

Thurston County Critical Areas Regulations Draft (revised 7/26/05)
Best Available Science Review: Important Marine Habitats section 17.15.830¹
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This review was completed as part of a Best Available Science (BAS) review of the Thurston County’s Critical Areas Regulations (CAO) Draft #1 (revised 7/26/05) by a group of specialists. The review was conducted at the request of the Black Hills Audubon Society. The purpose of the review is to provide Thurston County with an update of the BAS available since the 2005 draft was compiled, and where new science is available, to recommend changes in the regulations to adequately protect these critical areas.

The following CAO documents were reviewed:

1. AMENDMENTS TO THE CRITICAL AREAS REGULATIONS – Important Marine Habitats section Thurston County, DRAFT. TCC 17.15.830 (7/02/05).
2. BEST AVAILABLE SCIENCE/GUIDANCE –IMPORTANT HABITATS AND SPECIES. DRAFT (7/26/05)
3. AMENDMENTS TO THE CRITICAL AREAS REGULATIONS - Administrative Procedures: Thurston County, DRAFT in progress TCC 17.15.400 (10/07).

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Executive Summary of Key Recommendations

- Ensure that marine critical area protections are consistent with updated SMP designations and develop further approaches to protect ecosystem functions at a landscape scale under the Comprehensive Plan.
- Apply minimum buffer width protections based on two general categories of marine critical areas:
 - (1) Areas of high ecological importance. Establish greater protections having minimum buffer widths of 250 ft in the SMP designations of Natural, Rural Conservancy, Resource Conservancy as well as areas of Urban Conservancy that have been prioritized for forage fish habitat preservation and restoration, among other important designation criteria; and
 - (2) Areas of lower ecological importance. Allow flexibility in areas of more intense modification and use in the SMP designations of Shoreline Residential, and Urban Conservancy. Establish buffers on a site by site basis, to provide a minimum protection of between 80% to 90% function, with the objective to maximize buffer width and quality to prevent adverse impacts.
- The recommended 250 ft. minimum buffer for areas of high ecological importance will not satisfy the “no net loss” standard on its own. It remains significantly less than both the recommended precautionary high end variable buffer widths, and the widths for maintaining the key functions of: pollutant removal; sediment filtration/control; inputs of large woody debris (LWD); and wildlife habitat.
- Provide tax incentives to landowners who manage and enhance buffers that improve the flow of ecosystem services for public benefit. Increase taxes on bulkheads/shoreline structures to reflect the negative impacts of ecosystem degradation and the resulting loss of essential ecosystem services to the public.
- To help offset the problems associated with nonconforming uses, encourage landowners to maintain/enhance/restore native habitat in buffer areas around nonconforming developments. Provide these landowners with incentives, including recognition for good stewardship by changing their nonconforming designation to a more positive term that reflects the improvement. Consider establishing an education outreach program (similar to Mason County) for owners of critical areas to help achieve this and other related goals.
- Buffer widths required for 100% pollutant removal (600 to 1,804 ft) are higher than the buffer recommendations in this report. Therefore, additional management measures must be applied inland of the buffer area. These would include, among others, installing advanced septic systems that have high nitrogen removal rates on new developments and retrofitting existing developments, and prohibiting pesticide/herbicide use within and upland of riparian buffers.
- BAS does not support the building of Shoreline protective structures/armoring (e.g. bulkhead, gabion, riprap, or wall). The recommended standard buffer widths for important ecological areas described in this report avoid the need for shoreline stabilization. In addition, viable alternatives to structures/armoring exist for protection against marine erosion for all shoreline properties.
- Given the well documented loss of marine and nearshore ecosystem function due to bulkheading/hard armoring, the County should explore setting targets for

removing bulkheads in the SMP designations of Natural, Resource Conservancy and Rural Conservancy and replacing them with viable alternatives. This will help offset losses from unavoidable and cumulative impacts from previous development and/or new bulkheads that might be authorized in the urban areas that are not under the County's jurisdiction.

- Reasonable use exemptions and/or variances negatively impact ecosystem function and values, and inhibit the ability of the County to meet the no net loss standard. Administrative variances and exemptions should be strictly limited, and be evaluated for cumulative impacts (EnviroVision et al. 2007). The flexible buffer width for shorelines of lower ecological importance eliminates the need for variances while maximizing function protection.

The CAO standard and the nearshore areas of Thurston County.

As described in Sustainable Fisheries Foundation (2005), a panel of American and Canadian scientists concluded in 1994 that, "The extent of natural nearshore habitats [in the shared marine waters of British Columbia and Washington]...has reached critically low levels." The panel described the harm from altering these habitats as "cumulative and essentially irreversible" and called for a standard of no further loss, regardless of mitigation, in the most heavily developed areas and no net loss elsewhere. The standard of "no net loss" – to prevent adverse impacts to critical areas as the first option, minimize adverse impacts as the second option, and lastly, compensating for remaining impacts - is the cornerstone of the Critical Area Ordinance (CAO). The CAO is a key regulatory tool to ensure both preservation and enhancement of critical ecosystem functions.

Thurston County's nearshore ecosystems have not been sheltered from this regional trend. Appendix A. describes characteristics and values of Thurston County's marine critical areas, and State and local government identified factors that limit estuarine/marine function and recommendations for solutions.

Local data indicates that both increased protections and enhancement will be needed to assure against further degradation from current vested development and anticipated future growth. The Indicators Report (Puget Sound Action Team and Thurston Regional Planning Council. 2006) presented at the South Puget Sound Forum; Environmental Quality – Economic Vitality, projected that under our current approach to land use, the impervious area of many of Thurston County's basins will reach levels in the near future at which stream and basin health cannot be sustained. We cannot achieve the CAO standard and the larger goal of protecting our natural heritage without a dramatic and permanent change in how we use these lands.

A practical and strategic approach to achieve the standard.

The below findings and recommendations in this report are guided by the common sense principle that one size does not fit all when it comes to land use planning. The more protective regulations that would help achieve the 100% standard of "no net loss" should be applied to areas of high ecological importance, where they can do the most good,

while a more flexible level of protections could be allowed for lands with marine critical areas in landscapes that are more densely developed and therefore are not key contributors to ecosystem functions and ecosystem health.

Such an approach is recommended by Booth et al. (2002) for stormwater management and involves: (1) identifying those watersheds where existing low urbanization and associated high-quality conditions warrant the kinds of development conditions that protect much of the existing quality of these systems; and (2) developing a new set of goals for those watersheds whose surrounding development precludes significant ecosystem recovery. The approach also reflects BAS in EnviroVision (2007) which recommends both variable buffer widths, to reflect the true complexity of the environment and management goals, and consideration of site specific conditions when determining buffer width (e.g. soils, vegetation type and density, upland/adjacent land uses, and loading).

Linking the CAO with the SMP Shoreline Inventory

EnviroVision et al. (2007) recommends that to ensure no net loss of function, variable buffers must be closely linked to the shoreline inventory. The shoreline inventory is a tool used in the Shoreline Master Program (SMP) for identifying the most critical habitat features such as forage fish spawning habitat, aquatic vegetation communities, nearshore salmon habitat, and marine riparian communities. The SMP prescribes different sets of environmental protection measures for each category identified.

Thurston County has categorized its marine areas into the following SMP categories: Natural; Rural Conservancy; Resource Conservancy; Urban Conservancy; and Shoreline Residential. Establishing CAO buffers for critical areas that can be similarly categorized will help ensure CAO consistency with the SMP and also ensure that adequate buffer protections will be set for the most important shoreline processes and habitat areas.

Applying the above approach of Booth (2002) and Envirovision (2007), Thurston County's marine areas and their SMP categories fit into two general categories: marine areas of high quality and importance and marine areas of lower ecological importance.

(1) Marine critical areas of high quality and importance:

Establish buffer width protections that help meet the highest degree (100%) of "no net loss" for important riparian functions (e.g., large woody debris recruitment, sediment filtration/control, wildlife habitat, and pollutant removal) in marine critical areas of high quality and importance. These would include the areas designated under the SMP as Natural, Rural Conservancy, and Resource Conservancy, as well as those areas within Urban Conservancy that have been prioritized for forage fish habitat preservation and restoration, among other important designation criteria.

Thurston County has numerous critical marine areas that are healthy and of high ecological importance to Puget Sound. These areas have excellent to very good water quality. Many are connected to marine and freshwater riparian corridors which support a high level of biodiversity and habitats and species of local importance such as the

Chinook, Chum, Coho and Steelhead, among others. Examples include the Nisqually Reach, Eld Inlet and its headwaters of Green Cove Creek, Perry Creek, Fry Cove, and Perry Creek; and Totten Inlet. These Inlets are important shellfish growing areas, have Important Bird Areas of Washington, and a significant amount of shoreline listed as priority preservation and restoration sites in the Thurston County Marine Shoreline Sediment Survey and Assessment (2008). These areas lie within the above SMP categories in the current draft SMP.

Large investments of time and funds by a coalition of government agencies recently resulted in the reopening of commercial shellfish harvesting in Henderson Inlet. It makes economic sense to protect ecologically important areas. These Inlets, Coves, and headwaters produce ecosystem goods and services that provide valuable monetary public benefits to the region (Batker et al, 2008). Our quality of life and economy are dependant on these services. Puget Sound's water quality is perhaps the most locally recognized ecological service that is essential to our quality of life (Thurston Regional Planning Council, 2009). Investments we make today to preserve our healthy marine areas will save us the future high monetary costs and uncertain outcomes of restoration.

(2) Marine critical areas of lower ecosystem importance

Thurston County also has critical marine areas in watersheds where surrounding development prevents a significant contribution to ecosystem function and recovery. These include some LAMRID areas, for example along Budd Inlet, with small undeveloped lots (<1 acre) that are surrounded by developed lots containing nonconforming uses. These would include the specific areas of more intense modification and use, within the SMP designations of: Shoreline Residential, and Urban Conservancy.

In these areas, lower goals of protection might be a practical approach, and on a site by site basis. Buffers that will provide a minimum protection of between 80% to 90% function, would be a practical standard, with the objective to maximize buffer width to prevent adverse impacts to the extent possible given the site conditions. It is important to note that this could only be done if the losses are made up elsewhere – by preserving the critical areas of high ecological importance which are essential contributors to the larger ecosystem functions of South Puget Sound's watersheds.

BAS literature used to determine buffer widths.

Riparian area buffers are critical to sustaining many ecological functions (Sustainable Fisheries Foundation 2010, Washington Sea Grant 2009, EnviroVision 2007, Brennan, J.S., and H. Culverwell 2004, Brennan, J.S. 2007). Most of the current science on buffers is from freshwater systems. Because the ecological functions provided by marine riparian areas are similar to freshwater riparian areas, EnviroVision et al. (2007), Brennan and Culverwall (2004) and Washington Sea Grant (2009) recommend that until we have more empirical data to support marine buffer width determinations, we must rely on models or examples in freshwater systems and take a precautionary approach when developing along marine shorelines to prevent further, irreparable damage. A precautionary approach is needed to allow wide buffers for wildlife habitat, LWD recruitment, and other

functions over time in Puget Sound, where shoreline retreat is constantly present and expected to occur at an increased rate with sea level rise (Brennan, J.S., and H. Culverwell 2004, and Sustainable Fisheries Foundation 2010).

EnviroVision et al. (2007) further recommends a precautionary approach (i.e., “no further harm”) to protections that would rely on using the high end of the ranges required to protect specific functions. The precautionary approach would also help to offset losses due to vesting of inadequate buffers that may have been permitted in the past and through variances and/or exemptions. On the contrary, a reliance on the minimum end of the range of buffers will inevitably lead to a net loss of ecosystem functions.

There is consensus among scientists that different functions require different buffer widths and that buffers alone are not sufficient to ensure protections of ecosystem functions. Ecosystems are hierarchical and are best protected at a larger scale. The Puget Sound ecosystem is comprised of small ecosystems that are interconnected at a landscape scale; freshwater and nutrient inflows to Puget Sound are dependant on an interconnected mosaic of wetlands, creeks, streams, nearshore and estuarine areas. Lombard (2006) states that while the GMA allows for these interconnected areas to be considered ecosystems, and the hearings boards have supported broader approaches, the CAO is not well structured for protecting ecosystems at this scale. However, by ensuring that the protections for critical areas are consistent with use designations while updating the SMP, as recommended in this report, Thurston County can more easily manage land use regulations and the public can more easily understand the rules. In addition, the CAO and SMP protections can more easily be used to further protect ecosystems in the larger landscape scale planning tool of the Comprehensive Plan.

Vegetated buffers perform several individually recognized functions for waterbodies. Brennan and Culverwall (2004) explain that as in freshwater systems, the functions and benefits provided by the marine riparian zone will vary and be determined by a number of factors (e.g., soils, slope, vegetation type and density). EnviroVision et al. (2007) and Washington Sea Grant (2009) list the major functions and the varied buffer width associated with sustaining each function at different levels, and EnviroVision et al. (2007) recommends that “when applied properly, variable width buffers can be more ecologically sound because they have the potential to reflect the true complexity of the environment and management goals”.

For the purpose of this review, the following functions (also listed in the Draft CAO) for marine buffer areas are included in the determinations for a range of buffer widths:

- (1) Large Woody Debris (LWD) recruitment;
- (2) sediment filtration/control;
- (3) pollutant removal (e.g., from nutrients and bacteria from septic system releases, to lawn and garden chemical applications, and pollutants associated with vehicle use, among numerous others); and
- (4) wildlife habitat.

Functions needed to recover Salmon

The “special consideration” clause of the GMA places extra weight on functions necessary to recover salmon. The “special consideration” required for anadromous fisheries means that “the scientific evidence...must be more heavily weighted against issues of practicality and economics...when dealing with anadromous fish. The ‘special consideration’ language directs that local governments must go beyond what might otherwise be done in designating and protecting other kinds of critical areas.” (Clark County Natural Resources Council v. Clark County, 1996).

Thurston County’s nearshore areas are important habitat for the Puget Sound Chinook Salmon (listed as threatened under the Endangered Species Act (ESA)), the Puget Sound-Strait of Georgia ESU Coho (listed as a species of concern under the ESA), as well as Chum, Cutthroat Salmon and Steelhead (WRIA 13 data).

A petition to list the Puget Sound-Strait of Georgia ESU as an endangered or threatened species under the ESA has recently been filed (February, 2010). Of the 14 populations of Puget Sound Coho cited in the petition, three are resident to Thurston County:
Nisqually River Coho;
Deep South Sound tributaries Coho; and the
Deschutes River Coho.

The 2010 petition refers to the long term downward trend in smolt production capabilities of Puget Sound stream habitat and the consistently poor marine survival rates of Coho salmon smolts in South Puget Sound.

These recent findings are consistent with the 1995 Biological Review Team (BRT) minority report on the listing decision of this ESU in 1994, which stated that the ESU is likely to become endangered. In addition, a majority of the BRT concluded that healthy naturally sustaining Coho populations in the ESU were few and geographically clustered in a small area of the northern Puget Sound, and that habitat degradation remains an important concern and will place increasing pressure on natural populations in the future.

Indeed, these concerns of 1995 have been realized fifteen years later, and illustrate the need for applying special considerations to both protect and restore natural marine, estuarine, and stream riparian ecological functions, and on a watershed scale.

Results and Recommendations.

The following comments apply to the Important Marine Habitats section TCC Chapter 17.15.830:

B. Marine Riparian Habitat

- **Recommendation:** Areas of High Ecological Importance. Establish minimum buffer widths of 250 ft in all undeveloped lands. These would include marine critical areas designated under the SMP as Natural, Rural Conservancy, Resource Conservancy, as well as areas within Urban Conservancy that have been prioritized for forage fish habitat preservation/restoration, among other criteria.

This is consistent with EnviroVision et al. (2007) which recommends a precautionary approach (relying on the high end of the buffer width ranges) toward regulating these habitats to protect specific critical functions such as forage fish spawning habitat, aquatic vegetation communities, nearshore salmon habitat, and marine riparian communities, endangered, threatened, and sensitive species; and locally important habitats and species.

This is consistent with the minimum buffer width of at least 250 feet recommended by Knutson and Naef (1997) for Shorelines of the State (Type S). This width would satisfy the lower amount (200 ft) of the precautionary range (i.e., 200, 300 and 600 ft.) in EnviroVision et al. (2007) for sediment filtration/control. However, it would provide less than adequate sediment filtration/control as determined in Washington Sea Grant (2009), which indicates that 296 feet is needed for 90% filtration of sediment, and that 984 feet is needed to achieve 99% filtration.

The higher range of buffer widths for LWD range from 200 to 328 ft in EnviroVision (2007), and Washington Sea Grant (2009) states that some 95% LWD function will require a 200 ft wide buffer.

Pollutant (nitrogen, phosphorus, etc.) removal requires precautionary ranges of 600 to 1,804 ft wide buffers. EnviroVision (2007) gives ranges of 600 to 860 ft and Washington Sea Grant (2009) lists the capability of 95% removal of nitrogen and phosphorus at buffer widths of 1148 ft and 1804 ft, respectively.

Wildlife habitat requires buffer ranges (data from Brennan, J.S., and H. Culverwell 2004) of 197 to 328 ft. for general wildlife habitat; 302 ft. for important wildlife; and 1,968 ft. for critical species. BAS review by Washington Sea Grant (2009) indicates that buffer widths greater than 660 ft. will protect “some wildlife habitat functions” – noting that it is still less than 100% of functions. EnviroVision (2007) provides a precautionary buffer width of 984 ft. and a minimum recommended width of 328 ft. Because BAS indicates that buffer requirements for wildlife depend on upland habitat quality and connectivity with other habitats, and the 250 ft buffer is less than the minimum buffer recommendation and significantly less than the precautionary high end buffer widths for wildlife function in marine areas, the County will need to strengthen landscape scale protections for wildlife when updating the Comprehensive Plan.

In addition, because EnviroVision et al. (2007) recommends applying freshwater riparian buffer width standards to marine buffers, the buffer width protection of 250 ft in these important marine areas, would more closely reflect the County’s protections for fish bearing streams (i.e., 200 – 250) in the 2005 draft CAO. In addition, buffer protection beyond the minimum 250 ft. for ecologically important marine areas can be achieved on a site by site basis, and through incentives as per recommendations, Administrative Procedures section.

There are currently waterfront homes with 250 ft buffers on medium to low banks in Thurston County that offer aesthetically pleasing settings and views. This width of buffer will not place an economic burden on landowners but rather increase value of the property due to additional slope stability, protection from marine erosion and potential sea level rise. These protections benefit both property owners and the public.

Given the above analysis, the recommended 250 ft minimum buffer will not satisfy the “no net loss” standard on its own. This minimum buffer width of 250 feet still remains less than the high end of the variable buffer widths for many of the riparian functions, and will filter/remove less than 100% of the sediment and pollutants as described in Washington Sea Grant (2009). However, combined with incentives to increase buffers above the minimum 250 ft, and an improved stewardship for all waterfront landowners to maintain and enhance the condition of their riparian habitat areas, including installing advanced septic systems having high nitrogen removal rates on new developments and retrofitting existing developments, and if Thurston County seeks further approaches to protect functions at a landscape scale under the Comprehensive Plan, this 250 ft. minimum buffer will be a reasonable step towards achieving CAO goals.

- **Recommendation:** Areas of Lower Ecological Importance. Establish buffers on a site by site basis, to provide a minimum protection of between 80% to 90% function (data available in Washington Sea Grant (2009), with the objective to maximize buffer width to prevent adverse impacts. Buffer width should allow for the constraints of lot size and surrounding development, among other considerations. Areas of lower ecological importance have more intense modification and use and can be found within the SMP designations of: Shoreline Residential, and Urban Conservancy. Data from EnviroVision (2007) should also be considered when developing minimum buffer protections.
- **Recommendation:** BAS supports the consideration of applying additional width to the minimum buffer in both categories. This can be done with interested landowners, and on a site by site basis. Additional widths can be applied using the variable width buffer ranges found in EnviroVision et al (2007) to reflect the needs at a specific site to help sustain certain valued functions, and from Washington Sea Grant (2009). Additional widths could be achieved through economic incentives (see recommendation, Administrative Procedures section).

The Habitat Area Reduction section critical area report

- **Recommendation:** An approach similar to Qwg Applied Geology (2010, section 17.15.660 Special reports), for third party review should be used to avoid potential conflict of interest.

Condition of the Riparian Habitat Area

- **Recommendation:** The scientific literature on appropriate buffer widths for different functions generally assumes that those buffers have mature, native

vegetation, typically dominated by conifers (EnviroVision et al. 2007; Washington Sea Grant, 2009). To ensure that riparian buffers will contribute to sustaining the 3 essential functions (Large Woody Debris recruitment, sediment filtration/control, and pollutant removal), native shoreline vegetation should be conserved where new developments and/or uses are proposed. And where the riparian area has been altered, restore the habitat to structured native vegetation.

A combination of monitoring, enforcement, and incentives should be applied to ensure long term protection of the riparian buffer. Use current guidelines to develop standards and criteria for long term protection of the buffer. A guideline for maintaining and restoring quality riparian areas is provided in Manashe, E. (1993). This publication discusses key techniques, including how property owners can maintain existing trees to provide buffer benefits, while keeping and enhancing their views by using pruning alternatives that maintain a minimum of 60% of the original crown's foliage to ensure tree health and vigor.

In addition, Knight, K. (2009) recommends prohibiting pesticide/herbicide use in riparian buffers³. Expanding the requirement to prevent pollutants from entering the buffer area would be essential, as the buffer widths required for 100% pollutant removal are significantly higher than 250 ft.

17.17.860 Approvable uses and activities within important habitats. Table 8-3.

Structures and Accessory Uses:

- **Recommendation:** BAS does not support Expansion of a nonconforming use. BAS supports encouraging landowners to maintain native habitat in buffers, and enhance or restore the buffer areas around developments to one of structured native vegetation dominated largely by conifers where it has been altered (see *Condition of Habitat Area* recommendation above). This will help offset the problems associated with nonconforming uses. The County could provide these landowners who enhance or restore the buffer with incentives, including, among others, recognition for good stewardship by changing the nonconforming use designation to a positive term that reflects the improvement. Establish an outreach program for owners of critical areas to help achieve this goal.
- **Recommendation:** BAS does not support Replacement of a nonconforming structure. BAS for Landside Hazardous Areas (Knight, K., 2009) requires moving structures further back from marine feeder bluffs during redevelopment, provided sufficient land is available, and use smaller lot-line setbacks to accommodate structure relocation where it would protect habitat. Incentives for both relocation of structures and restoration of the resulting buffer area should be explored.

and Shoreline Stabilization:

- **Recommendation:** BAS does not support the building of Shoreline protective structures/armoring (e.g. bulkhead, gabion, riprap, or wall). The recommended

³ With exemptions for noxious weed control State of Washington Department of Ecology-approved activities and pesticides approved by the EPA for use near aquatic systems.

standard buffer widths described in this report avoid the need for shoreline stabilization in important ecological areas. In addition, viable alternatives to structures/armoring exist and are described in (EnviroVision et al., 2007). The guidance (Table III.4) also lists the impacts and natural functions that may be affected by shoreline armoring. The effects of hardened banks are also documented in Appendix A. and Sustainable Fisheries Foundation (2005) and Washington Sea Grant. 2009, among others. Alternatives such as anchored woody debris and structured vegetation which improve shoreline habitat (achieving *both* CAO goals of protection and enhancement) are cited. A local example of such an alternative constructed on private property, is on this report's cover page and Fig. 1 below.



Fig. 1. LWD anchored by auger, chain, and stones, with vegetated upland buffer: a viable alternative to bulkheads. Under construction, above, and completed project, below, during a 17.5 ft tide. Eld Inlet, Thurston Co.



Jurisdictions can also require that buildings be set back from buffers by at least an additional 50 feet (Sustainable Fisheries Foundation 2005), therefore further reducing the potential need for a bulkhead. Thus, the combination of anchored woody debris, structured vegetation throughout the riparian area, and additional buffer widths where needed, combined with incentives, are viable alternatives for local governments to help maintain ecosystem functions and values.

Given the well documented loss of marine and nearshore ecosystem function due to bulkheading/hard armoring, the County should explore setting quantitative

targets for removing bulkheads in strategic areas and replacing them with viable alternatives. This will help offset losses from unavoidable and cumulative impacts from previous development and/or new bulkheads that might be authorized in the urban areas that are not under the County's jurisdiction. Funds to assist landowners and the County could be sought from the Puget Sound Partnership.

Administrative Procedures section TCC 17.15.400:

- **Recommendation:** For review of permits containing important marine areas, a decision tree process as described in EnviroVision et al. (2007) should include, at a minimum the Recommended Review Steps in Figure III.3., page 116.
- **Recommendation:** Reasonable use exemptions and variances negatively impact ecosystem function and values, and inhibit the ability of the County to meet the no net loss standard. Administrative variances and exemptions should be strictly limited, and be evaluated for cumulative impacts (EnviroVision et al. 2007). The flexible buffer width for shorelines of lower ecological importance eliminates the need for variances/exemptions while maximizing function protection.
- **Recommendation:** Combine (1) subsidies (“carrots”) for good stewardship in ecologically important watersheds, (2) increased taxes for structures, such as bulkheads, that currently impair functions, and (3) enforcement (“sticks”) to develop a comprehensive program that achieves land use and ecosystem goals. Strong enforcement of the CAO will allow the county to use incentives.

Subsidies include incentive programs such as: (a) carbon sequestration credits for retention and/or establishment of fully vegetated buffers. The Northwest Natural Resource Group has a carbon offset program, “NW Neutral”, for small woodland owners.; and (b) tax credits for creating public benefits on private land – by expanding the County's current open space public benefit rating system by assigning benefit values to the public services provided by private landowners who manage adequate buffers to maintain or improve the flow of ecosystem services. The County's current open space program does not assign values at this scale however inputs can include quantitative values from Batker et al. (2008) that can be applied to CAO regulations (Batker D., 2010). This rating system would reflect the positive impacts of good stewardship and could include, among others: (i) shorelines that use alternatives to hard armoring and/or shorelines maintained in their natural state, (ii) buffers that have mature, native vegetation, typically dominated by conifers, and (iii) landowners that increase their buffer width and quality over the minimum standards to protect and enhance certain functions⁴.

Taxes could include property tax increases for existing cement bulkheads, among other shoreline structures, to reflect the negative impacts of ecosystem degradation and the resulting loss of essential ecosystem services to the public. These and the above benefit calculations can be made for an individual County (Batker D., 2010).

⁴ Incentives to increase buffers could be roughly based on a quantitative formula of public benefit (i.e., of ecosystem goods and services) per increment of ecosystem function (Batker D. 2010).

Enforcement should include improving enforcement of codes by increasing enforcement presence and increasing penalties and/or fines for code violations to levels that are significantly high enough to deter violations. Empirical studies of Kuperan and Sutinen (1998) have shown the validity of the basic deterrence model - that individuals weigh only the potential illegal gain against the severity and certainty of sanctions when deciding whether to comply; and that compliance is also influenced by the extent to which individuals accord legitimacy to enforcement agencies as seen by Tyler (1990a, 1990b).

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APPENDIX A.

Characteristics and values particular to Thurston County's marine critical areas.

Thurston County's nearshore and marine areas contain important habitat values that produce many locally important ecological goods and services, including salmon and shellfish, which in turn, sustain important parts of Thurston County's local economy. These ecological goods and services are public benefits and are a part of our local natural heritage and rural character.

As described in Puget Sound Action Team and Thurston Regional Planning Council (2006), Southern Puget Sound is characterized by shallow depth, unique morphology and a relatively long residence time of its marine waters. Because of these characteristics, South Sound and particularly the southern most inlets of Thurston County (i.e., Eld, Totten, and Budd Inlet), are sensitive to enrichment from eutrophication and the resulting reduced oxygen levels, especially during seasonal periods of high primary production when the marine water layers do not mix well.

The most recent profile by the Thurston Regional Planning Council (2009) lists concerns including excess effluent discharges and run-off from developed areas containing contaminants that are harmful to shellfish and marine life; and structured surfaces along the shoreline, such as bulkheads, that have replaced valuable marine life habitat. Explicit note is given to the influence of the quality of the water in Puget Sound on our quality of life in Thurston County, and that, over time, human activity within the basin has degraded the water quality of Puget Sound.

A recent report of the Washington State Conservation Commission (2009) lists factors that limit estuarine/marine function in Thurston County's WRIA 13 marine areas. Factors include: physical alteration of the natural estuary; poor water quality in the estuary; and significant alteration of nearshore ecological function due to shoreline armoring. The report states that continuing the same land management approaches will not be enough, and lists 3 solutions for the protection/restoration of salmonid resources, including those that are directly applicable to this CAO update:

- revision, implementation, and enforcement of land use ordinances that provide protection for natural ecological processes in the marine, instream, and riparian corridors, including measures to maintain effective impervious surfaces to levels, and in a manner, that will maintain natural hydrology;
- protection of marine, instream, and riparian habitat that is currently functioning, particularly key habitat areas; and
- restoration of natural marine, instream, and riparian ecological processes where they have been impaired.