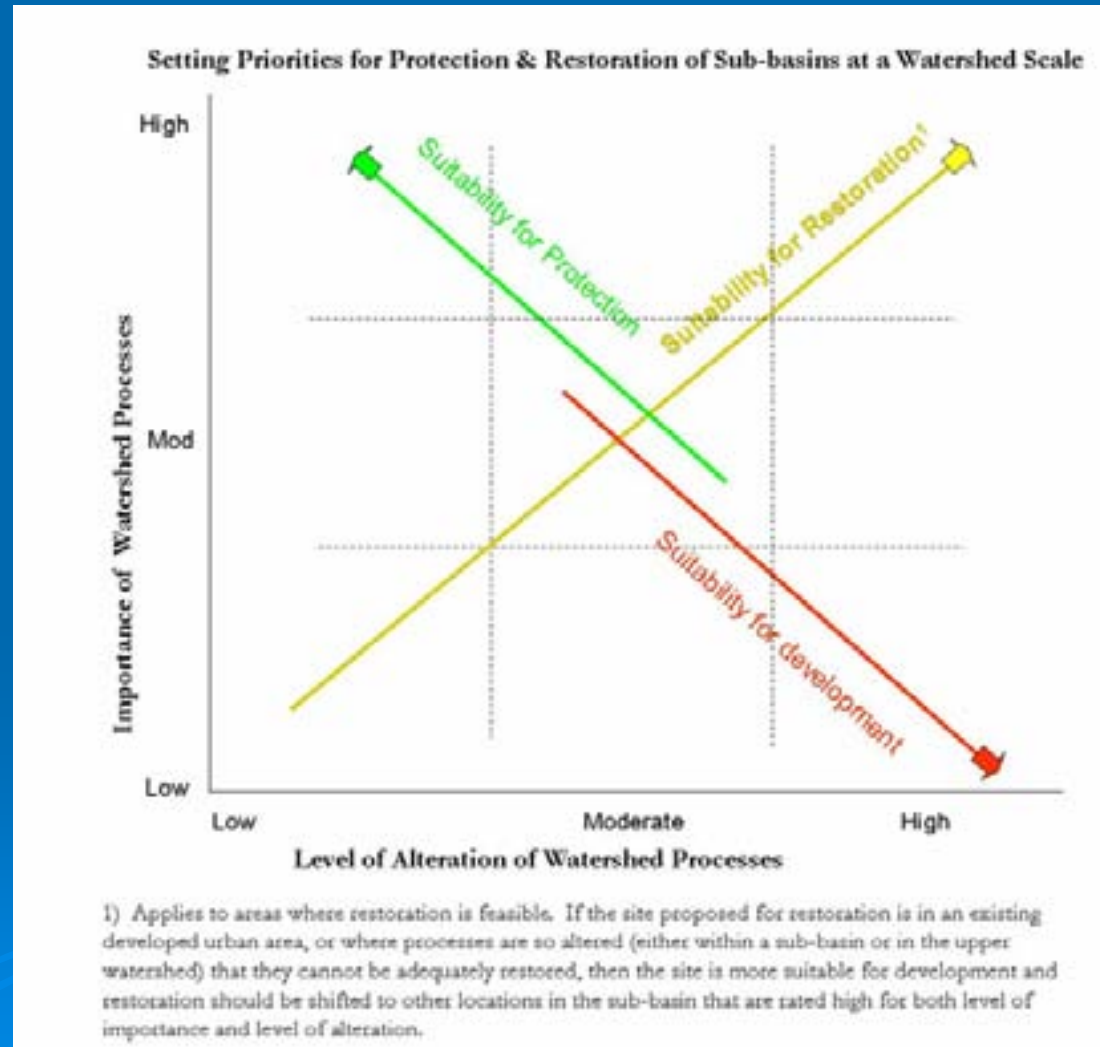


Note: Basin boundaries were hand drawn so they are approximate

Step 4 - Identify Most Suitable Areas for Protection & Restoration

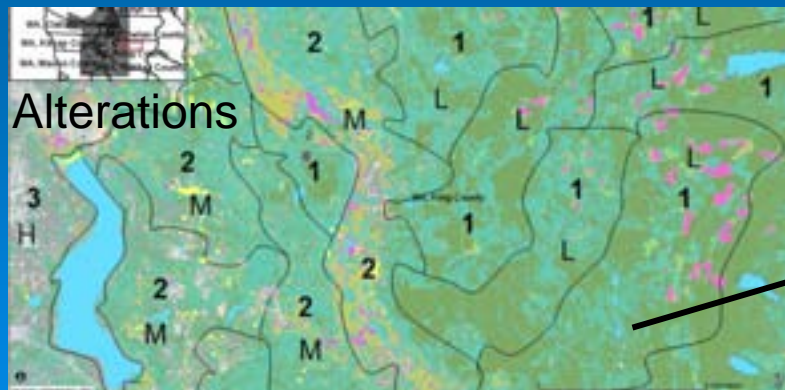
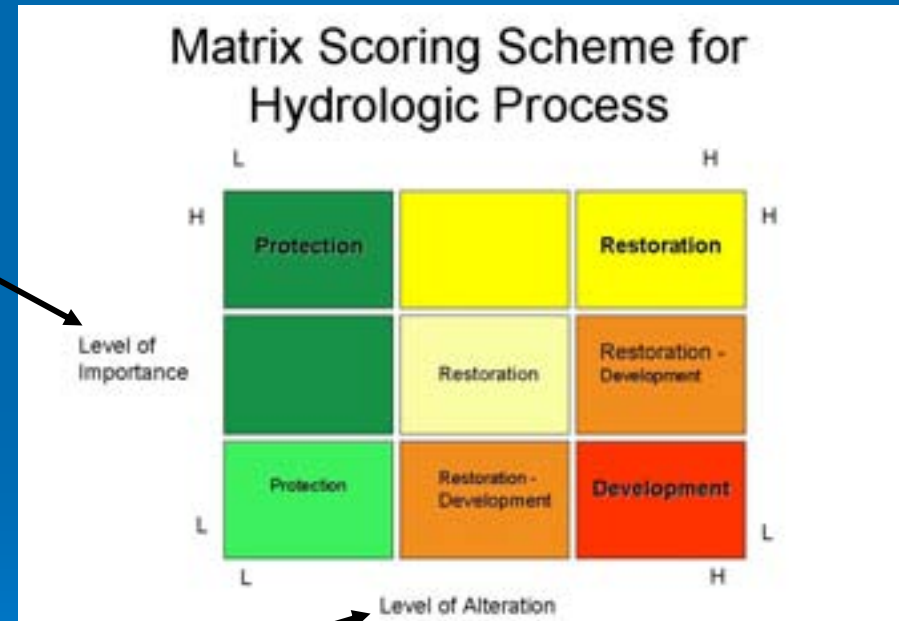
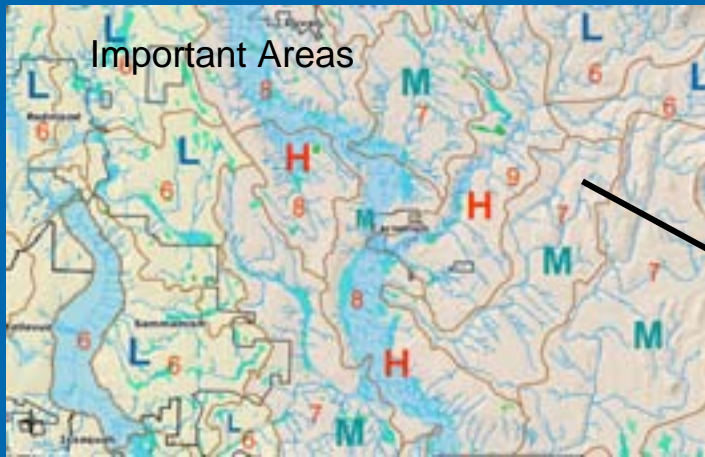
Using the matrix, determine where each sub-basin would fall out based on the relative importance of its hydrologic processes and its extent of alteration. This will allow you to identify suitable areas for:

Restoration
Protection
Development

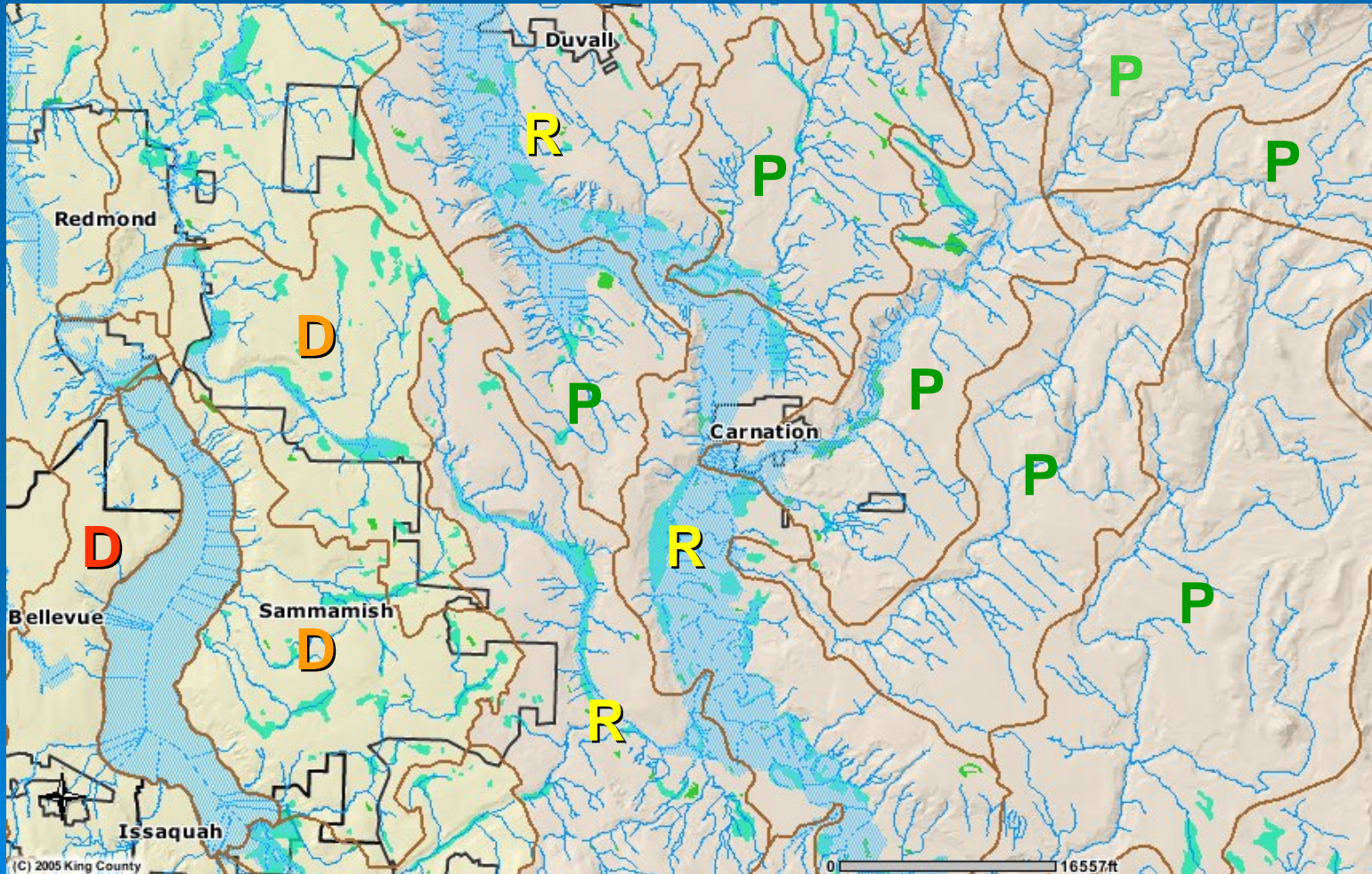


Example of Step 4 – Protection, Restoration Development Map

- Using the Matrix and Maps for step 2 and 3, develop final map



Example of Step 4 – Protection, Restoration Development Map



Interpreting the Final Map

Green = Protection: Protection of these watersheds and adjoining restoration sub-basins are critical to maintaining watershed processes for aquatic ecosystems downstream. Some restoration may be needed in these areas, but they are not highly altered in general. Banks may have a greater probability of successfully restoring wetland functions since processes are more intact. Darker green is a higher priority for protection. Lighter green areas have slightly higher degree of alteration and so may have more restoration opportunities than the darker green.

Yellow = Restoration: These areas come out highest on the matrix as potential areas for restoration. Undertaking restoration in these areas will be the most effective way to restore watershed processes. Banks in these areas would likely be surrounded by mostly rural or suburban land uses. Restoration in darker yellow areas will have the most significant benefits. Lighter yellow is a lower priority for restoration.

Interpreting the Final Map

Orange/Red = Restoration/Development: These score highest as development areas, although restoration could be achieved there as well. If planning restoration in these areas, extra care may need to be taken in planning how to protect the restoration sites from surrounding land uses. The orange sub-basins represent a transition from restoration areas and so should be prioritized over the red areas. These are the areas in which urban mitigation banks may be targeted. Restoration in these areas may help restore localized processes, but land use intensity limits the potential for restoration of broader watershed processes. Red areas have the lowest priority for restoration.



Incorporating Results into Site Selection Criteria for Your Mitigation Bank

This prioritization scheme allows you to identify the most suitable sub-basins in an area for wetland restoration in order to restore watershed processes.

This is a broad approach that incorporates a landscape perspective into mitigation site selection.

Once a sub-basin is selected, there are many more factors that should be considered in choosing a more precise restoration location. Many of these can be found in Appendix J – Site Selection Checklist in *Wetland Mitigation in Washington State – Part 2, Version 1* (Ecology Publication #06-06-011a). The document can be found at:
<http://www.ecy.wa.gov/biblio/0406013b.html>

END OF GUIDANCE

