Final

CITY OF EDMONDS CRITICAL AREAS ORDINANCE UPDATE

Best Available Science Addendum

Prepared for
City of Edmonds

March 16, 2015

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INTRODUCTION

The City of Edmonds (City) is in the process of updating its Comprehensive Plan and Critical Areas Ordinance (CAO) in accordance with the requirements of the Growth Management Act (GMA) (RCW 36.70A). The CAO is adopted into the Edmonds Community Development Code (ECDC) within Title 23 (Natural Resources), sections ECC 23.40 thru 23.90. The GMA requires the use of best available science (BAS) in the development of critical areas policies and regulations. This report reviews the existing CAO, additions to BAS and regulatory changes since the last update, and recent changes to the Edmonds setting in the context of updates to BAS since 2004.

Purpose

The purpose of this addendum report is to provide technical information to City staff regarding the efficacy of the City's current critical areas protection measures, and to provide recommendations for CAO updates that improve consistency with BAS.

Background

In 2005, the City reviewed the BAS and updated the CAO to comply with the GMA. The 2005 update to the CAO was comprehensive, with BAS documented in *The City of Edmonds 2004 Best Available Science Report* (EDAW, 2004). This Report is provided as an addendum to the City's 2004 BAS Report. Current assessment of BAS is focused on considerations and changes for critical areas protection that have emerged from recent regulatory agency guidance, regional and local studies, or other scientific information since 2004.

More recently, the City has been completing a comprehensive update to its Shoreline Master Program (SMP); approval of the updated SMP is anticipated in 2015 (City of Edmonds 2014; Lien 2014). The Planning Board Recommended Draft SMP (updated SMP) will integrate the majority of the City's CAO protections. This integrated SMP requires a shoreline variance process for specific provisions (providing allowances for buffer reduction and other activities) related to wetlands, geologically hazardous areas, and FWHCA where they occur within shoreline jurisdiction, and excludes other provisions of the CAO related to reasonable economic use, exemptions, variances. Additionally, an alternative regulatory approach for wetlands, applicable to wetland ratings, buffer widths, mitigation ratios, and other standards, is proposed within the SMP in order to improve consistency with new BAS and guidelines from Ecology and the Corps (see Section 24.40.020 of the updated SMP for specifics). Many of the same changes are provided as recommendations for the City-wide CAO update within this BAS Addendum report.

The City expects the current CAO update to be relatively limited in scope, with the majority of the focus on provisions relating to wetlands, existing development within buffers, upland vegetation in larger tracts, and tree protection within critical areas and buffers.

Updates to City of Edmonds Setting

Since 2004, the City of Edmonds has seen relatively low population growth, with 39,709 residents according to the 2010 US census and an estimated 40,727 residents as of 2013 (approximately 340 new residents per year, less than 1 percent annually). This estimated growth in the last four years is actually a slight increase from very low population change between 2000 and 2010, during which time the City added approximately 200 residents. Over the same ten year period, the City added approximately 850 housing units, close to a 5% increase (2000 and 2010 US Censuses). The majority of these units were added as part of the Point Edwards development which occurred at an abandoned oil tank farm site on the

western edge of the City. The relatively steady residential population is consistent with the largely built-out character of land use across the City.

Outside of completion of the multifamily development at Point Edwards (development was occurring at the time of the last CAO update, and was permitted before the existing CAO was adopted), no major development activities affecting critical areas within the City has occurred since the last CAO update. Development adjacent to critical areas has occurred primarily as redevelopment and additions on existing single-family residential lots. This pattern is anticipated to continue into the future.

The City has not annexed any new areas since 1999.

METHODS

According to the Growth Management Act (RCW 36.70A), Washington's counties and cities are required to continually review, evaluate, and update comprehensive land use plans and development regulations using BAS, with the intent of identifying, designating and protecting critical areas and giving special consideration to anadromous fisheries. Critical areas include the following elements: wetlands, critical aquifer recharge areas, fish and wildlife habitat conservation areas, frequently flooded areas, and geologically hazardous areas (RCW 36.70A.030). There are no critical aquifer recharge areas within Edmonds and thus are not discussed below.

BAS is defined as scientific information about critical areas, prepared by local, tribal, state, or federal natural resource agencies, or qualified scientific professionals that is consistent with the following criteria:

- Scientific information is produced through a valid scientific process that includes:
    - Peer review,
    - A discussion of methods used to gather information,
    - Logical conclusions,
    - Data analysis,
    - Information used in the appropriate context, and
    - References of literature and other sources of information used.
- Scientific information is obtained through a common source such as:
    - Research,
    - Monitoring,
    - Inventory,
    - Survey,
    - Modeling,
    - Assessment,
    - Synthesis, or
    - Expert opinion.

In the context of critical areas protection, a scientific process is one that produces reliable information useful in understanding the consequences of regulatory decisions, and in developing critical areas policies and regulations that are effective in protecting the functions and values of critical areas.

Non-scientific information can supplement, but it is not an adequate substitute for valid and available scientific information. Common sources of non-scientific information include: anecdotal information; non-expert opinion; and hearsay.

This addendum relies upon several regulatory guidance and BAS documents pertaining to critical areas. Current examples of regulatory language pertaining to critical areas can be found in *Critical Areas Assistance Handbook: Protecting Critical Areas Within the Framework of the Washington Growth Management Act* (CTED, 2007). BAS documents specific to each critical area are discussed in the following sections.

ESA reviewed the City's CAO for consistency with the current scientific literature and applicable regulatory agency guidance. For provisions specific to geologic hazards, The Stratum Group provided technical review as a subconsultant to ESA. The ESA team also reviewed recently updated critical area codes from other neighboring jurisdictions and recommended changes that would help Edmonds achieve greater consistency with current standards and practices. Our recommendations also reflect our professional judgment and experience assisting numerous cities and counties with code interpretation and administration.

To organize our review and recommendations, we created a matrix (attached to this memo) documenting consistency between CAO provisions and GMA regulations, relevant agency guidance and BAS published since 2004.

WETLANDS

Wetlands are specifically identified for protection as a critical area by the Growth Management Act (WAC 365-190-080[3]). The current CAO provides standards for protection of wetlands in ECDC Chapter 23.50. This section summarizes new scientific literature and regional policy concerning wetlands protection and management, provides an assessment of current CAO provisions, and summarizes recommendations for updates to ensure consistency with BAS.

Updates to Scientific Literature

In general, the latest documents in the record pertaining to wetlands have been prepared by state and federal agencies. Since the City's last major CAO update, new scientific findings have been published describing methods for assessing wetlands on a watershed-based and landscape-scale, alternative mitigation strategies (mitigation banking and in-lieu fee programs), improving the success of compensatory mitigation, and buffer effectiveness. For example, the Washington Department of Ecology (Ecology) and Washington Department of Fish and Wildlife (WDFW) released a two-volume BAS document that is still the primary source of new information for wetland management: *Wetlands in Washington State – Vol. 1 A Synthesis of the Science* (Sheldon et al. 2005) and *Vol. 2 Guidance for Protecting and Managing Wetlands* (Granger et al. 2005).

<u>Wetland Model Code</u>

The wetland model code found in the *Critical Areas Assistance Handbook: Protecting Critical Areas Within the Framework of the Washington Growth Management Act* (CTED, 2007) was updated in 2012 and can be found in *Wetlands and CAO Updates: Guidance for Small Cities, Western Washington Version* (Bunten et al., 2012). This model code offers example language that reflects many of the updates to BAS described in this section.

Wetland Delineation and Rating

In 2010, the U.S. Army Corps of Engineers released the *Regional Supplement to the Corps of Engineers Wetland Delineation Manual: Western Mountains, Valleys, and Coasts* (Corps, 2010). The regional supplement updates portions of the 1987 Corps' Wetland Delineation Manual and provides additional technical guidance and updated procedures for identifying and delineating wetlands. State law requiring the *Washington State Wetlands Identification and Delineation Manual* (Ecology, 1997) was repealed in 2011, and the state manual is no longer required or supported by Ecology. The Regional Supplement is now required by state law (WAC 173-22-035).

Ecology released an update to their wetland rating system, *the Washington State Wetland Rating System for Western Washington: 2014 Update* (Hruby, 2014), that goes into effect January 2015. Most of the material in the 2014 updated manual remains the same as that in the 2004 manual. The updated wetland rating manual includes a new scoring range (i.e., between 9 and 27 under the updated manual versus 1 to 100 in the 2004 manual) that is based on a qualitative scale of functions from high, medium, or low. The new approach to scoring wetland functions on a high, medium, or low scale is more scientifically supportable (Hruby, 2014). The 2014 updated manual also includes new sections for assessing a wetland's potential to provide functions and values on a landscape-scale.

Alternative Mitigation

One of the most significant changes in BAS since Edmonds last code update involves alternative mitigation strategies. According to the National Research Council, compensatory mitigation implemented in the past, particularly on-site mitigation installed by the permittee, has frequently been unsuccessful and has not achieved the national policy of "no net loss" of wetland area and functions (NRC, 2001). Traditionally, permit applicants have constructed mitigation projects to compensate for effects to aquatic resources (e.g., wetlands, streams, marine waters) with limited oversight and enforcement of mitigation requirements. This type of mitigation is referred to as "permittee-responsible" mitigation. Additionally, alternative forms of mitigation, such as mitigation banks and in-lieu fee (ILF) programs, and advance mitigation were not established uniformly across the country, or within individual states, and there were numerous cases where alternative mitigation programs were operated unsuccessfully.

To address these mitigation deficiencies, in early 2008 the US Army Corps of Engineers (Corps) and Environmental Protection Agency (EPA) released revised regulations governing compensatory mitigation for authorized impacts to waters of the US, including wetlands. The Federal Rule, formally known as the Compensatory Mitigation for losses of Aquatic Resources; Final Rule, lays out criteria and performance standards designed to improve the success and quality of mitigation activities (Corps, 2008).

The Federal Rule emphasizes a watershed approach to mitigation as part of the planning, implementation, and management of mitigation projects. A watershed approach is an analytical process for making compensatory mitigation decisions that support the sustainability or improvement of aquatic resources in a watershed; it involves consideration of watershed needs, and how locations and types of compensatory mitigation projects address those needs.

Alternatives to permittee-responsible mitigation are increasingly implemented within Washington State and around the country to compensate for authorized effects to aquatic resources. Common forms of alternative mitigation include:

- Mitigation Banks— restoring, establishing, enhancing, and/or preserving aquatic resources through funds paid to a public or private Sponsor to satisfy compensatory mitigation requirements

for Corps permits. At banks, the Sponsor has already secured a mitigation site and initiated mitigation activities before fees are accepted. Typically, mitigation banks exist at one location and the Corps does not have authority over bank expenditures.

- In-Lieu Fee (ILF) Programs—restoring, establishing, enhanceing, and/or preserving aquatic resources through funds paid to a governmental or non-profit natural resources management entity to satisfy compensatory mitigation requirements for Corps permits. In-lieu fee programs accept mitigation fees before securing and implementing projects. These programs implement mitigation at multiple sites as funds become available and after the Corps approves project funding.
- Consolidated Off-site Mitigation— restorating, establishing, enhancing, and/or preserving aquatic resources through funds paid to a public or private entity Sponsor. Mitigation typically occurs at a single location in a phased approach; as compensatory mitigation fees are paid to the public or private entity by permit applicants, portions of the mitigation site are constructed.
- Advance Mitigation— restorting, establishing, enhancing, and/or preserving of aquatic resources, undertaken by public or private permit applicants in advance of permitted impacts. This type of mitigation is considered permittee-responsible compensatory mitigation because only the permit applicant who implements the advance mitigation may use it to satisfy their compensatory mitigation obligations.

Alternative forms of mitigation do not change the requirements for permit applicants to adhere to "mitigation sequencing" required by regulatory agencies. These are step-wise requirements under federal and state laws that mandate permit applicants to demonstrate that avoidance and minimization measures have been taken before the remaining aquatic resource effects are determined unavoidable. Avoidance and minimization measures occur during project design and are intended to avoid and reduce a project's effects prior to construction. Once a determination is made that project effects are unavoidable, compensatory mitigation is required.

In the Federal Rule, the Corps outlined a mitigation hierarchy, preferring mitigation banks over ILF programs and ILF programs over permittee-responsible mitigation.

<u>Compensatory Mitigation</u>

Where compensatory mitigation (permittee-responsible) is the best option for mitigating wetland impacts, recent guidance has been developed to improve mitigation success. Ecology, in coordination with the U.S. Army Corps of Engineers (Corps) and the U.S. Environmental Protection Agency (EPA), developed a two-part guidance document intended to improve the quality, consistency, and effectiveness of compensatory mitigation in Washington State.

Part 1 of the document, *Wetland Mitigation in Washington State—Part 1: Agency Policies and Guidance* (Ecology Publication #06-06-011a, March 2006a), provides regulatory background and outlines information that regulatory agencies use. Some of this information has been superseded by recent guidance discussed in the Alternative Mitigation section; however, wetland mitigation ratios listed in this document are the basis for many local jurisdictions' mitigation requirements. Part 2 of the document, *Wetland Mitigation in Washington State—Part 2: Developing Mitigation Plans* (Ecology Publication #06-06-011b, March 2006b) provides specific technical guidance on developing a compensatory wetland mitigation plan.

As an alternative to using mitigation ratios, Ecology developed *Calculating Credits and Debits for Compensatory Mitigation in Wetlands of Western Washington* (Hruby, 2012) for estimating whether a

project's compensatory mitigation plan adequately replaces lost wetland functions and values . Termed the "Credit-Debit Method," this manual uses a functions and values-based approach to score functions lost at the project site (i.e., "debits") compared to functions gained at a mitigation site (i.e., "credits"). A mitigation project is considered successful when the "credit" score for a compensatory mitigation project is higher than the "debit" score. Based on our local experience, the Corps and Ecology are increasingly relying on the Credit-Debit Method instead of mitigation ratios alone.

Buffer Effectiveness

In 2005, Ecology and WDFW released *Wetlands in Washington State – Vol. 1 A Synthesis of the Science* (Sheldon et al. 2005) that synthesized literature related to wetland buffers and buffer effectiveness. In 2013, the Department of Ecology updated the 2005 synthesis with a literature review of scientific documents published between 2003 and 2012, titled *Update on Wetland Buffers: The State of the Science, Final Report* (Hruby, 2013).

The updated buffer synthesis confirmed that buffers perform an important water quality function by trapping pollutants before they reach a wetland. Generally, the wider the buffer, the more effective it may be at protecting water quality; however, recent research reveals that several other factors contribute to the effectiveness of water quality functions (e.g., slope, type of vegetation, surface roughness, soil properties, type and concentration of pollutants, etc.). Specifying only the width of a buffer as a means for protecting water quality functions can be complicated and may not address these other factors (Hruby, 2013). With respect to protecting habitat quality, research in the past decade reveals that larger buffers are needed to protect wetland-dependent species, which may require larger areas of relatively undisturbed uplands for survival (Hruby, 2013).

Ecology's model code outlines a combined fixed-with and variable-width approach to wetland buffers, with a minimum buffer prescribed based on a wetland's category and an additional buffer based on increasing habitat points (Bunten et al., 2012; Table XX.1 revised December 2014). For reductions to a standard buffer width, an applicant should demonstrate that a smaller buffer will protect wetland functions and values, with additional mitigation measures applied where needed to support "no net loss" of those functions and values (Granger et al., 2005). In highly developed communities, such as Edmonds, standard buffer widths may be difficult to achieve. As noted in the 2004 BAS Report, many wetland and stream buffers extend into residential yards that have been previously developed and likely provide limited function in terms of wetland protection. Furthermore, some buffers are substantially developed and contain impervious surfaces, commercial or residential buildings. While not explicitly stated in BAS and buffer guidance documents, a scientific judgment of these areas would conclude they do not provide the same function and values as a vegetated or undeveloped buffer due to the physical separation. Ecology's model code (Table XX.2) outlines required mitigation measures that can be used to protect wetlands (Bunten et al., 2012). The model code recommends that standard buffers should not be reduced below 25 percent of the standard buffer with mitigation measures (Bunten et al., 2012). Granger et al. (2005) notes that for some situations where the buffer is composed of non-native vegetation, and therefore providing limited functions and values, simply applying a fixed width buffer may fail to provide the necessary characteristics to protect a wetland's functions. In these cases, it can be better to restore the buffer through enhancement activities.

Other Sources of Information

Other scientific sources have also generated relevant information, which we reviewed and have referenced in the gap analysis matrix and in the references section of this report.

Assessment of Current Wetland Provisions and Summary of Code Recommendations

The wetlands section of the CAO needs to be updated in a few key areas to improve its consistency with BAS and current agency guidelines, as detailed in the attached matrix. A summary of key recommendations follows:

- Update references to newer manuals (e.g., Corps Regional Supplement and the updated Wetland Rating Manual).
- Update buffer widths to reflect those recommended in Ecology's "Table XX.1" and in the City's draft SMP. Note that Table XX.1 was revised in December 2014 to reflect the new scoring system used in the 2014 updated Wetland Rating Manual.
- Prioritize buffer averaging with enhancement over buffer reductions with enhancement: Buffer averaging results in the same amount of buffer area, while buffer reductions result in a net loss of area.
- Update provisions for buffer reductions with enhancement or for buffer averaging to be no greater than 25 percent of the standard buffer width and include the list of mitigation measures from Ecology's Table "XX.2" (Bunten et al., 2012) to further protect wetlands. Where additions to legally constructed structures will occur beyond the 25 percent reduction in the standard buffer (Section 23.50.040.H), a development footprint threshold and buffer mitigation measures (e.g., enhancement plan and elements from Table XX.2) should be required for consistency with BAS and "no net loss."
- Include provisions to address for physically separated and functionally isolated buffers and development within the previously developed footprint to be consistent with the City's draft SMP.
- Update wetland mitigation requirements to reflect BAS regarding wetland mitigation guidance (e.g., compensatory mitigation technical guidance, watershed-based documents, and the Credit-Debit Method) and the mitigation preference sequence (federal- and state-approved mitigation banks, in lieu fee programs, then compensatory mitigation).

FREQUENTLY FLOODED AREAS

Frequently flooded areas are specifically identified for protection as a critical area by GMA (WAC 365-190-110). The current CAO provides standards for protection of frequently flooded areas in ECDC Chapter 23.70, which includes standards for identification, reporting, and protection of floodplains, and additionally references floodplain standards for new development and structures within the International Building Code (IBC) and International Residential Code (IRC), both adopted by reference in ECDC Title 19. In addition, the updated SMP includes flood hazard reduction regulations (proposed ECDC 24.40.030) that were not in effect at the time of the last CAO update (City of Edmonds 2014).

This section summarizes new scientific literature and regional policy concerning frequently flooded areas protection and management that has emerged in the last 10 years, provides an assessment of current CAO provisions, and summarizes recommendations for updates to ensure consistency with BAS.

Updates to Scientific Literature

There is relatively little area of floodplain within Edmonds. For this reason, as noted within the 2004 BAS, little emphasis is placed on frequently flooded areas. The currently effective FIRM for the City (revised and effective on January 30, 1998) remains consistent with floodplain mapping that was available during the 2004 BAS review; however, in November 2014 the Federal Emergency Management Agency (FEMA) released draft flood zone maps that include coastal floodplains subject to inundation by the 1-percent-annual-chance flood event.

The 2004 BAS notes several City documents that detail areas of potential flooding outside of the flood zones depicted on FIRMs. The 2003 Stormwater Comprehensive Plan (City of Edmonds 2003b) was updated by the 2010 Storm and Surface Water Management Comprehensive Plan (City of Edmonds 2010). Chapter 3 of the 2010 Plan details flooding issues in the City, including discussion of flooding associated with increased impervious surfaces and runoff during storm events, and site-specific problems. Many of the site-specific problems are associated with undersized and/or failing stormwater infrastructure that results in flooding issues. Some site-specific problems (and proposed capital improvement solutions) are located within FIRM flood zones (Edmonds Marsh, Perrinville Creek at Talbot Road, Lake Ballinger); however many others are located outside of flood zone mapping (for example, high priority flood protection projects within the Southwest Edmonds Basin).

The 2004 BAS discussed frequently flooded areas chiefly from the perspective of flood effects on human health, safety, and property, and the effects of human activities on flooding. Floodplains perform a variety of beneficial functions including providing for natural flood and erosion control, water quality maintenance, groundwater recharge, biological productivity, fish and wildlife habitat (Steiger et al. 2005), production and of wild and cultivated products, recreational opportunities, and areas for scientific study and outdoor recreation (Kusler 2011). Floodplains typically contain several major types of habitats including aquatic, riparian, wetland, and upland habitat.

Recent BAS and regional guidance for protection of ecological functions within a floodplain emphasizes the importance of other critical areas (including wetlands, streams, riparian areas, and FWHCAs) within floodplains, and emphasizes the importance of protection of these critical areas (PSP 2010; NMFS 2009). Guidance highlights the importance of other critical areas provisions in ensuring that floodplain ecological functions are protected into the future. Due to a 2009 Biological Opinion by the National Marine Fisheries Service (NMFS) regarding protection Endangered Species Act listed salmonid species from the effects of floodplain development activities, assessment of floodplain habitat impacts and new standards for protection are now required for NFIP participating communities (NMFS 2009; FEMA 2013).

<u>Climate Change and Frequently Flooded Areas in Edmonds</u>

A recent review of the effects of climate change (ISAB 2007) identified the following probable consequences of global warming along the Pacific coast of North America, as relevant to Edmonds:

- Sea level rise will shift coastal beaches inland and increase erosion of unstable bluffs (Huppert et al. 2009)
- Urban stormwater infrastructure - regional climate model simulations generally predict increases in extreme high precipitation over the next half-century; existing drainage infrastructure designed using mid-20th century rainfall records is anticipated to reach capacity and result in urban flooding more frequently (Rosenberg et al. 2009).

Both of these consequences suggest that hazards associated with both coastal and urban flooding could increase in the decades ahead. Management of frequently flooded areas provides an opportunity for the City to anticipate increased flood hazards related to climate change and provide standards to further minimize future risks.

Assessment of Current Frequently Flooded Areas Provisions and Summary of Code Recommendations

Current frequently flooded areas provisions remain generally consistent with minimum guidelines provided by FEMA for NFIP communities and Washington State (WACs 173 and 365). ECDC includes provisions that ensure adequate reporting of development activities within frequently flooded areas, including standards to ensure that areas important to floodplain habitat functions (wetlands, streams, and other critical areas) are documented where they occur within floodplains. The updated SMP, which includes almost all floodplain areas (both along the City's Puget Sound shoreline and along Lake Ballinger), includes proposed standards that restrict development and redevelopment from occurring where it would require structural flood hazard reduction measures. Furthermore, the updated SMP only permits structural flood control works when necessary to protect health/safety or existing development, and only when documented that permitted facilities would not result in a net loss of ecological functions.

ECDC Chapter 23.70 primarily relies on reference to the IBC and IRC, as adopted by reference in ECDC Title 19. The IBC and IRC include flood hazard protections (IBC Section 1612 Flood Loads and IBC Appendix G Flood Resistant Construction). While these adopted by reference standards are consistent with minimum requirements for NFIP communities, most other Western Washington communities adopt their own flood hazard regulations. Including flood damage prevention standards directly within the City's Development Code would make requirements more readily apparent and may improve compliance for future floodplain development.

ECDC Title 19 building code requires that the lowest living space in a residential structure be at or above the Base Flood Elevation (BFE) (1% chance flood zone). This meets the minimum standards of the NFIP, but FEMA recommends and many communities have adopted higher standards – either 1 or 2 feet above the BFE. It has become a widely accepted policy to require at least a 1-foot above BFE for residential structures to reduce their potential loss or damage from flooding.

While the majority of the City's floodplain occurs along the marine shoreline of Puget Sound, the frequently flooded areas also extend along the shorelines of Lake Ballinger. In this area, recent BAS and guidance highlighting the importance of requiring compensatory floodplain storage is relevant (Steiger et al. 2005, FEMA 2013). Lake Ballinger, as well as upstream reaches of Hall Creek and downstream reaches of McAleer Creek have known flooding issues (Otak et al. 2009). For the Lake Ballinger floodplain, the City should consider amending ECDC Chapter 23.70 to require compensatory storage for new floodplain development.

Additionally, current frequently flooded areas provisions (either as adopted by reference or as proposed within the updated SMP) do not include any higher standards that would greatly reduce flood risks within coastal floodplains (Coastal A zones and V zones). The risks associated with wave run-up and impact forces within coastal floodplains are significant. A number of recommendations for additional flood hazard reduction are provided within the attached Matrix.

GEOLOGICALLY HAZARDOUS AREAS

Geologically hazardous areas are specifically identified as a critical area by GMA (WAC 365-190-120). Three geologic hazard areas are located in Edmonds: 1) erosion hazard areas, 2) landslide hazard areas, and 3) seismic hazard areas. The current CAO provides standards for protection of safety of citizens from geologically hazardous areas in ECDC Chapter 23.80, which includes standards for identification, report requirements for geologic hazard areas, and development and mitigation standards for geologically hazardous areas

The 2004 BAS Report states that the risk from geological hazards "can often be significantly mitigated through engineering, design, and/or modified construction and development techniques." While some geology hazards may be reduced through engineered mitigation measures, it is also important to emphasize that where possible geological hazardous areas should be avoided by locating structures outside of potential hazard areas. When mitigation alternatives cannot viably reduce risks to human health and safety to acceptable levels, building in geologically hazardous should not be permitted.

In addition to CAO standards for geologically hazardous areas, as last comprehensively updated in 2004, the City developed and implemented standards for development activities within "designated earth subsidence and landslide hazard areas" of the City in ECDC Chapter 19.10 (Building Permits – Earth Subsidence and Landslide Hazard Areas). These standards, which were adopted in 2007 and last amended in 2013, were developed primarily to address risks associated with a specific landslide hazard area in Edmonds, the Meadowdale Landslide.

This section summarizes new scientific literature and regional policy concerning geologically hazardous areas that has emerged in the last 10 years, provides an assessment of current CAO provisions (including considerations for integration with ECDC Chapter 19.10), and summarizes recommendations for updates to ensure consistency with BAS and risk management policies.

Updates to Scientific Literature

The two most noteworthy new science additions applicable to Edmonds are the North Edmonds Earth Subsidence and Landslide Area Summary Report (Landau, 2007) and the availability of LiDAR (light detection and ranging) imagery. The Meadowdale Landslide summarized in the Landau (2007) summary is a large, deep-seated landslide that is called out in the existing CAO but has specific regulations for that hazard area in Chapter 19.10 EDC. The LiDAR data should provide a clearer means of identifying potential landslide hazard areas as steep slopes potentially subject to landslides can be readily identified.

Ongoing seismic research has better characterized fault zones to the north and south of the Edmonds, the South Whidbey Fault Zone and the Seattle Fault Zone (Kelsey et al. 2004a; Kelsey and Sherrod, 2004b; Liberty and Pape, 2006; Liberty and Pape, 2013). Edmonds is located approximately mid-way between these two identified fault zones. The United States Geologic Society (2014) has updated seismic hazard maps for the area and shows similar peak ground acceleration risk as previous mapping in 2008 and 2002. Walsh and others (2014) have modeled potential tsunami hazards associated with a maximum credible seismic event on the Seattle Fault and found wave amplitudes in the Edmonds area to be approximately 4.5 feet. Modeling of seismic induced landsliding associated with the Seattle Fault (Allstadt and Vidale, 2012) suggests many landslides would be triggered and these effects will be of significant consequence.

While not new science, communities throughout Washington State have been grappling with best practices for addressing geologically hazardous areas. Some additional languages and changes have been added to the BAS to reflect lessons learned elsewhere. Washington State Department of Licensing Guidelines for Preparing Engineering Geology Reports in Washington (2006) provides reference

guidance for preparation of geologic reports that can be utilized for simplifying code language regarding geology hazard reports.

Assessment of Current Geologically Hazardous Areas Provisions and Summary of Code Recommendations

In general, the City currently regulates geologically hazardous areas in accordance with BAS, CTED and DOE guidance, and consistent with updated provisions adopted by similar and/or neighboring Western Washington jurisdictions. However, the current Edmonds CAO pertaining to geologically hazardous areas does not include a full listing of potential landslide areas that should be evaluated per WAC guidance language. The code should be updated to capture the range of potential landslide hazards as provided in the WAC guidance. Utilizing the language in the WAC guidance for slopes greater than 40% will eliminate confusion regarding measurement of slope break. The code should be updated to define slopes greater than 40% as potential landslide hazard areas regardless of toe and top of slope. That is if a 40% slope is present that is at least 10 feet high it will be considered a potential landslide area.

Potential geologic hazardous areas should be treated as potential hazards that require further assessment to determine if in fact the site is a geologic hazardous area. That determination should be made by a geologist. The code should be clarified to reflect that the specific areas considered as potential landslide and erosion hazard areas that should be reviewed by a qualified geologist to determine if they are a landslide or erosion hazard, and if they area what actions should be taken.

The current code provides a lengthy description of what should be included in geology and geotechnical reports but is not clear in what is required. A flow chart in the existing CAO suggests a clear path of types of reports and content. The CAO language should better reflect the flow chart which is consistent with the best available science and guidance and clarifies report requirements with the goal of establishing clear reports that assess the geologic hazards and mitigation as applicable.

Standard buffers should no longer be used. Buffers and setbacks should be determined by a geologist specific for the site. Additionally, clarity on the setback criteria should be added so that structures will not be at risk for the life of the structure (120 years) and that in evaluation of the geologic hazard there is a determination that there will be no on- or off-site increase in risk of erosion or landslides.

The Meadowdale Landslide area is covered in a separate code section in 19.10 and is referenced within the CAO. The Meadowdale Landslide is a deep-seated landslide and policy for development and/or denial of development is established within EDC 19.10. EDC 19.10 allows for development in an area where there is a known geologic hazard. For consistency the CAO should treat this particular landslide hazard differently than other landslide and erosion hazard areas. EDC 19.10 should be modified to better reflect the specific zone recommendations presented in Table 1 of the Landau report and each zone should be treated somewhat differently as the risks vary from zone to zone.

FISH AND WILDLIFE HABITAT CONSERVATION AREAS

Fish and wildlife habitat conservation areas are specifically identified for protection as a critical area by the Growth Management Act (WAC 365-190-080[3]). The current CAO provides standards for protection of fish and wildlife habitat conservation areas in ECDC Chapter 23.90. This section summarizes new scientific literature and regional policy concerning wetlands protection and management, provides an assessment of current CAO provisions, and summarizes recommendations for updates to ensure consistency with BAS.

Updates to Scientific Literature

The latest documents in the record pertaining to fish and wildlife habitat conservation areas have been prepared predominantly by state, federal, and tribal agencies. Much of this science is related to protecting salmon and fisheries habitat. For example, in 2009, WDFW published Land Use Planning for Salmon, Steelhead and Trout: A Land Use Planner's Guide to Salmonid Habitat Protection and Recovery as part of an initiative to integrate local planning programs with salmon recovery efforts (Knight, 2009). Other documents are related to managing biodiversity and habitat quality with urban development. In 2009, WDFW also published *Landscape Planning for Washington's Wildlife: Managing for Biodiversity in Developing Areas*, which provides guidance for wildlife issues related to rural and urban residential development.

Ecology has published guidance on minimum riparian buffer widths for implementing riparian restoration or planting projects that use water quality-related state and federal pass-through grants or loans (Appendix L *in* Ecology, 2013). The buffer widths are recommended by the NMFS to help protect and recover Washington's salmon populations. NMFS recommends a 100-foot minimum buffer for surface waters that are currently or historically have been accessed by anadromous or listed fish species and a 50-foot buffer for surfaces that do not have current or historic access.

<u>Fish and Wildlife Habitat Conservation Areas Model Code</u>

The model code found in the *Critical Areas Assistance Handbook: Protecting Critical Areas Within the Framework of the Washington Growth Management Act* (CTED, 2007) is the most recent related to fish and wildlife habitat conservations areas; however, portions of *Wetlands and CAO Updates: Guidance for Small Cities, Western Washington Version* (Bunten et al., 2012) are applicable or were referenced for code consistency.

<u>Buffer Effectiveness</u>

When discussing BAS for buffers and buffer effectiveness for fish and wildlife habitat conservation areas, one must distinguish between stream/riparian buffers (those areas providing functions related to fish habitat and stream processes) and habitat buffers (areas including riparian buffers and the terrestrial areas adjacent to them which provide wildlife functions for a variety of species). Recommendations for stream buffers have remained relatively similar since the City's last CAO update, with recommended buffer widths varying from 75 feet to well over 300 feet to protect a suite of ecological functions (Brennan et al., 2009; May, 2003; Knutson and Naef, 1997). As mentioned previously with regard to wetland buffers, achieving these recommended widths in the highly developed landscape of Edmonds may be difficult to achieve. Some stream/riparian buffers include commercial or residential buildings with actively maintained landscapes or impervious surface. These areas provide limited functions in comparison to fully vegetated buffers. In these cases, enhancement activities of the existing buffer width may be more effective in improving the functions and values of the stream/riparian buffer than simply increasing the buffer width (Granger et al. 2005).

Much of the recent scientific research regarding buffer effectiveness and habitat quality is related specifically to wetlands and wetland-dependent species, and is summarized in *Update on Wetland Buffers: The State of the Science, Final Report* (Hruby, 2013). Although this synthesis of the science is directly related to wetlands and wetland-dependent species, these species may also use riparian buffers for travel or life processes.
Research indicates that uplands surrounding wetlands and streams can serve as critical habitat for some species, a concept that expands the notion of a buffer beyond simply protecting wetland and riparian

functions to protecting aquatic-dependent species (Hruby, 2013; Semlitsch and Jensen, 2001). Several literature sources have suggested that these terrestrial areas adjacent to wetlands and streams be termed "core habitat." Studies on wetland-dependent species report that core habitat needs to extend between 1,000 feet to 0.6 mile from the wetland edge to be effective in supporting population survival; however, there is little information on how much connectivity is needed between a critical area and core habitat (Hruby, 2013). Research indicates that stream/riparian buffers alone will not be enough to protect certain species and that a broader approach to protecting wildlife is needed, especially in areas that are intensely developed (Hruby, 2013; Semlitsch and Jensen, 2001).

Research related to general wildlife habitat connectivity, however, indicates that connectivity is important for species to travel and carry out life processes. Small mammals, amphibians, and reptiles are generally more sensitive to changes and gaps in connectivity compared to larger mammals and birds (WDFW, 2009). Areas with less than 50 percent undisturbed land cover (i.e., developed urban environments) need assistance to ensure that habitat connectivity is maintained (WDFW, 2009). In addition to using local critical areas inventory information and Priority Habitats and Species (PHS) data, WDFW recommends protecting large undeveloped habitat patches and open space areas as part of planning and building habitat corridors (WDFW, 2009). Habitat corridor widths greater than 1,000 feet generally provide the most benefit for the most species (WDFW, 2009).

In general, the standards related to wetland buffer reductions and averaging discussed earlier are deemed to be applicable to fish and wildlife habitat conservation area buffers, although specific requirements and protections may be required for local, state, and federally listed species. The mitigation measures outlined in Ecology's model code (Table XX.2; Bunten et al., 2012) can also be used to minimize impacts to fish and wildlife habitat conservation areas. Low Impact Development (LID) strategies, which are mainly geared towards improving water quality, can also have secondary benefits to wildlife (WDFW, 2009).

Other Sources of Information

Other scientific sources have also generated relevant information, which we reviewed and have referenced in the gap analysis matrix and in the references section of this report.

Assessment of Current Fish and Wildlife Habitat Conservation Areas Provisions and Summary of Code Recommendations

The fish and wildlife habitat conservation areas section of the CAO needs to be updated in a few key areas to improve its consistency with BAS and current agency guidelines, as detailed in the attached matrix. A summary of key recommendations follows:

- Increase buffer widths to reflect BAS guidance. Buffer widths of 300 feet or greater are not feasible given the developed nature of the City. At a minimum, we suggest Type Ns streams be increased to a 40-foot buffer. Type F streams with anadromous fish habitat can continue to be protected with a 100-foot buffer, which is consistent with NMFS riparian buffer recommendations (Appendix L *in* Ecology, 2013).
- Prioritize buffer averaging with enhancement over buffer reductions with enhancement: Buffer averaging results in the same amount of buffer area, while buffer reductions result in a net loss of area.
- Update provisions for buffer reductions with enhancement or for buffer averaging to be no greater than 25 percent of the standard buffer width and include the list of mitigation measures from

Ecology's Table XX.2 (Bunten et al., 2012) to further protect fish and wildlife conservation areas. Where modifications or additions to legally constructed structures will occur in addition to the 25 percent reduction in the standard buffer, we suggest that a development footprint threshold and buffer mitigation measures (e.g., enhancement plan and elements from Table XX.2) be required for consistency with BAS and to achieve "no net loss."

- Include additional subsection for physically separated and functionally isolated buffers and development within the previously developed footprint to be consistent with the City's draft SMP. Include additional discussion of how piped/culverted stream systems are approached with respect to buffers.
- Revise vegetation retention section for parcels zoned RS-12 or RS-20: The vegetation retention requirement is not currently related to critical areas functions; therefore, we suggest this section be revised to focus on retaining "core habitat." There are several ways this can be achieved:
    - Requiring larger critical areas buffers for wetlands, streams, and local habitats and species of importance for parcels zoned RS-12 or RS-20. This approach would likely be the easiest for the City to implement.
    - Including a vegetation retention requirement for core habitats—i.e., uplands within a certain distance (e.g., 1000 feet) from wetlands, streams, or habitats and species of local significance that have connectivity with those critical areas. Vegetation retention can also be achieved by requiring LID strategies, which have secondary benefits to wildlife. This approach might protect more overall areas for vegetation retention, but would need clarification and criteria for the City to implement this effectively (i.e., clearly defining core habitat and requirements for connectivity with wetlands, streams, buffers, etc.).
    - Outlining a management approach which prioritizes areas for vegetation and habitat retention and tying this to the requirement for a habitat assessment in Section 23.90.020. Typically this would require development of a habitat model or completion of a City-wide assessment. This approach would likely be more costly than the approaches above, but could be incorporated with the City's current development of an Urban Forestry Management Plan.

CRITICAL AREAS INVENTORY MAPPING

Currently the data that exists for the City's critical areas are as follows:

- Stream and fish habitat layers;
- Wetland layers – wetland known extents, wetland boundaries not completely delineated, potential wetlands, areas with potential wetlands, 2003 NWI wetlands; and
- Geologic hazards – WDNR seismic hazards, earth subsidence hazard areas, 40% slopes, severe erosion hazard areas, and erosion hazard areas.

The City also maintains detailed mapping of stormwater infrastructure. This dataset integrates natural flow pathways, including streams and wetland areas, along with built conveyance features.

Upon initial review, the current breadth of potential critical areas mapped by the City is very good, because it covers the relevant critical areas including fish and wildlife habitat conservation areas (streams), wetlands, and geologically hazardous areas. Inventory data sets include features extending across the City's jurisdiction, suggesting that there are no major gaps in terms of coverage. That said,

additional datasets including LIDAR provide opportunity to improve the precision of critical areas inventory mapping.

LIDAR coverage for the region, including the City and its Municipal Urban Growth Areas, was provided by the Puget Sound LIDAR Consortium (PSLC) and is a subset of the 2000-2005 Puget Sound Lowlands data. High resolution aerial imagery dated from 2012 was also provided by the City.

LIDAR data is a measurement of the earth's surface, and therefore is a good tool for evaluating topographic driven critical areas including streams, wetlands, and geological hazards. LIDAR would be less effective in updating frequently flooded areas mapping; as methods for determining the extent of these areas are well defined, relying on multiple data sources and/or modeling.

Integrating LIDAR into Stream and Wetland Mapping: Surface water tends to flow from high areas of elevation to low lying areas, unless a barrier interrupts that flow. Since we have accurate elevation data in the form of LIDAR, the direction of water flow is determined by the direction of steepest descent, or maximum drop, from each cell of elevation data. This method of deriving flow direction is presented in Jenson and Domingue (1988). Once the direction each cell will flow towards is known, the accumulated flow into each cell can be determined. Identification of flow direction and accumulation can be derived from tools integrated into ArcGIS. The output of the flow accumulation is the number of cells flowing into each cell, which essentially creates a network of the lowest lying areas.

ArcHydro's stream definition tool has been used to develop a water network dataset indicating areas where wetlands and streams could likely occur. The dataset derived from LIDAR is being evaluated, refined, and verified with additional datasets, including the City's existing inventories for streams and wetlands, stormwater infrastructure, recent 2012 aerial imagery, land cover, and soils. The following specific steps are being implemented to integrate LIDAR into inventory datasets for streams and wetlands:

1. Use LIDAR data to create potential water flow network dataset using ArcGIS / ArcHydro tools, as indicated above;
2. Identify dense areas of flow networks to be evaluated further as potential streams and/or wetlands;
3. Verify LIDAR approach by comparing identified areas with City's "wetlands known extent" dataset;
4. Compare potential wetland and stream areas with existing land use / land cover conditions using high resolution aerial imagery; eliminate highly urbanized / impervious areas from further evaluation.
5. Evaluate vegetative cover within remaining potential wetland and stream areas to refine potential wetland extent;
6. Update wetland and stream inventory mapping:
    a. Streams – compare remaining identified areas to City's stream mapping, stormwater network mapping and DNR hyro mapping; rely on detailed LIDAR topo to update and improve accuracy of stream inventory.
    b. Wetlands – compare remaining identified areas to City's current wetland data layers; update the "potential wetlands" data layer to include newly identified wetland areas.
7. Complete field review of updates to stream and wetland inventories for targeted areas.

Updates to stream and wetland inventory mapping is still underway. Evaluation of water flow network has revealed approximately 20 sites where existing inventory layers for wetlands could be updated. As anticipated, very minor updates to stream inventory mapping have been identified and will be completed as part of the update process are underway.

CAO ORGANIZATION AND CRITICAL AREA REVIEW PROCESS

In general, the Edmonds CAO is one of the better ordinances in the region in terms of clarity, completeness, and comparable structure with state guidelines. The Edmonds CAO needs to be updated in a few key areas to improve its consistency with BAS and current agency guidelines, as detailed in the attached matrix, but no major overhaul or additional review is needed at this time.

The Critical Areas General Provisions (Section 23.40) should be updated with the following revisions to improve consistency with BAS and other code sections:

- Include additional information on the review process and the information or criteria needed related to critical areas (e.g., criteria for granting a waiver, criteria for critical areas reports and mitigation reports). These are minor revisions.
- Update mitigation language to be consistent with wetlands mitigation guidance (Corps, 2008; Ecology 2006a, 2006b; Hruby 2012).
- Minor updates to allowed uses, especially provisions for trails and walkways in critical areas.
- Increasing the standard monitoring period from 3 to 5 years to be consistent with BAS (CTED, 2007).
- Revise the penalties for critical areas violations.

The tree removal portion of the CAO (Section 23.40.220.C.7.b.0 is generally consistent with BAS; however, portions of Section 18.45—Land Clearing and Tree Removal are not consistent with this section and would allow clearing and tree cutting within wetland and stream buffers without mitigation or reference to the provisions in Section 23.40. Section 18.45 should be revised to be consistent with Section 23.40.

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Attachments

Best Available Science Review and Gap Analysis Matrix

City of Edmonds
Critical Areas Ordinance (CAO) Update
Best Available Science Review and Gap Analysis Matrix
March 2015
Final version with recommended actions for code revision

Existing CAO Provision EDCD Chapter / Section	Degree of Consistency with BAS & Guidance	Reason for Consistency/ Lack of Consistency	Suggested Change	Rationale/ Basis for Suggested Change	Recommended Action
23.40 Environmentally Critical Areas General Provisions					
23.40.000 Purpose	Consistent with BAS			CTED, 2007	None; consistent with BAS
23.40.010 Authority	Consistent with BAS			CTED, 2007	None; consistent with BAS
23.40.020 Relationship to other regulations	Generally consistent, but could be strengthened			CTED, 2007	None; consistent with BAS
23.40.030 Severability	Consistent with BAS			CTED, 2007	None; consistent with BAS
23.40.040 Jurisdiction – Critical Areas	Consistent with BAS			CTED, 2007 and Wetlands and CAO Updates: Guidance for Small Cities. Western Washington Version. Revised October 2012 Ecology Publication #10-06-002 (Bunten et al. 2012)	None; consistent with BAS
23.40.050 Protection of critical areas	Consistent with BAS			CTED, 2007	None; consistent with BAS
23.40.060 General requirements	Consistent with BAS			CTED, 2007	None; consistent with BAS
23.40.070 Critical areas preapplication consultation	Consistent with BAS			CTED, 2007	None; consistent with BAS
23.40.080 Notice of initial	Generally consistent, but	Section B.2 could be	Add the following statement to Section B.2.:	CTED, 2007	Revise to remove vague

Existing CAO Provision EDCD Chapter / Section	Degree of Consistency with BAS & Guidance	Reason for Consistency/ Lack of Consistency	Suggested Change	Rationale/ Basis for Suggested Change	Recommended Action
determination	could be strengthened	strengthened by including criteria for granting a waiver.	"A waiver may be granted if there is substantial evidence that all of the following requirements will be met: a. There will be no alteration of the critical area or buffer; b. The development proposal will not affect the critical area in a manner contrary to the purpose, intent, and requirements of this Title; and c. The proposal is consistent with other applicable regulations and standards.		decision criteria language (do not use the term "substantial evidence"). "A waiver may be granted if the director determines that all of the following requirements will be met:…"
23.40.090 Critical areas report – Requirements	Generally consistent, but could be strengthened	Additional detail could be added to strengthen reporting requirements in Section D.	Revise Section D to include the following requirements: - A statement specifying the accuracy of the report and all assumptions made and relied upon; -A description of the methodologies used to conduct the critical areas study, including references -An assessment of the probable cumulative effects to critical areas resulting from development of the site and the proposed development; - Plans for adequate mitigation, as needed to offset any effects, in accordance with the Mitigation Plan Requirements in Section 23.40.130	CTED, 2007 and Wetlands and CAO Updates: Guidance for Small Cities. Western Washington Version. Revised October 2012 Ecology Publication #10-06-002 (Bunten et al. 2012) These recommendations will clarify for the City how and what was done for a critical areas report as well as bolster the concept of mitigation sequencing and appropriate mitigation.	Revise Section D to include only the first, second, and fourth requirements in suggested change.
23.40.100 Critical areas report – Modifications to	Consistent with BAS			CTED, 2007	None; consistent with BAS

Existing CAO Provision EDCD Chapter / Section	Degree of Consistency with BAS & Guidance	Reason for Consistency/ Lack of Consistency	Suggested Change	Rationale/ Basis for Suggested Change	Recommended Action
requirements					
23.40.110 Mitigation requirements	Could be brought closer to consistency	Section B sets the standard for the types of mitigation allowed as: "in-kind and on-site, when possible, and sufficient." With respect to wetlands and streams especially, a watershed-based focus may be more successful or provide more ecological benefit. Language in this section is not fully consistent with mitigation banking discussed in 23.50.050.H.	Revise Section B to include allowances for: off-site and out-of-kind mitigation, in lieu fee programs, mitigation banks, or other mitigation strategies according to the criteria set forth in Innovative Mitigation Section 23.40.140.	Improve internal code consistency with 23.50.	Revise to include specific reference to Ecology Credit/Debit methodology, and allowance for out-of-basin mitigation with an approved mitigation bank or ILF program.
23.40.120 Mitigation sequencing	Consistent with BAS			CTED, 2007 and Wetlands and CAO Updates: Guidance for Small Cities. Western Washington Version. Revised October 2012 Ecology Publication #10-06-002 (Bunten et al. 2012)	None; consistent with BAS
23.40.130 Mitigation plan requirements	Section C Generally consistent but could be strengthened	Does not specify that impact and mitigation areas should be shown on plans.	Revise Section C to include areas of proposed effects to critical areas or buffers.	CTED, 2007	Make suggested change
	Section D Inconsistent with BAS	Requires monitoring for 3 years instead of 5.	Revise Section D last sentence to read: "The compensation project shall be monitored for a period necessary to establish that performance standards have been met, but not for a period less than 5 years without approval from the director.	CTED, 2007	Make suggested change. Provide City with citation for 5-year requirement for all critical areas mitigation monitoring and make sure this item is addressed and cited in BAS Addendum Report.

Existing CAO Provision EDCD Chapter / Section	Degree of Consistency with BAS & Guidance	Reason for Consistency/ Lack of Consistency	Suggested Change	Rationale/ Basis for Suggested Change	Recommended Action
23.40.140 Innovative mitigation	Consistent with BAS		Could provide additional clarification of types of innovative mitigation allowed (e.g., in lieu fee programs).	CTED, 2007 and Wetlands and CAO Updates: Guidance for Small Cities. Western Washington Version. Revised October 2012 Ecology Publication #10-06-002 (Bunten et al. 2012)	Revise to include clearer, more detailed definition of in-lieu fee mitigation programs. Use example language from Bunten et al. (20012).
23.40.150 Critical areas decision	Consistent with BAS			CTED, 2007	None; consistent with BAS
23.40.160 Review criteria	Consistent with BAS			CTED, 2007	None; consistent with BAS
23.40.170 Favorable critical areas decision	Consistent with BAS			CTED, 2007	None; consistent with BAS
23.40.180 Unfavorable critical areas decision	Consistent with BAS			CTED, 2007	None; consistent with BAS
23.40.190 Completion of the critical areas review	Consistent with BAS			CTED, 2007	None; consistent with BAS
23.40.200 Appeals	Consistent with BAS			CTED, 2007	None; consistent with BAS
23.40.210 Variances	Consistent with BAS			CTED, 2007	None; consistent with BAS
23.40.220 Allowed activities	Generally consistent, but could be strengthened	Can add additional clarity	Revise Section C.1.c. to include "There is no new information available that is applicable to any critical area review of the site or particular critical area;"	CTED, 2007 and Wetlands and CAO Updates: Guidance for Small Cities. Western Washington Version. Revised October 2012 Ecology Publication #10-06-002 (Bunten et al. 2012)	Make suggested change
	Section C4 Inconsistent with BAS	Any activities that directly affect a wetland or stream should receive further review	Revise Section C.4 to include "Except those activities that alter a wetland or watercourse, such as culverts or bridges,	CTED, 2007 and Wetlands and CAO Updates: Guidance for Small Cities.	Revise Section C.4 language to include only the second bullet in suggested change. Do not

Existing CAO Provision EDCD Chapter / Section	Degree of Consistency with BAS & Guidance	Reason for Consistency/ Lack of Consistency	Suggested Change	Rationale/ Basis for Suggested Change	Recommended Action
			or result in the transport of sediment or increased stormwater; subject to the following: - Critical area and/or buffer widths shall be increased, where possible, equal to the width of the right-of-way improvement, including disturbed areas; and - Retention and replanting of native vegetation shall occur wherever possible along the right-of-way improvement and resulting disturbance.	Western Washington Version. Revised October 2012 Ecology Publication #10-06-002 (Bunten et al. 2012)	include requirement for increased buffer widths.
23.40.220 Allowed activities (continued)	Section C.6 Partially inconsistent	Updated model code for wetlands and wetland buffers suggests more strict requirements for trails and walkways. See discussion for 23.50.040.F.8 below.	Revise Section C.6. first sentence to read: " Public and private trails, except in wetlands, fish, and wildlife habitat conservation areas, or their buffers,…"	Wetlands and CAO Updates: Guidance for Small Cities. Western Washington Version. Revised October 2012 Ecology Publication #10-06-002 (Bunten et al. 2012)	Make suggested change as described below under 23.50.040, which will allow trails in buffers under a set of criteria.
	Section C.7 Partially inconsistent	BAS suggests several strategies including but not limited to: hand removal, chemical treatment, shading, or other techniques may be appropriate depending on the species and situation. See discussion in 23.50.020.	Revise Section C.7.a. to include an additional information regarding invasive removal: "Removal of invasive plant species shall be restricted to hand removal unless permits or approval from the appropriate regulatory agencies have been obtained for approved biological or chemical treatments or other removal techniques. All removed plant material shall be taken away from the site and appropriately disposed of. Plants that appear on the Washington State Noxious Weed Control Board list of noxious weeds must be handled and disposed of	Wetlands and CAO Updates: Guidance for Small Cities. Western Washington Version. Revised October 2012 Ecology Publication #10-06-002 (Bunten et al. 2012)	Make suggested change. Ensure that all references to chemical treatments in code are revised similarly. Also add a square foot threshold for limiting invasive vegetation removal activities. Language will be developed during code revision stage, but suggest something similar to City of Seattle Environmentally Critical Areas

Existing CAO Provision EDCD Chapter / Section	Degree of Consistency with BAS & Guidance	Reason for Consistency/ Lack of Consistency	Suggested Change	Rationale/ Basis for Suggested Change	Recommended Action
			according to a noxious weed control plan appropriate to that species." Add additional allowed activities in Section C.7: - Chemical Applications. The application of herbicides, pesticides, organic or mineral-derived fertilizers, or other hazardous substances, if necessary, as approved by the City, provided that their use shall be restricted in accordance with state Department of Fish and Wildlife Management Recommendations and the regulations of the state Department of Agriculture and the U.S. Environmental Protection Agency.		Code (SMC 25.09.320), which permits restoring or improving vegetation and trees through invasive plant removal (by hand) to "promote maintenance or creation of a naturally functioning condition that prevents erosion, protects water quality, or provides diverse habitat… when the area of work is under one thousand five hundred (1,500) square feet in area calculated cumulatively over three (3) years…"
	Section C.7.b. Inconsistent with BAS and City code	Generally consistent with BAS and model code language; however, portions of 18.45—Land Clearing and Tree Cutting are not consistent with Section 23.40 and would allow clearing and cutting within wetland and stream buffers. There is no reference to Section 23.40.	Revise 18.45 for internal consistency with Section 23.40. Clearing and tree cutting should not be allowed within critical areas or buffers without review and compliance with Section 23.40. The terms "environmentally sensitive site" and "environmentally sensitive areas" should be revised to refer to environmentally critical areas for consistency.	Inconsistent with BAS and internal code	No changes to 23.40. City to make revisions to 18.45 per ESA suggestion, which is the more appropriate ECDC chapter.
23.40.230 Exemptions	Could be brought closer to consistency	No definition in Section C.2 to clarify what actions constitute operations and maintenance	Revise Section C.2 to include: "Operation and maintenance also includes vegetation management performed in accordance with	CTED, 2007	Make suggested change. Will address lack of clarity regarding vegetation

Existing CAO Provision EDCD Chapter / Section	Degree of Consistency with BAS & Guidance	Reason for Consistency/ Lack of Consistency	Suggested Change	Rationale/ Basis for Suggested Change	Recommended Action
		activitiesfor vegetation removal.	best management practices that is part of ongoing maintenance of structures, infrastructure, or utilities, provided that such management actions are part of regular and ongoing maintenance, do not expand further into the critical area, are not the result of an expansion of the structure or utility, and do not directly impact an endangered or threatened species."		maintenance for viewsheds under definitions. See row 23.40.320 below.
23.40.240 Unauthorized critical areas alterations and enforcement	Generally consistent with BAS, but can be strengthened	Section E. references tree code, which sets a penalty for tree cutting, but other types of violations are not covered.	Revise Section E. to include a daily penalty per day per violation (this is the recommended language used in the model code). Penalties could be included for tree cutting in addition to violation penalty.	Wetlands and CAO Updates: Guidance for Small Cities. Western Washington Version. Revised October 2012 Ecology Publication #10-06-002 (Bunten et al. 2012). Both Lynnwood and Mountlake Terrace have a fine of $1,000 and/or 90 days in jail. Snohomish County has a penalty scale, with a $500 penalty for the first 20 days and the penalty increasing with time thereafter to a max of $10,000 (SCC 30.85.170).	Make suggested change, but use a square foot cost and threshold instead of a daily penalty. Threshold will be developed during code revision stage. Revise Section E to include a penalty equal to the cost of the permit and a square footage cost ($3/SF of impact).
23.40.250 Critical areas markers and signs	Consistent with BAS			CTED, 2007	None; consistent with BAS
23.40.270 Critical areas tracts	Partially Inconsistent	Section E: Use of herbicides is prohibited; however, BAS suggests several strategies including but not limited to: hand removal, chemical	Section E. Update text to include herbicide treatment (aquatic approved herbicides when wetlands and streams are present) where recommended by the Noxious Weed Control Board.	Wetlands and CAO Updates: Guidance for Small Cities. Western Washington Version. Revised October 2012 Ecology Publication #10-06-002 (Bunten	Make suggested change

Existing CAO Provision EDCD Chapter / Section	Degree of Consistency with BAS & Guidance	Reason for Consistency/ Lack of Consistency	Suggested Change	Rationale/ Basis for Suggested Change	Recommended Action
		treatment, shading, or other techniques may be appropriate depending on the species and situation. See discussion in 23.40.220 and 23.50.020. These Sections should all be consistent.		et al. 2012)	
	New subsection	No discussion of notice on title or Native Growth Protection Areas	Include discussion of notice on title or Native Growth Protection Areas for all lots, not just subdivisions. ESA can provide example language during code revision process.	CTED, 2007. This informs subsequent purchases of property of critical areas present on their properties.	Make suggested change
23.40.280 Building setbacks	Consistent with BAS			CTED, 2007	None; consistent with BAS
23.40.290 Bonds to ensure mitigation, maintenance, and monitoring	Could be brought closer to consistency	Section D requires that a bond be held for 3 years. The standard is typically 5 years.	Revise Section D to reflect a 5 year period for holding the bond, to ensure consistency with 5 year monitoring period.	CTED, 2007 and Wetlands and CAO Updates: Guidance for Small Cities. Western Washington Version. Revised October 2012 Ecology Publication #10-06-002 (Bunten et al. 2012)	Make suggested change. Provide City with citation for 5-year requirement for all critical areas mitigation monitoring and make sure this item is addressed and cited in BAS Addendum Report.
23.40.300 Critical areas inspections	Consistent with BAS			CTED, 2007	None; consistent with BAS
23.40.310 Best available science	Could be brought closer to consistency	Section D mentions “anecdotal information” but leaves out other forms of nonscientific information	Revise Section D to include “Non-expert opinion and hearsay” as forms on nonscientific information	CTED, 2007	Make suggested change
23.40.320 Definitions	Generally consistent, but	Definitions out of date	Update definitions of:	CTED, 2007 and	Make suggested changes.

Existing CAO Provision EDCD Chapter / Section	Degree of Consistency with BAS & Guidance	Reason for Consistency/ Lack of Consistency	Suggested Change	Rationale/ Basis for Suggested Change	Recommended Action
pertaining to critical areas	could be brought closer to consistency		-Adjacent -Habitats of local importance (include concept of core habitat) -Noxious weeds Add definitions for: -In lieu fee program -Wetland mitigation bank	Wetlands and CAO Updates: Guidance for Small Cities. Western Washington Version. Revised October 2012 Ecology Publication #10-06-002 (Bunten et al. 2012)	Also add definitions for: -Normal maintenance (vegetation) - Suggested definition: "Removal of shrubs/non-woody vegetation and trees (less than 3-inch diameter at breast height) that occurs at least every other year. Maintenance also may include tree topping that has been previously approved by the City in the past 5 years" -Previously developed area - Language for definition will be developed during code revision stage
23.50 Wetlands					
23.50.000 Wetlands compliance requirements flowchart	Partially consistent	The flow chart states that no additional compliance is required when a "reconnaissance determines a wetland is not jurisdictional."	Revise this to state that the Corps determines a wetland is not jurisdictional, or revise text to clarify.	Wetland jurisdictional determinations are made at a federal level (Corps). Even if a wetland is exempt under City code, it may be regulated at a federal and/or state level. An applicant would need to request a jurisdictional determination from the Corps to get assurance that a wetland is not jurisdictional.	Make suggested change
23.50.010 Designation, rating and mapping –	Not consistent	Sections A, B, and E reference outdated wetland delineation	Revise Sections A, B, and E to refer to the approved federal wetland delineation	WAC 173-22-035, WAC 365-190-	Make suggested change

Existing CAO Provision EDCD Chapter / Section	Degree of Consistency with BAS & Guidance	Reason for Consistency/ Lack of Consistency	Suggested Change	Rationale/ Basis for Suggested Change	Recommended Action
Wetlands		and rating manuals.	manual and applicable regional supplements and the Washington State Wetland Rating System for Western Washington, 2014 Update.	090 The federal wetland delineation manual and regional supplements and updated 2014 wetland rating manual constitute BAS for wetland identification, delineation, and rating.	
	Section B.1 Could be strengthened to be more consistent	References wetland function scores from the City of Edmonds's wetland field data form, which is based on an older version of the wetland rating manual.	Revise Section B.1. to reflect the updated wetland function scores for each wetland Category based on the point system used in the updated 2014 rating manual. Consider revising the City's wetland field data form or referencing the appropriate state or federal manual instead.	Washington State Wetland Rating System for Western Washington: 2014 Update. Ecology Publication #14-06-029 (Hruby 2014)	Make suggested change.
	Section E Could be strengthened to be more consistent	Does not specify how long a wetland delineation is valid.	Section E could be improved for consistency with BAS by specifying that wetland delineations are valid for five years.	User-friendliness and clarity, improved consistency with BAS Corps of Engineers Regulatory Guidance Letters RGL 05-02 and 08-02 set a five year standard on wetland determinations.[i]	Make suggested change. Add a provision regarding critical area assessment reports and statute of limitations earlier in CAO chapter (23.40.090).
23.50.020 Allowed activities – Wetlands	Section D Could be revised to be more consistent.	The Washington State Noxious Weed Control Board has recommendations and resources for controlling state listed noxious weeds and invasive species.	Update Section D to include that those noxious weeds listed on the Washington State Noxious Weed Control Board list must be handled and disposed of according to a noxious weed control plan appropriate to that species.	BAS suggests several strategies including but not limited to: hand removal, chemical treatment, shading, or other techniques may be appropriate depending on the species and situation.[ii] Wetlands and CAO Updates: Guidance for Small Cities.	Make suggested change

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				Western Washington Version. Revised October 2012 Ecology Publication #10-06-002 (Bunten et al. 2012)	
23.50.030 Special study and report requirements – Wetlands	Generally consistent with BAS			CTED, 2007 and Wetlands and CAO Updates: Guidance for Small Cities. Western Washington Version. Revised October 2012 Ecology Publication #10-06-002 (Bunten et al. 2012)	None; consistent with BAS
23.50.040 Development standards – Wetlands	Section E Inconsistent with BAS	Scientific literature does not support exempting wetlands based on size or category alone, since small wetlands may perform important functions. However, Ecology has developed a strategy for exempting small wetlands when wetland functions are considered and mitigation is required.	Revise Section E to include provisions for considering wetland functions in addition to the requirement for mitigation.	Wetlands and CAO Updates: Guidance for Small Cities. Western Washington Version. Revised October 2012 Ecology Publication #10-06-002 (Bunten et al. 2012)	No change. This provision is not related to exemptions and therefore does not need to be revised. Note: ESA's recommended changes regarding exempt wetlands occur below under Section I.
23.50.040 Development standards – Wetlands (continued)	Section F.1. Inconsistent with BAS	Buffer widths are inconsistent with BAS and with Draft SMP buffers. BAS supports increased standard buffer widths or modified buffer widths based on intensity of impacts from adjacent land use or based on wetland functions.	Revise Section F.1. to reflect recent BAS updates for buffers (Ecology, 2013)[iii]. The draft SMP uses Ecology's Table "XX.1" for wetland buffers in shoreline areas. Table XX.1 was recently revised in December 2014 based on habitat scores used in the updated 2014 wetland rating manual. Ecology's updated Table XX.1 for standard buffer widths requires additional measures (Table "XX.2") to minimize wetland impacts. The	Wetlands in Washington State, Volume 2: Guidance for Protecting and Managing Wetlands, Ecology Publication #05-06-008 (Granger et al. 2005).	Make suggested change

Existing CAO Provision EDCD Chapter / Section	Degree of Consistency with BAS & Guidance	Reason for Consistency/ Lack of Consistency	Suggested Change	Rationale/ Basis for Suggested Change	Recommended Action
			draft SMP incorporates these measures. The CAO should be revised to reflect these BAS updates and to be consistent with the SMP section F.2.		
	Section F.1. Supplemental material	Can supplement section by expanding inadequate vegetation to include previously disturbed areas and also requiring revegetation pursuant to an approved planting plan.	Supplement F.1 with additional discussion of previously disturbed areas. These are generally considered those areas which are not composed of an intact native vegetation community, but still consist of pervious surfaces. Previously disturbed areas would include non-native vegetation, lawn, and gravel. Include requirement for revegetation according to an approved planting plan.	User-friendliness	Revise Section F1 to: "If the ~~vegetation is inadequate~~ buffer is composed of nonnative vegetation, lawn, or bare ground, then, at the discretion of the director..." Add reference to the location of the definition of "previously disturbed area"
	Section F.2. Partially inconsistent	Increased buffer widths required in general when needed "to protect other critical areas."	This section can be revised to be more specific by referencing federal or state listed endangered, threatened, candidate, sensitive, monitored or documented species or habitats, or essential habitat (e.g., nesting sites or rookeries).[iv]	Improve clarity regarding when an increased buffer is needed.	Revise Section F2 to: Add new subsection "d.": "If a wetland is occupied by a federally listed threatened or endangered species, a bald eagle nest, a great blue heron rookery, or at the discretion of the director to protect species considered locally important"
23.50.040 Development standards – Wetlands (continued)	New subsection in F	Create a new subsection for "Buffer Modification" that contains code for buffer averaging and buffer reductions.	Create a new subsection that incorporates criteria for allowing a buffer modification (outlined in F.3.) and outlines the sequence for preferred buffer modifications: buffer averaging with enhancement, then buffer reductions with enhancement.	User-friendliness and clarity. Will improve internal consistency and make criteria easy to follow.	Make suggested change
	Section F.3	A buffer reduction of up to 50 percent is allowed. Buffer	Model codes typically allow up to a 25 percent modification through averaging,	Inconsistent with BAS and City's	Make suggested change

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	Inconsistent	reduction with buffer enhancement is not discussed in BAS documents (Granger et al., 2005; or Ecology, 2012). However, the City's code requires that functions will be increased or retained, which is consistent with the state's requirement of no net loss.	which affords better protection to wetlands than a 50 percent reduction. Recommend revising code to only allow a reduction up to 25 percent of the standard buffer width with buffer enhancement. The draft SMP includes a 25 percent reduction; Revise code to be consistent with draft SMP text. Since buffer reductions are not discussed in BAS and buffer reductions result in a net loss of area (even if functions are improved or retained), this step should follow after buffer averaging in the sequence and be used only when buffer averaging cannot be accomplished on-site. This is also more consistent with the wetlands review flow chart in 23.50.000	SMP. Wetlands in Washington State, Volume 2: Guidance for Protecting and Managing Wetlands, Ecology Publication #05-06-008 (Granger et al. 2005).	
	Section F.4. Inconsistent	Code appears to allow reduction and averaging. Buffer averaging of up to 50 percent is allowed. BAS does not support the use of both tools in conjunction.	Revise Section F.4., first sentence, to exclude mention of a "reduced" wetland buffer. Only allow a reduction up to 25 percent of the standard buffer width. Buffer averaging should also include a requirement for buffer enhancement, as many urban buffers are degraded. The draft SMP includes a 25 percent reduction; revise code to be consistent with draft SMP text. See discussion above regarding prioritizing buffer averaging before buffer reductions where possible. ESA can provide example code language during code revision stage.	Inconsistent with BAS and City's SMP. Wetlands in Washington State, Volume 2: Guidance for Protecting and Managing Wetlands, Ecology Publication #05-06-008 (Granger et al. 2005).	Make suggested change
23.50.040 Development standards – Wetlands	Section F.8. Generally consistent, but	Some of the uses allowed in wetlands are not listed as buffer uses, but would presumably be	Revise to include uses allowed in wetlands that would also be allowed in wetland buffers. For example (not an inclusive list):	Improved internal consistency	Make suggested change

Existing CAO Provision EDCD Chapter / Section	Degree of Consistency with BAS & Guidance	Reason for Consistency/ Lack of Consistency	Suggested Change	Rationale/ Basis for Suggested Change	Recommended Action
(continued)	could be clarified.	necessary. Could be revised to address applicable uses and parallel treatment.	-Education and scientific research -Normal and routine maintenance and repair of public or private facilities within an existing right-of-way		
	Section F.8. Inconsistent	Walkways and trails are allowed in buffers with minimal provisions. Scientific research (Ecology, 2013; Granger, 2005) indicates that human disturbance in wetland buffers can affect wetland functions.	Revise text to limit walkways and trails to the outer 25 percent of the wetland buffer perimeter and avoid trees. Revise text to be consistent with draft SMP.	Wetlands and CAO Updates: Guidance for Small Cities. Western Washington Version. Revised October 2012 Ecology Publication #10-06-002 (Bunten et al. 2012) Wetlands in Washington State, Volume 2: Guidance for Protecting and Managing Wetlands, Ecology Publication #05-06-008 (Granger et al. 2005).	Make suggested change, but add clarification regarding application. Revise F8 to include a priority for limiting trails to the outer 25 percent of the wetland buffer perimeter and avoid trees, or in cases where the buffer is below the regulatory minimum, trails could be outer 25 % of existing buffer. Specific language to be developed during code revision stage.
	New subsection in F	Section F. Include discussion of physically separated and functionally isolated buffers.	Include text from draft SMP related to physically separated and isolated buffers.	Improve clarity/user-friendliness	No new subsection F. Physically separated and isolated buffers are addressed below in Section H (and do not belong in Section F)
23.50.040 Development standards – Wetlands (continued)	Section G. Inconsistent	Permanent fencing is not discussed as a form of wetland protection.	Section G. Revise text to discuss perimeter fencing. Perimeter fencing is mentioned as a measure to avoid impacts in Ecology's Table "XX.2" and in the draft SMP. Clarify that fencing, if required, should be designed so it doesn't interfere with wildlife migration and should be constructed in a way that minimizes impacts to the wetland, buffer,	Improve consistency with internal code requirements and consistency with BAS.	Make suggested change

Existing CAO Provision EDCD Chapter / Section	Degree of Consistency with BAS & Guidance	Reason for Consistency/ Lack of Consistency	Suggested Change	Rationale/ Basis for Suggested Change	Recommended Action
			and associated habitat.		
	Section H. Inconsistent	Additions to structures existing within buffers lists a sequence of steps. Buffer reduction through enhancement is prioritized before buffer averaging. The sequence also allows development beyond the 25 percent reduction in the standard buffer, which is not supported by BAS. See discussion in Section F.3.	Section H. Revise text to prioritize buffer averaging before buffer reductions. Consider a threshold for limiting the size of the addition when occurring outside of the inner 25 percent (e.g., 150 square feet or another number based on planning staff experience and feedback). Include a requirement for buffer enhancement and fencing or other mitigation measures (e.g. LID, etc.) to avoid further encroachment.	Wetlands and CAO Updates: Guidance for Small Cities. Western Washington Version. Revised October 2012 Ecology Publication #10-06-002 (Bunten et al. 2012) Reduction beyond the 25 percent standard buffer would be considered an impact and therefore requires mitigation.	Make suggested change Add a new H5 to include provisions from Interim)rdinance regarding additions in wetland buffers that are physically separated and functionally isolated. Language to be developed during code revision stage.
	Section I: Inconsistent	Scientific literature does not support exempting wetlands based on size or category alone without mitigation. Small wetlands may perform important functions. However, Ecology has developed a strategy for exempting small wetlands when wetland functions are considered and mitigation is required.	Revise Section I to allow exemptions for isolated wetlands under 500 square feet and include additional provisions for considering wetland functions/connectivity/habitat and a requirement for mitigation. ESA can provide example suggestions during code revision process.	Mitigation is required to be consistent with BAS. Wetlands in Washington State, Volume 2: Guidance for Protecting and Managing Wetlands, Ecology Publication #05-06-008 (Granger et al. 2005).	Make suggested change. Also revise title of Section I to: "Small, hydrologically isolated wetlands". Revise I.2 to better define "low-quality" by using scores from Ecology Wetland Rating System. Revise I.3 to include a wildlife habitat score (value or range) that defines "no significant habitat value".
23.50.050 Mitigation requirements – Wetlands	Intro Inconsistent with BAS	Introductory paragraph refers to outdated mitigation guidance.	Revise introductory paragraph to include latest mitigation guidance documents: *Wetland Mitigation in Washington State—Part 2: Developing Mitigation Plans* (Ecology, 2006) and *Selecting Wetland Mitigation Sites Using a Watershed Approach* (Ecology, 2009).	Wetlands and CAO Updates: Guidance for Small Cities. Western Washington Version. Revised October 2012 Ecology Publication #10-06-002 (Bunten et al. 2012)	Make suggested change

Existing CAO Provision EDCD Chapter / Section	Degree of Consistency with BAS & Guidance	Reason for Consistency/ Lack of Consistency	Suggested Change	Rationale/ Basis for Suggested Change	Recommended Action
	Section A Inconsistent with BAS	Mitigation preference is not consistent with federal and state guidance. Federal and state agencies are requiring the use of mitigation banks and ILF programs.	Consider specifying that mitigation using banks or ILF programs is preferred over permittee-responsible mitigation (regardless of location).	Compensatory Mitigation for Losses of Aquatic Resources. Final Rule. (Federal Register 73(70): 19594-1970) BAS indicates that mitigation banks and ILF programs have a significantly greater likelihood of mitigation success, as opposed to permittee-responsible mitigation.	Make suggested change, but add prioritization for in-basin mitigation followed by mitigation within City limits.
	Section F. Mitigation Ratios Partially consistent	Mitigation ratios are appropriate and generally consistent with BAS. This section could be clarified by adding a table with mitigation ratios for each type of mitigation action. As an alternative to mitigation ratios, the Credit/Debit method may be used, and in some cases, may be required by Ecology.	Include mitigation ratios in a table. Include reference to the Credit/Debit Method.	Clarity/user-friendliness Improved consistency by incorporating discussion of the Credit/Debit method Calculating Credits and Debits for Compensatory Mitigation in Wetlands of Western Washington: Final Report (Hruby, 2012)	Make suggested change. Do not need to include calculation guidance if method is referenced (do not need this level of detail in EDCD; a reference is adequate).
	Section H.3. Wetland Mitigation Banks Generally consistent, but could be strengthened	This section can be strengthened with additional discussion of in lieu fee programs. These programs should also have a system of calculating debits and credits specified in the approved instrument.	Incorporate text from model code (Ecology, 2012) to clarify the credit-debit process. ESA can provide example code language during code revision stage.	Improved consistency	Make suggested change to incorporate provisions from model wetland code that allow use of ILF programs only with an approved instrument.
23.50.060 Performance standards – Subdivisions	Consistent with BAS				None; consistent with BAS
23.50.070 Wetland field	Inconsistent with BAS	The City of Edmonds's wetland field data form is based on an	Consider revising the City's wetland field data form or referencing the appropriate	The wetland rating manual was	Make suggested change.

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data form		older version of the wetland rating manual.	state or federal manual instead.	updated in 2014 (Hruby, 2014) Washington State Wetland Rating System for Western Washington: 2014 Update. Ecology Publication #14-06-029 (Hruby 2014).	
23.70 Frequently Flooded Areas					
23.70.010 Designation, rating and mapping	Generally consistent, but could be strengthened	Sub-section A references currently effective FIRM panels, and sub-section B notes that newer and/or more restrictive updated information would be used. However, sub-section A references an incorrect effective date (January 30, 1998), only notes inclusion of Zone A floodplain areas, whereas November 2014 draft flood zone maps include both Zone A and Zone V floodplains.	Revise Section A to reference the correct effective date for FIRMs - "Snohomish County, Washington and Incorporated Areas" study and maps, effective date November 8, 1999. Revise Section A to state that both Zone A and Zone V areas on effective FIRMs should be designated as frequently flooded areas.	CTED 2007 guidance notes that both Zone A and Zone V flood hazard areas should be included. Zone V areas are coastal floodplains subject to inundation by the 1-percent-annual-chance flood event with additional hazards associated with storm-induced waves.	Make suggested change
23.70.020 Special study and report requirements	Reference to the IBC and IRC - Generally consistent, but could be strengthened.	This section notes that new development within frequently flooded areas must meet requirements of the International Building Code (IBC) and International Residential Code (IRC), as adopted by	Consider adopting a standalone flood damage prevention code or integrating minimum NFIP requirements / Washington State requirements from WACs 173 and 365 directly into Chapter ECDC 23.70	Including flood damage prevention standards directly within the City's Development Code would make requirements more readily apparent and may improve compliance for future floodplain development.	No change. Do not need to have a standalone flood damage prevention code to meet BAS standards.

Existing CAO Provision EDCD Chapter / Section	Degree of Consistency with BAS & Guidance	Reason for Consistency/ Lack of Consistency	Suggested Change	Rationale/ Basis for Suggested Change	Recommended Action
		reference in ECDC Title 19. While the IBC and IRC include flood hazard protections (IBC Section 1612 Flood Loads and IBC Appendix G Flood Resistant Construction), most Western Washington communities tend to adopt their own flood hazard regulations.			
23.70.020 Special study and report requirements	Sections A thru D – Consistent with BAS and Guidance			CTED 2007; PSP 2010	None; consistent with BAS
IBC Appendix G – Floodplain Subdivision standards	Subdivision standards (G301) - Inconsistent with BAS and Guidance	Subdivision standards allow for creation of new lots within floodplain (only prohibit within floodways, which are not mapped along the City's coastal floodplain); potential for new development should be minimized by prohibiting subdivision that creates new buildable lots within floodplain.	Add new section "Additional Provisions for Flood Hazard Reduction" – prohibit creation of new buildable lots within the floodplain.	CTED 2007; NMFS 2009	No change. This recommendation is better addressed through revisions to Title 19 and not the CAO chapter. City to consider revisions to Title 19.
	Site Improvement Standards (G401) - Inconsistent with BAS	Standards for coastal floodplain development (coastal A zones and V zones) are limited to prohibiting development waterward of "mean high tide" and use of structural fill. Additional standards are available to significantly reduce property damage and human	Add new section "Additional Provisions for Flood Hazard Reduction"; consider the following standards for coastal A zones and V zones: • require buildings be elevated on pilings or columns; • require enclosures below the base flood elevation to be free of obstruction; • require that building designs be certified	PSP 2009; FEMA 2013	No change. This recommendation is better addressed through revisions to Title 19 and not the CAO chapter. City to consider revisions to Title 19.

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		health and safety risks.	by an engineer that it will resist flotation, collapse, and lateral movement resulting from combined wind and hydrostatic loads;		
	Site Improvement Standards (G401) - Inconsistent with BAS	No standard for compensatory floodplain storage is provided for riverine floodplains.	Add new section "Additional Provisions for Flood Hazard Reduction" – Consider requiring compensatory storage for all permitted floodplain fill within the Lake Ballinger floodplain.	NMFS 2009; PSP 2009; FEMA 2013	May add provision under 23.70.040 Development Standards, but item needs additional discussion with City.
	Elevation standards - Inconsistent with BAS	The IBC and IRC require that new residential construction be elevated such that the lowest floor of the manufactured home is elevated to or above the design flood elevation. This provides protection only consistent with FIRM mapping (to the 1 percent chance annual flood), so does not provide any additional protection to further minimize risk or anticipate increasing flood risks (either from increased runoff or climate change).	Add new section "Additional Provisions for Flood Hazard Reduction" – require at minimum 1-foot of freeboard above the base flood elevation.	PSP 2009; FEMA 2013	May add provision under 23.70.040 Development Standards, but item needs additional discussion with City. Language to be determined during code revision stage.
23.80 Geologically Hazardous Areas (Review conducted by Stratum Group, subconsultant to ESA)					
23.40.090 Critical areas report – Requirements	Inconsistent with BAS	Language does not reflect the applicable role of geologists and engineers	Add language to clarify the role of geologists and engineers in report preparation	Clarify the distinctive roles of geologists and engineers in preparation of reports	Make suggested change

Existing CAO Provision EDCD Chapter / Section	Degree of Consistency with BAS & Guidance	Reason for Consistency/ Lack of Consistency	Suggested Change	Rationale/ Basis for Suggested Change	Recommended Action
23.40.220 Allowed activities	Code consistency	Not consistent with geologic hazard section	Add language regarding need for geology assessment for vegetation management in geologic hazardous areas	Will make code internally consistent	No change Hazard trees may be removed without a geohaz assessment; City currently uses Hazard Risk Assessment forms for live trees.
23.40.280 General critical areas protection measures - Building setbacks	Code consistency	Setbacks are established elsewhere in code	Remove the additional setback distance of 15 feet.	Setbacks are determined based on other sections of the code. This code section discusses what is permissible in the setback.	No change. This suggested change would remove setbacks on all critical areas, which was not the intent of the recommendation.
23.40.320 Definitions			Delete redundant language regarding geologists	It should be up to the Department of Licensing to ensure that geologists licensed in Washington have the appropriate education, skills and experience.	Make suggested change
23.80.010 Designation, rating and mapping	Consistent with BAS and Guidance			CTED 2007	None; consistent with BAS
23.80.020 Designation of specific hazard areas	Subsection A.2 - Inconsistent with BAS and Guidance	The language is from landslide hazards not erosion	Delete: current subsection 2 and 3 replace with: 2. Coastal and stream erosion areas which are subject to the impacts from lateral erosion related to moving water such as stream channel migration and shoreline retreat.	Current language is associated with landslides. Suggested change reflects the other type of erosion hazard.	Add suggested language as a separate item (A4) and do not delete subsections 2 and 3 because they related to erosion hazards. Action will be confirmed by Stratum Group during code revision stage.
	Section B - Generally consistent with BAS and Guidance		Add the word “potential” before landslide hazard areas in the last sentence	Not all of the areas that should require a landslide hazard assessment are in fact a	Make suggested change

Existing CAO Provision EDCD Chapter / Section	Degree of Consistency with BAS & Guidance	Reason for Consistency/ Lack of Consistency	Suggested Change	Rationale/ Basis for Suggested Change	Recommended Action
				landslide area.	
			Subsection B.1 - Add reference to more recent report on Meadowdale Landslide (Landau 2007)	The 2007 Landau report provides further guidance on this specific hazard area	
23.80.020 Designation of specific hazard areas, continued	Subsection B.2 - Inconsistent with BAS and Guidance	Takes into account a broader range of potential geology hazards	Delete: current subsection 2, and replace with new subsections 2 – 5 (keep existing subsections 3 and 4): 2. Coastal areas mapped as class u (unstable), uos (unstable old slides), and urs (unstable recent slides) in the Department of Ecology Washington coastal atlas; or 3. Areas designated as quaternary slumps, earthflows, mudflows, or landslides on maps published by the United States Geological Survey or Washington State Department of Natural Resources.	This captures a resource recommended by guidance and captures any new mapping that may be completed in the future.	Make suggested change. For #4 add detail that indicates the provision excludes rockeries that have been engineered and approved by the engineer as having been built according to the engineered design. Stratum notes that rockery walls or engineered walls have high potential for failure due to poor construction, so provision to approve as-built design is critical here.
			4. Any slope of 40 percent or steeper that exceeds a vertical height of 10 feet over a 25-foot horizontal runerosion	Simplifies and matches similar approaches that do not include determination of toe and top of slope for determining the 40 percent slope	Excluding solid rock from #4 is not applicable as there is no bedrock in Edmonds
			5. Areas with all three of the following characteristics: (i) Slopes steeper than fifteen percent; (ii) Hillsides intersecting geologic contacts with a relatively permeable sediment overlying a relatively impermeable sediment; and	Wet low angle slopes with perched water may be potentially subject to landslides	The list in section B is a list of <u>potential</u> landslide hazard areas. It is not to be used by staff as determining where this criterion is met (e.g, springs or groundwater seepage). The actual mapping is covered in B.3.

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			(iii) Springs or groundwater seepage.		
	Subsection B.1, Figure 1 - Inconsistent with BAS and Guidance	See above	Modify Figure 1	Match text changes	Make suggested change
23.80.020 Designation of specific hazard areas, continued	Section C - Inconsistent with BAS and Guidance		Revise section to read as follows: Seismic Hazard Areas. Seismic hazard areas are areas subject to severe risk of damage as a result of earthquake-induced ground shaking, slope failure, settlement, soil liquefaction, lateral spreading, or surface faulting. These areas are designated as having a high and moderate to high risk of liquefaction as mapped on the Liquefaction Susceptibility Map of Snohomish County by the Washington State Department of Natural Resources or areas located within or near landslide hazard areas.		Make suggested change except remove the words "near" at end of last sentence. Also add quotations around the designations "high" and "moderate to high" Although no "moderate to high risk" areas are mapped in Edmonds, the definition should be added as suggested since both "high risk" and "moderate to high risk" areas as mapped make up the definition. Designations will be clarified by adding quotations.
23.80.050 Special study and report requirements	Inconsistent with BAS and State Law	Geologic determinations must be made by licensed geologists. Engineered designed mitigation should be designed by an engineer in most cases.	Preparation by a Qualified Professional. A critical areas report for assessing a potential geologically hazardous area shall be prepared by a~~n engineer or~~ geologist licensed in the state of Washington, with experience analyzing geologic, hydrologic, and ground water flow systems, and who has experience preparing reports for the	State licensing –required by State law.	Make suggested change

Existing CAO Provision EDCD Chapter / Section	Degree of Consistency with BAS & Guidance	Reason for Consistency/ Lack of Consistency	Suggested Change	Rationale/ Basis for Suggested Change	Recommended Action
			relevant type of hazard. If mitigation measures are necessary, the report detailing the mitigation measures and design of the mitigation shall be prepared by an engineer licensed in the State of Washington, with experience stabilizing slopes with similar geotechnical properties. Critical areas studies and reports on geologically hazardous areas shall be subject to independent review pursuant to ECDC 23.40.090		
23.80.050 Special study and report requirements	Section C - Inconsistent with BAS	Guidance for preparing engineering geology reports has been prepared by the Geology Licensing Board	Add new language consistent with Geology Licensing Board; new language will have added benefit of greatly simplifying this section.	Geology Licensing Board guidance	Make suggested change
	Subsection F.2.e - Inconsistent with BAS	Bluff retreat rate is likely not applicable for most bluffs in Edmonds	Add the phrase "or an estimate of the percent risk of landslide area expansion"	Bluff retreat rate may be appropriate for some slides, but in some cases the percent risk of expansion of the slide area may be a better approach. The bluffs in question all formed by shoreline erosion processes and are over steep due to past landslides having been eroded by waves. That process has been discontinued with the construction of the railroad, but the railroad itself continues to operate as a force of erosion at the toe of these bluff slopes. Each time there is a landslide, the collapsed soil is removed	Make suggested change, which keeps the bluff retreat rate phase in place, but adds a second phrase to apply to other bluffs.

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				from the toe of the slope so the higher bluffs are still a long way from angle of repose and will continue to retreat. Eventually that will come to an end after enough bluff failures. But the railroad at the base of the slope should not be viewed as a protection of the toe as any failures will be removed.	
	Subsection H. 1 - Inconsistent with BAS	There are no known faults in Edmonds	Delete H 1 "~~The site map shall show all known and mapped active faults within 200 feet of the project area or that have the potential to be affected by the proposal.~~"	No known faults and main purpose is recognizing that specific soil types are susceptible to higher risk during seismic events	Make suggested change
23.80.060 Development standards – General requirements	Generally consistent with BAS and guidance; see ECDC 23.80.070 for details.			CTED 2007	None; consistent with BAS
23.80.070 Development standards – Specific hazards.	Subsection A.1 - Inconsistent with BAS	Does not match BAS	Setbacks should meet specific criteria to ensure the structure is not at risk for the life of the structure (120 years). Term setback is used to avoid confusion with buffers such as riparian, wetland or habitat buffers.	A specific policy value should be set for homes and homes are considered to have a life of 120 years. Other values or periods can be used dependent upon policy consistency. Separating setback and buffer terms may reduce potential confusion regarding activities within the buffer.	Make suggested change
	Subsection A.2 - Inconsistent with BAS	BAS for geohazards	Buffers requirements should be established within the geology hazard assessment	Buffer requirements will vary and in some case no restrictions	Make suggested change, but need replace with a clear

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			report	may be needed in the buffer.	trigger for City staff during initial application review. Language to be determined during code revision stage. Also consider revising Buffer Reduction language to City of Seattle code, which is allows buffer to be reduced if a geotech report concludes no risk. Seattle has recently adopted a requirement for a specifically worded statement by the geotech that says in effect that there will be minimal risk to the development by the steep slope conditions and that the development will present a minimal risk to the steep slope and surrounding properties.
23.90 Fish and Wildlife Habitat Conservation Areas					
23.90.000 Fish and wildlife habitat conservation areas compliance requirements flowchart	Inconsistent Improved clarity	Flow chart will need to be updated to include change in allowed buffer reductions and mitigation measures. The flow chart handles streams and FWHCA in the same manner.	Change allowed buffer reduction from 50 percent to 25 percent of buffer. Mention buffer reduction with enhancement and buffer averaging with enhancement. Create a separate flow chart for streams and FWHCA.	Inconsistent with BAS; Internal consistency with 23.90.040 Improved user-friendliness and clarity.	Make suggested change No change. City doesn't need.
23.90.010 Designation, rating and mapping – Fish	Consistent	May be able to strengthen this section by referencing core	Include discussion of "core habitat" in Section A.4.	Internal consistency. See discussion of 23.90.040.C below.	Do not make suggested change. Rather, develop a

Existing CAO Provision EDCD Chapter / Section	Degree of Consistency with BAS & Guidance	Reason for Consistency/ Lack of Consistency	Suggested Change	Rationale/ Basis for Suggested Change	Recommended Action
and wildlife habitat conservation areas		habitat. See discussion and references in 23.90.040.C. This will provide a science-based framework for vegetation retention and habitat protection discussed in 23.90.040.C.			map of FWHCAs in the City. Include the following steps: - Modify WDFW maps of Biodiversity Areas (the old Urban Open Space) so they more accurately depict conditions in the City. - Edit CAO to eliminate reference to the laundry list of WDFW habitats that are not used in the CAO. - Require a critical areas report for land clearing in the Biodiversity Areas of more than 200 sf (?) to show avoidance, minimization, and enhancement/mitigation of lost functions. (Threshold to be determined during code revision stage)
23.90.020 Special study and report requirements – Fish and wildlife habitat conservation areas	Generally consistent	May be able to strengthen this section by referencing core habitat. See discussion and references in 23.90.040.C. This will provide a science-based framework for vegetation retention and habitat protection discussed in 23.90.040.C. Ensure consistency of Section D. with Section 23.90.030.	See above	Improved internal consistency. Ensure internal consistency.	See above Make suggested change (if needed)

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23.90.030 Development standards – General requirements	Generally consistent with BAS	Section A. May be able to strengthen this section by referencing core habitat. See discussion and references in 23.90.040.C. This will provide a science-based framework for vegetation retention and habitat protection discussed in 23.90.040.C.	See above	Internal consistency.	See above
23.90.040 Development standards – Specific habitats	Section A.3 Inconsistent with BAS	References outdated rules for bald eagles.	Remove Section A.3. for bald eagle habitat. Habitat protections are still captured under Section A.2.	Bald eagles were federally delisted in 2007 and downlisted to a state sensitive species. WAC 232-12-292 has been revised (effective May 29, 2011)	Make suggested change
	Section C Inconsistent with BAS	Vegetation retention is not tied to BAS	There are several options for promoting vegetation and habitat retention, which include but are not limited to: -Outline a management approach which prioritizes areas for vegetation and habitat retention and tie this to the requirement for critical areas report is 200 sf of vegetation removal is proposed – tie to Biodiversity Areas.	See footnote discussing core habitat. Source: Ecology, 2013 Semlitsch and Jensen, 2001 provide an informative graphic[v]. Redmond and Bellevue both use habitat assessment models to score an upland's ability to provide wildlife habitat. The City of Bellevue's manual is the most recent (2009); however, the City of Redmond is currently revising their manual. Bellevue's scoring system ranks a parcel's ability to provide functional habitat and	Develop a map of FWHCAs as described above

Existing CAO Provision EDCD Chapter / Section	Degree of Consistency with BAS & Guidance	Reason for Consistency/ Lack of Consistency	Suggested Change	Rationale/ Basis for Suggested Change	Recommended Action
				their guidance requires closer review for development proposals that would affect higher-functioning habitat. Mitigation actions are specified on a site-specific basis, depending on the site and habitat present.	
23.90.040 Development standards – Specific habitats (continued)	Section D Consistent with BAS, can strengthen and provide more clarity.	No discussion of physically separated and functionally isolated buffers. No discussion of piped stream segments and buffers	Revise Section D to include discussion of physically separated and functionally isolated buffers, consistent with other provisions of the code. To further clarify where buffers are required, consider additional text discussing piped streams and development (e.g., no development allowed over piped streams without a variance, no buffers required over piped or culverted streams.	Clarity/user-friendliness	Make suggested change. Language to be developed during code revision stage.
23.90.040 Development standards – Specific habitats (continued)	Section D.1. Inconsistent with BAS	City's standard buffers range from 25 feet (Type Ns) to 150 feet (Type S). BAS supports wider standard buffer widths. BAS suggests widths from 75 feet to well over 300 feet to protect a suite of ecological functions. Upper ranges are likely not feasible given existing platting and development patterns.	Consider increases to standard stream buffer widths, but at a minimum, increase the stream buffer for Type Ns streams to 40 or 50 feet. Mountlake Terrace has the same buffer for Type 1 streams (150 feet). Woodways's code requires larger standard buffers (250 feet for a Type 1 stream, 50 feet for a Type 4), but has smaller buffers allowed as minimum buffer widths for low impact land uses. Where it is not feasible to achieve BAS-recommended buffers due to existing conditions, specific alternative strategies should be required (e.g., required use of LID;	Source: Brennan et al. 2009, May 2003, Knutson and Naef 1997 all suggest BAS based buffers wider than those currently required. Recommended approach improves consistency with neighboring jurisdictions such as Woodway. Alternative strategies to BAS-based buffers can provide some of the ecological functions provided by riparian buffers, and should be considered (especially where	Revise stream buffer widths as follows: Type Ns: change from 25 to 40 feet

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			elevated mitigation requirements for habitat, longer-term maintenance and monitoring).	narrow or reduced buffers are allowed).	
	Section D.1. Supplemental Information	Does not include language regarding intact native vegetation and previously disturbed buffers areas. See Section 23.50.040.F.1	Section D.1. Include language regarding intact native vegetation and previously disturbed buffers areas so the concept of buffers will be consistent with the language in Section 23.50.040.F.1	Supplemental information to improve internal code consistency.	Make suggested change, but also need additional discussion of previously developed area. Language to be developed during code revision stage.
	Section D.2. Inconsistent	Stream buffer width reductions greater than 25 percent are not supported by BAS.	Section D.2. Revise section to allow reductions no greater than 25 percent of the standard buffer width with mitigation. Suggest prioritizing buffer averaging with enhancement before buffer reductions with enhancement. See wetland buffer discussion.	CTED, 2007	Make suggested change
23.90.040 Development standards – Specific habitats (continued)	Section D.2.c. Inconsistent	Requirement for 3 years of monitoring. Five years is considered the standard monitoring period.	Revise Section D.2.c. to require 5 years of monitoring.	CTED, 2007	Make suggested change
	Section D.3 Inconsistent	Code appears to allow stream buffer reduction and averaging. Section D.3. also allows a 50 percent reduction of the standard buffer with no buffer enhancement.	Revise Section D.3. to exclude the term "reduced" in the first sentence. Revise the section to allow buffer averaging reductions no greater than 25 percent of the standard buffer. Include buffer enhancement and performance standards similar to Section D.2. as a requirement for buffer averaging. Suggest prioritizing buffer averaging with enhancement before buffer reductions with enhancement. See wetland buffer discussion.	Inconsistent with BAS, User-friendliness. CTED, 2007	Make suggested change

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	Section D.4 Inconsistent	Allows additions to existing legally constructed structures outside of the inner 25 percent of the standard stream buffer.	Section D.4. See suggested revisions for wetland buffers in 23.50.040.H.	Inconsistent with BAS. Reduction beyond the 25 percent standard buffer would be considered an impact and therefore requires mitigation. Source: Bunten et al., 2012; Ecology, 2013.	Make suggested change
	Section D.5. Generally consistent but can be strengthened	Can strengthen this section with additional requirements that protect fish and water quality.	Section D.5. Include provisions: -An alternative alignment or location with less impact is not feasible -The crossing will be designed as near as perpendicular with the water body as possible.	CTED, 2007	Make suggested change
	Section D.6. Inconsistent	Trails should be located along the outer edge of the buffer. See discussion in 23.50.040.F.	Section D.6. See recommendation in 23.50.040.F.	CTED, 2007 and Wetlands and CAO Updates: Guidance for Small Cities. Western Washington Version. Revised October 2012 Ecology Publication #10-06-002 (Bunten et al. 2012)	Make suggested change
23.90.040 Development standards – Specific habitats (continued)	Section D.7. Partially Inconsistent	Storm water management facilities should only be allowed in the outer 25 percent of the buffer	Revise D. 7 to include provision to allow stormwater management facilities in the outer 25 percent of the buffer.	CTED, 2007 and Wetlands and CAO Updates: Guidance for Small Cities. Western Washington Version. Revised October 2012 Ecology Publication #10-06-002 (Bunten et al. 2012)	Make suggested change ESA reviewed new stormwater permit requirements and the Stormwater Management Manual for Western Washington Guide Sheet 2 in App I-D and confirmed that this recommendation is not inconsistent with those standards.

Footnotes

[i] Regulatory Guidance Letters 05-02: http://www.usace.army.mil/Portals/2/docs/civilworks/regulatory/cwa_guide/app_f_rgl05-02.pdf and 08-02: http://www.ecy.wa.gov/programs/sea/wetlands/pdf/RGL08-02.pdf

[ii] Washington State Noxious Weed Control Board: http://www.nwcb.wa.gov/

[iii] Ecology's buffer recommendations (Table XX.1; Ecology, 2014) are based on a moderate-risk approach to protecting wetland functions. Buffer width recommendations in Table XX.1 are based on the assumption that the buffer is well-vegetated with native species. A recent synthesis regarding buffer functions and required widths, titled *Update on Wetland Buffers: State of the Science* (Hruby, 2013), recommends an approach to buffer widths based on buffer functions. Adequate performance of key buffer functions typically require the average buffer width ranges (depending on the site and landscape setting): 100 feet to 1,000 feet for wildlife, 30 to 100 feet for sediment removal, 100-180 feet for nitrogen removal, and 30 to 100 feet for phosphorus removal (Environmental Law Institute, 2008 in Hruby, 2013). Recent research indicates that fixed-width buffers may not adequately address issues of habitat fragmentation and population dynamics; rather, buffer widths and fragmentation are only two of many variables that affect wildlife population dynamics (Hruby, 2013). Surrounding land use, plant community structure, intensity of human disturbance are additional factors that affect wetland-dependent species (Hruby, 2013). Water quality and quantity factors may also be influenced by adjacent pollution sources and stormwater inputs. Measures included in Table XX.2 are intended to further minimize the impact of these factors.

[iv]Recent buffer synthesis (Ecology, 2013) confirms that buffer width requirements for wildlife need to be targeted at the species of interest and their life requirements. Uplands surrounding a wetland can serve as critical habitat for certain species, termed "core habitat" (Hruby, 2013). The concept of core habitat expands the idea of the wetland buffer from simply protecting the wetland to protecting the species in the upland (Hruby, 2013).

[v] Semlitsch and Jensen. 2001. Core Habitat, Not Buffer Zone. National Wetlands Newsletter: 23(4). Accessible at: http://www.northinlet.sc.edu/training/media/2011/06142011IsolatedWetlands/RESOURCES/CORE_HABITAT.pdf