

CHAPTER 1

Introduction

The Columbia Slough Watershed is a unique area of the City of Portland that contains large industrial areas, historic residential neighborhoods, newly developing residential and commercial areas, as well as multiple lakes and wetlands, miles of waterway, hiking and biking trails and canoeing opportunities. The watershed is rich in both history and natural resources. Protecting and enhancing the natural resources, as well as fostering economic development and a high quality of life, are important issues facing the City.

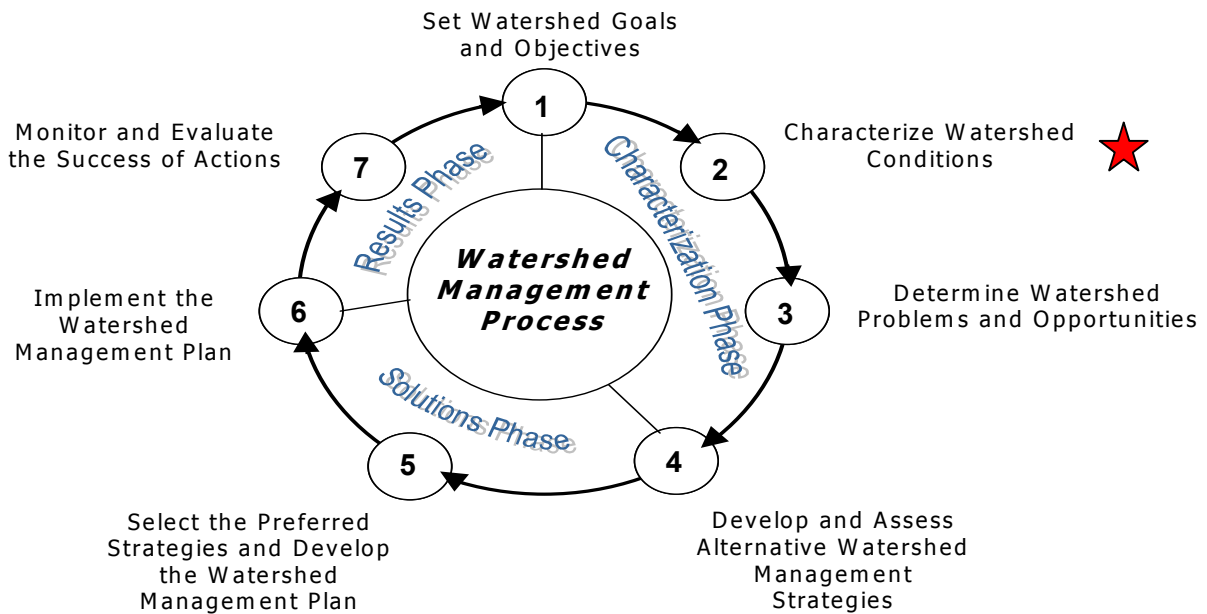
Vision: The Columbia Slough Watershed is a natural amenity that shelters healthy wildlife and aquatic communities, and supports healthy business, worker, resident, and recreational communities.

The *Columbia Slough Watershed Characterization* is intended to characterize the current conditions of the watershed and waterway and to inform activities undertaken by the City of Portland, including the development of a *Portland Watershed Management Plan*. Wherever possible, the characterization compares current conditions with historic or reference conditions.

The Bureau of Environmental Services (BES) is in the process of developing the *Portland Watershed Management Plan* to manage projects and programs in the City's watersheds. Figure 1-1 shows the three-phase, seven-step watershed management process that serves as the framework for development of the *Portland Watershed Management Plan*. The steps represent a sequential assessment and decision-making approach to set watershed goals and objectives, characterize conditions, develop management solutions, and implement actions and assess their success. The circular nature of the process suggests that watershed management involves ongoing adaptive management and important feedback to ensure that watershed goals and objectives are achieved.

The *Framework for Integrated Management of Watershed and River Health* describes the process being used to develop the *Portland Watershed Management Plan*. The *Framework* also provides the scientific foundation for watershed management. The scientific foundation summarizes the current understanding of how an ecosystem works and how this understanding can be applied to achieve watershed health goals. It provides a consistent and clearly defined approach to protection and restoration. This consistent scientific foundation will enable the City to draft, test, and refine the elements of the *Portland Watershed Management Plan* (such as objectives, targets, and actions) over time.

Figure 1-1: Watershed Management Process



The format of the *Columbia Slough Watershed Characterization* follows the goals established for Portland’s watersheds. A citywide process was undertaken to determine four goals for achieving watershed health: stream flow and hydrology, water quality, physical habitat and biological communities.

Two additional goals were identified for the Columbia Slough Watershed: public health and safety, and stewardship. Public health and safety —e.g., water systems, sewers, streets, and electricity—was added as a goal because part of BES’s mission is to serve the community by protecting human health. Public infrastructure provides the underlying built framework that supports public health and safety. BES is responsible for constructing and maintaining sanitary and stormwater collection and treatment facilities for the City of Portland.

Stewardship is an important factor in improving hydrology, water quality, habitat, and public health and safety, and in fostering sustainable management of all resources, whether public or private. A highly educated and involved public is important to achieving watershed health. Not only is it important for the public to participate in bureau programs and projects, it is also important to build stewardship within the public to protect and enhance the functions of the watershed.

The goals are:

Goal 1 - Stream Flow and Hydrology: Move toward normative flow conditions to protect and improve watershed and stream health, channel functions, and public health and safety. (Normative flow has the magnitude, frequency, duration, and timing essential to support salmonids and other resources.)

Goal 2 -Water Quality: Protect and improve surface water and groundwater quality to protect public health and support native fish and wildlife populations and biological communities.

Goal 3 - Physical Habitat: Protect, enhance, and restore aquatic and terrestrial habitat conditions to support key ecological functions and improved productivity, diversity, capacity, and distribution of native fish and wildlife populations and biological communities.

Goal 4 - Biological Communities: Protect, enhance, and restore native aquatic and terrestrial species and biological communities to improve and maintain biodiversity in Portland's watersheds.

Goal 5 - Public Health and Safety: Protect property and public health by planning, designing, developing, operating, and maintaining sanitary sewer and stormwater infrastructure.

Goal 6 - Stewardship: Incorporate public values into watershed plan development, implementation, and refinement, and support long-term, community-wide commitment to improve and sustain watershed health.

Additional information, such as watershed history and land use, is also included to provide a complete characterization of the watershed.

A *Map Atlas* is available. These color maps display many different aspects of the watershed, such as soil, land use, zoning, the sanitary and storm sewer system, and impervious areas. There are also maps showing the historic watershed in the 1850s and early 20th century.

PUBLIC INVOLVEMENT PROCESS

BES is committed to meaningful public involvement as an essential element of all bureau programs and projects. Public involvement enhances existing and builds new long-term partnerships with a variety of neighborhood, business, environmental, and citizen interest groups. Stakeholders were involved during the *Columbia Slough Watershed Characterization* process. BES also provided opportunities for the public to communicate ideas, opinions, and concerns about project elements and decisions. The objectives of the *Columbia Slough Watershed Characterization* public involvement process were:

- To inform, educate, and obtain feedback on the draft *Columbia Slough Watershed Characterization* from pertinent BES staff and managers, other city bureaus or programs (e.g. Endangered Species Act and Commissioners' offices), key public stakeholders, and other interested watershed residents.
- To incorporate appropriate comments received in order to produce a final *Columbia Slough Watershed Characterization* that is approved by BES management, consistent with general City policies, and has the support of key stakeholders.

In August 2003 the *Draft Characterization* went out for review to a select group of technically skilled stakeholders whose input was vital to completing the characterization. (See Appendix A: List of Stakeholders). The purpose was to make sure all information was accurate and to identify any information gaps. Comments were incorporated where appropriate, and a *Final Draft Characterization* was sent for review (January 2004) to past reviewers, plus an expanded group of stakeholders. The purpose of this mailing was to inform additional people about the watershed planning process and to do a final information gap review.

In April 2004, a Technical Review Work Session was held. Stakeholders involved in the review of the *Final Draft Characterization* were invited to help develop objectives and identify indicators and targets for reaching those objectives. Results from the work session were used to develop a database of objectives, indicators, and targets.

An open house was held on April 26, 2004. The purpose of the open house was to present the results of the characterization. The general public was invited to participate. Copies of the *Final Draft Characterization* and the *Map Atlas* were available, and written comments were accepted following the open house.

In April 2004, the *Final Draft Characterization* was placed on the BES website for public review. Comments were accepted via e-mail to the Columbia Slough Watershed Manager.

In April and May 2004, presentations were made to the Oregon Department of Environmental Quality, Port of Portland, and Columbia Slough Watershed Council. (Selected staff from these organizations had been involved during the review of the *Draft Characterization* and the Technical Review Work Session.) The purpose of the presentations was to make staff aware of the process, allow an opportunity to ask questions, and gain feedback to be included in the *Portland Watershed Management Plan*.

GLOSSARY

Below is a list of terms used in the *Columbia Slough Watershed Characterization* and their definitions:

Adaptive management: A dynamic planning and implementation process that involves applying scientific principles, methods and tools to improve management activities incrementally, as decision makers learn from experience and better information and analytical tools become available. Involves frequent modification of planning and management strategies — and sometimes goals and objectives — in recognition of the fact that the future cannot be predicted perfectly. Requires frequent monitoring and analysis of the results of past actions and application of those results to current decisions.

Alluvial: Deposited by running water.

Anadromous fish: Fish that hatch in fresh water, migrate to ocean water to grow and mature, and return to fresh waters to spawn; includes salmon, steelhead, and sea-run cutthroat trout.

Aquatic habitat: The water-based locality or geographic area in which a plant or animal species naturally lives or grows.

Asset: Watershed conditions or features that are currently in a healthy, properly functioning state and that are considered key to sustaining important watershed functions.

Bathymetric: Of or relating to the measurement of water depth at various places in a body of water.

Benthic macroinvertebrates: Animals without backbones found in the sediment of the stream or river bottom. Benthic macroinvertebrates are a food source for fish and other wildlife.

Benthic organisms: Bottom-dwelling aquatic organisms. Commonly, the first 6 to 10 inches of the top surface layer of mud are considered to be the bioactive layer (meaning, the layer that biological organisms dwell in).

Bioaccumulation: The increase in concentration of a chemical resulting from a direct uptake from the environment to an organism

Bioavailable: Chemicals that can be taken up or are available for uptake by biological organisms. Some chemicals are bound very tightly by sediment particles and so are not released for uptake. In order for a chemical to be bioavailable, it has to be in a form that can pass through cell membranes.

Biological diversity (biodiversity): Variety of plant and animal life coexisting in a specific habitat.

Biological indicator: A living organism that denotes the presence of a specific environmental condition.

Biomagnification: An increase in the concentration of heavy metals (such as mercury) or organic contaminants (such as chlorinated hydrocarbons) in organisms as a result of their consumption within the food chain of a particular habitat. Compare with "bioaccumulation," which can be regarded as the first step of the biomagnification process.

Biota: The flora and fauna of a region.

Channelization: The act of cutting off side channels of a stream or river and artificially confining the channel.

Characterization: A thorough documentation of existing conditions within a watershed. Summarizes what is known about environmental conditions in the watersheds in order to:

- Identify key threats to watershed health
- Set appropriate restoration objectives by comparing existing conditions to goals for the watershed
- Identify information gaps
- Set priorities for protection and restoration actions

Chlorinated pesticides: Pesticides that contain chlorine compounds. All chemical compounds that contain chlorine are toxic.

Confluence: The junction or union of two or more streams; a body of water produced by the union of several streams.

Core habitat: Core habitats are large habitat areas within the watershed that provide a variety of watershed functions, contain multiple habitat types and can support sustainable populations of wildlife, such as Smith and Bybee Lakes and Big Four Corners in the Columbia Slough watershed.

Corridor: A continuous connection between habitats; a migration route that allows wildlife migration. In terms of conservation biology, a connection between habitat fragments in a fragmented landscape.

Ecological functions: The uses that a natural resource provides that benefit the environment and humans.

Ecosystem: The living and nonliving components of the environment that interact or function together; includes plant and animal organisms, the physical environment and the energy systems in which they exist

Effective impervious area: The portion of the total impervious area that is directly connected to a stormwater sewer pipe system, which discharges to a surface water body.

Estuary: The part of the wide, lower course of a river or slough where its current meets and is influenced by the ocean tides. For the Columbia Slough, the area of tidal influence extends to the MCDD Pump Station #1 at mile 8.5.

Eutrophication: A process in an aquatic ecosystem where high nutrient concentrations and warm water stimulate blooms of algae and macrophytes.

Fiscal year: The City of Portland operates on a fiscal year budget ending June 30th annually.

Flashiness, or flashy stream: Stormwater within the watershed makes its way quickly from the land to the stream, causing the stream volume to increase quickly, and subside quickly once the precipitation has passed.

Floodplain: The area immediately adjacent to the stream or river channel that becomes inundated with over-bank flows during large storm events and floods. In the Columbia Slough watershed, the managed floodplain is the area protected by levees and managed by the Multnomah County Drainage District for flood control. The unmanaged floodplain is the area in the Lower Slough Watershed outside of the levees.

Flow: The volume of water, often measured in cubic feet per second (cfs), flowing in a stream or river.

Flow augmentation: Flow augmentation is a method to increase the flow rate in the Slough designed to decrease detention time of the water. Flow augmentation has been attempted to lower temperatures and to reduce algae growth.

Food web and food chain: Food web is the interrelationship among the biological organisms in a community according to the transfer of useful energy from food resources to organisms eating those resources. While a *food chain* depicts a simple linear transfer from one organism to another, most animals eat more than one type of food.

Fragmentation: Breaking up of contiguous areas into progressively smaller patches of increasing degrees of isolation.

Goal: A statement of a desired end state for the watershed; the City of Portland's obligations and aspirations for achieving watershed health.

Habitat: An area with the combination of necessary resources (e.g., food, cover, water) and environmental conditions (temperature, precipitation, presence or absence of predators and competitors) that promotes occupancy by individuals of a given species (or population), and allows those individuals to survive and reproduce.

Hardness: Hardness is a measurement of the concentration of metal ions such as calcium, magnesium, iron, zinc etc, usually acquired as rainwater percolates through rock. In most water it consist mainly of calcium and magnesium salts, with trace amounts of other metals.

Hazard index: The hazard index is a summation of hazard quotients (HQ) for each chemical of concern.

Hazard quotient: The hazard quotient is defined as the ratio of the expected environmental dose of one chemical to the toxicity reference value. The environmental dose is estimated from the sediment concentration of the chemical, while the toxicity reference value is usually derived from reported scientific literature values approved by the EPA.

Hydrograph: A graph showing the changing flow or depth of a body of water following a rain event with respect to time.

Hydrophobic chemicals: Chemicals, usually organic chemicals, which do not dissolve well – if at all - in water. These compounds are soluble in fats, oils or lipids. Most toxic organic chemicals, such as pesticides and PCBs, are hydrophobic. Being hydrophobic makes these chemicals bioaccumulative.

Impervious area: An impermeable ground cover or surface, such as paved roads, roofs, sidewalks and structures.

Indigenous: Native to the region.

Inorganic chemicals: Chemicals that do not contain a carbon molecule. Elemental metals are inorganic chemicals.

Legacy pollutants: Pollutants that are still found in the environment, even though they have been banned for many years. Examples: DDTs and PCBs.

Mitigation: The creation, restoration or enhancement of a habitat area to maintain the functional characteristics and processes of the habitat, such as its natural biological productivity, habitats and species diversity; unique water features; and water quality.

Natural area: A landscape unit composed of plant and animal communities, water bodies, soil and rock, largely devoid of human-made structures, maintained and managed in such a way as to promote or enhance populations of wildlife.

Off-channel habitat: The physical environment necessary and natural to fish that is located adjacent to or connected to the primary in-stream flow, such as tributary and side channels.

One in a million (or 1 in 1,000,000) health risk, or excess cancer risk: Usually refers to cancer risk. If a million people eat x amounts of contaminated fish frequently for a certain period of time (usually 35 years), then one person of that million people will have an increased 0.000001 chance of getting cancer.

Organics or organic chemicals: Chemicals that contain a carbon compound or molecule.

Persistent, bioaccumulative toxics: Toxic chemicals that do not easily break down in the environment (and therefore, persists for many years in the environment) and are accumulated by biological organisms. Most PBTs are hydrophobic organic compounds.

Problem: Watershed condition or feature that is not properly functioning or that is impairing the watershed and waterway health.

Protection: The protection of an ecological function to maintain the characteristics and processes of the habitat.

Reach: A section of waterway between two specified points; also can include the land that drains to that waterway.

Reference conditions. Watershed conditions that reflect one of various reference states, such as actual historical conditions or the habitat's ecological potential, meaning the conditions that would exist if all habitat attributes were unimpaired and functioning properly.

Refugia: Locations and habitats that support populations of organisms limited to small fragments of their previous geographic range. Also refers to areas used by fish and wildlife for hiding and resting.

Resident fish: A fish that does not migrate to the ocean but instead remains in fresh water for the entirety of its life.

Restoration: The process of assisting the recovery of an ecosystem that has been degraded, damaged or destroyed.

Riparian: Of or relating to the banks of a water body.

Riparian ecosystem: Transitional ecosystems between terrestrial and aquatic ecosystems.

Risk assessment: An analytical study of the probabilities and magnitude of harm to human health or the environment associated with a physical or chemical agent, activity or occurrence.

Sample: A representative portion withdrawn from a larger whole to determine some characteristic, such as the concentration of some constituent in a body of water, atmosphere, soil, sediments, a waste stream, or a biological component (fish or plant tissue).

Sanitary sewage: Sewage that contains human waste products.

Sediments: Soil, sand, clay particles or other substances that settle to the bottom of any water body.

Stream morphology: The study of the form and structure of stream systems.

Sumps: Gravity-drained wells that infiltrate stormwater to the ground, also known as Underground Injection Control systems, or UICs.

Surrogate: Something that serves as a substitute. In risk analysis, surrogates are often used when data on the item of interest, a chemical or water quality parameter, is lacking or unobtainable. In measuring biodiversity, a surrogate is an element of biodiversity that is used in management to

represent, or substitute for, a more complex element of biodiversity that is more difficult to define or measure.

Terrestrial: Living on or in or growing from land.

Total maximum daily loads (TMDL): A calculation of the maximum amount of a pollutant that a water body can receive and still meet water quality standards, and an allocation of that amount to the pollutant's sources. In Portland, the Department of Environmental Quality sets this standard.

Total suspended solids (TSS): Tiny particles that are dispersed throughout the water column.

Tributary: A stream feeding a larger stream or a lake.

Water column: The area or zone between the bottom and the surface of a waterbody (sea, lake, river, creek or pond).

Watershed: The specific land area that drains water into a river system or other body of water.

Wetland: Land areas where excess water is the dominant factor determining the nature of soil development and the types of plant and animal species living at the soil surface. Wetland soils retain sufficient moisture to support aquatic or semi-aquatic plant life.

Wetland mitigation: The creation, restoration, or enhancement of a wetland to maintain the functional characteristics and processes of the wetland, such as its water quality, unique water features, and natural biological productivity, habitats, and species diversity.