

Sensitive Areas and Tree Protection Update Project Advisory Group

Meeting #3 – Existing Conditions & Key Update Areas Monday, May 8, 2017 – 6:00 to 8:30 PM

MEETING AGENDA

The City is updating Sensitive Areas and Tree Protection standards – this agenda is for the 3rd Advisory Group meeting. This meeting will focus on the Sensitive Areas Ordinance update, and will be an opportunity to review draft best available science (BAS) documentation and a matrix of necessary and recommended code updates based on BAS and other update rationale. The meeting will also be an opportunity to discuss a proposed new approach for protection of habitat corridors.

6:00 – 6:10	Introduction Recap of Meeting #2: Lara Agenda preview: Aaron	No action
6:10 – 7:10	BAS Memo and Matrix Review Overview presentation: Aaron Questions and comments	<i>Please review memo and matrix ahead of meeting</i>
7:10 – 8:15	Key Issue – Habitat Corridors What Comp Plan and Watershed Plan say BAS for habitat corridor protection, and options from other jurisdictions (as available) Proposed approach – Habitat Corridor Rating and Management Form <ul style="list-style-type: none"> • Group review • Group activity – completing form for example properties • Questions and discussion 	Review Habitat Corridor memo ahead of meeting, and Draft Form EXTRA CREDIT: <i>Try applying it to a hypothetical development on your property, or another property of your choosing</i> Discussion
8:15 – 8:25	Public Comment Opportunity for input and questions from any interested members of the public in attendance (other than Advisory Group members)	No action
8:25 – 8:30	Next Steps Development of Draft SAO Update; review and revision Next Advisory Group Meeting – June, 2017 (date TDB)	No action

Please call Lara Thomas (425-789-9658) if you have any questions on the project.

memorandum

date May 2, 2017

to Lara Thomas, City of Duvall
Project Advisory Group, Sensitive Areas and Tree Protection Updates

from Aaron Booy and Christina Hersum, ESA
Dan McShane, Stratum Group (section on Geologically Hazardous Areas)

subject Sensitive Areas Ordinance Update - Gap Analysis and Best Available Science Consistency Review

The City of Duvall (City) is in the process of updating its Sensitive Areas Ordinance (SAO, Duvall Municipal Code [DMC] Chapter 14.42) in accordance with the requirements of the Growth Management Act (GMA) (RCW 36.70A)¹. The GMA requires cities to consider best available science (BAS) in the development of critical areas policies and regulations. In 2004 and 2005, the City reviewed the best available science and conducted a major update of its SAO to comply with the GMA. More recently, the City completed a comprehensive update to its Shoreline Master Program (SMP), which was approved by the Duvall City Council earlier this year and is pending approval from the Washington State Department of Ecology (Ecology) before becoming effective. The City expects the current SAO update to be relatively limited in scope and focused primarily on clarifying definitions and terms, streamlining the code, and ensuring consistency with the City's recently adopted Comprehensive Plan and Watershed Plan.

ESA reviewed portions of the City's SAO for consistency with the current scientific literature and applicable regulatory agency guidance. Specifically, we reviewed the SAO sections for General Provisions (DMC 14.42.100 to 150), Wetlands (DMC 14.42.200 to 260), Fish and Wildlife Habitat Conservation Areas (DMC 14.42.300 to 370), Flood Hazard Areas (DMC 14.42.500), and Critical Aquifer Recharge Areas (DMC 14.42.600 to 620). As a subconsultant to ESA, the Stratum Group reviewed the provisions for Geologically Hazardous Areas (DMC 14.42.400 to 460). The Stratum Group is a geologic assessment firm specializing in review and management of landslide, erosion, and other geologically hazardous areas

In general, the latest BAS documents pertaining to sensitive areas have been prepared by state agencies as guidance to local governments. The ESA team also reviewed recently updated critical area codes from other neighboring jurisdictions (e.g., King County) and evaluated the code for areas where Duvall could achieve greater consistency with current standards and practices. Our recommendations also reflect our professional judgment and experience assisting numerous cities and counties with sensitive areas management, code interpretation and administration.

¹ The City is completing the SAO update concurrently with an update to Tree Protection standards (DMC 14.40); this memo is focused only on updates to Sensitive Areas standards, except where standards are integrated between the two code chapters for protection of trees where occurring within Sensitive Areas.

BAS Review and Gap Analysis Methods

ESA and the Stratum Group conducted a line-by-line review of the current SAO for the purposes of identifying areas of inconsistency with agency guidance and BAS. We also focused on specific areas of concern identified by Watershed Plan and by City staff during scoping for this current code update project.

To organize our assessment of the City's SAO and Tree Protection Ordinance, we developed a gap analysis matrix (attached to this memo) to identify gaps and document consistency between SAO and Tree Protection provisions and GMA regulations, relevant agency guidance, and BAS published since 2005. Since that time new scientific findings have been published describing methods for improving the success of compensatory wetland mitigation, buffer effectiveness, and ecological functions of floodplains, among other topics. The gap analysis matrix provides an assessment of general consistency and the corresponding rationale and source for each gap identified. In addition to identifying provisions inconsistent with state law or recent science, our review identified several areas where the protection of critical areas could be improved by adding, removing, clarifying, and rearranging sections and subsections of the code to make them clearer and easier to implement. We categorized our assessment as follows:

- **Gap or Missing protection.** New code provision should be added to ensure compliance with GMA and BAS.
- **Consistency with BAS.** Code provision either does or does not, in our opinion, meet best available science or state guidance. Existing provision would result in detrimental impacts to critical areas and their functions and values.
- **Comprehensive Plan /Watershed Plan consistency.** The City recently adopted the 2015 Comprehensive Plan and 2015 Watershed Plan, both of which provide updated policy direction and recommended actions for Sensitive Areas management.
- **Clarity/ User friendliness.** Code provision is difficult to administer due to clarity, readability, and understandability.
- **Internal consistency.** Code provision is redundant (included in multiple sections) or is located in an inappropriate section.
- **Update to reflect current City procedures.** Code provision may not accurately reflect the current administrative procedures used by City staff in implementing the SAO and Tree Protection Ordinance.

The basis for each item identified is explained in the matrix and a citation is provided where applicable. Recommendations for revising the actual code language to achieve compliance or improve consistency will be provided in a separate document, per Task 2 of our scope of work.

Overall Code Structure and Definitions

The organization and content of the City's SAO regulations in DMC 14.42 is xx.

In general, the Duvall SAO reasonably clear and has a comparable structure with state guidelines. As detailed below, the wetlands, fish and wildlife habitat conservation areas, and geologically hazardous areas regulations, as well as several associated definitions sections, need to be updated in a few key areas to improve their consistency with BAS and current agency guidelines.

Best Available Science and Code Consistency Review

The following sections highlight gaps in the current SAO and Tree Protection Ordinance and areas that are inconsistent with BAS. They also summarize key best available science documents for each critical area. A complete list of references consulted during our review is provided at the end of this memo.

Wetlands

Wetlands are specifically identified for protection as a critical area under the GMA ([WAC 365-190-090](#)). The City's current SAO provides standards for protection of wetlands in DMC 14.42.200-260. ESA's review finds that the wetlands section of the SAO 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 gaps are as follows (a complete list is in the attached matrix):

- Current regulations refer to outdated manuals for wetland delineation and wetland rating. These manuals have been replaced with revised and newer versions.
- Current provisions for buffer reductions with enhancement or for buffer averaging allow for more reduction and/or averaging than suggested by BAS (Bunten et al., 2012).

Wetland Model Code

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 to address small cities. The updated model code *Wetlands and CAO Updates: Guidance for Small Cities, Western Washington Version* (Bunten et al., 2012) and is considered Ecology's BAS for wetland regulations.

Wetland Delineation and Rating

In 2010, the US Army Corps of Engineers (Corps) released the *Regional Supplement to the Corps of Engineers Wetland Delineation Manual: Western Mountains, Valleys, and Coast Region* (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 valid. State law now requires that wetland delineations follow the Regional Supplement (WAC 173-22-035).

Ecology released an update to the state wetland rating system, the *Washington State Wetland Rating System for Western Washington: 2014 Update* (Hruby, 2014), which went into effect January 2015. The rating system is still a four-tier system and most of the material in the 2014 updated manual remains the same as the 2004 manual. The updated wetland rating system includes a new scoring range (i.e., between 9 and 27 under the updated system versus 1 to 100 in the 2004 system) 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 than Ecology's 2004 rating system (Hruby, 2014). The 2014 system also includes new sections for assessing a wetland's potential to provide functions and values on a landscape scale.

Buffer Effectiveness

The guidance document, *Wetlands in Washington State – Vol. 1 A Synthesis of the Science* (Sheldon et al., 2005), synthesizes literature related to wetland buffers and buffer effectiveness among other wetland-related topics. In 2013, Ecology published *Update on Wetland Buffers: The State of the Science, Final Report* which updated the 2005 synthesis with a literature review of scientific documents published between 2003 and 2012 (Hruby, 2013). The 2013 update reviewed each of the conclusions in the Sheldon et al. (2005) report and referenced 144 scientific articles.

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 is at protecting water quality; however, recent research reveals that several other factors contribute to the effectiveness of buffers in protecting water quality functions. These factors include slope, type of vegetation, surface roughness, soil properties, and type and concentration of pollutants. 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 wider buffers are needed to protect wetland-dependent species, many of which require larger areas of relatively undisturbed uplands for survival (Hruby, 2013). Previously, Sheldon et al. (2005) recommended buffer widths between 50 and 300 feet for the protection of wildlife habitat, depending on site specific factors. The more recent recommendations specify buffer widths that go beyond 300 feet for many wildlife species. The *Planner's Guide to Wetland Buffers for Local Governments* prepared by the Environmental Law Institute (42) recommends a range of 100–1000ft for wildlife, 30–100ft for sediment removal, 100-180ft for nitrogen removal, and 30-100ft for phosphorus removal.

Ecology's model code outlines a combined fixed-width 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 2014²). Ecology (Bunten et al., 2013) acknowledges that in developing communities, such as Duvall, standard buffer widths may be difficult to achieve. When a development project requests a reduction to a standard buffer width, Ecology suggests that the local jurisdiction require documentation to demonstrate that a smaller buffer will protect wetland functions and values. The model code also recommends that standard buffers should not be reduced below 25 percent of the standard buffer width (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.

Mitigation for Wetland Impacts

One of the topics that has evolved the most since Duvall's last code update is wetland mitigation. Mitigation includes avoiding, minimizing, rectifying, reducing, and compensating for impacts. According to data analyzed by the National Research Council (NRC), compensatory mitigation efforts, particularly on-site

² Wetlands & CAO Updates: Guidance for Small Cities, Western Washington Version (Bunten et al., 2012) – Available:

<https://fortress.wa.gov/ecy/publications/SummaryPages/1006002.html>

Table XX.1 available: <https://fortress.wa.gov/ecy/publications/parts/1006002part1.pdf>

mitigation installed by the permittee, have poor success rates and have not achieved the national policy of “no net loss” of wetland area and functions (NRC, 2001).

To address these mitigation deficiencies, in early 2008 the 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 2008 Rule outlines a mitigation hierarchy, with preference for formally-approved mitigation banks over ILF programs and ILF programs over permittee-responsible mitigation (mitigation performed by a private party, usually the permit applicant). These different forms of mitigation are defined as follows:

- *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, enhancing, 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.
- *Permittee-responsible Mitigation using a Watershed Approach* – when a mitigation bank or ILF program is not available, then a permittee-responsible mitigation may be considered using a watershed approach. The goal is to maintain and improve the quality and quantity of aquatic resources within the watershed where the impact occurs through meaningful mitigation constructed by the project applicant.

Alternative forms of mitigation do not change the requirements for permit applicants to follow the prescribed “mitigation sequence” of avoid, minimize, rectify, reduce, and compensate for impacts. Each of these steps still is required, but the above types of compensatory mitigation must be used, if available, instead of traditional on-site mitigation projects. In 2015, the Corps permit system was analyzed to determine how the 2008 Rule has affected the number or type of compensatory mitigation projects (IWR 2015). The report states that over the past 5 years, the Corps issued 56,400 permits or authorizations each year nationally, with only 10% of these authorizations actually requiring compensatory mitigation. As a result of the 2008 rule, project impacts are being avoided and minimized with fewer projects requiring compensatory mitigation at banks.

Currently in Duvall, there are two formally-approved mitigation banks that include the city and surrounding areas within their service areas (the Snohomish Basin Mitigation Bank, located downstream of Duvall in the lower Snoqualmie River floodplain, and the Skykomish Mitigation Bank, located along the Skokomish River immediately downstream of Monroe). In the last several years, the City has allowed use of the Snohomish Basin Mitigation Bank to satisfy compensatory mitigation requirements under SAO wetland requirements. Allowance has occurred when the applicant has demonstrated that bank mitigation credit will “provide equivalent or greater replacement of sensitive area functions and values when compared to conventional on-site mitigation” (DMC 14.42.130.E). In addition, King County has an ILF program (the King County Mitigation

Reserves Program) that potentially could provide mitigation receiving sites eligible for impacts in the City, although to date no such sites exist. According to the 2008 Mitigation Rule overseeing authorized impacts to waters of the US (requiring Corps permits), applicants for permittee-responsible mitigation must demonstrate that the mitigation project uses a watershed approach.

Other BAS for compensatory mitigation is provided in a two-part guidance document published by Ecology, in coordination with the Corps and EPA. The document was intended to improve the quality, consistency, and effectiveness of compensatory mitigation in Washington State. *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 the 2008 Federal Rule; however, the wetland mitigation ratio recommendations are still pertinent. *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.

Mitigation Ratios

Ecology's *Guidance for Protecting and Managing Wetlands* (Granger et al. 2005) provides current BAS guidance on ratios for compensatory mitigation which are used by most local jurisdictions (Appendix 8-C). As an alternative to using mitigation ratios, Ecology developed *Calculating Credits and Debits for Compensatory Mitigation in Wetlands of Western Washington* (Hruby, 2012) as a tool for determining how much compensatory mitigation is needed to replace 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.

Comprehensive Plan and Watershed Plan Consistency

The wetlands section of DMC 14.42 could be more consistent with the policies of the Duval Comprehensive Plan, some policies that are not represented in the current SAO include:

- ES 16.2 Preserve wetland systems by maintaining native vegetation between nearby wetlands and between wetlands and nearby streams and other wildlife habitat areas.
- ES 16.3 Use multiple tools to achieve wetland protection and restoration, including property acquisition, voluntary enhancement, property developer incentives and code requirements.
- ES 16.5 Prohibit stormwater management facilities within wetlands and limit such facilities within wetland buffers; ensure that wetland hydrology and water quality is maintained as adjacent development occurs.
- ES 16.6 For significantly altered or isolated wetlands with limited ecological functions, consider allowances for land development provided that adequate compensatory mitigation is provided.

The Watershed Plan recommends adding buffer allowances to DMC 14.42.210 (Wetland buffer standards) that are specific to each subbasin management group within the City (SA-5 Action). Implementing these variable buffer allowances (and restrictions) are intended to protect wetlands and watershed-level functional processes across the City, and especially in areas where these processes are most important (and frequently, most intact). For example, within Watershed Management Groups 1 and 2A, very limited wetland buffer

modifications (e.g., buffer reduction or buffer averaging, and/or allowances for certain uses within buffer areas) should be allowed, except through a variance process. Within Management Groups 2B and 2C, buffer modifications should become progressively more available, while still limited, as the relative conservation value of the subbasin decreases. Within Management Group 3 subbasins, the greatest allowances for wetland buffer modifications should be provided. The recommended reductions of the Watershed Plan are consistent with 2012 Ecology guidance for protection of wetlands (Bunten et al., 2012).

In addition to revised buffer allowances, the Watershed Plan also recommends adding wetland mitigation site protection mechanisms to DMC 14.42.100 (Notice on title-plat map-site plan) and DMC 14.42.240 (Wetland mitigation) (SA-4 Action). The Watershed Plan recognizes that the Corps also requests that permittees place mitigation sites in a conservation easement or similar site protection mechanism (e.g., restrictive covenant). These site protection mechanisms are easier to legally enforce compared with tracts or notice to title, and should be the preferred protection mechanism required for wetland mitigation sites, and their associated buffers.

Fish and Wildlife Habitat Conservation Areas

Fish and wildlife habitat conservation areas (FWHCAs) are specifically identified for protection as a sensitive area under the GMA ([WAC 365-190-130](#)). The current SAO provides standards for protection of fish and wildlife habitat conservation areas in OMC 14.42.300-370.

Our review of these sections identified the following key gaps or inconsistencies (a complete list is in the attached matrix):

- Stream typing system and definitions are not fully consistent with state law use of DNR stream typing system.
- Current buffer reduction allowances on streams using enhancement or buffer averaging provide a greater degree of buffer width reduction (or averaging) than recommended by BAS for protection of aquatic resources and riparian processes (Bunten et al., 2012).

Stream Typing

State law refers to the use of the Washington Department of Natural Resources (DNR) stream typing system in Title 222 WAC, the forest practices regulations. The stream typing system codified in DMC 14.42.310 establishes a system that is generally consistent with the DNR stream typing system, but that does not include the same naming system, or the exact same definitions.

Current DMC 14.42 stream type <i>with definitions</i>	Proposed Name per DNR Stream Typing	Notes
<i>Streams under the jurisdiction of the Shoreline Management Act... ..as designated in the Duvall shoreline master program, DMC Chapter 14.78. The Snoqualmie River is the only designated shoreline stream in Duvall.</i>	Type S	<ul style="list-style-type: none"> • No need for definition change.
Salmon bearing streams - <i>Other fish bearing streams that do not meet the definition of shorelines of the state but</i>	Type F – Salmon Bearing	<ul style="list-style-type: none"> • Type F represents all waters (perennial or seasonal) that are known to be used by fish <u>OR</u> contain fish habitat as defined by DNR

Current DMC 14.42 stream type with definitions	Proposed Name per DNR Stream Typing	Notes
<i>have known or potential use by anadromous or resident [salmonid] fish species.</i>		criteria. <ul style="list-style-type: none"> DNR definition for Type F within WAC does not differentiate between salmon bearing and nonsalmon bearing streams.
Other fish bearing streams - Other nonsalmon bearing streams that do not meet the definition of shorelines of the state.	Type F – Nonsalmon bearing	<ul style="list-style-type: none"> Type F represents all waters (perennial or seasonal) that are known to be used by fish <u>OR</u> contain fish habitat as defined by DNR criteria. DNR definition for Type F within WAC does not differentiate between salmon bearing and nonsalmon bearing streams.
Nonfish-bearing streams - Nonfish-bearing streams are those streams that have no known or potential use by anadromous or resident fish based on the stream character, hydrology and gradient, provided that human-made barriers shall not be considered a limit on fish use except when the director makes [specific findings about the nature of the human-made barrier, detailed by DMC 14.42.310.A.4.].	Type Np – Nonfish-bearing perennial	<ul style="list-style-type: none"> Type Np represents perennial waters (flowing waters throughout the year under normal rainfall) that do not contain fish or fish habitat.
	<i>or</i>	<ul style="list-style-type: none"> DMC 14.42 does not currently differentiate between nonfish-bearing streams of perennial vs. intermittent flows; opportunity for differentiation during code update.
	Type Ns – Nonfish-bearing intermittent	<ul style="list-style-type: none"> Type Ns represents intermittent waters that do not contain fish or fish habitat and have intermittent flows

Buffer Widths and Buffer Allowances

There are two separate stream buffer width provisions codified in DMC 14.42.320.C and 14.42.320.E; one is for standard measurements while the other is for performance-based measurements and is administered by the Director. The performance-based buffer provisions also include management measures with site-specific goals and objectives, and conceptual designs for four streams in the City, including: Thayer Creek, Coe-Clemons Creek, Cherry Creek Tributary A, and Cherry Creek Tributary B. These provisions are supported by recommendations from the *Fish Habitat Restoration Plan* (Herrera, 2002) prepared for the City to improve fish habitat conditions in these streams and comply with Endangered Species Act (ESA) requirements for protecting listed fish species habitat.

Recent WDFW publications do not provide any new or updated science on stream buffers and recommended widths. In general, the most recent recommendations for stream buffer widths vary from 75 feet to well over 300 feet to protect a suite of riparian ecological functions (Brennan et al., 2009; May, 2003; Knutson and Naef, 1997). Some of these riparian ecological functions (e.g., elk habitat, migratory corridors, and protections for specific priority species) may not be applicable to the urban or suburban land use setting. Specific to salmonids, 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 National Marine Fisheries Service (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 accessed by anadromous or listed fish species and a 50-foot buffer for surface waters that do not have current or historical access. The standard buffer widths currently adopted by DMC 14.42.320.C (ranging from 100 feet for salmon-bearing stream to 25

feet for nonfish-bearing streams occurring within existing subdivisions³) are somewhat below Ecology and NMFS recommendations.

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 for streams supporting salmonids may be warranted. Many of Duvall's streams have experienced alteration from historic land use and development practices, providing opportunity for both in-channel and riparian enhancements as surrounding areas redevelop. From project permitting experience over the last 10 years, City staff and the City's environmental on-call consultant have recognized that performance-based stream buffer standards have been especially effective in incentivizing property developers to improve stream and riparian habitats.

Updating the performance-based stream buffer standards will be necessary to reflect development that has occurred, and stream enhancement measures that have already been implemented. In addition, 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 and hydrology, can also have secondary benefits to wildlife (WDFW, 2009)

Salmon and Fish Habitat and Biodiversity

State, federal, and tribal agencies have prepared many of the latest documents pertaining to protecting salmon and fish habitat. In 2009, the Washington Department of Fish and Wildlife (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. The guidance provides science-based management recommendations in the form of model policies and regulations to be used by local jurisdictions during GMA and SMA planning and periodic updates. Recommendations are organized by topic areas that include specialized management programs (e.g., stormwater) or habitat elements (e.g., nearshore areas) to protect salmonid habitat function from development impacts.

Another WDFW document relates to managing biodiversity and habitat quality in developing areas and is called *Landscape Planning for Washington's Wildlife: Managing for Biodiversity in Developing Areas* (WDFW, 2009). The document provides information to planners and others that can be used to minimize the impacts of development to wildlife and to conserve biodiversity. It includes science-based recommendations regarding planning for biodiversity at the watershed scale and at the site and sub-division scale including habitat management plans (HMP) and vegetation plans.

Wildlife Habitat Connectivity

Existing City provisions in the SAO do not include protection for wildlife habitat corridors, however the Watershed Plan and 2015 Comprehensive Plan have directed the City to do so. See discussion on next page for details, as well as review of wildlife habitat corridor BAS provided in the separate memorandum from ESA, titled *Wildlife Habitat Corridor Assessment and Management* (May 2, 2017 draft).

³ The SAO required buffer for the Snoqualmie River (the only SMA designated shoreline within the City) will be superseded by the City's updated SMP; final adoption of the updated SMP is anticipated by June 2017.

Comprehensive Plan and Watershed Plan Consistency

The Comprehensive Plan policies and goals relevant to the FWHCAs section of DMC 14.42 that are not represented in the sensitive areas regulations include:

Goal ES 9: *Value and support environmental quality and support choices that minimize impacts to the environment.*

- ES 19.1 Connect wildlife habitats within Duvall and within the region to achieve a continuous wildlife and watershed network. Habitat corridors may include preserved public or private open space, utility rights-of-ways, riparian corridors, wetland buffers or other features.
- ES 19.6 Minimize impacts from public projects, especially utility and transportation projects, on wildlife corridors and habitat connectivity.

The Watershed Plan recommended action, SA-1 Identify and Protect Habitat Corridors, is relevant to the FWHCAs section of the SAO. It calls for requiring a two-step process to identify and assess fish and wildlife habitat corridors: 1) establish a habitat corridor map that shows areas where site evaluation would be required; and 2) evaluate the onsite habitat corridor through addition of new criteria within DMC 14.42 and/or use of a rating form. Establishing fish and wildlife habitat corridors between sensitive areas and undeveloped land was identified in the Watershed Plan as important to maintaining physical connections for fish and wildlife throughout the watershed and minimizing habitat fragmentation city-wide. A map presenting initial fish and wildlife habitat corridors, with corridors along stream riparian areas, wetlands, and forested uplands was prepared as part of the Watershed Plan. The map identifies 350-foot wide habitat corridors throughout the city and urban growth areas⁴.

See the separate memorandum from ESA, titled *Wildlife Habitat Corridor Assessment and Management* (May 2, 2017 draft), for additional details on incorporating new protections for wildlife habitat corridors.

Frequently Flooded Areas

Frequently flooded areas are specifically identified for protection as a critical area under the GMA ([WAC 365-190-110](#)). The current SAO provides reference to standards for protection of frequently flooded areas in DMC 14.84 (Floodplain Regulations) for identification, reporting, and protection of floodplains that meet minimum NFIP and Washington State criteria. Our review of this chapter identified the following key gaps (a complete list is in the attached matrix):

- Current flood hazard regulations do not go beyond the FEMA minimum requirements for floodplain management as recommended by Ecology and BAS.
- Current flood hazard regulations focus chiefly from the perspective of flood effects on human health, safety, and property, and the effects of human activities on flooding. As discussed below, floodplains

⁴ Habitat corridors totaling 350 feet in width typically provide sufficient area for many species of wildlife to migrate, breed, and forage (Hennings and Soll, 2010).

perform a variety of beneficial functions and recent BAS and guidance from state and federal agencies emphasize ecological functions.

Ecology and FEMA Guidance

In 2015, Ecology released *Guidance to Local Governments on Frequently Flooded Areas Updates in CAOs* that contains a useful summary of BAS sources for updating the designation and mapping of frequently flooded areas and new information that focuses on improving habitat in floodplains (Ecology, 2015). As noted in Ecology (2015), Ecology and FEMA encourage local governments to go beyond the FEMA minimum requirements for floodplain management, whenever possible. Greater protection from floods may be a policy objective that should be incorporated into a local jurisdiction's critical areas regulations. For example, some jurisdictions use the "flood of record" elevations to regulate the minimum elevation of structures, where the record flood is higher than the 100-year flood elevation used by FEMA (called the Base Flood Elevation [BFE]). Additionally, some jurisdictions require that structures be built two (or three) feet above the BFE or flood of record, rather than the minimum FEMA standards.

Ecological Functions of Floodplains

Due to the 2009 Biological Opinion (BiOp) by the National Marine Fisheries Service (NMFS) regarding protection of some federally listed species under the Endangered Species Act, there is a requirement by FEMA to assess the effects of floodplain development on habitat used by listed species. This new standard for protection is now required for National Flood Insurance Program (NFIP) participating communities (NMFS 2009; FEMA 2013). Although limited in Duvall, 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 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. Thus, recent BAS and regional guidance for protection of ecological functions within a floodplain emphasize the importance of other critical areas (including wetlands, streams, riparian areas, and FWHCAs) within floodplains, and emphasizes the need to protect these areas from development (PSP, 2010; NMFS, 2009).

Relationship to SMP

The large majority of the City's 100-year floodplain, as designated by FEMA, is within the City's shoreline jurisdiction (shoreline areas associated with the Snoqualmie River). These areas will be regulated consistent with updated Shoreline Master Program (SMP) requirements, which will be fully adopted and become effective by June 2017 (local adoption has occurred, and Ecology's review and approval is anticipated later in May 2017). The updated SMP details that most Snoqualmie River floodplain areas are protected as City-owned open space, and designates these areas as "Passive Recreation and Conservancy" and "Public Recreation". The updated SMP includes standards that restrict development and redevelopment from occurring where it would require structural flood hazard reduction measures. Levees are to be prohibited, and fill within floodplain areas will only be permitted with limited allowed uses, and only when hydrologically better compensatory flood storage is provided (SMP Section 3.3, Table 1). Further, the updated SMP only permits structural flood control works, such as flood curtains or walls, to the east of the Snoqualmie Valley Trail when necessary to protect allowed development, and only when documented that net loss to ecological functions would occur consistent with WAC 173-26-201(2).

Comprehensive Plan and Watershed Plan Consistency

The Comprehensive Plan include policy ES 15.1, which state that “New floodplain development should generally be limited to passive park and utility uses, and should be consistent with the City’s shoreline management standards.”

New analysis and recommendations for frequently flooded areas were excluded from discussion in the Watershed Plan because they are adequately protected by the City’s recently updated Shoreline Master Program, as well as through the City’s compliance with Federal Emergency Management Agency guidance for protection of endangered species within floodplain areas.

Critical Aquifer Recharge Areas

Critical aquifer recharge areas (CARAs) are specifically identified and addressed as a critical area under the current SAO in DMC 14.42.600-620. The following paragraphs describe the City’s approach to CARAs and summarize important BAS sources for CARA protection.

The City’s mapped CARAs are predominantly located outside of the city limits and urban growth area. In general, most are located within the Snoqualmie River floodplain and extend upslope from the Cherry Creek floodplain into the Cherry Creek Tributary subbasin. Despite their location primarily outside City limits and UGA areas, CARAs in the Duvall vicinity do provide domestic water supplies for rural residents, and for agricultural uses; however once ground water is contaminated it is difficult, costly, and sometimes impossible to clean up. Preventing contamination is necessary to maintain groundwater domestic and agricultural supplies and to avoid extreme costs (or the loss of this resource) necessary if contamination were to occur (CTED, 2007).

The risk of ground water contamination depends on two main components. One set of conditions relates to the ground itself and how easy it is for water to pass through to ground water – this is the component that is identified through development of critical aquifer recharge area mapping. CARA mapping has been completed for the City, and represent the areas where underlying soils and geologic conditions allow for groundwater recharge (and correspondingly have a higher chance for contamination).

The other component relates to how likely it is for potential contaminants to reach ground water. The amount of potential contaminant material, chemical composition, and how the material is handled all contribute to this component, and are the key area where CARA standards are necessary to ensure that the potential is minimized. CARA regulations to minimize the potential for aquifer contamination have not changed significantly in the last ten years, and remain focused on ensuring that uses and activities with higher potential for contamination are appropriately evaluated (or prohibited) when occurring in CARAs.

Ecology has published guidance to assist local jurisdictions with developing protection measures in their CAO that includes an 8-step process for identifying, characterizing, and managing groundwater withdrawals and recharge impacts (Ecology, 2005). The guidance also includes BAS sources for protecting CARAs.

Geologically Hazardous Areas

Geologically hazardous areas are specifically identified as a critical area under the GMA ([WAC 365-190-120](#)) and notes four categories; erosion hazards, landslide hazards, seismic hazards, and areas subject to other geological events such as coal mine hazards and volcanic hazards. Duvall's sensitive areas code identifies regulations for landslide hazard areas, seismic hazard areas and erosion hazard areas. Our review found that the code needs to be updated in a few key areas to improve its consistency with the GMA, BAS literature, the City of Duvall Watershed Plan and the City of Duvall Comprehensive Plan, as detailed in the attached matrix. A summary of key gaps follows:

Erosion Hazard Areas

Soil erosion is a process in which individual soil particles are detached and moved by natural agents such as wind, rain, frost action, or surface water flows. Erosion poses a potential public health and safety hazard and over time can also undermine improvements such as building foundations, roads, and sidewalks. Eroded sediment entering bodies of water at greater rates than natural background can negatively impact ecosystem functioning, adding additional fine sediments to stream beds that degrade salmon spawning habitats. Increased stream sediment loads can also lead to downstream deposition causing increased flood frequency and stream channel changes. This can impact stream culverts at road crossings, limit conveyance capacity, restrict fish passage, and increase potential for infrastructure damage during storm events. A local (and recent) example of this was the old, undersized 6'-by-6' culvert where Coe-Clemmons Creek crosses under Main Street. While too small for the size of the stream, the culvert was further impacted by increased sediment and debris loads from upstream erosion within Taylor Park. Until the culvert was replaced in October 2015 with a much larger (25'-wide by 12'-high) culvert, stream flows were frequently forced through an opening less than 6-inches high.

King County mapped erosion hazard areas include those soils identified by U.S. Department of Agriculture (1973 and 1992) as susceptible to erosion with loss of vegetative cover, grading and land use changes (see Figure 3-1). These erosion hazard areas occur within the city, urban growth areas (UGAs) and surrounding area, with the largest concentration on steeper slopes along the northern edge of the city and areas surrounding the Coe-Clemmons Creek basin. Increased stream flows in these drainages can increase the rate of erosion and areas susceptible to erosion. Erosion along streams can also lead to up-slope instability and increasing the potential for landslides.

The City's current SAO (DMC 14.42.400) identifies erosion hazard areas based on slope and soil type with reference to the Natural Resources Conservation Services (NRCS). The soil types listed in DMC 14.42.400A.3.a. as erosion hazard area soils are not actually present within the City. However, there are other soil types present within the City that meet erosion hazard criteria [placeholder for examples of these soil types].

The City's standards for erosion hazard areas cross reference with landslide hazard area standards within the code. However, the landslide hazard area standards are only partially applicable to erosion hazard areas. More specific standards for soils susceptible to surface erosion would better address this hazard. For example, it may be more appropriate to apply fill and grade, land clearing and stormwater management standards to areas that are susceptible to surface soil erosion.

Watershed Plan Consistency for Erosion Hazard Areas: Currently, stream erosion hazard areas are not recognized as specific erosion hazard areas in the City's code. Providing specific protections for stream drainages susceptible to erosion would be consistent with the City's Watershed Plan. Strategy SA-7 of the Watershed Plan calls for improving tree protection of geologic hazards and geologic hazard buffer areas.

Retention of forested buffers around erosion susceptible stream slopes will minimize increases to stream peak discharges that cause increased erosion. This will be particularly true in the sub-basin Management Groups 1 and 2A areas per the recommended code changes under SA-7.

Landslide Hazard Areas

King County recently performed a County-wide landslide hazard assessment using LiDAR (light detecting and ranging) imagery of river valley slopes - *Mapping of Potential Landslide Hazards along River Corridors of King County* (King County, 2016). The mapping assessment identified several deep-seated landslide areas on slopes along the northeast side of the City, above Cherry Valley. While other deep-seated landslides were identified outside City limits there were some located below upland areas and slopes that are within City limits. The mapping assessment did not cover the steep slopes of Coe-Clemmons Creek, potentially because the area was outside the geographic focus of the study. That said, review of LiDAR imagery is consistent with the south slope in the steep ravine as being a deep-seated landslide. The LiDAR mapping assessment also identifies the presence of alluvial fans at the lower end of streams as they reach the Cherry Valley floodplain on the northeast side of the City and the Snoqualmie River floodplain on the west side of the City (associated with lower Coe-Clemmons Creek).

Areas of potential shallow landslides are identified on the steep slopes above Cherry Valley within the City and northeast of the City as well as within steep sided streams in upland areas of the City, such as the steep slopes of Coe-Clemmons Creek (King County, 2016 and LiDAR review by Stratum Group). Factors that impact the stability of shallow soils include soil cohesion, soil thickness, saturated soil thickness, and angle of internal friction as well as the slope angle. Slope angles are often used to identify potential shallow landslide hazard areas. King County (2016) used methodologies adopted from Burns et al., (2012) to map potential shallow landslide areas with slopes greater than 28.3 degrees (54 percent) as having a severe landslide hazard potential. Slopes between 23.7 degrees and 28.3 degrees were identified as having a moderate landslide hazard potential. Slopes meeting these criteria are present in the areas of the City described above.

The current SAO language used for landslide hazard area designations is commonly used by many jurisdictions across Washington State. Recent detailed mapping, LiDAR, and other resources are currently missing from the code and should be incorporated into the code language. In addition, the current landslide hazard areas map used by the City does not distinguish between potential shallow landslide hazard areas and potential deep-seated landslide hazard areas.

Watershed Plan Consistency for Erosion Hazard Areas: Potential landslide hazard areas can be impacted by increased groundwater in potentially unstable slopes. To prevent an increased frequency of landslides, the City should ensure requirements that maintain the natural hydrologic regime of water reaching landslide hazard areas. Strategy SA-7 of the Watershed Plan calls for improving tree retention and specifically recommends that reducing landslide buffers should be discouraged. It provides specific recommendations and suggestions for slopes within Management Groups 1 and 2A in the northern part of the City and UGA; areas just north of the City, extending down slopes to the Cherry Valley, are where the large majority of landslide hazard areas in the Duvall vicinity are located. The Watershed Plan recommendations are a good approach to reducing the potential impacts to landslide prone slopes in these areas.

Seismic Hazard Areas

The City is located in an area of relatively high seismic risk (Petersen et al., 2014; and UW Shake Map Scenarios, 2014). Atwater (1992) and Atwater et al., (1995) identified the potential for very large seismic events [placeholder for Richter scale range] on the outer Washington coast that would generate very large

earthquakes of long duration, with regional impacts including impacts to the Duvall area. Palmer et al., (2004) delineated areas potentially susceptible to soil liquefaction during earthquakes and hence more susceptible to damage to structures and infrastructure. Low areas along the floors of the Snohomish River and Cherry Creek Valleys are identified as potentially susceptible to soil liquefaction (Palmer et al., 2004).

In 1996, a magnitude 5.3 earthquake was centered in the Duvall area. The *Geologic Map of the Carnation 7.5-minute Quadrangle, King County, Washington* (Dragovitch et al., 2010) denotes several fault zones running through and in close proximity to the City. Highly disrupted older geologic units were identified along the base of Cherry Valley's slope on the northeast side of the City that have been interpreted as seismically induced; review of the larger area around Duvall and Northeast King County show evidence of large localized earthquakes. That said, no post glacial surface ruptures are evident in the LiDAR imagery of the Duvall area.

The City's Comprehensive Plan Policy ES 13.4 aims to "Support and promote seismic/liquefaction hazard preparedness efforts." The City can implement this policy through its SAO by adopting the International Building Code to address structure specific seismic hazards, and by ensuring that seismic hazard area designations are consistent with those identified on the City's seismic hazard map. DMC 14.42.460.B.9 already requires that projects in seismic hazards include a detailed engineering evaluation of expected liquefaction effects; this code section would likely be an appropriate location of for adoption of pertinent International Building Code standards.

Sensitive Areas Inventory Maps

The City recently compiled updated GIS data for sensitive areas mapping during the Watershed Plan and Comprehensive Plan development updates, resulting in updated sensitive areas inventory maps. ESA reviewed each data source as indicated in the table below. The City has generally complete and reliable inventory data for sensitive areas including fish and wildlife habitat conservation areas (streams and wildlife habitat corridors), wetlands, frequently flooded areas, and critical aquifer recharge areas. There is opportunity to update inventory mapping for geologically hazardous areas, focused on use of digital elevation models (DEM) from LiDAR imagery data to identify potential landslide hazard areas. Key data sources, some of which include existing mapping of shallow and deep-seated landslide areas, include King County (2016) and Dragovitch et al. (2010).

Next Steps

The attached matrix contains a variety of gaps or missing provisions in the City's code. Once the City has reviewed the list and determined how best to address the identified gaps, ESA will provide recommendations for revising the code. Our recommendations will include specific code language where applicable. We anticipate the City will want to discuss some of the gaps prior to the recommendation work and this step will allow time for communication.

Best Available Science References Consulted During Consistency Review

- Brennan, J., H. Culverwell, R. Gregg, and P. Granger. 2009. Protection of Marine Riparian Functions in Puget Sound, Washington. Prepared for Washington Department of Fish and Wildlife by Washington Sea Grant. June 15, 2009. 148 pp.
- Bunten, D., A. McMillan, R. Mraz, and J. Sikes. 2012. Wetlands and CAO Updates: Guidance for Small Cities. Western Washington Version. Washington State Department of Ecology Publication No. 10-06-002. October 2012 2nd Revision. Olympia, WA.
- Cramer, Michelle L. (managing editor). 2012. Stream Habitat Restoration Guidelines. Co-published by the Washington Departments of Fish and Wildlife, Natural Resources, Transportation and Ecology, Washington State Recreation and Conservation Office, Puget Sound Partnership, and the U.S. Fish and Wildlife Service. Olympia, Washington.
- CTED (Washington State Department of Community, Trade, and Economic Development). 2007. Critical Areas Assistance Handbook: Protecting Critical Areas within the Framework of the Washington Growth Management Act. Olympia, WA.
- Dragovich, J. D.; Anderson, M. L.; Mahan, S. A.; Koger, C. J.; Saltonstall, J. H.; MacDonald, J. H., Jr.; Wessel, G. R.; Stoker, B. A.; Bethel, J. P.; Labadie, J. E.; Cakir, Recep; Bowman, J. D.; DuFrane, S. A., 2011. Geologic map of the Monroe 7.5-minute quadrangle, King and Snohomish Counties, Washington. Open File Report 2011-1, scale:1:24,000
- Environmental Laboratory. 1987. Corps of Engineers Wetlands Delineation Manual. Technical Report Y-87-1. U.S. Army Engineer Waterways Experiment Station, Vicksburg, Massachusetts.
- Environmental Law Institute. 2008. Planner's guide to wetland buffers for local governments. Washington D.C.
- ESA (Environmental Science Associates). 2015. City of Duvall Watershed Plan. Prepared for City of Duvall. August 2015.
- Federal Emergency Management Agency (FEMA). 2013a. National Floodplain Insurance Program Community Rating System Coordinator's Manual. FIA-15/2013. Indianapolis, IN.
- Federal Emergency Management Agency (FEMA). 2013b. Model Ordinance for Floodplain Management under the National Flood Insurance Program and the Endangered Species Act. FEMA - Region 10. Bothell, WA.
- Federal Emergency Management Agency (FEMA). 2009. National Floodplain Insurance Program Floodplain Management Guidebook. FEMA – Region 10. Bothell, WA.
- Federal Emergency Management Agency (FEMA). 2002. CRS Credit for Higher Regulatory Standards. Indianapolis, IN.

- Granger, T., T. Hruby, A. McMillan, D. Peters, J. Rubey, D. Sheldon, S. Stanley, E. Stockdale. April 2005. Wetlands in Washington State - Volume 2: Guidance for Protecting and Managing Wetlands. Washington State Department of Ecology. Publication #05-06-008. Olympia, WA.
- Herrera Environmental Consultants, Inc. 2002. Fish Habitat Restoration Plan. Prepared for City of Duvall Planning Department. December 2002.
- Hruby, T. 2014. Washington State Wetland Rating System for Western Washington: 2014 Update. Washington Department of Ecology (Publication #14-06-029). Olympia, WA.
- Hruby, T. 2013. Update on Wetland Buffers: The State of the Science, Final Report, October 2013. Washington State Department of Ecology Publication #13-06-11.
<https://fortress.wa.gov/ecy/publications/SummaryPages/1306011.html>
- Hruby, T. 2012. Calculating Credits and Debits for Compensatory Mitigation in Wetlands of Western Washington. Ecology Publication No. 10-06-011.
<https://fortress.wa.gov/ecy/publications/publications/1006011.pdf>
- Hruby, T., K. Harper, and S. Stanley. 2009. Selecting Wetland Mitigation Sites Using a Watershed Approach. Washington State Department of Ecology (Publication #09-06-032). Olympia, WA.
- Institute for Water Resources (IWR). 2015. The Mitigation Rule Retrospective: A Review of the 2008 Regulations Governing Compensatory Mitigation for Losses of Aquatic Resources. Prepared by IWR, a Corps of Engineers Field Operating Activity located within the Washington DC National Capital Region (NCR). Alexandria, VA.
- Johnson, A.W., and D. Ryba. 1992. A literature review of recommended buffer widths to maintain various functions of stream riparian areas. King County Surface Water Management Division, Seattle, WA.
- King County. 2016. Mapping of Potential Landslide Hazards along River Corridors of King County.
- Knight, K. 2009. Land Use Planning for Salmon, Steelhead and Trout. Washington Department of Fish and Wildlife. Olympia, Washington.
- Knutson, K. L., and Naef, V. L. 1997. Management recommendations for Washington's priority habitats: Riparian. Washington Department of Fish and Wildlife. 181 pp.
- Kusler, J.A. 2011. Assessing the Natural and Beneficial Functions of floodplains: Issues and approaches; future directions. Prepared for the Association of State Wetland Managers, Inc. Berne, NY. October 18, 2011. Available at: http://www.aswm.org/pdf_lib/nbf.pdf
- May, C.W. 2003. Stream-riparian ecosystems in Puget Sound lowland eco-region: A review of best available science. Watershed Ecology LLC.
- Mayer, P.M., S.K. Reynolds, M.D. McCutchen, and T.J. Canfield. 2006. Riparian buffer width, vegetative cover, and nitrogen removal effectiveness: A review of current science and regulations. EPA/600/R-05/118. Cincinnati, OH, U.S. Environmental Protection Agency, 2006.

- National Marine Fisheries Service (NMFS).2008. Anadromous Salmonid Passage Facility Design. NMFS, Northwest Region. Portland, Oregon.
- NMFS. 2009. Final Biological Opinion Implementation of the National Flood Insurance Program in the State of Washington, Phase One Document – Puget Sound Region. Bothell, WA.
- National Resource Council (NRC). 2001. Compensating for Wetland Losses Under the Clean Water Act. The National Academies Press. Washington, DC. <http://www.nap.edu/>
- Olson, P. and E. Stockdale. 2010. Determining the Ordinary High Water Mark on Streams in Washington State. Second Review Draft. Washington State Department of Ecology, Shorelands & Environmental Assistance Program, Lacey, WA. Ecology Publication # 08-06-001.
- Parametrix. 2005. Landscape Analysis for Critical Areas Ordinance Update. Prepared for City of Duvall Planning Department. May 2005.
- PSP (Puget Sound Partnership). 2010. Floodplain Management: A Synthesis of Issues Affecting Recovery of Puget Sound. Prepared by Millie Judge (Lighthouse Natural Resource Consulting, Inc.); David St. John (PSP) and Caitlin Imaki (PSP). Available at: http://www.psp.wa.gov/vitalsigns/documents/Floodplain_Management_Report%20Judge%20Final-July%202010.pdf.
- Sheldon, D., T. Hruby, P. Johnson, K. Harper, A. McMillan, T. Granger, S. Stanley, and E. Stockdale. March 2005. Wetlands in Washington State - Volume 1: A Synthesis of the Science. Washington State Department of Ecology. Publication #05-06-006. Olympia, WA.
- Semlitsch, R. and J. B. Jensen. 2001. Core habitat, not buffer zone. National Wetlands Newsletter July-August 2001:5-11.
- U.S. Army Corps of Engineers (Corps). 2010. Regional Supplement to the Corps of Engineers Wetland Delineation Manual: Western Mountains, Valleys, and Coast Region. Version 2. Wetlands Regulatory Assistance Program. May 2010. ERDC/EL TR-10-3. http://www.usace.army.mil/CECW/Documents/cecwo/reg/west_mt_finalsupp.pdf.
- U.S. Army Corps of Engineers (Corps), Seattle District. 2011. Components of a Complete Wetland Delineation Report. <http://www.nws.usace.army.mil/Missions/CivilWorks/Regulatory/PermitGuidebook/Wetlands.aspx>
- U.S. Army Corps of Engineers (Corps) and U.S. Environmental Protection Agency (U.S. EPA). 2008. Compensatory Mitigation for Losses of Aquatic Resources. Final Rule. Federal Register 73(70): 19594-19705.
- U.S. National Archives and Records Administration. Code of Federal Regulations. “National Flood Insurance Program: Criteria for Land Management and Use.” 44 CFR Part 60.
- Washington State Department of Ecology (Ecology). 2005. Critical Aquifer Recharge Areas – Guidance Document. Ecology Publication # 05-10-028. Olympia, WA.

- Washington State Department of Ecology (Ecology). 2015. Guidance to Local Governments on Frequently Flooded Area Updates in CAOs. Shorelands and Environmental Assistance Program. Olympia, WA.
- Washington State Department of Ecology (Ecology). 2013. Appendix L- Riparian Restoration and Planting in Funding Guidelines State Fiscal Year 2015 – Water Quality Financial Assistance. Ecology Publication No. 13-10-041.
- Washington State Department of Ecology (Ecology). 2012a. Guidance on In-Lieu Fee Mitigation. Ecology Publication No. 12-06-012. <https://fortress.wa.gov/ecy/publications/publications/1206012.pdf>
- Washington State Department of Ecology (Ecology). 2012b. Calculating Credits and Debits for Compensatory Mitigation in Wetlands of Western Washington. Ecology Publication No. 10-06-011. <https://fortress.wa.gov/ecy/publications/publications/1006011.pdf>
- Washington State Department of Ecology (Ecology), U.S. Army Corps of Engineers (USACE), and Washington Department of Fish and Wildlife (WDFW). 2012c. Advance Permittee-Responsible Mitigation. Ecology Publication No. 12-06-015. <https://fortress.wa.gov/ecy/publications/publications/1206015.pdf>
- Washington State Department of Ecology (Ecology). 2008. Making Mitigation Work: The Report of the Mitigation that Works Forum. Ecology Publication No. 08-06-018. <https://fortress.wa.gov/ecy/publications/publications/0806018.pdf>
- Washington State Department of Ecology (Ecology), U.S. Army Corps of Engineers (Corps), and US Environmental Protection Agency (EPA). 2006a. Wetland Mitigation in Washington State—Part 1: Agency Policies and Guidance. Ecology Publication: #06-06-011a. March 2006.
- Washington State Department of Ecology (Ecology), U.S. Army Corps of Engineers (Corps), and US Environmental Protection Agency (EPA). 2006b. Wetland Mitigation in Washington State—Part 2: Developing Mitigation Plans. Ecology Publication #06-06-011b. March 2006.
- Washington State Department of Ecology (Ecology). 2005. Critical Aquifer Recharge Areas – Guidance Document. Ecology Publication # 05-10-028. Olympia, WA.
- Washington State Department of Ecology (Ecology). 1997. Washington State Wetlands Identification and Delineation Manual.
- Washington State Department of Fish and Wildlife (WDFW). 2009. Landscape Planning for Washington’s Wildlife: Managing for Biodiversity in Developing Areas. Olympia, WA.
- Washington Department of Licensing (DOL). 2006. Guidelines for Preparing Engineering Geology Reports in Washington. Prepared by the Geologist Licensing Board. Olympia, WA. Available at:
- Washington State Department of Transportation (WSDOT). 2015. Geotechnical Design Manual M 46-03.11. Environmental and Regional Operations, Construction Division, Geotechnical Office. Tumwater, WA

City of Duvall
 Sensitive Areas Ordinance (SAO) and Tree Protection Update
 Gap Analysis Matrix – **WORKING DRAFT**
 May 2, 2017

Existing Provision DMC Chapter	Degree of Consistency with BAS & Guidance	Reason for Consistency/ Lack of Consistency	Suggested Change	Rationale / Basis	Advisory Committee Review Comments
14.42.010-150 General Provisions					
14.42.010 Purpose	<p>Could be revised to be more consistent.</p> <p>Could be revised to be more consistent.</p>	<p>Section could be better aligned with the policies and objectives in the City's Comprehensive Plan.</p> <p>Section does not introduce the protection of buffers associated with sensitive areas.</p>	<p>Revise section to be more consistent with language used in the revised Comprehensive Plan</p> <p>Revise section include protection of buffers.</p>	<p>Internal consistency.</p> <p>CTED, 2007</p>	
14.42.020 Applicability	Consistent with BAS/GMA.				
14.42.030 Sensitive Area Review	Consistent with BAS/GMA.				
14.42.040 General Exemptions	Inconsistent with guidance.	Code does not include requirements for minimizing impacts to sensitive areas.	Consider revising the introductory language to: "All exempted activities shall use reasonable methods to avoid or minimize impacts to	Sensitive area impacts resulting from exempt activities	

Existing Provision DMC Chapter	Degree of Consistency with BAS & Guidance	Reason for Consistency/ Lack of Consistency	Suggested Change	Rationale / Basis	Advisory Committee Review Comments
			<p>sensitive areas, and that alteration of a sensitive area that is not a necessary outcome of the exempted activity shall be restored at the responsible party's expense.</p> <p>The following developments, activities, and associated uses shall be exempt from the requirements of this chapter, provided that they are otherwise consistent with the provisions of other local, state, and federal laws and requirements:"</p>	<p>should be minimized as much as possible. CTED, 2007</p>	
14.42.040 (B) General exemptions	Could be revised to be more consistent with GMA	Code exempts maintenance of irrigation and drainage ditches.	Change "irrigation and drainage ditches" to "irrigation and drainage ditches that do not meet the criteria for being considered a fish and wildlife habitat area" to ensure consideration of anadromous salmonids.	WAC 365-190 In some environments, existing drainage ditches may be completely manmade, or may be streams that were historically straightened and ditched,	

Existing Provision DMC Chapter	Degree of Consistency with BAS & Guidance	Reason for Consistency/ Lack of Consistency	Suggested Change	Rationale / Basis	Advisory Committee Review Comments
	Could be revised to be more consistent.	Code exempts maintenance of farm ponds, fish ponds, and livestock water ponds.	Change “farm ponds, fish ponds, and livestock water ponds” to “farm ponds, fish ponds, and livestock water ponds that do not meet criteria for being considered a fish and wildlife habitat area.”	that may still provide fish habitat. In some environments, manmade wetlands or ponds may be ponds that were historically straightened and ditched, which may still provide fish habitat.	
14.42.040 (D) Exemptions	Could be revised to be more consistent	Code exempts maintenance of existing, lawfully established landscaping and gardens within sensitive areas or their buffers. While maintaining this exemption is reasonable, code could be clarified to indicate that exemption is not applicable if property redevelopment or expansion of structures occurs.	Consider updating exemption to make it clear that exemption does not apply if redevelopment or expansion of existing structures occurs. Sensitive area buffers and landscaping serve different purposes, which may be at odds.	Improve clarity.	

Existing Provision DMC Chapter	Degree of Consistency with BAS & Guidance	Reason for Consistency/ Lack of Consistency	Suggested Change	Rationale / Basis	Advisory Committee Review Comments
14.42.050(F) Allowed Activities	Could be revised to be more consistent with BAS.	Section F(1) does not provide recommendations or resources for controlling state listed noxious weeds and invasive species. BAS provides suggestions for several strategies for controlling noxious weeds and invasive species including but not limited to: hand removal, chemical treatment, shading, or other techniques may be appropriate depending on the species and situation.	Revise Section F(1) to include additional information regarding noxious weed and invasive species removal. See Footnote 1 for example language.	Bunten et al., 2012	
14.42.060 (D) Sensitive Area Studies	Could be revised to be more consistent with BAS.	Code specifies that contents for sensitive area studies are provided in following sections of chapter, but there is no language describing general requirements for sensitive area reports.	Consider adding a list of minimum report contents. This will apply to all sensitive areas. The Commerce Example Code Provisions contain a set of report requirements that are commonly used by local jurisdictions (see X.10.0 in CTED, 2003).	Ecology and WDFW recommend that requirements for sensitive areas reports be included in administrative sections of the sensitive areas code. Sources: <i>Wetlands in Washington State, Volume</i>	

Existing Provision DMC Chapter	Degree of Consistency with BAS & Guidance	Reason for Consistency/ Lack of Consistency	Suggested Change	Rationale / Basis	Advisory Committee Review Comments
				<p><i>2: Guidance for Protecting and Managing Wetlands Ecology Publication #05-06-008 (Granger et al. 2005). Critical Areas Assistance Handbook: Protecting Critical Areas within the Framework of the Washington Growth Management Act (CTED 2003).</i></p>	
14.42.070 Reasonable Use	Consistent with BAS/GMA.				
14.42.080 Appeals	Consistent with BAS/GMA.				

Existing Provision DMC Chapter	Degree of Consistency with BAS & Guidance	Reason for Consistency/ Lack of Consistency	Suggested Change	Rationale / Basis	Advisory Committee Review Comments
14.42.090 Density Credits	Consistent with BAS/GMA.				
14.42.100 Notice on Title	Inconsistent with BAS.	Code does not include provisions for establishing site protection mechanisms for mitigation sites.	Add provisions requiring mitigation site protection mechanisms (e.g. conservation easement, restrictive covenant).	City of Duvall Watershed Plan (ESA, 2015)	
14.42.110 Temporary marking, permanent survey marking and signs	Could be revised to be more consistent with BAS.	Code includes provisions for permanent fencing as a form of wetland protection.	Consider clarifying 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, and associated habitat.	Improve consistency with BAS.	
14.42.120 Building Setbacks	Consistent with BAS/GMA; internal consistency issue with Landscaping Standards	Building setbacks required by this section extend 10 feet from the edges of all sensitive areas buffers. Portions of the City's Landscaping Standards (DMC Chapter 14.38) require a 15 foot wide landscape area extending from the edge of sensitive areas.	Revise DMC Chapter 14.42 and Chapter 14.38 so they provide corresponding building setback / landscape area width requirements.	Internal consistency within DMC Title 14.	
14.42.130 Mitigation	Consistent with BAS/GMA.				

Existing Provision DMC Chapter	Degree of Consistency with BAS & Guidance	Reason for Consistency/ Lack of Consistency	Suggested Change	Rationale / Basis	Advisory Committee Review Comments
14.42.140 Enforcement	Could be revised to be more consistent with guidance.	Code does not include provisions for the City to authorize a stop work order, or require a restoration plan for unauthorized alterations.	Consider including additional enforcement provisions for the Director; see Footnote 2 for example language.	CTED, 2003	
14.42.150 Administrative Rules	Consistent with BAS/GMA.				
14.42.200-260 Wetlands					
14.42.200(A) Designation, Rating, and Mapping	Could be more revised to be more consistent with GMA.	The wetland definition is not entirely consistent with the RCW/Ecology guidance definition.	Update definition to be consistent with RCW/Ecology guidance. See Footnote 3 for example language.	RCW 36.70A.030; Buntzen et al., 2012	
14.42.200(B) and (D) Designation, Rating, and Mapping	Inconsistent with BAS Could be more consistent with BAS.	Section B and D reference outdated wetland delineation and rating manuals. Section B does not specify how long a wetland delineation is valid.	Revise Sections B and D to refer to the approved federal wetland delineation manual and applicable regional supplements, and the updated scoring system using the Washington State Rating System for Western Washington: 2014 Update. Section B could be improved for consistency with BAS by specifying that wetland	Compliance with federal and state requirements (WAC 173-22-035, WAC 365-190-090) Corps of Engineers Regulatory	

Existing Provision DMC Chapter	Degree of Consistency with BAS & Guidance	Reason for Consistency/ Lack of Consistency	Suggested Change	Rationale / Basis	Advisory Committee Review Comments
			delineations are valid for five years.	Guidance Letters RGL 05-02 and 08-02 set a five year standard on wetland determinations	
14.42.210 Wetland Buffer Standards	Inconsistent with BAS.	Code does not include provisions for wetland buffer modifications specific to subbasin Management Groups identified in the Watershed Plan.	Revise to include provisions for specific wetland buffer modifications.	City of Duvall Watershed Plan (ESA, 2016)	
14.42.210(A) Wetland Buffer Standards	Inconsistent with BAS	Section A(3) buffer widths and habitat scores refer to the previous wetland rating system habitat scoring method. The rating system has been updated and scoring amounts have changed.	Revise Section A to refer to the Washington State Rating System for Western Washington: 2014 Update and to reflect recent BAS updates to buffers; for example, as shown in Table XX.1 in Ecology’s wetland guidance document (Bunten et al., 2012). Ecology’s example wetland buffer system contains provisions for increasing or decreasing buffer widths based upon the number of habitat points received; therefore the	Hruby, 2014; Bunten et al., 2012	

Existing Provision DMC Chapter	Degree of Consistency with BAS & Guidance	Reason for Consistency/ Lack of Consistency	Suggested Change	Rationale / Basis	Advisory Committee Review Comments
			corresponding language in Sections 14.42.210(B),(C), and (E) may not be required.		
14.42.210(B) and (C) Wetland Buffer Standards	Inconsistent with BAS	Section B(3) and C(4) allows for reducing wetland buffers greater than 25 percent and is not consistent with BAS.	Update provisions for buffer reduction to be no greater than 25 percent of the standard buffer width. If suggested revisions are made to include specific modifications per subbasin Management Group as identified in the Watershed Plan, then this may not be necessary.	Bunten et al., 2012	
14.42.220 Wetland Alterations	Could be revised to be more consistent.	Section does not refer to mitigation sequencing requirement.	Revise to include a reference to the mitigation sequencing provision in DMC 14.42.130(B).	Bunten et al., 2012 and consistency with federal and state standards.	
14.42.220(F) Wetland Alterations	Inconsistent with BAS.	Section F allows for stormwater management facilities to be located within the outer 50 percent of standard wetland buffers. It also allows for facilities to be located in buffers of Category II wetlands.	Remove provision or review "Allowed Buffer Uses" in Bunten et al. (2012).	Bunten et al., 2012	

Existing Provision DMC Chapter	Degree of Consistency with BAS & Guidance	Reason for Consistency/ Lack of Consistency	Suggested Change	Rationale / Basis	Advisory Committee Review Comments
14.42.220(H) Wetland Alterations	Inconsistent with BAS.	Section H allows for a trail to be located in the outer 50 percent of the standard buffer area and is inconsistent with BAS.	Remove provision or review "Allowed Buffer Uses" in Bunten et al. (2012).	Bunten et al., 2012.	
14.42.230 Wetland Review and Reporting Requirements	Could be revised to be more consistent.	Section 6(B.6) references the wrong code section (DMC 14.42.240) for mitigation plan requirements.	Revise to include correct code reference (DMC 14.42.250).	Improve clarity	
14.42.230 (B) Wetland Review and Reporting Requirements	Generally consistent, but could be strengthened.	Additional detail could be added to strengthen reporting requirements in this section.	Revise section 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 sensitive areas study, including references; and -An assessment of the probable cumulative effects to sensitive areas resulting from development of the site and the proposed development;	CTED, 2007; Bunten et al., 2012. These recommendations will clarify for the City how and what was done for a wetlands report.	

Existing Provision DMC Chapter	Degree of Consistency with BAS & Guidance	Reason for Consistency/ Lack of Consistency	Suggested Change	Rationale / Basis	Advisory Committee Review Comments
			-Wetland rating forms and datasheets		
14.42.240 Wetland Mitigation	Inconsistent with BAS.	Lacks reference to BAS sources for compensatory mitigation.	Revise to include the following required BAS references: <i>Wetland Mitigation in Washington state-Part 2: Developing Mitigation Plans-Version 1</i> (Ecology Publication #06-06-011b) and <i>Selecting Wetland Mitigation Sites Using a Watershed Approach, Western Washington</i> (Ecology Publication #09-06-32).	<i>Selecting Wetland Mitigation Sites Using a Watershed Approach, Western Washington</i> (Ecology Publication #09-06-32)	
14.42.240(B) Wetland Mitigation	Inconsistent with BAS.	The replacement ratio table in Sections B refers to outdated wetland replacement ratios. Current BAS also suggests different mitigation ratios for specific types of Category I wetlands.	Consider removing replacement ratio table in Section C with Ecology’s Table 8C-11.	Bunten et al., 2012	
14.42.240(H) Wetland Mitigation	Could be revised to be more consistent with BAS.	The code currently does not specify using mitigation banks or ILF programs as preferred over permittee-responsible mitigation (regardless of location). BAS indicates that advance mitigation and ILF programs have significantly greater likelihood of	Consider specifying that mitigation using banks or ILF programs is preferred over permittee-responsible mitigation (regardless of location), if the wetland alteration falls within the service areas of an existing	Corps, 2008; Ecology et al., 2012C	

Existing Provision DMC Chapter	Degree of Consistency with BAS & Guidance	Reason for Consistency/ Lack of Consistency	Suggested Change	Rationale / Basis	Advisory Committee Review Comments
		mitigation success, as opposed to permittee-responsible mitigation.	bank or ILF program. Consider using example language in Footnote 4.		
14.42.240(l) Wetland Mitigation	Could be revised to be more consistent BAS.	Code does not specify using wetland mitigation site protection mechanisms (e.g., conservation easement, restrictive covenant). BAS indicates that these will minimize functional loss from degradation of wetlands and buffers.	Consider revising Section I to include site protection mechanisms.	ESA, 2015	
14.42.250(A) Wetland Mitigation Plan	Could be revised to be more consistent with BAS.	Section A(2) does not include provisions for a contingency plan. Section A(2)(k) does not specify the use of BAS in evaluating performance standards.	Considering adding a new subsection requiring the development of a contingency plan. Revise subsection to require the use of BAS.	Bunten et al., 2012	
14.42.260 Wetland Mitigation Monitoring	Consistent with BAS/GMA.				

Existing Provision DMC Chapter	Degree of Consistency with BAS & Guidance	Reason for Consistency/ Lack of Consistency	Suggested Change	Rationale / Basis	Advisory Committee Review Comments
14.42.300-370 Fish and Wildlife Habitat Conservation Areas (FWHCAs) – including Streams, Lakes and Wildlife Habitat Corridors					
14.42.300(C) Designation, Mapping and Classification	Inconsistent with GMA.	Section C includes some but not all of the fish and wildlife habitat conservation area types that are listed by the GMA and its implementing regulations. <i>Missing: Naturally occurring ponds under twenty acres and their submerged aquatic beds that provide fish or wildlife habitat and Waters of the state as defined in RCW 90.48.020 and classified in WAC 365-190-130.</i>	Update this section with the regulated fish and wildlife habitat conservation area types that are listed in WAC 365-190-130 and in example code in CTED (2007).	Compliance with GMA (WAC 365-190-130). CTED, 2007.	
14.42.310(A) Streams	Inconsistent with GMA, BAS.	Section A(1) refers to the wrong WAC section for King County designated shorelines of the state. It should be WAC 173-18-210. The stream typing system is not completely consistent with State standards.	Revise to include correct WAC section. Consider revising standard stream classification system to include the Type S, F, Np, and Ns stream classes defined by Washington Department of Natural Resources. See BAS memo for details.	Compliance with GMA (WAC 173-18-210). The State stream typing system (WAC 222-16-030) is consistent with BAS.	

Existing Provision DMC Chapter	Degree of Consistency with BAS & Guidance	Reason for Consistency/ Lack of Consistency	Suggested Change	Rationale / Basis	Advisory Committee Review Comments
14.42.320 Stream Buffers	Inconsistent with BAS.	Code does not include provisions for stream buffer modifications specific to subbasin Management Groups identified in the Watershed Plan.	Revise to include provisions for specific stream buffer modifications.	ESA, 2015	
14.42.320(C) Stream Buffers	Inconsistent with BAS.	The City’s standard buffers range from 25 feet (non-fish bearing streams) to 100 feet (salmonid-bearing streams). 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; however recent BAS suggests 100 foot minimum standard buffers for any stream with anadromous fish use and a 50 foot minimum standard buffer for other streams (Appendix L in Ecology, 2013).	Consider increases to standard buffer widths. ESA can provide more details and example language.	Brennan et al., 2009; May, 2003; and Knutson and Naef, 1997	
14.42.320(E) Stream Buffers	Generally consistent with BAS.	Performance-based buffer standards are generally consistent with BAS; however, many of the specific provisions for reaches designated with performance-based buffers have	Update Performance-based Stream Buffer Standards to account for new development and resulting stream habitat improvements in the last 10+ years, and to integrate this approach with the buffer	Update to reflect current City circumstances; Comprehensive Plan /Watershed	

Existing Provision DMC Chapter	Degree of Consistency with BAS & Guidance	Reason for Consistency/ Lack of Consistency	Suggested Change	Rationale / Basis	Advisory Committee Review Comments
		been implemented in the last 10-years.	recommendations from the Watershed Plan.	Plan consistency	
14.42.320(F) Stream Buffers	Inconsistent with BAS.	Section F(2) allows for stream buffer width reductions greater than 25 percent, which is not supported by BAS.	Update provisions for buffer reductions to be no greater than 25 percent of the standard buffer width.	Bunten et al., 2012	
14.42.330 Streams Allowed Uses	Could be revised to be more consistent.	Section does not refer to mitigation sequencing requirement.	Consider updating section to reference mitigation sequencing requirement (DMC 14.42.130(B)).	CTED, 2007	
14.42.330(C) Streams Allowed Uses	Could be revised to be more consistent with BAS.	Section C(2) refers to outdated WDFW and NMFS guidance for fish passage.	Consider updating references to WDFW's <i>Design of Road Culverts for Fish Passage</i> (Bates et al., 2003) and/or NMFS's <i>Anadromous Salmonid Passage Facility Design</i> (NMFS, 2008).	WDFW 2013 <i>Water Crossing Design Guidelines</i>	
14.42.330(D) Streams Allowed Uses	Inconsistent with BAS.	Section D allows for stormwater management facilities to be located within the outer 50 percent of standard stream buffers, which is not supported by BAS.	Revise section the same as language regarding stormwater management facilities in wetland buffers (14.42.220(F)).	Improve internal consistency. Bunten et al., 2012	
14.42.330(H) Streams Allowed Uses	Inconsistent with BAS.	Section H allows for a trail to be located within the outer 50 percent of the standard buffer	Revise section the same as language regarding trails in wetland buffers (14.42.220(H)).	Improve internal consistency.	

Existing Provision DMC Chapter	Degree of Consistency with BAS & Guidance	Reason for Consistency/ Lack of Consistency	Suggested Change	Rationale / Basis	Advisory Committee Review Comments
		area, which is not supported by with BAS.		Bunten et al., 2012	
14.42.340 Habitat Conservation Areas – Ponds and Lakes	Consistent with BAS/GMA.				
14.42.350(A) Other FWHCA	Could be revised to be more consistent.	The table in Section A does not reference King County’s list of habitats and species of local importance found in their Comprehensive Plan (Attachment A to Ordinance 18427, E-435) and protected via King County Code (KCC) 21A.24.382. A list of the specific species and habitats relevant to the City would also be helpful to clarify and limit the application of this section.	Consider including King County’s list of habitats and species of local importance or include reference to the listed habitats and species.	Consistency with King County CAO.	
14.42.360(C) Review and Reporting Requirements	Generally consistent, but could be strengthened.	Additional detail could be added to strengthen the reporting requirements in this section.	Revise section with the same language regarding wetland reporting requirements (DMC 14.42.230(B)).	CTED, 2007; Bunten et al., 2012	
14.42.370 Management Standards	Inconsistent with BAS.	Code does not include provisions requiring a monitoring plan for proposed mitigation; or	Consider adding new sections for requiring the development of a contingency plan,	Bunten et al., 2012 and ESA, 2015	

Existing Provision DMC Chapter	Degree of Consistency with BAS & Guidance	Reason for Consistency/ Lack of Consistency	Suggested Change	Rationale / Basis	Advisory Committee Review Comments
		<p>requirements for a contingency plan or site protection mechanism for mitigation.</p> <p>Standards are not focused on specific habitats or species and lack detail.</p>	<p>monitoring plan and site protection mechanisms.</p> <p>Revise to address specific habitats and species. ESA can provide example language during code revision stage. Also see City of Kenmore CAO 18.55.530 for possible language.</p>	<p>Inconsistent with BAS. WDFW, 2009</p>	
14.42.3XX (NEW) Habitat Corridors	NA	NA	Consider including a new section for provisions and development standards to protect habitat corridors, as recommended in the Comp Plan and Watershed Plan. ESA can provide example language.	Comprehensive Plan /Watershed Plan consistency	
14.42.400-460 Geologically Hazardous Areas [PLACEHOLDER FOR GAP ANALYSIS REVIEW FROM STRATUM GROUP]					
14.42.400 Designation and Mapping					
14.42.420 General Standards					

Existing Provision DMC Chapter	Degree of Consistency with BAS & Guidance	Reason for Consistency/ Lack of Consistency	Suggested Change	Rationale / Basis	Advisory Committee Review Comments
14.42.430 Landslide Hazard Area Standards					
14.42.440 Erosion Hazard Areas Standards					
14.42.450 Seismic Hazard Areas Standards					
14.42.460 Review and Reporting Requirements					
14.42.500 Flood Hazard Areas					
14.42.500 Designation and Mapping	Could be revised to be more consistent.	Section designates "Flood Hazard Areas" for protection, but is not entirely consistent with GMA language (Frequently Flooded Areas)	Consider revising Section title and subsequent language to "Frequently Flooded Areas".	Internal consistency.	
Floodplain Regulations are provided	Could be revised to be more	DMC 14.84 does not require compensatory floodplain storage for riverine floodplains (except	Consider requiring compensatory storage for all permitted floodplain fill within	NMFS, 2009; PSP, 2009;	

Existing Provision DMC Chapter	Degree of Consistency with BAS & Guidance	Reason for Consistency/ Lack of Consistency	Suggested Change	Rationale / Basis	Advisory Committee Review Comments
in DMC Chapter 14.84	consistent with BAS and GMA.	<p>within floodways). That said, the updated SMP (to be effective by June 2017) does require compensatory storage throughout the large majority of the floodplain.</p> <p>Recent BAS has highlighted the importance of floodplains for providing habitat to numerous fish and wildlife species, including anadromous salmon. FEMA Region X now requires all floodplain development within the Puget Sound to assess and avoid potential impacts to Endangered Species Act-listed salmon and their habitat.</p>	<p>DMC Chapter 14.42 or the referenced section of DMC 14.84.</p> <p>Updated SMP will provide adequate environmental protection for activities occurring within floodplain areas. That said, to clearly define requirements and expectations for meeting FEMA Region X direction for protection of ESA-listed species and habitat, consider designating flood hazard areas/frequently flooded areas as a "fish and wildlife habitat conservation area" under 14.42.300. Consider including criteria for habitat assessment for floodplain development.</p>	<p>FEMA, 2013; Ecology, 2015</p> <p>PSP, 2009; FEMA, 2013</p> <p>Opportunity to strengthen consistency with FEMA Region X's Floodplain Habitat Assessment and Mitigation Guidance.</p>	

Existing Provision DMC Chapter	Degree of Consistency with BAS & Guidance	Reason for Consistency/ Lack of Consistency	Suggested Change	Rationale / Basis	Advisory Committee Review Comments
14.42.600-620 Critical Aquifer Recharge Areas (CARAs)					
14.42.600 Designation and Mapping	Inconsistent with BAS.	Code references outdated Ecology guidance document. Section does not reference City mapping of CARAs.	Revise to include updated guidance: <i>Critical Aquifer Recharge Areas – Guidance Document, January 2005, Publication #05-10-028.</i> Revise section to include sensitive areas inventory map of CARAs.	Ecology, 2005 Internal consistency.	
14.42.610 Standards	Could be revised to be more consistent with BAS.	Code does not include provisions prohibiting activities that are not connected to an available sanitary sewer system.	Revise to include provisions prohibiting these activities from CARAs associated with sole source aquifers.	Ecology, 2005	
14.42.620 Review	Could be revised for clarity. Inconsistent with BAS and GMA.	Section includes provisions for specific activity performance standards mixed with review requirements. Code does not include provisions requiring sensitive area studies be prepared by a qualified professional.	Consider separating performance standards and review requirements by adding a new section for 'Performance Standards, specific uses', see suggestion below. Revise to include provisions be prepared by a qualified professional or reference DMC 14.42.060(A)(5).	Clarity and ease-of-use. Internal consistency.	

Existing Provision DMC Chapter	Degree of Consistency with BAS & Guidance	Reason for Consistency/ Lack of Consistency	Suggested Change	Rationale / Basis	Advisory Committee Review Comments
14.42.620 Review (B)	Could be revised to be more consistent with BAS.	Code does not include requiring hydrogeological assessments specific to proposed activity types.	Consider requiring two levels of hydrogeological assessment for the sensitive area study of CARAs; one to apply generally and an additional level that applies to specific activities (use of hazardous substances, use of injection wells, etc.).	Ecology, 2005	
14.42.6XX (NEW) Activities Allowed	NA	NA	Consider adding a new section for 'Allowed Activities' within CARAs that do not require a sensitive areas study. ESA can provide example language.	Consistency with Ecology guidance (2005)	
14.42.6XX (NEW) Performance standards, specific uses	NA	NA	Consider adding a new section for 'Performance standards, specific uses'; this could include provisions for storage tanks, vehicle repair and servicing, and residential pesticide use. ESA can provide example language.	Ecology, 2005	
14.42.700 Definitions					
14.42.700 Definitions	Could be revised to be more consistent.	No definition provided for "sensitive areas"	Consider providing a definition for "sensitive areas."	Bunten et al., 2012	

Existing Provision DMC Chapter	Degree of Consistency with BAS & Guidance	Reason for Consistency/ Lack of Consistency	Suggested Change	Rationale / Basis	Advisory Committee Review Comments
14.42.700 (17) Definitions	Could be revised to be more consistent	The definition of “buffer” provided does not exclude legally established, functionally isolated areas (for example, legally established roads/impervious surfaces or areas on the opposite side of legally established roads.	Revise definition to be more consistent with definition included in guidance.	Bunten et al., 2012; also provides clarity to applicants and City staff.	
14.42.700 (20) Definitions	Inconsistent with BAS.	Current definition of “compensatory mitigation” lacks terminology of Environmental Protection Agency (EPA) and US Army Corps of Engineers (Corps) definition.	<p>Revise to be similar to the EPA and Corps definition <u>and</u> reference the 2008 joint rule on Compensatory Mitigation for Losses of Aquatic Resources.</p> <p>33 CFR 332.2: “Compensatory mitigation means restoration (re-establishment or rehabilitation), establishment (creation), enhancement, and/or in certain circumstances preservation of aquatic resources for the purposes of offsetting unavoidable adverse impacts which remain after all appropriate and practicable avoidance and minimization has been achieved.”</p>	<p>Inconsistent with BAS and state and federal guidance.</p> <p><i>CFR Title 33 – Navigation and Navigable Waters Part 332 Compensatory Mitigation for Losses of Aquatic Resources (July 1, 2011)</i></p>	

Existing Provision DMC Chapter	Degree of Consistency with BAS & Guidance	Reason for Consistency/ Lack of Consistency	Suggested Change	Rationale / Basis	Advisory Committee Review Comments
			http://water.epa.gov/lawsregs/guidance/wetlands/wetlandsmitigation_index.cfm		
14.42.700 (29) Definitions	Inconsistent with GMA.	The definition of “delineation” references outdated wetland delineation manual.	Update reference to new wetland delineation manual.	WAC 173-22-035-020	
14.42.700 (65) Definitions	Inconsistent with GMA.	Current definition of “hydric soil” references outdated wetland delineation manual.	Update reference to new wetland delineation manual.	WAC 173-22-035-020	
14.42.700 (71) Definitions	Could be revised to be more consistent with BAS.	The definition of “in-kind compensation” is fairly general and leaves room for interpretation, consider revising to be more specific.	Consider revising to something similar to Ecology (2006): “In-kind mitigation is compensatory mitigation that involves the same wetland type and functions as the lost or degraded wetland, for example, the same hydrogeomorphic (HGM) subclass (e.g., riverine flow-through, depressionnal outflow, flats, etc.), plant community, and Cowardin class (e.g., palustrine emergent, palustrine forested or estuarine wetlands).”	Improve clarity. <i>Wetland Mitigation in Washington State – Part I: Agency Policies and Guidance. (Ecology, Corps, EPA, 2006)</i>	
14.42.700 (134) Definitions	Inconsistent with GMA.	The definition of “wetland delineation” references outdated wetland delineation manual.	Update reference to new wetland delineation manual.	WAC 173-22-035-020	

Existing Provision DMC Chapter	Degree of Consistency with BAS & Guidance	Reason for Consistency/ Lack of Consistency	Suggested Change	Rationale / Basis	Advisory Committee Review Comments
14.42.700 Definitions (new)	NA	Consider adding new definitions for reasonable use exception and salmonid.	See CTED example code definition for "reasonable use" and "salmonid."	Improve clarity. CTED, 2003	

Footnotes

¹**Example language for DMC 14.42.050(F) (Bunten et al., 2012)**

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 according to a noxious weed control plan appropriate to that species.

²**Example language for DMC 14.42.140 Enforcement (CTED, 2007)**

- A. When a critical area or its buffer has been altered in violation of this Title, all ongoing development work shall stop and the critical area shall be restored. The City shall have the authority to issue a stop work order to cease all ongoing development work, and order restoration, rehabilitation, or replacement measures at the owner's or other responsible party's expense to compensate for violation of provisions of this Title.
- B. Requirement for Restoration Plan. All development work shall remain stopped until a restoration plan is prepared and approved by City. Such a plan shall be prepared by a qualified professional using the best available science and shall describe how the actions proposed meet the minimum requirements described in Subsection (C). The [director] shall, at the violator's expense, seek expert advice in determining the adequacy of the plan. Inadequate plans shall be returned to the applicant or violator for revision and resubmittal.
- C. Minimum Performance Standards for Restoration

1. For alterations to critical aquifer recharge areas, frequently flooded areas, wetlands, and habitat conservation areas, the following minimum performance standards shall be met for the restoration of a critical area, provided that if the violator can demonstrate that greater functional and habitat values can be obtained, these standards may be modified:
 - a. The historic structural and functional values shall be restored, including water quality and habitat functions;
 - b. The historic soil types and configuration shall be replicated;
 - c. The critical area and buffers shall be replanted with native vegetation that replicates the vegetation historically found on the site in species types, sizes, and densities. The historic functions and values should be replicated at the location of the alteration; and
 - d. Information demonstrating compliance with the requirements in Section X (Mitigation Plan Requirements) shall be submitted to the [director].
2. For alterations to flood and geological hazards, the following minimum performance standards shall be met for the restoration of a critical area, provided that, if the violator can demonstrate that greater safety can be obtained, these standards may be modified:
 - a. The hazard shall be reduced to a level equal to, or less than, the pre-development hazard;
 - b. Any risk of personal injury resulting from the alteration shall be eliminated or minimized; and
 - c. The hazard area and buffers shall be replanted with native vegetation sufficient to minimize the hazard.

D. Site Investigations. The [director] is authorized to make site inspections and take such actions as are necessary to enforce this Title. The [director] shall present proper credentials and make a reasonable effort to contact any property owner before entering onto private property.

E. Penalties. Any person, party, firm, corporation, or other legal entity convicted of violating any of the provisions of this Title shall be guilty of a misdemeanor. Each day or portion of a day during which a violation of this Title is committed or continued shall constitute a separate offense. Any development carried out contrary to the provisions of this Title shall constitute a public nuisance and may be enjoined as provided by the statutes of the state of Washington. The City may levy civil penalties against any person, party, firm, corporation, or other legal entity for violation of any of the provisions of this Title. The civil penalty shall be assessed at a maximum rate of _____ dollars per day per violation. *(The amount of the penalty needs to be decided locally and should be consistent with other adopted civil penalties. Commonly, the penalty is \$1,000 per day per violation)*

³**Defintion from Ecology guidance (Bunten et al., 2012)DMC 14.200(A)** : “wetland” or “wetlands” means areas that are inundated or saturated by surface water or ground water at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions. Wetlands generally include swamps, marshes, bogs, and similar areas. Wetlands do not include those artificial wetlands intentionally created from non-wetland sites, including, but not limited to, irrigation and drainage ditches, grass-lined swales, canals, detention facilities, wastewater treatment facilities, farm ponds, and landscape amenities, or those wetlands created after July 1, 1990, that were unintentionally created as a result of the construction of a road, street, or highway. Wetlands may include those artificial wetlands intentionally created from non-wetland areas created to mitigate conversion of wetlands.

Example language for DMC 14.42.240 (H) Wetland Mitigation (Corps, 2008; Ecology et al., 2012)

Wetland Mitigation Banks.

1. Credits from a wetland mitigation bank may be approved for use as compensation for unavoidable impacts to wetlands when:
 - a. The bank is certified under state rules;
 - b. The Administrator determines that the wetland mitigation bank provides appropriate compensation for the authorized impacts; and
 - c. The proposed use of credits is consistent with the terms and conditions of the certified bank instrument.
2. Replacement ratios for projects using bank credits shall be consistent with replacement ratios specified in the certified bank instrument.
3. Credits from a certified wetland mitigation bank may be used to compensate for impacts located within the service area specified in the certified bank instrument. In some cases, the service area of the bank may include portions of more than one adjacent drainage basin for specific wetland functions.

In-Lieu Fee. To aid in the implementation of off-site mitigation, the City may develop an in-lieu fee program. This program shall be developed and approved through a public process and be consistent with federal rules, state policy on in-lieu fee mitigation, and state water quality regulations. An approved in-lieu-fee program sells compensatory mitigation credits to permittees whose obligation to provide compensatory mitigation is then transferred to the in-lieu program sponsor, a governmental or non-profit natural resource management entity. Credits from an approved in-lieu-fee program may be used when paragraphs 1-6 below apply:

1. The approval authority determines that it would provide environmentally appropriate compensation for the proposed impacts.
2. The mitigation will occur on a site identified using the site selection and prioritization process in the approved in-lieu-fee program instrument.
3. The proposed use of credits is consistent with the terms and conditions of the approved in-lieu-fee program instrument.
4. Land acquisition and initial physical and biological improvements of the mitigation site must be completed within three years of the credit sale.
5. Projects using in-lieu-fee credits shall have debits associated with the proposed impacts calculated by the applicant's qualified wetland scientist using the method consistent with the credit assessment method specified in the approved instrument for the in-lieu-fee program.
6. Credits from an approved in-lieu-fee program may be used to compensate for impacts located within the service area specified in the approved in-lieu-fee instrument.

Advance Mitigation. Mitigation for projects with pre-identified impacts to wetlands may be constructed in advance of the impacts if the mitigation is implemented according to federal rules, state policy on advance mitigation, and state water quality regulations.

memorandum

date May 2, 2017

to Lara Thomas, City of Duvall
Project Advisory Group, Sensitive Areas and Tree Protection Updates

from Aaron Booy and Christina Hersum, ESA

subject Sensitive Areas Ordinance Update - ***Habitat Corridor Assessment and Management Approach***

This technical memorandum introduces a proposed approach to managing development activities within identified fish and wildlife habitat corridors, and describe methods and define key terms included within the *Draft Habitat Corridor Rating and Management Form* (attached). The City is considering opportunities to protect habitat corridors as part of updating the Sensitive Areas Ordinance (SAO) provisions for Fish and Wildlife Habitat Conservation Areas (FWHCAs), with updates to be adopted by July 2017. This tech memo is being provided ahead of the May 8, 2017 Advisory Group meeting for the City’s Sensitive Areas and Tree Protection Update Project. Some of the background and context on wildlife habitat connectivity is repeated from language included in the Draft Best Available Science (BAS) Review and Gap Analysis Memo (ESA and Stratum Group, May 2017).

Background and Policy Basis: The Duvall Watershed Plan was adopted in 2015 by the Duvall City Council after a two-year process of analysis and development of recommendations by City staff and a project advisory group¹. The Plan includes a variety of actions to protect sensitive areas and wildlife, trees, and water quality while providing opportunity for future development. The Plan’s recommended action, *SA-1 Identify and Protect Habitat Corridors*, calls for a two-step process to identify and assess fish and wildlife habitat corridors for protection within the City of Duvall.

As part of the Watershed Plan effort, wildlife habitat corridors were identified and mapped (see project web-map: <http://arcg.is/2n1m1T4>). These corridors were aligned along tributary streams and other undeveloped sensitive areas (wetland, erosion/landslide hazard) areas, open space areas and parks, and other remaining forested uplands in the City. Corridors were established to link remaining habitat areas within Duvall and to surrounding habitat areas around the city. The effort identified habitat corridors as lines transecting the City, with surrounding 350-foot wide habitat corridor zones². This standardized approach to designating habitat

¹ 2015 Watershed Plan, developed by ESA: <http://www.duvallwa.gov/350/Watershed-Plan>

² Habitat corridors totaling 350 feet in width typically provide sufficient area for many species of wildlife to migrate, breed, and forage (Hennings and Soll, 2010).

corridor zones was recommended to reduce confusion for property owners and the City in determining whether a development site is located within or outside of a corridor.

The Watershed Plan (action SA-1) suggests that developments proposed within a wildlife habitat corridor zone be required to evaluate onsite habitat corridor conditions using additional criteria, or through use of a habitat corridor rating form. Evaluation of habitat corridors would consider: extent of habitat(s), number of vegetation community types, interspersion of habitat types, distance to roads, and the presence of priority species, among other criteria. Existing SAO provisions do not include protection for wildlife habitat corridors.

Wildlife Habitat Connectivity Science: Research related to general wildlife habitat connectivity indicates that connectivity is important for species to travel and carry out life processes. Research concludes 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). Small mammals, amphibians, and reptiles are generally more sensitive to changes in land cover that occur with urban development and associated 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 environmental policies and regulations to ensure that habitat connectivity is maintained (WDFW, 2009).

Aquatic features such as wetlands, streams, and riparian corridors are of particular importance in the City of Duvall due to the functions and values they provide (e.g., stormwater attenuation, water quality improvement, wildlife habitat). Fortunately, the City's SAO designates and provides protections for these features through development restrictions and upland buffers. Wildlife corridors are not currently addressed by SAO provisions unless they occur within the buffers of aquatic features; as such, some additional measures are needed to maintain vegetated corridors between features.

Wildlife require vegetated corridors to travel between habitats for foraging, between seasons, and various life stages. Habitat loss and fragmentation is an unavoidable result of urban development and a major disruptor of wildlife movement as well as losses of biodiversity. Fragmentation can affect species in different ways depending on species' sensitivity to patch size, isolation, habitat within the patch, and landscape characteristics surrounding patches. Breaks between habitat patches, even small ones, can alter wildlife travel and even wildlife abundance (TWC, 2009). In fragmented landscapes, habitat occurs between and among manmade features as habitat "patches" (The Watershed Company [TWC], 2009).

In addition to using local sensitive areas inventory information and Priority Habitats and Species (PHS) data, WDFW and others recommends protecting large undeveloped habitat patches and open space areas as part of planning and building habitat corridors that maintain habitat connectivity (WDFW, 2009; Schaefer, 2003). Habitat corridor widths greater than 1,000 feet generally provide the most benefit for the most species (WDFW, 2009). Within the Urban Growth Areas (UGAs) of Duvall existing corridors of that width are not common; however, the remaining vegetated corridors do occur as stream riparian corridors, around other sensitive areas features (wetlands, landslide and erosion hazard areas), and as remaining rural lands within underdeveloped portions of the City and UGAs. WDFW's [Landscape Planning for Washington's Wildlife:](#)

[Managing for Biodiversity in Developing Areas](#) (2009)³ provides high level considerations and examples for wildlife habitat corridor protection that could inform the City’s strategy for preserving wildlife habitat functions and values.

Habitat Corridor Management in Neighboring Jurisdictions: While there are few examples of neighboring Puget Sound jurisdictions on approaches to protecting corridors, relevant approaches from several other King County and Puget Sound communities have been identified and are summarized below:

- City of Redmond sensitive areas standards for FWHCAs include protection of “land essential for preserving connections between habitat blocks and open spaces.” Standards within Redmond City Code 20D.140.20-070(2) direct the City to ensure that development maintains habitat corridors and blocks to the greatest extent feasible. Considerations include incorporation of corridors into site planning and design, and integrated open space and landscaping. While meeting the same objectives as those identified by Duvall, Redmond’s approach (which appears to be primarily focused on new subdivisions) does not include specific standards or mechanisms to ensure that these objectives are met.
- City of Sammamish sensitive areas standards do not specifically designate habitat corridors. However, they do require increased buffers around certain wetlands and streams, when these features occur adjacent to other critical/sensitive resources. For example, if a lower value (Category III) wetland requiring a standard 75 buffer is located within 300 feet of a high value (Category I) wetland and a stream corridor, the City has the authority to require establishment of a wider buffer width around the Category III wetland in order to maintain undeveloped connection between the resources. See Sammamish Municipal Code 21A.50.290(8).
- King County sensitive areas standards for FWHCAs include protection of the “wildlife habitat network” to reduce effects of fragmentation by linking diverse habitats through developed and developing landscape. The wildlife habitat network has been mapped by the County as part of comprehensive planning updates (map most recently updated in 2016), and identifies the portion of the Snoqualmie River west of Duvall as part of the habitat network⁴. Provisions within KCC 21A.24.386(B) direct wildlife habitat network protections, including standards that ensure network corridors maintain a width of 150 – 300 feet and extend continuously across any property where development is proposed. Provisions also encourage expansion of network corridors within a site to connect critical areas, open space areas, and wooded areas on the property and on adjacent properties.

While the County’s wildlife habitat networks are established at a large scale and may include protection requirements that are not feasible for urban areas and smaller geographies, the approach of pre-establishing corridors along which development must meet specific requirements is consistent with what the 2015 Watershed Plan suggested for future development in Duvall.

³ <http://wdfw.wa.gov/publications/00023/wdfw00023.pdf>

⁴ http://www.kingcounty.gov/~media/depts/executive/performance-strategy-budget/regional-planning/2016CompPlanUpdate/ExecRecommend2016CompPlan/Wildlife_Habitat_2016.ashx?la=en

- The City of Bellevue developed and adopted an Urban Wildlife Habitat Functional Model (Watershed Company, 2009). The Bellevue model is highlighted within WDFW (2009) as an example approach of a multi-scale assessment used to manage habitat within an urban environment. The Bellevue model establishes an approach that directs users (applicants and their consultants) to rate habitat on a property based on its potential to support species of local importance and other wildlife, including consideration of “landscape scale” and “site scale” conditions. As conceived, assessment of habitat through the model applies City-wide, so any property owner or developer submitting an application would be required to rate habitat. The Bellevue model does not tie results to specific measures or requirements for protection of habitat, instead suggesting “

The habitat corridor management approaches described above present useful considerations for what could be applied in Duvall. As will be evident from review of the *Draft Habitat Corridor Rating and Management Form* presented below, the property-specific rating approach implemented by Bellevue was identified as particularly useful. WDFW (2009) emphasizes the importance of customizing functional assessment tools to the existing conditions, development circumstances, and policy goals of a specific jurisdiction.

Habitat Corridor Rating and Management

Overall approach: Based on the policy direction included in the 2015 Watershed Plan, input from City Staff, and WDFW direction and examples for habitat corridor assessment and management approaches, ESA has developed an initial *Habitat Corridor Rating and Management Form*. The proposed approach for the protection of habitat corridors includes a three step process for anyone proposing new construction and/or additions to existing structures (requiring a Building Permit) where the property occurs within a designated Habitat Corridor Zone:

1. Complete rating form, responding to Corridor Assessment and Site Assessment questions
 2. Adjust score based on Watershed Management Group and Zoning Designation to determine Total Habitat Corridor Score
 3. Implement Habitat Corridor Management measures as necessary based on Total Habitat Corridor Score
- Through this approach, expectations for habitat protection will be adjusted from one site to another, consistent with the variable habitat conditions (and connections to corridors) that occur across the City. The approach will also recognize the variable opportunity that exists within different zoning districts. Further, providing options in what specific Habitat Corridor Management measures are implemented will provide property owners and developers some flexibility in how they achieve the requirements. The following provides a more detailed description and rationale for the proposed habitat corridor approach.

Corridor Scale Assessment: The corridor scale assessment includes four questions to identify conditions and relative habitat value of corridors near a specific property. Based on assessment completed for any development site occurring within a wildlife habitat corridor zone (see project web-map: <http://arcg.is/2n1m1T4>), the City will be able

CORRIDOR ASSESSMENT QUESTIONS (SEE FORM FOR DETAILS):

- 1.1 WHAT IS THE PROXIMITY OF KNOWN SENSITIVE AREAS TO THE PROPERTY?
- 1.2 WHAT IS THE PROPERTY’S CONNECTION TO MAPPED HABITAT CORRIDORS AND OTHER HABITAT AREAS?
- 1.3 WHAT IS THE AVERAGE SIZE OF HABITAT PATCHES FOUND WITHIN 1,000 FEET OF THE PROPERTY?
- 1.4 WHAT IS THE PROXIMITY OF THE PROPERTY TO A WATERBODY MAPPED BY THE CITY?

to ensure that necessary measures are implemented to protect and/or enhance habitat connectivity. Corridor scale assessment questions focus on proximity to known sensitive areas, off-site habitat patches, and waterbodies, and assessing the existing connectivity between the property and off-site habitat areas.

Site Scale Assessment: The site-scale assessment questions address the potential of a proposed development site to support wildlife.

Vegetative cover, including tree, shrub and herbaceous species provide structural complexity that optimizes the potential for breeding areas, shelter, and food production for the greatest number of species. The number of plant species present also reflects the potential number of habitat niches available for wildlife. In general, the total number of wildlife species in an area is expected to increase as the number of plants species increase (Hruby et al., 1999). Other features, such as snags and downed woody debris, provide refuge and resources for many different species. The presence of these features increases the potential that the area will provide a wide range of habitats for wildlife (Hruby et al., 1999).

SITE ASSESSMENT QUESTIONS (SEE FORM FOR DETAILS):

- 2.1 HOW MANY HABITAT TYPES ARE FOUND WITHIN THE PROPERTY?
- 2.2 WHAT IS THE VEGETATIVE SPECIES RICHNESS OF THE PROPERTY?
- 2.3 WHAT IS THE PERCENT OF FOREST CANOPY COVER OF THE PROPERTY?
- 2.4 WHAT IS THE SIZE OF NATIVE TREES FOUND WITHIN THE PROPERTY?
- 2.5 WHAT IS THE COMBINED HERBACEOUS AND SHRUB COVER WITHIN THE PROPERTY?
- 2.6 WHAT IS THE PERCENT COVER OF INVASIVE SPECIES ON THE PROPERTY?
- 2.7 HOW MANY SNAGS/ACRE ARE PRESENT ON THE PROPERTY?
- 2.8 ARE THERE ANY OTHER HABITAT FEATURES PRESENT ON THE PROPERTY?

Score Adjustments: After scoring for Corridor Assessment and Site Assessment parameters, the score is adjusted based on two parameters: 1) the Watershed Management Group, and 2) the Zoning Designation for the property. The Watershed Management Group adjustment is intended to support implementation of the overall 2015 Watershed Plan approach. Areas of the City within Watershed Management Groups 1 (Protect/Restore) and 2A (Highest Conservation) are considered higher priority areas for maintenance of multiple watershed processes. As such, the score adjustment would increase the habitat corridor score for development sites within these areas. Conversely, areas of the City within Watershed Management Groups 2C (Least Conservation) and 3 (Urban Development) are considered higher priority for focusing future development, as they are of lower importance for maintenance of multiple watershed processes. In these areas the score adjustment would decrease the score to reflect the lower importance of the habitat corridor.

The Zoning Designation adjustment is provided to recognize the variable pressures occurring in different portions of the City. In reality, there is less opportunity for protection of additional habitat areas when an R20 site is developed (density of up to 20 lots per acre) when compared to an R4 lot (development of up to 4 lots per acre). The Zoning Designation adjustment would modify the habitat corridor score down for areas where higher density development is designated, and would maintain habitat corridor scores for areas where lower density development is designated.

Habitat Corridor Management Measures: The project proponent would be required to implement measures from the list of options provided, so that the Habitat Corridor Credit achieved for the project meets or exceeds the Total Habitat Corridor Score. Under this approach, more measures to protect and/or restore habitat corridors would be required for sites with higher scoring habitat corridor conditions.

Under the proposed approach, measures are also differentiated to account for the opportunities provided by larger scale development types, including Subdivisions and Binding Site Plans, compared to smaller developments. Larger development sites provide different types of opportunities for protection and integration of habitat corridors into overall site and development planning. For this reason, we suggest that Subdivision and Binding Site Plan proposals be required to obtain a portion of required Habitat Corridor Credit from Corridor Management Approaches under List B. See the draft form for details.

03/14/17 – Duvall SAO/Tree Protection Update AG Meeting #2 – NOTES:

Attendees: Lara Thomas, Troy Davis, Amy McHenry, Amy Ockerlander, Angela Dillon, Bairivi Vijay, Beth LaDoux, Craig Krueger, Dianne Brudnicki, Jennifer Knaplund, Kirsten Lints, Michelle Hogg, Misty Blair, Richard Winn, Phil Bennett, Aaron Booy (ESA), Jim Barborinas (UFS),

Commented [AB1]: Verify highlighted names

Guests: Jason Walker (Duvall City Council / Resident)

Initial presentation/discussion focused on Recap of Meeting #1 – highlighting existing conditions of Sensitive Areas and Trees within Duvall – project team used web-map tool (<http://arcg.is/2n1m1T4>) to highlight existing extents for key layers.

Key Issue #1 – Implementing Watershed Approach

- Presentation / discussion on the Watershed Plan, focused on the overall Subbasin Management Group approach and implications for sensitive areas protections and tree protections across the City.
- Feedback:
 - Response to several questions on how the subbasins were established, and the purpose/intent of each Subbasin Management Group.
 - Desire to ensure that implementation of Subbasin Management Groups does not result in outright allowance for impacts to resources (whether trees, wetlands, or other resources) in portions of the City prioritized for higher intensity development. Voiced by several Group members.

Key Issue #2 – Tree Protection Priorities [majority of meeting time spent here]

- Presentation:
 - Refresh on current “significant tree” standards.
 - Options from other jurisdictions?
 - What key adjustments need to be made?
 - Implications for future development.
- Feedback / discussion:
 - More existing trees should be retained as development / redevelopment occur within the City. Allowances for full impact (resulting in clear-cut and highly graded subdivision development sites) with replacement has not been consistent with the policies of the 2015 Comp Plan, or with the perspectives of many Advisory Group members.
 - Smaller trees should be considered for retention (below the 16” diameter threshold that is within the current code).
 - Retaining or restoring trees on the basis of canopy cover was suggested – options to consider:

1. something similar to Sammamish, where expectations for protection is based on % retained (except that the percentage varies by zoning designation, and there is no opportunity for going below the percentage outside of a variance), or
2. something similar to Kirkland or Woodinville, where protection is based on a tree density requirement (with credit achieved for existing trees that are retained based on the specific DBH of each tree).

These jurisdictions include trees down to 6" DBH (Kirkland) and 8" DBH (Sammamish) in determining significant tree protections, and both include approaches where additional protection (and/or additional credit) is afforded to larger diameter trees.

- Feedback from group suggested that evergreen retention and planting is preferred (higher priority) over deciduous (cottonwood/alder).
- Where impacts occur, and replacement trees are necessary:
 - Restorative plantings within or on the edge of buffers is desirable – lots of discussion here, focused on the “edge” effect created by development sites being cleared/graded right to the edge of sensitive areas buffers (or site boundaries) – with remaining mature forest stands impacted by adjacent grading and subsequent wind throw (and located in close proximity to residential structures / other improvements). **all of a s and**
 - Replacement planting must start with good soil preparation.
 - Street trees need more soil volume space in the planter strips for long term stability and health.
 - Existing soil conditions should be evaluated when determining tree retention and replacement. Post soil conditions should be conducive to tree plantings.
 - A preferred street tree list should be developed and periodically updated.
 - Connection to Landscaping Standards, Clearing & Grading, and other land development requirements is apparent – need for coordinated approach as part of the Tree Protection update.
- Need to potentially better define the functions/benefits of different types of canopy cover and trees in different landscapes/environments within the City (trees within forest on undeveloped land, vs street trees, vs yard trees, vs areas within Open Spaces and sensitive areas tracts) – with this better definition, management that considers these different functions/benefits so that replacement is successful.
- The city and /or developer should stress the importance of planting new trees in yards that are appropriate for the location and that will grow and adapt to the location. Can city and/or developer provide incentives, physical assistance or even trees to new homeowners when planting is desirable but difficult for individuals to accomplish?
- Overall Perspective of feedback / next steps for Tree Protection Update:
 - Existing standards within DMC 14.38 are insufficient to protect /retain existing trees, and do not provide any protection for smaller / younger trees that also are important for protection

- Tree Protection standards (along with Landscaping Standards and other development requirements) do not provide enough specificity for replacement tree plantings, and street trees too frequently are planted in inappropriate conditions and/or locations.
- Review of Watershed Plan recommendations (and 2015 Comp Plan policies) are supportive of updates to Tree Protection standards (and related code sections) that were highlighted as highest priorities by the Advisory Group.
- Project team will work to integrate feedback into *Urban Forest & Tree Assessment and Best Practices Memorandum* (material that will provide key basis / documentation of rationale for proposed code updates). Advisory Group review of this memorandum will occur at initiation of project Phase III (local review and adoption of the Tree Protection Update), with review used to finalize memo and guide code updates.

5/8/2017 - Duvall SAO/Tree Protection Update AG Meeting #3 – NOTES:

Attendees: Lara Thomas, Amy McHenry, Amy Ockerlander, Angela Dillon, Beth LaDoux Craig Krueger, Dianne Brudnicki, Jennifer Knaplund, Kirsten Lints, Misty Blair, Richard Winn, Phil Bennett, Aaron Booy (ESA), Christina Hersum (ESA)

Commented [AB2]: Verify highlighted names

Guests: none

Comments received prior to meeting: submitted by email from J. Knaplund (review and consideration of those comments will be provided along with other comments on BAS Memo and Gap Analysis that are received by May X).

Intro / recap of previous meeting:

- Need for documentation follow-up after meetings – ESA/City committed email notes from meetings #2 and #3
- Comments/holdover thoughts from past Meeting #2:
 - Issue of tree planting installations occurring under powerlines – making sure trees are planted in the right places. Lara noted that this (and other considerations for new trees) will likely need to come through Landscape Standards code update. Lara is keeping list of these topics /comments for that effort.

BAS and Gap Analysis

- Multiple comments re: City liability issues affiliated with small/narrow wetland buffers (specifically lower scoring wetlands, where buffers are reduced to 30 feet or sometimes less) and tree failures onto private properties. Generally agreed that a wider buffer even for lower category wetlands is needed to be most effective in providing functions/values.
 - Lara – City often struggles to implement Cat IV buffers b/c of liability (patch work of trees/health); typically allowing fill of Cat IV wetlands for this reason.

- Opportunity for forestry / forested-landscape enhancement at developed edges (interface with Sensitive Areas buffers) to reduce the risk factor of tree failure especially in areas with unstable soils and tree uprooting susceptibility (used Legacy Ridge as an example); suggested that there be a way to implement this within the code as a long-term solution to reduce/eliminate liability and issues that frequently occur after the development occurs.
- City does not use the director discretion to increase wetland buffers (never happens) as a means to reduce wind throw damage (or in general), Misty Blair (DOE) agreed that she has not seen this used elsewhere either.
- City has found that many developers assume that they can automatically reduce / average buffers to the maximum extent allowed by SAO; City Planning Department review works hard to push back on this, but highlighted that expectations created by 50% reduction allowances need to be a point of consideration for the code update.
- Beth (King County) mentioned new research coming out of Andrews research forest in Oregon re: new tree growth resulting in decreased stream flows b/c of water uptake (under 100 year old forest) – focus here was on highlighting the need to still provide a wide buffer around sensitive areas, especially where mature forest remains, and implement the “edge” landscaping requirements in a setback area (and/or the outer-most portion of the buffer) between the Sensitive Areas tract and the adjacent development.
- Several members suggested a tree management program (as a requirement) for HOA to address tree failure issues.
- Herbicide and pesticide use should be addressed as part of disturbance minimization measures (WL impacts) – incentive programs and/or educational programs.
- Limited soil grading, or higher expectations for restoration, also suggested to be part of disturbance minimization measures.
- Consider removal of buffer reduction allowance. 2016 Ecology guidance removes buffer reduction allowance altogether. Or consider requiring buffer averaging first, and if not possible then allow for buffer reduction. Discussion on this also noted the buffer enhancement that has been facilitated by allowing for buffer reduction around sensitive areas where existing conditions are highly degraded (“pasture wetlands”). This approach (and similar allowances for Performance-Based buffer standards) were seen as effective in Duval over the last 10-years.
- Generally positive response on integrating Subbasin Management Group approach into sensitive areas protections (higher standards with very few allowances for Groups 1 and 2A, slightly more allowances for Group 2B and 2C, and maintaining many of the existing allowances for Group 3); Ecology (Misty) noted that this was a pretty new approach, so that any use of the Watershed Plan basis to go below minimum protections required by Ecology guidance would be closely reviewed by Ecology.
- Presentation on BAS review and Gap Analysis for other sensitive areas completed relatively quickly, with very little discussion – request for individual feedback/review by **May X**.

Habitat Corridors presentation/discussion

- Overview presentation focused on Comp Plan and Watershed Plan basis, BAS for habitat corridor protection, and options from other jurisdictions (as available).
 - Lara highlighted that conversations with other jurisdictions (Redmond) had highlighted that the policy basis of standards came from similar community goals, but that frequently standards were too vague or too flexible to result in actual implementation.
 - City of Bellevue approach identified as a useful tool to measure the site and habitat corridor value of each site. Feedback from City of Bellevue Critical Areas planner suggested that the tool was seen as an effective means of identifying corridor value, and requiring protection measures – although really only being used for larger developments.
- **Proposed approach – Habitat Corridor Rating and Management Form**
 - ESA presented approach, with key Corridor Assessment and Site Assessment questions, adjustment factors, and management measures.
 - Discussion on specific assessment questions, and on how the Rating and Management Form would be used, were the focus of discussion.
 - Lara suggested testing recent development project area to that have existing conditions (site-scale) information for habitat corridor rating form.
 - ESA to follow-up with group w/ example/test forms and parcels with potential mitigation measures on May 12.
 - Management measures:
 - Need to incorporate Incentivizes for protection/restoration of habitat corridors, as these standards will likely be seen as going “above and beyond” what is required... incentives approaches will make measures more palatable.
 - Need to consider what the highest priority habitat corridor measures are – could use “credit” / scoring system as a way to push people towards higher priority approaches.
 - See separate materials (provided in email) to guide additional review and input over the next week.

Next Steps:

- Next Advisory Group meeting scheduled for June 13, 2017, 6 – 8:30PM
- Meeting will review all additional comments received on BAS documentation, GAP analysis, and Habitat Corridor rating/management approach
- Ahead of meeting - Initial Draft SAO (updated code) will be provided to Group for review
- Majority of meeting will be used to discuss DRAFT code

DUE DATE:

All additional Advisory Group comments on the BAS memo, Gap Analysis matrix, and Habitat Corridor rating/management approach must be submitted by May X (see email for specific direction),

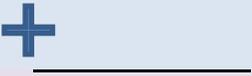
Corridor Assessment Questions	
<p>1.1 What is the proximity of known sensitive areas to the property? <i>Measure the distance from the subject parcel edge to the edge of known sensitive areas (streams, wetlands, ponds/lakes, other FWHCAs, erosion and landslide hazard areas). Consult King County Sensitive Areas iMap online GIS information (iMap) and City sensitive areas inventory mapping to determine the location of sensitive areas (City inventory maps were developed to integrate all available data from Federal, State and local sources). Distances can be measured using iMap, a GPS, or aerial photographs.</i></p>	
>1,500 ft	points = 0
<1,000 ft	points = 1
<500 ft	points = 2
<100 ft	points = 3
Property overlaps or is contiguous with a sensitive area	points = 4
<p>1.2 What is the property’s connection to mapped habitat corridors and other habitat areas? <i>Determine connections to off-site vegetated areas using on-site observation (primary) and aerial photographs (secondary). Breaks in connectivity are based on the tendency of wildlife to avoid crossing them and are categorized as full or partial interruptions. Connections must be vegetated with trees, shrubs (native or non-native) or wetlands. Other cover types such as lawn or ornamental vegetation may make up no more than 30% of the width of the connecting area at any point (except for “interrupted connections”). Qualifying vegetated areas may extend through designated habitat corridors (whether on public or private property), open spaces, or listed parks. Listed parks include the following: McCormick Park; Lake Rasmussen Park; Taylors Landing Park; Depot Park; Taylor Park; and Alva Miller Park.</i></p>	
No connection to other habitat areas – meaning that paved roadways greater than 15-foot wide fully interrupt connection between the property and adjacent vegetated corridors or areas that are at least 5 acres. (Driveways, trails, fences, and other structures less than 15-foot wide should not be considered full interruptions; maintained lawns, yards, and fields should not be considered full interruptions).	points = 0
Partially interrupted connection to other habitat areas – meaning that vegetated areas of the property are connected to adjacent vegetated corridors and/or areas that are at least 5 acres. (Partially interrupted connections can include residential driveways, structures, patios, paved trails less than 15-foot wide, and maintained lawns, yards, and fields).	points = 1

20 to 50-foot-wide shrub and/or forest vegetated connection to vegetated areas of at least 10 acres. Qualifying vegetated areas include those within designated habitat corridors (whether on public or private property), open spaces, or listed parks. Wildlife passable fences and utility connections do not qualify as breaks within a vegetated connection.	points = 2
≥50-foot-wide shrub and/or forest vegetated connection to vegetated areas of at least 20 acres. <i>(Same criteria as 2 point response)</i>	points = 3
≥150-foot-wide shrub and/or forest vegetated connection to vegetated areas of at least 40 acres. <i>(Same criteria as 2 point response)</i>	points = 4
<p>1.3 What is the average size of habitat patches found within 1,000 feet of the property? <i>The average size of a habitat patch is measured using iMap, a GPS, or aerial photographs. A habitat patch is considered to be an area of contiguous vegetation cover, with the exceptions of lawns and other highly manipulated and maintained areas. Vegetation/habitat cover types found in the City include forest, scrub-shrub, and meadow/grassland. The boundaries of habitat patches are delineated by the edges of vegetated areas. Count all the patches found in the parcel and within 1,000-feet of the parcel, and then average them by acre.</i></p>	
<0-1.0 acre	points = 0
1.0-5.0 acres	points = 1
>5-10 acres	points = 2
10-40 acres	points = 3
>40 acres	points = 4
<p>1.4 What is the proximity of the property to a river, stream, pond, or lake mapped by the City? <i>Categories are based on general home ranges and dispersal distances of bird, reptile and amphibian species. Waterbodies include perennial lakes, ponds, wetlands and streams mapped by the City.</i></p>	
>1.0 mi	points = 0
0.3-1.0 mi	points = 1
<0.3 mi	points = 2
Waterbody mapped on property	points = 3
Total corridor assessment points	

Site Assessment Questions		
<p>2.1 How many habitat types are found within the property? Using aerial photographs, count the number of different habitat types on the parcel. Consult City mapping (or site environmental survey results) to determine the existence of known wetlands. Any habitat type that is wholly or partially within the parcel should be counted. Do not count wetlands twice (e.g., as both wetland and as forest), but do count different wetlands individually. Habitat types are based on groups of vegetation types or other important habitat features; habitat types include: mature coniferous forest, mixed forest, scrub-shrub, meadow and grassland, ponds and lakes, streams, and wetlands.</p>		
0 habitat types	points = 0	
1 habitat type	points = 1	
2 habitat types	points = 2	
3+ habitat types	points = 3	
<p>2.2 What is the vegetative species richness of the property? Count the number of plant species in the parcel that cover at least 10 square feet (cumulatively). Do not include species on the King County noxious weed list, available at http://www.kingcounty.gov/services/environment/animals-and-plants/noxious-weeds/laws/list.aspx.</p>		
0-1 species	points = 0	
2-5 species	points = 1	
6-19 species	points = 2	
20+ species	points = 3	
<p>2.3 What is the percent of forest canopy (vegetation >25 feet in height) cover of the property? Visually estimate the percent of aerial forest canopy cover found across the entire parcel.</p>		
0%	points = 0	
0-25%	points = 1	
25-50%	points = 2	
50-75%	points = 3	

>75%	points = 4
2.4 What is the size of the largest trees found within property? <i>Points are awarded to sites containing trees likely to be used by wildlife for nesting or foraging. On residential or other small parcels, measure the diameter at breast height (dbh) of the largest trees on the parcel. Allot points based on the largest tree on-site. Large sites may require a tree survey for some permit applications. In this case, tree sizes can be obtained from the survey.</i>	
No tree greater than 6" dbh present on-site	points = 0
6-12" dbh tree(s) present	points = 1
12-20" dbh tree(s) present	points = 2
>20" dbh tree(s) present	points = 3
>30" dbh tree(s) present	points = 4
2.5 What is the combined herbaceous and shrub cover within the property? <i>Visually estimate the percent of combined shrub and herbaceous cover found within the parcel.</i>	
No herbaceous or shrub cover on-site	points = 0
0-25%	points = 1
25-50%	points = 2
50%	points = 3
>75%	points = 4
2.6 What is the percent cover of invasive species on the property? <i>Visually estimate the percent cover of invasive species found within the parcel. Include all species on the King County noxious weed list.</i>	
>75% cover	points = 0
25-75% cover	points = 1
10-25% cover	points = 2
<10% cover	points = 3
2.7 How many snags/acre are present on the property?	

<i>Count all snags at least 4 inches dbh, or estimate the average number of snags per acre on large sites. Additional points are added for snags of sizes preferred by or critical to wildlife.</i>	
No snags on site	points = 0
1/acre or fewer	points = 1
2-6/acre	points = 2
> 7/acre	points = 3
Add 0.5 points for each snag >20 in dbh and 1 point for each snag >30 in dbh	
2.8 Are there any other habitat features present on the property?	
<i>Features to be awarded points in this category include the following:</i>	
<ul style="list-style-type: none"> • <i>downed woody debris (>4 inches in diameter and 6 feet long)</i> • <i>unused structures such as sheds, barns, houses, wells and chimneys</i> • <i>trees with large (> 2 inches diameter entrance) cavities</i> • <i>active nests or dens</i> • <i>active raptor perches (defined by observation or documentation of use)</i> 	<ul style="list-style-type: none"> • <i>rockeries</i> • <i>rock piles</i> • <i>vertical banks</i> • <i>stumps at least 20 inches in diameter</i>
None	points = 0
1	points = 1
2-4	points = 2
5 or more	points = 3
Total site assessment points	

Total corridor assessment points	
Total site assessment points	
TOTAL POINTS BASED ON CORRIDOR AND SITE PARAMETERS	

Score adjustments based on Watershed Management Group and Zoning Designation

Circle the appropriate categories for the property, and record appropriate modifiers in Final Score Calculation below.

PAU Watershed Management Group	WMG Modifier
Group 3 – Urban Development	0.7
Group 2C – Least Conservation	0.9
Group 2B – Moderate Conservation	1.0
Group 2A – Highest Conservation	1.1
Group 3 – Protect / Restore	1.3

Zoning designation	Intensity	Zoning Modifier
PO	Low	1.0
PF	Low/Moderate	0.9
R4, R4.5		0.9
R6	Moderate	0.8
R8		0.75
R12		0.7
MU Zones	High	0.6
Commercial		0.55
R20		0.55

Total Habitat Corridor Score

Total Points Based on Corridor and Site Parameters	WMG Modifier	Zoning Modifier	Total Habitat Corridor Score
_____	_____ 	_____ 	 _____ (rounded to nearest whole #)

Scoring	
Grand Total Habitat Corridor Score	Habitat value & wildlife use potential
< 12 points	Little to no functional habitat value, little potential for wildlife to use site
12 – 28 points	Habitat potentially present in landscape, low potential for wildlife use
28 – 44 points	Site provides habitat, moderate potential for wildlife use
44+ points	High value habitat area, high potential for wildlife use

Habitat Corridor Management

The project proponent must implement measures from the lists below so that the Habitat Corridor Credit meets or exceeds the Total Habitat Corridor Score.

Larger scale development types, including Subdivisions and Binding Site Plans, provide different types of opportunities for protection and integration of habitat corridors into overall site and development planning. For this reason, Subdivision and Binding Site Plan proposals must obtain 25% [initial number – to be refined once lists are established] of required Habitat Corridor Credit from *Corridor Management Approaches* under List B, specific to their development types; the remainder of Habitat Corridor Credit can be obtained from *Corridor Management Approaches* under List A.

Corridor Management Approach	Habitat Corridor Credit	Notes / Limitations
List A. Measures applicable to all development types (SFR development, SFR remodel, short subdivisions, subdivisions, binding site plans, commercial, institutional, etc.)		
Protection of existing forest canopy outside of any required NGPAs:		All areas of protected existing forest canopy that receive credit must be placed in a habitat corridor easement, or trees otherwise indicated on survey, so that future tree removal or other impacts to protected forest canopy do not occur.
• 80% – 100% of canopy area	6	
• 60% - 80% of canopy area	4	
• 40% - 60% of canopy area	2	
• 30% - 40% of canopy area	1	
• Less than 30%	No points	
Protection of other native plant dominated, non-lawn vegetated areas:		
• 80% – 100% of cover	3	
• 60% - 80% of cover	2	
• 40% - 60% of canopy area	1	
• Less than 40%	No points	
Off-site habitat enhancement within listed park and/or designated open space.	6	Only available for properties within Watershed Management Groups 3 and 2C.
On-site habitat enhancement through invasive species removal.	4	Only applicable on sites with invasive species; removal/control must be provided across the site.

City of Duvall SAO Update
 WORKING DRAFT Habitat Corridor Rating and Management Form

<p>On-site habitat enhancement through native species planting meeting City Type V (Wildlife Corridor) Landscaping Standards requirements, with area enhanced immediately adjacent to vegetated, off-site habitat corridor and/or protected open space:</p> <ul style="list-style-type: none"> • Across 2,000 or more square feet per lot 	6	<p>May include areas outside of any required NGPA, or within a required NGPA where conditions are degraded and where enhancement is not already required for the project. To receive this credit, areas enhanced through native species plantings must be placed in a NGPA or habitat corridor easement to ensure ongoing protection. For plats, the area of enhancement may be consolidated to specific areas of the overall development site providing the best opportunity for meeting habitat corridor enhancement and site development objectives.</p>
<ul style="list-style-type: none"> • Across 1,500 – 2,000 square feet per lot 	4	
<ul style="list-style-type: none"> • Across 1,000 – 1,500 square feet per lot 	3	
<ul style="list-style-type: none"> • Across 500 – 1,000 square feet per lot 	2	
<ul style="list-style-type: none"> • Across 200 – 500 square feet per lot 	1	
<p>Protection of special habitat features (snags, large conifers, downed wood) – 2 points for each habitat feature type</p>	_____ X 2	<p>Cannot include special habitat features already protected within a required NGPA; protected features should be located within an established habitat corridor easement. Credit may be given for features in more natural yard areas adjacent to protected off-site open space areas.</p>
<p>Adding habitat features (snags, downed wood, rock piles, nesting platforms or boxes) at on-site location(s) approved by the City – 2 points for each habitat feature type.</p>	_____ X 2	<p>Preference for location of added features within projected NGPA and habitat corridor easements. Credit may be given for features in more natural yard areas adjacent to protected off-site open space areas.</p>
<p>Limiting lawn areas within each existing and/or create lot to no greater than 8% of lot area, or 500 square feet, whichever is greater.</p>	4	<p>This would allow:</p> <ul style="list-style-type: none"> • 870 SF on a ¼ acre R4 lot. • 580 SF on 1/6 acre R6 lot. • 500 SF on 1/8 acre R8 lot (above the 435 SF allowed by 8%)
<p>Limiting impervious surface areas within existing and/or created lots below applicable Zoning District impervious surface limits:</p> <ul style="list-style-type: none"> • 5 - 10% below impervious surface limit 	1	<p>Impervious surface limits are established in DMC Title 14, under chapters specific to Zoning Districts. For example, the maximum impervious coverage allowed under R4 – R8</p>

City of Duvall SAO Update
 WORKING DRAFT Habitat Corridor Rating and Management Form

<ul style="list-style-type: none"> • 10 – 20% below impervious surface limit 	3	zoning districts is 60% (DMC Chapter 14.12), and under R12 zoning district is 75% (DMC Chapter 14.14).
<ul style="list-style-type: none"> • Greater than 20 percent below impervious surface limit 	5	
Directing and/or screening all building lights away from habitat corridor easements, and excluding constant nighttime lighting in yard areas adjacent to habitat corridors.	4	
<i>Limit noise</i>		Limited only to Commercial, Light Industrial, and Public Facility Uses that are anticipated to produce operational noise that would impact adjacent habitat areas.
<ul style="list-style-type: none"> • Locate activity that generates noise away from habitat corridors 	4	
<ul style="list-style-type: none"> • Include native vegetation screening (plantings) between anticipated noise sources and habitat corridors (exceeding minimum Landscaping Standards requirements). 	4	
<i>Limit pet and human disturbance</i>		
<ul style="list-style-type: none"> • Use privacy fencing to discourage disturbance 	4	
<i>Short term construction impacts:</i>		
<ul style="list-style-type: none"> • Use BMPs to control dust • Construction planned outside of the spring and summer breeding and rearing seasons 	4	[DATES TO BE PROVIDED]

List B. Additional measures applicable only to subdivisions and binding site plans		
Establish habitat corridors across the overall site that link on-site habitats and off-site habitats along designated habitat corridors:		Mostly contiguous connection means that vegetated corridors are not interrupted by any new development, except for necessary crossings by public infrastructure. Any necessary crossings are mitigated to the greatest extent feasible.
<ul style="list-style-type: none"> On-site corridors provide mostly contiguous and vegetated connections between all on-site sensitive areas and designated habitat corridors extending off-site; on-site corridors are generally greater than 50 feet wide, as measured laterally. 	10	Interrupted connection means that corridors may be broken by necessary public infrastructure, residential driveways, structures, patios,
<ul style="list-style-type: none"> On-site corridors provide mostly contiguous and vegetated connections between all on-site sensitive areas and designated habitat corridors extending off-site; on-site corridors are generally between 20 and 50 feet wide, as measured laterally. 	7	All established on-site corridors should be placed in a habitat corridor easement and/or within a NGPA
<ul style="list-style-type: none"> On-site corridors provide interrupted connections between all on-site sensitive areas and designated habitat corridors extending off-site; on-site corridors are generally greater than 50 feet wide, as measured laterally. 	6	
<ul style="list-style-type: none"> On-site corridors provide interrupted connections between all on-site sensitive areas and designated habitat corridors extending off-site; on-site corridors are generally between 20 and 50 feet wide, as measured laterally. 	4	
Provide integrated treatment approaches for stormwater runoff that uses green infrastructure / LID, resulting in improved water quality and enhanced wildlife habitat.	6	
Provide habitat corridors that are integrated with open space and landscaping requirements for the site.	6	