Appendix G

Shoreline Inventory and Assessment

FINAL DRAFT

SHORELINE INVENTORY AND ANALYSIS REPORT

For City of Wenatchee Shorelines

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CHELAN COUNTY SHORELINE MASTER PROGRAM UPDATE
FINAL SHORELINE INVENTORY AND ANALYSIS

1. INTRODUCTION

1.1 Background and Purpose

Chelan County (County) obtained a grant from the Washington Department of Ecology (Ecology) in 2007 to conduct a comprehensive Shoreline Master Program (SMP) update. The Cities of Cashmere, Chelan, Entiat, Leavenworth and Wenatchee are active partners with the County, and will participate in all SMP Update-related efforts. This effort is precipitated by new Shoreline Master Program Guidelines (Chapter 173-26 WAC) promulgated by Ecology in 2003.

The Shoreline Inventory and Analysis report and accompanying map folio (see DVD mounted in back cover of this report) establishes the framework for future steps in the SMP update process. Those future steps include development of the updated SMP, and preparation of the Cumulative Impacts Analysis and Restoration Plan. This Shoreline Inventory and Analysis report will serve as the baseline from which the possible effects of potential development actions in the shoreline will be measured. The Guidelines require the County to demonstrate that its updated SMP yields "no net loss" in shoreline ecological functions relative to the baseline due to its implementation. Ideally, the SMP in combination with other County, City and regional efforts, will ultimately produce a net improvement in shoreline ecological functions.

1.1.1 Shoreline Inventory

As laid out in the Guidelines, one of the first steps of the update process is to prepare an inventory of all County and City shorelines as defined by the State's Shoreline Management Act (SMA) (RCW 90.58). The inventory is conducted according to direction provided in the Guidelines (WAC 173-26-201) and in the Grant Agreement promulgated by Ecology. A key excerpt from the WAC is presented below:

> Gather and incorporate all pertinent and available information, existing inventory data and materials from state agencies, affected Indian tribes, watershed management planning, port districts and other appropriate sources… Local governments shall be prepared to demonstrate how the inventory information was used in preparing their local master program amendments. Collection of additional inventory information is encouraged and should be coordinated with other watershed, regional, or statewide

> inventory and planning efforts in order to ensure consistent methods and data protocol as well as effective use of fiscal and human resources. Data from inter-jurisdictional, watershed, or regional inventories may be substituted for an inventory conducted by an individual jurisdiction, provided it meets the requirements of this section.

WAC 173-26-201(3)(c) includes a detailed list of information that should be gathered "to the extent such information is relevant and reasonably available." The references list (Chapter 9) outlines information sources for each general topic. The references was generated by soliciting information from County, City, State, and Federal agencies; utilities; private non-governmental organizations; and Advisory Committee members, among others. In addition, the County compiled a list of key potential stakeholders and interested groups. Many parties on the list became active participants in the Advisory Committee for the SMP Update; the remaining parties have been and will continue to be notified at key project stages and provided with opportunities to submit relevant information. Collected information was supplemented with other resources such as scientific literature, personal communications, aerial photographs, and Internet documents.

Chapters 3 and 4 contain the Shoreline Inventory component of this report.

1.1.2 Shoreline Analysis

WAC 173-26-201(3)(d) contains direction regarding analysis of the information gathered as part of the Shoreline Inventory. Accordingly, Chapters 5, 6 and 7 analyze the shorelines by waterbody and/or by reach, as appropriate, for ecological function/ecosystem-wide processes, land use, and public access. Chapter 8 contains additional analyses and specific recommendations related to development of the updated Shoreline Master Program. The Guidelines encourage use of available "regional environmental management plan[s]" when available. This Shoreline Inventory and Analysis utilizes the existing watershed and sub-basin plans to the maximum extent practicable given the Guidelines and the topical coverage of those management plans.

1.2 Study Area

Chelan County encompasses 2,294 square miles and is located in the north-central part of Washington. The county is bordered to the south by Kittitas County, to the southwest by King County, to the west by Snohomish County, to the northwest by Skagit County, to the northeast by Okanogan County, and to the east by Douglas County. Chelan County is predominantly rural in nature, with unincorporated areas making up most of the land area. Incorporated areas of the County include the cities of Cashmere, Chelan, Entiat, Leavenworth, and Wenatchee.

The study area for this report includes all land currently within the County and each City's proposed shoreline jurisdiction. This area is distributed among 80 rivers and streams and 53 lakes and reservoirs. Federal lands on which shoreline waterbodies lie are included in this report, but discussion is more limited in keeping with the application of the future SMP only to certain actions undertaken by non-federal parties on those lands.

The City of Wenatchee has removed a portion of the information related to Chelan County and the Cities of Cashmere, Chelan, Entiat, and Leavenworth so that this analysis is more reflective of the City of Wenatchee.

1.3 Shoreline Jurisdiction

As defined by the Shoreline Management Act of 1971, shorelines include certain waters of the State plus their associated "shorelands." At a minimum, the waterbodies designated as shorelines of the State are streams whose mean annual flow is 20 cubic feet per second (cfs) or greater or lakes whose area is greater than 20 acres.[1] In addition, shorelines of statewide significance are those streams and rivers that meet one or more of the following criteria:

> "i. that have either: a mean annual flow of 200 cubic feet per second or more, *or;*
>
> ii. the portion downstream from the first 300 square miles of drainage areas.

Shorelands are defined as:

> "those lands extending landward for 200 feet in all directions as measured on a horizontal plane from the ordinary high water mark; floodways and contiguous floodplain areas landward 200 feet from such floodways; and all wetlands and river deltas associated with the streams, lakes, and tidal waters which are subject to the provisions of this chapter…. Any county or city may determine that portion of a one-hundred-year-floodplain to be included in its master program as long as such portion includes, as a minimum, the floodway and the adjacent land extending landward two hundred feet therefrom…. Any city or county may also include in its master program land necessary for buffers for critical areas…" (RCW 90.58.030)

The County and City shoreline boundaries have been updated (subject to Board of County Commissioners (BOCC), City Councils, and Ecology approval) concurrent with this inventory. While extension of jurisdiction to encompass the

[1] Future climate change could affect precipitation patterns and snowpack in Chelan County in ways that are not yet fully understood or predictable. These changes will affect mean annual flow and lake size, which may alter the extent of shoreline jurisdiction. This shoreline inventory effort does not consider climate change impacts as part of its scope.

entire 100-year floodplain and critical areas buffers are options, the County and Cities have elected to regulate the minimum required jurisdictional area in their SMPs. In summary, improved stream flow modeling by the United States Geological Survey (USGS) and improved lake area mapping has resulted in increased accuracy of jurisdiction identification and mapping.

The Shoreline Management Act had always intended that jurisdiction extend onto federal land, but an error originally made by USGS in the early 1970s and perpetuated by Ecology omitted federal lands from jurisdiction maps and lists. As stated in WAC 173-27-060(3), "The policies and provisions of chapter 90.58 RCW [Shoreline Management Act], including the permit system, shall apply statewide to all nonfederal developments and uses undertaken on federal lands and on lands subject to nonfederal ownership, lease or easement, even though such lands may fall within the external boundaries of a federal ownership." These past mapping errors by USGS and Ecology have been corrected so that federal lands are no longer excluded from shoreline jurisdiction.

The current Shoreline Master Programs regulate 23 streams/rivers and 18 lakes. As considered in this shoreline inventory, 80 streams/rivers and 53 lakes may meet shoreline jurisdiction criteria. The total acreage of upland shorelands (excluding area of the shoreline waterbodies) is 42,693. Federal lands make up 68 percent of that acreage, or 29,211 acres total. Of the 133 total shoreline waterbodies, 94 are entirely on federal lands and another 17 have more than 50 percent of their shoreland areas on federal land. The three federal entities that own the majority of the federal land are the U.S. Forest Service (USFS), the National Park Service (NPS), and the U.S. Bureau of Land Management (BLM). Four USFS wilderness areas are found along Chelan County shorelines: Lake Chelan Sawtooth Wilderness, Glacier Peak Wilderness, Henry M. Jackson Wilderness, and Alpine Lakes Wilderness. These areas have the greatest level of protection and stringent prohibitions on alteration. A large area at the north end of Lake Chelan is also part of the National Park Service's Lake Chelan National Recreation Area.

Minor additional changes have been made based on new information about floodways, floodplains and wetland boundaries. Tables 1 presents the list of shoreline jurisdictional waterbodies, and some basic jurisdictional history. The "total length of proposed shoreline" column in Table 1 represents the combined length of shoreline of current and potential additional jurisdiction based on USGS data. The length of existing stream shoreline is not available.

Table 1. Shoreline Jurisdiction Streams and Rivers

River/Creek Name	Mapped as Shoreline Under Existing SMP	Total Length of Proposed Shoreline (ft)	River/Creek Name	Mapped as Shoreline Under Existing SMP	Total Length of Proposed Shoreline (ft)
Columbia River*	Yes	395,252[2]	Wenatchee River[1]	Yes	278,629[2]
					TOTAL: 673,881 ft (127.63 miles)[2]

[1] Streams/rivers that are partial or complete Shorelines of Statewide Significance.
[2] The length is for the total length of each river and not the limits within the City of Wenatchee.

1.4 Chelan County Watersheds

1.4.1 Geographic Context

Stemilt/Squilchuck - Colockum (WRIA 40a/b)

WRIA 40a/b encompasses the southeast portion of the County and continues southward into neighboring counties. In this vicinity, the County boundary does not follow stream or watershed boundaries, so portions of the WRIA boundary and the County boundary do not coincide. Because of this discrepancy, the WRIA was divided into two parts – WRIA 40a, the Stemilt/Squilchuck, and WRIA 40b, the Alkali/Colockum. Chelan County includes most of WRIA 40a, and significant portions of Colockum Creek. These drainages are tributary to the Columbia River, bounded on the north and east by the Columbia, and on the west by Mission Peak and Naneum Ridge. Mission Creek, which also drains Mission Ridge to the north, is a tributary to the Wenatchee and not part of WRIA 40.

WRIA 40a is the smallest WRIA in the State, at about 49,000 acres, or just over 76 square miles. It consists of four primary sub-basins: Stemilt (21,430 acres), Squilchuck (17,600 acres), Malaga (7,490 acres), and Wenatchee Heights (2,200 acres). Elevations in the basin range from close to 6,900 feet at Mission Ridge to 605 feet at the Columbia.

The Colockum Basin is approximately 36 square miles (23,000 acres), over half of which is located within the County limits. It lies immediately south of the Malaga and Stemilt basins, and like the others in WRIA 40a/b, it drains directly to the Columbia. Elevations range from about 5,800 feet at Naneum Ridge to 550 feet at the Columbia.

Wenatchee (WRIA 45)

The Wenatchee basin is the largest basin in the county, at approximately 1,370 square miles (877,000 acres), draining an area from the Cascade Crest to the Columbia immediately north of the WRIA 40 drainages. The basin is oriented

with headwaters in the northwest and the confluence with the Columbia to the southeast, at the City of Wenatchee. It is the most heavily populated of the basins in Chelan County, with Leavenworth, Cashmere and Wenatchee as the primary population centers. Over 80 percent of the land in the basin is federally or State owned (Wenatchee Watershed Planning Unit [WWPU] 2006).

There are seven major tributaries to the Wenatchee. The White River originates at the south side of Glacier Peak, the least well known of the Cascade volcanoes, and empties into Lake Wenatchee. Glacial runoff from Glacier Peak gives the river its name. The Little Wenatchee drains from non-glaciated portions of the Cascade Crest south of Glacier Peak, and also flows into Lake Wenatchee. The outlet of Lake Wenatchee forms the mainstem Wenatchee River. The Chiwawa, which originates between Fortress and Buck Mountains northeast of Glacier Peak, joins the Wenatchee just north of the town of Plain. Nason Creek originates south of the Little Wenatchee basin near Stevens Pass and flows into the Wenatchee just downstream of Lake Wenatchee. Icicle Creek drains an area south of the Nason Creek basin, including the west side of Mt. Stuart and the Chiwaukum Mountains, and meets the Wenatchee in Leavenworth. The Peshastin Creek drainage includes the south side of Mt. Stuart and the Stuart Range as well as the Blewett Pass area. Peshastin Creek meets the Wenatchee at Peshastin. Mission Creek drains the area to the west of the Peshastin Basin, from Naneum Ridge northward to its confluence with the Wenatchee at Cashmere.

In total, there are about 230 miles of major stream in the Wenatchee Basin (WWPU 2006). The Wenatchee itself has about 61 linear miles of stream accessible to salmonids (Laura Berg Consulting, et al. [Berg] 2004b).

1.4.2 Historic Geology, Topography, and Drainage Patterns

Topography and Geology

Throughout most of the County, the upper elevations area are characterized by deeply incised, high-relief terrain of the eastern Cascade Mountains, consisting primarily of metamorphic and intrusive igneous rocks, though significant sedimentary and volcanic rocks occur in the Stemilt/Squilchuck basin and portions of the Wenatchee basin. The Cascade Range has been formed over the last 37 million years by the subduction of the oceanic Juan de Fuca plate under the continental North American plate. The plate boundary is just off the coast of Washington, and as the Juan de Fuca plate subsides, it is forced downward at an angle under the North American plate. As the plate moves downward, the temperature around it increases to the point that the plate begins to melt. The melted material moves upward, forcing its way through and blending with the overriding continental crust. Where the melted material emerges at the surface, volcanoes are formed, including Glacier Peak near Chelan County. The upward migration of material also created a general uplift in the area, forming the Cascade Range

The Cascades have been heavily influenced by Quaternary mountain glaciation, with landforms typical of such glaciation, including cirques, arêtes, U-shaped valleys, and moraines. The valleys bottoms are largely filled with glacial and fluvial deposits, primarily unconsolidated silts, sands and gravels, as well as significant volumes of landslide/debris flow deposits. In the Wenatchee basin, deposits of glacial and post-glacial material are up to 170 feet thick (EEC and Golder 1998), and on the Icicle in Leavenworth, deposits are up to 300 feet thick (Andonaegui 2001).

Along the extreme eastern edge of County, nearest the Columbia as well as throughout most of the upper elevations of the Stemilt/Squilchuck watershed, flood basalts of the Columbia Plateau are the prevalent bedrock. These rocks were formed over a period of 10 million years or so, beginning about 17 million years ago, as several series of vents released massive volumes of basaltic lava, which flowed over most of the lower-lying areas of Eastern Washington and continued to the Pacific Ocean through the Columbia Gorge. These vents were located along several nearly north-south lines, up to 100 miles long, ranging from central Oregon to the Tri Cities, Spokane, Pullman, and central Idaho. Over 300 individual flows have been identified, with accumulations of over 6,000 feet in places. Broad plateaus or gently rolling hills with steep-walled, incised, stream-carved valleys, typify the topography.

The lower elevation areas of the county were heavily influenced by continental glaciation. At its maximum extent, the Cordilleran ice sheet reached a point just south of present-day City of Chelan within the county. In the Chelan Basin, the combination of mountain glaciation from the Cascades and continental glaciation combined to carve out and dam the lake. The valley flooded by the lake is a typical U-shaped mountain-glacier carved valley. The valley was subsequently dammed by moraine deposits from the Cordilleran ice sheet (Hillman and Giorgi 2000). Because of this, the lower lake, from Wapato Point eastward, is relatively shallow, having been filled with glacial deposits that form the dam. The upper lake, by contrast, is exceptionally deep, with steep walls that plunge deep into the water with little or no beach formation.

In other low-lying parts of the County, especially in the more northern portions close to the terminus of the Okanogan-Columbia Valley lobe, loess plains were formed as wind deposited fine sediments that had been eroded out of glacially deposited materials. Along the Columbia, massive floods scoured and deposited material when lakes that were dammed by the Cordilleran ice sheet were catastrophically released.

Drainage Patterns

There is significantly more precipitation in the upper portions of the basins in Chelan County than in the lower basins. The greatest discrepancy is in the Wenatchee basin, where the upper portions see up to 150" of precipitation

annually, and the lower portions less than 10" (Berg 2004b). In the smaller, and less-steep Stemilt/Squilchuck basin, the difference is less pronounced, with 32" in the upper reaches and about 8" in the lower (RH2 Engineering, Inc. 2007).

In all the basins, precipitation in the higher elevations usually occurs in the winter as snowfall (RH2 Engineering, Inc. 2007; WWPU and Chelan County Natural Resources 2003; Berg 2004a, c), though the White River is the only major tributary with heavy glacial input. Because most of the precipitation is snowfall, peak flows tend to be in the spring and summer months, as the snow melts. However, rain-on-snow events in the late fall and winter can produce dramatic flood events. Occasional, localized summer thunderstorms occur, which can lead to localized flash flood events.

The upper basins, being primarily rock with little soil or stored sediment, tend to have little sub-surface storage of water, though jointing and faulting can produce some potential water storage. Most of the snowmelt instead runs off to lower elevation/lower relief areas. The alluvial and/or glacial sediments that tend to fill the valleys store a significant portion of the runoff as groundwater. As stream flow decreases during the hot, dry summers water stored in the valley floor sediment re-enters the stream and contributes to low flow volumes. However, even with this contribution, summer flows tend to be quite low. Water withdrawals, both from the streams directly and from the valley-floor sediments, exacerbate the problem. In the Wenatchee basin, for example, the mainstem Wenatchee River, and the Icicle, Chumstick, Peshastin, and Mission Creeks, to name a few, have been included on the State 303(d) list for lack of flow (as well as low dissolved oxygen content, high temperatures, and pH) (Berg 2004b).

1.4.3 Major Land Use Changes and Current Shoreline Condition

Stemilt/Squilchuck – Colockum (WRIA 40a/b)

According to the 2000 Washington State Census,the population in the Stemilt/Squilchuck basin was 3,770. Most of these people work outside the drainage, mostly in the city of Wenatchee. The upper portion of the basin is predominately zoned as commercial forest land. However, the upper basin is also a popular place for recreational activities, including hunting, snow-machining, hiking, biking, fishing and skiing. The Mission Ridge ski area hosts 100,000 visitors annually.

The lower portions of the basin are primarily rural residential/resource or commercial agriculture. Unlike the other basins in the County, public land makes up very little of this basin.

Agricultural land is dominated by fruit trees, with cherry being the most common. The Wenatchee Heights sub-basin "Most relatively flat area[s in this basin] are covered by orchard" (RH2 Engineering 2007).

The industrial properties that exist in the drainage are located in the Malaga sub-basin, along the Columbia River. However, subsurface gold mining and some hydropower generation have occurred historically in the lower Squilchuck basin.

Wenatchee (WRIA 45)

The Wenatchee basin is home to approximately 54,000 people, according to Chelan County Long Range Planning Office. The majority of the population is concentrated in the lower basin, with major population centers including Wenatchee, Cashmere, and Leavenworth.

The City of Wenatchee is located at the confluence of the Wenatchee and Columbia Rivers. With a population of about 36,000 people, it makes up two-thirds of the overall basin population. It is expected to grow to about 54,000 by 2025 (Chelan County Community Development).

Cashmere is located at the confluence of Mission Creek and the Wenatchee River. It is the second largest city in the basin, with a population of 11,000. As with Wenatchee, Cashmere is expected to grow significantly in the future, with 17,000 expected by 2025 (Chelan County Community Development).

Leavenworth is located at the confluence of Icicle Creek and the Wenatchee River, near RM 25.6. Leavenworth, a popular tourist destination, has a full-time resident population of about 6,000 people, or roughly 11 percent of the basin total. Like the other cities in the basin, the population of Leavenworth is expected to increase significantly over the next 20 years, to 8,500 by 2025.

Peshastin is a small community established in the 1890s, during which time a depot was erected along the Northern Pacific Railroad. Today, Peshastin is a small unincorporated community located within the newly adopted Peshastin UGA. The UGA contains 610 acres, 93 acres of which lie in shoreline jurisdiction along the Wenatchee River and approximately 3 acres of which lie in shoreline jurisdiction along Peshastin Creek. A majority of the area is surrounded by orchards, with some wineries and bed and breakfasts. According to the Peshastin Urban Growth Area Comprehensive Plan, the community is expected to grow to approximately 1,110 residents within the Peshastin UGA by 2025.

Publicly owned lands dominate the basin, with 76% of the basin, totaling 671,000 acres, owned by the USFS. Of this area, 316,000 acres is designated wilderness, 243,000 acres is designated as multiple resource (i.e. forestry, recreation, water supply, etc.), and 112,000 acres is designated as no-cut forest (Berg 2004b).

Though less than 25% of the basin is privately owned, private landholders border two-thirds of the lineal extent of anadromous streams (Chelan PUD 1998, Berg 2004b). The largest industry in the basin is agriculture, dominated by fruit trees. Indeed, the region is internationally recognized for its fruit production, especially winter pears (WWPU 2006). Low rainfall in the lower portions of the basin makes it necessary to irrigate in order to have fruit production (WWPU

2006). Such irrigation must be year-round and continuous, since unlike annual crops, the trees live year-round and take several years to mature. One interruption in irrigation can damage or kill the trees, which cannot be quickly replaced (WWPU 2006).

2. CURRENT REGULATORY FRAMEWORK SUMMARY

This section presents a brief summary of land use regulations that are related to shoreline activities. The *Shoreline Management Recommendations* report provides additional analysis of shoreline, critical area, and zoning regulations in particular.

2.1 Existing Shoreline Master Programs

The Shoreline Management Act of 1971 (Chapter 90.58 RCW) was established to:

> "…prevent the inherent harm in an uncoordinated and piecemeal development of the state's shorelines…" and to "provide for the management of the shorelines of the state by planning for and fostering all reasonable and appropriate uses. This policy is designed to insure the development of these shorelines in a manner which, while allowing for limited reduction of rights of the public in the navigable waters, will promote and enhance the public interest. This policy contemplates protecting against adverse effects to the public health, the land and its vegetation and wildlife, and the waters of the state and their aquatic life, while protecting generally public rights of navigation and corollary rights incidental thereto."

The SMA emphasizes accommodation of reasonable and appropriate uses, protection of shoreline environmental resources and protection of the public's right to access and use the shorelines" (http://www.ecy.wa.gov/programs/sea/sma/st_guide/intro.html). Ecology is responsible for developing and overseeing implementation of Shoreline Master Program Guidelines (Chapter 173-26 WAC), which provide direction to local governments regarding development and implementation of local Shoreline Master Programs. While cities and counties are the primary regulators under the Shoreline Management Act, Ecology has final approval authority over the local government's SMP. Ecology also reviews and has final approval over Shoreline Conditional Use and Shoreline Variance permits processed under the local jurisdiction's SMP.

The first City of Wenatchee Shoreline Master Program (SMP) was adopted by the City and Washington State Department of Ecology in 1975. There are currently four shoreline environment designations: Urban, Rural, Conservancy and Natural (Figure 1). The City modified the procedural sections slightly to

increase administrative decision-making. The SMP requires all proposed projects to comply with the State's Shoreline Management Act (RCW 90.58), Washington Administrative Code (WAC) Chapter 173-26, and the Shoreline Master Program. In addition, all proposed projects must be consistent with local comprehensive plans, development regulations, International Building Code, and other local and federal laws.

2.2 Existing Critical Area Regulations

The City of Wenatchee each has a set of critical area regulations that dictate protection of environmentally sensitive areas, including wetlands, streams (fish and wildlife habitat conservation areas), geologically hazardous areas, frequently flooded areas, and aquifer recharge areas. These regulations use a version of the Department of Ecology's Eastern Washington Wetland Rating System.

Figure 1 below identifies the shoreline environmental designations as they were originally adopted for Chelan County and the Cities; on one map.

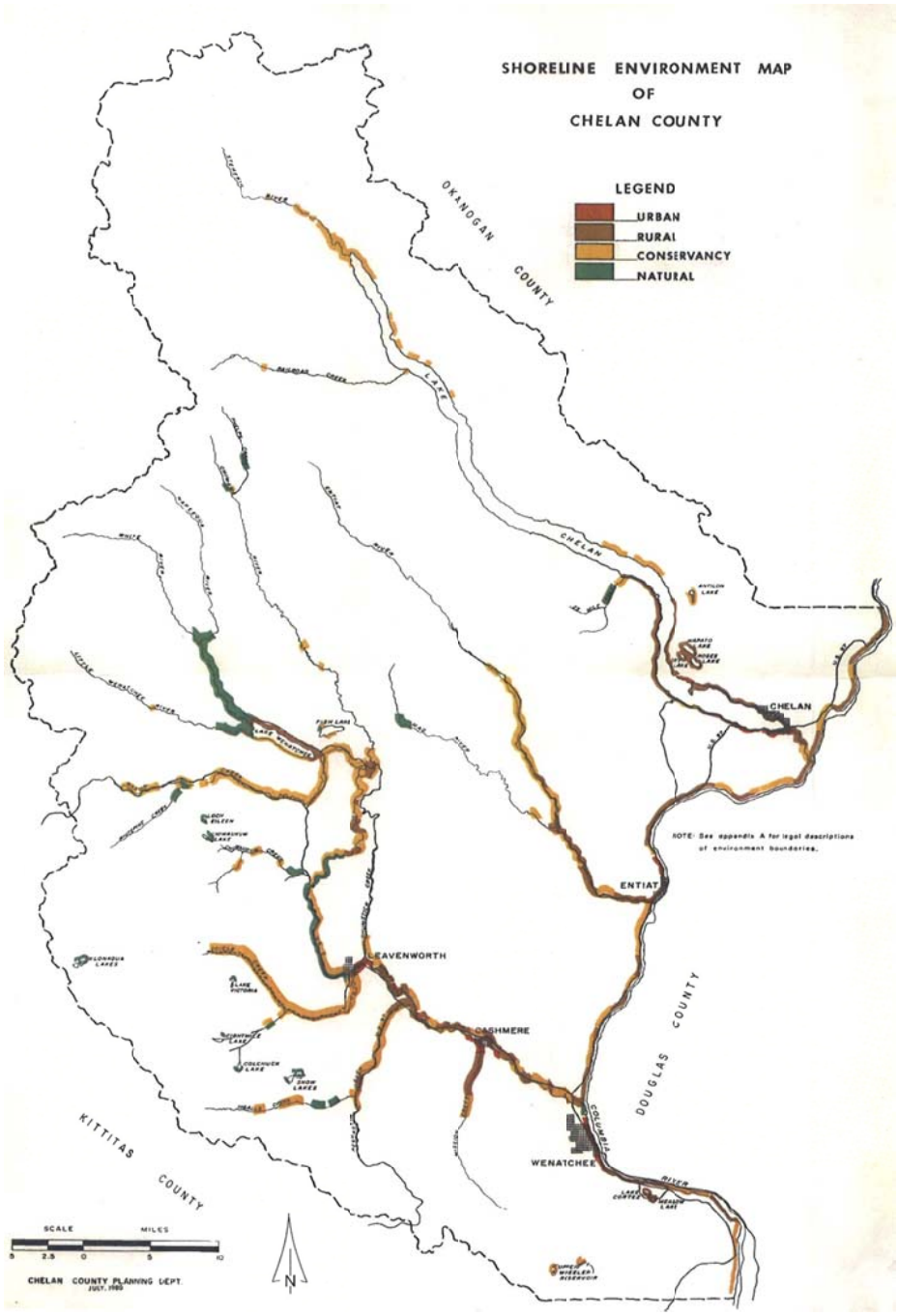

Figure 1. Shoreline jurisdiction and environment designations under the existing Shoreline Master Program.

Table 2 summarizes critical areas regulations by jurisdiction:

Table 2. Critical Area Regulations summary (as of 2013)

Jurisdiction	Date of Last Update	Wetland Rating System	Stream Classification System	Buffer Width (feet)			
City of Wenatchee	2009	Ecology E. WA- (2004/ 2007)	None	**Wetlands**	**Low Impact Land Use**	**Moderate Impact Land Use**	**High Impact Land Use**
				Cat 1	50-100	75-150	100-200
Title No. Chapter 12.08.130-170 Wetlands; Crit. Aq. Recharge Areas; Freq. Flooded Areas; Geo. Haz Areas; Fish & Wildlife Hab. Cons. Areas				**Cat 2**	50-100	75-150	100-200
				Cat 3	40-75	60-110	80-150
				Cat 4	25	40	50
				Streams	General protection standards only for fish and wildlife habitat conservation areas, no dimensional standards for buffers		

The City of Wenatchee's critical areas regulations were recently updated (2007), and are considered to be consistent with Growth Management Act "best available science" standards. No further revisions to the regulations in the near future are anticipated.

Because the City's critical areas regulations do not establish shoreline buffers or setbacks, they have greater flexibility in establishing a new environment designation scheme, possibly mirroring the suggested designation system presented in the SMP Guidelines. The City's critical areas regulations will be included in the SMP as an appendix, likely with minor revisions necessary to meet Shoreline Management Act requirements.

2.3 City of Wenatchee

Comprehensive Plan: The *Planning to Blossom 2025 Wenatchee Urban Area Comprehensive Plan* provides for urban land use designations in the City and UGA, and addresses other important elements such as capital facilities (e.g. parks and recreation). The *Waterfront Subarea Plan* is a part of the City's Comprehensive Plan and guides the development of the Columbia River waterfront. The Comprehensive Plan may be updated no more frequently than on an annual basis.

Zoning Code: Wenatchee City Code Title 10 (as amended) contains the City's zoning standards which regulate land in the city limits related to uses, building bulk, scale, and location, and other design considerations. Until land is annexed, the County is responsible for permitting in the UGA. However, the County has a Memorandum of Understanding with all the Cities, including Wenatchee,

regarding the adoption and use of the City zoning and zoning standards for review of proposals in the City's UGA.

Floodplain Regulations: Chapter 2.05 of the Wenatchee City Code (WCC) addresses flood hazard prevention. These regulations apply to lands identified as "special flood hazard areas" on the federal Flood Insurance Rate Maps (FIRM). Standards for preventing flood hazards are provided for all types of special flood hazard areas located in the City, including requirements for anchoring, construction methods and materials, utilities, design standards for residential and nonresidential construction, including manufactured homes, and recreational vehicles and crawlspaces.

Additional specific standards are provided for "shallow flooding areas," which generally corresponds to those areas that experience sheet flow between depths of 1 to 3 feet outside of a defined channel. Despite being in the City code, presently, the City does not have any A1-30 zones. WCC 12.08.150 of the critical areas code contains complementary regulations for frequently flooded areas.

Shoreline Permit History: Wenatchee reports relatively little shoreline permit activity, primarily related to bridges, the Riverside Dock, and other public docks (Table 3). The Public Utility District owned park provides a buffer that exceeds shoreline jurisdiction over much of the City's shoreline, which may be responsible for the limited permit activity over the past decade.

Table 3. Shoreline Permit History in the City of Wenatchee since 1999.

Year	# of Cases	Bridge	Dock	Upland Structure or Activity
Wenatchee River				
1999	1	1		
2001	1			1
2004	1		1	
2006	1		1	
2007	1			1
2008	2	1		1
TOTAL	7	2	2	3

2.4 State Agencies/Regulations

Aside from the Shoreline Management Act, State regulations most pertinent to development in the City's shorelines include the State Hydraulic Code, the Growth Management Act, State Environmental Policy Act, tribal agreements and case law, Watershed Planning Act, Water Resources Act, and Salmon Recovery

Act. A variety of agencies (e.g., Washington Department of Ecology, Washington Department of Fish and Wildlife, Washington Department of Natural Resources) are involved in implementing these regulations or otherwise own shoreline areas. The Department of Ecology reviews all shoreline projects that require a shoreline permit, but has specific regulatory authority over Shoreline Conditional Use Permits and Shoreline Variances. Other agency reviews of shoreline developments are typically triggered by in- or over-water work, discharges of fill or pollutants into the water, or substantial land clearing.

Depending on the nature of the proposed development, State regulations can play an important role in the design and implementation of a shoreline project, ensuring that impacts to shoreline functions and values are avoided, minimized, and/or mitigated. During the comprehensive SMP update, the City will consider other State regulations to ensure consistency as appropriate and feasible with the goal of streamlining the shoreline permitting process. A summary of some of the key State regulations and/or State agency responsibilities follows.

Washington Department of Natural Resources: Washington Department of Natural Resources (WDNR) is charged with protecting and managing use of State-owned aquatic lands. Toward that end, water-dependent uses waterward of the ordinary high water mark require review by WDNR to establish whether the project is on State-owned aquatic lands. In the Columbia River, WDNR has authority over activities extending into the original (pre-dam) channel. If WDNR has jurisdiction, the project may be required to obtain an Aquatic Use Authorization from WDNR and enter into a lease agreement. Certain project activities, such as single-family or two-party joint-use residential piers, on State-owned aquatic lands are exempt from these requirements. WDNR recommends that all proponents of a project waterward of the ordinary high water mark contact WDNR to determine jurisdiction and requirements.

Chelan County Public Utility District: Although the Chelan County PUD is not a State agency, it does act like an agency in its review and denial or approval of certain projects on the Columbia River (Rock Island Reservoir).

- Rock Island Reservoir: Rock Island Dam was originally constructed in 1933, and then modified in 1953 and 1979. The current project boundary for the Rock Island Hydroelectric Project, as licensed with the Federal Energy Regulatory Commission (FERC), is delineated on a set of maps labeled Exhibit G. The PUD owns the majority of land within the project boundary on the Rock Island reservoir. Similar to the restrictions on the Rocky Reach Reservoir, alteration of the land within the project boundary is restricted. The PUD maintains and operates a number of parks on its land along the Rock Island Reservoir. The 1976 Lake Chelan Project Exhibit R Recreation Plan identified seven sites on the Rocky Reach Project for recreational development. Three were completed by the Chelan PUD and opened to the public in the late 1970's, one in the 1980's

and three in the 1990's. The parks include: Rocky Reach Dam Site, Orondo Park, Entiat Park, Lincoln Rock State Park (Eastbank), Daroga State Park, Chelan Falls/Powerhouse Parks, and Beebe Bridge Parks.

Section 401 Water Quality Certification: Section 401 of the federal Clean Water Act allows states to review, condition, and approve or deny certain federal permitted actions that result in discharges to State waters, including wetlands. In Washington, the Department of Ecology is the State agency responsible for conducting that review, with their primary review criteria of ensuring that State water quality standards are met. Actions within shoreline waterbodies, or wetlands and streams within the shoreline zone that require a Section 10 or Section 404 permit (see Section 2.5 below), will also need to be reviewed by Ecology.

Watershed Planning Act: The Watershed Planning Act of 1998 (Chapter 90.82 RCW) was passed to encourage local planning of local water resources, recognizing that there are citizens and entities in each watershed that "have the greatest knowledge of both the resources and the aspirations of those who live and work in the watershed; and who have the greatest stake in the proper, long-term management of the resources." Chelan County and partners in the County have taken advantage of the available funding for watershed planning to complete the watershed management plans for the Entiat watershed (WRIA 46) in 2004, the Wenatchee watershed (WRIA 45) in 2006, and the Stemilt/Squilchuck watershed (WRIA 40a) in 2007. WRIA 40b (the Alkali Squilchuck, which includes Colockum Creek and is otherwise located primarily in Kittitas County) does not have a watershed management plan.

Hydraulic Code: Chapter 77.55 RCW (the Hydraulic Code) gives the Washington Department of Fish and Wildlife (WDFW) the authority to review, condition, and approve or deny "any construction activity that will use, divert, obstruct, or change the bed or flow of State waters." These activities may include stream alteration, culvert installation or replacement, pier and bulkhead repair or construction, among others. WDFW can condition projects to avoid, minimize, restore, and compensate adverse impacts.

Water Pollution Control Act: Chapter 90.48 RCW establishes the State's policy "to maintain the highest possible standards to insure the purity of all waters of the State consistent with public health and public enjoyment thereof, the propagation and protection of wild life, birds, game, fish and other aquatic life, and the industrial development of the State, and to that end require the use of all known available and reasonable methods by industries and others to prevent and control the pollution of the waters of the State of Washington." The Department of Ecology is the agency charged with crafting and implementing rules and regulations in accordance with this legislation.

2.5 Federal Agencies/Regulations

Federal regulations most pertinent to development in the Cities' and County's shorelines include the Endangered Species Act, the Clean Water Act, and the Rivers and Harbors Appropriation Act. Other relevant federal laws include the National Environmental Policy Act, Anadromous Fish Conservation Act, Clean Air Act, and the Migratory Bird Treaty Act. A variety of agencies (e.g., U.S. Army Corps of Engineers [Corps], National Marine Fisheries Service, U.S. Fish and Wildlife Service) are involved in implementing these regulations, but review by these agencies of shoreline development in most cases would be triggered by in- or over-water work, or discharges of fill or pollutants into the water. Depending on the nature of the proposed development, federal regulations can play an important role in the design and implementation of a shoreline project, ensuring that impacts to shoreline functions and values are avoided, minimized, and/or mitigated. During the comprehensive SMP update, the City will consider other federal regulations to ensure consistency as appropriate and feasible with the goal of streamlining the shoreline permitting process. A summary of some of the key State regulations and/or State agency responsibilities follows.

Section 404: Section 404 of the federal Clean Water Act provides the Corps, under the oversight of the U.S. Environmental Protection Agency, with authority to regulate "discharge of dredged or fill material into waters of the United States, including wetlands" (http://www.epa.gov/owow/wetlands/pdf/reg_authority_pr.pdf). The extent of the Corps' authority and the definition of fill have been the subject of considerable legal activity. However, it generally means that the Corps must review and approve many activities in shoreline waterbodies, and other streams and wetlands. These activities may include wetland fills, stream and wetland restoration, and culvert installation or replacement, among others. Similar to Washington State Environmental Policy Act (SEPA) requirements, the Corps is interested in avoidance, minimization, restoration, and compensation of impacts.

Section 10: Section 10 of the federal Rivers and Harbors Appropriation Act of 1899 provides the Corps with authority to regulate activities that may affect navigation of "navigable" waters. The Columbia River is a designated navigable waters. Accordingly, proposals to construct new or modify existing in-water structures (including piers, marinas, bulkheads, breakwaters), to excavate or fill, or to "alter or modify the course, location, condition, or capacity of" these waterbodies must be reviewed and approved by the Corps.

Federal Endangered Species Act (ESA): Section 9 of the ESA prohibits "take" of listed species. Take has been defined in Section 3 as: "harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect, or to attempt to engage in any such conduct." The take prohibitions of the ESA apply to everyone, so any action of the City that results in a take of listed fish or wildlife would be a

violation of the ESA and exposes the County and Cities to risk of lawsuit. Per Section 7 of the ESA, activities with potential to affect federally listed or proposed species and that either require federal approval, receive federal funding, or occur on federal land must be reviewed by the National Marine Fisheries Service (NOAA Fisheries) and/or U.S. Fish and Wildlife Service (USFWS) via a process called "consultation." As previously mentioned, a Corps permit under Section 10 of the Rivers and Harbors Appropriation Act is required for projects in the Columbia River, and Section 404 permits are required for discharges of fill material into other river, streams and wetlands within shoreline jurisdiction. Since the listing of chinook salmon, sockeye salmon, steelhead trout, and bull trout as Threatened under the ESA, the Corps, NOAA Fisheries and USFWS have jointly developed a number of Regional General Permits (RGPs) or programmatic consultations to streamline permitting of projects in waterbodies containing listed fish, including:

RGP 8: Authorizes fish passage improvement projects, including culvert replacement and removal, on National Forest Service lands.

A programmatic biological opinion is also available for restoration or enhancement of aquatic and associated riparian habitat, including culvert replacements (nine separate categories of work are covered). Applicable to Washington State waters, with exceptions to some categories of work on main stem Columbia River.

Phase 1 programmatics are also available in Chelan County for:

- Placement of navigation aids and regulatory markers, including placement of buoys for such purposes.
- Replacement of up to eighteen existing piling.
- Placement of new devices or replacement of old devices (with no greater dimensions than those already in place) whose purpose is to measure and record scientific data such as staff gages, tide gages, water recording devices, water quality testing and improvement devices, and similar structures.
- Activities required for the containment (but not cleanup) of oil and hazardous substances, including placement of booms and anchors.
- Placement of up to 25 cubic yards of fill material waterward of the ordinary high water (OHW) line to meet mitigation requirements imposed by Washington State Department of Fish and Wildlife (WDFW) in association with an Hydraulic Project Approval (HPA) where all other work (the bank stabilization activity and associated stockpiling) is outside Corps jurisdiction (landward of the OHW line) and has already been constructed (Not applicable to Columbia River mainstem).

Clean Water Act: The federal Clean Water Act has a number of programs and regulatory components, but of particular relevance to Chelan County is the National Pollutant Discharge Elimination System (NPDES) program. In Washington State, the Department of Ecology has been delegated the responsibility by the U.S. Environmental Protection Agency for managing implementation of this program. The City of Wenatchee is engaged in compliance with the NPDES Phase II Municipal Stormwater General Permit requirements that address stormwater system discharges to surface waters (see Section 3.3.2 below).

3. SHORELINE INVENTORY

The following discussion identifies each of the required inventory elements and sources of information for each element, and may provide a brief Countywide or watershed-wide narrative. In this chapter discussions and calculations are broken as needed into the four Watershed Resource Inventory Areas (WRIAs) (WRIA 40a - Stemilt-Squilchuck and part of WRIA 40b located in Chelan County [Colockum Creek basin], WRIA 45 - Wenatchee, and the City of Wenatchee. The WRIA discussions and calculations do not include data for the incorporated City of Wenatchee. The City's discussion and calculation includes the UGA. Additional watershed-, shoreline-, or City-specific discussion can be found in Section 4.0. Table 4 lists those relevant inventory elements for which data is available for the County and Cities' shorelines. The table also provides a brief description of the general utility of the data for general planning purposes versus site-specific analysis. Data gaps, assumptions, and limitations are identified in the following sections (3.1-3.13). Map Figures are provided in the Map Folio, and they depict the various inventory pieces listed in the table, as well as additional analysis.

Table 4. Shoreline Inventory Elements, Data Sources, Assumptions, and Limitations.

Inventory Element	Information Gathered	Data Source	Assumptions/Limitations
Physical Setting			
Surficial Geology	Geologic classifications	WA Department of Natural Resources, Division of Geology and Earth Resources, Surface Geology	• Based on broad scale geologic classifications • Useful for broad scale assessment of geologic conditions • Not to be used in place of site-specific studies
Soils	Soil types	USDA NRCS (SSURGO)	• Based on broad scale soil mapping • Useful for broad scale assessment of soil conditions • Not to be used in place of site-specific studies
Precipitation, Rain-on-snow	• Annual precipitation • Areas of rain-on-snow	• PRISM group, OSU • WA Department of Natural Resources	• Useful for broad scale assessment of soil conditions • Groundwater flow patterns data were not available- Data gap • Not to be used in place of site-specific studies
• Land Use/Development			
Land Use Patterns	• Current land use • Land ownership • Water-oriented uses	• Chelan County Assessor data • The Nature Conservancy • City and citizen input	• Gross scale characterization (e.g., urban, forest, rural/ag) • Identifies publicly owned land by agency (e.g., USFS, WA Parks, County, City) • Useful in assessing existing intensity and type of development at broad-scale planning level • Data may not be up-to-date
	Future land use	County and City Comprehensive Plans	• Based on area-wide categorization- includes roads, easements, and utilities • Comparison to current use indicates likely changes in intensity and type of development • Useful in planning to accommodate future land use changes at broad-scale planning level
Transportation	• Roads • Railroads	WA Department of Transportation	• Road data include publicly maintained streets and highways • Railroad data include abandoned and in-use railways • Data may not include private roads

Inventory Element	Information Gathered	Data Source	Assumptions/Limitations
Stormwater/ Sewer facilities	• Stormwater outfalls • Sewer lines and points • Large on-site sewage systems	• County and City GIS data • WA Department of Health	• Stormwater data was occasionally unavailable or unavailable in GIS format • Stormwater data may be incomplete
Water Supply	Water supply infrastructure	• County and City Comprehensive Plans and Water System Plans • Chelan County PUD • Lake Chelan Reclamation District	• Includes public water infrastructure and irrigation district information
Impervious Surfaces	General impervious surface	US Geological Survey	• Based on interpretation of multispectral imagery at 30 x 30 meter cell resolution • Data captures impervious surfaces (e.g., rooftops, roads, parking lots), but may not capture areas with reduces infliltration potential (e.g., compacted areas) • Useful for broad scale assessment of impervious surface coverage • May overestimate impervious surface coverage • Not useful for accurate characterization of fine scale data (e.g., City or parcel level)
Vegetation	Terrestrial vegetation type and land cover	• US Geological Survey	• Based on interpretation of multispectral imagery at 30 x 30 m cell resolution • Useful for broad scale assessment of vegetation coverage • Not useful for accurate characterization of fine scale data (e.g., City or parcel level, species composition)
Shoreline Modifications	Docks and other overwater structures	• WA Department of Natural Resources	• Overwater structures may include piers, boatlifts, moorage covers, and bridges, • Shoreline stabilization is a data gap

Inventory Element	Information Gathered	Data Source	Assumptions/Limitations
Public Access Areas	• Parks • Trails • Recreation Sites • Snowmobile Trails • X-Country Ski Trails • Proposed Trails • WDFW Fishing Easements • Utility Corridors and other easements • Key visual access corridors	• Chelan County Assessor • Washington State Parks and Recreation • USFS • Trust for Public Lands • City GIS data	• Includes established parks and recreation sites • Includes no-owner parcels and easements • Requires ongoing future review and evaluation to verify and add to information collected
Historical/ Archeological/ Cultural Sites	• Historical sties • Archeologically significant sites	• WA Department of Archaeology and Historic Preservation	• Data not mapped in shoreline inventory report • Data represent only known sites; additional, presently unknown sites may exist
Critical Areas/Other Ecological Conditions			
Geologically hazardous areas	Geohazards	Washington Department of Natural Resources, Geology and Earth Sciences Division	• Specific type of geohazard (e.g., steep slope, seismic hazard) is not mapped • Data are primarily DNR derived landslide hazard areas, but they also show City of Chelan steep slopes and City of Wenatchee critical area categories erosion hazards and slide hazards. • Useful for broad scale assessment of geologically hazardous areas • Requires site-specific review to verify presence/absence of geohazards
Frequently flooded areas	• Floodplains • Floodways • Channel Migration Zone (Wenatchee	• Federal Emergency Management Agency (FEMA) • Consultant studies	• Floodplain and floodways based on federally established models • Channel migration zone delineation based on LiDAR, geologic and soil mapping, current aerial photographs, and County-wide road and railroad data. LiDAR data was

Inventory Element	Information Gathered	Data Source	Assumptions/Limitations
	River Only)		corrected for ground returns and mapped by both percent slope and "differential elevation."
Wetlands	• Potential wetlands • Hydric soils	• U.S. Fish and Wildlife Service National Wetland Inventory (NWI) • Hydric Soils, Natural Resource Conservation Service, Soil Survey (SSURGO)	• Useful for broad scale assessment of soil conditions and potential wetlands • NWI mapping based on interpretation of multi-spectral imagery and ground truthing • Hydric soils based on broad scale soil mapping • Many wetlands are not identified by NWI or hydric soils mapping; mapped wetlands may not meet wetland criteria • Not to be used in place of site-specific studies
Surface water	• Lakes • Streams	• Pacific States Marine Fisheries Commission • WA Department of Natural Resources	• Small, intermittent or ephemeral streams may not be identified in data
WDFW Priority Habitats & Species	• Priority fish • Priority wildlife • Priority habitats	WA Department of Fish and Wildlife	• WDFW maps do not capture every priority species location or habitat, particularly for rare species or species that use shoreline habitats seasonally or intermittently • Absence of mapping information does not indicate absence of a particular species • The number of documented species may reflect the relative amount of past survey efforts • New data will need to be obtained at the time of project application
Aquifer Recharge Areas	NA	NA	• Data not available- Data Gap
Water quality impairment	303(d) waters and regulated sites	WA Department of Ecology	• Water quality impairments are based on monitoring at specific locations • Impairments may extend beyond the mapped area
Restoration opportunities	Site-specific and general projects	• Watershed Plans • Subbasin Plans	• Restoration opportunities are not limited to those identified in this report

3.1 Land Use Patterns

3.1.1 Existing and Planned Land Use

Land use patterns were derived from geographic information system (GIS) data provided by County and partner cities, including County Assessor records for current land use and Comprehensive Plan designations for planned land use. The method and approach to data collection are described below:

- Unincorporated shorelines are addressed by watershed, i.e. WRIAs. City and associated Urban Growth Areas (UGAs) are addressed by jurisdiction. Each area is more specifically described in Section 4.
- Assessor use types were sorted into similar categories to show current use patterns (e.g. Commercial includes retail, business services, and other related activities). Existing land use information is parcel based and relatively extensive except in government owned forested areas where data is omitted. Assessor existing land use data is not the most important piece of information in County assessments and thus it is not updated as frequently as other property information. However, it represents the best readily available information on current land use in the shoreline area[2]. Due to City and citizen input, current land use maps have been modified in some locations through the inventory review process, with emphasis on shoreline jurisdictional areas. Current land use was generally not updated for areas outside of shoreline jurisdiction.
- Future land use categories are based on adopted Comprehensive Plans and are reported by the category names in the City comprehensive plan. Future land use data is based on area-wide classifications and include roads, resource lands (unlike Assessor data), etc., which tends to mean the future land use acres are greater than existing land use acres for the same jurisdictional area.

In the unincorporated WRIAs, the current land use patterns are predominantly rural residential, government/utility, and forestry and agriculture resource lands with exceptions – such as small towns along rivers and streams, lake communities, and some focused areas of rural industrial and rural waterfront commercial.

Relatively more urban and intensive development is found in the City of Wenatchee (utility and industrial). The City of Wenatchee has extensive open space along its shorelines due to PUD and State park lands.

Future land use designations tend to reinforce current land use patterns. Unincorporated shorelines that are in private ownership tend to be planned for

[2] The County has an on-going inventory of land use data; however, the focus has been on non-shoreline areas; therefore the Assessor's data was considered the best available for the SMP inventory and analysis.

rural residential, rural commercial/waterfront, or rural industrial uses. City shorelines are planned for a wider variety of activities that support their role as centers of the local community – residential at a variety of single family and multifamily densities, local and tourist oriented commercial, manufacturing/industrial, mixed use, open space and recreation. Many areas in the City are already developed, but some are likely to see re-development as discussed in Section 3.1.3.

As is true for nearly all developments around the world, most human settlements (both pre-historic and historic) in Chelan County have developed along waterbodies where lands are more arable and level, water for drinking or irrigating is present, the climate is more accommodating, wildlife (for food, clothing and other uses) tend to congregate, and transportation is available (on navigable waterbodies). Maps of existing land use today are a testimony to this pattern, and location along waterbodies is still perpetuated. The developed communities are likewise connected along waterbodies by transportation and utility corridors.

3.1.2 Water-Oriented Uses

According to Ecology's SMP Guidelines (173-26-020 WAC), "water-oriented use means a use that is water-dependent, water-related, or water-enjoyment, or a combination of such uses." The Shoreline Management Act promotes uses that are "unique to or dependent upon use of the State's shoreline" as well as "ports, shoreline recreational uses including but not limited to parks, marinas, piers, and other improvements facilitating public access to shorelines of the State, industrial and commercial developments which are particularly dependent on their location on or use of the shorelines of the State and other development that will provide an opportunity for substantial numbers of the people to enjoy the shorelines of the State." (RCW 90.58.020)

Definitions and examples of water-oriented uses are included in Table 5 below.

Table 5. Water-Oriented Uses Definitions and Examples.

Water-Oriented Use Definitions	Water-Oriented Use Examples
"Water-dependent use" means a use or portion of a use which cannot exist in a location that is not adjacent to the water and which is dependent on the water by reason of the intrinsic nature of its operations. (WAC 173-26-020(36))	Examples of water-dependent uses may include ship cargo terminal loading areas, ferry and passenger terminals, barge loading facilities, ship building and dry docking, marinas, aquaculture, float plane facilities, sewer outfalls, and water diversion facilities, such as agricultural pump houses.
"Water-related use" means a use or portion of a use which is not intrinsically dependent on a waterfront location but whose economic viability is dependent upon a waterfront location because: (a) The use has a functional requirement for a waterfront location such as the	Examples of water-related uses may include warehousing of goods transported by water, seafood processing plants, hydroelectric generating plants, gravel storage when transported by barge, oil refineries

Water-Oriented Use Definitions	Water-Oriented Use Examples
arrival or shipment of materials by water or the need for large quantities of water; or (b) The use provides a necessary service supportive of the water-dependent uses and the proximity of the use to its customers makes its services less expensive and/or more convenient. (WAC 173-26-020 (40))	where transport is by tanker, log storage, and (potentially) agriculture and agriculturally related water transportation systems.
"Water-enjoyment use" means a recreational use or other use that facilitates public access to the shoreline as a primary characteristic of the use; or a use that provides for recreational use or aesthetic enjoyment of the shoreline for a substantial number of people as a general characteristic of the use and which through location, design, and operation ensures the public's ability to enjoy the physical and aesthetic qualities of the shoreline. In order to qualify as a water-enjoyment use, the use must be open to the general public and the shoreline-oriented space within the project must be devoted to the specific aspects of the use that fosters shoreline enjoyment. (WAC 173-26-020 (37))	Primary water-enjoyment uses may include, but are not limited to, parks, piers and other improvements facilitating public access to the shorelines of the State; and general water-enjoyment uses may include, but are not limited to restaurants, museums, aquariums, scientific/ecological reserves, and resorts/hotels (as part of mixed use development or with significant public access or restoration components), and commercial/office as part of a mixed-use development.

Based on a review of County Assessor records, the current use categories that were considered most likely to meet the definition of water-oriented uses were selected as follows:

- Agriculture
- Hotels/Motels (as part of mixed-use development or with significant public access or restoration components)
- Marine Craft Transportation
- Open Space
- Parks
- Recreational Activities
- Resorts and Group Camps
- Retail Trade-Eating/Drinking (as part of mixed-use development)

In the unincorporated portions of the County, much of the potential water-oriented uses are agricultural. Agriculture is considered a potential water-oriented use where the shoreline waterbody provides a source of water to the crops or other agricultural product. Also, many orchardists along shoreline waterbodies have indicated that they are sited near the water to take advantage

of the riparian microclimate that is important to agricultural operations, such as mediating temperatures.[3]

Recreation and group camp water-oriented uses tend to be located on the major rivers and lakes such as the Columbia River and Wenatchee River.

More urban examples of water-oriented uses, including hotels/motels as part of a mixed-use development or that provide public access and ecological restoration and eating/drinking places that provide public access and ecological restoration, are found in the cities as well as in compact rural areas.

3.1.3 Developing or Redeveloping Waterfronts

This inventory compiles several sources of information to characterize which shorelines are likely to see new development or redevelopment. The data includes local government land use plans, Assessor information regarding parcels without buildings, and permitting activity in the recent past.

The City of Wenatchee's Waterfront Subarea Plan contains the vision and strategies for waterfront redevelopment, where a mostly industrial waterfront is planned to change to a mixed-use area with nodes. The *Wenatchee Waterfront Subarea Plan* provides guidance for how this redevelopment will occur. Most of the redevelopment activity will take place outside of shoreline jurisdiction as a large percentage of the Columbia River frontage in the *Wenatchee Waterfront Subarea Plan* is already developed with PUD parks and the Burlington Northern Santa Fe railroad corridor.

All of the WRIAs are likely to see additional rural residential growth as well, since aside from resource lands, rural residential categories are applied most frequently in unincorporated Chelan County.

The City of Wenatchee has a limited number of parcels within shoreline jurisdiction lacking buildings. These parcels include vacant properties and properties in a use that does not require buildings, such as parcels with agriculture or government activities. These properties without structures could see shoreline permits for new structures or improvements in the future.

[3] Washington Apple Country Tours reports that "The topography surrounding the lake [Lake Chelan] creates something of a 'micro-climate' along the lakeshore which moderates the temperatures during the colder months of winter and the hotter months of summer." (http://www.appleorchardtours.com/hist01.htm). Tiny's Orchards in East Wenatchee is close to the Columbia River in Douglas County "in a superb microclimate with weather conditions ideal for growing stone fruit ..." The orchardist reports that this particular location has "only experienced frost and/or extreme cold conditions or hail or damaging winds only a couple of times since …1979." The other orchard location is close to the airport in East Wenatchee and temperatures in this location away from the river generally "run 5 to 10 degrees cooler than at the lower river elevation." See http://www.ilovetiny.com/OurFarmandHarvestDates.aspx. While in Douglas County, Tiny's fronts the Columbia River, a shared shoreline waterbody with Chelan County. Attendees at several shoreline visioning workshops verbally corroborated the relationship between shoreline microclimate and orchard location.

However, a review of permitting indicates that most shorelines have not seen rapid development with the exception of the Wenatchee River (see Table 2 in Section 2.3).

3.2 Transportation

As outlined below, there are several State and federal highway road sections and railroad corridors in Wenatchee and its UGA that either parallel, cross, or are otherwise located in existing or future shoreline jurisdiction.

- U.S. Highway 2 frequently crosses or parallels shoreline jurisdiction along a majority of the Wenatchee River between Lake Wenatchee and the City of Wenatchee. It also crosses the Columbia River within the City of Wenatchee UGA, where it combines with US 97.
- U.S. Highway 97 crosses the Columbia River within the Wenatchee UGA.
- Alternate U.S. Highway 97 (97a), between the City of Wenatchee and Lake Chelan, parallels the Columbia River and Lake Chelan shoreline jurisdictions, as well as crossing the Entiat River at the confluence with the Columbia.
- SR 285 crosses shoreline jurisdiction at the Wenatchee River Bridge just west of the confluence with the Columbia River and also at the Columbia River Bridge between the cities of Wenatchee and East Wenatchee.
- The Malaga Alcoa Highway (actually a County road) also parallels the Columbia River south of Wenatchee to the County line, and is within shoreline jurisdiction in a few areas.
- Burlington Northern Santa Fe (BNSF) rail lines parallel the Columbia River and the Wenatchee River. A main track line runs along the south bank of the Wenatchee River from the western County limits to the City of Wenatchee, and then south along the west shore of the Columbia River.
- A RailAmerica, Inc. subsidiary named Cascade & Columbia River Railroad operates a line parallel to the Columbia River from Wenatchee north to Oroville. The line has an interchange station in Wenatchee.
-

These major transportation corridors have had and continue to have a variety of affects on watershed processes and shoreline function by limiting channel migration, interfering with natural recruitment of gravels and woody debris, eliminating or minimizing riparian vegetation, constricting flows, and providing a source of pollutants such as hydrocarbons and heavy metals. The remainder of the transportation corridors within shoreline jurisdiction is city access or private

roads, and driveways. These roadways can have similar impacts on processes and functions, but generally on a smaller scale.

The Wenatchee Valley Transportation Council (WVTC) is the Metropolitan Planning Organization (MPO) consisting of nine State and local agencies that work within the greater Wenatchee Valley area. This group, along with the North Central Regional Transportation Planning Organization (NCRTPO), which consists of all communities located within Okanogan, Chelan, and Douglas Counties and the Confederated Tribes of the Colville Nation, coordinates long-range transportation planning projects in the region. Typically, federal law requires MPOs to submit a transportation improvement program annually, while the NCRTPO is required by State law to submit a regional transportation improvement program every two years. The partnership between the WVTC and NCRTPO has developed the North Central Washington Regional Transportation Improvement Program (NCW RTIP), the most recent of which is the 2008-2013 NCW RTIP. The NCRTPO is already planning an update.

- There are 10 federally funded Urban transportation projects identified in the NCW RTIP that are located within the Wenatchee urban area of Chelan County, three of which are either partially or fully within shoreline jurisdiction. These include bridge repairs, paving, and a congestion relief study.
- There are 26 federally funded Rural transportation projects identified in the NCW RTIP that are located in rural areas of Chelan County, 3 of which are fully within shoreline jurisdiction. The three projects within shoreline jurisdiction are the Chelan River Bridge within the City of Chelan, the Old Blewett Bridge #1 replacement south of U.S. Highway 2, and the Wenatchee River Bridge replacement along Highway 2 near the City of Cashmere.
- In addition to the fully funded projects listed above, there are 72 planned projects within Chelan County that are currently unfunded. None of these projects are confirmed to be within or outside of shoreline jurisdiction as information and specific map locations are currently unavailable.
- A new regional transportation corridor in Wenatchee is included in the North Wenatchee Avenue Transportation Master Plan (Wenatchee Valley Transit Council 2011). The plan includes the construction of a new "Confluence Parkway", which will cross over the Wenatchee River near the confluence with the Columbia, and occur in portions of shoreline jurisdiction in the City of Wenatchee.
- A North Central Washington Transportation Plan and Metropolitan Transportation Plan were recently adopted, and these plans establish strategic priorities for transportation infrastructure development in the

Wenatchee Valley. Options to improve regional transportation include upgrades to existing infrastructure or development of new transportation infrastructure. Options considered in the Metropolitan Transportation Plan include new bridges over the Wenatchee and Columbia Rivers.

The County is currently planning an update of the transportation element of its Comprehensive Plan, including a prioritized list of transportation projects (motorized and non-motorized) that compiles the work in the *Chelan County Six-Year Transportation Improvement Program (2007-2012)* and, where appropriate, regional plans/projects. Shoreline projects are planned for 10 sub-areas. The one relevant to the City of Wenatchee and the Wenatchee UGA is outlined briefly below:

- Sunnyslope sub-area: Roadway improvements to Sleepy Hollow Road along and crossing the Wenatchee River, non-motorized improvements leading to Columbia River south of bridge to East Wenatchee

The NCRTPO is working on an update of the Regional Transportation Plan.

3.3 Utilities

3.3.1 Wastewater

General Information Sources

Basic information about wastewater facilities and programs was derived from meeting notes with City staff, Washington Department of Ecology website, City of Wenatchee website, City of Wenatchee Comprehensive Plan, and data provided by the Washington Department of Health.

City of Wenatchee

The City of Wenatchee provides wastewater services to residents within the City limits, residents within Olds Station north of the Wenatchee River Bridge, and areas within the UGA boundary of Sunnyslope and the Boodry Street area. The City has one treatment plant located in downtown Wenatchee along the shores of the Columbia River. In order to reduce the number of pollutants that enter the treatment plant, the City utilizes a pre-treatment program to remove contaminants prior to entering the system. As mentioned previously, the Sunnyslope and Olds Station areas are provided wastewater services under a revenue sharing agreement with Chelan County. In 2008, the City updated its General Sewer Plan, which identifies specific details about the wastewater network.

3.3.2 Stormwater

General Information Sources

Basic information about City stormwater management was derived from the City

Wenatchee Valley Stormwater Technical Advisory Committee

In April 2006, the Wenatchee Valley Stormwater Technical Advisory Committee (WVSTAC) was established through an interlocal agreement with Chelan County, Douglas County, the City of East Wenatchee and the City of Wenatchee. According to the City of Wenatchee website, the goal of the committee is to develop a regional stormwater program and meet the requirements of the Eastern Washington Phase II Municipal Stormwater Permit. This permit requires public involvement through education, outreach and participation, illicit discharges detection and elimination, construction site stormwater runoff and post-construction stormwater facility discharge management, pollution prevention and good housekeeping for municipal operations and stormwater monitoring.

As part of the WVSTAC's role in public involvement, the *Public Involvement, Education and Outreach Plan* was developed in February 2008. In addition, the Wenatchee Valley Stormwater Program Development Steering Committee was formed, which includes elected officials, private citizens, business owners and community stakeholders. Through the review of program elements, public education and recommendations to local jurisdictions, the Committee is tasked with protecting the water quality in the Wenatchee Valley urbanized area.

In May 2008, the *Wenatchee Valley Stormwater Management Program* was completed. This document will be reviewed and updated annually in accordance with the NPDES permit.

City of Wenatchee

The City of Wenatchee's stormwater system includes a series of catch basins and stormwater pipes that divert stormwater to 12 separate outfalls along the Columbia River. The system, originally installed in 1952, includes over 100 miles of drainage pipe. In 1994, the City's stormwater utility was formed. As a member of WVSTAC, the City is working together with other member cities to meet the NPDES permit requirements.

According to the City's Comprehensive Plan, the City is considering alternative methods for stormwater treatment, including low-impact development. Additionally, the City is also considering filtering stormwater through wetlands, re-using stormwater for irrigation, and educational efforts about the effects stormwater has on water quality.

3.3.3 Water Supply

General Information Sources

Basic information about the City water supply was derived from the City comprehensive plan and water system plan, and Chelan County PUD website.

Chelan County PUD

A majority of the County's drinking water is supplied by Chelan County PUD. The District assumed ownership of water operations in 1974 after Wenatchee Valley Water Company was unable to finance system improvements. Today, there are nine water systems that the District operates.

In 1979, the District entered into an agreement with the City of Wenatchee for joint development of a regional water supply system using a groundwater aquifer near Rocky Reach Dam. The system, which includes the aquifer, regional wells and water mains, was brought into operation in 1983 and is operated by the City of Wenatchee. The City provides wholesale water to the PUD, who then provides the water to their customers. East Wenatchee Water District, located in Douglas County, became a partner with the District in 1998, and today all residents in the greater Wenatchee area are served by one regional water system. The District also provides water to the Sunnyslope, Olds Station, Monitor, and western and southern boundaries of the greater Wenatchee areas. Improvements are continually being made to improve service in outer service areas. Four other systems operated by Chelan County PUD include Chelan Falls, Chelan Ridge, Olalla Canyon, and Dryden (LCRD website).

During summer 2008, the PUD extended drinking water service to the Monitor community from the Sunnyslope area. The new line crossed the Wenatchee River, mounted underneath the Monitor Bridge.

City of Wenatchee

The City of Wenatchee and its UGA are supplied with water by the City of Wenatchee in its service area and Chelan County PUD in its service area. The City serves approximately 24,297 people over a 7.4-square-mile area, covering portions of areas within and outside of City limits. City-supplied drinking water originates in regional wells and is then stored in four reservoirs for distribution into supply lines.

Other Sources

Along with the water districts listed above, there are several other small water, reclamation and irrigation districts throughout the City of Wenatchee and Wenatchee UGA. These include: Pioneer Water Users, Wenatchee Reclamation District, Greater Wenatchee Irrigation District, and Lower Squilchuck Irrigation.

3.4 Impervious Surfaces

Impervious surface mapping and analysis was developed using the U.S. Geological Survey National Land Cover Data (NLCD 2001). The data captured include impenetrable surfaces such as rooftops, roads, or parking lots, but may not include reduced perviousness caused by compaction or vegetative changes. The data was generated using 30 x 30 meter cells, with each cell reporting the

percentage of that cell that is impervious. For purposes of this analysis, each cell was considered to be completely impervious if it had any percentage of impervious surfaces. While this results in a net over-estimation of actual impervious, it allows for a useful comparison of impervious surface between waterbodies. Impervious surface summaries are not useful for planning or assessing conditions at the site level or project scale. Impervious surface coverage estimates are generally less sensitive to differences or changes in impervious surface coverage in cities with existing development compared to unincorporated areas with patchy impervious surface coverage.

The following tables (6a and 6b) show percent impervious surface for those shoreline areas that have impervious surfaces; shorelines with no impervious surfaces (or impervious surface data) are not listed. All waterbodies in the cities and their UGAs have impervious surface percentages greater than 10 percent. Shoreline areas with impervious surface percentages greater than 10 percent in the remainder of the county are shaded for easy identification.

Table 6a. Total Impervious Surface within Each Shoreline in Unincorporated Chelan County by WRIA, Outside of Cities and Their Urban Growth Areas.

Waterbody	Total Upland Shoreline Area (Acres)	Impervious Surface (acres)	% Impervious
WRIA 40a/b (Stemilt/Squilchuck - Colockum)			
Columbia River	413.66	22.90	6%
WRIA 45 (Wenatchee)			
Columbia River	112.87	34.15	30%
Wenatchee River	4,070.47	776.60	19%

Table 6b. Total Impervious Surface within the City, Including the Urban Growth Areas.

Waterbody	Total Shoreline Area (Acres)	Impervious Surface (acres)	% Impervious
Wenatchee and UGA			
Columbia River	177.78	65.87	37%
Wenatchee River	104.27	20.10	19%

Impervious surface is relevant to shoreline functions because of the relationship between impervious surfaces and stormwater runoff. In a number of ways, vegetated areas slow the movement and reduce the quantity of runoff that makes its way into streams and other waterbodies. Increases in impervious surface coverage, and the consequent reduction in soil infiltration, have been correlated with increased velocity, volume and frequency of surface water flows. This hydrologic shift alters sediment and pollutant delivery to streams and other receiving bodies (Booth 1998; Arnold and Gibbons 1996).

Increased surface water flows associated with impervious surface coverage of suburban areas (20-30%) has been linked to decreased bank stability and increased erosion (May et al. 1997a). Rainwater can evaporate off of vegetation without ever reaching the ground, infiltrate into the soils to recharge groundwater, infiltrate into the soils where it is taken up by vegetation and evapotranspirated, or move slowly over the surface or subsurface into a waterbody. Again, data presented in this study likely overestimates impervious surface coverage, so percent coverage estimates should not be compared to the 20-30 percent standard above.

In parts of Chelan County, generally lower lying areas in the eastern portions of the County, low precipitation combined with pervious soil types allows for infiltration of much of the annual rainfall. The effect of increased impervious surface in these areas may be less pronounced. Such areas generally have little vegetation given the dry climate and well-drained soils. With less vegetation, transpiration and interception rates are lower than in more heavily vegetated areas, so that the loss of vegetation has less of an effect on runoff volumes. Nevertheless, the loss of direct infiltration caused by impervious surfaces still has an effect on runoff volume and the associated bank stability and erosion issues that result from increases in runoff volumes.

3.5 Vegetation

Vegetative cover mapping and analysis was generated using the U.S. Environmental Protection Agency's 2001 National Land Cover Data (NLCD). Other data sets were evaluated, including information from the U.S. Forest Service (USFS) and the Interior Columbia Basin Ecosystem Management Project (ICEBMP). However, the USFS data, while providing exceptional detail for forest lands, lumped or mis-categorized non-forest lands. The ICEBMP data is at a much larger scale than the NLCD (1,000 meters rather than 30 meters), and is older (1994 vs. 2001). NLCD provided the most accurate mapping of the entire County, with vegetation classifications that would be most useful to SMP development. An additional benefit of the NLCD is the integration of impervious surface data in the classification of various intensities of developed lands. The following cover type descriptions are those developed in conjunction with and pertaining directly to the NLCD data. While each is present as a unit within Chelan County shorelines, individual components included in the NLCD cover class definitions grouped and summarized below may be absent from Chelan County shorelines.

- Developed (high, medium and low intensity) cover classes

Development in Chelan County shorelines ranges from high intensity to low intensity. These categories are defined primarily by amount of impervious surface. Percentage of impervious cover in "high intensity" developed areas ranges from 80 to 100. "Medium" and "low" intensity developed areas have 50

to 79 percent and 21 to 49 percent cover by impervious surface, respectively. Commercial and industrial development tends to characterize high intensity areas, while single-family structures predominate in medium intensity areas, and low intensity areas feature trees, grasses, and landscaping in addition to the types of structures in medium-intensity developed areas. Areas where parks, golf courses, and other land uses that may be considered development but generally do not require large expanses of impervious surface are classified as open space development.

- Cultivated crops and pasture/hay cover classes

Per the NLCD general definition, cultivated crops are primarily annual bean and vegetable crops, nurseries, orchards, vineyards, and all actively tilled lands. In contrast, the pasture/hay classification comprises grasses and legumes planted for livestock, typically untilled and on a perennial cycle. [Note: pasture/hay also captures areas of lawn on a number of park and residential properties]

- Grassland/herbaceous, scrub/shrub deciduous forest, coniferous forest, and mixed forest cover classes

Upland vegetative cover types with more natural compositions are the grassland/herbaceous category, which includes meadows, fields, and naturally vegetated undeveloped lands, covering at least 80 percent of the area. Grassland/herbaceous land can be grazed, but is generally not intensively managed.

The scrub/shrub cover category is typically at least 20 percent shrub canopy cover and includes both shrub species and early seral stage tree species, provided the area is dominated by vegetation less than 5 meters tall. Early seral stands are made up of shade-intolerant species such as western larch, western white pine, ponderosa pine, and Douglas-fir, as well as dense shrubs, grasses, and forbs. Johnson and O'Neil (2001) categorize eastern Washington scrub/shrub as "Eastside canyon shrublands," which are most commonly dominated by mallowleaf ninebark, bitter cherry, choke cherry, oceanspray, or Rocky Mountain maple. Species compositions vary with location and may include snowberry, rabbitbrush, smooth sumac, currants, Nootka rose, black hawthorn, and various grasses.

Deciduous, evergreen, and mixed forest cover types are dominated by trees greater than 5 meters in height, again in quantities amounting to at least 20 percent of canopy cover. At least 75 percent of trees species in evergreen forest maintain leaves year-round, the same percentage lose leaves in deciduous forest, and neither evergreen nor deciduous trees make up more than 75 percent of the cover in mixed forest. Montane conifer and mixed forest in Chelan County is usually dominated by Pacific silver fir, mountain hemlock, subalpine fir, Shasta red fir, Engelmann spruce, noble fir, or Alaska yellow-cedar. Possible co-

dominants are Douglas-fir, lodgepole pine, western hemlock, western red cedar, ponderosa pine, or white fir.

Forest cover types generated by NLCD data can be more finely described for Chelan County shorelines using sources specific to the Northwest. Eastern Washington interior forest is typically dominated by mixed coniferous forest and includes Douglas-fir and other dominant or co-dominant species, the composition of which often depends on elevation and moisture regime and may include western red cedar, western hemlock, ponderosa pine, or grand fir. Deciduous forests include quaking aspen and Garry oak as dominants, although Oregon white oak can be found in areas (Johnson and O'Neil 2001; Franklin and Dyrness 1988). Understories support numerous and diverse shrub and herbaceous species. These also tend to vary with elevation and moisture. Common species are vine maple, serviceberry, oceanspray, ninebark, fool's huckleberry, low huckleberry, snowberry, baldhip rose, Oregon grape, vanilla leaf, wild ginger, false Solomon seal, lupines, plantains, and many others.

Numerous wetlands are associated with Chelan County shorelines. In accordance with the NLCD system, wetlands are classified according to vegetative cover. Palustrine emergent wetlands include those dominated by persistent emergent vascular plants, mosses, and lichens. In the study area, emergent wetlands are most likely to be sedge meadows and montane meadows, although numerous variations of this cover type occur throughout Chelan County. Some representative dominant groups are the bulrushes, sedges, slough sedges, rushes, and spike rushes. The forbs species arrowleaf groundsel and lady fern occasionally dominate in montane meadow wetlands (Johnson and O'Neil 2001). Total vegetative cover must exceed 80 percent for inclusion in this category.

Palustrine forested wetland is also documented in Chelan County shoreline jurisdiction. This category includes wetlands dominated by woody vegetation at least 5 meters in height and forming at least 20 percent cover. The most common type of woody wetland in the study area is mountain coniferous wetland, which most often occurs along watercourses. Indicator tree species of this type of forested wetland are Engelmann spruce, subalpine fir, western hemlock, and western red cedar. Douglas-fir, grand fir, quaking aspen, and black cottonwood can co-dominate. Common in the understory are devil's club, stink currant, swamp gooseberry, red-osier dogwood, Douglas spiraea, Sitka alder, sedges, spike rushes, and many other woody and herbaceous species (Johnson and O'Neil 2001).

Documented non-vegetated areas in shorelines are open water, barren land, and perennial ice/snow. The open water classification is assigned to areas with less than 25 percent cover by vegetation and soil and includes lakes, ponds, streams, rivers, and reservoirs. Barren land comprises talus, bedrock, sand dunes, glacial debris, gravel pit, dry riverbeds, and exposed rock, and generally has less than 10

percent vegetative cover. Ice and snow must make up more than 25 percent cover for an area to be classified as perennial ice/snow.

The U.S. Forest Service also mapped old-growth corridors as part of its Northwest Forest Plan. Although this data set is old, the information is shown on the vegetation maps. Additional USFS land management allocations and vegetation management designations (e.g., late successional reserves, congressionally designated wilderness, MATRIX, etc.) will be considered in the analysis phase of this Shoreline Master Program update project.

Information about the dominant vegetation communities in specific shorelines of the County (by WRIA) and in the Cities with their UGAs is provided in Chapter 4.

3.6 Shoreline Modifications

Shoreline modifications are human-caused alterations to the natural water's edge and nearshore environments, and include a variety of armoring types to protect bridge footings, roads, and upland structures on private property. City mapping of shoreline armoring is not available, but is expected to be most common at Confluence State Park, Walla Walla Park and Riverside Park at the public boat launches and public swimming area (Walla Walla). Armoring can also be found along roads or other transportation corridors that parallel shorelines or state routes that cross the Columbia River and Wenatchee River. Some armoring measures may have fish habitat benefits (such as log cribbing and jams, cabled logs), while others provide no direct habitat benefits (such as rip-rap or concrete bags) (Riedel 2008). These sorts of modifications alter the function of stream edges, change erosion and sediment movement patterns, block channel migration, affect the distribution of aquatic vegetation, and are often accompanied by upland/riparian vegetation loss.

City and County data is available for over-water structures, another common type of shoreline modification. The Washington Department of Natural Resources has digitized piers and other in-water structures such as boatlifts, boathouses, and moorage covers. The Columbia River is crossed by a number of bridges, mainly in the Wenatchee area, as well as Rock Island Dam, Rocky Reach Dam, and Wells Dam.

In the City of Wenatchee and Wenatchee UGA there is overwater cover on the Columbia River. This is attributed to the presence of piers and docks associated with boat launches and public access.

Table 7 below provides more detail on the extent of overwater structures in Chelan County shorelines as mapped by Washington Department of Natural Resources using aerial photographs from 2002 to 2006.

Table 7. Overwater Cover by Waterbody in Shoreline Jurisdiction

Area	Residential Docks	Large Commercial or Public Facilities (incl. bridges)	Total Cover (ft^2)
	Area (ft^2)	Area (ft^2)	
City of Wenatchee and UGA			
Columbia River	3,558	17,690	21,248
Wenatchee River	---	51,076	51,076
WRIA 40a/b			
Columbia River	191,790	12,777	204,568
WRIA 45			
Columbia River	261,145	89,658	350,803
Wenatchee River	40,554	205,437	245,990

[1] Overwater cover calculations include piers and docks, but also include areas of covered moorage and boathouses.

Both measures, total overwater cover and number of structures, are relevant to ecological function assessment. Total overwater cover is an indication of the amount of water surface that may be shaded, which can impact growth of aquatic vegetation and subsequently the food chain as a whole. Overwater cover is also implicated in exacerbating the predator-prey relationship between native fish and non-native fish. The number of structures is relevant as it indicates the number of impedances to juvenile salmon migration along the shoreline.

3.7 Existing and Potential Public Access

Information about public access sites in the City was drawn from City GIS data, adopted parks and recreation plans, watershed plans, and other sources. Parks and public access categories include:

- Public or protected lands – government owned, land trust, or similar properties
- View corridors identified by the City
- Public trails; campgrounds; picnic areas; fishing easements; and boat launches

The City contains extensive public or protected lands owned by the government, such as State Parks, County lands, and Chelan County PUD. The City contains trails, campgrounds, picnic areas, and boat launches. The PUD provides more formal parks, recreation, and open space opportunities.

The City of Wenatchee completed a public access plan as part the Shoreline Master Plan update. The City's 2012-2018 Parks, Recreation and Open Space Comprehensive Plan includes a level of service standard for different facilities community wide. These standards were considered in the development of

specific parks and recreation improvements for the current and future City of Wenatchee population. (Table 8).

Table 8. Parks and Recreation Resources

CLASSIFICATION TYPE	ACRES (A)	STANDARD (D)
Park System Standard	325.31	10 acres/1,000 people
Neighborhood Park	25.35	2 acres/1,000 people
Community Park	93.40	7 acres/1,000 people
Regional Park	206.56	8 acres/1,000 people
Natural Open Space	566.04	20 acres/1,000 people
Special Use Areas	213.38	5 acres/1,000 people
SPECIALIZED FACILTY TYPE	EXISTING FACILITIES	RECOMMENDED STANDARD
Trails	4.7	0.5 miles/1,000 people
Pathways	3.6	0.25 miles/1,000 people
Bikeways	3.6	0.25 miles/1,000 people
Baseball Field	3	1 field/8,500 people
Youth Baseball Field	7	1 field/2,500/ people
Basketball Hoops	49	1 hoop/1,000 people
BMX Area	0	1 area/30,000 people
Dog Off Leash Area	0	1 area/30,000 people
Football Field	4	1 field /8,000 people
Disc Golf Course	1	1 course/35,000 people
Gymnasium	12	1 gym/2,500 people

Horseshoe Pitch	5	1 pitch/10,000 people
Picnic Area	15	1 area/2,000 people
Play Area	13	1 area/2,000 people
Indoor Pool	1	1 pool/30,000 people
Outdoor Pool	1	1 pool/30,000 people
Recreation Center	0	1 center/30,000 people
Golf Courses	0	1 course/50,000 people
Rock Climbing Wall	0	1 wall/35,000 people
Sand Volleyball Court	3	1 court/10,000 people
Skate Spot, Dot, Area	1	1 area/2,000 people
Soccer Field	9	1 field/2,500 people
Softball Field	10	1 field/2,500 people
Tennis Court	19	1 court/2,000 people
Indoor Tennis Court	0	1 court/30,000 people
Indoor Soccer Field	0	1 field/30,000 people
Water Play Area	4	1 area/5,000 people

Due to extensive government and public ownership throughout the City, current park and public access opportunities are exceedingly abundant.

The City will implement the Shoreline Master Plan public access plan through implementation of its Wenatchee Urban Area Comprehensive Plan, 2012-2018 Parks, Recreation and Open Space Comprehensive Plan, and the Wenatchee Waterfront Sub-area Plan.

3.8 Critical Areas

The inventory of critical areas was based on a wide range of information sources. A complete listing of citations used to compile information on critical areas is included in Section 5.0 at the end of this study. Shorelands mapped as one or more of the following critical area types are suitable only for certain uses and developments, which factor into future environment designations, along with existing development and ecological functions.

The *Chelan County Multi-Jurisdiction Natural Hazard Mitigation Plan* identifies Chelan County's natural hazard areas and provides strategic methods in mitigating for a number of natural hazards that County residents are subject to, including flooding, earthquakes, severe storms, volcanoes, landslides, drought, wildfires, and avalanches. The Plan's "Mitigation Strategy" provides a number of implementation measures that could mitigate the effects of these natural disasters and reduce the risk of damage to structures, property, and loss of life.

As identified in the Plan, the mission statement is:

> "To promote sound public policy designed to protect citizens, critical facilities, infrastructure, private property and the environment from natural hazards by increasing public awareness, documenting the resources for risk reduction and loss-prevention, and identifying activities to guide Chelan County towards building a safer, more sustainable community."

3.8.1 Geologically Hazardous Areas

Maps of geologically hazardous areas were developed using WDNR data. Presumably, WDNR based those designations on topographic information and soil types as cataloged by the Natural Resources Conservation Service (NRCS). The presence of geologically hazardous areas in shorelines can be a factor in determining suitability of the area for certain activities, including restoration and development. Human safety is an important concern for development in geologically hazardous areas. In addition, geologically hazardous areas can be important sources of large woody debris and sediment to the aquatic system, the latter to the benefit or detriment of aquatic life. This WDNR data provided coverage for areas outside of the Cities and their UGAs, except for 31 acres in the City of Chelan and its UGA. Mapped geohazards are also located just outside of Entiat and its UGA.

The Cities of Chelan and Wenatchee also contributed geologically hazardous areas mapping.

3.8.2 Frequently Flooded Areas

For all practical purposes, "frequently flooded areas" are those areas within the 100-year floodplain. Maps were developed using FEMA's floodplain data, as well as floodways where available.

Recent information prepared by the University of Washington Climate Impacts Group indicates that spring flooding may decrease in drainage basins that currently have high amounts of snow accumulation and where the biggest floods come from rain-on-snow events. Climate change is expected to raise the snow level, thus reducing the amount of snow stored in the basin. The rain event may be higher volume than in recent years, but the amount of snow available to be melted will be even less. The models for the zone between the west and east side of the Cascades predict less spring snow melt. However, less spring snow melt will not necessarily lead to lower peak flows on an annual basis. As the area experiencing rain-on-snow events is expected to increase, flooding during fall and winter is also expected to increase. Since the rain-on snow events will reduce the overall snowpack remaining, reduced peak flows are expected during the spring runoff. These models contain a high level of uncertainty, and future changes in flooding due to climate change cannot yet be reliably predicted.

3.8.3 Wetlands

Wetland mapping was assembled from the National Wetlands Inventory, and supplemented with hydric soils information contained in the Natural Resources Conservation Service's Soil Survey Geographic (SSURGO) Database. Soil types classified as "hydric" are often indicative of wetland soils. Wetlands provide a number of hydrologic functions, including water storage, groundwater recharge, and maintenance of stream base flows; water quality improvement functions; and fish and wildlife habitat functions. Shoreline wetlands should be targeted for protection and restoration. To establish the potential wetland area in shoreline jurisdiction by waterbody as presented in Chapter 4 below, the NWI and hydric soils layers were combined to determine net potential wetland area. In some instances, the reported percentages are elevated when the NWI polygon incorporates some open water, on Lake Chelan or the Columbia River for example.

Many wetlands are not identified by NWI or hydric soils, and some NWI wetlands may not meet wetland criteria. Whether or not they are captured by this mapping effort, actual wetland conditions that may or may not be found on a site determine shoreline jurisdiction on a site-specific basis.

3.8.4 Fish and Wildlife Habitat Conservation Areas

Streams and lakes are one type of fish and wildlife habitat conservation area (FWHCA). Stream data was gathered from WDFW, WDNR, and Pacific States Marine Fisheries Commission. Many shoreline and non-shoreline streams and lakes contain State or federally listed fish species, as well as other WDFW-designated "priority"[4] fish species. Priority fish species include:

[4] Priority species require protective measures for their survival due to their population status, sensitivity to habitat alteration, and/or recreational, commercial, or tribal importance. Priority species include State

- Pacific lamprey (federal Species of Concern)
- White sturgeon
- Leopard dace (State Candidate)
- Umatilla dace (State Candidate)
- Mountain sucker (State Candidate)
- Bull trout (federal Threatened, State Candidate)
- Chinook salmon (federal Endangered, State Candidate)
- Coho salmon (State Candidate)
- Kokanee salmon
- Pygmy whitefish (federal Species of Concern, State Sensitive)
- Rainbow trout
- Steelhead trout (federal Threatened, State Candidate)
- Sockeye salmon (State Candidate)
- Westslope cutthroat trout (federal Candidate)

In addition to streams, lakes and priority fish, fish and wildlife habitat conservation areas include other priority habitats, habitat features and wildlife. WDFW Priority Habitats and Species map data are of two general types: habitat/feature polygons, either general features or specific habitats associated with a particular species, and Natural Heritage points. A number of habitats, features and species[5] are found in Chelan County's shoreline areas. Many of the priority species rely on shoreline waterbodies or riparian areas to meet certain life cycle requirements. Table 9 highlights some of the major habitat components that are found in shoreline areas and utilized by priority wildlife species, and Table 10 identifies the federally listed species and their WRIA or City location.

Table 9. Priority species use of shorelines in Chelan County.

Species	Shoreline Habitat Components
Birds	
Bald eagle	Fish-bearing waters (lakes, streams, rivers) for foraging Tall trees for nesting and perching
Golden eagle	Rocky cliffs for nesting
Osprey	Fish-bearing waters (lakes, streams, rivers) for foraging Tall trees for nesting and perching

Endangered, Threatened, Sensitive, and Candidate species; animal aggregations (e.g., heron colonies, bat colonies) considered vulnerable; and species of recreational, commercial, or tribal importance that are vulnerable.

[5] Although northern spotted owl habitat may be mapped by WDFW or other agencies in shoreline jurisdiction, these areas are not shown on the inventory maps because of the sensitivity of the information.

Species	Shoreline Habitat Components
Wood duck	Open water Forested riversides Cavities
Harlequin duck	Fast-moving mountain streams in breeding season Gravel bars and in-stream rocks for roosting Rocky coastlines in winter
Common loon	Forested mountain lakes in breeding season
Trumpeter swan	Open water for foraging
Sandhill crane	Wet meadows River valleys
Great blue heron	Lakes and lakeshores Show-moving streams Wetlands Wet meadows
Spruce grouse	no specific habitat needs related to shorelines
Waterfowl concentration	Open water Meadows Wetlands
Mammals	
Marten	Riparian zones for winter foraging Lakeshores for winter foraging
Fisher	no specific habitat needs related to shorelines, but commonly found in forests interspersed with rivers and lakes
Western gray squirrel	no specific habitat needs related to shorelines
Mule deer	Streams and lakes for year-round water
Mountain goat	no specific habitat needs related to shorelines
Bighorn sheep	no specific habitat needs related to shorelines
Elk	Lakes, rivers, streams and wetlands for year-round water Wet meadows in winter
Lynx	no specific habitat needs related to shorelines
Herptiles	
Cascades frog	Streams with pools for breeding Ponds, bogs and wetlands with mud substrate for wintering
Tailed frog	Streams needed for all lifecycle stages
Columbia spotted frog	Ponds, lakes, and slow-moving streams year-round
Western toad	Pools, ponds, wetlands and lakes for breeding Soft substrate (e.g., wetland soils) for wintering
Racer	no specific habitat needs related to shorelines and in fact prefer arid climes, but frogs are common prey item so may benefit from the presence of aquatic habitats
Great Columbia spire snail	Clear, cold streams needed for all lifecycle stages

Table 10. Federal Endangered Species Act listed fish and wildlife species in shoreline jurisdiction of Chelan County.

Common Name Scientific Name	ESU/DPS[1]	Federal Status[2]	Critical Habitat?	WRIAs / City
Bald eagle Haliaeetus leucocephalus	(none)	C, Monitor	No	45, 46, 47, City of Entiat
Bull trout Salvelinus confluentus	USA coterminous,	T	Yes	40, 45, 46, 47

	(lower 48 states)			
Canada lynx Lynx canadensis	USA	T	Yes	45, 46, 47
Chinook salmon, spring run Oncorhynchus tshawytscha	Upper Columbia Basin, Spring Run	E	Yes	40, 45, 46, 47, all Cities
Fisher Martes pennanti	West Coast DPS	C	No	47
Great Columbia spire snail (Columbia pebblesnail) *Fluminicola columbiana*	(none)	SC	No	45
Northern spotted owl Strix occidentalis caurina	(none)	T	Yes	Chelan County
Pacific lamprey Entosphenus tridentatus	(none)	SC	No	47, City of Entiat
Pygmy whitefish Prosopium coulteri	(none)	SC	No	47, City of Chelan
Steelhead trout Oncorhynchus mykiss	Upper Columbia River Basin	T	Yes	40, 45, 46, Cities of Cashmere, Entiat, Leavenworth and Wenatchee
Western gray squirrel *Sciurus griseus griseus*	(none)	SC	No	47, City of Chelan
Westslope cutthroat trout *Oncorhynchus clarki lewisi*	(none)	SC	No	40, 45, 46, 47, all Cities

[1] Status codes: C = Candidate, SC = Species of Concern, T = Threatened, E = Endangered, UR = Under review

Other priority habitats found in County or City shorelines include aspen stands, old-growth/mature forest, riparian zones, and wetlands. Priority habitat features found in County or City shorelines include talus slopes, cliffs, and snag-rich areas.

WDFW maps do not capture every priority species location or habitat in shoreline jurisdiction, particularly those species that use the water for foraging and drinking, but that nest or den farther from the shoreline. Absence of mapping information does not indicate that a particular species does not or could not utilize the shoreline or adjacent lands.

3.8.5 Critical Aquifer Recharge Areas

Specific information about locations of critical aquifer recharge areas could not be located. As noted in the County's 2008 critical areas regulations (Chapter 11.82), "There is insufficient scientific data at this time, to determine with any specificity the location of areas having a critical recharging effect on aquifers used for potable water within the boundary of Chelan County."

3.9 Floodplains and Channel Migration Zones

WAC 173-26-201(3)(c) directs local government to collect the "[g]eneral location of channel migration zones, and flood plains… to the extent such information is relevant and reasonably available. Towards that end, maps have been developed showing the locations of floodplains, floodways, and channel migration zones (CMZ), the definitions of which are provided below:

- Floodplain (SMA): synonymous with 100-year floodplain, land area susceptible to inundation with a one percent chance of being equaled or exceeded in any given year. The limit of this area shall be based upon flood ordinance regulation maps or a reasonable method which meets the objective of the SMA.
- Floodway (FEMA): channel of a river or other watercourse and the adjacent land areas that must be reserved in order to discharge the base flood without cumulatively increasing the water surface elevation more than a designated height (FEMA definition)
- Floodway (SMA): area, as identified in a Shoreline Master Program, that either:
    - (i) Has been established in federal emergency management agency flood insurance rate maps or floodway maps; or
    - (ii) Areas flooded with reasonable regularity: "those portions of the area of a river valley lying streamward from the outer limits of a watercourse upon which flood waters are carried during periods of flooding that occur with reasonable regularity, although not necessarily annually."
    - (iii) Identified by soil and vegetation: floodway to be "identified, under normal condition, by changes in surface soil conditions or changes in types or quality of vegetative ground cover condition."
    - (iv) Not to include lands protected from floods by legal dikes and levees: "The floodway shall not include those lands that can reasonably be expected to be protected from flood waters by flood control devices maintained by or maintained under license from the federal government, the State, or a political subdivision of the State."
- Channel Migration Zone (SMA): the area along a river within which the channel(s) can be reasonably predicted to migrate over time as a result of

> natural and normally occurring hydrological and related processes when considered with the characteristics of the river and its surroundings.[6]

Floodplain boundaries have been determined for the majority of large rivers and creeks in Chelan County through FEMA mapping.

The FEMA mapping corresponds to the 100-year flood event and is typically limited to the lower reaches. FEMA-mapped floodplains are completed for portions of the following waterbodies: Wenatchee River, Entiat River, Stehekin River, Chelan River, Nason Creek, White River, Little Wenatchee River, Icicle Creek, Chumstick Creek, Peshastin Creek, and Mission Creek.

Chelan County's original Flood Insurance Study was prepared by CH2M-Hill for FEMA; it started in 1976 and became effective on February 4, 1981. Detailed studies were performed for portions of the Wenatchee, Chiwawa, Entiat, Mad and Stehekin Rivers, and Mission, Peshastin, Icicle, Chumstick and Squilchuck Creeks. A revision to the original study was also performed by CH2M-Hill for FEMA; this revision added detailed study for Nason Creek and portions of the Wenatchee River.

Available CMZ mapping from a Chelan County-commissioned study of the Wenatchee River and the lower portions of a few key tributaries, and from the National Park Service's assessment of the Stehekin River are provided on maps included in this report, and described below. A January 2009 study of the Entiat River is described below as well. Development of additional CMZ mapping was undertaken in conjunction with the development of this report for segments of the Wenatchee, White, and Entiat Rivers and Icicle, Nason, and Chumstick Creeks (See Map Folio). CMZ area was estimated using LiDAR, geologic and

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[6] As relayed by Martin Fisher, P.E., ICF Jones & Stokes, defining the CMZ also considers the influence of certain human-made structures. Many human-made structures like roads do not meet the current standard of being able to withstand the 100-year flood. Most of them were built 50 or more years ago and the science of fluvial geomorphology and river engineering have advanced significantly since then based on observations of performance of human made structures in the river environment. These structures, even if not up to current standards, represent a boundary for the CMZ. If damaged from erosion, as occurred on U.S. 97 in January 2009, the boundary would be restored by emergency maintenance. When maintenance activities occur, they are ideally implemented using modern methodologies and standards which lead to a more stable CMZ boundary.

When defining CMZ boundaries, the typical method is to define human-made hard points that will be maintained with some certainty as a CMZ boundary. This includes public roads, railroads, and levees that have a governmental agency or diking district overseeing maintenance. Erosion may occur to these locations of the CMZ boundary, but it is fairly certain that the responsible maintaining agency will repair the erosion. On the other hand, human-made hard points on private property, like private driveways and farm fields protected by riprap, are an area requiring judgment by the authors of the CMZ study as it is unknown if the landowner will maintain/restore the hard point or if damage occurs. Often these privately owned human-made hard points are not considered a CMZ boundary.

soil mapping, current aerial photographs, and County-wide road and railroad data. LiDAR data was corrected for ground returns, then mapped by both percent slope and by a technique we referred to as "differential elevation." The differential elevation mapping was developed by digitizing the water surface on the LiDAR ground returns, then comparing the water surface elevation to the elevation of the land adjacent to the water on a line perpendicular to the channel. The resulting data were grouped and colored based on the height above the water surface. The groupings varied somewhat from stream to stream. For example, the smaller streams may have shown 1′ elevation difference bands, while larger streams might have shown 2′ or 3′ elevation difference bands, depending on the overall elevation differential in the data. Also, as the elevation increased above the water surface, the band increment often increased, to 5′ or 10′ category ranges, again depending on the total relief of the data. The combination of slope data and differential elevation provided good insight on the topographic characteristics of the valley bottoms, emphasizing old channel scars and highlighting terrace scarps and valley walls. Assumptions were checked using geologic and soil mapping, and aerial photography.

From WAC 173-26-221(3) and following guidance from Ecology (Patricia Olson, pers comm., 3/3/2010; Peter Skowlund, pers comm., 4/5/2010) roads were considered to be a limit to future channel migration if they were County- or State- maintained. In cases where road ownership and/or responsibility could not be readily determined, it was generally assumed that paved roads (as determined from aerial photography) would be a barrier to future channel migration, but that unpaved roads would not.

This methodology is likely to provide a liberal assessment of the actual CMZ, in that it assumes that channel migration is occurring on the identified reaches, and that the entire geologic floodplain is potentially within the CMZ, unless separated from the channel by a CMZ-limiting structure.

It should be noted that some areas outside of the estimated CMZ may, in fact, be subject to future channel migration. For instance, terraces were assumed to be outside the CMZ, but in some instances, channel migration can occur on terraces, especially in disturbed basins. However, such migration is difficult to predict and does not typically meet the standard definition of CMZ as provided in the WAC, since terraces generally reflect channel activity much older than 100 years.

3.9.1 Wenatchee River and Tributaries

After major flooding on the Wenatchee River in November 1995 that exceeded 100-year discharges and, in some areas, 500-year discharges, FEMA contracted with the Corps of Engineers to revise the Wenatchee River floodplain maps in the vicinity of the City of Leavenworth, from the confluence with Chumstick Creek to the confluence with Icicle Creek. That study became effective on July 2, 2002. Subsequently, FEMA contracted with the Corps again to study the

Wenatchee River from Leavenworth through Cashmere and down to Wenatchee. That study became effective on September 30, 2004.

As many of the rivers and creeks within Chelan County are confined due to geologic and human influences, the FEMA floodplains and CMZs are generally limited to natural areas directly adjacent to the waterbodies and not within dense human development, with some exceptions. Floodplain areas on the Wenatchee River near the City of Leavenworth at the Icicle Creek confluence do extend to include residential areas; however, most of the FEMA floodplain is composed of naturally vegetated islands and City Parks. On the lower Wenatchee River, the FEMA floodplain extends at the Mission Creek confluence to within residential areas in the City of Cashmere. The lower reaches of the Stehekin River also have mapped FEMA floodplains within residential areas.

The NHC study developed channel migration zone boundaries for the Wenatchee River, from above Leavenworth to the confluence with the Columbia River and the lower reaches of tributaries including the mouths of Icicle, Peshastin, and Mission Creeks, and the lower four miles of Nason Creek (2003). The CMZs were determined through interpretation of current and historic channel and floodplain features identified in aerial photographs and compiled within a GIS database. The CMZ determinations identified in the 2003 study were integrated into and updated in the most recent CMZ mapping (See Map Folio).

The CMZ analysis showed that the Wenatchee River is partly incised or entrenched with a narrow floodplain and has maintained the same general alignment for at least 100 years. Its banks are mostly stable due to both geologic and human constraints. Human development on the lower Wenatchee River has reduced the total floodplain area to 60 percent of the pre-development area. The loss of floodplain to development over time is due to construction of the railway, major roads, and levees, all of which are assumed to be barriers to flooding by the Wenatchee River. The Peshastin Creek floodplain has been reduced to 71 percent of the pre-development area primarily due to the construction of U.S. 97. Icicle Creek's floodplain has been reduced to 89 percent of the pre-development area (NHC 2003). The loss of floodplain area was not calculated for Nason Creek (NHC 2003).

The CMZ maps show erosion hazard zones based on the potential for channel migration. Erosion or migration potential on the Wenatchee River is generally limited to localized bank erosion on outer channel bends. Large channel avulsion or migration is typically not a threat due to both geologic and human confinement. However, bank stability (and curtailment of channel migration) is not an indicator that the area upland of those geologic and human conditions is protected from flooding, nor are any human alterations completely invulnerable to failure. Potential areas of channel migration include the confluence of the Icicle Creek and Wenatchee River, the area below South Dryden along Stines Hill

Road, and the Sleepy Hollow area on the Lower Wenatchee River. While these areas do have the potential for channel migration due to the lack of geologic or human confinement, the river banks are typically hardened in places with rip-rap which has greatly reduced the risk of migration. Human features, such as bridges, roads, and the railroad, that prevent channel migration are typically found downstream of the Peshastin River confluence. Bridges at Sleepy Hollow Road, Main Street in Monitor, and Cottage Avenue and Aplets Way in Cashmere limit the migration potential of the river. The construction of SR 2 downstream of Monitor also prevents the migration of the river and use of its historic floodplain. Upstream of the Peshastin River confluence, the river is more

3.10 Historical or Archaeological Sites

Throughout the City of Wenatchee there are known and unknown historical/cultural resource sites that occur within the shorelines. The existing City of Wenatchee Shoreline Master Program (1975) provides general goals and policies to protect and restore historical and cultural areas having significant historic, cultural, educational, or scientific value that are located within the shoreline jurisdiction.

According to the National Register of Historic Places and the Washington Heritage Register (list dated January 23, 2008) that are maintained by the Washington State Department of Archaeology and Historic Preservation (DAHP), there are known sites listed with the City of Wenatchee and Wenatchee UGA. The listed historical sites include the following:

- Wenatchee; Columbia and Okanogan Steamship Company Boat Yard; On Columbia River at Foot of Fifth Street
- Wenatchee; Columbia River Bridge; Spans Columbia River Between Wenatchee and East Wenatchee
- Wenatchee; Horan, Michael, House; 2 Horan Road
- Wenatchee vicinity; Columbia River Bridge at Wenatchee; U.S. Route 2 and Wenatchee, Spanning the Columbia River
- Wenatchee vicinity; Lincoln Rock; Directly Above Hwy 97, Between Wenatchee and Entiat, Near Rocky Reach Dam
- Wenatchee vicinity; Rock Island Dam; Spanning the Columbia River - 8 Miles SE of Wenatchee
- Wenatchee vicinity; Wenatchee Avenue Southbound Bridge; State Route 285 at Wenatchee River
- Wenatchee vicinity; Wenatchee Flat Site; Address Restricted (8/14/1973)

In addition to these known historic sites and structures, the City of Wenatchee and Wenatchee UGA was once home to Native American tribes, many of which had permanent winter settlements along shoreline streams, rivers and lakes. The

Wenatchi, Yakama, and Chelan tribes were three of the most prominent. In 1855, the Wenatchee chief and 13 other tribal leaders signed the Yakama Treaty, which ceded 10.8 million acres of land in exchange for reservation lands and other benefits. The Wenatchi, Chelan, and Yakama Tribes were now part of the "Confederated Tribes and Bands of the Yakama Nation". In 1902 and 1903, the Wenatchi, Chelan, Entiat and a few other tribes of the original Confederated Tribes and Bands of the Yakama Nation that had not moved to the Yakama Reservation were moved to the Colville Indian Reservation. These tribes and others became the Confederated Tribes of the Colville Reservation.

Many of these tribes were highly nomadic prior to establishment at the reservations, particularly between spring and fall. As a result, artifacts and campsites may be scattered along many of Chelan County's shorelines and other streams and lakes. Many of the County's shorelines are or have been of significance to the tribes, as indicated by many of the waterbody names. The tribes are actively involved with fish recovery and shoreline management in general. The tribes continue to exercise their traditional treaty rights in these areas. For example, as noted on the USFWS website for the Leavenworth National Fish Hatchery, "Adult salmon returning to the Hatchery are an important component of tribal fisheries activities. The focus of the fishery is the large pool located below the Leavenworth NFH spillway. The character of the river here provides access to construct scaffolds and fishing platforms. The fishery is important to tribal members as one of the few remaining places in Washington State that offers a productive fishing opportunity utilizing traditional methods."

3.11 Water Quality

As a requirement of Section 303(d) of the federal Clean Water Act that all waterbodies be "fishable and swimmable," Ecology classifies waterbodies into five categories:

- Category 1: Meets tested standards,
- Category 2: Waters of concern,
- Category 3: No data,
- Category 4: polluted waters that do not require a TMDL, and
- Category 5: polluted waters requiring a TMDL.

Individual waterbodies are assigned to particular "beneficial uses" (public water supply; protection for fish, shellfish, and wildlife; recreational, agricultural, industrial, navigational, and aesthetic purposes). Waterbodies must meet certain numeric and narrative water quality criteria established to protect each of those established beneficial uses. Waterbodies may provide more than one beneficial

use, and may have different levels of compliance with different criteria for those beneficial uses in different segments of the stream or lake. As a result, many waterbodies may be on the 303(d) list for more than one parameter in multiple locations. The following tables (Tables 11a-11c) outline the different parameters for which each shoreline waterbody is designated as Category 2, 4 or 5 polluted waters.

Table 11a. Category 2 - Waters of Concern.

Waterbody	Total Frequency	Ammonia-N	Chlorpyrifos	Dieldrin	Dissolved Oxygen	Fecal Coliform	Guthion (azinphos-methyl)	pH	Temperature	Total Polychlorinated Biphenyls (PCBs)	Total Phosphorus	Water Column Bioassay
Columbia River	7								6			1
Wenatchee River	108	14			12	33		32	17			
TOTAL	**115**	**14**	**0**	**0**	**12**	**33**	**0**	**32**	**23**	**0**	**0**	**1**

Table 11b. Category 4 – Polluted Waters That Do Not Require a TMDL.

Waterbody	Total Of Frequency	Instream Flow	Invasive Exotic Species	Temperature	Total Dissolved Gas	Total Phosphorus
Columbia River	20				20	
Wenatchee River	5	5				
TOTAL	**25**	**5**	**0**	**0**	**20**	**0**

Table 11c. Category 5 – Polluted Waters Requiring a TMDL.

Waterbody	Total Frequency	Ammonia-N	Chlorpyrifos	Dieldrin	Dissolved Oxygen	Fecal Coliform	Guthion (azinphos-methyl)	pH	Temperature	Total PCBs	Total Phosphorus	Water Column Bioassay
Columbia River	12										12	
Wenatchee River	290	33	33	33	33		8			38	79	33
TOTAL	**302**	**33**	**33**	**33**	**33**	**0**	**8**	**0**	**0**	**38**	**91**	**33**

Water Quality Improvement Projects or Total Maximum Daily Loads (TMDLs) have been established or are under development for segments of the Wenatchee River Basin as outlined in Table 12. Local governments and the local community that will be impacted by implementation of a cleanup plan develop the TMDL, with agency support. TMDLs include a description of the type, amount and sources of water pollution and analysis of the necessary pollutant reduction needed to meet water quality standards. The final result is a strategy for controlling the targeted pollutant.

Table 12. Total Maximum Daily Load (TMDL) projects in Chelan County, Including Non-Shoreline Waterbodies.

Waterbody Name	Pollutant	Status (Approved by EPA, Under Development or Implementation)
Wenatchee River Basin	DDT Dissolved Oxygen pH[7]	Approved, Completed in August 2009
Wenatchee River Basin	Fecal Coliform	Approved
Wenatchee River Basin Wenatchee River	Temperature	Approved

Source: http://www.ecy.wa.gov/programs/wq/tmdl/TMDLsbyWria/TMDLbyWria.html

The Washington State Department of Health has issued a statewide fish consumption for mercury that applies to all fresh waters and suggests that certain groups (e.g., pregnant women, children) should not eat more than two large- or smallmouth bass per month. Only two waterbody specific consumption advisories have been issued in Chelan County with one specific to this inventory - mountain whitefish in the Wenatchee River downstream of Leavenworth. In the Wenatchee River, PCBs are a concern in mountain whitefish, with a recommendation to consume none of that species.

3.12 Opportunity Areas

Ecology's *Shoreline Master Program Guidelines* (173-26 WAC) includes the following definition:

> "Restore," "Restoration" or "ecological restoration" means the reestablishment or upgrading of impaired ecological shoreline processes or functions. 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. Restoration does not imply a requirement for returning the shoreline area to aboriginal or pre-European settlement conditions.

[7] The TMDL developed to address dissolved oxygen and pH water quality exceedences targets control of phosphorus loading as the mechanism to restore dissolved oxygen and pH parameters.

Consistent with Ecology's definition, use of the word "restore," or any variations, in this document is not intended to encompass actions that re-establish historic conditions. Instead, it encompasses a suite of strategies that can be approximately delineated into four categories: creation (of a new resource), restoration (of a converted or substantially degraded resource), enhancement (of an existing degraded resource), and protection (of an existing high-quality resource).

There is a critical distinction between restoration and mitigation. Mitigation will require applicants whose shoreline proposals have adverse impacts to complete actions to mitigate those impacts or provide compensation in other ways for losses of ecological function. The City of Wenatchee cannot require applicants to go beyond returning the impacted area (or compensating in other ways for lost functions) to the condition it was in at the time of this inventory or as further detailed at the time of application. However, the County and Cities can encourage applicants to implement restoration actions that will improve ecological functions relative to the applicant's pre-project condition. As stated in WAC 173-26-201(2)(c):

> It is intended that local government, through the master program, along with other regulatory and non-regulatory programs, contribute to restoration by planning for and fostering restoration and that such restoration occur through a combination of public and private programs and actions. Local government should identify restoration opportunities through the shoreline inventory process and authorize, coordinate and facilitate appropriate publicly and privately initiated restoration projects within their master programs. The goal of this effort is master programs which include planning elements that, when implemented, serve to improve the overall condition of habitat and resources within the shoreline area of each city and county."

The Opportunity Areas discussions in this section and in Chapter 4 present options for "restoration" that would improve ecological functions. For example, enhancement of riparian vegetation, reductions or modifications to shoreline hardening, minimization of in- and over-water structures, and improvements to fish passage would each increase one or more ecological parameters of the County and Cities' shorelines. These options could be implemented voluntarily by the local governments, non-profit entities, residents or, depending on specific project details, could be required measures to mitigate adverse impacts of new shoreline projects.

The mission statement of the Upper Columbia Salmon Recovery Board (UCSRB), whose planning area includes all of Chelan County except for the Chelan watershed, is:

> To restore viable and sustainable populations of salmon, steelhead, and other at risk species through collaborative, economically sensitive efforts, combined resources, and wise resource management of the Upper Columbia region.

The *Upper Columbia Spring Chinook Salmon and Steelhead Recovery Plan* (UCSRB 2007) summarizes 12 factors for decline of the covered species:

- Social, Cultural, and Economic Factors
- Public Policy
- Management Actions
- Harvest
- Hatcheries
- Hydropower
- Habitat (includes alteration from land use practices, logging, mining, diversions, and other uses)
- Ecological Factors
- Factors Outside the ESU [Evolutionarily Significant Unit] and DPS [Distinct Population Segment][8]
- Interaction of Factors
- Current Threats
- Uncertainties

Development and implementation of the updated SMP and its components will primarily influence public policy, management actions, and habitat factors, either directly or indirectly.

Projects included on the Restoration Projects maps in the enclosed DVD originate from data provided by Chelan County Department of Natural Resources and the Cascadia Conservation District.

A Restoration Plan document was prepared beginning in 2010 as a later phase of the Shoreline Master Program update process, consistent with WAC 173-26-201(2)(f). The Restoration Plan will "include goals, policies and actions for restoration of impaired shoreline ecological functions. These master program provisions should be designed to achieve overall improvements in shoreline ecological functions over time, when compared to the status upon adoption of the master program." The Restoration Plan will mesh the specific potential projects mapped or identified in this report, with regional or County/City-wide efforts and programs of the County or Cities, watershed planning entities, and environmental organizations that contribute or could potentially contribute to improved ecological functions of the shoreline. Prioritization of specific projects

[8] ESU and DPS are terms used by National Marine Fisheries Service and U.S. Fish and Wildlife Service, respectively, to identify "distinct populations that are substantially reproductively isolated from other conspecific populations and that represent an important component of the evolutionary legacy of the species."

and project types, implementation strategies, and schedules will be based on information found in watershed or basin plans. The Restoration Plan will be finalized upon adoption of the Shoreline Master Program.

4. SHORELINE-SPECIFIC CONDITIONS

4.1 Stemilt/Squilchuck - Colockum (WRIA 40a/b)

The Stemilt/Squilchuck - Colockum watershed (WRIA 40a/b) is approximately 49,000 acres, and includes two shoreline streams/rivers and five lakes. The area of upland shoreline jurisdiction totals 739 acres along 137,001 linear feet (26 miles) of shoreline. A summary table (Table 13) provides further details on each waterbody's shoreline characteristics.

Table 13. Summary Table of Basic Characteristics of Each Shoreline Waterbody in WRIA 40a/b

Jurisdictional Streams/Lakes	Area of Upland Shoreline Jurisdiction (acres)	Major Existing Land Uses[1]	Ownership Profile[2]	Vegetation Profile[3]	Critical Area/Priority Habitat or Species (PHS)[4] Presence
Streams/Rivers					
Colockum Creek	180.48	Single Family Residential	• Private 98% • Public (PUD) 2%	Scrub/shrub 37%; grassland 37%; evergreen forest 9%	• PHS elk • PHS mule deer • PHS riparian zone • PHS cliffs/bluff • PHS fish • 13% wetland • 1.4% geohazard
Columbia River	413.66	Government/ Utility	• Private 64% • Public (Federal, County, PUD) 36%	Scrub/shrub 55%; evergreen forest 11%; deciduous forest 7%	• PHS mule deer • PHS elk • PHS riparian zone • PHS cliffs/bluffs • PHS fish • FEMA floodplain • 21% wetland • 8.5% geohazard
Lakes					
Spring Hill Reservoir (aka Black Lake or Wheeler Hill Reservoir)	30.20	Government/ Utility	• Private 56% • Public (State) 44%	Scrub/shrub 38%; emergent wetland 24%; evergreen forest 21	• PHS elk • 6% wetland • 100% geohazard

Jurisdictional Streams/Lakes	Area of Upland Shoreline Jurisdiction (acres)	Major Existing Land Uses[1]	Ownership Profile[2]	Vegetation Profile[3]	Critical Area/Priority Habitat or Species (PHS)[4] Presence
Cortez Lake	33.24	Single Family and Other Residential	• Private 100%	Low intensity development 28%; evergreen forest 25%; developed open space 21%	• PHS wood duck • 21% wetland • 19.6% geohazard
Meadow Lake	30.88	Undeveloped	• Private 100%	Pasture/hay 59%; evergreen forest 30%; developed open space 9%	• PHS wood duck • PHS wetland • 14% wetland • 18.1% geohazard
Stemilt Project Reservoir	21.24	Government/ Utility	• Private 100% [5]	Scrub/shrub 81%; evergreen forest 6%; emergent wetland 5%	• 2% wetland • 100% geohazard
Upper Wheeler Reservoir	29.33	Forestry	• Private 96% • Public (State) 4%	Evergreen forest 62%; scrub/shrub 22%; high-intensity development 12%	• PHS elk • 7% wetland • 82.3% geohazard

[1] Major existing land use is reported by acres located in the shoreline jurisdiction rather than full parcels. "Government/Utility" includes governmental services, utilities, and other transportation and communication utilities.
[2] Acres of shoreline owned by public or private entities. Public includes municipal, County, PUD, state, and federal lands.
[3] Three dominant types listed. Consult maps for distribution and other types.
[4] PHS = Priority Habitat or Species as identified by WDFW
[5] Owned by the Stemilt Project irrigation purveyor.

4.1.1 Land Use Patterns

Existing and Planned Uses

WRIA 40a/b is dominated by resource lands, including commercial agriculture and commercial forestry. Residential and industrial uses tend to congregate closer to the Columbia River and other waterbodies in the eastern portion of the WRIA (RH2 Engineering, Inc. 2007). The shorelands within WRIA 40a/b exhibit the following existing land uses:

- Agriculture – 10%
- Cultural/Recreation/Assembly – <1%
- Forestry – 6%
- Government/Utility – 22%
- Manufacturing/Industrial –3%
- Natural Resources – 7%
- No Category – <1%
- Other Residential – 3%
- Single Family Residential – 20%
- Transportation – 1%
- Undeveloped – 27%

The existing land uses vary by individual waterbody, with some shorelines dominated by governmental/utility uses (Stemilt Project Reservoir, Spring Hill Reservoir, Columbia River), resource uses (Upper Wheeler Reservoir), and rural residential (Cortez Lake, Colockum Creek), and undeveloped lands (Meadow Lake). While "governmental/utilities" represents the largest current use category on the Columbia River, its shoreline is characterized by the widest variety of existing uses, including single-family, agriculture, other natural resource, transportation, and manufacturing. The Columbia River is the only shoreline in WRIA 40a/b with transportation and manufacturing activities.

The County Comprehensive Plan includes a variety of rural and urban land use designations. WRIA 40a/b is predominantly rural in character and planned to continue that way. Much of the area along the Malaga Alcoa Highway in the Malaga community is designated for limited areas of more intensive rural development (LAMIRDs). LAMIRDs are designated in accordance with the Growth Management Act to identify more intense areas of existing development, and to minimize and contain those existing developed areas within the rural lands. LAMIRDs in the County Comprehensive Plan include:

- Rural Waterfront: Provides the opportunity for the development, redevelopment and infill of existing intensely developed shoreline areas for residential, and water related/water dependent recreational and tourist development.
- Rural Recreational/Residential: Provides the opportunity for the development, redevelopment and infill of existing intensely developed rural recreational/residential areas for residential, recreational and tourist development.

- Rural Village: Recognizes the existence of intensely developed rural residential developments and communities, with densities less than 2.5 acres per dwelling unit, which typically will not have sewer service.
- Rural Commercial: Provide for a range of commercial uses to meet the needs of local residents, and small scale tourist or recreational uses including commercial facilities to serve those recreational or tourist uses within the rural areas to meet the needs of local residents and visitors.
- Rural Industrial: Recognize the need for rural industrial and resource based industrial activities within the rural areas.

Except for Rural Waterfront, all of the LAMIRD designations are present in WRIA 40a/b. In the shoreline jurisdiction, the predominant LAMIRD is Rural Industrial, which is designated along the Columbia River. Rural Recreational and Residential is designated surrounding Cortez Lake and applies to the golf course and homes.

Chelan County has planned the following uses for all the shorelines as a whole:

- Commercial Agriculture – 4%
- Commercial Forest – 8%
- Rural Industrial – 22%
- Rural Recreation and Resource – 5%
- Rural Residential – 60%
- UGA – < 1%[9]

Based on Chelan County's Comprehensive Plan, future land uses vary by waterbody as shown in Table 13. Rural Residential categories are designated along Colockum Creek, Cortez Lake, and Stemilt Project Reservoir. Resource lands categories predominate on the Spring Hill Reservoir, Meadow Lake, and Upper Wheeler Reservoir shorelines. Various categories of Rural Residential and Rural Industrial are planned on the Columbia River.

Current environment designations include Rural and Conservancy for shorelines currently in jurisdiction (see Table 14). Except along the Columbia River which shows both designations, only single designations are applied along smaller waterbodies, either Rural or Conservancy.

[9] The UGA area is 0.30 acres. The WRIA 40a/b analysis is intended to focus on non-City and non-UGA lands. However, the data that the County and the individual cities maintain is not always 100% edge-matched. The small UGA figures are likely the result of slight discrepancies in boundary digitization.

Table 14. WRIA 40a/b Shorelines Land Use, Comprehensive Plan Designation, and Shoreline Environment Designation

Jurisdictional Streams/ Lakes (Existing/ Future Acres)	**Existing Land Use**	**Comprehensive Plan Designation (Chelan County)**		**Current Shoreline Environment Designation (Chelan County)**
Streams/Rivers				
Colockum Creek (167.66/ 180.48)	Single Family 48%, Undeveloped 39%, Agriculture 12%, Natural Resources <1%	• Rural Residential (5, 10, 20)	• 180.48 acres/100%	--
Columbia River (341.39/ 381.01)	Government/Utility 32%, Undeveloped 24%, Natural Resources 14%, Single Family Residential 11%, Agriculture 11%, Manufacturing/ Industrial 6%, Transportation 2%, No Category <1%	• Rural Residential (2.5, 5, 20) • Rural Industrial • Urban Growth Area	• 222.37 acres/58% • 158.64 acres/42% • 0.3/<1%	• Conservancy • Rural
Lakes				
Spring Hill Reservoir (aka Black Lake or Wheeler Hill Reservoir) (30.20/ 30.20)	Government/Utility 44%, Forestry 30%, Undeveloped 26%	• Commercial Forest Lands	• 30.20 acres/ 100%	• Conservancy
Cortez Lake (31.22/ 33.24)	Other Residential 69%, Single Family Residential 26%, Cultural/Recreation/ Assembly 4%	• Rural Recreation & Resource •	• 33.24 acres/ 100% •	• Rural
Meadow Lake (27.74/ 30.88)	Undeveloped 52%, Agriculture 30%, Single Family Residential 18%	• Commercial Agricultural Lands • Rural Residential (5)	• 28.53 acres/ 92% • • 2.35 acres/ 8%	• Rural
Stemilt Project Reservoir (21.24/ 21.24)	Government/Utility 90%, Undeveloped 9%, Single-Family Residential 1%	• Residential Rural (10, 20)	• 21.24 acres/ 100%	
Upper Wheeler Reservoir (29.33/ 29.33)	Forestry 95%, Government/Utility 5%	• Commercial Forest Lands • Rural Residential (20)	• 28.52 acres/ 97% • 0.81 acres/ 3%	• Conservancy

Subarea Plans

There are two planning efforts sponsored by Chelan County in conjunction with local citizens and stakeholders that have influenced plans or activities in WRIA 40a. The *Malaga Community Vision Subarea Plan* focuses on the community of Malaga and the future vision and land use. The *Stemilt-Squilchuck Community*

Vision addresses the basin-level conservation and development of the Stemilt-Squilchuck basin area in WRIA 40a. Each plan is described below.

Malaga Community Vision Subarea Plan

In 2005 and 2006, the Malaga Area Vision plan was developed to identify the vision and potential land use designations that implement the vision for the Malaga community. The BOCC adopted the recommendations in 2006.

The vision, originally adopted in the year 2000 into the County Comprehensive Plan, states:

> The citizens of the Malaga-Stemilt-Squilchuck Study Area believe that their greatest asset is the rural character of the community. Rural character may be defined as that mixture of open space, housing, and agricultural land uses which are believed to express and preserve the quality of life desired by the residents.
>
> The citizens of the Malaga-Stemilt-Squilchuck Study Area envision future development that will complement and enhance, and not unreasonably impact, our rural character, our strong agricultural economy, and natural resource based industries.
>
> We foresee maintaining the area's high quality of life while sustaining growth that can be served with the necessary public services and, facilities. Open spaces, wildlife conservation, and recreational opportunities will be encouraged.
>
> We foresee expansion of transportation systems to allow efficient movement of goods, services and people within the planning area and connecting with the rest of Chelan County.
>
> We foresee the establishment of quality educational facilities to meet the needs of community growth.
>
> We foresee varied levels of development with suitable mitigation between different land uses. We envision that the expansion of our existing residential, commercial and industrial land uses will take place in those areas already characterized by that type of use.
>
> We foresee the requirement to support sustainable hydroelectric power generation to maintain and meet our community growth.
>
> In recognition of the importance of preservation of existing water rights and future need for water for our community and its agricultural base; we foresee the continued support, development and expansion, and maintenance of water supplies and their associated sources.

> In conclusion we envision growth that will maintain the continuity of our rural character and quality of life while protecting the private property rights of the citizens of this area.

In the Malaga area, the future land use designations along the Columbia River, and Meadow Lake were largely left intact, but the designations outside of the shoreline jurisdiction and south of the Malaga Alcoa Highway and north of Malaga/Saturday Road were modified to add greater areas of Rural Residential Recreation, Rural Village, Rural Commercial, and Rural Residential 2.5. A small area changed to Rural Residential Recreation around Cortez Lake. All of these changes recognize the Malaga area as a LAMIRD consistent with the Growth Management Act.

Stemilt-Squilchuck Community Vision

The Washington State Department of Natural Resources (WDNR) proposed to privatize 2,500 acres of public land in the Stemilt basin. Chelan County formed The Stemilt Partnership including agriculture, wildlife, recreation, development, and conservation representatives. The plan describes a landscape-based vision and strategies for the overall Stemilt-Squilchuck basin that form a portion of WRIA 40a and places the importance of the exchange parcels in the context of the basin. The vision includes the following:

- Water resources are protected, ensuring adequate water supply for irrigation and domestic purposes
- Wildlife resources are conserved, maintaining critical habitat and corridors
- Recreational access to hunting grounds, trails, fishing reservoirs, and other recreational lands is maintained and enhanced where appropriate, and
- New development is low impact and well-planned, considers multiple uses where appropriate, and meets the requirements of the community's shared goals.

A conceptual plan identifies areas in use for agricultural activities as well as areas that are suitable or should be managed as snow retention areas, primary wildlife and habitat areas, secondary wildlife and habitat areas, recreational resources, and water storage priority. In terms of the shoreline jurisdiction waterbodies, the plan identifies the following:

- Columbia River: the land along the river is shown for low, moderate, and high development intensity, recreational resources, as well as agriculture
- Cortez Lake: lakeside property is shown for high development intensity
- Meadow Lake: lakeside property is shown for agriculture and low and moderate development intensity

- Upper Wheeler Reservoir: land surrounding the reservoir is shown as low development intensity, primary wildlife and habitat area, snow retention area, water storage priority area and recreational resource
- Spring Hill Reservoir (aka Black Lake): shown as primary wildlife and habitat area, water storage priority area, and recreational resource
- Stemilt Project Reservoir: shown with low development intensity, primary wildlife and habitat areas, and water storage priority area

Colockum Creek is not included in the boundaries of the vision plan.

A land exchange between WDNR and Western Pacific Timber, LLC occurred in February 2008, but did not include the 2,500-acre Stemilt property (The Stemilt Partnership and Trust for Public Land, September 2008).

The vision plan includes strategies to help implement the plan. The plan is a resource for the County, citizens, and stakeholder groups. It has not been adopted by the BOCC as part of the County's Comprehensive Plan (pers. com., Lilith Yanagimachi, November 3, 2008).

Water-Oriented Uses

In WRIA 40a/b, potential water-oriented uses include agriculture at 68 acres, with most of the acreage on the Columbia River, followed by Colockum Creek and Meadow Lake. Also there are 9 acres of open space (noncommercial forest) along Spring Hill Reservoir (aka Black Lake).

Developing or Redeveloping Waterfronts

WRIA 40a/b shorelines tend to have parcels without buildings as follows:[10]

- Spring Hill Reservoir – 4 parcels or 100% of shoreline acres
- Colockum Creek – 18 parcels, 54% of shoreline acres
- Columbia River – 65 parcels or 60% of shoreline acres
- Cortez Lake – 18 parcels or 35% of shoreline acres
- Meadow Lake – 5 parcels or 59% of shoreline acres
- Stemilt Project Reservoir – 5 parcels or 99% of shoreline acres
- Upper Wheeler Reservoir – 2 parcels or 5% of shoreline acres

As undeveloped lands convert to the planned future land uses, the shorelines are likely to see added single-family rural residential dwellings, which make up 23% of current uses, but are planned for 65% of the shorelands. Likewise, manufacturing/industrial uses account for 3% of the existing shoreline uses but are planned for 22% of the shoreline as rural industrial. Lands in

10 Note: Selected parcels have a BLDGAV of $0. All parcels with the following Assessor Use Codes have been excluded from this analysis: 'agriculture-not in open space'; 'agric in open space rcw 84.34'; 'desig forest land rcw 84.33'; or 'mining activities'.

government/utility uses may not convert to rural residential or industrial uses since government/utility uses are allowed activities in multiple County land use and zoning districts.

4.1.2 Existing and Potential Public Access

WRIA 40a/b shorelines include properties characterized as open space that are either publicly owned or protected from development. Open space in the shoreline jurisdiction totals about 166 acres. Most of the acreage is on the Columbia River. By waterbody, the acres and the percent of that shoreline in open space are presented below:

- Colockum Creek, over 2 acres, 2% of shoreline jurisdiction
- Columbia River, approximately 162 acres, 47% of shoreline jurisdiction
- Spring Hill Reservoir (aka Black Lake or Wheeler Hill Reservoir), approximately 13 acres, 44% of shoreline jurisdiction
- Upper Wheeler Reservoir, over 1 acre, 4% of shoreline jurisdiction

Though there are areas of open space, no parks or recreation facilities have been inventoried along the two shoreline streams/rivers and five lakes.

Chelan County's Comprehensive Parks and Recreation Plan includes recommendations for subarea parks planning in the Malaga area. It also calls for a County trails plan. Depending on the more detailed parks planning results, additional shoreline public access may be possible. Other Comprehensive Parks and Recreation Plan recommendations address the Stemilt Basin Land Exchange. However, this project would not address public access on shorelines of the State.

4.1.3 Critical Areas

Shorelines in WRIA 40a/b contain a combined total of 569 acres of priority habitats and habitat features, including wetlands, riparian zones, cliffs/bluffs, elk and mule deer habitat, and wood duck breeding areas (see Table 14 above). The river and the stream each contain priority fish species as well. According to the NWI and hydric soils information, as much as 17% of the total shoreline area may be wetlands. Geologically hazardous areas (as mapped by WDNR) are common, particularly around the three reservoirs, which are considered to have 100% geohazard coverage.

4.1.4 Potential Restoration Opportunities

The purpose of the WRIA 40a Watershed Plan (RH2 Engineering Inc. 2007) was to assess water quantity and multi-purpose water storage. Water quality, instream flow, and habitat were not direct components of the WRIA 40a plan. However, as the plan notes:

> "…increasing the flow and expanding the timing of water in streams may benefit riparian and wetland habitat conditions. Diverting excess storm

> runoff may reduce flooding risk, preserve instream habitat and mitigate some of the effects of development. Enlarging or creating new reservoirs may create new recreational and/or habitat conditions."

Actions and facilities that increase storage may also "substantially modify the landscape and change hydrologic conditions," potentially to the detriment of in-stream and riparian habitats.

The WRIA 40a Watershed Plan is the deliverable for Phase 3 of the watershed planning process. Phase 4 (implementation plan) is underway. When specific projects are carried forward for agency permits or grant funding, specific environmental assessments will be conducted that will evaluate the possible benefits and adverse impacts of each water quantity or water storage project. Any adverse impacts would be mitigated consistent with rules and guidelines established by the various reviewing agencies, which may include the U.S. Army Corps of Engineers, Washington Department of Fish and Wildlife, Washington Department of Ecology, National Marine Fisheries Service, U.S. Fish and Wildlife Service, Washington Department of Natural Resources, tribal governments, local government, and others.

WDFW completed a *Diversion Screening and Fish Passage Inventory Report for Colockum Creek, Stemilt Creek and Squilchuck Creek* in 2006. In the area of Colockum Creek identified as shoreline jurisdiction, at least five potential barriers to fish passage were identified. These are all recommended for removal or repair, as they block or hinder anadromous salmonids access to suitable habitat upstream. According to WDFW (2006), "Reconnecting fragmented habitat, increasing fish passage and decreasing juvenile mortality by correcting all passage barriers and screening surface water diversions could realistically be attained in the Colockum watershed due to the low quantity of barriers, habitat quality and current fish distribution."

4.2 Wenatchee (WRIA 45)

The Wenatchee watershed (WRIA 45) is approximately 1,370 square miles, and contains 45 shoreline streams/rivers and 29 shoreline lakes. The area of upland shoreline jurisdiction totals 24,652 acres along 2,159,741 linear feet (409 miles) of shoreline. The headwaters of WRIA 45 originate in the Cascade Mountain range as the Little Wenatchee and White Rivers. These rivers flow into Lake Wenatchee, the source of the Wenatchee River. Various tributaries to the Wenatchee River add significant volume to the river (WRIA 45 Planning Unit 2006). A summary table (Table 15) provides further details on each waterbody's shoreline characteristics.

Table 15. Summary Table of Basic Characteristics of Each Shoreline Waterbody in WRIA 45, Outside of Cities and their Urban Growth Areas.

Jurisdictional Streams/Lakes	Area of Upland Shoreline Jurisdiction (acres)	Major Existing Land Uses[1]	Ownership Profile[2]	Vegetation Profile[3]	Critical Area/Priority Habitat or Species (PHS)[4] Presence
Streams/Rivers					
Columbia River	112.87	Not applicable [4]	• Private 57% • Public (PUD) 43%	Low-intensity development 29%; scrub/shrub 17%; high-intensity development 15%	• PHS bald eagle/bald eagle nest • PHS bighorn sheep • PHS mule deer • PHS riparian zone • PHS fish • 43% wetland • FEMA floodplain • 1.2% geohazard
Wenatchee River	4,070.47	Government/ Utility	• Private 64% • Public (Federal, State, County) 36%	Evergreen forest 28%; scrub/shrub and low-intensity development 12% each	• Heritage Point bald eagle (4) • Heritage Point great blue heron (2) • Heritage Point great Columbia spire snail (3) • Heritage Point mountain sucker (1) • Heritage Point osprey (16) • Heritage Point Umatilla dace (2) • PHS mule deer • PHS aspen stand • PHS riparian zone • PHS wetlands • PHS cliffs/bluffs • PHS fish • 49% wetland • FEMA floodplain • Floodway • Channel migration zone • Flood zone • 0.2% geohazard

[1] Major existing land use is reported by acres located in the shoreline jurisdiction rather than full parcels. "Government/Utility" includes governmental services, utilities, and other transportation and communication utilities.

[2] Acres of shoreline owned by public or private entities. Public includes municipal, County, PUD, state, and federal lands.
[3] Three dominant types listed. Consult maps for distribution and other types.
[4] PHS = Priority habitats and species as identified by WDFW

4.2.1 Land Use Patterns

Existing and Planned Land Uses

The combined WRIA 45 shorelines exhibit the following existing land uses:

- Agriculture – 3%
- Commercial – 1%
- Cultural/Recreation/Assembly – 1%
- Forestry – 11%
- Government/Utility – 58%
- Manufacturing/Industrial – <1%
- Natural Resources – 1%
- No Category – 1%
- Open Space – 3%
- Other Residential – 11%
- Single Family Residential – 6%
- Transportation – <1%
- Undeveloped Land – 3%

Government/utility uses and resource lands (forestry, agriculture, other natural resources) dominate along a majority of the 75 shorelines under review. Shorelines exhibiting a wider mix of uses, such as residential, commercial, industrial, recreation, or other uses, include:

- Chiwaukum Creek
- Chiwawa River
- Chumstick Creek
- Colchuck Lake
- Columbia River
- Fish Lake
- Icicle Creek
- Lake Wenatchee
- Mission Creek

- Nason Creek
- Peshastin Creek
- Wenatchee River
- White River

WRIA 45 contains unincorporated and incorporated lands. Unincorporated lands are under the jurisdiction of Chelan County. The County has planned the following uses for its shorelines as a whole:

- Commercial Agricultural Lands – 1%
- Commercial Forest Lands – 65%
- Industrial – <1%
- Commercial Mineral – <1%
- Public Lands and Facilities – 1%
- Rural Commercial – <1%
- Rural Industrial – <1%
- Rural Residential – 24%
- Rural Recreational and Resource – <1%
- Rural Village –<1%
- Rural Waterfront – 2%
- Urban Growth Area –<1%[11]
- Water – 5%

Based on Chelan County's Comprehensive Plan, future land uses vary by waterbody as shown in Table 16. Shorelines that are dominated by government/utility uses or forestry uses tend to be designated as Commercial Forest Lands. Shorelines planned for a wider variety of uses including residential, commercial, industrial, recreation, or other uses tend to be those that currently exhibit a variety of uses.

Current shoreline use environment designations vary by waterbody, but typically include Rural and Conservancy through most of the unincorporated areas, though there are several areas identified as Natural, and more limited areas as Urban. Numerous shorelines are not currently in the SMP jurisdiction,

[11] The UGA area is 64.71 acres – a fraction of the total shoreline acres of 24,652. The WRIA 45 analysis is intended to focus on non-City and non-UGA lands. However, the data that the County and the individual cities maintain is not always 100% edge-matched. The small UGA figures are likely the result of slight discrepancies in boundary digitization.

but appear to meet thresholds for jurisdiction in the proposed SMP based on currently available information.

Table 16. WRIA 45 Land Use, Comprehensive Plan Designation, and Shoreline Environment Designation

Jurisdictional Streams/Lakes (Existing/ Future Acres)	Existing Land Use	Comprehensive Plan Designation (Chelan County)		Current Shoreline Environment Designation (Chelan County)
Streams/Rivers				
Columbia River (55.63/ 79.42)	Government/Utility (59%), Open Space (30%), Other Residential (11%),	• Rural Residential (5, 20) • Public Lands and Facilities • Urban Growth Area • Water • • Industrial	• 25.71 acres/32% • • • 20.96 acres/ 26% • 16.03 acres/ 20% • 15.54 acres/ 20% • 1.19 acres/ 1%	• Conservancy • Rural • Urban
Wenatchee River (2,388.22/ 3,955.95)	Government/ Utility (30%), Other Residential (24%), Single Family Residential (12%), Forestry (11%), Agriculture (8%), Undeveloped (6%), Commercial (3%), No Category (2%), Open Space (1%), Cultural/Recreation/ Assembly (1%)	• Rural Residential (2.5, 5, 10, 20) • Water • • Commercial Forest Land • Commercial Agricultural Land • Rural Waterfront • • Public Lands and Facilities • Rural Village • Urban Growth Area • Rural Industrial • Rural Commercial • Rural Recreational and Resource • No Category	• 1,487.84 acres / 38% • • 991.52 acres/ 25% • 769.99 acres/ 19% • 276.82acres/ 7% • 199.91 acres/ 5% • 67.48 acres/ 2% • • 66.57 acres/ 2% • 47.24 acres/ 1% • 17.49 acres/ <1% • 29.18 acres/ 1% • • 1.84 acres/ <1% • 0.07 acres/ <1%	• Conservancy • Natural • Rural • Urban

[1] There is no parcel-based current land use data for numerous waterbodies that are 100% in Federal ownership.

Water-Oriented Uses

Water-oriented uses along shorelines in WRIA 45 include agriculture, parks/recreation/recreational activities, resorts and group camps, hotel/motel,

eating and drinking places, and others. The following shorelines may contain water-oriented uses:

- Wenatchee River – approximately 210 acres in open space (non-commercial forest), 200 acres in agriculture, 27 acres in parks and open space, 16 acres in recreational activities, and less than 1 acre in eating/drinking

Developing or Redeveloping Waterfronts

WRIA 45 shorelines tend to have parcels without buildings largely due to the commercial forest lands in the watershed (Table 17).

Table 17. WRIA 45 Shorelines and Parcels without Buildings.

Waterbody	Total Parcels	Total Acres	Parcels Without Buildings	Parcels without Buildings - Acres	% Without Buildings
Columbia River	41	56	36	56	100%
Wenatchee River	1,453	2,400	598	1,467	61%
TOTAL	1,494	2,456	634	1,523	62%

Note: Selected parcels have a BLDGAV of $0. All parcels with the following Assessor Use Codes have been excluded from this analysis: 'agriculture-not in open space'; 'agric in open space RCW 84.34'; 'desig. forest land RCW 84.33'; or 'mining activities'.

Most of the shoreline land is under government/utility use, and is expected to remain in that pattern even where there are vacant parcels. Where undeveloped lands convert to the planned future land uses, the shorelines are likely to see added rural residential which makes up 17% of current uses but is planned over 24% of the shoreline lands.

Lake Wenatchee and the Wenatchee River were the locations of numerous County shoreline permits between 2000 and 2007.

4.2.2 Existing and Potential Public Access

Parks and open space are found along numerous shorelines in WRIA 45. Open space is estimated at approximately 24,699 acres (Table 18). Park acres total about 17 acres and are found along the Columbia and Wenatchee Rivers.

Table 18. Open Space along Shorelines in WRIA 45.

Waterbody	Total Acres	Open Space Acres	% Open Space
Columbia River	114	33	29%
Wenatchee River	4,095	1,553	38%
TOTAL	4,209	1,586	37%

In addition, formal developed public access points include: trails, campgrounds, picnic areas, fishing easements, and boat launches. The trails are extensive,

linking various waterbodies as well as running alongside waterbodies. The fishing easements and boat launches are located along the Wenatchee River.

There are 2 shoreline rivers in the proposed shoreline jurisdiction and both have formal recreation facilities per Table 19, predominantly consisting of campgrounds. Both have shoreline have trails per Table 20.

Table 19. WRIA 45 Public Access Facilities

Waterbody	Total Facilities	Campground	Horse Camp	Picnic Area	Trailhead
Wenatchee River	3	2		1	
Columbia River	1	1		1	

Table 20. WRIA 45 Trails

Waterbody	Trail Length – Linear Feet
Wenatchee River	21,561*
Columbia River	26,400

*Includes areas outside City of Wenatchee Jurisdiction.

The County Comprehensive Parks and Recreation Plan identifies several parks and recreation projects in the Wenatchee watershed along the shoreline jurisdiction. The Comprehensive Parks and Recreation Plan recommends the preparation of a comprehensive trails plan and suggests that the plan address, among other items:

- Leavenworth-Wenatchee Valley Non-motorized Trail
- Wenatchee River Water Trail
- Monitor Connector Trail

Another relevant project includes the Wenatchee Row and Paddle Boating Facility Upgrade. Subarea planning for the Monitor and Sunnyslope areas may provide for additional parks and recreation facilities.

4.2.3 Critical Areas

Shorelines in WRIA 45 contain a combined total of 19,433 acres of priority habitats and habitat features. The most common habitats, in order of frequency of occurrence, are those for elk calving, migration, concentrations, or foraging and mountain goat breeding or concentrations. Twenty-seven separate osprey nest sites are mapped in shoreline jurisdiction, distributed on five waterbodies. Twenty-five additional point locations of 12 other species are also found in WRIA 45 shoreline jurisdiction. Many of the rivers, streams and lakes also contain priority fish species. According to the NWI and hydric soils information, as much as 39% of the total shoreline area may be wetlands. Floodplains and a few geohazard areas are also documented in the WRIA.

4.2.4 Peshastin Urban Growth Area

The Peshastin community was established in the 1890s along the Northern Pacific Railroad, and a depot was erected. Peshastin is a small town in unincorporated Chelan County, and is village-like in character surrounded by orchards. The Peshastin UGA contains 610 acres, with about 93 acres lying in the shoreline jurisdiction along the Wenatchee River. About 3 acres of shoreline jurisdiction lies along Peshastin Creek, though the waterbody immediately abuts the UGA and does not lie within the UGA.

4.2.5 Potential Restoration Opportunities

The Wenatchee River system provides important habitat for many life stages of spring and summer Chinook, steelhead, bull trout and other culturally important species, and needs to be protected, enhanced, and restored. The *Salmon, Steelhead, and Bull Trout Habitat Limiting Factors for the Wenatchee Subbasin (WRIA 45) and Portions of WRIA 40*[12] *within Chelan County (Squilchuck, Stemilt and Colockum Drainages). Final Report* (Andonaegui 2001) identifies some broad habitat limiting factors for salmon.

- Road and railroad construction and placement;
- Conversion of riparian habitat to agriculture and residential development;
- Reduced large woody debris (LWD) recruitment;
- Flood control efforts that include LWD removal, berm construction, and stream channelization;

These activities have generally been responsible for decreasing habitat complexity, function, and abundance and are primarily found in lower gradient, lower reaches of all Chelan County watersheds, not just WRIAs 40a and 45.

The WRIA 45 Planning Unit identified 25 opportunities for habitat actions in the Wenatchee watershed, including six short-term actions and four hatchery-oriented actions. Opportunities exist to increase habitat and/or restore complexity and riparian function to benefit ESA-listed endangered and threatened salmonid species throughout the Wenatchee watershed. The following opportunities for watershed-wide habitat actions are summarized from those in the *Wenatchee Watershed Management Plan*, as well as from the WDFW Habitat Work Schedule for Chelan County (http://hws.ekosystem.us/SiteView.aspx?sid=290#).

[12] WRIA 40 (Alkali-Squilchuck) extends south outside of Chelan County. Discussions in this report are for the area known as 40a (Stemilt-Squilchuck) and the Chelan County-portion of WRIA 40b (the Colockum Creek basin).

- Restore floodplain function, particularly on the Wenatchee River from the Mission Creek confluence downstream to the Columbia River confluence and in the Nason Creek watershed
- Improve access to spawning habitat and migration corridors in the Chumstick Creek, Lower Wenatchee River, and Mission Creek watersheds by eliminating barriers for anadromous salmonids.
- Noxious weeds threaten aquatic and terrestrial ecosystems throughout the Wenatchee Watershed. Opportunities exist for control and eradication and should be supported.
- Improve channel structure and complexity on the lower Wenatchee River and in Nason Creek.
- Take efforts to reduce excessive sediment in the Lower Wenatchee River and improve overall water quality.
- Improve riparian areas and increase the amount of large woody debris in the Nason Creek watershed.
- Identify the presence of habitat limiting factors in Peshastin Creek drainage.

The *Wenatchee Watershed Management Plan* classifies the 12 sub-watersheds into three categories based on existing function, fragmentation, and salmonid habitat quality. Category 1 sub-watersheds are prioritized for protection because they "most closely resemble natural, fully functional aquatic ecosystems." Six sub-watersheds are ranked Category 1: White, Little Wenatchee, Chiwawa, Lake Wenatchee, Chiwaukum, and Upper Wenatchee. Category 2 sub-watersheds "are strongholds for one or more listed species," but "have a higher level of fragmentation." Four sub-watersheds are ranked Category 2: Nason, Icicle, Peshastin, and Lower Wenatchee. Finally, Category 3 sub-watersheds "support salmonids, but they have experienced substantial degradation…" Two sub-watersheds are ranked Category 3: Chumstick and Mission.

The U.S. Bureau of Reclamation prepared an assessment of processes and habitat for three reaches in a 10-mile-long stretch of Nason Creek, a tributary of the Wenatchee River. The purpose of the assessment was to "develop a restoration and protection strategy based on a sound scientific assessment of channel processes." The overall goals of the restoration actions are to:

- increase the complexity of the main channel,
- increase availability and quality of off-channel areas, and
- increase the amount of accessible floodplain.

The second of the three reaches, corresponding to a rest area, was determined to have low restoration opportunity, so specific actions were not recommended.

Actions for the other two reaches (Table 21) are identical in type, although at the project level the scales and specific habitat element improvement targets are different.

Table 21. Summary of proposed restoration types for each reach of the Nason Creek study area based on findings of geomorphic assessment.

Reach	Riparian Restoration within HCMZ	Riparian Restoration within Floodplain	Side-channel Reconnection	Obstruction Reconnection	Road Maintenance	Floodplain Restoration	LWD Restoration
1 (RM 4.6 – 8.9) Coles Corner to Rest Area	X	X	X	X	X	X	X
3 (RM 9.4 – 14.3) Rest Area to White Pine Railroad Bridge	X	X	X	X	X	X	X

Source: Table excerpted and modified from USBR 2008.

In 2006, Chelan County commissioned a riparian assessment of private and County-owned riparian lands in the Wenatchee subbasin along streams that contained priority fish species and lands that were identified in the *Wenatchee Salmon Recovery Implementation Schedule* (UCSRB 2005; EcoA.I.M. 2006). After analysis of aerial photos, 588 individual sites were determined to need some level of riparian enhancement, either full revegetation or just addition of conifers. Riparian restoration efforts may be particularly valuable in the channel migration zone, where vegetation serves to both limit excessive bank erosion and supply large woody debris to the river during channel migration occurrences. Because of the significant role of channel migration in habitat forming processes, efforts to restore or maintain channel migration zone processes should also be pursued.

A number of government organizations have or are developing plans to raise salmon and steelhead in the Wenatchee River watershed. While this may enhance salmon recovery efforts, care needs to be taken in implementation of hatchery projects that riparian habitat and water quality are not adversely affected.

4.3 City of Cashmere

Within the City of Cashmere and its UGA are two shoreline waterbodies: Mission Creek and the Wenatchee River. The shoreline acres in the City and UGA equal 238, and the shoreline length equals 12,159 feet. Shoreline vegetation is generally limited to a thin strip of shrubs and trees along the Wenatchee River.

Scattered trees occur on single-family residential parcels. The City's Riverside Park includes a large mowed lawn and large paved and gravel parking lots, which provide parking and river access for recreational boaters and the general public. In the southeast portion of the City and UGA, orchards, stormwater treatment ponds, the railroad and industrial areas with extensive impervious surfaces are separated from the River by a relatively narrow band of trees. The railroad and commercial areas are situated close to the River in the City's northwestern UGA, and shoreline vegetation is sparse.

Similar to the Wenatchee River shoreline, a narrow riparian corridor exists along Mission Creek. Impervious surface coverage is particularly high in the City's industrial areas, including the area at the mouth of Mission Creek. Roads intersect and run parallel to the Creek, and developed areas ranging from single family houses to public facilities adjoin the Creek's course along most of its length within the City. Due to the Creek's proximity to development, much of the shoreline is armored. The extent of development along the Creek tends to limit the potential for natural channel processes.

4.3.1 Potential Restoration Opportunities

Wenatchee Watershed Management Plan: The *Wenatchee Watershed Management Plan* includes four specific habitat actions for the Lower Wenatchee Watershed, which includes the City of Cashmere:

- LowWenH-1: Use practical and feasible means to increase stream flows (within the natural hydrologic regime and existing water rights) in the Wenatchee River (UCSRB, 2005).
- LowWenH-2: Reduce water temperatures by restoring riparian vegetation along the river (UCSRB, 2005).
- LowWenH-3: Increase habitat diversity and quantity by restoring riparian habitat along the Wenatchee River, reconnecting side channels and the floodplain with the river, and increasing large woody debris in the side channels (UCSRB, 2005).
- LowWenH-4: Protect existing riparian habitat and channel migration floodplain function (UCRTT, 2002).

Five separate habitat actions, as follows, are included for the Mission sub-watershed:

- MissionH-1: Re-establish connectivity throughout the assessment unit by removing, replacing, or fixing artificial barriers (culverts and diversions) (UCSRB, 2005).
- MissionH-2: Use practical and feasible means to increase stream flows (within the natural hydrologic regime and existing water rights) in Mission Creek (UCSRB, 2005).

- MissionH-3: Decrease water temperatures and improve water quality by restoring riparian vegetation along the stream (UCSRB, 2005).
- MissionH-4: Reduce unnatural sediment recruitment to the stream by restoring riparian habitat and improving road maintenance (UCSRB, 2005).
- MissionH-5: Increase habitat diversity and quantity by restoring riparian habitat, reconnecting side channels and the floodplain with the channel, increasing large woody debris within the channel, and by adding instream structures (UCSRB, 2005).

Several of the water-quality actions for the Lower Wenatchee Watershed address inputs of nutrients, particularly phosphorus to the Wenatchee River. Many parks and other intensively maintained lawns or landscape areas are potential sources of nutrient run-off. The Plan specifically mentions a need to reduce phosphorus inputs from wastewater treatment plants, including the City of Cashmere's facility. The Plan also includes 19 water-quality actions in the Lower Wenatchee Watershed and 33 water-quality actions for the Mission sub-watershed.

Riverside Park: Wenatchee River spring and fall discharges of 20,000 cfs or greater threaten the existing streamside canopy cover, vegetation and dike stability. Left and right bank reduction of shoreline armoring, addition of LWD, river meandering and revegetation could stabilize the stream bank and create off-channel salmonid spawning and juvenile rearing areas. Nature interpretive signs can be posted to entice the birding and naturalist communities to utilize this park. Special restoration attention to the left bank could decrease noise from U.S. Highway 2, improving the overall park and City aesthetic.

Chelan County Historical Museum and Pioneer Village: Similar Wenatchee River armor reduction, stream bank stabilization and revegetation, as mentioned above, can continue downstream of the Riverside Park to the end of Riverfront Drive (right bank) and the Chelan County Historical Museum and Pioneer Village (left bank). The Chelan County Historical Museum and Pioneer Village has wonderful restoration potential providing opportunities for public involvement and education.

Mission Creek: Seasonal floods cause considerable property damage, bank erosion and sediment loss throughout the creek. Reduce armoring and improve native vegetative cover to add habitat complexity and contribute to large woody debris recruitment. Creation of off-channel areas may minimize flooding and provide salmonid spawning and juvenile rearing areas. A combination of native revegetation and bioengineering techniques could be provided to secure the bank from excessive erosion.

General: At an October 2008 public meeting, a number of attendees commented that several sections of the Wenatchee River and Mission Creek contain debris (old tractors, large metal pieces, household appliances etc…) that could be removed to improve stream and fish habitat, and City aesthetics.

4.4 City of Leavenworth

Within the City of Leavenworth and its UGA are two shoreline waterbodies: Chumstick Creek and the Wenatchee River. In the City and its UGA, total shoreland area is approximately 148 acres and runs 5,071 linear feet.

Shoreline characteristics vary within the City, and functions are generally related to shoreline use. Shoreline vegetation along the golf course on the western side of the City is characterized by mown grass with scattered trees along the water's edge. In contrast, the City's parks offer significant forested areas along the river with low intensity public access. Among areas of residential development, shoreline vegetation varies, but is generally less dense, with fewer trees compared to the City parks. The mouth of Chumstick Creek is well vegetated with trees and shrubs, but the vegetated buffer decreases just upstream of the mouth, where it runs adjacent to the Chelan County Public Works Facility.

4.4.1 Potential Restoration Opportunities

The City of Leavenworth is already engaged in a number of cooperative restoration efforts with Trout Unlimited and U.S. Fish and Wildlife Service. The City is working with Trout Unlimited to enhance ponds in public recreation areas, including Enchantment Park and Blackbird Island. The north channel of the Wenatchee River around Blackbird Island is the subject of a study by USFWS for inclusion of large woody debris to provide habitat and control bank erosion.

Wenatchee Watershed Management Plan: The same four habitat projects listed above in Section 4.5.4 for the City of Cashmere are relevant to City of Leavenworth's Wenatchee River and Chumstick Creek shorelines. Five separate habitat actions, as follows, are included for the Chumstick sub-watershed, which is located for a small area at its downstream end in the City of Leavenworth:

- ChumH-1: Re-establish connectivity throughout the assessment unit by removing, replacing, or fixing artificial barriers (culverts and diversions) (UCSRB, 2005).
- ChumH-2: Use practical and feasible means to increase stream flows (within the natural hydrologic regime and existing water rights) in Chumstick Creek (UCSRB, 2005).
- ChumH-3: Decrease water temperatures and improve water quality by restoring riparian vegetation along the stream (UCSRB, 2005).
- ChumH-4: Increase habitat diversity and quantity by restoring riparian habitat, reconnecting side channels and the floodplain with the channel,

increasing large woody debris within the channel, and by adding instream structures (UCSRB, 2005).

- ChumH-5: Protect remaining floodplain and riparian habitat (UCRTT, 2002).

Several of the water-quality actions for the Lower Wenatchee Watershed address inputs of nutrients, particularly phosphorus to the Wenatchee River. The Plan specifically mentions a need to reduce phosphorus inputs from wastewater treatment plants, including the City of Leavenworth's plant. To date, the cities and townsites within the Wenatchee Upper Valley area are working to determine all sources of phosphorus contamination, as there appears to be a large amount of "naturally occurring" phosphorus in the area. The Plan also includes 20 water-quality actions in the Chumstick sub-watershed.

Blackbird Island: The City should continue to remain involved stream bank stabilization and native vegetation establishment efforts. According to the City, the southwest tip of Blackbird Island has eroded 40 feet in 10 years. This site may be a good candidate for shoreline stabilization using bioengineering techniques. A combination of native revegetation and bioengineering techniques could be provided to secure the streambank from excessive erosion, such as was caused by the November 2006 high water event. Design of any stabilization would need to consider the high velocities in the mainstem Wenatchee River and safety issues related to high use of this section of river by non-motorized boaters and recreationists. The interpretive signs could also be updated to provide relevant information about the Wenatchee River, its biological value, and its potential.

4.9 City of Wenatchee

Within the City of Wenatchee and its UGA are two shoreline waterbodies: the Columbia River and the Wenatchee River. In the City and its UGA, shoreline jurisdiction contains 282 acres and 51,484 linear feet.

In an effort to document current conditions, the City of Wenatchee photographed the entire Columbia River Shoreline. These photos contain GPS locations along with date stamp. This information is attached to this document as Appendix A.

In the Wenatchee UGA north of the City, the Columbia River is closely bordered by industrial development, Highway 97, and railroads. Vegetation in this area is patchy, generally consisting of a narrow strip of shrubs. Shoreline vegetation becomes more consistent south of Highway 2, where it is composed of a mix of shrubs and deciduous trees. West of the confluence, the Wenatchee River is closely bordered by the railroad on the south side of the river, which limits vegetated area and channel processes.

Shoreline vegetation and habitat functions are variable among the many shoreline parks. Wetlands at Confluence State Park provide some of the best shoreline habitat in the City for birds, amphibians and small mammals. These shoreline habitats are also significant for fish as they occur at an ecologically significant position at the confluence of two major rivers. South of the confluence, along the Columbia River, Walla Walla Point Park has the potential to provide off-channel habitat for small fish during high river flows; however, the lack of vegetative complexity in the off-channel area minimizes the likely value of such functions. Other parks, such as Riverfront Park include moderately well vegetated shoreline areas. South In commercial and industrial areas toward the southern end of the City development, roads, and the railroad are located adjacent to the River, and shoreline vegetation is sparse.

Table 22 summarizes the characteristics of each shoreline waterbody within the City and its UGA.

Table 22. Summary Table of Basic Characteristics of Each Shoreline Waterbody in the City of Wenatchee and its Urban Growth Area.

Jurisdictional Streams/Lakes	Area of Upland Shoreline Jurisdiction (acres)	Major Existing Land Uses[1]	Ownership Profile[2]	Vegetation Profile[3]	Critical Area/Priority Habitat or Species (PHS)[4] Presence
Columbia River	177.78	Open Space	• Private 60% • Public (PUD, Municipal) 40%	Low-intensity development 28%; medium-intensity development 16%; evergreen forest 14%	• PHS bald eagle • PHS bighorn sheep • PHS mule deer • PHS riparian zone • FEMA floodplain • 19% wetland
Wenatchee River	104.27	Open Space	• Private 69% • Public (PUD) 31%	Woody wetlands 30%; developed open space 27%; medium-intensity development 12%	• Heritage Point osprey • PHS mule deer • PHS riparian zone • FEMA floodplain • CMZ • 70% wetland

[1] Major existing land use is reported by acres located in the shoreline jurisdiction rather than full parcels. "Government/Utility" includes governmental services, utilities, and other transportation and communication utilities.

[2] Acres of shoreline owned by public or private entities. Public includes municipal, County, PUD, State, and federal lands.
[3] Three dominant types listed. Consult maps for distribution and other types.
[4] PHS = Priority habitat or species as identified by WDFW

4.9.1 Land Use Patterns

Existing and Planned Land Uses

The City of Wenatchee and its UGA are located along the banks of the Columbia River at the confluence of the Wenatchee River. Wenatchee is the largest city in Chelan County and is the primary center for jobs. Table 23 presents information about existing and planned use by waterbody. Along the two shorelines in the Wenatchee community – the Columbia and Wenatchee Rivers – the current land uses are dominated by Government/Utility and open space, as follows:

- Agriculture – 4%
- Commercial – 6%
- Government/Utility – 24%
- Manufacturing/Industrial – 6%
- Other Residential – 3%
- Open Space – 37%
- Single Family Residential – 4%
- Transportation – 4%
- Undeveloped Land – 4%
- No Category – 7%

Table 23. City of Wenatchee Shorelines: Land Use, Comprehensive Plan Designation, and Shoreline Environment Designation

Jurisdictional Streams/Lakes (Existing/ Future Acres)	**Existing Land Use**	**Comprehensive Plan Designation**		**Current Shoreline Environment Designation**
Columbia River (149.67/ 187.95)	Open Space (30%), Government/Utility (26%), Manufacturing/ Industrial (9%), No Category (9%), Commercial (8%), Transportation (5%), Single Family Residential (4%), Other Residential (4%), Agriculture (4%), Undeveloped Land (1%)	• Industrial • • Waterfront Mixed Use • Residential High •	• 110.35 acres/59% • 63.82 acres/ 34% • 13.78 acres/ 7% •	• Urban • Natural • Rural
Wenatchee River (36.58/ 99.20)	Open Space (59%), Government/Utility (20%), Undeveloped	• Waterfront Mixed Use • Residential	• 69.61 acres/ 70% • 16.97 acres/	• Conservancy • Natural • Rural

Jurisdictional Streams/Lakes (Existing/ Future Acres)	Existing Land Use	Comprehensive Plan Designation		Current Shoreline Environment Designation
	(14%), Single Family (5%), Agriculture (3%), Commercial (1%), No Category (<1%)	Single Family • Industrial • Residential Moderate • North Wenatchee Business District	17% • 6.79 acres/ 7% • 5.30 acres/ 5% • • 0.52 acres/ 1%	

Through its Comprehensive Plan the City envisions that "increased riverfront development and recreation, combined with regional partnerships," will "inspire a unique identity for the City." The City has adopted a Waterfront Subarea Plan for the Columbia River shoreline creating a series of mixed-use activity nodes.

Development along the total of both shorelines would occur consistent with the following categories:

- Industrial – 41%
- North Wenatchee Business District – < 1%
- Residential High – 5%
- Residential Moderate – 2%
- Residential Single Family – 6%
- Waterfront Mixed Use – 46%

Current SMP shoreline environments include Conservancy, Rural, Urban, and Natural.

Sunnyslope Subarea Plan

Sunnyslope is part of unincorporated Chelan County, within the Urban Growth Boundary for the City of Wenatchee, on the north side of the Wenatchee River and its confluence with the Columbia River.

The area is forecast to have an additional 6,000 new residents by 2025. The Sunnyslope Long Range Plan and Supplemental Environmental Impact Statement (SEIS) includes goals and policies and a proposed land use scenario to guide growth in the Sunnyslope subarea, and was intended to support Chelan County and the City of Wenatchee's comprehensive planning efforts.

The plan includes modification to future land use designations that are designed to achieve:

- Builds on the existing land use mix

- Increase residential density in Central Sunnyslope including creation of a new town center at School Road and Easy Street, introducing a mixed-use commercial/residential concept intended to become the hub of a safe and walkable community.
- Retain Olds Station as a regional employment center

Planned Land Uses along the waterfront of the Columbia River include Industrial, High Density Residential, and Parks. Planned Land Uses along the Wenatchee River include Single Family Residential, Industrial, and Parks.

Water-Oriented Uses

Water-oriented uses include approximately 80 acres of parks and open space, and 6 acres of agriculture, with 50 combined acres on the Columbia River and 30 combined acres on the Wenatchee River. There are also parks and recreation uses. See Parks and Public Access below.

Developing or Redeveloping Waterfronts

The City has experienced little shoreline permit activity as much of the Columbia River shoreline is owned by the PUD (see Section 2.8). The waterfront is flanked by public properties such as PUD recreation facilities and the railroad. The Sunnyslope area along the Wenatchee and Columbia Rivers is generally developed with homes and industrial uses, and is unlikely to see a significant change in the land use pattern (pers. com, Brian Frampton, City of Wenatchee, April 2008).

Although the Wenatchee area has not seen a high level of permit activity in the recent past, future development could occur on vacant parcels and on parcels subject to the City's *Waterfront Subarea Plan* which promotes redevelopment.

Parcels with No Structures: There are several public and private parcels with no structures on them (these sites may be committed to particular activities such as recreation).[13] Seventy-seven of 125 parcels on the Columbia River do not have buildings, and represent 66% of the shoreline acres. Twenty of the 31 parcels on the Wenatchee River representing 94% of the shoreline acres do not contain buildings.

Waterfront Subarea Plan: The Columbia River in Wenatchee has had an urban character for some time and historically developed with industrial uses. The City's *Waterfront Subarea Plan* proposes instead a mix of residential, commercial, and recreation uses. The *Waterfront Subarea Plan* intends that the growth be focused in north, central and south nodes as illustrated by the following policy:

[13] Selected parcels have a BLDGAV of $0. All parcels with the following Assessor Use Codes have been excluded from this analysis: 'agriculture-not in open space'; 'agric in open space RCW 84.34'; 'desig. forest land RCW 84.33'; or 'mining activities'.

- Create a series of development nodes or focal points along the waterfront – each with a different type of setting, different mix of land uses, design emphasis, and park improvements. Specifically:
- Encourage a concentration of pedestrian-oriented retail uses near the boat basin.
- Encourage mixed-use development between the pedestrian bridge and Thurston Street.
- Foster the development of a pedestrian-oriented mixed-use focus area in the area between 5th and 9th streets.
- Encourage the development of a permanent Farmers Market facility in the Central Node.
- Encourage the development of private/public recreational uses in the North End, including indoor sports complex, water-park, and/or an aquatic center, that complement existing park uses and add vitality to the waterfront.
- Encourage the development of a variety of housing types in the North End.
- Allow for a variety of uses west of Walla Walla Avenue, including general commercial, recreational, offices, industrial, and residential.
- Promote agri-tourism uses and activities in the North End that build on the area's rich agricultural history.

The most intense development/redevelopment is planned/zoned for the area between Orondo Avenue and Walla Walla Avenue. Most of this activity will take place outside of shoreline jurisdiction as a large percentage of the Columbia River frontage in the *Waterfront Subarea Plan* is already developed with PUD parks and the railroad corridor.

The City of Wenatchee has prepared a Height Analysis to support the above proposed development/redevelopment. This analysis will propose allowing taller heights in limited areas of the City's shorelines consistent with the proposed planning. The Height Analysis is found as Appendix E.

4.9.2 Existing and Potential Public Access

Open space and park acres within the shoreline jurisdiction include about 120 acres total on the Wenatchee and Columbia Rivers. Several park areas offer water access via boat launches, piers, or trails.

Waterfront parks and trails in the City and UGA of Wenatchee include the following (acres below show total property within and outside of the 200-foot shoreline jurisdictional area):

- **Washington Confluence State Park** at the "confluence" of the Columbia and Wenatchee Rivers: The facility was built and is owned by the Chelan County PUD, but is operated and maintained by Washington State Parks and includes overnight RV and tent campsites, a boat launch, swimming beach, restrooms, showers, picnic shelter, volleyball, tennis courts, playground, pedestrian bridge across the river, 4.5 miles of trail, wildlife habitat, and interpretive graphics.
- **Riverfront Park:** This 31-acre park is effectively owned by the Chelan County PUD through a 99-year lease with the City, and contains restrooms, a boat launch, short-term moorage and boat trailer parking, 1.1 miles of shoreline trail, and a "special event" mini-railroad.
- **Walla Walla Point Park:** This 70-acre park adjoins the Riverfront Park, and contains restrooms, picnic shelters, ballfields, swimming area, 1.2 miles of trail, tennis and volley ball courts, horseshoe pits, a playground, and fishing pier platform. It also contains a nonmotorized boat launch. At 9th Street is found the Wenatchee Row and Paddle Club.
- **Apple Capital Loop Trail:** This trail fronts the Columbia River along Wenatchee in Chelan County and "loops" through East Wenatchee in Douglas County. The portion in Wenatchee is a multi-use trail approximately 5 miles long. It was established in 1990. According to the Chelan County PUD, "the trail has become a major transportation corridor that serves thousands of commuter and recreational trail users each year" (http://www.chelanpud.org/apple-capital-loop-trail.html).

Planned parks and recreation improvements through 2012 in or near the shoreline include a waterfront trail upland access and boathouse (City of Wenatchee 2006). Waterfront moorage and parking in Riverfront Park have already been added as a part of the planned parks and recreation improvements.

While the City is well served with shoreline public access, due to historic development patterns (e.g. produce packing, industrial, railroads) in the Sunnyslope area, there is less public access in that location. The County is serving as the lead planning agency in that location.

4.9.3 Critical Areas

Shorelines in the City of Wenatchee and its UGA contain 253 acres of priority habitats, consisting of bald eagle, bighorn sheep, mule deer, and priority riparian zones concentrations (see Table 22 above). All of the City's shorelines contain priority fish species. According to the NWI and hydric soils information, as much as 38% of the total shoreline area may be wetlands. However, this figure is high because of the inclusion of some of the mainstem Columbia River as a wetland.

4.9.4 Potential Restoration Opportunities

Wenatchee Watershed Management Plan: The same four habitat projects listed above in Section 4.5.4 for the City of Cashmere are relevant to the City of Wenatchee's Wenatchee River shoreline.

Wenatchee Parks (Riverfront and Confluence State Parks): Reduction of shoreline armoring, removal of non-native vegetation, native re-vegetation, shoreline stabilization, and the addition of interpretive nature and/or historical signs. Enhance and maintain the habitat along the south Confluence State Park wetland area.

General: Reduce shoreline armoring, improve shoreline stabilization, and remove non-native plantings. These projects should take into account ongoing PUD operations and maintenance within the shoreline. A combination of native re-vegetation and bioengineering techniques could be provided to secure the shoreline from excessive erosion.

5. ANALYSIS OF ECOLOGICAL FUNCTIONS AND ECOSYSTEM-WIDE PROCESSES

A simple semi-quantitative method was developed to characterize the relative performance of each relevant watershed ecological process and function by shoreline reach (delineated based on function and land use), as outlined in WAC 173-26-201(3)(d)(i). The developed assessment tool utilizes the available information gathered as part of the Shoreline Inventory and applies a standardized ranking criterion for each independent shoreline reach to provide a consistent methodological treatment among reaches for comparison purposes. These numerical results will ensure consistent and well-documented treatment of all reaches when assigning existing ecological function and hopefully reduce observer bias associated with the arbitrary assignment of ecological value. The numerical results are intended to complement the inventory information in Chapters 3 and 4, the brief narrative discussions were developed using available data and watershed plans, and should not be viewed as a quantitative measure of existing ecological function.

5.1 Assessment Methodology, Rationale and Limitations

5.1.1 Methodology and Rationale

Chelan County and/or its partners have produced a number of watershed and/or sub-basin plans that were used extensively to place the waterbody in its WRIA context, particularly with regards to basic geography, geology, climate, and major land uses (see Section 1.4). Discussion of the land use changes by WRIA focuses on those that have had particularly significant impacts on shoreline

functions/processes, such as dams, transportation corridors, highly developed urban areas, forestry, and agriculture.

The 134 stream, river and lake shorelines contained within the county were broken into appropriate reaches. The first reach breaks isolated the Cities and their UGAs from the rest of the County. Additional breaks were made within the Cities/UGAs as needed to delineate differences in sections of shoreline based on ecological conditions (e.g., vegetation, wetlands, channel migration zones), current/planned land use, and presence in City limits or the UGA. The shorelines in the remainder of the County were broken into reaches using either reach break precedence from previous scientifically based assessments[14] or were located based on major changes in ecological conditions, current land use, and ownership.

Current/planned land use breaks and ownership breaks (except federal vs. non-federal) are secondary to ecological condition. Current land use, in particular, is part of the function assessment method because many land uses may have direct, discrete impacts on ecological function and processes. Planned land use and ownership breaks are intended to facilitate use of this data to assign environment designations. Several environment designations have designation criteria that specifically relate to current and planned land use. Current and planned land uses are particularly significant to consider when developing environment designations within cities and urban growth areas. In these areas, existing and planned development will be weighed heavily, in conjunction with ecological functions, in order to develop appropriate environment designations and allowed uses.

Four major function categories are identified in the Department of Ecology's guidelines: hydrologic, shoreline vegetation, habitat, and hyporheic.[15] The available information gathered County-wide in the Shoreline Inventory was used as a proxy for determining the performance and relative rank score of these functions. Assessment of each function using this categorical assessment ranking tool is based upon quantitative data results derived from the GIS inventory information described in Chapters 3 and 4.

Each of the four major functions were divided into related processes and numerically scored based on the available data for each reach. The mean of each major function was calculated to provide a simple standardized tool useful for inter-reach functional comparison. While the functional score is derived from a standardized numerical process that formalizes and enables a basis for

[14] While several studies did assess various reaches of a number of waterbodies, the reach breaks were generally not sufficient for purposes of this shoreline assessment. See additional discussion in Section 5.3.

[15] Department of Ecology Hydrogeologist Patricia Olson has confirmed that "hyporheic function" is a non sequitur for lakes, which do not have true hyporheic zones as by definition a hyporheic zone can only be found along flowing waters. The remaining three functions identified for lakes are valid.

comparison of ecological functions among reaches, it is important to emphasize that the initial rankings were often derived from categorical information.[16] Thus, differences in numerical rankings among reaches should be viewed as a relative scale difference in ecological function and not as a quantified difference among areas. A list detailing each functional breakdown and tables identifying how each data layer contributed to each process score for lakes and rivers/streams can be found in Appendix B. Because the Columbia River in Chelan County is composed of a series of highly regulated reservoirs it is evaluated using the functional characteristics of a reservoir/lake rather than as a river.

Functional categories varied slightly to account for the inherent differences between streams/rivers and reservoir/lake functions. For each of the final selected parameters used in the function assessment, the quantitative data was sorted into four categories, with H being the most desired end of the range and L the least desired (e.g., impervious 0-5% = H, >5-15% = MH, >15-45% = M, and >45% = L). The sorting scheme for each variable used in the assessment tool is described in Appendix B. The exact sorting of quantitative data into categories was based on the actual range of numbers for the parameter for each WRIA and for each City. The Cities are separately categorized as it was expected that their high level of development and alteration compared to the rest of the County would obscure differences in level of function among reaches within each City.

For multi-parameter data, such as vegetation type, the categorization varies depending on the particular function for which that vegetation parameter is being considered. For example, for large woody debris recruitment, the various forested types may be grouped and classified as H or value '4' if percent forested is greater than 75%, MH or '3' if between 50-75%, etc. Any other vegetation type would have no value for LWD recruitment. However, for sediment removal functions, forested types may be classified as an L or '1' and emergent/herbaceous wetland may be the high-rating vegetation type.

Scoring was completed on a scale from 1 to 4, with 1 representing "low" function and 4 representing "high" function. Values were assigned to each function, and then averaged for each of the four major processes. Finally, the process average scores were averaged, so as not to weight one process more than another, to reach a final function score that is identified in Table 23 (equation 1). The scores were mapped into four "buckets" based on the actual spread of the scores in each jurisdiction. Data were roughly divided into quartiles with divisions between "buckets" occurring at natural breaks in the data. Intuitively, the Low (L)-scoring reaches are mapped in red, the High (H)-scoring reaches are mapped in green, and the Moderate (M)- and Medium High (MH)-scoring reaches are

[16] The data generated by this ranking tool is used it in its simplest form –categorical – so that it is all comparable. These categorical data do not need to be distributed normally as statistical analyses are not being developed. The results stand alone.

intermediate colors of orange and yellow, respectively. The raw data and scoring scheme are provided in Appendix B.

Equation 1:

Functional score = Mean (mean Hydrologic score, mean Vegetation score, mean Habitat score, mean Hyporheic score)

Each reach has an average score for each of the function/process parameters and can be compared to other reaches within the same waterbody and to reaches in other waterbodies within the same WRIA or City. The scores will not be independently meaningful, but will provide a way to evaluate relative differences between reaches. Separately rating each City and its UGA will help identify relative differences in ecological functions among developed areas. Functional scores may have greater weight in distinguishing between appropriate environment designations in unincorporated areas compared to cities and UGAs, where existing and planned land use will be particularly significant factors influencing environment designations.

5.1.2 Limitations

This simple ranking approach cannot take into account that some areas naturally may function "lower" than others, not because of any anthropogenic alteration or natural disaster, but simply because of the combined effects of a particular locale's geology, aspect, or topography. This ranking approach, for instance, considers forest to be the ideal condition, but some areas are naturally not suited for forest. Many functions operate "better" when there is a floodplain to capture sediments or store water, but there are a number of drainages in steep areas that do not have floodplains. However, when the results for a particular stream are averaged, the general finding matches the intuitive hypothesis that the lower elevation areas which are typically more altered score lower than the higher elevation areas which are typically less altered and often protected through Northwest Forest Plan or Wenatchee National Forest Land and Resource Management Plan land use allocations.

5.2 Ranking Tool Results

5.2.1 Stemilt/Squilchuck - Colockum (WRIA 40a/b)

Results

The Stemilt/Squilchuck – Colockum shoreline was broken into 23 unique segments containing separate characteristics and functions that were used to produce ecological function scores (Table 24). Functional scores within WRIA 40a/b ranged from 1.9 in the Cortez Lake 1 reach to 3.3 in the Columbia River 02 reach. Despite the relatively low score of the Cortez Lake 1 segment compared with the other segments in this WRIA, the ecological function of Cortez Lake 1 is considered at a moderate level. The lower score of Cortez Lake 1 resulted

primarily from the relatively high amount of impervious surfaces, presence of geologic hazards, and the impaired waterbody status of the lake. Conversely, the Columbia River 02 reach with its high amount of shrub/scrub wildlife habitat, low amount of developed land, and lack of impervious surfaces rated as an area containing relatively high ecological function.

Table 24. Function Scores by Reach in WRIA 40a/b (outside of Cities and their UGAs).

Reach Name	Function Score / Category[2]
Columbia River 01	2.8 / MH
Columbia River 02	3.3 / H
Columbia River 03	3.0 / H
Columbia River 04	2.6 / MH
Columbia River 05	2.5 / MH
Columbia River 06	2.6 / MH
Columbia River 07	2.2 / M
Columbia River 08	2.7 / MH
Columbia River 09	2.6 / MH
Columbia River 10	2.0 / M
Columbia River 11	2.2 / M

[1] Average for waterbody weighted by area of segment.
[2] H = High (functional scores >3), MH = Medium High (functional scores 2.5<x<3), M = Moderate (functional scores 2<x<2.5), L = Low (functional scores <2)

Implications for Protection or Restoration

The assessment results suggest that the ecological function of Cortez Lake would benefit from restoration efforts primarily aimed at improving water quality in the lake. Similarly, the Columbia River reaches contained in WRIA 40 had relatively high levels of ecological function, suggesting these areas would be ideal for protection. Assessment results suggested that Columbia River reaches would benefit most from efforts to protect and restore native vegetation, and from improvements in land use practices that facilitated water infiltration, storage, and filtration.

5.2.2 Wenatchee (WRIA 45)

Results

Because of the large number of segments in this watershed (457) and in order to correspond with the *Wenatchee Watershed Management Plan* sub-watershed analysis, Table 25 is organized by the 12 sub-watersheds rather than by segment. Segment-specific scores can be found in Appendix B. Ecological function scores for WRIA 45 ranged from 1.7 in Peshastin Creek 23 R reach to 3.5 in the White River 07 R reach. The Peshastin Creek sub-watershed reaches consistently scored moderate to below moderate functional marks across all categories of the functional assessment. Conversely, all of the 34 segments on the White River consistently scored high for ecological function with 74 percent of reaches averaging above 3.0. Similarly, reaches located in the broader White sub-

watershed scored moderately high to high scores across the majority of the functional categories assessed.

Table 25. Function Scores by Waterbody and Sub-Watershed in WRIA 45 (outside of Cities and their UGAs).

Waterbody	Function Score[1] **/ Category**[2]	Sub-Watershed Category[3]
Columbia River	2.3 / M	Not included
Wenatchee River (Wenatchee River 1L/1R-19L/19R)	2.5 / MH	Category 2
		Category 3
Wenatchee River (Wenatchee River 20L/20R-21L/23R)	2.7 / MH	
Icicle Sub-Watershed	2.6 / MH	Category 2
Eightmile Creek	2.5 / MH	
French Creek	2.3 / M	
Icicle Creek	2.7 / MH	
Jack Creek	2.4 / M	
Leland Creek	2.6 / MH	
Meadow Creek	2.4 / M	
Mountaineer Creek	2.5 / MH	
Prospect Creek	2.3 / M	
Snowall Creek	2.2 / M	
Trapper Creek	2.8 / MH	
Trout Creek	2.6 / MH	
Colchuck Lake	2.0 / M	
Eightmile Lake	2.3 / M	
Josephine Lake	2.3 / M	
Klonaqua Lakes Lower	2.9 / MH	
Klonaqua Lakes Upper	2.8 / MH	
Lake Leland	2.9 / MH	
Lake Victoria	2.7 / MH	
Nada Lake	2.7 / MH	
Perfection Lake	2.7 / MH	
Shield Lake	2.9 / MH	
Snow Lake Lower	2.3 / M	
Snow Lake Upper	3.0 / H	
Square Lake	2.7 / MH	
Stuart Lake	2.4 / M	
Upper Wenatchee Sub-Watershed	2.7 / MH	Category 1
Wenatchee River (Wenatchee River 22L/24R - 37L/40R)	2.7 / MH	
Lake Augusta	2.4 / M	
Chiwaukum Sub-Watershed	2.6 / MH	Category 1
Chiwaukum Creek	2.5 / MH	
South Fork Chiwaukum Creek	2.6 / MH	
Chiwaukum Lake	2.8 / MH	
Larch Lake	2.6 / MH	
Chiwawa Sub-Watershed	2.9 / MH	Category 1
Chiwawa River	3.0 / H	
Big Meadow Creek	2.6 / MH	
Pole Creek	2.8 / MH	

Waterbody	Function Score[1] **/ Category[2]**	Sub-Watershed Category[3]
Chikamin Creek	2.7 / MH	
Rock Creek	2.4 / M	
Phelps Creek	2.6 / MH	
Buck Creek	2.5 / MH	
Schaefer Lake	2.4 / M	
Nason Sub-Watershed	2.8 / MH	
Nason Creek	2.9 / MH	
Roaring Creek	3.3 / H	
Whitepine Creek	2.6 / MH	
Wildhorse Creek	3.0 / H	Category 2
Mill Creek	2.4 / M	
Lake Valhalla	2.8 / MH	
Lichtenwasser Lake	2.9 / MH	
Loch Eileen Lake	2.8 / MH	
White Sub-Watershed	3.0 / H	
White River	3.1 / H	
Napeequa River	2.9 / MH	
Panther Creek	2.5 / MH	
Ibex Creek	2.5 / MH	
Cougar Creek	2.4 / M	
Indian Creek	2.6 / MH	Category 1
Boulder Creek 2	2.4 / M	
Thunder Creek	2.5 / MH	
Lightning Creek	2.4 / M	
Twin Lakes (1)	2.5 / MH	
Twin Lakes (2)	3.3 / H	
Little Wenatchee Sub-Watershed	**2.7** / MH	
Little Wenatchee River	2.9 / MH	
Rainy Creek	2.3 / M	
Lake Creek 2	2.2 / M	
Fish Creek 2	2.3 / M	
Cady Creek	2.3 / M	Category 1
Lost Lake	2.6 / MH	
Heather Lake	2.6 / MH	
Glasses Lake	2.7 / MH	
Theseus Lake	2.6 / MH	
Lake Wenatchee Sub-Watershed	2.7 / MH	
Lake Wenatchee	2.4 / M	Category 1
Fish Lake	3.0 / H	

[1] Average for waterbody weighted by area of segment.
[2] H = High (functional scores >3), MH = Medium High (functional scores 2.5<x<3), M = Moderate (functional scores 2<x<2.5), L = Low (functional scores <2)
[3]Source: *Wenatchee Watershed Management Plan,* Wenatchee Watershed Planning Unit 2006.
Category 1 – "closely resembles natural, fully functional aquatic ecosystems"
Category 2 – "higher level of fragmentation resulting from habitat disturbance or loss"
Category 3 – "substantial degradation and are strongly fragmented by habitat loss"

Implications for Protection or Restoration

Assessment results suggest that a variety of restoration and protection efforts would benefit the broad ecological function of WRIA 45. Lower-scoring

shoreline segments similar to the Peshastin Creek sub-watershed would benefit from a broad range of restoration efforts often associated with shoreline vegetation and improvements to wildlife habitat. Similarly, shoreline segments containing relatively high ecological function scores offer some of the more appropriate areas for protection efforts. The *Wenatchee Watershed Management Plan* and Detailed Implementation Plan classifications suggest that the Category 1 sub-watersheds should be protected, Category 2 sub-watersheds should be restored (e.g., improving ecosystem function and connectivity), and Category 3 sub-watersheds should receive restoration actions designed to "rectify the primary factors that cause habitat degradation."

5.2.3 City of Cashmere

Results

Shorelines in the City of Cashmere were broken into 29 separate segments, with 10 unique segments located in Mission Creek and 19 in the Wenatchee River. Assessment results for Mission Creek segments produced low to moderate scores for ecological function, with a low score of 2.0, and high of 2.5 (Table 26). Whereas, the Wenatchee River results produced moderate to moderate-high scores, with a low of 1.8 and a high of 2.9. The majority of functional scores in Cashmere were negatively impacted by poor wildlife habitat scores and areas of impaired water quality. Areas containing high amounts of impervious surfaces were also a significant detriment to function scores in many shoreline segments.

Table 26. Function Scores by Reach for the City of Cashmere and its Urban Growth Area.

Reach Name	Hydrologic Function	Shoreline Vegetation	Hyporheic Function	Habitat	Average Score[1] / Category[2]
Mission Creek					
CCA Mission Creek 1L	2.8	2.5	2.3	2.4	2.5 / H
CCA Mission Creek 1R	2.6	2.3	2.3	2.0	2.3 / MH
CCA Mission Creek 2L	2.8	2.5	2.2	2.1	2.4 / MH
CCA Mission Creek 2R	2.7	2.3	2.3	1.9	2.3 / MH
CCA Mission Creek 3L	2.6	2.2	2.1	1.6	2.1 / M
CCA Mission Creek 3R	2.5	2.1	2.0	1.5	2.0 / M
CCA Mission Creek 4L	2.5	2.1	2.0	1.6	2.1 / M
CCA Mission Creek 4R	2.6	2.2	2.2	1.8	2.2 / MH
CCA Mission Creek 5R	2.7	2.3	2.3	1.8	2.3 / MH
CCA Mission Creek 6R	2.5	2.1	2.0	1.5	2.0 / M
CCA Mission Creek 7	2.7	2.2	2.1	1.5	2.1 / M
Wenatchee River					
CCA Wenatchee River 1L	2.6	2.3	2.3	2.1	2.3 / MH
CCA Wenatchee River 1R	3.2	2.9	2.8	2.8	2.9 / H
CCA Wenatchee River 2L	2.5	2.2	2.1	2.0	2.2 / M
CCA Wenatchee River 2R	2.4	2.0	1.9	1.6	2.0 / L

Reach Name	Hydrologic Function	Shoreline Vegetation	Hyporheic Function	Habitat	Average Score[1] / Category[2]
CCA Wenatchee River 3L	2.3	2.2	2.2	1.9	2.1 / M
CCA Wenatchee River 3R	2.2	2.1	2.1	1.6	2.0 / L
CCA Wenatchee River 4L	2.2	2.0	2.1	1.8	2.0 / M
CCA Wenatchee River 4R	2.7	2.3	2.2	1.7	2.2 / MH
CCA Wenatchee River 5R	2.4	2.3	2.4	1.9	2.3 / MH
CCA Wenatchee River 6R	2.6	2.6	2.7	2.1	2.5 / H
CCA Wenatchee River 7R	2.1	2.0	2.0	1.4	1.9 / L
CCA Wenatchee River 8R	2.6	2.1	2.2	1.8	2.2 / MH
CCA Wenatchee River 9R	2.6	2.2	2.2	1.8	2.2 / MH
CCA Wenatchee River 10R	2.5	2.1	2.0	1.5	2.1 / M
CCA Wenatchee River 11R	2.4	2.3	2.3	2.1	2.3 / MH
CCA Wenatchee River 12R	2.1	1.9	1.9	1.4	1.8 / L
CCA Wenatchee River 13R	2.7	2.5	2.4	2.6	2.5 / H

[1] Average scoring rounded for display purposes. Category ranking based on actual average number (example average score of 1.97= Low category ranking, displayed as 2.0).
[2] H = High (functional scores >2.4), MH = Medium High (functional scores 2.2<x<2.4), M = Moderate (functional scores 2<x<2.2), L = Low (functional scores <2)

Implications for Protection or Restoration

Assessment results suggest that restoration and protection of wildlife habitat and efforts to limit and reduce impervious surfaces would provide the most benefit to the ecological function of shorelines in the City of Cashmere. Mission Creek reaches were estimated to be the most heavily impacted and in need of restoration efforts, while the Wenatchee River segments offer areas that could benefit from protective measures.

5.2.4 City of Leavenworth

Results

The City of Leavenworth shorelines were broken into 18 unique segments contained in the Chumstick Creek and Wenatchee River drainages. The two segments making up the Chumstick Creek shorelines scored moderate to moderate-high levels of ecological function. Chumstick Creek scores differed slightly primarily due to the differing levels of road density and other impervious surfaces between the segments (Table 27). Conversely, assessment results for the Wenatchee River segments were highly variable with the highest and lowest ecological function scores produced in adjacent segments. The Wenatchee River 1L segment provided the poorest ecological function score of 2.2 due to high impervious surfaces and impaired water quality conditions, while the Wenatchee River 1R segment produced the highest score of 3.2 due to its relatively undeveloped landscape.

Table 27. Function Scores by Reach for the City of Leavenworth and its Urban Growth Area.

Reach Name	Hydrologic Function	Shoreline Vegetation	Hyporheic Function	Habitat	Average Score[1] / Category[2]
Chumstick Creek					
CLV Chumstick Creek 1	2.8	2.4	2.4	2.6	2.6 / MH
CLV Chumstick Creek 2	2.8	2.2	2.3	2.1	2.4 / M
Wenatchee River					
CLV Wenatchee River 1L	2.5	2.0	2.0	1.8	2.1 / L
CLV Wenatchee River 1R	3.1	2.8	2.9	3.1	3.0 /MH
CLV Wenatchee River 2L	2.1	1.8	2.0	1.7	1.9 / L
CLV Wenatchee River 2R	2.6	2.1	2.3	2.1	2.3 / M
CLV Wenatchee River 3L	2.7	2.1	2.2	1.9	2.2 / M
CLV Wenatchee River 3R	2.0	1.6	1.9	1.6	1.7 / L
CLV Wenatchee River 4L	2.7	2.3	2.2	2.2	2.4 / M
CLV Wenatchee River 4R	2.6	2.2	2.3	2.0	2.3 / M
CLV Wenatchee River 5L	2.9	2.9	3.0	3.3	3.0 / H
CLV Wenatchee River 5R	3.3	3.1	3.2	3.5	3.3 / H
CLV Wenatchee River 6L	2.9	2.6	2.7	2.5	2.7 / MH
CLV Wenatchee River 7L	2.7	2.3	2.5	2.0	2.4 / M
CLV Wenatchee River 8L	3.0	3.2	3.4	3.7	3.3 / H
CLV Wenatchee River 9L	3.0	2.7	2.6	2.8	2.8 / MH
CLV Wenatchee River 10L	2.7	2.3	2.4	2.2	2.4 / MH
CLV Wenatchee River 11L	2.7	2.3	2.4	2.6	2.5 / MH
CLV Wenatchee River BI	3.0	2.8	2.7	3.1	2.9 / MH

[1] Average scoring rounded for display purposes. Category ranking based on actual average number (example average score of 1.97= Low category ranking, displayed as 2.0).
[2] H = High (functional scores >2.7), MH = Medium High (functional scores 2.3<x<2.7), M = Moderate (functional scores 2<x<2.3), L = Low (functional scores <2)

Implications for Protection or Restoration

Similar to other City jurisdictions in Chelan County, assessment results for Leavenworth indicate that ecological function is primarily being impacted by the high amounts of impervious surfaces found in the shoreline boundary. Restoration of ecological function through the reduction of impervious surfaces would be costly and time consuming. Efforts to protect the Wenatchee River and Chumstick Creek from further degradation of ecological function would benefit from Low Impact Development standards and efforts to reduce the overall amount of impervious surfaces placed within the watershed.

5.2.5 City of Wenatchee

Results

Shorelines in the City of Wenatchee were separated into 20 distinct segments: 7 segments in the Wenatchee River drainage and 14 segments contained in the Columbia River (Table 28). Columbia River shorelines average slightly lower

than Wenatchee River segments with functional scores of 2.6 and 2.8 respectively. Similarly, the lowest scoring shoreline segment is found in the Columbia River, whereas the highest is located in the Wenatchee River system. Low-ranking shorelines in the Columbia River consistently ranked low across all aspects of the functional analysis, while lower-ranking segments in the Wenatchee often had lower vegetation scores.

Table 28. Function Scores by Reach for the City of Wenatchee and its Urban Growth Area.

Reach Name	Hydrologic Function	Shoreline Vegetation	Hyporheic Function	Habitat	Average Score[1] / Category[2]
Wenatchee River					
CWN Wenatchee River 1L	2.9	2.9	3.0	3.2	3.0 / H
CWN Wenatchee River 1R	2.6	2.5	2.6	2.9	2.7 / MH
CWN Wenatchee River 2L	2.1	1.9	2.0	1.9	2.0 / L
CWN Wenatchee River 2R	1.9	1.8	1.9	2.0	1.9 / L
CWN Wenatchee River 3L	3.0	3.0	3.2	3.5	3.2 / H
CWN Wenatchee River 4L	3.1	3.2	3.3	3.7	3.3 / H
CWN Wenatchee River 5L	2.9	2.8	2.6	2.8	2.8 / MH
Columbia River					
CWN Columbia River 1	2.6	2.4	NA	2.5	2.5 / MH
CWN Columbia River 2	2.6	2.2	NA	2.2	2.3 / M
CWN Columbia River 3	2.7	2.4	NA	2.5	2.6 / MH
CWN Columbia River 4	2.2	2.3	NA	2.4	2.3 / M
CWN Columbia River 5	1.9	2.0	NA	1.9	2.0 / L
CWN Columbia River 6	2.0	1.8	NA	1.7	1.8 / L
CWN Columbia River 7	2.3	2.2	NA	2.3	2.3 / M
CWN Columbia River 8	3.1	3.0	NA	3.3	3.1 / H
CWN Columbia River 9	2.7	2.4	NA	2.5	2.6 / MH
CWN Columbia River 10	2.7	2.3	NA	2.2	2.4 / M
CWN Columbia River 11	2.8	2.6	NA	2.6	2.7 / MH
CWN Columbia River 12	2.3	1.9	NA	1.6	1.9 / L
CWN Columbia River 13	2.5	2.0	NA	1.8	2.1 / M
CWN Columbia River 14	2.3	1.8	NA	1.8	2.0 / L

[1] Average scoring rounded for display purposes. Category ranking based on actual average number (example average score of 1.97= Low category ranking, displayed as 2.0).
[2] H = High (functional scores >2.7), MH = Medium High (functional scores 2.3<x<2.7), M = Moderate (functional scores 2<x<2.3), L = Low (functional scores <2)

Implications for Protection or Restoration

Assessment results suggest that shoreline segments associated with lower ecological function scores often contained limited amounts of shoreline vegetation. Restoration of shoreline vegetative areas offers a relatively cost-efficient and tractable opportunity for the restoration of ecological function in the shorelines of the City of Wenatchee. Similarly, protection of the existing

vegetated areas should be a high priority in both the Wenatchee and Columbia River jurisdictions of the City of Wenatchee.

5.3 Function Assessments from Other Studies

The following discussions present some narrative descriptions of function for major waterbodies within the WRIAs for which information is readily available. There is certainly more information available about a number of these waterbodies and others not discussed, but that information is not considered necessary to craft the updated SMP.

5.3.1 Stemilt/Squilchuck - Colockum (WRIA 40a/b)

Colockum Creek

According to USGS, the lower approximately 3.7 miles of Colockum Creek has a mean annual flow of 20 cubic feet per second and is therefore in shoreline jurisdiction. According to WDFW (2006), "Stream flow is primarily from snowmelt and fluctuates from year to year" and "Water use and permeable soils reduce the amount of surface flow reaching the mouth of Colockum Creek during the summer low flow period."

In spite of flow issues, portions of the mainstem Colockum Creek and its tributaries are utilized by ESA-listed Chinook and summer steelhead. The first complete passage barrier on the mainstem Colockum Creek is located approximately 2 miles upstream of the mouth, and consists of a poured concrete dam (see Section 4.1.4 for additional barrier information). Resident rainbow/cutthroat trout and planted brook trout are also present in Colockum Creek (WDFW 2006). The lower 4.3 miles of Colockum Creek have been rated "good to excellent" for Chinook rearing and spawning potential. Riparian vegetation condition is generally good, except through a 150-foot-long canyon and in a few riparian areas impacted by clearing and livestock use. Substrates are almost uniformly gravels and cobbles, large woody debris and undercut banks are abundant, and beaver dams and debris jams create abundant pools and ponds (WDFW 2006).

Cortez Lake

According to Ecology (1997), Cortez Lake is "an irrigation reservoir fed by diversions from Stemilt Creek and drainage from Meadow Lake." Based on measurements taken in 1994, the lake is eutrophic (high productivity) based on phosphorus and chlorophyll a findings. These measurements generally indicate that water quality overall may be poor, as excessive productivity can result in depressed dissolved oxygen and mortality of some organisms. A survey of aquatic vegetation in 1994 noted a number of native species, as well as milfoil, possibly the invasive, non-native Eurasian variety.

5.3.2 Wenatchee (WRIA 45)

The following are brief summaries of ecological functions as derived primarily from the *Final Wenatchee Watershed Management Plan* (WRIA 45 Planning Unit 2006), unless referenced otherwise. Other sources included the *Nason Creek Tributary Assessment* (USBR 2008) and various Ecology water quality studies. These reports can be consulted for more detailed information.

The *Final Wenatchee Watershed Management Plan* (WRIA 45 Planning Unit 2006) has classified each of the sub-watersheds into three categories based on current condition and expected effectiveness of restoration efforts. The categories are defined as follows:

> "Category 1 – These sub-watersheds represent systems that most closely resemble natural, fully functional aquatic ecosystems. In general, they support large, often continuous blocks of high-quality habitat and smaller drainages supporting multiple populations. Connectivity among smaller drainages and through the main sub-watershed stream corridor is good, and more than two species of federally listed fish are known to occur. Exotic species may be present but are not dominant. ***Protecting functioning ecosystems in these sub-watersheds is a priority.***
>
> Category 2 – These sub-watersheds support important aquatic resources, often with smaller drainages classified as strongholds for one or more populations. The most important difference between Category 1 and Category 2 is an increased level of fragmentation that has resulted from habitat disturbance or loss. These sub-watersheds have a substantial number of smaller drainages where native populations have been lost or are at risk for a variety of reasons. At least one federally listed fish species can be found within each of these sub-watersheds. Connectivity among smaller drainages may still exist or could be restored within the watershed so that it is possible to maintain or rehabilitate life history patterns and dispersal. ***Restoring ecosystem functions and connectivity within these sub-watersheds are priorities.***
>
> Category 3 – These sub-watersheds may still contain smaller drainages that support salmonids. In general, however, these smaller drainages have experienced substantial degradation and are strongly fragmented by extensive habitat loss, most notably through loss of connectivity with the mainstem corridor. At this time, the opportunities for restoring full expression of life histories for multiple populations found within the sub-watershed are limited. ***The priority for funding in these subwatersheds should be to rectify the primary factor that is causing the habitat degradation.***"

Lower Wenatchee Sub-Watershed

The Lower Wenatchee Sub-Watershed is classified as Category 2, and extends from the confluence with the Columbia River upstream to Tumwater Canyon. As a result of land use alterations related to agriculture, residential development, and transportation corridors, the lower Wenatchee River shoreline has experienced the following impacts to ecological functions and processes:

- Hydrology: Major roadways (including U.S. 2), bridge crossings, and railroad lines paralleling the river have reduced channel migration, floodplain connectivity, recruitment of large woody debris and substrate materials, and riparian vegetation (both width and composition). Water withdrawals and alteration of base flow support have reduced late summer stream flows, and development with associated stormwater runoff has increased spring peak flows. Reduced summer stream flows and loss of riparian vegetation contribute to high water temperatures. The *Wenatchee Subbasin Plan* also reports possible increased sedimentation related to increased peak flows and loss of soil-stabilizing vegetation. Sedimentation would have direct impacts on suitability of substrates for salmon spawning.
- Vegetation: Loss and alteration of riparian vegetation has reduced future large woody debris for instream use; downed wood and snags for terrestrial wildlife; and cover, nesting, foraging, and perching sites for terrestrial wildlife. The ability of riparian vegetation to moderate the microclimate and instream temperatures is limited. Vegetation is also not able to provide full water quality improvement and overland flow moderation. Inadvertent introductions of noxious weeds are also threatening native plant communities. According to the *Wenatchee Subbasin Plan*, "Riparian and floodplain conditions have been substantially altered (70% measured)…"
- Habitat: The hydrologic and vegetation impacts described above have reduced the quality and quantity of instream and riparian habitat. Background high levels of phosphorus are aggravated by possible nutrient inputs from wastewater treatment plant discharges and septic failures.

Upper Wenatchee Sub-Watershed including Chiwaukum Creek

The Upper Wenatchee Sub-Watershed is classified as Category 1, extends from Tumwater Canyon upstream to the mouth of Lake Wenatchee, including Chiwaukum Creek. This sub-watershed is dominated by "commercial forest" zoning, which would be more accurately characterized as "forest management," including activities ranging from commercial harvest to wilderness protection. As a result, the Upper Wenatchee Sub-Watershed is functioning at a much higher level than the Lower Wenatchee Sub-Watershed. However, railways and private

developments are present to a lesser degree and have similar impacts as those described above, but at a much smaller scale. U.S. 2and SR 207 are still highly impacting constructed elements that interfere with channel migration, large woody debris and gravel recruitment, and the width and composition of riparian vegetation, and has isolated an oxbow near the mouth of Nason Creek.

The Upper Wenatchee Sub-Watershed has also been affected by past harvest practices, which have reduced the availability of wood suitable for recruitment. Fires in the sub-watershed have also reduced soil stability, resulting in sedimentation impacts to the Wenatchee River, particularly near Tumwater Canyon.

Mission Sub-Watershed

The Mission Sub-Watershed is classified as Category 3. The Mission Creek shoreline has experienced the following impacts to ecological functions and processes:

- Hydrology: Reduced channel migration, and loss of sinuosity and floodplain connectivity have resulted from roadways, urban development in Cashmere, and agriculture. Reduced summer stream flows and loss of riparian vegetation contribute to high water temperatures.
- Vegetation: Loss and alteration of riparian vegetation has reduced future large woody debris for instream use; downed wood and snags for terrestrial wildlife; and cover, nesting, foraging, and perching sites for terrestrial wildlife. The ability of riparian vegetation to stabilize banks and moderate the microclimate and instream temperatures is limited. Vegetation is also not able to provide full water quality improvement and overland flow moderation.
- Habitat: The Mission Sub-Watershed contains several culvert fish passage barriers, likely not on the mainstem of Mission Creek however. Water quality (septic systems and livestock effects) and riparian habitat degradation and reduced summer stream flows have substantially reduced upland and aquatic habitat conditions. The *Wenatchee Basin Plan* also notes that "Mission Creek does not meet State water quality standards for DDT; 4, 4-DDT; 4, 4-DDE and Gunthion, as well as dissolved oxygen, [and] fecal coliform. Currently, only Mission Creek in the Wenatchee River subbasin is listed as impaired due to pesticides in fish tissues."

Peshastin Sub-Watershed

The Peshastin Sub-Watershed is classified as Category 2. The Peshastin Sub-Watershed has experienced the following impacts to ecological functions and processes:

- Hydrology: US 97 has had substantial effects on Peshastin Creek through direct channel re-routing, reduced channel migration (affects recruitment of large woody debris and substrate material), and loss of sinuosity and floodplain connectivity. Reduced summer stream flows from irrigation and other withdrawals and loss of riparian vegetation contribute to high water temperatures, and affect migration and rearing of salmonids.
- Vegetation: Loss and alteration of riparian vegetation related to US 97 and other land uses has reduced future large woody debris for instream use; downed wood and snags for terrestrial wildlife; and cover, nesting, foraging, and perching sites for terrestrial wildlife. The riparian corridor has been fragmented. Vegetation is also not able to provide full water quality improvement and overland flow moderation. Ponderosa pine community habitat has been reduced in the lower watershed as a result of fire suppression, timber harvest and other development. Much of the upper sub-watershed is protected as part of the Alpine Lakes Wilderness.
- Habitat: "This sub-watershed provides important bull trout and steelhead spawning and rearing habitat, both in the main stem Peshastin and in Peshastin tributaries." However, ongoing modifications described above as well as historic mining are limiting the distribution and quality of instream habitat.

Chumstick Sub-Watershed

The Chumstick Sub-Watershed is classified as Category 3. This highly altered watershed "has been substantially degraded and is strongly fragmented." The Chumstick Sub-Watershed has experienced the following impacts to ecological functions and processes:

- Hydrology: SR 209 (Chumstick Highway), rail line, multiple creek crossings by the highway, and other developments have had substantial effects on Chumstick Creek through reduced channel migration (affects recruitment of large woody debris and substrate material), and loss of sinuosity and floodplain connectivity.
- Vegetation: Forest management, including a series of harvests and fire suppression, has altered the community composition, distribution, and density. A number of noxious weeds have been introduced and are spreading, possibly permanently displacing native species.
- Habitat: Alteration and fragmentation of forest communities has degraded habitat for fish and wildlife. In spite of this, the sub-watershed does contain a wide range of special-status species. However, non-native brook trout are distributed through much of the sub-watershed, and the only native anadromous species is the steelhead trout. Partial barriers to fish passage exist through culverts in lower Chumstick Creek and farther

upstream. Loss of vegetation has had impacts on water temperature, and fecal coliform levels from livestock and septic systems are also elevated. Land development and road runoff have also increased sediment delivery to the system, which can adversely affect substrate suitability for spawning and invertebrate production.

Icicle Sub-Watershed

The Icicle Sub-Watershed is classified as Category 2, and is the largest of the Wenatchee sub-watersheds. The Icicle Sub-Watershed has experienced the following impacts to ecological functions and processes:

- Hydrology: Several locations of Icicle Road and development downstream of the Leavenworth National Fish Hatchery (LNFH) reduce channel migration (affects recruitment of large woody debris and substrate material), sinuosity and floodplain connectivity, and formation of and access to off-channel habitat. Instream flows are low to non-existent during the summer downstream of the hatchery intake in general and in particular between the intake and the outflow, although this is substantially attributable to irrigation withdrawals. Recent models prepared by the University of Washington Climate Impacts Group indicates that rain-on-snow events will become more frequent; this is expected to increase peak flows in the winter, leading to decreased spring flows as a result of reduced snowpack.
- Vegetation: Loss of vegetation resulting from the 1994 Rat Creek fire has destabilized soils and resulted in increased water temperatures and sedimentation of lower and middle Icicle Creek.
- Habitat: "This sub-watershed contains high quality aquatic and terrestrial habitat in the upper watershed above RM 5.7, and is designated as a Key Watershed[17] by the Northwest Forest Plan." The LNFH has been a major barrier to fish passage as a deliberate management decision to protect hatchery-reared spring Chinook from disease. Summer low flows have also affected water temperature.

Nason Sub-Watershed

The Nason Sub-Watershed is classified as Category 2. The Nason Sub-Watershed has experienced the following impacts to ecological functions and processes:

- Hydrology: US 2 and SR 207, rail line, and other developments have had substantial effects on Nason Creek through reduced channel migration

[17] Key Watersheds "provide habitat critical for the maintenance and recovery of anadromous salmonids and resident fish species" as part of the Northwest Forest Plan's Aquatic Conservation Strategy (Entiat Planning Unit 2004).

(affects recruitment of large woody debris and substrate material), and loss of sinuosity and floodplain connectivity.

- Habitat: Nason Creek is on Ecology's 303(d) list for water temperature standard exceedances.

The U.S. Bureau of Reclamation (2008) evaluated three reaches of Nason Creek, between RM 4.6 (Coles Corner) and RM 14.3 (White Pine Railroad Bridge). These three reaches correspond to segments Nason Creek 5 to Nason Creek 7 in this analysis (see Section 5.2 above). The general conclusions drawn from the USBR study supplementary to the *Final Wenatchee Watershed Management Plan* (WRIA 45 Planning Unit 2006) follow:

- Vegetation: Although much of the Nason Creek watershed had been heavily impacted by timber harvest, "within the valley floor of the assessment area, the forest appears to be recovering back to the historical grand fir forest." This is true only where permanent loss or maintenance of vegetation has not occurred due to US 2, other roads, rail lines, or power/transmission line corridors. LWD recruitment potential is relatively high, considering past and current impacts, as well as the percent shading of Nason Creek.
- Hydrology: While the recruitment potential may be relatively high, the ability of the stream to retain the wood is low because of channel straightening that tends to facilitate passage of wood (and sediment) through the assessment area. Existing large woody debris in the channel is still fairly low in areas, and results in reduced complexity of pools and reduced pool formation. Bank hardening associated with roads, rail lines, and other developments has also altered sediment/gravel recruitment. Within the assessment area alone, anthropogenic alterations have disconnected 386 acres of floodplain, 59% of that was accomplished by the railroad.
- Habitat: The hydrologic and vegetation impacts described above have reduced the quality and quantity of instream habitat.

Chiwawa Sub-Watershed

The Chiwawa Sub-Watershed is classified as Category 1, and is the second largest of the Wenatchee sub-watersheds. "Chiwawa is designated as a Key Watershed by the Northwest Forest Plan. "Significant resource extraction (timber, mineral, and grazing), heavy recreational use, and excellent fish, wildlife, and rare plant values co-exist in this [sub-]watershed," (USFS, 1997)." The Chiwawa Sub-Watershed has experienced the following relatively limited impacts to ecological functions and processes:

- Hydrology: "Water withdrawals in the lower Chiwawa River could potentially affect the amount of juvenile rearing habitat available in low

flow years." According to the *Wenatchee Subbasin Plan* (Chelan County and Yakama Nation 2004), "The Chiwawa River valley floor has an extensive high quality network of ponds, beaver canals, side channels, abandoned oxbows and other wetlands. Abundance, diversity, connectivity and quality of these wetlands are extremely high."

- Vegetation: The lower Chiwawa River has a few residential housing developments that may have reduced riparian vegetation.
- Habitat: "Overall, the Chiwawa sub-watershed supports moderate to high-quality terrestrial habitat." Riparian vegetation that may be lost due to a few residential developments could increase water temperatures and reduce cover.

Upper Watershed (Lake Wenatchee, White, and Little Wenatchee Sub-Watersheds)

The three sub-watersheds comprising the Upper Watershed are classified as Category 1. The Upper Watershed has experienced the following relatively limited impacts to ecological functions and processes:

- Hydrology: No major impacts to hydrologic functions/processes were noted in the *Final Wenatchee Watershed Management Plan* for the White and Little Wenatchee Sub-Watersheds. However, the *Wenatchee Subbasin Plan* noted that localized sections of the White River have been armored in conjunction with roads, bridges, and residential or recreational developments. Shoreline armoring on Lake Wenatchee has the potential to affect wave processes ability to recruit and distribute substrates, which in turn affects invertebrate production and habitat condition.
- Vegetation: Past riparian harvests and log drives in the White and Little Wenatchee Sub-Watersheds has affected large woody debris presence and potential, which in turn has affects on channel form and function. According to the *Wenatchee Subbasin Plan*, those activities coupled with the accompanying sediment pulse have reduced pool frequency in the White River. Some minor alterations in riparian vegetation were also noted along the lower Little Wenatchee River.
- Habitat: "The watershed is located at an important point along the Cascade Range and provides connectivity for terrestrial wildlife for species moving north-south and east-west. 'From a landscape scale/range-wide status of many species, it is important to maintain the integrity of the White River and Little Wenatchee watershed,' (USFS, 1998)." "Important terrestrial habitat contributions of these sub-watersheds include habitat for 'rare plant species, disjunct plant species, and species endemic to the Wenatchee Mountains [which] occur within these watersheds,' (USFS, 1998)." The three watersheds provide

important rearing and/or spawning habitat for a variety of salmonids, as well as a number of federally listed wildlife species.

5.3.3 Entiat (WRIA 46)

The Entiat watershed consists of the Entiat and Mad River sub-basins. The Entiat River has two major tributaries that include the North Fork Entiat and the Mad River. The following are brief summaries of ecological functions for the Entiat watershed as derived primarily from the *Entiat WRIA 46 Management Plan* (Chelan County Conservation District 2004), unless referenced otherwise.

- Hydrology: Water quality temperature standard exceedances occur in both the Entiat and Mad Rivers during the late summer/fall period. Wintertime low temperatures and the formation of anchor ice in the lower mainstem Entiat and Mad Rivers may be a greater limiting factor than summertime highs (Berg 2004a). Soils in the Entiat basin are generally very erodible, and most land types have high sediment delivery rates. Additional sediment pulses have occurred as a result of fire/flood scenarios in 1976-1977 (Crum Canyon Fire), 1988-1989 (Dinkelman Fire), and 1994 (Tyee Fire).
- Habitat: Many priority species use the wildlife habitats within the Entiat WRIA for at least part of the year. Priority habitats that occur in the Entiat WRIA include: aspen stands, caves, cliffs, old-growth/mature forests, prairies and steppe, instream, riparian, shrub-steppe (both large and small blocks), snag habitat, talus, rural and urban natural open space, freshwater wetlands and fresh deepwater habitats.

Entiat Sub-Watershed

A range of elevations, from the Entiat headwaters to the mouth, results in a wide variety of ecosystems, from alpine to shrub-steppe. As a result of land use alterations related to wildfire, animal grazing, residential development and transportation corridors, the Entiat watershed has experienced the following minimal impacts to ecological functions and processes:

- Hydrology: The Entiat headwaters are fed by a rim of snow-covered peaks, resulting in rapid runoff with relatively frequent flood events in the mainstem. It is unregulated and sustained largely by groundwater (vs. precipitation) during the late summer to late winter (August through February) period. The stream channel shape of the lower 10 miles of the Entiat River, between the town of Ardenvoir and the mouth of the Entiat, has been influenced by past human activities, such as channel straightening/widening and diking, and streamside vegetation disturbance. The lack of aquatic habitat diversity, high width:depth ratio, and stream downcutting are also concerns. Typical flood and bank protection activities include dikes, rock riprap, and log revetments.

Bankfull discharge is primarily responsible for the maintenance of current channel geometry in the Entiat River. These flows move and redistribute streambed and bank material, sediment, and incoming debris, and these processes are most responsible for forming or removing channel bars, bends and meanders. Current system dynamics are working to develop channel features that create a balance between stream flow and sediment loads.

- Vegetation: Wildfire is noted as one of the primary disturbance factors affecting riparian vegetation and function throughout the Entiat sub-watershed, whereas human influences cause most of the disturbance in the lower 10 miles of shoreline. This lower section of the Entiat River experiences the highest water temperatures, decreased riparian vegetation (primarily deciduous species), and poor to good shade and recruitment of large woody debris. In general, the upper sub-watershed (from the headwaters to RM 25) is reported as having fair to excellent shade levels and recruitment of large woody debris. In the upper sub-watershed, there is only minimal impact to riparian areas at localized developed campgrounds (such as Cottonwood Campground). Throughout the sub-watershed, in areas where there is a loss of vigorous shrubs, the riparian zone has reduced instream organic input and shade, which contributes to unstable stream banks and associated erosion.
- Habitat: The Entiat sub-watershed is listed as having a lack of and/or an improperly functioning riparian zone in the lower 10 river miles that acts as a major limiting factor for fish habitat (Andonaegui 1999). The *WRIA 46 Limiting Factors Analysis* reported that a lack of overwintering juvenile rearing habitat is perhaps the most limiting factor of the aquatic habitat in the Entiat watershed to fully sustain salmon populations (Andonaegui 1999). Data indicates that the benthic macroinvertebrate community condition is generally healthy; however, specific characteristics of the community condition indicate slight degradation. Macroinvertebrate studies on the lower Entiat River may indicate environmental stress or an altered site. Studies conducted on the lower Entiat River have recorded exceedances in both temperature and pH, suggesting some degree of eutrophication.

Mad River Sub-Watershed

The Mad River flows into the lower Entiat River near the town of Ardenvoir, at RM 10.5. From limited available sources, the section below describes the Mad River shoreline as experiencing very few impacts to ecological function and process.

- Hydrology: As mentioned earlier, the Mad River experiences water quality temperature standard exceedences during the late summer/fall

period and wintertime low temperatures with the formation of anchor ice in the lower portion of the stream.

- Habitat: The Mad River has good macroinvertebrate species richness and diversity. It currently supports steelhead, bull trout, and spring and late-run Chinook salmon.

5.3.4 Chelan (WRIA 47)

The Chelan basin is primarily made up of a 50-mile lake that consists of two sub-basins. The Lucerne basin is deep (max. depth of 1,486 feet) and fjord-like, and extends for 38 miles containing over 92% of the total lake volume. The Wapato basin is relatively wide and shallow in comparison (max. depth of 400 feet), and extends for 12 miles. With the exception of the Stehekin and Lucerne areas, there is very little development in the Lucerne basin, resulting in natural and healthy habitat function and processes. The majority of inflow to Lake Chelan is from two major tributaries: the Stehekin River, which feeds into the lake from the west, provides 65%, and Railroad Creek provides 10%. Approximately 50 small streams provide the remaining 25% of the inflow. Due to the shape of the valley, most tributaries are relatively steep and short.

The following information on the ecological function and processes of WRIA 47 shorelines were summarized primarily from the *Lake Chelan Subbasin Plan* (Berg 2004c) and the *Stehekin River Corridor Implementation Plan* (National Park Service 2008).

Stehekin River Sub-Watershed

The Stehekin River provides most of the inflow to Lake Chelan. It has a fairly low gradient; a wide, broad floodplain; and has a mostly gravel substrate. In the broadest sense, the Stehekin is typical of a glacial-fluvial river, with gravel bed and riffle-pool morphology.

- Hydrology: The Stehekin watershed is flood prone due to its climate, steep topography, and other watershed factors. Many of these floods come on very quickly, causing substantial erosion. Most of the erosion sites have rip-rap banks or rock barb protection. Massive accumulation of gravel and large wood in the river channel has revived interest in returning to the practice of large-scale removal of woody debris and channel dredging.
- Vegetation: The growth of native riparian vegetation at the mouth of the Stehekin River is greatly affected by changes in the lake's seasonal elevation due to the Lake Chelan Hydroelectric Project (Project). These riparian areas are inundated for an extended period of time during the growing season (April through October). There has been residential development near the mouth of the Stehekin River, where high quality riparian and wetland habitat has been removed and low areas filled.

- Habitat: The Stehekin River meanders through floodplain, providing excellent fish and rearing habitat, good spawning gravels, and plenty of instream large woody debris. Overall, there is very little unnatural impact to the aquatic and terrestrial habitat function and processes throughout the Stehekin sub-watershed.

Lake Chelan

Lake Chelan is considered to be one of the most pristine water bodies in North America. It is a natural lake, but its levels are affected and controlled by the Project, a dam and powerhouse which are located at the mouth of the lake on the Chelan River. The 40-foot-high concrete gravity dam raised the elevation of the lake by 21 feet above normal high water levels. The Project reservoir, Lake Chelan, is operated between elevations of 1,079 feet and 1,100 feet to ensure optimum use of the reservoir for power generation, fish and wildlife conservation, recreation, water supply, and flood control.

Lake Chelan is characterized by deep, cold, clear water, with little organic material in the sediments, high dissolved oxygen levels, and relatively low nutrient levels. It therefore has low biological productivity. The lake's productivity is also hindered by elevated bacterial levels near water supply intakes and elevated pesticide residues (DDT and PCBs) in lake sediments and fish populations.

- Hydrology: Seasonal changes in the lake level lead to shoreline erosion, causing slope instability, including some slumping, rockslides and debris flows, along portions of the relatively steep shoreline. Fecal coliform found throughout the lake (primarily in the Wapato sub-basin) is likely caused by seasonal differences in waterfowl abundance, recreation use, and irrigation return flow that coincide with lake level fluctuations. The highest lake levels are maintained during the summer by Project operations. As a result, the highest lake levels also coincide with the highest seasonal population in the area, peak irrigation operations and waterfowl activity. Waterfowl activities appear to be the most likely source of the observed bacterial inputs. Nevertheless, fecal coliform levels in the Wapato sub-basin have not exceeded applicable State water quality standards.

- Vegetation: Riparian areas along the shoreline of Lake Chelan are small, distinctly linear, and concentrated in the few areas of relatively flat terrain on tributary alluvial fans, and in a few scattered pockets near Manson. The basin is mostly steep-sided due to its formation by glacial activity, and consists of coarse substrates, including cobbles, boulders and bedrock. These coarse substrates are generally unsuitable for plant colonization and limit the extent of riparian and emergent vegetation on most areas along the lake shoreline. The long and narrow basin results in

heavy wave action during the frequently windy conditions, which limits the establishment of riparian vegetation along most of the shoreline. Human activities also influence the extent and condition of riparian zones.

- Habitat: Both the aquatic and shoreline habitats are functioning well. Competition between native fish species and introduced game fish has reduced and possibly eliminated certain native fish populations. Levels of nitrates, phosphorous, chlorophyll a, zooplankton, and benthic organisms are low, especially in the Lucerne basin, preventing the lake from supporting high densities of fish. There also have been releases of pesticides, especially DDT, and polychlorinated biphenyls (PCBs) into Lake Chelan. Large woody debris is considered a navigational hazard so much of it is removed, limiting cover and reducing habitat complexity for fish.

Railroad Creek Sub-Watershed

Railroad Creek flows past the village of Holden into Lake Chelan at Lucerne. The creek has elevated levels of metals (iron, zinc and arsenic) due to runoff from abandoned contaminated tailings at the Holden Mine.

Chelan River Sub-Watershed

Nearly the entire Lake Chelan outflow, averaging approximately 2,000 cfs, is diverted through a 2.2-mile-long power tunnel that passes the water through the powerhouse for hydroelectric generation and into the tailrace, which empties into the Columbia River. The remaining Lake Chelan outflow passes through the 3.9-mile Chelan River channel. The Chelan River has been without flow during most of the year since the Project's completion, with flow only in the spring and early summer when snow melt raises the lake to levels requiring spill for flood control. The 76-year-old Project was relicensed for 50 years by FERC in November 2006. Provisions of the implementation agreement include "year-round minimum flow in the Chelan River, maintaining existing parks, regulating lake levels, fish habitat enhancements in the Chelan River, adding a trail that improves access to the Chelan River, and a variety of other actions" (http://www.chelanpud.org/282.html).

- Hydrology: The flows in the river are controlled by the Project. The water temperature leaving Lake Chelan is potentially high enough to exceed Washington State's numeric standard for riverine water temperatures. Water quality parameters (nutrients, hardness, pH, conductivity, and fecal coliform levels) are expected to be similar to those in Lake Chelan. Shoreline erosion along the rivers banks may affect turbidity under high flow conditions, during spill events, but most of the highly unstable bank areas have been armored. A small amount of

ground water enters in the steep areas within the gorge, but the cooling effect of this flow is negligible except at low flow.

- Vegetation: The Chelan River descends through a steep-walled gorge to a broad floodplain and is bordered by shrub-steppe, open coniferous forest, cliffs, and urban areas. Vegetation is sparse, mostly restricted to upper and lower sections of the stream, and consists primarily of deciduous trees and shrubs.
- Habitat: The Chelan River has not functioned properly since the Project's installation. It may provide poor habitat for terrestrial species, but aquatic and riparian habitat has been nearly nonexistent. Most of the Chelan River is currently unsuitable habitat for fish, given that it has been dewatered for most of the year until recently. With flows returning and stream enhancement projects by the Chelan PUD, there should be improvement to the biological function of the Chelan River habitat in years to come.

5.3.5 Mid-Columbia Mainstem

The Columbia River has been classified by the Washington Department of Ecology as a "Class A" water. On a scale ranging from Class AA (extraordinary) to Class C (fair), Class A waters are considered "excellent." State and federal regulations require that Class A waters meet or exceed certain requirements for all uses. The following section summarizes impacts to ecological function and process as related in the *Upper Middle Mainstem Subbasin Plan* (Berg 2004d).

- Hydrology: Columbia River hydrology has been greatly altered with the construction of 14 hydroelectric dams throughout the basin (United States and Canada). Smoothing of the hydrograph and lack of significant reservoir fluctuation has increased the amount of fine sediment present in the Columbia River. Flows average more than 180,000 cfs in the mid-Columbia, mostly coming from upriver areas in the Columbia basin and from the Kettle and Spokane Rivers. While water quality is good, compared to other rivers in the United States, there is still cause for concern. Primary concerns include levels of dissolved gases, changes in stream temperatures, turbidity levels, and exposure to environmental contaminates above biological thresholds for fish species utilizing the river. These concerns are generally related to hydropower production.
- Vegetation: Vegetation along the upper mid-Columbia mainstem consists mainly of steppe and shrub-steppe vegetation. Forest vegetation is generally confined to mountain slopes with sufficient precipitation. Present vegetative communities vary widely from historic conditions, as much of it was cultivated or grazed by livestock. Low-bank riparian habitat is extremely rare along the river and some areas that were once dominated by cottonwood have been lost. Some of this habitat was lost because of the development of hydropower on the river that altered the

natural flood regime. As a result, some of the upper mid-Columbia now exhibits steep shorelines and sparse riparian vegetation providing limited fish and wildlife habitat.

- Habitat: Embayments connected to the river via culverts or small channels provide special wildlife habitat. The reduced water fluctuation and protection from wave action is beneficial to wildlife. Columbia River anadromous salmonid spawning is concentrated at the upstream portions of reservoirs, where it is generally assumed that river hydraulics are sufficient to maintain well-sorted substrates that are relatively free of fine sediment. Water velocity in the upstream reservoir areas is also sufficient for adult anadromous salmonids to move cobble substrate for redd construction. Terrestrial and aquatic habitat functions and processes have dramatically been impacted with the damming of the river. Many avian and terrestrial species utilize the modified shoreline throughout the mid-Columbia.

6. LAND USE ANALYSIS

This section presents a use analysis, identifying current and projected shoreline use patterns, as well as estimating future demand for shoreline space, consistent with SMP guidelines.

This section is broken into two subsections: a land capacity analysis of parcels that are partially or fully included in the shoreline jurisdiction and a discussion of economic analyses prepared for shoreline areas in the County, where available.

6.1 Shoreline Land Capacity Analysis

The purpose of the shoreline land capacity analysis is to gauge the potential level of development that may occur in the future along shorelines given adopted future land use designations. The information is intended to provide an understanding of the future level of intensity that may occur given current plans and regulations.

The County's and cities' future land use plans contained in their Comprehensive Plans give a more specific picture of likely future activities on shorelines than the present SMP's which allow many uses/activities in each of the shoreline environments. For example, in the Urban shoreline environment, residential, commercial, and industrial activities are allowed by the SMP whereas County or city Comprehensive Plans and zoning regulations may have designated a particular area for residential uses only.

The method to determine shoreline land capacity is summarized below. A more detailed matrix of assumptions is included in Appendix C.

- **Determine shoreline use boundaries.** The analysis includes all parcels that intersect with the shoreline jurisdiction (generally 200 feet of the ordinary high water mark, associated wetlands, and the floodway) whether the parcels are wholly contained in the shoreline jurisdiction or not.
- **Compile County and City land capacity analyses.** Based on adopted Comprehensive Plans and County and City planner input, assumptions about vacant, partially used, and under-utilized properties have been compiled.
- **Determine development potential.** The analysis estimates developable acres by future land use category. Developable acres include: 1) vacant (no building value); 2) partially used (e.g. single family properties containing one home but the land can be further subdivided); or 3) under-utilized (land value exceeds building value on multifamily, commercial or industrial properties). Constraints such as critical areas, rights of way, and infrastructure are deducted from gross acres. Market factor reductions, which account for land that may not be available (e.g. owner does not wish to develop), are also included. Densities or floor area ratios are applied to the net buildable acres to estimate total future dwellings or commercial/industrial square feet.

Public lands, government owned forest lands, and mineral lands were coded as vacant, partially utilized, or underutilized where Assessor information was available. Due to the different purposes for these lands, typical assumptions regarding dwelling and commercial/industrial density were not applied to public lands, government owned forest lands, and mineral lands. However, because these shoreline lands could be altered due to a variety of public purposes such as recreation, utilities, or resource extraction, the discussion of these types of lands is included in each WRIA and City/UGA, including the total number of acres. More discussion about the approach to these lands is identified below:

- **Lands specifically identified as "public" on comprehensive plans.** Lands identified as "public" on future land use maps were mapped if they met the developable parcel attributes (e.g. vacant, etc.), but excluded from statistical analysis of additional residences and commercial/ industrial square footages. However, since public uses may result in shoreline development of structures or facilities, designated public acres are described in each subsection where applicable. In contrast, statistics do include lands that are designated on future land use maps for resource, residential, commercial or industrial activities – whether they are publicly or privately owned. Though this may overestimate land capacity currently, the market factor discount reduces the potential that these lands skew results. Further, public ownership may change overtime, though rare.

- **Government owned forest lands**. The County's Assessor database includes little information on these lands, and thus they were not always coded as vacant, partially utilized, or underutilized. It should be noted that some leasing of lands may be possible on federal government forest lands, and could be subject to the SMP, though rare in general.
- **Lands specifically designated for mineral extraction** were mapped if they met the developable parcel attributes (e.g. vacant, etc.), but excluded from statistical analysis of additional residences and commercial/ industrial square footages. These activities have few structures, but may alter shorelines. However, designated mineral lands acres are described in each subsection where applicable.

Maps are also provided of parcels that meet the initial screening criteria. Through a review of statistics, some parcels are removed, though they remain present on the maps, e.g. public lands.

It is important to note that this analysis is intended to give an overall picture of the potential for development along shorelines, but is not an exact predictor of which parcels may develop or redevelop. In addition, the analysis does not provide a "rate" of development; review of past shoreline permits in Section 2.3 may help provide a gauge of activity levels over time.

Results are shown by WRIA and jurisdiction below.

6.1.1 Stemilt/Squilchuck – Colockum (WRIA 40a/b)

The Stemilt/Squilchuck – Colockum watershed is unincorporated and designated for predominantly rural land uses. Comprehensive Plan future land use designations along shorelines include Rural Industrial, Rural Residential, and Commercial Forestry Lands among others. Based on these designations, the most intense use of property appears to be with Rural Industrial designated lands along the Columbia River at a potential for 10 million square feet on vacant shoreline lands. Single-family dwellings would be spread along the remaining waterbodies. Single-family dwellings are estimated at between 90 to 172 additional dwellings, dependent on whether vacant non-resource lands are considered or whether all lands meeting the land capacity criteria are considered. The resulting capacity for development along shorelines in the watershed is shown in Table 29.

Table 29. WRIA 40a/b Shoreline Land Capacity Estimates

Waterbody	Net Acres-Vacant	Net Acres-Partially Used/ Underused	Single Family Units	Multi-Family Units	Commercial Sq Ft	Industrial Sq Ft
Colockum Creek	573	202	81	-	-	-
Columbia River	856	423	56	-	-	10,307,790
Cortez Lake	2	2	12	-	-	-
Meadow Lake *	-	19	3	-	-	-

Waterbody	Net Acres-Vacant	Net Acres-Partially Used/ Underused	Single Family Units	Multi-Family Units	Commercial Sq Ft	Industrial Sq Ft
Spring Hill Reservoir *	-	221	11	-	-	-
Stemilt Project Reservoir	32	-	3	-	-	-
Upper Wheeler Reservoir	-	576	29	-	-	-
Total	**1,463**	**1,442**	**195**	**-**	**-**	**10,307,790**
Partially Used Reduction (Existing Units)			**23**			
Adjusted Total	**1,463**	**1,442**	**172**	**-**	**-**	**10,307,790**
Vacant Only**	**1,463**	**809**	**131**	**-**	**-**	**10,307,790**
Adjusted Total Minus Resource Lands	**1,463**	**633**	**131**	**-**	**-**	**10,307,790**
Vacant Only Minus Resource Lands	**1,463**	**-**	**90**	**-**	**-**	**10,307,790**

Note: * Majority of acres in Commercial Agricultural or Commercial Forest Lands designations.
**The "partially used/underused acres" in this row represent vacant commercial agriculture or forest lands. The reason these acres are treated as "partially used/underutilized" is that they have an activity on them presently and because the analysis applied a higher market factor reduction since these lands are less likely to develop with residential uses than non-resource lands.

6.1.2 Wenatchee (WRIA 45)

The Wenatchee watershed is likely to see growth in single-family dwellings along the shorelines, ranging from 355 to 1,132 new dwellings depending on whether resource lands are considered. Nason and Peshastin Creeks, and the Wenatchee River have some commercial capacity based on Comprehensive Plan future land use designations, and Peshastin Creek and the Wenatchee River have potential for additional industrial development. Shoreline designation recommendations will be based on ecological functions, current land use, and planned land use.

In addition to the results in Table 30, shoreline development may occur on vacant parcels designated for public uses at about 86 acres, and on vacant commercial mineral lands equaling about 41 acres (excluding critical areas). These acres exclude critical areas, but no further deductions for rights of way/infrastructure or market factors are taken. Intensive activities are not typically allowed in critical areas; low intensity uses such as passive recreation may be allowed, though usually in the buffers and not in the critical area itself.

Table 30. WRIA 45 Shoreline Land Capacity Estimates

Waterbody	Net Acres - Vacant	Net Acres - Partially Used/ Underused	Single Family Units	Multi-Family Units	Commercial Sq Ft	Industrial Sq Ft
Chikamin Creek*	-	967	48	-	-	-
Chiwaukum Creek*	-	321	16	-	-	-
Chiwaukum Creek	-	258	13	-	-	-

Waterbody	Net Acres - Vacant	Net Acres - Partially Used/ Underused	Single Family Units	Multi-Family Units	Commercial Sq Ft	Industrial Sq Ft
South Fork*						
Chiwaukum Lake*	-	208	10	-	-	-
Chiwawa River*	156	2,611	198	-	-	-
Chumstick Creek	59	30	17	-	-	-
Colchuck Lake*	-	27	1	-	-	-
Columbia River**	-	-	0	-	-	-
Eightmile Creek*	-	151	8	-	-	-
Eightmile Lake*	128	-	6	-	-	-
Fish Lake*	2	488	29	-	-	-
Icicle Creek*	104	918	15	-	-	-
Ingalls Creek*	-	647	32	-	-	-
Klonaqua Lakes (2) Upper *	-	27	1	-	-	-
Lake Augusta*	-	65	3	-	-	-
Lake Victoria*	-	110	5	-	-	-
Little Wenatchee River*	-	482	24	-	-	-
Loch Eileen Lake*	-	221	11	-	-	-
Mill Creek	-	91	5	-	-	-
Mission Creek	120	248	36	-	-	-
Mountaineer Creek*	-	279	14	-	-	-
Nada Lake*	-	135	7	-	-	-
Napeequa River*	2	199	10	-	-	-
Nason Creek*	154	1,803	116	-	1,437	-
Perfection Lake	-	171	9	-	-	-
Peshastin Creek*	43	468	64	-	2,868	-
Phelps Creek*	-	369	18	-	-	-
Pole Creek*	-	163	8	-	-	-
Shield Lake	-	198	10	-	-	-
Snow Lake - Lower*	-	83	4	-	-	-
Snow Lake - Upper*	-	85	4	-	-	-
Stuart Lake*	-	59	3	-	-	-
Trout Creek*	-	285	14	-	-	-
Twin Lakes (2)*	-	284	14	-	-	-
Wenatchee Lake*	16	461	93	-	-	-
Wenatchee River*	668	2,153	468	-	83,868	112,118
White River*	402	1,087	81	-	-	-
Whitepine Creek*	-	143	7	-	-	-
Peshastin UGA: Peshastin Creek	10	-	-	-	-	179,034
Peshastin UGA: Wenatchee River	36	16	63	-	59,896	536,263
Total	**1,900**	**16,312**	**1,487**	-	**148,069**	**827,416**
Partially Used Reduction (Existing Units)	-	-	**355**	-	-	-
Adjusted Total	**1,900**	**16,312**	**1,132**	-	**148,069**	**827,416**
Vacant Only* **	**1,891**	**14,820**	**1,128**	**-**	**97,529**	**827,416**
Adjusted Total Minus Resource Lands	**1,538**	**554**	**700**	**-**	**148,069**	**861,095**
Vacant Only Minus	**1,527**	**-**	**355**	**-**	**97,529**	**827,416**

Waterbody	Net Acres - Vacant	Net Acres - Partially Used/ Underused	Single Family Units	Multi-Family Units	Commercial Sq Ft	Industrial Sq Ft
Resource Lands						

Notes:
* Majority of acres in Commercial Agricultural or Commercial Forest Lands designations.
**Analysis excludes public acres. On the Columbia River, public acres equal approximately 40.
*** The "partially used/underused acres" in this row represent vacant commercial agriculture or forest lands. The reason these acres are treated as "partially used/underutilized" is that they have an activity on them presently and because the analysis applied a higher market factor reduction since these lands are less likely to develop with residential uses than non-resource lands.

6.1.3 Entiat (WRIA 46)

The Entiat watershed is largely unincorporated, with rural and commercial forestry uses. As shown in Table 31, depending on whether resource lands are included, between 103 and 230 dwellings may be added to shoreline areas. Small amounts of rural commercial square footage may occur along the Entiat or Mad Rivers on vacant properties designated for these uses. In addition, about 20 acres of designated Commercial Mineral lands may be altered on vacant shoreline properties, as may approximately 7 acres of public designated property (excluding critical areas).

Table 31. WRIA 46 Shoreline Land Capacity Estimates

Waterbody	Net Acres - Vacant	Net Acres - Partially Used/ Underused	Single Family Units	Multi-Family Units	Commercial Sq Ft	Industrial Sq Ft
Columbia River	274	58	85	-	-	-
Entiat River*	220	1,438	127	-	14,029	-
Mad River*	5	1,456	75	-	12,455	-
Total	**498**	**2,952**	**287**	-	**26,484**	-
Partially Used Reduction (Existing Units)	-	-	**57**	-	-	-
Adjusted Total	**498**	**2,952**	**230**	-	**26,484**	-
Vacant Only	**498**	**2,479**	**230**	-	**26,484**	-
Adjusted Total Minus Resource Lands	**498**	**122**	**134**	-	**26,484**	-
Vacant Only Minus Resource Lands	**498**	-	**103**	-	**26,484**	-

Note:
* Majority of acres in Commercial Agricultural or Commercial Forest Lands designations.
**The "partially used/underused acres" in this row represent vacant commercial agriculture or forest lands. The reason these acres are treated as "partially used/underutilized" is that they have an activity on them presently and because the analysis applied a higher market factor reduction since these lands are less likely to develop with residential uses than non-resource lands.

6.1.4 Chelan (WRIA 47)

The Chelan watershed is largely rural, with commercial forest and agricultural lands. With the attractiveness of Lake Chelan and other lakes and streams, additional residential dwellings are likely. The land capacity analysis estimates a range of 697 to 806 dwellings, depending on whether resource lands are included (Table 32). A small amount of additional rural commercial and pedestrian commercial (Manson) uses may occur along Lake Chelan or the Columbia River on vacant properties. In addition, about 342 acres of public lands (excluding critical areas) are vacant and may be modified along the shorelines in the future.

Table 32. WRIA 47 Shoreline Land Capacity Estimates

Waterbody	Net Acres - Vacant	Net Acres - Partially Used/ Underused	Single Family Units	Multi-family Units	Commercial Sq Ft	Industrial Sq Ft
Antilon Lake*	5	56	3	-	-	-
Boulder Creek 1	140	-	14	-	-	-
Chelan River	144	-	9	-	-	110,609
Columbia River*	183	598	123	-	974	210
Company Creek*	59	67	6	-	-	-
Dry Lake*	-	33	3	-	-	-
Fish Creek 1	-	10	1	-	-	
Lake Chelan	707	481	646	-	6,435	-
Manson UGA: Lake Chelan	19	14	176	-	3,236	-
Railroad Creek*	-	8	-	-	-	-
Rainbow Creek	-	-	-	-	-	-
Roses Lake	33	15	16	-	-	-
Stehekin River	829	240	85	-	-	-
Twentyfive Mile Creek*	3	184	9	-	-	-
Unnamed Lake 1*	13	143	8	-	-	-
Wapato Lake	7	109	26	-	-	-
Total	**2,108**	**1,943**	**1,109**	**-**	**10,645**	**110,820**
Partially Used Reduction (Existing Units)	**-**	**-**	**303**	**-**	**-**	**-**
Adjusted Total	**2,108**	**1,943**	**806**	**-**	**10,645**	**110,820**
Vacant Only**	**2,121**	**1,321**	**769**	**-**	**10,645**	**110,820**
Adjusted Total Minus Resource Lands	**2,141**	**129**	**1,002**	**-**	**10,645**	**110,820**
Vacant Only Minus Resource Lands	**2,121**	**-**	**697**	**-**	**10,645**	**110,820**

Note:
* Majority of acres in Commercial Agricultural or Commercial Forest Lands designations.
**The "partially used/underused acres" in this row represent vacant commercial agriculture or forest lands. The reason these acres are treated as "partially used/underutilized" is that they have an activity on them presently and because the analysis applied a higher market factor reduction since these lands are less likely to develop with residential uses than non-resource lands.

6.1.5 City of Cashmere

The City of Cashmere is largely developed along its shoreline, but may see additional development in the form of residential dwellings: 8 to 58 single-family

and 57 to 103 multi-family units. The lower range represents vacant land development and the upper range represents subdivision of lots that already have a home, or addition of multi-family dwellings on multi-family properties where the land value exceeds the building value. Commercial and industrial uses may be expanded on existing underutilized properties or added to vacant properties (Table 33). Also, there are about 7 acres (excluding critical areas) of vacant properties designated for public uses which may be modified along the shoreline.

Table 33. City of Cashmere Shoreline Land Capacity Estimates

Waterbody	Net Acres - Vacant	Net Acres - Partially Used/ Underused	Single Family Units	Multi-family Units	Commercial Sq Ft	Industrial Sq Ft
Mission Creek	1	18	76	28	3,310	17,396
Wenatchee River	6	7	25	75	27,282	22,452
Total	**7**	**26**	**101**	**103**	**30,591**	**39,848**
Partially Used Adjustment	**-**	**-**	**43**	**-**	**-**	**-**
Adjusted Total	**7**	**26**	**58**	**103**	**30,591**	**39,848**
Total - Vacant Only	**7**	**0**	**8**	**57**	**8,027**	**21,391**

6.1.6 City of Chelan

Future development along Lake Chelan and the Chelan River may add 208 to 466 new dwellings, most of which are single-family. More commercial development is also possible on those same shorelines in the commercial and tourist-oriented districts. There is also capacity for industrial development along the Columbia River (Table 34). In addition to the land capacity estimates, there are approximately 41 acres (excluding critical areas) of public lands which may see modification along the shoreline in the future.

Table 34. City of Chelan Shoreline Land Capacity Estimates

Waterbody	Net Acres - Vacant	Net Acres - Partially Used/ Underused	Single Family Units	Multifamily Units	Commercial Sq Ft	Industrial Sq Ft
Chelan River	22	4	67	4	86,835	0
Columbia River	9	0	0	0	0	160,301
Lake Chelan	47	105	560	24	107,106	0
Total	**78**	**109**	**626**	**29**	**193,942**	**160,301**
Partially Used Adjustment	**-**	**-**	**160**	**-**	**-**	**-**
Adjusted Total	**78**	**109**	**466**	**29**	**193,942**	**160,301**
Vacant Only	**78**	**0**	**208**	**29**	**148,641**	**160,301**

6.1.7 City of Entiat

The City of Entiat is expected to see additional growth of all types: single-family, multi-family, commercial, and industrial. The land capacity analysis was modified to ensure that the parcels that are part of the waterfront redevelopment plan were accounted for, whether or not they met the initial land capacity analysis screening requirements. Though the City does not designate "public" properties in their zoning districts, some PUD properties shown on the land capacity mapping are excluded in the statistics; there are about 9 acres of PUD property that maybe modified along the shoreline in the future.

The range of potential single-family dwellings is 44 to 49, though the configuration of current lots, location of dwellings, and availability of utilities may make additional subdivision difficult (Table 35). Multi-family equals about 40 dwelling units (assumed as part of mixed use on waterfront). Commercial square footage is possible both along the waterfront plan area and in areas designated for Commercial/Light Industrial on vacant properties. Also, some industrial square footage is estimated on Commercial/Light Industrial designated properties that are vacant.

Additional information can be found in Appendix A which characterized land use patterns, biologically critical areas, other areas of interest, and shoreline opportunity areas.

Table 35. City of Entiat Shoreline Land Capacity Estimates

Waterbody	Net Acres - Vacant	Net Acres - Partially Used/ Underused	Single Family Units	Multifamily Units	Commercial Sq Ft	Industrial Sq Ft
Columbia River	22	9	79	40	133,974	91,406
Entiat River	1	4	17	0	0	0
Total	**22**	**13**	**96**	**40**	**133,974**	**91,406**
Partially Used Adjustment	**-**	**-**	**47**	**-**	**-**	**-**
Adjusted Total	**22**	**13**	**49**	**40**	**133,974**	**91,406**
Total Vacant Only	**22**	**0**	**44**	**40**	**133,974**	**91,406**

6.1.8 City of Leavenworth

Land capacity results show additional single-family, multi-family, commercial and industrial is possible along Leavenworth shorelines. In particular, commercial uses are possible along the Wenatchee River. The statistics in Table 36 do not show development on public recreation properties, which total about 116 acres (excluding critical areas). These 116 acres may see modification of parks and recreation facilities, but are not likely to see commercial or residential uses.

Table 36. City of Leavenworth Shoreline Land Capacity Estimates

Waterbody	Net Acres - Vacant	Net Acres - Partially Used/ Underused	Single Family Units	Multi-family Units	Commercial Sq Ft	Industrial Sq Ft
Chumstick Creek	3	2	3	-	-	79,427
Alternative Assumptions	3	2	2	-	-	79,427
Wenatchee River	14	11	14	41	142,795	0
Alternative Assumptions	14	10	8	41	140,452	0
Total - All	**17**	**13**	**18**	**41**	**142,795**	**79,427**
Partially Used Adjustment	-	-	31	-	-	-
Adjusted Total	**17**	**13**	**-13**	**41**	**142,795**	**79,427**
Total - Minus parcel screen	**17**	**12**	**10**	**41**	**140,452**	**79,427**
Partially Used Adjustment			**31**			
Adjusted Total - Minus Parcel Screen	**17**	**12**	**-21**	**41**	**140,452**	**79,427**
Total - Vacant Only	**17**	**0**	**5**	**15**	**102,846**	**48,755**

About five additional single-family residential dwellings may be added along Leavenworth shorelines, as well as 41 multi-family dwellings. The City of Leavenworth requested a higher parcel screen to exclude residential parcels less than 10,000 square feet from the analysis. A comparison is made, similar to other jurisdictions, to the standard approach of excluding lots less than 2,500 square feet.

Since the single-family parcels that are considered partially developed have very little area left for second dwellings given various discount factors, there are a negative number of single-family dwellings shown. It is unlikely that the City will see a reduction in housing. Rather, it is more likely that owners of properties that theoretically could subdivide would not add a second dwelling, and rather that the City would see five additional dwellings on the vacant acres only.

6.1.9 City of Wenatchee

The City of Wenatchee and its UGA contain potential for additional mixed use, multi-family/commercial, and residential and industrial uses. Uses near the waterfront are likely to be the most intense in the County due to greater density and height allowed compared to other communities. However, most new development will occur beyond the 200-foot shoreline jurisdiction.

Though the City's plans do not separately designate public lands, and rather include them in the Waterfront Mixed Use district, much of the land in the shoreline jurisdiction consists of PUD and State parkland, as well as BNSF railroad property, and thus the development will be based on the primary function of those properties as recreation and transportation. Table 37 identifies land capacity with and without Waterfront Mixed Use lands. For reference, it also includes an estimate with only a portion of Waterfront Mixed Use lands

removed (those removed are public properties per the Ownership map). Estimates partially excluding the Waterfront Mixed Use lands are more likely given that the majority of Waterfront Mixed Use lands in shoreline jurisdiction consist of public or infrastructure uses.

Table 37. City of Wenatchee Shoreline Land Capacity Estimates

Waterbody	Net Acres - Vacant	Net Acres - Partially Used/ Underused	Single Family Units	Multifamily Units	Commercial Sq Ft	Industrial Sq Ft
Columbia River	82	26	-	1,200	85,926	910,551
Minus Waterfront Mixed Use	42	14	-	82	-	910,551
Wenatchee River	62	68	25	1,844	123,417	639,870
Minus Waterfront Mixed Use	31	23	25	238	-	639,870
Total - All	**144**	**94**	**25**	**3,044**	**209,344**	**1,550,421**
Partially Used Adjustment	**-**	**-**	**7**	**-**	**-**	**-**
Adjusted Total	**144**	**94**	**18**	**3,044**	**209,344**	**1,550,421**
Total - Minus Waterfront Mixed Use	**72**	**37**	**25**	**320**	**-**	**1,550,421**
Partially Used Adjustment	**-**	**-**	**7**	**-**	**-**	**-**
Adjusted Total - Minus Partial Waterfront Mixed Use	**74**	**46**	**25**	**530**	**16,098**	**155,0421**
Adjusted Total - Minus All Waterfront Mixed Use	**72**	**37**	**18**	**320**	**-**	**1,550,421**
Total - All Zones - Vacant Only	**144**	**-**	**21**	**1,753**	**116,800**	**1,020,270**
Total - Minus Waterfront Mixed Use - Vacant Only	**72**	**-**	**21**	**233**	**-**	**1,020,270**

6.2 Available Economic Studies

This section describes economic or market studies to give context to the land capacity analysis results. Two communities with recent waterfront plans have prepared such studies: Entiat and Wenatchee.

6.2.1 City of Entiat

Entiat intends to transform a portion of its Columbia River waterfront currently used for mining activity to a mixed use tourist-oriented center. The area available for development is approximately 19.3 acres. Entiat's "Waterfront Visioning

Process 2008/2009" provides a summary of citizen input, conceptual plans, and environmental and economic information. The visioning report notes

> "Currently, Entiat has a very small retail base that does not generate enough tax revenue to balance the cost of growth. The community has identified a desire for a tourist-commercial waterfront area within the city limits as a means of generating sales and lodging tax revenue while providing both visitors and residents better opportunities for water access."

Conceptual waterfront plans identify the following potential uses: marina, business and commercial, mixed use condominiums and retail, open space, riparian restoration, multi-use trail, a new waterfront road, and parking, among other features. The development may be phased over 20 years as a current gravel operation completes extraction and reclamation.

In terms of economic impact, the visioning report identifies the following basis for considering a tourist-based economic strategy and the potential local economic impact:

- Chelan County is listed as one of six Counties in the State in which more than 10% of jobs are travel generated.
- In 2006, visitors to public campgrounds in Chelan County spent a total of $10.7 million, while visitors that stayed in hotels and motels spent $202.3 million, almost 19 times the amount spent by campers.
- Visitor spending on Food & Beverage Services in Chelan County amounted to $98.3 million in 2006
- A 50 unit hotel and restaurant could provide $56,430.90 tax revenue to Entiat in its first year and $93,783.60 revenue in its second year of operation.
- Based on a comparison of marinas in the City of Lake Chelan, Port of the Dalles, and Port of Hood River, a 60 to 70 slip marina could have slightly better than break-even potential. Because the goal of offering a marina facility on Lake Entiat is to bring in tourists who will spend money on hotels, restaurants, and shops rather than to be profitable in itself, a 60 to 70 slip size could be effective for the City of Entiat.
- It is likely that the City would enter into a public/private partnership with developers who would lease the land designated for marina and take on the costs of permitting, design, land construction in return for a long-term operational lease of the facility.

Land capacity analysis results for the subject waterfront plan area show the following: 77,000 square feet of additional commercial space and 40 multifamily units. This assumes a 75% commercial and 25% residential split, with residential

at 17 dwelling units per acre. This also assumes a shoreline setback of 50 feet for purposes of a conservative estimate.

6.2.2 City of Wenatchee

The City has adopted the Wenatchee Waterfront Sub-area Plan for an area bounded by the Wenatchee River confluence on the north, the Columbia River on the east, pedestrian bridge to the south, and the BNSF Railroad tracks on the west. This plan intends to transform this area from an industrial intensive area to a mixed use district with residential, commercial, and recreation uses. Three major nodes are planned, each with a different emphasis:

- North node: commercial, recreation and residential
- Central node: recreation, retail, mixed use
- South node: mixed use development building or boating and recreation activity
An economic analysis (Berk & Associates 2003) projected the following levels of development:

- 1,440 Waterfront dwelling units developed incrementally and geographically spread over the south, central and north ends of the Waterfront;
- 96,000 square feet of new retail development likely consisting of convenience and boutique shopping;
- 155,000 square feet of office space spread between the south and central portions of the Waterfront;
- Other uses that are considered: A family-oriented restaurant located on the Waterfront at the foot of Orondo; long-term development of two Waterfront hotel concepts, one catering to conference attendees and the other to tournament-goers; and indoor sports complex and a water park.
Because the Wenatchee Waterfront Sub-area Plan is much larger in area than the 200-foot shoreline jurisdiction area, these development projections are far greater than projected in the shoreline land capacity analysis for shoreline jurisdiction. Additionally, the shoreline jurisdiction largely falls on the PUD and State parkland, as well as BNSF railroad property, and thus the development there will be based on the primary function of those properties as recreation and transportation.

7. PUBLIC ACCESS ANALYSIS

Discussions in Chapters 3 and 4 describe existing and planned public access sites. This chapter describes additional opportunities for future public access sites.

7.1 Parks and Recreation Easements

This section describes lands and easements that are dedicated for public use, but which have not been fully improved. The focus is upon fishing easements along the Wenatchee River; however, Public Access maps provided with this report

generally identify fishing and recreation areas and constraints throughout the County.

The Trust for Public Land "Wenatchee Watershed Vision: Ideas for Sustaining and Enhancing a Balanced Landscape" describes the current status of fishing easements as follows:

> In the 1970s, the Chelan PUD purchased over 30 fishing easements along the Wenatchee River as part of mitigation efforts for Rocky Reach Dam. The fishing easements were transferred to the Washington Department of Fish and Game, now WDFW. The easements are an incredible public asset but have not been adequately mapped in decades and are not currently maintained. Opportunities exist to accurately map the fishing easements, contact relevant landowners, pursue "low-hanging fruit" easements, and embark on educating the public about fishing-access opportunities along the Wenatchee River. Several challenges will need to be overcome to make progress on the fishing easement issue. (The Trust for Public Land 2007)

Discussions with WDFW and PUD staff are recommended to sort out the status of the easements, and to collect legal descriptions. Easements likely need to be reviewed and surveyed prior to determining appropriate actions. Actions may include improving access on unused sites, consolidating access points for maintenance purposes, or land surplus, exchanges or purchases, etc. Scattered, small access points with low levels of alteration are preferred by some recreators for certain uses (e.g., fishing), but not others (e.g., RV camping, swim beaches, picnicking, event facilities).

The Wenatchee River fishing easements are identified generally on Public Access maps provided with this report. For purposes of the Shoreline Analysis, additional information has been added to the Public Access maps, showing the areas within shoreline jurisdiction that exceed 15% slope and areas that contain wetlands. These may be constraints to future use of unmaintained fishing easements. Opportunities for additional fishing easements may include the vacant lands that lie along the shoreline, and these are also mapped on the Public Access maps.

A summary of active Wenatchee River fishing access locations and concerns are shown in Table 37. Some of these sites encompass WDFW easements and others do not. The WDFW easements are identified generally on the Public Access maps.

Table 37. Wenatchee River fishing access locations.

Name	General Location	Comments
Braeburn Road	• Near Lake outlet • Downstream of first bridge across Wenatchee River	• Do not block access to Braeburn Road residents. • This can also be takeout for Nason Creek.

Name	General Location	Comments
Cashmere	• Downstream of Cotlets Bridge • Cross bridge, then immediately turn left onto Riverfront Drive • Park on road right-of-way, after Parkhill Street	• No facilities • Short trail to river
Cashmere Riverfront Park	• Follow signs to Riverside Park located downstream of river, right side of bridge	• Parking, restrooms, changing rooms • Landing on river right, below bridge
Confluence State Park	• Highway 2 exit at Wenatchee interchange; follow State park signs	• Requires short paddle up Columbia River • Use dock or beach
Dryden	• Access located on State Fish & Wildlife property • Below Gorilla Falls, across from irrigation flume	• Parking and toilet
Glacier View Campground	• Access located in Wenatchee National Forest • 5.5 miles from south State Park entrance • Located on opposite side of lake from other sites	• Can be takeout for White River, but shuttle is longer • Boat launch and picnic fees
Goodwin Bridge	• Road right-of-way above Snow Blind rapid • Opposite Camino Real Café	• Lift boats over guard rail
Lake Wenatchee State Park	• Use south park entrance	• Parking and boat launch fees
Lake Wenatchee – University Beach	• Parking located between YMCA camp and first houses on N Shore Road	• Path leads to N Shore Road, but no signage exists
Lake Wenatchee – Wenatchee National Forest	• Access located along Forest Service road to lake, after 1211 N Shore Drive	Problems with this Lake Wenatchee Landing Area Access • Access point is on list of land that Forest Service might sell in future • Gated dirt road is approximately one-quarter of a mile long and goes down hill • Lack of parking space
Leavenworth	• Access located on City property • East Leavenworth Road, between the bridge and Safeway shopping center • Continue approximately one-half mile and when road bends left, follow dirt road to right	• No fees for non-commercial use • Large parking area
Peshastin Dryden Dam	• Access located on Department of Transportation and Chelan Public Utility District properties	• Gate was locked in spring 2006 due to neighbor complaints, excessive littering, and damage to WSDOT equipment. • Reasons for unlocking gate: emergency vehicle access; Ability to put in and run some challenging water

Name	General Location	Comments
		• Future plans: WSDOT says site will be declared surplus in few years
Peshastin State Fish & Wildlife	• River Road	• Portable toilet • State Fish and Wildlife parking permit required • Easy carry to river
Plain	• Highway right-of-way at bridge • Bridge on Highway 209, near Plain	• Room to park approximately 4 vehicles • Upstream, river right • Carry boats to river
Rodeo Hole / Fox Access	• Access located on State Fish & Wildlife property	• Popular access point • Parking and toilet • Watch out for poison oak
Schugart Flat Gravel Pit	• Schugart Flat Road	• Caution – check suitability of eddy, especially when cfs is high
Sleepy Hollow Bridge	• Access located on Chelan County property • River access is left of power pole	• After unloading, return to Lower Sunnyslope Road and park • This site was only recently made available. • During summer, toilet available on other side of road
Monitor #1	• Access located on State Fish & Wildlife property • Cross bridge at town of Monitor, then turn right	
Monitor #2	• Access located on State Fish & Wildlife property. Old Monitor Road to dirt road. • Located just above fish trap	
Tumwater Campground	• Located along Highway 2 in the Wenatchee National Forest • Located at bridge just south of campground entrance	• Large parking area near bridge • Access upstream of bridge • Access trail to river is steep • Check out eddy before shuttle and launch
Turkey Shoot Road	• Access located on State Fish & Wildlife property • Turkey Shoot Road. Continue 0.7 miles to access point at end of road	• Toilet • Easy carry to river

Source: Pers. com., Spencer, 2008

7.2 Opportunities for Future Public Access

This section describes opportunities for future public access along shorelines in Chelan County beyond those identified in County and City plans. Opportunities include road/street ends, potential acquisitions based on vacant parcels, and "no owner" parcels, land trust activities, and areas where informal access is occurring now.

7.2.1 Road/Street Ends

Road or street ends consist of street segments that are not required for vehicular access and that can potentially provide the public with visual or physical access to a body of water and its shoreline. Table 38 provides a summary of the number and acres of such road/street ends that have been identified along 12 waterbodies. The most are identified along Lake Chelan and along the Wenatchee River. The potential road/street ends are mapped on the series "ROW Analysis." The maps and data require verification by City public works staffs and citizens.

Table 38. Street Ends

			Confirmed by County or City		Unconfirmed but highly probable	
Waterbody/ Jurisdiction	**Parcels**	**Acres**	**Parcels**	**Acres**	**Parcels**	**Acres**
Chiwawa River	1	0.68	1	0.68		
Columbia River[1]	18	3.89	7	1.73	11	2.15
Entiat River	7	1.18	7	1.18		
Fish Lake	1	0.63	1	0.63		
Icicle Creek	12	2.09	8	1.86	4	0.23
Lake Chelan	45	8.55	16	5.59	6	0.60
Lake Chelan: City of Chelan Analysis			23	2.36		
Lake Wenatchee	11	2.44	11	2.44		
Mad River	10	2.44	10	2.44		
Nason Creek	1	0.18	1	0.18		
Peshastin Creek	2	5.50	2	5.50		
Wenatchee River	40	5.15	33	4.35	7	0.79
TOTAL	**148**	**32.71**	**120**	**28.94**	**28**	**3.77**

[1] Two street ends along the Columbia River appear to lie in the Entiat City limits and are under review for confirmation.

The following examples of street end programs in other jurisdictions may provide management ideas for Chelan County. The City of Seattle, Washington has a "street ends" program applicable to 149 street ends. The program includes a process for improving a shoreline street end for public access and permitting of private uses. Neighbors that petition for development of a street end for public access may assume maintenance. A City resolution includes criteria to be employed in "evaluating the suitability of a street end for public use improvements, and providing that new private use permits will be granted only when there is no active proposal for a public street improvement." A City ordinance further clarified the intent and process to: "a) keep adjacent property owners from encroaching on the public's shoreline street-ends; b) encourage people with permitted encroachments to remove them; c) require unpermitted encroachments to be permitted and removed; and d) discourage private use permit applications" (City of Seattle 2008).

The City of Lakewood, Washington is currently addressing street ends around a lake. Initial staff and parks board recommendations identify particular street ends that should be retained as is, improved, leased, or vacated. The process involved two years of efforts by staff and the parks board, including consultation with citizens (City of Lakewood 2008).

An implementation strategy for the SMP could be to further study street ends for purposes of public visual or physical access.

7.2.2 Vacant and "No Owner" Parcels

Opportunities for public access and recreation properties may be found by reviewing the location of vacant parcels and parcels with "no owners" according to the Assessor records.

Vacant properties have been layered along with parks and public and protected lands inventories on "Public Access" maps. There are numerous properties without structures along shorelines in all basins and communities. Statistics regarding parcels without buildings are provided in Section 4 for each basin and City/UGA under the heading "Developing or Redeveloping Waterfronts."

"No owner" parcels are identified on inventory maps titled "ROW Analysis." These are properties for which the Assessor has not identified an owner. Some parcels may be associated with a condominium development (e.g. common open space) and are "under review," but others appear to be separate full parcels unassociated with other properties. Table 39 summarizes the number of "no owner" parcels along 17 shorelines. The full set of identified parcels requires review and conformation by the County, Cities, and citizens.

Table 39. "No Owner" Parcels

Waterbody	Total Parcels	Total Acres	No Owner		No Owner, in Review	
			Count	Acres	Count	Acres
Chiwawa River	2	3.73	1	3.05		
Columbia River	23	26.22	18	25.57	2	0.21
Dry Lake	1	0.13	1	0.13		
Eightmile Creek	2	2.20	2	2.20		
Entiat	1	0.52				
Entiat River	4	10.48	4	10.48		
Fish Lake	1	0.63	1	0.63		
Icicle Creek	16	6.21	2	5.00		
Lake Chelan	25	11.12	21	4.19	3	6.71
Lake Chelan: City Data	23	10.41				
Mad River	5	1.92	2	0.87		
Mission Creek	11	1.40	2	0.65	9	0.76
Nason Creek	3	5.93	2	5.75		
Peshastin Creek	4	10.76	4	10.76		
Roses Lake	2	0.49	1	0.26		
Stehekin River	1	1.14	1	1.14		
Wenatchee Lake	11	2.47	1	0.63		
Wenatchee River	46	30.68	17	26.35	4	1.08

Waterbody	Total Parcels	Total Acres	No Owner		No Owner, in Review	
			Count	Acres	Count	Acres
Total	181	126.43	80	98	18	9

7.2.3 Land Trusts

Two land trusts are particularly active in Chelan County: The Chelan-Douglas Land Trust and The Trust for Public Land. Both trusts have active programs for land stewardship and open space acquisition in and around Chelan County. Trust planning, stewardship and land acquisitions may help local governments and citizens to further public access goals and prioritize efforts. Recent programs are described below.

Chelan-Douglas Land Trust

The Chelan-Douglas Land Trust has a mission: "Conserving our land, our water, and our way of life through voluntary land agreements, education, partnerships, stewardship, and well planned growth." The Trust's projects along shorelines include, but are not limited to:

- White River: Working with private landowners, federal and State agencies and Chelan County to permanently protect the natural functions and scenic qualities of the White River watershed.
- Entiat River Valley: Actively involved in efforts to protect fish habitat, wildlife habitat, and floodplain function along the "Stillwaters" reach of the Entiat River.
- Icicle Valley: Acquisitions near Mountain Home Road.
- Wenatchee Valley Trail: Active planning with grant funding. (Chelan-Douglas Land Trust 2008 a, b)

The Trust for Public Land

The Trust for Public Land is a national non-profit organization, with a mission to conserve "land for people to enjoy as parks, community gardens, historic sites, rural lands, and other natural places, ensuring livable communities for generations to come." The Trust has been actively involved in land management strategies including the "Stemilt-Squilchuck Community Vision and Conceptual Plan" and "Wenatchee Watershed Vision: Ideas for Sustaining and Enhancing a Balanced Landscape."

The "Stemilt-Squilchuck Community Vision" includes a conceptual plan identifying areas in use for agricultural activities as well as areas that are suitable or should be managed as snow retention areas, primary wildlife and habitat areas, secondary wildlife and habitat areas, recreational resources, and water storage priority. The areas identified as suitable for recreation may be opportunity areas to purchase or conserve for public access.

The "Wenatchee Watershed Vision" provides a plan for "critical mass of orchards, compact urban development, biodiversity conservation, migration

corridor protection, and safe recreational corridors and connections." Biodiversity conservation and migration corridor protection is shown along the major shorelines in the basin. Recreation corridors are designated along Icicle Creek, Peshastin Creek, Mission Creek, and the Wenatchee River. Additionally, the plan identifies areas with significant mass for agriculture running along the Wenatchee River valley, and compact development in current urban areas and towns. This plan is likewise useful as a guide to potential priorities for parks and recreation plans and acquisition.

7.2.4 Public Utility District No. 1 of Chelan County

Section 3.7 describes parks and recreation facilities across the County. One key provider along shorelines in Chelan County is the Public Utility District (PUD). The PUD maintains 10 facilities and 467 acres, including, but not limited to, Entiat Park, Chelan Falls Park, Chelan Riverwalk Park, Manson Bay Park, Walla Walla Point Park, Washington Confluence State Park, and others.

The PUD has also worked with local communities in the Wenatchee River valley to plan for parks and recreation areas. In March 2003, the Upper Valley Plan for the Wenatchee River was completed to develop an interpretive program focusing on sites exhibiting the natural and cultural resources of the Wenatchee River Upper Valley. The sites are located in Leavenworth, Peshastin, Dryden, Cashmere, and Monitor. The plan was not formally adopted, but serves as a guide to identify interpretive sites, river access points, and habitat enhancement, as well as promoting tourism. The PUD worked with property owners, stakeholders, government agencies, and others. The process involved identifying opportunity sites, and analyzing and ranking them for further concept development. The five sites selected for concept development included:

- Leavenworth Fish Hatchery – Owned by the U.S. Fish and Wildlife Service, the site is described as suitable for passive recreation, interpretation, and habitat enhancement.
- Peshastin Log Deck – Owned by the Port Authority of Chelan County, the opportunities included relationship to the Port's development plans, passive recreation, interpretation, with a potential trail link to Leavenworth on an old rail bed.
- Dryden Beaver Pond – Habitat enhancement, environmental education, passive recreation, site protection, and local community use are proposed features on the Washington Department of Fish and Wildlife property.
- Cashmere Museum – Key features for the Chelan County Historical Museum-owned property include reinforcing existing and proposed interpretive displays, adding signs, trails, and an interpretive orchard at the entry.
- Monitor Eagle Overlook – This private property is described as a suitable passive recreation site with an interpretive kiosk, viewpoint, and interpretive signs, as well as bird, river, and valley viewing opportunities.

Concept plans are included in the Upper Valley Plan for the Wenatchee River and provide more detail (J.T. Atkins & Company PC and J.A. Brennan and Associates PLLC, March 2003).

7.2.5 Informal Public Access

At shoreline visioning workshops, several citizens identified informal or private access points, such as: KOA campground at Leavenworth, an informal boat launch down river of Cashmere, the mouth of the Entiat River, and "Three Fingers" in Lake Chelan. There are likely many more informal access points. Planning for more public access points in high use areas can reduce pressure at other crowded public access points and avoid trespass of private properties.

7.3 Shoreline Public Access Planning

Each jurisdiction is developing a shoreline public access plan as part of their Shoreline Master Program which identifies additional opportunities for future public access along shorelines.

8. DATA GAPS

Information was not located for the following parameters:

- Geohazard mapping for Cities of Cashmere, Entiat, and Leavenworth
- Sewer system mapping for City of Entiat
- Mapping of aquifer recharge areas
- Mapping of groundwater movement patterns – this is not a required element, but may be useful in future analysis and development siting efforts.
- Shoreline armoring mapping.

Although information about each of the above items might help develop a fuller picture of shoreline conditions and processes, it is not expected that the absence of these items would have significant impacts on the selection of environment designations or the development of the SMP. The presence/absence in shoreline jurisdiction of other environmental conditions for which data is available is expected to be more relevant to decision making.

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10. LIST OF ACRONYMS AND ABBREVIATIONS

CAO ..... Critical Areas Ordinance
cfs ..... cubic feet per second
CMZ ..... channel migration zone
Corps ..... U.S. Army Corps of Engineers
DPS ..... Distinct Population Segment
Ecology ..... Washington Department of Ecology
ESA ..... Endangered Species Act
ESU ..... Evolutionarily Significant Unit
FEMA ..... Federal Emergency Management Agency
FERC ..... Federal Energy Regulatory Commission
FIRM ..... Flood Insurance Rate Map
FWHCA ..... Fish and Wildlife Habitat Conservation Area
GIS ..... Geographic information systems
GMA ..... Growth Management Act
HFEP ..... Habitat Farming Enterprise Program
HPA ..... Hydraulic Project Approval
ICEBMP ..... Interior Columbia Basin Ecosystem Management Project
IRIS ..... Initiative for Rural Innovation and Stewardship
LCRD ..... Lake Chelan Reclamation District
LOSS ..... large on-site sewage systems
LWD ..... large woody debris
MPO ..... Metropolitan Planning Organization
MS4s ..... Small Municipal Separate Storm Sewers
NCRTPO ..... North Central Regional Transportation Planning Organization
NCW RTIP ..... North Central Washington Regional Transportation Improvement Program
NOAA Fisheries ..... National Marine Fisheries Service
NLCD ..... National Land Cover Data
NPDES ..... National Pollutant Discharge Elimination System
NRCS ..... Natural Resources Conservation Service
NWI ..... National Wetlands Inventory
OHW/M ..... ordinary high water/mark
PCBs ..... Polychlorinated biphenyls
PHS ..... Priority Habitats and Species
PUD ..... Public Utility District
RCW ..... Revised Code of Washington
RGP ..... Regional General Permit
SDP ..... Shoreline Substantial Development Permit
SEPA ..... State Environmental Policy Act
SCUP ..... Shoreline Conditional Use Permit

SMA ..... Shoreline Management Act
SMP..... Shoreline Master Program
SSURGO..... Soil Survey Geographic Database
SWS..... Shoreline Works and Structures
TMDL ..... total maximum daily load
UGA..... Urban Growth Area
USFS ..... United States Forest Service
USFWS ..... U.S. Fish and Wildlife Service
USGS..... United States Geological Survey
WAC ..... Washington Administrative Code
WCC ..... Wenatchee City Code
WDFW..... Washington Department of Fish and Wildlife
WDNR..... Washington Department of Natural Resources
WRIA..... Watershed Resource Inventory Area
WVSTAC..... Wenatchee Valley Stormwater Technical Advisory Committee
WVTC..... Wenatchee Valley Transportation Council

Appendix A: Columbia River Shoreline Photo Record

PHOTO NUM	TIMESTAMP	ORIGINAL	EAST	NORTH	ALTITUDE	DATUM	LOCALTIME	PICTURE
1	22-Sep-2011 21:08:06	Picture 001.jpg	1769630.91	155858.24	544.619	US State Plane NAD 83 Washington North ft (4601)	22-Sep-2011 14:08:06	Picture 001_tag.jpg
2	22-Sep-2011 21:08:16	Picture 002.jpg	1769635.65	155869.42	544.619	US State Plane NAD 83 Washington North ft (4601)	22-Sep-2011 14:08:16	Picture 002_tag.jpg
3	22-Sep-2011 21:08:32	Picture 003.jpg	1769615.02	155869.28	544.619	US State Plane NAD 83 Washington North ft (4601)	22-Sep-2011 14:08:32	Picture 003_tag.jpg
4	22-Sep-2011 21:08:56	Picture 004.jpg	1769552.50	155861.76	541.339	US State Plane NAD 83 Washington North ft (4601)	22-Sep-2011 14:08:56	Picture 004_tag.jpg
5	23-Sep-2011 13:46:08	Picture 005.jpg	1767616.15	163888.95	656.168	US State Plane NAD 83 Washington North ft (4601)	23-Sep-2011 06:46:08	Picture 005_tag.jpg
6	23-Sep-2011 13:46:14	Picture 006.jpg	1767615.45	163891.99	656.168	US State Plane NAD 83 Washington North ft (4601)	23-Sep-2011 06:46:14	Picture 006_tag.jpg
7	23-Sep-2011 13:47:06	Picture 007.jpg	1767603.31	163754.10	593.832	US State Plane NAD 83 Washington North ft (4601)	23-Sep-2011 06:47:06	Picture 007_tag.jpg
8	23-Sep-2011 13:47:43	Picture 008.jpg	1767640.00	163612.49	577.428	US State Plane NAD 83 Washington North ft (4601)	23-Sep-2011 06:47:43	Picture 008_tag.jpg
9	23-Sep-2011 13:49:12	Picture 009.jpg	1767802.49	163571.02	616.798	US State Plane NAD 83 Washington North ft (4601)	23-Sep-2011 06:49:12	Picture 009_tag.jpg
10	23-Sep-2011 13:49:59	Picture 010.jpg	1767929.43	163500.94	636.483	US State Plane NAD 83 Washington North ft (4601)	23-Sep-2011 06:49:59	Picture 010_tag.jpg
11	23-Sep-2011 13:50:33	Picture 011.jpg	1768001.83	163466.98	643.045	US State Plane NAD 83 Washington North ft (4601)	23-Sep-2011 06:50:33	Picture 011_tag.jpg
12	23-Sep-2011 13:51:00	Picture 012.jpg	1768088.72	163425.00	649.606	US State Plane NAD 83 Washington North ft (4601)	23-Sep-2011 06:51:00	Picture 012_tag.jpg
13	23-Sep-2011 13:51:12	Picture 013.jpg	1768125.93	163411.07	646.325	US State Plane NAD 83 Washington North ft (4601)	23-Sep-2011 06:51:12	Picture 013_tag.jpg
14	23-Sep-2011 13:51:27	Picture 014.jpg	1768172.77	163396.18	643.045	US State Plane NAD 83 Washington North ft (4601)	23-Sep-2011 06:51:27	Picture 014_tag.jpg

15	23-Sep-2011 13:51:43	Picture 015.jpg	1768223.10	163373.21	646.325	US State Plane NAD 83 Washington North ft (4601)	23-Sep-2011 06:51:43	Picture 015_tag.jpg
16	23-Sep-2011 13:51:56	Picture 016.jpg	1768266.46	163364.39	649.606	US State Plane NAD 83 Washington North ft (4601)	23-Sep-2011 06:51:56	Picture 016_tag.jpg
17	23-Sep-2011 13:52:18	Picture 017.jpg	1768347.07	163335.54	652.887	US State Plane NAD 83 Washington North ft (4601)	23-Sep-2011 06:52:18	Picture 017_tag.jpg
18	23-Sep-2011 13:52:34	Picture 018.jpg	1768396.75	163307.50	656.168	US State Plane NAD 83 Washington North ft (4601)	23-Sep-2011 06:52:34	Picture 018_tag.jpg
19	23-Sep-2011 13:52:52	Picture 019.jpg	1768459.01	163248.14	652.887	US State Plane NAD 83 Washington North ft (4601)	23-Sep-2011 06:52:52	Picture 019_tag.jpg
20	23-Sep-2011 13:53:04	Picture 020.jpg	1768496.50	163193.68	652.887	US State Plane NAD 83 Washington North ft (4601)	23-Sep-2011 06:53:04	Picture 020_tag.jpg
21	23-Sep-2011 13:53:32	Picture 021.jpg	1768606.66	163064.72	659.449	US State Plane NAD 83 Washington North ft (4601)	23-Sep-2011 06:53:32	Picture 021_tag.jpg
22	23-Sep-2011 13:53:54	Picture 022.jpg	1768669.92	162958.75	659.449	US State Plane NAD 83 Washington North ft (4601)	23-Sep-2011 06:53:54	Picture 022_tag.jpg
23	23-Sep-2011 13:54:19	Picture 023.jpg	1768753.94	162832.66	666.011	US State Plane NAD 83 Washington North ft (4601)	23-Sep-2011 06:54:19	Picture 023_tag.jpg
24	23-Sep-2011 13:54:49	Picture 024.jpg	1768848.39	162689.42	649.606	US State Plane NAD 83 Washington North ft (4601)	23-Sep-2011 06:54:49	Picture 024_tag.jpg
25	23-Sep-2011 13:55:19	Picture 025.jpg	1768857.68	162535.46	656.168	US State Plane NAD 83 Washington North ft (4601)	23-Sep-2011 06:55:19	Picture 025_tag.jpg
26	23-Sep-2011 13:55:55	Picture 026.jpg	1768849.55	162414.83	633.202	US State Plane NAD 83 Washington North ft (4601)	23-Sep-2011 06:55:55	Picture 026_tag.jpg
27	23-Sep-2011 13:56:21	Picture 027.jpg	1768907.79	162341.26	626.640	US State Plane NAD 83 Washington North ft (4601)	23-Sep-2011 06:56:21	Picture 027_tag.jpg
28	23-Sep-2011 13:56:54	Picture 028.jpg	1768935.05	162172.23	610.236	US State Plane NAD 83 Washington North ft (4601)	23-Sep-2011 06:56:54	Picture 028_tag.jpg
29	23-Sep-2011 13:57:13	Picture 029.jpg	1768966.01	162067.06	606.955	US State Plane NAD 83 Washington North ft (4601)	23-Sep-2011 06:57:13	Picture 029_tag.jpg
30	23-Sep-2011	Picture	1768969.	161925.	603.675	US State Plane NAD 83	23-Sep-2011	Picture

	13:57:38	030.jpg	72	22		Washington North ft (4601)	06:57:38	030_tag.jpg
31	23-Sep-2011 13:57:44	Picture 031.jpg	1768969.25	161891.78	606.955	US State Plane NAD 83 Washington North ft (4601)	23-Sep-2011 06:57:44	Picture 031_tag.jpg
32	23-Sep-2011 13:57:57	Picture 032.jpg	1768969.75	161818.83	610.236	US State Plane NAD 83 Washington North ft (4601)	23-Sep-2011 06:57:57	Picture 032_tag.jpg
33	23-Sep-2011 13:58:10	Picture 033.jpg	1768960.66	161739.74	610.236	US State Plane NAD 83 Washington North ft (4601)	23-Sep-2011 06:58:10	Picture 033_tag.jpg
34	23-Sep-2011 13:58:22	Picture 034.jpg	1768960.49	161662.73	610.236	US State Plane NAD 83 Washington North ft (4601)	23-Sep-2011 06:58:22	Picture 034_tag.jpg
35	23-Sep-2011 13:58:52	Picture 035.jpg	1768956.54	161432.69	620.079	US State Plane NAD 83 Washington North ft (4601)	23-Sep-2011 06:58:52	Picture 035_tag.jpg
36	23-Sep-2011 13:59:12	Picture 036.jpg	1768984.44	161271.77	636.483	US State Plane NAD 83 Washington North ft (4601)	23-Sep-2011 06:59:12	Picture 036_tag.jpg
37	23-Sep-2011 13:59:36	Picture 037.jpg	1769002.24	161079.37	629.921	US State Plane NAD 83 Washington North ft (4601)	23-Sep-2011 06:59:36	Picture 037_tag.jpg
38	23-Sep-2011 13:59:50	Picture 038.jpg	1769009.13	160974.04	623.360	US State Plane NAD 83 Washington North ft (4601)	23-Sep-2011 06:59:50	Picture 038_tag.jpg
39	23-Sep-2011 14:00:14	Picture 039.jpg	1769028.40	160768.48	639.764	US State Plane NAD 83 Washington North ft (4601)	23-Sep-2011 07:00:14	Picture 039_tag.jpg
40	23-Sep-2011 14:00:55	Picture 040.jpg	1769053.33	160436.30	636.483	US State Plane NAD 83 Washington North ft (4601)	23-Sep-2011 07:00:55	Picture 040_tag.jpg
41	23-Sep-2011 14:01:12	Picture 041.jpg	1769040.45	160306.51	623.360	US State Plane NAD 83 Washington North ft (4601)	23-Sep-2011 07:01:12	Picture 041_tag.jpg
42	23-Sep-2011 14:01:17	Picture 042.jpg	1769036.58	160268.99	623.360	US State Plane NAD 83 Washington North ft (4601)	23-Sep-2011 07:01:17	Picture 042_tag.jpg
43	23-Sep-2011 14:01:26	Picture 043.jpg	1769032.24	160199.05	620.079	US State Plane NAD 83 Washington North ft (4601)	23-Sep-2011 07:01:26	Picture 043_tag.jpg
44	23-Sep-2011 14:01:34	Picture 044.jpg	1769037.49	160134.24	626.640	US State Plane NAD 83 Washington North ft (4601)	23-Sep-2011 07:01:34	Picture 044_tag.jpg
45	23-Sep-2011 14:01:45	Picture 045.jpg	1769029.16	160045.01	626.640	US State Plane NAD 83 Washington North ft (4601)	23-Sep-2011 07:01:45	Picture 045_tag.jpg

46	23-Sep-2011 14:01:50	Picture 046.jpg	1769027.38	160002.45	623.360	US State Plane NAD 83 Washington North ft (4601)	23-Sep-2011 07:01:50	Picture 046_tag.jpg
47	23-Sep-2011 14:01:55	Picture 047.jpg	1769031.74	159968.02	623.360	US State Plane NAD 83 Washington North ft (4601)	23-Sep-2011 07:01:55	Picture 047_tag.jpg
48	23-Sep-2011 14:02:09	Picture 048.jpg	1769050.22	159877.97	643.045	US State Plane NAD 83 Washington North ft (4601)	23-Sep-2011 07:02:09	Picture 048_tag.jpg
49	23-Sep-2011 14:02:15	Picture 049.jpg	1769058.06	159836.48	656.168	US State Plane NAD 83 Washington North ft (4601)	23-Sep-2011 07:02:15	Picture 049_tag.jpg
50	23-Sep-2011 14:02:30	Picture 050.jpg	1769080.89	159714.03	662.730	US State Plane NAD 83 Washington North ft (4601)	23-Sep-2011 07:02:30	Picture 050_tag.jpg
51	23-Sep-2011 14:02:40	Picture 051.jpg	1769106.82	159641.25	659.449	US State Plane NAD 83 Washington North ft (4601)	23-Sep-2011 07:02:40	Picture 051_tag.jpg
52	23-Sep-2011 14:02:51	Picture 052.jpg	1769115.03	159546.06	649.606	US State Plane NAD 83 Washington North ft (4601)	23-Sep-2011 07:02:51	Picture 052_tag.jpg
53	23-Sep-2011 14:03:03	Picture 053.jpg	1769134.21	159453.98	652.887	US State Plane NAD 83 Washington North ft (4601)	23-Sep-2011 07:03:03	Picture 053_tag.jpg
54	23-Sep-2011 14:03:12	Picture 054.jpg	1769164.28	159379.20	646.325	US State Plane NAD 83 Washington North ft (4601)	23-Sep-2011 07:03:12	Picture 054_tag.jpg
55	23-Sep-2011 14:03:37	Picture 055.jpg	1769239.71	159204.42	649.606	US State Plane NAD 83 Washington North ft (4601)	23-Sep-2011 07:03:37	Picture 055_tag.jpg
56	23-Sep-2011 14:03:51	Picture 056.jpg	1769264.41	159110.35	646.325	US State Plane NAD 83 Washington North ft (4601)	23-Sep-2011 07:03:51	Picture 056_tag.jpg
57	23-Sep-2011 14:04:02	Picture 057.jpg	1769286.29	159026.40	652.887	US State Plane NAD 83 Washington North ft (4601)	23-Sep-2011 07:04:02	Picture 057_tag.jpg
58	23-Sep-2011 14:04:18	Picture 058.jpg	1769324.00	158939.51	652.887	US State Plane NAD 83 Washington North ft (4601)	23-Sep-2011 07:04:18	Picture 058_tag.jpg
59	23-Sep-2011 14:04:44	Picture 059.jpg	1769357.22	158805.99	652.887	US State Plane NAD 83 Washington North ft (4601)	23-Sep-2011 07:04:44	Picture 059_tag.jpg
60	23-Sep-2011 14:05:13	Picture 060.jpg	1769445.38	158681.95	646.325	US State Plane NAD 83 Washington North ft (4601)	23-Sep-2011 07:05:13	Picture 060_tag.jpg
61	23-Sep-2011	Picture	1769487.	158587.	636.483	US State Plane NAD 83	23-Sep-2011	Picture

	14:05:35	061.jpg	96	00		Washington North ft (4601)	07:05:35	061_tag.jpg
62	23-Sep-2011 14:06:00	Picture 062.jpg	1769462.75	158451.05	639.764	US State Plane NAD 83 Washington North ft (4601)	23-Sep-2011 07:06:00	Picture 062_tag.jpg
63	23-Sep-2011 14:06:24	Picture 063.jpg	1769501.92	158353.03	623.360	US State Plane NAD 83 Washington North ft (4601)	23-Sep-2011 07:06:24	Picture 063_tag.jpg
64	23-Sep-2011 14:06:39	Picture 064.jpg	1769565.54	158299.76	616.798	US State Plane NAD 83 Washington North ft (4601)	23-Sep-2011 07:06:39	Picture 064_tag.jpg
65	23-Sep-2011 14:06:46	Picture 065.jpg	1769590.52	158265.47	620.079	US State Plane NAD 83 Washington North ft (4601)	23-Sep-2011 07:06:46	Picture 065_tag.jpg
66	23-Sep-2011 14:07:10	Picture 066.jpg	1769662.85	158143.36	610.236	US State Plane NAD 83 Washington North ft (4601)	23-Sep-2011 07:07:10	Picture 066_tag.jpg
67	23-Sep-2011 14:07:16	Picture 067.jpg	1769684.47	158097.91	606.955	US State Plane NAD 83 Washington North ft (4601)	23-Sep-2011 07:07:16	Picture 067_tag.jpg
68	23-Sep-2011 14:07:22	Picture 068.jpg	1769706.01	158065.63	610.236	US State Plane NAD 83 Washington North ft (4601)	23-Sep-2011 07:07:22	Picture 068_tag.jpg
69	23-Sep-2011 14:07:36	Picture 069.jpg	1769776.59	157998.22	606.955	US State Plane NAD 83 Washington North ft (4601)	23-Sep-2011 07:07:36	Picture 069_tag.jpg
70	23-Sep-2011 14:07:45	Picture 070.jpg	1769825.66	157961.07	597.113	US State Plane NAD 83 Washington North ft (4601)	23-Sep-2011 07:07:45	Picture 070_tag.jpg
71	23-Sep-2011 14:07:58	Picture 071.jpg	1769870.88	157884.37	600.394	US State Plane NAD 83 Washington North ft (4601)	23-Sep-2011 07:07:58	Picture 071_tag.jpg
72	23-Sep-2011 14:08:11	Picture 072.jpg	1769901.70	157800.47	606.955	US State Plane NAD 83 Washington North ft (4601)	23-Sep-2011 07:08:11	Picture 072_tag.jpg
73	23-Sep-2011 14:08:25	Picture 073.jpg	1769935.26	157718.63	606.955	US State Plane NAD 83 Washington North ft (4601)	23-Sep-2011 07:08:25	Picture 073_tag.jpg
74	23-Sep-2011 14:08:35	Picture 074.jpg	1769961.23	157640.78	616.798	US State Plane NAD 83 Washington North ft (4601)	23-Sep-2011 07:08:35	Picture 074_tag.jpg
75	23-Sep-2011 14:08:46	Picture 075.jpg	1769997.38	157581.25	620.079	US State Plane NAD 83 Washington North ft (4601)	23-Sep-2011 07:08:46	Picture 075_tag.jpg
76	23-Sep-2011 14:08:57	Picture 076.jpg	1770042.54	157512.65	616.798	US State Plane NAD 83 Washington North ft (4601)	23-Sep-2011 07:08:57	Picture 076_tag.jpg

77	23-Sep-2011 14:09:05	Picture 077.jpg	1770073.19	157454.09	626.640	US State Plane NAD 83 Washington North ft (4601)	23-Sep-2011 07:09:05	Picture 077_tag.jpg
78	23-Sep-2011 14:09:14	Picture 078.jpg	1770108.71	157388.47	626.640	US State Plane NAD 83 Washington North ft (4601)	23-Sep-2011 07:09:14	Picture 078_tag.jpg
79	23-Sep-2011 14:09:21	Picture 079.jpg	1770135.14	157343.06	613.517	US State Plane NAD 83 Washington North ft (4601)	23-Sep-2011 07:09:21	Picture 079_tag.jpg
80	23-Sep-2011 14:09:30	Picture 080.jpg	1770170.71	157270.34	623.360	US State Plane NAD 83 Washington North ft (4601)	23-Sep-2011 07:09:30	Picture 080_tag.jpg
81	23-Sep-2011 14:09:38	Picture 081.jpg	1770201.38	157208.74	613.517	US State Plane NAD 83 Washington North ft (4601)	23-Sep-2011 07:09:38	Picture 081_tag.jpg
82	23-Sep-2011 14:09:55	Picture 082.jpg	1770269.00	157072.41	606.955	US State Plane NAD 83 Washington North ft (4601)	23-Sep-2011 07:09:55	Picture 082_tag.jpg
83	23-Sep-2011 14:10:03	Picture 083.jpg	1770292.82	157008.74	616.798	US State Plane NAD 83 Washington North ft (4601)	23-Sep-2011 07:10:03	Picture 083_tag.jpg
84	23-Sep-2011 14:10:13	Picture 084.jpg	1770335.22	156941.14	610.236	US State Plane NAD 83 Washington North ft (4601)	23-Sep-2011 07:10:13	Picture 084_tag.jpg
85	23-Sep-2011 14:10:22	Picture 085.jpg	1770374.84	156878.59	610.236	US State Plane NAD 83 Washington North ft (4601)	23-Sep-2011 07:10:22	Picture 085_tag.jpg
86	23-Sep-2011 14:10:28	Picture 086.jpg	1770401.94	156836.22	597.113	US State Plane NAD 83 Washington North ft (4601)	23-Sep-2011 07:10:28	Picture 086_tag.jpg
87	23-Sep-2011 14:10:36	Picture 087.jpg	1770429.15	156778.65	603.675	US State Plane NAD 83 Washington North ft (4601)	23-Sep-2011 07:10:36	Picture 087_tag.jpg
88	23-Sep-2011 14:10:47	Picture 088.jpg	1770470.31	156691.79	603.675	US State Plane NAD 83 Washington North ft (4601)	23-Sep-2011 07:10:47	Picture 088_tag.jpg
89	23-Sep-2011 14:10:53	Picture 089.jpg	1770491.93	156648.36	600.394	US State Plane NAD 83 Washington North ft (4601)	23-Sep-2011 07:10:53	Picture 089_tag.jpg
90	23-Sep-2011 14:11:04	Picture 090.jpg	1770534.43	156566.58	590.551	US State Plane NAD 83 Washington North ft (4601)	23-Sep-2011 07:11:04	Picture 090_tag.jpg
91	23-Sep-2011 14:11:19	Picture 091.jpg	1770619.75	156457.73	606.955	US State Plane NAD 83 Washington North ft (4601)	23-Sep-2011 07:11:19	Picture 091_tag.jpg
92	23-Sep-2011	Picture	1770660.	156396.	613.517	US State Plane NAD 83	23-Sep-2011	Picture

	14:11:28	092.jpg	74	20		Washington North ft (4601)	07:11:28	092_tag.jpg
93	23-Sep-2011 14:11:37	Picture 093.jpg	1770705.16	156335.71	620.079	US State Plane NAD 83 Washington North ft (4601)	23-Sep-2011 07:11:37	Picture 093_tag.jpg
94	23-Sep-2011 14:11:47	Picture 094.jpg	1770751.02	156266.11	626.640	US State Plane NAD 83 Washington North ft (4601)	23-Sep-2011 07:11:47	Picture 094_tag.jpg
95	23-Sep-2011 14:11:53	Picture 095.jpg	1770778.12	156223.74	626.640	US State Plane NAD 83 Washington North ft (4601)	23-Sep-2011 07:11:53	Picture 095_tag.jpg
96	23-Sep-2011 14:12:10	Picture 096.jpg	1770851.22	156092.51	613.517	US State Plane NAD 83 Washington North ft (4601)	23-Sep-2011 07:12:10	Picture 096_tag.jpg
97	23-Sep-2011 14:12:16	Picture 097.jpg	1770875.58	156050.12	613.517	US State Plane NAD 83 Washington North ft (4601)	23-Sep-2011 07:12:16	Picture 097_tag.jpg
98	23-Sep-2011 14:12:27	Picture 098.jpg	1770920.84	155967.35	616.798	US State Plane NAD 83 Washington North ft (4601)	23-Sep-2011 07:12:27	Picture 098_tag.jpg
99	23-Sep-2011 14:12:32	Picture 099.jpg	1770940.34	155932.02	613.517	US State Plane NAD 83 Washington North ft (4601)	23-Sep-2011 07:12:32	Picture 099_tag.jpg
100	23-Sep-2011 14:12:37	Picture 100.jpg	1770966.71	155895.72	610.236	US State Plane NAD 83 Washington North ft (4601)	23-Sep-2011 07:12:37	Picture 100_tag.jpg
101	23-Sep-2011 14:12:43	Picture 101.jpg	1770995.88	155854.38	610.236	US State Plane NAD 83 Washington North ft (4601)	23-Sep-2011 07:12:43	Picture 101_tag.jpg
102	23-Sep-2011 14:12:53	Picture 102.jpg	1771030.79	155776.59	613.517	US State Plane NAD 83 Washington North ft (4601)	23-Sep-2011 07:12:53	Picture 102_tag.jpg
103	23-Sep-2011 14:13:11	Picture 103.jpg	1771094.94	155647.34	613.517	US State Plane NAD 83 Washington North ft (4601)	23-Sep-2011 07:13:11	Picture 103_tag.jpg
104	23-Sep-2011 14:13:15	Picture 104.jpg	1771112.33	155618.07	613.517	US State Plane NAD 83 Washington North ft (4601)	23-Sep-2011 07:13:15	Picture 104_tag.jpg
105	23-Sep-2011 14:13:20	Picture 105.jpg	1771131.15	155581.72	610.236	US State Plane NAD 83 Washington North ft (4601)	23-Sep-2011 07:13:20	Picture 105_tag.jpg
106	23-Sep-2011 14:13:43	Picture 106.jpg	1771181.12	155413.86	613.517	US State Plane NAD 83 Washington North ft (4601)	23-Sep-2011 07:13:43	Picture 106_tag.jpg
107	23-Sep-2011 14:13:55	Picture 107.jpg	1771213.30	155334.04	616.798	US State Plane NAD 83 Washington North ft (4601)	23-Sep-2011 07:13:55	Picture 107_tag.jpg

108	23-Sep-2011 14:14:06	Picture 108.jpg	1771235.20	155250.09	620.079	US State Plane NAD 83 Washington North ft (4601)	23-Sep-2011 07:14:06	Picture 108_tag.jpg
109	23-Sep-2011 14:14:15	Picture 109.jpg	1771240.48	155182.23	616.798	US State Plane NAD 83 Washington North ft (4601)	23-Sep-2011 07:14:15	Picture 109_tag.jpg
110	23-Sep-2011 14:14:23	Picture 110.jpg	1771249.80	155126.57	620.079	US State Plane NAD 83 Washington North ft (4601)	23-Sep-2011 07:14:23	Picture 110_tag.jpg
111	23-Sep-2011 14:14:37	Picture 111.jpg	1771279.30	155036.59	613.517	US State Plane NAD 83 Washington North ft (4601)	23-Sep-2011 07:14:37	Picture 111_tag.jpg
112	23-Sep-2011 14:14:50	Picture 112.jpg	1771294.38	154943.48	603.675	US State Plane NAD 83 Washington North ft (4601)	23-Sep-2011 07:14:50	Picture 112_tag.jpg
113	23-Sep-2011 14:15:06	Picture 113.jpg	1771311.01	154825.04	606.955	US State Plane NAD 83 Washington North ft (4601)	23-Sep-2011 07:15:06	Picture 113_tag.jpg
114	23-Sep-2011 14:15:17	Picture 114.jpg	1771334.92	154748.19	603.675	US State Plane NAD 83 Washington North ft (4601)	23-Sep-2011 07:15:17	Picture 114_tag.jpg
115	23-Sep-2011 14:15:29	Picture 115.jpg	1771367.81	154665.33	610.236	US State Plane NAD 83 Washington North ft (4601)	23-Sep-2011 07:15:29	Picture 115_tag.jpg
116	23-Sep-2011 14:15:45	Picture 116.jpg	1771408.51	154546.05	606.955	US State Plane NAD 83 Washington North ft (4601)	23-Sep-2011 07:15:45	Picture 116_tag.jpg
117	23-Sep-2011 14:16:13	Picture 117.jpg	1771446.51	154320.35	597.113	US State Plane NAD 83 Washington North ft (4601)	23-Sep-2011 07:16:13	Picture 117_tag.jpg
118	23-Sep-2011 14:16:18	Picture 118.jpg	1771450.89	154283.90	600.394	US State Plane NAD 83 Washington North ft (4601)	23-Sep-2011 07:16:18	Picture 118_tag.jpg
119	23-Sep-2011 14:16:37	Picture 119.jpg	1771506.93	154135.34	606.955	US State Plane NAD 83 Washington North ft (4601)	23-Sep-2011 07:16:37	Picture 119_tag.jpg
120	23-Sep-2011 14:16:47	Picture 120.jpg	1771529.42	154064.57	606.955	US State Plane NAD 83 Washington North ft (4601)	23-Sep-2011 07:16:47	Picture 120_tag.jpg
121	23-Sep-2011 14:17:05	Picture 121.jpg	1771578.48	153930.14	603.675	US State Plane NAD 83 Washington North ft (4601)	23-Sep-2011 07:17:05	Picture 121_tag.jpg
122	23-Sep-2011 14:17:26	Picture 122.jpg	1771625.61	153777.46	600.394	US State Plane NAD 83 Washington North ft (4601)	23-Sep-2011 07:17:26	Picture 122_tag.jpg
123	23-Sep-2011	Picture	1771727.	153630.	606.955	US State Plane NAD 83	23-Sep-2011	Picture

	14:17:47	123.jpg	03	23		Washington North ft (4601)	07:17:47	123_tag.jpg
124	23-Sep-2011 14:17:59	Picture 124.jpg	1771757.87	153545.32	623.360	US State Plane NAD 83 Washington North ft (4601)	23-Sep-2011 07:17:59	Picture 124_tag.jpg
125	23-Sep-2011 14:18:12	Picture 125.jpg	1771775.01	153454.25	629.921	US State Plane NAD 83 Washington North ft (4601)	23-Sep-2011 07:18:12	Picture 125_tag.jpg
126	23-Sep-2011 14:18:25	Picture 126.jpg	1771812.15	153353.18	623.360	US State Plane NAD 83 Washington North ft (4601)	23-Sep-2011 07:18:25	Picture 126_tag.jpg
127	23-Sep-2011 14:18:39	Picture 127.jpg	1771878.74	153270.55	633.202	US State Plane NAD 83 Washington North ft (4601)	23-Sep-2011 07:18:39	Picture 127_tag.jpg
128	23-Sep-2011 14:18:58	Picture 128.jpg	1771932.67	153130.08	623.360	US State Plane NAD 83 Washington North ft (4601)	23-Sep-2011 07:18:58	Picture 128_tag.jpg
129	23-Sep-2011 14:19:08	Picture 129.jpg	1771968.90	153062.44	626.640	US State Plane NAD 83 Washington North ft (4601)	23-Sep-2011 07:19:08	Picture 129_tag.jpg
130	23-Sep-2011 14:19:22	Picture 130.jpg	1772028.01	152967.60	629.921	US State Plane NAD 83 Washington North ft (4601)	23-Sep-2011 07:19:22	Picture 130_tag.jpg
131	23-Sep-2011 14:19:31	Picture 131.jpg	1772057.99	152908.03	639.764	US State Plane NAD 83 Washington North ft (4601)	23-Sep-2011 07:19:31	Picture 131_tag.jpg
132	23-Sep-2011 14:19:40	Picture 132.jpg	1772079.82	152834.21	639.764	US State Plane NAD 83 Washington North ft (4601)	23-Sep-2011 07:19:40	Picture 132_tag.jpg
133	23-Sep-2011 14:19:54	Picture 133.jpg	1772132.85	152724.13	639.764	US State Plane NAD 83 Washington North ft (4601)	23-Sep-2011 07:19:54	Picture 133_tag.jpg
134	23-Sep-2011 14:20:12	Picture 134.jpg	1772203.21	152593.91	620.079	US State Plane NAD 83 Washington North ft (4601)	23-Sep-2011 07:20:12	Picture 134_tag.jpg
135	23-Sep-2011 14:20:31	Picture 135.jpg	1772272.25	152456.58	606.955	US State Plane NAD 83 Washington North ft (4601)	23-Sep-2011 07:20:31	Picture 135_tag.jpg
136	23-Sep-2011 14:20:55	Picture 136.jpg	1772354.57	152287.94	616.798	US State Plane NAD 83 Washington North ft (4601)	23-Sep-2011 07:20:55	Picture 136_tag.jpg
137	23-Sep-2011 14:21:10	Picture 137.jpg	1772409.02	152171.79	620.079	US State Plane NAD 83 Washington North ft (4601)	23-Sep-2011 07:21:10	Picture 137_tag.jpg
138	23-Sep-2011 14:21:17	Picture 138.jpg	1772436.91	152117.26	620.079	US State Plane NAD 83 Washington North ft (4601)	23-Sep-2011 07:21:17	Picture 138_tag.jpg

139	23-Sep-2011 14:21:25	Picture 139.jpg	1772479.26	152059.80	613.517	US State Plane NAD 83 Washington North ft (4601)	23-Sep-2011 07:21:25	Picture 139_tag.jpg
140	23-Sep-2011 14:21:39	Picture 140.jpg	1772539.75	151965.99	613.517	US State Plane NAD 83 Washington North ft (4601)	23-Sep-2011 07:21:39	Picture 140_tag.jpg
141	23-Sep-2011 14:21:57	Picture 141.jpg	1772623.26	151824.71	613.517	US State Plane NAD 83 Washington North ft (4601)	23-Sep-2011 07:21:57	Picture 141_tag.jpg
142	23-Sep-2011 14:22:06	Picture 142.jpg	1772665.71	151754.08	616.798	US State Plane NAD 83 Washington North ft (4601)	23-Sep-2011 07:22:06	Picture 142_tag.jpg
143	23-Sep-2011 14:22:24	Picture 143.jpg	1772732.64	151623.83	623.360	US State Plane NAD 83 Washington North ft (4601)	23-Sep-2011 07:22:24	Picture 143_tag.jpg
144	23-Sep-2011 14:22:35	Picture 144.jpg	1772765.43	151557.18	629.921	US State Plane NAD 83 Washington North ft (4601)	23-Sep-2011 07:22:35	Picture 144_tag.jpg
145	23-Sep-2011 14:22:52	Picture 145.jpg	1772826.07	151441.08	633.202	US State Plane NAD 83 Washington North ft (4601)	23-Sep-2011 07:22:52	Picture 145_tag.jpg
146	23-Sep-2011 14:23:09	Picture 146.jpg	1772875.12	151311.72	636.483	US State Plane NAD 83 Washington North ft (4601)	23-Sep-2011 07:23:09	Picture 146_tag.jpg
147	23-Sep-2011 14:23:28	Picture 147.jpg	1772945.48	151182.51	626.640	US State Plane NAD 83 Washington North ft (4601)	23-Sep-2011 07:23:28	Picture 147_tag.jpg
148	23-Sep-2011 14:23:41	Picture 148.jpg	1772991.49	151093.67	626.640	US State Plane NAD 83 Washington North ft (4601)	23-Sep-2011 07:23:41	Picture 148_tag.jpg
149	23-Sep-2011 14:23:56	Picture 149.jpg	1773031.56	150969.31	636.483	US State Plane NAD 83 Washington North ft (4601)	23-Sep-2011 07:23:56	Picture 149_tag.jpg
150	23-Sep-2011 14:24:07	Picture 150.jpg	1773047.35	150875.19	626.640	US State Plane NAD 83 Washington North ft (4601)	23-Sep-2011 07:24:07	Picture 150_tag.jpg
151	23-Sep-2011 14:24:18	Picture 151.jpg	1773045.87	150791.08	626.640	US State Plane NAD 83 Washington North ft (4601)	23-Sep-2011 07:24:18	Picture 151_tag.jpg
152	23-Sep-2011 14:24:31	Picture 152.jpg	1773069.23	150696.00	623.360	US State Plane NAD 83 Washington North ft (4601)	23-Sep-2011 07:24:31	Picture 152_tag.jpg
153	23-Sep-2011 14:24:43	Picture 153.jpg	1773100.08	150612.11	636.483	US State Plane NAD 83 Washington North ft (4601)	23-Sep-2011 07:24:43	Picture 153_tag.jpg
154	23-Sep-2011	Picture	1773123.	150495.	633.202	US State Plane NAD 83	23-Sep-2011	Picture

	14:24:58	154.jpg	59	75		Washington North ft (4601)	07:24:58	154_tag.jpg
155	23-Sep-2011 14:25:17	Picture 155.jpg	1773132.09	150362.06	629.921	US State Plane NAD 83 Washington North ft (4601)	23-Sep-2011 07:25:17	Picture 155_tag.jpg
156	23-Sep-2011 14:25:25	Picture 156.jpg	1773137.34	150299.27	633.202	US State Plane NAD 83 Washington North ft (4601)	23-Sep-2011 07:25:25	Picture 156_tag.jpg
157	23-Sep-2011 14:25:30	Picture 157.jpg	1773140.38	150257.75	629.921	US State Plane NAD 83 Washington North ft (4601)	23-Sep-2011 07:25:30	Picture 157_tag.jpg
158	23-Sep-2011 14:25:49	Picture 158.jpg	1773170.29	150111.03	626.640	US State Plane NAD 83 Washington North ft (4601)	23-Sep-2011 07:25:49	Picture 158_tag.jpg
159	23-Sep-2011 14:26:03	Picture 159.jpg	1773186.23	149995.63	600.394	US State Plane NAD 83 Washington North ft (4601)	23-Sep-2011 07:26:03	Picture 159_tag.jpg
160	23-Sep-2011 14:26:17	Picture 160.jpg	1773182.75	149902.39	590.551	US State Plane NAD 83 Washington North ft (4601)	23-Sep-2011 07:26:17	Picture 160_tag.jpg
161	23-Sep-2011 14:26:32	Picture 161.jpg	1773205.74	149761.70	603.675	US State Plane NAD 83 Washington North ft (4601)	23-Sep-2011 07:26:32	Picture 161_tag.jpg
162	23-Sep-2011 14:26:45	Picture 162.jpg	1773205.05	149663.41	626.640	US State Plane NAD 83 Washington North ft (4601)	23-Sep-2011 07:26:45	Picture 162_tag.jpg
163	23-Sep-2011 14:26:54	Picture 163.jpg	1773211.07	149589.49	636.483	US State Plane NAD 83 Washington North ft (4601)	23-Sep-2011 07:26:54	Picture 163_tag.jpg
164	23-Sep-2011 14:27:02	Picture 164.jpg	1773208.05	149529.68	643.045	US State Plane NAD 83 Washington North ft (4601)	23-Sep-2011 07:27:02	Picture 164_tag.jpg
165	23-Sep-2011 14:27:08	Picture 165.jpg	1773214.51	149490.21	636.483	US State Plane NAD 83 Washington North ft (4601)	23-Sep-2011 07:27:08	Picture 165_tag.jpg
166	23-Sep-2011 14:27:12	Picture 166.jpg	1773216.03	149468.94	629.921	US State Plane NAD 83 Washington North ft (4601)	23-Sep-2011 07:27:12	Picture 166_tag.jpg
167	23-Sep-2011 14:27:18	Picture 167.jpg	1773217.00	149429.43	629.921	US State Plane NAD 83 Washington North ft (4601)	23-Sep-2011 07:27:18	Picture 167_tag.jpg
168	23-Sep-2011 14:27:32	Picture 168.jpg	1773212.17	149332.13	616.798	US State Plane NAD 83 Washington North ft (4601)	23-Sep-2011 07:27:32	Picture 168_tag.jpg
169	23-Sep-2011 14:27:45	Picture 169.jpg	1773210.77	149237.88	620.079	US State Plane NAD 83 Washington North ft (4601)	23-Sep-2011 07:27:45	Picture 169_tag.jpg

170	23-Sep-2011 14:27:54	Picture 170.jpg	1773220.90	149165.00	626.640	US State Plane NAD 83 Washington North ft (4601)	23-Sep-2011 07:27:54	Picture 170_tag.jpg
171	23-Sep-2011 14:28:08	Picture 171.jpg	1773230.50	149070.83	626.640	US State Plane NAD 83 Washington North ft (4601)	23-Sep-2011 07:28:08	Picture 171_tag.jpg
172	23-Sep-2011 14:28:22	Picture 172.jpg	1773253.93	148966.63	620.079	US State Plane NAD 83 Washington North ft (4601)	23-Sep-2011 07:28:22	Picture 172_tag.jpg
173	23-Sep-2011 14:28:35	Picture 173.jpg	1773262.11	148878.53	626.640	US State Plane NAD 83 Washington North ft (4601)	23-Sep-2011 07:28:35	Picture 173_tag.jpg
174	23-Sep-2011 14:28:39	Picture 174.jpg	1773253.37	148850.10	629.921	US State Plane NAD 83 Washington North ft (4601)	23-Sep-2011 07:28:39	Picture 174_tag.jpg
175	23-Sep-2011 14:28:53	Picture 175.jpg	1773256.09	148754.87	626.640	US State Plane NAD 83 Washington North ft (4601)	23-Sep-2011 07:28:53	Picture 175_tag.jpg
176	23-Sep-2011 14:29:17	Picture 176.jpg	1773284.16	148576.73	623.360	US State Plane NAD 83 Washington North ft (4601)	23-Sep-2011 07:29:17	Picture 176_tag.jpg
177	23-Sep-2011 14:29:38	Picture 177.jpg	1773284.75	148394.35	616.798	US State Plane NAD 83 Washington North ft (4601)	23-Sep-2011 07:29:38	Picture 177_tag.jpg
178	23-Sep-2011 14:29:56	Picture 178.jpg	1773288.56	148241.37	629.921	US State Plane NAD 83 Washington North ft (4601)	23-Sep-2011 07:29:56	Picture 178_tag.jpg
179	23-Sep-2011 14:30:10	Picture 179.jpg	1773322.37	148129.14	672.572	US State Plane NAD 83 Washington North ft (4601)	23-Sep-2011 07:30:10	Picture 179_tag.jpg
180	23-Sep-2011 14:30:27	Picture 180.jpg	1773347.19	148021.90	656.168	US State Plane NAD 83 Washington North ft (4601)	23-Sep-2011 07:30:27	Picture 180_tag.jpg
181	23-Sep-2011 14:30:48	Picture 181.jpg	1773370.41	147849.81	626.640	US State Plane NAD 83 Washington North ft (4601)	23-Sep-2011 07:30:48	Picture 181_tag.jpg
182	23-Sep-2011 14:31:09	Picture 182.jpg	1773466.44	147692.41	613.517	US State Plane NAD 83 Washington North ft (4601)	23-Sep-2011 07:31:09	Picture 182_tag.jpg
183	23-Sep-2011 14:31:38	Picture 183.jpg	1773500.41	147457.57	616.798	US State Plane NAD 83 Washington North ft (4601)	23-Sep-2011 07:31:38	Picture 183_tag.jpg
184	23-Sep-2011 14:31:42	Picture 184.jpg	1773496.49	147428.16	616.798	US State Plane NAD 83 Washington North ft (4601)	23-Sep-2011 07:31:42	Picture 184_tag.jpg
185	23-Sep-2011	Picture	1773493.	147402.	610.236	US State Plane NAD 83	23-Sep-2011	Picture

	14:31:45	185.jpg	22	81		Washington North ft (4601)	07:31:45	185_tag.jpg
186	23-Sep-2011 14:31:50	Picture 186.jpg	1773496.91	147367.37	610.236	US State Plane NAD 83 Washington North ft (4601)	23-Sep-2011 07:31:50	Picture 186_tag.jpg
187	23-Sep-2011 14:32:08	Picture 187.jpg	1773549.29	147255.26	603.675	US State Plane NAD 83 Washington North ft (4601)	23-Sep-2011 07:32:08	Picture 187_tag.jpg
188	23-Sep-2011 14:32:29	Picture 188.jpg	1773617.05	147107.80	613.517	US State Plane NAD 83 Washington North ft (4601)	23-Sep-2011 07:32:29	Picture 188_tag.jpg
189	23-Sep-2011 14:32:35	Picture 189.jpg	1773640.73	147066.42	610.236	US State Plane NAD 83 Washington North ft (4601)	23-Sep-2011 07:32:35	Picture 189_tag.jpg
190	23-Sep-2011 14:32:48	Picture 190.jpg	1773644.11	146977.28	610.236	US State Plane NAD 83 Washington North ft (4601)	23-Sep-2011 07:32:48	Picture 190_tag.jpg
191	23-Sep-2011 14:33:12	Picture 191.jpg	1773632.22	146806.97	603.675	US State Plane NAD 83 Washington North ft (4601)	23-Sep-2011 07:33:12	Picture 191_tag.jpg
192	23-Sep-2011 14:33:16	Picture 192.jpg	1773626.95	146773.49	603.675	US State Plane NAD 83 Washington North ft (4601)	23-Sep-2011 07:33:16	Picture 192_tag.jpg
193	23-Sep-2011 14:33:47	Picture 193.jpg	1773696.68	146541.94	606.955	US State Plane NAD 83 Washington North ft (4601)	23-Sep-2011 07:33:47	Picture 193_tag.jpg
194	23-Sep-2011 14:33:52	Picture 194.jpg	1773709.28	146511.63	603.675	US State Plane NAD 83 Washington North ft (4601)	23-Sep-2011 07:33:52	Picture 194_tag.jpg
195	23-Sep-2011 14:34:00	Picture 195.jpg	1773729.67	146448.95	603.675	US State Plane NAD 83 Washington North ft (4601)	23-Sep-2011 07:34:00	Picture 195_tag.jpg
196	23-Sep-2011 14:34:04	Picture 196.jpg	1773740.87	146421.67	597.113	US State Plane NAD 83 Washington North ft (4601)	23-Sep-2011 07:34:04	Picture 196_tag.jpg
197	23-Sep-2011 14:34:11	Picture 197.jpg	1773772.14	146376.29	603.675	US State Plane NAD 83 Washington North ft (4601)	23-Sep-2011 07:34:11	Picture 197_tag.jpg
198	23-Sep-2011 14:34:30	Picture 198.jpg	1773893.18	146283.92	613.517	US State Plane NAD 83 Washington North ft (4601)	23-Sep-2011 07:34:30	Picture 198_tag.jpg
199	23-Sep-2011 14:34:46	Picture 199.jpg	1774005.82	146212.77	620.079	US State Plane NAD 83 Washington North ft (4601)	23-Sep-2011 07:34:46	Picture 199_tag.jpg
200	23-Sep-2011 14:35:14	Picture 200.jpg	1774200.18	146065.18	620.079	US State Plane NAD 83 Washington North ft (4601)	23-Sep-2011 07:35:14	Picture 200_tag.jpg

201	23-Sep-2011 14:35:28	Picture 201.jpg	1774288.86	145977.65	626.640	US State Plane NAD 83 Washington North ft (4601)	23-Sep-2011 07:35:28	Picture 201_tag.jpg
202	23-Sep-2011 14:35:48	Picture 202.jpg	1774401.34	145830.50	626.640	US State Plane NAD 83 Washington North ft (4601)	23-Sep-2011 07:35:48	Picture 202_tag.jpg
203	23-Sep-2011 14:36:05	Picture 203.jpg	1774482.80	145693.27	633.202	US State Plane NAD 83 Washington North ft (4601)	23-Sep-2011 07:36:05	Picture 203_tag.jpg
204	23-Sep-2011 14:36:25	Picture 204.jpg	1774574.71	145537.88	623.360	US State Plane NAD 83 Washington North ft (4601)	23-Sep-2011 07:36:25	Picture 204_tag.jpg
205	23-Sep-2011 14:36:48	Picture 205.jpg	1774692.22	145362.40	629.921	US State Plane NAD 83 Washington North ft (4601)	23-Sep-2011 07:36:48	Picture 205_tag.jpg
206	23-Sep-2011 14:37:13	Picture 206.jpg	1774839.27	145194.22	633.202	US State Plane NAD 83 Washington North ft (4601)	23-Sep-2011 07:37:13	Picture 206_tag.jpg
207	23-Sep-2011 14:37:27	Picture 207.jpg	1774928.06	145090.48	633.202	US State Plane NAD 83 Washington North ft (4601)	23-Sep-2011 07:37:27	Picture 207_tag.jpg
208	23-Sep-2011 14:37:33	Picture 208.jpg	1774955.93	145041.03	633.202	US State Plane NAD 83 Washington North ft (4601)	23-Sep-2011 07:37:33	Picture 208_tag.jpg
209	23-Sep-2011 14:37:49	Picture 209.jpg	1775000.91	144907.59	636.483	US State Plane NAD 83 Washington North ft (4601)	23-Sep-2011 07:37:49	Picture 209_tag.jpg
210	23-Sep-2011 14:38:00	Picture 210.jpg	1775031.83	144815.60	633.202	US State Plane NAD 83 Washington North ft (4601)	23-Sep-2011 07:38:00	Picture 210_tag.jpg
211	23-Sep-2011 14:38:12	Picture 211.jpg	1775099.23	144722.86	636.483	US State Plane NAD 83 Washington North ft (4601)	23-Sep-2011 07:38:12	Picture 211_tag.jpg
212	23-Sep-2011 14:38:28	Picture 212.jpg	1775175.64	144619.03	633.202	US State Plane NAD 83 Washington North ft (4601)	23-Sep-2011 07:38:28	Picture 212_tag.jpg
213	23-Sep-2011 14:38:33	Picture 213.jpg	1775193.74	144589.78	629.921	US State Plane NAD 83 Washington North ft (4601)	23-Sep-2011 07:38:33	Picture 213_tag.jpg
214	23-Sep-2011 14:38:42	Picture 214.jpg	1775216.16	144532.18	620.079	US State Plane NAD 83 Washington North ft (4601)	23-Sep-2011 07:38:42	Picture 214_tag.jpg
215	23-Sep-2011 14:39:09	Picture 215.jpg	1775291.16	144338.16	620.079	US State Plane NAD 83 Washington North ft (4601)	23-Sep-2011 07:39:09	Picture 215_tag.jpg
216	23-Sep-2011	Picture	1775301.	144307.	620.079	US State Plane NAD 83	23-Sep-2011	Picture

	14:39:13	216.jpg	00	83		Washington North ft (4601)	07:39:13	216_tag.jpg
217	23-Sep-2011 14:39:18	Picture 217.jpg	1775308. 17	144267. 36	623.360	US State Plane NAD 83 Washington North ft (4601)	23-Sep-2011 07:39:18	Picture 217_tag.jpg
218	23-Sep-2011 14:39:25	Picture 218.jpg	1775310. 60	144215. 70	620.079	US State Plane NAD 83 Washington North ft (4601)	23-Sep-2011 07:39:25	Picture 218_tag.jpg
219	23-Sep-2011 14:39:52	Picture 219.jpg	1775270. 07	144012. 76	613.517	US State Plane NAD 83 Washington North ft (4601)	23-Sep-2011 07:39:52	Picture 219_tag.jpg
220	23-Sep-2011 14:40:25	Picture 220.jpg	1775334. 97	143786. 24	633.202	US State Plane NAD 83 Washington North ft (4601)	23-Sep-2011 07:40:25	Picture 220_tag.jpg
221	23-Sep-2011 14:40:58	Picture 221.jpg	1775417. 05	143563. 91	603.675	US State Plane NAD 83 Washington North ft (4601)	23-Sep-2011 07:40:58	Picture 221_tag.jpg
222	23-Sep-2011 14:41:04	Picture 222.jpg	1775442. 78	143525. 59	603.675	US State Plane NAD 83 Washington North ft (4601)	23-Sep-2011 07:41:04	Picture 222_tag.jpg
223	23-Sep-2011 14:41:08	Picture 223.jpg	1775456. 01	143503. 39	610.236	US State Plane NAD 83 Washington North ft (4601)	23-Sep-2011 07:41:08	Picture 223_tag.jpg
224	23-Sep-2011 14:41:11	Picture 224.jpg	1775464. 35	143491. 29	613.517	US State Plane NAD 83 Washington North ft (4601)	23-Sep-2011 07:41:11	Picture 224_tag.jpg
225	23-Sep-2011 14:50:03	Picture 225.jpg	1775733. 11	144403. 10	574.147	US State Plane NAD 83 Washington North ft (4601)	23-Sep-2011 07:50:03	Picture 225_tag.jpg
226	23-Sep-2011 14:50:17	Picture 226.jpg	1775404. 44	144858. 77	587.270	US State Plane NAD 83 Washington North ft (4601)	23-Sep-2011 07:50:17	Picture 226_tag.jpg
227	23-Sep-2011 14:50:28	Picture 227.jpg	1775176. 03	145245. 23	600.394	US State Plane NAD 83 Washington North ft (4601)	23-Sep-2011 07:50:28	Picture 227_tag.jpg
228	23-Sep-2011 14:50:44	Picture 228.jpg	1774857. 55	145820. 55	610.236	US State Plane NAD 83 Washington North ft (4601)	23-Sep-2011 07:50:44	Picture 228_tag.jpg
229	23-Sep-2011 14:51:06	Picture 229.jpg	1774389. 11	146592. 39	616.798	US State Plane NAD 83 Washington North ft (4601)	23-Sep-2011 07:51:06	Picture 229_tag.jpg
230	23-Sep-2011 14:51:11	Picture 230.jpg	1774292. 87	146777. 14	610.236	US State Plane NAD 83 Washington North ft (4601)	23-Sep-2011 07:51:11	Picture 230_tag.jpg
231	23-Sep-2011 14:51:16	Picture 231.jpg	1774219. 30	146968. 13	606.955	US State Plane NAD 83 Washington North ft (4601)	23-Sep-2011 07:51:16	Picture 231_tag.jpg

232	23-Sep-2011 14:51:30	Picture 232.jpg	1774036.61	147513.00	600.394	US State Plane NAD 83 Washington North ft (4601)	23-Sep-2011 07:51:30	Picture 232_tag.jpg
233	23-Sep-2011 14:51:44	Picture 233.jpg	1773892.33	148075.37	606.955	US State Plane NAD 83 Washington North ft (4601)	23-Sep-2011 07:51:44	Picture 233_tag.jpg
234	23-Sep-2011 14:51:50	Picture 234.jpg	1773849.38	148314.19	613.517	US State Plane NAD 83 Washington North ft (4601)	23-Sep-2011 07:51:50	Picture 234_tag.jpg
235	23-Sep-2011 14:52:01	Picture 235.jpg	1773778.77	148771.70	597.113	US State Plane NAD 83 Washington North ft (4601)	23-Sep-2011 07:52:01	Picture 235_tag.jpg
236	23-Sep-2011 14:52:07	Picture 236.jpg	1773744.72	149016.67	606.955	US State Plane NAD 83 Washington North ft (4601)	23-Sep-2011 07:52:07	Picture 236_tag.jpg
237	23-Sep-2011 14:52:28	Picture 237.jpg	1773609.40	149875.98	613.517	US State Plane NAD 83 Washington North ft (4601)	23-Sep-2011 07:52:28	Picture 237_tag.jpg
238	23-Sep-2011 14:52:36	Picture 238.jpg	1773512.31	150185.36	613.517	US State Plane NAD 83 Washington North ft (4601)	23-Sep-2011 07:52:36	Picture 238_tag.jpg
239	23-Sep-2011 14:52:46	Picture 239.jpg	1773453.05	150595.32	603.675	US State Plane NAD 83 Washington North ft (4601)	23-Sep-2011 07:52:46	Picture 239_tag.jpg
240	23-Sep-2011 14:52:50	Picture 240.jpg	1773423.74	150754.20	606.955	US State Plane NAD 83 Washington North ft (4601)	23-Sep-2011 07:52:50	Picture 240_tag.jpg
241	23-Sep-2011 14:52:54	Picture 241.jpg	1773386.87	150912.01	603.675	US State Plane NAD 83 Washington North ft (4601)	23-Sep-2011 07:52:54	Picture 241_tag.jpg
242	23-Sep-2011 14:52:58	Picture 242.jpg	1773334.90	151065.66	603.675	US State Plane NAD 83 Washington North ft (4601)	23-Sep-2011 07:52:58	Picture 242_tag.jpg
243	23-Sep-2011 14:53:10	Picture 243.jpg	1773205.04	151539.98	603.675	US State Plane NAD 83 Washington North ft (4601)	23-Sep-2011 07:53:10	Picture 243_tag.jpg
244	23-Sep-2011 14:53:15	Picture 244.jpg	1773141.77	151736.11	606.955	US State Plane NAD 83 Washington North ft (4601)	23-Sep-2011 07:53:15	Picture 244_tag.jpg
245	23-Sep-2011 14:53:22	Picture 245.jpg	1773020.27	151999.72	613.517	US State Plane NAD 83 Washington North ft (4601)	23-Sep-2011 07:53:22	Picture 245_tag.jpg
246	23-Sep-2011 14:53:35	Picture 246.jpg	1772808.43	152494.75	616.798	US State Plane NAD 83 Washington North ft (4601)	23-Sep-2011 07:53:35	Picture 246_tag.jpg
247	23-Sep-2011	Picture	1772743.	152695.	620.079	US State Plane NAD 83	23-Sep-2011	Picture

	14:53:40	247.jpg	07	93		Washington North ft (4601)	07:53:40	247_tag.jpg
248	23-Sep-2011 14:53:46	Picture 248.jpg	1772670.50	152945.71	613.517	US State Plane NAD 83 Washington North ft (4601)	23-Sep-2011 07:53:46	Picture 248_tag.jpg
249	23-Sep-2011 14:53:52	Picture 249.jpg	1772597.93	153195.48	613.517	US State Plane NAD 83 Washington North ft (4601)	23-Sep-2011 07:53:52	Picture 249_tag.jpg
250	23-Sep-2011 14:53:57	Picture 250.jpg	1772524.26	153405.73	610.236	US State Plane NAD 83 Washington North ft (4601)	23-Sep-2011 07:53:57	Picture 250_tag.jpg
251	23-Sep-2011 14:54:06	Picture 251.jpg	1772375.29	153765.42	613.517	US State Plane NAD 83 Washington North ft (4601)	23-Sep-2011 07:54:06	Picture 251_tag.jpg
252	23-Sep-2011 14:54:14	Picture 252.jpg	1772232.16	154076.51	620.079	US State Plane NAD 83 Washington North ft (4601)	23-Sep-2011 07:54:14	Picture 252_tag.jpg
253	23-Sep-2011 14:54:22	Picture 253.jpg	1772100.01	154391.73	626.640	US State Plane NAD 83 Washington North ft (4601)	23-Sep-2011 07:54:22	Picture 253_tag.jpg
254	23-Sep-2011 14:54:30	Picture 254.jpg	1771984.30	154716.19	633.202	US State Plane NAD 83 Washington North ft (4601)	23-Sep-2011 07:54:30	Picture 254_tag.jpg
255	23-Sep-2011 14:54:38	Picture 255.jpg	1771875.42	155047.79	639.764	US State Plane NAD 83 Washington North ft (4601)	23-Sep-2011 07:54:38	Picture 255_tag.jpg
256	23-Sep-2011 14:54:44	Picture 256.jpg	1771791.19	155295.46	636.483	US State Plane NAD 83 Washington North ft (4601)	23-Sep-2011 07:54:44	Picture 256_tag.jpg
257	23-Sep-2011 14:54:51	Picture 257.jpg	1771689.55	155575.43	636.483	US State Plane NAD 83 Washington North ft (4601)	23-Sep-2011 07:54:51	Picture 257_tag.jpg
258	23-Sep-2011 14:54:55	Picture 258.jpg	1771630.67	155739.17	639.764	US State Plane NAD 83 Washington North ft (4601)	23-Sep-2011 07:54:55	Picture 258_tag.jpg
259	23-Sep-2011 14:54:59	Picture 259.jpg	1771573.85	155901.92	639.764	US State Plane NAD 83 Washington North ft (4601)	23-Sep-2011 07:54:59	Picture 259_tag.jpg
260	23-Sep-2011 14:55:03	Picture 260.jpg	1771515.68	156060.60	633.202	US State Plane NAD 83 Washington North ft (4601)	23-Sep-2011 07:55:03	Picture 260_tag.jpg
261	23-Sep-2011 14:55:08	Picture 261.jpg	1771444.13	156266.81	629.921	US State Plane NAD 83 Washington North ft (4601)	23-Sep-2011 07:55:08	Picture 261_tag.jpg
262	23-Sep-2011 14:55:13	Picture 262.jpg	1771366.39	156471.97	629.921	US State Plane NAD 83 Washington North ft (4601)	23-Sep-2011 07:55:13	Picture 262_tag.jpg

263	23-Sep-2011 14:55:17	Picture 263.jpg	1771298.67	156621.47	626.640	US State Plane NAD 83 Washington North ft (4601)	23-Sep-2011 07:55:17	Picture 263_tag.jpg
264	23-Sep-2011 14:55:25	Picture 264.jpg	1771150.74	156935.57	626.640	US State Plane NAD 83 Washington North ft (4601)	23-Sep-2011 07:55:25	Picture 264_tag.jpg
265	23-Sep-2011 14:55:32	Picture 265.jpg	1771005.95	157193.98	626.640	US State Plane NAD 83 Washington North ft (4601)	23-Sep-2011 07:55:32	Picture 265_tag.jpg
266	23-Sep-2011 14:55:42	Picture 266.jpg	1770782.78	157553.17	633.202	US State Plane NAD 83 Washington North ft (4601)	23-Sep-2011 07:55:42	Picture 266_tag.jpg
267	23-Sep-2011 14:55:48	Picture 267.jpg	1770660.93	157775.25	636.483	US State Plane NAD 83 Washington North ft (4601)	23-Sep-2011 07:55:48	Picture 267_tag.jpg
268	23-Sep-2011 14:55:54	Picture 268.jpg	1770556.21	158008.60	639.764	US State Plane NAD 83 Washington North ft (4601)	23-Sep-2011 07:55:54	Picture 268_tag.jpg
269	23-Sep-2011 14:55:59	Picture 269.jpg	1770472.99	158213.72	649.606	US State Plane NAD 83 Washington North ft (4601)	23-Sep-2011 07:55:59	Picture 269_tag.jpg
270	23-Sep-2011 14:56:04	Picture 270.jpg	1770392.60	158407.72	646.325	US State Plane NAD 83 Washington North ft (4601)	23-Sep-2011 07:56:04	Picture 270_tag.jpg
271	23-Sep-2011 14:56:07	Picture 271.jpg	1770350.51	158530.04	649.606	US State Plane NAD 83 Washington North ft (4601)	23-Sep-2011 07:56:07	Picture 271_tag.jpg
272	23-Sep-2011 14:56:16	Picture 272.jpg	1770228.99	158908.17	656.168	US State Plane NAD 83 Washington North ft (4601)	23-Sep-2011 07:56:16	Picture 272_tag.jpg
273	23-Sep-2011 14:56:26	Picture 273.jpg	1770096.88	159327.77	652.887	US State Plane NAD 83 Washington North ft (4601)	23-Sep-2011 07:56:26	Picture 273_tag.jpg
274	23-Sep-2011 14:56:36	Picture 274.jpg	1769962.13	159731.15	643.045	US State Plane NAD 83 Washington North ft (4601)	23-Sep-2011 07:56:36	Picture 274_tag.jpg
275	23-Sep-2011 14:56:40	Picture 275.jpg	1769924.56	159898.08	643.045	US State Plane NAD 83 Washington North ft (4601)	23-Sep-2011 07:56:40	Picture 275_tag.jpg
276	23-Sep-2011 14:56:48	Picture 276.jpg	1769841.20	160227.84	643.045	US State Plane NAD 83 Washington North ft (4601)	23-Sep-2011 07:56:48	Picture 276_tag.jpg
277	23-Sep-2011 14:56:55	Picture 277.jpg	1769777.37	160516.18	643.045	US State Plane NAD 83 Washington North ft (4601)	23-Sep-2011 07:56:55	Picture 277_tag.jpg
278	23-Sep-2011	Picture	1769725.	160820.	636.483	US State Plane NAD 83	23-Sep-2011	Picture

	14:57:02	278.jpg	12	82		Washington North ft (4601)	07:57:02	278_tag.jpg
279	23-Sep-2011 14:57:10	Picture 279.jpg	1769684.23	161172.14	633.202	US State Plane NAD 83 Washington North ft (4601)	23-Sep-2011 07:57:10	Picture 279_tag.jpg
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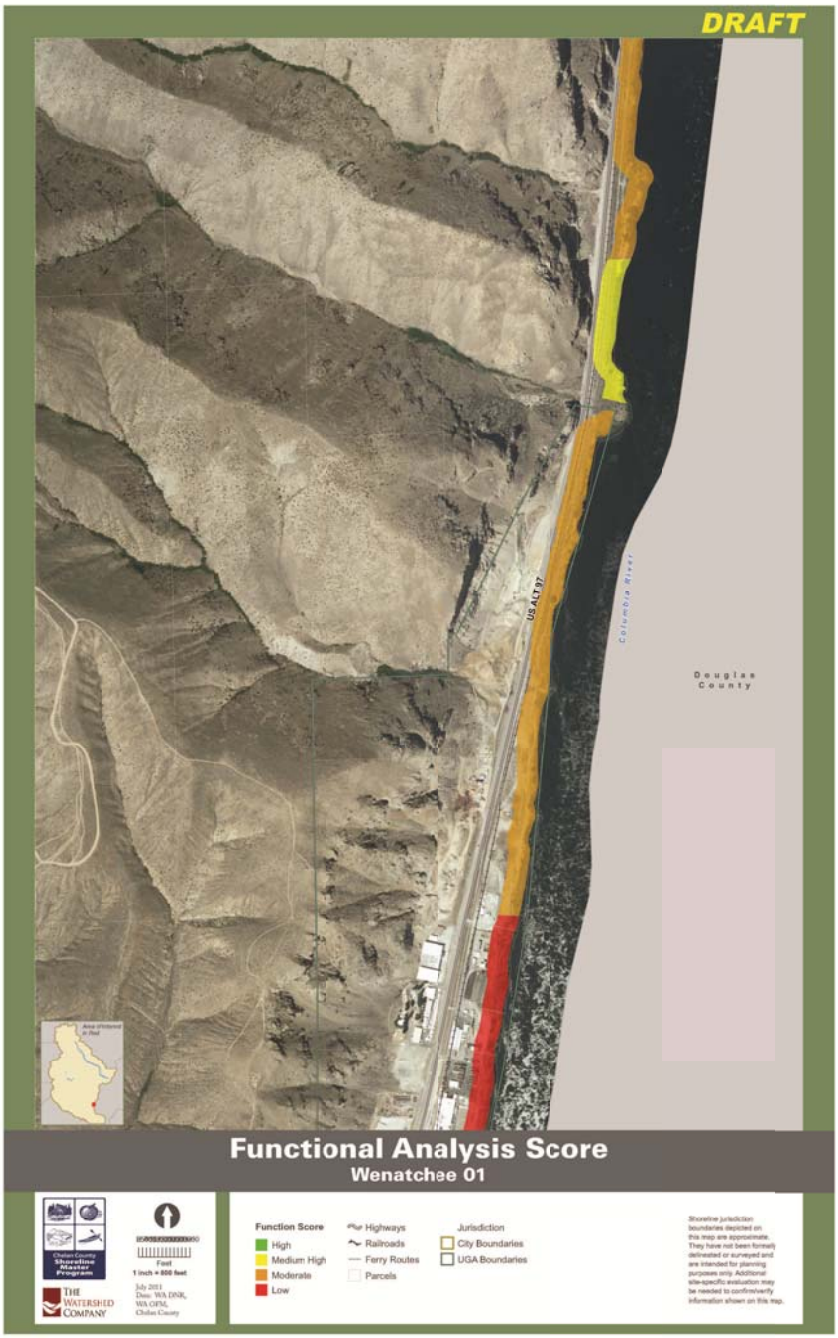
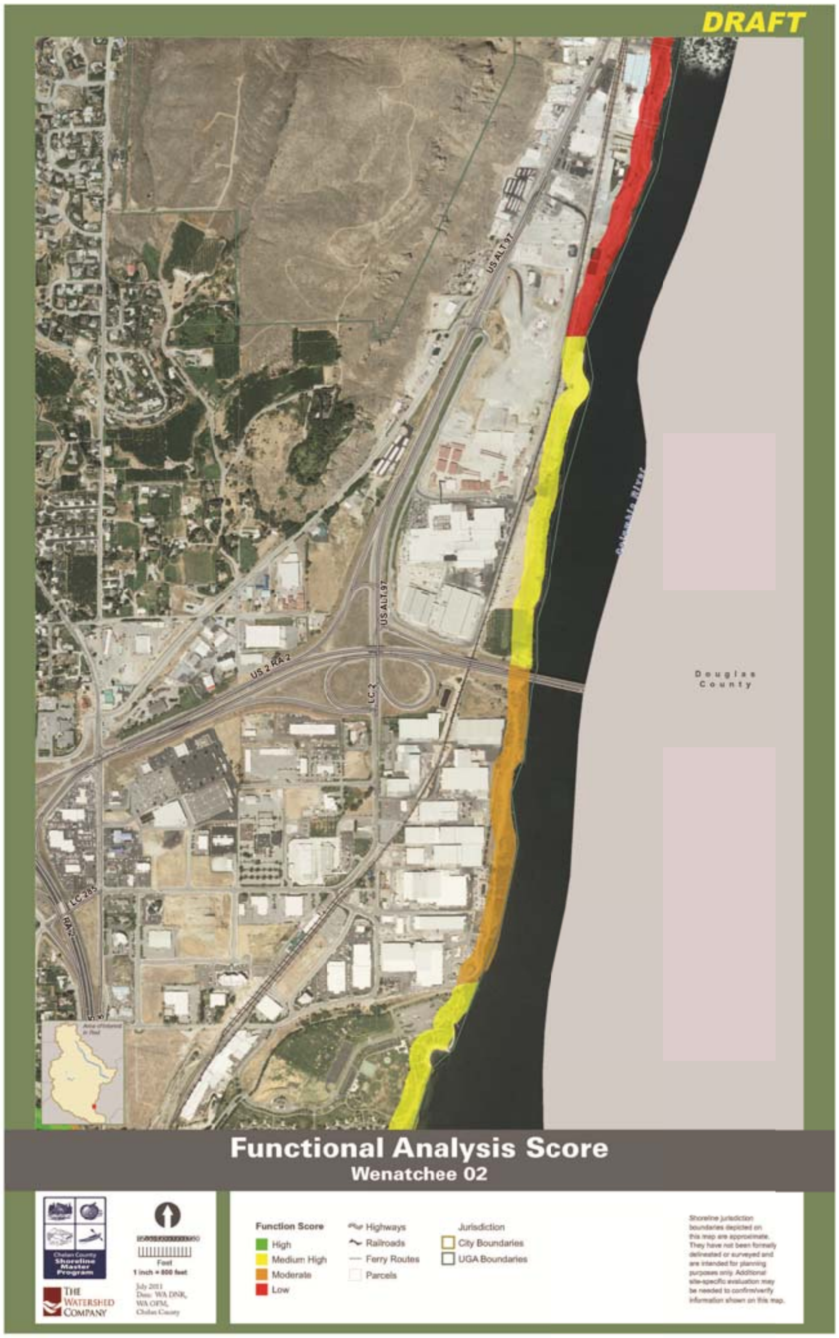
282	23-Sep-2011 14:57:35	Picture 282.jpg	1769521.88	162203.55	620.079	US State Plane NAD 83 Washington North ft (4601)	23-Sep-2011 07:57:35	Picture 282_tag.jpg
283	23-Sep-2011 14:57:38	Picture 283.jpg	1769490.78	162330.00	620.079	US State Plane NAD 83 Washington North ft (4601)	23-Sep-2011 07:57:38	Picture 283_tag.jpg
284	23-Sep-2011 14:57:43	Picture 284.jpg	1769441.31	162529.28	616.798	US State Plane NAD 83 Washington North ft (4601)	23-Sep-2011 07:57:43	Picture 284_tag.jpg
285	23-Sep-2011 14:57:51	Picture 285.jpg	1769347.04	162847.82	600.394	US State Plane NAD 83 Washington North ft (4601)	23-Sep-2011 07:57:51	Picture 285_tag.jpg
286	23-Sep-2011 14:58:00	Picture 286.jpg	1769176.96	163197.25	603.675	US State Plane NAD 83 Washington North ft (4601)	23-Sep-2011 07:58:00	Picture 286_tag.jpg
287	23-Sep-2011 14:58:04	Picture 287.jpg	1769091.44	163341.57	610.236	US State Plane NAD 83 Washington North ft (4601)	23-Sep-2011 07:58:04	Picture 287_tag.jpg
288	23-Sep-2011 14:58:08	Picture 288.jpg	1769004.58	163480.81	616.798	US State Plane NAD 83 Washington North ft (4601)	23-Sep-2011 07:58:08	Picture 288_tag.jpg
289	23-Sep-2011 14:58:08	Picture 289.jpg	1769004.58	163480.81	616.798	US State Plane NAD 83 Washington North ft (4601)	23-Sep-2011 07:58:08	Picture 289_tag.jpg
290	23-Sep-2011 14:58:15	Picture 290.jpg	1768842.05	163731.01	616.798	US State Plane NAD 83 Washington North ft (4601)	23-Sep-2011 07:58:15	Picture 290_tag.jpg
291	23-Sep-2011 14:58:23	Picture 291.jpg	1768657.97	164018.54	613.517	US State Plane NAD 83 Washington North ft (4601)	23-Sep-2011 07:58:23	Picture 291_tag.jpg
292	23-Sep-2011 14:58:34	Picture 292.jpg	1768496.10	164479.50	606.955	US State Plane NAD 83 Washington North ft (4601)	23-Sep-2011 07:58:34	Picture 292_tag.jpg
293	23-Sep-2011 14:58:42	Picture 293.jpg	1768453.23	164823.72	603.675	US State Plane NAD 83 Washington North ft (4601)	23-Sep-2011 07:58:42	Picture 293_tag.jpg

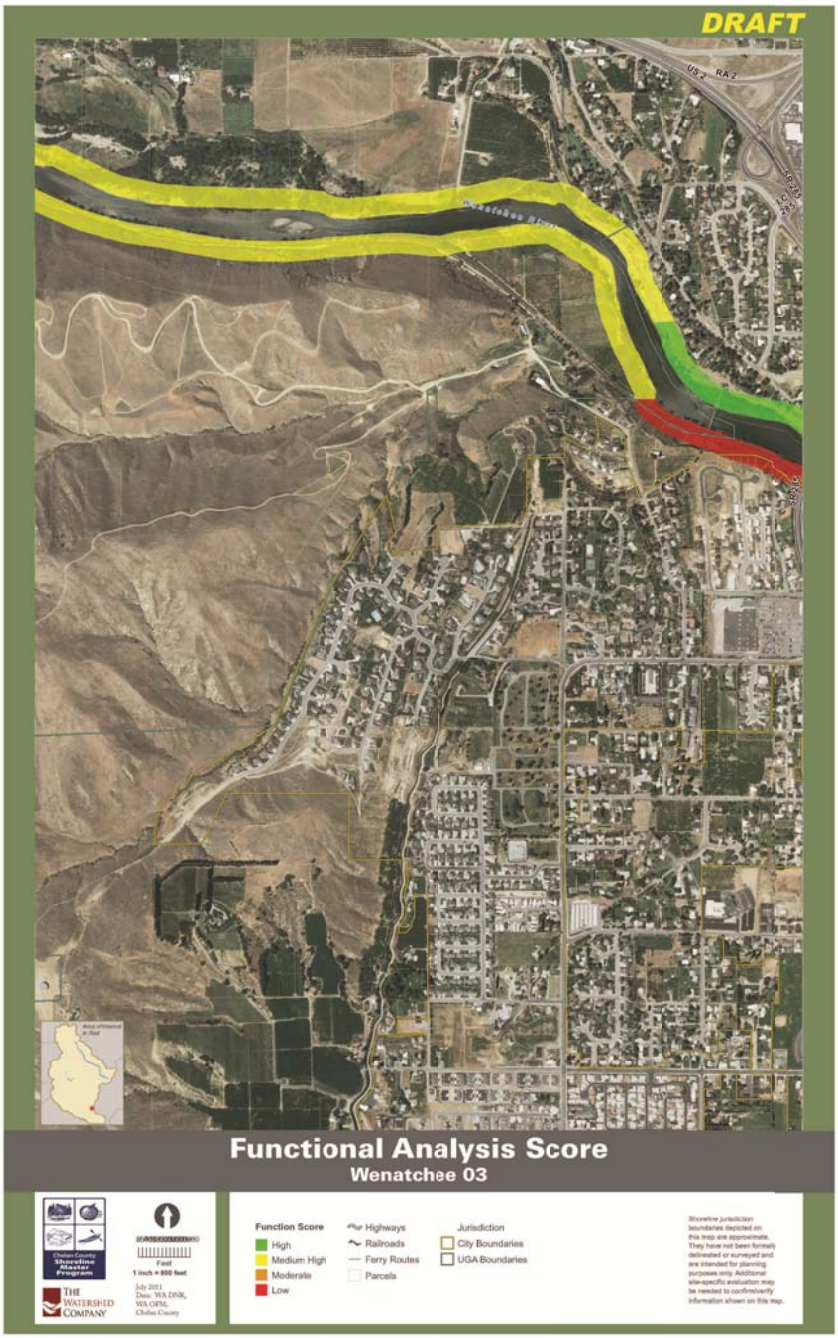
294	23-Sep-2011 14:58:48	Picture 294.jpg	1768433.65	165077.92	597.113	US State Plane NAD 83 Washington North ft (4601)	23-Sep-2011 07:58:48	Picture 294_tag.jpg
295	23-Sep-2011 14:58:52	Picture 295.jpg	1768418.71	165255.14	593.832	US State Plane NAD 83 Washington North ft (4601)	23-Sep-2011 07:58:52	Picture 295_tag.jpg
296	23-Sep-2011 14:58:56	Picture 296.jpg	1768401.06	165427.27	587.270	US State Plane NAD 83 Washington North ft (4601)	23-Sep-2011 07:58:56	Picture 296_tag.jpg
297	23-Sep-2011 14:59:02	Picture 297.jpg	1768368.51	165668.21	580.709	US State Plane NAD 83 Washington North ft (4601)	23-Sep-2011 07:59:02	Picture 297_tag.jpg
298	23-Sep-2011 14:59:14	Picture 298.jpg	1768285.38	166176.31	577.428	US State Plane NAD 83 Washington North ft (4601)	23-Sep-2011 07:59:14	Picture 298_tag.jpg
299	23-Sep-2011 14:59:25	Picture 299.jpg	1768228.00	166635.94	587.270	US State Plane NAD 83 Washington North ft (4601)	23-Sep-2011 07:59:25	Picture 299_tag.jpg
300	23-Sep-2011 14:59:35	Picture 300.jpg	1768196.38	167046.10	600.394	US State Plane NAD 83 Washington North ft (4601)	23-Sep-2011 07:59:35	Picture 300_tag.jpg
301	23-Sep-2011 14:59:42	Picture 301.jpg	1768159.39	167335.65	613.517	US State Plane NAD 83 Washington North ft (4601)	23-Sep-2011 07:59:42	Picture 301_tag.jpg
302	23-Sep-2011 14:59:49	Picture 302.jpg	1768114.86	167622.10	606.955	US State Plane NAD 83 Washington North ft (4601)	23-Sep-2011 07:59:49	Picture 302_tag.jpg
303	23-Sep-2011 14:59:57	Picture 303.jpg	1768059.74	167951.04	603.675	US State Plane NAD 83 Washington North ft (4601)	23-Sep-2011 07:59:57	Picture 303_tag.jpg
304	23-Sep-2011 15:00:01	Picture 304.jpg	1768035.27	168116.04	606.955	US State Plane NAD 83 Washington North ft (4601)	23-Sep-2011 08:00:01	Picture 304_tag.jpg
305	23-Sep-2011 15:00:04	Picture 305.jpg	1768015.92	168235.47	606.955	US State Plane NAD 83 Washington North ft (4601)	23-Sep-2011 08:00:04	Picture 305_tag.jpg
306	23-Sep-2011 15:00:10	Picture 306.jpg	1767987.44	168485.55	600.394	US State Plane NAD 83 Washington North ft (4601)	23-Sep-2011 08:00:10	Picture 306_tag.jpg
307	23-Sep-2011 15:00:20	Picture 307.jpg	1767946.11	168910.85	597.113	US State Plane NAD 83 Washington North ft (4601)	23-Sep-2011 08:00:20	Picture 307_tag.jpg
308	23-Sep-2011 15:00:29	Picture 308.jpg	1767942.94	169281.68	597.113	US State Plane NAD 83 Washington North ft (4601)	23-Sep-2011 08:00:29	Picture 308_tag.jpg
309	23-Sep-2011	Picture	1767951.	169419.	590.551	US State Plane NAD 83	23-Sep-2011	Picture

	15:00:33	309.jpg	64	54		Washington North ft (4601)	08:00:33	309_tag.jpg
310	23-Sep-2011 15:00:33	Picture 310.jpg	1767951.64	169419.54	590.551	US State Plane NAD 83 Washington North ft (4601)	23-Sep-2011 08:00:33	Picture 310_tag.jpg
311	23-Sep-2011 15:00:40	Picture 311.jpg	1767924.07	169534.87	597.113	US State Plane NAD 83 Washington North ft (4601)	23-Sep-2011 08:00:40	Picture 311_tag.jpg

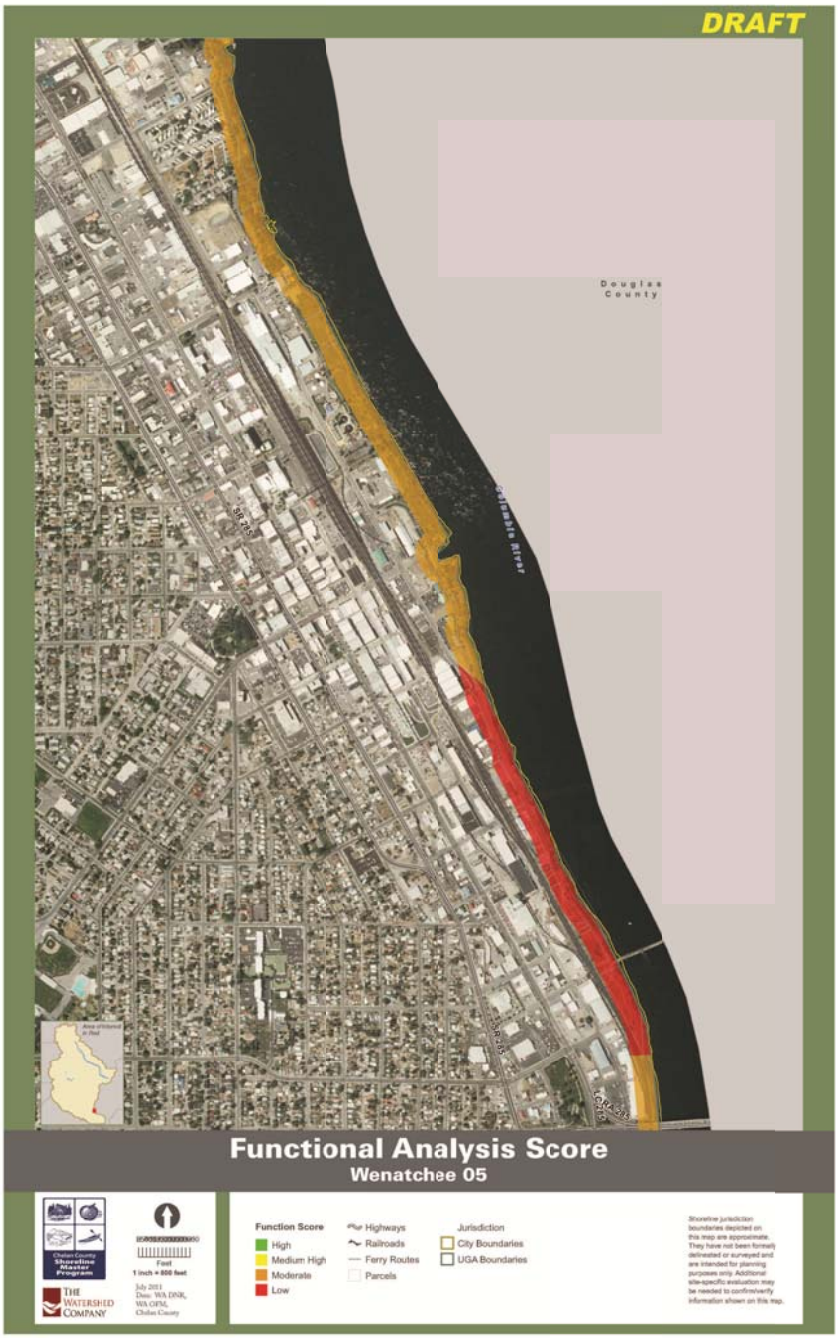
Appendix B: Complete Ecological Function Score Results


DRAFT
US ALT 97
Columbia River
Douglas County
Functional Analysis Score
Wenatchee 01
Function Score
High
Medium High
Moderate
Low
Highways
Railroads
Ferry Routes
Parcels
Jurisdiction
City Boundaries
UGA Boundaries
Chelan County Shoreline Master Program
THE WATERSHED COMPANY


DRAFT
US ALT 97
US 2 RA 2
LC 2
Douglas County
Functional Analysis Score
Wenatchee 02
Chelan County Shoreline Master Program
Feet
1 inch = 800 feet
July 2011
Data: WA DNR, WA OFM, Chelan County
THE WATERSHED COMPANY
Function Score
High
Medium High
Moderate
Low
Highways
Railroads
Ferry Routes
Parcels
Jurisdiction
City Boundaries
UGA Boundaries
Shoreline jurisdiction boundaries depicted on this map are approximate. They have not been formally delineated or surveyed and are intended for planning purposes only. Additional site-specific evaluation may be needed to confirm/verify information shown on this map.


DRAFT
US 2
SR 285
Functional Analysis Score
Wenatchee 03
Function Score
High
Medium High
Moderate
Low
Highways
Railroads
Ferry Routes
Parcels
Jurisdiction
City Boundaries
UGA Boundaries
Chelan County Shoreline Master Program
THE WATERSHED COMPANY


DRAFT
Wenatchee River
Douglas County
Columbia River
Functional Analysis Score
Wenatchee 04
Function Score
High
Medium High
Moderate
Low
Highways
Railroads
Ferry Routes
Parcels
Jurisdiction
City Boundaries
UGA Boundaries
Chelan County Shoreline Master Program
THE WATERSHED COMPANY
Feet
1 inch = 800 feet


DRAFT
Douglas County
Columbia River
Functional Analysis Score
Wenatchee 05
Function Score
High
Medium High
Moderate
Low
Highways
Railroads
Ferry Routes
Parcels
Jurisdiction
City Boundaries
UGA Boundaries
Chelan County Shoreline Master Program
THE WATERSHED COMPANY
1 inch = 800 feet


DRAFT
Douglas County
Columbia River
Functional Analysis Score
Wenatchee 06
Chelan County Shoreline Master Program
THE WATERSHED COMPANY
Feet
1 inch = 800 feet
July 2011
Data: WA DNR, WA OFM, Chelan County
Function Score
High
Medium High
Moderate
Low
Highways
Railroads
Ferry Routes
Parcels
Jurisdiction
City Boundaries
UGA Boundaries
Shoreline jurisdiction boundaries depicted on this map are approximate. They have not been formally delineated or surveyed and are intended for planning purposes only. Additional site-specific evaluation may be needed to confirm/verify information shown on this map.

Appendix C: Land Capacity Analysis Assumptions

No.	Step	Proposed Assumption	Chelan County Residential LCA	City of Cashmere Comp Plan LUE	City of Chelan Residential LCA	City of Entiat Residential LCA	City of Leavenworth Residential LCA	City of Wenatchee Comp Plan LUE
Geography/ Time Period								
1.	Base point in time	2008 (Use SMP Inventory Assessor data date as baseline)	Undated. Included in 2007 plan. New analysis in 2008 for Peshastin UGA.	2008	2007	2007	2003	2007 plan (2005 UGA boundaries)
2.	Study area boundaries	Parcels fully within or intersecting shoreline jurisdiction. Look at whole parcel – not just 200 foot jurisdictional area by water body (determined by WRIA, and cities).	Unincorporated UGAs (Sunnyslope, Manson, Peshastin)	City and UGA	City and UGA	City and UGA	City and UGA	City and UGA
Gross Developable Land Inventory		Include public and private lands that meet criteria since all lands may have shoreline uses. Can discount or remove public/reserved lands after Step 11 as needed.						
3.	Developable Land: Vacant	Assessor Building Value = $0; Remove lots less than 2,499 s.f.	Vacant land and orchards Recommend: 2,499 instead of 2,500 to capture 25 x 100 cabin lots	Available land (not defined)	Vacant land and orchards	Vacant land and orchards	Vacant, non-governmental land Recommend: 10,000 or 20,000 s.f. (Note: for conservative estimate kept smaller screen. Can alter market factor if needed in Leavenworth.)	Vacant land and orchards identified by aerial photo, further distinguished by determining degree of development limitations
4.	Developable Land: Partially Used	Single Family. Parcel is 2 times the minimum allowed by zoning. (Note: more conservative; may capture some ADU trend.)	Not addressed Recommend: method to account for ADUs	Available land (not defined)	Not addressed	Not addressed	Residentially used parcels greater than 1 acres Recommend: 2 times instead of 3.	Residential parcels with infill opportunities, visual assessment using aerial photo
5.	Developable Land: Under-Utilized	Multifamily, commercial, industrial designated parcels occupied by single family uses. Also, multifamily, commercial, industrial parcels where the ratio of improvement value to land value is <1.0.	Not addressed	Available land (not defined)	Not addressed in supply (see below in deductions)	Not addressed in supply (see below in deductions)	Not addressed Recommend: removing small CC zone lots with 60% lot coverage. (Note: can remove CC zone property after #11 if needed)	Waterfront area
Deduct Critical Areas								
6.	Wetlands	Deduct actual wetlands acres using SMP inventory maps.	Comp. Plan: Not deducted. Peshastin: Flat 5%.	Not deducted	Not deducted	Not deducted	Part of 15% flat deduction Recommend: deduct actual wetland acres	Not applicable
7.	Streams/lakes	Deduct streams and lakes based on ordinary high water mark.	Comp. Plan: Lakes, rivers deducted Peshastin: Flat 5%.	Part of 12% flat deduction	Not deducted	Not deducted	Part of 15% flat deduction. Recommend: deduct based on OHW mark.	Not applicable
8.	Steep Slopes/Soils	Deduct geo-hazards using SMP inventory maps. (If slope information is complete use 40% slopes or greater.)	Comp. Plan: 40% slopes or greater deducted Peshastin: Flat 5%.	Part of 12% flat deduction	40% slopes or greater deducted	40% slopes or greater deducted (3% acres assumed to be steep slope in residential designations, and except 10% in the Mixed Tourist	Part of 15% flat deduction Recommend: Deduct using SMP inventory maps	Steep slopes (percent not identified)

Comment [ML1]: City performed a residential vacant land inventory and capacity analysis in 2004, which was updated in the Supplemental EIS completed in conjunction with the Comp Plan update in 2007.

No.	Step	Proposed Assumption	Chelan County Residential LCA	City of Cashmere Comp Plan LUE	City of Chelan Residential LCA	City of Entiat Residential LCA	City of Leavenworth Residential LCA	City of Wenatchee Comp Plan LUE
						Recreational district)		
9.	Floodplains	Deduct floodways.	Comp. Plan: Deduct floodways Peshastin: Flat 5%.	Part of 12% flat deduction	Not deducted	Not deducted	Part of 15% flat deduction Recommend: Deduct floodways	Deducted
10.	Critical Area Buffers	Rural: Assume an average buffer of 125 feet for wetlands and 150 feet for Type S or F streams/lakes. UGAs: Assume average 75 feet for wetlands; 100 feet for Type F streams/lakes, and 50 feet for Type S.	Not deducted Consider: Distinguishing larger wetlands. (Note: Due to limits of wetlands inventory data and variations in actual quality recommend continuing with average.)	Not deducted	Not deducted	Not deducted	Not deducted Recommend: Riparian buffers are 25' in current regulations. Assumed: Average buffers at left. Critical areas regulations likely to change in 2009.	Not applicable
11.	Determine developable acres by planned land use category	Sum developable acres (vacant, partially used, and underutilized with critical area deductions) by planned land use category. Use each jurisdiction's planned land use categories.	Adopted land use categories in Comprehensive Plan					
Deduct Future Infrastructure and Public Uses								
12.	Rights of Way and Other Development Requirements	Percentage reduction; vary by community.	Comp. Plan: 15% Peshastin: 30% Recommend: 20%	20% for future roads and utilities	15%	25% for future roads and utilities	20% for future roads and utilities Recommend: 5%	25% reduction for non-residential factors including ROW & other public usesAssumed: 5% based on city input to recognize waterfront plan
13.	Schools, police/fire stations, water, sewer, recreation/ open space, and similar.	Percentage reduction based on lands for public purposes. Vary by community.	Comp. Plan: 7% Peshastin: 0% (see above) Recommend: 0% (combine with above)	Part of roads/utilities	7%	10%	Part of roads/utilities Recommend: 0% if deducting public lands (Note: can remove from consideration after Step 11 if needed)	25% reduction for non-residential factors including ROW & other public usesAssumed: 0% based on city input to recognize waterfront plan
Market Factor Deduction								
14.	Vacant lands	Vary by community.	Comp. Plan: 25% market factor and 15% for lands unavailable. Peshastin Sub-area: 20% flat market factor. Also assumed 40% of vacant would not develop. Recommend 20-25% Assumed: 20%	Comp. Plan: 15% Recommend: 25% due to water supply	25% (market/safety factor)	25% Recommend: reduced market factor MDR and HDR lands due to marina development.	15% Use GIS data	25% market factor and 15% for lands unavailable Recommended: 5 or 10% Assumed: 5% based on city input to recognize waterfront plan
15.	Partially Used and Under-Utilized	UGAs: Use Plan assumption for each community, or where not included, 25% for land not likely to develop in next 20 years. Rural: 50%	Comp. Plan: Not addressed Peshastin: Agricultural lands 25%	Comp. Plan: Not addressed Recommend: 25% due to water supply	30% - single family 20% multifamily 50% Tourist Accommodations and Special Use District	Orchards - 40% remain in production. 50% of multifamily land will convert to highest density, (rest currently	Not addressed 25%	25% market factor and 15% for lands unavailable Assumed: 10% - based on city input to recognize

Comment [ML1]: City performed a residential vacant land inventory and capacity analysis in 2004, which was updated in the Supplemental EIS completed in conjunction with the Comp Plan update in 2007.

No.	Step	Proposed Assumption	Chelan County Residential LCA	City of Cashmere Comp Plan LUE	City of Chelan Residential LCA	City of Entiat Residential LCA	City of Leavenworth Residential LCA	City of Wenatchee Comp Plan LUE
		Agriculture and forestry lands treated as partially used/under-utilized			(Unavailable/ Underutilized Land factor – percent not used for residential purposes)	subdivided at single-family densities) Tourist Recreational Development, 25% e in an open space use		waterfront plan
Determine Population Capacity								
16.	Mixed Use Development Share	Vary by local plan. If not addressed, assume 50/50 share of development will be residential or commercial.	Comp. Plan: Not addressed Peshastin: Assume 10% of commercial or mixed use will include residential dwellings.	Not addressed	See underutilized/ unavailable factor	See underutilized/ unavailable factor	Not addressed 50/50	Comp. Plan: Not addressed Waterfront Plan: Use economic study. Assumed 85%/15% residential/ commercial split based on report.
17.	Determine Total Dwelling Units Capacity By Zone	Multiply net acres of developable land in each zone by assumed density of each zone to determine total dwelling units of capacity. Subtract existing dwelling units.	Comp. Plan: Unincorporated UGAs 4 units per acre Peshastin: LDR 4, MDR 8; HDR 16 Proposed: Urban per above. Rural areas – base on zoning.	Single Family 6 units/acre Suburban Residential Average 3/acre Multi Family 15 units/acre	Single Family 3 du/ac Multi-family 9 du/ac Tourist Accommodations 3 du/ac Special Use District 3 du/ac	Single Family: Up to 4 units per acre Multi Family: Up to 10 units per acre Mixed Tourist Recreational: Up to 4 units per acre Current analysis: Assuming 25% unbuildable and 17 du/ac for High Density	Goal is average 4.6 du/ac and average lot size of 9,400 s.f.	Comp Plan: 6.22 housing units (h.u.) per net acre for vacant and underutilized land Waterfront Plan: 1440 housing units Proposed: Waterfront Plan and Comprehensive Plan.
Determine Employment Capacity								
18.	Determine Total Square Footage Capacity By Zone	Vary by community if there is information. Otherwise, multiply net acres of commercial and industrial developable land by the assumed floor area ratio. Commercial = FAR of 0.25 Industrial = FAR of 0.4 Subtract existing building square footage on partially used and under-utilized land.	No employment land capacity conducted Recommended: Review Transportation Plan assumptions for commercial and industrial growth	No employment land capacity conducted	No employment land capacity conducted	No employment land capacity conducted	No employment land capacity conducted	Comp. Plan: No employment land capacity conducted Waterfront Plan: Market demand prepared. Used proposed assumption due to lack of FAR information.

Comment [ML1]: City performed a residential vacant land inventory and capacity analysis in 2004, which was updated in the Supplemental EIS completed in conjunction with the Comp Plan update in 2007.

Appendix D: Zoning Standards Summary

Chelan County: Zoning Standards Summary.

Zone	Primary Land Uses	Minimum Lot Size (acres or sq ft.)	Maximum Building Height (ft.)	Standard Minimum Setbacks (ft.)	Maximum Building Coverage (%)
Commercial Agricultural Lands	Agriculture Single Family Residential	10 acres. Cluster subdivisions may have reduced minimum lot sizes.	35 ft., except for barns and similar agricultural buildings shall not exceed 50 ft. in height.	**Front:** 25 ft. from front property line or 55 ft. from the street centerline, whichever is greater. **Side:** 10 ft. Street side yard same as front. **Rear:** 20 ft. **Dwelling Setbacks from agriculture:** 100 ft. from property line including road width, with minimum 80 ft. from centerline or 50 ft. from front property line, whichever is greater.	35%
Commercial Forest Lands	Forestry Agriculture Single Family Residential	20 acres. Cluster subdivisions may have reduced minimum lot sizes.	35 ft.	Required except when abutting commercial agricultural lands (AC), commercial forest lands (FC), riparian and shoreline areas. **Front:** 25 ft. from the front property line or 55 ft. from the street centerline, whichever is greater. **Side:** 10 ft. Street side yard same as front. **Rear:** 20 ft.	35%
Commercial Mineral	Sand, gravel extraction Agriculture Forestry	5 acres	None specified	Required except when abutting commercial agricultural lands (AC), commercial forest lands (FC), riparian and shoreline areas. **Structures:** 50 ft. setback from all property lines. **Offices:** 25 ft. setback from all property lines.	35%
Rural Public Lands and Facilities	Public and Government Agriculture Forestry	Lot size in accordance with the Chelan-Douglas health district standards for public or community water and sewage disposal.	50 ft.	**Front:** 15 ft. from the front property line or 45 ft. from the street centerline, whichever is greater. **Side:** 10 ft. **Street Side:** not specified **Rear:** 10 ft.	No maximum.
Rural Commercial	Commercial Lodging Wholesale Storage Repair Agriculture Forestry	Lot size in accordance with the Chelan-Douglas health district standards for public or community water and sewage disposal.	35 ft.	Required except when abutting commercial agricultural lands (AC), commercial forest lands (FC), riparian or shoreline areas. **Front:** 10 ft. from the front property line or 40 ft. from the street centerline, whichever is greater. **Side:** Zero ft., except 30 ft. from the side property line when the lot abuts any zone other than a commercial or industrial district. **Street Side:** not specified **Rear:** Zero ft., except 30 ft. from the rear property when the lot abuts any district other than a commercial or industrial district.	No maximum.
Rural Industrial	Industrial Agriculture Forestry	Lot size in accordance with the Chelan-Douglas health district standards for public or community water and sewage disposal.	60 ft.	Required except when abutting commercial agricultural lands (AC), commercial forest lands (FC), riparian and shoreline areas. **Front:** 10 ft. from the front property line or 40 ft. from the street centerline, whichever is greater. **Side:** Zero ft., except 30 ft. from the side property line when the lot abuts any district other than an industrial district. Street Side: not specified **Rear**: Zero ft., except 30 ft. from the rear property line when the lot abuts any zone other than an industrial district.	70%
Rural Recreational / Residential	Single Family Residential Agriculture Forestry	Lot size in accordance with the Chelan-Douglas health district standards for public or community water and sewage disposal; however, in no case shall lot size be less than 12,000 sq ft., except for cluster subdivisions or planned development districts.	35 ft.	Required except when abutting commercial agricultural lands (AC), commercial forest lands (FC), riparian or shoreline areas. **Front:** 25 ft. from the front property line or 55 ft. from the street centerline, whichever is greater. **Side:** 5 ft. Street side yard same as front. **Rear:** 20 ft.	35%
Rural Residential 1_2.5	Single Family Residential	2.5 acres. Cluster subdivisions or planned development districts may have reduced minimum lot sizes.	35 ft.	**Front:** 25 ft. from the front property line or 55 ft. from the street centerline, whichever is greater.	35%

Zone	Primary Land Uses	Minimum Lot Size (acres or sq ft.)	Maximum Building Height (ft.)	Standard Minimum Setbacks (ft.)	Maximum Building Coverage (%)
	Agriculture Forestry			**Side:** 5 ft. from the side property line. Street side yard same as front. **Rear:** 20 ft.	
Rural Residential 1_5	Single Family Residential Agriculture Forestry	5 acres. Cluster subdivisions or planned development districts may have reduced minimum lot sizes.	35 ft.	**Front:** 25 ft. from the front property line or 55 ft. from the street centerline, whichever is greater. **Side:** 5 ft. Street side same as front. **Rear:** 20 ft. from the rear property line.	35%
Rural Residential 1_10	Single Family Residential Agriculture Forestry	10 acres. Cluster subdivisions or planned development districts may have reduced minimum lot sizes.	35 ft.	**Front:** 25 ft. from the front property line or 55 ft. from the street centerline, whichever is greater. **Side:** 5 ft. from the side property line. Street side same as front. **Rear:** 20 ft.	35%
Rural Residential 1_20	Single Family Residential Agriculture Forestry	20 acres. Cluster subdivisions or planned development districts may have reduced minimum lot sizes.	35 ft.	**Front:** 25 ft. from the front property line or 55 ft. from the street centerline, whichever is greater. **Side:** 5 ft. from the side property line. Street side yard same as front. **Rear:** 20 ft.	35%
Rural Village	Single Family Residential Agriculture Forestry	Lot size, which measures to include 10% of the adjoining public rights-of-way, shall be in accordance with the Chelan-Douglas health district standards for public or community water and sewage disposal. Single family minimum 12,000 sq ft.; duplex minimum 15,050 sq ft.; and 3,050 additional sq ft. for each additional multifamily dwelling unit, except for cluster subdivisions or planned development districts	35 ft.	**Front:** 25 ft. from the front property line or 55 ft. from the street centerline, whichever is greater. **Side:** 5 ft. from the side property line. Street side yard same as front. **Rear:** 20 ft.	35%
Rural Waterfront	Single Family Residential Agriculture Forestry	Lot sizes, which measures to include 10% of the adjoining public rights-of-way, shall be in accordance with the Chelan-Douglas health district standards for public or community water and sewage disposal; however, in no case shall lot size be less than 12,000 sq ft. except for cluster subdivisions or planned development districts.	35 ft.	**Front:** 25 ft. from the front property line or 55 ft. from the street centerline, whichever is greater. **Side:** 5 ft. Street side yard same as front. **Rear:** 20 ft.	35%
Urban Residential 2	Residential, detached & attached	7,000 sq ft. for single-family, 10,000 sq ft. for duplex, 7,000 sq ft. plus 3,050 sq ft. per unit for multifamily.	35 ft.	**Front:** 25 ft. from the front property line or 55 ft. from the street centerline, whichever is greater. **Side:** 5 ft. **Street Side:** not specified **Rear:** 25 ft.	35%
Urban Residential 3	Residential, detached & attached	5,000 sq ft. for single-family, 7,000 sq ft. for duplexes, 4,000 sq ft. plus 1,650 sq ft. per multifamily unit, except for cluster subdivisions or planned development districts.	50 ft.	**Front:** 10 ft. from the front property line or 55 ft. from the street centerline, whichever is greater. **Side:** 5 ft. **Street Side:** not specified **Rear:** 20 ft.	Buildings and structures up to 2 stories shall not occupy more than 50% of the lot area, less 5% for each additional story up to 4.
Urban Waterfront Residential	Residential, detached & attached	5,000 sq ft. for a single-family dwelling unit, 7,000 sq ft. for a duplex dwelling unit, and 4,000 sq ft. plus 1,650 sq ft. per unit for multifamily dwelling units; except for cluster subdivisions or planned development districts.	35 ft.	**Front:** 25 ft. from the front property line or 55 ft. from the street centerline, whichever is greater. **Side:** 5 ft. **Street Side:** not specified **Rear:** 15 ft.	35%
Low Density Residential (R-1)	Single Family Duplex	7,500 sq ft. – single family 9,000 sq ft. – duplex	25 ft.	Front: 25 ft. Side: 5 ft. Street Side: 25 ft. Rear: 20 ft.	50%
Medium Density Residential (R-2)	Single Family Duplex Multifamily Condominium	7,000 sq ft. – single family 9,000 sq ft. – duplex plus 1,000 sq ft. for each additional unit	25 ft.	Front: 20 ft. Side: 5 ft. Street Side: 20 ft. Rear: 15 ft.	65%
High Density	Single Family	6,000 sq ft. – single family	35 ft.	Front: 20 ft.	65%

Zone	Primary Land Uses	Minimum Lot Size (acres or sq ft.)	Maximum Building Height (ft.)	Standard Minimum Setbacks (ft.)	Maximum Building Coverage (%)
Residential (R-3)	Duplex Multifamily Condominium	9,000 sq ft. – duplex plus 1,000 sq ft. for each additional unit		Side: 5 ft. Street Side: 20 ft. Rear: 15 ft.	
Downtown Commercial	Commercial Residential	0 sq. ft.	35 ft.	0 ft. all sides	None
Highway Commercial	Large scale commercial, multifamily	0 sq. ft.	45 ft.	Front: 40 ft. Side: 20 ft. Street Side: 40 ft. Rear: 20 ft.	75%
Industrial	Heavy Industrial	0 sq. ft.	45 ft.	Front: 25 ft. Side: 25 ft. Street Side: 25 ft. Rear: 25 ft.	75%
Campus Industrial	Light Industrial, Technology	0 sq. ft.	45 ft.	Front: 20 ft. Side: 20 ft. Street Side: 20 ft. Rear: 20 ft.	80%
Public Use	Public facilities and services	0 sq. ft.	35%	0 ft. all sides	30%

City of Cashmere: Zoning Standards Summary.

Zone	Primary Land Uses	Minimum Lot Size (sq ft.)	Maximum Building Height (ft.)	Standard Minimum Setbacks (ft.)	Maximum Building Coverage (%)
Downtown Business District	Commercial	That area necessary to comply with all applicable provisions, including without limitation requirements for off-street parking, ingress/egress, lot coverage, landscaping, etc.	3 stories, not greater than 40 ft. including all signs and decorations	**Front:** Same as adjacent buildings or zero. **Side:** Zero ft. common wall, or 5 ft. from side property line. Adjacent to residential 15 ft. Street Side: Not specified **Rear:** Zero ft. Adjacent to residential 15 ft. Alley 8 ft. from rear lot line.	80%
Mixed Commercial / Light Industrial	Commercial Industrial	That area necessary to comply with all applicable provisions, including without limitation requirements for off-street parking, ingress/egress, lot coverage, landscaping, etc.	3 stories, not greater than 40 ft., including all signs or decorations. Where development occurs adjacent to a residential or public district, maximum building height for all structures and storage of materials shall be 30 ft.	**Front:** Arterial 55 ft. from centerline or 25 ft. from front lot line, whichever is greater. Non-arterial, 50 ft. from centerline or 20 ft. from front lot line, whichever is greater. **Side & Rear:** 10 ft. Adjacent to residential 15 ft. **Street Side:** Not specified	80%

Zone	Primary Land Uses	Minimum Lot Size (sq ft.)	Maximum Building Height (ft.)	Standard Minimum Setbacks (ft.)	Maximum Building Coverage (%)
Multi Family Residential	Multifamily Duplex Single Family	SF: 7,000 sq ft. Duplex: 8,500 sq ft. MF: 8,500 sq ft.	3 stories; not greater than 40 ft.; cornices, eaves, gutters, sunshades and other similar architectural features may not project more than 2 ft. into required yard setback	Front: 20 ft. **Side:** 5 ft. for one-story structure, or 8 ft. for two-story structure, or 11 ft. for three-story structure. **Street Side:** Not specified **Rear:** 10 ft. Accessory buildings 5 ft. to the rear lot line. Setback from alley 8 ft.	50%
Public	Public/ Semi-Public Recreation	That area necessary to comply with all applicable provisions, including without limitation requirements for off-street parking, ingress/ egress, lot coverage, landscaping, etc.	30 stories, not greater than 40 ft., including all signs or decorations. Where development is adjacent to a residential district, maximum building height shall be two stories or greater than 30 ft.	Front: Zero **Side:** Zero except adjacent to residential, 30 ft. **Street Side:** Not specified **Rear:** Zero ft. Adjacent to residential, 30 ft. and adjacent to alley 8 ft.	80%
Single Family Residential	Single Family Dwellings	7,000 sq ft.	2 stories; not greater than 30 ft.; cornices, eaves, gutters, sunshades and other similar architectural features may not project more than 2 ft. into a required yard setback	**Front:** 25 ft. from front property line or 50 ft. from centerline of the street ROW, whichever is greater. **Side:** 5 ft. **Street Side:** Not specified **Rear:** 10 ft. Accessory buildings 5 ft. Alley setback 8 ft.	35%
Suburban Residential	Single Family Dwellings Duplexes Multifamily Agriculture	10,000 sq ft. (Duplexes allowed 15,000 sq ft.)	2 stories; not greater than 30 ft.; cornices, eaves, gutters, sunshades and other similar architectural features may not project more than 2 ft. into required yard setback	**Front:** 25 ft. from front property line or 50 ft. from centerline of the street ROW, whichever is greater. **Side:** 5 ft. **Street Side:** Not specified **Rear:** 10 ft. Accessory buildings 5 ft. Alley setback 8 ft.	35%

Zone	Primary Land Uses	Minimum Lot Size (sq ft.)	Maximum Building Height (ft.)	Standard Minimum Setbacks (ft.)	Maximum Building Coverage (%)
Warehouse Industrial	Industrial Commercial	That area necessary to comply with all applicable provisions, including without limitation requirements for off-street parking, ingress/egress, lot coverage, landscaping, etc.	3 stories, not greater than 40 ft. (existing allows 80 ft.), including all signs or decorations. Where development occurs adjacent to a residential or public district, maximum building height for all structures and storage of materials shall be 30 ft.	**Front, Side & Rear:** None. Where necessary for roof snow sloughing, 8 ft. **Street Side:** Not specified	80%

City of Chelan: Zoning Standards Summary.

Zone	Primary Land Uses	Minimum Lot Size (sq ft.)	Maximum Building Height (ft.)	Standard Minimum Setbacks (ft.)	Maximum Building Coverage (%)
High Density Commercial	Commercial Lodging	No minimum	50 ft.	**Front:** Zero ft. **Side:** Zero ft. **Street Side:** Not specified **Rear:** 5 ft.	No maximum
Highway Service Commercial	Highway and convenience commercial Trailer courts Boat building/sales	5,000 sq ft.	50 ft.	**Front:** Zero ft. **Side:** Zero ft. **Street Side:** Not specified Rear: 5 ft.	65%
Multi Family Residential	Single family Dwellings Townhomes Multifamily	5,000 sq ft. or 1,000 sq ft. per dwelling unit, whichever is greater	Townhouses 30 ft.; all other uses 50 ft. with the following exception: where the building site abuts an existing single-family residence, side step backs or an alternative design approved by City shall be required for any building taller than 30 ft.	Front: 20 ft. **Side:** 5 ft., plus one additional foot for each 2 ft. by which the building height exceeds 30 ft. Street Side: Not specified **Rear:** 20 ft. plus one additional foot for each 2 ft. by which the building height exceeds 30 ft.	40%
Public Lands & Facilities	Public and Semi-Public Uses Recreation Marinas Commercial Leases	Not specified	35 ft.	Abutting residential: **Front:** 25 ft. **Side:** 5 ft. **Street Side:** Not specified **Rear:** 20 ft. Abutting non-residential: **Front:** Zero ft.	35%

Zone	Primary Land Uses	Minimum Lot Size (sq ft.)	Maximum Building Height (ft.)	Standard Minimum Setbacks (ft.)	Maximum Building Coverage (%)
				Side: Zero ft. **Street Side:** Not specified **Rear:** 5 ft.	
Single Family Residential	Single Family Dwellings Agriculture	6,000 sq ft.	30 ft.	**Front:** 25 ft. **Side:** 5 ft. **Street Side:** 15 ft., except garage 20 ft. **Rear:** 20 ft.	30%
Special Use District	Single Family Agriculture Commercial PUD Marinas	5,000 sq ft.	50 ft.	**Front:** 25 ft. The setback for commercial structures may be reduced based on criteria. **Side:** 5 ft. **Street Side:** Not specified **Rear:** 20 ft.	75%
Tourist Accommo-dations	Residential Lodging Restaurants Personal services Travel services Small scale retail Boat launches Marinas Offices	5,000 sq ft.	50 ft.	**Front:** 25 ft. The setback for commercial structures may be reduced based on criteria. **Side:** 5 ft. **Street Side:** Not specified **Rear:** 20 ft.	75%
Warehousing and Industrial	Retail Sales Wholesaling Manufacturing Assembling,	10,000 sq ft.	Not specified	**Front:** Not specified **Side:** Not specified **Street Side:** Not specified **Rear:** Not specified	Not specified
Waterfront Commercial	Boat transportation, boat building and sales, marinas, docks Residential Commercial	5,000 sq ft.	35 ft.	Front: 25 ft. Side: 5 ft. Street Side: 25 ft. **Rear:** Zero ft.	65%

City of Entiat: Zoning Standards Summary.

Zone	Primary Land Uses	Minimum Lot Size (sq ft.)	Maximum Building Height (ft.)	Standard Minimum Setbacks (ft.)	Maximum Building Coverage (%)
Commercial / Light Industrial	Commercial Industrial Agricultural	No minimum lot area or dimensions	3 stories or 50 ft.	Front: City streets, 45 ft. from the centerline or 15 ft. from the front property line, whichever is greater. State highway, 40 ft. from the front property line when front yard parking, or 20 ft. no front yard parking. Side: Zero ft. Street Side: not specified Rear: Zero ft.	60%

Zone	Primary Land Uses	Minimum Lot Size (sq ft.)	Maximum Building Height (ft.)	Standard Minimum Setbacks (ft.)	Maximum Building Coverage (%)
Highway Commercial	Commercial Limited Industrial	No minimum lot area or dimensions	3 stories or 40 ft.	Front: City streets, 45 ft. from the centerline or 15 ft. from the front property line, whichever is greater. State highway, 40 ft. from the front property line when front yard parking, or 20 ft. no front yard parking. Side: Zero ft. unless adjacent to residential, then 15 ft. Street Side: not specified Rear: Zero ft. from the rear property line, improved access (alley, street) 5 ft. without established access. Adjacent to residential, then 20 ft.	50%
Residential Low Density	Residential Agriculture	8,500 sq ft. for a single-family dwelling 12,500 sq ft. for a duplex dwelling	2 stories or 35 ft.	Front: 25 ft. from the front property line or 55 ft. from the centerline of the street, whichever is greater. Side: 5 ft. from side property line Street Side: Same as front Rear: 20 ft. from rear property line	35%
Waterfront Business	Commercial	No minimum lot area or dimensions	2 stories or 35 ft.	Front: City streets, 55 ft. from the centerline of city streets or 25 ft. from the front property line, whichever is greater. State highway, 40 ft. when front yard parking is provided, or 20 ft. not front yard parking Side: 5 ft. Street Side: not specified Rear: 20 ft.	50%

City of Leavenworth: Zoning Standards Summary.

Zone	Primary Land Uses	Minimum Lot Size (sq ft.)	Maximum Building Height (ft.)	Standard Minimum Setbacks (ft.)	Maximum Building Coverage (%)
Central Commercial	Commercial Office Lodging Condominiums	No minimum lot size	50 ft.	**Front:** 25 ft. for parcels which have direct frontage on or along Highway 2 in the city or which are located across the street from residential or recreational zones. **Side:** 10 ft. when side yard abuts, touches or adjoins any residential or recreational zones. **Street Side:** not specified **Rear:** 15 ft. when rear yard abuts, touches or adjoins residential or recreational zones.	Not specified
General Commercial	Commercial Multifamily Lodging	No minimum lot size	35 ft.	**Front:** 25 ft. for parcels which have frontage on or along Highway 2 in the city, or which are located across the street from any residential or recreational zone. **Side:** 10 ft. when side yard abuts, touches or adjoins any residential or recreational zone. **Street Side:** not specified **Rear:** 15 ft. when rear yard abuts, touches or adjoins any residential or recreational zone.	75%
Light Industrial	Light manufacturing Warehousing Wholesale commercial	No minimum lot size	50 ft.	**Front:** 25 ft. **Side:** 5 ft.; when abutting, touching or located across street or alley from residential or recreational zone, increased to 20 ft. **Street side:** Same as front. **Rear:** 10 ft., increased to 20 ft. when abutting, touching or located across street or alley from residential or recreational zone	Not specified

Zone	Primary Land Uses	Minimum Lot Size (sq ft.)	Maximum Building Height (ft.)	Standard Minimum Setbacks (ft.)	Maximum Building Coverage (%)
Low Density Residential 6,000 (RL6)	Single Family Dwellings	6,000 sq ft. for single-family; 12,000 sq ft. for duplex	35 ft.	Front: 25 ft. **Side:** 5 ft. Street Side: 10 ft. **Rear:** No less than 15 ft. for lots without adjacent alley to rear yard; no less than 8 ft. for lots with alley adjacent to rear yard	35%
Low Density Residential 12,000 (RL12)	Single Family Dwellings	12,000 sq ft. for single-family and duplex	35 ft.	Front: 25 ft. **Side:** 10 ft. Street Side: 15 ft. **Rear:** 15 ft. for lots without alley adjacent to rear yard; 8 ft. for lots with alley adjacent to rear yard	35%
Multi Family Residential	Duplex and multifamily dwellings	6,000 sq ft. for new land divisions of up to 3 units; 2,000 for each additional dwelling unit.	35 ft.	**Front:** 25 ft. **Side:** 5 ft. Street Side: 10 ft. **Rear:** 15 ft. for lots without alley adjacent to rear yard; 8 ft. for lots with alley adjacent to rear yard	40%
Recreation	Parks, golf course, cultural facilities, education	Area dedicated as park or open space must be equal to the total area begin developed, including supporting infrastructure	35 ft.	Front: 25 ft. Side: 5 ft. **Street Side:** not specified **Rear:** 20 ft.	35%
Recreation Public	Parks, golf course, play areas, swimming pool, ballfields, commercial leases, wildlife refuge	Designated public open space must equal or exceed total gross floor area of all structures and parking	35 ft.	**Front:** 25 ft. Side: 5 ft. **Street Side:** not specified **Rear:** 20 ft.	35%
Tourist Commercial	Commercial Office Lodging Multifamily	3,500 sq ft.	35 ft.	Front: 25 ft. **Side:** 10 ft. Street Side: **Rear:** 10 ft., except yard area shall be increased to 20 ft. when abutting, touching or adjoining residential or recreational zone	50%

City of Wenatchee: Zoning Standards Summary.

Zone	Primary Land Uses	Minimum Lot Size (sq ft.)	Maximum Building Height (ft.)	Standard Minimum Setbacks (ft.)	Maximum Building Coverage (%)
Industrial	Industrial Storage including Boat Storage Commercial Recreation including boat clubs, marinas, boat launch	5,000 sq ft.	6 stories above grade and 90 ft.	**Front:** Zero ft. from the front property line or 35 ft. from the street centerline, whichever is greater. **Side:** Zero ft. **Street Side:** Not specified **Rear:** Zero ft.	70%
North Wenatchee Business	Commercial Mixed Use Residential Office	None	6 stories above grade and 90 ft.	**Front:** Zero ft. from the front property line or 35 ft. from the street centerline, whichever is greater. Wenatchee Avenue 45 ft. from the centerline. **Side:** Zero ft. If adjacent to a residential zone 15 ft.	65%

Zone	Primary Land Uses	Minimum Lot Size (sq ft.)	Maximum Building Height (ft.)	Standard Minimum Setbacks (ft.)	Maximum Building Coverage (%)
	Boating and Mini-Storage			**Street Side:** Not specified **Rear:** Zero ft. If adjacent to a residential zone 20 ft.	
Residential High	Single and Multifamily Residential	4,000 sq ft.	4 stories above grade and 60 ft.	**Front:** 10 ft. Minimum distance from the centerline of the road equal to one-half of the required right-of-way. **Side:** 6 ft. Plus one-half foot for each foot by which the building height exceeds 30 ft. if the lot adjoins an RS, RL, or RM district. **Street Side:** Not specified **Rear:** 10 ft.	55%
Residential Moderate	Single Family Dwellings Duplex	6,000 sq ft.	30 ft.	**Front:** 25 ft. Minimum distance from the centerline of the road equal to one-half of the required right-of-way. **Side:** 5 ft. **Street Side:** Not specified **Rear:** 15 ft.	45%
Residential Single Family	Single Family Dwellings	10,000 sq ft.; minimum lot size shall be increased 1,500 sq ft. for accessory dwelling units.	30 ft.	**Front:** 25 ft. Minimum distance from the centerline of the road equal to one-half of the required right-of-way. **Side:** 5 ft. **Street Side:** Not specified **Rear:** 20 ft.	35%
Waterfront Mixed Use	Commercial Office Recreation including boat clubs, marinas, boat launch	None	Residential: 30 ft. Commercial/mixed use: 50 ft.	**Front:** None except for any required additional public right-of-way. Minimum distance from the centerline of the right-of-way equal to one-half of the required right-of-way. Side: None **Street Side:** Not specified Rear: None	100%

Appendix E: Height Analysis

City of Wenatchee Shoreline Height Analysis

INTRODUCTION

This height analysis is in reality a view analysis to promote continuity with the City of Wenatchee's adopted Waterfront Subarea Plan and Wenatchee Urban Area Comprehensive Plan for increased heights in a limited area for a limited number of properties (see attached map) that lie within the shoreline jurisdiction of the Columbia River. The City's Shoreline Master Program is being updated under grants from Department of Ecology.

The City of Wenatchee is physically constrained by geography; steep sloped foothills and two rivers (Columbia and Wenatchee). The Columbia River and Wenatchee River are shorelines of statewide significance.

The shoreline area identified for the height analysis (see Figure 1) is along the Columbia River and is owned or leased by the Chelan County PUD for operation as a public riverfront park (Figure 2). In large part, the riverfront park is over 200 feet wide and adjoining properties to the riverfront park are outside of shoreline jurisdiction.

PURPOSE

The purpose of the view analysis is to consider impacts to residential areas within the City of Wenatchee, protect the vision of the City's planning efforts, and meet the requirements of the Shoreline Management Act, RCW 90.58; more specifically:

RCW 90.58.020

This is a policy provision in the Shoreline Management Act (SMA) that states: "*The public's opportunity to enjoy the physical and aesthetic qualities of natural shorelines of the state shall be preserved to the greatest extent feasible consistent with the overall best interest of the state and the people generally*."

RCW 90.58.320

This provision states: "*No permit shall be issued pursuant to this chapter for any new or expanded building or structure of more than thirty-five feet above average grade level on shorelines of the state that will obstruct the view of a substantial number of residences on areas adjoining such shorelines except where a master program does not prohibit the same and then only when overriding considerations of the public interest will be served*."

HEIGHT ANALYSIS AREA

The area for this analysis is limited to properties within the High Intensity environment of the SMP that are landward of the Waterfront Park environment designation. A map (see Figure 1) identifies the area. **Note:** The zoning for these properties must allow for increased heights and in most cases does, prior to any application for additional height.

CITY OF WENATCHEE'S WATERFRONT PLANNING HISTORY.

One can look through the historic photos within the City of Wenatchee and you will see continued Industrial and Commercial development along the Columbia River, but rarely see Residential development. One of the overriding factors before the installation of Dams on the Columbia River was that the Columbia River could flood quickly and severely. It wasn't until after the construction of dams on the Columbia River that you can begin to see residential development within the City of Wenatchee along the Columbia River. However, the residential development occurred in limited areas as the Public Utility District, Burlington Northern Santa Fe Railroad, and the commercial and industrial businesses didn't want to part with their riverfront property. Past land use maps for the city, indicate that single family zoning was limited along the Columbia River.

On October 25, 1994, the city of Wenatchee adopted ordinance #3070, which was a new zoning code in compliance with the Growth Management Act. The city, in this adoption, designated the waterfront area as commercial general and industrial zoning and a small residential area; thereby making a single family residences as non-conforming uses for the majority of the shoreline area. The 1998 zoning maps (the only ones available at this time) identify the limitation of single family development within the waterfront area. The attached 1998 map only shows one small area in the northern node of the waterfront to be residential with the remaining being industrial and commercial. In addition, the city adopted non-conforming use regulations (" *Within the districts established by this ordinance or subsequent amendments thereto, there exists uses, structures and lots which were lawfully established or created, but which would be prohibited, regulated, or restricted under the terms of this ordinance or future amendments. The intent of this ordinance is to permit these non-conformities to continue, but not to encourage their perpetual survival.*"), that further ensure single-family residences are removed from the waterfront area. As it pertains to non-conformities be it uses or structures, the language crafted for Ordinance #3070 still exists in the current adopted Wenatchee City Code (WCC) Title 10 Zoning.

The City's adopted 2004 Wenatchee Waterfront Sub Area Plan focuses on the redevelopment and enhancement of the city through urban infill and mixed uses. The plan was developed through a public process with the assistance of the Wenatchee Downtown Association and looks to bring new energy and activity to the city's core through the development of our waterfront. As part of this subarea plan, a shoreline inventory, economic analysis, and traffic analysis were completed. The Waterfront Subarea Plan established a waterfront area vision by creating nodes of development. In all of these nodes, a mix of commercial, retail, recreational, and residential uses is proposed. With the adoption of the Waterfront Subarea Plan, single family residential development became a non-conforming use for the entirety of the City of Wenatchee's Columbia River shoreline.

In 2007, the City of Wenatchee adopted the Wenatchee Urban Area Comprehensive Plan as a required update under RCW36.70A. This plan used the previous work of the Waterfront Subarea Plan and Zoning changes to plan for the City's twenty-five (25) year population projections. The Comprehensive Plan eliminated the density restrictions in the zoning regulations for the areas along the Columbia River; more specifically, within the identified waterfront area (see Waterfront Subarea Plan). Additionally, the residential zoning districts were given increased densities to accommodate the population allocations as required by RCW58.70A. The subsequent zoning code adopted by Ordinance 2007-34 followed up on the guidance of the Comprehensive Plan and furthered the ban on single-family residences in the Waterfront Mixed Use zone, which is the zoning district for a majority of the Columbia River shoreline within the City of Wenatchee. The Waterfront Mixed Use zone would serve the City of Wenatchee as a mixed use area by providing residential densities and provide an accommodating area for business development.
With the commercial zoning districts being applied to the waterfront area since 1994, the only height restriction for development has been the 1975 Shoreline Master Program. Because the PUD waterfront park lies along the Columbia River shoreline and is over 200 feet in width, a majority of properties have already developed and exceed the thirty-five foot height requirement for shoreline areas of statewide significance.

Furthermore, in all zoning ordinances adopted and amended since Ordinance #3070, height restrictions have been unregulated. In the 2004 Waterfront Subarea Plan, you begin to see defined building heights based upon guidelines for mixed use development and articulation/modulation standards that encourage a pedestrian feel to development.

COMPLIANCE WITH RCW 90.58.020

RCW90.58.020 - "The public's opportunity to enjoy the physical and aesthetic qualities of natural shorelines of the state shall be preserved to the greatest extent feasible consistent with the overall best interest of the state and the people generally."

A majority of the City of Wenatchee's waterfront is under Chelan County PUD ownership/lease and operated as public parks that provide both visual and public access to the Columbia River. The PUD Riverfront Park and Walla Walla Park are exactly the intent of RCW90.58.020.

In addition, the City's current adopted code guides development to enhance the physical and aesthetic qualities of the waterfront by requiring all development to meet aesthetic architectural standards that are pedestrian friendly and are orientated to the riverfront park, by limiting the types of development, and by requiring development to provide pedestrian amenities that encourage a vibrant waterfront area.

Another significant portion of the Columbia River is separated from private ownership by the Burlington Northern Santa Fe Railroad right-of-way. In these sections, the shoreline area is protected from further development.

COMPLIANCE WITH RCW 90.58.320

This provision states: "*No permit shall be issued pursuant to this chapter for any new or expanded building or structure of more than thirty-five feet above average grade level on shorelines of the state that will obstruct the view of a substantial number of residences on areas adjoining such shorelines except where a master program does not prohibit the same and then only when overriding considerations of the public interest will be served*."

The City of Wenatchee has a few overriding considerations that serve the public interest as it relates to the visibility of the shoreline area. These are:

1) The City is a sloped community with the Ordinary High Water Mark (OHWM) at approximately the 620 feet above sea level and land rising to the foothills between 1020 and 1225 feet above sea level.

2) A separation exists between private property ownership and the shoreline area with approximately 95 percent of the City of Wenatchee's Columbia River shoreline area having an intervening right-of-way or public ownership through the combination of BNSF railroad right-of-way, PUD park system and property ownership, Wenatchee Loop Trail, Reclamation District right-of-way, and public streets.

    a. The majority of the shoreline area is separated from private property by Chelan County Public Utility District ownership in the form of the riverfront park. The PUD riverfront park (Figure 2) encompasses a large percentage of the City's shoreline. The PUD riverfront park provides direct visual and public access to the shoreline for the City of Wenatchee and surrounding areas with vehicular access in several locations by public rights-of-way (see attached city road map and PUD park map).
    b. A small section exists where the southern portion of Worthen Street and the Wenatchee Loop Trail are between properties and the shoreline.
    c. Another significant segment of the Columbia River is occupied by the Burlington Northern Santa Fe (BNSF) mainline (Figure 3) with a switching station and several side tracks that separate Wenatchee from both the Columbia and Wenatchee rivers.

3) There are but a limited number of properties partially within the shoreline jurisdiction that the allowance for taller structures can affect. More specifically, these limited properties are adversely impacted by adjoining properties that have the outright ability to construct taller buildings without the Shoreline Management Act provisions applied to them. This is solely caused by a twenty to thirty foot difference in distance that the subject properties are from the OHWM. In most cases, the average distance from the OHWM is at or greater than 200-feet with intervening ownership of the PUD riverfront park, a public road, Wenatchee Loop Trail, or a BNSF railroad line.

4) For sixteen plus years, the city of Wenatchee has planned for taller buildings in the waterfront area beginning in 1994 with Zoning Ordinance #0370 (Appendix A). In 2004 a detailed Waterfront subarea plan (Appendix B) was created to help identify how the city desired waterfront development to occur. In 2007, the City updated the Urban Area Comprehensive Plan (Appendix C) and Zoning Ordinance 2007-34 (Appendix D) to match the previous work completed.

5) Since the adoption of Ordinance #3070 (Appendix A), single family residences have been prohibited from development as the City's plan for a mixed use waterfront area had begun. Slowly over the past seventeen (17) years, single family residences have been slowly removed with the exception of two remaining residential areas. The Island View and River Park Drive streets (Figure 3). There are approximately twenty-four single family residences. However, not one is within shoreline jurisdiction. All properties have their shoreline and river views obscured by mature vegetation either by that which is on their property or that established on the PUD riverfront park (see photos in Appendix E).

6) The City of Wenatchee has been awarded several grants (both state and federal) for the extension and upgrade of infrastructure in the waterfront area in support of furthering the Waterfront Subarea Plan and the planned for a mixed use waterfront development. These grants have provided for the construction of Riverside Drive (including water, sewer, stormwater, and irrigation upgrades), improvements to Walla Walla Street (including water, sewer, stormwater, and irrigation updrages), the painting of the pedestrian/pipeline bridge (providing public access (pedestrian/bicycle) across the Columbia River to and from Wenatchee and East Wenatchee), the construction of a public moorage dock, and odor/visual improvements to the City of Wenatchee Wastewater treatment facility.

7) The City of Wenatchee downtown core and existing buildings near the shoreline have been built between the residential areas of the City, as was planned. The City's residential area for the most part is landward of the downtown and shoreline areas; where the heights of the existing building obscure a large portion of the direct shoreline view with the city limits. However, Columbia River shoreline views do exist from the residential areas within the city. These views are more scenic as they are to the North and South and include a better landscape view of the shoreline.

VIEW ANALYSIS

As part of any plan or proposal, other than those specified in the Wenatchee Shoreline Master Program standards, for structures over 35 feet in height, an applicant shall be required to submit a view analysis and cumulative impacts analysis that reviews residential obstruction(s) to allow the City to determine whether development under the master plan or proposal obstructs a substantial number of residences (RCW 90.58.320). Structures over 35 feet, other than those specified in the Wenatchee Shoreline Master Program standards, shall be approved only through a Conditional Use Permit process according to Section 5.2 of the Wenatchee Shoreline Master Program and WAC 173-27-160. Designs shall protect visual access to the water from onshore. Shoreline view corridors shall be protected through incorporation of appropriate design (e.g., modulation of building heights and massing) and location of new development. Potential impacts to views shall be minimized through location and orientation of development on the subject property. The applicant shall:

(1) Incorporate a view analysis using photographs, videos, photo-based simulations, or computer-generated simulations. The view analysis shall assess and portray visual access from mainland residences adjoining the shoreline. In all cases photographs, videos, land use, land cover, or other sources of information shall be no older than 12 months prior to submittal of the application. All photographic, video or simulated view representations will employ equipment that produces imagery with an angle of view equivalent to that achievable with a35 mm “normal” camera lens, i.e., an angle of view of about 50°. To document any possible obstruction of existing or potential residential views by proposed development in the Urban Conservancy Environment designation, a minimum of three pictures shall be taken from residences or potential residential lots at a radius of 400 feet from the proposed development at equal distances from each other and toward the shoreline.

(2) Ensure that the view analysis is cumulative in nature by including vacant existing parcels of record as well as existing structures. Vacant parcels of record shall be assumed to be developed and, as such, their structures to be in compliance with the 35-foot height limitation as established through photographs, videos, photo-based simulations, or computer generated simulations.

(3) If demonstrated through photographs, videos, photo-based simulations, or computer-generated simulations that the proposed development will obstruct less than 30% of the view of the shoreline enjoyed by a substantial number of residences on areas adjoining such shorelines, then the development may be considered through the conditional use process.

(4) In consideration of the potential view obstruction resulting from the proposed structure, side yard setbacks may need to be increased. No side yard setbacks shall be reduced to accommodate the proposed structure.

(5) To address "overriding considerations of the public interest" the applicant shall provide a cumulative impact analysis that documents the public benefits served by issuance of a Conditional Use Permit. The analysis shall address such considerations as cumulative view obstruction results of height adjustments (within a 1,000-foot radius) of the proposed development combined with those of other developments that exceed the 35-foot height limitation, environmental benefits (enhancement or restoration), public access/open space benefits, and economic benefits. The cumulative impact analysis shall address overall views that are lost, compromised, and/or retained; available view corridors; and surface water views lost, compromised, and/or retained.

CONCLUSION

The above analysis demonstrates the City's compliance with RCW 90.58.020 and 90.58.320; demonstrates a twenty year plus history for permitting and proposing development adjacent to the shoreline areas that will have increased heights; demonstrates the topographical features that allow views over taller structures from the city; demonstrates aged vegetation that precludes the few residents along in the immediate vicinity of the shoreline to have views of the shoreline; and demonstrates that existing structures in the downtown and vicinity of the shoreline block a portion of the shoreline view.

In the end, allowing increased heights on a few properties that lie partially within shoreline jurisdiction will not have an increased cumulative impact on shoreline views that already do not exist. In addition, those properties that may eventually desire increased heights outside of the identified area (Figure 1) will have to go through a conditional use permit process to address cumulative impacts and reduction of shoreline views.

Figure 1 of Appendix G, Height Analysis, of the City of Wenatchee Shoreline Master Program

Figure 1
Height Anaylsis Area

Residences with limited impact by increased height allowances.

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