Technical Memorandum

To:	Mona Davis, Community and Economic Development Director City of Snoqualmie
From:	Jeff Gray, MS, PWS
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Date:	September 18, 2025
Subject:	Best Available Science Review for the 2044 Snoqualmie Comprehensive Plan Update (Environmental Element) and Snoqualmie Municipal Code Chapters 19.12 (Critical Areas) and 15.12 (Flood Hazard Regulations)
Project No.:	Otak 32703.V00

This technical memorandum has been completed as a component of a Best Available Science (BAS) review, to provide a summary of the current BAS recommendations as they pertain to the City of Snoqualmie (City) 2044 Comprehensive Plan Update (Environmental Element) and Chapters 19.12 Critical Areas and 15.12 Flood Hazard Regulations of the City of Snoqualmie's Municipal Code (SMC). A review of BAS for environmentally sensitive areas (i.e., critical areas) is required per the Washington State Growth Management Act [Chapter 36.70A of the Revised Code of Washington (RCW)]. Most recent updates to SMC Critical Areas were passed in 2016 and updates to SMC Flood Hazard Regulations were passed in 2020. The BAS review has been completed to provide recommendations, as applicable, for updates to the 2044 Comprehensive Plan Update and Critical Areas and Flood Hazard Regulations code amendments. Completed versions of the Washington State Department of Commerce's (DOC) Critical Areas Checklist and the Washington Department of Fish and Wildlife's (WDFW) Riparian Management Zone Checklist for Critical Areas Ordinances are attached, including a Crosswalk Matrix itemizing each suggested change.

Best Available Science Review

The City's last update to their critical areas' regulations, passed in 2016, were based on the BAS at that time. Since 2016, the WDFW and the Washington Department of Ecology (Ecology) have released updated guidance based on BAS for management of riparian zones along streams and for wetland mitigation. Riparian ecosystem BAS has been synthesized in *Volume 1: Science Synthesis and Management Implications* (Quinn et al. 2020) that describes how riparian ecosystems and watersheds affect ecological functions and aquatic habitats. *Volume 2: Management Recommendations* (Rentz et al. 2020) provides guidance for cities to protect and restore functioning riparian ecosystems. Healthy functioning riparian ecosystems are fundamental for clean water, productive salmon populations, and climate resilient watersheds. In 2021, Ecology led the preparation of *Wetland Mitigation in Washington State, Part 1: Agency Policies and Guidance (Version 2)* (Ecology et al. 2021) that provides updated guidance on compensatory mitigation according to BAS. All three documents are intended to support local governments in developing consistent policies based on BAS as required under the Growth Management Act. Ecology additionally published *Critical Aquifer Recharge Areas Guidance* (2005, revised March 2021) to help local jurisdictions protect groundwater resources under the Growth Management Act.

Flood Hazard Areas

Twenty-two percent of the City of Snoqualmie is located within the floodway and floodplain of the Snoqualmie River. The City's flood hazard regulations, last updated in 2020, are based on the National Flood Insurance Program (NFIP) and BAS at that time. FEMA regularly updates its mapping (e.g. the Flood Insurance Rate Maps, or FIRMs) and applicable regulations at 44 CFR Part 60 Subpart A – Requirements for Flood Plain Management Regulations. When this occurs, the City must update its flood hazard regulations to remain in conformance with federal rules. Since 2020, there have been no updates to 44 CFR Part 60 Subpart A and the City's code is in compliance with the FEMA regulations. The City identifies frequently flooded areas as defined in the most current FIRMs.

Ecology's critical area ordinance regarding guidance for floodplains encourages local governments to go beyond FEMA minimum requirements for floodplain management including identifying areas that may be impacted by flooding due to climate change or in a future build-out scenario. For example, FEMA's NFIP notes that 40 percent of all flood insurance claims are from outside of mapped floodplains (e.g., high-risk zones) (FEMA 2024). Increased protections are encouraged because FEMA's FIRMs are increasingly unreliable in a changing climate. King County, for example, has requirements that exceed the minimum FEMA requirements, including requiring three feet of freeboard above the 100-year flood elevation in their building code to provide increased protections for property and public safety. The NFIP requires only one foot of freeboard currently. Per Executive Order (EO) #13690, effective September 9, 2024, federal agencies must implement the Federal Flood Risk Management Standard that requires a minimum of two feet of freeboard above the 100-year flood elevation for non-critical facilities, and three feet of freeboard for critical facilities. The two foot of freeboard standard is also required for United States Housing and Urban Development and Federal Housing Administration home loans for new constriction after January 1, 2025. However, EO #13690 was rescinded on January 22, 2025.

The University of Washington's (UW) Climate Mapping for a Resilient Washington webtool was developed to provide data for state and local governments on expected changes to inform planning for climate resilience (UW 2024). Data for King County shows increased total precipitation under different greenhouse gas loading scenarios, including increased storm magnitude, defined as precipitation intensity over time that could result in increased flood events. King County prepared the *Snoqualmie River Hydrologic Study – Evaluation of Flooding Trends and Current Conditions* (2018) that showed an increased flooding frequency and potential increased flood magnitude. The report notes that climate change projections indicate that seasonal flows will shift, higher flows will occur during annual peak floods in winter, higher flows will occur in spring and fall, and lower flows in summer. These projections are consistent with the observed trends in the Snoqualmie River basin.

Additionally, King County prepared the *Snoqualmie River Hydrologic Study – Evaluation of Effects of Snoqualmie Falls Projects on Downstream Flooding* (2016) that showed downstream projects at the Snoqualmie Falls would result in a 1.4-foot drop in the river's 100-year water surface elevation within the City. The USACE's 205 Project completed in 2004 widened the stream channel above Snoqualmie Falls, and Puget Sound Energy's (PSE) Snoqualmie Falls Project completed in 2012 widened the river channel and lowered the weir crest. The projected 1.4-foot decrease provides a factor of safety within the City because FEMA has not updated the FIRM to reflect these changes and the City's flood hazard regulations are based on the NFIP requirements and FEMA maps.

Riparian Ecosystems

According to Quinn et al. (2020) and Rentz et al. (2020), riparian ecosystems are defined as the area that provides full ecological function for bank stability, shade, pollution removal, detrital inputs, recruitment of large woody debris, and wildlife movement. The current term or approach to managing these habitats is to identify them as Riparian Management Zones (RMZ) rather than buffers, as is commonly used in most critical areas ordinances. The preferred term is RMZ because buffer implies undeveloped natural areas that can contribute habitat to riparian functions, whereas RMZ is meant to capture the area capable of providing full functions and is managed to that end.

One of the goals of managing RMZs is the Desired Future Condition (DFC), in which habitat composition and structure is old, structurally complex conifer-dominated forest with large diameter trees, numerous snags and logs, and multi-strata canopies that promote plant diversity. This is used as the benchmark for the DFC in riparian areas. Riparian restoration is also expected to counteract climate change and protect juvenile salmon according to climate change models (Fullerton et al. 2022; Yan et al. 2021). A significant component of implementing the RMZ management concept is to use the site-potential tree height (SPTH) for determining RMZ widths on streams. Tree height refers to the average height of the tallest dominant tree (200 years or older) in which key riparian ecosystem functions are effectively captured. The effectiveness of providing riparian functions decreases as the distance from a stream increases. Designating RMZs based on at least $SPTH_{200}$ is therefore a scientifically supported approach to protecting and managing fully functioning riparian ecosystems, including salmon.

Rentz et al. (2020) describe procedures for delineating RMZs in forested ecosystems (e.g., portions of the City). The inner edge of the RMZ should be based on the active channel as determined by the location of the stream ordinary high water mark (OHWM) following Ecology's OHWM delineation manual (Anderson et al. 2016). The outer edge should be the recommended minimum based on $SPTH_{200}$, vegetation composition, and pollution removal. The minimum RMZ width for pollution removal is 100 feet, which has been documented to remove 80-95% or more of common stream contaminants (e.g., nitrogen, phosphorous, sediment, and most pesticides). The mean $SPTH_{200}$ in western Washington ranges from 100 to 240 feet and is correlated with soil types that support different climax tree species. The greater of the two (e.g., one full $SPTH_{200}$ or the 100-foot pollution removal overlay) should be utilized to determine the regulated RMZ to protect all key riparian functions. WDFW has created the SPTH mapping tool (https://arcg.is/1ueq0a), which includes the extent of the City's jurisdiction and can be used if this approach is to be adopted for regulating riparian ecosystems.

In addition, Quinn et al. (2020) and Rentz et al. (2020) do not distinguish between non-fish bearing and fish-bearing streams. No evidence or scientific literature has been identified that full riparian ecosystem functions along non-fish bearing streams are less important to aquatic ecosystems than full riparian ecosystem functions along fish-bearing streams, due to their connectivity.

Wetland Buffers and Mitigation

Ecology's *Wetland Guidance for Critical Areas Ordinance (CAO) Updates, Western and Eastern Washington* (2022) is informed by best available science and provides a concise and current representation of the many strategies and approaches for managing wetlands. Wetland buffers are necessary to protect wetland functions and values regulated under the Growth Management Act. This guidance document includes buffer width recommendations selected from the middle of the range of buffers suggested in the literature. Specific changes in the update guidance include adjustments to the range of habitat scores based on review of the reference wetland data used to calibrate the Washington wetland rating system.

Ecology's *Wetland Mitigation in Washington State, Part 1: Agency Policies and Guidance (Version 2)* (Ecology et al 2021) provides updated guidance for selecting, designing, and implementing compensatory mitigation based on BAS, to ensure that environmental policies and regulatory requirements are achieved. The updated guidance emphasizes mitigation sequencing, functional assessment tools, determining adequate compensation for lost wetland functions and values, the importance of site selection for habitat connectivity, and long-term sustainability and protection. Guidance on calculating impacts addresses permanent and temporary impacts, short and long-term temporary impacts, indirect impacts, and shading (e.g., habitat conversion).

The goal of any project that impacts wetlands is to achieve "no net loss" of wetland functions and values- a key national and state policy goal since 1989. Determining no net loss is contingent on the amount of compensation required to offset wetland losses and typically requires compensating for both area and functions. Commonly

used methods for evaluating the adequacy of proposed compensation include using Ecology's *Calculating Credits and Debits for Compensatory Mitigation* (Credit-Debit Method) (Hruby 2012) and mitigation ratios.

Comprehensive Plan – Environmental Element (2024 Update)

On February 5, 2024, the City Planning Commission recommended the approval of the visons, goals, and policies for the Environmental Element of the 2044 Snoqualmie Comprehensive Plan. Otak reviewed the City's updated Environmental Element and considers the visions, policies, and goals consistent with BAS for the protection of the City's natural environment. The City is dedicated to working with stakeholders in the Snoqualmie River basin, identifies special consideration for anadromous fisheries, and identifies opportunities for improvement such as low impact development (LID) techniques, retrofitting contaminant loading sources, and restoring historically impacted areas. A significant portion of the City lies within the FEMA-regulated floodplain associated with the Snoqualmie River, and the City pursues strategies to minimize risk and harm to both the natural and built environment through floodplain restoration through development regulations as well as incentives in the federal FEMA program (e.g., purchasing high risk properties along the shoreline).

Findings of Fact

Flood Hazard Regulations / Frequently Flooded Areas

No changes are proposed to the Flood Hazard Regulations (SMC 15.12) and Frequently Flooded Areas (SMC 19.12.150). Increasing the amount of freeboard above the 100-year flood elevation for the lowest floors of residential, commercial, and industrial structures from one foot to two feet would potentially exceed the intent of the additional protection during flood events. King County's 2016 hydrologic study showed a 1.4-foot drop in the river's 100-year water surface elevation within the City that has yet to be incorporated by FEMA in updated flood zone mapping. King County is planning to update the hydrologic model for the Snoqualmie River, which will be used to update the FEMA flood maps and 100-year flood boundaries. King County is planning to submit a Letter of Map Revision (LOMR) to FEMA in 2026 to update the flood maps. The City will reassess the need for additional flood protections in the City code after the FEMA 100-year flood boundaries have been updated and established based on the current conditions.

Wetlands

Minor changes are proposed to SMC 19.12.090 (General provisions) and SMC 19.12.170 regarding functionally isolated wetlands and buffers, wetland buffers based on habitat scores, and compensatory mitigation guidance. The exemption for filling Category IV wetlands less than 1,000 square feet at SMC 19.12.170.E has been deleted because the scientific literature does not support exempting wetlands from regulatory protections based solely on size (Ecology 2022). Wetland buffer widths and compensatory mitigation requirements are based on wetland functions and values using the Washington State Wetlands Rating System rather than size. Functionally isolated wetland buffers separated by legally established roads, impervious surfaces, or structures are proposed to be excluded from critical areas regulations per SMC 19.12.090.B.5. An allowance of 250 square feet of buffer impacts has been provided for single family residences part of approved developments for decks, patios, and appurtenances. Lastly, Ecology's most current mitigation guidance has been added as a requirement for mitigation plan submittals with development applications.

Fish and Wildlife Habitat Conservation Areas and Streams

The City reviewed current BAS for Streams and FWHCAs protected under SMC Chapter 19.12.160 and 19.12.190, respectively. The City found that the most substantive potential code changes would be to SMC 19.12.160 (Streams) from expanding stream buffer widths (e.g., Riparian Management Zones) per WDFW's recommendations catalogued in WDFW's *Volume 1: Science Synthesis and Management Implications* (Quinn et al. 2020) and *Volume 2: Management Recommendations* (Rentz et al. 2020).

The City evaluated the feasibility of implementing increased standard stream buffers based on the 200-year SPTH using WDFW's SPTH200 and RMZ Values mapping tool (https://arcg.is/1ueq0a), which would result in buffer increases on Class 2 (Type F) streams from the current 75 feet to between 105 feet (red alder) and 235 feet (Douglas-fir), and on Class 3 (Type Np) and Class 4 (Type Ns) streams generally from 25 or 50 feet to 100 feet based on water quality protection functions. Type S streams are regulated under the City's Shoreline Regulations at SMC 19.08 and the City's critical areas code (SMC 19.12), and changes to these buffers were not evaluated for compliance with the Growth Management Act. The City's assessment identified additional stream protections on upper reaches of Class 2, 3, and 4 streams from implementing wider buffers, mainly occurring on protected tract lands and designated open spaces.

Regulatory and policy challenges to implementing buffer widths based on WDFW's mapping tool within city limits were identified. For example, on abutting properties parallel to Coal Creek, one parcel would have a 105-foot buffer and the adjacent parcel on the same stream would have a 235-foot buffer. Implementing strict use of WDFW's mapping tool with this level of variation on property encumbrances on adjacent parcels would be challenging to implement and communicate to applicants. Therefore, the City proposes to implement the new buffer widths using an averaged buffer approach for consistency and reduce uncertainty in development applications. Class 2 (Type F) streams are proposed to have 200-foot buffers, and Class 3 (Type Np) and Class 4 (Type Ns) streams are proposed to have 100-foot buffers for water quality protection.

Limitations of implementing wider stream buffers in developed areas were also identified. Similar to the wetlands code update, functionally isolated stream buffers separated by legally established roads, impervious surfaces, or structures are proposed to be excluded from critical areas regulations per SMC 19.12.090.B.5. An allowance of 250 square feet of buffer impacts has been provided for single family residences part of approved developments for decks, patios, and appurtenances.

Municipal Code Amendments – Recommended Updates

Based on the review of BAS for critical areas, recommended municipal code amendments are described in the attached Crosswalk Matrix. Completed versions of the Washington State Department of Commerce's (DOC) Critical Areas Checklist and the WDFW-completed Riparian Management Zone Checklist for Critical Areas Ordinances are both attached.

Attachments:

1) Washington State Department of Commerce's Critical Areas Checklist
2) WDFW Riparian Management Zone Checklist for Critical Areas Ordinances
3) Crosswalk Matrix

References

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