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**COMMUNITY PLANNING &
ECONOMIC DEVELOPMENT DEPARTMENT**

Creating Solutions for Our Future

Joshua Cummings, Director

MEMORANDUM

TO: Planning Commission

FROM: Andy Deffobis, Associate Planner,

DATE: May 9, 2019

SUBJECT: Shoreline Master Program Buffers

Introduction

As part of the overall Shoreline Master Program update, staff have been gathering and analyzing information about shoreline buffers to provide the Planning Commission and Board of County Commissioners (Board) with information to make buffer decisions. This includes research on best available science for shoreline buffers (Appendix A), what other jurisdictions in western Washington have proposed, and what has been approved by the Department of Ecology (Appendix B).

Vegetation along the shoreline provides a myriad of benefits for the water body, the upland area and shoreline residents and users. Vegetation helps to stabilize soils, which filter pollutants and fine sediments, contributing to improved water quality. Trees and shrubs provide habitat for many species and provide food for aquatic species. More stable banks reduce occurrences of landslides, damage to structures and threats to life safety (Ecology SMP Handbook, Chapter 11).

Marine vs. Freshwater Riparian Areas

Shorelines of the state include both marine and freshwater shorelines. Research suggests that freshwater and marine riparian areas adjacent to the water share ecological functions. The Department of Ecology's Shoreline Master Program handbook states:

"Research on freshwater riparian areas is relevant to marine riparian areas and vice versa. A panel of 14 scientists with expertise related to riparian ecosystems generally agreed that "findings from studies of freshwater riparian areas are transferable to marine riparian areas, although some processes and functions are unique to marine riparian areas." (*Protection of Marine Riparian Functions in Puget Sound, Washington*, Appendix H, 2009.) This document also concludes that "riparian areas provide ecological functions regardless of whether they

are adjacent to freshwater or marine water bodies” (Section 1). (Ecology SMP Handbook Chapter 11)

What does science say about buffers?

The legislature requires SMP provisions to be based on an analysis incorporating the most current, accurate, and complete scientific or technical information available (WAC 173-26-201(2)(a)).

Recommended buffer widths vary, depending on shoreline environment designation and which functions the shoreline is provided in a given area. In order to support conversations about buffers during the SMP update, staff analyzed recommendations from scientific literature and the master programs adopted by other jurisdictions.

The following was adapted from the literature. See Appendix A for more complete documentation.

Function	Recommended Buffer Width (includes literature averages)	Study
Wildlife	100-1,000 ft 287 ft 318 ft 571 ft	Ecology 2013, citing Environmental Law Institute WDFW 1997 Kitsap County Brennan & Culverwell 2009
Sediment removal Fine sediment control Erosion control Sediment filtration	30-100 ft 112 ft 117 ft 190 ft	Ecology 2013, citing Environmental Law Institute WDFW 1997 Kitsap County Brennan & Culverwell 2009
Nitrogen removal	100-180 ft	Ecology 2013, citing Environmental Law Institute
Phosphorus removal	30-100 ft	Ecology 2013, citing Environmental Law Institute
Water quality	358 ft	Brennan & Culverwell 2009
Pollution filtration	78 ft 231 ft	WDFW 1997 Kitsap County
Shade	79 ft 132 ft	Brennan & Culverwell 2009 Kitsap County
Temperature control	90 ft	WDFW 1997
Microclimate	280 ft 412 ft	Kitsap County WDFW 1997
Large woody debris	147 ft 161 ft 180 ft	WDFW 1997 Kitsap County Brennan & Culverwell 2009

Current Buffers in Thurston County SMP/CAO

The existing SMP was adopted in 1990. At that time, buffers established in the adopted SMP were as follows:

1990 Shoreline Environment Designation*	Standard Buffer Width
Urban Environment	20 feet or width prescribed in local zoning ordinance
Suburban Environment	50 feet
Rural	50 feet
Conservancy	100 feet
Natural	100 feet

*The current SMP also contains provisions for special management areas.

In 2010, Substitute House Bill 1653 clarified that critical area regulations adopted under the GMA apply within shoreline areas until Ecology approves either a comprehensively updated SMP, or a SMP amendment specifically related to critical areas. The County's CAO update was adopted in 2012. It currently prescribes 250' buffers for marine shorelines and for Type S streams, with an additional 50 foot vegetation management zone in which vegetation removal must be limited. The CAO defers to the SMP on lakes, and on marine shorelines with the "Rural" environmental designation.

2012 Shoreline Environment Designation*	Standard Buffer Width		
	Marine	Lakes	Streams
Urban Environment	250 feet	100 feet	250 ft
Suburban Environment	50 feet	50 feet	250 ft
Rural	250 feet	100 feet	250 ft
Conservancy	250 feet	100 feet	250 ft
Natural	250 feet	100 feet	250 ft

*The current SMP/CAO also contains provisions for special habitat management areas. See Chapters 24.25.045-060 TCC.

Proposed Buffers in Thurston County Draft Shoreline Master Program Update

In 2018, staff were directed by the Board to propose buffers in line with those adopted by other jurisdictions and approved by the Washington Department of Ecology. The proposed buffers are intended to represent a moderate risk approach for protecting shoreline function, based on a review of the literature. This means there is a moderate risk that shoreline functions will be impacted by the adoption of the proposed buffer widths. This is the approach that the Washington Department of Ecology used for its recommendations on wetlands in Washington State (see Bunten et al., 2016). The current buffers proposed are:

Designation	Marine (Standard/Reduced Buffer)	Freshwater Lakes (Standard/Reduced Buffer)
Shoreline Residential	50 feet*	50 feet*
Urban Conservancy	125 feet/75-90 feet	125 feet/75-90 feet
Rural Conservancy	150 feet/110 feet	150 feet/110 feet
Natural	200 feet/150 feet	200 feet/150 feet

*No reduction without Type III variance

		Streams
		250 feet**

**Freshwater stream buffers may be administratively reduced by 10-25% via a Type I or II administrative variance. Reductions greater than 25% require a Type III variance.

Additional Buffer Options

The County has latitude in how it structures its approach to buffers. Currently, buffers are proposed by shoreline environment designation for marine shorelines and lakes, while streams have a proposed fixed buffer width of 250 feet.

One option the Planning Commission could consider is to propose varying buffers for streams, based on shoreline environment designation. They may also consider proposing a fixed buffer width on marine shorelines. This is the approach taken for freshwater and marine riparian areas in the Critical Areas Ordinance.

What buffers have been adopted by other jurisdictions?

As part of the Thurston County SMP update process, staff reviewed buffers adopted by other jurisdictions. Buffer widths discussed here have been approved by Ecology, with the exception of Clallam County, which is currently under review by Ecology.

The SMPs of other jurisdictions take varying approaches to prescribing buffers. Below are a few comparisons of buffer widths in the region. Please refer to Appendix B for more information.

Jurisdictional Buffer Comparison, by Shoreline Environment Designation:

	Thurston County 1990 SMP/2012 CAO	DRAFT Thurston County SMP	Kitsap County SMP	Mason County SMP	Lewis County SMP	Pierce County SMP
Shoreline Residential	Marine/lakes 50 feet	50 feet	85 feet	Marine /lakes 100ft/100ft	150 feet	75 feet
Urban Conservancy	Marine/lakes 250ft/100ft	125 feet (90)	100 feet	Marine/lakes 100ft/100ft	150 feet	100 feet
Rural Conservancy	Marine/lakes 250ft/100ft	150 feet (110)	130 feet	Marine/lakes 150ft/100ft	150 feet	100 feet
Natural	Marine/lakes 250ft/100ft	200 feet (150)	200 feet	Marine/ lakes 150ft/100ft	200 feet	150 feet
Streams	250 feet*	250 feet*	200 feet*	150 feet**	150-200 feet***	100-150 feet**

- * Or the flood hazard area (whichever is larger)
- ** Or the outer extent of the Channel Migration Zone (whichever is larger)
- *** Within the CMZ, SMP flood course or floodway, new development or uses, including subdivision of land, shall not be established when it would be reasonably foreseeable that the development or use would require new structural flood hazard reduction measures.

Jurisdictional Buffer Comparison, by Shoreline Type (if specified):

Jurisdiction	Streams Buffer Width Range (in feet)	Marine Buffer Width Range (in feet)	Lake Buffer Width Range (in feet)
Thurston County Proposed	250	50-200	50-200
Other Jurisdictions	50-250	50-200	30-200

How do Thurston County's proposed buffers measure up to Ecology's recommendations?

The Department of Ecology provides recommendations for buffer widths in Chapter 11 of the SMP handbook.

Ecology recommends that buffers on undeveloped shorelines with largely intact ecological functions should be 150-200 feet. A 200 foot buffer is proposed for 'Natural' marine and lake shorelines in the Thurston County draft SMP.

Ecology further recommends that areas with rural residential development have 150 foot buffers to protect existing functions. The proposed buffer for the 'Rural Conservancy' SED is 150 feet. The proposed buffer for the 'Urban Conservancy' SED is 125 feet.

A 30-60 foot buffer on more densely developed residential shorelines may be appropriate, according to Ecology's guidance. The County's SMP proposes a 50 foot buffer in the 'Shoreline Residential' SED on lakes and marine shorelines.

Streams are proposed to have a 250' buffer, which exceeds Ecology's recommendation of 150-200 feet for the most intact shorelines but is the current buffer in the CAO. Reductions to the current buffer width could impact the County's Community Rating Score through FEMA's National Flood Insurance Program. Thurston County is currently one of only 6 counties in the nation with a CRS rating of Class II.

Literature Cited

Brennan, J., H. Culverwell, R. Gregg, and P. Granger, P.I. 2009. Protection of marine riparian functions in Puget Sound, Washington. Washington Sea Grant. Prepared for Washington Department of Fish and Wildlife.

Bunten, D., R. Mraz., L. Driscoll., and A. Yahnke. 2016. Wetland guidance for CAO updates – Western Washington Version. Washington State Department of Ecology Shorelands and Environmental Assistance Program. Publication No. 16-06-001.

EnviroVision, Herrera Environmental, and Aquatic Habitats Guidelines Program. 2010. [Protecting nearshore habitat and functions in Puget Sound.](#)

Federal Emergency Management Agency. 2013. Floodplain Management and the Endangered Species Act – A Model Ordinance. Produced by FEMA – Region 10.

Hruby, T. 2013. Update on Wetland Buffers: The State of the Science, Final Report, October 2013. Washington State Department of Ecology Publication #13-06-11.

Kitsap County Department of Community Development. 2012. Technical Memorandum for Proposed Kitsap County SMP Buffers.

Knutson, K.L., and V.L. Naef. 1997. Management recommendations for Washington's priority habitats: riparian. Washington Department of Fish and Wildlife.

Washington Department of Ecology. 2017. Shoreline Master Programs Handbook. Publication No. 11-06-010.

Appendix A: Scientific Literature Review

Washington Department of Ecology (2013)

The Department of Ecology published guidance for protecting and managing in wetlands in 2005. In 2013, an update on wetland buffer science was published. The document notes that ecological attributes by which buffers protect water quality do not depend on whether the buffer is adjacent to a stream or a wetland (Hruby 2013). The following is an update to the original science synthesis provided by this document is the following:

Recent synthesis documents recommend a focused approach to buffer widths that is based on the many functions provided by a buffer. In addition, the more recent recommendations specify buffer widths that are larger than those recommended in the 2005 synthesis. The *Planner's Guide to Wetland Buffers for Local Governments*, prepared by the Environmental Law Institute (42), recommends a range of 100ft–1000ft for wildlife, 30–100ft for sediment removal, 100-180ft for nitrogen removal, and 30-100ft for phosphorus removal.

If prescribed buffers are to be used to adequately protect wetland wildlife, they will probably have to be larger than what is currently used. Based on the needs of wildlife species found in Wisconsin (some of which are also found in Washington State), the minimum buffer width is about 400 ft, and the optimal width for sustaining the majority of wildlife species is about 900 ft (81). (Hruby 2013)

Brennan & Culverwell (2009)

Brennan and Culverwell (2009) summarized several studies on buffer effectiveness, reporting on average widths to achieve 80% of a desired function for the marine riparian environment. Their results are summarized as follows.

Function	Buffer width recommendation to achieve ≥ 80% effectiveness	Literature cited	Avg of all literature (to achieve ≥ 80% effectiveness)	Min. buffer width (approximate) based on FEMAT curve to achieve ≥ 80% effectiveness
Water quality	5-600 m (16 – 1,968 ft) (Appendix C contains specific buffer widths for different water quality parameters)	5 m (16 ft): Schooner and Williard (2003) for 98% removal of nitrate in a pine forest buffer	109 m (358 ft)	25 m (82 ft) sediment 60 m (197 ft) TSS 60 m (197 ft) nitrogen 85 m (279 ft) phosphorus
		600 m (1969 ft): Desbonnet et al (1994/1995) for 99% removal		

Fine sediment control	25-91 m (92 – 299 ft)	25 m (82 ft): Desbonnet et al (1994/1995) for 80% removal	58 m (190 ft)	25 m (82 ft) (sediment) 60 m (197 ft) (TSS)
		91 m (299 ft): Pentec Environmental (2001) for 80% removal		
Shade	17-38 m (56 – 125 ft)	17 m (56 ft): Belt et al 1992 <i>IN</i> Eastern Canada Soil and Water Conservation Centre (2002) for 90%	24 m (79 ft)	37 m (121 ft) (.6 SPTH*)
		38 m (125 ft): Christensen (2000) for 80% temperature moderation		
LWD	10-100 m (33 – 328 ft)	10 m (33 ft): Christensen (2000) for 80-90% effectiveness	55 m (180 ft)	40 m (131 ft) (.65 SPTH*)
		100 m (328 ft): Christensen (2000) 103 for 80-90% effectiveness		
Litter fall	No studies found	N/A	N/A	24 m (79 ft) (.4 SPTH*)
Hydrology/slope stability	No studies found	N/A	N/A	N/A
Wildlife	73-275 m (240 – 902 ft)	73 m (240 ft): Goates (2006) for 90% of hibernation and nesting	174 m (571 ft)	N/A
		275 m (902 ft): Burke and Gibbons 1995 <i>IN</i> Goates 2006 for 100% of hibernation and nesting		

The research presented above is also cited in the 2010 document Protecting Nearshore Habitat and Functions in Puget Sound (EnviroVision, Herrera Environmental, and Aquatic Habitat Guidelines Program). The authors contend:

“There is consensus in the literature that buffers or protected riparian areas are critical to sustaining many ecological functions. A precautionary approach toward regulating marine riparian habitat areas is recommended. A precautionary approach would rely on using the high end of the ranges required to protect specific functions, where those widths are achievable. Where there is opportunity (e.g., in areas of undeveloped or low-density shorelines with high habitat value), maximum protection will help compensate for unavoidable and cumulative impacts from development and redevelopment elsewhere in the landscape.” (EnviroVision et al. 2010)

WDFW Riparian Management Recommendations (1997)

Washington Department of Fish and Wildlife’s riparian management recommendations (Knutson & Naef 1997) is an oft-cited document that discusses buffer science. They recommend 250’ buffers on shorelines of the state (information adapted from publication):

Stream Type	Recommended Riparian Habitat Area widths (in feet)
Type 1 and 2 streams; or Shorelines of the State, Shorelines of Statewide Significance	250
Type 3 streams; or other perennial or fish bearing streams 5-20 feet wide	200
Type 3 streams; or other perennial or fish bearing streams <5 feet wide	150
Type 4 and 5 streams; or intermittent streams and washes with low mass wasting* potential	150
Type 4 and 5 streams; or intermittent streams and washes with high mass wasting* potential	225

**Mass wasting is a general term for a variety of processes by which large masses of rock or earth material are moved downslope by gravity, either slowly or quickly.*

Their general summary of scientific literature is as follows (information adapted from publication):

Riparian habitat function	Range of reported widths (feet)	Average of reported widths (feet)
Temperature control	35-151	90
Large woody debris	100-200	147
Sediment filtration	26-300	138
Pollution filtration	13-600	78
Erosion control	100-125	112
Microclimate maintenance	200-525	412
Wildlife habitat	25-984	287

Federal Emergency Management Agency

In 2008, The National Marine Fisheries Service (NMFS) issued a biological opinion regarding the National Flood Insurance Program (NFIP) operated by the Federal Emergency Management Agency (FEMA). The opinion noted that continued implementation of the NFIP in the Puget Sound adversely affects the habitat of listed salmon species and Orca whales.

In the opinion, FEMA was ordered to modify its floodplain management criteria to allow no development in the riparian buffer zone. In the model ordinance developed for Washington State, FEMA referred to recommended riparian buffers in Knutson and Naef (1997), which include a 250 foot buffer for shorelines of the state.

Kitsap County SMP Buffers Technical Memorandum

For their SMP update, Kitsap County evaluated science for the various buffer functions, and summarized findings in the following tables in a January 2012 technical memorandum.

Buffer Function	References	Recommendation
Microclimate	Knutson and Naef, 1997	412'
	May, 2003	100-328'
Shade	Brennan, et al., 2009	56-125'
	May, 2003	98-262'
	FEMAT	121'
Sediment Filtration	Brennan, et al., 2009	92-299'
	May, 2003	100'
	FEMAT	82-197'
	Knutson and Naef, 1997	78'
	Neibling and Alberts, 1979*	7.9'
	Desbonnet, et al., 1994	82' (80%)
Pollutant Filtration	Brennan, et al. , 2009	16-1,968'
	May, 2003	66-196'
	Knutson and Naef, 1997	78'
	Desbonnet, et.al., 1994	148' ("adequate")
	Larsen, 1994*	2'
	Doyle, 1977*	13'
	Lim, 1998*	20'
Strivastava, 1996*	10-20'	
Large Woody Debris	Brennan, et al., 2009	33-328'
	May, 2003	164'
	FEMAT	131'
	Knutson and Naef, 1997	147'
Wildlife Habitat	Brennan, et al., 2009	240-902'

	May, 2003	100-328'
	Knutson and Naef, 1997	287'
	Desbonnet, et.al., 1994	49' (min. for wildlife + 60% pollutant removal)
All Functions	Desbonnet, et.al., 1994	16.4' (min. for densely developed areas); 49' (min. for moderately developed areas); 164' (undeveloped areas) 82' (min. general wildlife and 70% pollut. removal)
	Castelle, 2000	16-82'

**This reference may not be as applicable to Kitsap County shorelines as others listed here due to the location and type of environment analyzed.*

Buffer Function Average and Median Widths from the Literature

Buffer Function	Average Buffer	Average minus outliers	Median Buffers	Range (Lowest/Highest)
Microclimate	280'	100'	100'	100'-412'
Shade	132'	115'	121'	56'-262'
Sediment Filtration	117' [133']	105' [111']	87' [100']	7.9'-299' [78'-299']
Pollutant Filtration	231' [412']	63' [122']	20' [113']	2'-1,968' [16'-1,968']
Large Woody Debris	161'	147'	147'	33'-328'
Wildlife Habitat	318'	239'	264'	49'-902'
TOTAL	197' [211']	157' [172']	100' (Lower=49' [80']; Upper=196' [257'])	

Numbers in brackets indicate the results when () documents were not considered based on their applicability to Kitsap County shorelines.*

Appendix B: SMP Buffers Established by Other Jurisdictions

Proposed buffers in the draft SMP were compared to standard buffers in master programs approved by Ecology for other jurisdictions. Master programs are organized differently across jurisdictions, and not all jurisdictions use the same shoreline environment designations or specify buffer widths by type of shoreline. Results of the jurisdictional comparison are in the tables below.

Jurisdictional Buffer Comparison, by Shoreline Environment Designation:

	Thurston County Proposed	Kitsap	Mason	Lewis	Pierce*	Clallam
Shoreline Residential	50	85	100	150	75	
Urban Conservancy	125	100	100	150	100	
Rural Conservancy	150	130	100-150	150	100	
Natural	200	200	100-150	200	150	175

*Most restrictive buffer between CAO and SMP applies (additive buffers if certain characteristics are present).

Jurisdictional Buffer Comparison, by Shoreline Type (if specified):

Jurisdiction	Streams Buffer Width Range (in feet)	Marine Buffer Width Range (in feet)	Lake Buffer Width Range (in feet)
Thurston County proposed	250	50-200	50-200
Mason County	150	100-150	100
Snohomish County	150 (anadromous streams)	150	150
Island County	150*	0-125*	30-130*
Whatcom County	150	150	100
Jefferson County	150	150	100
Clallam County	50-100 "other streams"	50-100	
Kitsap County	200	85-200	85-200
City of Lacey	**	200	**
City of Tumwater	250	N/A	50-100

*Additional 10-45' setback depending on SED.

** Determined with Habitat Management Plan and Chapter 17.41.021-Table 1 of Lacey SMP.

Jurisdictional Buffer Comparison, by Absolute Standard Width Range (includes all SEDs and shoreline types, may not include 100 yr floodplain or channel migration zone areas):

Jurisdiction	Gross Buffer Width Range (in feet)
Mason County	100-150
Pierce County	35-150
King County	115-165
Snohomish County	150
Island County	0-195
Whatcom County	100-150
Jefferson County	100-150
Clallam County	35-175
San Juan County	50-100
Kitsap County	50-200
City of Lacey	50-200
City of Olympia	30-200
City of Tumwater	50-250