7. RESTORATION PLANNING ANALYSIS

This section defines the term restoration for planning purposes, discusses various strategies and methodologies for undertaking restoration analysis, and discusses how King County will approach restoration planning.

A. Definition of Restoration

"Restoration" is often a catch-all term for a range of actions, encompassing not only what the scientific literature refers to as restoration (i.e., returning a function to its predevelopment, undisturbed condition), but also rehabilitation, enhancement, improvement, reclamation and creation (Williams et al. 1997; Roni 2005). For the purposes of Shoreline Master Program updates, the Guidelines define ecological restoration as the "reestablishment or upgrading of impaired ecological shoreline processes or functions." Further, the Guidelines provide that "this may be accomplished through measures including, but not limited to, re-vegetation, removal of intrusive shoreline structures and removal or treatment of toxic materials." Finally, the guidance explicitly notes that "restoration does not imply a requirement for returning the shoreline area to aboriginal or pre-European settlement conditions" (WAC 173-26-020). The following provides a general overview of restoration planning and a general description of King County's approach for defining restoration priorities.

B. Methodology

Restoration Planning and Strategy

Most King County shorelines have been altered to some degree, resulting in a multitude of potential shoreline restoration opportunities. Roni (2005; Figure 7) provides a strategy similar to that of the National Research Council (1992) for assessing and prioritizing rehabilitation or restoration actions. The first step is to conduct an assessment of both historical and current conditions and restoration opportunities. The second and third steps are to protect high quality habitats and to improve or provide for adequate water quality and quantity, respectively. The fourth step is to restore watershed processes. The final step is to implement specific habitat improvement measures, such as installing instream structures or nutrient management. In order to prioritize and maximize the effectiveness of restoration, planning must be guided by clear goals and priorities. Ultimately, restoration must be done in concert with protection to ensure that restoration actions are compatible with both land uses and natural disturbances such as floods and landslides.

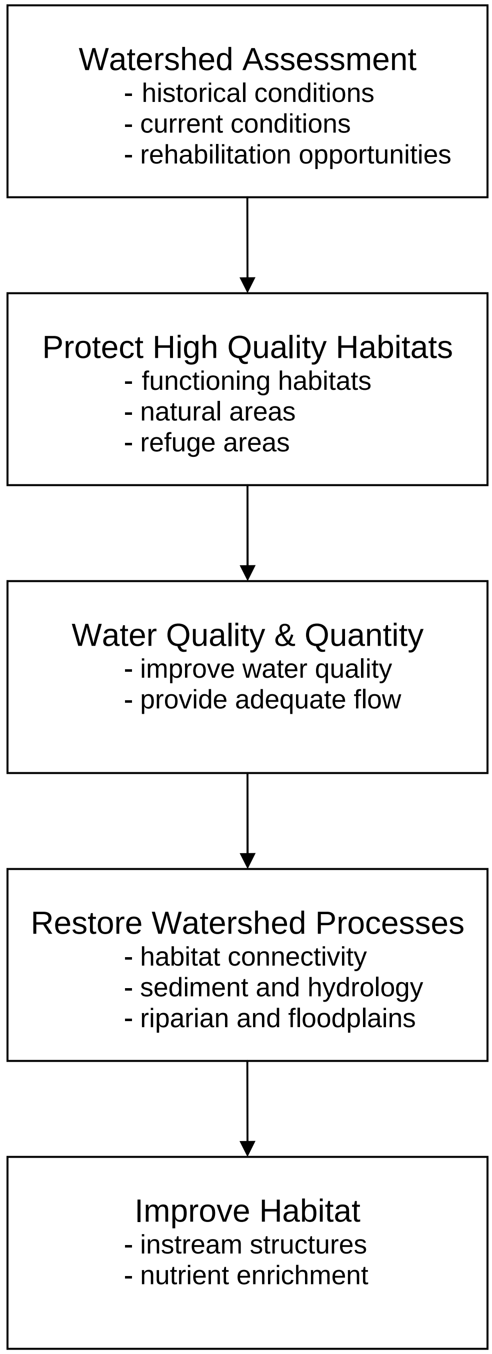

Figure 7. Steps for prioritizing watershed restoration (from Roni et al 2005)

Once a shoreline protection strategy is in place, restoration planning generally entails: (1) identifying the spatial and temporal scales for assessing the causes and degree of impairment of desired ecological functions; (2) identifying the type, extent, and nature of ecological impairment; (3) identifying opportunities to return these functions to a desired condition; and (4) prioritizing and selecting among a suite of possible actions and methods, based on likelihood of success, feasibility, and cost.

Scales of Restoration

The spatial and temporal scales for assessing restoration needs and opportunities typically include habitat units (individual sites or project scale), reach (e.g., a stretch of freshwater shoreline with similar geomorphic conditions or a marine drift cell subunit), and catchments or marine drift cells (Montgomery and Buffington 1998; Williams et al 2004). Of these, the habitat unit scale is generally the smallest and operates at the shortest timeframe (multiple years or less). The habitat scale typically includes distinct features such as pools and riffles (in streams), the base of a feeder bluff (along a marine shoreline), a salt marsh or spit (in marine or estuarine areas), inlets and outlets (of lakes) and, for all shorelines, tributary confluences, deltas, and relatively short shoreline areas with similar substrate, depth and vegetative characteristics.

It is not feasible to conduct analysis of restoration potential at the habitat unit scale for the unincorporated area of King County, because existing geographic data generally lacks sufficient detail to support such analysis. As a result, planning approaches, such as for shoreline management, are usually intended to provide general guidance rather detailed direction. However, many restoration actions such as modifying local land uses, removing or setting back levees and revetments, restoring native shoreline plant communities, removing fish passage barriers, and adding large woody debris or boulders to increase habitat structural complexity will often be implemented at the habitat unit scale and guidance should be compatible with that scale of implementation.

Reach and watershed scale analyses are essential because many restoration projects fail due to inadequate consideration of the landscape condition surrounding and/or influencing individual habitat units (Frissell 1997; Booth 2005; Stanley et al 2005). These larger scales operate at much longer time-frames, typically in tens to hundreds of years. Analysis at these scales can help to refine or identify new area-specific goals, as well as the type, extent and potential success of various long-term and larger-scale restoration actions. For example, actions such as placing gravel for salmon spawning where spawning gravel would not normally accumulate or where it could be degraded by surrounding land uses that are likely to impact its quality and usability for spawning should be avoided (see Booth 2005). Assessments of conditions and processes at the reach and watershed scale for land use, natural dynamics (flooding, erosion and channel migration) and biological functions (reproduction, rearing, and migration) can help avoid failure and ensure that appropriate and effective actions are undertaken at the single or multiple habitat unit scale.

Restoration Goals and Tradeoffs

To identify and help prioritize options, protection and restoration planning generally entails assessment of functions and processes at the site and watershed scales, respectively (Figure 8 from Stanley et al 2005, adapted from Shreffler and Thom 1993 and Booth et al 2004). Where site and watershed level alterations are low, protection of processes and functions should be emphasized. Conversely where alterations are high at both scales, process-based restoration should be emphasized in rural landscapes (where land use constraints are generally low), while for urban landscapes, enhancement of functions (rather than true restoration) or out-of-basin processes should be the goal because often land use constraints will make true restoration difficult or unfeasible. Examples of the latter category of sites include urban waterfronts lined with shipping terminals and large commercial piers, and river reaches hemmed in by high density, economically valuable development and infrastructure that is not capable or likely to be moved.

The likelihood of protection and restoration success is higher where the existing watershed processes are less impaired, and the existing constraints and process impairments are slight. In areas where alteration of site conditions is high but watershed processes are relatively unaltered, functions should be restored and processes protected. Where site conditions are relatively unaltered, but watershed processes are highly altered, the goal should be to restore processes.

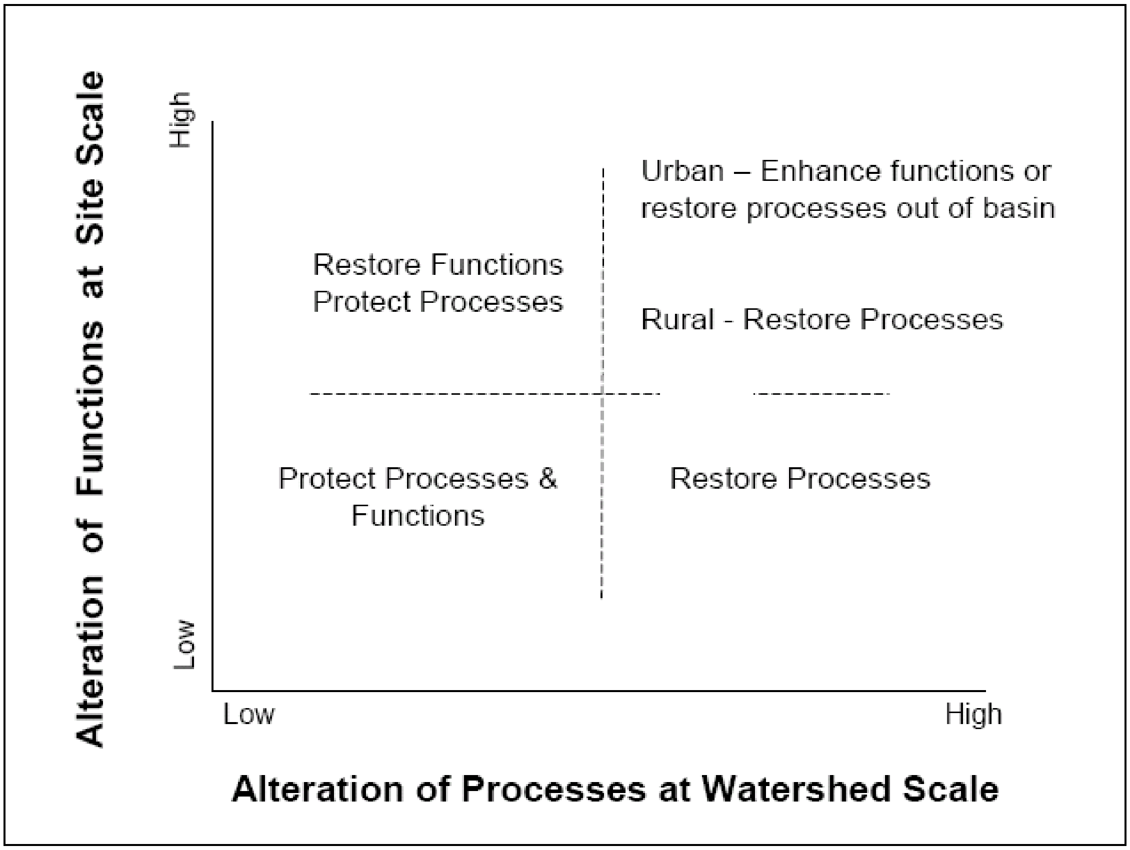

Figure 8. Example of prioritizing restoration and protection efforts based on degree to which the watershed processes and site functions have been altered (Stanley et al (2005), adapted from Shreffler and Thom (1993) and Booth et al (2004))

Biological function is difficult to assess directly, because there are no rating systems that span all of the shoreline habitat types, and few comprehensive and quantitative survey methods that include fish, wildlife and vegetation. Furthermore, the types of broad-based quantitative data that exist (e.g., satellite imagery of land cover) generally only provide estimates of general land cover class areas. Existing methods do not provide direct estimates of abundance, biomass or diversity that would be helpful for prioritizing conditions among a variety of habitats, especially those that support valuable, rare or endangered species, which tend be targeted for protection and restoration.

In recent years, more detailed and comprehensive knowledge of some species in selected areas has been collected (see Section 2.D). Unfortunately, while the quality of such information has greatly improved in recent years, it is generally not equally comprehensive across all species of concern or across all shoreline areas. Perhaps the least well characterized of all shoreline biological resources are terrestrial vegetation and wildlife species; no comprehensive surveys or planning has been carried out for these resources to date in King County. Equally poorly studied are the biota of the unincorporated regions' many smaller lakes, with only Lakes Washington, Sammamish and Union having been the focus of detailed limnological characterizations. Several lakes have had Lake Management Plans produced, which included investigations of both phytoplankton and zooplankton over a full year, but many of those lakes have been incorporated into cities under the Growth management Act, with only Lake Desire still under county jurisdiction.

Historical information, such as biological surveys done prior to existing development, can help ensure that areas with high or critical species use are not prematurely excluded from consideration for restoration as the result of sole reliance on current information. Wissmar (1997) describes the uses and value of historical information and notes that, ultimately, this information is critical in guiding restoration plans since the preferred goal of restoration is usually to return ecological functions to a previous condition rather than to maintain existing conditions or create new conditions. For example, historical reconstructions of pre-settlement physical conditions for portions of the Snoqualmie, Cedar, Green and White River channels, Puget Sound tidal marshes and select marine nearshore areas are helpful in providing insight about predevelopment conditions (Collins and Sheikh 2002; Collins, Sheikh, and Kiblinger. 2003; Collins and A. J. Sheikh 2004a; Collins and Sheikh. 2004b; Collins and Sheikh. 2005a; Collins and Sheikh. 2005b).

The type, degree and distribution of urban, rural, agricultural and forestry land uses can also inform restoration planning as land use has varied affects on the quality and flow of water, sediment and vegetation. Land use also alters the disturbance regime (such as timing, magnitude and frequency of floods) of a shoreline.

Summary and next steps

Restoration as used here is a catch-all term for a wide range of activities that protect on-the-ground conditions, restore an area to pre-existing ecological conditions, or endeavor to make the conditions better by modifying or creating new habitats, consistent with the altered processes of developed areas. Strategies for restoration typically include protection of intact areas, as well as a range of site, reach and watershed level actions chosen with reference to the type and degree of human alterations and constraints affecting a given area. King County's shorelines exist in the context of a wide array of land uses, ranging from wilderness, with only minimal impact from recreation or limited historic activities such as mining, to high density urban, commercial and industrial development, with associated high levels of modification and constraint on shorelines and ecological processes. Therefore, a restoration plan should assess and incorporate knowledge of the variability in conditions, using it to identify and prioritize actions accordingly.

Consistent with the restoration planning literature, Appendix A of the Shoreline Master Plan uses available information on reach and basin conditions to create a contextual analysis of shorelines processes and conditions. From this, marine, lake and river shoreline reaches are classified according to the types of priority actions, ranging from protection and conservation of processes and species to creation of new habitats appropriate for the context. The former actions would be priorities for reaches where processes are largely intact, while the latter would be priorities for highly modified and constrained situations where processes have been heavily altered or supplanted by artificially engineered processes.