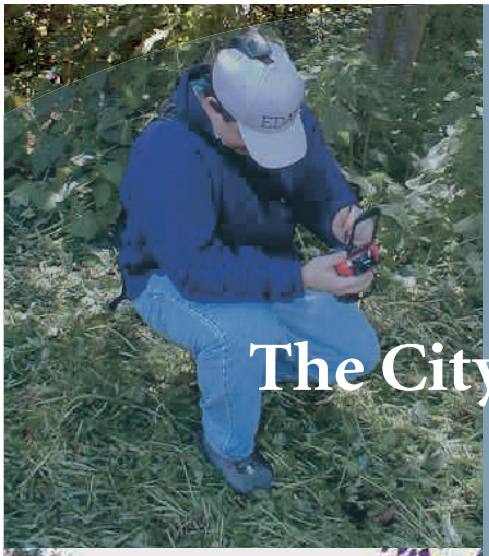

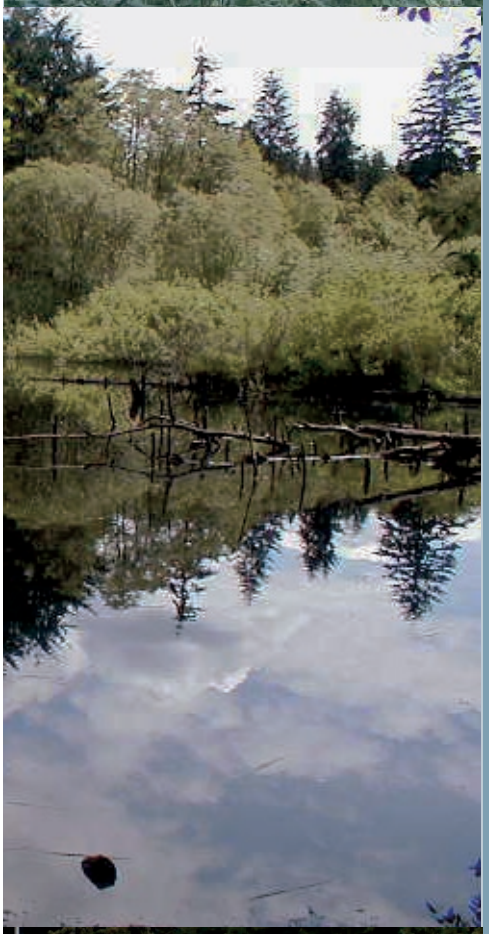

The City of Edmonds

2004 Best Available Science Report

A companion document to the 2004 critical areas ordinance update including a comparative code analysis and description/justification of proposed conceptual code changes.

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Acronyms and Abbreviations

BAS	Best Available Science
CAO	Critical Areas Ordinance
cfs	cubic feet per second
Corps	U.S. Army Corps of Engineers
CTED	Washington State Department of Community, Trade, and Economic Development
CWA	Clean Water Act
DNR	Washington State Department of Natural Resources
DOE	Washington Department of Ecology
ECDC	Edmonds Community Development Code
ESHB	Engrossed Substitute House Bill
FEMA	Federal Emergency Management Agency
FEMAT	Forest Ecosystem Management Assessment Team
FIRM	Flood Insurance Rate Maps
GIS	geographic information system
GMA	Growth Management Act
RCW	Revised Code of Washington
SAO	Sensitive Areas Ordinance
SEPA	State Environmental Policy Act
SMA	Shoreline Management Act
SMP	Shoreline Master Program
T/E	Threatened/Endangered
TES	Threatened, Endangered, Sensitive
WAC	Washington Administrative Code
WDFW	Washington Department of Fish and Wildlife

1.0 INTRODUCTION

The Washington Growth Management Act (GMA) requires cities and counties in the state to protect critical areas within their jurisdiction to preserve the natural environment and protect the public's health and safety. To respond to this mandate, jurisdictions have developed Critical Areas Ordinances (CAO) that define buffers and other standards to protect these resources. The GMA was amended in 2002 to require jurisdictions to update their comprehensive land use plan and critical areas ordinance every 7 years to ensure the protection of sensitive resources. Five critical areas are identified by the GMA (RCW 36.70A.030[5]):

- Wetlands
- Areas with a critical recharging effect on aquifers used for potable water
- Frequently flooded areas
- Geologically hazardous areas
- Fish and wildlife habitat conservation areas

Each of these categories is discussed in detail later in this document, except aquifer recharge areas, which are not a concern in Edmonds. Protecting these critical areas within a jurisdiction aids in reducing risk to natural disasters such as floods and landslides, and for retaining the ecosystem functions of elements of the landscape such as streams and wetlands.

Counties and cities are required to include the best available science (BAS) in developing policies and development regulations to protect the functions and values of critical areas. In addition, counties and cities are required to give special consideration to conservation or protection measures necessary to preserve or enhance anadromous fish populations (those that mature in salt water and spawn in freshwater). Protecting the function and values of a critical area does not mean exclusion of all uses or development within or adjacent to these areas, but requires managing changes in land use, new activities, and development that can harm these resources (CTED 2003).

According to the Washington State Department of Community, Trade, and Economic Development (CTED), there are four primary steps in developing a local critical areas program. These steps can progress concurrently:

1. Identify the local critical areas;
2. Review BAS information relevant to local critical areas;
3. Set goals and policies under the comprehensive plan for protecting critical areas; and
4. Define, designate, and protect critical areas.

Identification of critical areas and mapping these resources is the first step in the update process. Most jurisdictions have some level of inventory data and will use the CAO update process to refine these data. Comprehensive plan updates help define the broader goals and policies of managing the landscape within a jurisdiction. These goals are then used as a framework to update existing CAO codes and regulations. Some classifications

of critical areas, such as streams and wetlands, have changed on a state level, and these elements also need to be updated in the new code. Finally, jurisdictions will provide public comment on the daft CAO and will submit the final regulations to CTED for review and comment.

1.1 Purpose

The purpose of this BAS review is to provide technical information to City staff regarding the efficacy of protection measures regarding critical areas within their jurisdiction. This information will allow decision-makers to update the Edmonds CAO in accordance with GMA and CTED guidelines that reflect the available resources and particular needs of the City.

1.2 Best Available Science Overview

In 1995, the Washington State Legislature added a new section to the GMA that requires cities and counties to use reliable scientific information when developing policies and development regulations regarding critical areas. This new requirement (RCW 36.70A.172) requires all counties and cities in Washington to "include the best available science in developing policies and development regulations to protect the functions and values of critical areas." It is the responsibility of the local jurisdiction that their CAO update includes a review of BAS relevant to the resources within their boundary. In 1998, CTED organized a technical team of experts from state and local agencies to clarify the issue of BAS for jurisdictions undertaking CAO updates. CTED eventually adopted six new sections to the Procedural Criteria, Part Nine, WAC 365-195. The science rules are codified at WAC 365-195 through 925 and took effect on August 27, 2000.

The Western Washington Growth Management Hearings Board applies three factors to determine if a local or county government has included BAS in their process:

- The scientific evidence contained in the record.
- Whether the local government's analysis of the "scientific evidence and other factors involved a reasoned process."
- Whether the local government's decision was within the parameters of the GMA as directed by the provisions of RCW 36.70A.172(1).

The local jurisdiction's record supporting their CAO process and decisions should include the following (WAC 365-195-915):

- The specific policies and regulations adopted to protect the functions and values of critical areas.
- Copies of (or references to) the best available science used in the decision-making and the nonscientific information used as a basis for departing from science-based recommendations.

- The rationale supporting the local government's reliance on the nonscientific information.
- Actions taken to address potential risks to the functions and values of the critical areas that policies and regulations are intended to protect.

Jurisdictions also must give special consideration to anadromous fish when developing their CAO. Specifically, WAC 365-195-192 explains what "special consideration" entails:

- The county or city should take the same steps it takes to demonstrate it has included the best available science. It should make a record showing that its critical areas policies and regulations identify and address "conservation or protection measures necessary to preserve or enhance anadromous fisheries" that are grounded in BAS.
- The "conservation or protection measures" for anadromous fisheries should include measures that preserve or enhance habitat for all life stages of anadromous fish.

Protection of critical areas can preserve and enhance anadromous fish habitat through a variety of mechanisms including buffers around streams and wetlands that provide protection from ground-disturbing activities, erosion, and surface water runoff. Requirements for proper erosion control and stormwater control also protect aquatic habitats. These and other protection measures are explored in the following chapters.

1.3 Integration of the CAO and Shoreline Master Program

In reaction to a decision in *Everett Shorelines Coalition v. the City of Everett* (Central Puget Sound Growth Management Hearings Board No. 02-30009c), the 2003 Washington Legislature adopted Engrossed Substitute House Bill (ESHB) 1933, which clarifies the relationship between the Shoreline Management Act (SMA) and GMA. Among other items, the bill stipulates that critical areas that occur within or exist as shorelines of the state (as defined by SMA) are to be protected by the jurisdiction's Shoreline Master Program (SMP). Local governments must ensure this protection while updating their SMP to meet Washington State Department of Ecology's (DOE) new SMP guidelines. Regulations for critical areas under the SMP must be as stringent under the SMP as the CAO. During the period of time between the effective date of ESHB 1933 and a local government's update of its SMP, the local government's GMA critical areas regulations continue to apply to designated critical areas throughout the jurisdiction, including those in the vicinity of shorelines of the state.

The City of Edmonds is currently updating its Comprehensive Plan and CAO and plans to update its SMP in 2005. Thus, the City's CAO will cover critical areas within shorelines until the updated SMP is adopted.

1.4 City of Edmonds Overview

The City of Edmonds is located in southeastern Snohomish County along Puget Sound just north of the Town of Woodway and south of the City of Lynwood. The Burlington Northern/Amtrak train line runs parallel to the shoreline for the entire north-south shoreline of Edmonds.

While no comprehensive critical areas geographical information system (GIS) database was previously available for the resources within the City limits, a number of unconnected data sources were available for wetlands, streams, steep slopes, landslide areas, and some critical wildlife habitat zones.

Because of the City's topographic position and its relatively small size, the drainages that flow through the jurisdiction are relatively small. No streams meet the 20 cubic foot per second (cfs) annual flow threshold for classification as a water of the state. While a few streams provide limited access for coho salmon, these are limited to the lower reaches of the streams (Shellabarger Creek, Shell Creek, and Willow Creek). Stream reaches that flow through parks or other protected public lands or are adjacent to undevelopable land (steep slopes) have defined riparian habitat. In contrast, many lower stream reaches have been subject to historical residential development and have no riparian zones, with grass, concrete, or other man-made banks.

Larger wetland systems in the City, such as the Edmonds Marsh and Good Hope Marsh, are protected within public open space. Lake Ballinger (partially within the City limits), however, in the southeastern corner of the City, is developed down to its shoreline with little or no native vegetation buffer. Many smaller wetland complexes are associated with the headwaters of streams such as Shell Creek, Perrinville Creek, and Fruitdale Creek. Other less significant wetlands are scattered throughout the jurisdiction. Most of the creeks within Edmonds originate within the City limits and flow directly into Puget Sound. While the wetlands present in these small watersheds may be minor in size, because of past development and loss of riparian zones, these wetlands provide significant functions within these small watersheds.

Steep slopes and landslide issues, particularly in the Meadowdale portion of the City, have been constant concerns for City staff trying to balance public safety and reasonable development. Several recent engineering studies have helped refine the issues, map susceptible areas, and provide input into the CAO update process. Continued vigilance and accurate assessment of proposed development in this area is required.

The City contains a number of important fish and wildlife habitat zones in addition to wetlands and streams. While the interaction between upland areas and the Puget Sound shoreline has been diminished from the construction of the railroad right-of-way and other developments, the Edmonds shoreline still provides productive estuarine habitat for a number of fish species, marine mammals, and recreation in the form of the designated underwater diving park. Riparian zones, wetlands, and adjacent buffers form some connected patches of habitat, particularly along the stream corridors. Where these are

supplemented by public open space, such as Yost Park and Southwest County Park, the area and connectivity of wildlife habitat is substantially increased. These features are important in providing limited and connected wildlife habitat within a relatively urban zone.

The City of Edmonds is unique in two particular areas when compared to other jurisdictions in the Puget Sound area:

- There are few parcels of land that have not previously been developed
- Historical building practices have left minimal and often no buffers along the small streams that flow through the City.

The small streams that are present in the City often traverse through residential lots where they have been diverted around structures, are located directly adjacent to houses, are bridged by driveways, or have been incorporated into residential landscaping. Developing buffer recommendations that are practical and enforceable for the CAO is difficult because of this urban residential context of few undeveloped parcels and historical integration of residential housing and these small streams.

2.0 REVIEW OF SCIENTIFIC INFORMATION

The update of the Edmonds CAO is being completed under CTED guidelines regarding BAS. The concept of BAS is to have jurisdictions review the science of resource protection in the context of the critical areas within their jurisdiction. Much of the data regarding protection of resources from development impacts concerns the appropriate width of buffers of native vegetation between critical areas and development. There is no one answer, however, regarding the width of buffers needed to protect resources such as streams and wetlands. Often, it depends on a specific research topic addressed, such as protection from nutrient loading, excess sediment, excess stormwater flow, or protection of wildlife habitat. Ultimately, the larger the buffer, the greater protection will be provided, up to an often undefined threshold. As an example, some of the literature suggests buffers of over 900 feet along streams to attain protection of wildlife habitat (Knutson and Naef, 1997, FEMAT 1993), while buffers of 50 feet are sufficient to protect streams from the majority of pollutants from runoff (Lee et al. 2000).

GMA sets up an inherent conflict for urban growth areas. The primary goal of the act is to discourage sprawl and the damage to natural resources from unplanned growth, and encourage denser growth in urban zones. In contrast, urban growth jurisdictions are also directed to protect and enhance resources within their boundaries. Thus, policy-makers must decide on the level of resource protection (such as buffer widths) that are appropriate for their resources that does not unduly restrict urban growth directed by GMA. While the science can provide some clear guidelines regarding these issues, ultimately, this is a policy and public-process decision.

2.1 Related Actions and Regulations

The City is currently updating its Comprehensive Plan and coordinating this update effort and the CAO update. In addition, once the Comprehensive Plan and CAO are adopted by the City Council, a joint State Environmental Policy Act (SEPA) document will be completed on the implications of these updates.

The updated GMA rules stipulate that special emphasis must be given to anadromous fish, those that spend their adult life in marine waters but return to spawn in freshwater rivers and streams. A number of anadromous species in Puget Sound are protected by the Federal Endangered Species Act; thus, jurisdictions should be aware of the effects of their CAOs to these species. Protection in the CAO is generally provided from buffers along streams, wetlands, and the estuarine shoreline.

CAO regulation of activities near wetlands and streams often overlaps with wetland fill laws under Section 404 of the Clean Water Act (CWA), administered by the U.S. Army Corps of Engineers (Corps). CAOs usually provide very specific guidelines regarding such items as buffer widths and mitigation rations for wetland enhancement or replacement from development loss where the Corps' guidelines do not. In addition, the minimum size of wetland fill under the Corps' guidelines is generally much larger that

the minimum size for compliance with CAOs. Thus, in general, local ordinances can provide added protection for these resources as appropriate for their community above the Federal requirements.

3.0 CRITICAL AREAS ORDINANCE MECHANISMS SUMMARY

Several general strategies can be incorporated into CAO for resource protection. These include:

- Engineering analysis and design
- Buffer requirements
- Mitigation requirements
- Incentives and public education
- Upland native vegetation retention

Reports on steep slopes and landslide hazard areas are often required in CAO to determine if and how development can proceed. Specific buffer widths are often recommended for these areas but can be adjusted if a report, provided by a qualified geotechnical expert, determines that development can be accommodated with certain engineering or construction elements. The primary concern with these critical areas is public safety. Many jurisdictions do not include specific recommendations in their CAO but refer to guidelines within their building code.

Buffer requirements are often the primary mechanism used to protect sensitive resources, which range from wetlands and streams to bald eagle nest sites. The general idea is to allow development only at a set distance from the resource to protect it from physical, chemical, and noise effects. Most often, the buffers must consist of native vegetation, which also provides a visual screen important for some wildlife species. If impacts to a wetland or stream, or its buffer, cannot be avoided, then CAOs usually provide a ratio of mitigation or enhancement to compensate for the development impact. The ratios are usually based on the relative value of the lost resource and the estimated time to regain those lost functions. For instance, a high ratio of habitat replacement to habitat loss would be appropriate for loss of forested wetland because of the time it would take for a forested wetland to become established compared to the loss of a wetland dominated by emergent, non-woody vegetation. CTED recommends that mitigation ratios be increased when:

- Uncertainty about potential success exists;
- A significant period of time is expected before a functioning wetland recovers;
- Mitigation results in a lower category wetland or diminished function; and
- Wetland impacts were not authorized.

While not often directly part of a CAO, incentives and public education are important components of retention of native vegetation in urban zones. Particularly in Edmonds, historical residential development is already a part of the landscape adjacent to streams and within recommended buffer zones. It is important to foster community awareness of the functions of stream and wetland buffers so residents will protect existing native vegetation and potentially enhance areas with native species outside a regulatory construct.

Upland areas outside of sensitive area buffer zones are generally key development parcels within urban growth boundaries. However, undeveloped upland parcels often also provide habitat for wildlife and may be components of habitat corridors comprised of adjacent open space parcels around stream corridors, steep slopes, or wetlands. Rather than clear an entire developable lot and then implement landscaping with non-native plant species, it can be beneficial to consider the placement of structures, driveways, and roads to limit the amount of clearing of vegetation. CAOs can include provisions for retention of a certain percentage of existing native vegetation on undeveloped lots to help preserve small-scale habitat segments, particularly if they contribute to a larger parcel or corridor of open space. Development of a Vegetation Management Plan to assess the options for retaining vegetation on undeveloped sites can provide the required analysis for City staff to work with project proponents. Flexibility on both sides is often needed in these cases to accommodate reasonable development and protection of resources in an urban environment.

4.0 WETLANDS

Wetlands in Washington State are fragile ecosystems that perform a number of important beneficial functions. As such, wetlands are identified in the Washington GMA as a distinct critical area for which continued protection is imperative (see WAC 365-190-080[1]). Wetlands reduce the risk of erosion, siltation, flooding, and ground and surface water contamination as well as provide valuable habitat for wildlife, plants, and fish. Wetland destruction or degradation may result in increased public and private costs or property losses through increased risk of flooding.

In designating wetlands for regulatory purposes, jurisdictions are required to use the definition of wetlands in RCW 36.70A.030(20) as follows:

> *"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 nonwetland 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 nonwetland areas created to mitigate conversion of wetlands.*

In addition, to comply with definitive mandates of BAS, CTED encourages counties and cities to develop protective measures consistent with the intent and goals of “protection of wetlands,” Executive Orders 89-10 and 90-04 as issued on September 1, 1990. Additionally, counties and cities must consider updated guidance on wetlands protection provided by DOE.

Recent CAO updates typically include modification of wetland classification systems to conform with the state system developed and intensively reviewed by DOE for consistency with BAS. Although adoption of DOE’s system is not mandatory, CTED encourages counties and cities that do not rate wetlands or intend classification updates to consider a wetland rating system to reflect the relative function, value, and uniqueness of wetlands in their jurisdictions. In developing wetland rating systems, CTED guidance (CTED 2003) instructs counties and cities to consider the following:

- The Washington State four-tier wetlands rating system;
- Wetlands functions and values;
- Degree of sensitivity to disturbance;
- Rarity; and
- Ability to compensate for destruction or degradation.

4.1 Wetlands: Code Review and Comparison

The City of Edmonds' current CAO uses a modified three-tiered system for wetland classification (Table 4-1). This system is not consistent with CTED guidance on classifying Washington State wetlands in accordance with BAS. As indicated in *Example Code Provisions for Designating and Protecting Critical Areas*, CTED encourages adoption of the four-tiered wetland classification system developed by DOE. This four-tiered system – in both its 1993 revised (DOE 1993) and recently updated (2004a) draft form – allows refined distinction of wetland categories based upon function and value, especially in regard to "lower quality" wetland types. DOE has prepared a draft document that reviews the science of wetland management and buffers in Wetlands in Washington State Volume 2: Managing and Protecting Wetlands (DOE 2004b). DOE provided input to CTED regarding the appropriate buffers for wetlands and streams.

Table 4-1. Wetlands code comparison.

City of Edmonds	CTED Example CAO	Draft Mukilteo CAO	Burien CAO	Draft King County CAO	Notes: Best Available Science and other precedents.
Wetland Classification Existing Code: Three categories defined as follows. Category 1 Category 2 Category 3	Uses 4-tiered wetland classification system per DOE: Category 1 Category 2 Category 3 Category 4	Uses 4-tiered wetland classification system per DOE's 1993 wetland rating system: Category 1 Category 2 Category 3 Category 4	Basically uses a 3-tiered system with a 4th category (Category 4 wetlands) defining wetlands associated with a specific hydrologic system (Lake Burien). Category 1 Category 2 Category 3 Category 4 – Lake Burien and associated wetlands.	Adopts DOE 4-tiered wetland classification system: Category 1 Category 2 Category 3 Category 4	• In general, all jurisdictions in Washington are adopting the 4-tiered system developed by DOE, typically with slight modification. • Edmonds code currently only specifies use of the Federal manual for wetland delineations. CTED and most jurisdictions typically specify use of the State manual, which is based upon the Federal manual. In practicality, both manuals are used for field delineation and updated code should allow for use of both. • Edmonds code only regulates wetlands larger than 2,500 square feet in size. This regulatory minimum is inconsistent with guidance provided by CTED and DOE, although most jurisdictions retain minimum size requirements in updated CAO.
Wetland Buffers Existing code: Category 1 – 100 ft Category 2 – 50 ft Category 3 – 25 ft	Category 1 high intensity – 300ft moderate intensity – 250 ft low intensity – 200 ft Category 2 high intensity – 200 ft moderate intensity – 150 ft low intensity – 100 ft Category 3 high intensity – 100 ft moderate intensity – 75 ft low intensity – 50 ft Category 4 High intensity – 50 ft low and moderate intensity – 35 ft	Category 1 – 160 ft Category 2 – 100 ft Category 3 – 75 ft Category 4 – 50 ft (As programmatic mitigation for use of smaller buffers, Mukilteo requires development of a Buffer Enhancement Plan for any parcel containing a regulated wetland.)	Category 1 – 200 ft Category 2 – 100 ft Category 3 – 50 ft Category 4 – 30 ft	Category 1 – 300 ft Category 2 – 200 ft Category 3 – 100 ft Category 4 – 50 ft	• "Intensity" classification for wetland buffers in CTED's Example Code Provisions refer to "land use intensity." Numerous jurisdictional precedents reflect an opposite correlation between regulated buffer widths and "intensity" of land use: i.e., buffers are typically reduced in size in urban, built-out jurisdictions to accommodate existing development and land uses. • Currently, Edmonds code allows for a minimum spot reduction through buffer averaging to 50% of standard buffer width. This is inconsistent with CTED guidance, which allows spot reduction to 75% of standard width or to 35 ft, whichever is larger. Other jurisdictions (e.g., King County) do not stipulate a minimum but, instead, include text confirming that wetland functions and values will not be reduced. • Many jurisdictions include details on wetland buffer enhancement plans. Mukilteo, to provide systematic mitigation for the potential adoption of reduced standard buffer widths, stipulates in its updated wetland ordinance that a buffer enhancement plan is required for all parcels containing a wetland regardless of the potential for impacts.
Wetland Mitigation Existing code: Compensatory mitigation ratios as follows. Category 1-6:1 Category 2-forested 3:1, shrub	Category 1 – 6:1 Category 2 – 3:1 Category 3 – 2:1 Category 4 – 1.5:1	Category 1 – 6:1 Category 2 – 3:1 Category 3 – 2:1 Category 4 – 1.5:1	Category 1 and 2 – 3:1 Category 3 and 4 – 2:1	<u>On-site:</u> Restoration. Category 1,2,3 – 3:1 Category 4 – 2:1 Enhancement or creation. Category 1,2,3 – 4:1 Category 4 – 3:1	• CTED's Example Code Provisions stipulates mitigation ratio increases when: (a) uncertainty about potential success exists; (b) a significant period of time is expected before wetland functioning recovers; (c) mitigation results in a lower category wetland or diminished functions; and (d) wetland impacts were not authorized. • King County allows for reduced compensatory ratios under

Table 4-1. Wetlands code comparison.

City of Edmonds	CTED Example CAO	Draft Mukilteo CAO	Burien CAO	Draft King County CAO	Notes: Best Available Science and other precedents.
2:1, emergent 1.5:1 Category 3-1.25:1				<u>Off-site same drainage basin:</u> Restoration. Category 1,2,3 – 4:1 Category 4 – 3:1 Creation. Category 1,2,3 – 5:1 Category 4 – 4:1 Enhancement: Category 1,2,3 – 6:1 Category 4 – 4:1 <u>Off-site different drainage basin:</u> Restoration. Category 1,2,3 – 5:1 Category 4 – 4:1 Creation. Category 1,2,3 – 6:1 Category 4 – 5:1 Enhancement. Category 1,2,3 – 8:1 Category 4 – 5:1	various – very specific – conditions, typically requiring an applicant to provide valid proof (hydrological data, monitoring precedents, etc.) of mitigation success. • Currently, alternatives for mitigation other than compensation are not directly addressed in Edmonds CAO. Many jurisdictions provide managers with leeway in determining appropriate strategies for wetland impact mitigation. Many jurisdictions (e.g., Burien, King County, etc.) include provisions for wetland enhancement as mitigation. Under such provisions, applicants are allowed to enhance existing wetlands and buffers in lieu of compensatory wetland creation.
Wetlands – Permitted Uses Existing code: Depending on wetland category, wetlands may be used for stormwater treatment.	Stormwater management facilities, limited to stormwater dispersion outfalls and bioswales, may be allowed within the outer 25% of the buffer of Category 3 and 4 wetlands only provided that: no other location is feasible; and, facilities do not degrade the function and values of such wetlands.	"Stormwater Management Facilities […] shall not be located within the required buffer unless no other locations are feasible and the location of such facilities will not have an adverse impact on the wetland. Stormwater detention ponds shall not be allowed in wetlands or their buffers."	Sewer utility corridors may be allowed in certain wetlands and stormwater facilities are allowed consistent with requirements based upon wetland category.	Practically allows stormwater discharge and utilities in wetlands and wetland buffers as long as wetland function and values are maintained or enhanced from original conditions.	• Jurisdictions incorporating BAS generally allow stormwater facilities in wetland buffers and establish mechanisms in the code for variances to allow planning departments leeway with placement of facilities as practical. However, all code updated in accordance with BAS includes text specifically stating that all attempts should be made to exclude stormwater facilities from wetlands and wetland buffers. facilities may be incorporated into wetlands and buffers only as necessary.

Inclusion of a fourth wetland category in the Edmonds CAO will provide consistency with BAS and the updated classification systems of jurisdictions throughout Western Washington. In addition, use of a four-tiered classification system will allow for standards of development that are not unduly restrictive and provide a level of protection suited to the lower functions and values associated with Category 4 wetlands common to urban, built-out environments.

Edmonds CAO currently mandates wetland protection by category, with the following buffer widths:

- Category 1 – 100 ft
- Category 2 – 50 ft
- Category 3 – 25 ft

These existing code mandates are not consistent with CTED and DOE guidance or provisions for increased buffer widths adopted by other local jurisdictions in accordance with BAS (Table 4-1). CTED and DOE guidance on wetland buffer protection provides a range of buffer widths depending upon the degree of "land-use intensity" in surrounding areas. DOE and CTED provide guidance on buffer widths for wetland protection by category based upon land-use intensity as follows:

- Category 1 Wetland
  high intensity – 300 ft
  moderate intensity – 250 ft
  low intensity – 200 ft
- Category 2 Wetland
  high intensity – 200 ft
  moderate intensity – 150 ft
  low intensity – 100 ft
- Category 3 Wetland
  high intensity – 100 ft
  moderate intensity – 75 ft
  low intensity – 50 ft
- Category 4 Wetland
  high intensity – 50 ft
  moderate and low intensity – 35 ft

Given the density and size of residential lots in the City of Edmonds, buffer widths specified by CTED and DOE – especially those prescribed for high intensity land-use areas – may be unreasonable and overly restrictive. In addition, provisions for some buffer flexibility along low quality wetlands may be appropriate for the Edmonds CAO to allow for use of reduced buffer widths. The City of Mukilteo is using such a strategy to mitigate for the proposed adoption of reduced wetland buffer widths in its updated draft CAO. Although Mukilteo's updated draft wetland ordinance deviates from CTED guidance by mandating reduced wetland buffers widths (Category 1 – 160 ft; Category 2 – 100 ft; Category 3 – 75 ft; Category 4 – 50 ft), the ordinance also requires that any

applicant seeking a permit for a parcel containing a regulated wetland develop a buffer enhancement plan, regardless of the potential for impact to the wetland. As indicated in the draft 2004 Critical Areas Inventory, only two Category 1 and two Category 2 wetland are known to exist within the entire jurisdiction of Edmonds. Potential wetland buffer width reduction should necessarily focus on Category 3 and 4 wetlands to limit the potential for land-use conflicts within the Edmonds City limits.

Current compensatory replacement ratios for wetland mitigation specified in the existing Edmonds CAO are consistent with CTED and Ecology guidance on BAS for Category 1 wetlands (6:1) and forested Category 2 wetlands (3:1). However, existing replacement ratios for Category 2 shrub (2:1) and emergent wetlands (1.5:1), and Category 3 wetlands (1.25:1) are lower than those prescribed under CTED guidelines (all Category 3 wetlands 2:1; Category 4 wetlands 1.5:1). Surrounding jurisdictions (e.g., Mukilteo) are generally adopting replacement ratios per CTED guidelines. King County's updated draft CAO modifies CTED's suggested ratios to allow decreased ratios for on-site and local compensatory mitigation. Mitigation sequencing to be specified in Edmonds updated CAO will mandate compensation only as "last resort" mitigation. If compensatory mitigation is necessary, it is likely to be implemented on or near a project site. Thus, reduced replacement ratios or modification similar to that proposed by King County for on-site and local wetland compensation may be appropriate for consideration by the City of Edmonds.

Other elements of the City of Edmond's existing ordinances pertaining to wetlands that will likely require modification in accordance with BAS include: specification of both the State and Federal manual for use in delineation and wetland boundary determination, and reduction of the minimum size requirement for a regulated wetland. Although the State manual, *Washington State Wetlands Identification and Delineation Manual*, is based on the Federal manual, in Washington State, both manuals are used for field delineation.

Currently, the City regulates only those wetlands larger than 2,500 square feet in area. This minimum requirement is inconsistent with CTED and DOE guidance on BAS – neither advocate adoption of a minimum wetland size requirement. However, many jurisdictions have retained original or modified minimum wetland size requirements through the BAS update process to minimize land-use restrictions on private parcels (Table 4-1).

4.2 Review of Scientific Literature

Scientific literature documenting the effectiveness of wetland protections has been in a dynamic state of flux since wetlands were first emphasized as a valuable and declining natural resource in the 1970s. Studies typically do not provide a "right" or a "wrong" but rather a range of parameters or conditions that result in an estimated probability of protection. Identification of those parameters indicative of increased wetland protection is also subjective to a degree. Wetlands perform a variety of beneficial functions – e.g.,

flood protection, sediment removal, water quality control, wildlife habitat provision, etc. – and individual studies typically focus on only a single parameter.

The sections below provide a summary of empirical evidence documented on the effectiveness of wetland classification, buffers, and mitigation regarding preservation of different beneficial wetland functions. Comparison of the data provided in these summaries and Table 4-2 will allow development of CAO wetland protections consistent with both updated information on BAS and the needs of the Edmonds community.

Wetland Classification

Just as there is no single definition of wetlands used by ecologists, land managers, and regulators (Dennison and Berry 1993, Mitsch and Gosselink 1993), there is no universal system of wetland classification. Wetland classification is simply a tool to assist land managers in the identification and protection of those areas located at the fringe of aquatic and upland ecosystems that are known to provide important beneficial functions in terms of wildlife habitat, flood control, maintenance of water quality, nutrient cycling, etc. Empirical study of wetland classification focuses on the percentage of such areas existing in a region that are afforded protection under different systems of wetland classification.

Classification based on vegetation has been the most common approach to rating wetlands since the publication of Cowardin et al. (1979). Even newer systems of classification – such as the hydrogeomorphic method (Brinson 1993) and classifications based on trophic status (Rieley and Page 1990) or hydrology (Kistritz and Porter 1993) – still largely rely on delineation of plants and vegetation communities existing within a wetland complex. Basing wetland categories on vegetation has the advantage of allowing for rapid field assessment due to the conspicuous nature of plants and the ease with which they can be identified, often at a distance.

Most systems of wetland classification in use in Washington are based on one of two models. The older system was first developed by King County in the 1980s. It is a three-tiered system in which the major factors are total wetland size and the number of different vegetation classes present, with vegetation classes defined by Cowardin et al. (1979). DOE developed a more complex wetland rating system in 1993 (DOE 1993) that is currently being revised and updated based on BAS. Both DOE's 1993 and revised 2004 draft wetland rating systems are based on a four-tiered system of classification that incorporates the number of vegetation classes and additional vegetative analysis on factors such as vegetative class interspersion, intra-class plant species diversity, and the presence of unwanted, invasive species. In addition to plant data, the DOE system considers many other factors such as the presence of threatened or endangered plant or animal species and whether the wetland is regionally rare (such as a mature forested wetland) or has greater than average sensitivity to disturbance (such as bogs or fens).

Table 4-2 provides a summary of different wetland rating systems used in the state. Ecology's most recent (2004) revised system allows for greater distinction between wetlands with varying degrees of function and value.

Table 4-2. Wetland rating systems.

Rating System	Summary	Basis	Notes
3-Tiered Rating System Based on King County Model (1980s)	Original system designed to distinguish among wetland types in King County.	Adopted and modified by other jurisdictions based on practical understanding without standardization or empirical study of effectiveness.	• One of the first state jurisdictional systems of distinguishing wetland types to vary protection. • Developed without extensive scientific validation prior to GMA BAS mandates.
DOE's 1993 4-tiered Wetland Rating System	Defines wetland types based on 7 criteria: sensitivity, rarity, Natural Heritage status, replacement potential, functions, T/E species, local significance.	Based on classification of 122 reference wetlands: Cat. 1 – 27 (22%) Cat. 2 – 68 (56%) Cat. 3 – 20 (16%) Cat. 4 – 7 (6%)	• DOE system – often with slight modification – adopted by many state jurisdictions. • First state system developed with extensive scientific review and standardization. • Source: *Washington State Wetland Rating system for Western Washington.* (DOE 1993).
DOE's 2004 Updated 4-tiered Draft Wetland Rating System	Refines 1993 system based upon 10+ years of practical use. Reduces number of criteria for wetland categorization to 5.	Based on classification of 122 reference wetlands: Cat. 1 – 24 (20%) Cat. 2 – 50 (41%) Cat. 3 – 39 (32%) Cat. 4 – 9 (7%)	• Increased emphasis on lower quality wetlands, more accurately reflecting Washington conditions. • Five of seven criteria for categorization retained from 1993 DOE system. • Removes consideration of Threatened and Endangered Species and "local significance." • Source: *Washington State Wetland Rating system for Western Washington – Revised.* (Hruby 2004).

Use of this system in an urban residential community like Edmonds would limit the misclassification or over-valuation of lower quality wetlands most typically occurring in a built-out environment. Use of DOE's revised system would also allow for more stringent regulatory protections for the one Class 1 and one Class 2 wetland existing in Edmonds: the Edmonds Marsh and the wetlands associated with Good Hope Pond, respectively.

Wetland Buffers

For wetland protection, protective buffers are typically vegetated upland areas immediately adjacent to a wetland. Existing Edmonds code defines buffers for aquatic areas as "a designated area immediately next to and part of a stream or wetland that is an integral part of the stream or wetland ecosystem" (ECDC 20.15B.020 D). Although many factors, including vegetation density, soil composition, and adjacent land-use, affect the functioning of a wetland buffer, most buffer regulations focus primarily on buffer width.

Many studies have been published summarizing the effectiveness of various buffer widths (e.g., Castelle et al. 1992, Castelle and Johnson 2000, Desbonnet et al. 1994, FEMAT 1993, etc.). Table 4-3 provides a summary of empirical studies and literature surveys documenting the efficacy of wetland buffers based on buffer width. As indicated, it is difficult to discern a direct valid correlation between the width of a wetland buffer and its effectiveness in regard to maintaining water quality. All aspects of water quality protection – control or removal of sediment, phosphorous, nitrate, fecal coliform, bacteria, etc. and water temperature control – may be affected by the type of wetland buffer, the vegetation established within the buffer, and the environment in which a wetland and its buffer is located. In general, studies indicate that buffers with dense vegetative cover on slopes less than 15% are most effective for water quality functions, and buffer widths most effective at preventing water quality impacts are generally 100 feet or greater.

The majority of empirical studies on wetland buffer efficacy focus on the effectiveness of protective buffers at maintaining or improving water quality (Table 4-3). However, wetland buffers also function to maintain wetland hydrology, provide habitat for wetland associated wildlife species, and minimize impacts from direct human disturbance. An assessment of wetland buffer effectiveness in terms of these beneficial buffer functions is provided in DOE's *Wetland Buffers: Use and Effectiveness* (Castelle et al. 1992).

Wetland buffers maintain wetland hydrology by preventing large, sudden fluctuations associated with flash surface run-off in developed areas with impervious surfacing. In terms of maintaining wetland hydrology, there is a direct correlation between the amount of undisturbed, pervious vegetated lands adjacent to a wetland and the degree to which severe hydrological fluctuation is minimized (Castelle et al. 1994). While larger buffer widths better limit hydroperiod extremes, it is generally thought that buffer widths of 100 feet or more function to effectively maintain wetland hydrology (Puget Sound Water Quality Authority 1991, Wenger 1999)

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Table 4-3. Empirical Studies on Buffer effectiveness.

Buffer	Function	Effectiveness	Source/Location
10-20 ft grass buffer	Sediment control. Phosphorous control. Nitrogen control. Nitrate control. Orthophosphorous control.	Sediment reduction – 66-77%. Phosphorous reduction – 37-52%. Nitrogen reduction – 28-42%. Nitrate reduction – 25-42%. Orthophosphorous reduction – 34-43%.	• Source: Lee et al. 1999. • State: Iowa.
13-30 ft grass buffer	Sediment control. Nitrogen control. Phosphorous control.	Sediment reduction – 84%. Nitrogen reduction – 73%. Phosphorous reduction – 79%.	• Source: Dillaha et al. 1989. • State: Virginia.
16 ft grass buffer	Nitrate and Orthophosphorous control.	Nitrate and orthophosphate reduction 90%.	• Source: Madison et al. 1992.
16-30 ft grass buffer	Nutrient control.	Nutrient reduction – <50%.	• Source: Magette et al. 1989. • State: Maryland
16-30 ft grass buffer	Herbicide control.	Herbicide reduction – 28-72%.	• Source: Mickelson et al. 1995. • State: Iowa.
20-59 ft grass buffer	Sediment control. Phosphorous control. Total Kedall N. Ammonia control. Nitrate control. Orthophosphorous control.	Sediment reduction – 30-60%. Phosphorous reduction – 60%. Total Kedall N – 35-50%. Ammonia reduction – 20-50%. Nitrate reduction – 50-90%. Orthophosphorous reduction – 50%.	• Source: Daniels and Gilliam 1996. • State: North Carolina.
23-52 ft mixed buffer	Sediment control. Phosphorous control. Nitrogen control. Nitrate control. Orthophosphorous	Sediment reduction – 70-90%. Phosphorous reduction – 46-93%. Nitrogen reduction – 50-80%. Nitrate reduction – 41-92%.	• Source: Lee et al. 2000. • State: Iowa.

Table 4-3. Empirical Studies on Buffer effectiveness.

Buffer	Function	Effectiveness	Source/Location
	control	Orthophosphorous reduction – 28-85%.	
30 ft grass buffer	Sediment control.	Sediment reduction – 85%.	• Source: Ghaffarzadeh et al. 1992.
62 ft forested buffer	Nitrogen control. Phosphorous control.	Nitrogen reduction – 89%. Phosphorous reduction – 80%.	• Source: Shisler et al. 1987. • State: Maryland.
65 ft grass buffer	Herbicide control. Sediment control.	Herbicide reduction – 8-100%. Sediment reduction – 40-100%.	• Source: Arora et al. 1996. • State: Iowa
75 ft grass buffer	Fecal coliform control.	Fecal coliform reduction – 30%.	• Source: Schellinger and Clausen 1992.
80 ft grass buffer	Nitrate control. Phosphorous control. Sediment control. Bacteria control.	Nitrate reduction – 96%. Phosphorous reduction – 88%. Sediment reduction – 80%. Bacteria reduction – 0%.	• Source: Chaubey et al.1994. • State: Arkansas.
82 ft grass buffer	Sediment control.	Sediment reduction – 92%.	• Source: Young et al. 1980. • State: Minnesota.
85 ft grass buffer	Sediment control. Phosphorous control. Total Kedall N. Ammonia control.	Sediment reduction – 45%. Phosphorous reduction – 78%. Total Kedall N – 76%. Ammonia control – 2%.	• Source: Schwer and Clausen 1989. • State: Vermont
89 ft grass buffer	Nitrogen control.	Nitrogen reduction – 84%.	• Source: Young et al. 1980. • State: Minnesota.
100 ft forested buffer	Sediment control.	Sediment reduction – 75-80%.	• Source: Lynch et al. 1985.
100 ft grass buffer	Fecal coliform control.	Fecal coliform reduction – 60%.	• Source: Grismer 1981.
115 ft grass buffer	Microorganism control.	Microorganism reduction – <1,000/100ml.	• Source: Young et al. 1980.
200 ft grass buffer	Sediment control.	Sediment reduction – 80%.	• Source: Horner and Mar 1982. • State: Washington.
100 ft	Wildlife habitat	Buffer size effective for	• Source: Emmons and Olivier Resources.

Table 4-3. Empirical Studies on Buffer effectiveness.

Buffer	Function	Effectiveness	Source/Location
	provision.	unthreatened (non-special status) wildlife species.	
200-300 ft	Wildlife habitat and corridor protection.	Effective for special status (TES) wildlife species.	• Source: Emmons and Olivier Resources 2001.
50 ft in rural area 100 ft in urban area	Maintenance of wildlife species diversity.	Effective for maintenance of species diversity.	• Source: Emmons and Olivier Resources 2001.
50-175 ft	Preventing wildlife disturbance.	Maintenance of 175 ft buffers effective in preventing direct disturbance to avian species.	• Source: Josselyn et al. 1989. • State: California
200-300 ft plus	Preventing avian species disturbance (flushing).	Concludes 300 ft buffers may not be sufficient to prevent direct avian disturbance.	• Source: WDFW 1992.
20 ft forested	Reducing noise impacts.	Loss of 4-6 decibels of noise (equivalent to tripling the distance to the noise source.	• Source: Harris 1985.
50-100-200 ft	Maintenance of wildlife species diversity.	Buffers of 50 to 100 to 200 feet were found to effectively maintain diversity dependant on wetland size.	• Source: Milligan 1985.
100 ft	Maintenance of suitable fish habitat.	100-ft buffer effective at providing aquatic fish habitat if 50-75% shading at midday.	• Source: Raleigh 1982, Raleigh et al. 1984.

Wetland buffers larger than 100 feet in width have generally been advocated to provide habitat area suitable to maintain wetland-associated populations of wildlife (Dodd and Cade 1998). The vegetated uplands adjacent to wetlands are considered to be one of the richest zones for aquatic organisms, mammals, and birds (Clark 1977, Williams and Dodd 1978). In Washington State, 85% of terrestrial vertebrate species are known to use wetlands and their buffers: 359 of 414 species in western Washington (Brown 1985a), and 320 of 378 species in eastern Washington (Castelle et al. 1992). In association with DOE's 1992 assessment of wetland buffer effectiveness, the Washington Department of Fish and Wildlife (WDFW) prepared a report entitled *Buffer Needs of Wetland Wildlife* (WDFW 1992) to, in part, assess buffer widths necessary to maintain healthy wetland-associated wildlife populations. WDFW concluded in their report that:

> *To retain wetland-dependent wildlife in important wildlife areas, buffers need to retain plant structure for a minimum of 200 to 300 feet beyond the wetland. This is especially the case where open water is a component of the wetland or where the wetland has heavy use by migratory birds or provided feeding for heron. The size needed would depend upon disturbance from adjacent land use and resources involved.* (WDFW 1992)

The increased buffer width of 200 to 300 feet suggested by WDFW for protection of wetland-associated wildlife provided the justification for DOE to include increased buffer width mandates for high quality (Category 1 and 2) wetlands in their guidance on critical areas protections.

Wetland buffers provide an important protective function by limiting human intrusion and impacts in a wetland area (WDFW 1992). Direct human impacts to wetlands most often consist of refuse dumping, trampling of vegetation, and noise. Cooke (1992) studied 21 wetlands in King and Snohomish counties in a post-project evaluation to assess the effectiveness of buffers in protecting wetlands from human disturbances. Efficiency was measured qualitatively, using observations of human-caused disturbance to the wetland and buffer to indicate loss of buffer effectiveness. Buffers functioned most effectively when adjacent development was of low intensity; when buffer areas were 50 feet wide or greater and were planted with shrub and/or forested plant communities; and when the buffers were next to residential lots or land owned by individuals who understood the rationale for establishing buffers. Nearly all buffers less than 50 feet wide at the time they were established demonstrated a significant decrease in effective size within a few years; in some instances, degradation was so great that the buffers were effectively eliminated. Fewer than half of the buffers that were originally at least 50 feet wide showed demonstrable degradation (Cooke 1992).

Wetland Mitigation

Wetland mitigation refers to any action serving to compensate for a potential impact to or degradation of the functioning and/or value of a wetland. Wetland replacement ratios are a regulatory tool used to standardize the extent of replacement, and are expressed as a

ratio of wetland area replaced to wetland area lost. There is a growing body of literature and scientific consensus recommending ratios greater than 1:1 in order to ensure full replacement of wetlands. These recommendations stem from research that demonstrates a significant rate of failure in current wetland replacement projects, as well as a loss of wetland function over the time it takes for a created wetland to represent a fully functioning ecosystem (Ossinger 1999, National Academy of Sciences 2001, Johnson et al. 2000). Some investigators doubt that created systems can ever reach the functional equivalent of a natural system (Johnson et al. 2002). Thus, to ensure that mitigation is successful, ratios of wetland replacement area should be higher than the area of wetland lost. Wetlands of greater value require higher replacement rations than wetlands with low value.

4.3 Assessment of Wetland Ordinance

The City's updated wetland ordinance will include a four-tiered wetland rating system. The four wetland rating categories (Categories 1, 2, 3, and 4) will be defined and delineated in accordance with CTED and updated DOE guidance (Hruby 2004) as provided below:

"**Category 1 Wetlands**. Category 1 wetlands are those that meet one or more of the following criteria:

i. Relatively undisturbed estuarine wetlands larger than 1 acre;
ii. Wetlands that are identified by scientists of the Washington Natural Heritage
Program/DNR as high quality wetlands;
iii. Bogs larger than ½ acre;
iv. Mature and Old growth forested wetlands larger than 1 acre;
v. Wetlands in coastal lagoons;
vi. Wetlands that perform many functions well as indicated by a score of 70 or more on the City of Edmonds Wetland Field Data Form.

Category 2 Wetlands. Category 2 wetlands are:

i. Estuarine wetlands smaller than 1 acre, or disturbed estuarine wetlands larger than
1 acre;
ii. A wetland identified by the state Department of Natural Resources as containing
"sensitive" plant species;
iii. A bog between ¼ and ½ acre in size; or,
iv. Wetlands with a moderately high level of functions as indicated by a score of 51-69 on the City of Edmonds Wetland Field Data Form.

Category 3 Wetlands. Category 3 wetlands are: Wetlands with a moderate level of functions as indicated by a score of 30-50 points on the City of Edmonds Wetland Field Data Form.

Category 4 Wetlands. Category 4 wetlands are those with the lowest levels of functions as indicated by scores below 30 on the City of Edmonds Wetland Field Data Form.

Wetland ratings will largely be based upon field assessment using the City of Edmonds Wetland Field Data Form. The City of Edmonds Wetland Field Data Form was modified for use in the Edmonds vicinity from the Draft Wetland Rating Form for Western Washington used in DOE updated wetland classification and assessment system (Hruby 2004).

Protective buffer widths for revised wetland categories will be mandated in Edmonds updated code as follows:

Category 1 – 200 ft
Category 2 – 100 ft
Category 3 – 50 ft
Category 4 – 35 ft

These wetland buffer widths are consistent with BAS, CTED, and DOE minimum requirements for wetland protection and ordinances for wetland protection recently adopted by Western Washington jurisdictions. Edmonds updated ordinances will also include provisions for buffer reductions for Category 3 and 4 wetlands if a Wetland Buffer Enhancement Plan is developed and implemented. Specific requirements for a Wetland Buffer Enhancement Plan including requirements for performance standards used to measure success will be provided in the updated code.

Development of a Wetland Buffer Enhancement Plan will be required prior to approving applicant requests for buffer reductions. In addition, the updated wetland ordinance will include provisions for retaining wetland function and values if buffer averaging will be used for spot reductions of wetland buffer widths. To the extent practical, proof of retention of wetland functions and values will be required for both buffer reductions and buffer averaging. Provision for spot buffer reductions up to 50% of the standard buffer width, as stipulated in Edmonds existing code, will be retained. However, updated wetland provisions will allow for buffer averaging only across the extent of a wetland buffer existing on an applicant's property and not the entirety of a wetland buffer. These updated provisions and additional requirements pertaining to wetland buffer reductions and use of buffer averaging will allow Edmonds updated wetland code to meet or exceed wetland protections mandated by BAS.

Compensatory mitigation ratios for wetland replacement currently specified in the existing Edmonds code are largely consistent with CTED and DOE guidance and BAS. However, the updated Edmonds code must include additional compensatory mitigation ratios to accommodate the additional wetland category in the updated four-tiered system of wetland classification. Compensatory mitigation ratios in the updated code will be mandated as follows:

Category 1 – 6:1
Category 2 – 3:1
Category 3 – 2:1
Category 4 – 1.5:1

These updated compensatory mitigation ratios are consistent with CTED and DOE guidance and BAS information on compensatory mitigation efficacy.

The updated CAO will include specific requirements for a Wetland Mitigation Plan to be developed and submitted to the Edmonds Planning Department for approval when the function or value of a wetland is anticipated to be affected by project development. Wetland Mitigation Plan requirements will be designed to discourage the use of compensatory mitigation and wetland replacement to the extent practical. Instead, the focus will be on avoidance of impacts directly to wetlands and buffers. Compensatory mitigation should be viewed as a last resort. This "re-focusing" of mitigation strategies in the updated Edmonds code will increase conformance with recent BAS information emphasizing the high probability of failure often associated with compensatory wetland replacement as mitigation.

As with the update of ordinances pertaining to other critical area types, the most notable alterations to Edmonds wetland ordinances will likely result from general organizational changes. The Edmonds CAO update will include the re-organization of existing code to simplify the organization and language, and make the code more accessible to users. The Edmonds critical areas code will be re-organized to include separate chapters pertaining to each of the five GMA-identified critical areas types. As with other updated code sections, the Wetlands Chapter will include four subsections consistent with CTED and DOE guidance: Designation, Rating, and Mapping; Allowed Activities; Additional Report Requirements; and Development Standards. The revised wetland ordinances will include specific directions on the process of managing wetlands in the vicinity of a subject parcel and specifically identify report requirements and steps in the process of classifying, assessing, and mitigating wetlands in accordance with the requirements of project development (see Section 8.0 below).

4.4 Conclusions and Risk Assessment

Overall, revision and update of the City of Edmonds wetland provisions will increase protection of area wetlands and decrease the risk to the continued preservation of these important habitat areas. In addition, update of the Edmonds wetland ordinances will generally increase protection to the community and City public and private facilities through increased flood protection and water quality control. The text below provides a risk assessment for anticipated changes resulting from the three central conceptual revisions to Edmonds wetland ordinances: update of Edmonds wetland classification to a four-tiered system; revision of Edmonds wetland protective buffer widths for consistency with agency and BAS guidance; and alteration to the potential wetland mitigation alternatives offered under City code.

It should be emphasized that the adoption of the 2004 Critical Areas Inventory for the City of Edmonds will immediately decrease risk to both the continued preservation of wetland areas located within the jurisdiction and to the flood and water quality protection afforded by these important environmental areas. Although current Edmonds wetlands ordinances refer to the existence of critical areas inventory, no such tool has been available for use by City planning to identify potential land-use conflicts between

wetland areas and potential future development. Instead, Edmonds planning relied on a number of dispersed data sources and applicant disclosure to identify wetlands to which protective code provisions might apply. The 2004 inventory identifies all significant wetland areas existing in Edmonds. However, the inventory may not include all small wetlands and applicants will still be required to conduct a field delineation regardless of designation on the inventory.

Under the revised four-tiered system of wetland classification with associated buffer provisions to be prescribed in the updated Edmonds code, protection of wetland areas will increase, resulting in a decreased risk to continued preservation of area wetlands. The value of wetlands will be more clearly defined and subject to appropriate protection levels. With the revised buffer requirements, it is likely that wetland buffer widths will increase jurisdiction-wide. However, the potential for increases in land-use conflicts resulting from such wetland buffer width increases will be mitigated substantially by the alternatives for mitigation and discretion offered the City planning department under the updated wetland provisions. In addition, wetland buffers for the least valuable wetlands are the smallest. This, in combination with some flexibility in buffer requirements, will allow City staff to accommodate growth while protecting these resources.

Adoption of provisions for effective alternatives to compensatory wetland creation will decrease the risk to wetlands. Buffer averaging and spot buffer width reductions will only be approved with the submittal of a Wetland Buffer Enhancement Plan by a project applicant. This represents a significant increase in wetland protection in comparison to the existing code. In addition, the required development of a viable Wetland Mitigation Plan for projects anticipated to impacts a wetland's function and/or value will decrease risk to area wetlands as well as decrease risk to the Edmonds community. Furthermore, updated Edmonds code provisions will discourage reliance on compensatory wetland mitigation and instead focus mitigation strategy on preservation of existing wetlands and enhancement and/or restoration of degraded wetland areas.

Updated Wetland Buffer Widths

Updated wetland buffer widths (Category 1 – 200 ft; Category 2 – 100 ft; Category 3 – 50 ft; Category 4 – 35 ft) will effectively double the width of wetland buffers for Category 1, 2, and 3 wetlands (the updated width for Category 4 wetlands [35 ft] represents a 40% increase over the existing buffer width for *Category 3* wetlands in Edmonds). If buffer width directly correlated with environmental protection, then buffer width increases mandated in the updated CAO would constitute a doubling of protection for wetlands within the jurisdiction of Edmonds. However, though the width of a wetland buffer largely influences protective efficacy (Keller et al. 1993), buffer width is not the only factor affecting buffer effectiveness. Establishment of wetland buffer widths in accordance with BAS must necessarily consider the environmental conditions and general land uses of the region in which they will be implemented.

For urban built-out areas, the emphasis in establishing suitable buffer widths must be on preserving existing sensitive wetland habitat types and on protecting those features,

functions and values most important in an urban environment. Expansive wetland buffers advocated by Ecology (e.g., Category 1 – 300 ft; Category 2 – 200 ft; Category 3 – 100 ft; Category 4 – 50 ft) are not suited to or based upon BAS for urban areas and may in fact provide an inappropriate level of protection for functions and values that are not germane in urban settings. For instance, very large buffer widths (200 or 300 ft plus) have been shown to be important in the provision and protection of maximum habitat function for wildlife (Milligan 1985, Wenger 1999). However, the City of Edmonds is estimated to be 96% built-out and it is likely that wildlife diversity has already been influenced by habitat fragmentation, road density, residential development and general human disturbance. Wildlife species that would most benefit from expansive buffer widths – typically mammals with large home ranges and species intolerant of increased human disturbance – likely no longer occur in the region or could not be sustained regardless of buffer widths. Thus, updated wetland buffer widths for the City of Edmonds have been established to preserve wetland and habitat functions most important within an developed, built-out community.

In assessing the potential effectiveness of Edmonds updated wetland buffer widths and comparing them to mandates of BAS, it is important to remember that much of the literature on wetland buffer widths cited above was developed from studies in rural areas, forested regions, and generally more pristine natural environments. As mentioned above, areas within the jurisdiction of Edmonds cannot be expected to provide habitat for species requiring large contiguous areas of forest habitat. Without this consideration, BAS indicates that those functions and values most important within a built-out urban area like Edmonds (e.g., water quality protection, flood storage, provision of habitat for species common to developed areas) can be adequately protected with buffer widths commensurate with those proposed in the updated CAO.

The City of Edmonds is largely built-out with approximately 96% of the land previously developed. GMA density goals will be met through redevelopment. Instituting large buffers that would extend into residential yards that were previously developed would offer no additional protection for the resource. To ensure improvement in wetland buffer function over time the new CAO requires buffer enhancement for redevelopment that expands an existing structure footprint into a buffer. The CAO provides flexibility for City staff to work with landowners in developing a scientifically-based enhancement plan for such redevelopment.

5.0 FREQUENTLY FLOODED AREAS

Frequently flooded areas are one of five critical area types specifically identified for protection in the Washington GMA (see WAC 365-190-080[3]). Floodplains and areas subject to flooding perform important hydrologic functions and can present a risk to persons and property. According to DOE and CTED guidance on critical area classification (CTED 2003), frequently flooded areas should at least include those areas within the 100-year floodplain designated by the Federal Emergency Management Agency (FEMA) and the National Flood Insurance Program.

According to CTED guidance (CTED 2003), jurisdictions should consider the following when designating and classifying frequently flooded areas:

- Effects of flooding on human health and safety and on public facilities and services.
- Available documentation including Federal, State, and local laws, regulations, and programs; local studies and maps; and Federal flood insurance programs.
- The future flow floodplain, defined as the channel of the stream and that portion of the adjoining floodplain that is necessary to contain and discharge the base flood flow at build-out without any measurable increase in flood heights.
- The potential effects of tsunami, high tides with strong winds, sea level rise resulting from global climate change, and greater surface runoff caused by increasing impervious surfaces.

5.1 Frequently Flooded Areas: Code Review and Comparison

In general, there is little divergence among jurisdictions in the definition, delineation, and regulation of frequently flooded areas. Most jurisdictions' existing CAO – including Edmonds' – are consistent with minimum guidelines on frequently flooded areas provided by CTED.

Within all Washington State jurisdictions, frequently flooded areas include those lands located within the 100-year floodplain as delineated on FEMA Flood Insurance Rate Maps (FIRM). FIRMs provide the basic critical areas designation tool for frequently flooded areas used, almost universally, by cities and counties in the state. However, CTED guidance advocates the use of newer, more refined data in the delineation of frequently flooded areas whenever possible (CTED 2003). Data supplementing FIRM floodplain information should focus on those areas within a jurisdiction known to be susceptible to frequent flooding. Inclusion of supplemental data and designation of areas outside the FEMA 100-year floodplain is the principal exception to the noted consistency among jurisdictions on frequently flooded area designations (Table 5-1).

Table 5-1 provides a comparison of Edmonds' existing frequently flooded area ordinance with the CTED example code provisions and other jurisdictions' regulations. CTED suggests incorporation of additional specific data on "channel migration, maps showing

built-out conditions, riparian habitat areas, etc." (CTED 2003). The drainages that occur within the City are small and often confined by ravines or the built environment. Thus, channel migration zones, which are more applicable to large alluvial rivers, are not an issue within the City.

As indicated in Table 5-1, protection of frequently flooded areas typically focuses on avoiding development within the 100-year floodplain and/or incorporating design modifications and providing for compensatory storage within the floodplain to limit the risk of flooding. The existing Edmonds CAO does not provide specific development standards or protective provisions for frequently flooded areas. Instead, frequently flooded areas are regulated under ECDC Chapter 19.97, the Floodplain Management section of the building code. However, ECDC Chapter 19.97 provides no direct reference to frequently flooded areas. Although it may be appropriate to retain regulation of frequently flooded areas within the City's building code, to be compliant with CTED guidelines, the Edmonds updated CAO should, at a minimum, include development standards for frequently flooded areas with reference to ECDC Chapter 19.97.

5.2 Review of Scientific Literature

For many cities and counties in Washington, little emphasis is placed on frequently flooded areas simply because the extent of the 100-year floodplain within the boundary of a jurisdiction may be limited. This is certainly the case in Edmonds where FIRM data indicate that, aside from the shoreline of Puget Sound itself, the FEMA 100-year floodplain only includes: the Edmonds Marsh; a small portion of the Shell Creek drainage extending about 0.25 mile upstream from stream outfall; and shoreline areas of Lake Ballinger located within the City limits (FEMA 2003). In total, these areas include only 84 acres or 0.67% of Edmonds' total jurisdictional area. These limited floodplain areas are clearly indicated on the 2004 Edmonds Critical Areas Inventory (EDAW 2004).

Technical literature and documents potentially identifying areas outside of the FEMA 100-year floodplain to be identified as frequently flooded areas include Edmonds' 2003 Comprehensive Plan (City of Edmonds 2003a), the 2003 Stormwater Comprehensive Plan (City of Edmonds 2003b), and the Meadowdale Drainage Investigation (RW Beck 2000). In particular, Section IX of the City's Stormwater Comprehensive Plan identifies specific areas with drainage problems that are prone to flooding brought to the attention of the City of Edmonds Public Works, often through public complaint. In addition, public response to a mailer distributed as part of the Meadowdale Drainage Investigation (RW Beck 2000) identified seven problem areas in the Meadowdale region alone that

Table 5-1. Frequently flooded areas code comparison.

City of Edmonds	CTED Example CAO	Kirkland SAO	Burien CAO	Draft King County CAO	Notes: Best Available Science and other precedents.
Frequently Flooded Areas – FEMA Consistency Currently defined by 100-year floodplain – "those lands in the floodplain subject to a one percent or greater chance of flooding in any given year."	Consistent with current Edmonds code with language allowing for more liberal delineation (i.e., inclusion of other areas important for flood prevention). "Classifications of frequently flooded areas include, at a minimum, the 100-year floodplain designations of the Federal Emergency Management Agency and the National Flood Insurance Program."	Defines frequently flooded areas as all areas within the 100-year FEMA floodplain.	Does not include the term "frequently flooded areas" per se, but regulates lands within the 100-year floodplain as "flood hazard areas" consistent with FEMA and CTED guidance. Includes provisions for specific areas within the floodplain: A. Floodplain; B. Flood fringe; C. Zero-rise floodway; and D. FEMA floodway.	Does not include the term "frequently flooded areas" per se, but regulates lands within the 100-year floodplain as "flood hazard areas" consistent with FEMA and CTED guidance. Flood hazard areas: those areas in King County subject to inundation by the base flood and those areas subject to risk from channel relocation or stream meander including, but not limited to, streams, lakes, wetlands and closed depressions. (Ord. 11621 § 31, 1994: 10870 § 135, 1993).	• Need to ensure CAO pertaining to Frequently Flooded Areas are consistent with the *Washington Model of the Flood Damage Prevention Ordinance* prepared by FEMA and DOE.
Frequently Flooded Areas – Regulatory Protection Protections and provisions for frequently flooded areas currently regulated under Edmonds building code, ECDC Chapter 19.97.	Example code provisions provide specific protective provisions for frequently flooded areas within distinct CAO chapter.	Regulated under Chapter 21.56 of Kirkland Municipal Code (Flood Damage Prevention section of the Buildings and Construction Code)	Provides development standards and specific provisions, focusing on building design and safety modifications, within the CAO. Includes specific provisions for distinct areas within the floodplain including both the zero-rise floodway and the FEMA floodway.	Provides development standards and specific provisions, focusing on building design and safety modifications, within the CAO. Includes specific provisions for distinct areas within the floodplain including both the zero-rise floodway and the FEMA floodway.	• Although the provisions provided in ECDC Chapter 19.97 are generally consistent with CAO development standards for frequently flooded areas, this critical area type is not specifically referenced in the building code. • Many jurisdictions delineate and provide specific provisions for distinct areas within the 100-year floodplain. However, this level of detail may not be appropriate given the limited extent of the 100-year floodplain within Edmonds jurisdiction.
Frequently Flooded Areas – Identification of Specific Areas Current Edmonds CAO does not include specific call-out of areas within the City know to be prone to flooding. ECDC Chapter 19.97 does not include separate provisions for distinct areas within the floodplain (i.e., flood fringe and floodway).	Example code provisions designate frequently flooded areas as: 1. Areas Identified on the Flood Insurance Map(s). 2. Areas Identified by the Director. Example code provisions do not mandate inclusion of specific provisions for distinct areas within the floodplain (i.e., flood fringe and floodway).	Does not include call-out of specific areas within the jurisdiction prone to flooding. However, code includes provisions for separate sections within the flood-plain including the flood-way and shallow-flooding areas.	CAO does not include call-out of or reference to specific areas prone to flooding within Burien. Provides distinct provisions for risk management within: A. Floodplain; B. Flood fringe; C. Zero-rise floodway; and D. FEMA floodway.	CAO does not include call-out of or reference to specific areas prone to flooding within King County. Includes provisions for distinct areas within the floodplain as well as separate regulations for management within "channel migration zones."	• Given the limited extent of the floodplain within Edmonds, call-out of specific areas prone to flooding may be more appropriate than reference to separate zones within a floodplain in general (i.e., floodway and flood fringe).

were prone to frequent flooding (problem areas were often associated only with a single residence). The updated CAO should allow City discretion in the delineation and identification of frequently flooded areas existing in Edmonds outside of the 100-year floodplain.

5.3 Assessment of Frequently Flooded Areas Ordinance

Aside from organizational changes to the Edmonds CAO (see Section 8.0), update of provisions pertaining to frequently flooded areas will focus on establishing consistency between Edmonds CAO and ECDC Chapter 19.97. Chapter 19.97 only regulates "areas of special flood hazard." Such areas are consistent with the CAO definition of frequently flooded areas – all areas existing within the FEMA 100-year floodplain. However, neither the existing CAO nor Chapter 19.97 provide a "link" equating the two areas. The updated code will define frequently flooded areas and include language specifying equivalency with special flood hazard areas as regulated in Chapter 19.97.

Revision of Edmonds provisions pertaining to frequently flooded areas will also include specific requirements for geotechnical review and report development necessary to ensure the continued protection of frequently flooded areas. As in the revision of wetland ordinances where lists of specific requirements will be provided in the CAO text, updated critical areas provisions pertaining to frequently flooded areas will include a description of the process, field assessments, and reports required for review of areas containing or adjacent to frequently flooded areas.

Jurisdictions with substantial areas included within the FEMA 100-year floodplain and/or with complex river systems with large corridors for channel migration identify specific areas within the floodplain (e.g., flood fringe, flood way, etc.) for specific protective provisions. Update of the Edmonds CAO will not include call-out of these specific sub-areas within the 100-year floodplain. This level of detail is inappropriate for the extent of floodplain areas and types of drainage systems existing within the Edmonds jurisdiction. However, prior to adoption of the 2004 Comprehensive Critical Area Inventory, Edmonds Planning and Public Works Departments will review historical data on area flooding to determine if additional areas outside of the 100-year floodplain should be specifically identified on the inventory. This review and potential inclusion of additional areas as frequently flooded areas, and the additional discretion afforded the City by the updated code, will represent a substantial improvement to the City's CAO.

5.4 Conclusions and Risk Assessment

Although provisions for the protection of Edmonds areas located within the FEMA 100-year floodplain will remain largely unchanged through the update of the City's CAO, adoption of the 2004 Critical Areas Inventory and organization changes to code provisions pertaining to frequently flooded areas will substantially reduce the risk to continued preservation of such areas. Currently, Edmonds planning has no consistent methodology for the identification of frequently flooded areas within the jurisdiction. City planners have previously relied on applicant disclosure and geotechnical

consultation to identify frequently flooded areas. With the adoption of the 2004 inventory, the City will be able to conclusively identify those properties where protective provisions for frequently flooded areas are applicable.

Review of the 2004 inventory and the discretion offered the City of Edmonds to identify areas prone to frequent flooding outside of the 100-year floodplain will result in an increased level of protection to the Edmonds community and a decreased risk of catastrophic flood damage. Re-organization of the code to include specific provisions on frequently flooded areas will clarify the requirements within the code.

6.0 GEOLOGICALLY HAZARDOUS AREAS

The Washington State GMA identifies a broad range of potential geologically hazardous areas for protection as environmentally critical areas (See WAC 365-190-080[4]). This critical area includes areas susceptible to erosion, sliding, earthquake, or other geological events. Geologically hazardous areas pose a threat to health and safety when incompatible commercial, residential, or industrial development is sited in areas of significant hazard. Geologically hazardous areas can also function to maintain habitat integrity and facilitate important ecological processes. Mass wasting events, such as landslides and debris flows, contribute sediment, brush, and nutrients to develop healthy, complex instream habitats, estuarine marshes, and beaches important for fisheries, wildlife, and recreation. At the same time, mass wasting events may pose a substantial risk to habitat and developed communities.

The risk from geological hazards can often be significantly mitigated through engineering, design, and/or modified construction and development techniques. When mitigation alternatives cannot viably reduce risks to human health and safety to acceptable levels, building in geologically hazardous areas should be avoided. However, risk mitigation and protections for this critical area generally emphasize specialized development standards to avoid unduly limiting the amount of buildable lands.

In interpreting WAC 365-190-080[4] (CTED 2003), CTED guidance indicates that areas susceptible to one or more of the following types of hazards should be classified as a geologically hazardous area:

- Erosion hazard (including river and coastal streambank erosion areas and channel migration areas).
- Landslide hazard.
- Seismic hazard.
- Areas subject to other geological events such as coal mine hazards and volcanic hazards including: mass wasting, debris flows, rock falls, and differential settlement.

6.1 Geologically Hazardous Areas: Code Review and Comparison

Table 6-1 provides a comparison of Edmonds' current ordinance pertaining to geologically hazardous areas with the CTED example code provisions and those of other jurisdictions. In general, delineation and protection of geologically hazardous areas under current Edmonds CAO is consistent with other jurisdictions and BAS guidance provided by CTED. However, there are notable inconsistencies in the organization of the existing ordinance (see Table 6-1 and Section 8.0).

The principal difference between Edmonds' existing geologically hazardous areas ordinance and CTED example code provisions lies in the classification of specific hazard areas. CTED's example code provisions identify only three specific types of geologically hazardous areas regarding Edmonds' environment: erosion hazard areas, landslide hazard

areas, and seismic hazard areas. Existing Edmonds code includes provision for four distinct categories of geologically hazardous areas: erosion hazard areas, landslide hazard areas, seismic hazard areas, *and* steep slope hazard areas. Aside from the existence of an additional category in Edmonds code, CTED example code and Edmonds' provisions are consistent because CTED incorporates Edmonds' definition for steep slope hazard areas – slopes of 40% or greater with a minimum vertical rise of 20 feet – into the criteria for delineating landslide hazard areas. Limiting the number of specific geologic hazards to three would effectively streamline the Edmonds CAO and avoid confusion where areas may currently meet criteria for multiple classes of geologically hazardous areas.

Buffers for geologically hazardous areas are typically ancillary to the principal mitigation of risk provided by geologically hazardous areas. The majority of protections for geologically hazardous areas stem from specific recommendations developed as part of a geotechnical report and assessment required for development sited in the vicinity of hazard areas. Typically, detailed requirements for geotechnical reports associated with different classes of geologically hazardous areas are provided in a jurisdiction's CAO (Table 6-1). However, report requirements are not specifically addressed in Edmonds' current CAO. Instead, existing Edmonds CAO references and defers to chapters of the City's building code (ECDC Chapter 18.30, 18.45,19.05) for specific protective provisions. To be consistent with CTED guidance, the Edmonds geologically hazardous areas ordinance should be re-organized and include details on geotechnical report requirements at a minimum consistent with the requirements of the City's building code

The City of Edmonds Planning Department has reported regulatory confusion resulting from the criteria delineating steep slope hazard areas in the current CAO. Under ECDC 20.15B.060 A3c, steep slope hazard areas are defined as:

> *[…] any ground that rises at an inclination of 40 percent or more within a vertical elevation change of at least 20 feet (a vertical rise of 10 feet or more for every 25 feet of horizontal distance). A slope is delineated by establishing its toe and top and measured by averaging the inclination over at least 20 feet of vertical rise.*

Table 6-1. Geologically hazardous areas code comparison.

City of Edmonds	CTED Example CAO	Kirkland SAO	Burien CAO	Draft King County CAO	Notes: Best Available Science and other precedents.
20.15B.060 A 3 a **Erosion Hazard Areas** Currently defined as: Slopes of 15% or greater with specific soil types.	"…at least those areas identified by the USDA's Natural Resources Conservation Service as having 'moderate to severe,''severe,' or 'very severe' rill and interrill erosion hazard. Erosion hazard areas are also those areas impacted by shoreland and/or stream bank erosion and those areas within a river's channel migration zone."	Defines as follows: Erosion Hazard Areas – Those areas containing soils which, according to the USDA Soil Conservation Service King County Soil Survey dated 1973, may experience severe to very severe erosion hazard. This group of soils includes, but is not limited to, the following when they occur on slopes of 15 percent or greater: Alderwood gravelly sand loam (AgD), Kitsap silt loam (KpD), Ragnar Indianola Association (RdE) and portions of the Everett gravelly sand loams (EvD) and Indianola Loamy fine sands (InD).	Geologically Hazardous Areas are not clearly defined in Burien SAO. No definition for Erosion Hazard Area could be found.	Erosion hazard areas. Erosion hazard areas: those areas in King County underlain by soils which are subject to severe erosion when disturbed. Such soils include, but are not limited to, those classified as having a severe to very severe erosion hazard according to the USDA Soil Conservation Service, the 1990 Snoqualmie Pass Area Soil Survey, the 1973 King County Soils Survey or any subsequent revisions or addition by or to these sources. These soils include, but are not limited to, any occurrence of River Wash ("Rh") or Coastal Beaches ("Cb") and the following when they occur on slopes 15% or steeper: (Lists soil types.)	• Current reference to soil type parameters for this critical area may be unnecessary as the soil types are prevalent and common throughout Snohomish County.
20.15B.110 **Geologically Hazardous Area Buffers** Currently 50 ft reducible to 10 ft.	Minimum buffer width is 50 feet or the height of a slope, whichever is greater. The buffer may be reduced to 10 ft through geotechnical recommendation.	Does not include specific provisions for geologically hazardous areas protection (e.g., buffers). Instead, protection of areas is subject to the discretion of the planning department and consulting engineers.	Standard buffer for Geologically Hazardous Areas (Burien includes Seismic, Erosion and Landslide Hazard Areas) is 50 ft which may be reduced to zero if allowed by planning department.	King County does not define and regulate Geologically Hazardous Areas per se. Instead, typical subclassifications of Geologically Hazardous Areas (e.g., Landslide, Steep Slope, Seismic hazard Areas) are defined and regulated as separate distinct critical area.	• In accordance with Example Code Provisions incorporating all BAS, Edmonds development standards for Geo Hazard areas may allow for more varied design alternatives as determined by City staff. • *Buffer distances of fifty (50) feet, height of slope, or potentially ten (10) feet are commonly used by jurisdictions to protect against erosion and landslide hazards. However, such distances may not be appropriate in all jurisdictions, and they should be scientifically evaluated in relation to local hazards before being adopted.* (CTED Example Code Provisions A-89)
Steep Slope Hazard Area Currently: Any ground that rises at an inclination of 40 percent or more within a vertical elevation change of at least 20 feet.	Steep Slope Hazard Areas are not included as a Geologically Hazardous Area. In the Example Code Provisions, similar parameters – 40% slope over 10 feet of vertical rise – are used to define a Landslide Hazard Area.	Does not include steep slope hazard areas as a geologically hazardous area subtype.	Steep Slope Hazard Areas are not included as a Geologically Hazardous Area by the City of Burien although protections for steep slopes are include within the SAO.	Steep Slope Hazard Area included as a distinct critical area though not addressed in BAS documentation directly. No specific development standards are included for Steep Slope Hazard Areas although a distinction is made between	• Consistent with Example Code Provisions developed with BAS, Edmonds may eliminate the Steep Slope Hazard Area as a specific classification of Geologically Hazardous Area.

Table 6-1. Geologically hazardous areas code comparison.

City of Edmonds	CTED Example CAO	Kirkland SAO	Burien CAO	Draft King County CAO	Notes: Best Available Science and other precedents.
				landslide hazard areas greater and less than a 40% slope.	
Development within a Steep Slope Hazard Area Currently: Development is not allowed unless a reasonable use exception or variance is granted.	CTED Example Code Provisions such areas are protected and defined as Landslide Hazard Areas. Example Code allows development in such areas with submittal of a suitable hazard analysis indicating development would not increase or would mitigate the hazard.	Does not include as a geologically hazardous area. Allows development in vicinity of steep slopes at the discretion of the planning department and consulting engineers.	Not applicable: Burien does not define or regulate Steep Slope Hazard Areas.	No specific development standards are included for Steep Slope Hazard Areas although a distinction is made between landslide Hazard Areas greater and less than a 40% slope.	• Zipper Zeman Associates (2000) recommend modification of development standards for Steep Slope Hazard Areas to allow for development on slopes > 40% that are not also defined as a Landslide Hazard Area. (See specific language in ZZA memo dated 8/17/2000). Zipper Zeman Associates also provide further description of recommended parameters for exemption from Steep Slope development standards. • Zipper Zeman's recommendation may not be necessary give that development may be allowed on Steep Slope Hazard Areas in accordance with a RUE or variance. • This specific critical area definition may be incorporated in to the Landslide Hazard Area subcategory of Geologically Hazardous Area as suggested by the CTED Example Code Provisions. • Edmonds code should include mandates for a specific geotechnical hazards analysis prior to issuance of a RUE or variance for development in areas currently defined as Steep Slope Hazard Areas.
Landslide Hazard Areas Code refers to 1979 and 1985 geotechnical reports and 5 parameters in 20.15B.060 3 b.	Defined as: 1. Areas of historic failures. 2. Areas with all of the 3 characteristics: • slope steeper than 15% • hills intersecting geologic contacts with permeable sediment overlying impermeable substrate • springs or ground water seepage	Defined as: Landslide Hazard Areas – Both of the following: a. High Landslide Hazard Areas – Areas sloping 40 percent or greater, areas subject to previous landslide activities and areas sloping between 15 percent and 40 percent with zones of emergent groundwater or underlain by or embedded with impermeable silts or clays. b. Moderate Landslide Hazard Areas – Areas sloping between 15 percent and 40 percent and underlain by relatively permeable soils consisting largely of sand and gravel or highly competent glacial till. (Definition includes steep slope areas > 40%.)	Landslide Hazard Areas are regulated as a Geologically Hazardous Area by the City of Burien although a definition could not be located in the code.	Landslide Hazard Areas are specifically regulated in the new draft King County CAO. The classification for Landslide Hazard Areas seems to encompass the classification and protection for Steep Slope Hazard Areas – the distinction between the 2 Geologically Hazardous Areas is unclear in the new draft King County CAO.	• As defined in both current code and CTED Example Code Provisions most undeveloped marine embankments (coastal areas) should be delineated as Landslide Hazard Areas.

The Planning Department notes that problems in delineating the toe and top of a slope arise when slopes exist along oblique ridgelines. Additional parameters for delineating steep slopes and/or definitions effectively used by other jurisdictions (Table 6-1) should be considered in updating the CAO.

6.2 Review of Scientific Literature

The 2004 Critical Areas Inventory for Edmonds identifies geologically hazardous areas based on Washington Department of Natural Resources (DNR) Hazard Mitigation Grant Program and Divisions of Geology and Earth Resources data, as well as from historic landslide information provided by the City. Regardless of classification, the City throughout its development has successfully managed risk from multiple areas prone to landslides, erosion, and other mass wasting events.

Edmonds is located in the Puget-Willamette Lowland physiographic province. The Puget Sound region and Edmonds area have been shaped by several advances of continental ice sheets from the north followed by post-glacial meltwater, interglacial stream action, and periods of marine submergence. The Edmonds area consists of a series of semiconsolidated and unconsolidated sediments bordered on the west by Puget Sound.

In the vicinity of Edmonds, Vashon age till (approximately 13,000 years old and approaching thicknesses of up to 30 ft), forms a relatively strong and resistant cap that covers much of the uplands and highlands and protects softer, less cohesive underlying layers from erosion. Although till is in many places impermeable to groundwater, fractures and gullying in the till surface can allow percolation into the lower sedimentary layers. The till in the Edmonds area commonly overlies advance outwash deposits locally known as the Esperance Sand (DNR 2004).

Esperance Sand, deposited by streams issuing from melting glacial ice as the Puget glacial lobe advanced into the Puget Sound area, is highly permeable and poorly consolidated due to the general lack of silt and clay. The advance outwash deposits are underlain by transitional beds and undifferentiated Pleistocene deposits. These units range from sand and gravel to silt and clay and are transitional between the overlying advance glacial outwash deposits and the underlying older non-glacial related deposits. The older non-glacial deposits in Edmonds consist of the Whidbey Formation. This formation consists of compact medium to coarse-grained sand with interbeds of gravel and peat layers. The unit also contains sequences of silt and clay.

Small areas of Edmonds are underlain by post-glacial sediments deposited as the Puget lobe retreated (recessional outwash) and alluvial sediment deposited in low-lying areas by streams. Low-lying areas along the shoreline and adjacent to wetland and marsh areas have also been filled.

Types of landslide hazards typical of the high, steep slopes underlain by glacial deposits in the Puget Sound region include high bluff peel-off (earth fall or topple), shallow colluvial sliding (debris slide and debris flow), groundwater blow-out (debris flow, earth

flow), and deep-seated landslides (rotational slide, deep translational slide, large earth flow).

High bluff peel-off occurs on very steep slopes underlain by very compact deposits such as glacial till or high cohesion sand and gravel deposits. Slabs up to a few feet thick will pull off and topple due to weathering and surface and/or groundwater flow.

Shallow colluvial sliding takes place within loose colluvial soils and top soils, especially on slopes steeper than 70%. These slides commonly occur on steep slopes during periods of wet weather when pore pressure in the soil rises.

Groundwater blow-out occurs within layers of permeable soils overlying less permeable soils. In typical Esperance Sand deposits (advance glacial outwash), the upper part may be dry, even in winter, whereas groundwater flows rapidly through its basal zone, where the water is perched on underlying clays and silts, if present. The seepage of perched groundwater toward the free face of a steep slope can cause pore-water pressures sufficient to cause the sand unit to fail and flow as a debris flow or earth flow.

Deep-seated landslides can involve large areas of the slope. A deep-seated landslide occurred in the Meadowdale area of north Edmonds in the past. Deep-seated slides are controlled by the underlying geologic units, local stresses on the geologic units, and the local water table.

6.3 Assessment of Geologically Hazardous Areas Ordinance

In general, the City of Edmonds currently regulates geologically hazardous areas in accordance with BAS, CTED and DOE guidance, and consistent with updated provisions adopted by similar and/or neighboring Western Washington jurisdictions. However, the Edmonds CAO pertaining to geologically hazardous areas is not in compliance with GMA mandates because specific provisions for protection are not included within the City's CAO. Instead, provisions stipulating the protection of areas potentially meeting criteria for geologically hazardous areas are contained within ECDC Chapter 18. However, nomenclature within Chapter 18 often does not specifically identify or reference geologically hazardous areas as defined in the City's CAO.

In large part, update of critical areas provisions pertaining to geologically hazardous areas will involve incorporating protections and development standards contained within Chapter 18 into the Edmonds CAO and ensuring consistency between chapters. The updated CAO will include only three subclasses of geologically hazardous areas: Erosion Hazard Areas, Seismic Hazard Areas, and Landslide Hazard Areas. (Note: Steep Slope Hazard Areas will no longer be included as a subclass of geologically hazardous areas within the updated CAO.) However, provisions for protection of areas meeting current criteria for Steep Slope Hazard Areas within the City's existing CAO will remain largely unchanged and be incorporated into provisions protecting Landslide Hazard Areas. The exclusion of Steep Slope Hazard Areas as a subclass is consistent with CTED guidance – Steep Slope Hazard Areas are not identified as geologically hazardous areas in CTED's

Example Code Provisions for Designating and Protecting Critical Areas – and will streamline the updated code.

The existing Edmonds CAO does not include a description of the process of review and compliance pertaining to geologically hazardous areas. The updated Edmonds CAO will include a distinct chapter on geologically hazardous areas (see Section 8.0) with specific requirements for geotechnical report development.

Although Steep Slope Hazard Areas will no longer be included as a geologically hazardous area subclassification under the City's updated CAO, areas meeting criteria for Steep Slope Hazard Areas under the existing code will be protected as Landslide Hazard Areas. Slopes between 15% and 40% will be protected as Erosion Hazard Areas and slopes greater than 40% will be defined as Landslide Hazard Areas. Delineation of the top and toe of such slopes for geotechnical analysis will remain necessary. As mentioned above, Edmonds planning has identified the code text defining the toe and top of slopes as problematic for slopes with oblique ridgelines and for slopes where the toe or top is located off a subject parcel. To eliminate confusion in the delineation of slopes as Landslide Hazard Areas, the updated code will include the modification of text defining the toe and top of slopes as follows:

> The current text – *"A slope is delineated by establishing its toe and top and measured by averaging the inclination over at least 20 feet of vertical rise."*
>
> Will be replaced with - *"A slope is delineated by establishing its toe and top and measured by averaging the inclination over the full rise and run of the slope from toe to top, which must include at least 20 feet of vertical rise. If the toe and/or top of a slope is located off of a subject parcel, the toe and/or top of the slope will be delineated 200 feet from the property boundary or at its topographic location, whichever is closer, following the steepest possible incline."*

With this text modification, the toe and/or top of a slope located off a subject parcel will be arbitrarily delineated 200 feet from the property boundary following the steepest possible incline. This modification to the current text defining the toe and/or top of a slope will eliminate confusion in the assessment of slope inclines. In addition, it will allow for geotechnical recommendations consistent with the incline of a slope within and immediately adjacent to a subject parcel.

6.4 Conclusions and Risk Assessment

Adoption of the 2004 Critical Areas Inventory for Edmonds and the conceptual modifications to CAO pertaining to geologically hazardous areas described above will significantly improve the process of review of geologically hazardous areas existing on a parcel and the development and enforcement of suitable associated protections. The

improvement and facilitation of this process, in turn, will decrease risk to the Edmonds community potentially associated with development within or adjacent to geologically hazardous areas.

The 2004 Critical Areas Inventory identifies known geologically hazardous areas in the Edmonds vicinity. This helpful tool will ensure that geotechnical review is completed commensurate to the risk of existing site conditions and potential geological hazards. By increasing the facility of identification of geologically hazardous areas for both permit applicants and the City Planning Department, the updated inventory substantially decreases the potential risk to the Edmonds community.

Perhaps the most substantial benefit resulting from the update of the CAO pertaining to geologically hazardous areas is the clarification of the process of critical areas review regarding geohazards. The City of Edmonds has noted that the existing critical areas code is not "user friendly" and requires familiarity with multiple sections of City code additional to Chapter 21.15B. Update of the Edmonds CAO will include a separate chapter on geologically hazardous areas with information necessary to complete review and meet requirements for compliance. The development of a report analyzing the geologically hazardous areas existing in the vicinity of a subject parcel is central to critical areas compliance. The updated CAO will include geotechnical report requirements based on geologically hazardous area sub-class. Clarification and facilitation of the process of critical areas review and compliance will result in uniform application of regulation pertaining to geologically hazardous areas within the jurisdiction.

7.0 FISH AND WILDLIFE HABITAT CONSERVATION AREAS

The Washington GMA requires jurisdictions within the state to address land use issues that directly and indirectly impact fish and wildlife habitat. Fish and wildlife habitat conservation requires the management of land for maintaining species in suitable habitats within their natural geographic distribution so that isolated subpopulations subject to increased risk of extinction are not created. This does not require the protection of all individuals of all wildlife species at all times. However, the GMA mandate does specifically emphasize that cooperative and coordinated land-use planning is critically important among jurisdictions within a region. The principal mechanism for preservation of wildlife species and habitat in Washington State is through the designation and protection of fish and wildlife habitat conservation areas as stipulated in WAC 365-190-080[5].

In some cases, intergovernmental cooperation and coordination among jurisdictions may be sufficient to ensure that wildlife species populations remain viable in counties and cities in a region. However, to ensure protection of wildlife species and fisheries important to the State, CTED guidance suggests that designation of fish and wildlife habitat conservation areas include (CTED 2003):

- Areas with which endangered, threatened, and sensitive species have a primary association.
- Habitats and species of local importance.
- Commercial and recreational shellfish areas.
- Kelp and eelgrass beds.
- Mudflats and marshes.
- Herring, surf smelt, and sand lance spawning areas.
- Naturally occurring ponds under 20 acres and their submerged aquatic beds that provide fish or wildlife habitat.
- Waters of the state.
- Lakes, ponds, streams, and rivers planted with game fish by a governmental or tribal entity.
- State natural area preserves and natural resource conservation areas.
- Areas critical for habitat connectivity.

In addition, CTED suggests adherence to the following principles in classification and designation of this critical area:

- Creating a system of fish and wildlife habitat with connections between larger habitat blocks and open spaces.
- Providing for some level of human activity in such areas including presence of roads and level of recreation type (passive or active recreation may be appropriate for certain areas and habitats).
- Protecting riparian ecosystems.
- Evaluating land uses surrounding ponds and fish and wildlife habitat areas that may negatively impact these areas.

- Establishing buffer zones around these areas to separate incompatible uses from the habitat areas.
- Restoring lost salmonid habitat.

7.1 Fish and Wildlife Habitat Conservation Areas: Code Review and Comparison

While city and county planning departments have been aware of the need for protection of some important community environmental resources – notably wetland and streams – since the late 1970s and early 1980s, jurisdictions have struggled with the appropriate identification and protection of habitat areas used by fish and wildlife. Prior to recent CAO updates, most jurisdictions have identified fish and wildlife habitat conservation areas without providing specific protective provisions within CAO. Furthermore, most jurisdictions have not identified fish and wildlife habitat conservation areas on existing critical areas inventories. In practicality, enforced protection of fish and wildlife habitat conservation areas has been largely overlooked to date in most Western Washington jurisdictions.

Existing Edmonds code defines three fish and wildlife habitat conservation area subtypes under ECDC 20.15B.060 A1 as follows:

> "a. **Critical Habitats.**
>
> i. Known or documented habitat for any species listed by the state or federal process as rare, endangered, threatened, or sensitive. Approximate locations of such habitats will be available for city staff review on maps located at City Hall and provided by the Washington State Department of Wildlife. Mapped locations of habitat for known listed species shall not be made available for public disclosure.
>
> ii. Streams, rivers, and wetlands used by salmonids. Refer to ECDC 20.15B.120 and 20.15B.130 for further detail.
>
> b. **Significant Habitats.**
>
> i. Inventoried and mapped habitat for species identified as having local significance within the city of Edmonds. Areas may include, for example, specific areas known to be utilized by large numbers of migratory waterfowl; or
>
> ii. Habitats of significance within the city of Edmonds as inventoried and mapped during the city's critical area mapping process.
>
> c. **Habitats and Species of Local Importance**.
>
> To be determined and defined in locally adopted administrative procedures."

Although current code provides additional explanation in regard to these subtypes, identification of fish and wildlife habitat conservation areas has previously been left to the discretion of the planning department and/or a permit applicant. In practicality, fish and wildlife habitat conservation areas have not been consistently regulated by the City. Other jurisdictions define fish and

wildlife habitat conservation areas by the presence of particular species as defined in the critical areas code (Table 7-1).

Typically, jurisdictions do not rely on buffers to provide protection for fish and wildlife habitat conservation areas. Instead, the focus of protection has often been on the restriction of development in areas known to support important fish and wildlife populations. When impacts from development to such areas cannot be avoided, jurisdictions often require the development of mitigation plans utilizing native plant species for landscaping to retain and support wildlife populations as practical.

Jurisdictions differ in the designation and identification of streams as critical areas. Previously, most jurisdictions identified and classified streams as a separate critical area type, with limited exceptions (e.g., City of Seattle). However, CTED and DOE guidance suggests that streams should be included as a sub-class of fish and wildlife habitat conservation areas. This directive from CTED is intended to emphasize the importance of streams to both fish and terrestrial wildlife species (pers. comm., Doug Peters, Senior Planner, CTED).

Jurisdictions updating their CAO in accordance with BAS mandates have utilized various methodologies to designate and protect streams as fish and wildlife habitat conservation areas. Many jurisdictions have developed nomenclature (e.g., riparian corridors, City of Seattle; aquatic areas, King County; riparian areas, King County) that reiterate the importance of critical areas to fish and wildlife conservation. Other jurisdictions have retained streams as separate critical area types, contrary to CTED and DOE guidance.

Edmonds' existing code includes streams as a separate critical area and uses a three-tiered system of classification (Table 7-1). Both inclusion of streams as a separate critical area type and the three-tiered system of classification run contrary to CTED and DOE guidance. Most jurisdictions with updated critical areas code have adopted either DNR's five-tiered interim system of stream classification or a modified version of DNR's permanent water typing system. DNR's permanent system of water typing is to be adopted by jurisdictions statewide upon completion of fish habitat water type maps showing the location of classification of streams, rivers, lakes, and other waterways throughout the state (WAC 222-16-030). DNR's permanent water typing system, as described in WAC 222-16-030, classifies streams as follows[1]:

- **"Type S Water"** means all waters, within their bankfull width, as inventoried as "shorelines of the state" under Chapter 90.58 RCW and the rules promulgated pursuant to Chapter 90.58 RCW, including periodically inundated areas of their associated wetlands.
  "Type F Water" means segments of natural waters other than Type S Waters, which are within the bankfull widths of defined channels and periodically inundated areas of their associated wetlands, or within lakes, ponds, or impoundments having a surface area of 0.5 acre or greater at

[1] Abbreviated text. Additional information and classification criteria can be found in WAC 222-16-030.

seasonal low water and which in any case contain fish habitat or are described by one of the following four categories:

(a) Waters, which are diverted for domestic use by more than 10 residential or camping units.
(b) Waters, which are diverted for use by federal, state, tribal or private fish hatcheries.
(c) Waters, which are within a federal, state, local, or private campground having more than 10 camping units.
(d) Riverine ponds, wall-based channels, and other channel features that are used by fish for off-channel habitat.

- **"Type Np Water"** means all segments of natural waters within the bankfull width of defined channels that are perennial nonfish habitat streams.
- **"Type Ns Water"** means all segments of natural waters within the bankfull width of the defined channels that are not Type S, F, or Np Waters. These are seasonal, nonfish habitat streams in which surface flow is not present for at least some portion of a year of normal rainfall and are not located downstream from any stream reach that is a Type Np Water.

Existing Edmonds code mandates protective buffer widths for streams as follows:

Category 1 – 50 ft
Category 2 – 25 ft
Category 3 – 10 ft

These buffer widths are far smaller than those suggested by BAS (see detailed buffer discussion for wetlands Section 4.0) that have been incorporated into CTED and DOE guidance, and are generally smaller than protective stream buffer widths adopted by other jurisdictions with updated critical areas code (Table 7-1).

Many of the provisions for protection of fish and wildlife habitat conservation areas contained within Edmonds' existing code may be retained through the update process, but clearer definitions of the critical areas are needed. Increased protection of fish and wildlife habitat within the Edmonds jurisdiction will result primarily from the formal delineation of this critical area type on the 2004 Critical Areas Inventory. CTED and DOE guidance, developed in consultation with WDFW, advocate protection of the following specific habitat areas and species through fish and wildlife habitat conservation area provisions (Table 7-1):

- Areas with which State or Federally designated Endangered, Threatened, and Sensitive Species have a primary association.
- State Priority Habitats and Areas Associated with State Priority Species.

Table 7-1. Fish and wildlife habitat conservation areas code comparison.

City of Edmonds	CTED Example CAO	Kirkland SAO	Burien CAO	Draft King County CAO	**Notes:** Best Available Science and other precedents.
Fish and Wildlife Habitat Conservation Area Subtypes Currently 3 subtypes: 1. Critical Habitat 2. Significant Habitat 3. Habitat/Species of Local Importance	Includes the three critical are identified in current Edmonds CAO in addition to others. CTED Example Code Provisions specifically identify 10 types of Fish and Wildlife Habitat Conservation Areas. 1. Areas with which State or Federally designated Endangered, Threatened, and Sensitive Species have a primary association. 2. State Priority Habitats and Areas Associated with State Priority Species. 3. Habitats and Species of Local Importance. 4. Commercial and Recreational Shellfish Areas. 5. Kelps and Eelgrass Beds and Herring and Smelt Spawning Areas. 6. Naturally Occurring Ponds Under 20 Acres. 7. Waters of the State. 8. Lakes, Ponds, Streams, and Rivers Planted with Game Fish by a Government or Tribal Entity. 9. State Natural Area Preserves and Natural Resource Conservation Areas. 10. Areas of Rare Plant Species and High Quality Ecosystems. 11. Land Useful or Essential for Preserving Connections Between habitat Blocks and Open Spaces.	Includes only significant habitat areas, defined as: "An area that provides food, protective cover, nesting, breeding, or movement for threatened, endangered, sensitive, monitor, or priority species of plants, fish, or wildlife. The terms threatened, endangered, sensitive, monitor, and priority pertain to lists, categories, and definitions of species promulgated by the Washington Department of Wildlife (Non-Game Data Systems Special Animal Species), as identified in WAC 232-12-011 or 232-12-014, or in the Priority Habitat and Species (PHS) program of the Washington State Department of Wildlife, or in rules and regulations adopted from time to time by the U.S. Fish and Wildlife Service."	Includes: A. Areas with which endangered, threatened, and sensitive *species* listed by the federal government or the State of Washington have a primary association; B. All public and private tidelands or bedlands suitable for commercial or recreational shellfish harvest; C. Kelp and eel-grass beds identified by the Washington Department of Natural Resources; D. Herring and smelt spawning areas as outlined in Chapter 220-110 WAC and the Puget Sound Environmental Atlas as presently constituted or as may be subsequently amended; E. Naturally occurring ponds under 20 acres and their submerged aquatic beds that provide fish or *wildlife habitat*; F. Bald eagle habitat protected pursuant to the Washington State Bald Eagle Protection Rules (WAC 232-12-292); or G. Heron rookeries or active nesting trees.	Specifically defines Wildlife Conservation Areas as: A. Bald Eagle Nests B. Great Blue Heron Rookeries C. Marbled Murrelet Nest D. Goshawk Nest E. Osprey Nest F. Peregrine Falcon Nest G. Spotted Owl Nest H. Townsend's Big-Eared Bat Nursery or Hibernacula I. Vaux's Swift Nest Specific guidance on protection and buffer widths around each of these areas is provide in the CAO. (Note: King county also regulates Wildlife Habitat Networks as distinct critical area. Such areas are more generally defined to include wildlife corridors and open space areas providing significant wildlife habitat in the County.)	• As per protections for streams included in updated CAO to be adopted by reference in SMPs, specific protections for the marine habitats and shoreline areas identified as Fish and Wildlife Habitat Conservation in CTED's Example Code Provisions should be developed. • Typically, jurisdictions either vaguely or very specifically define Wildlife Habitat Conservation Areas. For Edmonds, it may be appropriate to do both: generally define areas in accordance with CTED's example provisions; and, specifically cite important habitat features (e.g., Bald Eagle Nests, Kelp and Eelgrass beds, Pigeon Guillemot breeding colonies) with detailed specific associated protections. • Note: King County and other jurisdiction with detailed CAO provide specific guidance on buffer widths and compensatory mitigation ratios – King County's is very specific – for Wildlife Habitat Conservation areas.
Streams as Fish and Wildlife Habitat Conservation Areas	Regulates Streams as Fish and Wildlife Habitat Conservation	Streams retained as distinctly regulated critical area.	Streams regulated as distinct critical area category.	Under the new draft KC CAO, streams are regulated as a type	• CTED has included streams within the critical area of Fish and Wildlife Habitat Conservation Areas to emphasize that

Table 7-1. Fish and wildlife habitat conservation areas code comparison.

<table>
<tr><th>City of Edmonds</th><th>CTED Example CAO</th><th>Kirkland SAO</th><th>Burien CAO</th><th>Draft King County CAO</th><th>Notes: Best Available Science and other precedents.</th></tr>
<tr><td>Currently, streams are regulated as a distinct critical area.</td><td>Areas – as either a Water of the State or as “Lakes, Ponds, streams, and Rivers Planted with Game Fish by a Government or Tribal Entity.”</td><td></td><td></td><td>of Aquatic Area. An Aquatic Area is a distinct type of critical area.</td><td>wildlife habitat is to be protected and not simply a watercourse.</td></tr>
<tr><td>Stream Classification

Currently a 3-tiered system of stream classification.
Category 1
Category 2
Category 3

Stream Categories
Currently 1,2,3.

Currently no length parameter included in stream definition.</td><td>Stream categories defined in WAC 222-16-031 include 5 (1,2,3,4,5) types of Waters of the State.</td><td>3-tiered system of stream classification:

Class A Streams – Streams that are used by salmonids. Class A streams generally correlate with Type 3 streams as defined in the Washington State Hydraulic Code.

Class B Streams – Perennial streams (during years of normal precipitation) that are not used by salmonids. Class B streams generally correlate with Type 4 streams as defined in the Washington State Hydraulic Code.

Class C Streams – Seasonal or ephemeral streams (during years of normal precipitation) not used by salmonids. Class C streams generally correlate with Type 5 streams as defined in the Washington State Hydraulic Code.

(Provisions for protection differ depending upon if stream is within a Primary or Secondary basin.)</td><td>4-tiered classification system:

i. Type 1: Streams inventoried as “Shorelines of the State” under Chapter 90.58 (RCW).
ii. Type 2: Streams that are natural streams that have perennial (year round) or intermittent flow and have documented use by salmonids.
iii. Type 3: Streams that are natural streams that have perennial flow and are not used by salmonids.
iv. Type 4: Streams that are natural streams with perennial or intermittent flows that are not used by fish. [Ord. 394 § 1, 2003]</td><td>King County uses a 4-tiered water typing system consistent with DNR’s water typing unmodified. Water types include:

Type S
Type F
Type N
Type O

Note: water types include but are not limited to streams.</td><td>• BAS precedents suggest Edmonds should adopt the 4-tiered stream classification or water typing system. However, stream protections will have to be highly modified to suit the incorporation of native stream channels into the landscaping of contiguous tracts of urban/residential lots as exist in Edmonds.</td></tr>
<tr><td>Stream Buffers

Class 1-50 ft

Class 2-25 ft

Class 3-10 ft</td><td>Type 1 and 2, shorelines of the State, or shorelines of Statewide significance – 250 ft

Type 3; and perennial and/or fish-bearing streams 5-20 ft wide – 200 ft

Type 3 <5 ft wide – 150 ft</td><td><table><tr><th>Stream Class</th><th>Primary Basins</th><th>Secondary Basins</th></tr><tr><td>A</td><td>75 feet</td><td>N/A</td></tr><tr><td>B</td><td>60 feet</td><td>50 feet</td></tr><tr><td>C</td><td>35 feet</td><td>25 feet</td></tr></table></td><td>Type 1 - 125
Type 2 - 100
Type 3 - 50
Type 4 - 25</td><td>Within the King County Urban Growth Area

Type S and F – 115 ft
Type S and F (special urban type water*) – 165 ft
Type N – 65 ft
Type O – 25 ft</td><td>• The delineation of streams as critical area is currently in a state of flux. Although streams have, in the past, been consistently regulated as critical area, the “Everett ruling” suggests stream protection is to be afforded through a jurisdiction’s SMP. However, CAO updates for all jurisdictions include streams as critical area and typically adopt DOE’s (DNR’s) classification for waters of the state.</td></tr>
</table>

Table 7-1. Fish and wildlife habitat conservation areas code comparison.

City of Edmonds	CTED Example CAO	Kirkland SAO	Burien CAO	Draft King County CAO	**Notes:** Best Available Science and other precedents.
	Type 4 and 5 or intermittent with low mass wasting potential – 150 ft Type 4 and 5 or intermittent streams with high mass wasting potential – 225 ft			(Outside Urban Growth Area Type S and F – 165 ft Type N – 65 ft Type O – 25 ft) *CAO specifically calls out many streams within the Urban growth Boundary identified as such.	

- Habitats and Species of Local Importance.
- Commercial and Recreational Shellfish Areas.
- Kelps and Eelgrass Beds and Herring and Smelt Spawning Areas.
- Naturally Occurring Ponds Under 20 Acres.
- Waters of the State.
- Lakes, Ponds, Streams, and Rivers Planted with Game Fish by a Government or Tribal Entity.
- State Natural Area Preserves and Natural Resource Conservation Areas.
- Areas of Rare Plant Species and High Quality Ecosystems.
- Land Useful or Essential for Preserving Connections Between habitat Blocks and Open Spaces.

In development of the 2004 Critical Areas Inventory, these specific areas and resources were included by focusing the identification and designation of fish and wildlife habitat conservation areas on four important general categories and habitats:

- Streams
- WDFW-identified priority habitat and species
- Shoreline habitat
- Urban open space

WDFW data identified priority habitats and species existing in Edmonds including:

- Bald eagles and bald eagle breeding territories
- Heron rookeries
- Sand lance and surf smelt spawning grounds
- Marine mammal haul-out sites

These species and their associated habitats represent important natural resources that help define the character of the City of Edmonds. Most of these WDFW-identified Priority Habitats and Species are associated with City shoreline areas. In addition, the shoreline reaches of Puget Sound along Edmonds are known to be valuable areas for recreational shellfishing and scuba diving. The emphasis on urban open space allowed for designation for remaining areas of contiguous upland forested areas and smaller patches of remaining undeveloped habitat that have been shown to be vitally important to the maintenance of natural wildlife populations in built-out regions of the Pacific Northwest (see below).

7.2 Review of Scientific Literature

Researchers and biologists tend to agree on the importance of protecting small areas of actively used wildlife habitat and habitat features, such as nesting trees and hibernacula sites (Rodrick and Milner 1991, Van Horne and Wiens 1991). It is also widely accepted that wildlife habitat,

ecosystems, and habitat features vary in usage and distribution over time. For example, nesting sites for sensitive avian species found in the Pacific Northwest, such as bald eagles and red-tailed hawks, may blow down or degrade from year to year. Thus, these bird species, and other wildlife associated with specific natural habitat features, must constantly respond to environmental changes to find suitable habitat in which to thrive. To maintain viable populations, wildlife species must have access to alternate sources of habitat and appropriate habitat features (Thomas 1979, Marzluff and Ewing 2001). Conservation of active breeding, foraging, and refugia habitat is essential to maintaining native wildlife populations within a region. However, it is equally important to maintain alternate potential habitat areas within a region to accommodate temporal and spatial environmental changes (Gotzwiller 2002, Peterson and Parker 1998, Bissonette 1997, Forman 1995). Identification and protection of fish and wildlife habitat conservation areas are intended to maintain area wildlife populations through the preservation of suitable habitat areas regardless of active usage.

Management of wildlife in urban areas is often difficult because of the competing and simultaneous demands on the land (Milligan-Raedeke and Raedeke 1995). In such areas, a delicate balance must be achieved between the needs of a community and the needs of wildlife populations. Two general strategies are often utilized to strike a balance of needs and maintain populations within urban areas. The first is to focus wildlife preservation within large, contiguous ecological reserves that are relatively homogenous in vegetative composition and habitat structure regardless of adjoining land use (e.g., forested ecological reserves; Soule and Wilcox 1980; Frankel and Soule 1981; Wright 1998). The second approach strives to protect wildlife species across an entire region by enhancing and maintaining the quality of existing habitat where available, even in small non-contiguous habitat patches (Franklin 1993, Morrison et al. 1998). While the second approach may be more difficult to implement, it is often the only viable option for wildlife management in developed built-out regions.

In general, large patches of suitable habitat have been found to be more valuable to wildlife populations than small patches (Brown 1985b). In Western Washington, habitat patches larger than 75 acres have been found to support a broad diversity of native terrestrial wildlife species (Donnelly 2002). However, numerous studies have demonstrated the value to wildlife of preserving and maintaining small, isolated patches of diverse habitat (Potter 1990, Burel 1989). Small habitat patches (e.g., 5-20 acres) have been postulated to both provide habitat suitable to maintaining small wildlife populations, and to act as "stepping stones" for species (notably birds) to move between larger habitat areas (Fahrig and Merriam 1994).

Studies on how habitat should be maintained, and which habitat parameters should be enhanced, generally point to the importance of maintaining sufficient forested cover. A study by Marzluff and Donnelly (2002) conducted in the Puget Sound region concluded that to conserve native forest species within the context of an urban environment, policy-makers should:

1. Limit development to 52% of the landscape;
2. Maintain at least 64% of remaining forested areas in single contiguous patches, with an emphasis on preserving stands greater than 103 acres (42 hectares); and

3. Maintain a tree density of at least 4.0 per acre (9.8 per hectare) with a minimum of 23% conifers.

In another Puget Sound area study, Rohila and Marzluff (2002) found that cavity-nesting bird species – an avian group often identified for special status protection – may be adequately protected in urban areas if at least 30% is retained in develop areas and high live-tree densities and large tree diameters are retained. The authors recommend that forested areas be retained in the largest patches possible (74 acres [30 hectares] or greater) and that average patch size does not fall below 7.4 acres (3 hectares); (Rohila and Marzluff 2002).

7.3 Assessment of Fish and Wildlife Habitat Conservation Areas Ordinance

Streams will be distinguished as a sub-type of fish and wildlife habitat conservation area for which buffer protections will be based on an updated stream classification system consistent with DNR's four-tiered permanent water typing system (S, F, Np, Ns). Protective buffer widths for streams will be increased for consistency with BAS and jurisdictional precedents as follows:

Type S – 150 ft
Type F – 100 ft (anadromous) 75 ft (non-anadromous)
Type Np – 50 ft
Type Ns – 25 ft

All streams currently existing in the City of Edmonds provide general "fish" habitat but are not designated as "shorelines of the state." Thus, all Edmonds streams currently meet DNR criteria for Type F waters. However, some Edmonds streams - Willow Creek, Shellabarger Creek, Shell Creek, Hindley Creek, Perrinville Creek, and Lunds Creek – are known to support anadromous fish. In order to provide special consideration for and increased protection of anadromous fisheries, Edmonds updated CAO will further classify streams as either Anadromous Fishbearing Streams or Non-Anadromous Fishbearing Streams. Buffers for Anadromous Fishbearing Streams will be increased by 30% (100 ft for Anadromous Fishbearing Streams vs. 75 ft for Non-Anadromous Fishbearing Streams) to provide increased protection for anadromous fish and associated habitat.

Provisions will be provided in the code to allow stream buffer reductions with the development of a viable Buffer Enhancement Plan, similar to provisions to be included in the updated wetland ordinances. The updated code will include specific requirements for development of the Buffer Enhancement Plan to be completed by the applicant or representative.

Aside from the special consideration for anadromous fish, the most practical improvement to the protection of fish and wildlife habitat conservation areas under the 2004 code update stems from the development of the Critical Areas Inventory. The 2004 inventory includes the delineation of all areas to be designated as fish and wildlife habitat conservation areas within the jurisdiction of Edmonds. The inventory delineates areas based on WDFW data on TES (Threatened, Endangered and Sensitive) species presence, fish spawning areas, raptor nests, heron rookeries,

breeding species aggregations, shellfish areas, marine mammal haul-out areas, and contiguous areas of undeveloped open space suitable to supporting native wildlife species populations. Delineation of terrestrial areas on the inventory emphasizes riparian habitat and forested open space unlikely to be developed in the future. The inventory will be used as an effective tool by the City Panning Department to identify projects that may result in impacts to important fish and wildlife habitat conservation areas.

Aside from the provisions for stream buffering to be included in the updated code, provisions for the protection of fish and wildlife habitat conservation areas will principally focus on the regulation of development in and around these areas, and the mitigation of potential impacts. Although land-use conflicts are unlikely given the minimal potential for development on fish and wildlife habitat conservation areas as delineated on the 2004 inventory, provisions within the updated code will allow for development in and around some identified fish and wildlife habitat conservation areas upon completion of a suitable mitigation plan. Mitigation will be dependent upon the wildlife species and/or natural resources likely supported within a fish and wildlife habitat conservation area. In general, an increased emphasis will be placed on retention of native vegetation on undeveloped parcels. New development or expansion of existing development into fish and wildlife habitat conservation areas would require a native vegetation enhancement plan. Buffers for estuarine shoreline habitat would be consistent with Edmonds SMP and BAS.

In order to protect potential fish and wildlife habitat throughout the jurisdiction of Edmonds, the updated CAO will include specific provisions for native vegetation retention on undeveloped, sub-dividable lands. Although this provision will not specifically apply to fish and wildlife habitat conservation areas, it will allow for increased protection of fish and wildlife species and populations. Updated CAO will require that 30% of native vegetation be retained on undeveloped, subdividable lands zoned RS-12 or RS-20. The focus of this provision will be on retention of large trees suitable for perching and use by bald eagles, a protected wildlife species known to occur in the Edmonds vicinity. In addition to providing general wildlife habitat, retention of vegetation can reduce surface water runoff and sedimentation, and can contribute to slope stability.

7.4 Conclusions and Risk Assessment

Overall, update of the Edmonds CAO pertaining to fish and wildlife habitat conservation areas will substantially decrease risk to the continued preservation of habitat important to area fish and wildlife populations. As mentioned above, the process of critical areas review and compliance for fish and wildlife habitat conservation areas had not previously been systematic or coordinated in Edmonds due to a lack of formal designation for such areas. Adoption of the 2004 Critical Areas Inventory will provide City planning with an effective tool for identifying areas important to fish and wildlife where critical areas provisions apply. In addition, the updated code will include a provision requiring the development of a mitigation plan to preserve the function and value of fish and wildlife habitat if development will potentially result in impacts to fish and wildlife habitat conservation areas. These updated provisions along with the requirement for 30% native vegetation retention on select undeveloped land, will represent a significant

improvement in the sustainable management of fish and wildlife habitat in the Edmonds area and reduce the risk to the very natural resources that define the unique character of the City.
The buffers proposed for streams in Edmonds do not meet the recommendations listed by CTED, DOE, or WDFW. These agencies recommend buffer widths of 200-250 ft wide on either side of a stream. While these larger buffers could provide benefits if a streamside was not developed, the majority of streams in Edmonds flow through previously developed residential neighborhoods and have limited streamside vegetation. There are exceptions where streams flow through public land or within steep ravines that were never developed. Given the built-out nature of Edmonds and the minimal potential buffers that can be developed in this urban area, smaller buffers were chosen as practical alternatives that provide increased protection over the existing CAO. In addition, the new CAO requirement for stream buffer enhancements for construction projects that increase a structure's footprint into a buffer will provide some benefit to streams over the long term.

Updated Stream Buffer Widths

Stream buffer widths mandated under the updated CAO (Type S – 150 ft; Type F – 100 ft [anadromous] 75 ft [non-anadromous]; Type Np – 50 ft; Type Ns – 25 ft) constitute a tripling of buffer widths from those proscribed under the existing CAO (Category 1 – 50 ft; Category 2 – 25 ft; Category 3 – 10 ft). However, updated stream buffer widths are less those recommended by DOE. As is the case with wetland buffer widths (see above), this apparent discrepancy between updated Edmonds stream buffer widths and DOE guidance largely stems from the context and environmental settings used to assess stream buffer width efficacy. Though smaller stream buffer sizes have been proven to provide adequate protection of functions important in urban setting (flood storage, water quality protection, sediment removal etc.) wildlife species requiring large home ranges benefit from increased stream buffer sizes. As mentioned above, such species are unlikely to occur within the jurisdiction of Edmonds. The mandated smaller stream buffer widths will effectively provide protection of Edmonds streams and aquatic habitat while balancing other important policy objectives – e.g., allow for focused growth and density increase in UGAs and built-out areas, provide for a variety of uses along shoreline areas, etc. – with the updated CAO.

Because approximately 96% of the City's land area is already developed, incremental effects to stream buffers will occur from redevelopment. The City has addressed this issue by an overall doubling of buffer widths on fish-bearing streams with similar increases for high gradient and seasonal water courses. In addition, the new CAO includes requirements for enhancement of stream buffers when a proposal increases the footprint of an existing structure into a stream buffer. Buffer width flexibility, only with the backing of a scientific-based enhancement plan, will provide incremental buffer improvements for areas is residential neighborhoods where current buffer function is minimal.

8.0 CAO ORGANIZATION AND CRITICAL AREAS REVIEW PROCESS

The 2004 Edmonds CAO update will include broad-scale re-organization of the City's critical areas code from its current structure. The proposed re-organization has been requested and approved by the Edmonds Planning Department and will, perhaps, be the most prominent overall change to the existing code.

Edmonds planning has noted that the City's current critical areas code is not "user friendly" and requires permit applicants to have a working knowledge of a complex and arguably byzantine code structure and/or coordinate closely with City personnel. As opposed to separate chapters or sections on the five GMA-mandated critical areas types, the current code interweaves definitions and directions on the process of critical areas review and compliance in an amalgam of code text. As mentioned above, many provisions for critical areas protection are contained within other ECDC chapters, and references to code sections often do not use nomenclature consistent with ECDC Chapter 21.15B (Critical Areas).

It is anticipated that both the 2004 Critical Areas Inventory and the updated critical areas code will be available for public access on a City-hosted interactive website. This noted increase in user accessibility should clarify and streamline the process of critical areas review and compliance and decrease the burden on City planning. Integral to the code re-organization and increase in "usability" is the inclusion of separate chapters germane to each of the five GMA-mandated critical areas types. Each distinct critical areas chapter will include both updated provisions for critical areas protection as well as applicant instructions on the process of critical areas review and compliance, including a description of specific requirements and report outlines and/or templates as appropriate. Not only will this notable re-organization increase the usability of the code and decrease confusion and complications in regard to the process, but it will also bring the code into compliance with GMA mandates and CTED and DOE guidance. In addition, the substantial potential effects of the re-organization should not be discounted within the context of a comprehensive risk assessment. By increasing the code usability and potential access to information on critical areas compliance to the Edmonds community, both the risk to the continued preservation of critical areas and the risk posed to the Edmonds community by the destruction or degradation of these important environmental resource areas may be substantially decreased.

Adoption of the updated and re-organized CAO will result in a substantial change in the City of Edmonds' process of critical areas review and approval. This change will provide consistency with CTED guidance on the process of critical areas review and help to streamline the process for the Edmonds planning division. Currently, the Development Services Department relies upon the issuance of Reasonable Use Exceptions when development proposals are anticipated to impact critical areas, regardless of mitigation. This is a public process requiring review by the City hearing examiner. Consistent with the critical areas review process for most Washington State jurisdictions, CTED guidance advocates a critical areas determination process. Under this process, the Development Services Director has authority to approve, condition or deny critical areas determinations (often included as part of an initial SEPA determination) without hearing

examiner review. The process becomes public and requires hearing examiner review *only* if an applicant pursues a variance, a public agency and utility exception, or a reasonable use exception. This avenue for critical areas ordinance compliance, however, should only be considered if an applicant cannot maintain the function and values of critical areas through mitigation, enhancement or restoration pursuant to the requirements of mitigation sequencing as part of the critical area determination process.

8.1 Organizational Code Review and Comparison

CTED and DOE guidance on critical areas code organization provided in *Example Code Provisions for Designating and Protecting Critical Areas* includes separate code chapters divided by critical areas type. Most jurisdictions updating critical areas ordinances in accordance with GMA mandates follow this basic organizational protocol. However, some jurisdictions (e.g., Kirkland, Burien, etc.) have deviated from this general organizational structure, with varying degrees of success. It is not uncommon for updated CAO to include reference to other code sections (e.g., building code, stormwater code, etc.) for specific provisions. This strategy is problematic, however, when inconsistencies in cross-referencing and nomenclature across code sections do not provide the modicum of protection mandated under GMA for specific critical areas types. Under Edmonds' current code, provisions for protection of frequently flooded areas and geologically hazardous areas are generally provided in alternative code sections (ECDC Chapter 18 and 19). However, because nomenclature is inconsistent across these sections and critical area types are often not referenced by name, the existing code does not meet compliance standards mandated under Washington's GMA.

Notably absent from Edmonds' existing critical areas ordinances, in comparison with those of other jurisdictions, is specific direction on the *process* of critical areas review and compliance. Updated CAO typically include step-by-step directions for permit applicants and representatives on the sequencing of critical areas review and necessary requirements, depending on the type of critical area associated with a subject parcel. While Edmonds existing code does include a minimal amount of direction and information on requirements, the code organization is not conducive to applicant understanding of process based on the type of critical area of concern. The updated CAO will include a General Provisions sections providing a basic overview of the critical areas review process, as well as separate section within each chapter relating to different critical areas types on process sequencing, including written report requirements. In addition, each chapter will include an outline of necessary reports and a list of requirements necessary for critical areas review.

8.2 Assessment of Critical Areas Ordinance Organization

Most critical areas code follows a sub-structure within each critical areas type section similar to that provided in CTED's *Example Code Provisions for Designating and Protecting Critical Areas.* In general, separate sections on each of the five GMA-mandated critical areas include four sub-sections: Designation, Rating, and Mapping; Allowed Activities; Additional Report Requirements; and Development Standards. Edmonds' existing critical areas code includes no

such subsections, and the code structure follows no typical critical areas code protocol outline. The updated code will include separate sections for each critical area type and sub-sections consistent with CTED and DOE guidance and the general CAO structure of other Western Washington jurisdictions.

While the overall structure of Edmonds' existing critical areas code will be altered substantially as part of the 2004 update, alterations to code content and provisions will generally be limited to the conceptual changes described for each critical areas type above. Most of the specific development standards within Edmond's existing code are consistent with BAS and agency guidance. An effort will be made to retain text and code content from Edmonds' existing CAO to the extent practical through the 2004 update. Additional wording will be necessary, primarily to provide description of the process and sequencing of critical areas review and compliance, and as narrative text in support of the inclusion of outlines, templates and requirements for applicant produced reports.

8.3 Conclusions and Risk Assessment

Re-organization of Edmonds' critical areas code to increase usability and applicant understanding of the process of critical areas review and compliance will significantly reduce the risk to critical areas and to the Edmonds community. The very process of CAO review and update has increased public awareness on the importance of local critical areas to the protection of the public and Edmonds' community facilities. The re-organization and update of Edmonds' critical areas code, coupled with the development of the 2004 Critical Areas Inventory, will increase access and understanding of code provisions and critical areas protections by permit applicants and the Edmonds public. This revision will go a long way toward reducing the risk to the continued preservation of Edmonds critical areas and the benefits to community protection such areas afford.

9.0 REFERENCES

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