TO: Thurston County Planning Commission

FROM: Claire Swearingen, Associate Planner

DATE: June 17, 2025

SUBJECT: CAO Wetlands Gap Analysis

BAS Overview

Introduction

Wetlands are areas where water often saturates the soil or pools on the ground, whether permanently or seasonally. Wetlands support a variety of unique plants and animals, including threatened and endangered species of plants and animals. State law defines wetlands in WAC 365-190-030 as follows:

> *"'Wetland' or 'wetlands' means areas that are inundated or saturated by surface water or groundwater at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions. Wetlands generally include swamps, marshes, bogs, and similar areas. Wetlands do not include those artificial wetlands intentionally created from nonwetland sites, grass-lined swales, canals, detention facilities, wastewater treatment facilities, farm ponds, and landscape amenities, or those wetlands created after July 1, 1990, that were unintentionally created as a result of the construction of a road, street, or highway. However, wetlands may include those artificial wetlands intentionally created from nonwetland areas to mitigate conversion of wetlands, if permitted by the county or city."*

In addition to providing habitat, wetlands also help maintain water quality and play an important role in the hydrologic cycle (WA Dept. of Ecology, 2022). The functions and locations of wetlands often overlap with other critical areas, and areas protected under other County programs like the Habitat Conservation Plan, which protects habitat for select federally listed endangered species. The functions of wetlands can be impacted by human activity, and avoiding intense or harmful activity within wetlands and their established buffers helps protect them. Wetland buffer widths are determined based on the characteristics of each wetland area.

Functions and Values

Wetlands connect dry land and surface water systems, helping to manage water flow and filter out pollutants and sediments. Wetlands help mitigate damage from flooding by absorbing flood water, provide clean water to rivers and streams, and reduce erosion by slowing down water as it moves over the land. These functions occur on an individual site-specific scale, and on a larger watershed scale (WA Dept. of Ecology, 2022).

Wetlands perform a variety of functions that positively impact water quality, and the ability to impact water quality is related to the physical setting and features of the wetland. The underlying slope and geology, soil type, and plant variety and density all affect how wetlands function. For example, wetlands on a slope generally store less water than wetlands in a depression (Brinson, 1993; Hruby, 2013).

Wetlands remove nutrients from the water that passes through them. While some nutrients are necessary for healthy ecosystems, too much organic material, especially from sources like manmade fertilizer, can cause pollution and eutrophication which negatively impact fish habitat. Wetlands also act as sinks for heavy metals and other pollutants, including pharmaceuticals and personal care products (Wang et al. 2019, Zhang et al. 2015). Wetlands perform these functions most effectively when water has enough time and space to move through them slowly and they can support the vegetation that helps perform nutrient-filtering (Sheldon et al., 2005).

Wetlands also help surface water move across the landscape in a way that maintains healthy water quantities, and mitigates flooding and erosion. Because water moves slowly through wetlands, they help with groundwater recharge (Sheldon et al., 2005). Wetlands also help release floodwaters gradually and slowly, rather than all at once. When floodwaters release over time, they are less damaging and intense, and cause less erosion. Impervious surfaces in wetlands disrupt their ability to perform these hydrologic functions, and can worsen flooding and decrease water quantity in streams and aquifers (Sheldon et al., 2005). Disruption to the hydrology in wetlands also impacts the plants that can survive in them.

Wetlands provide habitat for many kinds of animals (mammals, birds, fish, reptiles, and amphibians), which rely on them at various life stages (Sheldon et al., 2005). The location, size, vegetation, seasonal changes, and connectivity of a wetland all impact how well it functions as a habitat for a given species. When wetland areas and the landscapes connected to them are developed or urbanized, the quality of habitat function can be compromised, negatively affecting the number of animals that can survive in an ecosystem (Sheldon et al., 2005, Quesnelle et al., 2015).

Climate Change

Wetlands are sensitive to changes in the ecosystem, and at the same time, are very effective at helping guard against the impacts of climate change. Coastal wetlands help protect shorelines from flooding and erosion associated with sea level rise, and wetlands reduce the intensity of flood events and help disperse floodwaters (Association of State Wetland Managers, 2015). Flooding is a particular concern as climate change may increase the frequency and intensity of severe precipitation events and storms in the region. As surface water temperatures rise due to climate change and pollution and eutrophication threatens the health of aquatic ecosystems, wetlands help provide streams, rivers, and aquifers with cool, clean water (Sheldon et al., 2005). Wetlands provide refuge for animals in hot, dry conditions, which are also intensified by climate change.

The plants, trees, and soils found in wetlands also act as carbon sinks, helping to clean the air and reduce greenhouse gas effects (Gallagher et al., 2022, Association of State Wetland Managers, 2015). The ability of wetlands to help protect against climate change impacts can be affected by disturbance to the landscape. Physical construction can prevent wetlands from migrating in response to ecological and climatological changes, and can reduce a wetland's ability to support healthy hydrology. Pollution, chemical, and pH changes can also impact a wetland's ability to store carbon and remove pollutants from water (Sheldon et al., 2005). If wetlands are destroyed by human activity, animals will lose important refuge and habitat, especially for the dry months of the year (Association of State Wetland Managers, 2015).

Protection Strategies

Wetlands are generally protected by implementing buffers, or areas around a wetland where development is restricted. Wetland buffers help prevent impacts to wetlands by protecting vegetation, reducing harmful human activity in sensitive areas, and avoiding pollution and erosion. When impacts to a wetland cannot be avoided, mitigation sequencing must be followed. The *Wetland Guidance for Critical Areas Ordinance (CAO) Updates* (2022) Washington Department of Ecology (Ecology) highlights three main factors for determining an appropriate buffer:

- *"The wetland type and the functions needing protection*
- *The types of adjacent land use and their expected impacts*
- *The characteristics of the buffer area (slope, soils, vegetation)"*

This guidance document from Ecology lays out three BAS-based options for calculating wetland buffers in critical areas ordinances. Each option provides a different balance of simplicity and site-specific flexibility. The appendix from Ecology elaborating on the buffer calculation options will be included with this memo.

- Option 1 is the most specific and most flexible, but also the most complex to implement.
- Option 2 balances simplicity with flexibility and specificity.
- Option 3 is the least flexible, but the simplest.

In previous discussions, the Planning Commission has recommended that a combination of Option 1 and Option 3 be adopted, allowing applicants to choose the path that is most appropriate for their proposal. Option 1 requires a more in-depth level of reporting, but can allow for buffer reduction and averaging. Option 3 can utilize a simpler report, and compensates for this by generally requiring larger buffers. For more details, please see *Wetland Guidance for Critical Areas Ordinance (CAO) Updates,* Appendix C.

Gap Analysis

The following gap analysis highlights potential changes to the existing CAO that came from initial Planning Commission feedback, public comment to date, recommendations from County staff who implement the existing CAO, and County, state or federal agency staff with relevant subject matter expertise. This table and the descriptions that follow provide rationale for the proposed changes, and are intended to serve as a reference.

Code Section	Title	Recommendations	Reason
24.30.013 (New)	Wetlands designated	Add designation criteria	Clarity and accessibility
24.30.020	Determination of boundaries	Add criteria for reports required for various site scenarios and buffer options	Clarity and transparency
24.30.023	Expedited review for single-family homes	Consider adding process and criteria to allow for some expedited review for SFRs	Implementation and flexibility
24.30.045	Wetland buffers – Standard width	Replace buffer tables with the tables from Ecology's Option 1 and Option 3	State guidance, BAS, flexibility
24.30.050	Wetland buffers – Reduced width	Replace buffer tables and minimization standards with those from Ecology's Option 1	State guidance, BAS, flexibility
24.30.065	Wetland buffers – Tree protection	Create provisions that are appropriate for wetlands in prairie environments	BAS, feedback from conservation partners

24.30.013 Wetlands Designated (New)

As with other chapters, a new section should be added which describes the designation criteria, including publicly available mapping tools, for wetlands. This will support clarity and transparency for permit applicants, and make the chapter more easily navigable.

24.30.020 Determination of boundaries

This section should be updated to include specific requirements for different types of required reports, including reports establishing that no wetland is present on site, and the levels of reporting necessary for both Ecology Option 1 and 3.

24.30.023 Expedited review for single-family homes

Some jurisdictions (see Pierce and Kitsap Counties) utilize an expedited review processes for single-family home development near potential wetland areas. Incorporating a similar process where appropriate could help alleviate administrative burden on both applicants and County staff.

24.30.045 Wetland buffers – Standard width

As directed by the Planning Commission, buffer standards should be updated to reflect guidance from the Department of Ecology. To support the goal of flexibility while maintaining high levels of environmental protection, applicants should have the choice between using Ecology's Option 1 or Option 3, as described above.

24.30.050 Wetland buffers – Reduced width

As directed by the Planning Commission, buffer standards should be updated to reflect guidance from the Department of Ecology. To support the goal of flexibility while maintaining high levels of environmental protection, applicants should have the choice between using Ecology's Option 1 or Option 3, as described above. Option 1 includes provisions and standards for reducing buffer width.

24.30.065 Wetland buffers – Tree protection

Feedback from regional conservation organizations has highlighted barriers to prairie restoration work. This section should be updated to include provisions that support the restoration of wetlands in prairie areas and other restoration contexts, which can include appropriate, science-supported removal of certain tree species, pared with mitigation and restoration efforts.

Best Available Science Resources

Association of State Wetland Managers. (2015). *Wetlands and Climate Change: Considerations for Wetland Program Managers*. https://www.nawm.org/pdf_lib/wetlands_and_climate_change_consideratons_for_wetland_program_managers_0715.pdf

Brinson, M. M. (1993). *A Hydrogeomorphic Classification for Wetlands* (WRP-DE-4). US Army Corps of Engineers.

Burton, C. A., Hoefen, T. M., Plumlee, G. S., Baumberger, K. L., Backlin, A. R., Gallegos, E., & Fisher, R. N. (2016). Trace Elements in Stormflow, Ash, and Burned Soil following the 2009

Station Fire in Southern California. *PLOS ONE*, *11*(5), e0153372. https://doi.org/10.1371/journal.pone.0153372

Gallagher, J. B., Zhang, K., & Chuan, C. H. (2022). A Re-evaluation of Wetland Carbon Sink Mitigation Concepts and Measurements: A Diagenetic Solution. *Wetlands*, *42*(3), 23. https://doi.org/10.1007/s13157-022-01539-5

Guderyahn, L. B., Smithers, A. P., & Mims, M. C. (2016). Assessing habitat requirements of pond-breeding amphibians in a highly urbanized landscape: Implications for management. *Urban Ecosystems*, *19*(4), 1801–1821. https://doi.org/10.1007/s11252-016-0569-6

HATTERMANN, F. F., KRYSANOVA, V., & HESSE, C. (2008). Modelling wetland processes in regional applications. *Hydrological Sciences Journal*, *53*(5), 1001–1012. https://doi.org/10.1623/hysj.53.5.1001

Hruby, T. (2013). *Update on Wetland Buffers: The State of the Science, Final Report, October 2013* (Nos. 13-06–11). Washington State Department of Ecology.

Hruby, T., Harper, K., & Stanley, S. (2009). *Selecting Wetland Mitigation Sites Using a Watershed Approach* (Nos. 09-06–032). Washington State Department of Ecology.

Hruby, T., & Yahnke, A. (2014). *Washington State Wetland Rating System* (Nos. 23-06–009). Washington State Department of Ecology.

Mauger, G. (n.d.). *Global Climate Model Projections for the PNW* [Dataset]. Retrieved January 28, 2026, from https://cig.uw.edu/datasets/downscaled-global-climate-model-projections-for-the-pnw/

Mauger, G., Casola, J., Morgan, H., Strauch, R., Jones, B., Curry, B., Busch Isaken, T., Whitely Binter, L., Krosby, M., & Snover, A. (2015). *State of Knowledge: Climate change in Puget Sound*. University of Washington Climate Impacts Group. https://data.cig.uw.edu/picea/mauger/ps-sok/PS-SoK_2015.pdf

Mauger, G., Lee, S.-Y., Bandaragoda, C., Serra, Y., & Won, J. (2016). *Effect of Climate Change on the Hydrology of the Chehalis Basin*. https://doi.org/10.7915/CIG53F4MH

Mote, P. W., & Salathé, E. P. (2010). Future climate in the Pacific Northwest. *Climatic Change*, *102*(1–2), 29–50. https://doi.org/10.1007/s10584-010-9848-z

Newman, T., Kuhta, S., Andrade, C., Dial, G., Whittaker, K., Folkerts, K., Chase, C., Blair, M., Sears, T., & Ballash, H. (n.d.). *Critical Areas Handbook*. Washington State Department of Commerce. Retrieved January 28, 2026, from https://deptofcommerce.app.box.com/s/rlysjrfvrxpxwnm9jvbcd3lc7ji19ntp

Quesnelle, P. E., Lindsay, K. E., & Fahrig, L. (2015). Relative effects of landscape-scale wetland amount and landscape matrix quality on wetland vertebrates: A meta-analysis. *Ecological Applications*, *25*(3), 812–825. https://doi.org/10.1890/14-0362.1

Schueler, T. (2000). *The Impact of Stormwater on Puget Sound Wetlands*. Center for Watershed Protection. https://owl.cwp.org/257lmkb/

Sheldon, D., Hruby, T., Johnson, P., Harper, K., McMillan, A., Granger, T., Stanley, S., & Stockdale, E. (2005). *Wetlands in Washington State Volume 1: A Synthesis of the Science* (Nos. 05-06–006). Washington State Department of Ecology. https://apps.ecology.wa.gov/publications/documents/0506006.pdf

Staples, C., Mihaich, E., Carbone, J., Woodburn, K., & Klecka, G. (2004). A Weight of Evidence Analysis of the Chronic Ecotoxicity of Nonylphenol Ethoxylates, Nonylphenol Ether Carboxylates, and Nonylphenol. *Human and Ecological Risk Assessment: An International Journal*, *10*(6), 999–1017. https://doi.org/10.1080/10807030490887122

Taylor, K. E., Stouffer, R. J., & Meehl, G. A. (2012). An Overview of CMIP5 and the Experiment Design. *Bulletin of the American Meteorological Society*, *93*(4), 485–498. https://doi.org/10.1175/BAMS-D-11-00094.1

Thomas, H. (2012). *Calculating Credit and Debits for Compensatory Mitigation in Wetlands of Western Washington, Final Report* (Nos. 10-06–011). Washington State Department of Ecology.

US Army Corps of Engineers Seattle District, WA Dept. of Ecology, & WA DNR. (2012). *Interagency Regulatory Guide: Advance Permittee-Responsible Mitigation* (Nos. 12-06–015). Washington State Department of Ecology. https://apps.ecology.wa.gov/publications/documents/1206015.pdf

WA Dept. of Ecology. (1992). *Wetlands Buffers: Use and Effectiveness Appendices* (Nos. 92–10a). Washington State Department of Ecology. https://apps.ecology.wa.gov/publications/documents/9210a.pdf

WA Dept. of Ecology. (2018). *Guidance on Widths of Buffers and RAtios for Compensatory Mitigation for Use with the Western Washington Rating System* [05-06-008]. Washington State Department of Ecology. https://apps.ecology.wa.gov/publications/parts/0506008part3.pdf

WA Dept. of Ecology. (2022). *Wetland Guidance for Critical Areas Ordinance Updates* (Nos. 22-06–14). Washington State Department of Ecology. https://apps.ecology.wa.gov/publications/documents/2206014.pdf

WA Dept. of Ecology, US Army Corps of Engineers Seattle District, & US EPA. (2006). *Wetland Mitigation in Washington State Part 2: Developing Mitigation Plans* [06-06-011b]. Washington State Department of Ecology.

WA Dept. of Ecology, US Army Corps of Engineers Seattle District, & US EPA. (2021). *Wetland Mitigation in Washington State, Part 1: Agency Policies and Guidance (Version 2)* (Nos. 21-06–003). Washington State Department of Ecology.

Wang, W.-X., & Rainbow, P. S. (2008). Comparative approaches to understand metal bioaccumulation in aquatic animals. *Comparative Biochemistry and Physiology. Toxicology & Pharmacology: CBP*, *148*(4), 315–323. https://doi.org/10.1016/j.cbpc.2008.04.003

Wang, Y., Yin, T., Kelly, B. C., & Gin, K. Y.-H. (2019). Bioaccumulation behaviour of pharmaceuticals and personal care products in a constructed wetland. *Chemosphere*, *222*, 275–285. https://doi.org/10.1016/j.chemosphere.2019.01.116

Weller, C. M., Watzin, M. C., & Wang, D. (1996). Role of wetlands in reducing phosphorus loading to surface water in eight watersheds in the Lake Champlain Basin. *Environmental Management*, *20*(5), 731–739. https://doi.org/10.1007/BF01204144

Xiao, T., Li, P., Fei, W., & Wang, J. (2024). Effects of vegetation roots on the structure and hydraulic properties of soils: A perspective review. *Science of The Total Environment*, *906*, 167524. https://doi.org/10.1016/j.scitotenv.2023.167524

Zhang, D., Gersberg, R. M., Ng, W. J., & Tan, S. K. (2014). Removal of pharmaceuticals and personal care products in aquatic plant-based systems: A review. *Environmental Pollution*, *184*, 620–639. https://doi.org/10.1016/j.envpol.2013.09.009