

Polly Stoker

From: Brad Murphy
Sent: Wednesday, March 06, 2019 11:59 AM
To: PlanningCommission
Cc: Polly Stoker; Ian Lefcourte
Subject: FW: Comments on the SMP Draft Chapters
Attachments: Futurewise Coms to Thurston Co on SMP Update March 6 2019.pdf

From: Tim Trohimovich [mailto:Tim@futurewise.org]
Sent: Tuesday, March 05, 2019 6:34 PM
To: Brad Murphy <brad.murphy@co.thurston.wa.us>
Subject: Comments on the SMP Draft Chapters

Dear Mr. Murphy:

Enclosed please find Futurewise's comments on the Shoreline Master Program (SMP) Draft Chapters for March 6th Planning Commission Meeting. We are also mailing the paper copy and supporting documents.

Please contact me if you require anything else.

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March 6, 2019

Thurston County Planning Commission
c/o Thurston County Community Planning & Economic Development Department
2000 Lakeridge Drive SW
Olympia, Washington 98502

Dear Planning Commissioners:

Subject: Comments on the Shoreline Master Program (SMP) Draft Chapters for March 6th Planning Commission Meeting.

Sent via U.S. Mail and email to: brad.murphy@co.thurston.wa.us

Thank you for the opportunity to comment on the Shoreline Master Program (SMP) Draft Update. Futurewise strongly supports the update.

The southern resident orcas, or killer whales, are threatened by (1) an inadequate availability of prey, the Chinook salmon, “(2) legacy and new toxic contaminants, and (3) disturbance from noise and vessel traffic.”¹ “Recent scientific studies indicate that reduced Chinook salmon runs undermine the potential for the southern resident population to successfully reproduce and recover.”² A 2018 analysis by the National Oceanic and Atmospheric Administration and the State of Washington Department of Fish and Wildlife ranked the Southern Puget Sound fall Chinook stocks that originate in the Nisqually and Deschutes River systems highest in importance as food sources for the southern resident killer whales.³ The Shoreline Master Program update is an opportunity to take steps to help recover the southern resident orcas, the Chinook salmon, and the species and habitats on which they depend. We support improving protections for these key species such as improved regulations to manage hard shoreline armoring and improved protections for shoreline vegetation.

Therefore, we strongly support the shoreline master program update. We do have suggestions to improve the update discussed below.

Futurewise works throughout Washington State to support land-use policies that encourage healthy, equitable and opportunity-rich communities, and that protect our most valuable farmlands, forests,

¹ State of Washington Office of the Governor, Executive Order 18-02 Southern Resident Killer Whale Recovery and Task Force p. 1 (March 14, 2018) last accessed on Feb. 20, 2019 at: https://www.governor.wa.gov/sites/default/files/execute_order/eo_18-02_1.pdf and enclosed with the paper original of this letter.

² *Id.*

³ National Oceanic and Atmospheric Administration and the State of Washington Department of Fish and Wildlife, *Southern Resident Killer Whale Priority Chinook Stocks* p. 6 (June 22, 2018) accessed on March 4, 2019 at: <https://www.documentcloud.org/documents/4615304-SRKW-Priority-Chinook-Stocks.html> and enclosed with the electronic version of this letter with the filename: “SRKW-Priority-Chinook-Stocks.pdf.”

and water resources. Futurewise has members and supporters throughout Washington State including Thurston County.

Provisions Futurewise Particularly Supports

The SMP update has many good provisions. We want to highlight some of the best provisions:

- The vegetation conservation goal and policies in proposed 19.300.110. Retaining native vegetation in shorelines jurisdiction is important to maintaining no net loss of shoreline ecological functions.⁴
- Calling for carrying out the Alliance for a Healthy South Sound's (AHSS) South Sound Strategy through the shoreline master program and its implementation. This will better protect water quality and water quantity.
- Proposed 19.400.130B.'s requirement that sites with known or potential archaeological resources require a site inspection by a professional archaeologist. This will significantly improve protections for archaeological resources and save permit applicants time and money because the risk of having their project stopped for archaeological work will be reduced.⁵
- Proposed 19.500.105K.'s monitoring provisions. These provisions are needed to determine if the Shoreline Master Program is achieving no net loss. These provisions are required the Shoreline Master Program Guidelines.⁶

Summary of Key Recommendations

- Please correct the descriptions of critical areas and their status under the Shoreline Management Act in proposed 19.100.110. Please see page 3 of this letter for the detailed recommendation.
- Please clarify shoreline master program jurisdiction to include shorelands, floodways, flood plains adjacent to floodways, lakes 20 acres in size, and streams with a mean annual flow of 20 cubic feet per second consistent with the Shoreline Management Act (SMA). Please see pages 4 and 5 of this letter for the detailed recommendation.
- Please clarify the definition of no net loss in proposed 19.150.590 so it is consistent with the Shoreline Master Program (SMP) Guidelines. Please see page 4 of this letter for the detailed recommendation.
- Modify Policy SH-18 to maintain water quality as the SMP Guidelines require. Please see page 7 of this letter for the detailed recommendation.

⁴ EnviroVision, Herrera Environmental, and Aquatic Habitat Guidelines Program, *Protecting Nearshore Habitat and Functions in Puget Sound* p. II-39 – II-40 (October 2007, Revised June 2010) accessed on Feb. 20, 2019 at: <https://wdfw.wa.gov/publications/00047/> and enclosed with the paper original of this letter.

⁵ See for example Jeff Chew, *Jefferson PUD sticks with Beckett Point* Connections pp. 8 – 9 (Washington Public Utility Districts Association [WPUDA]: Winter 2008) last accessed on Feb. 20, 2019 at:

<https://www.yumpu.com/en/document/view/46547248/connections-washington-public-utility-district-association/11>

⁶ *Friends of the San Juans v. San Juan County and State of Washington*, Department of Ecology, WWRGMHB Case No. 17-2-0009, Final Decision and Order (June 13, 2018), at 34 of 38 last accessed on March 4, 2019 at: <http://www.gmhb.wa.gov/search/case>.

- Adopt improved landslide hazard requirements to better protect people and property. Please see page 8 of this letter for the detailed recommendation.
- Include vegetation conservation requirements consistent with the SMA and SMP Guidelines. Please see page 11 of this letter for the detailed recommendation.
- Please adopt aquatic buffers in proposed 19.400.120 consistent with Management Recommendations for Washington's Priority Habitats. Please see page 14 of this letter for the detailed recommendation.
- Require wider setbacks between development and critical areas and critical areas buffers in areas subject to wildfire danger. Please see page 16 of this letter for the detailed recommendation.
- Please adopt a ten percent impervious surface limit for the Rural Conservancy shoreline environment consistent with the SMP Guidelines to protect shoreline ecological functions. Please see page 17 of this letter for the detailed recommendation.
- Protect people, property, and habitat from sea level rise and increased coastal erosion. Please see page 18 of this letter for the detailed recommendation.
- Require mitigation for all losses of shoreline ecological functions including the adverse impacts of development outside of buffers as required by the SMP guidelines. Please see page 21 of this letter for the detailed recommendation.
- Prohibit marine net pen aquaculture for nonnative species in the Aquatic environment. Please see page 21 of this letter for the detailed recommendation.
- In the Rural Conservancy environment only allow new structural shoreline stabilization and flood control works where there is a documented need to protect an existing structure as SMP Guidelines require. Please see page 22 of this letter for the detailed recommendation.
- Please modify proposed 19.600.170B.7. to require public access consistent with the SMP Guidelines. Please see page 22 of this letter for the detailed recommendation.
- Include all required elements in the Shoreline Restoration Plan. Please see page 23 of this letter for the detailed recommendation.

Detailed Recommendations

Recommendations for SMP Draft Chapter 19.100 update Strike-thru WM

Please correct the descriptions of critical areas and their status under the Shoreline Management Act in proposed 19.100.110 Purpose and Intent on page 1.

The Shoreline Management Act (SMA), in RCW 90.58.610, provides that “RCW 36.70A.480 governs the relationship between shoreline master programs and development regulations to protect critical areas that are adopted under chapter 36.70A RCW.” RCW 36.70A.480(5) provides that the “[s]horelines of the state shall not be considered critical areas under this chapter except to the extent that specific areas located within shorelines of the state qualify for critical area designation based on the definition of critical areas provided by RCW 36.70A.030(5) and have been designated as such by

a local government pursuant to RCW 36.70A.060(2).” Proposed 19.100.110 in the third paragraph is unclear as to whether the Growth Management Act (GMA) definitions identify critical areas as RCW 90.58.610 and RCW 36.70A.480(5) require. So we suggest that the last sentence in the third paragraph of Proposed 19.100.110 be revised to read as follows with our additions double underlined and deletions double struck through.

Although Washington’s shorelines may contain critical areas, the shorelines themselves are not critical areas ~~by default as~~ unless they meet the definitions in the defined by GMA.

Please clarify shoreline master program jurisdiction in proposed 19.100.120D on page 2.

The shoreline master program applies to all shorelines and shorelands in unincorporated Thurston County.⁷ The GMA divides unincorporated Thurston County within the county’s jurisdiction into three broad categories: urban, rural, and natural resource lands. We are concerned that proposed 19.100.120D may inadvertently be interpreted as exempting natural resource lands from the jurisdiction of the shoreline master program (SMP). In addition, the SMA allows cities to predesignate lands within their urban growth areas. Once annexed, these predesignations apply to the annexed land. In this case, no amendment is required to apply the city SMP to those areas. So, we suggest that proposed 19.100.120D be revised with our additions double underlined and deletions double struck through.

- D. This Master Program shall apply to all unincorporated ~~rural and urban~~ lands within Thurston County until such time as a city incorporates land into their city boundaries through annexation and, if necessary, an SMP amendment.

Please clarify the definition of no net loss in proposed 19.150.590 on page 13.

The Shoreline Master Program (SMP) Guidelines require the application of no net loss on an individual use or project basis, not as some countywide “aggregate.”⁸ This can be seen in WAC 173-26-201(2)(e)(i) which provides in relevant part that “[t]o assure no net loss of shoreline ecological functions, master programs shall include provisions that require proposed individual uses and developments to analyze environmental impacts of the proposal and include measures to mitigate environmental impacts not otherwise avoided or mitigated by compliance with the master program and other applicable regulations.” The second, third, and fourth sentences of the definition of no net loss comply with WAC 173-26-201(2)(e)(i). We particularly appreciate the third sentence’s recognition that no net loss applies at multiple scales, this scientifically correct and is recognized by the SMP Guidelines.⁹ However, the first sentence does not comply with WAC 173-26-201(2)(e)(i) because it treats no net loss as an aggregate when the SMP Guidelines require it to be applied

⁷ RCW 90.58.030(2).

⁸ Even though the Shoreline Master Program (SMP) Guidelines are called “guidelines,” they are actually binding state agency rules and shoreline master program updates must comply with them. RCW 90.58.030(3)(b) & (c); RCW 90.58.080(1) & (7). The SMP Guidelines cited in this letter were accessed on Feb. 27, 2019 at: <https://app.leg.wa.gov/wac/default.aspx?cite=173-26&full=true>.

⁹ WAC 173-26-201(2)(c).

function by function and project by project throughout the county's shorelines. This is not to say that offsite mitigation is not allowed, it can be where that mitigation replaces all lost functions. So, we suggest that proposed 19.150.590 be revised with our deletions double struck through.

19.150.590 No Net Loss: the maintenance of the ~~aggregate total of the~~ County's shoreline ecological functions. The no net loss standard requires that the impacts of shoreline development and/or use, whether permitted or exempt, be identified and prevented or mitigated such that there are no resulting adverse impacts on ecological functions or processes. Each project shall be evaluated based on its ability to meet the no net loss requirement. The no net loss standard applies at multiple scales, starting at the project site. Compensatory mitigation standards include sequencing guidelines to ensure the most appropriate mitigation type and site are selected, as close to the impacted location as possible.

Recommendations for SMP Draft Chapter 19.200 update Strike-thru WM.pdf

Clarify proposed 19.200.100A. Shoreline Jurisdiction on page *2 to comply with the jurisdiction of the Shoreline Management Act.

The Thurston County SMP applies to unincorporated Thurston County. In addition, RCW 90.58.030(2)(e) provides in full that:

(e) "Shorelines" means all of the water areas of the state, including reservoirs, and their associated shorelands, together with the lands underlying them; except (i) shorelines of statewide significance; (ii) shorelines on segments of streams upstream of a point where the mean annual flow is twenty cubic feet per second or less and the wetlands associated with such upstream segments; and (iii) shorelines on lakes less than twenty acres in size and wetlands associated with such small lakes; ...¹⁰

So, rivers and streams with a flow of 20 cubic feet per second are within shoreline jurisdiction. But proposed 19.200.100A.2. requires the mean annual flow to be more than 20 cubic feet per second. We recommend that proposed 19.200.100A be modified so it is consistent with RCW 90.58.030(2)(e).

In addition, RCW 90.58.030(2)(e) provides that the "shorelands" associated with the waters of the state are "shorelines" and therefore within the minimum required shoreline jurisdiction. RCW 90.58.030(2)(d) defines shorelands providing that:

(d) "Shorelands" or "shoreland areas" means those lands extending landward for two hundred feet in all directions as measured on a horizontal plane from the ordinary high water mark; floodways and contiguous floodplain areas landward two hundred feet from such floodways; and all wetlands and river deltas associated with the streams, lakes, and tidal waters which are subject to the provisions of this chapter; the same to be designated as to location by the department of ecology.

¹⁰ Underlining added.

- (i) Any county or city may determine that portion of a one-hundred-year-flood plain to be included in its master program as long as such portion includes, as a minimum, the floodway and the adjacent land extending landward two hundred feet therefrom.

Proposed 19.200.100A.5. seems to have confused the shorelands concept and the requirement to include floodways which may extend beyond 200 feet from the ordinary high water mark. RCW 90.58.030(2)(d) requires that both be included in the minimum shoreline jurisdiction. Proposed 19.200.100 also omits river deltas associated with the streams, lakes, and tidal waters which are subject to the provisions of the SMA which are part of the minimum jurisdiction of the shoreline master program.

So we recommend that proposed 19.200.100A. be modified to comply with RCW 90.58.030(2)(e) and RCW 90.58.030(2)(d). Our recommended additions are double underlined and our recommended deletions are double struck through.

- A. The Shoreline Master Program jurisdiction applies to all shorelines of the state in unincorporated Thurston County and their associated shorelands. This includes:
1. All marine waters;
 2. Rivers and streams with ~~more than~~ 20 cubic feet per second (cfs) or greater mean annual flow;
 3. Lakes and reservoirs 20 acres and greater in area;
 4. Associated wetlands to 1 thru 3 above;
 5. Those lands extending landward for two hundred feet in all directions as measured on a horizontal plane from the ordinary high water mark of the water bodies ~~The flood hazard areas adjacent to these waterbodies listed in 1 thru 3 above, typically within 200 feet of the ordinary high water mark (OHWM);~~
 6. Buffers necessary to protect critical areas that are located within shoreline jurisdiction as described in this program;*
 7. Floodways and contiguous floodplain areas landward two hundred feet from such floodways; and
 8. River deltas associated with the streams, lakes, and tidal waters listed in 1 thru 3 above.

~~* optional jurisdiction~~

Finally, given the important habitat value of flood plains and the danger they present to development,¹¹ we recommend that shoreline jurisdiction include the full 100-year flood plain as authorized in RCW 90.58.030(2)(d)(i). This will improve protection for the Chinook salmon on which the Southern Resident Orcas depend. To implement this recommendation, the proposed 19.200.100A.7. would be substituted with our recommended additions double underlined.

¹¹ Timothy Quinn, George Wilhere and Kirk Krueger, (Managing Editors), *Riparian Ecosystems, Volume 1: Science synthesis and management implications* pp. 21 – 25 & pp. 35 – 36 (A Priority Habitat and Species Document of the Washington Department of Fish and Wildlife, Olympia, WA: Final Version May 2018 [unformatted]) last accessed on March 1, 2019 at: <https://wdfw.wa.gov/publications/01987/> and enclosed with the paper original of this letter.

7. The one-hundred-year -flood plains associated with the streams, lakes, and tidal waters listed in 1 thru 3 above; and

Please clarify Urban Conservancy designation criterion 19.200.120B.4. on page *4

The Urban Conservancy criteria provide these areas must also have any of the following characteristics, which we support. Criterion 19.200.120B.4. ends with an “or” which may be confusing. We recommend that this “or” be deleted.

Please clarify Natural designation criterion 19.200.130B.1. on page *5

The Natural criteria provide this environment may be designated when any of the following characteristics apply which we support. Criterion 19.200.130B.1. ends with an “or” which may be confusing. We recommend that this “or” be deleted.

Recommendations for SMP Draft Chapter 19.300 update Strike-thru WM.pdf

Modify Policy SH-18 to maintain water quality as the SMP Guidelines require. See proposed 19.300.115A. on pages *5 and *6

The SMP Guidelines, in WAC 173-26-186(8)(b), provides that “[l]ocal master programs shall include policies and regulations designed to achieve no net loss of those ecological functions.” Shoreline ecological functions include the “maintenance of water quality.”¹² Unfortunately, rather than maintaining water quality, proposed Policy SH-18 provides that shoreline uses should minimize impacts that contaminate surface or ground water. Minimizing contamination will not maintain water quality. So we recommend that Policy SH-18 be revised to read as follows with our additions double underlined and our deletions double struck through.

- A. Policy SH-18 Shoreline use and development ~~shall not~~ should minimize impacts that contaminate surface or ground water, cause adverse effects on shoreline ecological functions, or impact aesthetic qualities and recreational opportunities, including, but not limited to, healthy shellfish harvest, swimming, and boating.

Please correct the cross reference in proposed 19.300.130B. Policy SH-27 on page *7.

Proposed 19.300.130B. Policy SH-27 includes a cross reference to Section 19.300.100(B). That section no longer seems to exist. It may be that the reference is to Section 19.300.1003. Policy SH-3, although there are only two use preferences in that policy. Parks and public access should also be use preferences on shorelines of statewide significance to be consistent with RCW 90.58.020.

¹² WAC 173-26-201(2)(c) underlining added.

Recommendations for SMP Draft Chapter 19.400 update Strike-thru WM.pdf and Appendix B: Mitigation Options to Achieve No Net Loss for New or Re-Development Activities

Modify 19.400.115C. on page *6 to reflect that lakes of 20 acres and streams with a mean annual flow of 20 cubic feet per second are within shoreline jurisdiction. See page *6

RCW 90.58.030(2)(e) provides in full that:

(e) “Shorelines” means all of the water areas of the state, including reservoirs, and their associated shorelands, together with the lands underlying them; except (i) shorelines of statewide significance; (ii) shorelines on segments of streams upstream of a point where the mean annual flow is twenty cubic feet per second or less and the wetlands associated with such upstream segments; and (iii) shorelines on lakes less than twenty acres in size and wetlands associated with such small lakes; ...¹³

The SMA requires that lakes 20 acres and larger are shorelines. So are rivers and streams with a flow of 20 cubic feet per second. But proposed 19.400.115C.2. requires lakes to be over 20 acres in size to be shorelines, this is inconsistent with the SMA. Proposed 19.400.115C.2. requires the mean annual flow to be more than 20 cubic feet per second. Again, this is inconsistent with the SMA. We recommend that proposed 19.400.115C. be modified so it is consistent with RCW 90.58.030(2)(e). Our recommended additions are double underlined and our recommended deletions are double struck through.

1. Lakes ~~over~~ 20 acres or larger.

....

2. Streams and rivers ~~with a over~~ 20 cubic feet per second (cfs) or more mean annual flow as determined by the Department of Ecology.

Adopt improved landslide hazard requirements to better protect people and property. See 19.400.115E. on page *7

Thurston County, like many other cities and counties along Puget Sound, is susceptible to landslides. For example, the 1999 landslide at Carlyon Beach and Sunset Beach damaged 49 homes to the extent that they were uninhabitable.¹⁴ The losses were not covered by homeowners insurance.¹⁵

¹³ Underlining added.

¹⁴ Laurence M. Cruz, *Lawmakers Meet as Homes Get Swept Away – Landslides Make Houses Unlivable* Seattle Times (Mar 12, 1999) accessed on March 4, 2019 at: <http://archives.evergreen.edu/webpages/curricular/2006-2007/stress/carlyonarticles.htm> and included with the paper original of this letter.

¹⁵ *Id.*

The SMP Guidelines, in WAC 173-26-221(2)(c)(ii)(B), provide: “Do not allow new development or the creation of new lots that would cause foreseeable risk from geological conditions to people or improvements during the life of the development.” Landslides are a type of geological hazards that can result in major impacts to people and property.

The March 22, 2014, Oso landslide “claimed the lives of 43 people, making it the deadliest landslide event in United States history. Of the approximately 10 individuals who were struck by the landslide and survived, several sustained serious injuries.”¹⁶ So properly designating geologically hazardous areas and protecting people from geological hazards is very important.

It is important to understand that homeowner’s insurance does not cover the damage from landslides. “Insurance coverage for landslides is uncommon. It is almost never a standard coverage, and is difficult to purchase inexpensively as a policy endorsement.”¹⁷ The Carlyon Beach and Sunset Beach landslide losses were not covered by homeowners insurance.¹⁸ None of the Oso victims’ homes were covered by insurance for landslide hazards.¹⁹ And that is common when homes are damaged by landslides.²⁰ For example, on March 14, 2011, a landslide damaged the home of Rich and Pat Lord.²¹ This damage required the homeowners to abandon their home on Norma Beach Road near Edmonds, Washington. Because their homeowner’s insurance did not cover landslides, they lost their home.²² This loss of what may be a family’s largest financial asset is common when homes are damaged or destroyed by landslides or other geological hazards.

Landslide buyouts are rare and when they occur the property owner often only recovers pennies on the dollar. The property owners bought out after the Aldercrest-Banyon landslide in Kelso,

¹⁶ Jeffrey R. Keaton, Joseph Wartman, Scott Anderson, Jean Benoît, John deLaChapelle, Robert Gilbert, David R. Montgomery, *The 22 March 2014 Oso Landslide, Snohomish County, Washington* p. 1 (Geotechnical Extreme Events Reconnaissance (GEER): July 22, 2014) accessed on Feb. 19, 2019 at: http://www.geerassociation.org/index.php/component/geer_reports/?view=geerreports&layout=build&id=30. If the American territories are included, then the Oso landslide is the second deadliest landslide in American history. R.M. Iverson, D.L. George, K. Allstadt, *Landslide mobility and hazards: implications of the Oso disaster* 412 EARTH AND PLANETARY SCIENCE LETTERS 197, 198 (2015).

¹⁷ Robert L. Schuster & Lynn M. Highland, *The Third Hans Cloos Lecture: Urban landslides: socioeconomic impacts and overview of mitigative strategies* 66 BULLETIN OF ENGINEERING GEOLOGY AND THE ENVIRONMENT 1, p. 22 (2007) accessed on Feb. 19, 2019 at: ftp://193.134.202.10/pub/TRAMM/Workshop_EWS/Literature/Schuster_and_Highland_2007_Bulletin_of_Engineering_Geology_and_the_Environment.pdf

¹⁸ Laurence M. Cruz, *Lawmakers Meet as Homes Get Swept Away – Landslides Make Houses Unlivable* Seattle Times (Mar 12, 1999).

¹⁹ Sanjay Bhatt, *Slide erased their homes, but maybe not their loans* *The Seattle Times* (April 2, 2014) accessed on Feb. 19, 2019 at: http://old.seattletimes.com/html/latestnews/2023278858_mudslidefinancial.xml.html

²⁰ *Id.*

²¹ Ian Terry, *Abandoned and trashed after mudslide, Edmonds house now for sale* *The Herald* (Feb. 11, 2015). The house is for sale after the bank who held the Lord’s mortgage took ownership of the home. *Id.* accessed on Feb. 19, 2019 at: <http://www.heraldnet.com/article/20150211/NEWS01/150219829>.

²² *Id.* at p. *6.

Washington destroyed their homes received 30 cents on the dollar.²³ This underlines why preventing development in geologically hazardous areas is just plain ordinary consumer protection.

**Designate all areas susceptible to landslide hazards as geologically hazardous areas.
See 19.400.115E. on page *7**

Landslides are capable of damaging commercial, residential, or industrial development at both the tops and toes of slopes and on the sides of landslides due to the earth sliding and other geological events.²⁴ So the areas at the top, toe, and sides of the slope are geological hazards. We recommend these areas be designated as landslide hazards.

Require the review of geologically hazardous areas capable of harming buildings or occupants on a development site

We recommend that the regulations require review of any landslide capable of damaging the proposed development. Geological hazards, such as landslides are capable of damaging property outside the hazard itself. The 1949 Tacoma Narrows Landslide ran out 1,500 feet into Puget Sound.²⁵ The 2014 Oso slide ran out for over a mile (5,500 feet) even though the slope height was 600 feet.²⁶ A 2006 landslide at Oso traveled over 300 feet.²⁷ Recent research shows that long runout landslides are more common than had been realized.²⁸ This research documents that over the past 2000 years, the average frequency of long runout landslides in the area near the Oso landslide is one landslide every 140 years.²⁹ The landslides ran out from 787 feet to the 5,500 feet of the 2014

²³ Isabelle Sarikhan, *Sliding Thought Blog*, *Washington's Landslide Blog* Landslide of the Week – Aldercrest Banyon Landslide July 29, 2009 accessed on Feb. 19, 2019 at: <https://slidingthought.wordpress.com/2009/07/29/landslide-of-the-week-aldercrest-banyon-landslide/>

²⁴ Jeffrey R. Keaton, Joseph Wartman, Scott Anderson, Jean Benoit, John deLaChapelle, Robert Gilbert, David R. Montgomery, *The 22 March 2014 Oso Landslide, Snohomish County, Washington* p. 1 & p. 68 (Geotechnical Extreme Events Reconnaissance (GEER): July 22, 2014).

²⁵ Alan F. Chleborad, *Modeling and Analysis of the 1949 Narrows Landslide, Tacoma, Washington* xxxi ENVIRONMENTAL AND ENGINEERING GEOSCIENCE 305 p. 305 (1994) accessed on Feb. 19, 2019 at:

<https://pubs.geoscienceworld.org/aeg/eeg/article-abstract/xxxi/3/305/137520/modeling-and-analysis-of-the-1949-narrows?redirectedFrom=fulltext> and the webpage and page 305 is enclosed with the paper original of this letter.

²⁶ Jeffrey R. Keaton, Joseph Wartman, Scott Anderson, Jean Benoit, John deLaChapelle, Robert Gilbert, David R. Montgomery, *The 22 March 2014 Oso Landslide, Snohomish County, Washington* p. 56 & p. 144 (Geotechnical Extreme Events Reconnaissance (GEER): July 22, 2014).

²⁷ *Id.* at p. 1.

²⁸ Sean R. LaHusen, Alison R. Duvall, Adam M. Booth, and David R. Montgomery, *Surface roughness dating of long-runout landslides near Oso, Washington (USA), reveals persistent postglacial hillslope instability* GEOLOGY pp. *2 – 3, published online on 22 December 2015 as doi:10.1130/G37267.1; Geological Society of America (GSA) Data Repository 2016029, *Data repository for: Surface roughness dating of long-runout landslides near Oso, WA reveals persistent postglacial hillslope instability* p. 4 both enclosed with the paper original of this letter. Geology is a peer-reviewed scientific journal. Geology – Prep webpage accessed on Jan. 23, 2018 at:

<http://www.geosociety.org/GSA/Publications/Journals/Geology/GSA/Pubs/geology/home.aspx#overview> and enclosed with the paper original of this letter.

²⁹ Sean R. LaHusen, Alison R. Duvall, Adam M. Booth, and David R. Montgomery, *Surface roughness dating of long-runout landslides near Oso, Washington (USA), reveals persistent postglacial hillslope instability* GEOLOGY p. *2, published online on 22 December 2015 as doi:10.1130/G37267.1.

landslide.³⁰ So we recommend that Thurston County require review of all geological hazards capable of harming a proposed lot or building site.

Do not limit landslide buffers to 50 feet or the buffer in Thurston County Code Section (TCC) 24.15.015B

Landslides in Thurston County and Western Washington are capable of running out significant distances. The 1949 Tacoma Narrows Landslide, in Tacoma, “failed catastrophically along steep” 300 feet high bluffs and ran out 1,500 feet into Puget Sound.³¹ This is five times the buff height. The 2014 Oso slide ran out for over a mile (5,500 feet) even through the slope height was 600 feet.³² This was nine times the slope height. The 2013 Ledgewood-Bonair Landslide on Whidbey Island extended approximately 300 feet into Puget Sound.³³ In a study of shallow landslides along Puget Sound from Seattle to Everett, the average runout length was 197.5 feet (60.2 m) and the maximum runout length was 771 feet (235 m).³⁴ So limiting landslide buffers to 50 feet or the buffer in Thurston County Code Section (TCC) 24.15.015B. will not adequately protect people and property.

The Joint SR 530 Landslide Commission recommends identifying “[c]ritical area buffer widths based on site specific geotechnical studies” as an “innovative development regulation[]” that counties and cities should adopt.³⁵ So we support the landslide buffer requirement in TCC 24.15.015C. that is based on the minimum distance recommended by the geotechnical professional. Construction should not be allowed in these areas.

Include vegetation conservation requirements consistent with the SMA and SMP Guidelines. See proposed 19.400.120A on page *8.

As the State of Washington Court of Appeals has concluded, “[i]n adopting the Master Program guidelines, [Ecology] adopted the phrase ‘no net loss of ecological functions’ as a guiding principle for considering whether or not to approve local government programs. WAC 173-26-186(8)(d). In construing this principle, the Master Program guidelines acknowledge that any development has

³⁰ Geological Society of America (GSA) Data Repository 2016029, *Data repository for: Surface roughness dating of long-runout landslides near Oso, WA reveals persistent postglacial hillslope instability* p. 4.

³¹ Alan F. Chleborad, *Modeling and Analysis of the 1949 Narrows Landslide, Tacoma, Washington* xxxi ENVIRONMENTAL AND ENGINEERING GEOSCIENCE 305 p. 305 (1994).

³² Jeffrey R. Keaton, Joseph Wartman, Scott Anderson, Jean Benoit, John deLaChapelle, Robert Gilbert, David R. Montgomery, *The 22 March 2014 Oso Landslide, Snohomish County, Washington* p. 56 & p. 144 (Geotechnical Extreme Events Reconnaissance (GEER): July 22, 2014).

³³ Stephen Slaughter, Isabelle Sarikhan, Michael Polenz, and Tim Walsh, *Quick Report for the Ledgewood-Bonair Landslide, Whidbey Island, Island County, Washington* pp. 3 – 4 (Washington State Department of Natural Resources, Division of Geology and Earth Resources: March 28, 2013) accessed on Feb. 19, 2019 at: http://www.dnr.wa.gov/publications/ger_qr_whidbey_island_landslide_2013.pdf and enclosed with the paper original of this letter.

³⁴ Edwin L. Harp, John A. Michael, and William T. Laprade, *Shallow-Landslide Hazard Map of Seattle, Washington* p. 17 (U.S. Geological Survey Open-File Report 2006–1139: 2006) accessed on Feb. 19, 2019 at: <http://pubs.usgs.gov/of/2006/1139/> and enclosed with the paper original of this letter.

³⁵ The SR 530 Landslide Commission, *Final Report* p. 31 (Dec. 15, 2014) accessed on Feb. 19, 2019 at: http://www.governor.wa.gov/sites/default/files/documents/SR530LC_Final_Report.pdf and enclosed with the paper original of this letter.

potential for 'actual, short-term or long-term impacts' and that mitigation and other measures can assure the 'end result will not diminish the shoreline resources and values as they currently exist.' WAC 173-26-201(2)(c)."³⁶ As the court of appeals also wrote "reasonable and appropriate uses should be allowed on the shorelines only if they will result in no net loss of shoreline ecological functions and systems. *See* RCW 90.58.020; WAC 173-27-241(3)(j)."³⁷

Marine riparian vegetation includes "salt-tolerant vegetation on beaches or tidal flood plains, to forest communities that grow along the shoreline and on adjacent bluffs. Despite this variability, these communities share two common characteristics; they are directly influenced by the marine environment, and they directly or indirectly influence nearshore aquatic habitat."³⁸

Riparian vegetation contributes to the foodweb by providing large woody debris and organic matter, important to many species, and creates habitat for insects and marine invertebrates that are important food sources for fish and other aquatic life. Vegetation in tidal plains provides refuge for juvenile salmon and shades shallow water to maintain cooler temperatures that are necessary for the survival of salmon and other species. Large trees, which shade the upper intertidal zone is especially important for maintaining forage fish spawning habitat.

Marine riparian vegetation also protects water quality and reduces surface erosion by slowing run off. Terrestrial and shoreline vegetation acts as a filter for runoff, while submerged vegetation causes sediments to settle out of the water column. By slowing erosion and retaining sediments, riparian vegetation reduces pollutants including nitrogen, phosphorus, hydrocarbons, PCBs, metals, and pesticides. It also prevents excessive turbidity, which can smother eggs and aquatic vegetation.³⁹

Removing or disturbing this native vegetation results in reduced ecological functions as does decreasing the width of the vegetated riparian area, reducing plant density, and reducing plant diversity.⁴⁰

"Stream riparian ecosystems include the riparian zone, active floodplain including riverine wetlands, and terraces, and the adjacent uplands that contribute matter and energy to the active channel or floodplain"⁴¹ The "[p]rotection and restoration of riparian ecosystems continues to be critically

³⁶ *Olympic Stewardship Found. v. State Envtl. & Land Use Hearings Office through W. Washington Growth Mgmt. Hearings Bd.*, 199 Wn. App. 668, 702, 399 P.3d 562, 578 (2017), *review denied Olympic Stewardship Found. v. State Dep't of Ecology*, 189 Wn. 2d 1040, 409 P.3d 1066 (2018), and *cert. denied Olympic Stewardship Found. v. State of Washington Envtl. & Land Use Hearings Office*, 139 S. Ct. 81, 202 L. Ed. 2d 25 (2018).

³⁷ *Olympic Stewardship Found.*, 199 Wn. App. at 690, 399 P.3d at 572 underlining added.

³⁸ EnviroVision, Herrera Environmental, and Aquatic Habitat Guidelines Program, *Protecting Nearshore Habitat and Functions in Puget Sound* p. II-37 (October 2007, Revised June 2010) accessed on March 1, 2019 at: <https://wdfw.wa.gov/publications/00047/> and enclosed with the paper original of this letter.

³⁹ EnviroVision, Herrera Environmental, and Aquatic Habitat Guidelines Program, *Protecting Nearshore Habitat and Functions in Puget Sound* pp. II-39 – II-40 (October 2007, Revised June 2010).

⁴⁰ *Id.* at p. II-43.

⁴¹ Timothy Quinn, George Wilhere and Kirk Krueger, (Managing Editors), *Riparian Ecosystems, Volume 1: Science synthesis and management implications* pp. 249 – 50 (A Priority Habitat and Species Document of the Washington Department of Fish and Wildlife, Olympia, WA: Final Version May 2018 [unformatted]).

important because: a) they are disproportionately important, relative to area, for aquatic species, e.g., salmon, and terrestrial wildlife, b) they provide ecosystem services such as water purification and fisheries-related economic activity (Naiman and Bilby 2001; NRC 2002; Richardson *et al* 2012), and c) they respond to and interact with watershed-scale processes to help create and maintain aquatic habitats and the other ecosystem services.”⁴²

To protect shoreline riparian vegetation and the species, such as the Chinook salmon and the orcas, depend on it, the policy of the Shoreline Management Act, in RCW 90.58.020, “contemplates protecting against adverse effects to the public health, the land and its vegetation and wildlife, and the waters of the state and their aquatic life” Also recognizing the need to protect these species, the SMP Guidelines, in WAC 173-26-221(5)(b), require that “[m]aster programs shall include: Planning provisions that address vegetation conservation and restoration, and regulatory provisions that address conservation of vegetation; as necessary to assure no net loss of shoreline ecological functions and ecosystem-wide processes, to avoid adverse impacts to soil hydrology, and to reduce the hazard of slope failures or accelerated erosion.” “Local governments may implement these objectives through a variety of measures, where consistent with Shoreline Management Act policy, including clearing and grading regulations, setback and buffer standards, critical area regulations, conditional use requirements for specific uses or areas, mitigation requirements, incentives and nonregulatory programs.”⁴³ Shoreline ecological functions include shoreline vegetation and habitat for native aquatic and shoreline-dependent mammals and anadromous and resident native fish, which include Chinook salmon and orcas.⁴⁴

WAC 173-26-221(5)(c) provides that:

Master programs shall implement the following requirements in shoreline jurisdiction. Establish vegetation conservation standards that implement the principles in WAC 173-26-221(5)(b). Methods to do this may include setback or buffer requirements, clearing and grading standards, regulatory incentives, environment designation standards, or other master program provisions. Selective pruning of trees for safety and view protection may be allowed and the removal of noxious weeds should be authorized.

Note that WAC 173-26-221(5)(c) requires vegetation conservation standards in addition to buffers. Unfortunately, the SMP update does not include effective vegetation conservation standards. While proposed 19.400.120A.3. requires mitigation sequencing and avoidance for development within shoreline jurisdiction, there are no limits on vegetation removal outside of buffers and no mitigation for vegetation removal outside buffers.⁴⁵ So we recommend that limits on vegetation removal be required outside buffers. As is also explained below, mitigation must be required for the loss of vegetation within shoreline jurisdiction.

⁴² *Id.* at p. 249.

⁴³ WAC 173-26-221(5)(b).

⁴⁴ WAC 173-26-201(3)(d)(i)(C).

⁴⁵ See proposed Appendix B B.1.D.

Please adopt aquatic buffers in proposed 19.400.120 consistent with Management Recommendations for Washington's Priority Habitats. Please see pages *8 – *10

2016 State of Our Watersheds: A Report by the Treaty Tribes in Western Washington shows that forest cover is declining in parts of Thurston County including within shoreline jurisdiction.⁴⁶ This adversely impacts salmon habitat. “Minimizing forest cover removal to reduce long-term impacts is a ‘key strategy for protecting habitat’” in the Puget Sound Salmon Recovery Plan.⁴⁷ The National Marine Fisheries Service has “identified degraded riparian areas as a limiting factor to the recovery of Chinook salmon.”⁴⁸ The recovery of the Chinook is necessary to enable the southern resident orca population to successfully reproduce and recover.⁴⁹

To protect species such as the Chinook salmon and the orcas, the policy of the Shoreline Management Act, in RCW 90.58.020, “contemplates protecting against adverse effects to the public health, the land and its vegetation and wildlife, and the waters of the state and their aquatic life” Also recognizing the need to protect these species, the SMP Guidelines, in WAC 173-26-221(5)(b), require that “[m]aster programs shall include: Planning provisions that address vegetation conservation and restoration, and regulatory provisions that address conservation of vegetation; as necessary to assure no net loss of shoreline ecological functions and ecosystem-wide processes, to avoid adverse impacts to soil hydrology, and to reduce the hazard of slope failures or accelerated erosion.” Shoreline ecological functions include shoreline vegetation and habitat for native aquatic and shoreline-dependent mammals and anadromous and resident native fish, which include Chinook salmon and orcas.⁵⁰

Shoreline “[v]egetation conservation includes activities to protect and restore vegetation along or near marine and freshwater shorelines that contribute to the ecological functions of shoreline areas.”⁵¹ Shoreline master programs “shall” “[e]stablish vegetation conservation standards that implement the principles in WAC 173-26-221(5)(b). Methods to do this may include setback or buffer requirements, clearing and grading standards, regulatory incentives, environment designation standards, or other master program provisions.”⁵²

The SMP Guidelines, in WAC 173-26-221(5)(b), also provide in part that “[i]n establishing vegetation conservation regulations, local governments must use available scientific and technical information, as described in WAC 173-26-201(2)(a). At a minimum, local governments should consult shoreline management assistance materials provided by the department and *Management Recommendations for Washington's Priority Habitats*, prepared by the Washington state department of fish and wildlife where applicable.”

⁴⁶ *2016 State of Our Watersheds: A Report by the Treaty Tribes in Western Washington* p. 194 & p. 242.

⁴⁷ *Id.* p. 16.

⁴⁸ *Id.* p. 15.

⁴⁹ State of Washington Office of the Governor, Executive Order 18-02 Southern Resident Killer Whale Recovery and Task Force p. 1 (March 14, 2018).

⁵⁰ WAC 173-26-201(3)(d)(i)(C).

⁵¹ WAC 173-26-221(5)(b).

⁵² WAC 173-26-221(5)(c).

The State of Washington Department of Fish and Wildlife has recently updated the priority habitat and species recommendations for riparian areas. The updated management recommendations document that fish and wildlife depend on protecting riparian vegetation and the functions this vegetation performs such as maintaining a complex food web that supports salmon and maintaining temperature regimes to name just a few of the functions.⁵³

To maintain riparian functions, the updated *Riparian Ecosystems, Volume 1: Science synthesis and management implications* scientific report recommends protecting the riparian ecosystem which has a width estimated to be “one Site-Potential Tree Height (SPTH) measured from the edge of the channel, channel migration zone or active floodplain; it also includes wetlands and steep slopes associated with this area. Protecting functions within at least one SPTH is a scientifically supported approach if the goal is to protect and maintain high function of the riparian ecosystem.”⁵⁴ The report defines site-potential tree height (SPTH) as the “average maximum height of the tallest dominant trees (200 years or more) for a given site class.”⁵⁵ For Thurston County, the stream length-weighted third quartile 200-year SPTH is 235 feet.⁵⁶

We recommend that shoreline jurisdiction be expanded to include the 100-year flood plain⁵⁷ and that the buffers for river and stream shoreline be increased to use the newly recommended 200-year SPTH of 235 feet and that this width should be measured from the edge of the channel, channel migration zone, or active floodplain whichever is wider.⁵⁸ This will help maintain shoreline functions and Chinook habitat.

As was documented in the prior recommendation, *Protecting Nearshore Habitat and Functions in Puget Sound* documents marine riparian vegetation is important to maintaining the health of Puget Sound.⁵⁹ Removing or disturbing this native vegetation results in reduced ecological functions as does decreasing the width of the vegetated riparian area, reducing plant density, and reducing plant diversity.⁶⁰ The widths of marine riparian vegetation necessary to provide the functions listed above vary with the function. To maintain a 100 percent of the delivery of large organic debris is estimated to require approximately 200 feet of marine riparian vegetation.⁶¹ Most of the leaf litter and other

⁵³ Timothy Quinn, George Wilhere and Kirk Krueger, (Managing Editors), *Riparian Ecosystems, Volume 1: Science synthesis and management implications* pp. 33 – 36 (A Priority Habitat and Species Document of the Washington Department of Fish and Wildlife, Olympia, WA: Final Version May 2018 [unformatted]).

⁵⁴ *Id.* at p. 250.

⁵⁵ *Id.* at p. xv.

⁵⁶ Amy Windrope, Timothy Quinn, Keith Folkerts, and Terra Rentz, *Riparian Ecosystems, Volume 2: Management Recommendations* p. A2-16 (A Priority Habitat and Species Document of the Washington Department of Fish and Wildlife, Olympia: May 2018 Public Review Draft) last accessed on March 1, 2019 at: <https://wdfw.wa.gov/publications/01988/> and cited pages enclosed with the paper original of this letter.

⁵⁷ Authorized by RCW 90.58.030(2)(d)(i).

⁵⁸ Amy Windrope, Timothy Quinn, Keith Folkerts, and Terra Rentz, *Riparian Ecosystems, Volume 2: Management Recommendations* p. A2-16 (A Priority Habitat and Species Document of the Washington Department of Fish and Wildlife, Olympia: May 2018 Public Review Draft).

⁵⁹ EnviroVision, Herrera Environmental, and Aquatic Habitat Guidelines Program, *Protecting Nearshore Habitat and Functions in Puget Sound* pp. II-39 – II-40 (October 2007, Revised June 2010).

⁶⁰ *Id.* at p. II-43.

⁶¹ Jim Brennan, Hilary Culverwell, Rachel Gregg, Pete Granger, *Protection of Marine Riparian Functions in Puget Sound, Washington* p. 21 (Washington Sea Grant Seattle, WA: June 15, 2009. Prepared for: Washington Department of Fish and

organic matter that reaches Puget Sound is from vegetation 100 to 200 feet from the sound.⁶² Shading forage fish spawning habitat can require 56 – 125 feet of marine riparian vegetation to maintain 80 percent of the shaded area.⁶³ *Protecting Nearshore Habitat and Functions in Puget Sound* documents that protecting wildlife habitats requires buffers 240 to 902 feet wide.⁶⁴ Removing 99 percent of the sediment for runoff requires 984 feet of riparian vegetation.⁶⁵ To effectively perform these functions, the riparian vegetation needs to be undisturbed and undeveloped native vegetation.⁶⁶

“[R]esearch shows that there is no particular impervious area threshold where degradation in stream integrity begins to occur; rather, the relationship is a continuum.”⁶⁷ “Degradation can occur at even low levels of total impervious area . . .”⁶⁸ The Thurston Regional Planning Council and Thurston County studied the “impacts of planned growth under current plans” in the basins that make up the Deschutes Watershed.⁶⁹ Every basin in the watershed will experience moderate or high increases in total impervious area (TIA) at buildout.⁷⁰ “The [i]mpacts of [p]lanned [g]rowth” put every basin “[p]ossibly at risk of further impacts” or “[a]t risk of further impacts.”⁷¹ As was documented above, current regulations are not maintaining riparian forests and their decline is harming the Chinook salmon and orcas.⁷²

Our recommended buffers will reduce the potential for future adverse impacts to both fresh water and marine shorelines. We urge you to adopt our recommended buffers for non-water dependent uses.

Require wider setbacks between development and critical areas and critical areas buffers in areas subject to wildfire danger. See proposed 19.400.120B.4. on page *9

Setbacks from critical areas buffers provide an area in which buildings can be built, repaired, and maintained without having to intrude in the buffer. So, setbacks cannot be ended after construction. The statement “[t]he building setback is to protect the buffer during construction and is no longer

Wildlife) accessed on Feb. 25, 2019 at: <http://wdfw.wa.gov/publications/00693/> and enclosed with the paper original of this letter.

⁶² *Id.* at p. 22.

⁶³ *Id.* at p. 15.

⁶⁴ EnviroVision, Herrera Environmental, and Aquatic Habitat Guidelines Program, *Protecting Nearshore Habitat and Functions in Puget Sound* p. III-39 (October 2007, Revised June 2010).

⁶⁵ Jim Brennan, Hilary Culverwell, Rachel Gregg, Pete Granger, *Protection of Marine Riparian Functions in Puget Sound, Washington* p. 9 (Washington Sea Grant Seattle, WA: June 15, 2009. Prepared for: Washington Department of Fish and Wildlife).

⁶⁶ *Id.* at pp. 39 – 40.

⁶⁷ IR 190 p. 116 of 142 in Tab IR 190, Thurston Regional Planning Council & Thurston County, *Deschutes Watershed Land Use Analysis: Current Conditions Report* (Dec. 29, 2015).

⁶⁸ *Id.*

⁶⁹ *Id.* at p. 117 of 142.

⁷⁰ *Id.*

⁷¹ *Id.*

⁷² 2016 *State of Our Watersheds: A Report by the Treaty Tribes in Western Washington* pp. 15 – 16, p. 26, p. 46, p. 52, & p. 66; State of Washington Office of the Governor, Executive Order 18-02 Southern Resident Killer Whale Recovery and Task Force p. 1 (March 14, 2018).

required after construction is completed” in proposed 19.400.120B.4. on page *9 should not be adopted.

Setbacks also allow for the creation of a Home Ignition Zone that can protect buildings from wildfires and allow firefighters to attempt to save the buildings during wildfires. Thurston County averages 63 wildfires per year.⁷³ The county “can expect at least one fire exceeding 100 acres over the next 25 years.”⁷⁴ Since a 30-foot-wide Home Ignition Zone is important to protect buildings,⁷⁵ we recommend that Shoreline Management Program require a setback at least 30 feet wide adjacent to critical areas and shoreline and critical area buffers in areas at high risk of wildfires. High risk areas are identified on Table 4.5.1 and on Map 4.5.4 of the *3rd Edition Hazards Mitigation Plan for the Thurston Region*. Combustible structures, such as decks, should not be allowed within this setback to protect the building from wildfires.

Please correct the cross reference in proposed 19.400.140 on page *19 and adopt a ten percent impervious surface limit for the Rural Conservancy shoreline environment consistent with the SMP Guidelines to protect shoreline ecological functions.

Table 19.400.140(A) in Note 4 indicates that Hard Surface thresholds for Shoreline Environmental Designations are in Section 19.400.125. But Section 19.400.125 does not include any hard surface limits. The Thurston County Drainage Design and Erosion Control Manual referenced in Section 19.400.125 calls on project applicants to limit impervious surface to the minimum necessary, but it does not include impervious surface limits.⁷⁶

Impervious surfaces are increasing in some areas of Thurston County outside urban growth areas including within shoreline jurisdiction.⁷⁷ “The Chinook Recovery Plan for South Sound identified an objective to promote land-use practices that prevent stormwater flows. This objective calls for the preservation of native land cover and natural drainage systems, while limiting the area and connectivity of impervious surfaces.”⁷⁸ The Thurston Regional Planning Council and Thurston County studied the “impacts of planned growth under current plans” in the basins that make up the Deschutes Watershed.⁷⁹ Every basin in the watershed will experience moderate or high increases in total impervious area (TIA) at buildout.⁸⁰ “The [i]mpacts of [p]lanned [g]rowth” put every basin

⁷³ Thurston Regional Council, *3rd Edition Hazards Mitigation Plan for the Thurston Region* p. 4.5-6 (The Emergency Management Council of Thurston County: April 2017) accessed on March 4, 2019 at: <https://www.trpc.org/160/Hazards-Mitigation-Plan>

⁷⁴ *Id.*

⁷⁵ Nation Fire Protection Association “preparing homes for wildfire” webpage accessed on Feb. 6, 2019 at: <https://www.nfpa.org/Public-Education/By-topic/Wildfire/Preparing-homes-for-wildfire> and enclosed with the paper original of this letter.

⁷⁶ Thurston County Drainage Design and Erosion Control Manual p. vi (Dec. 2016 Edition).

⁷⁷ *2016 State of Our Watersheds: A Report by the Treaty Tribes in Western Washington* p. 12, p. 17, p. 195, p. 240 & p. 247 accessed on Feb. 28, 2019 at: <https://nwifc.org/publications/state-of-our-watersheds/> and enclosed with the paper original of this letter.

⁷⁸ *Id.* at p. 247.

⁷⁹ *Id.* at p. at 107.

⁸⁰ *Id.*

“[p]ossibly at risk of further impacts” or “[a]t risk of further impacts.”⁸¹ Many Thurston County basins already have impervious surfaces greater than ten percent.⁸² These include the West Bay, Chambers, Mission Creek, Indian Creek, Percival Creek, Schneider, Capitol Lake, Moxile Creek, Green Cove Creek, Squaxin Passage, Woodard, and Woodland basins.⁸³ Many basins are likely to be covered by more than five or ten percent impervious surfaces in the coming years.⁸⁴

To prevent adverse impacts on and degradation of shoreline ecological functions, WAC 173-26-211(5)(b)(ii)(D) requires rural conservancy shoreline environments to limit impervious surfaces to ten percent of the lot. The proposed SMP does not include any impervious surface limits for the Rural Conservancy environment. This is inconsistent WAC 173-26-211(5)(b)(ii)(D) and will result in continuing adverse impacts shoreline ecological functions. A ten percent maximum impervious surface limit is required for the Rural Conservancy environment.

Protect people, property, and habitat from sea level rise and increased coastal erosion. See proposed 19.400.150B on pages *22 – 23.

The Shoreline Management Act and Shoreline Master Program Guidelines require shoreline master programs to address the flooding that will be caused by sea level rise. RCW 90.58.100(2)(h) requires that shoreline master programs “shall include” “[a]n element that gives consideration to the statewide interest in the prevention and minimization of flood damages ...” WAC 173-26-221(3)(b) provides in part that “[o]ver the long term, the most effective means of flood hazard reduction is to prevent or remove development in flood-prone areas ...” The areas subject to sea level rise are flood prone areas just the same as areas along bays, rivers, or streams that are within the 100-year flood plain.

Sea level rise is a real problem that is happening now. Sea level is rising and floods and erosion are increasing. In 2012 the National Research Council concluded that global sea level had risen by about seven inches in the 20th Century.⁸⁵ The new report *Projected Sea Level Rise for Washington State – A 2018 Assessment* projects that for a low greenhouse gas emission scenario there is a 50 percent probability that sea level rise will reach or exceed 1.9 feet by 2100 for Budd Inlet including Boston Harbor.⁸⁶ *Projected Sea Level Rise for Washington State – A 2018 Assessment* projects that for a higher emission scenario there is a 50 percent probability that sea level rise will reach or exceed 2.3 feet by 2100 for

⁸¹ *Id.*

⁸² *South Puget Sound Forum: Environmental Quality – Economic Vitality Indicators Report* p. 4 accessed on March 1, 2019 at: <https://www.trpc.org/ArchiveCenter/ViewFile/Item/68> and enclosed with the paper original of this letter.

⁸³ *Id.*

⁸⁴ *Id.* at p. 5.

⁸⁵ National Research Council, *Sea-Level Rise for the Coasts of California, Oregon, and Washington: Past, Present, and Future* p. 23, p. 156, p. 96, p. 102 (2012) accessed on Feb. 19, 2019 at: <https://www.nap.edu/download/13389>.

⁸⁶ *Relative Sea Level Projections for RCP 4.5 for the Coastal Area Near: 47.1N, 122.9W* accessed on March 4, 2019 at: <http://www.wacoastalnetwork.com/wcrp-documents.html> and enclosed with the paper original of this letter. The methodology used for these projections is available in Miller, I.M., Morgan, H., Mauger, G., Newton, T., Weldon, R., Schmidt, D., Welch, M., Grossman, E., *Projected Sea Level Rise for Washington State – A 2018 Assessment* (A collaboration of Washington Sea Grant, University of Washington Climate Impacts Group, Oregon State University, University of Washington, and US Geological Survey. Prepared for the Washington Coastal Resilience Project: 2018) available at the prior webpage and enclosed with the paper original of this letter.

for Budd Inlet including Boston Harbor.⁸⁷ Projections are available for all of the marine shorelines in Washington State. The general extent of the projected sea level rise currently projected for coastal waters can be seen on the NOAA Office for Coastal Management Digitalcoast Sea Level Rise Viewer available at: <https://coast.noaa.gov/digitalcoast/tools/slr.html>

Projected sea level rise will substantially increase flooding. As Ecology writes, “[s]ea level rise and storm surge[s] will increase the frequency and severity of flooding, erosion, and seawater intrusion—thus increasing risks to vulnerable communities, infrastructure, and coastal ecosystems.”⁸⁸ Not only our marine shorelines will be impacted, as Ecology writes “[m]ore frequent extreme storms are likely to cause river and coastal flooding, leading to increased injuries and loss of life.”⁸⁹

A peer-reviewed scientific study ranked Washington State 14th in terms of the number of people living on land less than one meter above local Mean High Water compared to the 23 contiguous coastal states and the District of Columbia.⁹⁰ This amounted to an estimated minimum of 18,269 people in 2010.⁹¹ Zillow recently estimated that 31,235 homes in Washington State may be underwater by 2100, 1.32 percent of the state’s total housing stock. The value of the submerged homes is an estimated \$13.7 billion.⁹² Zillow wrote:

It’s important to note that 2100 is a long way off, and it’s certainly possible that communities [may] take steps to mitigate these risks. Then again, given the enduring popularity of living near the sea despite its many dangers and drawbacks, it may be that even more homes will be located closer to the water in a century’s time, and these estimates could turn out to be very conservative. Either way, left unchecked, it is clear the threats posed by climate change and rising sea levels have the potential to destroy housing values on an enormous scale.⁹³

Sea level rise will have an impact beyond rising seas, floods, and storm surges. The National Research Council wrote that:

Rising sea levels and increasing wave heights will exacerbate coastal erosion and shoreline retreat in all geomorphic environments along the west coast. Projections of

⁸⁷ *Relative Sea Level Projections for RCP 8.5 for the Coastal Area Near: 47.1N, 122.9W* accessed on March 4, 2019 at: <http://www.wacoastalnetwork.com/wcrp-documents.html> and enclosed with the paper original this letter.

⁸⁸ State of Washington Department of Ecology, *Preparing for a Changing Climate Washington State’s Integrated Climate Response Strategy* p. 90 (Publication No. 12-01-004: April 2012) accessed on Feb. 19, 2019 at: <https://fortress.wa.gov/ecy/publications/summarypages/1201004.html> and enclosed with the paper original of this letter.

⁸⁹ *Id.* at p. 17.

⁹⁰ Benjamin H. Strauss, Remik Ziemlinski, Jeremy L. Weiss, and Jonathan T. Overpeck, *Tidally adjusted estimates of topographic vulnerability to sea level rise and flooding for the contiguous United States* 7 ENVIRON. RES. LETT. 014033, 4 (2012) accessed on Sept. 26, 2018 at: <http://iopscience.iop.org/1748-9326/7/1/014033/article> This journal is peer reviewed. Environmental Research Letters “Submission requirements” webpage accessed on Sept. 26, 2018 at: <http://iopscience.iop.org/1748-9326/page/Submission%20requirements>.

⁹¹ *Id.*

⁹² Krishna Rao, *Climate Change and Housing: Will a Rising Tide Sink all Homes?* ZILLOW webpage (8/2/2016) last accessed on Feb. 19, 2019 at: <http://www.zillow.com/research/climate-change-underwater-homes-12890/>.

⁹³ *Id.*

future cliff and bluff retreat are limited by sparse data in Oregon and Washington and by a high degree of geomorphic variability along the coast. Projections using only historic rates of cliff erosion predict 10–30 meters [33 to 98 feet] or more of retreat along the west coast by 2100. An increase in the rate of sea-level rise combined with larger waves could significantly increase these rates. Future retreat of beaches will depend on the rate of sea-level rise and, to a lesser extent, the amount of sediment input and loss.⁹⁴

A recent paper estimated that “[a]nalysis with a simple bluff erosion model suggests that predicted rates of sea-level rise have the potential to increase bluff erosion rates by up to 0.1 m/yr [meter a year] by the year 2050.”⁹⁵ This translates to four additional inches of bluff erosion a year.

A recent peer-reviewed article estimated that up to 8,017 people in Thurston County will be at risk of adverse impacts from sea level rise in 2100.⁹⁶ The time to adopt protective measures is now.

Homes built today are likely to be in use 2100. And new lots created today will be in use in 2100. This is why the Washington State Department of Ecology recommends “[l]imiting new development in highly vulnerable areas.”⁹⁷

Therefore, we recommend that the SMP update require that new lots and new buildings be located outside the area of likely sea level rise and if that is not possible, buildings should be elevated above the likely sea level rise. We recommend the following new regulations be added to the SMP update in proposed 19.400.150B on page *23.

8. New lots shall be designed and located so that the buildable area is outside the area likely to be inundated by sea level rise in 2100 and outside of the area in which wetlands will likely migrate during that time.
9. Where lots are large enough, new structures and buildings shall be located so that they are outside the area likely to be inundated by sea level rise in 2100 and outside of the area in which wetlands and aquatic vegetation will likely migrate during that time.

⁹⁴ National Research Council, *Sea-Level Rise for the Coasts of California, Oregon, and Washington: Past, Present, and Future* p. 135 (2012).

⁹⁵ George M. Kaminsky, Heather M. Baron, Amanda Hacking, Diana McCandless, David S. Parks, *Mapping and Monitoring Bluff Erosion with Boat-based LIDAR and the Development of a Sediment Budget and Erosion Model for the Elwha and Dungeness Littoral Cells, Clallam County, Washington* p. 3 last accessed on Feb. 19, 2019 at: <http://www.coastalwatershedinstitute.org/Final%20Report%20Clallam%20County%20Bluffs%202014%20Final%20revised.pdf>.

⁹⁶ Mathew E. Hauer, Jason M. Evans, and Deepak R. Mishra, *Millions projected to be at risk from sea-level rise in the continental United States* NATURE CLIMATE CHANGE Letters Advance Online Publication p. 3 (Published Online: 14 March 2016 | DOI: 10.1038/NCLIMATE2961). Nature Climate Change is a peer-reviewed science journal. See the Author Instructions accessed on Nov. 26, 2018 at: http://mts-nclim.nature.com/cgi-bin/main.plex?form_type=display_auth_instructions.

⁹⁷ State of Washington Department of Ecology, *Preparing for a Changing Climate Washington State's Integrated Climate Response Strategy* p. 90 (Publication No. 12-01-004: April 2012).

10. New and substantially improved structures shall be elevated above the likely sea level rise elevation in 2100 or for the life of the building, whichever is less.

Require mitigation for all losses of shoreline ecological functions including the adverse impacts of development outside of buffers as required by the SMP guidelines. See Appendix B page B-1

As the State of Washington Court of Appeals wrote “reasonable and appropriate uses should be allowed on the shorelines only if they will result in no net loss of shoreline ecological functions and systems. *See* RCW 90.58.020; WAC 173-27-241(3)(j).”⁹⁸

Proposed Appendix B B.1.D violates this requirement in two ways. First, by providing that “mitigation is not required for impacts outside of the Standard Buffer,” Appendix B B.1.D does not require any mitigation for adverse impacts within the water. No mitigation is required for in water fills, dredging, shading, or other impacts. This violates the principle of no net loss and will harm fish and wildlife habitat.

Second, it also does not require mitigation for development in shorelines jurisdiction but outside buffers. For example, forest cover is declining in parts of Thurston County including within shoreline jurisdiction.⁹⁹ This adversely impacts salmon habitat. “Minimizing forest cover removal to reduce long-term impacts is a ‘key strategy for protecting habitat’” in the Puget Sound Salmon Recovery Plan.¹⁰⁰ As was discussed above, the proposed vegetation management regulations require avoidance and mitigation, but not mitigation. Allowing the removal of shoreline vegetation outside buffers will adversely impact shoreline ecological resources violating the no net loss requirement of the SMP Guidelines. To comply with the SMP Guidelines, the SMP Update must require mitigation vegetation loss and other adverse impacts of developments on shoreline ecological functions both inside and outside buffers.

On way of making mitigation easier to implement and more effective is to develop a vegetation management manual with minimum requirements for planting plans and mitigation. Bainbridge Island has developed a mitigation manual the county could use as an example.

Comments on SMP Draft Chapter 19.600 update Strike-thru WM.pdf

Prohibit marine net pen aquaculture for nonnative species in the Aquatic environment. Please see proposed Table 19.600.105 Shoreline Use and Modifications Matrix on page *1

RCW 77.125.050(1) provides that the State of Washington Department of Natural Resources “may authorize or permit activities associated with the use of marine net pens for nonnative marine finfish aquaculture only if these activities are performed under a lease of state-owned aquatic lands in effect

⁹⁸ *Olympic Stewardship Found.*, 199 Wn. App. at 690, 399 P.3d at 572.

⁹⁹ 2016 *State of Our Watersheds: A Report by the Treaty Tribes in Western Washington* p. 194 & p. 242.

¹⁰⁰ *Id.* p. 16.

on June 7, 2018. The department may not authorize or permit any of these activities or operations after the expiration date of the relevant lease of state-owned aquatic lands in effect on June 7, 2018.” Consistent with RCW 77.125.050(1), proposed Table 19.600.105 should prohibit marine net pens for nonnative marine finfish aquaculture in the Aquatic environment.

In the Rural Conservancy environment only allow new structural shoreline stabilization and flood control works where there is a documented need to protect an existing structure. Please see proposed Table 19.600.105 Shoreline Use and Modifications Matrix on page *2

WAC 173-26-211(5)(b)(ii)(C), which applies to the Rural Conservancy environment, provides that:

(C) Construction of new structural shoreline stabilization and flood control works should only be allowed where there is a documented need to protect an existing structure or ecological functions and mitigation is applied, consistent with WAC 173-26-231. New development should be designed and located to preclude the need for such work.

Based on this requirement, we recommend new structural shoreline stabilization only be allowed in the Rural Conservancy environment to protect an existing structure or ecological functions. Recent studies in Puget Sound have documented that structural shoreline stabilization has significant adverse impacts on the local beach on which it is installed and on large areas of Puget Sound.¹⁰¹ So this change is necessary to maintain shoreline ecological functions.

Please modify proposed 19.600.170B.7. on page *31 to require public access consistent with the SMP Guidelines.

One of the policies of Washington’s Shoreline Management Act is to increase public access to publicly owned shorelines.¹⁰² Unfortunately, proposed 19.600.170B.7. does not fully comply with the SMA or the SMP Guidelines.

The SMP Guidelines implement the Shoreline Management Act (SMA) policies by including more specific requirements for public access. These provisions include WAC 173-26-221(4)(d) which requires in part that:

(iii) Provide standards for the dedication and improvement of public access in developments for water-enjoyment, water-related, and nonwater-dependent uses

¹⁰¹ Megan N. Dethier, Wendel W. Raymond, Aundrea N. McBride, Jason D. Toft, Jeffery R. Cordell, Andrea S. Ogston, Sarah M. Heerhartz, Helen D. Berry, *Multiscale impacts of armoring on Salish Sea shorelines: Evidence for cumulative and threshold effects* 175 *ESTUARINE, COASTAL AND SHELF SCIENCE* 106 p. 106 (2016) enclosed with the paper original of this letter. *Estuarine, Coastal and Shelf Science* is a peer-reviewed scientific journal. *Estuarine, Coastal and Shelf Science Author Information Pack* pp. 9 – 11 (20 Feb 2019) accessed on Feb. 22, 2019 at: <https://www.journals.elsevier.com/estuarine-coastal-and-shelf-science> and enclosed with the paper original of this letter.

¹⁰² RCW 90.58.020.

and for the subdivision of land into more than four parcels. In these cases, public access should be required except:

(A) Where the local government provides more effective public access through a public access planning process described in WAC 173-26-221(4)(c).

(B) Where it is demonstrated to be infeasible due to reasons of incompatible uses, safety, security, or impact to the shoreline environment or due to constitutional or other legal limitations that may be applicable.

In determining the infeasibility, undesirability, or incompatibility of public access in a given situation, local governments shall consider alternate methods of providing public access, such as off-site improvements, viewing platforms, separation of uses through site planning and design, and restricting hours of public access.

(C) For individual single-family residences not part of a development planned for more than four parcels.

Shoreline master programs, including the Thurston County SMP Update, must include public access requirements that are consistent with the SMA and the SMP Guidelines. Thurston County's proposed SMP update does not fully comply with these requirements because proposed 19.600.170B.7. allows joint or community access in place of public access. So, we recommend that proposed 19.600.170B.7. be modified to read as follows with our deletions double struck through:

7. New multi-residential development, including the subdivision of land for five or more parcels, shall provide for ~~joint or community and/or~~ public access, except where demonstrated to be infeasible due to any of the following:

[no further recommended amendments to proposed 19.600.170B.7.]

Comments on Appendix C. Shoreline Restoration Plan

WAC 173-26-201(2)(f) provides that:

Consistent with principle WAC 173-26-186 (8)(c), 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. The approach to restoration planning may vary significantly among local jurisdictions, depending on:

- The size of the jurisdiction;
- The extent and condition of shorelines in the jurisdiction;
- The availability of grants, volunteer programs or other tools for restoration; and
- The nature of the ecological functions to be addressed by restoration planning.

Master program restoration plans shall consider and address the following subjects:

- (i) Identify degraded areas, impaired ecological functions, and sites with potential for ecological restoration;
- (ii) Establish overall goals and priorities for restoration of degraded areas and impaired ecological functions;
- (iii) Identify existing and ongoing projects and programs that are currently being implemented, or are reasonably assured of being implemented (based on an evaluation of funding likely in the foreseeable future), which are designed to contribute to local restoration goals;
- (iv) Identify additional projects and programs needed to achieve local restoration goals, and implementation strategies including identifying prospective funding sources for those projects and programs;
- (v) Identify timelines and benchmarks for implementing restoration projects and programs and achieving local restoration goals;
- (vi) Provide for mechanisms or strategies to ensure that restoration projects and programs will be implemented according to plans and to appropriately review the effectiveness of the projects and programs in meeting the overall restoration goals.

If Appendix C is intended to be the Shoreline Restoration Plan, we are concerned that the requirements of WAC 173-26-201(2)(f)(i), (iii), (iv), and (vi) have not been addressed. We recommend that they be addressed.

Thank you for considering our comments. If you require additional information, please contact me at telephone 206-343-0681 Ext. 102 and email: tim@futurewise.org.

Very Truly Yours,

A handwritten signature in blue ink, appearing to read 'Tim Trohimovich', with a stylized, cursive script.

Tim Trohimovich, AICP
Director of Planning & Law

Enclosures

Polly Stoker

From: Brad Murphy
Sent: Wednesday, March 06, 2019 11:59 AM
To: PlanningCommission
Cc: Polly Stoker; Ian Lefcourte
Subject: FW: Comments on the SMP Draft Chapters
Attachments: SRKW-Priority-Chinook-Stocks.pdf

From: Tim Trohimovich [mailto:Tim@futurewise.org]
Sent: Tuesday, March 05, 2019 6:46 PM
To: Brad Murphy <brad.murphy@co.thurston.wa.us>
Subject: RE: Comments on the SMP Draft Chapters

Mr. Murphy:

Here is the enclosure. The other enclosures are being mailed with the paper original.

Tim Trohimovich
Director of Planning & Law
Futurewise
tim@futurewise.org
(206) 343-0681 Ext. 102

From: Tim Trohimovich
Sent: Tuesday, March 5, 2019 6:34:20 PM
To: brad.murphy@co.thurston.wa.us
Subject: Comments on the SMP Draft Chapters

Dear Mr. Murphy:

Enclosed please find Futurewise's comments on the Shoreline Master Program (SMP) Draft Chapters for March 6th Planning Commission Meeting. We are also mailing the paper copy and supporting documents.

Please contact me if you require anything else.

Tim Trohimovich
Director of Planning & Law
Futurewise
tim@futurewise.org
(206) 343-0681 Ext. 102

SOUTHERN RESIDENT KILLER WHALE PRIORITY CHINOOK STOCKS

Outline of Prey Prioritization Conceptual Model

NOAA and WDFW have developed a framework to identify Chinook salmon stocks that are important to Southern Resident killer whales to assist in prioritizing actions to increase critical prey for the whales. The framework currently includes three factors that contribute to the identification of priority Chinook salmon populations. Note, here “population” could mean management unit, stock, ESU, run, etc. Each of the three factors has a range of scores which affects its weight. For each Chinook population ranging from Southeastern Alaska to California, a total score is calculated by adding up the three individual factor scores. The Chinook salmon populations with the highest total scores are considered the highest priority to increase abundance to benefit the whales. Several sensitivity analyses provided initial help in understanding how the weighting/scoring affects the priority list. The conceptual model, factors, and scoring were reviewed at a workshop sponsored by the National Fish and Wildlife Foundation and modifications were made to incorporate feedback from participants. The factors, scoring and priority list can be adapted as new scientific information becomes available.

The three evaluation factors include:

FACTOR 1- Observed Part of SRKW Diet

Description and data sources: Prey tissues/scales and fecal samples have been collected from 2004 – present (Hanson et al. 2010, Ford et al. 2016, Hanson et al. in prep). From the prey tissues/scales collected, Genetic Stock Identification (GSI) were run to identify the Chinook stocks in the diet. The majority of samples have been collected in the summer months in inland waters of WA and B.C.

Assumption

- Chinook populations that have been observed in the diet will have higher priority than those that have not.

Caveat: There is currently no spatial correction factor for sample collection (stocks originating from near the sample locations are more likely to be collected), no correction factor for abundance (more abundant stocks are more likely to be identified in the diet), and no correction factor for potential whale selectivity (older, larger fish more likely to be recovered in scale samples).

FACTOR 2- Consumed During Reduced Body Condition or Diversified SRKW Diet

Description and data sources: For the second factor, “Consumed During Reduced Body Condition or Diverse Diet”, stocks consumed during times of potential reduced body condition and increased diet diversity receive additional weight.

Since 2008, NOAA's SWFSC has used aerial photogrammetry to assess the body condition and health of SRKWs, initially in collaboration with the Center for Whale Research and, more recently, with the Vancouver Aquarium and SR³. Photogrammetry data has been collected during seven field efforts in five years, including September 2008, 2013, and 2015, and May and September 2016 and 2017 (Durban et al. 2017; Fearnbach et al. 2018). The proportion of Chinook salmon consumed in whales' diet was estimated by season and region (inland vs coastal waters) using the data from prey tissues/scales and fecal samples (Hanson et al. 2010, Ford et al. 2016, Hanson et al. in prep).

Assumptions

- Reduced body condition and diverse diet occurs from Oct through May.
- Whales switch from preferred prey, Chinook salmon, to other salmonids or prey when Chinook are less available.

FACTOR 3- Degree of Spatial and Temporal Overlap

Description and data sources: Recent prey mapping from Shelton et al. in press (CWT data) was used to assess the overlap in time and space distribution of individual fall Chinook salmon stocks and SRKWs. The distribution/timing of all Chinook salmon stocks across the whales' range from California to Southwest Vancouver Island (and the inland waters of the Salish Sea) was divided into weighted spatial/temporal areas. Currently, Shelton et al. in press includes detailed information on fall runs. Available data for spring Chinook was included, but detailed analyses of data from spring runs are in progress and will be completed in the next two years, incorporating both recoveries in directed Chinook troll fisheries, and Chinook recovered as bycatch in fisheries not targeting Chinook.

For spring run Chinook we relied on reports from the Chinook Technical Committee of the Pacific Salmon Commission (PSC 2018a, 2018b) and published literature (e.g. Satterthwaite et al. 2013, Wahle et al. 1981, Weitkamp 2010) to assign approximate ocean distributions. For stocks with less information, we assumed that the risk to predation was low in seasons and regions that did not correspond to the return timing and origin of each stock (for example, Columbia spring Chinook are assumed to be most available to whales in winter and spring months near the mouth of the Columbia River, but because of their approximate ocean distribution, they are not available in other regions or seasons – particularly mid-summer to fall). Because of limited recoveries, we also assumed that for stocks returning to the Salish Sea (Strait of Georgia, Puget Sound), the distribution was similar in the Salish Sea to Southwest Vancouver Island distributions.

The spatial/temporal Areas currently include: 1) Southwest Vancouver Island (WCVI); 2) Salish Sea; 3) Cape Falcon, Oregon north to British Columbia border; 4) Cape Falcon, OR south to Cape Mendocino (northern California); 5) Cape Mendocino, CA to Point Sur, CA. Seasons are defined as: Spring: April-May; Summer: June-July; Fall: Aug-Oct; Winter: November-March. These areas

reflect the division of Chinook run timing (approximately), correspond to periods of coded wire tag recoveries in fisheries, and correspond to predictable patterns of SRKW movement. SRKW distribution data was assessed from multiple sources (e.g. Center for Whale Research, The Whale Museum, NWFSC satellite tagging, NWFSC coastal hydrophones, coastal spring/winter NWFSC cruises, other opportunistic observations).

Assumptions

- Chinook salmon stocks that overlap in space and time are potential prey.
- Chinook salmon stocks that have a higher degree of overlap in space and time have a higher priority than stocks that have a relatively lower degree of overlap.
- Weighted spatial/temporal areas accommodate variation in the distribution of SRKW and Chinook salmon

Caveat- CWT model interpolates movement of stocks seasonally to account for gaps in fishing effort. Also, the hatchery releases going into the CWT model are not comprehensive, but rather model the distribution of major stock groupings. Within regions and run type (e.g. fall Puget Sound), the ocean distribution is assumed to be the same for all watersheds. Smaller release groups, such as those from the San Juan Islands (SJUA in RMIS) were not included in Shelton et al. because of the low recovery rates – though the ocean distribution of these fish is assumed to be similar to those populations originating from Puget Sound. In particular, ocean distributions of spring run stocks tend to be less well understood than fall stocks. We use the best information available but acknowledge that advances in estimates of ocean distribution of many stocks will improve with the completion of on-going research over the course of the next 1-3 years.

Weight and Scoring

FACTOR 1

If the Chinook stock was observed $\geq 5\%$ of the whales diet in summer or fall/wi/spr, the stock receives 1 point. If it was not observed in the diet, the stock receives 0 points. This prioritizes stocks observed in the diet compared to those that have not been observed.

FACTOR 2

Current data indicate that both reduced body condition and a diversified diet occur in non-summer months. If a stock is consumed during October through May, it receives 1 point. If it is consumed during June through September, the stock receives 0 points. This prioritizes stocks that are consumed during periods with a higher likelihood of food limitation or stress in the whales' health.

FACTOR 3

For each space/time area described above, if more than 25% of the Chinook stock is distributed in that area, the area receives a sub-score of 2. For areas that contain between 5% and 25% of the Chinook stock, the area receives a sub-score of 1. If an area contains less than 5% of the Chinook stock, it receives a sub-score of 0. The sub-scores for each area are multiplied by an importance weight for each area. The final score for the Chinook stock/population is the sum of the products of the scores and weight for each area normalized such that the highest possible score of a given stock is equal to 3.

Here are the seven space/time combinations included in Factor 3 and their associated weights.

1. WA coast in Winter/Spring; weight = 0.5
2. WA coast in Summer/Fall; weight = 0.5
3. Salish Sea in Winter/Spring; weight = 0.5
4. Salish Sea in Summer/Fall; weight = 0.5
5. OR / N.CA coast in Winter/Spring; weight = 0.25
6. CA coast in Winter/Spring ; weight = 0.25
7. West Coast of Vancouver Island in Winter/Spring; weight = 0.5

The Salish Sea and coastal waters off WA have a 0.5 weight. The areas off BC, OR/North CA and CA have a 0.25 weight. This structure means that the areas of highest SRKW use – the Salish Sea and coastal WA – are treated as twice as important as the other areas.

References

- Durban, J. W., H. Fearnbach, L. Barrett-Lennard, M. Groskreutz, W. Perryman, K. Balcomb, D. Ellifrit, M. Malleson, J. Cogan, J. Ford, and J. Towers. 2017. Photogrammetry and Body Condition. Availability of Prey for Southern Resident Killer Whales. Technical Workshop Proceedings. November 15-17, 2017.
- Fearnbach, H., J. W. Durban, D. K. Ellifrit and K. C. Balcomb III. 2018. Using aerial photogrammetry to detect changes in body condition in endangered Southern Resident killer whales. *Endangered Species Research*. <https://doi.org/10.3354/esr00883>.
- Ford, M. J., J. Hempelmann, M. B. Hanson, K. L. Ayres, R. W. Baird, C. K. Emmons, J. I. Lundin, G. S. Schorr, S. K. Wasser, and L. K. Park. 2016. Estimation of a killer whale (*Orcinus orca*) population's diet using sequencing analysis of DNA from feces. *PLoS ONE*. 11(1):e0144956. Doi:10.1371/journal.pone.0144956.
- Hanson, M. B., R. W. Baird, J. K. B. Ford, J. Hempelmann-Halos, D. M. Van Doornik, J. R. Candy, C. K. Emmons, G. S. Schorr, B. Gisborne, K. L. Ayres, S. K. Wasser, K. C. Balcomb, K. Balcomb-Bartok, J. G. Sneva, and M. J. Ford. 2010. Species and stock identification of prey consumed by endangered southern resident killer whales in their summer range. *Endang. Spec. Res.* 11: 69-82.
- Pacific Salmon Commission (PSC) Joint Chinook Technical Committee Report. 2018a. 2017 Exploitation Rate Analysis And Model Calibration Volume One. Available at: <http://www.psc.org/publications/technical-reports/technical-committee-reports/chinook/>
- Pacific Salmon Commission (PSC) Joint Chinook Technical Committee Report. 2018b. 2017 Exploitation Rate Analysis And Model Calibration Volume Two: Appendix Supplement. Available at: <http://www.psc.org/publications/technical-reports/technical-committee-reports/chinook/>
- Satterthwaite, W. H., M. S. Mohr, M. R. O'Farrell, and B. K. Wells. 2013. A comparison of temporal patterns in the ocean spatial distribution of California's Central Valley Chinook salmon runs. *Canadian Journal of Fisheries and Aquatic Sciences* 70:574–584.
- Shelton, A.O., W.H. Satterthwaite, E.J. Ward, B.E. Feist, and B. Burke. In press. Using hierarchical models to estimate stock-specific and seasonal variation in ocean distribution, survivorship, and aggregate abundance of fall run Chinook salmon. *Can. J. Fish. Aquat. Sci.* DOI: 10.1139/cjfas-2017-0526.
- Wahle, R.J., E. Chaney, and R.E. Pearson. 1981 Areal distribution of marked columbia river basin spring Chinook salmon recovered in fisheries and at parent hatcheries. *Marine Fisheries Review* 43:1-9.
- Weitkamp, L. A. 2010. Marine distributions of Chinook salmon from the West Coast of North America determined by coded wire tag recoveries. *Transactions of the American Fisheries Society* 139:147–170

Priority Chinook Stocks Using Conceptual Model

ESU / Stock Group	Run Type	Rivers or Stocks in Group	Diet Contribution Score (0,1)	Killer Whale Reduced Body Condition or Diverse Diet Score (0,1)	Spatio-Temporal Overlap Score (0 - 3)	Total Score (sum of factors)
			Avg. Factor 1 (see note)	Avg. Factor 2 (see note)	Avg. Factor 3	
Northern Puget Sound	Fall	Nooksack, Elwha, Dungeness, Skagit, Stillaguamish, Snohomish	1	1	3.00	5.00
Southern Puget Sound	Fall	Nisqually, Puyallup, Green, Duwamish, Deschutes, Hood Canal systems	1	1	3.00	5.00
Lower Columbia	Fall	Fall Tules and Fall Brights (Cowlitz, Kalama, Clackamas, Lewis, others)	1	1	2.63	4.63
Strait of Georgia	Fall	Lower Strait (Cowichan, Nanaimo), Upper Strait (Klinaklini, Wakeman, others), Fraser (Harrison)	1	1	2.63	4.63
Upper Columbia & Snake Fall	Fall	Upriver Brights	1	1	2.25	4.25
Fraser	Spring	Spring 1.3 (upper Pitt, Birkenhead; Mid & Upper Fraser; North and South Thompson) and Spring 1.2 (Lower Thompson, Louis Creek, Bessette Creek)	1	1	2.25	4.25
Lower Columbia	Spring	Lewis, Cowlitz, Kalama, Big White Salmon	1	1	2.25	4.25
Middle Columbia	Fall	Fall Brights	1	1	2.06	4.06
Snake River	Spring-Summer	Snake, Salmon, Clearwater	1	1	1.88	3.88
Northern Puget Sound	Spring	Nooksack, Elwha, Dungeness, Skagit (Stillaguamish, Snohomish)	1	1	1.88	3.88
Washington Coast	Spring	Hoh, Queets, Quillayute, Grays Harbor	1	1	1.69	3.69
Washington Coast	Fall	Hoh, Queets, Quillayute, Grays Harbor	1	1	1.69	3.69
Central Valley	Spring	Sacramento and tributaries	1	1	1.50	3.50
Middle & Upper Columbia Spring	Spring	Columbia, Yakima, Wenatchee, Methow, Okanagan	1	1	1.31	3.31
Middle & Upper Columbia Summers	Summer		1	1	1.31	3.31

Fraser	Summer	Summer 0.3 (South Thompson & lower Fraser; Shuswap, Adams, Little River, S. Thompson mainstem, Maria Slough in Lower Fraser) and Summer 1.3 (Nechako, Chilko, Quesnel; Clearwater River in North Thompson)	1	0	1.88	2.88
Central Valley	Fall and Late Fall	Sacramento, San Joaquin	1	1	0.75	2.75
Klamath River	Fall	Upper Klamath and Trinity	1	1	0.75	2.75
Klamath River	Spring	Upper Klamath and Trinity	1	1	0.75	2.75
Upper Willamette	Spring	Willamette	0	0	2.25	2.25
Southern Puget Sound	Spring	Nisqually, Puyallup, Green, Duwamish, Deschutes, Hood Canal systems	0	0	1.88	1.88
Central Valley	Winter	Sacramento and tributaries	0	0	1.50	1.50
North & Central Oregon Coast	Fall	Northern (Siuslaw, Nehalem, Siletz) and Central (Coos, Elk, Coquille, Umpqua)	0	0	1.41	1.41
West Coast Vancouver Island	Fall	Roberts Creek, WCVI Wild	1	0	0.38	1.38
Southern Oregon & Northern California Coastal	Fall	Rogue, Chetco, Smith, lower Klamath	0	0	0.75	0.75
Southern Oregon & Northern California Coastal	Spring	Rogue	0	0	0.75	0.75
California Coastal	Fall	Mad, Eel, Russian	0	0	0.75	0.75
California Coastal	Spring	Mad, Eel, Russian	0	0	0.75	0.75
Southeastern Alaska	Spring	Taku, Situk, Chilkat, Chickamin, Unuk, Alsek, Stikine	0	0	0.00	0.00
Northern BC	Spring	Yakoun, Skeena, Nass	0	0	0.00	0.00
Central BC	mostly Summer	Atnarko, Dean River, Rivers Inlet	0	0	0.00	0.00
Note: Factor 1 and 2 are not literal averages. If a major component of the rivers in the ESU / Stock group had 1 then this was scored a 1. If no major component was scored a 1, this was scored a 0						

