Walla Walla County

Critical Areas Ordinance

Best Available Science Review

FINAL DRAFT

August, 2008

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Revision History

Version	Primary Author(s)	Description of Version/Reason for Change	Date completed
Initial draft V1.0	HDR Staff	First cut document structure	04/23/08
V2.0	HDR Staff	Incorporated County comments; Updated per field work; Added additional best available science	05/21/08
V3.0	HDR Staff	Incorporated Technical Advisory Committee and County comments.	08/01/08

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Acronyms

ASR	Aquifer Storage and Recovery
BAS	Best Available Science
BFE	Base Flood Elevation
bgs	Below Ground Surface
BMP	Best Management Practice
CAO	Critical Areas Ordinance
CARA	Critical Aquifer Recharge Area
CRB	Columbia River Basalt
CREP	Conservation Reserve Enhancement Program
cfs	Cubic Feet per Second
CMZ	Channel Migration Zone
CTED	Washington State Department of Community, Trade and Economic Development
CTUIR	Confederated Tribes of the Umatilla Indian Reservation
DNR	Washington Department of Natural Resources
DPS	Distinct Population Segment
Ecology	Washington State Department of Ecology
EDT	Ecosystem Diagnosis and Treatment
ELI	Environmental Law Institute
EPA	Environmental Protection Agency
ESA	Endangered Species Act
ESU	Evolutionarily Significant Unit
FEMA	Federal Emergency Management Agency
FEMAT	Forest Ecosystem Management Assessment Team
FIRM	Flood Insurance Rate Maps
FSA	Farm Services Agency
ft	Feet
FWHCA	Fish and Wildlife Habitat Conservation Areas
GMA	Growth Management Act
HGM	Hydrogeomorphic Classification System
HMP	Hazard Mitigation Plan
HPA	Hydraulic Project Approval
LID	Low Impact Development
LWD	Large Woody Debris

MSA	Major Spawning Aggregations
MSL	Mean Sea Level
NFIP	National Flood Insurance Program
NOAA	National Oceanic and Atmospheric Administration Fisheries Service
NRCS	Natural Resources Conservation Service
NWI	National Wetlands Inventory
OWL	Olymipic-Wallowa Lineament
PHBA	Peak Horizontal Bedrock Accelerations
PHS	Priority Habitats and Species
RCW	Revised Code of Washington
RM	River Mile
SEPA	State Environmental Policy Act
SMA	Shoreline Management Act
SOI	Species of Interest
SPTH	Site Potential Tree Height
TMDL	Total Maximum Daily Load
UGA	Urban Growth Area
USACE	United States Army Corps of Engineers
USDA	U.S. Department of Agriculture
USFS	United States Forest Service
USFWS	U.S. Fish and Wildlife Service
USGS	United States Geological Survey
WAC	Washington Administrative Code
WDFW	Washington Department of Fish and Wildlife
WDOH	Washington State Department of Health
WRIA	Water Resource Inventory Area
WSDOT	Washington State Department of Transportation
WWBWC	Walla Walla Basin Watershed Council

1 Introduction

1.1 Report Background and Purpose

Under the Washington State Growth Management Act (GMA) all counties and cities are required to protect certain natural resources within their boundaries called “critical areas”. In 1995, the Washington State Legislature amended the GMA to require that local governments include Best Available Science (BAS) in designating and protecting critical areas (Revised Code of Washington [RCW] 36.70A.172(1)). Washington Administrative Code 365-196-900 gives the background and purpose of the best available science rule followed by five sections on criteria (Washington Administrative Code [WAC] 365-195-905 to 925). These criteria guide local governments on how to recognize and locate sources of valid scientific information and use that information in their decision making process. In addition, in 2000 the Department of Community Trade and Economic Development (CTED) adopted procedural guidance to implement these changes to the GMA, and provided guidance for identifying BAS (CTED 2004).

In 1995, Walla Walla County passed a Critical Areas Ordinance (CAO) to designate and protect critical areas. This ordinance must be updated by December 1, 2008.

BAS is current scientific information derived from research, monitoring, inventory, survey, modeling, assessment, synthesis, and expert opinion that is:

- Logical and reasonable
- Based on quantitative analysis
- Peer reviewed
- Used in the appropriate context
- Based on accepted methods
- Well referenced

This document summarizes the BAS for the Walla Walla County critical areas as part of the administrative record and provides recommendations for policies and CAO requirements.

As directed by RCW 36.70A.050, this document addresses the following critical areas:

- Geologically hazardous areas
- Frequently flooded areas
- Critical aquifer recharge areas
- Wetlands (both freshwater and estuarine)

- Fish and wildlife habitat conservation areas including habitat requirements and management needs for anadramous fish

The information contained in this document is a summary of scientific studies related to designating and protecting critical areas, including habitat for anadramous fish species, as defined by the GMA. The information is intended to provide a BAS information set as a basis for development of Walla Walla County's CAO. It is not intended to provide an exhaustive summary of all science available for all critical areas. Information for this review was selected, to the extent possible, on its relevance to the natural conditions found in Walla Walla County. It should be understood that it is possible that applicable and relevant work was overlooked because of the immense volume of available information. An exhaustive review and incorporation of all relevant and applicable scientific information is beyond the scope of this project.

This report contains BAS findings for each of the critical areas for Walla Walla County to consider within the CAO development process. In many cases, the information presented for one critical area may overlap, complement, or be applicable to another critical area because these areas function as integrated components of the ecosystem. The chapters also summarize the GMA requirements for protection of these areas.

In developing the CAO, the County has to ensure that:

- Critical areas are not exempted or excluded from designation

- All designated areas are protected using specific criteria and standards

- The values and functions of critical areas are protected, that "no net loss" of these values and functions occurs, and that adverse impacts are prevented or mitigated

In some cases the GMA is very specific about the type of protection that is required for a critical area. In others, the County will have options to choose from. Local governments must balance critical areas protection with other public values, such as preserving public health and safety, economic development, and protecting environmentally sensitive areas.

While local governments can adopt CAOs that may result in localized impacts on some critical areas or even the loss of some critical areas, there must be no net loss of the structure, value, and functions of the natural systems. A county or city must provide a detailed and reasoned justification based on best available science for any designated critical area.

The County is required to integrate critical areas protection into all of its permitting and regulation activities, including: zoning regulations, clearing and grading provisions, stormwater management requirements, subdivision regulations and other applicable regulations, plans and policies.

1.2 County Setting

Walla Walla County is located in southeastern Washington State and is approximately 1,270 square miles (U.S. Census 2008). The County, most of which is located in the Walla Walla River Basin, is home to 58,300 residents (OFM 2007). The County is bordered by the Columbia River, which forms the entire western boundary of the County; the Snake River, which forms the entire northern boundary of the County; the Washington-Oregon state border, which forms the southern boundary of the County; and by Columbia County, which borders the County to the east. The topography of the County varies widely, ranging from 350 feet in the low river valleys to 6,000 feet in the Blue Mountains (Stalzer and Associates, et al. 2007).

1.3 References

CTED (Washington State Department of Community Trade and Economic Development). 2004. Review Guidelines for use of Best Available Science in Critical Areas Ordinances.

OFM (Washington State Office of Financial Management). 2007. April 1 Population of Cities, Towns, and Counties Used for Allocation of Selected State Revenues. Office of Financial Management Forecasting Division.

Stalzer and Associates, et al. 2007. Integrated Comprehensive Plan and EIS Volume I: Comprehensive Plan. Walla Walla County Comprehensive Plan Update 2007. December. Prepared for Walla Walla County.

US Census. 2008. State and County Quickfacts: Walla Walla County. Available: http://quickfacts.census.gov/qfd/states/53/53071.html. Accessed on February 12, 2008. Website last revised: January 2, 2008.

Walla Walla County. 2007. Draft Comprehensive Plan Volume I.

2 Fish and Other Aquatic Species

2.1 Section Overview and GMA Requirements

This analysis focuses on fish and other aquatic species and their habitats on non-federal lands in Walla Walla County, with special emphasis on anadromous salmonids. State Growth Management Act (GMA) guidelines (Ousley et al. 2003) suggest the following habitat types should be designated as fish and wildlife habitat conservation areas (FWHCAs) in accordance with the GMA procedural criteria for adopting development regulations[1] (WAC 365-190):

- Areas where state or federally listed species (endangered, threatened, or sensitive) have a primary association. The U.S. Fish and Wildlife Service (USFWS) and National Oceanic and Atmospheric Administration Fisheries Service (NOAA Fisheries) are responsible for designating federal special status. The Washington Department of Fish and Wildlife (WDFW) is responsible for designating state special status species and maintains the current list of these species (Ousley et al. 2003). These three agencies maintain current lists for protected species.

- State priority habitats and areas associated with state priority species. The Priority Habitats and Species (PHS) database is updated on a regular basis with input from WDFW field biologists and other scientists, and represents the best available science on the distribution of special status wildlife species and habitats in Washington. Priority species are discussed in Section 2.2.2. The PHS habitats identified by WDFW are considered a priority for conservation and management due to their high fish and wildlife species density and/or diversity, important habitat functions, importance to priority species, limited distribution or rarity, vulnerability, or their cultural value (e.g., commercial or recreational) (Ousley et al. 2003; WDFW 2007).

- Habitats and species of local importance. These could include a seasonal range of habitat elements with which a given species has a primary association, and which, if altered, may reduce the likelihood that the species will maintain and reproduce over the long-term. Examples are areas of high relative density or species richness, breeding habitats, winter ranges, movement corridors, and habitats that are of limited availability or high vulnerability to alteration, such as riparian areas, wetlands, and shorelines. Local jurisdictions may designate habitats and species of local importance because of their value to the local environment (Ousley et al. 2003). There are no designated habitats or species of local importance for fish and other aquatic organisms in Walla Walla County.

- Naturally occurring ponds under 20 acres. Naturally occurring ponds and ponds created for wetland/critical areas mitigation may provide fish and wildlife habitat and other wetland functions. These ponds do not include other manmade ponds such as farm ponds and detention ponds (Ousley et al. 2003). These ponds classify as wetlands will be addressed by wetland buffers (Section 4). Lake Wallula is a 52,000 acre reservoir created by the impoundment of water behind McNary Dam. It is classified as a shoreline of the state under WAC 173-20-300.

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[1] Habitat types not found in Walla Walla County are not included in this discussion.

- Waters of the State. Waters of the state include surface waters and watercourses within state jurisdiction as defined in WAC 222-16-030 or WAC 222-16-031 (Ousley et al. 2003). Waters of the state within Walla Walla County include the Columbia and Snake Rivers and their tributaries, including the Walla Walla River. Major tributaries of the Walla Walla River in the County include the Touchet River, Dry Creek, and Mill Creek.

- Lakes, ponds, streams, and rivers planted with game fish[2] by a government or tribal entity.

- State natural area preserves and natural resource conservation areas. Natural area preserves and natural resource conservation areas, owned and administered by the Washington State Department of Natural Resources (DNR), represent unique or high quality undisturbed ecosystems and habitats (DNR 2004). There are no natural area preserves or natural resource conservation areas in Walla Walla County.

- Land essential for preserving connections between habitat blocks and open space. Maintaining habitat connectivity for fish and wildlife species is necessary to sustain population viability. Habitat connectivity enables individuals to move between habitat patches in obtaining requisite resources, the dispersal of individuals, and genetic exchange between populations. Isolated populations are at greater risk of extinction due to natural population fluctuations, random events, and inbreeding (Morrison et al. 1998; Lemkuhl et al. 2001).

2.2 Inventory of Species in Walla Walla County

The aquatic habitats of Walla Walla County support a number of species (Figure 2.2-1). The principal aquatic priority habitats on non-federal lands in the County are found along the Columbia and Snake Rivers, and within the waterbodies of the Walla Walla basin including the Walla Walla River and its major tributaries. Further discussion of the Walla Walla County FWHCAs with respect to fish species and aquatic habitat is provided in this section.

Table 2.2-1 presents the aquatic species focused on in this document. The species considered include federally listed species, priority species, and focal and/or species of interest as identified in the Walla Walla Subbasin Plan (NPCC 2004). Information presented in the table has been reviewed and updated based on information obtained from WDFW biologists during review of this BAS document. Further discussion of these categories is provided in the following sections.

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[2] Specific analysis and protection recommendations are not provided for game species. Game species protections are assumed to be addressed through protections for habitat function and value for native aquatic species.

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Table 2.2-1
Aquatic Focal Species

Common Name	Scientific Name	Federal Status	Priority anadromous	Priority resident	Species of Interest in Sub Plan	Focal Species in Sub Plan
White sturgeon	*Acipenser transmontanus*	-	x			
American shad	*Alosa sapidissima*	-	x			
Brook lamprey	*Lampetra richardsoni*	-				
Pacific lamprey	*Lampetra tridentata*	-			x	
Smallmouth bass	*Micropterus dolomieu*	-		x		
Largemouth bass	*Micropterus salmoides*	-		x		
Freshwater mussels	*Mollusca unionoida*	-			x	
Pink salmon[1]	*Oncorhynchus gorbuscha*	-	x			
Chum salmon[1]	*Oncorhynchus keta*	See Note[1]	x			
Coho salmon	*Oncorhynchus kisutch*	-	x			
Summer steelhead trout	*Oncorhynchus mykiss*	Threatened[2]	x			x
Redband/Rainbow trout	*Oncorhynchus myskiss*	-		x		x
Sockeye salmon	*Oncorhynchus nerka*	See Note[3]	x			
Kokanee	*Oncorhynchus nerka clarki*	-		x		
Fall Chinook	*Oncorhynchus tshawytscha*	See Note[4]	x			
Spring/Summer Chinook	*Oncorhynchus tshawytscha*	See Note[5]	x			x
Mountain whitefish	*Prosopium williamsoni*	-		x	x	
Bull trout	*Salvelinus confluentus*	Threatened[6]		x		x
Walleye	*Sander vitreus vitreus*	-		x		
Margined sculpin	*Cottus marginatus*	Species of concern		x		

[1] Pink salmon and chum are only occasionally present in the Columbia and Snake rivers within Walla Walla County. Chum that may be present are far upstream of federally-threatened Columbia River ESU

[2] Snake River DPS of steelhead is threatened

[3] Snake River ESU of sockeye are endangered

[4] Snake River Fall Chinook are threatened

[5] Upper Columbia River spring/summer Chinook are endangered; Snake River spring/summer Chinook are threatened

[6] Columbia River DPS is threatened

Note: Brown trout are no longer a priority resident species in the Walla Walla Basin as WDFW has discontinued stocking in hopes of reducing competition and predation on ESA listed stocks in the basin (K. Divens, WDFW, pers comm.)

2.2.1 Federally Listed Species

Walla Walla County supports habitat for several listed salmonid species, though only two federally listed aquatic species are present in the Walla Walla basin: bull trout (*Salvelinus confluentus*) and summer steelhead (*Oncorhynchus mykiss*). Bull trout in the

Walla Walla River basin are included in the Columbia/Klamath River Distinct Population Segment (DPS), which was listed as threatened under the Endangered Species Act (ESA) in 1998. Walla Walla County summer steelhead are part of the Middle Columbia River DPS, which was originally listed as threatened under the ESA on March 15, 1999, with the threatened status reaffirmed in 2006. This DPS includes all naturally spawned steelhead populations upstream from the Wind River, Washington, to and including the Yakima River, Washington (NMFS 2007). Critical habitat for the DPS includes the Columbia and Snake rivers, and the mid-to upper Walla Walla River mainstem and most tributaries in the Walla Walla subbasin.

Portions of the Snake River within the County contain habitat for the Snake River Basin DPS of steelhead (threatened), as well as the the Snake River fall Chinook (threatened) Evolutionarily Significant Unit (ESU). Several federally-listed endangered species migrate through the Snake and Columbia Rivers on their way to spawning grounds including Snake River sockeye, Upper Columbia River Spring Chinook, and Upper Columbia Steelhead. WDFW PHS data indicates that chum salmon occasionally occur in the Columbia and Snake River; however, those individuals are not likely part of the federally-threatened ESU of Columbia River chum as they are far upstream of the ESU boundary.

2.2.2 State-Listed/Priority Species

State-listed/priority species require protective measures for their perpetuation due to their population status, sensitivity to habitat alteration, and/or recreational, commercial, or tribal importance. Priority species include state endangered, threatened, sensitive, and candidate species; animal aggregations considered vulnerable; and those species of recreational, commercial, or tribal importance that are vulnerable.

Table 2.2-1 lists the priority species that are found within Walla Walla County, according to WDFW[3] (2007). Priority species are subdivided into priority anadromous and priority resident. Salmon, which constitute a majority of the priority anadromous species, are also associated with other types of priority habitats and species, particularly in relation to riparian areas. As such, the protection of salmonid habitats serves to protect other species dependent on similar or associated habitats. More detailed information regarding the presence and distribution of fish species in the County is presented later in this document.

2.2.3 Walla Walla Subbasin Plan Focal Species

The Walla Walla Subbasin Plan (NPCC 2004) identified three aquatic focal species on which emphasis was placed to facilitate management of habitats in the subbasin (Table 2.2-1). The three species include:

- Steelhead/rainbow trout
- Spring Chinook
- Bull trout

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[3] WDFW is in the process of updating the priority species database. It is recommended that the County update their PHS data annually.

The subbasin planning parties (Walla Walla County, Walla Walla Basin Watershed Council [WWBWC], WDFW, Confederated Tribes of the Umatilla Indian Reservation [CTUIR], the Water Resource Inventory Area [WRIA] 32 Planning Unit, private citizens, and other agencies and entities) selected these species based on the following considerations:

- These species' life histories are representative of the Walla Walla Subbasin ecosystem and therefore, habitat conditions that are appropriate for these three species will also provide conditions that allow for the prosperity of other aquatic life
- ESA status of the species
- Cultural importance of the species
- Level of information available/knowledge on each species' life history to conduct an effective assessment
- Interest by co-managers to reintroduce spring Chinook into the subbasin

2.2.4 Species Discussed in Recovery Planning Documents

Recent planning documents were reviewed during the development of this document to refine species distribution and status for various listed salmonid stocks, including those in Walla Walla County. Plans reviewed included the following:

- Snake River Salmon Recovery Plan for SE Washington (Snake River Salmon Recovery Board 2006)
- Recovery Plan for Oregon's Middle Columbia River Steelhead (Carmichael 2006)
- Bull Trout (*Salvelinus confluentus*) Draft Recovery Plan (USFWS 2002)

These plans present a draft recovery framework for various listed salmon and trout and update information presented in the Walla Walla Subbasin Plan (NPCC 2004).

2.2.5 Walla Walla Subbasin Plan Focal Species of Interest

Along with mountain whitefish; Pacific lamprey (*Lampetra tridentate*), brook lamprey (*Lampetra richardsoni*), and freshwater mussels (*Mollusca unionoida*), are presented in the Walla Walla Subbasin Plan as "species of interest" (SOI). Each SOI was included in the plan in consideration of the potential ecological and/or cultural significance that the species may provide. Because there is not yet enough known regarding the value of ecological significance provided by each species, they are not currently considered focal with regard to Subbasin planning efforts and subsequent habitat protection. However, with planned research aimed at determining their specific life histories and conditions that may be limiting their productivity, they may become focal species in the future. Since these species have been suggested as SOI by various resource managers including WDFW and the CTUIR, protection of their habitat may become a priority in the near future.

2.2.6 Other Species – Game Fish

The WDFW (2007) has identified several game fish that occur in Walla Walla County including smallmouth bass (*Micropterus dolomieu*), largemouth bass (*Micropterus salmoides*), brown trout (*Salmo trutta*), and walleye (*Sander vitreus vitreus*). Walleye and bass both occur in the Columbia and Snake rivers. Bass and brown trout are documented in the Walla Walla and Touchet Rivers.

2.3 Distribution of Salmonids in Walla Walla County

Salmonid distribution data were obtained from multiple sources including the 2008 StreamNet database (http://www.streamnet.org/), the Snake River Salmon Recovery Plan for SE Washington (Snake River Salmon Recovery Board 2006), Mahoney et al. (2008), Mendel et al. (2007), and the Walla Walla Subbasin Summary (Saul et al. 2001) and Plan (NPCC 2004). Streamnet delineates specific reaches of suitable habitat believed to be used by the various life stages of specific species, based on the best professional judgement of local fish biologists.

Within the boundaries of Walla Walla County, reaches of the Columbia and Snake rivers support adult and juvenile migratory habitat for spring, summer and fall Chinook, chum, sockeye, coho and summer steelhead. WDFW PHS maps obtained for the County also indicate that pink salmon occasionally occur in the mainstem Columbia and Snake Rivers.

Within the Walla Walla Subbasin, bull trout, summer steelhead and spring Chinook extensively utilize the mainstem river and several of its tributaries. Fall Chinook, chum, coho and sockeye salmon were once reported to be present in the subbasin although the extent of their local populations is unknown. Some species such as fall Chinook, sockeye and chum salmon likely only used the lower portions of the Walla Walla River (Mahoney et al. 2008). Fish species present in the Walla Walla River and tributaries are identified in Table 2.3-1. Mendel et al. (2005) report that rainbow trout/steelhead (*O. mykiss*) are the most common salmonid in the Walla Walla River basin and that their densities in the mainstem reach from the stateline to Mojonnier Road have increased since the USFWS/Irrigation Districts' settlement agreement.

Further detail about the distribution of bull trout, summer steelhead, fall Chinook, and spring Chinook, and other specific species is presented in the following subsections. Table 2.3-2 presents anadromous salmonids and life histories present within Walla Walla County waterways.

Table 2.3-1
Fish Species Present in the Walla Walla River and its Tributaries

Common Name	Scientific Name	Origin[1]	Occurrence[2]	Federal/State Listing[3]
Bull trout	*Salvelinus confluentus*	N	Common	FT; SC
Spring Chinook	*Oncorhynchus tshawytscha*	H	Common	
Fall Chinook	*Oncorhynchus tshawytscha*	H	Rare	
Coho	*Oncorhynchus kisutch*	H	Rare	
Summer steelhead	*Oncorhynchus mykiss*	N	Common	FT, SC
Redband trout	*Oncorhynchus mykiss*	N	Common	
Mountain whitefish	*Prosopium williamsoni*	N	Few/Rare	
Brown trout	*Salmo trutta*	E	Few/Rare	
Lamprey	*Petromyzontidae*	N	Uncommon	
Longnose dace	*Rhinichthys cataractae*	N	Uncommon	
Speckled dace	*Rhinichthys osculus*	N	Abundant	
Umatilla dace	*Rhinichthys Umatilla*	N	Uncommon	SC
Leopard dace	*Rhinichthys falcatus*	N	Uncommon	SC
Chiselmouth	*Acrocheilus alutaceus*	N	Common	
Peamouth	*Mylocheilus caurinus*	N	Few	
Redside shiner	*Richardsonius balteatus*	N	Abundant	
Northern pikeminnow	*Ptychocheilus oregonensis*	N	Common	
Sucker spp.	*Catostomidae*	N	Common	
Bridgelip sucker	*Catostomus columbianus*	N	Common	
Largescale sucker	*Catostomus sp*	N	Common	
Carp	*Cyprinus carpio*	E	Common	
Bullhead catfish	*Ameiurus nebulosus*	E	Rare/ Insufficient data	
Tadpole madtom	*Notorus gyrinus*	E	Rare/ Insufficient data	
Channel catfish	*Ictalurus natalis*	E	Common	
Smallmouth bass	*Micropterus dolomieu*	E	Common	
Largemouth bass	*Micropterus salmoides*	E	Rare	
Pumpkinseed	*Lepomis gibbosus*	E	Rare	
Bluegill	*Lepomis macrochirus*	E	Rare	
White crappie	*Pomoxis annularis*	E	Few	
Black crappie	*Pomoxis nigromaculatus*	E	Few	
Warmouth	*Lepomis gulosus*	E	Insufficient data	
Yellow perch	*Perca flavescens*	E	Rare	
Paiute sculpin	*Cottus beldingi*	N	Common	
Margined sculpin	*Cottus marginatus*	N	Common	F SOC; SS
Torrent sculpin	*Cottus rhotheus*	N	Rare	
3-spine stickleback	*Gasterosteus anculeatus*	E	Rare/ Insufficient data	
Sandroller	*Percopsis transmontana*	N	Insufficient data	

Source: G. Mendel, WDFW, *in* Saul et al. (2001); Contour et al. 2003; Mahoney et al. 2008; Mendel et al. 2005

[1] Origin: N=Native stock, E=exotic, H=Hatchery reintroduction

[2] Occurrence based on average number of fish per 100 meters squared: A=abundant, C=common R=rare, U=uncommon, and I =insufficient data

[3] FT = Federally threatened, F SOC – Federal species of concern; SC = State Candidate; SS = State Sensitive

2.3.1 Bull Trout

The current distribution of bull trout in the waterbodies of Walla Walla County is shown in Figure 2.3-1. Bull trout distribution is generally limited to the mountainous reaches of upper tributaries of the Touchet River, Walla Walla River, and Mill Creek (Mongillo 1993), although they are known to migrate into the middle or lower reaches of these rivers during winter months (Mendel et al. 2005). Although the USFWS (2002) suggests that habitat conditions in the Walla Walla River limit bull trout distribution and abundance, bull trout are common in upper reaches of the Walla Walla River basin (Contor and Sexton 2003). However, their occurrence in the lower reaches of the Walla Walla and Touchet rivers is seasonally low and may be limited by habitat conditions, particularly warm water temperatures and low flow barriers in the summer. As a result, some lower sections of the Walla Walla and Touchet rivers are not designated as bull trout critical habitat.

Within the Walla Walla River Basin, the mainstem Walla Walla River is designated as migratory habitat from just upstream of the confluence with Dry Creek to the County limits (state line), as are the mid to lower reaches of the Mill Creek system. Only the uppermost reaches of Mill Creek are designated as spawning and rearing habitat within the County limits. Recent genetic analyses as presented in Mendel et al. (2007) suggest bull trout from the Walla Walla River, Mill Creek, and the Touchet River are very significantly different. The genetic findings, combined with the geographic isolation of these three groups of bull trout lends strong support for treating them as separate, and generally unrelated, populations.

As illustrated in Figure 2.3-1, the Columbia River mainstem at the mouth of the Walla Walla River, including Lake Wallula, is designated as a migratory corridor for fluvial and/or adfluvial bull trout. According to the figure, bull trout do not currently utilize the majority of the Snake River within the County limits, although it is likely that some individuals may occur in the area periodically. Approximately the upper third of the Snake River within the County limits is designated as migratory habitat for bull trout.

2.3.2 Summer Steelhead

Steelhead are widely distributed and use all stream reaches with suitable, accessible habitat (WDFW 2004; Snake River Salmon Board 2006). In addition to use of the mainstem Walla Walla River, tributary use by steelhead is widespread. Recent radio-telemetry studies indicated that roughly 51 percent of tagged steelhead used the Touchet River; 39 percent used the upper Walla Walla River; 7 percent used Mill Creek, Yellowhawk, and Cottonwood Creeks; while 3% used Dry Creek (Mahoney et al. 2008).

Numerous studies have evaluated steelhead use in the Walla Walla River watershed (Mahoney et al. 2008; Mendel et al. 1999, 2000, 2001, 2002, 2003, 2004, 2005; Mendel et al. 2007). The distribution of summer steelhead in reaches of Walla Walla County is shown in Figure 2.3-2. As illustrated in this figure, the majority of the waterbodies present within Walla Walla County function primarily as summer steelhead migratory corridors. These reaches are used by adults in their upstream migrations to spawning grounds, as well as by steelhead kelts, or repeat spawners that migrate back to the ocean or to large river systems before spawning again. Juvenile steelhead also outmigrate to the ocean via these waterbodies. Within Walla Walla County, a few reaches function as spawning and rearing habitat. These reaches primarily include

Insert Figure 2.3-1 (8.5x11)

Insert Figure 2.3-2 (8.5x11)

portions of the middle and upper reaches of Mill Creek, and the upper-most reaches of Dry Creek and the Touchet River, including Coppei Creek. Spawning, rearing and migration habitat is provided in the upper reaches of the Touchet River and its tributaries (typically upstream of the Coppei confluence), and the middle reaches of Mill Creek (upstream of the flood control channel) into Oregon (Snake River Salmon Recovery Board 2006; K. Divens, WDFW, pers comm.).

Within the Washington portion of the Walla Walla River watershed, Mill Creek (upstream of Bennington Dam above river mile [RM] 16.7), Blue Creek (approximately RM 0 to 1.6), and Dry Creek's tributaries (Mud Creek, North Fork Dry Creek, and South Fork Dry Creek) have the highest densities of age 1+ and older steelhead. The lowest densities occur in the west Little Walla Walla Drainage, which periodically dewaters, in the mainstem Walla Walla between its confluences with Dry and Mill Creeks, and in Mill Creek from Gose Street to Bennington Dam (RM 5.4 to 11.4) (WDFW 2004 as cited in Snake River Salmon Recovery Board 2006).

Generally, steelhead do not use the lower portion of the Touchet River (approximately RM 0 to RM 51) during summer because of reduced flows, elevated water temperatures, and excessive sedimentation (Snake River Salmon Recovery Board 2006). During non-summer months, juveniles are occasionally found downstream of the Coppei Creek confluence (RM 50.8); however, this portion of the river appears to be used primarily as a migration corridor (WDFW 2004 as cited in Snake River Salmon Recovery Board 2006).

Genetic analysis has revealed that there are two independent steelhead populations within the Walla Walla Subbasin – the Walla Walla population, including all tributaries except the Touchet River, and the Touchet River population. The Snake River Salmon Recovery Plan (Snake River Salmon Board 2006) identifies four major spawning aggregations (MSA) in the Walla Walla and Touchet river populations:

1. Mainstem Walla Walla excluding Mill Creek and Touchet River watersheds (Walla Walla population)

2. Mill Creek and all tributaries from mouth to headwaters (Walla Walla population)

3. Middle Mainstem Touchet River and all tributaries from Coppei Creek to Patit Creek confluence exclusive of Patit Creek (Touchet population)

4. Upper Touchet and all tributaries upstream of Patit Creek confluence (Touchet population)

Within the Walla Walla population, the Recovery Plan for Oregon's Middle Columbia River Steelhead (Carmichael 2006) identifies five historic major spawning areas within the state of Washington including Mill, Pine, Dry, and Cottonwood Creeks. The Walla Walla River was identified as a major spawning area in the state of Oregon. Historic minor spawning areas for the Walla Walla population in the County include Woodward Canyon and Spring Valley Creeks.

Currently, summer steelhead are believed to be the only naturally occurring anadromous fish species still present in the Walla Walla River basin (Saul et al. 2001), which includes the Walla Walla River and all its tributaries (of which the Touchet River, Dry Creek, and

Mill Creek are the three largest). Carmichael (2006) reports that the Interior Columbia Technical Recovery Team classified the Walla Walla River and Touchet populations as “Intermediate” in size. An intermediate population has a mean minimum abundance threshold of 1,000 natural spawners with a sufficient productivity to achieve a 5 percent or less risk of extinction over a 100-year timeframe. Populations of steelhead in the Washington portion of the Walla Walla River Watershed (including Mill Creek) were considered depressed in 1992 and unknown in 2002, and populations in the Touchet River Watershed were considered depressed in both 1992 and 2002 (WDF and WDW 1993, WDFW 2002; Mendel et al. 2007).

2.3.3 Fall Chinook

Spawning and rearing habitat for fall Chinook has been identified in the upper reaches of the Snake River within the County limits (Streamnet 2008). Mahoney et al. (2008) report that fall Chinook likely only use the lower portions of the Walla Walla River. Small numbers of fall Chinook salmon have been observed spawning the lower Walla Walla River and lower Mill Creek for several years. These occurrences are documented by WDFW and the CTUIR has trapped fall Chinook in the Walla Walla River watershed in the past five years (K. Divens, WDFW, pers comm.,)

It is possible that a persistent population of fall Chinook or a recolonization of an adjacent population of fall Chinook is present in the Walla Walla subbasin (Bambrick 2003).

2.3.4 Spring Chinook

The current distribution of spring Chinook salmon in the waterbodies of Walla Walla County is shown in Figure 2.3-3. As shown in the figure, the Columbia and Snake rivers function as migratory corridors for spring/summer Chinook. Naturally-occurring spring Chinook salmon have not been present in the Walla Walla Basin since the early 1920s although some adults were recorded in steelhead creel surveys as late as 1955 (NPCC 2004).

Prior to the mid-1990s, spring Chinook occurrence in the Walla Walla River watershed was low. However, recent surveys (Mahoney et al. 2008; Mendel et al. 2005. 2007) have identified spawning spring Chinook in the upper Walla Walla mainstem and South Fork Walla Walla River. Although these spawning areas are primarily outside of the Walla Walla County limits, spring Chinook were also reported to spawn within an 11.0 river kilometer reach of Mill Creek (Mahoney et al. 2008), portions of which may be within County limits. In late July 2004, over 300 adults (likely from the hatchery outplants in 2000) were observed in the upper Walla Walla and Mill Creek. These findings illustrate that the lower mainstem of the Walla Walla River, as well as portions of the Mill Creek drainage, serve as migratory corridors for spawning adults and outmigration corridors for their progeny. Spring/summer Chinook adults have also been observed in the Touchet River since 1997. Mendel et al. (2006) report that although timing, distribution, relative abundance and frequency of returns to the Touchet River Watershed have not been documented, observed fish are generally unmarked and presumably from out-of-basin. Due to the current use of the Walla Walla mainstem and tributaries by spring Chinook, the WDFW now considers the stock common in the basin (K. Divens, WDFW, pers comm.).

Insert Figure 2.3-3 (8.5x11)

Reintroduction efforts by the CTUIR, and use of the basin by fish of unknown origin (possibly hatchery strays) have likely contributed to the return of spring Chinook salmon to the Walla Walla Basin. Prior to 2004, most spring Chinook returning to the basin were likely strays from the neighboring Umatilla and Tucannon subbasins (Mahoney et al. 2008; Mendel et al. 2007). The CTUIR have released spring Chinook into the basin in efforts to reintroduce the species; those found outside the Touchet River watershed are likely directly related to those releases.

2.3.5 Other Species

Whitefish

According to Mendel et al. (2007) whitefish (*Prosopium williamsoni*) are not very common or well distributed in the subbasin as they were found in only 5 percent of sites sampled in the Touchet River Watershed, and 3.6 percent of the sites sampled in the lower Walla Walla River Watershed during WDFW studies conducted from 2006 to 2007. When whitefish are observed, they are generally in clusters of adults in pools, though occasionaly, isolated juveniles are scattered throughout the subbasin (Mendel et al. 2002). As reported by Kuttel (2001), the species appears to have low population levels, limited distribution, and low reproduction in the Washington portion of the Walla Walla watershed.

Mahoney et al. (2008) report that mountain whitefish persist in the upper Walla Walla and Touchet river drainages in uncertain populations. During surveys conducted in the Touchet River Watershed during 2006 to 2007 (Mendel et al. 2007), whitefish were noted primarily in areas outside the County limits including the lower North Fork Touchet and the lower Wolf Fork. However, individuals were noted at the County’s periphery in the mainstem Touchet River upstream of Whetstone Creek (below Waitsburg). Although previous studies conducted by Mendel et al. (1999 to 2005) indicate that whitefish have been observed in the Touchet River mainstem downstream of the confluence with Coppei Creek, no whitefish were detected downstream of Whetstone Creek in the mainstem Touchet River during 2006 to 2007 sampling periods (Mendel et al. 2007). In the mainstem Walla Walla River, whitefish were found in less than 8 percent of sites sampled in 2006 to 2007, with all locations upstream of Mill Creek. Whitefish have been observed in Big Spring Branch and the East Little Walla Walla River in low abundance. No whitefish were collected or observed in any other tributaries of the Walla Walla River or in lower stream reaches of Mill Creek during the 2006 to 2007 sampling period (Mendel et al. 2007).

Margined Sculpin

The margined sculpin is listed as a “sensitive” species by the State of Washington. Margined sculpin have been relatively common in the mainstem Touchet River near Waitsburg, in Coppei Creek, Wolf Creek, the North Fork of the Touchet and Robinson Fork (Mendel et al. 1999).

Lamprey

Pacific and western brook lamprey were both abundant in the Walla Walla River Subbasin historically (Saul et al. 2001, Swindell 1940). The USFWS currently recognizes Pacific lamprey as a Category 2 candidate species for listing under the ESA. The current distribution and abundance of Pacific lamprey is considered severely depressed (Saul et al. 2001), although information is incomplete. Populations of western brook lamprey appear to be maintaining, while Pacific lamprey are believed to be at or very near extinction. Mendel et al. (2007) collected lamprey during electrofish sampling in Yellowhawk Creek in 2006. During fish management sampling conducted in the Touchet and Walla Walla river watersheds from 1998 to 2006, a total of 23 sites contained lamprey in the mainstem Touchet River downstream of Coppei Creek, and relatively low numbers of lamprey were collected from sites in the mainstem Walla Walla River from Dry Creek to the state line. No sites with lamprey collections were reported in the mainstem Walla Walla River downstream of Dry Creek. Relatively low numbers of lamprey were also recorded from sites in Yellowhawk, Garrison, Russel, and Big Spring Ranch Creeks, and the East Little Walla Walla River. Moderate numbers of lamprey were collected in the Mill Creek system, with the highest percentage occurring in the reach between Gose Street and Blue Creek (Mendel et al. 2007).

Freshwater Mussels

Freshwater mussels are valuable components of salmonid ecosystems and are culturally important to Native Americans. Salmon serve as the host to juvenile mussels, who parasitize (non-lethally) individual fish for a period of 3 weeks to 4 months before dropping off the fish and maturing into adulthood. It is believed that the parasite-host relationship is species-specific in that only certain fish species can serve as hosts for a particular freshwater mussel species (O'Brien and Brim Box 1999). Because of this relationship, freshwater mussels are a useful indicator species for assessing the health of freshwater environments.

Little is known about the distribution of freshwater mussels according to information in the Walla Walla Subbasin (NPCC 2004). Brim Box et al. (2006) report that several CTUIR elders recall gathering mollusks at the mouth of the Walla Walla River, commenting that mussels were plentiful in all tributaries in the region. Although discussions with David Wolf, CTUIR biologist, indicate that no formal inventories for freshwater mussels have been conducted in the Walla Walla River watershed by the CTUIR, Mr. Wolf has conducted a few informal surveys in the watershed. He reported that individuals of the genus *Margaritifera* were observed during surveys conducted along private parcels in reaches of the mainstem Walla Walla River near Mojonnier Road. Additionally, pockets of *Margaritifera* have been found in the Little Walla Walla River, and members of the genus *Anodonta* have been collected near the mouth of the Walla Walla River (D. Wolf, CTUIR, pers comm.). According to Mr. Wolf, the CTUIR is planning to conduct surveys in the Walla Walla River watershed in the future, but until then, without inventory data, it is difficult to speculate on population status.

Other Aquatic Species

WDFW PHS data for the County indicate that the Wallula Lake (pool) of the Columbia River contains white sturgeon (*Acipenser transmontanus*), walleye (*Sander vitreus vitreus*), and American shad (*Alosa sapidissima*). These species are also found in the Snake River (K. Divens, WDFW, pers comm.). Other salmonids, including sockeye and summer Chinook occur in the Snake and Columbia River mainstems as migrants within the County limits.

Table 2.3-2
Anadromous Salmonids Present Within Walla Walla County Waterways & Their Life Histories Stages Present

	Spring Chinook			Fall Chinook			Summer Chinook			Bull Trout			Summer Steelhead Trout			Coho			Sockeye Salmon	Chum Salmon	Pink Salmon
	Migration	Spawning	Rearing	Migration	Spawning	Rearing	Migration	Spawning	Rearing	Migration	Spawning	Rearing	Migration	Spawning	Rearing	Migration	Spawning	Rearing	Migration	Migration	Migration
Columbia River	x			x			x			x			x			x			x	x	x
Snake River	x			x	x	x	x			x			x						x		
Walla Walla River	x	x	x	x	x	x				x	x	x	x	x	x		x[2]	x[2]			
Dry Creek													x	x	x						
Mill Creek	x	x	x							x	x	x	x	x	x						
East Little WW			x									x	x		x						
Pine Creek													x		x						
Touchet River	x	x[1]	x							x	x	x	x	x	x		x[2]	x[2]			
Coppei Creek													x	x	x						

[1] Spawning may oncly occur upstream of the Walla Walla County line in the Touchet River

[2] Information from K. Divens, WDFW, pers comm

2.4 Inventory of Aquatic Habitats in Walla Walla County

The three main water bodies in Walla Walla County are the Walla Walla, Columbia, and Snake Rivers. This section describes these three habitats, their existing conditions, functions and values, limiting factors, and recommended methods to address limiting factors through the designation of priority restoration and protection areas.

2.4.1 Existing Conditions and Limiting Factors in Walla Walla County

Walla Walla Subbasin

Riparian Habitat in the Walla Walla Subbasin
Historically, extensive riparian zones existed along rivers and streams in the Walla Walla River basin (U. S. Army Corps of Engineers 1997); however, riparian areas have diminished due to development. Estimates currently define only about 37 percent of the Touchet River as containing riparian vegetation (NPCC 2004). Riparian areas are a significant habitat resource within the County for several reasons. First, riparian zones within the arid west are home to approximately 85 percent of wildlife species in the area (Knutson and Naef 1997), and within an agricultural landscape they provide connecting habitat or wildlife corridors. Because riparian habitats within the County are dominated by fast-growing deciduous species of plants like willows and cottonwood trees, these areas are important to the contribution of LWD and for providing temperature attenuation through shading. The WDFW (2007) maps riparian habitat along several tributaries and distributaries to the mainstem Walla Walla River, including Pine Creek, Little Mud Creek, Mud District Number 7 Canal, Walsh Creek, lower portions of the Little Walla Walla River, and several unnamed drainages.

Ecosystem Diagnosis and Treatment Analysis of the Walla Walla Subbasin
In 2003 and 2004, the WDFW assessed aquatic habitat for steelhead and spring Chinook in the Walla Walla Subbasin by stream reach using the Ecosystem Diagnosis and Treatment (EDT) method (NPCC 2004). This analysis evaluated existing stream conditions and identified stream reaches in the subbasin, including the Walla Walla River and its tributaries, which have the potential to provide the greatest biological benefit to salmonid species. The EDT analysis is summarized in this subsection to provide information about the Walla Walla River and its tributaries in Walla Walla County.

EDT determines which environmental elements limit the potential for salmonid species to thrive in specific areas. For the Walla Walla subbasin, the EDT analysis determined that the key limiting factors for steelhead and spring Chinook were: sediment, large woody debris (LWD), key habitat (presence of pools), riparian function, stream confinement, summer water temperature, bedscour, and flow. Limiting factors for Walla Walla River bull trout have been identified by Kuttel (2002), as well as the draft Bull Trout Recovery Plan (USFWS 2002). These documents identify fish passage barriers, sedimentation, and high stream temperatures as some of the primary limiting factors affecting bull trout production in the basin. These factors are consistent with EDT analyses for steelhead and spring/summer Chinook in the subbasin (Snake River Salmon Recovery Board 2006).

Mendel et al. (2005) report that physiological barriers (primarily stream temperature) and impediments to salmonid passage and rearing were extensive in terms of stream miles affected in the Walla Walla River basin. As reported by Kuttel (2001), the WDFW identified 417 diversions (both pump and gravity), including diversions identified by private landowners. More recently, WDFW, with the assistance of other managers in the basin, has compiled a list of physical and physiological barriers and potential barriers that have been documented since 1996. The list, presented in Mendel et al. (2007), includes any barriers that have been removed or fixed, and a priority ranking that will help managers prioritize projects to eliminate these barriers. Seasonal temperature related barriers for salmonids generally occur in lower areas of the Touchet River, Mill Creek, and the Walla Walla Rivers and their tributaries. Stream reaches with mean water temperatures exceeding 75°F during the summer are associated with low densities of salmonids (Mendel et. al.1999).

Additional assessments focus on floodplain connectivity, flow, riparian health (both of which are related to the EDT attribute Riparian Function), and LWD. Limiting factors, as determined by EDT, for specific reaches in the subbasin that are within the limits of Walla Walla County are presented below. The Snake River Salmon Recovery Board (2006) also stresses that, in addition to limiting factors in the Walla Walla subbasin, other elements should be considered with respect to effects on salmonid habitat. These include historical impacts due to the operation of Nine Mile Dam in the lower Walla Walla subbasin and current and historical impacts caused by the Mill Creek flood channel through the City of Walla Walla.

Walla Walla River Mainstem

Habitat complexity is generally reduced or absent in the lower reaches of the Walla Walla River within the County limits, particularly in channelized areas (Carmichael 2006). The Limiting Factors Report for the Walla Walla Watershed (Kuttel 2001) identified the following as limiting the potential for salmonid habitat in the lower Walla Walla River (downstream of the state line):

- Fish passage
- Screens and diversions
- Riparian and streambank condition
- Substrate embeddedness
- Floodplain connectivity
- Width to depth ratio
- Large woody debris
- Pool frequency and quality
- Off-channel habitat
- Water quality/temperature
- Water quantity/dewatering

- Changes in flow regime
- Biological processes

In the Lower Walla Walla (mouth to Touchet) and Walla Walla (Touchet to Dry Creek) reaches, the primary limiting factors identified in the Subbasin Plan (2004) for summer steelhead were low flow, temperature, sediment load, key habitat quantity, and habitat diversity. Sediment load had high to extreme impacts on most life stages, except prespawn holding adults. There is no loss to spawning and incubation due to sediment load below RM 24 because it is unlikely that steelhead ever spawned in that stretch of the Walla Walla River.

In the lower Walla Walla mainstem from the mouth to Mill Creek, sediment load, key habitat quantity, habitat diversity, and temperature were the primary limiting factors for spring Chinook, whereas flow and predation were secondary limiting factors. The Snake River Salmon Recovery Board (2006) summarized findings of the EDT as related to steelhead limiting factors for the Walla Walla River Watershed (Figure 2.4-1; it is recognized that not all reaches shown in the figure are within Walla Walla County).

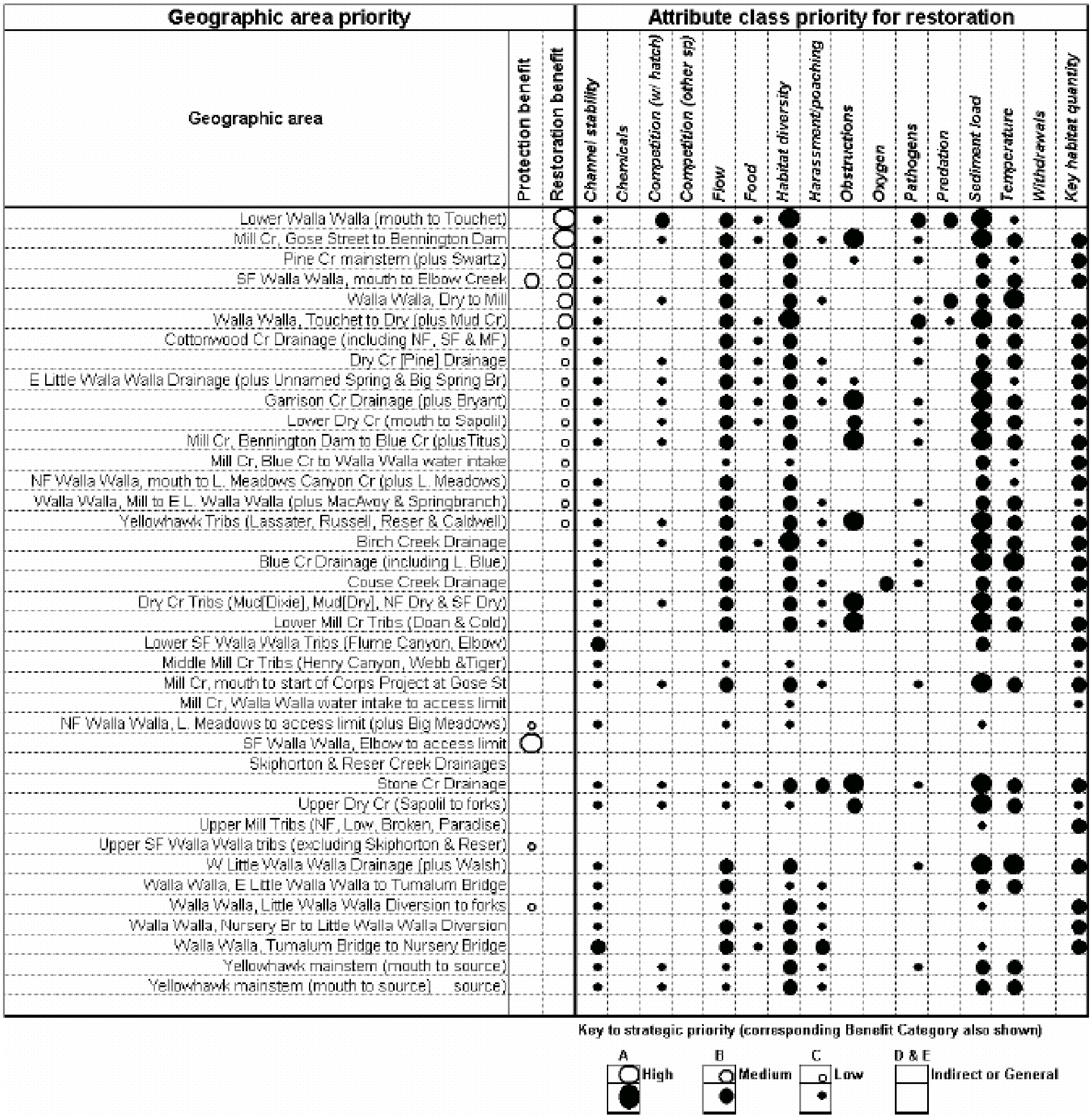
The Subbasin Plan attributed sedimentation problems to residential and agricultural land uses, poor riparian condition, increased width-to-depth ratio, road-drainage systems, and overgrazing. In addition, the Snake River Salmon Recovery Board (2006) reports that hydropower and irrigation diversion dams on the lower mainstem Walla Walla (i.e., Nine Mile Dam) played a much larger role than they do at present. Although Nine Mile Dam no longer exists, it likely contributed to the precipitous decline of salmon and steelhead populations in the early 20th century. The cumulative impact of irrigation diversions was typically the partial, and in some places, total dewatering of the mainstem Walla Walla River from Nursery Bridge near Milton-Freewater (outside County limits) to the Columbia River confluence.

In addition to dewatering of portions of the lower Walla Walla mainstem, agricultural practices in the region have contributed to erosion and increased stream temperatures. Removal of riparian vegetation contributes to increased stream temperatures (the effect is greater on smaller systems) and decreases the filtering effect riparian buffers have on streams (Snake River Salmon Recovery Board 2006). Historic grazing and urban development along riparian areas in the lower Walla Walla have also resulted in the removal of riparian vegetation through the development of roads, channel realignment and straightening, and bank armoring.

Pine Creek Sub Watershed

In the Pine Creek mainstem, sediment load, habitat diversity, flow, temperature, and obstructions were the primary limiting factors identified in the Subbasin Plan and by the Snake River Salmon Recovery Board (2006). Other limiting factors include key habitat quantity, channel stability, and food. Sediment affected most life stages at extreme levels in RMs 0 to 5, with greatly reduced impacts upstream. Habitat diversity had moderate affects on most life stages, but high losses occurred to spawning, fry colonization, and age-0 and age-1 active rearing. Increased peak flows had a moderate to high impact to colonizing fry, and low summer flows had small to moderate affects on juvenile rearing. Warm summer temperatures were limiting to egg incubation, fry colonization, and juvenile rearing in the lower reaches (~RM 0 to 10) and eight obstructions were present that partially blocked fish passage. Channel stability and food had small to moderate impacts throughout most juvenile life history stages.

Figure 2.4-1 Factors Limiting the Viability of the Walla Walla Steelhead Population (Source: Snake River Salmon Recovery Board 2006)



Geographic area priority			Attribute class priority for restoration															
Geographic area	Protection benefit	Restoration benefit	Channel stability	Chemicals	Competition (w/ hatch)	Competition (other sp)	Flow	Food	Habitat diversity	Harassment/poaching	Obstructions	Oxygen	Pathogens	Predation	Sediment load	Temperature	Withdrawals	Key habitat quantity
Lower Walla Walla (mouth to Touchet)		◯	•		●		●	•	⬤				●	●	⬤	•		
Mill Cr, Gose Street to Bennington Dam		◯	•		•		●	•	●	•	⬤		•		⬤	●		●
Pine Cr mainstem (plus Swartz)		○	•				●		●		•		•		●	•		●
SF Walla Walla, mouth to Elbow Creek	○	○	•				●		●						●	●		●
Walla Walla, Dry to Mill		○	•		•		●		●	•			•	●	●	⬤		
Walla Walla, Touchet to Dry (plus Mud Cr)		○	•				●	•	⬤				●	•	⬤	●		●
Cottonwood Cr Drainage (including NF, SF & MF)		◦	•				●	•	●				•		●	●		●
Dry Cr [Pine] Drainage		◦	•		•		●	•	●	•			•		●	●		●
E Little Walla Walla Drainage (plus Unnamed Spring & Big Spring Br)		◦	•		•		●	•	●	•	•				⬤	•		●
Garrison Cr Drainage (plus Bryant)		◦	•		•		●	•	●	•	⬤		•		⬤	●		●
Lower Dry Cr (mouth to Sapolil)		◦	•		•		●	•	●		●		•		⬤	●		•
Mill Cr, Bennington Dam to Blue Cr (plusTitus)		◦	•		•		●		●		⬤		•		⬤	●		●
Mill Cr, Blue Cr to Walla Walla water intake		◦					•		•						●	•		●
NF Walla Walla, mouth to L. Meadows Canyon Cr (plus L. Meadows)		◦	•				●		●						●	•		●
Walla Walla, Mill to E L. Walla Walla (plus MacAvoy & Springbranch)		◦	•				●		●	•			•		●	●		•
Yellowhawk Tribs (Lassater, Russell, Reser & Caldwell)		◦	•		•		●		●	•	⬤				⬤	●		●
Birch Creek Drainage			•		•		●	•	⬤	•			•		⬤	●		●
Blue Cr Drainage (including L. Blue)			•				●		●				•		⬤	⬤		●
Couse Creek Drainage			•				●		●	•		●	•		●	●		●
Dry Cr Tribs (Mud[Dixie], Mud[Dry], NF Dry & SF Dry)			•		•		●		●	•	⬤				⬤	●		•
Lower Mill Cr Tribs (Doan & Cold)			•				●		●	•	⬤				⬤	●		●
Lower SF Walla Walla Tribs (Flume Canyon, Elbow)			●												●			●
Middle Mill Cr Tribs (Henry Canyon, Webb &Tiger)			•				•		•									•
Mill Cr, mouth to start of Corps Project at Gose St			•		•		●		●	•			•		⬤	●		●
Mill Cr, Walla Walla water intake to access limit									•									•
NF Walla Walla, L. Meadows to access limit (plus Big Meadows)	◦		•				•		•						•			
SF Walla Walla, Elbow to access limit	◯																	
Skiphorton & Reser Creek Drainages																		
Stone Cr Drainage			•		•		•	•	●	●	⬤		•		⬤	●		●
Upper Dry Cr (Sapolil to forks)			•		•		•		•		●				⬤	●		•
Upper Mill Tribs (NF, Low, Broken, Paradise)															•			●
Upper SF Walla Walla tribs (excluding Skiphorton & Reser)	◦																	
W Little Walla Walla Drainage (plus Walsh)			•				●		●				•		⬤	⬤		●
Walla Walla, E Little Walla Walla to Tumalum Bridge			•				●		•	•					●	●		
Walla Walla, Little Walla Walla Diversion to forks	◦		•				•		●	•					•			●
Walla Walla, Nursery Br to Little Walla Walla Diversion			•				●	•	●	•								●
Walla Walla, Tumalum Bridge to Nursery Bridge			●				●	•	●	●					•			●
Yellowhawk mainstem (mouth to source)			•		•		•		●	•			•		●	●		
Yellowhawk mainstem (mouth to source) source)			•		•		•		●	•					●	●		

Key to strategic priority (corresponding Benefit Category also shown)

A		B		C		D & E	
◯	High	○	Medium	◦	Low		Indirect or General
⬤		●		•			

Mill Creek Sub Watershed

Upstream of the Walla Walla municipal water intake (RM 26.9), the Mill Creek drainage is considered nearly pristine salmonid habitat. However, this area only represents about 17 to 33 percent of the watershed as the majority of the drainage provides habitat ranging in quality from fair to very poor (Snake River Salmon Recovery Board 2006). The Mill Creek drainage below the municipal water intake was considered of poor quality in the 2004 Lead Entity Habitat Protection and Restoration Strategy document (SRSRC 2004).

According to the Snake River Salmon Recovery Board (2006), fish habitat in the 6.9 miles from Bennington Dam downstream to Gose Street is “nearly nonexistent” as virtually all of the reach is confined within concrete walls and gabions. The primary limiting factors for steelhead in this reach identified by the Subbasin Plan include obstructions to passage, sediment load, habitat diversity, flow, temperature, and key habitat quantity. Secondary limiting factors include channel stability and food. Numerous obstructions associated with the flood channel and diversion dams were modeled, with a cumulative effect that seems to all but eliminate the possibility of successful adult passage. According to EDT analysis, sediment load and habitat diversity had high to extreme impacts to most life stages. Warm summer temperatures were limiting to egg incubation, fry colonization, and juvenile rearing. Increased peak flows had a moderate to high impact to colonizing fry, and low summer flows had small to moderate affects on rearing.

For spring Chinook in Mill Creek, from Gose Street to Bennington Dam, obstructions, sediment load, key habitat quantity, habitat diversity, and temperature were the primary limiting factors, whereas flow was a secondary limiting factor. According to the Snake River Salmon Recovery Board (2006), it is extremely difficult for an adult salmon or steelhead to pass from Gose Street to Bennington Dam. Passage in the reach is compounded by the diversion at Yellowhawk Creek, about a mile below Bennington Dam. This structure diverts nearly all of the summer Mill Creek flow to the Yellowhawk Creek distributary system, eliminating passage opportunity between Gose Street and Bennington Dam and partially or totally dewatering a large portion of lower Mill Creek. Adult steelhead, and perhaps spring/summer Chinook, do seem to negotiate access to upper Mill Creek via Yellowhawk Creek as evidenced through observation of steelhead swimming up the ladder at Bennington Dam in spring 2004, when 35 redds were observed between Bennington Dam and the state line (G. Mendel, WDFW, pers. comm., as cited in Snake River Salmon Recovery Board 2006).

In a recent study conducted by Mahoney et al. (2008) to document steelhead passage within the Mill and Yellowhawk stream complex, no radio tagged steelhead used Mill Creek as a migration corridor though the City of Walla Walla and no fish moved past the Gose Street Dam or used the concrete flood control channel to move through the City. Radio-tagged fish used Yellowhawk Creek as a migration route through Walla Walla to reach Cottonwood and Mill Creeks, and some fish delayed at Gose Street may have spawned downstream (e.g. lower Mill Creek, mainstem Walla Walla). Based on the reported lack of fish passage at Gose Street, CTUIR completed a project to replace the old fish weir in 2007. This project continues to monitor (improved) fish passage at the new Gose Street fish weir (Mahoney et al. 2008).

Touchet River Watershed

The Limiting Factors Report for the Walla Walla Watershed (Kuttel 2001) identified the following as limiting the potential for salmonid habitat in the Lower Touchet River (portion of river within County limits):

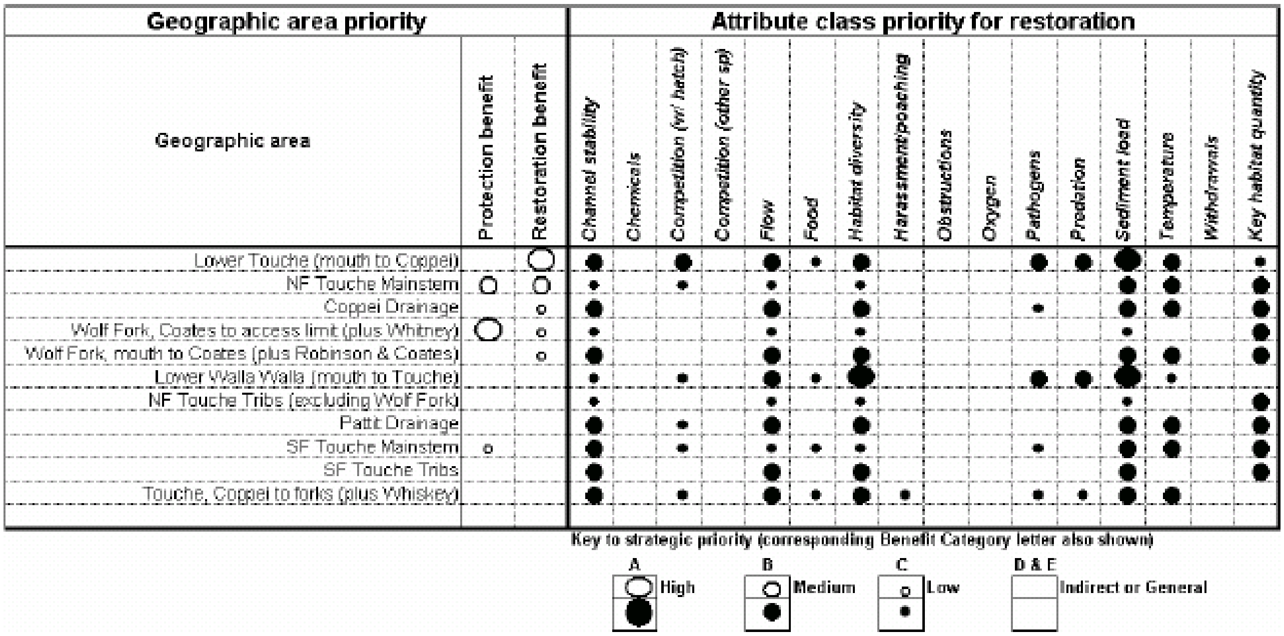
- Substrate embeddedness

- Large woody debris
- Water quality/temperature
- Water quantity/dewatering
- Biological processes

According to EDT analysis (Saul et al. 2001; Snake River Salmon Recovery Board 2006), in the Lower Touchet (mouth to Coppei Creek), the primary limiting factor for steelhead was sediment load, which affected most life stages of summer steelhead and spring Chinook at high to extreme levels. Other limiting factors included key habitat quantity, habitat diversity, flow, predation, temperature, channel stability, and obstructions. In the Touchet River (from Coppei to County limits, including Whiskey Creek) habitat diversity and flow were the primary limiting factors, whereas temperature, sediment load, predation, and channel stability were secondary. The major environmental limiting factors and their relative degree of impact are shown by reach in Figure 2.4-2 (it is recognized that not all reaches are within Walla Walla County).

For spring Chinook, from the mouth of the Touchet River to Coppei Creek, sediment load, key habitat quantity, habitat diversity, and temperature were the primary limiting factors for spring Chinook, whereas flow, predation, and obstructions were secondary limiting factors. Limiting factors were similar from Coppei to the County limits (including Whiskey Creek); however, sediment load dropped to a secondary limiting factor throughout and key habitat quantity was not a primary factor.

Figure 2.4-2 Factors Limiting the Viability of the Touchet River Steelhead Population (Source: Snake River Salmon Recovery Board 2006)



Geographic area priority			Attribute class priority for restoration															
Geographic area	Protection benefit	Restoration benefit	Channel stability	Chemicals	Competition (w/ hatch)	Competition (other sp)	Flow	Food	Habitat diversity	Harassment/poaching	Obstructions	Oxygen	Pathogens	Predation	Sediment load	Temperature	Withdrawals	Key habitat quantity
Lower Touche (mouth to Coppei)		◯	●		●		●	•	●				●	●	⬤	●		•
NF Touche Mainstem	○	○	•		•		•		•						●	●		●
Coppei Drainage		∘	●				●		●				•		●	●		●
Wolf Fork, Coates to access limit (plus Whitney)	◯	∘	•				•		•						•			●
Wolf Fork, mouth to Coates (plus Robinson & Coates)		∘	●				●		●						●	●		●
Lower Walla Walla (mouth to Touche)			•		•		●	•	⬤				●	●	⬤	•		
NF Touche Tribs (excluding Wolf Fork)			•				•		•						•			●
Pattit Drainage			●		•		●		●						●	●		●
SF Touche Mainstem	∘		●		•		•	•	•				•		●	●		●
SF Touche Tribs			●				●		●						●			●
Touche, Coppei to forks (plus Whiskey)			●		•		●	•	●	•			•	•	●	●		

Key to strategic priority (corresponding Benefit Category letter also shown)

A		B		C		D & E	
◯ ⬤	High	○ ●	Medium	∘ •	Low		Indirect or General

The adverse effects of sedimentation to all life stages of steelhead are considered high or extreme below Coppei Creek while sediment impacts to incubation remain high throughout the mainstem and in Whiskey Creek. Similar to the lower Walla Walla Watershed, historic hydropower and irrigation diversion dams in the lower Touchet River (i.e., Hofer and Maiden Diversions) likely played an historic role in the decline of salmon and steelhead populations (Snake River Salmon Recovery Board 2006). Though the Maiden Dam no longer exists, the adverse effects on historic populations due to the structure are unquestionable. Currently, agricultural development is the main cause of the majority of limiting factors identified in the Touchet mainstem, although residential development and road encroachment are locally important near Prescott and Waitsburg in Walla Walla County.

Columbia and Snake Rivers

As shown in the distribution figures presented for focal aquatic species (Figures 2.3-1, 2.3-2, and 2.3-3), the Columbia and Snake rivers are primarily used as migratory corridors. Freshwater juvenile rearing habitat is not designated for any salmonid species in the majority of mainstem habitat in either river, although fall Chinook are shown to spawn and rear in the upper reaches of the Snake River, upstream of Lower Monumental Dam (Streamnet 2008). In addition, fall Chinook are documented to spawn below Lower Monumental Dam in the tailrace, and below Little Goose and Lower Granite dams (K. Divens, WDFW, pers comm.). Therefore, in the upper reaches of the Snake River, particularly the reach from just below Lower Monumental Dam to the County limits, riparian function should be given consideration as it serves to support fall Chinook spawning and rearing.

In both the Columbia and Snake rivers, outmigrating salmonids will orient themselves with the shoreline environment so it is important to limit shoreline armoring, and to maintain streamside vegetation. Dams in the Columbia and Snake rivers have caused a broad range of habitat degradation, contributing to high instream temperatures and high concentrations (supersaturation) of dissolved oxygen and nitrogen (Spence et al. 1996). These elements have a negative impact on water quality. Habitat elements in vicinity of the dams are not properly functioning according to NOAA Fisheries' "Matrix of Pathways and Indicators" for several reasons. When the Columbia River was transformed from a flowing body of water to a series of slow moving reservoirs, much of the historic habitat was inundated and habitat functions were lost. Sediment transport has been restricted to the extent that fine materials (silt, sand) settle out of the water column in the reservoirs instead of being flushed downstream (causing sedimentation or floodplain deposition) (NMFS 1996). Additionally, low water velocity and the physical presence of the dams trap spawning substrates, preventing downstream recruitment (NMFS 1996). Off-channel habitat, refugia (remnant habitat that buffers populations against extinction), and LWD production has been reduced by inundating off-channel areas and historic riparian zones. Because the flow is highly regulated between dams, hydraulic variation is lacking. The dams have created several large reservoir pools, including Lake Wallula, leading to the alteration of habitat distribution patterns and a loss of habitat diversity.

The Columbia and Snake rivers provide migratory habitat for nearly all of the anadromous salmonids that occur in the County, and development adjacent to aquatic habitat should be limited. Because the Snake and Columbia Rivers are large systems characterized by well-defined floodplains and adjacent wetlands, streamside buffers should be adequate to allow for meandering, as well as to improve channel stability, water quality, and wildlife corridors (Palone and Todd 1997). Due to the influence of riparian habitat on large rivers, the removal of riparian vegetation along large streams has less effect on stream structure and function (Knutson and Naef 1997).

2.4.2 Recommendations to Address Limiting Factors

According to the Snake River Salmon Recovery Board (2006), the desired future condition for stream habitat within the Walla Walla River watershed would be the attainment of habitat conditions where the effects of limiting factors on fish populations are substantially reduced or eliminated. For the Walla Walla River, the desired future condition includes:

- Restoration of riparian function and reduction of instream temperatures
- Restoration of floodplain connectivity
- Elimination of passage barriers
- Increase in instream flow

The Draft Bull Trout Recovery Plan (USFWS 2002) identifies the following actions to specifically address the protection, restoration, and maintenance of suitable bull trout habitat in the Umatilla-Walla Walla Recovery Unit (specific strategies can be found in Chapter 10 of the Plan):

1. Maintain or improve water quality in bull trout core areas or potential core habitat.
2. Identify barriers or sites of entrainment for bull trout and implement tasks to provide passage and eliminate entrainment.
3. Identify impaired stream channels and riparian areas and implement tasks to restore their appropriate functions.
4. Operate dams and diversions to minimize negative effects on bull trout in reservoirs and downstream.
5. Identify upland conditions negatively effecting bull trout habitats and implement tasks to restore appropriate functions.

The Limiting Factors report for the Walla Walla Watershed (Kuttel 2001) recommends the following watershed-wide recommendations to improve habitat conditions:

- Conduct a comprehensive inventory of surface water diversions (legal and illegal) in Washington and Oregon.
- Screen all surface water diversions in Washington and Oregon according to state and federal juvenile fish screening criteria.
- Replace push-up dams with more permanent structures that reduce streambed disturbance and improve fish passage.

- Increase summer stream flows in the Lower Touchet and Lower Walla Walla subbasins as well as downstream from Nursery Bridge in Oregon.

- Summer flows on fish bearing tributary streams should also be restored.

- Where possible, conserve water by converting irrigated agriculture to dryland farming, reducing lawn watering, car washing, etc.

- Utilize no-till farming methods on as many acres of dry farmed cropland as possible.

- Replant native riparian vegetation along streams beginning on the upper reaches of spawning and rearing areas, then progressing downstream to lower priority migration areas.

- Reduce summer water temperatures to comply with state standards for salmonid habitat usage.

- Improve instream habitat on the upper reaches of spawning and rearing areas by providing large woody debris, consolidating braided channels, stabilizing eroding banks with bioengineering, and creating pools.

- Restore floodplain connectivity and natural channel migration by removing or setting back dikes and levees and removing bank armoring.

- Continue to identify fish passage problems and correct barriers that restrict access to useable habitat.

- Increase water quality monitoring to ensure that streams comply with state water quality standards and correct violations where identified.

- Determine the appropriate management strategy of Mill Creek below Bennington Lake Dam and Yellowhawk and Garrison Creeks, including investigating the feasibility of screening-off Mill Creek at Gose Road and at the Yellowhawk Division. Yellowhawk Creek would then serve as the migration corridor from the Walla Walla River to the Upper Mill Creek Subbasin.

- In emergency situations, restrict unpermitted flood repair work to a short timeframe during which an eminent threat of damage to life or property exists, thereby minimizing destruction of salmonid habitat.

- Enforce landuse regulations including the Growth Management Act, Shoreline Management Act, and Critical Area ordinances.

- Fence livestock out of streams.

- Increase protection of critical salmonid habitat areas.

The last bullet, among others, is the focus of efforts by various planning and assessment teams that have designated priority restoration and protection areas for salmonid stocks, as described in detail in the following section.

2.4.3 Designated Priority Restoration and Protection Areas

For steelhead and spring Chinook salmon present in the Walla Walla subbasin, the EDT analysis identified areas that are currently important for fish production and therefore should be protected. Protection strategies focus on the maintenance of current conditions, and are provided through prescribed management actions designed to maintain the desired ecological function of a habitat (Saul et al. 2001; Snake River Salmon Recovery Board 2006). Restoration focuses on improvements to riparian and instream conditions (see the Snake River Salmon Recovery Plan for SE Washington for Details). The EDT analysis also identified areas with the greatest potential for restoring critical life stages of priority fish. Priority protection and restoration areas identified in the Walla Walla Subbasin, within the limits of Walla Walla County, are shown in Table 2.4-1 below. These results are based on analysis of EDT results by subbasin assessment teams (Saul et al. 2001; Snake River Salmon Recovery Board 2006). Reaches identified as priority restoration areas are automatically added to the list of high priority protection areas to prevent further degradation before restoration actions can be implemented. Figure 2.4-3 maps priority restoration and protection reaches in the County.

Table 2.4-1
Priority Protection and Restoration Areas of the Walla Walla Subbasin in the County Limits as Identified through EDT Analysis

River Reach Description	Priority Protection Area	Priority Restoration Area
Walla Walla River from Mill Creek to East Little Walla Walla River	x	x
Walla Walla River from East Little Walla Walla to Tumalum Bridge[1]	x	x
Coppei Drainage	x	x
Touchet River from Coppei to County limits (reach extends to North and South forks)	x	x
Walla Walla River, Dry Creek to Mill Creek	x	
All of the Mill Creek drainage above Bennington Dam and below Gose Street (Mill Creek MSA)[2]	x	
Yellowhawk Mainstem – mouth to source[2]	x	
Upper Dry Creek	x	
Cottonwood Creek[3]	x	

[1] Not all portions of reach within County limits
[2] Protection designations based on existing conditions, not EDT analysis
[3] Not identified as priority protection area in Subbasin Plan or by the Snake River Salmon Recovery Board (2006), but upgraded to a priority protection area in 2007 (K. Divens, WDFW, pers comm.)
Sources: Saul et al. 2001; NPPC 2004; Snake River Salmon Recovery Board 2006

Several reaches within the County limits were determined to have high restoration potential; however, they were not been included on the restoration or protection list for the Snake River Salmon Recovery Plan (Snake River Salmon Recovery Board 2006). Such areas are clearly important to the ultimate recovery of listed stocks and may even include short sections within which recovery potential per kilometer is as high as in the designated high-priority areas. Examples include:

Insert Figure 2.4-3 (8.5 x 11)

- Lower Touchet River from the mouth to Coppei Creek: This Geographic Area has the highest absolute restoration potential for both steelhead and spring/summer Chinook, but ranks eleventh for steelhead and third for spring/summer Chinook in terms of scaled restoration potential.

- Pine Creek mainstem: Pine Creek ranks fourth in terms of unscaled steelhead restoration potential, but seventeenth when restoration potential is scaled.

- Lower Walla Walla River (mouth to Touchet River): The unscaled restoration potential of the Lower Walla Walla for spring/summer Chinook is the sixth highest in the subbasin. The scaled restoration potential of this area is only the fourteenth highest for spring/summer Chinook.

These reaches have been excluded from the priority restoration list because they are quite long and because they had a low benefit-to-effort ratio compared to reaches presented in Table 2.4-1. Also, the reaches bulleted above occur near relatively densely developed areas and restoration of these areas would likely be expensive and controversial. For Pine Creek, reasons for exclusion also included the presence of multiple barriers, the presence of only steelhead, and the relatively small potential contribution of fish to the Walla Walla population. However, because of the potential importance of the areas to listed species, projects in these areas should be considered if actions in other parts of the subbasin do not achieve recovery goals.

In addition to those reaches presented above, the reach of Mill Creek from Gose Street to Bennington was excluded from priority restoration and protection designation. As previously discussed, this “engineered” reach has been radically altered by a series of USACE flood control projects designed to protect the City of Walla Walla. The flood control projects have had major negative impacts on fish habitat and, perhaps more importantly, have severely limited access into the upper watershed. Although this reach was one of the highest ranking in regard to restoration according to EDT analysis, it was excluded as a priority restoration area due to the relative low occurrence of focal species or the existence of several instream obstructions. According to the Snake River Salmon Recovery Board (2006), any solution to the fish passage problems in this reach will have to be acceptable to a wide array of stakeholders including city governments, tribal interests, state agencies, federal agencies, and private citizens. To this end, the Mill Creek Working Group has been meeting since 2002 in an attempt to generate solutions to the fish passage and habitat problems in Mill Creek. This group will take the lead in resolving fish passage issues in this area, and therefore it is not included in regional recovery planning.

The Walla Walla mainstem from Touchet to Dry Creek (RM 29.4) also had good restoration potential. However, it was not included in the final recommendation as a restoration area since it functions primarily as a migration corridor that does not currently support enough focal life history stages when compared to the rest of the subbasin.

The East Little Walla Walla drainage rated high in restoration potential but was not included as a priority restoration area under the Subbasin Plan or Snake River Salmon Recovery Plan. The East Walla Walla River supports only a small population of steelhead and is primarily used for rearing.

2.4.4 *Functions and Values to Protect and Manage in Aquatic Habitats*

Functions and values to protect and manage fall under the general categories of those related to instream habitat, and those related to riparian habitat.

Instream Habitat Functions and Values

Instream functions that need to be managed include flow, water temperature, confinement, sediment, supply of LWD, and pools. These attributes are currently regulated by WDFW and Ecology through hydraulic project approvals (HPAs), Total Maximum Daily Loads (TMDLs), and instream flow rules. Many of these functions are, however, impacted by riparian condition, which the County can regulate.

Riparian Habitat Functions and Values

There are two basic types of riparian habitat in Walla Walla County: those in the forested or previously forested areas of the Blue Mountain foothills, and those in the arid Walla Walla and Columbia basins. In the Blue Mountain foothills, the vegetation of riparian areas is often younger and lower in profile than the surrounding upland forest. In the arid Walla Walla and Columbia basins, the riparian vegetation is usually prominent, often taller and/or greener than the surrounding landscape.

The size of the riparian area generally varies with the amount of stream flow. Intermittent streams often have limited interaction with the landscape and contain narrow riparian corridors, while large perennial rivers may have expansive riparian areas with multiple vegetation layers. Therefore, as the size of a waterbody increases, the influence of the stream on the riparian area increases. Conversely, the influence of riparian area on the stream decreases as stream size increases (Bilby 1988, quoted in Knutson and Naef 1997). Intermittent and smaller perennial streams located in the arid portions of Walla Walla County may have little or no riparian vegetation.

The riparian influence corridor provides a variety of ecological functions as related to salmonid performance. These functions can generally be grouped into three categories: energy, nutrients, and habitat. Some aspects of these functions are expressed through specific environmental attributes within EDT, such as wood debris, flow, temperature characteristics, substrate condition, pollutant conditions, and habitat type characteristics (e.g., pool/riffle units). Riparian function also includes the following:

- Terrestrial insect input (affects fish food abundance)
- Shade (provides a form of cover, temperature covered by specific attributes)
- Source of fine detritus (affects fish food abundance, large wood covered by specific attribute)
- Bank and channel stability (affects suitability of fish habitat, as well as micro-habitat)
- Bank cover (affects suitability of fish habitat, as well as micro-habitat)
- Secondary channel development (affects channel stability, flow velocities, and habitat suitability)

- Groundwater recharge and hyporheic flow characteristics (affects fish food abundance, strength of upwelling, and micro temperature spatial variation)

- Flow velocity along stream margins (affects suitability of fish habitat)

- Connectivity to off-channel habitat (affects likelihood of finding off-channel sites)

- Supply the majority of LWD to streams, which is often transferred through the system during flow events and alters channel shape by modifying stream flow and velocity. LWD trap organic and inorganic matter, supplying food to a variety of aquatic organisms.

- Pollutant filtration of surface sheet flow when vegetation is present, and streambank stabilization and through decreased erosion and the input of fine sediment.

- Temperature moderation along stream margins, through increased humidity, greater air movement, and shading.

Loss of riparian function most commonly occurs through hydromodifications (roads, dikes, bank armoring, channelization, etc.) and through altered riparian vegetation and reduced input of LWD (from agriculture, development, past forest practices). In order to maintain the existing status of riparian habitat function for priority protection reaches in the Walla Walla Subbasin, actions related to land use should consider the impact that potential development will have on environmental parameters such as sedimentation to streams, temperatures, and the input of LWD.

Many of these riparian functions and values are described in more detail in Section 2.5.2

2.5 Habitat Protection Tools

2.5.1 Designation, Rating and Classification, and Regulatory Options

Classification systems should ideally be biologically and physically relevant to the fisheries resource, while also providing for ease of public understanding and straightforward implementation. Walla Walla County does not currently designate or classify streams according to any stream typing system. Potential classification systems for use in the CAO include the following types:

- Washington Department of Natural Resources (DNR) Water Typing System – A combination physical/biological based classification system using simplified stream types (S, F, and N).

- Salmonscape, Snake River Recovery Plan, and Mid Columbia Steelhead Recovery Plan – Documents provide up to date information and maps of distribution, spawning and rearing.

- Aquatic Habitat Quality Based Classification System – A habitat based classification system for streams or stream reaches based on existing aquatic habitat condition and EDT-identified limiting factors.

- Combination Classification System – A habitat classification system that combines elements from several of the above methods.

Each of these is discussed in more detail below, along with the recommended classification approach. For any classification system, there will be streams that are not currently classified due to lack of available information (e.g. fish presence) or streams that are incorrectly classified. In such cases, a special study would be required to document the stream habitat features.

DNR Water Typing System

New water types have been established in WAC 222-16-030. As excerpted from WAC 222-16-030, new water types are as follows:

Type S Water – all waters, within their bankfull width, as inventoried as "shorelines of the state" under chapter 90.58 RCW and the rules promulgated pursuant to chapter 90.58 RCW including periodically inundated areas of their associated wetlands.

Type F Water – segments of natural waters other than Type S Waters, which are within the bankfull widths of defined channels and periodically inundated areas of their associated wetlands, or within lakes, ponds, or impoundments having a surface area of 0.5 acres or greater at seasonal low water and which in any case contain fish habitat.

Type Np Water – means all segments of natural waters within the bankfull width of defined channels that are perennial nonfish habitat streams. Perennial streams are waters that do not go dry any time of a year of normal rainfall. However, for the purpose of water typing, Type N Waters include the intermittent dry portions of the perennial channel below the uppermost point of perennial flow.

Type Ns Water – means all segments of natural waters within the bankfull width of the defined channels that are not Type S, F, or Np Waters. These are seasonal, nonfish habitat streams in which surface flow is not present for at least some portion of a year of normal rainfall and are not located downstream from any stream reach that is a Type Np Water. Ns Waters must be physically connected by an above-ground channel system to Type S, F, or Np Waters.

A “U” is assigned to reaches when they are un-typed, un-modeled hydrographic features that may or may not be field verified. This code is used as a placeholder in DNR’s database; it is not a water type.

Table 2.5-1 presents the main waterways in the County as identified by the Walla Walla County Draft Comprehensive Plan (2007) and County GIS information, along with the DNR stream type assigned to each system. In some cases as indicated in the table, WDFW surveys of specific streams have resulted in the collection of fish in creeks that were typed as non-fish-bearing. In these cases, the DNR stream typing data has been corrected to Type F. Figure 2.5-1 identifies these streams.

Insert Figure 2.5-1 (8.5x11)

Table 2.5-1
Waterways within Walla Walla County and Associated DNR Stream Typing and/or Streams Identified to Contain Fish Based on WDFW Surveys

Waterway	DNR Stream Type
Columbia River	Type S – fish bearing
Mill Creek (Walla Walla tributary)	Type S – fish bearing
Snake River	Type S – fish bearing
Touchet River (Walla Walla tributary)	Type S – fish bearing
Walla Walla River	Type S – fish bearing
Dry Creek (Walla Walla River tributary)	Type S – fish bearing below Hwy 125 Type F – fish bearing above Hwy 125
Blue Creek (Mill Creek tributary)	Type F – fish bearing (~last river mile = N type)
Coppei Creek (Touchet tributary)	Type F – fish bearing
Cottonwood Creek (Yellowhawk tributary)	Type F – fish bearing
E. Little Walla Walla (Walla Walla tributary)	Type F – fish bearing
Garrison Creek (Walla Walla tributary)	Type F – fish bearing to Lion's park in College Place Above Lion's park – Type Np - WDFW reports[1,2] that fish have been documented throughout system[3]
Pine Creek (Walla Walla tributary)	Type F – fish bearing
Yellowhawk (Walla Walla tributary)	Type F – fish bearing
Bergevin Spring Branch (Dry Creek tributary)	Type Np – non fish bearing[4]
Birch Creek (Walla Walla tributary)	Type Np – non fish bearing[5]
Bryant Creek (Garrison tributary)	Type F – WDFW has documented fish[1,2]
Cold Creek (Mill Creek tributary)	Type F – WDFW has documented fish[1,2]
Doan Creek (Mill Creek tributary)	Type F – WDFW has documented fish[1,2,6]
Gardena Creek (Walla Walla tributary)	Type Np – non fish bearing[4]
Grandview Spring Branch (Walla Walla tributary)	Type Np – non fish bearing[4]
Mud Creek (1) (Walla Walla tributary)	Type F – WDFW has documented fish[1,2]
Mudd Creek (2) (lower Dry Creek tributary)	Type F – WDFW has documented fish[1,2]
Mud Creek (3) (upper Dry Creek tributary)	Type F – WDFW has documented fish[1,2]
Reser Creek (Russell Creek tributary)	Type F – WDFW has documented fish[1,2]
Russell Creek (Yellowhawk tributary)	Type F – WDFW has documented fish[1,2]
Spring Valley Creek (1) (lower Dry Creek tributary)	Type Np – non fish bearing[4]
Spring Creek (2) (upper Dry Creek tributary)	Type Np – non fish bearing [6,7]
Stone Creek (Walla Walla tributary)	Type F – WDFW has documented fish[1,2]
Titus Creek (Mill Creek tributary)	Type F – WDFW has documented fish[1,2]
Warm Springs (Walla Walla tributary)	Type Np – non fish bearing[4]
Whetstone Creek (Touchet tributary)	Type F – WDFW has documented fish in lower Whetstone[1,2]
Caldwell Creek (Yellowhawk tributary	Type F – WDFW has documented fish[1,2]
Little Mud Creek (Pine Creek tributary)	Type Ns – non fish bearing[4]
W. Little Walla Walla (Walla Walla tributary)	Type F – WDFW has documented fish when water is present[1,2]
Wilson Creek (Touchet tributary)	Type Ns – non fish bearing[4]

[1] Sources: Mendel et al. 1999-2008; G. Mendel (WDFW, pers comm., 7/2/08).

[2] Although indicated as "Type Np – non-fish bearing" on current DNR mapping, WDFW reports that this system has documented fish use. Based on this information, the stream type has been updated to "Type F."

[3] Although WDFW reports that fish have been documented throughout the system, the designation has been revised as "Type Np – non fish bearing" due to the Walla Walla County Conservation District screening project planning in 2009 or 2010. This screening project will eliminate fish access between Lion's Park and the Yellowhawk confluence. This reach is reported as "Type Np – non fish bearing" on current DNR mapping.

[4] DNR indicates these systems do not bear fish; however, surveys have not been conducted by WDFW to verify this classification

[5] The Oregon Department of Fish and Wildlife suggest this stream is fish-bearing in Oregon (G. Mendel, WDFW, pers comm.)

[6] Restoration projects are planned to provide salmonid rearing.

[7] Non-fish bearing classification verified by WDFW in surveys

Fish Species and Lifestage Distribution Classification System

Though DNR stream typing system was applied to Walla Walla County waterways, the best available science for the area has focused on the occurrence and distribution of ESA-listed aquatic species, which better define focal species use and aquatic functions that require protection. The fish distribution maps presented earlier in this section illustrate that the predominant function provided by most of the waterbodies in the County is migration for the focal salmonid species. Although vital for each species to travel to or from spawning and rearing areas, such migratory corridors do not provide the habitat elements necessary for species production and maintenance. Areas designated as spawning and rearing, or as rearing and migration habitat, should be protected through a land use regulatory approach that maintains stream functions and values for these life stages.

Although the predominant stream function for salmonids in Walla Walla County may be migration, the Walla Walla River from the state line to at least the mouth of Mill Creek is spawning and rearing habitat for steelhead. In addition, the following systems provide spawning and/or rearing habitat for steelhead and/or bull trout: Coppei Creek, Cottonwood Creek, Yellowhawk Creek, East Little Walla Walla, Mill Creek, upper and middle Dry Creek, among others.

Based on the current distribution of anadromous salmonids and bull trout in the aquatic habitat of Walla Walla County (Streamnet 2008), it is apparent that ESA-listed summer steelhead distribution should define the level of protection for most reaches. They are currently known to spawn and rear in several reaches within the Walla Walla subbasin and represent the “limiting factor” for aquatic habitat protection. There is one exception, as the uppermost reach of the Snake River (upstream of Lower Monumental Dam) is designated as fall Chinook spawning and rearing habitat while it is only a migratory corridor for summer steelhead. In addition, fall Chinook are documented to spawn below Lower Monumental Dam in the tailrace and below Little Goose and Lower Granite dams (K. Divens, WDFW, pers comm.).

Based on distribution data, protection of summer steelhead habitat will benefit most other aquatic species present in the County. Because spawning and rearing habitat support the most critical life stages, those areas classified as steelhead spawning and rearing habitat should receive the highest level of protection. The next level of protection should be for rearing and migratory habitat, followed by migratory habitat.

Aquatic Habitat Quality Based Classification System

The classification of reaches for protection does not end with species utilization as other factors specific to the subbasin should also be considered. As presented in this document, extensive research has been conducted to determine the environmental or habitat elements that are limiting the potential for each reach to provide suitable habitat for various stages of each aquatic focal species. As shown in Table 2.4-1, the EDT analysis has determined that the following reaches of the Walla Walla subbasin are appropriate for priority protection and/or restoration:

- Walla Walla River from Mill Creek to East Little Walla Walla River

- Walla Walla River from East Little Walla Walla to Tumalum Bridge (portions within County limits are applicable to this document)

- Coppei Drainage

- Touchet River from Coppei to forks

- Walla Walla River, Dry Creek to Mill Creek

- Upper Dry Creek

In addition, though not identified as priority areas by EDT, based on existing habitat conditions and the need to restore and improve passage in the Mill Creek system, the following areas were identified as priority protection reaches (Saul et al. 2001; Snake River Salmon Recovery Board 2006):

- All of the Mill Creek drainage above Bennington Dam and below Gose Street (Mill Creek MSA)

- Yellowhawk Mainstem – mouth to source

Cottonwood Creek was also recently upgraded to priority protection status (K. Divens, WDFW, pers comm.).

It should be noted that for bull trout, the Subbasin Plan recommends that headwater reaches receive priority protection. These headwaters areas typically fall outside the limits of the County, although portions of the Mill Creek headwaters may occur within the County. Headwater habitat recommended for protection with regard to bull trout is typically included in protected areas for steelhead.

Because the EDT analysis did not determine limiting factors for the Snake and Columbia Rivers, the NOAA Fisheries-based information relating to pathways and indicators for freshwater migration corridors can be used to classify those river systems. Because these systems function primarily as migrational corridors, those functions should be protected.

Summary of Classifications for Aquatic Habitats in Walla Walla County

Table 2.5-2 presents the aquatic reaches identified to contain habitat for various life stages of summer steelhead and how they are classified in consideration of the classification systems decribed above.

Table 2.5-2

Aquatic Reaches within Walla Walla County with Mapped Use by Summer Steelhead and Associated DNR Stream Typing, EDT, Subbasin and Snake River Salmon Recovery Plan Restoration/Protection Reach Classifications and Limiting Factors

Geographic Area	River Reach	Summer Steelhead Habitat Present	DNR Stream Type	EDT Priority Protection Reach	Subbasin Plan Protection Reach	SRSRR Priority Protection and Restoration Areas	Limiting Factors	Snake River Salmon Recovery Plan Restoration or Protection Benefit
Columbia River	Mainstem/Wallula Lake within County limits	Migration	S	No	No	NA	NA	NA
Snake River	Mainstem from confluence with Columbia River to Lower Monumental Dam	Migration	S	No	No	NA	NA	NA
Snake River	Mainstem from Lower Monumental Dam upstream to County limits	Migration, spawning and rearing[1]	S	No	No	NA	NA	NA
Lower Touchet River	Mainstem to confluence with McCay Creek	Migration	S	No	No	NA	SL, K, H, F, P, T, O	High benefit - Restoration
Touchet River	Mainstem from McCay Creek to Coppei Creek	Rearing and migration	S	No	No	NA		High benefit - Restoration
Touchet River	Mainstem from Coppei Creek to County limits	Spawning and rearing	S	Yes	No	Restoration and protection	H, F	NA
Touchet River	Coppei Creek	Spawning and rearing	F (~ last 1.5 river mile of South Fork Coppei Creek and last 0.5 river mile of North Fork Coppei Creek = N type)	Yes	No	Restoration and protection	F, T, SL	Low benefit - restoration
Dry Creek	Mainstem from confluence with Walla Walla River to Highway 125 Bridge	Migration	S	No	No	Upper portions - protection	F, T, SL, H, K	Low benefit - restoration
Dry Creek	Mainstem from Highway 125 Bridge to river's end	Spawning and rearing	F (end of N and S forks = N type)	No	No	Protection	F, H, SL	NA
Walla Walla River	Mainstem from mouth to	Migration	S	No	No	NA	SL, K, H,	High to medium

Table 2.5-2
Aquatic Reaches within Walla Walla County with Mapped Use by Summer Steelhead and Associated DNR Stream Typing, EDT, Subbasin and Snake River Salmon Recovery Plan Restoration/Protection Reach Classifications and Limiting Factors

Geographic Area	River Reach	Summer Steelhead Habitat Present	DNR Stream Type	EDT Priority Protection Reach	Subbasin Plan Protection Reach	SRSRR Priority Protection and Restoration Areas	Limiting Factors	Snake River Salmon Recovery Plan Restoration or Protection Benefit
	confluence with Dry Creek						T	benefit - restoration
Walla Walla River	Mainstem from Dry Creek to Mill Creek	Migration	S	Yes	No	Protection	SL, K, H, T	Medium benefit - restoration
Walla Walla River	Mainstem from Mill Creek Creek to East Little Walla Walla River	Migration	S	Yes	No	Restoration and protection	SL, F, H, LWD, K, T	Low to medium restoration benefit
Walla Walla River	Mainstem from confluence with Yellowhawk Creek to County limits	Rearing and migration	S	Yes	No	Restoration and protection	F, H	
Pine Creek	Mainstem from confluence with Walla Walla River to County limits	Migration	F	No	No	NA	SL, H, F, T, O, LWD	Medium benefit - restoration
Mill Creek	Mainstem from confluence with Walla Walla River to just downstream of Yellowhawk Creek dam	Spawning and rearing	S	No	Yes[2]	Protection	O, SL, H, F, T, K	High benefit - restoration
Mill Creek	Mainstem from Yellowhawk Creek dam to Bennington Lake dam	Rearing and migration	S	No	No	NA		
Mill Creek	Mainstem from Bennington Lake dam to confluence with Blue Creek	Migration	S	No	Yes	Protection	O, T, F	Low benefit – restoration
Mill Creek	Mainstem from confluence of Blue Creek to County limits	Spawning and rearing	S (end reaches = F type)	No	Yes	Protection	Fair to excellent habitat	Low benefit – restoration
Blue Creek	From confluence with Mill Creek to end	Spawning and rearing	F (~last river mile = N type)	No	Yes	Protection	H, though fair to excellent habitat	NA
Yellowhawk Creek	Mainstem from the Mouth to Cottonwood Creek confluence	Rearing and migration	F	Yes	No	Protection	F, T, O, K, H, LWD, SL	Yellowhawk mainstem – NA

Table 2.5-2
Aquatic Reaches within Walla Walla County with Mapped Use by Summer Steelhead and Associated DNR Stream Typing, EDT, Subbasin and Snake River Salmon Recovery Plan Restoration/Protection Reach Classifications and Limiting Factors

Geographic Area	River Reach	Summer Steelhead Habitat Present	DNR Stream Type	EDT Priority Protection Reach	Subbasin Plan Protection Reach	SRSRR Priority Protection and Restoration Areas	Limiting Factors	Snake River Salmon Recovery Plan Restoration or Protection Benefit
Yellowhawk Creek	Mainstem at the Cottonwood Creek confluence and just upstream	Migration	F	Yes	No	Protection	F, T, O, K, H, LWD, SL	Yellowhawk tribs – low restoration benefit
Yellowhawk Creek	Mainstem just upstream of Cottonwood Creek confluence to the Yellowhawk Creek dam	Rearing and migration	F	Yes	No	Protection	SL, K, H, O, LWD	
Yellowhawk Creek	Cottonwood Creek at confluence with Yellowhawk Creek	Rearing and migration	F	Yes	No	Protection	SL, K, H, LWD	
Cottonwood Creek	Mainstem from mouth to County limits	Spawning and rearing	F	No	No; however, recently upgraded to protection reach	NA	F, T, H, K	Low benefit - restoration
Garrison Creek	Mainstem from confluence with Walla Walla River to confluence with Mill Creek	Rearing and migration	F	No	No	NA	F, T, O, K, H, LWD, SL	Low restoration benefit

[1] The reach of the mainstem Snake River from the Lower Monumental Dam upstream to the County limits is designated as migratory habitat for summer steelhead; however, it is designated as spawning and rearing habitat for fall Chinook salmon. Therefore, this reach is unique in that fall Chinook habitat defines the recommended level of protection.

[2] Mill Creek from mouth to start of Corps project at Gose Street

KEY

Sediment load = SL, Key habitat quantity = K, Habitat diversity = H, Temperature = T, Large Woody Debris = LWD, Flow = F, Predation = P, Obstructions = O, Channel stability = C

Sources: Snake River Salmon Recovery Board (2006) – Chapters 4 and 6; Saul et al. 2001; DNR 2007;

2.5.2 Riparian/Stream Buffers

A riparian buffer can be defined as a strip of land adjacent to a river or stream. For planning purposes, a buffer can be established to mitigate the impacts of human activities on the stream ecosystem (Johnson and Ryba 1992). In its natural state, riparian buffers are characterized by native plants, including trees, shrubs, or tall, coarse grasses. As the name suggests, these plants "buffer" the stream from anything that flows into it - polluted water, eroding soil or toxic chemicals. The roots of the plants hold the river banks in place, stabilizing the land and absorbing the water and materials that flow across the land.

As discussed in Section 2.4.4, riparian areas serve multiple functions in the aquatic ecosystem and in terrestrial and semiaquatic wildlife habitat, and they serve as migration or dispersion corridors. As related to aquatic species, riparian areas provide extensive shading benefits, and overhanging vegetation serves as quality habitat for juvenile rearing. Vegetation also is instrumental in providing for sources of large woody debris and providing protection against erosion and streambank instability. Temperature attenuation is another role fulfilled by riparian areas, although the beneficial impact regarding temperature is a function of stream width; the wider the stream, the less cumulative reduction in surface water temperature due to riparian buffers. Riparian areas also play key roles in connecting the water table to adjacent streams.

General Overview of BAS

Appropriate buffer sizes will depend on the area necessary to maintain the desired riparian or stream functions for the given suite of land use activities that may cause impacts to the associated waterbody. A wider buffer may be desired to protect streams from impacts resulting from high intensity land use activities such as unpermitted ad hoc trail construction, recreation, pets, garbage, and tree removal for unpermitted view improvements and hazard reduction. Narrower buffers may suffice in areas of low-intensity land use (May 2000). It should be noted that opportunities for protection or improvement of buffer conditions in areas of existing high-intensity land use are often effectively foreclosed by existing development, or because the existing habitat conditions are already highly altered. Under such conditions, establishing buffers wide enough to provide an effective full-range of riparian functions is likely unattainable, and other actions may be required to improve habitat conditions beyond what riparian buffers are able to provide. In addition, buffer vegetation type, diversity, condition, and maturity are equally as important as buffer width, and the best approach to providing high-quality buffers is to strive for establishing and maintaining mature native vegetation communities (May 2000).

The literature presents little information regarding riparian areas in eastern Washington (Yakima County 2006); however, the best available science specifies that the width of a riparian buffer will depend on the particular function or range of functions being protected. As presented throughout this document, those functions relate directly to the EDT-derived limiting factors for specific stream reaches throughout the County.

The life stages of Walla Walla County fish species to be addressed by the CAO are tied to the following general habitat requirements that are provided in the County:

- Adequate but not excessive stream flows

- Cool, well-oxygenated, unpolluted water
- Clean, appropriately sized streambed spawning gravels that are relatively free of fine sediments
- Instream structural diversity (interposed pools, riffles, hiding, holding and resting cover)
- Unimpeded migratory access to and from spawning and rearing areas

These habitat requirements and life cycle needs should be given special consideration when developing critical area protection programs. For example, critical area programs can ensure that riparian corridors and vegetation management areas along shorelines are preserved to help provide LWD for structural diversity, lower water temperature, nutrient input, and shoreline stabilization. Protection of riparian habitat can, at least partially, mitigate the adverse effects of urbanization and development on aquatic species. The riparian area necessary to maintain functions and values of critical aquatic species should be wide enough to permit natural channel migration (Knutson and Naef 1997; Portland Metro 2002; Snyder and Stanford 2001; Stanford et.al. 2002; Ward and Stanford 1995). It is recognized that channelized systems would have limited channel migration flexibility.

When establishing buffer widths, it is important to consider the surrounding environment. For example, when slopes are present, Wenger (1999) recommends a buffer base of 100 feet, plus 2 feet per each 1 percent of slope. Wenger (1999) also recommends consideration of the following criteria:

- Existing or potential value of the resource to be protected
- Site, watershed, and buffer characteristics
- Intensity of adjacent land use
- Specific water-quality and/or habitat functions desired

WDFW's (1997) Final Environmental Impact Statement for the Wild Salmonid Policy developed a buffer system dependent on stream-typing. The system requires a maximum buffer of 100 to 150 feet on each side of a stream larger than 5 feet wide, with a minimum of at least 50 feet on all other streams. WDFW's system is adaptive based on the surrounding landscape and should be increased or decreased based on adjacent land use and anticipated channel migration. WDFW determined that intermittent and ephemeral streams with low gradient may not require the full buffer width.

Generally, narrower buffers may be sufficient when the riparian area is in good condition, the resource values are low, the adjacent land use has a low potential for impact, and/or the desired buffer functions are few. On the other hand, wider buffers are necessary when the riparian quality is poor and high-value water resources exist adjacent to intense land uses, or where a high level of multiple buffer functions is desired (Palone and Todd 1997). Riparian areas associated with small streams are narrower and less distinct than those associated with large streams or rivers. In smaller streams, riparian areas typically have more influence on specific characteristics, including instream shading. As stream width increases, the amount of water surface shaded by riparian vegetation decreases and therefore the influence of streamside vegetation on the water temperature of large streams is less than the influence on smaller streams. Stream temperature in large rivers is more dependent on water coming from upstream reaches.

In urban environments, Leavitt (1998) found that a buffer width of 30 meters (approximately 98 feet) was adequate to control nutrients, stormwater and sediments, as well as to attenuate temperature. However, he cautions that an appropriately sized buffer will vary according to the surrounding environment and adjacent land uses. Palone and Todd (1997) reported that buffers should be a minimum of 35 to 100 feet wide to provide appropriate riparian function under most circumstances. Pizzimenti (2002) found that riparian buffers on agricultural lands with widths from 5 to 30 meters (16 to 98 feet) provide improved water quality function. During a review of literature regarding buffer widths specific to LWD recruitment, Cederholm et al. (2000) reported that most sources recommended buffers of 30 to 60 meters (98 to 197 feet).

Best available science information regarding specific riparian-based functions that are currently limiting in most aquatic waterways in the County is presented by specific buffer functions below.

Riparian Buffer Widths in Relation to Specific Limiting Factors

Large Woody Debris (LWD) Recruitment

The important role of fallen trees and tree parts as structure-forming elements in stream channels is well known. LWD in streams influences coarse sediment storage and pool formation, provides instream hiding cover, creates hydraulic heterogeneity, moderates flow disturbances, provides cover, and contributes to overall channel complexity. LWD traps and accumulates sediment, small woody debris, and other organic matter (Bilby 1981). The complex, submerged structure formed by LWD and entrapped smaller woody debris provides flow refugia and essential cover in which salmonids conceal themselves from predators and competitors and find profitable feeding positions (McMahon and Hartman 1989; Fausch 1984). The removal of riparian forest reduces woody debris in streams, which in turn leads to adverse changes in channel and habitat-forming processes (Bilby 1984; Heifetz et al. 1986; McDade et al. 1990; Van Sickle and Gregory 1990; Bilby and Ward 1991).

With regard to LWD input, Spence et al. (1996) refer to the Forest Ecosystem Management Assessment Team's (FEMAT) (1993) site potential tree height (SPTH) standard for riparian buffers in forested environments. A SPTH can be defined as the potential height of a mature tree at a particular location. The concept of scaling riparian buffer widths to the potential height of a tree was first proposed by FEMAT who was assessing riparian protections for national forest lands (FEMAT 1993). They reasoned that trees were a logical scaling factor because (1) they are a dominant factor in determining habitat conditions and (2) when left unmanaged, their size (height) reflected inherent productivity and constraints of a given site. As a result of this logic generalized curves using scientific data and professional judgment were developed to help rate buffer effectiveness for a variety of ecological functions, including shade, litter fall (e.g. leaves, branches), root strength and coarse woody debris inputs.

A SPTH of 110 feet for eastside forests was established, and estimates that a buffer width of approximately 0.75 SPTH (82.5 feet) is needed to provide minimum protection of stream shading, litter inputs, LWD, and nutrient regulation. FEMAT (1993) concluded that most of the bank stabilizing influence of riparian areas is likely provided by trees within 0.5 SPTH of the stream channel (55 feet). Spence et al. (1996) further suggest that buffer widths designed to protect LWD recruitment and shading may be adequate to prevent excessive nutrient or pollution concentrations. However, if a land use activity is intense and has the potential to increase pollutant loadings, buffers may need to be wider.

Riparian buffer widths of 100 to 200 feet (equal to about 1 SPTH) generally provide adequate LWD recruitment potential, depending on site conditions such as stream size, channel confinement, gradient, and buffer vegetation characteristics (i.e. type, maturity, and density) (Robison and Beschta 1990; McDade et al. 1990; Thomas et al. 1993). With respect to stream size, the role of LWD varies, with riparian vegetation generally exerting a greater influence on smaller streams (Knutson and Naef 1997). Large woody debris is not easily transported in small streams, regardless of gradient, thus individual pieces (logs, root wads, etc) can greatly influence channel morphology, instream cover, food resources, and sediment transport. As stream size increases, the influence of riparian vegetation and individual pieces of LWD decreases, and more substantial logjams are needed to affect instream structural complexity. Larger buffer widths (greater than 200 feet) may be required for long-term natural recruitment of woody material (FEMAT 1993; May 2000). Humans can “import” woody debris to streams and rivers, but these artificial recruitment efforts provide limited, short-term benefits to stream habitat (e.g., fish cover, localized hydraulic complexity). Therefore, human installation of LWD is not an adequate substitute for the natural recruitment potential of healthy riparian areas, nor does it provide many other important long-term benefits provided by native vegetation buffers. Artificially introduced LWD can provide some habitat benefits in the absence of riparian buffers and natural recruitment (e.g. highly managed agricultural areas), or as an interim measure while existing or newly established riparian buffers mature.

Shading and Temperature

Thermal benefits of shading by riparian vegetation in summer are obvious. Aside from summer cooling, riparian forest cover also exerts winter-insulating effects (Murphy and Meehan 1991).

As was reviewed in GEI (2002), thermal modeling results indicate that stream temperature in any given location is primarily dependent on the temperature of water directly upstream, or the input water temperature. Riparian vegetation generally serves to reduce solar heating and maintain water temperatures. Under undisturbed conditions, stream temperatures are maintained because the surface and groundwaters that comprise streamflow are thermally protected by upland and riparian vegetation and soils. As forested area in a watershed is removed, thermal protection is removed and the ratio of surface to groundwater in a stream increases. Combined with loss of thermal protection, stream temperatures increase. Therefore, actions in upper watersheds can lead to increased water temperatures in lowland areas, but adequate shading is required in lowland areas to prevent further solar heating.

The value of riparian buffers in moderating stream temperatures is well-established, but the effectiveness of different buffer widths varies depending on site conditions. Several authors (Beschta et al. 1987) have concluded that buffer strip widths of 100 feet or more generally provide the same level of shading as that of an old growth forest in the Pacific

Northwest while several authors have recommended a minimum buffer width of 30 feet (Davies and Nelson 1994). In forested areas, harvest treatments that leave overstory vegetation buffers adjacent to streams have been shown to have no significant impact on stream temperature (Lee and Samuel 1976; Sugimoto et al. 1997). In coastal British Columbia, Gomi et al. (2003) conducted a 6-year field experiment to evaluate the effects of riparian buffer widths on stream and riparian ecosystems, including stream temperature response. Treatments included no timber harvesting, harvesting with 33 feet and 100 feet wide riparian buffers, and clear-cut harvesting with no buffer. The results indicated that water temperature in the streams with 33 feet and 100 feet wooded buffers did not exhibit statistically significant warming. Todd (2000) examined various buffer functions and found that smaller riparian buffers (as narrow as about 40 feet) are required to protect water temperature and food web functions, and Johnson and Ryba (1992) recommend a similar buffer width of from 30 to 100 feet to effectively protect stream temperature. However, Brown and Kryier (1970) noted that on very small streams, adequate shade may be provided by brush species.

Bank Stabilization and Habitat Formation

The effectiveness of riparian vegetation is well known to naturally stabilize stream banks while providing structural habitat for salmonids. The vegetation also influences water current and shoreline shape in other ways that benefit salmonid habitat. As reviewed in Spence et al. (1996), roots bind streambank soils, and stems, branches, and projecting roots slow water currents that bear against riparian areas. The cover of healthy, native-plant communities generally perform this function more beneficially for salmonid habitat than do artificial reinforcements made of rock or other hard, non-living materials.

The riparian vegetation that protects shorelines also provides structural habitat for aquatic organisms, such as many salmonid microhabitats in live vegetation and in woody debris. This material, most important being tree roots and brush that drapes into the water, creates positions that are concealed from predators and give shelter from water velocity but are near fast currents that bring food (Fausch 1984). Vegetation resists shoreline erosion but generally not as drastically as do rock riprap, concrete bulkheads, steel sheet-piling, and the like. Diverse native vegetation can be expected to moderately retard shoreline erosion while maintaining the ability for the channel to migrate, and to form and reform salmonid habitat features.

Filtering of Sediment, Nutrients, and Chemicals

Uptake of dissolved chemicals and filtration of sediments from overland-runoff and flood water is an important riparian function (Cummins et al. 1994). Spence et al. (1996) reviewed evidence for these processes and for alteration of the flux of these materials through stream systems. Wenger (1999) found the buffer width required for maintenance of long-term riparian function is 30 to 100 meters (98 to 328 feet) and that 30 meter (100 foot) buffers are sufficient to trap sediments under most circumstances. Trapping and filtration of upland-generated sediments contributes to the formation of spawning gravels that are free of fine materials for adequate egg incubation, spawning and rearing.

Literature analysis indicated that healthy riparian zones greater than 200 feet from the edge of the floodplain probably remove most sediment from overland flow (FEMAT 1993). The chemicals that constitute plant nutrients may be largely incorporated in the riparian zone’s biomass. This and deposits of sediment contribute to the building of “new land” involved in channel or shoreline migration. Any action, such as clearing, that degrades the integrity of the riparian zone will hamper its functions of chemical filtering, uptake, and of land-building.

Organic Input and Nutrient Source

Riparian trees and other vegetation furnish water bodies with a "litter fall" of plant particles (leaves, pollen grains, etc.), as well as with terrestrial insects. These organic materials compose a major nutrient and energy source for food webs that sustain production of salmonids, particularly in small (low- and mid-order) streams (Cummins et al. 1994). Along smaller stream channels, litter fall from healthy stands of riparian vegetation (an allochthonous source) is a relatively more important basis for the aquatic food web than is within-channel (autochthonous) production of algae, which tends to predominate as the basis for the aquatic food web in wider, less shaded streams and in standing waters (Vannote et al. 1980).

Clearing and certain other subsequent actions obviously reduce or destroy the nutrient providing function of riparian vegetation.

Microclimate

Less obvious but perhaps no less important are the microclimatic influences of the riparian forest on air that passes through on its way to a stream or pond. These include humidity, temperature, and wind speed, as reviewed in Pollack and Kennard (1998). Brosofske et al. (1997) documented that riparian microclimate is important to consider in management because it affects plant growth, therefore influencing ecosystem processes such as decomposition, nutrient cycling, plant succession, and plant productivity. Thus microclimate alterations can affect structure of the riparian forest, the waters within it, and the well-being of many animals, including fish.

Summary of BAS Recommended Buffer Widths by Function

The following discussion is a review of major riparian functions and the level of functionality afforded by riparian buffers of varying widths as reported in the literature. Table 2.5-3 summarizes the conclusions and recommendations for riparian buffer widths in frequently cited literature reviews of riparian buffer functions. This table is not intended to be prescriptive, but does serve to illustrate the wide range of effective buffer widths reported in the literature, and also recommends buffer widths that provide a reasonable level of habitat functionality under most conditions. However, it must be recognized that a single prescription is not necessarily appropriate or warranted for all situations. Buffer recommendations and functionality are frequently expressed in terms of SPTH (the height of mature trees that a given site can be expected to support).

There is no consensus in the scientific literature regarding single buffer widths for particular functions, or to accommodate all functions (Yakima County 2006); however, neither does the literature indicate that buffers are not needed, nor that riparian buffers beyond the equivalent of several SPTHs are needed. A buffer width equal to 1 SPTH would provide for a broad range of riparian functions important for sustaining salmonids.

Table 2.5-3
Range of Functional Riparian Area Widths for Fish and Wildlife Habitat

Function		Reference	Functional width (each side of stream)
Temperature regulation and shade	Shade	FEMAT 1993	100 ft
	Shade	Castelle et al. 1994	50-100 ft
	Shade	Spence et al. 1996	98 ft
	Shade	May 2000	98 ft
	Shade	Osborne and Kovacic 1993	33-98 ft
	Shade	FEMAT 1993	150 ft
	Shade/reduce solar radiation	Brosofske et al. 1997	250 ft
	Control temperature by shading	Johnson and Ryba 1992	39-141 ft
	Water temperature	May 2000	98 ft
	Water temperature	Knutson and Naef 1997	35-151 ft
Bank stabilization and sediment control	Bank stabilization	Spence et al. 1996	170 ft
	Bank stabilization	FEMAT 1993	100 ft
	Sediment removal and erosion control	May 2000	98 ft
	Ephemeral streams	Clinnick et al. 1985	66 ft
	Bank stabilization	FEMAT 1993	1 SPTH
	Sediment control	Erman et al. 1977	100 ft
	Sediment control	FEMAT 1993	200 ft
	Sediment Removal	Johnson and Ryba 1992	10 ft (sand)-400 ft (clay)
	High mass wasting area	Cederholm 1994	125 ft
	Sediment removal and erosion control	May 2000	98 ft
	Erosion control	Knutson and Naef 1997	100-125 ft
	Sediment filtration	Knutson and Naef 1997	26-300 ft
Pollutant removal	Nitrogen	Wenger 1999	50-100 ft
	General pollutant removal	May 2000	98 ft
	Filter metals and nutrients	Castelle et al. 1994	100 ft
	Pesticides	Wenger 1999	>49 ft
	Nutrient removal	Johnson and Ryba 1992	33-141 ft
	Pollutant removal	May 2000	98 ft
	Pollutant removal	Knutson and Naef 1997	13-600 ft
Large woody debris and organic litter	Large woody debris	Spence et al. 1996	1 SPTH
	Large woody debris	Wenger 1999	1 SPTH
	Large woody debris	May 2000	262 ft
	Large woody debris	McDade et al. 1990	150 ft
	Large woody debris	Knutson and Naef 1997	100-200 ft
	Large woody debris	FEMAT 1993	200 ft
	Small woody debris	Pollock and Kennard 1998	100 ft
	Organic litterfall	FEMAT 1993	1 SPTH
	Organic litterfall	Erman et al. 1977	100 ft
	Organic litterfall	Spence et al. 1996	170 ft
	Organic litter	FEMAT 1993	100 ft

2.6 Human Activity and Aquatic Habitat Functions

2.6.1 General Conditions

Walla Walla County streams and rivers once flowed through vegetated floodplains. These streams had natural flow regimes, excellent water quality, and complex instream cover. Today, streams and riparian areas have been altered for flood control purposes, and to accommodate agricultural land use and development activities. The effects of human activities on aquatic habitats are summarized in Table 2.6-1.

Table 2.6-1
General Effects of Different Human Activities on Aquatic Habitats

Activities	Effects
Removing riparian vegetation	Reduced channel complexity, simplified channel morphology, increased stream velocities, loss of pools for holding and rearing, loss of spawning gravel, loss of side channels, loss of wood recruitment, loss of connectivity with floodplain and riparian zone, reduced shade and cover; increased solar radiation; increased erosion and sedimentation, elevated water temperatures and reduced leaf litter.
Introducing invasive non-native vegetation	Altering native riparian habitat functions including associated wildlife refuge, insect litter, replacement of coniferous shade producing trees, etc.
Creating impervious surfaces, filling and draining of wetlands, and increasing water allocations	Altered flow regimes (timing and magnitude of flows), degraded water quality/increased stream temperatures, increased stormwater runoff, and altered instream habitat.
Streambank modifications	Loss of natural meander/habitat-forming processes, disconnected floodplains and subsequent loss of floodplain processes.
Discharging sewage effluent	Degraded water quality, altered water temperatures, reduced dissolved oxygen concentrations, and increased contaminant levels.
Constructing culverts, pipes, and ditches	Obstructed upstream passage of fish and reducing the downstream movement of wood and gravel.
Construction activities	Increased erosion, turbidity and inputs of fine sediment during construction and prior to revegetation.
Recreational activities	Degraded water quality, and increased contact with listed species.

2.6.2 Existing Riparian Conditions

Riparian conditions vary throughout Walla Walla County. In the urban or urbanizing areas, development is often directly adjacent to streams. Riparian vegetation is often limited and the riparian areas narrow. In the more rural areas of the County, riparian areas are typically less developed and provide more typical riparian functions.

Understanding existing riparian conditions can help provide context for stream buffer recommendations for the water bodies within Walla Walla County (identified in Table 2.5-1). To determine the existing riparian conditions within Walla Walla County, each stream within the County was analyzed based upon a series of cross-section measurements of detailed aerial imagery provided by the County's GIS department. For each stream segment, the channel width and riparian vegetation width were measured, and average, maximum, and minimum widths were determined. Ninety segments were

Insert Figure 2.6-1 (11x17)

analyzed in total. The results of this analysis are presented in this section and in Table 2.6-2. Figure 2.6-1 shows the riparian areas that were analyzed.

It is important to note that averages of riparian widths per stream side is meant to typify an average condition and does not necessaryly reflect actual conditions. In almost every case, more or less riparian area is found on a given stream side. In addition, for many streams analyzed, riparian wetlands contribute to a maximum riparian width calculation, which will typically increase average riparian widths. While these riparian wetland areas were not backed out in calculating riparian widths, this condition was accounted for in riparian buffer recommendations. Riparian wetlands will receive their own buffer based upon their classification, and the riparian buffer will be integrated with the wetlands buffer into a larger protection area, where applicable. The US Department of Agriculture's (USDA's) Conservation Reserve Enhancement Program (CREP) buffers have also been included in riparian areas, for those in place by spring 2006.

Bergevin Spring Creek
County (Stream Segment SP1-1)
The riparian width is approximately 31 feet per stream side for the one segment. The maximum riparian width (including both stream sides) is 360 feet and the minimum width (including both stream sides) is 15 feet. The stream channel width averages approximately 8 feet.

Birch Creek
County (Stream Segment BIR-1)
The riparian width is approximately 25 feet per stream side for the one segment. The maximum riparian width (including both stream sides) is 97 feet and the minimum width (including both stream sides) is 39 feet. The stream channel width averages approximately 19 feet.

Blue Creek
County (Stream Segment BLU-1)
The riparian width is approximately 39 feet per stream side for the one segment. The maximum riparian width (including both stream sides) is 159 feet and the minimum width (including both stream sides) is 43 feet. The stream channel width averages approximately 10 feet.

Bryant Creek
UGA (Stream Segment BRY-1)
The riparian width is approximately 14 feet per stream side for the one segment. The maximum riparian width (including both stream sides) is 100 feet and the minimum width (including both stream sides) is 9 feet. The stream channel width averages approximately 7 feet.

Big Spring Branch Creek
County (Stream Segment BSB-1)
The riparian width is approximately 17 feet per stream side for the one segment. The maximum riparian width (including both stream sides) is 108 feet and the minimum width (including both stream sides) is 24 feet. The stream channel width averages approximately 12 feet.

Table 2.6-2
Existing Riparian Conditions in Walla Walla County

Name	Stream Segment ID#	Riparian / Stream Maximum width	Riparian / Stream Minimum width	Stream at Riparian Maximum width	Stream at Riparian Minimum width	Stream Average Width	Riparian / Stream Average Total Width	Riparian Average Width	Riparian Average Width per Side	Segment Description (* Concrete channel), (UG = Underground)
BERGEVIN SPRING CREEK	SP1-1	360.1	14.9	15.3	4.5	8.0	68.9	60.9	30.5	FROM DRY CREEK TO LOWER WAITSBURG ROAD
BIRCH CREEK	BIR-1	96.8	38.7	27.6	16.7	19.1	69.1	50.0	25.0	FROM WALLA WALLA RIVER TO COUNTY LINE
BLUE CREEK	BLU-1	158.6	42.8	20.9	9.5	10.3	87.9	77.6	38.8	FROM MILL CREEK TO FORESTED AREA
BRYANT CREEK	BRY-1	100.4	8.5	8.5	5.4	6.6	35.4	28.8	14.4	FROM FORT WALLA WALLA PARK TO SPRAGUE AVE
BIG SPRING BRANCH CREEK	BSB-1	107.8	23.6	22.2	6.6	11.9	46.5	34.6	17.3	FROM EAST LITTLE WALLA WALLA RIVER TO COUNTY LINE
CALDWELL CREEK	CAL-1	135.1	15.4	18.0	4.8	10.8	47.8	37.0	18.5	FROM YELLOWHAWK CREEK TO HEADWATERS
COLD CREEK	COL-1	156.5	19.1	39.1	11.3	15.1	58.7	43.6	21.8	FROM MILL CREEK TO HEADWATERS
COPPEI CREEK	COP-1	315.0	47.2	21.3	15.1	18.0	128.6	110.6	55.3	FROM TOUCHET RIVER TO NORTH-SOUTH FORK
COPPEI SOUTH FORK	COP-2	453.7	62.2	7.9	13.8	16.9	226.3	209.3	104.7	FROM COPPEI CREEK TO FORESTED AREA
COPPEI NORTH FORK	COP-3	227.1	25.5	9.8	9.3	10.9	123.0	112.1	56.0	FROM COPPEI CREEK TO FORESTED AREA
COTTONWOOD CREEK	COT-1	267.9	66.3	41.6	15.9	33.8	126.3	92.5	46.2	FROM YELLOWHAWK CREEK TO POWERLINE RD
COTTONWOOD CREEK	COT-2	167.8	48.5	38.0	23.0	32.6	95.4	62.8	31.4	FROM POWERLINE RD TO COUNTY LINE
DOAN CREEK	DOA-1	237.3	5.0	8.7	3.0	9.6	47.7	38.1	19.1	FROM MILL CREEK TO WHITMAN RD
DOAN CREEK	DOA-2	364.1	22.3	12.0	9.2	10.0	105.8	95.8	47.9	FROM WHITMAN DR TO HEADWATERS
DRY CREEK	DRY-1	125.4	47.6	14.4	10.8	15.5	83.9	68.4	34.2	FROM WALLA WALLA RIVER TO GUY FINE RD
DRY CREEK	DRY-2	381.7	70.8	35.7	27.0	32.0	184.2	152.2	76.1	FROM GUY FINE RD TO SR 125
DRY CREEK	DRY-3	336.4	39.0	28.6	17.3	21.0	96.1	75.1	37.5	FROM SR 125 TO MIDDLE WAITSBURG RD
DRY CREEK	DRY-4	366.6	22.3	45.7	6.6	23.3	172.8	149.5	74.7	FROM MIDDLE WAITSBURG RD TO COCHRAN ST
DRY CREEK	DRY-5	293.8	14.4	25.3	5.5	19.0	97.6	78.6	39.3	FROM COCHRAN ST TO FORESTED AREA
E. LITTLE WALLA WALLA RIVER	ELW-1	110.3	30.8	8.5	13.0	17.1	59.5	42.3	21.2	FROM WALLA WALLA RIVER TO COUNTY LINE
GARRISON CREEK	GAR-1	69.9	19.8	12.6	13.4	15.0	35.8	20.8	10.4	FROM WALLA WALLA RIVER TO EDGE OF UGA
GARRISON CREEK	GAR-2	201.1	16.0	24.1	8.1	11.8	76.0	64.2	32.1	FROM EDGE OF UGA TO S COLLEGE AVE
GARRISON CREEK	GAR-3	144.6	15.0	20.9	7.4	9.8	53.3	43.5	21.8	FROM S COLLEGE AVE TO FORT WALLA WALLA PARK
GARRISON CREEK	GAR-4	29.7	6.8	10.2	4.8	7.9	16.8	8.9	4.4	FROM FORT WALLA WALLA PARK TO 2nd AVE
GARRISON CREEK	GAR-5	38.6	12.2	10.2	4.8	7.9	22.6	14.7	7.4	FROM 2nd AVE TO PLEASANT ST
GARRISON CREEK	GAR-6	74.8	9.0	35.1	4.8	7.4	22.9	15.5	7.8	FROM PLEASANT ST TO E. ALDER ST
GARRISON CREEK	GAR-7	112.4	10.8	7.3	4.2	6.9	27.0	20.1	10.0	FROM E. ALDER ST TO YELLOWHAWK CREEK
GRANDVIEW SPRING BRANCH	GRA-1	46.3	11.5	5.2	4.6	6.6	23.0	16.4	8.2	FROM WALLA WALLA RIVER TO COUNTY LINE

Table 2.6-2
Existing Riparian Conditions in Walla Walla County

Name	Stream Segment ID#	Riparian / Stream Maximum width	Riparian / Stream Minimum width	Stream at Riparian Maximum width	Stream at Riparian Minimum width	Stream Average Width	Riparian / Stream Average Total Width	Riparian Average Width	Riparian Average Width per Side	Segment Description (* Concrete channel), (UG = Underground)
GARDENA CREEK	GRD-1	270.5	20.3	9.5	3.8	6.3	65.8	59.5	29.7	FROM WALLA WALLA RIVER TO INGHAM ROAD
LITTLE MUD CREEK	LMD-1	55.58	14.81	9.37	6.18	22.56	6.94	15.66	7.83	FROM PINE CREEK TO COUNTY LINE
MUD CREEK	MD1-1	181.8	17.9	5.6	4.0	8.2	66.2	58.0	29.0	FROM WALLA WALLA RIVER TO MC DONALD ROAD
MUD CREEK	MD1-2	421.0	23.7	14.1	10.9	9.9	118.1	108.2	54.1	FROM MC DONALD ROAD TO COUNTY LINE
MUD CREEK	MD2-1	202.5	66.0	17.3	7.0	10.3	141.7	131.4	65.7	FROM DRY CREEK TO T7R35S15
MUD CREEK	MD3-1	416.4	24.9	15.3	17.7	14.7	120.3	105.5	52.8	FROM DRY CREEK AT DIXIE TO FORESTED AREA
MILL CREEK	MIL-1	330.2	49.2	26.7	15.8	29.0	162.9	133.9	67.0	FROM WALLA WALLA RIVER TO LASTCHANCE RD
MILL CREEK	MIL-2	343.1	115.4	53.9	23.2	58.2	214.6	156.4	78.2	FROM LASTCHANCE RD TO GOSE ST
MILL CREEK *	MIL-3 *	*	*	*	*	*	*	*	*	FROM GOSE ST TO MILL CREEK LAKE DIVERSION *
MILL CREEK	MIL-4	1613.9	153.2	64.4	118.8	63.6	550.5	486.9	243.4	FROM MILL CREEK LAKE DIVERSION TO TITUS CREEK
MILL CREEK	MIL-5	967.9	70.6	29.7	32.3	33.6	304.9	271.2	135.6	FROM TITUS CREEK TO BLUE CREEK
MILL CREEK	MIL-6	560.0	93.1	44.9	58.2	36.4	189.1	152.7	76.4	FROM BLUE CREEK TO MILL CREEK RD
MILL CREEK	MIL-7	237.1	68.4	92.0	39.6	40.3	138.5	98.2	49.1	FROM MILL CREEK RD TO COUNTY LINE
NORTH RUSSELL CREEK	NRU-1	372.4	39.5	30.0	5.8	10.0	107.8	97.8	48.9	FROM RUSSELL CREEK TO HEADWATERS
PINE CREEK	PIN-1	556.4	41.3	13.0	16.0	16.7	149.6	132.9	66.4	FROM WALLA WALLA RIVER TO COUNTY LINE
RESER CREEK	RES-1	63.1	10.2	8.1	4.7	7.3	30.7	23.4	11.7	FROM RUSSELL CREEK TO S WILBUR AVE
RESER CREEK	RES-2	290.1	19.3	23.3	3.8	8.6	52.5	43.9	22.0	FROM S WILBUR AVE TO COUNTY LINE
RUSSELL CREEK	RSL-1	111.7	20.8	12.8	12.2	10.8	52.7	41.9	20.9	FROM YELLOWHAWK TO RESER CREEK
RUSSELL CREEK	RSL-2	115.8	19.6	9.2	4.3	10.6	51.3	40.7	20.4	FROM RESER CREEK TO DEEPING RD
RUSSELL CREEK	RSL-3	183.4	22.2	26.7	10.5	23.2	87.9	64.7	32.3	FROM DEEPING RD TO NORTH SOUTH FORK
SPRING CREEK	SP2-1	144.6	30.3	15.6	12.7	12.8	66.9	54.1	27.0	FROM DRY CREEK TO BLUE CREEK ROAD
SPRING VALLEY CREEK	BEV-1	289.6	UG	7.63	UG	29.43	4.13	25.3	12.65	FROM DRY CREEK TO HEADWATERS
SOUTH RUSSELL CREEK	SRU-1	115.0	49.6	8.8	11.6	12.9	76.0	63.1	31.6	FROM RUSSELL CREEK TO MCKAY GRADE RD
SOUTH RUSSELL CREEK	SRU-2	140.7	41.1	6.8	21.3	13.4	92.6	79.2	39.6	FROM MCKAY GRADE RD TO COUNTY LINE
STONE CREEK	STO-1	164.8	26.3	7.5	8.1	23.6	73.6	50.0	25.0	FROM WALLA WALLA RIVER TO TEAL RD
STONE CREEK	STO-2	107.0	33.3	10.2	6.3	8.1	70.8	62.7	31.3	FROM TEAL RD TO S COLLEGE AVE
STONE CREEK	STO-3	121.2	15.6	7.4	6.4	8.0	46.2	38.2	19.1	FROM S COLLEGE AVE TO SE MYRA RD
STONE CREEK	STO-4	109.4	9.1	6.7	5.3	6.5	29.1	22.6	11.3	FROM SE MYRA RD TO W. TIETAN ST
STONE CREEK	STO-5	164.4	7.4	8.0	4.8	6.7	44.7	38.0	19.0	FROM W. TIETAN ST TO HEADWATERS

Table 2.6-2
Existing Riparian Conditions in Walla Walla County

Name	Stream Segment ID#	Riparian / Stream Maximum width	Riparian / Stream Minimum width	Stream at Riparian Maximum width	Stream at Riparian Minimum width	Stream Average Width	Riparian / Stream Average Total Width	Riparian Average Width	Riparian Average Width per Side	Segment Description (* Concrete channel), (UG = Underground)
TITUS CREEK	TI-1	197.3	14.7	8.1	5.0	7.1	56.3	49.2	24.6	FROM MILL CREEK TO BLACKBERRY LN
TITUS CREEK	TI-2	442.0	40.4	19.1	6.9	7.1	168.7	161.6	80.8	FROM BLACKBERRY LN TO MILL CREEK
TOUCHET RIVER	TOU-01	826.4	80.3	44.5	36.1	46.4	475.4	428.9	214.5	FROM WALLA WALLA RIVER TO CUMMINS RD
TOUCHET RIVER	TOU-02	705.9	76.5	37.1	38.5	41.3	273.2	231.9	116.0	FROM CUMMINS RD TO JOHNSON RD
TOUCHET RIVER	TOU-03	766.3	150.2	55.6	34.5	50.3	363.0	312.7	156.3	FROM JOHNSON RD TO PLUCKER RD
TOUCHET RIVER	TOU-04	976.6	133.1	33.7	37.6	38.9	401.7	362.9	181.4	FROM PLUCKER RD TO LUCKENBILL RD
TOUCHET RIVER	TOU-05	808.4	165.4	54.4	37.2	53.1	382.9	329.8	164.9	FROM LUCKENBILL RD TO HARVEY SHAW RD
TOUCHET RIVER	TOU-06	1380.4	100.0	45.5	40.5	59.6	500.8	441.2	220.6	FROM HARVEY SHAW RD TO PETTY JOHN RD
TOUCHET RIVER	TOU-07	1584.7	308.0	68.7	41.3	50.0	601.5	551.6	275.8	FROM PETTY JOHN RD TO SR 125
TOUCHET RIVER	TOU-08	1139.1	270.4	65.6	60.1	52.3	658.1	605.8	302.9	FROM SR 125 TO HART RD
TOUCHET RIVER	TOU-09	1053.8	165.4	31.2	37.8	52.4	555.3	502.9	251.5	FROM HART RD TO SR 124
TOUCHET RIVER	TOU-10	1201.8	93.7	52.7	28.2	38.1	464.4	426.3	213.2	FROM SR 124 TO MAIN ST
TOUCHET RIVER	TOU-11	308.2	94.9	38.2	24.2	38.3	187.7	149.3	74.7	FROM MAIN ST TO COUNTY LINE
WALLA WALLA RIVER	WAL-01	794.2	138.9	207.4	83.2	109.0	295.9	186.9	93.5	FROM COLUMBIA RIVER TO US HWY 12
WALLA WALLA RIVER	WAL-02	679.1	138.3	66.0	88.4	56.0	451.6	395.6	197.8	FROM US HWY 12 TO BYERLEY RD
WALLA WALLA RIVER	WAL-03	880.4	118.6	41.8	76.0	65.6	255.8	190.2	95.1	FROM BYERLEY RD TO TOUCHET RIVER
WALLA WALLA RIVER	WAL-04	871.7	69.2	45.0	47.3	43.1	236.1	193.0	96.5	FROM TOUCHET RIVER TO PINE CREEK
WALLA WALLA RIVER	WAL-05	1048.6	99.7	70.3	64.0	48.2	340.8	292.6	146.3	FROM PINE CREEK TO LOWDEN GARDENA RD
WALLA WALLA RIVER	WAL-06	729.6	60.4	42.4	27.6	31.8	291.7	260.0	130.0	FROM LOWDEN GARDENA RD TO MILL CREEK
WALLA WALLA RIVER	WAL-07	756.1	153.4	32.2	30.6	39.0	440.9	401.9	200.9	FROM MILL CREEK TO GARRISION CREEK
WALLA WALLA RIVER	WAL-08	350.4	180.9	46.1	54.4	61.2	241.9	180.6	90.3	FROM GARRISION CREEK TO STONE CREEK
WALLA WALLA RIVER	WAL-09	496.2	152.7	54.9	83.3	68.1	356.1	288.1	144.0	FROM STONE CREEK TO EAST LITTLE WALLA WALLA RIVER
WALLA WALLA RIVER	WAL-10	394.0	91.5	94.9	20.4	57.2	191.1	133.9	67.0	FROM E. LITTLE WALLA WALLA RIVER TO YELLOWHAWK CREEK
WALLA WALLA RIVER	WAL-11	372.6	107.1	82.1	79.1	43.0	225.4	182.4	91.2	FROM YELLOWHAWK CREEK TO COUNTY LINE
WARM SPRINGS CREEK	WSP-1	13.34	UG	2.13	UG	UG	UG	UG	UG	FROM WALLA WALLA RIVER TO COUNTY LINE
WHETSTONE CREEK	WHE-1	166.9	37.3	12.7	8.4	10.9	84.6	73.7	36.9	FROM TOUCHET RIVER TO COUNTY LINE
WILSON CREEK	WIL-1	209.0	14.1	8.1	6.0	5.7	42.7	37.0	18.5	FROM TOUCHET RIVER TO T8R38S31
W. LITTLE WALLA WALLA RIVER	WLW-1	232.1	30.7	20.2	5.2	9.4	69.1	59.7	29.8	FROM WALLA WALLA RIVER TO FROG HOLLOW RD

Table 2.6-2
Existing Riparian Conditions in Walla Walla County

Name	Stream Segment ID#	Riparian / Stream Maximum width	Riparian / Stream Minimum width	Stream at Riparian Maximum width	Stream at Riparian Minimum width	Stream Average Width	Riparian / Stream Average Total Width	Riparian Average Width	Riparian Average Width per Side	Segment Description (* Concrete channel), (UG = Underground)
W. LITTLE WALLA WALLA RIVER	WLW-2	290.2	29.4	13.6	6.2	11.0	107.6	96.6	48.3	FROM FROG HOLLOW RD TO COUNTY LINE
YELLOWHAWK CREEK	YEL-1	179.9	52.1	20.4	20.5	21.0	100.4	79.4	39.7	FROM WALLA WALLA RIVER TO COTTONWOOD CREEK
YELLOWHAWK CREEK	YEL-2	180.8	28.6	11.5	12.0	14.5	76.8	62.3	31.2	FROM COTTONWOOD CREEK TO RUSSELL CREEK
YELLOWHAWK CREEK	YEL-3	57.3	22.6	23.0	7.0	13.3	44.8	31.5	15.8	FROM RUSSELL CREEK TO CALDWELL CREEK
YELLOWHAWK CREEK	YEL-4	116.8	21.6	13.0	8.1	15.2	43.6	28.4	14.2	FROM CALDWELL CREEK TO FERN AVE
YELLOWHAWK CREEK	YEL-5	83.3	14.0	29.5	8.0	15.0	34.9	19.9	10.0	FROM FERN AVE TO EAST-WEST SPLIT
YELLOWHAWK CREEK	YEL-6	49.3	14.1	11.5	10.1	12.6	26.5	13.9	7.0	WEST SPLIT
YELLOWHAWK CREEK	YEL-7	94.0	15.7	15.8	14.1	12.7	43.0	30.3	15.2	EAST SPLIT
YELLOWHAWK CREEK	YEL-8	72.7	18.7	13.4	12.6	16.4	45.7	29.3	14.6	FROM EAST-WEST SPLIT TO MILL CREEK

Caldwell Creek

UGA (Stream Segment CAL-1)

The riparian width is approximately 19 feet per stream side for the one segment. The maximum riparian width (including both stream sides) is 135 feet and the minimum width (including both stream sides) is 15 feet. The stream channel width averages approximately 11 feet.

Cold Creek

County (Stream Segment COL-1)

The riparian width is approximately 22 feet per stream side for the one segment. The maximum riparian width (including both stream sides) is 157 feet and the minimum width (including both stream sides) is 19 feet. The stream channel width averages approximately 15 feet.

Coppei Creek

County (Stream Segment COP-1)

The riparian width is approximately 55 feet per stream side for the one segment. The maximum riparian width (including both stream sides) is 315 feet and the minimum width (including both stream sides) is 47 feet. The stream channel width averages approximately 18 feet.

Coppei Creek South Fork

County (Stream Segment COP-2)

The riparian width is approximately 105 feet per stream side for the one segment. The maximum riparian width (including both stream sides) is 454 feet and the minimum width (including both stream sides) is 62 feet. The stream channel width averages approximately 17 feet.

Coppei Creek North Fork

County (Stream Segment COP-3)

The riparian width is approximately 56 feet per stream side for the one segment. The maximum riparian width (including both stream sides) is 227 feet and the minimum width (including both stream sides) is 26 feet. The stream channel width averages approximately 11 feet.

Cottonwood Creek

County (Stream Segments COT-1 and COT-2)

Two stream segments were measured for Cottonwood Creek. The average riparian width per stream side ranges from 31 to 46 feet. The maximum riparian width (including both stream sides) is 268 feet and the minimum width (including both stream sides) is 49 feet. The average stream channel width ranges from 33 to 34 feet.

Doan Creek

County (Stream Segment DOA-1)

The riparian width is approximately 19 feet per stream side for the one segment. The maximum riparian width (including both stream sides) is 227 feet and the minimum width (including both stream sides) is 5 feet. The stream channel width averages approximately 10 feet.

UGA (Stream Segment DOA-2)
The riparian width is approximately 48 feet per stream side for the one segment. The maximum riparian width (including both stream sides) is 364 feet and the minimum width (including both stream sides) is 22 feet. The stream channel width averages approximately 10 feet.

Dry Creek
County (Stream Segments DRY-1 to DRY-5)
Five stream segments were measured for Dry Creek. The average riparian width per stream side ranges from 34 to 76 feet. The maximum riparian width (including both stream sides) is 382 feet and the minimum width (including both stream sides) is 14 feet. The average stream channel width ranges from 16 to 32 feet.

East Little Walla Walla River
County (Stream Segment ELW-1)
The riparian width is approximately 21 feet per stream side for the one segment. The maximum riparian width (including both stream sides) is 110 feet and the minimum width (including both stream sides) is 31 feet. The stream channel width averages approximately 17 feet.

Garrison Creek
County (Stream Segment GAR-1)
The riparian width is approximately 10 feet per stream side for the one segment. The maximum riparian width (including both stream sides) is 70 feet and the minimum width (including both stream sides) is 20 feet. The stream channel width averages approximately 15 feet.

UGA (Stream Segments GAR-2 to GAR-7)
Six stream segments were measured for Garrison Creek within the UGA areas. The average riparian width per stream side ranges from 4 to 32 feet. The maximum riparian width (including both stream sides) is 201 feet and the minimum width (including both stream sides) is 7 feet. The average stream channel width ranges from 7 to 12 feet.

Grandview Spring Branch
County (Stream Segment GRA-1)
The riparian width is approximately 8 feet per stream side for the one segment. The maximum riparian width (including both stream sides) is 46 feet and the minimum width (including both stream sides) is 12 feet. The stream channel width averages approximately 7 feet.

Gardena Creek
County (Stream Segment GRD-1)
The riparian width is approximately 30 feet per stream side for the one segment. The maximum riparian width is 271 feet (including both stream sides) and the minimum width (including both stream sides) is 20 feet. The stream channel width averages approximately 6 feet.

Little Mud Creek
County (Stream Segment LMD-1)
The riparian width is approximately 8 feet per stream side for the one segment. The maximum riparian width (including both stream sides) is 56 feet and the minimum width

(including both stream sides) is 15 feet. The stream channel width averages approximately 23 feet.

Mud Creek (1)
County (Stream Segments MD1-1, MD1-2)
Two stream segments were measured for Mud Creek. The average riparian width per stream side ranges from 29 to 54 feet. The maximum riparian width (including both stream sides) is 421 feet and the minimum width is 182 feet. The average stream channel width ranges from 8 to 10 feet.

Mud Creek (2)
County (Stream Segment MD2-1)
The riparian width is approximately 66 feet per stream side for the one segment. The maximum riparian width is 203 feet (including both stream sides) and the minimum width (including both stream sides) is 66 feet. The stream channel width averages approximately 10 feet.

Mud Creek (3)
County (Stream Segment MD3-1)
The riparian width is approximately 53 feet per stream side for the one segment. The maximum riparian width is 416 feet (including both stream sides) and the minimum width (including both stream sides) is 25 feet. The stream channel width averages approximately 15 feet.

Mill Creek
County (Stream Segments MIL-1 to MIL-7)
Seven stream segments were measured for Mill Creek. The average riparian width per stream side ranges from 49 to 243 feet, not including Stream Segment MIL-3, which has a concrete channel and therefore does not have a riparian area, although some adjacent vegetation canopy can provide shading. The maximum riparian width (including both stream sides) is 1,614 feet and the minimum width (including both stream sides) is 49 feet. The average stream channel width ranges from 29 to 64 feet.

North Russell Creek
County (Stream Segment NRU-1)
The riparian width is approximately 49 feet per stream side for the one segment. The maximum riparian width (including both stream sides) is 372 feet and the minimum width (including both stream sides) is 40 feet. The stream channel width averages approximately 10 feet.

Pine Creek
County (Stream Segment PIN-1)
The riparian width is approximately 66 feet per stream side for the one segment. The maximum riparian width (including both stream sides) is 556 feet and the minimum width (including both stream sides) is 41 feet. The stream channel width averages approximately 17 feet.

Reser Creek
County (Stream Segment RES-2)
The riparian width is approximately 22 feet per stream side for the one segment. The maximum riparian width (including both stream sides) is 290 feet and the minimum width

(including both stream sides) is 19 feet. The stream channel width averages approximately 9 feet.

UGA (Stream Segment RES-1)
The riparian width is approximately 12 feet per stream side for the one segment. The maximum riparian width (including both stream sides) is 63 feet and the minimum width (including both stream sides) is 10 feet. The stream channel width averages approximately 7 feet.

Russell Creek
County (Stream Segment RSL-3)
The riparian width is approximately 32 feet per stream side for the one segment. The maximum riparian width (including both stream sides) is 183 feet and the minimum width (including both stream sides) is 22 feet. The stream channel width averages approximately 23 feet.

UGA (Stream Segment RSL-1 and RSL-2)
Two stream segments were measured for Russell Creek within the UGA areas. The average riparian width per stream side ranges from 20 to 21 feet. The maximum riparian width (including both stream sides) is 116 feet and the minimum width (including both stream sides) is 20 feet. The stream channel width averages approximately 11 feet.

Spring Creek
County (Stream Segment SP2-1)
The riparian width is approximately 27 feet per stream side for the one segment. The maximum riparian width (including both stream sides) is 145 feet and the minimum width (including both stream sides) is 30 feet. The stream channel width averages approximately 13 feet.

Spring Valley Creek
County (Stream Segment BEV-1)
The riparian width is approximately 13 feet per stream side for the one segment. The maximum riparian width (including both stream sides) is 290 feet and the minimum width (including both stream sides), excluding the intermittent areas where riparian vegetation does not exist, is 10 feet. The stream channel width averages approximately 29 feet.

South Russell Creek
County (Stream Segments SRU-1 and SRU-2)
Two stream segments were measured for South Russell Creek. The average riparian width per stream side ranges from 32 to 40 feet. The maximum riparian width (including both stream sides) is 141 feet and the minimum width (including both stream sides) is 41 feet. The stream channel width averages approximately 13 feet.

Stone Creek
County (Stream Segment STO-1)
The riparian width is approximately 25 feet per stream side for the one segment. The maximum riparian width (including both stream sides) is 165 feet and the minimum width (including both stream sides) is 26 feet. The stream channel width averages approximately 24 feet.

UGA (Stream Segment STO-2 to STO-5)
Four stream segments were measured for Stone Creek within the UGA areas. The average riparian width per stream side ranges from 11 to 31 feet. The maximum riparian width (including both stream sides) is 164 feet and the minimum width (including both stream sides) is 7 feet. The average stream channel width ranges from 7 to 8 feet.

Titus Creek
County (Stream Segment TI-2)
The riparian width is approximately 81 feet per stream side for the one segment. The maximum riparian width (including both stream sides) is 442 feet and the minimum width (including both stream sides) is 40 feet. The stream channel width averages approximately 7 feet.

UGA (Stream Segment TI-1)
The riparian width is approximately 25 feet per stream side for the one segment. The maximum riparian width (including both stream sides) is 197 feet and the minimum width (including both stream sides) is 15 feet. The stream channel width averages approximately 7 feet.

Touchet River
County (Stream Segments TOU-01 to TOU-11)
Eleven stream segments were measured for the Touchet River. The average riparian width per stream side ranges from 75 to 303 feet. The maximum riparian width (including both stream sides) is approximately 1,585 feet and the minimum width (including both stream sides) is 77 feet. The average stream channel width ranges from 38 to 60 feet.

Walla Walla River
County (Stream Segments WAL-01 to WAL-11)
Eleven stream segments were measured for the Walla Walla River. The average riparian width per stream side ranges from 67 to 201 feet. The maximum riparian width (including both stream sides) is 1,049 feet and the minimum width (including both stream sides) is 60 feet. The average stream channel width ranges from 32 to 109 feet.

Whetstone Creek
County (Stream Segment WHE-1)
The riparian width is approximately 37 feet per stream side for the one segment. The maximum riparian width (including both stream sides) is 167 feet and the minimum width (including both stream sides) is 37 feet. The stream channel width averages approximately 11 feet.

Wilson Creek
County (Stream Segment WIL-1)
The riparian width is approximately 19 feet per stream side for the one segment. The maximum riparian width (including both stream sides) is 209 feet and the minimum width is 14 feet. The stream channel width averages approximately 6 feet.

Warm Springs Creek
County (Stream Segment WSP-1)
Warm Springs Creek runs mostly underground and does not have woody riparian vegetation.

West Little Walla Walla River
County (Stream Segment WLW-1 and WLW-2)
Two stream segments were measured for the West Little Walla Walla River. The average riparian width per stream side ranges from 30 to 48 feet. The maximum riparian width (including both stream sides) is 290 feet and the minimum width (including both stream sides) is 29 feet. The average stream channel width ranges from 9 to 11 feet.

Yellowhawk Creek
County (Stream Segment YEL-1)
The riparian width is approximately 40 feet per stream side for the one segment. The maximum riparian width (including both stream sides) is 180 feet and the minimum width (including both stream sides) is 52 feet. The stream channel width averages approximately 21 feet.

UGA (Stream Segments YEL-2 to YEL-8)
Seven stream segments were measured for Yellowhawk Creek within the UGA areas. The average riparian width per stream side ranges from 7 to 31 feet. The maximum riparian width (including both stream sides) is 181 feet and the minimum width (including both stream sides) is 14 feet. The average stream channel width ranges from 13 to 16 feet.

2.7 Aquatic Species Findings and Code Recommendations

2.7.1 Recommended Stream Classification and Buffer Systems

Stream Designation and Classification System

As noted in Section 2.5.1, several stream designation systems can be used to classify water bodies and aquatic habitats in Walla Walla County. In consideration of the best available science presented in this document, the most appropriate classification system should consider all documentation relative to stream typing, summer steelhead distribution, focal species habitat, limiting factors, recommendations for reach protection from the EDT analysis and SRSRP, and existing conditions (which includes both degraded riparian areas and riparian areas enhanced through CREP). Consideration of all the available data for specific reaches within the County results in a combination system for classification, which defines six categories of County waterways in consideration of DNR stream types, existing functions, and EDT- and SRSRP-recommended priority protection reaches. When compared to more simplified approaches that, for example, consider only DNR stream typing for classification and application of streamside buffers, the combination system provides more protection for focal aquatic species in reaches that have been specifically identified to provide critical habitat functions. The following describes the six catergories of waterways:

<u>Category 1 Waterways</u>
Category 1 waterways include the Snake and Columbia Rivers. The Columbia and Snake Rivers provide migratory habitat for most anadromous salmonids, and development adjacent to aquatic habitat should maintain migration habitat function. The upper reaches of the Snake River also support rearing and spawning for fall Chinook salmon.

Category 2 Waterways

Category 2 waterways are those with DNR "S" ratings that have been mapped to contain spawning and/or rearing habitat for summer steelhead and/or have been identified as priority protection areas by EDT analysis or as recommended by the SRSRP (see Table 2.5-2). Many of these areas have CREP buffer enhancements in place.

Cateogry 3 Waterways

Category 3a waterways are those reaches within the rural County areas with DNR "S" or "F" ratings (as provided in Table 2.5-1) that are documented to contain migration or limited rearing habitat for focal aquatic species. Focal aquatic species for the County include summer steelhead, spring Chinook and bull trout and the utilization by specific lifestages for each species are depicted in Figures 2.3-1, 2.3-2, and 2.3-3, presented earlier in this section. Category 3 includes both the East Fork Little Walla Walla River and Pine Creek, within the County limits. Also, included are Lower Garrison Creek (up to Lion's Park in College Place) and Doan Creek (due to planned restoration). Upper Garrison is in the process of being screened off and so this section would be protected from water quality impacts only (included under Category 6). These reaches have been identified to provide habitat for focal species and/or have significant restoration potential (as determined by EDT or other methods), but are limited in function due to the low numbers of fish known to use the systems, the degraded condition of habitat, or lack of open-channel connection to downstream waters. Many of these areas have CREP buffer enhancements in place.

Category 3b waterways are those reaches in the County with DNR "F" ratings that provide limited rearing habitat primarily for resident, local non-listed fish species, with some potential for limited steelhead habitat in some cases.

Category 4 Waterways

Category 4 waterways include perennial streams (flowing year-round) within the rural County areas that have a defined bed and bank and are mapped as non-fish bearing streams using DNR stream typing, "Np" (Figure 2.5-1). These areas may still have significant influence on downstream fish habitat since they carry water, sediment, nutrients, and woody debris downstream. Because small streams are more intimately related to their riparian area, the removal of riparian vegetation may have a relatively great effect (Knutson and Naef 1997).

Category 5 Waterways

Category 5 includes intermittent streams, non-fish bearing streams with a definable bed and bank. These streams are intermittent and identified as "Ns," applying the DNR stream typing system.

Category 6 Waterways

Category 6 includes streams in the urbanized areas of the greater Walla Walla and College Place area, as described in Section 2.6.2, including both incorporated and unincorporated areas. Although some waterways within this area are mapped as spawning and/or rearing habitat for summer steelhead, the application of buffers includes consideration of existing conditions. Because the riparian areas adjacent to these waterways have been subjected to high levels of development with limited riparian protections, new development in these areas will be subjected to decreased minimum streamside buffers that reflect stream potential.

As reported in the Subbasin Plan and SRSRP (NPCC 2004 and SRSRP 2005) the unique challenges of the Mill Creek system require that a special strategy be developed for Mill Creek related to biological objectives and protection strategies. The Mill Creek section from Gose Street to the Walla Walla River will be addressed as a Category 2 waterbody. The Mill Creek section from Bennington Lake diversion to Gose Street in most areas does not have a functioning riparian area, but a riparian buffer is still recommended. A vegetation removal buffer of 35' has also been suggested, and is under evaluation by the County and City of Walla Walla.

Other water bodies without bed and bank are not identified and not intended for regulation under the CAO. This includes seasonal drainage pathways and man-made water bodies, such as canals. Piped stream segments are also not regulated, but if piping is removed and a stream is restored to open channel, then it would be regulated as other open channel segments of that stream.

Designation of Buffers

Specific habitat functions important to Walla Walla County streams and associated buffer recommendations are outlined in Table 2.7-1. The recommendations in Table 2.7-1 include consideration of aquatic stream classification and associated aquatic habitat conditions as provided above, and also migratory habitat conditions for terrestrial species. Water quality is also considered. This table will be referred to throughout this document. The importance of riparian habitat to terrestrial species migration is discussed in Section 3. Specific buffers for wetlands are discussed in Section 4.

Based on the stream classification approach outlined above, it is recommended that a combination of available data specific to individual stream reaches be considered in Walla Walla County code. The resulting minimum streamside buffer widths are presented in Table 2.7-1 for waterways within Walla Walla County. These buffer width recommendations are measured from the ordinary high water mark, or from the edge of channel migration zones/braided channel areas, which exists in many areas of the County. In stream segments where CREP buffers are established, then CREP buffers become the minimum streamside buffer width. In areas where wetlands also exist, then the combined stream buffer and wetlands buffer would be the buffer that applies. Certain areas, such as along the Walla Walla River, Touchet River, and Mill Creek are known to have wetlands that will increase the buffer width in certain areas. See Section 4 and Figure 4.2-1 for information about wetlands in Walla Walla County.

Table 2.7-1
Recommended Minimum Streamside Buffer Widths for Six Categories of Waterways within Walla Walla County

Waterway Category	River Reach Included	Existing Conditions/Targeted Functions	Minimum Streamside Buffer Width (per side)[1,2]
1	-Columbia River (including Lake Wallula) within County limits -Snake River within County limits	-DNR Type S Stream -Provides limited rearing and migration habitat for anadromous fish species -1 SPTH for LWD recruitment[3]	100 feet

Table 2.7-1
Recommended Minimum Streamside Buffer Widths for Six Categories of Waterways within Walla Walla County

Waterway Category	River Reach Included	Existing Conditions/Targeted Functions	Minimum Streamside Buffer Width (per side)[1,2]
		(limited effect) and shade (limited effect) -Control sediment, nutrients, and stormwater runoff[4] - Burbank stormwater addressed through Phase II NPDES - Wildlife migration corridor[4]	
2	Touchet River mainstem from Coppei Creek to County limits	-Summer steelhead spawning and rearing habitat -EDT priority protection reach -1 SPTH for LWD recruitment[3] and shade -Control sediment, nutrients, and stormwater runoff[4] -Wildlife migration corridor[4]	100 feet
	Touchet River Mainstem from Whetsone Creek to Coppei	-Summer steelhead rearing habitat -1 SPTH for LWD recruitment[3] and shade -Control sediment, nutrients, and stormwater runoff[4]	100 feet
	Coppei Creek	-Summer steelhead spawning and rearing habitat -EDT priority protection reach -1 SPTH for LWD recruitment[3] and shade -Controls for sediment, nutrients, and stormwater runoff[4] in higher gradient and steep slopes in upper segments -Wildlife migration corridor[4]	100(5) feet
	Walla Walla River mainstem from confluence with Dry Creek to confluence with Yellowhawk Creek	-EDT priority protection reach -LWD recruitment -1 SPTH for LWD recruitment[3] and shade -Control sediment, nutrients, and stormwater runoff[4] -Wildlife migration corridor	100 feet
	Walla Walla River mainstem from Yellowhawk Creek to County limits/state line	-Summer steelhead rearing habitat -EDT priority protection reach -1 SPTH for LWD recruitment[3] and shade -Control sediment, nutrients, and stormwater runoff[4] -Wildlife migration corridor	100 feet

Table 2.7-1
Recommended Minimum Streamside Buffer Widths for Six Categories of Waterways within Walla Walla County

Waterway Category	River Reach Included	Existing Conditions/Targeted Functions	Minimum Streamside Buffer Width (per side)[1,2]
	Mill Creek from Walla Walla River to Gose Street	-Summer steelhead spawning and rearing habitat and/or SRSRP protection reach -Control sediment, nutrients, and stormwater runoff[4] -Wildlife migration corridor	100 feet
	Mill Creek from Bennington Diversion to County Line and upper headwaters	-Bull trout spawning and rearing habitat -Summer steelhead spawning and rearing habitat and/or SRSRP protection/restoration reach -Control sediment, nutrients, and stormwater runoff[4] -Wildlife migration corridor	100 feet
	Blue Creek	-Summer steelhead spawning and rearing habitat -SRSRP priority protection reach -1 SPTH for LWD recruitment[3] and shade -Controls for sediment, nutrients, and stormwater runoff[4] in higher gradient and steep slopes in upper segments - Wildlife migration corridor	100(5) feet
	Cottonwood Creek (tributary to Yellowhawk Creek)	-Summer steelhead spawning and rearing habitat -1 SPTH for LWD recruitment[3] and shade -Control sediment, nutrients, and stormwater runoff[4]	75 feet
	Upper Dry Creek above Highway 125 Bridge	-Summer steelhead spawning and rearing habitat -1 SPTH for LWD recruitment[3] and shade -Controls for sediment, nutrients, and stormwater runoff[4] in higher gradient and steep slopes in upper segments	100 feet
3a	Touchet River mainstem from mouth to confluence with Whetstone Creek	-Summer steelhead migration habitat -1 SPTH for LWD recruitment[3] and shade -Control sediment, nutrients, and stormwater runoff[4] -Wildlife migration corridor	100 feet

Table 2.7-1
Recommended Minimum Streamside Buffer Widths for Six Categories of Waterways within Walla Walla County

Waterway Category	River Reach Included	Existing Conditions/Targeted Functions	Minimum Streamside Buffer Width (per side)[1,2]
	Dry Creek mainstem from mouth to Highway 125 Bridge	-Summer steelhead migration -Control sediment, nutrients, and stormwater runoff	75 feet
	Walla Walla mainstem from mouth to Dry Creek	-Summer steelhead migration -1 SPTH for LWD recruitment[3] and shade -Control sediment, nutrients, and stormwater runoff[4] -Wildlife migration corridor	100 feet
	East Little Walla Walla River	-Salmonid limited rearing habitat (future restoration potential) -1 SPTH for LWD recruitment[3] and shade -Control sediment, nutrients, and stormwater runoff[4]	75 feet
	Pine Creek	-Summer steelhead limited rearing habitat (see SRSRP) -1 SPTH for LWD recruitment[3] and shade -Control sediment, nutrients, and stormwater runoff[4]	75 feet
	Yellowhawk Creek – Confluence with Walla Walla River to confluence with Cottonwood Creek	-Summer steelhead migration, limited rearing habitat and/or EDT priority protection reach -1 SPTH for LWD recruitment[3] and shade -Control sediment, nutrients, and stormwater runoff[4] -Wildlife migration corridor	50 feet
	Lower Garrison Creek – College Place WWTP outfall to confluence with Walla Walla River	-Summer steelhead migration, limited rearing habitat and/or EDT priority protection reach -1 SPTH for LWD recruitment[3] and shade -Control sediment, nutrients, and stormwater runoff[4]	50 feet
	Lower Doan Creek – Confluence (future) to Last Chance Road	-Steelhead rearing habitat (future) -1 SPTH for LWD recruitment[3] and shade -Control sediment, nutrients, and stormwater runoff[4] -Wildlife habitat	75 feet
3b	Birch Creek (Walla Walla tributary)	-Resident fish habitat primarily -Influence on downstream listed species habitat -Control sediment, nutrients, and	50 feet
	W. Little Walla Walla (Walla Walla tributary		50 feet

Table 2.7-1
Recommended Minimum Streamside Buffer Widths for Six Categories of Waterways within Walla Walla County

Waterway Category	River Reach Included	Existing Conditions/Targeted Functions	Minimum Streamside Buffer Width (per side)[1,2]
	Mud Creek (1) (Walla Walla tributary)	stormwater runoff[4]	50 feet
	Mudd Creek (2) (lower Dry Creek tributary)		75 feet
	Mud Creek (3) (upper Dry Creek tributary)		75 feet
	Stone Creek		50 feet
	Whetstone Creek (Touchet tributary)		50 feet
4	Bergevin Spring Branch (Dry Creek tributary) Gardena Creek (Walla Walla tributary) Grandview Spring Branch (Walla Walla tributary) Spring Valley Creek (1) (lower Dry Creek tributary) Spring Creek (2) (upper Dry Creek tributary) Warm Springs (Walla Walla tributary)	-Influence on downstream listed species habitat -Control sediment, nutrients, and stormwater runoff[4]	50 feet
5	Little Mud Creek (Pine Creek tributary)	-Influence on downstream listed species habitat -Control sediment, nutrients, and stormwater runoff[4]	50 feet
	Wilson Creek (Touchet tributary)		
6a	Mill Creek from Gose Street to Bennington Lake dam diversion	-Flood channel -No riparian vegetation allowed within the channel -Trees outside the concrete channel section with potential to shade the channel should remain	35 feet (Also 35 foot tree removal restriction for concrete channel sections)
6b	Yellowhawk Creek – Russell Creek to Mill Creek	-Summer steelhead migration, limited rearing habitat and/or EDT priority protection reach -LWD recruitment -Shade -Existing riparian average = 31ft -Meet CREP minimum -Control sediment, nutrients, and stormwater runoff[4]	50 feet
	Russell Creek – Dipping Road to Yellowhawk	-Influence on downstream habitat -Existing riparian average = 21 ft -Meet CREP minimum -Control sediment, nutrients, and	35 feet

Table 2.7-1
Recommended Minimum Streamside Buffer Widths for Six Categories of Waterways within Walla Walla County

Waterway Category	River Reach Included	Existing Conditions/Targeted Functions	Minimum Streamside Buffer Width (per side)[1,2]
		stormwater runoff[4]	
	Russell Creek – Headwaters to Dipping Road	-Influence on downstream habitat -Existing riparian average = 32 ft -Meet CREP minimum -Control sediment, nutrients, and stormwater runoff[4]	35 feet
	Reser Creek – Wilbur Avenue to Russell Creek	-Influence on downstream habitat -Existing riparian average = 23 ft -Meet CREP minimum -Control sediment, nutrients, and stormwater runoff[4]	35 feet
	Reser Creek – Headwaters to Wilbur Avenue	-Influence on downstream habitat -Existing riparian average = 22 ft -Meet CREP minimum -Control sediment, nutrients, and stormwater runoff[4]	35 feet
	Caldwell Creek – Headwaters to Yellowhawk	-Influence on downstream habitat -Meet CREP minimum -Control sediment, nutrients, and stormwater runoff[4]	35 feet
	Stone Creek – Headwaters to Teal Street	-Influence on downstream habitat -Existing riparian average = 20 ft -Meet CREP minimum -Control sediment, nutrients, and stormwater runoff[4]	35 feet
	Doan Creek – Headwaters to Last Chance Road	-Influence on downstream habitat -Existing riparian average = 48 ft (with wetlands and CREP) -Meet CREP minimum -Control sediment, nutrients, and stormwater runoff[4]	75 feet
	Garrison Creek – Lions Park in College Place to College Place WWTP outfall	-Summer steelhead rearing opportunity -Existing riparian average = 24 ft -Meet CREP minimum -Control sediment, nutrients, and stormwater runoff[4]	35 feet
	Garrison Creek – Yellowhawk to Lions Park (excluding wetland)	-Influence on downstream habitat -Existing riparian average = 24 ft -Meet CREP minimum -Control sediment, nutrients, and stormwater runoff[4] -Wildlife habitat	35 feet
	Bryant Creek – Sprague Avenue to Fort Walla Walla park	-Influence on downstream habitat -Existing riparian average = 14 ft -Meet CREP minimum	35 feet

Table 2.7-1
Recommended Minimum Streamside Buffer Widths for Six Categories of Waterways within Walla Walla County

Waterway Category	River Reach Included	Existing Conditions/Targeted Functions	Minimum Streamside Buffer Width (per side)[1,2]
		-Control sediment, nutrients, and stormwater runoff[4]	
	Titus Creek – Blackberry Lane to Mill Creek by community college	-Influence on downstream habitat -Existing riparian average = 25 ft -Meet CREP minimum -Control sediment, nutrients, and stormwater runoff[4]	35 feet
	Titus Creek – Mill Creek diversion to Blackberry Lane	-Influence on downstream habitat -Existing riparian average = 81 ft -Meet CREP minimum -Control sediment, nutrients, and stormwater runoff[4]	35 feet
	All Other Creeks within city limits/UGA – Intermittent open channels with piped sections	-Influence on downstream habitat -Meet CREP minimum -Control sediment, nutrients, and stormwater runoff[4]	35 feet

[1] In stream segments where CREP buffers are established, and are larger than the minimum buffer listed in Table 2.7-1, then CREP buffers become the minimum streamside buffer width.
[2] Buffer width is measured for the ordinary high water mark.
[3] 1 SPTH = 100 ft. Based on NRCS program in Walla Walla County (personal comm. with Larry Hooker, July 2008)
[4] Source: Table 5-8 from Sheldon et al. 2005
[5] As a higher gradient stream with steeper upland slopes in many areas and in a higher precipitation area, additional performance measures are recommended to ensure sediment is controlled during and post-construction.

Figure 2.7-1 identifies streams with their associated recommended buffers.

Opportunity for buffer reductions through habitat enhancement

The recommended buffers in Table 2.7-1 are based upon maintaining habitat functions and values for salmonid habitat, protecting water quality and maintaining wildlife migration corridors (where applicable), as provided in the rationale. There is opportunity for reducing buffers, within certain constraints, where additional riparian enhancements are implemented in the project area to improve existing function and value.

For example, if existing riparian vegetation extends only 50 feet in an area with a 100 foot buffer, and vegetation is limited and lacking diversity, the project applicant could agree to enhance vegetation for both aquatic and terrestrial species consistent with a prescribed plan prepared by a qualified professional and approved by the County. In exchange for improving riparian conditions, the applicant could have the buffer reduced to 75 feet. The applicant would also need to demonstrate how water quality would be protected through stormwater handling during and post-construction, and how vegetation for the 25 feet (part of the original 100 feet) outside the buffer would be managed to maintain water quality. It is also recommended that a minimum buffer width, or proportion of existing buffer width be retained, in cases of standard buffer adjustments to promote buffer continuity. For example, in cases of buffer averaging, ensure that the buffer is no less than 75 percent of the required buffer width in any given location to maintain buffer continuity while retaining the overall area of required buffer unless it can be demonstrated that other options will not result in loss of riparian functionality. No reduction is recommended for the proposed minimum 35' buffer.

The following recommendations in Table 2.7-2 are provided for buffer reductions with associated habitat enhancement.

Table 2.7-2
Modified Buffer Widths with Approved Habitat Enhancement/Water Quality Treatment

No Habitat Enhancement	Modified Buffer Width with Approved Enhancement/Treatment
100'	75'
75'	56'
50'	38'
35'	35'

Definitions, performance, and reporting standards must be included the Walla Walla County Code to ensure that allowable activities within critical areas undergo a review, approval, and monitoring process. This will help ensure that activities will either not adversely impact aquatic habitats, or that loss of habitat functions are appropriately mitigated.

Accepting performance standards as those required in WDFW's HPA process, or implementing accepted strategies such as those described in documents such as the Ecology stormwater manual are good approaches to ensuring that proposals are reviewed and approved on a consistent basis.

2.7.2 Mitigation Recommendations

Timing Restrictions

Timing restrictions for conducting in-water work are necessary to protect habitat and life-stage requirements that differ by species and time of year. Windows for conducting work below the ordinary high water mark of freshwater systems have been established by state and federal resource management agencies. The approved freshwater fish work windows for the Columbia River from the mouth to the Snake River is from November 1 to February 28. For the Snake River, the general work window is from August 1 to August 31. For those watercourses, including tributaries, within National Park boundaries, the window is site-dependent and an individual application should be submitted to resource agencies to determine the appropriate work window for a specific area. For the Walla Walla River and its associated tributaries, the general work window is from July 15 to August 15. However, for other streams in the County, the general work window is from July 15 to October 31.

Insert Figure 2.7-1 (8.5x11)

Mitigation Options

Mitigation is defined as actions that are required or recommended to avoid or compensate for impacts to fish and other aquatic resources from a proposed project. Complete mitigation is achieved when these mitigation elements ensure no net loss of ecological functions, wildlife, fish, and aquatic resources. Mitigation shall be considered and implemented, where feasible, in the following sequential order of preference:

- Avoiding the impact altogether by not taking a certain action or parts of an action.
- Minimizing impacts by limiting the degree or magnitude of the action and its implementation (design criteria and use of best management practices).
- Compensating for the impact by replacing and providing substitute resources or environments through creation, restoration, enhancement, or preservation of similar or appropriate resource areas.

Regulators and applicants need to look at the watershed ecosystem as a whole when considering impacts and the use of preservation, mitigation banking, and off-site or out-of-kind mitigation as tools for salmon and watershed recovery. Despite the agreed upon benefits of a watershed-based approach, there is no guidance to assist regulators and developers with the selection and evaluation of mitigation proposals for alternative watershed-based approaches.

In some cases, protecting high-functioning, irreplaceable areas at substantially higher ratios may be the best ecological choice and acceptable for compensatory mitigation, as long as there is no overall loss of habitat functions. There is value gained in protecting sites that are already providing high quality functions necessary for watershed health and salmon recovery efforts. For example, protecting aquatic habitat high in the watershed serves to protect downstream resources from erosion and degradation.

Preservation may be beneficial in some circumstances because; a) larger mitigation areas can be set aside due to the higher preservation mitigation ratios; b) preservation can ensure protection for high quality, highly functioning aquatic systems that are critical for the health of the watershed and aquatic resources that may otherwise be adversely affected; and c) preservation of an existing system removes the uncertainty of success inherent in a creation or restoration project.

Stormwater management is a critical issue in implementing salmon recovery and watershed improvement efforts of the state. The emphasis for stormwater management should be on prevention of impacts to aquatic resources through appropriate development regulations, and best management practice applications for erosion control, water quantity and water quality treatment. The guiding principal should be to do no further harm to aquatic resources and to build into projects and plans the incremental improvements necessary to protect, restore, and enhance the beneficial uses and functions of the state’s water bodies.

Mitigation for adverse impacts to riparian habitat areas should result in the replacement of equivalent functions and values so as to result in no net loss of habitat functions and values. Mitigation projects should be located as near the alteration as feasible, and be located in the same sub drainage basin as the habitat impacted. Recommendations for mitigation include the following:

- Riparian habitat enhancement through vegetating with appropriate tree and shrub species and removal of noxious weeds
- Restoring riparian understory shrub communities
- Implementing conservation easements
- Decommissioning and/or paving roads near streams
- Debris removal
- Direct seeding
- Erosion control (native riparian vegetation planting)
- Exclosures/fencing
- Woody debris addition

Walla Walla County Conservation District has developed a native vegetation planting list, based upon three precipitation zones for the County (WWCD 2008). Vegetation recommendations within each individual precipitation zones are further broken down into three riparian zones: Zone 1 is generally 0 to 35 feet, Zone 2 is generally 35' to 75 feet, and Zone 3 is typically greater than 75 feet. Riparian zones can be adjusted based upon site specific conditions, including groundwater levels, slope of the riparian area and other factors.

Planting densities are also identified, with trees planted every 8 feet, shrubs every 4 feet, and grasses planted at 6 lbs per acre. Appendix A contains the native vegetation planting recommendations developed by the Conservation District.

2.7.3 Recommended Provisions for Non-conforming Lots and Structures

In some cases, existing parcels are too small to provide for the recommended buffers. Generally, "reasonable use" exceptions or "variance" procedures are provided for those situations. In the case of a County, such as Walla Walla, where parcels have been created over a long period without consideration of current buffer requirements, it is recommended that a streamlined process be designed to provide for development of up to 3,500 square feet on a parcel under contiguous ownership, with buffer areas provided in the remaining portion of the site.

2.7.4 Recommended Provisions for Piped/Channelized Streams

One of the most significant impacts to streams or creeks in Walla Walla County is that a number of waterways have been piped or culverted in significant length as they flow through urbanized areas. In some cases, the purpose of these actions was to limit evapotranspiration loss in irrigation canals. In other cases, the natural flow of creeks conflicted with desired transportation infrastructure or development patterns. Nevertheless, some of these highly impacted stream systems still provide fish passage for anadromous species and connectivity to upstream fish habitat.

The GMA authorizes the protection of existing habitat in critical areas, but does not require restoration of habitat. Nevertheless, piped and culverted streams represent an area where mitigation efforts can be focused at some time in the future. Daylighting of these creeks could be a restoration effort that the County or cities could consider.

In a first step, it is recommended that the County prevent new permanent structures from being built over these piped and culverted streams, with exemptions for transportation and utility uses. No critical habitat area buffers would be required for sections of streams that are piped or culverted, but typical building setbacks would continue to apply. In the future the city could provide greater incentives for property owners to daylight creeks, especially when these actions represent a fiscally and ecologically sound method to improve aquatic health.

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3 Terrestrial Wildlife Habitat Conservation Areas

3.1 Section Overview and GMA Requirements

This section focuses on terrestrial wildlife species and habitats in Walla Walla County. The GMA established a goal of no net loss of habitat functions and values. The CTED GMA guidelines recommend that Fish and Wildlife Habitat Conservation Areas (FWHCAs) include the items discussed in Section 2.1.

Fish and wildlife habitat conservation is defined as land management intended to maintain species in suitable habitats within their natural geographic distribution so that isolated subpopulations are not created (WAC 365-190-080). Such management is considered critical and requires cooperative and coordinated land use planning (Ousley et al. 2003). Because terrestrial species also depend on aquatic habitats and wetlands, primarily in riparian and wetland buffer areas, the protection strategies for terrestrial wildlife overlap with protection of aquatic species and wetlands. Aquatic species and wetlands are addressed in Sections 2 and 4 of this document.

3.2 Inventory of Species and Habitats in Walla Walla County

3.2.1 Walla Walla County Species Inventory

This subsection identifies federally listed species, state priority species, Natural Heritage species, certain species designated in the Walla Walla Subbasin Plan as focal species, and other species of local importance that are present in Walla Walla County. Table 3.2-1 lists the species this analysis will focus on, their status, and habitats where they may occur. Habitats are discussed in Section 3.2.2.

Federally Listed Species

There are two federally listed species present in Walla Walla County: Canada lynx (*Lynx canadensis*) which was listed as threatened under the ESA and 2000, and Ute ladies'-tresses (*Spiranthes diluvialis*), which was listed as threatened in 1992 (USFWS 2007a). No critical habitat designations for these species occur within Walla Walla County. In addition, two federal candidate species occur in the County: Yellow-billed cuckoo (*Coccyzus americanus*) and the Washington ground squirrel (*Spermophilus washingtoni)* (USFWS 2007a). Federal species of concern are also listed in Table 3.2-1.

State Priority Species

As discussed in Section 2, the Washington Administrative Code (WAC 365-190-080) identifies priority habitats and priority species as separate categories of FWHCAs. Priority species are those species that require protective measures for their perpetuation due to their population status, sensitivity to habitat alteration, and/or recreational, commercial, or tribal importance. Priority species include state endangered, threatened, sensitive, and candidate species; animal aggregations considered vulnerable; and those species of recreational, commercial, or tribal importance that are vulnerable. Table 3.2-1 identifies the priority wildlife species that may be found within Walla Walla County. Specific Priority Habitats that are subject to the CAO are discussed in Section 3.2.2.

Table 3.2-1
Species Presence in Habitats

Common Name	Scientific Name	Federal Status	State Status	PHS	Natural Heritage	Focal Species[1]	Cliffs/Bluffs	Ponderosa Pine/Forest	Shrub-steppe	Eastside (Interior) Riparian Wetland	Agricultural Areas
Animals											
American beaver	*Castor canadensis*	-	-	-	-	Yes		x		x	
American white pelican	*Pelecanus erythrorhynchos*	-	Candidate	Yes	-	-				x	
Bald eagle	*Haliaeetus leucocephalus*	Concern	Threatened	Yes	-	-		x	x	x	
Black-crowned night-heron	*Nycticorax nycticorax*	-	Monitor	Yes	-	-				x	
Blue grouse	*Dendragapus obscurus*	-	-	Yes	-	-		x			
Brewer's sparrow	*Spizella breweri*	-	-	-	-	Yes		x	x		
Burrowing owl	*Athene cunicularia*	Concern	Candidate	Yes	-	-			x		
Canada lynx	*Lynx canadensis*	Threatened	Threatened	-	-	-		x			
California quail	*Callipepla californica*	-	-	Yes	-	-		x	x		
Caspian tern	*Sterna caspia*	-	Monitor	Yes	-	-				x	
Chukar	*Alectoris chukar*	-	-	Yes	-	-			x	x	
Ferruginous hawk	*Buteo regalis*	Concern	Threatened	Yes	-	-			x		
Flammulated owl	*Otus flammeolus*	-	Candidate	Yes	-	Yes		x		x	
Forster's tern	*Sterna forsteri*	-	Monitor	Yes	-	-				x	
Giant Columbia spire snail	*Fluminicola columbiana*	Concern	Candidate	-	-	-				x	
Grasshopper sparrow	*Ammodramus savannarum*	-	Monitor	Yes	-	Yes			x		x
Great blue heron	*Ardea herodias*	-	Monitor	Yes	-	Yes				x	x
Loggerhead shrike	*Lanius ludovicianus*	Concern	Candidate	Yes	-	-			x		x
Long-billed curlew	*Numenius americanus*	-	Monitor	Yes	-	-			x		x
Long-eared myotis	*Myotis evotis*	Concern	Monitor	-	-	-		x	x	x	
Mule deer	*Odocoileus hemionus*	-	-	Yes	-	Yes		x	x	x	
Northern goshawk	*Accipiter gentilis*	Concern	Candidate	Yes	-	-		x	x	x	
Olive-sided flycatcher	*Contopus cooperi*	Concern	-	-	-	-		x	x	x	
Ord's kangaroo rat	*Dipodomys ordii*	-	Monitor	Yes	-	-			x		
Osprey	*Pandion haliaetus*	-	Monitor	Yes	-	-		x	x	x	
Pallid Townsend's big-eared bat	*Corynorhinus townsendii pallescens*	Concern	Candidate	-	-	-		x	x	x	
Peregrine Falcon	*Falco peregrinus*	Concern	Sensitive	Yes	-	-		x	x	x	
Prairie falcon	*Falco mexicanus*	-	Monitor	Yes	-	-		x	x	x	
Rio Grande wild turkey	*Meleagris gallopavo intermedia*	-	-	Yes	-	-		x		x	
Rocky Mountain elk	*Cervus elaphus nelsoni*	-	-	Yes	-	Yes			x	x	
Rocky Mountain-tailed frog	*Ascaphus montanus*	Concern	Candidate	-	-	-		x		x	
Sage sparrow	*Amphispiza belli*	-	Candidate	Yes	-	Yes			x		
Sage thrasher	*Oreoscoptes montanus*	-	Candidate	Yes	-	Yes			x		
Sagebrush lizard	*Sceloporus graciosus*	Concern	Candidate	-	-	-		x	x		
Sharp-tailed grouse	*Tympanuchus phasianellus*	Concern	Threatened	Yes	-	Yes			x	x	
Swainson's hawk	*Buteo swainsoni*	-	Monitor	Yes	-	-			x	x	x
Washington ground squirrel	*Spermophilus washingtoni*	Candidate	Candidate	Yes	-	-			x		
White-headed woodpecker	*Picoides albolarvatus*	-	Candidate	Yes	-	Yes		x		x	
White-tailed jackrabbit	*Leups townsendii*	-	Candidate	Yes	-	-			x	x	
Yellow-billed cuckoo	*Coccyzus americanus*	Candidate	Candidate	-	-	-				x	
Yellow warbler	*Dendroica petechia*	-	-	-	-	Yes				x	
Species in the Walla Walla Subbasin that may be present in Walla Walla County (from Subbasin Plan)											
Columbia spotted frog	*rana luteiventris*	-	Candidate	Yes	-	-				x	
Common loon	*Gavia immer*	-	Sensitive	Yes	-	-		x		x	
Western grebe	*Aechmophorus occidentalis*	-	Candidate	-	-	-				x	
Golden eagle	*Aquila chrysaetos*	-	Candidate	Yes	-	-	x		x		
Merlin	*Falco columbarius*	-	Candidate	-	-	-					x
Sandhill crane	*Grus canadensis*	-	Endangered	Yes	-	-				x	
Upland sandpiper	*Bartramia longicauda*	-	Endangered	-	-	-			x		x
Vaux's swift	*Chaetura vauxi*	-	Candidate	Yes	-	-		x			
Lewis' woodpecker	*Melanerpes lewis*	-	Candidate	Yes	-	-		x			

Table 3.2-1
Species Presence in Habitats

Common Name	Scientific Name	Federal Status	State Status	PHS	Natural Heritage	Focal Species[1]	Cliffs/Bluffs	Ponderosa Pine/Forest	Shrub-steppe	Eastside (Interior) Riparian Wetland	Agricultural Areas
Pileated woodpecker	*Dryocopus pileatus*	-	Candidate	Yes	-	-		x			
Black-backed woodpecker	*Picoides arcticus*	-	Candidate	Yes	-	-		x			
Merriam's shrew	*Sorex merriami*	-	Candidate	Yes	-	-		x	x		
Black-tailed jackrabbit	*Leups californicus*	-	Candidate	-	-	-			x		
Striped whipsnake	*Masticophis Taeniatus*	-	Candidate	Yes	-	-			x		
Plants											
Thistle milk-vetch	*Astragalus kentrophyta* var. *douglasii*	Concern	E[2]	-	-	-				x	
Bristly Sedge	*Carex comosa*	-	Sensitive	-	Yes	-				x	
Gray cryptantha	*Cryptantha leucophaea*	Concern	Sensitive	-	Yes	-				x	
Beaked cryptantha	*Cryptantha rostellata*	-	Threatened	-	Yes	-			x		
Snake Canyon desert-parsley	*Lomatium serpentinum*	-	Sensitive	-	Yes	-		x		x	
Prairie lupine	*Lupinus cusickii*	Concern	Review Group 2[3]	-	Yes	-			x		
Sabin's lupine	*Lupinus sabinianus*	-	E	-	Yes	-		x			
Pulsifer's monkey-flower	*Mimulus pulsiferae*	-	Sensitive	-	Yes	-		x			
Annual sandwort	*Minuartia pusilla* var. *pusilla*	-	Review Group 1[3]	-	Yes	-		x			
Plumed clover	*Trifolium plumosum* var. *plumosum*	-	Threatened	-	Yes	-			x		
Ute ladies'-tresses	*Spiranthes diluvialis*	Threatened	Endangered						x	x	
Liverwort monkey-flower	*Mimulus jungermannioides*	Concern	E	-	-	-	x				
Mapped Plant Communities included in Natural Heritage Program											
Snow Buckwheat/Sandberg's Bluegrass	*Eriogonum niveium/Poa secunda* Dwarg-shrub Herbaceous Vegetation	-	-	-	Yes	-			x		
Bluebunch wheatgrass - Idaho fescue canyon	*Pseudoroegneria spicata - Festuca idahoensis* Canyon Herbaceous Vegetation	-	-	-	Yes	-			x		
Bluebunch Wheatgrass - Sandberg's Bluegrass	*Pseudoroegneria spicata - Poa secunda* Herbaceous Vegetation	-	-	-	Yes	-			x		

Notes:

1. Focal species were identified for the WW Subbasin, and therefore may not be present in WW County

2. E	Possibly extinct or extirpated from Washington
3. Review Group 1	Of potential concern but needs more field work to assign another rank
Review Group 2	Of potential concern but with unresolved taxonomic questions

Washington Natural Heritage Program Rare Plant Designations

The following is the Washington Natural Heritage Program's list of known occurrences of rare plants in Walla Walla County (WDNR 2007):

- Bristly sedge (*Carex comosa*)
- Gray cryptantha (*Cryptantha leucophaea*)
- Beaked cryptantha (*Cryptantha rostellata*)
- Snake Canyon Desert-parsley (*Lomatium serpentinum*)
- Prairie lupine (*Lupinus cusickii*)
- Sabin's lupine (*Lupinus sabinianus*)
- Pulsifer's monkey-flower (*Mimulus pulsiferae*)
- Annual Sandwort (*Minuartia pusilla var. pusilla*)
- Plumed Clover (*Trifolium plumosum var. plumosum*)

Walla Walla Subbasin Plan Designated Focal Species

The 2004 Walla Walla Subbasin Plan designated focal species based upon the following criteria (NPCC 2004):

1. Primary association with focal habitats for breeding
2. Specialist species that are needed for or highly associated with key habitat elements/conditions important in functioning ecosystems
3. Declining population trends or reduction in their historic breeding range (may include extirpated species)
4. Special management concern or conservation status such as threatened, endangered, species of concern, and management indicator species
5. Professional knowledge on species of local interest

As shown in Table 3.2-1, the majority of these Subbasin focal species are also designated as priority species under the PHS program. Only three species, listed below, are not. These species are included in this document due to their designation as focal species in the Subbasin Plan.

- American beaver (*Castor canadensis*)
- Brewer's sparrow (*Spizella breweri*)
- Yellow warbler (*Dendroica petechia*)

3.2.2 *Walla Walla County Habitat Inventory*

Habitat is a place where animals and plants reside, find foods, water, and cover, grow, and reproduce. A habitat includes the physical and biotic resources to sustain and support fish and wildlife over space and through time. Wildlife habitat is typically classified by the predominant vegetation conditions and structures, but other environmental factors influence and affect wildlife species and their habitats as well (McComb 2001; O'Neil et al. 2001). Terrestrial habitats discussed in this Section are shown in Figure 3.2-1.

Typical habitat functions include the ability to provide food (foraging habitat), shelter from the weather and predators, and allowing for successional reproduction (breeding habitat) as well as migration (Lemkuhl et al. 2001; McComb 2001; O'Neil et al 2001).

The value of habitat for wildlife depends on several factors including habitat types, size, configuration, and the structural complexity. Species diversity and rarity are other ways to measure the quality of habitat.

State Priority Habitats

Priority habitats, as designated by the PHS program, are those habitat types or elements with unique or significant value to a diverse assemblage of species. A priority habitat may consist of a unique vegetation type or dominant plant species, a described successional stage, or a specific structural element (WDFW 2007). WDFW maintains a database that shows priority habitats. The County receives regular updates to Priority Habitat Maps that are updated annually. WDFW designated priority habitats in Walla Walla County are listed in Table 3.2.2. These priority habitats are discussed in this Section, along with a discussion on forest habitat, which has been included due to its importance as wildlife habitat and its decline in the region (Section 3.2-6). In addition, County-identified habitats of local importance are included, as well as a discussion of naturally occurring ponds under 20 acres, waters of the state, natural areas/refuges/preserves, and areas critical for habitat connectivity.

3.2.3 *Riparian Habitat*

Description of Habitat

As a habitat, riparian areas support the highest amount of fish and wildlife biodiversity (Knutson and Naef 1997). WDFW defines riparian habitat as "the area adjacent to aquatic systems with flowing water (e.g., rivers, perennial or intermittent streams, seeps, springs) that contains elements of both aquatic and terrestrial ecosystems which mutually influence each other." (Knutson and Naef 1997). The Walla Walla Subbasin Plan (NPCC 2004) quotes Ashley and Stovall's (2004) description of eastside riparian wetlands in eastern Washington as follows:

> "Historically, riparian wetland habitat was characterized by a mosaic of plant communities occurring at irregular intervals along streams and dominated singularly, or in some combination by grass-forbs, shrub thickets, and mature forests with tall deciduous trees. Beaver activity and natural flooding are two ecological processes that affected the quality and distribution of riparian wetlands."

Table 3.2-2
WDFW Priority Habitat

Habitat Type of Element	Priority Area
Cliffs	Greater than 7.6 m (25 ft) high and occurring below 1524 m (5,000 ft). *Criteria*: Significant wildlife breeding habitat, limited availability, dependent species.
Riparian	The area adjacent to aquatic systems with flowing water that contains elements of both aquatic and terrestrial ecosystems which mutually influence each other. In riparian systems, the vegetation, water tables, soils, microclimate, and wildlife inhabitants of terrestrial ecosystems are influenced by perennial or intermittent water. Simultaneously, the biological and physical properties of the aquatic ecosystems are influenced by adjacent vegetation, nutrient and sediment loading, terrestrial wildlife, as well as organic and inorganic debris. Riparian habitat encompasses the area beginning at the ordinary high water mark and extends to that portion of the terrestrial landscape that is influenced by, or that directly influences, the aquatic ecosystem. Riparian habitat includes the entire extent of the floodplain and riparian areas of wetlands that are directly connected to stream courses. *Criteria*: High fish and wildlife density, high fish and wildlife species diversity, important fish and wildlife breeding habitat, important wildlife seasonal ranges, important fish and wildlife movement corridors, high vulnerability to habitat alteration, unique or dependent species.
Shrub-steppe	Large Tracts: Tracts of land >259 ha (640 ac) consisting of plant communities with one or more layers of perennial grasses and a conspicuous but discontinuous layer of shrubs. Large tracts of shrub-steppe contribute to the overall continuity of the habitat type throughout the region because they are relatively unfragmented, contain a substantial amount of interior habitat, and are in close proximity to other tracts of shrub-steppe. These tracts should contain a variety of habitat features (e.g., variety of topography, riparian areas, canyons, habitat edges, plant communities). Another important component is habitat quality based on the degree with which a tract resembles a site potential natural community, which may include factors such as soil condition and degree of erosion; and distribution, coverage, and vigor of native shrubs, forbs, grasses, and cryptogams. Small Tracts: Tracts of land <259 ha (640 ac) with a habitat type consisting of plant communities with one or more layers of perennial grasses and a conspicuous but discontinuous layer of shrubs. Although smaller in size and possibly more isolated from other tracts of shrub-steppe these areas are still important to shrub-steppe obligate and other state-listed wildlife species. Also, important are the variety of habitat features and habitat quality aspects as listed above. *Criteria*: Comparatively high fish and wildlife density and species diversity; important fish and wildlife breeding habitat and seasonal ranges, limited availability, high vulnerability to habitat alteration, unique and dependent species.

Source: WDFW 1999

Insert Figure 2.3-1 (11x17)

> “Today, riparian/riverine areas contain the most biologically diverse habitats in the subbasin because of their variety of structural features (including live and dead vegetation) and the close proximity of riparian areas to water bodies. This combination of habitat features provides a wide array of habitats for numerous terrestrial species. Common deciduous trees and shrubs in riparian areas include cottonwood, alder, willow, and red osier dogwood (U. S. Forest Service and Bureau of Land Management 2000). Riparian vegetation is used by more species than any other habitat (Quigley and Arbelbide 1997).”

Functions and Values to Protect and Manage

As discussed in Section 2.4.2, riparian areas provide numerous functions in relation to aquatic habitat, including supplying LWD to streams, filtering pollutants, and moderating stream temperatures. Riparian habitats also provide important functions for terrestrial species. Riparian zones within the arid west are home to approximately 85 percent of wildlife species (Knutson and Naef 1997). Riparian habitats function as habitat connectors for terrestrial species and are often used for daily movements, seasonal migration, and dispersal of young (Forman and Godron 1986; Noss 1993; Thomas 1979). Many vertebrates depend on riparian habitat for at least a part of their lifecycles (O’Connell et al. 1993). Examples of these species in Walla Walla County include Peregrine falcon, blue grouse, and great blue heron. Riparian habitats also provide breeding for wildlife species, especially migrant birds (Andelman and Stock 1994). In addition, riparian areas have the following additional functions and values:

- Structural complexity: a variety of vegetative and physical features provide habitat for wildlife (Anderson et al. 1978a Marzluff and Lyon 1983, and Renken and Wiggers 1989 as cited in Knutson and Naef 1997).

- Abundant food sources and available water: riparian areas have enhanced growth of plants that provide food for wildlife and provide drinking water (Knutson and Naef 1997).

- Moist and moderate microclimate: the proximity to water and abundant vegetation creates a moist and mild environment in riparian areas, providing a desirable habitat to wildlife during hot, dry summers and cold winters (Knutson and Naef 1997).

Riparian Habitat in Walla Walla County

Riparian habitats within the County are dominated by fast-growing deciduous species of plants like willows and cottonwood trees. Historically, extensive riparian zones existed along rivers and streams in the Walla Walla River basin (U. S. Army Corps of Engineers 1997); however, estimates currently define only about 37 percent of the Touchet River as containing riparian vegetation (NPCC 2004). Riparian areas are a significant habitat resource within the County for several reasons. The WDFW (2007) maps riparian habitat along several tributaries and distributaries to the mainstem Walla Walla River, including Pine Creek, Little Mud Creek, Mud District Number 7 Canal, Walsh Creek, lower portions of the Little Walla Walla River, and several unnamed drainages.

There are two basic types of riparian habitat in Walla Walla County: those in the forested or previously forested areas of the Blue Mountain foothills, and those in the arid Walla Walla and Columbia basins. In the Blue Mountain foothills, the vegetation of riparian areas is often younger and lower in profile than the surrounding upland forest. In the arid Walla Walla and Columbia basins, the riparian vegetation is usually prominent, often taller, and/or greener than the surrounding landscape.

Much of the riparian area along the Columbia and Snake Rivers is federally owned and managed (Figure 3.2-2). The USACE manages the Wallula Habitat Management Unit, which is a 1,500 acre expanse of relatively high quality riparian habitat. This Unit, located at the mouth of the Walla Walla River, is comprised of cottonwood forest, shrubs, wetlands, sagebrush, and agricultural land, and provides habitat to birds, deer, and small mammals (Stalzer and Associates, et al. 2007).

Species Associated with Riparian Habitat in Walla Walla County

Table 3.2-1 indicates the focal species that are associated with riparian habitat in Walla Walla County.

3.2.4 Shrub-steppe Habitat

Description of Habitat

Shrub-steppe habitats consist of widely scattered shrubs mixed with perennial grasses and occurs between 300 and 9,000 feet in elevation (Johnson and O'Neil 2001, as cited in NPCC 2004). The Walla Walla Subbasin Plan (NPCC 2004) quotes Ashley and Stovall's (2004) description of the shrub-steppe habitat as follows:

> "Big sagebrush, bluebunch wheatgrass, and Sandberg bluegrass dominate shrubsteppe climax vegetation (Daubenmire 1970). Other grass species occur in much smaller amounts including needle-and-thread, Thurbers needlegrass, Cusick's bluegrass, and/or bottlebrush squirreltail grass. Forbs play a minor role. A cryptogamic crust of lichens and mosses grows between the dominant bunchgrasses and shrubs. Without disturbance, particularly trampling by livestock, the cryptogamic crust often completely covers the space between vascular plants."

Grazing and overgrazing of shrub-steppe habitat has led to the replacement of native grasses with competitive and/or introduced plant species in many shrub-steppe areas, such as cheatgrass, Nutall's fescue, eight flowered fescue, and Indian wheat (Grable 1974 and Harris and Chaney 1984 as cited in NPCC 2004).

Functions and Values to Protect and Manage

The native shrubs, forbs, and grasses of shrub-steppe areas provide unique habitats to wildlife such as the sage thrasher and sage grouse, and Brewer's sparrow. Over 100 species of birds are known to forage and nest in shrub-steppe habitat (Braun et al. 1976 as cited in NPCC 2004). As this habitat declines due to conversion of land for commercial and residential development, grazing and agriculture, so do the species that inhabit these areas.

Insert Figure 3.2-2 (11x17)

Shrub-steppe Habitat in Walla Walla County

Shrub-steppe habitat once covered the majority of Walla Walla County from its western boundary to the forested areas of the Blue Mountains. Much of this habitat, however, has been used for grazing or has been converted to agricultural areas. Many of the native sagebrush and bunchgrasses have been replaced with lesser quality rabbit brush, cheat grass, yellow star thistle, and other undesirable grasses and broadleaf weeds (Stalzer and Associates, et al. 2007). The largest remaining area of shrub-steppe habitat is in the southwestern portion of the County, north of Highway 12.

According to the Walla Walla Subbasin Summary (Saul et al. 2001), a comparison of the historic vegetation layer developed by Interior Columbia Ecosystem Management Project with a current land use map indicates that 77 percent of the subbasin historically covered by native grass and shrub-steppe vegetation is now cultivated. A comparison of land coverage data with the modeled historic extent of shrub-steppe habitats found that Walla Walla County’s shrub-steppe lands have declined from 777,017 to 178,037 acres (Dobler et al. 1996). Most of the remaining shrub-steppe habitats in the subbasin are small and disjointed from other remnants. Fragmentation compounds the negative effect of habitat loss on the shrub-steppe obligate species of the subbasin, as many areas are too small or isolated to support viable populations.

Species Associated with Shrub-steppe Habitat in Walla Walla County

Table 3.2-1 indicates the focal species that are associated with shrub-steppe habitat in Walla Walla County.

3.2.5 Cliffs and Bluffs

Description of Habitat

As described in Table 3.2-2, WDFW defines cliffs that are greater than 7.6 m (25 ft) high and occurring blow 1524 m (5000 ft) and that meet the criteria of having significant wildlife breeding habitat, limited availability, and dependent species to be priority areas as a critical habitat (WDFW 1999).

Functions and Values to Protect and Manage

Many cliffs and bluffs have significant breeding habitat for wildlife such as prairie falcons, which nest on cliffs and catch prey in the surrounding shrub-steppe environment (Hays and Milner 2004). Bats also use cliffs as roosting areas (NPCC 2004). Although cliffs are less vulnerable to development, species that use cliffs may be impacted by residential development and conversion to agricultural/grazing uses in the surrounding shrub-steppe habitat (NPCC 2004).

Cliffs and Bluffs in Walla Walla County

Cliffs and bluff habitat is located in southwestern Walla Walla County along the Columbia River.

Species Associated with Cliffs and Bluffs in Walla Walla County

Table 3.2-1 indicates the focal species that are associated with cliffs and bluffs in Walla Walla County.

3.2.6 Ponderosa Pine and Douglas-fir Forest Habitat

Description of Forest Habitat

Ponderosa Pine forests occur in dry areas, often on moderate to steep slopes. In Washington, ponderosa pine habitat is generally found between 2,000 and 5,000 feet, however its location is strongly impacted by aspect and soil type (Cassidy 1997 as cited in NPCC 2004). Management of the area and fire suppression have led to younger forests replacing old-growth Ponderosa Pine and has resulted in a greater proportion of Douglas-fir than Ponderosa Pine (WDFW 2004). In addition, native understory species have in many areas been replaced by introduced annuals, such as cheatgrass (WDFW 2004). This change in understory, in turn, can result in a change in fire patterns leading to more catastrophic fires (WDFW 2004). Threats to Ponderosa Pine forests include timber harvesting, fire reductions/wildfires, mixed forest encroachment, development, invasive species, and overgrazing (NPCC 2004).

In the higher elevations of eastern Washington, the Ponderosa Pine forest transitions into Interior Douglas-fir (University of Washington n.d.).

Functions and Values to Protect and Manage

Compared to other eastern Washington forest habitats, Ponderosa Pine supports the highest number of vertebrate wildlife species, including bird species in decline, such as the flammulated owl (NPCC 2004). Ponderosa pine habitat has experienced decline in the region through management and fire suppression, resulting in habitat and species loss, especially declines in bird species associated with snags and old forest conditions (Wisdom et al. in press and Hillis et al. 2001 as cited in NPCC 2004). Douglas-fir forests also provides important habitat to similar wildlife.

Forest Habitat in Walla Walla County

Ponderosa Pine habitat is found in southeastern Walla Walla County in the northeast corner of the Blue Mountains. It exists in dryer canyons that have soils 4 feet or greater in thickness (NRCS 1964). Stands of Ponderosa Pine tend to be open, with grasses and shrubs making up the understory (NPCC 2004).

Ponderosa Pine makes up a small percentage of trees on the higher slopes in eastern Walla Walla County, where Douglas-fir and Grand-fir dominate (Stalzer and Associates, et al. 2007). Douglas-fir habitat is more widespread in the County than Ponderosa Pine, covering the southeast corner of the County.

Species Associated with Ponderosa Pine Habitat in Walla Walla County

Table 3.2-1 indicates the focal species that are associated with forest habitat in Walla Walla County.

3.2.7 Habitats of Local Importance

Walla Walla County offers some unique habitats that warrant special consideration. The first is a large swath of fallow ground that is set aside within the Conservation Reserve Program (CRP). These areas provide foraging and nesting opportunities for a number of wildlife species including Ferruginous hawks, which have shown declines in recent years. Neotropical migrant songbirds also find important habitat within Walla Walla County. Riparian habitats throughout the County may be used by this group of wildlife, but two specific areas are known hot spots for migrants. The west slope of the Blue Mountains lie within the north/south migratory corridor and is heavily used by migrants. The other area that has been identified for special consideration in relation to neotropical migrants is the South and North forks of the Coppei Creek drainage. This area tends to attract neotropical migrants on their northern migration. The third habitat area important for wildlife is the irrigated farmland that occurs south of U.S. Highway 12, between Byrnes Road and Locher Road. This area attracts wintering birds of prey in large numbers, presumably because of the large densities of small mammals.

Hawk Habitat

Numerous Ferruginous and Swainson’s hawk sightings reported within the PHS database review for Walla Walla County occur within the Hawk Habitat polygon depicted on the map. These areas are also protected under the CRP program administered by the Farm Services Agency (FSA). Ferruginous hawks are known to nest in these areas and many species of hawks, owls, and songbirds utilize these areas. Ferruginous hawks are sensitive to disturbances and agricultural development (Richardson et al. 1999). This area of Walla Walla County has less agricultural development due to the topography and soils and offers sufficient prey populations of small mammals, such as ground squirrels, to support hawks.

Raptor Wintering Habitat

The irrigated farmland south of U.S. Highway 12, between Byrnes Road and Locher Road is raptor wintering habitat. Local birding enthusiasts also know this area as a good place to observe hawks during the winter and during the spring and fall migrations. Hawk use of the area is probably limited by the availability of prey, but alterations to other habitat elements, such as perches, resting areas and movement corridors may also affect these areas.

Neotropical Migrant Songbird Habitat

Large flocks of neotropical migrant songbirds are known to visit Walla Walla County each spring. These birds include mostly insectivorous perching birds like warblers, flycatchers, buntings, swifts, and orioles. They migrate at night and key into habitats that may provide enough food for them to continue their trip north. Research by the U.S. Forest Service has shown that neotropical migrants pass along the western flanks of the Blue Mountains and spend significant portions of time within the Coppei Creek Drainages. The Columbia River shoreline is also an important neotropical bird migration corridor. These habitats may be crucial to the continued existence of many of these migratory birds.

3.2.8 Naturally Occurring Ponds under 20 acres

Naturally occurring ponds less than 20 acres can provide important habitat for aquatic and terrestrial species. They are called out specifically for protection because they would not fall under the Shoreline Management criteria for ponds greater than 20 acres, and they may not qualify as wetlands. Naturally occurring ponds under 20 acres classify as wetlands and are addressed by wetland buffers (Section 4).

3.2.9 Waters of the State

Waters of the state include lakes, rivers, ponds, streams, inland waters, underground water, salt water, estuaries, tidal flats, beaches, and lands adjoining the seacoast of the state, sewers, and all other surface waters and watercourses within the jurisdiction of the state of Washington (WAC 173-183-100).

Waters of the state within Walla Walla County include the Columbia and Snake Rivers and their tributaries, including the Walla Walla River. Major tributaries of the Walla Walla River in the County include the Touchet River, Dry Creek, and Mill Creek. Instream habitats for these waterways are discussed in Section 2.

3.2.10 Federal and State Natural Areas/Refuges/Preserves

The McNary National Wildife Refuge is located in Walla Walla County; as a federal land, it is managed by USFWS. The Refuge and recreation area contains more than 15,000 acres of various habitats, including wetlands, shrub-steppe, irrigated farmlands, river islands, and riparian areas (USFWS 2007b). In addition, the USACE manages lands along the Snake River which are managed for wildlife and other purposes. There are no state natural area preserves or natural resource conservation areas found within Walla Walla County (WDNR 2008).

3.2.11 Areas Critical for Habitat Connectivity

In Walla Walla County, riparian areas serve as areas critical for habitat connectivity. The semi-arid climate serves to accentuate the importance of these riparian corridors in maintaining wildlife populations. The riparian corridors associated with the Columbia, Snake, and Walla Walla Rivers and Yellowhawk, Touchet and Mill Creeks provide this important wildlife corridor function for the County. While all riparian areas within the County provide habitats, these larger ones also help maintain regional systems like the movement of large mammals such as elk and deer and migratory birds and fish. For example, it is believed that white tail deer, mule deer, coyote, skunk, raccoon, and possibly cougars forage in the area north of US 12 and migrate to Mill Creek daily for water (WDOT 2005).

3.3 Human Activity and Terrestrial Habitat Functions

For wildlife, disturbance may include a behavioral and an ecological component. The behavioral aspect of disturbance may be defined as any action, such as human presence or noise from machinery that alters the behavior of an animal (Dahlgren and Korschgen 1992; Martin 2001). The ecological effect of human disturbance includes the alteration of habitat structure and distribution on the landscape through human activities. Disturbances may include spatial and temporal components and direct and indirect effects. Factors such as the magnitude of the disturbance, the time of year at which the disturbance occurs, and the duration of the disturbing activity help determine the effect on wildlife species. Many wildlife species vary their tolerance for disturbance and habitat modification over the course of any given year (Martin 2001; McComb 2001). Table 3.3-1 presents potential effects to wildlife from disturbance and habitat alteration.

3.3.1 Ecological Disturbance

Habitat modifications may be temporary, like clear cutting a forest, or permanent, like converting a habitat area to a residential development. Temporary modifications may alter habitat structure, like logging mature trees which essentially converts a forest habitat to a shrub habitat. They may change vegetation composition, like selectively logging conifer trees and leaving an open deciduous forest. And they may result in fundamental changes to ecological processes by introducing invasive species, or by disrupting nutrient cycling processes. Habitat fragmentation, the isolation of habitat patches from one another, is a type of disturbance that may affect habitat suitability at sites well beyond the site of the disturbance that caused the fragmentation. For some very sensitive wildlife species, the presence of a road may represent a barrier to movement, fragmenting the habitat and rendering otherwise suitable habitat on the far side of the road inaccessible (Claar et al. 1999; Lemkuhl et al. 2001). Habitat alteration may change the vegetation community and structural elements of a site, which can then affect the density or configuration of wildlife species assemblages that use a site (McComb 2001). Generally, as the size of a habitat area increases the number of species and individual animals the area can sustain also increases. The maximum number of individual animals of a given species that a particular area can support is referred to as a site’s carrying capacity (Robinson and Bolen 1984). Habitat alterations may decrease or increase a site’s carrying capacity. Another factor affecting wildlife use of smaller patch sizes is the relatively greater amount of edge habitat that may harbor predatory species, or represent a change in habitat type. These smaller patch sizes and increase in edge habitat has a particularly negative affect on species that rely on continuous habitat or specific habitat elements that only develop within continuous stands. For example the sage sparrow or sage thrasher, which depend on continuous shrub-steppe habitat, or species that tend to range over large areas to meet their life history needs, like the mule deer or elk.

Table 3.3-1
Effects of Disturbance and Habitat Alternation on Wildlife

Activity	Habitat Effect	Sensitive Species	Areas at Risk in Walla Walla County
Clearing	▪ Changes in habitat composition, complexity, and structure ▪ Loss of habitat, including snags and large trees, resulting in loss of habitat diversity ▪ Habitat fragmentation ▪ Alteration of local hydrology ▪ Potential introduction of non-native species	▪ Snag dependent species (primary cavity nesters including chickadees, nuthatches, woodpeckers and black bear; bats, amphibians, small mammals for roosting, perch and forage sites) ▪ Forest interior and old-growth associated species (silver-haired bat; red-tailed chipmunk; boreal owl; pinion jay; several flycatchers) ▪ Large trees in riparian/shoreline areas important for bald eagle and great blue heron nest and perch sites	▪ Ponderosa Pine Forest ▪ Riparian areas ▪ Shrub-steppe
Grading	▪ Loss of soil organic layer ▪ Potential soil compaction ▪ Alteration of local hydrology ▪ Increased sedimentation of local waters ▪ Potential for landslides and mass wasting on slopes	▪ Aquatic and wetland dependent species (bull trout, juvenile salmonids, amphibians)	▪ Low-lying portions of the County adjacent to major waterbodies ▪ Riparian areas ▪ Shrub-steppe
Urbanization	▪ Loss of open space, breeding feeding, cover and dispersal habitat ▪ Loss of unique habitats and species diversity ▪ Habitat fragmentation ▪ Potential increased prevalence of introduced species ▪ Increased wildlife injury/mortality from vehicle collisions, domestic animals ▪ Increased behavioral disturbance from human/domestic animal presence	▪ Species intolerant of human activities or with large home ranges (bobcat, elk, sandhill crane) ▪ Ground-nesting birds (mallard, towhee, quail) ▪ Species associated with unique habitats (rare plants, butterflies) ▪ Species that require unobstructed flight corridors	▪ Undeveloped parcels throughout the County ▪ Large tracts of undeveloped land near urban fringe ▪ Large tracts of land near major waterbodies
Introduction of non-native species	▪ Potential loss of breeding, feeding, cover	▪ Insects dependent on rare plants	▪ Riparian systems throughout the County

Table 3.3-1
Effects of Disturbance and Habitat Alternation on Wildlife

Activity	Habitat Effect	Sensitive Species	Areas at Risk in Walla Walla County
	and dispersal habitat ■ Displacement and extirpation of native species ■ Food web simplification	■ Aquatic or wetland associated species (sedge species) ■ Neotropical migrant songbirds	
Increased Noise/Light	■ Interference with courtship, breeding and foraging behaviors ■ Potential increased susceptibility to predation	■ Species intolerant of human activities (herons) ■ Nesting songbirds	■ Larger undeveloped parcels throughout the County
Human presence and recreational activities	■ Interference with courtship, breeding and foraging behaviors ■ Potential increased susceptibility to predation	■ Species intolerant of human activities (songbirds, wading birds)	■ Larger undeveloped parcels throughout the County

3.3.2 Behavioral Disturbance

Increased human activity can affect where wildlife species feel safe and how well wildlife species are able to cope with their environment. Direct effects of behavioral disturbance on wildlife can include interruption of activity, flushing, and abandonment of a site or young. Indirect effects may include weight loss due to insufficient time for foraging and reduced food intake, or long-term population decline resulting from lower breeding success rates (Castelle et al. 1992). Human presence may disturb some species of wildlife while others may be very tolerant of human activities. The time of year may also influence the sensitivity of wildlife to disturbance. Some species may be highly tolerant of human activities while foraging, but be highly sensitive to human disturbance during courtship, breeding or while rearing young (McComb 2001; Stinson et al. 2001; Quinn and Milner 2004). Activities such as the use of heavy equipment, blasting, or pile driving may disturb species for up to 0.25 mile beyond the source of the noise (Ruediger et al. 2000; Watson and Rodrick 2002; Kennedy 2003). Recreational activities can be a significant source of disturbance in breeding and wintering habitat (Claar et al. 1999; Stinson et al. 2001). Bird watching, wildlife viewing and dog walking have also been shown to induce behavioral effects on wildlife populations (Watson and Pierce 1998; Stinson et al. 2001; Banks and Bryant 2007).

3.4 Habitat Protection Tools

Protection and management of FWHCAs requires protection of individual species, species groups, and populations; as well as protection of habitats that provide the life stage needs of the target species. Appropriate identification, mapping, of species and habitats, development of buffers and best management practices that address wildlife disturbance and enforcing timing restrictions on disturbing activities and the development of habitat restoration and mitigation strategies are effective tools for accomplishing these goals.

3.4.1 Acquisition, Designation, Rating, and Classification

Terrestrial wildlife may be protected through the purchase and ownership of property by private parties, non-profit organizations (The Nature Conservancy, The Trust for Public Land), and natural resource agencies such as the National Park Service, USFWS, WDNR, WDFW, or Walla Walla County. Protection can also be achieved by classification or designation through state or federal laws or through a local land use ordinance. For instance, the USFWS may designate critical habitat for federally-listed species. Land uses within designated critical habitat usually are restricted and proposed work in these areas requires coordination with the resource agency. The WDFW PHS Program may identify Priority Habitat areas. Management recommendations for these areas or for species that inhabit specific areas may limit timing or the extent of land use actions. Public agencies may designate their lands for the management of terrestrial wildlife habitat or condition land use practices through rules and permitting requirements. The CTED Critical Areas Handbook recommends that local jurisdictions use PHS data in designating FWHCAs and, when possible, large, round or square blocks of habitat should be prioritized for FWHCAs over smaller or linear open space tracts.

3.4.2 Buffers

Buffers are vegetated lands that separate critical areas from more intensive land uses and are generally intended to reduce potential impacts to the critical area from activities beyond the buffer (O’Connell et al. 2000; Sheldon et al. 2003; Castelle et al. 1992). Land use regulations have required buffers adjacent to wetlands and streams for a number of years and buffers have been the subject of numerous scientific studies and reviews (Castelle et al. 1992; Knutson and Naef 1997; O’Connell et al. 2000; Kauffman et al. 2001; Sheldon et al. 2003).

For wildlife, the principle benefits provided by vegetated buffers are as additional habitat (feeding, cover, breeding); as travel corridors; microclimate moderation; organic input; and to ameliorate the impacts associated with human disturbance (light, noise activity) (Castelle et al. 1992; Kauffman et al. 2001; Sheldon et al. 2003). Since buffers often include the riparian zone, they often contain a higher diversity of wildlife (Castelle et al. 1992; Knutson and Naef 1997; O’Connell et al. 2000; Kauffman et al. 2001). Buffers in Walla Walla County almost exclusively include the riparian corridor, and thus are addressed in buffer recommendations in Sections 2 and 4. There are no specific buffers recommended for state or federally listed wildlife, or wildlife of local importance, identified in Walla Walla County.

3.4.3 Timing Restrictions

Some species of wildlife may be particularly sensitive to disturbance during their breeding seasons, on their wintering grounds, or during migration. Providing restrictions on when highly disturbing types of activity may occur when proposed near sensitive habitat areas is another way to protect habitat and help maintain species use of these areas. The WDFW management recommendations for bald eagles, for example, recommend restricting activities within 880 feet of an active bald eagle nest between January 1 and August 15 (Watson and Rodrick 2002). For the ferruginous hawk, WDFW recommends that ground-based activities should be avoided within a distance of 250 meters (820 feet) of nests during the hawks' most sensitive period (March 1 to May 31) (White and Thurow 1985), while prolonged noise-producing activities should not occur, within 1 kilometer (0.6 mile) of nests during the breeding season (March 1 to August 15) (Suter and Joness 1981). The WDFW, USFWS and NMFS have developed timing restrictions for work that may impact other listed species of fish and wildlife.

3.4.4 Habitat Mitigation

Mitigation refers to a series of steps that project proponents can employ to first locate and avoid impacting sensitive species and habitats and then minimizing the effects of a project and ultimately compensating for any unavoidable impacts. Mitigation may result in restoration and compensatory mitigation of wildlife habitat that results in better and better functioning habitat. Where required, mitigation often includes the approval of a mitigation plan, and the posting of a mitigation bond. The mitigation plan usually includes a monitoring plan and a requirement for the project proponent to monitor the mitigation site for a given period. The plan should include measures to mitigate for impacts to FWHCAs based on WDFW management recommendations and should be developed by consulting with WDFW biologists.

3.5 Code Recommendations

It is recommended that the County implement the buffers discussed in Section 2.7, as they incorporate riparian habitat areas. In addition, it is recommended that hawk habitat, raptor wintering habitat, and neotropical migrant songbird habitat are designated as habitats of local importance and that the timing restrictions and habitat mitigation measurements discussed in Section 3.4 should be implemented.

It is also recommended that the following mitigation standards are required for wind farms:

- No on site mitigation allowed, unless area is sufficient distance from power generation facilities to avoid impacts as demonstrated through critical areas report. Offsite habitat easements or wildlife (birds and bats) habitat replacement and/or enhancement are preferred.

- Mortality monitoring is required during the life of the wind farm. One season every 3 years throughout the 30 years of the farm. Seasons should alternate between fall (1 August to 15 October) and spring migration (1 March to 5 June).

3.6 References

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4 Wetlands

4.1 Section Overview and GMA Requirements

The U.S Army Corps of Engineers (USACE) (Federal Register 1982), the Environmental Protection Agency (EPA) (Federal Register 1985), the Shoreline Management Act (SMA), and the GMA all define wetlands as “areas that are inundated or saturated by surface or ground water at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions.”

Wetlands generally include swamps, marshes, bogs, and similar areas but do not include those artificial wetlands such as irrigation and drainage ditches, grass-lined swales, canals, detention facilities, wastewater treatment facilities, farm ponds, and landscape amenities, or those wetlands created after July 1, 1990, that were unintentionally created as a result of the construction of roadways. Mitigated wetlands that are created from upland areas may be included (WAC 173-22-030).

All of the following criteria must be met for an area to be defined as a wetland:

1. Hydrophytic vegetation. Hydrophytic vegetation is defined as vegetation adapted to growing in wetland conditions (Reed 1997).
2. Wetland hydrology. Wetland hydrology criteria are considered to be satisfied if the soil was seasonally inundated or saturated to the surface for a consecutive number of days greater than or equal to 12.5 percent of the growing season (Ecology 1997).
3. Hydric soils. Hydric soil is formed when soils are saturated, flooded, or ponded long enough during the growing season to develop anaerobic conditions.

Detailed description of wetland delineation methods are found in the Washington State Wetlands Identification and Delineation Manual (Ecology 1997).

4.2 Inventory of Wetlands in Walla Walla County

The following section is primarily derived from the Walla Walla Subbasin Plan (Walla Walla County, 2004).

Walla Walla County lies within the rainshadow formed by the Cascade Mountains. This effect creates the semi-arid conditions that define most of the County. Higher elevations in the Blue Mountains receive more precipitation and receive much of this precipitation in the form of snow. Because of this semi-arid condition, wetlands have formed primarily along perennial drainageways. These wetlands are generally referred to as “riparian wetlands” primarily due to their landscape position and how they interact with the surface water system in the stream. Water availability appears to limit the extent of wetlands, and therefore, riparian wetlands are the most common wetland type found within the County. Isolated wetlands do occur in the County, and, though rare, are known to provide important habitat functions. Wetlands also occur within the forested and alpine areas of the Blue Mountains and in areas influenced by groundwater, such as springs. Agricultural diversions of surface water and subsequent irrigation also affect where wetlands occur and the type of wetlands that are present. Agricultural return flows often collect in drains or low spots that develop wetland conditions. When these conditions occur over time because of widespread agricultural practices, they may be regulated as wetlands. When wetlands develop as a result of a single or minor operation, the wetlands may be non-regulated and treated as normal farming practices. The interaction of agricultural water manipulation, natural drainage features, and long-term trends of groundwater make wetland determination and regulation somewhat complex within Walla Walla County.

Within the semi-arid lower elevations of Walla Walla County, wetlands, particularly riparian wetlands, provide important functions to both humans and wildlife. Woody vegetation provides stability to streamside areas in times of flood or high water. The woody vegetation helps regulate temperatures within the aquatic environment, and provides habitat support for aquatic and terrestrial areas. Riparian vegetation, particularly, the woody vegetation such as willow and cottonwood, provide habitat for insects which support both resident and migratory birds.

The riparian wetlands that occur along the major drainage corridors such as the Walla Walla River, the Touchet River, Mill Creek, Yellowhawk Creek and The Snake and Columbia Rivers provide significant habitat resources for resident wildlife and provide important functions that support aquatic life in these systems. These major drainage courses and their associated riparian areas are also important wildlife corridors with Walla Walla County. Wetlands in the County are shown in Figures 4.2-1A and 4.2-1B.

4.2.1 Wetland Identification

Wetlands within Walla Walla County were identified by two steps: reviewing existing information and conducting limited reconnaissance-level fieldwork. These two steps are discussed in detail below.

Document Review

The following information was reviewed to determine the presumed presence of wetlands in the study area:

- National Wetland Inventory (NWI) maps (online at http://wetlandsfws.er.usgs.gov/wtlnds/launch.html)
- The NWI map identified wetlands in Walla Walla County based on the USFWS wetland classification system (Cowardin et al. 1979). The USFWS wetland classification system, also called as the Cowardin classification system, characterizes wetlands according to water sources and vegetation types.
- WDFW Priority Habitat and Species Data
- The Soil Survey for Walla Walla County County (http://websoilsurvey.nrcs.usda.gov/app/)
- Aerial photographs
- The Walla Walla County Comprehensive Land Use Plan (Walla Walla County 2007)

Insert Figure 4.2-1A (11x17)

Insert Figure 4.2-1B (11x17)

Field Investigation

Qualified wetland scientists conducted field reconnaissance surveys in May 2008 to verify the existence of wetlands identified by document review. This effort, while brief and not comprehensive for such a large and diverse area such as Walla Walla County, confirmed the perception that the presence of wetlands is limited within the County. Wetland data from this field work is provided in Appendix B. Dryland wheat farming dominates the landscape. Many areas with highly erodable soils have been placed into the CRP with the Natural Resources Conservation Service. Through this program thousands of acres of uplands have been left undisturbed, shrub-steppe plantings have been installed, and riparian buffer vegetation has been established throughout the county.

Wetland scientists met with the Conservation District to learn about wetlands of local importance, and the range of conditions expected to occur in Walla Walla County. The CRP and CREP programs, administered by the FSA and the Conservation District, use national criteria to establish appropriate buffer zones along qualifying streams. Since most of the wetlands that occur within Walla Walla County also occur along streams, the CREP plantings are also wetland buffer plantings. The Conservation District biologists identified select vernal pool type wetland areas in the County. Little research has been done in the County on these wetland types, but because of their rarity, and level of function they provide, special management considerations are warranted.

Some wetlands that were included within the NWI mapping of the County were removed from the Figures 4.2-1A and 4.2-1B because they were determined to be man-made, and not associated with a natural drainage course. These wetlands generally included areas that were designed as treatment systems or wetlands or ponds that were fed by pumps and then water levels were controlled with control structures. These include farm ponds or ornamental ponds near rivers.

The field investigation revealed that most wetlands within the County would be classified as:

- Riverine, flow-through (usually within the ordinary high water mark of the stream or river)
- Riverine, impounded (usually abandoned side channels or off-channel areas fed by groundwater or only high flows)
- Depressional, open (usually in headwater areas and may be culvert-controlled)
- Depressional, closed (classification reserved for vernal pool type wetlands)
- Lacustrine/Slope (these areas occur at the stream deltas formed along the confluences with the dam pools associated with the Columbia and Snake Rivers)

To evaluate the potential and opportunity for wetlands in Walla Walla County to perform specific functions, biologists rated select wetlands according to the Washington State Department of Ecology's (Ecology's) Wetland Rating System for Eastern Washington – Revised 2007. Riverine flow-through, Riverine impounded and Depressional open were evaluated in the field. This effort revealed that wetlands that occur along major fish bearing rivers, like the Walla Walla River and the Touchet River, are capable of providing many functions well. It is likely that riparian wetlands associated with these major river/riparian corridor areas will rank Category I or II under the state rating system.

Smaller streams are also maintained by well-functioning wetlands. Smaller streams may be particularly dependent on headwater seep-driven wetlands even though these wetlands score lower for habitat functions. Wetlands associated with smaller streams are likely to rate as Category II or III wetlands according to the state wetland rating system.

Depressional wetlands that display surface water outlets are usually associated with headwater areas. These wetlands also may play significant roles maintaining stream functions, but may not score high for habitat functions.

Depressional wetlands with no outlet appear to be rare in Walla Walla County, and the appropriate scores for various wetland functions may be difficult to evaluate. For those reasons the Ecology rating system ranks vernal pool systems according to special characteristics and they may rank as Category II or III in this system. Field biologists did not visit a vernal pool wetland in Walla Walla County.

Lacustrine/lake fringe wetlands that occur along the Columbia and Snake Rivers perform many important functions, particularly when they are associated with a river. The Walla Walla River delta, for instance, is probably the most diverse habitat area in the County and more bird species have been observed in this area than almost any area east of the Cascade mountains in Washington (Pers. Com. M. Denny, May 2008). They not only provide habitat, they also may trap and filter sediments entering the larger rivers, and stabilize shorelines affected by high flows or wind erosion. Lacustrine/lake fringe wetlands were visited during the field work but none were specifically rated. It is likely that the Walla Walla River delta would rank as Category I and wetlands that occur within the McNary Wildlife Refuge would also classify as Category I under the state rating system.

4.3 Wetland Functions and Values

Wetlands potentially perform a variety of unique physical, chemical and biological functions which are beneficial for both the human and biological environment (NRC 1995; Brinson and Rheinhardt 1996). These functions include flood storage and retention, stream base flow maintenance and groundwater support, improving water quality, shoreline protection, and biological support for fish and wildlife habitat (Null et al. 2000; Adamus et al. 1987; Hruby et al. 1999). Because of their unique combination of water and biodiversity, wetland areas are also used by humans for a broad range of recreational, educational, and aesthetic activities including bird watching and hunting.

Factors affecting wetland function include size of wetlands, location, vegetation diversity, and the level of disturbance. Not all wetlands perform all functions, nor do they perform all functions equally (Novitzski et al. 1995). The following sections describe how wetlands expected to occur in Walla Walla County may perform these functions.

4.3.1 *Flood Water Attenuation and Flood Peak Desychronization*

Wetlands control stormwater flow by capturing and slowly releasing surface water runoff that would otherwise flow directly downstream and cause more severe flooding (Reinelt and Horner 1995). Wetlands in the upper watershed with constricted outlets or closed basins are generally important in capturing and detaining potential floodwaters. Other wetlands that contribute to flood storage and flood desynchronization include wetlands located within broad floodplains and plant communities consisting of low and dense vegetation (Hruby 2004).

The effectiveness of reducing flooding by wetlands increases with:

- An increase in wetland area (the larger the wetland, the more water it can store)
- Proximity of the wetland to flood waters (upstream of floodprone areas)
- Location of the wetland (along a river, lake, or stream)
- Amount of flooding that would occur without the presence of wetlands (climate)
- The lack of other storage areas (Mitsch and Gosselink 2000)

4.3.2 *Stream Baseflow Maintenance and Ground Water Support*

Wetlands may function as both recharge and discharge areas for groundwater by retaining large volumes of water and slowly releasing it to streams and groundwater (Mitsch and Gosselink 2000; Reinelt and Horner 1995). This function contributes to stream baseflow and groundwater recharge (Mitsch and Gosselink 2000). Although these factors have been documented to occur, little information is available on deep aquifer recharge by wetlands. Site-specific studies indicate that some wetlands have more groundwater recharge systems occurring than in others (Carter et al. 1979; Novitzki 1979; Carter and Novitzki 1988).

Wetlands have been assumed to enhance base flows in streams during drier seasons because of their ability to store water. However, recent studies indicate that wetlands in Washington may contribute to reduced baseflow because of water loss through evapotranspiration (Adamus et al. 1991; Bullock and Acreman 2003). Wetlands on alluvial soils are unlikely to hold water long enough into the dry season to support baseflow because alluvial soils are permeable. On the other hand, wetlands with organic and peat soils would hold water but not release very much of it because of the low hydraulic conductivity. As a result of these studies, wetlands are not considered to maintain low flows in streams in Washington (Sheldon et al. 2005).

Groundwater recharge typically occurs around the edges of depressional and riverine wetland systems that impound and hold surface water (Mitsch and Gosselink 2000; Novitzki 1979; Hruby 2004).

4.3.3 *Water Quality Improvement*

Wetlands may help improve water quality by removing organic and inorganic nutrients and toxic materials before they reach open water (Mitsch and Gosselink 2000).

Processes of removing contaminants in wetlands involve settling, chemical reactions in and with the soils, and biotransformations. Major contaminants that can enter wetlands include sediments, nitrogen and phosphorous compounds, hydrocarbons, heavy metals, pathogens, pesticides, and herbicides (Hammer 1989; Moshiri 1993; Kadlec and Knight 1996). Wetlands that may perform well on improving water quality are wetlands that have the following characteristics:

- Are located downstream from sources of pollutants (agriculture, urban development)
- Contain 80 percent or more vegetative cover
- Experience low velocity stormwater flows
- Have a restricted outlet
- Attenuate 50 percent or more of overland flow (Ecology 1996)

Herbaceous and woody wetland vegetation can physically trap and filter suspended sediments that are deposited in wetlands from surrounding areas (Adamus et al. 1991; Sipple 2002). Gilliam (1994) suggested that 85 to 90 percent of sediment from runoff remained trapped by wetland vegetation. Wetland vegetation also provides extensive attachment surfaces for bacteria, which are primary mechanism for nitrogen and phosphorous removal (Hruby et al. 2000).

Metals and toxic organic compounds entering wetlands are generally removed through sedimentation, adsorption, chemical precipitation, plant uptake, and biodegradation (Adamus et al. 1991). Certain toxins can be broken down by plant metabolic processes, and other toxins remain within the plants' biomass until the plants decompose (Gambrell and Trace 1994; Sheldon et al. 2005).

Wetlands that contain organic or clay soils can also remove metals and toxic compounds from surface and groundwater. Metals and toxic compounds entering wetlands bind to the negatively ionized surface of clay particles, precipitate as inorganic compounds, form a complex with humic materials, and adsorb or occlude to precipitated hydrous oxides (Gambrell and Trace 1994).

4.3.4 Erosion/Shoreline Protection

Wetlands that are adjacent to water bodies such as lakes, rivers, and bays help protect shorelines and stream banks against erosion by decreasing the velocity of water flowing downstream (Sheldon et al. 2005). The ability of wetlands for reducing water flow depends on the presence of woody vegetation, the configuration of the wetland, and the substrate type (Adamus et al. 1991; Sheldon et al. 2005).

Vegetated depressional wetlands with no outlet are most effective at reducing erosion since they store all surface waters. Riverine wetlands with riparian vegetation also provide erosion protection by decreasing the water velocity near the shoreline. The riverine wetland that is wider than the channel width allows water to spread out; thus slows down the water flow (Sheldon et al. 2005; Hruby et al. 1999). Wetlands with dense vegetation along relatively undeveloped shorelines and banks may also reduce erosion providing high shoreline protection during high-water periods (Adamus et al. 1991).

4.3.5 Biological Support and Fish and Wildlife Habitat

As described in Sections 2 and 3 of this document, wetlands support various species by providing sources of food, shelter, and refuge. Different vegetation communities within wetland boundaries can support a higher diversity of invertebrates by adding more structure complexes and creating more edge habitat (Dvorak and Best 1982; Lodge 1985). Diversity of wildlife species increases when wetlands are connected to undisturbed natural upland habitat or aquatic ecosystems. These connections provide corridors for migration and dispersal of many wildlife species (Mitsch and Gosselink 2000; Kauffman et al. 2001).

Moist and moderate microclimate is one of the characteristics of the wetland habitat that contribute to species richness and abundance (Knutson and Naef 1997). Wetlands with the wet and moist microclimate condition and organic rich soils contribute to high production of plant materials, which increases in the number of invertebrates. Leeper and Taylor (1998) indicated that small seasonal wetlands can support more than 700,000 animals per square meter. Increase in invertebrates provides more species diversity since larger predators including amphibians, reptiles, fish, birds, and mammals feed on these invertebrates as a part of the food web (Sipple 2002). In Walla Walla County, seasonal and isolated wetlands sometimes support unique wildlife species, such as tiger salamanders.

4.3.6 Recreation, Education, Cultural Resources, and Open Space

Because of their unique characteristics, wetlands support a wide range of recreational activities including swimming, fishing, and hunting. Wetlands and surrounding areas also provide other activities such as hiking, wildlife viewing, and nature study. The quality of these recreational activities depends on the health of the wetland. Within urbanized and suburbanized settings, wetlands are also important by providing open space for aesthetic enjoyment to local communities (Stevens and Vanbianchi 1993).

4.4 Human Activity and Wetland Habitat Functions

Human activities may alter wetland functions and values that could have both positive and negative effects. For example, logging, agriculture, mining, urbanization, and construction of utilities, in-water structures, and roads could have negative impacts whereas restoration, enhancement, dam removal, and control of invasive species could result in beneficial effects on wetlands (Mitsch and Gosselink 2000; Booth 2000; Sheldon et al. 2005).

Different types of human activities can affect wetland functions and values at various levels. The most extreme impacts caused by human activities are filling or de-watering a wetland. These activities remove all the wetland functions (Sheldon et al. 2005). More subtle impacts may result from human activity. Human pets, specifically cats, have been demonstrated as significant predators on songbirds, and general human activity and noise may preclude a site from being inhabited by more reclusive or easily frightened species.

4.4.1 Flood Water Attenuation and Flood Peak Desychronization

Dredging, filling, and channelization (i.e., dikes, levees) alter a wetland's storage capacity and flood control functions by separating the wetland from the floodplain (Mitsch and Gosselink 2000). Roads, culverts, and other outlets also affect flood control by regulating flow rate (Taylor 1993; Taylor et al. 1995). Changing the water flow and storage capacity in wetlands could increase rates and volumes of the stormwater as well as the timing of stormwater entering aquatic systems (Mitsch and Gosselink 2000; Sheldon et al. 2005).

The loss of the flood control function in urban basins tends to increase discharge to wetlands, changing the pattern of water level fluctuations. Increase in water level fluctuations can reduce biological diversity and native plant cover in wetlands (Reinelet et al. 1998; Azous and Horner 2001). Additionally, increase in stormwater runoff could result in sediment loading to a wetland, which could introduce higher levels of contaminants, increase in stream bank erosion, and disturb aquatic habitat (Richter 2001; Azous and Horner 2001).

4.4.2 Stream Baseflow Maintenance and Ground Water Support

Surface and groundwater movement are affected by changes in land uses and vegetation cover such as urban development and agricultural conversion . Increases in impervious surface or extensive groundwater pumping may remove or alter wetlands that provide groundwater support (Sheldon et al. 2005; Gersib 2001). As mentioned above, recent studies show that wetlands do not necessary provide stream baseflow; therefore this particular function is not discussed further.

4.4.3 Water Quality Improvement

Wetlands maintain the water quality of receiving waters through biofiltration and infiltration. Human land uses such as urbanization, agricultural conversion, and forest practices could alter the physical properties of a wetland and affect the water quality enhancement function of the wetland either by the loss of wetland area or through changing vegetation or changes in wetland hydroperiod. Typical human disturbances include filling, draining, vegetation removal, compacting surface soils, and creating impervious surfaces (Sheldon et al. 2005; Ecology 1996).

Clearing vegetation causes the rate of surface runoff to increase, which limits suspended sediments and contaminants to settle and react with the soils. Denitrification and phosphorus retention processes are likely restricted by severe water fluctuations (Ecology 1996). Additionally, some studies show that flowing water across the ground surface tends to collect dissolved nutrients and toxics sending them downstream (Reinelt and Horner 1995; Azous and Horner 2001; Sheldon et al. 2005).

The impact of human activity and development on water quality varies widely between wetlands of different urbanization levels. In general, increases in impervious surfaces would likely change the frequency and the magnitude of surface runoff (Booth and Reinelt 1993). However, there are few studies available addressing the impacts of surface water runoff on water quality in wetlands since many studies have focused more on the effectiveness of wetlands for water treatment. Azous and Horner (2001) studied 28 wetlands in the lower Puget Sound area and found that pollutant concentrations tended to be higher in urban wetlands, but these concentrations were still within Ecology's water quality standards. Alterations to water quality of a wetland by hydrologic changes, such as low dissolved oxygen, high turbidity, and pollutant levels, may negatively affect plants and animals as well (Adamus et al. 2001).

4.4.4 Erosion/Shoreline Protection

Human activities can affect erosion and shoreline protection functions by removing vegetation, compacting soils, and increasing the peak flow. Vegetation removal in wetlands that are located nearby lakes, rivers, or bays may increase in the downstream erosion and flooding by increasing the water velocity (Sheldon et al. 2005).

This function is especially important in urban watersheds with frequent flooding, but many studies suggested that urbanization is the major cause of erosion due to the increase in the movement and deposition of sediments (Azous and Horner 1997; Sheldon et al. 2005). Construction activities especially affect erosion since soil surfaces are often disturbed and exposed during construction.

4.4.5 Biological Support and Fish and Wildlife Habitat

Wetlands support both aquatic and terrestrial environments when hydrologic conditions are stable and follow natural patterns. As urbanization or changes in land use occur, habitats may simplify and specific support for some species might be lost. Direct impact to specific habitats are caused by filling, draining or outlet modification whereas indirect impacts include increased or decreased quantity and reduced quality of water flow to a wetland (Azous and Horner 1997).

Most aquatic and terrestrial species are influenced by types of plants growing in a wetland; therefore altering vegetation communities in the wetland may cause the loss or degradation of habitat for many fish and wildlife species, especially sensitive species in Washington State (Sheldon et al. 2005). Vegetation clearing also contributes to introduction of invasive species, which affects habitat diversity by lowering vegetation diversity. Some examples of vegetation clearing include logging, mowing, burning, and plowing.

Although specific species are impacted in a different way, changes in hydrology and hydroperiod can generally affect the distribution and richness of aquatic and terrestrial species. For example, breeding of amphibians can be greatly influenced by altering hydroperiod (Rowe and Dunson 1993; Richter et al. 1991). Reducing water levels of a wetland through ditching, draining, or pumping may provide less habitat for fish and bird species (Adamus et al. 2001; David 1994; DeAngelis et al. 1997). Changes in wetland vegetation communities are also observed by increase or decrease in water levels (Sheldon et al. 2005).

Human activities such as urbanization, agriculture, and mining can also increase the amounts of pollutants that are released into wetlands by surface water runoff and suspended sediments (Sheldon et al. 2005). Urban development is often associated with increased export of sediment to water bodies, especially affecting aquatic invertebrates and fish species (Sheldon et al. 2005; Euliss et al. 1999). Pollutants including heavy metals, pesticides, herbicides, and oil can cause either acute or chronic toxicity to aquatic and terrestrial species. The response of individual species to pollutants vary depending on other environmental factors such as characteristics of wetlands, but many studies have reported that pollutants change community structure of wetlands over time (Sheldon et al. 2005).

4.4.6 Recreation, Education, Cultural Resources, and Open Space

Opportunities for recreation, education, and open space in wetlands can be limited by direct human activities such as filling, draining, or alteration of wetlands. Wetlands surrounded by development are often valued as open space or green space by homeowners who live nearby. Human activities can lower the recreational values of wetlands by impacting fish and wildlife species richness and abundance.

4.5 Wetland Protection and Regulation

Wetlands in Walla Walla County are currently regulated at the federal and state levels. Under Section 404 of the Clean Water Act, the USACE regulates discharges of dredged or fill materials into waters of the United States, including wetlands. Additionally, Section 401 of the Clean Water Act requires that any activities permitted under Section 404 meet water quality standards regulated by state and tribal governments. Wetlands for all farm program participants are regulated by the USDA under the Food Security Act. Ecology defines isolated wetlands as waters of the state, and regulates the loss of, and activities within, such wetlands.

The GMA requires cities and counties to designate critical areas including wetlands by adopting development regulations (RCW 36.70A.130). This best available science document is being prepared in the context of the County's adopting such regulations. The following sections describe the regulatory options for protecting wetlands, and the recommendations for Walla Walla County.

4.5.1 Four-step Framework for Protecting and Managing Wetlands

Ecology's publication, *Wetlands in Washington State Volume 2: Guidance for Protecting and Managing Wetlands* (Granger et al. 2005) outlines a framework for managing wetlands. The framework consists of four steps, and these four steps are briefly summarized and described below:

Step 1: Analyzing the landscape and its wetlands

Step 2: Prescribing solutions

Step 3: Taking actions

Step 4: Monitoring results

Step 1 involves a landscape analysis at different scales that influence wetland resources and the processes that occur on the site. A landscape analysis provides important information that forms the basis of a program to protect wetlands. This information provided by the landscape analysis could be used to develop or update comprehensive plans. The goal of this step is to develop an understanding of where landscape processes occur and where they are particularly sensitive to human disturbances.

Understanding the environmental factors in the landscape is essential to plan land use designations in the future.

Information generated from the landscape analysis can also protect some landscape processes by assisting development of regulations. Although beneficial at larger scales, this is best done at a sub-basin or subarea scale, where specific regulations can be developed to prevent degradation of landscape processes and to target protection of connected habitats (Granger et al. 2005).

Step 2 describes the process by which local governments develop solutions to protect and manage wetlands within their jurisdiction. The goal is to identify means for incorporating the results of the landscape analysis in Step 1 into effective planning, regulatory, and non-regulatory tools. This is the step in which Smart Grow planning approaches, such as Green Infrastructure or Alternative Futures, can be applied and when comprehensive plans, critical area ordinance, shoreline management plans, restoration plans, and incentives for conservation are typically developed.

Step 3 ensures that the solutions developed and adopted in Step 2 are effectively implemented through taking actions at the different geographic scales. Examples of taking actions could include:

- Implementing regional, subarea, or community plans on the ground
- Applying critical areas and clearing and grading ordinances at specific wetland sites when a development is proposed
- Restoring or preserving wetlands identified in a restoration plan through a landscape analysis
- Providing tax relief for landowners with wetlands

Step 4 applies monitoring to determine whether cumulative impacts have been minimized during Step 3. Local jurisdictions cannot determine whether their solutions are actually protecting wetlands without collecting data that monitor the success of their approach. Monitoring whether adequate protection has been achieved, followed by any needed corrective action, is especially critical. Much of the information collected to date and reviewed indicates that there is still continued loss of wetlands and their functions and values (i.e. cumulative impacts).

Adaptive management is based upon the information collected through Step 4 and can be used to determine what changes are necessary to improve protection when the identified goals are not met. Using adaptive future management, policies, and regulations can be more effective in protecting the wetland resource (Washington State Joint Natural Resource Cabinet 1999).

4.5.2 Wetland Delineation, Classification, Rating, and Reporting

Wetland Delineation

Wetlands are those areas that meet the state definition of “those areas that are inundated or saturated by surface or ground water at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions. Wetlands generally include swamps, marshes, bogs, and similar areas." Wetlands are identified in accordance with the Washington State Wetlands Identification and Delineation Manual (Ecology 1997). All areas within the County that meet the definition are designated as critical areas, unless the type of wetland is specifically exempt from regulation by the CAO. Wetland boundaries are identified by applying methods found in the delineation manual. Typically, a qualified professional conducts a site visit gathering data on hydrology, vegetation, and soils. In the State of Washington, local jurisdictions are required to use the Washington State Wetlands Identification and Delineation Manual for delineating wetlands (RCW 36.70A.175, Chapter 173.22.080 WAC).

Wetland Classification

There are two commonly used wetland classification systems: the Cowardin classification system and the Hydrogeomorphic classification system (HGM). The Cowardin system classifies wetland habitats based on landscape position, vegetation cover, and hydrologic regime. This system is hierarchical and includes several layers of detail for wetland classification including:

- Water flow
- Substrate type
- Vegetation types
- Dominant plant species

The Cowardin system focus is on describing habitat and is useful for developing wetland inventories from aerial photographs. It incorporates some landscape factors, but it is not designed to help understand how functions differ among wetlands (Sheldon et al. 2005).

The HGM classification was developed by Brinson (1993) to categorize wetlands into groups that function in similar ways. This classification method was chosen by the statewide wetland technical committee that guided the development of the Washington wetland function assessment methods (Hruby et al. 1999). The HGM classification system characterizes wetlands based on:

- Geomorphic setting (topographic location)
- Water source and its transport (precipitation, surface, groundwater)
- Hydrodynamics (direction and strength of flow)

The categories are divided by classes, and the highest class is established based on the geomorphic setting of the wetland (Brinson 1993). Within a region, subclasses for each of these wetland classes can be defined by local wetland experts. Table 4.5-1 lists the general classes and subclasses of HGM wetland types within Eastern Washington Lowlands.

Table 4.5-1
Classes and Subclasses of HGM Wetland Types in Eastern Washington Lowlands (Hruby et al. 2004)

Class	Subclass
Riverine	Impounding Flow-through
Depressional	Outflow Closed
Slope	ND[1]
Lacustrine (Lake) Fringe	ND[1]

1. ND signifies a classification system that has not yet been developed

Both Cowardin and HGM classification systems are important to identify wetland functions and are helpful when assessing a wetland by providing detailed information. It is recommended that wetland mitigation projects require this information as the baseline information of the site. This information will help the County determine whether or not the proposed mitigation is the best and most appropriate option for the type of wetland.

Wetland Rating

The CTED recommends cities and counties to use a wetland rating system for identifying the relative function, value, and uniqueness of wetlands in their jurisdiction. As a tool to develop a rating system, the CTED suggests local jurisdiction consider:

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

The most recommended option by the CTED is the Washington State rating system, which is supported by scientific literature and provides continuity between local and state permit decisions. Local jurisdictions can choose not to use the Washington state rating system and develop their own system that is appropriate for their local conditions. However, the rationale for that decision needs to be included in the legal record (Ousley et al. 2003).

Ecology has developed a wetland rating system for ranking wetlands according to their relative importance in terms of functions and special characteristics. This rating system is described in *the Washington State Wetland Rating System for Eastern Washington – Revised* (Hruby 2004).

This rating system incorporates existing land use, and site specific data to develop numerical scores that rate a particular wetland's ability to perform 1) Water Quality Improvement Functions, 2) Hydrologic Support Functions, and 3) Wildlife Habitat

Functions. Each wetland is also placed into one of four overall categories based on these scores.

Points are also assigned to wetlands based on their sensitivity to disturbance, rarity, the functions they provide, and whether or not they are replaceable. The maximum number of points a wetland can score is 100. Ecology's rating system rates wetlands into four distinct categories, from Category I to Category IV (Table 4.5-2). This rating system was designed to be used for developing standards for protecting and managing the wetlands and wetland buffer areas. However, it does not replace a full wetland functional assessment for compensatory mitigation projects.

Table 4.5-2
Wetland Rating System[1]

Category	Criteria
I	Category I wetlands are those that: 1). Represent a unique or rare wetland type; or 2). Are more sensitive to disturbance than most wetlands; or 3). Are relatively undisturbed and contain ecological attributes that are impossible to replace within a human lifetime; or 4). Provide a high level of functions. Specific wetlands that meet the Category I criteria include: • Alkali wetlands; • Natural Heritage Wetlands, specifically, Wetlands identified by the Washington Natural Heritage Program/DNR as high quality relatively undisturbed wetlands; and Wetlands that support state-listed threatened or endangered plants; • Bogs; • Mature and old-growth forested wetlands with slow growing trees; and, • Wetlands that perform many functions very well, as indicated by a score of 70 or more points out of 100 on the Ecology wetland rating form.
II	Category II wetlands provide high levels of some functions. Specific wetlands that meet the Category II criteria include: 1. Forested wetlands in the floodplains of rivers; 2. Mature and old-growth forested wetlands with fast growing trees 3. Vernal pools; and 4. Wetlands that perform functions well and score between 51 and 69 points out of 100 on the wetland rating form.
III	Category III wetlands are: 1. Wetlands that score between 30 and 50 points out of 100 on the wetland rating form.
IV	Category IV wetlands have the lowest levels of functions and are often heavily disturbed. Specific wetlands that meet the Category IV criteria include wetlands scoring less than 30 points out of 100 on the wetland rating form.

1. Hruby 2004

Wetland Exemptions

A review of best available science data indicates that wetlands, regardless of their size, provide some type of important physical, chemical, or biological functions (Sheldon et al. 2005; Granger et al. 2005). In the past, regulatory agencies have often exempted certain wetlands from regulatory requirements or mitigation based on their small size. For example, a jurisdiction may allow filling wetlands that are between 1,000 square feet and 2,500 square feet without mitigation.

Ecology has provided informal guidance regarding potential exemption of small wetlands that allows local jurisdictions to consistently determine what protection measures are required. It states that wetlands less than 1,000 square feet or smaller may be exempt from regulatory requirements when they meet the following criteria:

- They are not associated with a riparian corridor

- They are not part of a wetland mosaic

- They do not contain habitat identified as essential for local populations of priority species identified by WDFW

However, the scientific literature does not provide support for such exemptions because the loss of wetlands may possibly cause cumulative impacts such as fragmentation or exceeding thresholds of ecosystem viability on the landscape (Granger et al. 2005). Therefore, understanding the potential cumulative impacts (e.g., how many acres of wetlands would be affected, what functions would be most affected, how such impacts would be compensated, etc.) and considering and documenting the potential implications are critical to protect wetland functions.

Ecology also suggests that local jurisdictions may limit the exemption to certain areas (such as Urban Growth Areas [UGAs] or specific sub-basins), to certain wetland types (e.g., Category IV wetlands, those with non-native species), which will help minimize the risk of losing important wetland functions. Additionally, it may be important to limit the total acreage of wetlands exempted on a project basis or within a sub-basin (Granger et al. 2005).

Regulatory Recommendations

Both the USACE and Ecology have established a coordinated framework for assessing impacts to wetlands and mitigation of such impacts (Ecology et al 2006a; Ecology et al 2006b) It is recommended that Walla Walla County adopt regulations that are as consistent as possible with this state and federal framework. This will ensure that a prospective applicant will develop their projects in a manner that meets the requirements of all three levels of jurisdiction, and that County approvals will be consistent with state and federal approvals, thereby minimizing conflicting requirements for the permittee.

The following requirements would therefore be incorporated into the County's regulations:

- Wetland delineation: the County would require that wetlands be delineated in accordance with the Washington State Wetlands Identification and Delineation Manual for delineating wetlands (RCW 36.70A.175, Chapter 173.22.080 WAC).

  It should be noted that the Corps has developed supplements to the 1994 delineation manual that the state's manual must comport with. This is the Arid West Supplement (U.S. Army Corps of Engineers. 2006. *Interim regional supplement to the Corps of Engineers Wetland Delineation Manual: Arid West Region.* ed. J. S. Wakeley, R. W. Lichvar, and C. V. Noble. ERDC/EL TR-06-16. Vicksburg, MS: U.S. Army Engineer Research and Development Center.)

  The Corps now requires this supplement to the 1987 manual be used in the arid interior west, which includes all of Walla Walla County. Ecology typically will accept the use of this manual in place of the Ecology manual until the Ecology manual is updated and republished to incorporate the changes. In cases where only isolated wetlands are affected, the applicant can choose which manual they use; Ecology's preference is to use both so that they may evaluate any changes to delineation lines that may be expected from the new supplement.

- Wetland rating: the County would require that wetlands be rated according to the Washington State Wetland Rating System for Eastern Washington – Revised, Ecology Publication No. 04-06-15, unless updated.

- Wetland exemptions: the County should allow minor activities without review, but no activity should be allowed that degrades the functions and values of the critical area affected.

- Wetland reporting: It is recommended that the County require documentation that aligns as closely as possible with the requirements of Ecology and the USACE (Ecology et al 2006b). This will simplify the permitting procedure across local state and federal requirements for the prospective applicant.

Ecology is responsible for administering the State Water Pollution Control Act (RCW 90.48). Under this state law, wetlands are "waters of the state," including wetlands considered "isolated" by the Corps via the Corps Jurisdictional Determination process (requested from the Corps in writing by an applicant). Discharges to waters of the state, including the placement of fill in a wetland, are regulated by Ecology under chapter 90.48 RCW. Thus, the state Department of Ecology is continuing to regulate isolated wetlands and to apply the water quality standards called for in the state law. However, the department's process for reviewing projects involving isolated wetlands is now different from the process for other types of wetlands.

Instead of using the 401 Water Quality Certification process (triggered by a 404 permit from the Corps), Ecology uses Administrative Orders to regulate projects involving isolated wetlands. The review standards and elements within the Order remain the same as those found in the 401 Certification.

The State Water Quality Standards consist of three main elements: characteristic uses of surface waters and numerical criteria for conventional water quality parameters that are not to be exceeded (173-201A-130), and an antidegradation policy (173-201A-070). The antidegradation policy establishes the bottom line for water quality protection in the state: "Existing beneficial uses shall be maintained and protected and no further degradation which would interfere with or become injurious to existing beneficial uses shall be allowed. Beneficial uses are more or less equivalent to wetland "functions and values" and therefore include: water supply, surface and groundwater treatment, stormwater attenuation, fish and shellfish migration, rearing, spawning, and harvesting, wildlife habitat, recreation, support of biotic diversity, and aesthetics.

4.5.3 Wetland Buffers

Wetland Buffers Values and Functions

Buffers are relatively undisturbed, vegetated areas adjacent to wetlands that can reduce impacts through physical, chemical, and/or biological processes. Buffers generally provide habitats for wildlife species, but primary function of buffers is to protect and maintain many functions and values of wetlands described above. The scientific literature provides considerable guidance on buffer characteristics and effectiveness of providing functions (Sheldon et al. 2005).

Wetland buffers may provide the following functions to protect and maintain wetland functions:

- Remove sediment
- Remove excess nutrients (phosphorus and nitrogen)
- Remove toxics (bacteria, metals, pesticides)
- Influence the microclimate
- Maintain adjacent habitat critical for the life needs of many species that use wetlands
- Screen adjacent disturbances (noise, light, etc.)
- Maintain habitat connectivity

A review of scientific literature also indicates that buffer functions are determined by site-specific attributes of a buffer. These factors include landscape position of the buffer, vegetation characteristics (composition, density, and roughness), percent slope, soil type, and buffer widths and lengths (adjacent to the source of impacts) (Sheldon et al. 2005).

Determining appropriate buffer widths for a wetland has been a subject of numerous studies and is challenging because of a wide variety of the physical settings of the research. Much of the research focuses on how buffers influence water quality, with fewer studies looking at the influence of a buffer’s physical characteristics on attenuating surface water flow rates. Some reports indicated that appropriate buffer widths for a wetland depend on the environmental settings and functions to be achieved by the buffer (Castelle et al. 1992a; Castelle and Johnson 2000; Desbonnet et al. 1994). The most recent literature review specific to wetland buffers in western Washington is included in *Freshwater Wetlands in Washington State Volume 1: A Synthesis of the Science* (Sheldon et al. 2005).

Ecology’s recent published guideline describes the use of appropriate wetland buffer widths based on wetland functions and characteristics and adjacent land uses (Granger et al. 2005). Larger buffers are recommended when the adjacent land use intensity is high from commercial and residential development and the quality of the buffer is low.

Buffers play the following roles in protecting and maintaining specific wetland functions:

- Flood water attenuation and flood peak desychronization
- Stream baseflow maintenance and ground water support
- Water quality improvement

- Erosion/shoreline protection
- Biological support and fish and wildlife habitat
- Recreation, education, cultural Resources, and open Space

Wetland Buffer Width Alternatives

Granger et al. (2005) outlines four different alternatives that local jurisdictions could choose to determine standard wetland buffer widths (Buffer Alternatives 1, 2, 3, and 3A). Summaries of alternatives 2, 3, and 3A are described in the following. The buffer widths presented below are Ecology's recommended buffer widths, but Walla Walla County can revise the buffer widths based upon BAS, land-use designations, and additional protection measures outlined below. Ecology provides basic assumptions regarding the guidance for each of the buffer alternatives described below. Recommended buffer alternatives assume that:

- The wetland has been categorized using the Washington State Wetland Rating System for Eastern Washington-Revised.
- The buffer is vegetated with native plant communities that are appropriate for the *ecoregion* or with a plant community that provides similar functions. Ecoregions denote areas of general similarity in ecosystems and in the type, quality, and quantity of environmental resources. The EPA maintains updated maps of ecoregions that are available at http://www.epa.gov/naaujydh/pages/models/ecoregions.htm. Ecoregions currently mapped for Washington are: Coast Range, Puget Lowland, Cascades, Eastern Cascades Slopes and Foothills, North Cascades, Columbia Plateau, Blue Mountains, and Northern Rockies.
- If the vegetation in the buffer is disturbed (grazed, mowed, etc.), proponents planning changes to land use that will increase impacts to wetlands need to rehabilitate the buffer with native plant communities that are appropriate for the ecoregion, or with a plant community that provides similar functions.
- The width of the buffer is measured along the horizontal plane.
- The buffer will remain relatively undisturbed in the future within the width specified.

Buffer Alternative 1

Buffer alternative 1 prescribes buffers solely on the overall rating the wetland receives when the Washington State Wetland Rating System for Eastern Washington (Ecology 2004 Revised) is applied. This alternative is the least flexible and generally prescribes larger buffers. Because no distinction is made in this system between wetlands that have high habitat values and wetlands that provide important hydrologic or water quality function, all Category I and Category II wetlands receive the larger buffers needed to protect habitat functions. This system may be easier to understand and describe, but it tends to over regulate and provide little flexibility to applicants who can demonstrate that the required buffer may have little practical effect. Table 4.5-3 shows recommended buffer widths for eastern Washington wetlands under buffer alternative 1.

Table 4.5-3
Recommended Buffer Widths for Eastern Washington under Alternative 1

Category of Wetland	Widths of Buffers
IV	50 ft
III	150 ft
II	200 ft
I	250 ft

Buffer Alternative 2

Buffer alternative 2 derives wetland buffer widths based upon intensity of the proposed land uses. This alternative provides three levels of proposed land use intensity (high, moderate, and low) and includes the concept that not all proposed changes in land uses have the same level of impact.

Table 4.5-4 shows recommended buffer widths for this alternative. Types of proposed land uses are shown in Table 4.5-5.

Table 4.5-4
Recommended Buffer Widths for Eastern Washington under Alternative 2

	Buffer Widths		
Category of wetland	Low Impact Land Use	Moderate Impact Land Use	High Impact Land Use
IV	25 feet	40 feet	50 feet
III	75 feet	110 feet	150 feet
II	100 feet	150 feet	200 feet
I	125 feet	190 feet	250 feet

Table 4.5-5
Draft Land Use Intensity Table: Types of Proposed Land Use that can result in High, Moderate, and Low Levels of Impacts to Adjacent Wetlands

Level of Impact from Proposed Change in Land Use	Types of Land Use Based on Common Zoning Designations *
High	•Commercial •Urban •Industrial •Institutional •Retail sales •Residential (more than 1 unit/acre) •High-intensity recreation (golf courses, ball fields, etc.)
Moderate	•Residential (1 unit/acre or less) •Moderate-intensity open space (parks with biking, jogging, etc.) •Paved driveways and gravel driveways serving 3 or more residences •Paved trails

Table 4.5-5 Draft Land Use Intensity Table: Types of Proposed Land Use that can result in High, Moderate, and Low Levels of Impacts to Adjacent Wetlands	
Level of Impact from Proposed Change in Land Use	**Types of Land Use Based on Common Zoning Designations ***
Low	•Low-intensity open space (hiking, bird-watching, preservation of natural resources, etc.) •Timber management •Gravel driveways serving 2 or fewer residences •Unpaved trails •Utility corridor without a maintenance road and little or no vegetation management.

* Local governments are encouraged to adopt land-use designations for zoning that are consistent with these examples.

Buffer Alternative 3

Buffer alternative 3 is the most complicated option but offers the most flexibility by basing the buffer widths on three factors: the wetland category, the intensity of the proposed impacts (Table 4.5-5), and the functions or special characteristics of the wetland. Table 4.5-6 shows recommended buffer widths under this alternative. As compared to Alternative 2, this system provides reduction in wetland buffers with lower habitat values, given the same wetland classification and land use intensity.

Buffer Alternative 3A

Buffer alternative 3A bases wetland buffer widths on a graduated scale for habitat function. The graduated scale is derived from habitat scores received using the 2004 Ecology's habitat function worksheet (Publication #04-06-025). Three grouping of scores (0 to19, 20 to 28, and 29 to 36) are used with this system.

As a result, a one-point difference between 28 and 29 could result in a 150-foot increase in buffer width. Because a one-point increase in habitat score may be contentious, Ecology states that jurisdictions may reduce the increments in buffer widths by developing a more graduated (but inherently more complicated) scale on the scores for habitat. For example, buffer width can increase by 20 feet for every one point increase in the habitat score between 22 and 31 points (Table 4.5-7). This type of graduated scale allows for decrease in buffer widths for wetlands with higher scores in function, which are typically Category I and II wetlands. Table 4.5-7 compares Ecology's example of a graduated scale for wetland buffers with Alternative 3 buffer widths.

Table 4.5-6
Recommended Buffer Widths under Alternative 3

Wetland Characteristics	Buffer Width by Impact of Proposed Land Use	Other Measures Recommended for Protection
Category IV Wetlands (For wetlands scoring less than 30 points or more for all functions)		
Score for all 3 basic functions is less than 30 points	Low – 25 ft Moderate – 40 ft High – 50 ft	No recommendations at this time[1]
Category III Wetlands (For wetlands scoring 30-50 points or more for all functions)		
Moderate level of function for habitat (score for habitat 20-28 points)	Low – 75ft Moderate – 110ft High – 150 ft	No recommendations at this time[1]
Not meeting above characteristic	Low – 40 ft Moderate – 60 ft High – 80 ft	No recommendations at this time[1]
Category II Wetlands (For wetlands that score 51-69 points or more for all functions or having the "Special Characteristics" identified in the rating system)		
High level of function for habitat (score for habitat 29-36 points)	Low – 100 ft Moderate – 150 ft High – 200 ft[2]	Maintain connections to other habitat areas.
Moderate level of function for habitat (score for habitat 20-28 points)	Low – 75ft Moderate – 110ft High – 150 ft	No recommendations at this time[1]
High level of function for water quality improvement and low for habitat (score for water quality 24-32 points; habitat less than 20 points)	Low – 50 ft Moderate – 75 ft High – 100 ft	No additional surface discharges of untreated runoff
Vernal pool	Low – 100 ft Moderate – 150 ft High – 200 ft OR Develop a regional plan to protect the most important vernal pool complexes – buffers of vernal pools outside protection zones can then be reduced to: Low – 40 ft Moderate - 60 ft High – 80 ft	No intensive grazing or tilling of wetland
Riparian forest	Buffer width to be based on score for habitat functions or water quality functions	Riparian forest wetlands need to be protected at a watershed or subbasin scale Other protection based on needs to protect habitat and/or water quality functions
Not meeting above characteristic	Low – 50 ft Moderate – 75 ft High – 100 ft	No recommendations at this time[1]
Category I Wetlands (For wetlands that score 70 points or more for all functions or having the "Special Characteristics" identified in the rating system)		
Natural Heritage Wetlands	Low – 125 ft Moderate – 190 ft High – 250 ft	No additional surface discharges to wetland or its tributaries. No septic systems within 300 ft of wetland. Restore degraded parts of buffer.
Bogs	Low – 125 ft Moderate – 190 ft High – 250 ft	No additional surface discharges to wetland or its tributaries.

Table 4.5-6
Recommended Buffer Widths under Alternative 3

Wetland Characteristics	Buffer Width by Impact of Proposed Land Use	Other Measures Recommended for Protection
		Restore degraded parts of buffer.
Alkali	Low – 100 ft Moderate – 150 ft High – 200 ft	No additional surface water discharges to wetland or its tributaries Restore degraded parts of buffer
Forested	Buffer width based on score for habitat functions or water quality functions	If forested wetland scores high for habitat, need to maintain connections to other habitat areas.
High level of function for habitat (score for habitat 29-36 points)	Low – 100 ft Moderate – 150 ft High – 200 ft	Restore degraded parts of buffer. Maintain connections to other habitat areas
Moderate level of function for habitat (score for habitat 20-28 points)	Low – 75ft Moderate – 110ft High – 150 ft	No recommendations at this time[1]
High level of function for water quality improvement (24-32 points) and low for habitat (less than 20 points)	Low – 50 ft Moderate – 75 ft High – 100 ft	No additional surface discharges of untreated runoff
Not meeting above characteristics	Low – 50 ft Moderate – 75 ft High – 100 ft	No recommendations at this time[1]

1. No information on other measures for protection was available at the time the document was written. Ecology will continue to collect new information future updates to this document.

2. Fifty of the 122 wetlands used to calibrate the rating systems for western Washington were Category II. Of these 50, only five (10 percent) would require 300-ft buffers to protect them from high-impact land uses. The maximum buffer width for the remaining 45 wetlands would be 150 ft.

Table 4.5-7
Comparison of Buffer Alternative 3 with Buffer Alternative 3A for Proposed Land Uses with High Impacts based on the Score for Habitat Functions in Eastern Washington

Alternative	Points for Habitat from Wetland Rating Form																	
	19	**20**	**21**	**22**	**23**	**24**	**25**	**26**	**27**	**28**	**29**	**30**	**31**	**32**	**33**	**34**	**35**	**36**
Alternative 3	100	150	150	150	150	150	150	150	150	150	200	200	200	200	200	200	200	200
Alternative 3A	100	100	100	110	120	130	140	150	160	170	180	190	200	200	200	200	200	200

Wetland Buffer Width Adjustment

The recommended buffer widths are based on the assumptions stated above. Changes (i.e., increases, reductions, or enhancements) in the proposed buffer widths could be required or allowed if proper mitigation or conditions were present. For example, increase in buffer widths may be required if the buffer is unvegetated, sparsely vegetated, or vegetated with invasive species that do not perform necessary functions. The buffer should either be planted with native plants or widened to ensure that adequate functions of the buffer are provided. Generally, improving the vegetation is considered more effective than widening the buffer.

If a buffer is to be rated based on the score for its ability to improve water quality instead of habitat or other criteria, then the buffer should be increased by 50 percent if the slope is greater than 30 percent. Similarly, if the buffer is used by a species that might be sensitive to human disturbance, buffer widths should be increased to provide additional protection. Consultation through WDFW may be necessary to determine the appropriate buffer widths for wildlife protection.

Buffer Width Averaging

Buffer averaging may be allowed if averaging improves the wetland protection functions, or if it is the only way to allow for reasonable use of a parcel. Averaging to improve wetland functions may be permitted when all of the following conditions are met:

- The wetland has significant differences in characteristics that affects its habitat functions, such as a wetland with a forested component adjacent to a degraded emergent component or a “dual-rated” wetland with a Category I area adjacent to a lower rated area

- The buffer is increased adjacent to the higher-functioning area of habitat or more sensitive portion of the wetland and decreased adjacent to the lower-functioning or less sensitive portion

- The total area of the buffer after averaging is equal to the area required without averaging

- The buffer at its narrowest point is never less than ¾ of the required width

All of the following must be met to allow averaging for reasonable use of a parcel:

- There are no feasible alternatives to the site design that could be accomplished without buffer averaging

- The averaged buffer will not result in degradation of the wetland’s functions and values as demonstrated by a report from a qualified wetland professional

- The total buffer area after averaging is equal to the area required without averaging

- The buffer at its narrowest point is never less than ¾ of the required width

Buffer Width Reduction with Impact Mitigation

The buffer widths could be lessened by reducing impacts of a proposed project using mitigation measures. These measures are shown in Table 4.5-8. These measures can reduce glare, noise, surface water discharge, and other proximity impacts. Table 4.5-9 shows the possible buffer widths for Alternative 3 and 3A when appropriate mitigation activities are implemented. Buffer widths can be reduced by 25 percent by using the mitigation measures identified in Table 4.5-8.

Table 4.5-8
Examples of Measures to Reduce Impacts to Wetlands from Adjacent High Impact Land Use Actions

Examples of Disturbance	Activities and Uses that Cause Disturbances	Examples of Measures to Minimize Impacts
Lights	• Parking lots • Warehouses • Manufacturing • Residential	• Direct lights away from wetland • Plant a dense screen of native evergreen trees at the perimeter of the buffer
Noise	• Manufacturing • Residential	• Locate activity that generates noise away from wetlands
Toxic runoff*	• Parking lots • Roads • Manufacturing • Residential areas • Application of agricultural pesticides • Landscaping	• Route all new, untreated runoff away from wetlands while ensuring the wetland is not dewatered • Establish covenants limiting use of pesticides within 150 ft of wetland • Apply integrated pest management.
Stormwater runoff	• Parking lots • Roads • Manufacturing • Residential areas • Commercial • Landscaping	• Retrofit stormwater detention and treatment for roads and existing adjacent development • Prevent channelized flow from lawns that directly enters the buffer
Change in water regime	• Impermeable surfaces • Lawns • Tilling	• Infiltrate or treat, detain, and disperse into buffer new runoff from impervious surfaces and new lawns
Pets and human disturbance	• Residential areas	• Use privacy fencing; plant dense vegetation to delineate buffer edge and to discourage disturbance using vegetation appropriate for the eco-region; place wetland and its buffer in a separate tract
Dust	• Tilled fields • Construction sites	• Use best management practices to control dust
Lack of native vegetation in buffer	• Previous land use	• Assure minimum vegetation density or plant to 300 stems

Table 4.5-9
Comparison of Buffer Alternative 3 with Buffer Alternative 3A for Land Use with High Impacts if Impacts are Mitigated

Alternative	Points for Habitat from Wetland Rating Form																	
	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36
Large steps Alternative 3 (w/o mitigation)	100	150	150	150	150	150	150	150	150	150	200	200	200	200	200	200	200	200
Alternative 3 (w/ mitigation)	75	110	110	110	110	110	110	110	110	110	150	150	150	150	150	150	150	150
Small Steps Alternative 3A (w/o mitigation)	100	100	100	110	120	130	140	150	160	170	180	190	200	200	200	200	200	200
Alternative 3A (w/ mitigation)	75	75	75	83	90	98	105	113	120	128	135	143	150	150	150	150	150	150

Examples of Buffer Widths

As described in more detail above, buffer widths can be refined by taking into account the quality of the functions that the wetland performs in the landscape, and the land uses and land use intensity adjacent to the wetland. Nevertheless, the combination of these two factors allows for a wide array of buffer widths for a single wetland category.

During the County's ordinance adoption process, citizens will be interested in knowing what the potential impact of establishing buffers around a wetlands landscape may mean to their current and future property use. Without delineating and classifying all of the wetlands within the County, these types of questions can not be specifically and accurately answered.

Low Impact Development

Low impact development (LID) is a stormwater management approach with a basic principle that is modeled after nature. LID is used for describing development techniques and can benefit wetlands and buffers directly and indirectly by preserving wetlands and the hydrologic system that wetlands depend on. LID consists of a variety of design and construction practices to preserve the functions of natural soils and vegetation, reduce peak stormwater runoff, and improve water quality.

LID focuses on several levels of design and construction by addressing measures for site planning standards, minimizing effective impervious surfaces and stormwater runoff through building design and construction features, and improving stormwater management standards.

Recommendations

- Buffers for wetland critical areas: In order to protect the values and functions of wetland critical areas, BAS clearly recommends the implementation of buffers around wetlands. Prospective permittees would be required to evaluate the impact of their projects on both wetlands and wetland buffers and implement best management practices in both of these types of areas. Buffers should be consistent with those recommended by Ecology in the Wetlands in Washington State. Volume 2: Guidelines for Protecting and Managing Wetlands (Granger et al. 2005) with incorporation of mitigation impacts in site design and buffer screening.

- Buffer widths: Wetland buffers for Walla Walla County should be applied according to the Ecology Alternative 3A method, meaning that larger buffers should be applied to wetlands that serve significant habitat functions. The following standards do not preclude the County from conditioning land use decisions to include larger or smaller buffers. These standards are meant to be a guideline, and a means to simplify project reviews. Site-specific management plans are the best way to preserve functions and values and should be encouraged as part of the land use decision process. The standards presented reflect CREP evaluation criteria, Ecology recommendations, and existing conditions. Wetlands that qualify as Category 1 Wetlands due to "Special Characteristics", such as natural heritage site, bogs, alkali wetlands and mature forested systems would receive specific buffers as shown in Table 4.5-6.

- Buffer width adjustment: It is recommended that the County allow changes (i.e. increases, reductions, or enhancements) in the proposed buffer widths if proper mitigation or conditions are present.

- Low impact development and stormwater management: It is recommended that the County encourage projects that implement low impact development techniques, since these techniques benefit many types of critical areas.

4.6 Wetland Mitigation

Mitigation is a sequential process to avoid, minimize, or compensate for the loss of functions and values of wetlands from the proposed impacts. When the proposed project has the potential to adversely affect a wetland, federal and state government agencies generally require the mitigation sequencing to be used for addressing impacts to wetlands. According to the Washington State Environmental Policy Act (SEPA) (WAC 197-11-768), mitigation sequencing is defined as:

1. Avoiding the impact all together by not taking a certain action or parts of an action;

2. Minimizing impacts by limiting the degree of magnitude of the action and its implementation, by using appropriate technology, or by taking affirmative steps to avoid or reduce impacts;

3. Rectifying the impact by repairing, rehabilitating, or restoring the affected environment;

4. Reducing or eliminating the impact over time by preservation and maintenance operations during the life of the action;

5. Compensating for the impact by replacing, enhancing, or providing substitute resources or environments; and/or

6. Monitoring the impact and taking appropriate corrective measures.

The majority of local jurisdictions in Washington implement these guidelines through local critical area regulations. Local jurisdictions generally require compensatory mitigation as the fifth mitigation element, only after the first four have been addressed. Compensatory mitigation is required when wetlands and/or their buffers are impacted from development or associated activities. Types of compensatory mitigations include creation, rehabilitation, enhancement, and preservation (Gwin et al. 1999; Sheldon et al. 2005). The different types of compensatory mitigation take place either on-site or offsite but are typically applied within the same basin. Mitigation guidance prepared by the WA Department of Ecology, the Corps and EPA titled Wetland Mitigation in Washington State, Parts 1 and 2 provides specific details on mitigation plans.

4.6.1 Compensatory Mitigation Success and Failure

Several studies have been conducted to determine how successful the compensatory mitigation projects are. Evaluation of various projects indicated that most compensatory wetland mitigation projects in Washington have not been successful in both regulatory compliance and functional replacement. Many projects have resulted in lost acreage, wetland types, and wetland functions (Castelle et al. 1992b; Ecology 2001; Mockler et al. 1998). Studies conducted by Ecology (Bill 1990; Castelle et al. 1992b) also found that 50 percent or more of the compensatory mitigation projects did not comply with permit requirements. Common problems include:

- Inadequate design
- Lack of proper maintenance, site infestation by exotic species
- Grazing by geese or other animals
- Destruction by floods, erosion, fires or other catastrophic events
- Failure to maintain water levels and failure to protect projects from on-site and off-site impacts such as sediment and pollutant loading
- Off-road vehicles

When compensatory mitigation fails to produced the targeted wetland area and/or function, it can take as long as 20 years to more than 100 years for a newly created or restored wetland to perform some functions (Granger et al. 2005).

Ecology also analyzed 24 freshwater wetland compensatory mitigation sites and indicated that mitigation success has improved in the last 10 years, yet there is much room for improvement (2001). The Ecology's study had the following findings:

- Twenty-nine percent of the projects were achieving all of their specified measures.
- Eighty-four percent of the total acreage of mitigation was actually established.
- Sixty-five percent of the total acreage of lost wetlands was replaced with new wetlands.
- Fifty-four percent of the projects were found to be minimally successful or not successful.
- Wetland enhancement as a type of mitigation performed poorly, compared to creation (50 percent of enhancement sites provided minimal or no contribution to overall wetland functions; 75 percent of sites provided minimal or no contribution to general habitat function). Over half of the wetland creation sites provided at least moderate functions for water quality, quantity, and wildlife habitat.
- Publicly funded mitigation projects tended to fail at a higher rate than privately funded mitigation (71 percent of private projects were deemed moderately or highly successful compared with 35 percent of public projects).
- Sixty percent of created wetlands were moderately or fully successful and provided significant contribution to water quality and quantity functions.

Compensatory mitigation has been more successful for some wetland types, including emergent and open water wetlands (Castelle et al. 1992b). Other wetland types have been very difficult to replicate due to their complex systems or sensitivity. These wetland types include matured forest or bog systems or wetlands that contain habitat for sensitive wildlife species.

Restoration of prior wetlands is often recommended for compensation since it is often found easier to achieve. Restoration is more likely to succeed than other types of mitigation because the site will benefit from restored hydrology, and seed sources from the original wetland that may be present and viable. However, Morgan and Roberts (1999) suggested that mitigation projects in urban settings may be difficult to find restoration opportunities.

In the past, on-site mitigation was considered desirable and most likely to be successful at replacing lost wetland functions, but it is now recognized that taking a watershed or landscape approach to mitigation is more likely to result in ecological benefits and sustainable mitigation projects (NRC 2001). Greater functional benefit may be reached through a larger mitigation project that is established within the context of landscape level assessment where optimum location to meet the “needs” of the hydrologic and ecological system can be determined (Kusler 1992; Ecology 2001; Bedford 1996).

4.6.2 Location of Mitigation

Previously, mitigation activities were required to be performed on-site, but recent studies have concluded that this requirement has often forced applicants to fit a mitigation project into an area that makes little ecological sense and is not suitable (Johnson et al. 2000; Johnson et al. 2002). Mitigation standards should emphasize a site where the target functions can be performed and sustained. Location of compensatory mitigation should be a site that best matches the type of existing wetland (i.e. geomorphic setting and hydroperiod). Further, mitigation wetlands should not create exaggerated morphology or require a berm or other engineered structures to hold back water (Granger et al. 2005).

4.6.3 Performance Standards

Site-specific project goals or standards are one of the critical components of wetland mitigation plans (Granger et al. 2005; Sheldon et al. 2005). Performance standards are observable or measurable attributes used to determine how effective a compensatory mitigation meets regulatory requirements. These standards need to be measurable in the field and achievable by the methods and timeframe selected for monitoring the site. Granger et al. (2005) provides a detailed explanation of how to develop performance standards for measuring success in wetland mitigation projects.

4.6.4 Replacement Ratios for Restoration and Creation

Replacement ratio reflects the acreage of a particular type of compensatory mitigation (creation, restoration, and enhancement) needed to make up for the loss of an acre of wetland (King et al. 1993; McMillan 1998). For example, a loss of 1 acre may be permitted to compensate with 4 acres of enhancement; thus requiring a 4:1 replacement ratio. They also compensate for temporal loss of function and the potential risk of unsuccessful replacement of lost wetland acreage (Sheldon et al. 2005; Castelle et al. 1992b; King et al. 1993).

Required replacement ratios vary from one jurisdiction to another based on the type of compensation proposed and project specific circumstances. The literature review indicated that the wetland functions and acreage achieved by using replacement ratios were less than what was required. In some cases, less than 1:1 replacement of acreage resulted in a net loss of wetland acreage and function on the landscape.

Ecology has recently developed new criteria for determining recommended wetland mitigation ratios based on wetland categories and characteristics with the types of mitigation proposed (i.e. creation, restoration, enhancement, or a combination of these) (Sheldon et al. 2005). Ecology's recommended ratios vary as shown in Table 4.6-1. Some wetlands including natural heritage sites or Category I bogs should not be considered for impacts because they are measured to be irreplaceable and cannot be replaced or compensated through mitigation.

Table 4.6-1
Ratios for Projects in Eastern Washington that do not alter the Type of HGM setting of a Compensation Site (Source: Ecology 2004)

Category and Type of Wetland	Re-establishment or Creation	Rehabilitation**	1:1 Re-establishment or Creation (R/C) and Enhancement (E)	Enhancement Only
All Category IV	1.5:1	3:1	1:1 R/C and 2:1 E	6:1
All Category III	2:1	4:1	1:1 R/C and 2:1 E	8:1
Category II Forested	4:1	8:1	1:1 R/C and 6:1 E	16:1
Category II Vernal pool	2:1 Replacement has to be seasonally ponded wetland	4:1 Replacement has to be seasonally ponded wetland	Case by Case	8:1
All other Category II	3:1	6:1	1:1 R/C and 4:1 E	12:1
Category I (Forested)	6:1	8:1	1:1 R/C and 10:1 E	24:1
Category I (based on score for functions)	4:1	8:1	1:1 R/C and 6:1 E	16:1
Category I (Natural Heritage site)	Not considered possible*	6:1 rehabilitation of a Natural Heritage site	Case by Case	Case by Case
Category I Alkali	Not considered possible*	6:1 rehabilitation of an alkali wetland	Case by Case	Case by Case
Category I (Bog)	Not considered possible*	6:1 rehabilitation of a bog	Case by Case	Case by Case

*Natural Heritage sites, Alkali wetlands, coastal lagoons and bogs are considered irreplaceable wetlands, and therefore no amount of compensation would replace these ecosystems. Avoidance is the best option. In the rare cases when impacts cannot be avoided, replacement ratios will be assigned on a case-by-case basis. However, these rations will be significantly higher than the other ratios for Category I wetlands. *Criteria for determining appropriate ratios in these circumstances will be forthcoming.*

**Rehabilitation ratios are based on the assumption that actions judged to be most effective are being implemented (see Tables 4 and 5 on pp. 48-49 of Ecology 2004). Also, refer to page 47 in Ecology 2004.

4.6.5 Types of Compensatory Mitigation

Four general types of compensatory mitigation can be used to mitigate wetland impacts. These actions are creation, restoration (re-establishment and rehabilitation), enhancement, or preservation. A mitigation project can consist of a single type or a group of these four compensation types. Studies showed that a mitigation project with mixed compensation types is more likely successful than a project using only one of the creation or enhancement types.

Wetland restoration focuses on reestablishing functions and values of wetlands that had been partially or completely lost by proposed activities. Activities associated with wetland restoration could be removing fill materials, plugging ditches, or breaking drain tiles. It is the preferred form of mitigation because it typically has the greatest chance of successfully establishing natural wetland functions (Granger et al. 2005). Restoration is typically considered feasible and cost effective for a large area, but opportunities for on-site wetland restoration are usually limited (Sheldon et al. 2005). Restoration can be further broken down into two different approaches: re-establishment and rehabilitation. Re-establishment restores functions to a former wetland site (a site that was historically a wetland but due to human activities, no longer meets wetland criteria) whereas rehabilitation restores some functions to a degraded wetland (Granger et al. 2005).

Wetland creation generally establishes wetland conditions (area, functions, and values) in a location where a wetland previously did not exist. It offers the benefit of maintaining no-net-loss of wetland acreage, but there is less assurance of success in creating a new wetland than in restoring a degraded one (Erwin 1991). Success rates appear to be increasing as wetland construction technology improves.

Wetland enhancement usually involves altering a specific structural feature of an existing wetland to improve one or more selected functions or values based on management objectives. Enhancement typically consists of planting vegetation, controlling non-native or invasive species, and modifying site elevations of the proportion of open water to influence hydroperiods (Sheldon et al. 2005; Granger et al. 2005). A review of the scientific literature identified three main concerns regarding the use of enhancement in mitigation project:

- Enhancement fails to replace lost wetland area (Shaich and Franklin 1995).

- Enhancement may fail to replace wetland functions (Kruczynski 1990; Lewis 1990).

- Enhancement may result in a conversion of HGM and/or Cowardin classes, typically producing a compensation wetland without natural analogues (Shaich and Franklin 1995; Gwin et al. 1999; Johnson et al. 2002).

An evaluation study conducted by Johnson et al. (2002) showed that longer timeframes are necessary to replicate structurally complex habitats. This is equally true for all three compensation types described above.

Preservation provides the opportunity to protect wetland areas that might otherwise be in jeopardy. Preservation is highly controversial because of following reasons:

- Preservation results in a net loss of wetland area.

- Preserved wetlands are generally not large enough to protect ecosystems and biodiversity over the long term.

- Preserved areas may not be checked by regulatory agencies to verify that they contain the specified acreage of wetland.

For these reasons, Ecology recommends that preservation is only used to compensate for wetland losses in exceptional circumstances (Granger et al. 2005).

4.6.6 Monitoring

Monitoring requirements are another critical component of most wetland mitigation plans. Monitoring is used to determine whether a project is achieving its performance standards within a time frame. The types of monitoring data collected and the timing of the data collection depend upon the performance standards being evaluated. Most mitigation projects are monitored for at least five years on an annual basis (Hruby 2004). Ecology recommends requiring monitoring for at least 5 years or a period necessary to establish that performance standards have been met. Having a ten-year monitoring program need not require biologists to collect data and produce a report every year. That could be done in years 1, 2, 3, 5, 7, and 10, for example. Monitoring reports that present the data collected and compliance with performance standards are typically provided by the project applicant and are reviewed by the regulator agency for project success and compliance.

4.6.7 Mitigation Banking

Mitigation banking provides an alternative for compensatory wetland mitigation that can be used to offset impacts to the environment. The practice of mitigation banking has commonly been applied to wetlands, but banks can be also used to generate a variety of habitat credits. Mitigation banking involves the generation of “credits” through restoring, creating, enhancing and, in exceptional circumstances, preserving wetlands and other natural resources. These credits can then be sold to permit applicants who need to offset the adverse environmental impacts of projects.

Wetland banking can be used to achieve mitigation for projects permitted at the federal, state, and/or local levels. Recently, proposed joint USACE and EPA guidance recognized the benefits of applying banking in a watershed approach to achieve “no net loss” of wetland functions and areas (Ecology et al. 2006a). Banks are generally established prior to the majority of wetland losses, and this practice may provide advantages over traditional compensatory mitigation by reducing the temporal loss of wetland functions (Driscoll and Granger 2001). A study conducted by the Environmental Law Institute (ELI) (2002) indicated that 78 percent of mitigation banks used multiple types of compensation, and a combination of enhancement and restoration was most commonly used.

Effectiveness of wetland mitigation banks have been studied by Brown and Lant (1999). They examined 68 banks that had been established by the beginning of 1996 and found that wetland mitigation banks were projected to result in a net loss of 21,328 acres of wetlands nationally, as already credited wetland acreages are converted to other uses.

The authors noted that most wetland mitigation banks were using appropriate compensation methods and ratios, but that several of the largest banks use preservation or enhancement at ratios of 1:1, instead of restoration or creation. They also cautioned that mitigation banking inevitably leads to geographic relocation of wetlands, and therefore changes the functions and ecosystem services that they provide, possibly resulting in a net loss of certain functions (Brown and Lant 1999).

Walla Walla County could use wetland banks to provide credit for mitigation by using the ratios incorporated in the local code or the ratios specified in the wetland banking agreement. Washington State's Draft Administrative Rules on Wetland Mitigation Banking list the following ranges of conversion ratios for determining credits available from each bank site:

- **Restoration** of wetlands shall generate credits at a ratio of 1:1 to 1:2 acre-credit to acres of restored wetland
- **Creation** of wetlands shall generate credits at a ratio of 1:1 to 1:5 acre-credit to acres of creation
- **Enhancement** of wetlands on bank sites shall generate credits at a ratio of 1:2 to 1:6 acre-credit to acres of enhanced wetland
- **Preservation** in combination with restoration and creation of wetlands on bank sites shall generate credits at a ratio of 1:2 to 1:10 acre-credit to acres of protected wetland
- **Preservation** alone shall generate credits at a ratio of 1:5 to 1:20 acre-credit to acres of preserved wetland.

4.6.8 Wetlands Mitigation Recommendations

Both the USACE and Ecology have established a coordinated framework for mitigating impacts to wetlands, and providing compensatory mitigation to off-set losses of wetlands (Ecology et al 2006a; Ecology et al 2006b). It is recommended that Walla Walla County adopt regulations that are as consistent as possible with this state and federal framework. This will ensure that mitigation projects are reviewed and approved by local, state and federal agencies using on a consistent basis, and provide the least uncertainty for prospective permittees.

The County should also consider a wetland banking system as a future option.

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5 Geologically Hazardous Areas

5.1 Section Overview and GMA Requirements

This section describes geologically hazardous areas that can be found in Walla Walla County, summarizes the scientific literature concerning various types of geologic hazards, and describes how these areas can affect or be affected by land use and other human activities. The section also presents the management and protection tools for these areas that can be implemented through a CAO and other County ordinances.

According to WAC 365-190-080 (4)(a), geologically hazardous areas include areas susceptible to erosion, landslides, earthquakes, volcanic eruptions, or other geological events. These areas can 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 geologic hazards can be reduced or mitigated by engineering, design, or modified construction practices so that risks to health and safety are acceptable.

5.2 Overview of Walla Walla's Geological Setting

5.2.1 Regional Setting

Walla Walla County lies within the southeastern part of the Walla Walla Plateau section of the Columbia Plateaus physiographic province (Freeman et al., 1945). The Columbia Plateaus is bounded by the northern Rocky Mountains to the east and the Sierra Nevada-Cascade region to the west. Noted for its diverse landforms in Oregon, Idaho, and Washington, the Columbia Plateaus covers approximately 100,000 square miles. The Columbia Plateaus consist of relatively uniform basaltic lava flows that contain significant folding and faulting, causing elevations to range from approximately 200 to 5,000 feet above mean sea level (MSL). Older mountains (i.e., Blue Mountains and Wallowa Mountains) protrude through the lava flows in select areas.

The terrain of the Columbia Plateaus is almost uniformly harsh and arid; it contains coulees, scablands, and other phenomena characteristic of a rush of glacial waters across the land surface, with isolated volcanic features. Sedimentary deposits are mixed with the lava, and the loess is deep enough on some surfaces to provide fertile land. The plateau encompasses lands within the Big Bend of the Columbia River in Washington (the Walla Walla Plateau), the Blue Mountains of eastern Oregon, the Snake River Plain of southern Idaho, and the Harney Desert of southern Oregon.

5.2.2 Physiographic Divisions

Based on contrasting topographic features, climate, and other distinguishing characteristics, Walla Walla County is broken into the Walla Walla and Blue Mountain sections, or physiographic divisions. The Walla Walla section is considered the upper, eastern edge of the greater Columbia Basin and consists of “rolling, treeless upland, deeply mantled by fine, windborne deposits of silt that overlie the previously eroded and incised Columbia River basalt. Thick lake and stream-terrace deposits…” (Harrison et al., 1964) line the valley floor.

Within the Walla Walla section, distinct physiographic features distinguish the Walla Walla Valley, Millcreek Fan, Gardena Terrace, Eureka Flats, and the Wallula Gap subsections. The Walla Walla Valley consists of Walla Walla River and Mill Creek deposits. The Mill Creek Fan is located at the Mill Creek Canyon mouth and consists of an area approximately two miles wide by five miles long, encompassing the City of Walla Walla. The fan includes deposits of silt and gravel, and is situated at elevations ranging from approximately 900 to 1,200 feet MSL. The City of Walla Walla lies at approximately 949 feet MSL.

The Gardena Terrace consists of remnant lake-laid deposits of fine sand and silt called the Touchet beds. The largest area of this formation is south of Pine Creek and the Walla Walla River, a mile or more south of Touchet. In the northwestern part of the county, the Eureka Flats are an abandoned glacial out-wash channel approximately two miles wide at the upper end and six to eight miles wide below Eureka. Lengthwise, the subsection extends from near Pleasant View southwest for approximately 36 miles, or within approximately six miles of the Columbia River.

The Wallula Gap subsection is located in the southwestern corner of the County where the Columbia River flows through a narrow, steep-walled canyon formed by the river as it maintained its channel throughout the Horse Heaven uplift. The southwestern corner of the County is the lowest topographic feature within the County at approximately 300 feet MSL. Located some 20 miles downstream, McNary Dam raises the normal river (pool) level of the Columbia River to approximately 340 feet through the Wallula Gap.

The Blue Mountain section is located in the eastern portion of the county and consists of the “extreme northern extension of the Blue Mountains of Oregon and the long, tilted plateau that extends northward into Columbia County. This section is a tilted, folded and faulted uplift of the Columbia River basalt.” (Harrison et al., 1964). The topography consists of flat-topped ridges, steep-walled canyons, and mountain slopes that result from erosion and stream-cutting of the basalt.

From the normal pool level of the Columbia River at Wallula Gap to the top of Lewis Peak on the eastern edge of the county, there is an elevation difference of approximately 4,540 feet. For the first 40 miles, the increase is gradual; about half the gain takes place in the last five or six miles.

5.2.3 NRCS Soil Survey

The Natural Resources Conservation Service (NRCS) Soil Survey (formerly USCS Soil Survey) of Walla Walla County groups the soil associations into seven “General Soil Areas”. Table 5.2-1 lists the “General Soil Areas”, the included soil associations, and brief descriptions of the particular soil associations.

Table 5.2-1
Description of General Soil Areas and Relevant Soil Associations

General Soil Area	Predominant Soil Associations	Description
1) Bottom Lands and Low Terraces Nearly level to gently sloping stream bottoms and low terraces, soil associations account for large percentage of irrigated farms.	Snow-Patit Creek	Found in the upper valleys of major streams; generally deep, well-drained soils formed from alluvium washed from the uplands; annual precipitation ±16-24 inches.
	Yakima-Hermiston-Ahtanum	Found in Mill Creek drainage system, and lower valleys of Cottonwood, Reser, and Russell Creeks; also includes small areas of the Catherine, Pedigo, Onyx, and Touchet soils; consists of mixed soils on alluvial fans, stream bottoms, and small outwash plains; annual precipitation ±12-16 inches.
	Onyx-Hermiston-Pedigo	Found along Dry Creek above Sudsbury and along the Touchet River above the Shaw Bridge; formed from deep alluvium washed from the uplands, deep, mostly well-drained; annual precipitation ±12-16 inches.
	Esquatzel	Found on the wide bottoms of the lower Walla Walla and Touchet Rivers; also has small inclusions of the Onyx, Pedigo, and Umapine soils; deep, well-drained soils annual precipitation ±8-12 inches.
	Umapine-Stanfield	Found in the Walla Walla Valley, including areas of Onyx and Touchet soils on the Walla Walla River flood plain; saline or alkaline soils; annual precipitation ±8-12 inches.
2) Loessal Uplands Loess formed soils that occupy nearly two-thirds of the county.	Athena-Palouse	Occupies a narrow belt along the eastern edge of the loessal upland; dark-colored, well-drained soils annual precipitation ±16-24 inches.
	Walla Walla	Occupies a 6-10 mile wide area that extends from Walla Walla northeast to Columbia County; well-drained, mostly deep soils annual precipitation ±12-16 inches.
	Ritzville	Occupies approximately the western half of the loessal uplands; well-drained soils that lime at a depth of 30-36 inches; annual precipitation ±8-12 inches.
3) Loessal and Basaltic Uplands	Couse-Palouse	Occupies transitional areas between the loessal uplands/mountains and grassland/forests, including small areas of steep Basalt rock land; dark, well-drained to moderately well-drained, shallow to moderately deep soils with clay in subsoil.
4) Loessal and Lake-Laid Terraces	Ellisforde-Ritzville	Occupies the strongly rolling to hilly uplands north of the Walla Walla Valley, on both sides of the Touchet River; also includes small areas of Sagemoor and Esquatzel soils, and rock land; well-drained to somewhat excessively drained, loessal soils; annual precipitation ±9-12 inches.
	Sagemoor-Ellisforde	Found in the lower Walla Walla Valley, also includes small scattered areas of saline-alkali soils, Basalt rock land, and Farrell soils; well-drained to excessively drained soils over stratified lake deposits; annual precipitation generally ±6-8 inches.
5) Mountains	Klicker-Gwin-Helmer	Found in the Blue Mountains; well-drained to somewhat excessively drained, shallow to moderately-deep soils; steep, formed mainly from loess and weathered basalt.

Table 5.2-1
Description of General Soil Areas and Relevant Soil Associations

General Soil Area	Predominant Soil Associations	Description
6) Sandy Terraces and Outwash Plains	Adkins	Found along the upper margins of sandy terraces that join the loessal uplands; also includes small areas of Quincy, Ritzville, and Taunton soils; well-drained to somewhat excessively drained, deep soils formed in wind-deposited silt and sand; annual precipitation ±8-10 inches.
	Adkins-Quincy-Ritzville	Found near and west of the Touchet River; well-drained to excessively drained, formed in wind-deposited sand and silt, mainly with lime in the subsoil; severely eroded by wind after fire in early part of 20th century; annual precipitation ±8-10 inches.
	Quincy	Found between the Walla Walla and Snake Rivers in the western part of the county; excessively drained and somewhat excessively drained, formed in wind-worked deposits of sand; annual precipitation ±6-8 inches.
7) Terraces and Riverbanks	Magallon-Starbuck-Rock land	Found in and adjacent to the Snake and Columbia River canyons (north, northwestern, and southwestern Wallula Gap portions of the county); basalt derived soils and rock land.

5.2.4 Groundwater

Groundwater levels throughout the county likely vary based on characteristics of the local sediments, proximity to water bodies, underlying rock characteristics, time of year, etc. Based on well data available from the Department of Ecology (http://apps.ecy.wa.gov/welllog/MapSearch), the local groundwater table ranges from several hundred feet (upwards of 800 feet below the ground surface [bgs] or more) in the Eureka Flats to relatively shallow (less than 50 feet bgs) in the bottom lands.

Perched groundwater may exist when water becomes trapped on relatively impermeable layers of clays, silts, and/or cemented materials. Based on the general soil descriptions listed previously in Table 5.2-1, perched conditions are likely limited and only occur in isolated areas, most notably during the winter months.

5.2.5 Faulting and Seismisity

For the purpose of fault activity classification, faults are often grouped into the categories shown in Table 5.2-2.

Faults with Historic or Holocene rupture are often considered "active." Table 5.2-3 lists recognized faults located within 50 miles of the County boundaries. Due to the relatively light to moderate studies completed on the regional fault systems, Maximum Earthquake Magnitudes (Moment Magnitude, MW) which are based on seismological data such as maximum historic earthquakes and on geologic data such as fault length and fault displacement parameters, are not available. The faults listed are considered to have the greatest potential for impacting the County if they were to rupture.

Table 5.2-2
Fault Classification[1]

Latest Known Movement (Geologic Time)	Description
Historic	Displacement during historic time (approximately the last 200 years)
Holocene	Displacement has occurred within the last 11,000 years
Late Quaternary	Displacement has occurred within the last 700,000 years but evidence of Holocene activity is lacking
Quaternary	Evidence of displacement within the last 1.6 million years
Pre-Quaternary	No recognized evidence of displacement in Quaternary time

1. After Jennings, 1994 and Hart, 1997.

Table 5.2-3
Faults Located Within 50 miles of the County Boundary

Fault Name	General Location	Most Recent Deformation (Ma)
Olympic-Wallowa lineament (Wallula Fault Zone)	±6 miles west of Milton-Freewater, ±5.5miles south of Hwy 12	<0.015 to 1.6
Hite Fault System	Begins ±40 miles south of the southwestern corner of the county and trends north-northeast through the southeast corner, through Columbia County and into Garfield County	<0.750 to 1.6
West Grande Ronde Valley Fault Zone	±28 miles south-southwest of the county's southeast boundary corner	<0.015
East Grande Ronde Valley Fault Zone	±29 miles south of the county's southeast boundary corner	<0.015
Saddle Mountains Structures	±30 miles west of the northern portion of the county	<0.130 to 1.6
Columbia Hills Structures	±32 miles west-southwest of the county's southwest boundary corner	<1.6
Umtanaum Ridge Structures, Central Gable Mountain Fault	±34 miles north of the county's northwest boundary	<0.130 to 1.6
Unnamed Fault north of Service Anticline	±35 miles west-southwest of the county's southwest boundary corner	<1.6
Frenchman Hills Structures	±40 miles west-northwest of the northern portion of the county	<1.6

The major tectonic element in southeastern Washington is the northwest-trending Olympic-Wallowa lineament (OWL), including the Wallula Fault Zone. The OWL is in part a strike-slip fault system that is aligned with many of the anticlines of the Yakima fold belt (Tolan and Reidel 1989). Most of the Yakima fold belt structures plunge to the east and die out in central Washington, but the Horse Heaven Hills anticline continues east across southern Washington and intersects the larger Blue Mountains anticline in northern Oregon. Between the Columbia River and the Blue Mountains, the OWL is formed by a 650-foot high escarpment that marks the trace of the Wallula Fault Zone, a series of high-angle en echelon faults that display evidence for both dip-slip and strike-slip motion.

The Hite Fault intersects the OWL at an approximate right angle 22 miles southeast of Walla Walla. This northeasterly-striking fault disappears near Lower Granite Dam on the Snake River (Tolan and Reidel 1989). On July 15, 1936, the Walla Walla area experienced an intensity VII (approximately magnitude 6) earthquake (Brown 1937). The earthquake and its aftershocks may have been caused by movement on the Wallula Fault Zone and/or the Hite Fault.

5.3 Overview of Applicable Geologic Hazards and Engineering Constraints

5.3.1 Faulting and Ground Shaking

Due to the proximity of “active” faulting to the County boundaries, transportation corridors, and population centers, the potential for significant ground rupture and/or fault creep (if either or both should occur within the County during a seismic event) is low. However, some degree of ground motion resulting from seismic activity in the region is expected.

The United States Geological Survey (USGS) National Seismic Hazards Maps indicate that for a seismic event with a two percent probability of exceedance in 50 years, the County should expect peak horizontal bedrock accelerations (PHBA) of approximately 0.13 to 0.18g.

5.3.2 Liquefaction

Liquefaction can occur when loose to medium dense, granular, saturated soils (generally within 50 feet of the surface) are subjected to ground shaking. According to WDNR’s Liquefaction Susceptibility Map of Walla Walla County, Washington (Palmer 2004), the majority of the land areas have a relatively “low” susceptibility to liquefaction. However, more populated areas (Walla Walla, College Place, Waitsburg, etc.) lie within historic drainage basins that are generally labeled as “low to moderate” to “moderate to high” with isolated areas labeled as “high” susceptibility to liquefaction. Figure 5.3-1 shows areas considered potentially susceptible to liquefaction.

5.3.3 Landslides and Slope Stability

According to mapping by WDNR, landslides are generally confined to approximately 40 percent or greater slopes, located within the Blue Mountains in the extreme eastern limits of the County. A study on landslides in Washington after the February 5-9, 2006 event, the USGS (Harp, et al., 1997) states that the County experienced the “highest concentration (in the state)…at the northwest edge of the Blue Mountains….” Washington State Department of Transportation (WSDOT) also indicates “…localized

Insert Figure 5.3-1 (11x17)

landslides in loess cuts…" are common (Anderson, et al., 2005); they likely go unrecognized due to their relatively minimal impact to property and economics.

Based on S&W work experience in the area, the high concentration of landslides at the northwest edge of the Blue Mountains generally consisted of shallow, surficial slumps of fine-grained, virtually saturated, loess materials immediately underlain by sloping bedrock conditions. We believe landslides of this frequency pose a very low hazard due to their relatively small size and the extreme event required to trigger such occurrences. Based on the information above, we consider the potential for damaging landslides to be low and generally contained to a relatively small region of the County. Table 5.3-1 provides the County's slope categories. Figure 5.3-2 shows landslide hazard areas in the County.

Table 5.3-1
Slope Categories

Slope Range (percent)	Comments
Less than 15	No slope hazard
Less than 30	Mix of slope areas; potential slope hazard, evaluate on case-by-case basis
15 to 30	Generally located in transitional topographic areas
15 to 45	Generally located in the headwaters of the North Fork Coppei Creek, near the Columbia County line (i.e., limited area)
30 to 45	Scattered throughout the steeper portions of the County including the southwest, southeast, north, but predominantly located within the central and northeast
30 to 60	Scattered throughout the steeper portions of the County, but predominantly in the Blue Mountains of the extreme southeast County corner
45 to 60	Scattered throughout the steeper portions of the County including the southwest, north, northeast, but predominantly within the Blue Mountains of the extreme southeast County corner
Less than 60	Generally located within Basalt terraces along the Snake and Columbia Rivers (i.e., limited area)
Greater than 60	Most notably in the Blue Mountains of the extreme southeast County corner

5.3.4 Seismically Induced Sediment

During a seismic event, ground shaking can cause densification of soil that can result in settlement of the ground surface. Due to the presence of relatively young outburst flood deposits, particularly within the low-lying river bottom areas, some degree of densification may occur at anticipated ground motion levels. Therefore, we consider the potential for seismically induced ground settlement as low to moderate.

5.3.5 Collapsible Soil

Based on the non-uniform arrangement of soil particles typically associated with loess soil deposits, the possibility of collapsible soils exist, particularly under new development and during the seasonally wetter portions of the year. Site selection, grading, and foundation design should consider potential collapsible soils. We consider the potential for collapsible soils which may result in potentially damaging effects is moderate to high and generally confined to loess deposits.

5.3.6 Volcanic Activity

According to the USGS (1997), the annual probability of 10 centimeters or more of ash (tephra) to fall within the County from volcanoes known to be active in the last 4,000 years (all located in the Cascade Mountain Range) is 0.01 percent, or less. We consider the potential hazards associated with volcanic activity to be low.

5.3.7 Flooding/Earthquake Induced Flooding

The Federal Emergency Management Agency (FEMA), National Flood Insurance Program, Flood Insurance Rate Maps (FIRM) dated December 1, 1983 indicates that much of the low-lying bottom areas lie within the 100-year floodplain. Due to the lack of upgradient dams, high levees, or other significant waterways outside of the Snake and Columbia River portions of the County, the potential for earthquake induced flooding is low.

Along the Snake and Columbia Rivers, the potential for earthquake induced flooding exists due to upgradient dams of significant water volumes. We suggest the County consult with the United States Army Corps of Engineers to assess the potential likelihood of failure of these upgradient structures and the inherent consequences.

5.3.8 Tsunamis or Sieches

Tsunamis are great sea waves typically generated by ground shaking or ground displacement. A seiche is wave action created within restricted bodies of water, typically in response to an earthquake or earthquake induced landslide. Based on the County's location relative to the sea, the potential for tsunamis is nonexistent. However, the potential for seiches exist for portions of the County along the Snake and Columbia Rivers. The hazard associated with potential seiches is a function of general slope stability along the corridor. Based on the absence of historical landslides through the corridor, we consider the potential hazard associated with seiches as low.

5.3.9 Erosion

The potential for erosion from wind and water varies depending on the physical properties of individual soil associations, including clay content, particle size and shape, depositional environment, etc. Erosion potential due to stormwater runoff and the thawing of ice and snow generally increases with the increase in slope gradient. Similarly, topography is also a factor of wind erosion, although to a lesser extent. Based

Insert Figure 5.3-2 (11x17)

on definition, many of the soils within the County consist of fine-grained, wind-blown deposits (loess). Therefore, their potential for wind erosion is relatively high.

According to existing County ordinance (and customary practices), Erosion Hazard Areas include “Areas with a slope greater than 15 percent”. Based on slope data from the NRCS Soil Survey, we list the following slope ranges to catergorize the soil associations. According to the NRCS data, many of the categories’ slope ranges overlap each other due to the presence of certain soil associations to exist across a broader range of slopes.

Based on topographic overlay of the Geologic Hazards Slope Map, we note that current topographic information and NRCS data may not be consistent. Specifically, we note areas mapped with slopes from 15 to 30 percent (according to NRCS) and located northwest to northeast and southeast of Walla Walla. Current topographic contours suggest slopes in these areas may actually be as low as 1 to 2 percent. We recommend field verification and updated mapping for these areas.

To classify the County’s various soil associations for potential susceptibility to water and wind erosion, we considered the intent of this ordinance. Specifically, when looking at water erosion, the Universal Soil Loss Equation (USLE) is often applied. However, the equation is focused on the effects from the natural environment; it is not readily applicable to development conditions. The USLE considers such factors as ground cover type and amount, slope length, annual precipitation, etc. However, we understand the intent of this ordinance is to guide development. Under development conditions, key factors of the USLE either are not applicable (i.e., ground cover, assuming worst case scenario and common practice, development strips the land) or are considered negligible compared to potential effects development will introduce (i.e., concentrated flows of irrigation or site run-off, etc. versus typical precipitation events). A common equation to assess wind erosion is the Wind Erosion Equation (WEQ), which again, is primarily directed towards application to natural or managed landscapes, not development. The WEQ considers vegetative cover, soil crust factor which is computed from clay and organic matter contents, climatic factor, etc. In large part, the same holds true for typical methods to quantify wind erosion as water erosion. However, we do acknowledge a shortcoming of our wind erosion assessment, that being a climatic factor including average wind speeds should be included. Comprehensive wind data is not readily available to use in our rating system. Therefore, our wind ratings are based solely on the NRCS soil erodibility factor, a physical properties assessment. In summary, wind and water erosion as rated herein, are developed to guide development decisions. The ratings represent worse case scenarios potentially introduced during development, not our assessment of the native, undisturbed soils.

Tables 5.3-2 and 5.3-3 list each soil association (by symbol) according to assigned ratings for water and wind erosion, respectively. Appendix C lists each soil association (name and symbol), slope information, and their potential for erosion (wind and water) according to the NRCS Soil Survey of Walla Walla County.

Based on the ratings in Table 5.3-2, we provide a breakdown of the General Soil Areas generally associated with the different water erosion ratings. Within each General Soil Area, isolated areas (soil associations) exist that differ from the general ratings assigned (see Table 5.2-1). Figure 5.3-3 shows the susceptibility of Walla Walla County to water erosion.

High to very high:
4) Loessal and Lake-Laid Terraces
6) Sandy Terraces and Outwash Plains

Moderate:
4) Loessal and Lake-laid Terraces
5) Mountains
6) Sandy Terraces and Outwash Plains
7) Terraces and Riverbanks

Slight:
5) Mountains
6) Sandy Terraces and Outwash Plains

Based on the ratings in Table 5.3-3, we provide a breakdown of the General Soil Areas generally associated with the different wind erosion ratings. Within each General Soil Area, isolated areas (soil associations) exist that differ from the general ratings assigned (see Table 5.2-1). Figure 5.3-4 shows the susceptibility of Walla Walla County to wind erosion.

High to very high:
1) Bottom Lands and Low Terraces
2) Loessal Uplands
4) Loessal and Lake-Laid Terraces
6) Sandy Terraces and Outwash Plains
7) Terraces and Riverbanks

Moderate: We consider at least portions of all General Soil Areas to have moderate potential to wind erosion.

Slight to non-susceptible:
5) Mountains
7) Terraces and Riverbanks

The NRCS indicates many soil associations possess minimal soil cover and, in various other soil associations, the soil and its vegetation is routinely disturbed due to general land practices. We expect the potential for erosion from wind and/or water to increase as vegetation is disturbed. Proper stormwater runoff management with silt fencing or other techniques may be required to limit the effects of erosion on the surrounding areas; erosion due to wind is much more difficult to minimize. Outside of agricultural areas, permanent slopes should be protected from erosion with revegetation. During construction, the contractor should make efforts to reduce wind erosion through moisturizing or fixing of soils using appropriate methods. Drainage channels and/or banks may require hardening through appropriate methods. Special consideration may be warranted in areas adjacent to potentially unstable slopes and existing landslides.

Insert Figure 5.3-3 (11x17)

Insert Figure 5.3-4 (11x17)

Table 5.3-2

Water Erosion Ratings of Soil Associations

	Very High	High	Moderate	Slight	Non-Susceptible
Soil Association Symbol	AdC, AdC2, AdD, AdE, AeD2, AmA, EfE2, EzA, FaC, FaD, FaF, RlB, RlD, RlD2, RlE, RlE2, RlF, RlF2, RlG, RtB, RtD, RtD2, RtE, RtF, RtF2, RvB, RvD2, RvF, SgA, SgB, SgC, SgC2, SgD, SgD2, SgE, SgE2, SkA, SkB, SkC, SkD, SmA, SmB, SmC, SmC2, SmD, SmD2, SnB2, VaC, VaE, WvB, WvD2, WvF2	AfC AfC2 AfD, AfD2, AfE, AgD2, AkD, AtB, AtD, AtD2, AtE, AtE2, CaA, CoB, CoB2, CoC, CoC2, CoD, CoD2, CoD3, CoE, CoE2, CoF, EfA, EfB, EfC, EfC2, EfD, EfD2, EfE, EhA, EvB, EvC, EvC2, EvD, EvD2, EvE2, EyA, HeC, HeD, HeE, HeF, HfF, HmA, HnA, HoC2, HoD2, HoE2, MsC, MsD, MsD2, MsF, OnA, PaB, PaD, PaD2, PaE, PaF, PbB, PbD, PbD2, PbE, PbE2, PbF, PbF2, PmA, PoA, QmB2, QmC2, RmD, RmE, SoA, SpA, SpB, SrA, SsA, StA, SvA, SyD, SyE, TaD2, TaE2, ToE, ToF, TsA, UmA, UpA, UvA, UwA, WaB, WaD, WaD2, WaE, WaE2, WaF, WhB, WlD, WlD2, WlB	Ac, An, BdF, BoA, CrF, EhB, Hp2, KkD, KkF, MfC, MfD, MfD2, MfE, MgD, MgF, MvD, MvF, PkA, QcB2, Qd, QfD2, QfF2, QmD2, QuB2, QuC2, SfD, SfD2, SfE, Tc, ToA, YmA	BcD, BcF, BnA, GrD, GrD2, GrF, GvD2, GvF2, GwF, KrF, KrG, PcA, QnB2, QnC2, QnD2, YaA, YkA	Ba, BcG, Bk, Bm, Bp, Ma, Rw

Table 5.3-3

Wind Erosion Ratings of Soil Associations

	Very High	High	Moderate	Slight to Non-Susceptible
Soil Association Symbol	Ac, AfC, AfC2, AfD, AfD2, AfE, BnA, HeC, HeD, HeE, HeF, HfF, HoC2, HoD2, HoE2, Hp2, QcB2, Qd, QfD2, QfF2, QmB2, QmC2, QmD2, QnB2, QnC2, QnD2, QuB2, QuC2, RvB, RvD2, RvF, ToE, ToF, VaC, VaE, WvB, WvD2, WvF2	AdC, AdC2, AdD, AdE, AeD2, AgD2, AkD, AmA, An, Bm, BoA, EfE2, EvB, EvC, EvC2, EvD, EvD2, EvE2, EyA, FaC, FaD, FaF, HnA, MfC, MfD, MfD2, MfE, MgD, MgF, MsC, MsD, MsD2, MsF, MvD, MvF, PmA, PoA, RlD2, RlE2, RtB, RtD, RtD2, RtE, RtF, RtF2, SfD, SfD2, SfE, SgC2, SgD2, SgE2, SkA, SkB, SkC, SkD, SmA, SmB, SmC, SmC2, SmD, SmD2, SnB2, SrA, SsA, StA, SvA, TaD2, TaE2, UmA, UpA, UvA, UwA, YaA, YkA	AtB, AtD, AtD2, AtE, AtE2, CaA, CoB, CoB2, CoC, CoC2, CoD, CoD2, CoD3, CoE, CoE2, CoF, CrF, EfA, EfB, EfC, EfC2, EfD, EfD2, EfE, EhA, EhB, EzA, GrD, GrD2, GrF, GwF, HmA, KkD, KkF, KrF, KrG, OnA, PaB, PaD, PaD2, PaE, PaF, PbB, PbD, PbD2, PbE, PbE2, PbF, PbF2, PcA, PkA, RlB, RlD, RlE, RlF, RlF2, RlG, RmD, RmE, SgA, SgB, SgC, SgD, SgE, SoA, SpA, SpB, SyD, SyE, Tc, ToA, TsA, WaB, WaD, WaD2, WaE, WaE2, WaF, WhB, WID, WID2, WlB, YmA	Ba, BcD, BcF, BcG, BdF, Bk, Bp, GvD2, GvF2, Ma, Rw

5.3.10 Mining

According to the Directory of Washington Mines (2001), registered mines within the County consist of surface operations for rock, stone, and/or sand and gravel products. The Walla Walla County Mining and Mineral Sites map indicates surface and mineral sites exist at various locations throughout the County. However, details of many of the mines, including those that may contain vertical shafts and lateral tunnels are not readily available. Case histories from around the country indicate ground collapse and/or subsidence of underground mining operations is a very real and present danger. For surface mining operations, slope stability should be reviewed prior to development near mines. Based solely on the relatively low density of mining operations within the County, we consider the potential hazards related to public health and safety to be low.

5.3.11 Geologic Hazards Summary

Based on our review and analysis, **potential** geologic hazards could significantly impact select areas of the County. These include the following:

1. A moderate potential for ground shaking to occur.

2. A moderate to high potential for liquefiable soils to be present, generally as mapped by DNR.

3. A low to moderate potential for seismically induced settlement to occur, generally within the outburst flood deposits of the low-lying bottom areas.

4. A moderate to high potential for collapsible soils generally confined to loess deposits.

5. A moderate to very high potential for significant erosion due to wind and/or water to occur within various soil associations.

5.4 Recommendations

The following recommendations would help limit the health and safety threats to Walla Walla County residents in geologically hazardous areas:

- Require the preparation of a critical areas report that contains a geologic assessment of the area of proposed development.

- Apply provisions consistent with findings from geologic assessments.

- Consider applying a buffer around severe erosion or landslide hazard areas.

5.5 References

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6 Frequently Flooded Areas

6.1 Section Overview and GMA Requirements

For regulatory purposes, frequently flooded areas are defined as “lands in the floodplain subject to a one percent or greater chance of flooding in any given year” (WAC 365-190-030 (7)). This is equivalent to the 100-year floodplain designation mapped by the Federal Emergency Management Agency (FEMA) on Flood Insurance Rate Maps (FIRMs). FEMA also produces a separate set of Floodway maps for the portions of the floodplain areas that are included in the detailed study areas, as described in the Flood Insurance Study.

Floodplain areas can be adjacent to rivers, small streams, or lakes. For rivers and flowing waters, the floodplains consist of two designations:

- Floodway – the channel of a river or other watercourse and the adjacent land areas that must be reserved in order to discharge the base flood without cumulatively increasing the water surface elevation more than one foot
- Floodway fringe – the 100-year floodplain outside the designated floodway

The floodway is managed for substantial conveyance of floodwaters and for fast-flowing water, while the floodway fringe typically has less significant flow amounts and velocities. The FIRMs show the floodplain areas for the 100-year and 500-year frequency flood events. The 100-year flood is also termed the Base Flood, and the total area of the 100-year floodplain is the area that is typically subject to floodplain regulations, and is designated as the Area of Special Flood Hazard by FEMA.

Development within a floodplain creates a risk to human health and property. Floodplain development can also pose risks to aquatic habitats and species and disrupt natural riverine processes.

WAC 365-190-080 (3) states that counties and cities should consider the following (adapted to Walla Walla County) when designating and classifying frequently flooded areas:

- Effects of flooding on human health and safety, and to public facilities and services.
- Available documentation including federal, state, and local laws, regulations, and programs, local studies and maps, and federal flood insurance programs.
- The future flow floodplain defined as the channel of the stream and that portion of the adjoining floodplain that is necessary to contain and discharge the base flood flow at build out without any measurable increase in flood heights.
- The potential effects of greater surface runoff caused by impervious surfaces.

This chapter discusses frequently flooded areas chiefly from the perspective of flood effects on human health, safety, and property protection, and the effects of human activities on flooding. Floodplain development also has the potential to affect other critical areas designated in the GMA under RCW 36.70A.030(5). For the most part, the ecological issues associated with floodplain management are addressed in the Sections for wetlands, and fish and wildlife habitat conservation areas. Floodplain management issues will also be addressed in the chapter for geologically hazardous areas. One important goal of these reviews will be to ensure that the connection between frequently flooded areas and the other critical areas is integrated, so that ecological impacts associated with development within frequently flooded areas are adequately reviewed.

6.2 Overview of Inventory

6.2.1 Existing Inventory

The existing FIRMs, which were prepared by FEMA and have an effective date of December 1, 1983, are the basis for the existing inventory of frequently flooded areas. These FIRMs are also used for regulating development in the County's floodplains. The FIRMs consist of a number of individual map panels, and the majority of these map panels have the effective dates as December 1, 1983, which is the date of all the initial FIRMs and the Flood Insurance Study prepared by FEMA. Three of the individual map panels have been updated and these three panels have effective dates of January 18, 2002.

FEMA is in the process of updating all the FIRMs and Flood Insurance Studies through their Map Modernization program, with the largest population centers and areas of highest flood damages receiving the highest priority for their maps to be updated. The updated maps associated with this program will be county-wide digital maps, using updated orthophotogrammetry and topography to produce more accurate base maps, from which improved floodplain boundaries will be delineated. In conducting the Map Modernization Program, FEMA will consult with, receive information from, and enter into agreements or other arrangements with state, regional, and local agencies to more accurately identify floodplain areas.

An update to Walla Walla County's FEMA Flood Insurance Study and FIRMs is not currently on FEMA's schedule, so it can be expected that the existing FIRMs would be all that would be available to the County for the next several years.

Existing FEMA designated floodplains for Walla Walla County are shown in Figure 6.2-1.

6.2.2 Past Major Floods

There have been three major floods in the County since 1930 (USACE 1997).

In late March or early April, 1931, there was a major flood as a result of heavy rainfall on wet snow on Mill Creek in the vicinity of the City of Walla Walla, causing severe damages in the City of Walla Walla. Mill Creek originates in the mountains south of the Cities of Walla Walla and College Place and flows through the City of Walla Walla, with its confluence with the Walla Walla River about two miles west of College Place.

In December 1964, heavy rainfall following significant snowfall on frozen ground caused rapid snowmelt, leading to flooding of widespread areas of the County. This flood is still the flood of record for the US Geological Survey stream gaging station at RM 18.2 of the Walla Walla River, which is located about three miles downstream of the Touchet River.

Insert Figure 6.2-1

The maximum flow at this gage was 33,400 cubic feet per second (cfs). As a comparison, average December river flow at this gage is about 800 cfs.

The most recent major flood in the County occurred in February 1996, also because of heavy rainfall and melting snow on frozen ground. The 1996 flood had an estimated flow of approximately 32,500 cfs at the RM 18.2 stream gage, and as was the case for the December 1964 flood, caused damages throughout the County. This snowmelt/rainstorm flood also resulted in severe flooding on the Touchet River and Coppei Creek, which caused major damage in the Waitsburg area.

Primary flooding damage for both the 1964 and 1996 floods was from flooding in the Walla Walla and Touchet River drainages.

Flooding and the resulting flood damages have occurred many times over the years in the County, with the most significant flooding occurring on the Walla Walla and Touchet Rivers, as well as a number of creeks, including Mill, Coppei, Yellowhawk, Cottonwood, Russell, Garrison, Reser and Dry Creek.

There has not been any significant widespread flooding in Walla Walla County since the February 1996 floods.

6.3 Floodplain Functions and Values

River floodplains convey and store flood waters when river flow exceeds the capacity of the main river channel. As river stages increase, the depth and velocity of the flood water increases, increasing the areal extent of inundated land and flowing water. Encroachment into the floodplain of a river can increase the flood level in some sections of the river and the subsequent flow velocity. Displaced floodwater (lost floodplain storage) can also increase flooding and flood duration.

Floodplains are also areas of reduced flow velocity. As water overflows from the main channel of a river or stream, it spreads over the land surface, resulting in a much wider flow path over rougher vegetated land. The increased roughness and relatively shallow flow depth result in lower flow velocity which allows suspended sediment to settle in the floodplain. This provides a mutual benefit for the floodplain and stream, depositing fertile soil and nutrients in the floodplain, and reducing sedimentation in the stream channel.

Floodplains are an interface between ground water and surface water, providing areas of ground water discharge or recharge. These areas may vary spatially or seasonally. For example, some areas may always function as either discharge or recharge areas, based on relatively constant ground water levels and flow patterns. Other areas may act as recharge areas during dry months when the water table is low and as discharge areas during the wet season when the water table rises. Ground water discharge is critical to maintaining stream base flows, which are in turn critical to maintaining aquatic habitat and water quality during dry months by maintaining wetted channels and delivery of cool, oxygenated water.

Floodplains are also a setting for riparian ecosystems. Riparian ecosystems are found where high water tables, overbank flooding, or channel meandering occur. Riparian ecosystems are highly variable environments both spatially and temporally. They form a transition between terrestrial and aquatic ecosystems. They are saturated or flooded during most of the wet season followed by recession of the water table below the root surface during the summer. Riparian ecosystems have a high flux of energy, water, and other material. As such, they generally have high plant and animal species diversity, high species and biomass density, and high productivity (Mitsch and Gosselink 1993). See Sections 2, 3, and 4 for additional discussion of riparian ecosystems.

6.4 Human Activity and Frequently Flooded Areas

The most common types of human disturbance to floodplains are filling, channelization, and construction or alteration of barriers. Each of these is described below.

6.4.1 Filling

Filling is typically performed to raise an area above the flood elevation so that it may be developed. Without compensatory volume replacement filling typically reduces floodplain storage. FEMA minimum regulations require that the cumulative effect of a proposed development, when combined with all other existing and anticipated development, will not increase the water surface elevation of the base flood more than one foot at any point within the community. This is the basis for the delineation of the floodway on the floodplain, with filling allowed in the floodway fringe areas of the floodplain, but not allowed in the floodway. Encroachments into the floodway are typically prohibited unless it is demonstrated that the encroachment will not result in any increase of flood levels during the base flood.

6.4.2 Channelization

Stream or river channelization can be described as the deliberate or unintended alteration of channel slope, width, depth, sediment roughness or size, or sediment load (Bolton and Shellberg 2001). Widening, deepening, dredging, removal of live or dead vegetation, bank armoring, straightening, and construction of levees or similar structures may alter these variables. The physical effects of channelization include higher flow velocities, increased sediment transport, increased channel incision, bank instability, loss of channel and floodplain capacity, increased flood heights, and draining of wetlands and floodplains. These effects result in damage to or loss of stream and wetland habitat (Bolton and Shellberg 2001).

Channelization also results in loss of natural habitat-forming processes, and even intentional homogenization of the channel. As a result, channel complexity is reduced and specific habitat types (pool-riffle sequences, logjam-formed pools, meander pools, etc.) are reduced or eliminated. Loss of specific habitat types (pools, eddies, and off-channel areas), increased flow velocity, and longer durations of elevated flows affect fish and invertebrates.

Filling and channelization also reduce the water quality maintenance function of floodplains, through loss of wetlands and floodplain vegetation that filter sediment, nutrients, and chemicals, and by reducing the volume of flood flow that interacts with the floodplain outside of the channel.

The Mill Creek Project described in Section 6.5 is an example of a channelization and barrier project. This project, which was constructed to reduce future flood damages, and has proven to be extremely beneficial for this purpose, also may have had some significant environmental costs to the previous natural stream channel.

6.4.3 Barriers

Barriers are features that restrict the movement of water, sediment, animals (fish), or other material such as LWD, either downstream or laterally within the floodplain. Barriers may also restrict channel migration. Barriers include dams, levees, road, and highway embankments, bridges and culverts, floodplain fill, bioengineering structures (cribwalls, rootwad/rock mixtures, etc.), and walls.

Levees protect infrastructure from flooding. Levees also affect conveyance and storage of floodwaters in two ways: (1) levees isolate naturally occurring floodplain storage from the channel, and (2) levees constrict flows to a narrower channel, resulting in increased flow depth and velocity. This may cause increased scour, sedimentation, and transference of flooding problems to downstream areas (Hey 1994). Other types of barriers such as road embankments, bridges, culverts, fill, and embankments may impede flow, causing greater flood heights. Levees also physically disconnect riparian areas, wetlands, and off-channel habitats, from the main channel, which has adverse effects on natural ecological processes (Bolton and Shellberg 2001).

Levees have been constructed in several areas around the county to prevent or reduce overflow from flooding events. The Mill Creek Project described in Section 6.5 is an example of a combination of barriers to control flooding.

6.5 Flood Control Projects

As a means of reducing future similar flood damages, the Corps of Engineers constructed the Mill Creek diversion and storage reservoir (Bennington Lake) and the Mill Creek flood channel, which was completed in November 1941. This system diverts a portion of Mill Creek floodwater and stores it in Bennington Lake, decreasing the peak flow of Mill Creek as it passes through Walla Walla. The Mill Creek flood channel passes through Walla Walla and College Place and is composed of three sections: (1) a concrete-lined rectangular middle section, (2) a wide rectangular gravel upper section, and (3) a wide rectangular gravel lower section. This system has alleviated future flood damages through this area of Mill Creek during the other significant flooding events in 1964 and 1996 in this area.

In response to the devastating flooding from the 1996 flood in the County, the USACE prepared the 1997 Walla Walla River Watershed Reconnaissance Report describing problems and opportunities related to the creeks and rivers in the County. This report identified two potential projects which received a positive Benefit Cost ratio: a Coppei Creek Levee and a Mill Creek Levee. The following is a short summary of each of these potential projects and the status:

6.5.1 Coppei Creek Levee

The proposed partially set-back levee would be constructed along the north side of Coppei Creek on the south side of Waitsburg, west of the fairgrounds. The levee would extend from the canyon wall south of the fairgrounds to the upstream side of the

Highway 12 bridge. If this levee were to be constructed it would alleviate most of the future floodwater damages from Coppei Creek.

The Coppei Creek levee project has not been constructed; however there is some renewed interest by the City of Waitsburg in pursuing this project.

6.5.2 Mill Creek Levee

This project would involve constructing a levee along the north side of Mill Creek below the Five Mile Bridge. This reach of Mill Creek flooded during the 1996 flood event, which was approximately a 70-year frequency event. Flood fighting was done during the 1996 flood in this area to protect the Community College and to direct the flood water back into the Mill Creek channel near its confluence with Titus Creek. The Mill Creek project constructed in 1941 had once provided 100-year frequency flood protection, which no longer exists, so this project is needed to restore at least this level of protection for this highly urbanized area within the City of Walla Walla.

The Mill Creek Levee project was constructed in the early 2000s by the Corps of Engineers with Walla Walla County as the local sponsor. There has not been any major flooding in this area since the levee was constructed, so there has not really been a test of this project at this time.

Maintenance Activities for the Mill Creek Flood Control Zone District

Vegetation Control Measures: Vegetation control on the levees is necessary to maintain their structural integrity. Roots can penetrate earthen levees providing a pathway for water leakage during flood events. In the concrete sections of the levee system, roots can displace or even crack the concrete. Vegetation within the wetted perimeter of the canal also has the effect of slowing water passage and thereby reducing the capacity of the system to pass floodwaters. Vegetation can also be a source of debris that has the potential to accumulate in or plug the channel.

Vegetation control primarily consists of annual herbicide applications in the gabion lined sections of the channel (gabions are large wire baskets filled with rock). Applications are done in accordance with the applicable state and federal regulations, with special consideration given to the aquatic environment.

Manual removal of debris and vegetation within the concrete sections of the channel generally occurs on a biennial cycle due to need and to the amount of work necessary to construct access into the channel.

Sediment Removal: Over time, rock and sediments eroded from the upstream reaches of Mill Creek wash into the levee system through a natural process called “stream bed transport”. These rocks and sediment accumulate or “aggrade”, mostly on the non-concrete lined sections of the channel. These sections of the levee system look like they are made from rock, but are actually lined with gabions. The gabion lined sections of the canal are constructed with small “dams” every 100 to 200 ft. The dams are energy dissipaters designed to slow the floodwaters just enough to avoid erosion or “scouring” of the canal walls and bed. When the sediments accumulate between the dams, the ability of the dams to slow the velocity of floodwaters is reduced and the threat of unplanned erosion increases. If allowed to continue, buildup of sediments will also raise the bed of the channel, reducing the channel volume available to carry floodwater.

The buildup of sediment occurs relatively slowly. Maintenance periods vary from 10 to 20 years, depending on a variety of factors. Sediment removal requires constructing temporary access roads within the channel so trucks and sediment removal equipment can traverse the dams. Due to the magnitude of work involved, sediment removal operations are generally planned several years in advance. The removal operation requires a significant permitting effort. The work is closely coordinated with regulatory agencies to minimize impacts to the aquatic environment.

The concrete lined sections of the channel are designed to withstand very high water velocities. The velocity of waters during flood stages is designed to be high enough to flush rocks and sediment through. The design works well, and so very little sediment accumulates in the concrete lined sections. The small amount of accumulation that does occur is removed during biennial maintenance activities mentioned above.

6.6 Flood Hazard Management Planning

The Disaster Mitigation Act of 2000 (44 CFR 201) requires state, local, and tribal governments, taxing districts, and not-for-profit organizations to develop Hazard Mitigation Plans (HMPs) to remain eligible for FEMA pre-disaster mitigation and post-disaster relief funding. The HMP identifies hazards (such as flooding, volcanic, landslides, and earthquakes) that could potentially affect or be present in a community or area, and estimates the level of risk these hazards pose in the event of a natural disaster. These risk estimates are then used to prioritize mitigation planning efforts. The law requires that each HMP include the following elements:

- Public involvement
- Planning process documentation
- Risk/vulnerability assessment
- Mitigation strategy(ies)
- Plan maintenance and updates
- Formal plan adoption by each participant.

Walla Walla County has an approved Hazard Mitigation Plan that was approved by FEMA on May 17, 2005. This Plan includes all of the unincorporated areas of the County as well as the cities of Walla Walla, College Place, Waitsburg, Prescott, and the Mill Creek Flood Control District.

6.7 GMA Requirements and Regulatory Options

This section analyzes the existing code for potential deficiencies in meeting the requirements of chapter 36.70A.

6.7.1 GMA Standards

Chapter 365-190 WAC contains minimum guidelines for classification of critical areas including frequently flooded areas. WAC 365-190-080(3) states that classifications of frequently flooded areas should include, at a minimum, the 100-year floodplain designations of FEMA and the National Flood Insurance Program (NFIP).

GMA guidelines in chapter 365-190 WAC do not provide specific guidelines to address hazards to human health and safety from frequently flooded areas. CTED policy interpreting the GMA discourages allowing any new development within a floodplain. However, if a local jurisdiction does allow development in floodplains, the CTED guideline for density in a floodplain is one dwelling unit per 10 to 20 acres.

6.7.2 FEMA/Ecology Requirements

Even though they are not requirements, the GMA guidelines and CTED policies are more restrictive than the FEMA/Ecology minimum requirements, which do not specifically regulate or prohibit development densities in the floodplain. Minimum Ecology requirements are contained in chapter 173-158 WAC and do prohibit residential development in the floodway portion of the floodplain, but there are no prohibitions or density restrictions in the fringe portion of the floodplain. Minimum building requirements must still be met, such as elevating floor levels of residential structures at or above the base flood level, flood-proofing non-residential structures and electrical equipment and ensuring that development does not raise downstream flood levels, etc. FEMA minimum requirements are less restrictive than Ecology requirements.

The interrelationship of frequently flooded areas with other critical areas means that all important functions and values need to be considered in establishing comprehensive plan policies and development regulations for these critical areas (CTED 2004). To address this policy, the CTED Example Code proposes requiring that all structures, utilities and other improvements be located outside of floodplains, unless a site has no buildable area outside of the floodplain (CTED 2003).

Growth Management Hearings Board decisions on frequently flooded areas are limited. The most relevant clarifies that location of development within a floodplain is an issue:

> *"Ordinances which merely regulated building requirements within a floodplain and did not address issues of whether and under what conditions building should occur in a floodplain did not comply with the GMA." WWGMHB Diehl* v. *Mason County 95-2-0073 (Final Decision and Order, 1-8-96)*

6.7.3 Existing Walla Walla County Regulations

Walla Walla County's regulations relating to floodplain development are contained in Chapter 18.12 Flood Damage Prevention. This chapter of the County's ordinance was adopted as an element of the requirements for the County's participation in the NFIP administered by FEMA.

The County's current Critical Areas Ordinance is contained in Chapter 18.08 CRITICAL AREAS. Section 18.08.120 Frequently Flooded Areas refers to sections in the Flood

Damage Prevention Chapter of the Walla Walla County Code for specific requirements for Frequently Flooded Areas.

The following are some of the key sections from Chapter 18.12:

- 18.12.070 requires that the area regulated under this chapter (areas of special flood hazard) is based on the County's Flood Insurance Study and is shown on the FIRMs, with an effective date of January 18, 2002.

- 18.12.250 requires that new construction or substantial improvement of any residential structure shall have the lowest floor, including basement, elevated to or above one foot above the base flood elevation (BFE).

- 18.12.260 requires that new construction or substantial improvement of any commercial, industrial or other non-residential structure shall be floodproofed or have the lowest floor, including basement, elevated to the level of one foot above the BFE.

- 18.12.290 contains additional requirements for floodways, including the prohibition of any fill or development of any nature that would result in any increase in flood levels and the prohibition of new construction or substantial improvement of any residential structure.

6.7.4 Regulatory Options

There are four basic approaches to limiting flood exposure for new development:

- Limiting the types and density of uses allowed in floodplains by zoning these areas for resource use rather than for residential, commercial, and industrial use.

- Limiting or prohibiting subdivisions within these areas, or requiring new lots to have a buildable area outside the floodplain.

- Requiring new construction on existing parcels to locate outside of the floodplain if a buildable area is outside the floodplain.

- Allowing limited new development in floodplains, but requiring construction to be done in such a manner that potential flood damages are minimized and do not cause an increase in flood levels.

Limitations on Development in Floodplains

The restriction of development in the floodplain has a threefold purpose:

1. To reduce risk to human health, safety, and property

2. To prevent development activities from adversely affecting the capacity of the floodplain or floodway to convey and store floodwaters

3. To preserve important ecological functions of the floodplain.

The type, depth, velocity and severity of flooding in the identified floodplains within the County vary widely throughout the County. In the steeper portions of the river and creek gradients, high velocity flooding occurs that even with shallow depths, can result in flood damages. In other portions of the County where the gradient is flatter and the flood velocities are relatively low, shallow flooding typically does not result in severe damages, Greater depths of flooding even in low velocity areas, can cause severe damages and inconveniences relating to access.

In addition, some areas not in the identified floodplain, but which are adjacent to identified floodplains which have high banks above flooding levels can be subject to erosion from the flood flow velocities. These areas are also hazardous because there is the potential for buildings washing away as a result of the eroding stream banks caused by flooding.

6.8 Floodproofing

Floodproofing is designed to limit the damage from flooding. In a flood situation, individuals are often evacuated, but with adequate floodproofing they can often return to their property after the flood and resume activities with little need for repair.

Section 18.12.260 of the Flood Damage Prevention Code and the Department of Ecology and FEMA requirements all require floodproofing of new non-residential construction and substantial improvements to existing non-residential construction within the floodplain, to reduce damage to structures during floods. Key floodproofing provisions include the following:

- Anchoring to prevent flotation, lateral movement, or collapse
- Construction of utilities to prevent entry of water during flooding
- Elevation of residential structures to or above one foot above BFE
- Prohibition of enclosed areas below the lowest floor, or allowance for flow of floodwaters
- Elevation of non-residential structures to one foot above the BFE or floodproofing so that portions of the structure below the BFE are watertight and non-buoyant

6.9 Findings and Code Recommendations

In its present form, the Walla Walla County Chapter 18.12 Flood Damage Prevention addresses the minimum guidelines for frequently flooded areas, and with some minor updates, would meet the FEMA and Ecology minimum requirements for continuation of being in good standing for participation in the NFIP.

The following are recommendations for County's consideration in updating Chapter 18.12:

- Update the existing 2002 version of Flood Damage Prevention to incorporate the 2002 revisions to the Ecology requirements contained in Chapter 173-158 WAC-Floodplain Management.

- Check cross references to other sections, since some of these refer to sections of Chapter 17.38 instead of to other sections in Chapter 18.12.

- Consider increasing the elevation requirement from one foot above the base flood elevation to two foot or more above the base flood elevation for floor levels for residential structures and non-residential structures. Also, consider prescribing additional flood proofing requirements for non-residential structures.

- Consider establishing setback areas from river banks to provide additional safety from erosion as well as providing a riparian buffer for protecting fish and wildlife habitat, or establish setback areas through the FWHCAs.

- Consider adding language relating to wetlands management as described in Chapter 173-158 WAC.

- Consider adding language relating to farmhouses in floodplains as addressed in Chapter 173-158 WAC.

- Consider adding language relating to a definition of critical facilities and more restrictive location requirements for these types of facilities, which can include hospitals, assisted living facilities, etc.

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7 Critical Aquifer Recharge Areas

7.1 Section Overview and GMA Requirements

Critical Aquifer Recharge Areas (CARAs) are defined as areas with a critical recharging effect on aquifers used for potable water that is vulnerable to contamination that would affect water quality (WAC 365-190-030(2)). Examples include sole-source aquifers designated pursuant to the federal Safe Drinking Water Act; areas established for special protection pursuant to RCW 90.44, 90.48, and 90.54; and wellhead protection areas designated pursuant to WAC 246-290-135. Critical aquifer recharge areas function to protect human health from contaminated drinking water (anti-degradation of ground water), and to maintain stream flows and moderate temperatures for fish and wildlife.

7.2 Summary of Aquifers in Walla Walla County

The Walla Walla Basin has two primary aquifers: (1) The gravel aquifer, which consists of unconsolidated sediments lying above a clay unit in the south central lowland part of the County and also straddles the state line, and (2) the underlying basalt aquifer, which underlies the entire Walla Walla County (and Walla Walla River basin). The gravel aquifer encompasses approximately 190 square miles (about a third of which is in Oregon), while the basalt aquifer system in the Walla Walla River basin is approximately 2,500 square miles including the portion of the Basin in Oregon (Barker and MacNish 1976).

7.2.1 Gravel (Shallow) Aquifer

Various studies of the Gravel Aquifer have determined that the depth of this shallow aquifer ranges from 300 to 800 feet. According to Newcomb (1965), the gravel unit can be as much as 300 feet thick. Barker and MacNish (1976) estimate the gravel aquifer thickness to be up to approximately 500 feet, which includes some portions of imbedded clay. Whiteman et al. (1994) estimated the total thickness of the gravel and clay can be as much as 800 feet in a limited area in the western portion of the south central lowlands of Walla Walla County near the City of Walla Walla and north of Milton-Freewater. Based on the dimensions of the gravel aquifer, MacNish et al. (1973) estimated that the gravel aquifer has a total storage capacity of 5 million acre-feet of water with approximately 1 million acre-feet being manageable for use. This total storage includes the portions outside of Walla Walla County.

The gravel aquifer generally occurs under unconfined or water table conditions, with exceptions in a few places. The shallow aquifer is moderately to highly permeable (i.e. ability to transmit water). The higher permeabilities are associated with sands and gravels near stream and river channels. The gravel aquifer is also hydraulically connected with the streams, canals, and ditches that overlie its surface. Water moves in and out of the gravel aquifer system through a variety of mechanisms. Rainfall, snow pack, rivers, streams, ditches and water uses such as irrigation leak water through infiltration and percolation. Water also moves out of the aquifer through mechanisms including irrigation pumping, industrial and municipal pumping, resurfacing spring flow and by direct groundwater losses to surface evapotranspiration or to the basalt aquifer (WWBWC 2007). Thus, the gravel aquifer receives recharge from stream and canal leakage and infiltration of irrigation water.

Most of the direct recharge from streams occurs in the higher elevation areas to the north and east of the City of Walla Walla, where the aquifer contains more coarse-grained material. Mill Creek loses water to the gravel aquifer as it flows out of the Blue Mountains. January represents the time of year where the aquifer is least stressed. In February and March the groundwater levels generally rise as a result of recharge from stream leakage, and precipitation. As irrigation canals begin to convey water (in March), the rise continues into June. Groundwater levels tend to decrease from July through September when water levels are lowest because of pumping and evapotranspiration. Water levels have greatest seasonal fluctuations in the upper part of the Walla Walla River alluvial fan with annual water level fluctuations as great as 30 feet. Other areas experience changes typically between 5 and 10 feet. Regional groundwater flow in the gravel aquifer is generally from east to west and generally parallels the direction of the Walla Walla River and Mill Creek, although in areas adjacent to streams groundwater may be discharging to, or receiving water, from the streams.

7.2.2 Basalt Aquifer

The Columbia River Basalt (CRB) formation underlying Walla Walla County is divided into three major formations separated by sedimentary interbeds. These sedimentary interbeds can act as aquifers but in general act to impede vertical movement of water. For the purposes of this discussion and because of the complex nature of the flow patterns, the individual basalt formations are combined and considered to be the “basalt aquifer.” The aquifer’s geologic structure strongly influences how water is transmitted. Although the basalt bedrock is at least 2,000 feet thick near the City of Walla Walla, the basalt aquifer is actually a series of interconnected layers of individual basalt (lava) flows that are between about 5 to 150 feet thick. The contacts between individual flows are typically broken, rubbly, and may contain sedimentary materials. This “interflow zone” typically comprises only 5 to 10 percent of the entire 2,000 feet thickness and contains the portion of the aquifer that transmits most of the water. The interflow zones are separated by less transmissive and more massive features. Surface mapping reveals features interpreted to be faults and folds. In addition to these folds and faults, the basalt surface underlying the basin is found to not be defined by the same basalt unit at all locations. At a minimum, three different basalt units form the uppermost basalt unit at different locations in the basin.

Separate groundwater “compartments” exist due to folding and faults of the basalt. These compartments limit the ability of water to move because of low-permeability structures bounding them. However, within the compartments, the basalt aquifer has high permeability. According to Newcomb (1965), groundwater flow generally follows the direction of the low topographical areas in the basalt aquifer (“synclines”). It is in these lower parts of the basalt flows around the edge of the Walla Walla valley floor where most of the groundwater storage occurs.

Depth to the water-bearing zones within the basalt varies widely due to the complicated nature of groundwater occurrence in the basalt aquifer. Groundwater is generally present under confined (pressurized) conditions. The general directions of flow in the basalt aquifer have not changed significantly since pumping in the early 1900s.

Discharge from the basalt aquifer in the highlands in the eastern portion of the county occurs primarily directly to streams and is the major factor in maintaining summer flows in Mill Creek and the Walla Walla River. The basalt aquifer also discharges by seepage flow to the Columbia and Snake Rivers, which are the major groundwater discharge points for the basalt aquifer.

Near the margins of the central lowland and valley area of Walla Walla County, the gravel formation rests on the basalt. Toward the east and north of the county, the gravels taper in both the vertical and horizontal direction. Toward the Blue Mountain in the east the gravel layer tapers toward the slopes and along the northern side of the lower valley the gravel largely terminates above Lowden. The gravel layers in these areas are typically underlain by clays. The unconsolidated gravels and clays can be from 50 to 200 feet thick. Going further north and east to the uplands, the Palouse Formation extensively covers the basalt formation. The Palouse Formation is comprised of fine-grained, wind-blown loess with thickness on the order of 50 feet. In these areas, infiltration of precipitation can occur through this overlying Palouse Formation to recharge the basalt aquifer directly. Direct recharge to the basalt aquifer along the margins of the valley area and upland area is still fairly limited because of the presence of clays beneath the gravel. Recharge to the basalt aquifer system generally occurs from the Blue Mountains located at the south and east side of the County and Walla Walla River Basin (Barker and MacNish, 1976).

The extent of hydraulic connection between the gravel aquifer and the basalt aquifer is not completely known or easily predicted. In some locations there is evidence of upward and downward flow between the gravel and basalt aquifers through the clay layers separating the two aquifers (EES 1995). However, in general modeling estimates indicate a net greater upward movement of groundwater from the basalt to the gravel aquifer (Barker and MacNish, 1976). A recent aquifer storage and recovery (ASR) study by the City of Walla Walla (Golder 2007) indicates that the connection may be less direct than previously thought (MacNish et al. 1973). If this is true, increases and decreases in basalt well pumping may have less significant effects on gravel aquifer levels, wells, and flow patterns. It should be pointed out that the Golder (2007) study was focused on the area immediately around the City of Walla Walla. With the high variability in the Basalt Aquifer characteristics, the behavior of the shallow aquifer and basalt aquifer immediately in the rest of the gravel area within the County may be different.

7.3 Overview of Aquifer Functions and Values

7.3.1 Drinking Water Supply

Advantages of ground water as a water supply source include natural filtration as precipitation percolates through unsaturated soils; protection from turbidity, algal blooms, and other surface water quality issues; generally constant cool temperature; and ease of accessibility with surface wells and pumps. Ground water provides more than 65 percent of drinking water for Washington State through private wells and public water systems (Ground Water Protection Council 2004).

7.3.2 Base Flow to Streams

Ground water and surface water systems constantly interact with respect to recharge and discharge of ground water. One critical interaction is discharge of ground water into streams as base flow during parts of the year and the recharge of ground water from streams during other parts of the year. The magnitude and timing of ground water discharge and recharge depends on the relative elevations of the stream bed and the water table, the flow gradient between the aquifer and the stream, the water-transmitting characteristics of the geologic layers that comprise the aquifer and the stream channel, the location and extent of pumping from ground water wells, drainage activity, climate, and other actions and conditions. Base flow from ground water also provides critical water volumes to support fish life cycles (including moderation of stream temperatures) and to maintain public water supplies that draw water from streams and rivers.

A number of past and current studies provide insights into base flow contributions from ground water, including Barker and MacNish (1976) and Sinclair and Pitz (1999). These studies indicate that the shallow aquifers are responsible for approximately 70 percent of stream base flow (Ground Water Protection Council 2004).

7.3.3 Discharge to and Recharge from Wetlands

Shallow aquifers can be recharged by wetlands and can also discharge to wetlands that support vegetation and wildlife. Wetlands provide beneficial water quality functions including particulate filtration and buffering of pollutants. The interrelationships of wetlands, aquifer recharge, discharge from shallow aquifers, and water quality occur on both a landscape and site-specific scale. Assessment of the potential impacts of changes in ground water conditions (such as water-table elevation, ground water recharge and discharge rates, and water quality) on wetlands requires field data to define wetland hydrology and function.

7.3.4 Storage of Infiltrated Precipitation

Aquifers can provide temporary storage of the portion of precipitation that infiltrates into the ground and moves downward past the root zone where it is not lost through evapotranspiration. This storage can function as a detention mechanism that reduces stormwater runoff and allows delayed discharge into streams and lakes well after the precipitation event. Stored ground water becomes a resource for water supply, base flow, and discharge to wetlands and other surface water bodies.

7.4 Overview of Critical Aquifer Recharge Area Issues

7.4.1 Susceptibility of Aquifer Recharge Areas

Aquifer susceptibility is defined as the ease with which contaminants can move from source areas to the aquifer based solely on the characteristics of surface and subsurface geologic materials in the unsaturated zone above the aquifer (Cook 2000). For example, an aquifer with a ground water depth less than 20 feet and overlain by course sand and gravel would have high susceptibility to contamination, but a confined aquifer overlain by 50 feet of clay would have a relatively low susceptibility.

Susceptibility can be estimated in a number of ways ranging from evaluation matrices supported by the scientific literature and field data, to ground water computer models calibrated with data from field aquifer tests.

7.4.2 Vulnerable Aquifer Recharge Areas

Aquifer vulnerability is defined as the combined effects of susceptibility and the presence of pollutants above the aquifer at specific locations (Cook 2000). The factors that contribute to vulnerability include the nature of the chemical threat (potential or confirmed release), the form of the chemicals (solid or liquid), the toxicity of the chemical, and the mobility of the chemicals in the subsurface.

Vulnerability can be approached from varying levels of detail. For example, non-point contamination sources such as agricultural chemicals may best be addressed on a regional scale, whereas point sources such as leaking underground storage tanks or registered hazardous waste disposal sites are best addressed on a site-specific basis.

7.4.3 Wellhead Protection Areas

The 1986 amendments to the federal Safe Drinking Water Act mandated measures to protect ground water supplies through wellhead protection. The State of Washington adopted regulations (WAC 246-290-135, Source Water Protection) to address these requirements. Potable water-supply purveyors in Washington using ground water must develop and implement wellhead protection programs that include delineation of protection areas around each well, inventorying of contamination sources within wellhead protection areas, and development and implementation of water supply contingency and spill response plans to address contamination incidents that could cause loss of a well. The EPA (1987, 1993) and Washington State Department of Health (DOH) (1995) provide guidance for wellhead protection program development.

The State of Washington wellhead protection regulations exclude individual domestic wells and well systems that do not meet the definition of public water supplies. The well drilling regulations (Chapter 173-160 WAC) include requirements to locate water wells minimum distances from potential contamination sources such as feedlots and landfills.

7.4.4 Sole Source Aquifer

The federal Safe Drinking Water Act also authorized the EPA to designate aquifers that are the sole or principal source of drinking water for an area. To meet the criteria for designation, a sole source aquifer must supply at least 50 percent of the drinking water to persons living over the aquifer, and there can be no feasible alternate source of drinking water. No sole source aquifers are designated in Walla Walla County.

7.4.5 Susceptible Ground Water Management Areas and Special Protection Areas

WAC 173-100-010 provides guidelines, criteria, and procedures for the designation of ground water management areas, subareas, or zones and to set forth a process for the development of ground water management programs. The objectives of these designations are protection of ground water quality, assurance of ground water quantity, and efficient management of water resources to meet future needs while recognizing existing water rights. WAC-173-200-090 addresses designation of special groundwater protection areas that require special consideration or increased protection. There are currently no ground water management areas or protection areas designated within Walla Walla County under these programs.

7.4.6 Ground Water Quantity

The quantity of ground water present in aquifers under natural conditions represents an equilibrium of recharge, storage, and discharge, and responds to changes in climate. Land-use activities that can affect ground water quantity by reducing recharge include impervious surfaces with drainage diversion, drainage ditches, ground water cutoff trenches, overpumping from wells and springs. Increases in recharge also occur as a result of irrigation, leakage from irrigation canals, and septic system discharges in areas served by surface water supplies.

7.5 Human Activity and Aquifer Functions

7.5.1 Ground Water Quality

Use and disposal of chemicals is the principal cause of adverse impacts to ground water quality from human activities. Leaks and spills of chemical products and hazardous residues from manufacturing operations, storage tanks, shipping containers, and waste disposal areas are major point sources of contamination. On-site septic systems that are improperly installed or maintained are also potential point sources of ground water contamination. Non-point sources of ground water contamination include runoff from agricultural areas, field application of fertilizers and manure at greater than agronomic rates, concentrated agricultural feeding operations, paved and unpaved areas used by vehicles or used for chemical storage, runoff from residential and business uses, and areas where airborne dispersion of hazardous chemicals has contaminated soils.

Recent studies indicate that on-site septic systems can be a significant contributor to ground water contamination, depending upon system density and hydrogeologic conditions. Generally, a maximum density of one system per one acre is sufficient to avoid ground water contamination (Cook 2000). However, varying soil types and depths can influence the allowable septic system density.

7.5.2 Ground Water Quantity

Withdrawal of ground water at rates and/or volumes exceeding natural recharge causes depletion of ground water storage in aquifers. If this situation persists for an extended period of time, significant declines in ground water levels and change of flow gradients and directions can occur. Long-term water level declines can also cause damaging compaction of the aquifer matrix. In principle, ground water withdrawals are regulated by the Department of Ecology through the allocation of water rights, although state law (RCW 90.44.050) allows for small ground water withdrawals for specific purposes of use which are exempt from the water right permitting process.

Natural ground water recharge rates can be reduced by changes in land use. For example, agricultural drainage systems and drainage systems associated with roads and urban areas are specifically designed and constructed to intercept water that would have otherwise discharged from the site and recharged aquifers. Similarly, installation of impervious areas (such as pavement and buildings), soil compaction from heavy equipment, and changes in vegetation type and quantities can affect recharge rates to ground water (Fair 2003). Techniques to mitigate some of these impacts are addressed by the Stormwater Manual for Eastern Washington (Ecology 2004).

Agricultural drainage systems, stormwater collection and conveyance systems in developed areas, and impervious surfaces have the effect of reducing the amount of ground water available to support baseflow in streams. Decreased recharge can lower ground water levels and cause reversal of ground water flow directions and gradients. The aquifer is then recharged by the stream (resulting in stream baseflow losses), rather than discharging to the stream to augment baseflow.

7.6 Applicability of CARAs in Walla Walla County

Recharge areas replenish groundwater supplies but also allow contaminants into the aquifer, and as a result all groundwater is potentially vulnerable to contamination. However, problems or risk to contamination vary spatially and not all regions are equally vulnerable. Effective protection strategies for groundwater should be targeted at the most critical areas. The following considerations are used to designate the critical aquifer recharge areas in Walla Walla County:

- Of the three regulatory measures that account for susceptibility and value of the groundwater resources (see Section 7.4) only the Source Water Protection – Wellhead Protection Area (WAC 246-290-135) currently applies to Walla Walla County. Walla Walla County maintains a database of all the wellhead protection areas submitted by community water systems required to prepare wellhead protection plans and periodically updates its database with DOH provided information from systems. The 10-year time of travel to the wellhead captures a reasonable area for management purposes and beneficial use.

- The Gravel Aquifer receives recharge from stream and canal leakage and infiltration of irrigation water and there is a high level of hydraulic connectivity between the gravel aquifer and the surface streams.

- The Basalt Aquifer is generally less susceptible to contamination than the Gravel Aquifer because of the depth to groundwater, presence of overlying sediments, and the lower permeability of the basalt formation. The main source of susceptibility of the Basalt Aquifer is through water supply wells installed in the aquifer. The primary recharge area to the Basalt Aquifer is in the Blue Mountains located at the south and east side of the County and Walla Walla River Basin. Most of this area is part of a watershed protected by United State Forest Service (USFS) and City of Walla Walla regulations. Although the basalt aquifer is less susceptible to contamination, it is difficult to treat contamination once it occurs.

Based on the considerations above, the critical aquifer recharge areas for Walla Walla County are defined as:

- The 10-year time of travel as defined in the wellhead protection plans submitted by communities and water providers to DOH. Walla Walla County maintains these groundwater capture zones. The CARA delineated by the 10-year capture zones are defined in Figure 7.6-1. Table 7.6-1 lists the communities and water providers in Walla Walla County that have designated wellhead protection areas and the total area encompassed by the 10-year time of travel. This capture zone information was secured from DOH[1].

- The entire extent of the gravel aquifer as delineated in Figure 7.6-1 is *not* defined as a CARA, however it is an aquifer of significance/consideration. The susceptibility of the gravel aquifer is further defined using an overlay of surficial soil type and the relative permeability (for infiltration). The ratings are divided into three categories: high, medium, low. High susceptibility corresponds with higher permeability soils that have a greater potential for contaminants to infiltrate to groundwater.

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[1] DOH data through 12/31/07.

Insert Figure 7.6-1

Table 7.6-1
List of Water Providers in Walla Walla County with Delineated 10-year Capture Zones

Water System	Area of 10-mile Capture Zone (acres)
Arelenes Addition	55
Artesia Water District 8	19
Blalock Orchard Dist 10	19
Blalock Orchards Dist 12	37
Boise Cascade Trucking Division	28
Broetje Orchards	69
Burbank Heights	139
Burbank Irrigation District 4	358
Christ Community Fellowship	280
Columbia Elementary School	280
Columbia High School	28
Columbia View Water System	837
Cottonwood Glen Water Assn	69
Dixie Water Association	47
Dodd Road Industrial Park Water	47
Flat Top Ranch	69
Grandview Farms Pasco - Dodd Road	14
Harrison-Ray-Burbank Water System	570
Hill Top Acres	87
Hydro Irrigation District #9	560
Ice Harbor Dam	843
Jubilee Youth Ranch	69
Kooskooskie Cabin Owners Assn	138
KPS Gas & Grocer	9
Mini-Pearl Water System	69
Pierces Green Valley RV Park	69
Prescott, Town of	419
Reser Creek Water System	46
Simplot Feeders LTD	3,483
Snake River Housing Water System	14
Sun Harbor Water District #3	419
Sydney Heights Water Assn	419
Touchet School	139
Tyson Fresh Meats INC	745
Veteran Affair Med Center, Dept of	419
Waitsburg, City of	4,043
Walla Walla Airport	94
Walla Walla Labor Home	37
Walla Walla River Packing & Storage	14
Walla Walla Water Division	157,624
Wallula Water District	139
Westbiyrne Acres	699
Grand Total	173,566

Source: DOH 2007

In addition to the water systems provided in Table 7.6-1, there are additional Group A ground water systems for which wellhead protection areas are are not available. Some of these systems, which are listed below, may have capture zones delineated while others may not depending on their size.

Group A ground water systems not included in Table 7.6-1 (DOH 2008):

- Bennington Lake
- Broetje Wallula Ranch
- Burbank LDS Church
- Burbank Library Water System
- Charbonneau Park
- College Place Water Dept
- Consolidated Irrigation Dist 14
- Fishhook Park
- Green Tank Irr District 11
- Hood Park
- K2H Farms-Higgy Water System
- K2H Farms-Shop & Office
- Klicker Water System 1
- Lundgren Water System
- Mill Creek Project Office
- Prospect Heights Comm Water Assn
- Rooks Park Water
- Snake River Vineyards
- Three Rivers Winery
- Tri-Fresh LLC
- Walla Walla University
- Whitman Mission National Historic

7.7 Recommendations

It is recommended that the County inform residents of best management practices (BMPs) for critical aquifer recharge areas and for the gravel aquifer zones. Recommended BMPs are provided in Appendix C.

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Appendix A

Walla Walla County Conservation District Suggested Native Plants by Precipitation and Riparian Zone

Walla Walla County Conservation District
Suggested Native Plants by Precipitation and Riparian Zone

County Area	Zone #1 – Generally 0'-35'	Zone #2 – Generally 35'-75'	Zone #3 – Generally 75' and greater
Western Walla Walla County: Wallula-Lowden.	**Black Cottonwood –** moist soils, silts, slightly alkaline soils (5’-20’ from shoreline) **Water Birch** – moist soils, silts, ph neutral soils (3’-12’ from shoreline) **Black Hawthorn** – moist to well drained soils, silts and gravel loess (5’-45’ from the shoreline) **Coyote Willow** – moist soils-ph neutral silts and clays (3’-15’ off shoreline) **Red-osier Dogwood** – moist silts and soils, also seasonally dry sites, pH neutral to slightly alkaline soils (2’-25’ off the shoreline)	**Great Basin sage** – deep well drained soils **Big Wyoming Sage –** deep well drained soils **Western juniper** – sandy, pH neutral loess, rocky soils **Green rabbit brush** – sandy well drained soils **Black Hawthorn** – moist to well drained soils, silts and gravel loess (5’-45’ from the shoreline) **Common Snowberry** – well drained, slightly acidic soils (10’-20’ off the shoreline) **Choke Cherry** – moist-dry well drained soils, pH neutral to slightly acidic soils (5’- 25’) **Coyote Willow** – moist soils, pH neutral to slightly alkaline soils (3’-15’ off the shoreline). This plant needs space to expand from the base. **Golden Current** – well drained pH neutral to slightly alkaline soils, (10’-25’ off the shoreline). This plant needs room to expand and grow at the base. Can take moderate shade. **Blue Elderberry** – well drained soils, loess and silts, seasonally moist soils pH neutral to moderately alkaline soils (10'-45' off the shoreline). This plant needs room to expand and grow at the base.	**Western Juniper** – sandy/silt-pH neutral loess, rocky soils (45’-100’ from shoreline) **Choke Cherry** – moist soils, seasonally dry soils, seasonally wet **Ponderosa Pine** – well drained soils, dry sites (25’-50’ from shoreline) **Great Basin sage** – deep well drained soils **Creosote Bush** – alkaline soils **Big Wyoming Sage** – deep well drained soils **Alkaline Sage** – thin alkaline soils **Hop Sage** – sandy loess well drained soils **Green rabbit brush** – sandy well drained soils **Blue elderberry** – moist soils, loose sandy soils **Gray rabbit brush** – slightly alkaline well drained soils
Central Walla Walla County: Lowden-College Place-10”-15” precipitation zone	**Black Cottonwood –** moist soils, silts, slightly alkaline soils (5’-20’ from shoreline) **Water Birch** – moist soils, silts, pH neutral soils (3’-12’ from shoreline) **Thin-leaf Alder** – moist soils- neutral-slightly acidic silts and loess (3’-15’ off shoreline) **White Alder** – moist soils-ph neutral to slightly acidic silts, cobble (1’-15’ off shoreline) **Coyote Willow** – moist soils-ph neutral silts and clays (3’-15’ off shoreline) **Peach-leaf Willow** – moist soils- ph neutral-slightly alkaline (5’-25’ off the shoreline) **Red-osier Dogwood** – moist-well drained soils, ph neutral to slightly alkaline (2’-25’ off the shoreline) **Antelope-brush (Bitterbrush)** – well drained soils, pH neutral to slightly acidic	**Black Hawthorn** – pH neutral to slightly alkaline silts and soils (25’-40’ off shoreline) **Ponderosa Pine** – well drained soils, dry sites (25’-50’ from shoreline) **Mock-orange** – well drained soils, slightly acidic (15’-35’ off shoreline) **Choke Cherry** – moist-dry well drained soils, pH neutral to slightly acidic soils (5’- 25’ off shoreline) **Peach-leaf Willow** – moist soils, pH neutral-slightly alkaline (5’-25’ off the shoreline) **Smooth Sumac** – well drained soils, silts & loess, pH neutral to slightly alkaline (25’-100’ off shoreline) **Blue Elderberry** – well drained soils, pH neutral-slightly alkaline (15’-50’ off the shoreline) **Buffalo Berry** – well drained soils, slightly alkaline (25’-100’+ off the shoreline) **Antelope-brush (Bitterbrush)** – well drained soils, pH neutral to slightly acidic	**Smooth Sumac** – well drained soils, silts & loess pH neutral to slightly alkaline (25’-100’ off shoreline) **Buffalo Berry** – well drained soils, slightly alkaline (25’-100’+ off the shoreline) **Antelope-brush (Bitterbrush)** – well drained soils, ph neutral to slightly acidic
Eastern Walla Walla County: Walla Walla to Waitsburg and east to the Coppei and Mill Creek Drainages-17”-28” precipitation zone	**Black Cottonwood –** moist soils, silts, slightly alkaline soils (5’-20’ from shoreline) **Water Birch** – moist soils, silts, ph neutral soils (5’-12’ from the shoreline) **Black Hawthorn** – moist to well drained soils, silts and gravel loess (5’-45’ from the shoreline) **Thin-leaf Alder** – moist soils (5’-25’ off the shoreline) **Choke-cherry** – moist soils, dry well drained loess, ph neutral to slightly acidic soils (5’-35’ off the shoreline). This plant needs room to expand from the base. **Bitter Cherry** – moist soils, well drained loess, slightly acidic to pH neutral soils (5’- 40’ off the shoreline). This plant needs room to expand from the base. **Cascara** – moist to well drained ph neutral silts and sandy loess, can take slightly acidic soils. Shade tolerant (5’-25’ off the shoreline).	**Ponderosa Pine** – Well drained silts, sandy loess, and slightly acidic soils (35’-100’ from shoreline) **Douglas-Fir** – loess, sandy soils, well drained silts, slightly acidic soils (25’-50’) from the shoreline **Black Hawthorn** – moist to well drained soils, silts and gravel loess (5’-45’ from the shoreline) **Thin-leaf Alder** – moist soils (5’-25’ off the shoreline) **Choke-cherry** – moist soils, dry well drained loess, pH neutral to slightly acidic soils (5’-35’ off the shoreline). This plant needs room to expand from the base. **Bitter Cherry** – moist soils, well drained loess, slightly acidic to pH neutral soils (5’- 40’ off the shoreline). This plant needs room to expand from the base. Cascara – moist to well drained pH neutral silts and sandy loess, can take slightly acidic soils. Shade tolerant (5’-25’ off the shoreline).	**Ponderosa Pine** – **Well drained** silts, sandy loess, and slightly acidic soils (35’-100’ from shoreline) **Douglas-Fir** – loess, sandy soils, well drained silts, slightly acidic soils (25’-50’ from the shoreline) **Smooth Sumac** – well drained loess, to slightly alkaline silts (12’-30’ off the shoreline). This plant needs space at the base to expand as it grows.

Walla Walla County Conservation District
Suggested Native Plants by Precipitation and Riparian Zone

County Area	Zone #1 – Generally 0'-35'	Zone #2 – Generally 35'-75'	Zone #3 – Generally 75' and greater
Eastern Walla Walla County: Walla Walla to Waitsburg and east to the Coppei and Mill Creek Drainages-17”-28” precipitation zone	**Pacific Willow** – moist soils, ph neutral to slightly alkaline soils (5’-12’ off the shoreline). This plant needs to have room to expand at the base. **Coyote Willow** – moist soils-ph neutral to slightly alkaline soils. (3’-15’ off the shoreline). This plant needs space to expand from the base. **Red-osier Dogwood** – moist silts and soils, also seasonally dry sites, ph neutral to slightly alkaline soils (2’-25’ off the shoreline) **White Alder** – moist soils (3'-12' off the shoreline)	**Coyote Willow** – moist soils, pH neutral to slightly alkaline soils (3’-15’ off the shoreline). This plant needs space to expand from the base. **Smooth Sumac** – well drained loess, to slightly alkaline silts (12’-30’ off the shoreline). This plant needs space at the base to expand as it grows. **Red-osier Dogwood** – moist silts and soils, also seasonally dry sites, pH neutral to slightly alkaline soils (2’-25’ off the shoreline) **Blue Elderberry** – well drained soils, loess and silts, seasonally moist soils, pH neutral to moderately alkaline soils (10'-45' off the shoreline). This plant needs space to grow from the base, to expand out. **Mock-orange** – well drained silts-rocky soils, seasonally moist sites (8’-20’ off the shoreline). This plant will take moderate shade. It also needs space at the base to expand and grow. **Oceanspray** – well drained pH neutral soils, can grow in slightly acidic soils (10’-35’ off the shoreline). This plant needs space at the base to expand and grow. **Golden Current** – well drained, pH neutral to slightly alkaline soils (10’-25’ off the shoreline). This plant needs space to expand and grow at the **Pacific Ninebark** – well drained, slightly acidic to ph neutral soils, (10’-2 **Common Snowberry** – well drained, slightly acidic soils (10’-20’ off the	

Planting Densities
Trees: 1 tree/8 feet
Shrubs: 1 plant/4 feet
Grasses: 6 pounds/acre

Appendix B

Wetland Rating Forms

Wetland name or number Doan Creek

WETLAND RATING FORM – EASTERN WASHINGTON

Version 2 - Updated June 2006 to increase accuracy and reproducibility among users

Name of wetland (if known): Doan Creek headwater wetland Date of site visit: 5-7-08

Rated by M. Witter/S. Edgar Trained by Ecology? Yes ✓ No___ Date of training 2005

SEC: 35 TWNSHP: 7N RNGE: 35E Is S/T/R in Appendix D? Yes___ No X

Map of wetland unit: Figure ____ Estimated size ______

SUMMARY OF RATING

Category based on FUNCTIONS provided by wetland

I___ II___ III___ IV___

Category I = Score >=70
Category II = Score 51-69
Category III = Score 30-50 *
Category IV = Score < 30

Score for "Water Quality" Functions	14
Score for Hydrologic Functions	4
Score for Habitat Functions	22
TOTAL score for functions	40

Category based on SPECIAL CHARACTERISTICS of wetland

I___ II___ III___ Does not Apply___

Final Category **(choose the "highest" category from above)** ☐

Summary of basic information about the wetland unit

Wetland Type		Wetland Class	
Vernal Pool		Depressional	✓
Alkali		Riverine	
Natural Heritage Wetland		Lake-fringe	
Bog		Slope	
Forest			
None of the above		Check if unit has multiple HGM classes present	☐

Wetland name or number Doan Creek

Does the wetland being rated meet any of the criteria below?

If you answer YES to any of the questions below you will need to protect the wetland according to the regulations regarding the special characteristics found in the wetland.

Check List for Wetlands That Need Special Protection, and That Are Not Included in the Rating	**YES**	**NO**
SP1. *Has the wetland unit been documented as a habitat for any Federally listed Threatened or Endangered* ***animal or plant*** *species (T/E species)?* For the purposes of this rating system, "documented" means the wetland is on the appropriate state or federal database.		✓
SP2. *Has the wetland unit been documented as habitat for any State listed Threatened or Endangered* ***animal*** *species?* For the purposes of this rating system, "documented" means the wetland is on the appropriate state database. Note: Wetlands with State listed plant species are categorized as Category I Natural Heritage Wetlands (see p. 19 of data form).		✓
SP3. *Does the wetland unit contain individuals of Priority species listed by the WDFW for the state?*		✓
SP4. *Does the wetland unit have a local significance in addition to its functions?* For example, the wetland has been identified in the Shoreline Master Program, the Critical Areas Ordinance, or in a local management plan as having special significance.		

<u>To complete the next part of the data sheet you will need to determine the Hydrogeomorphic Class of the wetland being rated.</u>

The hydrogeomorphic classification groups wetlands into those that function in similar ways. Classifying the wetland first simplifies the questions needed to answer how it functions. The Hydrogeomorphic Class of a wetland can be determined using the key below. See p. 20 for more detailed instructions on classifying wetlands.

Wetland name or number Doan Creek

Classification of Vegetated Wetlands for Eastern Washington

If the hydrologic criteria listed in each question do not apply to the entire unit being rated, you probably have a unit with multiple HGM classes. In this case, identify which hydrologic criteria in questions 1-7 apply, and go to Question 8.

1. Does the entire wetland unit **meet both** of the following criteria?

___The vegetated part of the wetland is on the shores of a body of open water (without any vegetation on the surface) at least 20 acres (8 ha) in size;

___At least 30% of the open water area is deeper than 3 m (10 ft)?

[✓ NO] – go to Step 2 **YES** – The wetland class is **Lake-fringe (lacustrine fringe)**

2. Does the entire wetland unit **meet all** of the following criteria?

____The wetland is on a slope (*slope can be very gradual*),

____The water flows through the wetland in one direction (unidirectional) and usually comes from seeps. It may flow subsurface, as sheetflow, or in a swale without distinct banks.

____The water leaves the wetland **without being impounded**?

NOTE: *Surface water does not pond in these type of wetlands except occasionally in very small and shallow depressions or behind hummocks (depressions are usually <3ft diameter and less than a foot deep).*

[✓ NO] - go to Step 3 **YES** – The wetland class is **Slope**

3. Is the entire wetland unit in a valley or stream channel where it gets inundated by overbank flooding from that stream or river? In general, the flooding should occur at least once every ten years to answer "yes." *The wetland can contain depressions that are filled with water when the river is not flooding.*

[✓ NO] - go to Step 4 **YES** – The wetland class is **Riverine**

4. Is the entire wetland unit in a topographic depression, outside areas that are inundated by overbank flooding, in which water ponds, or is saturated to the surface, at some time of the year. *This means that any outlet, if present, is higher than the interior of the wetland.*

NO – go to Step 5 [✓ **YES**] – The wetland class is **Depressional**

5. Your wetland unit seems to be difficult to classify and probably contains several different HGM clases. For example, seeps at the base of a slope may grade into a riverine floodplain, or a small stream within a depressional wetland has a zone of flooding along its sides. GO BACK AND IDENTIFY WHICH OF THE HYDROLOGIC REGIMES DESCRIBED IN QUESTIONS 1-7 APPLY TO DIFFERENT AREAS IN THE UNIT (make a rough sketch to help you decide). Use the following table to identify the appropriate class to use for the rating system if you have several HGM classes present within your wetland. NOTE: Use this table only if the class that is recommended in the second column represents 10% or more of the total area of the wetland unit being rated. If the area of the class listed in column 2 is less than 10% of the unit; classify the wetland using the class that represents more than 90% of the total area.

Wetland name or number Doan Creek

HGM Classes Within One Delineated Wetland Boundary	Class to Use for Rating
Slope + Riverine	Riverine
Slope + Depressional	Depressional
Slope + Lake-fringe	Lake-fringe
Depressional + Riverine (riverine is within boundary of depression)	Depressional
Depressional + Lake-fringe	Depressional

If you are unable still to determine which of the above criteria apply to your wetland, or you have more than 2 HGM classes within a wetland boundary, classify the wetland as **Depressional** for the rating.

Wetland name or number Doar Creek

D	**Depressional Wetlands** WATER QUALITY FUNCTIONS - Indicators that the wetland functions to improve water quality	**Points** (only 1 score per box)
D	**D 1.0 Does the wetland unit have the potential to improve water quality?**	***(see p. 38)***
D	D 1.1 Characteristics of surface water flows out of the wetland unit: Wetland has no surface water outlet - points = 5 Wetland has an intermittently flowing outlet points = 3 Wetland has a highly constricted permanently flowing outlet points = 3 [✓ Wetland has a permanently flowing surface outlet points = 1]	1
D	D 1.2 The soil 2 inches below the surface (or duff layer) is clay or organic *(use NRCS definitions of soil types)* YES points = 3 [✓ NO] points = 0	0
D	D 1.3 Characteristics of persistent vegetation (emergent, shrub, and/or forest Cowardin class) [✓ Wetland has persistent, ungrazed, vegetation for > 2/3 of area points = 5] Wetland has persistent, ungrazed, vegetation from 1/3 to 2/3 of area points = 3 Wetland has persistent, ungrazed vegetation from 1/10 to < 1/3 of area points = 1 Wetland has persistent, ungrazed vegetation <1/10 of area points = 0 Map of Cowardin vegetation classes	**Figure** ___ 5
D	D 1.4 Characteristics of seasonal ponding or inundation. *This is the area of ponding that fluctuates every year. Do not count the area that is permanently ponded.* Area seasonally ponded is > ½ total area of wetland points = 3 [✓ Area seasonally ponded is ¼ - ½ total area of wetland points = 1] Area seasonally ponded is < ¼ total area of wetland points = 0 NOTE: *See text for indicators of seasonal and permanent inundation/flooding.* Map of Hydroperiods	**Figure** ___ 1
D	**Total for D 1** *Add the points in the boxes above*	7
D	**D 2. Does the wetland unit have the opportunity to improve water quality?** Answer YES if you know or believe there are pollutants in groundwater or surface water coming into the wetland that would otherwise reduce water quality in streams, lakes or groundwater downgradient from the wetland. *Note which of the following conditions provide the sources of pollutants. A unit may have pollutants coming from several sources, but any single source would qualify as opportunity.* — Grazing in the wetland or within 150 ft ✓ Untreated stormwater discharges to wetland ✓ Tilled fields or orchards within 150 ft of wetland — A stream or culvert discharges into wetland that drains developed areas, residential areas, farmed fields, roads, or clear-cut logging — Residential, urban areas, golf courses are within 150 ft of wetland — Wetland is fed by groundwater high in phosphorus or nitrogen — Other__________________ **YES** multiplier is [✓ **2**] **NO** multiplier is **1**	multiplier 2
D	**TOTAL - Water Quality Functions** Multiply the score from D1 by the multiplier in D2 ***Record score on p. 1 of field form***	14

Wetland name or number Doan Creek

D	**Depressional Wetlands** HYDROLOGIC FUNCTIONS - Indicators that wetland functions to reduce flooding and stream erosion	**Points** (only 1 score per box)
D	**D 3.0 Does the wetland unit have the <u>potential</u> to reduce flooding and stream erosion?**	***(see p. 39)***
D	D 3.1 Characteristics of surface water flows out of the wetland unit: Wetland has no surface water outlet points = 8 Wetland has an intermittently flowing outlet points = 4 Wetland has a highly constricted permanently flowing outlet points = 4 [✓ Wetland has a permanently flowing surface outlet points = 0]	0
D	D 3.2 Depth of storage during wet periods: *Estimate the height of ponding above the surface of the wetland (see text for description of measuring height). In wetlands with permanent ponding, the surface is the lowest elevation of "permanent" water)* Marks of ponding are at least 3 ft above the surface points = 8 The wetland is a "headwater" wetland" *(see p. 39)* points = 6 Marks are 2 ft to < 3 ft from surface points = 6 Marks are 1 ft to < 2 ft from surface points = 4 [✓ Marks are 6 in to < 1 ft from surface points = 2] No marks above 6 in. or wetland has only saturated soils points = 0	2
D	**Total for D 3** *Add the points in the boxes above*	2
D	**D 4.0 Does the wetland unit have the <u>opportunity</u> to reduce flooding and erosion?** *Answer NO if the major source of water is groundwater, irrigation return flow, or water levels in the wetland are controlled by a reservoir.* Answer YES if the wetland is in a location in the watershed where the flood storage, or reduction in water velocity, it provides helps protect downstream property and aquatic resources from flooding or excessive and/or erosive flows. *Note which of the following conditions apply.* ✓ — Wetland is in a headwater of a river or stream that has flooding problems — Wetland drains to a river or stream that has flooding problems — Wetland has no outlet and impounds surface runoff water that might otherwise flow into a river or stream that has flooding problems — Other____________________ **YES** multiplier is [✓ **2**] **NO** multiplier is **1**	***(see p. 42)*** multiplier 2
D	**TOTAL - Hydrologic Functions** Multiply the score from D3 by the multiplier in D4 ***Record score on p. 1 of field form***	4

Comments

Wetland name or number Doan Creek

These questions apply to wetlands of all HGM classes. HABITAT FUNCTIONS - Indicators that wetland functions to provide important habitat	**Points** (only 1 score per box)
H 1. Does the wetland unit have the <u>potential</u> to provide habitat for many species?	
H 1.1 <u>Categories of vegetation structure</u> ***(see p.62)*** *Check the vegetation classes (as defined by Cowardin) and heights of emergents present. Size threshold for each class or height category is ¼ acre or more than 10% of the area if unit is < 2.5 acres.* ✓ Aquatic bed ✓ Emergent plants 0-12 in. (0 – 30 cm) high are the highest layer and have > 30% cover ✓ Emergent plants >12 – 40 in.(>30 – 100cm) high are the highest layer with >30% cover ____Emergent plants > 40 in.(> 100cm) high are the highest layer with >30% cover ✓ Scrub/shrub (areas where shrubs have >30% cover) ✓ Forested (areas where trees have >30% cover) *Add the number of vegetation types that qualify. If you have:* 4-6 types [✓ points = 3] 3 types points = 2 2 types points = 1 1 type points = 0 Map of Cowardin vegetation classes and areas with different heights of emergents	**Figure** ___ 3
H 1.2. Is one of the vegetation types "aquatic bed?" ***(see p .64)*** [✓ YES = 1 point] NO = 0 points	1
H 1.3. <u>Surface Water</u> ***(see p.65)*** H 1.3.1 Does the unit have areas of "open" water (without herbaceous or shrub plants) over at least ¼ acre or 10% of its area during the spring (March – early June) OR in early fall (August – end of September)? *Note: answer YES for Lake-fringe wetlands* YES = 3 points & **go to H 1.4** [✓ NO] = go to H 1.3.2 H 1.3.2 Does the unit have an intermittent or permanent stream within its boundaries, or along one side, over at least ¼ acre or 10% of its area, AND that has an unvegetated bottom (*answer yes only if H 1.3.1 is NO*)? [✓ YES] = 3 points NO = 0 points Map showing areas of open water	**Figure** ___ 3
H 1.4. <u>Richness of Plant Species</u> ***(see p. 66)*** Count the number of plant species in the wetland that cover at least 10 ft^2. (*different patches of the same species can be combined to meet the size threshold)* *You do not have to name the species.* *Do not include Eurasean Milfoil, reed canarygrass, purple loosestrife, Russian Olive, Phragmites ,Canadian Thistle, Yellow-flag Iris, and Salt Cedar (Tamarisk)* If you counted: > 9 species [✓ points = 2] 4-9 species points = 1 # of species ____ < 4 species points = 0 points *List species below if you wish*	2

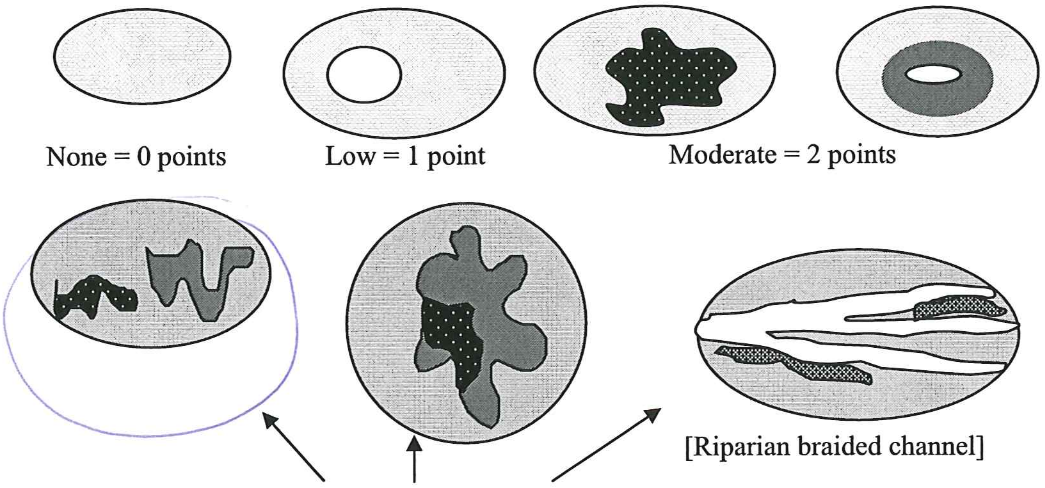
7

Wetland name or number Doan Creek

H 1.5. Interspersion of habitats *(see p. 67)*

Decided from the diagrams below whether interspersion between categories of vegetation (described in H 1.1), or categories and un-vegetated areas (can include open water or mudflats) is high, medium, low, or none.

Figure ___



High = 3 points

NOTE: If you have four or more vegetation categories or three vegetation categories and open water the rating is always "high". Use maps from H1.1 and H1.3

3

H 1.6. Special Habitat Features: *(see p. 68)*

Check the habitat features that are present in the wetland unit. The number of checks is the number of points you put into the next column.

____Loose rocks larger than 4" **or** large, downed, woody debris (>4in. diameter) within the area of surface ponding or in stream.

✓ Cattails or bulrushes are present within the unit.

✓ Standing snags (diameter at the bottom > 4 inches) in the wetland unit or within 30 m (100ft) of the edge.

✓ Emergent or shrub vegetation in areas that are permanently inundated/ponded. *The presence of "yellow flag" Iris is a good indicator of vegetation in areas permanently ponded.*

____Stable steep banks of fine material that might be used by beaver or muskrat for denning (>45 degree slope) OR signs of recent beaver activity

____ Invasive species cover less than 20% in each stratum of vegetation *(canopy, sub-canopy, shrubs, herbaceous, moss/ground cover)*

Maximum score possible = 6

3

TOTAL Potential to provide habitat
Add the scores in the column above

15

Comments

8

Wetland name or number Doan Creek

H 2.0 Does the wetland have the opportunity to provide habitat for many species?	
H 2.1 Buffers ***(see p. 71)*** *Choose the description that best represents condition of buffer of wetland unit. The highest scoring criterion that applies to the wetland is to be used in the rating. See text for definition of "undisturbed." Relatively undisturbed also means no grazing, no landscaping, no daily human use, and no structures or paving within undisturbed part of buffer.* — 330ft (100 m) of relatively undisturbed vegetated areas, rocky areas, or open water >95% of circumference **Points = 5** — 330 ft (100 m) of relatively undisturbed vegetated areas, rocky areas, or open water > 50% circumference. **Points = 4** — 170ft (50 m) of relatively undisturbed vegetated areas, rocky areas, or open water >95% circumference. **Points = 4** — 330ft (100 m) of relatively undisturbed vegetated areas, rocky areas, or open water > 25% circumference, . **Points = 3** — 170ft (50 m) of relatively undisturbed vegetated areas, rocky areas, or open water for > 50% circumference. **Points = 3** **If buffer does not meet any of the criteria above** — No paved areas (except paved trails) or buildings within 80ft (25 m) of wetland > 95% circumference. Light to moderate grazing, or lawns are OK. **Points = 2** — No paved areas or buildings within 170ft (50m) of wetland for >50% circumference. Light to moderate grazing, or lawns are OK. **Points = 2** — Heavy grazing in buffer. **Points = 1** — Vegetated buffers are <6.6ft wide (2m) for more than 95% of the circumference (e.g . tilled fields, paving, basalt bedrock extend to edge of wetland). **Points = 0** — Buffer does not meet any of the criteria above. [✓ **Points = 1**] Aerial photo showing buffers	**Figure ___** 1
H 2.2 Wet Corridors ***(see p. 72)*** H 2.2.1 Is the wetland unit part of a relatively undisturbed and unbroken, > 30 ft wide, vegetated corridor at least ¼ mile long with surface water or flowing water throughout most of the year (> 9 months/yr)? (*dams, heavily used gravel roads, paved roads, fields tilled to edge of stream, or pasture to edge of stream are considered breaks in the corridor*). YES = 4 points (go to H 2.3) NO = go to H 2.2.2 H 2.2.2 Is the unit part of a relatively undisturbed and unbroken, > 30 ft wide, vegetated corridor, at least ¼ mile long with water flowing seasonally, **OR** a lake-fringe wetland without a "wet" corridor, **OR** a riverine wetland without a surface channel connecting to the stream? [✓ YES = 2 points] (go to H 2.3) NO go to H 2.2.3 H 2.2.3 Is the wetland within a 1/2 mile of any permanent stream, seasonal stream, or lake (*do not include man-made ditches*)? YES = 1 point NO = 0 points	2

Wetland name or number Doan Creek

H 2.3 Near or adjacent to other priority habitats listed by WDFW ***(see p. 74)***
Which of the following priority habitats are within 330ft (100m) of the wetland unit?
*NOTE: the connections **do not** have to be relatively undisturbed. These are DFW definitions. Check with your local DFW biologist if there are any questions.*

✓ **Riparian**: The area adjacent to aquatic systems with flowing water that contains elements of both aquatic and terrestrial ecosystems which mutually influence each other.
____**Aspen Stands:** Pure or mixed stands of aspen greater than 2 acres.
____**Cliffs:** Greater than 25 ft high and occurring below 5000 ft.
____**Old-growth forests:** (east of Cascade crest): In general, stands will be >150 years of age, with 10 trees/acre that are > 21 in dbh, and 1 - 3 snags/acre > 12-14 in diameter.
____**Mature forests:** Stands with average diameters exceeding 21 in dbh; crown cover may be less that 100%; decay, 80 - 160 years old east of the Cascade crest.
____**Prairies and Steppe:** Relatively undisturbed areas (as indicated by dominance of native plants) where grasses and/or forbs form the natural climax plant community.
____**Shrub-steppe:** Tracts of land consisting of plant communities with one or more layers of perennial grasses and a conspicuous but discontinuous layer of shrubs.
____**Talus:** Homogenous areas of rock rubble ranging in average size 0.5 - 6.5 ft, composed of basalt, andesite, and/or sedimentary rock, including riprap slides and mine tailings. May be associated with cliffs.
____**Caves:** A naturally occurring cavity, recess, void, or system of interconnected passages
____**Oregon white Oak:** Woodlands Stands of pure oak or oak/conifer associations where canopy coverage of the oak component of the stand is 25%.
____**Urban Natural Open Space**: A priority species resides within or is adjacent to the open space and uses it for breeding and/or regular feeding; and/or the open space functions as a corridor connecting other *priority habitats*, especially those that would otherwise be isolated; and/or the open space is an isolated remnant of natural habitat larger than 4 ha (10 acres) and is surrounded by urban development.
____**Aspen Stands:** Pure or mixed stands of aspen greater than 0.8 ha (2 acres).

2

If wetland has **2 or more** Priority Habitats = **4 points**
If wetland has **1** Priority Habitat = **2 points**
No Priority habitats = **0 points**

ote: All vegetated wetlands are by definition a priority habitat but are not included in this list. Nearby wetlands are addressed in question H 2.4)

Comments

Wetland name or number Doan Creek

H 2.4 Landscape *(choose the **one** description of the landscape around the wetland that best fits)* ***(see p. 76)*** — The wetland unit is in an area where annual rainfall is less than 12 inches, and its water regime is not influenced by irrigation practices, dams, or water control structures. (*Generally, this means outside boundaries of reclamation areas, irrigation district, or reservoirs*) **points** = **5** — There are at least 3 other wetlands within ½ mile, and the connections between them are relatively undisturbed (light grazing in the connection or an open water connection along a lake shore without heavy boat traffic are OK, but connections should NOT be bisected by paved roads, fill, fields, heavy boat traffic or other development) **points** = **5** — There are at least 3 other wetlands within ½ mile, BUT the connections between them are disturbed? **points** = **2** — There is at least 1 wetland within ½ mile. **points** = **1** — Does not meet any of the four criteria above **points** = **0**	2
H 2. TOTAL Score - opportunity for providing habitat *Add the scores in the column above*	22
H 3.0 Does the wetland unit have indicators that its ability to provide habitat is reduced?	
H 3.1 Indicator of reduced habitat functions ***(see p. 75)*** Do the areas of open water in the wetland unit have a resident population of carp (see text for indicators of the presence of carp)? *(NOTE: This question does not apply to reservoirs with water levels controlled by dams, such as the reservoirs on the Columbia and Snake Rivers)* YES = **- 5 points** NO = 0 points	*Points will be subtracted*
Total Score for Habitat Functions – *add the points for H 1, H 2, and H 3 and record the result on p. 1*	22

Comments

Wetland name or number Garrison Creek

WETLAND RATING FORM – EASTERN WASHINGTON

Version 2 - Updated June 2006 to increase accuracy and reproducibility among users

Name of wetland (if known): Garrison Creek Wetland Date of site visit: 5-7-08

Rated by M. Witter S. Edgar Trained by Ecology? Yes X No___ Date of training 2005

SEC: 31 TWNSHP: 7N RNGE: 36E Is S/T/R in Appendix D? Yes___ No X

Map of wetland unit: Figure ____ Estimated size ______

SUMMARY OF RATING

Alt 1 - 200'
L m H
Alt 2 - 100, 150, 200
Alt 3 - 150 - 110
Alt 3A - 140 - 105

Category based on FUNCTIONS provided by wetland

I___ II X III___ IV___

Category I = Score >=70
Category II = Score 51-69 ←
Category III = Score 30-50
Category IV = Score < 30

Score for "Water Quality" Functions	22
Score for Hydrologic Functions	16
Score for Habitat Functions	23 ←
TOTAL score for functions	61

Category based on SPECIAL CHARACTERISTICS of wetland

I___ II___ III___ Does not Apply___

Final Category (choose the "highest" category from above) ☐

Summary of basic information about the wetland unit

Wetland Type		Wetland Class	
Vernal Pool		Depressional	✓
Alkali		Riverine	
Natural Heritage Wetland		Lake-fringe	
Bog		Slope	
Forest			
None of the above		Check if unit has multiple HGM classes present	☐

Wetland name or number Garrison Creek

Does the wetland being rated meet any of the criteria below?

If you answer YES to any of the questions below you will need to protect the wetland according to the regulations regarding the special characteristics found in the wetland.

Check List for Wetlands That Need Special Protection, and That Are Not Included in the Rating	**YES**	**NO**
SP1. *Has the wetland unit been documented as a habitat for any Federally listed Threatened or Endangered* ***animal or plant*** *species (T/E species)?* For the purposes of this rating system, "documented" means the wetland is on the appropriate state or federal database.		✓
SP2. *Has the wetland unit been documented as habitat for any State listed Threatened or Endangered* ***animal*** *species?* For the purposes of this rating system, "documented" means the wetland is on the appropriate state database. Note: Wetlands with State listed plant species are categorized as Category I Natural Heritage Wetlands (see p. 19 of data form).		✓
SP3. *Does the wetland unit contain individuals of Priority species listed by the WDFW for the state?*		
SP4. *Does the wetland unit have a local significance in addition to its functions?* For example, the wetland has been identified in the Shoreline Master Program, the Critical Areas Ordinance, or in a local management plan as having special significance.		

To complete the next part of the data sheet you will need to determine the Hydrogeomorphic Class of the wetland being rated.

The hydrogeomorphic classification groups wetlands into those that function in similar ways. Classifying the wetland first simplifies the questions needed to answer how it functions. The Hydrogeomorphic Class of a wetland can be determined using the key below. See p. 20 for more detailed instructions on classifying wetlands.

2

Wetland name or number Garrison Creek

Classification of Vegetated Wetlands for Eastern Washington

If the hydrologic criteria listed in each question do not apply to the entire unit being rated, you probably have a unit with multiple HGM classes. In this case, identify which hydrologic criteria in questions 1-7 apply, and go to Question 8.

1. Does the entire wetland unit **meet both** of the following criteria?

___The vegetated part of the wetland is on the shores of a body of open water (without any vegetation on the surface) at least 20 acres (8 ha) in size;

___At least 30% of the open water area is deeper than 3 m (10 ft)?

[✓ NO] – go to Step 2 **YES** – The wetland class is **Lake-fringe (lacustrine fringe)**

2. Does the entire wetland unit **meet all** of the following criteria?

____The wetland is on a slope (*slope can be very gradual*),

____The water flows through the wetland in one direction (unidirectional) and usually comes from seeps. It may flow subsurface, as sheetflow, or in a swale without distinct banks.

____The water leaves the wetland **without being impounded**?

NOTE: *Surface water does not pond in these type of wetlands except occasionally in very small and shallow depressions or behind hummocks (depressions are usually <3ft diameter and less than a foot deep).*

[✓ NO] - go to Step 3 **YES** – The wetland class is **Slope**

3. Is the entire wetland unit in a valley or stream channel where it gets inundated by overbank flooding from that stream or river? In general, the flooding should occur at least once every ten years to answer "yes." *The wetland can contain depressions that are filled with water when the river is not flooding.*

[✓ NO] - go to Step 4 **YES** – The wetland class is **Riverine**

4. Is the entire wetland unit in a topographic depression, outside areas that are inundated by overbank flooding, in which water ponds, or is saturated to the surface, at some time of the year. *This means that any outlet, if present, is higher than the interior of the wetland.*

NO – go to Step 5 [✓ **YES**] – The wetland class is **Depressional**

5. Your wetland unit seems to be difficult to classify and probably contains several different HGM clases. For example, seeps at the base of a slope may grade into a riverine floodplain, or a small stream within a depressional wetland has a zone of flooding along its sides. GO BACK AND IDENTIFY WHICH OF THE HYDROLOGIC REGIMES DESCRIBED IN QUESTIONS 1-7 APPLY TO DIFFERENT AREAS IN THE UNIT (make a rough sketch to help you decide). Use the following table to identify the appropriate class to use for the rating system if you have several HGM classes present within your wetland. NOTE: Use this table only if the class that is recommended in the second column represents 10% or more of the total area of the wetland unit being rated. If the area of the class listed in column 2 is less than 10% of the unit; classify the wetland using the class that represents more than 90% of the total area.

3

Wetland name or number Garrison Creek

HGM Classes Within One Delineated Wetland Boundary	**Class to Use for Rating**
Slope + Riverine	Riverine
Slope + Depressional	Depressional
Slope + Lake-fringe	Lake-fringe
Depressional + Riverine (riverine is within boundary of depression)	Depressional
Depressional + Lake-fringe	Depressional

If you are unable still to determine which of the above criteria apply to your wetland, or you have more than 2 HGM classes within a wetland boundary, classify the wetland as **Depressional** for the rating.

Wetland name or number Garrison Creek

D	**Depressional Wetlands** WATER QUALITY FUNCTIONS - Indicators that the wetland functions to improve water quality	**Points** (only 1 score per box)
D	**D 1.0 Does the wetland unit have the <u>potential</u> to improve water quality?**	***(see p. 38)***
D	D 1.1 Characteristics of surface water flows out of the wetland unit: Wetland has no surface water outlet - points = 5 → Wetland has an intermittently flowing outlet [✓ points = 3] Wetland has a highly constricted permanently flowing outlet points = 3 Wetland has a permanently flowing surface outlet points = 1	3
D	D 1.2 The soil 2 inches below the surface (or duff layer) is clay or organic *(use NRCS definitions of soil types)* YES points = 3 [✓ NO] points = 0	0
D	D 1.3 Characteristics of persistent vegetation (emergent, shrub, and/or forest Cowardin class) Wetland has persistent, ungrazed, vegetation for > 2/3 of area points = 5 Wetland has persistent, ungrazed, vegetation from 1/3 to 2/3 of area points = 3 Wetland has persistent, ungrazed vegetation from 1/10 to < 1/3 of area points = 1 Wetland has persistent, ungrazed vegetation <1/10 of area points = 0 Map of Cowardin vegetation classes	Figure ___ 5
D	D 1.4 Characteristics of seasonal ponding or inundation. *This is the area of ponding that fluctuates every year. Do not count the area that is permanently ponded.* Area seasonally ponded is > ½ total area of wetland [✓ points = 3] Area seasonally ponded is ¼ - ½ total area of wetland points = 1 Area seasonally ponded is < ¼ total area of wetland points = 0 NOTE: *See text for indicators of seasonal and permanent inundation/flooding.* Map of Hydroperiods	Figure ___ 3
D	**Total for D 1** *Add the points in the boxes above*	11
D	**D 2. Does the wetland unit have the <u>opportunity</u> to improve water quality?** Answer YES if you know or believe there are pollutants in groundwater or surface water coming into the wetland that would otherwise reduce water quality in streams, lakes or groundwater downgradient from the wetland. *Note which of the following conditions provide the sources of pollutants. A unit may have pollutants coming from several sources, but any single source would qualify as opportunity.* — Grazing in the wetland or within 150 ft ✓ Untreated stormwater discharges to wetland — Tilled fields or orchards within 150 ft of wetland — A stream or culvert discharges into wetland that drains developed areas, residential areas, farmed fields, roads, or clear-cut logging ✓ Residential, urban areas, golf courses are within 150 ft of wetland — Wetland is fed by groundwater high in phosphorus or nitrogen — Other___ **YES** multiplier is **2** **NO** multiplier is **1**	multiplier 2
D	**<u>TOTAL</u> - Water Quality Functions** Multiply the score from D1 by the multiplier in D2 ***Record score on p. 1 of field form***	22

Wetland name or number Garrison Creek

D	**Depressional Wetlands** HYDROLOGIC FUNCTIONS - Indicators that wetland functions to reduce flooding and stream erosion	**Points** (only 1 score per box)
D	**D 3.0 Does the wetland unit have the <u>potential</u> to reduce flooding and stream erosion?**	***(see p. 39)***
D	D 3.1 Characteristics of surface water flows out of the wetland unit: Wetland has no surface water outlet points = 8 Wetland has an intermittently flowing outlet [✓ points = 4] Wetland has a highly constricted permanently flowing outlet points = 4 Wetland has a permanently flowing surface outlet points = 0	4
D	D 3.2 Depth of storage during wet periods: *Estimate the height of ponding above the surface of the wetland (see text for description of measuring height). In wetlands with permanent ponding, the surface is the lowest elevation of "permanent" water)* Marks of ponding are at least 3 ft above the surface points = 8 The wetland is a "headwater" wetland" *(see p. 39)* points = 6 Marks are 2 ft to < 3 ft from surface points = 6 Marks are 1 ft to < 2 ft from surface [✓ points = 4] Marks are 6 in to < 1 ft from surface points = 2 No marks above 6 in. or wetland has only saturated soils points = 0	4
D	**Total for D 3** *Add the points in the boxes above*	8
D	**D 4.0 Does the wetland unit have the <u>opportunity</u> to reduce flooding and erosion?** *Answer NO if the major source of water is groundwater, irrigation return flow, or water levels in the wetland are controlled by a reservoir.* Answer YES if the wetland is in a location in the watershed where the flood storage, or reduction in water velocity, it provides helps protect downstream property and aquatic resources from flooding or excessive and/or erosive flows. *Note which of the following conditions apply.* — Wetland is in a headwater of a river or stream that has flooding problems ✓ Wetland drains to a river or stream that has flooding problems — Wetland has no outlet and impounds surface runoff water that might otherwise flow into a river or stream that has flooding problems — Other____________________ **YES** multiplier is [✓ **2**] **NO** multiplier is **1**	***(see p. 42)*** multiplier 2
D	**TOTAL - Hydrologic Functions** Multiply the score from D3 by the multiplier in D4 ***Record score on p. 1 of field form***	16

Comments

Wetland name or number Garrison Creek

	Points (only 1 score per box)
These questions apply to wetlands of all HGM classes. HABITAT FUNCTIONS - Indicators that wetland functions to provide important habitat	
H 1. Does the wetland unit have the <u>potential</u> to provide habitat for many species?	
H 1.1 Categories of vegetation structure ***(see p.62)*** *Check the vegetation classes (as defined by Cowardin) and heights of emergents present. Size threshold for each class or height category is ¼ acre or more than 10% of the area if unit is < 2.5 acres.* ____Aquatic bed ____Emergent plants 0-12 in. (0 – 30 cm) high are the highest layer and have > 30% cover ____Emergent plants >12 – 40 in.(>30 – 100cm) high are the highest layer with >30% cover ____Emergent plants > 40 in.(> 100cm) high are the highest layer with >30% cover __✓__Scrub/shrub (areas where shrubs have >30% cover) __✓__Forested (areas where trees have >30% cover) *Add the number of vegetation types that qualify. If you have:* 4-6 types points = 3 3 types points = 2 2 types [✓ points = 1] 1 type points = 0 Map of Cowardin vegetation classes and areas with different heights of emergents	Figure ___ 1
H 1.2. Is one of the vegetation types "aquatic bed?" ***(see p .64)*** YES = 1 point [✓ NO] = 0 points	0
H 1.3. Surface Water ***(see p.65)*** H 1.3.1 Does the unit have areas of "open" water (without herbaceous or shrub plants) over at least ¼ acre or 10% of its area during the spring (March – early June) OR in early fall (August – end of September)? *Note: answer YES for Lake-fringe wetlands* YES = 3 points & **go to H 1.4** [✓ NO] = go to H 1.3.2 H 1.3.2 Does the unit have an intermittent or permanent stream within its boundaries, or along one side, over at least ¼ acre or 10% of its area, AND that has an unvegetated bottom (*answer yes only if H 1.3.1 is NO*)? [✓ YES] = 3 points NO = 0 points Map showing areas of open water	Figure ___ 3
H 1.4. Richness of Plant Species ***(see p. 66)*** Count the number of plant species in the wetland that cover at least 10 ft^2. (*different patches of the same species can be combined to meet the size threshold)* *You do not have to name the species.* *Do not include Eurasean Milfoil, reed canarygrass, purple loosestrife, Russian Olive, Phragmites ,Canadian Thistle, Yellow-flag Iris, and Salt Cedar (Tamarisk)* If you counted: > 9 species points = 2 ← 4-9 species points = 1 # of species ____ < 4 species points = 0 points *List species below if you wish* RO dogwood Black cottonwood	2

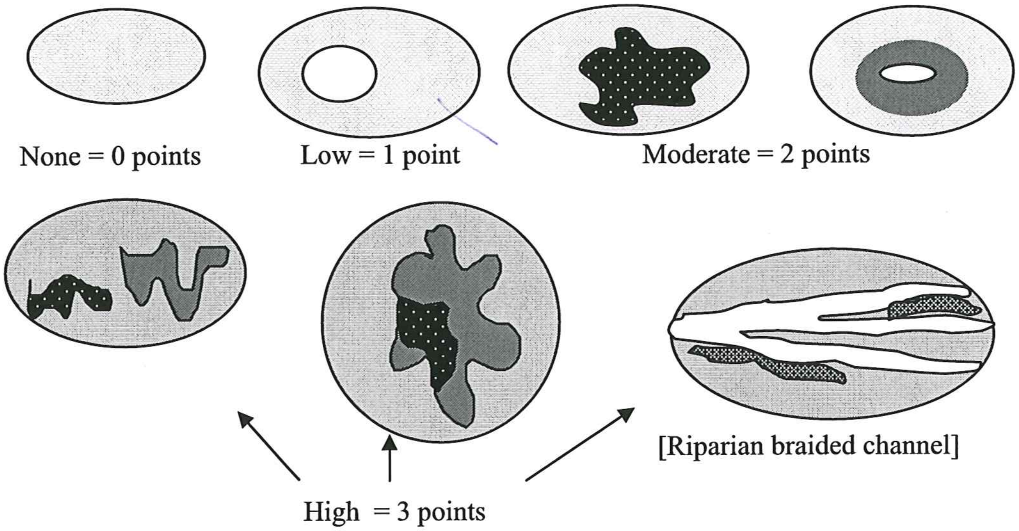
7

Wetland name or number Garrison Creek

H 1.5. Interspersion of habitats *(see p. 67)*

Decided from the diagrams below whether interspersion between categories of vegetation (described in H 1.1), or categories and un-vegetated areas (can include open water or mudflats) is high, medium, low, or none.

Figure ___



NOTE: If you have four or more vegetation categories or three vegetation categories and open water the rating is always "high". Use maps from H1.1 and H1.3

1

H 1.6. Special Habitat Features: *(see p. 68)*

Check the habitat features that are present in the wetland unit. The number of checks is the number of points you put into the next column.

✓ Loose rocks larger than 4" **or** large, downed, woody debris (>4in. diameter) within the area of surface ponding or in stream.

____Cattails or bulrushes are present within the unit.

✓ Standing snags (diameter at the bottom > 4 inches) in the wetland unit or within 30 m (100ft) of the edge.

____Emergent or shrub vegetation in areas that are permanently inundated/ponded. *The presence of "yellow flag" Iris is a good indicator of vegetation in areas permanently ponded.*

____Stable steep banks of fine material that might be used by beaver or muskrat for denning (>45 degree slope) OR signs of recent beaver activity

✓ Invasive species cover less than 20% in each stratum of vegetation *(canopy, sub-canopy, shrubs, herbaceous, moss/ground cover)*

Maximum score possible = 6

3

TOTAL Potential to provide habitat
Add the scores in the column above

10

Comments

8

Wetland name or number Garrison Creek

H 2.0 Does the wetland have the opportunity to provide habitat for many species?

Figure ___

H 2.1 Buffers ***(see p. 71)***

Choose the description that best represents condition of buffer of wetland unit. The highest scoring criterion that applies to the wetland is to be used in the rating. See text for definition of "undisturbed." Relatively undisturbed also means no grazing, no landscaping, no daily human use, and no structures or paving within undisturbed part of buffer.

— 330ft (100 m) of relatively undisturbed vegetated areas, rocky areas, or open water >95% of circumference **Points = 5**

— 330 ft (100 m) of relatively undisturbed vegetated areas, rocky areas, or open water > 50% circumference. **Points = 4**

— 170ft (50 m) of relatively undisturbed vegetated areas, rocky areas, or open water >95% circumference. **Points = 4**

— 330ft (100 m) of relatively undisturbed vegetated areas, rocky areas, or open water > 25% circumference, . **Points = 3**

— 170ft (50 m) of relatively undisturbed vegetated areas, rocky areas, or open water for > 50% circumference. [✓ **Points = 3**]

If buffer does not meet any of the criteria above

— No paved areas (except paved trails) or buildings within 80ft (25 m) of wetland > 95% circumference. Light to moderate grazing, or lawns are OK. **Points = 2**

— No paved areas or buildings within 170ft (50m) of wetland for >50% circumference. Light to moderate grazing, or lawns are OK. **Points = 2**

— Heavy grazing in buffer. **Points = 1**

— Vegetated buffers are <6.6ft wide (2m) for more than 95% of the circumference (e.g . tilled fields, paving, basalt bedrock extend to edge of wetland). **Points = 0**

— Buffer does not meet any of the criteria above. **Points = 1**

Aerial photo showing buffers

3

H 2.2 Wet Corridors ***(see p. 72)***

H 2.2.1 Is the wetland unit part of a relatively undisturbed and unbroken, > 30 ft wide, vegetated corridor at least ¼ mile long with surface water or flowing water throughout most of the year (> 9 months/yr)? *(dams, heavily used gravel roads, paved roads, fields tilled to edge of stream, or pasture to edge of stream are considered breaks in the corridor).*

[✓ YES] = 4 points (go to H 2.3) NO = go to H 2.2.2

H 2.2.2 Is the unit part of a relatively undisturbed and unbroken, > 30 ft wide, vegetated corridor, at least ¼ mile long with water flowing seasonally, **OR** a lake-fringe wetland without a "wet" corridor, **OR** a riverine wetland without a surface channel connecting to the stream?

YES = 2 points (go to H 2.3) NO go to H 2.2.3

H 2.2.3 Is the wetland within a 1/2 mile of any permanent stream, seasonal stream, or lake (*do not include man-made ditches*)?

YES = 1 point NO = 0 points

4

Wetland name or number _Garrison Creek_

H 2.3 <u>Near or adjacent to other priority habitats listed by WDFW</u> ***(see p. 74)***
Which of the following priority habitats are within 330ft (100m) of the wetland unit?
*NOTE: the connections **do not** have to be relatively undisturbed. These are DFW definitions. Check with your local DFW biologist if there are any questions.*

_✓_**Riparian**: The area adjacent to aquatic systems with flowing water that contains elements of both aquatic and terrestrial ecosystems which mutually influence each other.

____**Aspen Stands:** Pure or mixed stands of aspen greater than 2 acres.

____**Cliffs:** Greater than 25 ft high and occurring below 5000 ft.

____**Old-growth forests:** (east of Cascade crest): In general, stands will be >150 years of age, with 10 trees/acre that are > 21 in dbh, and 1 - 3 snags/acre > 12-14 in diameter.

_✓_**Mature forests:** Stands with average diameters exceeding 21 in dbh; crown cover may be less that 100%; decay, 80 - 160 years old east of the Cascade crest.

____**Prairies and Steppe:** Relatively undisturbed areas (as indicated by dominance of native plants) where grasses and/or forbs form the natural climax plant community.

____**Shrub-steppe:** Tracts of land consisting of plant communities with one or more layers of perennial grasses and a conspicuous but discontinuous layer of shrubs.

____**Talus:** Homogenous areas of rock rubble ranging in average size 0.5 - 6.5 ft, composed of basalt, andesite, and/or sedimentary rock, including riprap slides and mine tailings. May be associated with cliffs.

____**Caves:** A naturally occurring cavity, recess, void, or system of interconnected passages

____**Oregon white Oak:** Woodlands Stands of pure oak or oak/conifer associations where canopy coverage of the oak component of the stand is 25%.

_✓_**Urban Natural Open Space**: A priority species resides within or is adjacent to the open space and uses it for breeding and/or regular feeding; and/or the open space functions as a corridor connecting other *priority habitats*, especially those that would otherwise be isolated; and/or the open space is an isolated remnant of natural habitat larger than 4 ha (10 acres) and is surrounded by urban development.

____**Aspen Stands:** Pure or mixed stands of aspen greater than 0.8 ha (2 acres).

If wetland has **2 or more** Priority Habitats = **4 points**
If wetland has **1** Priority Habitat = **2 points**
No Priority habitats = **0 points**

4

ote: All vegetated wetlands are by definition a priority habitat but are not included in this list. Nearby wetlands are addressed in question H 2.4)

Comments

10

Wetland name or number ______

H 2.4 Landscape *(choose the **one** description of the landscape around the wetland that best fits)* ***(see p. 76)*** — The wetland unit is in an area where annual rainfall is less than 12 inches, and its water regime is not influenced by irrigation practices, dams, or water control structures. (*Generally, this means outside boundaries of reclamation areas, irrigation district, or reservoirs*) **points = 5** — There are at least 3 other wetlands within ½ mile, and the connections between them are relatively undisturbed (light grazing in the connection or an open water connection along a lake shore without heavy boat traffic are OK, but connections should NOT be bisected by paved roads, fill, fields, heavy boat traffic or other development) **points = 5** ✓ — There are at least 3 other wetlands within ½ mile, BUT the connections between them are disturbed? **points = 2** — There is at least 1 wetland within ½ mile. **points = 1** — Does not meet any of the four criteria above **points = 0**	2
H 2. TOTAL Score - opportunity for providing habitat *Add the scores in the column above*	23
H 3.0 Does the wetland unit have indicators that its ability to provide habitat is reduced?	
H 3.1 Indicator of reduced habitat functions ***(see p. 75)*** Do the areas of open water in the wetland unit have a resident population of carp (see text for indicators of the presence of carp)? *(NOTE: This question does not apply to reservoirs with water levels controlled by dams, such as the reservoirs on the Columbia and Snake Rivers)* YES = **- 5 points** [✓ NO] = 0 points	*Points will be subtracted*
Total Score for Habitat Functions *– add the points for H 1, H 2, and H 3 and record the result on p. 1*	23

Comments

11

Wetland name or number Walla Walla River

WETLAND RATING FORM – EASTERN WASHINGTON

Version 2 - Updated June 2006 to increase accuracy and reproducibility among users

Name of wetland (if known): Walla Walla River Last Chance Date of site visit: 5-7-08

Rated by M. Witter S. Edgar Trained by Ecology? Yes x No___ Date of training 2005

SEC: 4 TWNSHP: 6N RNGE: 35E Is S/T/R in Appendix D? Yes ~~✓~~ No ✓

Map of wetland unit: Figure ____ Estimated size ______

SUMMARY OF RATING

Category based on FUNCTIONS provided by wetland

I X **II** X **III**___ **IV**___

Category I = Score >=70
Category II = Score 51-69
Category III = Score 30-50
Category IV = Score < 30

Score for "Water Quality" Functions	22
Score for Hydrologic Functions	24
Score for Habitat Functions	25
TOTAL score for functions	71

Category based on SPECIAL CHARACTERISTICS of wetland

I___ **II**___ **III**___ **Does not Apply**___

Final Category **(choose the "highest" category from above)** ☐

Summary of basic information about the wetland unit

Wetland Type		**Wetland Class**	
Vernal Pool		**Depressional**	
Alkali		**Riverine**	X
Natural Heritage Wetland		**Lake-fringe**	
Bog		**Slope**	
Forest			
None of the above		Check if unit has multiple HGM classes present	☐

Wetland name or number Walla Walla River

Does the wetland being rated meet any of the criteria below?

If you answer YES to any of the questions below you will need to protect the wetland according to the regulations regarding the special characteristics found in the wetland.

Check List for Wetlands That Need Special Protection, and That Are Not Included in the Rating	YES	NO
SP1. *Has the wetland unit been documented as a habitat for any Federally listed Threatened or Endangered* **animal or plant** *species (T/E species)?* For the purposes of this rating system, "documented" means the wetland is on the appropriate state or federal database.	✓	
SP2. *Has the wetland unit been documented as habitat for any State listed Threatened or Endangered* **animal** *species?* For the purposes of this rating system, "documented" means the wetland is on the appropriate state database. Note: Wetlands with State listed plant species are categorized as Category I Natural Heritage Wetlands (see p. 19 of data form).	✓	
SP3. *Does the wetland unit contain individuals of Priority species listed by the WDFW for the state?*		
SP4. *Does the wetland unit have a local significance in addition to its functions?* For example, the wetland has been identified in the Shoreline Master Program, the Critical Areas Ordinance, or in a local management plan as having special significance.		

Walla Walla River support listed Steelhead

<u>To complete the next part of the data sheet you will need to determine the Hydrogeomorphic Class of the wetland being rated.</u>

The hydrogeomorphic classification groups wetlands into those that function in similar ways. Classifying the wetland first simplifies the questions needed to answer how it functions. The Hydrogeomorphic Class of a wetland can be determined using the key below. See p. 20 for more detailed instructions on classifying wetlands.

Wetland name or number Walla Walla River

Classification of Vegetated Wetlands for Eastern Washington

If the hydrologic criteria listed in each question do not apply to the entire unit being rated, you probably have a unit with multiple HGM classes. In this case, identify which hydrologic criteria in questions 1-7 apply, and go to Question 8.

1. Does the entire wetland unit **meet both** of the following criteria?

___The vegetated part of the wetland is on the shores of a body of open water (without any vegetation on the surface) at least 20 acres (8 ha) in size;

___At least 30% of the open water area is deeper than 3 m (10 ft)?

[✓ NO] – go to Step 2 **YES** – The wetland class is **Lake-fringe (lacustrine fringe)**

2. Does the entire wetland unit **meet all** of the following criteria?

____The wetland is on a slope (*slope can be very gradual*),

____The water flows through the wetland in one direction (unidirectional) and usually comes from seeps. It may flow subsurface, as sheetflow, or in a swale without distinct banks.

____The water leaves the wetland **without being impounded**?

NOTE: *Surface water does not pond in these type of wetlands except occasionally in very small and shallow depressions or behind hummocks (depressions are usually <3ft diameter and less than a foot deep).*

[✓ NO] - go to Step 3 **YES** – The wetland class is **Slope**

3. Is the entire wetland unit in a valley or stream channel where it gets inundated by overbank flooding from that stream or river? In general, the flooding should occur at least once every ten years to answer "yes." *The wetland can contain depressions that are filled with water when the river is not flooding.*

NO - go to Step 4 [✓ **YES**] – The wetland class [✓ is **Riverine**]

4. Is the entire wetland unit in a topographic depression, out~~side areas~~ that are inundated by overbank flooding, in which water ponds, or is saturated to the surface, at some time of the year. *This means that any outlet, if present, is higher than the interior of the wetland.*

NO – go to Step 5 **YES** – The wetland class is **Depressional**

5. Your wetland unit seems to be difficult to classify and probably contains several different HGM clases. For example, seeps at the base of a slope may grade into a riverine floodplain, or a small stream within a depressional wetland has a zone of flooding along its sides. GO BACK AND IDENTIFY WHICH OF THE HYDROLOGIC REGIMES DESCRIBED IN QUESTIONS 1-7 APPLY TO DIFFERENT AREAS IN THE UNIT (make a rough sketch to help you decide). Use the following table to identify the appropriate class to use for the rating system if you have several HGM classes present within your wetland. NOTE: Use this table only if the class that is recommended in the second column represents 10% or more of the total area of the wetland unit being rated. If the area of the class listed in column 2 is less than 10% of the unit; classify the wetland using the class that represents more than 90% of the total area.

Wetland name or number Walla Walla River

HGM Classes Within One Delineated Wetland Boundary	Class to Use for Rating
Slope + Riverine	Riverine
Slope + Depressional	Depressional
Slope + Lake-fringe	Lake-fringe
Depressional + Riverine (riverine is within boundary of depression)	Depressional
Depressional + Lake-fringe	Depressional

If you are unable still to determine which of the above criteria apply to your wetland, or you have more than 2 HGM classes within a wetland boundary, classify the wetland as **Depressional** for the rating.

Wetland name or number Walla Walla River

R	**Riverine Wetlands** WATER QUALITY FUNCTIONS - Indicators that the wetland functions to improve water quality	**Points** (only 1 score per box)
R	**R 1.0 Does the wetland unit have the <u>potential</u> to improve water quality?**	***(see p. 45)***
R	R 1.1 Area of surface depressions within the riverine unit that can trap sediments during a flooding event: Depressions cover >1/3 area of wetland [✓ points = 6] Depressions cover > 1/10 area of wetland points = 3 If depressions > 1/10th of area of unit draw polygons on aerial photo or map Depressions present but cover < 1/10 area of wetland points = 1 No depressions present points = 0	Figure ___ 6
R	R 1.2 Characteristics (cover) of the vegetation in the unit *(area of polygons with >90% cover at person height. This is **not** Cowardin vegetation classes)*: Forest or shrub > 2/3 the area of the wetland points = 10 Forest or shrub 1/3 – 2/3 area of the wetland [✓ points = 5] Ungrazed, herbaceous plants > 2/3 area of wetland points = 5 Ungrazed herbaceous plants 1/3 – 2/3 area of wetland points = 2 Forest, shrub, and ungrazed herbaceous < 1/3 area of wetland points = 0 Aerial photo or map showing polygons of different vegetation cover	Figure ___ 5
R	**Total for R1** *Add the points in the boxes above*	11
R	**R 2.0 Does the wetland have the <u>opportunity</u> to improve water quality?** Answer YES if you know or believe there are pollutants in groundwater or surface water coming into the wetland that would otherwise reduce water quality in streams, lakes or groundwater downgradient from the wetland. *Note which of the following conditions provide the sources of pollutants. A unit may have pollutants coming from several sources, but any single source would qualify as opportunity.* — Grazing in the wetland or within 150ft — Wetland intercepts groundwater within the Reclamation Area — Untreated stormwater flows into wetland ✓ — Tilled fields or orchards within 150 feet of wetland — Water flows into wetland from a stream or culvert that drains developed areas, residential areas, farmed fields, roads, or clear-cut logging — Residential or urban areas are within 150 ft of wetland — The river or stream that floods the wetland has a contributing basin where human activities have raised the levels of sediment, toxic compounds or nutrients in the river water above water quality standards — Other________________ **YES** multiplier is [✓ **2**] **NO** multiplier is **1**	***(see p.46)*** multiplier 2
R	**<u>TOTAL</u> - Water Quality Functions** Multiply the score from R1 by the multiplier in R2 ***Record score on p. 1 of field form***	22

5

Wetland name or number Walla Walla River

R	**Riverine Wetlands** HYDROLOGIC FUNCTIONS - Indicators that wetland functions to reduce flooding and stream degradation	**Points** (only 1 score per box)
R	**R 3.0 Does the wetland have the <u>potential</u> to reduce flooding and erosion?**	***(see p. 47)***
R	R 3.1 Amount overbank storage the wetland provides: *Estimate the average width of the wetland perpendicular to the direction of the flow of water and the width of the stream or river channel (distance between banks). Calculate the ratio: width of wetland/ width of stream.* If the ratio is 2 or more points = 10 If the ratio is between 1 and < 2 → points = 8 If the ratio is ½ to < 1 points = 4 If the ratio is ¼ to < ½ points = 2 If the ratio is < ¼ points = 1 Aerial photo or map showing average widths	**Figure** ___ 8
R	R 3.2 Characteristics of vegetation that slow down water velocities during floods: *Treat large woody debris as "forest or shrub" (area of polygons with >90% cover at person height. This is **not** Cowardin vegetation classes)*: Forest or shrub for more than 2/3 the area of the wetland. points = 6 Forest or shrub for >1/3 area OR herbaceous plants > 2/3 area → points = 4 Forest or shrub for > 1/10 area OR herbaceous plants > 1/3 area points = 2 Vegetation does not meet above criteria points = 0 Aerial photo or map showing polygons of different vegetation types	**Figure** ___ 4
R	**Total for R3** *Add the points in the boxes above*	12
R	**R 4.0 Does the wetland have the <u>opportunity</u> to reduce flooding and erosion?** *Answer NO if the major source of water is irrigation return flow or water levels are controlled by a reservoir.* Answer YES if the wetland is in a location in the watershed where the flood storage, or reduction in water velocity, it provides helps protect downstream property and aquatic resources from flooding or excessive and/or erosive flows. *Note which of the following conditions apply.* — There are human structures and activities downstream (roads, buildings, bridges, farms) that can be damaged by flooding. — There are natural resources downstream (e.g. salmon redds) than can be damaged by flooding — Other___ [✓ **YES**] multiplier is [✓ **2**] **NO** multiplier is **1**	***(see p. 50)*** 2 multiplier
R	**TOTAL - Hydrologic Functions** Multiply the score from R3 by the multiplier in R4 ***Record score on p. 1 of field form***	24

Comments

6

Wetland name or number Walla Walla River

These questions apply to wetlands of all HGM classes. HABITAT FUNCTIONS - Indicators that wetland functions to provide important habitat	**Points** (only 1 score per box)
H 1. Does the wetland unit have the <u>potential</u> to provide habitat for many species?	

H 1.1 <u>Categories of vegetation structure</u> ***(see p.62)*** **Figure ____**

Check the vegetation classes (as defined by Cowardin) and heights of emergents present. Size threshold for each class or height category is ¼ acre or more than 10% of the area if unit is < 2.5 acres.

____Aquatic bed
____Emergent plants 0-12 in. (0 – 30 cm) high are the highest layer and have > 30% cover
____Emergent plants >12 – 40 in.(>30 – 100cm) high are the highest layer with >30% cover
✓ Emergent plants > 40 in.(> 100cm) high are the highest layer with >30% cover
✓ Scrub/shrub (areas where shrubs have >30% cover)
____Forested (areas where trees have >30% cover)

Add the number of vegetation types that qualify. If you have:

4-6 types	points = 3
3 types	points = 2
<u>2 types</u>	<u>points = 1</u>
1 type	points = 0

Points: 1

Map of Cowardin vegetation classes and areas with different heights of emergents

H 1.2. Is one of the vegetation types "aquatic bed?" ***(see p .64)***

YES = 1 point [✓ NO = 0 points]

Points: 0

H 1.3. <u>Surface Water</u> ***(see p.65)*** **Figure ____**

H 1.3.1 Does the unit have areas of "open" water (without herbaceous or shrub plants) over at least ¼ acre or 10% of its area during the spring (March – early June) OR in early fall (August – end of September)? *Note: answer YES for Lake-fringe wetlands*

YES = 3 points & **go to H 1.4** [✓ NO] = go to H 1.3.2

H 1.3.2 Does the unit have an intermittent or permanent stream within its boundaries, or along one side, over at least ¼ acre or 10% of its area, AND that has an unvegetated bottom (*answer yes only if H 1.3.1 is NO*)?

[✓ YES] = 3 points NO = 0 points

Map showing areas of open water

Points: 3

H 1.4. <u>Richness of Plant Species</u> ***(see p. 66)***

Count the number of plant species in the wetland that cover at least 10 ft^2. (*different patches of the same species can be combined to meet the size threshold)*

You do not have to name the species.

Do not include Eurasean Milfoil, reed canarygrass, purple loosestrife, Russian Olive, Phragmites ,Canadian Thistle, Yellow-flag Iris, and Salt Cedar (Tamarisk)

If you counted:	> 9 species	points = 2
	4-9 species	<u>points = 1</u>
# of species ____	< 4 species	points = 0 points

List species below if you wish

Points: 2

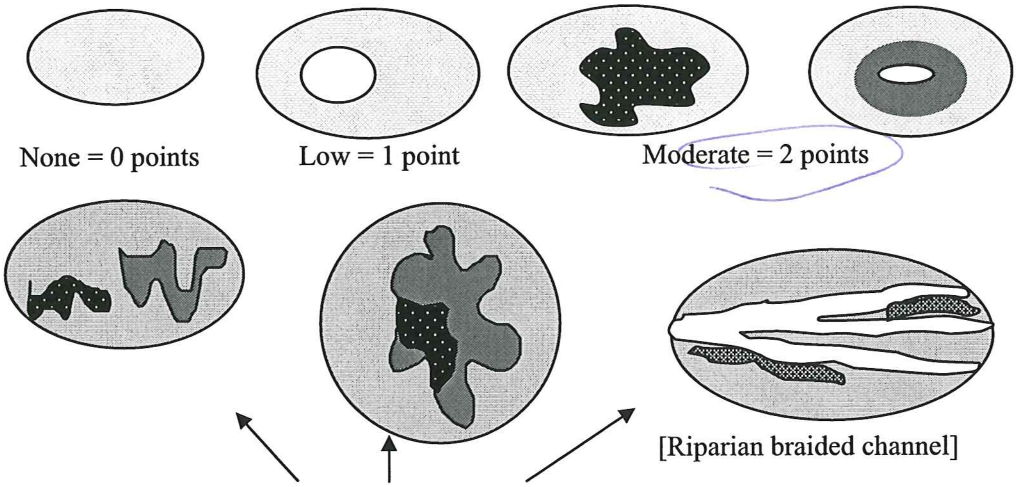
7

Wetland name or number Walla Walla River

H 1.5. Interspersion of habitats ***(see p. 67)***

Decided from the diagrams below whether interspersion between categories of vegetation (described in H 1.1), or categories and un-vegetated areas (can include open water or mudflats) is high, medium, low, or none.

Figure ___



None = 0 points

Low = 1 point

[✓ Moderate = 2 points]

[Riparian braided channel]

High = 3 points

NOTE: If you have four or more vegetation categories or three vegetation categories and open water the rating is always "high". Use maps from H1.1 and H1.3

2

H 1.6. Special Habitat Features: ***(see p. 68)***

Check the habitat features that are present in the wetland unit. The number of checks is the number of points you put into the next column.

____Loose rocks larger than 4" **or** large, downed, woody debris (>4in. diameter) within the area of surface ponding or in stream.

____Cattails or bulrushes are present within the unit.

____Standing snags (diameter at the bottom > 4 inches) in the wetland unit or within 30 m (100ft) of the edge.

____Emergent or shrub vegetation in areas that are permanently inundated/ponded. *The presence of "yellow flag" Iris is a good indicator of vegetation in areas permanently ponded.*

✓ Stable steep banks of fine material that might be used by beaver or muskrat for denning (>45 degree slope) OR signs of recent beaver activity

____ Invasive species cover less than 20% in each stratum of vegetation *(canopy, sub-canopy, shrubs, herbaceous, moss/ground cover)*

Maximum score possible = 6

1

TOTAL Potential to provide habitat
Add the scores in the column above

9 [illegible]

Comments

8

Wetland name or number Walla Walla Rive

H 2.0 Does the wetland have the opportunity to provide habitat for many species?

H 2.1 Buffers *(see p. 71)*

Choose the description that best represents condition of buffer of wetland unit. The highest scoring criterion that applies to the wetland is to be used in the rating. See text for definition of "undisturbed." Relatively undisturbed also means no grazing, no landscaping, no daily human use, and no structures or paving within undisturbed part of buffer.

- 330ft (100 m) of relatively undisturbed vegetated areas, rocky areas, or open water >95% of circumference **Points = 5**
- 330 ft (100 m) of relatively undisturbed vegetated areas, rocky areas, or open water > 50% circumference. **Points = 4**
- 170ft (50 m) of relatively undisturbed vegetated areas, rocky areas, or open water >95% circumference. **Points = 4**
- 330ft (100 m) of relatively undisturbed vegetated areas, rocky areas, or open water > 25% circumference, . **Points = 3**
- 170ft (50 m) of relatively undisturbed vegetated areas, rocky areas, or open water for > 50% circumference. **Points = 3**

If buffer does not meet any of the criteria above

- No paved areas (except paved trails) or buildings within 80ft (25 m) of wetland > 95% circumference. Light to moderate grazing, or lawns are OK. **Points = 2**
- No paved areas or buildings within 170ft (50m) of wetland for >50% circumference. Light to moderate grazing, or lawns are OK. **Points = 2**
- Heavy grazing in buffer. **Points = 1**
- Vegetated buffers are <6.6ft wide (2m) for more than 95% of the circumference (e.g . tilled fields, paving, basalt bedrock extend to edge of wetland). **Points = 0**
- Buffer does not meet any of the criteria above. **Points = 1**

Aerial photo showing buffers

Figure ___

3

[✓ 2]

H 2.2 Wet Corridors *(see p. 72)*

H 2.2.1 Is the wetland unit part of a relatively undisturbed and unbroken, > 30 ft wide, vegetated corridor at least ¼ mile long with surface water or flowing water throughout most of the year (> 9 months/yr)? *(dams, heavily used gravel roads, paved roads, fields tilled to edge of stream, or pasture to edge of stream are considered breaks in the corridor).*

[✓ YES] = 4 points (go to H 2.3) NO = go to H 2.2.2

H 2.2.2 Is the unit part of a relatively undisturbed and unbroken, > 30 ft wide, vegetated corridor, at least ¼ mile long with water flowing seasonally, **OR** a lake-fringe wetland without a "wet" corridor, **OR** a riverine wetland without a surface channel connecting to the stream?

YES = 2 points (go to H 2.3) NO go to H 2.2.3

H 2.2.3 Is the wetland within a 1/2 mile of any permanent stream, seasonal stream, or lake (*do not include man-made ditches*)?

YES = 1 point NO = 0 points

4

9

Wetland name or number Walla Walla River

H 2.3 Near or adjacent to other priority habitats listed by WDFW *(see p. 74)*
Which of the following priority habitats are within 330ft (100m) of the wetland unit?
*NOTE: the connections **do not** have to be relatively undisturbed. These are DFW definitions. Check with your local DFW biologist if there are any questions.*

✓ **Riparian**: The area adjacent to aquatic systems with flowing water that contains elements of both aquatic and terrestrial ecosystems which mutually influence each other.

____**Aspen Stands:** Pure or mixed stands of aspen greater than 2 acres.

____**Cliffs:** Greater than 25 ft high and occurring below 5000 ft.

____**Old-growth forests:** (east of Cascade crest): In general, stands will be >150 years of age, with 10 trees/acre that are > 21 in dbh, and 1 - 3 snags/acre > 12-14 in diameter.

✓ **Mature forests:** Stands with average diameters exceeding 21 in dbh; crown cover may be less that 100%; decay, 80 - 160 years old east of the Cascade crest.

____**Prairies and Steppe:** Relatively undisturbed areas (as indicated by dominance of native plants) where grasses and/or forbs form the natural climax plant community.

____**Shrub-steppe:** Tracts of land consisting of plant communities with one or more layers of perennial grasses and a conspicuous but discontinuous layer of shrubs.

____**Talus:** Homogenous areas of rock rubble ranging in average size 0.5 - 6.5 ft, composed of basalt, andesite, and/or sedimentary rock, including riprap slides and mine tailings. May be associated with cliffs.

____**Caves:** A naturally occurring cavity, recess, void, or system of interconnected passages

____**Oregon white Oak:** Woodlands Stands of pure oak or oak/conifer associations where canopy coverage of the oak component of the stand is 25%.

____**Urban Natural Open Space**: A priority species resides within or is adjacent to the open space and uses it for breeding and/or regular feeding; and/or the open space functions as a corridor connecting other *priority habitats*, especially those that would otherwise be isolated; and/or the open space is an isolated remnant of natural habitat larger than 4 ha (10 acres) and is surrounded by urban development.

____**Aspen Stands:** Pure or mixed stands of aspen greater than 0.8 ha (2 acres).

If wetland has **2 or more** Priority Habitats = [✓ **4 points**] 4
If wetland has **1** Priority Habitat = **2 points**
No Priority habitats = **0 points**

ote: All vegetated wetlands are by definition a priority habitat but are not included in this list. Nearby wetlands are addressed in question H 2.4)

Comments

Wetland name or number Walla Walla River

H 2.4 Landscape *(choose the **one** description of the landscape around the wetland that best fits)* ***(see p. 76)*** — The wetland unit is in an area where annual rainfall is less than 12 inches, and its water regime is not influenced by irrigation practices, dams, or water control structures. (*Generally, this means outside boundaries of reclamation areas, irrigation district, or reservoirs*) **points = 5** — There are at least 3 other wetlands within ½ mile, and the connections between them are relatively undisturbed (light grazing in the connection or an open water connection along a lake shore without heavy boat traffic are OK, but connections should NOT be bisected by paved roads, fill, fields, heavy boat traffic or other development) [✓ **points = 5**] — There are at least 3 other wetlands within ½ mile, BUT the connections between them are disturbed? **points = 2** — There is at least 1 wetland within ½ mile. **points = 1** — Does not meet any of the four criteria above **points = 0**	5
H 2. TOTAL Score - opportunity for providing habitat *Add the scores in the column above*	25
H 3.0 Does the wetland unit have indicators that its ability to provide habitat is reduced?	
H 3.1 Indicator of reduced habitat functions ***(see p. 75)*** Do the areas of open water in the wetland unit have a resident population of carp (see text for indicators of the presence of carp)? *(NOTE: This question does not apply to reservoirs with water levels controlled by dams, such as the reservoirs on the Columbia and Snake Rivers)* YES = **- 5 points** [✓ NO] = 0 points	*Points will be subtracted*
Total Score for Habitat Functions – *add the points for H 1, H 2, and H 3 and record the result on p. 1*	25

Comments

Appendix C

Slopes and Erosion Potential of NRCS (USCS) Soil Associations

Walla Walla County Geologic Hazards Best Available Sciences

Slopes and Erosion Potential of NRCS (SCS) Soil Associations

	Soil Association		Slope Range (percent)	Potential Erosion Ratings	
	Map Symbol	Name		Water	Wind
1	**Ac**	Active dune land	0 to 10	mod	v. high
2	**AdC**	Adkins fine sandy loam	0 to 15	v. high	high
3	**AdC2**	Adkins fine sandy loam, eroded	0 to 15	v. high	high
4	**AdD**	Adkins fine sandy loam	15 to 30	v. high	high
5	**AdE**	Adkins fine sandy loam	30 to 45	v. high	high
6	**AeD2**	Adkins fine sandy loam, shallow	8 to 30	v. high	high
7	**AfC**	Adkins loamy fine sand	0 to 15	high	v. high
8	**AfC2**	Adkins loamy fine sand, eroded	0 to 15	high	v. high
9	**AfD**	Adkins loamy fine sand	15 to 30	high	v. high
10	**AfD2**	Adkins loamy fine sand, eroded	15 to 30	high	v. high
11	**AfE**	Adkins loamy fine sand	30 to 45	high	v. high
12	**AgD2**	Adkins rocky sandy loam, moderately deep, eroded	3 to 30	high	high
13	**AkD**	Adkins very rocky sandy loam, moderately deep	0 to 30	high	high
14	**AmA**	Ahtanum silt loam	0 to 3	v. high	high
15	**An**	Alluvial land	0 to 4	mod	high
16	**AtB**	Athena silt loam	0 to 8	high	mod
17	**AtD**	Athena silt loam	8 to 30	high	mod
18	**AtD2**	Athena silt loam, eroded	8 to 30	high	mod
19	**AtE**	Athena silt loam	30 to 45	high	mod
20	**AtE2**	Athena silt loam, eroded	30 to 45	high	mod
21	**Ba**	Badland	0 to 50	ns	sl-ns
22	**BcD**	Basalt rock land, undulating to hilly	30 to 60	sl	sl-ns
23	**BcF**	Basalt rock land, steep	30 to 60	sl	sl-ns
24	**BcG**	Basalt rock land, very steep	60 to 70	ns	sl-ns
25	**BdF**	Basalt rock land - Walla Walla complex	30 to 60	mod	sl-ns
26	**Bk**	Basalt rock outcrop	0 to 90	ns	sl-ns
27	**Bm**	Beverly sandy loam and Riverwash	0 to 3	ns	high
28	**BnA**	Beverly loamy fine sand	0 to 3	sl	v. high
29	**BoA**	Beverly sandy loam	0 to 3	mod	high
30	**Bp**	Borrow pits	0 to 10	ns	sl-ns
31	**CaA**	Catherine silt loam	0 to 3	high	mod
32	**CoB**	Couse silt loam	3 to 8	high	mod
33	**CoB2**	Couse silt loam, eroded	3 to 8	high	mod
34	**CoC**	Couse silt loam	8 to 15	high	mod
35	**CoC2**	Couse silt loam, eroded	8 to 15	high	mod
36	**CoD**	Couse silt loam	15 to 30	high	mod
37	**CoD2**	Couse silt loam, eroded	15 to 30	high	mod
38	**CoD3**	Couse silt loam, severely eroded	15 to 30	high	mod
39	**CoE**	Couse silt loam	30 to 45	high	mod
40	**CoE2**	Couse silt loam, eroded	30 to 45	high	mod
41	**CoF**	Couse silt loam	45 to 60	high	mod
42	**CrF**	Couse-Rock land complex	30 to 60	mod	mod
43	**DAM**		-----	NA	NA
44	**EfA**	Ellisforde silt loam	0 to 3	high	mod
45	**EfB**	Ellisforde silt loam	3 to 8	high	mod
46	**EfC**	Ellisforde silt loam	8 to 15	high	mod
47	**EfC2**	Ellisforde silt loam, eroded	8 to 15	high	mod
48	**EfD**	Ellisforde silt loam	15 to 30	high	mod
49	**EfD2**	Ellisforde silt loam, eroded	15 to 30	high	mod
50	**EfE**	Ellisforde silt loam	30 to 45	high	mod
51	**EfE2**	Ellisforde silt loam, eroded	30 to 45	v. high	high
52	**EhA**	Ellisforde silt loam, hardpan variant	0 to 3	high	mod
53	**EhB**	Ellisforde silt loam, hardpan variant	3 to 8	mod	mod
54	**EvB**	Ellisforde very fine sandy loam	3 to 8	high	high
55	**EvC**	Ellisforde very fine sandy loam	8 to 15	high	high
56	**EvC2**	Ellisforde very fine sandy loam, eroded	8 to 15	high	high
57	**EvD**	Ellisforde very fine sandy loam	15 to 30	high	high
58	**EvD2**	Ellisforde very fine sandy loam, eroded	15 to 30	high	high
59	**EvE2**	Ellisforde very fine sandy loam, eroded	30 to 45	high	high
60	**EyA**	Esquatzel very fine sandy loam	0 to 3	high	high
61	**EzA**	Esquatzel silt loam	0 to 3	v. high	mod
62	**FaC**	Farrell very fine sandy loam	3 to 15	v. high	high
63	**FaD**	Farrell very fine sandy loam	15 to 30	v. high	high
64	**FaF**	Farrell very fine sandy loam	30 to 60	v. high	high
65	**GrD**	Gwin rocky silt loam	0 to 30	sl	mod
66	**GrD2**	Gwin rocky silt loam, eroded	0 to 30	sl	mod
67	**GrF**	Gwin rocky silt loam	30 to 60	sl	mod
68	**GvD2**	Gwin very rocky silt loam, eroded	0 to 30	sl	sl-ns
69	**GvF2**	Gwin very rocky silt loam, eroded	30 to 60	sl	sl-ns
70	**GwF**	Gwin-Rock land complex	45 to 60	sl	mod
71	**HeC**	Helmer silt loam	3 to 15	high	v. high
72	**HeD**	Helmer silt loam	15 to 30	high	v. high
73	**HeE**	Helmer silt loam	30 to 45	high	v. high
74	**HeF**	Helmer silt loam	45 to 60	high	v. high

Walla Walla County Geologic Hazards Best Available Sciences

Slopes and Erosion Potential of NRCS (SCS) Soil Associations

	Soil Association		Slope Range (percent)	Potential Erosion Ratings	
	Map Symbol	Name		Water	Wind
75	**HfF**	Helmer-flock land complex	45 to 60	high	v. high
76	**HmA**	Hermiston silt loam	0 to 3	high	mod
77	**HnA**	Hermiston very fine sandy loam	0 to 3	high	high
78	**HoC2**	Hezel loamy fine sand, eroded	0 to 15	high	v. high
79	**HoD2**	Hezel loamy fine sand, eroded	15 to 30	high	v. high
80	**HoE2**	Hezel loamy fine sand, eroded	30 to 45	high	v. high
81	**Hp2**	Hezel-Quincy complex, eroded	0 to 30	mod	v. high
82	**KkD**	Klicker rocky silt loam	0 to 30	mod	mod
83	**KkF**	Klicker rocky silt loam	30 to 60	mod	mod
84	**KrF**	Klicker-Gwin-Rock land complex	30 to 60	sl	mod
85	**KrG**	Klicker-Gwin-Rock land complex	60 to 75	sl	mod
86	**Ma**	Made land	0 to 5	ns	sl-ns
87	**MfC**	Magalon fine sandy loam	0 to 15	mod	high
88	**MfD**	Magallon fine sandy loam	15 to 30	mod	high
89	**MfD2**	Magallon fine sandy loam, eroded	15 to 30	mod	high
90	**MfE**	Magallon fine sandy loam	30 to 45	mod	high
91	**MgD**	Magallon rocky very fine sandy loam, basalt substratum	0 to 30	mod	high
92	**MgF**	Magallon rocky very fine sandy loam, basalt substratum	30 to 60	mod	high
93	**MsC**	Magallon very fine sandy loam	0 to 15	high	high
94	**MsD**	Magallon very fine sandy loam	15 to 30	high	high
95	**MsD2**	Magallon very fine sandy loam, eroded	15 to 30	high	high
96	**MsF**	Magallon very fine sandy loam	30 to 60	high	high
97	**MvD**	Magallon very rocky very fine sandy loam	0 to 30	mod	high
98	**MvF**	Magallon very rocky very fine sandy loam	30 to 60	mod	high
99	**OnA**	Onyx silt loam	0 to 3	high	mod
100	**PaB**	Palouse silt loam	0 to 8	high	mod
101	**PaD**	Palouse silt loam	8 to 30	high	mod
102	**PaD2**	Palouse silt loam, eroded	8 to 30	high	mod
103	**PaE**	Palouse silt loam	30 to 45	high	mod
104	**PaF**	Palouse silt loam	45 to 60	high	mod
105	**PbB**	Palouse silt loam, moderately deep	0 to 8	high	mod
106	**PbD**	Palouse silt loam, moderately deep	8 to 30	high	mod
107	**PbD2**	Palouse silt loam, moderately deep, eroded	8 to 30	high	mod
108	**PbE**	Palouse silt loam, moderately deep	30 to 45	high	mod
109	**PbE2**	Palouse silt loam, moderately deep, eroded	30 to 45	high	mod
110	**PbF**	Palouse silt loam, moderately deep	45 to 60	high	mod
111	**PbF2**	Palouse silt loam, moderately deep, eroded	45 to 60	high	mod
112	**PcA**	Patit Creek silt loam	0 to 3	sl	mod
113	**PkA**	Patit Creek cobbly silt loam	0 to 3	mod	mod
114	**PmA**	Pedigo silt loam	0 to 3	high	high
115	**PoA**	Pedigo silt loam, overwashed	0 to 3	high	high
116	**QcB2**	Quincy complex, eroded	0 to 8	mod	v. high
117	**Qd**	Quincy-Duneland complex	0 to 10	mod	v. high
118	**QfD2**	Quincy fine sand, eroded	0 to 30	mod	v. high
119	**QfF2**	Quincy fine sand, eroded	30 to 60	mod	v. high
120	**QmB2**	Quincy loamy fine sand, moderately deep over coarse sand, eroded	0 to 8	high	v. high
121	**QmC2**	Quincy loamy fine sand, moderately deep over coarse sand, eroded	8 to 15	high	v. high
122	**QmD2**	Quincy loamy fine sand, moderately deep over coarse sand, eroded	15 to 30	mod	v. high
123	**QnB2**	Quincy loamy fine sand, moderately deep over gravel, eroded	0 to 8	sl	v. high
124	**QnC2**	Quincy loamy fine sand, moderately deep over gravel, eroded	8 to 15	sl	v. high
125	**QnD2**	Quincy loamy fine sand, moderately deep over gravel, eroded	15 to 30	sl	v. high
126	**QuB2**	Quincy loamy fine sand, eroded	0 to 8	mod	v. high
127	**QuC2**	Quincy loamy fine sand, eroded	8 to 15	mod	v. high
128	**RlB**	Ritzville silt loam	0 to 8	v. high	mod
129	**RlD**	Ritzville silt loam	8 to 30	v. high	mod
130	**RlD2**	Ritzville silt loam, eroded	8 to 30	v. high	high
131	**RlE**	Ritzville silt loam	30 to 45	v. high	mod
132	**RlE2**	Ritzville silt loam, eroded	30 to 45	v. high	high
133	**RlF**	Ritzville silt loam	45 to 60	v. high	mod
134	**RlF2**	Ritzville silt loam, eroded	45 to 60	v. high	mod
135	**RlG**	Ritzville silt loam	60 to 65	v. high	mod
136	**RmD**	Ritzville silt loam, moderately deep	8 to 30	high	mod
137	**RmE**	Ritzville silt loam, moderately deep	30 to 45	high	mod
138	**RtB**	Ritzville very fine sandy loam	0 to 8	v. high	high
139	**RtD**	Ritzville very fine sandy loam	8 to 30	v. high	high
140	**RtD2**	Ritzville very fine sandy loam, eroded	8 to 30	v. high	high
141	**RtE**	Ritzville very fine sandy loam	30 to 45	v. high	high
142	**RtF**	Ritzville very fine sandy loam	45 to 60	v. high	high
143	**RtF2**	Ritzville very fine sandy loam, eroded	30 to 60	v. high	high
144	**RvB**	Ritzville very fine sandy loam, volcanic-ash variant	0 to 8	v. high	v. high
145	**RvD2**	Ritzville very fine sandy loam, volcanic-ash variant, eroded	8 to 30	v. high	v. high
146	**RvF**	Ritzville very fine sandy loam, volcanic-ash variant	30 to 60	v. high	v. high
147	**Rw**	Riverwash	0 to 3	ns	sl-ns
148	**SfD**	Sagemoor rocky very fine sandy loam	3 to 30	mod	high

Walla Walla County Geologic Hazards Best Available Sciences

Slopes and Erosion Potential of NRCS (SCS) Soil Associations

	Soil Association		Slope Range (percent)	Potential Erosion Ratings	
	Map Symbol	**Name**		**Water**	**Wind**
149	**SfD2**	Sagemoor rocky very fine sandy loam, eroded	8 to 30	mod	high
150	**SfE**	Sagemoor rocky very fine sandy loam	30 to 60	mod	high
151	**SgA**	Sagemoor silt loam	0 to 3	v. high	mod
152	**SgB**	Sagemoor silt loam	3 to 8	v. high	mod
153	**SgC**	Sagemoor silt loam	8 to 15	v. high	mod
154	**SgC2**	Sagemoor silt loam, eroded	8 to 15	v. high	high
155	**SgD**	Sagemoor silt loam	15 to 30	v. high	mod
156	**SgD2**	Sagemoor silt loam, eroded	15 to 30	v. high	high
157	**SgE**	Sagemoor silt loam	30 to 45	v. high	mod
158	**SgE2**	Sagemoor silt loam, eroded	30 to 45	v. high	high
159	**SkA**	Sagemoor silt loam, saline-alkali	0 to 3	v. high	high
160	**SkB**	Sagemoor silt loam, saline-alkali	3 to 8	v. high	high
161	**SkC**	Sagemoor silt loam, saline-alkali	8 to 15	v. high	high
162	**SkD**	Sagemoor silt loam, saline-alkali	15 to 30	v. high	high
163	**SmA**	Sagemoor very fine sandy loam	0 to 3	v. high	high
164	**SmB**	Sagemoor very fine sandy loam	3 to 8	v. high	high
165	**SmC**	Sagemoor very fine sandy loam	8 to 15	v. high	high
166	**SmC2**	Sagemoor very fine sandy loam, eroded	8 to 15	v. high	high
167	**SmD**	Sagemoor very fine sandy loam	15 to 30	v. high	high
168	**SmD2**	Sagemoor very fine sandy loam, eroded	15 to 30	v. high	high
169	**SnB2**	Sagemoor very fine sandy loam, saline-alkaline, eroded	3 to 8	v. high	high
170	**SoA**	Snow silt loam	0 to 3	high	mod
171	**SpA**	Spofford silt loam	0 to 3	high	mod
172	**SpB**	Spofford silt loam	3 to 8	high	mod
173	**SrA**	Stanfield silt loam	0 to 3	high	high
174	**SsA**	Stanfield silt loam, leached surface	0 to 3	high	high
175	**StA**	Stanfield very fine sandy loam	0 to 3	high	high
176	**SvA**	Stanfield very fine sandy loam, leached surface	0 to 3	high	high
177	**SyD**	Starbuck rocky silt loam	0 to 30	high	mod
178	**SyE**	Starbuck rocky silt loam	30 to 45	high	mod
179	**TaD2**	Taunton fine sandy loam, eroded	0 to 30	high	high
180	**TaE2**	Taunton fine sandy loam, eroded	30 to 45	high	high
181	**Tc**	Terrace escarpments	45 to 80	mod	mod
182	**ToA**	Touchet gravelly silt loam	0 to 3	mod	mod
183	**ToE**	Tolo	15 to 40	high	v. high
184	**ToF**	Tolo	40 to 65	high	v. high
185	**TsA**	Touchet silt loam	0 to 3	high	mod
186	**UmA**	Umapine silt loam	0 to 3	high	high
187	**UpA**	Umapine silt loam, leached surface	0 to 3	high	high
188	**UvA**	Umapine very fine sandy loam	0 to 3	high	high
189	**UwA**	Umapine very fine sandy laom, leached surface	0 to 3	high	high
190	**VaC**	Volcanic-ash land, undulating to hilly	0 to 30	v. high	v. high
191	**VaE**	Volcanic-ash land, steep	30 to 65	v. high	v. high
192	**W**	Water	-----	NA	NA
193	**WaB**	Walla Walla silt loam	0 to 8	high	mod
194	**WaD**	Walla Walla silt loam	8 to 30	high	mod
195	**WaD2**	Walla Walla silt loam, eroded	8 to 30	high	mod
196	**WaE**	Walla Walla silt loam	30 to 45	high	mod
197	**WaE2**	Walla Walla silt loam, eroded	30 to 45	high	mod
198	**WaF**	Walla Walla silt loam	45 to 60	high	mod
199	**WhB**	Walla Walla silt loam, hardpan variant	0 to 8	high	mod
200	**WlB**	Walla Walla silt loam, lacustrine substratum	0 to 8	high	mod
201	**WlD**	Walla Walla silt loam, lacustrine substratum	8 to 30	high	mod
202	**WlD2**	Walla Walla silt loam, lacustrine substratum, eroded	8 to 30	high	mod
203	**WvB**	Walvan very fine sandy loam	0 to 8	v. high	v. high
204	**WvD2**	Walvan very fine sandy loam, eroded	8 to 30	v. high	v. high
205	**WvF2**	Walvan very fine sandy loam, eroded	30 to 60	v. high	v. high
206	**YaA**	Yakima cobbly loam	0 to 3	sl	high
207	**YkA**	Yakima gravelly silt loam	0 to 3	sl	high
208	**YmA**	Yakima silt loam	0 to 3	mod	mod

Notes: ns = non-susceptible, sl = slight, mod = moderate, high, v. high = very high

Appendix D

Recommended Best Management Practices in Critical Aquifer Recharge Areas
(Source: City of San Diego's Think Blue Program)

Minimum Best Management Practices (BMPs) for Residential Areas and Activities

No.	BMP Title	Description and Examples	Justification for BMP
1	Use drip pans, etc. to collect leaks/spills	Repair vehicle leaks promptly. Use drip pans or other means (e.g. sealable containers) to capture spills or leaks of oil and other fluids from vehicles during maintenance; dispose of captured fluids per BMP #4 where applicable.	Prevents pollutants from potentially entering the storm drain system by keeping them onsite
2	Wash vehicles in designated areas and implement practices to minimize water from entering the storm drain	Minimize runoff from vehicle washing. Where feasible, drain wash water (which contains pollutants such as detergents, brake dust, oil, etc.) onto pervious areas, such as a lawn or landscaping, or wash on suitable pervious area, to minimize pollutants from entering the storm drain system. Use a control nozzle or similar method to minimize unnecessary amounts of runoff.	Prevents pollutants from potentially entering the storm drain system by keeping them onsite
3	Properly store and dispose of green waste	Do not dump or leave green matter from landscaping maintenance where it could enter the storm drain system. Take to green waste section of landfill or use appropriately on site.	Prevents pollutants from potentially entering the storm drain system
4	Properly store and dispose of hazardous materials	Store household hazardous materials (paints, solvents, oils, pesticides) such that they will not come into contact with storm water if leaks or spills occur. Dispose of household hazardous materials at household hazardous collection center and/or auto parts stores.	Prevents pollutants from potentially entering the storm drain system
5	When there is flexibility, schedule during dry weather any outdoor activities that could release pollutants	When there is flexibility, schedule outdoor activities such as vehicle washing and maintenance, handling of hazardous materials, mobile cleaning operations, etc. for non-rainy days. Or, move activities indoors.	Reduces potential for washing pollutants into storm drain system
6	Drain and properly dispose of fluids from inoperable vehicles	Drain oil, antifreeze, and other fluids from vehicle stored outside for storage or salvage. Dispose of waste per BMP #4 where applicable.	Prevents pollutants from potentially entering the storm drain system
7	Properly manage pesticide/fertilizer use	Apply pesticides and fertilizers in strict accordance with manufacturer's guidance. Safely store chemicals in closed/covered areas. Dispose of waste products per BMP #4. When feasible, use integrated pest management principles (plant selection, biological controls, habitat manipulation) to reduce use of chemicals.	Reduces introduction of pollutants to areas that generate runoff
8	Protect landscaped areas from erosion by maintaining vegetative cover	Plant and maintain healthy ground cover on exposed soils to reduce runoff and erosion of soils that may contain or transport pollutants	Reduces erosion and associated pollutants

Minimum Best Management Practices (BMPs) for Residential Areas and Activities

No.	BMP Title	Description and Examples	Justification for BMP
9	Eliminate irrigation runoff to the storm drain system	The goal of this BMP is to eliminate irrigation runoff to the storm drain system through proper landscape maintenance and watering practices, though it is recognized that some irrigation runoff may occur due to broken sprinklers, irrigation system failures, etc. Adopt proper watering and site design practices, properly maintain irrigation systems by abating runoff from broken sprinklers and other system components, control overspray, and abide by local watering restrictions.	Reduces potential for non-storm water to enter storm drain system
10	Protect trash storage areas from contact with storm water	Trash areas should be either: (1) paved with an impervious surface, designed not to allow run-on from adjoining areas, and screened to prevent off-site transport of trash; (2) contain attached lids that exclude rain; and/or (3) covered to minimize direct precipitation. Locate trash areas downstream of drain inlets where applicable. Keep area free of trash.	Reduces contact of rain water with potential pollutants, and reduces runoff of potentially contaminated storm water
11	Properly dispose of swimming pool, spa, fountain, and filter backwash water	Discharge swimming pool, spa, and fountain water only if the water is dechlorinated, has a pH in 7-8 range, is within ambient temperature, and has no algae or suspended solids. If any of the above standards are not met, dispose of swimming pool, spa, and fountain water either by (1) discharging water to the sanitary sewer system; and/or (2) draining water to landscaped areas. Dispose of filter backwash water only to a landscaped area or the sanitary sewer system.	Prevents contaminated discharge water from entering storm drain system
12	Clean trash disposal areas	Keep trash in dumpsters and other receptacles; prevent trash from blowing offsite; sweep trash storage areas frequently; check dumpsters for leaks; never place liquid waste in dumpsters; use dry cleanup methods in trash disposal areas.	Prevents contact of rain water with pollutants
13	Pick up and dispose of pet waste in yards and right of ways	Pick up and properly dispose of pet waste (toilet or trash).	Prevents pollutants from potentially entering the storm drain system

Appendix E

Technical Advisory Committee Response to Comments

Comment Originator	Comment	BAS Comment	Comment Response
General			
Stacia Peterson USFS	SP-1	This is a complicated process and the document would benefit from summary introductions and conclusions. These could be used to explain the process, the DOE framework, and over all recommendations. Noting where DOE standards, best science, etc are used would clarify the document and establish the baseline you're working with. Maps that integrate various critical area recommendations would be particularly useful. I make this suggestion assuming that there will be a public review of the BAS.	The County has made the Technical Advisory Committee's PowerPoint presentations available on the project website for general information. Figure 2.7-1, Recommended Buffer Systems was developed. This figure graphically shows the buffer recommendations from Table 2.7-1.
Chapter 2			
Glen Mendel WDFW	GM-1	My first primary response is that HDR has NOT included the Salmon Recovery Plan as a primary source of information. It updated and generally supersedes the Subbasin Plan for salmonids and their habitats and priorities. HDR should redo the aquatics sections with the Salmon Recovery Plan fully incorporated. They should also reference and use the bull trout recovery plan (plus updated information from CTUIR, USFWS, WDFW, and others), and they should look over the OR mid Columbia steelhead recovery plan that includes some of the WA portion of the Walla Walla Basin.	Updated as suggested.
Karin Divens WDFW	KD-1	There are additional or alternative source documents that we strongly suggest be considered BAS for addressing fish and other aquatic species: WDFW is currently in the final stages of updating our Priority Habitats and Species (PHS) List, which is our agency's list of what we consider to be the most vulnerable species and habitats in the state, particularly for land use activities. The draft update includes 20 habitat types, 138 vertebrate species, 39 invertebrate species, and 11 species. The list provides information on which of these habitats and species occur in Walla Walla County; it can be accessed for your review at http://wdfw.wa.gov/hab/phs/phs_review/index.htm. WDFW strongly recommends that this information be incorporated as BAS in the CAO.	Because the final update of the PHS list is not available at the time of the Final Draft's completion, HDR used the current PHS information and noted in the BAS that the PHS list is being updated and the County plans to update their PHS data annually.
Karin Divens WDFW	KD-2	WDFW recommends that the Limiting Factors Report for the WRIA 32 be used as a source of BAS. The Washington Conservation Commission (http://www.scc.wa.gov/) can provide a copy of this document.	HDR updated the BAS using the report for information on species

Comment Originator	Comment	BAS Comment	Comment Response
			other than salmonids.
Karin Divens WDFW	KD-3	Section 2.2 Table 2.2-1 The Mid Columbia Steelhead Management Plan from Oregon (includes the Walla Walla and Touchet) as well as the Snake River Salmon Recovery Plan for SE WA will inform Table 2.2.1 on Page 2-3 regarding species and distributions. Mahoney et al. 2008 and Mendel et al. 2008 further documents species and their distributions. Consulting these sources will show that the current Table 2.2.1 contains some errors; it shows pink salmon and chum, but these are only occasionally present in the Columbia and Snake rivers along Walla Walla County. There are no winter steelhead upstream of McNary Dam or near Walla Walla County. Rrainbow trout is more accurately listed as rainbow/redband trout since this species goes by either or both names. Spring and summer Chinook are grouped together under the ESA as Spring/Summer Chinook so can be listed together in the Table. Kokanee are present, if uncommon, in the Snake and Columbia River. Brown trout are no longer a priority resident trout in the Walla Walla Basin as WDFW has terminated stocking and is hopeful that this species will fade out of existence in the Basin to reduce its potential adverse effects on ESA listed stocks.	Updated as suggested.
Karin Divens WDFW	KD-4	Section 2.2.3 The BAS document cites the Subbasin Plan as a baseline, however, this Plan contains outdated information. More relevant and recent information is contained in the Snake River Salmon Recovery Plan (http://www.snakeriverboard.org/) and recent modifications as the BAS. It can be cited on Page 2-5 as last bullet or new subsection.	Updated as suggested.
Karin Divens WDFW	KD-5	The following text changes would help to include the additional resources cited above: Section 2.2.3, Pg 2-5, last bullet or new subsection We recommend citing the Salmon Recovery Plans from OR and WA that include the Walla Walla Basin.	Updated as suggested.
Karin Divens WDFW	KD-6	Section 2.2.5, last sentence This would be more accurately stated as, “While walleye occur primarily in the Columbia <u>and Snake rivers, …”</u> (delete the part about Wallula Pool). Note that bass also exist in large numbers in the Columbia and Snake Rivers.	Updated as suggested.
Karin Divens WDFW	KD-7	Section 2.3, end of first sentence Recommend adding a reference to and use of the Salmon Recovery Plans and Mendel et al. 2008, and Mahoney et al. 2008, for more detailed distribution data.	Updated as suggested.
Karin Divens WDFW	KD-8	Section 2.3, Second paragraph, second to last sentence “pink salmon <u>occasionally</u> occur in the Mainstem Columbia <u>and Snake rivers</u>…” and delete the reference. to Wallula Lake, where they are not found.	Updated as suggested.
Karin	KD-9	Section 2.3, Table 2.3-1, Pg 2-6	Updated as suggested.

Comment Originator	Comment	BAS Comment	Comment Response
Divens WDFW		Spring Chinook are no longer rare, and they are not all coming into the basin because of the tribal efforts (although most outside the Touchet are directly related). They should be considered common now. Also, this table shows carp as rare, but this species is very common in the lower Walla Walla River. Again, Mendel et al. 2008 and Mahoney et al. 2008 provide more accurate information on species and relative abundance or distribution that can help to update of this 2001 table.	
Karin Divens WDFW	KD-10	Section 2.3.1, Pg 2-7 Recommend referring to the Draft Bull Trout Recovery Plan for Walla Walla Basin.	Updated as suggested.
Karin Divens WDFW	KD-11	Section 2.3.2 Recommend referring to Oregon's Mid Columbia River Steelhead Recovery Plan, and the Snake River Salmon Recovery Plan for SE WA (includes steelhead). In the last two sentences of the first paragraph, it is reflective of BAS to add the word "primarily" before the "include portions …" in the second to last sentence, and to add also add "and Coppei Creek" at the end of that sentence, because steelhead spawn are rear there. The last sentence should indicate that spawning, rearing and migration habitat exist in the upper Touchet and its tributaries and in middle Mill Creek (upstream of the flood control channel) into Oregon.	Updated as suggested.
Karin Divens WDFW	KD-12	Section 2.3.2, Pg 2-8 Recommend adding to the first line in parenthesis, "three" largest.	Updated as suggested.
Karin Divens WDFW	KD-13	Section 2.3.3 Fall Chinook This section incorrectly states that "no other species or stock of Anadromous salmonids are identified to spawn or rear in the reaches of the Columbia and Snake rivers …" BAS shows many stocks and species of salmonids rear in the Snake and Columbia rivers. Such rearing includes winter use and delays in migration. Small numbers of Fall Chinook have been documented spawning in the lower Walla Walla and lower Mill Creek for several years. WDFW has documented these fish and Confederated Tribes of the Umatilla Indian Reservation (CTUIR)has trapped these fish in the past 5 yrs.	Updated as suggested.
Karin Divens WDFW	KD-14	Section 2.3.4 See the Salmon Recovery Plan and Mendel et al. 2002 and 2003, plus Mahoney et al. 2008, for spring Chinook summaries. Spring Chinook are returning in relatively large numbers to the Walla Walla – primarily because reintroduction efforts of CTUIR, and some spring Chinook enter the Walla Walla and Touchet from outside the basin (unknown origin, but possibly hatchery strays). The statement in the middle of the paragraph that the only reaches currently designated as habitat used by spring Chinook are the Columbia and Snake is incorrect. Spring Chinook also use Mill	Updated as suggested.

Comment Originator	Comment	BAS Comment	Comment Response
		Creek, Walla Walla River and Touchet River and its tributaries.	
Karin Divens WDFW	KD-15	Section 2.3.5 Whitefish – Please see Table 8 of Mendel et al. 2008 for distribution and relative abundance information on this species	Updated as suggested.
Karin Divens WDFW	KD-16	Table 2.3-2 In order to be accurate to the BAS, this table needs many modifications. Winter steelhead should be removed as they do not exist in SE WA. Bull trout do not use Dry Creek. Spring and Fall Chinook migrate, spawn and rear in parts of the Walla Walla River, spring Chinook do all those life activities in Mill Creek, and rear in East Little Walla Walla, and they spawn, rear and migrate in the Touchet River (although spawning may only occur upstream of the Walla Walla County line right now). Bull trout rear in East Little Walla Walla and coho spawn and possibly rear in the Walla Walla and lower Touchet rivers.	Updated as suggested.
Karin Divens WDFW	KD-17	Section 2.3.5 Freshwater Mussels see CTUIR for recent mussel study Contact the *CTUIR Public Affairs Office at 541-966-2047 or via email at* *info@ctuir.com*	Updated as suggested.
Karin Divens WDFW	KD-18	Section 2.3.5 Other Aquatic Species, first sentence – White sturgeon, walleye, and American shad also exist in the Snake River. Upper Mill Creek subbasin does not contain kokanee habitat. The last sentence in the last paragraph is incorrect as no winter steelhead exist in SE WA or generally East of the Cascades.	Updated as suggested.
Karin Divens WDFW	KD-19	Section 2.4/Table 2.4.1 – As described above, please refer to the Snake River Salmon Recovery Plan and subsequent Planning Documents for a substantial update to the Subbasin Plan and inventory of Aquatic Habitats.	Updated as suggested.
Karin Divens WDFW	KD-20	Section 2.4.1 Riparian Habitat in the WW Subbasin (Pg 2-14, first sentence) Cottonwood Creek was changed to priority protection last year under Salmon Recovery Planning.	Updated as suggested.
Stacia Peterson USFS	SP-2	Section 2.4.2 Page 2-15 "The size of the riparian area generally varies with the amount of stream flow. Intermittent streams often have limited interaction with the landscape and contain narrow riparian corridors…" Important to recognize that many important features and functions of streams are protected by "upland" veg communities and locations.	Comment noted. HDR considered this information in developing updated riparian buffer recommendations and Table 2.7-1 was revised by changing the "Rationale" column to "Existing Conditions/Targeted

Comment Originator	Comment	BAS Comment	Comment Response
			Functions."
Stacia Peterson USFS	SP-3	Section 2.4.2 third paragraph under Riparian Habitat Functions and Values, add the word "influence": "The riparian influence corridor provides…"	Updated as suggested.
Karin Divens WDFW	KD-21	Section 2.5, Table 2.5-1 has many errors when compared with BAS. Please see separately attached table with WDFW suggested corrections.	Updated as suggested.
Larry Hooker WWCCD	LH-1	Table 2.5-1. This table lists Walla Walla County streams by type. Cold Creek and Doan Creek are listed as Type Np – non fish bearing. These streams are being restored at this time and will be suitable for rearing of salmonids within the next year. The same thing is true for Spring Creek (2).	Doan and Spring Creeks has a footnote stating that they will be restored. Both Doan Creek and Cold Creek are listed as having fish documented by WDFW.
Stacia Peterson USFS	SP-4	Section 2.5.1 Designation, Rating and Classification, and Regulatory Options These classification and rating systems have different reach breaks and when buffer recommendations are made it's hard to see how these systems relate to them. A map of the "Waterway Categories" table 2.7-1 and a discussion of how they relate to recommendations by these other systems would be useful in understanding what exactly is being proposed.	Figure 2.7-1, Recommended Buffer Systems was developed. This figure graphically shows the buffer recommendations from Table 2.7-1.
Karin Divens WDFW	KD-22	Section 2.5.1 Fish Species and Lifestage Distribution Classification System (Pg 2-19, first paragraph) I have not seen the maps for this document. Salmonscape on the WDFW website and the Snake River Salmon Recovery Plan, as well as the Mid Columbia Steelhead Recovery Plan provide up-to-date maps of distribution and spawning and rearing. The predominant stream function for salmonids in Walla Walla County may be migration, but the Walla Walla River from state line down to at least the mouth of Mill Creek is spawning and rearing habitat for steelhead. So is Coppei Creek (almost the entire system), Cottonwood, Yellowhawk, East Little Walla Walla, Mill Creek, upper and middle Dry Creek, and many other streams.	Updated as suggested.
Karin Divens WDFW	KD-23	Section 2.5.1 Fish Species and Lifestage Distribution Classification System (Pg 2-19, second paragraph) Fall Chinook are documented to spawn below Lower Monumental Dam in the tailrace, and below Little Goose Dam and Lower Granite Dam.	Updated as suggested.

Comment Originator	Comment	BAS Comment	Comment Response
		The Aquatic Habitat Quality Based Classification System is using outdated information from the Subbasin Plan. The Snake River. Salmon Recovery Plan and supporting documents are an updated BAS resource to use here.	
Karin Divens WDFW	KD-24	Section 2.5.2 Riparian/Stream Buffers WDFW is concerned that the Riparian Habitat Areas (RHA) proposed for some of the streams are, in some cases, considerably less than the buffers supported by the BAS for riparian habitat areas, especially given the special consideration that should be given to the presence of anadromous fish. We are pleased that the text of WDFW's PHS publication: *Management Recommendations for Washington's Priority Habitats: Riparian, accessed at http://wdfw.wa.gov/hab/ripxsum.htm*, is referenced and used verbatim throughout the Walla Walla County draft CAO document. However, however WDFW is concerned that the buffer widths proposed in the CAO consider only the water quality function of riparian areas. WDFW recommended RHA widths represent a synthesis of science (presented in Appendix C) that shows RHA widths that address both instream functions *and* terrestrial functions (buffers for nesting riparian species, for example). WDFW strongly recommends that Walla Walla revisit our PHS Riparian Management Recommendations and consider the different functions of riparian areas with regards to terrestrial and aquatic systems.	Comment noted. HDR considered this information in developing updated riparian buffer recommendations and in some cases buffers were increased.
Karin Divens WDFW	KD-25	Section 2.5.2 – first paragraph The discussion presented here is currently very limited regarding riparian function and protection. In this section, we suggest emphasizing shading and water temperature influence, as well as keeping the water table high and connected to the stream. Riparian vegetation is also instrumental in providing large wood for fish habitat and protecting banks from eroding and enhancing channel stability and habitat function.	Updated as suggested.
Karin Divens WDFW	KD-26	Section 2.5.2 (bottom of page 2-21) While this section discusses some of the functions necessary to support ESA-listed salmonids and other fish (adequate water that is cool, well oxygenated and unpolluted), it leaves out other, critical habitat functions. These fish also require hiding cover, adequate pools, clean, appropriately size spawning gravels, little sediment in gravels and cobbles to provide rearing and overwintering habitat. This depends on a functioning stream system that has sinuosity and large woody debris, and shading from riparian vegetation (salmonids tend to avoid bright sunlight during hiding or rearing). Healthy riparian vegetation for some of their terrestrial food sources and for providing nutrients to the stream. We suggest that the summary at the bottom of page 2-21 be expanded to discuss these habitat needs of ESA listed salmonids.. We strongly suggest that Table 2.5-2 be revised in consideration of the Limiting Factors Report, the	Updated as suggested.

Comment Originator	Comment	BAS Comment	Comment Response
		Snake River Salmon Recovery Plan, the Mid Columbia Steelhead Recovery Plan for Oregon (includes the Walla Walla Basin), and Mendel et al. 1999-2008, plus Mahoney et al 2008 and previous CTUIR reports for fish monitoring in the Walla Walla Basin (described above)	
Stacia Peterson USFS	SP-5	Section 2.5.2 Its likely that different results between studies in the literature review are due to different vegetative cover, geology and topography, disturbance level, range of ppt events during the study, method of measurements, etc. rather than lack of consensus. The literature demonstrates that buffers can be effective and some of the conditions needed for them to be effective. The reference to site potential tree is taken from conifer forest settings and may not be a good indicator for most of the county. Conclusions about protection from sediment protection from a SPTH might not be applicable to this area since it was based on forested landscapes. A summary of how this literature leads to buffer recommendations, the attributes that will be protected and those that won't, would be useful here. The document would benefit by making clear links between BAS and buffer recommendations.	HDR expanded the narrative to clarify the link between the BAS and buffer recommendations. Table 2.7-1 was revised by changing the "Rationale" column to "Existing Conditions/Targeted Functions."
Stacia Peterson USFS	SP-6	Table 2.6-3 (Existing riparian conditions in the County) Outside of the urban areas, riparian width may not be the best representation of riparian (near channel) condition or of the availability or usefulness of stream buffers.	Comment noted. Riparian width was not the only factor considered in buffer recommendations. This analysis was used to provide context for riparian buffer recommendations.
Stacia Peterson USFS	SP-7	Section 2.6.2 under Placeholder for Rural Streams Summary A description of how this helps to identify buffers would be useful. Outside of the urban areas, riparian width may not be the best representation of riparian (near channel) condition or of the availability/usefulness of stream buffers. A discussion of how this helps identify buffers would be useful.	Comment noted. Riparian width was not the only factor considered in buffer recommendations. This analysis was used to provide context for riparian buffer recommendations.
Bill Neve Ecology	BN-1	Existing Riparian Conditions *The CD is restoring Cold Creek as a tributary to Doan Creek*. Ecology records show that Cold Creek has never been a tributary to Doan Creek, so I believe the "restore" reference is in error. There would be water right issues associated with such a change that have not been addressed; while I understand that restoration efforts are being contemplated for Cold Creek, I am not sure that the reference to connecting it to Doan Creek is correct.	Clarified that Cold Creek is not being restored.
Bill Neve Ecology	BN-2	Existing Riparian Conditions *Garrison Creek was identified as having restoration potential*: Important to define what type of	Clarified as recommended.

Comment Originator	Comment	BAS Comment	Comment Response
		restoration and what reaches are being referred to. The headwaters of Garrison Creek are in the process of being screened to prevent fish from entering the Garrison channel, and the dam at Lyons Park in College Place is impassable to fish. The restoration potential for Garrison Creek for fish habitat would then appear to be limited to the reach from Lyons Park to the mouth, with the upper portion restoration potential being limited to water quality considerations only.	
Bill Neve Ecology	BN-3	Existing Riparian Conditions *Spring Valley Creek flows through Dixie*: Spring Valley Creek, if it is the spring branch I believe is being referenced, flows through Spring Valley, approximately 4 miles north of Dixie. Dry Creek flows through Dixie from the south, as well as Mud Creek, which flows through Dixie from the NE and enters Dry Creek in Dixie.	Document clarified.
Stacia Peterson USFS	SP-8	Section 2.7.1/Table 2.7-1 Map of Streams by Streamside Buffer Category Without this map it's difficult to see how the segments were identified; what is being protected, where, and why there. It's not clear how the literature review leads to buffer width recommendations or what functions/components are expected to be protected and what won't. Some of the recommendations seem overly precise, and may come out of a particular document rather than the overall review. Footnotes would help a lot here.	Figure 2.7-1, Recommended Buffer Systems was developed. This figure graphically shows the buffer recommendations from Table 2.7-1, along with stream reaches. Table 2.7-1 was revised by changing the "Rationale" column to "Existing Conditions/Targeted Functions." Additional footnotes were added to table to better connect references to recommended buffer.
Stacia Peterson USFS	SP-9	Section 2.7.1/Table 2.7-1 • *-98 ft adequate* • *Minimum of 35 ft. provides appropriate riparian function* • *-Provides 60% water quality treatment* It's hard to know what "adequate", or "appropriate", or "60%" water quality protection", means. The	Table 2.7-1 was revised by changing the "Rationale" column to "Existing Conditions/Targeted Functions."

Comment Originator	Comment	BAS Comment	Comment Response
		60% number comes from a paper which is not referenced or cited in this doc. The success of the buffers is likely controlled by slope, existing ground cover, and level of disturbance. The reference should be cited and discussed in the review since it is used extensively as rationale for buffer widths. I don't recall seeing anything in the literature review that talks about 35 feet providing appropriate riparian function. The literature review does mention a study where 98 feet was found to provide protection, but also 100 and 120'.	Additional footnotes were added to table to better connect references to recommended buffer.
Stacia Peterson USFS	SP-10	Section 2.7.1/Table 2.7-1 The role of slope and existing ground cover condition is critical to buffer effectiveness. This is clearly expressed in the lit review but doesn't seem incorporated here. Although steelhead use the lower Walla Walla, "Walla Walla mainstem from mouth to Dry Creek", and the lower Touchet, "Touchet River mainstem from mouth to confluence with McCay Creek" only as a migration corridor, there are other important hydrologic, water quality, and habitat functions in that reach and a 50' buffer seems inadequate. Steelhead use may not be the only function that should be considered in the buffer recommendation.	Streams with steep slopes are noted and additional protection measures are recommended to control runoff.
Mike Denny WWCCD	MD-1	Table 2.7-1 Waterway Category 1 The Columbia River shoreline is a major neotropical bird migration corridor. The river is a major waterfowl and shoreland migration area.	The narrative and Figure 3.2-1 have been updated.
Mike Denny WWCCD	MD-2	Table 2.7-1 Waterway Category 3a, Lower Doan Creek Change Whitman Drive to Last Chance Road. Add wildlife habitat to Existing Conditions/Targeted Functions. Increase the buffer to 75 feet.	Updated as suggested.
Mike Denny WWCCD	MD-3	Table 2.7-1 Waterway Category 6b, Caldwell Creek, Stone Creek, and Doan Creek Change Whitman Drive to Last Chance Road for Doan Creek. Increase the buffer for the three Creeks to 75 feet.	Updated as suggested.
Mike Denny WWCCD	MD-4	Table 2.7-1 Waterway Category 6b Garrison Creek – Lions Park in College Place to College Place WWTP outfall. Suggest buffer of 25 feet through urban College Place.	The recommended buffer for this reach will remain at 35 feet.
Mike Denny WWCCD	MD-5	Table 2.7-1 Waterway Category 6b Garrison Creek – Yellowhawk to Lions Park (excluding wetland). Add wildlife habitat to Existing Conditions/Targeted Functions.	Updated as suggested.
Bill Neve Ecology	BN-4	Table 2.7-1 Caldwell Creek is listed twice in the table – both as a 3b stream with a 50 foot buffer and a 6b steam with a 75 foot buffer.	Caldwell Creek was removed from Category 3b. It has been designated as a Category 6b stream with a 35 foot buffer.

Comment Originator	Comment	BAS Comment	Comment Response
Bill Neve Ecology	BN-5	Table 2.7-1 With streams such as Doan, Caldwell and Stone being recommended for 75 foot buffers, not sure why East Little Walla Walla would only rate a 50 foot buffer. While the preceding three streams all can and do dry up at their mouths during late summer, the ELWWR has never in my experience gone dry. While the flow has dropped in the summer months in the past couple of years due to activities on the Oregon side of the basin, this stream has historically provided a consistent flow of relatively cool water to the mainstem Walla Walla. I would think an appropriate buffer would at least match that of these other streams.	The buffer on the East Little Walla Walla River was increased to 75 feet, as suggested.
Bill Neve Ecology	BN-6	Table 2.7-1 To reiterate my comments at the meeting, I believe there should be some minimum buffer (35 feet?) to protect against vegetation removal, particularly trees, along the concrete channel in Mill Creek through the City of Walla Walla. These trees provide riparian shade to help prevent heating of the cool spring waters which empty into this section of Mill Creek. This section does provide, somewhat surprisingly, good habitat for fish. Maintaining riparian habitat in the broader flood control section, particularly on the south side of the channel, should also be considered to the extent possible, given the cross purpose of maintaining capacity for flood control. There are currently efforts underway to determine the best methods possible to establish a low flow channel in Mill Creek through these sections to allow for improved passage and habitat. A riparian shading component would be an important part of this effort.	Table 2.7-1 has been revised to include a 35 foot tree removal restriction for concrete channel sections.
Stacia Peterson USFS	SP-11	Section 2.7.3 under Mitigation Options, reword second bullet: Minimizing impacts by limiting the degree or magnitude of the action and its implementation (design criteria and use of best management practices).	Updated as suggested.
Chapter 3			
Karin Divens WDFW	KD-27	Section 3.2 Walla Walla County's land use is nearly 90% agricultural, but important habitat remnants remain, including CRP habitat. WDFW is very pleased that the draft CAO designates upland and riparian habitats as important habitat for wildlife. However, Table 3.2-2 lists only three designated habitats: Cliffs, Riparian, and Shrub-Steppe, although the text references others. It is unclear whether Walla Walla intends to adopt PHS as its designated habitats for purposes of triggering CAO review of projects. PHS includes the following additional habitats that occur in the county: prairies and steppe, elk and mule deer concentration areas, and wildlife corridors. Designating these additional habitats and species will go a long way toward protecting species and habitat to prevent future ESA or state listings.	Habitat designations will be expanded to include major wildlife corridors that are expected to serve multiple functions. These corridors will be clearly identified on a map. The County will not use the CAO to manage mule deer and elk, however we recognize that there will be

Comment Originator	Comment	BAS Comment	Comment Response
			benefit to them from the wildlife corridors. PHS habitat definitions from March 2008 were used, therefore prairies and steppe was not identified. The BAS notes that WDFW is currently updating their PHS information and the County plans to update their PHS data annually
Karin Divens WDFW	KD-28	Section 3.2 *Shrub-steppe habitat:* While there is a large area of shrub steppe habitat SW portion of the County, there may be other, smaller tracts of shrub-steppe that are not mapped and are not as large. These remnant areas of shrub-steppe serve an important function for terrestrial wildlife, and we strongly suggest they are designated and protected per the CAO. Local WDFW wildlife and habitat staff will be meeting in early July to discuss remaining shrub-steppe and steppe habitats in the area, and can provide further information to you. We do know that small tracts provide habitat for species that are not dependent on large areas, and these smaller parcels can also provide passage and connectivity to large tracts. Although species may be at a higher risk due to the restricted size of the habitat, it is all the more important to designate and protect this habitat when it is all that remains in the landscape. The PHS list for Walla Walla County includes many State listed species that are dependent on shrub-steppe habitat, including for example: Ferruginous hawks (state threatened species) Sage sparrow (candidate), Sage thrasher (candidate), Loggerhead shrike (candidate), Sagebrush lizard (candidate). Black –tailed jackrabbit (candidate) White-tailed jackrabbit (candidate)	HDR worked with the conservation district to identify additional shrub-steppe areas.
Karin	KD-29	Section 3.2	Burrowing owl habitat is

Comment Originator	Comment	BAS Comment	Comment Response
Divens WDFW		Walla Walla County also has remaining prairie and steppe habitat that is important for priority species including the burrowing owl (State Candidate and Federal species of Concern), Townsend's ground squirrel (State Candidate). This habitat has not been designated in the BAS document, which could result in population declines due to development that is not reviewed and mitigated for impacts to these highly vulnerable species	located on federal land within the McNary Wildlife Refuge. No specific management recommendations are made because the County does not have jurisdiction there. Townsend's ground squirrel habitat correlates to the hawk habitat that has been designated.
Larry Hooker WWCCD	LH-2	Table 3.2-2 Under the Shrub-Steppe habitat type of element, after Criteria: at the bottom of page 3-4, are these comments intended to include fish? Is there breeding habitat for fish in the shrub-steppe habitat? I think not.	This is the general criteria as stated by WDFW, so the table has not been changed.
Larry Hooker WWCCD	LH-3	3.2.5, page 3-7: Cliffs and Bluffs in Walla Walla County (last sentence on the page) – change southeastern to southwestern.	This language was updated.
Larry Hooker WWCCD	LH-4	Section 3.2.7, page 3-9: Hawk Habitat Hawk habitat is not protected under the CRP program. Known hawk nesting sites were given additional environmental points in some of the early scoring hierarchies in the mid- to late-1980's. Also, CRP is not administered by NRCS. It is administered by the Farm Services Agency (FSA). NRCS used to handle the technical assistance portion of the program. Note: The pocket gopher is the prey base for the Ferruginous hawk.	Text will be modified to acknowledge administration of the CRP program by the FSA and not NRCS. The CAO is using the CRP lands as a surrogate for mapping specific habitats important to a variety of wildlife species, including the nesting hawks, Townsend ground squirrel, and short-eared owls.
Karin Divens WDFW	KD-30	Section 3.2.7 *Riparian Areas/Wildlife Corridors* WDFW is pleased that the draft CAO refers to the importance of riparian areas as natural corridors for avian and terrestrial species, as well as aquatic species. The document focuses on the	The importance of riparian habitat for wildlife is noted and the urban area buffer recommendations will

Comment Originator	Comment	BAS Comment	Comment Response
		importance of riparian areas associated with larger streams and rivers. However, in more developed landscapes (urban, agricultural), smaller streams provide a similar corridor function. As stated above, WDFW is concerned that the RHA widths in the draft were determined thus far based on water quality function only. Riparian areas contain the highest diversity of any other habitat; 85% of Washington's wildlife species utilize riparian areas for various life stages and requirements, including corridors and a connection to adjacent habitats. WDFW would like to reiterate the importance of this habitat and suggest that the RHA widths be reconsidered with more than just water quality as a function. Adequate buffers based on BAS will protect function for not only anadromous and resident fish, but for terrestrial wildlife as well.	provide for enhanced corridors over existing conditions.
Larry Hooker WWCCD	LH-5	Section 3.2.8, page 3-10 There are a number of naturally occurring ponds of less than 20 acres in Walla Walla County.	Naturally occurring ponds under 20 acres will classify as wetlands and will be protected by wetland buffers.
Larry Hooker WWCCD	LH-6	Section 3.2.10, page 3-10 What about wildlife lands administered by the USACOE along the Snake River?	Figure 3.2-1 is a land ownership map showing publicly owned lands. The text has been updated to include the USACE lands.
Karin Divens WDFW	KD-31	Section 3.3, Table 3.3-1 Effects of Disturbance and Habitat Alteration on Wildlife This table is helpful, but some habitat types are missing from the areas at risk. Clearing and Grading, can have a profound effect on every type of native habitat. Riparian areas, shrub-steppe, and prairies and steppe, are all examples of habitat that is vulnerable to alteration.	Riparian areas and shrub-steppe were added to the "Areas at Risk in Walla Walla County" column for clearing and grading. Prairies and steppe were not added per the response to Comment KD-27.
Chapter 4			
Jeremy Sikes Ecology	JS-1	Section 4.5.2 under Regulatory Recommendations There is a very important missing element here. Ecology is responsible for administering the State Water Pollution Control Act (RCW 90.48). Under this state law, wetlands are "waters of the state," including wetlands considered "isolated" by the Corps via the Corps Jurisdictional Determination	Updated as suggested.

Comment Originator	Comment	BAS Comment	Comment Response
		process (requested from the Corps in writing by an applicant). Discharges to waters of the state, including the placement of fill in a wetland, are regulated by Ecology under chapter 90.48 RCW. Thus, the state Department of Ecology is continuing to regulate isolated wetlands and to apply the water quality standards called for in the state law. However, the department's process for reviewing projects involving isolated wetlands is now different from the process for other types of wetlands. Instead of using the 401 Water Quality Certification process (triggered by a 404 permit from the Corps), Ecology uses Administrative Orders to regulate projects involving isolated wetlands. The review standards and elements within the Order remain the same as those found in the 401 Certification. The State Water Quality Standards consist of three main elements: characteristic uses of surface waters and numerical criteria for conventional water quality parameters that are not to be exceeded (173-201A-130), and an antidegradation policy (173-201A-070). The antidegradation policy establishes the bottom line for water quality protection in the state: "Existing beneficial uses shall be maintained and protected and no further degradation which would interfere with or become injurious to existing beneficial uses shall be allowed. Beneficial uses are more or less equivalent to wetland "functions and values" and therefore include: water supply, surface and groundwater treatment, stormwater attenuation, fish and shellfish migration, rearing, spawning, and harvesting, wildlife habitat, recreation, support of biotic diversity, and aesthetics.	
Jeremy Sikes Ecology	JS-2	Section 4.5.2 under Regulatory Recommendations – First Bullet (Wetland Delineation) The County should also be aware that the Corps has developed supplements to the 1994 delineation manual that the state's manual must comport with. This is the Arid West Supplement (U.S. Army Corps of Engineers. 2006. *Interim regional supplement to the Corps of Engineers Wetland Delineation Manual: Arid West Region.* ed. J. S. Wakeley, R. W. Lichvar, and C. V. Noble. ERDC/EL TR-06-16. Vicksburg, MS: U.S. Army Engineer Research and Development Center.) The Corps now requires this supplement to the 1987 manual be used in the arid interior west, which includes all of Walla Walla County. Ecology typically will accept the use of this manual in place of the Ecology manual until the Ecology manual is updated and republished to incorporate the changes. In cases where only isolated wetlands are affected, the applicant can choose which manual they use; our preference is to use both so that we may evaluate any changes to delineation lines that may be expected from the new supplement.	Comment noted. This section was revised as recommended.
Stacia Peterson	SP-12	Section 4.5.3, Table 4.5-5 (Wetlands pg.4-19 and ordinance page 54): Logging road construction is identified under "moderate impact". In fact logging road construction	This table has been revised. See comment JS-

<table>
<tr><th>Comment Originator</th><th>Comment</th><th>BAS Comment</th><th>Comment Response</th></tr>
<tr><td>USFS</td><td></td><td>has one of the highest adverse effects, or potential for effects of any activity that could occur in a buffer. These include severe erosion potential due to earth movement, intercepting ground water, and damming subsurface flows. Though roads have most effect to increased sedimentation during construction and for the first years after construction, location of new roads inside wetland or streamside buffer areas would have the long term affect of increasing sedimentation. Logging roads often have low levels of design and are not constructed to include installation of permanent drainage features. I would strongly recommend that logging road construction be identified as “high impact”.

In these same places, single unit homes are identified as “moderate impact”. My concerns here are similar to those above. During the construction phase home site leveling, etc, require moving large volumes of soil. Prevention of sedimentation during construction requires significant erosion control work and monitoring.</td><td>3.</td></tr>
<tr><td>Jeremy
Sikes
Ecology</td><td>JS-3</td><td>Deleted Table 4.5-5 and replaced with the following:

Substitute Senate Bill 5248 does not allow local governments to change their regulations that affect agriculture (either existing or new agriculture), we have been asked to change our guidance (Table 8D-3 of <i>Wetlands in Washington State, Volume 2)</i> so that it no longer recommends any new regulations on agricultural activities. I have inserted it here.

Draft Land Use Intensity Table

Types of proposed land use that can result in high, moderate, and low levels of impacts to adjacent wetlands.
<table>
<tr><th>Level of Impact from Proposed Change in Land Use</th><th>Types of Land Use Based on Common Zoning Designations *</th></tr>
<tr><td>High</td><td>• Commercial
• Urban
• Industrial
• Institutional
• Retail sales
• Residential (more than 1 unit/acre)
• High-intensity recreation (golf courses, ball fields, etc.)</td></tr>
</table>
</td><td>HDR replaced the existing Table 4.5-5 with this revised table.</td></tr>
</table>

<table>
<tr><th>Comment Originator</th><th>Comment</th><th>BAS Comment</th><th>Comment Response</th></tr>
<tr><td></td><td></td><td><table>
<tr><td>Moderate</td><td>• Residential (1 unit/acre or less)
• Moderate-intensity open space (parks with biking, jogging, etc.)
• Paved driveways and gravel driveways serving 3 or more residences
• Paved trails</td></tr>
<tr><td>Low</td><td>• Low-intensity open space (hiking, bird-watching, preservation of natural resources, etc.)
• Timber management
• Gravel driveways serving 2 or fewer residences
• Unpaved trails
• Utility corridor without a maintenance road and little or no vegetation management.</td></tr>
<tr><td colspan="2">* Local governments are encouraged to adopt land-use designations for zoning that are consistent with these examples.</td></tr>
</table></td><td></td></tr>
<tr><td>Jeremy Sikes Ecology</td><td>JS-4</td><td>Table 4.5-7 and Table 4.5-9
This table appears to be using numbers derived from the BAS Appx 8 C for Western WA. Appx 8 D is for Eastern Wa and would top out at 200 feet, not 300. Please revise.</td><td>Tables 4.5-7 and 4.5-9 have been revised.</td></tr>
<tr><td>Jeremy Sikes Ecology</td><td>JS-5</td><td>Table 4.5-10, Table 4.5-11, and Table 4.5-12
The layout for this and the other buffer tables is confusing. We recommend that if the County is planning to use Alternative 3A (which we also strongly recommend), that they also simply cut and paste the appropriate table from Wetlands in Washington State Volume 2; Appendix 8D Guidance on Buffers and Ratios.</td><td>Updated as suggested.</td></tr>
<tr><td>Jeremy Sikes Ecology</td><td>JS-6</td><td>Section 4.6 Wetland Mitigation
We recommend that the CAO reference, and be consistent with the latest guidance regarding compensatory mitigation: <i>Wetland Mitigation in Washington State</i>, <i>Part 1: Agency Policies and Guidance</i> (Version 1, Publication #06-06-011a, March 2006) and <i>Wetland Mitigation in Washington State</i>, <i>Part 2: Developing Mitigation Plans</i> (Version 1, Publication #06-06-011b, March 2006).</td><td>The Wetland Mitigation section was revised to include Table 6 from the Draft – Guidance on Wetland Mitigation in</td></tr>
</table>

Comment Originator	Comment	BAS Comment	Comment Response
		The new mitigation guidance is the result of a collaborative effort between Ecology, the U.S. Army Corps of Engineers, and the Environmental Protection Agency. Part 1 includes information on the general permit process, the laws, rules and policies that apply to projects where wetlands are involved and agency policies, requirements, and recommendations for compensatory mitigation. Technical information on the preparation of proposals and plans for compensatory mitigation can be found in Part 2 of this guidance. This guidance is consistent with what the state and federal agencies require for mitigation. We recommend that you consider adopting the mitigation ratios presented in Table 1a of *Wetland Mitigation in Washington State*, *Part 2: Developing Mitigation Plans* (Version 1, Publication #06-06-011b, March 2006). By requiring mitigation based on this guidance, you will be providing consistency for applicants who must also apply for state and federal permits.	Washington State – Part 1 (Publication #04-06-013A) per conversation with Jeremy Sikes.
Larry Hooker WWCCD	LH-7	4.6.2, page 4-31 Location of Mitigation. Comment: There is no requirement for on-site mitigation of the impacts of Wind Farms even though these installations can greatly impact shrub-steppe, etc.	Section 4.6 is specific to wetland mitigation. Shrub-steppe mitigation would be located on a case by case basis.
Mike Denny WWCCD	MD-6	Wind Farm Mitigation: A. No on site mitigation – the goal is not to attract birds by providing cover or prey base near turbine sites. B. Mortality monitoring should be part of doing business in Walla Walla County – Post construction mortality searches should run throughout the life of the wind farm. One season every 3 years throughout the 30 years of the farm. Alternate between fall and spring migration (1 August to 15 October and 1 March to 5 June). C. The CAO should require off site habitat easements or wildlife (birds and bats) habitat acquisition paid for by the power co.	This text has been added to the BAS document and the ordinance.
Jeremy Sikes Ecology	JS-7	Section 4.6.6 Monitoring Ecology recommends requiring monitoring for at least 5 years or a period necessary to establish that performance standards have been met. For example, ten years or more of monitoring are needed for forested and scrub-shrub communities. These communities take at least eight years after planting to reach 80% canopy closure. Having a ten-year monitoring program need not require biologists to collect data and produce a report every year. That could be done in years 1, 2, 3, 5, 7, and 10, for example.	HDR revised the section to include the recommendation as suggested.
Chapter 5			

Comment Originator	Comment	BAS Comment	Comment Response
Larry Hooker WWCCD	LH-8	5.3.9, page 5-8: Erosion – the last statement in the first paragraph is incorrect. The erosive wind energy declines from west to east in Walla Walla County so that an estimated 2/3rds of the county has a low hazard for wind erosion. This is also substantiated by the soils. The Wind Erodibility Group (WEG) of soils progressively gets lower from west to east across the county.	This table lists the erosion potential of soil associations. The text has been revised to further explain how this analysis should be used for guiding development in the County.
Larry Hooker WWCCD	LH-9	Appendix X: The interpretations on this table are off base. There are high water erosion hazards listed for soils that are found in the 6-8 inch rainfall zone and soils listed for high wind erosion that timbered. This table needs a total rework.	This table lists the erosion potential of soil associations. The text has been revised to further explain how this analysis should be used for guiding development in the County.
Larry Hooker WWCCD	LH-10	Map: Water Erosion: Totally out of whack.	This figure maps the erosion potential of soil associations. The figures title has been revised to read “Potential Water Erosion Susceptibility.”
Larry Hooker WWCCD	LH-11	Map: Wind Erosion: High hazard of wind erosion in the Blue Mountains? I don’t think so. A low hazard of wind erosion east of the Touchet River.	This figure maps the erosion potential of soil associations. The figures title has been revised to read “Potential Wind Erosion Susceptibility.”
Chapter 6			
Karin Divens WDFW	KD-32	The draft BAS document describes well the risks of developing in the floodplain and channel migration zones. Given this science, WDFW strongly recommends that development in floodplains be discouraged. Protecting, restoring, and managing floodplain areas provides for a more natural flow regime by minimizing floodplain modification and limiting development within floodplains. This not only reduces the potential for flood damages but also provides an improved condition for the fish and wildlife species dependent upon these areas. (USDA, 1998, Poff et al. 1997). Walla Walla	Comment noted. The County’s existing ordinance provides for development in the floodplain under certain conditions and this is not

Comment Originator	Comment	BAS Comment	Comment Response
		County may wish to refer to the King County CAO and Flood Hazard Areas for additional guidance. Consider requiring that buildable portions of parcels be located outside of the floodplain areas. Doing so will leave the door open for protection and restoration of floodplain areas and riparian habitats.	likely to change. HDR will provide the King County CAO and Flood Hazard Areas to the County for consideration.
Chapter 7			
Bill Neve Ecology	BN-1	Section 7.5.2: *although ground water withdrawals that are less than 5,000 gallons per day (approximately 3.5 gallons per minute continuous pumpage) and for certain purposes (stock watering, single or group domestic purposes, industrial purposes, or watering a lawn or non-commercial garden that is not larger than one-half acre) are exempt from the water-right permitting process.* The current interpretation of the ground water permit exemptions (RCW 90.44.050) considers each purpose to have a separate allocation, not all of which are limited to 5,000 gpd. Might be best to replace this narrative with something along the lines of "…although state law (RCW 90.44.050) allows for small ground water withdrawals for specific purposes of use which are exempt from the water-right permitting process."	This section has been updated with the recommended language.
Bill Neve Ecology	BN-2	Section 7.6 The discussion of the Basalt system could note that while it is not as directly susceptible to contamination as the gravels, it is extremely difficult to do anything about that contamination once it occurs.	This language has been added.

Comment Originator	Comment	Ordinance Comment	Comment Response
Karin Divens WDFW	KD-1	GMA requires the adoption of development regulations that protect critical areas designated in accordance with RCW 36.70A.170. WDFW has not had the opportunity to review this document and may have additional comments in the future.	Comment noted.
Karin Divens WDFW	KD-2	The Goals and Purpose section of the Draft CAO are well stated and WDFW appreciates the inclusion of language regarding avoidance of critical areas when possible and mitigation for unavoidable impact to critical areas and areas adjacent to critical areas, and prevention of cumulative adverse impacts to habitats.	Comment noted.
Karin Divens WDFW	KD-3	18.08.015 Applicability: Given the impacts of clearing and grading activities on native vegetation that provides habitat for listed and candidate species and shading for listed fish species, WDFW strongly recommends that clearing and grading be added to the list of a activities that will not be approved, authorized, or permitted without compliance with the requirements of the CAO. Other suggested additions include: dredging, dumping, or discharging of material, filling draining, or flooding of an area, or activities affecting surface or groundwater resources. We also recommend adding language to alert users that bald eagle nest occurrences should trigger WDFW review per our rules for buffering nests from disturbance.	Clearing and grading was added to the list of activities. The County plans to revise their grading permit to include clearing.
Jeremy Sikes Ecology	JS-1	18.08.015 Applicability This list should include Grading Permits.	Updated as suggested.
Jeremy Sikes Ecology	JS-2	18.08.020 Definitions Ecology recommends that a “qualified professional” for wetlands should be a professional wetland scientist with at least two years of full-time work experience as a wetlands professional, including delineating wetlands using the state or federal manuals, preparing wetland reports, conducting function assessments, and developing and implementing mitigation plans.	Updated as suggested.
Karin Divens WDFW	KD-4	18.08.030 Jurisdiction- Critical Areas Under subsection 5, it is unclear whether the Fish and Wildlife Habitat Conservation Areas were all named or whether some habitat were inadvertently left off the list.	The list of resources that are considered under the Fish and Wildlife Habitat Conservation Area Critical Area are listed in Chapter 18.08.600 of the ordinance. This list includes all of the

Comment Originator	Comment	Ordinance Comment	Comment Response
			habitats discussed in the document, including habitats of local importance.
Karin Divens WDFW	KD-5	Reasonable Use Exemptions and Substantial Development Permits: Allowable activities and exempt activities might be placed in a table for easier review and use by planning staff. It is unclear for example, if a new road or driveway is allowable and if so what the road standard are. Refer to the 2008 Spokane County Critical Areas Ordinance for an example of a table.	Comment noted.
Jeremy Sikes Ecology	JS-3	18.08.300 A and B Please see comment in BAS Review regarding Corps supplements. Ecology recommends that the word "as amended" are added to each occurrence of this and all Ecology document references. This allows the CAO to remain up-to-date with document revisions without re-adopting the ordinance each time.	Updated as suggested.
Jeremy Sikes Ecology	JS-4	18.08.300 B1 We are concerned that here and throughout the document, the County is not using the most recent definitions of Category 1 wetlands. Specifically, the numerical rating value is not included and, more importantly, the Special Characteristic wetlands are not included. This is particularly important because some special characteristic wetlands have higher buffer requirements than typical wetlands (i.e. bogs have 250 buffers, and vernal pools have 200 foot buffers). Below is a more complete definition of Category 1 Wetlands. Category 1 Wetlands Wetlands which are: alkali wetlands, wetlands that are identified by scientists of the Washington Natural Heritage Program (DNR) as high quality wetlands, bogs, mature old-growth forested wetlands over 1/4 acre with slow-growing trees, forests with stands of aspen, and wetlands that perform many functions very well function at a very high level (scores of 70 points or more). meet at least one of the following criteria: These wetlands typically are: **a.** Unique or rare wetland types **b.** Are more sensitive to disturbance than most wetlands **c.** Are relatively undisturbed and contain ecological attributes that are impossible to replace within a human lifetime **d.** Provide a high level of functions	The definition of Category 1 Wetlands was revised as suggested.

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		e. Documented Wetlands of local significance	
Jeremy Sikes Ecology	JS-5	18.08.300 B1, reword end of first sentence: "…or 4) provide a high level of functions (scores of 70 points or more using the Eastside Rating System)."	Updated as suggested.
Jeremy Sikes Ecology	JS-6	18.08.300 B2, reword: Category II wetlands are difficult, though not impossible, to replace, and provide high levels of some functions (scores between 51 and 69 points).	Updated as suggested.
Jeremy Sikes Ecology	JS-7	18.08.320 C1 How does this relate to 150' required above? Is there a conflict?	The 150' was updated to 200'.
Jeremy Sikes Ecology	JS-8	18.08.320 C1a The wetlands should be rated as part of the delineation report.	Updated as suggested.
Jeremy Sikes Ecology	JS-9	18.08.330 C This could be interpreted as a dock. This should be clarified to exclude structures for such purposes.	Updated as suggested.
Jeremy Sikes Ecology	JS-10	18.08.340 C3, reword: If vegetation in the buffer is disturbed (grazed or mowed), proponents planning changes to land that will increase impacts to wetlands need to rehabilitate the buffer with native plant communities that are appropriate for the site conditions, and assure the establishment of a functional buffer.	Addressed through performance standards and performance ponds (see 18.08.230).
Jeremy Sikes Ecology	JS-11	18.08.340 Table 3 Please see comment in BAS review about the updated land use table. The table should remove the reference to conversion to High Intensity Ag.	Table 3 has been replaced with the updated table provided in the BAS comments.
Stacia Peterson USFS	SP-1	18.08.340 Table 3 (also Wetlands pg.4-19 in BAS): Logging road construction is identified under "moderate impact". In fact logging road construction has one of the highest adverse effects, or potential for effects of any activity that could occur in a buffer. These include severe erosion potential due to earth movement, intercepting ground water, and damming subsurface flows. Though roads have most effect to increased sedimentation during construction and for the first years after construction, location of new roads inside wetland or streamside buffer areas would have the long term affect of increasing sedimentation. Logging roads often have low levels of design and are not constructed to include installation	Table 3 has been replaced. See comment JS-11.

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		of permanent drainage features. I would strongly recommend that logging road construction be identified as "high impact". In these same places, single unit homes are identified as "moderate impact". My concerns here are similar to those above. During the construction phase home site leveling, etc, require moving large volumes of soil. Prevention of sedimentation during construction requires significant erosion control work and monitoring.	
Jeremy Sikes Ecology	JS-12	18.08.340 Table 4, Table 5, and Table 6 Please see comments in the BAS review on the use of Ecology's standard table to describe the use of Alternative 3A for setting buffer widths. These tables are confusing and difficult to review. They also do not take Special Characteristic wetlands into consideration.	Updated as suggested.
Jeremy Sikes Ecology	JS-13	18.08.344 C BAS does not support the reduction of buffers by more than 25%, regardless of wetland category. In fact, Category 3 and 4 wetlands tend to already be in a degraded condition and are less resilient. Thus, further reduction of buffer width will increase stressors on the functions provided. The larger scale effect of this incremental degradation is magnified by the fact that <u>most</u> wetlands in the county are likely Category 3 and 4.	The buffer reduction limit of 25% was included.
Jeremy Sikes Ecology	JS-14	18.08.346 B1 We recommend that these pathways are limited to 5' shoulder-to-shoulder, are made of pervious materials, and require no excavation for foundation or stabilization.	Updated as suggested.
Jeremy Sikes Ecology	JS-15	18.08.346 B2 These should be temporary in nature, or not build with permanent foundations.	Updated as suggested.
Jeremy Sikes Ecology	JS-16	18.08.346 D2b This should specify that the <u>buildable</u> portion of the lot meet minimum lot size. It's a little confusing.	Updated as suggested.
Jeremy Sikes Ecology	JS-17	18.08.346 D3 This should specify that mitigation requirements still apply for these roads.	Updated as suggested.
Jeremy Sikes Ecology	JS-18	18.08.346 H Same as comment 11	Tables deleted and replaced as recommended.
Jeremy	JS-19	18.08.347	Comment noted.

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Sikes Ecology		The County's proposed mitigation ratios are consistent with the guidance contained in Table 1a of Wetland Mitigation in Washington State, Part 1: Agency Policies and Guidance (Version 1, Publication #06-06-011a, March 2006). This guidance was cooperatively developed by the U.S. Army Corps of Engineers, the U.S. Environmental Protection Agency and Ecology. By requiring mitigation based on this guidance, you will be providing consistency for applicants who must also apply for state and federal permits.	
Jeremy Sikes Ecology	JS-20	18.08.347 D See comment in BAS review on requiring sufficient time to ensure the mitigation performs as intended.	Updated as suggested.
Jeremy Sikes Ecology	JS-21	18.08.347 D, reword: Annual maintenance and monitoring reports will be submitted to the County <u>and, where applicable, the Department of Ecology,</u> and shall include:	Updated as suggested.
Stacia Peterson USFS	SP-2	18.08.650 Table 8 (Ordinance pgs. 89-94) Buffer recommendations on mainstem Touchet and Walla Walla River based on steelhead migration does not take into account other important functions that those rivers have. Same comment about the "60% improvement in water quality" as in chapter 2.	HDR considered this in developing updated riparian buffer recommendations and Table 2.7-1 was revised by changing the "Rationale" column to "Existing Conditions/Targeted Functions."