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# Klickitat Basin (WRIA 30) Watershed Management Plan

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*Prepared for:*  
**WRIA 30 Watershed Planning Unit**

*Prepared by:*  
**Watershed Professionals Network  
and  
Aspect Consulting**

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# Klickitat River Basin (WRIA 30) Watershed Management Plan

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## **List of Acronyms**

ASR	Aquifer Storage and Recovery
BOCC	Board of County Commissioners
BOD	Biochemical Oxygen Demand
BPA	Bonneville Power Administration
CCRP	Continuous Conservation Reserve Program
cfs	Cubic feet per second
CKCD	Central Klickitat Conservation District
CRC	Citizens Review Committee
CREP	Conservation Reserve Enhancement Program
CRP	Conservation Reserve Program
CSP	Conservation Security Program
EA	Environmental Assessment
Ecology	Washington Department of Ecology
EDT	Ecosystem Diagnosis and Treatment
EIS	Environmental Impact Statement
EPA	United States Environmental Protection Agency
EQIP	Environmental Quality Incentives Program
ESA	Endangered Species Act
FERC	Federal Energy Regulatory Commission
GLO	Government Land Office
gpm	Gallons per minute
GRP	Grasslands Reserve Program
HFRP	Healthy Forest Reserve Program
IFIM	Instream Flow Incremental Methodology
ISAB	Independent Scientific Advisory Board
ISRP	Independent Scientific Review Panel
KPUD	Klickitat Public Utilities District
LEPA	Low Energy Precision Application
LFA	Limiting Factors Analysis
NEPA	National Environmental Policy Act
NOAA	National Ocean and Atmospheric Administration
NRCS	National Resource Conservation Service
OFM	Washington State Office of Financial Management
PDO	Pacific Decadal Oscillation
RCW	Revised Code of Washington
RM	River Mile
SASSI	State Salmon and Steelhead Stock Inventory
SEPA	State Environmental Policy Act
SR	State Road
SRFB	Salmon Recovery Funding Board
SRSRP	Salmon Recovery Science Review Panel
TFW	Timber, Fish, and Wildlife
TMDL	Total Maximum Daily Load
USDA	United States Department of Agriculture



USGS	United States Geologic Survey
WAC	Washington Administrative Code
WDFW	Washington Department of Fish and Wildlife
WDNR	Washington Department of Natural Resources
WDOH	Washington Department of Health
WHIP	Wildlife Habitat Incentive Program
WPN	Watershed Professionals Network
WPPAC	Water Resources Planning and Advisory Committee
WRIA	Watershed Resource Inventory Area
WRP	Wetlands Reserve Program
WRTS	Water Rights Tracking System (Washington State Dept. Ecology)
WSCC	Washington State Conservation Commission
WSCC	Washington State Conservation Commission
WSDA	Washington State Department of Agriculture
WSDOT	Washington State Department of Transportation
WSPRC	Washington State Parks and Recreation Commission
WSU	Washington State University
WWT	Washington Water Trust

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# **Klickitat River Basin (WRIA 30) Watershed Management Plan**

## **1.0 INTRODUCTION AND BACKGROUND**

Water Resource Inventory Area (WRIA) 30 consists of the Klickitat River basin and the watershed area draining into the Columbia River between the mouth of the Klickitat River and the John Day Dam in Washington State. Roughly the southern half of the WRIA is in Klickitat County and the northern half is in Yakima County.

A variety of sometimes competing needs must be met by surface and ground waters in WRIA 30. While there is currently a hiatus in human population growth, water resources and the attendant supply systems need to be maintained and managed in order to meet current demand as well as future demand that will accompany the resumption of population and economic growth. Agricultural producers require access to irrigation and stock water. Fish, including species that are listed under the federal Endangered Species Act and other aquatic species, require adequate water in streams and rivers. Fishers, boaters, hydroelectric facilities, and others also require water in rivers and streams. Wise and balanced management of water resources is needed.

This document is the Watershed Management Plan for WRIA 30 wherein key water resources issues are identified and the agreed-upon strategies to address those issues are presented. The scope of this Watershed Management Plan addresses matters pertaining to water quantity, water quality, and fish habitat within that portion of WRIA 30 that is outside of the Yakama Indian Reservation closed lands.

### **1.1 LEGAL FRAMEWORK**

This Watershed Management Plan was developed and approved in accordance with Chapter 90.82 Revised Code of Washington (Chapter 90.82 RCW). The planning effort was initiated in 1999 with the concurrence of Klickitat County, Yakima County, City of Goldendale, and Public Utility District No. 1 of Klickitat County (KPUD). While supportive of watershed planning for WRIA 30, Yakima County elected not to participate in the process and opted out with the concurrence of the other Initiating Governments in accordance with the provisions of the statute. The Yakama Nation was invited to participate in the planning effort as an initiating government, but did not affirmatively accept the invitation. Therefore, Klickitat County, City of Goldendale and KPUD comprise the “Initiating Governments” tasked under the statute with organizing the planning effort. The Initiating Governments designated Klickitat County to serve as the lead agency to receive grant funding and coordinate the planning effort. As provided in Chapter 90.82.060(6) RCW, the Initiating Governments determined the scope of the planning effort, composition of a Planning Unit that is representative of a wide range of water resource interests, and a planning process.

The Washington Department of Ecology (Ecology) participated in the planning process. As provided in Chapter 90.82.130(6) RCW, this Watershed Management Plan satisfies Ecology’s watershed planning authority with respect to the components of the plan included under the

provisions of Chapter 90.82.070 RCW (water quantity), Chapter 90.82.090 RCW (water quality), and Chapter 90.82.100 RCW (habitat). Ecology shall use this Watershed Management Plan as the framework for making future water resource decisions for WRIA 30 and rely upon this Watershed Management Plan as a primary consideration in determining the public interest related to such decisions.

During the development of this plan, Ecology provided coordination with the state caucus, which includes Washington Department of Fish and Wildlife (WDFW), Washington Department of Health (WDOH), Washington Department of Agriculture (WSDA), and Washington State Parks and Recreation Commission (WSPRC).

If any provision of this plan or any provision of any document incorporated by reference shall be held invalid, such invalidity shall not affect the other provisions of this plan which can be given effect without the invalid provision, and to this end the provisions of this plan are declared to be severable.

## **1.2 VISION FOR WATER RESOURCES**

The following is the vision statement for water resources within WRIA 30: “Water resources within Water Resource Inventory Area 30 are managed pursuant to a Watershed Management Plan developed through a community-based partnership. The quantity of water available is sufficient to meet the needs of current and future populations and support economic growth and agricultural needs. Aquatic and riparian habitats are properly functioning at levels that enhance fish and wildlife populations and provide recreation and other cultural benefits. The quality and management of water resources are contributing to the quality of life and long term economic well-being of the citizenry, community sustainability, and habitats.”

## **1.3 PLANNING UNIT ORGANIZATION**

As determined by the Initiating Governments the composition of WRIA 30 Planning Unit, which developed this plan and will monitor its implementation, is representative of a wide range of water resource interests. Members of the Planning Unit are appointed by the Klickitat County Board of County Commissioners (Klickitat BOCC). The appointment specifies whether the appointee represents a unit of government or is a regular member or ex officio member of the Planning Unit. The representatives of the following water resource interests were appointed as members representing units of government: the Washington State agencies, the City of Goldendale, KPUD, Klickitat County, the Central Klickitat Conservation District (CKCD), and the Klickitat County Water Conservancy Board. Representatives of the Port of Klickitat and federal agencies were appointed as ex officio members. All other members of the Planning Unit were appointed as regular voting members. Invitations to participate as units of government members of the Planning Unit were extended to the Yakama Nation and the Klickitat County Health Department, and these invitations remain open should either body elect to participate on the Planning Unit in the future, subject to Klickitat BOCC appointment procedures.

Watershed Management Plan approval requires a consensus of the members representing a unit of government and a majority vote of the regular voting members. Consensus is defined in the Planning Unit operating procedures manual approved by the Initiating Governments.

## WRIA 30 Planning Unit Composition

### Determined by the Initiating Governments<sup>1</sup>

- Washington Department of Ecology
- City of Goldendale
- Central Klickitat Conservation District
- Yakama Nation
- Large Industry
- Irrigators in the Eastern area of the WRIA
- Livestock Growers
- Timber interests in the Western area of the WRIA
- Environmental
- Klickitat County Water conservancy Board
- Citizens at large
- Klickitat Citizens Review Committee
- Klickitat PUD No. 1
- Klickitat County Health Department
- Klickitat County
- Small Business
- Irrigators in the Western area of the WRIA
- Education
- Timber interests in the Eastern area of the WRIA
- Port of Klickitat (ex-officio)
- USDA Forest Service (ex-officio)

<sup>1</sup> As of the drafting of this document, the Yakama Nation, Klickitat County Health Department, Timber East, Education, and Large Industry did not have representatives appointed to the Planning Unit.

## 1.4 SCOPE (WATER QUANTITY, QUALITY, AND HABITAT)

The Initiating Governments chose to include three elements in the scope of planning: Water Quantity, Water Quality, and Habitat. In accordance with Chapter 90.82 RCW, assessments were completed to support the development of the Watershed Management Plan.

### Water Quantity Component (Chapter 90.82.070 RCW)

- An estimate of surface and ground water present in the management area;
- An estimate of the surface and ground water available in the management area, taking into account seasonal and other variations;
- An estimate of the water in the management area represented by claims in water rights, claims registry, water use permits, certificated rights, existing minimum instream flow rules, federally reserved rights, and any other rights to water;
- An estimate of the surface and ground water actually being used in the management area;

- An estimate of the water needed in the future for use in the management area;
- An identification of areas where aquifers are known to recharge surface bodies of water and areas known to provide for the recharge of aquifers from the surface; and
- An estimate of the surface and ground water available for further appropriation, taking into account the minimum instream flows adopted by rule or to be adopted by rule under Chapter 90.82 RCW for streams in the management area including the data necessary to evaluate necessary flows for fish.

### **Water Quality Component (Chapter 90.82.090 RCW)**

For the water quality component of the Watershed Management Plan the following information was developed:

- An examination based on existing studies conducted by federal, state, and local agencies of the degree to which legally established water quality standards are being met in the management area;
- An examination based on existing studies conducted by federal, state, and local agencies of the causes of water quality violations in the management area, including an examination of information regarding pollutants, point and nonpoint sources of pollution, and pollution-carrying capacity of water bodies in the management area;
- An examination of legally established characteristic uses of each of the non-marine bodies of water in the management area;
- An examination of any total maximum daily load established for nonmarine bodies of water in the management area, unless a total maximum daily load process has begun in the management area as of the date the watershed planning process is initiated; and
- An examination of existing data related to the impact of fresh water on marine water quality.

### **Habitat Component (Chapter 90.82.100 RCW and Chapter 90.82.110 RCW)**

No habitat assessment requirements are specified within Chapter 90.82.100 RCW. However, an assessment of fish habitat was conducted to support the development of the Watershed Management Plan.

As is specified in Chapter 90.82.110 RCW, the following were reviewed and incorporated as appropriate into this Watershed Management Plan:

- Historical data such as fish runs, weather patterns, land use patterns, seasonal flows, and geographic characteristics of the management area.
- Planning, planning projects, and activities that have already been completed regarding natural resource management or enhancement in the management area, as well as the products or status of those that have been initiated but not completed for such management.

## Water Resource and Habitat Assessment Work Products

Assessments of watershed conditions were conducted at the direction of the Planning Unit. The following documents were produced to support the development of the Watershed Management Plan:

- **WRIA 30 Watershed Assessment (Watershed Professionals Network and Aspect Consulting, January 2005):** The document was published in several volumes. The primary volume provides a summary of all portions of the assessment work. The various reports produced during the assessment are published as appendices to the *WRIA 30 Watershed Assessment*.
  - **Appendix A, WRIA 30 Level I Assessment,** contains the results of an evaluation of water quantity, water quality, and fish habitat that was based, primarily, on existing information found in reports and other literature;
  - **Appendix B, WRIA 30 Multipurpose Water Storage Screening Assessment Report,** contains the results of the first phase of the water storage assessment project;
  - **Appendix C, Addendum to WRIA 30 Multipurpose Water Storage Screening Assessment Report,** contains the results of the second phase of the water storage assessment project;
  - **Appendix D, WRIA 30 Nitrate Concentration and Distribution Study,** contains the results of the investigations into nitrate concentrations in ground water; and
  - **Appendix E, WRIA 30 Swale Creek Water Temperature Study,** contains the results of the assessment of stream temperature in Swale Creek and includes an evaluation of such factors as stream flow and effective shade.

An additional assessment was completed to support the development of the Watershed Management Plan. This is a memo from Aspect Consulting dated December 6, 2004 regarding strategies for meeting future municipal water demands in WRIA 30. The WRIA 30 watershed assessment is the source of the water quantity, water quality, and habitat information provided in this Watershed Management Plan. Information from other sources is referenced.

### 1.5 PLANNING AREA

WRIA 30 (Water Resources Inventory Area 30) is located in Klickitat and Yakima Counties, in south central Washington (Figure 1). The City of Goldendale and the communities of Lyle, Dallesport, Murdock, Wishram, Klickitat, Centerville, High Prairie, and Glenwood are located within the WRIA. The border of Washington and Oregon at the Columbia River is WRIA 30's southern boundary (Figure 2). For the purpose of

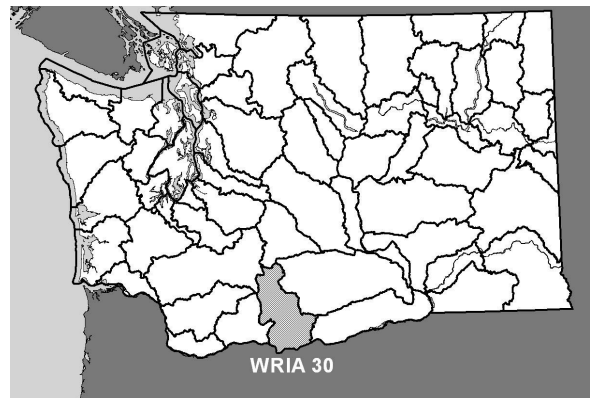


Figure 1. Location of WRIA 30 in Washington State.

the watershed assessment and planning activities, WRIA 30 was divided into six subbasins: Upper Klickitat, Middle Klickitat, Little Klickitat, Swale, Lower Klickitat, and Columbia River Tributaries. The Upper Klickitat Subbasin and the eastern part of the Middle Klickitat Subbasin are largely within the Yakama Indian Reservation, which is outside the geographical scope of this Watershed Management Plan.

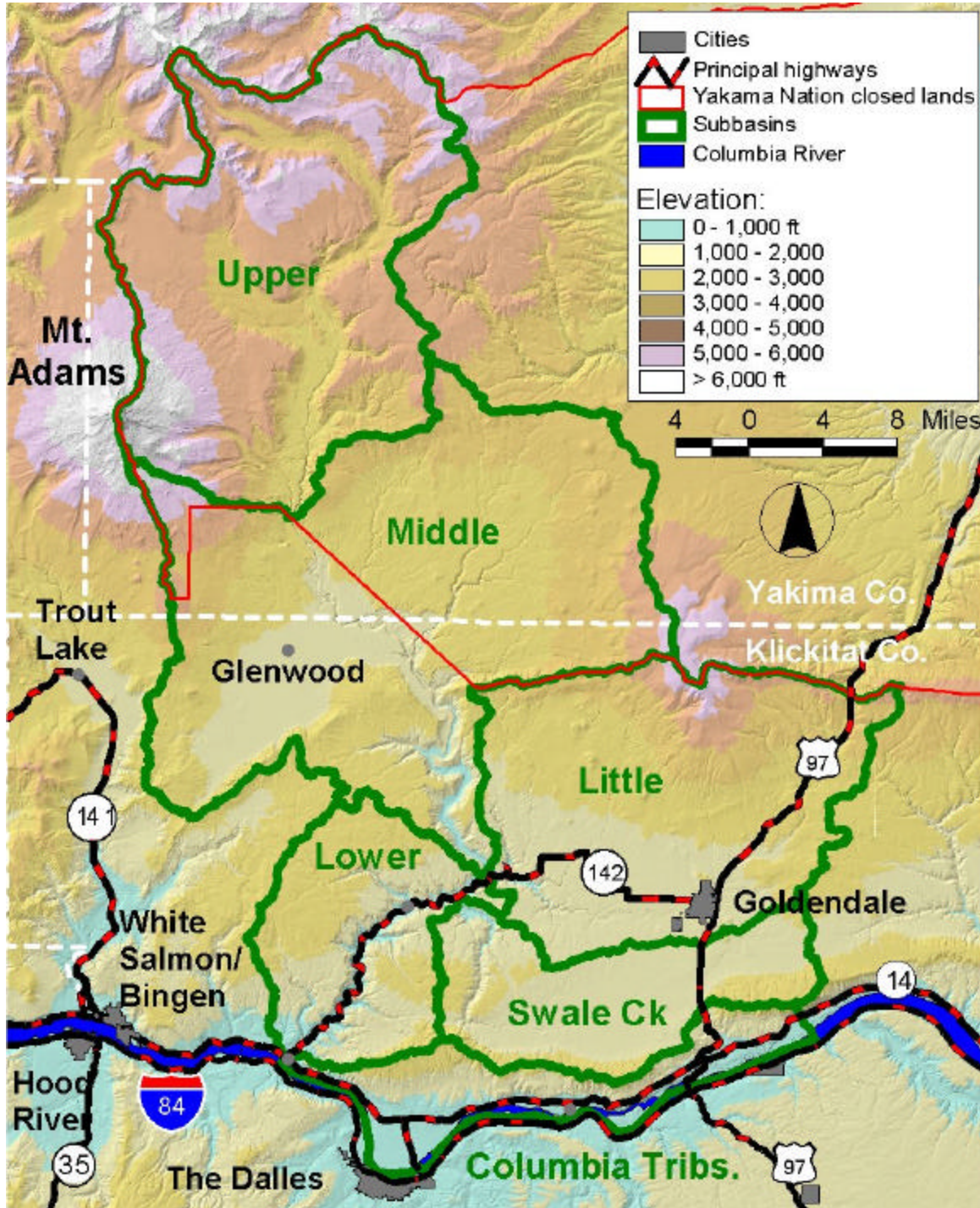


Figure 2. Map of WRIA 30 depicting major subbasins in the watershed.



## 1.6 APPROACH

The approach to development of the Watershed Management Plan started with the identification of issues. The Planning Unit developed a list of primary issues/problems regarding water quantity, water quality, and fish habitat in the WRIA based upon the results of the watershed assessment (see Section 1.4) and public input. Each problem was then characterized so that a sound basis could be developed for considering alternative solutions. “Problem statements” were developed that included the following information:

- ❑ **Problem Definition:** A brief description of the issue or problem.
- ❑ **Goal:** The long-term goal regarding the problem.
- ❑ **Prioritization:** The issues and the alternatives for addressing each issue were rated by the Planning Unit as being high, medium, or low based upon the understanding of the magnitude of the problem and the expected effectiveness of the alternatives.
- ❑ **Background:** Background information addressing the geographic distribution and severity of the problem across the WRIA, trend information where known, underlying causes of the situation, effects on human health and/or natural resources, existing regulations and programs (including voluntary actions) addressing the problem, long-term trends if known, and data gaps.
- ❑ **Assumptions and Constraints:** Assumptions made in identifying the problem and constraints regarding actions that can be taken to address the problem.
- ❑ **Approaches:** A listing of potential approaches to addressing the identified situation.
- ❑ **Monitoring:** Recommendations and/or considerations regarding monitoring the effectiveness of approaches implemented to address identified issues
- ❑ **Funding:** Discussion of funding needs and resource commitments and/or potential funding sources.

While regulatory approaches are discussed in this Watershed Management Plan, the Planning Unit urges the implementation of voluntary and positive incentive based approaches to addressing issues covered under this plan.

Implementation of this Watershed Management Plan is envisioned to be an adaptive management approach. Many aspects of this plan rely upon data collection efforts that will help with the identification of action items necessary to achieve the goals and objectives of the plan. Should modification of the Watershed Management Plan or the Detailed Implementation Plan be found necessary, the process through which such modifications are made is specified in Section 1.8.

## 1.7 WATERSHED MANAGEMENT PLAN LIMITATIONS

As provided in Chapter 90.82.120 RCW, the Watershed Management Plan cannot include provisions that do any of the following:

- ❑ Conflict with existing State statutes, federal law, or tribal treaty rights;

- ❑ Impair or diminish in any manner an existing water right evidenced by a claim filed in the water right registry established under Chapter 90.14 RCW or water right certificate or permit;
- ❑ Require a modification in the basic operation of a federal reclamation project with water right the priority date of which is before June 11, 1998, or alter in any manner whatsoever the quantity of water available under the water right for the reclamation project, whether the project has or has not been completed before June 11, 1998;
- ❑ Affect or interfere with an ongoing general adjudication of water rights;
- ❑ Require modification of any waste discharge permit issued under Chapter 90.48 RCW;
- ❑ Modify or require modification of activities or actions taken or intended to be taken under a habitat work schedule developed under Chapter 246, Laws of 1989;
- ❑ Modify or require the modification of activities or actions taken to protect or enhance fish habitat if the activities are: a) part of an approved habitat conservation plan and incidental take statement, a management or recovery plan, or other cooperative or conservation agreement entered into with a Federal or State fish and wildlife agency under its statutory authority for fish and wildlife protection that addresses the affected fish habitat; or b) part of a water quality program adopted by an irrigation district under Chapter 87.03 RCW or a board of joint control under Chapter 87.80 RCW.

Assessments conducted under Chapter 90.82.070 RCW, water quantity component, Chapter 90.82.090 RCW, water quality component, and Chapter 90.82.100 RCW, habitat component, are required to take into consideration such activities and actions taken under the forest practices rules, including watershed analyses adopted under the Forest Practices Act, Chapter 76.09 RCW.

The Watershed Management Plan cannot create any obligations or restrictions on forest practices additional to or inconsistent with the Forest Practices Act and its implementing rules. Further, the Watershed Management Plan cannot change existing local ordinances or existing State rules or permits, but may contain recommendations for changing such ordinances or rules. No additional requirements for forestry beyond forest practices rules are included in this Watershed Management Plan; however, the Planning Unit supports funding for implementation of cost-efficient programs that will improve fish habitat and water quality.

## **1.8 PLAN APPROVAL AND AMENDMENT PROCESS**

Chapter 90.82.130 RCW defines a clear two-step process for approving the Watershed Management Plan. First, the Planning Unit itself must approve the plan. Once the Planning Unit has approved a plan, or components of a plan, it can submit the plan (or component(s)) to the legislative authorities of the affected counties. Each county is required to hold a public hearing. The counties involved are then directed to hold a joint session of their legislative authorities to consider approving the plan. The joint session may either approve the plan by a majority vote of the members of each county's legislative authority, or return the plan to the Planning Unit with recommendations for changes. However, the county legislative authorities are not empowered to change the plan themselves. If the plan is returned to the Planning Unit, it may amend the plan and resubmit it to the counties for approval using the same process.

Yakima County opted out of the WRIA 30 planning process; therefore, only Klickitat County is required to hold a public hearing and legislative session to approve or reject the Watershed Management Plan.

As provided in Chapter 90.82.130 RCW, this Watershed Management Plan was approved by consensus among the members of the Planning Unit appointed to represent units of government and a majority vote of the nongovernmental members of the Planning Unit.

Following plan approval, the Planning Unit shall develop a Detailed Implementation Plan, as provided in Chapter 90.82.043 RCW and Chapter 90.82.048 RCW. The statute does not specify a process for approving the Detailed Implementation Plan. However, as an obligation under Chapter 90.82.130(3) RCW, Ecology shall not accept a detailed implementation plan, or amendment thereof, until such plan or amendment has been approved by the Planning Unit, using the same procedures by which it approved the Watershed Management Plan under Chapter 90.82.130(1)(a) RCW, and the Detailed Implementation Plan or amendment thereof has been approved by the legislative authority of Klickitat County following a public hearing.

Amendment of an approved Watershed Management Plan is addressed in Chapter 90.82.130(5) RCW, which provides that Ecology may develop and adopt modifications to the Watershed Management Plan or obligations imposed by the plan only through a form of negotiated rule making that uses the same processes that applied in the watershed for developing the plan. Per Chapter 90.82.130(3) RCW, Ecology shall utilize a form of negotiated rule making that includes approval of the watershed plan or obligation modification by the Planning Unit using the same procedures by which it approved the Watershed Management Plan under Chapter 90.82.130(1)(a) RCW and includes approval of the watershed plan or obligation modification by the legislative authority of Klickitat County following a public hearing.

## 1.9 ORGANIZATION OF PLAN DOCUMENT

Information in this document is organized as follows:

- ❑ **Section 1, Introduction:** Presents the vision for water resources and provides an overview of legal framework for planning, Planning Unit organization, scope of planning, planning area, approach, and plan approval and amendment processes.
- ❑ **Section 2, Existing Environment:** Provides an overview of the watershed, including the physical setting, population and economy, land use, surface and ground water resources, water right, water use, future water demand, and water available for allocations, water quality, fish populations, and fish habitat.
- ❑ **Section 3, Identified Data Gaps:** Provides an overview of the primary data gaps identified in the watershed assessment and management planning processes.
- ❑ **Section 4, Overall Management of Plan:** Provides information regarding general requirements under the plan, including constraints.
- ❑ **Section 5, Water Quantity Management:** Contains background information on water quantity issues and the approaches to addressing water quantity issues.

- ❑ **Section 6, Water Quality Management:** Contains background information on water quality issues and the approaches to addressing water quality issues.
- ❑ **Section 7, Fish Habitat Management:** Contains background information on fish habitat issues and the approaches to addressing fish habitat issues.
- ❑ **Section 8, Implementation:** Contains information regarding the management of implementation actions and specific requirements and constraints regarding plan implementation.
- ❑ **Section 9, State Environmental Policy Act (SEPA) Compliance:** Addresses SEPA requirements for this Watershed Management Plan and actions taken during implementation of the plan.
- ❑ **Section 10, References:** Includes full citations for all documents cited in this plan.
- ❑ **Appendices:** Four appendices located at the end of the document provide additional supporting information. These appendices include:
  - **Appendix A:** Loading Capacity and Load Allocations for streams in the Little Klickitat Subbasin (Anderson 2005)
  - **Appendix B:** List of Alternative Considered in the Statewide Environmental Impact Statement Addressing Development and Implementation of Watershed Plans under the Watershed Planning Act (Chapter 90.82 RCW)
  - **Appendix C:** Estimated Ecology Full Time Equivalents (FTEs) Needed to Implement the WRIA 30 Watershed Management Plan
  - **Appendix D:** WRIA 30 Stream Gauge Locations and Periods of Operation

## **2.0 EXISTING CONDITIONS**

This section summarizes existing conditions in WRIA 30, including water rights, use, allocation, and demand; surface and ground water resources; surface and ground water quality, and fish habitat. This section provides basic background information summarized from the WRIA 30 Watershed Assessment (Watershed Professionals Network (WPN) and Aspect, 2005). The reader is referred to the WRIA 30 Watershed Assessment for more detailed information regarding the subjects covered in this section, including references and citations supporting the information and methods used to develop the assessment.

### **2.1 PHYSICAL SETTING**

WRIA 30 is located in Klickitat and Yakima Counties in south central Washington. The primary rivers in the WRIA are the Klickitat River and the Columbia River. The headwaters of the Klickitat River drain from Mount Adams and the eastern flanks of the Cascade Mountains. The primary tributary to the lower Klickitat River is the Little Klickitat River, which drains the Simcoe Mountains located to the east of the mainstem Klickitat River.

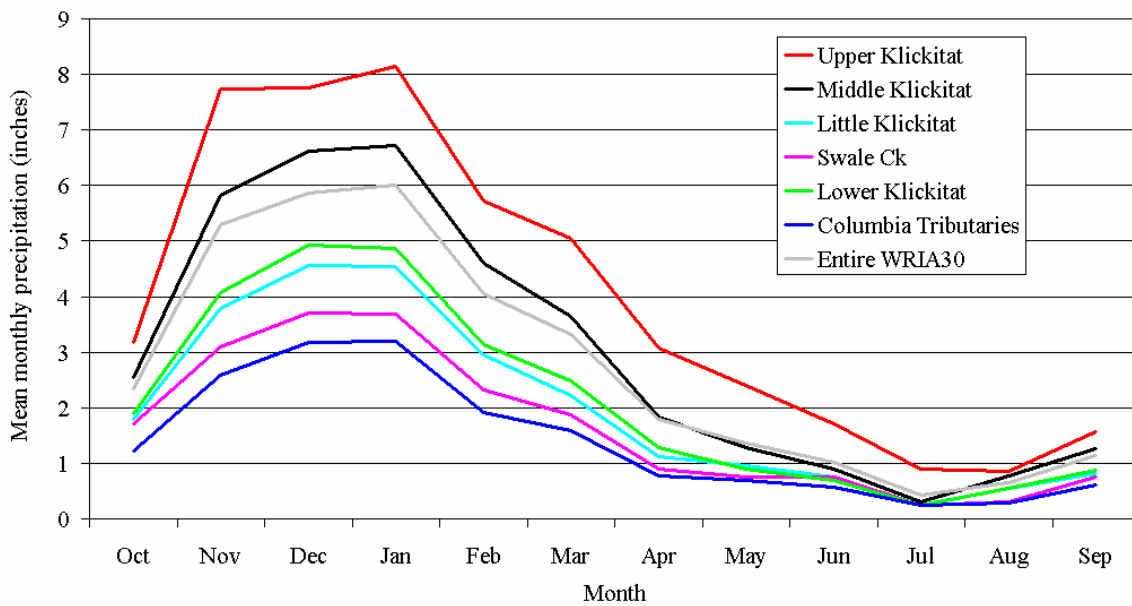
For the purposes of the watershed assessment, WRIA 30 was subdivided into six subbasins (Figure 2). These include the Upper Klickitat, the Middle Klickitat, the Lower Klickitat, the Little Klickitat, Swale, and Columbia Tributaries Subbasins. Most of the subbasins incorporate one or more major tributaries as well as some of the smaller side tributaries that drain to the Klickitat River; however, the subbasin designated as “Columbia Tributaries” encompasses several very small tributaries, all of which drain directly to the Columbia River. Most of the Upper Subbasin and the eastern half of the Middle Klickitat Subbasin are within the Yakama Indian Reservation, which were nominally addressed in the assessment.

Elevation in the WRIA ranges from 75 feet at the Columbia River to 12,296 feet at the crest of Mount Adams (Table 1). The Upper Klickitat Subbasin contains many areas of high topographic relief, particularly near Mt. Adams. Many of the headwater areas of the Little Klickitat River are also relatively steep. The remainder of WRIA 30 consists primarily of low rolling hills with the exception of areas where water features have dissected the underlying bedrock creating steep canyon areas. Such canyons can be found in the lower reaches of the Little Klickitat River, the lower Klickitat River Subbasin, the lower portion of Swale Creek, near the mouths of most of the tributaries to the Klickitat and Little Klickitat Rivers, and in the smaller tributaries along the Columbia River.

Precipitation is highly variable in the WRIA. Mean annual precipitation generally increases with elevation and from east to west. Mean annual precipitation is as little as nine inches per year in the eastern end of the Columbia Tributaries Subbasin and as high as 105 inches per year on Mount Adams in the Upper Klickitat Subbasin (Figure 3).

**Table 1. Subbasin areas and elevations. Data Source: United States Geologic Survey (USGS) (2001).**

Subbasin	Drainage area (mi <sup>2</sup> )	Elevation (ft)			Average Annual Precipitation (in)
		Median	Min.	Max.	
Upper Klickitat	350	4,518	1,969	12,276	67
Middle Klickitat	467	2,644	558	9,397	51
Little Klickitat	280	2,275	558	5,824	26
Swale Ck	126	1,785	509	3,219	23
Lower Klickitat	128	1,913	75	3,166	26
Columbia Tributaries	91	929	75	3,215	20
<b>Entire WRIA 30</b>	<b>1,442</b>				



**Figure 3. Mean monthly precipitation distribution.**

In average years, a shallow snow pack is typically present on the first day of January in the majority of the Upper, Middle, and Little Klickitat Subbasins and in approximately half of the Lower and Swale Creek Subbasins. Snow is largely absent in the Columbia Tributaries Subbasin on the first day of January. Snow pack typically increases in depth throughout the winter and spring in the Upper Klickitat Subbasin and in the higher elevation areas of the Middle and Little Klickitat Subbasins. Snow pack is typically at its maximum by the first day of April.

The extensive erosion-resistant basalts, which dominate the basin, have formed deep (700 to 1500 feet) steep-walled canyons. Local variations in erosion resistance of the underlying geology have resulted in the formation of cascades and waterfalls along the mainstem and in many tributaries. This geomorphology creates a pattern where most of the Klickitat mainstem is a canyon with steep walls and a narrow valley floor. There are several waterfalls in these reaches, which are among the main factors limiting anadromous fish distribution in the watershed. The stream reaches in the plateau areas are lower gradient and are able to develop meander patterns. These areas tend to have more agricultural, urban, and recreational land use.

Geology in the watershed is primarily of volcanic sources. From the surface down (youngest to oldest), the geologic units of primary significance with respect to WRIA 30 ground water are:

- Quaternary Volcanics (including Simcoe Volcanics)
- Wanapum Basalt
- Grande Ronde Basalt

Alluvium is present in depositional areas along lower gradient sections of streams. Additionally, a deposit of alluvium that is up to 250 feet deep is present in the Swale Valley. A fault on the western edge of the Swale Valley acts as a barrier to ground water flow out of this alluvial plain.

## **2.2 POPULATION AND ECONOMY**

In 1990, the population of Klickitat County was 16,616 people (U.S. Census Bureau). The population grew to 19,547 persons in 2000. This is a 17.6 percent increase in population over ten years. Subsequent to the year 2000 Census, the Washington State Department of Financial Management (OFM) has estimated no growth for Klickitat County. OFM estimated the 2000 population at 19,161 persons and the 2002 through 2004 population at 19,300 for the County as a whole. Significant population growth is not expected to occur in the County in the near future.

The area has traditionally relied on agricultural crop, livestock, and timber production as its primary economic sectors. Agricultural production includes primarily wheat, hay, alfalfa, barley, triticale, forage grasses, and orchards (grapes, cherries, apples, and other fruit). Cropland is most common in the Little Klickitat and Swale Creek Subbasins, but is also present in the Middle Klickitat Subbasin near the community of Glenwood and in the Columbia Tributaries Subbasin near the Columbia River. Manufacturing, aggregate mining, tourism, and wholesale and retail trade also help support the local economy. Klickitat County, the City of Goldendale, KPUD, and others are actively seeking to increase economic diversity and employment opportunities in the area.

## **2.3 LAND USE**

The majority of the watershed is forested (Table 2). Shrublands are the second most common vegetation type in the watershed. Developed areas (commercial and residential) cover less than one percent of the land in the watershed.

Two large wildlife areas are present in the watershed. The Klickitat Wildlife Area (managed by the Washington Department of Fish and Wildlife) covers roughly 14,000 acres in the Middle Klickitat Subbasin. Conboy Lake National Wildlife Refuge, located south and west of the

community of Glenwood in the Middle Klickitat Subbasin, is approximately 5,800 acres in size and is managed by the U.S. Fish and Wildlife Service.

**Table 2. Vegetation/land use in WRIA 30.**

	Upper Klickitat	Middle Klickitat	Little Klickitat	Swale Creek	Lower Klickitat	Columbia Tributaries
<b>Developed</b>	0%	0%	2%	0%	0%	2%
<b>Barren</b>	9%	8%	4%	0%	2%	0%
<b>Vegetated; Natural Forested Upland</b>	83%	85%	57%	11%	75%	6%
<b>Shrubland</b>	3%	1%	20%	47%	11%	50%
<b>Grasslands/Herbaceous</b>	3%	1%	7%	8%	9%	27%
<b>Planted/Cultivated</b>	0%	4%	11%	33%	2%	2%
<b>Other</b>	1%	0%	0%	0%	0%	11% <sup>1</sup>

1/ Includes lands inundated by Columbia River reservoirs

The lower ten miles of the Klickitat River and portions of the Lower Klickitat Subbasin (near the Columbia River) are designated as a recreational river under the Wild and Scenic Rivers Act. Much of the Columbia River Tributaries Subbasin is within the Columbia River Gorge National Scenic Area.

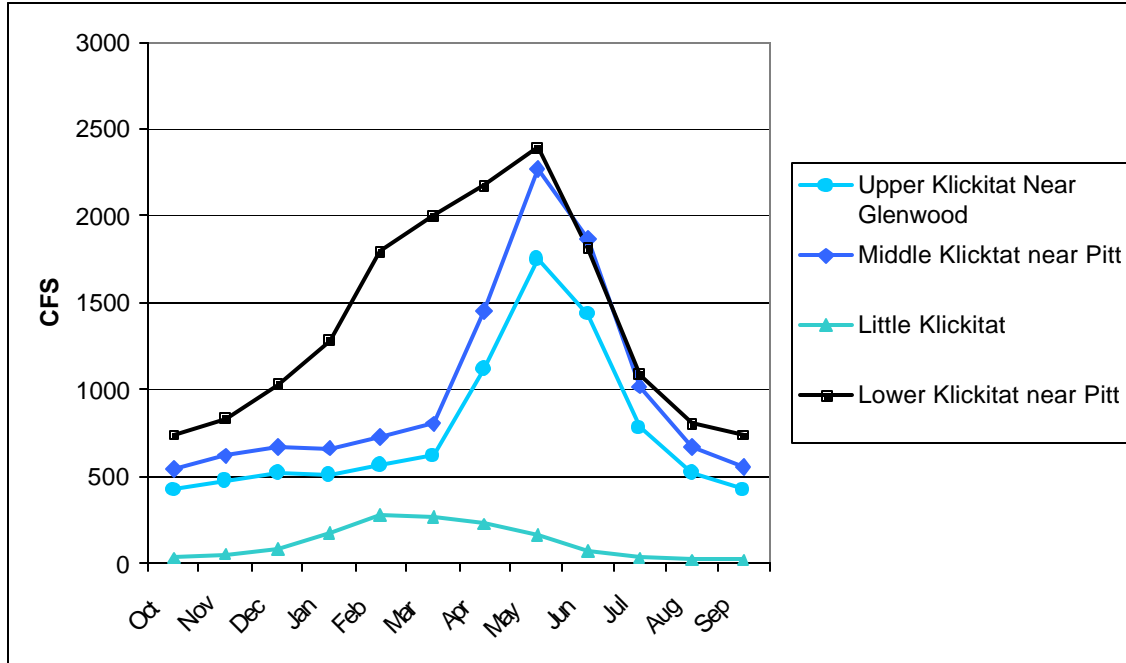
## **2.4 SURFACE WATER RESOURCES**

Portions of the mainstem of the Klickitat River originate from Mount Adams, the Goat Rocks Wilderness area, and the foothills of the Cascades Mountains. Klickitat River flow is primarily fed by snowmelt in spring and early summer and by glacial meltwater in late spring and summer. Peak flows in the mainstem tend to occur in late May and early June (Figure 4). The Little Klickitat River flows from the Simcoe Mountains and is largely fed by snowmelt supplemented by base flow from ground water sources. Snow melts out of the Simcoe Mountains earlier than in the Cascade Mountains and snow pack tends to be substantially lower. As a result, peak flows in the Little Klickitat River tend to occur in late February or early March, roughly three months earlier than in the mainstem Klickitat River (Figure 4). Most of the stream flow gauges in WRIA 30 are no longer active (Appendix D). Stream flow records that ended 20 years are likely not reflective of current conditions.

## **2.5 GROUND WATER RESOURCES**

Ground water within WRIA 30 occurs both within the basalt bedrock units and in the surficial alluvium (overburden). Ground water in the basalts occurs primarily at the tops of the individual volcanic flows where the rock formations are porous and permeable.





**Figure 4. Average stream flow (fifty percent exceedance) estimated at three locations on the mainstem Klickitat River and for the Little Klickitat River.**

Sediments are often layered between basalt flows (interbeds). These sediments may also transmit ground water if they are coarse-grained. Because the composition, thickness, and extent of the interbeds are highly variable, ground water production from these geologic units is correspondingly variable. A single basalt formation (e.g., Wanapum Basalt) can encompass multiple individual basalt flows. As a result, each formation can encompass multiple layered sequences of aquifer zones (interflows) separated by relatively impervious rock.

The continuity and distribution of water-bearing zones within the basalt bedrock are affected by the geologic structures. Folds and faults can disrupt the continuity of the permeable interflow zones. For example, the weight of evidence strongly suggests that the Warwick Fault, which crosses the southwestern edge of the Swale Creek valley, acts locally as a hydraulic barrier impounding ground water on the up gradient (east) side of the fault (toward Centerville). Faults also can provide conduits for vertical ground water flow between water-bearing zones. Erosional canyons can also limit lateral continuity of shallower ground water-bearing zones. Canyons dissect the basalt surface and can restrict lateral movement of ground water, subsequently limiting the productivity of shallower aquifer systems.

### 2.5.1 MAJOR AQUIFERS

From the surface down (youngest to oldest), the geologic units of primary significance with respect to WRIA 30 ground water are:

- Alluvium

- Quaternary Volcanics (including Simcoe Volcanics)
- Wanapum Basalt
- Grande Ronde Basalt

**Alluvium:** Alluvial deposits tend to be found in depositional (flatter) areas. These deposits are typically aggregations of materials transported and deposited by surface waters or glacial action. In most areas within WRIA 30, the alluvial areas are relatively small and seldom contain sufficient ground water to support water uses. There are two known alluvial areas that provide substantial amount of ground water. These are located in the Swale Creek Valley and in the Camas Prairie area (Middle Klickitat Subbasin).

Within the Swale Creek Subbasin, a deposit of alluvium exists that is up to 200 feet or greater in depth. This deposit serves as a source of water for water users in the subbasin. The Warwick Fault, running northwest-southeast through Warwick, is an important structural control on ground water flow in this subbasin. The weight of evidence indicates that the fault forms a structural closure to the Swale Creek valley and impounds ground water to the east of the fault, holding it within the alluvial aquifer in the valley. Swale Creek between approximately Highway 97 and Warwick is an expression of the water table in the Alluvial Aquifer. As such, it is ephemeral or of a seasonal nature directly related to the ground water level in the alluvium. In early spring, ground water levels in the alluvium are generally high (shallow depth below the ground surface). Localized flooding of the low-lying areas around Swale Creek has reportedly occurs during wet periods in the late winter and early spring. This portion of the creek is generally dry by late spring/early summer and for the balance of the year as ground water levels in the alluvium decline. Ground water level data from the 1960s to present indicate the ground water levels rebound each spring, with no apparent long-term water level declines in that period.

Within the Middle Klickitat Subbasin, Camas Prairie consists of a large expanse of alluvium up to 160 feet deep. Shallow wells (including dug wells) in the alluvium are common, with small to moderate yields depending on the permeability of the alluvium.

**Quaternary Volcanics:** Within the Little Klickitat Subbasin, the Quaternary-aged Simcoe Volcanics, which form the Simcoe Mountains, represent an important source of ground water. The Simcoe Volcanics are made up of many volcanic flows that have a coarse, open texture that permits rapid recharge and good vertical and lateral movement of water. Because of the high permeability of some zones in the Simcoe Volcanics, they can provide large quantities of ground water. The majority of the documented springs in this subbasin discharge from the Simcoe Volcanics and often feed the numerous tributary streams to the Little Klickitat River.

**Wanapum Basalt:** The Wanapum Basalt is the largest source for ground water supply, particularly for large irrigation and municipal withdrawals across the mid and southern portion of WRIA 30. Available geologic data indicate that the Wanapum Basalt extends to depths of roughly 750 feet in the Goldendale area. Yields from this aquifer are normally less than 500 gallons per minute (gpm), although a few of the deeper wells are capable of producing greater than 1,000 gpm. Ground water in the Wanapum regionally flows toward the southwest, but a significant ground water divide occurs between the Goldendale area and the Centerville area.

From this ground water divide, ground water flows in the basalt northward to the Little Klickitat River and southward to the Swale Creek valley.

**Grande Ronde Basalt:** Relatively few wells within WRIA 30 produce ground water from the Grande Ronde Basalt, and those that do are typically deep wells (greater than 400 feet deep) used for irrigation in the southern portion of the watershed. Ground water in the Grande Ronde flows toward the south and appears to discharge to the mainstem Klickitat River and the Columbia River. In the Goldendale area and immediately north of Goldendale, deep wells completed in the Grande Ronde have water quality unsuitable for potable use (mineralized water with high total dissolved solids and localized presence of hydrogen sulfide). Little information regarding ground water in the Grande Ronde is available for the northwestern portion of the watershed.

## 2.5.2 GROUND WATER RECHARGE

Ground water recharge within WRIA 30 (Table 3) occurs primarily through the infiltration of precipitation (both rain and snowmelt), and secondarily as seepage from surface waters and from anthropogenic effects (e.g. return flows from irrigation and septic systems). The United States Geologic Survey (USGS) estimated that recharge for the current land use is nearly 60 percent greater than under pre-development land uses, primarily due to irrigation return flows.

**Table 3. Estimated Annual Recharge Volumes by Subbasin**

<b>Subbasin</b>	<b>Area (acres)</b>	<b>Ave. Annual Recharge Rate (inch/yr)</b>	<b>Ave. Annual Recharge Volume (acre-ft/yr)</b>	<b>Relative % Contribution to Recharge</b>
Upper Klickitat	224,113	15	280,000	33%
Middle Klickitat	298,831	14	345,000	41%
Little Klickitat	179,195	7	109,000	13%
Swale	80,490	4	26,000	3%
Lower Klickitat	82,111	10	69,000	8%
Columbia Tribs	58,155	3	12,000	2%
<b>WRIA 30 Totals</b>	<b>922,915</b>	<b>-</b>	<b>841,000</b>	

## 2.6 HYDRAULIC CONTINUITY OF SURFACE AND GROUND WATER SOURCES

There are varying degrees of hydraulic continuity between ground water and surface water in WRIA 30. Continuity between water bodies depends largely on the position of the ground water aquifer relative to the surface water body and the presence or absence of low-permeability materials or structural controls between the two.

The Middle Klickitat Subbasin includes the Camas Prairie region west of the Klickitat River and the Summit Creek drainage east of the Klickitat River. The Camas Prairie consists of a large expanse of alluvium that holds substantial quantities of ground water. Springs are common in

the Camas Prairie (Glenwood) area reflecting the abundance of shallow ground water in the region. Substantial quantities of spring water discharge to local streams. This discharge is indicative of direct hydraulic continuity between shallow ground water (alluvium) and streams in this portion of the Middle Klickitat Subbasin.

Ground water production in the Little Klickitat River Subbasin occurs primarily from the Wanapum Basalt and, north and west of Goldendale, from the younger Simcoe Volcanics. Several wells north and west of Goldendale produce ground water of excellent quality from the Simcoe Volcanics. Subsurface collection of spring discharge from the Simcoe Volcanics provides the City of Goldendale's primary municipal water supply.

As was previously discussed, the Swale Creek Subbasin is an alluvium-filled basin. Alluvial deposits have filled the depression over an area measuring approximately three miles wide and eight miles long, with depths to bedrock along the axis of Swale Creek to greater than 250 feet near Centerville. Ground water in this basin occurs within both the alluvial deposits and the underlying Wanapum and Grande Ronde Basalts. The Warwick fault on the western margin of the Swale Creek Valley impedes westerly ground water flow within the alluvium and basalt aquifers, and thus impedes ground water contribution to the Swale Creek Canyon (west of Warwick). This geologic control on ground water discharge is confirmed by low summer surface water flows and lack of any significant springs within Swale Creek Canyon.

The Lower Klickitat Subbasin encompasses the area between Wahkiacus and the Klickitat River's discharge to the Columbia River at Lyle. Ground water in this region is produced primarily from the Wanapum Basalt. In the highlands west of the Klickitat River, ground water is typically produced from shallow wells tapping the Wanapum Basalt, but yields are generally low. In areas where the Klickitat River valley is wider, some shallow wells produce from recent alluvial gravels. Ground water in the alluvium is expected to have direct hydraulic continuity with the river. Springs commonly discharge from the basalts along the walls of the Klickitat River valley in this subbasin. Wells drilled to depths of 200 to 300 feet in this area have historically flowed at the surface due to naturally occurring pressure. It is hypothesized that this ground water has migrated upward from deeper basalt zones via faults. The locations of springs adjacent to some streams in the subbasin indicate hydraulic continuity between ground water in the Wanapum Basalt and surface waters of the subbasin.

Little or no water quantity data are available for the High Prairie area, which is east of the Klickitat River in the Lower Klickitat Subbasin. High Prairie residents have expressed concern regarding the quantity and dependability of water supplies. Additional data and information are needed.

Within the Columbia Tributaries Subbasin, ground water is used primarily for municipal, domestic, and industrial supplies; the bulk of the irrigation and industrial water supply is obtained from the Columbia River. In the western half of the subbasin, springs discharging from the basalt provide small water quantities for domestic or stock-watering purposes. However, most of the ground water in this area is obtained from wells. Wells completed in close proximity to the Columbia River can be highly productive, owing largely to their direct hydraulic connection with the river.

## 2.7 WATER RIGHTS, WATER USE, FUTURE DEMAND, AND WATER AVAILABLE FOR ALLOCATION

### 2.7.1 WATER RIGHTS, CLAIMS, AND APPLICATIONS

A total of 59,577 acre-feet/year of water is allocated to 881 water right certificate and permit holders (Table 4). The vast majority (77 percent) of water allocated within the watershed is for irrigation use (Figure 5). Water rights allocated for municipal, domestic, commercial/industrial, heat exchange, and railway uses collectively make up an additional 22 percent of the total allocation. Water rights allocated for stock watering, fire protection, fish propagation, and wildlife propagation collectively make up less than one percent of the total. The majority of the water right certificates and permits are located in the Little Klickitat, Swale, and Columbia Tributaries Subbasins (Figure 6).

There are 1,178 claims in WRIA 30 for a total of 91,062 acre-feet of water per year (Table 4). The overwhelming majority of water claimed is for irrigation use. There are also 92 water right applications for new appropriations (ground water and surface water) pending in WRIA 30. The cumulative rate of diversion/withdrawal encompassed by these applications is approximately 1,170 acre-feet per year. The largest number of applications, but not necessarily the largest quantities requested, is for irrigation use. Annual quantities are determined during the permitting process and thus not recorded for applications.

**Table 4. Number of certificates and permits, claims, and applications for WRIA 30 and the corresponding water volumes associated with those certificates, permits, claims, and applications in acre-feet per year.**

	Ground water Certificates and Permits		Surface Water Certificates and Permits		Claims		Applications
	Number	ac-ft/yr	Number	ac-ft/yr	Number	ac-ft/yr	Number
Upper Klickitat	0	0	10	10	28	43300	0
Middle Klickitat	6	487	188	699	278	44590	5
Little Klickitat	181	18910	259	15136	182	1536	31
Swale Creek	58	11632	7	27	273	15	22
Lower Klickitat	15	217	67	3002	240	13	16
Columbia Tributaries	61	7997	29	1468	177	1608	18
<b>Total</b>	<b>321</b>	<b>39243</b>	<b>560</b>	<b>20342</b>	<b>1178</b>	<b>91062</b>	<b>92</b>

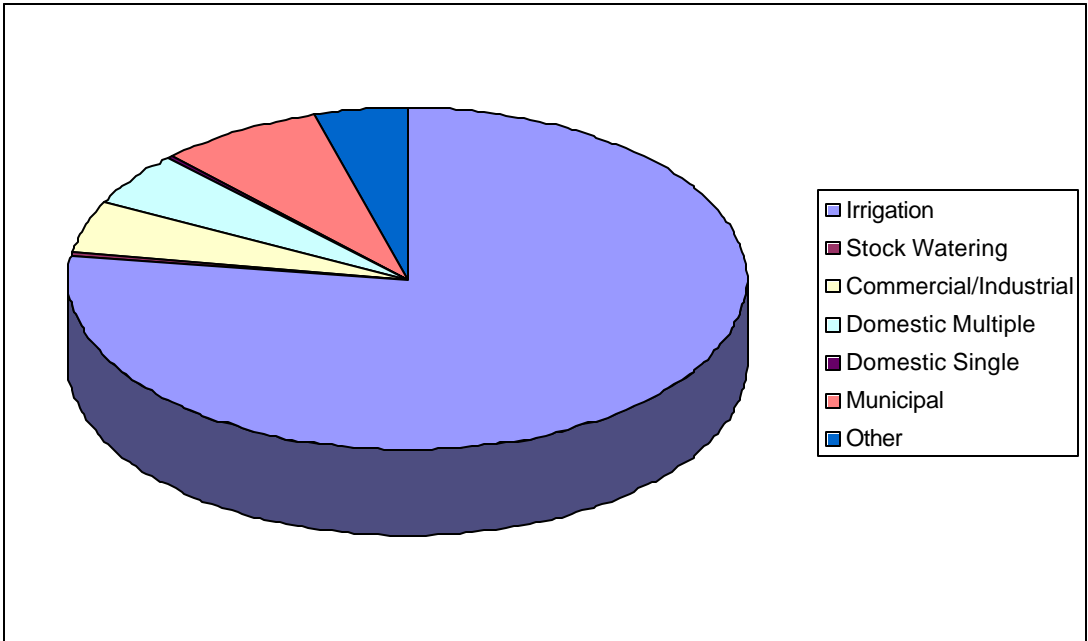


Figure 5. Distribution of the total allocated acre-feet per year of water across use.

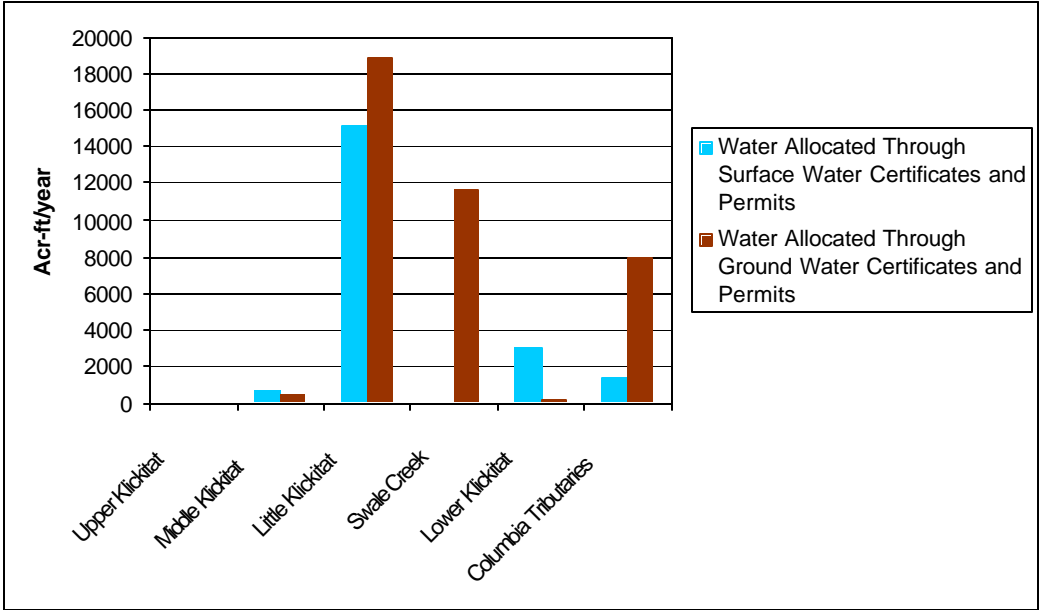


Figure 6. Surface and ground water volumes allocated through certificates and permits in each subbasin.

## 2.7.2 WATER USE

Estimates of actual water use are important for comparison against appropriated ("paper") water rights and for developing a preliminary water budget for WRIA 30. Typically, actual water use will be lower than water right appropriations because recorded water rights may be inactive or development of the allocated resources may be constrained by a variety of factors. With the exception of the larger purveyors, water use has historically not been metered, although this is changing with promulgation of a metering rule (Chapter 173-173 Washington Administrative Code (WAC)) by Ecology. Therefore, preliminary estimates of actual water use were based on available information and numerous assumptions.

Irrigation represents the overwhelming majority (approximately 92 percent) of the total water use in WRIA 30, which is consistent with the results of the water rights analysis (Table 5). Residential (including exempt wells) and non-residential uses comprise roughly seven and one percent of the total water use, respectively.

**Table 5. Estimated Total Water Use for WRIA 30 by Subbasin in 2003<sup>1</sup>**

Subbasin	Estimated Water Use (Acre -Feet/Year) by Category				Subbasin totals
	Irrigation	PWS-Supplied Residential	Self-Supplied Residential	PWS Non-Residential	
Middle Klickitat	13,895	154	13	10	14,072
Little Klickitat	9,788	750	477	400	11,415
Swale Creek	5,729	3	19	0.1	5,751
Lower Klickitat	0	111	307	26	444
Columbia Tributaries	48	358	56	34	496
WRIA 30 Totals:	29,459	1,376	871	471	32,177
% of Total WRIA 30 Use:	92%	4%	3%	1%	100%

<sup>1</sup>Estimated use in the Little Klickitat Subbasin does not reflect the water use of the new Goldendale energy plant (see text)

## 2.7.3 FUTURE DEMAND

Future demand is influenced by expected change in population, expected change in industrial/commercial uses, and expected change in existing water uses. At present, residential and non-residential water use comprise only eight percent of the total water used in the WRIA. This includes water use by self-supplied users. Irrigation uses consume 92 percent of the water used.

There is currently little or no human population growth in Klickitat County. For the foreseeable future, water consumption for residential use is likely to continue to be nominal relative to irrigation use.

At present, water consumed by commercial/industrial uses is only one percent of the total volume used in the WRIA. A new energy plant has recently gone online in Goldendale. The

plant is permitted to use a maximum of 660 gallons per minute. Future changes in commercial demand are not projected, but substantial change could occur if additional water-dependent industries move into the WRIA.

The number of irrigated acres in the WRIA has declined over the last decade, but future water demand for irrigation is unknown. Demand will be affected by economic and other factors. Given that irrigation comprises the largest water use in WRIA 30, estimates of future demand can be improved with additional information.

## 2.7.4 WATER AVAILABLE FOR ALLOCATION

Additional information is necessary to adequately assess the quantity of ground water available for allocation. Estimates of annual recharge are available, however the quantity of ground water discharged to streams is unknown in most areas. The portion of the estimated irrigation use that is drawn from ground water is also uncertain in some areas; hence, additional information is needed to support estimates of the total amount available for allocation. Ground water appears to be abundant in the Camas Prairie (Glenwood) area and the Simcoe volcanics located in the northern portion of the Little Klickitat basin. The Wanapum basalts are also quite productive. The quantity of water available for allocation from these areas is unknown. Surface water available for allocation is uncertain due to lack of data regarding actual water use in some areas and uncertainties regarding the quantity of water needed to provide for specified beneficial uses.

No estimates of water use were available for the Upper Klickitat Subbasin. Recorded water right allocations are nominal in the subbasin relative to stream flows. The recorded water rights do not include federally reserved rights; hence, the total use of water in the subbasin is highly uncertain.

Total estimated annual surface water use in the Middle Klickitat Subbasin is equivalent to approximately two percent of the average annual 50 percent exceedance flow, and annual ground water use is equivalent to slightly less than one tenth of a percent of the total annual ground water recharge volume. Total annual surface water allocations (including claims) are equivalent to roughly six percent of the 50 percent exceedance flows, and ground water allocations are equivalent to approximately one tenth of a percent of the annual ground water recharge. Water use is concentrated from April through September, which includes the summer months when

### Explanation of Exceedance Flows

**Exceedance flows** express the proportion of time that a specified daily flow is equaled or exceeded during the period of record. In general, higher exceedance flow values represent low flow situations and vice versa.

For example, stream flows are greater than the 90 percent exceedance flow for 90 percent of the time during which stream flows were recorded. Hence, the 90 percent exceedance flow is an unusually low flow.

The 10 percent exceedance flow is the flow which is equaled or exceeded only 10 percent of the time during which flows were recorded. Since the 10 percent exceedance flow is rarely exceeded, it is a measure of larger peak flows.

The 50 percent exceedance flow is roughly equivalent to the average flow measured over the period of record.

When exceedance flows are calculated, actual measured stream flows are used. Hence, exceedance flows do not reflect "natural" conditions, but rather conditions that exist with water uses in place. Since, exceedance flows are usually calculated over a long period of time, changes in water use over that period of time contribute to some of the variability in the data.



stream flows are naturally lowest. Current water use is estimated to be equivalent to roughly six percent of the summer 50 percent exceedance flow. Note that the exceedance flows reported in this paragraph and elsewhere in this plan were determined using flow data from a period of record during which water diversion was occurring and, therefore, do not reflect pre-development flow conditions.

The Little Klickitat Subbasin has the second highest estimated water use in WRIA 30. The estimated annual surface water use is equivalent to approximately six percent of the average annual 50 percent exceedance flow, and annual ground water use is equivalent to approximately six percent of the annual ground water recharge. Total annual surface water allocations (excluding claims) are equivalent to roughly 17 percent of the 50 percent exceedance flows, and ground water allocations are equivalent to approximately 17 percent of the annual ground water recharge. Recharge is estimated at 109,000 acre-feet per year, which is roughly ten times higher than the estimated use in the basin. The majority of the water use is in summer when flows are lowest.

Total water use within the Lower Klickitat River subbasin is negligible. The cumulative water use, which is the sum of the use within the subbasin plus water use in all subbasins upstream, is negligible in winter. In summer, estimated use is equivalent to approximately 7.3 percent of the 50 percent exceedance flow.

Sufficient information is not available to develop water budgets for the Swale Creek and Columbia River Tributaries Subbasins. With the exception of the Columbia River, most of the creeks in these subbasins are dry or near dry in summer; hence, no surface water is available for allocation in summer months. However, ground water in the underlying aquifers appears to be abundant. Columbia River flow was not assessed during the watershed planning effort, but should be addressed in future planning efforts

## **2.8 WATER QUALITY**

### **2.8.1 SURFACE WATER**

Twelve streams and stream segments in WRIA 30 have been included on Ecology's 1998 list of impaired water bodies (303d list) (Table 6). Most of the listings are in the Little Klickitat Subbasin or the Columbia River. The identified impairments include segments impaired due to temperature, instream flows, dissolved oxygen, dioxin, pH, and chlorine.

**Middle Klickitat Subbasin:** There were no water quality data sources or reports identified for the Middle Klickitat Subbasin. Big Muddy Creek, a tributary to the West Fork Klickitat River, originates at the Rusk and Klickitat glaciers on the east flank of Mount Adams, and Little Muddy Creek originates at the Wilson glacier. There are occasional natural glacial outbursts that feed a significant volume of water and volcanic debris into Big Muddy Creek. Little Muddy Creek also carries a large volume of fine sediments due to the weathering of volcanic rocks and glacial action. During the warmest months, a sediment plume from these tributaries colors the Klickitat River from the West Fork to the Columbia River 63 miles downstream.

**Table 6, Streams and stream segments in WRIA 30 that are on Ecology’s 1998 303(d) list.**

		PARAMETER					
Stream Name	Ecology’s Segment ID	Temperature	Instream Flow	Dissolved Oxygen	Dioxin	pH	Chlorine
Blockhouse Creek	ID95ML		◆				
Bloodgood Creek	XU61DO		◆				
Bowman Creek	TN94DB		◆				
Butler Creek	YU86SG	◆					
Little Klickitat River	AY21LB	◆	◆	◆		◆	◆
East Prong	PW77VQ	◆					
East Prong	PU81CT	◆					
East Prong	AG85MX	◆					
West Prong	XU61EK	◆					
Mill Creek	FF43IZ		◆				
Swale Creek	XN32HN	◆	◆				
Columbia River	NN57SG	◆		◆	◆		

**Lower Klickitat Subbasin:** The Lower Klickitat Subbasin is the area that lies below the confluence with the Little Klickitat with the mainstem Klickitat River. The water quality issues identified in the Lower Klickitat Subbasin are elevated stream temperatures, periodic high sediment loads, elevated fecal coliform bacteria, and nutrient loading. Information on most of these situations is supported by limited data.

**Little Klickitat Subbasin:** Several stream segments in the Little Klickitat Subbasin are listed on Ecology’s 1998 303(d) list due to exceedance of the State temperature criteria and low instream flows. A Technical Report supporting a Total Maximum Daily Load (TMDL) for the Little Klickitat River was completed in July of 2002 (Brock and Stohr, 2002). A Detailed Implementation Plan was released in March of 2005 (Anderson, 2005). Actions addressing shade levels and stream flow in the Little Klickitat have been implemented since the TMDL Technical Report was completed. The TMDL Technical Report information should be updated to reflect those actions.

The stream flow impairment listings for water bodies in the Little Klickitat Subbasin are based on an Instream Flow Incremental Methodology (IFIM) study (Caldwell, 1990). However, several aspects of this IFIM study were not conducted in conformance with standard IFIM

methodologies. Additional data and information on stream flows in the Little Klickitat Subbasin are needed.

In addition to the temperature TMDL, a TMDL addressing total residual chlorine and biochemical oxygen demand (BOD) discharges from the Goldendale Wastewater Treatment Plant was developed by Ecology in 1993 (Pederson, 1993). The TMDL did not set load allocations, but recognized that modifications to the treatment plant completed in 1984 addressed previously identified issues. The treatment plant has undergone significant changes since that TMDL was completed. Hence, the information in that TMDL is now out of date. Surface waters in the Little Klickitat Subbasin were tested for fecal coliform and nitrate content in 2003. All nitrate samples were well below the State drinking water criteria. Elevated fecal coliform concentrations were found at one location in Blockhouse Creek and one location in Bloodgood Creek. These measurements of fecal coliform concentrations were based on single grab samples. Additional sampling to determine the scope of the problem, if any, is warranted.

**Swale Creek Subbasin:** A segment of Swale Creek near the confluence with the Klickitat River is listed on Ecology's 1998 303(d) list as impaired due to exceedance of water temperature criteria. A water quality study was completed between June and December 2003 to assess the water temperature situation in Swale Creek and to estimate the potential and natural temperature situation in the lower portion of the creek which runs through a canyon (WPN and Aspect, 2005). The temperature criterion of 18°C was exceeded at all stations monitored in 2003. Under current conditions, the upper two reaches of the canyon (covering roughly nine miles) are largely dry, with isolated bedrock dominated pools. In this area, shade tends to be very sparse around the pools (<25 percent; Figure 7). The lower three miles of Swale Creek (excluding the mouth), is continuously wet in summer, though flow is negligible (estimated at 0.25 to 0.5 cfs during 2003 study). Shade in the lower three miles approaches 100 percent effective shade in some areas. The lack of soils and water in Swale Creek downstream of Warwick is the primary limiting factor on the development of riparian vegetation.



**Figure 7. Typical pool in the intermittent portion of Swale Creek Canyon.**

The survey notes from the Government Land Office (GLO) surveys conducted from 1861 to 1872 indicate that vegetation in the area was either non-existent or “scattered” along most of the creek. The lower five miles of the creek apparently had denser vegetation. Temperature modeling suggests that Swale Creek stream temperatures could be reduced slightly with additional shade. The model was applied in a situation that was outside of the data used to develop the model, which can potentially introduce substantial error. Therefore, the results of the modeling should be interpreted carefully. The weight of evidence strongly suggests that the

stream flow conditions in Swale Creek are unchanged relative to conditions prior to development.

**Columbia Tributaries Subbasin** The Columbia River is listed on Ecology's 1998 303(d) list due to exceedances of the State standards/criteria for total dissolved gas, temperature, and instream flow.

## **2.8.2 GROUND WATER**

Most ground water data were collected by water purveyors as part of their routine monitoring of water supply wells. Since the mid-1990s, one time testing of newly constructed residential wells has been required, and this testing provided another source of ground water quality data. There is no large-scale ground water monitoring plan in place that can be used to evaluate potential effects of land use on ground water quality or long-term trends in water quality. The available data indicate that most ground water and monitored water supplies are well within drinking water standards, although some aquifers have high concentrations of sediments and the alluvial aquifer in the Swale Creek and lower Little Klickitat Subbasins has localized areas of elevated nitrate levels. Higher concentrations of nitrate tend to be found in wells that tap the upper 150 feet of the aquifer. Wells with elevated nitrate concentrations are correlated with elevated chloride concentrations, suggesting a septic source for the nitrate. A study conducted primarily in the Swale and Little Klickitat Subbasins (but also included samples from the middle and Lower Klickitat Subbasins) found no detectable fecal coliform concentrations in ground water samples drawn from wells.

## **2.9 FISH HABITAT**

Actual data documenting fish population distributions, fish population size, and habitat quality within the WRIA are sparse within the published record. A watershed analysis conducted in the upper Little Klickitat Subbasin provided in-depth information for that portion of the WRIA. Another study provided geomorphic information regarding the Swale Creek Subbasin. A study addressing the distribution of bull trout in the basin was also completed. Other published studies provided generalized descriptions or habitat conditions with limited reported data. The reader is referred to the WRIA 30 Watershed Assessment, Appendix A, Section 3 for further discussion on this issue. Studies designed to document current fish distribution, habitat quality, and land use interactions with aquatic habitat are highly recommended to fill this information gap.

### **2.9.1 FISH POPULATIONS**

Currently, there are three stocks of chinook salmon (spring, tule, upriver bright), coho salmon, two stocks of steelhead (summer, winter), bull trout, rainbow/redband trout, and mountain white fish in the Klickitat watershed (Table 7), as well as several non-salmonid fish species. Winter and summer steelhead and bull trout are listed under the Endangered Species Act as threatened. Summer steelhead are known to be native to the Klickitat watershed. Winter steelhead were not observed in the basin before the early 1980s, but are presumed in various documents to have been present historically. Tule fall chinook and coho were introduced starting in the 1940s and early 1950s. Upriver bright fall chinook are also considered to be an introduced stock. They were first found in the basin in 1989. Information on current population size is not available.

Currently, hatchery spring and fall bright chinook salmon, coho salmon, and summer steelhead are released into the Klickitat River, and hatchery rainbow trout are released in the Goldendale area of the Little Klickitat River. These hatchery released are primarily, if not entirely, for harvest augmentation purposes.

**Table 7: Klickitat River Watershed Salmon, Steelhead, and Bull Trout Stock Profiles (WDF and WDW 1992; WDFW 1998).**

<b>Stock</b>	<b>Major Subbasin(s)</b>	<b>Endangered Species Act (ESA) Status<sup>3</sup></b>	<b>SASSI Status<sup>4</sup></b>
<b>Spring Chinook</b>	Lower and Middle Klickitat, Portions of Upper Klickitat, Little Klickitat, Swale Creek <sup>2</sup>		Depressed
<b>Fall (Tule) Chinook</b>	Lower and Middle Klickitat		Depressed
<b>Fall Upriver Bright (URB) Chinook</b>	Lower and Middle Klickitat		Depressed
<b>Summer Chinook</b>	Lower and Middle Klickitat		?
<b>Coho<sup>1</sup></b>	Lower and Middle Klickitat Portions of Upper Klickitat, Little Klickitat <sup>2</sup>		Depressed
<b>Winter Steelhead</b>	Lower and Middle Klickitat, Upper Klickitat, Little Klickitat, Swale Creek <sup>2</sup>	Threatened	Unknown
<b>Summer Steelhead</b>	Lower and Middle Klickitat, Upper Klickitat, Little Klickitat, Swale Creek <sup>2</sup>	Threatened	Unknown
<b>Bull Trout</b>	Upper Klickitat	Threatened	Unknown

<sup>1</sup> Note coho were introduced to the watershed starting in the 1940s and early 1950s and are not a native. Stock depressed indicates that current numbers are lower than previous years.

<sup>2</sup> Distribution is limited to the lower 14 miles of Swale Creek. Distribution of chinook and coho in the Little Klickitat is limited to the lower 6.1 miles of the stream. Passage of steelhead upstream of river mile 6.1 in the Little Klickitat is uncertain, see text.

<sup>3</sup> ESA status as of April, 2004

<sup>4</sup> State Salmon and Steelhead Stock Inventory

To date, the carrying capacity of the watershed for salmonid species has not been determined and the risks to indigenous wild fish populations posed by the release of large numbers of hatchery fish have not been evaluated. A recent evaluation (Independent Scientific Review Panel (ISRP), 2005) of proposed changes to hatchery programs and hatchery and fish passage facilities in the Klickitat basin indicates that the hatchery releases and fish harvest levels in the Klickitat River may be limiting recovery of the indigenous wild spring chinook and steelhead stocks. Additional data and information on the fish aquaculture programs in the Klickitat basin is needed.

Twelve races of four species of anadromous salmonids are found in the Columbia River within the WRIA waters (including those passing through to upstream watersheds) (Table 8). Seven of these races are listed as threatened or endangered under the Endangered Species Act. The

Columbia River also supports a diversity of native and introduced resident fish species and a few additional anadromous species.

**Table 8. List of anadromous salmonids present in the WRIA 30 Columbia River waters during some portion of their life cycle (including migration) ([www.nwr.noaa.gov](http://www.nwr.noaa.gov))**

SPECIES	STOCK	ESA STATUS
Chinook Salmon <i>(Oncorhynchus tshawytscha)</i>	Upper Columbia River Spring	Endangered
	Mid-Columbia River Spring	Not listed
	Upper Columbia River Summer/Fall	Not listed
	Snake River Fall	Threatened
	Snake River Spring/Summer	Threatened
	Deschutes River Summer/Fall	Not listed
Coho Salmon <i>(Oncorhynchus kisutch)</i>	Introduced (historic stocks extinct)	Not listed
Sockeye Salmon <i>(Oncorhynchus nerka)</i>	Lake Wenatchee	Not listed
	Snake River	Endangered
Steelhead <i>(Oncorhynchus mykiss)</i>	Snake River	Threatened
	Middle Columbia River	Threatened
	Upper Columbia River	Endangered

## 2.9.2 FISH PASSAGE

One of the major limitations on anadromous fish production is the presence of a number of natural migration barriers in the watershed. The Klickitat River flows through a deep, steep walled canyon with historically impassable or marginally passable falls and cascades where the river flows over resistant bedrock. In addition, access to many of the tributaries is restricted because there are impassably high gradients close to the tributary mouths. The most significant natural fish passage barriers and impediments include:

- ❑ **Lyle Falls** (River Mile (RM) 2.2) is currently not a barrier to any indigenous salmon or steelhead stocks, but passage at the falls is considered difficult. Historically the Lyle Falls was a barrier to coho salmon and possibly fall chinook.
- ❑ **Castile Falls** (RM 64.0) is a series of 11 falls with an elevation change of 80 feet over one-half mile. These falls are considered the historical upper limit of anadromous fish usage on the mainstem Klickitat River (Washington State Conservation Commission (WSCC), 1999). Fish passage facilities have been installed at Castile Falls.
- ❑ **Little Klickitat River Falls** (RM 6.1) is considered passable by steelhead under some flow conditions. The frequency that the falls is passable is unknown. Larger flow events are probably required to enable passage. Long-term residents have not observed steelhead above the falls, but limited observations of redds suggest that spawning of large fish may have occurred in a high flow year. No documentation is available to determine whether the spawning fish were steelhead that passed the falls or large trout that were

stocked by the trout hatchery or escaped from trout ponds (both of which have been documented through communications with residents).

- ❑ **West Fork Klickitat River Falls** (RM 0.3 and RM 4.6) is a 15 to 20 foot falls located 0.3 miles upstream of the confluence with the mainstem of the Klickitat River. The falls is likely a passage barrier.
- ❑ **Tributary Falls**: Numerous tributaries in the WRIA, such as Outlet Creek, Bowman Creek, Canyon Creek, and Blockhouse Creek, have falls that block passage into upstream habitats.

In addition to the naturally occurring barriers, several culverts have been identified as total or partial barriers to fish passage in WRIA 30.

### **2.9.3 HABITAT CONDITIONS**

**Middle Klickitat Subbasin:** There is little specific information available regarding habitat in the Middle Klickitat Subbasin. Much of the Klickitat mainstem within the Middle Klickitat Subbasin flows through the Klickitat Wildlife area. Habitat quality in this subbasin is largely unaffected by land use. Habitat quality in the subbasin is generally in excellent condition. An adjacent road and grazing in the area may have some unquantified effect on habitat associated with sediment inputs and local reductions in shading. The river in this subbasin is rather wide and small reductions in shading are unlikely to have measurable effects on temperature. In a couple of locations, the road has cut the river off from a small section of the floodplain, but in most areas, the road is located upslope of the floodplain. Some minor residential development has occurred along the lower reaches of the subbasin. The Klickitat hatchery is also located within this subbasin. The highest density of *O. mykiss* (steelhead and/or rainbow trout) is reportedly found in the Middle Klickitat area.

**Little Klickitat Subbasin:** The Little Klickitat Subbasin is on the drier side of the Klickitat watershed. Here there is less snow pack for runoff and streams tend to have lower flows. Additionally, water temperatures tend to be warmer. Summer low flows are such that there are areas of intermittent flow preventing fish movements through the mainstem Little Klickitat River during portions of the year. Downstream of the Little Klickitat Falls (river mile 6.1), the river is generally low gradient with a cobble bottom. The dominant habitat in the lower reaches is pool/glide habitat. Further upstream, near river mile 9.6, the stream gradient is roughly 0.8 percent and gravel and cobble dominate the substrate. Some diking and channelization has occurred in the Little Klickitat River between river miles 10 and 18. Grazing occurs in some areas along the mainstem Little Klickitat River above river mile 12 and more extensive rural residential developments are present above river mile 17.4, including the City of Goldendale. These land uses may affect riparian conditions and floodplain function. North of the town of Goldendale, Highway 97 parallels the stream for short distances. In these areas, some local modification of floodplain function may have occurred.

Information regarding the tributaries downstream of Goldendale is sparse. Blockhouse Creek has a 56-foot falls between river mile 0.1 and river mile 0.2. A canyon extends upstream for a distance of 1.8 miles. Bowman Creek runs through a canyon from the mouth to river miles 2.6.

Mill Creek also runs through a canyon in the lower 2.6 miles. Bloodgood Creek has an average gradient of 2.2 percent. At river mile 2.2, the creek is ten to twelve feet wide with a sand and gravel substrate and heavy riparian vegetation. Spring Creek has a number of cascades between river mile 0.1 and 0.2 and has an average gradient of 1.1 percent. The substrate at river mile 0.7 is gravel and mud. Thick riparian vegetation is present at that site.

**Lower Klickitat Subbasin:** Limited habitat data is available for the Lower Klickitat Subbasin. Lyle Falls, located at river mile 2.2, creates difficult passage for salmon and steelhead stocks entering the Klickitat River. The road SR 142 and an abandoned rail line parallel the river along much of the mainstem Klickitat. In the Snyder Creek watershed, a tributary to the Klickitat River within the subbasin, an old lumber mill site has a 2400-foot concrete sluiceway that forms a depth and/or velocity barrier to all anadromous species. A major passage restoration project was completed in 2004 and is expected to enable fish passage past the old mill site.

**Swale Creek Subbasin:** Swale Creek flows through the one of the driest portions of the watershed. During summer, there is no stream flow upstream of Warwick. Habitat upstream of Warwick is limited to a few pools. Although hatchery fish were released upstream of Warwick decades ago, no fish have been documented in this section of the subbasin in recent years. Downstream of Warwick, flow is also negligible. The first five miles downstream of Warwick are virtually dry. Scattered pools are present that are sustained by small seeps. Farther downstream, the bed passes through a deep canyon. Flows in the canyon increase to an estimated 0.25 to 0.50 cfs (fed by a small spring) and summer stream temperatures exceed 23°C annually (73.4°F). Summer habitat in most of the canyon consists of a series of isolated pools (Figure 7). The only continuously wetted portion of the creek lies within the lowest three miles of the subbasin. Stream flow here is negligible and temperatures are high. The mouth of the creek is isolated from the mainstem Klickitat River by alluvial deposits, prohibiting the movement of fish out of the subbasin in summer. A railroad bed, which was constructed in 1902, confines the channel primarily in the four miles downstream of Warwick where the stream is virtually dry during summer and fall.

**Columbia River Tributaries Subbasin:** No information on the Columbia tributaries was available in the reviewed documents. Generally, the tributaries tend to be steep streams. Most are dry or have little flow in the summer. They are unlikely to contain significant fish habitat. No assessment was completed as part of this watershed planning effort for the Columbia River itself or its adjacent riparian habitats.



### 3.0 OVERVIEW OF IDENTIFIED DATA GAPS

Several data gaps were identified during the watershed assessment and planning processes. These gaps limit the understanding of water resources in WRIA 30. The Watershed Management Plan identifies approaches to address issues identified in the basin. These approaches include the filling of important data gaps. Once the data gaps are filled, information gained may suggest modifications to the Watershed Management Plan (see Section 8.0).

An overview of the data gaps that have been identified are discussed briefly below. Detailed information regarding the data gaps is provided in Sections 5.0 through 7.0.

#### 3.1 WATER QUANTITY

Data gaps related to water quantity issues are listed in this section. Note that several of these data gaps also affect the understanding of water quality and fish habitat issues.

- ❑ **Estimates of Actual Water Use and Water Budgets are uncertain. Additional information is needed to improve those estimates:** Uncertainty remains regarding actual water use in the WRIA. Estimates of stream flow in some cases are poor or out of date. Uncertainty also remains regarding the size of aquifers, ground water-surface water interactions, and interactions between ground water aquifers.
- ❑ **Estimates of Current and Historical Little Klickitat Stream Flows are out of date or unavailable:** As was mentioned above, current estimates of stream flow need to be updated. Additionally, questions have arisen regarding the magnitude of historical flows in the Little Klickitat and the effects of land use on those flows. Hence, studies have been recommended to close those information gaps.
- ❑ **Snow level information and relationships between snow levels and subsequent summer water availability are not available in sufficient detail to support efforts to forecast drought conditions :** The Simcoe Mountains are the primary water sources for the eastern portion of the basin. Local droughts can occur in the basin due to low snow packs in those mountains. Additional information regarding snow levels and a method to predict pending drought situations is needed.

#### 3.2 WATER QUALITY

Data gaps related to water quality issues are listed in this section. Note that several of these data gaps also affect the understanding of fish habitat issues.

- ❑ **Natural background temperature in the Little Klickitat River:** Questions have arisen regarding the levels of shade that can be achieved along the Little Klickitat River and, consequently, the stream temperatures that can be attained.
- ❑ **Sediment Inputs:** Limited data is available regarding sediment concentrations in streams and the sources of sediment inputs. A study estimating the sediment inputs

associated with various land uses and the background inputs is recommended to identify areas where reductions in sediment may be beneficial.

- ❑ **Swale Creek potential shade improvements:** The lower portion of Swale Creek has been listed for temperature and flows on the 303(d) list. An abandoned railroad bed is located adjacent to the lower creek. This railroad bed impinges on the floodplain in some locations. Questions have arisen regarding the potential to increase shade with modifications of the railroad bed.
- ❑ **Nitrate Concentrations in the Swale Valley:** A study was completed addressing nitrate concentrations in the Swale Valley. Klickitat County Health Department is continuing to collect data on nitrate concentrations when new wells are installed in the Swale Valley. This should be encouraged. Additionally, further sampling of older wells is recommended.
- ❑ **Lower Klickitat Water Quality Data:** Temperature and dissolved oxygen levels in the lower Klickitat River exceed State criteria. The available data were collected as grab samples. Additional information is needed to quantify the extent of the situation. Deployment of continuous recording water quality instruments is recommended to provide a better understanding of stream temperature and dissolved oxygen conditions in the lower mainstem Klickitat River.
- ❑ **Middle Klickitat Water Quality:** There is little water quality data available for the Middle Klickitat Subbasin. Water quality monitoring is recommended in this subbasin.
- ❑ **Fecal Coliform Concentrations :** Limited data is available regarding the concentration of fecal coliform bacteria in surface waters of the watershed. Additional data collection to determine the current situation and identify problem areas, if any, is needed.
- ❑ **Additional studies regarding feasibility of management options :** The potential of bringing public water supplies to Centerville has been identified as a possible option for addressing future water demand. The feasibility of this option needs to be assessed.
- ❑ **Pollution Trading Options :** The management plan options include possible development of a pollution trading program. An assessment of pollution trading options is needed
- ❑ **Indicators of Peak Flow and Sediment Inputs:** A need to develop indicators of changes in peak flows and sediment inputs over time has been identified. These indicators can be used to evaluate the need to initiate actions addressing these processes.

### **3.3 FISH HABITAT**

Data gaps related to fish habitat issues are listed in this section. Note that several data gaps regarding temperature, flow, riparian condition, and sediment effects on fish habitat are addressed above. These are not repeated here.

- ❑ **Assessment of conditions limiting natural fish production:** Little numeric information has been documented regarding the quality of fish habitat in the watershed. Collection of data to characterize habitat conditions in the watershed and identify the limiting habitat characteristics (see Section 7 for further discussion and definition) is needed. This information will be used to identify priority actions for habitat restoration and preservation.
- ❑ **Fish Passage through Culverts:** Culvert inventories need to be updated in some locations to identify areas of passage concern and estimate the benefit of replacement of these structures to fish population production.
- ❑ **Fish Passage into Little Klickitat Subbasin:** There is little known about how often (or if) the waterfall at river mile 6.1 is passable for steelhead or other migratory fish species. An in-depth study of passage at the falls is recommended to determine the frequency (number of years) at which this falls is passable and the numbers of fish that are able to pass in years when flows are high enough to support passage.
- ❑ **Fish Population Abundance and Distribution:** At present, information regarding fish abundance is limited. Data on total size of native anadromous populations, including those listed under the Endangered Species Act, are not available. Monitoring of fish populations to provide estimates of the number of fish returning to the watershed and changes in those numbers over time is needed.
- ❑ **Carrying Capacity:** The carrying capacity of the Klickitat basin for salmonid species is unknown.
- ❑ **Species Interactions:** Interactions between and risks posed by hatchery/introduced salmonid stocks and native naturally spawning fish populations have not been assessed.

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## **4.0 OVERALL MANAGEMENT OF PLAN**

This section provides a brief overview of elements of the plan that are included in Sections 5, 6, and 7. This section also includes a discussion of constraints regarding data collection methods, quality assurance, cost efficiency, applicable law, and reporting.

### **4.1 PLAN OVERVIEW**

This Watershed Management Plan addresses identified key issues regarding water quantity, water quality, and fish habitat. Section 5 addresses water quantity, Section 6 addresses water quality, and Section 7 addresses fish habitat. Each section provides information regarding key issues that were identified in the watershed assessment and during the management planning process. Each section also provides background information for each situation, suggested approaches to addressing the situation, and a discussion of management approaches. Summaries of existing programs and regulations related to the various issues addressed in this plan are provided in the background information for each of those situations.

This Watershed Management Plan assumes that existing programs will be implemented and monitored. As such, action items related to implementation of existing programs that were deemed to adequately address the identified issue are not specifically addressed in this plan, but are referenced as contributing to solutions.

While regulatory approaches are discussed in this Watershed Management Plan, the Planning Unit urges the implementation of voluntary and positive incentive-based approaches to address issues covered under this plan.

The Planning Unit recognizes that integration of this Watershed Management Plan with other state and local level processes will benefit implementation of the plan through expanded participation. Integration with other processes will also help to ensure compatible efforts that are not redundant. This integration will result in efficient use of public funds and a productive approach to addressing issues. Related programs addressing various identified issues in WRIA 30 are discussed in Sections 5, 6, and 7.

### **4.2 CONSTRAINTS**

#### **4.2.1 PROJECT COST EFFICIENCY**

The Planning Unit is committed to focusing efforts on actions that have the greatest cost efficiency possible. Adherence to a cost-efficient approach to addressing issues will assure that public funds are being spent to the greatest overall advantage to the public and the environment.

#### **4.2.2 QUALITY ASSURANCE AND REPORTING**

The Planning Unit is committed to the application of quality assurance principles in the implementation of the Watershed Management Plan. The Planning Unit is also committed to ensuring that information developed during studies and monitoring programs is available for

public use. Therefore, guidance regarding quality assurance and reporting for the purposes of this Water Management Plan will be developed during plan implementation.

### **4.2.3 FUNDING**

This plan recognizes that implementation of the plan will be funding dependent. Funding will be required to support management and coordination of activities as well as actual projects. The need for funding may extend to existing entities (e.g. CKCD, Ecology) and existing programs that are participatory to the implementation of the plan. The Planning Unit has emphasized the need to ensure that the cost-efficiency of implemented programs is high. This will help to defray implementation costs and assure that monies will be spent where the greatest good can be attained. Requirements for quality assurance will help to assure that information gained during implementation is of good quality and is publicly available.

### **4.2.4 APPLICABLE LAW**

Nothing in the plan supercedes any Federal, State, or County regulations. All actions in this plan are subject to applicable law. This Watershed Management Plan does not include any obligations or restrictions on forest practices that are additional to or inconsistent with the Forest Practices Act (Chapter 76.09 RCW) and its implementing rules.

## **5.0 WATER QUANTITY MANAGEMENT**

The management of the quantity of surface and ground water in the WRIA 30 is addressed in this section. The development of this portion of the Watershed Management Plan included considerations regarding all potential beneficial uses of water in the basin with special emphasis on water supply, stock watering (including the riparian rights incorporated in the Little Klickitat River adjudication), and fish habitat. In general, this Watershed Management Plan does not provide complete details of water management in the basin. The Planning Unit recognizes that additional details regarding water management will be developed during the implementation planning process. Holders of water rights for municipal supply purposes will be invited to participate with the Planning Unit in the process of defining milestones and timelines for plan implementation.

The following sections discuss the key issues regarding water quantity that were identified during the watershed planning process. A discussion of the potential approaches to addressing those issues and a discussion regarding management and implementation issues are also provided.

The discussion in this section builds on information and analyses presented in the WRIA 30 Watershed Assessment (with appendices). The sections of the report particularly pertinent to the management of water quantity in the basin include:

- ◆ WRIA 30 Watershed Assessment, Appendix A
  - ◆ Section 2.0, Hydrologic overview, including information on stream flow
  - ◆ Section 5.0, Water Quantity
  - ◆ Section 6.0, Water Rights and Water Use
  - ◆ Section 8.0, Data Gaps
- ◆ WRIA 30 Watershed Assessment, Appendix B, Water Storage Assessment
- ◆ WRIA 30 Watershed Assessment, Appendix C, Water Storage Assessment Addendum

In addition, information in a memorandum dated December 6, 2004 regarding strategies for meeting future municipal water demands in WRIA 30 is applicable to the water quantity issues.

The following three key issues regarding the availability of water were identified and prioritized during the development of the Watershed Management Plan.

- Current and Future Water Demand in WRIA 30 (High Priority)
- Climate Effects on Water Availability (Moderate Priority)
- Summer Stream Flow in the Little Klickitat River (Moderate Priority)

Each of these issues is discussed below. Considerations regarding management and implementation of the plan follow those discussions.

## 5.1 CURRENT AND FUTURE WATER DEMAND IN WRIA 30

**Problem:** There is a strong need to develop a system that will facilitate the approval of new water rights and/or ensure that current and future water needs can be met. It has not been possible to obtain new water rights within WRIA 30 in recent decades. The KPUD has an immediate need for additional water to meet demands of its customers. The KPUD and other water purveyors are likely to need additional water in the future as the population in the WRIA grows. Additionally, applications for new water rights to support irrigation uses have been difficult or impossible to obtain. The economy of the WRIA is heavily dependent upon agricultural land uses. Hence, the availability of water for agricultural uses can have a large effect on the economic viability of the region.

**Goal:** The goal for management is to ensure adequate water supply to meet the current and future needs of the citizens of WRIA 30

**Priority:** High

### 5.1.1 BACKGROUND

#### 5.1.1.1 Current Rights, Claims, and Applications

Based on the information contained in Ecology's Water Rights Tracking System (WRTS), 59,585 acre-feet/year of water is allocated by 881 water right certificates and permits (Table 9) in WRIA 30. Of this total quantity, the vast majority (77 percent) of water allocated within the watershed is for irrigation use. Water rights allocated for municipal, domestic, commercial/industrial, heat exchange, and railway uses collectively make up an additional 22 percent of the total. Water rights allocated for stock watering, fire protection, fish propagation, and wildlife propagation collectively make up less than one percent of the total. The majority of the water right certificates and permits are located in the Little Klickitat, Swale Creek, and Columbia Tributaries Subbasins. A large portion of the water rights certificates and permits in the Columbia Tributaries Subbasin are rights for Columbia River diversions.

According to the WRTS, there are 1,178 claims in WRIA 30 for 91,062 acre-feet of water per year (Table 10). The majority of water claimed is for irrigation use (99.6 percent). The WRTS database includes 92 water right applications for new appropriations (ground water and surface water) pending in WRIA 30. The cumulative rate of diversion/withdrawal encompassed by these applications is approximately 1,170 acre-feet per year. The largest number of applications (64 percent) is for irrigation use. Annual quantities are determined during the permitting process and thus not recorded for applications in WRTS.

#### 5.1.1.2 Current Water Use

Sufficient information was not available to develop water budgets for the Swale Creek and Columbia River Tributaries Subbasins. Most of the creeks in these subbasins are dry or near dry in summer; hence, no surface water is available for additional allocation in summer months. However, ground water in the underlying basalt aquifers represents a significant source of water



supply within the limits of annual recharge quantities. Ground water development in the Swale Creek Valley for irrigation showed a marked increase in the 1960s and early 1970s (Mix, 1976). Based on available information, it appears that the area of irrigated acres in the valley and the average annual ground water pumpage have declined somewhat since the 1970s. Despite the apparent decline in ground water use for irrigation in the valley, obtaining a new water right is very difficult. Transfers of existing irrigation water rights have occurred in recent years, but there is a growing concern that a significant portion of the historical agricultural water right appropriation has inadvertently been relinquished and is no longer available.

**Table 9. Number of certificates and permits, claims, and applications for WRIA 30 and the acre-feet per year certificated, permitted, claimed, or applied for.**

	Ground water Certificates and Permits		Surface Water Certificates and Permits		Claims		Applications
	Number	ac-ft/yr	Number	ac-ft/yr	Number	ac-ft/yr	Number
Upper Klickitat	0	0	10	10	28	43300	0
Middle Klickitat	6	487	188	699	278	44590	5
Little Klickitat	181	18910	259	15136	182	1536	31
Swale Creek	58	11632	7	27	273	15	22
Lower Klickitat	15	217	67	3002	240	13	16
Columbia Tributaries	61	7997	29	1468	177	1608	18
<b>Total</b>	<b>321</b>	<b>39243</b>	<b>560</b>	<b>20342</b>	<b>1178</b>	<b>91062</b>	<b>92</b>

**Table 10. Estimated Total Water Use for WRIA 30 by Subbasin**

Subbasin	Estimated Water Use (Acre -Feet/Year) by Category				Subbasin totals
	Irrigation	PWS- Supplied Residential	Self- Supplied Residential	PWS Non- Residential	
Middle Klickitat	13,895	154	13	10	14,072
Little Klickitat	9,788	750	477	400	11,415
Swale Creek	5,729	3	19	0.1	5,751
Lower Klickitat	0	111	307	26	444
Columbia Tributaries	48	358	56	34	496
WRIA 30 Totals:	29,459	1,376	871	471	32,177
% of Total WRIA 30 Use:	92%	4%	3%	1%	100%

### 5.1.1.3 Current and Future Demand

#### **Commercial, Industrial, and Municipal Demand**

In 2003 the quantity of water consumed by commercial/industrial uses comprised only one percent of the total annual volume used in WRIA 30. In 2003, water consumed by residential uses on public water supply systems comprised only four percent of the water used in WRIA 30. The US Census data from 1990 to 2000 suggests a small growth rate in

Klickitat County; however the Office of Financial Management is predicting no growth and possibly a small decrease in population in future years (see Section 5.2). The cities and municipal water purveyors, however, are projecting growth.

Within WRIA 30, KPUD operates the Glenwood, Ponderosa Park, Rimrock, Klickitat, Lyle, and Wishram Water Systems. The City of Goldendale operates its own system. Dallesport is supplied water through a series of small water systems. All of the systems managed by the KPUD and the City of Goldendale have sufficient capacity (have sufficient water, but not necessarily sufficient water rights) to meet current demand with the exception of the Ponderosa Park water system, which currently has a moratorium on additional hook-ups and cannot meet the local demand (Aspect Consulting, 2004). Several of the KPUD systems do not have sufficient water rights to meet current water use, or are currently pursuing changes to address water right deficiencies related to water system improvements (e.g. alternative points of withdrawal). All but one KPUD water system is projecting deficits by 2023. The overall capacity of the various systems in the Dallesport area is unknown.

Since population levels are low in the WRIA, projections of future demand are very sensitive to minor changes in the number of employers in the area. The addition of one moderate-sized employer or a few smaller businesses could have a substantial change on population levels in the basin. Future changes in commercial demand are also unknown and difficult to predict. Commercial/industrial demand could change suddenly if additional water-dependent industries move into the WRIA. The Goldendale Energy power plant in Goldendale is such an example. Currently, the various public water systems in the watershed are operating at or near capacity. The municipal water purveyors are interested in ensuring that sufficient supply is available to meet the demand associated with sudden changes in population. The current and projected status of each system is summarized from Aspect (2004) below.

Glenwood Water System: KPUD has adequate instantaneous water rights to support the Glenwood Water System, but has inadequate annual volume rights to meet current and projected 20-year demands. The KPUD projects a 30 percent increase in water demand over the next 20 years. The KPUD's strategy to meet the projected demand includes system improvements, conservation, and water right acquisition. The KPUD is attempting to identify and transfer any existing customers that may be using the water system for large-scale irrigation to the local irrigation district. If transferring these customers does not reduce the projected demands to the level of the existing water rights, additional water rights may have to be pursued. The KPUD may be able to acquire an additional water right via the transfer process. Certainty regarding possible approaches to meeting the demand does not exist. The KPUD may have to explore other options in addition to those described here.

Ponderosa Water System: KPUD has a moratorium in place that prohibits additional hook-ups to the water system in the Ponderosa development. The system is currently operating near the limits of its water rights. The water right granted in 1978 covered the water demand at the time but was not sufficient to provide water at full build out of the development. This occurred due to a premature application for proof of appropriation. KPUD projects a 226 percent increase in demand over the next 20 years. KPUD is currently pursuing several options including changes to the existing water right certificate and potential for an intertie with the City of Goldendale's water supply. Resolution of all or part of the situation is expected to occur in the near future.

Rimrock Water System: The Rimrock Water System is the only system in the basin that has sufficient capacity and sufficient water rights to meet projected demand. This could change if growth within the service area is greater than expected.

City of Goldendale: The City's current water rights and capacity are sufficient to meet current demand. The current rights are also sufficient to meet the projected 20-year instantaneous demand but are not sufficient to meet its 20-year projected annual volume demand. Options for meeting the future requirement for water rights may include a) increasing withdrawal capacity at Simcoe Springs and/or the Chlorination Station well source, which would require either a transfer of rights from an existing unused source or a new water right, b) acquisition and transfer of non-City existing water rights, c) storage of winter excess flows to supply summer demand including potential aquifer storage and recovery (ASR), and/or d) improvements of existing water distribution system to reduce water loss. Other options may also be identified and implemented to meet demand.

Klickitat Water System: The Klickitat Water System's current water rights are slightly less than the amount needed to meet current demand and are not sufficient to meet projected future demand. The KPUD has installed two water wells, has applied for new water rights, and is preparing to install a third well. The KPUD has a pending application to transfer a portion of the former surface water treatment plant and the Klickitat Mill surface water rights to its well sources. If approved, the transfer would meet the projected 20-year demand. If the application is not approved, the KPUD will have to explore other options to meet future demand.

The Lyle Water System: The KPUD has existing water rights for two wells that are not currently in use, but has no permitted rights for the water sources in use. Applications for new water rights were filed at the time the new water sources were constructed. The system has been operating on the assumption that existing ground water rights held for the inactive sources will be transferred to the new well sources. Multiple options may have to be considered to meet future demand.

Wishram Water System: The Wishram Water System is operating without water rights for its current sources, although applications for new water rights for one of the two wells currently in use were filed at the time of construction. The system has several inactive sources of water that have water rights. The KPUD has been operating the system on the presumptions that existing water rights held for the inactive sources were to have been transferred to the new sources and had initiated the transfer process. If the transfer is approved, the municipal portions of the inactive supply sources alone are not adequate to meet the projected 20-year demand. The inactive sources include rights for irrigation use, and the KPUD is pursuing a change to municipal use for those existing water rights. Other options may also have to be explored to meet future demand.

Dallesport Water System(s): Currently, water in Dallesport is supplied through one small Group A system and several smaller Group B systems. The total capacity of the systems is unknown.

### ***Agricultural Water Demand***

Irrigation is the largest water use in the WRIA. Estimates of current irrigation use are subject to some uncertainty. Refinement of the irrigation water use estimates has been recommended for

more detailed evaluation, such as deriving an improved estimate of actual water use based on analysis of satellite imagery to assess actual irrigated acreage over a full irrigation season. Irrigation use has been changing in the WRIA in recent years. The irrigated acreage is estimated to have decreased in some areas, based on input from Farm Service Agency records and local landowners. Future demand in irrigation is unknown. Demand will be affected by economic factors, the effect of which is difficult to predict, but may result in a shift toward higher value crops, such as grape vineyards, as well as a redistribution of irrigated acreage to areas best suited for this type of crop. Such a change would result in a shift in the water demand.

### ***Changes in Spatial Distribution of Water Demand***

Some shift in the spatial distribution of water demand may be occurring in WRIA 30. For instance, the development in High Prairie (located primarily in the Lower Klickitat Subbasin but also extending into the western portion of the Swale Subbasin) is growing and interest in further development of the Ponderosa Park area (north of Goldendale) of the Little Klickitat Subbasin is high. Small shifts in public water systems demand can be accommodated with the current water systems; however, larger shifts may create additional challenges in meeting water demand. Additionally, an interest in increasing production of wine grapes in the Columbia River Tributaries has emerged. The extent of recent shifts in water demand has not been evaluated.

#### **5.1.1.4 Inchoate Rights**

Inchoate water rights are those municipal rights that are not perfected or developed. Inchoate water rights held by municipalities are exempted from relinquishment and can be held for future development (Chapter 90.03.460 RCW). Further development of information regarding municipal inchoate rights and planned future use of those rights will be developed during the first year of the implementation phase of planning per Chapter 90.82.048 (1) RCW.

#### **5.1.1.5 Water Available for Allocation**

Additional information is needed to support the development of accurate estimates of the water available for allocation. Estimates of annual recharge are available, as presented in the Watershed Assessment Report; however, the quantity of ground water discharged to streams is unknown. Also, the quantity of actual water use versus the quantity allocated by water rights (“paper rights”) and the proportion of the irrigation use that is drawn from ground water (versus surface water) has not been estimated with sufficient certainty; hence, additional information is needed to develop estimates of the quantity of water available for allocation.

Ground water appears to be a viable source of additional supply in the Camas Prairie (Glenwood) area in the Middle Klickitat Subbasin, the Simcoe volcanics located in the northern portion of the Little Klickitat Subbasin, and the Swale Creek valley (Swale Creek Subbasin). However, a better understanding of the ground water contribution to stream flow would be required to evaluate further allocation of ground water supplies in these areas. The Wanapum basalt is also quite productive across most of WRIA 30, and in many areas, such as the Swale Creek valley, the Wanapum basalt can provide good quality water for all uses. Surface water available for allocations cannot be reliably determined due to uncertainties in actual water use and uncertainties regarding the quantity of water needed to provide for specified beneficial uses.

Water may also be available from the Columbia River, particularly to provide for demand in the Columbia River tributaries and the lower end of the mainstem Klickitat River. Future management considerations by State and federal agencies may influence water availability in this area. During implementation of the plan, Columbia River issues and sources need to be further evaluated. The Planning Unit expects that Ecology will work with them on future developments regarding Columbia River water issues.

#### **5.1.1.6 Stream Flow Considerations**

Water is needed in streams to support aquatic resources, including fish, wildlife, stock watering, navigation, and aesthetic values. Ecology has the authority to set minimum instream flows by rule. Chapter 90.22 RCW provides for the setting of minimum flows to protect instream values when such actions appear to be in the public interest or when requested by the WDFW (Washington Department of Fish and Wildlife). Chapter 90.54 RCW mandates the retention of base flows in streams except where there are “overriding considerations of the public interest”. The setting of minimum stream flows is also mandated as a permit condition for surface water diversion or storage projects (Chapter 75.20 RCW).

A minimum instream flow rule is comparable to a water right that is junior to all water allocation through permit, certificate, or claim prior to the setting of the flow, but senior to any subsequently issued appropriation. Applications for new water rights and/or applications for transfer of rights are evaluated in light of the minimum instream flows. Ground water use can also affect stream flow if there is connectivity between the ground water source and surface waters. Therefore, ground water right applications are also reviewed to determine if the proposed water withdrawal will affect stream flows. Where minimum instream flows have been set, the courts have been clear that no ground water appropriation that will adversely affect meeting specified minimum instream flows can be granted (Ecology, 2002).

At present, instream flow requirements have not been established for any stream in the WRIA. An instream flow set in 1980 for the mainstem Columbia River was repealed on July 27, 1997 (Chapter 173-563 WAC). Water right permits and certificates issued while the instream flow rule was in effect were approved subject to instream flow requirements for the Columbia River. The instream flow provisions of these certificates and permits remain in effect. Water right applications approved since July 27, 1997 may also be subject to the instream flow requirement in order to protect the senior water rights approved prior to July 27, 1997.

Chapter 90.82 RCW gave the Initiating Governments the option of addressing instream flow rule making within the WRIA. The Initiating Governments chose not to include the instream flow component in the scope of watershed planning for WRIA 30. Ecology will likely set flows for portions of the WRIA at some time. Information collected as the plan is implemented will help to support instream flow discussions. As may be enabled under 90.82.080 RCW and 90.82.085, the Initiating Governments reserve the ability to add the instream flow component to the scope of watershed planning for WRIA 30.

### **5.1.1.7 Adjudication**

Surface and ground water rights were adjudicated for Mill Creek (tributary to the Little Klickitat River) on October 19, 1976 and Blockhouse Creek (also tributary to the Little Klickitat River) on June 1, 1972. The surface rights in the Little Klickitat River were adjudicated on February 17, 1987. Livestock rights were given highest priority for instream rights. These adjudications provided a quantification of actual water use at that time of the action. Some of the specific rights quantified in the adjudication may no longer be accurate due to relinquishments, transfers, and/or changes that have occurred since the adjudication was completed.

### **5.1.2 ASSUMPTIONS AND CONSTRAINTS**

Chapter 90.82 RCW states: “The legislature declares and reaffirms that a core principle embodied in Chapter 90.82 RCW is that State agencies must work cooperatively with local citizens in a process of planning for future uses of water by giving local citizens and the governments closest to them the ability to determine the management of water in the WRIA being planned”. The statute also states: “The legislature is committed to meeting the needs of a growing population and a healthy economy statewide; to meeting the needs of fish and healthy watersheds statewide; and to advancing these two principles together, in increments over time.”

The success of this plan in providing the water needed to meet the current and future demands of the population, to support economic growth of the WRIA, and to meet the needs of fish and other resources will be dependent upon the timely processing of water right applications, transfers, and trust actions.

### **5.1.3 GENERAL APPROACH**

There are several approaches that the citizens and governments of WRIA 30 may take to address water quantity issues. Alternative approaches are discussed in Section 5.1.3.3. The objective of these approaches is to supply water in sufficient quantities to satisfy the stream flow needs of fish and to ensure that adequate water supplies are available for sustainable growth of agriculture, industry (e.g. energy production), and residential populations .

Further evaluation of the legal, operational, and economic constraints is necessary before commitments can be made regarding any specific approach. Several potential tools and approaches to developing a water management system are discussed in this section. Further evaluation will be given to these options in the first year of plan implementation and the preferred tools and approaches will be selected at that time. The Planning Unit urges the implementation of voluntary and positive incentive-based approaches to addressing issues associated with meeting water demand.

All of the identified approaches include a need for additional information and need for public outreach and education.

### **5.1.3.1 Obtain information needed to quantify water available for allocation**

A high priority objective of the Planning Unit is the quantification of the amount of water available for allocation. In general, information currently available in WRIA 30 regarding ground water sources, ground water/surface water interactions, and water use is insufficient to support evaluation of applications for new water rights. Information needed to fill the data gaps includes the following:

- ' Refine estimates of actual water use
- ' On a subbasin scale, refine understanding of ground water/surface water interactions utilizing baseflow analysis where appropriate
- ' Interaction between aquifers and surface water
  - Effect of water withdrawal from ground water sources on stream flow
  - Identify losing and gaining stream reaches in areas where additional water is needed
- ' Delineate specific aquifer zones within subbasins.
- ' Estimate storage volume within each aquifer
- ' Improve water budgets
- ' Evaluate the spatial distribution of needs; now and in the future.
- ' Establish permanent gauging locations to measure stream flow (at least two additional stations in the Little Klickitat River and two stations in the Middle Klickitat Subbasin).
- ' Comparative analysis of historical versus current stream flow in subbasins, focusing initially on the Little Klickitat basin
- ' Complete mapping of water rights and correct WRTS database within two years; and
- ' Other studies as will be determined through interactions with Ecology

The details and extent of studies required have not been fully scoped. Further scoping of these efforts will be completed during development of the Detailed Implementation Plan.

Requirements for quality assurance and reporting discussed in Section 4.0 are applicable to all studies done under this plan.

### **5.1.3.2 Public Education and Outreach**

Public education regarding water rights is critical. The public needs to be informed regarding existing water right law, particularly with regard to statutory relinquishment and the rules and regulations regarding water rights transfers and obtaining water rights. The public also needs to be informed regarding existing and future programs available to help them manage water. This effort would augment the on-going education efforts of the Klickitat County Water Conservancy Board. A public education and outreach program is also needed to inform the public regarding purposes and cost efficiency of water resource projects and interactions between water use and stream flow.

### **5.1.3.3 Develop Options for Water Management in WRIA 30**

Options for addressing water demand may involve some or all of the following:

- ◆ **Water Conservation**
  - Irrigation Efficiency Projects

- ❑ Urban Water Conservation Projects
- ❑ Water Reclamation
  
- ◆ **Water Right Transfer, Relinquishment, and Appropriation**
  - ❑ Water Right Transfer/Trading
  - ❑ Local Water Bank
  - ❑ Water Trust Program
  - ❑ Appropriation of New Water Rights
  - ❑ Adjudication
  
- ◆ **Water Storage**
  - ❑ Surface Reservoirs
  - ❑ Aquifer Storage and Recovery

Conservation measures are encouraged where appropriate. For instance, upgrades of water conveyance systems to reduce water loss, modification of irrigation systems to improve efficiency, and agronomic application of water can improve water use efficiency and may help to meet increasing demand. State laws and regulations require certain conservation considerations for municipal water suppliers.

Water banks and/or use of the State water trust program may be used to manage short term and long-term shifts in water demand. Local management of water banks and/or water trust programs is preferred. Because transfer of existing water rights is such an important tool for meeting current and future water demand, water trust programs must at least coordinate with the Implementing Governments and/or Planning Unit. Efforts to put water into trust that are not coordinated with these bodies may seriously undermine watershed plan implementation. In addition to establishing water bank and/or trust, water storage projects may help meet water demand, particularly when such storage projects also benefit fish habitat and other natural resources.

Projects and programs to address water demand in the WRIA may range in complexity from simple education and assistance to local landowners to help them address their individual situations to the development of a larger scale program, such as a local water bank, where transfers, trusts, right applications, conservation, and tracking of water use changes (including water conserved) are facilitated by a central organization. All options will be reviewed during the first year of plan implementation and commitments will be made regarding the preferred option(s). Once preferred options are identified, recommendations to Ecology regarding allocation of resources will be developed. Recommendations may include a request for the dedication of resources to provide for timely processing of water right applications.

Brief summaries of various options and/or components that may be included in the Detailed Implementation Plan are discussed below.



## **Water Conservation**

**Irrigation Efficiency:** Efficiencies in irrigation water use may be achieved through modification of water transport systems, upgrades in irrigation equipment, application of water at agronomic rates, soil tillage and amendment techniques, and/or changes in crops in dry years, and many other approaches. There are several programs in place to help fund conversions to more efficient irrigation equipment and/or updates of water transport systems. An irrigation efficiency program should include an education component designed to ensure that irrigators are aware of the need for conservation and are aware of programs in place to assist them with water conservation efforts. Additional programs may be needed to help effectively use water in the basin. These may include options that provide an accounting of actual water used and water saved through conservation and programs that allow for the transfer of water not in use to users that are not able to meet their needs (see water in trust, water right trading, and water banking discussed above).

The paragraphs below discuss some of the more commonly used irrigation efficiency methods. Additional options are also available and should be explored to determine the best fit to a particular situation. Links to websites containing additional information can be found at: <http://www.microirrigationforum.com/new/links> as well as the Klickitat Conservation Districts and Washington State University.

**Irrigation Scheduling:** The decision process on determining when to irrigate crops is referred to as irrigation scheduling. Measuring or monitoring soil moisture content can help determine when to irrigate, how much water to apply, depth of wetting, patterns of soil moisture extraction by roots, and trends in soil moisture content with time (Trimmer, 1994). Methods commonly used to monitor soil moisture content include tensiometers, electrical resistance blocks (gypsum blocks), and neutron moisture meters (Hanson, 1999). Measuring soil moisture enables many irrigators to shorten their watering seasons and reduce their overall pumping costs.

Other methods commonly used for irrigation scheduling are a variety of water balance approaches. The water balance method considers the amount of water the crop needs and irrigation losses (which vary with wind speed, air temperature and precipitation). Numerous programs have been developed to assist irrigators in determining the correct amount of water to apply for various regions and crops. The water budget methods are often used in conjunction with soil moisture monitoring.

The costs of monitoring needed to implement irrigation scheduling approaches are typically small and may be offset by the reduced costs of pumping. The amount of water that can be conserved using these methods will be highly dependent upon the crops grown.

Information regarding local recommendations on irrigation scheduling can be obtained from the Klickitat County Conservation District and/or Washington State University (WSU). WSU maintains a website that addresses the subject at: <http://sis.prosser.wsu.edu>.

**Low-Energy Precision Application (LEPA):** Highly efficient irrigation systems use much less water to achieve full crop yields. Low-Energy Precision Application (LEPA) nozzles on center-

pivot sprinkler systems apply water through low-pressure drop nozzles, allowing more water to reach the ground and reducing evaporation losses. With a LEPA system, about 90-95 percent of the water reaches the crop's root zone, compared with 65-70 percent with pivot irrigation systems (Brown et al., 2005). Low pressure systems only work on pivot sprinkler systems and cannot be installed on hand lines or wheel lines. Some older pivot systems are difficult to convert to low-pressure drop lines. The cost of conversions to LEPA systems can be high, but are offset over time by reduced pumping costs. The payback period experienced by irrigators in WRIA 30 will be dependent upon the cost of electricity and the amount of funding (either grants or low-cost loans) that can be obtained. Without funding assistance, some landowners may find that installation of these high efficiency systems is cost prohibitive.

**Soil Inoculants:** Soil Inoculants are formulated to help reduce soil compaction, soil erosion and to enhance water penetration. They are soil treatments that possess moisture retention agents that may help to improve soil conditions, increase water penetration and to help reduce moisture stress. This will allow increased crop production through better water utilization and plant nutrition.

**Water Transport Systems:** Water transport systems are often the source of significant water loss. Evaporation of water from open ditches can be substantial and leakage from unlined and/or poorly maintained systems can effectively result in delivery of water to locations where it is not needed.

**Reuse of Water:** Water can be conserved by reusing tailwater at the end of a field. In a water reuse system, water is collected at the end of the field and pumped back to the top of the farm or field. This can result in water savings of up to 60 percent (Trimmer, 1994). There are pumping costs associated with pumping the runoff water, but these costs are often less than the costs associated with pumping from the original water source.

**Mulching and Cultivation:** Methods of cultivation have been developed for several crops that reduce or eliminate soil erosion and enhance water infiltration. Straw mulch can be used to improve water infiltration in tight soils and can be used to reduce water loss and erosion in irrigation furrows.

**Federal and State Funded Conservation Programs:** A number of programs have been developed to encourage landowners to place lands into conservation agreements. Most of these programs provide financial incentives for taking land out of production and/or developing habitat for fish and wildlife. When irrigated land is placed in a conservation agreement, water use is reduced for the duration of the agreement. Participation in a federal conservation program that removed land from crop production falls under one of the exceptions from water right relinquishment under the five-year measure (Chapter 90.14 RCW).

Some of the federal programs are described below. The list below should not be construed to represent the entire list of possible options. The list is incomplete. Additionally, new programs may be developed in the future that can be used to assist with conservation actions on private lands.

- The Conservation Reserve Enhancement Program (CREP) is a voluntary program designed to establish forested buffers along streams where riparian habitat is poorly developed. Land enrolled in CREP is removed from production and grazing under ten to fifteen year contracts. In return, landowners receive annual rental, incentive, maintenance and cost share payments. The CREP program is administered by the Farm Service Agency and the State of Washington.
- The Conservation Reserve Program (CRP) provides technical and financial assistance to eligible farmers and ranches to address soil, water, and related natural resource concerns on their lands. The program encourages farmers to convert highly erodible cropland or other environmentally sensitive acreage to vegetative cover such as native grasses, wildlife plantings, trees, filter strips, or riparian buffers. Farmers receive an annual rental payment for the term of a multi-year contract. The program is funded by the Farm Service Agency with technical assistance from the National Resource Conservation Service (NRCS).
- The Continuous Conservation Reserve Program (CCRP) is a voluntary program that focuses on using grasses and trees to protect soil, improve air and water quality, and enhance fish and wildlife habitat through the use of buffers, filter strips, and wind breaks. Contract periods range from 10 to 15 years. Cost shares and yearly payments are provided as incentives for participation in the program. The program is run by the Farm Services Agency.
- The Grassland Reserve Program (GRP) is a voluntary program that helps landowners and operators restore and protect grassland, including rangeland, pastureland, shrubland, and certain other lands, while maintaining the areas as grazing lands. The program includes options for permanent or 30 year easements. Landowners receive payment for the easements. The Natural Resources Conservation Service (NRCS) administers the program in cooperation with the United States Department of Agriculture (USDA) Forest Service.
- Environmental Quality Incentives Program (EQIP) was re-authorized by the 2002 Farm Bill to promote agricultural production and environmental quality as compatible national goals. The program is administered by NRCS. Management incentive payments and cost share benefits are available to support implementation of practices directly affecting the health of soils, water, animals, plants, and air.
- The Conservation Security Program (CSP) is a voluntary program that provides financial and technical assistance to producers who practice good stewardship on their agricultural lands and incentive to those that want to improve or expand their conservation measures. Lands that can be placed into the program include cropland, pastureland, prairie, rangeland, and incidental forested land. The contract period and cost-share payments are based on a three-tier approach, with increasing compensation associated with increased natural resource protection. The program is run by the NRCS.
- The Wildlife Habitat Incentive Program (WHIP) is a voluntary program that encourages creation of high quality wildlife habitats that support populations of National, State,

Tribal, and local significance. Through WHIP, the NRCS provides technical and financial assistance to landowners to develop upland, wetland, riparian, and aquatic habitat areas on their properties. Participants voluntarily limit future use of the land for a period of time, but retain private ownership. Agreements are usually five to ten years in duration.

- The Healthy Forest Reserve Program (HFRP) is a voluntary program established for the purpose of restoring and enhancing forest ecosystems to promote the recovery of threatened and endangered species, improve biodiversity, and enhance carbon sequestrations. The program offers three enrollment options including a 10-year agreement, a 30-year easement, and a longer term easement. The compensation to landowners increases with the term of the easement agreement. The program is administered by the U.S. Department of Agriculture through the Conservation District.
- The Wetlands Reserve Program (WRP) is a voluntary program that provides technical and financial assistance to landowner to address wetland, wildlife habitat, soil, water, and related natural resource concerns on private lands. The landowner receives financial incentives to restore, protect, and enhance wetlands or lands that have been historically modified for agricultural production in exchange for retiring marginal land from agriculture. Easements are either permanent or 30-year agreements. The NRCS administers the program.
- The Forestry Riparian Easement Program (FREP) was developed to partially compensate eligible small forest landowners in exchange for a 50-year easement on timber that is required to be left under the forest practices rules. The landowner still owns the property and retains full access, but has “leased” the trees and their associated riparian function to the State. WDNR administers this program.

**Urban Conservation:** Water use in urban landscapes can be reduced through selection of drought-resistant plants. Local extension service offices and nurseries can provide guidance on selecting appropriate landscape plants. The selection of drought-tolerant plants also extends to turf grass. Very early morning irrigation helps to conserve water because of minimal evaporation at that time. Soaker hose or drip systems reduce evaporation and runoff. Monitoring of soil water levels in urban landscapes can also help the owner to determine when water is needed and assist in reducing water use.

Numerous avenues may be used to encourage and attain water conservation in the home. These include: minimizing the time water is left running, fixing leaks, purchasing more efficient washers, installing low volume faucets, placing water displacement devices in toilets or installing water efficient toilets, etcetera. Lists of things that homeowners can do to reduce water use are readily available on the Internet, from Ecology, and from many water purveyors.

Development of programs that encourage the use of gray water for watering ornamental plants may also be considered. Gray water can only be used on ornamental plants and can only be applied through subsurface applications. No runoff of gray water into surface or ground waters is permitted.

**Definition:** Gray water is the water that drains from sinks, bathtubs, showers, dishwashers, and clothes washers. It does not include water draining from toilets.

Implementation of a gray water system also requires the development of a special water conveyance system, which ensures that gray water and potable water do not intermix and ensures that pipes carrying gray water are easily identified. Numerous other regulations also apply to the use of gray water. Gray water applications are regulated by the Washington State Department of Health.

Water conservation options for water purveyors include updates of water distribution systems to reduce leakage and water loss, education of customers regarding water conservation, and possible use of emergency water restrictions (e.g. limitations on lawn watering) during times of drought. Public water systems develop conservation programs as part of Washington Department of Health's water system planning program. Program developed by municipal water purveyors must be consistent with the Comprehensive Water System Plans filed with the Washington State Department of Health.

**Water Reclamation:** Some cities in the State of Washington have elected to reclaim water for reuse. Storm water has been treated by some municipalities to be used for fire suppression, landscape watering, and other non-potable uses. Other municipalities are treating used water to higher standards to allow for recharge of aquifers (water quality must meet or exceed the quality of the ground water in the aquifer). Such actions are regulated under the Reclaimed Water Act, Chapter 90.46 RCW. All reclaimed water permits issued by the Department of Ecology must specify conditions demonstrating that the wastewater has been adequately and reliably treated to meet the requirements in the Water Reclamation and Reuse Standards appropriate for the use.

Development of a water reuse facility may be considered as an option for meeting water demand. If considered, such a program would require special considerations regarding funding.

### ***Water Transfers, Allocation, and Relinquishment***

**New Water Rights:** Water right permits, certificates, or claims are required for all surface water withdrawals. Ground water rights, certificates, or claims are also required for all ground water withdrawals with the exception of the use of 5000 gallons per day or less for stock watering, single or group domestic use, industrial purposes, and lawn watering or non-commercial gardening no larger than one half acre. Largely due to staffing limitations, the State currently has a backlog of over 6,000 applications and makes less than 200 decisions a year on applications ([www.ecy.wa.gov/programs/wr/images/wr-trend.html](http://www.ecy.wa.gov/programs/wr/images/wr-trend.html)). Therefore, new applications and applications for water rights changes are unlikely to be processed in a timely fashion unless staffing at Ecology is increased or other measures are adopted to facilitate processing of applications. Additionally, required consultation processes without statutorily defined time lines can delay processing of applications indefinitely.

**Water Rights Transfers:** Existing water rights in good standing can be changed or transferred to a new user. Changes can be made to the purpose of use, period of use (e.g. seasonal irrigation to year-round municipal), place of use (e.g. specific acreage), and point of withdrawal or diversion (e.g. spring source to a well supply). Existing water rights can be transferred from one individual (or entity) to another. Water right transfers are common and, in light of the difficulty and long timeframe in obtaining a new water right, can be an effective means of addressing

water supplies needs. In basins where no water is available for new appropriations, obtaining a water right through transfer is the only option of obtaining a water right.

Prior to the creation of Water Conservancy Boards (Boards), all applications for new water rights or changes and transfers of existing rights went through Ecology. With the creation of the water conservancy boards, a second option for processing transfers became available. The boards were established to provide local input on the processing of change and/or transfer applications to existing water rights only. They are not authorized to process applications for new water rights. Applications for change/transfer are reviewed by the Board, which makes a Record of Decision that is subject to review by Ecology. Applications for water right changes/transfers can still be processed by Ecology directly; however, the timeline is less certain.

Key considerations in the change/transfer process include the following:

- Establishing the validity of the existing water right (not abandoned or relinquished through the lack of beneficial use in any given five year period);
- Demonstrating the “same body of ground water” for changes in the point of withdrawal/diversion for a ground water right and “hydraulic continuity” in the case of a surface water right;
- Evaluating that the change will not result in “enlargement” of the right – e.g. potential change in consumptive use associated with a proposed change in use; and
- Assessing whether the change/transfer will impair existing water rights.

There currently is no formal water “market” for buying and selling water rights in the State of Washington. Given the importance of preserving existing water rights within WRIA 30, developing a clearinghouse to facilitate water right transfers needs to be strongly encouraged. Water conservancy boards have the authority to track owners interested in participating in transfers. Note, all water right transfers/changes actions will include provisions for metering, except, possibly, voluntary transfers to water in trust.

**Water Trust:** Chapter 90.42 RCW authorizes the State trust water rights program. This statute allows Ecology to hold water rights in trust for entities that wish to lease, sell or donate their water rights. Trust water rights can be held for instream flow purposes to benefit fisheries, water quality, recreation, or aesthetics, as well as for out-of-stream purposes such as domestic use, irrigation, or municipal water supply. A water right held in the trust is not subject to relinquishment. The period during which a water right is in trust is not counted in the five-year period of use normally used to prove existing rights. For these reasons, the trust water program provides an excellent depository for water bank transactions. In 2003, the Washington Legislature clarified the conditions under which Ecology can use the trust water program for water banking purposes (Engrossed Substitute House Bill 1640, 2003 Regular Session).

To date, the water right trust program has focused on acquiring water rights for in-stream flow purposes in 16 watersheds across the state experiencing chronic water shortages. Although WRIA 30 is not one of these priority watersheds, the trust program nonetheless provides a mechanism that could be used to manage water quality issues. The State Legislature has appropriated funds for the acquisition of water rights to address the water shortage issues in the

16 critical basins where endangered species are present. These funds are likely not available for use in WRIA 30; however there are other means to participate in the program that may have value to both the environment and the water right holder. Information on the water trust program can be found at [www.ecy.wa.gov/prgrams/wr/instream-flows/wacqstra.html](http://www.ecy.wa.gov/prgrams/wr/instream-flows/wacqstra.html).

Water rights placed into the Washington State's Water Trust Program in exchange for compensation must be perfected. Only that portion of the right that the owner can prove has been put to beneficial use in the last five years can be put into trust. The balance is subject to relinquishment.

Water can also be put into the trust voluntarily. In these situations, no payment is available but the beneficial use determination is not required.

The Washington Water Trust (WWT) is a private, nonprofit corporation that works closely with the State Trust Water Rights Program and provides assistance with water trust actions. WWT obtains Funding from the State of Washington, Bonneville Power Administration, and private donations. The WWT can provide technical assistance in setting up a water bank or other water management programs. Additional information regarding the WWT can be found at: [www.thewatertrust.org](http://www.thewatertrust.org).

**Water Bank:** Water banking is a means of “depositing” a water use entitlement with a local entity that then makes it available for withdrawal by either the depositor or another person or entity, either at the same time and place or later in time or at another place. This is an institutionalized process designed to facilitate the transfer of available water to those in need of water. Holders of water rights who are not planning to use their entire entitlement can place the unused portion of the rights into the bank. The deposit can be either temporary or permanent. Others can draw upon this bank of water to fill their needs. Water banks are typically administered at a local level through some formalized local institution (public or private).

An audit process conducted by a local authority is an important aspect of a water bank program. The audit process would help ensure accountability regarding tracking of water passing through the water bank and compliance with the procedures defined for the operation of the bank. Water trust transactions might be subject to audit by the State as well.

In addition to the overarching goal of facilitating transfers, individual water banks have strived to achieve one or more of the following objectives (Clifford et al, 2004):

- ' Create a reliable water supply during dry years.
- ' Ensure a future water supply for people, farms, and fish.
- ' Promote water conservation by encouraging right holders to conserve and deposit rights into the bank.
- ' Act as a market mechanism.
- ' Resolve issues of inequity between ground water and surface-water users.
- ' Ensure compliance with intrastate agreements of instream flow.

A water bank needs to have a designated local entity that manages the bank. This entity can connect water buyers and water sellers and generally administer the transfers of water within a basin. When a bank is set up, certain issues need to be addressed such as what rights can be banked, who can purchase or rent from the bank, contract terms, prices, facilitating regulatory requirements, and numerous other considerations.

Clifford et al (2004) provide an excellent review of water banks in the west. The document includes information regarding possible water bank formats, administration, bank structure, contract types, and other considerations affecting the nature of a new water bank. This document can be obtained at: <http://www.ecy.wa.gov/programs/wr/instream-flows/wtrbank.html>.

**Adjudication:** Adjudication of water rights may be an option for addressing water quantity issues. An adjudication of water rights determines the validity and extent of existing water rights in a given area at the time of the adjudication. Adjudication is a legal process conducted through the superior court in the county where the water is located. The adjudication does not create new rights; it only confirms existing rights, and thereby clarifies and resolves any disparity between water rights (whether by claim or permit) which have all or in part been put to their beneficial use and remain in good legal standing and those that have been relinquished due to lack of use. Adjudications may address surface rights, ground water rights, or both. Adjudications are triggered when a citizen, organization, or Ecology files a case in a superior court. For the purposes of the court case, Ecology is the plaintiff.

Known water users or water right holders in the adjudication area are notified of the action by a summons issued by the court. The water users and/or water right holders become the defendants in the case. Those in the area that feel they have a right to use water can file a Statement of Claim with the court. An evidentiary hearing is held to evaluate the validity of water rights and claims. Based on these hearings, an order is issued in the matter of the adjudication.

## **Water Storage**

**Water Storage Projects:** Aside from relatively small scale municipal water storage facilities, water storage in WRIA 30 is limited to a few small farm ponds that are used primarily for livestock watering and a few ponds on timber land that are used for fire suppression. An assessment of water storage opportunities (both off-channel and on-channel impoundments) was conducted for the Swale Creek and Little Klickitat Subbasins, the two basins with the greatest water demand (WRIA 30 Phase II Watershed Assessment Report, Appendices B and C).

On-channel dams and reservoirs are sited on streams and are filled directly by flow from the upstream watershed. The stored water can be held and released downstream to augment summer low flows and could be diverted for out-of stream uses. On-channel dams are typically constructed in deeply incised bedrock channels. Because the resulting reservoir is relatively deep with small surface area, it helps maintain the stored water at lower temperature than a shallow off-channel reservoir of comparable volume.

Off-channel impoundments are sited outside the main river valley, completely off-stream or possibly on an intermittent stream. Water to fill the reservoir can be diverted by gravity or



pumping from an adjacent stream. Numerous stock-watering ponds in Klickitat County are constructed off-channel.

Potential storage projects were screened to identify those that had the greatest likelihood for success. Potential on-channel and off-channel projects in the Swale Creek and Little Klickitat Subbasins were identified in the screening process. Potential projects in other subbasins were not evaluated. Specific locations, project details, engineering and/or cost feasibility, or potential project effects (environmental, economical) were also not evaluated during the assessment phase. Considerably more study will be required to determine which of the options that have been identified are truly feasible.

If the development of a storage project is pursued, an environmental assessment of expected project effects must be developed. Detailed engineering information will also be required. A water right must be obtained for storage of water. Permit requirements for water storage projects are extensive and may include a water quality certificate, a Corp of Engineers 404 permit, a hydraulic project approval from the WDFW, potentially Section 7 consultation under the Endangered Species Act, and potentially a Forest Practices Authorization. The project must also go through the SEPA process and will likely require the development of an Environmental Impact Assessment (EIS). If the storage project includes a hydroelectric facility (which are often included to offset the costs of project maintenance), a Federal Energy Regulatory Commission License may be required, and rules and regulations regarding transmission lines must be addressed. Permit conditions will include at minimum defined requirements for instream flow releases during the year and most likely will include mitigation requirements for any impacts on resources.

If the development of storage facilities in the WRIA is pursued, facilities that address multiple beneficial uses are preferred. A storage facility could potentially provide benefits to irrigation use, stock watering, agriculture, instream flows, water quality (temperature and sediment), fish and wildlife habitat, and recreation.

**Aquifer Storage and Recovery (ASR):** Water can be stored underground, where an aquifer serves as a subsurface reservoir. Aquifer storage and recovery (ASR) refers to temporarily storing water in an aquifer for later recovery and use. In the 2000 session, the Washington State Legislature expanded the definition of “reservoir” in Chapter 90.03.370 RCW to include “any naturally occurring underground geological formation where water is collected and stored for subsequent use as part of an underground artificial storage and recovery project.” In March 2003, Ecology adopted Chapter 173-157 WAC, which establishes the standards for review of applications for ASR projects and standards for mitigation of potential adverse impacts to ground water quality or the environment.

Often water sources used to recharge an aquifer for ASR will require some degree of water quality treatment prior to its storage. At a minimum, the recharged water must have minimal turbidity to avoid clogging the ASR well and the aquifer around the well. In addition, recharge water quality cannot exceed applicable ground water quality standards, or degrade ambient ground water quality in the storage aquifer. The water quality in headwaters of WRIA 30 during the snowmelt period tends to be very good. Hence, the requirements for treatment of water may

be minimal if snowmelt water were used to recharge aquifers. The low treatment requirements would reduce total project costs.

Typically in ASR applications, a greater volume of water is recharged to the aquifer for storage than is subsequently withdrawn for beneficial use, because some recharge water is “lost” to mixing with the ambient ground water. This can lead to an increase in the volume of ground water in the storage aquifer through successive ASR cycles. As is the case for a surface water reservoir, ASR requires up to three water rights – a permit to divert water to be stored, a reservoir permit (termed the ASR permit), and a secondary permit to use the stored water. The secondary permit is not needed if the primary permit for the source water already authorizes the intended beneficial use of the stored water.

ASR options in the Swale Creek and Little Klickitat Subbasins were evaluated during the watershed assessment process. The options identified in the Little Klickitat Subbasin are likely the most viable options, largely because there are more options for obtaining surplus winter water. The reader is referred to Appendix B of the WRIA 30 Watershed Assessment for details on these options.

#### **5.1.3.4 Other Actions**

**Water Availability:** Concerns regarding ground water levels in the High Prairie area have arisen recently. The area currently relies upon private wells for water supply. Alternatives for meeting water demands may need to be explored. An evaluation of aquifer water levels and water availability in the local aquifer needs to be conducted. Once this information is obtained, a determination regarding the best means for meeting water demand in the area can be developed.

#### **RCW Addressing Conveyance of Stock Water Away From Stream to Protect Water**

**Quality:** At present, the conveyance of stock water to a stock tank or other structure to reduce the impacts of stock animals on water quality is recognized as a beneficial action by Ecology. Ecology has developed a policy that allows for such actions without modification of water rights if the amount of water consumed is not increased and that the overflow water is returned to a point near the point of diversion (Ecology, 1994a). Per the Ecology policy, the decision to divert stock water from the stream into a tank does not constitute an adjudication of any claim to the water right. This policy is not reflected in rule. The citizens of WRIA 30 would like to be able to implement this conservation measure without threat of loss of water rights or the requirement to obtain a water right for the diversion. Hence, an action item under this Watershed Management Plan is to facilitate the development of a statute that addresses pumping out of stream to water animals while protecting water rights. The cooperation of Ecology and State legislators will be sought in this effort.

#### **5.1.4 MONITORING**

Monitoring programs addressing water demand in the WRIA may be extensive and will be dependent upon the options selected to manage water resources. Numerous information gaps need to be filled in order to evaluate and process water right applications. These were discussed earlier in Section 5.1.3.1. Monitoring of resources to measure progress against goals will include

tracking of changes in stream flow and documentation of the ability of the program to meet water demand. Effectiveness monitoring will include documentation of changes associated with specific programs. Other monitoring may be required for specific projects. The quality assurance requirements discussed in Section 4.0 will apply to all monitoring programs.

## **Monitoring Progress**

**Stream and Climate Gauging:** Stream gauges were identified in Section 5.1.3.1 as a necessary component for filling data gaps. Gauging will also provide information regarding long-term trends in water levels in basin streams. In addition to stream flow gauging, monitoring of climate patterns will be needed. This monitoring should include air temperature and precipitation at several points in the WRIA and the installation of at least two SNOTEL sites, one in the Simcoe Mountains and one in the western portion of the basin. A third in the Columbia Hills may be considered.

**Ground Water Levels:** Ground water levels in the various aquifers need to be monitored over time to determine if there are any long-term declining trends. At present, the City of Goldendale monitors ground water levels in the Swale Valley and in their water supply well in the Simcoe Mountains. Additional monitoring of water levels needs to be conducted in all aquifers not currently monitored. Larger aquifers, such as the Wanapum, Grande Ronde, and Simcoe aquifers, should ideally be monitored at more than one site. Data collected to fill the data gaps regarding connectivity of aquifers will also provide insight into the appropriate locations for ground water level monitoring.

**Demand Versus Supply:** The water purveyors in WRIA 30 track water supply and demand within their supply areas. The ground water monitoring described above will provide insight regarding areas where supply is not meeting demand and will help to identify situations that need to be addressed to meet demand.

**Water Quality:** Tracking of changes regarding water quality is important in determining if beneficial uses are being met. The monitoring program defined in Section 6 of this plan will serve this purpose.

## **Effectiveness Monitoring**

**Public Outreach:** Actions taken to inform the public regarding water rights, conservation measures, projects, and other efforts should to be documented. Responsibility for documentation of these efforts will be determined during the development of the Detailed Implementation Plan.

**Conservation Measures:** Implementation of water conservation measures that receive funding and/or assistance from a conservation district, the city, the County, or the State will be documented by those entities. Individual members of the public may implement conservation measures on a voluntary basis without seeking funding or assistance. These efforts will be difficult to track. The public outreach program can encourage landowners to report significant actions taken to reduce water use, but in general, tracking of these conservation efforts will be incomplete at best.

**Water Rights:** Water rights, water changes, water transfers, water in trust programs, and formalized water right relinquishments are automatically collected by the Department of Ecology. Annual reports to the Legislature and the County provide documentation of Water Conservancy Board activities.

### **Other Potential Project Specific Monitoring**

**Water Bank:** All transactions passing through a water bank need to be documented. Water available for allocation, water in trust, short term and long term water transfers, and other actions undertaken by the bank need to be recorded. The actions of the water bank will be subject to audit by a local authority and potentially subject to audit by the State.

**Water Reclamation:** Water reclamation projects, if pursued and permitted, will be subject to monitoring requirements at the time the permit is approved. Likely monitoring requirements include quantity of water reclaimed, documentation of water quality of reclaimed water, and use of reclaimed water. Monitoring requirements in addition to the ones specified here are likely.

**Water Storage:** Water storage projects, if implemented, will be subject to monitoring requirements at the time the permit is approved. Likely monitoring requirements include documentation of flows relative to minimum instream flows downstream of the facility, documentation of the effectiveness of various mitigation requirements, and monitoring of project effects. If a hydroelectric facility is incorporated in the project, the Federal Energy Regulatory Commission (FERC) will require reports on generation and transmission of power and will require extensive environmental monitoring.

**Aquifer Storage and Recovery:** Aquifer storage and recovery projects, if implemented, will be subject to monitoring requirements at the time the permits are approved. Likely monitoring requirements include documentation of water quality diverted to the system, documentation of water quality injected into the aquifer, quantification of water volumes recharged and recovered, and documentation of instream flows relative to minimum flows specified by the project permit.

### **5.1.5 DISCUSSION**

The development of an approach to address water demand in WRIA 30 may involve numerous agreements between agencies and other entities. Evaluation of options will necessarily include assessment of legal, political, and economic considerations. The preferred approach will be identified during the first year of the plan implementation.

Minimum instream flows have not been set for streams within the WRIA. Ecology will contact the Initiating Governments in advance of starting activities (prior to project scoping and study design development) to address instream flows. The Planning Unit wishes to have the opportunity to provide information and to work with Ecology on instream flow issues and expects to be involved and consulted throughout any instream flow-setting process.

## **5.2 CLIMATE FLUCTUATION AND WATER AVAILABILITY**

**Problem:** The problem that has been identified is that inter-annual, decadal, and global fluctuations in climate affect the amount of water available for use each year. Periodic droughts affect water users and impact the WRIA's economy. Currently, the basin has no storage capacity and is particularly vulnerable to droughts.

**Goal:** The management goal identified for this issue is to obtain extra capacity to provide water in low water years.

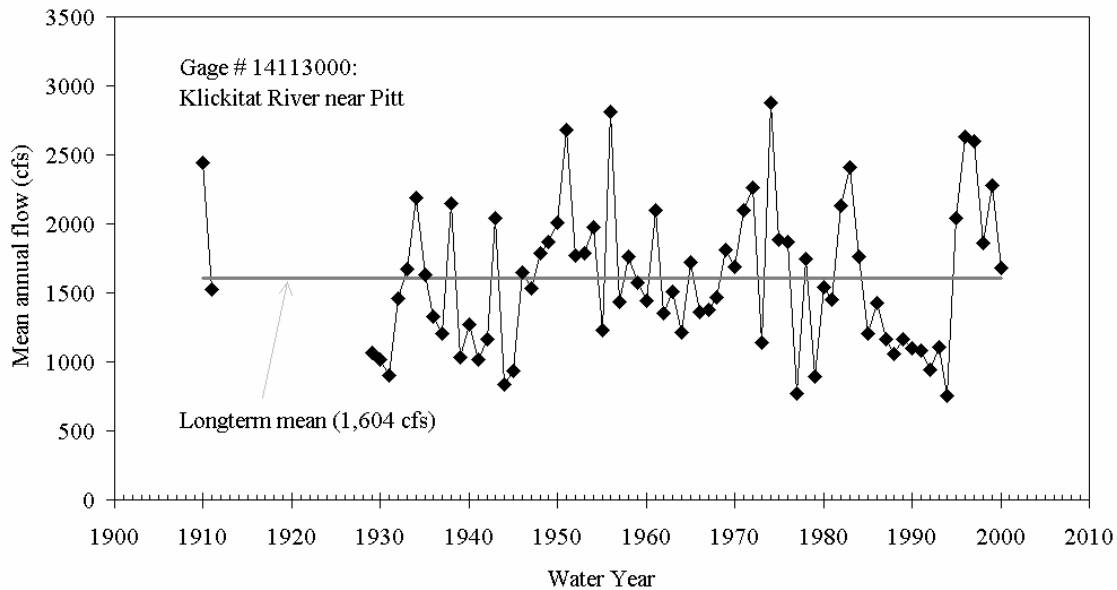
**Priority:** Moderate

### **5.2.1 BACKGROUND:**

Well-documented cycles of relatively warm/dry and cold/wet weather in the Pacific Northwest persist over periods of 20 to 30 years. These cycles are known as the Pacific Decadal Oscillation, or PDO. Much of the data from gauges in WRIA 30 were collected during cold/wet periods; hence, estimates of long-term average stream flow are overestimated. Mean annual flow over the 75-year record at the stream gauge near Pitt (Figure 8) reflects variations in the PDO cycles over time.

Warm/dry periods are often accompanied by drought, although droughts can also occur during cold/wet periods. Since water recharge and stream flow in WRIA 30 are largely driven by snowmelt patterns in the Eastern Cascade Mountains and the Simcoe Mountains, the intensity of drought is dependent largely upon the amount of snowfall in the mountains in any given winter. The intensity of drought conditions can also vary within the WRIA. The Simcoe Mountains have a much lower elevation than the Cascade Mountains and climate patterns can be very different. Hence, the Little Klickitat Subbasin, which is fed by the Simcoe Mountains, may have a different drought experience than the subbasins in the western portion of the WRIA.

During periods of drought, stream flow and ground water recharge are reduced. Water needs, on the other hand, often increases to provide the water needed to support crops, pasture land, and landscapes. In such years, water available may not be sufficient to meet water demand.



**Figure 8. Mean annual flow time series at the Klickitat River gauge near Pitt.**

During periods of drought, conservation of water can be encouraged. Irrigators may decide not to plant certain fields and/or which crops to plant. Water conserved or otherwise not used can be placed in trust for one year to preserve the water right. Decisions regarding crop and acres to farm need to be made early in the season. Therefore, a system that helps to inform agricultural interests regarding expected water issues would be valuable.

During periods of drought, sufficient water may not be available to meet the water demand of residences and commercial/industrial uses. If ground water decreases to unusual levels, wells may go dry. Water purveyors may also have difficulty in meeting demand. Emergency water supplies may be needed in some years to meet residential water demand.

## 5.2.2 ASSUMPTIONS AND CONSTRAINTS

It is assumed that Ecology will assist with drought emergency actions when appropriate.

## 5.2.3 APPROACH

Many of the approaches discussed in Section 5.1 are also applicable to addressing water shortages during periods of drought. Should water users choose not to use water in a drought year, that water can be temporarily put into a voluntary trust. This provides a form of documentation that the right was not beneficially used due to drought, which is an exception to the 5-year period for relinquishment. Water banking may also be used to track and facilitate water transfers in times of need. All water conservation options discussed in Section 5.1 are applicable to this situation. The reader is referred to Section 5.1 for an in-depth discussion of these actions. Additional actions to be taken to address drought situation are discussed below.

## **Drought Forecasting**

The monitoring actions discussed in Section 5.1 included the establishment of stream flow, climate, and snow monitoring stations and the monitoring of ground water levels. The monitoring stations and ground water level information will also be useful to efforts regarding drought forecasting. The effect that snow levels in the Simcoe and Cascade Mountains have on ground water recharge and stream flow needs to be identified to facilitate interpretation of data and identification of pending drought situations. An initial relationship can be developed using the limited data currently available. Data collected over time at the new monitoring sites will be reviewed to update predicted effects on ground and surface water as a function of snow accumulation.

## **Emergency Actions**

**Drought Declaration:** Under Washington State law, the Governor authorizes Ecology to declare a drought emergency when expected water supplies are below 75 percent of normal, based on March 1 snow-pack measurements, and the water shortage is expected to cause undue hardship to people and the environment (Chapter 173-166 WAC). A series of emergency response tools and financial assistance becomes available once a drought is declared. A drought can be declared for the entire state or for a portion of the state. Generally, potential droughts are tracked and evaluated for larger basins.

In WRIA 30 a large portion of the agricultural operations and residential population are dependent upon snowmelt in the Simcoe Mountains. Agricultural and residential water users in WRIA 30 can therefore be impacted by significant drought not felt in other areas of the state. With improved tracking of snow levels in the Simcoe Mountains, forecasts of drought conditions will become more reliable. This information will be used to inform Ecology and the Governor's office regarding impending drought situations and to make requests for formal declarations of local drought.

**Emergency Response Options:** When a drought emergency is declared, Ecology may authorize temporary transfers of water rights to redistribute water to more critical uses, permit the use of previously drilled emergency wells, permit the construction of new emergency wells, allow the use of alternate sources of water, issue temporary water permits to expand capacity on existing wells, and/or purchase and lease water rights from willing sellers. Ecology may also restrict water use by junior water right holders to ensure water is available to senior water right holders. If a water bank is developed, the water bank may choose to facilitate water management in response to water needs during a drought.

**Water Leases:** In 2005, Ecology is offering to lease irrigation water from senior water right holders in the Yakima Basin so that junior water right holders facing cutoff will still have water for drinking and other domestic uses. Water may also be leased to improve flows for fish and to offset some of the effects of transferring water diversions to new locations during the drought emergency. Ecology is asked to extend this program to WRIA 30 during drought years to assist in meeting local demand.

**Water Restrictions:** Water purveyors may choose to restrict water use for certain applications such as watering of lawns. The choice to implement such measures lies entirely within the jurisdiction of each purveyor.

### **Documentation of Water Not Used Due to Drought**

Under State law, water rights are wholly or partially relinquished if there are five successive years of non-use unless there is sufficient cause to explain the non-use. One of the causes of non-use specified in Chapter 90.14.140 RCW is drought or other unavailability of water. Landowners concerned about maintaining their water right may choose to document the decision not to use water during a drought year. One option for documentation is the placement of unused water into a voluntary trust for the period of drought. The Water Trust Program automatically excludes the period of time that the water is in trust from the five-year use evaluation. Other options for documentation exist.

### **Water Storage**

Water storage options were discussed in Section 5.1. Evaluations of expected benefits of water storage projects under consideration will include an analysis of expected benefits in terms of water available to offset drought impacts. The reader is referred to Section 5.1 for further discussion of water storage options.

### **Public Education and Outreach**

**Impending Drought:** Public education and outreach is of paramount importance during drought situations. Farmers make decisions regarding the number of acres to farm and what to plant early in the year, often before the March 1 date set for evaluation of the need for a drought declaration. The information gained in monitoring will help entities within the WRIA forecast drought situations. This information will be provided to the public as early as possible to help facilitate spring decisions regarding farming.

**Water in Temporary Trust and/or Documentation of Non-Use of Water:** During years of drought, information regarding options available to help preserve rights and document non-use due to drought conditions also needs to be disseminated early in the season.

**Conservation:** Public outreach regarding conservation measures described in Section 5.1 will need to be scaled up in years of drought.

**Emergency Measures:** Purveyors implementing emergency measures to reduce the effects of drought or implementing water use restrictions will inform the public regarding these decisions. This portion of the public education process is in place and does not need modification, although purveyors may seek emergency funding to offset the costs of public education in such situations.

## **5.2.4 MONITORING**

The monitoring of climate, stream flow, snow pack levels, ground water levels, public outreach, optional water bank actions, water rights transfers, and water right permits described in section



5.1 is applicable to this issue as well. In addition to these monitoring actions previously described, monitoring to address the climate issue will include the development of a method to forecast drought based on measurements of climate and snowpack.

### 5.3 SUMMER STREAM FLOW IN THE LITTLE KLICKITAT RIVER

**Problem:** Summer stream flow is currently low in summer. Fish habitat and water quality would be benefited by increased flows.

**Goal:** Increase summer stream flow in the Little Klickitat to the extent that is reasonably possible, while balancing the needs of competing demands.

**Priority:** Moderate

#### 5.3.1 BACKGROUND

**Gaging Record:** Seven stream flow gauges were operated historically within the Little Klickitat Subbasin, five of which had mean daily stream flow records. Cumulatively, these gauges provide information regarding flows for the period from 1910 to 1981. The gauge with the longest period of record (1910-1970) was located near Goldendale. The gauge near Wahkiacus was operated from 1944 to 1981. The others were operated for only a few years. Ecology installed a new gauge on the Little Klickitat River at the old Wahkiacus gauge site in 2005. The Planning Unit requests that Ecology maintain this gauge for at least 10 years and not decommission it prior to discussing the matter with the Implementing Governments and/or Planning Unit.

**Stream Flow:** Flows near Goldendale tended to be higher in winter and lower in summer than those near the mouth of the river. Currently, flows near Goldendale are often extremely low in summer. The median (50 percent exceedance) flow near Wahkiacus ranges from 24 cfs in August to 282 cfs in February. The 90 percent exceedance flow (low flow) ranges from 12 cfs in August to 104 cfs in March.

**Recent changes affecting flow:** The City of Goldendale has made major changes in its water supply sources in the last two years. The City has discontinued its diversion of water from Bloodgood Springs (a tributary to the Little Klickitat River) and is now using ground water from the Simcoe Mountain volcanics and Wanapum basalt aquifer in the Swale Creek Basin. Potentially, curtailment of diversion from Bloodgood Springs will increase flow by up to two cfs in the Little Klickitat River. The City has modified and redeveloped the Simcoe Springs system to eliminate surface water intrusion, thus allowing surface flow to pass downstream. The City has abandoned the Emerson Spring Big Spring, Butler Springs developments, which provides up to 350 gpm for instream use.

**Importance of Maintaining Summer Flows :** The magnitude of summer flows affects the quantity and quality of fish habitat available in the Little Klickitat River. Higher flows would provide for deeper rearing pools and a larger habitat area. The Technical Assessment completed in support of the Little Klickitat TMDL process indicated that increased summer flows might

also reduce summer water temperatures. Reductions in water temperatures will further improve the quality of fish habitat.

**Interaction with other issues and approaches:** Increasing summer stream flow was identified as one of the options for addressing elevated stream temperatures in the Little Klickitat River. Hence, actions taken to address this issue also will help to address the elevated stream temperature problem addressed in Section 6.0. Stream flows were also recognized as a beneficial use to be protected under actions taken to meet current and future demand (Section 5.1). Improved stream flows in the Little Klickitat River are expected to result in improved fish habitat conditions. Therefore, this issue also addresses those issues discussed in Section 7.

### **5.3.2 ASSUMPTIONS AND CONSTRAINTS**

Implementation of programs is funding dependent.

### **5.3.3 APPROACH**

The approach to addressing the low summer flows in the Little Klickitat basin is highly dependent upon data collection to identify the extent and sources of land use effect on stream flows. The data collection effort will provide insight into the degree of change that is possible, the uses that have the greatest effect on stream flows, and the projects that are likely to have the greatest benefit in terms of improving flows. In the interim, all actions that reduce water use described in Section 5.1 may improve stream flows. The reader is referred to Section 5.1 for details on options for water conservation and water trust programs.

#### **Address Data Gaps**

Obtain information needed to identify current land use effects on summer flows in the Little Klickitat River. Data collection described in Section 5.1.3.1 will also aid in evaluation of the actions that should be taken to improve stream flow. Actions described in Section 5.1.3.1 that are also applicable to this issue include:

- ' Refine estimate of actual use (including interpretation of satellite imagery, considering inter-annual variation)
- ' On a subbasin scale, refine understanding of ground water/surface water interactions utilizing base flow analysis where appropriate
  - Interaction between aquifers and points of surface water
  - Effect of water withdrawal from ground water sources on stream flow
- ' Identify losing and gaining reaches in areas where additional water is needed
- ' Delineate specific aquifer zones within subbasins.
- ' Estimate storage volume within each aquifer
- ' Improve water budgets
- ' Establish permanent gauging locations to measure stream flow
- ' Comparative analysis of historical versus current streamflow in subbasins, focusing initially on the Little Klickitat Subbasin

In addition to the actions described in 5.1.3.1, the following is needed:

- Review cadastral survey notes from the mid-1800s to determine what information can be obtained regarding the historic water levels.
- Evaluate the effects of channelization of summer flows

Details regarding project objectives and scope will be developed on a schedule determined during the first year of plan implementation.

### **Identify and Implement Actions**

The information obtained in the studies described above will provide sufficient information to assess the effects of land use on summer stream flow and to identify those actions that have the greatest potential benefit. If reduction of surface water use proves to be a viable strategy for addressing stream flow, selection of projects to implement may include purchase or lease of water rights, encouragement of participation in water trust programs (Section 5.1), and/or implementation of water conservation actions (Section 5.1). If a water banking program is developed, water lying in the water bank will effectively become available to enhance instream flow and will likely be placed temporarily in trust.

### **Evaluate storage options**

Water storage projects in the Little Klickitat Subbasin may be used to enhance instream flows, subsequently improving water quality and fish habitat. Storage options were addressed in Section 5.1.3.2. If the development of storage options is pursued, options that provide benefits to multiple uses, including instream flows, are preferred.

### **Public Outreach and Education**

Public outreach to inform the public about the importance of increasing summer flows will help the public understand why funds are being expended to conduct studies. Public education can also be used to encourage water conservation and inform water right holders regarding options for water in trust and other programs that may increase stream flow. Once the interaction between land use and stream flow is better understood, public education to inform the public regarding the scope of the problem will also be required.

### **5.3.4 DISCUSSION**

There is significant overlap between the actions taken to address this issue and the actions described to address current and future water needs (Section 5.1). In addition, improvements in fish habitat and water quality are expected with increased stream flow. The extent of improvements to fish habitat and water quality will be dependent upon the magnitude of increase in summer stream flows that can be obtained.

## **5.4 MANAGEMENT OF ACTIONS ADDRESSING WATER QUANTITY**

The management of the quantity of surface and ground water in WRIA 30 is addressed in this section. In general, this Watershed Management Plan does not provide in-depth discussion of

water management in the basin. The Planning Unit recognizes that details regarding water management will be developed during the implementation planning process.

#### **5.4.1 ACTION ITEMS**

Action items related to water quantity to be addressed during Watershed Management Plan implementation include a large number of activities. In all cases, Ecology may be asked to provide guidance regarding appropriate approaches and/or rules and regulations and may also be asked to provide review of project proposals, plans, and study documents. Ecology will also be asked to act as the liaison between the various other State agencies regarding water quantity issues that may benefit from input from those other agencies. The action items are summarized below. Subtasks are listed for some items under the major tasks.

##### **Action Items Needed to Address Water Quantity Issues**

- ' Develop estimates of water available for allocation
  - Refine estimates of actual use
    - ? Identify rights that are no longer in use
    - ? Refine understanding of ground water/surface water interactions
    - ? Identify losing and gaining reaches in areas where additional water is needed
    - ? Estimate volume of water in Wanapum, Simcoe, and Ellensburg aquifers
    - ? Improve water budgets
    - ? Identify critical instream habitat areas (see Section 7.0)
  - Refine estimates of current and historical flow in the Little Klickitat River
    - ? Measure stream flow
    - ? Update Little Klickitat hydrograph
    - ? Estimate the effect of water use on stream flows in critical areas
    - ? Estimate historical flow in the Little Klickitat basin
    - ? Review cadastral survey notes for the Little Klickitat to help depict historical conditions
  - Study the effects of channelization on summer flows in the Little Klickitat
  - Initiate other studies as will be determined through interactions with Ecology
  
- ' Develop and implement program to assist with meeting future water needs
  - Evaluate water right management options
  - Evaluate storage options and implement options as found necessary and feasible
  - Determine if water management program is desirable and implement if appropriate
  - Develop and implement program that will assist water users in drought years
  - Facilitate use programs that will provide increased stream flow where needed
  - Facilitate the implementation of programs designed to assist with irrigation efficiency projects
  - Develop program(s) to address water conservation opportunities and to quantify water conserved through various efforts;
    - ? Irrigation efficiencies
    - ? Residential conservation options
    - ? Water transport and distribution systems

? Possible gray water use

- ' Public communication and education
  - Watershed Management Plan implementation information
  - Critical Areas Ordinance requirements
  - Irrigation efficiencies
  - Residential water conservation
  - Cost efficiency of projects
  - Water rights law
  - Water management programs
  - Benefits of metering water use
  - Adjudication process
  
- ' Additional monitoring of water quantity conditions
  - Stream flow
  - Ground water levels
  - Water use
  
- ' Implementation Monitoring
  - Programs implemented
  - Water conserved
  - Water available for allocation
  
- ' Overall coordination of entities involved in implementation of Watershed Management Plan
  - Tracking of overall progress
  - Reporting to and coordination with Ecology and other entities

Some of the items above may be eliminated or modified based on results of additional studies, monitoring, and evaluation. Additional action items may also be identified during the course of plan implementation.

#### **5.4.2 MANAGEMENT OPTIONS**

The details regarding the management and oversight of the implementation of the water quantity portion of the plan will be developed during development of the Detailed Implementation Plan.

Many of the action items listed in the previous section are currently at least partially addressed by existing programs; hence, the assistance of entities with existing programs may be requested by the plan management entity.

Table 11 provides an overview of the possible entities that could be asked to assist with various aspects of the Watershed Management Plan that address water quantity issues. The table is not to be construed as an assignment of responsibility. The checks on the table merely indicate options that the plan management coordinator(s) may consider when asking for assistance.

Further development of this plan during the implementation process and/or at later dates may be required. However, the plan will remain consistent with the Comprehensive Water System Plans developed by the major water purveyors in the WRIA and submitted to the State Department of Health.

**Table 11. Entities That May Be Asked to Assist with the Implementation of Action Items Related to the Water Quantity Issues.**

*Note:* Ecology will likely be asked to provide guidance and document review associated with all the items listed below. Ecology will also be asked to serve as a liaison with other State agencies, including State Department of Health and the Department of Fish and Wildlife, regarding matters addressed in the actions below. Checks associated with Ecology that are in bold indicate those action items that Ecology may (or may not) be requested to accept a major role in the completion of the action item.

<b>Action Item (Subtasks are italic and right justified)</b>	<b>Ecology</b>	<b>Water Purveyors</b>	<b>WA Health Dept</b>	<b>Water Conservancy Board</b>	<b>County Planning Dept.</b>	<b>County Health Dept.</b>	<b>Conser- vation District<sup>1</sup></b>	<b>Cities</b>
<b>ADDITIONAL STUDIES</b>								
Refine Estimates of Actual Use	√	√	√	√	√	√	√	√
<i>Update L. Klick. Hydrograph</i>	√	√			√			√
<i>Aerial Photo Analysis of Crop Use</i>	√				√		√	√
<i>Ground Water / Surface Water Interactions</i>	√	√		√	√			√
<i>Losing and Gaining Reaches</i>	√				√		√	√
<i>Volume of Water in Aquifers</i>	√	√			√			√
<i>Updated Water Budgets</i>	√	√		√	√			√
<i>Identify Critical Instream Habitat Areas<sup>3</sup></i>	√				√			
Refine Estimates of Current & Historical L. Klick Flow	√	√		√	√	√	√	√
<i>Stream Flow Measurements</i>	<b>0</b>				√		√	√
<i>Estimates of L. Klick Historical Flow</i>	√	√			√		√	√
<i>Review Cadastral Survey Notes</i>	√				√			
<i>Effect of Water Use on Stream Flow</i>	√	√		√	√			√
Effect of Channel Mods on Flow (L. Klick)	√				√		√	√
Other Studies as Needed	√	√	√	√	√	√	√	√
<b>DEVELOPMENT AND IMPL EMENTATION OF PROGRA MS</b>								
Evaluate Water Management Options	√	√	√	√	√	√		√
Storage Options	√	√	√	√	√	√		√
Implement Water Management Program if	√	√		√	√	√		√

<sup>1</sup> NRCS may be the more pertinent agency in some cases

<sup>3</sup> See Section 7.0 for additional information

Action Item (Subtasks are italic and right justified)	Ecology	Water Purveyors	WA Health Dept	Water Conservancy Board	County Planning Dept.	County Health Dept.	Conser- vation District <sup>1</sup>	Cities
Appropriate								
Program to Assist Water Users in Drought Years	√	√		√	√		√	√
Programs to Increase Stream Flow Where Needed	√	√		√	√		√	√
Irrigation Efficiencies	√				√		√	
Water Conservation	√	√	√	√	√	√	√	√
<b><i>PUBLIC EDUCATION AND INTERACTION</i></b>								
Plan Implementation Information	√	√		√	√	√	√	√
Critical Areas Ordinance Requirements					√			
Irrigation Efficiencies	√			√	√		√	
Residential Water Conservation	√	√	√	√	√	√	√	√
Cost Efficiency of Projects	√	√			√		√	√
Water Rights Law	√	√		√	√			√
Water management Programs	√	√		√	√		√	√
Benefits of Metering Water Use	√	√		√			√	
Adjudication Process	√				√			
<b><i>WATER QUANTITY MONITORING</i></b>								
Stream Flow	√	√			√		√	√
Ground Water Levels	√	√			√	√	√	√
Water Use	√	√		√	√		√	√
<b><i>IMPLEMENTATION MONITORING</i></b>								
Programs Implemented	√				√		√	√
Water Conserved	√	√		√	√		√	√
Water Available for Allocation	√	√		√	√		√	√



### 5.4.3 FUNDING

Numerous options are available for funding water management programs addressing water quantity issues. Table 12 provides a summary of commonly used funding sources managed by State and federal agencies.

**Table 12. Potential Funding Sources to Support Portions of the Watershed Management Plan Addressing Water Quantity.**

*Sources: Kathleen Bartu, Foster Creek Conservation District; Washington State Infrastructure Assistance Coordinating Council ([www.ingrafunding.wa.gov](http://www.ingrafunding.wa.gov)), Boise State University ([ssrc.boisestate.edu](http://ssrc.boisestate.edu)), and various state and federal web pages.*

<b>PROGRAM</b>	<b>AGENCY</b>	<b>DESCRIPTION</b>
Aquatic Ecosystems Program	Bullitt Foundation	The Foundation strives to protect, restore, and maintain the region's aquatic resources and ecosystems, from the pure water of high mountain streams to the productive richness of marine environments.
Capitalization Grants for Drinking Water State Revolving Fund	EPA	EPA awards grants to states to capitalize their Drinking Water State Revolving Funds.
Centennial Clean Water Fund	Ecology	Projects that prevent and control water pollution.
Community Development block Grant	Office of Community Development	Funds top priority projects addressing water, wastewater, infrastructure, economic development, feasibility studies, pre-engineering reports, infrastructure planning, and community facilities
Conservation and Stewardship in Agriculture	Bullitt Foundation	Promote conservation and stewardship of agricultural lands: adoption of agricultural practices that reduce soil loss and water pollution, minimize pesticide use, conserve biodiversity, promote the efficient and non-polluting use of water, as well as efforts to preserve farmland.
Conservation Reserve Program	Farm Service Agency	The Conservation Reserve Program (CRP) provides annual rental payments and cost sharing assistance to landowners and operators to take environmentally sensitive land out of production and plant it to a perennial cover under 10 to 15 year contracts. CRP also includes the Conservation Reserve Enhancement Program (CREP), which enrolls riparian buffers along selected salmon-bearing streams with substantially higher compensation. Both programs can be used to offset the costs of voluntarily taking land out of production.
Conservation Security Program	NRCS	Provides payments for producers who practice good stewardship on their agricultural lands and incentives for those who want to do more.

<b>PROGRAM</b>	<b>AGENCY</b>	<b>DESCRIPTION</b>
Drought Emergency Water Supply	Ecology	Measures to conserve water during drought or develop alternate water supplies.
Emergency Community Water Assistance Grant Program	USDA – Rural Development	Provide emergency community water assistance for residents in rural areas. May be used for waterline extensions, new water lines, repairs, construction of wells, reservoirs, transmission lines, and other water source equipment.
Emergency Conservation Program	Farm Service Agency	Cost share to farms and ranchers for the rehabilitation of farmlands damaged by floods, drought, or other natural disasters.
Environmental Education Grants	EPA	Supports project to design, demonstrate, or disseminate practices, methods, or techniques related to environment education.
Environmental Education Grants Program	EPA	Projects must focus on one of the following: (1) improving environmental education teaching skills; (2) educating teachers, students, or the public about human health problems; (3) building state, local, or tribal government capacity to develop such programs; (4) educating communities through community-based organization; or (5) educating the public through print, broadcast, or other media.
Environmental Quality Incentive Program (EQIP)	NRCS	Voluntary conservation program for farmers and ranchers to address significant natural resource needs and objectives.
Forest Stewardship and Stewardship Incentive Program	Washington Department of Natural Resources and USDA Forest Service	Technical and financial assistance to non-industrial forest owners for a variety of forest stewardship projects, including riparian, wetland, and fisheries habitat enhancement. Applies to programs intended to increase stream flow.
Ground water Foundation		Provides educational programs for all ages on ground water.
National Research Initiative Competitive Grants Program	U.S. Department of Agriculture	Research problems of national and regional importance in biological, environmental, physical, and social sciences relevant to agriculture and food and the environment, including water resources assessment and protection.
Nonpoint Source Implementation Grants	U.S. Environmental Protection Agency	To assist states in implementing agency approved Section 319 statewide nonpoint source management programs.
Non-Point Water Quality Grants	Washington Conservation Commission	Financial assistance for implementation of projects and practices to improve water quality. Examples: Work with farmers to reduce water use; control run-off to reduce sedimentation; improve fish habitat; improve water quality in shellfish areas.

<b>PROGRAM</b>	<b>AGENCY</b>	<b>DESCRIPTION</b>
Planning/Technical Assistance Program	Bureau of Reclamation	Bureau of Reclamation provides assistance in data collection and analysis related to water supply and water quality, engineering, hydrologic studies, sedimentation, and water resources planning. Priorities include water use efficiencies, and long-term water supply planning.
Public Works and Economic Development Program	Economic Development Administration	Communities on the economic decline to revitalize, expand, and upgrade their physical infrastructure to attract new industry, encourage business expansion, diversify local economies and generate or retain long term, private sector jobs, and investment.
Public Works Construction Loan	Washington Department of Community, Trade, and Economic Development	Construction loan program.
Public Works Planning	Washington Department of Community, Trade, and Economic Development	Loan to provide funding for preparation of long-term capital facilities plans
Public Works Pre - Construction Loan	Washington Department of Community, Trade, and Economic Development	Assists local governments accelerate the construction of eligible public works
Regional Geographic Initiative (RGI) Program	EPA	Funds unique, geographically-based projects that fill critical gaps in the Agency's ability to protect human health and the environment.
Rural Community Assistance	USDA Forest Service	Often used as seed money. Emphasis on planning and partnerships that enable communities to work towards economic development, job creation, capacity building, and sustainability.
Section 22: Planning Assistance to the States Program	US Army Corps of Engineers	Authority for the Corps of Engineers to assist entities in the preparation of comprehensive plans for the development, utilization, and conservation of water and related land resources.
Student Environmental Stewardship Program	Washington Environmental Education Foundation	Encourage student participation in local environmental stewardship projects and enhance student understanding of community service and philanthropy.
Sustainable Agriculture Research Education	Cooperative State Research Education and Extension Service	Increase scientific investigation and education to reduce the use of chemical pesticides, fertilizers, and toxic materials in agricultural production; improve management of on-farm resources to enhance productivity, profitability, and competitiveness; to promote enterprise diversification; to study farms that optimize the use of on-farm resources and conservation practices; and to promote partnerships among farmers, nonprofit organizations, agribusiness, and public and private research and extension institutions.

<b>PROGRAM</b>	<b>AGENCY</b>	<b>DESCRIPTION</b>
The Challenge Grant Program—the Heart of Water 2025	US Department of Interior-Bureau of Reclamation	Funding to irrigation and water districts for projects focused on water conservation, efficiency, and water marketing. This program can be used to fund canal lining and piping, and can cover construction costs.
USGS Cooperative Water Program	USGS	The USGS Cooperative Water Program jointly funds water-resources projects in an ongoing partnership between the USGS and non-Federal agencies.
Washington State Water Pollution Control Revolving Fund	Washington State Department of Ecology	This program helps local governments finance water quality projects by providing low interest loans to public entities. Project examples: wastewater treatment facilities, nonpoint source water pollution control, wetlands acquisition, estuarine management.
Water Quality Incentives Projects	Farm Service Agency	Funding available in terms of incentive payments to encourage farming practices that reduce the amount of water pollution caused by agricultural activities.
Water Reclamation and Reuse	Washington State Department of Ecology	Promote and facilitate the use of reclaimed water to replace potable water in non-potable applications.
Wetlands Reserve Program	Natural Resources Conservation Service and Farm Service Agency	Offers landowners the opportunity to receive payments for restoring and protecting wetlands on their property.

## **6.0 WATER QUALITY MANAGEMENT**

The management of the quantity of surface and ground water in WRIA 30 is addressed in this section. In general, this Watershed Management Plan does not provide in-depth discussion of water quality management in the basin. The Planning Unit recognizes that details regarding water quality management will be developed during development of the Detailed Implementation Plan. The following sections discuss the key issues regarding water quality that were identified during the watershed planning process. A discussion of the potential approaches to addressing these issues and a discussion regarding management and implementation issues are also provided. It is recommended that this water quality management strategy be used by federal, State, and local governments and private organizations to guide proposals and funding for future programs to improve water quality.

The discussion in this section builds on information and analyses presented in the WRIA 30 Watershed Assessment document (with appendices). The sections of the report particularly pertinent to the management of water quality in the basin include:

- ◆ WRIA 30 Watershed Assessment, Appendix A
  - ◆ Section 2.0, Hydrologic overview, including information on stream flow
  - ◆ Section 4.0, Water Quality
- ◆ WRIA 30 Watershed Assessment, Appendix D, WRIA 30 Nitrate Study
- ◆ WRIA 30 Watershed Assessment, Appendix E, Swale Creek Temperature Study

Four key issues regarding the quality of water were identified and prioritized during the planning phase. Management goals were identified in general terms for each of these issues. The four water quality issues and level of priority are as follows:

1. Little Klickitat River Temperature (High Priority)
2. Nitrates in Ground water (Swale Creek Valley) (Moderate Priority)
3. Swale Creek Temperature (Low Priority)
4. Elevated Fecal Coliform Levels (Low Priority)

An adaptive management approach to addressing water quality issues is envisioned. The approach will include documentation of baseline conditions and tracking of progress against the baseline. Baseline conditions will include not only the starting conditions of the water quality parameter in question, but will also include information regarding upland conditions that may be affecting water quality. For instance, shade over the stream is known to affect stream temperature. Hence, baseline information regarding riparian condition will be developed. In some circumstances, control sites may be desirable, especially in situations where variations in climate may affect the water quality parameter. In such cases, control sites will be carefully selected to represent an appropriate stratification scheme. Changes relative to baseline conditions will be monitored to evaluate the effectiveness of actions taken to address the identified water quality situations. The change in baseline conditions relative to actions taken will provide useful information regarding the effectiveness of various actions. The management strategy may be revised in response to the information gained over time. The Planning Unit

urges the implementation of voluntary and positive incentive-based approaches to addressing water quality issues.

Discussions regarding the identified issues, the management goals for those issues and background information regarding the issues are described below.

## 6.1 LITTLE KLICKITAT RIVER TEMPERATURE

**Problem:** Water temperature in the Little Klickitat River exceeds the applicable State water quality criterion.

**Priority:** High

**Goal:** The goal regarding this issue is to reduce temperature in the Little Klickitat River to standard or to an attainable level. The approach that has been identified strives to:

- ◆ Determine and refine estimates of attainable temperatures and shade using appropriate methodologies.
- ◆ Increase shading to attain the goals specified in the TMDL where reasonably attainable by 2090.
- ◆ Increase summer flows.
- ◆ Create refuge areas if possible
- ◆ Protect existing shade

### 6.1.1 BACKGROUND

#### State Temperature Criteria Exceedances

Six stream segments in the Little Klickitat Subbasin are listed as impaired on the 1998 303(d) list due to exceedances of the State temperature criterion (Table 13). The reader is referred to Section 2.8 for additional information regarding the 303(d) list. The listed segments are located on the West Prong tributary, East prong tributary, Butler Creek, and the mainstem of the Little Klickitat River near its confluence with the Klickitat River. Some of these segments are located on land regulated under the Forest Practices Act.

#### Pertinent Rules, Regulations, and Ordinances Addressing Land Use Effects on Stream Temperature

The primary rules, regulations, and ordinances addressing land use effects on stream temperature are briefly summarized below. Additional rules, regulations, and ordinances are also applicable.

**Clean Water Act:** The federal Clean Water Act addresses the development and implementation of water quality standards, the development of total maximum daily loads (TMDL), filling of wetlands, point source permitting, protection of navigational waters, and other provisions related to protection of U.S. waters. The Clean Water Act is administered in the State of Washington by

Ecology with oversight by the EPA. Ecology has a water quality certification program under which it reviews projects and issues certifications that the proposed action meets State water quality standards and other aquatic protection regulations, if appropriate.

**Table 13. Water bodies in the Little Klickitat Subbasin that are listed on the 1998 State of Washington 303(d) list for exceedance of the State temperature criterion.**

Water Body	Stream Segment ID	Township, Range, Section
Butler Creek	YU86SG	05N, 17E, 17
Little Klickitat River River mainstem	AY21LB	04N, 14E, 09
Little Klickitat River, East Prong	AG85MX PW77VQ PW77VQ PW77VQ PU81CT	05N, 17E, 16 05N, 17E, 10 05N, 17E, 03 05N, 17E, 09 06N, 17E, 35
Little Klickitat River, West Prong	XU61EK	05N, 17E, 18

**Washington State Water Pollution Control Act (Chapter 90.48 RCW):** This act gives Ecology the authority to protect water quality in the state and to promulgate regulations as needed to achieve this goal. The Act also makes discharge of pollutants in waters unlawful and sets guidelines regarding determination that violations have occurred, penalties associated with violations, permitting processes, cooperation with other entities, water quality monitoring, grants, and numerous other subjects regarding management of water quality issues in the state.

**State Environmental Policy Act (SEPA):** SEPA regulations require an environmental review of actions taken by the State, including funding and permitting. Some actions, such as the construction of single-family dwellings, minor road repair, and issuance of business licenses, are exempt. A SEPA review evaluates the environmental and economic effects of a proposed project. This information is used to determine if the action should be taken as proposed, if mitigation is necessary, or if the proposal should be rejected.

**Shoreline Management Act (Chapter 90.58 RCW):** The Klickitat County Shoreline Master Plan recognizes the importance of the County’s shorelines and represents the long term management plan for the Klickitat River and other areas meeting the applicability criteria. The master plan defines policies and regulations for twenty-one use activities potentially affecting shorelines and waters within the management area.

**Critical Areas Ordinance:** Klickitat County’s Critical Areas Ordinance includes provisions that limit development with the intent of protecting wetlands, critical riparian habitat,

floodplains, and ground water recharge areas. The ordinance also includes provisions that limit development within geological hazard areas. The critical area ordinance buffers around wetlands greater than 2500 square feet in size and along all streams. The required buffer widths vary with the size of the wetland or stream. Some activities are exempted from the Critical Areas Ordinance and variances from the ordinance may be granted, providing suitable mitigation is included in the project proposal. The Critical Areas Ordinance is not applicable in areas subject to the Shoreline Master Plan.

**On-Site Sewage Systems:** Chapter 246-272 WAC regulates the on site disposal of sewage in the state. The law is applicable to septic systems as well as larger on-site systems. The rule addresses location of systems, site evaluations, design, installation, inspection, operation and maintenance, repair, abandonment, and other areas of concern.

**Stormwater Regulations:** Stormwater runoff is regulated through Chapter 90.48 RCW and 40 C.F.R., part 125.3 of the Federal code. The regulations require that all known, available, and reasonable methods of prevention, control and treatment of waste be applied prior to discharge to waters of the state.

**Forest Practices Act:** Forest practices in the State of Washington are regulated through the Forest Practices Act, Chapter 76.09 RCW. The rules and regulations were revised in 2003. The revisions were intended to address issues regarding protection of fish and water quality. Per statute, the act satisfies water pollution act requirements specified in Chapter 90.48.425 RCW.

**Hydraulic Code:** Chapter 75.20 RCW governs construction projects within the waters of the state. The law covers wharves, bulkheads, bridges, culverts, fish habitat restoration projects, and other construction activities within the ordinary high water line.

**Concentrated Animal Feeding Operation General Permit (CAFO):** Chapter 90.64 RCW addresses cattle, swine, horses, sheep, turkeys, and chickens grown in confined areas that exceed threshold limits and discharge to waters of the State. The intent of the regulation is to protect water quality. Ecology is the regulatory authority for this permit. WSDA provides assistance with meeting the CAFO requirements. Inspections and enforcement of the CAFO regulations are coordinated between Ecology and WSDA.

**Other Rules and Regulations:** There are over 100 additional rules and regulations applicable to water quality in the state. These rules cover a broad range of subjects such as surface and ground water standards, application of pesticides, well construction, motor oil disposal, utilities, solid waste disposal and recycling, water supply facilities, mining, energy facilities, dikes and levies, dairy nutrient management, aquaculture, etcetera. Lists of applicable laws and rules and links to the specific requirements of those laws and rules can be found at [www.ecy.wa.gov/laws-rules](http://www.ecy.wa.gov/laws-rules).

## **Little Klickitat TMDL**

A Technical Report in support of the development of a TMDL (Total Maximum Daily Load) was completed for the Little Klickitat River in June 2002 (Brock and Stohr, 2002). In this analysis, effective shade was used as a surrogate measure of heat flux affecting temperature. Load allocations for effective shade were developed using modeling techniques. Load



allocations were set between 50 and 95 percent effective shade for all perennial streams in the subbasin (Appendix A). Effective shade includes shade created by overhanging vegetation and topographic shading (shade provided by adjacent hill slopes). Those stream segments that were not modeled were assigned a load allocation of 73 percent shade.

The TMDL technical report also noted that additional reductions may be achieved through reductions in stream width in some areas and noted that efforts should be made to protect the cool water in Bloodgood Creek. Other recommendations in the TMDL technical report included the promotion of water use efficiency to increase stream flow and the reduction of sediment loads to address channel widening associated with high sediment inputs.

A TMDL Detailed Implementation Plan (DIP) was released in March 2005 (Anderson, 2005). The DIP summarizes the types of actions that could be undertaken to reduce stream temperature in the Little Klickitat River. The TMDL and the Detailed Implementation Plan are not new regulations. Actions described in the DIP are voluntary, although some actions are required by other regulations.

### **Columbia River TMDL**

The states of Idaho, Oregon, and Washington are working with the U.S. Environmental Protection Agency (EPA) and the Columbia Basin Tribes to develop a TMDL addressing temperature and total dissolved gas in the Columbia and Snake Rivers. The completion date for the TMDL is unknown. Additional information regarding this action can be found at <http://yosemite.epa.gov/R10/water.nsf>.

### **Prior Studies**

A watershed inventory completed in the early 1990s (CKCD, 1991) included water quality data from sampling done on two dates in early to mid summer. The numeric criterion for temperature was exceeded at three sites in the Little Klickitat River as well as at sites in Bowman, Mill, West Prong, and Butler Creeks.

A watershed analysis was conducted on forested lands in the upper Little Klickitat River in 1999 (Raines et al., 1999). The analysis evaluated shade levels on forested lands as they affect stream temperature. The report concluded that forest practices (prior to the adoption of the current regulations) resulted in insufficient canopy closure to maintain summer stream temperatures in 22 percent of the fish-bearing streams, and non-forest related activities have reduced shade below target levels for ten percent of the fish-bearing stream length. It was noted that shade was low due to naturally sparse canopy closure along 19 percent of the fish-bearing streams. The current forest practices rules are intended to result in increased shade over time and to address water quality issues on forested land. Hence, the water quality actions included in this plan address only non-forestry lands and land uses.

### **Recent actions addressing stream temperature**

**City of Goldendale:** The City of Goldendale has undertaken a number of actions to reduce stream temperature in the Little Klickitat River. Some of these affect shade levels; others increase flow and reduce sediment inputs. Actions reported by the City include the following.

- In 1986 and 1987, the City, in cooperation with the Conservation District, constructed several jetties and planted trees to provide shade along the Little Klickitat River
- The treatment plant was upgraded in November 2002 and the City now discharges year round. The discharge water is aerated and cooled before it is released. Prior to that change, the City's wastewater treatment plant did not discharge in the Little Klickitat River in the months of May through November. During these months, flow was augmented by the 3<sup>rd</sup> Street well at a rate of 1.6 cfs. The City of Goldendale currently discharges 400,000 gallons per day for those months.
- The City transferred a 2.0 cfs surface water right at the Bloodgood Springs to a deep ground water source in 2003. This action increased spring contribution to the headwaters of Bloodgood Creek with attendant flow contribution to the Little Klickitat. The water in Bloodgood Creek tends to run cooler than the Little Klickitat River, and provides a potential refuge area for fish in the river.
- In 2003, the City abandoned Emerson Springs, Big Springs, and Butler Springs. This increased the contribution of the springs to stream flow in those tributaries.
- The City redeveloped Simcoe Springs in 2004 to eliminate surface water capture at that facility. This increased the contribution of the springs to surface flows in the Little Klickitat River tributaries of Butler Creek, East Prong, and West Prong.
- Replacement of the Columbus Avenue Bridge in 2002-2003 improved stream habitat, allowed for the development of increased shade, and reduced channel erosion.
- Eight bio-swales were constructed by the City at reconstruction sites on South Roosevelt Street and North Columbus Street to reduce sediment inputs to the Little Klickitat River. These projects were completed in 2001 and 2004, respectively.
- The City worked with Calpine Energy Plant to install chillers on the plant's discharge to the City's wastewater treatment plant to reduce the temperature of discharged water. The chillers were installed prior to the startup of the plant in September 2004.
- The City is providing continuous temperature and flow monitoring at the Miller Road Bridge. The monitoring equipment was installed in 2002; however, technical difficulties were encountered with the equipment. The monitoring system has run continuously since May 2004.

**Central Klickitat Conservation District:** The CKCD has been involved in numerous projects involving temperature monitoring and addressing situations potentially affecting shade, sediment inputs, and flow in the Little Klickitat Subbasin. The Conservation District reported completing the following projects from 2001 to 2004:

- Gregg project: Installed livestock control fencing along  $\frac{3}{4}$  mile of Little Klickitat River, installed habitat improvement, bank stabilization structures (rock veins, j hooks, rootwads) and installed native riparian area plantings along  $\frac{3}{4}$  mile of Little Klickitat River (5,000 plants).

- Kinkade Project: Installed ½ mile of livestock control fencing along Little Klickitat River and planted 2,500 pine trees in the riparian and upland areas of the Little Klickitat River.
- Presher Springs (a tributary of Bowman creek that is tributary to the Little Klickitat River): Installed spring box, pipeline and troughs to distribute grazing and provide water away from the channel, constructed riparian fencing along one quarter mile of Presher springs, and relocated corral facilities away from stream.
- Planted 5,000 to 8,000 tree seedlings that were left over from the annual tree sale along Little Klickitat River in Goldendale.
- Provided technical and financial support for the conversion of numerous farms from conventional tillage to direct seed and permanent cover. Management Plans may be updated because of these conversions. These actions reduce sediment inputs to the Klickitat River and its tributaries.
- Simcoe Mountain Project/Upper Little Klickitat Watershed: Installed 1.5 miles of fencing around a wetland (Purdy Swamp) to exclude livestock and allow access at one point for watering; installed 1.5 to 2.0 miles of fencing around Quiney Meadow to exclude livestock during wet season, and allow access in fall when no damage can be done to the meadow; installed rock surface along the dike side of cattle watering pond in Quiney Meadow to eliminate berm degradation by cattle watering; planted 5,000 trees along little Klickitat River and its tributaries; installed 1.25 miles of riparian fencing along Butler Creek; and repaired a spring development and pipeline to better distribute grazing in the upper little Klickitat watershed.
- Lacy Project: Installed root wads and modified stream bank along 330 feet of the Little Klickitat River and planted trees along the riparian zone.
- Enderby Project: Repaired channel and rebuilt a small irrigation pond at headwaters of Blockhouse Creek (tributary to The Little Klickitat River), installed 300 feet of willow fascines along portions of repaired channel, planted 500 trees and shrubs along riparian zone of project area, installed 2000 feet of livestock exclusion fencing in project area, and installed rain gutters and downspouts on barns and outbuildings to prevent barnyard runoff from entering Blockhouse Creek.
- Keirn Project: Repaired a channel and modified a reed canary grass swamp on a 400-foot section of Blockhouse Creek, installed four livestock water access points along same 400 foot section, installed livestock exclusion fencing to prevent livestock access to Blockhouse Creek except at specified access points, and planted 400 native plants and shrubs in riparian area.
- The Little Klickitat River and its tributaries have been monitored since 1995 for temperature, pH, dissolved oxygen, and nitrate concentrations at several locations. Up to

nine sites on the mainstem Little Klickitat River and eight sites on its tributaries are monitored. The number of locations that are monitored each year are somewhat variable and is reflective of available funding each year.

### **6.1.2 ASSUMPTIONS AND CONSTRAINTS:**

The Little Klickitat TMDL assumes that the specified targets can be met. There may be areas where conditions suitable to meeting the allocations (e.g. specified level of effective shade) are naturally not available. In these areas, the load allocations may not be met; however, efforts to reduce temperature to attainable levels will improve water quality and fish habitat. Additional information is needed to either validate or correct some of the assumptions in the Little Klickitat TMDL. Modification of targets in the TMDL may be appropriate if the additional information indicates such a need. The Planning Unit encourages the incorporation of an adaptive management approach into the TMDL when the TMDL is updated or revised.

Temperature improvement in the Little Klickitat will be a long-term effort. Response may be slow due to funding constraints, but more importantly will be affected by the time required for vegetation to grow. Given the expected length of time that will be needed for riparian vegetation to develop, actions that provide temperature refuges for aquatic species may be appropriate. These actions can provide local protection from excessive temperatures while riparian vegetation matures. As currently envisioned, creating thermal refuges would involve strategic sequencing of geographic areas for implementation of actions to reduce stream temperatures.

### **6.1.3 APPROACHES**

An adaptive management approach to addressing the stream temperature situation in the Little Klickitat Subbasin is envisioned. Baseline information will be collected, including stream temperature, flow information, instream sediment, riparian condition, and sediment inputs. Information on modifying conditions, such as climate, will also be collected. Progress will be tracked over time against the baseline conditions. Because temperature is strongly affected by climate, the development of control sites will be considered to facilitate evaluations of trends adjusted for inter-annual variability in climate. Changes in stream temperature, riparian conditions, flow, and sediment inputs will be monitored relative to baseline conditions. The effectiveness of actions taken to address stream temperature will be evaluated using the baseline information and data from control sites. The change in baseline conditions relative to actions taken will provide useful information regarding the effectiveness of various actions. The management strategy may be revised in response to the information gained over time

Approaches have been identified that address each of the five goals for this situation; 1) determine and refine estimates of attainable shade and temperature, 2) increase shade, 3) increase summer flows, and 4) create cold water refuge areas for aquatic species, and 5) protect existing streamside shade.

## **Determine and refine estimates of attainable temperatures and shade using appropriate methodologies**

**Study Need:** Some factors have changed that may have resulted in increases in average stream flow since the Technical Analysis was completed in support of Ecology's TMDL. The change in flow regime may potentially affect the outcomes of modeling efforts. Additionally, some members of the Planning Unit and some members of the local community at large have questioned some of the assumptions that were included in the TMDL Technical Assessment. In particular, questions have arisen regarding the attainability of the specified target effective shade levels. Questions have also arisen regarding the effectiveness of some of the actions specified in the Detailed Implementation Plan. The Planning Unit has identified a need to conduct additional analysis to address questions raised in the community and to evaluate attainable shade and stream temperatures.

Baseline information is also needed to evaluate trends over time, evaluate effectiveness of actions, and to facilitate the adaptation of the management plan to improve effectiveness of the overall program.

**Use and Administration of Data Collection and Analysis Efforts:** It is the intent of the Planning Unit to work with Ecology to update analyses and potentially update the TMDL when the next review cycle for the TMDL approaches. Hence, implementation of this Watershed Management Plan includes an obligation for Ecology to contact the Initiating Governments prior to scoping the next review of the TMDL and allow local participation in the review process. The Planning Unit is also requesting that Ecology consider incorporation of studies conducted under this plan in the TMDL review process provided that they meet Ecology's standards regarding data quality, accuracy of assessment, and reporting. Recognizing the need to develop studies that meet with Ecology's approval, the Planning Unit has specified that study designs be reviewed and approved by Ecology prior to implementation and that all data and documents developed during studies be submitted to Ecology for review and comment.

It is the intent of the Planning Unit that studies conducted to address questions and issues regarding stream temperature in the Little Klickitat River and its TMDL be implemented locally with local oversight and direction. Studies must follow the quality assurance requirements specified in Section 4.0. Ecology will be asked to review study plans and study reports. Funding will be sought to support the additional analyses.

**Assessment Approach:** A scope of work to address current flow conditions, site conditions, attainable shade, and best estimates of natural shading levels will be developed and submitted to Ecology for review and approval. The scope of work will note relationships between that scope and the TMDL. The scope of work will include the collection of baseline data, the development of control sites, and methods to evaluate effectiveness of various actions and the overall program. The details of the adaptive management approach addressing this issue will also be included. All data collection efforts will be subject to the quality assurance and reporting requirements specified in Section 4.0. Details of the scope of work will be developed during development of the Detailed Implementation Plan. Implementation of the scope of work will be subject to the availability of funding and other resources.

## **Evaluate cost effectiveness of actions**

Initially, existing literature will be used to identify the relative effect that various factors (sediment, width/depth ratio, shade, etcetera.) have on stream temperature. This information will be used to prioritize general classifications of actions. Additional studies may be identified to fill gaps not addressed in the existing literature. Monitoring of trends in water quality and effectiveness of implemented projects may suggest a need to modify action priorities.

Within the higher priority actions, projects would be prioritized by the greatest expectation of benefit relative to project costs. Implementation of higher priority projects would be facilitated. Lower priority projects may, however, be conducted at any time if funding becomes available and the landowner is interested in implementing a project.

## **Increase shading to attain the goals specified in the TMDL where reasonably attainable by 2090**

The following list of approaches includes the suggestions published in the TMDL Detailed Implementation Plan (Anderson, 2005) and several other options that may affect stream temperature. These approaches may be included in the efforts to address the Little Klickitat River stream temperature. Priority will be given to actions that are most effective in reducing stream temperature based on the existing literature and monitoring efforts within the subbasin.

- **Grazing:** Control access of livestock to the riparian area via use of off-channel watering, placement of salt away from streams, regular rotation of pastures, fencing, scheduling of use of riparian pastures to protect riparian vegetation, and/or implementing other best management practices (BMPs).
- **Forestry:** Follow Forest and Fish agreement rules
- **Land Development:** Follow County regulations regarding setbacks from streams. Encourage those owners that are exempt (as defined in the ordinances) to voluntarily follow the critical areas ordinance.
- **Agriculture:** Encourage participation in CRP, CREP, CCRP, and other voluntary actions that protect lands in riparian areas and/or enhance riparian conditions, and consequently protect water quality
- **Revegetation:** Develop and implement a riparian area revegetation program.
- **Increase Hyporheic Flow:** Hyporheic zones can be enhanced by increasing complexity of the channel along the riparian zone. Increase in riparian vegetation will help to increase the complexity of the riparian zone/water interface. Removal of levees also increases interactions of water between the channel and adjacent soils.

## **Increase summer flows**

The approaches described in Section 5 have the potential to directly affect stream flow in the Little Klickitat River. Included among these are conservation strategies, transfers of water rights

from surface to ground water sources, and development of storage projects designed to provide summer stream flow. The reader is referred to Section 5 for greater discussion of these approaches.

Increasing wetland storage could also play a role in increasing stream flow. Wetlands can store water in spring that is subsequently slowly released into the soils. Wetlands located on a stream will tend to release that water directly into the stream. Improvements in wetland storage may be attained through the following:

- Protect existing wetlands, especially those that are stream-adjacent or in the vicinity of channels
- Encourage the development of new wetlands where appropriate. Possible locations for constructed wetlands would be dependent on many factors including land ownership and the combination of topography, geology/soil type, and water inputs to maintain year-round wetland hydrology.

### **Create Thermal Refuge Areas**

Temperature refuge areas are areas where water is locally cooler. These can occur where ground water seeps into streams, where subsurface flow resurfaces, or where water flows through hyporheic zones. Localized refuges can also be found at confluences with cooler tributaries and in extended areas with high levels of effective shade. These refuge areas can provide an important fish habitat component in warmer streams. During periods when the stream is hot, fish can congregate in these cooler refuge areas.

An inventory of refuge areas in the Little Klickitat River is warranted. Identified refuge areas can be protected to maintain this important habitat and/or targeted for early enhancement actions.

Approaches may exist to increase the number of refuge areas. Actions could include enhancement of hyporheic areas discussed above. Other approaches could include diversion of water into graveled areas or into underground pipes to cool water before it is returned to the stream. Pumping of cold ground water into the stream can also provide refuge areas.

### **Reduce Sediment Inputs**

Sediment inputs can cause a stream to become shallower and wider over time in sediment depositional areas (Satterlund and Adams, 1992). Shallower streams tend to have a larger surface area. As a result, stream heating is increased (Brown, 1969). Sediment inputs can be reduced through the following:

- **Grazing:** Encourage appropriate grazing management practices that avoid over-utilization of grazing areas, including adoption of the NRCS specifications for prescribed grazing. Leave sufficient forage levels to provide sediment filtration. Different management standards would apply for irrigated and dry land pastures. Appropriate management standards are also likely to vary with local variations in climate, soils, and topography.

- ' **Forestry**: Follow Forest and Fish agreement rules
- ' **Roads**: Evaluate and quantify sediment delivered to streams from unpaved roads. Upgrade roads that are contributing high volumes of sediment by upgrading surfacing and/or modifying drainage from the road to divert water onto upslope lands rather than deliver water to streams. Follow Forest and Fish agreement rules regarding forest road systems.
- ' **Land Development**: Follow County regulations regarding setbacks from streams. Follow sediment control requirements on construction sites. Encourage developers and others to voluntarily follow the eastern Washington Storm Water Manual when developing storm water systems.
- ' **Agriculture**: A number of actions can be undertaken to reduce sediment delivered to streams from agricultural areas. Some of these include encouraging the following:
  - Participation in the Conservation Reserve Enhancement Program or other voluntary actions that protect and/or enhance lands in riparian areas.
  - Use of filter strips to reduce sediment runoff.
  - Use of sediment basins where appropriate.
  - Direct seed or reduced tillage operations to reduce sediment runoff from tilled lands where appropriate.
  - Implementation of suitable BMPs on concentrated animal feeding operations (CAFO) and follow CAFO requirements.
  - Facilitate education and training of conservation district personnel to provide local public education, technical support, and assistance.
- ' **Bank Stability**: Bank stability can be affected by a number of land use practices. Action items that could be implemented to reduce effects on bank stability include:
  - Increase riparian vegetation, which will subsequently increase root strength in stream banks and reduce erosion.
  - Use BMPs to minimize or prevent livestock damage of stream banks.
  - Stabilize actively eroding stream banks where situation is associated with anthropogenic disturbance and enhance riparian vegetation using appropriate bioengineering techniques. Care should be taken in design and implementation to ensure that the restoration effort will be successful. A stream restoration specialist should be contacted to assess the feasibility of a restoration project and to aid in the design of the project.
  - Identify funds to assist with conservation easements (including urban areas) to enhance degraded areas and protect existing areas that are functioning beneficially for water quality.



## **Channel Width**

Wide shallow streams tend to heat faster and attain warmer temperatures than narrower, deeper waters (Brown, 1969). All actions described above to increase shade and reduce sediment inputs will also help to defer degradation of channel width and may help to recover a more natural stream channel. In addition, sections of stream that are currently excessively wide can be addressed through well-engineered stream enhancement projects designed to re-establish a narrower and more complex channel with appropriate width to depth ratio. The locations and specifications of such projects should be given careful review to assure the project will have the expected benefits.

## **Protection of Existing Streamside Shade**

- ‘ **Forestry**: Follow Forest and Fish agreement rules
- ‘ **Land Development**: Follow County regulations regarding setbacks from streams. Encourage those owners that are exempt (as defined in the ordinances) to voluntarily follow the critical areas ordinance.
- ‘ **Agriculture**: Encourage participation in the Conservation Reserve Enhancement Program and other voluntary actions that protect lands in riparian areas and/or enhance riparian conditions, and consequently protect water quality
- ‘ **Public Education**: Provide public education regarding the importance of maintaining existing riparian vegetation.

## **Pollution Trading and Pollution Mitigation Options**

Pollution trading is a way to help improve water quality by focusing on cost-effective, local solutions to problems caused by pollutant discharges to surface waters. Typically, a party facing relatively high pollutant-reduction costs chooses to compensate another party to achieve an equivalent or better, though less costly, pollutant reduction. Pollution trading is a relatively new concept in the State of Washington, but has been implemented in the Boise River in Idaho and other areas. The Environmental Protection Agency (EPA) has developed a formal pollution trading policy (EPA 2003) and a pollution trading handbook (EPA 2004) that provide guidance regarding approaches that may be taken and federal requirements that must be met. The State of Idaho has also developed a pollutant trading guidance document (Idaho Department of Environmental Quality, 2003) that provides more specific suggestions on approaches to implementing trading programs.

The potential to implement a pollution-trading program in WRIA 30 will be explored as a possible solution to water temperature problems. The determination to implement a trading program and the details of the program will be developed during the implementation of the Watershed Management Plan.

## **Use Attainability**

Use Attainability analysis is a structured assessment that is used to determine if a water body can attain the specified state standards. If a determination is made that certain beneficial uses cannot

be met, those non-attainable uses may be removed from the designated uses for a water body. Ecology has developed a draft document that provides guidance regarding use attainability analyses (Ecology 2004c).

The data collected under this management plan will include information that can be used to assess the attainability of the temperature criterion applied to the Little Klickitat River. Further details regarding this assessment will be developed during plan implementation. If the available data and modeling indicates that attainment of state standards specified for the River cannot be attained, Ecology will be requested to work with the Implementing Governments to conduct a formal use attainability analysis.

## **Public Education**

Public education is an important component of this Watershed Management Plan. Public education needs to cover the following at minimum:

- ❑ Explanations of the projects that are undertaken, including a description of why they are needed and the expected effectiveness of the projects.
- ❑ Information regarding the requirements of the Shorelines regulations and other pertinent rules and regulations.
- ❑ Explanations of the TMDL and this Watershed Management Plan
- ❑ Information regarding programs implemented to address stream temperature in the Little Klickitat River.
- ❑ Information regarding simple low cost actions that can contribute to reductions of stream temperature. Examples of such actions include low water landscaping, maintaining or planting of riparian areas, minimizing disturbance of riparian areas, and protecting instream functioning riparian areas.
- ❑ Feedback regarding public education approaches can help to improve those programs.

Details regarding the public education approach will be developed during plan implementation.

### **6.1.4 MONITORING**

Monitoring related to stream temperature in the Little Klickitat River includes two components. The first component is monitoring of change relative to the baseline conditions that are established per Section 6.1.3. The second component relates to monitoring to determine effectiveness of actions taken, effectiveness of overall plan, and the need to adapt the plan in the light of new information.

Monitoring of stream temperature and factors affecting stream temperature will build upon current programs. Current programs include the CKCD's monitoring of temperature and other water quality parameters, The City of Goldendale's monitoring of temperature, sediment, and flow, and Ecology's monitoring of stream flow at the newly installed stream gauge near the mouth of the Little Klickitat River.

## Measuring Change Relative to Baseline Conditions

Documentation of change relative to baseline conditions will involve regular monitoring of the parameters used to define those baseline conditions. Parameters that may be monitored could include shade levels, riparian vegetation, stream temperature, stream sediment levels, channel width to depth ratio, temperature refuges, or other parameters deemed important indicators of stream temperature conditions and the factors that affect stream temperature. Details regarding monitoring of change relative to baseline conditions will be developed during plan implementation. Quality assurance and reporting requirements outlined in Section 4.0 will apply to all related efforts.

## Monitoring Effectiveness of Specific Actions and Overall Plan

The effectiveness of specific actions will be evaluated by documenting local changes in temperature, shade, flow, or sediment inputs resulting from those actions. Evaluation of the efficacy of these actions is likely to include the identification and monitoring of control sites to document relative changes given natural environmental variations. Those actions that are deemed effective will be encouraged throughout the portions of the Little Klickitat Subbasin that are included in the TMDL. Those actions that are not found to be effective will not be actively pursued.

The effectiveness of the overall plan in addressing water temperature in the Little Klickitat River will be evaluated by comparing trends in water temperature, shade, and other parameters over time relative to the baseline conditions. If change is not occurring at an acceptable rate, modification of the plan may be needed. Details of the effectiveness monitoring program will be developed during the plan implementation.

## 6.2 NITRATES IN GROUND WATER

**Problem:** Nitrate concentrations exceed or approach State standards in some wells less than 150 feet deep drilled in Swale Creek Alluvial Aquifer. Analyses indicate that the primary source of this nitrate is likely septic tanks, although fertilization and animals may also be contributing to the situation. Persons most susceptible to high nitrate levels are children less than six months old.

**Goal:** The goal of the approaches identified in this Watershed Management Plan with regards to the nitrate concentrations is to reduce nitrates in wells to safe levels.

**Priority:** Moderate

### 6.2.1 BACKGROUND

Nitrate concentrations in ground water were tested in the Swale Creek and Little Klickitat Subbasins and in the Glenwood area in 2003 (WPN and Aspect, 2005). Additional information regarding nitrate concentrations in groundwater is collected by the Klickitat County Health Department (summarized in WPN and Aspect, 2005) and through the Washington Department of

Health (WDOH) for Group A and Group B wells. No exceedance of the drinking water standard has been reported to WDOH for Group A or B water systems within the watershed.

WPN and Aspect (2005) found that nitrate concentrations in wells that draw from the Simcoe volcanics and the Ellensburg formation are very low and are not an area of concern. Nitrate levels in the Glenwood area and in areas within the Columbia Tributaries Subbasin were also below the State standard of 10 mg/l. Nitrate concentrations that exceeded the State standard of 10 mg/l were found in wells drawing from the Wanapum aquifer and the Swale Creek alluvium. The majority of the Wanapum wells are affected only in the upper portions of the Wanapum where the basalts are broken and likely in contact with the alluvium. The affected area is located primarily within the Swale Creek Subbasin, but extends a short distance into the Little Klickitat Subbasin north of Centerville. Within this area, 19 percent of the well samples had nitrate concentrations greater than the State criteria (10 mg/l) and an additional 13 percent had concentrations in the range of five to ten milligrams per liter. All of the wells with elevated nitrate concentrations in these aquifers drew water from less than 150 feet deep. Note that the minimum depth of the perforations in the well casings or linings is a better indicator of the minimum depth of water that is drawn than is well depth. Hence, the wells where nitrate concentrations may be elevated are limited to those that draw from the Wanapum basalts and Swale Creek alluvium that have a total well depth or a minimum depth of perforations less than 150 feet deep.

Within the Swale Creek alluvium and Wanapum basalt, nitrate concentrations were highly and significantly correlated with chloride concentrations. This correlation strongly suggests the source of nitrate is associated with septic systems. No elevated concentrations of nitrate were found in the surface waters sampled in this study, suggesting that nitrate situations in wells are an issue that is local to the site and not manifested across the entire aquifer. The presence of many shallow wells within the aquifers that have non-detectable or very low nitrate concentrations further supports the conclusion that nitrate inputs have a localized effect.

The significance of the elevated nitrate concentrations remains somewhat controversial because study results have been inconsistent. The primary avenue through which nitrates affect humans is the oxidation of iron in hemoglobin forming methemoglobin. Infants less than six months old are the most sensitive to the effects (Hartman, 1982; Bouchard et al., 1992). Baby formula made with drinking water with nitrate levels <10 mg/l have not been documented to result in toxic effects (Francis, 1995). Given the clinical evidence that supports some risk for the development of methemoglobinemia (Blue Baby Syndrome) in babies up to six months old, use of drinking water with nitrate concentrations  $\geq 10$  mg/l should be avoided in the preparation of formula for infants. There is no evidence to suggest potential effects to unborn or nursing infants resulting from the intake of nitrates by the mother.

Potential mitigation options include removing the source of the pollutant, avoiding contaminated water, and water treatment. Specific options include the following:

- ' Provide for testing of existing wells to determine where high nitrate concentrations are found.
- ' Locate or move either the septic system or the well to locations that are far apart to minimize local contamination of ground water.

- ' Upgrade septic systems to avoid interaction between water discharged in drain fields and ground water.
- ' Maintain septic systems to ensure that the system is not overflowing and that water is not leaking into ground water through cracks in the system.
- ' Withdraw water from wells that are greater than 150 feet deep and are cased to that depth. This could include modification of existing wells.
- ' Treat residential well water to remove nitrates.
- ' Avoid feeding water with nitrate concentrations  $\geq 10$  mg/l to infants under six months old.
- ' If practical, hook to City or KPOD water supplies.

Currently, water must be tested in all newly developed wells. Regulations regarding the construction of new septic systems are also in place. Hence, situations with elevated nitrates are most likely to exist where older wells and/or septic systems are present.

Rules and regulations addressing land use effects on nitrate discharge into ground water include requirements for testing of new wells, County and State septic regulations, Washington's Water Pollution Control Act, the State Concentrated Animal Feeding Operation regulations, and other State and County Health Department regulations.

### **6.2.2 ASSUMPTIONS AND CONSTRAINTS**

This Watershed Management Plan addresses actions that will decrease inputs of nitrates into ground water and provides options to avoid use of ground water with high concentrations of nitrates. Nitrates are difficult to treat. They break down most easily in areas with high concentrations of organic matter and anoxic conditions. Limited information regarding dissolved oxygen content of water is available and no information is available regarding the organic content of materials in contact with septic drainfield areas. Hence, the persistence of nitrate in ground water in the Swale Creek Valley is unknown.

### **6.2.3 APPROACHES**

Several approaches to addressing the nitrate situation discussed above have been identified by the Planning Unit. Most of the potential actions would fall within the auspices of the Klickitat County Health Department. Hence, the responsibility for developing and implementing a program addressing the aspects of the plan pertaining to Health Department responsibilities will be allocated to the Health Department. The County Health Department will contact the State Health Department as is determined to be appropriate. Some of the approaches will require the assistance of other entities for implementation. These include well abandonment (Ecology), grazing and agricultural programs (CKCD, NRCS, local residents), and possible expansion of the City of Goldendale water supply system (City of Goldendale). The Initiating Governments will support the Health Department and other entities in their pursuit of implementing a program to address the situation, including assistance in pursuing funding.

The following are approaches that the County Health Department may consider implementing to address the nitrate situations.

- **Public Education:** Develop and implement a public education program that informs at risk populations of the problem, the risks associated, and approaches to avoid those risks.
- **Collect Additional Information:** The previous site of a nitrogen storage area has recently been identified in the Centerville area. Local citizens report that some testing was completed at the site. The results of this testing should be gathered and evaluated to determine if additional testing is necessary and to ascertain the extent of nitrate contamination, if any, at that site.

The organic content of soils near drainfields and the oxygen content of those fields are unknown. These are important soil characteristics related to the uptake or breakdown of nitrates. Additional information is needed regarding these parameters to support an assessment of the effectiveness of septic systems in removing nitrates from septic effluent.

- **Develop and implement strategy to identify wells with elevated nitrate concentrations.** This could include increased monitoring of existing wells (in addition to the testing of new wells required by the County Health Department and monitoring of Group A and Group B wells implemented by WDOH) to identify wells with high nitrate concentrations and/or to verify surface seals of wells. Options may include development and funding of a voluntary program that will assist interested landowners with testing of their water source and inspection of systems in the area where higher nitrate concentrations were found.
- **Develop a septic testing program** to help identify faulty systems in the Swale Creek valley. This could be a required or voluntary program and potentially could include financial incentives to offset the cost of inspections.
- **Evaluate efficiency of existing regulations regarding construction of new septic systems**
- **Develop program to update septic systems and/or update wells where problems are found**
- **Provide incentives for landowners to upgrade well or septic systems where needed**

Three additional approaches to addressing the nitrate situation have been identified. Implementation of these approaches lie outside of the auspices of the County and State Health Departments. These are discussed below.

- **Identify abandoned wells and seal.** Abandoned wells are common within the WRIA. Open abandoned wells could potentially be a source of nitrate inputs; however, nitrate inputs through abandoned wells have not been evaluated. Existing literature and possibly monitoring of a set of abandoned wells may provide insight into the effect that these wells are having on the nitrate situation in the Swale valley. If abandoned wells are

determined to be contributing significantly to the situation, options will be developed to address the problem.

- **Evaluate potential to develop public water system in Centerville or connect to the City of Goldendale water system.** The City of Goldendale's water supply system currently extends to within one mile of Centerville. Evaluation of the potential to connect Centerville to public water will have to include a cost feasibility analysis.
- **Encourage proper agronomic nitrate fertilizer application.** Recommendations regarding agronomic nitrate fertilization applications are provided by agricultural experts, including conservation districts and the Washington State University cooperative extension service.

## 6.2.4 MONITORING

Monitoring may include any or all of the following:

- Continued monitoring of water quality in new wells
- Monitoring and testing of water quality in older wells
- Septic system inspections
- Tracking of grazing and agricultural BMP implementation
- Water quality parameters in addition to nitrate concentrations may be collected to assist with source identification or to address questions relative to other issues covered under the Watershed Management Plan.

## 6.2.5 DISCUSSION

A similar situation with nitrates in ground water has been identified in the La Pine area of the Deschutes watershed in Oregon. The Oregon Department of Environmental Quality and Deschutes County have received \$5.5 million in funding to conduct an innovative demonstration project. Project objectives are to 1) field test the performance of various promising technologies for removing nitrates from septic systems and develop a way to maintain those systems, and 2) increase ground water monitoring and modeling to identify movement of contaminants into other waters. The USGS developed a work plan (USGS, 1999) and has initiated its work. Work products are expected later in 2005 or 2006. The results of these studies may provide additional insight into effective approaches to address the nitrate situation in Swale Creek. Additional information on the La Pine project can be found at <http://www.dep.state.or.us/WQ/onsite/LaPineGW.htm>.

## 6.3 SWALE CREEK TEMPERATURE.

**Problem:** Water temperature in Swale Creek exceeds the State temperature criteria (16 °C). One segment near the confluence with the Klickitat River is listed on the State of Washington 303(d) list for temperature exceedance.

**Goal:** The goal for this situation is to meet standard or decrease temperature to attainable level. A secondary goal is to develop a plan that will avoid the need for a TMDL for the 303(d) listed reach in Swale Creek.

**Priority:** Low

### **6.3.1 BACKGROUND**

#### **Swale Creek Temperature Studies**

A reach of Swale Creek near the mouth is included in the 1998 303(d) list due to temperature conditions. Summer water temperatures in Swale Creek regularly exceed the State criterion of 18°C (WPN and Aspect, 2005, Appendix E). Summer temperatures at all 12 locations monitored exceeded 23 °C. Ecology considers temperatures less than 23 °C to be protective against mortality in salmonids (Ecology, 2003).

**Current Condition:** Under current conditions, the upper reaches of Swale Creek, downstream of Warwick (covering roughly nine miles), are largely dry, with isolated bedrock-dominated pools. In this area, shade tends to be quite sparse around the pools. The lower three miles of Swale Creek (excluding the mouth), is continuously wet in summer, though flow is negligible (estimated at 0.25 to 0.5 cfs). Shade in the area is denser and reaches almost 100 percent in some areas. At the mouth, flow goes largely subsurface and vegetation adjacent to the channel is sparser than the area just upstream.

The lack of soils and water in some reaches of Swale Creek are the primary limiting factors on the development of riparian vegetation. Much of the upper canyon is bedrock-dominated and, hence, has little shade. The lower canyon has better soils and substantially more shade. In most locations where soil is present, the soils are shallow and overlie bedrock. In large flood events, the existing vegetation is often uprooted and lost in some areas. As a result, riparian vegetation decreases in some areas during a flood event. In the intervening years between flood events, revegetation starts to re-establish in the disturbed areas where soil is present. This pattern results in a dynamic riparian vegetation situation in many locations under the current conditions.

“Potential shade” was estimated based on available soils and water, adjusted upwards where channel restoration may increase vegetative growth (WPN and Aspect, 2005, Appendix E). In the reach downstream of Warwick, the stream is largely dry. Pockets of standing water are present on or adjacent to bare areas of bedrock. In these areas, the potential for any vegetation development would not be expected without a change in soil depositional patterns. Further downstream, isolated pockets of water are more common, and soils near the channel are somewhat more common. Greater vegetation can develop in these areas; however, maximum potential shade is less than 25 percent and averages less than 10 percent. In the lower 3 miles of the stream, the channel is continuously wet (although isolated from the Klickitat River) and dense vegetation is present in most areas. In general, the vegetation currently present along the channel is at or near the maximum vegetation that can develop in these areas. The entire channel downstream of Warwick is subject to occasional flood events that remove substantial vegetation. At present, the vegetation adjacent to the creek is recovering from the last flood event. Several areas currently have little shade; however, small trees are present. These trees will eventually develop to provide shade unless future stream flow events remove them.



**Historical Condition:** The 1860 General Land Office (GLO) cadastral surveys provide a basis for establishing historical conditions in Swale Creek. The 1860 survey notes are reviewed and discussed in WPN and Aspect (2005, Appendix E). These surveys were conducted in October 1860 in the Swale Creek valley area and in lower Swale Creek (downstream of Warwick) to the section line between township 3N and township 4N. The October surveys provide insight into low flow conditions. The lower four miles of the creek and the headwaters were surveyed in April; hence, information in the Government Land Office (GLO) survey notes for these areas is representative of higher flow conditions. Drought indices reconstructed from tree rings indicate that the years when the surveys were done tended to be much wetter than average with the exception of the survey conducted in the lower four miles of the creek, which were completed in a year of average wetness.

The GLO survey notes indicate that Swale Creek flowed in October from roughly Warwick to a point approximately three miles downstream (roughly one mile downstream of present day Harris Road, approximately where the current power line crosses the creek). They also indicate there was some water in the bottom of the canyon. No flow, standing water, or channel was noted between the power line and the canyon, although dry channels and springs that did not flow very far were noted in areas where tributaries, (Stacker Canyon and two others further upstream) are currently mapped.

The GLO survey notes therefore suggest that historical presence of perennial water was very similar to what is seen today. Downstream of Warwick, there was intermittent flow near Warwick and some spatially intermittent water in the bottom of the canyon. The lower few miles of the stream, which is currently perennially wet, was surveyed by the GLO in April. Hence, the survey notes provide no insight into historical summer conditions in this reach.

Regarding riparian vegetation, the GLO survey notes indicate no trees were present upstream of Warwick with the exception of a few patches in the headwater area. Downstream of Warwick, the survey notes indicate “scattered pine and oak” interspersed with areas with no trees in township 3N, range 14E. Timber apparently was somewhat denser in the canyon than in other areas and very sparse to non-existent upstream of Stacker Canyon. The lower five miles of the stream ran through timber; primarily pine and oak with some alder, cherry, and hazel. In most of this area, trees were less than ten inches in diameter, although a couple of small pockets of larger trees were noted. None of the descriptions of vegetation differentiated between upslope and riparian vegetation.

### **Pertinent Regulations**

The Klickitat County Shorelines regulations limit development near the stream. A minimum 50-foot natural buffer is required along the stream. Actions within 150 feet of the natural buffer are restricted.

### **Recent Actions**

The KKCD has been monitoring temperature in Swale Creek since 2000. This monitoring is expected to continue into the future if funding is available. Yakama Nation Fisheries also monitors temperature in Swale Creek and recently started monitoring stream flow near the

confluence with the Klickitat River.

The CKCD has been involved in several projects addressing situations potentially affecting shade, sediment inputs, and flow and has provided continued monitoring of the temperature condition in the creek. Projects that were completed from 2001 and 2004 include the following:

- Fernandez Projects: Built livestock barnyard settling ponds with grass buffer strips at two barn facilities to prevent runoff from entering an unnamed tributary to Swale Creek, installed rain gutters on barns to prevent barnyard runoff from entering the settling pond and tributary, and currently working on developing another feedlot settling pond which will prevent feedlot runoff from entering the same tributary.
- Monitoring of temperature, pH, dissolved oxygen, and nitrate concentrations at the mouth of Swale Creek.

### **6.3.2 ASSUMPTIONS AND CONSTRAINTS**

The approach outlined in this document assumes that soil and moisture conditions will support increased vegetation near the channel in at least some locations. In areas dominated by bedrock formations, efforts to increase shade may prove to be impractical. Episodic events may tend to limit the longevity of any plantings along the channel. The assessment of historic conditions suggests that current vegetation along the channel is similar to that which was present in the mid 1800s. Therefore, substantial improvements in shade and subsequent reductions in temperature are not likely; however, minor improvements may be possible.

### **6.3.3 APPROACHES FOR ADDRESSING THE SWALE CREEK TEMPERATURE ISSUE**

Direction from the Planning Unit places strong emphasis on cost-effectiveness regarding actions taken to address Swale Creek temperature issues. The plans to improve temperatures must be informed by the weight of evidence regarding the natural conditions of Swale Creek.

A water quality improvement plan modeled on the Ecology's 4B approach will be developed to address water temperature in Swale Creek. The plan to improve stream temperature in Swale Creek must meet the following criteria to be considered as a 4B plan:

- The plan has enforceable pollution controls or actions stringent enough to attain water quality standards
- The plan is problem specific and waterbody specific
- The plan has reasonable time limits established for correcting the specific problem including interim targets where appropriate
- The plan has a monitoring component
- The plan includes an adaptive management strategy to allow for future course corrections if necessary

- ' The plan is feasible with enforceable legal or financial guarantees that implementation will occur
- ' The plan is actively and successfully implemented and shows progress on water quality improvements in accordance with the plan.

The plan will be submitted for review to Ecology and submitted for consideration as a 4B plan. Implementation will be started once the plan is developed (or before) and progress against the plan will be tracked and documented. Monitoring will include tracking of temperature trends over time, corrected for variations in air temperature to the extent possible. Modifications to the plan may be necessary as approaches are fine-tuned in the adaptive management process. Should Ecology determine the need for a TMDL, Ecology will contact the Initiating Governments prior to scoping of the TMDL to initiate coordination and cooperation.

Primary action items that have been identified to include in the water quality improvement plan are described below.

- ' **Maintain and/or enhance existing shade**
  - Follow County shorelines regulations
  - Implement grazing BMPs to minimize riparian disturbance
  - Plant vegetation in areas where survival appears to be likely. Plant woody species appropriate to the site near the stream along the lower five miles of the channel.
- ' **Evaluate potential to increase shade through modification of the railroad bed or placement of structures to facilitate the capture of stream adjacent sediments that could support vegetation.**

Any action that may be identified in this evaluation would require cooperation of and, possibly, obligation by the WSPRC.

As use attainability analysis may become necessary if water quality standards cannot be met. Use Attainability analysis is a structured assessment that is used to determine if a water body can attain the specified state standards. If a determination is made that certain beneficial uses cannot be met, those non-attainable uses may be removed from the designated uses for a water body. Ecology has developed a draft document that provides guidance regarding use attainability analyses (Ecology 2004c).

The data collection and modeling efforts conducted under this management plan will include information that can be used to assess the attainability of the temperature criterion applied to Swale Creek. If the available data and modeling indicates that attainment of state standards specified for Swale Creek cannot be attained, Ecology will be requested to work with the Implementing Governments to conduct a formal use attainability analysis.

#### **6.3.4 MONITORING**

Details regarding monitoring will be developed as the water quality improvement plan is developed. Monitoring will include at minimum:

- ' Long term tracking of stream and air temperature

- Evaluation of temperature trends
- Tracking of actions taken to address the situation including the number and species of trees planted, the length of stream that was planted, grazing BMPs implemented, riparian acres placed in CREP or similar programs.
- The survival of plantings and the growth of riparian vegetation
- Effects of major flow events on vegetation

### 6.3.5 DISCUSSION

As was discussed in Section 6.1, shading of a stream will tend to reduce stream temperature. In the Swale Creek area, vegetation is already near attainable levels; however, there are areas where additional planting may increase shade. Additionally, many areas in lower Swale Creek currently have immature vegetation. As this vegetation matures, shading will increase. Historical vegetation patterns observed in aerial photos taken periodically suggest that vegetation is sometimes displaced by major flood events. Therefore, monitoring should include documentation of effects of major flow events on vegetation. Evaluation of the cost-effectiveness and probability of long-term success of efforts to enhance vegetation must take into account the threat posed by major flow events.

## 6.4 ELEVATED FECAL COLIFORM LEVELS

**Problem:** Concentrations of fecal coliform bacteria in excess of the State standard have been identified in some tributaries of the Little Klickitat River and in Swale Creek Subbasins. Note the evidence for this is based on limited sampling and sampling methods (see below).

**Goal:** The goals of the approaches identified in this management plan are to achieve and maintain surface water standards for fecal coliform bacteria.

**Priority:** Low

### 6.4.1 BACKGROUND

#### Current Data Regarding Fecal Coliform Concentration and Distribution

Fifteen surface water locations were sampled during the fall low flow conditions in the Little Klickitat and Swale Creek Subbasins. Fecal coliform concentrations were present at all sites. The State water sampling guidelines for fecal coliform concentrations indicate that concentrations should be measured as the geometric mean of ten or more samples. The guidelines also indicate that samples should not be taken from standing water. Bacteria can be concentrated in such areas over time.

Only one measurement was taken at each site. Hence, a geometric mean of ten or more samples could not be estimated. Therefore, samples represent only the first of several samples that need to be collected to establish concentrations relative to the State standards. All samples taken in

Swale Creek were taken from standing water; hence, those sites do not meet the State guidelines for the selection of samples sites.

The State standard for fecal coliform concentration was exceeded at the mouth of Bloodgood Creek, the mouth of Blockhouse Creek, and all five of the Swale Creek sample sites. The highest concentrations (1600 MPN/100 ml) were found in a stagnant pool in Swale Creek near Clyde Story Road and near the intersection of Dalles Mountain Road and Basse Road (also stagnant). No fecal coliform concentrations were found in ground water in the Swale Creek area, indicating that the pollutants are not percolating into the ground water at a measurable rate.

Additional samples (nine or more per site) should be taken in the areas where elevated concentrations were found in 2003 to allow for the calculation of a geometric mean and to determine if the standards are truly exceeded and to ensure that the concentrations found in October were not anomalous. Sampling of stagnant waters (isolated pools) must be avoided in order to conform to State guidance.

The most likely sources of bacteria in the Little Klickitat and Swale subbasin are domestic animal waste sources, agricultural animal waste sources, septic systems, and aquatic and terrestrial wildlife near or in surface waters.

## **Pertinent Rules and Regulations Addressing Land Use Effects on Fecal Coliform**

Pertinent rules and regulations regarding fecal coliform concentrations in surface and ground waters are:

- Federal Clean Water Act
- State Water Pollution Control Act
- State Concentrated Animal Feeding Operations Regulations
- State and federal regulations regarding drinking water standards

### **6.4.2 ASSUMPTIONS AND CONSTRAINTS**

As discussed above, the sampling of fecal coliform concentrations is very limited and some samples were taken in stagnant waters. Additional sampling should be conducted to define the extent of the problem (if any). The approaches outlined in this Watershed Management Plan are subject to change once additional information regarding fecal coliform concentrations becomes available.

### **6.4.3 APPROACH**

The approach to addressing the fecal coliform situation hinges on the collection of additional data. Once the fecal coliform situation in WRIA 30 is better understood, a more detailed plan addressing the situation can be developed, if necessary.

- **Conduct additional monitoring** following the Ecology sampling methodologies to determine frequency, extent, and seasonality of exceedance. Additional water quality parameters may also be monitored to provide insight into sources or solutions.

- ' **Identify sources:** Additional monitoring may be required to narrow the search field for sources. Once the general input location is known with some confidence, the adjacent land uses potentially affecting fecal inputs can be inspected to determine the quantity of inputs.
  
- ' **Develop strategies to address identified issues** within three years after the additional monitoring needed to define the problem is completed, and implement those strategies. Appropriate strategies will be dependent upon the source. Possible actions items could include:
  - Mandatory or voluntary upgrades and/or maintenance of septic systems
  - Implementation of BMPs to minimize runoff of fecal matter from pastures and/or stockyards.
  - Support in the form of consultation regarding implementation of State of Washington Concentrated Animal Feeding Operations (CAFO) requirements for large-scale stock operations.
  
- ' **Develop public education program.** This program should be defined to inform the public of the problem, explain the hazards associated with the problem, and let them know what they can do to reduce the problem.

#### **6.4.4 MONITORING**

A detailed monitoring plan will be developed if a problem is determined to exist. If needed, the plan will include, at minimum, monitoring of implementation actions to address the problem and changes in pollutant concentrations over time.

### **6.5 MANAGEMENT OF ACTIONS ADDRESSING WATER QUALITY**

#### **6.5.1 ACTION ITEMS**

Action items related to water quality include a large number of activities. Ecology may be asked to provide guidance regarding appropriate approaches and/or rules and regulations and may also be asked to provide review of project proposals, plans, and study documents for all actions. Ecology will also be asked to act as the liaison between the various other State agencies regarding water quantity issues that may benefit from input from those other agencies. The action items are summarized below. Subtasks are listed as for some items under the major tasks. Action items related to water rights and water use are not included in this list. These were covered under Section 5.

#### **Action Items Needed to Address Water Quality Issues**

- ' **Additional studies to address outstanding questions**
  - Document baseline conditions regarding water quality situations
  - Evaluate natural background conditions for the Little Klickitat River
  - Evaluate effectiveness of current septic requirements in addressing nitrate concentrations in ground water in the Swale valley

- Evaluate potential to develop public water system in Centerville or connect to the City of Goldendale water system
  - Update ground water nitrate concentration and distribution information based upon new data collected over time
  - Evaluate potential to increase shade in Swale Creek through modification of the railroad bed or placement of structures to facilitate the capture of stream-adjacent sediments that could support vegetation.
  - Explore the potential to develop a pollution trading system that would assist with reductions in stream temperature
  - Assess sediment inputs to the Little Klickitat River relative to impact on fish habitat and sources of inputs
- ‘ **Development and implementation of programs**
- Shade along the Little Klickitat River and Swale Creek
  - Sediment reduction program if determined necessary
  - Enhanced stream flow in the Little Klickitat River
  - Actions to reduce fecal coliform concentrations, if needed
  - Incentive program to encourage upgrades of existing wells and/or septic systems
  - Sealing of abandoned wells
  - Septic system testing
- ‘ **Development of a 4B recovery plan addressing Swale Creek temperature situation**
- ‘ **Public Education and interaction**
- General information regarding implementation of the plan
  - Education and assistance with well and septic issues
  - Education and assistance with grazing land and livestock management
  - Education and assistance with Critical Areas Ordinance requirements
  - Education and assistance with water conservation programs
  - Education and assistance with fertilizer applications on farm land
  - Encourage participation in the CREP program and/or other programs that help to protect riparian areas
  - Assistance with CAFO requirements
- ‘ **Additional monitoring of water quality conditions and effectiveness of actions**
- Stream temperature
  - Fecal coliform concentrations
  - Nitrate concentrations in wells

Some of the items above may be modified based on results of additional studies and monitoring. Additional action items may also be identified during the course of plan implementation.

## **6.5.2 MANAGEMENT OPTIONS**

The details regarding the management and oversight of the implementation of the water quality portion of the plan will be developed during the development of the Detailed Implementation Plan (see Section 4).

Many, if not most, of the action items listed in the previous section are currently implemented by existing agencies; hence, the assistance of entities with existing programs may be requested by the Implementing Governments.

Table 14 provides an overview of the possible entities represented on the Planning Unit that could be asked to assist with various aspects of the Watershed Management Plan that address water quality issues. The table is not to be construed as an assignment of responsibility. The checks on the table merely indicate options that the plan management coordinator(s) may consider when asking for assistance. Additional assistance may be requested of additional entities, including the Yakama Nation, schools, realtors, and other organizations capable of providing support.



**Table 14. Entities That May Be Asked to Assist with the Implementation of Action Items Related to the Water Quality Issues.**

*Note:* Ecology will likely be asked to provide guidance and document review associated with all the items listed below. Ecology will also be asked to serve as a liaison with other State agencies, including State Department of Health and the Department of Fish and Wildlife, regarding matters addressed in the actions below. Ecology is not assumed to take a major role in the following action items with the exception of guidance, review, and State caucus coordination.

<b>Action Item (Subtasks are italic and right justified)</b>	<b>Ecology</b>	<b>WDFW</b>	<b>Dept. Ag</b>	<b>County Planning Dept.</b>	<b>County Health Dept.</b>	<b>County Public Works</b>	<b>Conservation Districts<sup>2</sup></b>	<b>Cities</b>	<b>WSPRC</b>
<b><i>ADDITIONAL STUDIES</i></b>									
Baseline Conditions	√			√	√		√	√	√
Nat'l background flow, temperature Little Klickitat	√			√	√	√	√	√	
Effectiveness of Existing Septic Regs.	√				√				
Public Water to Centerville	√			√				√	
Update Nitrate Data (ongoing)	√				√				
Shade and Swale Creek Railroad Bed	√						√		√
Pollution Trading Options	√			√	√			√	
Sediment inputs and sources Little Klickitat River				√		√	√		
<b><i>DEVELOPMENT AND IMPLEMENTATION OF PROGRAMS</i></b>									
L. Klick., Swale Shade Improvements	√						√		√
Sediment reduction program if determined necessary	√					√	√		
L. Klick. Enhanced Stream Flow <sup>3</sup>	√						√		
Fecal Coliform Reduction	√		√		√		√		
Upgrade Well/Septic Incentive Program					√				

<sup>2</sup> NRCS may be the more pertinent agency in some cases

<sup>3</sup> Assistance could also be asked of the Water Conservancy Board

<b>Action Item</b> (Subtasks are italic and right justified)	<b>Ecology</b>	<b>WDFW</b>	<b>Dept. Ag</b>	<b>County Planning Dept.</b>	<b>County Health Dept.</b>	<b>County Public Works</b>	<b>Conservation Districts<sup>2</sup></b>	<b>Cities</b>	<b>WSPRC</b>
Septic System Testing					√				
<b><i>MONITORING</i></b>									
L. Klick/Swale Temperature and Related Monitoring Parameters	√			√			√	√	√
Nitrate Concentrations	√				√				
Fecal Coliforms	√		√	√	√		√		
<b><i>OTHER</i></b>									
Swale Creek 4B Plan	√			√					√
Little Klickitat TMDL	√			√			√	√	

### 6.5.3 FUNDING

Numerous options are available for funding. Table 15 provides a summary of commonly used funding sources. Other sources are likely available.

**Table 15. Potential Funding Sources to Support Portions of the Watershed Management Plan Addressing Water Quality.**

*Sources: Kathleen Bartu, Foster Creek Conservation District; Washington State Infrastructure Assistance Coordinating Council (www.ingrafunding.wa.gov), Boise State University (ssrc.boisestate.edu), and various state and federal web pages.*

<b>PROGRAM</b>	<b>AGENCY</b>	<b>DESCRIPTION</b>
American Water Works Association Research Foundation	American Water Works Association Research Foundation	Water-related research projects.
Aquatic Ecosystems Program	Bullitt Foundation	The Foundation strives to protect, restore, and maintain the region's aquatic resources and ecosystems, from the pure water of high mountain streams to the productive richness of marine environments.
Aquatic Lands Enhancement Account	Washington Department of Natural Resources	Primarily focused on recreation, but also funds habitat improvement projects.
Bonneville Environmental Foundation Watershed Program	Bonneville Environmental Foundation	Funds proponents with desire and capacity to implement a comprehensive watershed restoration strategy that incorporates community support, scientific basis, watershed-scale approach; and monitoring and evaluation systems that track restoration progress and provide feedback to adjust restoration strategies.
Centennial Clean Water Fund	Ecology	Projects which prevent and control water pollution
Challenge Grants for Conservation	National Fish and Wildlife Foundation	Support model projects that positively engage private landowners, primarily farmers and ranchers, in the conservation and enhancement of wildlife and natural resources on their land.
Conservation and Stewardship in Agriculture	Bullitt Foundation	Promote conservation and stewardship of agricultural lands: adoption of agricultural practices that reduce soil loss and water pollution, minimize pesticide use, conserve biodiversity, promote the efficient and non-polluting use of water, as well as efforts to preserve farmland.

<b>PROGRAM</b>	<b>AGENCY</b>	<b>DESCRIPTION</b>
Conservation Reserve Program	Farm Service Agency	The Conservation Reserve Program (CRP) provides annual rental payments and cost sharing assistance to landowners and operators to take environmentally sensitive land out of production and plant it to a perennial cover under 10 to 15 year contracts. CRP also includes the Conservation Reserve Enhancement Program (CREP), which enrolls riparian buffers along selected salmon-bearing streams with substantially higher compensation.
Conservation Security Program	NRCS	Provides payments for producers who practice good stewardship on their agricultural lands and incentives for those who want to do more.
Drinking Water State Revolving Fund	WDOH	Provides loans to community and nonprofit non-community water systems for capital improvements that increase public health protection and compliance with drinking water regulations.
Ducks Unlimited	Ducks Unlimited	Projects that protect, enhance, restore, and managing important wetlands and associated uplands
Ecosystem Restoration in the Civil Works Program	US Army Corps of Engineers	Resolve major problems in water related resources on a watershed scale, such as reconnecting streams to the main stem, restoring meandering in river courses, or resolving sediment loading problems.
Environmental Education Grants Program	EPA	Projects must focus on one of the following: (1) improving environmental education teaching skills; (2) educating teachers, students, or the public about human health problems; (3) building state, local, or tribal government capacity to develop such programs; (4) educating communities through community-based organization; or (5) educating the public through print, broadcast, or other media.
Environmental Grant Program, The	Educational Foundation of America	The Foundation focuses on approaches to sustainable agriculture and promotion of family farms; protection, and restoration of water quality and habitat; promotion of renewable energy and energy conservation; land conservation and protection of roadless forest areas, and providing technical assistance and training to environmental groups.
Environmental Quality Incentive Program (EQIP)	NRCS	Voluntary conservation program for farmers and ranchers to address significant natural resource needs and objectives.

<b>PROGRAM</b>	<b>AGENCY</b>	<b>DESCRIPTION</b>
EPA Assessment and Watershed Protection Program Grants	EPA	Prevention, reduction and elimination of water pollution through watershed program, non-point source program, and monitoring and assessment program.
FishAmerica Foundation	FishAmerica Foundation	Hands on-projects at the local level aimed at enhancing fish populations, improving water quality, and/or advancing fisheries research; thereby increasing the opportunity for sportfishing success.
Five-Star Restoration Program	Environmental Protection Agency	Financial assistance to support community-based on-the-ground wetland, riparian and coastal habitat restoration projects that build diverse partnerships and foster local natural resource stewardship through education, outreach and training activities. The EPA provides funds to four intermediary organizations the National Association of Counties, the National Association of Service and Conservation Corps, the National Fish and Wildlife Foundation, and the Wildlife Habitat Council, which then make subgrants.
Forest Stewardship and Stewardship Incentive Program	Washington Department of Natural Resources and USDA Forest Service	Technical and financial assistance to non-industrial forest owners for a variety of forest stewardship projects, including riparian, wetland, and fisheries habitat enhancement.
Grassland Reserve Program	US Department of Agriculture	The 2002 Farm Bill established the Grassland Reserve Program (GRP) for the purpose of restoring and conserving two million acres of grassland, rangeland, and pastureland.
Groundwater Foundation, The		Provides educational programs for all ages on ground water.
Habitat Conservation - Partners for Fish and Wildlife Program	USFWS	This program provides technical assistance to the private sector to maximize wildlife conservation.
Kenney Foundation		Funds programs which seek to protect significant wild rivers and river ecosystems in the West.
Landowner Incentive Grant Program	USFWS	Provide technical and financial assistance to private landowners for projects that protect and restore habitats of listed species or species determined to be at-risk.
National Research Initiative Competitive Grants Program	U.S. Department of Agriculture	Research problems of national and regional importance in biological, environmental, physical, and social sciences relevant to agriculture and food and the environment, including water resources assessment and protection.

<b>PROGRAM</b>	<b>AGENCY</b>	<b>DESCRIPTION</b>
Native Plant Conservation Initiative	Natinal Fish and Wildlife Foundation	Conservation projects that protect, enhance, and/or restore native plant communities on public and private land.
Nonpoint Source Implementation Grant (319) Program – Washington	Washington State DOE/ Environmental Protection Agency	Management of nonpoint source pollution and to improve and protect water quality. Funds may be used for planning and implementation, including the development of TMDLs, restoration of riparian, and prevention of pollution through active educational programs.
Nonpoint Source Implementation Grants	U.S. Environmental Protection Agency	To assist states in implementing agency approved Section 319 statewide nonpoint source management programs.
Non-Point Water Quality Grants	Washington Conservation Commission	Financial assistance for implementation of projects and practices to improve water quality.
Partners for Fish and Wildlife	U.S. Fish and Wildlife Service	Program focuses on re-establishing historic native communities and offers assistance to private landowners who wish to restore degraded or converted wetlands, riparian, stream, and other critical habitats.
Planning/Technical Assistance Program	Bureau of Reclamation	Technical assistance in data collection and analysis related to water supply and water quality, engineering, hydrologic studies, sedimentation, and water resources planning.
Private Stewardship Grant	USFWS	Provides assistance to individuals and groups engaged in local, private, and voluntary conservation efforts that benefit federally listed, proposed, or candidate species, or other at-risk species.
Public Participation Grants	Ecology	Helps groups educate and involve the public on waste issues.
Regional Fisheries Enhancement Groups	Washington State Department of Fish and Wildlife	Regional Fisheries Enhancement Groups receive funds for salmon habitat restoration and enhancement projects.
Riparian Habitat Program	Interagency Committee to Outdoor Recreation	This pilot program provides matching grants for projects that protect habitat on privately owned land through less than fee simple acquisition methods.
River Network		River Network makes grants available to local watershed partnerships to support their organizational development and long-term effectiveness.
Salmon Recovery Funding Board	Office of the Interagency Committee for Outdoor Recreation	The Salmon Recovery Funding Board (SRFB) supports salmon recovery by funding habitat protection and restoration projects and related programs and activities that produce sustainable and measurable benefits for fish and their habitat.

<b>PROGRAM</b>	<b>AGENCY</b>	<b>DESCRIPTION</b>
Section 206: Aquatic Ecosystem Restoration Program	US Army Corps of Engineers	Provides authority for the Corps of Engineers to construct aquatic ecosystem restoration and protection projects.
Section 22: Planning Assistance to the States Program	US Army Corps of Engineers	Authority for the Corps of Engineers to assist entities in the preparation of comprehensive plans for the development, utilization, and conservation of water and related land resources. The program can encompass many types of studies including water supply, quality, conservation, flood control, floodplain management, erosion, and navigation.
Student Environmental Stewardship Program	Washington Environmental Education Foundation	Encourage student participation in local environmental stewardship projects and enhance student understanding of community service and philanthropy.
Terrestrial Ecosystems Program	Bullitt Foundation	Protection of the forests, grasslands, high desert, and other pristine wild lands of the Pacific Northwest.
Upland Wildlife Restoration Program	Washington Department of Fish and Wildlife	Focuses on upland and riparian habitats on agricultural lands. Covers long-term agreements with willing landowners interested in habitat improvements.
Washington State Water Pollution Control Revolving Fund	Washington State Department of Ecology	This program helps local governments finance water quality projects by providing low interest loans to public entities.
Washington Wildlife and Recreation Program (WWRP)	Interagency Committee for Outdoor Recreation	Funding supports acquisition and development of outdoor recreation and conservation lands. Eligible projects include important parks, critical habitat, water access sites, trails, natural areas, and urban wildlife habitat.
Water Pollution Control - State and Interstate Program Support	EPA	Establishing and maintaining adequate measures for prevention and control of surface water and ground water pollution.
Water Quality Incentives Projects	Farm Service Agency	Funding available in terms of incentive payments to encourage farming practices that reduce the amount of water pollution caused by agricultural activities.
Water Quality Special Research Grants Program	Cooperative State Research Education and Extension Service	Identification and resolution of agriculture-related degradation of water quality.

<b>PROGRAM</b>	<b>AGENCY</b>	<b>DESCRIPTION</b>
Watershed Processes and Water Resources Program	U.S. Department of Agriculture	Research that addresses two areas: (1) Understanding fundamental processes controlling (a) source areas and flow pathways of water, (b) the transport and fate of water, sediment, nutrients, dissolved matter, and organisms within forest, rangeland, and agricultural environments, and (c) water quality. (2) Developing appropriate technology and management practices for improving the effective use of water and protecting or improving water quality for agricultural and forestry production.
WDFW Landowner Incentive Program	WDFW	Financial assistance to private landowners for the protection, enhancement, or restoration of habitat to benefit “species at risk” on privately owned lands.
Wetland Program Development Grants	EPA	Financial assistance to support development of new, or augmentation and enhancement of existing wetland programs. Opportunity to conduct projects that promote research, investigations, experiments, training, demonstrations, surveys, and studies relating to water pollution.
Wetland Protection, Restoration, and Stewardship Discretionary Funding	EPA	Studies and activities related to implementation of Section 404 of the Clean Water Act for both wetlands and sediment management. Projects can support regulatory, planning, restoration or outreach issues.
Wetlands Reserve Program	Natural Resources Conservation Service and Farm Service Agency	Offers landowners the opportunity to receive payments for restoring and protecting wetlands on their property.
Wildlife Habitat Incentives Program	Natural Resources Conservation Service	Provides technical assistance and cost-share payments to help establish and improve fish and wildlife habitat on private lands.
Wyden Amendment	BLM	This legislation provides the authority for both the USFS and BLM to enter into cooperative agreements with public and private entities for the protection, restoration, and enhancement of fish, wildlife or other resources on public or private lands that directly benefit biotic resources on public lands.



## 7.0 FISH HABITAT MANAGEMENT

The management of fish habitat issues in the Klickitat basin (WRIA 30) is addressed in this section. The Planning Unit recognizes that details regarding fish habitat management will be developed within the Detailed Implementation Plan. The Planning Unit urges the implementation of voluntary and positive incentive based approaches to addressing fish habitat issues.

The following sections discuss the key issues regarding fish habitat that were identified during development of the Watershed Management Plan. A discussion of the approaches to addressing those issues is also provided.

The discussion in this section builds on information and analyses presented in the WRIA 30 Watershed Assessment. The sections of the report particularly pertinent to the management of fish habitat in the basin include:

- ◆ WRIA 30 Watershed Assessment, Appendix A
  - Section 2.0, Hydrologic overview, including information on stream flow
  - Section 3.0, Fish Habitat
- ◆ WRIA 30 Watershed Assessment, Appendix B: Swale Creek Temperature Assessment Report

Two key issues regarding fish habitat were identified and prioritized during the planning phase. Management goals were identified in general terms for each of these issues. The following are the two key habitat issues.

- Fish Habitat Protection and/or Restoration (High Priority)
- Potential Effects of Population Growth on Fish Habitat (Moderate Priority)

In addition, low summer flows in the Little Klickitat River and summer water temperatures in the Little Klickitat River and Swale Creek have been identified as issues. The low stream flows and warm temperatures can affect the quantity and quality of fish habitat. The management approach to address summer flows in the Little Klickitat River is discussed in Chapter 5 and the approaches to addressing the Swale Creek and Little Klickitat water temperature situations are addressed in Chapter 6. The reader is referred to those Chapters for additional information. Actions described in Chapters 5 and 6 are expected to result in habitat improvements in the Little Klickitat River and Swale Creek and are considered part of the overall strategy for addressing fish habitat issues in WRIA 30.

### 7.1 FISH HABITAT PROTECTION AND/OR RESTORATION

**Problem:** Fish habitat has been degraded in some areas.

**Goal:** Protect or Enhance Fish Habitat

**Priority:** High

## **7.1.1 BACKGROUND**

Information regarding current fish distributions and fish habitat condition is summarized in Section 2.9 of this Watershed Management Plan and is provided in detail in the WRIA 30 Watershed Assessment (Chapter 3). The discussion below addresses data gaps, provides information regarding prior habitat assessments, summarizes existing programs addressing fish habitat, and identifies recently completed projects to improve or protect fish habitat.

### **7.1.1.2 Data Available to Assess Fish Habitat Conditions and Identify Restoration and Protection Opportunities**

Data regarding fish and habitat conditions in WRIA 30 are sparse. Fish habitat data were collected in a watershed analysis conducted in the upper half of the Little Klickitat Subbasin (Raines et al., 1999). These data were collected primarily within the forested regions of the upper Little Klickitat basin. The action items identified in the Upper Little Klickitat Watershed Analysis are covered under the State of Washington Forest Practices Act. Habitat data are also available for lower Swale Creek (Inter-Fluve inc., 2002; Watershed Professionals Network and Aspect Consulting, 2003).

### **7.1.1.3 Prior Habitat Assessment Actions**

Chapter 90.82.110 RCW requires review of “planning, planning projects, and activities that have already been completed regarding natural resource management or enhancement in the management area and the products or status of those that have been initiated but not completed for such management”. Products of these efforts are to be incorporated as appropriate to avoid duplication of work already performed or underway. The following sections provide an overview of these actions and a review of the applicability of those actions to the implementation of the Watershed Management Plan. The reviews include an assessment of the various products in light of the quality assurance and reporting requirements adopted into this plan and the definitions of best available science provided in Chapter 365-195-905 WAC. Comments from independent review panels are also discussed.

**Limiting Factors Analysis:** A limiting factors analysis (LFA) was completed pursuant to Chapter 246, Laws of 1998, for the WRIA in 1999 (Washington State Conservation Commission (WSCC) 1999). The LFA was part of the critical pathways methodology utilized in the Lead Entity process (refer to section 7.1.1.4 of this plan) to develop an adaptive management strategy, habitat work schedule, and habitat project lists pursuant to Chapter 246, Laws of 1998. As stated in the LFA: “It is intended that the findings of this analysis be used by a locally-based habitat selection committee to prioritize appropriate projects for funding under the state salmon recovery program; the analysis may also be used by local organizations and individuals interested in habitat restoration to identify such projects.” Under Chapter 90.82.100 RCW, habitat restoration activities that are being conducted pursuant to Chapter 246, Laws of 1998 shall be relied upon as the primary non-regulatory fish habitat component of the Watershed Management Plan. The Klickitat Lead Entity’s activities comprise this Watershed Management Plan’s primary non-regulatory component for fish habitat.

The LFA for WRIA 30 (WSCC, 1999) provides overview information but does not provide sufficient information to quantitatively or accurately characterize habitat condition. The document was affected by the paucity of data regarding fish and habitat conditions in the basin. Hence, the analysis was based primarily on expert opinion. Ecology has determined (Ecology, 2004b) that, statewide, the LFAs that were conducted pursuant to Chapter 246, Laws of 1998, do not conform with Ecology's Water Quality Policy 1-11 section 7 Data Quality Assurance (Ecology, 2002). While, under statute, the LFA and other activities conducted pursuant to Chapter 246, Laws of 1998, are to comprise the primary non-regulatory component of Watershed Management Plans, care should be taken to ensure that the quality of the information provided in the LFA is appropriate for the intended purpose. Where quality assurance rules or policies are applicable, the LFA should be reviewed for conformance prior to use for specific projects or actions.

Where "best available science" criteria are applicable to the intended use, the LFA should be reviewed for conformance with guidelines regarding those criteria prior to use. In the case of Growth Management Act programs, the criteria for determining best available science are found in Chapter 365-195-905 WAC. As a source of information, the LFA as a whole would be classified as a "synthesis" per Chapter 365-195-905 WAC. As a synthesis, the LFA appears to lack the following characteristics required to be considered scientifically valid, as defined in the WAC.

- **Methods** : In most cases, methods used are not clearly stated.
- **Logical conclusions and reasonable inferences**: The sources of the information and/or the assumptions supporting the conclusions were rarely presented. Hence, a basis in logical conclusions and reasonable inferences as defined in Chapter 365-195-905 WAC is not provided.
- **References**: References supporting the assumptions and conclusions were not provided for most of the information in the document.

Additionally, the peer review criteria specified in the WAC may not have been met.

A comprehensive evaluation of the individual elements of the LFA for conformance with the criteria for determining best available science was not conducted as part of the watershed planning process. However, the user of information found in the LFA is cautioned to check the type of information being considered (e.g., expert opinion) for conformance with the appropriate required best available science characteristics (e.g., logical conclusions and reasonable inferences, content, and references).

The LFA for WRIA 30 (WSCC, 1999) was cited extensively in the fish habitat assessment portion of the WRIA 30 Watershed Assessment (Watershed Professionals Network and Aspect Consulting, 2004), which provides the technical foundation for the fish habitat components of this Watershed Management Plan. Many of the deficiencies with the available data and information are identified in the assessment. The reader is cautioned that information and data cited in the fish habitat section of the assessment may or may not conform to the applicable quality assurance or best available science criteria.

**Klickitat River Subbasin Summary** : A draft subbasin summary was generated in 2000 (Sharp 2000). This document was developed as a precursor to the Northwest Power and Conservation

Council's (NPCC's) subbasin planning process. The Subbasin Summary provides information in the form of an overview of the basin's fisheries, but does not provide specific information sufficient to quantitatively or accurately characterize fish habitat conditions. There is no indication that the Subbasin Summary has been reviewed for conformance with Ecology's Water Quality Policy 1-11. However, NPCC officials have stated (personal communications Tony Grover and Larry Cassidy) that the subbasin planning work products are not intended to be used for regulatory purposes. With respect to best available science criteria, the subbasin summary does not appear to conform with the criteria specified in Chapter 365-195-905 WAC regarding documentation of methods and assumptions, logical conclusions and reasonable inferences, support with credible references, and, possibly, peer review.

The Draft Klickitat Subbasin Summary (Sharp 2000) is cited in numerous places in the WRIA 30 Watershed Assessment (Watershed Professionals Network and Aspect consulting, 2003, Appendix A), which provides the technical foundation for the fish habitat components of this Watershed Management Plan. Many of the deficiencies with the available data and information are identified in the assessment. As in the case of information and data from the WRIA 30 LFA, the reader is cautioned that information and data cited in the fish habitat chapter of the assessment may or may not conform to the applicable quality assurance or best available science criteria.

**Klickitat Subbasin Plan:** The Klickitat Subbasin Plan was adopted by the NPCC in March 2005. The plan was intended to be based on an assessment of fish habitat effects on fish populations. Key findings and work objectives were identified to restore habitat in the basin.

The data and information used to support the analyses presented in the Klickitat Subbasin Plan are not well documented, and in many instances, are based on expert opinion. The results of the analysis were not published with the draft plan. The NPCC's Independent Scientific Review Panel (ISRP) and the Independent Scientific Advisory Board (ISAB) provided comments on the draft plan ([www.nwppc.org/plans/KlickitatFinal.pdf](http://www.nwppc.org/plans/KlickitatFinal.pdf); ISRP and ISAB 2004) during the review period prior to adoption. The comments recognize the fact that limited data were available to support the development of the plan. The ISRP comment regarding the key findings was: "The majority of the key findings appear to be more like a list of belief statements or desired issues to address such as hatchery supplementation and Pacific Lamprey (neither of which are addressed in the assessment)." The ISRP's conclusions regarding the plan were "Overall, a better basis for planning likely exists in the Klickitat than is presented in this report. Substantial revision is required to clarify what the plan might be, and evidence of community consultation and agreement is needed." The final Klickitat Subbasin Plan and its Klickitat Subbasin Supplement that were produced during the review period do not appear to have substantially addressed the ISRP comments or comments received from other entities.

With respect to best available science criteria, the Klickitat Subbasin Plan does not appear to conform to the criteria described in Chapter 165-195-905 WAC due to poor documentation of methods, inadequate documentation of quantitative methods, conclusions that do not appear to be based on reasonable assumptions or support by studies or valid quantitative methods, lack of references regarding assumptions and conclusions, and failure to adequately address comments

during peer review. There is no indication that Ecology has reviewed the subbasin plan or the assessments conducted to support the subbasin plan for conformance with Ecology Policy 1-11.

An Ecosystem Diagnostic and Treatment (EDT) model (Mobrand Biometrics Inc., 2004) was developed and run for the Klickitat basin. This effort was conducted to support the subbasin planning process. The results of the modeling effort were not published and the extent to which the modeling results were incorporated in the provisions of Klickitat Subbasin Plan is unclear. The EDT model is a tool designed to assess relative habitat capacity by species and to identify habitat attributes that are likely limiting factors to survival and production. The EDT model is based on the weight of expert opinion regarding changes in habitat relative to a historical reference. Current conditions can be estimated based on opinion or observations or can be quantified using existing data. Data regarding historical conditions is rarely available. Within the Klickitat River watershed, data are largely lacking regarding both current and historical conditions; hence, the model was largely based on the opinions of the modelers. It is important to note that the model has never been validated; therefore, the relative accuracy of the model outputs is unknown. The ISRP and ISAB comments regarding use of the model in developing subbasin (ISRP and ISAB 2004) plans encourages testing and evaluation of the model if it is planned to be used to support future management planning efforts. Additionally, the EDT model was reviewed by the National Marine Fisheries Service's Salmon Recovery Science Review Panel (SRSRP 2000), which was highly critical of the model.

The Klickitat Anadromous Fisheries Master Plan, December 2004, is published as Appendix F to the Klickitat Subbasin Plan. The ISRP's review (ISRP 2005) of the plan identified numerous substantial deficiencies, stating: "Nevertheless, the Master Plan remains scientifically deficient as a planning document." Moreover, the ISRP's comments on the Master Plan indicate that some of the proposed fisheries management actions put at risk the salmonid species that are indigenous to the Klickitat basin. With respect to best available science criteria, the Master Plan does not appear to conform with the criteria described in Chapter 165-195-905 regarding methods, logical conclusions and reasonable inferences, references, and peer review.

**Fish Passage Assessments:** Total or partial fish passage barriers have been identified in numerous locations in the watershed. The Washington Department of Transportation has identified 15 barriers on Highways 97 and 142. Some of these barriers are scheduled for repair in the next five years. The repair of the balance of the passage barriers is pending future funding (personal communication, John Peterson, WSDOT, 11/2/04). The schedule for upgrades of State highway culverts is determined using the Washington Department of Fish and Wildlife's prioritization process (WDFW 2000), which factors in the amount of habitat that would be opened up, the species present, and other considerations.

The County Public Works Department had a culvert survey conducted in areas with perennial water in the 1990s. All but one of the passage barriers identified in this survey have been addressed. A more recent survey conducted in 2003 by the Northwest Service Academy (Adams et al, 2003) identified additional barriers. Most of these are located on seasonally intermittent streams. The County is addressing these culverts as funding allows.

Passage barriers on commercial forestland are being addressed under the Washington State Forest Practices rules. These rules provide a 15-year window (extending to October of 2018) to address problem roads, as defined in the rules, including passage. Special programs have been put in place to assist small forest landowners.

**Instream Flow Assessment:** Ecology conducted an analysis of stream flows and their effect on fish habitat for the Little Klickitat River and some of its tributaries (Caldwell and Hirschey, 1990). Although this analysis has been described as an Instream Flow Incremental Methodology (IFIM) analysis, it did not follow the full process normally associated with IFIM assessments, which includes detailed data collection and modeling efforts and multi-party negotiations. However, the study did utilize some of the methods typically used to develop supporting information for instream flow actions. Due to budgetary constraints, the number of calibration sites that would normally be called for in such a study was reduced. The mainstem Little Klickitat River had two calibration sites and one site was used in the tributaries. Fewer flow measurements were used in the analysis than are normally recommended for instream flow studies. Four measurements from the mainstem and one measurement from the tributaries were used in the modeling exercise. Measures of model accuracy suggest accuracy was poor at the upper Little Klickitat site and marginal at the lower site. The reported range of errors included values that are higher than is normally considered acceptable at the upper Little Klickitat site, Bowman Creek, and Mill Creek. No error was calculated for Bloodgood Creek. WPN and Aspect (2005, Appendix A) provide a more detailed review of the instream flow study.

The results of the study indicate that virtually all the species included in the evaluation would be benefited by higher summer flows in the Lower Little Klickitat River, Mill Creek, and Bowman Creek (Caldwell and Hirschey, 1990). Rainbow trout would be benefited by higher summer flows in the upper river and its tributaries. Other species, if they were present, would also benefit from higher summer flows upstream of the falls. No instream flows were set based on this study.

The results of this abbreviated IFIM study should be used with caution. The high error rates and the low number of representative sites contribute to uncertainty in the results. Additionally, the use of the one-flow method in the tributaries also introduces error into the model results.

#### **7.1.1.4 Existing Programs Addressing Fish Habitat Enhancement/Restoration**

##### **Lead Entity Process:**

In 1998, the Washington State Legislature enacted Chapter 77.85 RCW to empower citizens at the community level to engage in salmon recovery through a locally driven habitat protection and restoration program. The legislation recognized that active local participation is the key to ensuring public participation in, and support for, salmon recovery. Through this legislation, local “Lead Entities” were identified and funded to implement Chapter 7.85 RCW.

Klickitat County was established as the “Lead Entity” in 1999 pursuant to Chapter 77.85 RCW for a geographic area composed of WRIA 30 and the area of WRIA 29 extending from the Little

White Salmon River east, inclusive. As the Klickitat Lead Entity, Klickitat County formed the Klickitat Citizens Review Committee (Klickitat CRC) in 1999.

As provided in Chapter 77.85.060(2)(e) RCW, the Klickitat CRC developed an adaptive management strategy for the Klickitat River basin and other parts of the geographic area covered by the strategy. The Klickitat CRC also develops and maintains a list of habitat projects and a habitat work schedule (Klickitat CRC 2004). The habitat project list is prioritized annually by the Klickitat CRC. The prioritized list is submitted by the Klickitat Lead Entity for funding through the State's Salmon Recovery Funding Board (SRFB) process pursuant to Chapter 77.85.130 RCW. Substantial technical advice and support for the development of the adaptive management strategy, project work schedule, and project list were/are provided to the Klickitat CRC by the Klickitat Technical Advisory Committee. Chapter 77.85.050(1)(a) RCW provides that no project on the habitat project list shall be considered mandatory in nature and no private landowner may be forced or coerced into participation in any respect.

The SRFB's Review Panel evaluated the Klickitat Lead Entity Strategy for specificity and focus and gave the plan an overall/general rating of "Excellent". The plan was also rated "Excellent" for addressing community issues. The few negative findings in the review revolved around not providing empirical linkages between watershed processes and habitat features.

Within the Klickitat Lead Entity Strategy, salmonid stocks were categorized into three tiers by the Klickitat CRC in order to help guide protection and restoration. Tier 1 is the highest priority and is composed of salmonid stocks that are either listed under the Federal Endangered Species Act or are native to the watershed and have exceptionally high cultural value. Tier 2 stocks are all naturally spawned salmonids that are native to the watershed, but are not in Tier 1. Tier 3 stocks are all naturally spawned salmonids that are not native to the watershed and do not have a negative impact on Tier 1 or 2 species. Specific Tier 1, 2, and 3 species identified for the Klickitat River basin include the following.

Tier 1:

- Spring Run Chinook Salmon (*Oncorhynchus tshawytscha*);
- Summer Run Mid-Columbia River ESU Steelhead (anadromous *Oncorhynchus mykiss*);
- Winter Run Mid-Columbia River ESU Steelhead (anadromous *Oncorhynchus mykiss*); and
- Bull Trout (*Salvelinus confluentus*).

Tier 2:

- Cutthroat Trout (*Oncorhynchus clarki*);
- Mountain Whitefish (*Prosopium williamsoni*); and
- Rainbow Trout (resident *Oncorhynchus mykiss*).

Tier 3:

- Coho Salmon (*Oncorhynchus kisutch*) in WRIA 30;
- Tule Fall Chinook (*Oncorhynchus tshawytscha*); and
- Upriver Bright Fall Chinook (*Oncorhynchus tshawytscha*).

The ISRP comments on the Klickitat Anadromous Fisheries Master Plan indicate that the currently identified Tier 3 species potentially pose a risk to the Tier 1 Species. The Planning

Unit has also noted that the Tier 3 species may have some negative impact on the Tier 1 and Tier 2 species, and recommends that the interactions between these species be evaluated to determine if the Tier 3 species meet the Tier 3 definition specified above. Until the potential risk of non-native species enhancement has been addressed, the Planning Unit recommends that the Tier 3 species not be given priority in developing habitat restoration and protection programs.

Chapter 90.82.100 RCW specifies that habitat restoration activities that are being conducted pursuant to Chapter 77.85 RCW are to be relied upon as the primary non-regulatory fish habitat component of this Watershed Management Plan. In conformance with Chapter 90.82.120(1)(f) RCW, the WRIA 30 Watershed Management Plan does not modify or require modifications of activities or actions taken or intended to be taken under the habitat restoration work schedule developed by the Klickitat CRC.

The rating that the Klickitat Lead Entity received of Excellent clearly indicates that the plan meets the intent of Chapter 7.85 RCW. However, the plan appears to fall short of criteria specified under Chapter 365-195-905 WAC regarding best available science. The Klickitat Lead Entity Strategy fails to meet the criteria regarding standardized replicable methods, logical conclusions and reasonable inferences based on documented studies and assumptions underlain by reports, references, and peer review. (To date, the findings of the peer review have not been addressed and the peer review was limited to the “specificity and focus” aspects of the strategy). There is no indication that Ecology has reviewed the Klickitat Lead Entity Strategy for conformance with Ecology Policy 1-11. While recognizing that data pertaining to habitat conditions in WRIA 30 is lacking in many areas, it is recommended that future editions of the Klickitat Lead Entity Strategy incorporate quality data and information as it becomes available.

**Washington’s statewide monitoring program:** In 2001, Substitute Senate Bill (SSB) 5637 was signed into law. This act related to monitoring of watershed health and salmon recovery. The Monitoring Oversight Committee developed a comprehensive statewide strategy that addresses the actions identified in SSB 5637 (Monitoring Oversight Committee 2002). Among other things, the plan is intended to provide information regarding trends in fish, water, and habitat conditions and assess effectiveness of actions taken to improve watershed health and provide for salmon recovery. The strategy includes documentation of fish population trends in some areas of the state; however, WRIA 30 is not one of the areas included to date in that monitoring effort. The strategy is also monitoring the effectiveness of habitat restoration efforts funded by the State. The monitoring of project effectiveness follows the Monitoring and Evaluation Strategy (Washington Salmon Recovery Funding Board 2003) that was developed in support of the Comprehensive Statewide Strategy. The Monitoring and Evaluation Strategy specified methods to assess a wide range of restoration and protection projects.

As part of the statewide strategy, the effectiveness of habitat restoration efforts in Logging Camp Creek has been assessed. The data collected and the report are not yet available. Another project in WRIA 30, a river bar revegetation project funded by the SRFB, will also be monitored through the strategy’s monitoring program. Other monitoring in WRIA 30 may be included in the future efforts, but specifics regarding future actions are unknown.



**Northwest Power and Conservation Council (NPCC) Fish and Wildlife Program:** The NPCC’s Columbia River Fish and Wildlife program is funded by the Bonneville Power Administration. Projects in the Klickitat basin that have been funded through this program include habitat data collection efforts, fish distributions and abundance monitoring, hatchery operations, and passage projects. The Klickitat Subbasin Plan, which was adopted in March 2005 as part of NPCC’s Columbia River Fish and Wildlife Program, will be used to help direct Bonneville Power Administration (BPA) funding of projects that enhance, mitigate, and protect fish and wildlife populations that have been adversely impacted by the operation of the Columbia River hydropower system.

Klickitat County, CKCD, the Glenwood Community Council and a group of Klickitat landowners provided comments to the NPCC regarding the subbasin planning process in which they stated that they do not support the Klickitat Subbasin Plan and that they had problems with the planning process. This apparent lack of support for the Klickitat Subbasin Plan and the planning process indicate that the subbasin plan is inappropriate for use in guiding habitat management decisions within the area covered by this Watershed Management Plan.

The Planning Unit would like to encourage NPCC to work with local entities during development of annual funding decisions and future subbasin planning efforts. The Planning Unit would also like to encourage the NPCC to ensure that data collected through their efforts are available for use in public processes.

**7.1.1.5 Recently Completed Projects Addressing Fish Habitat**

The efforts listed in Table 16 to restore and protect fish habitat have been completed by various entities working in WRIA 30 through a variety of funding processes (including public, private, and owner funding).

**Table 16. Fish habitat enhancement and protection projects completed in WRIA 30 through 2004. Additional projects are approved and funded annually.**

PROJECT	PROJECT TYPE	SPONSOR
Blockhouse Creek 1 CRP	Enhancement, Protection	Farm Service Agency and Landowner
Blockhouse Creek 2 CRP	Enhancement, Protection	Farm Service Agency and Landowner
Bowman Creek CRP	Enhancement, Protection	Farm Service Agency and Landowner
Bowman Creek Passage (3 projects)	Fish Passage	Boise Cascade
Butler Creek Crossing Abandonment	Fish Passage	Boise Cascade
Butler Riparian Enhancement	Restoration	NWSA
Chapman Creek (2 projects)	Restoration	RFEG
Dead Canyon Fencing	Restoration	Yakama Nation
Devil Passage	Fish Passage	Boise Cascade
Dillacort Creek CRP	Enhancement,	Farm Service Agency

<b>PROJECT</b>	<b>PROJECT TYPE</b>	<b>SPONSOR</b>
	Protection	and Landowner
Dillacort Canyon	Acquisition	Columbia Land Trust
East Prong Tributary CRP	Enhancement,	Farm Service Agency and Landowner
Highland Creek Passage	Fish Passage	Boise Cascade
Horseshoe Bend/Little Klickitat Conservation Easement	Acquisition	Columbia Land Trust
Idlewild Culvert Removal	Fish Passage	Boise Cascade
Klickitat Mill Restoration #2	Restoration	Klickitat County
Klickitat River Fish Barriers Survey	Fish Passage	Northwest Service
Lacey In-Stream Project	Restoration	Klickitat County
Little Klickitat CREP	Enhancement, Protection	Farm Service Agency and Landowner
Little Klickitat Riparian Enhancement (0.6 miles) (2 phases)	Restoration	Yakama Nation
Little Klickitat Riparian Restoration	Restoration	Klickitat County
Little Klickitat Tributary CRP	Enhancement, Protection	Farm Service Agency and Landowner
Logging Camp Canyon – Phase 1	Acquisition	Columbia Land Trust
Logging Camp Creek Fish Passage	Fish Passage	Klickitat County
Lower Swale Creek Scissors Project	Restoration	UCD
Lyle Falls Fish Passage	Fish Passage	Yakama Nation
Mill Creek 1 CRP	Enhancement, Protection	Farm Service Agency and Landowner
Mill Creek 2 CRP	Enhancement, Protection	Farm Service Agency and Landowner
Mill Creek Passage (3 projects)	Fish Passage	Boise Cascade
Presher Springs Restoration	Restoration	Central Klickitat Conservation District
Projects Maintenance	Non-Capital	Klickitat County
Rootwad Distribution and Storage	Restoration	Klickitat County
Simmons Creek Riparian Enhancement	Restoration	NRCS
Snyder Creek Fish Passage (Mill #1)	Fish Passage	Klickitat County
Snyder Creek Fencing	Enhancement, protection	Underwood Conservation District
Snyder Creek Riparian Restoration	Enhancement, protection	Underwood Conservation District
Summit Creek CRP	Enhancement, Protection	Farm Service Agency and Landowner
Swale Creek CRP	Enhancement, Protection	Farm Service Agency and Landowner
Swale Creek Ponds	Restoration	Klickitat County
Swale Creek Restoration Assessment	Non-Capital	Yakama Nation

PROJECT	PROJECT TYPE	SPONSOR
Swale Creek Riparian Enhancement	Restoration	WDFW, Yakama Nation, NRCS, Underwood Conservation District
Swale Creek Riparian Restoration	Restoration	Klickitat County
Swale Creek Tributary CRP	Enhancement, Protection	Farm Service Agency and Landowner
Wahkiacus Oaks Preserve	Acquisition	Columbia Land Trust
West Prong Fish Passage (3 projects)	Fish Passage	Boise Cascade

### **7.1.1.6 Existing Regulations Providing Protection for Fish Habitat**

The State, federal, and local regulations providing for the protection of fish habitat are numerous and are not described in this document. In general, various areas related to fish habitat and/or fish habitat protection are relegated to distinct agencies. These general areas of regulatory authority are summarized in Table 17. Numerous agreements exist between agencies and tribal entities regarding review of regulatory actions taken by various agencies. This provides for coordination and cooperation between regulatory and oversight entities regarding regulations and specific project permits.

The primary regulations affecting permitting of fish enhancement projects are listed below along with a short description of the process and situations that are applicable. The information provided below should not be construed as a list of all permits that are required. The information is provided solely as an overview of the major regulations in place that are applicable to the protection and enhancement of fish habitat. Entities interested in the permit requirements for specific projects should contact the pertinent regulatory agencies for additional information. The State of Washington’s Environmental Permit Handbook (<http://apps.ecy.wa.gov/permithandbook>) provides an excellent starting point for permit information. The State of Washington has developed the Joint Aquatic Regulatory Permit Application which covers all state permits required for work in or near water bodies of the state. The application can also be found on Ecology’s website.

#### ***Federal Regulations***

**NOAA Fisheries and/or U.S. Fish and Wildlife Section 7 Consultation:** Section 7 of the Endangered Species Act directs all federal action agencies to consult with NOAA Fisheries and the U.S. Fish and Wildlife Service to ensure that their actions will not jeopardize the continued existence of listed species or destroy or adversely modify designated critical habitat. Actions include not only direct federal actions, but also actions funded with federal dollars. A Biological Assessment or Biological Evaluation needs to be developed and submitted to NOAA Fisheries for review prior to implementation of the project. The reader can find additional information regarding the consultation process at: [www.cit.noaa.gov/nosign/default.asp?action=ConsultationGuide](http://www.cit.noaa.gov/nosign/default.asp?action=ConsultationGuide).

**Table 17. Primary regulatory authority of State, Federal, and County agencies regarding various actions. Coordination and review by other agencies and tribal entities is normally involved in regulatory actions.**

Regulated Resource	FEDERAL		STATE			COUNTY
	NOAA Fisheries <sup>3</sup>	Army Corps Engineers	Ecology (coordinates with EPA)	WDFW	WDNR	
Endangered Species	X			X		
Wetlands Modification		X		X <sup>1</sup>		X
Other Aquatic Species				X		X
Instream Construction		X		X		
Riparian Areas			X			X
Water Quality			X <sup>2</sup>			X
Forestry					X	
Land Use						X

1/ Within ordinary high water mark where fish are present

2/ Also Department of Health

3/ National Oceanographic and Atmospheric Administration

**Corps of Engineers 404(b) permit:** The Clean Water Act restricts the fill of wetlands. The Supreme Court has recently ruled that isolated wetlands are not regulated under the Clean Water Act; these wetlands are however regulated by the state. Actions involving fill of wetlands must receive a permit from the Corps of Engineers and/or the state. Permits are reviewed by numerous State and federal agencies. All 404(b) permitted actions also require a Water Quality Certification from the State (see State Regulations). Where filling is permitted, the State has specified mitigation requirements.

**Corps of Engineers Section 10 permit:** Placement of structures and discharge of material into navigable waters require a Section 10 permit. The permitting process is designed to prohibit the obstruction or alteration of navigable waters in the United States. The Clean Water Act (as amended in 1987), the Rivers and Harbors Act of 1899 (33 U.S.C. 401, et seq.), and the Federal Water Pollution Control Act (33 W.S.C. 1344) provide the regulatory authority for this permit. Navigable waters include “those waters that are subject to the ebb and flow of the tide and/or are presently used, or have been used in the past, or may be susceptible to use to transport interstate or foreign commerce.” The Columbia River falls within the jurisdiction of this permit.

**National Pollutant Discharge Elimination system (NPDES) Permit:** A construction permit is required for all construction activities (including grading, stump removal and demolition) on sites of one acre or larger where there is a discharge of stormwater to surface waters (wetlands, creek, rivers, ditches, etcetera) and/or storm drains that discharge to surface waters. NPDES permits are also required for commercial, industrial, or municipal discharge of wastewater to surface waters. Sewage disposals (ranging from septic systems to large industrial or municipal facilities) also require an On-site Sewage Disposal Permit from Ecology. Numerous other permits also apply to the discharge of water. The reader is referred to the State of Washington's Environmental Permit Handbook (<http://apps.ecy.wa.gov/permithandbook>) for additional information regarding permitting of such discharges.

**National Environmental Policy Act (NEPA) Review:** NEPA requires federal agencies to consider the impacts of their proposed activities, programs, and projects (including funding of State, local, and private actions) on the quality of the human environment. NEPA reviews help agencies decide whether to undertake a proposed action. In most cases, the NEPA review requires the development of an Environmental Assessment (EA) or Environmental Impact Statement (EIS) that addresses the potential effects of a project and its alternatives on soils, geology, landscapes, atmospheric conditions, vegetation, fish and wildlife, cultural resources, and local and regional economies. Many federal funding programs are covered under a general NEPA review completed when the funding program was developed.

### ***State Regulations***

**Water Quality Certification:** Any action that requires a federal permit or license under the Clean Water Act and any action involving dredging or filling of wetland, construction in or around streams, or other actions potentially affecting water quality either directly or indirectly requires a Water Quality Certification from Ecology. This includes management of surface erosion on commercial and subdivision developments and stormwater runoff.

**Shoreline Management Act:** The Shoreline Management Act affects actions within 200 feet of the ordinary high water mark of certain water bodies and associated wetlands and floodplains. Ecology's role is a) determine the areas that fall within the jurisdiction of the law, b) review and approve local regulations that guide permit decisions, and c) review and approve or appeal local government permit decisions (see County regulations).

**Hydraulic Project Approval (HPA):** HPAs are required for any work that uses, diverts, obstructs, or changes the natural flow or bed of State waters. Major types of activities requiring an HPA are those that disturb the bed and banks of a stream within the ordinary high water line, including streambank protection, construction of bridges and culverts, channel modifications, gravel removal, pond constriction, installation and maintenance of water diversions, and placement or removal of instream wood. WDFW issues HPAs. Some restoration actions are covered under blanket approvals.

***Definition***

The Ordinary High Water Line is the line along the shore where action of water has created a distinct mark upon the soil with respect to upland vegetation.

**Forest Practices Permit:** Practices related to growing, harvesting, or processing timber including road construction and maintenance on forest lands, harvesting, reforestation, brush

control and other related practices are regulated by the Washington Forest Practices Act (Chapter 76.09 RCW). Certain small-scale actions are exempted from the requirements under the act. Permits are obtained from WDNR.

**Concentrated Animal Feeding Operation General Permit (CAFO):** This permit addresses cattle, swine, horses, sheep, turkeys, and chickens grown in confined areas that exceed threshold limits and discharge to waters of the State. The intent of the regulations is to protect water quality. Ecology is the regulatory authority for this permit. WSDA provides assistance with meeting permit requirements and also coordinates inspections and enforcement with Ecology.

**Washington Department of Transportation (WSDOT) Road Construction Standards :** WSDOT has a set of road standards designed to avoid or minimize environmental effects of road systems constructed by the State. These standards minimize effects on fish habitat and fish passage.

**State Environmental Policy Act (SEPA):** Any proposed action that requires a State or local decision to license, fund, or undertake a project can trigger an environmental review under SEPA. Proposed adoption of policies, plans, or programs can also trigger SEPA reviews. SEPA is a process, not a permit. It provides a mechanism that allows agencies to review the environmental consequences of a proposed project. Project proponents are required to complete an environmental checklist and submit it to the agency that has been designated as the lead agency for the purposes of the project. Many State funding programs are covered under a general SEPA review completed when the funding program was developed.

### ***County Regulations***

**Shoreline Management Act Permits:** The County administers actions under the State Shorelines Management Act. Ecology ensures compliance with the Act. The County's Shoreline Master Program implements the Act at the County level. All of the shorelines of the County bordering streams with a mean annual flow of 20 cfs or greater, lakes over 20 acres in size, and associated wetlands and floodplains are designated as natural, conservancy, rural, community, or urban/industrial. The permitted, prohibited, and shoreline conditional uses are based on these designations. The ordinance addresses public access, agriculture practices, aquaculture, forest management, mining, commercial development, marinas and boating facilities, outdoor advertising, piers and docks, ports, recreation, residential development, road and railroad construction, solid waste disposal, utilities, breakwaters, bulkheads, dredging, jetties and groins, land filling, clearing and grading, and shoreline alteration within the areas protected under the Act. Three different types of shoreline permits that may be applicable to any given action. Additional information regarding the Shoreline Master Plan and the requirements of the plan can be found on the County Planning Department's website ([www.Klickitatcounty.org/planning](http://www.Klickitatcounty.org/planning)).

**Klickitat County Flood Plain Management Ordinance:** The flood plain ordinance restricts or prohibits uses in flood plains that are dangerous to health, safety, and property due to water or erosion hazards. It controls the alteration of natural flood plains, stream channels, and natural protective barriers. It also places restrictions on filling, grading, dredging, and other

development that may increase flood damages and it limits or prevents construction of flood barriers that unnaturally divert floodwaters or increase flood hazards.

**Klickitat County Critical Areas Ordinance:** Klickitat County's Critical Areas Ordinance includes provisions that limit development with the intent of protecting wetlands, critical riparian habitat, floodplains, and ground water recharge areas. The ordinance also includes provisions that limit development within geological hazard areas. The Critical Areas Ordinance prohibits construction within floodplains. It also requires buffers around wetlands greater than 2500 square feet in size and along all streams. The required buffer width around wetlands varies from 75 to 300 feet, depending on the category of the wetland. The ordinance requires 150 to 200 foot buffers along fish-bearing waters and 25 to 50 foot buffers along streams without fish. These buffers include a minimum width of natural vegetation and restrictions of activities in the balance of the buffer width. Artificially created structures, ditches, canals, ponds, irrigation return ditches, and storm water channels are exempted from this requirement. The ordinance addresses situations where disturbance within these buffers is unavoidable and spells out mitigation requirements for such situations. Exemptions to the Critical Areas Ordinance requirements are allowed in limited situations, and mitigation of effects would be required under such circumstances.

**Klickitat County Public Works Department Road Construction Standards:** Klickitat County has a set of road standards designed to avoid or minimize environmental effects of roads constructed by the County, commercial, industrial, and private entities. These standards minimize effects on fish habitat and fish passage. Road construction standards are detailed in Title 12 of the Klickitat County Code.

## **7.1.2 ASSUMPTIONS AND CONSTRAINTS**

Limited data are available for WRIA 30 regarding the current condition of fish. The paucity of information limits the Planning Unit's ability to develop a detailed approach to addressing fish habitat.

Several studies are described in the approach (Section 7.1.3). Completion of studies is subject to the availability of funding and resources.

All studies and monitoring projects are subject to the quality assurance and reporting requirements described in Section 4.0.

Priority areas for habitat restoration and protection will be identified during the implementation planning process. The top priority areas are expected to be habitats that support anadromous fish species.

## **7.1.3 APPROACH**

Approaches described previously addressing water quality and water quantity also serve to restore and protect fish habitat. The reader is referred to Sections 5 and 6 for a discussion of plans to address these issues. This section focuses on instream habitat conditions not previously addressed.

The stated preference in this Watershed Management Plan is to identify issues and develop approaches to resolve those issues based on quality data (Section 4). Due to the paucity of quality fish habitat data for the WRIA, the approach identified to address fish habitat restoration and protection options relies extensively on data collection efforts to be conducted during implementation of the plan. Specific projects to be undertaken to address fish habitat issues will be identified based on the results of those studies.

The preferred approach to addressing fish habitat protection and restoration is to identify characteristics of the habitat that are limiting fish production and then focus restoration efforts first on those characteristics. The definition of limiting factors for this effort is that described by Hall and Field-Dodson (1981) and Nickelson et al (1992). These authors refer to limiting factors as the habitat required to support a particular life stage of a species but is in the shortest supply relative to habitats required to support other life stages. Limiting factors can include rearing habitat characteristics, spawning habitat characteristics, prey availability, migration barriers, competition with other fish populations, harvest, and out-of-basin effects.

As an example of this approach to assessing limiting factors, assume a basin had enough rearing habitat to raise 100,000 smolts, but only had enough spawning habitat to produce 50,000 smolts. In this situation, spawning habitat would be the limiting factor on production in that basin. As such, restoration actions aimed at increasing the amount of spawning habitat would tend to increase the population size. In this situation, actions designed to increase rearing habitat, however, would have no effect on fish production in the basin. Where spawning habitat is found to be the limiting factor, specific characteristics of the spawning habitat can be further evaluated to determine specifically what needs to be done to improve spawning. For instance, low quantities of spawning habitat may be the result of several situations such as:

**Definition:** A smolt is a young anadromous salmonid that is ready to migrate to sea.

- Limited quantities of gravel are entering the stream, so limited spawning size material is available
- Sufficient gravel is entering the stream, but there is not enough wood or boulders to capture that gravel; hence it is washed downstream
- Sufficient gravel is entering the stream and is present in the stream bottom, but fine sediments are high causing mortality of eggs
- Good quality spawning habitat is available in ample supply, but migration barriers are preventing access to that habitat.

Each of the situations above suggests a different approach to addressing the problem. The specific situation must be addressed in order to improve salmon production. Note that the specific factors limiting fish production may vary between subbasins or within subbasins and may change as habitat is restored.

Once the specific situation(s) limiting fish production is known, then an assessment of the source of the situation can be conducted to identify the most efficient method of addressing the situation. The assessment of sources should be as site-specific as possible. Once again, using the example above, assume that spawning habitat was found to be the limiting factor and the primary problem affecting the volume of spawning habitat was the amount of fine sediment in



the spawning gravel. Once this is known, an assessment of the sources of fine sediment delivered to the stream will identify actions that need to be taken to reduce the fine sediment load. The assessment of sources should be as site-specific as possible to minimize the potential of addressing situations that are contributing little to the problem. Returning to the example above, an assessment of sources, such as roads, runoff from fields, etcetera, may generally identify the area of effect but could result in very expensive road upgrades when, in fact, only a subset of the roads are causing the problem. A more detailed assessment that specifies which roads are contributing the most sediment would help to focus restoration efforts on the site-specific situation affecting habitat. The assessments cost more up front, but in the end costs of habitat restoration are minimized.

The Planning Unit prefers to take such an approach to assessing the restoration and protection needs in the basin. This approach helps meet the goals of developing a cost-effective program and implementing projects that are the most cost-efficient.

Knowing the limiting habitat factor(s) in a basin is not always necessary to determine projects that will have a net benefit to fish. For instance, where fish are present and water is approaching lethal temperatures, efforts to cool that water will most likely have a positive effect on survival. Likewise, replacing a culvert that is blocking access to upstream habitat will also have a direct and positive effect on production capacity. Hence, good restoration projects can be identified without a limiting habitat analysis; however, the actions that will result in the greatest benefit to fish may not be obvious without such an analysis.

The approach used in this plan includes an identification of limiting factors as described above and identification of site-specific situations affecting those habitat factors, followed by implementation of projects to address the identified site-specific situations. Additional detail on the approach is provided in the following sections. The discussion is broken into four general action areas including:

- ◆ data gaps,
- ◆ identification and implementation of potential restoration projects,
- ◆ habitat protection actions, and
- ◆ public education.

### **7.1.3.1 Data Gaps**

Collection of the information needed to assess current habitat conditions, limiting habitat characteristics, and to identify the projects that will provide the greatest benefit to fish would preferably be completed early in the implementation phase. These efforts are subject to the availability of funding and resources. Information needed is outlined below.

**Current Habitat Conditions** : Inventories of current habitat within the management area will be developed. These inventories will include a quantification of the volume of rearing and spawning habitat, an assessment of prey available to fish, and summer stream temperature. Information collected during the inventories will include data regarding habitat quality, including estimates of fines in spawning gravels, abundance of wood and boulders that influence the

development of pools and capture and sorting of gravel and other sediments, and the amount of cover available.

**Passage Barriers :** Additional information on passage barriers that will help to refine estimates of habitat available for anadromous fish will be collected. Any culverts that have not been assessed need to be evaluated to determine if they are passage barriers. Some of the culverts that have been previously assessed may need to be revisited if there are questions regarding earlier conclusions. Assessments will be compatible with the WDFW Fish Passage and Surface Water Diversion Screening Assessment and Prioritization Manual (WDFW 2000).

Passage above the Little Klickitat Falls needs to be assessed. The Falls may be passable to steelhead under some, but not all, conditions. Long-term residents indicate that steelhead have not been seen above the falls. Some evidence of redds above the Falls has been reported, but it is unknown whether those redds were constructed by steelhead or resident trout. Large trout have been planted in the river and, reportedly, they occasionally escape from private trout ponds during high flows. The frequency that passable conditions exist, if any, and the numbers of fish passing the Falls during such times needs to be evaluated to help determine the production capacity of anadromous fish in the Little Klickitat River.

**Limiting Habitat Characteristics and Processes Affecting those Characteristics:** Data collected needs to be evaluated to determine the carrying capacity of the existing habitat and to identify limiting habitat characteristics. Once the limiting habitat characteristics are known, assessments of the sources of inputs limiting the habitat can be completed. This may take the form of an evaluation of sediment inputs, wood inputs, shade levels, nutrient levels, or other inputs affecting fish habitat. The assessment needs to be as site-specific as possible to allow for the identification of actions required to address the situation.

**Fish Population Size:** At present, available information is limited regarding fish populations and estimates of catch. This information is not sufficient to determine run size of natural and hatchery origin fish. Additional information regarding the size of fish populations is needed to determine if the existing habitat is fully seeded. This information can be obtained through smolt traps, spawning surveys (difficult to do for steelhead), side-scan sonar, creel surveys, tag recovery programs, or other stock assessment tools. This information should be collected in conjunction with the WDFW and may be contracted if needed.

**Data Collection Methods and Standards:** Several manuals describing methods for fish habitat surveys have been developed by State agencies. The most commonly used of these methods include the following.

- WDFW's Stream Habitat Restoration Guidelines, Final Draft. (Saldi-Caromile et al., 2004)
- WDFW's Integrated Streambank Protection Guidelines (Cramer et al, 2002)
- Ecology's invertebrate assessment protocols (Ecology, 1994b, 1997, 2001)
- Timber, Fish and Wildlife (TFW) Monitoring Program method manuals for:
  - habitat unit surveys (Pleus et al., 1999),

- large woody debris surveys (Schuett-Hames et al., 1999),
- salmonid spawning gravel composition surveys (Schuett-Hames et al., 2000c),
- salmonid spawning gravel scour surveys (Schuett-Hames et al., 2000b),
- salmonid spawning habitat availability surveys (Schuett-Hames, et al., 2000d),
- stream segment identification (Pleus and Schuett-Hames, 2000),
- stream temperature surveys (Schuett-Hames et al., 2000a), and
- riparian stand surveys (Smith, 1998).

Protocols developed to address information needs will strive to be consistent with one or more of these State protocols; however, modifications of protocols may be required to ensure that the information needed is obtained during the assessments.

Data collection efforts must be developed using statistically robust methods and must include a quality assurance process. Data collected must be publicly available to ensure that the information can be used to identify projects, to facilitate monitoring of success against the goals of this action item, and to reduce redundancy of efforts, as well as to provide opportunity for critical review and validation. All data, with sample sites, methods, quality assurance data, data analyses, and discussion and conclusions must be provided in a publicly available format. See Section 4 for additional discussion regarding data quality and reporting.

If sufficient funding is not available to address all habitats in the WRIA, anadromous habitats will be given priority. The Planning Unit will consider using the Klickitat CRC's evaluation criteria to prioritize geographic areas and projects, but may need to modify those criteria to fit the goals of the program. The WRIA 30 entities implementing the Watershed Management Plan will strive to make data collected during implementation available to the Klickitat CRC and other groups to help them invest funding effectively.

### **7.1.3.2 Identification and Implementation of Potential Restoration Projects**

Drawing upon the information regarding habitat that is gained through filling data gaps, action is required to identify areas where fish habitat could be enhanced through direct modification (e.g. planting riparian areas, placing wood, providing fish passage) and/or through indirect management strategies (e.g. upgrade of roads, modification of runoff patterns) and implement those actions. Areas where restoration is implemented should be sites where actions will have long-term benefits. The procedures described in the previous section should be followed where applicable although some modification of those procedures may be required to address site-specific situations.

**Passage Barriers** : Man-made fish passage barriers identified through existing or new information will be addressed. Priority will be given to barriers that block access to larger volumes of upstream habitat. Natural features limiting fish distribution (e.g., Little Klickitat Falls) should not be altered to enable fish passage.

**Sediment Inputs** : Where sediment is found to be limiting fish production, sediment reduction programs will be developed and implemented to reduce those inputs. Sediment programs may address surface erosion from fields and construction sites, road erosion, land slides, or other sources identified during the source evaluation process described in Section 7.1.3.

**Stream Temperature:** Monitoring of stream temperature will aid in the identification of areas where temperature is limiting population production. In areas where elevated stream temperature is found, programs aimed at reducing temperature through riparian restoration, reduction of sediment inputs, and/or changes in stream flow will be implemented. Programs addressing known issues in the Little Klickitat and Swale Subbasins are addressed in Chapter 6.

**Instream Wood Abundance:** In areas where instream wood abundance is found to be limiting fish production, programs will be developed and implemented to increase wood in streams. These programs may include active instream restoration programs, riparian restoration programs, and riparian protection efforts.

**Nutrients:** Excessive nutrient loads can cause water quality problems that affect dissolved oxygen in streams. Low concentrations of nutrients can affect the amount of prey available to fish. Monitoring will aid in the identification of areas where nutrient levels are affecting fish population production. Programs will be developed and implemented to improve identified situations. These programs may include efforts that increase nutrients in nutrient deficient areas (such as placement of fish carcasses) and efforts to reduce nutrients in nutrient rich areas (such as reduction of fertilizer runoff, and improvement of septic systems near water bodies).

**Fish Population Interactions:** If interactions between native populations and introduced species or hatchery stocks are identified as a limiting factor on the production of native salmonid populations, the information supporting these conclusions will be provided to WDFW. Reductions in non-native populations and/or changes in hatchery management to address identified situations will be encouraged.

**Harvest or Out-of Basin Effects:** If harvest or out-of-basin effects are limiting fish production in WRIA 30, the information supporting these conclusions will be provided to WDFW and other appropriate agencies. Modification of fish management actions to address the identified situation will be encouraged if viable solutions can be identified. It is recognized that out-of-basin effects can include natural conditions such as variability in ocean conditions, large scale anthropogenic effects such as global climate warming, or the spread of disease, parasites, and other organisms affecting survival of fish populations. These factors can be difficult or impossible to control.

### **7.1.3.3 Habitat Protection**

Protection of existing habitat will be addressed through regulatory and voluntary efforts. Regulatory review and applications are discussed in Section 5.2. Several voluntary programs are available that encourage the development of riparian reserves. The following list of programs, which was discussed in detail in Section 5.1.3.3, can be applied to provide habitat protection.

- The Conservation Reserve Enhancement Program (NRCS and Conservation Districts)
- The Conservation Reserve Program (NRCS)
- The Grassland Reserve Program (NRCS and the Farm Service Agency)

- The Wildlife Habitat Incentive Program (NRCS)
- The Healthy Forest Reserve (U.S. Department of Agriculture and Conservation District).
- The Wetlands Reserve Program (NRCS)
- The Forestry Riparian Easement Program (WDNR)

Participation in these programs is encouraged. Public education efforts will focus on providing landowners with information regarding these programs. Landowners with critical riparian habitats will be targeted.

#### **7.1.3.4 Public Education**

Public education and communication is critical to the success of this program. Landowners must be informed regarding the intent of projects. Basic understandings regarding the influence of land use on the quality of fish habitat will be fostered through education programs. Participation in volunteer efforts will be encouraged. Details of the public education program will be developed during the plan implementation.

#### **7.1.4 MONITORING**

Monitoring of water quantity and water quality previous addressed in Sections 5 and 6 are also applicable to this situation. Additional monitoring relative to the restoration and protection of fish habitat should include documentation on long-term trends in fish population levels and habitat quality. Additionally, the effectiveness of individual projects needs to be monitored to ensure that the projects result in the intended benefit. A Monitoring Plan will be developed during plan implementation. The Monitoring Plan will strive to be consistent with the statewide monitoring program, but may need to be modified to address individual situations.

### **7.2 FISH HABITAT PROTECTION POTENTIAL EFFECTS OF POPULATION GROWTH AND POPULATION MOVEMENT ON FISH HABITAT**

**Problem:** Future development might impact fish habitat through reductions in summer low stream flow, increases in peak flow, reductions in riparian shade, and/or changes in water quality.

**Goal:** Manage future growth to minimize or avoid effects on fish habitat

**Priority:** Moderate

#### **7.2.1 BACKGROUND**

**Population Growth:** At present, growth in Klickitat County is slow (see Section 2.2 for details). OFM is not forecasting significant growth in the County. Growth rates could change if additional businesses move into the area, thereby increasing employment. Growth may also occur through the construction or purchase of secondary homes.

**Mechanisms of Effect of Growth on Fish Habitat:** Future growth has the potential to affect fish habitat in a number of ways. Some of these include:

- Changes in peak flows associated with an increase in impervious areas.
- Possible increase in water use that reduces instream flows (current estimated residential use is very small relative to estimated irrigation use).
- Inputs of sediment through the runoff from roads and/or ground-disturbing activities.
- Loss of riparian habitat, which affects channel condition, sediment inputs, and stream temperature.
- Inputs of chemicals into streams arising from agricultural and residential applications and runoff from roads.
- Pollution of ground water resources through septic systems and use of chemicals.

**Existing Regulations:** Regulations that are currently in place provide protection against the impacts of future development. These regulations were discussed previously in Section 7.1.1.6. That discussion is also applicable to this issue.

## **7.2.2 ASSUMPTIONS AND CONSTRAINTS**

The plan outlined to address the effect of future growth on fish habitat assumes that existing regulations and ordinances will remain in existence and will be implemented. This includes periodic review of regulations and ordinances, as provided in the applicable statutes

## **7.2.3 APPROACH**

The rules and regulations and the volunteer efforts described in Section 7.1 to protect fish habitat will also help to protect against the impacts of future growth. Hence, habitat protection actions described in Section 7.1 are also applicable to the issue of the effects of growth on fish habitat. Sections 5 and 6, which address water quantity and water quality, are also applicable to this issue.

Future growth could potentially change stream flow, sediment inputs, riparian conditions, and/or water quality. The approach to monitoring and responding to changes in each of these parameters is described below. Most of the approaches involve monitoring of change over time. This monitoring is a programmatic subbasin-wide tracking of cumulative effects. Due to the cumulative scale of the monitoring, reliance on individual project proponents for completion of the monitoring is inappropriate. The monitoring must be done on a programmatic level by an appropriate centralized entity. The responsible entity(s) will be identified in the first year of program implementation.

While regulatory approaches are discussed in this Watershed Management Plan, the Planning Unit urges the implementation of voluntary and positive incentive-based approaches to addressing issues associated with population growth.

## **Development in Riparian Areas**

Development and disturbance in riparian areas can affect fish habitat through changes in riparian cover, sediment inputs, changes in wood inputs to the stream, bank disturbance, and other processes. As was discussed previously, development in riparian areas is regulated through a number of County ordinances. Some land uses are exempted from these ordinances, and variances from the ordinances can be granted. Therefore, monitoring of trends in riparian disturbance is warranted. Trends can be monitored through periodic review of aerial photographs. Changes in riparian condition and the number of buildings and roads can be estimated using automated computer techniques that distinguish differences between photo sets. New photos are taken by the WDNR on roughly an eight-year schedule. Hence, monitoring of changes in time can occur at eight-year intervals. Given the slow population growth rate in the WRIA, this interval should be sufficient to document trends. Information obtained through monitoring can be used to assess the need for additional voluntary or regulatory actions to protect riparian areas.

## **Stream Flows**

Section 5 addresses meeting current and future water demand, including providing for beneficial uses, and Section 6 addresses current known low flow situations. Hence, future minimum instream flows are addressed through approaches described in those sections.

Peak flows (magnitude of flood events) are not addressed elsewhere in this plan. Peak flows are most often affected by changes in the area of impervious surfaces and/or reductions in forest cover. The Watershed Assessment concluded that the effects of land use on peak flows are unlikely with the current level of development. The Little Klickitat Watershed Analysis (Raines et al., 1999) concluded that peak flows have been reduced rather than increased due to an overall average increase in the density of trees in forested areas relative to historical, pre-fire suppression, conditions. The Little Klickitat analysis did not address conditions on Yakama Nation lands; however, those lands are not included in this Watershed Management Plan.

Growth has been negligible in recent years and slow growth is expected in the future. As a result, changes in impervious areas are not likely to increase rapidly. Forest management is regulated under the Forest Practices Act, and average density of the forest cover is unlikely to change significantly unless forestlands are converted to residential or agricultural uses. In light of the absence of any current indication of significant peak flow effects and the expected slow changes into the future, no action is warranted as the present time. However, monitoring of changes over time to determine if a situation of concern is developing is warranted.

To address this situation, baseline information regarding the area of impervious surfaces or an indicator of the areas of impervious surfaces (such as population density) in subbasins with higher population density will be assembled. Additional monitoring in other areas will be initiated as population densities increase. Change in the selected indicator parameters will be updated approximately every eight years, depending on the availability of new data and information such as aerial photography. Monitoring of change will reflect both increases and decreases in the selected indicator parameter. This information will be incorporated into a GIS

system that allows for the tracking of changes over time. The acres of land in forest management will also be tracked over time.

During implementation of the Watershed Management Plan, the literature will be reviewed to identify typical conditions where significant peak flow effects have been encountered. Based on this information, one or more indicators of impervious surfaces (which may be actual measurements of surfaces, population density, rezones, conversions, building permits, changes from septic to sewer, changes from well to city supply or other measures) will be identified and a level will be set that is lower than found in the literature to cause significant effects. That identified level of the indicator parameter will be used to prompt a study of the cumulative effects of development on peak flows. The identified indicator level is **not** a trigger for the development of new regulations or for requiring additional assessment by individual development project proponents, but rather an indicator that sufficient growth has occurred to warrant an investigation into the effects of land use on peak flows. The information from studies can be used to provide further clarification of when an action may be required to avoid peak flow impacts. Ecology and other agencies may be asked for technical input on the assessment.

### **Sediment Inputs**

Sediment levels in streams are currently unknown. The approach described in Section 7.1 is designed to identify and address any existing sediment issues in the WRIA. The monitoring program described in 7.1 will document changes in sediment loads in streams. Monitoring will also include miles and locations of roads, developed acres within gradient ranges, and acres of agricultural land. All monitoring will include both increases and decreases in the indicator parameters that are monitored. For instance, documentation will include both the construction of new roads and the removal of roads. Changes in streambed sediment and land uses potentially affecting sediment inputs will be monitored over time using a GIS based tracking system. The amount of change in the monitoring parameters will be evaluated relative to baseline levels every five years.

During implementation of the Watershed Management Plan, the literature will be reviewed to identify typical conditions where significant sediment impacts have been encountered. These may be related to miles of road in the basin, acres of agricultural land, acres of higher gradient land in development, or other factors that may be indicators of sediment inputs. Based on this information, an indicator will be identified that is lower than is found in the literature to cause significant effects. The identified indicator level is **not** a trigger for the development of new regulations or for requiring additional assessment by individual development project proponents, but rather an indicator that sufficient growth has occurred to warrant an investigation into the cumulative effects of land use on sediment inputs. That identified indicator will be used to prompt a study of the effects of development on sediment inputs. The information from studies can be used to provide further clarification of when an action may be required to avoid cumulative sediment impacts. Ecology and other agencies may be asked for technical input on the assessment.



## **Water Quality**

With the exceptions of the water quality issues addressed in Section 6 and water quality issues in the mainstem Columbia River, water quality is currently believed to be good in the basin but the available data on water quality is limited in a number of areas. Water quality will be monitored in the future to track trends in time. If degradation of water quality is documented in the future, approaches to address the problem areas will be developed.

## **Riparian Condition**

Development within riparian conditions is regulated by the County (see Section 7.1.1.5). These regulations are expected to protect riparian conditions from future degradation. Approaches to address current stream temperature situations described in Section 6 are expected to result in improvements in riparian condition. However, riparian conditions could potentially degrade due to the cumulative effects of exemptions to regulations and permitted disturbances.

The data collection efforts described in Section 7.1 and Section 6.0 will provide sufficient information to develop and describe baseline conditions. Monitoring, also described in Sections 7.1 and 6.0, will provide information regarding changes in riparian condition as well as changes in water temperature and fish habitat quality. Riparian condition will be monitored over time using aerial photographs. Monitoring will include both improvements and loss of quality so that the cumulative change can be identified. Riparian condition information will be updated when new photos become available from WDNR, which typically occurs on a five to seven year rotation (funding dependent).

If the monitoring programs indicate that the existing regulations and voluntary programs are insufficient to protect riparian areas, modifications to regulations and/or increased emphasis on voluntary efforts may be needed. The Shorelines regulations are subject to review and update on a regular basis. Should monitoring programs suggest a need for revision of rules, then the situation will be addressed at the time the regulations are reviewed and updated. Monitoring of the implementation and effectiveness of voluntary efforts and of public outreach efforts has also been described previously regarding riparian restoration efforts. If that monitoring suggests the programs described previously have not been successful in meeting the goals described in Section 6, then the public outreach program will be modified to encourage increased participation in voluntary programs.

## **Public Education**

Public Education is an important component of this portion of the plan. The public needs to be aware of the purposes of monitoring and evaluations conducted to help ensure cooperation and access to lands. In the future, if the need for additional regulation to avoid cumulative effects is required, public education regarding the need and the importance of regulatory changes is imperative to gain public acceptance of those changes.

During the development of this plan, an increasing number of hobby farms was noted as a current pattern in land use. Hobby farms can benefit from all of the programs currently in place to assist agricultural uses; however, a need to complete focused effort in terms of public outreach

to hobby farm owners was identified. Currently, the CKCD is developing a program to reach those landowners. Further financial assistance would aid in the success of their efforts.

## **7.2.4 MONITORING**

Monitoring for each situation covered in this section was previously described under each heading above.

## **7.2.5 DISCUSSION**

The areas where population changes are most likely to be seen are areas radiating from existing population centers. Growth is also affected by zoning regulations. The upper basin is managed as forestland and, hence, is not subject to development and/or the effects of population change as long as those lands are managed for timber production. Forest Practices regulations address management effects on peak flows and sediment runoff on those lands. Monitoring of change in those areas is therefore unnecessary.

Minimum instream flows have not been set for streams within the WRIA. As was indicated in Section 5, Ecology is requested to contact the Initiating Governments in advance of starting activities addressing instream flows. The Planning Unit and other local entities wish to have the opportunity to provide information and to work with Ecology on the instream issue.

## **7.3 MANAGEMENT OF ACTIONS ADDRESSING FISH HABITAT**

### **7.3.1 ACTION ITEMS**

Action items included in this Watershed Management Plan that address fish habitat cover a large number of activities. Ecology and WDFW may be asked to provide guidance regarding appropriate approaches and/or rules and regulations and may also be asked to provide review of project proposals, plans, and study documents. Ecology will be asked to act as the liaison between the various other State agencies regarding water quantity issues that may benefit from input from those other agencies.

The action items are summarized below. Subtasks are listed for some items under the major tasks. Action items related to water rights and water use are not included in this list. These were covered under Section 5. Likewise, action items related to stream temperature in Swale Creek and the Little Klickitat River are not included. These were covered in Section 6.

#### **Action Items Needed to Address Fish Habitat Issues**

- ' Additional studies to address outstanding questions
  - Assessment of Stream Conditions Limiting Fish Production
  - Inventories of culverts impeding fish passage
  - Evaluations of the frequency that the Little Klickitat River falls is passable to returning anadromous fish.
- ' Additional monitoring of fish populations and fish habitat conditions
- ' Development and implementation of programs based on current information and the results of additional studies

- Fish passage
- Sediment inputs
- Stream temperature
- Instream wood
- Nutrients
- Fish population interactions
- Harvest and out-of-basin effects
- Monitoring of cumulative trends in parameters potentially affected by population growth
  - Sediment inputs
  - Peak flows
  - Riparian condition
- Public Education and interaction
- Monitoring of effectiveness of habitat enhancement projects
- Overall coordination of entities involved in implementation of Watershed Management Plan including reporting to Ecology

Some of the items above may be modified based on results of additional studies and monitoring. Additional action items may also be identified during the course of plan implementation.

### **7.3.2 MANAGEMENT OPTIONS**

The details regarding the management and oversight of the implementation of the fish habitat portion of the plan will be developed during development of the Detailed Implementation Plan (see Section 4).

Many, if not most, of the action items listed previously in this section are currently implemented by existing agencies; hence, the assistance of entities with existing programs may be requested by the plan management entity. The preferred approach to addressing habitat concerns in the WRIA is to complete the work needed through contracts managed locally and coordinated with State agencies.

Table 18 provides an overview of the possible entities that could be asked to assist with various aspects of the Watershed Management Plan that address fish habitat issues. The table is not to be construed as an assignment of responsibility. The checks on the table merely indicate options that may be considered during plan implementation.

### **7.3.3 FUNDING**

Many fish habitat projects are funded through the Lead Entity process. Projects identified under this Watershed Management Plan may be submitted to the Klickitat CRC for consideration for funding. Numerous other options are available for funding. Table 19 provides a summary of commonly used funding sources managed by State and federal agencies. Other government programs may also provide funding now or in the future. Additionally, many private entities might provide funding for environmental assessment, restoration, and protection.

**Table 18. Entities that may be asked for assistance on the Implementation of Action Items Related to the Fish Habitat Issues.**

*Note:* Ecology will likely be asked to provide guidance and document review associated with the items listed below. Ecology will also be asked to serve as a liaison with other State agencies, including State Department of Health and the Department of Fish and Wildlife, regarding matters addressed in the actions below. Ecology is not assumed to take a major role in the following action items with the exception of guidance, review, and State caucus coordination.

<b>Action Item</b> <i>Items in italics and right justified are subtasks within the specified task listed ahead of those subtasks</i>	<b>Ecology</b>	<b>WDFW</b>	<b>County Planning Dept.</b>	<b>NRCS</b>	<b>County Public Works</b>	<b>Conser- vation District</b>	<b>Cities</b>
<b><i>ADDITIONAL STUDIES</i></b>							
Assessment of Conditions Limiting Fish Production	√	√	√	√	√	√	
Culvert Inventory	√	√		√	√	√	
L. Klickitat Falls Passage	√	√	√	√		√	
Address Conditions Limiting Fish Production	√	√	√	√	√	√	
Land Use and Fish Habitat Interactions		√	√			√	√
Changes in Fish Populations	√	√	√				
Changes in Carrying Capacity	√	√	√	√		√	
Changes in Limiting Habitat Factors	√	√	√	√		√	
Sediment Monitoring	√		√	√		√	
Peak Flow Monitoring	√		√		√		√
Riparian Condition Monitoring	√		√	√		√	
Water Quality Monitoring	√		√	√		√	
<b><i>HABITAT RESTORATION AND PROTECTION</i></b>							
Identification of Appropriate Habitat Restoration and Protection Actions	√	√	√	√	√	√	√
Implementation of Identified Projects	√	√	√	√	√	√	√
<i>Fish Passage</i>		√	√		√		√
<i>Sediment Inputs</i>	√		√	√	√	√	√
<i>Stream Temperature</i>	√		√	√		√	√
<i>Instream Wood</i>		√	√	√		√	√
<i>Nutrients</i>	√		√	√		√	√
<i>Fish Population Interactions</i>		√					
<i>Harvest/Out-of-Basin Effects</i>		√					
<b><i>PUBLIC EDUCATION</i></b>							
	0	0	0	0	0	0	0

**Table 19. Potential Funding Sources to Support Portions of the Watershed Management Plan Addressing Water Quality.**

*Sources: Kathleen Bartu, Foster Creek Conservation District; Washington State Infrastructure Assistance Coordinating Council (www.ingrafunding.wa.gov), Boise State University (ssrc.boisestate.edu), and various state and federal web pages.*

<b>PROGRAM</b>	<b>AGENCY</b>	<b>DESCRIPTION</b>
Centennial Clean Water Fund	Ecology	Projects which prevent and control water pollution
Conservation Reserve Program	Farm Service Agency	The Conservation Reserve Program (CRP) provides annual rental payments and cost sharing assistance to landowners and operators to take environmentally sensitive land out of production and plant it to a perennial cover under 10 to 15 year contracts. CRP also includes the Conservation Reserve Enhancement Program (CREP), which enrolls riparian buffers along selected salmon-bearing streams with substantially higher compensation.
Environmental Quality Incentive Program	Natural Resources Conservation Service and Farm Service Agency	Encourages commercial agricultural producers to solve point and nonpoint source pollution on farms and ranches. May include establishment of permanent vegetative cover, sediment retention, erosion or water control structures, stream protection, and other actions.
Nonpoint Water Quality Grants	Conservation Commission	Implement projects and practices to improve water quality.
Partners for Fish and Wildlife	U.S. Fish and Wildlife Service	Program focuses on re-establishing historic native communities and offers assistance to private landowners who wish to restore degraded or converted wetlands, riparian, stream, and other critical habitats.
Regional Fisheries Enhancement Groups	Washington State Department of Fish and Wildlife	Regional Fisheries Enhancement Groups receive funds for salmon habitat restoration and enhancement projects.
Riparian Habitat Program	Interagency Committee to Outdoor Recreation	This pilot program provides matching grants for projects that protect habitat on privately owned land through less than fee simple acquisition methods.
Family Forest Fish Passage Program	Washington Department of Natural Resources	Provides funding to small forest landowners to upgrade stream crossings
Salmon Recovery Funding Board	Office of the Interagency Committee for Outdoor Recreation	The salmon Recovery Funding Board (SRFB) supports salmon recovery by funding habitat protection and restoration projects and related programs and activities that produce sustainable and measurable benefits for fish and their habitat.
Water Quality Incentives Projects	Farm Service Agency	Funding available in terms of incentive payments to encourage farming practices that reduce the amount of water pollution caused by agricultural activities.

<b>PROGRAM</b>	<b>AGENCY</b>	<b>DESCRIPTION</b>
Wetland protection, restoration, and stewardship discretionary funding	US EPA	Provides support for studies and activities related to implementation of Section 404 of the Clean Water Act for both wetland and sediment management. Projects can support regulatory, planning, restoration, or outreach issues.
Wetlands Reserve Program	Natural Resources Conservation Service and Farm Service Agency	Offers landowners the opportunity to receive payments for restoring and protecting wetlands on their property.
Wildlife Habitat Incentives Program	Natural Resources Conservation Service	Provides technical assistance and cost-share payments to help establish and improve fish and wildlife habitat on private lands.
Washington Wildlife and Recreation Program	Interagency Committee for Outdoor Recreation	Funding supports acquisition and development of outdoor recreation and conservation lands. Eligible projects include important parks, critical habitat, water access sites, trails, natural areas, and urban wildlife habitat.
Forest Stewardship and Stewardship Incentive Program	Washington Department of Natural Resources and USDA Forest Service	Technical and financial assistance to non-industrial forest owners for a variety of forest stewardship projects, including riparian, wetland, and fisheries habitat enhancement.
Aquatic Lands Enhancement Account	Washington Department of Natural Resources	Primarily focused on recreation, but also funds habitat improvement projects.
Public Participation Grants	Ecology	Helps groups educate and involve the public on waste issues.
Water Quality Special Research Grants Program	Cooperative State Research Education and Extension Service	Identification and resolution of agriculture-related degradation of water quality.
FishAmerica Foundation	FishAmerica Foundation	Hands on-projects at the local level aimed at enhancing fish populations, improving water quality, and/or advancing fisheries research; thereby increasing the opportunity for sport fishing success.
Nonpoint Source Implementation Grant (319) Program –Washington	Washington State DOE/ Environmental Protection Agency	Management of nonpoint source pollution and to improve and protect water quality. Funds may be used for planning and implementation, including the development of TMDLs, restoration of riparian, and prevention of pollution through active educational programs.
Bonneville Environmental Foundation Watershed Program	Bonneville Environmental Foundation	Funds proponents with desire and capacity to implement a comprehensive watershed restoration strategy that incorporates community support, scientific basis, watershed-scale approach; and monitoring and evaluation systems that track restoration progress and provide feedback to adjust restoration strategies.

<b>PROGRAM</b>	<b>AGENCY</b>	<b>DESCRIPTION</b>
National Research Initiative Competitive Grants Program	U.S. Department of Agriculture	Research problems of national and regional importance in biological, environmental, physical, and social sciences relevant to agriculture and food and the environment, including water resources assessment and protection.
Watershed Processes and Water Resources Program	U.S. Department of Agriculture	Research that addresses two areas: (1) Understanding fundamental processes controlling (a) source areas and flow pathways of water, (b) the transport and fate of water, sediment, nutrients, dissolved matter, and organisms within forest, rangeland, and agricultural environments, and (c) water quality. (2) Developing appropriate technology and management practices for improving the effective use of water and protecting or improving water quality for agricultural and forestry production, including the evaluation of management policies that affect the quantity and quality of water resources.
Wetland Protection, Restoration, and Stewardship Discretionary Funding	EPA	Studies and activities related to implementation of Section 404 of the Clean Water Act for both wetlands and sediment management. Projects can support regulatory, planning, restoration or outreach issues.
American Water Works Association Research Foundation	American Water Works Association Research Foundation	Water-related research projects.
Cooperative Endangered Species Conservation Fund	USFWS	The Fund is dispersed to the states and territories through four programs: Conservation Grants, Habitat Conservation Planning Assistance Grants, Habitat Conservation Plan Land Acquisition Grants, and Recovery Land Acquisition Grants. Although not directly eligible for these grants, third parties such as nonprofit organizations and local government may work with their state or territorial wildlife agency to apply for these funds.
USGS Cooperative Water Program	USGS	The USGS Cooperative Water Program jointly funds water-resources projects in an ongoing partnership between the USGS and non-Federal agencies.
EPA Assessment and Watershed Protection Program Grants	EPA	Prevention, reduction and elimination of water pollution through watershed program, non-point source program, and monitoring and assessment program.
Native Plant Conservation Initiative	National Fish and Wildlife Foundation	On-the-ground conservation projects that protect, enhance, and/or restore native plant communities on public and private land.

<b>PROGRAM</b>	<b>AGENCY</b>	<b>DESCRIPTION</b>
WDFW Landowner Incentive Program	WDFW	Financial assistance to private landowners for the protection, enhancement, or restoration of habitat to benefit “species at risk” on privately owned lands.
Ducks Unlimited	Ducks Unlimited	Projects that protect, enhance, restore, and managing important wetlands and associated uplands
Non-Point Water Quality Grants	Washington Conservation Commission	Financial assistance for implementation of projects and practices to improve water quality. Examples: Work with farmers to reduce water use; control run-off to reduce sedimentation; improve fish habitat; improve water quality in shellfish areas.
Section 206: Aquatic Ecosystem Restoration Program	US Army Corps of Engineers	Provides authority for the Corps of Engineers to construct aquatic ecosystem restoration and protection projects.
Wetland Program Development Grants	EPA	Financial assistance to support development of new, or augmentation and enhancement of existing wetland programs. Opportunity to conduct projects that promote the coordination and acceleration of research, investigations, experiments, training, demonstrations, surveys, and studies relating to the causes, effects, extent, prevention, reduction, and elimination of water pollution.
Wetland Reserve Program	NRCS	This voluntary program provides landowners with financial incentives to restore and protect wetlands in exchange for retiring marginal agricultural land.
North American Wetlands Conservation Act Grants Program	USFWS	Provides matching grants to carry out wetlands conservation projects (on-the-ground projects).
Private Stewardship Grant	USFWS	Assists individuals and groups engaged in local, private, and voluntary conservation efforts that benefit federally listed, proposed, or candidate species, or other at-risk species.
Conservation and Stewardship in Agriculture	Bullitt Foundation	Promote conservation and stewardship of agricultural lands: adoption of agricultural practices that reduce soil loss and water pollution, minimize pesticide use, conserve biodiversity, promote the efficient and non-polluting use of water, as well as efforts to preserve farmland.



<b>PROGRAM</b>	<b>AGENCY</b>	<b>DESCRIPTION</b>
Five-Star Restoration Program	Environmental Protection Agency	Financial assistance to support community-based on-the-ground wetland, riparian and coastal habitat restoration projects that build diverse partnerships and foster local natural resource stewardship through education, outreach and training activities. The EPA provides funds to four intermediary organizations the National Association of Counties, the National Association of Service and Conservation Corps, the National Fish and Wildlife Foundation, and the Wildlife Habitat Council, which then make subgrants.
Environmental Grant Program, The	Educational Foundation of America	The Foundation focuses on approaches to sustainable agriculture and promotion of family farms; protection, and restoration of water quality and habitat; promotion of renewable energy and energy conservation; land conservation and protection of roadless forest areas, and providing technical assistance and training to environmental groups.
Challenge Grants for Conservation	National Fish and Wildlife Foundation	Support model projects that positively engage private landowners, primarily farmers and ranchers, in the conservation and enhancement of wildlife and natural resources on their land.
Aquatic Ecosystems Program	Bullitt Foundation	The Foundation strives to protect, restore, and maintain the region's aquatic resources and ecosystems.
Terrestrial Ecosystems Program	Bullitt Foundation	Protection of the forests, grasslands, high desert, and other pristine wild lands of the Pacific Northwest.
Wyden Amendment	BLM	This legislation provides the authority for both the USFS and BLM to enter into cooperative agreements with public and private entities for the protection, restoration, and enhancement of fish, wildlife or other resources on public or private lands that directly benefit biotic resources on public lands within the watershed.
Ecosystem Restoration in the Civil Works Program	US Army Corps of Engineers	Resolve major problems in water related resources on a watershed scale, such as reconnecting streams to the main stem, restoring meandering in river courses, or resolving sediment loading problems.
Habitat Conservation - Partners for Fish and Wildlife Program	USFWS	This program provides technical assistance to the private sector to maximize wildlife conservation. To pursue opportunities and cooperative efforts with other government agencies and private partnerships to protect, restore, and enhance fish and wildlife habitats.

<b>PROGRAM</b>	<b>AGENCY</b>	<b>DESCRIPTION</b>
National Fish and Wildlife Foundation (NFWF), Matching Grants for Conservation on Private Lands	NFWF	The NFWF is working to expand and strengthen its partnership with NRCS to support innovative and effective conservation and stewardship of the country's private lands. The goal of the partnership is to support high quality projects that engage private landowners, primarily farmers and ranchers, in the conservation and enhancement of fish and wildlife and natural resources on their lands.
Environmental Education Grants Program	EPA	Projects must focus on one of the following: (1) improving environmental education teaching skills; (2) educating teachers, students, or the public about human health problems; (3) building state, local, or tribal government capacity to develop such programs; (4) educating communities through community-based organization; or (5) educating the public through print, broadcast, or other media.
Student Environmental Stewardship Program	Washington Environmental Education Foundation	Encourage student participation in local environmental stewardship projects and enhance student understanding of community service and philanthropy.

## **8.0 IMPLEMENTATION**

Implementation of the Watershed Management Plan will consist of both independent and coordinated actions by various organizations. Implementation of the actions called for in the Watershed Management Plan will be subject to budgetary and staffing constraints. However, in approving the Watershed Management Plan, the water resource interests in WRIA 30 agree to help seek and support funding to carry out the actions identified in the plan, focusing first on the priority issues and actions with the greatest expected benefit.

A wide range of interests worked cooperatively to create a vision for the future condition of water resources within WRIA 30, evaluate the current condition of water resources and fish habitat, and reach agreement, as embodied in this plan, on how to manage the water resources and fish habitat. The effort to produce the Watershed Management Plan is but the beginning of the cooperative effort that will be required to achieve the envisioned state of water resources. Entities who are accepting responsibility for actualizing various actions set forth in the Watershed Management Plan need to formally commit themselves through memoranda of agreement, resolutions, policy statements, or other such actions. As the plan is implemented and new information becomes available, all water resources interests need to remain committed to monitor progress and steer the effort in response to the evolving situation.

### **8.1 MANAGEMENT OF PLAN IMPLEMENTATION**

Coordination of the various actions associated with implementation of the Watershed Management Plan is an important aspect of the implementation process. The details regarding the management and oversight of the implementation of the plan will be developed during the implementation planning process; however, the general approach to management of those activities is described here.

The Initiating Governments (i.e., Klickitat County, the City of Goldendale, and KPUD) will provide oversight of plan implementation, initiate planning activities, define the scope of actions associated with plan implementation, and address policy issues that arise during implementation.

The Planning Unit will continue to operate. Upon approval of the Watershed Management Plan, the Planning Unit will be renamed as the Water Resource Planning and Advisory Committee (WRPAC) to reflect the planning and advisory responsibility of the committee. The WRPAC will serve as a dedicated resource for providing input to Initiating Governments regarding water resource and habitat issues, but shall have no authority that is not specifically granted by the Initiating Governments. The WRPAC is an advisory body to the Initiating Governments and the Implementing Governments.

The WRPAC is tasked with developing the Detailed Implementation Plan during the first year of Implementation. Upon approval of the Detailed Implementation Plan, it is envisioned that quarterly meetings will be sufficient to address WRPAC responsibilities.

The following are the responsibilities of the WRPAC:

- Developing a Detailed Implementation Plan;
- Clarifying the Watershed Management Plan and Detailed Implementation Plan as needed;
- Updating/amending the Watershed Management Plan and/or Detailed Implementation Plan if requested by the Initiating Governments (the Initiating Governments retain the authority to initiate planning, and define the scope and process associated with any plan amendments);
- Reviewing work that is accomplished and advising on upcoming plan implementation work;
- Assisting with prioritizing projects and developing a statement of agreed priority for the management area; and
- Assisting with and advising on planning issues as requested by the Initiating Governments or Implementing Governments.

The “Implementing Governments” will be made up of the City of Goldendale, KPUD, Klickitat County, Ecology (representing the State agencies), and the CKCD (representing conservation districts within the management area). These are the primary agencies and local governments that have authority to implement various plan activities. The Implementing Governments will meet quarterly or as needed to provide oversight and coordination of the implementation process.

A memorandum of understanding amongst the Implementing Governments and between the Implementing Governments and the Initiating Governments may be required to facilitate plan implementation.

## **8.2 DETAILED IMPLEMENTATION PLAN**

Pursuant to 90.82.043 RCW and 90.82.048 RCW, a Detailed Implementation Plan will be developed within one year of acceptance of funding under 90.82.040(2)(e) for implementing the Watershed Management Plan. Per the statute, the Detailed Implementation Plan will include strategies to provide sufficient water for production agriculture; commercial, industrial, and residential water use; and instream flows. The plan will contain timelines to achieve the strategies and interim milestones to measure progress. The Detailed Implementation Plan will clearly define coordination and oversight responsibilities; any needed inter-local agreements, rules, or ordinances; any needed state or local administrative approvals and permits that must be secured; and specific funding mechanisms. In developing the Detailed Implementation Plan, the WRPAC will consult with other entities in the watershed management area and identify and seek to eliminate any activities or policies that are duplicative of or inconsistent with the Watershed Management Plan.

The implementation timelines will be subject to funding constraints. Timelines and interim milestones will address planned future use of existing water rights for municipal water supply purposes that are inchoate, including how these rights will be used to meet project future needs identified in the Watershed Management Plan, and how the use of these rights will be addressed when implementing the instream flow strategies identified in the Watershed Management Plan. As the lead agency, Klickitat County will ensure

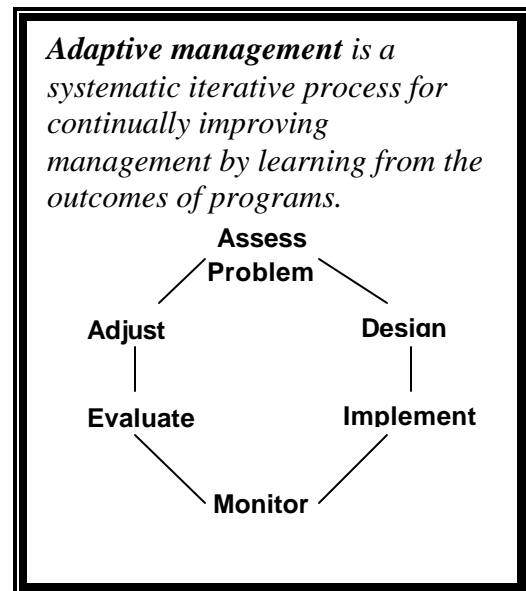
that holders of water rights for municipal water supply purposes not currently in use are asked to participate in defining the timelines and interim milestones included in the Detailed Implementation Plan.

The Detailed Implementation Plan may need to include a funding strategy. The funding strategy may include pooling of resources with additional WRIAs to facilitate the implementation of the applicable plans in those WRIAs.

### 8.3 MONITORING AND ADAPTIVE MANAGEMENT

The Watershed Management Plan is considered an adaptive management plan. Adaptive management will enhance performance of the overall plan and will result in more cost effective approaches to dealing with identified issues in the WRIA.

The various components of the Watershed Management Plan include additional studies regarding watershed resources and processes. The Watershed Management Plan also includes monitoring of project success and subsequent environmental responses to actions implemented. The monitoring programs address environmental trends, environmental changes associated with implementation of projects, project longevity, and implementation of voluntary programs. The studies and monitoring programs will provide information regarding the efficacy of the program. As implementation of the plan progresses, information may be obtained through the studies and monitoring programs that suggests a need to modify the Watershed Management Plan or the Detailed Implementation Plan in order to met the plan objectives.



The WRPAC will annually review progress against the plan and information obtained through studies and monitoring to determine if objectives of the plan are being met. The WRPAC may make recommendations for modifications of the Watershed Management Plan and/or the Detailed Implementation Plan if the available information suggests that adjustments to the plans are necessary. Recommendations will be forwarded to the Initiating Governments for consideration. Upon concurrence of the Initiating Governments, the WRPAC will pursue amendment of the plan(s) following the plan approval procedures outlined in Section 1.8.

### 8.4 RULE MAKING AND INTERAGENCY AGREEMENTS

As provided in Chapter 90.82.130(3) RCW, the Planning Unit has given its consent to State agencies, county governments, and parties who voluntarily assume obligations or commitments for Watershed Management Plan implementation to employ written agreement, policy adoption, or change in documented procedures as a means of fulfilling

the obligations and commitments related to provisions of the statute. The Planning Unit determined that rule making is not required for any obligation associated with the Watershed Management Plan. Should the WRPAC (subsequent to approval of the Watershed Management Plan the Planning Unit shall be known as the WRPAC) come to determine that rule making is appropriate, such determination shall be made only through the same process as was used by the Planning Unit to approve the Watershed Management Plan under Chapter 90.82.130(1)(a) RCW. This does not preclude State agencies, county governments, or other entities from pursuing rule making or promulgation of ordinances under its own authority. If any State agency, county government, or other entity pursues rule making or promulgation of ordinances under its own authority, this Watershed Management Plan shall not be utilized as the basis to justify such actions without a determination by the WRPAC and Initiating Governments that development of rules or ordinances is appropriate.

The Planning Unit recognizes that many of the strategies and actions described in the Watershed Management Plan may need additional information to address current data gaps prior to initiating the development of rules or ordinances.

The Initiating Governments currently intend to have Ecology continue to serve as the State representative responsible for communication and coordination of the State caucus. Ecology will be asked to facilitate reviews of proposals and documents, to provide necessary guidance and advice, to attend meetings as needed, and to facilitate interactions with other State agencies where necessary.

Upon approval by the County legislative authority(ies), the Watershed Management Plan will be recognized by Ecology and accepted through a memorandum of agreement or official written statement. The binding agreement or official statement will acknowledge that Ecology participated in the planning process and that the plan is deemed to satisfy the Ecology's watershed planning authority for WRIA 30 with respect to the components included under the provisions of 90.82.070 RCW, 90.82.90.82.090, and 90.82.100.

## **8.5 OBLIGATIONS, FORMALIZED COMMITMENTS, AND AGREEMENTS**

Nothing in this document should be construed as an obligation under 90.82.130(3) RCW to any party or entity unless expressly identified as such within this section.

Pursuant to 90.82.030(3), State caucus agencies agree to continue to provide technical assistance on implementing the Watershed Management Plan at the request of the WRPAC, the Initiating Governments, and/or the Implementing Governments, contingent on available resources.

The Planning Unit expects that local and State agencies will review the plan and as they deem appropriate assume responsibility for recommended actions by incorporating these into agency work plans and through establishing cooperative agreements. The Planning Unit accepts that any strategies, actions, commitments, obligations, or potential obligations assigned to local, State, or federal agencies are directly associated with securing funding, resources, and legislative authorizations where required.

The Planning Unit recognizes that some actions may be subject to SEPA and, possibly, NEPA considerations and that applicable permits are to be obtained as required prior to initiating projects or programs. The State and local permitting agencies commit to timely review and decisions on permit applications needed to implement recommended actions. It is understood this review may or may not result in a favorable decision for a given action. It is also understood that the decision process may be impacted by staffing and funding constraints or by absence of information required to process applications.

Access to lands managed by WDNR, WSPRC, WDFW, and Federal entities (e.g. U.S. Army Corps of Engineers, U.S. Fish and Wildlife Service) may be requested. Any projects proposed on State or Federal lands would require approval by the appropriate management agency. Actions are likely to be undertaken in the Swale Creek Canyon to address identified water quality issues. WDPRC manages access to that area and would be asked to review and approve, if appropriate, action items undertaken on Park lands. Likewise, any actions taken within the wildlife areas managed by WDFW will require the approval of that agency prior to undertaking those actions.

Minimum instream flow rules have not been promulgated for water bodies within WRIA 30. The Planning Unit and Initiating Governments wish to have the opportunity to provide information and to work with Ecology on the instream issues. As an obligation under 90.82.130(3), Ecology shall contact the Initiating Governments prior to initiating actions to address instream flows within WRIA 30 and negotiate with the Initiating Governments to determine the appropriate roles for various parties in the instream flow-setting process.

As an obligation under 90.82.130(3), Ecology shall contact the Initiating Governments prior to the scoping process for any actions addressing new TMDLs or updating existing TMDLs affecting any water body in WRIA 30. The Initiating Governments and other local water resource interests expect to have the opportunity to provide information and to work with Ecology on water quality issues. To the extent enabled under 90.82.090 RCW, the water quality component is within the scope of watershed planning for WRIA 30. The role of the Planning Unit/WRPAC in addressing water quality issues, including TMDLs and other planning efforts, is a continuing function of the WRPAC.

Ecology will, if asked, assist with the declaration of local drought conditions to help facilitate implementation of actions defined to address such situations per Chapter 173-166 WAC.

Ecology is requested to complete the mapping of water rights and correction of the WRTS database within 30 months following the adoption of this plan. This will facilitate development and implementation of actions addressing current and future water demand.

Legislation pertaining to timelines for consultation processes specified in Chapter 173.563.020WAC is needed in order to implement the Watershed Management Plan provisions pertaining to timely processing of water right decisions. The need for

statutory change regarding timely consultation processes is an appropriate matter to report to the Legislature as provided in Chapter 90.82.043(5) RCW and the matter should be reported annually until it is addressed. The Planning Unit will work with legislators and coordinate with Ecology regarding this matter.

At present, the conveyance of stock water to a stock tank or other structure to reduce the impacts of stock animals on water quality is recognized as a beneficial action by Ecology. Ecology has developed a policy that allows for such actions without modification of water rights if the amount of water consumed is not increased and that the overflow water is returned to a point near the point of diversion (Ecology, 1994a). This policy is not reflected in rule. The need for statutory change addressing the conveyance of stock water is an appropriate matter to report to the Legislature as provided in Chapter 90.82.043(5) RCW and the matter should be reported annually until it is addressed.

As an obligation under Chapter 90.82.130(3) RCW, Ecology shall adhere to the approval processes prescribed in this plan for Watershed Management Plan amendments and the approval and amendment processes for the Detailed Implementation Plan. These processes are specified in Section 1.8.

Preliminary and rough estimates of the time required for Ecology to meet the obligations of that agency under this plan are 2.3 Full Time Equivalents (FTEs) in year one, 1.2 FTEs in year two, and 0.7 FTEs in the out years (Appendix C). These estimates are based on numerous assumptions that may or may not hold. Hence, these estimates are subject to change. Additionally, the estimates do not include time required to process water right applications, water change applications, or permit applications.

Ecology commits to the best of its ability to maintaining the stream flow gauge placed on the Little Klickitat River and any other gauges for a period of at least 10 years. Prior to removing the gauge(s), Ecology will consult with the Planning Unit or Initiating Governments to determine if an extension of this commitment is needed.

The Planning Unit expects a written acknowledgement of obligations from Ecology regarding implementation of this plan.

If any portion of this plan is found to be legally deficient, existing rules, regulations, and ordinances supercede those portions of this plan.

If any provision of this plan or any provision of any document incorporated by reference shall be held invalid, such invalidity shall not affect the other provisions of this plan which can be given effect without the invalid provision, and to this end the provisions of this plan are declared to be severable.



## **9.0 SEPA COMPLIANCE**

The State Environmental Policy Act (Chapter 43.21C RCW) (SEPA) was enacted by the legislature to ensure that State and local agencies consider the likely environmental consequences of proposed actions during decision-making processes. The SEPA rules (Chapter 197-11 WAC) provide State and local agencies with specific requirements for implementing SEPA. If a proposal requires agency action, including funding, a SEPA review must be conducted, unless specifically exempted by statute. Pertinent actions that may be exempted include but are not limited to acquisition of forest lands in stream channel mitigation zones, acquisition of conservation easements pertaining to forest lands in riparian zones, certain fish enhancement projects, water appropriations of 50 cubic feet per second or less for irrigation, and certain watershed restoration projects implementing a watershed restoration plan that has been reviewed under SEPA. Applicability of the exemptions is subject to review by Ecology.

The SEPA environmental review must include an assessment of any adverse effects of the proposed action on earth, air, water, plants, animals, energy and natural resources, environmental health, land and shoreline use, housing, aesthetics, light and glare, recreation, transportation, public services and utilities. If the lead agency determines that the proposal will not result in probable significant adverse environment impacts, a determination of non-significance is issued. If the lead agency determines that the proposal will likely have significant adverse environmental impacts, a determination of significance will be issued and the environmental impact statement process will be initiated. Potential mitigation measures that will modify project effects will be considered. If reasonable mitigation measures can be defined to sufficiently mitigate the identified impact to a non-significant level, then a proposal may be approved under SEPA. Additional information regarding the SEPA process can be found at [www.ecy.wa.gov/programs/sea/sepa/e-review.html](http://www.ecy.wa.gov/programs/sea/sepa/e-review.html).

### **9.1 ECOLOGY'S ENVIRONMENTAL IMPACT STATEMENT FOR WATERSHED PLANNING**

The 2001 Washington State Legislature directed Ecology to develop a SEPA template to streamline the environmental review process associated with development and local approval of Watershed Management Plans. Ecology concluded that the most appropriate form for the template would be a statewide environmental impact statement (EIS) that could be adopted in whole or in part by SEPA lead agencies as part of the local Watershed Management Plan approval process.

The statewide EIS was completed in 2003 (Ecology, 2003). The actions addressed by the EIS include local development and approval of Watershed Management Plans under the provisions of the Watershed Planning act (Chapter 90.82 RCW) and rule making undertaken by State agencies to support implementation of the Watershed Management Plans. The EIS describes the planning process and the procedures for rule making that may be undertaken by State agencies to support implementation of the Watershed Management Plans. It also evaluated the impacts of and identified mitigation measures

for various types or classes of recommended actions that may be included in Watershed Management Plans.

The statewide EIS covers non-project actions. The document is intended to assist local decision makers in meeting SEPA requirements, but does not eliminate the need for local decision makers to comply with SEPA. All or portions of the statewide EIS can be adopted to meet part or all of the local decision maker's responsibilities under SEPA.

Fifty-seven alternatives were addressed in the statewide EIS. The general categories covered by these alternatives are listed below. A full listing of the alternatives is provided in Appendix B. Additional information regarding the EIS alternatives and the assessment of impacts can be found in the EIS itself (Ecology, 2003) or at [www.ecy.wa.gov/biblio/0306013.html](http://www.ecy.wa.gov/biblio/0306013.html).

#### **Water Quantity Alternatives**

- Promote water use efficiency
- Effectively manage allocation and use of water resources through legal mechanisms.
- Develop or improve water resources storage infrastructure
- Take no action regarding water quantity

#### **Instream Flow Alternatives**

- Request Ecology to set instream flows by administrative rule (in the Washington Administrative Code, or WAC).
- Take no action.

#### **Water Quality Alternatives**

- Improve point source pollution control
- Improve non-point source pollution control
- Modify land/shoreline use activities to protect, preserve, or enhance water quality.
- Take no action regarding water quality.

#### **Habitat Alternatives**

- Conduct instream modifications to fish habitat
- Conduct out-of-stream modifications to riparian habitat.
- Modify land/shoreline use to protect, preserve, or enhance habitat.
- Improve or enhance hatchery operations (addresses new or expanding facilities)
- Improve Forest Practices (addresses support of the Washington Forest and Fish Report).
- Take no action regarding habitat.

## **9.2 SEPA COMPLIANCE FOR THE WRIA 30 WATERSHED MANAGEMENT PLAN**

Adoption of the WRIA 30 Watershed Management Plan constitutes an action under SEPA for cities, counties, and other agencies subject to SEPA. City, County and State implementation measures will invoke SEPA. Projects implementing Watershed

Management Plan recommendations will be subject to SEPA. Upon approval of the Watershed Management Plan by the Planning Unit, the plan will be reviewed relative to the statewide EIS to determine whether the statewide EIS can be adopted in part or in full to meet SEPA requirements. Additional actions required under SEPA will also be identified and addressed prior to implementation of the plan.

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## **APPENDICES**

**Appendix A:** Loading Capacity and Load Allocations for streams in the Little Klickitat Subbasin (Anderson 2005)

**Appendix B:** List of Alternative Considered in the Statewide Environmental Impact Statement Addressing Development and Implementation of Watershed Plans under the Watershed Planning Act (Chapter 90.82 RCW)

**Appendix C:** Estimated Ecology Full Time Equivalent (FTEs) Needed to Implement the WRIA 30 Watershed Management Plan

**Appendix D:** WRIA 30 Stream Gauge Locations and Periods of Operation

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## APPENDIX A

### Loading Capacity and Load Allocations for streams in the Little Klickitat Subbasin (Anderson 2005)

Stream Segment	Current Effective Shade (%)	Target Effective Shade (%)
<b>Tributaries</b>		
Butler	55.0	95
East Prong	62.3	94
West Prong	77.5	93
Spring Creek	38.6	73
Blockhouse Creek	68.1	73
Mill Creek	59.2	73
Bowman Creek	50.7	73
Un-modeled tributaries		73
<b>Mainstem (river mile from mouth)</b>		
0.0	48.1	50
0.6	49.7	51
1.6	51.1	52
2.6	48.0	53
3.6	52.3	54
4.7	56.0	60
5.7	58.0	62
6.7	55.9	61
7.7	50.7	59
8.7	50.8	62
9.7	30.0	62
10.7	30.0	62
11.7	30.0	63
12.7	30.0	66
13.7	30.0	71
14.7	30.0	74
15.7	30.0	76
16.7	30.0	74
17.7	30.0	72
18.7	30.0	71
19.8	20.4	75
20.8	29.4	77
21.8	24.8	78

<b>Stream Segment</b>	<b>Current Effective Shade (%)</b>	<b>Target Effective Shade (%)</b>
22.8	18.9	76
23.8	46.4	82
24.8	66.7	86
25.8	66.6	86
26.8	60.2	82
27.8	42.1	77
28.8	60.0	81
29.8	57.4	79
30.8	51.5	83
31.8	55.1	83
32.8	37.2	82
33.8	17.8	83
34.8	33.5	79
35.9	47.4	80
36.9	43.7	81
37.9	50.0	74
38.9	34.9	76
39.9	59.4	79
40.9	54.4	79
41.9	58.7	78

## **APPENDIX B**

### **List of Alternatives Considered in the Statewide Environmental Impact Statement Addressing Development and Implementation of Watershed Plans under the Watershed Planning Act (Chapter 90.82 RCW)**

The following is the complete list of alternatives considered in the statewide Environmental Impact Statement (EIS) completed by Ecology (2003). The EIS addresses development and implementation of watershed plans under the Watershed Planning Act (Chapter 90.82 RCW). For a complete description of these alternatives and additional information regarding the assessment of impacts of these alternatives, the reader is encouraged to review the EIS itself. The EIS can be obtained at [www.ecy.wa.gov/biblio/0306013.html](http://www.ecy.wa.gov/biblio/0306013.html).

#### **WATER QUANTITY ALTERNATIVES**

- **Promote water use efficiency**
  - Develop and implement municipal conservation programs including demand management and operation efficiency measures.
  - Develop and implement agricultural water conservation and irrigation efficiency efforts through regional or irrigation district infrastructure improvements.
  - Develop and implement on-farm agricultural water conservation and irrigation efficiency efforts.
  - Develop and impellent industrial conservation measures.
  - Request local governments or sewer utilities to construct and operate water reclamation and reuse facilities to provide water for beneficial uses.
  - Promote greywater segregation and use in accordance with Department of Health standards.
- **Effectively manage allocation and use of water resources through legal mechanisms.**
  - Request Ecology to transfer existing water rights for out-of-stream beneficial uses acquired through purchase, lease, voluntary methods, or condemnation to other out-of-stream beneficial uses.
  - Request Ecology to transfer existing water rights for out-of-stream beneficial uses acquired through purchase, lease, voluntary methods, or condemnations to instream beneficial uses through the state's Trust Water Right Program. (This alternative covers water banking in addition to other actions.)
  - Transfer water through interties of public water systems or irrigation systems.
  - Request Ecology to allocate additional ground or surface water on a short-term or long-term basis (provisions apply).
  - Request Ecology adopt a rule to close or partially close a basin or subbasin.

- Request Ecology to initiate an adjudication of a basin or subbasin.
- Request Ecology to assign a watermaster to a basin, subbasin, or other geographic area.
- Request Ecology to increase enforcement against illegal water use within a basin or subbasin.
- Request Ecology to evaluate some set or subset of existing water rights within a basin or subbasin to identify those that are subject to relinquishment.
- Request local governments to adopt regulation or for Ecology to adopt rules to minimize use of exempt wells, to restrict the siting of well in proximity to stream, and/or to restrict the finished depth of new wells to the second aquifer unit or lower.
- Where adequate public water supplies are available, extend public water system service into areas served by exempt wells and require any new development to connect to such public water supplies.
- Request Ecology to require water users to install, operate, and maintain water quantity monitoring devices such as meters and gauges.
- **Develop or improve water resources storage infrastructure**
  - Construct and operate new on-channel storage facilities.
  - Raise and operate existing on-channel storage facilities.
  - Construct and operate new off-channel storage facilities.
  - Raise and operate existing off-channel storage facilities.
  - Use existing storage facilities for additional beneficial uses.
  - Construct and operate artificial recharge/aquifer storage projects.
- **Take no action regarding water quantity**

#### **INSTREAM FLOW ALTERNATIVES**

- **Request Ecology to set instream flows by administrative rule (in the Washington Administrative Code, or WAC).**
- **Take no action regarding instream flows.**

#### **WATER QUALITY ALTERNATIVES**

- **Improve point source pollution control**
  - Request local governments or sewer utilities to construct and operate water reclamation and reuse facilities to reduce wastewater discharges to surface water bodies and improve water quality in receiving waters.
  - Request Ecology to implement a pollution trading (credit) system for water in order to facilitate compliance with a Total Maximum Daily Load.
  - Request Ecology to incorporate requirements for improving the quality of discharges from existing industries when issuing State Waste Discharge Permits or National Pollutant Discharge Elimination System Permits.
  - Request Ecology to increase the level of inspection of commercial dairy operations and enforcement of water quality as appropriate.



- **Improve nonpoint source pollution control**
  - Request that Ecology expedite development and implementation of a Total Maximum Daily Load for a basin or subbasin.
  - Request conservation districts or irrigation districts to assist in achieving reductions in nonpoint pollution and/or to implement Total Maximum Daily Loads established for specific federal 303(d) listed water bodies.
  - Request conservation districts to modify individual farm plans as necessary to reduce or prevent nonpoint pollution and erosion.
  - Request local governments and state agencies to continue to implement or more fully implement existing water quality plans, including plans developed under Chapter 400-12 WAC (covers local planning and management of nonpoint source pollution).
  - Develop and implement a water quality public education program intended to prevent or reduce nonpoint pollution with focus on pollution sources associated with an urban setting, or with focus on pollution sources associated with a rural setting.
  - Request local governments and Ecology to develop and operate water quality monitoring programs, including installation and maintenance of monitoring devices, to measure the extent of nonpoint pollution and/or measure the effectiveness on nonpoint pollution control measures.
- **Modify land/shoreline use activities to protect, preserve, or enhance water quality.**
  - Request local governments to modify Growth Management Act comprehensive plans and other land use plans to help reduce the potential for nonpoint pollution and/or to implement Total Maximum Daily Loads established for federal 303(d) listed water bodies.
  - Request local governments to amend shoreline master programs to help reduce the potential for nonpoint pollution and/or to implement Total Maximum Daily Loads established for federal 303(d) listed water bodies.
  - Request local governments to modify local regulations such as critical areas ordinance, stormwater regulations, and on-site sewage regulations to help reduce the potential for nonpoint pollution and/or to implement Total Maximum Daily Loads established for federal 303(d) listed water bodies.
- **Take no action regarding water quality.**

## **HABITAT ALTERNATIVES**

- **Conduct instream modifications to fish habitat**
  - Implement habitat improvement projects involving construction or placement of instream structures, such as cross vanes, vortex weirs, large woody debris, fish screen, or side-channels.
  - Implement habitat improvement projects intended to “daylight” streams that are currently contained within enclosed channels.
  - Request local governments to reroute treated stormwater to water limited streams to allow for channel maintenance.

- Request the Washington Department of Transportation, local governments, and other applicable agencies to remove or replace bridges, culverts, roadways, and other infrastructure as necessary to eliminate or reduce their impacts as fish passage obstructions and/or channel constrictions.
- Support construction of fish passage facilities where such facilities do not currently exist.
- **Conduct out-of-stream modifications to riparian habitat.**
  - Implement habitat improvement projects involving out-of-stream riparian restoration or enhancement such as replanting or bank stabilization projects. Bioengineering methodologies should be incorporated into bank stabilization projects.
  - Move river dikes back from existing river channels to allow for floodplain restoration and channel maintenance.
- **Modify land/shoreline use to protect, preserve, or enhance habitat.**
  - Request local governments to amend or modify Growth Management Act comprehensive plans or other land use plans, shoreline master programs, and/or critical areas ordinances to protect habitat or control floodplain development.
  - Request local governments to develop regulations or programs to control sources of sediment that are not addressed through critical areas ordinances or other existing regulations and programs.
  - Request local governments to integrate habitat improvement planning into flood hazard reduction plans.
  - Request conservation districts and irrigation districts to assist in achieving protection of habitat including, as appropriate, establishment and maintenance of riparian buffers and control of erosion and sedimentation.
  - Request local, state, and federal governments, conservation districts, and private entities to acquire land and/or conservation easements for purposes of protecting habitat.
  - Request Ecology and local governments to increase the level of enforcement of Shoreline Management Act violations in critical habitat areas.
- **Improve or enhance hatchery operations**
  - Require proponents of new or expanding fish hatcheries to follow the recommendations of the Hatchery Scientific Review Group regarding siting, interactions with native stocks, and water quality.
- **Improve Forest Practices**
  - Support implementation of the recommendations of Washington's Forest and Fish Report.
- **Take no action regarding habitat.**

## APPENDIX C

### Estimated Ecology Full Time Equivalents (FTEs) Needed to Implement the WRIA 30 Watershed Management Plan

The tables included in this appendix provide rough estimates of the full time equivalents that will be needed from Ecology staff to implement the WRIA 30 Watershed Management Plan. **It is important to note that these estimates were not developed by Ecology staff, nor were they reviewed by Ecology staff.** They were developed as a draft estimate to assist Ecology with planning of staff requirements. These estimates should be considered preliminary at best and may not be accurate reflections of the actual time required from Ecology staff. The estimates were provided in this document at the request of Ecology.

Table 1 provides estimates of FTEs needed during the first year of implementation, Table 2 provides the same estimates for the second year of implementation, and Table 3 provides estimates for the out years.

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**Table 1. Estimated Ecology FTEs needed in Year 1 to Implement WRIA 30 Management Plan**

Action Item in Watershed Management Plan	Guidance on regulations, policies (days)	Plan Review (days)	Review of Documents (days)	Coordination with State Caucus (days)	Hands On Assistance (days)	Total Days	Total FTEs
<b>General</b>							
<b>Detailed Implementation Plan</b>							
Water Bank Option Review and Possibly Development	10					10	0.04
Drafting of Overall Implementation Plan	15	5	5	5		30	0.12
<b>Water Quantity</b>							
<b>Additional Studies</b>							
Refine Estimates of Actual Use							
<i>Update L. Klick. Hydrograph</i>		1	2	0.5		4	0.01
<i>Aerial Photo Analysis of Crop Use</i>		1	2			3	0.01
<i>Ground Water / Surface Water Interactions</i>	2	2	5			9	0.04
<i>Volume of Water in Aquifers</i>		2	2			4	0.02
<i>Updated Water Budgets</i>		2	4			6	0.02
Refine Estimates of Current & Historical L. Klick Flow							
<i>Stream Flow Measurements</i>		1.5	2	0.5	20	24	0.09
<i>Estimates of L. Klick Historical Flow</i>		1.5	2.5	2.5		7	0.03
<i>Review Cadastral Survey Notes</i>		0.5	2	2.5		5	0.02
<i>Effect of Water Use on Stream Flow</i>		4	5	4		13	0.05
Effect of Channel Mods on Flow (L. Klick)		1	1	2		4	0.02
<b>Development and Implementation of Programs</b>							

**Table 1. Estimated Ecology FTEs needed in Year 1 to Implement WRIA 30 Management Plan**

<b>Action Item in Watershed Management Plan</b>	<b>Guidance on regulations, policies (days)</b>	<b>Plan Review (days)</b>	<b>Review of Documents (days)</b>	<b>Coordination with State Caucus (days)</b>	<b>Hands On Assistance (days)</b>	<b>Total Days</b>	<b>Total FTEs</b>
Evaluate Water Management Options	7	7	5	7		26	0.10
Storage Options (not including permitting, SEPA)	2.5	15	15	14		47	0.18
Program to Assist Water Users in Drought Years	4	4	2	5		15	0.06
Programs to Increase Stream Flow Where Needed	2	2	4	4		12	0.05
Irrigation Efficiencies	2	2	4	4		12	0.05
Water Conservation	2	2	4	4		12	0.05
<b><i>Public Education and Interaction</i></b>							
Water Rights Law	2		1			3	0.01
Water management Programs	1		1			2	0.01
Adjudication Process	1		0.5			2	0.01
<b><i>Water Quantity Monitoring</i></b>							
Stream Flow		1.5	4	4		10	0.04
Ground Water Levels		4	6	2		12	0.05
Water Use		6	8	2		16	0.06
<b><i>Implementation Monitoring</i></b>							
Programs Implemented			4	7		11	0.04
Water Conserved			4	6		10	0.04
Water Available for Allocation			10	8		18	0.07
<b>Water Quality</b>							
<b><i>Additional Studies</i></b>							
Nat'l background flow, temperature Little Klickitat	2					2	0.01

<i>L. Klick. Natural Vegetation</i>		2	2	2	6	0.02
<i>L. Klick Natural Flow</i>		2	4	4	10	0.04
<i>Update L. Klick. Hydrograph</i>		0.5	1	0.5	2	0.01
<i>Effect of Water Use on L. Klick Flow</i>		2	4	4	10	0.04
Survey of Abandoned Wells		1.5	1.5		3	0.01
Shade and Swale Creek Railroad Bed		2	4	6	12	0.05
Pollution Trading Options	4	4	4	10	22	0.09
Sediment inputs and sources Little Klickitat River	1.5	4	8	8	22	0.08
<b><i>Development and Implementation of Programs</i></b>						
Shade Improvements in L. Klick and Swale		2	1.5	2	6	0.02
L. Klick. Stream Flow Enhancement	1.5	6	4	7	19	0.07
Fecal Coliform Reduction		6	4	2	12	0.05
Seal Abandoned Wells		1.5			2	0.01
<b><i>Public Education and Interaction</i></b>						
Plan Implementation Information			0.5		1	0.00
Well and Septic Issues			2		2	0.01
Water Conservation			0.5		1	0.00
<b><i>Water Quality Monitoring</i></b>						
Stream Temperature		4	2	2	8	0.03
Fecal Coliforms		4	2	2	8	0.03
Nitrate in Ground water		4	2	1	7	0.03
<b><i>Other</i></b>						
Swale Creek Temperature Plan					20	0.08
Little Klickitat TMDL					30	0.12

<b>Fish Habitat</b>							
<b>Additional Studies</b>							
Assessment of Conditions Limiting Fish Production		6	6	15		27	0.11
L. Klickitat Falls Passage		2.5	4	10		17	0.06
<b>Development and implementation of Programs</b>							
Address Conditions Limiting Fish Production						2	0.00
<b>Public Education and Interaction</b>							
Purposes and Intent of Projects				5		5	0.02
Land Use and Fish Habitat Interactions				10		10	0.04
Actions Public Can Undertake						0	0.00
<b>Additional Monitoring Fish Populations and Habitat</b>							
Changes in Fish Populations	5	10		20		35	0.14
Changes in Carrying Capacity						0	0.00
Changes in Limiting Habitat Factors						0	0.00
<b>Implementation Monitoring</b>							
Project Implementation		5		5		10	0.04
<b>TOTAL (Days)</b>	65	134	164	205	20	587	
<b>TOTAL (FTEs)</b>	0.25	0.53	0.64	0.80	0.08		2.30

Totals do not include SEPA review or permitting of projects (especially if storage is pursued)

Totals do not include processing of applications for grants

**Assumptions:**

All Studies initiated in Year 1, actual schedule for implementation has not been developed

All Components of Implementation Plan Completed in Year 1

Water Bank is Pursued

Storage Options are Pursued



**Table 2. Estimated FTEs needed in Year 2 to Implement WRIA 30 Management Plan**

<b>Action Item in Watershed Management Plan</b>	<b>Guidance on regulations, policies (days)</b>	<b>Plan Review (days)</b>	<b>Review of Documents (days)</b>	<b>Coordination with State Caucus (days)</b>	<b>Hands On Assistance (days)</b>	<b>Total Days</b>	<b>Total FTEs</b>
<b><i>Development and Implementation of Programs</i></b>							
Storage Options (not including permitting, SEPA)		5		5		10	0.04
Implement Water Management Program if Appropriate	7		7	7		21	0.08
Program to Assist Water Users in Drought Years	2		2	2		6	0.02
Programs to Increase Stream Flow Where Needed	2		2	4		8	0.03
Irrigation Efficiencies			2			2	0.01
Water Conservation			2			2	0.01
<b><i>Water Quantity Monitoring</i></b>							
Stream Flow			4	2		6	0.02
Ground Water Levels			4	2		6	0.02
Water Use			4	2		6	0.02
<b><i>Implementation Monitoring</i></b>							
Programs Implemented			4	2		6	0.02
Water Conserved			4	2		6	0.02
Water Available for Allocation			6	2		8	0.03
<b>Water Quality</b>							
<b><i>Additional Studies</i></b>							
Survey of Abandoned Wells			1.5			1.5	0.01

**Table 2. Estimated FTEs needed in Year 2 to Implement WRIA 30 Management Plan**

<b>Action Item in Watershed Management Plan</b>	<b>Guidance on regulations, policies (days)</b>	<b>Plan Review (days)</b>	<b>Review of Documents (days)</b>	<b>Coordination with State Caucus (days)</b>	<b>Hands On Assistance (days)</b>	<b>Total Days</b>	<b>Total FTEs</b>
Update Nitrate Data (ongoing)			1			1	0.00
Pollution Trading Options			2	4		6	0.02
<b><i>Development and Implementation of Programs</i></b>							
Shade Improvements in L. Klick and Swale			1.5			1.5	0.01
Sediment reduction program if determined necessary		6	3	6		15	0.06
L. Klick. Stream Flow Enhancement			1.5	1		2.5	0.01
Fecal Coliform Reduction			2	0.5		2.5	0.01
Seal Abandoned Wells			1			1	0.00
Changes in sediment inputs over time		3	4	2		9	0.04
<b><i>Water Quality Monitoring</i></b>							
Stream Temperature			2	0.5		2.5	0.01
Fecal Coliforms			2	0.5		2.5	0.01
Nitrate in Ground water			2	0.5		2.5	0.01
<b><i>Implementation Monitoring</i></b>							
Klick/Swale Shade		2	1.5	0.5		4	0.02
L. Klick Sediment Inputs			1	0.25		1.25	0.00
L. Klick Stream Flow			1	0.25		1.25	0.00
Fecal Coliforms			1.5	0.25		1.75	0.01
L. Klick. Channel Changes			1	0.25		1.25	0.00
Grazing and Livestock BMPs			0.5			0.5	0.00

**Table 2. Estimated FTEs needed in Year 2 to Implement WRIA 30 Management Plan**

<b>Action Item in Watershed Management Plan</b>	<b>Guidance on regulations, policies (days)</b>	<b>Plan Review (days)</b>	<b>Review of Documents (days)</b>	<b>Coordination with State Caucus (days)</b>	<b>Hands On Assistance (days)</b>	<b>Total Days</b>	<b>Total FTEs</b>
Agronomic fertilizer and ag. BMPs			0.5			0.5	0.00
<b><i>Other</i></b>							
Swale Creek Temperature Plan	3	14	4	6		27	0.11
Little Klickitat TMDL	3	14	4	6		27	0.11
<b>Fish Habitat</b>							
<b><i>Additional Studies</i></b>							
L. Klickitat Falls Passage			1.5	4		5.5	0.02
<b><i>Development and implementation of Programs</i></b>							
Address Conditions Limiting Fish Production		5	3	8		16	0.06
<b><i>Public Education and Interaction</i></b>							
Purposes and Intent of Projects				5		5	0.02
Land Use and Fish Habitat Interactions				5		5	0.02
<b><i>Additional Monitoring Fish Populations and Habitat</i></b>							
Changes in Fish Populations	2	5		15		22	0.09
Changes in Carrying Capacity		4	4	8		16	0.06
Changes in Limiting Habitat Factors		4	4	8		16	0.06
<b><i>Implementation Monitoring</i></b>							
Project Implementation			4	2		6	0.02

**Table 2. Estimated FTEs needed in Year 2 to Implement WRIA 30 Management Plan**

Action Item in Watershed Management Plan	Guidance on regulations, policies (days)	Plan Review (days)	Review of Documents (days)	Coordination with State Caucus (days)	Hands On Assistance (days)	Total Days	Total FTEs
<b>TOTAL (Days)</b>	19	62	96	119	0	296	
<b>TOTAL (FTEs)</b>	0.07	0.24	0.38	0.46	0.00		1.16

Totals do not include SEPA review or permitting of projects (especially if storage is pursued)

Totals do not include processing of applications for grants

**Assumptions:**

All Studies initiated in Year 1, actual schedule for implementation has not been developed

All Components of Implementation Plan Completed in Year 1

Water Bank is Pursued

Storage Options are Pursued

<b>Table 3. Estimated FTEs needed in Out Years to Implement WRIA 30 Management Plan</b>							
<b>Action Item in Watershed Management Plan</b>	<b>Guidance on regulations, policies (days)</b>	<b>Plan Review (days)</b>	<b>Review of Documents (days)</b>	<b>Coordination with State Caucus (days)</b>	<b>Hands On Assistance (days)</b>	<b>Total Days</b>	<b>Total FTEs</b>
<b><i>Development and Implementation of Programs</i></b>							
Implement Water Management Program if Appropriate	2		6	5		13	0.05
Irrigation Efficiencies			2			2	0.01
Water Conservation			2			2	0.01
<b><i>Water Quantity Monitoring</i></b>							
Stream Flow			4	2		6	0.02
Ground Water Levels			4	2		6	0.02
Water Use			4	2		6	0.02
<b><i>Implementation Monitoring</i></b>							
Programs Implemented			4	1		5	0.02
Water Conserved			4	1		5	0.02
Water Available for Allocation			6	1		7	0.03
<b><i>Water Quality</i></b>							
<b><i>Additional Studies</i></b>							
Survey of Abandoned Wells			1.5			1.5	0.01
Update Nitrate Data (ongoing)			1			1	0.00
Shade and Swale Creek Railroad Bed						1	0.00
Pollution Trading Options			2	1		3	0.01
<b><i>Development and Implementation of Programs</i></b>							

<b>Table 3. Estimated FTEs needed in Out Years to Implement WRIA 30 Management Plan</b>							
<b>Action Item in Watershed Management Plan</b>	<b>Guidance on regulations, policies (days)</b>	<b>Plan Review (days)</b>	<b>Review of Documents (days)</b>	<b>Coordination with State Caucus (days)</b>	<b>Hands On Assistance (days)</b>	<b>Total Days</b>	<b>Total FTEs</b>
Shade Improvements in L. Klick and Swale			1.5			1.5	0.01
Sediment reduction program if determined necessary			2	1.5		3.5	0.01
L. Klick. Stream Flow Enhancement			1.5	1		2.5	0.01
Fecal Coliform Reduction			1.5	0.5		2	0.01
Seal Abandoned Wells			1			1	0.00
Changes in sediment inputs over time			1.5	0.5		2	0.01
<b><i>Water Quality Monitoring</i></b>							
Stream Temperature			2	0.5		2.5	0.01
Fecal Coliforms			2	0.5		2.5	0.01
Nitrate in Ground water			2	0.5		2.5	0.01
<b><i>Implementation Monitoring</i></b>							
Klick/Swale Shade			1.5	0.5		2	0.01
L. Klick Sediment Inputs			1	0.25		1.25	0.00
I. Klick Stream Flow			1	0.25		1.25	0.00
Fecal Coliforms			1.5	0.25		1.75	0.01
L. Klick. Channel Changes			1	25		26	0.10
Grazing and Livestock BMPs			0.5			0.5	0.00
Agronomic fertilizer and ag. BMPs			0.5			0.5	0.00
<b><i>Other</i></b>							
Swale Creek Temperature Plan			2	2		4	0.02
Little Klickitat TMDL			3	2		5	0.02

<b>Table 3. Estimated FTEs needed in Out Years to Implement WRIA 30 Management Plan</b>							
<b>Action Item in Watershed Management Plan</b>	<b>Guidance on regulations, policies (days)</b>	<b>Plan Review (days)</b>	<b>Review of Documents (days)</b>	<b>Coordination with State Caucus (days)</b>	<b>Hands On Assistance (days)</b>	<b>Total Days</b>	<b>Total FTEs</b>
<b>Fish Habitat</b>							
<i>Additional Studies</i>							
L. Klickitat Falls Passage			1.5	1		2.5	0.01
<i>Development and implementation of Programs</i>							
Address Conditions Limiting Fish Production			3	8		11	0.04
<i>Additional Monitoring Fish Populations and Habitat</i>							
Changes in Fish Populations		3		5		8	0.03
Changes in Carrying Capacity			3	6		9	0.04
Changes in Limiting Habitat Factors			3	6		9	0.04
<i>Implementation Monitoring</i>							
Project Implementation			4	2		6	0.02
<b>TOTAL (Days)</b>	2	3	82	78	0	165	
<b>TOTAL (FTEs)</b>	0.01	0.01	0.32	0.31	0.00		0.65

Totals do not include processing of applications for grants

**Assumptions:**

All Studies initiated in Year 1, actual schedule for implementation has not been developed

All Components of Implementation Plan Completed in Year 1

Water Bank is Pursued

Storage Options are Pursued

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## APPENDIX D

### WRIA 30 Stream Gauge Locations and Periods of Operation

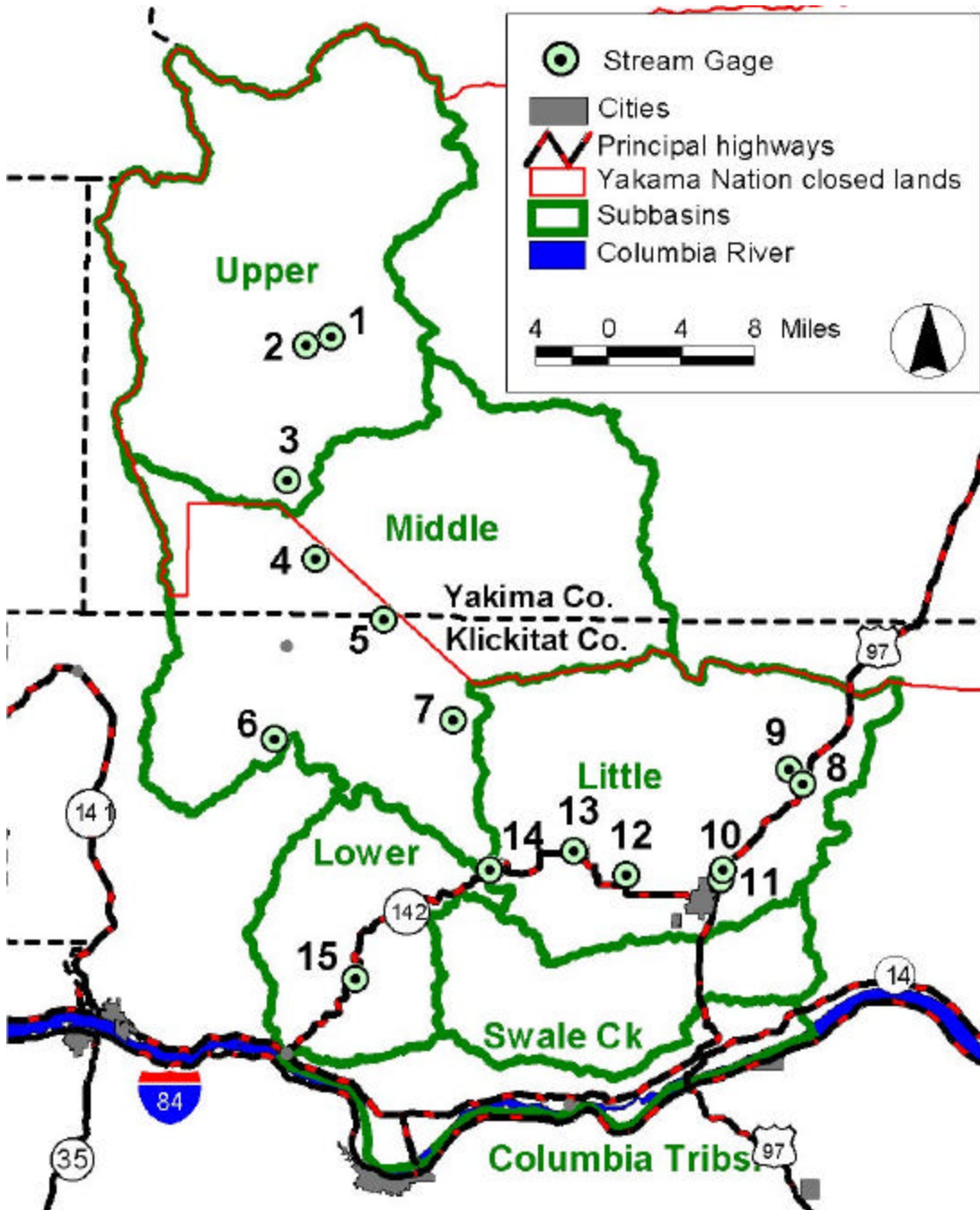


Figure D-1. USGS stream gauges in WRIA 30. Data Sources: USGS (2002a).

**Table D-1. USGS stream gauges in WRIA 30. Map number refers to Figure D-1.**

Map #	Sta. #	Station Name	Drain. area (mi <sup>2</sup> )	Daily Stream flow:		Peak Stream flow:		Remarks <sup>1</sup>
				Period of record	Years	Period of record	Years	
1	1410-7000	Klickitat R Abv West Fork Nr Glenwood	151	10/01/1944 - Current	42	1945-Current	43	No regulation or diversion
2	1410-8000	West Fork Klickitat R Nr Glenwood	87	07/01/1910 - 09/30/1948	8	n/a	n/a	Flows seasonally affected by snow melt or glacial-melt. No diversion. <sup>3</sup>
3	1410-9000	Big Muddy Cr Nr Glenwood	22.5	09/01/1916 - 09/30/1949	8	n/a	n/a	
4	1411-0000	Klickitat River Nr Glenwood	360	11/01/1909 - 09/30/1971	62	1909-1979	69	
5	1411-0500	Indian Ford Springs No. 1 Nr Glenwood	n/a	10/01/1946 - 09/30/1948	2	n/a	n/a	
6	1411-0700	Medley Canyon Cr Nr Glenwood	1.26	n/a	n/a	1970-1976	7	
7	1411-1400	Klickitat R BI Summit Cr Nr Glenwood	n/a	10/01/1996 - Current	4	1997-Current	4	No regulation, some upstream diversion for irrigation
8	1411-1700	Butler Creek Nr Goldendale	11.6	8/1/1964 - 09/30/1968	4	n/a	n/a	
9	1411-1800	W Prong Little Klickitat R Nr Goldendale	10.4	n/a	n/a	1961-1975	15	
10	1411-2000	Little Klickitat R Nr Goldendale	83.5	10/01/1910 - 09/30/1970	20	1911-1912; 1945-1978	27	Small diversion for domestic use and irrigation of 35 acres. No regulation. <sup>2</sup>
11	1411-2200	Little Klickitat River Trib Nr Goldendale	0.71	n/a	n/a	1960-1988	29	
12	1411-2300	Spring Creek Near Blockhouse	2.75	08/01/1964 - 09/03/1968	4	n/a	n/a	Small diversions for fish hatchery and uses either for domestic, municipal or industrial sources. <sup>3</sup>
13	1411-2400	Mill Creek Nr Blockhouse	26.9	08/01/1964 - 10/12/1972	8	1965-1978	14	Small diversions for irrigation and uses either for domestic, municipal or industrial sources. <sup>3</sup>
14	1411-2500	Little Klickitat R Nr Wahkiacus	280	12/01/1944 - 10/14/1981	36	1945-1981	36	Small diversions above station for irrigation of 600 acres. <sup>2</sup>
15	1411-3000	Klickitat River Near Pitt	1,297	07/01/1909 - Current	75	1910-1912; 1929-2000	75	Diversions upstream for irrigation of 7,500 acres.

Notes: <sup>1</sup> All information from EarthInfo (1996) or USGS (2002a), unless otherwise noted.  
<sup>2</sup> From USGS (1962)  
<sup>3</sup> From Sinclair and Pitz (1999)  
n/a = not available