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CLARK COUNTY
WASHINGTON

Planning Commission Recommendation
to the Board of County Councilors

TO: Clark County Board of County Councilors

FROM: Jan Bazala on behalf of Steve Morasch, Chair of the Clark County Planning Commission

DATE: December 31, 2018

SUBJECT: Fall 2018 Bi-Annual Code Changes

I. SUMMARY

Proposed are 11 main items in the Fall 2018 Biannual code amendments, which will amend various Title 40 Sections and two fee tables. These items are presented in Attachment "A" for the Board's review.

II. BACKGROUND

Periodically staff "batch" minor amendments to the Clark County Code to correct scrivener's errors, update references and fees, clarify standards, and to make some minor policy changes. These batches of code changes are commonly known as "Biannual Code Amendments".

III. ANALYSIS

Should the code changes be approved, several sections of Title 40 (including the Highway 99 overlay standards in Appendix F) and two fee tables will be amended.

Attachment "A" includes the entire text of the changes, along with a "rationale" section which explains why the change is proposed. Attachment "A" is divided into four sections:

- **Scrivener's errors**, which correct obvious mistakes;
- **Fee Table Updates,** which proposes changes to fees;
- **Clarifications,** which are intended to make existing code language more clear; and,
- **Minor policy items**

IV. Community Outreach

This is an ongoing program. Many of these items come from staff; some come from the development community working in concert with staff, some have come from the Team 99, and some have been requested by the Board.

The required sixty day notification of intent to adopt development regulation items 1, 2, and 5-11 were received by the State Department of Commerce on November 7, 2018 (Fee updates are not development regulations and are not required to be sent to Commerce).

A SEPA determination of non-significance was published in the "Columbian" newspaper on October 29, 2018. No SEPA comments were received on any of the items.

A comment letter and supporting reference documents were received from Futurewise in regards to item number 1. The letter and supplemental references submitted by Futurewise are included in the record. See Tabs 4-8.

The text of the proposed changes was presented to, and reviewed by the Development and Engineering Advisory Board (DEAB). The DEAB supports the amendments. See Tab 3.

Legal notices of the Planning Commission public hearing were published in the "Columbian" and "Reflector" newspapers on October 31, 2018.

The Planning Commission a held work session on these items on November 1, 2018; the Planning Commission hearing was held on November 15, 2018.

V. FISCAL IMPACT

None anticipated.

VI. RECOMMENDATION

The Planning Commission recommends approval of all Title 40 items. See Tab 10 for PC Minutes.

VII. PROCESS

It's anticipated that the Board will hold deliberations on the proposed amendments at the January 22, 2018 hearing. Staff will integrate any changes requested by the Board to the Attachment "A" into a final ordinance to be approved on consent at a subsequent hearing.

Enclosures:

- Tab 1 Index of proposed code amendments
- Tab 2 Attachment "A" – Proposed text changes
- Tab 3 DEAB Memo
- Tab 4 Futurewise letter to Planning Commission
- Tab 5 Futurewise supporting document-Buildable Lands Model

Tab 6 Futurewise supporting document-Water Source Map
Tab 7 Futurewise supporting document-Cumulative Effects of Urbanization
Tab 8 Futurewise supporting document-Citation of Recommended Sources
Tab 9 Team 99 Recommendation on cottage housing
Tab 10 Planning Commission Minutes

BI-ANNUAL CODE CHANGE ITEMS – FALL 2018			
No.		Title/Chapter/Section	Description
Scrivener's Errors			
1		Tables 40.210.010-1, 40.210.020-1, and 40.210.030-1	Add Accessory Dwelling units as allowable uses in the Rural district use tables
2		Section 5.5.1 of the Highway 99 overlay standards	Correct / Clarify that Highway 99 Overlay residential developments must meet the parking requirements in Title 40
Fee Updates			
3		Table 6.120.040	Add a re-inspection fee for multiple failed fire inspections
4		Table 6.120.040	*Item removed from consideration*
Clarifications			
5		40.540.030.E	Amend the short plat approval criteria to further clarify that tracts created in short plats are not buildable unless subsequently approved through the platting process
6		40.540.040.E	Amend the subdivision approval criteria to clarify that tracts created in subdivisions are not buildable unless subsequently approved through the platting process
7		40.520.010.E.1.b(5) and 40.540.020.B.4.d	Clarify circumstances under which the County will recognize exemptions to platting
Minor Policy Changes			
8		40.260.220.E	Remove requirement to post a bond for temporary uses
9		40.350.030	Amend the transportation code in regards to stopping sight distance, sight distance triangles, yield controlled intersections, barricades, supplemental publication references, passing sight distance, and school zone traffic control
10		40.450.030.E and 40.450.040.C&D	Update wetland code to enable reduced wetland buffers in areas of low habitat function
11		40.260.073.B and Appendix F, Section 7.6	Remove separate cottage housing standards from the Highway 99 overlay; instead, defer to the standards in Section 40.260.073 and update that section accordingly

2018 Fall Biannual code amendments Attachment "A"

County Council review

Periodically staff "batch" minor amendments to the Clark County Code to correct scrivener's errors, update references, clarify standards, and to make some minor policy changes. These batches of code changes are commonly known as "Biannual Code Amendments". The following changes to Title 40 are proposed to be made.

Language proposed to be deleted is ~~struck-through~~. Language proposed to be added is double-underlined.

SCRIVENER'S ERRORS

1. Add Rural ADU's into Resource, Rural and Rural Center use tables

Table 40.210.010-1. Uses					
	FR-80	**FR-40**	**AG-20**	**AG-WL**	**Special Standards**
1. Residential.					
a. Single-family dwellings and accessory buildings	P[1]	P[1]	P[1]	P	40.260.010
b. Rural Accessory Dwelling Unit	P	P	P	P	40.260.022
~~b.~~ c. Guest house	C[2]	C[2]	C[2]	C[2]	40.260.010
~~c.~~ d. Family day care centers	P	P	P	P	40.260.160
~~d.~~ e. Adult family homes	P	P	P	P	40.260.190
~~e.~~ f. Home business – Type I	P	P	P	P	40.260.100
~~f.~~ g. Home business – Type II	R/A	R/A	R/A	R/A	40.260.100
~~g.~~ h. Bed and breakfast establishments (up to 2 guest bedrooms)	R/A	R/A	R/A	R/A	40.260.050
~~h.~~ i. Bed and breakfast establishments (3 or more guest bedrooms)	C	C	C	C	40.260.050
~~i.~~ j. Garage sales	P	P	P	P	40.260.090
~~j.~~ k. Temporary dwellings	P	P	P	X	40.260.210
*****					

[1] *One (1) single-family dwelling on legal lot or legal nonconforming lot of record.*

[2] *One (1) guesthouse in conjunction with a single-family dwelling or mobile home.*

Table 40.210.020-1. Uses				
	R-20	R-10	R-5	Special Standards
1. Residential.				
a. Single-family dwellings and accessory buildings, including 1 guest house	P	P	P	40.260.010
b. Rural Accessory Dwelling Unit	P	P	P	40.260.022
~~b.~~c. Family day care centers	P	P	P	40.260.160
~~c.~~ d. Adult family homes	P	P	P	40.260.190
~~d.~~ e. Home business – Type I	P	P	P	40.260.100
~~e.~~ f. Home business – Type II	R/A	R/A	R/A	40.260.100
~~f.~~ g. Bed and breakfast establishments (up to 2 guest bedrooms)	R/A	R/A	R/A	40.260.050
~~g.~~ h. Bed and breakfast establishments (3 or more guest bedrooms)	C	C	C	40.260.050
~~h.~~ i. Country inns of historic significance	C	C	C	
~~i.~~ j. Garage sales	P	P	P	40.260.090
~~j.~~ k. Residential care homes	C	C	C	40.260.180
~~k.~~ l. Temporary dwellings	P	P	P	40.260.210
~~l.~~ m. Staffed residential homes	C	C	C	40.260.205
*****				

1

Table 40.210.030-1. Uses			
	RC-1	RC-2.5	Special Standards
1. Residential.			
a. Single-family dwellings and accessory buildings, including 1 guest house	P	P	40.260.010
b. Rural Accessory Dwelling Unit	P	P	40.260.022
~~b.~~ c. Family day care centers	P	P	40.260.160
~~c.~~d.Adult family homes	P	P	40.260.190
~~d.~~ e. Home business – Type I	P	P	40.260.100
~~e.~~ f. Home business – Type II	R/A	R/A	40.260.100
~~f.~~ g. Bed and breakfast establishments (up to 2 guest bedrooms)	P	P	40.260.050
~~g.~~ h. Bed and breakfast establishments (3 or more guest bedrooms)	P	P	40.260.050
~~h.~~ i. Country inns of historic significance	C	C	
~~i.~~ j. Garage sales	P	P	40.260.090
~~j.~~ k. Residential care homes	C	C	40.260.180
~~k.~~ l. Temporary dwellings	P	P	40.260.210
~~l.~~ m. Staffed residential homes	C	C	40.260.205
~~m.~~ n. Residential care facilities (on parcels 2.5 acres or greater)	C	C	40.260.180
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2

3

Rationale: Ordinance 2018-01-17 enabled accessory dwelling units to be legally placed in all non-commercial zones in the County. Special use Section 40.260.022 now indicates what zones in which Rural Accessory Dwelling Units (RADU's) can be located; however the Resource, Rural and Rural Residential use tables were not updated to include RADU's. The proposed amendments to these tables adds RADU's, consistent with the ordinance.

Comments and supporting documents regarding this item were submitted by Futurewise. See Tabs 4 through 8. The main letter (Tab 4) supports attached RADU's in the rural area, but does not support detached RADU's or guest houses unless they are subject to minimum density requirements. The special standards for RADU's already requires them to be attached, and this amendment does not change that requirement.

In regards to the comment that guest houses should be subject to density requirements, no change to the County's regulations regarding guest houses are proposed.

2. Section 5.5.1 of the Highway 99 overlay standards – Correct / Clarify that Highway 99 Overlay residential developments must meet the parking requirements in Title 40

5.5 Parking Standards
INTENT
• To provide flexibility in how developments accommodate parking.
• To physically and visually integrate parking garages with other uses.
• To reduce the overall impact of parking garages when they are located in proximity to the designated pedestrian environment.

5.5.1 Parking

(1) Parking shall comply with the provisions in Chapter 40.340, with the exception that ~~N~~non-residential developments are exempt from complying with the minimum parking space provisions in ~~CCC~~ Section 40.340.010.B.~~, The following are encouraged to comply with the following, and may qualify for limited fee reductions:~~

~~(a) Multifamily dwelling studio unit: 1 space/dwelling unit.~~
~~(b) Senior housing: 1 space/dwelling unit.~~
~~(c) Tandem parking (one car behind the other) may be used for all housing types, provided the spaces are identified for the exclusive use of a designated dwelling unit.~~
~~(d) On-street parking spaces directly fronting the applicable use shall count in the calculations for off-street parking requirements.~~
~~(e) Innovative, sustainable amenities including, but not limited to electric power connections, Smart car parking spaces, carpool, and bicycle parking shall count in the calculations for parking requirements.~~

~~(2) Shared parking between and among uses is encouraged.~~

Rationale: The Highway 99 Overlay area has its own standards that generally supersede the "regular" standards in Title 40. Prior to 2017, the highway 99 standards specifically exempted all

developments from meeting the minimum parking space numbers in Chapter 40.340 of Title 40. In 2017, Section 5.5.1 of the Highway 99 overlay standards code was changed to require that residential developments meet the minimum number of parking spaces as found in Chapter 40.340, but the text change was incomplete. As currently written in Section 5.5.1 of the Highway 99 standards, it appears that non-residential developments are only *encouraged* to meet the minimum standards found in the same section, namely items "a" through "e".

The text as proposed will eliminate the apparent contradiction. Subsections "a" through "e" will be removed since they refer to the "encouraged" standards, which conflict with the proposed required standards in Chapter 40.340.

FEE TABLE UPDATES

3. Table 6.120.040 Add a re-inspection fee for failed fire inspections

Section	Activity	Fee	
11	**Reinspections- Each**[1]		
			$162
12	~~**Fire Code Annual Inspections**~~ **Fire and Life Safety**	**Square Foot**	**Cost**
A	For the purpose of performing inspections and related activities for the issuance of required operational permits as outlined in Section 15.12.105.6. Must be paid before operational permit(s) can be issued		
		1—29,999 sq. ft.	$150 plus $50 per operational permit
		30,000—69,999 sq. ft.	$200 plus $50 per operational permit
		70,000—99,999 sq. ft.	$250 plus $50 per operational permit
		100,000 sq. ft. or more	$300 plus $50 per operational permit
B	For the purpose of performing inspections and related activities for occupancies referenced in Section 15.12.106.2		
		1—29,999 sq. ft.	$150
		30,000—69,999 sq. ft.	$200
		70,000—99,999 sq. ft.	$250
		100,000 sq. ft. or more	$300
C	Re-inspections – Each[2]		
		Re-inspections	$162

		taking up to 1 hour	
		Each additional 15 minutes or portion thereof	$40
C D	Unless alternatives have been agreed upon between the county and responsible party for the inspected premises, failure to pay fees for the inspections referenced above shall result in the following penalties:		
I	More than 105 days past due	12% annual interest added	

Notes:

[1] *This fee applies where no progress has been made toward correction of noted violation(s) related to work on an existing permit. This fee does not apply to re-inspections required under subsection 12.*

[2] *This fee may be applied when more than one re-inspection has been required to verify corrections of noted violations related to Fire and Life Safety Inspections.*

The Fire Marshal has requested an amendment to Section 12.C of Table 6.120.040 to enable the office to collect an additional fee for failed re-inspections. The current proposal is for a $162 fee for re-inspections taking up to one hour, with an additional $40 per 15 minute time increment or portion thereof.

4. Table 6.110A.010 Add an intake fee for Type 1 applications

This item has been removed from consideration pending further work.

CLARIFICATIONS

5. 40.540.030 E. Amend the short plat approval criteria – further clarify that tracts created are not buildable unless subsequently approved through the platting process

40.540.030 Short Plats

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D. Approval Criteria for a Preliminary Short Plat.

The responsible official shall approve a preliminary short plat if the applicant has sustained the burden of proving that the application complies with the approval criteria in Section 40.540.040(D) or that the application can comply with those criteria by complying with conditions of approval, and those conditions are adopted.

E. Approval Criteria for Tracts for Non-Building Purposes.

1. Tracts established for the purpose of providing utilities, access or stormwater facilities shall not apply to the maximum number of lots permitted through the short plat process. A covenant(s), or a note(s) on the plat, shall be recorded to ensure tracts will be used only

for the intended non-building use. ~~If at some time, a non-building tract is able to be developed under the provisions of county code, completion of a separate platting process shall be required to establish the tract as a legal building lot.~~

2. A tract established through platting, whether or not designated as a non-building tract, shall not be considered a legal lot of record. A separate platting process shall be required to convert a previously platted tract to a legal lot of record.

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6. 40.540.040 Amend the subdivision approval criteria - clarify that tracts created in subdivisions are not buildable unless subsequently approved through the platting process

40.540.040 Subdivisions

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D. Approval Criteria for a Preliminary Plat Application.

The review authority shall approve a preliminary plat if he or she finds the applicant has sustained the burden of proving that the application complies with the following approval criteria or that the application can comply with those criteria by complying with conditions of approval:

1. The preliminary plat is in the public interest;

2. The following facilities are adequate to serve the proposed subdivision before or concurrent with development of the preliminary plat:

   a. Public and private streets and roads,

   b. Open spaces, parks and recreation,

   c. Drainage,

   d. Access to mass transit where there is or will be such transit,

   e. Potable water supplies,

   f. Sanitary waste collection and treatment,

   g. Schools and educational services (if residential),

   h. Pedestrian facilities (if residential), particularly for students who only walk to and from school, and

   i. Fire prevention services;

3. The proposal complies with all applicable standards in this code or variations therefrom permitted by law, including:

a. Subtitle 40.1, Introduction and Administration;

b. Subtitle 40.2, Land Use Districts;

c. Subtitle 40.3, Design Standards;

d. Subtitle 40.4, Critical Areas;

e. Subtitle 40.5, Procedures;

f. Subtitle 40.6, Impact Fees; and

g. Title 15, Fire Prevention.

4. If a phasing plan is proposed, then the applicant also shall show:

a. The phasing plan includes all land within the preliminary plat;

b. Each phase is an independent planning unit with safe and convenient circulation and with facilities and utilities coordinated with requirements established for the entire subdivision; and

c. All road improvement requirements are assured.

E. Approval Criteria for Tracts for Non-Building Purposes.

1. Tracts established for the purpose of providing utilities, access or stormwater facilities shall not apply to the maximum number of lots permitted through the short plat process. A covenant(s), or a note(s) on the plat, shall be recorded to ensure tracts will be used only for the intended non-building use.

2. A tract established through platting, whether or not designated as a non-building tract, shall not be considered a legal lot of record. A separate platting process shall be required to convert a previously platted tract to a legal lot of record.

~~E.~~F. Expiration and Extensions of Preliminary Plat Approval.

The expiration and extension of preliminary plat approvals are determined pursuant to Section 40.500.010(B).

Rationale (# 5 and # 6): A hearing examiner decision determined that two subdivision tracts of already recorded plats could be determined legal lots of record even though they were not designed, nor approved as such. Language in the short plat ordinance currently addresses such tracts, but no such language exists in the subdivision ordinance.

The language in the short plat provisions are proposed to be clarified and added to the subdivision provisions to eliminate further interpretations that would allow unintended conversion of tracts to buildable lots.

7. 40.520.010.E.1.b(5) and 40.540.020.B.4.d - Clarify circumstances under which the County will recognize lots created through exemptions to platting

40.520.010 Legal Lot Determination

A. Purpose and Summary.

1. The purpose of this section is to provide a process and criteria for determining whether parcels are lots of record consistent with applicable state and local law, and to include a listing of potential remedial measures available to owners of property which do not meet the criteria.

2. In summary, parcels are lots of record if they were in compliance with applicable laws regarding zoning and platting at the time of their creation. Zoning laws pertain primarily to the minimum lot size and dimensions of the property. Platting laws pertain primarily to the review process used in the creation of the lots. Specific provisions are listed herein.

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E. Approval Criteria.

1. Basic Criteria. Parcels which meet both of the following basic criteria are lots of record:

a. Zoning. The parcel meets minimum zoning requirements, including lot size, dimensions and frontage width, in effect currently or at the time the parcel was created.

b. Platting.

(1) The parcel was created through a subdivision or short plat recorded with Clark County; or

(2) The parcel is five (5) acres or more in size and was created through any of the following:

(a) An exempt division which occurred prior to April 19, 1993,

(b) A tax segregation requested prior to April 19, 1993,

(c) A survey completed as to boundaries prior to April 19, 1993, and recorded prior to July 19, 1993; or

(3) The parcel was created through a division or segregation of four (4) or fewer lots requested prior to July 1, 1976; or

(4) The parcel was created through division or segregation and was in existence prior to August 21, 1969; or

(5) The parcel was created ~~through court order, will and testament, or other~~ by a process listed as exempt from platting requirements by RCW 58.17.035, 58.17.040, or Section 40.540.010(A), or through an exemption from platting regulations provided by law at the time of creation of the parcel;

(6) The parcel was segregated at any time and is twenty (20) acres or more in size.

40.540.020 Land Division – Introduction

A. Purpose. In addition to those purposes set forth in RCW 58.17.010, the following purposes are also essential to the regulation of the subdivision of land within the unincorporated areas of the county:

1. To promote the effective utilization of land;

2. To make adequate provision for the housing, commercial, and industrial needs of the county;

3. To prescribe procedures for the subdivision of land in accordance with officially adopted plans, policies, and standards, including the provisions of any adopted zoning ordinance; and

4. To provide for the efficient processing of subdivision applications without undue delay.

B. Applicability.

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4. Exemptions. The provisions of this chapter shall not apply to the following:

a. Cemeteries and burial plots while used for that purpose.

b. Divisions of land into lots or tracts, each of which is one thirty-second (1/32) of a section of land or larger, or twenty (20) acres or larger, if the land is not capable of description as a fraction of a section of land. For purposes of computing the size of any lot under this item which borders on a street or road, excluding limited-access streets or roads, the lot size shall be expanded to include that area which would be bounded by the centerline of the road or street, and the side lot lines of the lot running perpendicular to such centerline.

c. Divisions of land which are the result of the actions of governmental agencies, such as condemnation for road construction purposes.

d. Divisions of land made by testamentary provisions, or the laws of descent.

e. Divisions of land into lots or tracts classified for industrial or commercial use, when the responsible official has approved a "binding site plan" for use of the land in accordance with Section 40.520.040(C).

f. Divisions of land made for the purpose of lease when no residential structure other than mobile homes or travel trailers are permitted to be placed upon the land, when the responsible official has approved a "binding site plan" for the use of land in accordance with Section 40.520.040.

g. Divisions of land made by subjecting a portion of a parcel or tract of land to Chapter 64.32 RCW.

h. Divisions of land made ~~by court order~~ through a process listed as exempt from platting requirements by RCW 58.17.035, 58.17.040, or Section 40.540.010(A); provided that the parcel meets all other provisions of the UDC, including, but not limited to, applicable zoning and dimensional requirements. ~~provided, the divisions shall comply with all other provisions of the UDC.~~

i. A boundary line adjustment pursuant to Section 40.540.010.

j. A division for the purpose of leasing land for facilities providing personal wireless services while used for that purpose. "Personal wireless services" means any federally licensed personal wireless service. "Facilities" means unstaffed facilities that are used for the transmission or reception, or both, of wireless communication services including, but not necessarily limited to, antenna arrays, transmission cables, equipment shelters, and support structures.

Rationale: A potential loophole was recently discovered in these two sections of code which could be interpreted to mean that court orders that divide land may not need to be consistent with exemptions from platting found in the RCWs. The presence of a comma between "court order" and "will and testament" and the absence of any limiting language in 40.520.010.E.1.b.(5) could support the argument that *any* court order partitioning or dividing property qualifies for an exemption to platting, regardless of the circumstances or the number of lots created. The legal lot determination approval criteria contained similar ambiguity. The proposed clarification would eliminate the "court order" language in favor of the exemptions that are recognized by RCW 58.17.

Section 40.520.020.B.4.h is one of the listed exemptions from platting and does not mention any limitations on court orders, and thus needs to be amended in conjunction with the amendment to 40.520.010.E. .

MINOR POLICY ITEMS

8. 40.260.220.E - Remove requirement to post a bond for temporary uses

40.260.220 Temporary Uses and Structures

A. Purpose.

This section provides for the establishment of temporary uses and structures. Temporary uses and the use of temporary structures shall be limited to those uses allowed in the respective zone.
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E. Permits.

1. The responsible official may approve permits for temporary uses and structures, with conditions to mitigate negative impacts. Uses may be allowed for a period of not more than eighteen (18) months, or less as may be specified by the responsible official.

2. ~~Prior to granting a temporary permit under this section, other than Section 40.260.220(C)(2)(b), the responsible official shall require that the applicant provide a cash or surety bond of not less than two thousand five hundred dollars ($2,500), payable to the county treasurer.~~ Upon the expiration of the temporary use permit, the applicant shall immediately discontinue the temporary use. Within thirty (30) days of the expiration of the temporary permit, the applicant shall remove any temporary structures associated with the temporary use. If at the end of this time period such temporary use or structure is not removed or discontinued, ~~said cash or surety bond shall be forfeited.~~ the County shall begin enforcement proceedings which may include penalties and liens subject to Title 32.

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Rationale: Temporary use permits are occasionally issued for situations when an applicant needs a short term, non-permanent addition or expansion of an existing use. Past examples have included activities such as permitting outside storage of containers on a nearby parcel, use of a portable rock crusher, short term use of a portable office, and a temporary parking lot expansion.

The current code requires a $2,500 bond or cash to be submitted with the application to help pay the cost of removing the temporary use if the owner does not remove the temporary improvements.

Other than the bonding requirements for certain public improvement for final plats and final site plan, no other land use process requires the County's retention of a bond. The current process for keeping and returning these temporary bonds is cumbersome, and there is an established process in place through the code enforcement process to obtain compliance, without the additional exercise of providing and releasing a bond.

9. Amend Section 40.350.030 in regards to stopping sight distance, sight distance triangles, yield controlled intersections, barricades, supplemental publication references, passing sight distance, and school zone traffic control

40.350.030 Street and Road Standards

A. Overview.

1. Purpose. It is the purpose of this section to establish minimum standards for public and private transportation facilities for vehicles, public transit, pedestrians, and bicycles, hereinafter constructed or improved as a condition of county approval of a development, or a transportation project constructed by the county. These standards are intended to preserve the community's quality of life and to minimize total costs over the life of the transportation facility.

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6. Functional Classifications – Rural Roads. Rural roads are classified as follows:

a. Rural Arterial. "Rural arterial" roads are rural extensions of urban principal arterials and some urban minor arterials. They provide adequate right-of-way for future urban arterial routes. The provision of land access remains subordinate to providing for traffic movement. Parking is not allowed.

b. Collectors.

(1) Rural Major Collector. "Rural major collector" roads are rural extensions of urban minor arterials and some urban collectors. Their primary purpose is to link rural centers with nearby towns and cities and with state arterial routes. The provision of land access remains subordinate to providing for traffic movement. Parking is not allowed.

(2) Rural Minor Collector. "Rural minor collector" roads connect local traffic to rural major collectors and state arterial routes and may be rural extensions of urban minor arterials or urban collectors. They are spaced so as to be accessible to all developed areas within the county. The provision of land access

is given the same priority as the provision of traffic movement. Parking is not allowed.

c. Access Roads.

(1) Rural Local Access. "Local access" roads provide access from parcels to the rural collector system. Parking is not allowed.

7. Scenic Routes.

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40.350.030.B.8 & 9

8. Sight Distances. As noted in Section 40.350.030(A)(2), this subsection also applies to applications for building permits and applications for access to public roads. Unless modified pursuant to Section 40.550.010, public and private roads shall comply with the following sight distance requirements:

a. Stopping Sight Distance.

Intersection sight distance and stopping sight distance values are based on the default assumption of level grades, normally intersecting roadways, and with passenger cars as the design vehicle. When deviating from the default assumptions, the engineer shall take the roadway grades, intersection skew, and design vehicle classification into consideration when calculating the required intersection sight distance and/or stopping sight distance.

Public roads shall have minimum stopping sight distance, as measured from a height of three and one-half (3.5) feet to a target on the roadway nominally two (2) feet in height, in accordance with Table 40.350.030-7. The effect of grades on stopping sight distance shall be calculated using the most current version of the Washington State Department of Transportation's "Design Manual."

For unposted roadways, the legal maximum speed limit shall be fifty (50) mph per the "Basic rule" under RCW 46.61.400.

Table 40.350.030-7. Stopping Sight Distance	
Speed (mph)	Minimum Stopping Distance (feet)
25	~~150~~ 155
30	200
35	250
40	~~325~~ 305
45	~~400~~ 360
50	~~475~~ 425

(Amended: Ord. 2012-05-14; Ord. 2014-01-08)

b. Controlled Intersection and Driveway Sight Distance Triangle.

Traffic entering an uncontrolled public road from stop controlled public roads, or from private roads or private driveways, shall have minimum intersection sight distances, as shown in Table 40.350.030-8. Sight distance shall be measured from an eye height of three and one-half (3.5) feet above the controlled road pavement surface and fifteen (15) feet from the edge of the vehicle ~~travel lane~~ travelled way of the uncontrolled public road. The object height on the uncontrolled public road shall be three and one-half (3.5) feet above the pavement surface located four (4) feet to the right of the striped or assumed centerline of the roadway. For multilane highways, the object on the uncontrolled roadway shall be located on the approach lane closest to the controlled side street. Sight distance triangles shall be clear of all obstructions, including, but not limited to, landscaping, fences, structures and earth berms between the heights of three (3) and ~~seven (7)~~ eight and one-half (8.5) feet, as measured from the pavement surface.

Table 40.350.030-8. Controlled Intersection, Public Road and Driveway Sight Distance	
Speed, Uncontrolled Road (mph)	Minimum Corner Sight Distance (feet)
20	200
25	250
30	300
35	350
40	400
45	450
50	500

(Amended: Ord. 2012-05-14; Ord. 2014-01-08)

c. Yield Controlled Intersections.

For roads with a posted speed of twenty-five (25) mph or less, traffic entering an uncontrolled public road from a yield controlled public road shall have minimum intersection sight distance of 250 feet. The intersection sight distance shall be measured at 130 feet back on the yield controlled approach from the line that is four (4) feet from the uncontrolled roadway center, in drivers' direction, for both approaches.

~~c.~~ d. Uncontrolled Intersections.

Uncontrolled intersections for access roads in urban and rural areas with a posted speed limit of twenty-five (25) mph or less shall have an unobstructed intersection sight distance triangle per Section 40.350.030(B)(8)(b) of one hundred (100) feet on both approaches. This requirement may be reduced to eighty (80) feet for intersections abutting corner lots in an urban residential subdivision. The intersection sight distance shall be measured along the lines four (4) feet from the roadway center, in drivers' direction, for both approaches.

~~d.~~ e. New urban and rural residential driveways.

New urban and rural residential driveways accessing roads with a speed limit of over twenty-five (25) mph are subject to Table 40.350.030-8.

9. Street Extensions.

a. General Requirements. Where a public or private road has been constructed, created or stubbed in such a manner as to be able to be extended or widened in accordance with the Clark County Arterial Atlas, other requirements of this section, or prior approved development, the following shall apply:

(1) Connection with Adjacent Areas. All residences, buildings or structures shall be constructed in such a position on the property that they will not interfere with the extension or widening of the roadway to adjacent areas and shall be so situated that such extension will make orderly and planned development for additional road installations to meet the reasonable minimum requirements of good and safe traffic circulation, consistent with applicable zoning setbacks.

(2) Right-of-Way for Street Extensions. Right-of-way or private easements necessary to such extension or widening and falling within parcels being developed shall be granted or created as a condition of development approval.

b. Urban Developments.

(1) Provisions for Future Extensions. Any street within the urban area for which an extension in the future is planned shall be extended to the edge of the property being developed through the plat, short plat or site plan approval process, unless otherwise approved by the review authority. The street stub shall be a full street section, including sidewalks.

(2) Use of Temporary Turnaround. If a road serving more than eighteen (18) dwelling units or more than one hundred fifty (150) feet in length temporarily terminates at a property boundary, a temporary turnaround cul-de-sac bulb

consistent with this standard shall be constructed near the plat boundary. The bulb shall be paved and shall be eighty (80) feet in diameter, which may include the width of the roadway with sidewalks, where required, terminating at the point where the bulb radius begins. Removal of the temporary turnaround and extension of the sidewalk shall be the responsibility of the developer who extends the road (see the Standard Details Manual). The easement for a temporary turnaround may be extinguished without county approval after the temporary turnaround is determined to be no longer necessary by the county.

(3) Barricades. ~~Barricades. A barricade shall be placed at the end of all stub streets, whether or not a temporary turnaround is constructed.~~ For placement of temporary and permanent barricades, see Section 40.350.030(C)(4)(f).

c. Rural Developments. For any road in the rural area for which an extension is planned, the right-of-way falling within parcels being developed shall be dedicated where the existing platting pattern, the development under review and the potential for development of adjacent lots demonstrates a need for the dedication.

10. Private Roads.

*****

40.350.030.C.1.b(5)

C. Specifications for Design and Construction.

1. Transportation Standard Specifications.

a. Transportation Standards.

The standards for Clark County roads and bridges, and all other construction within publicly owned rights-of-way, shall consist of:

(1) The current published edition of the Standard Specifications for Road, Bridge and Municipal Construction as published by the Washington Department of Transportation (WSDOT) and the American Public Works Association (APWA) referred as Standard Specifications;

(2) The current Standard Plans for Road and Bridge Construction as published by WSDOT and APWA (referred as standard plans); and

(3) The Standard Details Manual as defined in Section 40.100.070, and issued by the County Engineer, containing typical drawings to implement transportation, erosion control, drainage, and other engineering standards adopted in the Clark County Code.

b. Supplemental Standards. To implement the above standards, the following publications and their subsequent revisions are adopted and shall apply:

(1) The WSDOT Design Manual;

(2) The WSDOT Construction Manual;

(3) The WSDOT Hydraulics Manual;

(4) A Policy on Geometric Design of Highways and Streets prepared by the American Association of State Highway and Transportation Officials (AASHTO);

(5) The Washington State adopted Manual on Uniform Traffic Control Devices (MUTCD) prepared by the U.S. Department of Transportation, Federal Highway Administration;

(6) Chapter 40.386, Stormwater and Erosion Control;

(7) Chapter 51-304 WAC, state of Washington adoption of the Americans with Disabilities Act into the International Building Code; and

(8) The AASHTO LRFD Bridge Design Specifications, U.S. Customary Units, including its commentary (refer to Section 40.350.040, Private Bridges, for exceptions to this manual).

c. Conflict of Standards. In the event of conflict with any of the specifications, the County Engineer shall specify which of the supplemental specifications will apply.

****

40.350.030.C.3 & 4

3. Transportation Design Specifications. The design criteria set out Tables 40.350.030-2 and 40.350.030-3 are adopted as a portion of the Clark County Standard Specifications. Such criteria are applicable to roads located within and adjacent to a development. These criteria are intended for normal conditions. The responsible official may require higher standards for unusual site conditions.

****

g. Passing Sight Distance. ~~Arterial roads~~ County roadways with centerline striping shall have minimum passing sight distance, as measured from a height of three and one-half (3.5) feet to an object of ~~four and one-quarter (4.25)~~ three and one-half (3.5) feet ~~in height~~, in accordance with Table 40.350.030-9. ~~The effect of grades on the sight distances shall be governed by the criteria stated in the American Association of State Highway and Transportation Officials' (AASHTO) reference "A Policy on Geometric Design of Rural Highways (1990)."~~ The passing sight distance shall be based on the most current version of the American Association of State Highway and Transportation Officials (AASHTO) "A Policy on Geometric Design of Highways and Streets."

Table 40.350.030-9. Passing Sight Distance	
Posted Speed (mph)	Minimum Passing Distance (feet)

Table 40.350.030-9. Passing Sight Distance	
25	450
30	~~1,100~~ 500
35	~~1,300~~ 550
40	~~1,500~~ 600
45	~~1,650~~ 700
50	~~1,800~~ 800

(Amended: Ord. 2012-05-14)

~~h. Signing.~~

~~(1) General Requirement. The developer shall reimburse the county for the installation of all necessary street name signs, warning signs and regulatory signs. The cost of all signs, barricades, and pavement markings will be determined on a time and materials basis.~~

~~(2) Private Road Signs. Private road signs with street designations shall be provided by the developer at the intersection of private roads with private and public roads. Such signs shall meet the specifications shown on the typical drawing and, in the case of intersections with public roads, shall either be located within the public right-of-way or within a separate maintenance easement. Road signs shall be included in the private road maintenance agreement.~~

h. School Zone Traffic Control.

School zone traffic control shall be updated when impacted by a project, in accordance with the "Clark County School Zone Traffic Control Policy".

i. Pedestrian Crossing Treatment.

Appropriate pedestrian crossing treatments shall be evaluated and provided in accordance with the "Clark County Pedestrian Crossing Treatment Policy".

j. Traffic Control Devices.

(1) Reimbursable. The developer shall reimburse the county for the installation and/or modification of all necessary traffic control devices including but not limited to street name signs, warning and regulatory signs, pavement markings and traffic signals within County right-of-way. The cost of all the traffic control devices will be determined on a time and materials basis.

(2) Road Name Signs (private road to private road). Private road name signs shall be provided, installed, and maintained by the developer.

(3) Road Name Signs (private road to public road). Private road name signs shall be provided, installed, and maintained in County right-of-way by the County.

(4) Exceptions. Except for traffic signal related items, all other traffic control devices related to private roads shall be provided, installed and maintained by the developer outside County right-of-way. In some unusual circumstances, traffic control devices for private roads, such as stop control, may be installed and maintained by the developer within County right-of-way under a licensing agreement.

4. Transportation Construction Specification.

a. General. No construction shall begin until plans have been approved by the county, except that rough grading operations may proceed before the plans are approved under the following conditions:

(1) The grading plan is submitted separately along with an application for a grading permit, if required;

(2) The grading plan is in conformance with the approved preliminary plat or other development approval;

(3) The grading plan will not be in conflict with the street and drainage plans; and

(4) Any required grading permit is issued. No utility installation is allowed under grading permits.

The responsible official shall be notified not less than forty-eight (48) hours prior to the start of any phase of construction.

b. Subgrade. The subgrade must be inspected and approved by the responsible official prior to application of the crushed surfacing material.

c. Crushed Surfacing Materials. The standard specifications shall apply to all materials and workmanship. Compaction of subgrade and surfacing materials shall be in accordance with the WSDOT Standard Specifications. The subgrade and crushed surfacing materials shall be compacted to ninety-five percent (95%) of the maximum density for the material. The base course shall be approved prior to application of top course, and top course shall be approved prior to placement of pavement. Approval shall be by the responsible official.

d. Paving. The standard specifications shall apply to all materials and workmanship. The department shall be notified not less than forty-eight (48) hours in advance of the application of any type of paving and, in accordance with the standard specifications, the responsible official may stop or delay paving operations when the weather or other conditions indicate that suitable results may not be obtained.

e. Trench Backfill.

(1) Trench Backfill for Construction. All trench backfill within the county right-of-way and the road improvement area shall be imported gravel backfill meeting the material specification of the WSDOT Standard Specifications Section 9-03.19. Native soils may be utilized upon the responsible official's approval if testing shows the material is classified as A-1 or A-3 by AASHTO. Trench backfill shall

be compacted within the roadway prism to ninety-five percent (95%) of maximum density as determined by AASHTO T-99. Areas within the right-of-way and outside the roadway prism may be compacted to ninety percent (90%) of AASHTO T-99. The trench backfill shall be placed in conformance with the Standard Specification Section 7-08.3(3).

(2) Trench Backfill for Utility. Application of this specification is required on principal and minor arterials, urban collectors, rural major and minor collectors, and any roadway that has been reconstructed or overlaid within two (2) years.

Utility trenches in existing roadways and which run transverse to the direction of vehicle travel shall be constructed in accordance with the requirements of the utility cut permit, issued from Clark County's operations division. In addition to the requirements listed in Section 40.350.030(C)(4)(e)(1), transverse utility cuts will be required to have the top three (3) feet of trench backfill constructed with controlled density fill meeting the requirements of the Standard Specification Section 2-09.3.(1)E. Refer to the Standard Details Manual for examples.

f. Temporary and Permanent Barricades. Temporary and permanent barricades shall conform to the standards described in ~~Section 6C-8 of~~ the current adopted version of the Manual on Uniform Traffic Control Devices (MUTCD). For street extensions, including subtitle connection with adjacent areas, right-of-way for street extension, provision for future extension, and use of temporary turnaround, see Section 40.350.030(B)(9).

(1) Type I or Type II barricades may be used when traffic is maintained through the ~~area being constructed/reconstructed~~ temporary traffic control zone.

(2) Type III barricades may be used when roadways and/or proposed future roadways are closed to traffic. Type III barricades may extend completely across roadway (as a fence) or from curb to curb. Where provision must be made for access of equipment and authorized vehicles, the Type III barricades may be provided with movable sections that can be closed when work is not in progress, or with indirect openings that will discourage public entry. When job site access is provided through the Type I barricades, the developer/contractor shall assure proper closure at the end of each working day.

(3) In the general case, Type III permanent barricades shall be installed to close arterials or other through streets ~~hazardous~~ to traffic. They shall also be used to close off lanes where tapers and/or delineations are not ~~sufficiently delineated~~ sufficient.

(4) Type III barricades or Type 4 (end-of-roadway) object markers shall be used at the end of a local access street terminating abruptly without cul-de-sac bulb or on temporarily stubbed off streets. ~~Each such barricade shall be used together with an end-of-road marker.~~ Such Type III barricades can be supplemented with a Type 4 object marker.

(5) ~~Barricades on dead-end streets which may be extended in the future will have a sign placed upon them, as approved by the responsible official, which gives~~

~~notice that the road will be extended in the future, and will give a telephone number for interested persons to call to receive more information.~~ Dead-end streets which may be extended in the future, shall have a Type III barricade and a sign placed giving notice that the road will be extended in the future and an informational telephone number.

g. Private Road Maintenance Agreement.

****

Rationale: The proposed changes are intended to bring the County's code in line with other state and federal traffic guidelines. Transportation staff vetted the changes with the Development and Engineering Advisory Board.

10. Update the wetland code to enable reduced wetland buffers in areas of low habitat function

40.450.030. Standards

A. General. The standards apply whenever a nonexempt project (see Section 40.450.010(B)) is proposed on a parcel of real property containing a nonexempt wetland or wetland buffer (see Section 40.450.010(C)). The standard provisions shall be implemented in conjunction with the processing of the development permits listed in Section 40.450.010(B).

****

E. Buffers. Wetland buffer widths shall be determined by the responsible official in accordance with the standards below:

1. All buffers shall be measured horizontally outward from the delineated wetland boundary or, in the case of a stream with no adjacent wetlands, the ordinary high water mark as surveyed in the field.
2. Buffer widths are established by comparing the wetland rating category and the intensity of land uses proposed on development sites per Tables 40.450.030-2, 40.450.030-3, 40.450.030-4 and 40.450.030-5. For Category IV wetlands, the required water quality buffers, per Table 40.450.030-2, are adequate to protect habitat functions.

Table 40.450.030-2. Buffers Required to Protect Water Quality Functions

Wetland Rating	Low Intensity Use	Moderate Intensity Use	High Intensity Use
Category I or II	50 ft.	75 ft.	100 ft.
~~Category II~~	~~50 ft.~~	~~75 ft.~~	~~100 ft.~~
Category III	40 ft.	60 ft.	80 ft.
Category IV	25 ft.	40 ft.	50 ft.

Table 40.450.030-3. Buffers Required to Protect Habitat Functions in Category I, II and III Wetlands

Habitat Score in the Rating Form	Low Intensity Use	Moderate Intensity Use	High Intensity Use
54 points or less	See Table 40.450.030-2	See Table 40.450.030-2	See Table 40.450.030-2
~~5 points~~	~~70 ft.~~	~~105 ft.~~	~~140 ft.~~
6 or 7 points	~~90~~75 ft.	~~135~~110 ft.	~~180~~150 ft.
~~7 points~~	~~110 ft.~~	~~165 ft.~~	~~220 ft.~~
8 or 9 points	~~130~~150 ft.	~~195~~225 ft.	~~260~~300 ft.
~~9 points~~Wetlands of High Conservation Value with a Habitat Score of 7 points or less	~~150~~125 ft.	~~225~~190 ft.	~~300~~250 ft.

1

~~Table 40.450.030-4. Buffers Required to Protect Habitat Functions in Category III Wetlands~~			
~~Habitat Score in the Rating Form~~	~~Low Intensity Use~~	~~Moderate Intensity Use~~	~~High Intensity Use~~
~~4 points or less~~	~~See Table 40.450.030-2~~	~~See Table 40.450.030-2~~	~~See Table 40.450.030-2~~
~~5 points~~	~~60 ft.~~	~~90 ft.~~	~~120 ft.~~
~~6 points~~	~~65 ft.~~	~~100 ft.~~	~~135 ft.~~
~~7 points~~	~~75 ft.~~	~~110 ft.~~	~~150 ft.~~

2

Table 40.450.030-5. Land Use Intensity Matrix1						
	Parks and Recreation	Streets and Roads	Stormwater Facilities	Utilities	Commercial/Industrial	Residential2
Low	Natural fields and grass areas, viewing areas, split rail fencing	NA	Outfalls, spreaders, constructed wetlands, bioswales, vegetated detention basins, overflows	Underground and overhead utility lines, manholes, power poles (without footings)	NA	Density at or lower than 1 unit per 5 acres
Moderate	Impervious trails, engineered fields, fairways	Residential driveways and access roads	Wet ponds	Maintenance access roads	NA	Density between 1 unit per acre and higher than 1 unit per 5 acres
High	Greens, tees,	Public and private	Maintenance access roads,	Paved or concrete	All site development	Density higher than

	structures, parking, lighting, concrete or gravel pads, security fencing	streets, security fencing, retaining walls	retaining walls, vaults, infiltration basins, sedimentation fore bays and structures, security fencing	surfaces, structures, facilities, pump stations, towers, vaults, security fencing, etc.		1 unit per acre

[1] The responsible official shall determine the intensity categories applicable to proposals should characteristics not be specifically listed in Table 40.450.030-5.

[2] Measured as density averaged over a site, not individual lot sizes.

3. In urban plats and subdivisions, wetlands and wetland buffers shall be placed within a nonbuildable tract with the following exceptions:
   a. Creation of a nonbuildable tract would result in violation of minimum lot depth standards; or
   b. The responsible official determines a tract is impractical.
   c. Where the responsible official determines the exceptions in Section 40.450.030(E)(3)(a) or (b) apply, residential lots may extend into wetlands and wetland buffers; provided, that all the requirements of Section 40.450.030(F) are met.
4. Adjusted Buffer Width.
   a. Adjustments Authorized by Wetland Permits. Adjustments to the required buffer width are authorized by Section 40.450.040(D) upon issuance of a wetland permit.
   b. Functionally Isolated Buffer Areas. Areas which are functionally separated from a wetland and do not protect the wetland from adverse impacts shall be treated as follows:
      (1) Pre-existing roads, structures, or vertical separation shall be excluded from buffers otherwise required by this chapter;
      (2) Distinct portions of wetlands with reduced habitat functions that are components of wetlands with an overall habitat rating score greater than four (5 4) points shall not be subject to the habitat function buffers designated in Tables 40.450.030-3 and 40.450.030-4 if all of the following criteria are met:
         (a) The area of reduced habitat function is at least one (1) acre in size;
         (b) The area supports less than five (5) native plant species and does not contain special habitat features listed in Section H1.5 of the rating form;
         (c) The area of reduced habitat function has low or no interspersion of habitats as defined in Section H1.4 of the rating form;
         (d) The area does not meet any WDFW priority habitat or species criteria; and
         (e) The required habitat function buffer is provided for all portions of the wetland that do not have reduced habitat function.
   c. Maximum Buffer Area. Except for streams, buffers shall be reduced as necessary so that total buffer area (on- and off-site) does not exceed two (2) times the total wetland area (on- and off-site); provided, the minimum buffer width at any point shall not be less

than the water quality buffer widths for low intensity uses contained in Table 40.450.030-2.

40.450.040 Wetland Permits

A. General.

1. A wetland permit is required for any development activity that is not exempt pursuant to Section 40.450.010(C) within wetlands and wetland buffers.

****

C. Buffer Standards and Authorized Activities. The following additional standards apply for regulated activities in a wetland buffer:

****

4. Stormwater Facilities.

a. Dispersion Facilities. Stormwater dispersion facilities that comply with the standards of Chapter 40.386 shall be allowed in all wetland buffers. Stormwater outfalls for dispersion facilities shall comply with the standards in subsection (C)(4)(b) of this section. Enhancement of wetland buffer vegetation to meet dispersion requirements may also be considered as buffer enhancement for the purpose of meeting the buffer averaging or buffer reduction standards in this section.

b. Other stormwater facilities are only allowed in buffers of wetlands with low habitat function (less than six ~~five~~ (6 ~~5~~) points on the habitat section of the rating system form); provided, the facilities shall be built on the outer edge of the buffer and not degrade the existing buffer function and are designed to blend with the natural landscape. Unless determined otherwise by the responsible official, the following activities shall be considered to degrade a wetland buffer when they are associated with the construction of a stormwater facility:

(1) Removal of trees greater than four (4) inches diameter at four and one-half (4-1/2) feet above the ground or greater than twenty (20) feet in height;

(2) Disturbance of plant species that are listed as rare, threatened or endangered by the county or any state or federal management agency;

(3) The construction of concrete structures other than manholes, inlets, and outlets that are exposed above the normal water surface elevation of the facility;

(4) The construction of maintenance and access roads;

(5) Slope grading steeper than four to one (4:1) horizontal to vertical above the normal water surface elevation of the stormwater facility;

(6) The construction of pre-treatment facilities such as fore bays, sediment traps, and pollution control manholes;

(7) The construction of trench drain collection and conveyance facilities;

(8) The placement of fencing; and

(9) The placement of rock and/or riprap, except for the construction of flow spreaders, or the protection of pipe outfalls and overflow spillways; provided, that buffer functions for areas covered in rock and/or riprap are replaced.

D. Standards – Wetland Activities. The following additional standards apply to the approval of all activities permitted within wetlands under this section:

****

4. Wetland Mitigation Ratios.

a. Standard Wetland Mitigation Ratios. The following mitigation ratios for each of the mitigation types described in Section 40.450.040(D)(3)(a) through (c) apply:

Table 40.450.040-1. Standard Wetland Mitigation Ratios (In Area)

Wetland to Be Replaced	Reestablishment or Creation	Rehabilitation	Reestablishment or Creation and Rehabilitation	Reestablishment or Creation and Enhancement	Enhancement
Category IV	1.5:1	3:1	1:1 R/C and 1:1 RH	1:1 R/C and 2:1 E	6:1
Category III	2:1	4:1	1:1 R/C and 2:1 RH	1:1 R/C and 4:1 E	8:1
Category II	3:1	6:1	1:1 R/C and 4:1 RH	1:1 R/C and 8:1 E	12:1
Category I, Forested	6:1	12:1	1:1 R/C and 10:1 RH	1:1 R/C and 20:1 E	24:1
Category I, Based on Score for Functions	4:1	8:1	1:1 R/C and 6:1 RH	1:1 R/C and 12:1 E	16:1
Category I, Natural Heritage Site	Not Considered Possible	6:1 Rehabilitate a Natural Heritage Site	N/A	N/A	Case-by-Case

b. Preservation. The responsible official has the authority to approve preservation of existing wetlands as wetland mitigation under the following conditions:

(1) The wetland area being preserved is a Category I or II wetland or is within a WDFW priority habitat or species area;

(2) The preservation area is at least one (1) acre in size;

(3) The preservation area is protected in perpetuity by a covenant or easement that gives the county clear regulatory and enforcement authority to protect existing wetland and wetland buffer functions with standards that exceed the protection standards of this chapter;

(4) The preservation area is not an existing or proposed wetland mitigation site; and

(5) The following preservation/mitigation ratios apply:

Table 40.450.040-2. Wetland Preservation Ratios for Category I and II Wetlands (In Area)				
Habitat Function of Wetland to Be Replaced	In Addition to Standard Mitigation		As the Only Means of Mitigation	
	Full and Functioning Buffer	Reduced and/or Degraded Buffer	Full and Functioning Buffer	Reduced and/or Degraded Buffer
Low (<6 ~~5~~ points)	10:1	14:1	20:1	30:1
Moderate (6 ~~5~~ – 7 points)	13:1	17:1	30:1	40:1
High (>7 points)	16:1	20:1	40:1	50:1

c. The responsible official has the authority to reduce wetland mitigation ratios under the following circumstances:

(1) Documentation by a qualified wetland specialist demonstrates that the proposed mitigation actions have a very high likelihood of success based on prior experience;

(2) Documentation by a qualified wetland specialist demonstrates that the proposed actions for compensation will provide functions and values that are significantly greater than the wetland being affected;

(3) The proposed actions for compensation are conducted in advance of the impact and are shown to be successful;

(4) In wetlands where several HGM classifications are found within one (1) delineated wetland boundary, the areas of the wetlands within each HGM classification can be scored and rated separately and the mitigation ratios adjusted accordingly, if all the following apply:

(a) The wetland does not meet any of the criteria for wetlands with "Special Characteristics," as defined in the rating system;

(b) The rating and score for the entire wetland is provided as well as the scores and ratings for each area with a different HGM classification;

(c) Impacts to the wetland are all within an area that has a different HGM classification from the one used to establish the initial category; and

(d) The proponents provide adequate hydrologic and geomorphic data to establish that the boundary between HGM classifications lies at least fifty (50) feet outside of the footprint of the impacts.

****

8. Stormwater Facilities. Stormwater facilities are allowed in wetlands with habitat scores less than six ~~five~~ (6 ~~5~~) points on the rating form, in compliance with the following requirements:

a. Stormwater detention and retention necessary to maintain wetland hydrology is authorized; provided, that the responsible official determines that wetland functions will not be degraded; and

b. Stormwater runoff is treated for water quality in accordance with the requirements of Chapter 40.386 prior to discharge into the wetland.

Rationale: Ecology recently made the changes to wetland buffer guidelines based on public feedback and review of the reference wetland data used to calibrate the wetland rating system. Ecology's preference is to maintain similar distributions between the 2004 and 2014 versions of the Washington State Wetland Rating System.

In Ecology's previous wetland buffer tables, low habitat function was represented by a score of 3 or 4 points and moderate habitat function by a score of 5 to 7 points.
However, after Ecology conducted a detailed analysis of habitat scores for the 211 reference wetlands used to calibrate the rating system, Ecology found that wetlands scoring 3, 4, or 5 points for habitat are more similarly distributed to those scoring ≤ 19 points in the 2004 version.

This information prompted Ecology to adjust the habitat score break points in the current wetland buffer tables. The modified tables now group habitat scores of 3 to 5 into low habitat function and scores of 6 and 7 into moderate habitat function.
The proposed updates to CCC 40.450 revise the wetland buffer tables and approval criteria based on the habitat score on the wetland rating form to align with Ecology's revised guidelines. These changes will reduce wetland buffers for any Category I, II, or III wetland with a habitat score of 5 points by 33% and allow placement of stormwater facilities within more wetland buffers without mitigation.

Figure 1a. Changes proposed to wetland buffers

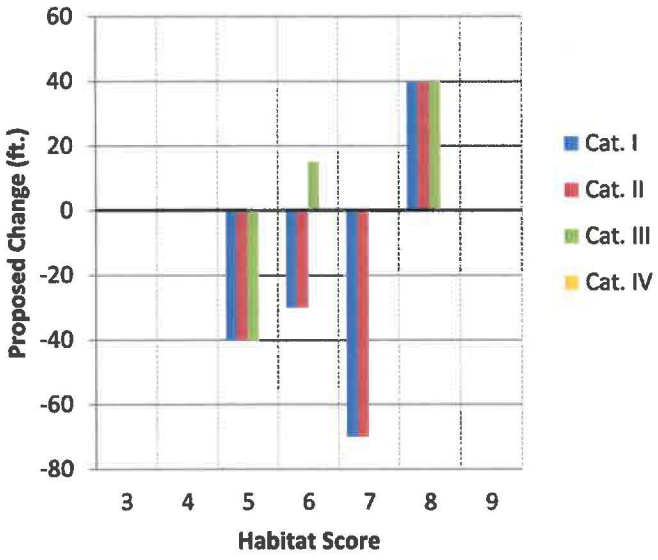
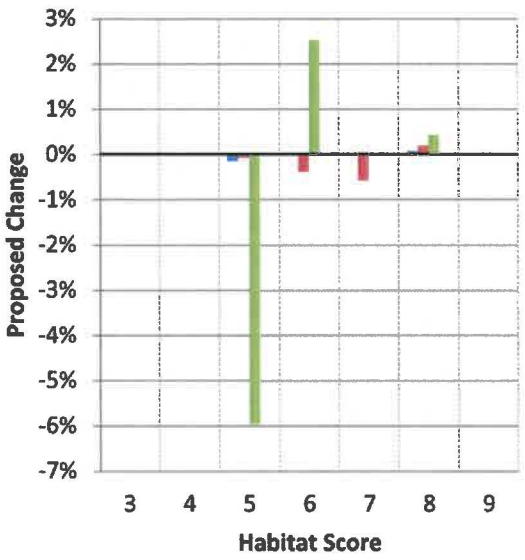


Figure 1b. Average % change relative to all wetlands county-wide by rating and habitat score



While the buffers for wetlands with habitat scores of 5 points will be reduced, adopting the new guidelines will *increase* wetland buffers for Category III wetlands with a habitat score of 6 points by 15 ft. or 11% (from 135 to 150 ft.). Based on the estimated frequency of occurrence (fig. 1b) this represents a more substantial impact than other buffer increases. All changes in buffers with habitat scores of 6 points or more are the result of the County's prior choice to incrementally increase buffers with habitat scores.

Overall, however, the proposed update will decrease buffer widths approximately 3.9%.

If these changes are not adopted now, they will likely be required to be adopted with the County's next update to our critical areas ordinances in approximately 2020.

See pages 8-15 of the Planning Commission minutes (Tab 10) for public testimony and additional discussion regarding this item.

11. Eliminate special Highway 99 Cottage Housing provisions in Section 7.6 of the Highway 99 Overlay standards in Appendix F; instead, defer to the cottage housing standards in Section 40.260.073 and update that section accordingly

40.260.073 Cottage Housing

A. Purpose.

The purposes of the cottage housing provisions are:

1. To promote sustainable development practices through smaller, more efficient housing and effective use of residential land.
2. To diversify the county's housing stock by providing a housing type that is affordable and that responds to changing household sizes and ages, such as retirees, small families, and single-parent households.
3. To encourage development in existing residential areas by allowing a density bonus and design flexibility.
4. To provide centrally located and functional common open space that fosters a sense of community and openness within the cottage development.
5. To provide private areas around the individual dwellings to enable diversity in landscape design and foster a sense of ownership.
6. To maintain the character of existing residential neighborhoods and ensure compatibility between cottage developments and their neighbors.

B. Applicability.

1. This section applies to cottage housing developments as defined in Section 40.100.070.
2. Except within the Mixed Use (MX) zone ~~and the Highway 99 Overlay District~~ (which ~~provide their~~ has its own standards), cottage housing shall comply with the standards, requirements, and limitations in Section 40.260.073(C).
3. The narrow lot development standards in Section 40.260.155 shall not apply to cottage housing developments.

7.6 Cottage Housing

~~INTENT~~

- ~~To provide a housing type that responds to changing household sizes and ages (e.g., retirees, small families, single person households).~~
- ~~To encourage creation of more usable open space for residents of the development through flexibility in density and lot standards.~~
- ~~To ensure that the overall size, including bulk and mass of cottage structures and cottage housing developments, remain smaller and incur less visual impact than standard sized single family dwellings, particularly given the allowed intensity of cottage dwellings.~~
- ~~To provide centrally located and functional common open space that fosters a sense of community and a sense of openness in cottage housing developments.~~
- ~~To provide private area around the individual dwellings to enable diversity in landscape design and foster a sense of ownership.~~
- ~~To ensure minimal visual impact from vehicular use and storage areas for residents of the cottage housing development as well as adjacent properties, and to maintain a single family character along public streets.~~
- ~~To ensure that there is compatibility between an existing single family neighborhood and new development.~~

Overlays where housing type is permitted					
Activity Center	Trans-itional Areas	Multi-Family	Mixed	Single Family	78th Street Property
	9[1]	9	9	9	

[1] Only permitted as part of a vertical or horizontal mixed-use development.

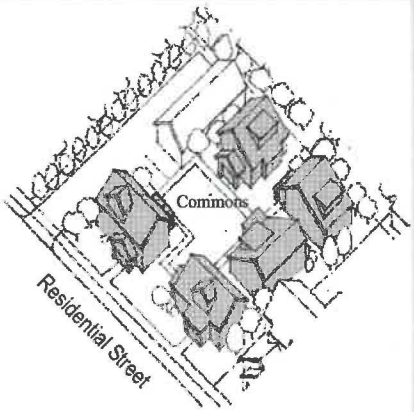


Figure 9-25. Cottage housing example. Note arrangement with central commons, connecting walkways, porches orienting to street and commons, varied roof forms, and parking off to the side.

Figure 9-26. Greenwood cottages (Seattle, WA).

Figure 9-27. Example of accessory dewlling units built over garages for cottage development (Issaquah, WA).

~~7.6.1 Cottage Housing Description~~

~~Cottages are small detached single family dwellings clustered around a common open space. Cottages may be condominiums or fee simple lots, provided they are subdivided to meet the standards herein. See Chapters 2, 3, and 4 for use provisions, permitted frontages, and overlay district standards.~~

~~7.6.2 Cottage Density Bonus~~

~~Due to the smaller relative size of cottage units, each cottage shall be counted as one half a dwelling unit for the purpose of calculating density. For example, six cottages are calculated as three dwelling units.~~

~~7.6.3 Cottage Configuration and Orientation~~

~~(1) Units in a cluster. Cottage housing developments shall contain a minimum of four and a maximum of 12 cottages located in a cluster to encourage a sense of community among the residents. A development site may contain more than one cluster.~~

~~(2) Maximum floor area: 1,200 square feet~~

~~(3) Maximum floor area/ground or main floor: 800 square feet~~

(5) Minimum parking spaces: 1.5 spaces/cottage

(6) ADU provision. Up to two accessory dwelling units (ADU's) may be built over detached garages per each cottage cluster provided they do not exceed 600 square feet in floor area and comply with applicable ADU standards set forth in Section 7.9 herein and CCC 40.260.020.

7.6.4 Cottage Open Space

(1) Common space. Minimum of 400 square feet/ unit. Design criteria:

(a) Shall abut at least 50 percent of the cottages in a cottage cluster.

(b)Shall have cottages abutting on at least two sides.

(c)Cottages shall be oriented around and have the main entry from the common open space.

(d)Cottages shall be within 60 feet walking distance of the common open space.

(e)Open space shall include at least one courtyard, plaza, garden, or other central open space, with access to all units. The minimum dimensions of this open space are 15 feet by 20 feet.

(2) Private open space. Minimum of 200 square feet/unit. Private open space shall be adjacent to each dwelling unit, for the exclusive use of the cottage resident(s). The space shall be usable (not on a steep slope) and oriented toward the common open space as much as possible, with no dimension less than 10 feet.

7.6.5 Cottage Building Design

(1) Covered entry. Cottages located adjacent to a public street shall provide a covered entry feature (with a minimum dimension of 6 feet by 6 feet facing the street).

(2) Porches. Cottage facades facing the common open space or common pathway shall feature a roofed porch at least 80 square feet in size with a minimum dimension of eight feet on any side.

(3) Maximum height. 25 feet for cottages and ADU's built over garages; 18 feet for accessory structures.

(4) Pitched roofs. All portions of roofs over 18 feet in height must be pitched with a minimum slope of 6:12.

Case Study

Danielson Grove
Kirkland, WA

Developed by The Cottage Company and Ross Chapin AIA, each cottage is "built green/energy star" certified and on its own lot. Homes range from 1-, 2-, and 3-bedrooms. The project was developed under Kirkland's Innovative Housing Demonstrative Program.

Figure 9-28. Danielson Grove Site plan.

Figure 9-29. Central commons area. Note alternate porch designs and semi-private front yard areas.

Figure 9-30. Danielson Grove Cottages in second, northern cluster.

~~(5) Character and Diversity. Cottages and accessory buildings within a particular cluster shall be designed within the same "family" of architectural styles. Examples include:~~

~~(a)Similar building/roof form and pitch.~~

~~(b)Similar siding materials.~~

~~(c)Similar porch detailing.~~

~~(d)Similar window trim.~~

~~A diversity of cottages can be achieved within a "family" of styles by:~~

~~(e)Alternating porch styles (such as roof forms).~~

~~(f)Alternating siding details on facades and/or roof gables.~~

~~(g)Different siding color.~~

Case Study

Conover Commons
Redmond, WA

Also developed by The Cottage Company and Ross Chapin AIA, Conover Commons is certified as a 3-star "built green" community. Half of the site is a woodland area designated as a Native Growth Protection Area.

Figure 9-31. Bird's eye view of Conover Commons.

Figure 9-32. Conover Commons Cottages surrounding commons.

Figure 9-33. Commons with "commons room" shared by commons residents.

7.6 Cottage Housing

See Section 40.260.073 for cottage housing standards. Examples noted herein are for illustrative purposes only.

Overlays where housing type is **permitted**					
Activity Center	Trans-itional Areas	Multi-Family	Mixed	Single Family	78th Street Property
	[1] ●	●	●	●	

[1] Only permitted as part of a vertical or horizontal mixed-use development.

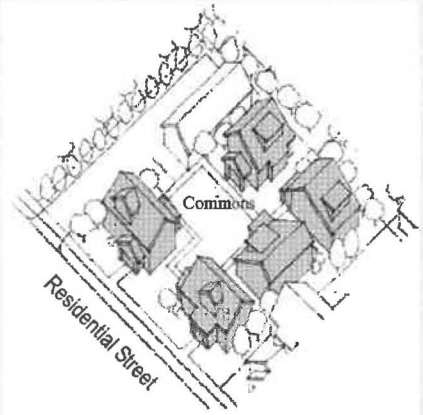


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Figure 9.31: Bird's eye view of Conover Commons.

Figure 9.32: Conover Commons and the surrounding community.

Figure 9.33: Community "commons" in Conover Commons, for residents.

Rationale: The Highway 99 Overlay cottage housing standards are substantially similar to the cottage housing standards in Section 40.260.073, with only a few differences as noted below:

	Highway 99	**Section 40.260.073**
Maximum square footage	1,200	1,600
Orientation of units	Main entry must face open space	No specific orientation to open space required
Minimum common open space dimension	15' X 20'	None specified

The proposal to eliminate the separate Highway 99 cottage standards would not eliminate cottage housing as an option in the Highway 99 overlay. Cottage housing will still be an option in the overlay area, but the review criteria in Section 40.260.073 will apply. Having just one set of standards should simplify matters for applicants and reduce the confusion over the relatively minor differences between the two codes.

According to Community Planning staff, Team 99 (the citizen group that helped develop the Highway 99 overlay standards) supports the change.

proud past, promising future
CLARK COUNTY
WASHINGTON

DEVELOPMENT and ENGINEERING ADVISORY BOARD (DEAB)

Memorandum

TO: Clark County Council
FROM: DEAB
DATE: October 15, 2018
SUBJECT: Biannual Code Amendments

During its October 4th, 2018 meeting DEAB reviewed and discussed said subject. A brief background and DEAB motion is as follows:

Biannual Code Amendment: Per attached, Staff presented background information on the Biannual Code Amendments for this fall of 2018, including text edits and code revisions.

- DEAB Motion: Support Biannual Code Amendments as proposed. Motion passed unanimously.

816 Second Ave, Suite 200, Seattle, WA 98104
p. (206) 343-0681
futurewise.org

November 14, 2018

Mr. Steve Morasch, Chair
Clark County Planning Commission
c/o Sonja Wiser, Program Assistant
Clark County Community Planning
PO Box 9810
Vancouver, WA 98666-9810

Dear Chair Morasch and Planning Commissioners:

Subject: Comments on the Urban Holding Removal - Phase II and the 2018 Biannual Code Amendments.
Sent via email to: sonja.wiser@clark.wa.gov

Thank you for the opportunity to comment on the Urban Holding Removal - Phase II and the 2018 Biannual Code Amendments. While we support some of the amendments, we have concerns about certain amendments discussed below.

Futurewise works throughout Washington State to support land-use policies that encourage healthy, equitable and opportunity-rich communities, and that protect our most valuable farmlands, forests, and water resources. Futurewise has supporters throughout Washington State including Clark County.

Please do not recommend removal of the Urban Holding Overlay until the necessary transportation funding is assured.

The Staff Report for this proposal documents that the Clark County Transportation Improvement Plan (TIP) does not ensure reasonable funding for the critical links and intersection modifications needed to lift the Urban Holding Overlay in this area.[1] Clark County's 20-year transportation facility plan has a $158,104,000 deficit.[2] So other County transportation funding is not available to pay for these transportation facilities. Therefore, we urge the Planning Commission not to recommend removal of the Urban Holding Overlay until the necessary additional transportation funding is assured.

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[1] Staff Report to the Clark County Planning Commission Subject: CPZ2018-00021 Amendment of Comprehensive Plan and Zoning Maps to Remove Urban Holding Overlay – Phase 2 p. 2 of 10 (Nov. 15, 2018) accessed on Nov. 13, 2018 at: https://www.clark.wa.gov/sites/default/files/dept/files/community-planning/CPZ2018-00021%20UH%20Holt%20Homes%20Staff%20Report%20Final.pdf

[2] *Clark County Comprehensive Growth Management Plan 2015-2035* Chapter 5, Transportation p. 160 accessed on Nov. 13, 2018 at: https://www.clark.wa.gov/community-planning/documents

Allow attached and internal Accessory Dwelling Units (ADUs) without requiring that they be counted towards the maximum allowed residential density. Only allow freestanding ADUs and guest houses outside of urban growth areas if they meet the minimum density requirements. Please see the 2018 Fall Biannual code amendments Attachment "A" Planning Commission review pp. 1 – 3 of 33

Futurewise supports allowing internal and attached accessory dwelling units (ADUs) in rural areas without requiring that they be counted towards the maximum allowed residential density. These are ADUs located inside or attached to a house or in an accessory building, such as a garage, located close to the house. Detached or freestanding ADUs outside urban growth areas count towards and must comply with the maximum allowed density.[3] Detached or freestanding refers to separate dwelling units constructed on the same lot a primary dwelling. A county should analyze existing conditions, future projections, the need for ADUs, the impacts of future ADUs on public facilities and services, and the impacts of future ADUs on shorelines, critical areas, and resource lands before adopting development regulations that authorize ADUs outside of urban growth areas.[4] We have the same concern about guest houses, they must meet the minimum lots size and density requirements outside urban growth areas.

Allowing freestanding ADUs and guest houses without requiring that the meet the minimum lot size and density requirements effectively doubles the allowed rural density. The Washington State Department of Ecology (Ecology) has determined that "[t]here is limited water available for new uses in [Water Resource Inventory Area] WRIA 27" the Lewis River Watershed and "much of the water in the Lewis River Watershed has already been spoken for."[5] The situation is the same in the Salmon-Washougal Watershed, WRIA 28. "There is limited water available for new uses …" and "much of the water in this watershed has already been spoken for."[6] In fact, water is in such short supply that there is already evidence that the overdevelopment of rural lands has caused farm wells to run dry.[7]

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[3] *Pierce County Neighborhood Association v. Pierce County (PNA II)*, CPSGMHB Case No. 95-3-0071, Final Decision and Order (March 20, 1996), at *18 – 19 accessed on Jan. 18, 2018 at: http://www.gmhb.wa.gov/Global/RenderPDF?source=casedocument&id=1923; *Friends of the San Juans, Lynn Bahrych and Joe Symons, et al. v. San Juan County*, WWGMHB Case No. 03-2-0003c Corrected Final Decision and Order and Compliance Order p.*1, 2003 WL 1950153 p. *1 (April 17, 2003). "The Thurston County Superior Court upheld the Board's ruling regarding the requirement that a freestanding ADU must be counted as a dwelling unit for the purposes of calculating density on a resource parcel. See *Friends of the San Juans v. Western Washington Hearings Board*, Thurston County Cause No. 03-2-00672-3 (January 9, 2004) at 10 and 11." *Friends of the San Juans, Lynn Bahrych and Joe Symons v. San Juan County*, WWGMHB Case No. 03-2-0003c, Compliance Order 2005 (July 21, 2005), at 12 of 22, 2005 WL 2288088, at 7 accessed on Nov. 13, 2018 at: http://www.gmhb.wa.gov/Global/RenderPDF?source=casedocument&id=277

[4] *Friends of the San Juans, Lynn Bahrych and Joe Symons, et al., v. San Juan County*, WWGMHB Case No.: 03-2-0003c Corrected Final Decision and Order and Compliance Order p.*1, 2003 WL 1950153 p. *1 (April 17, 2003).

[5] Washington State Department of Ecology Water Resources Program, *Focus on Water Availability Lewis River Watershed, WRIA 27* p. 1 (Publication Number: 11-11-031 Revised Nov. 2016) accessed on Nov. 13, 2018 at: https://fortress.wa.gov/ecy/publications/summarypages/1111031.html and enclosed with this letter.

[6] Washington State Department of Ecology Water Resources Program, *Focus on Water Availability Salmon-Washougal Watershed, WRIA 28* p. 1 (Publication Number: 11-11-032 Revised Nov. 2016) accessed on Nov. 13, 2018 at: https://fortress.wa.gov/ecy/publications/summarypages/1111032.html and enclosed with this letter.

[7] Val Alexander Letter to Clark County p. *1 (May 24, 2016) enclosed with this letter.

When Ecology adopted the instream flow rules for WRIAs 27 and 28, Ecology established reserves for future domestic uses.[8] The reserves in Clark County can serve another 4,859 new households or occupied housing units.[9] However, Clark County currently has 5,042 existing vacant lots in the rural areas and on resource lands as of 2014.[10] Clark County Utilities prepared a map identifying potential water source for tax lots outside the urban growth areas. That map identified 6,175 vacant lots outside of urban growth areas not adjacent to public water mains.[11] So the County already has more lots than can be supported by the surface and ground water resources available in the rural areas and on resource lands. Allowing detached ADUs and guest houses without requiring that they meet the minimum lot size and density requirements will not protect surface and ground water quality and quantity as the Growth Management Act requires in RCW 36.70A.070(1) and (5)(c)(iv). In addition, RCW 36.70A.590 provides that "[d]evelopment regulations must ensure that proposed water uses are consistent with RCW 90.44.050 and with applicable rules adopted pursuant to chapters 90.22 and 90.54 RCW when making decisions under RCW 19.27.097 [deciding building permits] and 58.17.110 [deciding subdivisions]." The instream flow rules for WRIAs 27 and 28 were adopted pursuant to chapters 90.22 and 90.54 RCW. So, Clark County's development regulations must ensure that proposed water uses are consistent with those rules. Allowing more lots than can be served with available water resources does not comply with this requirement.

The increased impervious surfaces allowed by freestanding ADUs and guest houses will also harm water quality. Research by the University of Washington in the Puget Sound lowlands has shown that when total impervious surfaces exceed five to 10 percent and forest cover declines below 65 percent of the basin, then salmon habitat in streams and rivers is adversely affected.[12] There are no limits preventing lots with detached ADUs from exceeding these thresholds. This will violate RCW 36.70A.070(1) and (5)(c)(iv) of the GMA.

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[8] Washington State Department of Ecology Water Resources Program, *Focus on Water Availability Lewis River Watershed, WRIA 27* p. 1 (Publication Number: 11-11-031 Revised Nov. 2016); Washington State Department of Ecology Water Resources Program, Focus on Water Availability *Salmon-Washougal Watershed, WRIA 28* p. 2 (Publication Number: 11-11-032 Revised Nov. 2016).

[9] Spreadsheet "WRIA 27-28 Reservations ESTIMATES w Totals for Clark County by Category" enclosed with this letter.

[10] *Clark County Buildable Lands Report* p. 13 (Revised 2017) and enclosed in a sperate email with the filename: "061015WS_2015BUILDABLE_LANDS_REPORT.pdf."

[11] Clark County Public Utilities, *Water Sources for Tax Lots Outside UGAs* accessed on Nov. 13, 2018 at: https://www.clark.wa.gov/sites/all/files/community-planning/2016-update/Plan%20Adoption/07%20Water%20Sources%20for%20Taxlots%20Outside%20UGA.pdf and enclosed in a sperate email with the filename: "07 Water Sources for Taxlots Outside UGA.pdf."

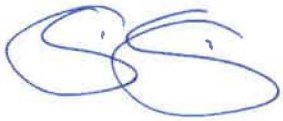
[12] Christopher W. May, Richard R. Horner, James R. Karr, Brian W. Mar, Eugene B. Welch, *The Cumulative Effects of Urbanization on Small Streams in the Puget Sound Lowland Ecoregion* pp. 19 – 20 of 26 (University of Washington, Seattle Washington) enclosed in a separate email with the filename: "chrisrdp.pdf." This report was identified as best available science in Washington State Office of Community Development. *Citations of Best Available Science for Designating and Protecting Critical Areas* p. 17 (March 2002) accessed on Nov. 13, 2018 at: https://www.google.com/url?sa=t&rct=j&q=&esrc=s&source=web&cd=1&ved=2ahUKEwiMgKWj2dLeAhViLH0KHXfdBBoQFjAAegQICBAC&url=https%3A%2F%2Fwww.ezview.wa.gov%2FDesktopModules%2FDocuments2%2FView.aspx%3FtabID%3D36890%26alias%3D1949%26mid%3D68545%26ItemID%3D4092&usg=AOvVaw0UCCoZhWjqD2uPnyKdnsnY. A copy of this report is enclosed in a separate email with the filename: "GMS-BAS-Citations-Final.pdf."

We support the amendment to UDC Subsections 40.520.010.E.1.b.(5) and 40.520.020.8.4.h. Please see the 2018 Fall Biannual code amendments Attachment "A" Planning Commission review pp. 6 – 8 of 33

While certain exemptions to the requirement to subdivide land exempt those land divisions from the subdivision process, to be legal those lots must comply with the County's other development regulations. As the court of appeals wrote in *Estate of Telfer* "we emphasize that our holding is not to be understood as intimating that the parcels resulting from the division are exempt from any other land use regulations" other than the requirement to go through the short subdivision process.[13] The clarifying amendments proposed by staff makes this clear and reduces the potential that property owners will inadvertently create unbuildable lots. Therefore, we support the proposed clarifications.

Thank you for considering our comments. If you require additional information, please contact me at telephone 206-343-0681 Ext. 102 and email: tim@futurewise.org.

Very Truly Yours,



Tim Trohimovich, AICP
Director of Planning & Law

Enclosures

[13] *Estate of Telfer v. Bd. of Cty. Comm'rs of San Juan Cty.*, 71 Wn. App. 833, 837, 862 P.2d 637, 639 (1993) *review denied Estate of Telfer v. Bd. of Cty. Comm'rs of San Juan Cty.*, 123 Wn.2d 1028, 877 P.2d 695 (1994).

Lewis River Watershed, WRIA 27

This focus sheet provides information on the availability of water for new uses in the Lewis River Watershed. This information provides a starting point for potential water users in determining the best strategies

This watershed consists of the Lewis River and numerous tributary creeks and streams. The lower Lewis Watershed is one of the most intensely farmed basins in western Washington. The annual precipitation in the Lewis Watershed ranges from 40 inches to over 150 inches per year. Most of this precipitation arrives during the winter months when overall water demands are the lowest. During the summer, snow pack is gone, there is little rain, and naturally low stream flows are dependent on groundwater inflow. This means that groundwater and surface water are least available when water demands are the highest.

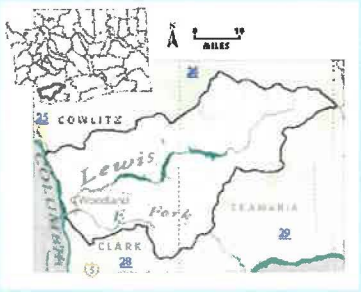
Factors affecting water availability

There is limited water available for new uses in WRIA 27, especially given that river levels need to be maintained to ensure adequate water quality and fish migration. Additionally, Pacificorp has senior water rights to maintain reservoir levels in Lake Merwin and Yale Lake, and as a result, much of the water in the Lewis River Watershed has already been spoken for. Increased demands from population growth, low summer and early fall streamflow levels, and impacts from climate change add to the challenge of finding new water supplies in WRIA 11, especially during the summer months.

Chapter 173-527 WAC is the instream flow rule for the Lewis River Watershed, including the Kalama, the North Fork of the Lewis River, and the East Fork of the Lewis River, and associated creeks. This rule establishes:

- Instream flows on streams (See Chapter 173-527-060 WAC).
- Closes all streams (See Chapter 173-527-070 WAC).

Reserves are established in subbasins for future domestic uses. To access these reserves for new appropriations, applicants must meet the mitigation requirements of the WRIA 27 established guidelines.



Definitions

Instream flows: Flow levels adopted into an administrative rule that create a water right for the stream to protect fish, wildlife, stock watering, recreational uses, and other instream uses and values. Typical instream flow rules now include broader water management strategies.

Mitigation Plan: A scientifically-sound plan to offset the impacts of a proposed water use.

Permit-exempt well: RCW 90.44.050 allows for use of small amounts of groundwater for specific uses without going through the regular permitting process. While exempt from the permitting process, these withdrawals are still subject to all other state water laws.

WRIA: Water Resources Inventory Area; also known as a watershed or river basin. For environmental administration and planning purposes, Washington is divided up into 62 major watersheds, or WRIAs.

For information on the mitigation requirements, contact your county permitting department.

Applicants seeking new water appropriations for other uses will likely need to mitigate for the impacts their proposed water use will have on surface water bodies.

Water supply available for new uses

Accessing municipal supplies or larger private water supply companies is the fastest and simplest option for obtaining a water supply.

All land west of Interstate 5, north of the east Fork of the Lewis River, and east of the Lewis River mainstem, and all lands west of Interstate 5, north of the Lewis River mainstem, and within the Lower Lewis subbasin are considered part of a "regional groundwater supply area" (per WAC 173-527-090) and is considered to be a location where water is potentially available on a year-round basis.

Additional options for finding a water supply include processing a water right application through the Cost Reimbursement Program. www.ecy.wa.gov/pubs/0511016.pdf. Reserves are established in the instream flow rule. Applicants may need to develop mitigation to offset the impacts of their water use to surface water if their new use is not for domestic supply. In addition the Lower Columbia mitigation guidance requirements will apply.

The groundwater permit exemption allows certain users of small quantities of ground water (most commonly single residential well owners) to construct wells and develop their water supplies without obtaining a water right permit from Ecology. For more information about the groundwater permit exemption, refer to www.ecy.wa.gov/pubs/fwr92104.pdf.

For more information on these and other options, refer to "Alternatives for Water Right Application Processing" http://www.ecy.wa.gov/pubs/1111067.pdf

Pending water right applications in this watershed

Washington water law is based on the "prior appropriation" system, often called "first in time, first in right." Applications for water from the same source must be processed in the order they are received.

Ecology asks anyone who needs a water right (new, change, or transfer) to submit the pre-application consultation form and meet with us to review your water supply needs and project proposal.

- Apply for a New Water Right
  http://www.ecy.wa.gov/programs/wr/rights/newrights.html
- Apply to Change or Transfer a Water Right or Claim
  http://www.ecy.wa.gov/programs/wr/rights/change_transfer_use.html

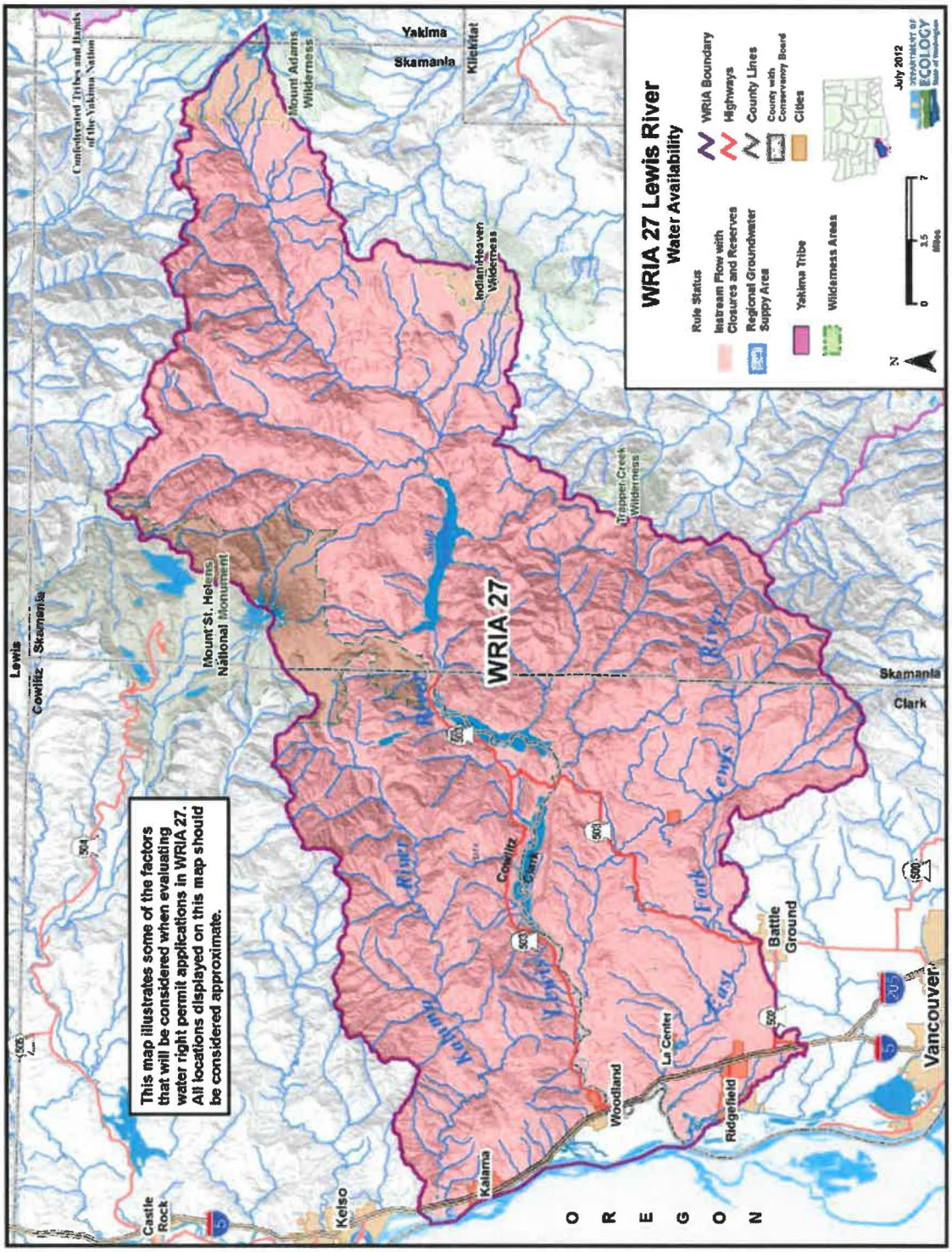
The map in this document shows some of the factors that will be considered when evaluating water right permit applications. Here are some information sources to assist you with your research:

- Locate and research water rights on land parcels anywhere in the state (Water Resource Explorer) http://www.ecy.wa.gov/programs/wr/info/webmap.html
- Pending Water Right Applications by County http://www.ecy.wa.gov/programs/wr/rights/tracking-apps.html
- Subscribe to a water right application RSS feed for a county or WRIA http://www.ecy.wa.gov/programs/wr/rights/wr_app_rss.html
- WRIA map showing the total number of water right claims, certificates, permits and applications http://www.ecy.wa.gov/programs/wr/rights/Images/pdf/waterright-wria-maps.pdf
- Search and view well reports using a variety of search tools https://fortress.wa.gov/ecy/waterresources/map/WCLSWebMap/default.aspx

For more Information

Ecology Southwest Regional Office
300 Desmond Drive
Lacey, WA 98503
360-407-6300

If you need this document in a version for the visually impaired, call the Water Resources Program at 360-407-6872. Persons with hearing loss can call 711 for Washington Relay Service. Persons with a speech disability can call 877-833-6341


WRIA 27 Lewis River
Water Availability
Rule Status
Instream Flow with Closures and Reserves
Regional Groundwater Supply Area
Yakima Tribe
Wilderness Areas
WRIA Boundary
Highways
County Lines
County with Conservancy Board
Cities
July 2012
DEPARTMENT OF ECOLOGY
State of Washington
0 1.5 3 Miles
N
This map illustrates some of the factors that will be considered when evaluating water right permit applications in WRIA 27. All locations displayed on this map should be considered approximate.
WRIA 27
Yakima
Skamania
Klickitat
Lewis
Cowlitz
Skamania
Clark
Confederated Tribes and Bands of the Yakima Nation
Mount Adams Wilderness
Indian Heaven Wilderness
Mount St. Helens National Monument
Trapper Creek Wilderness
Lewis River
East Fork Lewis River
Cowlitz River
Kalama River
Battle Ground
La Center
Woodland
Ridgefield
Kalama
Kelso
Castle Rock
Vancouver
OREGON

Salmon-Washougal Watershed, WRIA 28

This focus sheet provides information on the availability of water for new uses in the Salmon-Washougal Watershed. This information provides a starting point for potential water users in determining the best strategies for securing water for a future project or proposal in this area.

The Salmon-Washougal Watershed is located in southwest Washington, and includes Salmon Creek, Washougal River and numerous tributary creeks and streams. Annual precipitation in the watershed ranges from 40 to 80 inches. Most of this precipitation arrives during the winter months when water demands are the lowest, and only a fraction becomes available for human and economic uses. Little of the Salmon-Washougal Watershed benefits from snowpack so during the summer when there is little rain naturally, low stream flows are dependent on groundwater inflow. This means that groundwater and surface water are least available when water demands are the highest.

Factors affecting water availability

This watershed is one of the most intensely populated basins in western Washington, and as a result much of the water in this watershed has already been spoken for. There is limited water available for new uses, especially given that river and stream levels need to be maintained to ensure adequate water quality and fish migration. Increased demands from population growth, declining summer and early fall streamflow levels, and impacts from climate change add to the challenge of finding new water supplies in WRIA 28.

Chapter 173-528 WAC is the instream flow rule for the Salmon Creek and Washougal River watershed, including: Rock Creek, Fifth Plain Creek, Lacamas Creek, Little Washougal River, West Fork of the Washougal River, and associated creeks. Additionally, Gibbons, Lawton, Duncan, Hardy, Hamilton, and Green Leaf creeks, located east of the Washougal River watershed are considered part of this watershed.

Definitions

Instream flows: Flow levels adopted into an administrative rule that create a water right for the stream to protect fish, wildlife, stock watering, recreational uses, and other instream uses and values. Typical instream flow rules now include broader water management strategies.

Mitigation: A plan intended to avoid impairment to existing water rights or provide offsets to surface water depletion.

Water Resource Inventory Area (WRIA): one of 62 watershed areas in Washington State typically containing one or more river basins.

The instream flow rule:

- Establishes instream flows on streams (See WAC 173-528-060).
- Closes all streams (See WAC 173-528-070).
- Creates reserves for future domestic uses.

To access the reserves for new appropriations, contact your county permitting department.

Applicants seeking new water appropriations for other uses will likely need to provide mitigation to offset the impacts their proposed water use will have on surface water bodies.

Water supply available for new uses

Potential water supply in the Salmon-Washougal Watershed includes municipal suppliers and private water supply companies. New individual homes may access water through a permit-exempt well for in-door use. (See RCW 90.44.050 for information on permit-exempt groundwater withdrawals.).

If an applicant is not able to connect to an existing water system or more water is needed than can be obtained from a permit-exempt well, then the water right application may be processed through the Cost Reimbursement Program.

For more information on these and other options, refer to "Alternatives for Water Right Application Processing."

Pending water right applications in this watershed

Washington water law is based on the "prior appropriation" system, often called "first in time, first in right." Applications for water from the same source must be processed in the order they are received.

Ecology asks anyone who needs a water right (new, change, or transfer) to submit the pre-application consultation form and meet with us to review your water supply needs and project proposal.

- Apply for a New Water Right
  http://www.ecy.wa.gov/programs/wr/rights/newrights.html
- Apply to Change or Transfer a Water Right or Claim
  http://www.ecy.wa.gov/programs/wr/rights/change_transfer_use.html

The map in this document shows some of the factors that will be considered when evaluating water right permit applications. Here are some information sources to assist you with your research:

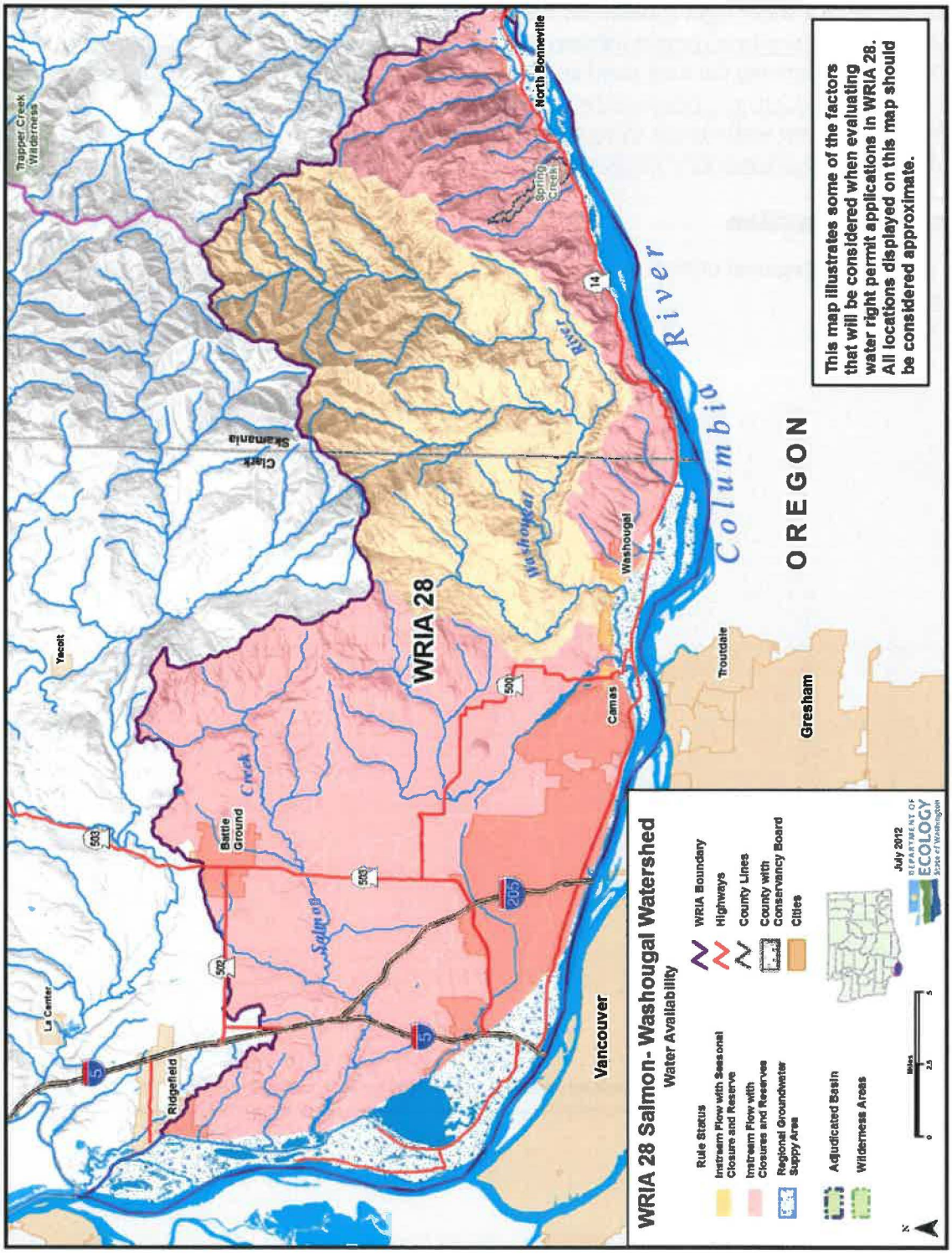
- Locate and research water rights on land parcels anywhere in the state (Water Resource Explorer)
  http://www.ecy.wa.gov/programs/wr/info/webmap.html

- Pending Water Right Applications by County
  http://www.ecy.wa.gov/programs/wr/rights/tracking-apps.html
- Subscribe to a water right application RSS feed for a county or WRIA
  http://www.ecy.wa.gov/programs/wr/rights/wr_app_rss.html
- WRIA map showing the total number of water right claims, certificates, permits and applications
  http://www.ecy.wa.gov/programs/wr/rights/Images/pdf/waterright-wria-maps.pdf
- Search and view well reports using a variety of search tools
  https://fortress.wa.gov/ecy/waterresources/map/WCLSWebMap/default.aspx

For more information

Ecology Southwest Regional Office
300 Desmond Drive
Lacey, WA 98503
360-407-6300

If you need this document in a version for the visually impaired, call the Water Resources Program at 360-407-6872.
Persons with hearing loss can call 711 for Washington Relay Service. Persons with a speech disability can call 877-833-6341


WRIA 28 Salmon- Washougal Watershed
Water Availability
Rule Status
Instream Flow with Seasonal Closure and Reserve
Instream Flow with Closures and Reserves
Regional Groundwater Supply Area
Adjudicated Basin
Wilderness Areas
WRIA Boundary
Highways
County Lines
County with Conservancy Board
Cities
July 2012
DEPARTMENT OF ECOLOGY
State of Washington
Miles
This map illustrates some of the factors that will be considered when evaluating water right permit applications in WRIA 28. All locations displayed on this map should be considered approximate.
WRIA 28
OREGON
Columbia River
Washougal River
Salmon Creek
Battle Ground Creek
Clark
Skamania
Trapper Creek Wilderness
North Bonneville
Spring Creek
Washougal
Camas
Troutdale
Gresham
Vancouver
Ridgefield
La Center
Yacolt

Val Alexander
2404 NW Coyote Ridge Rd
La Center, WA 98629

May 24, 2016

The Honorable Marc Boldt, Council Chair
Clark County Board of County Councilors
PO Box 5000
Vancouver, Washington 98666-5000

Mr Steve Morasch, Chair
Clark County Planning Commission
Clark County Community Planning

Attn: 2016 Comp Plan Record
PO Box 9810
Vancouver, Washington 98666-9810

Dear Council Chair Boldt, Councilors Madore, Mielke, Olson, and Stewart, Planning Commission Chair Morasch, and Planning Commissioners Wright, Blom, Quining, Barca, Johnson, and Bender·

I have lived on my property NW of La Center for more than 50 years. I have seen many changes through the years, as lots were developed around me. Almost all of them were 5 acre lots, so that was quite a few new wells to be drilled. I had a good supply of water from my first well, until more and more houses were allowed. Suddenly, my well dried up.

I did everything I could to bring it back, had it fracked and some other techniques used then, in the 70's to assist well output, but nothing worked. By this time I had bought some other property around me and so I had to pipe water from another well at the south end to the northern property where I had a house. I am one of the lucky ones, since I could do that. Most other people do not have that option.

For those of you who will be deciding on which option to choose, I'm hoping you will take seriously the damage that will be done to existing rural residents if you allow 8024 new families to establish homes in rural Clark County. There is a crisis in the ground water supply in the

county as indicated by Dennis Dykes, a hydrologist, and Ecology. To take the risk that many existing homes will lose their water supply is incredibly irresponsible. Try to put yourself in that situation. Some would have to move away, abandon their homes, since one couldn't easily sell a lot without a water supply. You will have to choose between protecting the present rural residents or trying to please a small group of vocal, greedy landowners who want to profit from land sales.

One of your responsibilities is to protect farmland, and farmers cannot make a living by having to pay for public water.

Please study the water situation as described by Ecology and Dennis Dykes, before you ignore the needs of present residents who have no access to public water.

Thank you,

Val Alexander

Wed 10/14/2015 3:59 PM

Hoff, Tryg (ECY) <THOF461@ECY.WA.GOV>

RE: Q about remaining water reserves for residential uses in WRIAs 27 and 28 in Clark Co

To Tim Trohimovich

You forwarded this message on 10/14/2015 5:21 PM.

Message | WRIA 27-28 Reservations ESTIMATES.xlsx (14 KB) | WRIA27withReservations.jpg (2 MB) | WRIA28withReservations.jpg (2 MB)

Bing Maps + Get more apps

Here are our estimates at the end of June this year

Let me know if you have any questions.

Tryg

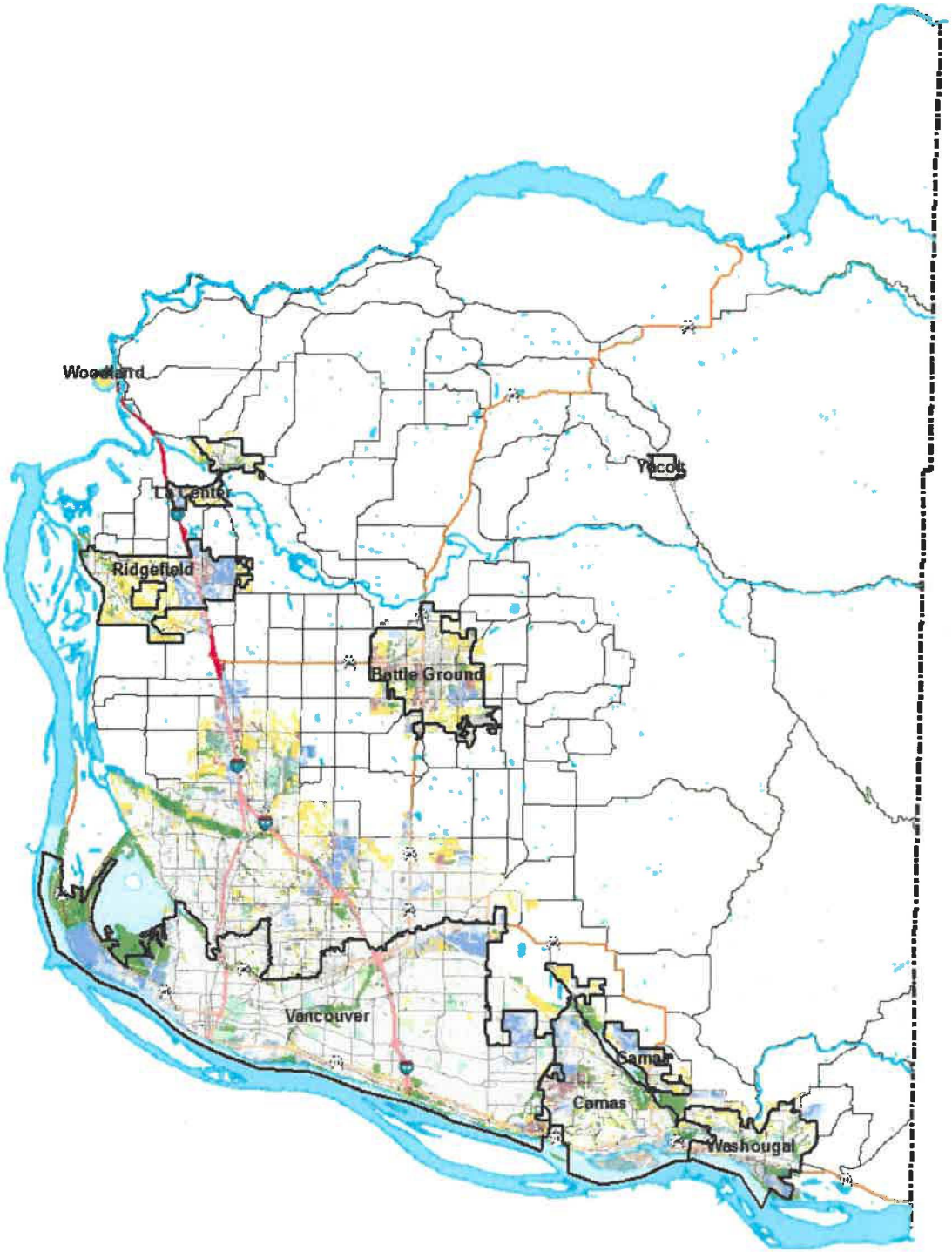
WRIA 27-28 as of June 2015

	Reservation Benefit (CFS)	Households Served	New Water Wells (ecy)	Public est* systems(doh)	CFS Permitted		TOTAL	RESERVATION % Used	Remaining Household Capacity
Kalama River Subbasin									
Kalama	1.92	1551					0	0.0%	1,551
Small Community Water Systems - Cowlitz Co.	0.37	299	1				1	0.3%	298
Domestic Wells - Cowlitz Co. NA 141 0.52 0.16 0.00 0.16	0.16	432	48				48	11.1%	384
North Fork Lewis River Subbasin									0
Small Community Water Systems - Cowlitz Co.	0.37	299	1				1	0.3%	298
Small Community Water Systems - Clark Co.	0.75	606	3				3	0.5%	603
Small Community Water Systems - Skamania Co.	0.4	323	0				0	0.0%	323
Domestic Wells - Cowlitz Co.	0.07	189	82				82	43.4%	107
Domestic Wells - Clark Co.	0.12	324	81				81	25.0%	243
Domestic Wells - Skamania Co.	0.4	1080	0				0	0.0%	1,080
Commercial - Skamania County	0.21		0				0		0
Ridgefield (Not applicable, due to location in tidally influenced area. (8)									0
East Fork Lewis River Subbasin									0
CPU, Battle Ground and Ridgefield	4.4	3554				0.67	0	15.2%	3,554
Small Community Water Systems - Clark Co.	0.37	299	2	19			21	7.0%	278
Small Community Water Systems - Skamania Co.	0	0	0				0	0.0%	0
Domestic Wells - Clark Co.	0.47	1269	122				122	9.6%	1,147
Domestic Wells - Skamania Co.	0.02	54	0				0	0.0%	54
Salmon Creek Subbasin									0
CPU, Battle Ground and Ridgefield	0.25	202	7				7	3.5%	195
Small Community Water Systems - Clark Co.	0	0	0				0		. 0
Domestic Wells - Clark Co.	0.12	324	92				92	28.4%	232
Burnt Bridge Creek Subbasin									0
Vancouver	0	0	0				0	0.0%	0
Small Community Water Systems - Clark Co.	0	0	0				0	0.0%	0
Domestic Wells - Clark Co.	0	0	0				0	0.0%	0
Lacamas Creek Subbasin									0
Camas	1	808					0	0.0%	808
Clark Public Utilities (CPU)	0.6	485					0	0.0%	485
Small Community Water Systems - Clark Co.	0.37	299	3	8			11	3.7%	288
Domestic Wells - Clark Co. NA	0.17	459	71				71	15.5%	388
Washougal River Subbasin									0
Washougal	0	0					0	0.0%	0
Small Community Water Systems - Clark Co.	0.37	299		10			10	3.3%	289
Small Community Water Systems - Skamania Co.	0.2	162					0	0.0%	162
Domestic Wells - Clark Co.	0.17	459	32				32	7.0%	427
Domestic Wells - Skamania Co.	0.64	1728	26				26	1.5%	1,702
Columbia River Tributaries Subbasin									0
Small Community Water Systems - Clark Co.	0.21	170	0				0	0.0%	170
Small Community Water Systems - Skamania Co.	0.21	170	3				3	1.8%	167
Domestic Wells - Clark Co.	0.12	324	14				14	4.3%	310
Domestic Wells - Skamania Co.	0.12	324	10				10	3.1%	314
Total	**14.58**	**16,490**							15,855

Cities in Clark County	808
CPU for Cities	3,749
Clark Public Utilities (CPU)	485
Small Community Water Systems - Clark Co.	1,627
Domestic Wells - Clark Co.	2,747
Total Outside Cities	4,859

BUILDABLE LANDS REPORT, June 2015

CLARK COUNTY WASHINGTON
proud past, promising future



Board of Commissioners
David Madore, Chair
Tom Mielke
Jeanne Stewart

County Manager
Mark McCauley

Clark County Community Planning
Oliver Orjiako, Director
Gordy Euler, Program Manager
Gary Albrecht, Planner II

Clark County Information and Technology
Jon Levitre

Community Planning would like to thank:

Clark County GIS
Ken Pearrow
Barbara Hatman

EXECUTIVE SUMMARY

The Growth Management Act (GMA) requires the county and its cities to provide sufficient land to accommodate specific population and employment targets. This is the third buildable lands report since 1990. It presents a series of basic, quantifiable indicators in Clark County and tracks how they are changing each year.

Clark County coordinated with its cities to compile data that shows the progress of each community's comprehensive plan toward the goals of sprawl reduction and concentrated urban growth identified in the Growth Management Act. Each community collects development data, which is forwarded to the county and added to a central database located at this webpage: http://www.clark.wa.gov/planning/comp_plan/monitoring.html#capacity

The primary sources of data are new commercial, industrial and residential building permits from July 1, 2006 through December 31, 2014. Clark County's Geographic Information System (GIS) was used to associate new building permits issued with city and urban growth area boundaries, Vacant Buildable Land Model (VBLM), employment, assessor information, and constrained land.

Following are the major observations presented in this report:

- Residential development within urban growth areas of Clark County consumed 1,245 acres with a density of 4.7 dwelling units per acre. Based on the VBLM, there are 7,513 net buildable acres that can accommodate 51,436 households. At 2.66 persons per household urban growth areas can accommodate 136,820 persons.

- There were 1,387 building permits issued in the rural area on 7,799 acres. Given the underlying zoning, the total vacant and development potential in the rural area is 9,390 lots. Assuming 2.66 persons per household, there is potential for additional rural capacity of 24, 977 persons. Overall, the county can accommodate 161,797 persons.

- Review of development indicates that 43% of all residential development occurred on land with some environmental constraint. More importantly, this percent does not imply that development is occurring on lands with critical areas, because in general environmentally constrained lands are not being developed.

- Building permit review and evaluation has indicated that commercial and industrial development in the UGAs during the period consumed 3,372 acres of land. Commercial uses consumed 2,704 acres and industrial uses consumed 668 acres. Based on the 2015 VBLM inventory there are 2,057 net buildable commercial acres and 3,982 net buildable industrial acres.

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Introduction

The Growth Management Act (GMA) requires the county and its cities to provide sufficient land to accommodate specific population and employment targets. This report responds to and satisfies the review and evaluation requirements of the Washington State Growth Management Act (GMA) in RCW 36.70A.215, commonly referred to as the "buildable lands" statute. The report was prepared by county staff and the cities using the Clark County Community Framework process, the county's adopted multi-jurisdictional process for GMA issues.

The Comprehensive Plan indicates the Buildable Lands Program, at a minimum should answer the following questions:

- What is the actual density and type of housing that has been constructed in UGA's since the last comprehensive plan was adopted? Are urban densities being achieved within UGA's? If not, what measures could be taken, other than adjusting UGA's, to comply with the GMA?

- How much land was actually developed for residential use and at what density since the comprehensive plan was adopted? Based on this and other relevant information, how much land would be needed for residential development during the remainder of the 20-year comprehensive planning period?

- To what extent have capital facilities, critical areas, and rural development affected the supply of land suitable for development over the comprehensive plan's 20-year timeframe?

- Is there enough suitable land in Clark County and each city to accommodate county-wide population growth for the 20-year planning period?

- Does the evaluation demonstrate any inconsistencies between the actual level of residential, commercial, and industrial development that occurred during the review period compared to the vision contained in the county-wide planning policies and comprehensive plans and the goals and requirements of the GMA?

- What measures can be taken that are reasonably likely to increase consistency during the subsequent eight-year period, if the comparison above shows inconsistency?

Process

Clark County, in consultation with each city, has been working cooperatively to address the requirements of Section 215. In 2005, Community Planning received a grant from Washington State Department of Commerce formerly known as Community Trade and Economic Development (CTED). That grant provided a valuable opportunity to unify buildable lands data into one system and make collection and analysis easier for individual cities and the county. Through that process, a methodology was developed for collecting the buildable land data in the link below (see Data Transfer Protocols and Monitoring of Growth Management Trends).
http://www.clark.wa.gov/planning/comp_plan/monitoring.html#capacity

The data collection methods and procedures were developed through the Clark County Growth Management Act (GMA) Technical Advisory Committee (TAC). An Amendment to the countywide planning policies was adopted by reference as Ordinance 2000-12-16 by the Board of County Commissioners.

The Ordinance amended language in the Community Framework Plan to comply with the requirements of RCW 36.70A.215. The Growth Management Act requires Clark County to compile data that shows the process of each community's comprehensive plan toward the goals of the Growth Management Act. Each community collects development data, which is forwarded to the county and added to a central database. The web site draws data from that database. It allows citizens, interest groups, elected officials and advisory boards the most comprehensive source of development data.

Methodology

Following the first Buildable Lands report, the county met with each building official and city staffs to refine how data was to be compiled in the future. Each month, staff in each jurisdiction (except Yacolt) forwards an electronic spreadsheet to the county with updated development data such as permit types, parcel numbers, numbers of units, etc. Staff performs a quality assurance check to ensure data has permit number, permit type, parcel number, number of units, building square feet for non-commercial permits, and issue dates. They look for duplicates and check for errors with parcel numbers, addresses, number of units and square feet.

If data is missing or incorrect, staff contacts the respective jurisdiction. Staff also adds missing parcel numbers by using the parcel match option in Clark View.

Information Technology extracts permit data for Clark County and Yacolt, and transfers the files to a server. The server completes the following steps: normalize and read data, translate data, import data, obtain GIS data, generate reports in PDF format, and generates an exception report. The exception report contains permits that are not recognized by the server. If the error rate is greater than one to three percent per jurisdiction for the total number of permits, the county contacts the jurisdiction to correct the discrepancy. County staff also performs a visual check to confirm that the data has merged into the database correctly. The county runs another program that creates a report and a PDF file that is automatically placed on the web.

The primary sources of data were from new commercial, industrial and residential building

permits issued from July 1, 2006 through December 31, 2014. Clark County's Geographic Information System (GIS) was used to link parent parcel serial numbers taken from new building permits issued to identify parcels within city and urban growth area boundaries, acreage and critical lands coverage.

Baseline Assumptions
The 2007 Comprehensive Plan planning assumptions have to do with growth rates, population, and persons per household, and are listed below:

- No more than 75 percent of any product type of detached/attached housing
- Average residential densities in urban areas would be 8 units per net acre for Vancouver, 6 for Battle Ground, Ridgefield, Camas, Washougal, 4 units per net acre for La Center, and no minimum for the town of Yacolt
- Infrastructure factor of 27.7 percent for residential development and 25 percent for industrial and commercial development
- 2.59 persons per household
- 20 employees per commercial acre; 9 employees per industrial acre
- A total population of 584,310 by 2024, from an annual growth rate of 2.0 percent, with 2.2 percent assumed in 2004-2010 for capital facilities planning purposes

COUNTYWIDE TRENDS, 2007-2014

Housing and Job Totals

Background and Relevance
Tracking the number of people who live and work in the community is a fundamental measure of how fast the community is growing and what additional land may be needed to accommodate future growth. A goal of growth management is to encourage the development of housing in proximity to job growth. The strategy of balancing housing and job growth is intended to reduce the need for long commutes, and to keep living and working communities easily accessible to each other. However, when housing growth occurs it often takes several years for sufficient job growth to occur in the area and vice-versa. Reduced vehicle trips result in less demand on the existing street infrastructure.

Under the GMA, Clark County and its cities are required to plan for a total population projection as provided by the state Office of Financial Management. Clark County's population forecast for the 20-year planning period ending 2035 is 578,391 in 2035. Since 2007, the County's population has increased by 34,139 persons or by 1.13 percent annually.

Data Collection
Official population estimates as of January 1st for all cities and counties are produced annually by Clark County GIS. Employment estimates were provided by the local office of the Washington Department of Employment Security (ESD). Employment data includes workers

covered by state employment insurance, not including self-employed workers. On the following page, table 1 shows the estimated population trends of urban growth areas in Clark County from 2007 to 2014. Table 2 illustrates Clark County household and job patterns from 2007 to 2014.

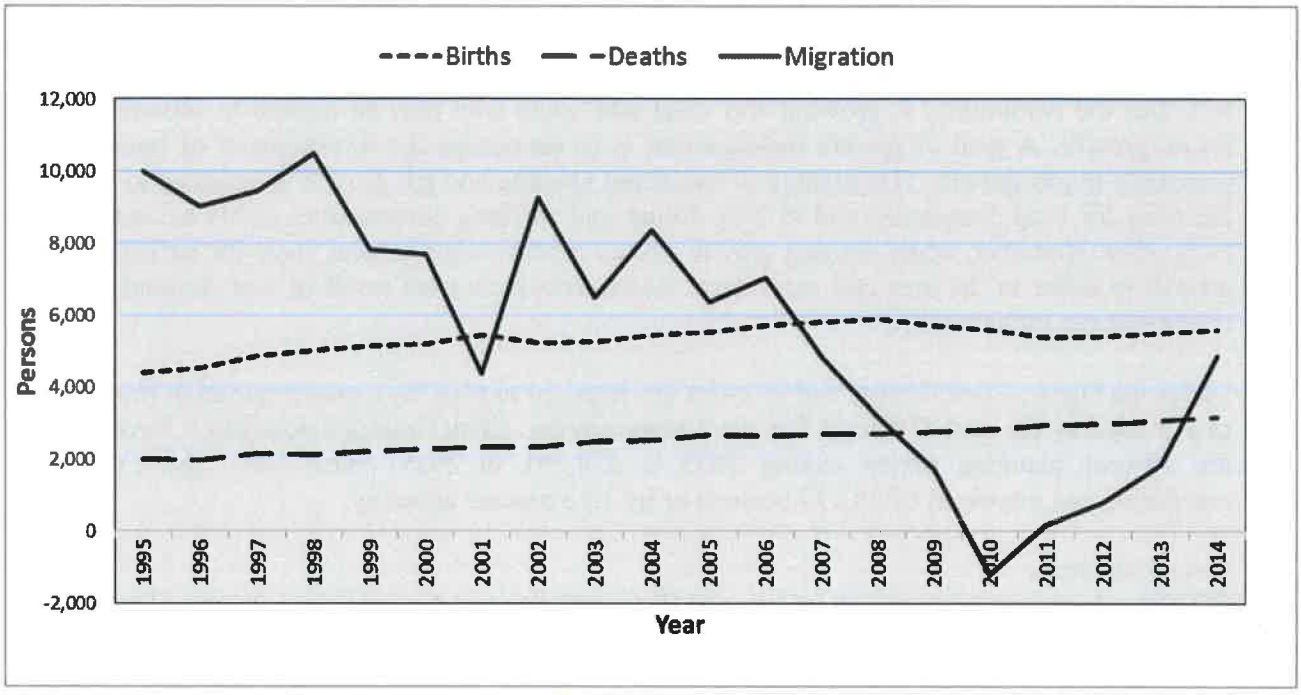
Table 1
Annual Population Estimates for Clark County, 2007-2014

Urban Growth Areas	2007	2008	2009	2010	2011	2012	2013	2014	2007-2014 Growth Rate
Battle Ground	18,654	18,867	19,297	19,479	19,851	20,052	20,163	20,871	1.60%
Camas	20,015	20,311	20,626	21,073	21,588	21,911	22,049	22,843	1.89%
LaCenter	3,017	3,069	3,010	3,050	3,220	3,135	3,163	3,209	0.88%
Ridgefield	5,015	5,112	5,175	5,402	5,608	5,741	6,150	6,575	3.87%
Vancouver	293,973	296,859	300,055	300,525	302,108	304,262	307,767	315,460	1.01%
Washougal	14,003	14,722	14,862	15,007	15,328	15,249	15,502	15,932	1.84%
Woodland	88	88	89	88	92	91	88	89	0.19%
Yacolt	1,535	1,578	1,613	1,636	1,645	1,644	1,653	1,661	1.13%
Rural County	58,408	58,840	59,642	59,689	60,049	60,280	60,112	62,205	0.90%
Total	414,708	419,445	424,368	425,949	429,490	432,365	436,647	448,847	1.13%

SOURCE: Clark County Department of GIS

NOTE: A portion of the City of Woodland is in Clark County.

Chart 1
Components of Population Change 1995-2014



SOURCE: Washington State Office of Financial Management, http://www.ofm.wa.gov/

Table 2
Clark County Household & Jobs, 2007-2014

Year	Households	Jobs	Jobs Per Household
2007	162,715	137,500	0.85
2008	164,796	137,300	0.83
2009	165,755	131,800	0.80
2010	166,989	130,400	0.78
2011	168,148	131,600	0.78
2012	169,467	134,400	0.79
2013	172,715	138,500	0.80
2014	173,827	144,300	0.83
Annual Average Percent change	**0.94%**	**0.69%**	

SOURCE: Clark County GIS and ESD.

Observations

- Population growth has three components: births, deaths and migration. Migration is the most volatile and has not recovered to pre-recession levels.
- Births and deaths have remained relatively constant over the last 20 years however deaths have been trending slightly higher due to the aging population
- During this period, 6,800 new jobs and 11,112 new households were added to Clark County.

Employment

The GMA does not mandate a source that must be considered in planning for future employment. However, in this report the county uses ESD to make comparisons between employment and employment densities. In 2007, commercial and industrial employment assumptions were 20 and 9 jobs per acre, respectively, to plan for future employment.

Observations

- From 2007 to 2014, Clark County added 11,112 new households, an annual average change of 0.94%; for the same period job growth was 0.69%.

- National recession starting in 2008 reversed a period of fast economic growth and low unemployment, resulting in significant layoffs and unemployment rates increasing to 11% by February 2013 in Clark County.

GROWTH TARGETS AND CAPACITY

In 1992, Clark County began the VBLM analysis to determine the potential capacity of urban growth areas to accommodate projected growth for the next 20 years to the year 2012. County staff met with interested parties from the development and environmental community to collectively examine criteria to be used to compute the supply of land available for development within each urban growth boundary. From the process, a methodology was developed using Clark County's Department of Geographic Information System (GIS) as the primary data source.

The evaluation component of the RCW 36.70A.215 Review and Evaluation Program, at a minimum, shall: "Determine whether there is sufficient suitable land to accommodate the countywide population projection established for the county pursuant to RCW 43.62.035 and the subsequent population allocations within the county and between the county and its cities and the requirements of RCW 36.70A.110."

The amount of land needed to accommodate projected growth through the 2035 planning horizon is the subject of this section. The amount of buildable land needed will be instrumental in the update of the comprehensive plan and provides a framework for addressing the land supply needs of a new 20-year planning horizon.

Tables 3 below and Table 4 on the following page indicate the amount of residential land needed to accommodate the projected population based on (1) the 2015 Comprehensive Growth Management Plan baseline assumptions; and (2) the densities observed since 2006. Each table provides the 2015 population (January 1st), the remaining population for planning horizon 2035, and the residential units and acres needed.

Table 3
2035 Urban Growth Residential Land Need

Jurisdiction	2015 Population	Remaining Population for planning horizon 2035	Residential units needed	Assumed units per net	Residential acres needed	Deficit	Surplus	2015 Vacant Buildable Land Inventory
Battle Ground	20,871	15,972	5,169	6	862		208	1,070
Camas	22,843	11,255	3,868	6	645		248	892
La Center	3,209	3,233	1,089	4	272		101	373
Ridgefield	6,575	13,087	4,377	6	729		280	1,009
Vancouver	315,460	52,786	21,723	8	2,715		907	3,622
Washougal	15,932	6,023	2,247	6	375		102	477
Woodland	89	229	83	4	21		5	25
Yacolt	1,661	303	88	4	22		22	44
Total	**386,640**	**102,890**	**38,643**		**5,640**			**7,513**

Source: Clark County Community Planning. Note: Land needs are based on the VBLM2015 model using net acres.

Table 4
2035 Urban Growth Residential Land Need Based on Observed Density

Jurisdiction	2015 Population	Remaining Population for planning horizon 2035	Residential units needed	Observed units per acre	Residential acres needed	Deficit	Surplus	2015 Vacant Buildable Land inventory
Battle Ground	20,871	15,972	5,169	4.2	1,231	-161		1,070
Camas	22,843	11,255	3,868	3.8	1,018	-125		892
La Center	3,209	3,233	1,089	1.9	573	-200		373
Ridgefield	6,575	13,087	4,377	5.2	842		168	1,009
Vancouver	315,460	52,786	21,723	7	3,103		519	3,622
Washougal	15,932	6,023	2,247	6.6	341		136	477
Woodland	89	229	83	4	21		5	25
Yacolt	1,661	303	88	3.4	26		18	44
Total	**386,640**	**102,890**	**38,643**		**7,154**			**7,513**

Source: Clark County Community Planning. Note: Land needs are based on the VBLM 2015 model using net acres. Observed densities are based on actual development in urban areas. City densities are within city limits, except for Vancouver which uses full UGA density. Residential units needed is based on person per household from the 2013 ACS data. Additional population not included in the vacant land model is 15,224 persons; bringing the 2035 estimate to 118,114.

Summary

- The observed unit per acre does not include existing platted, yet vacant lots or potential densities based upon maximum lot sizes und current zoning of vacant or underutilized land. The model relies on building permit data, not platted development data. A conclusion under GMA that a jurisdiction has a surplus or deficit in lands available within a jurisdiction to accommodate a planned population within a defined planning period, can only be concluded through a thorough analysis of the underlying zoning, site constraints, site infrastructure and platting patterns.

- Based on the 2015 VBLM there are 7,513 net buildable acres. At a potential of 7 dwelling units per acre and 2.66 persons per household, this land area will accommodate 136,820 persons. The Urban Growth estimate is 118,114 persons, and the January 1, 2015 Clark County population estimate is 448,845. Therefore, the 2015 VBLM has capacity to accommodate the anticipated Urban Growth population estimate.

- Based on the 2015 VBLM, there are 2,057 net buildable commercial acres and 3,982 net buildable industrial acres. Thus, there is potential job capacity of 76,978 plus the public sector jobs that are not included in the vacant and buildable lands model, and including 16,775 jobs that will occur from redevelopment totaling 101,153 potential jobs.

- Based on the existing zoning, the total vacant and development potential in the rural area is approximately 9,390 lots. Assuming 2.66 persons per household, there is capacity to add 24,977 persons in the rural areas.

- See Appendix D for the City of Ridgefield's planning consultants reply, Elizabeth Decker, on the observed density surplus.

In conclusion, based on observed density and the 2015 VBLM, Battle Ground, Camas and La Center show small deficits. If residential development continues to develop at the observed densities, then this deficit might become true by 2035. It is important to note that the observed densities occurred at a period of a deep recession having a significant impact to development occurring in the housing sector. However, Battle Ground, Camas, La Center, Ridgefield, Vancouver, Washougal and Clark County have adopted local development regulations that may reflect higher density development within the planning horizon.

Commercial and Industrial Needs Analysis

In 2014, the Board of County Commissioners chose to plan for a total of 91,200 net new jobs. The County has an estimated capacity of 101,153 jobs as follows: The 2015 VBLM, indicates a capacity of 76, 978 jobs. The cities of Battle Ground, La Center, and Ridgefield, have indicated they have additional capacity to accommodate 16, 755 jobs. Publicly owned land is not included in the model, therefore we assume that the 7,400 new public sector jobs estimated by ESD will occur on existing publicly owned facilities.

Residential Capacity Analysis

Tables 5-7 on the following pages provide the vacant buildable lands per urban growth area in the residential, commercial and industrial areas based on the 2015 VBLM. Countywide there are 7,513 net buildable residential acres with a capacity of 136,820 residents. See Appendix C for the Vacant Buildable Lands Model planning assumptions.

Table 5
Residential Capacity Analysis, 2015

Jurisdiction	Gross Acres	Net Acres	House holds	Population Capacity	Average Density per Net Acre
Battle Ground					
City	1,620.6	737.8	4,427	11,774	**6**
UGA	750.9	332.0	1,992	5,299	**6**
Total	2,371.5	1,069.8	6,419	17,073	**6**
Camas					
City	1,561.3	700.2	4,201	11,174	**6**
UGA	432.2	192.2	1,153	3,067	**6**
Total	1,993.5	892.3	5,354	14,242	**6**
La Center					
City	574.4	251.4	1,006	2,675	**4**
UGA	314.1	121.8	487	1,296	**4**
Total	888.5	373.2	1,493	3,971	**4**
Ridgefield					
City	1,583.2	654.0	3,924	10,438	**6**
UGA	858.2	355.2	2,131	5,669	**6**
Total	2,441.3	1,009.2	6,055	16,108	**6**
Vancouver					
City	1,208.4	567.1	4,536	12,067	**8**
UGA	6,764.4	3,055.4	24,443	65,019	**8**
Total	7,972.8	3,622.5	28,980	77,086	**8**
Washougal					
City	578.6	255.2	1,531	4,074	**6**
UGA	499.2	221.4	1,328	3,533	**6**
Total	1,077.8	476.6	2,860	7,606	**6**
Yacolt					
City	65.1	36.4	146	388	**4**
UGA	16.4	7.3	29	77	**4**
Total	81.6	43.7	175	465	**4**
Woodland					
City	5.8	2.0	8	21	**4**
UGA	88.9	23.3	93	247	**4**
Total	94.8	25.2	101	269	**4**
URBAN TOTAL	**16,921.7**	7,512.6	**51,436**	**136,820**	**7**
Urban Growth Estimate				**118,114**	

Source: Clark County Community Planning and VBLM 2015

Note: Residential market factor is included in the land capacity target.

Table 6
Rural Capacity Analysis, 2014

Comprehensive Plan Designation	Conforming Vacant Lots			Undersized Vacant Lots (no minimum lot size)	Total Potential Vacant Lots	Rural Capacity
	Current	Potential Dividable	Total			
R-5	1,203	2,648	3,851	1,470	5,321	14,154
R-10	146	536	682	475	1,157	3,078
R-20	19	33	52	70	122	325
FR-40	34	90	124	643	767	2,040
FR-80	21	609	630	307	937	2,492
AG-20	156	432	588	498	1,086	2,889
Total Rural	**1,579**	**4,348**	**5,927**	**3,463**	**9,390**	**24,977**

Source: Clark County GIS

Table 7
Commercial and Industrial Capacity Analysis

Jurisdiction	COMMERCIAL			INDUSTRIAL			
	Gross Acres	Net Acres	Jobs	Gross Acres	Net Acres	Jobs	Total Jobs
Battle Ground							
City	591.4	372.5	7,449	335.3	177.3	1,596	9,045
UGA	59.0	39.5	790	28.8	10.9	98	888
Total	650.4	411.9	8,239	364.1	188.3	1,694	9,933
Camas							
City	514.3	337.2	6,744	846.1	456.9	4,112	10,856
UGA	0.0	0.0	0	76.7	36.2	326	326
Total	514.3	337.2	6,744	922.8	493.1	4,438	11,182
La Center							
City	63.6	44.2	884	83.3	48.2	434	1,318
UGA	0.0	0.0	0	1.1	0.7	6	6
Total	63.6	44.2	884	84.4	48.8	440	1,324
Ridgefield							
City	270.1	179.3	3,587	942.0	506.2	4,556	8,143
UGA	17.8	12.2	245	65.5	35.6	321	565
Total	287.9	191.6	3,831	1,007.4	541.8	4,877	8,708
Vancouver							
City	519.9	369.1	7,383	2,706.5	1,391.1	12,520	19,903
UGA	868.3	604.2	12,083	1,861.1	1,022.4	9,202	21,285
Total	1,388.3	973.3	19,466	4,567.7	2,413.5	21,722	41,188
Washougal							
City	83.8	56.3	1,126	167.8	62.9	566	1,693
UGA	45.5	31.8	635	343.0	205.2	1,847	2,482
Total	129.3	88.1	1,762	510.8	268.1	2,413	4,175
Yacolt							
City	14.1	10.6	211	9.7	6.5	59	270
UGA	0.0	0.0	0	39.6	21.9	198	198
Total	14.1	10.6	211	49.2	28.5	256	468
Woodland							
City	0.0	0.0	0	0.0	0.0	0	0
UGA	0.0	0.0	0	0.0	0.0	0	0
Total	0.0	0.0	0	0.0	0.0	0	0
Urban Job Total	**3,047.8**	**2,056.9**	**41,138**	**7,506.4**	**3,982.2**	**35,840**	**76,978**
Public Sector							**7,400**
Redevelopment							**16,775**
Employment Growth Target							**101,153**

Source: Clark County Community Planning and VBLM 2015. Note: In February 2014, Clark County received an application for the establishment of an Industrial Land Bank on 601 acres with a potential of 5,400 jobs.

DEVELOPMENT TRENDS, 2006-2014

Residential

Monitoring building permits provides a measure of the level of construction activity and the rate at which residential land is being developed. Table 8 on the following page shows the number of new single-family and multi-family building permits issued, and the single-family and multi-family split from July 1, 2006 to December 31, 2014 for each of the Urban Growth Areas. Single family includes single-family residential, accessory dwelling units (ADU), and mobile homes (on individual lots). Multi-family includes multi-family residential, duplexes, and new mobile home parks. For the residential split, Countywide Planning Policy 1.1.12 in the 2007 Clark County Comprehensive Plan specifies that no more than 75 percent of new dwelling units to be a specific product type (i.e. single-family housing). See Appendix C for an annual breakdown of each jurisdiction's building permits.

Table 8

Single- and Multi-Family Building Permits, 2006-2014

Jurisdiction		Single-Family			Multi-Family			Total		
		Units	*%SF*	*Acres*	*Units*	*%MF*	*Acres*	*Units*	Acres	Units/ Acre
Battle Ground										
	City	506	**64%**	175.1	280	**36%**	11.8	786	187	4.2
	UGA	45	**100%**	62.2	0	**0%**	0	45	62	0.7
Sub Total		551	**66%**	237.3	280	**34%**	11.8	831	249	3.3
Camas										
	City	803	**72%**	267.9	306	**28%**	20.7	1,109	289	3.8
	UGA	21	**100%**	9.3	0	**0%**	0	21	9	2.3
Sub Total		824	**73%**	277.2	306	**27%**	20.7	1,130	298	3.8
La Center										
	City	66	**100%**	34	0	**0%**	0	66	34	1.9
	UGA	7	**100%**	13.2	0	**0%**	0	7	13	0.5
Sub Total		72	**100%**	47.2	0	**0%**	0	73	47	1.5
Ridgefield										
	City	680	**99%**	130.3	4	**1%**	0.2	684	131	5.2
	UGA	5	**100%**	62	0	**0%**	0	5	62	0.1
Sub Total		685	**99%**	192.3	4	**1%**	0.2	689	193	3.6
Vancouver										
	City	1,728	**38%**	271.5	2,838	**62%**	135	4,566	406	11.2
	UGA	4,534	**79%**	1006	1,220	**21%**	51.8	5,754	1,058	5.4
Sub Total		6,262	**61%**	1277	4,058	**39%**	186.9	10,320	1,464	7
Washougal										
	City	547	**77%**	99	163	**23%**	7.9	710	107	6.6
	UGA	7	**100%**	40.4	0	**0%**	0	7	40	0.2
Sub Total		554	**77%**	139.4	163	**23%**	7.9	717	147	4.9
Yacolt										
	City	51	**100%**	15	0	**0%**	0	51	15	3.4
	UGA	0	**0%**	0	0	**0%**	0	0	0	0
Sub Total		51	**100%**	15	0	**0%**	0	51	15	3.4
Clark County Rural		1,383	**100%**	7785.8	5	**0%**	15.6	1,388	7,801	0.2
Total Cities		4,381	**55%**	992.7	3,591	**45%**	175.7	7,972	1,168	6.8
Total UGAs		4,619	**79%**	1193.1	1,220	**21%**	51.8	5,839	1,245	4.7
Grand Total		9,000	**65%**	2185.8	4,811	**35%**	227.5	13,811	2,413	5.7

Source: Clark County Community Planning,

Chart 2 and chart 3 below show single-family and multi-family development by City from 2006 to 2014.

Chart 2
New Single-Family Development Density by City, 2006-2014

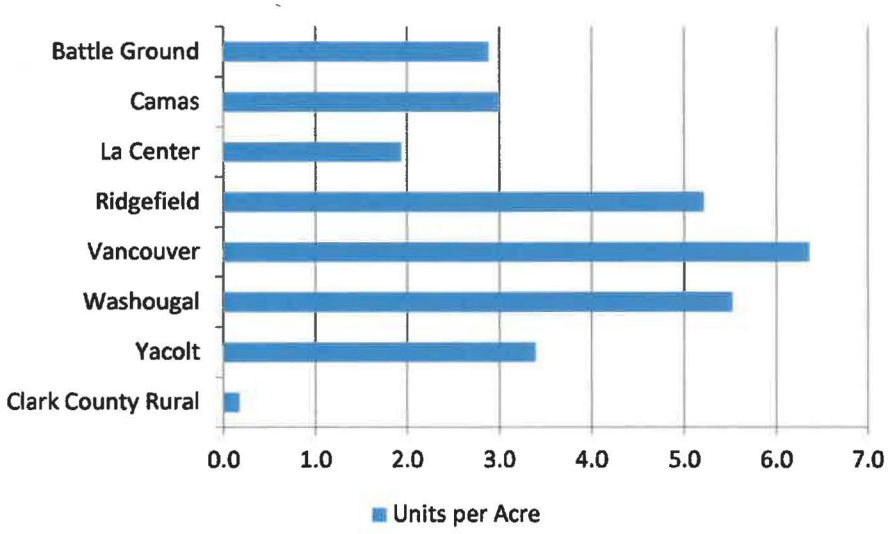
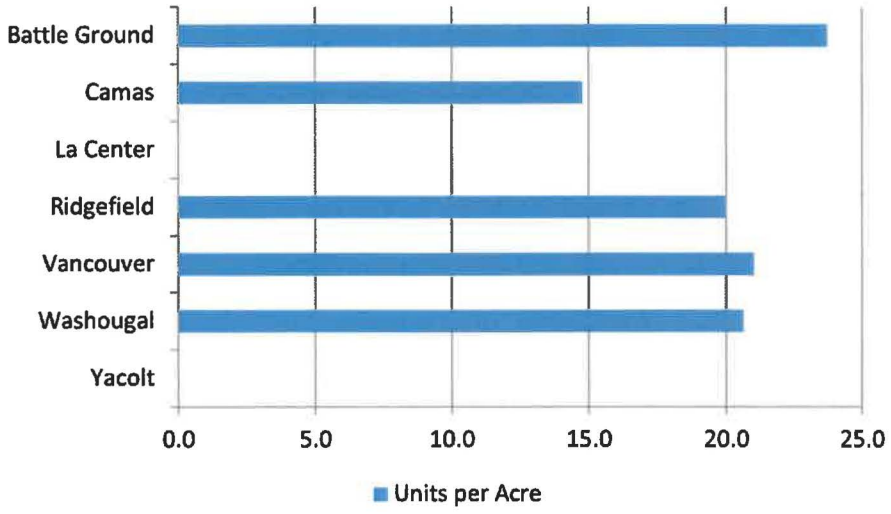


Chart 3
New Multi-Family Development Density by City, 2006-2014



Between 2006 and 2014:

- City of Vancouver achieved a density of 11.2 units per acre.
- City of Battle Ground's multi-family residential land developed at 23.7 dwelling units per acre.
- Overall, observed density on Single- & Multi-family residential dwelling units per acre is 5.7.
- The unincorporated portion of the Vancouver UGA achieved a 79% single-family and 21% multi-family residential split which exceeds the County-wide planning policy of no more than 75% of the new housing stock of a single product type.
- The VUGA reported average of 7.0 units per acre appears to have been reduced by a very small number of developments on existing large properties in the Urban Holding zone and other properties with extensive critical areas. Data indicates new single family lots are becoming smaller. The median size of new residential lots in urban density zones created since 2007 was 5,400 sq.ft. within the City of Vancouver, 5,900 sq.ft. within the unincorporated Vancouver UGA.

Non-residential

Data on commercial building permits issued from July 1, 2006 through December 31, 2014 was collected (Table 9). Tenant improvements were excluded unless the improvement resulted in an increase of building square footage. The parcel serial number from each building permit was linked to a GIS coverage to determine the parcel size, geography and critical area. Commercial building permits include commercial, industrial and multi-family development. Table 10 below reflects industrial building permits sorted by comprehensive plan designation for industrial uses. The Department Information and Technology provided information for both tables below that are shown as net acres. See Appendix B for Commercial and Industrial Building Permits by Year and Jurisdiction.

Table 9
Commercial Building Permits by UGA

UGA	Number of Permits	Acre	Critical Acres	Percent Critical
Battle Ground	63	224.8	168.1	75%
Camas	27	102.8	16.9	16%
La Center	2	4.5	0.3	7%
Ridgefield	6	33.5	12.6	38%
Vancouver	293	1,539.2	547.9	36%
Washougal	2	2.2	1.1	50%
Yacolt	1	1.1	0.0	0%
Total	**394**	**1,908.0**	**747.0**	39%
Rural	**19**	**795.7**	**552.6**	69%
County Total	**413**	**2,703.6**	**1,299.6**	48%

Table 10
Industrial Building Permits by UGA

UGA	Number of Permits	Acres	Critical Acres	Percent Critical
Battle Ground	2	2.2	1.4	66%
Ridgefield	4	26.1	10.7	41%
Vancouver	68	465.6	222.0	48%
Washougal	1	1.2	1.2	101%
Total	**75**	**495.0**	**235.2**	48%
Rural	**4**	**173.4**	**130.1**	75%
County Total	**79**	**668.3**	**365.4**	55%

Observations

- Based on commercial building permits issued, development occurred on 2,703.6 acres of commercially designated land and 668.3 acres of industrial designated land.

Employment Density Methodology

Information for employment below is based on new construction permits from July 1, 2006 to June 30, 2014. The building permit information was matched to parcels and employment locations to obtain acres and employment. In table 11, a total of 224 records matched between the new construction permits and the employment records. Commercial values include the following permit types: commercial, institutional, office and retail permit types. Industrial values include industrial permit types.

Table 11
Commercial and Industrial Employment Density

		Urban Growth Area								
		Battle Ground	Camas	LaCenter	Ridgefield	Vancouver	Washougal	Yacolt	Rural	Grand Total
Commercial	Employees	882	127	22	223	15,523	0	0	195	16,972
	Acres	79	11	5	14	1,462	0	0	249	1,819
	Employees per Acre	11.1	11.7	4.7	16.3	10.6	0.0	0.0	0.8	**9.3**
Industrial	Employees	21	0	0	12	3,043	7	0	10	3,093
	Acres	1	0	0	2	273	1	0	7	284
	Employees per Acre	23.7	0.0	0.0	6.0	11.1	6.0	0.0	1.4	**10.9**

Source: Clark County GIS

Observations

A caveat of the observations below is that they are from a limited set of employment data.

- The planning assumptions applied in 2007 were based on employees per net acre; twenty (20) for commercial and nine (9) for industrial. The result is that the observed densities are lower than the 2007 planning assumptions.
- From 2006 to 2014, new permits show employees per net acre for commercial at 9.3 employees per acre and industrial at 10.9 employees per net acre.
- Clark County has seen employment gains from 2006 to 2014. It is likely that some businesses have added employees, which would not require new building permits and may account for the low employment density reported.

Development on Constrained Parcels

Background and Relevance

Tracking development on parcels with critical lands provides an indicator of impacts from growth to the environment and illustrates the general effectiveness of environmental protection measures. It is also an indicator of land demand. When there is a high demand for land, development tends to occur more frequently on areas that are more difficult to develop. Critical lands are identified in Clark County code Title 40 Unified Development.

Data Collection

Only the constrained portion of a parcel is identified in the VBLM. Table 12 illustrates the percent of vacant and underutilized constrained land that converted to built by UGA for residential, commercial and industrial land from 2007 to 2014. The critical layer is based on best available science, and includes a new slopes layer and the most recent habitat and species information. See Appendix C for a description of constrained acres.

Table 12
Vacant and Underutilized Land Converted to Built, 2007-2014

Urban Growth Area	Residential			Commercial			Industrial		
	Total Converted to Built (Acres)	Of Total Built-Converted w/Constraints (Acres)	Percent Built w/Constraints	Total Converted to Built (Acres)	Of Total Built-Converted w/Constraints (Acres)	Percent Built w/Constraints	Total Converted to Built (Acres)	Of Total Built-Converted w/Constraints (Acres)	Percent Built w/Constraints
Battle Ground	286	190	66.5%	105	74	70.3%	105	91	86.2%
Camas	366	228	62.4%	13	5	40.1%	124	82	66.0%
La Center	23	7	29.2%	5	4	82.7%	0	0	0.0%
Ridgefield	322	162	50.4%	16	10	62.3%	189	87	46.2%
Vancouver	1,577	526	33.3%	338	96	28.6%	626	237	37.8%
Washougal	152	65	42.7%	11	4	34.6%	83	46	55.0%
Woodland	0	0	0.0%	0	0	0.0%	0	0	0.0%
Yacolt	14	6	40.7%	1	0	0.0%	0	0	0.0%
Total UGAs	**2,739**	**1,183**	**43.2%**	**489**	**193**	**39.6%**	**1,126**	**542**	**48.1%**

Source: Community Planning and Clark County GIS

Observations

Between 2007 and 2014:

- 1,183 acres of residential development occurred on parcels with some constrained areas, or 43.2%.
- 193 acres of commercial development occurred on parcels with some constrained areas or 39.6%.
- 542 acres of industrial development occurred on parcels with some constrained areas or 48.1%

Infrastructure Analysis

Background and Relevance

Land used for infrastructure is not available for housing or employment development. It is important to know the amount of available land that will be needed to provide the necessary infrastructure for development. This indicator will help calculate the amount of land needed for growth.

Data Collection

The 2007 Comprehensive Growth Management Plan assumed infrastructure will consist of 27.7 percent for residential development and 25 percent for industrial and commercial development. The Vacant Buildable land model comparison report provides a breakdown of easements & infrastructure by residential, industrial, and commercial land. Table 13 below shows percentages of residential, commercial and industrial portions of vacant and underutilized land that converted to infrastructure from January 1, 2007 to December 31, 2014.

Table 13
Infrastructure Summary

Easement & Infrastructure	Residential Acres	Percent of Residential Converted to Infrastructure	Commercial Acres	Percent of Commercial Converted to Infrastructure	Industrial Acres	Percent of Industrial Converted to Infrastructure
Vacant & Underutilized Land (2007)	2,739.4		488.7		1,126.4	
Easements & Right of Way	213.8	7.8%	46.8	9.6%	66.4	5.9%
Schools	10.2	0.4%	0.0	0.0%	0.0	0.0%
Public Lands (Except Right of Way)	171.0	6.2%	29.4	6.0%	123.8	11.0%
Greenway (Public & Private)	339.0	12.4%	19.6	4.0%	51.9	4.6%
Easement & Infrastructure Total	**733.9**	**26.8%**	**95.7**	**19.6%**	**242.2**	**21.5%**

Source: Clark County Community Planning and Clark County GIS.

Note: In 2012, the County acquired the Leichner industrial properties of 120.96. It was not included in this table as it is under remedial action through a consent decree under the Jurisdiction of Washington State Department of Ecology.

Observations

From January 1, 2007 to December 31, 2014, Residential easements and infrastructure consumed less than the assumed 27.7 percent of development. About 734 acres or 26.8 percent of residential vacant and underutilized land converted to infrastructure in all UGAs. For commercial, almost 96 acres or 19.6% converted to infrastructure. Industrial had 242 acres converted to infrastructure or 21.5%. There have been recent changes to Stormwater regulations that may lead to more land being set aside for the retention of stormwater. However, there is insufficient development data under the new regulations to warrant a change to the planning assumptions. This is an area we will continue to monitor and update, as necessary.

The data collected for this report is available online at http://www.clark.wa.gov/planning/comp_plan/monitoring.html#capacity or via CD-ROM from Clark County Community Planning.

APPENDIX A – Residential Building Permits by Year and Jurisdiction

The following residential tables are reported by year from July 1, 2006 to December 31, 2014 for each jurisdiction and assembled by Clark County Community Planning.

Table 1
Rural Annual Residential Development

Clark County	2006			2007			2008			2009			2010			2011			2012			2013			2014			Total 2006-2014		
Single Family	Units	Acres Used	Units /Acre	Units	Acres Used	Units /Acre	Units	Acres Used	Units/ Acre	Units	Acres Used	Units/ Acre	Units	Acres Used	Units /Acre	Units	Acres Used	Units/ Acre	Units	Acres Used	Units /Acre	Units	Acres Used	Units/ Acre	Units	Acres Used	Units/ Acre	Units	Acres Used	Units /Acre
Rural	198	1,268.2	0.2	286	1,501.2	0.2	150	872.8	0.2	105	644.5	0.2	109	520.8	0.2	85	412.3	0.2	112	681.2	0.2	168	894.8	0.2	171	989.9	0.2	1,384	7,785.8	0.2
Multi-Family																														
Rural	0			0			0			0			0			1	0.9		1	5.3		1	3.2		2	6.2		5	15.6	0.3
Total Rural	**198**			**286**	**1,501.2**	**0.2**	**150**	**872.8**	**0.2**	**105**	**644.5**	**0.2**	**109**	**520.8**	**0.2**	**86**	**413.2**	**0.2**	**113**	**686.5**	**0.2**	**169**	**898.0**	**0.2**	**173**	**996.1**	**0.2**	**1,389**	**7,801.4**	**0.2**

Table 2
Battle Ground Annual Residential Development

Battle Ground	2006			2007			2008			2009			2010			2011			2012			2013			2014			Total 2006-2014		
Single Family	Units	Acres Used	Units /Acre	Units	Acres Used	Units/ Acre	Units	Acres Used	Units/ Acre	Units	Acres Used	Units/ Acre	Units	Acres Used	Units /Acre	Units	Acres Used	Units/ Acre	Units	Acres Used	Units /Acre	Units	Acres Used	Units/ Acre	Units	Acres Used	Units/ Acre	Units	Acres Used	Units /Acre
City	23	7.5	3.1	86	17.6	4.9	66	38.4	1.7	47	16.6	2.8	59	21.3	2.8	32	8.9	3.6	41	19.6	2.1	70	22.4	3.1	82	22.8	3.6	506	175.1	2.9
UGA	4	7.1	0.6	7	7.2	1.0	2	2.2	0.9	3	3.1	1.0	7	8.0	0.9	5	6.8	0.7	6	9.6	0.6	7	10.7	0.7	4	7.6	0.5	45	62.2	0.7
Multi-Family																														
City	0			20	1.4	14.6	4	0.4	10.5	80	4.3	18.5	0			24	0.8	30.3	30	1.0	30.3	122	4.0	30.7	0			280	11.8	23.7
Total UGA	**27**	**14.7**	**1.8**	**113**	**26.1**	**4.3**	**72**	**40.9**	**1.8**	**130**	**23.9**	**5.4**	**66**	**29.3**	**2.3**	**61**	**16.5**	**3.7**	**77**	**30.2**	**2.6**	**199**	**37.1**	**5.4**	**86**	**30.4**	**2.8**	**831**	**249.1**	**3.3**

Table 3
Camas Annual Residential Development

Camas	2006			2007			2008			2009			2010			2011			2012			2013			2014			Total 2006-2014		
Single Family	Units	Acres Used	Units /Acre	Units	Acres Used	Units /Acre	Units	Acres Used	Units/ Acre	Units	Acres Used	Units/ Acre	Units	Acres Used	Units /Acre	Units	Acres Used	Units/ Acre	Units	Acres Used	Units /Acre	Units	Acres Used	Units/ Acre	Units	Acres Used	Units/ Acre	Units	Acres Used	Units /Acre
City	59	24.8	2.4	91	86.2	1.1	58	10.5	5.5	65	17.3	3.8	127	37.7	3.4	60	12.7	4.7	68	15.8	4.3	116	30.0	3.9	159	32.8	4.8	803	267.6	3.0
UGA	0			0			0			1	1.1	1.0	0			3	1.0	2.9	3	0.5	6.5	5	0.7	7.7	9	6.1	1.5	21	9.3	2.3
Multi-Family																														
City	20	1.4	14.1	23	1.9	12.4	25	1.6	16.1	11	0.6	18.3	63	3.6		0			67	6.09	11.0	10	0.5	19.6	87	5.1	17.1	306	20.8	14.7
Total UGA	**79**	**26.2**	**3.0**	**114**	**88.0**	**1.3**	**83**	**12.0**	**6.9**	**77**	**19.0**	**4.1**	**190**	**41.3**	**4.6**	**63**	**13.8**	**4.6**	**138**	**22.3**	**6.2**	**131**	**31.1**	**4.2**	**255**	**44.0**	**5.8**	**1130**	**297.7**	**3.8**

Table 4
La Center Annual Residential Development

La Center	2006			2007			2008			2009			2010			2011			2012			2013			2014			Total 2006-2014		
Single Family	Units	Acres Used	Units /Acre	Units	Acres Used	Units/ Acre	Units	Acres Used	Units/ Acre	Units	Acres Used	Units/ Acre	Units	Acres Used	Units /Acre	Units	Acres Used	Units/ Acre	Units	Acres Used	Units /Acre	Units	Acres Used	Units/ Acre	Units	Acres Used	Units/ Acre	Units	Acres Used	Units /Acre
City	2	5.3	0.4	14	5.5	2.6	6	1.3	4.7	4	0.6	6.6	12	1.94	6.2	6	6.2	1.0	5	1.0	5.2	11	11.2	1.0	6	1.06	5.7	66	34.0	1.9
UGA	0			1	1.5		0			0			0			2	7.5	0.3	2	2.0	1.0	1	1.2	0.9	1	1.0	1.0	7	13.2	0.5
Multi-Family																														
City	0			0			0			0			0			0			0			0			0			0		
Total UGA	**2**	**5.3**	**0.4**	**15**	**7.0**	**2.2**	**6**	**1.3**	**4.7**	**4**	**0.6**	**6.6**	**12**	**1.9**	**6.2**	**8**	**13.7**	**0.6**	**7**	**3.0**	**2.3**	**12**	**12.3**	**1.0**	**7**	**2.1**	**3.4**	**73**	**47.2**	**1.5**

Table 5
Ridgefield Annual Residential Development

Ridgefield	2006			2007			2008			2009			2010			2011			2012			2013			2014			Total 2006-2014		
Single Family	Units	Acres Used	Units /Acre	Units	Acres Used	Units/ Acre	Units	Acres Used	Units/ Acre	Units	Acres Used	Units/ Acre	Units	Acres Used	Units /Acre	Units	Acres Used	Units/ Acre	Units	Acres Used	Units /Acre	Units	Acres Used	Units/ Acre	Units	Acres Used	Units/ Acre	Units	Acres Used	Units /Acre
City	59	28.0	2.1	49	8.1	6.1	26	13.0	2.0	27	4.4	6.1	77	10.3	7.5	55	10.9	5.1	117	16.1	7.3	174	24.4	7.1	96	15.1	6.4	680	130.3	5.2
UGA	1	39.4		1	4.3		0			0			1	10.8		0			1	5.1	0.2	1	2.4	0.4	0			5	62.0	0.1
Multi-Family																														
City	0			4	0.2		0			0			0			0			0			0			0			4	0.2	18.2
Total UGA	**60**	**67.4**	**0.9**	**54**	**12.6**	**4.3**	**26**	**13.0**	**2.0**	**27**	**4.4**	**6.1**	**78**	**21.1**	**3.7**	**55**	**10.9**	**5.1**	**118**	**21.2**	**5.6**	**175**	**26.8**	**6.5**	**96**	**15.1**	**6.4**	**689**	**192.5**	**3.6**

Table 6
Vancouver Annual Residential Development

Vancouver	2006			2007			2008			2009			2010			2011			2012			2013			2014			Total 2006-2014		
Single Family	Units	Acres Used	Units /Acre	Units	Acres Used	Units/ Acre	Units	Acres Used	Units/ Acre	Units	Acres Used	Units/ Acre	Units	Acres Used	Units /Acre	Units	Acres Used	Units/ Acre	Units	Acres Used	Units /Acre	Units	Acres Used	Units/ Acre	Units	Acres Used	Units/ Acre	Units	Acres Used	Units /Acre
City	148	38	3.9	418	50	8.4	222	40	5.5	120	20	5.9	127	19	6.6	92	14	6.4	182	31	6.0	216	31	7.0	203	28	7.2	1,728	271.2	6.4
UGA	464	80	5.8	953	190	5.0	449	69	6.5	317	55	5.7	401	87	4.6	233	65	3.6	397	88	4.5	646	182	3.5	674	190	3.5	4,534	1,006.2	4.5
Multi-Family																														
City	403	15	26.8	445	33	13.6	237	12	19.8	73	7	10.2	67	2	40.4	92	2	37.2	305	15	20.9	615	28	21.9	601	21	28.2	2,838	135.1	21.0
UGA	5	0	13.5	127	2	53.1	29	1	56.3	2	0	13.3	18	1	21.7	206	3	61.3	163	10	16.9	583	25	22.9	87	9	9.4	1,220	52.0	23.5
Total UGA	**1020**	**133**	**7.7**	**1943**	**276**	**7.1**	**937**	**122**	**7.7**	**512**	**83**	**6.2**	**613**	**108**	**5.7**	**623**	**85**	**7.3**	**1047**	**143**	**7.3**	**2060**	**267**	**7.7**	**1565**	**249**	**6.3**	**10,320**	**1,464.5**	**7.0**

Table 7
Washougal Annual Residential Development

Washougal	2006			2007			2008			2009			2010			2011			2012			2013			2014			Total 2006-2014		
Single Family	Units	Acres Used	Units /Acre	Units	Acres Used	Units/ Acre	Units	Acres Used	Units/ Acre	Units	Acres Used	Units/ Acre	Units	Acres Used	Units /Acre	Units	Acres Used	Units/ Acre	Units	Acres Used	Units /Acre	Units	Acres Used	Units/ Acre	Units	Acres Used	Units/ Acre	Units	Acres Used	Units /Acre
City	0			122	24.0	5.1	69	11.1	6.2	22	3.9	5.6	45	7.6	5.9	61	9.3	6.5	49	9.3	5.3	101	18.6	5.4	78	15.3	5.1	547	99.0	5.5
UGA	0			2	2.4		0			0			0			1	1.4		1	1.5	0.7	1	5.0	0.2	2	30.1		7	40.4	0.2
Multi-Family																														
City	0			144	6.9		19	1.0		0			0			0			0			0			0			163	7.9	20.6
Total UGA	**0**			**268**	**33.2**	**8.1**	**88**	**12.2**	**7.2**	**22**	**3.9**	**5.6**	**45**	**7.6**	**5.9**	**62**	**10.7**	**5.8**	**50**	**10.8**	**4.6**	**102**	**23.6**	**4.3**	**80**	**45.4**	**1.8**	**717**	**147.3**	**4.9**

Table 8
Yacolt Annual Residential Development

Yacolt	2006			2007			2008			2009			2010			2011			2012			2013			2014			Total 2006-2014		
Single Family	Units	Acres Used	Units /Acre	Units	Acres Used	Units/ Acre	Units	Acres Used	Units/ Acre	Units	Acres Used	Units/ Acre	Units	Acres Used	Units /Acre	Units	Acres Used	Units/ Acre	Units	Acres Used	Units /Acre	Units	Acres Used	Units/ Acre	Units	Acres Used	Units/ Acre	Units	Acres Used	Units /Acre
City	15	4.8		7	1.8	3.9	14	4.9	2.9	5	1.3	3.9	8	1.8	4.4	1	0.2	5.6	0			0			1	0.2	4.3	51	15.0	3.4
Total UGA	**15**	**4.8**		**7**	**1.8**	**3.9**	**14**	**4.9**	**2.9**	**5**	**1.3**	**3.9**	**8**	**1.8**	**4.4**	**1**	**0.2**	**5.6**	**0**			**0**			**1**	**0.2**	**4.3**	**51**	**15.0**	**3.4**

APPENDIX B – Commercial & Industrial Building Permits by Year and Jurisdiction

The following commercial and industrial tables are reported by year for each jurisdiction from July 1, 2006 to December 31, 2014, and are from Clark County Information Technology.

Table 1
Battle Ground Annual Commercial and Industrial Permits

Battle Ground UGA	Year Issued	Number of Permits	Acres	Critical Acres	Percent Critial
Commercial	2006	7	15.3	13.3	87%
	2007	15	84.4	70.3	83%
	2008	17	40.9	28.6	70%
	2009	2	10.2	9.7	95%
	2010	6	23.9	20.4	85%
	2011	1	10.0	9.5	95%
	2012	2	1.5	1.3	86%
	2013	8	31.7	11.5	36%
	2014	5	6.9	3.7	53%
Commercial Total		**63**	**224.8**	**168.1**	**75%**
Industrial	2013	1	0.9	0.1	15%
	2014	1	1.3	1.3	100%
Industrial Total		**2**	**2.2**	**1.4**	**66%**

Table 2
Camas Annual Commercial Permits

Camas UGA	Year Issued	Number of Permits	Acres	Critical Acres	Percent Critical
Commercial	2007	3	3.2	0.2	5%
	2008	4	16.3	0.6	4%
	2009	2	22.8	1.9	8%
	2010	2	16.6	5.7	34%
	2011	6	22.8	0.2	1%
	2013	2	18.4	8.4	46%
	2014	8	2.7	0.0	0%
Commercial Total		**27**	**102.8**	**16.9**	**16%**

Table 3
La Center Annual Commercial Permits

La Center UGA	Year Issued	Number of Permits	Acres	Critical Acres	Percent Critical
Commercial	2007	1	4.2	0.3	8%
	2013	1	0.2	0.0	0%
Commercial Total		**2**	**4.5**	**0.3**	**7%**

Table 4
Ridgefield Annual Commercial and Industrial Permits

Ridgefield UGA	Year Issued	Number of Permits	Acres	Critical Acres	Percent Critical
Commercial	2006	3	14.0	11.0	79%
	2013	1	5.7	0.4	7%
	2014	2	13.8	1.1	8%
Commercial Total		**6**	**33.5**	**12.6**	**38%**
Industrial	2007	1	2.3	1.5	65%
	2008	3	23.8	9.2	39%
Industrial Total		**4**	**26.1**	**10.7**	**41%**

Table 5
Vancouver Annual Commercial and Industrial Permits

Vancouver UGA	Year Issued	Number of Permits	Acres	Cricial Acres	Percent Critical
Commercial	2006	34	67.9	24.1	36%
	2007	53	338.0	101.6	30%
	2008	49	230.0	81.3	35%
	2009	25	226.5	59.4	26%
	2010	32	99.1	14.0	14%
	2011	27	142.2	110.5	78%
	2012	24	57.9	5.7	10%
	2013	15	119.4	11.6	10%
	2014	34	258.2	139.7	54%
Commercial Total		**293**	**1,539.2**	**547.9**	**36%**
Industrial	2006	7	15.0	0.2	1%
	2007	15	41.2	17.6	43%
	2008	13	215.7	91.5	42%
	2009	7	50.5	17.1	34%
	2010	3	5.1	0.0	0%
	2011	6	43.9	25.7	59%
	2012	8	43.8	27.9	64%
	2013	4	38.7	38.5	100%
	2014	5	11.8	3.5	30%
Industrial Total		**68**	**465.6**	**222.0**	**48%**

Table 6
Washougal Annual Commercial and Industrial Permits

Washougal UGA	Year Issued	Number of Permits	Acres	Critical Acres	Percent Critical
Commercial	2010	1	1.1	1.1	100%
	2014	1	1.1	0.0	0%
Commercial Total		**2**	**2.2**	**1.1**	**50%**
Industrial	2014	1	1.2	1.2	100%
Industrial Total		**1**	**1.2**	**1.2**	**100%**

Table 7
Yacolt Annual Commercial Permits

Yacolt UGA	Year Issued	Number of Permits	Acres	Cricial Acres	Percent Critical
Commercial	2012	1	1.1	0.0	0%
Commercial Total		**1**	**1.1**	**0.0**	**0%**

Table 8
Rural Clark County Commercial and Industrial Permits

Rural Clark County	Year Issued	Number of Permits	Acres	Cricial Acres	Percent Critical
Commercial	2006	3	6.0	3.7	62%
	2007	3	212.5	170.1	80%
	2009	3	46.4	32.2	69%
	2010	2	9.5	5.5	58%
	2011	3	316.5	192.6	61%
	2013	4	202.3	148.5	73%
	2014	1	2.5	0.0	0%
Commercial Total		**19**	**795.7**	**552.6**	**69%**
Industrial	2007	1	7.3	7.1	97%
	2009	2	15.0	4.9	33%
	2011	1	151.1	118.2	78%
Industrial Total		**4**	**173.4**	**130.1**	**75%**

APPENDIX C – VACANT BUILDABLE LANDS MODEL

The Vacant Buildable Lands Model (VBLM) is a planning tool developed to analyze residential, commercial, and industrial lands within urban growth areas. The model serves as a tool for evaluating urban area alternatives during Clark County 20-year Comprehensive Growth Management Plan updates and for monitoring growth patterns during interim periods. The VBLM analyzes potential residential and employment capacity of each urban growth area within the county based on vacant and underutilized land classifications. This potential capacity is used to determine the amount of urban land needed to accommodate projected population and job growth for the next 20 years during plan updates and to analyze land consumption or conversion rates on an annual basis for plan monitoring purposes.

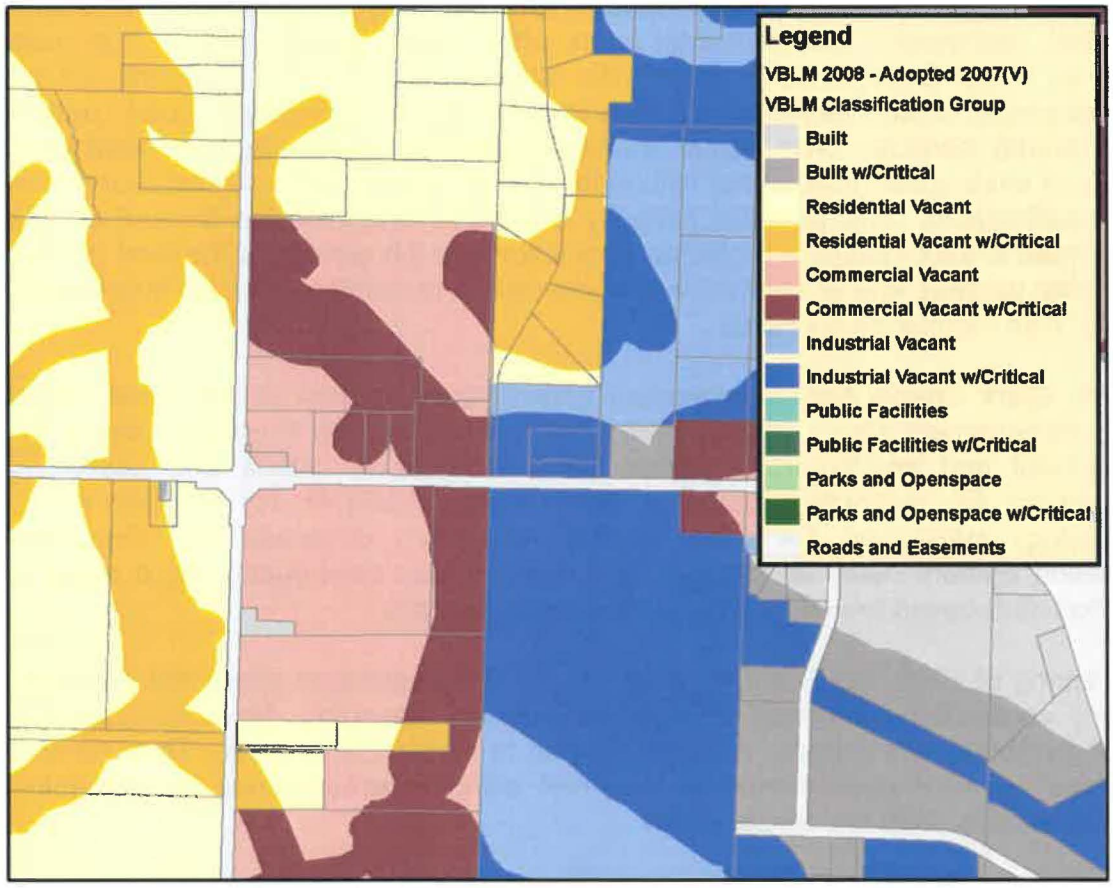
In 1992, Clark County began evaluating vacant lands as part of the initial 20-year growth management plan. At that time, County staff met with interested parties from development and environmental communities to examine criteria and establish a methodology for computing potential land supply available for development. A methodology relying on the Clark County Assessor's database and Geographic Information System (GIS) as primary data sources was developed. As a result the VBLM is a GIS based model built on geoprocessing scripts.

In the spring of 2000, the Board of Clark County Commissioners appointed a technical advisory committee consisting of local government agencies, Responsible Growth Forum members, and Friends of Clark County to revisit this process. They reviewed definitions for each classification of land and planning assumptions for determining potential housing units and employment.

Another comprehensive review of the VBLM criteria and assumptions was undertaken in 2006 as part of the growth management plan update. This review compared the 1996 prediction to the 2006 model. This review demonstrated that for the most part the model was a good predictor of what land would develop. However, changes were made to the model based on results of this review. Important changes to the model include:

- Underutilized land determination for all models was changed to a building value per acre criteria.
- The industrial model and commercial model now have consistent classifications. The industrial model was revised to match the commercial process.
- Environmental constraints methodology changed from applying assumptions to parcels based on percentage of critical land to simply identifying constrained and non constrained land by parcel and applying higher deductions to constrained lands.

Example Map of Constrained Lands



Benefits of the current improvements are more consistency and easier monitoring of the model. Better accounting for private open space, constrained lands, and exempt port properties. And calculations for underutilized lands are more dynamic.

Model Classifications

The model classifies lands into three urban land use categories--residential, commercial, and industrial. Lands are grouped into land use codes based on comprehensive plan designations for model purposes. Lands designated as parks & open space. public facility, mining lands, or airport within the urban growth areas are excluded from available land calculations. Additionally, all rural and urban reserve designated lands are excluded from the model. Table 1 lists a breakdown of the land use classes.

Table 1: Land Use Classes

LU	Comprehensive Plan Classification	VBLM Model
1	Urban Low Density Residential	Residential – Urban Low
1	Single-Family_Low	Residential – Urban Low
1	Single-Family_Medium	Residential – Urban Low
1	Single-Family_High	Residential – Urban Low
2	Urban Medium Density Residential	Residential – Urban High
2	Urban High Density Residential	Residential – Urban High
2	Multi-Family_Low	Residential – Urban High
2	Multi-Family_High	Residential – Urban High
3	Neighborhood Commercial	Commercial
3	Community Commercial	Commercial
3	General Commercial	Commercial
3	City Center	Commercial
3	Regional Center	Commercial
3	Downtown	Commercial
3	Commercial	Commercial
4	Mixed Use	Commercial
4	Town Center	Commercial
5	Office Park/Business Park	Commercial
5	Light industrial/Business park	Commercial
5	Employment Campus	Commercial
6	Light Industrial	Industrial
6	Heavy Industrial	Industrial
6	Railroad Industrial	Industrial
6	Industrial	Industrial
33	Mixed use - Residential	Residential
34	Mixed use - Employment	Commercial

The model classifies each urban parcel as built, vacant, or underutilized by the three major land uses. Additionally lands with potential environmental concerns and/or geologic hazards as consistent with the applicable section of the Clark County and other municipal codes are classified as constrained (critical lands) lands. Constrained lands are identified by parcel in the model.

Constrained lands include:

- 100 year floodplain or flood fringe
- Wetlands inventory (NWI, high quality, permitted, modeled) with 100 foot buffer
- Slopes greater than 15 percent (>25% for City of Vancouver)
- Land slide area that has active or historically unstable slopes
- Designated shorelines

- Hydric soils with 50 foot buffer
- Habitat areas with 100 foot buffer
- Species areas with 300 foot buffer
- Riparian stream buffers by stream type (Table 2)

Table 2: Riparian Buffers

Stream Type	Countywide	Vancouver Exception
Type S (Shoreline)	250 Feet	175 Feet
Type F (Fish Bearing)	200 Feet	175 Feet
Type NP (Non-fish bearing, perennial)	100 Feet	150 Feet
Type NP (Non-fish bearing, seasonal)	75 Feet	100 Feet

Residential Model

Important residential classifications include vacant, vacant critical, underutilized, and underutilized critical. These classes are used to determine gross acres available for development. Vacant exempt, vacant lots less than 5,000 square feet and all other classes are excluded from available land calculations. Table 3 lists all residential classes.

Table 3: Residential Classifications

RESCLASS	Description
0	Not Residential
1	Built
2	Unknown
3	Vacant
4	Underutilized
5	Roads and Easements
6	Mansions and Condos
12	Built Exempt
13	Vacant Exempt
14	Vacant Critical
18	Underutilized Critical
19	Less than 5,000 square feet
20	Private Open Space
21	Parks and Open Space

Criteria for classifying residential lands are as follows:

- Residential Vacant Criteria
  - Building value less than $13,000

- Not tax exempt
- Not an easement or right of way
- Not a state assessed or institutional parcel
- Not a mobile home park
- Parcel greater than 5,000 square feet

- Underutilized
  - Same as Vacant except building value criteria is replaced with a building value per acre criteria.
  - Building value per acre of land is below the 10th percentile of building value per acre for all residential parcels within all UGAs. The 10th percentile is calculated by the model for each year and for each UGA alternative.
  - Parcel size greater than 1 acre

- Mansions and Condos
  - Parcel size greater than 1 acre
  - Building value per acre greater than the 10th percentile.

- Residential Exempt
  - Properties with tax exempt status

- Easements and right of ways

- Constrained (Critical lands)
  - All classifications may be subdivided into constrained vs. not constrained. Constrained lands are described above.

Commercial and Industrial Models

Commercial and industrial lands are classified using consistent criteria with one exception; industrial classes include exempt port properties in the current model.

Important commercial classes for determining gross acres available for development include vacant, vacant critical, underutilized, and underutilized critical. Vacant exempt and vacant lots less than 5,000 square feet are excluded from available land calculations. Table 4 lists all commercial classes.

Table 4: Commercial Classifications

COMCLASS	Description
0	Not Commercial
1	Built
2	Vacant
3	Underutilized
5	Vacant Lot less than 5,000 sq feet
7	Vacant Critical
9	Underutilized Critical
10	Vacant Exempt

Important industrial classes for determining gross acres available for development include vacant, vacant critical, exempt vacant port property, exempt vacant port property critical, underutilized, underutilized critical, exempt underutilized port property, and exempt underutilized port property critical. All exempt not port properties are excluded in the available land calculations. Table 5 lists all industrial classes.

Table 5: Industrial Classifications

INCLASS	Description
0	Not Industrial
1	Vacant
2	Underutilized
3	Vacant Critical
4	Underutilized Critical
6	Built
7	Exempt Vacant Port Property
8	Exempt Vacant Not Port
9	Exempt Vacant Port Property Critical
10	Exempt Underutilized Port
11	Exempt Underutilized Port Critical
12	Exempt Underutilized Not Port
15	Easements

Commercial and industrial models classify vacant and underutilized land as follows:

- Vacant land
  - Building value less than $67,500
  - Not "Assessed With"- Some parcels are assessed with other parcels. These parcels are often parking lots, or multiple parcels comprising a single development. All assessed with parcels are considered built.
  - Not Exempt.
    - Port property is exempt, and is included as a separate classification in the Industrial land model.

- Not an Easement or right of way
- Parcel greater than 5,000 square feet
- Not a state assessed or institutional parcel

- Underutilized Lands
  - Same as vacant except building value criteria is replaced with a building value per acre criteria of less than $50,000.

- Constrained (Critical lands)
  - All classifications may be subdivided into constrained vs. not constrained. Commercial and industrial constrained lands are defined the same as residential constrained lands and are listed above.

- Exempt Port Properties in the Industrial Model
  - Includes lands that are under port ownership and available for development. Buildable exempt port properties are included in available land calculations.
  - Port properties can be classified as vacant, underutilized, or constrained.

The model produces a summary of gross residential, commercial, and industrial acres available for development. Gross acres are defined as the total raw land available for development prior to any deductions for infrastructure, constrained lands, and not to convert factors.

Planning Assumptions

The next step in the buildable lands process is applying planning assumptions to the inventory of vacant and underutilized gross acres in order to arrive at a net available land supply. These assumptions account for infrastructure, reduced development on constrained land, and never to convert factors. Use factors along with employment and housing units per acre densities are applied to derived net acres to predict future capacities.

Residential Model Planning Assumptions:

- 27.7% deduction to account for both on and off-site infrastructure needs. 20% infrastructure deduction for mixed use lands.
- Never to convert factor
  - 10% for vacant land
  - 30% for underutilized
- 50% of available constrained (critical) land will not convert
- 60% of mixed use land will develop as residential, 85% residential for Battle Ground mixed use - residential and 25% residential for mixed use - employment.

Commercial and Industrial Model Planning Assumptions

- 25% infrastructure factor applied for both commercial and industrial lands.
- 20% of available constrained (critical) commercial and mixed use land will not convert
- 50% of available constrained (critical) industrial land will not convert
- 40% of mixed use land will develop as commercial, 15% commercial for Battle Ground mixed use - residential and 75% commercial for mixed use - employment.

Employees and unit per acre density assumptions are applied to net developable acres to predict future employment and housing unit capacities. Densities are set by the Current Planning staff based on observed development and comprehensive plan assumptions for each UGA.

Applied residential densities vary by UGA. Table 6 lists the units per acre by UGA.

Table 6: Residential units per Acre

Urban Growth Area	Applied Housing Units per Net Developable Acre
Battle Ground	6
Camas	6
La Center	4
Ridgefield	6
Vancouver	8
Washougal	6
Woodland	6
Yacolt	4

Applied employment densities vary by land use as well. Commercial classes which includes commercial, business park, and mixed use categories apply 20 employees per acre while industrial classes apply 9 employees per acre.

Applying residential and employment planning assumptions to the VLM results produce housing units and employment carrying capacity estimates for urban growth areas. These estimates help monitor growth on an annual basis and is part of the criteria used for setting UGA boundaries during growth management plan updates.

Current model layers and reports are available for viewing in Clark County's GIS Maps Online web application at:

http://gis.clark.wa.gov/vblm/

Underutilized land classes are grouped with vacant classes by land use in Maps Online and on other map products. Table 7 lists the group classes used for mapping.

Table 7: Group Classes

GRPCLASS	Description
1	Built
2	Built w/Critical
3	Residential Vacant
4	Residential Vacant w/Critical
5	Commercial Vacant
6	Commercial Vacant w/Critical
7	Industrial Vacant
8	Industrial Vacant w/Critical
9	Public Facilities
10	Public Facilities w/Critical
11	Parks and Open Space
12	Parks and Open Space w/Critical
13	Roads and Easements

For more information on the model inputs, structure and outputs, please contact Clark County Community Planning at (360) 397-2280 or Clark County Geographic Information System (GIS) at (360) 397-2002.

APPENDIX D – ASSESSMENT OF REASONABLE MEASURES

Clark County and the incorporated cities within the county have completed review under RCW 36.70A.215 which includes comparisons between development that has occurred and the original planning assumptions and targets.

In summary, several of the cities have addressed their reasonable measures by adopting local development regulations. However, these changes in regulations may not immediately reflect higher density development within the time reviewed (2006-2014). The market and economy might regulate development and density, which may delay development with higher densities. These adopted measures will likely be reflected in the next buildable lands evaluation report. If cities do not increase their densities, then county-wide planning policies will need to be amended possibly before the next Buildable Lands Report is completed.

The following actions were previously identified as necessary revisions to local development regulations. These revisions were to be incorporated into the update process and adopted in an ordinance or resolution to ensure compliance with the GMA. These measures reflect changes in regulation that would gradually allow for higher density development within the planning horizon.

City of Battle Ground

- The City of Battle Ground Comprehensive Plan, 2004, Chapter 3: Land Use Element, reviewed the ratio of zoned land to density goals, assuring the plan is implementing current countywide density goals and housing type mix.

- Battle Ground has developed a mixed-use ordinance, Ord. 04-024 § 20 (part), 2004. Their updated 2006 development code, Title 17, Chapter 17.101.040 and 2004 Comprehensive Plan, examine minimum densities in certain districts as tools to achieve density goals.

- Battle Ground Comprehensive Plan, 2004, contains a growth management element that addresses annexation and sub-area planning in four growth management goals, listed below.

> **Growth Management Goal 1: The City will seek a sustainable rate of growth**
>
> Objectives
> **GMO1.1** The City will coordinate its growth projections and growth goals with other jurisdictions.
> **GMO1.2** The City will balance its growth with other City goals.
> **GMO1.3** The City will strive to grow at a rate that maintains its small town character.
> **GMO1.4** The City will work to provide adequate urban services concurrently with development.

GMO1.5 The City will encourage efficient growth within the existing city limits before pursuing additional annexations.
GMO1.6 The City will coordinate with Battle Ground School District during annexation processes to maintain District service standards

Growth Management Goal 2: Future growth is to occur primarily to the west and south of the current city limits and in all directions consistent with the 50-year vision.

Objectives
GMO2.1 The City will primarily focus future planning efforts to the south and west of the current city limits.
GMO2.2 The City will focus secondary planning efforts for future growth to the north and east.

Growth Management Goal 3: The City will encourage the efficient and sustainable expansion of the City through the Urban Growth Areas.

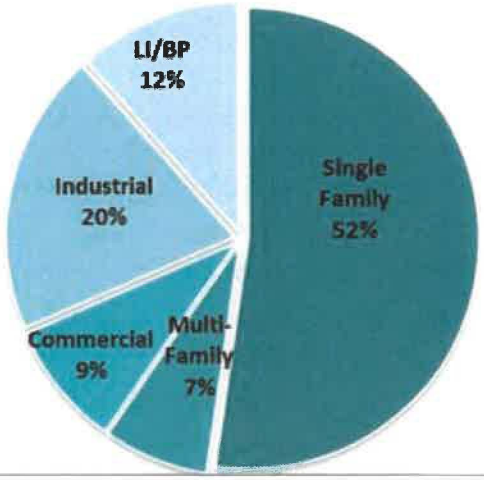
Objectives
GMO3.1 The City will seek to achieve desirable growth patterns through annexations.
GMO3.2 The City will seek to achieve a jobs/housing balance through annexations.

Growth Management Goal 4: The City will work with the County and other jurisdictions in determining growth policies for the Area of Influence.

Objectives
GMO4.1 The City will seek to preserve the Area of Influence for future urban growth patterns anticipated by the Vision.

City of Camas

- The City of Camas designated and zoned land, consistent with the 2007 Clark County Framework Plan, 52% of the land for single-family residential and 7% for multifamily with a range of densities such that the average density for new development can yield six units per acre. The City has designated the remaining area for 20% to industrial development, 12% for Light Industrial/Business Park development, and 9% for Commercial development.



- According to the County's 2035 projections, the City must accommodate 3,868 additional housing units within the 20-year planning horizon. The City has approximately 3,607 vacant, platted or approved lots/multi-unit complexes within the existing city limits. There are also development agreements within vacant lands that will provide an additional 583 units. Notwithstanding lands within the UGB that have not been annexed, this combined data provides the city with 4,190 future residential units—a surplus of 322 units within the 20-year planning horizon. A study in 2013 for the purpose of updating the City's transportation impact fees in 2013, forecasted that the City can accommodate a total of 7,002 additional housing units within the 20 year planning horizon. Both methods of factoring future units conclude that there will be a surplus of residential units within the planning horizon and densities in excess of 6 units per acre.
- The City of Camas adopted development standards that encourage density and efficient development of land. The following regulations in Camas Municipal Code (CMC) allow for flexible lot sizes and dimensions, to include: the Planned Residential Development code (CMC Chapter 18.23); Accessory Dwelling Units code (CMC Chapter 18.27); Mixed Use codes (CMC Chapters 18.22 and 18.24); and Flexible Development codes (CMC Chapter 18.26).
- The City has approximately 2,854 acres designated for employment (combined commercial and industrial lands), or 41% of the overall acreage. The County estimates that there is 1,279 gross acres of vacant and underutilized employment land, with a potential for creating 12,157 additional jobs.

City of La Center

- In 2006, the City La Center adopted new density requirements with single family zoning (LDR-7.5) at a minimum density of four (4) dwelling units per acre. Ninety percent of all new parcels in this district must average within 10 percent of 7,500 square feet as a total development and any phase within the development. LCMC18.130.080.

- In 2006, the City of La Center's medium density residential (MDR-16) set a minimum requirement of eight units per net acre, and a maximum density of 16 units per net acre. LCMC 18.140.010

- In 2007, the City of La Center adopted critical area development regulations that prohibit the creation of lots in wetlands or wetland buffers, allowing the city to achieve a higher net density. LCMC 18.300.050.4.f.iii.

- In 2010, La Center amended their municipal code Title 18 Subdivision Provisions to mandate applicants remainder lost must contain at least 50 percent buildable area, and that the remainder lot is capable of being developed to urban density standards. LCMC 18.210.100.

- See City of La Center's correspondence to their observed density.

La Center Correspondence

From:	Eric Eisemann
To:	Albrecht, Gary; Orjiako, Oliver; Lebowsky, Laurie
Cc:	Jeff Sarvis; "Elizabeth Decker"; Naomi Hansen
Subject:	Buildable land report - Remedial action
Date:	Friday, May 08, 2015 11:58:15 AM
Attachments:	BLR Subdivivision table v2.docx MulitFamilyHousingMap.pdf

Hello Gary,

I response to the recent iteration of the Buildable Land Report (BLR) the City of La Center would like to add the attached information in the County record and make the following comments.

Residential Land Supply. La Center, like every other jurisdiction in Clark County, experienced a dramatic run-up of housing activity in the early 2000s and an equally dramatic crash of housing starts as a result of the great recession. The City is recovering slowly, more so than Ridgefield or Camas. During the run-up, from 2005 – 2008, La Center approved 305 new single family lots. Each of the preliminary plats met the City's 4 DU/NET ACRE standard. Two subdivisions reached Final Plat (Hanna's Farm and Gordon Crest), however, 40% of their combined lots remain vacant as a result of the recession. Five (5) additional subdivisions, totaling 188 lots, were moving forward but abruptly stopped. Now, two are very close to final plat approval (Kays and Gordon Crest II) and two more have awakened and are moving forward. Earlier this year the City conducted a pre-application conference for Sunset Terrace, a new 121 lots subdivision along NE 339th St. Given this 'ground-truthing' information, it is highly unlikely that La Center has a surplus of residential land.

County-approved subdivision in La Center UGA. During the recession, Clark County approved the subdivision of approximately 75 acres of land within the La Center UGA creating 13 new lots. The average density of these new developments is 1 DU/5 acres. It is difficult to imagine how these lands in the La Center UGA will develop to urban densities during the 20-year planning horizon. I encourage you to consider the effect County-approved 5 acre lots has on La Center's density performance. (These lots at the City boundary limits and along arterial streets were approved with septic service. La Center requires all dwellings built on newly created land to connect to City sanitary sewer.)

Net Density. In La Center new subdivisions must achieve 4 DU/NET acre. 90% of all new subdivision lots must be within 10% of 7,500 S.F. The maximum allowable lot is 10,000 S.F. and the minimum 6,000SF. Like other jurisdictions La Center has an abundant supply of critical lands. The City prohibits the creation of lots in wetlands or wetland buffers. (LCMC 18.300.050.4.f.iii.) Consequently the city is able to achieve a higher net density.

Multi-family dwellings. La Center has 56 multi-family units in the City limits. See attached map. The Residential Professional (RP) zoning district allows single family development (4 DU/acre), multi-family units (8-16 units/acre), and retail/office uses. The Timmen Mixed Use (MX) zoning district allows single family development (4 DU/acre), multi-family units (8-16 units/acre), and retail/office uses. In the MX zone no single use may be less than 25 percent, nor more than 50 percent, of the net acreage. Regrettably, the multi-family and mixed use market has not yet found La Center a favorable location.

We recognize that the BLR is a general model. That is why we are pleased to provide this information to you in hopes that the model will more accurately tell the story of what is happening in La Center.

If you have any questions, please contact me directly.

Thank you.
Eric

Eric Eisemann
E2 Land Use Planning, LLC
215 W. 4th Street, Suite # 201
Vancouver, WA 98660
360.750.0038
e.eisemann@e2landuse.com

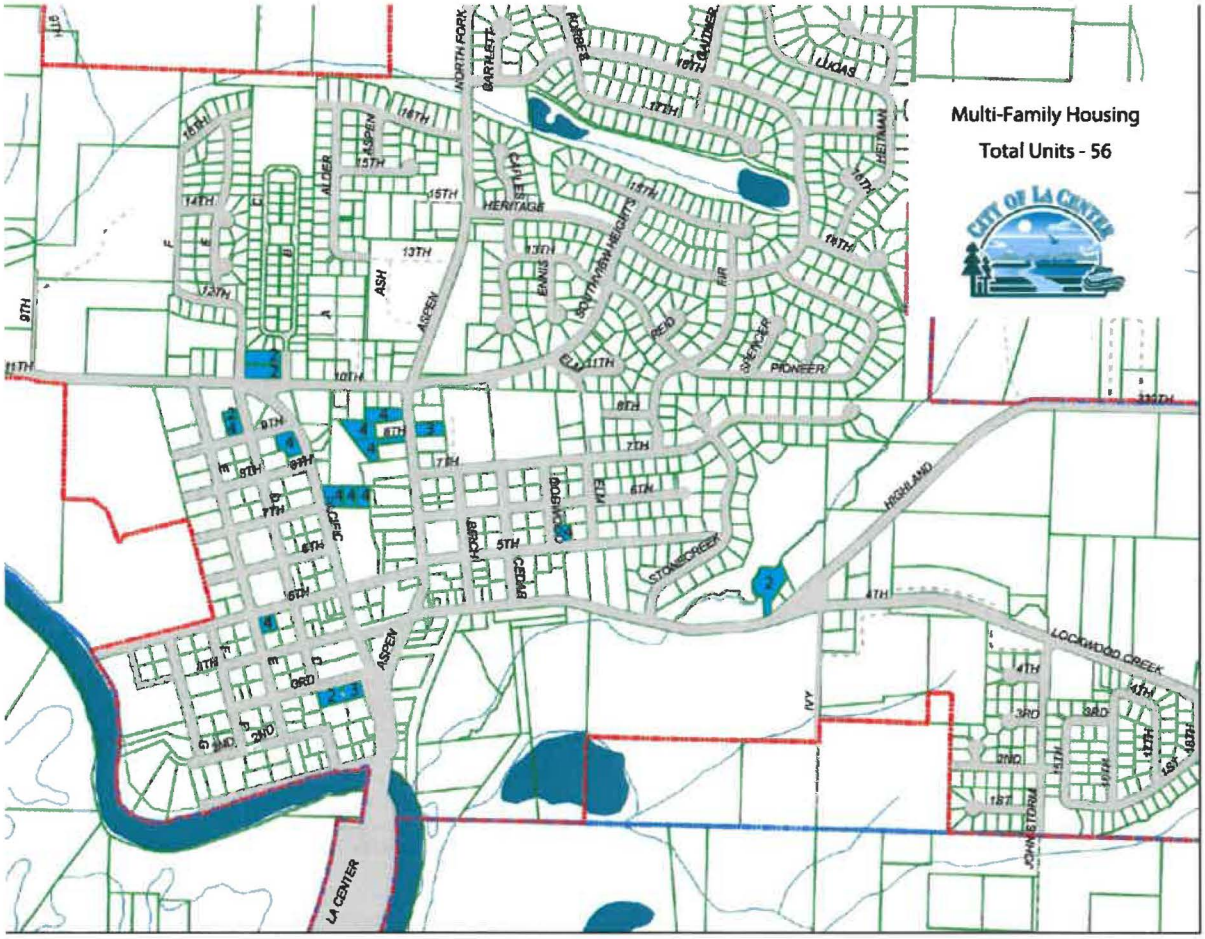
Attachment: BLR Subdivivision table v2.docx

Subdivision	PIN	Location	File	Gross Acres	Lots
		La Center UGA	Approved by Clark County		
East Fork Estates (Goode Cluster)	986028830	1514 NW 339th St. La Center, WA	PLD2010-00008 Final plat 2010	40+	10
Perrott Short Plat	209062000	2219 NE 339th St. La Center, WA	PLD-2008-0005 Final Plat in 2009	35+	3
Totals			**5.7 DU/Acre**	**75+**	**13**
		City of La Center	Approved by City of La Center	Gross Acres *	Lots
Hanna's Farm	258905000 62965040 258924000 62965094	North of NW Pacific Highway	2005-001-SUB 21 vacant lots	17.07	57
Gordon Crest	258894000 258896000 258943000	West of Aspen Ave	2005-007-SUB 26 vacant lots	18.19	60
Total Final Plats			3.31 DU/ Gross ac.	35.26	117
Approved Preliminary Plats					
Kays	209488000	South West of NW Pacific Highway	2008-016-SUB	11.8	37
Gordon Crest II	258892000	West of Aspen Ave	2006-012-SUB	6.74	26
Highland Terrace	258636000 258644000 258702000 258703000 258704000 258727000 258763000	East of NW Pacific Highway	2006-019 SUB	25.3	100
Dana Heights	62647000	North of East 7th Street	2006-002-SUB	3.87	14
Sargent	258717000	34102 NW 9th Avenue	2006-033-SUB	5.3	11
Preliminary Plat Total			3.55 DU/Gross ac.	53.01	188

La Center Buildable Land Report Comments: 2005 – 2014 5/8/2015

*** Note:** New subdivisions must achieve 4 DU/Net acre. New plats must achieve 7,500 S.F. average lot size. The maximum lot size, allowable at the perimeter of the City Limits, is 11,000 S.F.

Attachments: MulitFamilyHousingMap.pdf



Ridgefield Correspondence

From: Elizabeth Decker
To: Albrecht, Gary; Orjiako, Oliver; Eric Eisemann; Jeff Niten
Subject: VBLM remedial actions for Ridgefield **Date:** Friday, May 08, 2015 5:13:20 PM
Attachments: VBLM_PreliminaryPlatInfo.docx

Hi Gary,

I had a few comments to submit regarding the recent version of the Buildable Lands Report for the City of Ridgefield, and would like to have these comments included in the record.

Residential Land Supply: A couple of things I want to put in the record for the VBLM report for Ridgefield since the change in methodology shows the City with a 63 acre surplus for residential land, when the previous versions showed Ridgefield with a significant deficit. The City, as have most areas, suffered a tremendous downturn in development activity during the great recession. We have several hundred lots platted preliminarily and those lots still exist, and are going through the final plat process and/or being constructed now at a rapid pace. Several subdivisions and PUDs I want to bring to your attention include Ridgefield Woods which just received signatures on the final plat last week and contains 34 single family home lots. Canterbury Trails received preliminary plat approval in 2006 and is now going through the process to finalize the plat. Canterbury Trails will provide for 69 single family home lots. Pioneer Canyon Phases 3 and 4 are rapidly coming on-line and
will provide both single family and multi family home sites. Bella Noche is coming forward with a revised preliminary plat that will provide 30 lots. Hawks Landing was preliminary platted recently and will move forward with 57 lots in the near future. Additionally, the Kemper subdivision was approved in 2007 for a total of 200 single family homes sites, none of which have been constructed at this time. In total, Ridgefield knows of 444 single and multifamily lots that will be coming forward within a year for final plat or have been final platted within the past month.

We estimate an additional 290 lots may move forward to final plat within the coming years, based on existing preliminary plat approvals, for a total of 734 lots on over 200 acres of residential land. These lots have already been committed to development and should not be calculated and vacant and buildable in the County's report.

Another factor that will impact the development potential of the residential land in the City's UGA is the City's strong commitment to parks. The City requires 25% of residential land be dedicated to park and open space during the development approval process. While up to half of that dedication may contain critical areas, the other half must contain active usable space. An override for the standard infrastructure deduction would be an appropriate remedy to accurately reflect the residential land Ridgefield has available for future development. We would suggest an additional 12.5% of gross acres be deducted from the VBLM totals to account for active usable space required for parks use, assuming that the critical areas have already been accounted for in the VBLM standard deduction.

A final consideration is that some of the residential land within Ridgefield's UGA has already been developed as large lot subdivisions under County standards, which will make it unlikely and difficult for that land to be developed at urban densities.

Multifamily Targets: The City currently has sufficient low and medium density residential land to achieve a 75/25 split for new development, however, the market for single-family development has moved more quickly than multifamily development. While on-the-ground supply of multifamily housing does not yet meet the 25% split, the City will comply at full build-out as proposed in the 20-year plan. Further, there are additional opportunities for higher density residential development in the City's commercial and mixed-use zones.

The City is under taking several major planning efforts including the 45th and Pioneer sub-area plan which is expected to provide up to 2,000 dwelling units during the planning horizon along with commercial uses. Ridgefield Junction sub-area and the Downtown/Waterfront sub-area are expected to promote additional dwelling units as well.

The VBLM can't, unfortunately, take into account what is planned for in our current boundary and only recognizes what is on the ground at a moment in time. However, I think this e-mail should provide the county policy makers with the appropriate information to determine that the 63 acre surplus is not reflective of the development activity occurring now, or expected to occur over the next several years. Additionally, the model or the staff discussion of the model should take into account the additional ways in which Ridgefield can satisfy its 75/25 housing split with future mixed use development.

Thank you,

Elizabeth

Elizabeth Decker
City of Ridgefield Consulting Planner
503.705.3806
edecker@jetplanning.net

Attachments: VBLM_PreliminaryPlatInfo.docx

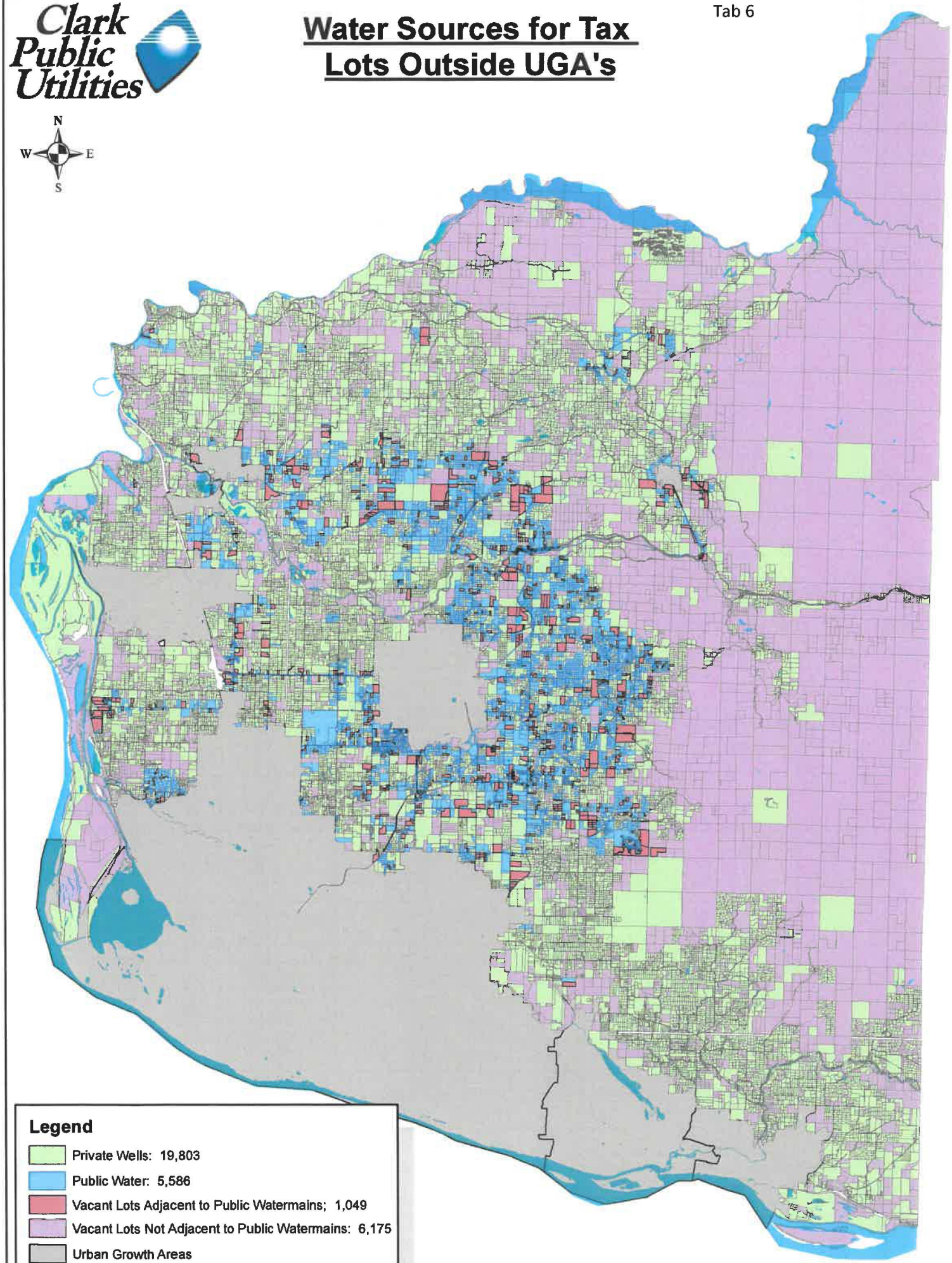
Technical information: Supplemental VBLM Information
City of Ridgefield

The following are active preliminary plats with potential to be final platted.

Subdivision Name	Assessor serial number	Location	Number of lots
Ridgefield Woods	986036007	45th and Pioneer	34 (has been recorded on GIS now)
Canterbury Trails	213958000	N 45th Ave and Pioneer	69
Kemper	213745000	Pioneer and Bertsinger	200
Bella Noche	213707000	Pioneer and N 35th Ave	30
Hawks Landing	215825000	HIllhurst and S 35th Place	57
Pioneer Canyon Phase 3	986027692	Pioneer and N 40th Ave	54 (final plat approved by Council April 23)
Pioneer Canyon Phase 4	986027694 and surrounding	NW corner of N 45th Ave and Pioneer	50 (estimated)
Taverner Ridge Phases 7-9	220025000, 220034000, 220032114, 216032010, 216032005, 216032015	Hillhurst and Great Blue Rd	105 (estimated)
Garrison Ridge Phase 2	121105000	Hillhurst and S Refuge Rd	15 (estimated)
Stephenson Manor	220016000	Hillhurst and Great Blue Rd	30 (estimated)
Columbia Acres	213710000	Reiman and N 10th St	30 (estimated)
Cedar Creek	213713000	N 35th Ave and N 10th St	30 (estimated)
Pioneer Place	213800000, 213798000	N 35th Ave and N 10th St	30 (estimated)
		Total known	**444**
		Total estimated	**290**
		Combined total expected	**734**

Clark Public Utilities

Water Sources for Tax Lots Outside UGA's



THE CUMULATIVE EFFECTS OF URBANIZATION ON SMALL STREAMS IN THE PUGET SOUND LOWLAND ECOREGION

Christopher W. May
Richard R. Horner
James R. Karr
Brian W. Mar
Eugene B. Welch

University of Washington
Seattle Washington

BACKGROUND

The Pacific Northwest (PNW), like many areas of North America, is experiencing an increase in urban development that is rapidly expanding into areas containing much of the remaining natural aquatic ecosystems. In the Puget Sound lowland (PSL) ecoregion, the natural resources most directly affected by the current pattern of watershed land use, are small streams and associated wetlands. These stream ecosystems are critical spawning and rearing habitat for several species of native salmonids (both resident and anadromous) including cutthroat trout (*Oncorhynchus clarki*), steelhead trout (*O. mykiss*), coho salmon (*O. kisutch*), chum salmon (*O. keta*), chinook salmon (*O. tshawytscha*), pink salmon (*O. gorbuscha*), and sockeye salmon (*O. nerka*). These fish, especially the salmon species, hold great ecological, cultural, and socio-economic value to the peoples of the PNW. Despite this value, the wild salmonid resource is in considerable jeopardy of being lost to future generations (Figure 1). Over the past century, salmon have disappeared from about 40% of their historical range and many of the remaining populations (especially in urbanizing areas) are severely depressed (Nehlsen et al. 1991). There is no one reason for this decline. The cumulative effects of land-use practices including timber-harvest, agriculture, and urbanization have all contributed significantly to this widely publicized "salmon-crisis".

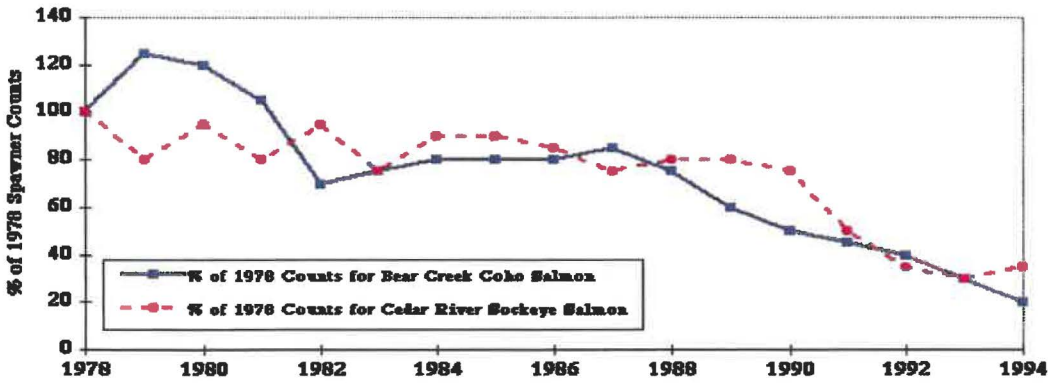


Figure 1: Representative data showing the decline in salmon stocks in the Puget Sound lowland (PSL) region **using 1978 as the base year** for spawner counts (Washington State Department of Fisheries data).

The effects of watershed urbanization on streams are well-documented (Leopold 1968; Hammer 1972; Hollis 1975; Klein 1979; Arnold et al. 1982; Booth 1991) and include extensive changes in basin hydrologic regime, channel morphologic features, and physio-chemical water quality. The cumulative effects of these alterations has produced an instream habitat structure that is significantly different from that in which salmonids and associated fauna have evolved. In addition, development pressure has a negative impact on riparian forests and wetlands that are essential to natural stream functioning. Considerable evidence of these effects exists from studies of urban streams in the PNW (Perkins 1982; Richey 1982; Steward 1983; Scott et al. 1986; Booth 1990; Booth and Reinelt 1993; Taylor 1993). Nevertheless, most previous work has fallen short of establishing cause-effect relationships among physical and chemical variables resulting from urbanization and the response of aquatic biota.

The most obvious manifestation of urban development is the increase in impervious cover and the corresponding loss of natural vegetation. Land clearing, soil compaction, riparian corridor encroachment, and modifications to the surface water drainage network all typically accompany urbanization. Watershed urbanization is most often quantified in terms of the proportion of basin area covered by impervious surfaces (Schueler 1994; Arnold and Gibbons 1996). Although impervious surfaces themselves do not generate pollution, they are the major contributor to the change in basin hydrologic regime that drives many of the physical changes affecting urban streams. Basin imperviousness and runoff are directly related (Schueler 1994). The two most common measures of imperviousness are total impervious area (%TIA) and effective impervious area (%EIA). The distinction between the two lies in the linkage between the impervious surface and the drainage network. Effective impervious surfaces are those which are directly connected to the surface drainage system. Total and effective basin impervious fractions are typically proportional to each other (Alley and Veenhuis 1983; Beyerlein 1996). In previous studies, an impervious level (%TIA) of about 10% has been identified as the level at which stream ecosystem impairment begins (Klein 1979; Steedman 1988; Schueler 1992; Booth and Reinelt 1993). Recent studies also suggest that this potential threshold may apply to wetlands as well (Reinelt and Horner 1991; Taylor 1993; Horner et al. 1996).

STUDY DESIGN

A key objective of the Puget Sound lowland (PSL) stream study was to identify the linkages between landscape-level conditions and instream environmental factors, including defining the functional relationships between watershed modifications and aquatic biota. The goal was to provide a set of stream quality indices for local resource managers to use in managing urban streams and minimizing resource degradation due to development pressures. In this scenario, there would be a reasonable expectation that a goal of maintaining given populations or communities of organisms (native salmonids) at a specified level could be met by sustaining a certain set of habitat characteristics, which in turn depend on an established group of watershed conditions. A part of this overall objective was to

identify any thresholds of watershed urbanization as related to instream salmonid habitat and aquatic biota. The study was designed to establish the linkages between landscape-level conditions, instream habitat characteristics, and biotic integrity. A conceptual model of this design is illustrated below:

Watershed and Riparian => Characteristics **Instream Habitat => Conditions** **Aquatic Biota**

A sub-set (22) of small-stream watersheds was chosen to represent a range of development levels from relatively undeveloped (reference) to highly urbanized (Figure 2). Total impervious surface area (% TIA), because of its integrative nature, was used as the primary measure of watershed urbanization. The attributes of the stream catchments were established using standard watershed analysis methods including geographic information system (GIS) data, aerial photographs, basin plans, and field-surveys. Impervious surface coverage, riparian integrity, instream physical habitat characteristics, chemical water-quality constituents, and aquatic biota were analyzed on both watershed and stream-segment scales. Discharge was continuously monitored by local agencies on ten of the study streams. Chemical water-quality monitoring (baseflow and storm events) was conducted at 23 sites on 19 of the study streams. Biological sampling (macroinvertebrates) was performed in 31 reaches on 21 of the study streams. Extensive surveys of instream physical habitat and riparian zone characteristics were made on 120 stream-segments on all 22 PSL streams, each representing local physiographic, morphologic, and sub-basin land use conditions from the headwaters to the mouth of each stream. Salmonid abundance data were obtained from public, private, and tribal sources.

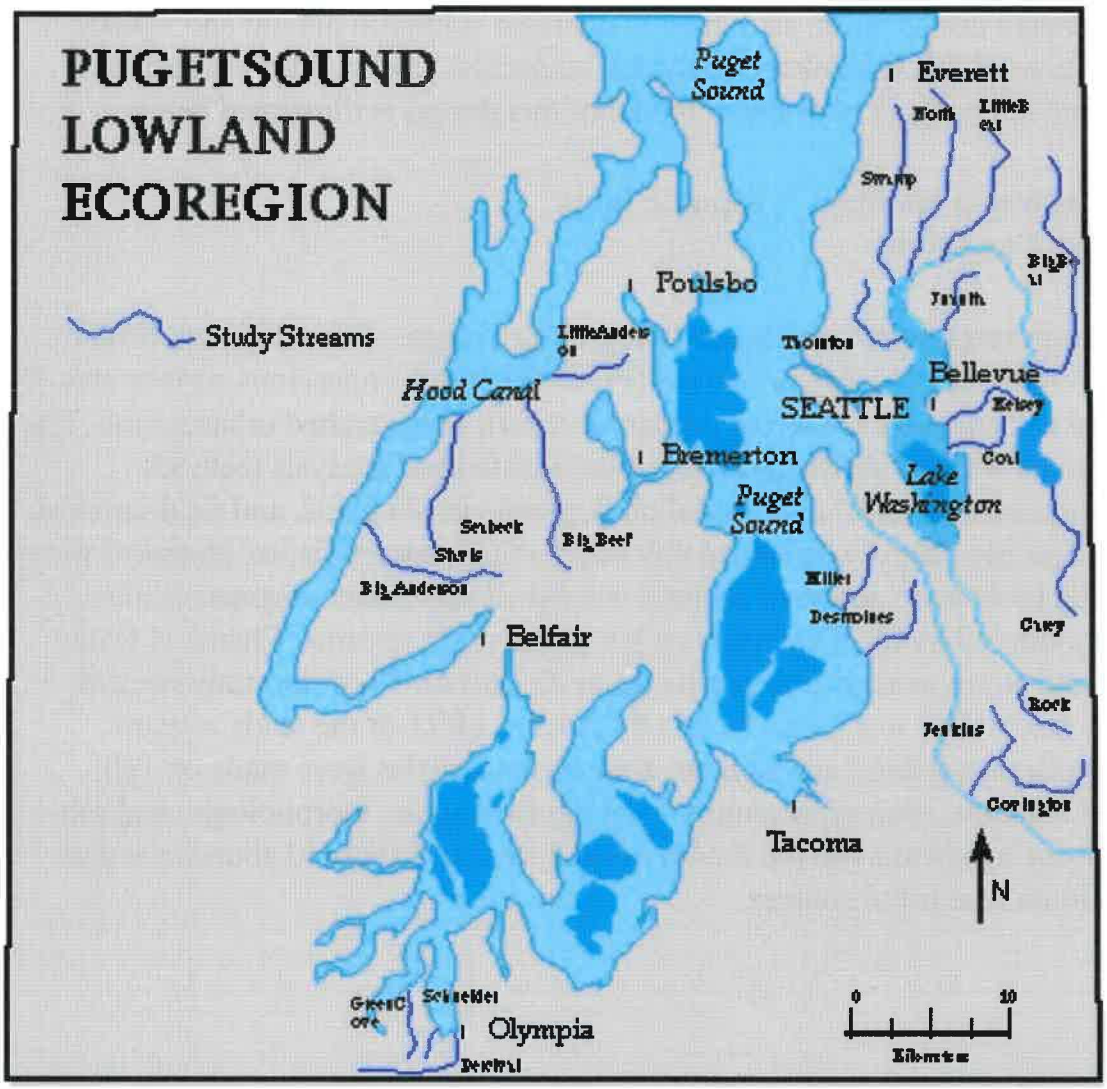


Figure 2: Puget Sound Lowland (PSL) Ecoregion

All streams were third-order or smaller, ranging in basin area from 3 to 90 km2, with headwater elevations less than 150 meters. Stream gradients were less than 3.5% (most were < 2%). The study watersheds represented the two general types of geologic and soil conditions found in the Puget Sound region. The underlying geology and soil types are mainly a result of the last glacial period (15,000 years ago). All but three of the watersheds were dominated by poorly-drained glacial till soils, with the remaining basins dominated by glacial outwash soil types (moderately well-drained). In the undisturbed, natural forested condition, PSL catchments are capable of providing adequate natural precipitation storage in the surficial "forest-duff" layer with little runoff resulting. Therefore, in natural PSL watersheds a subsurface flow hydrologic regime dominates. Development typically strips away this absorbent forest soil layer and compacts the underlying soil and exposes the underlying till layer. Also lost is a significant amount of interception storage as well as evapo-transpiration potential provided by the regionally dominant coniferous forest. The typical suburban development in the PNW has been estimated to have roughly 90% less storage capacity than under naturally forested conditions (Wigmosta

et al. 1994). The latest (1990) stormwater mitigation and best-management practices (BMPs) have the potential to recover only about 25% of the original storage capacity (Barker et al. 1991). Because these standards affected very little new development that occurred between 1990 and the start of this study in 1994, the basin conditions observed largely reflected the pre-1990 situation with little effective stormwater control present. Therefore, no significant conclusions could be drawn about the effectiveness of current stormwater controls (BMPs) and regulations during this research.

RESULTS AND DISCUSSION

Watershed Conditions

Watershed imperviousness ranged from undeveloped (%TIA < 5%) to highly urbanized (%TIA > 45%). Imperviousness (%TIA) was the primary measure of watershed development; however, other measures of urbanization were investigated. Calculating impervious surface area can be costly, especially if computerized methods like GIS are utilized. In addition, the land-use data required for calculation of %TIA may be unavailable or inaccurate. As part of this study, a low-cost alternative to imperviousness was also investigated. Analysis demonstrated that the relationships to be discussed were very similar if development is alternatively expressed as road-density (Figure 3). This is especially relevant in that the transportation component of imperviousness often exceeds the "rooftop" component in many land-use categories (Schueler 1994). A recent study in the Puget Sound region has shown that the transportation component typical accounts for over 60% of basin imperviousness in suburban areas (City of Olympia 1994).

Watershed urbanization results in significant changes in basin hydrologic regime (Leopold 1968; Hollis 1975; Booth 1991). This was confirmed for streams in the PSL study. The ratio of modeled 2-year stormflow to mean winter baseflow (Cooper 1996), was used as an indicator of development-induced hydrologic fluctuation (Figure 4). This discharge ratio is proportional to the relative stream power, and thus is representative of the hydrologic stress on instream habitats and biota exerted by stormflow relative to baseflow conditions. The modified basin hydrologic regime was found to be one of the most influential changes resulting from watershed urbanization in the PSL region.

In addition to an increase in basin imperviousness and the resulting stormwater runoff, urbanization also affects watershed drainage-density (km of stream per km2 of basin area). This was first investigated by Graf (1977). Natural, pre-development drainage-density (DD) was calculated using historic topographic maps. This was compared to the current, urbanized DD which included both the loss of natural stream channels (mostly first-order and ephemeral channels lost to grading or construction) and the increase in artificial "channels" due to road-crossings and stormwater outfalls. The ratio of urban to natural DD was used as an indicator of urban impact (Figure 5).

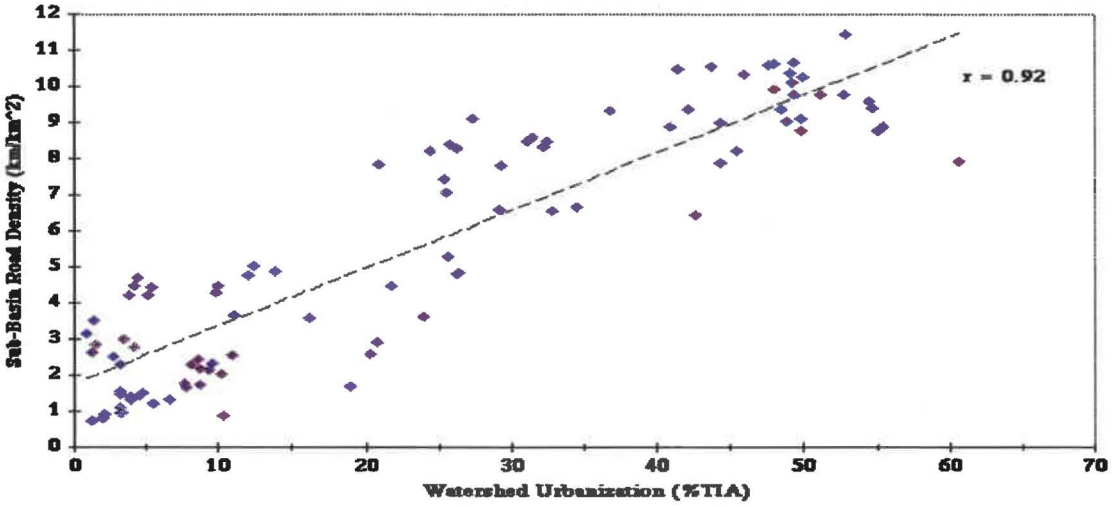


Figure 3: Relationship between urbanization (%TIA) and sub-basin road-density in Puget Sound **lowland (PSL) streams.**

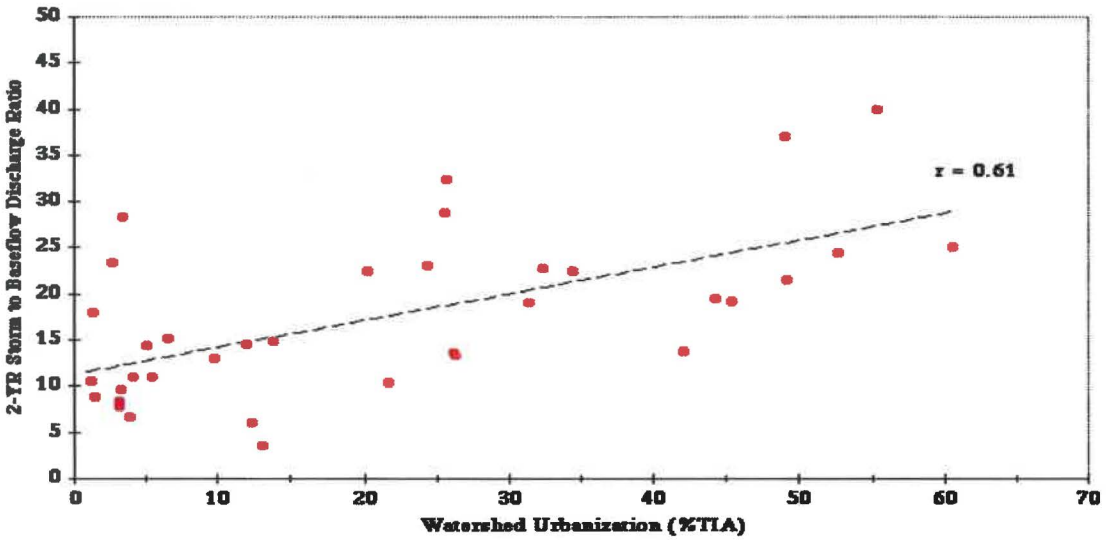


Figure 4: Change in basin hydrologic regime with urbanization in Puget Sound lowland (PSL) streams as indicated by the ratio of 2- **year stormflow to winter baseflow.**

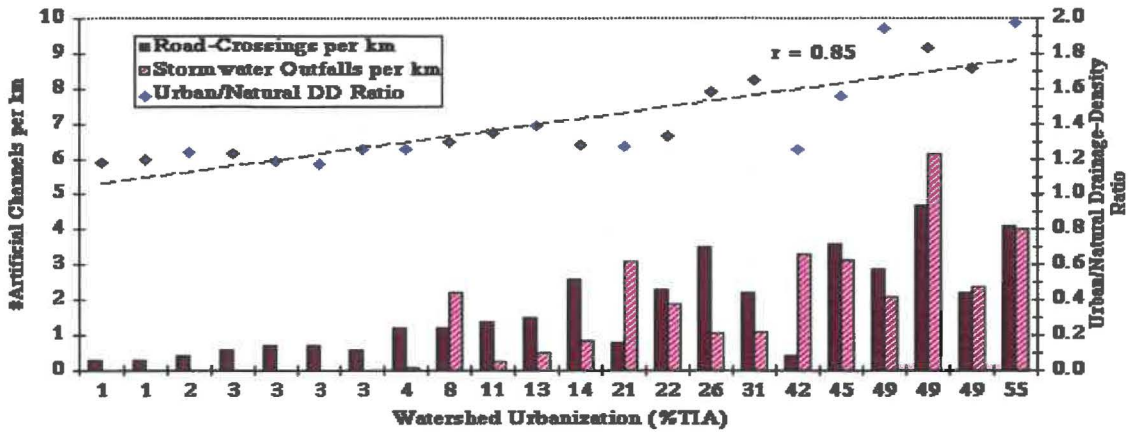


Figure 5: Change in watershed drainage-density (DD) due to the effects of urbanization on the stream channel network.

Riparian Conditions

The natural riparian corridors along PNW streams are among the most diverse, dynamic, and complex ecosystems in the region. Natural riparian integrity in the PNW is characterized by wide buffers, a near-continuous corridor, and mature, coniferous forest as the dominant vegetation. Riparian corridors are key landscape features with significant regulatory control on environmental conditions in stream ecosystems (Naiman 1992). The extent of the riparian zone, the level of control that the riparian forest exerts on the stream environment, and the diversity of functional attributes are mainly determined by the size of the stream and the longitudinal position within the drainage network (Naiman et al. 1993). Well developed, morphologically complex floodplains are often an integral part of riparian corridors in PNW streams and rivers (Naiman 1992). The riparian corridor is frequently disturbed by flooding events, creating a naturally complex landscape. Ecological diversity in riparian zones is maintained by the natural disturbance regime (Naiman et al. 1993).

Not surprisingly, riparian conditions were also strongly influenced by the level of development in the surrounding landscape. The impact of development activities on riparian corridors can vary widely depending on the type and intensity of land-use, the degree of disturbance to streamside vegetation, and the residual integrity of the riparian zone. Under past land-use practices, increased development has led to a loss of riparian buffer width, a fragmentation of the riparian corridor, and an overall degradation in riparian quality. In general, until recently (1993), development regulations in the PNW did not specifically address riparian buffer requirements. Sensitive area ordinances, now in effect in most local municipalities, typically require riparian buffers of 30-50 meters (100-150 feet) in width. These recently adopted regulations had little influence on the urbanized streams in the PSL study. In general, wide riparian buffers were found only in undeveloped or rural stream watersheds (Figure 6). The actual size of riparian buffer needed to protect the ecological integrity of the stream system is difficult to establish (Schueler 1995). In most cases, minimum buffer width "required" depends on the resource or beneficial use of interest and the quality of the existing riparian vegetation (Castelle et al. 1994).

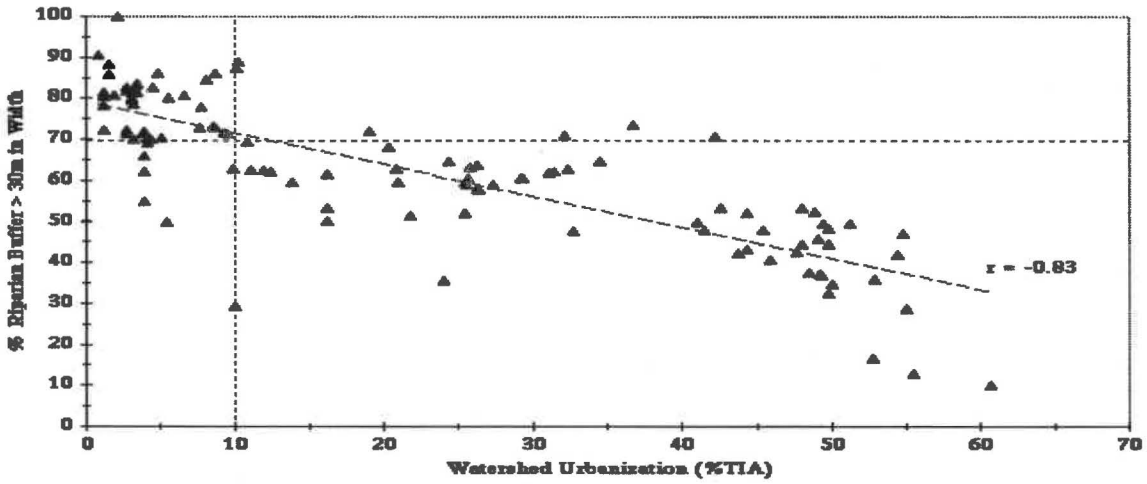


Figure 6: Relationship between riparian buffer width and basin **urbanization (%TIA) in Puget Sound lowland (PSL) streams.**

Encroachment into the riparian buffer zone is pervasive, continuous, and extremely difficult to control. At the same time, riparian forests and wetlands, if maintained, appear to have a significant capacity to mitigate some of the adverse effects of development. A buffer width of less than 10 meters is generally considered functionally ineffective (Castelle et al., 1994). The fraction of riparian buffer less than 10 meters in width was used as a measure of riparian zone encroachment. In general, only streams in natural, undeveloped basins (%TIA < 10%) had less than 10% of their buffer in a non-functional condition. As watershed urbanization (%TIA) increased, riparian buffer encroachment also increased proportionally. The most highly urbanized streams (%TIA > 40%) in this study, generally had a large portion (upwards of 40%) of their buffers in a non-functional condition.

The longitudinal continuity or connectivity of the riparian corridor is at least as important as the lateral riparian buffer width. A near-continuous riparian zone is the typical natural condition in the PNW (Naiman 1992). Fragmentation of the riparian corridor in urban watersheds can come from a variety of human impacts; the most common and potentially damaging being road crossings. In the PSL stream study, the number of stream crossings (roads, trails, and utilities) increased in proportion to basin development intensity. All but one undeveloped stream (%TIA < 10%) had, on average, less than one riparian break per km of stream. Of the highly urbanized streams (%TIA > 40%), all but one had greater than two breaks per kilometer. Based on current development patterns in the PSL, only rural land use consistently maintained breaks in the riparian corridor to < 2 per kilometer of stream length. In general, the more fragmented and asymmetrical the buffer, the wider it needs to be to perform the desired functions (Barton et al. 1985).

The riparian zone was also examined on a qualitative basis. Mature forest, young forest, and riparian wetlands were considered "natural" as opposed to residential or commercial development. From an ecological perspective, mature forest or riparian wetlands are the two most ecologically functional riparian conditions in the PNW (Gregory et al. 1991). In the 22 PSL streams, riparian maturity was also found to be strongly influenced by watershed development. Only the natural streams (%TIA < 5%) had a

substantial portion of their riparian corridor as mature forest (40% or greater), while urban streams consistently had little mature riparian area (Figure 7). In addition, none of the urbanized PSL streams retained more than 25% of their natural floodplain area.

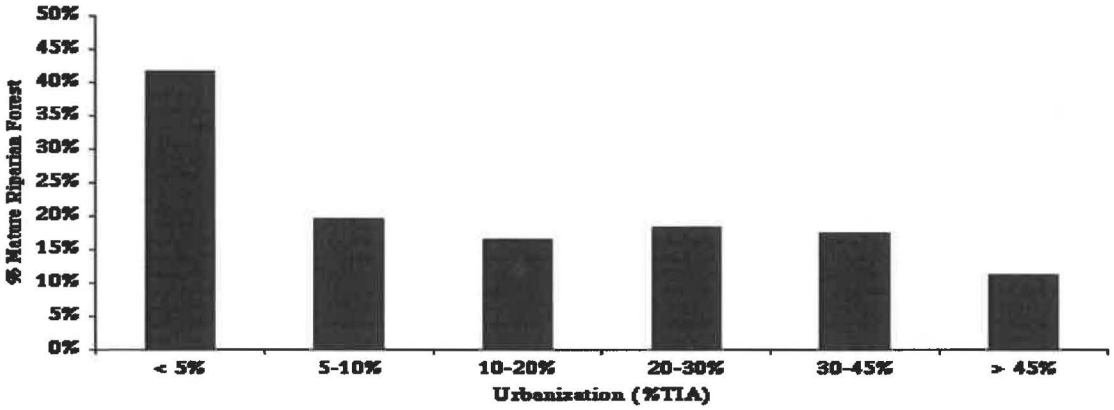


Figure 7 : Relationship between watershed urbanization (%TIA) and riparian quality (maturity) in Puget Sound lowland (PSL) streams.

Chemical Water Quality

Chemical water quality constituents were monitored under baseflow and stormflow conditions. Baseflow conductivity (µS/cm) was found to be strongly related to the level of basin development (Figure 8). Coal Creek was a confirmed outlier due to the residual effects of historic coal-mining in its headwaters. While conductivity is a non-specific chemical parameter, it is a surrogate for total dissolved solids and alkalinity, and an excellent indicator of the cumulative effects of urbanization (Olthof 1994). Storm event mean concentrations (EMC) of several chemical constituents were found to be related to both storm size (magnitude and intensity) and basin imperviousness (Bryant 1995). However, water quality criteria were rarely violated except in the most highly urbanized watersheds (%TIA > 45%). Figure 8 shows total zinc (TZn) as a representative storm EMC. Total phosphorus (TP) and total suspended solids (TSS) also showed similar relationships. Sediment zinc and lead also indicated a relationship with urbanization, again showing the highest concentrations in the most developed basins, although all were still below sediment quality guidelines. As with other recent studies (Bannerman et al. 1993; Pitt et al. 1995), these findings indicate that chemical water quality of urban streams is generally not significantly degraded at the low impervious levels, but may be a more important factor in streams draining highly urbanized watersheds.

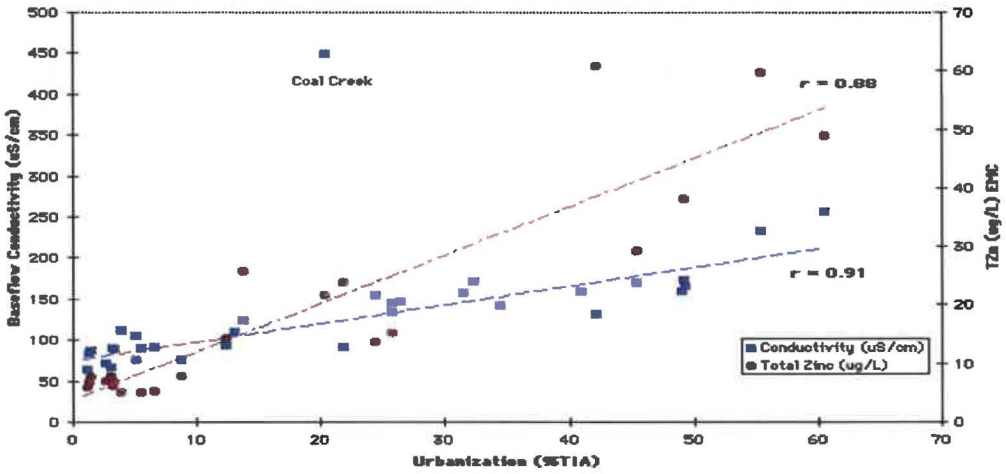


Figure 8: Baseflow conductivity and storm event mean concentration (EMC) total zinc (TZn) in comparison to watershed urbanization **(%TIA) in Puget Sound lowland (PSL) streams.**

Instream Salmonid Habitat Characteristics

Large woody debris (LWD) is a ubiquitous component in streams of the PNW. There is no other structural component as important to salmonid habitat, especially in the case of juvenile coho (Bisson et al. 1988). LWD performs critical functions in forested lowland streams, including dissipation of flow energy, streambank protection, streambed stabilization, sediment storage, and providing instream cover and habitat diversity (Bisson et al. 1987; Masser et al. 1988; Gregory et al. 1991). Although the influence of LWD may change over time, both functionally and spatially, its overall importance to salmonid habitat is significant and persistent. Both the prvalence and quantity of LWD declined with increasing basin urbanization (Figure 9). At the same time, measures of salmonid rearing habitat, including % pool area, pool size, and pool frequency, were strongly linked to the quantity and quality of LWD in PSL streams. While LWD quantity and quality were negatively affected by urbanization, even many of the natural, undeveloped streams also had a lack of LWD (especially very large LWD). This deficit appears to a residual effect of historic timber-harvest and "stream-cleaning" activities. Nevertheless, with few exceptions (habitat restoration sites), high quantities of LWD occurred only in streams draining undeveloped basins (%TIA < 5%). It appears that stream restoration in the PSL should include enhancement of instream LWD, including addressing the long-term LWD recruitment requirements of the stream ecosystem.

An intact and mature riparian zone is the key to maintenance of instream LWD (Masser et al. 1988; Gregory et al. 1991). The lack of functional quantities of LWD in PSL streams was significantly influenced by the loss of riparian integrity (Figure 10). In general, except for restoration sites, higher quantities of LWD were found only in stream-segments with intact upstream riparian corridors. In addition, LWD quality was strongly influenced by riparian integrity. Very large, stable pieces of LWD (greater than 0.5 meter in diameter) were found only in stream-segments surrounded by mature, coniferous riparian forests. This natural LWD historically provided stable, long-lasting instream structure for salmonid habitat and flow mitigation (Masser et al. 1988).

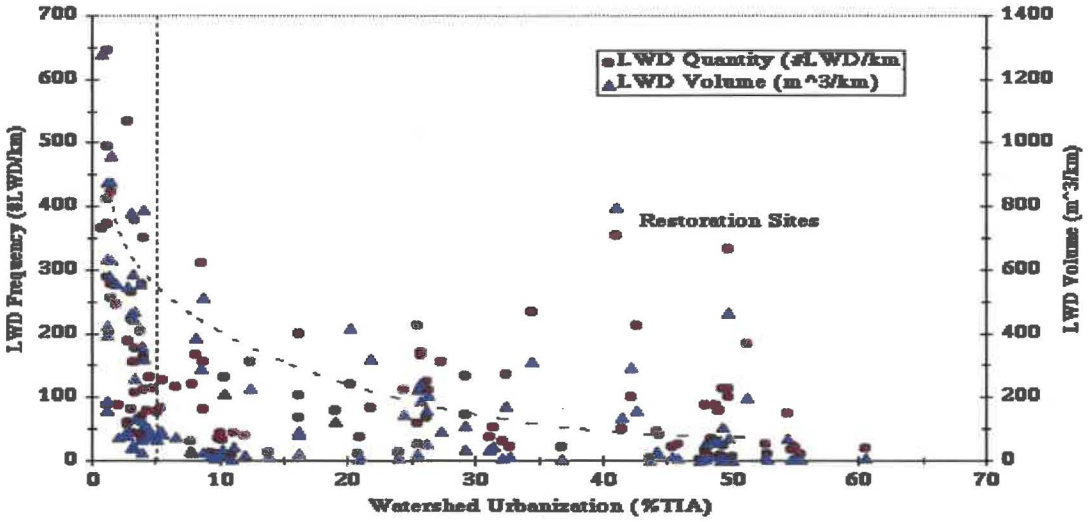


Figure 9: LWD quantity and watershed urbanization (%TIA) in Puget Sound lowland (PSL) streams.

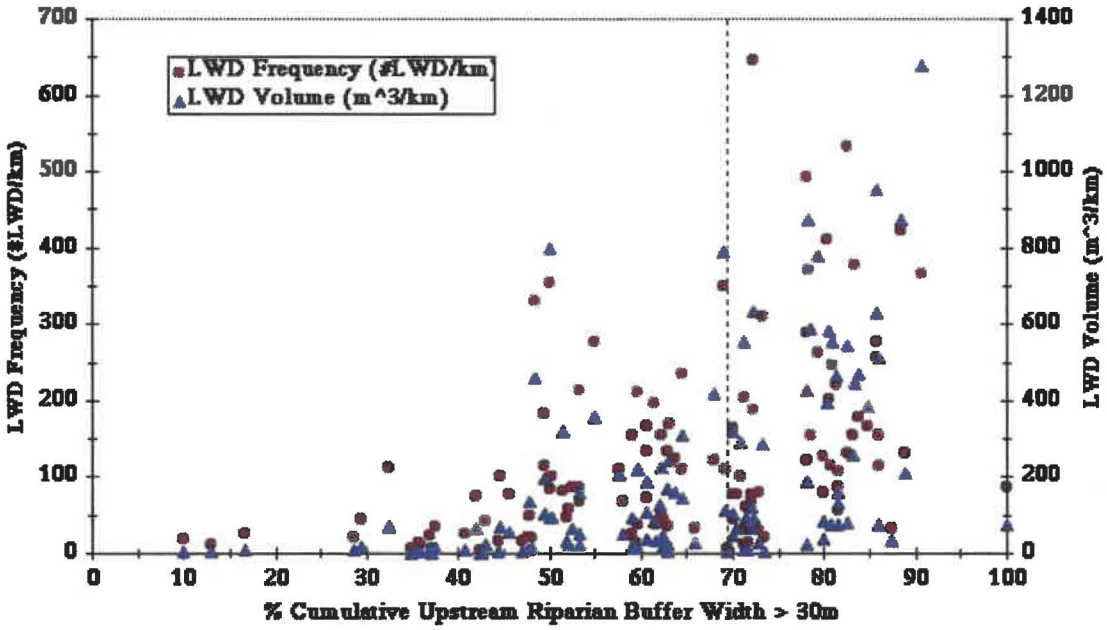


Figure 10: LWD quantity and riparian integrity in Puget Sound lowland (PSL) streams.

The stream bottom substratum is critical habitat for salmonid egg incubation and embryo development, as well as being habitat for benthic macroinvertebrates. Streambed quality can be degraded by deposition of fine sediment, streambed instability due to high flows, or both. Although, the redistribution of streambed particles is a natural process in gravel-bed streams, excessive scour and aggradation often result from excessive flows. Streambed stability was monitored using bead-type scour monitors installed in salmonid spawning riffles in selected reaches (Nawa and Frissell 1993). Figures 11a and 11b illustrate these devices. As would be expected, larger scour and/or fill events normally

resulted from larger storms and the resultant higher flows. The available stream power and basal shear stress may be the most significant factors with regard to the potential for streambed instability. Stream power is proportional to discharge and slope. Since flows tend to increase with urbanization, it would generally be expected that stream power would increase as urbanization does, all else being equal. Cooper (1996) found this to be the case for the PSL study streams. Shear stress is dependent on slope, flow velocity, and bed-roughness. It is the critical basal shear stress that determines the onset of streambed particle motion and the magnitude of scour and/or aggradation. In that local slope and streambed roughness are highly variable, it is not surprising that scour and fill are also variable and that no significant relationship was noted between the 2-Year stormflow to winter-baseflow ratio and any of the scour monitor measurements. This tends to emphasize the local nature of scour and aggradation events. Nevertheless, basin urbanization in PSL streams was found to have the potential to cause locally excessive scour and fill. Urban streams in the PSL with gradients greater than 2% and lacking in LWD, were found to be more susceptible to scour than their undeveloped counterparts.

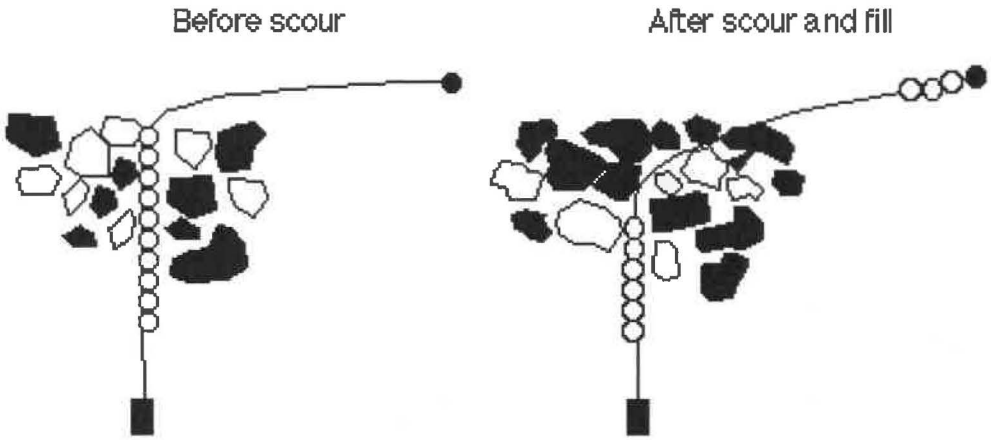


Figure 11a: Sliding-bead type scour monitors.

Streambank erosion was also far more common in urbanized PSL streams than in streams draining undeveloped watersheds. Using a survey protocol similar to Booth (1996), all stream-segments were evaluated for streambank stability. Stream segments with >75% of the reach classified as stable were given a score of 4. Between 50% and 75% stable banks were scored as a 3, 25-50% as a 2, and <25% as a 1. Artificial streambank protection (rip-rap) was considered a sign of bank instability and graded accordingly (1). Only two undeveloped, reference (%TIA < 5%) stream-segments had a stability rating less than 3. In the 5-10% basin imperviousness (%TIA) range, the streambank ratings were generally 3 or 4. Between 10-30% sub-basin impervious area (%TIA), there was a fairly even mixture of streambank conditions from stable and natural to highly eroded or artificially "protected". Above a sub-basin %TIA of 30%, there were no segments with a streambank stability rating of 4 and very few with a rating of 3. These outliers were found only in segments with intact and wide riparian corridors. Artificial streambank protection (rip-rap) was a common feature of all highly-urbanized (%TIA > 45%) streams. Overall, the streambank stability rating was inversely correlated with cumulative upstream basin %TIA and even more closely correlated with development within the segment itself, perhaps reflecting the local effects of construction and other human activities. Streambank stability is also influenced by the condition of the riparian vegetation surrounding the stream. In this study, the streambank stability rating

was strongly related to the width of the riparian buffer and inversely related to the number of breaks in the riparian corridor. While not completely responsible for the level of streambank erosion, basin urbanization and loss of riparian vegetation, contribute to the instability of streambanks. Besides vegetative cover, other stream corridor characteristics, such as soil-type and valley hillslope gradient, also contribute to the stability potential and current condition of the banks.

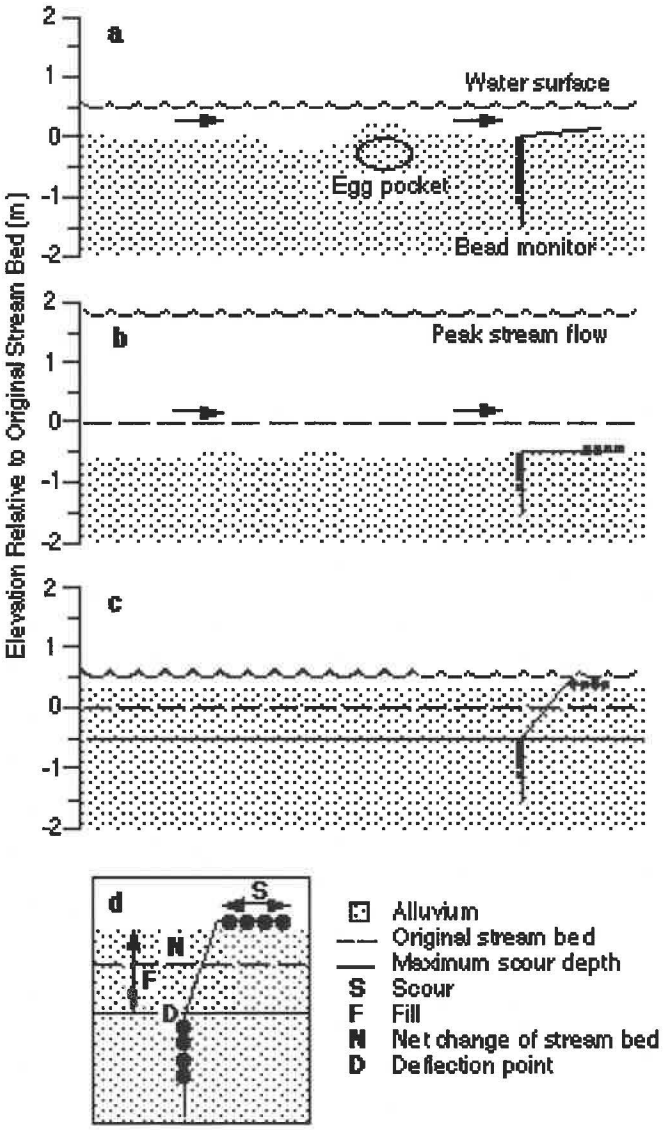


Figure 10b: Streambed scour and fill as measured by a sliding-bead scour monitor.
(a) Scour monitor installed in streambed near salmonid redd
(b) Maximum streambed scour at peak flow during a large storm
* Scoured beads slide down to the end of the wire
* Deep enough scour may wash out salmonid redd
(c) Post-storm sediment aggradation buries scour monitor wire
(d) Measurement of scour and fill (aggradation)
(modified from Nawa and Frissell, 1993)

Results of fine sediment sampling (McNeil method) indicated that urbanization can result in degradation of streambed habitat. Fine sediment levels (% fines) were related to upstream basin urban

development, but the variability, even in undeveloped reaches, was quite high (Wydzga 1997). Nevertheless, % fines did not exceed 15% until %TIA exceeded 20%. In the highly urbanized basins (% TIA > 45%), the % fines were consistently > 20% except in higher gradient reaches where the sediment was presumably flushed by high stormflows.

The intragravel dissolved oxygen (IGDO) was also monitored as an integrative measure of the deleterious effect of fine sediment on salmonid incubating habitat. IGDO monitors were installed in artificial salmonid redds and monitored throughout the coho incubation period (Figures 12). A significant impact of fine sediment on salmonids is the degradation of spawning and incubating habitat (Chapman 1988). The incubation period represents a critical and sensitive phase of the salmonid life-cycle. The typical mortality during this period in natural streams can be quite high (> 75%). A high percentage of fine sediment can effectively clog the interstitial spaces of the substrata and reduce water flow to the intragravel region. This can result in reduced levels of IGDO and a buildup of metabolic wastes, leading to even higher mortality. In extreme situations, sediment can form a barrier to alevin emergence, resulting in entombment and death. Elevated fine sediment levels can also have various sublethal effects on developing salmonids which may reduce the odds of survival in later life-stages (Steward 1983). While low IGDO levels are typically associated with fine sediment intrusion into the salmonid redd, local conditions can have a strong influence on intragravel conditions as well as the distribution of fine sediment (Chapman 1988). Spawning salmonids themselves can also reduce the fine sediment content of the substrata, at least temporarily. Measurement of instream DO coincident with IGDO allowed for the calculation of a IGDO/DO interchange ratio (Figure 13). In all but one case, the mean interchange ratio was > 80% in the undeveloped reaches (%TIA < 5%). As basin development (% TIA) increased above 10%, there was a great majority of the reaches in which the mean interchange ratio was well below 80% (as low as 30%). While these DO levels are not lethal, low IGDO levels during embryo development can reduce survival to emergence (Chapman 1988). Several urbanized stream-segments had unexpectedly high (>80%) IGDO concentrations (Figure 12). All of these segments were associated with intact riparian corridors and upstream riparian wetlands. Generally, these reaches also had stable streambanks and adequate levels of instream LWD.

Coho salmon rely heavily on small lowland streams and associated off-channel wetland areas during their rearing phase (Bisson et al. 1988). They are the only species of salmon that over-winter in the small streams of the PSL. Cutthroat trout are commonly found in almost all small streams in the PNW. Cutthroat and coho are sympatric in many small streams in the PNW and as such are potential competitors (adult cutthroat also prey on juvenile coho). In general, habitat, rather than food, is the limiting resource for most salmonids in the PNW region (Groot and Margolis 1991). In urban streams of the PSL, rearing habitat appears to be limiting. This study found all but the most pristine (%TIA < 5%) lowland streams had significantly less than 50% of stream habitat area as pools. In addition, the fraction of cover on pools decreased in proportion to sub-basin development. Coho rear primarily in pools with high habitat complexity, abundant cover, and with LWD as the main structural component (Bisson et al. 1988). Urbanization and loss of riparian forest area significantly reduced pool area, habitat complexity, and LWD in PSL streams.

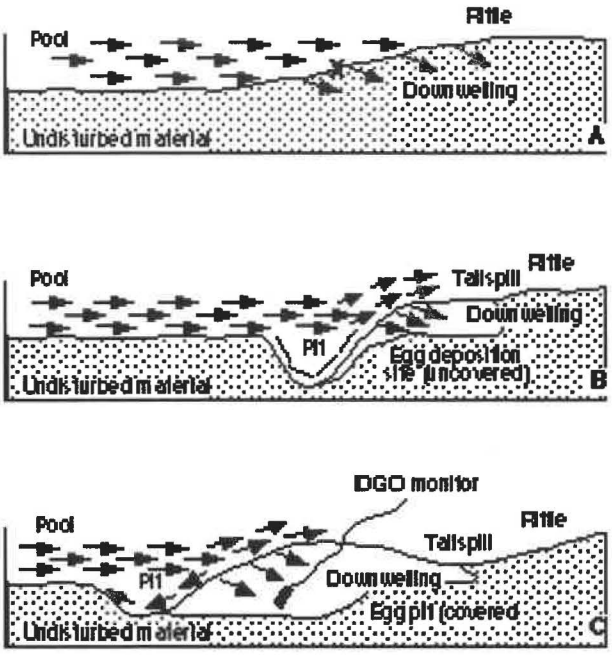


Figure 11: Architecture of a typical salmonid redd with intragravel dissolved oxygen (IGDO) monitor installed. (A) Streambed topography near pool-tailout. Likely spawning area is marked with "X" (area of flow into gravel) (B) Redd construction creates a low-flow zone, facilitating egg deposition and fertilization (fine sediment flushed from pocket) (C) Egg-pocket covered by upstream digging activity and downwelling flow maximized by redd topography. Induced flow flushes fines, provided oxygenated surface water to developing embryos, and removes metabolic wastes. **(modified from Bjornn and Reiser, 1991)**

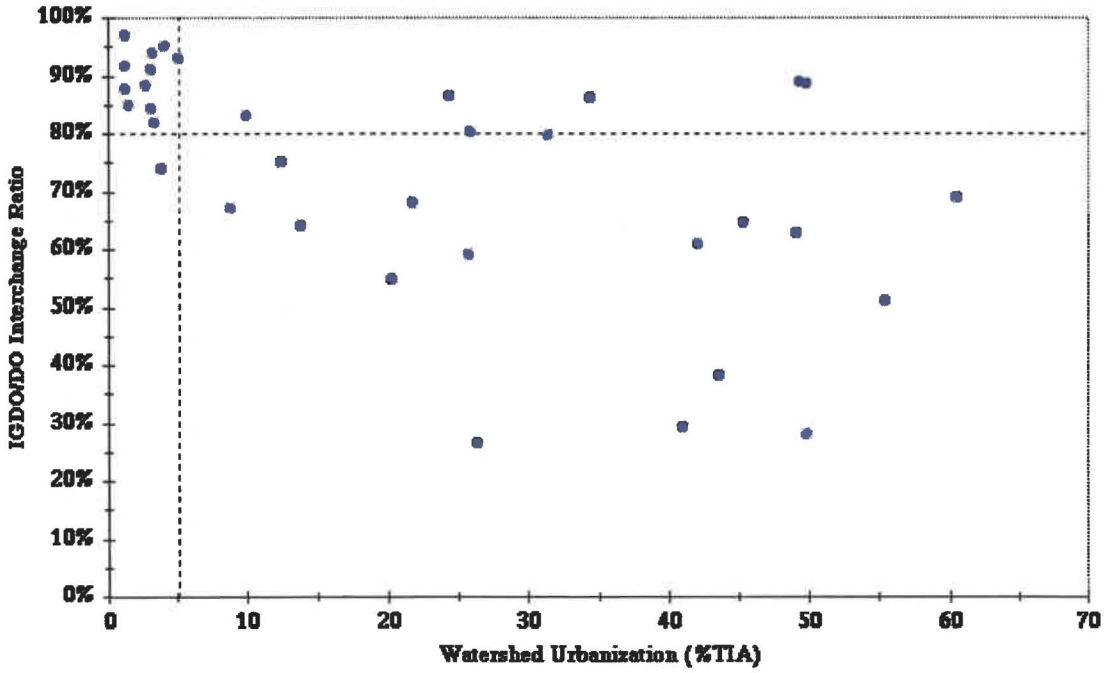


Figure 13: Relationship between urbanization (%TIA) and mean intragravel dissolved oxygen (IGDO) to instream dissolved oxygen **(DO) in Puget Sound lowland (PSL) streams.**

Biological Integrity

The biological condition of the benthic macroinvertebrate community was expressed in terms of a multi-metric PSL Benthic Index of Biotic Integrity (B-IBI) developed by Kleindl (1995) and Karr (1991). The abundance ratio of juvenile coho salmon to cutthroat trout (Lucchetti and Fuerstenberg 1993) was used as a measure of salmonid community integrity. Figure 13 shows the direct relationship between urbanization (%TIA) and biological integrity, using both measures. Only undeveloped reaches (%TIA < 5%) exhibited an B-IBI of 32 or greater (45 being the maximum possible score). There also appears to be rapid decline in biotic integrity with the onset of urbanization (%TIA < 10%). At the same time, it appears unlikely that streams draining highly urbanized sub-basins (%TIA > 45%) could maintain a B-IBI greater than 15 (minimum B-IBI is 9). B-IBI scores between 25 and 32 were associated with reaches having a %TIA < 10%, with eight notable exceptions (Figure 14). These eight reaches had sub-basin %TIA values in the 25-35% (suburban) range and yet each had a much higher biological integrity than other streams at this level of development. All eight had a large upstream fraction of intact riparian wetlands and all but one had a large upstream fraction of wide riparian buffer (> 70% of the stream corridor with buffer width > 30 m). These observations indicate that maintenance of a wide, natural riparian corridor may mitigate some of the effects of watershed urbanization.

Urbanization also appears to alter the relationship between juvenile coho salmon and cutthroat trout. In this study, coho tended to dominate in undeveloped (%TIA < 5%) streams, while cutthroat were more tolerant of conditions found in urbanized streams. Figure 14 shows the ratio of coho to cutthroat abundance ratio in those PSL study streams (11) where data were available for the period of the study. Natural coho dominance (cutthroat:coho ratio > 2) was seen only at very low watershed development levels (%TIA < 5%). Due to the lack of data, a more specific development threshold could not be established. Nevertheless, it is significant that both salmonid and macroinvertebrate data indicate that a substantial loss of biological integrity occurs at a very low level of urbanization. These results confirmed the findings of earlier regional studies (Perkins 1982; Steward 1983; Scott et al. 1986; Lucchetti and Fuerstenberg 1993).

Given that relationships were identified between basin development conditions and both instream habitat characteristics and biological integrity, it is reasonable to hypothesize that similar direct associations exist between physical habitat and biological integrity. As a general rule, instream habitat conditions (both quantity and quality) correlated well with the B-IBI and the coho:cutthroat ratio. Measures of spawning and rearing habitat quality were closely related to the coho:cutthroat ratio. As might be expected, measures of streambed quality were also closely related to the B-IBI (benthic macroinvertebrates). Chemical water quality may also influence aquatic biota at higher levels of watershed urbanization.

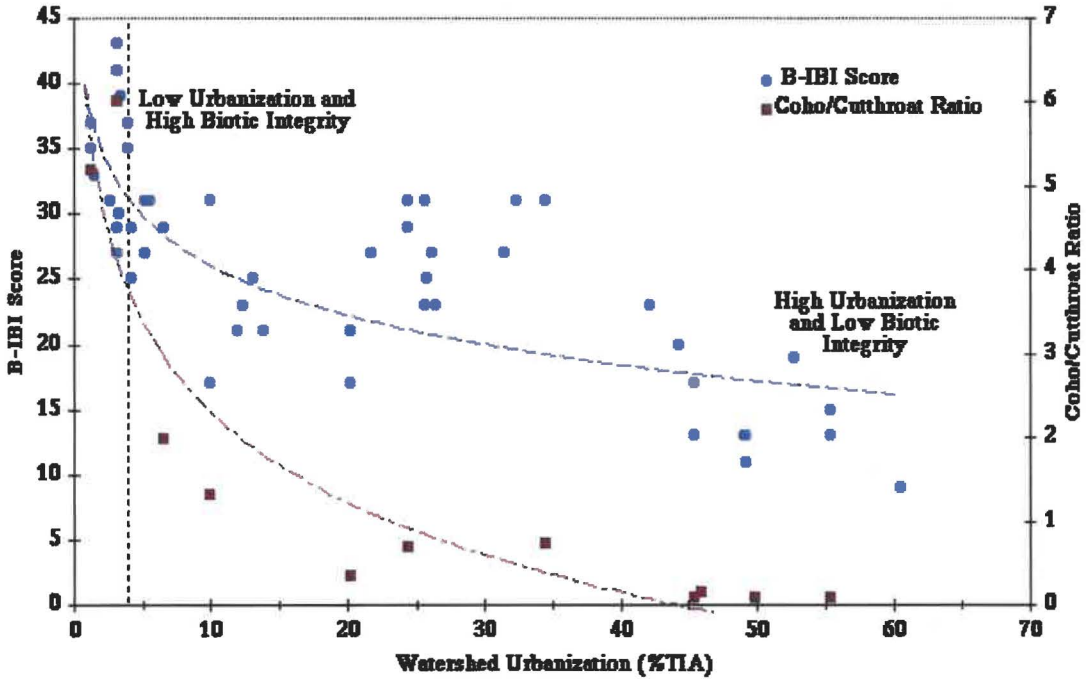


Figure 14: Relationship between watershed urbanization (%TIA) and biological integrity in Puget Sound lowland (PSL) streams. Benthic **index of biotic integrity (B-IBI) and the abundance ratio of juvenile** coho salmon to cutthroat trout used as indices of biological integrity.

In addition to the quantitative habitat measures, a multi-metric Qualitative Habitat Index (QHI) was also developed for PSL streams. This index assigns scores of poor (1), fair (2), good (3), and excellent (4) to each of 15 habitat-related metrics, then sums all 15 metrics for a final reach-level score (minimum score of 15 and maximum score of 60). The QHI is similar in design to that which is used in Ohio (Rankin 1989) and as part of the US EPA Rapid Bioassessment Protocol (Plafkin et al. 1989). As was expected, biological integrity was directly proportional to instream habitat quality (Figure 15). Coho dominance is consistent with a B-IBI > 33 and a QHI > 47; conditions found only in natural (%TIA < 5%), undeveloped streams. These results were consistent with the findings of a similar study in Delaware (Maxted et al. 1994). The QHI has the advantage of being simpler (less-costly) than more quantitative survey protocols, but may not meet the often rigorous (quantitative) requirements of resource managers. However, as a screening tool, it certainly has merit.

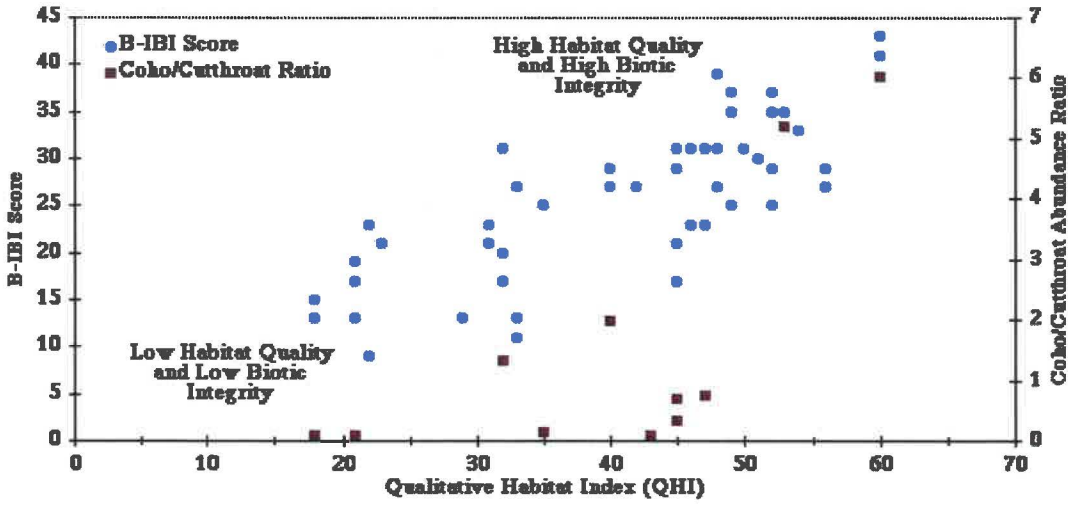


Figure 15: Relationship between instream habitat quality and biotic integrity. Benthic **index of biotic integrity (B-IBI) and the ratio of** juvenile coho salmon to cutthroat trout are **used as indices of** biological integrity in Puget Sound lowland (PSL) streams..

A major finding of this study was that wide, continuous, and mature-forested riparian corridors appear to be effective in mitigating at least some of the cumulative effects of adjacent basin development. Using the B-IBI as the primary measure of biological integrity, Figure 16 illustrates how the combination of riparian buffer condition and basin imperviousness explains much of the variation in stream quality. These observations suggest a set of possible stream quality zones similar to those proposed by Steedman (1988). Excellent (natural) stream quality requires a low level of watershed development and a substantial amount of intact, high-quality riparian corridor. If a "good" or "fair" stream quality is acceptable, then greater development may be possible with an increasing amount of protected riparian buffer required. Poor stream quality is almost guaranteed in highly urbanized watersheds or where riparian corridors are impacted by human activities such as development, timber-harvest, grazing, or agriculture. Because of the mixture of historical development practices and resource protection strategies included in this study, it was difficult to make an exact judgment as to how much riparian corridor is appropriate for each specific development scenario. More intensive research is needed in this area.

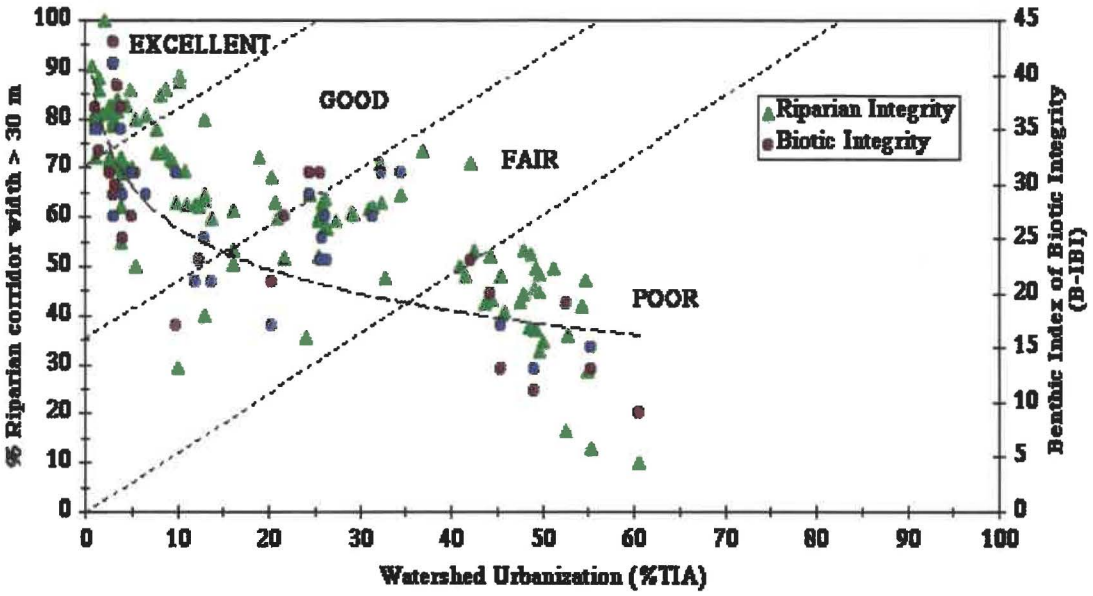


Figure 16: Relationship between basin development, riparian buffer width, and biological integrity in PSL streams

SUMMARY

Results of the PSL stream study have shown that physical, chemical, and biological characteristics of streams change with increasing urbanization in a continuous rather than threshold fashion. Although the patterns of change differed among the attributes studied and were more strongly evident for some than for others, physical and biological measures generally changed most rapidly during the initial phase of the urbanization process as %TIA above the 5-10% range. As urbanization progressed, the rate of degradation of habitat and biologic integrity usually became more constant. There was also direct evidence that altered watershed hydrologic regime was the leading cause for the overall changes observed in instream physical habitat conditions.

Chemical water quality constituents and concentrations of metals in sediments did not follow this pattern. These variables changed little over the urbanization gradient until imperviousness (%TIA) approached 40%. Even then water column concentrations did not surpass aquatic life criteria, and sediment concentrations remained far below freshwater sediment guidelines. As urbanization (%TIA) increased above the 50% level, with most pollutant concentrations rising rapidly at that point, it is likely that the role of water and sediment chemical water quality constituents becomes more important biologically.

It is also apparent that, for almost all PSL streams, large woody debris quantity and quality must be restored for natural instream habitat diversity and complexity to be realized. Of course, prior to undertaking any habitat enhancement or rehabilitation efforts, the basin hydrologic regime must be restored to near-natural conditions. Results suggest that resource managers should concentrate on preservation of high-quality stream systems through the use of land-use controls, riparian buffers, and

protection of critical habitat. Enhancement and mitigation efforts should be focused on watersheds where ecological function is impaired but not entirely lost.

Biological community alterations in urban streams are clearly a function of many variables representing conditions in both the immediate and more remote environment. In addition to urbanization level, a key determinant of biological integrity appears to be the quantity and quality of the riparian zone available to buffer the stream ecosystem, in some measure, from negative influences in the watershed (Figure 16). Instream habitat conditions also had a significant influence on instream biota. Streambed quality, including fine sediment content and streambed stability, clearly affected the benthic macroinvertebrate community (as measured by the B-IBI). The composition of the salmonid community was also influenced by a variety of instream physio-chemical attributes. In the PSL region, management of all streams for coho (and other sensitive salmonid species) may not be feasible. Management for cutthroat trout may be a more viable alternative for streams draining more highly urbanized watersheds. The apparent linkage between watershed, riparian, instream habitat, and biota shown here supports management of aquatic systems on a watershed scale.

The findings of this research indicate that there is a set of necessary, though not by themselves sufficient, conditions required to maintain a high level of stream quality or ecological integrity (physical, chemical, and biological). If maintenance of that level is the goal, then this set of enabling conditions constitutes standards that must be achieved if the goal is to be met. For the PSL streams, imperviousness must be limited (< 5-10 %TIA), unless mitigated by extensive riparian corridor protection and BMPs. Downstream changes to both the form and function of stream systems appear to be inevitable unless limits are placed on the extent of urban development. Stream ecosystems are not governed by a set of absolute parameters, but are dynamic and complex systems. We cannot "manage" streams, but instead should work more as "stewards" to maintain naturally high stream quality. Preservation and protection of high-quality resources should be a priority. Engineering solutions in urban streams have utility in some situations, but in most cases cannot fully mitigate the effects of development. Rehabilitation and enhancement of aquatic resources will almost certainly be required in all but the most pristine watersheds. In order to support natural levels of stream quality, the following recommendations are proposed:

- Reduce watershed imperviousness, especially targeting transportation-related surfaces and compacted pervious areas.
- Preserve at least 50% of the total watershed surface area as natural forest cover.
- Maintain urbanized stream system drainage-density to within 25% of pre-development conditions (i.e. urban/natural DD ratio < 1.25).
- Continuously monitor streamflow and maintain 2-year stormflow/baseflow discharge ratio much less than 20.
- Allow no stormwater outfalls to drain directly to the stream without first being treated by stormwater quality and quantity control facilities.
- Replace culverted road-crossings with bridges or arched-culverts with natural streambed

material.

- Retrofit existing BMPs or replace with regional (sub-basin) stormwater control facilities with the goal of restoring the natural hydrologic regime.
- Limit stream-crossings by roads or utility-lines to less than 2 per km of stream length and strive to maintain a near-continuous riparian corridor.
- Ensure that at least 70% of the riparian corridor has a minimum buffer width of 30 m and utilize wider (100 m) buffers around more sensitive or valuable resource areas.
- Limit encroachment of the riparian buffer zone through education and enforcement (< 10% of the riparian corridor should be allowed to have a buffer width < 10 m).
- Actively manage the riparian zone to ensure a long-range goal of at least 60% of the corridor as mature, coniferous forest.
- Allow no development in the active (100-year) floodplain area of streams. Allow the stream channel freedom of movement within the floodplain area.
- Protect and enhance headwater wetlands and off-channel riparian wetland areas as natural stormwater storage areas and valuable aquatic habitat resources (buffers).
- Adopt a set of regionally specific stream assessment protocols including standardized biological sampling (e.g., B-IBI).
- Under low-moderate basin development, chemical water quality monitoring should be used sparingly, if a chemical pollutant is suspected or in situations where biological monitoring indicates a problem. For highly urbanized streams, sampling should be more frequent, but should still be focused on specific constituents of concern.
- Monitoring of instream physical conditions should be tailored to the specific situation. Salmonid habitat surveys should include a measure of rearing habitat (LWD and/or pools) and a measure of spawning/incubating habitat (% fines and/or IGDO). In addition, standard channel morphological characteristics should be measured (BFW, BFD, pebble-count, and streambank condition). Scour monitoring should be used to evaluate local streambed stability in association with specific development activity.
- The complexity and diversity of salmonid life-cycles and stream communities, along with our limited understanding of them, should engender caution in proposing any simple solutions to reverse the cumulative effects of urbanization in streams of the PSL region as well as other regions.
- The following instream salmonid habitat target conditions are also proposed for urban, lowland streams in the PNW:

Instream Habitat Parameter	Salmonid Life-Phase Influenced	Indication of Poor Habitat Quality	Target for Fair Habitat Quality	Target for Good Habitat Quality
% Pool Habitat (Surface Area)	Rearing	< 30%	30-50%	> 50%

Pool Frequency (BFW-Spacing)	Rearing	> 4 BFWs	2-4 BFWs	< 2 BFWs
LWD Frequency (BFW-Spacing)	Rearing	< 1/BFW	1-2/BFW	> 2/BFW
% Key LWD (Dia. > 0.5 m)	Rearing	< 20%	20-40%	> 40%
Pool Cover (%)	Rearing	< 25%	25-50%	> 50%
IGDO/DO Interchange (%)	Spawning and Incubating	< 60%	60-80%	> 80%
Pebble-Count D10 (mm)	Spawning and Incubating	< 3 mm	3-5 mm	> 5 mm
Fine Sediment (% < 0.85 mm)	Spawning and Incubating	> 20%	15-20%	< 15%

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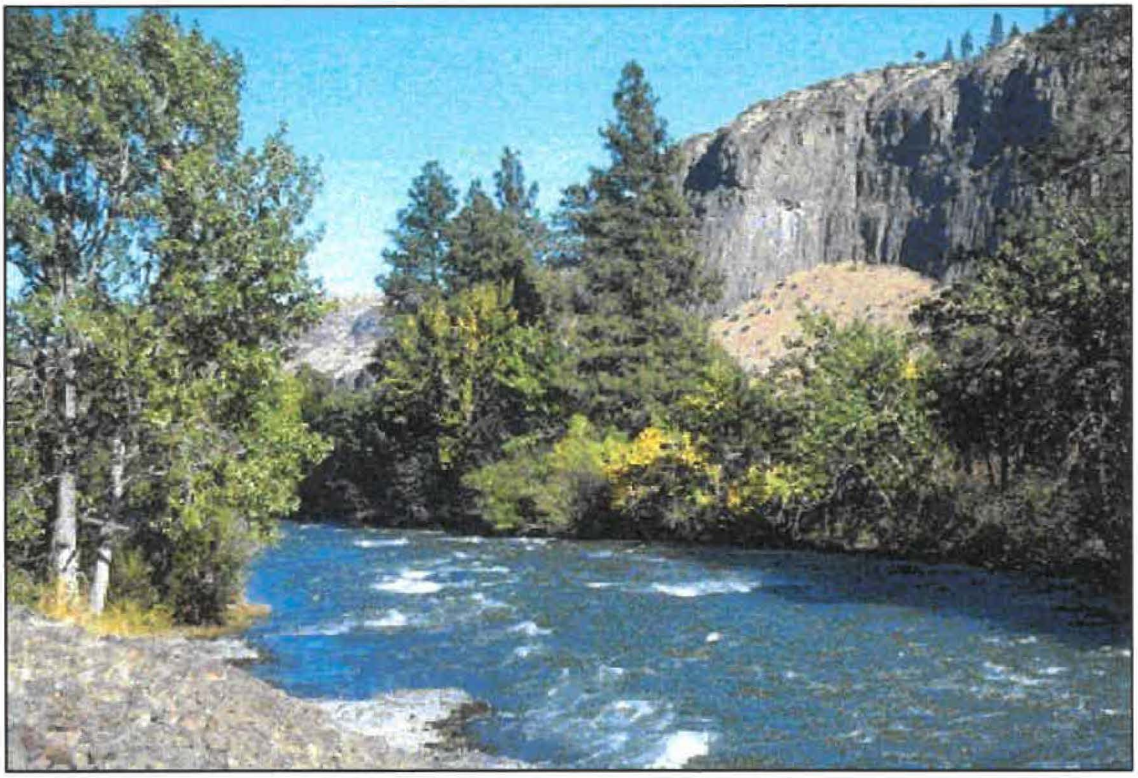
Citations of Recommended Sources of Best Available Science



For Designating and Protecting Critical Areas

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Washington State Office of Community Development
Busse Nutley, Director

Local Government Division
Steve Wells, Assistant Director

Growth Management Services
Leonard Bauer, AICP, Managing Director
Christine B. Parsons, AICP, Senior Planner
Rita R. Robison, AICP, Senior Planner
Chris Thomas, Research Analyst
Sheri Bennett, Secretary Lead
Jan Unwin, Secretary Lead

Post Office Box 48350
Olympia, Washington 98504-8350
(360) 725-3000
(360) 753-2950 FAX
http://www.ocd.wa.gov/growth

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Introduction

The Washington State Growth Management Act (GMA) requires every county and city in Washington to adopt policies and development regulations that designate and protect critical areas. Critical areas are defined as:

(a) Wetlands
(b) Areas with a critical recharging effect on aquifers used for potable water
(c) Frequently flooded areas
(d) Geologically hazardous areas
(e) Fish and wildlife habitat conservation areas

While the GMA does not set specific state or regional development standards for critical areas protection, it requires local governments to designate them and protect them through the adoption of comprehensive plan policies and development regulations to carry out the plan policies.

In 1995 the Legislature added a new section to the GMA that raised the standard for designating and protecting critical areas and protecting anadromous fisheries. RCW 36.70A.172 clarifies the state's goals and policies for protecting critical areas' functions and values by requiring that local governments include the "best available science" when designating and protecting them.

The best available science or valid science is often represented as research conducted by qualified individuals using documented methodologies that lead to verifiable results and conclusions. It is important for elected officials to understand how to identify valid science and how best to integrate it into policymaking. The responsibility for including the best available science into GMA policies and development regulations rests with the legislative authority of the county or city. However, when feasible, counties and cities should consult with a qualified scientific expert or team of experts to help identify and determine the best available scientific information and assess its applicability to the relevant critical areas. State agencies can also assist local governments with guidance and identifying additional resources.

Best Available Science Guidance

The Washington State Office of Community Development (OCD) adopted administrative rule guidance in August 2000 (Chapters 365-195-900 through 925 WAC) to assist cities and counties in determining what is the best available science, where to obtain it, how to include it in land use management policies and regulations, and what to do if there is no available valid scientific information.

Scientific information can be produced only through a valid scientific process. To ensure that the best available science is being included in policies and regulations, a county or city should consider the "characteristics" of a valid scientific process and common sources of scientific information [see Chapter 365-195-905(5) WAC]. In the

context of critical areas protection, a valid scientific process is one that produces reliable information useful in understanding the consequences of a local government's regulatory decisions.

Chapter 365-195-905(2) WAC states that OCD will make available a list of resources that state agencies have identified as meeting the characteristics of the best available science. This publication, *Citations of Recommended Sources of Best Available Science for Designating and Protecting Critical Areas*, meets that requirement. However, because science is a dynamic process and new science and new interpretation of existing work occur continually, it is impossible to present all of the science in a single document that may be appropriate for use in decision making. This publication is the product of a multistate agency effort to provide current information that may be used as the best available science. OCD plans to update this information annually.

How to Use This Report

This report provides local governments with a list of valid scientific information that the state has identified to represent current sources of the best available science. As previously stated, when feasible, counties and cities should consult with qualified scientific experts or teams of experts to help identify and determine if more current valid scientific information exists and assess its applicability to the relevant issues. Local governments must substantively include the best available science in the process of developing their policies and regulations to protect the functions and values of critical areas. In addition, citations to the best available science must be presented in the record when local plans and regulations are being considered.

This report is organized into six sections and two appendices. Five sections cover the five critical areas topics and an additional section includes information on special consideration for anadromous fisheries that is useful for local planning and permitting efforts. Appendix A provides contact names from state agencies that may be helpful in providing additional localized information. Appendix B offers the relevant statutory and administrative codes for easy reference.

The citations are alphabetized by author's name and are not prioritized. They are not an exclusive list of all the best available science currently published, but offer a set of scientifically valid sources in one place. Other details about the citations are as follows:

- The critical areas information follows the topics provided in OCD's Minimum Guidelines to Classify Critical Areas, Chapter 365-190-080 WAC.
- The citations are organized into two general topic areas, critical areas classification information and critical areas guidance information.
- Much of the information relates to specific geographic areas and may not have applicability to other locations. OCD attempted to ensure that the citations met

characteristics of the best available science. Where data was outdated or was site specific, this was noted.

- If publications are available through the Internet, the hyperlink site is noted. State agency libraries or the Washington State Library can also be a source for these reports and studies.

Some critical area mapping information was developed for purposes other than land use planning. For example, information presented here for tsunami areas was developed primarily for emergency management preparation. Similarly, flood maps provided from the Federal Emergency Management Agency provide important information for planning flood hazard mitigation and receiving grants from the Flood Control Assistance Account Program, but do not address aquatic habitats or other ecological information about the value of riparian functions.

For your convenience, *Citations of Recommended Sources of Best Available Science for Designating and Protecting Critical Areas* is posted on the Web site: http://www.ocd.wa.gov/growth

Section 1: Wetlands

The citations identified are not an exclusive list of all the best available science currently published on wetlands, but offer a principal source of scientifically valid information useful for local planning and permitting efforts. Local governments are encouraged to consult with qualified scientific experts or teams of experts to help identify and determine if more current valid scientific information exists and assess its applicability to the relevant critical areas.

Identification and Delineation

1. Washington Department of Ecology. 1997. Washington State wetlands identification and delineation manual. Publication #96-94.

   The manual describes methods to be used for delineating the jurisdictional boundary of a wetland using the three parameters: water regime/hydrology, soils, and vegetation. It is required to be used by all state and local jurisdictions (RCW 36.70A.175) and produces the same boundary as the U.S. Army Corps of Engineers 1987 manual.

2. Washington Department of Natural Resources. Updated annually. GIS Data Set. Washington Natural Heritage Program.

   This data set provides geographic information system (GIS) coverage available for licensed use. The Washington Natural Heritage Program GIS includes locations and information regarding mapping high-quality wetland ecosystems in Washington State. The Natural Heritage Information System functions as a central repository of information on high quality aquatic and wetland ecosystems.

Classification

3. Brinson, M. M. 1993. A hydrogeomorphic classification for wetlands. U.S. Army Engineer Waterways Experiment Station. Technical Report WRP-DE-4.

   This publication describes a wetland classification system that is used to separate different wetland types for the purpose of assessing their functions. Wetlands are grouped into different categories based on their geomorphic setting, their water source, and differences in the fluctuations of water levels.

4. Cowardin, L. M., Carter, V., Golet, F. C., and LaRoe, E. T. 1979. Classification of wetlands and deepwater habitats of the United States. Office of Biological Services, U.S. Fish and Wildlife Service, U.S. Department of the Interior. FWS/OBS-79/31. 103 pp.

This publication describes classification of wetlands based on the types of plants present, soils, and frequency of flooding. It was developed by the U.S. Fish and Wildlife Service to inventory wetlands across the U.S. from aerial photographs.

5. Kunze, Linda M. 1994. Preliminary classification of native, low elevation, freshwater wetland vegetation in Western Washington. Washington Natural Heritage Program, Department of Natural Resources.

   This study is a result of ten years of wetland inventory and a review of the literature. It classifies and describes native wetland plant community types, provides references, and includes an appendix translating it to the Cowardin et al. (1979) classification. This preliminary classification includes native, undisturbed wetlands found in the lowlands of Western Washington. It includes impounded, semi-impounded, and tidal freshwater wetland plant communities.

Rating System

6. Washington Department of Ecology. 1991. Washington State wetland rating system for Eastern Washington. Publication #91-58.

   The Washington State wetland rating system is a method for grouping wetlands into one of four categories based on their sensitivity to disturbance, whether they can be easily replaced, the presence of highly valued characteristics (such as threatened and endangered species), and habitat structure. It is often used as the basis for setting buffer requirements when development occurs in, or near, wetlands. The rating system for Eastern Washington is intended to be used in wetlands on the east side of the Cascade crest.

7. Washington Department of Ecology. 1993. Washington State wetland rating system for Western Washington. Publication #93-74.

   The Washington State wetland rating system is a method for grouping wetlands into one of four categories based on their sensitivity to disturbance, whether they can be easily replaced, the presence of highly valued characteristics (such as threatened and endangered species), and habitat structure. It is often used as the basis for setting buffer requirements when development occurs in, or near, wetlands. The rating system for Western Washington is intended to be used in wetlands on the west side of the Cascade crest.

Function Assessment

8. Bartoldus, C. C. 1999. A comprehensive review of wetland assessment procedures: A guide for wetland practitioners. Environmental Concern Inc., St. Michaels, Maryland. 196 pp.

   This manual provides a compendium of current wetland assessment procedures that wetland practitioners can use to: (a) learn the steps, approaches, and terminology of a method, and (b) identify a procedure that meets their specific needs. A non-profit corporation devoted to wetlands research and restoration prepared this report.

9. Hruby, T. 1999. Assessments of wetland functions: What they are and what they are not. Environmental Management, vol. 23, pp. 75-85.

   This scientific journal article describes the technical basis and limitations of current rapid methods for assessing wetland functions.

10. Washington Department of Ecology. 2000. Methods for assessing wetland functions volume II: Depressional wetlands in the Columbia Basin for Eastern Washington – parts 1 and 2. Publication #00-06-47.

    The methods provide relatively rapid, scientifically valid procedures for assessing how well wetlands perform functions, such as improving water quality, reducing floods, and providing wildlife habitat. The methods described in this volume can be used in depressional wetlands of the Columbia Basin. The Washington Department of Ecology recommends that these methods be used only by people who have completed the five-day training workshop offered by Ecology.

11. Washington Department of Ecology. 1999. Methods for assessing wetland functions volume I: Riverine and depressional wetlands in the lowlands of Western Washington – parts 1 and 2. Publication #99-115.

    The methods provide relatively rapid, scientifically valid procedures for assessing how well wetlands perform functions, such as improving water quality, reducing floods, and providing wildlife habitat. The methods described in this volume can be used in riverine and depressional wetlands in Western Washington that are in the lowlands and the foothills of the Olympic and Cascade Mountains. The Washington Department of Ecology recommends that these methods be used only by people who have completed the five-day training workshop offered by Ecology.

12. Washington State Department of Transportation. 2000. Wetland functions characterization tool for linear projects. Environmental Affairs Office. 28 pp. Available at: http://www.wsdot.wa.gov/eesc/environmental/programs/biology/docs/bpjtool.pdf

The Washington State Department of Transportation's method is a qualitative tool designed for rapid documentation of functions present or absent in wetlands throughout the state. It uses the best professional judgment of the qualified user to characterize the functions provided by a wetland.

Mitigation

13. Kentula, M. E., et al. 1992. An approach to improving decision making in wetland restoration and creation. U.S. Environmental Protection Agency. EPA/600/R-92/150.

A summary of strategies that can be used by resource managers to determine the appropriate mitigation for wetland impacts. This is a technical document that addresses management concerns, such as site selection and how to develop design criteria.

14. National Research Council. 1996. Guidelines for the development of wetland replacement areas. National Cooperative Highway Research Program, Transportation Research Board. National Academy Press, Washington, D.C. Report 379.

This publication is a comprehensive review of wetland mitigation. It covers function assessment, setting goals and objectives, site selection, site design and construction, and developing conceptual and final mitigation plan. The appendices cover specific wetland elements (hydrology, soils, vegetation, and cost estimating) in more detail.

15. Washington Department of Ecology. 2000. Washington State wetland mitigation evaluation study, phase 1: Compliance. Publication #00-06-016.

A report that summarizes the results from visits to 45 wetlands that were created, restored, and/or enhanced in Washington to compensate for impacts to existing wetlands. This report from the first phase of the study assessed the compliance of the projects with the conditions in their development permits.

16. Washington Department of Ecology. 2001. Washington State wetland mitigation evaluation study phase 2: Success. Publication #02-06-09.

A report that summarizes the results from visits to 24 wetlands that were created, restored, and/or enhanced in Washington to compensate for impacts to existing wetlands. This second phase study assesses the overall success of compensatory mitigation projects in the state of Washington.

17. Washington Department of Ecology. 1994. Guidelines for developing freshwater wetlands mitigation plans and proposals. Publication #94-29.

    This report provides guidance for those planning to undertake restoration, creation, or enhancement of freshwater wetlands to compensate for unavoidable impacts. It describes an outline that should be followed when submitting plans and proposals.

18. Washington Department of Ecology. 1992. Wetland mitigation replacement ratios: Defining equivalency. Publication #92-08.

    The report summarizes and evaluates the information available before 1992 for setting the ratios needed to offset losses due to filling or other impacts to wetlands through compensatory mitigation.

Buffers

19. Desbonnet, A., Pogue, P., Lee, V., and Wolff, N. 1994. Vegetated buffers in the coastal zone: A summary review and bibliography. Coastal Resources Center, University of Rhode Island Graduate School of Oceanography, Narragansett, Rhode Island. Technical Report No. 2064. 72 pp.

    This report summarizes the scientific literature up to 1994 on the effectiveness of different buffer widths at maintaining the functions of aquatic resources. It also summarizes the functions provided by different buffer widths.

20. McMillan, A. 2000. The science of wetland buffers and its implications for the management of wetlands. Master's Thesis. The Evergreen State College.

    This report summarizes the scientific literature on wetland buffers up to 1999. It also explores the meaning of the phrase "best available science" found in the Growth Management Act, outlines the essential provisions in buffer regulation, and recommends specific regulatory language. For information on this report, contact the author, Andy McMillan, at (360) 407-7272.

21. Washington Department of Ecology. 1992. Wetland buffers: Use and effectiveness. Publication #92-10.

This report was developed to assist those developing policies and standards for wetland protection. Specifically, the report summarizes and assesses information available before 1992 related to the use and effectiveness of wetland buffers.

General Wetland Resources

22. Azous, A. L. and Horner, R. R., editors. 1997. Wetlands and urbanization: Implications for the future. Final report of the Puget Sound Wetlands and Stormwater Management Research Program. Available at: http://splash.metrokc.gov/wlr/basins/weturban.htm

    Also published as: Amanda L. Azous and Richard R. Horner, editors. 2001. Wetlands and urbanization, implications for the future. Lewis Publishers, New York.

    A compendium of research covering hydrology, water quality, soils, vegetation, invertebrates, and wildlife communities (amphibians, birds, and small mammals) in 19 wetlands carried out over a ten-year period. The report describes the research program and characterizes the baseline physical and chemical conditions and biological communities of these wetlands. The report further describes how these characteristics changed with differing intensities of urbanization. Guidelines for better management of wetlands to minimize detrimental impacts to the abiotic and biotic conditions from watershed development are also presented.

23. Mitsch, W. J. and Gosselink, J. G. 2000. Wetlands. 3rd ed. Van Nostrand Reinhold, New York.

    This is the basic textbook on wetlands used by many colleges and universities. It provides a good summary of the chemistry, geology, hydrology, and biology of wetlands.

24. National Academy of Sciences. 1995. Wetlands: Characteristics and boundaries. National Research Council, Washington, D.C.

    This book presents the results of a national scientific committee on the issues of defining wetlands, characterizing them, and delineating them. It contains information on the scientific basis of wetland delineation, the regulatory framework for managing wetlands, and wetland functions.

25. Schneider, C. B. and Sprecher, S. W. 2000. Wetlands management handbook. U.S. Army Engineer Research and Development Center. ERDC/EL SR-00-16.

This document addresses the wetlands facet of natural resource management from a U.S. Army Corps of Engineers perspective. The purpose is to provide land managers with general guidance on basic ecological and regulatory issues that must be considered in wetland protection and management.

Section 2: Critical Aquifer Recharge Areas

The citation identified is not an exclusive list of all the best available science currently published for critical aquifer recharge areas, but offers a source of scientifically valid information useful for local governments planning and permitting efforts. Local governments are encouraged to consult with qualified scientific experts or teams of experts to help identify and determine if more current valid scientific information exists and assess its applicability to the relevant critical areas.

Guidance

Washington Department of Ecology. July 2000. Guidance document for establishment of critical aquifer recharge area ordinance. Water Quality Program. Publication #97-30.

This document provides guidance on what is considered a technically valid delineation of a critical aquifer recharge area boundary and to what extent additional characterization should be required for a given land use activity once a jurisdiction makes an initial determination. This document is revised and updated as new scientific information is recognized.

Section 3: Frequently Flooded Areas

The citations identified are not an exclusive list of all the best available science currently published for frequently flooded areas, but offer a source of scientifically valid information useful for local governments planning and permitting efforts. Local governments are encouraged to consult with qualified scientific experts or teams of experts to help identify and determine if more current valid scientific information exists and assess its applicability to the relevant critical areas.

Floodplains

Classification

1. Federal Emergency Management Agency. Flood Insurance Rate Maps.

   Federal Emergency Management Agency
   130-228th S.W.
   Bothell, WA 98021-9796
   (425) 487-4678
   Or
   1-800-358-9616 for the FEMA map service center

   Federal Emergency Management Agency (FEMA) flood maps (flood insurance rate maps) are a good resource that can help local governments classify and designate frequently flooded areas. These maps delineate the flood ways and the floodplains. These maps are used by a local government that participates in the National Flood Insurance Program (NFIP). Counties and cities must, at a minimum, include the 100-year floodplain designated by FEMA and the NFIP when designating floodways and floodplains. Maps identifying floodplains for most rivers and streams are available. The greatest detail is on the most developed or developing areas. The scale of the maps is as follows: cities (1:3,600 or 6,000); counties (1:12,000); rural areas (1:12,000). These maps show the elevation within the floodplain at which building is permitted. Local governments with shorelines should also evaluate the potential for flooding that can result from high tides combined with strong winds, tsunami resulting from oceanic seismic activity, and increases in sea level because of global warming.

Guidance

2. Bolton, S. and Shellberg, J. 2001. Ecological issues in floodplains and riparian corridors. Center for Streamside Studies, University of Washington. 150 pp.

   This report, or white paper, addresses the state of the knowledge about impacts of development and land management activities on aquatic habitats including fish and shellfish habitats. This synthesis document focuses on the

comprehensive and effective management of activities affecting aquatic ecosystems in Washington State. It includes an overview and the assessment of the state of the knowledge on ecological issues in floodplain and riparian corridors, a summary of existing guidance, recommendations for future guidance documents, a glossary of technical terms, and a bibliography. Available at: http://www.wa.gov/wdfw/hab/ahg/floodrip.htm

3. Washington Department of Ecology. 1991. Comprehensive planning for flood hazard management. Publication #91-44. 106 pp.

   This guidebook assists local governments in preparing a comprehensive flood hazard management plan (CFHMP) to comply with state laws and to enable communities to receive grant funds through the Flood Control Assistance Account Program (FCAAP). The guidebook provides an introduction to FCAAP, discusses the process for initiating a FCAAP, discusses the elements of the comprehensive plan, presents recommendations in preparing a CFHMP, and includes an appendix of brief descriptions of regulatory reform programs.

4. Federal Emergency Management Agency. 1999. Executive summary: Riverine erosion hazard areas, mapping feasibility study. Technical Services Division, Hazard Study Branch. 11 pp.

   The purpose of this study is to determine whether it is technologically feasible to map riverine erosion hazards areas. The study includes sections regarding riverine erosion, evaluation of channel changes, literature review, assessment of technical feasibility, cost, implementations, and conclusions. Available at: http://www.fema.gov/mit/tsd/ft_reha.htm

Increased Impervious Surfaces and Stormwater

1. Arnold, C. L. and Gibbons, C. J. 1996. Impervious surface coverage: The emergence of a key environmental indicator. Journal of the American Planning Association, vol. 62, no. 2, pp. 243-258.

   This article documents the importance of impervious surface coverage as an environmental indicator and its usefulness in protecting the health of local water resources. The author explains the relationship between imperviousness and changes in hydrologic processes then provides a number of examples and alternative approaches for applying these principles.

2. Booth, Derek B. and Jackson, Rhett. 1997. Urbanization of aquatic systems: Degradation thresholds, stormwater detection, and the limits of mitigation. Journal of the American Water Resources Association, vol. 33, #5, pp. 1077-1090.

This paper focuses on the impact of urbanization on the hydrology and stability of stream channels and discusses the limited effectiveness of the traditional detention pond approach to solving those problems.

3. Horner, Richard R. 1999. Regional study supports natural land cover protection as leading best management practice for maintaining stream ecological integrity. Conference paper. Comprehensive Stormwater and Aquatic Ecosystem Management, First South Pacific Conference, Auckland, New Zealand. February 22-26, 1999. ISBN 1-877134-18-X. Vol. 1, pp. 233-247.

   The study's intent was to produce a knowledge base for managing land with reference to ecological protection goals. The study conducted on streams in the Puget Sound region produced a set of conditions necessary to preserve the highest levels of biological integrity or avoid the lowest. A follow-up study is in progress to assess the influence of structural and non-structural best management practices on the same ecological communities. Results to date demonstrate that retention of a wide, nearly continuous riparian buffer in native vegetation has greater and more flexible potential than other options to uphold biological integrity when development increases. Upland forest retention also offers valuable benefits, especially in managing any development occurring in previously undeveloped or lightly developed areas. While circumstances differ in other settings, the methods used and general conclusions likely have wide applicability.

4. May, Christopher W., Welch, E. B., Horner, R. R., Karr, J. R., and Mar, B. W. 1997. Quality indices for urbanization effects on Puget Sound lowland streams. University of Washington, Civil Engineering Department, Water Resources Series, Technical Report No. 154.

   This report examines the relationships between watershed urbanization and the physical, chemical, and biological characteristics of streams. The authors assess the conditions and factors involved in this relationship, including the importance of calculating total impervious area as a measure of urbanization and stream health. Although the research focuses on stream environments, the concepts linking development with the health of aquatic systems are transferable to shellfish watersheds and shoreline environments. Companion papers available at: http://www.stormwatercenter.net/Practice/18-Effects of Urbanization on Small Streams.pdf and http://pluto.apl.washington.edu/etg/chrisrdp.html

5. Schueler, T. R. 1994. The importance of imperviousness. Watershed Protection Techniques, vol. 1, no. 3, pp. 100-111. Available at: http://www.stormwatercenter.net/Practice/1 Importance%20of%20Imperviousness.pdf

This article outlines the significance of impervious surfaces as a measure of the potential impact of land development on aquatic systems. Specifically, the article correlates changes in imperviousness with changes in the hydrology, habitat structure, water quality, and bio-diversity of aquatic systems, concluding that significant degradation occurs at relatively low levels of development. The article also outlines techniques for mitigating or avoiding these impacts.

6. Washington Department of Ecology. 2001. Stormwater management manual for Western Washington. Vols. I-V. Available at: http://www.ecy.wa.gov/programs/wq/stormwater/index.html

   This manual establishes the technical standards and recommended practices for stormwater management in Western Washington. The standards and practices address both new development and redevelopment and aim to protect and restore aquatic habitats and natural hydrologic processes throughout the region.

Climate Change

1. Canning, D. J. 2001. Climate variability, climate change, and sea level rise in Puget Sound: Possibilities for the future. Puget Sound Action Team. Puget Sound Research, 2001 Proceedings.

   This paper discusses historical sea level rise and possible anthropogenic climate changes as it relates to Puget Sound and climate variation due to El Nino and La Nina. It also reviews current scientific and management questions.

2. Craig, D. 1993. Preliminary assessment of the sea level rise in Olympia, Washington: Technical and policy implications. Policy and Program Development Division, Olympia Public Works Department.

   This report examines the potential impact of sea level rise in the City of Olympia over the next 100 years. The document studies the increased risk of higher flood tides, higher water table, and diminished surface drainage. The focus of this paper is on Olympia's long-range planning for land uses and facilities. This document could be useful to low lying coastal communities in gaining a better understanding of potential impacts and possible responses to long-term sea level rise due to global warming.

Tsunami

Most of these documents regarding tsunami hazard areas are site specific and can be useful in critical area designation. Tsunami maps were designated to assist with emergency evacuation planning efforts.

1. Preuss, J. and Hebenstreit, G. T. 1998. Integrated tsunami-hazard assessment for a coastal community, Grays Harbor, Washington. In Rogers, A. M., Walsh, T. J., Kockelman, W. J., and Priest, G. R., editors. Assessing earthquake hazards and reducing risk in the Pacific Northwest. U.S. Geological Survey Professional Paper 1560, v. 2, pp. 517-536.

2. Walsh, T. J., Caruthers, C. G., Heinitz, A. C., Myers, E. P., III, Baptista, A. M., Erdakos, G. B., and Kamphaus, R. A. 2000. Tsunami hazard map of the Southern Washington coast – modeled tsunami inundation from a Cascadia subduction zone earthquake. Division of Geology and Earth Resources, Washington Department of Natural Resources. Geologic Map GM-49, 1 sheet, scale 1:100,000, p. 12.

Section 4: Geologically Hazardous Areas

The citations are not an exclusive list of all the best available science currently published for geologically hazardous areas, but offer a principal source of scientifically valid information useful for local governments planning and permitting efforts. Local governments are encouraged to consult with qualified scientific experts or teams of experts to help identify and determine if more current valid scientific information exists and assess its applicability to the relevant critical areas.

The following references can be useful in critical area mapping and designation, but some mapping information was designed for emergency management purposes and may have limited utility for land use planning.

General

1. King County Parks, Planning, and Resources Department. 1990. Sensitive areas map folio. King County. Vol. 1.

2. Manson, C. J., editor. 2001. Digital bibliography of the geology and mineral resources of Washington State, 1798-2000. Division of Geology and Earth Resources, Washington Department of Natural Resources. CD-ROM.

   The file contains the citations and indexing for more than 35,000 items and includes both the items listed in the Department of Natural Resources' printed bibliographies and those non-Washington items located in its library. The CD-ROM disc contains search software and runs on Windows 3.1 or higher; it does not run on Macintosh computers or over a local area network (LAN). The software allows searching by author, date, title, publisher, county or formation name, call number, or subject, with Boolean combinations. Search results can then be sorted by any of the fields, and the user can print in several different report forms. The CD-ROM disc is updated every January and is free to local governments and educators in Washington State.

3. Washington Department of Ecology. 1978-1980. Slope stability maps and Coastal Zone Atlas. Vols. 1-12, maps, scale 1:24,000. Available at: http://www.ecy.wa.gov/programs/sea/landslides/maps/maps.html

   These maps of Puget Sound coastal areas are intended to educate the public about Washington's shoreline and to guide regional land use decisions. The Washington Department of Ecology (Ecology) recommends that these maps should not be used as a substitute for site-specific studies carried out by qualified, licensed geologists and engineers.

   This mapping represents conditions observed in the early and mid-1970s. Shorelines and steep slopes are dynamic areas and many landslides have

occurred since that time that are not reflected on these maps. Subsequent human activities may have increased or decreased the stability of some areas. Ecology can make no warranty of the accuracy, completeness, or fitness for use of this information.

Mapping in the Coastal Zone Atlas only extends 2000 feet inland from the shoreline. Mapping was carried out only in those areas under direct state shoreline jurisdiction and therefore did not include federal military installations or tribal jurisdictions.

4. Washington Department of Natural Resources. 2001. Publications of the Washington Division of Geology and Earth Resources. Division of Geology and Earth Resources. 38 pp. Available at: http://www.wa.gov/dnr/htdocs/ger/publist.htm

   This publication provides a list of publications available through the Washington Department of Natural Resources regarding Washington State earth resources. The publication includes: reports, bulletins, geologic maps, topographic maps, report investigations, information circulars, open file reports, miscellaneous publications, author index, subject index, and Washington geology article index.

Erosion Hazard Areas

Federal Emergency Management Agency. 1999. Executive summary: Riverine erosion hazard areas, mapping feasibility study. Technical Services Division, Hazard Study Branch. 11 pp. Available at: http://www.fema.gov/mit/tsd/ft_reha.htm

The purpose of this study is to determine whether it is technologically feasible to map riverine erosion hazards areas. The study includes sections regarding riverine erosion, evaluation of channel changes, literature review, assessment of technical feasibility, cost, implementations, and conclusions.

Landslide and Marine Bluff Hazard Areas

Most of these documents regarding landslide hazards areas are site specific and can be useful in critical area designation.

1. Baum, R. L., Harp E. L., and Hultman, W. A. 2000. Map showing recent and historic landslide activity on coastal bluffs of Puget Sound between Shilshole Bay and Everett, Washington. U.S. Geological Survey. Miscellaneous Field Studies Map MF-2346, 1 sheet, scale 1:24,000.

2. Deeter, J. D. 1979. Quaternary geology and stratigraphy of Kitsap County, Washington. Western Washington University Master of Science thesis, 175 pp., 2 plates.

3. Easterbrook, D. J. 1976. Map showing slope stability in Western Whatcom County, Washington. U.S. Geological Survey Miscellaneous Investigations Series Map I-854-C, 1 sheet, scale 1:62,500.

4. Gerstel, W. J. and Brunengo, M. J. 1994. Mass wasting on the urban fringe. Washington Geology, v. 22, no. 2, pp. 11-17.

5. Gerstel, W. J., Brunengo, M. J., Lingley, W. S., Jr., Logan, R. L., and Walsh, T. J. 1997. Puget Sound bluffs: The where, why, and when of landslides following the holiday 1996/97 storms. Washington Geology, vol. 25, no. 1, pp. 17-31.

6. King County Parks, Planning, and Resources Department. 1990. Sensitive areas map folio. King County. V 1.

7. Shipman, Hugh. 2001. Coastal landsliding on Puget Sound: A review of landslides occurring between 1996 and 1999. Washington Department of Ecology. Report #01-06-019. 87 pp.

   The report provides documentation of major episodes of landsliding during the 1996-97 and 1998-99 winter seasons, and uses this information to better understand how local governments and agencies might reduce the risks from coastal landslides in the future.

8. Thorsen, G. W. 1989. Landslide provinces in Washington. In Galster, R. W., Chairman. Engineering Geology in Washington. Division of Geology and Earth Resources, Washington Department of Natural Resources. Bulletin 78, v. I, pp. 71-89.

9. Thom, Ronald M. and Williams, Gregory D. 2001. Marine and estuarine shoreline modification issues. Battelle Marine Sciences Laboratory, Sequim, Washington. 136 pp. Available at: http://www.wa.gov/wdfw/hab/ahg/marnrsrc.htm

   The state-of-the-knowledge white paper on marine and estuarine shoreline modification addresses design and ecological considerations associated with hard and soft structural shoreline stabilization (bulkheads, rock revetments, groins, jetties, beach nourishment, and biotechnology), non-structural stabilization (setbacks, vegetation management, and ground/surface water management), estuary and shoreline restoration, tidegates, outfalls, and artificial reefs.

10. Tubbs, D. W. 1974. Landslides in Seattle. Division of Geology and Earth Resources, Washington Department of Natural Resources. Information Circular 52, 15 pp., 1 plate.

11. U.S. Geological Survey. 1975. Slope map of part of west-central King County, Washington. U.S. Geological Survey. Miscellaneous Investigations Series Map I-852-E, 1 sheet, scale 1:48,000.

12. Washington Department of Ecology. 1978-1980. Slope stability maps and Coastal Zone Atlas. Vols. 1-12, maps, scale 1:24,000. Available at: http://www.ecy.wa.gov/programs/sea/landslides/maps/maps.html

    Mapping in the Coastal Zone Atlas only extends 2000 feet inland from the shoreline, and does not include tribal or federal jurisdictions.

    These maps are intended to educate the public about Washington's shoreline and to guide regional land use decisions. The Washington Department of Ecology recommends that these maps should not be used as a substitute for site-specific studies carried out by qualified, licensed geologists and engineers.

Seismic Hazard Areas

Many of these documents regarding seismic hazard areas are site specific and can be useful in critical area designation.

1. Chleborad, A. F. and Schuster, R. L. 1998. Ground failure associated with the Puget Sound region earthquakes of April 13, 1949, and April 29, 1965. In Rogers, A. M., Walsh, T. J., Kockelman, W. J., and Priest, G. R., editors. Assessing earthquake hazards and reducing risk in the Pacific Northwest. U.S. Geological Survey Professional Paper 1560, vol. 2, pp. 373-440.

2. Dragovich, J. D. and Pringle, P. T. 1995. Liquefaction susceptibility for the Sumner 7.5-minute quadrangle, Washington, with a section on liquefaction by S. P. Palmer. Division of Geology and Earth Resources, Washington Department of Natural Resources. Geologic Map GM-44, 1 sheet, scale 1:24,000, p. 26.

3. Grant, W. P., Perkins, W. J., and Youd, T. L. 1998. Evaluation of liquefaction potential in Seattle, Washington. In Rogers, A. M., Walsh, T. J., Kockelman, W. J., and Priest, G. R., editors. Assessing earthquake hazards and reducing risk in the Pacific Northwest. U.S. Geological Survey Professional Paper 1560, pp. 441-473.

4. King County Parks, Planning, and Resources Department. 1990. Sensitive areas map folio – King County, December 1990. Vol. 1.

5. Kockelman, W. J. 1998. Techniques for reducing earthquake hazards. In Rogers, A. M., Walsh, T. J., Kockelman, W. J., and Priest, G. R., editors. Assessing earthquake hazards and reducing risk in the Pacific Northwest. U.S. Geological Survey Professional Paper 1560, vol. 2, pp. 479-496.

6. May, P. J. 1998. Earthquake risk-reduction prospects for the Puget Sound and Portland, Oregon, areas. In Rogers, A. M., Walsh, T. J., Kockelman, W. J., and Priest, G. R., editors. Assessing earthquake hazards and reducing risk in the Pacific Northwest. U.S. Geological Survey Professional Paper 1560, vol. 2, pp. 497-515.

7. Palmer, S. P. 1992. Preliminary maps of liquefaction susceptibility for the Renton and Auburn 7.5-minute quadrangles, Washington. Division of Geology and Earth Resources, Washington Department of Natural Resources. Open File Report 92-7, 24 pp., 2 plates.

8. Palmer, S. P. 1994. Revision to the 1994 Uniform Building Code seismic zone map for Washington and Oregon. Washington Geology, vol. 22, no. 2, p. 35.

9. Palmer, S. P., Schasse, H. W., and Norman, D. K. 1994. Liquefaction susceptibility for the Des Moines and Renton 7.5-minute quadrangles, Washington. Division of Geology and Earth Resources, Washington Department of Natural Resources. Geologic Map GM-41, 2 sheets, scale 1:24,000, p. 15.

10. Palmer, S. P., Walsh, T. J., and Gerstel, W. J. 1999. Geologic folio of the Olympia-Lacey-Tumwater urban area, Washington – Liquefaction susceptibility map. Division of Geology and Earth Resources, Washington Department of Natural Resources. Geologic Map GM-47, 1 sheet, scale 1:48,000, p. 16.

11. Palmer, S. P., Walsh, T. J., Logan, R. L., and Gerstel, W. J. 1995. Liquefaction susceptibility for the Auburn and Poverty Bay 7.5-minute quadrangles, Washington. Division of Geology and Earth Resources, Washington Department of Natural Resources. Geologic Map GM-43, 2 sheets, scale 1:24,000, p. 15.

12. Perkins, J. B. and Moy, K. K. 1998. Liability for earthquake hazards or losses and its impacts on the cities and counties of Washington. In Rogers, A. M., Walsh, T. J., Kockelman, W. J., and Priest, G. R., editors. Assessing earthquake hazards and reducing risk in the Pacific Northwest. U.S. Geological Survey Professional Paper 1560, vol. 2, pp. 543-545.

13. Rogers, A. M., Walsh, T. J., Kockelman, W. J., and Priest, G. R. 1996. Map showing known or suspected faults with quaternary displacement in the Pacific Northwest. In Rogers, A. M., Walsh, T. J., Kockelman, W. J., and Priest, G. R., editors. Assessing earthquake hazards and reducing risk in the Pacific Northwest. U.S. Geological Survey Professional Paper 1560, Plate 1, scale 1:2,000,000.

14. Rogers, A. M., Walsh, T. J., Kockelman, W. J., and Priest, G. R., editors. 1998. Assessing earthquake hazards and reducing risk in the Pacific Northwest. U.S. Geological Survey Professional Paper 1560, vol. 2, 545 pp., 6 plates.

15. Shannon & Wilson Inc. 1993. Evaluation of liquefaction potential Tacoma, Washington. Final technical report. Vol. 1.

16. Youd, T. L. 1996. Liquefaction hazard maps for the Portland quadrangle, Oregon, and comparison of hazard with performance during past earthquakes [abstract]. Geological Society of America Abstracts with Programs, vol. 28, no. 5, pp. 127-128.

Mine Hazard Areas

1. King County Parks, Planning, and Resources Department. 1990. Sensitive areas map folio – King County, December 1990. Vol. 1.

2. Walsh, T. J. 1994. Growth management planning for abandoned coal mines. Washington Geology, vol. 22, no. 2, pp. 33-34.

3. Walsh, T. J. and Bailey, M. J. 1989. Coal mine subsidence at Renton, Washington. In Galsters, R. W., chairman. Engineering Geology in Washington. Division of Geology and Earth Resources, Washington Department of Natural Resources. Bulletin 78, v. II, pp. 703-712.

Note: The Division of Geology and Earth Resources, Washington Department of Natural Resources also maintains a large collection of maps showing the underground workings of Western Washington coal mines.

Volcanic Hazard Areas

The following documents provide general information on volcanic hazards in Washington.

1. Pringle, P. T. 1994. Volcanic hazards in Washington – A growth management perspective. Washington Geology, vol. 22, no. 2, pp. 25-33.

2. Waldron, H. H. 1989. Volcanic hazards in Washington. In Galster, R. W., chairman. Engineering Geology in Washington. Division of Geology and

Earth Resources, Washington Department of Natural Resources. Bulletin 78, vol. I, pp. 91-96.

Most of these documents regarding volcanic hazards are site specific and can be useful in critical area designation.

3. Gardner, C. A., Scott, K. M., Miller, C. D., Myers, B., Hildreth, W., and Pringle, P. T. 1995. Potential volcanic hazards from future activity of Mount Baker, Washington. U.S. Geological Survey. Open-File Report 95-498, 16 pp., 1 plate. Available at: http://vulcan.wr.usgs.gov/Publications/hazards_reports.html

4. Hoblitt, R. P., Walder, J. S., Driedger, C. L., Scott, K. M., Pringle, P. T., and Vallance, J. W. 1998. Volcano hazards from Mount Rainier, Washington, revised 1998. U.S. Geological Survey. Open-File Report 98-428, 2 plates, 11 pp. Available at: http://vulcan.wr.usgs.gov/Publications/hazards_reports.html

5. Hoblitt, R. P., Miller, C. D., and Scott, W. E. 1987. Volcanic hazards with regard to siting nuclear power plants in the Pacific Northwest. U. S. Geological Survey. Open-File Report 87-297. Available at: http://vulcan.wr.usgs.gov/Publications/hazards_reports.html

6. Scott, W. E., Iverson, R. M., Vallance, J. W., and Hildreth, W. 1995. Volcano hazards in the Mount Adams region, Washington. U.S. Geological Survey. Open-File Report 95-492, 2 plates, p. 11. Available at: http://vulcan.wr.usgs.gov/Publications/hazards_reports.html

7. U.S. Geological Survey. 1995. Washington State On-Line Spatial Data Sets – 1995. Available at: http://vulcan.wr.usgs.gov/Hazards/DataSets/Washington/framework.html

   These 1995 digital data sets provide Arc-Info Coverage of volcano hazards in Washington State. Twenty GIS data sets have been created that represent hazard information from the U.S. Geological Survey hazard assessments of Mount Adams, Mount Baker, Glacier Peak, Mount Rainier, and Mount St. Helens. Also available at: http://vulcan.wr.usgs.gov/Publications/hazards_reports.html

8. Waitt, R. B., Mastin, L. G., and Beget, J. E. 1995. Volcanic-hazard zonation for Glacier Peak volcano, Washington. U.S. Geological Survey. Open-File Report 95-499, 2 plates, p. 9. Available at: http://vulcan.wr.usgs.gov/Publications/hazards_reports.html

9. Wolfe, E. W. and Pierson, T. C. 1995. Volcanic-hazard zonation for Mount St. Helens, Washington, 1995. U.S. Geological Survey. Open-File Report 95-497, 1 plate, p. 12. Available at: http://vulcan.wr.usgs.gov/Publications/hazards_reports.html

Tsunami Hazard Areas

1. Preuss, Jane and Hebenstreit, G. T. 1998. Integrated tsunami-hazard assessment for a coastal community, Grays Harbor, Washington. In Rogers, A. M., Walsh, T. J., Kockelman, W. J., and Priest, G. R., editors. Assessing earthquake hazards and reducing risk in the Pacific Northwest. U.S. Geological Survey, Professional Paper 1560, vol. 2, pp. 517-536.

2. Walsh, T. J., Caruthers, C. G., Heinitz, A. C., Myers, E. P., III, Baptista, A. M., Erdakos, G. B., and Kamphaus, R. A. 2000. Tsunami hazard map of the Southern Washington coast – modeled tsunami inundation from a Cascadia subduction zone earthquake. Division of Geology and Earth Resources, Washington Department of Natural Resources. Geologic Map GM-49, 1 sheet, scale 1:100,000, p. 12.

Guidance

3. Menashe, E. 1993. Vegetation management: A guide for Puget Sound bluff property owners. Shorelands and Coastal Zone Management Program, Washington Department of Ecology. Publication #93-31.

   This booklet provides some general information concerning the use of existing vegetation on steep slopes around Puget Sound. The booklet discusses reducing soil mass surface and soil erosion by vegetation management. The booklet does not deal with issues such as shoreline armoring.

4. Myers, R. D., Michele, L., and Myers, J. N. 1995. Surface water and groundwater on coastal bluffs: A guide for Puget Sound property owners. Shorelands and Water Resources Program, Washington Department of Ecology. Publication #95-107.

   This publication provides general information pertaining to water management techniques and drainage control programs on coastal slope areas.

Section 5: Fish and Wildlife Habitat Conservation Areas

The citations identified are not an exclusive list of all the best available science currently published for fish and wildlife habitat conservation areas, but offer a principal source of scientifically valid information useful for local planning and permitting efforts. Local governments are encouraged to consult with qualified scientific experts or teams of experts to help identify and determine if more current valid scientific information exists and assess its applicability to the relevant critical areas.

Endangered, Threatened, and Sensitive Species and Habitats

Classification

1. Cullinan, T. 2001. Important bird areas of Washington. Audubon Washington. 170 pp.

   This publication presents the initial results or first phase of the Important Bird Area (IBA) program in Washington. It is intended to be updated as new information is submitted and scientifically reviewed using biological criteria and expert ornithologists' review for IBA status. IBAs represent both terrestrial and aquatic sites that are critically important to birds during breeding, wintering, and migration. Copies can be obtained by contacting Audubon Washington, P.O. Box 462, Olympia, Washington 98507.

2. Washington Department of Fish and Wildlife. Maps and digital information. Available at: http://www.wa.gov/wdfw/hab/release.htm

   The Washington Department of Fish and Wildlife (WDFW) maintains a GIS database that contains information on important fish and wildlife species that can be useful in land use decisions and activities. WDFW provides maps and reports that answer the most common questions concerning the presence of important fish and wildlife species. The data available from WDFW documents include known important wildlife resources. The materials covered on the maps include information from several databases, including Priority Habitats and Species, Wildlife Heritage, National Wetlands Inventory, and the Washington Rivers Information System. Information on specific locations of some fish and wildlife species is considered sensitive and access to that information is restricted by WDFW policy.

   Washington Department of Fish and Wildlife species of concern lists are available at: http://www.wa.gov/wdfw/wlm/diversty/soc/concern.htm

   Washington Natural Heritage Program rare plant species lists are available at: http://ww.wa.gov/dnr/htdocs/fr/nhp/refdesk/fsrefix.htm

3. Washington Department of Natural Resources. 1997. Endangered, threatened and sensitive vascular plants of Washington with working lists of rare non-vascular species. Washington Natural Heritage Program. 62 pp.

This publication reflects the most current information available on the rare plants of Washington. The information was compiled from amateur and professional botanists. The purpose of this publication is to promote the conservation of rare plant species in Washington by serving as the most current reference on the status of Washington's rare plant species; help focus conservation attention on those species most in need of special consideration; and assist land and resource managers and planners in determining which species of concern might occur within their management jurisdiction. Visit the Department of Natural Resources' Natural Heritage Program online reference desk at: http://www.wa.gov/dnr/htdocs/fr/nhp/refdesk/fsrefix.htm

Guidance

4. Bolton, S. and Shellberg, J. 2001. White Paper: Ecological issues in floodplains and riparian corridors. Center for Streamside Studies, University of Washington. 150 pp.

This report on ecological issues in floodplain and riparian corridors addresses the current state of the knowledge of impacts of development and land management activities on aquatic habitat and identifies potential mitigation measures from these impacts. The focus of the document is to protect and promote fully functional fish and shellfish habitat through the comprehensive and effective management of activities affecting aquatic ecosystems in Washington State. It includes an overview of the guidelines project, an overview of the subject white paper, an assessment of the state of knowledge, a summary of existing guidance, recommendations for future guidance documents, a glossary of technical terms, and a bibliography. Available at: http://www.wa.gov/wdfw/hab/ahg

5. Carrasquero, J. 2001. White Paper. Over-water structures: Freshwater issues. Herrera Environmental Consultants. 116 pp.

This report on over-water structures and freshwater issues addresses the current state of the knowledge of impacts of development and land management activities on aquatic habitat and potential mitigation measures of these impacts. It includes an overview of the guidelines project, an overview of the subject white paper, an assessment of the state of knowledge, a summary of existing guidance, recommendations for future guidance documents, a glossary of technical terms, and a bibliography. The focus of the document is to protect and promote fully functional fish and

shellfish habitat through the comprehensive and effective management of activities affecting aquatic ecosystems in Washington State. Available at: http://www.wa.gov/wdfw/hab/ahg

6. Knutson, K. L. and Naef, V. L. 1997. Management recommendations for Washington's priority habitats: Riparian. Washington Department of Fish and Wildlife. 181 pp. Available at: http://www.wa.gov/wdfw/hab/ripxsum.htm

   This synthesis from the Washington Department of Fish and Wildlife provides statewide riparian management recommendations based on the best available science. Riparian habitat provides a vital and important resource to Washington's fish and wildlife. This document presents a synthesis of more than 1,500 pieces of literature to develop land use recommendations that accommodate riparian-associated fish and wildlife.

7. Kondolf, Nathias G., Smeltzer, M., and Kimball, L. 2001. White Paper. Freshwater gravel mining and dredging issues. Prepared for the Aquatic Habitat Guidelines Steering Committee and jointly published by the Washington State Departments of Ecology, Fish and Wildlife, and Transportation. Available at: http://www.wa.gov/wdfw/hab/ahg

8. Larson, E. M. and Nordstrom, N., editors. 2000. Management recommendations for Washington's priority species, volume IV: Birds. Available at: http://www.wa.gov/wdfw/hab/phs/vol4/birdrecs.htm

   This document provides information on each species' geographic distribution, habitat requirements, and limiting factors. A bibliography of literature and a summary of habitat requirements and management recommendations for each species are also provided.

9. Larson, E. M. and Morgan, J. T. 1998. Management recommendations for Washington's priority habitats: Oregon white oak woodlands. Washington Department of Fish and Wildlife. 37 pp. Available at: http://www.wa.gov/wdfw/hab/oaksum.htm

   This document provides management recommendations for the priority habitat of the Oregon white oak woodlands. Oregon white oak woodlands supply a wide variety of habitats for many wildlife species. This document discusses definitions, rationale, distribution, habitat description, fish and wildlife use, impact of land use, and management recommendations.

10. Larson, E. M., editor. 1997. Management recommendations for Washington's priority species, volume III: Amphibians and reptiles. Washington Department of Fish and Wildlife. 122 pp. Available at: http://www.wa.gov/wdfw/hab/vol3.htm

This guidance document provides information on each organism's geographic distribution, habitat requirements, and limiting factors. A bibliography of literature and a summary of habitat requirements and management recommendations for each species are also provided.

11. Larson, E. M., Rodrick, E., and Milner, R, editors. 1995. Management recommendations for Washington's priority species, volume I: Invertebrates. Washington Department of Fish and Wildlife. 82 pp. Available at: http://www.wa.gov/wdfw/hab/val1.htm

    The document contains species management recommendations and includes most terrestrial and freshwater invertebrates on the Priority Habitats and Species list. This guidance document provides information on each organism's geographic distribution, habitat requirements, and limiting factors. A bibliography of literature and a summary of habitat requirements and management recommendations for each species are also provided.

12. May, Christopher W. 2000. Kitsap Peninsula salmonid habitat refugia study. 282 pp.

    This Kitsap County sponsored study provides a helpful watershed model for identifying and prioritizing areas for fish habitat conservation, enhancement, and restoration efforts at the water resource inventory area level. Available at: www.kitsapgov.com/download/Refugia_body.pdf

13. Miller, D. E., Skidmore, P. G., and White, D. J. 2001. White Paper. Channel Design. Inter-Fluve Inc. 109 pp.

    This report on channel design addresses the current state of the knowledge of impacts of development and land management activities on aquatic habitat and potential mitigation measures of these impacts. It includes an overview of the guidelines project, an overview of the subject white paper, an assessment of the state of knowledge, a summary of existing guidance, recommendations for future guidance documents, a glossary of technical terms, and a bibliography. The focus of the document is to protect and promote fully functional fish and shellfish habitat through the comprehensive and effective management of activities affecting aquatic ecosystems in Washington State. Available at: http://www.wa.gov/wdfw/hab/ahg

14. Morgan, J. T. 1998. Annotated bibliography for Washington's priority habitats: Freshwater wetlands and fresh deepwater. Washington Department of Fish and Wildlife.

    This document is an annotated bibliography from Washington Department of Fish and Wildlife Priority Habitats and Species (PHS) Program. The PHS

program develops management recommendations for the state's priority habitat and species through a review and synthesis of the best available science. The bibliography includes a wetlands bibliography and a bibliography reference organized by PHS headings that includes: definition, rationale, distribution, habitat description, fish and wildlife use, impact of land use, and management recommendations.

15. Nightingale, B. and Simenstad, C. 2001. White Paper. Over-water structures: Marine issues. Wetland Ecosystem Team, School of Aquatic and Fishery Sciences, University of Washington. 159 pp. Available at: http://www.wa.gov/wdfw/hab/ahg

    This report on over-water structures addresses the current state of the knowledge of impacts of development and land management activities on aquatic habitat and potential mitigation measures of these impacts from over-water structures. It includes an overview of the guidelines project, an overview of the subject white paper, an assessment of the state of knowledge, a summary of existing guidance, recommendations for future guidance documents, a glossary of technical terms, and a bibliography.

16. Poston, T. 2001. White Paper. Treated wood issues associated with over-water structures in marine and freshwater environments. Battelle. 90 pp. Available at: http://www.wa.gov/wdfw/hab/ahg

    This report on treated wood issues associated with over-water structures in marine and freshwater environments addresses the current state of the knowledge of impacts of development and land management activities on aquatic habitat and potential mitigation measures of these impacts. It includes an overview of the guidelines project, an overview of the subject white paper, an assessment of the state of the knowledge, a summary of existing guidance, recommendations for future guidance documents, a glossary of technical terms, and a bibliography.

17. Rodrick, E. and Milner, R., editors. 1991. Management recommendations for Washington's priority habitats and species. Wildlife Management, Fish Management, and Habitat Management Divisions, Washington Department of Fish and Wildlife.

    This publication provides management recommendations for forest associated priority species. The recommendations are intended for site specific discussions with landowners to encourage retention of enhancement of suitable wildlife habitat. This guidance document provides information on each species' geographic distribution, habitat requirements, and limiting factors. A bibliography of literature and a summary of habitat requirements and management recommendations for each species are also provided.

18. Washington Department of Fish and Wildlife. 1999. Priority habitats and species list. Habitat Program. 32 pp.

This publication is a catalog of habitats and species considered to be priorities for conservation and management. This documents list 18 habitat types, 140 vertebrate species, 28 invertebrate species, and 14 species groups currently on the Priority Habitat and Species list. Priority species include state endangered, threatened, sensitive, and candidate species. Priority habitats include habitat types with unique or significant value to a wide range of species.

19. Williams, G. D. and Thom, R. M. 2001. White Paper. Marine estuarine shoreline modification issues. Battelle Marine Sciences Laboratory, Pacific Northwest National Laboratory. 121 pp.

This report on marine estuarine shoreline modification issues addresses the current state of the knowledge of shoreline structures and the impacts of development and land management activities on aquatic habitat and potential mitigation measures of these impacts. It includes an overview of the guidelines project, an overview of the subject white paper, an assessment of the state of the knowledge, a summary of existing guidance, recommendations for future guidance documents, a glossary of technical terms, and a bibliography. The focus of the document is to protect and promote fully functional fish and shellfish habitat through the comprehensive and effective management of activities affecting aquatic ecosystems in Washington State.

The following citations have not been annotated, but might be helpful references to species specific issues. Reports can be obtained through the Washington Department of Fish and Wildlife.

20. Almack, J. 1995. Washington Grizzly Bear and Gray Wolf Research Project 1981-1995. Vols. 1-6.

21. Dobler, F. C., Eby, J., Perry, C., Richardson, S., and Vander Haegen, M. 1996. Status of Washington's shrub steppe ecosystem: Extent, ownership, and wildlife/vegetation relationships.

22. Dunn, P. and Ewing, K., editors. 1997. Ecology and conservation of the South Puget Sound prairie landscape. The Nature Conservancy of Washington, Seattle, Washington, 289 pp.

23. Hallock, M. and Mongillo, P. E. 1998. Washington State status report for the pygmy whitefish. Washington Department of Fish and Wildlife.

24. Hayes, G. E. and Buchanan, J. B. 2001. Draft Washington State status report for the peregrine falcon. Washington Department of Fish and Wildlife. 108 pp.

25. Hays, D. 1997. Washington State status report for the Aleutian Canada goose. Washington Department of Fish and Wildlife.

26. Hays, D., McAllister, K. R., Richardson, S. A., and Stinson, D. W. 1999. Washington State recovery plan for the western pond turtle. Washington Department of Fish and Wildlife. 66 pp.

27. Hays, D., Tirhi, M., and Stinson, D. 1998. Washington State status report for the sharp-tailed grouse. Washington Department of Fish and Wildlife.

28. Hays, D., Tirhi, M., and Stinson D. 1998. Washington State status report for the sage grouse. Washington Department of Fish and Wildlife.

29. Johnson, D. H. and O'Neil, T. A., directors. 2001. Wildlife-habitat relationships in Oregon and Washington. Oregon State University Press, Corvallis, Oregon. 768 pp.

30. Lewis, J. C. and Stinson, D. W. 1998. Washington State status report for the fisher. Washington Department of Fish and Wildlife.

31. Littlefield, C. D. and Ivey, G. L. 2001. Draft – Washington State recovery plan for the sandhill crane. Washington Department of Fish and Wildlife. 62 pp.

32. McAllister, K. R. 1995. Distribution of amphibians and reptiles in Washington State. Northwest Fauna, No. 3. 81 pp.

33. McAllister, K. R. and Leonard, W. P. 1997. Washington State status report for the Oregon spotted frog. Washington Department of Fish and Wildlife.

34. Mongillo, P. E and Hallock, M. 1998. Washington State status report for the margined sculpin. Washington Department of Fish and Wildlife.

35. Potter, A., Fleckenstein, J., Richardson, S., and Hays, D. 1999. Washington State status report for the mardon kipper. Washington Department of Fish and Wildlife. 39 pp.

36. Pruitt, L. 2000. Loggerhead shrike status assessment. U.S. Fish and Wildlife Service, Bloomington, Indiana. 169 pp.

37. Richardson, S. and Allen, H. 2000. Draft – Washington State recovery plan for the sea otter. Washington Department of Fish and Wildlife. 67 pp.

38. Richardson, S., Hays, D., Spencer, R., and Stofel, J. 1997. Washington State status report for the common loon. Washington Department of Fish and Wildlife. 53 pp.

39. Ruggiero, L. F., Aubry, K. B., Buskirk, S. W., Koehler, G. M., Krebs, C. J., McKelvey, K. S., and Squires, J. R. 1999. Ecology and conservation of lynx in the United States. U.S. Forest Service, Rocky Mountain Research Station. GTR RMRS-GTR-30WWW.

40. Stinson, D. W. 2001. Washington State recovery plan for the lynx. Washington Department of Fish and Wildlife. 78 pp. plus five maps.

41. Stinson, D. W., Watson, J. W., and McAllister, K. R. 2001. Draft – Washington State status report for the bald eagle. Washington Department of Fish and Wildlife. 90 pp.

42. U.S. Fish and Wildlife Service. 2001. Western snowy plover (Charadrius alexandrinus nivosus). Pacific Coast population draft recovery plan. Portland, Oregon. 630 pp.

43. Vander Haegen, W. M., Dobler, F. C., and Pierce, D. J. 2000. Shrubsteppe bird response to habitat and landscape variables in Eastern Washington, U.S.A. Conservation Biology, vol. 14, pp. 1145-1160.

44. Richardson, S. 1997. Washington State status report for the gray whale. Washington Department of Fish and Wildlife.

45. Washington Department of Fish and Wildlife. 1995. Washington State recovery plan for the pygmy rabbit.

46. Washington Department of Fish and Wildlife. 1995. Washington State recovery plan for the upland sandpiper.

47. Washington Department of Fish and Wildlife. 1995. Washington State recovery plan for the snowy plover.

48. Washington Department of Fish and Wildlife. 1996. Washington State recovery plan for the ferruginous hawk.

49. Washington Department of Fish and Wildlife. 1993. Washington State status report for the steller sea lion.

50. Washington Department of Fish and Wildlife. 1993. Washington State status report for the larch mountain salamander.

51. Washington Department of Fish and Wildlife. 1993. Washington State status report for the Oregon silverspot butterfly.

Shellfish Areas

Shellfish Sanitation and Growing Area Designations

1. May, C. W., Horner, R. R., Karr, J. R., Mar, B. W., and Welch, E. B. 1997. Effects of urbanization on small streams in the Puget Sound lowland ecoregion. Watershed Protection Techniques, vol. 2, no. 4, pp. 483-494.

   This article examines the relationships between watershed urbanization and the physical, chemical, and biological characteristics of streams. The authors assess the conditions and factors involved in this relationship, including the importance of calculating total impervious area as a measure of urbanization and stream health. Although the research focuses on stream environments, the concepts linking development with the health of aquatic systems are transferable to shellfish watersheds and shoreline environments. Companion paper available at: http://pluto.apl.washington.edu/etg/chrisrdp.html
   Also available at: http://www.stormwatercenter.net/Practice/18-Effects%20of%20Urbanization%20on%20Small%20Streams.pdf

2. Schueler, T. R. 1994. The importance of imperviousness. Watershed Protection Techniques, vol. 1, no. 3, pp. 100-111. Available at: http://www.stormwatercenter.net

   Also available at: http://www.stormwatercenter.net/Practice/1-Importance%20of%20Imperviousness.pdf

   This article outlines the significance of impervious surfaces as a measure of the potential impact of land development on aquatic systems. Specifically, the article correlates changes in imperviousness with changes in the hydrology, habitat structure, water quality, and bio-diversity of aquatic systems, concluding that significant degradation occurs at relatively low levels of development. The article also outlines techniques for mitigating or avoiding these impacts. Although the research focuses on stream environments, the concepts linking development with the health of aquatic systems are transferable to shellfish watersheds and shoreline environments.

3. U.S. Food and Drug Administration. 2000. National shellfish sanitation program model ordinance. 134 pp. Available at: http://vm.cfsan.fda.gov/~ear/nsspotoc.html

This document provides guidance and sets national standards on the safe and sanitary growing, processing, and shipping of molluscan shellfish.

4. Washington State Department of Health. 2001. 2000 annual inventory of commercial and recreational shellfish areas of Puget Sound. 30 pp. Available at: http://www.doh.wa.gov/ehp/sf/sfpubs.htm

   This report provides general information on the state's shellfish resources and an overview of the Washington State Department of Health's shellfish programs. The report also includes an accompanying map of the state's shellfish growing areas.

5. Washington State Department of Health. 2001. Shellfish programs 2000 annual reports. 384 pp.

   These annually updated assessments provide information on the location and status of all commercial shellfish growing areas in the state. The reports include maps of the classified growing areas and summary water quality data for all monitoring stations.

6. Washington State Department of Health and others. 1999. Public shellfish sites of Puget Sound. 41 pp. Available at: http://www.doh.wa.gov/ehp/sf/sfpubs.htm

   This booklet provides advice on recreational shellfish harvesting plus maps and other information on the location of public beaches, access sites, and shellfish resources around Puget Sound.

7. Washington State Department of Health. 1990 to present. Shellfish growing area sanitary surveys.

   These documents are prepared periodically for all commercial shellfish growing areas in the state (the survey data will be less than 12 years old). The surveys describe the sanitary conditions of the growing areas and provide the rationale for determining the appropriate classifications.

Water Quality and Habitat Protection

8. Aquatic Habitat Guidelines Project Web site is located at: http://www.wa.gov/wdfw/hab/ahg

   This Web site contains a suite of state-of-the-knowledge white papers that synthesizes the scientific and technical literature on a variety of topics. The purpose of the papers is to provide a basis for development of future guidance materials for fisheries issues. The Aquatic Habitat Guidelines project is a joint venture of the Washington State Departments of Ecology,

Fish and Wildlife, and Transportation. In July 2001, the U.S. Army Corps of Engineers, Seattle District, joined the Aquatic Habitat Guidelines Steering Committee.

9. Arnold, C. L. and Gibbons, C. J. 1996. Impervious surface coverage: The emergence of a key environmental indicator. Journal of the American Planning Association, vol. 62, no. 2, pp. 243-258.

   This article documents the importance of impervious surface coverage as an environmental indicator and its usefulness in protecting the health of local water resources. The author explains the relationship between imperviousness and changes in hydrologic processes then provides a number of examples and alternative approaches for applying these principles.

10. Bremerton-Kitsap County Health District. 1999. Manual of protocol: Fecal coliform bacteria pollution identification and correction projects. Version Eight. 24 pp.

    This manual describes the local health department's techniques and standards for identifying and correcting nonpoint sources of fecal contamination in Kitsap County. The program serves as a model for resolving nonpoint pollution problems in shellfish watersheds.

11. Determan, T. 2001. Status and trends in fecal coliform pollution in Puget Sound embayments year 2000. A report for the Puget Sound Ambient Monitoring Program, Washington State Department of Health. 81 pp.

    This report describes the status of fecal coliform pollution in 43 growing areas around Puget Sound (focusing on central Puget Sound and Hood Canal) from January 1999 through March 2000. The document provides a short summary for each of the 26 of the growing areas suffering significant pollution impact. Each summary includes fecal coliform trends and actions undertaken to protect and restore water quality.

12. Determan, T. 2000. 1999 status and trends in fecal coliform pollution in Puget Sound embayments. A report for the Puget Sound Ambient Monitoring Program, Washington State Department of Health. 104 pp.

    This report describes the status of fecal coliform in 45 growing areas around Puget Sound (focusing on north Puget Sound and the Strait of Georgia) from January 1998 through March 1999. The document provides a short summary of each of the 19 growing areas suffering significant pollution impact. Each summary includes fecal coliform trends and action undertaken to protect and restore water quality. The report helps link water quality trends with changing conditions in the adjacent watersheds.

13. Determan, T. 1993. Nonpoint remedial action in Puget Sound watersheds: The effort to clean up contaminated shellfish beds, 1983 to 1990. Washington Department of Ecology. Publication #93-66. 46 pp.

This report assesses efforts to protect and restore water quality in seven Puget Sound watersheds between 1983 and 1990. Although slightly dated, the analysis outlines useful findings related to the control of pollution from agricultural sources and on-site sewage systems in rural and urbanizing watersheds.

14. Fletcher, M., Verity, P. G., Frischer, M. E., Maruya, K. A., and Scott, G. I. Not dated. Microbial indicators, phytoplankton, and bacterial communities as evidence of contamination caused by changing land use patterns. South Atlantic Bight Land Use Coastal Ecosystem Study (LUCES), South Carolina Sea Grant Consortium. Available at: http://inlet.geol.sc.edu/luces2/fletcher.html

Information on LUCES available at: http://www.baruch.sc.edu/luces2/luces/LUCES_1.HTML

This publication is a state-of-the-knowledge report of the LUCES. It examines the use of microbial, phytoplankton, and contaminant indicators and their relationship with land use practices in adjacent areas. The report lays a foundation for refining these indicators and improving their use in evaluating the impact of changing land uses on water quality in coastal areas.

15. Mallin, M. A., Williams, K. E., Esham, E. C., and Lowe, R. P. 2000. Effect of human development on bacteriological water quality in coastal watersheds. Ecological Applications, vol. 10, no. 4, pp. 1047-1056.

This article examines the effects of human development on water quality in five estuarine watersheds in North Carolina over a four-year period. The analysis identifies a strong correlation between levels of bacterial contamination and watershed populations and an even stronger correlation between contamination and percentages of developed lands within the watersheds. The authors conclude that health risks and environmental impacts can be reduced in urbanizing watersheds by using sound land use planning to minimize impervious surfaces while maximizing the passive water treatment function of natural and constructed wetlands, grassy swales, and other "green" areas. Abstract available at: http://www.esajournals.org/esaonline/?request=get-abstract&issn=1051-0761&volume=010&issue=04&page=1047

16. May, C . W., Horner, R. R., Karr, James R., Mar, B. W., and Welch, Eugene B. 1997. Effects of urbanization on small streams in the Puget Sound lowland ecoregion. Watershed Protection Techniques, vol. 2, no. 4, pp. 483-494. This article examines the relationships between watershed urbanization and the physical, chemical, and biological characteristics of streams. The authors assess the conditions and factors involved in this relationship, including the importance of total impervious area as a measure of urbanization and stream health. Companion paper available at: http://pluto.apl.washington.edu/etg/chrisrdp.html

Also available at: http://www.stormwatercenter.net/Practice/18-Effects%20of%20Urbanization%20on%20Small%20Streams.pdf

17. Pacific Coast Shellfish Growers Association. 2001. Environmental codes of practice for the West Coast shellfish industry.

The codes serve as guidelines to ensure that shellfish operations are managed in ways that protect the natural marine environment. The document outlines objectives, strategies, and performance measures designed to address potential habitat, water quality, and other environmental changes associated with shellfish aquaculture. The document also provides the means for monitoring compliance in implementing the strategies. A comprehensive literature review and an evaluation of environmental regulations related to shellfish aquaculture are included.

18. Sargeant, D. 1999. Fecal contamination source identification methods in surface water. Washington Department of Ecology. Publication #99-345. 17 pp. Available at: http://www.ecy.wa.gov/pubs/99345.pdf

This literature review examines optional approaches and methods for identifying and differentiating sources of human and animal fecal contamination.

19. Schueler, T. R. 1994. The importance of imperviousness. Watershed Protection Techniques, vol. 1, no. 3, pp. 100-111. Available at: http://www.cwp.org/Articles/importance_of_imperviousness.htm
Also available at:
http://www.stormwatercenter.net/Practice/1-Importance%20of%20Imperviousness.pdf

This article outlines the significance of impervious surfaces as a measure of the potential impact of land development on aquatic systems. Specifically, the article correlates changes in imperviousness with changes in the hydrology, habitat structure, water quality, and bio-diversity of aquatic systems, concluding that significant degradation occurs at relatively low

levels of development. The article also outlines techniques for mitigating or avoiding these impacts.

20. Schueler, T. R. 1999. Microbes and urban watersheds: Concentrations, sources, and pathways. Watershed Protection Techniques, vol. 3, no. 1, pp. 554-565. Available at: http://www.stormwatercenter.net/Practice/17-Microbes%20in%20Urban%20Watersheds.pdf

    This article characterizes contamination problems associated with bacteria and other microorganisms in developed watersheds. Among other conclusions, the author points out that "it is exceptionally difficult to maintain beneficial uses of water in the face of even low levels of watershed development" and "if a watershed manager has a beach, shellfish bed, or drinking water intake to protect, they can expect that even a modest amount of development is likely to restrict or eliminate that use."

21. Scott, G. I. 1998. The impacts of urbanization on shellfish harvesting waters: Development of techniques to identify coliform pollution sources. Abstracts of Technical Papers presented at the International Conference on Shellfish Restoration, 1998. Journal of Shellfish Research, vol. 17, no. 4, pp. 1312-1313.

    This abstract explains how urbanization in areas adjacent to estuarine ecosystems has resulted in significant bacterial and chemical contamination in the Southeastern United States. The author points out that these findings "clearly indicate that fecal coliform bacteria pollution is associated with urbanization and that closure of shellfish harvesting waters may be perhaps the most significant, quantifiable impact from urbanization."

22. University of Washington. 1998. Abstracts from the Salmon in the City Conference. Center for Urban Water Resources Management. 65 pp. Available at: http://www.depts.washington.edu/cuwrm/research/sitc.pdf

    These abstracts discuss the effects of urbanization on lowland streams and salmon habitat in the Puget Sound basin. Among the findings, the papers point out that streams are generally damaged at relatively low levels of development and impacts increase significantly at higher levels of impervious surface cover.

23. U.S. Environmental Protection Agency. 2000. Low impact development: A literature review. Office of Water. EPA-841-B-00-005, 35 pp. Available at: http://www.epa.gov/owow/nps/lid.pdf

    This publication provides background information on key issues associated with low impact development (LID) and assesses available data and

literature describing the effectiveness of LID practices in controlling surface runoff and reducing pollution loadings to receiving waters.

24. Washington Department of Ecology. 2001. Stormwater management manual for Western Washington. Vols. I-V. Available at: http://www.ecy.wa.gov/programs/wq/stormwater/index.html

    This manual establishes the technical standards and recommended practices for stormwater management in Western Washington. The standards and practices address both new development and redevelopment and aim to protect and restore aquatic habitats and natural hydrologic processes throughout the region.

25. Washington Department of Fish and Wildlife. 1999. Priority habitats and species list. 31 pp. Available at: http://www.wa.gov/wdfw/hab/phslist.pdf

    This list identifies fish and wildlife resources, including shellfish species and habitats, that are priorities for management and conservation because of their population status, sensitivity to habitat alteration, or commercial, recreational, or tribal importance.

26. Washington Department of Fish and Wildlife. Not dated. Species of concern list. Available at: http://www.wa.gov/wdfw/wlm/diversty/soc/soc.htm

    This list identifies fish and wildlife species that are designated by the state as either endangered, threatened, sensitive, or candidate, as well as species listed or proposed for listing by the U.S. Fish and Wildlife Service or the National Marine Fisheries Service.

27. Washington State Department of Health. 2001. List of approved systems and products. 45 pp. Available at: http://www.doh.wa.gov/ehp/ts/Approved_Systems_List_May-2001.PDF

    This document outlines the list of conventional, alternative, and proprietary on-site wastewater technologies approved for use in Washington State. Conditions for the use of these systems and products are described in the Recommended Standards and Guidance published by the Washington State Department of Health. The most recently published edition of these documents are available at: http://www.doh.wa.gov/ehp/ts/pubs.htm#wastewater

28. Weiskel, P. K., Howes, B. L., and Heufelder, G. R. 1996. Coliform contamination of a coastal embayment: Sources and transport pathways. Environmental Science and Technology, vol. 30, no. 6, pp. 1872-1881.

This article documents the effects of bacterial contamination on a coastal embayment in Massachusetts.

Kelp and Eelgrass Beds

Classification

1. Berry, H. D., Harper, J. R., Mumford, Jr., T. F., Bookheim, B. E., Sewell, A. T., and Tamayo, L. J. 2001. The Washington State shorezone inventory user's manual. Nearshore Habitat Program, Washington Department of Natural Resources.

2. Nearshore Habitat Program. 2001. The Washington State shorezone inventory. Washington Department of Natural Resources. CD-ROM.

   This CD-ROM disc is a good resource for designating near shore habitat. It characterizes many biotic and physical aspects of the shoreline over a large geographic area but is limited on site-specific uses. The inventory was collected by helicopter and was not designed to capture small features.

3. Dethier, Megan N. 1990. A marine and estuarine habitat classification system for Washington State. Washington Natural Heritage Program, Washington Department of Natural Resources.

Herring and Smelt Spawning Areas

Fact Sheets

1. Washington Department of Fish and Wildlife. Not dated. Washington State sand lance fact sheet. Forage Fish Unit. Available at: http://www.wa.gov/wdfw/fish/forage/forage.htm

2. Washington Department of Fish and Wildlife. Not dated. Puget Sound herring fact sheet. Forage Fish Unit. Available at: http://www.wa.gov/wdfw/fish/forage/forage.htm

3. Washington Department of Fish and Wildlife. Not dated. Washington State surf smelt fact sheet. Forage Fish Unit. Available at: http://www.wa.gov/wdfw/fish/forage/forage.htm

Classification

4. Penttila, D. E. 2001. Documented spawning areas of the Pacific herring (clupea), surf smelt (hypomesus), and the Pacific sand lance (ammodytes) in Snohomish County, Washington. Marine Resource Division, Washington Department of Fish and Wildlife. Manuscript Report.

   This document depicts all currently known spawning areas for the Pacific herring, surf smelt, and Pacific sand lance within the area of Snohomish County, Washington. These type of forage fish species are an important part of the local marine nearshore food web. The spawning beaches designated in these documents include: the Kayak Point areas, Southern Port Gardner, the Picnic Point area, the Edmonds-Richmond Beach area, and the Tulalip Bay area.

Guidance

5. Lemberg, N. A., O'Toole, M. F., Penttila, D. E., and Stick, K. C. 1997. 1996 forage fish stock status report. Washington Department of Fish and Wildlife.

   This 1994 report provides the status of marine forage fish stocks in Washington which include the Pacific herring (clupea), surf smelt (hypomesus), Pacific sand lance (ammodytes), and northern anchovy (engraulis mordax).

6. Penttila, D. E. and Moulton, L. L. 2001. Field manual: For sampling forage fish spawn in intertidal shore regions. First edition.

   This is a field manual for sampling forage fish spawn in intertidal shores regions within San Juan County. This document was development as part of the San Juan Forage Fish Assessment Project and includes sections on study design descriptions, assessment, quality assurance, quality control, data reporting, and references.

7. Penttila, D. E. 2000. Documented spawning areas of the Pacific herring (clupea), surf smelt (hypomesus), and the Pacific sand lance (ammodytes) in East Jefferson County, Washington. Marine Resource Division, Washington Department of Fish and Wildlife. Manuscript Report.

   This document charts all the known spawning grounds and beaches of the Pacific herring, surf smelt, and Pacific sand lance within Jefferson County and was complied from various Washington Department of Fish and Wildlife reports from 1995-1999.

8. Penttila, D. E. 2000. Documented spawning areas of the Pacific herring (clupea), surf smelt (hypomesus), and the Pacific sand lance (ammodytes) in Skagit

County, Washington. Marine Resource Division, Washington Department of Fish and Wildlife. Manuscript Report.

This paper documents the spawning beaches areas of the Pacific herring, surf smelt, and Pacific sand lance in Skagit County, Washington.

9. Penttila, D. E. 1999. Documented spawning beaches of the surf smelt (hypomesus) and the Pacific sand lance (ammodytes) in Hood Canal, Washington. Marine Resource Division, Washington Department of Fish and Wildlife. Manuscript Report.

This 1999 paper documents all known spawning beaches of the surf smelt and Pacific sand lance in the Hood Canal region.

10. Penttila, D. E. 1999. Documented spawning beaches of the surf smelt (hypomesus) and the Pacific sand lance (ammodytes) in Clallam County, Washington. Marine Resource Division, Washington Department of Fish and Wildlife. Manuscript Report.

This 1999 document charts all the known spawning beaches of the surf smelt and Pacific sand lance within Clallam County, including the La Push area, the Deep Creek area, the Twin Rivers area, the Lyre River area, Dungeness Bay, Port Angeles Harbor, Sequim Bay, and Discovery Bay.

11. Penttila, D. E. 1999. Documented spawning areas of the Pacific herring (clupea), surf smelt (hypomesus), and the Pacific sand lance (ammodytes) in Island County, Washington. Marine Resource Division, Washington Department of Fish and Wildlife. Manuscript Report.

This 1999 paper documents the spawning beaches within Island County for the Pacific herring, surf smelt, and Pacific sand lance.

12. Penttila, D. E. 1999. Documented spawning areas of the Pacific herring (clupea), surf smelt (hypomesus), and the Pacific sand lance (ammodytes) in San Juan County, Washington. Marine Resource Division, Washington Department of Fish and Wildlife. Manuscript Report.

This 1999 paper charts the spawning beaches of the Pacific herring, surf smelt, and Pacific sand lance in San Juan County.

13. Penttila, D. E. 1996. Documented spawning beaches of the surf smelt (hypomesus) and the Pacific sand lance (ammodytes) in Whatcom County, Washington. Marine Resource Division, Washington Department of Fish and Wildlife. Manuscript Report. Revised, 1997.

This document depicts all currently known spawning areas for the surf smelt and Pacific sand lance within Whatcom County, Washington. These type of forage fish species area an important part of the local marine nearshore food web. The spawning beaches designated in this document include: Point Roberts Peninsula, the Semiahmoo Bay area, the Birch Point area, the Point Whitehorn area, Cherry Point, the Portage Bay area, the Southern Bellingham Bay area, and the Northern Bellingham area.

14. Penttila, D. E. 1995. Baitfish resource and habitats of Fidalgo Bay, Skagit County, Washington. Baitfish Unit, Washington Department of Fish and Wildlife. Manuscript Report.

    This report reviews studies conducted in and around Fidalgo Bay between 1972-1995. It summarizes the local life histories and spawning habitats and ecology. The report also includes other marine resources observed during the study.

15. Penttila, D. E. 1995. Known spawning beaches of the surf smelt (hypomesus) and the Pacific sand lance (ammodytes) in Southern Puget Sound, Washington (Pierce, Thurston, and Mason Counties), as of March 1995. Marine Resource Division, Washington Department of Fish and Wildlife. Manuscript Report. Charts updated and revised, 1999.

    This document depicts all currently known spawning areas for the surf smelt and Pacific sand lance within Southern Puget Sound including Pierce, Thurston, and Mason Counties. These type of forage fish species are an important part of the local marine nearshore food web.

16. Penttila, D. E. 1995. Spawning areas of the Pacific herring (clupea), surf smelt, (hypomesus), and Pacific sand lance (ammodytes) in Central Puget Sound, Washington. Marine Resource Division, Washington Department of Fish and Wildlife. Manuscript Report. Charts updated and revised. 1999.

    This document depicts all currently known spawning areas for the Pacific herring, surf smelt, and sand lance within Central Puget Sound. The report summarizes pertinent Pacific elements of the life history of baitfish species in the marine waters north from the Tacoma Narrows Bridge to a line connecting Edmonds and Kingston, including the inlet systems on the east shore of the Kitsap Peninsula.

17. Penttila, D. E. 1995. Effects of shading upland vegetation on egg survival for summer spawning surf smelt on upper intertidal beaches in Puget Sound. Marine Resources Division, Washington Department of Fish and Wildlife. CD-ROM.

This study investigates how shading effects surf smelt mortalities in the northern Puget Sound.

18. Washington Department of Fish and Wildlife. 1998. Forage fish management plan: A plan for managing the forage fish resources and fisheries of Washington.

    Adopted by the Washington Fish and Wildlife Commission on January 24, 1998, this document contains a plan for the management of forage fish resources and fisheries in Washington State. This guidance document is used to guide resource management decisions and establish priorities regarding forage fish, such as Pacific herring, eulachon, northern anchovy, Pacific sand lance, surf smelt, sardine, and longfin smelt.

19. Washington Department of Fish and Wildlife. 1999. Documented spawning beaches of the surf smelt (hypomesus) and Pacific sand lance (ammodytes) in Hood Canal, Washington.

    This briefing report documents surf smelt spawning seasons throughout the Puget Sound basin. The entire surf smelt spawning habitat survey record of the Washington Department of Fish and Wildlife, 1972-1999, was examined and spawning dates of individual broods of eggs estimated.

Naturally Occurring Ponds (Under 20 Acres)

Guidance

Morgan, J. T. 1998. Annotated bibliography for Washington's priority habitats: Freshwater wetlands and fresh deepwater. Washington Department of Fish and Wildlife.

This document is an annotated bibliography from the Washington Department of Fish and Wildlife Priority Habitats and Species (PHS) Program. The PHS program develops management recommendations for the state's priority habitat and species through a review and synthesis of the best scientific information available. The bibliography includes a wetlands bibliography and a bibliography reference organized by PHS headings that includes: definition, rationale, distribution, habitat description, fish and wildlife use, impact of land use, and management recommendations.

Waters of the State

Classification

Washington, State of. WAC 222-16-030 defines water types and a water typing system.

Waters of the state are defined in Title 222 WAC, the forest practices rules and regulations. Counties and cities should use the classification system established in WAC 222-16-030 to classify waters of the state. Waters of the state are to be classified according to the new Department of Natural Resources stream typing method (Type S, F, and N waters), in cooperation with the Departments of Ecology and Fish and Wildlife and in consultation with affected tribal governments. The mapping is based on a multi-parameter, field-verified GIS logistic regression model. This model is habitat-driven and uses geomorphic parameters. Until these water type maps are available, an interim five stream typing system should be used. Fish habitat water types are to be updated every five years based on observed field conditions. Chapter 365-190-080(5)(vi) WAC describes how jurisdictions may consider further factors when classifying waters of the state as fish and wildlife habitats.

Water, Including Lakes, Ponds, Streams, and Rivers Where Finfish Have Been Released and Lands Where Shellfish Have Been Planted

Local governments should consult with the local tribal entity and the Washington Department of Fish and Wildlife for the latest finfish release information.

Northwest Indian Fisheries Commission
6730 Martin Way E.
Olympia, WA 98512
(360) 438-1180

Columbia River Intertribal Fisheries Commission
729 N.E. Oregon, Suite 200
Portland, OR 97232
(503) 238-0667

Washington Department of Fish and Wildlife, Fish Program
600 Capital Way N.
Olympia, WA 98501-1091
(360) 902-2700

Designation

1. Washington Department of Fish and Wildlife. 2001. Spring hatchery trout stocking plan for Washington lakes and streams – Annual Report. #FPA 01-02.

   This publication is helpful to anglers who are looking for information on trout planting in the state and where the best opportunities for catching fish might be. Annually updated, this report can be obtained by calling the Washington Department of Fish and Wildlife at (360) 902-2700.

2. Washington Department of Fish and Wildlife. 2000. Steelhead harvest summary report.

   This annually updated report offers the previous year's planting data for steelhead in the state of Washington. This report gives anglers information on where steelhead are being planted and caught in the previous year.

Guidance

3. Morgan, J. T. 1998. Annotated bibliography for Washington's priority habitats: Freshwater wetlands and fresh deepwater. Washington Department of Fish and Wildlife.

   This document is an annotated bibliography from the Washington Department of Fish and Wildlife Priority Habitats and Species (PHS) Program. The PHS program develops management recommendations for the state's priority habitat and species through a review and synthesis of the best scientific information available. The bibliography includes a wetlands bibliography and a bibliography reference organized by PHS headings that includes: definition, rationale, distribution, habitat description, fish and wildlife use, impact of land use, and management recommendations.

State Natural Areas Preserves and Natural Resources Conservation Areas

1. Washington Department of Natural Resources. 2001. State of Washington natural heritage plan. Washington Natural Heritage Program. Available at: www.wa.gov/dnr/htdocs/fr/nhp

   As required by Chapter 79.70 RCW, this plan presents the criteria for the selection and approval of natural areas and lists the natural heritage resources to be considered for protection. In addition, the plan identifies priorities for protection and the roles for various agencies and groups in natural area protection.

   Washington Natural Heritage Program

Washington Department of Natural Resources
1111 Washington Street S.E.
P.O. Box 47014
Olympia, WA 98504-7014

2. Washington Department of Natural Resources. 1997. Endangered, threatened, and sensitive vascular plants of Washington with working lists of rare, non-vascular species. Washington Natural Heritage Program. 62 pp.

   This publication reflects the most current information available on the rare plants of Washington. The information was compiled by amateur and professional botanists. The purpose of this publication is to promote the conservation of rare plant species in Washington by serving as the most current reference on the status of Washington's rare plant species; help focus conservation attention on those species most in need of special consideration; and assist land and resource managers and planners in determining which species of concern might occur within their management jurisdiction.

3. Washington Department of Natural Resources. 1992. State of Washington natural resources conservation areas: Statewide management plan. 33 pp.

   The Natural Resources Conservation Areas Statewide Management Plan guides the management of conservation areas within Washington State, based upon Chapter 79.71 RCW. Currently there are 27 natural resource conservation areas that total more than 85,000 acres statewide. Conservation areas are designated to maintain, enhance, or restore ecological systems and habitat for threatened, endangered, and sensitive plants and animals, while providing opportunities for education and low impact use. Maintaining exceptional scenic landscapes is also a high priority. The statewide plan sets the standard for a program that will combine site protection and low impact public use.

4. Natural area preserves publications are available through Natural Areas Program, Washington Department of Natural Resources. Additional Information about Natural Area Preserves and Natural Resource Conservation Areas is available by contacting:

   Natural Areas Program
   Lands and Resources Division
   Washington Department of Natural Resources
   P.O. Box 47016
   Olympia, WA 98504-7016
   (360) 902-1340

For a list of individual region Natural Areas managers in seven statewide offices, call the number listed above or consult the Washington Department of Natural Resources Web site at:
http://www.wa.gov/dnr/base/execfone.htm

Section 6: Special Consideration For Anadromous Fish Life Cycles

The citations listed are not an exclusive list of all the best available science currently published on anadromous fish, but offer a source of scientifically valid information useful for local planning and permitting efforts. Local governments are encouraged to consult with qualified scientific experts or teams of experts to help identify and determine if more current valid scientific information exists and assess its applicability to the relevant critical areas.

Special Consideration for Anadromous Fisheries

1. Aquatic Habitat Guidelines Project Web site: http://www.wa.gov/wdfw/hab/ahg

   This Web site contains a suite of state-of-the-knowledge white papers that synthesize the scientific and technical literature on a variety of topics. The purpose of the papers is to provide a basis for development of future guidance materials for salmon issues. The Aquatic Habitat Guidelines project is a joint venture of the Washington Departments of Ecology, Fish and Wildlife, and Transportation. In July 2001, the U.S. Army Corps of Engineers, Seattle District, joined the Aquatic Habitat Guidelines Steering Committee.

2. Cederholm, C. J., Johnson, D. H., Bilby, R. E., Dominguez, L., G., Garrett, A. M., Graeber, W. H., Greda, E. L., Kunze, M. D., Marcot, B. G., Palmisano, J. F., Plotnikoff, R. W., Pearcy, W. G., Simenstad, C.A., and Trotter, P. C. 2000. Pacific salmon and wildlife-ecological contexts, relationships, and implications for management. Special Edition Technical Report, Prepared for D. H. Johnson and T. A. O'Neil, Wildlife-Habitat Relationships in Oregon and Washington. Washington Department of Fish and Wildlife.

   This special edition technical report synthesizes fundamental and crucial information linking salmon and wildlife species and the broader aquatic and terrestrial realms in which they co-exist. Readers will find that this report will greatly strengthen the collective understanding of the role that salmon play in the populations of Pacific Northwest wildlife species and the ecology of freshwater ecosystems, and how management activities – such as hatcheries – and harvest can impact this. Copies of this report can be acquired by contacting:

   David H. Johnson
   Washington Department of Fish and Wildlife
   Habitat Program
   600 Capitol Way N.
   Olympia, WA 98501-1091

3. Spence, B. C., Lomnicky, G. A., Hughes, R. M., and Novitzki, R. P. 1996. An ecosystem approach to salmonid conservation. ManTech Environmental Research Services Corporation. TR-4501-96-6057.

   Available from the National Marine Fisheries Service, Portland, Oregon. Available at: http://www.nwr.noaa.gov/1habcon/habweb/ManTech/front.htm#References

   This document provides the technical basis from which government agencies and landowners can develop and implement an ecosystem approach to habitat conservation planning, protection, and restoration of aquatic habitat on nonfederal lands. The report also describes a process for developing, approving, and monitoring habitat conservation plans, pre-listing agreements, and other conservation agreements for nonfederal lands to be consistent with the mandates of applicable legal requirements. An appendix lists information resources that landowners and agencies may find useful in developing and evaluating habitat conservation plans. More than 1,100 sources are cited in this document.

4. National Research Council. 1996. Upstream: Salmon and society in the Pacific Northwest. Committee on Protection and Management of Pacific Northwest Anadromous Salmonids, National Academy of Science. 472 pp.

   This publication can be viewed and purchased through National Academy of Science publication Web site at: http://www.nap.edu/books/0309053250/html/index.html

   The report deals with anadromous forms of the seven species of the genus oncorhynchus, including: chinook, chum, coho, pink, and sockeye salmon and the anadromous forms of rainbow and cutthroat trout – steelhead and sea-run cutthroat. The Committee on Protection and Management of Pacific Northwest Anadromous Salmonids was asked to "evaluate options for improving the prospects for long-term sustainability of the stocks, and to consider economic and social implications of such changes." They were asked to perform the following tasks: assess the status of the salmon stocks, analyze the causes of declines, and analyze options for intervention. The committee considered all stages of salmon life histories and options for intervention and likely effectiveness.

5. Washington Department of Fisheries, Washington Department of Wildlife, and Western Washington Treaty Indian Tribes. 1993. Washington State Salmon and Steelhead Stock Inventory (SASSI). Washington Department of Fish and Wildlife. 212 pp.

SASSI is now called Salmon Stock Inventory (SaSI). The Salmon Stock Inventory is a standardized, uniform approach to identifying and monitoring the status of Washington's salmonid fish stocks. The inventory is a compilation of data on all wild stocks and a scientific determination of each stock's status as: healthy, depressed, critical, unknown, or extinct. SaSI thus is a basis for prioritizing recovery efforts and for measuring the results of future recovery actions. SaSI is a cooperative product of the Washington Department of Fish and Wildlife and the tribal co-managers.

To learn more about the SaSI program, contact:
http://www.wa.gov/wdfw/fish/sassi/intro.htm

6. Washington State Conservation Commission. Salmonid habitat limiting factors reports.

   These individual watershed-scaled reports are available at:
   http://www.conserver/prg/salmon/index.phps

   Habitat limiting factors reports are developed for each water resource inventory area (WRIA) in Washington State. Check the referenced Web site for a current listing of completed reports. The reports identify habitat conditions that limit the ability of habitats to fully sustain populations of salmonids. The results of assessing habitat-limiting factors will be used to help develop strategies for salmon recovery and identify gaps in existing information. Maps illustrating the known extent of salmonid distribution in individual streams are included at a scale of 1:24,000.

7. Washington Department of Fish and Wildlife. Salmon and Steelhead Habitat Inventory and Assessment Program (SSHIAP). Available at:
   http://www.wa.gov/wdfw/hab/sshiap/

8. Washington Department of Fish and Wildlife. Salmon and Steelhead Statistical Inventory (SASSI). Available at: http://www.wa.gov/wdfw/hab/release.htm

9. Washington Department of Fish and Wildlife. Information about requesting maps from WDFW. Available at: http://www.wa.gov/wdfw/hab/release.htm

10. Joint Natural Resources Cabinet. 2001. Guidance on watershed assessment for salmon. 54 pp. Available at:
    http://www.governor.wa.gov/esa/watershed/watershed.htm

    While this guidance document focuses on salmon habitat, the key activities and products discussed have a broader utility to other initiatives, such as water quality and water supply assessments.

For further updated information, contact:

Governor's Salmon Recovery Office
P.O. Box 43135
Olympia, WA 98504-3135
(360) 902-2231

Appendix A: State Agency Contacts

Agency	Name	Title	Work Phone	Fax Number	E-mail Address	Region/ Specialty	Counties
Department of Ecology							
Department of Ecology, Shorelands and Environmental Assistance	Adelsman, Hedia	GMA Coordinator	(360) 407-6222	(360) 407-6902	hade461@ecy.wa.gov	Statewide	Statewide
Department of Ecology, Shorelands and Environmental Assistance	Boeholt, Ann	Environmental Specialist	(360) 407-6221	(360) 407-6305	aboe461@ecy.wa.gov	Wetlands, Critical Area Ordinances	Clallam, Jefferson, Mason, Pierce, Thurston
Department of Ecology, Shorelands and Environmental Assistance	Canning, Doug	Environmental Specialist / Geologically Hazardous Areas, Regulation, and Technical Support	(360) 407-6781	(360) 407-6902	dcan461@ecy.wa.gov	Statewide	Statewide
Department of Ecology, Shorelands and Environmental Assistance	D'Acci, Tim	Floodplain Lead, Policy and Regulations / Floods, Policy, Regulations	(360) 407-6796	(360) 407-6902	tdac461@ecy.wa.gov	Statewide	Statewide
Department of Ecology, Shorelands and Environmental Assistance	Driscoll, Lauren	Environmental Specialist / Mitigation Banking	(360) 407-6861	(360) 407-6902	ldri461@ecy.wa.gov	Statewide	Statewide
Department of Ecology, Shorelands and Environmental Assistance	Granger, Teri	Environmental Planner / Best Available Science, Project Coordinator	(360) 407-6857	(360) 407-6902	tgra461@ecy.wa.gov	Statewide	Statewide

Agency	Name	Title	Work Phone	Fax Number	E-mail Address	Region/ Specialty	Counties
Department of Ecology, Shorelands and Environmental Assistance	Hruby, Tom	Senior Ecologist / Best Available Science	(360) 407-7274	(360) 407-6902	thru461@ecy.wa.gov	Statewide	Statewide
Department of Ecology, Shorelands and Environmental Assistance	Keys, Penny	Environmental Technician / GMA Document Coordinator	(360) 407-6927	(360) 407-6902	pkey461@ecy.wa.gov	Statewide	Statewide
Department of Ecology, Shorelands and Environmental Assistance	Lund, Perry	Section Manager	(360) 407-7260	(360) 407-6305	plun461@ecy.wa.gov	Wetlands, Critical Area Ordinances	Grays Harbor, Pacific
Department of Ecology, Shorelands and Environmental Assistance	McMillan, Andy	Policy Lead / Wetlands Policy and Regulation, Best Available Science	(360) 407-7272	(360) 407-6902	anmc461@ecy.wa.gov	Statewide	Statewide
Department of Ecology, Shorelands and Environmental Assistance	Merker, Chris	Environmental Specialist	(509) 456-6174	(509) 456-6175	cmer461@ecy.wa.gov	Wetlands, Critical Area Ordinances	Adams, Asotin, Columbia, Garfield, Grant, Ferry, Franklin, Lincoln, Pend Oreille, Spokane, Stevens, Walla Walla, Whitman
Department of Ecology, Shorelands and Environmental Assistance	Meyer, Susan	Environmental Specialist	(425) 649-7168	(425) 649-7098	sume461@ecy.wa.gov	Wetlands, Critical Area Ordinances	Island, Skagit, Whatcom
Department of Ecology, Shorelands and Environmental Assistance	Murphy, Brad	Environmental Specialist	(360) 407-7273	(360) 407-6305	bmur461@ecy.wa.gov	Wetlands, Critical Area Ordinances	Clark, Cowlitz, Lewis, Skamania, Wahkiakum

Agency	Name	Title	Work Phone	Fax Number	E-mail Address	Region/ Specialty	Counties
Department of Ecology, Shorelands and Environmental Assistance	Olson, Ted	Environmental Engineer / Floodplain Issues	(509) 456-2862	(509) 456-6175	tols461@ecy.wa.gov	Eastern Regional Office	Adams, Asotin, Columbia, Garfield, Grant, Ferry, Franklin, Lincoln, Pend Oreille, Spokane, Stevens, Walla Walla, Whitman
Department of Ecology, Shorelands and Environmental Assistance	Reed, Catherine	Environmental Specialist	(509) 575-2616	(509) 575-2809	craj461@ecy.wa.gov	Wetlands, Critical Area Ordinances	Benton, Klickitat, Kittitas, Yakima
Department of Ecology, Shorelands and Environmental Assistance	Schuppe, Mark	Environmental Specialist	(509) 575-2384	(509) 575-2809	msch461@ecy.wa.gov	Wetlands, Critical Area Ordinances	Chelan, Douglas, Okanogan
Department of Ecology, Shorelands and Environmental Assistance	Sokol, Dan	Environmental Planner / Floodplain Issues	(360) 407-7253	(360) 407-6305	dsok461@ecy.wa.gov	Southwest Regional Office	Benton, Chelan, Clallam, Clark, Cowlitz, Douglas, Grays Harbor, Jefferson, Klickitat, Kittitas, Lewis, Mason, Okanogan, Pacific, Pierce, Skamania, Thurston, Yakima
Department of Ecology, Shorelands and Environmental Assistance	Steele, Chuck	Environmental Planner / Floodplain Issues	(425) 649-7139	(425) 649-7098	chst461@ecy.wa.gov	Northwest Regional Office	Island, King, Kitsap, San Juan, Skagit, Snohomish, Whatcom
Department of Ecology, Shorelands and Environmental Assistance	Stockdale, Erik	Environmental Specialist	(425) 649-7061	(425) 649-7098	esto461@ecy.wa.gov	Watershed Planning and Technical Assistance	Northwest Region
Department of Ecology, Shorelands and Environmental Assistance	Suggs, Sarah	Environmental Specialist	(425) 649-7124	(425) 649-7098	ssug461@ecy.wa.gov	Wetlands, Critical Area Ordinances	King, Kitsap, San Juan, Snohomish

Agency	Name	Title	Work Phone	Fax Number	E-mail Address	Region/ Specialty	Counties
Department of Ecology, Water Quality Program	Morgan, Laurie	Hydrogeologist / Aquifer Recharge Areas	(360) 407-6483		lmor461@ecy.wa.gov	Statewide	Statewide
Department of Fish and Wildlife							
Department of Fish and Wildlife, Habitat Program	Azerrad, Jeff	PHS/GMA Biologist / Fish and Wildlife	(509) 456-4079	(509) 456-4071	azerrjma@dfw.wa.gov	Eastern (Region 1 – Spokane	Ferry, Stevens, Pend Oreille, Lincoln, Spokane, Whitman, Walla Walla, Columbia, Garfield, Asotin
Department of Fish and Wildlife, Habitat Program	Baxter, Bruce	Area Habitat Biologist / Fish and Wildlife	(360) 249-1228	(360) 664-0689	baxterbab@dfw.wa.gov	Coastal (Region 6 - Montesano)	Grays Harbor
Department of Fish and Wildlife, Habitat Program	Byrnes, Chris	Area Habitat Biologist / Fish and Wildlife	(360) 417-1426	(360) 417-3302	byrnecjb@dfw.wa.gov	Coastal (Region 6 - Montesano)	Clallam, Jefferson
Department of Fish and Wildlife, Habitat Program	Carnevali, Debbie	Area Habitat Biologist / Fish and Wildlife	(360) 264-5148	(360) 664-0689	carneddc@dfw.wa.gov	Coastal (Region 6 - Montesano)	Pierce, Thurston
Department of Fish and Wildlife, Habitat Program	Davis, Jeff	Area Habitat Biologist / Fish and Wildlife	(360) 895-3965	(360) 876-1894	davisjpd@dfw.wa.gov	Coastal (Region 6 - Montesano)	Kitsap, Mason, Pierce
Department of Fish and Wildlife, Habitat Program	Goldsmith, Mark	PHS/GMA Biologist / Fish and Wildlife	(425) 379-2308	(425) 338-1066	goldsmfq@dfw.wa.gov	North Puget Sound (Region 4 - Mill Creek)	Whatcom, Skagit, Snohomish, King, San Juan, Island
Department of Fish and Wildlife, Habitat Program	Manlow, Steve	Regional Habitat Program Manager / Fish and Wildlife	(360) 906-6731	(360) 906-6776	manloswm@dfw.wa.gov	Southwest Region (Region 5 - Vancouver)	Clark, Cowlitz, Klickitat, Lewis, Skamania, Wahkiakum
Department of Fish and Wildlife, Habitat Program	March, Katherine	PHS/GMA Biologist / Fish and Wildlife	(509) 754-4624	(509) 754-5257	marchkcm@dfw.wa.gov	North Central (Region 2 - Ephrata)	Okanogan, Chelan, Douglas, Grant, Adams

Agency	Name	Title	Work Phone	Fax Number	E-mail Address	Region/ Specialty	Counties
Department of Fish and Wildlife, Habitat Program	McMurry, Key	Area Habitat Biologist / Fish and Wildlife	(360) 249-4628	(360) 664-0689	mcmurklm@dfw.wa.gov	Coastal (Region 6 - Montesano)	Pacific, Grays Harbor
Department of Fish and Wildlife, Habitat Program	Nauer, Don	Area Habitat Biologist / Fish and Wildlife	(253) 863-7979	(253) 863-7979	nauerdcn@dfw.wa.gov	Coastal (Region 6 - Montesano)	King, Pierce
Department of Fish and Wildlife, Habitat Program	Rogers, Gloria	Area Habitat Biologist / Fish and Wildlife	(360) 495-3068	(360) 664-0689	rogergsr@dfw.wa.gov	Coastal (Region 6 - Montesano)	Grays Harbor, Mason
Department of Fish and Wildlife, Habitat Program	Schirato, Margie	Area Habitat Biologist / Fish and Wildlife	(360) 427-2179	(360) 432-8707	schirmms@dfw.wa.gov	Coastal (Region 6 - Montesano)	Mason, Thurston (marine waters only)
Department of Fish and Wildlife, Habitat Program	Shaffer, Anne	Area Habitat Biologist / Fish and Wildlife	(360) 457-2634	(360) 417-3302	shaffjas@dfw.wa.gov	Coastal (Region 6 - Montesano)	Clallam, Jefferson (marine waters only)
Department of Fish and Wildlife, Habitat Program	Small, Doris	Area Habitat Biologist / Fish and Wildlife	(360) 895-4756	(360) 876-1894	smalldjs@dfw.wa.gov	Coastal (Region 6 - Montesano)	Kitsap, Mason
Department of Fish and Wildlife, Habitat Program	Teske, Mark	PHS/GMA Biologist / Fish and Wildlife	(509) 962-3421	(509) 925-4702	teskemst@dfw.wa.gov	South Central (Region 3 - Yakima)	Kittitas, Yakima, Benton, Franklin
Department of Fish and Wildlife, Intergovernmental Policy	Deusen, Millard	Land Use Policy Coordinator / Fish and Wildlife	(360) 902-2562	(360) 902-2947	deusemsd@dfw.wa.gov	Statewide	Statewide
Department of Natural Resources							
Department of Natural Resources	Kurowski, Stan	Project Section Manager	(360) 856-3500	(360) 856-2150	stanley.kurowski@wadnr.gov	Northwest Region	Snohomish, Skagit, Whatcom, San Juan, Island

Agency	Name	Title	Work Phone	Fax Number	E-mail Address	Region/ Specialty	Counties
Department of Natural Resources, Asset Management and Protection	Sharar, Anne	Environmental Planner	(360) 902-1739	(360) 902-1776	anne.sharar@wadnr.gov	Headquarters	Statewide
Department of Natural Resources, Aquatic Resources Division	Flores, Hugo	Environmental Planner / Shoreline Management Act	(360) 902-1126	(360) 902-1786	hugo.flores@wadnr.gov	Headquarters	Statewide – Aquatic Resources
Department of Natural Resources, Growth Management Program	Huestis, Roger	Growth Management Coordinator	(509) 684-7474	(509) 684-7484	roger.huestis@wadnr.gov	Northeast Region	Okanogan, Ferry, Stevens, Pend Oreille, Spokane
Department of Natural Resources, Growth Management Program	Wedin, Dick	Growth Management Coordinator	(509) 925-8510	(509) 925-8522	dick.wedin@wadnr.gov	Southeast Region	Chelan, Douglas, Kittitas, Klickitat, Yakima, Skamania (part), Grant, Benton, Franklin, Lincoln, Adams, Walla Walla, Garfield, Asotin, Whitman, Columbia
Department of Natural Resources, Public Lands	Johnson, Bob	District Manager	(360) 748-2383	(360) 274-4196	johnson.bob@wadnr.gov	Central	
Department of Natural Resources, State Lands	Hotvedt, Jim	State Land Assistant Regional Manager	(360) 740-6803	(360) 748-2387	jim.hotvedt@wadnr.gov	Central	Grays Harbor, Pacific, Lewis, Thurston
Department of Natural Resources, State Lands	McClelland, Douglas	Asset Operations Manager	(360) 825-1631	(360) 825-1672	doug.mcclelland@wadnr.gov	South Puget Sound Region	King
Department of Natural Resources, Washington Natural Heritage Program	Caplow, Florence	Rare Plant Botanist	(360) 902-1793	(360) 902-1789	florence.caplow@wadnr.gov	Statewide	
Department of Natural Resources, Washington Natural Heritage Program	Chappell, Chris	Vegetation Ecologist	(360) 902-1671	(360) 902-1789	chris.chappell@wadnr.gov	Western Washington	

Agency	Name	Title	Work Phone	Fax Number	E-mail Address	Region/ Specialty	Counties
Department of Natural Resources, Washington Natural Heritage Program	Crawford, Rex	Vegetation Ecologist	(360) 902-1749	(360) 902-1789	rex.crawford@wadnr.gov	Eastern Washington	
Department of Natural Resources, Washington Natural Heritage Program	Farone, Steve	Information Manager	(360) 902-1349	(360) 902-1789	steve.farone@wadnr.gov	Statewide	
Department of Natural Resources, Washington Natural Heritage Program	Fleckenstein, John	Zoologist / Rare Bats and Butterflies	(360) 902-1674	(360) 902-1789	john.fleckenstein@wadnr.gov	Statewide	
Department of Natural Resources, Washington Natural Heritage Program	Gamon, John	Program Leader / Lead Scientist	(360) 902-1661	(360) 902-1789	john.gamon@wadnr.gov	Statewide	
Department of Natural Resources, Washington Natural Heritage Program	Hallock, Lisa	Herpetologist	(360) 902-1670	(360) 902-1789	lisa.haddock@wadnr.gov	Statewide	
Department of Natural Resources, Washington Natural Heritage Program	Swope Moody, Sandy	Environmental Review Coordinator / Information Requests	(360) 902-1667	(360) 902-1789	sandra.moody@wadnr.gov	Statewide	
Office of Community Development							
Office of Community Development, Growth Management Services	Andersen, David	Senior Planner	(360) 725-3049	(360) 753-2950	davida@cted.wa.gov	N/A	Chelan, Douglas, Ferry, Grant
Office of Community Development, Growth Management Services	Babineau, Patrick	Senior Planner	(360) 725-3045	(360) 753-2950	patrickb@cted.wa.gov	N/A	Island, Mason, Pacific
Office of Community Development, Growth Management Services	Caputo, Dee	Senior Planner	(360) 725-3068	(360) 753-2950	deeca@cted.wa.gov	N/A	Columbia, Garfield, Kittitas, Spokane, Walla Walla, Pend Oreille
Office of Community Development, Growth Management Services	Gadbaw, Holly	Senior Planner and Review Manager	(360) 725-3048	(360) 753-2950	hollyg@cted.wa.gov	N/A	Clark, Whatcom

Agency	Name	Title	Work Phone	Fax Number	E-mail Address	Region/ Specialty	Counties
Office of Community Development, Growth Management Services	Gage, Ted	Senior Planner	(360) 725-3049	(360) 753-2950	tedg@cted.wa.gov	N/A	Adams, Benton, Cowlitz, Franklin, Okanogan, Stevens, Yakima
Office of Community Development, Growth Management Services	Nwankwo, Ike	Senior Planner and Technical and Financial Assistance Programs Manager	(360) 725-3056	(360) 753-2950	iken@cted.wa.gov	N/A	King, Pierce
Office of Community Development, Growth Management Services	Ojennus, Matt	Assistant Planner	(360) 725-3057	(360) 753-2950	matthewo@cted.wa.gov	N/A	Thurston
Office of Community Development, Growth Management Services	Parsons, Chris	Senior Planner	(360) 725-3058	(360) 753-2950	chrisp@cted.wa.gov	N/A	Skagit, Kitsap
Office of Community Development, Growth Management Services	Peters, Doug	Senior Planner	(360) 725-3046	(360) 753-2950	douglasp@cted.wa.gov	N/A	Clallam, Jefferson
Office of Community Development, Growth Management Services	Riley, Peter	Senior Planner	(360) 725-3067	(360) 753-2950	peterr@cted.wa.gov	N/A	Snohomish, San Juan, Lewis
Puget Sound Water Quality Action Team							
Puget Sound Water Quality Action Team	Broadhurst, Ginny	Local Liaison	(360) 738-6122	(360) 736-6122	gbroadhurst@psat.wa.gov	N/A	San Juan
Puget Sound Water Quality Action Team	Cambalik, John	Local Liaison	(360) 582-0575	(360) 582-0575	jcambalik@psat.wa.gov	N/A	Kitsap, Jefferson, Clallam

Agency	Name	Title	Work Phone	Fax Number	E-mail Address	Region/ Specialty	Counties
Puget Sound Water Quality Action Team	Drinkwin, Joan	Local Liaison	(360) 848-0924	(360) 848-0924	jdrinkwin@psat.wa.gov	N/A	Island, Snohomish
Puget Sound Water Quality Action Team	Glascoe, Stuart	Local Liaison	(360) 407-7319	(360) 407-7333	sglascoe@psat.wa.gov	N/A	Whatcom, Skagit
Puget Sound Water Quality Action Team	Ransom, Tim	Local Liaison	(360) 407-7323	(360) 407-7333	transom@psat.wa.gov	N/A	Thurston, Mason
Puget Sound Water Quality Action Team	Taylor, Kathy	Local Liaison	(253) 333-4920	(360) 407-7333	ktaylor@psat.wa.gov	N/A	King, Pierce

Appendix B: Statutory and Administrative Code References

GROWTH MANAGEMENT ACT – RCW 36.70A
References to Critical Areas Policies and Development Regulations

RCW § 36.70A.020. Planning goals

The following goals are adopted to guide the development and adoption of comprehensive plans and development regulations of those counties and cities that are required or choose to plan under RCW 36.70A.040. The following goals are not listed in order of priority and shall be used exclusively for the purpose of guiding the development of comprehensive plans and development regulations:

(1) Urban growth. Encourage development in urban areas where adequate public facilities and services exist or can be provided in an efficient manner.

(2) Reduce sprawl. Reduce the inappropriate conversion of undeveloped land into sprawling, low-density development.

(3) Transportation. Encourage efficient multimodal transportation systems that are based on regional priorities and coordinated with county and city comprehensive plans.

(4) Housing. Encourage the availability of affordable housing to all economic segments of the population of this state, promote a variety of residential densities and housing types, and encourage preservation of existing housing stock.

(5) Economic development. Encourage economic development throughout the state that is consistent with adopted comprehensive plans, promote economic opportunity for all citizens of this state, especially for unemployed and for disadvantaged persons, and encourage growth in areas experiencing insufficient economic growth, all within the capacities of the state's natural resources, public services, and public facilities.

(6) Property rights. Private property shall not be taken for public use without just compensation having been made. The property rights of landowners shall be protected from arbitrary and discriminatory actions.

(7) Permits. Applications for both state and local government permits should be processed in a timely and fair manner to ensure predictability.

(8) Natural resource industries. Maintain and enhance natural resource-based industries, including productive timber, agricultural, and fisheries industries. Encourage the conservation of productive forest lands and productive agricultural lands, and discourage incompatible uses.

(9) Open space and recreation. Encourage the retention of open space and development of recreational opportunities, conserve fish and wildlife habitat, increase access to natural resource lands and water, and develop parks.

(10) Environment. Protect the environment and enhance the state's high quality of life, including air and water quality, and the availability of water.

(11) Citizen participation and coordination. Encourage the involvement of citizens in the planning process and ensure coordination between communities and jurisdictions to reconcile conflicts.

(12) Public facilities and services. Ensure that those public facilities and services necessary to support development shall be adequate to serve the development at the time the development is available for occupancy and use without decreasing current service levels below locally established minimum standards.

(13) Historic preservation. Identify and encourage the preservation of lands, sites, and structures, that have historical or archaeological significance.

RCW § 36.70A.050. Guidelines to classify agriculture, forest, and mineral lands and critical areas

(1) Subject to the definitions provided in RCW 36.70A.030, the department shall adopt guidelines, under chapter 34.05 RCW, no later than September 1, 1990, to guide the classification of: (a) Agricultural lands; (b) forest lands; (c) mineral resource lands; and (d) critical areas. The department shall consult with the department of agriculture regarding guidelines for agricultural lands, the department of natural resources regarding forest lands and mineral resource lands, and the department of ecology regarding critical areas.

(2) In carrying out its duties under this section, the department shall consult with interested parties, including but not limited to: (a) Representatives of cities; (b) representatives of counties; (c) representatives of developers; (d) representatives of builders; (e) representatives of owners of agricultural lands, forest lands, and mining lands; (f) representatives of local economic development officials; (g) representatives of environmental organizations; (h) representatives of special districts; (i) representatives of the governor's office and federal and state agencies; and (j) representatives of Indian tribes. In addition to the consultation required under this subsection, the department shall conduct public hearings in the various regions of the state. The department shall consider the public input obtained at such public hearings when adopting the guidelines.

(3) The guidelines under subsection (1) of this section shall be minimum guidelines that apply to all jurisdictions, but also shall allow for regional differences that exist in Washington State. The intent of these guidelines is to assist counties and cities in

designating the classification of agricultural lands, forest lands, mineral resource lands, and critical areas under RCW 36.70A.170.

(4) The guidelines established by the department under this section regarding classification of forest lands shall not be inconsistent with guidelines adopted by the department of natural resources.

RCW § 36.70A.060. Natural resource lands and critical areas – Development regulations

(1) Each county that is required or chooses to plan under RCW 36.70A.040, and each city within such county, shall adopt development regulations on or before September 1, 1991, to assure the conservation of agricultural, forest, and mineral resource lands designated under RCW 36.70A.170. Regulations adopted under this subsection may not prohibit uses legally existing on any parcel prior to their adoption and shall remain in effect until the county or city adopts development regulations pursuant to RCW 36.70A.040. Such regulations shall assure that the use of lands adjacent to agricultural, forest, or mineral resource lands shall not interfere with the continued use, in the accustomed manner and in accordance with best management practices, of these designated lands for the production of food, agricultural products, or timber, or for the extraction of minerals. Counties and cities shall require that all plats, short plats, development permits, and building permits issued for development activities on, or within five hundred feet of, lands designated as agricultural lands, forest lands, or mineral resource lands, contain a notice that the subject property is within or near designated agricultural lands, forest lands, or mineral resource lands on which a variety of commercial activities may occur that are not compatible with residential development for certain periods of limited duration. The notice for mineral resource lands shall also inform that an application might be made for mining-related activities, including mining, extraction, washing, crushing, stockpiling, blasting, transporting, and recycling of minerals.

(2) Each county and city shall adopt development regulations that protect critical areas that are required to be designated under RCW 36.70A.170. For counties and cities that are required or choose to plan under RCW 36.70A.040, such development regulations shall be adopted on or before September 1, 1991. For the remainder of the counties and cities, such development regulations shall be adopted on or before March 1, 1992.

(3) Such counties and cities shall review these designations and development regulations when adopting their comprehensive plans under RCW 36.70A.040 and implementing development regulations under RCW 36.70A.120 and may alter such designations and development regulations to insure consistency.

(4) Forest land and agricultural land located within urban growth areas shall not be designated by a county or city as forest land or agricultural land of long-term commercial significance under RCW 36.70A.170 unless the city or county has

enacted a program authorizing transfer or purchase of development rights.

RCW § 36.70A.160. Identification of open space corridors – Purchase authorized

Each county and city that is required or chooses to prepare a comprehensive land use plan under RCW 36.70A.040 shall identify open space corridors within and between urban growth areas. They shall include lands useful for recreation, wildlife habitat, trails, and connection of critical areas as defined in RCW 36.70A.030. Identification of a corridor under this section by a county or city shall not restrict the use or management of lands within the corridor for agricultural or forest purposes. Restrictions on the use or management of such lands for agricultural or forest purposes imposed after identification solely to maintain or enhance the value of such lands as a corridor may occur only if the county or city acquires sufficient interest to prevent development of the lands or to control the resource development of the lands. The requirement for acquisition of sufficient interest does not include those corridors regulated by the interstate commerce commission, under provisions of 16 U.S.C. Sec. 1247(d), 16 U.S.C. Sec. 1248, or 43 U.S.C. Sec. 912. Nothing in this section shall be interpreted to alter the authority of the state, or a county or city, to regulate land use activities.

The city or county may acquire by donation or purchase the fee simple or lesser interests in these open space corridors using funds authorized by RCW 84.34.230 or other sources.

RCW § 36.70A.170. Natural resource lands and critical areas – Designations

(1) On or before September 1, 1991, each county, and each city, shall designate where appropriate:

(a) Agricultural lands that are not already characterized by urban growth and that have long-term significance for the commercial production of food or other agricultural products;

(b) Forest lands that are not already characterized by urban growth and that have long-term significance for the commercial production of timber;

(c) Mineral resource lands that are not already characterized by urban growth and that have long-term significance for the extraction of minerals; and

(d) Critical areas.

(2) In making the designations required by this section, counties and cities shall consider the guidelines established pursuant to RCW 36.70A.050.

RCW § 36.70A.172. Critical areas – Designation and protection – Best available science to be used

(1) In designating and protecting critical areas under this chapter, counties and cities shall include the best available science in developing policies and development regulations to protect the functions and values of critical areas. In addition, counties and cities shall give special consideration to conservation or protection measures necessary to preserve or enhance anadromous fisheries.

(2) If it determines that advice from scientific or other experts is necessary or will be of substantial assistance in reaching its decision, a growth management hearings board may retain scientific or other expert advice to assist in reviewing a petition under RCW 36.70A.290 that involves critical areas.

Review of Policies Relating to RCW 36.70A.172 can be found in the following Court of Appeals case and in the Law Review Article:

If a city or county chooses to adopt critical areas policies, the board has jurisdiction, pursuant to RCW 36.70A.280, to review such policies, but only for purpose of determining whether the policies are in compliance with the requirement of this section to include the best available science in the process of developing a policy. Honesty in Envtl. Analysis & Legislation v. Central Puget Sound Growth Mgt. Hearings Bd., 96 Wn. App. 522, 979 P.2d 864 (1999).

SEATTLE UNIVERSITY – LAW REVIEW.
Including best available science in the designation and protection of critical areas under the growth management act. 23 Seattle U. L. Rev. 97 (1999).

CHAPTER 190. MINIMUM GUIDELINES TO CLASSIFY AGRICULTURE, FOREST, MINERAL LANDS AND CRITICAL AREAS
PART THREE GUIDELINES

WAC § 365-190-080 (2001)

WAC 365-190-080. Critical areas.

(1) Wetlands. The wetlands of Washington State are fragile ecosystems which serve a number of important beneficial functions. Wetlands assist in the reduction of erosion, siltation, flooding, ground and surface water pollution, and provide wildlife, plant, and fisheries habitats. Wetlands destruction or impairment may result in increased public and private costs or property losses.

In designating wetlands for regulatory purposes, counties and cities shall use the definition of wetlands in RCW 36.70A.030(22). Counties and cities are requested and encouraged to make their actions consistent with the intent and goals of "protection of wetlands," Executive Orders 89-10 and 90-04 as they exist on

September 1, 1990. Additionally, counties and cities should consider wetlands protection guidance provided by the department of ecology including the model wetlands protection ordinance.

(a) Counties and cities that do not now rate wetlands shall consider a wetlands rating system to reflect the relative function, value, and uniqueness of wetlands in their jurisdictions. In developing wetlands rating systems, counties and cities should consider the following:

(i) The Washington State four-tier wetlands rating system;

(ii) Wetlands functions and values;

(iii) Degree of sensitivity to disturbance;

(iv) Rarity; and

(v) Ability to compensate for destruction or degradation.

If a county or city chooses to not use the state four-tier wetlands rating system, the rationale for that decision must be included in its next annual report to department of community development.

(b) Counties and cities may use the National Wetlands Inventory as an information source for determining the approximate distribution and extent of wetlands. This inventory provides maps of wetland areas according to the definition of wetlands issued by the United States Department of Interior – Fish and Wildlife Service, and its wetland boundaries should be delineated for regulation consistent with the wetlands definition in RCW 36.70A.030(22).

(c) Counties and cities should consider using the methodology in the Federal Manual for Identifying and Delineating Jurisdictional Wetlands, cooperatively produced by the United States Army Corps of Engineers, United States Environmental Protection Agency, United States Department of Agriculture Soil Conservation Service, and United States Fish and Wildlife Service, that was issued in January 1989, and regulatory guidance letter 90-7 issued by the United States Corps of Engineers on November 29, 1990, for regulatory delineations.

(2) Aquifer recharge areas. Potable water is an essential life sustaining element. Much of Washington's drinking water comes from ground water supplies. Once ground water is contaminated it is difficult, costly, and sometimes impossible to clean up. Preventing contamination is necessary to avoid exorbitant costs, hardships, and potential physical harm to people.

The quality of ground water in an aquifer is inextricably linked to its recharge area. Few studies have been done on aquifers and their recharge areas in Washington

State. In the cases in which aquifers and their recharge areas have been studied, affected counties and cities should use this information as the base for classifying and designating these areas.

Where no specific studies have been done, counties and cities may use existing soil and surficial geologic information to determine where recharge areas are. To determine the threat to ground water quality, existing land use activities and their potential to lead to contamination should be evaluated.

Counties and cities shall classify recharge areas for aquifers according to the vulnerability of the aquifer. Vulnerability is the combined effect of hydrogeological susceptibility to contamination and the contamination loading potential. High vulnerability is indicated by land uses that contribute contamination that may degrade ground water, and hydrogeologic conditions that facilitate degradation. Low vulnerability is indicated by land uses that do not contribute contaminants that will degrade ground water, and by hydrogeologic conditions that do not facilitate degradation.

(a) To characterize hydrogeologic susceptibility of the recharge area to contamination, counties and cities may consider the following physical characteristics:

(i) Depth to ground water;

(ii) Aquifer properties such as hydraulic conductivity and gradients;

(iii) Soil (texture, permeability, and contaminant attenuation properties);

(iv) Characteristics of the vadose zone including permeability and attenuation properties; and

(v) Other relevant factors.

(b) The following may be considered to evaluate the contaminant loading potential:

(i) General land use;

(ii) Waste disposal sites;

(iii) Agriculture activities;

(iv) Well logs and water quality test results; and

(v) Other information about the potential for contamination.

(c) Classification strategy for recharge areas should be to maintain the quality of the

ground water, with particular attention to recharge areas of high susceptibility. In recharge areas that are highly vulnerable, studies should be initiated to determine if ground water contamination has occurred. Classification of these areas should include consideration of the degree to which the aquifer is used as a potable water source, feasibility of protective measures to preclude further degradation, availability of treatment measures to maintain potability, and availability of alternative potable water sources.

(d) Examples of areas with a critical recharging effect on aquifers used for potable water, may include:

(i) Sole source aquifer recharge areas designated pursuant to the Federal Safe Drinking Water Act.

(ii) Areas established for special protection pursuant to a ground water management program, chapters 90.44, 90.48, and 90.54 RCW, and chapters 173-100 and 173-200 WAC.

(iii) Areas designated for wellhead protection pursuant to the Federal Safe Drinking Water Act.

(iv) Other areas meeting the definition of "areas with a critical recharging effect on aquifers used for potable water" in these guidelines.

(3) Frequently flooded areas. Floodplains and other areas subject to flooding perform important hydrologic functions and may present a risk to persons and property. Classifications of frequently flooded areas should include, at a minimum, the 100-year floodplain designations of the Federal Emergency Management Agency and the National Flood Insurance Program.

Counties and cities should consider the following when designating and classifying frequently flooded areas:

(a) Effects of flooding on human health and safety, and to public facilities and services;

(b) Available documentation including federal, state, and local laws, regulations, and programs, local studies and maps, and federal flood insurance programs;

(c) 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;

(d) 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.

(4) Geologically hazardous areas.

(a) Geologically hazardous areas include areas susceptible to erosion, sliding, earthquake, or other geological events. They pose a threat to the health and safety of citizens when incompatible commercial, residential, or industrial development is sited in areas of significant hazard. Some geological hazards can be reduced or mitigated by engineering, design, or modified construction or mining practices so that risks to health and safety are acceptable. When technology cannot reduce risks to acceptable levels, building in geologically hazardous areas is best avoided. This distinction should be considered by counties and cities that do not now classify geological hazards as they develop their classification scheme.

(b) Areas that are susceptible to one or more of the following types of hazards shall be classified as a geologically hazardous area:

(i) Erosion hazard;

(ii) Landslide hazard;

(iii) Seismic hazard; or

(iv) Areas subject to other geological events such as coal mine hazards and volcanic hazards including: Mass wasting, debris flows, rockfalls, and differential settlement.

(c) Counties and cities should classify geologically hazardous area as either:

(i) Known or suspected risk;

(ii) No risk;

(iii) Risk unknown – data are not available to determine the presence or absence of a geological hazard.

(d) Erosion hazard areas are at least those areas identified by the United States Department of Agriculture Soil Conservation Service as having a "severe" rill and inter-rill erosion hazard.

(e) Landslide hazard areas shall include areas potentially subject to landslides based on a combination of geologic, topographic, and hydrologic factors. They include any areas susceptible because of any combination of bedrock, soil, slope (gradient), slope aspect, structure, hydrology, or other factors. Example of these may include, but are not limited to the following:

(i) Areas of historic failures, such as:

(A) Those areas delineated by the United States Department of Agriculture Soil Conservation Service as having a "severe" limitation for building site development;

(B) Those areas mapped as class u (unstable), uos (unstable old slides), and urs (unstable recent slides) in the department of ecology coastal zone atlas; or

(C) Areas designated as quaternary slumps, earthflows, mudflows, lahars, or landslides on maps published as the United States Geological Survey or department of natural resources division of geology and earth resources.

(ii) Areas with all three of the following characteristics:

(A) Slopes steeper than fifteen percent; and

(B) Hillsides intersecting geologic contacts with a relatively permeable sediment overlying a relatively impermeable sediment or bedrock; and

(C) Springs or ground water seepage;

(iii) Areas that have shown movement during the holocene epoch (from ten thousand years ago to the present) or which are underlain or covered by mass wastage debris of that epoch;

(iv) Slopes that are parallel or subparallel to planes of weakness (such as bedding planes, joint systems, and fault planes) in subsurface materials;

(v) Slopes having gradients steeper than eighty percent subject to rockfall during seismic shaking;

(vi) Areas potentially unstable as a result of rapid stream incision, stream bank erosion, and undercutting by wave action;

(vii) Areas that show evidence of, or are at risk from snow avalanches;

(viii) Areas located in a canyon or on an active alluvial fan, presently or potentially subject to inundation by debris flows or catastrophic flooding;

(ix) Any area with a slope of forty percent or steeper and with a vertical relief of ten or more feet except areas composed of consolidated rock. A slope is delineated by establishing its toe and top and measured by averaging the inclination over at least ten feet of vertical relief.

(e) Seismic hazard areas shall include areas subject to severe risk of damage as a result of earthquake induced ground shaking, slope failure, settlement, soil liquefaction, or surface faulting. One indicator of potential for future earthquake

damage is a record of earthquake damage in the past. Ground shaking is the primary cause of earthquake damage in Washington. The strength of ground shaking is primarily affected by:

(i) The magnitude of an earthquake;

(ii) The distance from the source of an earthquake;

(iii) The type of thickness of geologic materials at the surface; and

(iv) The type of subsurface geologic structure.

Settlement and soil liquefaction conditions occur in areas underlain by cohesionless soils of low density, typically in association with a shallow ground water table.

(f) Other geological events:

(i) Volcanic hazard areas shall include areas subject to pyroclastic flows, lava flows, debris avalanche, inundation by debris flows, mudflows, or related flooding resulting from volcanic activity.

(ii) Mine hazard areas are those areas underlain by, adjacent to, or affected by mine workings such as adits, gangways, tunnels, drifts, or air shafts. Factors which should be considered include: Proximity to development, depth from ground surface to the mine working, and geologic material.

(5) Fish and wildlife habitat conservation areas. Fish and wildlife habitat conservation means land management for maintaining species in suitable habitats within their natural geographic distribution so that isolated subpopulations are not created. This does not mean maintaining all individuals of all species at all times, but it does mean cooperative and coordinated land use planning is critically important among counties and cities in a region. In some cases, intergovernmental cooperation and coordination may show that it is sufficient to assure that a species will usually be found in certain regions across the state.

(a) Fish and wildlife habitat conservation areas include:

(i) Areas with which endangered, threatened, and sensitive species have a primary association;

(ii) Habitats and species of local importance;

(iii) Commercial and recreational shellfish areas;

(iv) Kelp and eelgrass beds; herring and smelt spawning areas;

(v) Naturally occurring ponds under twenty acres and their submerged aquatic beds that provide fish or wildlife habitat;

(vi) Waters of the state;

(vii) Lakes, ponds, streams, and rivers planted with game fish by a governmental or tribal entity; or

(viii) State natural area preserves and natural resource conservation areas.

(b) Counties and cities may consider the following when classifying and designating these areas:

(i) Creating a system of fish and wildlife habitat with connections between larger habitat blocks and open spaces;

(ii) 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);

(iii) Protecting riparian ecosystems;

(iv) Evaluating land uses surrounding ponds and fish and wildlife habitat areas that may negatively impact these areas;

(v) Establishing buffer zones around these areas to separate incompatible uses from the habitat areas; and

(vi) Restoring of lost salmonid habitat.

(c) Sources and methods

(i) Counties and cities should classify seasonal ranges and habitat elements with which federal and state listed endangered, threatened, and sensitive species have a primary association and which, if altered, may reduce the likelihood that the species will maintain and reproduce over the long term.

(ii) Counties and cities should determine which habitats and species are of local importance. Habitats and species may be further classified in terms of their relative importance.

Counties and cities may use information prepared by the Washington department of wildlife to classify and designate locally important habitats and species. Priority habitats and priority species are being identified by the department of wildlife for all lands in Washington State. While these priorities are those of the department, they and the data on which they are based may be considered by counties and cities.

(iii) Shellfish areas. All public and private tidelands or bedlands suitable for shellfish harvest shall be classified as critical areas. Counties and cities should consider both commercial and recreational shellfish areas. Counties and cities should at least consider the Washington department of health classification of commercial and recreational shellfish growing areas to determine the existing condition of these areas. Further consideration should be given to the vulnerability of these areas to contamination. Shellfish protection districts established pursuant to chapter 90.72 RCW shall be included in the classification of critical shellfish areas.

(iv) Kelp and eelgrass beds; herring and smelt spawning areas. Counties and cities shall classify kelp and eelgrass beds, identified by department of natural resources aquatic lands division and the department of ecology. Though not an inclusive inventory, locations of kelp and eelgrass beds are compiled in the *Puget Sound Environmental Atlas, Volumes 1 and 2.* Herring and smelt spawning times and locations are outlined in WAC 220-110-240 through 220-110-260 and the *Puget Sound Environmental Atlas.*

(v) Naturally occurring ponds under twenty acres and their submerged aquatic beds that provide fish or wildlife habitat.

Naturally occurring ponds do not include ponds deliberately designed and created from dry sites, such as canals, detention facilities, wastewater treatment facilities, farmponds, temporary construction ponds (of less than three years duration), and landscape amenities. However, naturally occurring ponds may include those artificial ponds intentionally created from dry areas in order to mitigate conversion of ponds, if permitted by a regulatory authority.

(vi) Waters of the state. Waters of the state are defined in Title 222 WAC, the forest practices rules and regulations. Counties and cities should use the classification system established in WAC 222-16-030 to classify waters of the state.

Counties and cities may consider the following factors when classifying waters of the state as fish and wildlife habitats:

(A) Species present which are endangered, threatened or sensitive, and other species of concern;

(B) Species present which are sensitive to habitat manipulation;

(C) Historic presence of species of local concern;

(D) Existing surrounding land uses that are incompatible with salmonid habitat;

(E) Presence and size of riparian ecosystems;

(F) Existing water rights; and

(G) The intermittent nature of some of the higher classes of waters of the state.

(vii) Lakes, ponds, streams, and rivers planted with game fish.

This includes game fish planted in these water bodies under the auspices of a federal, state, local, or tribal program or which supports priority fish species as identified by the department of wildlife.

(viii) State natural area preserves and natural resource conservation areas. Natural area preserves and natural resource conservation areas are defined, established, and managed by department of natural resources.

Statutory Authority: RCW 36.70A.050. 91-07-041, § 365-190-080, filed 3/15/91, effective 4/15/91.

GROWTH MANAGEMENT ACT – PROCEDURAL CRITERIA FOR ADOPTING COMPREHENSIVE PLANS AND DEVELOPMENT REGULATIONS
PART FOUR INVENTORIES AND REVIEWS

WAC 365-195-410. Critical areas.

(1) *Requirements.* Prior to the development of comprehensive plans, cities and counties ought to have designated critical areas and adopted regulations protective of them. Such areas are defined to include:

(a) Wetlands;

(b) Areas of critical recharging effect on aquifers used for potable water;

(c) Fish and wildlife habitat conservation areas;

(d) Frequently flooded areas; and

(e) Geologically hazardous areas.

The previous designations and regulations shall be reviewed in the comprehensive plan process to ensure consistency.

(2) *Recommendations for meeting requirements.* Much of the analysis which is the basis for the comprehensive plan will come later than the initial identification and regulation of critical areas. The result may be plan features which conflict with the previous critical area provisions.

(a) The department has issued guidelines for the classification of critical areas

which are contained in chapter 365-190 WAC.

(b) Critical areas should be designated and protected wherever the applicable natural conditions exist, whether within or outside of urban growth areas.

(c) The review of existing designations should, in most cases, be limited to the question of consistency with the comprehensive plan, rather than a revisiting of the entire prior designation and regulation process. However, to the extent that new information is available or errors have been discovered, the review process should take this information into account.

(d) In connection with critical area protection, the department recommends that planning jurisdictions identify the policies by which decisions are made on when and how police powers will be used (regulation) and when and how other means will be employed (purchases, development rights, etc.).

Statutory Authority: RCW 36.70A.190 (4)(b). 92-23-065, § 365-195-410, filed 11/17/92, effective 12/18/92.

PROCEDURAL CRITERIA FOR ADOPTING COMPREHENSIVE PLANS AND DEVELOPMENT REGULATIONS

PART NINE DEVELOPMENT REGULATIONS

WAC 365-195-900. Background and purpose.

(1) Counties and cities planning under RCW 36.70A.040 are subject to continuing review and evaluation of their comprehensive land use plan and development regulations. Every five years they must take action to review and revise their plans and regulations, if needed, to ensure they comply with the requirements of the Growth Management Act. RCW 36.70A.130.

(2) Counties and cities must include the "best available science" when developing policies and development regulations to protect the functions and values of critical areas and must give "special consideration" to conservation or protection measures necessary to preserve or enhance anadromous fisheries. RCW 36.70A.172(1). The rules in WAC 365-195-900 through 365-195-925 are intended to assist counties and cities in identifying and including the best available science in newly adopted policies and regulations and in this periodic review and evaluation and in demonstrating they have met their statutory obligations under RCW 36.70A.172(1).

(3) The inclusion of the best available science in the development of critical areas policies and regulations is especially important to salmon recovery efforts, and to other decision-making affecting threatened or endangered species.

(4) These rules are adopted under the authority of RCW 36.70A.190 (4)(b) which

requires the department of community, trade, and economic development (department) to adopt rules to assist counties and cities to comply with the goals and requirements of the Growth Management Act.

WAC 365-195-905. Criteria for determining which information is the "best available science."

(1) This section provides assessment criteria to assist counties and cities in determining whether information obtained during development of critical areas policies and regulations constitutes the "best available science."

(2) Counties and cities may use information that local, state, or federal natural resource agencies have determined represents the best available science consistent with criteria set out in WAC 365-195-900 through 365-195-925. The department will make available a list of resources that state agencies have identified as meeting the criteria for best available science pursuant to this chapter. Such information should be reviewed for local applicability.

(3) The responsibility for including the best available science in the development and implementation of critical areas policies or regulations rests with the legislative authority of the county or city. However, when feasible, counties and cities should consult with a qualified scientific expert or team of qualified scientific experts to identify scientific information, determine the best available science, and assess its applicability to the relevant critical areas. The scientific expert or experts may rely on their professional judgment based on experience and training, but they should use the criteria set out in WAC 365-195-900 through 365-195-925 and any technical guidance provided by the department. Use of these criteria also should guide counties and cities that lack the assistance of a qualified expert or experts, but these criteria are not intended to be a substitute for an assessment and recommendation by a qualified scientific expert or team of experts.

(4) Whether a person is a qualified scientific expert with expertise appropriate to the relevant critical areas is determined by the person's professional credentials and/or certification, any advanced degrees earned in the pertinent scientific discipline from a recognized university, the number of years of experience in the pertinent scientific discipline, recognized leadership in the discipline of interest, formal training in the specific area of expertise, and field and/or laboratory experience with evidence of the ability to produce peer-reviewed publications or other professional literature. No one factor is determinative in deciding whether a person is a qualified scientific expert. Where pertinent scientific information implicates multiple scientific disciplines, counties and cities are encouraged to consult a team of qualified scientific experts representing the various disciplines to ensure the identification and inclusion of the best available science.

(5) Scientific information can be produced only through a valid scientific process. To ensure that the best available science is being included, a county or city should

consider the following:

(a) *Characteristics of a valid scientific process.* In the context of critical areas protection, a valid scientific process is one that produces reliable information useful in understanding the consequences of a local government's regulatory decisions and in developing critical areas policies and development regulations that will be effective in protecting the functions and values of critical areas. To determine whether information received during the public participation process is reliable scientific information, a county or city should determine whether the source of the information displays the characteristics of a valid scientific process. The characteristics generally to be expected in a valid scientific process are as follows:

1. *Peer review.* The information has been critically reviewed by other persons who are qualified scientific experts in that scientific discipline. The criticism of the peer reviewers has been addressed by the proponents of the information. Publication in a refereed scientific journal usually indicates that the information has been appropriately peer-reviewed.

2. *Methods.* The methods that were used to obtain the information are clearly stated and able to be replicated. The methods are standardized in the pertinent scientific discipline or, if not, the methods have been appropriately peer-reviewed to assure their reliability and validity.

3. *Logical conclusions and reasonable inferences.* The conclusions presented are based on reasonable assumptions supported by other studies and consistent with the general theory underlying the assumptions. The conclusions are logically and reasonably derived from the assumptions and supported by the data presented. Any gaps in information and inconsistencies with other pertinent scientific information are adequately explained.

4. *Quantitative analysis.* The data have been analyzed using appropriate statistical or quantitative methods.

5. *Context.* The information is placed in proper context. The assumptions, analytical techniques, data, and conclusions are appropriately framed with respect to the prevailing body of pertinent scientific knowledge.

6. *References.* The assumptions, analytical techniques, and conclusions are well referenced with citations to relevant, credible literature, and other pertinent existing information.

(b) *Common sources of scientific information.* Some sources of information routinely exhibit all or some of the characteristics listed in (a) of this subsection. Information derived from one of the following sources may be considered scientific information if the source possesses the characteristics in Table 1. A county or city may consider information to be scientifically valid if the source possesses the

characteristics listed in (a) of this subsection. The information found in Table 1 provides a general indication of the characteristics of a valid scientific process typically associated with common sources of scientific information.

Table 1

SOURCES OF SCIENTIFIC INFORMATION	**CHARACTERISTICS**					
	Peer Review	Methods	Logical conclusions and reasonable inferences	Quantitative analysis	Context	References
A. Research. Research data collected and analyzed as part of a controlled experiment (or other appropriate methodology) to test a specific hypothesis.	x	x	x	x	x	x
B. Monitoring. Monitoring data collected periodically over time to determine a resource trend or evaluate a management program.		x	x	y	x	x
C. Inventory. Inventory data collected from an entire population or population segment (e.g., individuals in a plant or animal species) or an entire ecosystem or ecosystem segment (e.g., the species in a particular wetland).		x	x	y	x	x
D. Survey. Survey data collected from a statistical sample from a population or ecosystem.		x	x	y	x	x
E. Modeling. Mathematical or symbolic simulation or representation of a natural system. Models generally are used to understand and explain occurrences that cannot be directly observed.	x	x	x	x	x	x
F. Assessment. Inspection and evaluation of site-specific information by a qualified scientific expert. An assessment may or may not involve collection of new data.		x	x		x	x
G. Synthesis. A comprehensive review and explanation of pertinent literature and other relevant existing knowledge by a qualified scientific expert.	x	x	x		x	x
H. Expert Opinion. Statement of a qualified scientific expert based on his or her best professional judgment and experience in the pertinent scientific discipline. The opinion may or may not be based on site-specific information.			x		x	x

x = characteristic must be present for information derived to be considered scientifically valid and reliable

y = presence of characteristic strengthens scientific validity and reliability of information derived, but is not essential to ensure scientific validity and reliability

(c) *Common sources of nonscientific information.* Many sources of information usually do not produce scientific information because they do not exhibit the necessary characteristics for scientific validity and reliability. Information from these sources may provide valuable information to supplement scientific information, but it is not an adequate substitute for scientific information. Nonscientific information should not be used as a substitute for valid and available scientific information. Common sources of nonscientific information include the following:

(i) Anecdotal information. One or more observations which are not part of an organized scientific effort (for example, "I saw a grizzly bear in that area while I was hiking").

(ii) Nonexpert opinion. Opinion of a person who is not a qualified scientific expert in a pertinent scientific discipline (for example, "I do not believe there are grizzly bears in that area").

(iii) Hearsay. Information repeated from communication with others (for example, "At a lecture last week, Dr. Smith said there were no grizzly bears in that area").

(6) Counties and cities are encouraged to monitor and evaluate their efforts in critical areas protection and incorporate new scientific information, as it becomes available.

WAC 365-195-910. Criteria for obtaining the best available science.

(1) Consultation with state and federal natural resources agencies and tribes can provide a quick and cost-effective way to develop scientific information and recommendations. State natural resource agencies provide numerous guidance documents and model ordinances that incorporate the agencies' assessments of the best available science. The department can provide technical assistance in obtaining such information from state natural resources agencies, developing model GMA-compliant critical areas policies and development regulations, and related subjects. The department will make available to interested parties a current list of the best available science determined to be consistent with criteria set out in WAC 365-195-905 as identified by state or federal natural resource agencies for critical areas.

(2) A county or city may compile scientific information through its own efforts, with or without the assistance of qualified experts, and through state agency review and the Growth Management Act's required public participation process. The county or city should assess whether the scientific information it compiles constitutes the best available science applicable to the critical areas to be protected, using the criteria set out in WAC 365-195-900 through 365-195-925 and any technical guidance provided by the department. If not, the county or city should identify and assemble

additional scientific information to ensure it has included the best available science.

WAC 365-195-915. Criteria for including the best available science in developing policies and development regulations.

(1) To demonstrate that the best available science has been included in the development of critical areas policies and regulations, counties and cities should address each of the following on the record:

(a) The specific policies and development regulations adopted to protect the functions and values of the critical areas at issue.

(b) The relevant sources of best available scientific information included in the decision-making.

(c) Any nonscientific information – including legal, social, cultural, economic, and political information – used as a basis for critical area policies and regulations that depart from recommendations derived from the best available science. A county or city departing from science-based recommendations should:

(i) Identify the information in the record that supports its decision to depart from science-based recommendations;

(ii) Explain its rationale for departing from science-based recommendations; and

(iii) Identify potential risks to the functions and values of the critical area or areas at issue and any additional measures chosen to limit such risks. State Environmental Policy Act (SEPA) review often provides an opportunity to establish and publish the record of this assessment.

(2) Counties and cities should include the best available science in determining whether to grant applications for administrative variances and exemptions from generally applicable provisions in policies and development regulations adopted to protect the functions and values of critical areas. Counties and cities should adopt procedures and criteria to ensure that the best available science is included in every review of an application for an administrative variance or exemption.

WAC 365-195-920. Criteria for addressing inadequate scientific information.

Where there is an absence of valid scientific information or incomplete scientific information relating to a county's or city's critical areas, leading to uncertainty about which development and land uses could lead to harm of critical areas or uncertainty about the risk to critical area function of permitting development, counties and cities should use the following approach:

(1) A "precautionary or a no risk approach," in which development and land use activities are strictly limited until the uncertainty is sufficiently resolved; and

(2) As an interim approach, an effective adaptive management program that relies on scientific methods to evaluate how well regulatory and nonregulatory actions achieve their objectives. Management, policy, and regulatory actions are treated as experiments that are purposefully monitored and evaluated to determine whether they are effective and, if not, how they should be improved to increase their effectiveness. An adaptive management program is a formal and deliberate scientific approach to taking action and obtaining information in the face of uncertainty. To effectively implement an adaptive management program, counties and cities should be willing to:

(a) Address funding for the research component of the adaptive management program;

(b) Change course based on the results and interpretation of new information that resolves uncertainties; and

(c) Commit to the appropriate timeframe and scale necessary to reliably evaluate regulatory and nonregulatory actions affecting critical areas protection and anadromous fisheries.

WAC 365-195-925. Criteria for demonstrating "special consideration" has been given to conservation or protection measures necessary to preserve or enhance anadromous fisheries.

(1) RCW 36.70A.172(1) imposes two distinct but related requirements on counties and cities. Counties and cities must include the "best available science" when developing policies and development regulations to protect the functions and values of critical areas, and counties and cities must give "special consideration" to conservation or protection measures necessary to preserve or enhance anadromous fisheries. Local governments should address both requirements in RCW 36.70A.172(1) when developing their records to support their critical areas policies and development regulations.

(2) To demonstrate compliance with RCW 36.70A.172(1), a county or city adopting policies and development regulations to protect critical areas should include in the record evidence that it has given "special consideration" to conservation or protection measures necessary to preserve or enhance anadromous fisheries. The record should be developed using the criteria set out in WAC 365-195-900 through 365-195-925 to ensure that conservation or protection measures necessary to preserve or enhance anadromous fisheries are grounded in the best available science.

(3) Conservation or protection measures necessary to preserve or enhance

anadromous fisheries include measures that protect habitat important for all life stages of anadromous fish, including, but not limited to, spawning and incubation, juvenile rearing and adult residence, juvenile migration downstream to the sea, and adult migration upstream to spawning areas. Special consideration should be given to habitat protection measures based on the best available science relevant to stream flows, water quality and temperature, spawning substrates, instream structural diversity, migratory access, estuary and nearshore marine habitat quality, and the maintenance of salmon prey species. Conservation or protection measures can include the adoption of interim actions and long-term strategies to protect and enhance fisheries resources.

Statutory Authority: RCW 36.70A.190 (4)(b). 00-16-064, § 365-195-925, filed 7/27/00, effective 8/27/00.

Hwy 99 AND POINTS EAST
Planning a new direction

Highway 99 Corridor Revitalization Effort - **"Team 99"**
6400 NE Highway 99, Suite G PMB 178
Vancouver, WA 98665-8748

10 October 2018

Laurie Lebowsky
Clark County Community Planning
1300 Franklin Street
Vancouver, WA 98660

Dear Laurie,

I have now had a chance to go over, with the Team members, the discussion and recommendations on the Cottage Housing Code presented at the Team 99 committee meeting earlier this year. As you indicated then, we agree with the County's proposal to remove the provisions from the Appendix F: Highway 99 form-based code on Cottages and to apply the Title 40 Cottage Housing Code directly in the Highway 99 Sub-Area Overlay Plan.

We recognize that perhaps the Title 40 Cottage Housing Code is more easily understood and applied for developers, especially as this will eliminate any possible confusion on the applicable code language.

The only stipulation would be that, inside the Sub-Area Overlay Plan, direction is given to "see Title 40 Cottage Housing Code" (which is probably done anyway). This is so that it cannot be said that the Overlay makes no reference to Cottages.

Thank you for providing the work session and hearing schedules on this change. I will share that with the Team and Hazel Dell/Salmon Creek Business Association board as well. We appreciate very much being kept abreast of any and all change to the Sub-Area Plan.

Ila Stanek

Ila Stanek, Team 99 Chair & Coordinator
500 NW Wildwood Drive
Vancouver, WA 98665-7546
(360) 609-1283 Cell & Text
ilastanek@hotmail.com

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CLARK COUNTY
WASHINGTON

CLARK COUNTY PLANNING COMMISSION
THURSDAY, NOVEMBER 15, 2018
MINUTES OF PUBLIC HEARING

Public Services Center
BOCC Hearing Room, 6th Floor
1300 Franklin Street
Vancouver, Washington

6:30 p.m.

CALL TO ORDER & ROLL CALL

JOHNSON: Good evening. I'd like to call this meeting to order for the 15th of November, 2018 of the Clark County Planning Commission. I am acting chair, Karl Johnson. Could we have roll call, please.

MORASCH:	ABSENT
WRIGHT:	HERE
BARCA:	ABSENT
SWINDELL:	HERE
JOHNSON:	HERE
GRIMWADE:	HERE
BENDER:	HERE

GENERAL & NEW BUSINESS

A. Approval of Agenda for November 15, 2018

JOHNSON: Next on the agenda, I'd like the approval of the agenda for November 15th, 2018, I'll take a motion.

WRIGHT: So moved.

SWINDELL: I'll second it.

JOHNSON: Moved and seconded. All those in favor?

EVERYBODY: AYE

B. Approval of Minutes for October 18, 2018

JOHNSON: All those opposed? Let's see. Next I'll take an approval for the minutes for October 18th, 2018.

GRIMWADE: So moved.

SWINDELL: Second it.

JOHNSON: So moved and seconded. All those in favor?

EVERYBODY: AYE

Planning Commission Procedures

JOHNSON: All those opposed? Okay. So before I begin tonight, is there anybody on the Planning Commission that would like to disclose any conflicts of interest?

WRIGHT: I have a conflict with Item A, so I would recuse myself out in the hall when that --

JOHNSON: During that time. Okay. Thank you. Our procedure tonight is as follows: We will begin the hearing with a staff report. The Planning Commission members will ask the staff questions if there is any at this point. I will then open the hearing for public testimony.

Members of the audience who wish to testify on a hearing item need to sign in on the sign-in sheets at the back of the room. Members of the public wishing to give oral testimony are to come to the front of the room at the table facing the Planning Commission.

The chair has the discretion to make the following statement if reasonable and appropriate under the circumstances: Testimony on this matter is limited to three minutes per person. Your testimony should be, should relate to the applicable standards for this hearing item. The relevant standards are set out in the staff report, copies of which are available on the table in the back of the hearing room.

If you have any exhibits you want us to consider such as a copy of your testimony, photographs, petitions or other documents or physical evidence, please hand that to staff. This information will be included in the record for the hearing item, we will consider this part of our deliberations.

When you testify, you must testify at the front table in front of the microphone so the court reporter can hear your testimony. State your name and your address for the record and spell your name for the court reporter. Be relevant and concise and please don't repeat yourself or others testifying. I will then close the public testimony portion of the hearing.

The Planning Commission will deliberate and ask the staff to answer questions or make rebuttals. The Planning Commission will then take a vote on their decision. It is important for you to understand our recommendations will be forwarded to the Board of County Councilors who have the final decision-making authority.

C. Communications from the Public

JOHNSON: With that said, what I'd like now, is there any communications from the public other than things that are on the agenda? Seeing none, we will move on, and I will read it.

PUBLIC HEARING ITEMS:

A. CPZ2018-00021 Urban Holding I-5/179th Street Area, Phase 2:
The proposal will remove the comprehensive plan and zoning urban holding overlay. The proposed comprehensive plan map amendment will occur on six properties (181581000, 181548000, 181466000, 181580000, 181701000, and 181702000). These properties are designated with Single Family Residential Land Use and Zoning. The approximate area of the proposal is 143 acres

Staff Contact: Matt Hermen at (564) 397-4343 or Matt.hermen@clark.wa.gov

JOHNSON: So the first public hearing scheduled tonight is CPZ2018-00021, Urban Holding on the I-5/179th Street, Phase 2. It is my understanding tonight that staff along with the applicant's representative are requesting to continue this hearing until a certain date. Matt, can you let us know what's going on here.

HERMEN: Sure. For the record, my name is Matt Hermen with Clark County Community Planning. Staff and the applicant are requesting that the hearing scheduled tonight be postponed until February 21st, 2019, at 6:30 p.m. Staff would like to take the time in between that date to conduct financial analysis for the funding the critical links and intersection improvements necessary to remove urban holding from the 179th/I-5 area. This analysis will provide staff as well as the County Council with all of the options to consider whether the improvements are reasonably funded. Therefore, we are requesting that the Planning Commission approve a motion to continue the Planning Commission's public hearing on CPZ2018-00021 until February 21st at 6:30 p.m. This continuance will keep the record open for any members of the public to submit information or argument on this matter.

JOHNSON: Would the applicant like to address the Planning Commission?

HERMEN: I don't believe he's present.

JOHNSON: Okay. Thank you. Does the Planning Commission have any questions for Matt? With that, I'll ask for a motion to continue public hearing CPZ2018-00021 until February 21st, 2019.

BENDER: I make a **MOTION** that CPZ2018-00021 be carried forward until February 21st.

SWINDELL: I'll **second** it.

JOHNSON: Hearing the motion and seconded, I'll ask for a roll call to continue the hearing.

ROLL CALL VOTE

SWINDELL: AYE
GRIMWADE: AYE
BENDER: AYE
JOHNSON: AYE

JOHNSON: Moving on. Next up, Jan, I believe it's you.

PUBLIC HEARING ITEMS, continued

B. BIANNUAL CODE AMENDMENTS

BI-ANNUAL CODE CHANGE ITEMS – FALL 2018			
No.		Title/Chapter/Section	Description
		Scrivener's Errors	
1		Tables 40.210.010-1, 40.210.020-1, and 40.210.030-1	Add Accessory Dwelling units as allowable uses in the Rural district use tables
2		Section 5.5.1 of the Highway 99 overlay standards	Correct / Clarify that Highway 99 Overlay residential developments must meet the parking requirements in Title 40
		Fee Updates	
3		Table 6.120.040	Include a re-inspection fee for multiple failed fire inspections
4		Table 6.110A.010	Include a submittal fee for Type I land use applications

Clarifications			
5		40.540.030.E	Provide additional clarification that tracts created in short plats are not buildable unless subsequently approved through the platting process
6		40.540.040.E	Add clarifications that tracts created in subdivisions are not buildable unless subsequently approved through the platting process
7		40.520.010.E.1.b(5) and 40.540.020.B.4.d	Clarify circumstances under which the County will recognize court orders as exemptions to platting
Minor Policy Changes			
8		40.260.220.E	Remove requirement to post a bond for temporary uses
9		40.350.030	Several changes including stopping sight distance reductions, addition of a section on yield controlled intersections, barricades, passing sight distance reductions, and school zone traffic control
10		40.450.030.E and 40.450.040.C&D	Update wetland code to enable reduced wetland buffers in areas of low habitat function
11		Appendix F, Section 7.6	Remove separate cottage housing standards from the Highway 99 overlay; instead defer to the standards in Section 40.260.073

(Items 3 and 4 are not development regulations and are not subject to Planning Commission review)

Staff Contact: Jan Bazala, 397-2375, Ext. 4499
Email: jan.bazala@clark.wa.gov

BAZALA: All right. Good evening, Commissioners. My name is Jan Bazala, I'm with Community Development. We're here tonight to conduct the Planning Commission hearing on the fall Biannual Code Amendments. Every now and then staff's batch minor amendments to the Clark County Code to correct scrivener's errors, update references, clarify standards and also to make some minor policy changes at times. These batches of code changes are kindly known as the Biannual Code Amendments.

County Council gave staff the go ahead on 11 main items, 2 of the items that they gave us the go ahead on are fee items that you will not need to deliberate on. All the items as currently drafted have been reviewed by the Development and Engineering Advisory Board and they have provided a motion of support for the items as written.

SEPA determination of nonsignificance was published in the Columbian on October 29th. Legal notice of the hearing was published in the Columbian and Reflector newspapers on October 31st. We held a work session on these items on November 1st.

Haven't received SEPA comments on these code amendments, but yesterday we did receive a comment letter from Futurewise and they also submitted a number of supporting documents

that I believe that you have copies of. Futurewise commented on Items Number 1, 5 and 6 in our list of amendments that we're going to discuss tonight.

So starting off, I'll start out with Item Number 1 which starts out on the first page of the Attachment A which is the main large attachment that you have that has the text of all the code amendments.

This first item has been revised and you should have a copy of the Revision to Attachment A in your packets, it's the proposal to Add Rural ADU's into Resource, Rural and Rural Center use tables. Do you guys have all that? All right. So please refer to that version and we'll use that as the one to review tonight.

Back in January of 2017 the code was amended to allow accessory dwelling units in the rural area and a special use section, Section 40.260.022 was created and it spells out the requirements for ADU's in the rural areas. However, when that was done, the listings for accessory dwelling were not put in the use table, so the special use section explicitly spells out where they are allowed. So we're not changing anything about where they are allowed, all we're doing here is making them as a line item in the rural use tables.

Futurewise, in their letter, they had concerns about allowing detached accessory structures in the rural area; however, detached accessory dwelling units are not allowed under current code as it's written now, so nothing is changing in that regard. The County does not allow detached accessory dwelling units in the rural area, so I don't think, well, that aspect is a moot point because we don't allow them under the current code and nothing is changing.

They also noted some concerns with detached guest houses; however, the use table that you have in front of you makes no changes to guest houses, so hopefully pretty straightforward. And at any point if you have questions, feel free to stop me.

And I should have asked first, do you want to go through each item and then make a motion on each item as we go through it or group them all together and make a motion on --

JOHNSON: I don't know how we feel here, but we were talking about that. So maybe we just keep block them out and vote on them as they're blocked out, the scrivener's errors, fee updates, the clarifications and then the minors. Is that okay with you guys?

BAZALA: All right. So then if there's no questions on the first one, I will move on to Number 2, now we're back to the main Attachment A.

So the second item starts on Page 3. So this is amendment to correct and clarify the Highway 99 overlay standards to require, to clearly state that residential developments have to meet the minimum parking requirements in Title 40. In 2000- -- well, let me step back a little bit.

Highway 99 overlay area has its own standards that generally supersede those in Title 40. Prior to 2017, the Highway 99 standard specifically exempted all developments from meeting the minimum number of parking spaces that are found in the regular Title 40.

So the code was amended in 2017 to change that all residential developments now did need to meet the minimum parking numbers and we made that change, but the change was incomplete, and there's additional language that still exists that make it appear that, that non-- that, sorry, that residential developments are only encouraged to meet the minimum standards.

So now we're going back to the drawing board making a more complete and hopefully clearer version that clearly states that residential developments have to meet parking standards. Nonresidential, that is commercial developments, still do not have to meet the minimum parking standards. So any questions on that one? Okay. All right.

Numbers 3 and 4 are the fee items that we do not need to discuss. So we'll move on to Items Number 5 and 6, I'll kind of talk about these as a pair. Number 5 starts on Page 4 and also Number 6 starts on Page 4 also.

So these are amendments to the short plat and subdivision approval criteria to clarify that tracts that are created for nonresidential purposes must go through a separate platting process. Now, tract is an area of land that's created with a land division, typically these are for stormwater purposes, private streets, maybe habitat and wetland tracts, possibly like a public park, although, or a private park, excuse me.

There's existing language in the short plat code that states that non-building tracts have to go through a platting process in order to be converted to a buildable lot, but there isn't that same language in the subdivision code.

A Hearing Examiner found in one case that some subdivision tracts could be converted to residential use without a separate platting review processes and those tracts were never reviewed as building intended, they were not originally intended for buildable lots. And one of the reasons that or part of the rationale is that the language prohibiting or the language requiring additional review was in the short plat code, but it was not in the subdivision code.

So we're proposing to update the language in the short plat code, elaborate a little bit and then replicate that language in the subdivision code to make it clear those tracts that weren't originally created as buildable lots have to go through a separate platting process in order to be converted. Questions on that? Okay. So that covers 5 and 6.

So Number 7, we are now on Page 6 of the Attachment A. Number 7 is to clarify the

circumstances under which the County will recognize lots that are created through exemptions to platting. There was a potential loophole that was discovered lately in the County's legal lots and land division codes that could be interpreted to mean that court orders that divide land may not need to be consistent with the exemptions from platting that are found in the RCWs.

The existing language might support an argument that any court order partitioning or dividing property could qualify as an exemption to platting regardless of the circumstances or the number of lots that are created. So we're trying to close that loophole with the revisions to the legal lot and the short plat codes. Any questions on that one? All right.

We'll move on to Number 8 which is we're getting into the minor policy items now. So it's pretty minor. Number 8 is a change to the temporary use code to eliminate the need for surety bonds for temporary uses.

Temporary uses are occasionally issued for odd situations where an applicant needs a temporary expansion like some outside storage on a nearby parcel. Another example would be short-term use of a portable office, those are a couple of the situations where we've seen temporary uses.

The current code requires that the applicant submit a $2500 surety bond or cash with the application, and the idea is that if the temporary use isn't removed at the end of the 180 days, that the County would get something to help defray the cost of removing it. But this is the only circumstance in land use world where we hold somebody's money, except for when somebody's platting property and they're bonding for those types of improvements.

So there is a current process already in place for Code Enforcement to get applicants in cases into compliance and the current process of holding people's money has just really proven to be cumbersome. So we're proposing to get out of that business and just defer back to the Code Enforcement processes if they're, if a use is not removed in a timely fashion.

Number 9. These are a number of changes to the transportation code in 40.350.030. There's changes being proposed to stopping sight distance, sight distance triangles, yield controlled intersections, barricades, supplemental publication references, passing sight distance and school zone traffic control. So if you want to discuss these, I will have Ejaz in transportation kind of explain some of these, but if you don't have questions on them, we can continue on.

JOHNSON: No? No questions.

BAZALA: Okay. All right. Move on to Number 10. This is a proposal to update the wetland code which will enable reduced wetland buffers in areas of low habitat function, and it almost sounds like I know what I'm talking about but I really don't. Brent Davis in habitat wetland review is very familiar with what this code entails.

I can sum up that basically Ecology recently made changes to the wetland buffer guidelines based on public feedback and review of various wetland data and so the Department of Ecology is updating their wetland forms and these changes would be consistent with those. And if you wanted further elaboration, I'm going to hand it over to Brent if you have further questions. No? Okay.

Number 11, the last one, is to eliminate the special Highway 99 cottage housing provisions and to also update the Title 40 cottage housing section accordingly. So, again, we're talking about Highway 99, they have special standards for lots of things that are different than Title 40 and title, I'm sorry, Highway 99 has their own special cottage housing standards as there are also special housing standards, cottage housing standards in regular Title 40. The differences are not that many.

The Highway 99 standards have a couple differences, they allow smaller homes than what is already allowed in other sections of the code. Basically the limit on square footage in Highway 99 cottage housing standards is 1200-square feet; regular Title 40 standards is 1600-square feet.

So there's also a difference in the codes in that in the Highway 99 cottage standards the main entry must face the open space, and in the regular Title 40 standards there isn't a requirement like that. So there aren't that many differences.

Team 99 which is the citizen advisory group that helped develop the Highway 99 standards, they support the change and it will help eliminate confusion, and again, the differences are not that great, so they're okay with just deferring back to regular Title 40. It doesn't mean that cottage housing won't be allowed, it will still be allowed, it will just be allowed in the same places under the same circumstances, it's just that the standards will be the same as those in Title 40. So that wraps up my presentation.

JOHNSON: Any questions for Jan? With that said, we will take comments regarding the Biannual Code Change Items 1 through 11. I have five people here signed up.

Public Testimony

Mary, I can't read the writing. Is Mary here? Mary, 4418 N.E. 179th Street. No? Okay. Carol, I know you're here to address the biannual code items.

LEVANEN: Carol Levanen for Clark County Citizens United, spelling C-a-r-o-l, L-e-v-a-n-e-n.

Specifically we're concerned about Item Number 10 which is the update wetlands code to enable reduced wetland buffers in areas of the low habitat function. This leads the public to

believe that there's going to be a reduction in wetland buffers when in fact if you look on your, in the detail page, they're actually increasing buffers on 8 or 9 points from 130 feet to 150 feet for low intensity, 195 to 225 feet on moderate and 260 to 300 feet. So it's real easy to get these numbers here on the Department of Ecology's form. It's a subjective form. I talked with the Department of Ecology and they've already confirmed to me it is a subjective form.

Wetlands are supposed to be determined by three items, by Federal, State and local law and that happens to be water, it happens to be soil and it happens to be vegetation. So there are specifics about wetlands regarding this and it is not to be called a wetland unless in fact they have all three of those parameters correctly determined. That form does not since it's subjective cannot determine those adequately, you have to have a full scientific study, the best available science has to be used.

That being said, the Department of Ecology also told me that they're advisory only. They don't have wetland buffers. They don't determine wetland buffers for a county, they let the county decide in their own wetland ordinances. So these buffers that are in this ordinance are indeed buffers that were created when the ordinance was created in this county, it had nothing to do with Department of Ecology's buffers, so...

And I remember we worked through this ordinance because we've been working with this stuff for 24 years and I remember when this wetland ordinance was first adopted and there was a lot of problems with it and the buffers were quite large and there was a lot of issues. And the same with the critical lands ordinance, the same thing.

So just to let you know that actually they're not -- we support the reduction of the buffers because the scientific data, best available science tells you that you don't need this kind of -- sometimes the buffers are much bigger than the wetland - how do I say it? - the whole wetland itself, the buffer winds up being bigger than the wetland, so we are opposing that portion.

So I have to say that we support the reduction, but we oppose the increase on with 8 or 9 points because we know it's very easy to change those points around and we feel that it's a hardship on the landowner to have to do a 300 feet.

When the ordinance was first proposed, one 20-acre piece had a wetland area through it and we found out that it was, it took 90 percent of that land, of those people's land, so that's not what you want to do. We want to preserve the wetland when it's true wetland and preserve it in the best way so that people who pay the taxes on that land and own that land will have an opportunity to use the land and take care of it for the county because actually those are the folks who do that.

Also, there was a number of people who came to give testimony regarding the urban holding. I understand that you want to have more time to talk about it, but I really think the Planning

Commission should have taken the testimony from those people who drove. I drove 45 minutes in here and I'll drive 45 minutes back and I'll have to come back again another day.

I really think that you, it would have been nicer to have taken the testimony from those elderly people who came in today because they thought that they were going to be giving testimony. So I have a written testimony, I will turn it in for that.

But, anyways, I highly encourage you to stop and consider what's happening with wetlands and habitat ordinances in this county, there's where the problem lies and I think it's time for this county to go through those ordinances and make good sense with them. Thank you.

JOHNSON: Thank you. Next up Shirley is it Morgan? This could have been people that wrote on the wrong sheet. Greg Zilke. Dane Brooks. Okay. That's my list.

Is there anybody else in the audience wishing to speak on the Biannual Code Change Items Numbers 1 through 11? Seeing none, bring it back to the Planning Commission. Comments or motions?

Return to Planning Commission

GRIMWADE: Do you want to give the person from the natural resource area --

COOK: We can't hear you.

GRIMWADE: Do you want to give the person from the natural resource section the opportunity to comment on that statement on the buffers.

JOHNSON: Jan, is that person here?

BAZALA: I'll have Brent comment on that.

DAVIS: Good evening. I'm Brent Davis, I'm the Wetland and Habitat Review Manager in Community Development.

A couple of things. It is true with the proposed buffer revisions that in some cases buffers will get larger. What Ecology essentially did was they revised the rating form that we use to determine the level of protection that a wetland gets in terms of how important it is, how hard it is to replace and how big the buffers that are needed to protect the functions of those wetlands.

And after using that revised form statewide or, well, it's Western Washington, on the western side of Washington for three years, they looked at the data and realized that the new form had

really kind of skewed the wetland buffers that are based on the habitat scores.

And essentially the science suggests that when you have habitat functions in a wetland, that the buffers need to be larger to protect those functions and to protect all the needs of the species who rely on those wetlands and that's why the buffers get bigger with higher habitat scores, the habitat score represents the level of importance of the habitat functions in that wetland.

And so what they found was compared to how the prior rating system was working, their threshold for what they considered low habitat function was set too low with the new rating system.

So the rating form scores wetlands between 3 and 9 points and they set the threshold for low habitat at 4 points, and what they found was to be consistent with how the buffers were applied under the old rating system in terms of the distribution of wetlands on the landscape that they could lower that low habitat function to 5 points.

In doing so, the other thing that they decided to do was they limited the number of options that they recommend to local jurisdictions in adopting their wetland regulations with regard to how you scale the buffers related to those habitat scores.

They used to have an option where you could essentially create a linear line so that each point incrementally increased the buffer between the low end and the high end, and in the current guidelines that they issued in the summer, that option turned into more of a sigmoidal curve so that you very quickly got to bigger buffers.

So as you went from 5 points to 6 points to 7 points to 8 points, instead of doing that in linear increments, essentially shot up very quickly, and then at 8 and 9 points was as high as it is for the option that we're proposing which is essentially use three steps, low, moderate and high.

And so when I initially reviewed this, I sent it out to a number of the consultants that work in the County for private clients and got their feedback on which option they thought might work best as well as whether or not they thought it was even worthwhile to do this now.

Because we are not required to do this update right now, but we will be required to consider these recommendations when we do our next critical areas ordinance update which is currently scheduled to begin in 2020 or 2021, to be in advance of the comp plan update.

And so the thinking was that since there's a pretty substantial benefit for wetlands that score 5 points for habitat relative to some of the increases in some of the other areas, and there are other circumstances where it decreases as well, the consensus was that it was a good idea to go ahead and move forward with it and we presented the same information to the DEAB and they

agreed as well.

I did an analysis with two-years worth of rating data from the current rating system, we adopted it a year after Ecology made it available. So we've only been using it for, well, we're getting close to three years now, but I had two years of data from applications that we have reviewed.

In that time, about 220 wetlands, and I looked at the distribution of the different habitat scores and the different ratings and how these changes in the buffers would affect those wetlands, and I concluded that the two highest cases, most frequent cases are habitat scores of 5 and 6 points. That represents about 40 percent of the wetlands, about a little, a few more of the 6 points versus the 5 points countywide.

And the distribution in the urban and rural area, the data that I had, was pretty, pretty consistent, there wasn't really a difference between the urban and the rural area. And when you applied the actual magnitude of the changes up and down across that distribution, it's a net decrease over all.

So it's about four percent from current, the current standards over all, though in some cases there will be some increases. I will also point out that the reaching habitat scores of 8 and 9 points is very infrequent, like two to three percent of the cases we see.

And in addition to that, we have provisions in our code where the buffer cannot be more than twice the area of the wetland, and that comes into play almost every time we run into these larger buffers unless it's a very large wetland system. And that's actually a provision that Ecology doesn't like in our code and has expressed concern about for future updates. So we may be revisiting that flexibility in the future, but currently it's still there and we do apply it. And we actually we don't wait for applicants to ask for it, we look at it when we assess the buffers.

With regard to the subjectivity of the rating form, there is subjectivity in it. Ecology provides training two or three times a year. We send all of our staff to that training and we consistently, you know, work with consultants who have been through the same training and work.

As we work with the new system longer and longer, we're getting more and more consistent in the overall results. There's always going to be variability in the individual scores and how we get to the end result, but, you know, it is a methodology and there is a rationale to it.

There's a large manual that talks about each of the metrics and how they're to be interpreted and applied, so it isn't entirely subjective. It's not like I pick a number, there is a rationale behind it. And at the end of the day we go to Department of Ecology for a final interpretation if we don't agree with a landowner or a consultant or, you know, if we're not sure we're

interpreting something correctly.

And I think on the last thing there was a comment about how you define a wetland, and I just want to make it clear, there is a distinction between delineating a wetland and the definition of what a wetland is and how it's rated to determine how important it is for protection, and we are not proposing any changes to how a wetland is defined.

GRIMWADE: Thanks very much for that. I think you've actually done a really good job in putting this together and I think probably, if anything, I'd say you're a little conservative on your buffers and in some cases they probably will need to be increased.

WRIGHT: Was the citizen accurate in stating that buffers are optional and are just merely a recommendation from Ecology?

DAVIS: It's not a cut and dried answer. Growth Management Act requires us to use best available science in developing our critical areas ordinances. When I say use, what I mean is we're supposed to consider it and we're supposed to show our work when we do our analysis.

So if we are not going to follow recommendations of best available science, we need to explain why and, you know, that explanation basically, you know, needs to hold water. And part of the regulation from the State is states that in terms of defining best available science, that the Department of Commerce will provide a list of documents that have been provided by various state agencies. And while it may not have been the intent of the statute, that essentially sets the bar for local governments of what best available science is.

And part of that list is Ecology's wetlands in Washington State documentation, it's two volumes about this thick each. One is a summary of the science. They did an exhaustive nationwide search for documentation and did a white paper level synthesis of all kinds of things related to wetlands, including buffers, and then the second volume is basically how to interpret that science into a policy and regulation.

And so part of that is a model ordinance which we're not required to use. And our ordinance has many significant differences from that model ordinance, and then also specific recommendations for certain standards like wetland mitigation ratios, like wetland buffers.

We could vary from those standards, but we would have to have the scientific support to do that and that comes with a lot of risk. If we had the funds to do that research, we may come to a conclusion that is similar to Ecology's, we may come to a conclusion that the buffers need to be bigger, we may come to a conclusion that maybe we could have smaller buffers, we wouldn't know until we did the science.

And regardless, there would also be an increased risk on any decision based on that alternative

science of litigation on both sides of the issue because it, you know, it's just a lot harder to challenge something that Ecology has put out and is being used statewide, you know. When we try to do something a little different, it's the burden is on us to really justify what we're doing. So I guess that's a complicated answer, but...

WRIGHT: No. Thank you. That was a good answer.

JOHNSON: Any other questions for staff? Okay. So I'd like to kind of break this up if we may, and if you have a better idea, gentlemen, let me know, but I'd like to take the Scrivener's Errors first, Number 1 and 2. Is there any problems with that, do it that way? Just break up each section so then we come down. Okay. So I'll take a motion on the Scrivener's Errors, Numbers 1 and 2.

WRIGHT: So **MOVED** .

SWINDELL: I'll **second** it.

JOHNSON: Okay. We have a motion and a second to accept staff recommendations of the Biannual Code Changes to the Scrivener's Errors, Number 1 and 2. Can I have a roll call, please.

SWINDELL: AYE
GRIMWADE: AYE
BENDER: AYE
JOHNSON: AYE
WRIGHT: AYE

JOHNSON: Moving on to the Fee Updates.

JOHNSON: Yeah. Bill what? So now with Bill included we will move on to the Fee Updates, Items 3 and 4. I will take a motion on those.

BENDER: Make a **MOTION** that the Fee Updates be accepted.

SWINDELL: I'll **second** it.

JOHNSON: There's a motion and second for the Fee Updates, Numbers 3 and 4 of the Biannual Code Change items. Roll call, please.

ROLL CALL VOTE

WRIGHT: AYE
SWINDELL: AYE
GRIMWADE: AYE
BENDER: AYE
JOHNSON: AYE

JOHNSON: Moving on, 5 and 6 of the Biannual Code Changes, Clarifications. Motion, please.

BENDER: 5, 6 and 7.

JOHNSON: Excuse me. 5, 6 and 7. Thank you.

GRIMWADE: I'll **MOVE** staff recommendation be accepted.

SWINDELL: I'll **second** it.

JOHNSON: There's been a motion and seconded on staff's recommendations on Biannual Code Changes on Clarifications Number 5, 6 and 7. Roll call, please.

ROLL CALL VOTE

WRIGHT: AYE
SWINDELL: AYE
GRIMWADE: AYE
BENDER: AYE
JOHNSON: AYE

JOHNSON: Finally, we'll take the Minor Policy Changes, staff recommendations of the Biannual Code Changes Numbers 8, 9, 10 and 11.

GRIMWADE: I **MOVE** that staff recommendations on those be accepted.

WRIGHT: **Second** it.

JOHNSON: We have a motion and a seconded on staff's recommendations to Biannual Code Change items, the Minor Policy Changes Number 8, 9, 10 and 11. Roll call, please.

ROLL CALL VOTE

WRIGHT: AYE
SWINDELL: AYE
GRIMWADE: AYE
BENDER: AYE
JOHNSON: AYE

JOHNSON: Okay. I believe that was all we had; correct?

BAZALA: Correct.

OLD BUSINESS

None.

NEW BUSINESS

None.

COMMENTS FROM MEMBERS OF THE PLANNING COMMISSION

None.

ADJOURNMENT

The record of tonight's hearing, as well as the supporting documents and presentations can be viewed on the Clark County Web Page at:
https://www.clark.wa.gov/community-planning/planning-commission-hearings-and-meeting-notes

Proceedings can be viewed on CVTV on the following web page link:
http://www.cvtv.org/

Minutes Transcribed by:
Cindy Holley, Court Reporter/Rider & Associates, Inc.
Sonja Wiser, Program Assistant, Clark County Community Planning