Cumulative Impacts Analysis of Thurston County's Shoreline Master Program

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CUMULATIVE IMPACTS ANALYSIS

Thurston COUNTY SHORELINE MASTER PROGRAM

1 INTRODUCTION

This Cumulative Impacts Analysis assesses the proposed Thurston County Shoreline Master Program (SMP) policies and regulations in relation to current shoreline conditions documented in the *Shoreline Inventory and Characterization* report (Thurston County 2013) to assess if future development approved under the proposed SMP could achieve no net loss of ecological function. This Cumulative Impacts Analysis can help the County make adjustments where appropriate in its proposed SMP if there are potential gaps between maintaining or degrading ecological functions.

The State Master Program Approval/Amendment Procedures and Master Program Guidelines (SMP Guidelines; WAC 173-26) require local shoreline master programs to regulate new development to "achieve no net loss of ecological function." The Guidelines (WAC 173-26-186(8)(d)) state that, "To ensure no net loss of ecological functions and protection of other shoreline functions and/or uses, master programs shall contain policies, programs, and regulations that address adverse cumulative impacts and fairly allocate the burden of addressing cumulative impacts."

The Guidelines further elaborate on the concept of net loss as follows:

> *"When based on the inventory and analysis requirements and completed consistent with the specific provisions of these guidelines, the master program should ensure that development will be protective of ecological functions necessary to sustain existing shoreline natural resources and meet the standard. The concept of "net" as used herein, recognizes that any development has potential or actual, short-term or long-term impacts and that through application of appropriate development standards and employment of mitigation measures in accordance with the mitigation sequence, those impacts will be addressed in a manner necessary to assure that the end result will not diminish the shoreline resources and values as they currently exist. Where uses or development that impact ecological functions are necessary to achieve other objectives of RCW 90.58.020, master program provisions shall, to the greatest extent feasible, protect existing ecological functions and avoid new impacts to habitat and ecological functions before implementing other measures designed to achieve no net loss of ecological functions." [WAC 173-26- 201(2)(c)]*

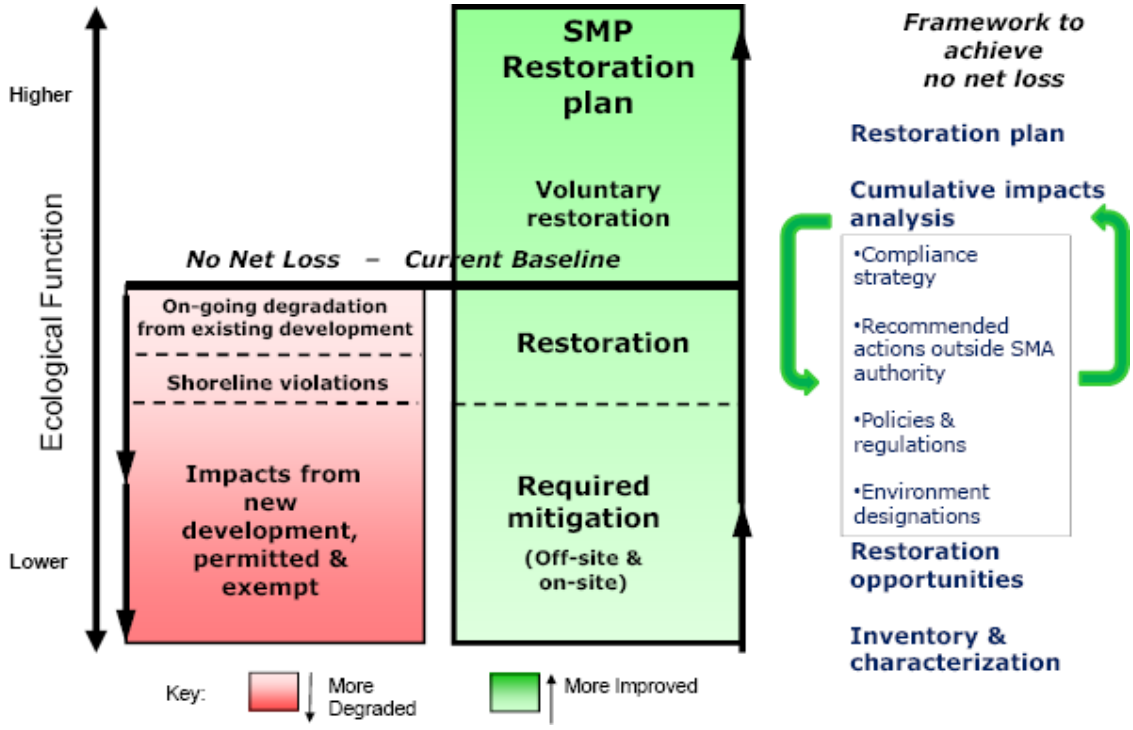
In short, updated SMPs shall contain goals, policies and regulations that prevent degradation of ecological functions relative to the existing conditions as documented in

that jurisdiction's inventory and characterization report. For those projects that result in degradation of ecological functions, the required mitigation must return the resultant ecological function back to the baseline. This is illustrated in the figure below. The jurisdiction must be able to demonstrate that it has accomplished that goal through an analysis of cumulative impacts that might occur through implementation of the updated SMP. Evaluation of such cumulative impacts should consider:

(i) current circumstances affecting the shorelines and relevant natural processes [Chapter 2 below and Shoreline Inventory and Characterization report];

(ii) reasonably foreseeable future development and use of the shoreline [Chapter 3.1 below and Shoreline Inventory and Characterization report]; and

(iii) beneficial effects of any established regulatory programs under other local, state, and federal laws." [Chapter 5 below]



Source: Department of Ecology

The Cumulative Impacts Analysis assesses the policies and regulations in the draft SMP to determine whether no net loss of ecological function will be achieved as new development occurs. SMP regulations fundamentally rely on the concept of mitigation sequencing to avoid, minimize, and mitigate for any unavoidable losses of function. An

accompanying component of the SMP process that can bring environment conditions to an improved level is the *Shoreline Restoration Plan,* which identifies and prioritizes potential actions and programs that may be implemented on a voluntary basis. These actions, intended to improve existing environmental conditions through a combination of enhancement, restoration, and protection, cannot be required by SMP regulations, but Section 173-26-201(2)(f) of the Guidelines says: "master programs shall include goals, policies and actions for restoration of impaired shoreline ecological functions." In certain communities with a particular existing and planned future condition, the Shoreline Master Program may not be able to achieve no net loss of functions through the regulations. For example, a community may expect a significant reduction in riparian vegetation coverage to accommodate a water-dependent use. Compensatory mitigation would be implemented to offset unavoidable impacts, perhaps through replanting of riparian vegetation in an adjacent site; however, it may take many years before the benefits from the compensatory mitigation are realized. In such a circumstance, as for others, the *Shoreline Restoration Plan* may help bridge the gap between the SMP-required mitigation outcome and no net loss of ecological function.

As the SMP is implemented, the County will need to identify methods to track shoreline conditions, permit activity, and policy and regulatory effectiveness. County planning staff will be required to track land use and development activity, including exemptions, within shoreline jurisdiction, and may incorporate actions and programs of the other departments as well. With each project application, staff should consider whether implementation of the SMP is meeting the basic goal of no net loss of ecological functions relative to the baseline condition established in the *Shoreline Inventory and Characterization* report.

A complete reassessment of conditions, policies and regulations will be considered every eight years, during the scheduled SMP update (concurrent with the Comprehensive Plan update). To conduct a valid reassessment of the shoreline conditions, the County will need to identify metrics and then monitor, record and maintain key environmental metrics to allow a comparison with baseline conditions. As monitoring occurs, the County should assess environmental effects of development and restoration objectives. With this level of attention to conditions, permitted development, and adaptive management as needed in the long term, the County should be able to confirm and ensure that the regulations and mitigation sequencing required by the SMP will maintain functions of Thurston shorelines over time.

2 METHODOLOGY

This Cumulative Impacts Analysis was prepared consistent with direction provided in the Shoreline Master Program Guidelines as described above. Existing conditions were first evaluated using the information, both textual and graphic, developed and presented in the *Shoreline Inventory and Characterization* report (Thurston County 2013).

To the extent that existing information was sufficiently detailed and assumptions about possible new or re-development could be made with reasonable certainty, the following analysis is quantitative. Future development along Thurston County shorelines was approximated using a land capacity analysis method developed by Thurston Regional Planning Council as outlined in *Estimates of Population and Employment Land Supply Assumptions for Thurston County* (2012) and adapted to identify parcels in shoreline jurisdiction that could develop over the next twenty years.

Vacant and underutilized properties were identified using data from 2010 developed for the proposed Thurston County Comprehensive Plan 10-Year Update and other watershed planning initiatives, so recent development activities are not considered in the projection of future growth. Vacant lands are presently unused for a land use purpose. Underutilized properties are those that could be further developed given zoning allowances and land value.

The effects of likely development were then evaluated in the context of SMP provisions, as well as other related plans, programs, and regulations. Cumulative impacts were analyzed quantitatively where possible. Where specific details regarding redevelopment likelihood or potential were not available at a level that could be assessed quantitatively or the analysis would be unnecessarily complex to reach a conclusion that could be derived more simply, a qualitative approach was used.

3 SUMMARY OF EXISTING CONDITIONS

The following summary of existing conditions is based on the *Shoreline Inventory and Characterization* (Thurston County 2013) for Thurston County.

REGIONAL OVERVIEW

Thurston County is located in western Washington at the southern point of Puget Sound. The total area of the county is approximately 717 square miles. The County is bordered by Pierce County and the Nisqually River to the northeast, Lewis County to the south, Grays Harbor County to the west, Mason County to the north/northwest, and Puget Sound to the north.

Thurston County is one of the most rapidly urbanizing regions of Puget Sound. Since the 1960's, Thurston County's population has generally exceeded the statewide growth rate. Thurston County's population grew by 14.8 percent, to roughly 238,000 residences, between 2000 and 2007. Thurston County's cities and UGA's contain approximately 67 percent of the residential population (TRPC, 2007). Thurston County's largest population centers are the cities of Olympia, Lacey, and Tumwater. Other population centers include the cities of Yelm, Bucoda, Rainier, and Tenino.

A "watershed" is an area that drains into a common river, lake, or other waterbody. Washington State has been divided into 62 watershed areas known as water resource inventory areas (WRIAs). The WRIAs were formalized under Washington Administrative Code (WAC) 173-500-040 and authorized under the Water Resources Act of 1971, Revised Code of Washington (RCW) 90.54. Thurston County contains portions of the following WRIAs: 11 - Nisqually, 13 - Deschutes, 14 – Kennedy-Goldsborough, and 23 - Upper Chehalis. A small portion of WRIA 22 - Lower Chehalis is located in the western-most portion of the county. However, WRIA 22 does not contain any SMA jurisdictional shorelines (Map 8).

Thurston County Shorelines

Within Thurston County there are approximately 468 linear miles of shoreline. There are approximately 116 linear miles of marine shoreline (including the inner shores of bays and marinas) and approximately 131 miles of lakeshore on 38 lakes that are designated as shorelines of the state in Thurston County. In addition, there are more than 221 miles of stream shoreline

(per WAC 173-18, with revisions from 20 cubic feet per second [cfs] mapping from USGS, 1998). There are 137 marine reaches, 164 lake reaches, and 236 stream reaches (Maps 1-7).

Marine Shorelines

Thurston County is adjacent to several bodies of marine waters within the Puget Sound. The major marine waters are as follows and are provided in order from east to west and with the corresponding WRIA number in parentheses: Nisqually Reach (WRIA 11) Henderson Inlet (WRIA 13) Budd Inlet (WRIA 13) Eld Inlet (WRIAs 13 and 14) and Totten Inlet (WRIA 14).

Freshwater Shorelines

Rivers, Streams, and Associated Floodplains

Thurston County is drained by five major rivers, in addition to several small streams which flow directly in to Puget Sound. The five major rivers are described below in order from east to west with the corresponding WRIA number in parentheses (See Map 8).

The Nisqually River (WRIA 11) is the easternmost river in Thurston County, forming the east county border with Pierce County. The Nisqually River is fed by glaciers on the south flank of Mount Rainier. It flows from Mount Rainier in a northwesterly direction into Puget Sound at a point about ten miles northeast of Olympia. The vast majority of the River and its regulated tributaries include associated 100-year floodplain. The associated floodplain is relatively simple by comparison with other rivers in the County (e.g., Chehalis). It is typically tightly associated with the channel but widens in a number of areas, effectively expanding the area of regulated shoreline well beyond the 200-ft zone.

The Deschutes River (WRIA 13) begins in the Bald Hills of Lewis County and flows northwesterly. The Deschutes River is roughly parallel to the Nisqually River and is located five to ten miles to the west of the Nisqually. It flows into the Puget Sound at Budd Inlet in the City of Olympia. The vast majority of the River and its regulated tributaries include associated 100-year floodplain. The associated floodplain is somewhat more complex than that of the Nisqually River and includes a number of wide spots, lobes, and alternate channels based on the local topography. This contributes to a more complicated associated shoreline jurisdiction. The Deschutes River has four SMA regulated tributaries: Little Deschutes, Mitchell Creek, Reichel Creek, and Spurgeon Creek.

The Skookumchuck River (WRIA 23) also begins in the Bald Hills of Lewis County. It flows north into Thurston County where it drains the hills in the south central portion of the County. It winds towards the City of Bucoda and then turns in a southern direction to its confluence with the Chehalis River in Lewis County. Part of the upper Skookumchuck River has been impounded to form Lake Skookumchuck. Most of the River and its regulated tributaries include associated 100-year floodplain. Below Lake Skookumchuck, the floodplain is relatively wide and is complex in areas including lobes, alternate channels, and areas where the floodplain includes pockets of non-floodplain land. It also extends up at least one non-regulated tributary. All of these characteristics contribute to a more complicated associated shoreline jurisdiction. The Skookumchuck River has two SMA regulated tributaries: Thompson Creek (Skookumchuck) and Johnson Creek.

The Chehalis River (WRIA 23) flows into Thurston County in a northwesterly direction from Lewis County. It crosses from Lewis County into the southwestern corner of Thurston County where it drains the Michigan Hills area and receives water from both Prairie and Scatter Creeks. The Chehalis discharges into the Pacific Ocean at Grays Harbor. The entire Chehalis

River and most of Scatter Creek, its single SMA regulated tributary within the County, include associated 100-year floodplain. The topography around the Chehalis River results in a very wide, very complex associated floodplain, particularly where the Black and Chehalis Rivers share 100-year floodplain areas. The most complicated floodplain areas are in the uppermost reaches within the County and the area immediately downstream of the Scatter Creek confluence. The Scatter Creek floodplain is relatively wide downstream of the City of Tenino and includes features such as lobes and alternate channels. The lower reaches of the Chehalis River (within Thurston County) along with the lower reaches of the Black River (again within the County) have some of the most complicated associated jurisdiction in the County due to floodplains and the wetlands which are also typical of the area.

The Black River (WRIA 23 south of Black Lake, WRIA 13 north of Black Lake) like the Skookumchuck, is also a tributary to the Chehalis River. The Black River drains a large portion of the easternmost Black Hills and much of the prairie area east of the river. The gradient of the Black River is not great enough for effective drainage, and consequently, has a large number of adjacent wetlands throughout its course. Its confluence with the Chehalis is within Grays Harbor County. The Black River has five SMA regulated tributaries: Mima Creek, Beaver Creek, Waddell Creek, Salmon Creek, and Dempsey Creek.

In addition to the five large rivers, there are four SMA regulated streams draining to Puget Sound shorelines. Kennedy Creek (WRIA 14) originates in northwest Thurston County and flows to Totten Inlet by way of Mason County. Kennedy Creek does not have associated floodplain. McLane Creek (WRIA 13) drains the area immediately south of the head of Eld Inlet. Its associated floodplain is relatively simple but wide in places. Woodland Creek (WRIA 13) drains the area immediately south of the head of Henderson Inlet. It also has a relatively simple associated floodplain. McAllister Creek (WRIA 11) drains the area immediately west of the Nisqually River and empties into the Nisqually Delta area. South of 1-5, its associated floodplain is simple and relatively narrow. North of 1-5, its associated floodplain is extremely wide and complex where it merges with the floodplain of the Nisqually River in the Nisqually Delta area.

Two additional regulated streams, Sherman Creek and North Fork Porter Creek (both in WRIA 23) do not connect to the five larger rivers in Thurston County. Both streams originate in the southwest area of the County within Capitol Forest and eventually drain to the Chehalis River. Neither stream includes associated floodplain or substantial wetland areas; their jurisdiction is primarily defined by the 200-ft distance from OHWM. While the 20 cfs point for North Fork Porter Creek occurs approximately 200 ft within the boundary of Thurston County, the remainder of the area that falls within shoreline jurisdiction on North Fork Porter Creek is within Grays Harbor County.

Lakes

Lakes greater than 20 acres and therefore managed under the SMA within Thurston County include the following, arranged by WRIA:

WRIA 11: Lake Saint Claire, Clear Lake, Elbow Lake, Bald Hill Lake, Inman Lake, Alder Lake, and an unnamed lake.

WRIA 13: Bigelow Lake, Trosper Lake, Ward Lake, Hewitt Lake, Shinke pond, Long Lake, Munn Lake, Hicks Lake, Southwick Lake, Pattison Lake, Sunwood Lake, Tempo Lake, Offut Lake, McIntosh Lake, Lawrence Lake, Reichel Lake, Lawrence lake, unnamed lake.

WRIA 14: Summit Lake, two unnamed ponds.

WRIA 23: Deep Lake, Scott Lake, Pitman Lake, Black Lake, Skookumchuck Lake, several unnamed lakes, several unnamed ponds, and four unnamed lake shorelines created from mining activities.

Lakes that are located within the County but are wholly within a municipal jurisdiction are not included in this list. Additional information for the above listed lakes is provided within the individual WRIA chapters (Chapters 5-8). Information at an even more detailed scale can be found within Appendix A - the Reach Matrix.

Wetlands

Most regulated freshwater jurisdiction, with the exception of some of the higher gradient streams and rivers, are also mapped as wetland areas. Associated wetland areas, those areas outside of the actual waterbody, are less ubiquitous within County shorelines. In low gradient areas, including the main stems of the major rivers and many of the lakes, associated wetland and associated floodplain areas often co-occur. The Black River, which has a particularly low gradient and very slow flow, has large areas where a quite wide channel, essentially the entire floodplain, is almost entirely vegetated with complex wetland vegetation (much of this area has been identified by the USFWS as priority restoration/conservation area as part of the Black River Unit of the Nisqually Wildlife Refuge). The Deschutes River includes large reaches where associated wetlands extend beyond the floodplain; again, a function of a relatively low gradient reach.

Particularly in low-gradient areas, wetlands (like floodplains) are often not associated with a single regulated waterbody but rather form a complex between them. The complex of wetland and floodplain making up associated wetland jurisdiction between the Chehalis and Black Rivers an example of this, as is the much smaller complex located between Scott and Deep Lakes.

In higher gradient areas, including much of Capitol Forest and the upper reaches of the Nisqually and Skookumchuck Rivers, associated wetlands are much less prevalent.

Topography

Thurston County's topography varies from coastal lowlands to Puget prairie flatlands to the foothills of the Cascades. The northwest and southeast corners of the County are marked by peaks ranging from 1,700 to 3,000 feet in elevation. However, the central region rarely exceeds 600 to 700 feet in altitude and most of the prairie areas range from 100 to 500 feet in altitude. Glacial activity in Thurston County's geologic past left the land scattered with lakes and ponds. The northernmost boundary of the County is determined by the shoreline of Puget Sound. Inlets exclusive to the County are Budd, Henderson, and Eld Inlets. Budd and Henderson Inlets are separated by Dana Passage. Other inlets form the boundaries between Thurston and adjacent counties. Totten Inlet divides Thurston and Mason Counties, and the Nisqually River separates Thurston County from Pierce County (Map 10).

Geology

Thurston County lies within the Puget Trough. The Puget Trough is a long northward slanting lowland located between the Cascade Mountains on the east and the Olympic Mountains on the west, extending from central western Oregon into Canada. The County is heavily influenced by past glaciations and glacial erosional and depositional features dominate the landscape. These features influence the routing of water and sediment through the landscape. Glacially deposited

sediment varies in composition depending on the depositional process and can influence infiltration and erosion potential.

The underlying geology of the region is the end product of over 40 million years of long-term tectonic, glacial, fluvial, and hillslope processes occurring at the western end of the North American plate. The geologic history can be condensed into three general time frames, ordered here from oldest to newest. Thurston County's bedrock was formed from 50 to 2 million years ago, by volcanism and marine deposition. The volcanism resulted from the North American plate moving over more dense oceanic rocks. Basaltic and Andesitic volcanic flows are found in the higher elevation areas of Thurston County, including the Capitol Forest area and the hills in southern Thurston County around Skookumchuck Lake and north to the City of Tenino, the Deschutes River, and around Alder lake. Marine sedimentary rocks are found in the same locations as the volcanic flows. Additionally, there is a large patch of marine sedimentary rock south of the Chehalis River (Map 12).

The geology, soils and land forms of Thurston County are largely the result of glacial action during the ice age that lasted from 2,000,000 years ago to 10,000 years ago (the Pleistocene Epoch) (Map 11). Between 2 million to approximately 10,000 years ago, during the Pleistocene epoch, the landscape experienced multiple glacial and inter-glacial periods that provided the raw materials and shaped much of the modern landscape in the Puget Sound lowlands. During the Pleistocene ice age, valley glaciers joined into huge continental glaciers that were thousands of feet thick. At their maximum advance, the glaciers extended to Scatter Creek south of Olympia, and to the Deschutes River in eastern Thurston County.

The glaciers advanced and retreated four times during the ice age, with the last advance (ending around 14,000 years ago) referred to as the Vashon glaciation. As the glaciers moved southward from British Columbia they gouged and scoured the land beneath them and picked up large amounts of sediment ranging from boulders to silt. The friction of movement caused melting of the ice at the glaciers' base, resulting in some of the sediment load being deposited as a compressed layer directly below the glacier. This formed the dense, generally impermeable material known as glacial till (also hardpan or boulder clay). Glacial till is found in patches throughout the lowland areas of all the Thurston County WRIAs. The largest areas include the peninsulas that jut into Puget Sound, the area south of Yelm between the Nisqually and Deschutes Rivers, and an area west of the Black River south of the Tumwater Urban Growth Area and north of the City of Tenino (Map 12).

Most recently, from 10,000 years ago to present, the large ice sheets receded and the post-glacial reorganization occurred. As the glaciers melted, the waters that flowed off it carried large amounts of silt, sand, and gravel. Coarser materials were deposited close to the glacier's edge, while sands were carried farther and deposited on the flood plains. Silt and clay were deposited mainly in lakes and marine waters. Except for numerous scattered "islands" of older consolidated rocks, the entire basin has been partly filled with unconsolidated fluvial and glacial materials of the Pleistocene age. Glacial "drift", "moraines", and "outwash" are found in the majority of the low elevation areas in Thurston County. The meltwater from the retreating glaciers carved complex drainages that likely created an outlet from the Puget Sound lowlands to what is now the Chehalis River and Grays Harbor. After the glacier melted, large remnant ice blocks were left on the outwash plains and covered by younger sediments. When the ice blocks melted, the surface collapsed into the holes left by the melted ice, thereby forming the numerous "kettle" lakes of the County (Map 12).

Currently, the dominant geologic factors driving landforms in Thurston County are hillslope and fluvial processes, which are superimposed on glacial, volcanic, and tectonic regimes. Hillslope and fluvial processes govern the movement of materials through the landscape, creating and

maintaining aquatic habitat. The large rivers in Thurston County move materials to valley floors through hillslope processes and transport or temporarily store those materials via fluvial processes. Deposited alluvium is found throughout Thurston County in the floodplains of the large rivers and to a lesser extent in smaller systems (Map 12).

Climate

Thurston County has a marine type climate with mild temperatures year-round. In the warmest months, the average high temperature ranges between 75 and 80 degrees. In the winter months, high temperatures average 45 degrees. Like most of western Washington, Thurston County's weather is characterized by cool, dry, sunny summers and mild, wet winters. Average yearly rainfall for Thurston County is 50 inches with the majority of precipitation occurring between October and May. Precipitation is highest in areas of higher elevation such as the headwaters of the Deschutes, and in the Black Hills. Precipitation typically occurs as low-intensity, long-duration storms. The county spans at least two of Washington's climatic regions; the Puget Sound Lowlands, and the western Cascades.

Global Climate Change

Thurston County's shorelines will undoubtedly be impacted by global climate change over time. Effects of global climate change will occur everywhere on the shorelines, but will probably be most pronounced on the low lying nearshore areas. The United Nations Intergovernmental Panel on Climate Change (IPCC, 2007) concluded that, "Warming of the climate system is unequivocal, as is now evident from observations of increases in global average air and ocean temperatures, widespread melting of snow and ice, and rising global mean sea level."

University of Washington's Climate Impacts Group researchers and others have dedicated substantial effort to modeling potential climate change effects on the Pacific Northwest. Despite these modeling efforts, uncertainty exists regarding the precise timing, magnitude, and extent of climate change impacts in the Puget Sound region. However, it is certain that global climate change impacts will occur. Being proactive by developing plans and taking action now will reduce harm to natural resources and human communities in the future.

The IPCC predicts that average global surface temperature could increase from 2.5 to 10.4˚F, and global sea level could rise between 4 and 35 inches between 1990 and 2100, depending on both the rate of natural changes and the response of the climate system to present and future greenhouse gas emissions (IPCC, 2007). Thurston County's shorelines are likely to be impacted in multiple ways from increasing temperatures and sea levels, as described below.

Temperature Effects on Habitat

Over the past century, Washington has already experienced climate change (Casola et al., 2005a). The surface air temperature has increased on average by approximately 1.5˚F. Over the past 80 years, snowpack has declined, particularly at lower elevations. The beginning of snowmelt and peak stream flows in snow-fed rivers has been occurring earlier in the year. Many plants are also blooming earlier (Casola et al., 2005a).

Washington is likely to face an increase in temperature across all seasons over time (Casola et al., 2005a). By the 2020s, average Pacific Northwest temperatures will likely rise between 2.5 and 3.7˚F, with additional increases in the 2040s of between 3.1 and 5.3˚F. As air temperatures rise, water temperatures are also predicted to increase. Increased air and water temperatures may create inhospitable conditions in lakes, rivers, and salt water, for coldwater fish species such as salmon and trout. The change in conditions may be beyond those species' ability to adapt. Along with temperatures, lake and ocean stratification may also increase which may reduce available nutrients and increase competition among fish species. Additionally, rising air and water

temperatures may further impair areas of Puget Sound that are already suffering from low dissolved oxygen levels (e.g., Hood Canal) (Casola et al., 2005a).

Some marine plant species, such as eelgrass and bull kelp, appear to have a narrow range of tolerance for water temperature. As such, these species may suffer as a result of projected temperature increases (Snover et al. 2005). Changes in marine plant communities could alter habitat for marine species that are not substantially affected by moderate water temperature increases, but that depend on bull kelp and eelgrass habitat for shelter, food, or nesting sites. Pacific salmon species have an unusual life cycle that might make them particularly sensitive to air and water temperature changes (Casola et al., 2005a).

Increased summer stream temperatures could stress juvenile salmon rearing in those streams as well as create thermal barriers to adult salmon upstream migration. Lower winter snowpack and earlier spring runoff may increase the occurrence of redd-scouring events and prevent the flushing of juvenile salmon to salt water in runoff. In marine waters, higher water temperatures or altered currents may affect the food availability and change predator distribution, though the impacts of climate change on these factors are not well understood (Casola et al., 2005a).

As water temperatures increase, marine and freshwater planktonic communities may also change (King County, 2006). Warm temperatures in shallow water over prolonged periods favor several groups of organisms, including bluegreen cyanobacteria, (some species of which make toxic substances to people and animals); dinoflagellates, (which produce the toxins that cause red tides); and chlorophyte algae, (some species of which form sizable filamentous masses that cover rocks and structures) (King County, 2006).

Precipitation and Runoff

The modeling results of effects of global climate change on precipitation levels are somewhat uncertain, because many factors influence precipitation that are not well understood (Casola et al., 2005a). However, the majority of models predict that Washington will receive more precipitation with most increases occurring from October through March due to climate change during the 21st century. As winter temperatures increase, more of this precipitation is expected to fall as rain rather than snow, leading to reduced snowpack and earlier spring runoff (Casola et al., 2005a).

Air temperature and precipitation changes from global climate change will affect stream flow, stormwater runoff, and water temperature (Casola et al., 2005a). Stream flow is predicted to experience varying impacts depending on whether a stream is fed primarily by snowmelt or rainfall (Casola et al., 2005a). Low elevation coastal rivers have flow volumes closely connected to seasonal precipitation patterns; as winter precipitation increases, winter flows in these systems are thus also likely to increase. Rivers draining intermediate “transient snow zone” elevations have higher sensitivity to the proportion of winter precipitation falling as snow versus rain. These rivers typically have peak flows during November and December and again during spring runoff. Rivers draining “transient snow zone” elevations are likely to see an increase in “wet season” flows as rainfall increases, reduced spring and summer flows, and an earlier occurrence of runoff. Basins dominated by transient snow zones are also expected to experience an increase in moderate floods, though large floods are expected to occur at roughly the same frequency as present (Casola et al., 2005a).

As temperatures increase and snowpack declines toward mid-century, river systems that depend on snowmelt will likely have peak runoff occur earlier in the spring, as well as have lower summer base flows (King County, 2006). Both of these changes may greatly impact fish and

other biota adapted to coldwater habitat during the warm, dry months of summer (King County, 2006).

Sea Level Rise

One of the anticipated effects of climate change in the Pacific Northwest is sea-level rise. In response to global climate change, sea levels are estimated to rise between 4 and 35 inches by 2100 (Intergovernmental Panel on Climate Change 2006). In Olympia, land subsidence alone is already responsible for a sea level rise of approximately 1 foot per century. Adding the impacts of climate change to subsidence on sea level rise may result in port district inundation and central business district flooding in Olympia in the future (Casola et al. 2005b).

Climate change might affect sea levels and coastlines of Washington State in a number of ways (Casola et al., 2005b). Coastal flooding and erosion could be increased by rising sea levels, particularly in areas of tectonic subsidence and on flat beaches. To protect infrastructure, shoreline armoring in many areas may have to be enhanced, while in other areas, development and housing may simply have to be abandoned or moved in response to flooding. Landslide and freshwater flooding occurrence may also increase with winter precipitation. In order to minimize additional risks to infrastructure in the future, further development in coastal hazard areas should be discouraged (Casola et al., 2005b).

Sea level rise may also considerably change the geographic locations of the shoreline jurisdiction over time. A sea level rise of up to 3 feet will cause a substantial movement of water inland and would be particularly pronounced in lower slope or flatter areas (King County, 2006). Water moving inland has the potential to flood beachfront homes and cause associated property damage, as well as significantly increasing erosion of feeder bluffs. Rising sea level is also likely to disrupt other coastline ecological processes. Predicted habitat changes in Thurston County are: increased shoreline erosion, loss of estuarine beach and tidal flat areas, saltwater intrusion into freshwater wetlands and brackish marshes, and reduction in tidal marshes (NWF, 2007).

Options to address the impacts of rising sea levels were presented by Casola et al. (2005b) including:

- Preserving ecological buffers to allow for beach migration inland;
- Restoring wetlands to control runoff and floods;
- Augmenting shoreline protection while understanding its negative consequences on shoreline habitat;
- Creating a disaster relief plan for erosion and flooding events.

Landcover

Land cover in Thurston County follows the patterns of geology and topography discussed above. Forest land dominates the higher elevation part of the county that lies within the foothills of the Black Hills and the hills along the County's southern border. Much of the forest land is in active harvest rotation, as evidenced by numerous patches of shrub and grassland in these areas.

The river valleys and adjacent lowland areas around the Black River, Chehalis River, Scatter Creek, Skookumchuck River, Deschutes River, and the Nisqually River are covered primarily in pasture/hay, cultivated land, grassland, and Palustrine emergent wetlands.

Developed land cover is most heavily concentrated within the cities and urban growth areas of Olympia, Lacey, and Tumwater in WRIA 13. Secondarily, developed land cover is most concentrated within the cities of Yelm, Tenino, Bucoda, and Rainier.

To provide an overall summary of land cover in Thurston County, data from the NOAA CCAP (2006) project are shown on Map 25 (Land Cover) in the Inventory and Characterization Report (I & C) and summarized in Table 3.1 below. The density of urban development generally decreases with distance away from Puget Sound.

Table 3.1. NOAA CCAP Landcover Category Percentages per WRIA

	WRIA Number			
2006 NOAA CCAP Landcover Category	**11**	**13**	**14**	**23**
2 - Developed, High Intensity	0.3%	1.7%	0.0%	0.2%
3 - Developed, Medium Intensity	1.5%	4.8%	0.6%	0.7%
4 - Developed, Low Intensity	4.8%	10.9%	3.7%	3.1%
5 - Developed, Open Space	3.2%	6.1%	1.7%	2.2%
6 - Cultivated Crops	0.6%	0.5%	0.0%	2.5%
7 - Pasture/Hay	12.0%	5.7%	1.1%	9.1%
8 - Grassland/Herbaceous	4.7%	6.0%	5.7%	5.2%
9 - Deciduous Forest	3.0%	6.4%	7.5%	6.3%
10 - Evergreen Forest	36.9%	28.9%	44.2%	33.4%
11 - Mixed Forest	11.1%	11.8%	15.5%	10.2%
12 - Scrub/Shrub	11.9%	10.3%	13.5%	17.3%
13 - Palustrine Forested Wetland	2.0%	1.7%	1.8%	2.3%
14 - Palustrine Scrub/Shrub Wetland	2.8%	1.9%	1.5%	3.5%
15 - Palustrine Emergent Wetland	3.4%	1.8%	1.0%	2.6%
18 - Estuarine Emergent Wetland	0.4%	0.1%	0.2%	0.0%
19 - Unconsolidated Shore	0.1%	0.2%	0.2%	0.1%
20 - Barren Land	0.5%	0.4%	0.2%	0.6%
21 - Open Water	0.6%	1.0%	1.6%	0.8%
22 - Palustrine Aquatic Bed	0.0%	0.0%	0.0%	0.0%
23 - Estuarine Aquatic Bed	0.0%	0.0%	0.0%	0.0%
25 - Perennial Ice/Snow	0.0%	0.0%	0.0%	0.0%

OVERVIEW OF KEY SPECIES AND HABITATS IN THURSTON COUNTY

Thurston County Critical Areas

The Thurston County Critical Areas Ordinance addresses the following types of critical areas, all of which occur within shorelines: critical aquifer recharge areas; geologic hazard areas; seismic hazard areas; volcanic hazard areas; mine hazard areas; frequently flooded areas (including channel migration zones); fish and wildlife habitat conservation areas; and wetlands. Regulations protecting Critical Areas are listed in Thurston County Code (TCC) Title 24, which was last updated in July, 2012. See Maps 29-32. Agricultural uses and lands critical areas are addressed in TCC 24. Pursuant to TCC 24, agricultural uses and lands critical areas applies to agricultural lands and uses as defined as “Agricultural Activities” in the Growth Management Act, as amended (RCW 36.70A.703). The Thurston County Critical Areas Ordinance (Title 24) applies to all other uses, structures, and lands.

Critical aquifer recharge areas

Pursuant to TCC 24.03, "Critical aquifer recharge areas" means an area with a critical recharging effect on aquifers used for potable water, including areas where an aquifer that is a source of drinking water is vulnerable to contamination that would affect the potability of the water, or is susceptible to reduced recharge.

Geologic Hazard areas

Pursuant to TCC 24.03, "Geologic hazard areas" means those areas that because of their susceptibility to erosion, landsliding, earthquake, volcanic lahar, liquefaction or other geological events, are not suited to siting commercial, residential or industrial development consistent with public health or safety concerns.

Seismic hazard areas

Pursuant to TCC 24.03, “Seismic hazard areas” means the following:

A. Those areas subject to severe risk of damage as a result of earthquake induced ground shaking, slope failure, surface faulting, settlement or soil liquefaction, such as artificial fill areas, and areas underlain by glaciolacustrine deposits and/or glacial outwash; or
B. Those areas mapped as having a liquefaction susceptibility of high, moderate to high, or low to moderate on the Liquefaction Susceptibility Map of Thurston County, Washington, published by Washington Department of Natural Resource (September 2004).

Volcanic hazard areas

Pursuant to TCC 24.03, “Volcanic hazard areas” means those areas subject to pyroclastic flows, lava flows and inundation by debris flows, mud flows or related flooding resulting from geologic or volcanic events of Mount Rainier, as mapped by United States Geological Survey Open File Report 98-428. The boundaries on these maps are approximately located, and areas outside of the boundaries should not be regarded as hazard-free.

Mine hazard areas

Pursuant to TCC 24.03, “Mine hazard areas” means those areas directly underlain by, adjacent to, or directly affected by mine workings such as adits (mine entrances) gangways (tunnels) drafts or air shafts.

Frequently flooded areas

The frequently flooded areas chapter applies to frequently flooded areas and one-hundred-year channel migration hazard areas as defined in TCC 24.03. Pursuant to TCC 24.03, “Frequently flooded areas” means lands in the flood plain subject to at least a one percent or greater chance of flooding in any given year or areas within the highest known recorded flood elevation, or within areas subject to flooding due to high ground water. This includes all areas within unincorporated Thurston County identified on flood insurance rate maps prepared by the Federal Insurance Administration, as supplemented by "The Flood Insurance Study for Thurston County," dated November 17, 1980, as amended. (These maps and the referenced report shall be on file with the department at the Thurston County Permit Assistance Center). Frequently flooded areas may include special flood hazard areas as defined in Chapter 14.38 TCC or high ground water flood hazard areas, where high ground water forms ponds on the ground surface, or may overlap with other critical areas, such as streams, rivers, lakes, coastal areas, and wetlands. Frequently flooded areas include: channel migration areas; high groundwater flood hazard areas; and river, lake, marine, and coastal flood hazard areas.

Fish and wildlife habitat conservation areas

Pursuant to TCC 24.03, "Fish and wildlife habitat conservation areas" are areas that serve a critical role in sustaining needed habitats and species for the functional integrity of the ecosystem, and which, if altered, may reduce the likelihood that the species will persist over the long term. These areas may include, but are not limited to, rare or vulnerable ecological systems, communities, and habitat or habitat elements including seasonal ranges, breeding habitat, winter range, and movement corridors; and areas with high relative population density or species richness. These also include locally important habitats and species.

A. Fish and wildlife habitat conservation areas that must be considered for classification and designation include:
B. Areas where endangered, threatened, and sensitive species have a primary association;
C. Habitats and species of local importance, as determined locally;
D. Commercial and recreational shellfish areas;
E. Kelp and eelgrass beds; herring, smelt, and other forage fish spawning areas;
F. Naturally occurring ponds under twenty acres and their submerged aquatic beds that provide fish or wildlife habitat;
G. Waters of the state;
H. Lakes, ponds, streams, and rivers planted with game fish by a governmental or tribal entity;
I. State natural area preserves, natural resource conservation areas, and state wildlife areas; and
J. Any other habitat areas as defined by WAC 365-190-130, as amended.

Wetlands

Pursuant to TCC 24.03, "Wetlands" means areas that are inundated or saturated by surface water or ground water at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions, and other areas meeting the definition of wetland under RCW 36.70A.030, as amended.

Wetlands generally include swamps, marshes, bogs, and similar areas. Wetlands do not include those artificial wetlands intentionally created from non-wetland sites, including, but not limited to, irrigation and drainage ditches, grass-lined swales, canals, detention facilities, wastewater treatment facilities, farm ponds, and landscape amenities, or those wetlands created after July 1, 1990, that were unintentionally created as a result of the construction of a road, street, or highway.

Wetlands may include those artificial wetlands intentionally created from non-wetland areas in order to mitigate conversion of natural wetlands. Areas below the ordinary high water mark (OHWM) of a water body, including but not limited to marine waters, lakes, ponds, streams, and rivers, may also qualify as wetlands if they meet the criteria of the 1987 U.S. Army Corps of Engineers Wetlands Delineation Manual and the Regional Supplement to the Corps of Engineers Wetland Delineation Manual: Western Mountains, Valleys, and Coast Region.

Important Habitats and Species

This section describes some of the key shoreline-related species and habitat resources of Thurston County. Many of these species rely upon the shorelines (nearshore, freshwater, or shorelands) of the county for some portion of their life cycle.

This is not an exhaustive review of all habitats and species in the County, but a general overview of the resources that are most closely related to or affected by shoreline planning. Additional

information on the locations of these specific resources in Thurston County is provided in the Inventory and Characterization Report (2013) shoreline-reach scale analysis by basin and waterbody (Chapters 5-8) in the Shoreline Reach Matrix (Appendix A) and in the Map Folio (Appendix H).

Federal and State Species and Habitat Lists

Thurston County provides critical habitat resources for many federally and/or state listed threatened and endangered species. The federal Endangered Species Act (ESA) (64 FR 14307) lists species as threatened or endangered and their federally designated critical habitats.

The WDFW Priority Habitats and Species (PHS) Program manages information for habitats and species considered by the State to be priorities for conservation and management. 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 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. Priority habitats are habitat types or elements with unique or significant value to a diverse assemblage of species. A priority habitat may consist of a unique vegetation type (e.g., West side prairie) or dominant plant species (e.g., Oregon white oak woodlands) a described successional stage (e.g., old-growth forest) or a specific habitat feature (e.g., cliffs). WDFW reports the PHS information listed in Table 3.2 for Thurston County, many of which may occur in regulated shorelines.

Table 3.2. Thurston County Priority Habitats and Species including Federal and State Status

	Species/ Habitats	State Status	Federal Status
Habitats	Aspen Stands		
	Biodiversity Areas & Corridors		
	Herbaceous Balds		
	Old-Growth/Mature Forest		
	Oregon White Oak Woodlands		
	West Side Prairie		
	Riparian		
	Freshwater Wetlands & Fresh Deepwater		
	Instream		
	Puget Sound Nearshore		
	Caves		
	Cliffs		
	Snags and Logs		
	Talus		
Fishes	Pacific Lamprey		Species of Concern
	River Lamprey	Candidate	Species of Concern
	White Sturgeon		

	Olympic Mudminnow	Sensitive	
	Pacific Herring	Candidate	Species of Concern
	Longfin Smelt		
	Surfsmelt		
	Bull Trout/ Dolly Varden	Candidate (Bull Trout only)	Threatened (Bull Trout only)
	Chinook Salmon	Candidate	Threatened (Puget Sound ESU) (Upper Columbia Spring run is Endangered)
	Chum Salmon	Candidate	Threatened
	Coastal Res./ Searun Cutthroat		Species of Concern
	Coho		Threatened – Lower Columbia Species of Concern – Puget Sound
	Pink Salmon		
	Rainbow Trout/ Steelhead/ Inland Redband Trout	Candidate (Steelhead only)	Threatened (Steelhead only)
	Sockeye Salmon	Candidate	Threatened – Ozette Lake Endangered – Snake River
	Pacific Cod	Candidate	Species of Concern
	Pacific Hake	Candidate	Species of Concern
	Walleye Pollock	Candidate	Species of Concern
	Brown Rockfish	Candidate	Species of Concern
	Copper Rockfish	Candidate	
	Quillback Rockfish	Candidate	Species of Concern
	Lingcod		
	Pacific Sand Lance		
	English Sole		
	Rock Sole		
Amphibians	Cascade Torrent Salamander	Candidate	
	Van Dyke's Salamander	Candidate	Species of Concern
	Oregon Spotted Frog	Endangered	Candidate
	Western Toad	Candidate	Species of Concern
Reptiles	Pacific Pond Turtle (also known as Western Pond Turtle)	Endangered	Species of Concern
Birds	Common Loon	Sensitive	
	Common Murre	Candidate	
	Marbled Murrelet	Threatened	Threatened
	Western grebe	Candidate	
	W WA nonbreeding concentrations of: Loons, Grebes, Cormorants, Fulmar,		

	Shearwaters, Storm-petrels, Alcids		
	W WA breeding concentrations of: Cormorants, Storm-petrels, Terns, Alcids		
	Great Blue Heron		
	Brant		
	Cavity-nesting ducks: Wood Duck, Barrow's Goldeneye, Common Goldeneye, Bufflehead, Hooded Merganser		
	Western Washington nonbreeding concentrations of: Barrow's Goldeneye, Common Goldeneye, Bufflehead		
	Harlequin Duck		
	Waterfowl Concentrations		
	Bald Eagle		
	Golden Eagle	Sensitive	Species of Concern
	Peregrine Falcon	Candidate	
	Mountain Quail		
	Sooty Grouse		
	Wild Turkey		
	W WA nonbreeding concentrations of: Charadriidae, Scolopacidae, Phalaropodidae		
	Band-tailed Pigeon		
	Yellow-billed Cuckoo	Candidate	Candidate
	Spotted Owl	Endangered	Threatened
	Vaux's Swift	Candidate	
	Pileated Woodpecker	Candidate	
	Oregon Vesper Sparrow	Candidate	Species of Concern
	Purple Martin	Candidate	
	Streaked Horned Lark	Endangered	Candidate
Mammals	Dall's Porpoise		

	Harbor Seal		
	Orca (Killer Whale)	Endangered	Endangered
	Pacific Harbor Porpoise	Candidate	
	California Sea Lion		
	Roosting Concentrations of: Big-brown Bat, Myotis bats, Pallid Bat		
	Townsend's Big-eared Bat	Candidate	Species of Concern
	Western Gray Squirrel	Threatened	Species of Concern
	Western Pocket Gopher	Threatened	Candidate
	Fisher	Endangered	Candidate
	Marten		
	Columbian Black-tailed Deer		
	Elk		
Invertebrates	Geoduck		
	Butter Clam		
	Native Littleneck Clam		
	Manila Clam		
	Olympia Oyster	Candidate	
	Pacific Oyster		
	Dungeness Crab		
	Pandalid shrimp (Pandalidae)		
	Beller's Ground Beetle	Candidate	Species of Concern
	Pacific Clubtail	Candidate	
	Leschi's Millipede	Candidate	
	Mardon Skipper	Endangered	
	Puget Blue	Candidate	
	Valley Silverspot	Candidate	Species of Concern
	Taylor's Checkerspot	Endangered	Candidate

Thurston County Important Habitat and Species

This section includes important habitat and species defined by the Thurston County Critical Areas Ordinance (TCC 24.25.065) as the following:

A. **Federally Listed Species and Associated Habitats**. Animal and plant species listed under the federal Endangered Species Act (64 FR 14307) as endangered, threatened, or candidates for listing and their habitats of primary association. (Consult the U.S. Fish and Wildlife Service and National Marine Fisheries Service for current listings.)

B. **State Listed Species and Associated Habitats**.

1. Priority species and their habitats of primary association. Priority species identified on the WDFW Priority Habitats and Species (PHS) List and their habitats of primary association. (Consult the state department of fish and wildlife for the current PHS list).
2. Priority habitats. Priority habitats identified on the WDFW Priority Habitats and Species (PHS) List. (Consult the state department of fish and wildlife for the current PHS list).
3. Prairies meeting the following criteria are priority habitats:

a) Prairie habitat, as defined in Chapter 24.03 and Table 24.25-4 TCC;

b) Areas less than one acre in size with characteristics meeting the definition of prairie habitat which are functionally connected to another prairie habitat located within one-half mile of the subject area.

3. Oregon white oak (Quercus garryana) woodlands, stands, and individual trees meeting the following criteria are subject to this section:

c) Oak woodlands, as defined in Chapter 24.03 TCC.

d) Oak Savanna, as defined in Chapter 24.03 TCC.

e) Individual oak trees and stands of oak or oak conifer associations less than one acre in size that are located within one-half mile of a stand meeting the criteria in this subparagraph.

4. State listed plant species, such as those occurring on the Department of Natural Resources' List of Known Occurrences of Rare Plants.

C. Habitats and Species of Local Importance

1. Habitats of Local Importance. Habitats of local importance in Thurston County are listed in TCC Table 24.25-4 in Appendix 24.25-1 (See Table 3.3 below).
2. Species of Local Importance. Wildlife species of local importance are listed in TCC Table 24.25-5 in Appendix 24.25-1 (See Table 3.4 below).

Table 3.3. Habitats of Local Importance (TCC 24.25-4).

Habitat	Purpose of Habitat/Basis for Listing	Related Species
Cottonwood floodplains	Current floodplain regulations do not protect this habitat from being cleared for converting to agricultural uses. This is a habitat found only along the Nisqually River in Thurston County. Cottonwoods are a keystone species in many riparian zones (Johnson et al 2001).	Red-eyed vireo
Balds (dry plant communities, grasslands)	Globally unique and rare plant community. Primarily located in SE corner of Thurston County, vicinity of Bald Hills. Similar to prairies, but smaller and shallower soils (associated with bedrock outcrops).	
Prairie or Westside Prairie	Important prairie or westside prairie habitat means herbaceous, non-forested (forested means greater than or equal to sixty percent forest canopy cover) plant communities that can either take the form of a dry prairie where soils are well-drained or a wet prairie. Priority dry prairie areas have a minimum size of one acre. In addition, some areas dominated by Scot's (Scotch) Broom (non-native shrub) or other invasive species to prairies shall be considered prairie if the area is restorable and when there are native prairie species in the understory below the shrubs. Such marginal and restorable areas can be less valuable, but may have significant value if they are large in area, or in a landscape that connects two or more prairies. Small areas less than one	Mazama pocket gopher, Taylor's checkerspot butterfly, Mardon skipper, streaked horned lark

	acre with characteristics meeting the definition of prairie habitat which are functionally connected to another larger prairie habitat within approximately one half mile are also important prairie habitat areas. Mima mounds shall be preserved to the greatest practicable extent as determined by the review authority. See the definitions for prairie habitat, dry prairie, and wet prairie.	
Oregon White Oak Habitat	Important Oak Habitat means stands of Oregon white oak (Quercus garryana) or oak/conifer associations where canopy coverage of the oak component of the stand is twenty-five percent or more; or where total canopy coverage of the stand is less than twenty-five percent, but oak accounts for at least fifty percent of the canopy coverage. The latter is often referred to as oak savanna. Important oak habitat consists of stands greater than or equal to one acre (0.4 hectares) in size. Single oaks or stands less than one acre (0.4 hectares) shall also be considered an important habitat when found to be particularly valuable to fish and wildlife (i.e. they contain many cavities, have a large diameter at breast height, are used by priority species, or have a large canopy) or are located in degraded habitat areas. Individual oak trees and stands of pure oak or oak conifer associations less than one acre in size that are located in close proximity to an oak habitat larger than one acre may also be considered an important habitat.	Western gray squirrel
Springs and seeps (includes mineral springs)	Forested springs/seeps are protected in the Forests and Fish Report to protect stream associated amphibians (SAA) protect water quality, etc. fifty-foot no cut buffer required. Mineral springs are important to Band-tailed pigeons, especially during breeding season.	

Table 3.4. Wildlife Species of Local Importance (TCC 24.25-5)

Common Name	Scientific Name	Basis for Listing as Locally Important
Birds:		*The following bird species depend on prairie habitat and are declining in population due to loss of habitat. They serve as indicator species for relatively large and/or healthy prairie and may assist in protection of prairie habitat.*
Western Meadowlark	Sturnell neglecta	Prairie species. Needs large open areas. Found on Joint Base Lewis McChord (JBLM) Mima Mounds, and Olympia Airport year round.
Lazuli Bunting	Passerina amoena	Prairie species. Declining populations. Found near Scatter Creek and Joint Base Lewis McChord (JBLM).
Common nighthawk	Chordeiles minor	Prairie species. Population declining significantly.
American Kestrel	Falco sparverius	Prairie species. Population is declining. Nests in cavities. Can use nest boxes.
Northern Harrier	Circus cyaneus	Prairie and herbaceous wetlands. Ground nester. Uncommon breeding in Washington.
American Bittern	Botaurus lengitinosus	State of Washington Birds classifies A. Bittern as a Species of Immediate Concern for wetlands.
Olive-sided Flycatcher	Contopus cooperi	State of Washington Birds classifies Olive-sided Flycatcher as a Species of Immediate Concern for forests.
Short-eared owl	Asio flammeus	State of Washington classifies Short-eared owl as a Species of High Concern for grasslands.
Amphibians and Reptiles:		*The following amphibian species ranges have been significantly reduced due to habitat alteration and development. Sensitive to site and landscape alterations, specifically that limit breeding and foraging site connectivity, and dispersal/seasonal corridors.*
Olympic Torrent Salamander	Rhyacotriton olympicus	Three of the four species of Rhyacotritoninae occur in Thurston County - Olympic Torrent, Columbia Torrent, and Cascade Torrent. Cascade and Columbia Torrent salamanders are both listed as State Candidate Species by WDFW. Erik Neatherlin of WDFW and Bill Leonard, Biologist with WDOT, both recommend listing the Olympic Torrent Salamander as a Locally Important Species due to their association with old-growth forests and sensitivity to increased temperatures and sedimentation in streams and headwaters.
Tailed Frog	Ascaphus truie	Sensitive to timber harvest. Survival may depend on protection of cool flowing streams required for breeding and larval development. Likely to be affected by increased water temperatures occurring after timber harvest. Headwater stream protection through buffers is important mitigation measure.
Cope's Giant Salamander	Dicamptodon copei	Cope's giant salamander (Dicamptodon copei) are sensitive to habitat change and fragmentation from development. Both species would be expected to occur in the extreme SE portion of the county, similar to the two PHS species, Cascades torrent salamander and Van Dyke's salamander. The SE portion of the county in the headwaters of the Deschutes systems and the Nisqually system in the vicinity of Alder lake should be considered a "hot" region for all four (2 PHS, 2 local species mentioned) as this area is the only place they are likely to occur in the county. (Source: E. Neatherlin, WDFW)
Pacific Giant Salamander	Dicamptodon tenebrosus	May be associated with old-growth forests. Found in moist coniferous forests. During breeding season found in or near streams. Closely associated with high gradient streams with coarse substrate.

Salmonids

Both federally listed and non-listed species of salmonids use streams, rivers, and nearshore habitats throughout Thurston County. In Thurston County, Chinook, coho, pink, and summer and fall chum salmon, resident and searun cutthroat trout, as well as summer and winter steelhead are documented in the larger rivers and streams. Thurston County rivers and estuaries provide spawning and rearing habitat for summer and fall Chinook, coho, and chum salmon as well as for winter and summer steelhead trout. Resident fish are also present in streams and lakes through Thurston County. All of Thurston County's marine nearshore is designated as federal critical habitat for Puget Sound Chinook. The Nisqually Delta area is designated as federal critical habitat for Bull Trout. Much of the Nisqually River is designated federal critical habitat for both the Puget Sound Chinook and Bull Trout.

Nearshore Habitats and Species

Important nearshore marine habitats in Thurston County include shoreline types, forage fish spawning areas; shellfish beds; estuaries / pocket estuaries, salt marshes, eelgrass and kelp, and marine nearshore riparian areas. Many of these areas or habitats are included in the definition of critical saltwater habitats in the Guidelines (WAC 173-26-221 (2) (iii)).

Shoreline Type

The WDNR qualified and mapped information, including shoreline type, observed on the shorelines of Thurston County in the Washington ShoreZone Database. The Shoreline Type divides the shoreline into 15 shoreline types commonly used in British Columbia. The classification is a simplification of the BC shoreline classification.

Analyses of shoreline type data show that the most frequently occurring shoreline type in Thurston County is sand beach (39.5%) followed by mud flat (25.5%) (Table 3.5).

Table 3.5. Thurston County Shoreline Type (DNR Shorezone Inventory).

Shoreline Type	Miles	% of Thurston County Shoreline
Estuary wetland	13.5	11.6%
Man-made	3.2	2.7%
Mud flat	29.6	25.5%
Sand and gravel beach	6.2	5.4%
Sand and gravel flat	1.7	1.4%
Sand beach	45.8	39.5%
Sand flat	16.0	13.8%
	116.0	100.0%

Forage Fish

Forage fish such as Surf smelt, sand lance and herring are a critical prey base for salmonids. Forage fish use a variety of shallow nearshore and estuarine habitats for spawning, feeding, and rearing (Long et al., 2005). Surf smelt (*Hypomesus pretiosus*) and Pacific sand lance (*Ammodytes*

hexapterus) have habitat requirements for spawning in the upper intertidal zones of beaches, within a limited tidal elevation range, and in substrate of specific size and type (Penttila, 1978; 1995). In contrast, Pacific herring (*Clupea harengus*) spawn in intertidal and shallow subtidal areas, where they deposit eggs on marine vegetation at elevations between 0 and -10 feet MLLW (WDFW, 2000a). Spawning habitat suitable for forage fish for these species is limited, and these species are especially vulnerable to changes in beach morphology, beach sediment characteristics (sources, transport or deposition) or nearshore riparian cover (WDFW, 2000a). Forage Fish spawning beaches have been mapped along much of the marine shoreline of Thurston County. Documented surf smelt spawning areas occur widely along Thurston County's shorelines. Sand Lance documented spawning areas include the upper Steamboat Island Peninsula, the upper Cooper Point peninsula, between Boston Harbor to Big Fishtrap, and along the Nisqually Reach. Herring have been documented spawning in Gallagher Cove, Dana Passage, and the Nisqually Reach (I & C Map 35).

Shellfish Resources

Cobble to fine sand beaches and tidal sand and mudflats are important habitats for many shellfish species. Intertidal areas in Thurston County support hardshell clams including butter clams (*Saxidomus gigantea*) native littleneck (*Protothaca staminea*) manila clams (*Venerupis philippinarum*) cockles (*Clinocardium nuttalli*) and horse clams (*Tresus* spp.). Geoducks (*Panopea abrupta*) typically burrow offshore in subtidal areas up to 2 to 3 feet into the mud or soft sand. Shrimp, crab, Olympia oysters (*Ostreola conchaphila*) and non-native Pacific oysters (*Crassostrea gigas*) also inhabit the shoreline areas. Dungeness crab (*Cancer magister*) frequent eelgrass beds, and red rock crab (*Cancer productus*) inhabit rocky terrain with less silt content (Thurston County 2008, WDFW, DOE).

Shellfish beds perform a number of ecological functions including stabilizing substrates, cycling nutrients, enhancing water quality (filtering and retention) creating habitat structure (e.g., oyster reefs) and providing food for a wide variety of marine invertebrates, birds, fish, and mammals. Shellfish beds and commercial and recreational shellfish harvest beaches are found along the shorelines of Thurston County. For locations within Thurston County, please see I & C Map 35 - Marine Fisheries, Map 36 - Shellfish Areas, and Map 38 - Nationwide Permit 48 (NWP 48) for Shellfish Aquaculture. The U.S. Corps of Engineers NWP 48 covers all existing shellfish aquaculture activities, including all culture methods currently used in oyster, mussel, scallop, clam (including geoduck) farming. Activities not covered under NWP 48 include: new operations; expansion of project area; stockpiles and staging areas. The Tribal shellfish beaches and growing areas are also distributed throughout the County.

Water quality issues and their effect on the harvest of commercial and recreational shellfish have resulted in the Henderson Inlet and Nisqually Reach Shellfish Protection Districts (Thurston County Public Health and Social Services 2013). Commercial harvest areas have been closed (classified prohibited) along Carlyon Beach, in Woodard Bay, lower Henderson Inlet, and along sections of the Nisqually Reach. Part of Henderson Inlet is open conditionally (DOH, 2013).

Estuaries/ Pocket Estuaries

Estuaries are semi-protected inland waters with freshwater inputs that act as transition zones between freshwater and marine environments. They make up the area at the mouth of a river or stream from the head of tidal influence seaward to the point where fluvial influences no longer dominate (Map 14). Historically, Thurston County estuaries were located at the mouths of the major river systems. Several of these, such as Budd Inlet at the mouth of the Deschutes River, have been highly modified and have impacted habitat. However, habitat remnants are present

even in the most impacted areas. Nisqually Delta is the largest and most prominent of the Thurston County estuary systems.

As well as the major estuaries listed above, there are tidal marsh systems called "pocket estuaries" that are believed to support the early marine life histories of juvenile salmon species, though are not connected to the natal watersheds (Hood Canal Coordinating Council, 2005). 'Pocket estuaries' range from the mouths of small streams and creeks to nearly enclosed bays, and can be composed of habitats such as unvegetated flats, salt marsh, and tidal channels. Pocket estuaries occur irregularly along the protected and exposed shorelines that dominate most of Puget Sound. The amount of freshwater input into a pocket estuary ranges from year round to none. There may be hundreds of pocket estuaries scattered throughout Puget Sound, and cumulatively, these smaller estuaries can be very important to several life history stages of juvenile Chinook or juvenile chum salmon.

Pocket estuaries are mapped in Thurston County to occur in Totten Inlet in Burns Cove, north of Elizan Beach, and along Gallagher Cove. Pocket estuaries are mapped in Eld Inlet in Sanderson Harbor, Flapjack Point, Sunrise Beach, Mud Bay, and north of Countryside Beach. Budd Inlet contains mapped pocket estuaries in Silver Spit, Gull Harbor, and Little Fishtrap. Henderson Inlet contains two mapped pocket estuaries. Along the Nisqually Reach, pocket estuaries are mapped near Baird Cove, near Sandy Point and in several other small inlets (Washington Coastal Atlas and WDWF). Mapped estuarine wetlands are also located in the Oyster Bay and Gallagher Cove areas of Totten Inlet, in Sanderson Harbor and the Mud Bay area of Eld Inlet, Henderson Inlet at the mouth of Woodland Creek, and in Baird Cove and several other places along Nisqually Reach (I & C Map 14).

Estuaries supply critical ecological functions and biological resources including: water quality improvement such as nutrient retention and cycling; food web support; and habitat structure/connectivity; erosion/shoreline protection; flood attenuation; tidal exchange/organic matter exchange; and stream base-flow and groundwater support. Estuaries supply critical habitat for the fish migration as well as refugia for many marine and brackish species. They provide critical functions for salmon by providing salinity gradients that allow juveniles to gradually adjust to salt water as well as serving as nurseries for a multitude of aquatic species that are a forage base for salmon.

Many species, including juvenile salmonids, use estuaries and other shallow water habitats as a refuge from predation when migrating, particularly when complex habitat features such as woody debris or submerged vegetation are absent (Kahler et al., 2000). Juvenile Chinook salmon and summer chum both depend on estuarine environments (WDFW and PNPTC, 2000). For recovery of threatened salmon stocks in Puget Sound, preservation and/or restoration of estuaries is considered crucial (Brewer et al. 2005; Hood Canal Coordinating Council, 2005; Todd et al., 2006).

Salt Marshes

Salt marshes and brackish marshes are tidally inundated habitats. Salt marshes occur in areas at and above mean higher high water (MHHW) where sediment supply and accumulation are relatively high. Salt marshes can occur on river and stream deltas, such as the Nisqually River Delta, along sand spits sheltered from waves and currents, and in bays. Salt marsh root mats and areas of dense stems trap and stabilize sediments. The accumulation of sediment cause marshes to extend outward over time as the sediments entering the delta from rivers are captured and retained by salt marsh vegetation. Salt marshes provide complex, branching networks of tidal channels

used by juvenile salmonids for feeding and refuge from predators. The tidal channel networks also form migratory linkages to riverine and marine environments (Brewer et al., 2005).

In Thurston County, mapped salt marsh is located in most of the inlets within Totten and Eld Inlets; in Butler Cove, Gull Harbor; and Little and Big Fishtraps in Budd Inlet; in Woodard Bay and throughout the southern half of Henderson Inlet; and in most of the inlets along Nisqually Reach (Washington Coastal Atlas) (I & C Map 34c).

Eelgrass and Kelp

Eelgrass (*Zostera marina*) is a native marine seagrass that develops extensive meadows on fine sand, gravel, and mud substrates in the lower intertidal and shallow subtidal zones within semi-protected or protected shorelines (Bulthuis, 1994; Thom et al., 1998). Eelgrass typical substrate locations have fine to medium sands as well as containing comparatively high levels of organic matter and nutrients (Simenstad, 2000). Typically this includes shallow tideflats, lining channels in estuaries, and in the shallow fringe areas of the subtidal zone. Eelgrass primarily grows between tidal elevations of +1 meter to -2 meters relative to mean lower low water (MLLW) (Thom et al., 2001; Simenstad, 2000).

Eelgrass can reach 2 meters in height, forming a dense canopy. Where undisturbed, eelgrass can grow in nearly adjoining corridors within a drift cell, but also grows patchily within and between drift cells. In general, eelgrass corridors decrease in width as beach gradient steepens and waters increase in turbidity (Simenstad, 2000). Eelgrass beds supply an important source of organic matter to food webs in the intertidal/shallow subtidal zones. Eelgrass plants produce organic carbon which is delivered to the food web via microbial decomposition of eelgrass materials (Williams and Thom, 2001).

Juvenile salmon, and numerous species of fish and other marine animals use the decomposed organic matter in their diets. Eelgrass provides habitat structure and refuge from predators, for salmon and other species. Whereas herring use eelgrass for spawning and rearing habitat, epiphytic algae and other organisms use eelgrass leaves as attachment sites to ameliorate wave and current energy (PSAT, 2001).

Although Thurston County has limited mapping of eelgrass, there are some known areas associated with the Nisqually Delta and at the southern end of Oyster Bay in Totten Inlet; as well as the potential for habitat recovery in other areas of the County (Washington Coastal Zone Atlas and the DNR Shorezone Inventory) (I & C Map 34b).

Kelp, are large brown seaweeds, which attach to bedrock or cobbles in shallow waters, especially in areas with moderate to high waves or currents. Kelp includes both floating and non-floating species. Thurston County does not contain any areas of floating kelp species. The southernmost floating bull kelp forest (*Nereocystis luetkeana*) in Puget Sound is located outside of Thurston County, near Squaxin Island (Mumford, 2007).

Kelp is found primarily in the shallow subtidal zone in areas where the water is shallow enough to allow light penetration, and there is hard substrate including pilings and other artificial surfaces. Kelp beds are a critical component of nearshore food webs, reduce wave energy, and provide sheltered habitat within the kelp bed for juvenile salmon, other fishes, crabs, and other animals. Kelp can also change its environment by affecting wave and current energy (Mumford, 2007).

Non-floating kelp is mapped in the DNR ShoreZone Inventory data as occurring in Totten Inlet around Gallagher Cove, off of Steamboat Island, from Carlyon Beach past Hunter Point to Edgewater Beach and Sanderson Inlet into Eld Inlet, along Cooper Point and at the north end of Budd Inlet, from Zangle Cove to Big Fishtrap and northeast into Henderson Inlet, off of Johnson Point both into Henderson Inlet and along Nisqually Reach. It is also mapped just outside of the Thurston County boarder around islands in the South Sound (Washington Coastal Zone Atlas and the DNR Shorezone Inventory) (I & C Map 34b).

Marine Riparian

Marine riparian areas occur at the interface between upland and aquatic areas and provide unique protection of the aquatic nearshore by the preservation of vegetation and protection of hydrologic regimes. Intact riparian habitats provide many critical ecological functions including: delivery of organic matter to nearshore and marine habitats; insect food sources for juvenile fish; microclimate control to upper beach and intertidal areas; sediment control, shoreline stabilization, and erosion reduction; water quality protection, woody debris to help build complex habitat and stabilize beach substrate; wildlife habitat; buffer from wave energy; protection from wind exposure; reduce rate and effects of stormwater runoff; increase infiltration versus runoff along bluffs (Levings and Jamieson, 2001; Brennan and Culverwell, 2004).

Slope stability is dependent on a healthy nearshore riparian vegetation zone to protect against landslides and other erosion hazards. Nearshore riparian vegetation can mitigate the effects of excessive soil moisture which can lead to erosion and/or mass instability by promoting evapotranspiration and providing root masses that support mechanical slope stability (Brennan and Culverwell, 2004).

The nearshore riparian habitat in Thurston County varies considerably in its condition. There are areas of intact native vegetation ranging to areas of dense residential development where there is very little remaining native vegetation (See I & C Maps 24 and 25).

Thurston County Freshwater Habitats

Freshwater Wetlands

Thurston County's Critical Areas Ordinance is consistent with the state and federal definition of wetland. WAC 173-22-030 defines wetlands as "those areas that are inundated or saturated by surface or ground water at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions." Wetlands perform numerous functions including: flood attenuation; water quality protection and groundwater recharge; habitat provision for numerous species of fish and wildlife. Freshwater wetlands provide biogeochemical functions involving trapping and transforming chemicals and improving water quality in the watershed; hydrologic functions related to reducing flooding and maintaining water regimes; and food web and habitat functions (Granger et al., 2005).

Freshwater wetlands are present throughout the County and mapped on Thurston County's Geodata system. Wetlands are frequently indicated by areas dominated by "hydric" soil types (including organic soil deposits) areas of low slope, depressional areas, along streams, and on slopes/transitional areas where groundwater is expressed to the surface (I & C Map 10).

Wetlands associated with shorelines of the state, or the shoreline jurisdiction, are managed under the SMA. In the context of the SMA, *associated wetlands* means wetlands that are in proximity to

shorelines or that influence or are influenced by waters subject to the Act (WAC 173-22-030 (1)). These typically include wetlands that are functionally related to the shoreline through a hydrologic connection or other factors, and wetlands that physically extend into the shoreline jurisdiction (I & C Map 1 and Maps 3-7).

Riparian Areas

Freshwater riparian areas function similarly to marine nearshore riparian areas. Riparian zones contribute to healthy streams by suppressing the erosional processes that move sediment, mechanically filtering and/or storing upland sediments before they can enter stream channels, and dissipating energy and inhibiting sediment input (Knutson and Naef, 1997). Riparian areas perform water quality functions related to pollutant removal. This occurs primarily through trapping/storing of nutrients and heavy metals in the vegetation root systems and fine sediment present in the riparian areas.

Riparian zones are the major source of large woody debris (LWD) input to streams. This large woody debris is crucial to creating habitat within the ecosystem. Structural complexity within streams is developed from trees, root wads, and limbs that fall into the stream resulting from normal tree mortality, mass slope movement, windthrow, or bank undercutting. LWD creates complex hydraulic patterns that form pools and side channels; waterfalls; enhanced channel sinuosity; and other physical and biochemical channel changes. Aquatic species depend on the in-channel structural diversity created by LWD for hiding, overwintering habitat, and juvenile rearing, in all sizes of streams and rivers (Knutson and Naef, 1997).

Forest practices, including clear cutting, can damage and degrade many of the riparian zones on state-owned and private forest lands in Thurston County. Forest and Fish rules have helped minimize the short and long term effects of forest cover loss. However, the recovery on a basin scale and overall ecological functions may take time to recreate functional habitats.

In Thurston County, the condition of riparian habitat ranges from areas where the riparian habitat is essentially untouched, to areas where the riparian habitat has been primarily removed and extremely fragmented (I & C Maps 24 and 25).

Priority Terrestrial Wildlife Habitats and Core Areas

Other habitat resources within Thurston County freshwater shoreline jurisdiction include terrestrial forests (including old growth/mature forests) Oregon White Oak Woodlands, and west side prairies. Lowland forests are dominated by western hemlock (*Tsuga heterophylla*) Douglas-fir (*Pseudotsuga menziesii*) and western red cedar (*Thuja plicata*). Old Growth/Mature Forests are mapped along the upper Nisqually River.

Oregon White Oak Woodlands and west side prairies occur in Thurston County freshwater shoreline jurisdiction. Oregon White Oak habitats are mapped along the Black River, Scatter Creek, and the Deschutes River. They are mapped (WDNR) in many locations throughout WRIAs 23, 13, and 11, including around Offutt Lake, and Long Lake (Map 34). Many rare grassland species are declining with increased urbanization and the suppression of frequent fires that once sustained the grasslands, leading to more densely forested areas (WDNR, 2005). West side prairie habitat is mapped along the Black River and Scatter Creek in WRIA 23 (WDFW). Soils that may support west side prairies are mapped throughout Thurston County in the low-lying and low gradient areas (I & C Map 34).

Soils that may support the Mazama (Western) Pocket Gopher (*Thomomys mazama*) have been mapped in all Thurston County WRIAs. The soils are most prevalent in the low gradient areas of

WRIA 23 around Black River and Scatter Creek, around the Deschutes River, and the low gradient areas in the northern section of WRIA 11 (I & C Map 34).

Thurston County Local Habitat Assessment

The Washington Department of Fish and Wildlife developed a Local Habitat Assessment Model to identify areas of overall best habitat condition (described in Chapter 2 methods). The Local Habitat Assessment combined results from three analyses: Ecoregional Assessment, Road Density Analysis, and Land Conversion Analysis (Map 23b - Thurston County Local Habitat Assessment). Priority Habitat and Species (PHS) locations (mapped separately by the Washington Department of Fish and Wildlife) are also considered high wildlife value. The locations of PHS habitats and species are not shown on Map 23b, but will be generally discussed in the individual WRIA chapters. The locations of PHS habitats (though not the individual habitat types) are shown on I & C maps 29 and 34.

In Thurston County overall, the areas of highest habitat condition are located in the Nisqually National Wildlife Refuge, in the southeast portion of the county near Alder Lake, in portions of Capitol Forest, the Scatter Creek Wildlife Area, several areas along the Black River, an area between the Deschutes River, Offut Lake and Millersylvania State Park, and along the upper Skookumchuck between the Skookumchuck Lake and the county border. These areas contain the highest biodiversity, have the fewest roads, and contain the least land conversion.

4 FUTURE DEVELOPMENT

This section estimates future development along Thurston County shorelines using a land capacity analysis method developed by Thurston Regional Planning Council, *Population and Employment Land Supply Assumptions for Thurston County* (2012).

Vacant and underutilized properties were identified using data from 2010 developed for the proposed Thurston County Comprehensive Plan 10-Year Update and other watershed planning initiatives, so recent development activities are not considered in the projection of future growth. Vacant lands are presently unused for a land use purpose. Underutilized properties are those that could be further developed given zoning allowances and land value.

The effects of likely development were then evaluated in the context of SMP provisions, as well as other related plans, programs, and regulations. Cumulative impacts were analyzed quantitatively where possible. Where specific details regarding redevelopment likelihood or potential were not available at a level that could be assessed quantitatively or the analysis would be unnecessarily complex to reach a conclusion that could be derived more simply, a qualitative approach was used.

It should be noted that the land capacity analysis is a planning level tool intended to provide an idea of the areas most likely to change or develop from a broad/cumulative perspective; however, on individual properties land owners and developers may consider more unique locational or market factors that may influence whether their properties are more or less likely to develop.

Maps of shoreline environment designations are found in Appendix B of this report. Maps of vacant, underutilized, and developed, lands by shoreline environment designation are included in Appendix C (note that some categories of land are collapsed on the maps where the standard land capacity methodology indicates that the land is unlikely to add development – e.g. developed or tax exempt properties are collectively mapped). These maps represent the starting place for the analysis showing categories of parcels and their developability; as noted above, discount factors were applied to the potentially developable land.

Results of the residential and current use analysis appear in Table 4-1 below. Additional discussion of residential, commercial, industrial, and resource land uses is below the table.

4.1 Residential Growth

Residential use and associated population are expected to grow along the shorelines as shown in Table 4-1. The discussion below describes potential residential uses along marine waters, lakes and wetlands, and rivers and creeks.

4.1.1 Marine Shorelines

Thurston County's residential unit capacity for marine shorelines was determined to be 13% of the overall residential unit capacity. Population growth and additional single-family home development is expected along many of the shorelines, given the length and extent of such shorelines. Most of these future marine dwelling units are likely to occur on shorelines designated Rural Conservancy (6%) and Shoreline Residential (1%). These designations make up 31% and 5% respectively; (total 36%) of available acres along the County's marine shorelines.

The Urban Conservancy and Natural designations make up 1% and 63% respectively of the County's developable marine shoreline acres, but they are also expected to see some population growth and additional single-family home development (2% and 4% of future residential unit capacity dwellings respectively.

The Urban Conservancy acres are located in the County's urban growth areas. The Natural acres, most of which are protected in buffers, are dispersed across the County's marine shoreline. Based on a review of Appendix B, the majority of public use acres along the marine shoreline are designated Rural Conservancy and Natural and would not see residential development.

Table 4-1. Potential for Future Residential and Public Use Development in Thurston County's Shoreline Jurisdiction

			Residential Capacity (Number of Units)		
Watershed	Basin	City/UGA	Natural	Rural Conservancy	
Black River	Allen Creek	Rural	0	20	
Black River	Beaver Creek	Rural	11	75	
Black River	Black River	Reservation			
Black River	Black River	Rural	127	62	
Black River	Black River	UGA	0		
Black River	Bloom Ditch	Rural	38	6	
Black River	Dempsey Creek	Rural	23	16	
Black River	Mima Creek	Rural	0	34	
Black River	Salmon Creek	City			
Black River	Salmon Creek	Rural	41		
Black River	Salmon Creek	UGA			
Black River	Waddell Creek	Rural	3	16	
Budd Inlet/Deschutes River	Black Lake	City			
Budd Inlet/Deschutes River	Black Lake	Rural	0	1	
Budd Inlet/Deschutes River	Black Lake	UGA	0		
Budd Inlet/Deschutes River	Capitol Lake	City			
Budd Inlet/Deschutes River	Chambers	City			
Budd Inlet/Deschutes River	Chambers	Rural	1	12	
Budd Inlet/Deschutes River	Chambers	UGA			
Budd Inlet/Deschutes River	Deschutes River (Mainstem Lower)	City			
Budd Inlet/Deschutes River	Deschutes River (Mainstem Lower)	Rural	50	99	
Budd Inlet/Deschutes River	Deschutes River (Mainstem Lower)	UGA	227		
Budd Inlet/Deschutes River	Deschutes River (Mainstem Middle)	City			
Budd Inlet/Deschutes River	Deschutes River (Mainstem Middle)	Rural	74	230	
Budd Inlet/Deschutes River	Deschutes River (Mainstem Middle)	UGA			
Budd Inlet/Deschutes River	Deschutes River (Mainstem Upper)	Rural	0	22	
Budd Inlet/Deschutes River	East Bay	Rural	16	3	
Budd Inlet/Deschutes River	Ellis Creek	City			
Budd Inlet/Deschutes River	Ellis Creek	Rural			
Budd Inlet/Deschutes River	Ellis Creek	UGA			
Budd Inlet/Deschutes River	Indian/Moxlie Creeks (Indian)	City			

Budd Inlet/Deschutes River	Indian/Moxlie Creeks (Indian)	UGA			
Budd Inlet/Deschutes River	Indian/Moxlie Creeks (Moxlie)	City			
Budd Inlet/Deschutes River	Indian/Moxlie Creeks (Moxlie)	UGA			
Budd Inlet/Deschutes River	Lake Lawrence	Rural	0	20	
Budd Inlet/Deschutes River	McIntosh Lake	Rural	4	1	
Budd Inlet/Deschutes River	Mission Creek	City			
Budd Inlet/Deschutes River	Mission Creek	UGA			
Budd Inlet/Deschutes River	Offut Lake	Rural	12	3	
Budd Inlet/Deschutes River	Percival Creek	City			
Budd Inlet/Deschutes River	Percival Creek	Rural			
Budd Inlet/Deschutes River	Percival Creek	UGA			
Budd Inlet/Deschutes River	Reichel Lake	Rural		13	
Budd Inlet/Deschutes River	Schneider Creek (West Bay)	City			
Budd Inlet/Deschutes River	Schneider Creek (West Bay)	UGA			
Budd Inlet/Deschutes River	Spurgeon Creek	Rural	121	12	
Budd Inlet/Deschutes River	West Bay	City			
Budd Inlet/Deschutes River	West Bay	Rural		23	
Budd Inlet/Deschutes River	West Bay	UGA			
Chehalis River	East Fork Independence	Rural		5	
Chehalis River	Lincoln Creek	Rural			
Chehalis River	Michigan	Rural		16	
Chehalis River	Prairie Creek	Reservation		74	
Chehalis River	Prairie Creek	Rural	13	88	
Chehalis River	Prairie Creek	UGA		0	
Chehalis River	Scatter Creek	City	25		
Chehalis River	Scatter Creek	Rural	80	154	
Chehalis River	Scatter Creek	UGA			
Eld Inlet	Eld Inlet (East)	City			
Eld Inlet	Eld Inlet (East)	Rural	6	43	
Eld Inlet	Eld Inlet (East)	UGA			
Eld Inlet	Eld Inlet (West)	Rural	16	21	
Eld Inlet	Green Cove Creek	City			
Eld Inlet	Green Cove Creek	Rural		0	
Eld Inlet	Green Cove Creek	UGA			
Eld Inlet	McLane Creek	Rural	1	29	
Eld Inlet	Perry Creek	Rural		3	
Eld Inlet	Squaxin Passage	Rural	6	8	
Henderson Inlet	Dana Passage	Rural	33	17	
Henderson Inlet	Henderson Inlet (East)	Rural	7	28	
Henderson Inlet	Henderson Inlet (West)	Rural	20	18	
Henderson Inlet	Woodard Creek	City			
Henderson Inlet	Woodard Creek	Rural	0	1	
Henderson Inlet	Woodard Creek	UGA			
Henderson Inlet	Woodland Creek	City	6		
Henderson Inlet	Woodland Creek	Rural	3	21	

Henderson Inlet	Woodland Creek	UGA	194		
Nisqually River	Alder Lake	Rural		0	
Nisqually River	Bald Hill Lake	Rural	0		
Nisqually River	Clear Lake	Rural	0	61	
Nisqually River	Elbow Lake	Rural	27		
Nisqually River	McAllister Creek	City			
Nisqually River	McAllister Creek	Reservation			
Nisqually River	McAllister Creek	Rural	37	51	
Nisqually River	McAllister Creek	UGA		73	
Nisqually River	Nisqually	City			
Nisqually River	Nisqually	Reservation			
Nisqually River	Nisqually	Rural	77	70	
Nisqually River	Nisqually	UGA			
Nisqually River	Nisqually Reach	City			
Nisqually River	Nisqually Reach	Rural	13	27	
Nisqually River	Nisqually Reach	UGA			
Nisqually River	Thompson Creek	City			
Nisqually River	Thompson Creek	Rural	2	45	
Nisqually River	Thompson Creek	UGA			
Skookumchuck River	Bloody Run	Rural			
Skookumchuck River	Frost Prairie	City			
Skookumchuck River	Frost Prairie	Rural	0	18	
Skookumchuck River	Hanaford Creek	Rural			
Skookumchuck River	Johnson Creek	Rural		16	
Skookumchuck River	O'Conner	Rural		0	
Skookumchuck River	Salmon Creek (Sk)	Rural		0	
Skookumchuck River	Skookumchuck	City			
Skookumchuck River	Skookumchuck	Rural	5	147	
Skookumchuck River	Thompson Creek (Sk)	Rural	0	39	
Skookumchuck River	Zenkner	Rural			
Totten Inlet	Burns/Pierre	Rural		16	
Totten Inlet	Kennedy Creek	Rural		9	
Totten Inlet	Schneider Creek (Totten)	Rural		0	
Totten Inlet	Totten Inlet (East)	Rural	40	55	
West Capitol Forest	Fall Creek	Rural			
West Capitol Forest	Lost Valley	Rural			
West Capitol Forest	Monroe Creek	Rural			
West Capitol Forest	Porter Creek	Rural		0	
West Capitol Forest	Sherman Creek	Rural		0	
Total			**1,359**	**1,835**	

4.1.2 Lakes and Wetlands

The County's lake and wetland shorelines are projected to see the majority of their population growth and additional single-family home development in areas designated Shoreline Residential and Rural Conservancy.

Most of the remainder of the development along the County's lake and wetland shorelines is projected to occur in areas designated Natural. Although this designation makes up the majority of available acres, it is anticipated to account for less than a third of projected growth. Several lakes and wetlands are anticipated to see a relatively small amount of growth in Rural Conservancy-designated acres. Natural- designated acres along lake and wetland shorelines are anticipated to have a relatively small amount of population growth and single-family development, and Urban Conservancy-designated areas are projected to potentially have a small amount.

4.1.3 Rivers and Creeks

The County's river and creek shorelines are projected to see the majority of their population growth and additional single-family home development occur on portions of parcels that lie outside of shoreline jurisdiction areas mostly designated Rural Conservancy.

Most of the remainder of the development along the County's river and creek shorelines is projected to occur in areas designated Natural and Rural Conservancy. This analysis included a conservative methodology of assuming future development in shoreline jurisdiction when a parcel is partially in shoreline jurisdiction while at the same time assuming large buffers on these creeks (stream buffers are 250 feet); as a result, future development potential is probably over-estimated in these locations. Second, steep slopes and public purchase of lands would also limit development in shoreline jurisdiction.

The Urban Conservancy and Shoreline Residential designated acres are projected to have a very limited amount of population growth and single-family home development.

4.2 Commercial and Industrial Development

There are approximately 200 acres of commercially zoned lands that are vacant or underutilized, associated with the following shoreline designations:

- Natural: 45 acres
- Rural Conservancy: 164 acres
- Shoreline Residential: 0 acres
- Urban Conservancy: 2 acres

Most of those acres would be developable outside of the shoreline buffers. However, current County plans and zoning and the proposed SMP would allow for future residential or commercial development similar to other Urban Conservancy sites. Potential site-specific development plans would be the subject of their own shoreline permit applications and associated environmental review. Future redevelopment on sites would be required to meet the same SMP provisions as other sites.

4.3 Resource Lands

Thurston County has two types of lands designated as resource lands of long-term

commercial significance: forestry and mineral.

Designated “Forest Resource” lands lie along the west and southeast portion of the County most prominently in Capitol Forest associated with the Black River and the upper and middle Deschutes watersheds. In these areas, most of the shoreline acres are designated as Rural Conservancy or Natural.

5 EFFECTS OF DEVELOPMENT WITH APPLICATION OF THE SMP

5.1 Environment Designations

5.1.1 Purpose and Distribution

The first line of protection of the County's shorelines is the environment designation assignments (see SMP Appendix A). According to the Guidelines (WAC 173-26-211), the assignment of environment designations must be based on the existing use pattern, the biological and physical character of the shoreline, and the goals and aspirations of the community as expressed through a comprehensive plan.

The assignment of environment designations can help minimize cumulative impacts by concentrating development activity in lower functioning areas that are not likely to experience significant function degradation with incremental increases in new development or redevelopment.

Consistent with WAC Shoreline Master Program Guidelines, the County's environment designation system is based on the existing use pattern, the biological and physical character of the shoreline, and community interests. The *Shoreline Inventory and Characterization* report provided information on shoreline conditions and functions that informed the development of environment designations for each of the shoreline waterbodies. The proposed environment designations, consistent with SMP Guidelines, include: Natural, Rural Conservancy, Urban Conservancy, and Shoreline Residential, listed in order by increasing level of use. An Aquatic environment designation applies to most shorelines waterward of the ordinary high water mark (OHWM).

In general, the Natural environment designation was recommended for shorelines with unique features that are generally incompatible with intensive human use. These areas include undisturbed portions of wetlands, estuaries, unstable bluffs, spits, and other ecologically intact areas. Approximately 31 percent of the County's total shoreline area is in the Natural environment designation.

The Rural Conservancy designation covers just over 60 percent of the County's entire shoreline jurisdiction (Figure 5-1). The Rural Conservancy environment designation was assigned to areas supporting low-intensity resource-based uses (e.g., agriculture, forestry, and recreation) or areas with existing residential development that are subject to environmental limitations (e.g., steep banks, feeder bluffs, and floodplains).

The Urban Conservancy designation is limited to 1.1 percent of the total shoreline area in the County (Figure 5-1). The designation applies to areas within UGAs or LAMIRDs,

where existing and planned development is compatible with maintaining and restoring ecological functions.

The Shoreline Residential designation applies to 3.5 percent of the shoreline area (Figure 5-1) and nearly half of the total number of parcels (Figure 5-2). The designation applies to areas that are predominantly single-family or multi-family residential development, excluding areas where further residential development would cause adverse ecological impacts to sensitive environments (e.g., steep slopes, floodplains, wetlands).

There are approximately six reaches or portions of reaches that were given a more "protective" SED during Planning Commission review in 2021 and 2022. There are approximately five reaches or portions of reaches that were updated in 2021/2022 in a manner that allows for additional impacts to occur within shoreline jurisdiction, either by placing a SED that allows a smaller buffer or allows additional uses that may impact the shoreline. However, mitigation sequencing is still a requirement in these areas, and new activity in the shoreline is subject to the development standards in the SMP.

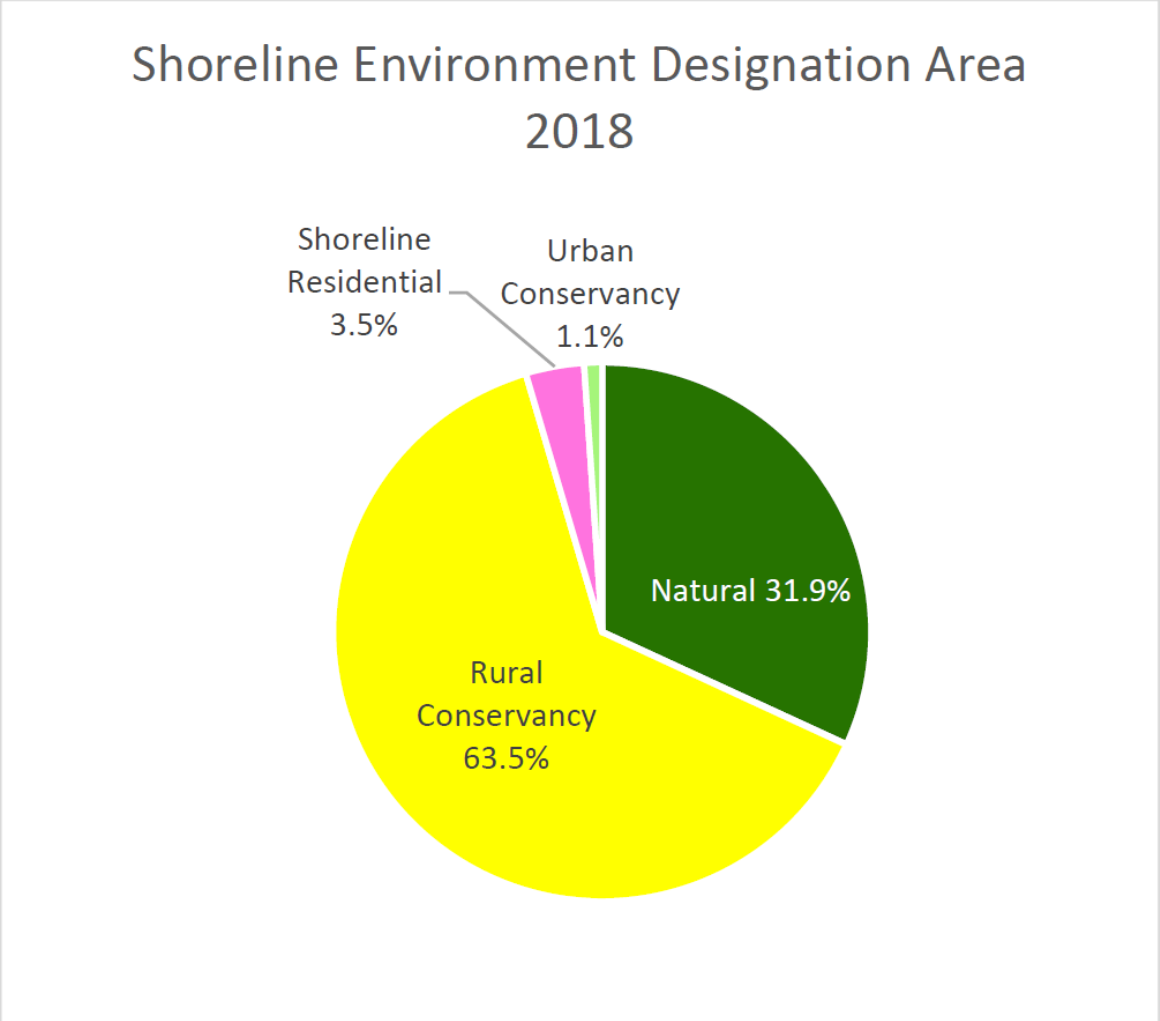


Figure 5.1 Distribution of Shoreline Environment Designations by Acres in Thurston County

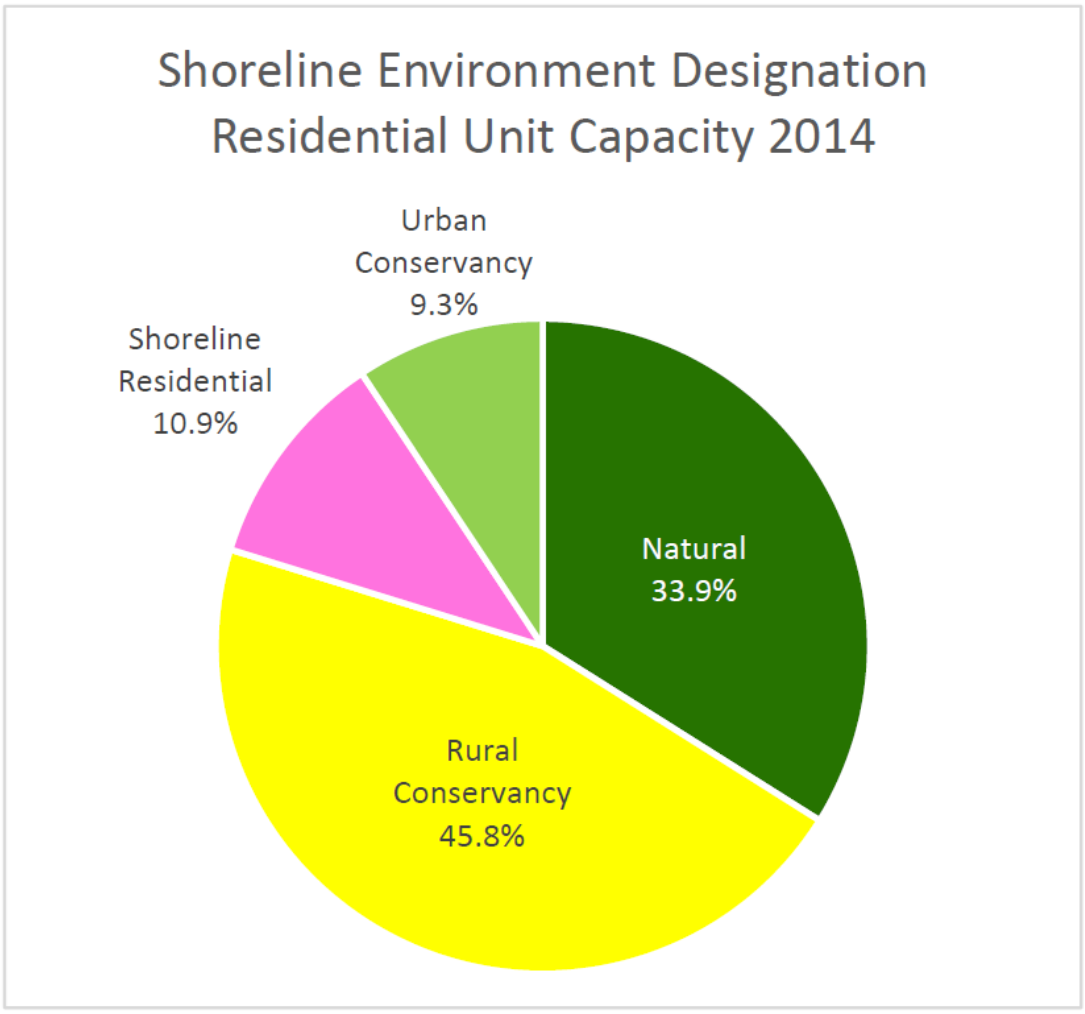


Figure 5-2. Distribution of Shoreline Environment Designations by Number of Parcels in Thurston County

5.1.2 Use and Modification Matrix

The Use and Modification Matrix (Chapter 19.600 and Appendix D of this document) identifies the prohibited and allowed uses and modifications in each of the shoreline environments, and clearly shows a hierarchy of higher-impacting uses and modifications being allowed in the already highly-altered shoreline environments, with uses more limited in the less developed areas either through prohibition or a requirement for a Shoreline Conditional Use Permit.

The allowed and prohibited uses established in the Use and Modification Matrix help minimize cumulative impacts by concentrating development activity in lower

functioning areas that are not likely to experience significant function degradation with incremental increases in new development. Furthermore, prohibited and permitted uses specific to environment designations limit potential conflicts between neighboring uses and ensure that uses are consistent with comprehensive plans, zoning, and existing functions.

5.1.3 Relationship to Marine Functions

Existing analyses of shoreline functions were used to evaluate how the distribution of environment designations correlates to existing levels of ecological functions. In the marine shoreline, the distribution of environment designations was compared to the level of direct disturbance on controlling factors (i.e. substrate, wave energy, depth/slope, light, frequency of disturbance, and water quality) as reported by Borde et al. (2009) and Judd (2010) and used in the Thurston County *Shoreline Inventory and Characterization* report. Direct disturbances included in the evaluation are armoring, boat launches, overwater structures, heavily modified areas, and impervious surface coverage (Borde et al. 2009). The direct disturbance score was used to provide a comparison of site-specific functions relevant to existing local land use conditions. It should be noted, however, that landscape-scale disturbances and factors also play a significant role in overall shoreline functions, and these factors are not explicitly considered in the functional score.

5.2 General Policies and Regulations

The SMP contains numerous general policies, with supporting regulations (see SMP Chapters 19.300 and 19.400), intended to protect the ecological functions of the shoreline and prevent adverse cumulative impacts and to satisfy the main objectives of the SMA. The General Policies and Regulations chapter applies to all activities, uses and modifications.

The proposed SMP requires mitigation sequencing for all permitted activities within shoreline jurisdiction to protect current ecological conditions and prevent or mitigate for adverse impacts (SMP 19.400). Mitigation sequencing involves first avoiding impacts where possible, and then minimizing the intensity of impacts; finally, where remaining impacts are unavoidable and cannot be reasonably minimized, mitigation is required to compensate for those remaining unavoidable impacts and ensure that shoreline functions are retained.

Among the general regulations, the Thurston County Critical Areas Ordinance (Title 24 TCC) is amended and incorporated by reference into the proposed SMP (19.400.115 and Appendix E). In addition to critical areas established in the existing Critical Areas Ordinance, the SMP establishes “Critical Freshwater Habitats” and “Critical Saltwater Habitats.” Critical Freshwater Habitats include all lakes and streams that qualify as Shorelines of the State (SMP 19.400.115(C)). Critical Saltwater Habitats (19.400.115 (D)) include kelp and eelgrass beds, forage fish spawning and holding areas, shellfish beds, mudflats, intertidal habitats with vascular plants, and areas with which priority species have a primary association. The basic components of Thurston County’s critical areas regulations include Ecology’s four-tiered wetland rating system with standard buffers ranging from 50 to 300 feet

depending on wetland rating, habitat score, and water quality score, (TCC 24.30.035). Stream buffers are applied to streams that are not Shorelines of the State depending on the Washington Department of Natural Resources' water type as set forth in WAC 222-16-030. Buffers on streams that are not Shorelines of the State range from 100 feet for Type Np and Ns streams to 250 feet for Type F (fish- bearing) streams, plus an additional 15-foot building setback (TCC 24.25.). The critical areas regulations also include designation and protection of other fish and wildlife conservation areas.

The proposed SMP establishes standard vegetation conservation buffer widths, as well as set buffer reduction limits (19.400.120). Any reduced buffers must be accompanied by mitigation options outlined in Chapter 19.400 and Appendix B of the proposed SMP to achieve no net loss of shoreline ecological functions. In the Rural Conservancy and Natural environments and along Shorelines of Statewide Significance, reduced buffers may only be implemented where specific site constraints exist, or in rare circumstances where development outside of the standard buffer would result in a greater shoreline impact than if the reduced buffer were implemented (19.400.120(B)3). Specific water-dependent uses (e.g., access trails and stairs, boat launches, small decks, and water-dependent storage) are allowed provided they meet specific dimensional criteria (19.400.120 (C)1c). Since the 2018 draft Cumulative Impacts Analysis was published, the SMP draft has changed to allow additional encroachments into the buffer.

Shoreline streams and rivers provide significant spawning, rearing, and migratory paths for anadromous salmon, as well as habitat for other fish and wildlife. Existing development on Thurston County's larger streams and rivers is limited compared to other shoreline waterbodies. The protections provided by a conservative buffer standard on all shoreline streams and rivers will ensure that most riparian and floodplain functions will be maintained.

Proposed buffer areas are generally designated as no touch areas, with provisions included to allow for minor alterations to accommodate water-dependent uses, including trails, stairs, boat houses, and maintenance of views. These standards are designed to allow for common shoreline uses with relatively minor ecological impacts while maintaining a high level of shoreline function.

5.3 Use and Modification Provisions

The SMP contains numerous shoreline modification and use policies and supporting regulations (see SMP Chapter 19.600) intended to protect the ecological functions of the shoreline and prevent adverse cumulative impacts. These regulations are summarized below, including an indication of how potential activities may impact ecological functions and which function or functions the regulations helps to protect. It should be noted that an "X" in the following tables indicates a direct anticipated relationship between an SMP provision and a shoreline ecosystem function. A blank cell indicates that the SMP provision either does not affect the function or has an indirect effect on the function.

5.3.1 Upland Natural Resource Extraction

Agriculture:

"…uses and practices, primarily commercial in nature, which are in support of agricultural activities, agricultural products, agricultural equipment and facilities, and agricultural land…"

Forest Resources:

"Any activity conducted on or directly pertaining to forestland and relating to growing, harvesting or processing timber..."

Potential Impacts to Functions:

Hydrologic	Reduced infiltration associated with forestry actions resulting in flashier hydrology.
	Agricultural irrigation activities reduce summer low flows in streams.
Water Quality	Increased erosion from removal of trees or tilling of soil.
	Erosion and fine sediment from logging roads.
Vegetative/ Habitat	Reduction in forest cover associated with forestry actions and conversion of lands to agricultural uses.

Table 5-1. Summary of Key SMP Regulations for Resource Extraction that Protect Ecological Functions. "X" indicates direct relationship between SMP provision and shoreline function.

Location in SMP	SMP Provisions Providing Protection of Ecological Function	Shoreline Ecological Functions			
		Hydrologic	Water Quality	Shoreline Vegetation	Habitat
Environment Designations	New agriculture is prohibited in the Natural and High Intensity environments. New agriculture may be permitted through a SDP in the Rural Conservancy, Urban Conservancy, and Shoreline Residential environments.	X	X	X	X
	Commercial forestry is a conditional use in the Natural environment and permitted through a SDP in the Rural Conservancy environment. Commercial forestry is prohibited in the Shoreline Residential, Urban Conservancy and High Intensity environments; however, Class IV-general permits may be permitted through a SDP.	X	X	X	X

Location in SMP	SMP Provisions Providing Protection of Ecological Function	Shoreline Ecological Functions			
		Hydrologic	Water Quality	Shoreline Vegetation	Habitat
New Agriculture-Development Standards	New agriculture shall comply with shoreline buffer standards (19.400.115). New agricultural practices below the Standard Buffer and above the Reduced Standard Buffer require an approved Farm Management Plan.		X	X	X
	Confined animal feeding operations, retention and storage ponds for feed lot wastes, and stock piles or manure solids are not allowed in floodways and floodplains, unless otherwise mitigated through a Farm Management Plan.		X		
	Soil conservation measures including erosion control, crop rotation, mulching, strip cropping, contour cultivation, and best management practices shall be utilized to minimize soil erosion.		X		
	Aerial spraying of fertilizers, pesticides, or herbicides over waterbodies is prohibited.		X		
	No fertilizers, pesticides or herbicides may be used in agricultural practices that may result in direct runoff of contaminated waters into waterbodies or aquifer-recharge areas.		X		
	A soil study and drainage plan may be required.		X		
Forest Practices-Development Standards	Forest practices shall comply with the requirements of the Forest Practices Act (RCW 76.09) and the Forest and Fish Report, except Class IV and Class III conversions, which are subject to SMP provisions.	X	X	X	X
	Timber harvest shall assure no net loss of shoreline ecological functions and shall maintain ecological quality of the watershed's hydrologic system.	X	X	X	X
	For shorelines of statewide significance, no more than thirty percent of the merchantable trees may be harvested in any ten-year period of time, with limited exceptions.	X		X	X

5.3.2 Aquaculture

"The culture or farming of fish, shellfish, or other aquatic plants and animals."

Functions	Potential Impacts to Functions
Hydrologic	Alteration in hydrologic and sediment processes associated with aquaculture structures.
Water Quality	Reduction in water quality from substrate modification, supplemental feeding practices, pesticides, herbicides, and antibiotic applications.

Functions	Potential Impacts to Functions
Vegetative/ Habitat	Disruption of benthic community.
	Accidental introduction of non-native species or potential interactions between wild and artificially produced species.

Table 5-2. Summary of Key SMP Regulations for Aquaculture that Protect Ecological Functions. "X" indicates direct relationship between SMP provision and shoreline function.

Location in SMP	SMP Provisions Providing Protection of Ecological Function	Shoreline Ecological Functions			
		Hydrologic	Water Quality	Shoreline Vegetation	Habitat
Environment Designations	Commercial geoduck aquaculture requires a Shoreline Conditional Use Permit regardless of the adjoining upland designation. A SDP is required for new aquaculture operations, except that in the Natural designation, a CUP is required if the project requires new structures or facilities. Non-commercial wild stock supplementation is exempt.	X	X		X
Development Standards	Aquaculture shall not be permitted in areas where it would result in a net loss of shoreline ecological functions, or where adverse impacts to critical saltwater and freshwater habitats cannot be mitigated.	X	X	X	X
	In general, projects that require no structures, little or no substrate modification, little or no supplemental food sources, pesticides, herbicides or antibiotic application are preferred.	X	X		X
	Aquatic species that have not previously been cultivated in Washington State may only be permitted with written approval of the Director of the Washington State Department of Fish and Wildlife and the Director of the Washington Department of Health, and in saltwater, written comment from agencies and tribes with jurisdiction.		X		X
	Fish net pens and rafts shall meet additional standards, including meeting all state approved administrative guidelines.	X	X		X

5.3.3 Barrier Structures

"Barrier structures include any shoreline or in-water structure that has the primary purpose of diverting, capturing or altering the natural flow or transport of water or sediment."

Functions	Potential Impacts to Functions
Hydrologic	Interfere with long-shore movement of sediments, altering substrate composition and development.
Water Quality	Short term, construction related impacts
Vegetative/ Habitat	Alteration of aquatic habitat conditions.

Table 5-3. Summary of Key SMP Regulations for Barrier Structures that Protect Ecological Functions. "X" indicates direct relationship between SMP provision and shoreline function.

Location in SMP	SMP Provisions Providing Protection of Ecological Function	Shoreline Ecological Functions			
		Hydrologic	Water Quality	Shoreline Vegetation	Habitat
Environment Designations	Barrier structures are prohibited in the Aquatic environment when adjacent to the Natural environment, and require a Shoreline Conditional Use Permit when adjacent to any other upland environments. When barrier structures are proposed entirely for restoration purposes, they require a SDP.	X			X
Development Standards	Structures shall be designed to protect critical areas, shoreline processes and natural character/scenery, and shall provide for mitigation sequencing.	X		X	X
	Structures shall be the minimum size necessary to achieve the intended purpose.	X			X
	Floating breakwaters shall be utilized instead of solid fill breakwaters, except where proven infeasible.	X			X

5.3.4 Overwater Structures

Boating Facilities:

"Boating facilities include public and private mooring structures and related services serving five or more single-family residences or the public. This shall include marinas, boat launches, boat storage, sale of supplies, or service for pleasure or commercial craft."

Mooring Structures:

"Mooring Structures include piers, docks, floats and buoys and their associated pilings, ramps, lifts and railways. Any mooring structure or grouping of structures that provide docking space for more than ten boats is considered a marina...."

Functions	Potential Impacts to Functions
Hydrologic	**Potential interference with movement of sediments, altering substrate composition and development**
Water Quality	Water quality impacts associated with construction of docks and other in-water structures (e.g., spills, harmful materials use) and related uses of new docks (e.g., boat maintenance and operation)
Vegetative/ Habitat	Increased shading in nearshore habitat areas resulting from dock and pier construction can limit macrophyte growth
	Substrate disturbance from pilings and anchors
	Nighttime lighting effects on fish behavior
	Loss of habitat for benthic community, less LWD for habitat complexity

Table 5-4. Summary of Key SMP Regulations for Overwater Structures that Protect Ecological Functions. "X" indicates direct relationship between SMP provision and shoreline function.

Location in SMP	SMP Provisions Providing Protection of Ecological Function	Shoreline Ecological Functions			
		Hydrologic	Water Quality	Shoreline Vegetation	Habitat
Environment Designations	Boating facilities are prohibited in the Natural environment. In all other environments, general boating facilities require an SDP, but marinas and buoy fields for 10 or more vessels are a conditional use. Mooring structures are prohibited in the Natural environment, except that up to two buoys may be permitted through an SDP for joint use or public use when adjoining land is a public park.	X	X	X	X

Location in SMP	SMP Provisions Providing Protection of Ecological Function	Shoreline Ecological Functions			
		Hydrologic	Water Quality	Shoreline Vegetation	Habitat
Boating Facilities Development Standards-General	Boating facilities and associated uses shall not result in a net loss of shoreline ecological functions.	X	X	X	X
	Boating facilities to meet federal and state health, safety, and welfare requirements.		X		
	Piers and docks shall avoid impacts to littoral drift. Impacts to be avoided and mitigated.	X			
	Non-water-dependent structures to be located landward of the OHWM.		X	X	
Marinas	Marinas to provide adequate facilities and procedures for fuel handling and storage, and for recovery and mitigation of hazardous materials.		X		
	If dredging at marina entrances changes the littoral drift processes or adversely affects adjacent shores, the marina will be required to replenish these shores periodically.	X			
	Marinas are permitted to moor houseboats provided sewer hookups are available and live-aboards do not account for more than 10% of the surface area or number of slips.		X		
Mooring Structures Development Standards-General	Overwater structures to be constructed to the minimum size necessary to meet the proposed use.	X		X	X
	Buoys are preferred over piers, docks or floats. In critical saltwater and freshwater habitats, the applicant must demonstrate that a buoy is not a feasible option	X		X	X
	Single-use piers, docks, and floats are prohibited unless joint use facility is not feasible.	X		X	X
	Moorage structures for new residential development of two or more dwellings shall be limited to a single, joint-use facility, with one moorage space per dwelling.	X		X	X
	No creosote, chromate copper arsenate, or pentachlorophenol treated wood, or other toxic compounds allowed as part of the decking, pilings, or other in-water structures.		X		
	During maintenance, existing deteriorated treated wood or tires used for floatation shall be replaced with alternative materials that prevent toxins from leaching out.		X		
	Tires are prohibited where they could potentially come in contact with the water.		X		
	New covered moorage, over-water boat houses, side walls or barrier curtains associated with single family residential use are prohibited. Replacement covered moorage shall use transparent roofing.			X	
	New structures shall be designed and located so no new armoring of the shoreline is necessary.	X			
	Functional grating standards for new or replacement piers.			X	X

Location in SMP	SMP Provisions Providing Protection of Ecological Function	Shoreline Ecological Functions			
		Hydrologic	Water Quality	Shoreline Vegetation	Habitat
Critical Saltwater Habitats	All mooring facilities shall be designed and constructed to avoid, minimize and mitigate impacts to ecological functions and critical saltwater habitats and species.			X	X
	Where covered moorage associated with single family residential use exists in a critical saltwater habitat, the structure shall be removed at the end of its life or relocated at time of >50% replacement.			X	X
	Minimum setbacks for new or expanded moorage structures from Critical Saltwater Habitats.				X
	In areas that could support forage fish spawning, unless a 2-year habitat survey documents absence of spawning, the project must be designed under the assumption that spawning does occur.				X
	For sites adjacent to sand lance and surf smelt spawning areas, in-water work during the spawning period requires vertical and/or horizontal separation from the edge of the spawning zone.				X
Pilings, Piers, Floats, Ramps, and Buoys	Dimensional, materials, and design standards for pilings, piers, floats, boat ramps, buoys, and anchors to minimize impacts to aquatic habitat and water quality.	X	X	X	X
Rivers and Streams	Mooring structures prohibited on rivers and streams.	X			
	No mooring structures shall be constructed within 100’ of the mouth of a river, stream or creek.	X			X

5.3.5 Commercial Development

“Commercial development is a use which involves wholesale or retail trade, or the provision of services for compensation.”

Functions	Potential Impacts to Functions
Hydrologic	Increase in stormwater runoff and discharge in association with more impervious surfaces
	Disruption of shoreline wetlands
Water Quality	Increase in contaminants associated with the creation of new impervious surfaces (e.g. metals, petroleum hydrocarbons)
	Potential for chemical spills
	Increase in pesticide and fertilizer use
	Greater potential for increased erosion, bank instability, and turbidity associated with vegetation clearing

Functions	Potential Impacts to Functions
Vegetative/ Habitat	Reduced shoreline habitat complexity, increased water temperatures, and less LWD
	Loss of or disturbance to riparian habitat during upland development
	Lighting effects on both fish and wildlife in nearshore areas

Table 5-5. Summary of Key SMP Commercial Development Regulations that Protect Ecological Functions. "X" indicates direct relationship between SMP provision and shoreline function.

Location in SMP	SMP Provisions Providing Protection of Ecological Function	Shoreline Ecological Functions			
		Hydrologic	Water Quality	Shoreline Vegetation	Habitat
Environment Designations	Prohibited in Natural environment; SDP in other upland environments. Prohibited in Aquatic environment unless water-dependent use or necessary to support water-dependent use, then SDP.	X	X	X	X
General-Development Standards	Commercial development shall not result in a net loss of shoreline ecological functions or have significant adverse impact to other shoreline uses, resources and values.	X	X	X	X
	Parking shall be located upland of the commercial use and designed to minimize adverse visual impacts to the shoreline. Over-water parking is prohibited.		X		
Redevelopment - Development Standards	When commercial redevelopment involves relocating or expanding the existing structure, shoreline mitigation is required, which may include: • Moving the structure away from the shoreline; • Removing any shoreline armoring or replacing hard with soft armoring; • Riparian vegetation restoration, including removing invasive and planting natives; Stormwater • retrofits to implement Low Impact Development.	X	X	X	X

5.3.6 Dredging and Fill

Dredging:

"Dredging is the removal of earth, gravel or other substances from the bottom of a stream, river, lake, bay, or other water body, including wetlands."

Fill:

"Fill means the addition of soil, sand, rock, gravel, sediment, earth retaining structure, or other material to an area waterward of the OHWM, in wetlands, or on shorelands in a manner that raises the elevation or creates dry land."

Functions	Potential Impacts to Functions
Hydrologic	Alteration in channel hydrologic and sediment processes.
Water Quality	Reduction in water quality from turbidity and in water dredge material disposal.
Vegetative/ Habitat	Disruption of benthic community.
	Reduction in shallow-water habitat/ simplification of in-channel habitats.

Table 5-6. Summary of Key SMP Regulations for Dredging and Fill that Protect Ecological Functions. "X" indicates direct relationship between SMP provision and shoreline function.

Location in SMP	SMP Provisions Providing Protection of Ecological Function	Shoreline Ecological Functions			
		Hydrologic	Water Quality	Shoreline Vegetation	Habitat
Environment Designations	Dredging and fill prohibited in Natural environment and CUP in all other environments, except that dredging and fill may be permitted as CUP in Natural environment or SDP in all other environments for ecological restoration.	X	X	X	X
Dredging-Development Standards	Dredging and dredge material disposal shall be conducted in a manner which avoids, minimizes, and mitigates effects on ecological functions to assure no net loss of shoreline functions.	X	X	X	X
	Development to be sited and designed to avoid and minimize the need for new and maintenance dredging.	X	X	X	X
	Maintenance dredging limited to previously dredged or existing authorized location, depth, and width.	X		X	X
	Dredging for the primary purpose of obtaining fill is prohibited, unless necessary for ecological restoration.	X			
	Disposal of contaminated dredge materials to only occur at permitted disposal facilities		X		
Fill-Development Standards	Fill to be located, designed, and constructed to protect shoreline ecological functions and processes, including channel migration	X	X		X
	Fill to avoid water-quality impacts in accordance with local, state and federal regulations.		X		

5.3.7 Industrial Development

"Industrial development includes facilities for processing, manufacturing, and storage of finished or partially finished goods."

Functions	Potential Impacts to Functions
Hydrologic	Increase in stormwater runoff and discharge in association with more impervious surfaces
	Disruption of shoreline wetlands
Water Quality	Increase in contaminants associated with the creation of new impervious surfaces (e.g. metals, petroleum hydrocarbons)
	Potential for chemical spills
	Greater potential for increased erosion, bank instability, and turbidity associated with vegetation clearing
Vegetative/ Habitat	Reduced shoreline habitat complexity, increased water temperatures, and less LWD
	Loss of or disturbance to riparian habitat during upland development
	Lighting effects on both fish and wildlife in nearshore areas

Table 5-7. Summary of Key SMP Industrial Development Regulations that Protect Ecological Functions. "X" indicates direct relationship between SMP provision and shoreline function.

Location in SMP	SMP Provisions Providing Protection of Ecological Function	Shoreline Ecological Functions			
		Hydrologic	Water Quality	Shoreline Vegetation	Habitat
Environment Designations	Prohibited in Natural and Rural Conservancy environments. CUP in Shoreline Residential and Urban Conservancy environments for water-oriented uses. SDP in High Intensity environment for water-oriented uses. Prohibited in Aquatic environment, except CUP for water-dependent use or if necessary to support water-dependent use.	X	X	X	X
Development Standards	Industrial development shall be located, designed and constructed to ensure no net loss of shoreline ecological functions.	X	X	X	X
	Industrial development and redevelopment shall locate, when feasible, where environmental cleanup and restoration of the shoreline area can be incorporated.	X	X	X	X
	Buffers shall not be used for storage of industrial equipment or materials, nor for waste disposal, but may be used for outdoor recreation if consistent with public access and other provisions of this Program.		X	X	X
	Boat yards and similar ship-building facilities shall comply with the mandatory best management practices		X		

Location in SMP	SMP Provisions Providing Protection of Ecological Function	Shoreline Ecological Functions			
		Hydrologic	Water Quality	Shoreline Vegetation	Habitat
	and other provisions of the Boatyard General Permit issued through the Department of Ecology				

5.3.8 Mining

Mining:

"Mining is the removal of sand, soil, minerals, and other earth materials for commercial or economic use."

Functions	Potential Impacts to Functions
Hydrologic	Alteration in hydrologic and sediment processes potentially leading to erosion, channel incision, head cutting, and/ channelization of a river upstream or downstream from the mining location.
	Loss of floodplain habitat associated with armoring and levees to isolate pits from the river channel (Rivers).
Water Quality	Reduction in water quality from turbidity and dredge material disposal.
Vegetative/ Habitat	Disruption of benthic community.
	Reduction in shallow-water habitat (Lake/Marine)/ Simplification of in-channel habitats (Rivers/Streams).
	Potential to strand fish during pit capture events (Rivers).

Table 5-8. Summary of Key SMP Regulations for Mining that Protect Ecological Functions. "X" indicates direct relationship between SMP provision and shoreline function.

Location in SMP	SMP Provisions Providing Protection of Ecological Function	Shoreline Ecological Functions			
		Hydrologic	Water Quality	Shoreline Vegetation	Habitat
Environment Designations	Mining is prohibited in the Natural, Urban Conservancy and Shoreline Residential environments. Mining is a conditional use in Rural Conservancy and High Intensity environments, provided that it is consistent with the County's Mineral Resource Overlay.	X	X	X	X
Development Standards	Mining is permitted only when the activity is dependent on its shoreline location, and the activity demonstrates no net loss of shoreline functions through mitigation sequencing	X	X	X	X
	All applicable state requirements are otherwise met.	X	X	X	X
	Reclamation of disturbed shoreline areas shall be required to provide appropriate ecological functions consistent with the setting	X		X	X
	Mining proposals shall give consideration to activities that result in the creation, restoration, or enhancement of habitat for priority species	X			

5.3.9 Recreation

"Recreational development includes commercial and public facilities designed and used to provide recreational opportunities to the public."

Functions	Potential Impacts to Functions
Hydrologic	Increase in stormwater runoff and discharge in association with more impervious surfaces
Water Quality	Increase in contaminants associated with the creation of new impervious surfaces (e.g. metals, petroleum hydrocarbons)
Vegetative/ Habitat	Increase in pesticide and fertilizer use
	Greater potential for increased erosion, bank instability, and turbidity associated with vegetation clearing
	Loss of or disturbance to riparian habitat during upland development
	Lighting effects on both fish and wildlife in nearshore areas

Table 5-9. Summary of Key SMP Regulations for Aquaculture that Protect Ecological Functions. "X" indicates direct relationship between SMP provision and shoreline function.

Location in SMP	SMP Provisions Providing Protection of Ecological Function	Shoreline Ecological Functions			
		Hydrologic	Water Quality	Shoreline Vegetation	Habitat
Environment Designations	In the Natural environment, non-water-oriented recreational development is prohibited; non-motorized, water-oriented recreational development or other water-oriented development consistent with approved park plans permitted with a SDP. Recreational development is permitted with a SDP in all other environments.	X	X	X	X
Development Standards	Recreational development shall not result in a net loss of shoreline ecological functions or processes.	X	X	X	X
	Water-oriented recreation may be allowed in shoreline buffers. The removal of on-site native vegetation to be limited to the minimum necessary for the development areas (e.g., picnic areas, campsites, selected views, or other permitted structures or facilities).			X	X
	Non-water-oriented recreational facilities (e.g., golf courses, playing fields, and facilities with extensive impervious surfaces) shall observe Critical Area Buffers and Vegetation Conservation Standards.		X	X	X
	Vehicular traffic is prohibited on beaches, bars, spits and streambeds, except for permitted construction and boat launching, or in areas with a demonstrated historical use.				X
	Shoreline trails and pathways shall be located, designed, and constructed to protect bank stability.	X	X		X

5.3.10 Residential Development

"Residential uses and development are those which provide for the permanent dwelling of human beings. Residential development includes the construction or modification of one-and two-family detached structures, multi-family structures, condominiums, townhouses, mobile-home parks, and other similar group housing…"

Functions	Potential Impacts to Functions
Hydrologic	Increase in stormwater runoff and discharge in association with more impervious surfaces
Water Quality	Increase in contaminants associated with the creation of new impervious surfaces (e.g. metals, petroleum hydrocarbons)
	Water quality contamination from failed septic systems
	Increase in pesticide and fertilizer use
	Greater potential for increased erosion, bank instability, and turbidity associated with vegetation clearing
Vegetative/ Habitat	Reduced shoreline habitat complexity, increased water temperatures, and less LWD
	Loss of or disturbance to riparian habitat during upland development

Table 5-10. Summary of Key SMP Residential Development Regulations that Protect Ecological Functions. "X" indicates direct relationship between SMP provision and shoreline function.

Location in SMP	SMP Provisions Providing Protection of Ecological Function	Shoreline Ecological Functions			
		Hydrologic	Water Quality	Shoreline Vegetation	Habitat
Environment Designations	Single-family residential development requires an administrative CUP (meaning simplified local process, still requires Ecology approval) in the Natural environment, otherwise exempt in upland designations and prohibited in Aquatic environment. Multifamily and accessory dwelling units are prohibited in the Natural environment; subdivisions may be permitted through a CUP in the Natural environment. Multi-family development, subdivisions, and accessory dwelling units require a CUP in Rural Conservancy and Urban Conservancy environments.	X	X	X	X
Development Standards	All new residential development, including subdivision of land, to be designed, configured and developed to ensure no net loss of shoreline ecological function.	X	X	X	X
	All sewage disposal and water systems to be in compliance with state and local health regulations.		X		
	New and remodeled residential development and new subdivisions shall be designed, located and constructed so that structural stabilization measures are not required.	X	X	X	X
	New over-water residences, including floating homes, are prohibited.		X		X
	Stormwater quality and quantity measures to comply with Title 15.05 TCC.	X	X		
	Flood hazard reduction standards to ensure no net loss in shoreline functions.	X		X	X

5.3.11 Shoreline Stabilization

"Shoreline Stabilization and Armoring refer to actions taken to address erosion impacts to property and dwellings, businesses, or structures caused by natural processes, such as current, flood, tides, wind or wave action."

Functions	Potential Impacts to Functions
Hydrologic	Increase in wave energy at the shoreline resulting in increased nearshore turbulence and uprooting of aquatic vegetation
	Disruption of shoreline wetlands
	Marine shorelines: impoundment of sediment recruitment from backshore areas alters sediment balance, resulting in coarsening of substrate and loss of eelgrass beds (particularly significant for historical feeder bluffs)
Water Quality	Water quality impacts associated with construction
	Removal of shoreline vegetation increases erosion and water temperatures
Vegetative/ Habitat	Reduction in nearshore vegetation- loss of eelgrass beds associated with sediment coarsening.
	Increased slope of the nearshore reduces shallow nearshore habitat area

Table 5-11. Summary of Key SMP Regulations for Shoreline Stabilization that Protect Ecological Functions. "X" indicates direct relationship between SMP provision and shoreline function.

Location in SMP	SMP Provisions Providing Protection of Ecological Function	Shoreline Ecological Functions			
		Hydrologic	Water Quality	Shoreline Vegetation	Habitat
Environment Designations	SDP for soft Shoreline stabilization, except where exemption criteria are met. Administrative CUP for hard shoreline stabilization, where demonstrated necessary.	X		X	X
Development Standards-General	Applications for shore protection will be reviewed pursuant to comments by WDFW and WDNR.	X		X	X
	Soft shoreline stabilization measures shall be utilized unless a geotechnical analysis finds that soft measures are not sufficient to protect primary structures.	X		X	X
	When hard shoreline stabilization measures are needed, the size must be the minimum necessary; they must avoid a net loss of shoreline functions, and where feasible, include mitigation.	X			X
	Shoreline stabilization measures shall not be for the purpose of creating dry land.	X			
	Bluff stabilization walls shall be prohibited unless proven necessary through a geotechnical report.	X			

Location in SMP	SMP Provisions Providing Protection of Ecological Function	Shoreline Ecological Functions			
		Hydrologic	Water Quality	Shoreline Vegetation	Habitat
	Placement of shoreline stabilization methods shall follow the natural contour of the existing shoreline, be parallel to and at or above the ordinary high-water mark.	X			
	Shoreline stabilization on marine feeder bluffs may require additional mitigation, including measures necessary to offset the loss of sediment supply.	X			
Development Standards-New and Expanded Stabilization	New development, including development of steep slopes or bluffs, shall be located and designed to avoid the need for future shoreline stabilization for the life of the structure.	X		X	X
	New development on lots constrained by depth, topography or critical areas shall be located to minimize, to the extent feasible, the need for shoreline stabilization.	X			
	If shoreline stabilization is necessary pursuant to a geotechnical analysis, the method, either hard or soft, shall not result in a net loss of shoreline ecological functions. To meet this requirement, on and off-site mitigation measures may be required.	X		X	X
	New structural stabilization measures to be allowed only when need is documented to protect primary structures or protect projects for the restoration of ecological functions or hazardous substance remediation projects.	X			
Replacement and Repair of Existing Shoreline Stabilization and Armoring	Alternative or soft stabilization approaches to be considered before replacement.	X		X	X
	The structure shall be designed, located, sized, and constructed to assure no net loss of ecological functions. It shall not encroach water-ward of the ordinary high water mark or existing structure unless the residence was occupied prior to January 1, 1992 and there are overriding safety or environmental concerns.	X		X	X
	As feasible or as part of mitigation sequencing, failing, harmful, unnecessary, or ineffective structures should be removed, and shoreline ecological functions and processes restored using non-structural or soft long term stabilization measures.	X			X
Shore Stabilization on Streams	Hard shoreline stabilization methods are prohibited in shoreline streams, on estuarine shores, in wetlands, and in salmon spawning areas, except for the purpose of habitat enhancement or restoration, or when deemed necessary through a geotechnical report to protect an existing primary structure.	X		X	X
	All revetments or similar structures shall be designed in accordance with WDFW Integrated Streambank Protection Guidelines.	X			X
Subdivision and Existing Lots without structures	Subdivision to be designed so that newly created lots will not require shoreline stabilization.	X		X	X
	Use of shoreline armoring to protect a platted lot where no primary use or structure presently exists shall be prohibited.	X		X	X

5.3.12 Transportation and Utilities

Transportation

"Transportation includes systems for automobiles, public transportation, pedestrians, and bicycles."

Utilities

"Services and facilities which produce, convey, store or process electric power, gas, sewage, water, communications, oil, and waste."

Functions	Potential Impacts to Functions
Hydrologic	Increase in stormwater runoff and discharge in association with more impervious surfaces
Water Quality	Increase in contaminants associated with the creation of new impervious surfaces (e.g. metals, petroleum hydrocarbons)
Vegetative/ Habitat	Greater potential for increased erosion, bank instability, and turbidity associated with vegetation clearing
	Fish passage impacts associated with stream crossings

Table 5-12. Summary of Key SMP Regulations for Transportation and Utilities that Protect Ecological Functions. "X" indicates direct relationship between SMP provision and shoreline function.

Location in SMP	SMP Provisions Providing Protection of Ecological Function	Shoreline Ecological Functions			
		Hydrologic	Water Quality	Shoreline Vegetation	Habitat
Environment Designations	New transportation and utilities are prohibited in the Natural environment, except when necessary for essential facilities or accessory to a permitted use, then CUP.	X	X	X	X
	A CUP is required for transportation in the Rural Conservancy and Urban Conservancy environments, and transportation is permitted through a SDP in the Shoreline Residential and High Intensity environments.	X	X	X	X
	New utilities are permitted in the Rural Conservancy, Urban Conservancy, Shoreline Residential, and High Intensity environments. New utilities require a CUP in the Aquatic environment.	X	X	X	X
Transportation	New transportation facilities and maintenance of existing transportation facilities shall be carried out in a	X	X	X	X

Location in SMP	SMP Provisions Providing Protection of Ecological Function	Shoreline Ecological Functions			
		Hydrologic	Water Quality	Shoreline Vegetation	Habitat
-Development Standards	manner that will not result in a net loss of shoreline ecological functions. Unavoidable adverse impacts shall be mitigated.				
	Parking facilities shall only be allowed when necessary to support an authorized use, and no net loss of ecological functions can be demonstrated.	X	X	X	X
	New or expanded transportation routes in the shoreline jurisdiction, including associated wetlands, shall be located to avoid and minimize impacts to the shoreline environment and sensitive areas.	X	X	X	X
	All proposed road, bridge or railroad crossings, shall be designed to cross at the shortest, most direct route, except where such design would result in a net loss of shoreline ecological functions or is prohibited by topography.	X	X	X	X
	Bridge approach fill shall not encroach in the floodway of any stream or river.	X			
	All bridges and culverts shall be large enough to pass the 100-year flood waters with consideration for debris flow likely to be encountered, or designed to the standards of the Department of Fish and Wildlife Aquatic Habitat Guidelines.	X			X
	Roads and bridges located in wetland areas shall be designed and maintained to prevent erosion and to permit the natural movement of groundwater to the greatest extent feasible.		X		X
Utilities-Development Standards	All utility facilities shall be designed and located to assure no net loss of shoreline ecological functions and preserve the natural landscape.	X	X	X	X
	New or expanded utility facilities shall, to the greatest extent feasible, be located in areas that do not require shoreline stabilization, dredging, extensive cut/fill and other forms of shoreline alteration.	X	X		X
	Maintenance of existing utilities shall be carried out in manner that will not result in a net loss of shoreline ecological functions and any unavoidable adverse impacts shall be mitigated.	X	X	X	X
Sewer Treatment Plant-Development Standards	Where allowed, sewage treatment plant outfalls shall be below the extreme low water mark and are permitted only where adequate natural water circulation can be provided.		X		
	Sewage treatment plant outfalls shall be located where their effluent will not negatively impact commercial and recreational shellfish and other critical habitat and marine resource areas. Mitigation may be required for any adverse impacts to fisheries and wildlife resources, natural systems and sensitive areas.		X		X
	Discharge of untreated effluent over or into the shorelines of the county is prohibited.		X		

5.4 Critical Areas

As noted above, the proposed SMP (Chapter 19.400.115 and Appendix E) amends and incorporates by reference the Thurston County Critical Areas Ordinance (TCC Title 24 and Chapter 17.15).

5.4.1 Wetlands

Under the County's existing Critical Areas Regulations (TCC 24), wetland buffers range from 50 feet to 300 feet depending on the hydrologic functions, water quality functions, and habitat functions (as determined by Ecology's Wetland Rating System for Western Washington, revised 2014, as amended), (TCC 24.30.035). Buffer reductions, increases and averaging are allowed provided specific criteria are met, including that reductions or averaging will not degrade functions and may not be used together. However, wetland buffers may not be reduced through reduction or averaging more than 25 percent of the standard buffer width within shoreline jurisdiction (SMP 19.400.120). In addition to the buffer width, an additional 15-foot building setback applies.

5.4.2 Streams

Streams that are not considered shorelines of the state are regulated as Fish and Wildlife Habitat Conservation Areas (TCC 24.25). Stream buffers are determined based on stream class as per the current DNR stream typing, described in WAC 222-16-030. Buffers range from 100 feet to 250 feet from the Ordinary High Water Mark (OHWM) (TCC 19.300.315).

In addition to the buffer width, an additional 15-foot building setback applies. Buffer reductions, increases and averaging are allowed provided specific criteria are met, including that reductions or averaging will not degrade functions and may not be used together.

Applications for uses and activities on sites containing a habitat or species subject to TCC 24.25 shall include a critical area report (see Chapter 24.35 TCC) prepared by a qualified professional that evaluates the potential impacts of the proposed use or activity on the habitat and/or species, as applicable. The process for determining whether critical area reports are required, and the extent of information required is outlined in Chapter 24.05.027 TCC. Critical area reports that pertain to important habitats and species may also be referred to as habitat management plans.

5.4.3 Flood Hazard Areas

The County's Critical Areas Regulations also incorporate flood hazard regulations (TCC 14.38 & 24.20) by reference. These regulations prohibit fill or construction within the floodway that would result in any increase in flood levels during base flood discharge. The construction of new residential structures within the floodway is also prohibited (TCC 14.38.050(5), 24.20.020, & 24.20.100). Additionally, under the proposed SMP, before new development activities are permitted within the floodplain, compliance with Federal Emergency Management Agency (FEMA) National Flood Insurance Program (NFIP) protection standards for critical habitats for listed species shall be demonstrated through submittal of a Habitat Management Plan prepared by a qualified wildlife biologist (SMP 5.4.2).

5.4.4 Geologically Hazardous Areas

Regulations specific to geologically hazardous areas apply performance standards to minimize and manage risks and ecological impacts to areas of high and moderate geologic hazards.
The buffer for all geologically hazardous areas (TCC 24.15.015) includes native vegetation from the toe of the slope to fifty feet beyond the top of the slope unless otherwise allowed through a geological report or a site-specific determination. In addition to vegetated buffer standards, for areas of high geological hazard, buildings and impervious surfaces must be setback from the toe and top of slope equal to the following: The distance measured from the toe of slope upward at a slope of 2:1 (horizontal to vertical) to a point that intersects with the existing topography of the site; or in marine Bluff Hazard Areas, a distance from the ordinary high water mark landward at a slope of 2:1 (horizontal to vertical) which intersects with the existing topography of the site; or the minimum distance recommended by the geotechnical professional in the geological assessment, based on review of the extent of unstable landform and definition of the potential hazard area from each site investigation, as measured outward from the toe and top of slope. Buffers for marine bluff hazard areas shall also comply with TCC 24.25.045—24.25.055, and all applicable sections of the Shoreline Master Program for the Thurston Region, as amended.

5.5 Shoreline Restoration Plan

As discussed above, one of the key objectives that the SMP must address is "no net loss of ecological functions necessary to sustain shoreline natural resources" (Ecology 2011). Although the implementation of restoration actions to restore historic functions is not required by SMP provisions, the guidelines state that "master programs shall 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" (WAC 173-26-201(2)(f)). Pursuant to that direction, the County prepared the *Shoreline Restoration Plan* (Appendix C of the SMP), which identifies opportunities for voluntary restoration, enhancement, and protection actions.

The Restoration Plan represents a long-term vision for restoration that will be implemented over time, resulting in a gradual improvement over the existing conditions. Although the SMP is intended to achieve no net loss of ecosystem functions through regulatory standards, practically, despite required practices to follow mitigation sequencing to avoid, minimize, and compensate for impacts on a site-specific scale, an incremental loss of shoreline functions may still occur at a cumulative level. These losses may occur through minor, exempt development, illegal development, failed mitigation efforts, or a temporal lag between the loss of existing functions and the realization of mitigated functions. The Restoration Plan, and the voluntary actions described therein, can be an important component in making up that difference in ecological function that would otherwise result.

The County identified appropriate management recommendations for each drift cell and freshwater waterbody based on the condition of shoreline processes and functions at the landscape and site scales (Chapter 3 of the *Shoreline Inventory and Characterization* report). Management options for each recommendation class are outlined in Chapter 4 of the *Shoreline Inventory and Characterization* report. The Thurston County *Shoreline Restoration Plan (Appendix B)* carries these options forward, and further identifies a number of opportunities for restoration on both public and private properties inside and outside of shoreline jurisdiction, and identifies ongoing County programs and activities, non-governmental organization programs and activities, and other recommended actions consistent with a variety of watershed-level efforts.

Major *Shoreline Restoration Plan* components that contribute to improvement in ecological functions are summarized below:

- Site specific projects to restore ecological processes and eliminate barriers. Projects include, among others:
    - Restoring tidal connectivity in estuaries by replacing culverts with bridges;
    - Removal of shoreline armoring;
    - Improving fish passage by replacing culverts on streams and lakes;
    - Stormwater treatment facilities and stormwater retrofits; and
    - Floodplain restoration and instream complexity.
- Where existing systems are largely intact, the restoration plan focuses on protecting those intact processes and functions.
- Using programmatic approaches and teaming with key partners in education and outreach, as well as project implementation.
- Identifying and applying to available funding sources to implement projects.

5.6 Other Programs

5.6.1 Effects of Current County Regulations and Programs Critical Areas Regulations

Critical Areas Regulations prepared under the Growth Management Act and adopted through County ordinance apply to designated critical areas both within and outside of shoreline jurisdiction, as discussed above in Section 5.4.

Zoning Code

Title 20 of the Thurston County Code provides zoning standards that direct uses, building bulk, scale, and location, and other design considerations throughout the County.

Flood Hazard Regulations

The County's Flood Hazard development regulations are contained within TCC 14.38, and they are incorporated into the County's Critical Areas regulations by reference.

Because the regulations prohibit any development within the floodway that would increase the base flood elevation, the regulations limit development in the floodway and help maintain flood storage capacity functions of freshwater shorelines. Flood hazard regulations also apply to Coastal High Hazard areas associated with high velocity waters from tidal surges. These regulations are primarily focused on limiting structural damage and loss of life by floods.

Stormwater Management

The County's Stormwater Drainage regulations are found in TCC 15.05 of the Thurston County Code. The Thurston County Stormwater Design Manual is incorporated by reference into the stormwater regulations. The regulations and the County Stormwater Design Manual establish minimum requirements for control, treatment, and detention of stormwater during construction and for the life of the structure depending on the size and disturbance associated with the proposed project.

The Thurston County Surface and Stormwater Management Program developed a six-year stormwater capital facilities plan that identifies 30 planned stormwater improvement projects. Projects identified in the plan include Low Impact Development (LID) retrofitting, culvert replacement, floodplain restoration, and development of stormwater treatment facilities. The plan identifies the implementation timeframes and the planned funding sources for each identified project. These projects will improve water quality, flood storage, and fish passage in shoreline waterbodies throughout the County.

5.6.2 State Agencies/Regulations

Aside from the Shoreline Management Act, State regulations most pertinent to development in the County's shorelines include the State Hydraulic Code, the Growth Management Act, State Environmental Policy Act, tribal agreements and case law, 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 County 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. 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.

Washington Department of Ecology

The Washington Department of Ecology may review and condition a variety of project types, including any project that needs a permit from the U.S. Army Corps of Engineers (see below), any project that requires a Shoreline Conditional Use Permit or Shoreline Variance, and any project that disturbs more than 1 acre of land. Project types that may trigger Ecology involvement include pier and shoreline modification proposals and wetland or stream modification proposals, among others. Ecology's three primary goals are to: 1) prevent pollution, 2) clean up pollution, and 3) support sustainable communities and natural resources (http://www.ecy.wa.gov/about.html). Their authority comes from the State Shoreline Management Act, Section 401 of the Federal Clean Water Act, the Water Pollution Control Act, the Federal Coastal Zone Management Act of 1972, the State Environmental Policy Act, the Growth Management Act, and various RCWs and WACs of the State of Washington.

Washington Department of Fish and Wildlife

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." Practically speaking, these activities include, but are not limited to, installation or modification of piers, shoreline stabilization measures, culverts, bridges and footbridges. These types of projects must obtain a Hydraulic Project Approval from WDFW, which will contain conditions

intended to prevent damage to fish and other aquatic life, and their habitats. In some cases, the project may be denied if significant impacts would occur that could not be adequately mitigated.

State Forest Practices Act

Activities related to growing, harvesting, or processing timber are regulated under Washington's State Forest Practices Act (WAC 222) administrated by Washington State DNR and are not regulated under the SMA unless the land is being converted to another use besides growing trees or the commercial harvest is within 200 feet of a shoreline of statewide significance and exceeds the harvest limits established in the SMA. Conversions must comply with the provisions in the SMP for the new use.

Surface Mining Act

The Surface Mining Act is a reclamation law administered by WA DNR that requires a permit for each mine that: 1) results in more than 3 acres of mine- related disturbance, or 2) has a high-wall that is both higher than 30 feet and steeper than 45 degrees. The DNR is responsible for reviewing and approving site reclamation plans to achieve the following goals:

- segmental or progressive reclamation;
- preservation of the topsoil;
- slope restoration such that high-walls are rounded in plan and section for all mines;
- stable slopes;
- final topography that generally comprises sinuous contours, chutes and buttresses, spurs, and rolling mounds and hills, all of which blend with adjacent topography to a reasonable extent; and
- effective revegetation with native multi-species ground cover and trees depending on the municipality-approved subsequent use designated for the site.

5.7 Federal Agencies/Regulations

Federal regulations most pertinent to development in the 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. A summary of some of the key federal regulations and/or agency responsibilities follows.

Clean Water Act, 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 303(d) of the Clean Water Act requires the state to develop a list of waters that do not meet water quality standards. A Total Maximum Daily Load, or TMDL, must be developed for impaired waters. Ecology is working with the County and other partners to implement water quality improvement projects as a part of TMDLs for fecal coliform bacteria in, Henderson Inlet, and Deschutes River. The Henderson Inlet Fecal Coliform Water Quality Implementation Plan Total Maximum Daily Load - TMDL details plans to identify and address pollutant sources (Hempleman. 2008).

Rivers and Harbors Act, 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. 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 navigable 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 County that results in a take of listed fish or wildlife would be a violation of the ESA and exposes the County to risk of lawsuit. Per Section 7 of the ESA, the Corps must consult with the

National Marine Fisheries Service and the U.S. Fish and Wildlife Service on any projects that fall within Corps jurisdiction (e.g., Section 404 or Section 10 permits) that could affect species listed under the Federal Endangered Species Act. These agencies ensure that the project includes impact minimization and compensation measures for protection of listed species and their habitats.

National Pollutant Discharge Elimination System (NPDES)

As a component of the Clean Water Act, in Washington State, the Department of Ecology has been delegated the responsibility by the U.S. Environmental Protection Agency for managing implementation of the NPDES program. The County is engaged in compliance with the NPDES Phase II Municipal Stormwater General Permit requirements that address stormwater system discharges to surface waters.

6 SUMMARY OF POTENTIAL CUMULATIVE IMPACTS

WAC 173-26-186(8)(d) guides local master programs to evaluate and consider cumulative impacts of "reasonably foreseeable future development on shoreline ecological functions." The most commonly anticipated changes in shoreline development involve residential, commercial, and industrial development. These activities include upland development, and may also include the development of overwater structures and/or shoreline stabilization. As directed by the WAC, the policies and regulations in the proposed SMP are designed to ensure that cumulative impacts do not result in a net loss of ecological functions.

Potential development is not limited to residential, commercial and industrial uses; however, the location, timing, and impacts of less common uses and development projects are less predictable. WAC 173-26-201(3(d)(iii) provides guidance that "for those projects and uses with unanticipatable or uncommon impacts that cannot be reasonably identified at the time of master program development, the master program policies and regulations should use the permitting or conditional use permitting processes to ensure that all impacts are addressed and that there is no net loss of ecological function of the shoreline after mitigation." Potential uses and projects with less predictable implementation and impacts include such activities as new aquaculture, timber harvest, and mining. In addition to regulations that avoid, minimize, and mitigate for potential impacts from these less common developments, the proposed SMP includes specific regulations that require these types of developments to demonstrate on an individual basis that proposed projects will not result in a loss of ecological functions. Because these developments will be required to

demonstrate no net loss on an individual basis, these types of projects will generally not be addressed in great detail in this cumulative impacts analysis.

6.1 Marine

Thurston County's marine shorelines are projected to see the most population growth and additional single-family home development in the County. The following discussion will address the key areas of anticipated development and likely effects of the SMP and other relevant regulations, plans, programs, and restoration actions to determine the likely net effect on shoreline functions in each environment designation.

6.1.1 Natural Designation

Overall, development in the Natural environment on the County's marine shorelines is expected to be limited, such that it will not have a significant impact on shoreline functions. Areas protected under the Natural environment designation include many of the high-functioning areas identified in Section 3.1, including pocket estuaries and lagoons, areas of intact forested vegetation, high bluffs, wetlands, mud flats, forage fish spawning habitats, and intact seagrass beds. Although the analysis in Section 3 indicates potential for new residential units in the Natural environment, SMP provisions significantly limit new development in the Natural environment, such that nearly all development would occur outside of shoreline jurisdiction (see discussion below in 6.1.2).
Any subdivision or new single-family residence proposed in the Natural environment would require a Shoreline Conditional Use Permit that would need to demonstrate that no net loss of functions was achieved on an individual basis.

Development within the Natural environment would be limited by the proposed 200-foot standard vegetation conservation buffer, which would apply except where site constraints justify the use of the 150-foot reduced buffer option.
Mitigation measures would be required if the reduced buffer were implemented to ensure that no net loss of shoreline functions was achieved. Much of the Natural environment designation falls along bluffs, where development would be further restricted by steep slope buffers and setbacks under the Critical Areas Regulations, adopted under the SMP. Where Natural designations occur in salt marsh estuaries, these areas are also protected under wetland buffers. Significant salt marsh and estuarine habitats protected under the Natural environment designation include: high-functioning areas of Henderson Inlet, Woodard Bay, Chapman Bay, Gull Harbor, Big Fishtrap, Mud Bay, and Baird Cove.

Recreational uses in the Natural environment include parks, which may expand amenities over time. Washington State Parks and Recreation Commission's plans for the Natural environment, are generally limited to trail maintenance, historic preservation, and forest maintenance. Any such expansion will need to follow SMP vegetation conservation standards and stormwater standards to avoid a net loss in shoreline functions.

Overall, little development is anticipated on marine shorelines in the Natural environment. Given the dramatic improvements in marine and estuarine processes and functions resulting from recent restoration activities, and planned restoration and conservation of shoreline habitats in the Natural environment, a net improvement in shoreline functions is anticipated.

6.1.2 Rural Conservancy

Summary

The Rural Conservancy environment has the most developable marine shoreland area of all of the environment designations. Most new development in the Rural Conservancy environment would occur through infill of existing developed areas. Potential impacts from development will be limited through several proposed provisions in the SMP, including vegetation conservation standards, stormwater management standards, and provisions relating to overwater structures and shoreline stabilization measures.

In the Rural Conservancy environment, standard buffer widths would ensure a substantial buffer of 125 feet was maintained. Similar to the Natural environment, a reduced buffer (110 feet for the Rural Conservancy environment) would only be permitted where site constraints necessitate its use, and where accompanying compensatory mitigation is conducted. In several areas within the Rural Conservancy environment, development is further constrained by the presence of steep slopes and wetlands.

In addition to potential developable lands, the Rural Conservancy environment includes significant marine shorelands in park uses, including Burfoot Park among others. Each of these park areas includes significant, relatively high- functioning shorelines. Parks development has the potential to balance development for public access with enhancement of natural shoreline functions.

Proposed regulations in the Rural Conservancy environment are expected to ensure that the shoreline buffer remains fully functional with regard to vegetative, habitat, water quality, and hydrologic functions. Where lots are presently undeveloped, upland vegetation conservation standards will ensure that impacts to vegetation and associated habitat functions are avoided and minimized to the maximum extent practicable. Stormwater regulations will further limit potential impacts on water quality in the nearshore environment. Where impacts remain despite minimization measures, ongoing and planned voluntary restoration activities are expected to provide significant ecological lift to the nearshore environment by restoring estuarine habitat-forming processes and habitat and hydrologic functions. In summary, no net loss of ecological functions is anticipated in the marine Rural Conservancy environment.

6.1.3 Urban Conservancy

Summary

Potential development in the Urban Conservancy environment is located in areas that retain significant ecological functions, but are in close proximity to the County's more highly disturbed urban centers within Urban Growth Areas (UGA's). Limited areas of residential and commercial development are anticipated in the Urban Conservancy environment. Standard shoreline buffers of 125 feet in the Urban Conservancy environment will help maintain existing shoreline vegetative and surface water filtration functions.

A reduced buffer of 90 feet will be permitted if compensatory mitigation measures are implemented; unlike the Natural and Rural Conservancy environment, no site constraints are needed for landowners to implement the reduced buffer option. Where the reduced buffer is applied, the enhancements to existing buffer functions are required to demonstrate mitigation measures that will offset any loss of functions associated with a reduced buffer width.

Also in the Urban Conservancy environment, a reduced buffer of 75 feet may be permitted if an applicant can demonstrate that a net gain in ecological functions would be achieved. This type of reduced buffer would be most likely to apply to areas where the existing shoreline condition is highly degraded. Other potential impacts from development will be limited by stormwater management standards and provisions relating to overwater structures and shoreline stabilization measures. Where commercial structures are relocated or expanded in the Urban Conservancy environment, mitigation required under the proposed SMP would help maintain shoreline functions.

Together, SMP provisions are expected to maintain shoreline functions in the Urban Conservancy environment. In addition, the Urban Conservancy environment offers significant potential for voluntary shoreline restoration.

Implementation of voluntary restoration projects is highly likely in the near future, and the improved shoreline functions resulting from each of these projects suggests that with the combined implementation of proposed SMP provisions and planned voluntary restoration actions, shoreline functions will be enhanced on marine Urban Conservancy shorelines over time.

6.1.4 Shoreline Residential

Summary

Significant new development in the Shoreline Residential environment is anticipated to occur through infill development of existing vacant and underdeveloped properties. Potential impacts from development would be minimized by shoreline buffer standards and stormwater management standards. Impacts from overwater structures and shoreline stabilization measures would follow mitigation sequencing to avoid, minimize, and mitigate impacts.

Standard buffer widths of 50 feet would apply in the Shoreline Residential environment. A reduced buffer will not be permitted without a variance permit, provided that compensatory mitigation is conducted. Steep slopes substantially limit development of existing vacant lots in shoreline jurisdiction in some areas in or adjacent to the Shoreline Residential designation - one area is adjacent to Carlyon Beach, which contains a split designation with Natural.

Potential dredging applications are likely in the future. Any future non-maintenance dredging would require a Shoreline Conditional Use Permit, and as such, applicants would need to demonstrate on an individual project basis that no adverse impacts to ecological functions would occur.

Several potentially developable lots are cleared of significant vegetation; therefore, mitigation measures to compensate for a reduced buffer would likely provide an improvement over existing conditions. In addition to shoreline buffer standards, many vacant parcels could be constrained by wetland buffers.

The presence of wetland areas would also likely prohibit future development of additional overwater structures on these parcels. New overwater structures could be permitted for properties away from wetlands provided there is a demonstrated need, and that other alternatives (e.g., buoys) were pursued and found infeasible. Given the proximity to a boat launch and marina, it is unlikely that new piers would be permitted. Any new piers would need to meet specific dimensional and design criteria to minimize impacts, and mitigation would be required for any new overwater structure. As existing piers (including piers associated with the existing marina) are replaced, they will need to

incorporate grated decking, eliminate any existing skirting, and comply with materials and width guidelines, each of which are expected to minimize habitat impacts in this protected bay.

SMP provisions would limit the potential for new shoreline stabilization, but existing shoreline stabilization measures could be replaced over time. As bulkheads are replaced, property owners will need to first assess the feasibility of lower impact stabilization measures, including non-structural or soft-structural approaches. As bulkheads are replaced over time, a gradual reduction in the impact of stabilization measures is anticipated.

In summary, proposed SMP provisions regulate new development and redevelopment of existing uses and structures so that despite potential increases in impervious surfaces and overwater cover associated with new development, shoreline vegetation functions are expected to improve over existing conditions. Furthermore, planned stormwater management facilities should improve water quality conditions within South Sound. As a result, no net loss of functions is anticipated over time.

6.2 Freshwater

6.2.1 Lakes

Similar to other shorelines in Thurston County, development on lake shorelines in Thurston County will likely be driven by new residential development. In every lake where new residential development is anticipated, this development would occur as infill of existing residential development. In addition to new development, redevelopment of existing residential uses may occur. Potential impacts associated with new development and redevelopment of existing residential uses include the following:

- Hydrology:
  - Increased impervious surface cover contributes to a flashier hydrograph, and
  - Shoreline armoring disrupts sediment transport processes and increases wave energy reflected into the lake.
- Water Quality:
  - Increased impervious surface cover reduces infiltration of stormwater runoff,
  - Increased use of fertilizers and herbicides, and
  - Reduced filtration capacity of natural vegetation.
- Vegetative:
  - Clearing of vegetation to accommodate new residential development.
- Habitat
  - Reduction in vegetative habitat associated with clearing; and
  - Overwater structures alter aquatic habitat, including aquatic vegetation.

The proposed SMP provisions are designed to ensure that shoreline development will avoid, minimize, and mitigate for these potential impacts (See Section 5.3). Despite such regulations, areas with high densities of new development have the greatest potential to experience a loss of functions as a result of the cumulative impacts. Development potential of and likely impacts on each lake are identified below, with particular attention to lakes with anticipated high levels of new development.

Except where otherwise noted, SMP standards will avoid and minimize adverse impacts to existing ecological functions on lake shorelines through a combination of the following:

- Standard buffer widths that are consistent with or slightly greater than existing development setbacks;
- Options to reduce standard buffer widths through mitigation actions that enhance existing shoreline functions;
- Vegetation conservation standards that require that vegetation clearing will be limited to the minimum necessary and that prioritize retention of significant native trees;
- Provisions that limit the dimensions of overwater structures and ensure that potential impacts to aquatic species are minimized (e.g., grated decking standards and pile standards); and
- Provisions to ensure that new development will not require future shoreline stabilization measures.

6.2.2 Streams and Rivers

The proposed standard buffer of 250 feet for all shoreline freshwater streams and rivers will ensure that existing stream functions are maintained, and the buffer will limit most development along streams to the area outside of shoreline jurisdiction. Where future development of residential units along streams is indicated in Section 4 (Table 4-1), these figures are indicative of potential development outside of jurisdiction on lots that partially extend within jurisdiction.

Significant restoration is planned and underway in the streams and rivers of Thurston County. Near-term restoration efforts will be focused on restoring fish passage and improving stream habitat, including fish barrier/culvert replacement projects.

Additionally, efforts to reduce agricultural impacts on water quality in county streams are ongoing. In the longer term, efforts will focus on a balance of protecting intact functions and restoring functions and processes where they are impaired. Long-term restoration will include floodplain restoration, enhancing channel complexity, improving water quality, and restoring fish passage.

6.2.3 Wetlands

Any development within wetlands would require state and federal permits, as well as appropriate mitigation to achieve no net loss of wetland ecosystem functions. Critical areas regulations would further impose buffers on wetland areas to maintain effective wetland buffer functions. Therefore, where future development of residential units is indicated in Section 4 (Table 4-1) for associated wetlands, these figures are indicative of potential development outside of jurisdiction on lots that partially extend within jurisdiction. Together, these regulations will ensure that future residential development will not adversely affect shoreline functions.

7 NET EFFECT ON ECOLOGICAL FUNCTION

This Cumulative Impacts Analysis indicates that future growth is likely to be targeted in specific environment designations, waterbodies, and marine shoreline reaches. Future development has the potential to impact specific shoreline functions. This analysis can help inform the County of potential future shoreline impacts and the importance of specific proposed SMP provisions.

The proposed SMP is expected to maintain existing shoreline functions within Thurston County while accommodating the reasonably foreseeable future shoreline development. Other local, state and federal regulations, acting in concert with this SMP, will provide further assurances of maintaining shoreline ecological functions over time. The *Shoreline Restoration Plan,* and voluntary actions described therein, will ensure that incremental losses that could occur despite SMP provisions do not result in a net loss of functions, and these restoration actions may result in a gradual improvement in shoreline functions.

As discussed above, major elements of the SMP that ensure no net loss of ecological functions fall into four general categories: 1) environment designations (Chapter 19.200) general policies and regulations (Chapters 19.300 and 19.400) shoreline use and modification provisions (Chapter 19.600) critical areas regulations (19.400 and TCC Title 24). The *Shoreline Restoration Plan* (Appendix C) identifies ongoing and planned voluntary restoration that will provide an opportunity to improve shoreline conditions over time.

Environment designations: The *Shoreline Inventory and Characterization* report provided the information necessary to assign environment designations by segment to each of the shoreline waterbodies (see Chapter 19.200).

General provisions: Chapter 19.300 of the SMP contains a number of goals and policies pertaining to the protection and restoration of ecological functions. Chapter 19.400 includes regulations relating to the adopted policies. These regulations include provisions that provide the basis for achieving no net loss of shoreline functions, such as mitigation sequencing, vegetation conservation standards, and critical areas regulations.

Shoreline modification and use provisions: Chapter 19.600 of the SMP contains a number of regulations on a variety of topics that contribute to protection and restoration of ecological functions. Shoreline uses and modifications were

individually determined to be either permitted (as substantial developments or conditional uses) or prohibited in each environment designation. The most uses and modifications are allowed in areas with the highest level of existing disturbance.

Shoreline modification regulations emphasize minimization of size of structures, and use of designs that do not degrade and may even enhance shoreline functions. Use regulations prohibit uses that are incompatible with the existing land use and ecological conditions, and emphasize appropriate location and design of the various uses.

Shoreline Restoration Plan: The ***Shoreline Restoration Plan*** **(Appendix C)** identifies opportunities for restoration on both public and private properties inside and outside of shoreline jurisdiction, and also identifies ongoing County programs and activities, restoration partners, and recommended actions consistent with a variety of watershed-level efforts.

Key features identified in the proposed SMP and this evaluation that protect and enhance shoreline ecological functions are identified in Table 7-1.

Table 7-1. Key features of the proposed SMP to achieve no net loss of shoreline ecosystem functions.

SMP Actions to Maintain Shoreline Functions	Voluntary Actions to Restore Degraded Shoreline Functions and Processes
The County established a 250-foot buffer on all rivers and streams designated as shorelines of the state. This provision provides for protection of existing stream functions.	Planned restoration along the shorelines of the County will help identify and prioritize opportunities to restore shoreline ecological functions.
Regulations focus development and growth in areas that are already developed, while protecting those areas that are ecologically intact or otherwise sensitive to development pressures. The County's undisturbed shorelines were designated as Natural, and it is anticipated that adequate standards will provide the necessary protection of those areas in shoreline jurisdiction. The Natural environment includes many of the most sensitive and unique shoreline conditions and shoreforms in the County.	
Vegetation conservation areas (buffers) are based on environment designation and existing conditions. Larger setbacks are required in areas with a higher need for protection of shoreline resources.	
SMP provisions require any projects with potential for significant adverse ecological effects to follow mitigation sequencing to avoid, minimize and mitigate any anticipated impacts.	
Emphasis is placed on achieving no net loss of shoreline ecological functions throughout shoreline jurisdiction.	

Given the above provisions of the SMP, including the key features listed above, implementation of the proposed SMP is anticipated to achieve **no net loss of ecological functions in the shorelines of Thurston County.** Voluntary actions identified and prioritized in the *Shoreline Restoration Plan* will provide the opportunity to enhance and restore shoreline functions over time.

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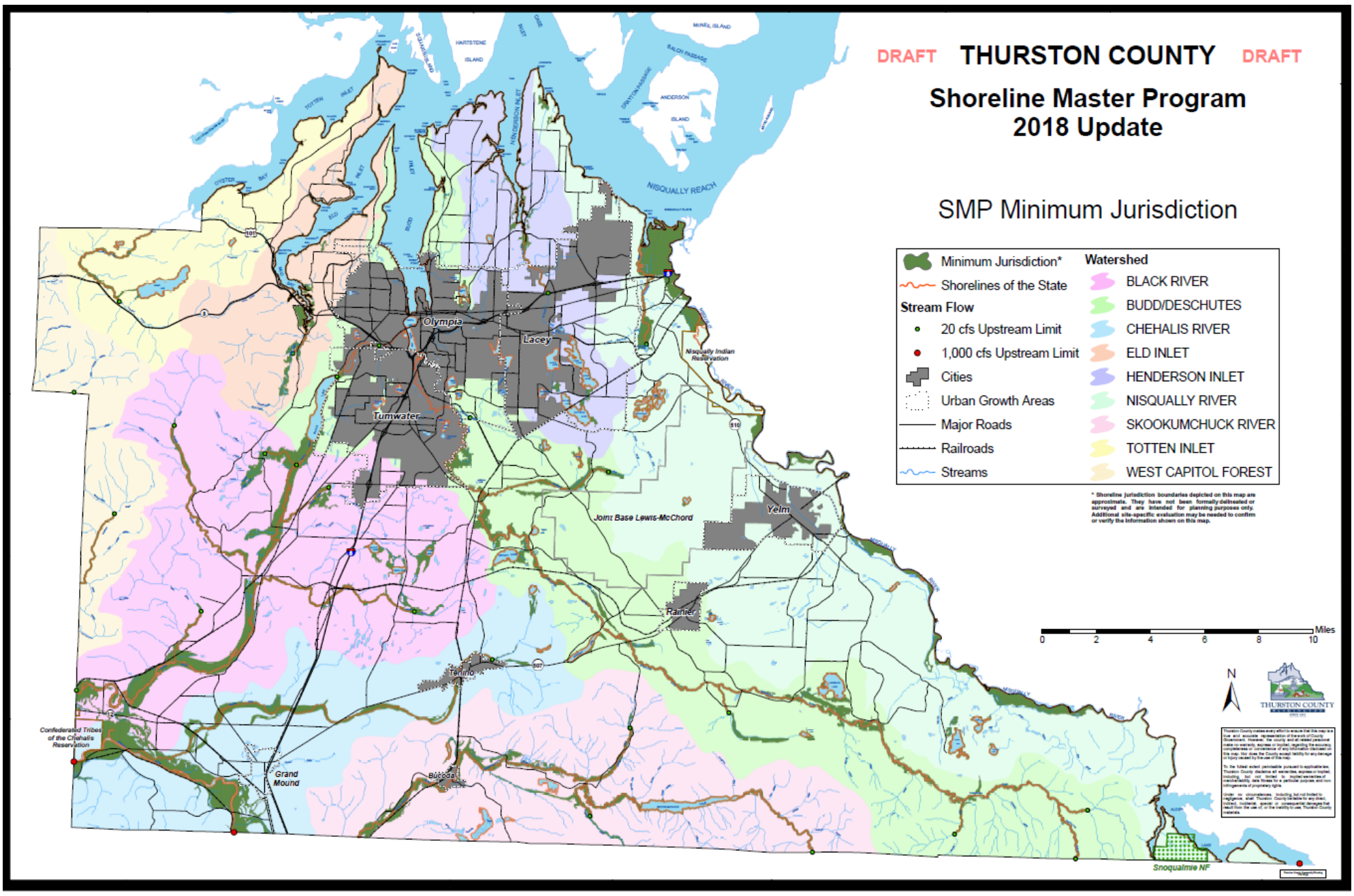
APPENDIX A: MAP OF SHORELINE CHARACTERIZATION AREAS

March 2024

Shoreline Master Program Characterization and SMP Minimum Jurisdiction



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.

USE OF THIS MAP IMPLIES THE USER'S AGREEMENT WITH THE FOLLOWING STATEMENT:

Thurston County disclaims any warrantee of merchantability or warrantee of fitness of this map for any particular purpose, either expressed or implied. No representation or warranty is made concerning the accuracy, currency, completeness or quality of data depicted on this map. Any user of this map assumes all responsibility for the use thereof, and further agrees to hold Thurston County harmless from and against any damage, loss, or liability arising from any use of this map.

Map Date:

APPENDIX B: MAPS OF SHORELINE ENVIRONMENT DESIGNATIONS

SHORELINE ENVIRONMENT DESIGNATIONS

Shoreline Environment Designations Summary

The Shoreline Management Act (SMA) Guidelines [WAC 173-26-211(2)(a)] require local shoreline master programs (SMPs) to "classify shoreline areas into specific environment designations. This classification system shall be based on the existing use pattern, the biological and physical character of the shoreline, and the goals and aspirations of the community as expressed through comprehensive plans" as well as the criteria in WAC 173-26-211.

The following are the Purpose statements for each of these Designations:

APPENDIX C: MAPS OF VACANT AND UNDERUTILIZED PARCELS BY SHORELINE ENVIRONMENT DESIGNATION

APPENDIX D: SHORELINE USE AND MODIFICATIONS MATRIX

Table 7.2-1. Shoreline Use and Modifications Matrix

Table 19.600.105 Shoreline Use and Modifications Matrix

SHORELINE USES and MODIFICATIONS *The following permits apply to the specific uses, modifications and development. Individual us modifications and development shall comply with the provisions of this Program, particularly Sec 19.400.110 (Mitigation), and the Thurston County Comprehensive Plan as of the effective date of t Program.*						
Legend: **P =** Substantial Development Permit (SDP) **E=** Exempt if exemption criteria in Section 19.500.100(C) are met **C =** Conditional Use Permit (CUP) **Ad =** Administrative CUP **X =** Prohibited	**Natural**	**Rural Conservancy**	**Urban Conservancy**	**Shoreline Residential**	**Mining**	**Aqua**
Agriculture						
General[1]	X	P	P	P	X	X
Aquaculture						
Commercial Geoduck	C	C	C	C	C	[2]
Other Aquaculture	P[3]	P[3]	P[3]	P[3]	P[3]	[2]
Note: An SDP shall not be required for aquaculture development that meets the exemption criteria at Section 19.500.100(C) Supplemental see activities are also exempt.						
Barrier Structures (Includes Breakwaters, Jetties, Groins and Weirs)						
General	X	C	C	C	C	[2]
Ecological Restoration[4]	P	P	P	P	P	[2]
Boating Facilities (including Marinas)						
General	X	P	P	P	P	[2]
Marinas	X	C	C	C	C	[2]
Commercial						
Water-Oriented	X	P	P	P	P	X[5]
Non-Water-Oriented	X	X[6]	X[6]	X[6]	X[6]	X[6]
Dredging (see Section 19.600.135)						
General	X	C	C	C	C	2
Dredge Disposal (see section 19.600.135)						
General	X	C	C	C	C	[2]
Ecological Restoration[7]	C	P	P	P	P	[2]
Fill (See section 19.600.140)						
Waterward of OHWM	X	C	C	C	C	[2]
Upland of OHWM, or Ecological Restoration	C	P	P	P	P	[2]
Ecological Restoration	P	P	P	P	P	[2]
Flood Hazard Reduction Measures						
General	C	C	C	C	C	C
Forest Practices						
Commercial Forestry	C	P	X	X	X	N/
Class IV-General	C	P	P	P	P	N/
Industrial						
Water-oriented Uses	X	X	C	X	P	X[5]
Non-water-oriented Uses	X	X	X	X	X	X