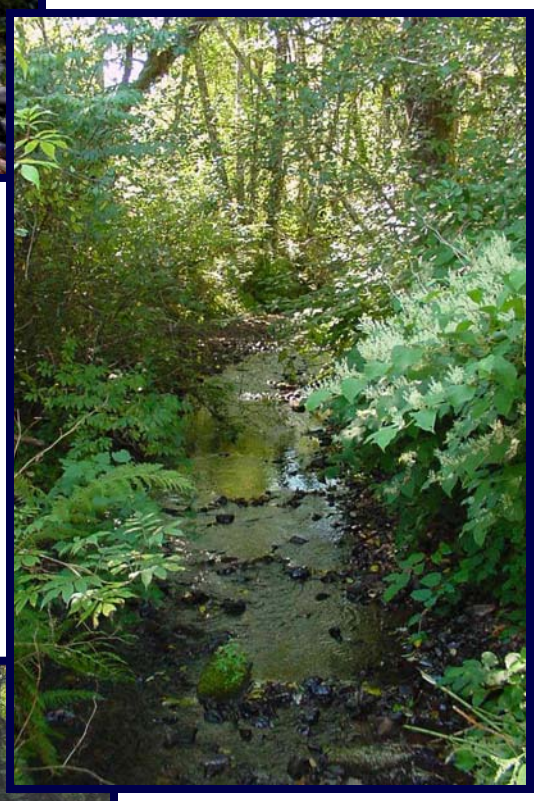
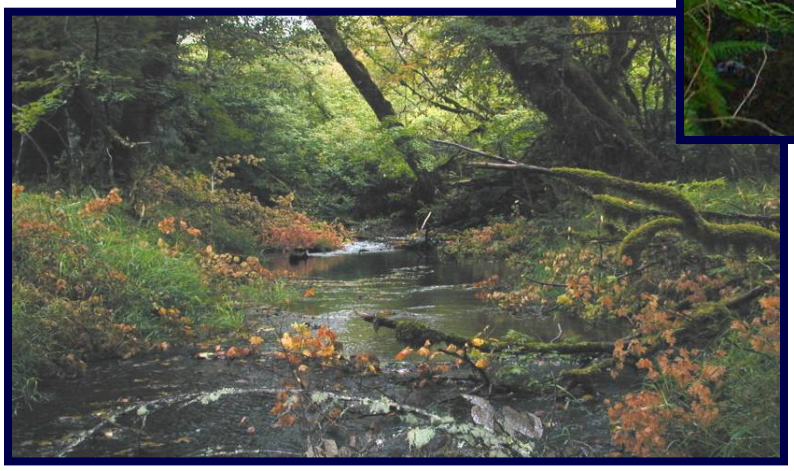
Grays-Elochoman and Cowlitz Watershed Management Plan



"Our mission is to prepare a locally developed plan for the beneficial management of watershed resources addressing water quantity and quality, habitat, and stream flows to meet the present and future needs of our communities, local economies, and fish & wildlife."



Lower Columbia Fish Recovery Board
December 9, 2004

Grays-Elochoman and Cowlitz Watershed Management Plan WRIAs 25 and 26

Lead Agency:
Lower Columbia Fish Recovery Board

December 2004
For Submission to the Planning Area Counties
WA Ecology Grant #9900028

Prepared by:

HDR | ees

Initiating Governments

Cowlitz County
Lewis County
Pacific County[1]
Pierce County[1]
Skamania County
Wahkiakum County
Yakima County
City of Kelso
City of Longview
Cowlitz PUD
Chinook Tribe
Cowlitz Tribe
Yakama Nation

Planning Unit

Audubon Society
Beacon Hill Sewer District
CDID #1
Chinook Indian Tribe
City of Castle Rock
City of Cathlamet
City of Kelso
City of Longview
City of Morton
City of Mossyrock
City of Toledo
City of Vader
City of Winlock
Cowlitz County
Cowlitz Farm Forestry Association
Cowlitz Game and Anglers
Cowlitz Indian Tribe
Cowlitz PUD
Friends of the Cowlitz
Lewis County
Lewis County Farm Bureau
Lewis PUD
Lower Columbia Contractors Association
Pacific County
Pierce County
Skamania County
Tacoma Power
US Forest Service – Gifford Pinchot
WA Department of Agriculture
WA Department of Ecology
WA Department of Fish & Wildlife
WA Department of Natural Resources
Wahkiakum County
Wahkiakum PUD
Weyerhaeuser Corp.
Yakama Nation
Yakima County

[1] Pacific and Pierce Counties have opted out of the process pursuant to RCW 90.82.130

Lead Agency and Consultants

Lower Columbia Fish Recovery Board:

Jeff Breckel, Executive Director
Phil Trask, Watershed and Recovery Plan Coordinator
Melody Tereski, Program Manager
Lorie Clark, Program Assistant
Gary Wade, Habitat Project Coordinator

HDR/EES Consultants:

Andrew Graham
Ronan Igloria
Jeff Hansen
Wade Hathhorn
Jerry Louthain
Kelly O'Rourke

Pacific Water Resources:

Lew Scholl
Roger Sutherland
Habib Matin
Seth Jelen

Others:

Michael Barber, PhD

Participants

Sam Adams	City of Kelso
Dave Andrew	Cowlitz PUD
John Barnett	Cowlitz Indian Tribe
Elaine Bowen	City of Toledo
Charly Boyd	Skamania County Planning
Lynn Briscoe	WA Department of Health
Ray Buckner	Cowlitz Indian Tribe
Harry Cody	US Forest Service
Ron Colbert	CDID #1
Rich Costello	WA Department of Fish and Wildlife
Linda Crerar	WA Department of Agriculture
John Diamant	City of Winlock
Marc Duboiski	Lewis County Planning
Stan Elliott	Chinook Tribe
Al Engstrom	Beacon Hill Sewer District
Susan Eugenis	City of Kelso
Earl Ford	US Forest Service
Toby Freeman	Tacoma Power
Gene Frymire	City of Castle Rock
Brian Galloway	Lewis County Planning
Ross Graham	Weyerhaeuser Corp.
Bob Gregory	City of Longview
Dennis Hadaller	Lewis County Board of Commissioners
Donna Hale	WA Department of Fish and Wildlife
Lisa Hendrickson	Cowlitz County Planning
Mike Hirko	Friends of the Cowlitz
Russ Hovey	WA Department of Natural Resources
Dave Howard	WA Department of Ecology
Debbie Hyde	Pierce County Council
Lynda Jamison	Audubon Society
Kahle Jennings	WA Department of Ecology
Gary Johnson	Chinook Tribe
Mark Kirkland	Cowlitz Farm Forest Association
Julie Klein	Cowlitz Indian Tribe
Mike Kohn	Lewis County PUD
Mark LaRiviere	Tacoma Power
Claire Lavendel	US Forest Service
Ray Lawrence	Wahkiakum County PUD
Bill Lehning	Cowlitz County Board of Commissioners
Tom Loranger	WA Department of Ecology
Don Manasco	Beacon Hill Sewer District
Steve Manlow	WA Department of Fish and Wildlife
Scott McKinney	WA Department of Ecology

Dick Miller	Cowlitz Game and Anglers
Jim Milton	Yakima County
Chan Noerenberg	WA Farm Forest Association
Ron Ozment	Wahkiakum County Board of Commissioners
Harry Paul	Wahkiakum County PUD
Brian Perleberg	Lower Columbia Contractors Association
George Raiter	Cowlitz County Board of Commissioners
Robert Rendler	Town of Cathlamet
David Russell	Cowlitz Indian Tribe
Mike Sallis	Cowlitz County Planning
Ed Smith	City of Castle Rock
Cheryl Spencer	River Cities Chamber of Commerce
Craig Swanson	Lewis County Planning
Chuck TenPas	Lewis County PUD
Harris Teo	Yakama Indian Nation
Robert Thode	Lewis County Farm Bureau
Ruth Tracy	US Forest Service
George Trott	Wahkiakum County BOCC
Rick Turnbull	Lewis County Community Development
Lee VanTussenbrook	WA Department of Fish and Wildlife
Jeff Veys	Cowlitz Farm Forest Association
David Vik	Town of Cathlamet
David Vorse	City of Castle Rock
Teresa Washburn	City of Longview
Barbara West	Town of Cathlamet
Bob Wheeler	City of Winlock
Kirk Willis	WA Department of Natural Resources
Ron Worthington	Cowlitz PUD

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Additional Appendices for Chapter 6 Bound as Separate Volumes:

Lower Columbia Salmon Recovery and Fish & Wildlife Subbasin Plan, Volume II - C, Grays Subbasin

Lower Columbia Salmon Recovery and Fish & Wildlife Subbasin Plan, Volume II - D, Elochoman Subbasin

Lower Columbia Salmon Recovery and Fish & Wildlife Subbasin Plan, Volume II - E, Cowlitz Subbasin

Acronyms

ADD	average day demand
afy	acre feet per year
ASR	Aquifer Storage and Recovery
cfs	cubic feet per second
CMS	Comprehensive Monitoring Strategy
COA	Coordination and Oversight Agency
CRBG	Columbia River Basalt Group
CWA	Clean Water Act
DO	Dissolved Oxygen
DOH	Washington State Department of Health
Ecology	Washington State Department of Ecology
EDT	Ecosystem Diagnosis and Treatment
EES	Economic and Engineering Services
ENSO	El Nino/Southern Oscillation
ESA	Endangered Species Act
FC	Fecal Coliform
FERC	Federal Energy Regulatory Commission
FFA	Washington Farm Forest Association
FTE	Full-Time Employee
LCFRB	Lower Columbia Fish Recovery Board
MDD	maximum day demand
mgd	million gallons per day
NRCS	Natural Resources Conservation Service
NWPPC	Northwest Power Planning Council
PDO	Pacific Decadal Oscillation
PWR	Pacific Water Resources, Inc.
Qa	authorized annual withdrawal/diversion
Qi	authorized instantaneous withdrawal/diversion
Ranney Well	A shallow perforated pipe used to extract shallow ground water beneath a riverbed
RWTP	Regional Water Treatment Plant
SDWA	Safe Drinking Water Act
SMA	Satellite Management Agency
TMDL	Total Maximum Daily Load
USEPA	U.S. Environmental Protection Agency
USGS	U.S. Geological Service
WDFW	Washington Department of Fish and Wildlife
WMA	Watershed Management Act
WRATS	Water Rights Application Tracking System
WRIA	Water Resource Inventory Area

Executive Summary

Introduction and Purpose

Under the State of Washington's Watershed Management Act (Chapter 90.82 RCW) local governments are authorized to initiate a watershed planning process. The process is broad in scope and involves stakeholders and agencies at the local, regional, state and federal levels. The watershed planning program is designed to foster planning for water quantity, water quality, aquatic habitat and instream flow in a comprehensive and integrated fashion.

This Watershed Management Plan has been prepared for Water Resource Inventory Areas (WRIAs) 25 and 26. WRIA 25 comprises the Grays River Basin and Elochoman River Basin as well as Germany, Mill and Abernathy Creeks. WRIA 26 comprises the Cowlitz River Basin, Most of the land area within WRIAs 25 and 26 lies within Wahkiakum, Cowlitz and Lewis Counties. Small portions of these two WRIAs also extend into Pacific, Skamania, Yakima and Pierce Counties. Exhibit ES-1 displays the planning area. WRIAs 25 and 26 include several subbasins that drain to the Columbia River, but do not include the Columbia River itself. Therefore, management of the mainstem Columbia River is not addressed in this plan.

The WRIA 25 and 26 Planning Unit met on a monthly basis from 1999 through 2004. During this period the Planning Unit undertook an assessment of water resource conditions, commissioned a series of technical memoranda on water resource issues and solutions, and oversaw preparation of the Management Plan. The Planning Unit was staffed by the Lower Columbia Fish Recovery Board (LCFRB) serving as Lead Agency for this effort. On a parallel track, the LCFRB has also coordinated the development of the Lower Columbia recovery/subbasin plan for Endangered Species Act list salmon and other fish and wildlife. Portions of the recovery plan constitute the habitat element of the Watershed Management Plan.

Planning objectives defined by the Planning Unit are listed in Table ES-1. These objectives were used as a basis in developing more detailed policy statements and recommendations within the Plan.

The remainder of this Executive Summary highlights the management policies and recommendations developed in four key areas: Water Supply, Stream Flow, Surface Water Quality, and Habitat. In addition, a summary of implementation considerations for carrying out these elements is provided. More detailed information on these topics can be found in the full Plan document.

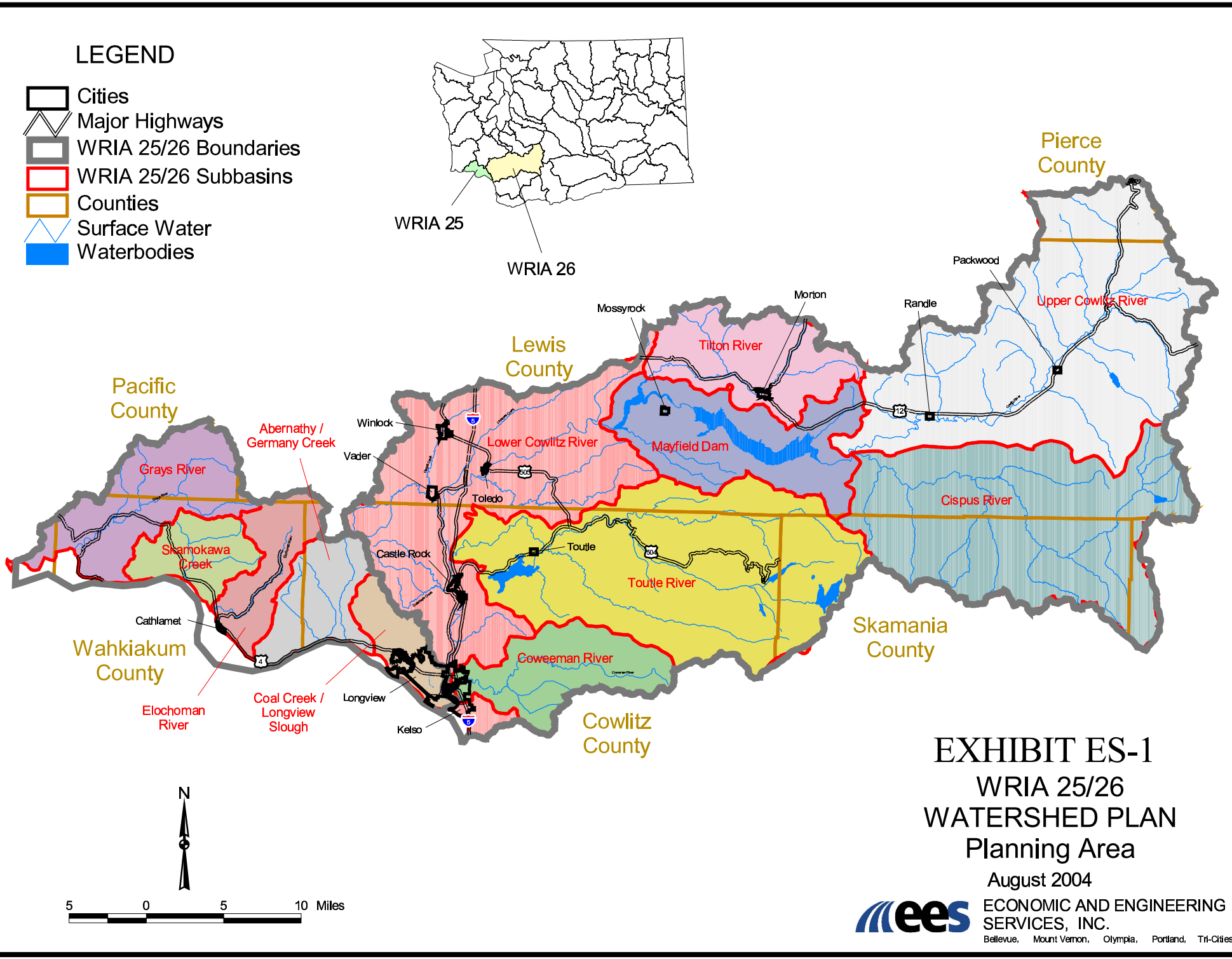
LEGEND
Cities
Major Highways
WRIA 25/26 Boundaries
WRIA 25/26 Subbasins
Counties
Surface Water
Waterbodies
WRIA 25
WRIA 26
Pierce County
Packwood
Upper Cowlitz River
Randle
Morton
Mossyrock
Tilton River
Lewis County
Pacific County
Abernathy / Germany Creek
Winlock
Vader
Lower Cowlitz River
Mayfield Dam
Grays River
Toledo
Cispus River
Skamokawa Creek
Castle Rock
Toutle
Toutle River
Skamania County
Cathlamet
Wahkiakum County
Coweeman River
Elochoman River
Coal Creek / Longview Slough
Longview
Kelso
Cowlitz County
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EXHIBIT ES-1
WRIA 25/26
WATERSHED PLAN
Planning Area
August 2004
ees
ECONOMIC AND ENGINEERING SERVICES, INC.
Bellevue, Mount Vernon, Olympia, Portland, Tri-Cities

Table ES-1
Planning Objectives

I. Objectives to Protect or Enhance Conditions in the Watershed

- Provide long-term reliable and predictable water supplies for human uses.
- Improve certainty, timeliness, and efficiency in water rights decisions.
- Manage stream flows to effectively support fish recovery and habitat enhancement plans.
- Provide for improved stormwater and flood control through improved land use practices
- Protect surface water quality for designated uses, with an emphasis on protection of fish and supporting aquatic biota.
- Protect surface and ground water quality needed for public drinking water supplies.
- Maintain productive habitat and enhance degraded habitat for indigenous/native fish species in all life stages.
- Ensure public waters are accessible for recreational uses.

II. Objectives Regarding the Process for Developing and Implementing Watershed Plan

- Manage water resources in a cost-effective manner, taking into account existing programs, potential partnerships, cost/benefit principles, and opportunities to achieve multiple objectives.
- Ensure fairness in distributing costs and burdens of water-resource management actions.
- Improve public understanding of water resources and encourage responsible stewardship.
- Provide for extensive and meaningful public participation.

III. Objectives for Improved Information and Data Management

- Improve scientific basis for decision-making on water-resource issues, through sound data, accepted technical methods, and effective quality assurance/quality control protocols.
- Develop effective protocols, administrative arrangements and funding sources for long-term monitoring to support adaptive management of water resources.

Policies and Recommendations

To achieve the objectives listed above, the Planning Unit carried out a detailed assessment of water resource conditions, and developed a wide-ranging set of policies and recommendations. Table ES-6 at the end of this Executive Summary summarizes all of the policy statements developed in this Watershed Management Plan. Under each policy a set of specific recommendations is then presented. These policies and recommendations are discussed further in the following sections of this Executive Summary.

Management of Water Supplies

Three principles guided the development of water supply strategies for WRIAs 25 and 26. First, existing water rights cannot be changed or impaired by this Watershed Management Plan. Second, as the region continues to grow and develop, new or expanded water supplies will be needed for communities, businesses, and citizens. Third, diversion of water from streams or pumping from aquifers can deplete stream flows, with unintended consequences for aquatic habitat. The watershed planning effort provided an opportunity to explore strategies for striking a balance among the latter two principles, without impairing existing water rights.

In order to strike this balance, two policies for management of water supplies were developed. These policies are:

Policy WSP-1: Public and private water users throughout WRIAs 25 and 26 should have access to water resources to meet new or expanded needs for water supply consistent with adopted land use plans.

Policy WSP-2: Water resource development to meet new or expanded needs should avoid or minimize effects on stream flows or aquatic habitat in stream reaches where flow conditions are an important factor for sustaining aquatic life, including fish populations in their various life stages.

To put these policies into operation, the Planning Unit reviewed a range of water management strategies. These strategies included development of new surface or ground water supplies; water conservation; water reclamation and reuse; voluntary transfers of water rights; aquifer storage and recovery; and surface water storage.

The Planning Unit also examined the needs of specific communities and general water-use groups within WRIAs 25 and 26. Profiles of water needs were developed for Longview, Kelso, Cowlitz PUD, Wahkiakum PUD, Cathlamet, Castle Rock, Winlock, Toledo, and Mossyrock. Water demands were also assessed generally for smaller public water systems throughout the region, and for homeowners who rely on domestic wells. Collectively, the need for water from public water supply and domestic wells is projected to increase by 47 percent from year 2000 to 2020.

In addition, there is a potential that new industrial facilities will need water supplies, in areas outside the major urban areas served by public water supply. While this need is difficult to quantify, the policies developed in the plan are intended to provide for this need in areas where sufficient supplies are available. Needs for additional water in the agricultural sector are not well defined. While this is not a strong growth sector, there are some pending applications for new water rights.

Stream flow in the lower reaches of streams that flow into the Columbia River in WRIAs 25 and 26 are influenced by tides from the Pacific Ocean, as well as other changes in water level on the Columbia River. Whenever the water level in the Columbia River is higher than the water level of the tributary's natural flow, the tributary is backed up. At some times and places this can extend for miles upstream of the tributary's mouth. At these times and places, diversions for water supply do not influence flows or water levels to any measurable degree.

Because of this effect, the Planning Unit anticipates that water users needing new or expanded rights from tidally influenced reaches should be able to have access to water rights. Policies presented in the stream flow management section of this plan reflect this consideration. Communities whose water supplies are drawn from tidally-influenced reaches or ground water adjacent to such reaches include Longview and Kelso, and Cowlitz PUD, which also serves the Longview/Kelso area.

Most other communities in WRIAs 25 and 26 have water sources located upstream of tidally influenced reaches. These communities will also need access to water supply. In order to prevent unnecessary impacts on stream flow, however, issuance of new water rights to these communities should be carefully managed. The Planning Unit offers a proactive set of recommendations to address these situations. Communities should evaluate all reasonable

alternatives prior to developing a new supply that will reduce late summer stream flows. For example, in some locations ground water from deeper confined aquifers may be more appropriate than shallow ground water sources. Where alternatives are either infeasible or prohibitively expensive, other approaches such as water conservation and development of reclaimed water supplies can help reduce needs for new supplies. The Planning Unit recommends a procedure whereby these alternative solutions must be explored in detail before Ecology issues new water rights that would impact stream flows. Where such rights are issued, mitigation should be provided to offset the effect on stream flow, at least in part.

The Plan presents policies and recommendations on water supply and stream flow in Sections 3 and 4 respectively. These two sections should be reviewed jointly since they are closely interrelated. Section 4 on stream flow management contains provisions that would guide Ecology's decision-making on new water right applications. At the same time, diversions of surface water and pumping from aquifers are not the only human activities that affect stream flows. The stream flow management section of this Watershed Management Plan also addresses a number of other factors that are important influences on stream flow and aquatic habitat.

Management of Stream Flows

This Watershed Management Plan explores tools for managing stream flow that include management of existing and new water supplies, management of land uses that affect the volume and timing of runoff, improved monitoring of stream flow, and target flow goals to guide management actions. In developing recommendations for this Plan, effects on both low flows and high flows were considered.

The range of flow management techniques discussed in this Plan are listed in Table ES-2. Table ES-6 lists policies and associated recommendations for stream flow management. Policies SFP-2 through SFP-8 are related to management of water supplies to protect or improve stream flows. Policies SFP-9 through SFP-13 focus on management of land uses as related to stream flows.

Table ES-2
Stream Flow Management Techniques

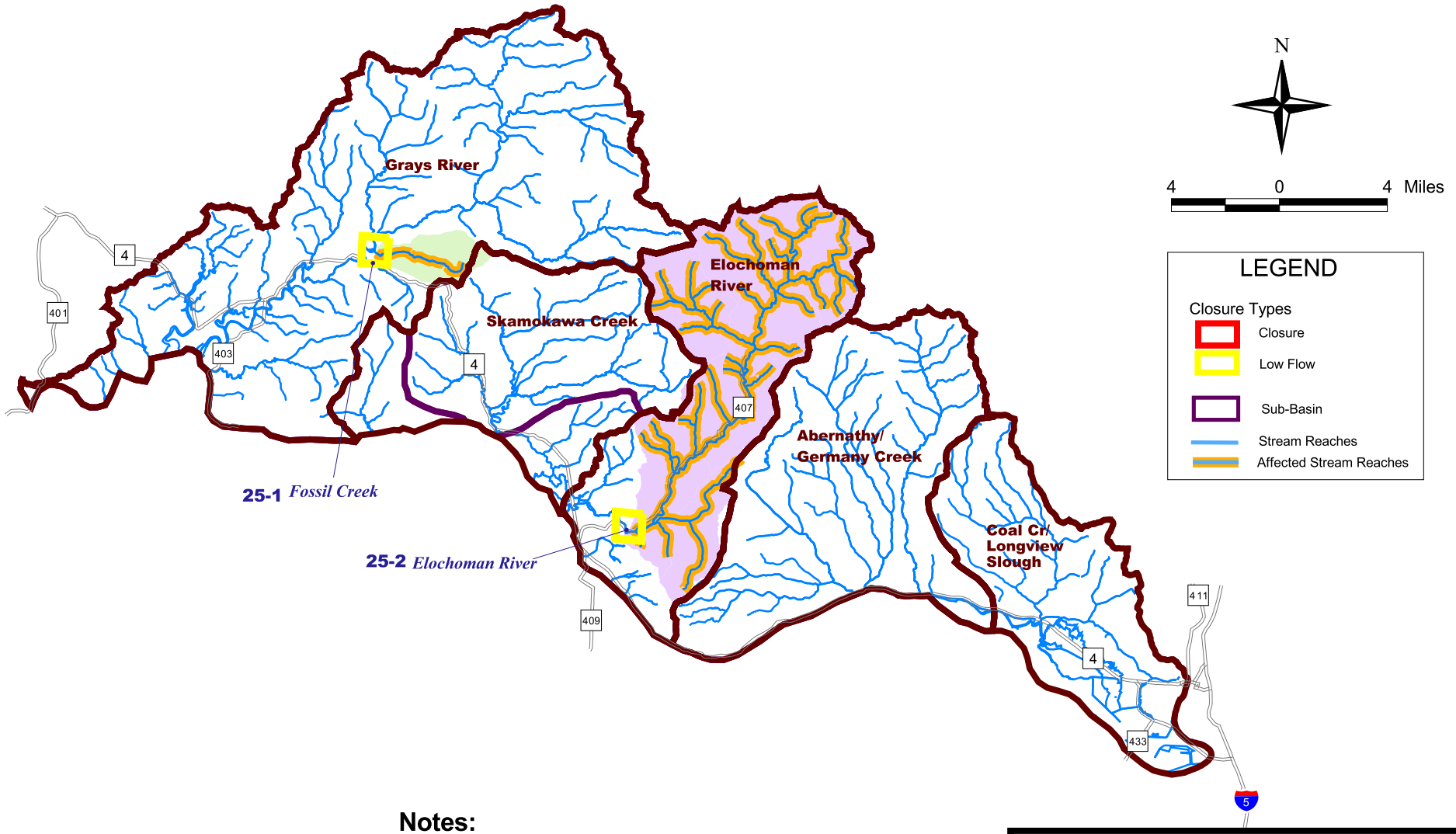
Category	Technique	Affects Low Flow	Affects High Flows
Water Use	Restrict issuance of new water rights	✓	N/A
	Water conservation	✓	N/A
	Curtailment or changed operations in drought conditions	✓	N/A
	Source substitution	✓	N/A
	Transfers to State Trust water rights	✓	N/A
	Enforcement actions against unauthorized water uses	✓	N/A
Land Use	Forest practices	✓	✓
	Development practices and stormwater management	✓	✓
	Floodplain management	✓	✓
	Wetlands management	✓	✓

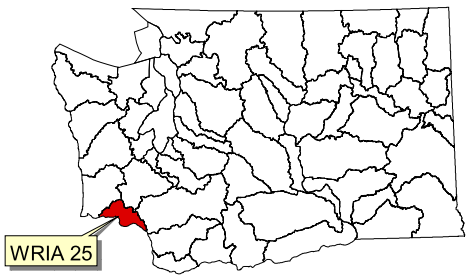
Stream Flow Protection Rule

Policy SFP-2 warrants particular attention due to the extent of stakeholder interest in availability of water rights and the impact of new water rights on stream flow. For many decades the State of Washington has restricted issuance of water rights in selected basins within WRIAs 25 and 26, via administrative stream closures and minimum instream flows, to protect stream flows from depletion. These pre-existing restrictions are shown on Exhibits ES-2 and ES-3. This Watershed Management Plan recommends that the Washington State Department of Ecology (Ecology) bolster these restrictions on new water rights by formally adopting them as a regulation. The Plan also recommends Ecology extend these restrictions to cover more of WRIAs 25 and 26. The recommended closures and instream flows are presented in Exhibits ES-4 and ES-5 for WRIAs 25 and 26, respectively. The State process for adopting such restrictions includes further opportunities for public input.

In developing this policy, the Planning Unit also intends to provide for needs for new water supplies across the region. The Planning Unit recommends that the regulation adopted to restrict new water rights also provide several important exceptions. First, it should be recognized that existing water rights will not be affected by this rule; only applicants for new water rights will be affected. Second, certain areas where water is backed up by the Columbia River will not be subject to these restrictions. For example, the lower reach of the Cowlitz River where Longview and Kelso withdraw water is tidally influenced. Water users in this area will not be affected by the new regulation; they will continue to be able to apply for new water rights under normal procedures for water rights processing.

Third, a pre-defined block of water will be "reserved" for communities, domestic wells, and other beneficial uses. These reservations are identified by subbasin. The intent of this provision is to ensure that existing communities will continue to have access to water to meet their needs for growth; and to provide a limited supply for potential industrial development in rural areas of WRIAs 25 and 26. However, the quantity of water will be limited. Except for domestic well owners, applicants desiring access to this supply will need to meet stringent conditions to ensure other alternatives have been considered and any new uses are carefully managed and partially mitigated. This approach balances the need for flow protections with the need for additional supply as the region grows.





Washington State

Notes:

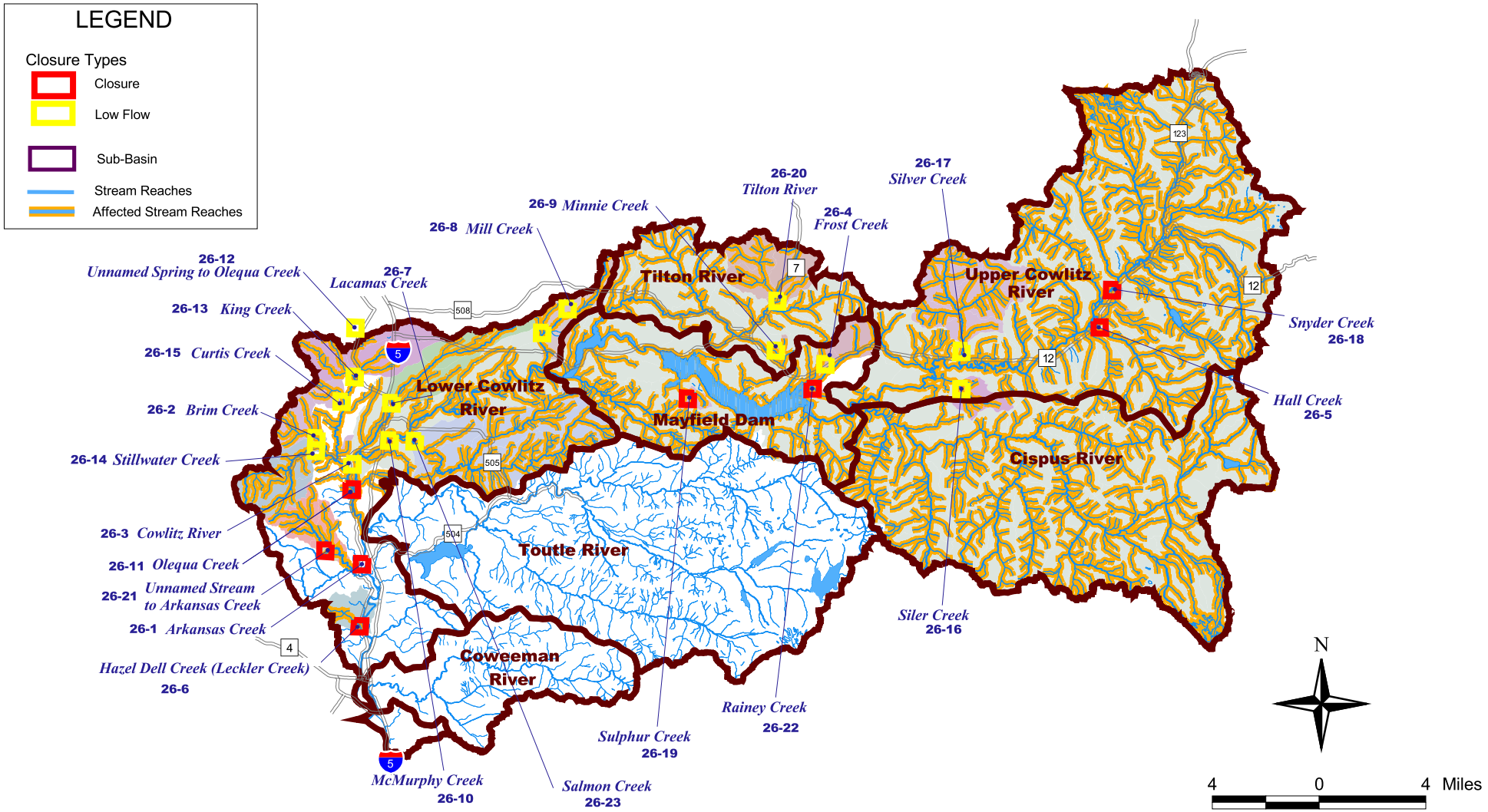
1. **The identification codes (e.g. 25-1) reference surface water source limitations (SWSL) tabulated for each subbasin in the appendices of the watershed plan.**

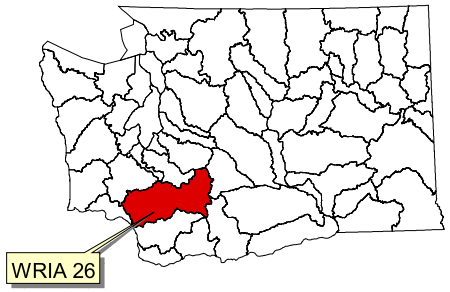
2. **Shaded zones represent the upstream drainage areas affected by surface water source limitations.**

EXHIBIT ES-2
WRIA 25
Pre-Existing Surface Water Source Limitations

December 2004

Economic and Engineering Services, Inc.
Bellevue Mount Vernon Olympia Portland Tri-Cities





Washington State

Notes:

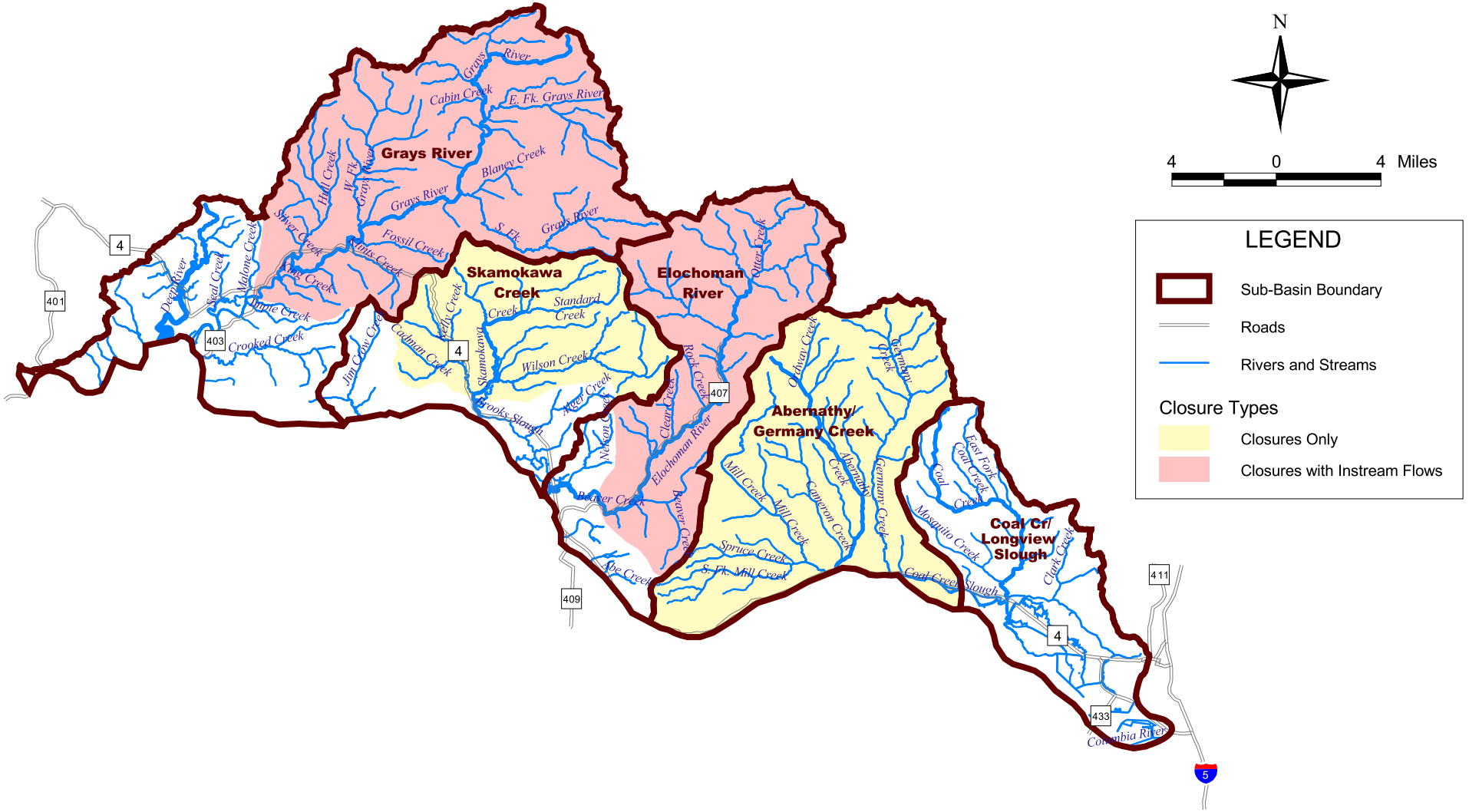
1. **The identification codes (e.g. 26-1) reference surface water source limitations (SWSL) tabulated for each subbasin in the appendices of the watershed plan.**

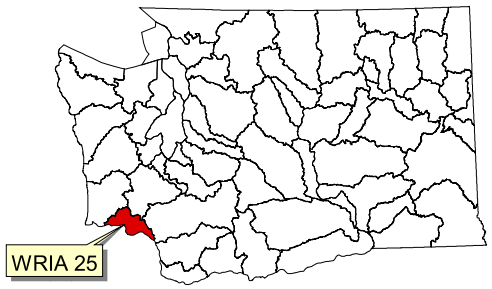
2. **Shaded zones represent the upstream drainage areas affected by surface water source limitations.**

EXHIBIT ES-3
WRIA 26
Pre-Existing Surface Water Source Limitations

December 2004

Economic and Engineering Services, Inc.
Bellevue Mount Vernon Olympia Portland Tri-Cities





Washington State

Notes:

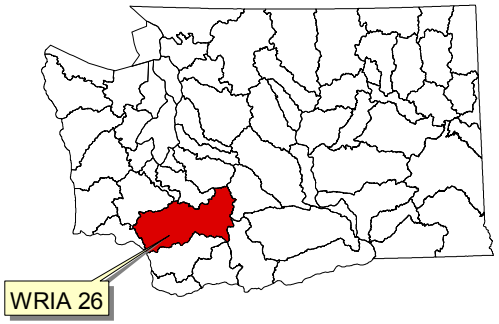
1. **Shaded zones represent approximate drainage areas affected by recommended restrictions. See Table I-1 for specifics.**

2. **Tidal reach areas have no recommended restrictions.**

EXHIBIT ES-4
WRIA 25
Recommended Instream Flows and Closures

December 2004

Economic and Engineering Services, Inc.
Bellevue Mount Vernon Olympia Portland Tri-Cities



Notes:

1. Shaded zones represent approximate drainage areas affected by recommended restrictions. See Table I-1 for specifics.

2. Tidal reach areas have no recommended restrictions.

Tilton River
Upper Cowlitz River
Lower Cowlitz River
Mayfield Dam
Cispus River
Toutle River
Coweeman River

LEGEND
Sub-Basin Boundary
Roads
Rivers and Streams
Closure Types
Closures Only
Closures with Instream Flows

N
7 0 7 Miles

EXHIBIT ES-5
WRIA 26
Recommended Instream Flows and Closures

December 2004

Economic and Engineering Services, Inc.
Bellevue Mount Vernon Olympia Portland Tri-Cities

If a water reservation is to be tapped, the water right applicant must further demonstrate responsible management of the resource, through off-setting actions, water conservation, or similar efforts. Actions should focus on those activities that can directly offset effects of pumping or diversions. For example, buying out and retiring upstream water rights can offset new withdrawals. As a second tier, mitigation may include other types of habitat restoration activities that do not directly offset flow impacts of expanded water supply. These actions should focus on restoration that optimizes habitat relative to instream flow.

These mitigation requirements do not apply to domestic well reservations.

It is important to clarify the relationship between reservations and domestic wells. Under current state law a person installing a domestic well to withdraw up to 5,000 gallons per day (including a well serving multiple residences) does not need to apply for a water right permit. The Watershed Management Plan makes no change to this exemption. However, through discussions with Ecology, the Planning Unit concluded that the ability of landowners to install domestic wells could be at risk under current law, in any area where a stream closure or minimum instream flow has been established. There are many such areas in WRIAs 25 and 26. The establishment of a water supply reservation for domestic wells in each subbasin is intended to protect the rights of landowners to install domestic wells, even in subbasins where stream closures and/or minimum instream flows have been established.

Table ES-3 provides a summary of the water right reservations developed for WRIAs 25/26, based upon an analysis of water needs through 2020. The net stream flow depletion allowance depicted in the table reflects the mitigation element described above. Every five years the water right restrictions and reservations should be evaluated to determine whether changes are needed to achieve the objectives of this Watershed Management Plan. For example, reservations may need to be increased as growth occurs beyond 2020 if such increases are compatible with objectives for aquatic habitat protection. If the rule adopted by Ecology is amended based on the 5-year evaluation, the Planning Unit intends the quantity of water reserved not be decreased.

Additional exceptions from water right restrictions include temporary uses of water for environmental restoration purposes, non-consumptive uses such as fish propagation and hydropower, and uses limited to the high flow season, as long as the use is not large enough to compromise habitat-forming processes.

Table ES-3
Water Right Reservation Summary for WRIAs 25/26

Water User [1]	Net Stream flow Depletion Allowance (cfs) [2]
Grays River Subbasin	
Wahkiakum PUD	0.15
Small Systems and Domestic Wells	0.57
Subbasin Total	**0.72**
Skamokawa Creek Subbasin	
Small Systems and Domestic Wells	0.20
Subbasin Total	**0.20**
Elochoman River Subbasin	
Cathlamet	0.00[5]
Small Systems and Domestic Wells	0.38
Subbasin Total	**0.38**
Abernathy/Germany Creek Subbasin	
Wahkiakum County Portion	
Small Systems and Domestic Wells	0.07
Cowlitz County Portion	
Small Systems and Domestic Wells	0.36
Subbasin Total	**0.43**
Coal Creek/Longview Slough Subbasin	
Not Applicable (restrictions on new water rights not proposed)	N/A
Upper Cowlitz River Subbasin	
Randle	0.02
Packwood	0.00[5]
Small Systems and Domestic Wells	0.20
Other Beneficial Uses	0.37
Subbasin Total	**0.59**
Cispus River Subbasin	
Lewis County Portion	
Small Systems and Domestic Wells	0.20
Other Beneficial Uses	0.19
Skamania County Portion	
Small Systems and Domestic Wells	0.20
Other Beneficial Uses	0.19
Subbasin Total	**0.77**
Tilton River Subbasin	
Morton	0.00[5]
Small Systems and Domestic Wells	0.20
Other Beneficial Uses	0.19
Subbasin Total	**0.39**
Mayfield Dam Subbasin	
Mossyrock	0.10
Small Systems and Domestic Wells	0.20
Other Beneficial Uses	0.19
Subbasin Total	**0.48**
Toutle River Subbasin	
Lewis County Portion	
Small Systems and Domestic Wells	0.20
Other Beneficial Uses	0.19
Cowlitz County Portion	
Small Systems and Domestic Wells	0.20
Other Beneficial Uses	0.19
Skamania County Portion	

Table ES-3 (cont.)
Water Right Reservation Summary for WRIAs 25/26

Water User [1]	Net Stream flow Depletion Allowance (cfs) [2]
Small Systems and Domestic Wells	0.19
Other Beneficial Uses	0.19
Subbasin Total	**1.14**
Coweeman River Subbasin	
Small Systems and Domestic Wells	0.20
Subbasin Total	**0.20**
Lower Cowlitz River Subbasin	
Lewis County Portion	
Winlock	0.00[5]
Toledo	0.22
Vader	0.00
Small Systems and Domestic Wells	0.38
Other Beneficial Uses	0.56
Cowlitz County Portion	
Longview	NA [3]
Kelso	NA [3]
Cowlitz PUD	NA [3]
Castle Rock	0.00[5]
Small Systems and Domestic Wells	0.38
Other Beneficial Uses	0.37
Additional Allowance [4]	4.00
Subbasin Total	**5.92**

Notes:

(1) Categories of water users include:

Large Public Water Systems, which are listed individually.

Small Systems, which refers to Small Community Water Systems.

Domestic Wells, including those serving multiple homes but exempt from the requirement to apply for a water right permit.

Other Beneficial Uses, such as self-supplied industrial uses.

(2) Calculated based upon an estimate of additional water rights needed to meet water demands through 2020. Incorporates the effects of offsetting and mitigation activities. The allowance applies only to mainstem flows; it is not intended to allow for extensive dewatering of smaller water bodies.

(3) Not applicable, due to location in tidally influenced area.

(4) An additional stream flow depletion allowance is provided for the Lower Cowlitz River, due to its potential as a future regional source of water supply. The additional 4.0 cfs is substantial enough to provide a regional-scale resource for industry and other uses, while still being adequately protective of habitat given the magnitude of late summer flows in the Cowlitz River.

(5) Current water rights are sufficient to meet needs through year 2020. Therefore no reservation is established.

The Planning Unit believes the modified restrictions on new water rights will strengthen protections of flows needed for aquatic habitat, while providing sufficient supplies for the region's communities. The provision for periodic evaluation of the adopted rule is intended to allow for flexibility and adaptation as growth occurs over time and as new information on aquatic resources is collected.

Cowlitz River and Hydroelectric Operations

As noted above, the City of Tacoma operates the Cowlitz River Hydroelectric Project. Operations of this project, including releases designed to support stream flows in the Lower Cowlitz Basin, are determined by the FERC license for this project. The Planning Unit acknowledges the importance of management of these facilities. However, the Planning Unit determined it should not duplicate the analysis and procedures related to FERC licensing. Therefore, the Planning Unit has not reviewed or analyzed Project operations.

It is important that the Cowlitz River downstream of the hydroelectric project be protected from unnecessary depletion of stream flows. There appears to be adequate flow in the Cowlitz River to support some new water uses. Therefore, the Planning Unit recommends Ecology adopt a numeric instream flow for the Lower Cowlitz River that will permit processing of water rights up to certain limits and recognizes the operating license of the Cowlitz River Hydroelectric Project.

In light of Policy SFP-2, it should be noted that there is a tidally influenced portion of the Lower Cowlitz River. As discussed in the previous section, water users in this area would not be affected by water rights restrictions set on the Lower Cowlitz River. Furthermore, a water right reservation has been established for the portion of the Lower Cowlitz River above the tidally-influenced area. This reservation is comprised of 1.92 cfs related to identified future water supply needs, plus an additional 4.0 cfs allowance, recognizing the potential for the Lower Cowlitz River as a future regional source of supply.

Forest Practices

77 percent of WRIA 25 is forested, and 67 percent of WRIA 26. The forested lands are typically located in the middle and upper portions of each subbasin. They include federal, state and private lands.

Based on changes in the timber economy in recent years, harvest rates for southwest Washington State over the next 50 years are expected to be lower, compared with harvests of the last 50 years. At the same time, regeneration of formerly harvested forests is likely to continue. Moreover, the Forests and Fish Rules adopted by the State will have a significant impact on forest management practices. In general, the WRIA 25 and 26 Planning Unit anticipates these changes will result in increased forest cover at the regional scale. Similar effects are anticipated on federal lands, based on the Northwest Forest Plan.

A modeling study commissioned as part of this watershed planning effort concluded that as clearcut areas are replanted and where existing younger timber matures, the predominant effect is anticipated to be a reduction in peak flows coupled with a reduction in low flows (i.e. flows are reduced). Peak flows are expected to decrease due to delay of

runoff as forest cover increases. Low flows are expected to decrease because of the net increase in evapotranspiration, which removes water from the watershed[1].

Policy SFP-9 is based on this expectation, and calls on forest managers to consider stream flow effects in making forest management decisions. This policy also calls for monitoring of forest lands over time, including their effects on stream flow.

Flow Monitoring Needs

Accurate, long term data on flows is needed for effective management of flow conditions. At this time there are several stream gauges on the Cowlitz River, its tributaries in the upper part of the Cowlitz Basin, and on the Toutle River. None of the other streams in WRIAs 25 and 26 have long-term, continuous flow gauges at this time. The Planning Unit offers the following policy statement:

Policy SFP-1: For purposes of improving stream flow management in the region, it is important that existing stream gauges be maintained over the long term and that additional, permanent stream gauges be installed.

Recommendations for stream gauging at specific sites are provided in Table ES-6.

Target Flows

One way the effectiveness of stream flow management can be quantified and monitored is through establishment of "target flows." As used in this watershed plan, the term "target flow" means a realistic flow regime that could be achieved in most years by following sound management techniques over a long period of time. The flow regime is defined by a set of flow statistics that include both low flows and high flows. For purposes of this plan, provisional target flows have been established for two streams, the Coweeman River and Olequa Creek. These target flows reflect existing conditions on these two streams and indicate management practices should seek to avoid deterioration of flow conditions and, if possible, should improve flow conditions. Additional target flows can be developed for other streams in the future, to assist in the overall stream flow management program recommended in this Watershed Management Plan.

Management of Surface Water Quality

The primary vehicle for achieving compliance with state criteria for surface water quality is Ecology's program for Total Maximum Daily Loads (TMDLs), also known as Water Cleanup Plans. Rather than attempt to duplicate efforts of the TMDL program, the WRIA 25 and 26 Planning Unit determined it would be most valuable to provide guidance to Ecology in terms of prioritizing its water cleanup plans. In developing the Watershed Management Plan, the Planning Unit relied primarily on the 1998 303(d) list of impaired waters. Development of the "2002/2004" list was under way and this updated list was also reviewed. However, the more

[1] Despite potential reductions in low flows, changes in forest practices are expected to improve aquatic habitat on the whole and improve prospects for recovery of salmon in the region.

recent list has not been formally adopted by the State or approved by the federal government at this time. Therefore the 1998 list was used to develop recommendations. Once finalized, the 2002/2004 list should be revisited during the implementation phase of the Watershed Management Plan.

The Planning Unit recommends that Ecology develop TMDLs according to the priority list shown in Table ES-4. These priorities should be revisited at such time as the 2002/2004 303(d) list is approved by Ecology and the federal government.

The Planning Unit also recommends that monitoring of water quality be improved in WRIAs 25 and 26 to improve information on both baseline conditions and long term trends. A strategic sampling plan was developed to fill data gaps on surface water quality. Sampling of 23 sites across the region is proposed. Sampling parameters include flow, dissolved oxygen, pH, specific conductance, temperature, ammonia, total suspended solids, coliform bacteria, nitrates and phosphorus. The estimated cost is $185,000 in the first year, and $139,000 annually in subsequent years.

Table ES-4
Summary Recommendations for Sequencing of Cleanup Plans
WRIAs 25 and 26

Priority for Cleanup Plans (TMDLs)	Subbasin Listed Under 303(d)	Basis for Prioritization
1	Lower Cowlitz River	• Importance as source of drinking water supplies; range of water quality issues potentially present.[(1)] • Temperature listing affects listed species.
2	Abernathy/Germany Creek	• Temperature listing affects listed species.
2	Longview Ditches	• Dissolved Oxygen and Fecal Coliform listing affects listed species.
2	Elochoman River	• Temperature listing affects listed species.
2	Grays River	• Temperature listing affects listed species.
2	Coweeman River	• Temperature listing affects listed species.
2	Upper Cowlitz River	• Temperature listing affects listed species.
2	Toutle River	• Temperature listing affects listed species.
2	Cispus River	• Temperature listing affects listed species.

(1) It should be noted that the Cowlitz River is listed only for temperature impairments. While other contaminants may be present they have not resulted in additional listings.

Management of Fish Habitat Conditions

Early in the watershed planning process, the Planning Unit elected to work collaboratively with the Lower Columbia Fish Recovery Board to develop the habitat element of the watershed plan. This unique arrangement was significant to the lower Columbia Region because it ensured a high degree of interconnectedness between watershed planning and the recovery of Endangered Species Act-listed species. In particular, the habitat element was developed using water quality, quantity and instream flow information from the Planning Unit's efforts coupled with other habitat data and modeling efforts developed through the recovery planning process. The result is a highly integrated habitat element for the watershed management plan that is the same as found in the recovery plan.

Each subbasin includes an extensive review of the available habitat information and analyses as well as extensive new analysis of stream condition, watershed conditions, and habitat forming processes. Modeling tools were applied that highlight a series of habitat perturbations in these watersheds that need to be addressed. Qualified local experts were convened to provide input to models where needed or where other data sources were lacking. Model outputs were also compared to other independent assessments of limiting factors to corroborate results. The outputs of these models identify reach scale issues that need to be addressed and provide a prioritization scheme for proposed actions.

A series of Subbasins Plans (Volumes II.A-II.L) describe local conditions and detail implementation at the subbasin level. Each subbasin plan includes:

- An ***overview summary*** of key priorities.
- An ***assessment*** that describes the subbasin, species of interest, subbasin habitat conditions, stream habitat limitations, watershed process limitations, other factors such as hatcheries, harvest, hydropower, and out-of-subbasin effects. The assessment includes qualitative and quantitative information.
- A ***program and project inventory*** describing significant activities in the subbasin.
- A ***management plan*** that details a subbasin vision, biological objectives, integrated strategy, and specific measures and actions in each threat category.

The following descriptions give a brief regional perspective for each subbasin.

Grays Subbasin

This subbasin is particularly important to regional recovery because it is one of two major basins in the coastal strata of the Evolutionarily Significant Unit. Populations of fall Chinook, winter steelhead, chum and coho will need to be restored to a high level of viability to meet regional recovery objectives. Priority actions include:

- Reducing out-of-subbasin impacts,
- Managing forests to restore watershed processes,
- Restoring valley floodplain function and stream habitat diversity, and
- Aligning hatchery priorities with conservation objectives.

Elochoman Subbasin

This subbasin includes the Elochoman, Skamokawa, Mill, Abernathy, and Germany watersheds. Populations of fall Chinook, chum, coho and winter steelhead will need to be restored to medium to high levels of viability to meet regional recovery objectives. The Elochoman/Skamokawa populations are particularly important for recovery. Priority actions include:

- Managing forest lands to protect and restore watershed processes,
- Restoring lowland floodplains, riparian conditions, and stream habitat diversity.
- Reducing out-of-subbasin impacts,
- Managing forests to restore watershed processes,

- Restoring valley floodplain function and stream habitat diversity, and
- Aligning hatchery priorities with conservation objectives.

Cowlitz Subbasin

This subbasin is particularly important to regional recovery by virtue of its large size and diverse habitats. It includes lower Cowlitz, upper Cowlitz, Cispus, Tilton, Toutle, and Coweeman watersheds. One or more populations of tule fall Chinook, bright fall Chinook, spring Chinook, chum, winter steelhead, summer steelhead, and coho are present and many need to be restored to high levels of viability to meet regional recovery objectives. Priority actions include:

- Restoring access above dams in the upper portion of the basin,
- Protecting intact forests in headwaters,
- Managing forest land to protect and restore watershed processes,
- Managing growth and development to protect watershed processes and habitat conditions,
- Restoring passage at culverts and other artificial barriers,
- Restoring lowland floodplain function, riparian conditions, and stream habitat diversity
- Addressing immediate risks with short term habitat fixes,
- Aligning hatchery priorities with conservation objectives, and
- Reducing out-of-subbasin impacts.

Plan Implementation

It is evident from the discussion above that the Watershed Management Plan encompasses a broad range of issues and activities. No one organization has authorities or capabilities in all of these areas. Like the planning effort itself, the implementation process will need to involve a diverse group of agencies, organizations and stakeholders working collaboratively.

Implementation of Specific Actions from Watershed Management Plan

Table ES-5 lists all of the organizations identified for roles in implementation. A selected group of these organizations are identified for "lead" roles. Lead organizations include each County government, City governments, public water systems, the Department of Ecology, State agencies with land-management responsibilities (e.g. Department of Natural Resources); private industry with large plants; landowners and agricultural producers; United States Forest Service and LCFRB. In some cases, the "lead" organization may directly carry out the action. In other cases, the lead organization will take responsibility for organizing an effective approach to implementation by multiple parties. This may include seeking outside sources of funding and securing commitments for actions by other parties. It is recognized that actions listed

in this plan are subject to availability of funding resources. The next section of this Executive Summary describes a coordinated approach to pursuing necessary funding. Table ES-5 also provides information on relative costs and potential funding sources for each type of action.

It should be noted that these roles are not mandatory and cannot become operational without the formal approval of specific activities by elected boards and commissions, or upper level managers at the respective organizations. The Planning Unit requests each organization consider its recommended role(s) and provide a written indication of its capability and intent to carry out these actions. Where actions are accepted, follow-up steps during the implementation phase should include decisions on funding sources, budgeting, staffing, work plans, and protocols for tracking and reporting progress towards Plan objectives.

Many agencies and jurisdictions are currently funding programs that align closely with the objectives and recommendations of this Plan. In many cases, existing expenditures can be effectively integrated with this Plan, reducing the overall financial impact. For other actions, new or expanded funding must be sought in order to provide for implementation. Table ES-5 lists some possible sources of funding for these actions. Full discussion of these funding sources is presented in Section 7 of the Plan.

Table ES-5
Implementation Considerations for Watershed Management Plan

Priority[(1)]	Activity	Implementers[(3)]	Financial/ Economic Costs[(2)]	Potential Funding Sources
Category: Water Supply				
High	Public Water Systems develop new or expanded supplies. Requires engineering studies; approval of water system plan; water rights processing; other permitting; SEPA compliance; construction; operations & maintenance. Standard procedures exist for all of these (See Section 3.3.1).	*Lead*: Public Water System *Others*: DOH, Ecology	Medium	*Main*: Water rates in affected service area *Additional*: Grants or low-interest loans from existing state & federal programs
High	Planning studies to explore alternative sources of supply to replace an existing source (selected communities) (See Section 3.3.2).	*Lead*: Public Water System	Low	*Main*: Water rates in affected service area
High	Replace an existing source of supply with a different source to reduce impacts on stream flow. Requires engineering studies; water rights processing; other permitting; inter-local agreements or contracts; construction; operations & maintenance (See Section 3.3.2).	*Lead*: Public Water System *Others*: DOH, Ecology, adjacent water system(s) to serve as wholesaler	Medium to High	*Main*: Leg. appropriation *Additional*: Water rates in affected service area
Medium	Enhanced conservation exceeding state requirements in selected communities (See Section 3.3.1).	*Lead*: Public Water System	Low to medium	*Main*: public water system *Additional*: Grants from DOH or Ecology

Table ES-5 (cont.)
Implementation Considerations for Watershed Management Plan

Priority[(1)]	Activity	Implementers[(3)]	Financial/ Economic Costs[(2)]	Potential Funding Sources
Medium	Industrial supplies: Expand conservation & reuse; develop non-potable sources; connect to municipal systems (See 3.5.3).	*Lead*: Private industry (large plants) *Others*: Ecology & DOH (technical assistance; water rights processing if applicable)	Low to High (Varies by facility)	*Main*: Private industry *Additional*: Leg. appropriations
Low	Periodically review policies on domestic wells, in context of local land use and development regulations (See Section 3.5.2).	*Lead*: Counties, cities	Low	*Main*: counties, cities general fund, permitting fees, or grants
Low	Agricultural supplies: switch from surface to ground water. Discourage new uses of surface water (use ground water instead) (See Section 3.5.4).	*Lead*: Landowner *Others*: Ecology, Conservation Districts	Low to medium	*Main*: Landowner *Additional*: Leg. appropriations
Category: Stream Flow Management				
High	Maintain existing stream gauges. Install new gauges at selected locations. Select exact sites; permit and construct gauges; O&M; data management (See Section 4.2).	*Lead*: Ecology *Support*: USGS, LCFRB, Counties	Medium	*Main*: Leg. appropriations (Ecology budget); Congr. appropriations (USGS budget); *Additional*: Counties; Public Water Systems
High	Adopt closures and/or minimum instream flows in State Rule (See Section 4.4.1).	*Lead*: Ecology *Support*: LCFRB	Low	*Main*: Ecology (staff time) *Additional*: LCFRB (staff time)
High	Selected actions involving water supply (See Section 3.6).	*See Section 3.6*	*See Section 3.6*	*See Section 3.6*
High	Establish target flow monitoring and management program (See Section 4.3).	*Lead*: LCFRB and Planning Unit or successor organization *Support*: Ecology, DFW	Medium	*Main*: Phase 4 implementation funds *Additional*: TBD
High	Initial surveys in selected subbasins to identify unauthorized uses and take enforcement actions. Follow-up in other basins if warranted (See Section 4.4.6).	*Lead*: Ecology *Support*: N/A	Low to medium	*Main*: Leg. appropriations (Ecology budget & staffing) *Additional*: N/A
High	Consider and address effects of forest practices on stream flow. Monitor effectiveness of F&F Rules and NW Forest Plan. Report to public periodically (See Section 4.5.1).	*Lead*: DNR, USFS *Support*: Private forest landowners	Low to medium	*Main*: Leg. appropriations (DNR budget); Congr. appropriations (USFS budget), Timber producers *Additional*: N/A

Table ES-5 (cont.)
Implementation Considerations for Watershed Management Plan

Priority[1]	Activity	Implementers[3]	Financial/ Economic Costs[2]	Potential Funding Sources
High	Protect floodplains from modifications that would impair hydrologic functions or habitat (See Section 4.5.3).	*Lead*: Counties, cities, State agencies with land management responsibilities *Support*: DFW	Low	*Main*: County permitting fees or general fund revenues, grants *Additional*: State agency budgets
Medium	Review effects of stormwater discharges on stream flow and habitat. Where needed to protect key habitat, implement programs that exceed minimum requirements (See Section 4.5.2).	*Lead*: Counties, Cities *Support*: Ecology	Low to Medium	*Main*: County, City general funds; Stormwater assessment and fees, grants *Additional*: N/A
Medium	Purchase or lease of water rights from willing sellers, for State Trust program (See Section 4.4.5).	*Lead*: Ecology *Support*: N/A	Low to medium	*Main*: Leg. appropriations (Ecology budget) *Additional*: N/A
Medium	Identify floodplain restoration projects and implement where feasible (See Section 4.5.3).	*Lead*: Counties, cities, State agencies with land management responsibilities *Support*: DFW	Medium to High	*Main*: State or federal grants; Leg. Appropriations, grants *Additional*: N/A
Low	Develop policies and procedures to identify and mitigate stream flow impacts of sewering communities formerly served by septic systems (See Section 4.5.2).	*Lead*: Counties, Cities *Support*: sewer agencies if different from Counties, Cities.	Low	*Main*: Counties, Cities, general funds, permitting fees, grants *Additional*: N/A
Low	Water conservation by farmers practicing irrigated agriculture. Technical assistance by Conservation District in each county (See Section 4.4.2).	*Lead*: Agricultural producer *Support*: Conservation Districts	Medium	*Main*: Agricultural producer *Additional*: Leg. Appropriations (Cons. Commission & CD budgets).
Low	Source substitution for selected areas served by individual household wells: relatively higher densities and likelihood of stream impacts; dependent on feasibility and cost (See Section 4.4.4).	*Lead*: Counties *Support*: Public water systems	Medium to high	*Main*: Assessments on affected properties (local improvement districts), grants *Additional*: Federal and State salmon recovery funding; Leg. appropriations
Low	Wetlands inventories and ordinances: assess and protect hydrologic functions, consider strengthening mitigation ratios (See Section 4.5.4).	*Lead*: Counties *Support*: N/A	Low to medium	*Main*: County development fees or general fund revenues (note staffing impact), grants *Additional*: N/A
Category: Surface Water Quality				
Medium	Develop water body cleanup plans (TMDLs) for subbasins, in prioritized sequence as indicated in Watershed Management Plan. Carry out necessary modeling, reporting, public involvement, and waste load allocations (See Section 5.3.2).	*Lead*: Ecology *Other*: Local governments, Conservation Districts, other interested parties	High	*Main*: Leg. appropriations (Ecology budget) *Additional*: N/A

Table ES-5 (cont.)
Implementation Considerations for Watershed Management Plan

Priority[1]	Activity	Implementers[3]	Financial/ Economic Costs[2]	Potential Funding Sources
Low	Expand water quality monitoring activities to improve understanding of status and trends. Install monitoring equipment; collect and analyze samples; manage and analyze data; report results (See Section 5.4.2).	Shared efforts by State, local, federal agencies	High	Combination of State, local, federal funding sources (to be developed further in Implementation Phase)

(1) Priority in context of all actions in Watershed Management Plan.

(2) Preliminary, generalized estimates of financial or economic cost to the community or water user involved. High: greater than $500,000; Medium: $50,000 to $500,000; Low: less than $50,000. Total cost, whether up-front or over a period of time up to ten years.

(3) "Lead" implementer would take responsibility for organizing efforts under this action, including pursuing funding sources listed in the far right column.

Abbreviations: SEPA = State Environmental Policy Act, DOH = Department of Health, Leg. = Legislative, Cong. = Congressional

Need for Coordination and Oversight

With a diverse group of organizations involved in implementing the Plan, and an implementation period that may span many years, it will be important to put in place a mechanism for oversight and coordination of the implementation process. The State Legislature has authorized Ecology to provide Phase 4 Implementation Grants of up to $125,000 per year for up to three years for a Planning Unit covering two WRIAs and half this amount for two additional years. It is recommended that LCFRB pursue this funding on behalf of the Planning Unit, and that the Planning Unit itself transition from planning functions to coordination and oversight of the implementation process. Coordination and oversight functions include collaborative pursuit of additional funding sources for implementation of specific programs, tracking implementation actions by the various organizations involved, providing ongoing information to the public, and carrying out adaptive management of plan elements. In addition, this function may include periodic updating of the Plan to ensure it remains relevant and effective in managing water resource conditions in WRIAs 25 and 26.

The Planning Unit will not take on any regulatory responsibilities or authorities. Regulatory activity will continue to be the responsibility of State or federal agencies and local governments, consistent with existing law.

It is suggested that, at a minimum, a core group be organized from Planning Unit members to carry out the coordination and oversight role. This core group could include at least the counties; affected Tribes, representatives of the various cities in WRIAs 25 and 26, Cowlitz and Wahkiakum PUDs, and the Department of Ecology. Other groups in the region may also elect to participate. An interlocal agreement may be useful in defining coordination and oversight responsibilities, as well as other implementation commitments by the respective organizations involved in this effort.

The Phase 4 implementation grants, by themselves, are not sufficient to implement the Plan. Instead, this should be viewed as "seed money" that can be used to pursue grants and leverage other resources for Plan implementation.

Table ES-6
Watershed Management Policies and Recommendations
WRIAs 25 and 26

Code	Issue	Policy or Recommendation
Water Supply Policies and Recommendations		
Policy WSP-1 (Pg 3-8)	Access to Water Supplies	Public and private water users throughout WRIAs 25 and 26 should have access to water resources to meet new or expanded needs for water supply consistent with adopted land use plans.
Recommendation (Pg 3-14, 3-15)	Water Supply – Longview, Kelso, and Cowlitz PUD	The Planning Unit endorses the two alternatives presented in the Longview-Kelso Urban Area Comprehensive Water Plan (1999) to meet the area's future water demands. Both alternatives involve expansion of the RWTP to meet the future demands of Longview and the Cowlitz PUD. The future demands of Kelso would also be met by the RWTP under one alternative, while such demands would be met by new ground water wells under the other alternative.
Recommendation (Pg. 3-11)	Reservations for water supply	In order to satisfy the goals associated with the establishment of closures and instream flows, and the goals associated with providing a secure source of water for future public water supply, it is recommended that in each basin a block of water be reserved for future uses that would not be subject to the closures and/or instream flows established by rules for WRIAs 25 and 26 (see Policy SFP-2)
Recommendation (Pg. 3-9)	Columbia River resource	The Planning Unit views the Columbia River and ground water in hydraulic continuity with the Columbia River as a major water resource to meet water supply needs. As new water supplies are needed, it is preferable they be withdrawn from the Columbia River, adjacent lowland reaches of tributaries subject to tidal effects, and associated ground waters, rather than from flow-limited of streams tributary to the Columbia. This approach can meet regional supply needs, while protecting important aquatic habitat in the region.
Recommendation (Pg. 3-9)	Cowlitz River Resource	The Planning Unit views the Cowlitz River as a significant regional resource. Due to the abundant supply in the mainstem Cowlitz River, the Planning Unit recommends that it be considered over other water resources tributary to the Columbia River in meeting future water supply needs. Use of the Cowlitz River should be consistent with the reservation quantity established for the River (See Section 4.4.1)
Recommendation (Pg 3-10)	Water Supply	The Planning Unit recommends communities and other water users requesting new water rights follow the procedure outlined in Section 3.3.1.
Recommendation (Pg 3-10)	Aquifer Mapping	The Planning Unit recommends that a map be developed during the implementation phase of the watershed planning process that would depict locations of deep aquifers suitable for water supply development. Such a map could be developed in partnership with the USGS, and will involve a study to identify aquifers that are not in hydraulic continuity with streams that are a priority for flow protection.
Recommendation (Pg. 3-13)	Tidally-influenced reaches	Surface water source limitations, such as stream closures administered by Ecology and low flow conditions on new water rights, should not apply to tidally-influenced stream reaches in WRIAs 25 and 26. Specific locations of tidal reaches for this purpose are defined in Appendix I (Table I-3).

Table ES-6 (cont.)
Watershed Management Policies and Recommendations
WRIAs 25 and 26

Code	Issue	Policy or Recommendation
Policy WSP-2 (Pg 3-9)	Stream Flow Protection in Developing Supplies	Water resource development to meet new or expanded needs should avoid or minimize effects on stream flows or aquatic habitat in stream reaches where flow conditions are an important factor for sustaining aquatic life, including fish populations in their various life stages.
Recommendation (Pg 3-12)	Procedure for Evaluating Existing Supplies	For cases in which *existing* municipal supplies (as contrasted with planned *future* supplies) have the potential to negatively impact flows in critical stream reaches, the Planning Unit recommends that the selected communities undertake a review of alternative sources of supply, similar to that described in Section 3.3.1. It is recommended that, where feasible, these water suppliers cease or limit the use of certain existing supplies and develop alternative sources of supply that are less likely to impact flows in critical stream reaches. It is also recommended that implementation of such alternatives be eligible for funding from regional, state, or federal funding programs (see Section 3.6) This is a Planning Unit recommendation for voluntary actions. Implementation should not be mandated by the State.
Recommendation (Pg 3-12)	Water supply – New developments and Industrial Supplies	In general, the Planning Unit recommends that new urban or suburban developments or industrial facilities that require new or expanded water supplies shall seek to obtain water from existing municipal or other water suppliers rather than developing separate sources of supply. (Note: this would not apply to agricultural uses). If an existing municipal supplier or other water supplier is not available, then the new development or industrial facility should follow the procedure described in Section 3.3.1. Options to provide financial incentives and/or technical assistance to large industries for water conservation and water reuse will be explored, where this can be linked directly to protection of stream flows.
Recommendation (Pg 3-19)	Water Supply – Small Water Systems	In those cases where new supplies are required for small Group A systems, it is recommended that a review of alternative sources of supply be conducted to address potential impacts on stream flow (see Section 3.3.1).
Recommendation (Pg 3-20)	Water Supply – Individual Household Wells	County and city policies provide an adequate means to help off-set impacts caused by exempt wells. In areas where exempt well use densities may adversely affect local flows, suburban and rural developments should utilize municipal or existing water sources over individual well sources, to the extent permissible by State law. If this is not possible, sources should be developed from deep aquifers. Land use densities in flow sensitive areas, such as small tributaries, should not be increased.

Table ES-6 (cont.)
Watershed Management Policies and Recommendations
WRIAs 25 and 26

Code	Issue	Policy or Recommendation
Recommendation (Pg 3-22)	Industrial water supply	***Conservation and reuse***: The Planning Unit places an emphasis upon water conservation and reuse with respect to industries with large water demands. Ecology should develop technical assistance and funding opportunities focused specifically upon the needs of self-supplied industries, to aid in reducing current water demands. ***Future Water Demands:*** Where feasible, industries requiring additional sources of supply in the future should connect to existing municipal water supplies. Where not feasible due to technical issues or cost, then it is recommended that the industry evaluate alternative sources as described in Section 3.3.1. ***Non-potable supply:*** The Planning Unit recommends that large self-supplied industrial water users evaluate development of Columbia River non-potable supplies. The Planning Unit commits to aiding industries in identifying and obtaining funding sources for implementation of such a project, most likely through programs administered by Ecology and DOH. (See recommendation in Section 7.3)
Recommendation (Pg 3-23)	Agricultural water supply	***New surface water supplies***: In those cases where surface water supplies are requested for agricultural purposes, it is recommended that a review of alternative sources of supply be conducted (see Section 3.3.1) to address potential impacts on stream flow. ***New ground water supplies:*** The Planning Unit recommends that Ecology grant water right requests pertaining to future agricultural ground water demand, subject to consistency with the Planning Unit's water supply policy and successful completion of Ecology's water right application review process.
Stream Flow Policies and Recommendations		
Policy SFP-1 (Pg 4-10)	Flow monitoring	For purposes of improving stream flow management in the region, it is important that existing stream gauges be maintained over the long term and that additional, permanent stream gauges be installed.
Recommendation (Pg 4-36, 4-41, 4-46, 4-51)	Stream gauging, various rivers	The Plan recommends stream gauges be installed on the Grays River, Elochoman River, several creeks tributary to the Cowlitz River, and the Coweeman River.
Recommendation (Appendices, Pg G-3, G-4, G-7, G-8)	Target Flow (Olequa Creek and Coweeman River)	For Olequa Creek and the Coweeman River it is recommended that target flows be established for management purposes. Target flows should address both low flows and peak flows. The suite of flow management techniques discussed for these streams should be designed with the goal of protecting these flows from degradation, and if possible improving the flow regime.

Table ES-6 (cont.)
Watershed Management Policies and Recommendations
WRIAs 25 and 26

Code	Issue	Policy or Recommendation
Policy SFP-2 (Pg 4-18)	Restrictions on New Water Rights	The Department of Ecology should adopt State Rules (WACs) under its Instream Resources Protection Program to restrict issuance of new water rights in WRIAs 25 and 26. In all affected streams reaches a closure should be established, but with certain exceptions as indicated below. Existing water rights shall not be affected by this policy. For each stream that flows into the Columbia River, the zone where water levels are substantially affected by tidal influence and backwater from the Columbia River shall not be closed to issuance of new water rights. The location of the lower most extent of the closure is identified in this Plan. The rules adopted shall not prevent issuance of water rights for selected purposes and conditions. These include: ■ New uses for domestic wells, based on the amount of water required to meet estimated needs. This quantity represents the net depletion of stream flow in each subbasin by all domestic wells installed after the effective date of the rule; ■ New uses for small community systems and other beneficial uses, up to a predefined, limited "block" of water. These quantities represent the net depletion of stream flow in each subbasin for these categories of water use. Access to this block shall be granted only after consideration of items as listed for municipal systems, below. ■ New uses for municipal water systems, based on the amount of water required to meet estimated needs. This quantity represents net depletion of stream flow in each subbasin. Access to this block should be granted only after consideration of reasonable alternative supplies, demonstration of appropriate measures to ensure water-use efficiency, and consideration of measures that offset and mitigate the depletion of stream flow or provide other types of aquatic habitat benefits; ■ Small, temporary uses of water for environmental restoration purposes not exceeding one year in duration. ■ Non-consumptive uses such as fish propagation or hydropower. ■ New uses limited to the high flow season, where the nature of the proposed use is such that water will not be taken in the low-flow season. However, this is not intended to allow withdrawals large enough to compromise habitat-forming processes of any stream. The Planning Unit recommends that minimum instream flows be adopted as an additional element of the State Rules in selected basins where sufficient data is available. The minimum instream flows will be used in processing applications for changes or transfers of existing water rights. However, the blocks of water reserved for domestic, municipal, and other beneficial uses (see above) shall not be subject to minimum instream flow conditions. The Planning Unit recommends the rule be evaluated every five years after adoption (or more frequently if needed); and that revisions to the rule be considered if needed. Increases to water supply reservations may be considered if compatible with aquatic habitat protection objectives. In addition, water reservation quantities may be shifted among water use categories to better address actual needs. However, the total reservation quantity in each subbasin shall not be decreased. Consistent with Chapter 90.82.130 any process to revise the rule should use a form of negotiated rulemaking that uses the same processes that applied in WRIAs 25 and 26 for developing this Watershed Management Plan.

Table ES-6 (cont.)
Watershed Management Policies and Recommendations
WRIAs 25 and 26

Code	Issue	Policy or Recommendation
Policy SFP-3 (Pg 4-23)	Water Conservation	Water conservation is part of a sound comprehensive water resources management program. In general, adherence to State requirements for municipal water conservation, as modified from time to time, will be sufficient for most communities within WRIAs 25 and 26. Conservation activities that exceed state requirements should be carried out in selected communities where water use has the potential to cause significant impairment of stream flow conditions. Based on the Planning Unit's assessment of watershed conditions, only the City of Winlock has been identified in this regard at this time. This is a Planning Unit recommendation for voluntary actions. Implementation should not be mandated by the State. Water conservation actions by farmers practicing irrigated agriculture may be warranted in selected locations, where there would be significant benefits to stream flows. The Conservation District in each County should provide technical assistance to farmers to identify water conservation opportunities and funding sources.
Policy SFP-4 (Pg 4-24)	Response to Drought Conditions	Where major surface water diversions or ground water withdrawals have a direct effect on stream flows on a time scale of weeks or less, the water user should be prepared to alter operations in the event of a State-declared drought emergency affecting WRIA 25 and/or 26. The water user should adopt policies and procedures in advance, to allow for quickly altering operations to minimize or eliminate the depletion of stream flow to the extent feasible in the event such a drought occurs. This is a Planning Unit recommendation for voluntary actions. Implementation should not be mandated by the State. For hydropower operations such as the Cowlitz River Project, it is assumed that FERC license conditions fully address releases under low flow conditions, including drought conditions. Efforts should continue to identify small surface water users that could implement this type of management strategy to improve low flow conditions.
Recommendation (Pg. 4-50)	Water Conservation - Winlock	The City of Winlock should carry out a water conservation program to minimize impacts on stream flow in Olequa Creek. This may warrant going above and beyond State requirements for conservation by municipal water systems. It is anticipated that this would require examination of cost, potential rate impacts on City customers and other feasibility criteria. This is a Planning Unit recommendation for voluntary actions. Implementation should not be mandated by the State.
Policy SFP-5 (Pg 4-25)	Source Substitution	Communities using water sources (surface or ground water) that significantly reduce base flows in any stream that provides important fish habitat within WRIAs 25 and 26 should evaluate alternative sources of supply that eliminate or minimize these effects. It is anticipated that this would require examination of cost, potential rate impacts, reliability considerations, and evaluation of other feasibility criteria. This is a Planning Unit recommendation for voluntary actions. Implementation should not be mandated by the State. In limited cases, this policy may also apply to rural areas where residents rely on domestic wells (exempt wells). Cowlitz, Lewis and Wahkiahkum Counties should assess this possibility through a water-balance analysis, in selected rural areas where extensive new development is expected to occur or where there is substantial existing development served by exempt wells.

Table ES-6 (cont.)
Watershed Management Policies and Recommendations
WRIAs 25 and 26

Code	Issue	Policy or Recommendation
Recommendation (Pg 4-45)	Source Substitution (Coweeman River)	Ecology should contact a large commercial/industrial water rights holder (10 cfs) on the Coweeman River to consider substituting a deeper ground water source for the current surface water diversion. This is a Planning Unit recommendation for voluntary actions. Implementation should not be mandated by the State.
Policy SFP-6 (Pg 4-26)	Transfer of Water Rights to State Trust	Ecology should use its existing State Trust program, and funding provided by the State Legislature, to identify and acquire water rights from holders willing to sell or donate their water rights in WRIAs 25 and 26, where transfers to the State Trust would provide a significant benefit to fish habitat.
Policy SFP-7 (Pg 4-26)	Enforcement Against Unauthorized Uses	Ecology should conduct or support initial surveys in selected subbasins to determine whether unauthorized water uses are occurring on streams deemed critical to salmon recovery within WRIAs 25 and 26. If these surveys identify extensive unauthorized uses, they should be expanded to additional subbasins and carried out on a regular, periodic basis (e.g. once every five years). Where unauthorized uses are identified, Ecology should take enforcement actions to eliminate these uses.
Policy SFP-8 (Pg. 4-27)	Cowlitz River and FERC License	The Planning Unit understands that the FERC license conditions take into account flows for anadromous fish and other wildlife species. While hydropower regulation of flows in the Cowlitz River is protective of the needs of fish, they do not account for additional use downstream of the Mayfield Dam. Therefore, the Planning Unit recommends additional protection for the Cowlitz River mainstem in the form of a numeric instream flow that provides water for beneficial uses subject to flow conditions.
Policy SFP-9 (Pg 4-28)	Forest Practices	Private landowners, State DNR, and USFS should consider effects of forest management practices on stream flow and other fish habitat factors, in making forest management decisions. The Planning Unit anticipates that existing programs under the State's Forests and Fish regulations, the state forest land's Habitat Conservation Plan and the federal government's Northwest Forest Plan will provide the regulatory framework needed in this regard. The State and federal governments should monitor the effectiveness of these programs and periodically provide public documentation of their effectiveness in protecting fish habitat in WRIAs 25 and 26.
Policy SFP-10 (Pg 4-30)	Stormwater Management	As Phase II communities, Cowlitz County and the Cities of Longview and Kelso should continue to carry out their legally mandated responsibilities with regard to stormwater management. Lewis and Wahkiakum Counties and the remaining cities in all three counties should review their stormwater management ordinances to determine whether they are adequately protective of fish habitat in local streams that may be affected by future development. Where enhanced stormwater management needs are identified, revisions to local ordinances should be considered in light of the guidance and BMPs provided in Ecology's Manual or a reasonable equivalent. The focus should be on upgrading development practices and mitigation requirements in areas where stream flow and fish habitat may be compromised as development occurs. Costs, expected magnitude of benefits, and feasibility considerations should be included in this review.

Table ES-6 (cont.)
Watershed Management Policies and Recommendations
WRIAs 25 and 26

Code	Issue	Policy or Recommendation
Recommendation (Pg 4-45)	Development Practices & Stormwater Management (Coweeman River)	Cowlitz County and the City of Kelso should review and consider revising their stormwater management ordinances and rules, in light of the guidance and BMPs provided in Ecology's stormwater manual.
Policy SFP-11 (Pg 4-30)	Sewer Extensions	Lewis, Cowlitz, and Wahkiakum Counties and the cities in all three counties in WRIAs 25 and 26 should develop policies to address the water balance implications of extending sewer service to developing areas. The Planning Unit recognizes that provision of sewer service can provide substantial water quality benefits. However, where sewer service is extended to replace septic systems, and residents continue to rely on water wells, stream flows may be reduced. This effect should be anticipated and mitigated where applicable. This is particularly important in areas with relatively dense development near small streams.
Policy SFP-12 (Pg 4-31)	Floodplain Management	Local jurisdictions and state agencies with land management responsibilities should protect existing floodplains from modifications that would impair their hydrologic functions and habitat value. Local jurisdictions and state agencies with land management responsibilities should identify floodplain restoration projects, subject to local input, cost-benefit analysis, and availability of funding. Where these factors are favorable, and where substantial benefits to flow or other habitat factors are identified, these projects should be pursued for implementation. Current floodplain uses and the benefits of existing control structures will be considered when determining if specific floodplain restoration projects should be pursued.
Policy SFP-13 (Pg 4-32)	Wetlands Management	Lewis, Cowlitz, and Wahkiakum Counties should assess the hydrologic function of wetlands as a part of their wetlands inventory. Their wetlands ordinances should be modified as needed to include hydrologic functions in the wetland protection hierarchy. The three Counties should review and consider strengthening mitigation ratios, for selected wetland areas that offer significant hydrologic functions or other fish habitat benefits.
Recommendation (Pg 4-50)	Wetlands (Lower Cowlitz Tributaries)	Lewis County should perform an inventory of the wetland complexes in the Lacamas Creek, Olequa Creek and Mill Creek drainages. These wetland areas should be a high priority in the County's management of wetlands, as they are the most likely to impact tributary stream flows. The County should develop a strategy to protect these wetlands, and restore hydrologic functions where needed.

Table ES-6 (cont.)
Watershed Management Policies and Recommendations
WRIAs 25 and 26

Code	Issue	Policy or Recommendation
Recommendation (Pg. 4-50)	Wetlands (Mainstem Cowlitz River)	Lewis and Cowlitz Counties should take steps similar to those listed above, with regard to protecting wetlands along the mainstem Lower Cowlitz River. Lewis and Cowlitz Counties should partner with the State of Washington and local cities to identify and pursue opportunities for floodplain restoration projects to benefit flows and fish habitat. Project implementation should be subject to local input, cost-benefit analysis, and availability of funding. If these factors are favorable, projects should be carried out.
Recommendation (Pg 4-45)	Floodplain and Wetlands Management (Coweeman River)	Cowlitz County should perform an inventory of the wetland complexes in the Coweeman River subbasin. These wetland areas should be a high priority in the County's management of wetlands.
Recommendation (Pg. 4-35, 4-39)	Floodplains and Wetlands, Grays River	Wahkiakum County should apply its land-use management authorities to protect existing floodplains and wetlands in the Grays River and Elochoman River subbasins. In addition, the County should partner with the State of Washington to assess whether hydrologic functions of major floodplains and wetlands have been disrupted, and to identify restoration opportunities where feasible and cost-effective.
Water Quality Policies and Recommendations		
Policy SWQ-1 (Pg 5-1)	TMDLs	The Washington State Department of Ecology's program to set Total Maximum Daily Loads (TMDLs) for waterbodies that do not meet state water quality standards is the primary vehicle for addressing surface water quality at the regional scale.
Recommendation (Pg 5-5)	TMDLs	The Planning Unit recommends that Ecology develop TMDLs according to the priority list shown in Table 5-2. These priorities should be re-visited at such time as the 2002/2004 303(d) list is approved by Ecology and EPA.
Recommendation (Pg. 5-7)	Monitoring of Surface Water Quality	The Planning Unit recommends that monitoring of surface water quality in WRIAs 25 and 26 be enhanced to improve information on baseline conditions and long-term trends.
Implementation		
Recommendation (Pg. 7-3)	Implementation Phase – Coordination and Oversight	In order to provide a venue for these activities, it is recommended that the WRIAs 25 and 26 Planning Unit transition from planning functions to coordination and oversight functions as listed above. The purpose is to foster an organized and collaborative approach, as many individual organizations carry out specific actions under their jurisdictions, and to secure funding for implementation. It is also recommended that LCFRB continue to provide staff resources to support the Planning Unit in this activity. Funding for these purposes can be based on the State Phase 4 grants for the first five years of the implementation phase. An interlocal agreement may be useful in defining coordination and oversight responsibilities. Such an agreement may also be beneficial in further defining other implementation commitments among the organizations involved, beyond the level of detail presented in this Plan.

Section 1
Introduction and Purpose

Water Resource Inventory Areas (WRIAs) 25 and 26 are located in southwest Washington State, and comprise large portions of Wahkiakum County, Lewis County, and Cowlitz County, and smaller portions of Skamania, Pacific, Yakima and Pierce Counties. A variety of needs must be met by surface and ground waters in this region of the state. Population growth in the region is minimal, with exceptions being in the Longview-Kelso area where growth is moderate. However, there remains a need to maintain and manage water supply, including those small communities that have pending water supply and water rights issues. Agricultural producers need continued access to water for irrigation and stock watering. Large industrial facilities require water for their operations. Local streams provide habitat for fish species that have recently been listed under the federal Endangered Species Act, as well as sustaining non-listed fish and wildlife. Finally, the region's rivers, streams and lakes offer fishing, boating and other recreational opportunities and natural beauty for residents and visitors to the area.

In general, current conditions in the basin are such that the WRIAs 25 and 26 stakeholders are not facing immediate and critical water shortages or conflicts and have an excellent opportunity for long range water resources planning through the watershed planning process. This Watershed Management Plan addresses a range of issues related to water resources in WRIAs 25 and 26, including water supply, stream flow management, water quality, and fish habitat. It reviews alternative approaches for managing water resources in the area and recommends selected strategies for implementation.

1.1 Legal Basis for Planning

In 1998 the Washington State Legislature passed the Watershed Management Act (WMA – Chapter 90.82 RCW) to provide a framework for citizens, interest groups, and government organizations to resolve water-resource issues in each of the State's 62 WRIAs. The Act offers funding for areas that wish to undertake planning and specifies ground rules for use of the funding.

The WMA provides for formation of a Planning Unit to develop a watershed plan, and provides a process for local counties to approve the plan or identify needed changes. The WMA identifies four topics that can be addressed as part of a watershed plan. Water quantity must be addressed if grant funding is received. Water quality, habitat, and recommendations regarding the setting of instream flows can also be addressed, but are optional under the law. The law specifies certain types of information that must be gathered in preparing a watershed plan. It also identifies a range of water-resource management strategies that must be considered. The law states that watershed plans must be consistent with efforts already under way in each watershed, and should not duplicate these efforts.

The law also identifies a number of limitations on watershed plans. For example, they may not conflict with existing law, modify laws, ordinances or permits, or impair existing water rights. The Plan cannot impose obligations on any organization without its consent.

1.2 Application of Watershed Planning in WRIAs 25 and 26

In WRIAs 25 and 26, a Planning Unit was formed in 1999 and held monthly meetings from then through 2004. Planning Unit representation is listed at the front of this document, following the title page. The Lower Columbia Fish Recovery Board (LCFRB) was selected to serve as the lead agency to receive and manage State grant money on behalf of the Planning Unit and to provide staffing and facilitation throughout the planning process. In 2000 each Initiating Government[1] adopted by resolution to include all four elements in the scope of planning: Water Quantity, Water Quality, Instream Flows and Habitat.

The Planning Unit and LCFRB have worked closely with professional service providers to assess watershed conditions and develop the Watershed Plan. This Plan was prepared by HDR/EES under the direction of LCFRB and the Planning Unit.

In accordance with the Watershed Management Act, this Plan has been developed in three phases. Phase I was an organizing phase, held during 1999 under the direction of the Initiating Governments. During Phase I the Planning Unit was organized, and the mission statement, ground rules, and operating principles were adopted (Appendix A, B, and C). A detailed work program was developed and funds for Phase 2 and 3 planning were obtained.

Phase II was an assessment phase, to gather technical information regarding the region's water resources and associated needs. A Level 1 assessment was carried out during 2000 and 2001 to assess existing conditions in the watershed. A final report for the Level 1 assessment was issued in September 2001 (EES, 2001). In November and December four public workshops were held in Morton, Toledo, Kelso and Cathlamet to review the findings with the public. Information and comments received during the meeting were incorporated into the final Level 1 report issued in January 2002. In May of 2002 an All-Commissioners meeting was convened where the Level 1 materials were reviewed. The Commissioners were provided an overview of additional studies that would be conducted and the draft plan development process. They were also provided information on integrating the watershed management plan into the regional ESA[2] salmon recovery plan. It was determined staff would meet again with each county individually to review the draft watershed management plan in 2004.

A Level 2 assessment was also carried out to provide in-depth technical studies. Several technical memoranda were developed during the Level 2 assessment and one report was completed in Fall 2003 (PWR 2003).

Phase III of the process was the Planning Phase, carried out from 2002 through 2004. This process was carried out in three stages. First, goals and objectives were established through a planning unit workshop and subsequent meetings. Second, a series of technical memoranda was prepared to provide review and analysis of key issues and alternative strategies in the areas of water supply, flow management, and surface water quality. Finally, this Watershed Plan

[1] WRIA 25 and 26 Initiating Governments include the seven counties, the largest city in each of the WRIAs, the largest water purveyor, and the Chinook and Cowlitz Tribes and the Yakama Nation.
[2] The Federally established Endangered Species Act.

document was prepared integrating all aspects of the planning process and recommending water resource management strategies.

The technical memoranda from all three phases are listed in Table 1-1. Together, they provide the background and basis for the water resource management alternatives presented and are cited extensively throughout this Plan document.

Table 1-1
Technical Memoranda Prepared During Planning Process

Assessment Phase: Level 1 Assessment [1]
Level 1 Technical Assessment for WRIAs 25 and 26 (September 2001)
Assessment Phase: Level 2 Assessment
TM No. 6 (Task 9): Hydrologic Modeling of Effects of Land Use Changes WRIAs 25 and 26 Grays River, Mill, Abernathy, and Germany Creeks, Olequa Creek, Delameter Creek (PWR, Draft, December 2003)
Planning Phase [2]
TM No. 1 (Task 2): Assessment of Key Issues and Existing Plans for Major Water Users (September 2002)
TM No. 2 (Task 3): Instream Flow Assessment – Elochoman and Coweeman Rivers (August 2002)
TM No.3 (Task 4): Overview of Potential Water-Resource Management Options Part 1: Water Supply (November 2002)
TM No. 3 (Task 4): Overview of Potential Water-Resource Management Options Part 2: Instream Flow (November 2002)
TM No. 7 (Task 5): Develop Strategies for Managing Flow (December 2003)
TM No. 4 (Task 4): Groundwater Development Scenarios and Follow-up Studies (Kennedy/Jenks, March 2003)
TM No. 7 (Task 7): Assessment of Priorities for Surface Water Cleanup Plans (TMDLs) (August 2003)
TM No. 8 (Task 7): Surface Water Quality Monitoring Strategy for WRIAs 25 and 26 (Michael Barber, April 2004).
TM No. 9 (Task 3-170): Tidal Effects as Related to Stream Flow Protection Rule (December 2004)

TM = Technical Memorandum
(1) All Level 1 Assessment documents prepared by EES
(2) All Planning Phase Technical Memoranda prepared by EES except where noted.

1.3 Planning Objectives

In February 2002 a workshop was held to identify objectives to guide the Phase III planning process. The list of objectives developed at the workshop was refined by the Planning Unit at a subsequent meeting in March 2002. The resulting list of objectives is presented in Table 1-2. The activities carried out during Phase III and the recommendations presented in this Watershed Management Plan were designed to meet this set of objectives.

Table 1-2
Planning Objectives

I. Objectives to Protect or Enhance Conditions in the Watershed

- Provide long-term reliable and predictable water supplies for human uses.
- Improve certainty, timeliness, and efficiency in water rights decisions.
- Manage stream flows to effectively support fish recovery and habitat enhancement plans.
- Provide for improved stormwater and flood control through improved land use practices
- Protect surface water quality for designated uses, with an emphasis on protection of fish and supporting aquatic biota.
- Protect surface and ground water quality needed for public drinking water supplies.
- Maintain productive habitat and enhance degraded habitat for indigenous/native fish species in all life stages.
- Ensure public waters are accessible for recreational uses.

II. Objectives Regarding the Process for Developing and Implementing Watershed Plan

- Manage water resources in a cost-effective manner, taking into account existing programs, potential partnerships, cost/benefit principles, and opportunities to achieve multiple objectives.
- Ensure fairness in distributing costs and burdens of water-resource management actions.
- Improve public understanding of water resources and encourage responsible stewardship.
- Provide for extensive and meaningful public participation.

III. Objectives for Improved Information and Data Management

- Improve scientific basis for decision-making on water-resource issues, through sound data, accepted technical methods, and effective quality assurance/quality control protocols.
- Develop effective protocols, administrative arrangements and funding sources for long-term monitoring to support adaptive management of water resources.

1.4 Organization of this Document

This document is organized into eight sections, as follows:

Section 1: Introduction and Purpose
Section 2: Existing Conditions
Section 3: Management of Water Supplies
Section 4: Management of Stream Flows
Section 5: Management of Surface Water Quality
Section 6: Management of Fish Habitat Conditions (Non-Flow)
Section 7: Plan Implementation Considerations

There are several appendices containing additional information on the analysis and strategies recommended in this Plan. Appendices providing detailed information on the habitat element are contained in three volumes bound separately and covering habitat protection and restoration actions recommended for the Grays, Elochoman, and Cowlitz Subbasins, respectively.

Section 2
Existing Conditions

This section summarizes existing conditions in Water Resource Inventory Areas (WRIAs) 25 and 26, including water supply systems, surface and ground water resources, surface and ground water quality, and fish habitat. This section provides basic background information in an overview format. More information on many of these topics is provided in subsequent sections of this Plan.

The information contained in this section was drawn primarily from the Assessment Phase of the watershed planning effort and various technical memoranda developed during the Assessment and Planning Phases (see Table 1-1). For detailed information, the reader should refer to those documents, which are available from the Lower Columbia Fish Recovery Board (LCFRB).

2.1 Physical Setting

Exhibit 2-1 displays key features of WRIAs 25 and 26. WRIAs 25 and 26 occupy approximately 296,000 and 1,592,000 acres, respectively, including large portions of Wahkiakum, Lewis, and Cowlitz Counties, and smaller portions of Skamania, Pacific, Yakima, and Pierce Counties.

The physiography of the area is widely varied, ranging from temperate lowlands near sea level to high mountainous terrain at elevations over 8,000 feet. The hydrologic features of the basins vary along with topography. At higher elevations in the Cascade Range, steeply dropping streams form waterfalls, pools, and rapids. In the lower portions of each basin, the terrain alternates from narrow canyon sections to broad meandering stretches with floodplains and terrace features.

For the purposes of this Plan, the Planning Unit defined twelve subbasins within WRIAs 25 and 26, each based on prominent surface water features within each WRIA. The subbasins are listed below for each WRIA:

WRIA 25
Grays River
Skamokawa Creek
Elochoman River
Abernathy/Germany Creek
Coal Creek/Longview Slough

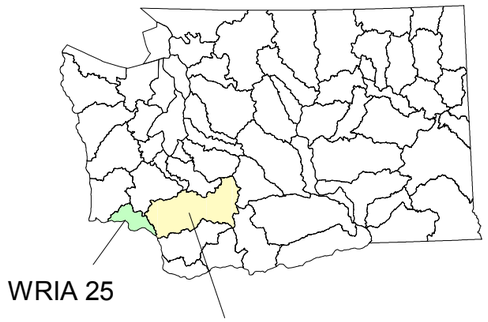
WRIA 26
Upper Cowlitz River
Cispus River
Tilton River
Mayfield Dam
Toutle River
Coweeman River
Lower Cowlitz River

In the habitat volumes (Appendices bound in separate volumes) the WRIA 25 subbasins are grouped together as the Grays and Elochoman Subbasins. All of WRIA 26 is grouped together as the Cowlitz Subbasin.

This Plan does not address management of the Columbia River.

LEGEND

- Cities
- Major Highways
- WRIA 25/26 Boundaries
- WRIA 25/26 Subbasins
- Counties
- Surface Water
- Waterbodies



Pierce County

Packwood

Randle

Upper Cowlitz River

Morton

Mossyrock

Tilton River

Lewis County

Mayfield Dam

Cispus River

Winlock

Lower Cowlitz River

Vader

Toledo

Pacific County

Abernathy / Germany Creek

Grays River

Skamokawa Creek

Castle Rock

Toutle

Toutle River

Skamania County

Cathlamet

Wahkiakum County

Coweeman River

Elochoman River

Coal Creek / Longview Slough

Longview

Kelso

Cowlitz County

N

5 0 5 10 Miles

EXHIBIT 2-1
WRIA 25/26 WATERSHED PLAN
Planning Area

August 2004

ECONOMIC AND ENGINEERING SERVICES, INC.
Bellevue, Mount Vernon, Olympia, Portland, Tri-Cities

8/17/04 25-26(august 2004).apr

The climate of the WRIAs 25 and 26 basins is heavily influenced by the presence of both the Coast Range and Cascade Range. Headwaters in each of these basins receive substantial precipitation. Mean annual precipitation ranges from 40 inches near the mouth of the Cowlitz River to about 130 inches along both the Coast Range and the Cascade crest. Throughout each basin the pattern of precipitation is seasonal with approximately 60 to 80 percent of annual precipitation occurring from October to March.

2.2 Land Use, Economy, and Population

In WRIAs 25 and 26 forested lands comprise 77 and 67 percent, respectively, of the land cover. Non-forested and logged land cover makes up 11 percent in WRIA 25 and 26 percent in WRIA 26. Agriculture makes up approximately 8 percent of land cover in WRIA 25 and 5 percent in WRIA 26, while urban developed land is 2 percent and 0.5 percent of land cover in WRIAs 25 and 26, respectively. Surface water bodies make up the remaining land cover. Tables 2-1a and 2-1b provides a summary of the land use in each of the subbasins in WRIAs 25 and 26.

The WRIAs 25 and 26 landscape is evolving slowly. Agricultural use has diminished and timber harvest has declined, while residential growth is occurring in both incorporated and unincorporated areas. The southwest Washington manufacturing economy is comprised primarily of wood processing, paper manufacturing, high-tech industries, and food processing. The local agricultural economy is composed mainly of hay production, livestock and dairy industries, and nurseries.

The population of WRIAs 25 and 26 was approximately 114,500 in year 2000. As depicted in Table 2-2, this population is expected to increase by over 33,000 people between 2000 and 2020. Although the percentage increase is relatively significant (29%), the overall population growth in absolute terms is relatively small over basins as large as WRIAs 25 and 26. Approximately half of the total population within WRIAs 25 and 26 is located outside of incorporated areas.

2.3 Sources of Water Supply and Projected Water Supply Needs

Communities in WRIAs 25 and 26 rely upon a variety of systems to meet their needs for domestic water supply, commercial and industrial supply, and agricultural supply. Such systems include large municipal systems, small public water systems, individual domestic wells, and wells and diversions owned by self-supplied industrial and agricultural users.

Most water supply needs in WRIAs 25 and 26 are found at the downstream end of watersheds. This is true in the Grays River, Elochoman River, Mill, Germany, Abernathy Creek subbasins, and the lower Cowlitz River subbasin. The exceptions are the Town of Mossyrock and the Cities of Toledo and Winlock and Morton, which are located higher in the Cowlitz River subbasin.

Table 2–1a
WRIA 25 Land Cover Summary

Basin	Developed (acres)		Agriculture (acres)	Forest (acres)			Aquatic (acres)		Non-Forested, Logged
	Business	Residential	Agriculture	Conifer	Hardwood	Mixed	Lakes, Shoreline Marshes	Riparian, Wide Rivers	
Grays River	--	--	6,280	66,517	17,341	6,937	--	1,899	5,230
Skamokawa Creek	--	--	4,984	13,027	23,568	--	--	408	4,088
Elochoman River	--	--	4,759	27,372	15,088	--	--	275	4,739
Abernathy/ Germany Creek	--	--	744	33,629	8,655	--	--	515	13,896
Coal Creek /Longview Slough	3,463	2,172	7,298	13,508	2,671	--	128	1043	5,724

Table 2-1b
WRIA 26 Land Cover Summary

Basin	Developed (acres)		Agriculture (acres)	Forest (acres)			Aquatic (acres)		Non-Forested, Logged
	Business	Residential	Agriculture	Conifer	Hardwood	Mixed	Lakes, Shoreline Marshes	Riparian, Wide Rivers	
Lower Cowlitz River	740	4102	72,597	154,154	22,751	11,287	99	3,449	22,678
Coweeman River	254	1,891	--	13,508	11,984	--	--	1,177	13,699
Toutle River	--	--	128	186,551	10,040	159	4,777	427	124,771
Tilton River	--	969	941	68,955	8,533	--	--	--	19,177
Mossyrock Dam	--	--	32	83,587	13,784	15,923	13,369	534	5,153
Upper Cowlitz River	--	--	--	217,299	1,700	10,237	436	2,413	138,273
Cispus River	--	--	--	197,155	226	4,305	492	20	86,536

Table 2-2
WRIAs 25 and 26 Population Projection

Subbasin	2000	2020
Grays River	1,502	2,064
Skamokawa Creek	1,502	2,064
Elochoman River	2,367	3,128
Abernathy/Germany Creek	1,502	2,064
Coal Creek/Longview Slough	62,498	79,568
Upper Cowlitz	907	1,107
Cispus River	907	1,107
Mossyrock Dam	907	1,107
Tilton River	4,836	6,766
Toutle River	907	1,107
Coweeman River	30,578	38,948
Lower Cowlitz River	6,054	9,424
Total	114,470	148,454

Source: Population estimates are based upon projections of municipal water providers and County planning staff. Details of the population projection are included in the Level 1 Assessment (EES 2001).

In general water needs throughout WRIAs 25 and 26 are met by both surface and ground water supplies. Municipal, industrial, and residential water supplies in WRIAs 25 and 26 are a mix of surface water diversion and ground water wells. The most significant consumptive surface water demands are composed of municipal and industrial uses primarily located in the Longview-Kelso area. The Cities of Longview and Kelso obtain source water from the Cowlitz River (Kelso has a Ranney well along the Cowlitz River) above the confluence with the Columbia River. Aside from moderate growth in these cities, no major changes to the use of water resources in the area are expected. The town of Cathlamet receives its water supply from the Elochoman River, while other communities such as Toledo and Mossyrock receive water supplies from ground water.

Based on a water rights review, ground water sources supply over 90 percent of the water required of self-supplied commercial and industrial facilities. Water rights for irrigation and stock watering demands are more evenly distributed among surface and ground water sources (i.e., 52 percent ground water, 48 percent surface water).

Other smaller municipal water providers are expected to have a relatively large percentage increase in population growth; however, the absolute increase in demands as a result of the growth will be relatively small. These smaller purveyors include the towns of Cathlamet, Castle Rock, Winlock, Toledo, and Mossyrock. There are still other small purveyors in the basin that did not specifically participate in the planning process, but their demands are accounted for

Table 2-3 presents current and projected demands through year 2020 for water use in the above-mentioned categories. The growth in municipal and domestic demand is expected to be served primarily by the following large municipal water systems of the City of Longview, City of Kelso, and Cowlitz PUD.

Table 2-3
WRIAs 25 and 26 Water Demand Projections (in acre-feet/year)

Water Use Category	2000	2020
Municipal and Domestic [1]	19,516	29,297
Self-Supplied Industrial	195,065 [2]	195,065
Agricultural	48,763 [3]	48,763
Total	263,344	273,125

Source: Municipal water use obtained from purveyor water system plans (see Section 3). Domestic water use calculated from Washington State Department of Health data (Drinking Water Automated Information Network, 2002).

[1] Majority of growth expected to be served by municipal water systems.

[2] Includes self-supplied industrial users in the Longview area. Estimated amounts obtained from the October 1999 Longview-Kelso Urban Area Comprehensive Water Plan

[3] Agricultural use includes estimates for mining, livestock, and irrigation. Data source is Water Use Data by County compiled by USGS, 1995. Usage assumed to not have changed greatly from 1995 to 2001.

2.4 Surface Water Resources

The major river systems located within WRIA 25 are the Grays and Elochoman Rivers, along with Skamokawa, Abernathy, and Germany Creeks. In WRIA 26, they are the Cowlitz River, Cispus, Toutle, Tilton, and Coweeman Rivers. Exhibit 2-1 identifies these major water bodies. Table 2-4 provides a summary of the major water features and their drainage areas, organized by subbasin.

Table 2-4
Major Surface Water Bodies in WRIAs 25 and 26 subbasins

Subbasin	Major Surface Water Features	Area (square miles)
Grays River	Grays River, West Fork Grays River	163
Elochoman River	Elochoman River	81.6
Skamokawa Creek	Skamokawa Creek	72.0
Abernathy-Germany Creeks	Abernathy and Germany Creeks	89.7
Coal Creek- Longview Slough	Coal Creek	56.3
Upper Cowlitz River	Cowlitz River, Lake Scanewa	579
Lower Cowlitz River	Cowlitz River	456
Cispus River	Cispus River	451
Mayfield Dam Subbasin	Cowlitz River (Mayfield Lake and Riffe Lake)	207
Tilton River	Tilton River	154
Toutle River	Toutle River (N. and S. Forks), Green River, Spirit Lake, Silver Lake	511
Coweeman River	Coweeman River	66.4

There are limited stream gauges throughout WRIAs 25 and 26 that have relatively recent measurements, long periods of record, and are free of multiple long data gaps. Table 2-5 provides a summary of the existing US Geological Survey (USGS) gauges that meet these criteria.

Table 2-6 provides a summary of median January and August flows for four primary surface water bodies, illustrating the range in flows throughout the basin, both on a geographic and temporal basis.

Determinations of minimum instream flow requirements for fish habitat, as would be established by Ecology, via rule adoption or administrative processes, have not been determined for any of the subbasins. However, some tributary streams have been closed administratively to further appropriations (see Section 4).

Table 2-5
Stream Gauge Locations and Record Summary – WRIAs 25 and 26

USGS Station No.	Name/Location	Drainage Area (square miles)	Period of Record
14246000	Abernathy Creek near Longview	20	1949-1957
14242580	Toutle River at Tower Rd.	496	1988-present
14249000	Grays River above S. Fork	40	1955-1975
14247500	Elochoman River near Cathlamet	66	1940-1971
14245000	Coweeman River near Kelso	119	1950-1984
14236200	Tilton River above Bear Creek Canyon Cr.	141	1956-present
14232500	Cispus River near Randle	321	1910-1996
14238000	Cowlitz River below Mayfield Dam	1,400	1934-present
14226500	Cowlitz River at Packwood	287	1911-present

Table 2-6
Median Flows for Selected Streams – WRIAs 25 and 26

Stream	Median January Flow (cfs)	Median August Flow (cfs)
Coweeman River	~600	~48
Abernathy Creek	~175	~10
Elochoman River	~550	~28
Grays River (Above South Fork)	~400	~21

2.4.1 Hydropower Facilities

The City of Tacoma operates a major hydropower facility, the Cowlitz River Project, on the Cowlitz River which has significant impacts on instream flows. While the Planning Unit does not have control over operation of the project and its associated instream flow impacts, it is important to understand the project since its impact on flows is substantial.

The Cowlitz River Project consists of two dams with hydropower facilities. The first dam, the Mayfield Dam, is located at River Mile 52 and was built in 1963. The dam is 250 feet high, impounds Mayfield Lake behind it with a gross storage of 133,700 acre-feet, and has an associated powerhouse with four turbines for a combined capacity of 162

megawatts. The second dam, Mossyrock Dam, is located at River Mile 65 and was built in 1968. The dam is 606 feet high, impounds Riffe Lake behind it with a gross storage of 1,685,100 acre-feet, and has an associated powerhouse with two turbines for a combined capacity of 300 megawatts. The primary purpose of the project is to generate electricity, although the stated purpose also includes flood control, recreation, and downstream flows for fish habitat protection.

Hydropower projects require licensing by the Federal Energy Regulatory Commission (FERC). The Cowlitz River Project was originally licensed in 1951 for a 50 year term. Tacoma began the relicensing process in the 1990's. Several groups protested the relicensing on multiple grounds including instream flows. In September of 2000, Tacoma filed a settlement agreement with FERC which was negotiated with most of the protesting groups. A draft EIS was released in June of 2001, and the final EIS was released in November of 2001. A new 35 year license (#2016-044) was issued by FERC on March 13, 2002 with an effective date of April 12, 2002.

Flows are addressed in two manners related to the license. Maximum flow restrictions are addressed in the main body of the license. Maximum flow restrictions are established to reduce flooding and the target is to keep flows at the downstream community of Castle Rock below 70,000 cfs. Two exceptions exist to this discharge rate requirement. First, discharge rates can exceed "equivalent maximum sustained turbine capacity" if necessary to quickly make room for flood storage. Second, additional discharge rate restrictions apply when releasing stored flood waters above elevation 770 Feet (Mean Sea Level Datum). In that case, the goal is to use a discharge rate that will keep Castle Rock flows below 50,000 cfs if possible.

Minimum flow requirements are addressed in the settlement agreement, which is an appendix to the license. Minimum flow requirements range from 2,000 cfs from July through September to 5,000 cfs from March through June.

The Cowlitz River Project recently went through the FERC relicensing procedure, and a schedule was established for instream flow requirements for release from Mayfield Dam. These flows are a condition of the operating license and are a primary factor affecting stream flows on the mainstem Cowlitz River from Mayfield Dam to the mouth of the river.

Lewis County PUD No. 1 operates the Cowlitz Falls Dam and impounds Lake Scanewa, which is located near the mouth of the Upper Cowlitz Subbasin. The Dam is 140 feet above streambed and the reservoir is normally operated between elevation 860 feet and 862 feet. The Cowlitz Falls Dam project operates under FERC license #2833 which was issued on June 30, 1986. The license is due to expire on June 30, 2036. There are no minimum flow requirements when Riffe Lake is above elevation 750 feet. However, when Riffe Lake levels fall below elevation 750 feet, the facility is to release the lesser of 1,000 cfs or the inflow coming into Lake Scanewa. Furthermore, if flows at Randle exceed 15,000 cfs, the reservoir is to be drawn down 8 to 10 feet. When flows at the dam reach 27,000 cfs the reservoir may be drawn down an additional 10 feet to control sediment.

2.4.2 Potential Effects of Climate Change

Climate change can impact instream flows in three ways due to its impact on temperature and precipitation: change minimum flow volumes, change flooding probability, and change flow timing. While the Planning Unit clearly does not have control over climate change, it is important to consider climate change in order to understand its impact and since water resource management decisions can serve to mitigate unwanted impacts.

There are three types of climate change: El Nino/Southern Oscillation (ENSO), Pacific Decadal Oscillation (PDO), and global warming. Scientific understanding of these three phenomena varies. ENSO is well understood by the scientific community. PDO is less well understood by the scientific community. Global warming is the least understood, and a minority of the scientific community discounts its existence and/or causes.

ENSO-caused shifts in climate are driven by changes in the temperature of equatorial Pacific Ocean water temperatures. In the default situation, called ENSO neutral, the equatorial Pacific Ocean water temperature is cold in the east and warm in the west. Two changes, or phases, from this norm can occur. The warm phase, also called El Nino, occurs when the eastern portion of the Pacific Ocean is warmer than average. The cool phase, also called La Nina, occurs when the eastern portion of the Pacific Ocean is cooler than average. The impact of ENSO in North America is strongest from October to March. The life of each ENSO event (i.e. an El Nino) ranges from 6-18 months and a complete cycle can take 2-7 years. As mentioned above, the scientific community has a strong understanding of ENSO and events can often be forecasted 6-9 months in advance.

PDO is very similar to ENSO except for the following three aspects. First, PDO has a stronger impact in the north Pacific Ocean than in the equatorial Pacific Ocean. Second, the timing of PDO is much longer with an event life of 20-30 years and complete cycles taking 50-70 years. Third, as mentioned above, the scientific community has a less robust understanding of PDO, which means less understanding of its impact and less capability for prediction.

The third type of climate change is global warming, which is the warming of the earth's surface temperature. Certain elements of global warming are well understood and accepted, while other elements are less understood and accepted. Well understood elements include documentation that the temperature has indeed risen (approximately 1 degree F since the late 19th century); that greenhouse gases (primarily carbon dioxide, methane, and nitrous oxide) trap heat; and that humans contribute the majority of greenhouse gases to the atmosphere. Elements that are less well understood include the causal link between human contributions of greenhouse gases and warming, as well as how fast temperatures rise due to the presence of greenhouse gases. Finally, the element with the least understanding is the impact of increased temperatures, although global warming is predicted to impact many subject areas including water resources.

The impacts of climate change upon watersheds may be determined based upon the hydrologic type of the watersheds being analyzed. The WRIAs 25 and 26 subbasins are

rain-dominated in the lower subbasins, such as the Grays and Elochoman. The upper subbasins, such as the Cowlitz and Cispus, are considered transient (a combination of rain- and snow-dominated. The potential effects of climate change upon surface water flows in WRIAs 25 and 26 are summarized as follows:

- Low flows will be decreased in warm phases of ENSO and PDO. Low flows will be increased in cool phases of ENSO and PDO. The impact of global warming on low flows is uncertain.
- The probability of flooding will decrease in warm phases of ENSO and PDO. Flooding probability will increase in cool phases of ENSO and PDO, as well as due to global warming.
- No impact to flow timing is expected, since timing remains unchanged for rain-dominated basins.

This information regarding changes to low flows, flood probability, and flow timing should be helpful for managing rivers in WRIAs 25 and 26. For dammed rivers, such as the Cowlitz, this information could be incorporated into the operating rules for the rivers. For undammed rivers, this information can be used to inform strategies discussed later in the Watershed Plan including conservation, source substitution, land use practices, wetland protection, and floodplain management.

2.4.3 Tidally Influenced Stream Reaches

The lower reaches of streams discharging to the Columbia River within WRIAs 25 and 26 are influenced by tides from the Pacific Ocean. In these reaches, water is backed up, reducing velocities and increasing depth. This effect on flow is important in the context of this watershed management plan, because water withdrawals in a tidally influenced reach will have a different effect than water withdrawals in a free-flowing reach.

Tidally influenced streams and rivers occur in all of the WRIAs 25 and 26 subbasins that have tributaries to the Columbia River or that flow into the tidally influenced reaches of the Cowlitz River. These subbasins include: Grays River, Elochoman River, Skamakowa Creek, Germany-Abernathy-Mill Creeks, Coal Creek-Longview Slough, Lower Cowlitz River, and Coweeman River subbasins. The magnitude and timing of daily fluctuations in water levels in tidally-influenced reaches vary. Major factors include the distance from the mouth of the tributary to the mouth of the Columbia River, and the daily variation in tidal levels at the mouth of the Columbia River.

A brief review of tidal data shows that the water level on the Columbia River can vary nearly eight feet at Skamokawa Creek, which is near the mouths of both the Grays and Elochoman Rivers. At Longview, near the mouth of the Cowlitz and Coweeman Rivers, the tidal variation can be nearly five feet. Tidal influence extends further up the Columbia River beyond the City of Vancouver, where the range of daily fluctuation can be approximately one foot. These are maximum values: depending on the phase of the moon and other factors, the range of tidal variation may be less.

Within tributaries to the Columbia River themselves, the extent of tidal influence depends on the gradient of the tributary stream valley. A relatively flat tributary valley may have tidal influence for several miles upstream of its confluence with the Columbia River. A steeper tributary stream may have only a short reach with tidal influence. Information is available from different agencies that have estimated the extent of tidal influence in these tributaries. The Washington Department of Fish and Wildlife (WDFW) has estimated the extent of tidal influence. In addition, each tributary was assigned a tidal reach for the Ecosystem Diagnosis and Treatment (EDT) model developed for tributaries entering the Columbia. The average reach lengths for tidal reaches were determined from professional knowledge of each tributary gained through stream surveys. For the major streams that flow into the Columbia River, the Planning Unit reviewed the extent of tidal influence. This information was used to develop the stream closures component of the stream flow management strategy described in Section 4.

2.5 Ground Water Resources

The principal hydrogeological units that yield the largest quantities of ground water to wells within WRIAs 25 and 26 are the unconsolidated sediments (Alluvium Unit) that occur in the Cowlitz River system valleys, Grays River system valleys and along the Columbia River. Historically, these units have yielded between 5 and 500 gpm to wells in the upper parts of the Cowlitz and Grays River systems and from 500 to greater than 3,000 gpm near the Columbia River.

The next most productive aquifers are generally the Glacial and Terrace Units that are present only in WRIA 26. These aquifers are very complex geologically and yield from 15 to 350 gpm typically in wells. These wells are generally acceptable for domestic usage. The other geologic units that have the potential to produce sustainable ground water yield include the Wilkes Formation of the Continental Sedimentary Rock Units and the Columbia River Basalt Group (CRBG). However, yields in these formations are variable. Typical yields are on the order of 50 gpm in the Continental Sedimentary Rock Units and as high as 1,200 gpm in local portions of the CRBG.

No comprehensive mapping of exempt wells in the subbasin is available to evaluate whether areas of dense well clusters exist that may impact stream water levels. However, based on estimated total ground water use and projected population increase, the ground water withdrawal does not appear to be significant compared to base flow within the subbasins (refer to Section 3.4 for further discussion of exempt well impacts).

2.6 Surface Water Quality

Protection and improvement of surface water quality is an important objective linked to the Watershed Plan. However, programs already exist to protect and improve water quality, and it is not the intent of this Plan to duplicate such programs. The primary vehicle for achieving compliance with State criteria for surface water quality is the Washington State Department of

Ecology's (Ecology) Total Maximum Daily Load (TMDL) program, also known as Water Cleanup Plans.

As required by section 303(d) of the federal Clean Water Act (CWA), each state must identify its polluted waterbody segments and submit a list of these water quality limited estuaries, lakes, and streams to the U.S. Environmental Protection Agency (USEPA). To qualify for the list, it must be determined through water quality monitoring that the waterbody segment does not meet state surface water quality standards and that water quality is not expected to improve within the next four years. The standards are the criteria to ensure that water may be beneficially used for multiple purposes such as fishing, swimming, drinking, and fish habitat.

At the time this Watershed Management Plan was developed, Ecology's 1998 303(d) list served as the State's official list of impaired water bodies. Development of the "2002/2004" list was underway, and a draft of this new list is included as Appendix F of this plan. However, the 1998 list was used to develop recommendations. Once finalized, the 2002/2004 list should be revisited during the implementation phase of the Watershed Plan.

Eighteen waterbody segments in the WRIAs 25 and 26 planning area are on Ecology's 1998 303(d) list. A summary of these impaired waterbody segments and the parameters in violation of water quality standards are found in Table 2-7. This list should not be considered an exhaustive inventory of all segments in the study area with water quality impairments, as there is a lack of quality data quantifying water quality violations in many cases; rather, the list includes only those that were formally listed on the 1998 list.

Only Skamokawa Creek, Tilton River, and Mossyrock Dam subbasins do not contain waterbody segments that are officially listed as impaired. Temperature is the most common parameter in violation of standards within the planning area, with 17 impaired waterbody segments. Only the Longview ditches have other water quality parameters besides temperature listed.

It is noted that the Longview Ditches are listed in the 2002/2004 list only for dissolved oxygen and fecal coliform. On the 1998 list, the Longview Ditches were also listed due to lead and turbidity. These changes are due in part to water quality management efforts of the City of Longview and Consolidated Improvement District No. 1.

Table 2-7
1998 303(d) List[1] of Impaired Waterbody Segments in WRIAs 25 and 26

Listed Waterbody Segment	Parameter(s)[2] in Violation of Water Quality Standards
Grays River Subbasin	
Grays River, West Fork	Temp
Elochoman River Subbasin	
Elochoman River	Temp
Abernathy-Germany Creek Subbasin	
Abernathy Creek	Temp
Germany Creek	Temp
Coal Creek/Longview Slough Subbasin	
Longview Ditches[3]	DO, FC
Upper Cowlitz River Subbasin	
Silver Creek	Temp
Willamette Creek	Temp
Lower Cowlitz River Subbasin	
Cowlitz River	Temp
Coweeman River Subbasin	
Baird Creek	Temp
Goble Creek	Temp
Mulholland Creek	Temp
Coweeman River	Temp
Toutle River Subbasin	
Herrington Creek	Temp
Green River	Temp
Cispus River Subbasin	
Cispus River	Temp
Cispus River, N. F.	Temp
East Canyon Creek	Temp
Iron Creek	Temp

(1) From the 1998 303(d) List; Department of Ecology, State of Washington.
(2) Parameter Abbreviations: Temp (Temperature); FC (Fecal Coliform); DO (Dissolved Oxygen). Ecology
(3) Parameters included in the 2002/2004 303(d) List are DO and FC, as depicted in the table. The 1998 303(d) List also included lead and turbidity for the Longview Ditches.

2.7 Ground Water Quality

A variety of factors have the potential to contribute to the degradation in quality of ground water supplies, upon which many communities rely as a primary source of drinking water. Such factors include point and non-point pollution sources, shallow aquifer depth, and unprotected ground water supplies.

Information on ground water quality is fairly limited in WRIAs 25 and 26. However, the information available suggests that, in general, water quality is currently in good condition in the shallow portions of the alluvium unit. Levels of monitored water quality parameters are generally within federal requirements, although there are elevated levels of inorganic constituents such as iron and manganese that require treatment in some of the deeper wells. This is generally true of deeper portions of the alluvium as well as glacial and terrace units, and Continental Sedimentary Rock Units and the CRBG.

2.8 Habitat Conditions

The LCFRB is leading a collaborative approach to restoring threatened anadromous fish species and rebuilding other focal fish and wildlife species in the Washington Lower Columbia River region. This approach integrates several different planning efforts, including Endangered Species Act (ESA) recovery planning, Northwest Power Planning Council (NWPPC) subbasin planning, and state salmon recovery planning, into a single regional planning process. A regional recovery/subbasin plan has been prepared (LCFRB 2004). The recovery planning process includes two Phases. Phase I is the development of a technical foundation. The foundation will be used in Phase II analyses to evaluate scenarios, strategies, and actions to further recovery.

The technical foundation is a comprehensive summary of information on subject fish and wildlife species, limiting factors, and subbasins included in the plan. Included are synopses of published and unpublished information as well as new analyses undertaken as part of the planning effort.

The planning effort focuses on six salmonid species. Four are listed as threatened under the ESA: chum, chinook, steelhead, and bull trout. One species, coho, is proposed for listing. Another species, coastal cutthroat, is included as a species of regional interest. These six species comprise 85 individual populations. The plan also addresses selected anadromous and resident fish and wildlife of interest under the NPCC subbasin planning process, including sturgeon, Pacific lamprey, smelt, northern pikeminnow, shad, introduced gamefish, dusky Canada goose, Caspian terns, Columbia white-tailed deer, sandhill crane, western pond turtle, and selected neo-tropical birds.

Subbasin habitat conditions that have an influence on salmonid population health include passage barriers, stream flow, water quality, nutrient loads, habitat diversity, substrate and sediment, woody debris, channel stability, riparian function, and floodplain function. Summary descriptions of the habitat conditions in the WRIAs 25 and 26 subbasins provided below were excerpted from the November 2004 Draft Subbasin Plans for the WRIAs 25 and 26 subbasins. Additional characterization of the habitat conditions of these subbasins is included in the Salmon and Steelhead Recovery and Subbasin Plan, which was developed concurrently with this Watershed Plan by the Lower Columbia Fish Recovery Board (refer to Section 7 of this plan).

- **Grays River Subbasin –**Chum, coho, and fall Chinook are most impacted by conditions within the middle mainstem and the lower portion of middle mainstem tributaries (i.e., Fossil Creek, Crazy Johnson Channel). Agricultural uses dominate the riparian areas and floodplains of these reaches, with forestry activities as the primary use on the surrounding hill slopes. The channel has been altered significantly due to past splash-damming, channel straightening, streambank hardening, and more recent flood control activities. The mainstem headwaters, East Fork Grays River, South Fork Grays River, and West Fork Grays River primarily support winter steelhead spawning and rearing. These reaches have been impacted most by recent and historical forest practices (including splash dam logging), which have disrupted riparian function, hydrology, and sediment supply processes.

- **Elochoman River Subbasin –** The upper Skamokawa and tributaries provide potentially productive habitat for all species. Wilson Creek primarily supports winter steelhead and coho. These reaches are heavily impacted by agriculture and rural residential development. Effective recovery measures will include riparian reforestation, cattle exclusion fencing, and floodplain re-connection. The lower Elochoman and the lower reaches of mainstem tributaries have been impacted by agriculture and rural residential development.

- **Mill-Abernathy-Germany Subbasin** – The reaches with the most current and potential production in the Mill Creek basin are in the lower mainstem (below the South Fork confluence and just upstream of the North Fork confluence), in lower South Fork Mill Creek, and in North Fork Mill Creek. The Mill Creek basin is nearly entirely forest land, with scattered rural residential development along the lower mainstem and lower South Fork Mill Creek. The primary impacts are related to basin-wide forest practices and recovery measures should therefore focus primarily on forestry related impacts.

  The most productive reaches in Abernathy Creek are located in the lowest 3-4 miles of the mainstem and in the tributaries Erick and Midway creeks. These reaches suffer from basinwide forest practices and from localized riparian and floodplain impacts related to agriculture and rural residential development. Successful restoration of habitat will involve riparian forest recovery, floodplain re-connection, and restoration of functional runoff and sediment supply processes from the entire basin.

  The lower and middle mainstem Germany reaches (Germany 1-8) are used by all salmonid populations. These reaches are impacted by basin-wide forest practices and by local agriculture and rural residential development. The upper Germany Creek reaches are utilized most by winter steelhead. These reaches are impacted most by upper basin forest harvest and road conditions. Germany Creek reaches will require stream corridor (riparian areas and floodplains) restoration as well as basin-wide recovery of functional runoff and sediment supply processes.

- **Lower Cowlitz Subbasin** – The lower mainstem Cowlitz and lower tributaries (e.g. Ostrander Creek, Lower Salmon Creek, Delameter Creek) historically provided productive habitat for chum, coho, and fall Chinook. These habitats, especially the mainstem, have been heavily impacted by mixed-use development. In addition to the influence of hydro-regulation from upstream dams, the primary impacts include channel manipulations, increased watershed imperviousness, and riparian degradation. Effective recovery measures will include riparian and floodplain restoration and land-use planning that protects and restores habitat and habitat-forming processes.

  Reaches with the greatest historical productivity in the middle mainstem are located between Skook Creek and Mayfield Dam. These reaches supported chum, fall Chinook, coho, and winter steelhead. Mill Creek was historically productive for coho and winter steelhead. One of the most effective recovery measures will be to preserve the canyon reaches downstream of the dam. This mixed use area will also benefit from land-use planning that protects and restores habitat and habitat-forming processes.

  The Olequa Creek basin contains potentially productive habitat for coho and winter steelhead. Key reaches include the mainstem Olequa and Stillwater Creek. These reaches are impacted primarily by urban and rural development and agriculture. Recovery emphasis is

for restoration of riparian areas, floodplains, and commercial forest lands. As with other rapidly developing portions of the lower Cowlitz basin, these areas will benefit from land-use planning that protects and restores habitat and habitat-forming processes. Lacamas Creek contains potentially productive habitats for coho, although winter steelhead also utilize these reaches. Lacamas Creek is impacted primarily by agriculture and rural development. The most effective recovery measures are consistent with those identified above for Olequa Creek. Salmon Creek contains productive habitat for coho and winter steelhead. Salmon Creek is impacted by agriculture along the first few reaches and by forest practices throughout the remainder of the basin. Riparian and floodplain restoration should be the emphasis along the first few reaches while restoration and preservation of watershed processes should be the emphasis on forest lands.

- **Coweeman River Subbasin** – The lower mainstem reaches contain potentially productive habitat for chum, coho, and fall Chinook. This reach is impacted by changes to the channel, riparian area, and floodplain due primarily to agricultural uses. Development around the outskirts of Kelso, WA also impact the Coweeman River. The most effective recovery measures will involve riparian and floodplain restoration. The middle mainstem reaches and Goble Creek are utilized most by winter steelhead, fall Chinook, and coho. They are impacted mostly by forest practices and to a limited degree by agriculture and rural residential uses. The most effective recovery measures will include riparian restoration and recovery of basin-wide watershed processes. The upper Coweeman reaches (including Mulholland and Baird Creeks) contain potentially productive habitat for coho, winter steelhead, and fall Chinook. They are heavily impacted by forest practices occurring throughout the upper Coweeman Basin. Restoration of basin-wide runoff and sediment supply conditions will yield the greatest benefits to fish habitat.

- **Upper Cowlitz, Tilton, Cispus River Subbasins –** The upper mainstem Cowlitz reaches with the greatest current or potential production are located between Siler Creek and Hall Creek. This alluvial reach contains historically productive spawning and rearing habitat for fall Chinook, spring Chinook, coho, and winter steelhead. The reaches with the greatest current productivity are located between Randle and Packwood. Effective restoration actions will involve addressing riparian and floodplain degradation related to mixed use development (agriculture, residential) along the river corridor and basin-wide watershed process restoration.

  The Cispus supports winter steelhead, coho, and spring Chinook. The most productive reaches are located in the alluvial section from Greenhorn Creek to just upstream of the North Fork Cispus confluence. The basin is nearly entirely within the Gifford Pinchot National Forest. The Tilton system is not expected to play a prominent role in recovery planning. The basin, however, was an important component of the historical upper Cowlitz populations and contains some potentially productive habitat that is currently degraded by watershed process impairments. Limiting factors, threats, and measures have therefore been specified for Tilton basin reaches. The primary impairments are related to intensive timber harvest and road building. There are also stream corridor impairments in and around the town of Morton, WA.

- **Toutle River Subbasin** - Potentially productive habitats for fall Chinook, chum, and coho exist in the lower few miles of the lower mainstem Toutle. These reaches were heavily

impacted by mud and debris flows during the 1980 Mount St. Helens eruption. Further degradation to channel, riparian, and floodplain conditions was caused by channel dredging and floodplain spoils placement in an effort to increase flow conveyance following the eruption. Effective recovery measures will entail reducing channel confinement and restoring riparian areas. The lower South Fork Toutle up to approximately Brownell Creek and the North Fork Toutle just upstream of the South Fork confluence have good current and potential habitat for coho and fall Chinook. These reaches also support winter steelhead, but to a lesser degree. The South Fork was heavily impacted by the 1980 eruption, but less so than the North Fork. These reaches have recovered significantly over the past 24 years. Floodplain and riparian restoration will need to be combined with recovery of functioning watershed process conditions. The upper South Fork Toutle provides important habitat for winter steelhead and fall Chinook. These reaches have experienced rapid recovery since the 1980 eruption and subsequent heavy timber harvests. The North Fork Toutle historically provided productive habitat for winter steelhead, spring Chinook, and coho. Fall Chinook may also have utilized these reaches to some degree. The reaches with the most potential are located just downstream of the Green River confluence and further upstream on the North Fork between Hoffstadt Creek and Castle Creek. Volitional passage is currently blocked just upstream of the Green River confluence by the sediment retention structure (SRS), created to retain eruption-related sediments following the 1980 eruption. North Fork Toutle reaches were severely impacted by mud and debris flows during the 1980 eruption, followed by intensive road building and timber harvests. The recovery emphasis is for restoration of watershed processes throughout the North Fork basin including addressing the dense road network and heavy harvests. Emphasis should also be placed on addressing the continued supply of sediment from the SRS, which has become a persistent limiting factor for fish in downstream reaches. Green River reaches contain important current and potential production for winter steelhead, fall Chinook, and coho, especially between Cascade Creek and Elk Creek. These reaches were spared the severe impacts from the 1980 eruption that most of the Toutle system experienced. These reaches are most impacted by forestry practices.

2.9 Tier System for Ranking Stream Reaches

The LCFRB has developed a Minimum Actions Recovery Scenario working draft which identifies specific fish populations and recovery goals to meet the recovery criteria developed by NOAA-Fisheries Technical Recovery Team. These criteria address abundance, productivity, diversity, spatial distribution, and habitat.

This scenario ranked populations using four categories or tiers for identified stream reaches. The tier designations are based on a combination of: a) priority of each fish population for restoration and b) potential for preservation or restoration of stream reaches. The tiers are listed and briefly described below in priority order from highest to lowest. A more detailed description of the development of these "tiers" and their application is included in the Salmon and Steelhead Recovery and Subbasin Plan, which is being developed concurrently with this Watershed Plan by the Lower Columbia Fish Recovery Board (refer to Section 7 of this plan).

Tier 1 Reaches include all high potential reaches for one or more primary populations.

Tier 2 Reaches include all reaches not included in Tier 1 and which are medium potential reaches for one or more primary species and/or all high potential reaches for one or more contributing populations.

Tier 3 Reaches include all reaches not included in Tiers 1 and 2 and which are medium potential reaches for contributing populations and/or high potential reaches for stabilizing populations; and

Tier 4 Reaches include reaches not included in Tiers 1, 2, and 3 and which are medium potential reaches for stabilizing populations and/or low potential reaches for all populations.

Exhibit 2-2 shows the Tier designations for stream reaches for each of the subbasins within WRIA 25, and Exhibit 2-3 shows these designations for subbasins within WRIA 26.

Grays River (Left Fork)
Grays River (Right Fork)
Grays River
East Fork Grays River
McDonald Creek
West Fork Grays River
Grays River
Grays River
South Fork Grays River
West Fork Elochoman River
Thadbar Creek
Nikka Creek
East Fork Elochoman River
Elochoman River
Skamokawa Creek
Abernathy Creek
Germany Creek
Midway Creek
Erick Creek
Fossil Creek
Abernathy/ Germany Creek
Germany Creek
West Valley Creek
Coal Cr/ Longview Slough
Skamokawa Creek
Skamokawa Creek
Wilson Creek
Elochoman River
Abernathy Creek
North Fork Mill Creek
Mill Creek
Cameron Creek
Spruce Creek
Mill Creek

LEGEND

Reach Tiers

Sub-Basins
Water
Rivers

1
2
3
4

N

5 0 5 Miles

WRIA 25

Washington State

EXHIBIT 2-2
WRIA 25
Habitat Reach Tier Priorities

August 2004

Economic and Engineering Services, Inc.
Bellevue Mount Vernon Olympia Portland Tri-Cities

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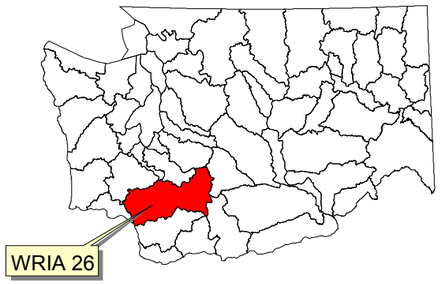

Washington State

Mill Creek
Tilton River
Miller Creek
Cowlitz River
Salmon Creek
Tilton River
Upper Cowlitz River
Lacamas Creek
Olequa Creek
Lower Cowlitz River
Cowlitz River
Stillwater Creek
Cispus River
Arkansas Creek
Toutle River
Toutle Creek
Salmon Creek
Delameter Creek
Coweeman River
Green River
Cispus River
Yellowjacket Creek
South Fork Toutle River
North Fork Toutle River
Coweeman River
Coweeman River

N

5 0 5 10 Miles

LEGEND

Sub-Basins
Water
Rivers

Reach Tiers
1
2
3
4

EXHIBIT 2-3
WRIA 26
Habitat Reach Tier Priorities

August 2004

ees Economic and Engineering Services, Inc.
Bellevue Mount Vernon Olympia Portland Tri-Cities

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Section 3
Management of Water Supplies

3.1 Introduction

WRIAs 25 and 26 are in an excellent position to proactively address water supply issues relative to many other areas of the state. This is partly due to the rural character of the planning area and the availability of tidally-influenced surface water for the Longview/Kelso's municipal and industrial uses. Although the planning area's needs are currently being met, moderate population growth in the area will translate into additional demand over the next 5 to 50 years.

Fish and wildlife also need cool, clean waters in sufficient supply. Changes to watershed processes have altered streams in the planning area in ways that impact the timing and duration of both high and low flows. These changes are a result of forest practices, agriculture, land use, climate cycles, and other factors. As a result, it is vital to retain as much surface water as possible in these basins to prevent additional impacts to fish and wildlife, including four salmonid species listed under the Endangered Species Act. Therefore, the Watershed Plan focuses on the protection and prudent use of water supplies for the future. With this in mind, the Planning Unit has established a high priority on defining strategies for the development of new water supplies that meet existing and future needs, while ensuring that stream flows are also protected or enhanced.

3.1.1 Population and Water Demand Projections for Municipal and Domestic Needs

The total population of WRIAs 25 and 26 is expected to increase by approximately 28 percent over the next 20 years. Table 3-1 and Exhibit 3-1 provide summaries of this change, illustrating a population increase of over 33,000 new people between 2000 and 2020. Year 2000 population figures are based upon Census 2000 data, while year 2020 population forecasts are based upon water supplier and County growth estimates.

While this amount of growth is not considered large relative to other areas of the state, it does represent additional water-supply demand. This new demand may cause problems in local areas where it impacts stream flows in critical tributaries for fish.

Table 3-1 and Exhibit 3-2 present the projected increase in water demands for various categories of municipal and domestic water use, including large and small public water systems, and individual domestic wells. The forecasts were obtained from purveyor water system plans and are depicted as average day demands (ADD) and maximum day demands (MDD), and are expressed in millions of gallons per day (mgd). Annual demands are expressed in the table in acre-feet.

Table 3-1
Summary of Projected Population and Municipal-Domestic Demand
WRIAs 25 and 26

	Year 2000				Year 2020			
	Population Served	ADD (mgd)	MDD (mgd)	Annual Demand (afy)	Population Served	ADD (mgd)	MDD (mgd)	Annual Demand (afy)
WRIA 25								
Major Public Water Systems								
Longview[1]	38,777	6.35	13.90	7,118	46,970	10.23	19.35	11,468
Small Public Water Systems								
Cathlamet	2,000	0.16	0.31	176	2,150	0.18	0.37	206
Other Community and Group B systems	N/A	0.25	0.53	282	N/A	0.39	0.83	442
Non-community systems	N/A	0.02	0.03	18	N/A	0.02	0.05	25
Individual Households	N/A	2.82	5.63	3,158	N/A	3.87	7.74	4,338
Unincorporated Areas[2]	29,395	N/A	N/A	N/A	40,566	N/A	N/A	N/A
Subtotal	**70,172**	**9.60**	**20.40**	**10,752**	**89,686**	**14.69**	**28.34**	**16,479**
WRIA 26								
Major Public Water Systems								
Kelso	12,995	3.71	4.91	4,159	18,470	5.54	7.19	6,210
Cowlitz PUD	9,000	0.92	2.07	1,031	14,750	1.52	3.41	1,704
Small Public Water Systems								
Castle Rock[3]	2,085	0.50	1.00	560	2,127	1.03	2.06	1,155
Morton	1,389	0.18	0.36	200	2,063	0.26	0.53	297
Winlock	1,283	0.15	0.30	169	1,907	0.22	0.45	251
Toledo	781	0.09	0.19	105	1,280	0.15	0.31	173
Mossyrock	608	0.09	0.19	104	1,017	0.15	0.31	174
Vader	552	0.06	0.13	72	905	0.11	0.21	118
Other Community and Group B systems	N/A	0.96	1.90	1,064	N/A	1.15	2.32	1,298
Non-community systems	N/A	0.43	0.85	478	N/A	0.52	1.04	583
Individual Households	N/A	0.73	1.24	822	N/A	0.76	1.29	855
Unincorporated Areas [2]	15,605	N/A	N/A	N/A	16,249	N/A	N/A	N/A
Subtotal	**44,298**	**7.82**	**13.14**	**8,764**	**58,768**	**11.41**	**19.13**	**12,818**
Total for WRIAs 25 and 26	**114,470**	**17.42**	**33.54**	**19,516**	**148,,454**	**26.10**	**47.43**	**29,297**

Notes:

ADD – Average day demand

MDD – Maximum day demand

Mgd – million gallons per day

Afy – Acre-feet per year

Population and demand forecast data taken from Level 1 Assessment (EES 2001) and was based primarily on water system plans when available, and input from County staff and analysis of US Census Block data. Smaller communities (e.g., Randall, Packwood) are covered under "Other Community and Group B Systems"

(1) Longview is located within WRIA 25; however, its source of supply is the Cowlitz River and its diversion is considered within WRIA 26.

(2) Population estimates were calculated for the unincorporated areas as a whole based on county data and includes those people served by all community, non-community and Group B systems not explicitly listed in the table. N/A means that the population is included with the total population for unincorporated areas in the table.

(3) ADD and MDD for Castle Rock has been modified from the values used in the Level 1 Assessment based on specific estimates provided by Castle Rock during follow-up discussion during the Level 2 Assessment. Castle Rock estimates its current ADD as 0.5 mgd and 0.9 mgd by 2015. A peaking factor of 2.0 was assumed for MDD. ADD and MDD were projected to 2020 based on linear growth.

Exhibit 3-1
Population Projection for WRIAs 25 and 26

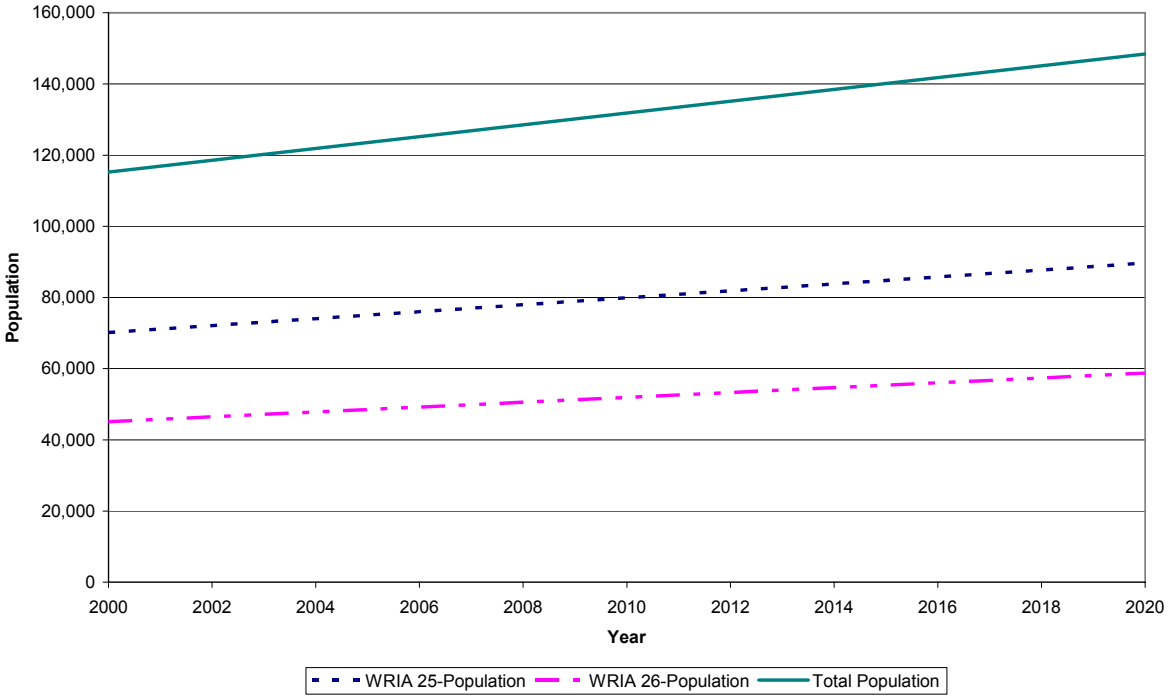
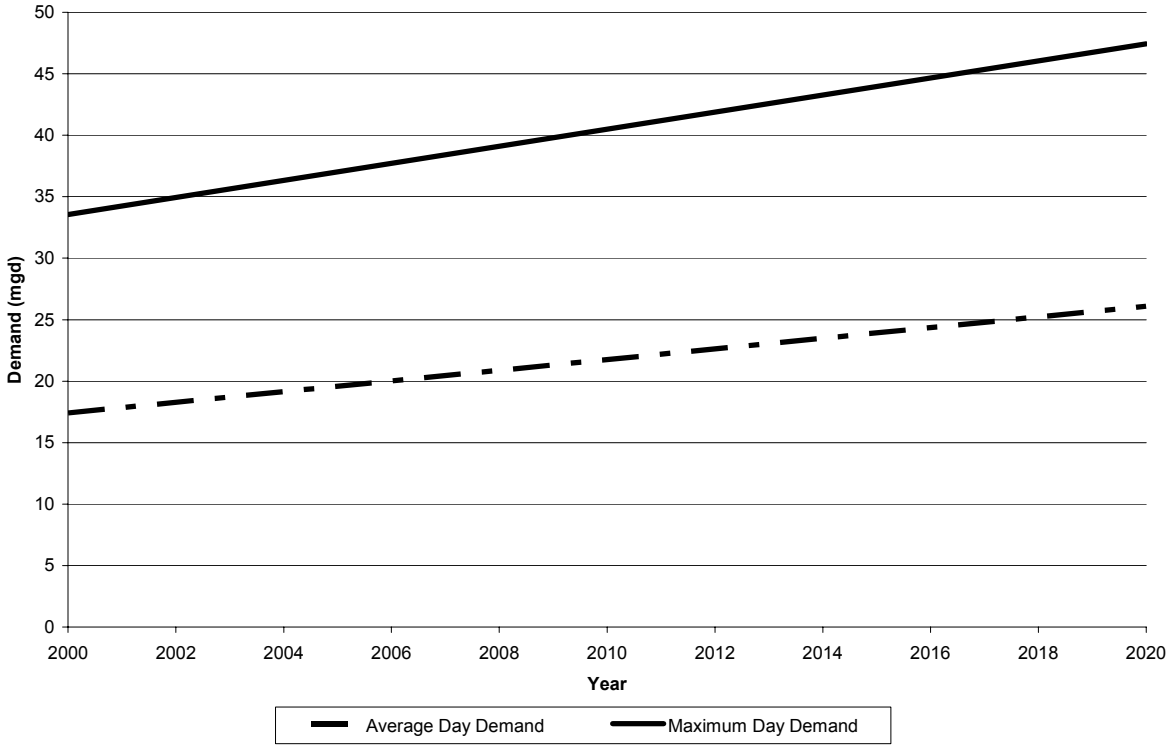


Exhibit 3-2
Demand Projections for WRIAs 25 and 26



As shown on Table 3-1, average day municipal and domestic demands are projected to increase by 53 percent, from approximately 17 mgd in 2000 to 26 mgd in 2020. Although the percentage change is large, the volumetric change over the entire basin is considered low. Of the total demand in these categories in Year 2020, approximately 67 percent is associated with the Cities of Longview-Kelso and Cowlitz PUD, as listed on the table. Approximately 16 percent is associated with small public systems (including community and non-community systems and Group B systems). The remaining 17 percent is associated with individual (exempt) well use. Furthermore, the relative percent growth from year 2000 to 2020 is similarly distributed: 75 percent of the demand growth is associated with the larger public water systems, 15 percent is associated with the small public systems and 10 percent is associated with individual (exempt) well use.

Thus, the majority of the areas where growth is expected are provided water by the large municipal purveyors (Longview-Kelso area) and by small community systems. As such, development of water supplies to meet the needs of these water providers is a central focus of this chapter. Attention is also given to self-supplied industrial needs and agricultural uses of water.

3.1.2 Relationship between Water Supply and Stream Flows

Water supply management has a significant relationship to management of stream flows. Where surface water is utilized as a source of supply, there is a direct reduction in stream flows downstream of diversions. A similar relationship often exists between stream flows and ground water supplies. Due to potential connectivity between ground water and surface water, pumping of wells can reduce baseflows in nearby streams. This is due to capture of ground water that otherwise would have discharged to surface water. In other locations, however, pumping ground water may have little to no effect on surface streams. These types of effects are complex and vary according to many factors, such as the nature of the local hydrogeology and topography.

While specific studies were not conducted in WRIAs 25 and 26 subbasins, a study was conducted in the Washougal River subbasin in WRIAs 27 and 28 that focused on evaluating the impact of exempt wells. This analysis considered the impact that withdrawals by individual domestic wells have upon stream flows in the Lacamas Creek drainage area within the Washougal River subbasin. The results of the effort have been reported in a Technical Memorandum entitled *Effect of Exempt Wells on Baseflow – Washougal River Watershed* (PGG, 2003). In general, this analysis concluded that exempt well withdrawals have a minimal impact upon stream flow levels. The percentage of stream capture, or baseflow reduction, by such wells in the driest time of year ranges from 0% to 3.5% of total baseflow, with the amount for the majority of evaluated stream tributaries being less than 0.5%. In some cases, baseflows are even increased when the effects of exempt wells and septic system return flows are considered in conjunction. This is due to return flows being greater than stream flow capture attributed to exempt well pumping. While this case study focused upon a specific geographic area, the findings may generally be considered in the WRIAs 25 and 26 basins.

Furthermore, by comparing the estimated exempt well demands over the entire WRIAs 25 and 26 basin (refer to Table 3-1) in the year 2020 to the estimated baseflows from the Level 1 Assessment (EES 2001), a general conclusion can be made regarding the impact of exempt wells on stream flows. The smallest subbasins[(1)] have on the order of 200,000 acre-feet volume of baseflow. Table 3-1 shows that the exempt well demands are thus less than 3 percent of this volume in a given year. Based on this comparison, it is unlikely that individual well withdrawals result in significant adverse impacts to stream flows in WRIAs 25 and 26. However, clusters of shallow wells located in proximity to tributary streams may have some local impact due to combined effect of their withdrawals.

Because of the relationship between water supply and stream flow, the impacts of management actions upon water supplies and stream flows are considered together. Therefore, the water supply policy and management strategies set forth in this chapter have been developed according to the following two goals of the Planning Unit:

- Effectively and efficiently manage water to ensure availability, reliability and predictability for beneficial uses over the long term, considering ongoing changes in population, local economies, and water-use technology.
- Manage stream flows effectively to sustain aquatic biota, including fish populations in their various life stages.

This same approach is followed in Chapter 4 – Management of Stream Flows, where certain water supply management actions are identified which may be employed to reduce impacts to surface water.

3.2 General Techniques for Managing Water Resources

Over the course of the planning process, the Planning Unit reviewed a number of strategies for supporting future water supply needs in WRIAs 25 and 26. Detailed descriptions of these techniques and their applicability to WRIAs 25 and 26 are provided in Appendix D. A brief summary of these strategies is provided below.

3.2.1 New Water Supply Development

This strategy involves development of additional future supplies from either surface or ground water. In general, the effectiveness and feasibility of each alternative (surface or ground water) is dependent on the location of the purveyor in the basin and the abundance of high quality ground water.

The primary challenge faced by those desiring to develop additional supplies is obtaining water rights. Although it is possible to obtain new rights in WRIAs 25 and 26, the process can be lengthy and expensive, due to the current backlog of water right applications at the Department of Ecology (Ecology) and the need to thoroughly evaluate

[(1)] Baseflows by volume were estimated for each subbasin. The subbasins with the smallest estimated baseflows included Skamokawa Creek, Elochoman River, Abernathy-Germany Creek, and Coweeman River with baseflows of approximately 200,000 acre-feet.

potential impacts to other water right holders and watershed health. Although the water right application process may be challenging, economic and logistic considerations favor development of new sources over options discussed below at the present time. As the true cost of water increases over time, these options will be more viable.

3.2.2 Water Conservation

Water conservation refers to the beneficial reduction of water use, loss, or waste. Conservation measures can be implemented within the municipal, industrial, and agricultural sectors.

In the municipal context, water conservation consists of a range of activities involving both water systems and their customers. Water systems must submit a water conservation plan to the Department of Health (DOH) outlining measures to be implemented, as a condition for approval of Water System Plans and issuance of new water right permits.

The importance of water conservation in the municipal sector has recently been reaffirmed with the passage of House Bill 1338 during the 2003 legislative session. Section 7 of this law authorizes the Washington Department of Health (DOH) to establish water efficiency requirements, to be applied to all municipal water purveyors. By December 31, 2005, DOH must adopt rules that outline conservation planning requirements, develop water distribution system leakage standards, and establish minimum conservation performance reporting requirements.

In the industrial context, water conservation consists of a range of activities based on the size and type of industry. Because of the large volumes associated with these users, opportunities often exist to conserve significant quantities of water.

In the agricultural context, water conservation involves different technologies and approaches, in comparison with the municipal sector. Efficiency measures at the individual farm level would typically be implemented by the landowner and/or agricultural producer raising a crop or producing livestock. WRIAs 25 and 26 do not have irrigation districts or extensive irrigation canal systems.

Some water conservation measures have already been implemented within WRIAs 25 and 26. The major public water systems in the Longview-Kelso area have taken basic conservation steps including leak detection programs, pricing structures, and fixture retrofits. Other water conservation measures are being implemented on a limited basis, and remain as part of future management strategies should the supply and demand picture change dramatically in next 20 years. Water conservation has also been utilized in the industrial sector in WRIAs 25 and 26. Some process efficiencies have been implemented at Longview Fibre and Longview Aluminum; however, additional opportunities exist due to the large volumes of water involved and the existence of various incentives such as reductions in overhead costs and energy consumption. In many cases, industrial process efficiencies may be coupled with water recycling efforts, as described in the next section.

3.2.3 Water Reclamation and Reuse

Water reclamation and reuse refers to the capture, treatment, and reuse of wastewater, typically for non-potable purposes. By using this as a source of water, the need for water from natural sources can be reduced.

Based on a review conducted during this planning process, municipal wastewater reuse is not considered an attractive water supply strategy for WRIAs 25 and 26 in the near future, in relation to other water supply alternatives. This is due primarily to the high costs of municipal wastewater reuse projects.

The viability of water reuse and recycling is highly dependent on the specific application, and is generally more feasible in the industrial sector than in the municipal sector for WRIAs 25 and 26. Some of the constraints on municipal relative to industrial reuse include higher costs compared to industrial projects, greater public concerns, and the need to manage wastewater discharges while complying with discharge permit limitations. However, even with industry the type of process factors heavily into whether or not reuse can be practicable. For example, Longview Fibre has been able to reuse process water in its system; however, some other industries do not consider reuse economically viable at this time.

3.2.4 Voluntary Transfers of Water Rights

This strategy involves changing an existing water right to meet needs associated with a different use or a different location than originally defined in the water right. Transfers (also known as water right changes) do not increase the overall amount of water being used in a basin; rather, they modify where and how the water is used. Transfers typically take the form of voluntary leases or sales of water rights.

Many water right transfers involve changes in the location of where the water will be used as well as changes in the point of withdrawal or point of diversion. These changes typically can not be moved to locations which are "upstream" within the same drainage basin or to another drainage basin. There are two primary reasons for this. One is that transfers can not be approved which would have an adverse effect upon existing water rights which may be located upstream of the original water right. The other reason that transfers are not generally approved to locations upstream in a drainage basin is that the move to an upstream location may result in a reduction in stream flows between the original location and the proposed upstream location.

In some cases upstream transfers may be approved if it is determined that there would be no impact to existing water rights or a reduction in stream flow. Upstream transfers could also be approved if adequate mitigation is provided to offset any impacts to existing water rights or stream flows. The Department of Ecology publication *Mitigation Measures Used In Water Right Permitting,* dated April 2003, contains examples of mitigation measures that have been used.

Transfers of industrial water rights to use for municipal purposes have potential in WRIAs 25 and 26, due to the existence of some substantial industrial water rights. However, this is primarily limited to the Longview-Kelso area. In a situation where an industrial water user scales back production, leaving a portion of its water right unused, that amount of water could be sold or leased to a public water system for municipal purposes.

Transfers of water rights from agricultural to municipal usage are not as feasible in WRIAs 25 and 26 as they could be in other, more irrigation-intensive areas of the state. Many existing agricultural water rights are typically not of enough size or in an appropriate location for use by municipal water consumers in the basin.

3.2.5 Aquifer Storage and Recovery

In areas where water availability is limited on a seasonal basis, excess water can be injected into ground water aquifers during wet periods and then withdrawn during dry periods to aid in meeting water demands. This process, known as Aquifer Storage and Recovery (ASR), serves to optimize the use of existing water resources, especially in areas dependent primarily upon surface water supplies.

ASR is currently not an attractive water supply option in WRIAs 25 and 26, because ASR implementation costs can be quite high (especially for smaller communities) and there are many legal and political uncertainties regarding ASR at this time. However, opportunities for ASR should be re-evaluated from time to time.

3.2.6 Surface Water Storage

Similar to ASR in its overall objective, surface water storage in impoundments and reservoirs is often used where surface water supplies are limited on a seasonable basis. During wet periods, when excessive flows are present, water is captured and retained for use later during drier periods.

Based on the limited water supply needs in the basin, the significant resources required to pursue storage projects, and the potential environmental impacts and mitigation requirements, surface water storage is currently not an attractive water supply option in WRIAs 25 and 26.

3.3 Water Supply Policy for WRIAs 25 and 26

The Planning Unit has developed proposed water supply policies to balance the objectives of water supply and stream flow protection:

Policy WSP-1:

Public and private water users throughout WRIAs 25 and 26 should have access to water resources to meet new or expanded needs for water supply consistent with adopted land use plans.

Policy WSP-2:

Water resource development to meet new or expanded needs should avoid or minimize effects on stream flows or aquatic habitat, in stream reaches where flow conditions are an important factor for sustaining aquatic life, including fish populations in their various life stages.

A strategy has been developed to guide the implementation of the water supply policy. As outlined below, the strategy addresses two issues: new or expanded municipal supplies (requiring new water rights) and existing municipal supplies (not requiring new water rights).

Inherent in this strategy is the concept that, apart from tidal reaches and potential limited uses of the Lower Cowlitz River, no new surface water diversions are recommended by the Planning Unit as a form of water provision. In those cases where additional water supplies are needed, ground water development is recommended. However, as discussed in Section 3.1.2, ground water has been shown to likely be in communication with surface water in some parts of the basin. This is especially true for withdrawals from shallow wells in proximity to tributary streams. Therefore, priority should be given to ground water supply alternatives that avoid surface water impacts.

Recommendation:

The Planning Unit views the Columbia River and ground water in hydraulic continuity with the Columbia River as a major water resource to meet water supply needs. As new water supplies are needed, it is preferable they be withdrawn from the Columbia River, adjacent lowland reaches of tributaries subject to tidal effects, and associated ground waters, rather than from flow-limited reaches of streams tributary to the Columbia. This approach can meet regional supply needs, while protecting important aquatic habitat in the region.

Recommendation:

The Planning Unit views the Cowlitz River as a significant regional resource. Due to the abundant supply in the mainstem Cowlitz River, the Planning Unit recommends that it be considered over other water resources tributary to the Columbia River in meeting future water supply needs. Use of the Cowlitz River should be consistent with the reservation quantity established for the river (See Section 4.4.1)

3.3.1 New or Expanded Municipal Water Supplies

In most cases, the development of additional water supplies requires the purveyors to obtain new or increased water rights. The Department of Ecology (Ecology) has the responsibility for reviewing water right applications. Under its current process, Ecology issues water right permits only if the proposed use meets the following requirements, in accordance with RCW 90.03.290:

- Water will be put to beneficial use;
- There is no impairment to existing, or senior, rights;
- Water is available for appropriation;
- Issuance of the requested water right will not be detrimental to the public welfare.

In reviewing ground water permit applications, Ecology takes into account the potential for impacts upon surface waters. Ecology has denied ground water right requests in cases where connectivity has been demonstrated and where stream flow was judged too low to support existing uses and/or fish habitat.

Recommendation:

It is recommended the following procedure be followed for communities requesting new or expanded water rights.

1. Communities requesting additional ground water rights to serve growth must evaluate the relationship of their proposed water supply projects to stream flows. Where such an evaluation indicates that the new or expanded source of supply will not impact stream flows, the Planning Unit recommends that Ecology grant water rights sufficient to meet projected demands. The Planning Unit has defined certain stream reaches as being under tidal influence (See Section 4.4.1 and Table I-3). These reaches meet the criteria described here. Other sources may potentially also meet these criteria, subject to demonstration by the applicant. Communities receiving new and additional water rights will be required to optimize the use of their new rights, through existing and future conservation requirements (see Section 3.2.2).

2. Where this evaluation indicates that development of the source of supply will impact the flow regime, the Planning Unit recommends that the municipal water supplier analyze alternative options for water supplies. In such cases, supply alternatives include use of a different (most likely a deeper) aquifer, purchase of water from a neighboring community, or developing water from tidally influenced areas.

Recommendation:

The Planning Unit recommends that a map be developed during the implementation phase of the watershed planning process that would depict locations of deep aquifers suitable for water supply development. Such a map could be developed in partnership with the USGS and will involve a study to identify aquifers that are not in hydraulic continuity with streams that are a priority for flow protection.

3. If the supply alternatives analysis indicates that no practicable alternative is available, the water right applicant may petition Ecology to utilize a reservation of water as described in Section 4.4.1. The Planning Unit recommends that Ecology (in conjunction with Fish & Wildlife) evaluate requests for reservation use by reviewing the applicant's analysis of other alternatives and by evaluating the applicant's proposal in terms of off-setting and mitigating actions.

   - The Planning Unit recommends that Ecology develop clear guidance for mitigation. A starting point for such guidance may be found in an Ecology publication entitled "Mitigation Measures used in Water Right Permitting" dated April 2003.
   - The Planning Unit recommends that where an applicant applies for a water right under a reservation, they be required to mitigate the predicted stream flow

depletion to the maximum extent practicable through flow-related actions. Practicable is meant to include both economic and logistic considerations.

- No less than half of the predicted stream flow depletion (see Table I-2a) must be offset through the acquisition of active upstream water rights. However, the Planning Unit recognizes there may be occasional exceptions where purchase of active upstream water rights may be infeasible or cost-prohibitive. In these limited cases, other types of mitigation actions can be considered that may not include acquisition of active upstream water rights. For example, the Grays River subbasin has been identified by the Planning Unit as one area where offsetting actions may be infeasible, due to the lack of upstream water rights that could be acquired as a mitigation action. Even in these limited cases, the amount of stream flow depletion from new water rights issued under this policy shall be no greater than the quantity shown in Table I-2a, under the column heading "Net Stream Flow Depletion Allowance."
- The Planning Unit recommends that Ecology consider other mitigating actions to address impacts that cannot be practicably off-set (no more than half) through water-for-water actions. This includes actions such as the restoration of wetlands and side-channels that increase stream storage capacity;
- The Planning Unit recommends that Ecology consider habitat restoration actions other than the restoration of wetlands and side-channels based on defined criteria. For more information, see discussion of mitigation in Appendix I (Core Issues, Section IV).
- The Planning Unit recommends that Ecology (and Fish & Wildlife) consider cost to the applicant in terms of other supply alternatives, water supply total project cost, and the cost of the off-setting and mitigating actions. These costs should be reasonable within the context of other fish recovery actions that may be needed to compensate for impairment to stream flow.
- The Planning Unit intends that domestic wells, including those serving multiple houses, be exempt from mitigation requirements.

Water Supply Reservations to Accommodate Future Needs

Several communities within WRIAs 25 and 26 have existing diversion/withdrawal facilities that are either surface water sources or ground water sources that are in hydraulic continuity with a surface water source. In many of these locations, the surface water source is proposed for either a closure or establishment of instream flows which will either prohibit or restrict future water uses, including those for public water supply (see Section 4.4.1).

Recommendation:

In order to satisfy the goals associated with the establishment of closures and/or instream flows, and the goals associated with providing a secure source of water for future public water supply, it is recommended that in each basin a block of water be reserved for future uses that would not be subject to the closures and/or instream flows established by rules for WRIAs 25 and 26.

Examples of entities that may need to reserve water for future public supply within WRIAs 25 and 26 include, but are not limited to, Wahkiakum PUD, Cathlamet, Longview, Kelso, Castle Rock, Vader, Winlock, Toledo, Mossyrock, Morton, Randle, and Packwood.

The amount of water, the entity, and the source(s) of the water to be reserved for public supply is recommended by the Planning Unit in Appendix I (Table I-2) and is intended to be stated in the proposed stream flow protection rules to be adopted by the Department of Ecology for WRIAs 25 and 26.

3.3.2 Existing Municipal Water Supplies

Recommendation:

For cases in which *existing* municipal supplies (as contrasted with planned *future* supplies) have the potential to negatively impact flows in critical stream reaches, the Planning Unit recommends that the selected communities undertake a review of alternative sources of supply, similar to that described in Section 3.3.1. It is recommended that, where feasible, these water suppliers cease or limit the use of certain existing supplies and develop alternative sources of supply that are less likely to impact flows in critical stream reaches. It is also recommended that implementation of such alternatives be eligible for funding from regional, state, or federal funding programs (see Section 3.6). This is a Planning Unit recommendation for voluntary action. Implementation should not be mandated by the State.

3.3.3 New Developments and Industrial Supplies

Recommendation:

In general, the Planning Unit recommends that new urban or suburban developments or industrial facilities that require new or expanded water supplies shall seek to obtain water from existing municipal or other water suppliers rather than developing separate sources of supply. (Note: this would not apply to agricultural uses). If an existing municipal supplier or other water supplier is not available, then the new development or industrial facility should follow the procedure described in Section 3.3.1. Options to provide financial incentives and/or technical assistance to large industries for water conservation and water reuse will be explored, where this can be linked directly to protection of stream flows.

3.3.4 Water Supply Considerations for Tidally-Influenced Stream Reaches

In considering the effects of water supplies on stream flow, it should be recognized that tidally influenced reaches of streams in WRIAs 25 and 26 are different from free-flowing reaches. Further information on tidally influenced reaches is presented in Section 2.4.3. In tidally influenced reaches, during the time of each day when water is backed up, the water level in the stream is controlled by the water level in the Columbia River. At these times, water withdrawals for water supply purposes do not affect the depth of water levels in the stream, and therefore do not impact flow-related habitat conditions. During

the time of each day when tides subside and the stream returns to a free-flowing condition, withdrawals may have effects similar to those in free-flowing reaches of a stream.

Therefore, in managing water supplies within tidally influenced stream reaches, the Planning Unit finds that:

Recommendation:

Surface water source limitations, such as stream closures administered by Ecology and low flow conditions on new water rights, should not apply to tidally-influenced stream reaches in WRIAs 25 and 26[(2)]. Specific locations of tidal reaches for this purpose are defined in Appendix I (Table I-3).

3.4 Water Supply Strategies for Major Municipal Water Providers

This section summarizes key information and the recommended water supply strategies for the largest municipal water providers in WRIAs 25 and 26, as listed in Table 3-1. The water system profiles are presented according to the size of the communities served, from the largest to the smallest. The three major providers included: City of Longview, City of Kelso, and Cowlitz PUD.

The water supply plans of each purveyor are subject to compliance with comprehensive land use plans at county and municipal levels.

3.4.1 City of Longview

The City of Longview supplied water to a population of approximately 39,000 people in 2000. The City anticipates serving approximately 47,000 people in 2020, with an average day demand of 10.23 mgd. The City's system serves primarily residential, commercial and industrial customers, including the Port of Longview and Weyerhaeuser Company.

The City diverts water from the Cowlitz River east of the City and provides treatment at the Longview-Kelso Regional Water Treatment Plant (RWTP), which is co-owned with Cowlitz PUD. This source is in the Lower Cowlitz Subbasin. The intake is located in the tidally influenced area of the Cowlitz River (refer to Section 2.4.3). Recent upgrades to the RWTP bring its capacity to 16 mgd. This plant capacity is considered adequate to meet short-term future demands, but would need to be expanded to meet long-term demands. The City also maintains a series of emergency interties with adjoining agencies, including four interties with the Cowlitz PUD and other interties with the City of Kelso. The interties with the Cowlitz PUD only benefit distribution of water; they do

[(2)] This approach has been used in instream flow regulations adopted by Ecology for other WRIAs. For example, the Chehalis Basin instream flow regulation, Chapter 173-522 WAC, states that the affected stream reach for streams that are tidally influenced is "from influence of mean high tide at low base flow levels to headwaters." In other words, the flow regulation does not apply in the tidally influenced reach.

not provide additional supply since both utilities obtain water from the same source. The interties with Kelso provide for limited, emergency service and are not utilized as part of regular supply service to City customers.

The City of Longview, on behalf of itself and Cowlitz PUD, was granted additional annual water rights under their existing permit. Currently water rights amount to 50 cfs (32.2 mgd) instantaneous rights and 14,629 acre-feet per year (13.06 mgd), which increased from 8,904 acre-feet per year. The action came as a result of the planned construction of a gas-fired electric generation facility. Here, the planned industrial owner sought to expedite the state's review of its pending water right application. In order to do so, it agreed to pay the Department of Ecology for the necessary review services to examine its own application(s) and all prior pending applications, including those of the City of Longview (for the RWTP) and the City of Kelso. In this process, the three major water suppliers were granted access to additional water. The resulting rights authorized to the City of Longview (for the RWTP), along with its previous rights, are considered adequate to meet its (and Cowlitz PUD's) 20-year planning period demands.

Based on the Comprehensive Water Plan (1999), future upgrades will be required to bring the facility's capacity up to 28.5 mgd in order to meet year 2020 demands. The City's water rights are adequate to meet the future demands and necessary upgrades to the RWTP. The City through the Comprehensive Plan has identified three major modifications (upgrades) for the RWTP. The schedule for the remaining upgrades depends on the selected regional treatment alternative. These alternatives include:

1. New Kelso Ground Water Source: (i) all future water demand for both Longview and the Cowlitz PUD would be through expansion of the RWTP, which would provide water only to Longview and Cowlitz PUD; (ii) existing Kelso WTP would convert to a surface water treatment plant and would maintain its current capacity; and (iii) new ground water wells would be installed in South Kelso along with associated treatment plant(s) as necessary.
2. Kelso Participates in Longview RWTP: (i) existing Kelso WTP would convert to a surface water treatment plant and would maintain its current capacity; and (ii) All future demand for Longview, Cowlitz PUD, and Kelso would be met through expansion of the RWTP.

Recommendation:

Expansion of the Regional Water Treatment Plant. The Planning Unit endorses the two alternatives presented in the Longview-Kelso Urban Area Comprehensive Water Plan (1999) to meet the area's future water demands. Both alternatives involve expansion of the RWTP to meet the future demands of Longview and the Cowlitz PUD. The future demands of Kelso would also be met by the RWTP under one alternative, while such demands would be met by new ground water wells under the other alternative. The City of Longview currently has the necessary water rights to meet its demand and RWTP expansion. Furthermore, the RWTP intake is low in the Cowlitz River basin and is within the zone of tidal influence. The additional diversions planned by the City are not expected to negatively impact habitat and other instream needs, as long as plans are consistent with the approach described in Section 3.3.1.

3.4.2 City of Kelso

The City of Kelso supplied water to a population of approximately 13,000 people in 2000. Kelso anticipates serving 18,500 people in 2020, with an average day demand of 5.54 mgd.

The existing supply for the City of Kelso is derived from a Ranney well, which is hydraulically connected to the Cowlitz River. This source is in the Lower Cowlitz Subbasin. The City's current treatment facility has a capacity of 3.6 mgd and is being upgraded to meet state requirements for pH and iron control. The resulting modifications will likely result in a minor increase in capacity. The City's system is also connected to the City of Longview via emergency interties.

As described in Section 3.4.1, the City of Kelso is investigating options for expanding its long-term access to water through installation of new ground water wells and potential construction of ground water treatment facility. Kelso has installed a test well near SR 4 and the Cowlitz River. Analysis results indicate that sufficient groundwater of good quality is available at that location (Robinson and Noble 1998).

The decision on whether to develop the ground water wells will be made in conjunction with the City of Longview and Cowlitz PUD. However, in either alternative, the existing Kelso WTP would convert to a surface water treatment plant that will comply with new federal requirements. The plant capacity would stay the same.

Recommendations:

Development of Ground Water Wells. The Planning Unit endorses the alternatives presented in the Longview-Kelso Urban Area Comprehensive Water Plan (1999) to meet the area's future water demands. Both alternatives involve expansion of the RWTP to meet the future demands of Longview and the Cowlitz PUD. The future demands of Kelso would also be met by the RWTP under one alternative, while such demands would be met by new ground water wells under the other alternative. Should new wells be developed, they may be hydraulically connected to the Cowlitz River like the existing Ranney well. However, they would be located low in the Cowlitz River basin and within the zone of tidal influence. The additional ground water wells planned by the City are not expected to negatively impact habitat and other instream needs, as long as plans are consistent with the policies developed in this watershed plan.

Expansion of Regional Water Treatment Plant. The Planning Unit also supports the City of Kelso's second alternative to participate in the expansion of the RWTP. See Section 3.4.1.

3.4.3 Cowlitz PUD

Cowlitz PUD supplied water to a population of approximately 9,000 people in the Longview-Kelso area in 2000. The PUD anticipates serving approximately 15,000 people in 2020, with an average day demand of 1.52 mgd. The service area of the PUD includes some customers within the City of Longview. The PUD primarily provides

water to both residential and commercial customers – the largest of which is a portion of a local golf course where the primary end use is for irrigation. No industrial facilities are supplied by the Cowlitz PUD.

As discussed above, the PUD has joint ownership in the RWTP, which takes its water from the Cowlitz River. This source is in the Lower Cowlitz Subbasin. The PUD also maintains a series of interties with the City of Longview that benefit the distribution of water but do not provide additional supply since both utilities obtain water from the same source. The PUD also maintains its own standby well for backup and redundancy at Woodbrook in the Ostrander area for use in case of a failure of the underground river crossing to Ostrander. Use of the well is very infrequent.

The same recommendations for the Cowlitz PUD are applied as those for the City of Longview, since the two entities share the same source of supply and coordinate planning.

3.5 Water Supply Strategies for Other Types of Water Users

3.5.1 Small Public Water Systems

State law defines a "public water system" as "any system providing water for human consumption through pipes or other constructed conveyances, excluding a system serving only one single-family residence and a system with four or fewer connections all of which serve residences on the same farm." Under this definition, most wells supplying two houses or more are designated as public water systems.

The Washington State Department of Health (DOH) regulates public water systems under two main categories. Group A systems are those systems regulated under the federal Safe Drinking Water Act (SDWA). Group B systems are regulated under State law, but are not regulated under SDWA. Typically, county health districts are delegated the regulatory role for Group B systems, while the State DOH performs regulatory responsibilities for Group A systems. Group A and B categories are described further, below.

- Group A, Community water systems provide water to 15 or more service connections used by year-round residents for 180 days or more in each calendar year. Community water systems may serve cities, individual subdivisions, mobile home parks, and other types of communities.
- Group A, Non-community water systems provide water to the public, but not to residential communities. DOH regulates two sub-categories: "transient" and "non-transient." Examples include campgrounds, restaurants, motels, schools, day-care centers, and some businesses.
- Group B systems are systems that meet the definition of a public water system, but do not fall into one of the categories listed above. For example, these include systems serving smaller communities or subdivisions ranging from 2 to 14 residential service connections.

Table 3-2 summarizes the water systems in WRIAs 25 and 26.

Table 3-2 Number and Type of Public Water Systems in WRIAs 25 and 26	
WRIA 25	
Group A – Community System	7
Group A – Non-community System	11
Group B System	17
WRIA 26	
Group A – Community System	39
Group A – Non-community System	96
Group B System	218

Source: DOH – DWAIN database

Table 3-3 lists the larger Group A community public water systems in WRIAs 25 and 26, not including the major water purveyors discussed in Section 3.4. As discussed in Section 3.1, a majority of the population and water demand growth in these basins will occur in the Longview-Kelso area and in rural areas supplied by individual exempt wells. Interviews with local planning departments and state agency staff suggests that little or no growth is anticipated in many of the small Group A community systems. In those areas where small developments are occurring at the outskirts of the small Group A community systems, the trend has been to encourage connection to the existing water system. Table 3-1 displays population and water demand projections collectively for the small systems. As shown in Table 3-1, estimated demand associated with small systems is a relatively small proportion of total demand in the municipal and domestic sector in WRIAs 25 and 26.

Table 3-3 Selected Small[(1)] Group A Community Water Systems	
Public Water System	**No. of Connections**
WRIA 25	
Cathlamet	570
Puget Island	476
Western Wahkiakum	273
WRIA 26	
Castle Rock	859
Morton	648
Toutle Regional Community Water System	568
Winlock	549
Toledo	342
Mossyrock	337
Ryderwood Improvements & Service Association	282
Lewis County Water District #3 (Packwood)	278
Vader	234

(1) For purposes of this discussion, "small" public water systems are those with less than 1,000 service connections.

Note: There are additional Group A systems that are classified as "non-community," such as campgrounds, churches, schools, small businesses, etc.

Summaries of water supply needs for the "larger" of the small systems are provided below.

Town of Castle Rock (Lower Cowlitz Subbasin). The Town of Castle Rock primarily serves residential customers, with a school and an apartment complex as the largest non-residential customers. Castle Rock draws its water from the Cowlitz River and provides treatment in a facility with a 2-mgd capacity. The Town also maintains a backup supply of 600,000 gpd drawn from local ground water wells. The growth that is occurring is mostly residential in nature, but Castle Rock hopes to encourage some future industrial development. However, no new changes to the existing supply are being planned and no new applications for additional water rights are being requested.

Town of Cathlamet (Elochoman River Subbasin). The Town of Cathlamet's water system primarily serves residential customers, with the largest non-residential customers being schools and a golf course. The Town's water source is derived from the Elochoman River through an infiltration gallery with a peak capacity of 1 mgd. Minimal growth is expected in the City's service area. With the addition of 0.25 mgd in new water rights during 2001, the current inventory of available water is considered adequate for the next 20 years.

Wahkiakum County PUD (Grays River Subbasin). Wahkiakum County PUD primarily serves residential users and small businesses and small farms. The system's source is two ground water wells adjacent to the Grays River each with 400 gpm capacity. The PUD believes there are adequate capacity and existing water rights within their present inventories. However, PUD officials believe that there could be a need to apply for additional water rights, depending on the outcome of requirements to reduce allowable withdrawals by Naselle Water customers. A major upgrade is being planned to increase water distribution to the Deep River and Salmon Creek area of West County and an intertie is being planned with the Naselle Water Company. The PUD is also considering Satellite management agency (SMA) status through Ecology to serve developments and nearby districts.

City of Winlock (Lower Cowlitz Subbasin). The City utilizes ground water wells as their source of supply. The six wells have an instantaneous capacity of 560 gpm total. In addition, a proposed new industry in the Winlock area is considering use of water from the City and would require approximately 180 acre-feet per year. It is expected that this new industry would initiate their water use in 2005, and would also initiate an effort to purchase additional water rights in the vicinity, to be transferred to the City to offset this additional water use. This industrial use may impact the City's ability to meet new demand much earlier than previously expected. It is also anticipated that the City would be initiating water use conservation associated with the 2003 update of their Water System Plan.

City of Toledo (Lower Cowlitz Subbasin). The City of Toledo primarily serves residential customers and does not serve industrial customers. The City receives its water from two shallow ground water wells that are pumped in alternating sequence. The City has been waiting for a permit for 10 years for Well No.1. Well No. 2 is certificated. It is expected that the existing water supply is adequate for the next 7 to 10 years. There are no plans to change the current supply system in the near future, nor any plans to apply for new water rights. However, there is a possibility of transferring water rights from an

existing property north of the City for municipal use if additional water is needed. The City has concerns that unrestricted activities and development outside their jurisdictional boundaries may impact their water source, owing to possible competition for supplies from the local shallow aquifer (exempt wells) or contamination caused by surface activities.

City of Mossyrock (Mayfield Dam Subbasin). Mossyrock primarily serves residential customers using two ground water wells pumped in alternating sequence. The City currently has insufficient water rights to supply its existing customers, let alone any new future expansion. The City has had a service connection moratorium for the water system for the last 10 years while the water rights application for Well No. 2 awaits processing. In the meantime, the City desires to get a third well and if water rights are acquired for Well No. 2, the City will eventually transfer the source location on the water rights to the third well, leaving Wells No. 1 and 2 as alternating sources. Ecology has recently indicated that Mossyrock's application for water rights will be reviewed, but the City needs to conduct a subbasin evaluation as part of the review of the application.

Town of Morton. Morton, although one of the larger communities in WRIAs 25 and 26, has not responded to requests for input to this watershed plan.

Recommendation:

In those cases where new supplies are required for small Group A systems, it is recommended that a review of alternative sources of supply be conducted to address potential impacts on stream flow (see Section 3.3.1).

3.5.2 Domestic Wells

Approximately 40,000 people in WRIAs 25 and 26 obtain their water supply from individual domestic wells. These wells are not part of any public water system, and are not regulated by DOH. In addition, under the State Ground Water Code, these wells are generally exempt from the requirement to obtain a water right (Chapter 90.44.050 RCW). For this reason, they are commonly known as "exempt wells" (note that some Group B systems may also have exempt wells – see Section 3.5.1).

Table 3-1 displays the amount of water use estimated to be associated with individual domestic wells. In 2000, approximately 5,000 acre-feet (4.47 mgd average day demand) of water (or roughly 25 percent of the total municipal and domestic demand in WRIAs 25 and 26) was withdrawn from such wells. The anticipated demand associated with rural population growth by 2020 is approximately 6,600 acre-feet, or 22 percent of the total municipal and domestic demand forecast for 2020.

As discussed in Section 3.1.2, a study by PGG (2003) to evaluate the effects of exempt well pumping upon baseflow was conducted in WRIAs 27 and 28 for the Washougal River Subbasin. The study was aimed at characterizing the effects of domestic wells on base flows in the Washougal River and its tributary streams. This was accomplished by comparing the amount of stream capture by exempt wells to the amount of return flows from septic systems, resulting in a net stream capture (or reduction in baseflow). In general, exempt wells were found to have a minimal impact upon baseflows. In some

cases, baseflows locally are even increased as a result of rural development, due to septic system return flows.

In WRIAs 25 and 26 individual (exempt) well use is a relatively large proportion of the water demand increase in the basin. However, based upon the results of the analysis described in Section 3.1.2, projected water withdrawals comprised by this category of water use will remain relatively small compared to overall baseflows.

Recommendations:

County and city policies provide an adequate means to help off-set impacts caused by exempt wells.

In areas where exempt well use densities may adversely affect local flows, suburban and rural developments should utilize municipal or existing water sources over individual well sources, to the extent permissible by State law. If this is not possible, sources should be developed from deep aquifers.

Land use densities in flow sensitive areas, such as small tributaries, should not be increased.

3.5.3 Self-supplied Industrial Water Users

Commercial and industrial facilities may receive water from a public water system, or may have their own, independent sources of supply. This section describes self-supplied users, since their demands are not captured in the discussion of other categories of water use and future needs. These demands are largely concentrated within the Kelso-Longview area, drawing upon water resources within the Cowlitz basin. Here, the highest water-consuming industries are those related to timber and aluminum processing, namely Longview Fibre, Weyerhaeuser Corporation, and Longview Aluminum.

Table 3-4 displays information on the largest of these self-supplied users. In general, these are industrial facilities, primarily in the vicinity of Longview-Kelso. Three users, Weyerhaeuser, Longview Aluminum, and Longview Fibre, have water rights that are much larger than the rest. Weyerhaeuser, located in Longview, has both surface and ground water rights. Longview Aluminum has ground water rights, and Longview Fibre has surface water rights. The surface water rights associated with Weyerhaeuser and Longview Fibre are both in the Columbia River. Thus, their use does not directly impact the subbasins in WRIAs 25 and 26.

Table 3-4
Self-Supplied Commercial/Industrial Water Rights

Name of Company [2]	Water Rights [1] Qi (gpm)	Qa (afy)
Surface Water Right Holders-WRIAs 25 and 26		
Lamphear B	4,488	N/A
Mt. Adams Veneer	1,795	N/A
Pac-Ply	1,346	N/A
All Others	22,606	N/A
Ground Water Right Holders-WRIAs 25 and 26		
Longview Aluminum (formerly Reynolds Metal)[3]	15,650	25,073
Weyerhaeuser	2,350	4,656
Askin Nick ET UX	2,250	862
American Cyanamid	1,200	1,920
Continental Grain	1,000	550
All Others	3,957	2,937
WRIAs 25 and 26 Total	213,809	35,998
Surface Water Right Holders-Columbia River Source		
Weyerhaeuser	100,531	N/A
Longview Fibre	56,100	N/A
Pacific Straw	1,436	N/A

Notes:
Qi = Authorized Instantaneous Withdrawal/Diversion
Qa = Authorized Annual Withdrawal/Diversion
gpm = gallons per minute
afy = acre-feet per year

(1) Water rights data obtained from Department of Ecology's Water Rights Application Tracking System (WRATS) database (May, 2002). Qi for surface water rights has been converted from cubic feet per second to gpm for comparative purposes.

(2) Only those water right holders with Qi greater than 1,000 gpm are listed individually.

(3) In final stages of bankruptcy negotiations. Water rights may be used by other industries locating to the area in the future.

Projection of water usage by self-supplied industry in the future is highly uncertain. In general, a basic assumption is that existing industries will continue to use the same amount of water used now; and that new industries will be supplied by major public water systems, with their needs included in existing demand projections. In support of this watershed planning work, contact was made with company officials at Longview Fibre and Longview Aluminum. Longview Fibre confirmed that their current water rights and water supplies are adequate to meet future demands. Longview Aluminum is in the final stages of bankruptcy negotiations. Production equipment and machinery is expected to be sold by April 2004. Though Longview Aluminum's water rights will likely go unused in the near-term (two to five years), there is a possibility that other industries will take advantage of the site in the future, due to the water rights and good transportation access.

Recommendations:

Conservation and reuse. The Planning Unit places an emphasis upon water conservation and reuse with respect to industries with large water demands. Ecology should develop technical assistance and funding opportunities focused specifically upon the needs of self-supplied industries, to aid in reducing current water demands.

Future water demands. Where feasible, industries requiring additional sources of supply in the future should connect to existing municipal water supplies. Where not feasible due to technical issues or cost, then it is recommended that the industry evaluate alternative sources as described in Section 3.3.1.

Consider the feasibility of non-potable supply. The Planning Unit recommends that large self-supplied industrial water users evaluate development of Columbia River non-potable supplies. The Planning Unit commits to aiding industries in identifying and obtaining funding sources for implementation of such a project, most likely through programs administered by Ecology and DOH (see recommendation in Section 7.3).

3.5.4 Agricultural Water Users

Water usage in the agricultural sector is not well documented. The U.S. Department of Agriculture provides periodic census of agriculture crop and livestock on a county basis throughout the State. The most recent set of comprehensive statistics on cropping was produced in 1998 and recent trends render this information somewhat outdated. For purposes of this Watershed Plan, estimates of water usage are used based upon the 1995 USGS Water Used Data compiled from 1995 to 2001. Usage is assumed not to have changed greatly since then. These values are shown in Table 3-5.

Table 3-5
Water Usage in the Agricultural and Livestock Sector

	ADD (mgd)	Annual (afy)
WRIA 25	7.56	8,488
WRIA 26	35.4	39,747

Source: Level 1 Assessment (EES 2001).

In support of the Watershed Plan, interviews were conducted with agencies representing the farmers and foresters in the area, including the Washington Farm Forest Association (FFA) and the Lewis County Farm Bureau. Interviews were also conducted with related governmental agencies in Lewis, Cowlitz and Wahkiakum Counties such as the Natural Resource Conservation Service (NRCS), the Cowlitz and Wahkiakum County Conservation Districts, and the WSU Agriculture Extension Service.

The agriculture that does exist tends to be concentrated along the major river basins. In the Cowlitz drainage, the storage capacity of the three dams provides a stable water supply to farmers. Among the existing farms, there is not a predominance of extensive commercial agriculture, rather small cattle raising plots of land with feed support and small farms with minor withdrawals for irrigation are present. Along the Gray's River basin, there are small farms with fewer irrigation withdrawals. On Puget Island in the

Columbia River, the roughly 40 dairy farms that historically operated there have decreased in number to around 5 and there are no irrigation withdrawals.

In Cowlitz County, particularly along the I-5 corridor, there has been considerable conversion of beef and dairy pasturelands to smaller parcels (e.g. 2 – 20 acres). These parcels are typically used for rural residential purposes and may or may not include an agricultural element such as livestock, berry production, or horticulture. The overall impact on total water use is unknown.

There is some indication that some farmers have changed to more water-efficient irrigation practices (e.g. drip irrigation and pressurized systems) over the past decade, but this is not well documented.

Despite some indications that agriculture use is not expected to grow, there are approximately 53 applications pending for new water rights that have at least one type of agricultural purpose (stock or irrigation use) listed in Ecology's water rights database. For the most part, the database did not show the annual use requested by applicants. However, the instantaneous rate requested totaled approximately 73.5 cfs for surface water rights and 4,700 gpm for ground water withdrawals. Processing of these applications will likely take several years, due to the overall backlog of water rights applications statewide.

As the number of applications indicate, there may be water supply issues affecting individual farmers in WRIAs 25 and 26. However, taken as a whole, the agricultural sector is not identified as an area where water supply issues represent a high priority for the WRIAs 25 and 26 Planning Unit.

Recommendations:

New surface water supplies. In those cases where surface water supplies are requested for agricultural purposes, it is recommended that a review of alternative sources of supply be conducted (see Section 3.3.1) to address potential impacts on stream flow.

New ground water supplies. The Planning Unit recommends that Ecology grant water right requests pertaining to future agricultural ground water demand, subject to consistency with the Planning Unit's water supply policy and successful completion of Ecology's water right application review process.

3.6 Implementation Considerations for Water Supply Management

Table 3-6 summarizes implementation considerations for the water supply recommendations discussed in Sections 3.4 and 3.5 above. Implementation issues may vary somewhat from those listed in the table, depending on the specific action and community involved. Where there are staffing impacts that would likely require hiring of at least ½ Full-Time Employee (FTE) by the implementing organization(s), they are called out in the funding column.

Table 3-6
Implementation Considerations for Water Supply Actions

Priority[1]	Activity	Implementers[3]	Financial/ Economic Costs[2]	Funding Sources
Category: Water Supply				
High	Public Water Systems develop new or expanded supplies. Requires engineering studies; approval of water system plan; water rights processing; other permitting; SEPA compliance; construction; operations & maintenance. Standard procedures exist for all of these (See Section 3.3.1).	*Lead*: Public Water System *Others*: DOH, Ecology	Medium	*Main*: Water rates in affected service area *Additional*: Grants or low-interest loans from existing state & federal programs
High	Planning studies to explore alternative sources of supply to replace an existing source (selected communities) (See Section 3.3.2).	*Lead*: Public Water System	Low	*Main*: Water rates in affected service area
High	Replace an existing source of supply with a different source to reduce impacts on stream flow. Requires engineering studies; water rights processing; other permitting; inter-local agreements or contracts; construction; operations & maintenance (See Section 3.3.2).	*Lead*: Public Water System *Others*: DOH, Ecology, adjacent water system(s) to serve as wholesaler	Medium to High	*Main*: Leg. appropriation *Additional*: Water rates in affected service area
Medium	Enhanced conservation exceeding state requirements in selected communities (See Section 3.3.1).	*Lead*: Public Water System	Low to medium	*Main*: public water system *Additional*: Grants from DOH or Ecology
Medium	Industrial supplies: Expand conservation & reuse; develop non-potable sources; connect to municipal systems (See Section 3.5.3).	*Lead*: Private industry (large plants) *Others*: Ecology & DOH (technical assistance; water rights processing if applicable)	Low to High (Varies by facility)	*Main*: Private industry *Additional*: Leg. appropriations
Low	Periodically review policies on individual domestic wells, in context of local land use and development regulations (See Section 3.5.2).	*Lead*: Counties, cities	Low	*Main*: counties, cities general funds, permitting fees, or grants
Low	Agricultural supplies: switch from surface to ground water. Discourage new uses of surface water (use ground water instead) (See Section 3.5.4).	*Lead*: Landowner *Others*: Ecology, Conservation Districts	Low to medium	*Main*: Landowner *Additional*: Leg. appropriations

(1) Priority in context of all actions in Watershed Management Plan.

(2) Preliminary, generalized estimates of financial or economic cost to the community or water user involved. High: greater than $500,000; Medium: $50,000 to $500,000; Low: less than $50,000. Total cost, whether up-front or over a period of time up to ten years.

(3) "Lead" implementer would take responsibility for organizing efforts under this action, including pursuing funding sources listed in the far right column.

Abbreviations: SEPA = State Environmental Policy Act, DOH = Department of Health, Leg. = Legislative

Section 4
Management of Stream Flows

4.1 Introduction

Management of stream flows is a critical component of the watershed plan. Stream flows are an important determinant of habitat conditions for fish and other aquatic life in streams throughout the region. Stream flows can be altered substantially by human activity in the watershed. Water withdrawals for public and private supplies reduce stream flow, as water is either diverted from a stream or withdrawn from an aquifer that may be connected with a surface stream. Other activities affect flows by changing how water drains from lands within the watershed. These activities include forestry, land use and development practices and alterations to floodplains and associated wetlands.

As described in Section 1.3, the Planning Unit has established the following goal with regard to stream flow management:

Goal: Manage stream flows to effectively support fish recovery and habitat enhancement plans.

Section 4 of the Watershed Management Plan presents policies and recommendations on management of stream flows intended to address this goal. The policies and recommendations presented here complement those presented in Sections 3 and 6 of this Plan which address water supply and fish habitat, respectively.

Management of both low and high flows is addressed in this Plan. It is important to manage flows during dry periods of the year when stream flows drop to their lowest levels. This typically occurs during the late summer and early fall months. Adequate flows at this time are essential to provide habitat for fish and other aquatic life. High flows that occur from runoff in the winter and spring are important in moving sediment through a river system and creating and maintaining proper habitat conditions within the stream channel and floodplain. On the other hand, excessively high flood conditions can be damaging to fish habitat, as well as property and human safety.

At this time there are few stream gauges in WRIAs 25 and 26, and this hampers the ability to monitor flows and target management actions. Therefore, this section proposes resources be directed towards improving routine monitoring of flow conditions in priority streams.

The WRIA 25 and 26 Planning Unit has attempted to take a comprehensive perspective on flow management issues. In general the discussion throughout Section 4 assumes that reduced flow rates during the dry season are harmful to fish and their habitat; and that increased peak flows (i.e. flood events) from human activity can also be harmful to fish and their habitat.

This section identifies a range of management actions to manage stream flow conditions at both the low and high ends of the flow spectrum. These actions can be divided into two general categories. Management of water supply is important for stream flow, where water sources

deplete flows. Management of land use and related issues is important where changes to the watershed disrupt runoff and ground water recharge. This breakdown is summarized in Table 4-1.

Table 4-1
Management Techniques

Category	Technique	Affects Low Flow	Affects High Flows
Water Use	Restrict issuance of new water rights	✓	N/A
	Water conservation	✓	N/A
	Curtailment or changed operations in drought conditions	✓	N/A
	Source substitution	✓	N/A
	Transfers to State Trust water rights	✓	N/A
	Enforcement actions against unauthorized water uses	✓	N/A
Land Use	Forest practices	✓	✓
	Development practices and stormwater management	✓	✓
	Floodplain management	✓	✓
	Wetlands management	✓	✓

The first six techniques listed in Table 4-1 are related to water use. They pertain to activities of those who divert surface water or withdraw ground water for consumptive uses, such as for municipal, domestic, industrial, and agricultural purposes. The latter four techniques are related to land use activities.

4.1.1 Stream Flow and Water Supply

As noted above, development and use of water supplies affects stream flow. In particular, water withdrawals can exacerbate low flow conditions that occur in the late summer and early fall. At this time of year, when flows are naturally low, even a small reduction in stream flow from water withdrawals have significant impacts on aquatic habitat. Flow is obviously reduced when surface water is diverted directly from a stream. Flow may also be reduced when ground water is pumped, if the aquifer used is hydraulically connected to surface waters.

At the same time, the Planning Unit recognizes that water supply is essential for communities, citizens and businesses, and needs for water will increase as the region continues to grow and develop. Striking a balance between protecting flows and allowing for water supply has been a major aspect of this watershed planning process.

To achieve this balance, Section 4 of the Watershed Management Plan presents a number of policies. For new supplies to meet needs of a growing population, this Plan recommends increased emphasis on ground water supplies rather than surface water supplies. Where feasible, confined ground water aquifers that have minimal impact on

stream flow in tributaries to the Columbia River should be developed rather than aquifers that are directly connected to these tributary streams.

The Watershed Planning Unit has reviewed the magnitude and locations of expected needs for new water supplies throughout WRIAs 25 and 26. In some cases, water can be withdrawn from areas that will not cause significant effects on stream flow or aquatic habitat. This is the case, for example, near the mouths of streams that are influenced by tidal effects and backwater from the Columbia River.

It is recognized that new development of water supplies will be needed for some communities where impacts to stream flow are unavoidable. The Planning Unit offers a proactive set of recommendations to address these situations. Communities should explore all reasonable alternatives prior to developing a new supply that will reduce late summer flows in tributary streams. Where alternatives are either infeasible or prohibitively expensive, other approaches such as water conservation and development of reclaimed water supplies[1] can help reduce needs for new supplies. The Planning Unit recommends a procedure whereby these alternative solutions must be explored in detail before the Washington State Department of Ecology (Ecology) considers issuing new water rights that would impact stream flows.

The Planning Unit also recommends a policy to prohibit issuance of new water rights that would reduce low flows, except under certain pre-defined circumstances. This policy can be accomplished under State law through what is known as a "closure" of streams to new allocations. In the Grays, Elochoman, and Coweeman basins, there is sufficient modeling data to assist in the development of numeric instream flow data. These numerical flows have been integrated with the stream closures to allow flexibility in managing intra-basin transfers while providing additional legal basis for the closures. The Planning Unit recognizes that a total closure of streams to all new water right applications would conflict with the goal of ensuring adequate water supplies are available for the region. Therefore the policy has conditions for:

- Domestic wells, served by septic systems
- Specific communities that may not have access to alternative supplies. In these cases a pre-defined quantity of water will be "reserved" for possible allocation to that community. The reserved quantity will be defined in terms of the net effect on stream flow from development of new supply capacity
- Other communities and industries that may need supplies in the future, but whose needs cannot be well-defined at this time. Again, a pre-defined quantity will be reserved to meet these needs.

For water supplies except for domestic wells, the reserved supplies discussed above can be tapped only if the community first demonstrates there is no other practicable

[1] Reclaimed water is highly treated wastewater that can be used for non-potable purposes such as irrigation of large landscapes and golf courses, industrial uses, and other uses permitted under State law.

alternative, commits to effective stewardship through conservation and/or production of reclaimed water; and commits to offsetting actions and mitigating actions that minimize the effects on stream flow or aquatic habitat. Actions will be evaluated within the context of other supply alternatives, water supply total project cost, and the cost of the off-setting and mitigating actions. These costs should be reasonable within the context of other fish recovery actions that may be needed to compensate for impairment to streamflow.

This Plan also recommends acquisition of water rights from willing sellers for the State Trust. This program sets aside water specifically for stream flows and other purposes. In addition, this Plan calls for increased enforcement actions against unauthorized uses of water. Finally, the Plan recommends that major water users develop policies and procedures to reduce the impacts of withdrawals during drought conditions when streams are under unusual stress.

These policies, taken as a whole, are designed to protect stream flows from unnecessary depletion, while still allowing reasonable opportunities for water supply to meet the needs of a growing region. Further details are provided later in this section of the Watershed Management Plan.

4.1.2 Stream Flow and Land Use

Water withdrawals to meet water supply needs are not the only human activity influencing stream flow. Land use, development practices, forest practices, and modification of floodplains and wetlands all affect runoff within a watershed. Where these factors allow precipitation to run off more quickly, they concentrate peak flows, erosion and flood damage. In addition, some of these activities reduce natural storage in ground water, floodplains and riparian wetlands. Where natural storage is reduced, less water is retained to support base flows during the dry season.

Forested areas occupy over 77 percent of the lands within WRIA 25 and over 67 percent of the lands in WRIA 26. In general, the Planning Unit anticipates that recent changes in forest management under the Forests and Fish Rules, DNR's Habitat Conservation Plan, the Northwest Forest Plan provide an adequate regulatory framework for forest practices. These programs offer a range of environmental benefits, and should generally improve water quality and move in the direction of a more natural flow regime in local streams and rivers. The Planning Unit does not offer new policies in this regard, but calls on State and federal government agencies to monitor the effectiveness of these programs and periodically report to the public on their results, including effects on stream flow and fish habitat.

The Planning Unit has recommended additional policies in the areas of stormwater management, extensions of sewer service to unsewered areas, floodplain protection and wetlands management. Specific project opportunities have been identified where possible. These policies and projects are described in greater detail later in Section 4.

Channel configuration is also important to aquatic habitat. On some streams, various factors have led to wider, shallower channels in some reaches. This generally magnifies

problems related to low flow and reduces habitat quality. Alterations to channel configuration problem are beyond the scope of the stream flow discussion in Section 4 of this Plan. However, this issue is being addressed in the Lower Columbia Fish Recovery Board's Salmon and Steelhead Recovery and Subbasin Plan (LCFRB 2004)

4.1.3 Summary of Stream Flow Management Policies

This section summarizes the stream flow management policy statements discussed in the upcoming sections. For convenient reference, Table 4-2 lists each policy statement.

4.1.4 Organization of this Section

The remainder of Section 4 lays out these policies and recommendations in greater detail. Section 4.2 describes the need for improved monitoring of flow conditions. Section 4.3 introduces the concept of "target flows." This concept offers a "measuring stick" for progress on protecting and improving stream flow conditions. Section 4.4 presents the suite of management tools for minimizing the effects of water withdrawals on flow conditions. Section 4.5 describes additional management tools related land use. Section 4.6 identifies priorities among the 12 major subbasins of WRIAs 25 and 26 for applying the stream flow management techniques. Section 4.7 summarizes stream flow conditions and recommendations in each of the subbasins. Finally, Section 4.8 discusses implementation considerations for the stream flow management program.

4.2 Flow Monitoring Needs

In order to manage flows, they must be monitored consistently. For purposes of the flow management program developed in this Plan, flow monitoring is needed to:

- Provide basic data needed to assess current status and long-term trends in stream flow
- Provide basic data to determine how various components of the watershed contribute to flow (e.g. flow contributed by specific tributaries; gains and losses from groundwater interactions, etc.)
- Assess how short-term or long-term changes in watershed conditions affect flows (e.g. land use, precipitation trends).
- Evaluate the effectiveness of specific management actions designed to improve the flow regime.
- While not the focus of this section, stream flow data is also very valuable in the context of water quality monitoring (see Section 5.4.2).

Table 4-2
Summary of Stream Flow Management Policies for WRIAs 25 and 26

No.	Technique	Policy
Policy on Flow Monitoring		
SFP-1	Flow monitoring	For purposes of improving stream flow management in the region, it is important that existing stream gauges be maintained over the long term and that additional, permanent stream gauges be installed.
Policies on Water Supply as Related to Stream Flow		
SFP-2	Restrictions on issuance of new water rights	The Department of Ecology should adopt State Rules (WACs) under its Instream Resources Protection Program to restrict issuance of new water rights in WRIAs 25 and 26. In all affected streams reaches a closure should be established, but with certain exceptions as indicated below. Existing water rights shall not be affected by this policy. For each stream that flows into the Columbia River, the zone where water levels are substantially affected by tidal influence and backwater from the Columbia River shall not be closed to issuance of new water rights. The location of the lower most extent of the closure is identified in this Plan. The rules adopted shall not prevent issuance of water rights for selected purposes and conditions. These include: ■ New uses for domestic wells, based on the amount of the water required to meet estimated needs. This quantity represents the net depletion of stream flow in each subbasin by all domestic wells installed after the effective date of the rule; ■ New uses for small community systems and other beneficial uses, up to a predefined, limited "block" of water. These quantities represent the net depletion of stream flow in each subbasin for these categories of water use. Access to this block shall be granted only after consideration of items as listed for municipal systems, below. ■ New uses for municipal water systems, based on the amount of water required to meet estimated needs. This quantity represents net depletion of stream flow in each subbasin. Access to this block should be granted only after consideration of reasonable alternative supplies, demonstration of appropriate measures to ensure water-use efficiency, and consideration of measures that offset and mitigate the depletion of stream flow or provide other types of aquatic habitat benefits; ■ Small, temporary uses of water for environmental restoration purposes not exceeding one year in duration. ■ Non-consumptive uses such as fish propagation or hydropower. ■ New uses limited to the high flow season, where the nature of the proposed use is such that water will not be taken in the low-flow season. However, this is not intended to allow withdrawals large enough to compromise habitat-forming processes of any stream. The Planning Unit recommends that minimum instream flows be adopted as an additional element of the State Rules in selected basins where sufficient data is available. The minimum instream flows will be used in processing applications for changes or transfers of existing water rights. However, the blocks of water reserved for domestic, municipal, and other beneficial uses (see above) shall not be subject to minimum instream flow conditions. The Planning Unit recommends the rule be evaluated every five years after adoption (or more frequently if needed); and that revisions to the rule be considered if needed. Increases to water supply reservations may be considered if compatible with aquatic habitat protection objectives. In addition, water reservation quantities may be shifted among water use categories to better address actual needs. However, the total reservation quantity in each subbasin shall not be decreased. Consistent with Chapter 90.82.130 any process to revise the rule should use a form of negotiated rulemaking that uses the same processes that applied in WRIAs 25 and 26 for developing this Watershed Management Plan.

Table 4-2 (cont.)
Summary of Stream Flow Management Policies for WRIAs 25 and 26

No.	Technique	Policy
SFP-3	Water Conservation	Water conservation is part of a sound comprehensive water resources management program. In general, adherence to State requirements for municipal water conservation, as modified from time to time, will be sufficient for most communities within WRIAs 25 and 26. Conservation activities that exceed state requirements should be carried out in selected communities where water use has the potential to cause significant impairment of stream flow conditions. Based on the Planning Unit's assessment of watershed conditions, only the City of Winlock has been identified in this regard at this time. This is a Planning Unit recommendation regarding voluntary actions. Implementation should not be mandated by the State. Water conservation actions by farmers practicing irrigated agriculture may be warranted in selected locations, where there would be significant benefits to stream flows. The Conservation District in each County should provide technical assistance to farmers to identify water conservation opportunities and funding sources.
SFP-4	Short Term Drought Response	Where major surface water diversions or ground water withdrawals have a direct effect on stream flows on a time scale of weeks or less, the water user should be prepared to alter operations in the event of a State-declared drought emergency affecting WRIA 25 and/or 26. The water user should adopt policies and procedures in advance, to allow for quickly altering operations to minimize or eliminate the depletion of stream flow to the extent feasible in the event such a drought occurs. This is a Planning Unit recommendation regarding voluntary actions. Implementation should not be mandated by the State. For hydropower operations such as the Cowlitz River Project, it is assumed that FERC license conditions fully address releases under low flow conditions, including drought conditions. Efforts should continue to identify small surface water users that could implement this strategy to improve low flow conditions.
SFP-5	Source Substitution	Communities using water sources (surface or ground water) that significantly reduce base flows in any stream that provides important fish habitat within WRIAs 25 and 26 should evaluate alternative sources of supply that eliminate or minimize these effects. It is anticipated that this would require examination of cost, potential rate impacts, reliability considerations, and evaluation of other feasibility criteria. This is a Planning Unit recommendation regarding voluntary actions. Implementation should not be mandated by the State. In limited cases, this policy may also apply to rural areas where residents rely on domestic wells (exempt wells). Cowlitz, Lewis and Wahkiakum Counties should assess this possibility through a water-balance analysis, in selected rural areas where extensive new development is expected to occur or where there is substantial existing development served by exempt wells.

Table 4-2 (cont.)
Summary of Stream Flow Management Policies for WRIAs 25 and 26

No.	Technique	Policy
SFP-6	Transfer of Water Rights to State Trust	Ecology should use its existing State Trust program, and funding provided by the State Legislature, to identify and acquire water rights from holders willing to sell or donate their water rights in WRIAs 25 and 26, where transfers to the State Trust would provide a significant benefit to fish habitat.
SFP-7	Enforcement against unauthorized uses	Ecology should conduct or support initial surveys in selected subbasins to determine whether unauthorized water uses are occurring on streams deemed critical to salmon recovery within WRIAs 25 and 26. If these surveys identify extensive unauthorized uses, they should be expanded to additional subbasins and carried out on a regular, periodic basis (e.g. once every five years). Where unauthorized uses are identified, Ecology should take enforcement actions to eliminate these uses.
SFP-8	Hydropower Operations	The Planning Unit understands that the FERC license conditions take into account flows for anadromous fish and other wildlife species. While hydropower regulation of flows in the Cowlitz River is protective of the needs of fish, they do not account for additional use downstream of the Mayfield Dam. Therefore, the Planning Unit recommends additional protection for the Cowlitz River mainstem in the form of a numeric instream flow that provides water for beneficial uses subject to flow conditions.
Policies on Land Use as Related to Stream Flow		
SFP-9	Forest Practices	Private landowners, State DNR, and USFS should consider effects of forest management practices on stream flow and other fish habitat factors, in making forest management decisions. The Planning Unit anticipates that existing programs under the State's Forests and Fish regulations, the state forest land's Habitat Conservation Plan, and the federal government's Northwest Forest Plan will provide the regulatory framework needed in this regard. The State and federal governments should monitor the effectiveness of these programs and periodically provide public documentation of their effectiveness in protecting fish habitat in WRIAs 25 and 26.
SFP-10	Stormwater Management	As Phase II communities, Cowlitz County and the Cities of Longview and Kelso should continue to carry out their legally mandated responsibilities with regard to stormwater management. Lewis and Wahkiakum Counties and the remaining cities in all three counties should review their stormwater management ordinances to determine whether they are adequately protective of fish habitat in local streams that may be affected by future development. Where enhanced stormwater management needs are identified, revisions to local ordinances should be considered in light of the guidance and BMPs provided in Ecology's Manual or a reasonable equivalent. The focus should be on upgrading development practices and mitigation requirements in areas where stream flow and fish habitat may be compromised as development occurs. Costs, expected magnitude of benefits, and feasibility considerations should be included in this review.

Table 4-2 (cont.)
Summary of Stream Flow Management Policies for WRIAs 25 and 26

No.	Technique	Policy
SFP-11	Sewer Extensions	Lewis, Cowlitz, and Wahkiakum Counties and the cities in all three Counties in WRIAs 25 and 26 should develop policies to address the water balance implications of extending sewer service to developing areas. The Planning Unit recognizes that provision of sewer service can provide substantial water quality benefits. However, where sewer service is extended to replace septic systems, and residents continue to rely on water wells, stream flows may be reduced. This is particularly important in areas with relatively dense development near small streams.
SFP-12	Floodplain Management	Local jurisdictions and state agencies with land management responsibilities should protect existing floodplains from modifications that would impair their hydrologic functions and habitat value. Local jurisdictions and state agencies with land management responsibilities should identify floodplain restoration projects, subject to local input, cost-benefit analysis, and availability of funding. Where these factors are favorable, and where substantial benefits to flow or other habitat factors are identified, these projects should be pursued for implementation. Current floodplain uses and the benefits of existing control structures will be considered when determining if specific floodplain restoration projects should be pursued.
SFP-13	Wetlands Management	Lewis, Cowlitz, and Wahkiakum Counties should assess the hydrologic function of wetlands as a part of their wetlands inventory. Their wetlands ordinances should be modified as needed to include hydrologic functions in the wetland protection hierarchy. The three Counties should review and consider strengthening mitigation ratios, for selected wetland areas that offer significant hydrologic functions or other fish habitat benefits.

At this time, there are several stream gauges on the mainstem Cowlitz River. There are also gauges on Cowlitz River tributaries in the Upper Cowlitz River Subbasin (Cispus and Tilton Rivers) and on the Toutle River. None of the other streams in WRIAs 25 and 26 have long-term, continuous flow gauges at this time.

Therefore, the Planning Unit offers the following policy statement regarding flow monitoring.

Policy SFP-1:

For purposes of improving stream flow management in the region, it is important that existing stream flow gauges be maintained over the long-term and that additional, permanent stream gauges be installed.

It is recognized that installation and operation of gauges requires funding, and it may be impossible to fund gauges in every location desired. The Planning Unit identified the following criteria for focusing funding resources on selected subbasins (for subbasin boundaries, see Exhibit 2-1 in Section 2):

- Presence of existing gauges that should be maintained permanently;
- Past record of discontinued stream gauges, which provide data that can be leveraged if new gauges are installed;
- Degree to which flow is impaired now, with potential harm to aquatic habitat;
- Size of subbasin and associated extent of habitat for aquatic life
- Priority of streams in LCFRB Recovery Plan;
- Expected future changes in land use or water withdrawals, that will cause impairment of flow;
- Extent of existing urbanization, and associated feasibility of protecting or enhancing flow (e.g. consider highly urbanized subbasins less feasible)

Based on these criteria, Table 4-3 identifies priorities for installation and maintenance of permanent, continuously-recording stream gauges:

Table 4-3
Subbasin Priorities for Stream Gauge Installation and Maintenance

High Priority	Medium Priority	Lower Priority
Maintain existing gauges in Cowlitz River Basin	Elochoman River	Other Upper Cowlitz Tributaries
Grays River	Mill/Abernathy/Germany Creek	Coal Creek/Longview Slough
Coweeman River	Other Lower Cowlitz River Subbasin Tributaries (Lacamas, Leckler, Delameter, Arkansas Creeks)	
Olequa Creek	Skamokawa Creek	

Consideration should also be given to whether existing weather stations for measuring precipitation and other weather variables are adequate to meet stream management needs.

The Planning Unit addressed particular attention to the Grays River, Elochoman River, Lower Cowlitz Tributaries and Coweeman River subbasins during the planning process. This is because they were used as "pilot" subbasins to develop the overall program for stream flow management. More detailed recommendations on flow gauging in these four subbasins are provided later in Section 4.

4.3 Target Flows

One way in which the effectiveness of stream flow management can be quantified and monitored is through the establishment of "target flows". As used in this watershed plan, the term "target flows" means a realistic flow regime that could be achieved in most years by following selected management techniques over a long period of time (e.g. 10 years or more). The "flow regime" is defined by a set of statistics that define both high flows and low flows, and their frequency of occurrence over a period of years. These statistics are readily developed from flow records at stream-gauging sites. An appropriate flow regime for a specific stream can be determined by evaluating historical flow conditions, current and projected water uses, and fish habitat needs.

Target flows should not be confused with "minimum instream flows" used in allocating water rights. Traditionally, a minimum instream flow for a given stream has been a single, low flow rate listed for each season (or sometimes a single flow rate for the entire year). The sole purpose of minimum instream flows in State law has been to define restrictions on issuance of new water rights. The minimum instream flow approach has value for that particular purpose, but does not provide a practical framework for addressing other factors that affect stream flow, nor for managing conditions that exacerbate peak flows.

The intent in establishing target flows is that, once management actions have been taken, the target flows should be achievable under typical precipitation and runoff conditions. Available management techniques are discussed later in Section 4 of this Plan. If improvement in flow conditions is to be achieved, management techniques that have the potential to achieve the desired target flows must be applicable in the specific watershed.

This approach can serve as the basis for a practical and achievable management program addressing all of the human activities that influence stream flow. It aims for achievable flow levels, it accounts for both low and high ends of the flow regime, and it captures the natural variability of stream flows (both seasonally and over long periods of time).

As with any stream flow management program, flow data is needed to define the flow regime. This underscores the value of permanent stream gauges. Target flows should be established only in areas where significant flow data has been collected over a long period of time (or where acceptable simulated flow data has been generated).

Briefly, for the low-flow period of late summer and early fall, flow levels can be defined at the 90th percentile, 50th percentile (median), and 10th percentile. These represent flows that can be expected, on average, either 1 year out of ten; 5 years out of ten, or 9 years out of ten, respectively.

For example, on the Coweeman River this range of flows at former gauge site at RM 7.0 for the month of August is from 37 cfs to 85 cfs. The median flow is 52 cfs. These values can be defined as the target range for low flows in August. The goal would be to manage the watershed and water withdrawals to prevent this range of flows from decreasing over a time period of

several years to decades (e.g. the range falls to a quantity such as 30 to 75 cfs, and the median falls to 45 cfs). In addition, it would be desirable to undertake management actions that would increase this range of flows (e.g. the range rises to a quantity such as 40 to 90 cfs, and the median rises to 55 cfs).

A different type of target flow statistic can be defined for peak flows that typically occur in the winter months. For peak flows, the Planning Unit has identified the 2-year flood and the 10-year flood as appropriate statistics. The 2-year flood has a 50 percent chance of occurring in any single year. The 10 year flood has a 10 percent chance of occurring in any single year. An appropriate goal would be to manage the watershed such that the 2-year flood and the 10-year flood either remain at a constant level over time, or decrease.

In addition, it is important that the duration of the highest flows not increase. Increased duration of flows above certain levels can be damaging to riparian and channel conditions and contribute to erosion and sedimentation.

Appendix G provides additional technical information on target flows, using the Coweeman River and Olequa Creek as examples. Target flows have not been developed for other streams in the region at this time, but could be developed in the future.

4.4 Water Supply Management Actions to Protect Stream Flow

As discussed in Section 4.1.1 water supply actions can affect stream flow. This is particularly true during the late summer and early fall, when stream flows are already low due to reduced precipitation. Diversions of stream flow for water supply directly reduce stream flow. Pumping ground water can also reduce stream flow in local streams, if the aquifer involved is interconnected with local surface waters. However, the effects of pumping are often diffuse and may be delayed by days, weeks or months.

It should be noted that all ground waters is inter-connected with surface water somewhere. For the purposes of this plan, the primary issue is whether pumping ground water will affect stream flow in streams other than the Columbia River. Furthermore, the primary issue is effects upstream of stream reaches that are tidally influenced.

Some aquifers have a more pronounced effect on local stream flows than others. Pumping from a large regional aquifer may not produce measurable impacts in the streams that flow into the Columbia River from WRIAs 25 and 26[2].

This subsection describes management actions that can be used to minimize the effects of water supply development on stream flow in WRIAs 25 and 26. More complete descriptions of these actions are provided in Technical Memorandum No. 7: Develop Strategies for Managing Flow (EES, 2003a). For each technique, the Planning Unit offers a policy statement intended to guide water resource management in WRIAs 25 and 26.

[2] Since the Columbia River itself is so large, pumping from a regional aquifer at the quantities existing or expected for local needs may have effects that are not measurable on the Columbia River either.

Section 3 of this Watershed Management Plan should be reviewed in conjunction with this Section 4.4. This is because the Planning Unit intends that as stream flows are protected or improved, provision also be made for adequate water supplies.

4.4.1 Stream Closures, Minimum Instream Flows, and Water Right Reservations

This management technique involves placing restrictions on issuance of new water rights by the Washington State Department of Ecology (Ecology). This approach is designed to protect stream flows from new appropriations of water. This can be accomplished with either stream closures or adoption of minimum instream flows. These restrictions affect only the issuance of new water rights; existing uses of water and other watershed factors that influence flow are not affected by this action. Furthermore, this approach is designed to manage only low flow conditions, not peak flows.

A stream "closure" means that Ecology will deny any future applications for water rights from that stream and all its tributaries. This includes applications for surface water rights, and applications for ground water rights that could affect flows in the stream.

"Minimum instream flows" are different from closures. With minimum instream flows an applicant can receive a new water right. However, their use of the water right must cease whenever the flow in the stream falls below a certain level at a prescribed control point (this would typically occur during the summer months). As a practical matter, this requires monitoring of stream flow and issuance of notices or orders to these water right holders by Ecology when flows drop below the prescribed level.

Some minimum instream flows and closures have been established by Ecology already through administrative actions in WRIAs 25 and 26. These administrative low flows and closures lists are referred to as Surface Water Source Limitations (SWSLs). Exhibits 4-1 and 4-2 present the locations of existing administrative low flows and closures from Ecology's SWSL listings for WRIAs 25 and 26, respectively. Details regarding each SWSL are provided in Appendix H.

Table I-1 in Appendix I shows proposed restrictions on the issuance of new water rights in WRIAs 25 and 26. Table I-4 shows proposed instream flows for the Grays, Elochoman, and Coweeman Rivers. These recommended instream flows and closures are presented in Exhibits 4-3 and 4-4 for WRIAs 25 and 26 respectively.

Ecology has the authority to pass a State Regulation (WAC) that would formalize minimum instream flows and closures. This is considered to offer stronger provisions that restrict issuance of new water rights or provide conditions on new water rights. This has been done in other WRIAs, but not in WRIAs 25 and 26. The Planning Unit views the additional protection for stream flow in an adopted State rule as desirable for achieving the objective of protecting stream flow. Therefore, this plan offers the following policy recommendation in this regard.

Grays River

Elochoman River

Skamokawa Creek

Abernathy/ Germany Creek

Coal Cr/ Longview Slough

25-1 *Fossil Creek*

25-2 *Elochoman River*

4

401

403

407

409

411

433

5

N

3 0 3 Miles

LEGEND

Closure Types

Closure

Low Flow

Sub-Basin

Stream Reaches

Affected Stream Reaches

WRIA 25

Washington State

Notes:

1. **The identification codes (e.g. 25-1) reference surface water source limitations (SWSL) tabulated for each subbasin in the appendices of the watershed plan.**

2. **Shaded zones represent the upstream drainage areas affected by surface water source limitations.**

EXHIBIT 4-1
WRIA 25
Pre-Existing Surface Water Source Limitations

December 2004

Economic and Engineering Services, Inc.
Bellevue Mount Vernon Olympia Portland Tri-Cities

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LEGEND

Closure Types

- Closure
- Low Flow
- Sub-Basin
- Stream Reaches
- Affected Stream Reaches

Notes:

1. The identification codes (e.g. 26-1) reference surface water source limitations (SWSL) tabulated for each subbasin in the appendices of the watershed plan.

2. Shaded zones represent the upstream drainage areas affected by surface water source limitations.

26-12 *Unnamed Spring to Olequa Creek*

26-7 *Lacamas Creek*

26-8 *Mill Creek*

26-9 *Minnie Creek*

26-20 *Tilton River*

26-4 *Frost Creek*

26-17 *Silver Creek*

26-13 *King Creek*

26-15 *Curtis Creek*

26-2 *Brim Creek*

26-14 *Stillwater Creek*

26-3 *Cowlitz River*

26-11 *Olequa Creek*

26-21 *Unnamed Stream to Arkansas Creek*

26-1 *Arkansas Creek*

Hazel Dell Creek (Leckler Creek) 26-6

McMurphy Creek 26-10

Salmon Creek 26-23

Sulphur Creek 26-19

Rainey Creek 26-22

Siler Creek 26-16

Snyder Creek 26-18

Hall Creek 26-5

Tilton River

Upper Cowlitz River

Lower Cowlitz River

Mayfield Dam

Cispus River

Toutle River

Coweeman River

123 12 12 7 508 505 504 4 5 5

N

5 0 5 Miles

WRIA 26

Washington State

EXHIBIT 4-2
WRIA 26
Pre-Existing Surface Water Source Limitations

December 2004

Economic and Engineering Services, Inc.
Bellevue Mount Vernon Olympia Portland Tri-Cities

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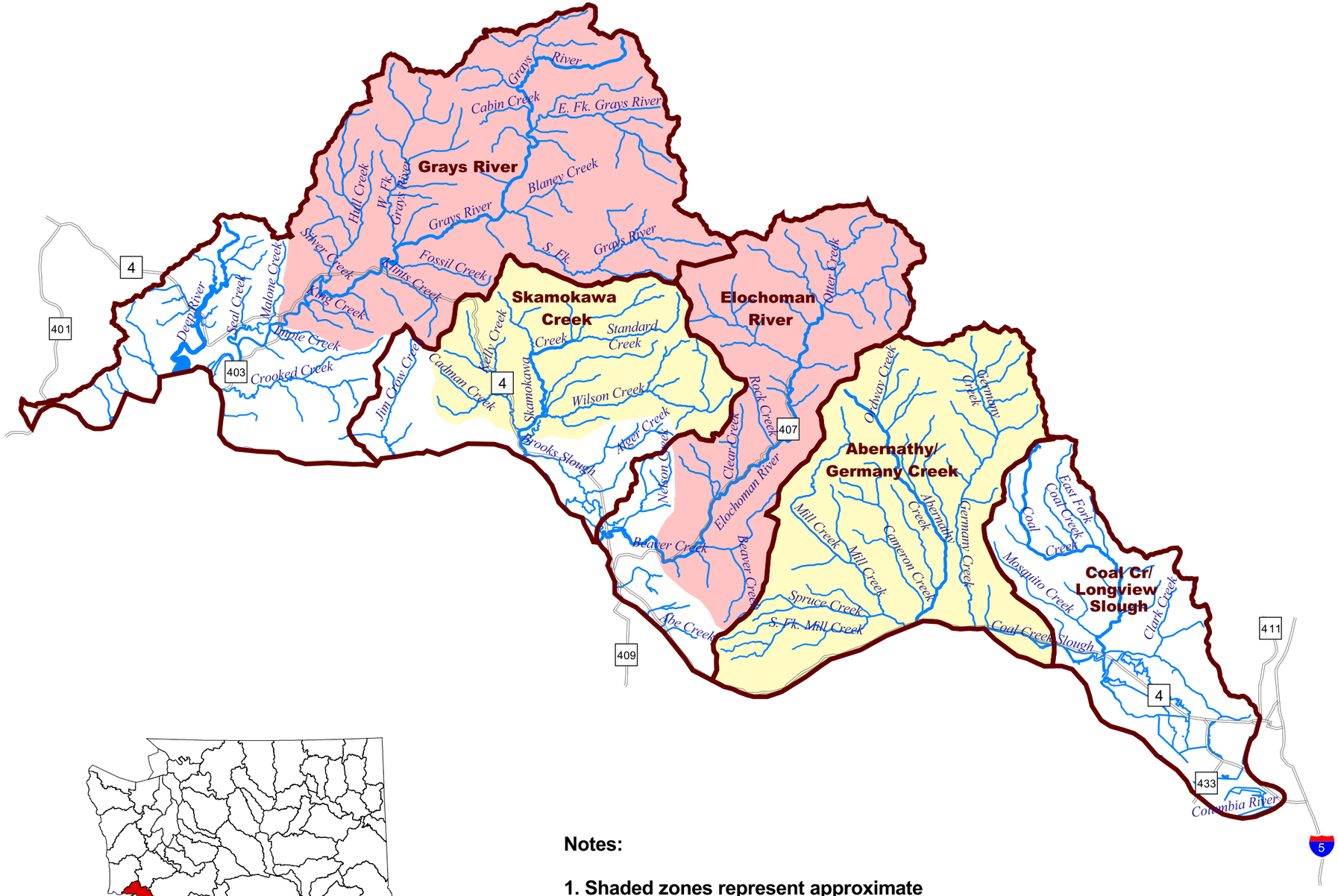


N

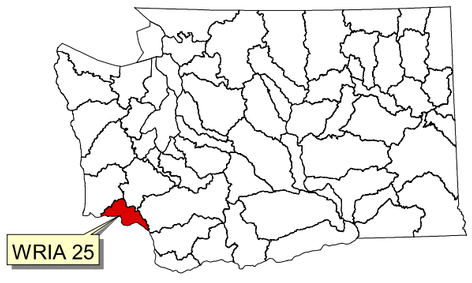
3 0 3 Miles

LEGEND

- Sub-Basin Boundary
- Roads
- Rivers and Streams

Closure Types

- Closures Only
- Closures with Instream Flows



Washington State

Notes:

1. **Shaded zones represent approximate drainage areas affected by recommended restrictions. See Table I-1 for specifics.**

2. **Tidal reach areas have no recommended restrictions.**

EXHIBIT 4-3
WRIA 25
Recommended Instream Flows and Closures

December 2004

Economic and Engineering Services, Inc.
Bellevue Mount Vernon Olympia Portland Tri-Cities

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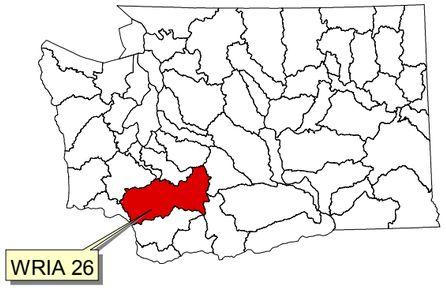

Washington State

Notes:

1. **Shaded zones represent approximate drainage areas affected by recommended restrictions. See Table I-1 for specifics.**

2. **Tidal reach areas have no recommended restrictions.**

Tilton River
Upper Cowlitz River
Lower Cowlitz River
Mayfield Dam
Cispus River
Toutle River
Coweeman River
Jesse Creek
Bear Canyon
Mill Creek
Tilton River
Connelly Creek
Lake Creek
E Fk. Tilton River
Klickitat Creek
Shelton Creek
Sulphur Creek
Sand Creek
Frost Creek
Rainy Creek
Cedar Creek
Skook Creek
Blue Creek
Olequa Creek
Bear Creek
Lacamas Creek
Cowlitz River
Little Salmon Creek
Salmon Creek
Rapid Creek
Brim Creek
Stillwater Creek
Campbell Creek
Arkansas Creek
Whittle Creek
Monahan Creek
Ostrander Creek
Devils Creek
Green
Cascade Creek
Elk Creek
Wakepish Creek
Goat Creek
Green River
Toutle River
Alder Creek
Cow Creek
North Fork
South Fork
Sucker Creek
Wyant Creek
Coweeman River
Goble Creek
Martin Creek
Silver Creek
Surrey Creek
Kiona Creek
Skate Creek
Cowlitz River
Dam Creek
Coal Creek
Carlton Creek
Summit Creek
Cortright Creek
Hager Creek
Johnson Creek
Dry Creek
Deception Creek
Smith Creek
Siler Creek
Camp Creek
W. Fk. Cispus River
Woods Creek
Crystal Creek
Iron Creek
Veta Creek
Big Creek
Pinto Creek
McCoy Creek
Yellowjacket Creek
Cat Creek
Pumico Creek
Muddy Fork
Killen Creek
East Canyon Creek
Walupt Creek
Ohanapecosh River
Deer Creek
Nickel Creek
Stevens Creek
Williams Creek
Davis Creek
Lewis River
Kalama River
Toutle River
Green River
Columbia River
Kalama
Longview
Kelso
Castle Rock
Toutle
Silver Lake
Spirit Lake
Mount St. Helens
Mount Adams
Mount Rainier
Packwood
Randle
Morton
Ashford
Elbe
Eatonville
Yelm
Tenino
Centralia
Chehalis
Winlock
Vader
Toledo
Napavine
Onalaska
Pe Ell
Adna
Salkum
Mossyrock
Mayfield Lake
Riffe Lake
Swofford Pond
Lake Scanewa
Lake Sacajawea
Lake Kalama
Lake Merrill
Lake Lewis
Silver Lake
Spirit Lake
Lake Tapps
Alder Lake
Lake Kapowsin
Lake Ohop
Lake Mineral
Lake Nahwatzel
Lake Wooten
Lake Wynoochee
Lake Aberdeen
Lake Quinault
Lake Quinault
Lake Crescent
Lake Sutherland
Lake Ozette
Lake Pleasant
Lake Dickey
Lake Ozette
Lake Pleasant
Lake Dickey
Lake Crescent
Lake Sutherland
Lake Quinault
Lake Wynoochee
Lake Aberdeen
Lake Nahwatzel
Lake Wooten
Lake Mineral
Lake Ohop
Lake Kapowsin
Alder Lake
Lake Tapps
Lake Sacajawea
Lake Kalama
Lake Merrill
Lake Lewis
Swofford Pond
Lake Scanewa
Riffe Lake
Mayfield Lake
Mossyrock
Salkum
Adna
Pe Ell
Onalaska
Napavine
Vader
Toledo
Winlock
Chehalis
Centralia
Tenino
Yelm
Eatonville
Elbe
Ashford
Morton
Randle
Packwood
Mount Rainier
Mount Adams
Mount St. Helens
Spirit Lake
Silver Lake
Toutle
Castle Rock
Kelso
Longview
Kalama
Columbia River
Green River
Toutle River
Lewis River
Kalama River
5
7
12
123
504
505
508
4

N

5 0 5 Miles

LEGEND

- Sub-Basin Boundary
- Roads
- Rivers and Streams

Closure Types

- Closures Only
- Closures with Instream Flows

EXHIBIT 4-4
WRIA 26
Recommended Instream Flows and Closures

December 2004

Economic and Engineering Services, Inc.
Bellevue Mount Vernon Olympia Portland Tri-Cities

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Policy SFP-2:

The Department of Ecology should adopt State Rules (WACs) under its Instream Resources Protection Program to restrict issuance of new water rights in WRIAs 25 and 26. In all affected streams reaches a closure should be established, but with certain exceptions as indicated below.

Existing water rights shall not be affected by this policy.

For each stream that flows into the Columbia River, the zone where water levels are substantially affected by tidal influence and backwater from the Columbia River shall not be closed to issuance of new water rights. The location of the lower most extent of the closure is identified in this Plan.

The rules adopted shall not prevent issuance of water rights for selected purposes and conditions. These include:

- New uses for domestic wells, based on the amount of water required to meet estimated needs. This quantity represents the net depletion of stream flow in each subbasin by all domestic wells installed after the effective date of the rule;
- New uses for small community systems and other beneficial uses, up to a predefined, limited "block" of water. These quantities represent the net depletion of stream flow in each subbasin for these categories of water use. Access to this block shall be granted only after consideration of items as listed for municipal systems, below.
- New uses for municipal water systems, based on the amount of water required to meet estimated needs. This quantity represents net depletion of stream flow in each subbasin. Access to this block should be granted only after consideration of reasonable alternative supplies, demonstration of appropriate measures to ensure water-use efficiency, and consideration of measures that offset and mitigate the depletion of stream flow or provide other types of aquatic habitat benefits;
- Small, temporary uses of water for environmental restoration purposes not exceeding one year in duration.
- Non-consumptive uses such as fish propagation or hydropower.
- New uses limited to the high flow season, where the nature of the proposed use is such that water will not be taken in the low-flow season. However, this is not intended to allow withdrawals large enough to compromise habitat-forming processes of any stream.

The Planning Unit recommends that minimum instream flows be adopted as an additional element of the State Rules in selected basins where sufficient data is available. The minimum instream flows will be used in processing applications for changes or transfers of existing water rights. However, the blocks of water reserved for domestic, municipal, and other beneficial uses (see above) shall not be subject to minimum instream flow conditions.

The Planning Unit recommends the rule be evaluated every five years after adoption (or more frequently if needed); and that revisions to the rule be considered if needed. Increases to water supply reservations may be considered if compatible with aquatic habitat protection objectives. In addition, water reservation quantities may be shifted among water use categories to better address actual needs. However, the total reservation quantity in each subbasin shall not be decreased. Consistent with Chapter 90.82.130 any process to revise the rule should use a form of negotiated rulemaking that uses the same processes that applied in WRIAs 25 and 26 for developing this Watershed Management Plan.

The Planning Unit discussed this policy extensively during the preparation of this Watershed Management Plan. Each of the items listed in the policy requires additional definition to ensure the Planning Unit's intent is met in final adoption of a state rule.

The provision for a "reservation" of water in a basin where issuance of water rights is restricted is particularly important. Communities and industries should explore a range of source options that do not affect surface waters. However, in cases where no reasonable and economical alternative is available, communities should still be able to meet their needs. The reservation offers a last resort after other possibilities have been exhausted.

If a water reservation is to be tapped, the water right applicant must further demonstrate responsible management of the resource, through off-setting actions, water conservation, or similar efforts. Actions should focus on those activities that can directly offset effects of pumping or diversions. For example, buying out and retiring upstream water rights can offset new withdrawals. As a second tier, mitigation may include other types of habitat restoration activities that do not directly offset flow impacts of expanded water supply. These actions should focus on restoration that optimizes habitat relative to instream flow.

These mitigation requirements do not apply to domestic well reservations.

It is important to clarify the relationship between reservations and domestic wells. Under current state law a person installing a domestic well to withdraw up to 5,000 gallons per day (including a well serving multiple residences) does not need to apply for a water right permit. The Watershed Management Plan makes no change to this exemption. However, through discussions with Ecology, the Planning Unit concluded that the ability of landowners to install domestic wells could be at risk under current law, in any area where a stream closure or minimum instream flow has been established. There are many such areas in WRIAs 25 and 26. The establishment of a water supply reservation for domestic wells in each subbasin is intended to protect the rights of landowners to install domestic wells, even in subbasins where stream closures and/or minimum instream flows have been established.

Table 4-4 provides a summary of the water right reservations developed for WRIAs 25 and 26, based on an analysis of water needs through 2020. The net stream flow depletion allowance depicted in the table reflects the mitigation element described above. Every five years the water right restrictions and reservations should be evaluated to determine whether changes are needed to achieve the objectives of this Watershed Management Plan. For example, reservations may need to be increased as growth occurs beyond 2020 if such increases are compatible with objectives for aquatic habitat protection. If the rule adopted by Ecology is amended based on the 5-year evaluation, the Planning Unit recommends the quantity of water reserved not be decreased.

Details regarding the development of the reservations are provided in Appendix I.

Table 4-4
Water Right Reservation Summary for WRIAs 25/26

Water User [1]	Net Stream flow Depletion Allowance (cfs) [2]
Grays River Subbasin	
Wahkiakum PUD	0.15
Small Systems and Domestic Wells	0.57
Subbasin Total	**0.72**
Skamokawa Creek Subbasin	
Small Systems and Domestic Wells	0.20
Subbasin Total	**0.20**
Elochoman River Subbasin	
Cathlamet	0.00[5]
Small Systems and Domestic Wells	0.38
Subbasin Total	**0.38**
Abernathy/Germany Creek Subbasin	
Wahkiakum County Portion	
Small Systems and Domestic Wells	0.07
Cowlitz County Portion	
Small Systems and Domestic Wells	0.36
Subbasin Total	**0.43**
Coal Creek/Longview Slough Subbasin	
Not Applicable (restrictions on new water rights not proposed)	N/A
Upper Cowlitz River Subbasin	
Randle	0.02
Packwood	0.00[5]
Small Systems and Domestic Wells	0.20
Other Beneficial Uses	0.37
Subbasin Total	**0.59**
Cispus River Subbasin	
Lewis County Portion	
Small Systems and Domestic Wells	0.20
Other Beneficial Uses	0.19
Skamania County Portion	
Small Systems and Domestic Wells	0.20
Other Beneficial Uses	0.19
Subbasin Total	**0.77**
Tilton River Subbasin	
Morton	0.00[5]
Small Systems and Domestic Wells	0.20
Other Beneficial Uses	0.19
Subbasin Total	**0.39**
Mayfield Dam Subbasin	
Mossyrock	0.10
Small Systems and Domestic Wells	0.20
Other Beneficial Uses	0.19
Subbasin Total	**0.48**
Toutle River Subbasin	
Lewis County Portion	
Small Systems and Domestic Wells	0.20
Other Beneficial Uses	0.19
Cowlitz County Portion	
Small Systems and Domestic Wells	0.20
Other Beneficial Uses	0.19
Skamania County Portion	
Small Systems and Domestic Wells	0.19

Table 4-4 (cont.)
Water Right Reservation Summary for WRIAs 25/26

Water User [1]	Net Stream flow Depletion Allowance (cfs) [2]
Other Beneficial Uses	0.19
Subbasin Total	**1.14**
Coweeman River Subbasin	
Small Systems and Domestic Wells	0.20
Subbasin Total	**0.20**
Lower Cowlitz River Subbasin	
Lewis County Portion	
Winlock	0.00[5]
Toledo	0.22
Vader	0.00
Small Systems and Domestic Wells	0.38
Other Beneficial Uses	0.56
Cowlitz County Portion	
Longview	NA [3]
Kelso	NA [3]
Cowlitz PUD	NA [3]
Castle Rock	0.00[5]
Small Systems and Domestic Wells	0.38
Other Beneficial Uses	0.37
Additional Allowance [4]	4.00
Subbasin Total	**5.92**

Notes:

[1] Categories of water users include:

Large Public Water Systems, which are listed individually.

Small Systems, which refers to Small Community Water Systems.

Domestic Wells, including those serving multiple homes but exempt from the requirement to apply for a water right permit.

Other Beneficial Uses, such as self-supplied industrial uses.

[2] Calculated based upon an estimate of additional water rights needed to meet water demands through 2020. Incorporates the effects of offsetting and mitigation activities. The allowance applies only to mainstem flows; it is not intended to allow for extensive dewatering of smaller water bodies.

[3] Not applicable, due to location in tidally influenced area.

[4] An additional stream flow depletion allowance is provided for the Lower Cowlitz River, due to its potential as a future regional source of water supply. The additional 4.0 cfs is substantial enough to provide a regional-scale resource for industry and other uses, while still being adequately protective of habitat given the magnitude of late summer flows in the Cowlitz River.

[5] Current water rights are sufficient to meet needs through year 2020. Therefore, no reservation is established.

Some smaller streams and tributaries that drain directly to the Columbia River were not specifically analyzed in this watershed plan. These streams are not recommended for closure. Ecology will address these water bodies on a case-by-case basis in the future as applicants apply for new water rights. If, upon review, these streams are closed by administrative action, then it is recommended that a water right reservation should also be considered, to allow for domestic wells and potentially other uses. Such closures and recommendations would then be added to the formal rule at the next time the rule is updated.

While restricting issuance of new water rights serves to protect existing flows from further degradation, many of the other actions discussed below are techniques that can

provide additional protection and can be used in some cases to enhance stream flows. Such increases in flow may be necessary to achieve healthy and harvestable levels of listed fish species. The actions in the land use category may also be used to reduce the frequency of high flow events and dampen their potentially devastating effects.

4.4.2 Water Conservation

By reducing the amount of water needed by water users, conservation can reduce diversions from surface waters, or pumping of ground water. In the case of surface water uses, this has a direct benefit for stream flows during the low flow periods. In the case of ground water uses, water conservation may improve low flows under certain conditions, but under other conditions may offer no benefits for stream flow. This is dependent on the degree of hydraulic continuity between the aquifer being pumped and the surface water of interest. Some aquifers have virtually no hydraulic continuity with surface streams that are flow limited, while others may have a high degree of continuity, as shown in studies performed by Pacific Groundwater Group in two nearby WRIAs (PGG, 2003).

Water conservation involves a range of activities, including both equipment and behavioral elements. Water conservation can be applied to municipal water users, industrial facilities that have their own water supplies, agricultural users, and potentially even individual households that have a single domestic well.

Because of the particular water sources or locations of the sources that provide most of the water used in WRIAs 25 and 26, there are only limited opportunities to improve or protect stream flows with water conservation programs. Most water supplies for municipal and industrial purposes are drawn from surface water near the downstream ends of the respective subbasins, where the impacts are less because of tidal influence.

There are some exceptions, however, where municipal wells are located in close proximity to surface water bodies farther upstream, and where surface/ground water interactions may result in well pumping affecting stream flows. This is the case for the City of Winlock. Enhanced conservation efforts by these municipalities may provide some benefit to surface flows, due to the potential hydraulic connectivity between their wells and nearby surface water. Even in these cases a greater benefit could be realized through source substitution, as discussed in the next section. For more information, see the subbasin-specific discussion in Section 4.7.

A significant component of growth in some of these basins is expected to be rural in nature and will likely obtain water from individual exempt wells. Individual wells in rural areas typically have a negligible impact upon nearby streams, due to the small amount of water pumped compared to flows in nearby surface waters, and because much of the water pumped is returned via septic systems (PGG, 2003). There are limited cases where relatively dense development relying on individual wells occurs in small tributary creek subbasins could have a larger effect on stream flows. All water users are encouraged to use water efficiently. This includes residents relying on exempt wells. However, establishment of public programs to encourage water conservation by these residents would require development of new government programs and administrative delivery systems, since these water users are not served by any public water system. In

those circumstances, the Planning Unit finds that source substitution would provide more substantial benefits than public programs to encourage water conservation.

Water conservation in the agricultural sector was not studied in detail during the planning process. There may be opportunities for water conservation activity involving agricultural irrigation uses. However, there are no irrigation districts in WRIAs 25 and 26, where water use and management is conducted on a large scale. Furthermore, there is no sign of increases in this type of water use. Water conservation by farmers in a localized area may offer localized opportunities for stream flow protection or enhancement.

Based on this information, the Planning Unit adopts the following recommendation regarding conservation as a stream flow management technique in WRIAs 25 and 26:

Policy SFP-3:

Water conservation is part of a sound comprehensive water resources management program. In general, adherence to State requirements for municipal water conservation, as modified from time to time, will be sufficient for most communities within WRIAs 25 and 26.

Conservation activities that exceed state requirements should be carried out in selected communities where water use has the potential to cause significant impairment of stream flow conditions. Based on the Planning Unit's assessment of watershed conditions, only the City of Winlock has been identified in this regard at this time. This is a Planning Unit recommendation for voluntary actions. Implementation should not be mandated by the State.

Water conservation actions by farmers practicing irrigated agriculture may be warranted in selected locations, where there would be significant benefits to stream flows. The Conservation District in each County should provide technical assistance to farmers to identify water conservation opportunities and funding sources.

4.4.3 Short-Term Operational Actions Responding to Drought Conditions

Short-term adjustments in water use or other activities can immediately improve flows during extreme conditions such as a severe drought. When the extreme conditions have passed, the action(s) can be discontinued.

An example of short-term actions that could be taken in response to extreme conditions is the short-term curtailment of water use by large water users that might have a direct impact on stream flows. This approach has been used in other areas in Washington State, such as in management of Tacoma's Green River supply related to its Second Supply Project. When flow levels drop to predetermined "trigger" levels, a water user may switch to an alternative supply, or curtail non-essential water uses in the community.

This approach is most effective in cases where a large water user relies directly on surface water supplies. This is because in this case, changes in water use have a direct and immediate effect on stream flow. However, investigation carried out during the course of the watershed planning effort (EES 2003a) identified only isolated opportunities for application of this approach to surface water users. For more detail, see Section 4.7. It should be recognized that there may be smaller surface water users in several subbasins that could adopt this type of management strategy. These could offer some benefits, but would be more difficult to implement, compared with programs addressing a few, large water users.

One significant exception with regard to surface water use is the hydropower project operated by Tacoma Power and Light on the Cowlitz River. For more information on this project, see Sections 2.4.1 and 4.7.7.

While there are some major ground water users located in close proximity to some tributary streams, actions by these users having long-term impacts (e.g., conservation, source substitution, water right transfers to State trust) are viewed as more beneficial than short-term curtailment measures.

While short-term operational actions offer relatively few opportunities in WRIAs 25 and 26, it is still important as an element of the overall, comprehensive approach to managing stream flow. The Planning Unit adopts the following policy:

Policy SFP-4:

Where major surface water diversions or ground water withdrawals have a direct effect on stream flows on a time scale of weeks or less, the water user should be prepared to alter operations in the event of a State-declared drought emergency affecting WRIA 25 and/or 26. The water user should adopt policies and procedures in advance, to allow for quickly altering operations to minimize or eliminate the depletion of stream flow to the extent feasible in the event such a drought occurs. This is a Planning Unit recommendation for voluntary actions. Implementation should not be mandated by the State.

For hydropower operations such as the Cowlitz River Project, it is assumed that FERC license conditions fully address releases under low flow conditions, including drought conditions.

Efforts should continue to identify small surface water users that could implement this type of management strategy to improve low flow conditions.

4.4.4 Source Substitution

This technique involves substitution of water supplies from sources that have little or no impact on stream flows in critical areas, to replace water supply sources that have a high impact on flows in such streams. For example, in some cases a ground water source tapping a deep aquifer could be substituted for a surface water source or shallow ground

water source that directly reduces flows in a stream. This potential opportunity has been identified by the Planning Unit for the City of Winlock. See Section 4.7 for more information on this community.

During preparation of a watershed plan in the nearby WRIAs 27 and 28, LCFRB commissioned a pilot review of data on individual domestic wells (exempt wells) in the Washougal River subbasin. In this setting, where rural residences are relatively low-density, and where most houses have septic systems that return domestic water to the subsurface, well withdrawals have a relatively small effect on stream flow in the dry season. Based on this finding, management of exempt wells does not appear to be a high priority at the regional scale within WRIAs 25 and 26. However, there may be localized areas where due to density, availability of public sewer service, or other conditions, even individual domestic wells could cause problems for stream flow. The recommendation below addresses this situation.

The Planning Unit adopts the following policy regarding source substitution as a stream flow management technique in WRIAs 25 and 26:

Policy SFP-5:

Communities using water sources (surface or ground water) that significantly reduce base flows in any stream that provides important fish habitat within WRIAs 25 and 26 should evaluate alternative sources of supply that eliminate or minimize these effects. It is anticipated that this would require examination of cost, potential rate impacts, reliability considerations, and evaluation of other feasibility criteria. This is a Planning Unit recommendation for voluntary actions. Implementation should not be mandated by the State.

In limited cases, this policy may also apply to rural areas where residents rely on individual domestic wells (exempt wells). Cowlitz, Lewis and Wahkiakum Counties should assess this possibility through a water-balance analysis, in selected rural areas where extensive new development is expected to occur or where there is substantial existing development served by exempt wells.

The Planning Unit recommends that a map be developed during the implementation phase that would depict locations of deep aquifers suitable for water supply development and which could be used in lieu of sources with greater impact to stream flows. See Section 3.3.1 for this recommendation.

4.4.5 Transfers to State Trust Water Rights

Ecology has established a program under chapter 90.42 RCW in which water rights can be acquired from willing water rights holders and put into a trust water rights program. Trust water rights can either be held by the state or authorized for use by Ecology for instream flows, irrigation, municipal, or other beneficial uses. The trust water rights program is voluntary on the part of the existing water right holder. By reducing or

eliminating selected diversions, the transfer of water rights to the trust program can increase stream flows.

This technique has limited applicability in the WRIAs 25 and 26 subbasins. As mentioned previously, the majority of surface water diversions (i.e., irrigation uses) are located in the lower portion of the subbasin where flow restoration, in general, is considered less beneficial to fish, as compared to flow protection and enhancement in the upper reaches of the subbasin. There may be local exceptions, however, where a transfer could offer a significant benefit. Such transfers may be made possible if funds were made available for the State to purchase the water rights. In addition, for the selected communities discussed above under the source-substitution technique, transfers of water rights to the State Trust could be performed for any water rights no longer needed. Therefore, the Planning Unit adopts the following policy:

Policy SFP-6:

Ecology should use its existing State Trust program, and funding provided by the State Legislature, to identify and acquire water rights from holders willing to sell or donate their water rights in WRIAs 25 and 26, where transfers to the State Trust would provide a significant benefit to fish habitat.

Priorities for applying this policy to the various subbasins within WRIAs 25 and 26 are discussed in Section 4.6.

4.4.6 Enforcement Action Against Unauthorized Water Uses

Aside from the legal, appropriated use of surface and ground waters, there is a potential for illegal diversions of surface water and withdrawals of ground water to occur. Where unauthorized uses are occurring involving either surface waters and/or ground waters in continuity with surface streams, enforcement actions against unauthorized uses can potentially help to improve low flows. Ecology is the agency responsible for enforcement actions.

The quantity of unauthorized water used within the WRIAs 25 and 26 watersheds is not known. However, some unauthorized uses probably occur. Therefore, the Planning Unit adopts the following policy regarding enforcement against unauthorized water use as a stream flow management technique in WRIAs 25 and 26:

Policy SFP-7:

Ecology should conduct or support initial surveys in selected subbasins to determine whether unauthorized water uses are occurring on streams deemed critical to salmon recovery within WRIAs 25 and 26. If these surveys identify extensive unauthorized uses, they should be expanded to additional subbasins and carried out on a regular, periodic basis (e.g. once every five years). Where unauthorized uses are identified, Ecology should take enforcement actions to eliminate these uses.

Priorities for applying this policy to the various subbasins within WRIAs 25 and 26 are discussed in Section 4.6.

4.4.7 Hydropower Operations

Hydropower facilities operated by the City of Tacoma (i.e., the Cowlitz River Project) are located on the Cowlitz River upstream of the Lower Cowlitz Subbasin. These facilities at Mayfield and Mossyrock Dams have significant impacts upon the flow of the Lower Cowlitz River. The Planning Unit has determined that the Watershed Planning process should not duplicate analysis and management strategies developed through the Federal Energy Regulatory Commission (FERC) licensing process for the Cowlitz River Project. Therefore, the Planning Unit adopts the following policy.

Policy SFP-8:

The Planning Unit understands that the FERC license conditions take into account flows for anadromous fish and other wildlife species. While hydropower regulation of flows in the Cowlitz River is protective of the needs of fish, they do not account for additional use downstream of the Mayfield Dam. Therefore, the Planning Unit recommends additional protection for the Cowlitz River mainstem in the form of a numeric instream flow that provides water for beneficial uses subject to flow conditions.

4.5 Land Use Management Actions to Protect Stream Flow

4.5.1 Forest Practices

As discussed in Section 2.2, 77 and 67 percent of the lands within WRIAs 25 and 26, respectively, are forested. These forested areas are typically found in the middle and upper reaches of the various subbasins. A majority of this forested land is owned and managed by private companies and the Washington State Department of Natural Resources (DNR). The U.S. Forest Service (USFS) also owns and manage significant acreages in some areas.

Given the extent of forested lands, forest practices have substantial potential to affect the magnitude and timing of flows. The Planning Unit commissioned a hydrologic modeling study by PWR (2003) to evaluate the effects of land use and land cover on stream flows. Results from this study indicated that as clearcut areas are replanted and where existing younger stands mature, the predominant effect is anticipated to be a reduction in peak flows and a reduction in low flows. Peak flows decrease due to delay of runoff as forest cover increases. Low flows decrease because of the net increase in evaportranspiration, which removes water from the watershed.

In areas where existing timber is harvested, effects will be the opposite, i.e. an increase in low flows and significant increase in peak flows.

Based on changes in the timber economy in recent years, harvest rates for southwest Washington over the next 50 years are expected to be lower, compared with rates of the

past 50 years. At the same time, regeneration of formerly harvested forests is likely to continue. Moreover, the Forests and Fish Rules adopted by Washington State and incorporated in the Forest Practices Act will have a substantial impact on forest management practices. On federal lands, the Northwest Forest Plan has also altered trends on forest management practices. In general, the WRIAs 25 and 26 Planning Unit anticipates these changes will result in increased forest cover at the regional scale. Based on the results from the hydrologic modeling study, this can be expected to reduce both peak flows and low flows. Despite the expected reduction in low flows, these changes in forest practices are expected to improve habitat factors on the whole and improve prospects for recovery of salmon in the region. For example, they are expected to improve conditions with regard to stream temperature, large woody debris, and sediment loads.

PWR's hydrologic modeling study was not designed to quantify the results of road management practices within the forested areas. Both the Forests and Fish Rules and the Northwest Forest Plan address forest roads. In general, changes in road management practices on federal, state and private forest lands are expected to delay runoff in comparison with historic practices. This should generally reduce peak flows and attendant problems from sedimentation.

The Watershed Planning Unit has limited ability to influence forest practices. Local regulations are not allowed to conflict with the Forest Practices Act, which regulates private and State forest lands[3]. This limitation also includes watershed plans as described in RCW 90.82.120(3). Local jurisdictions do not have the authority to regulate federal lands such as national forests. Recognizing the jurisdiction over forest management rests with private landowners, DNR and USFS, the Planning Unit adopts the following policy relating to forest practices as a tool for stream flow management.

Policy SFP-9:

Private landowners, State DNR and USFS should consider effects of forest management practices on stream flow and other fish habitat factors, in making forest management decisions. The Planning Unit anticipates that existing programs under the State's Forests and Fish regulations, the state forest land's Habitat Conservation Plan, ,and the federal government's Northwest Forest Plan will provide the regulatory framework needed in this regard. The State and federal governments should monitor the effectiveness of these programs and periodically provide public documentation of their effectiveness in protecting fish habitat, including flow conditions, in WRIAs 25 and 26.

In addition, expected effects of changes in the watersheds' forested areas should be considered as part of the overall context for the target flows discussed in this Watershed Management Plan (see Section 4.3).

[3] The Forest and Fish Rules are incorporated in the Forest Practices Act.

4.5.2 Development Practices and Stormwater Management

Land use and development practices, particularly those related to impervious surfaces and stormwater management, also impact stream flows. Conversion of lands from rural uses to suburban or urban uses typically alters watershed hydrology substantially. Based on the hydrologic study by PWR (2003) for the WRIAs 25 and 26 subbasins, small increases in impervious area can result in small but significant increases in peak flows and reductions in low flows. In general, when land uses pass a threshold of ten percent impervious surfaces, stream flow degradation can be expected to begin (PWR 2003). These effects have already occurred in the most urbanized portions of the region, such as the Longview-Kelso urban area. In other areas where rural lands are expected to be converted to urban uses in the future, changes in hydrology can also be expected.

Over the very long term (e.g. 50 years), there may be extensive changes in land use as the region continues to grow and development spreads. This will have corresponding effects on stream flow, unless significant resources are devoted to mitigation practices. Most of the region's future development is likely to occur within the downstream portions of selected Subbasins, in areas where there is existing development and in proximity to major transportation corridors such as I-5. This may affect runoff and stream flow, as rural lands are converted to urban and suburban lands with more impervious surfaces.

Because most new development in the region is expected to occur at the downstream end of the various subbasins, many stream reaches will not be affected in the middle and upper portions of these subbasins. The largest impacts can be expected in smaller creek drainages facing increased development. In addition, modifications to stream channels and adjacent floodplains often accompany development. For example, diking, hardening of stream banks, and alterations to floodplains and associated wetlands can exacerbate the effects of development on stream flow and other fish habitat factors. Changes in stream hydrology due to development are also accompanied by degradation of water quality, in many cases. This will require continued attention as water quality cleanup plans (TMDLs) are put in place by Ecology (see Section 5).

City and County policies can mitigate effects of development by controlling development densities, specifying amounts of impervious surface area, establishing stream buffers, protecting floodplains and wetlands, and addressing storm water management. Ecology's recently updated *Stormwater Management Manual for Western Washington* (Manual) provides guidance to local jurisdictions regarding implementation of best management practices (BMPs) regarding stormwater management. City and county ordinances, rules, and permits are used to translate Ecology's guidance into requirements that have authority.

In the WRIA 25 and 26 watersheds, no counties or cities are currently subject to the Stormwater Manual requirements. However, Cowlitz County and the Cities of Longview and Kelso are included in the tentative listing of Phase II communities that will be subject to the Stormwater Manual requirements in the near future.

Based on this information, the Planning Unit adopts the following policy regarding the use of stormwater management as a stream flow management technique in the WRIAs 25 and 26 watersheds:

Policy SFP-10:

As Phase II communities, Cowlitz County and the Cities of Longview and Kelso should continue to carry out their legally mandated responsibilities with regard to stormwater management. Lewis and Wahkiakum Counties and the remaining cities in all three counties should review their stormwater management ordinances to determine whether they are adequately protective of fish habitat in local streams that may be affected by future development. Where enhanced stormwater management needs are identified, revisions to local ordinances should be considered in light of the guidance and BMPs provided in Ecology's Manual or a reasonable equivalent. The focus should be on upgrading development practices and mitigation requirements in areas where stream flow and fish habitat may be compromised as development occurs. Costs, expected magnitude of benefits, and feasibility considerations should be included in this review.

Another development practice that potentially impacts stream flows is the use of exempt wells in rural areas. Of particular concern are dense clusters of individual shallow wells that are in close proximity to tributary or headwater streams. In this setting, well pumping may negatively impact flows due to hydraulic continuity. This effect is mitigated somewhat where household water use is returned to the shallow aquifer through a septic system.

Rural development relying upon deep exempt wells for water supply and septic systems for wastewater disposal may actually have the effect of increasing stream flows locally (PGG, 2003). This can occur where water is withdrawn from a deeper aquifer that is not connected to the local stream, but water is returned to the shallow aquifer through a septic system. This effect would change if sewer service were provided to an area, thereby eliminating the septic return flows.

To address these issues, the Planning Unit adopts the following policy:

Policy SFP-11:

Lewis, Cowlitz, and Wahkiakum Counties and the cities in all three counties in WRIAs 25 and 26 should develop policies to address the water balance implications of extending sewer service to developing areas. The Planning Unit recognizes that provision of sewer service can provide substantial water quality benefits. However, where sewer service is extended to replace septic systems, and residents continue to rely on water wells, stream flows may be reduced. This effect should be anticipated and mitigated where applicable. This is particularly important in areas with relatively dense development near small streams.

4.5.3 Floodplain Management

Floodplains provide storage for flood waters, thereby reducing peak flows and attendant damage during flood events. Water stored in a floodplain from a peak flow event drains back to the stream over a period of days or weeks. In addition to their hydrologic functions, floodplains offer important habitat functions. Benefits of floodplains practices for habitat purposes are discussed further in Section 6.

Since peak flow events in WRIA 25 and 26 occur primarily in the winter and spring months, water stored in floodplains is usually not available in late summer and early fall to contribute to base flows. Therefore, the primary hydrologic benefits from floodplain management are expected to involve peak flows rather than low flows. In some floodplain areas, off-channel storage (in the form of wetlands, oxbows and wall-based channels) is hydrologically connected to the river and likely provides some contribution to base flows.

The Planning Unit reviewed opportunities for using floodplain management actions as a tool for managing stream flow. Floodplain activities that can be regulated under local floodplain ordinances include controlling alteration of natural flood plains, controlling filling and grading within flood plains, controlling construction of flood barriers such as dikes, and restricting land uses that might increase erosion.

In addition to protecting existing floodplains, there may be opportunities to restore floodplain functions where floodplains have been altered or disconnected from the river channel. For example, existing dikes can be breached or removed to reconnect floodplains to the river channel. It should be recognized, however, that dikes were constructed to meet specific needs, and existing structures or land uses may depend on the presence of existing dikes for protection from floods. Plans to restore floodplains by modifying or removing dikes must address the effects on land use and the built environment.

The majority of floodplain areas within WRIAs 25 and 26 are located in the middle or lower reaches of the various subbasins. Therefore, hydrologic benefits of floodplain management actions would occur primarily in those areas.

The Planning Unit adopts the following policy regarding floodplain management:

Policy SFP-12:

Local jurisdictions and state agencies with land-management responsibilities should protect existing floodplains from modifications that would impair their hydrologic functions and habitat value.

Local jurisdictions and state agencies with land-management responsibilities should identify floodplain restoration projects, subject to local input, cost-benefit analysis, and availability of funding. Where these factors are favorable, and where substantial benefits to flow or other habitat factors are identified, these projects should be pursued for implementation. Current floodplain uses and the benefits of existing control structures will be considered when determining if specific floodplain restoration projects should be pursued.

Priorities for identifying and carrying out projects in the various subbasins within WRIAs 25 and 26 are discussed in Section 4.6.

More specific information is presented in the subbasin-specific sections that follow (see Sections 4.5 to 4.16). Quantifying the possible flow benefits of modifications would require detailed analysis that has not been carried out at this time.

4.5.4 Wetlands Management

There are a variety of different wetland types in WRIAs 25 and 26, and different wetlands offer different benefits in terms of hydrology and habitat. The hydrologic functions of most wetlands in the subbasins have not been studied in detail.

In very simple terms, those wetlands that are associated with streams and floodplains can help to moderate peak flows. However, the amount of attenuation provided by restoration of a wetland is not always significant relative to the flow rates that occur. There could also be some limited benefit to low flow periods, since water from high flow events is stored and then released over a period of several weeks. Wetlands associated with streams and floodplains occur throughout the many subbasins in WRIAs 25 and 26. However, the most hydrologically significant wetlands are located along the main stem rivers, and especially in low-lying terrain near the mouths of these rivers.

Wetlands that occur in upland areas separate from streams and floodplains are less likely to offer stream flow benefits. In general, these wetlands form because they are on soils that do not infiltrate water readily. Because of this, the Planning Unit has not studied these upland wetlands in detail.

As with floodplain preservation and restoration, there are benefits to restoring and preserving wetlands for benefit of fish habitat in general, apart from their effects on flow rates.

County policies offer the best tools for wetland management in WRIAs 25 and 26. Wetland ordinances can be modified to include hydrologic functions in the protection hierarchy. Prohibitions on development can be enacted for wetlands with strong hydrologic functions. Where development will reduce or eliminate wetlands, mitigation ratios can be increased.

The Planning Unit adopts the following policy regarding wetlands management as a steam flow management technique in WRIAs 25 and 26:

Policy SFP-13:

Lewis, Cowlitz, and Wahkiakum Counties should assess the hydrologic function of wetlands as a part of their wetlands inventory. Their wetlands ordinances should be modified as needed to include hydrologic functions in the wetland protection hierarchy.

The three Counties should review and consider strengthening mitigation ratios, for selected wetland areas that offer significant hydrologic functions or other fish habitat benefits.

4.6 Prioritization of Subbasins for Stream Flow Management Actions

In order to provide a strong implementation framework for the stream flow management program, it is important to lay out some priorities for applying the policies discussed in Sections 4.4 and 4.5. For the general policies that apply throughout the region, the Planning Unit has prioritized the various subbasins. Each policy discussed in Sections 4.4 and 4.5 should be targeted for action first in the highest priority subbasins; then in the medium priority subbasins, and finally in the lower priority subbasins.

Criteria for prioritizing subbasins include:

- Degree to which flow is impaired now, with potential harm to aquatic habitat;
- Priority of streams in LCFRB Recovery Plan;
- Expected future changes in land use or water withdrawals, that will cause impairment of flow;
- Extent of existing urbanization, and associated feasibility of protecting or enhancing flow (e.g. consider highly urbanized Longview area less feasible)

Based on these criteria, the following priorities are recommended:

4.6.1 Highest Priority

- Mill/Abernathy/Germany Creek (potential for development pressure in the long-term; forested areas covered by Washington State Forest and Fish Rules (F&F); value for habitat; relatively good stream gauge data and available modeling data)
- Grays River Subbasin (little development pressure; forested areas covered by F&F; value for habitat; relatively good stream gauge data and modeling data available)
- Elochoman River Subbasin (little development pressure; forested areas covered by F&F; value for habitat; relatively good stream gauge data available)
- Olequa Creek (in Lower Cowlitz River Subbasin; existing impairment and development pressure; hydrologic modeling data available)
- Other Lower Cowlitz River Subbasin tributaries (existing impairment and potential development pressure along I-5 corridor; value for habitat; focus on Lacamas Creek, Leckler Creek, Delameter Creek, Arkansas Creek)
- Coweeman River Subbasin (focus on lower end [including Ostrander Creek] where existing impairment and development pressure exists from Kelso area; value for habitat)

4.6.2 Medium Priority

- Skamokawa Creek Subbasin (little development pressure; forested areas covered by F&F; value for habitat)

- Toutle River (focus on lower end; little development pressure but lower end is located along I-5 corridor; forested areas covered by F&F; value for habitat)

4.6.3 Lower Priority

- Coal Creek/Longview Slough (difficulty of restoration; emphasize stormwater management Longview area)
- Cispus River and Upper Cowlitz River Subbasins (small development pressure; located above dams; forested areas covered by F&F.)
- Tilton River and Mayfield Dam Subbasins (small development pressure; located above dams and not a recovery priority basin; forested areas covered by F&F.)

4.7 Stream Flow Conditions and Recommendations by Subbasin

This subsection applies the concepts and policies presented in previous subsections to each of the 12 subbasins defined for the watershed planning process.

4.7.1 Grays River

The Grays River Subbasin is one of the four "pilot" subbasins used to assess stream flow management techniques. The others pilots are the Elochoman River, Coweeman River and Lower Cowlitz Tributaries subbasins. Detailed analysis was performed for each pilot subbasin regarding the applicability of the various techniques discussed in Sections 4.4 and 4.5. For more information, see the full Technical Memorandum on stream flow management strategies in the pilot subbasins (EES, 2003a).

Subbasin Characteristics Relevant to Stream Flow

The Grays River subbasin has a drainage area of approximately 124 square miles with the highest elevation in the watershed of approximately 2,840 feet. The main stem of the Grays River flows within the southeastern portion of Pacific County in a southerly direction through Wahkiakum County to its confluence with the Columbia River (at River Mile 21).

No major population centers exist in the Grays River Subbasin. Mixed forest and non-forest/logged cover are the predominant land use in the basin (87% of total land cover), especially in the upper portion of the subbasin. Most of the agricultural development (6% of total land cover) occurs in the lower reaches and flood plain areas of the watershed. Logging, fish propagation, and livestock management occur primarily in the middle and upper portions of the subbasins.

The Grays River and its tributaries flow through extremely unstable soils and geology. As a result, low flow concerns associated with accumulation of bedload in the West Fork and main stem Grays River have been identified in the Limiting Factors Analysis (Wade 2002). The Washington State Conservation Commission's Limiting Factors Analysis

(LFA) also indicates that high road densities and hydrologic maturity contribute to high peak flows.

Most of the floodplains are located in the lower portions of the subbasin. The Upper Grays and its tributaries flow through canyons and steep terrain where floodplains development is very limited. Most of the streams that do have floodplains have been disconnected from the floodplains as a result of flood control, bank hardening, and channelization, especially in the lower parts of the subbasin.

Existing Instream Flow Studies

The Department of Ecology (Ecology) conducted an instream flow study on the Grays River using the "toe-width" method, with the field work being performed during the summer of 1998. An Open File Technical Report titled *Washougal River Fish Habitat Analysis Using the Instream Flow Incremental Methodology and the Toe-Width Method for WRIAs 25, 26, 28, and 29* was published by Ecology in June 1999 as Publication # 99-153.

Table 4-5 summarizes the toe-width determined optimal flows for different fish species and lifestages for the Grays River. Instream flow recommendations have been developed and presented to the Planning Unit by Ecology and Fish & Wildlife. The toe-width data is one piece of information to consider in developing instream flow recommendations.

Table 4-5
Toe-Width Flows for the Grays River

Stream Name	Tributary To	Average Toe-Width (feet)	Toe-Width Flow for Fish Spawning and Rearing (cfs)					
			Chinook (spawning)	Coho (spawning)	Chum (spawning)	Steelhead (spawning)	Steelhead (rearing)	Salmon (rearing)
Grays River (@ State Route 4)	Columbia River	120.3	516.5	292.1	516.5	401.3	147.5	137.6

Stream Flow Management Recommendations for the Grays River Subbasin

Approximately 87 percent of the subbasin is forested; thus, the primary emphasis for stream flow management is through sound forest management practices to improve hydrologic conditions. Policy SFP-9 should be applied by land managers in forested areas in the Grays River Subbasin.

Wahkiakum County should apply its land-use management authorities to protect existing floodplains and wetlands in the Grays River and Elochoman River subbasins. In addition, the County should partner with the State of Washington to assess whether hydrologic functions of major floodplains and wetlands have been disrupted, and to identify restoration opportunities where feasible and cost-effective.

Policy SFP-2 should be applied to strengthen restrictions on issuance of new water rights in the subbasin. For details of the application of this policy to the Grays River Subbasin, see Appendix I. There is currently one administrative low flow in place in the subbasin.

The remaining stream flow management policies discussed in Sections 4.4 and 4.5 should be applied to the Gray's River Subbasin. Based on the features and characteristics of the Grays River Subbasin as discussed above, no additional subbasin-specific recommendations or projects for managing stream flow are presented at this time.

Target flows have not been developed for the Grays River Subbasin at this time because of the limited projected growth in the subbasin. It may be valuable to develop target flows in the future to improve stream flow management in the Subbasin.

This discussion is focused on protecting or enhancing stream flows alone. Other recommendations included in this plan address water supply and habitat issues.

Proposed Additional Gauging Sites for the Grays River Subbasin

There are no currently operating stream gauges in the Grays River Subbasin. There were three stream gauges that had been continuously operated to measure daily flows for a significant period of time by the U.S. Geological Survey (USGS) within the Grays River subbasin. However, only two gauges had sufficient data to conduct a statistical flow analysis. These two gauges include Grays River above the South Fork near Grays River (USGS No. 14249000), and West Fork Grays River near Grays River (USGS No. 14250500). The third gauge (USGS No. 14249500) was located on the Grays River below the South Fork and had only four years of data (1956-1960).

Section 4.2 discussed the importance of flow monitoring to improve capabilities for managing stream flows. For the Grays River, the Planning Unit makes the following recommendation:

Recommendation:

A stream gauge should be installed to replace the former USGS stream gauge on the mainstem Grays River. In addition, if funding can be obtained additional gauges should be installed in the Grays River basin to enhance capabilities for monitoring and managing stream flow.

It should be noted that field work has not been performed to address access considerations or property ownership issues related to potential stream gauging sites.

Table 4-6 summarizes candidate sites for installing new gauges. If new stream gauges are installed in the Grays River Subbasin, consideration should also be given to whether existing weather stations for measuring precipitation and other weather variables are adequate to meet stream management needs.

Table 4-6
Potential New Stream Gauges – Grays River Subbasin

	Candidate Site	Potential Value	Priority	Notes
1.	Former gauging site on Grays R., (No. 14249000)	Mainstem flow levels (middle to upper portion of subbasin)	High	Takes advantage of previous data collected (1956-75).
2.	Middle portion of mainstem Grays R. just below W. Fork confluence	Mainstem flow levels (middle portion of subbasin)	Medium	Downstream of a major tributary. Would need to avoid influence from Columbia R. flow backup. Consider locating close to toe-width site
3.	Former gauging site on W. Fork Grays R. (No. 14250500)	Monitor flows from major tributary; use to determine flow contribution to mainstem	Medium	Takes advantage of previous data collected (1949-69).
4.	Mouth of South Fork Grays R.	Monitor flows from major tributary; use to determine flow contribution to mainstem	Medium	South Fork Grays River is identified as a priority tributary for habitat

4.7.2 Skamokawa Creek

Subbasin Characteristics Relevant to Stream Flow

The Skamokawa Creek Subbasin has a drainage area of approximately 72 square miles. Skamokawa Creek flows directly into the Columbia River and is tidally influenced upstream to the Left Fork Skamokawa. There are no major municipal water users or community systems in this subbasin.

Sections of the creek flow through agricultural land in the lower portion of the subbasin. Most of the middle and upper portions of the subbasin are heavily forested. The LFA states that hydrologic immaturity and relatively high road densities in the forest lands potentially increase peak flows.

In the lower portion of the subbasin, Skamokawa Creek has been channelized from its mouth to RM 1.7. Several creeks are entrenched through the agricultural land in these areas. The LFA indicates that there are very limited floodplains in Skamokawa Creek subbasin. However, there are some areas in the lower portions of the subbasin where floodplain connectivity has been impaired due to entrenchment and diking.

The LFA mentions some opportunities for floodplain reconnection between Skamokawa Creek and Dead Slough.

Stream Flow Management Recommendations for the Skamokawa Creek Subbasin

The subbasin is predominantly forest lands and many of the stream flow issues are best addressed through forest management (see Policy SFP-9). Potential for enhancing floodplain connectivity in the lower portion of the subbasin would be related to alterations of existing structures for flood control. No specific projects have been identified at this time.

Policy SFP-2 should be applied to strengthen restrictions on issuance of new water rights. For details of the application of this policy to the Skamokawa River Subbasin, see Appendix I. There are currently no existing administrative low flows or closures in place in the Skamokawa Creek Subbasin.

The remaining stream flow management policies presented in Sections 4.4 and 4.5 apply to the Skamokawa Creek Subbasin. The stream flow management policies provide the guiding principles to identify specific projects to protect and enhance flows in the subbasin.

4.7.3 Elochoman River

The Elochoman River Subbasin is another of the four "pilot" subbasins, where detailed analysis was performed regarding the applicability of stream flow management techniques.

Subbasin Characteristics Relevant to Stream Flow

The Elochoman River Subbasin has a drainage area of approximately 73 square miles. The main stem of the Elochoman River flows within the eastern portion of Wahkiakum County in a southerly direction to its confluence with the Columbia River near the Town of Cathlamet.

The major concentration of population in the subbasin is Cathlamet, whose water supply intake is located on the Elochoman River near the downstream end of the subbasin at RM 4. Thus, most of the out-of-stream water use occurs in the lower portion of the subbasin. The other large users are associated with fisheries and are non-consumptive. Most of the agricultural development (9% of total land cover) and flood plain areas also occur in the lower reaches of the watershed. Furthermore, most of the subbasin's future development is likely to occur within the lower portion of the subbasin near Cathlamet. Logging, fish propagation, and livestock management occur primarily in the middle and upper portions of the subbasins. Mixed forest and non-forest/logged cover are the predominant land use in the basin (total of 81%), especially in the upper portion of the subbasin.

The Elochoman River floodplain is diked on the right bank from the mouth to Nelson Creek (RM 1.4) The Elochoman mainstem has stream-adjacent roads in many locations throughout the valley, including an old railroad grade from RM 9 through 16 along the river. The Elochoman River is also highly entrenched through the agricultural lands in

the lower and middle portions of the subbasin, but tends to improve in the upper watershed. According to the LFA, the upper watershed, which is primarily forested, is generally hydrologically immature and has relatively high road densities (< 4 miles per square mile). This potentially increases peak flows.

Only two percent of the subbasin is categorized as wetlands and the majority of the wetlands are in small parcels.

Existing Instream Flow Studies

The Department of Ecology (Ecology) conducted an instream flow study on the Elochoman River using the "toe-width" method, with the field work being performed during the summer of 1998. An Open File Technical Report titled *Washougal River Fish Habitat Analysis Using the Instream Flow Incremental Methodology and the Toe-Width Method for WRIAs 25, 26, 28, and 29* was published by Ecology in June 1999 as Publication # 99-153. The location of the toe-width study is near the Steel Bridge on SR 4.

Table 4-7 summarizes the toe-width determined optimal flows for different fish species and lifestages for the Elochoman River. Instream flow recommendations have been developed and presented to the Planning Unit by Ecology and Fish & Wildlife. The toe-width flows are one piece of information to be considered in developing instream flow recommendations.

Table 4-7
Toe-Width Flows for the Elochoman River

Stream Name	Tributary To	Average Toe-Width (feet)	Toe-Width Flow for Fish Spawning and Rearing (cfs)					
			Chinook (spawning)	Coho (spawning)	Chum (spawning)	Steelhead (spawning)	Steelhead (rearing)	Salmon (rearing)
Elochoman River (@ Steel Bridge)	Columbia River	89	355.5	196.8	355.5	282.9	96.2	89.2

Stream Flow Management Recommendations for the Elochoman River Subbasin

Approximately 81 percent of the subbasin is forested; thus, the primary emphasis for stream flow management is through sound forest management practices to improve hydrologic conditions. Policy SFP-9 should be applied by land managers in forested areas of the Elochoman River Subbasin.

Wahkiakum County should apply its land-use management authorities to protect existing floodplains and wetlands in the Elochoman River subbasin. In addition, the County should partner with the State of Washington and Town of Cathlamet to assess whether hydrologic functions of major floodplains and wetlands have been disrupted, and to identify restoration opportunities where feasible and cost-effective.

Policy SFP-2 should be applied to strengthen restrictions on issuance of new water rights. There is one existing administrative low flow in place in this subbasin (see Appendix H).

As discussed earlier, besides the Town of Cathlamet's diversion, there are no major water users in the Elochoman River Subbasin that would significantly affect flow conditions. The Town has a relatively small demand and is not growing rapidly. The primary effects of its diversion are in the lower reaches of the river, which is also subject to tidal influence. For these reasons, no project-specific stream flow management actions have been identified regarding Cathlamet's water uses or other water users in the Elochoman River Subbasin. State requirements for water conservation should be sufficient for the Town.

The remaining stream flow management policies discussed in Sections 4.4. and 4.5 should be applied to the Elochoman River Subbasin. Based on the features of the subbasin presented above, no additional subbasin-specific recommendations or projects for managing stream flow are presented at this time.

Target flows have not been developed for the Elochoman River Subbasin at this time. It may be valuable to develop target flows to improve stream flow management in the subbasin.

These recommendations are focused on protecting or enhancing stream flows alone. Other recommendations included in this plan address water supply and habitat issues.

Proposed Additional Gauging Sites for the Elochoman River Subbasin

There is one stream gauge that was continuously operated for a significant period of time within this watershed. The former USGS gauge on the Elochoman River (No. 14247500) was located near Cathlamet on river mile (RM) 4.5. This gauge measured daily flows from 1941-1971, and had a drainage area of approximately 65.8 square miles. The stream gauge was located downstream of most of the main tributaries to the rivers and accounted for the contribution of these tributaries to the total flow, as well as the most of the diversions along the rivers.

At the present time, there are no operational stream gauges in the Elochoman River Subbasin. The top priority for installing new gauges in the Elochoman River Subbasin would be to replace the gauge formerly located at R.M. 4.5. As noted above, this gauge had a 30-year period of record. Any new measurement of flows for the Elochoman River could take advantage of the data collected in the past, if a gauge were installed at approximately the same location. This can be highly valuable in characterizing trends and improving the accuracy of long-term flow statistics. Therefore, the Planning Unit makes the following recommendation:

Recommendation:

A stream gauge should be installed to replace the former USGS stream gauge on the mainstem Elochoman River. In addition, if funding can be obtained, one additional gauge should be installed in the Elochoman River subbasin to enhance capabilities for monitoring and managing stream flow.

It should be noted that field work has not been performed to address access considerations or property ownership issues related to potential stream gauging sites.

Table 4-8 summarizes the candidate sites for installing new gauges. If new stream gauges are installed in the Elochoman River Subbasin, consideration should also be given to whether existing weather stations for measuring precipitation and other weather variables are adequate to meet stream management needs.

Table 4-8
Potential New Stream Gauges – Elochoman River Subbasin

	Candidate Site	Potential Value	Priority	Notes
1.	Former gauging site on Elochoman R., R.M. 9.2	Mainstem flow levels (lower portion of subbasin); Would essentially record total flows for entire watershed	High	Takes advantage of previous data collected (1941-71). Would need to avoid influence from Columbia R. flow backup. Should also consider locating close to toe-width site (RM 3.5), especially if minimum instream flows established based on toe-width results.
2.	Upper end of mainstem, below northernmost cluster of tributaries	Monitor flows from forested headwaters; measure change due to forest practices. Predict peak flows.	Medium	Isolates flow contribution from tributaries in the upper portion of the subbasin.

4.7.4 Abernathy/Germany Creeks

Subbasin Characteristics Relevant to Stream Flow

The Abernathy/Germany Creek Subbasin has a drainage area of 90 square miles. As with Skamokawa Creek, Abernathy, Germany, Mill Creeks and other named and unnamed streams flow directly into the Columbia River, and are tidally influenced in their lower reaches. There are no major municipal water users or community systems in this subbasin.

Land use in the subbasin is primarily forest, especially higher in the subbasin. There are agricultural lands in the lower portion of the subbasin (lower 4 to 6 miles). According to the LFA, splash damming and flood control measures in the lower portion of the subbasin on Mill Creek and Abernathy Creek have disconnected streams from their floodplains. However, conditions are better in the upper watershed. Roads adjacent to streams also confine the stream channels throughout the subbasin.

The LFA also states that hydrologic immaturity and relatively high road densities in the forest lands potentially increase peak flows in most of the subbasin. According to the

LFA, there is significant connectivity between ground water and surface water in this subbasin based on baseflow measurements by Ecology.

The LFA identifies a series of wetlands between RM 10 and 12 of Mill Creek and floodplains in Lower Germany and Abernathy Creeks that have good habitat qualities and which should be preserved or enhanced.

Stream Flow Management Recommendations for the Abernathy/Germany Creek Subbasin

The upper subbasin is predominantly occupied by forest lands and many of the stream flow issues are best addressed through forest management practices (see Policy SFP-9).

Although there is potential for enhancing floodplain connectivity in the lower portion of the subbasin, most of the existing structures are needed for flood control. No specific projects have been identified at this time.

Because of the limited development and water use in this subbasin, there are no subbasin-specific water-use management options identified to address stream flow in this subbasin.

Policy SFP-2 should be applied to strengthen restrictions on issuance of new water rights in the subbasin. For details of application of this policy to this subbasin, see Appendix I. There are no existing administrative low flows or closures currently in place in the Abernathy/Germany Creek Subbasin.

4.7.5 Coal Creek-Longview Slough

Subbasin Characteristics Relative to Stream Flow

The Coal Creek-Longview Slough Subbasin has a drainage area of approximately 56 square miles. Longview Slough consists of the slough area and man-made ditches that flow through Longview and include several unnamed tributaries north of Longview. Coal Creek is tidally influenced to Harmony Creek and into Longview.

The lower (southern) portion of the subbasin is heavily urbanized and contains the City of Longview, the largest city within WRIAs 25 and 26. Most of the subbasin's future development is also likely to occur within this lower portion of the subbasin near the City of Longview. The major municipal and industrial water uses are located at the downstream end of the subbasin, in the City of Longview and Port of Longview. Because the City of Longview's diversion is on the Cowlitz River, it does not significantly impact flows in the Coal Creek-Longview Slough subbasin. Furthermore, there are no significant diversions in Coal Creek.

The City of Longview is not currently subject to Ecology's Stormwater Management Manual requirements or the National Pollutant Discharge Elimination System (NPDES) Phase I permit related to stormwater. The City is on EPA's list of expected Phase II communities.

There is a significant proportion of agricultural land to the north and west of the City of Longview. The majority of forested lands are located in the middle and upper portions of

the subbasin. Road densities in the forested areas are high (>5 miles per square mile). The hydrologic immaturity and the high road densities cause potential for high peak flows in the subbasin.

According to information from the Limiting Factors Analysis, Coal Creek is highly entrenched throughout the watershed, and residential development limits floodplain connectivity. The Longview Ditches also reduce possible floodplain connectivity.

Stream Flow Management Recommendations for the Coal Creek/Longview Slough Subbasin

In this subbasin there are numerous dikes along farmland and pastures that could be considered for removal or modification to enhance floodplain connectivity. This subbasin was not reviewed in detail, and no specific projects have been identified at this time.

There are no major water diversions in the subbasin. Thus, there are no subbasin-specific water-use management options identified to address stream flow.

The upper subbasin is predominantly forest lands and many of the stream flow issues are best addressed through forest management (see Policy SFP-9).

There are no existing administrative low flows or closures currently in place in the Coal Creek/Longview Slough Subbasin.

4.7.6 Coweeman River

The Coweeman River Subbasin is another of the four "pilot" subbasins. Detailed analysis has been performed for the pilot subbasins regarding the applicability of the stream flow management techniques.

Subbasin Characteristics Relevant to Stream Flow

The Coweeman River Subbasin has a drainage area of approximately 130 square miles. The main stem of the Coweeman River flows within the southwest portion of Cowlitz County in a westerly direction to its confluence with the Cowlitz River at the City of Kelso.

The major concentration of population in the subbasin is the City of Kelso, located near the mouth of the Coweeman River. The City of Kelso's water supply is provided by a Ranney well located adjacent to the Cowlitz River, and likely has little if any influence on flows in the Coweeman River. The majority of residential and commercial/industrial development occurs near the lower reaches of the subbasin around the Kelso area and along the Cowlitz River. This is also where future development will likely occur. Small farms exist in the lower and middle portions of the subbasin as well. Other primary activities include hatcheries, dairies, livestock, and logging. Forest (60%) and non-forested/logged (35%) areas are the predominant land uses in the basin. With respect to diversions and withdrawals, the only large diversions are associated with hatcheries whose demands are non-consumptive and are located in the middle portions of the subbasin.

The Coweeman River originates in the foothills below 3,000 feet. Since there is little snowpack, the river has poor summer flow yield. Summer flows are typically lower than the optimal flows determined in toe-width studies conducted in the river (see next section). However, because there are limited diversions in the subbasin, the low flow conditions likely result from the natural hydrology of the system. According to the LFA, extensive logging and high road densities have led to hydrologically immature forest stands and make the Coweeman River subject to increased peak flows, (Wade 2000).

The lower four miles of the river is a low-gradient stream that is tidally influenced. This area of the stream was historically a large floodplain, but development in the Kelso area and construction of Interstate 5 has resulted in channelization and diking. The floodplain and tributaries in this area are now highly disconnected from the river. In general, the floodplains along the river have been filled with deposits from the Mt. St. Helens eruption, which has also caused floodplain disconnection.

According to the LFA there is good potential for floodplain restoration projects from approximately RM 4 to RM 7.5 because of the unconfined channel and wetland habitat present in this area. This area also is dominated by agriculture land use. Beyond this point, the valley becomes narrower and the gradient increases and the valley is incised and disconnected from the floodplain terraces. In this upper area, forest land becomes dominant.

Existing Instream Flow Studies

The Department of Ecology (Ecology) conducted an instream flow study on the Coweeman River using the "toe-width" method, with the field work being performed during the summer of 1998. An Open File Technical Report titled *Washougal River Fish Habitat Analysis Using the Instream Flow Incremental Methodology and the Toe-Width Method for WRIAs 25, 26, 28, and 29* was published by Ecology in June 1999 as Publication # 99-153. The location of the toe-width study is at the Rose Valley Road crossing.

Table 4-9 summarizes the toe-width determined optimal flows for different fish species and lifestages for the Coweeman River. Instream flow recommendations have been developed and presented to the Planning Unit by Ecology and Fish & Wildlife. The toe-width flows are one piece of information to be considered in developing instream flow recommendations.

Table 4-9
Toe-Width Flows for the Coweeman River

Stream Name	Tributary To	Average Toe-Width (feet)	Toe-Width Flow for Fish Spawning and Rearing (cfs)					
			Chinook (spawning)	Coho (spawning)	Chum (spawning)	Steelhead (spawning)	Steelhead (rearing)	Salmon (rearing)
Coweeman River (@ Rose Valley Rd. Crossing)	Cowlitz River	75.5	289.9	158.7	289.9	233.7	76.1	70.3

Stream Flow Management Recommendations for Coweeman River

The recommendations shown in Table 4-10 should be carried out for the Coweeman River subbasin.

In Table 4-11 attention is called to Policy SFP-9 because the upper portion of the subbasin is predominantly forest lands and many of the stream flow issues are best addressed through forest management. In addition, emphasis is placed on the land use management policies described in Section 4.3 that address floodplain and wetlands management (SFP 12 and SFP-13).

Table 4-10
Stream Flow Management Recommendations Unique to the Coweeman River Subbasin

Management Technique	Relevant Basin Characteristics	Recommendation
Water Supply Actions as Related to Stream Flow		
Restrictions on Issuance of New Water Rights	▪ No existing closures or administrative low flows in the subbasin	Apply Policy SFP-2. For details, see Appendix I
Source Substitution/	▪ A certificated surface water right of 10 cfs is used for commercial/industrial purposes and may be a candidate for substituting a deeper groundwater supply.	Ecology should contact large water rights holder(s) to consider substituting a deeper ground water source for the current surface water diversion on the Coweeman River. This is a Planning Unit recommendation regarding voluntary actions. Implementation should not be mandated by the State.
Land Use Actions as Related to Stream Flow		
Forest Practices	▪ Approximately 95 percent of the subbasin is forested or has been logged in the past;	Policy SFP-9 should be applied by land managers in forested areas of the Coweeman River Subbasin, to ensure sound forest management practices to improve hydrologic conditions.
Development Practices and Stormwater Management	▪ Of any of the pilot subbasins evaluated, this portion of the Coweeman subbasin is likely to experience the most significant growth because of its proximity to Kelso and Interstate 5. This has the potential to affect stream flow, as rural lands are converted to urban and suburban lands with more impervious surfaces.	Cowlitz County and City of Kelso should review and consider revising their stormwater management ordinances and rules, in light of the guidance and BMPs provided in Ecology's Stormwater Manual.
Floodplain and Wetlands Management	▪ Above approximately RM 4 up to RM 7.5 on the Coweeman River there is good potential for floodplain and wetland restoration projects because of the unconfined channel and wetland habitat present in this area.	Cowlitz County should perform an inventory of the wetland complexes in the Coweeman River subbasin. These wetland areas should be a high priority in the County's management of wetlands.

Table 4-11
Potential New Stream Gauges – Coweeman River Subbasin

	Candidate Site	Potential Value	Priority	Notes
1.	Former gauging site on Coweeman R., R.M. 7.0	Mainstem flow levels (middle to lower portion of subbasin) Monitor target flows	High	Takes advantage of previous data collected (1951-84).
2.	Upper end of mainstem, below northernmost cluster of tributaries (Below Baird Creek)	Monitor flows from forested headwaters; measure change due to forest practices. Predict peak flows at downstream locations.	Medium	Value for flood prediction limited to periods when Cowlitz R. and Columbia R. not at flood stage.

These recommendations are focused on protecting or enhancing stream flows alone. Other recommendations included in this plan address water supply and habitat issues.

Target Flows

As part of the pilot subbasin analysis, a target flow regime was explored for the Coweeman River. It is recommended that the target flow regime described for the Coweeman River in Appendix G be used as a management tool. Application of the target flow concept will require installation of a stream flow gauge on the Coweeman River.

Proposed Additional Gauging Sites for the Coweeman River Subbasin

There is only one stream gauge that was continuously operated for a significant period of time within the Coweeman River Subbasin. The former USGS gauge on the Coweeman River (No. 14245000) was located near Kelso near River Mile (RM) 7.0. This gauge which measured daily flows was in operation from 1951-1984, and had a drainage area of approximately 119 square miles. This location is downstream of most of the main tributaries to the river and would account for the contribution of these tributaries to the total flow, as well as most of the diversions.

At the present time, there are no operational stream gauges existing in the Coweeman River Subbasin. The top priority for installing new gauges in the Coweeman River Subbasin would be to replace the gauge formerly located at RM 7.0. As noted above, this gauge had a 33-year period of record. Any new measurement of flows for the Coweeman River could take advantage of the data collected in the past, if a gauge were installed at approximately the same location. This can be highly valuable in characterizing trends and improving the accuracy of long-term flow statistics. Therefore the Planning Unit makes the following recommendation:

Recommendation:

Stream gauges should be installed on the Coweeman River, to provide for more effective implementation of the flow management strategy and monitoring of results.

Table 4-11 summarizes candidate sites for installing new gauges. This includes the site previously discussed for purposes of monitoring target flows, as well as an additional site

that would be advantageous, if additional funding could be secured. If new stream gauges are installed in the Coweeman River Subbasin, consideration should also be given to whether existing weather stations for measuring precipitation and other weather variables are adequate to meet stream management needs.

It should be noted that field work has not been performed to address access considerations or property ownership issues related to potential stream gauging sites.

4.7.7 Lower Cowlitz River

The Lower Cowlitz River (Lower Cowlitz) Subbasin is another of the four "pilot" subbasins within WRIAs 25 and 26. Detailed analysis has been performed for the four pilot subbasins regarding the applicability of the stream flow management techniques.

Subbasin Characteristics Relevant to Stream Flow

The Lower Cowlitz River Subbasin has a drainage area of approximately 456 square miles. The main stem of the Lower Cowlitz River flows westward from Mt. Rainier in western Lewis County south through the western portion of Cowlitz County to its confluence with the Columbia River at the Cities of Longview and Kelso.

Hydropower facilities operated by the City of Tacoma (i.e., the Cowlitz River Project) are located on the Cowlitz River upstream of the Lower Cowlitz Subbasin. These facilities at Mayfield and Mossyrock Dams have significant impacts upon the flow of the Lower Cowlitz River. The Planning Unit is considering actions in the Lower Cowlitz Mainstem to protect instream flows and meet the needs of the urbanizing I-5 corridor. See Policy SFP-8 (Section 4-4.).

The Planning Unit has assessed stream flow issues for the tributary creeks that flow into the Lower Cowlitz River. The flows in these tributaries are not impacted by the operations of the hydropower facilities. The primary tributaries reviewed during development of this watershed plan are Leckler Creek, Olequa Creek, Lacamas Creek, Salmon Creek, and Mill Creek. These tributaries were selected primarily because instream flow studies have conducted on the streams. These tributaries to the mainstem are also among the largest in the subbasin. The discussion that follows pertains to the entire Lower Cowlitz Subbasin, but is focused primarily upon the priority tributaries.

The major concentration of population in the subbasin is centered within the Cities of Longview and Kelso, which are located near the mouth of the Cowlitz River. The majority of municipal and industrial water use also occurs within and near the Cities of Longview and Kelso.

The Cities of Toledo and Vader are located near the mouths of streams tributary to the Lower Cowlitz River. However, due to their downstream locations on these tributaries, and the relatively small amount of water used, their effects on these tributary streams is believed to be relatively small.

The City of Winlock has some potential for impacting flows in Olequa Creek through groundwater withdrawals. In addition, substantial additional water uses are under consideration in Winlock at this time, associated with a proposed new industrial facility (Cardinal Glass).

Most of the wetlands within the subbasin occur in three general locations: (1) entire mainstem of the Cowlitz River; (2) large wetland complex within approximately two miles of the mouth of the Cowlitz River; (3) upper watershed on Cowlitz tributaries from Olequa Creek in the west to Mill Creek in the east. Land use maps show these three locations to currently be forest, shrub and agricultural land in the upper watershed and agricultural and developed (residential) land in the lower watershed. In general, all palustrine wetland types have increased, while riverine, unconsolidated shore wetland types have decreased (Wade 2000).

Wetland locations in the five tributaries identified by the Planning Unit as tributaries of interest are as follows:

- **Leckler Creek**: There are virtually no wetlands in this basin.
- **Lacamas Creek:** There are extensive wetlands throughout this basin, both along the creek and upland.
- **Olequa Creek:** There are extensive wetlands in the upper third of this basin, both along the creek and upland.
- **Salmon Creek:** There are wetlands in the lowest quarter of this basin, both along the creek and upland. There are also wetlands in the second lowest quarter along the creek. There are virtually no wetlands in the upper half of this basin.
- **Mill Creek:** There are extensive wetlands in the lower two-thirds of this basin, both along the creek and upland. The upper third has some wetlands along the creek.

With respect to floodplain storage, the lower portions of most of the tributary creek drainage areas other than Olequa Creek have broad floodplain areas that may contain a significant volume of storage. However, dikes were not observed directly in these areas. For most of its length, Olequa Creek has a deeply incised channel with little floodplain volume.

Existing Instream Flow Studies

Ecology conducted an instream flow study on several Lower Cowlitz River tributaries using the "toe-width" method, with the field work being performed during the summer of 1998. An Open File Technical Report titled *Washougal River Fish Habitat Analysis Using the Instream Flow Incremental Methodology and the Toe-Width Method for WRIAs 25, 26, 28, and 29* was published by Ecology in June 1999 as Publication # 99-153.

Table 4-12 summarizes the toe-width determined optimal flows for different fish species and lifestages for the priority tributaries in the Lower Cowlitz River.

Table 4-12
Toe-Width Flows for the Lower Cowlitz Tributaries

Stream Name	Tributary To	Average Toe-Width (feet)	Toe-Width Flow for Fish Spawning and Rearing (cfs)					
			Chinook (spawning)	Coho (spawning)	Chum (spawning)	Steelhead (spawning)	Steelhead (rearing)	Salmon (rearing)
Leckler Ck. (@ Hazel Dell Rd.	Cowlitz River	8.3	18.8	8.8	18.8	18.0	3.3	2.9
Olequa Ck. (@Kollock Rd. Bridge)	Cowlitz River	54.3	192.6	103.0	192.6	159.5	47.7	43.8
Lacamas Ck. (@Hwy 506 Bridge)	Cowlitz River	42	140.1	73.6	140.1	118.4	33.1	30.2
Salmon Ck. (@Jackson Hwy)	Cowlitz River	59.8	217.1	116.9	217.1	178.4	54.7	50.3
Mill Ck. (@Cowlitz Salmon Hatchery)	Cowlitz River	29.8	91.5	46.9	91.5	79.5	20.3	18.4

Stream Flow Management Recommendations for the Lower Cowlitz River Subbasin

Table 4-13 identifies recommendations specific to tributary creeks in the Lower Cowlitz River subbasin. These recommendations are focused on protecting or enhancing stream flows alone. Other recommendations included in this plan address water supply and habitat issues.

As noted above, the City of Winlock has some potential for impacting flows in Olequa Creek through groundwater withdrawals. In addition, substantial additional water uses are under consideration in Winlock, associated with a proposed new industrial facility. Based on these considerations, Table 4-13 identifies recommendations specific to Olequa Creek and the City of Winlock.

For most other communities in this subbasin, reductions in water use through conservation would have a negligible impact upon flows because of the downstream locations of most surface water diversions and ground water wells, and because the hydropower facility operations upstream have much more significant impacts upon stream flows in the Cowlitz River. In addition, the portion of the Cowlitz River near Kelso and Longview is influenced by tidal influences from the Columbia River.

There are substantial areas containing wetlands and floodplains in the Lower Cowlitz area. Protecting and enhancing these features can improve flow conditions and other fish habitat factors. Therefore emphasis is placed on the land use management policies

described in Section 4.3 that address floodplain and wetlands management (SFP-12 and SFP-13). This is highlighted with specific recommendations in Table 4-13.

Table 4-13
Stream Flow Management Recommendations Unique to the Lower Cowlitz River Subbasin

Management Technique	Relevant Basin Characteristics	Recommendation
Water Supply Actions as Related to Stream Flow		
Administrative Low Flows and Closures	▪ Fourteen existing administrative closures and low flows in the subbasin (see Appendix H)	Apply Policy SFP-2. For details, see Appendix I
Water Conservation	▪ City of Winlock is located adjacent to Olequa Creek. ▪ The City uses six wells for its source of water. While existing water use by the City is only approximately 170 acre-feet per year (afy), the City may experience a significant (i.e., 100 percent) increase in water use in the near future, as a new industry is considering locating near the City, and may request water on the order of 180 afy. ▪ Enhanced conservation efforts by Winlock could provide some benefit to stream flows in Olequa Creek, due to the potential hydraulic connectivity between the wells and nearby streams.	The City of Winlock should carry out a water conservation program to minimize impacts on stream flow in Olequa Creek. This may warrant going above and beyond State requirements for conservation by municipal water systems. It is anticipated that this would require examination of cost, potential rate impacts on City customers and other feasibility criteria. This is a Planning Unit recommendation regarding voluntary actions. Implementation should not be mandated by the State.
Land Use Actions as Related to Stream Flow		
Wetlands Management - tributaries	▪ **Lacamas Creek:** There are extensive wetlands throughout this basin, both along the creek and upland. ▪ **Olequa Creek:** There are extensive wetlands in the upper third of this basin, both along the creek and upland. ▪ **Salmon Creek:** There are wetlands in the lowest quarter of this basin, both along the creek and upland. There are also wetlands in the second lowest quarter along the creek. There are virtually no wetlands in the upper half of this basin. ▪ **Mill Creek:** There are extensive wetlands in the lower two-thirds of this basin, both along the creek and upland. The upper third has some wetlands along the creek.	Lewis County should perform an inventory of the wetland complexes in the Lacamas Creek, Olequa Creek, and Mill Creek drainages. These wetland areas should be a high priority in the County's management of wetlands, as they are the most likely to impact tributary stream flows. The County should develop a strategy to protect these wetlands, and restore hydrologic functions where needed.
Wetlands Management – Mainstem Cowlitz River	▪ There are extensive wetlands and floodplains along the Lower Cowlitz River.	▪ Lewis and Cowlitz Counties should take steps similar to those listed above, with regard to protecting wetlands along the mainstem Lower Cowlitz River. ▪ Lewis and Cowlitz Counties should partner with the State of Washington and local cities to identify and pursue opportunities for floodplain restoration projects to benefit flows and fish habitat. Project implementation should be subject to local input, cost-benefit analysis, and availability of funding. If these factors are favorable, projects should be carried out.

Target Flows

As part of the pilot subbasin analysis, a target flow regime was explored for Olequa Creek. It is recommended that the target flow regime described for Olequa Creek in Appendix G be used as a management tool. Application of the target flow concept will require installation of a stream flow gauge on Olequa Creek.

Proposed Additional Gauging Sites for the Lower Cowlitz River Subbasin

At the present time, there are no operational stream gauges existing in the priority tributaries of the Lower Cowlitz Subbasin, so there is currently no point at which flows could be measured to assess whether flow objectives are being met. The Planning Unit makes the following recommendation

Recommendation:

Stream gauges should be installed on several creeks tributary to the Lower Cowlitz River, to provide for more effective implementation of the flow management strategy and monitoring of results.

Table 4-14 summarizes candidate sites for installing new or replacement stream gauges. The top priorities for installing new gauges in the tributaries would be to install a new gauge on Olequa Creek, replace the gauge at Salmon Creek, and to install gauges near the mouth of each of the priority tributaries. Any new measurement of flows for the tributaries could take advantage of the data collected in the past, if a gauge were installed at approximately the same location. This can be highly valuable in characterizing trends and improving the accuracy of long-term flow statistics.

It should be noted that field work has not been performed to address access considerations or property ownership issues related to potential stream gauging sites.

Table 4-14
Potential New Stream Gauges – Lower Cowlitz River Subbasin

	Candidate Site	Potential Value	Priority	Notes
1.	Olequa Creek, upstream of Stillwater Creek	Proposed target flow site, near lower end of watershed.	High	Would provide ability to monitor for target flows.
2.	Former gauging site on Salmon Creek (No. 14239000)	Mainstem flow levels (middle to lower portion of subbasin)	High	Takes advantage of previous data collected
3.	Lower end of other priority tributaries (Lacamas, Leckler, and Mill)	Would record total flows for entire watershed	High	Downstream of a major tributary. Would need to avoid influence from Cowlitz R. and Columbia R. flow backup. Should also consider locating close to toe-width site, especially if minimum instream flows established based on toe-width results.
4.	Additional sites to be determined for special studies (if applicable)	Evaluate effects of specific changes in land use conditions or mitigation measures. E.g. development or forest harvest.	TBD	Depends on whether special studies are warranted.

TBD = To Be Determined

4.7.8 Toutle River Subbasin

Subbasin Characteristics Relevant to Stream Flow

The Toutle River Subbasin has a drainage area of approximately 511 square miles. It is a major tributary to the Cowlitz River. The subbasin has three major rivers including the North Fork, South Fork, and Green Rivers, and also has two large lakes including Spirit Lake and Silver Lake. The Mt. St. Helens eruption has influenced much of the subbasin's recent geologic and stream characteristics. There is no extensive development within this subbasin with the exception of the small community of Toutle. The majority of the subbasin is forested with over 35% of the land cover having been logged historically. There are many small water users associated with domestic use and irrigation, but these are located primarily in the lower third of the subbasin.

Data on stream flow is generally lacking in the Toutle Subbasin under current conditions. However, most stream systems are naturally recovering from the Mt. St Helens eruption (Wade 2000). It has been observed, however, that the sediment retention structure (SRS) on the North Fork Toutle is making recovery slower there than in other streams (Wade 2000). Furthermore, according to the LFA, one of the critical streams with low flow conditions is Outlet Creek, which flows from Silver Lake to the Toutle River. The low flow conditions along with how the lake level control dam is operated blocks access to spawning fish into Silver Lake (Wade 2000). On the high flows end, hydrologic immaturity of forest stands resulting from both the impacts of the eruption and pre- and post-eruption logging and relatively high road densities has resulted in the potential for increased peak flow according to the LFA.

Floodplains are in poor condition throughout the subbasin and especially in the lower subbasin below the SRS. Sediments from the eruption were dredged and placed on floodplains and adjacent wetlands. One effect is that the lower Toutle River now meanders through a wide shallow valley with an aggraded channel and dredge spoils form dikes along its banks.

Stream Flow Management Recommendations for the Toutle River Subbasin

The Toutle River Subbasin has been heavily impacted by the Mt St. Helens eruption, and the stream flow conditions in the subbasin are highly dependent on the natural recovery of the watershed. Because of the existing and potential future limited development and water use in this subbasin, there are no subbasin-specific water-use management options identified for the Toutle River Subbasin to address stream flow.

It should be noted that the sediment retention structure on the North Fork Toutle and the operation of the Silver Lake level control dam do have impacts on flow and on habitat factors that are not strictly flow related. Effects of the sediment-retention structure were not analyzed during the planning process and may warrant review. Essentially all of the mainstem Toutle, North Fork, South Fork, and the Green River are designated as Tier 1

or Tier 2 in the Salmon Recovery Plan and as such, the entire Toutle River watershed is recommended for closure.

Policy SFP-2 should be applied to strengthen restrictions on issuance of new water rights in the subbasin. For details of the application of this policy to the Toutle River Subbasin, see Appendix I. There are no existing administrative low flows or closures in place in the Toutle River Subbasin.

4.7.9 Upper Cowlitz River Subbasin

Subbasin Characteristics Relevant to Stream Flow

The Upper Cowlitz River Subbasin has a drainage area of approximately 579 square miles. This subbasin comprises the headwaters of the Cowlitz River system. While there is no extensive development within this subbasin, it does include the small communities of Packwood and Randle. The majority of the subbasin is forested with large portions being historically logged. In addition to municipal water use within the Randle and Packwood areas, and domestic use throughout the subbasin, there are some water users associated with forestry operations and irrigation located primarily in the lower third of the subbasin.

The system of dams located in the downstream subbasins blocks all natural passage and downstream migration of fish. Fish are moved around the dams by artificial means. Tributaries to the Upper Cowlitz flow through deep, narrow canyons with steep gradients. According to the LFA the lower portions of many tributaries have been affected by agricultural, residential, or other activity. Many of the streams, floodplains and wetlands have been dredged, channelized and diked to support farmland or pasture.

According to the LFA, it is these channel alterations that have created low flow passage problems because of channel aggradation in the lower reaches of some tributaries. The potential for increased peak flows has been identified for the lower parts of the subbasin because of the immature hydrologic conditions, although road densities are not considered to be a primary factor in this subbasin. Vegetative cover and watershed conditions in the upper portions of the subbasin are considered to be similar to historic conditions (Wade, 2000).

Stream Flow Management Recommendations for the Upper Cowlitz River Subbasin

This subbasin is predominantly forest lands and many of the stream flow issues are best addressed through forest management (see Policy SFP-9).

In addition, although there are modifications along farmland and pastures that may be considered for enhancement to enhance floodplain connectivity, no specific projects have been identified at this time.

Because of the limited development and water use in this subbasin, there are no subbasin-specific water-use management options identified to address stream flow.

Policy SFP-2 should be applied to strengthen restrictions on issuance of new water rights in the subbasin. For details of the application of this policy to the Upper Cowlitz River Subbasin, see Appendix I. There are currently four administrative closures and low flows in the subbasin.

4.7.10 Cispus River Subbasin

Subbasin Characteristics Relevant to Stream Flow

The Cispus River Subbasin has a drainage area of approximately 451 square miles. It is located south of the Upper Cowlitz River Subbasin and enters as a primary tributary to the Cowlitz River upstream of Riffe Lake. The Cispus River flows into Lake Scanewa, which is formed by the Cowlitz Falls Dam operated by the Lewis County PUD. There is no extensive development within this subbasin. The majority of the subbasin is forested with a large portion of the land cover being historically logged (~30%). There are a limited number of water users associated primarily with domestic use and irrigation.

As with the Upper Cowlitz River Subbasin, the system of dams located in the downstream subbasins blocks all natural passage and downstream migration of fish. According to the LFA roads constructed adjacent to streams as part of the timber industry have resulted in channelization of the river, tributaries, and floodplains in the subbasin (Wade 2000).

Past forest practices have been identified as contributing to impacting habitat and increasing peak flows in the subbasin. Drainage areas in the lower portion of the subbasin directly adjacent to the Cispus River were identified as having increased potential for peak flows, especially the North Fork Cispus.

The upper portion of the subbasin is not considered to be as much of a concern for increased peak flows partly because there are continuous late- and mid- seral stage forests with fairly good riparian conditions. Road densities are also not as high in these areas.

Stream Flow Management Recommendations for the Cispus River Subbasin

Due to the predominance of forested lands in this subbasin, the primary vehicle for managing flow is forest practices. See Policy SFP-9. Other policies may also apply, but were not reviewed in detail for application to this subbasin.

Policy SFP-2 should be applied to strengthen restrictions on issuance of new water rights in the subbasin. For details of the application of this policy to the Cispus River Subbasin, see Appendix I. There are no existing administrative low flows or closures in place in the Cispus River Subbasin.

4.7.11 Tilton River Subbasin

Subbasin Characteristics Relevant to Stream Flow

The Tilton River has a drainage area of approximately 154 square miles. It is a major tributary to the Cowlitz River and enters into Mayfield Lake. There is no extensive development within this subbasin with the exception of the small community of Morton. The majority of the subbasin is forested including both hardwood and conifer forests. Approximately 20% of the land cover has been logged historically. In addition to municipal water use in the Morton vicinity, there are many small water users associated with domestic use and irrigation.

As with the other upper-watershed subbasins, Mayfield Dam blocks all natural passage and downstream migration of fish. Fish are moved from below the dams and transported by artificial means to the Tilton River. Most smaller streams are naturally confined and have little floodplain area, while reaches in the upper portion of the subbasin are composed of large rock and bedrock. The exceptions are in the lower reaches of the North Fork Tilton and the mainstem below the West Fork.

Similar to the other subbasins in WRIA 26, historic timber harvests, high road densities, and stream adjacent roads have been identified as the cause for decreased riparian function and increased peak flows, according to the LFA (Wade 2000). The lower portions of the East Fork and South Fork Tilton have indication of increased peak flows. However, there are stands of old-growth and dense, mature trees in the upper East and South Fork Tilton areas, and past clearcuts are beginning to mature.

Dam break floods in Connelly Creek associated with logging roads have caused significant damage to habitat conditions according to the LFA. The LFA also identified floodplain restrictions on the West Fork Tilton where a highway is within the floodplain area. Connelly Creek has rip-rap restricting channel connection, and heavy armoring is present on the East Fork Tilton.

Stream Flow Management Recommendations for the Tilton River Subbasin

Due to the predominance of forested lands in this subbasin, the primary vehicle for managing flow is forest practices. See Policy SFP-9. Other policies may also apply, but were not reviewed in detail for application to this subbasin.

Policy SFP-2 should be applied to strengthen restrictions on issuance of new water rights in the subbasin. For details of the application of this policy to the Tilton River Subbasin, see Appendix I. There are two existing administrative low flows in place in this subbasin.

4.7.12 Mayfield Dam Subbasin

Subbasin Characteristics Relevant to Stream Flow

The Mayfield Dam Subbasin has a drainage area of approximately 207 square miles. The primary developed area within the Mayfield Dam Subbasin consists of the small community of Mossyrock. The Mayfield Dam Subbasin includes two dams (Mayfield Dam and Mossyrock Dam) and their associated reservoirs (Mayfield Lake and Riffe Lake) that effectively control flows. This subbasin contains only a short reach of the Cowlitz River between Mayfield and Riffe Lakes. There is very little existing development and limited potential for future development in this subbasin. The dams are operated by Tacoma Power and Light as the Cowlitz River Hydroelectric Project, and the operation of the project is regulated by a Federal Energy Regulatory Commission (FERC) license. Operational practices are described in Section 2.4.1 of this Watershed Management Plan.

Flow regimes have been significantly altered by operations of the dams. The level of the Riffe Lake fluctuates considerably during the fall to provide for flood storage. This process lowers ground water levels which likely alters the hydrology in the lower portions of the tributaries like Rainey Creek (Wade 2000).

Both dams are significant barriers to migration of fish through the lakes and the lower Cowlitz tributaries. Through construction of the dams, a significant amount of the valley was flooded. Rainey Creek on the upper portion of this subbasin and its tributaries have also been channelized as a result of flood prevention diking. Furthermore, logging and grazing have reduced or eliminated riparian vegetation in these areas and much of the lowland areas have been converted to agricultural use. The vegetation is generally early- to mid-seral stage and is considered hydrologically immature. However, almost the entire fringe around Riffe Lake is managed as wildlife lands by WDFW with funding from Tacoma Power and Light.

As discussed in Chapter 3, the City of Mossyrock is currently under a service connection moratorium while their water rights application for a new well awaits processing. Ecology has recently indicated that Mossyrock needs to conduct a subbasin evaluation as part of the review of the application. In addition to the municipal water use by the City of Mossyrock, there are other small water users in the subbasin.

Stream Flow Management Recommendations for the Mayfield Dam Subbasin

As mentioned above, flows on the Lower Cowlitz River and reservoir levels in Mayfield Lake and Riffe Lake are largely determined by operational practices of the hydroelectric projects. Since the WRIAs 25 and 26 Planning Unit has determined it would be unnecessarily duplicative to use the watershed planning process to review or make recommendations regarding these practices at this time, no additional subbasin-specific stream flow management recommendations are identified for this subbasin. However, the Planning Unit considers it appropriate to apply the general stream flow management

policies presented in Sections 4.4 and 4.5 to the Mayfield Dam Subbasin. This subbasin was not reviewed in detail, and no specific projects have been identified.

There are currently three administrative low flows and closures in place in this subbasin. Additional protection of tributary stream flow in the Mayfield Dam Subbasin is warranted. Policy SFP-2 should be applied to strengthen restrictions on issuance of new water rights in the subbasin.

4.8 Implementation Considerations for Stream Flow Management

Table 4-15 summarizes implementation considerations for the stream flow management recommendations discussed throughout Section 4, above. Implementation issues may vary somewhat from those listed in the table, depending on the specific action, and community involved. Where there are staffing impacts that would likely require hiring of at least ½ FTE by the implementing organization(s), they are called out in the funding column. Actions that relate to water conservation and substitution of water sources were presented in Section 3.6 and are not repeated here.

Table 4-15
Implementation Considerations for Stream Flow Management

Priority[1]	Activity	Implementers[3]	Financial/ Economic Costs[2]	Funding Sources
High	Maintain existing stream gauges. Install new gauges at selected locations. Select exact sites; permit and construct gauges; O&M; data management (See Section 4.2).	*Lead*: Ecology *Others*: USGS, LCFRB, Counties	Medium	*Main*: Leg. appropriations (Ecology budget); Congr. appropriations (USGS budget); *Additional*: Counties; Public Water Systems
High	Adopt closures and minimum instream flows in State Rule (See Section 4.4.1).	*Lead*: Ecology *Others*: LCFRB	Low	*Main*: Ecology (staff time) *Additional*: LCFRB (staff time)
High	Selected actions involving water supply (See Section 3.6).	*See Section 3.6*	*See Section 3.6*	*See Section 3.6*
High	Establish target flow monitoring and management program (See Section 4.3).	*Lead*: LCFRB and Planning Unit or successor organization *Support*: Ecology, DFW		*Main*: Phase 4 implementation funds *Additional*: TBD
High	Initial surveys in selected subbasins to identify unauthorized uses and take enforcement actions. Follow-up in other basins if warranted (See Section 4.4.6).	*Lead*: Ecology *Others*: N/A	Low to medium	*Main*: Leg. appropriations (Ecology budget & staffing) *Additional*: N/A
High	Consider and address effects of forest practices on stream flow. Monitor effectiveness of F&F Rules and NW Forest Plan. Report to public periodically (See Section 4.5.1).	*Lead*: DNR, USFS *Support*: Private forest landowners	Low to medium	*Main*: Leg. appropriations (DNR budget); Congr. appropriations (USFS budget), Timber producers *Additional*: N/A

Table 4-15 (cont.)
Implementation Considerations for Stream Flow Management

Priority[1]	Activity	Implementers[3]	Financial/ Economic Costs[2]	Funding Sources
High	Protect floodplains from modifications that would impair hydrologic functions or habitat (See Section 4.5.3).	*Lead*: Counties, cities, State agencies with land management responsibilities *Others*: DFW, Ecology	Low	*Main*: County permitting fees or general fund revenues, grants *Additional*: State agency budgets
Medium	Review effects of stormwater discharges on stream flow and habitat. Where needed to protect key habitat, implement programs that exceed minimum requirements (See Section 4.5.2).	*Lead*: Counties, Cities *Others*: Ecology	Low to Medium	*Main*: County, City general funds; Stormwater assessment and fees; grants *Additional*: N/A
Medium	Purchase or lease of water rights from willing sellers, for State Trust program (See Section 4.4.5).	*Lead*: Ecology *Others*: N/A	Low to medium	*Main*: Leg. appropriations (Ecology budget) *Additional*: N/A
Medium	Identify floodplain restoration projects and implement where feasible (See Section 4.5.3).	*Lead*: Counties, cities, State agencies with land management responsibilities *Others*: DFW, Ecology	Medium to High	*Main*: State or federal grants; Leg. Appropriations, grants *Additional*: N/A
Low	Develop policies and procedures to identify and mitigate stream flow impacts of sewering communities formerly served by septic systems (See Section 4.5.2).	*Lead*: Counties, Cities *Others*: sewer agencies if different from Counties, Cities.	Low	*Main*: Counties, Cities, general funds, permitting fees, grants *Additional*: N/A
Low	Water conservation by farmers practicing irrigated agriculture. Technical assistance by Conservation District in each county (See Section 4.4.2).	*Lead*: Agricultural producer *Others*: Conservation Districts	Medium	*Main*: Agricultural producer *Additional*: Leg. Appropriations (Cons. Commission & CD budgets).
Low	Source substitution for selected areas served by individual domestic wells: relatively higher densities and likelihood of stream impacts; dependent on feasibility and cost (See Section 4.4.4).	*Lead*: Counties *Others*: Public water systems	Medium to high	*Main*: Assessments on affected properties (local improvement districts); grants *Additional*: Federal and State salmon recovery funding; Leg. appropriations
Low	Wetlands inventories and ordinances: assess and protect hydrologic functions, consider strengthening mitigation ratios (See Section 4.5.4).	*Lead*: Counties *Others*: Ecology		*Main*: County development fees or general fund revenues (note staffing impact); grants *Additional*: N/A

(1) Priority in context of all actions in Watershed Management Plan.

(2) Preliminary, generalized estimates of financial or economic costs to the affected community, implementing organization or water user. High: greater than $500,000; Medium: $50,000 to $500,000; Low: less than $50,000. Total cost, whether up-front or over a period of time up to ten years.

(3) "Lead" implementer would take responsibility for organizing efforts under this action, pursuing funding sources listed in the far right column.

Abbreviations: CD = Conservation District, N/A = Not Applicable, USGS = U.S. Geological Survey, Leg. = Legislative

Section 5
Management of Surface Water Quality

The WRIAs 25 and 26 Planning Unit has identified protection and improvement of surface water quality as an important objective linked to the Watershed Management Plan. At the same time, the Planning Unit recognizes that programs already exist to protect and improve water quality, and it is not desirable to duplicate these programs. The primary vehicle for achieving compliance with state criteria for surface water quality is the Washington State Department of Ecology's (Ecology) Total Maximum Daily Load (TMDL) program, also known as Water Cleanup Plans. In an effort to ensure that all waters of the state meet or exceed designated water quality standards, Ecology is engaged in a long-term process to develop water cleanup plans by assessing sources of water quality impairment and developing measures to reduce pollutant loading.

Policy SWQ-1:

The Washington State Department of Ecology's program to set Total Maximum Daily Loads (TMDLs) for water bodies that do not meet State water quality standards is the primary vehicle for addressing surface water quality at the regional scale.

The Planning Unit determined that it would be valuable to provide guidance to Ecology in terms of prioritizing activities with regard to water cleanup plans. Local input at the watershed scale can help to establish the sequence of studies undertaken, and ensure that limited water quality funding is allocated in an effective and efficient manner. This section summarizes activities undertaken by the Planning Unit, in regards to providing this local guidance. Ecology's current list of polluted waterbodies is provided, followed by a discussion of pollutant sources in the planning area. A proposed framework for prioritizing cleanup plans is then described, including Ecology's current listing methodology and recommendations generated by the Planning Unit for TMDL prioritization. Also included in the section is discussion of water quality monitoring efforts, both existing and proposed future activities.

More detail regarding the Planning Unit's efforts regarding surface water quality management is provided in Technical Memorandum No. 5 (Task 5).

5.1 303(d) Listed Waterbody Segments

As required by section 303(d) of the federal Clean Water Act (CWA), every two years each state must identify its polluted waterbody segments and submit a list of these water quality limited estuaries, lakes, and streams to the U.S. Environmental Protection Agency (EPA). To qualify for the list, it must be determined through water quality monitoring that the waterbody segment does not meet state surface water quality standards and that water quality is not expected to improve within the next four years. The standards are the criteria to ensure that water may be beneficially used for multiple purposes such as fishing, swimming, drinking, and fish habitat.

At the time this Watershed Management Plan was developed, Ecology's 1998 303(d) list served as the State's official list of impaired water bodies. Development of the "2002/2004" list was underway, and a draft of this new list is included as Appendix F of this plan. However, the 1998 list was used to develop recommendations. Once finalized, the 2002/2004 list should be revisited during the implementation phase of the Watershed Plan.

Washington State is required by the EPA to set priorities for establishing TMDLs, or cleanup plans for these impaired waterbody segments. A cleanup plan, designed to restore the beneficial use of the impaired waters, consists of an analysis of how much pollution a waterbody segment can receive, recommendations for controlling point source and non-point source pollution, and a monitoring plan to ensure the effectiveness of cleanup actions.

In general, monitored waterbody segments in Washington State are those segments with a history of pollution problems. According to Ecology, the 1998 303(d) list Statewide, includes a total of 643 segments out of 1,099 for which data are available. These impaired segments compose only about two percent of all the waters in Washington. This indicates that the 303(d) list is a useful yet incomplete inventory of stream segments in violation of water quality standards.

Table 5-1 is an inventory of eighteen waterbody segments in WRIAs 25 and 26 that are impaired for one or more water quality parameters and on the 1998 303(d) list of impaired segments. Violation of temperature criteria is the predominant water quality standard violation in the planning area.

Table 5-1
1998 303(d) List[1] of Impaired Waterbody Segments in WRIAs 25 and 26

Listed Waterbody Segment	Parameter(s)[2] in Violation of Water Quality Standards	Waterbody Identification Number
Grays River Sub-basin		
Grays River, West Fork	Temp	OV80RL
Elochoman River Sub-basin		
Elochoman River	Temp	RE01VV
Abernathy/Germany Creek Sub-basin		
Abernathy Creek	Temp	AP47TF
Germany Creek	Temp	OF50GD
Coal Creek/Longview Slough Sub-basin		
Longview Ditches[3]	DO, FC	GG32VT, FQ06HT
Upper Cowlitz River Sub-basin		
Silver Creek	Temp	CT81WJ
Willamette Creek	Temp	YV88LF
Lower Cowlitz River Sub-basin		
Cowlitz River[4, 5]	Temp	EG25TW
Coweeman River Sub-basin		
Baird Creek	Temp	WA62BY
Goble Creek	Temp	HN80OU
Mulholland Creek	Temp	NA87LM
Coweeman River	Temp	ON59SG
Toutle River Sub-basin		
Herrington Creek	Temp	JJ99IK
Green River	Temp	KB88BE
Cispus River Sub-basin		
Cispus River	Temp	FB00IP
Cispus River, N.F.	Temp	TO54NT
East Canyon Creek	Temp	TV32WL
Iron Creek	Temp	ZZ28DH

(1) From the 1998 303(d) List; Department of Ecology, State of Washington.
(2) Parameter Abbreviations: Temp (Temperature); FC (Fecal Coliform); DO (Dissolved Oxygen); Turb (Turbidity).
(3) Longview Ditches are not accessible by migratory fish. The 2002 303(d) list includes DO and FC as parameters with violations for the Longview Ditches, as compared to the 1998 303(d) list which includes those parameters as well as Lead and Turb.
(4) Ecology is in the process of de-listing the Cowlitz River for Arsenic impairment.
(5) Cowlitz River is diverted for public water supply by the Cities of Kelso and Longview.

The Skamokawa Creek subbasin, Mayfield Dam subbasin, and Tilton River subbasin do not contain waterbody segments listed on the 1998 303(d) list.

Table 5-1 should not be considered an exhaustive inventory of all segments in the study area with water quality impairments, but only those that met criteria established by Ecology and were then approved by EPA. Agencies have limited resources to monitor water quality conditions; therefore, water quality data are not available for many waterbody segments in the planning area. The data that are available are often based on permit requirements and specific agency monitoring objectives. Also, parameters and numbers of stations are subject to these limitations, and not presently designed to give the best assessment of water quality conditions in all waterbody segments.

5.2 Current and Future Sources of Pollutant Loading in the Planning Area

Based on land use patterns, many of the temperature impairments within WRIAs 25 and 26 appear to be related to forest harvest activities and effects on riparian corridors. Non-point pollution from agricultural and urban lands may also have contributed. Ongoing recovery of lands impacted by the 1980 Mt. St. Helens eruption has contributed to water quality improvements over the years in affected areas.

As human population grows in the planning area, the spatial coverage of urban and suburban development will also increase in some areas. Therefore, it is reasonable to anticipate increased pollutant loading could occur in these areas, with additional listings of water quality impaired segments resulting.

By comparison to other WRIAs around the state, the severity of identified water quality problems in WRIAs 25 and 26 is relatively minor. However, as noted above, information about water quality is limited, especially for smaller streams.

5.3 Framework for Prioritizing Cleanup Plans

Under state and federal law, Ecology must develop and implement cleanup plans for all impaired waterbody segments. According to Ecology staff, future cleanup plans will address every impaired water quality parameter in the planning area: load allocations will be developed for all listed segments and parameters, not just for select tributaries or parameters like was common in previous cleanup planning efforts. For that reason, water quality impaired subbasins in WRIAs 25 and 26 will be ranked from highest to lowest priority for TMDLs.

The section below describe Ecology's general process for prioritizing TMDLs, followed by the Planning Unit's specific recommendations for TMDL prioritization in WRIAs 25 and 26. Ecology staff have indicated that the recommendations prepared by the Planning Unit have been used in their program activities for establishing TMDL priorities.

5.3.1 Ecology's Listing Methodology to Prioritize TMDLs

Ecology revised its Water Quality Program Policy 1-11 in September 2002. This policy, otherwise known as the "listing methodology" or WQP Policy 1-11, describes the State's process to periodically assess and prepare a list of waters in which beneficial uses are impaired due to water quality problems and for which TMDL cleanup plans are required. This policy was developed to assess systematically the water quality monitoring status of all waterbody segments in the State, regardless of whether water quality conditions are being monitored or not. It also provides guidance for data submittal and quality assurance and for assigning a segment to the 303(d) list.

Surface water quality standards used for this assessment process are found in Chapter 173-201A WAC, and the federal National Toxic Rule and Human Health Criteria in 40 CFR Part 131. Criteria for 303(d) listed waters were developed to identify only those waters for which there is good documentation of impairment. Under this policy, every waterbody segment in the State will be assigned to one of five categories. Segments assigned to Categories 1 through 4 do not require a cleanup plan (TMDL), and are intended to "inform the public and other water quality efforts in the state." Only waterbodies in Category 5 constitute 303(d) listed waters, or those segments that require preparation of a cleanup plan.

Under the listing methodology, Ecology formulated their own means of prioritizing development of cleanup plans. As described in this policy, waterbody segments on the 303(d) list will be prioritized as high, medium, or low priority for preparing a TMDL. Primary and secondary criteria were developed to evaluate the listed segments. Ecology's primary criteria include:

- Vulnerability of waterbodies to degradation
- Risks to public health, including drinking water
- Risk to aquatic life and other water-dependent wildlife, especially threatened and endangered species.

If a waterbody segment ranks high for any one of these criteria, the cleanup plan will be given a high priority. Secondary criteria may also be considered – such as technical feasibility or prioritization from other planning processes – which will raise the priority level of that TMDL if one or more of these secondary criteria is identified that would make a TMDL significantly more beneficial, effective, feasible, or timely.

During 2003, Ecology assessed the 1998 and 2002 lists of impaired waterbody segments and held scoping meetings to schedule cleanup plans in WRIAs 25 and 26. The preliminary draft of the water quality assessment has been made available for public comment during January through March of 2004, with a final priority list anticipated to be submitted to USEPA for approval in the summer 2004. Also, under a Memorandum of Agreement signed in 1997 by USEPA and Ecology, all waterbody segments on the 1996 303(d) list must have TMDL studies completed by 2014.

5.3.2 Planning Unit Recommendations for Prioritizing Cleanup Plans

A sub-group of the Planning Unit was assembled to propose and apply criteria to prioritize impaired waterbody segments, and then use the findings from this analysis as the basis for recommending cleanup plans. A summary of this effort is provided below as local input to Ecology for implementing the TMDL program.

As an initial step in this process, the sub-group proposed criteria to guide the prioritization. These were proposed to help the Planning Unit take into account factors such as the defined objectives planning process, the importance of particular waterbodies in meeting those objectives, the quality of water quality monitoring data, the availability of management techniques for improving water quality, vulnerability of waterbodies due to anticipated growth and development in the subbasins, and other factors.

Three criteria were proposed and evaluated to prioritize cleanup plans in water quality impaired subbasins in the planning area. The criteria were based on the watershed planning goals and objectives of the planning unit. The criteria included:

- Surface water quality impairing water supplies (including groundwater under the influence of surface water)
- Surface water quality harming human health from contact recreation
- Surface water quality harming listed fish species or other aquatic life

These criteria were then applied to the subbasins in WRIAs 25 and 26 and used to develop recommendations for prioritization of cleanup plans.

Recommendation:

The Planning Unit recommends that Ecology develop TMDLs according to the priority list shown in Table 5-2. These priorities should be re-visited at such time as the 2002/2004 303(d) list is approved by Ecology and EPA.

At this time, Table 5-2 indicates one subbasin (Lower Cowlitz) as the top priority, and all other subbasins as equal priorities below the Lower Cowlitz subbasin. The basis for this is the use of the Lower Cowlitz River as a source of drinking water supply, coupled with impairment of temperature which affects salmon habitat.

Table 5-2
Summary Recommendations for Sequencing of Cleanup Plans
WRIAs 25 and 26

Priority for Cleanup Plans (TMDLs)	Subbasin Listed Under 303(d)	Basis for Prioritization
1	Lower Cowlitz River	• Importance as source of drinking water supplies; range of water quality issues potentially present.[(1)] • Temperature listing affects listed species.
2	Abernathy/Germany Creek	• Temperature listing affects listed species.
2	Longview Ditches	• Dissolved Oxygen and Fecal Coliform listing affects listed species.
2	Elochoman River	• Temperature listing affects listed species.
2	Grays River	• Temperature listing affects listed species.
2	Coweeman River	• Temperature listing affects listed species.
2	Upper Cowlitz River	• Temperature listing affects listed species.
2	Toutle River	• Temperature listing affects listed species.
2	Cispus River	• Temperature listing affects listed species.

(1) It should be noted that the Cowlitz River is listed only for temperature impairments. While other contaminants may be present they have not resulted in additional listings.

5.4 Water Quality Monitoring in WRIAs 25 and 26

5.4.1 Existing Water Quality Monitoring Efforts

The list of 303(d) impaired waterbody segments in WRIAs 25 and 26 – and throughout the State for that matter – is driven by the availability of quality-assured water quality monitoring programs and the ambient water quality data they generate. Waterbody segments or sub-basins that are thought to be impaired are typically monitored more intensively than those thought to be unimpaired by pollution.

The frequency of water quality monitoring, as well as the monitoring protocols and parameters sampled, are usually not consistent among monitoring programs, locations, or even within sub-basins. These inconsistencies are due to factors such as the perception of ambient water quality conditions, permit requirements for wastewater discharges, limitation of resources, technical capabilities, and sampling location accessibility. Again, because of these factors, the 303(d) list of impaired waterbody segments should not be considered a complete inventory of water quality impaired segments or conditions where standards are in violation of water quality criteria in the planning area.

Water quality monitoring is occurring throughout the basin under the auspices of various local, State, and federal programs and regulations. A compendium of known local, State, and federal monitoring programs in the study area is provided in Appendix B. These activities include:

- U.S. Forest Service, under the Northwest Forest Plan, is monitoring water temperature in waterbody segments in the Gifford Pinchot National Forests (generally

the Upper Cowlitz and Cispus River subbasins) every 30 minutes from July through September.

- Ecology, through its statewide long-term assessment program, is monitoring water quality in the Cowlitz River at the City of Kelso on a monthly basis.
- Public water systems relying on surface water supplies monitor raw water quality at their intake facilities.
- The Cowlitz and Wahkiakum Conservation Districts are monitoring water temperature at long-term index stations throughout WRIA 25 (see Appendix E).

5.4.2 Proposed Water Quality Monitoring Program

As part of its assessment of water quality information, the Planning Unit reviewed existing water quality monitoring activities being conducted by local, state, and federal agencies (Appendix E). From this review, it was apparent that water quality monitoring activities currently in place are designed to meet specific needs of various programs, but are not comprehensive in terms of either the network of streams or the types of parameters monitored. In the absence of a comprehensive monitoring framework at the regional scale, it is difficult to identify impaired water bodies, characterize status and trends in surface water quality or develop effective approaches to improving water quality.

Recommendations:

The Planning Unit recommends that monitoring of surface water quality in WRIAs 25 and 26 be enhanced to improve information on baseline conditions and long-term trends.

The Planning Unit developed a recommended strategy for improving water quality data collected. Full documentation of this strategy is presented in Technical Memorandum No. 8 (Barber, 2004). The Planning Unit identified the three primary reasons for monitoring water quality in their watersheds as being able to determine the effects on:

1. Human health via drinking water systems relying on surface water,
2. Human health through contact recreation, and
3. Fish species listed under the Endangered Species Act (ESA) and other aquatic life.

These criteria are primarily associated with monitoring for 1) identifying specific existing or emerging water quality problems and 2) characterizing waters and identifying changes or trends in water quality over time. In addition, the current 303(d) listings show temperature to be a parameter of concern throughout the watershed. As temperature is also a concern for anadromous fish, all monitoring sites would be equipped with temperature gauges. It should be specifically noted that a premise of the sampling design was that collecting information for improved fisheries management (particularly those listed under ESA) was an essential driver. Many of the proposed sites pose little to no threat to drinking water supplies even under projected population growth estimates. Many of the monitoring sites and parameters would be unnecessary and the frequency of sampling would be reduced if only human health problems were considered.

The proposed Water Quality Analysis Plan (WQAP) would monitor core water quality information related to flow, temperature, nutrients, fecal coliforms, and several other parameters at as many as 24 different stream segments (not all parameters measured at each segment). The monitoring plan is shown in Tables 5-3 and 5-4. The types of monitoring objectives that the WQAP would address are those concerned with baseline information and background information for identifying long-term trends.

Table 5-3
Summary of Core Field Parameters for the Water Quality Monitoring Plan

	Field Sites (locations-frequency)				
Waterbody Segment	**Flow[1]**	**Dissolved Oxygen**	**pH**	**Specific Conductance**	**Temperature[2]**
Abernathy/Germany Creek Subbasin					
Abernathy Creek	1-Q	1-M	1-M	1-M	1-M
Germany Creek	1-Q	1-M	1-M	1-M	1-M
Coal Creek Subbasin					
Coal Creek	1-Q	1-M	1-M	1-M	1-M
Coweeman River Subbasin					
Coweeman River		1-M	1-M	1-M	1-M
Goble Creek	1-Q	1-Q	1-Q	1-Q	1-Q
Mulholland Creek		1-Q	1-Q	1-Q	1-Q
Cowlitz River Subbasin					
Lower					
Cowlitz River		2-M	2-M	2-M	2-M
Olequa Creek		1-M	1-M	1-M	1-M
Ostrander Creek	1-Q	1-M	1-M	1-M	1-M
Upper Cowlitz River		1-M	1-M	1-M	1-M
Elochoman River Subbasin					
Elochoman River	1-Q	2-M	2-M	2-M	2-M
West Fork		1-T	1-T	1-T	1-T
Grays River Subbasins					
Grays River	1-Q	1-M	1-M	1-M	1-M
Hull Creek		1-M	1-M	1-M	1-M
South Fork Grays River	1-Q	1-T	1-T	1-T	1-T
West Fork Grays River	1-Q	1-M	1-M	1-M	1-M
Toutle River Subbasin					
Green River		1-M	1-M	1-M	1-M
North Fork Toutle River	1-Q	2-M	2-M	2-M	2-M
South Fork Toutle River	1-Q	2-M	2-M	2-M	2-M
Toutle River	1-Q	1-M	1-M	1-M	1-M

A – annually, C – continuously, M – monthly, T – two months, Q – quarterly
Numbers (1, 2, etc.) refer to number of sites to be sampled
[1] Download of continuous stage recorder and rating curve development
[2] Verification of continuous temperature loggers

Table 5-4
Summary of Core Laboratory Parameters for Water Quality Monitoring Plan

Waterbody Segment	Field Sites (locations and frequency)					
	Ammonia	TSS	E. Coli	Fecal Coliform	Nitrate	Phosphorus
Abernathy/Germany Creek Subbasin						
Abernathy Creek	1-M	1-M	1-Q	1-M	1-M	1-M
Germany Creek	1-M	1-M	1-Q	1-M	1-M	1-M
Coal Creek Subbasin						
Coal Creek	1-M	1-M	1-Q	1-M	1-M	1-M
Coweeman River Subbasin						
Coweeman River	1-M	1-M	1-Q	1-M	1-M	1-M
Goble Creek		1-Q	1-Q	1-Q		
Mulholland Creek		1-Q		1-Q		
Cowlitz River Subbasin						
Lower						
Cowlitz River	2-M	2-M	1-M	2-M	2-M	2-M
Olequa Creek	1-T	1-T	1-T	1-T	1-T	1-T
Ostrander Creek	1-T	1-T	1-T	1-T	1-T	1-T
Upper Cowlitz River	1-M	1-M	1-M	1-M	1-M	1-M
Elochoman River Subbasin						
Elochoman River	1-M	1-M	1-Q	1-M	1-M	1-M
West Fork	1-T	1-T	1-Q	1-T	1-T	1-T
Grays River Subbasins						
Grays River	1-M	1-M	1-Q	1-M	1-M	1-M
Hull Creek		1-T		1-T		
South Fork Grays River		1-T		1-T		
West Fork Grays River		1-T		1-T		
Toutle River Subbasin						
Green River	1-M	1-M	1-Q	1-M	1-M	1-M
North Fork Toutle River	2-M	2-M	1-Q	2-M	2-M	2-M
South Fork Toutle River	2-M	2-M	1-Q	2-M	2-M	2-M
Toutle River	1-M	1-M	1-Q	1-M	1-M	1-M

A – annually, M – monthly, S – semiannually, T- every two months, Q – quarterly

Numbers (1, 2, etc.) refer to number of sites to be sampled

A range of options was discussed with the Planning Unit members in order to determine the practical scope of the monitoring plan. It became apparent that given the size of the watersheds in WRIAs 25 and 26, sampling each waterbody for parameters such as macroinvertebrates, pesticides, and heavy metals would be too expensive.

The WQAP addresses watershed scale issues. It is anticipated that many of the sample locations would be located near the mouths of the streams. It is recognized, however, that it is often difficult to assess changes occurring from multiple land use or remediation activities along the stream using single point monitoring. For example, a stream temperature gauge at one location in a watershed may indicate whether there is a problem somewhere within the watershed. However, multiple sites are needed if there is going to be an attempt to isolate the cause of the problem. For that reason, a few rivers have more than one proposed sampling location.

The goal of the proposed WQAP was to provide a strategic sampling plan that economically fills the data gaps currently existing. The EES tech memo on TMDLs summarized the existing monitoring efforts (EES 2003b). Every attempt was made not to duplicate ongoing long-term monitoring efforts. Because there are practically an infinite number of viable sampling plans, the water quality monitoring program implemented may be somewhat different than the plan discussed in this document. Implementing agencies may mix and match parameters and locations according to available funding and ongoing projects. Opportunities to partner with other agencies may dictate some priorities and shift monitoring activities. There may also be opportunities to convert existing short-term activities into long-term efforts.

The data would be used by various federal, state, and local government agencies to inform local decisions about where to implement stream restoration projects, prioritize TMDL mitigation procedures, and to publicize any water quality problems and seek community solutions. Since much of the information would be used to satisfy TMDL requirements and assessments that require the approval of Ecology, every attempt should be made to follow their accepted procedures for data collection, analysis, format, and assurance. Other State and federal agencies such as the Washington State Department of Fish and Wildlife, the Washington State Department of Health, the US EPA, the National Marine Fisheries Service, Conservation Districts, local schools, tribal interests, and other users would be given access to the data. However, each of these users will likely have different data requirements. BPA could also use this information to help prioritize their salmon recovery programs. In the future, program coordinators may want to contact as many potential information users as possible to determine their data needs and protocols.

The estimated cost of this WQAP includes: 1) upfront equipment and installation costs, and 2) annual costs. As indicated in Table 5-5, the upfront equipment costs of the WQAP are $50,850. The annual cost is $138,750. The total first year cost for the WQAP is $185,200. The plan assumes that a half-time staff person would be hired to coordinate monitoring activities. Annual data processing and data management costs were not included in the budget. These items depend on implementation arrangements and can be developed further as part of implementation planning.

The State of Washington has funded activity aimed at establishing an "Intensively Monitored Watershed" in the Germany/Mill/Abernathy Creek Subbasin. In addition, the Bonneville Power Authority (BPA) and U.S. Army Corps of Engineers (USACOE) have considered monitoring watershed conditions in the Grays River Subbasin. At this time it is unknown whether these initiatives will be funded and implemented. Implementation of the WQAP recommended in this plan should consider overlap and synergies with other water quality monitoring efforts.

For further information on the recommended water quality monitoring program, see the Technical Memorandum referenced above (Barber, 2004).

Table 5-5
Summary of Monitoring Plan Costs

Category	Option 1 - WQAP	
	Number of Sites	Cost[1]
Upfront costs:		
Stream gauges	12	$30,000.00
Temperature gauges	24	$4,800.00
Probes & flow meters		$8,550.00
Installation & supplies		$7,500.00
Total Upfront Costs:		$50,850.00
Annual costs:		
Equipment replacement		$4,400.00
Core laboratory analysis		
Bacteria	23	$11,200.00
Nutrients	18	$23,760.00
TSS	23	$3,360.00
QA/QC ~ 10%		$3,830.00
Sample collection labor, travel & shipping		$67,200.00[3]
Data processing & mg't		TBD[4]
Monitoring Coordinator[2]		$25,000.00
Total Annual Sample Costs		$138,750.00
Total Year 1 Costs[5]		$185,200.00

(1) Actual bid estimates may be lower when dealing with high volume samples
(2) One technical 0.5-FTE, salary and benefits
(3) Costs for professional services are used. If volunteers were used, cost of this item could be reduced by 90% although training costs would need to be included.
(4) Not determined at this time. Depends on implementation framework for monitoring plan.
(5) Excludes equipment replacement, since that would not be needed in year 1. Also excludes data processing and management (see footnote 4).

5.5 Implementation Considerations for Surface Water Quality Management

Table 5-6 summarizes implementation considerations for the surface water quality recommendations discussed throughout Section 5, above. Implementation issues may vary somewhat from those listed in the table, depending on the specific action, and community involved. Where there are staffing impacts that would likely require hiring of at least ½ FTE by the implementing organization(s), they are called out in the funding column.

Table 5-6
Implementation Considerations for Surface Water Quality

Priority[1]	Activity	Implementers[3]	Cost[2]	Funding Sources
Category: Surface Water Quality				
Medium	Develop water body cleanup plans (TMDLs) for subbasins, in prioritized sequence as indicated in Watershed Management Plan. Carry out necessary modeling, reporting, public involvement, and waste load allocations (See Section 5.3.2).	*Lead*: Ecology *Others*: Local governments, Conservation Districts, other interested parties	High	*Main*: Leg. appropriations (Ecology budget) *Additional*: N/A
Low	Expand water quality monitoring activities to improve understanding of status and trends. Install monitoring equipment; collect and analyze samples; manage and analyze data; report results (See Section 5.4.2).	Shared efforts by State, local, federal agencies	High	Combination of State, local, federal funding sources (to be developed further in Implementation Phase)

[1] Priority in context of all actions in Watershed Management Plan.
[2] Preliminary, generalized estimates of financial or economic costs to the affected community, implementing organization or water user. High: greater than $500,000; Medium: $50,000 to $500,000; Low: less than $50,000. Total cost, whether up-front or over a period of time up to ten years.
[3] Lead implementer would take responsibility for organizing efforts under this action, including pursuing funding sources listed in the far right column.
Abbreviations: TMDLs = Total Maximum Daily Loads, N/A = Not Applicable, Leg. = Legislative

Section 6
Management of Fish Habitat Conditions (Non-flow)

Early in the watershed planning process, the Planning Unit elected to work collaboratively with the Lower Columbia Fish Recovery Board to develop the habitat element of the watershed plan. This unique arrangement was significant to the lower Columbia Region because it ensured a high degree of interconnectedness between watershed planning and the recovery of Endangered Species Act-listed species. In particular, the habitat element was developed using water quality, quantity and instream flow information from the Planning Unit's efforts coupled with other habitat data and modeling efforts developed through the recovery planning process. The result is a highly integrated habitat element for the watershed management plan that is the same as found in the recovery plan.

Each subbasin includes an extensive review of the available habitat information and analyses as well as extensive new analysis of stream condition, watershed conditions, and habitat forming processes. Modeling tools were applied that highlight a series of habitat perturbations in these watersheds that need to be addressed. Qualified local experts were convened to provide input to models where needed or where other data sources were lacking. Model outputs were also compared to other independent assessments of limiting factors to corroborate results. The outputs of these models identify reach scale issues that need to be addressed and provide a prioritization scheme for proposed actions.

A series of Subbasins Plans (Volumes II.A-II.L) describe local conditions and detail implementation at the subbasin level. Each subbasin plan includes:

- An ***overview summary*** of key priorities.
- An ***assessment*** that describes the subbasin, species of interest, subbasin habitat conditions, stream habitat limitations, watershed process limitations, other factors such as hatcheries, harvest, hydropower, and out-of-subbasin effects. The assessment includes qualitative and quantitative information.
- A ***program and project inventory*** describing significant activities in the subbasin.
- A ***management plan*** that details a subbasin vision, biological objectives, integrated strategy, and specific measures and actions in each threat category.

The following descriptions give a brief regional perspective for each subbasin.

Grays Subbasin

This subbasin is particularly important to regional recovery because it is one of two major basins in the coastal strata of the Evolutionarily Significant Unit. Populations of fall Chinook, winter steelhead, chum and coho will need to be restored to a high level of viability to meet regional recovery objectives. Priority actions include:

- Reducing out-of-subbasin impacts,
- Managing forests to restore watershed processes,

- Restoring valley floodplain function and stream habitat diversity, and
- Aligning hatchery priorities with conservation objectives.

Elochoman Subbasin

This subbasin includes the Elochoman, Skamokawa, Mill, Abernathy, and Germany watersheds. Populations of fall Chinook, chum, coho and winter steelhead will need to be restored to medium to high levels of viability to meet regional recovery objectives. The Elochoman/Skamokawa populations are particularly important for recovery. Priority actions include:

- Managing forest lands to protect and restore watershed processes,
- Restoring lowland floodplains, riparian conditions, and stream habitat diversity.
- Reducing out-of-subbasin impacts,
- Managing forests to restore watershed processes,
- Restoring valley floodplain function and stream habitat diversity, and
- Aligning hatchery priorities with conservation objectives.

Cowlitz Subbasin

This subbasin is particularly important to regional recovery by virtue of its large size and diverse habitats. It includes lower Cowlitz, upper Cowlitz, Cispus, Tilton, Toutle, and Coweeman watersheds. One or more populations of tule fall Chinook, bright fall Chinook, spring Chinook, chum, winter steelhead, summer steelhead, and coho are present and many need to be restored to high levels of viability to meet regional recovery objectives. Priority actions include:

- Restoring access above dams in the upper portion of the basin,
- Protecting intact forests in headwaters,
- Managing forest land to protect and restore watershed processes,
- Managing growth and development to protect watershed processes and habitat conditions,
- Restoring passage at culverts and other artificial barriers,
- Restoring lowland floodplain function, riparian conditions, and stream habitat diversity
- Addressing immediate risks with short term habitat fixes,
- Aligning hatchery priorities with conservation objectives, and
- Reducing out-of-subbasin impacts.

Full details for each of these three subbasins can be found in the Subbasin Plans, Volumes II-C, II-D, and II-E. These are bound separately and serve as Appendices to this Watershed Management Plan. Tables 6-1 to 6-7 provide additional information on recommended actions for habitat.

Table 6-1. Habitat actions for the Grays Subbasin.

Action	Status	Responsible Entity	Measures Addressed	Spatial Coverage of Target Area[1]	Expected Biophysical Response[2]	Certainty of Outcome[3]
Grays 1. Fully implement and enforce the Forest Practices Rules (FPRs) on private timber lands in order to afford protections to riparian areas, sediment processes, runoff processes, water quality, and access to habitats	Activity is currently in place	WDNR	1, 2, 3, 5, 6 & 10	High: Private commercial timber lands.	High: Increase in instream LWD; reduced stream temperature extremes; greater streambank stability; reduction in road-related fine sediment delivery; decreased peak flow volumes; restoration and preservation of fish access to habitats	Medium
Grays 2. Expand standards in local government comprehensive plans to afford adequate protections of ecologically important areas (i.e. stream channels, riparian zones, floodplains, CMZs, wetlands, unstable geology)	Expansion of existing program or activity	Wahkiakum County, Pacific County	1 & 2	Medium: Private lands. Applies primarily to lands in the lower basin in agriculture, rural residential, and forestland uses	High: Protection of water quality, riparian function, stream channel structure (e.g. LWD), floodplain function, CMZs, wetland function, runoff processes, and sediment supply processes	High
Grays 3. Prevent floodplain impacts from new development through land use controls and Best Management Practices	New program or activity	Wahkiakum County, Pacific County, WDOE	1	Medium: Private lands currently in agriculture or timber production in lowland areas.	High: Protection of floodplain function, CMZ processes, and off-channel/side-channel habitat. Prevention of reduced habitat diversity and key habitat availability	High
Grays 4. Create and/or restore lost side-channel/off-channel habitat for chum spawning and coho overwintering	New program or activity	LCFRB, BPA (NPCC), NGOs, WDFW, NRCS/WCD, LCFEG	7	Medium: Lower mainstem and lower portion of lower mainstem tributaries	High: Increased habitat availability for spawning and rearing	High
Grays 5. Seize opportunities to conduct voluntary floodplain restoration on lands being phased out of agricultural production. Survey landowners, build partnerships, and provide financial incentives	New program or activity	NRCS/WCD, NGOs, WDFW, LCFRB, USACE, LCFEG	4, 5, 6, 7, &, 8	Medium: Lower mainstem and lower portion of lower mainstem tributaries	High: Restoration of floodplain function, habitat diversity, and habitat availability.	High
Grays 6. Manage future growth and development patterns to ensure the protection of watershed processes. This includes limiting the conversion of agriculture and timber lands to developed uses through zoning regulations and tax incentives	Expansion of existing program or activity	Wahkiakum County, Pacific County	1 & 2	Medium: Private lands. Applies primarily to lands in the lower basin in agriculture, rural residential, and forestland uses	High: Protection of water quality, riparian function, stream channel structure (e.g. LWD), floodplain function, CMZs, wetland function, runoff processes, and sediment supply processes	High
Grays 7. Review and adjust operations to ensure compliance with the Endangered Species Act; examples include roads, parks, and weed management	Expansion of existing program or activity	Wahkiakum County, Pacific County	1, 3, 5, & 6	Low: Applies to lands under public ownership	Medium: Protection of water quality; greater streambank stability, reduction in road-related fine sediment delivery, restoration and preservation of fish access to habitats	High
Grays 8. Implement the prescriptions of the WRIA 25/26 Watershed Planning Unit regarding instream flows	Activity is currently in place	WDOE, WDFW, WRIA 25/26 Planning Unit	9	High: Entire basin	Medium: Adequate instream flows to support life stages of salmonids and other aquatic biota.	Medium
Grays 9. Increase the level of implementation of voluntary habitat enhancement projects in high priority reaches and subwatersheds. This includes building partnerships, providing incentives to landowners, and increasing funding	Expansion of existing program or activity	LCFRB, BPA (NPCC), NGOs, WDFW, NRCS/WCD, LCFEG	3, 4, 5, 6, 7, 8, & 10	High: Priority stream reaches and subwatersheds throughout the basin	Medium: Improved conditions related to water quality (temperature and bacteria), LWD quantities, bank stability, key habitat availability, habitat diversity, riparian function, floodplain function, sediment availability, & channel migration processes	Medium
Grays 10. Increase technical support and funding to small forest landowners faced with	Expansion of existing	WDNR	1, 2, 3, 5, 6, & 10	Low: Small private timberland owners	High: Reduction in road-related fine sediment delivery; restoration and	Medium

Action	Status	Responsible Entity	Measures Addressed	Spatial Coverage of Target Area[1]	Expected Biophysical Response[2]	Certainty of Outcome[3]
implementation of Forest and Fish requirements for fixing roads and barriers to ensure full and timely compliance with regulations	program or activity				preservation of fish access to habitats	
Grays 11. Increase funding available to purchase easements or property in sensitive areas in order to protect watershed function where existing programs may not be able to adequately protect watershed function	Expansion of existing program or activity	LCFRB, NGOs, WDFW, USFWS, BPA (NPCC)	1 & 2	Low: Mixed-use lands at risk of degradation	High: Protection of riparian function, floodplain function, water quality, wetland function, and runoff and sediment supply processes	High
Grays 12. Increase technical assistance to landowners and increase landowner participation in conservation programs that protect and restore habitat and habitat-forming processes. Includes increasing incentives (financial or otherwise) and increasing program marketing and outreach	Expansion of existing program or activity	NRCS/WCD, WDNR, WDFW, Wahkiakum County, Pacific County	All measures	Medium: Private lands. Applies primarily to lands in the lower basin in agriculture, rural residential, and forestland uses	High: Increased landowner stewardship of habitat. Potential improvement in all factors	Medium
Grays 13. Conduct forest practices on state lands in accordance with the Habitat Conservation Plan in order to afford protections to riparian areas, sediment processes, runoff processes, water quality, and access to habitats	Activity is currently in place	WDNR	1 & 2	Low: State timber lands in the SF Grays Watershed (approximately 10% of the basin area)	Medium: Increase in instream LWD; reduced stream temperature extremes; greater streambank stability; reduction in road-related fine sediment delivery; decreased peak flow volumes; restoration and preservation of fish access to habitats. Response is medium because of location and quantity of state lands	Medium
Grays 14. Protect and restore native plant communities from the effects of invasive species	Expansion of existing program or activity	Weed Control Boards (local and state); NRCS/WCD, LCFEG	1 & 5	Medium: Greatest risk is in lower basin agriculture and residential use areas	Medium: restoration and protection of native plant communities necessary to support watershed and riparian function	Low
Grays 15. Assess, upgrade, and replace on-site sewage systems that may be contributing to water quality impairment	Expansion of existing program or activity	Wahkiakum County, Pacific County, WCD, LCFEG	6	Low: Private agricultural and rural residential lands in lower basin	Medium: Protection and restoration of water quality (bacteria)	Medium

[1] Relative amount of basin affected by action
[2] Expected response of action implementation
[3] Relative certainty that expected results will occur as a result of full implementation of action

Table 6-2. Habitat actions for the Elochoman/Skamokawa Basin.

Action	Status	Responsible Entity	Measures Addressed	Spatial Coverage of Target Area[1]	Expected Biophysical Response[2]	Certainty of Outcome[3]
Eloch-Skam 1. Fully implement and enforce the Forest Practices Rules (FPRs) on private timber lands in order to afford protections to riparian areas, sediment processes, runoff processes, water quality, and access to habitats	Activity is currently in place	WDNR	1, 2, 3, 5, 6, & 8	High: Private commercial timber lands.	High: Increase in instream LWD; reduced stream temperature extremes; greater streambank stability; reduction in road-related fine sediment delivery; decreased peak flow volumes; restoration and preservation of fish access to habitats	Medium
Eloch-Skam 2. Expand standards in local government comprehensive plans to afford adequate protections of ecologically important areas (i.e. stream channels, riparian zones, floodplains, CMZs, wetlands, unstable geology)	Expansion of existing program or activity	Wahkiakum County, Town of Cathlamet, Pacific County	1 & 2	Medium: Private lands. Applies primarily to lands in the lower basin in agriculture, rural residential, and forestland uses	High: Protection of water quality, riparian function, stream channel structure (e.g. LWD), floodplain function, CMZs, wetland function, runoff processes, and sediment supply processes	High
Eloch-Skam 3. Prevent floodplain impacts from development through land use controls and Best Management Practices	New program or activity	Wahkiakum County, WDOE, Town of Cathlamet	1	Medium: Private lands currently in agriculture or timber production in lowland areas.	High: Protection of floodplain function, CMZ processes, and off-channel/side-channel habitat. Prevention of reduced habitat diversity and key habitat availability	High
Eloch-Skam 4. Seize opportunities to conduct voluntary floodplain restoration on lands being phased out of agricultural production. Survey landowners, build partnerships, and provide financial incentives	New program or activity	NRCS/WCD, NGOs, WDFW, LCFRB, USACE, LCFEG	4, 5, 6, 7, &, 9	Medium: Middle mainstem Skamokawa, lower WF Skamokawa, Wilson Creek, lower and middle mainstem Elochoman	High: Restoration of floodplain function, CMZ function, habitat diversity, and habitat availability.	High
Eloch-Skam 5. Manage future growth and development patterns to ensure the protection of watershed processes. This includes limiting the conversion of agriculture and timber lands to developed uses through zoning regulations and tax incentives	Expansion of existing program or activity	Wahkiakum County, Town of Cathlamet, Pacific County	1 & 2	Medium: Private lands. Applies primarily to lands in the lower basin in agriculture, rural residential, and forestland uses	High: Protection of water quality, riparian function, stream channel structure (e.g. LWD), floodplain function, CMZs, wetland function, runoff processes, and sediment supply processes	High
Eloch-Skam 6. Review and adjust operations to ensure compliance with the Endangered Species Act; examples include roads, parks, and weed management	Expansion of existing program or activity	Wahkiakum County, Town of Cathlamet	1, 3, 5, & 6	Low: Applies to lands under public jurisdiction	Medium: Protection of water quality, greater streambank stability, reduction in road-related fine sediment delivery, restoration and preservation of fish access to habitats	High
Eloch-Skam 7. Create and/or restore lost side-channel/off-channel habitat for chum spawning and coho overwintering	New program or activity	LCFRB, BPA (NPCC), NGOs, WDFW, NRCS/WCD, LCFEG	7	Medium: Lower mainstem Elochoman and Skamokawa Creeks	High: Increased habitat availability for spawning and rearing	Medium
Eloch-Skam 8. Implement the prescriptions of the WRIA 25/26 Watershed Planning Unit regarding instream flows	Activity is currently in place	WDOE, WDFW, WRIA 25/26 Planning Unit, Town of Cathlamet	10	High: Entire basin	Medium: Adequate instream flows to support life stages of salmonids and other aquatic biota.	Medium
Eloch-Skam 9. Increase the level of implementation of voluntary habitat enhancement projects in high priority reaches and	Expansion of existing program or	LCFRB, BPA (NPCC), NGOs, WDFW,	3, 4, 5, 6, 7, 8, & 9	High: Priority stream reaches and subwatersheds	Medium: Improved conditions related to water quality (temperature and bacteria), LWD quantities, bank stability, key habitat	Medium

[1] Relative amount of basin affected by action
[2] Expected response of action implementation
[3] Relative certainty that expected results will occur as a result of full implementation of action

Action	Status	Responsible Entity	Measures Addressed	Spatial Coverage of Target Area[1]	Expected Biophysical Response[2]	Certainty of Outcome[3]
subwatersheds. This includes building partnerships, providing incentives to landowners, and increasing funding	activity	NRCS/WCD, LCFEG		throughout the basin	availability, habitat diversity, riparian function, floodplain function, sediment availability, & channel migration processes	
Eloch-Skam 10. Increase technical support and funding to small forest landowners faced with implementation of Forest and Fish requirements for fixing roads and barriers to ensure full and timely compliance with regulations	Expansion of existing program or activity	WDNR	1, 2, 3, 5, 6, & 8	Low: Small private timberland owners	High: Reduction in road-related fine sediment delivery; preservation of fish access to habitats	Medium
Eloch-Skam 11. Increase funding available to purchase easements or property in sensitive areas in order to protect watershed function where existing programs are inadequate	Expansion of existing program or activity	LCFRB, NGOs, WDFW, USFWS, BPA (NPCC)	1 & 2	Low: Mixed-use lands at risk of degradation	High: Protection of riparian function, floodplain function, water quality, wetland function, and runoff and sediment supply processes	High
Eloch-Skam 12. Increase technical assistance to landowners and increase landowner participation in conservation programs that protect and restore habitat and habitat-forming processes. Includes increasing the incentives (financial or otherwise) and increasing program marketing and outreach	Expansion of existing program or activity	NRCS/WCD, WDNR, WDFW, Wahkiakum County, Town of Cathlamet	All measures	Medium: Private lands. Applies primarily to lands in the lower basin in agriculture, rural residential, and forestland uses	High: Increased landowner stewardship of habitat. Potential improvement in all factors	Medium
Eloch-Skam 13. Conduct forest practices on state lands in accordance with the Habitat Conservation Plan in order to afford protections to riparian areas, sediment processes, runoff processes, water quality, and access to habitats	Activity is currently in place	WDNR	1 & 2	Medium: State timber lands in the Eloch-Skam Watershed (approximately 21% of the basin area)	High: Increase in instream LWD; reduced stream temperature extremes; greater streambank stability; reduction in road-related fine sediment delivery; decreased peak flow volumes; restoration and preservation of fish access to habitats.	Medium
Eloch-Skam 14. Protect and restore native plant communities from the effects of invasive species	Expansion of existing program or activity	Weed Control Boards (local and state); NRCS/WCD, LCFEG	1 & 5	Medium: Greatest risk is in lower basin agriculture and residential areas	Medium: restoration and protection of native plant communities necessary to support watershed and riparian function	Low
Eloch-Skam 15. Assess, upgrade, and replace on-site sewage systems that may be contributing to water quality impairment	Expansion of existing program or activity	Wahkiakum County, WCD	6	Low: Private agricultural and rural residential lands in lower basin	Medium: Protection and restoration of water quality (bacteria)	Low
Eloch-Skam 16. Assess the impact of fish passage barriers throughout the basin and restore access to potentially productive habitats	Expansion of existing program or activity	WDFW, WDNR, Wahkiakum County, WSDOT, LCFEG	8	Low: As many as 10 miles of stream are blocked by artificial barriers	Low: Increased spawning and rearing capacity due to access to blocked habitat. Habitat is marginal in most cases	High

Table 6-3. Habitat actions for the M-A-G Basin.

Action	Status	Responsible Entity	Measures Addressed	Spatial Coverage of Target Area[4]	Expected Biophysical Response[5]	Certainty of Outcome[6]
M-A-G 1. Fully implement and enforce the Forest Practices Rules (FPRs) on private timber lands in order to afford protections to riparian areas, sediment processes, runoff processes, water quality, and access to habitats	Activity is currently in place	WDNR	1, 2, 3, 5, 6 & 10	High: Private commercial timber lands.	High: Increase in instream LWD; reduced stream temperature extremes; greater streambank stability; reduction in road-related fine sediment delivery; decreased peak flow volumes; restoration and preservation of fish access to habitats	Medium
M-A-G 2. Expand standards in County Comprehensive Plans to afford adequate protections of ecologically important areas (i.e. stream channels, riparian zones, floodplains, CMZs, wetlands, unstable geology)	Expansion of existing program or activity	Wahkiakum County, Cowlitz County	1 & 2	Medium: Private lands. Applies primarily to lands in the lower basin in agriculture, rural residential, and forestland uses	High: Protection of water quality, riparian function, stream channel structure (e.g. LWD), floodplain function, CMZs, wetland function, runoff processes, and sediment supply processes	High
M-A-G 3. Prevent floodplain impacts from new development through land use controls and Best Management Practices	New program or activity	Wahkiakum County, Cowlitz County, WDOE	1	Medium: Private lands currently in agriculture or timber production in lowland areas.	High: Protection of floodplain function, CMZ processes, and off-channel/side-channel habitat. Prevention of reduced habitat diversity and key habitat availability	High
M-A-G 4. Seize opportunities to conduct voluntary floodplain restoration on lands being phased out of agricultural production. Survey landowners, build partnerships, and provide financial incentives	New program or activity	NRCS/WCD, NGOs, WDFW, LCFRB, USACE, LCFEG	4, 5, 6, 7, &, 8	Medium: Middle mainstem Abernathy and Germany Creeks	High: Restoration of floodplain function, habitat diversity, and habitat availability	High
M-A-G 5. Manage future growth and development patterns to ensure the protection of watershed processes. This includes limiting the conversion of agriculture and timber lands to developed uses through zoning regulations and tax incentives	Expansion of existing program or activity	Wahkiakum County, Cowlitz County	1 & 2	Medium: Private lands. Applies primarily to lands in the lower basin in agriculture, rural residential, and forestland uses	High: Protection of water quality, riparian function, stream channel structure (e.g. LWD), floodplain function, CMZs, wetland function, runoff processes, and sediment supply processes	High
M-A-G 6. Review and adjust operations to ensure compliance with the Endangered Species Act; examples include roads, parks, and weed management	Expansion of existing program or activity	Wahkiakum County, Cowlitz County	1, 3, 5, & 6	Low: Applies to lands under public jurisdiction	Medium: Protection of water quality, greater streambank stability, reduction in road-related fine sediment delivery, restoration and preservation of fish access to habitats	High
M-A-G 7. Create and/or restore lost side-channel/off-channel habitat for chum spawning and coho overwintering	New program or activity	LCFRB, BPA (NPCC), NGOs, WDFW, NRCS Wahkiakum CD	7	Medium: Lower Mill, Abernathy, and Germany Creeks	High: Increased habitat availability for spawning and rearing	Medium
M-A-G 8. Implement the prescriptions of the WRIA 25/26 Watershed Planning Unit regarding instream flows	Activity is currently in place	WDOE, WDFW, WRIA 25/26 Planning Unit, Cowlitz County	9	High: Entire basin	Medium: Adequate instream flows to support life stages of salmonids and other aquatic biota.	Medium
M-A-G 9. Increase the level of implementation of voluntary habitat enhancement projects in high priority reaches and subwatersheds. This includes building partnerships, providing incentives to	Expansion of existing program or activity	LCFRB, BPA (NPCC), NGOs, WDFW, NRCS Wahkiakum CD	3, 4, 5, 6, 7, 8, & 10	High: Priority stream reaches and subwatersheds throughout the basin	Medium: Improved conditions related to water quality (temperature and bacteria), LWD quantities, bank stability, key habitat availability, habitat diversity, riparian function, floodplain function, sediment	Medium

[4] Relative amount of basin affected by action
[5] Expected response of action implementation
[6] Relative certainty that expected results will occur as a result of full implementation of action

Action	Status	Responsible Entity	Measures Addressed	Spatial Coverage of Target Area[4]	Expected Biophysical Response[5]	Certainty of Outcome[6]
landowners, and increasing funding					availability, & channel migration processes	
M-A-G 10. Increase technical support and funding to small forest landowners faced with implementation of Forest and Fish requirements for fixing roads and barriers.	Expansion of existing program or activity	WDNR	1, 2, 3, 5, 6 & 10	Low: Small private timberland owners	High: Reduction in road-related fine sediment delivery; restoration and preservation of fish access to habitats	Medium
M-A-G 11. Increase funding available to purchase easements or property in sensitive areas in order to protect watershed function where existing programs are inadequate	Expansion of existing program or activity	LCFRB, NGOs, WDFW, USFWS, BPA (NPCC)	1 & 2	Low: Mixed-use lands at risk of degradation	High: Protection of riparian function, floodplain function, water quality, wetland function, and runoff and sediment supply processes	High
M-A-G 12. Increase technical assistance to landowners and increase landowner participation in conservation programs that protect and restore habitat and habitat-forming processes. Includes increasing the incentives (financial or otherwise) and increasing program marketing and outreach	Expansion of existing program or activity	NRCS Wahkiakum CD, WDNR, WDFW, LCFEG	All measures	Medium: Private lands. Applies primarily to lands in the lower basin in agriculture, rural residential, and forestland uses	High: Increased landowner stewardship of habitat. Potential improvement in all factors	Medium
M-A-G 13. Conduct forest practices on state lands in accordance with the Habitat Conservation Plan in order to afford protections to riparian areas, sediment processes, runoff processes, water quality, and access to habitats	Activity is currently in place	WDNR	1 & 2	Medium: State timber lands in the M-A-G Watershed (approximately 17% of the basin area)	Medium: Increase in instream LWD; reduced stream temperature extremes; greater streambank stability; reduction in road-related fine sediment delivery; decreased peak flow volumes; restoration and preservation of fish access to habitats. Response is medium because of location and quantity of state lands	Medium
M-A-G 14. Protect and restore native plant communities from the effects of invasive species	Expansion of existing program or activity	Weed Control Boards (local and state); NRCS Wahkiakum CD	1 & 5	Medium: Greatest risk is in lower basin agriculture and residential use areas	Medium: restoration and protection of native plant communities necessary to support watershed and riparian function	Low
M-A-G 15. Assess, upgrade, and replace on-site sewage systems that may be contributing to water quality impairment	Expansion of existing program or activity	Wahkiakum County, Cowlitz County, Wahkiakum CD	6	Low: Private agricultural and rural residential lands in lower basin	Medium: Protection and restoration of water quality (bacteria)	Medium
M-A-G 16. Assess the impact of fish passage barriers throughout the basin and restore access to potentially productive habitats	Expansion of existing program or activity	WDFW, WDNR, Wahkiakum County, Cowlitz County, WSDOT, LCFEG	10	Low: As many of 5 miles of stream are blocked by artificial barriers	Low: Increased spawning and rearing capacity due to access to blocked habitat. Habitat is marginal in most cases	High

Table 6-4. Habitat actions for the Lower Cowlitz Basin.

Action	Status	Responsible Entity	Measures Addressed	Spatial Coverage of Target Area[7]	Expected Biophysical Response[8]	Certainty of Outcome[9]
L Cow 1. Manage regulated stream flows to provide for critical components of the natural flow regime	Expansion of existing program or activity	Tacoma Power, Lewis County PUD, FERC, WDFW	3	High: Lower mainstem Cowlitz River	High: Adequate flows for life stage requirements and habitat-forming processes	High
L Cow 2. Expand standards in local government Comprehensive Plans to afford adequate protections of ecologically important areas (i.e. stream channels, riparian zones, floodplains, CMZs, wetlands, unstable geology)	Expansion of existing program or activity	Lewis County, Cowlitz County, Longview, Kelso, Castle Rock, Winlock	1 & 2	High: Private lands. Applies primarily to residential, agricultural, and forest lands at risk of development	High: Protection of water quality, riparian function, stream channel structure (e.g. LWD), floodplain function, CMZs, wetland function, runoff processes, and sediment supply processes	High
L Cow 3. Manage future growth and development patterns to ensure the protection of watershed processes. This includes limiting the conversion of agriculture and timber lands to developed uses through zoning regulations and tax incentives	Expansion of existing program or activity	Lewis County, Cowlitz County, Longview, Kelso, Castle Rock, Winlock	1 & 2	High: Private lands. Applies primarily to residential, agricultural, and forest lands at risk of development	High: Protection of water quality, riparian function, stream channel structure (e.g. LWD), floodplain function, CMZs, wetland function, runoff processes, and sediment supply processes	High
L Cow 4. Monitor and notify FERC of significant license violations, enforce terms and conditions of section 7 consultations on FERC relicensing agreements, and encourage implementation of section 7 conservation recommendations of section 7	Expansion of existing program or activity	NOAA, USFWS	3	High: Lower mainstem Cowlitz River	High: Adequate flows for life stage requirements and habitat-forming processes, protection of water quality, increased habitat availability for spawning and rearing	High
L Cow 5. Review and adjust operations to ensure compliance with the Endangered Species Act; examples include roads, parks, and weed management	Expansion of existing program or activity	Cowlitz County, Lewis County, Kelso, Longview, Winlock, Vader,	1, 8, 9, & 10	Low: Applies to lands under public jurisdiction	Medium: Protection of water quality, greater streambank stability, reduction in road-related fine sediment delivery, restoration and preservation of fish access to habitats	High
L Cow 6. Conduct floodplain restoration where feasible along the mainstem and in major tributaries that have experienced channel confinement. Survey landowners, build partnerships, and provide financial incentives	New program or activity	NRCS, W/Cowlitz CD, LCD, NGOs, WDFW, LCFRB, USACE, LCFEG	4, 5, 6, 9, 10 & 11	High: Mainstem Cowlitz and several of the major tributaries	Medium: Restoration of floodplain function, habitat diversity, and habitat availability.	High
L Cow 7. Prevent floodplain impacts from new development through land use controls and Best Management Practices	New program or activity	Lewis County, Cowlitz County, WDOE, Longview, Kelso, Winlock	1	Medium: Private lands currently in agriculture or timber production in lowland areas.	High: Protection of floodplain function, CMZ processes, and off-channel/side-channel habitat. Prevention of reduced habitat diversity and key habitat availability	High
L Cow 8. Create and/or restore lost side-channel/off-channel habitat for chum spawning and coho overwintering	New program or activity	LCFRB, BPA (NPCC), NGOs, WDFW, NRCS, W/CCD, LCD, LCFEG	4	High: Lower mainstem Cowlitz and lower portion of lower mainstem tributaries	High: Increased habitat availability for spawning and rearing	Medium

[7] Relative amount of basin affected by action
[8] Expected response of action implementation
[9] Relative certainty that expected results will occur as a result of full implementation of action

Action	Status	Responsible Entity	Measures Addressed	Spatial Coverage of Target Area[7]	Expected Biophysical Response[8]	Certainty of Outcome[9]
L Cow 9. Increase funding available to purchase easements or property in sensitive areas where existing programs may not be able to adequately protect watershed function	Expansion of existing program or activity	LCFRB, NGOs, WDFW, USFWS, BPA (NPCC)	1 & 2	Medium: Residential, agricultural, or forest lands at risk of further degradation	High: Protection of riparian function, floodplain function, water quality, wetland function, and runoff and sediment supply processes	High
L Cow 10. Increase technical assistance to landowners and increase landowner participation in conservation programs that protect and restore habitat and habitat-forming processes. Includes increasing incentives (financial or otherwise) and increasing program marketing and outreach	Expansion of existing program or activity	NRCS, W/CCD, LCD, WDNR, WDFW, Cowlitz County, Lewis County, Kelso	All measures	High: Private lands. Applies primarily to lands in agriculture, rural residential, and forestland uses throughout the basin	High: Increased landowner stewardship of habitat. Potential improvement in all factors	Medium
L Cow 11. Fully implement and enforce the Forest Practices Rules (FPRs) on private timber lands in order to afford protections to riparian areas, sediment processes, runoff processes, water quality, and access to habitats	Activity is currently in place	WDNR	1, 2, 6, 8, 9 & 10	Medium: Private commercial timber lands	High: Increase in instream LWD; reduced stream temperature extremes; greater streambank stability; reduction in road-related fine sediment delivery; decreased peak flow volumes; restoration and preservation of fish access to habitats	Medium
L Cow 12. Implement the prescriptions of the WRIA 25/26 Watershed Planning Unit regarding instream flows	Activity is currently in place	WDOE, WDFW, WRIA 25/26 Planning Unit, Castle Rock, Winlock, Longview, Kelso	7	High: Entire basin	Medium: Adequate instream flows to support life stages of salmonids and other aquatic biota.	Medium
L Cow 13. Increase the level of implementation of voluntary habitat enhancement projects in high priority reaches and subwatersheds. This includes building partnerships, providing incentives to landowners, and increasing funding	Expansion of existing program or activity	LCFRB, BPA (NPCC), NGOs, WDFW, NRCS, W/CCD, LCD, LCFEG	4, 5, 6, 8, 9, 10 & 11	High: Priority stream reaches and subwatersheds throughout the basin	Medium: Improved conditions related to water quality (temperature and bacteria), LWD quantities, bank stability, key habitat availability, habitat diversity, riparian function, floodplain function, sediment availability, & channel migration processes	Medium
L Cow 14. Increase technical support and funding to small forest landowners faced with implementation of Forest and Fish requirements for fixing roads and barriers to ensure full and timely compliance with regulations	Expansion of existing program or activity	WDNR	1, 2, 6, 8, 9 & 10	Low: Small private timberland owners	High: Reduction in road-related fine sediment delivery; decreased peak flow volumes; restoration and preservation of fish access to habitats	Medium
L Cow 15. Expand local government Comprehensive Planning to ensure consistent protections are in place to initiate review of development and real estate transactions that may affect natural resources	Expansion of existing program or activity	Lewis County, Cowlitz County, Kelso, Longview, Castle Rock, Winlock	1 & 2	High: Private lands. Applies primarily to residential, agricultural, and forest lands at risk of development	Medium: Protection of water quality, riparian function, stream channel structure (e.g. LWD), floodplain function, CMZs, wetland function, runoff processes, and sediment supply processes	Medium
L Cow 16. Protect and restore native plant communities from the effects of invasive species	Expansion of existing program or activity	Weed Control Boards (local and state); NRCS, W/CCD, LCD, LCFEG	1 & 9	High: Greatest risk is in agriculture and residential use areas	Medium: restoration and protection of native plant communities necessary to support watershed and riparian function	Low

Action	Status	Responsible Entity	Measures Addressed	Spatial Coverage of Target Area[7]	Expected Biophysical Response[8]	Certainty of Outcome[9]
L Cow 17. Assess the impact of fish passage barriers throughout the basin and restore access to potentially productive habitats	Expansion of existing program or activity	WDFW, WDNR, Lewis County, Cowlitz County WSDOT, LCFEG	6	Medium: As many as 50 miles of stream are potentially blocked by artificial barriers	Medium: Increased spawning and rearing capacity due to access to blocked habitat. Habitat is marginal in most cases	Medium
L Cow 18. Conduct forest practices on state lands in accordance with the Habitat Conservation Plan in order to afford protections to riparian areas, sediment processes, runoff processes, water quality, and access to habitats	Activity is currently in place	WDNR	1, 2, 6, 8, 9 & 10	Low: State timber lands in the Lower Cowlitz Watershed (approximately 10% of the basin area)	Medium: Increase in instream LWD; reduced stream temperature extremes; greater streambank stability; reduction in road-related fine sediment delivery; decreased peak flow volumes; restoration and preservation of fish access to habitats. Response is medium because of location and quantity of state lands	Medium
L Cow 19. Assess, upgrade, and replace on-site sewage systems that may be contributing to water quality impairment	Expansion of existing program or activity	Lewis County, Cowlitz County, Cowlitz CD, Lewis CD	10	Medium: Private agricultural and rural residential lands	Medium: Protection and restoration of water quality (bacteria)	Low

Table 6-5. Habitat actions for the Upper Cowlitz Basin

Action	Status	Responsible Entity	Measures Addressed	Spatial Coverage of Target Area[10]	Expected Biophysical Response[11]	Certainty of Outcome[12]
U-Cowl 1. Restore access above hydropower system	Expansion of existing program or activity	Tacoma Power, Lewis County PUD, FERC	1	High: the system of dams on the Cowlitz blocks volitional anadromous access to approximately 300 miles of habitat	High: Increased spawning and rearing capacity due to access to blocked habitat	High
U-Cowl 2. Continue to manage federal forest lands according to the Northwest Forest Plan	Activity is currently in place	USFS	2, 3, 5, 6, 7 & 9	High: National Forest and National Monument lands in the upper basin	High: Increase in instream LWD; reduced stream temperature extremes; greater streambank stability; reduction in road-related fine sediment delivery; decreased peak flow volumes; restoration and preservation of fish access to habitats	High
U-Cowl 3. Conduct floodplain restoration where feasible along the upper mainstem Cowlitz and the middle mainstem Tilton. Build partnerships with landowners and provide financial incentives	New program or activity	NRCS, LCD, NGOs, WDFW, LCFRB, USACE, LCFEG	4, 6, 7, 9 & 10	Medium: Upper mainstem Cowlitz and middle mainstem Tilton	High: Restoration of floodplain function, habitat diversity, and habitat availability.	High
U-Cowl 4. Fully implement and enforce the Forest Practices Rules (FPRs) on private timber lands in order to afford protections to riparian areas, sediment processes, runoff processes, water quality, and access to habitats	Activity is currently in place	WDNR	2, 3, 5, 6, 7 & 9	High: Private commercial timber lands	High: Increase in instream LWD; reduced stream temperature extremes; greater streambank stability; reduction in road-related fine sediment delivery; decreased peak flow volumes; restoration and preservation of fish access to habitats	Medium
U-Cowl 5. Expand standards in local government comprehensive plans to afford adequate protections of ecologically important areas (i.e. stream channels, riparian zones, floodplains, CMZs, wetlands, unstable geology)	Expansion of existing program or activity	Lewis County, City of Morton, Town of Mossyrock	2 & 3	Medium: Private lands under local jurisdiction (Tilton Basin, Reservoir Basins, and the mainstem Cowlitz valley from Lake Scanewa to Coal Creek)	High: Protection of water quality, riparian function, stream channel structure (e.g. LWD), floodplain function, CMZs, wetland function, runoff processes, and sediment supply processes	High
U-Cowl 6. Prevent floodplain impacts from new development through land use controls and Best Management Practices	New program or activity	Lewis County, WDOE	2	Medium: Private lands under County jurisdiction (Tilton Basin, Reservoir Basins, and the mainstem Cowlitz valley from Lake Scanewa to Coal Creek)	High: Protection of floodplain function, CMZ processes, and off-channel/side-channel habitat. Prevention of reduced habitat diversity and key habitat availability	High
U-Cowl 7. Manage future growth and development patterns to ensure the protection of watershed processes. This includes limiting the conversion of lands to developed uses through zoning regulations and tax incentives	Expansion of existing program or activity	Lewis County, City of Morton, Town of Mossyrock	2 & 3	Medium: Private lands under County jurisdiction (Tilton Basin, Reservoir Basins, and the mainstem Cowlitz valley from Lake Scanewa to Coal Creek)	High: Protection of water quality, riparian function, stream channel structure (e.g. LWD), floodplain function, CMZs, wetland function, runoff processes, and sediment supply processes	High
U–Cowl 8. Implement the prescriptions of the WRIA 25/26 Watershed Planning Unit regarding instream flows	Activity is currently in place	WDOE, WDFW, WRIA 25/26 Planning Unit, Lewis County, City of	8	High: Entire basin	Medium: Adequate instream flows to support life stages of salmonids and other aquatic biota.	Medium

[10] Relative amount of basin affected by action
[11] Expected response of action implementation
[12] Relative certainty that expected results will occur as a result of full implementation of action

Action	Status	Responsible Entity	Measures Addressed	Spatial Coverage of Target Area[10]	Expected Biophysical Response[11]	Certainty of Outcome[12]
		Morton, Town of Mossyrock				
U-Cowl 9. Increase the level of implementation of voluntary habitat enhancement projects in high priority reaches and subwatersheds. This includes building partnerships, providing incentives to landowners, and increasing funding	Expansion of existing program or activity	LCFRB, BPA (NPCC), NGOs, WDFW, NRCS, Lewis CD, LCFEG	4, 5, 6, 7, 9 & 10	High: Priority stream reaches and subwatersheds throughout the basin	Medium: Improved conditions related to water quality, LWD quantities, bank stability, key habitat availability, habitat diversity, riparian function, floodplain function, sediment availability, & channel migration processes	Medium
U-Cowl 10. Increase technical support and funding to small forest landowners faced with implementation of Forest and Fish requirements for fixing roads and barriers to ensure full and timely compliance with regulations	Expansion of existing program or activity	WDNR	2, 3, 5, 6, 7 & 9	Low: Small private timberland owners	High: Reduction in road-related fine sediment delivery; restoration and preservation of fish access to habitats	Medium
U-Cowl 11. Increase funding available to purchase easements or property in sensitive areas where existing programs may not be able to fully protect watershed function	Expansion of existing program or activity	LCFRB, NGOs, WDFW, USFWS, BPA (NPCC)	2 & 3	Low: Private lands in sensitive areas at risk of further degradation (e.g. small timber parcels in floodplains at risk of development)	High: Protection of riparian function, floodplain function, water quality, wetland function, and runoff and sediment supply processes	High
U-Cowl 12. Increase technical assistance to landowners and increase landowner participation in conservation programs that protect and restore habitat and habitat-forming processes. Includes increasing the incentives (financial or otherwise) and increasing program marketing and outreach	Expansion of existing program or activity	NRCS, Lewis CD, WDNR, WDFW, Lewis County	2, 3, 4, 5, 6, 7, 8, 9 & 10	Medium: Private lands. Applies primarily to lands in agricultural or forestry uses	High: Increased landowner stewardship of habitat. Potential improvement in all factors	Medium
U-Cowl 13. Assess the impact of fish passage barriers throughout the basin and restore access to potentially productive habitats (passage obstruction at mainstem dams is considered in a separate action)	Expansion of existing program or activity	WDFW, WDNR, Lewis County, WSDOT, LCFEG, USFS	9	Medium: There are many artificial barriers throughout the Tilton, Cispus, and Upper Mainstem Cowlitz Basins	Medium: Increased spawning and rearing capacity due to access to blocked habitat. Habitat is believed to be marginal in most cases	High
U-Cowl 14. Conduct forest practices on state lands in accordance with the Habitat Conservation Plan in order to afford protections to riparian areas, sediment processes, runoff processes, water quality, and access to habitats	Activity is currently in place	WDNR	2, 3, 5, 6, 7 & 9	Low: State timber lands in the U. Cowlitz Basin (approximately 2% of the basin area)	Medium: Increase in instream LWD; reduced stream temperature extremes; greater streambank stability; reduction in road-related fine sediment delivery; decreased peak flow volumes; restoration and preservation of fish access to habitats. Response is medium because of location and quantity of state lands	Medium
U-Cowl 15. Protect and restore native plant communities from the effects of invasive species	Expansion of existing program or activity	Weed Control Boards (local and state); NRCS, Lewis CD, LCFEG	2 & 6	Medium: Greatest risk is in agriculture and residential use areas	Medium: restoration and protection of native plant communities necessary to support watershed and riparian function	Low
U-Cowl 16. Assess, upgrade, and replace on-site sewage systems that may be contributing to water quality impairment	Expansion of existing program or activity	Lewis County, Lewis CD	7	Low: Private agricultural and rural residential lands	Medium: Protection and restoration of water quality (bacteria)	Medium
U-Cowl 17. Monitor an notify FERC of significant license violations, enforce terms and conditions of section 7 consultations on FERC relicensing agreements, and encourage	Activity is currently in place	NOAA, USFWS		High: Entire basin	High: Adequate flows for life stage requirements and habitat-forming processes, protection of water quality, increased habitat availability for spawning and rearing	High

Action	Status	Responsible Entity	Measures Addressed	Spatial Coverage of Target Area[10]	Expected Biophysical Response[11]	Certainty of Outcome[12]
implementation of section 7 conservation recommendations on FERC relicensing agreements						
U-Cowl 18. Review and adjust operations to ensure compliance with the Endangered Species Act; examples include roads, parks, and weed management	Expansion of existing program or activity	Lewis County, Mossyrock, Morton,	2, 5, 6, & 7	Low: Applies to lands under public jurisdiction	Medium: Protection of water quality, greater streambank stability, reduction in road-related fine sediment delivery, restoration and preservation of fish access to habitats	High

Table 6-6. Habitat actions for the Coweeman Basin.

Action	Status	Responsible Entity	Measures Addressed	Spatial Coverage of Target Area[13]	Expected Biophysical Response[14]	Certainty of Outcome[15]
Cowee 1. Expand standards in local government comprehensive plans to afford adequate protections of ecologically important areas (i.e. stream channels, riparian zones, floodplains, CMZs, wetlands, unstable geology)	Expansion of existing program or activity	Cowlitz County, City of Kelso	1 & 2	Medium: Private lands. Applies primarily to residential, agricultural, and forest lands at risk of development	High: Protection of water quality, riparian function, stream channel structure (e.g. LWD), floodplain function, CMZs, wetland function, runoff processes, and sediment supply processes	High
Cowee 2. Manage future growth and development patterns to ensure the protection of watershed processes. This includes limiting the conversion of agriculture and timber lands to developed uses through zoning regulations and tax incentives	Expansion of existing program or activity	Cowlitz County, City of Kelso	1 & 2	Medium: Private lands. Applies primarily to residential, agricultural, and forest lands at risk of development	High: Protection of water quality, riparian function, stream channel structure (e.g. LWD), floodplain function, CMZs, wetland function, runoff processes, and sediment supply processes	High
Cowee 3. Increase funding available to purchase easements or property in sensitive areas in order to protect watershed function where existing programs are inadequate	Expansion of existing program or activity	LCFRB, NGOs, WDFW, USFWS, BPA (NPCC)	1 & 2	Medium: Residential, agricultural, or forest lands at risk of further degradation	High: Protection of riparian function, floodplain function, water quality, wetland function, and runoff and sediment supply processes	High
Cowee 4. Increase technical assistance to landowners and increase landowner participation in conservation programs that protect and restore habitat and habitat-forming processes. Includes increasing the incentives (financial or otherwise) and increasing program marketing and outreach	Expansion of existing program or activity	NRCS, W/CCD, WDNR, WDFW, LCFEG, Cowlitz County, Kelso	All measures	High: Private lands. Applies to lands in agriculture, rural residential, and forestland uses throughout the basin	High: Increased landowner stewardship of habitat. Potential improvement in all factors	Medium
Cowee 5. Fully implement and enforce the Forest Practices Rules (FPRs) on private timber lands in order to afford protections to riparian areas, sediment processes, runoff processes, water quality, and access to habitats	Activity is currently in place	WDNR	1, 2, 3, 5, 6 & 8	High: Private commercial timber lands	High: Increase in instream LWD; reduced stream temperature extremes; greater streambank stability; reduction in road-related fine sediment delivery; decreased peak flow volumes; restoration and preservation of fish access to habitats	Medium
Cowee 6. Conduct floodplain restoration where feasible along the lower mainstem that has experienced channel confinement. Build partnerships with the City of Kelso and other landowners and provide financial incentives	New program or activity	NRCS, W/CCD, NGOs, WDFW, LCFRB, City of Kelso, USACE, Cowlitz County	4, 5, 6, 7 & 8	Low: Lower mainstem Coweeman	High: Restoration of floodplain function, habitat diversity, and habitat availability.	Medium
Cowee 7. Prevent floodplain impacts from new development through land use controls and Best Management Practices	New program or activity	Cowlitz County, WDOE, Kelso	1	Low: Private lands currently in agriculture or timber production in lowland areas.	Medium: Protection of floodplain function, CMZ processes, and off-channel/side-channel habitat. Prevention of reduced habitat diversity and key habitat availability	High
Cowee 8. Review and adjust operations to ensure compliance with the Endangered Species Act; examples include roads, parks, and weed management	Expansion of existing program or activity	Cowlitz County, Kelso	1, 3, 5, & 8	Low: Applies to lands under public jurisdiction	Medium: Protection of water quality, greater streambank stability, reduction in road-related fine sediment delivery, restoration and preservation of fish access to habitats	High

[13] Relative amount of basin affected by action
[14] Expected response of action implementation
[15] Relative certainty that expected results will occur as a result of full implementation of action

Action	Status	Responsible Entity	Measures Addressed	Spatial Coverage of Target Area[13]	Expected Biophysical Response[14]	Certainty of Outcome[15]
Cowee 9. Implement the prescriptions of the WRIA 25/26 Watershed Planning Unit regarding instream flows	Activity is currently in place	WDOE, WDFW, WRIA 25/26 Planning Unit, Kelso	9	High: Entire basin	Medium: Adequate instream flows to support life stages of salmonids and other aquatic biota.	Medium
Cowee 10. Increase the level of implementation of voluntary habitat enhancement projects in high priority reaches and subwatersheds. This includes building partnerships, providing incentives to landowners, and increasing funding	Expansion of existing program or activity	LCFRB, BPA (NPCC), NGOs, WDFW, NRCS, W/CCD, LCFEG	3, 4, 5, 6, 7, 8 & 10	High: Priority stream reaches and subwatersheds throughout the basin	Medium: Improved conditions related to water quality (temperature and bacteria), LWD quantities, bank stability, key habitat availability, habitat diversity, riparian function, floodplain function, sediment availability, & channel migration processes	Medium
Cowee 11. Increase technical support and funding to small forest landowners faced with implementation of Forest and Fish requirements for fixing roads and barriers to ensure full and timely compliance with regulations	Expansion of existing program or activity	WDNR	1, 2, 3, 5, 6, & 8	Medium: Small private timberland owners	High: Reduction in road-related fine sediment delivery; decreased peak flow volumes; restoration and preservation of fish access to habitats	Medium
Cowee 12. Assess the impact of fish passage barriers (especially culverts) throughout the basin and restore access to potentially productive habitats	Expansion of existing program or activity	WDFW, WDNR, Cowlitz County WSDOT, City of Kelso, LCFEG	6	Medium: As many as 9 miles of stream are potentially blocked by artificial barriers	Medium: Increased spawning and rearing capacity due to access to blocked habitat. Habitat is marginal in most cases	Medium
Cowee 13. Create and/or restore lost side-channel/off-channel habitat for chum spawning and coho overwintering	New program or activity	LCFRB, BPA (NPCC), NGOs, WDFW, NRCS, W/CCD, LCFEG	10	Low: Lower mainstem Coweeman	Medium: Increased habitat availability for spawning and rearing	Medium
Cowee 14. Protect and restore native plant communities from the effects of invasive species	Expansion of existing program or activity	Weed Control Boards (local and state); NRCS, W/CCD, LCFEG	1 & 5	Medium: Greatest risk is in agriculture and residential use areas	Medium: restoration and protection of native plant communities necessary to support watershed and riparian function	Low
Cowee 15. Address temperature impairments through development of water quality clean up plans (TMDLs)	Expansion of existing program or activity	WDOE	8	High: There are several reaches with temperature impairment	Medium: More suitable temperatures to support fish rearing	Medium

Table 6-7. Habitat actions for the Toutle Basin.

Action	Status	Responsible Entity	Measures Addressed	Spatial Coverage of Target Area[16]	Expected Biophysical Response[17]	Certainty of Outcome[18]
Toutle 1. Address fish passage and sediment issues at the Sediment Retention Structure on the NF Toutle	Expansion of existing program or activity	WDFW, USACE	3	High: Sediment from the SRS affects downstream reaches. Volitional access is blocked to approx. 50 miles	High: Reduction of sedimentation of lower NF and mainstem Toutle. Volitional passage to ~50 miles of habitat	High
Toutle 2. Conduct floodplain restoration where feasible along the mainstem Toutle, SF Toutle, and NF Toutle, especially in areas affected by dredging and floodplain filling following the 1980 Mount St. Helens eruption. Survey landowners, build partnerships, and provide financial incentives	New program or activity	NRCS, C/WCD, NGOs, WDFW, LCFRB, USACE, LCFEG	4, 6, 7, 8 & 10	High: Lower mainstem and lower portion of lower mainstem tributaries	High: Restoration of floodplain function, habitat diversity, and habitat availability.	High
Toutle 3. Fully implement and enforce the Forest Practices Rules (FPRs) on private timber lands in order to afford protections to riparian areas, sediment processes, runoff processes, water quality, and access to habitats	Activity is currently in place	WDNR	1, 2, 5, 6, 8 & 10	High: Private commercial timber lands	High: Increase in instream LWD; reduced stream temperature extremes; greater streambank stability; reduction in road-related fine sediment delivery; decreased peak flow volumes; restoration and preservation of fish access to habitats	Medium
Toutle 4. Continue to manage federal forest lands according to the Northwest Forest Plan	Activity is currently in place	USFS	1, 2, 5, 6, 8 & 10	Medium: National Forest and National Monument lands in the upper basin	High: Increase in instream LWD; reduced stream temperature extremes; greater streambank stability; reduction in road-related fine sediment delivery; decreased peak flow volumes; restoration and preservation of fish access to habitats	High
Toutle 5. Review and adjust operations to ensure compliance with the Endangered Species Act; examples include roads, parks, and weed management	Expansion of existing program or activity	Cowlitz County	1, 5, 6, & 8	Low: Applies to lands under public jurisdiction	Medium: Protection of water quality, greater streambank stability, reduction in road-related fine sediment delivery, restoration and preservation of fish access to habitats	High
Toutle 6. Expand standards in County ordinances to afford adequate protections of ecologically important areas (i.e. stream channels, riparian zones, floodplains, CMZs, wetlands, unstable geology)	Expansion of existing program or activity	Cowlitz County	1 & 2	Medium: Private lands. Applies primarily to lands in the lower basin in open-space, rural residential, or forestland uses at risk of development	High: Protection of water quality, riparian function, stream channel structure (e.g. LWD), floodplain function, CMZs, wetland function, runoff processes, and sediment supply processes	High
Toutle 7. Prevent floodplain impacts from new development through land use controls and Best Management Practices	New program or activity	Cowlitz County, WDOE	1	Medium: Private lands. Applies primarily to lands in the lower basin in open-space, rural residential, or forestland uses at risk of development	High: Protection of floodplain function, CMZ processes, and off-channel/side-channel habitat. Prevention of reduced habitat diversity and key habitat availability	High
Toutle 8. Manage future growth and development patterns to ensure the protection of	Expansion of existing	Cowlitz County	1 & 2	Medium: Private lands. Applies primarily to	High: Protection of water quality, riparian function, stream channel structure (e.g.	High

[16] Relative amount of basin affected by action
[17] Expected response of action implementation
[18] Relative certainty that expected results will occur as a result of full implementation of action

Action	Status	Responsible Entity	Measures Addressed	Spatial Coverage of Target Area[16]	Expected Biophysical Response[17]	Certainty of Outcome[18]
watershed processes. This includes limiting the conversion of lands to developed uses through zoning regulations and tax incentives	program or activity			lands in the lower basin in open-space, rural residential, or forestland uses at risk of development	LWD), floodplain function, CMZs, wetland function, runoff processes, and sediment supply processes	
Toutle 9. Implement the prescriptions of the WRIA 25/26 Watershed Planning Unit regarding instream flows	Activity is currently in place	WDOE, WDFW, WRIA 25/26 Planning Unit	9	High: Entire basin	Medium: Adequate instream flows to support life stages of salmonids and other aquatic biota.	Medium
Toutle 10. Increase the level of implementation of voluntary habitat enhancement projects in high priority reaches and subwatersheds. This includes building partnerships, providing incentives to landowners, and increasing funding	Expansion of existing program or activity	LCFRB, BPA (NPCC), NGOs, WDFW, NRCS, C/W CD, LCFEG	4, 5, 6, 7, 8, 10 & 11	High: Priority stream reaches and subwatersheds throughout the basin	Medium: Improved conditions related to water quality (temperature and bacteria), LWD quantities, bank stability, key habitat availability, habitat diversity, riparian function, floodplain function, sediment availability, & channel migration processes	Medium
Toutle 11. Increase technical support and funding to small forest landowners faced with implementation of Forest Practices Rules to ensure full and timely compliance with regulations	Expansion of existing program or activity	WDNR	1, 2, 5, 6, 8 & 10	Low: Small private timberland owners	High: Increase in instream LWD; reduced stream temperature extremes; greater streambank stability; reduction in road-related fine sediment delivery; decreased peak flow volumes; restoration and preservation of fish access to habitats	Medium
Toutle 12. Increase funding available to purchase easements or property in sensitive areas in order to protect watershed function where existing programs are inadequate	Expansion of existing program or activity	LCFRB, NGOs, WDFW, USFWS, BPA (NPCC)	1 & 2	Low: Private lands. Applies primarily to lands in the lower basin in open-space, rural residential, or forestland uses at risk of development	High: Protection of riparian function, floodplain function, water quality, wetland function, and runoff and sediment supply processes	High
Toutle 13. Increase technical assistance to landowners and increase landowner participation in conservation programs that protect and restore habitat and habitat-forming processes. Includes increasing the incentives (financial or otherwise) and increasing program marketing and outreach	Expansion of existing program or activity	NRCS, C/WCD, WDNR, WDFW, LCFEG, Cowlitz County	1, 2, 4, 5, 6, 7, 8, 9, 10 & 11	Medium: Private lands. Applies primarily to lands in the lower basin in open-space, rural residential, or forestland uses at risk of development	High: Increased landowner stewardship of habitat. Potential improvement in all factors	Medium
Toutle 14. Conduct forest practices on state lands in accordance with the Habitat Conservation Plan in order to afford protections to riparian areas, sediment processes, runoff processes, water quality, and access to habitats	Activity is currently in place	WDNR	1, 2, 5, 6, 8 & 10	Medium: State timber lands in the Toutle Basin (approximately 18% of the basin area)	Medium: Increase in instream LWD; reduced stream temperature extremes; greater streambank stability; reduction in road-related fine sediment delivery; decreased peak flow volumes; restoration and preservation of fish access to habitats. Response is medium because of location and quantity of state lands	Medium
Toutle 15. Assess the impact of fish passage barriers throughout the basin and restore access to potentially productive habitats (not including the SRS, which is covered in a separate action)	Expansion of existing program or activity	WDFW, WDNR, Cowlitz County, WSDOT, LCFEG	10	Low: As many as 23 miles of stream are blocked by artificial barriers	Low: Increased spawning and rearing capacity due to access to blocked habitat. Habitat is marginal in most cases	High
Toutle 16. Create and/or restore lost side-channel/off-channel habitat for chum spawning and coho overwintering	New program or activity	LCFRB, BPA (NPCC), NGOs, WDFW, NRCS, C/W CD	11	Low: Lower mainstem Toutle	Medium: Increased habitat availability for spawning and rearing	Low

Action	Status	Responsible Entity	Measures Addressed	Spatial Coverage of Target Area[16]	Expected Biophysical Response[17]	Certainty of Outcome[18]
Toutle 17. Protect and restore native plant communities from the effects of invasive species	Expansion of existing program or activity	Weed Control Boards (local and state); NRCS, C/W CD, LCFEG	1 & 6	Medium: Greatest risk is in lower basin agriculture and residential use areas	Medium: restoration and protection of native plant communities necessary to support watershed and riparian function	Low
Toutle 18. Assess, upgrade, and replace on-site sewage systems that may be contributing to water quality impairment	Expansion of existing program or activity	Cowlitz County, C/W CD	8	Low: Private agricultural and rural residential lands in lower basin	Medium: Protection and restoration of water quality (bacteria)	Medium

Section 7
Plan Implementation Considerations

Previous sections of this watershed management plan identify a range of recommended actions in the areas of water supply, stream flow management, surface water quality, ground water quality, and habitat. In each of these sections, implementation considerations were described, including prioritization of actions, identification of organizations that would have implementation responsibilities, cost, and potential sources of funding.

This section addresses overall implementation needs to provide a solid foundation for those individual actions. This Section builds on information and recommendations presented in a Report to the Legislature prepared by the Phase 4 Watershed Plan Implementation Committee in 2002. These recommendations have been reshaped to match local circumstances in WRIAs 25 and 26.

7.1 Plan Adoption Process and Resulting Obligations

The Watershed Management Act prescribes a specific process for adoption of a watershed plan, and voluntary acceptance of obligations under the plan (Section 90.82.130 RCW). This is a two-stage process. First, the Planning Unit considers the plan for approval, and individual members of the Planning Unit consider what actions they will commit to carrying out. Once this is completed, the Plan is sent to the Boards of County Commissioners of all Counties in the planning area for their consideration. If the Commissioners approve the plan, the voluntary commitments made by members of the planning unit become binding.

Through this process, no organization or person is required to take on a commitment without their consent. However, once an organization has formally agreed to implement actions under the Plan, and the Plan has been approved, these commitments must be implemented.

This Watershed Management Plan does not create any obligations for private businesses, citizens or landowners. However, there are actions identified for *voluntary* action in the private sector.

Actions recommended in this plan are intended to be specific enough to clearly specify the action and result; yet general enough to permit some flexibility in carrying them out. The Planning Unit recognizes that some actions require further investigation prior to full implementation. The Planning Unit also recognizes that some actions can be carried out only if funding is provided by the State Legislature or funding agencies, and that funding decisions will be made over a period of months or years following plan adoption. Therefore, the recommendations of this Plan have been crafted to recognize these limitations and to allow for further decision-making on the road to achieving the Plan's objectives.

7.2 Grant Funding for Implementation Phase

In 2003 the Washington State Legislature amended the Watershed Planning grants program to provide Phase 4 grants to support implementation of watershed plans (Section 90.82.040 RCW).

Application for the grant can be made following approval of the Watershed Plan by both the Planning Unit and Counties, following the procedure described in Section 90.82.130 RCW.

The WRIA 25 and 26 Planning Unit is eligible for up to $125,000 per year in each of the first three years of implementation. Following this, $62,500 per year can be awarded in the fourth and fifth years of implementation. A match of ten percent is required, which can include either financial contributions or in-kind goods and services.

It is not expected that this limited amount of funding will cover implementation of all the projects and programs discussed in this Watershed Management Plan. Instead, these funds should be considered "seed money" to strengthen the organizational foundation for Plan implementation and to pursue more substantial funding for the many activities recommended in this Plan. Section 7.5 discusses additional sources of funding that can be developed, if appropriate, during the implementation phase.

The Legislature also provided that the Planning Unit must complete a detailed implementation plan within one year of accepting the Phase 4 funding. Disbursements of Phase 4 funding for subsequent years is conditioned upon completion of the implementation plan. The implementation plan must contain strategies, timelines and milestones; define coordination and oversight responsibilities, any needed interlocal agreements, rules or ordinances; any needed state or local administrative approvals and permits, and specific funding mechanisms. In addition, the planning Unit must consult with other organizations developing plans in the same area, and identify and seek to eliminate activities or policies that are duplicative or inconsistent.

The WRIA 25 and 26 Planning Unit anticipates applying for the Phase 4 grant funding, at such time as this Watershed Management Plan is approved. The discussion of implementation considerations in the Plan provides a starting point for eventual development of the detailed implementation plan described above.

The Planning Unit anticipates that full implementation of Plan recommendations will require a time frame on the order of five to fifteen years. Many actions can be carried out in the first five years; while others will require longer to obtain funding, permits, and other necessary approvals. As noted above, the grant funding program is designed only for the first five years of this time frame.

7.3 Overall Coordination of Plan Implementation

The recommendations presented in this Watershed Management Plan span a range of natural resources, activities, and organizations. Recommendations are identified for county governments, public water systems, several state agencies, private industry, landowners and others. The intent has been to provide a balanced mix of recommended actions that collectively achieve the objectives stated in Section 1.3.

With a range of organizations involved, and an implementation period spanning many years, it will be important to put in place some mechanism for coordination and oversight. Some of the activities included under coordination and oversight are:

- Tracking implementation of Plan actions by the many organizations involved, to ensure actions are being carried out in a timely fashion; that the balanced nature of the plan is

retained as actions are implemented; and that the most important priorities defined by the Planning Unit are being addressed;

- Coordinating efforts to seek funding for Plan actions, to avoid duplication of effort and ensure the State legislature and funding agencies see well-organized and unified support for funding requests on an ongoing basis;
- Providing information to the public on Plan implementation and resulting improvements in watershed conditions;
- Providing early warning systems and joint responses to changing conditions, including physical conditions in the watershed; new regulatory developments; and new project proposals that may emerge from time to time.
- Monitoring of watershed conditions across jurisdictional boundaries, data management, and providing data access.
- Periodic review of the Plan, and updating if warranted.

This list is not necessarily complete, but it shows the value of creating a system of coordination and oversight for the implementation phase.

Recommendation:

In order to provide a venue for these activities, it is recommended that the WRIA 25 and 26 Planning Unit transition from planning functions to coordination and oversight functions as listed above. The purpose is to foster an organized and collaborative approach, as many individual organizations carry out specific actions under their jurisdictions, and to secure funding for implementation. The Planning Unit, at its option, may choose to form subcommittees to follow up on selected areas for implementation, such as securing resources to install additional stream flow gauges; assessing alternative sources of supply to reduce stream flow impacts; protecting ground water quality, etc.

It is also recommended that LCFRB continue to provide staff resources to support the Planning Unit in this activity. Funding for these purposes can be based on the State Phase 4 grants for the first five years of the implementation phase.

An interlocal agreement may be useful in defining coordination and oversight responsibilities. Such an agreement may also be beneficial in further defining other implementation commitments among the organizations involved, beyond the level of detail presented in this Plan.

In order for the group to be effective in the coordination and oversight role, local jurisdictions such as counties, cities, and water purveyors will need to make staff resources available. For example, a core group could include at least Lewis, Cowlitz, and Wahkiakum Counties; representatives of the various cities in WRIAs 25 and 26; Cowlitz and Wahkiakum PUDs; and the Department of Ecology. Other purveyors and groups in the region may also elect to participate.

7.4 Implementation Actions by Individual Organizations

The Coordination and Oversight role, while important, will not alone ensure effective implementation. It is critical that the individual organizations that voluntarily commit to carrying out Plan actions follow through on these commitments. These include the respective counties, cities, public water systems, state agencies and others, assuming each of them accepts certain commitments. It is important to recognize that the mix of actions in this plan results in a sharing of commitments. This will help to spread the burden of carrying out plan actions, and will also provide for delivering real benefits across the region's jurisdictions.

For each organization carrying out actions under the plan, several steps will be needed. First, it is critical that elected decision-makers and top managers of the organization be involved at the plan review and approval stage, before the Planning Unit approves the Plan. Second, once the Plan is approved organizations will need to budget for plan actions and identify funding sources. This should be incorporated in the budget process each year (or biennium for State agencies). Third, it will be important to identify staff who will be responsible for carrying out that organization's commitments, and provide for reporting back to management and to the Planning Unit. Finally, depending on how the organization operates, there may be a need for work plans to be prepared to define actions and schedule.

The involvement of individual organizations in carrying out their commitments is vital to this Plan. The Watershed Planning Unit has no independent capability to implement Plan actions. It is the counties, cities, water purveyors, and State agencies, among others, that will ultimately carry out Plan elements. Therefore, it is critical that their management and governing elected bodies take note of the responsibilities described here.

7.5 Summary of Implementation Roles and Considerations

Throughout this Watershed Management Plan, implementation roles and considerations have been identified in the areas of water supply, stream flow management, surface water quality, ground water quality and fish habitat restoration. Table 7-1 lists the organizations that have been identified for "lead" roles in implementing this watershed plan. For each organization, specific activities are listed. Table 7-2 provides additional detail on all of these activities, including involvement by other organizations, relative costs or each activity, and potential funding sources. It should be noted that many of these activities will also require staff resources. At the same time, many of these activities can be integrated with existing programs and should not necessarily be viewed as new, additional responsibilities.

These roles are not mandatory and cannot become operational without the formal approval of specific activities by elected boards and commissions, or upper level managers at the respective organizations. The Planning Unit requests each organization consider its recommended role(s) and provide a written indication of its capability and intent to carry out these actions.

Table 7-1
Lead Implementation by Organization

Lead for Implementation	Category	Activity
Counties, cities, public water systems, LCFRB, State agencies, others	Coordination and oversight	Track implementation of Watershed Management Plan, pursue funding, report to the public on Plan implementation and results, forum for ongoing discussion and periodic update of Plan.
Counties	Stream Flow Management	Wetlands inventories and ordinances: assess and protect hydrologic functions, consider strengthening mitigation ratios.
Counties	Stream Flow Management	Source substitution for selected areas served by individual domestic wells: relatively higher densities and likelihood of stream impacts; dependent on feasibility and cost.
Counties and Cities	Stream Flow Management	Review effects of stormwater discharges on stream flow and habitat. Where needed to protect key habitat, implement programs that exceed minimum requirements.
Counties and Cities	Stream Flow Management	Develop policies and procedures to identify and mitigate stream flow impacts of sewering communities formerly served by septic systems.
Counties and Cities	Water Supply	Periodically review policies on individual domestic wells, in context of local land use and development regulations.
Public Water System	Water Supply	Public Water Systems develop new or expanded supplies. Requires engineering studies; approval of water system plan; water rights processing; other permitting; SEPA compliance; construction; operations & maintenance. Standard procedures exist for all of these.
Public Water System	Water Supply	Planning studies to explore alternative sources of supply to replace an existing source (selected communities).
Public Water System	Water Supply	Replace an existing source of supply with a different source to reduce impacts on stream flow. Requires engineering studies; water rights processing; other permitting; inter-local agreements or contracts; construction; operations & maintenance.
Public Water Systems	Water Supply	Enhanced conservation exceeding state requirements in selected communities.
Counties, cities, State agencies with land management responsibilities	Stream Flow Management	Protect floodplains from modifications that would impair hydrologic functions or habitat.
Counties, cities, State agencies with land management responsibilities	Stream Flow management	Identify floodplain restoration projects and implement where feasible.
Private Industry (large plants)	Water Supply	Industrial supplies: Expand conservation & reuse; develop non-potable sources; connect to municipal systems.
Landowner	Water Supply	Agricultural supplies: switch from surface to ground water. Discourage new uses of surface water (use ground water instead).
Agricultural Producer	Stream Flow Management	Water conservation by farmers practicing irrigated agriculture. Technical assistance by Conservation District in each county
Ecology	Stream Flow Management	Maintain existing stream gauges. Install new gauges at selected locations. Select exact sites; permit and construct gauges; O&M; data management.

Table 7-1 (cont.)
Lead Implementation by Organization

Lead for Implementation	Category	Activity
Ecology	Stream Flow Management	Adopt closures and/or minimum instream flows in State Rule
Ecology	Stream Flow Management	Initial surveys in selected subbasins to identify unauthorized uses and take enforcement actions. Follow-up in other basins if warranted.
Ecology	Stream Flow Management	Purchase or lease of water rights from willing sellers, for State Trust program.
Ecology	Surface Water Quality	Develop water body cleanup plans (TMDLs) for subbasins, in prioritized sequence as indicated in Watershed Management Plan. Carry out necessary modeling, reporting, public involvement, and waste load allocations.
DNR/USFS	Stream Flow Management	Consider and address effects of forest practices on stream flow. Monitor effectiveness of F&F Rules and NW Forest Plan. Report to public periodically.
Shared effort by State, local and federal agencies	Surface Water Quality	Expand water quality monitoring activities to improve understanding of status and trends. Install monitoring equipment; collect and analyze samples; manage and analyze data; report results.
LCFRB and Planning Unit or successor organization	Stream Flow Management	Establish target flow monitoring and management program

Table 7-2
Implementation Considerations for Watershed Management Plan

Priority	Activity	Implementers	Financial/ Economic Costs[2]	Funding Sources
Category: Water Supply				
High	Public Water Systems develop new or expanded supplies. Requires engineering studies; approval of water system plan; water rights processing; other permitting; SEPA compliance; construction; operations & maintenance. Standard procedures exist for all of these.	*Lead*: Public Water System *Others*: DOH, Ecology	Medium	*Main*: Water rates in affected service area *Additional*: Grants or low-interest loans from existing state & federal programs
High	Planning studies to explore alternative sources of supply to replace an existing source (selected communities).	*Lead*: Public Water System	Low	*Main*: Water rates in affected service area
High	Replace an existing source of supply with a different source to reduce impacts on stream flow. Requires engineering studies; water rights processing; other permitting; inter-local agreements or contracts; construction; operations & maintenance.	*Lead*: Public Water System *Others*: DOH, Ecology, adjacent water system(s) to serve as wholesaler	Medium to High	*Main*: Leg. appropriation *Additional*: Water rates in affected service area
Medium	Enhanced conservation exceeding state requirements in selected communities.	*Lead*: Public Water System	Low to medium	*Main*: public water system *Additional*: Grants from DOH or Ecology

Table 7-2 (cont.)
Implementation Considerations for Water Supply Actions

Priority	Activity	Implementers	Financial/ Economic Costs[2]	Funding Sources
Medium	Industrial supplies: Expand conservation & reuse; develop non-potable sources; connect to municipal systems.	*Lead*: Private industry (large plants) *Others*: Ecology & DOH (technical assistance; water rights processing if applicable)	Low to High (Varies by facility)	*Main*: Private industry *Additional*: Leg. appropriations
Low	Periodically review policies on domestic wells, in context of local land use and development regulations.	*Lead*: Counties, cities	Low	*Main*: counties, cities general fund or permitting fees, grants
Low	Agricultural supplies: switch from surface to ground water. Discourage new uses of surface water (use ground water instead).	*Lead*: Landowner *Others*: Ecology, Conservation Districts	Low to medium	*Main*: Landowner *Additional*: Leg. appropriations
Category: Stream Flow Management				
High	Maintain existing stream gauges. Install new gauges at selected locations. Select exact sites; permit and construct gauges; O&M; data management.	*Lead*: Ecology *Other*: USGS, LCFRB, Counties	Medium	*Main*: Leg. appropriations (Ecology budget); Congr. appropriations (USGS budget); *Additional*: Counties; Public Water Systems
High	Adopt closures and/or minimum instream flows in State Rule	*Lead*: Ecology *Other*: LCFRB	Low	*Main*: Ecology (staff time) *Additional*: LCFRB (staff time)
High	Selected actions involving water supply. See Section 3.6.	*See Section 3.6*	*See Section 3.6*	*See Section 3.6*
High	Establish target flow monitoring and management program	*Lead*: LCFRB and Planning Unit or successor organization *Other*: Ecology, DFW	Medium	*Main*: Phase 4 implementation funds *Additional*: TBD
High	Initial surveys in selected subbasins to identify unauthorized uses and take enforcement actions. Follow-up in other basins if warranted.	*Lead*: Ecology *Other*: N/A	Low to medium	*Main*: Leg. appropriations (Ecology budget & staffing) *Additional*: N/A
High	Consider and address effects of forest practices on stream flow. Monitor effectiveness of F&F Rules and NW Forest Plan. Report to public periodically.	*Lead*: DNR, USFS *Other*: Private forest landowners	Low to medium	*Main*: Leg. appropriations (DNR budget); Congr. appropriations (USFS budget), Timber producers *Additional*: N/A
High	Protect floodplains from modifications that would impair hydrologic functions or habitat.	*Lead*: Counties, cities, State agencies with land management responsibilities *Other*: DFW	Low	*Main*: County permitting fees or general fund revenues, grants *Additional*: State agency budgets

Table 7-2 (cont.)
Implementation Considerations for Water Supply Actions

Priority	Activity	Implementers	Financial/ Economic Costs[2]	Funding Sources
Medium	Review effects of stormwater discharges on stream flow and habitat. Where needed to protect key habitat, implement programs that exceed minimum requirements.	*Lead*: Counties, Cities *Other*: Ecology	Low to Medium	*Main*: County, City general funds; Stormwater assessment and fees, grants *Additional*: N/A
Medium	Purchase or lease of water rights from willing sellers, for State Trust program.	*Lead*: Ecology *Other*: N/A	Low to medium	*Main*: Leg. appropriations (Ecology budget) *Additional*: N/A
Medium	Identify floodplain restoration projects and implement where feasible.	*Lead*: Counties, cities, State agencies with land management responsibilities *Other*: DFW	Medium to High	*Main*: State or federal grants; Leg. Appropriations, grants *Additional*: N/A
Low	Develop policies and procedures to identify and mitigate stream flow impacts of sewering communities formerly served by septic systems.	*Lead*: Counties, Cities *Other*: sewer agencies if different from Counties, Cities.	Low	*Main*: Counties, Cities, general funds, permitting fees, grants *Additional*: N/A
Low	Water conservation by farmers practicing irrigated agriculture. Technical assistance by Conservation District in each county.	*Lead*: Agricultural producer *Other*: Conservation Districts	Medium	*Main*: Agricultural producer *Additional*: Leg. Appropriations (Cons. Commission & CD budgets).
Low	Source substitution for selected areas served by domestic wells: relatively higher densities and likelihood of stream impacts; dependent on feasibility and cost.	*Lead*: Counties *Other*: Public water systems	Medium to high	*Main*: Assessments on affected properties (local improvement districts), grants *Additional*: Federal and State salmon recovery funding; Leg. appropriations
Low	Wetlands inventories and ordinances: assess and protect hydrologic functions, consider strengthening mitigation ratios.	*Lead*: Counties *Other*: N/A	Low to Medium	*Main*: County development fees or general fund revenues (note staffing impact), grants *Additional*: N/A
Category: Surface Water Quality				
Medium	Develop water body cleanup plans (TMDLs) for subbasins, in prioritized sequence as indicated in Watershed Management Plan. Carry out necessary modeling, reporting, public involvement, and waste load allocations.	*Lead*: Ecology *Other*: Local governments, Conservation Districts, other interested parties	High	*Main*: Leg. appropriations (Ecology budget) *Additional*: N/A
Low	Expand water quality monitoring activities to improve understanding of status and trends. Install monitoring equipment; collect and analyze samples; manage and analyze data; report results.	Shared efforts by State, local, federal agencies	High	Combination of State, local, federal funding sources (to be developed further in Implementation Phase)

(1) Priority in context of all actions in Watershed Management Plan.

(2) Preliminary, generalized estimates of financial or economic cost to the community or water user involved. High: greater than $500,000; Medium: $50,000 to $500,000; Low: less than $50,000. Total cost, whether up-front or over a period of time up to ten years.

(3) "Lead" implementer would take responsibility for organizing efforts under this action, including pursuing funding sources listed in the far right column.

Abbreviations: SEPA = State Environmental Policy Act, DOH = Department of Health, Leg. = Legislative

7.6 Funding Strategy

Tables have been presented in earlier sections of this Watershed Management Plan that summarize implementation considerations[1]. These tables include a preliminary estimate of the magnitude of costs, staffing implications for various organizations, and identification of potential funding sources. A mix of potential funding sources has been identified for different activities in the Plan. These sources include:

- Appropriations from the Washington State Legislature for state agency budgets (Ecology, DOH, DNR, Conservation Districts). This would provide funding and/or staffing that could be utilized under existing state programs to implement elements of the Plan.
- Direct appropriations from the Washington State Legislature for specific projects in WRIAs 25 and 26, based on requests to be formulated as the Plan is implemented;
- Appropriations from the U.S. Congress for federal agency budgets (USGS, USFS) under existing programs;
- Grants or low interest loans from existing funding programs, such as the Public Works Trust Fund, State Revolving Fund for Drinking Water, Salmon Recovery Fund, and many other sources[2].
- Rates collected from customers by public water systems (including cities that operate a water system, CPU, etc.)
- County permitting fees or general fund revenues;
- Assessments on property through local improvement districts, for projects that benefit those properties (subject to local approval);
- Private industry funds, for voluntary projects at selected industrial facilities (supplemented by public funds where possible);
- Landowners, for voluntary projects at selected sites (supplemented by public funds where possible);

While not called out for any specific actions, it is also worth noting that Public Utility Districts and Conservation Districts have authority under State law to levy property taxes up to certain limits. If this source of funding is desired, it must be subjected to a vote of the affected public. This could be a valuable supplementary source of funding, particularly for activities that cross local jurisdictional boundaries. However, at least one PUD (Cowlitz PUD) has indicated that it is not interested in pursuing this method of funding.

It is important to recognize that many agencies and jurisdictions are currently funding programs that align closely with the objectives and recommendations of this Plan. In many cases, existing expenditures can be effectively integrated with this Plan, reducing the overall financial impact.

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[1] Tables listing implementation issues for specific actions appear in Sections 3.6 (water supply); 4.17 (stream flow); 5.5 (surface water quality); and 6 (habitat).

[2] The Phase 4 Committee Report to the Legislature includes an Appendix listing several dozen grant and loan programs that may be suitable for funding watershed actions.

In developing a funding package for implementing the Plan, it is important to match funding to benefits. Some of the actions listed in the Plan, such as development of new ground water supplies, will benefit a specific community. In these cases, it is appropriate that the community contribute a large share of the cost.

Other actions may be carried out by one community, but the purpose is to serve broader needs of the region, State or Nation. For example, if a local community is to switch from an existing source of supply to a new source to help restore populations of listed species, there will likely be considerable costs. The purpose of a project of this nature is to restore fish populations for the good of the region, the State of Washington and the Nation as a whole. In this case, it is not equitable for a local community to bear the cost. While some cost burden may be acceptable at the local level, the majority of funding for this type of project should come from regional, state or federal sources.

7.7 Monitoring and Adaptive Management

Implementing a true adaptive management program for watershed planning is a very intensive exercise involving the development of conceptual models of the various systems and their interactions in the watershed. For this reason, the concept of adaptive management and its application are introduced here, but its full development is considered most appropriate for the Implementation Phase (Phase 4) of the watershed planning process. The intent of this section is to describe the adaptive management framework and provide a preliminary application of the framework to the stream flow management component of the Watershed Plan. This can be further refined and the same framework can be applied to the water supply, water quality, and habitat components under the Implementation Phase. Furthermore, this section includes a discussion of coordination and oversight for adaptive management, which are key components that need to occur during the Implementation Phase. Funding, as discussed in Section 7.6, is also critical to implement the monitoring and other activities taken under adaptive management. Because coordination, implementation, and funding issues have been discussed in the previous subsections, emphasis is placed on the monitoring aspects of adaptive management in the following discussion.

7.7.1 Background on Adaptive Management

Adaptive management has been defined in State law as "reliance on scientific methods to test the results of actions taken so that the management and related policy can be changed promptly and appropriately" (RCW 79.09.020). It is described as a cycle that occurs in four stages (Manley et al, 1999): (i) identification of information needs; (ii) information acquisition and assessment (monitor); (iii) evaluation and decision-making (evaluate); and (iv) management action or response (respond). Oftentimes, the first and fourth stages can be considered as one, since part of the response to newly evaluated data may be to identify new information needs. Thus, the key stages of the adaptive management cycle as the exhibit shows is to "monitor," "evaluate," and "respond." These three primary stages of adaptive management are described further below.

Adaptive management is a continuing attempt to reduce the risk arising from the uncertainty associated with information used to develop the management actions.

Generally speaking, each stage of the cycle has an associated uncertainty which should decrease through each completed cycle of the process.

This is one perspective to applying adaptive management. An alternative way to look at adaptive management is to consider it as "experimental management" wherein the management actions taken are used to test key hypotheses and assumptions used to develop the management actions. There are subtle differences in application, but conceptually they are similar in that adaptive management attempts to address uncertainty in information.

The watershed planning process culminating in this Watershed Plan can be regarded as having completed one cycle through this process. At this stage of the watershed plan, some management actions have been identified along with additional information needs. Thus, the beginning of the implementation phase of the plan can be considered to be starting the "information acquisition and assessment" stage of the cycle once again. From there, the cycle can continue wherein the new and additional information collected during the Implementation Phase can be evaluated to determine whether the management actions need to be refined or revised.

Monitor – Information Acquisition Programs

The Implementation Phase of the watershed planning process will involve putting into action many of the recommendations in the plan, including collection of additional information. Once the information needs are identified, the next step is to collect information on how the Plan is going. Different types of monitoring that would feed into the adaptive management framework could have different objectives. Three types of monitoring and the corresponding general goals are as follows:

- Validation: determines if initial assumptions used to develop the plan are valid
- Implementation: determines if plans/projects are implemented as designed (yes/no)
- Effectiveness: determines if plans/projects are meeting management objectives

Validation Monitoring

Validation monitoring determines whether the assumptions used to develop the Plan recommendations are valid. Many of the general recommendations were developed based on certain assumptions about population trends, land use trends, and flow information, among other information. The recommendations may need to be changed if it is determined that some of these assumptions are not valid. Specific recommendations for additional validation monitoring include stream flow monitoring at priority streams, conducting engineering and planning studies for new water source development, and researching potential projects for floodplain and wetlands restoration. Preliminary validation monitoring activities are included in Table 7-3.

Table 7-3
Preliminary Items to Include in Validation Monitoring for Adaptive Management Program

Monitoring/Study	Description	Priority[1]	Implementers and Funding Sources	Spatial Scale and Frequency	Potential Adaptive Action
Planning and Engineering Studies	▪ Primarily feasibility studies and subbasin studies investigating new ground water or alternative supplies ▪ Plan assumes ground water supply development will not have impacts to instream flows	▪ *High*	▪ *Lead:* Water purveyors ▪ *Support:* Ecology, DOH ▪ *Funding:* Public water systems, state or federal grants and loans	▪ *Scale:* Local site- and project-specific ▪ *Frequency:* Initial feasibility and hydrogeologic study and necessary follow-up studies	▪ Studies may indicate that hydraulic connectivity exists or the project is not feasible (costs, capacity, etc.) ▪ Other alternatives may be required, including mitigation
Land Use – Forest Monitoring	▪ Monitor assumptions regarding forest harvest rates and maturation of forests ▪ Plan assumes forest cover will mature and harvest rates decline ▪ Plan assumes no increase in agriculture	▪ *High*	▪ *Lead:* Land owner ▪ *Support:* DNR, USFS ▪ *Funding:* City and county permitting fees and general funds	▪ *Scale:* Forest lands ▪ *Frequency:* Same schedule as county comprehensive plan updates	▪ Can be used in conjunction with flow monitoring to evaluate what factors may be impacting changes in flow conditions
Land Use – Non-Forest Monitoring	▪ Monitor agricultural land use trends ▪ Road densities ▪ Rural and urban development ▪ Changes in comp. plans and land use plans	▪ *Medium*	▪ *Lead:* Cities ▪ *Support:* Counties ▪ *Funding:* City and county permitting fees and general funds	▪ *Scale:* WRIA-wide; consistent with county land use planning ▪ *Frequency:* Same schedule as county comprehensive plan updates	▪ May affect the water "reservation" allocation ▪ Can be used in conjunction with flow monitoring to evaluate what factors may be impacting changes in flow conditions

Table 7-3 (cont.)
Preliminary Items to Include in Validation Monitoring for Adaptive Management Program

Monitoring/Study	Description	Priority[1]	Implementers and Funding Sources	Spatial Scale and Frequency	Potential Adaptive Action
Water Demand Monitoring	▪ Monitor population trends in different sectors (urban, rural) ▪ Monitor industrial demands ▪ Confirm population and water demand projections assumed in the Plan	▪ *Medium*	▪ *Lead:* Water purveyors, counties ▪ *Support:* Ecology, DOH ▪ *Funding:* Public water systems, state or federal grants and loans	▪ *Scale:* WRIA-wide; consistent with county comprehensive plans boundaries and water system service areas ▪ *Frequency:* Continuous; *s*ame schedule as county comprehensive plan and water system plan updates	▪ May affect the water "reservation" allocation ▪ May need to reevaluate the ability to meet instream needs ▪ Evaluate the need for additional water conservation ▪ Identify areas in the basin where future instream and out-of-stream conflicts may arise and develop actions accordingly
Stream Flow Monitoring (basin-wide and project-specific)	▪ Monitor flows at priority streams that do not have any flow data to develop basis for potential future flow restrictions or target flows ▪ Monitor flows at priority streams that have adopted flow restrictions or target flows for "compliance" ▪ Flow monitoring to be integrated with land use monitoring to evaluate how land use change is actually affecting flow in priority streams ▪ Monitor flows where specific projects or actions have been implemented (e.g. water conservation, floodplain/wetland restoration, stormwater BMPs) ▪ Plan is currently limited to developing target flows at 4 locations within the basin where historical flow data exists ▪ Plan is relying on modeling data which needs to be validated over the long-term and at points throughout the basin	▪ *High*	▪ *Lead:* Ecology; will act as data clearinghouse ▪ *Support:* Ecology, USGS, LCFRB (or successor), counties, for general flow monitoring activities ▪ *Support:* USFS, DNR for monitoring effectiveness of forest practices ▪ *Support:* Cities and project owners for specific projects and developments ▪ *Funding:* Legislative (Ecology, DNR) and Congressional (USGS, USFS) appropriations; public water systems	▪ *Scale:* WRIA-wide; priority stream reaches and at project specific locations ▪ *Frequency:* Continuous: annual, seasonal , daily; long-term duration (10-40+ yrs); project specific monitoring may be over a shorter period (< 5 years) for effectiveness	▪ Long-term data can be used to develop future minimum instream flows ▪ Assess progress and whether target flows need to be modified ▪ Assess the effectiveness of specific projects and whether additional measures are needed to meet flow objectives

Table 7-3 (cont.)
Preliminary Items to Include in Validation Monitoring for Adaptive Management Program

Monitoring/Study	Description	Priority[1]	Implementers and Funding Sources	Spatial Scale and Frequency	Potential Adaptive Action
Ground Water Level Monitoring	▪ Monitor ground water levels in areas where new water supplies have been developed and in areas where significant exempt well use is occurring ▪ Plan assumes that developing ground water supplies will not impact flows in priority stream	▪ *High*	▪ *Lead:* Ecology; will act as data clearinghouse ▪ *Support:* Ecology, USGS, LCFRB (or successor), counties, for general water level monitoring activities ▪ *Support:* Cities and water purveyors for specific projects and developments ▪ *Funding:* Legislative (Ecology) and Congressional (USGS) appropriations; public water systems; city general funds	▪ *Scale:* WRIA-wide; priority stream reaches and at project specific locations ▪ *Frequency:* Continuous: annual, seasonal , daily; long-term duration (10-40+ yrs); project specific monitoring may be over a shorter period (< 5 years) for effectiveness	▪ Long-term monitoring may show decreased water levels indicating the need for decreased use, conservation, alternative supply or change in management actions
Water quality monitoring	▪ Implement components of surface water quality monitoring plan described in Section 5. ▪ Implement ground water risk assessment studies ▪ Cleanup plans have been prioritized in the Plan based on current information ▪ Ground water sources may need protection based on susceptibility	▪ *Medium*	▪ *Lead:* Ecology and County health departments ▪ *Support:* Cities, DOH, public water systems ▪ *Funding:*	▪ *Scale:* WRIA-wide; priority stream reaches and at project specific locations ▪ *Frequency:* Continuous, annual, seasonal	▪ New surface water quality data may result in new priorities or additional streams for cleanup plans ▪ New ground water quality data and susceptibility assessments may lead to new priorities for ground water protection or cleanup

Table 7-3 includes a summary of the preliminary monitoring activities and studies that should be included in the information acquisition and assessment step of the adaptive management program. The activities are based on the management actions and recommendations in the previous chapters of the Plan. However, the activities included in Table 7-3 do not include habitat and fish recovery activities because those are being addressed under Subbasin Planning and Salmon Recovery Planning. Validation monitoring activities under these programs should be coordinated with the activities under Watershed Planning.

Implementation Monitoring

Implementation monitoring involves tracking whether the recommendations and commitments adopted in the Watershed Plan are being implemented and whether or not these activities have been properly completed (i.e. yes or no). Implementation monitoring generally involves measures whose results or benefits are fairly certain and do not require complex study designs, e.g. confirmation of whether a flow monitoring gauge has been installed at the proper location.

Effectiveness Monitoring

Effectiveness monitoring is commonly applied in those cases where the benefit of a management action is less certain. For those commitments where the benefit is less certain, scientific study is needed to make a judgment of their effectiveness. The study can then also be used in developing or updating management responses that are appropriate. For example, the effectiveness of reconnecting a floodplain through removal of a dike may provide some flow benefits, but the magnitude of the benefit would require some further study. Once the actual benefit is measured, then a judgment can be made whether similar projects are worthwhile and should be continued or whether other options may be more beneficial.

Evaluate – Evaluation of Monitoring Information

Once information is collected through the information acquisition phase, it will be evaluated to determine whether the goals of the Plan are being met and what changes could be needed to achieve the Plan objectives. A general evaluation framework is presented below.

- Management Actions – all of the management actions designed to contribute to a Plan objective are identified. These management actions are evaluated to determine success.
- Performance Metrics – for each management action, one or more units of measurement are used to evaluate the success of the action. The implementation metric is yes/no, while the effectiveness metric is typically a statistical or numeric measurement resulting from the study.

- Triggers – for each performance metric, a threshold is established that serves as the indicator (or trigger) when the adaptive management process starts. The trigger must be measurable in a timeframe meaningful for informing management changes.
- Management response – after the trigger is "tripped" for a given performance metric, the management response process begins.

As part of the evaluation process, the cost-benefit of a particular management action can be considered by incorporating cost information as a performance metric or a trigger. For example, one can consider how the actual cost to implement the action compares with the estimated cost or evaluate how the realized benefits of the action balance the cost to implement the action.

Respond – Management Responses

Management responses are developed after the monitoring data are evaluated. The responses are then incorporated into the implementation of the Plan in a feedback loop. However, because of the limitations in information, the management response cannot always be known until the new information is collected and evaluated, and additional "negotiation" occurs. Therefore, three general responses can occur under adaptive management:

- Predefined mandatory management response - completely defined at the outset of the Plan.
- Mandatory collaborative management response - mandatory if a specific triggering condition is observed, but the Plan does not specifically describe in advance what the management response would be.
- Cooperative management response - result from opportunities to alter management activities that arise from observations during Plan implementation.

Because many of the recommendations and policies in the Plan are not enforceable on a "regulatory basis" many of the management responses are collaborative or cooperative in nature.

Table 7-4 illustrates the relationship between the performance metrics and triggers and the management responses. Table 7-4 includes an example for the stream flow management recommendations in this Watershed Plan. As indicated earlier, a similar framework can be used for water supply and water quality.

Table 7-4
Adaptive Management Framework for Stream Flow Management

Policy/ Recommendation	Management Action	Type [1]	Performance Metrics	Trigger (if…)	Management Response (then…)
SFP-1	*Maintain existing stream flow gauges and install additional permanent gauges* ▪ Replace former stream gauges on the mainstem Grays River and Elochoman stream ▪ Install new stream gauges in Lower Cowlitz River tributaries (as listed in Table 4-12) and in the Coweeman River at RM 7.0. ▪ Add gauges in other streams where minimum instream flows or target flows are to be established.	I	*Implementation:* Evaluated through observation/inventory by coordination and oversight agency (COA)[2] or third party. Audit to occur after an initial 2-year period from adoption of Plan and subsequently on a biannual basis.	*Implementation: (yes/no)* Audit determines that stream gauges are not being maintained and no additional gauges are being installed. Furthermore, a minimum number of gauges may be specified for installation within a certain time frame, e.g. 4 new gauges within 2 years of Plan adoption.	*Collaborative Response: Implementation:* COA will work with other implementing agencies to develop and implement an action plan for achieving the recommendation. This may include conducting a funding review and options for staffing to enable installation and maintenance of gauges.
SFP-2	*Closures are preferred over use of minimum instream flows, except in selected areas* ▪ Adopt closures and/or minimum instream flows in State Rule	I, E	*Implementation:* COA or third party audit of amendments to State Rule applicable to WRIAs 25 and 25. Audit to occur after an initial 2-year period from adoption of Plan and subsequently on a biannual basis. *Effectiveness:* Metrics will be developed to evaluate the impacts of the closures/minimum flows on protecting stream flows. May include: impacts to water rights applicants and changes in flow statistics (see target flows below). Metric to be evaluated at a minimum of every 5 years.	*Implementation: (yes/no)* Audit determines that no progress has been made toward developing closures/minimum instream flows; alternatively, audit determines agreements have been made on new closures or minimum instream flows but have not been adopted into rule. *Effectiveness:* Specific triggers will be developed if warranted after year 5 from Plan adoption as a mandatory collaborative agreement.	*Collaborative response: Implementation:* If no progress has been made, COA will work with Ecology to develop and implement an action plan for Ecology to develop the rule. If agreements have been made but have not been adopted, COA will work with Ecology to finalize or accelerate adoption schedule. *Effectiveness:* May require updates or revisions to closures or minimum instream flows based on effectiveness monitoring. This would require process to go through the rule-making process.
SFP-3	*Apply other land use and water use management in addition to stream closures to manage stream flows*	I	This policy refers to the use of the other specific recommendations and policies in the Plan to manage stream flow. Refer to other management actions for specific metrics, triggers, and responses.		

Table 7-4 (cont.)
Adaptive Management Framework for Stream Flow Management

Policy/ Recommendation	Management Action	Type [1]	Performance Metrics	Trigger (if…)	Management Response (then…)
SFP-4	*State requirements for water conservation is sufficient for most communities* ▪ Additional conservation efforts recommended for City of Winlock ▪ Water conservation by farmers practicing irrigated agriculture, with assistance from Conservation Districts	I, E	*Implementation:* COA or third party audit of water conservation plans developed by the communities/irrigators as part of their water master plan/irrigation plan updates. Audit to occur at every water system/irrigation plan update after adoption of Watershed Plan. *Effectiveness:* Specific metrics on appropriate level of conservation for these communities/irrigators to be developed, but may include percentage of projected demand or a total annual volume.	*Implementation: (yes/no)* Water conservation efforts only meet State's minimum requirements and no indications are evident that additional conservation efforts are planned. *Effectiveness:* Specific triggers will be developed if warranted after year 5 from Plan adoption as a mandatory collaborative agreement. Triggers will consider measurable benefits with costs and inform future management actions for effectiveness and continuous improvement.	*Collaborative response:* *Implementation:* COA will work with communities/irrigators to develop and implement an action plan for achieving conservation goals. *Effectiveness:* Conservation goals may be revised if costs become too high or projected demands are not realized. Other management options may need to be emphasized.
SFP-5	*Develop alternative water sources where stream flows are impacted that minimize these effects.* ▪ No specific communities identified at this time ▪ Cowlitz, Lewis, and Wahkiakum counties may apply this policy to rural areas	I, E	*Implementation:* COA or third party audit of water master plan updates or other engineering/planning studies to determine whether alternative water sources are being evaluated. Audit to occur at every water system plan update or after two years after adoption of Watershed Plan. *Effectiveness:* Specific metrics to be developed, but may include: the feasibility of the alternative sources based on new studies or information, other opportunities for improvements in the source of supply as they are identified.	*Implementation: (yes/no)* Audit indicates that communities are not considering other source of water. A finding is made that indicates a departure or an opportunity for improvement. *Effectiveness:* Specific triggers will be developed if warranted after year 5 from Plan adoption as a mandatory collaborative agreement. Triggers will consider measurable benefits with costs and inform future management actions for effectiveness and continuous improvement.	*Collaborative response:* *Implementation:* Coordination and oversight agency (COA) will develop and implement an action plan for refining source substitution goals. *Effectiveness:* Alternative supply sources may be eliminated if feasibility study indicates limitations for proceeding. May need to consider other alternatives as they are identified. May identify other communities that need to consider alternative sources.

Table 7-4 (cont.)
Adaptive Management Framework for Stream Flow Management

Policy/ Recommendation	Management Action	Type [1]	Performance Metrics	Trigger (if…)	Management Response (then…)
SFP-6	*Ecology should use State Trust Program to identify water rights for sale or donation* ▪ No specific State Trust transfers identified at this time	I, E	*Implementation:* COA or third party audit of number of water rights in State Trust for sale or lease. Participation of specific communities listed is dependent on whether alternative sources are pursued from SFP-5. *Effectiveness:* Specific metrics to be developed, but may include: the size of the water rights and whether water rights are being sold or leased once alternative sources are identified.	*Implementation: (yes/no)* No water rights are being submitted to State Trust. (An actual minimum number may be specified). A finding is made that indicates a departure or an opportunity for improvement. *Effectiveness:* Specific triggers will be developed if warranted after year 5 from Plan adoption as a mandatory collaborative agreement.	*Collaborative response:* *Implementation:* In conjunction with Ecology, COA will work directly with communities that have opportunities to transfer their rights to the State Trust and will refine goals for transferring to State Trust.
SFP-7	*Ecology to conduct initial surveys for unauthorized water use and take enforcement action when necessary*	I, E	Implementation: COA or third party audit of whether Ecology has conducted the survey after two years from adoption of the Watershed Plan. Effectiveness: Metrics will be developed after Ecology does initial survey, but may include number of unauthorized users or annual volume of use.	*Implementation: (yes/no)* Ecology has not conducted surveys after 2 years from Plan adoption. *Effectiveness:* Specific triggers will be developed if warranted after year 5 from Plan adoption as a mandatory collaborative agreement.	*Collaborative response:* *Implementation:* COA to work with Ecology to develop and implement an action plan for accelerating the survey schedule. *Effectiveness:* COA to work with Ecology to develop a response depending on the extent of unauthorized use and the cost-benefits of enforcement.

Table 7-4 (cont.)
Adaptive Management Framework for Stream Flow Management

Policy/ Recommendation	Management Action	Type [1]	Performance Metrics	Trigger (if…)	Management Response (then…)
SFP-8	*Consider effects of forest management practices on stream flow in making forest management decisions, and monitor the effects and provide public documentation*	I, E	*Implementation:* COA or third party audit of USFS, DNR, and private land owner compliance with F&F and Northwest Forest Plan requirements, specifically implementation of monitoring requirements. *Effectiveness:* Specific metrics to be developed, but may include: length of roads upgraded (in compliance), percent sediment reduction, compliance with other BMPs.	*Implementation: (yes/no)* Audit indicates non-compliance with forest management requirements. *Effectiveness:* A finding is made that indicates a departure or an opportunity for improvement. Monitoring studies will compare measurable benefits with costs and inform future management actions for effectiveness and continuous improvement.	*Collaborative response:* *Implementation:* COA to work with USFS, DNR, and private land owners to improve compliance. *Effectiveness:* Based on findings from monitoring activities, revise or create enhanced BMPs for forest practice requirements/recommendations.
SFP-9	*Cowlitz County and Cities of Longview and Kelso should carry out legal responsibilities for stormwater management; other communities and Lewis and Wahkiakum counties should review ordinances for protectiveness*	I, E	*Implementation:* Percent BMP compliance as determined by a combination of State, internal, and COA or third party audits. *Effectiveness:* Specific metrics to be developed, but may include: flow impacts to adjacent streams, water quality impacts, compliance with other BMPs.	*Implementation: (yes/no)* Compliance rate is less than some specified percentage or is some specific requirement(s) are not being complied with. *Effectiveness:* A finding is made that indicates a departure or an opportunity for improvement. Monitoring studies will compare measurable benefits with costs and inform future management actions for effectiveness and continuous improvement.	*Collaborative response:* *Implementation:* COA to work communities to improve compliance. *Effectiveness:* Based on findings from monitoring activities, revise or create enhanced BMPs for stormwater management requirements/recommendations.

Table 7-4 (cont.)
Adaptive Management Framework for Stream Flow Management

Policy/ Recommendation	Management Action	Type [1]	Performance Metrics	Trigger (if…)	Management Response (then…)
SFP-10	*Lewis, Wahkiakum, and Cowlitz Counties should develop policies addressing extending sewer services*	I	*Implementation:* COA or third party to audit whether counties have developed policies on sewer extension.	*Implementation: (yes/no)* Counties have not developed policies after 2 years from Plan adoption.	*Collaborative response:* *Implementation:* COA to work with counties to develop and implement an action plan for accelerating the policy development schedule.
SFP-11	*Local jurisdictions with land-management responsibilities should protect existing floodplains and identify floodplains for restoration*	I, E	*Implementation:* COA or third party to audit number and locations of floodplain restoration projects and the number of designated floodplains for protection every 5 years *Effectiveness:* COA or third party to audit number and locations of floodplain restoration projects every 5 years; in addition, the flow impacts from the floodplain restoration efforts.	*Implementation: (yes/no)* Audit indicates that only a certain percentage of the floodplain survey for restoration has been completed or only a certain percentage of total floodplains has been designated for protection. *Effectiveness:* A finding is made that indicates a departure or an opportunity for improvement. Monitoring studies will compare measurable benefits with costs and inform future management actions for effectiveness and continuous improvement.	*Collaborative response:* *Implementation:* COA to work with counties to develop and implement an action plan for accelerating the floodplain survey schedule and assessment for protection. *Effectiveness:* Based on findings from monitoring activities, revise or create floodplain restoration recommendations. Restoration activities may be reduced if flow impacts are minimal (unless habitat benefits provide justification).
SFP-12	*Lewis, Wahkiakum, Cowlitz Counties should assess the hydrologic function of wetlands; and consider strengthening mitigation ratios for selected wetlands*	I	*Implementation:* COA or third party to audit whether wetlands surveys for hydrologic function have been completed within 5 years from Plan adoption.	*Implementation: (yes/no)* Counties have not conducted wetlands surveys or have completed only a certain percentage of the survey (e.g. 25%).	*Collaborative response:* *Implementation:* COA to work with counties to develop and implement an action plan for accelerating the survey schedule.

Table 7-4 (cont.)
Adaptive Management Framework for Stream Flow Management

Policy/ Recommendation	Management Action	Type [1]	Performance Metrics	Trigger (if…)	Management Response (then…)
SFP-13	*Major water users should develop policies and procedures for state-declared drought emergencies* ▪ No specific communities identified at this time	I	*Implementation:* COA or third party audit of major water users' water master plan updates to occur after an initial 2-year period from adoption of Plan or at first water master plan update.	*Implementation: (yes/no)* Audit determines that major water users have not completed policies and procedures for drought emergencies.	*Collaborative Response:* COA will develop and implement an action plan for accelerating the schedule to develop policies and procedures.
SFP-14	*Planning Unit will rely on FERC licensing agreement to govern streamflow management related to hydropower operations on the Cowlitz River*	N/A	*N/A*	*N/A*	*N/A*
Target Flows	Establish target flow monitoring and management program.	I, E	*Implementation:* COA or third party to audit whether target flows have been established at other locations in the basin. Implementation of this action is directly tied to the installation of stream flow gauges (SFP-1). *Effectiveness:* This recommendation is the general (or "programmatic") metric for the combined effects of the stream flow management actions. The percentage change (5%) is the performance metric to be evaluated and requires significant period of record (e.g. greater than 10-15 years of flow data).	*Implementation: (yes/no)* Audit determines that target flows are not being developed and no additional gauges are being installed. Furthermore, a minimum number of target flows may be specified for development within a certain time frame, e.g. 4 new target flow locations within 2 years of Plan adoption. *Effectiveness:* Flow statistics have not changed (or have changed less then 1% for example); alternatively, flow statistics change beyond the 5% within the planning period. Monitoring study will compare measurable benefits with costs and inform future management actions for effectiveness and continuous improvement	*Collaborative Response:* *Implementation*: COA will work with other implementing agencies to develop and implement an action plan for achieving the number of target flows to be defined. This work would be completed in conjunction with SFP-1. *Effectiveness:* Revise or update flow management actions based upon how flow statistics change. It should be noted that depending on the type of monitoring, it may be difficult to attribute cause-effect relationships in this case, unless specific management actions from above are being monitored individually to measure their effects on flow.

Notes:
(1) Monitoring Types:
I – Implementation monitoring E – Effectiveness monitoring V – Validation monitoring
(2) Coordination and oversight agency (COA) – as discussed in Section 7.3, it is recommended that the WRIA 25 and /26 Planning Unit transition from planning functions to coordination and oversight functions to follow-up on selected areas of implementation. This same group or agency is used as the "surrogate" with responsibilities for tracking the triggers in this table.

7.7.2 Recommendations for Implementing an Adaptive Management Program for the Watershed Plan

Washington State Senate Bill (SSB 5637) was passed in 2001 relating to monitoring of watershed health and salmon recovery. Through the act an action plan and comprehensive statewide monitoring strategy (CMS) was developed which noted adaptive management as a primary recommendation (Crawford et al, 2002). Although the CMS was directed primarily toward habitat monitoring for salmon recovery, the general recommendations are applicable for the overall watershed plan monitoring and adaptive management, and are specifically applicable to the habitat monitoring portion of this plan. The most relevant recommendations are as follows:

- Establish a permanent "Watershed Monitoring Council" that would provide oversight and act as a central coordinating body for data collected by different parties
- Establish a consistent funding source for monitoring; or alternatively build upon existing monitoring efforts and use coordinating body to fill data gaps.
- Adopt monitoring protocols to provide a consistent means for comparing information across geographical and temporal scales.
- Establish a "data portal" through a State agency such as the Washington State Natural Resources to share data along with developing a universal interface from which to share the database.
- Conduct all three types of monitoring (implementation, effectiveness, and validation), specifically within what is referred to as "Intensively Monitored Watersheds" (IMW), as well as in other watersheds on a less frequent basis to compare how the IMWs relate to the others.

Overall these same recommendations are considered consistent and necessary for the monitoring and adaptive management process to be effective for this Watershed Plan. However, the CMS is yet to be implemented and much of the details in such monitoring remain to be developed. It falls on the individual planning organizations to develop the details of the monitoring and how to integrate this into an adaptive management program.

7.7.3 Next Steps for Adaptive Management Program

The issues discussed above provide a starting point for implementing an adaptive management program for the watershed plan. As mentioned previously, this is a very involved process. Some of the most important adaptive management issues that need further consideration during the Implementation Phase are listed below.

- It is a given that for adaptive management to proceed and be successful, stakeholders must commit to conducting the monitoring and must also commit to the actual adaptive management steps of evaluating the new information, and responding with revisions to management actions. In the Implementation Phase it is important to identify the coordinating and oversight entities (agencies or individuals) that will lead the adaptive management effort.

- "Metrics" and "triggers" need to be evaluated in detail to indicate whether a change in the management action is needed; or with respect to "validation" monitoring whether the management action needs to be reevaluated because of an incorrect input assumption. As part of this evaluation, an "error band" should be estimated for the sources of uncertainty. For example, if demand projections change, then the need for certain management practices may be more critical, e.g. conservation may be more important in projected demands are greater than estimated.
- The intended effects and unintended direct and indirect effects that the management actions have should be evaluated. For example, how might increased flows affect other conditions in the basin such as sediment loads, flushing flows, and bank stability.
- The cost-benefit of the different management objectives should be considered. For example, what are the economic impacts to implementing these management practices, e.g. in terms of jobs vs. actual improvements in water quality, water quantity, and fish recovery.

The priority for the different management actions are listed in the previous chapters of the Watershed Plan. Generally, this prioritization applies to the associated monitoring activities for stream flow management as listed in Tables 7-3 and 7-4. However, in order to fully evaluate how much monitoring is needed and how much can be coordinated with other competing needs in the basin, a similar adaptive management review for water quantity, water quality, and habitat needs to be done during the Implementation Phase

7.8 Future Plan Updates

This Watershed Management Plan has been developed over a four-year period, with input from dozens of local leaders, state and federal agency staff, and citizens. It is the first effort in this region to assemble a comprehensive portrait of water resource needs, issues and solutions. The actions recommended in this plan were devised given current understanding of conditions as they exist at the time the Plan was developed. Over the next several years, new data will be collected, conditions may change, regulatory and funding programs may change, and new projects affecting water resources may be proposed within the region. In addition, the implementation process may result in some modifications of the recommended actions as they are actually carried out.

To accommodate this ongoing evolution of information and events in the region, it is recommended that the Watershed Management Plan be reviewed from time to time to determine whether an update is needed. This review should be carried out by the Planning Unit, as one of its implementation responsibilities. The first review should occur within three years of the date this Plan is approved by the County Boards of Commissioners.

The Phase 4 Committee Report to the Legislature identified the following questions for a review of this type:

- Have the actions listed in the Plan been implemented?
- Are the desired results being achieved?

- Is the overall intent of the Plan being met?
- Are there new information gaps or changing conditions that require review?
- Are there new issues that were not considered during Plan development, and that need to be addressed?

If the Planning Unit finds that an update is needed, this finding should be communicated to the original Implementing Governments that launched the WRIA 25 and 26 Watershed Plan process. It should be noted that the Watershed Management Act does not require or address updates to watershed plans, and at this time no funding is available for such updates under the Watershed Planning program. The Implementing Governments should have the responsibility to determine whether to proceed with updating the Plan, and to identify means of funding and staffing an update.

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Appendix A
WRIAs 25 and 26 Mission Statement

Appendix A
WRIAs 25 and 26 Mission Statement

Mission Statement:

"Our mission is to prepare a locally developed plan for the beneficial management of watershed resources addressing:

- water quantity,
- water quality,
- habitat, and
- in-stream flows

to meet the present and future needs of our communities, local economies, and fish and wildlife."

Appendix B
Planning Unit Ground Rules

Appendix B
Planning Unit Ground Rules

December 9, 1999

The members of the Planning Unit for Water Resource Inventory Areas 25 and 26 adopt the following ground rules for the conduct of their business.

1) We will focus our discussions on the issues associated with developing a plan for the management and use of water resources. We will avoid debating issues beyond the scope of that effort.

2) We represent a broad range of interests, each having an interest in how our water resources are used and protected. We recognize the legitimacy of each other's interests and concerns in our efforts to forge an effective and viable management plan.

3) All participants will be treated with respect and dignity. We will not tolerate personal attacks directed at individuals and agencies.

4) We commit to understanding each other's interests and concerns. There should be no hidden agendas. We will openly and candidly share our concerns and interests and engage in thoughtful dialogue. We will listen carefully. We will ask questions for clarification. We will respect each other's right to disagree.

5) We commit not to characterize each other's motivations, values, or positions in any discussions that we may have with the press. We will not attribute specific statements or positions to a participant without their prior approval. We commit to work out our differences at the table rather than in the press.

6) We commit to search for opportunities and creative solutions. We will focus on problem solving, rather than stating positions.

7) We commit to making decisions by consensus. Consensus does not require that all members endorse or agree with the proposal or decision, but at a minimum all members must be willing to accept the proposal or decision. Members may be polled_to determine their position on an issue or decision. If consensus cannot be reached, the participants may:

   a) Determine if the decision is critical to the group's work. If not, the group may decide to drop the decision or proposal;

   b) Consider appointing a subgroup to examine the issue and, if possible, submit a revised proposal to the full group for consensus consideration; Consider adopting several alternatives or options for addressing an issue; Delay the decision; or

   c) Caucus.

8) We agree that this planning effort is a priority in terms of committing our time and resources. We agree that consistency in participation is critical. Accordingly, we commit to make every effort to attend meetings of the planning unit and read meeting minutes. However, in recognition that events may periodically arise which prevent attendance, each participant may name an alternate to attend meetings on his or her behalf. The alternate will not simply be an observer, but will have the same authority to act as the principal participant. The participants shall be responsible for ensuring their alternate is informed and fully prepared to participate.

9) All participants accept the responsibility of keeping their associates, organization, or constituency informed of planning unit's progress and issues under discussion. Each participant also accepts the responsibility of representing the needs and interests of their associates, organization, or constituencies. Adequate time will be provided prior to major decisions to allow participants to consult with their associates, organization, or constituency. Agendas will clearly identify all action items. Strategic checkpoints will be established to allow participants to review progress made with their associates, organization or constituency and report back any concerns to the group. A participant may ask the group to reconsider any decisions within two months following the decision.

10) The use and protection of our water resources is an important public issue. Our meetings will be open to the public and we will make time available at each meeting for the members of the public to share their concerns, interests, and suggestions with us. Meeting notices will be sent to newspapers within WRIA 25 and 26.

11) We agree that anyone may resign from the planning unit at anytime. If the reason for resignation stems from a concern with the work or conduct of the planning unit, the participant will advise the other participants of this concern and allow them to the opportunity to resolve the problem before resigning.

12) We will keep minutes of our meeting. The minutes shall summarize the discussions and document the decisions of the planning unit. They will not attribute statements to specific participants.

Appendix C
Operating Principles

Appendix C
Operating Principles

Definition of Consensus for WRIA 25/26						
Endorse	Endorse with a minor point of contention	Agree with reservation	Abstain	Stand aside	Formal disagreement but will go with the majority	Block
"I like it"	"Basically I like it"	"I can live with it"	"I have no opinion"	"I don't like it but I don't want to hold up the group"	"I want my disagreement to be noted in writing but I'll support the decision"	"I veto this proposal"

Consensus is defined in terms of agreement along a continuum. Team Members may register the degree of their agreement with the language in any of the fist six columns:
Adapted from: "Facilitator's Guide to Participatory Decision Making," 1996.
The last (shaded) column on the right side of the continuum is *not* considered acceptable for consensus in this process.

Appendix D
Water Supply Management Techniques

Appendix D
Water Supply Management Techniques

This appendix provides a comparison between six water supply management strategies: development of new surface and ground water sources; water conservation; water reclamation and reuse; water transfers; aquifer storage and recovery; and surface water storage. The benefits and constraints of each strategy are discussed, and their general effectiveness for providing water supplies and managing stream flows in WRIAs 25 and 26 is characterized.

1. New Water Supply Development

Description

The majority of growth in WRIAs 25 and 26 is anticipated to occur in the municipal water use category. Throughout the basin, municipal purveyors rely on a combination of surface water and ground water supplies. This strategy involves development of additional future supplies from either surface or ground water. As water rights are put to beneficial use, water purveyors may look to developing new sources either by new surface water diversions or new ground water withdrawals.

Effectiveness and Feasibility

The development of additional surface water supplies to meet municipal demands has been previously explored by some purveyors. In general, the effectiveness and feasibility of each alternative (surface or ground water) is dependent on the location of the purveyor in the basin and the abundance of high quality ground water. For example, the City of Longview already has a treatment plant on the Cowlitz River, which makes expansion of the surface water treatment facility highly feasible; whereas some other providers may not have access to a significant surface water supply that low in the basin.

The primary challenge faced by those desiring to develop additional supplies is obtaining water rights. Although it is possible to obtain new rights in WRIAs 25 and 26, the process can be lengthy and expensive, due to the current backlog of water right applications at the Department of Ecology (Ecology) and the need to thoroughly evaluate potential impacts to other water right holders and competing interests. Although the water right application process may be challenging, it is still considered more favorable than the other options discussed below.

As with all of the strategies discussed in this chapter, environmental factors must be addressed when planning for this water supply alternative. One specific issue of importance relative to development of additional ground water supplies is hydraulic continuity, which refers to the interaction between ground water and surface water bodies. Depending on the unique circumstances associated with the hydrogeology of a basin, increased ground water pumping rates can cause decreases in flows of nearby

streams at some places and some times. Ecology requires that this potential effect be considered when evaluating new source development.

2. Water Conservation

Description

Water conservation refers to the beneficial reduction of water use, loss, or waste. Conservation measures can be implemented within the municipal, industrial, and agricultural sectors.

In the municipal context, water conservation consists of a range of activities involving both water systems and their customers. At the customer end, "demand-management" programs use elements such as public information to encourage customers to manage their water use; installing high-efficiency plumbing fixtures and appliances; and using rate structures to provide economic incentives for water-use efficiency. These programs typically target certain types of water use that are particularly large for a given community, such as residential indoor uses, residential outdoor uses, non-residential indoor uses, and non-residential outdoor uses. With respect to the public water system itself, conservation involves improving the efficiency of water system operation, by minimizing losses and managing system uses such as flushing of water mains, draining storage reservoirs for maintenance, and finding and repairing leaks in water mains. Water systems must submit a water conservation plan outlining measures to be implemented, as a condition for approval of Water System Plans and issuance of new water right permits.

The importance of water conservation in the municipal sector has recently been reaffirmed with the passage of House Bill 1338 during the 2003 legislative session. Section 7 of this law authorizes Ecology to establish water efficiency requirements, to be applied to all municipal water purveyors. By December 31, 2005, Ecology is to have adopted rules that outline conservation planning requirements, develop water distribution system leakage standards, and establish minimum conservation performance reporting requirements. These rules will likely be based in large part upon existing mechanisms, such as those in use by DOH in relation to water system planning. The new rules are anticipated to strengthen conservation requirements and thereby reduce the need for development of additional water supplies to meet future demands.

In the industrial context, water conservation consists of a range of activities based on the size and type of industry. Because of the large volumes associated with these users, opportunities often exist to conserve significant quantities of water. On a daily basis, industrial facilities may use on the order of hundreds of thousands to millions of gallons of water. Industries have various incentives to initiate a water conservation program, such as reducing operating and wastewater treatment costs, reducing energy consumption, reducing demand relative to the available supply or water right, or in order to take advantage of financial incentive programs offered by municipal water suppliers. Larger industries often have in-house engineering capability to identify opportunities to save water.

In the agricultural context, water conservation involves different technologies and approaches, in comparison with the municipal sector. Efficiency measures at the individual farm level would typically be implemented by the landowner and/or agricultural producer raising a crop or producing livestock. Examples of on-farm measures, such as may be implemented within WRIAs 25 and 26, are:

- Replacement of unpressurized irrigation systems with pressurized spray systems, microspray or drip systems;
- Use of soil moisture sensors to optimize water applications;
- Refinement of irrigation scheduling to optimize water-use efficiency; and,
- On-farm ponds or pump-back systems to capture and reuse tailwater.

There are no irrigation districts in WRIAs 25 and 26, and farm operations that are present do not have extensive canal systems. Therefore, water-use efficiency measures typical of irrigation district conveyance systems are not applicable in this region.

Effectiveness and Feasibility

In any community, water conservation can be viewed as a continuum, from less aggressive and less costly programs; to more aggressive and more expensive programs. Some water conservation measures have already been implemented within WRIAs 25 and 26. The major public water systems throughout the basin have conducted public outreach and education efforts. In addition, some systems have instituted fixture retrofits (showerheads and toilets) and implemented leak detection and repair programs. There is potential for additional water savings to be realized through conservation at the major public water system level in the Longview-Kelso area, due to the fact that there are some conservation strategies that have not yet been employed, or have been applied only in limited areas. However, these may come at a higher cost. The smaller communities also have opportunities for yielding water use savings; however, their resources may be more limited in terms of developing and implementing these programs.

Some of the factors involved in evaluating the applicability of water conservation efforts in a given community are:

- Relationship between the cost per unit volume of water saved via conservation, compared with the cost per unit volume of water obtained by other supply strategies.
- Policy choices that may encourage conservation even in the absence of a cost-effectiveness benefit.
- Level of interest and support for conservation among the general public.

Currently, many of the major water users are implementing water conservation measures to varying degrees. The most prominent example in the WRIAs is the joint Comprehensive Water Plan adopted by the cities of Kelso and Longview, and Cowlitz PUD. Current conservation measures implemented by the three purveyors include metering of all connections, source metering, a pipeline replacement program, bills

showing consumption history, water saving kits for the community, and a leak detection program. In addition, Kelso and Cowlitz PUD also have a uniform rate structure. In the future, these two purveyors plan to increase public information related to conservation and to evaluate conservation-oriented rates (inverted block rates). The purveyors state that future management strategies would develop as the supply and demand picture change over the next 20 years.

Some of the smaller purveyors have also instituted conservation programming, though to a lesser degree. Several of these purveyors have expressed an interest in additional conservation programming in the future as demand increases and a larger portion of their water right is used.

Water conservation has been used in the industrial sector in WRIAs 25/26. For example, Longview Fibre has a modernization and expansion project underway, but plans to meet the increased water needs by continuing its water conservation and re-use efforts. The conservation methods in place include process water reuse and recycling, clarification, filtration, and heat and chemical reclamation. Due to the industrial sector's large volumes of water used, this sector continues to represent an opportunity to reap significant conservation savings in addition to the savings already gained.

A portion of the WRIA 25/26 population relies upon individual, private wells for water supply. Additional gains are possible with the development of programs specifically targeting this group of water users. Such programs are uncommon, due to the lack of a governmental entity (state or local) that is responsible for promoting water conservation within this particular water use category.

Where there are an abundance of opportunities in the municipal water conservation arena, there are relatively limited opportunities in WRIAs 25/26 to develop large irrigation conservation projects since there are no irrigation districts in the basin and farm operations that are present are not known to have extensive canal systems. Conservation practices would most likely fall on the onus of individual farm owners; however a lack of incentive to implement conservation may limit the impact of this option.

3. Water Reclamation and Reuse

Description

Water reclamation and reuse refers to the capture, treatment, and reuse of wastewater, typically for non-potable purposes. By using this as a source of water, the need for water from natural sources can be reduced. Wastewater reuse can apply both to municipal wastewater systems and the wastewater systems associated with individual industrial facilities. Typical applications of reclaimed municipal wastewater include landscape and golf course irrigation. Industrial wastewater reuse often takes the form of water recycling, where used process water is captured, treated if necessary, and used again in the same process or for a different purpose altogether.

Effectiveness and Feasibility

Municipal wastewater reuse is not an attractive water supply strategy for WRIAs 25 and 26 in the near future, in relation to other water supply alternatives. This is due primarily to the high implementation costs of municipal wastewater reuse projects and a general lack of acceptance of reclaimed water, among the public at large. Policy decisions and shifts in public perception would be needed to create a climate in which municipal wastewater reuse is viewed as a means by which water resources may be better utilized in the basin in the future.

Water reuse and recycling in the industrial sector is currently much more feasible than in the municipal sector for WRIAs 25 and 26, due to lower costs (relative to implementation of municipal reuse projects), fewer public concerns (as the public is less likely to come into contact with industrial reuse water), and the desire by some industries to promote an environmental ethic. Water-intensive industries in the basin have already implemented water recycling processes, typically driven by water withdrawal or wastewater discharge permit constraints. Additional future water savings are anticipated in the industrial sector, as water recycling systems become more common and less costly. As discussed in the conservation section, large industries in the Longview-Kelso area are currently implementing reuse practices as part of their overall water conservation program. However, continuation of this practice is significantly financially driven. In addition, benefits from reuse are primarily limited to the Lower Cowlitz and Coal Creek subbasins, since the large industrial/commercial users are primarily located in the Longview-Kelso area. Municipalities are not currently using reuse practices (graywater) as part of their conservation program.

4. Water Transfers

Description

This strategy involves changing an existing water right to meet needs associated with a different use or a different location than originally defined in the water right. Transfers (also known as water right changes) do not increase the overall amount of water being used in a basin; rather, they modify where and how the water is used.

Common types of changes involve the transfer of water from agricultural or commercial/industrial usage to municipal consumption. Such transfers have been increasingly used throughout the western states over the past 10 to 15 years. The reasons for this include:

- Rapid population growth in many areas, leading to a high demand for municipal water supplies;
- Quantities of water that appear relatively small in the irrigation or industrial context can have a significant impact on the ability to meet growing demands in the municipal context; and,

- These two together can lead to high prices for water transferred to municipal use, and this provides a strong incentive for irrigators and industries to transfer water to serve municipal needs.

Under State law, a water right holder may also transfer an existing water right to the State of Washington, to be held in reserve in the state's trust water rights program. Such reserved rights may be used by Ecology for instream flows or other beneficial uses.

Effectiveness and Feasibility

The attractiveness of transfers as a water supply management option in WRIAs 25 and 26 varies between the different types of transfers discussed above. Transfers of water rights from agricultural to municipal usage are not as feasible in WRIAs 25 and 26 as they could be in other, more irrigation-intensive areas of the state. Agricultural water use accounts for less than 17% of the total water used in WRIAs 27 and 28. Many existing agricultural water rights are typically not of enough size or in an appropriate location for use by municipal water consumers in the basin.

Transfers of industrial water rights to use for municipal purposes do have potential in WRIAs 25 and 26 in the Longview-Kelso area, but is not highly applicable in other parts of the basin. In a situation where an industrial water user scales back production, leaving a portion of its water right unused, that amount of water could be sold or leased to a public water system for municipal purposes.

Similar to the water rights constraint noted for new source development, the processing of water right transfers can be lengthy and involve evaluation to ensure other water right holders are not impaired by the transfer and to guarantee that competing interests are considered. Recent changes in State law have addressed this issue in part by allowing water right change applications to be processed on a different schedule than that used for reviewing applications for new water rights. In addition, water conservancy boards have been given the authority to process change applications (with Ecology retaining the authority to issue final determinations), in order to make the process more efficient.

5. Aquifer Storage and Recovery

Description

In areas where water availability is limited on a seasonal basis, excess water can be injected into ground water aquifers during wet periods and then withdrawn during dry periods to aid in meeting water demands. This process, known as Aquifer Storage and Recovery (ASR), serves to optimize the use of existing water resources, especially in areas dependent primarily upon surface water supplies. There are currently no sites being considered for ASR projects within WRIA 25/26.

Effectiveness and Feasibility

ASR is currently not an attractive water supply option in WRIAs 25 and 26, because ASR implementation costs can be quite high (especially for smaller communities) and there are many legal and political uncertainties regarding ASR at this time. There are other issues surrounding ASR. For example, the viability of ASR requires that the organization storing water underground have a reasonable assurance that other users will not deplete the resource, and that water rights will permit withdrawals when needed. There are also uncertainties in ground water quality resulting from mixing injected water with water already present in the aquifer.

6. Surface Water Storage

Description

Similar to ASR in its overall objective, surface water storage (i.e., impoundments and reservoirs) is often used where surface water supplies are limited on a seasonal basis. During wet periods, when excessive flows are present, water is captured and retained for use later during drier periods.

New water storage or enhancements to existing structures can be configured to deliver different types of benefits or to serve multiple purposes. It is a flexible management option, but also can have potentially significant environmental issues and often requires significant capital. There are generally four categories of storage enhancements: (1) new on-channel dams; (2) new off-channel dams; (3) raise existing dams; and (4) aquifer storage and recovery (discussed further in Section 4.6).

Storage projects are typically complex in terms of site needs, engineering consideration, permitting, and financing. Typically, planning units will be able to complete a general review of storage as a strategy, but must identify a particular project proponent to fund and carry out the more detailed studies toward developing an actual storage option. In general, identification and screening of potential storage sites can be a long process involving public and agency review. Critical information needed to evaluate storage options at the planning level include:

- Need to inventory existing dams and their feasibility for enhancement; potential sites for storage facilities.
- Need to review relationship between storage and other strategies.
- Implementation issues: permitting, water rights, land acquisition, financing, ownership and operation.

Effectiveness and Feasibility

Based on the limited water supply needs in the basin, the significant resources required to pursue storage projects, and the potential environmental impacts and mitigation requirements, surface water storage is currently not an attractive water supply option in

WRIAs 25 and 26. The large user category for which the majority of growth is anticipated in WRIAs 25 and 26 rely primarily upon the Cowlitz River. Due to the abundance of surface water supplies from the mainstem Cowlitz, water providers in these categories have little desire to develop surface water storage to meet future needs. Pipelines are required to convey water from storage sites to users. Furthermore, the cost of implementation, technical complexity, legal considerations, permitting requirements, and environmental concerns (e.g., impacts to instream flows) associated with surface water storage projects pose substantial challenges.

The Level 1 Assessment identified 37 storage facilities within WRIA 25/26 that serve various purposes including sewage lagoons, hydroelectric power generation, flood control, and agricultural water supply. Mayfield Dam and Mossyrock Dam are the two primary storage projects used for hydroelectric power and are owned by City of Tacoma. Operations of these facilities are undergoing review as part of the FERC re-licensing. Cowlitz Falk Dam, which impounds Lake Scanewa, is a smaller storage project used for hydroelectric generation and is owned by Lewis County PUD. At this time, there are no known plans for constructing new storage projects in the WRIA 25/26 basin.

Appendix E
Water Quality Monitoring Activities in WRIAs 25 and 26

Appendix E
Water Quality Monitoring Activities in WRIAs 25 and 26

Agency	WRIA	Watershed	Site No.	Monitoring Location	Lat/Long	Parameters	Yrs. Monitored[6]	Test Frequency	Monitoring Objectives	Funding Sources	Data Management/ QA/QC
State											
Ecology[2]	25		25B070	Grays River near Grays River	lat.26.35944, long.123.5653	Cond, FC, NH3-N, NO2-NO3, OPDIS, DO, pH, Press, SusSol, Temp, TPP, TPN, Turb.	73, 76, 77, 98	Monthly - Basin	Statewide and regional assessment	NA	Per Ecology Standards (1)
Ecology[2]	25	Skamokawa/ Elochoman	25C070	Elochoman River near Cathlament	lat.46.22111, long.123.3419	same as above	60, 73, 76, 77, 98	same as above	same as above	NA	same as above
Ecology[2]	26	Lower Cowlitz	26B070	Cowlitz River @ Kelso	lat.46.14556, long.122.9131	same as above	92-02	Monthly - Long-term	same as above	NA	same as above
Ecology[2]	26	Coweeman	26C080	Coweeman River @ Goble Creek	lat.46.27472, long.122.9122	same as above	98	Monthly - Basin	same as above	NA	same as above
Ecology[2]	26	Coweeman	26C070	Coweeman River @ Kelso	lat.46.13805, long.122.8958	same as above	66-62, 71, 72, 75, 84-92, 98	same as above	same as above	NA	same as above
Ecology[2]	26	Toutle	26D070	Toutle River near Castle Rock	lat.46.31944, long.122.9078	same as above	60-67, 69, 70, 72, 78-79	same as above	same as above	NA	same as above
Ecology[2]	26	Lower Cowlitz	26B150	Cowlitz River @ Toledo	lat.46.43889, long.122.8431	same as above	62-66,72,75,78-80,92	same as above	same as above	NA	same as above
Federal											
USFS [3]	26	Cispus River	-	Walupt Creek above Lake	NA	Temp	01	Every 30 mins. - July 1 - Sept 15	Compliance w/ CWA and NW Forest Plan	USFS appropriated funds	NA
USFS [3]	26	Cispus River	-	Walupt Creek near confluence w/ Cispus River	NA	same as above	01	same as above	same as above	same as above	NA
USFS [3]	26	Cispus River	-	East Canyon Creek near confluence w/ Cispus River	NA	same as above	94-97, 99-01	same as above	same as above	same as above	NA
USFS [3]	26	Cispus River	-	Cispus Rive above Pinto Creek	NA	same as above	01	same as above	same as above	same as above	NA
USFS [3]	26	Cispus River	-	North Fork Cispus River near confluence w/ Cispus River	NA	same as above	91-95, 97-01	same as above	same as above	same as above	NA
USFS [3]	26	Cispus River	-	Yellowjacket Creek above Badger Creek	NA	same as above	01	same as above	same as above	same as above	NA
USFS [3]	26	Cispus River	-	Badger Creek above Yellowjacket Creek	NA	same as above	01	same as above	same as above	same as above	NA
USFS [3]	26	Cispus River	-	Yellowjacket Creek above Pinto Creek	NA	same as above	01	same as above	same as above	same as above	NA
USFS [3]	26	Cispus River	-	Pumice Creek above Pinton Creek	NA	same as above	01	same as above	same as above	same as above	NA
USFS [3]	26	Cispus River	-	Pinto Creek above Yellowjacket Creek	NA	same as above	01	same as above	same as above	same as above	NA
USFS [3]	26	Cispus River	-	Yellowjacket Creek above McCoy Creek	NA	same as above	01	same as above	same as above	same as above	NA
USFS [3]	26	Cispus River	-	McCoy Creek above Yellowjacket Creek	NA	same as above	01	same as above	same as above	same as above	NA
USFS [3]	26	Cispus River	-	Yellowjacket Creek above Canyon Creek	NA	same as above	01	same as above	same as above	same as above	NA

Appendix E (cont)
Water Quality Monitoring Activities in WRIAs 25 and 26

Agency	WRIA	Watershed	Site No.	Monitoring Location	Lat/Long	Parameters	Yrs. Monitored	Test Frequency	Monitoring Objectives	Funding Sources	Management/ QA/QC
USFS [3]	26	Cispus River	-	Yellowjacket Creek near confluence w/ Cispus River	NA	same as above	96, 99-01	same as above	same as above	same as above	NA
USFS [3]	26	Cispus River	-	Greenhorn Creek above Soldier Creek	NA	same as above	01	same as above	same as above	same as above	NA
USFS [3]	26	Cispus River	-	Soldier Creek above Greenhorn Creek	NA	same as above	01	same as above	same as above	same as above	NA
USFS [3]	26	Cispus River	-	Greenhorn Creek above 1918 Creek	NA	same as above	01	same as above	same as above	same as above	NA
USFS [3]	26	Cispus River	-	Jefferson Creek above Greenhorn Creek	NA	same as above	01	same as above	same as above	same as above	NA
USFS [3]	26	Cispus River	-	1918 Creel above Greenhorn Creek	NA	same as above	01	same as above	same as above	same as above	NA
USFS [3]	26	Cispus River	-	Trapper Creek above Greenhorn Creek	NA	same as above	01	same as above	same as above	same as above	NA
USFS [3]	26	Cispus River	-	Greenhorn Creek .5 mi above Cispus River	NA	same as above	01	same as above	same as above	same as above	NA
USFS [3]	26	Cispus River	-	Greenhorn Creek near confluence w/ Cispus River	NA	same as above	01	same as above	same as above	same as above	NA
USFS [3]	26	Cispus River	-	Iorn Creek above Big Creek	NA	same as above	01	same as above	same as above	same as above	NA
USFS [3]	26	Cispus River	-	Big Creek above Iorn Creek	NA	same as above	01	same as above	same as above	same as above	NA
USFS [3]	26	Cispus River	-	Iorn Creek above Benham Creek	NA	same as above	01	same as above	same as above	same as above	NA
USFS [3]	26	Cispus River	-	Fourmile Creek above Iorn Creek	NA	same as above	01	same as above	same as above	same as above	NA
USFS [3]	26	Cispus River	-	Benham Creek above Iorn Creek	NA	same as above	01	same as above	same as above	same as above	NA
USFS [3]	26	Cispus River	-	Iorn Creek above Canyon Creek	NA	same as above	01	same as above	same as above	same as above	NA
USFS [3]	26	Cispus River	-	Iorn Creek near confluence w/ Cispus River	NA	same as above	96, 99-01	same as above	same as above	same as above	NA
USFS [3]	26	Cispus River	-	Quartz Creek 1 mi above Cispus River	NA	same as above	01	same as above	same as above	same as above	NA
USFS [3]	26	Cispus River	-	Chambers Creek near confluence w/Cispus River	NA	same as above	94, 00	same as above	same as above	same as above	NA
USFS [3]	26	Cispus River	-	East Canyon Creek above Dark Creek	NA	same as above	94, 95	same as above	same as above	same as above	NA
USFS [3]	26	Cispus River	-	Cispus R 1 mi below confluence w/ Lorn Creek	NA	same as above	91-92, 96-00	same as above	same as above	same as above	NA
USFS [3]	26	Upper Cowlitz River	-	NF Willame Creek above confluence w/ Willame Creek	NA	same as above	96, 98-01	same as above	same as above	same as above	NA
USFS [3]	26	Upper Cowlitz River	-	Lillian Creek above confluence w/ Willame Creek	NA	same as above	01	same as above	same as above	same as above	NA

Appendix E (cont)
Water Quality Monitoring Activities in WRIAs 25 and 26

Agency	WRIA	Watershed	Site No.	Monitoring Location	Lat/Long	Parameters	Yrs. Monitored	Test Frequency	Monitoring Objectives	Funding Sources	Management/ QA/QC
USFS [3]	26	Upper Cowlitz River	-	SF Willame Creek above confluence w/ Willame Creek	NA	same as above	01	same as above	same as above	same as above	NA
USFS [3]	26	Upper Cowlitz River	-	Willame Cr .5 mi above Cowlitz River	NA	same as above	98-01	same as above	same as above	same as above	NA
USFS [3]	26	Upper Cowlitz River	-	Silver Creek above Lake Creek	NA	same as above	99,01	same as above	same as above	same as above	NA
USFS [3]	26	Upper Cowlitz River	-	Silver Creek above EF Silver Creek	NA	same as above	01	same as above	same as above	same as above	NA
USFS [3]	26	Upper Cowlitz River	-	EF Silver Creek above confluence w/ Silver Creek	NA	same as above	01	same as above	same as above	same as above	NA
USFS [3]	26	Upper Cowlitz River	-	Silver Creek 1.5 mi above Cowlitz River	NA	same as above	92, 95-01	same as above	same as above	same as above	NA
USFS [3]	26	Upper Cowlitz River	-	Silver Creek 1 mi above Cowlitz River	NA	same as above	01	same as above	same as above	same as above	NA
USGS [4]	26	Coweeman River	14242690	Coweeman River	NA	Temp, sed, pH, cond	80-82	NA	NA	NA	NASQAN Standards
USGS [4]	26	Coweeman River	14242580	Coweeman River	NA	Temp, sed.	50-73	NA	NA	NA	same as above
USGS [4]	26	Coweeman River	14245000	Coweeman River	NA	Temp	50-72	NA	NA	NA	same as above
USGS [4]	26	Lower Cowlitz River	14236200	Lower Cowlitz River	NA	Temp	65-72	NA	NA	NA	same as above
USGS [4]	26	Toutle River	14241490	Toutle River	NA	Temp, sed, cond.	81	NA	NA	NA	same as above
USGS [4]	26	Toutle River	14241500	Toutle River	NA	Sed.	81	NA	NA	NA	same as above
USGS [4]	26	Toutle River	14243000	Toutle River	NA	Temp, cond.	90-91	NA	NA	NA	same as above
USGS [4]	26	Tilton/Mayfield River	14238000	Tilton River	NA	Temp	50-82	NA	NA	NA	same as above
USGS [4]	26	Tilton/Mayfield River	14234810	Mayfield Dam	NA	same as above	70-82	NA	NA	NA	same as above
USGS [4]	26	Upper Cowlitz River	1422650	Upper Cowlitz River	NA	same as above	71	NA	NA	NA	same as above
USGS [4]	26	Upper Cowlitz River	14232500	Upper Cowlitz River	NA	same as above	50-72	NA	NA	NA	same as above
USGS [4]	26	Upper Cowlitz River	14233400	Upper Cowlitz River	NA	same as above	53-82	NA	NA	NA	same as above
Local											
Town of Cathlamet	25	Elochoman	-	Water Supply Intake	NA	pH, temp, turbidity	not researched	Daily	Drinking water	water system rates	Not researched
Town of Cathlamet	25	Elochoman	-	Water Supply Intake	NA	fecal coliform	not researched	monthly	same as above	same as above	same as above
City of Longview	25	Cowlitz	-	Water Supply Intake	NA	pH, temp, turbidity	not researched	daily	same as above	same as above	same as above
City of Longview	25	Cowlitz	-	Water Supply Intake	NA	total organic carbon, alkalinity	not researched	monthly	same as above	same as above	same as above
City of Kelso	26	Cowlitz	-	Water Supply Intake	NA	pH, temp, turbidity	not researched	daily	same as above	same as above	same as above
City of Kelso	26	Cowlitz	-	Water Supply Intake	NA	total coliform, fecal coliform, total organic carbon	not researched	monthly	same as above	same as above	same as above

Appendix E (cont)
Water Quality Monitoring Activities in WRIAs 25 and 26

Agency	WRIA	Watershed	Site No.	Monitoring Location	Lat/Long	Parameters	Yrs. Monitored	Test Frequency	Monitoring Objectives	Funding Sources	Data Management/ QA/QC
City of Kelso	26	Cowlitz	-	Water Supply Intake	NA	Fe, Mn	not researched	occasional	same as above	same as above	same as above
Town of Castlerock	26	Cowlitz	-	Water Supply Intake	NA	pH, temp, turbidity	not researched	daily	same as above	same as above	same as above
Town of Castlerock	26	Cowlitz	-	Water Supply Intake	NA	fecal coliform	not researched	monthly	same as above	same as above	same as above
Cowlitz and Wahkiakum Conservation District [5]	25	Mill-Germany Creek	-	Abernathy Creek (lower)	NA	Temp	97-01	Reading every half hour (June-October)	NA	Centennial Clean Water Fund	Quality Assurance plan after 2002
same as above	25	Mill-Germany Creek	-	Abernathy Creek (2 mid)	NA	same as above	00-01	same as above	NA	same as above	same as above
same as above	25	Mill-Germany Creek	-	Abernathy Creek (upper)	NA	same as above	00-01	same as above	NA	same as above	same as above
same as above	25	Mill-Germany Creek	-	Cameron Creek	NA	same as above	01	same as above	NA	same as above	same as above
same as above	25	Mill-Germany Creek	-	Slide Creek	NA	same as above	00	same as above	NA	same as above	same as above
same as above	25	Mill-Germany Creek	-	Wiest Creek	NA	same as above	00	same as above	NA	same as above	same as above
same as above	25	Lower Cowlitz River	-	Arkansas Creek (lower)	NA	same as above	94-96, 01	same as above	NA	same as above	same as above
same as above	25	Lower Cowlitz River	-	Arkansas Creek (mid)	NA	same as above	01	same as above	NA	same as above	same as above
same as above	25	Lower Cowlitz River	-	Arkansas Creek (upper)	NA	same as above	01	same as above	NA	same as above	same as above
same as above	25	Mill-Germany Creek	-	Coal Creek (lower)	NA	same as above	01	same as above	NA	same as above	same as above
same as above	25	Mill-Germany Creek	-	Coal Creek (upper)	NA	same as above	00	same as above	NA	same as above	same as above
same as above	25	Mill-Germany Creek	-	Harmony Creek	NA	same as above	00-01	same as above	NA	same as above	same as above
same as above	25	Mill-Germany Creek	-	East Fork Coal Creek	NA	same as above	85, 00-01	same as above	NA	same as above	same as above
same as above	26	Coweeman River	-	Coweeman River (3 sites)	NA	same as above	85, 00-01	same as above	NA	same as above	same as above
same as above	26	Coweeman River	-	Goble Creek	NA	same as above	85, 00-01	same as above	NA	same as above	same as above
same as above	26	Coweeman River	-	Mulholland Creek	NA	same as above	85	same as above	NA	same as above	same as above
same as above	25	Crooked Creek	-	Crooked Creek	NA	same as above	00-01	same as above	NA	same as above	same as above
same as above	25	Deep River	-	Deep River (2 sites)	NA	same as above	01	same as above	NA	same as above	same as above
same as above	25	Deep River	-	Hendrickson Creek	NA	same as above	01	same as above	NA	same as above	same as above
same as above	25	Lower Cowlitz River	-	Delameter Creek (lower)	NA	same as above	94-96, 01	same as above	NA	same as above	same as above
same as above	25	Lower Cowlitz River	-	Delameter Creek (2 sites)	NA	same as above	01	same as above	NA	same as above	same as above
same as above	25	Lower Cowlitz River	-	Monahan Creek	NA	same as above	01	same as above	NA	same as above	same as above

Appendix E (cont)
Water Quality Monitoring Activities in WRIAs 25 and 26

Agency	WRIA	Watershed	Site No.	Monitoring Location	Lat/Long	Parameters	Yrs. Monitored	Test Frequency	Monitoring Objectives	Funding Sources	Data Management/ QA/QC
same as above	25	Lower Cowlitz River	-	Tucker Creek	NA	same as above	94-96	same as above	NA	same as above	same as above
same as above	25	Skamokawa/ Elochoman	-	Elochoman River (lower)	NA	same as above	00-01	same as above	NA	same as above	same as above
same as above	25	Skamokawa/ Elochoman	-	Elochoman River (mid)	NA	same as above	00-01	same as above	NA	same as above	same as above
same as above	25	Skamokawa/ Elochoman	-	Elochoman River (upper)	NA	same as above	00-01	same as above	NA	same as above	same as above
same as above	25	Skamokawa/ Elochoman	-	Beaver Creek	NA	same as above	00-01	same as above	NA	same as above	same as above
same as above	25	Skamokawa/ Elochoman	-	West Fork Elochoman	NA	same as above	01	same as above	NA	same as above	same as above
same as above	25	Mill-Germany Creek	-	Germany Creek (lower)	NA	same as above	99-01	same as above	NA	same as above	same as above
same as above	25	Mill-Germany Creek	-	Germany Creek (upper, mid)	NA	same as above	00-01	same as above	NA	same as above	same as above
same as above	25	Grays River	-	Grays River (lower)	NA	same as above	00-01	same as above	NA	same as above	same as above
same as above	25	Grays River	-	Grays River (above S. Fork)	NA	same as above	00-01	same as above	NA	same as above	same as above
same as above	25	Grays River	-	Hull Creek	NA	same as above	00-01	same as above	NA	same as above	same as above
same as above	25	Grays River	-	West Fork Grays River	NA	same as above	00-01	same as above	NA	same as above	same as above
same as above	25	Grays River	-	Blaney Creek	NA	same as above	00	same as above	NA	same as above	same as above
same as above	25	Grays River	-	East Fork Grays River	NA	same as above	00-01	same as above	NA	same as above	same as above
same as above	25	Grays River	-	Mitchell Creek	NA	same as above	00-01	same as above	NA	same as above	same as above
same as above	25	Jim Crow Creek	-	Jim Crow Creek	NA	same as above	01	same as above	NA	same as above	same as above
same as above	25	Lower Cowlitz River	-	Leckler Creek (mouth)	NA	same as above	96	same as above	NA	same as above	same as above
same as above	25	Lower Cowlitz River	-	Leckler Creek (lower)	NA	same as above	99-00	same as above	NA	same as above	same as above
same as above	25	Lower Cowlitz River	-	Leckler Creek (2 lower-mid)	NA	same as above	96,99-00	same as above	NA	same as above	same as above
same as above	25	Lower Cowlitz River	-	Leckler Creek (mid)	NA	same as above	96	same as above	NA	same as above	same as above
same as above	25	Lower Cowlitz River	-	Hepler Canyon Trib.	NA	same as above	99-00	same as above	NA	same as above	same as above
same as above	25	Lower Cowlitz	-	Leckler Creek (upper)	NA	same as above	99-00	same as above	NA	same as above	same as above

Long-term - data collected every year. Basin - data collected for one year and may be revisited every five years.

Abbreviations: Cond. (Conductivity), DO (Dissolved Oxygen), FC (Fecal Coliform), NH3-N (Ammonia Nitrogen), NO2-NO3 (Nitrite-Nitrate), OPDIS (Phosphorous Soil Reaction), Press (Barometric Pressure), SusSol (Suspended Solids), Temp

NA - Not available at this time

Notes:

1 Ecology monitoring protocols can be found in Ecology's publication "Stream Sampling Protocols for the Environmental Monitoring Trends Section"

2 Data from the Washington State Department of Ecology's website www.ecy.wa.gov/apps/watersheds/riv/stationlistbywria.asp?wria=25

3 Data from the Eleventh Annual Monitoring and Evaluation Report for the Gifford Pinchot National Forest for the fiscal year 2001.

4 Data from the Level 1 assessment Table 8-6 USGS Historical Daily Water Monitoring Stations in WRIA 25 and 26

5 Data from the Cowlitz Conservation District spreadsheet titled Summary of sites monitored by Cowlitz and Wahkiakum conservation districts from 1985 through 2001.

6 Data current through end of 2001

Appendix F
Draft 2002/2004 List of Impaired Waterbodies in WRIAs 25 and 26

Table F-1
Draft 2002/2004 List of Impaired Waterbodies in WRIAs 25 and 26 [1]

Listed Waterbody	# of Listed Segments	Parameter(s)[2] in Violation of Water Quality Standards	Assessment Category[5]	On the 1998 303(d) List
Grays River Sub-basin				
Crooked Creek	1	Temp	5	No
Grays River	2	Temp	5	No
Grays River South Fork	1	Temp	5	No
Elochoman River Sub-basin				
Elochoman River	1	Temp	5	Yes
Skamokawa Sub-basin				
Skamokawa Creek	1	Temp	5	No
Wilson Creek	1	Temp	5	No
Abernathy/Germany Creek Sub-basin				
Abernathy Creek	3	Temp	5	Yes
Germany Creek	3	Temp	5	Yes
Coal Creek/Longview Slough Sub-basin				
Coal Creek	2	Temp	5	No
Longview Ditches[3]	6	DO; FC	5	Yes
Sacajawea Lake	1	FC	5	No
Unnamed Creek Listing #35170	1	Temp	5	No
Unnamed Creek Listing #34949	1	Temp	5	No
Upper Cowlitz River Sub-basin				
Lake Creek	1	Temp	5	No
Lynx Creek	1	Temp	5	No
Silver Creek	2	Temp	5	Yes
Lower Cowlitz River Sub-basin				
Arkansas Creek	3	Temp	5	No
Cowlitz River [4]	4	Temp; FC; Total PCBs; 4,4'-DDE	5	Yes
Delameter Creek	2	Temp	5	No
Monahan Creek	1	Temp	5	No
Ostrander Creek	1	Temp	5	No
Ostrander Creek South Fork	1	Temp	5	No
Coweeman River Sub-basin				
Baird Creek	1	Temp	5	Yes
Coweeman River	4	Temp	5	Yes
Goble Creek	2	Temp	5	Yes
Mulholland Creek	1	Temp	5	Yes
Toutle River Sub-basin				
Herrington Creek	1	Temp	5	Yes
Hoffstadt Creek	1	Temp	5	No
Schultz Creek	1	Temp	5	No
Cispus River Sub-basin				
1919 Creek	1	Temp	5	No
Cispus River	4	Temp	5	Yes
Cispus River, N.F.	1	Temp	5	Yes
East Canyon Creek	1	Temp	5	Yes
Greenhorn Creek	2	Temp	5	No
Iron Creek	1	Temp	5	Yes
Pumice Creek	1	Temp	5	No
Walupt Creek	1	Temp	5	No
Yellowjacket Creek	2	Temp	5	No

(1) From the 2002/2004 Water Quality Assessment; Department of Ecology, State of Washington. Ecology released a draft Assessment in February 2004, with public comments accepted through March 2004. Ecology will submit a revised version to the EPA for approval once revisions from the public comments are incorporated.

(2) Parameter Abbreviations: Temp (Temperature); FC (Fecal Coliform); DO (Dissolved Oxygen).

(3) Longview Ditches are not accessible by migratory fish.

(4) Cowlitz River is diverted for public water supply by the Cities of Kelso and Longview.

(5) Ecology categorizes impaired waterbodies as Category 5 (Needs a TMDL), Category 4A (Has a TMDL), Category 4B (Has a pollution control plan), and Category 4C (Impaired by a non-pollutant). This table includes all impaired listings except for Category 4C.

Appendix G
Target Flow Examples

Appendix G
Target Flow Examples

Proposed Target Flows and Management Points for Olequa Creek Drainage

The concept of target flows was discussed in Section 4. As used in this Watershed Management Plan, target flows represent a realistic flow regime that may be achievable in most years by following selected management techniques over a long period of time. A flow regime consists of a range of flows that vary seasonally based on runoff and precipitation. Target flows should therefore be a range of flows that are both feasible and desirable, except in extended periods of dry weather or during time periods with excessive rainfall and/or snowmelt.

Within the Lower Cowlitz River Subbasin, a proposed target flow has been developed for the Olequa Creek drainage. The Olequa Creek drainage area was selected for several reasons including:

- Olequa Creek is flow limited and as a result, has been administratively closed by Ecology to the future issuance of water rights for many years
- This area is adjacent to Interstate Highway 5 and a major railroad line, both of which are contributors to additional potential future development
- There is a major industrial facility (Cardinal Glass) proposed in this drainage area that would use a significant amount of water
- Modeling work was done by Pacific Water Resources (PWR), so simulated stream flow data and statistics are available (PWR, 2003)

Within the Olequa Creek drainage area one management point is recommended for monitoring. This management point is located at approximately River Mile 4, and just upstream of the confluence of Stillwater Creek with Olequa Creek. This location is also referred to as (OLQ_20) and was chosen primarily because it is the most downstream point within this drainage area that simulated stream flow data and statistics are available.

Lower Range of Target Flows

The evaluation for determining the lower range of target flows is based on the data developed by PWR from their modeling work. These values should be viewed as "interim" numbers for flow management purposes. The PWR simulation was not designed to address potential gains or losses to ground water, nor to account for surface water diversions by water users. Interim management numbers can be replaced by accurate gauging data, if a gauge is installed as recommended below.

The average monthly flow values were used as the basis for calculating the 90%, 50%, and 10% exceedance values. The 90% values are the lowest of the three numbers and the 10% values are the highest of the three numbers. For example, the 90% exceedance values mean that these average monthly flows could be expected to be equaled or exceeded nine years out of ten. The 90% values show the expected low flows during each month of a low-flow year (e.g., one year

out of ten). See Table G-1 and Exhibit G-1 for the 90%, 50%, and 10% values for the management point for Olequa Creek.

A Toe-Width Method study was conducted for several streams within WRIAs 25 and 26, including Olequa Creek, by the Department of Ecology and the Department of Fish and Wildlife, during the summer of 1998. The toe-width method is used to determine needed spawning and rearing depths and velocities for various salmonid species and life stages, by calculating the square feet of habitat at each measured flow. Flow measurements are taken at various locations and the average toe-width and required toe-width flow is calculated for the different fish species and life stages.

For Olequa Creek, the measured average toe width was 54 feet and the required toe-width flow ranged from 192 cfs for Chinook and chum spawning to 44 cfs for salmon rearing. Stream flows were also measured on three different days from August to November, 1998 at this location. The flow measurements were 12 cfs in August and October and 31 cfs in November. As can be seen from these flow measurements during August and October, the measured flow of 12 cfs is far below the lowest toe-width desired flow of 44 cfs. Even the November 1998 flow measurement of 31 cfs is below the 44 cfs toe-width flow, when it could normally be expected that flow levels would be increased significantly due to the beginning of typical fall and winter rains.

By comparing the toe-width flows to the calculated 90, 50, and 10% flows, it can be seen that the toe-width flows for Chinook and chum spawning are not achieved during any month of the year for the 90% flows, as the highest 90% flow is 122 cfs during the month of February. Even in the highest flow years, which are exceeded only in 10% of the years, there are two months, July and August, which have calculated average monthly flows of 41 cfs and 27 cfs, respectively, which are below the lowest toe-width flow of 44 cfs for salmon rearing.

This shows that the flows determined by this toe-width study are in many months of the year, and particularly during the low flow months of the year, not achievable under existing flow conditions.

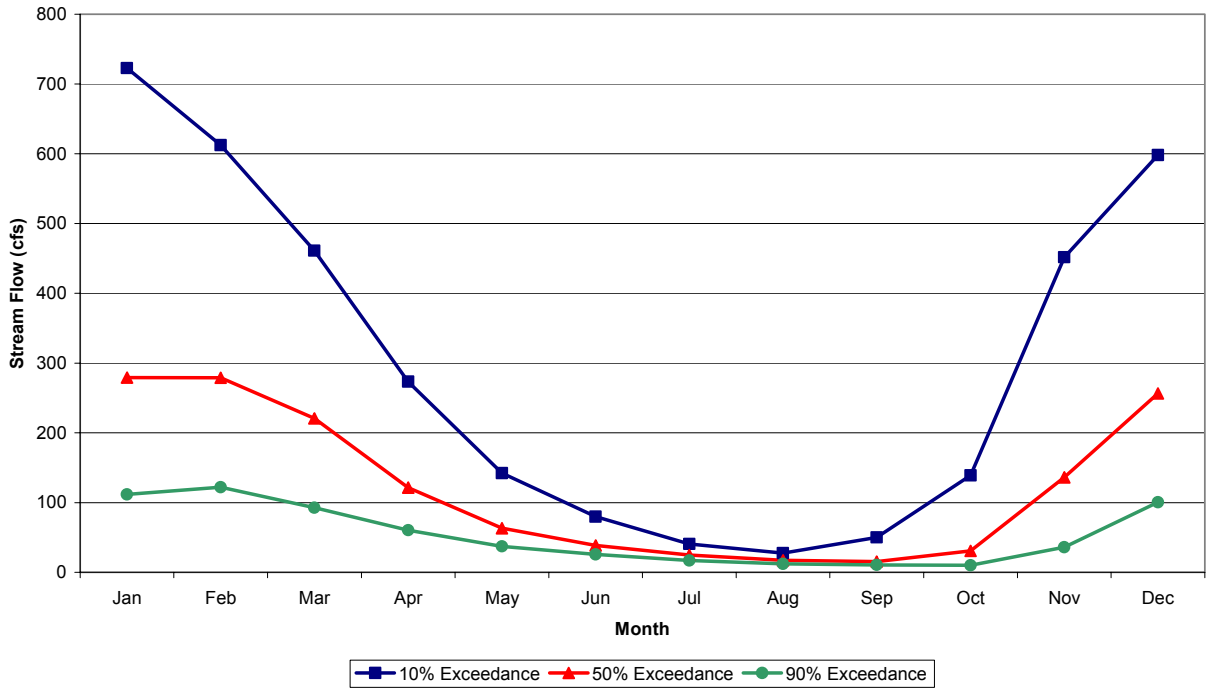
Table G-1
Average Monthly Exceedance Flows for Olequa Creek Gauge[1]

Month	90%	50%	10%
January	112	279	723
February	122	279	612
March	93	221	461
April	60	122	273
May	37	63	142
June	26	38	80
July[2]	**17**	**25**	**41**
August[2]	**12**	**17**	**27**
September[2]	**11**	**15**	**50**
October[2]	**10**	**31**	**139**
November	36	136	452
December	100	256	598

(1) Simulated by modeling flows at USGS gage located at ~ RM4 above Stillwater Creek, with a drainage area of 54.8 sq. mi. Values are the percent exceedance of monthly average flows for existing conditions modeled at control point OLQ_20 (PWR, 2003).

(2) Low flow months are highlighted for application of target flow approach.

Exhibit G-1
Monthly Average Flow Statistics
Olequa Creek (~RM 4) - Simulated



Although the 90% exceedance values are the flow levels that more closely reflect the lowest flow levels, the 50% and 10% values are also useful in that these numbers show the percentage of the time that more abundant flows occur. In addition to the importance of ensuring that the low range (90%) of flow levels are not reduced on a long-term basis, it is also important that the mid-high (50%-10%) range of flow levels not be significantly reduced, to protect fish habitat.

Recommendation:

For Olequa Creek it is recommended that the simulated flow statistics for the 90%, 50% and 10% exceedance levels serve as a basis for the target flow regime applying to the low-flow months on an interim basis. The suite of flow management techniques discussed for Olequa Creek should be designed with the goal of protecting these flows from degradation, and if possible increasing these flows statistics. This recommendation should be applied at the recommended management point. Eventually, actual stream gauging data should be substituted for the interim simulated flows.

Higher Range of Target Flows

The most reasonable statistics to use in the evaluation for determining the high end of the range for target flows are the 2-year and 10-year frequency floods, which have a 50% and 10% chance, respectively, of being equaled or exceeded in any given year. These provide more reliable metrics than the 100-year flood, which is difficult to estimate with high confidence. The 10-year

flood should be viewed as a "surrogate" metric, for reducing potential damages from the 100-year flood. Unlike the low range for target flows, which is variable throughout the year based on typical runoff patterns, the high end of the range for target flows as the 10-year flood, is a single value throughout the year. Values for the 2-year and 10-year floods are instantaneous peak flows and are calculated, based on existing gauging station records.

Based on the modeling work done by PWR, the 100-year, 10-year, and 2-year flood events at each of the two recommended management points in the Olequa Creek drainage area have increased from pre-settlement conditions to the present time in the range of nine to 12 percent. This amounts to an increase in flow from 3,081 to 3,361 cfs for the 10-year flood event. By recommending that the high end of the target flow range be maintained at the present day flows, this would halt the current trend of increasing flows for the 100-year, 10-year and 2-year flood events.

The modeled flows for the recommended management point in the Olequa Creek drainage area in cubic feet per second (cfs) are shown in Table G-2.

Table G-2
Flood Statistics for Olequa Creek

Site	2-year	10-year	100-year
Above Stillwater Creek	1,836	3,361	5,194

Recommendation:

For Olequa Creek it is recommended that the simulated 2-year and 10-year flood events be used as metrics for high flow events. The suite of flow-management techniques discussed for the Olequa Creek drainage should be designed such that these flow statistics do not increase over time, and if possible are reduced over time. This recommendation should be applied at the recommended management point, subject to installation of a stream gauge.

Management Point

A suitable site on Olequa Creek should be identified for a new stream gauge, to serve as a flow management point for application of the target flow approach. The gauge should be placed near the lower end of the Olequa Creek Subbasin, above Stillwater Creek.

Proposed Target Flows and Management Points for Coweeman River Subbasin

The concept of target flows was discussed in Section 4.2. As used in this Watershed Management Plan, target flows represent a realistic flow regime that may be achievable in most years by following selected management techniques over a long period of time. A flow regime consists of a range of flows that vary seasonally based on runoff and precipitation. Target flows should therefore be a range of flows that are both feasible and desirable, except in extended periods of dry weather or during time periods with excessive rainfall and/or snowmelt.

The Coweeman River Subbasin is one of two in WRIAs 25 and 26 for which proposed target flows are being developed during preparation of this Watershed Plan. The Coweeman River Subbasin along with the Olequa Creek drainage area in the Lower Cowlitz River Subbasin have been identified as two areas where greater potential for future conflicts between instream and out-of-stream demands can exist. In the case of the Coweeman River Subbasin this is primarily due to the presence of a highly developed urban area in and near the City of Kelso and also the presence of Interstate 5, which can foster further development in the subbasin.

One management point is recommended for monitoring in the Coweeman River Subbasin. The management point is located on the main stem of the Coweeman River at the location of the former USGS stream gauge (RM 7.0). This location was chosen primarily because of the available data from the former stream gauge, which was in continuous operation from 1951-1984. The location is also near the instream flow toe-width study and can be used to compare optimum fish flows to historical flows in the stream. Finally, the lower management point acts to define flows indirectly at all upstream tributary locations.

Lower Range of Target Flows

The evaluation for determining the lower range of target flows is based on streamflow data from the historic gauge (USGS No. 14245000). The target flow values should be viewed as "interim" numbers for flow management purposes. Interim management numbers can be updated, if the gauge is reinstalled as recommended (see below) and additional data is collected over the following years.

Average monthly flow values were used as the basis for calculating the 90%, 50%, and 10% exceedance values. The 90% values are the lowest of the three numbers and the 10% values are the highest of the three numbers. For example, the 90% exceedance values mean that these average monthly flows could be expected to be equaled or exceeded nine years out of ten. The 90% values show the expected low flows during each month of a low-flow year (e.g., one year out of ten). Table G-3 and Exhibit G-2 show the 90%, 50%, and 10% values for the management point for the Coweeman River.

As discussed in Section 4.8.2, a toe-width study was conducted for a section of the Coweeman River near Rose Valley Road crossing. Based on the toe-width results, the critical species and lifestage in terms of flow requirements is steelhead rearing which occurs during the low flow summer and early fall periods. The optimum flow based on the toe-width results is 76 cfs for

steelhead rearing. In comparing the monthly average flows for the Coweeman River management point to the optimum flows determined by toe-width results, it can be seen that in the lowest flow years (90% flows), the flows are less than the optimum steelhead rearing flows for the four low flow months of the year (refer to Table G-3). Even the median flows are below the optimum flow for steelhead rearing for three months of the year.

This shows that the optimum flows determined by the toe-width study are not achievable under existing flow conditions in the low flow months of the year. The toe-width study also acknowledged that the normal streamflow may not achieve optimum levels.

Although the 90% exceedance values are the flow levels that more closely reflect the lowest flow levels, the 50% and 10% values are also useful in that these numbers show the percentage of the time that more abundant flows occur. In addition to the importance of ensuring that the low range (90%) of flow levels are not reduced on a long-term basis, it is also important that the mid-high (50%-10%) range of flow levels not be significantly reduced, to protect fish habitat.

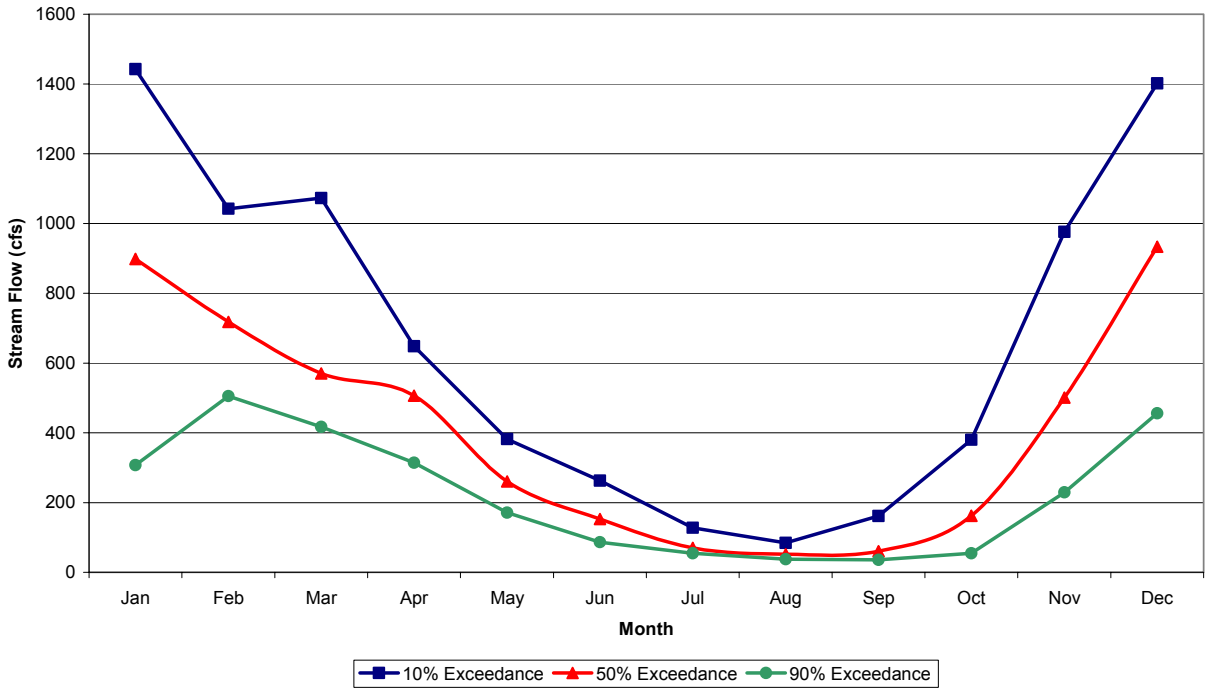
Table G-3
Average Monthly Exceedance Flows for Coweeman River Gauge[(1)]

Month	10%	50%	90%
January	1442	898	307
February	1042	718	504
March	1072	570	416
April	648	506	314
May	381	260	171
June	263	153	86
July[(2)]	**127**	**70**	**54**
August[(2)]	**85**	**52**	**37**
September[(2)]	**162**	**61**	**36**
October[(2)]	**380**	**162**	**54**
November	975	500	229
December	1403	933	456

(1) Based on historic stream flow data for former USGS gage No. 14245000 (RM7) with a drainage area of 119 sq mi. Values are the percent exceedance of monthly average flows.

(2) Low flow months are highlighted for application of target flow approach.

Exhibit G-2
Monthly Average Flow Statistics
Coweeman River USGS Gauge 14245000 (1950-1982)



Recommendation:

For the Coweeman River it is recommended that the flow statistics for the 90%, 50% and 10% exceedance levels serve as a basis for the target flow regime applying to the low-flow months on an interim basis. The suite of flow management techniques discussed for the Coweeman River should be designed with the goal of protecting these flows from degradation, and if possible increasing these flows statistics. This recommendation should be applied at the recommended management point at RM 7.0. Eventually, updated data from a newly installed stream gauge should be used to update the interim flow statistics.

Higher Range of Target Flows

The most reasonable statistic to use in the evaluation for determining the high end of the range for target flows are the 2-year and 10-year frequency floods, which have a 50% and 10% chance, respectively, of being equaled or exceeded in any given year. These provide more reliable metrics than the 100-year flood, which is difficult to estimate with high confidence. The 10-year flood should be viewed as a "surrogate" metric, for reducing potential damages from the 100-year flood. Unlike the low range for target flows, which is variable throughout the year based on typical runoff patterns, the high end of the range for target flows as the 10-year flood, is a single value throughout the year. Values for the 2-year and 10-year floods are instantaneous peak flows and are calculated, based on existing gauging station records.

Based on the modeling work by PWR, the 100-year, 10-year, and 2-year flood events at each of the modeled subbasins have had significant flow increases from pre-settlement conditions to the present time. By recommending that the high end of the target flow range be maintained at the present day flows, this would halt the current trend of increasing flows for the 100-year, 10-year and 2-year flood events.

The modeled flows for the recommended management point in the Coweeman Subbasin in cubic feet per second (cfs) are shown in Table G-4.

Table G-4
Flood Statistics for Coweeman River

Site	2-year	10-year	100-year
Coweeman River	4,950	7,900	12,200

Recommendation:

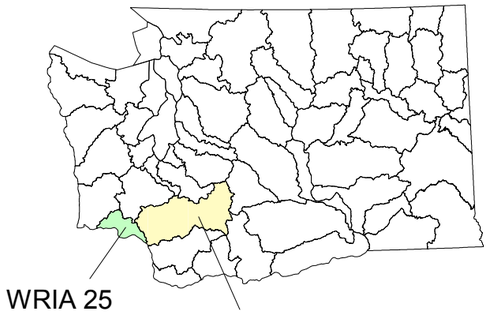
For the Coweeman River it is recommended that the 2-year and 10-year flood events be used as metrics for high flow events. The suite of flow-management techniques discussed for the Coweeman River subbasin should be designed such that these flow statistics do not increase over time, and if possible are reduced over time. This recommendation should be applied at the recommended management point, subject to installation of a new stream gauge.

Management Points

Stream gauges should be installed on the Coweeman River to allow for application of the target flow approach. Two locations are proposed, one at the former USGS gauging site at River Mile 7.0; and another below Baird Creek. For more information, see Section 4.7.4

LEGEND

- Cities
- Proposed Stream Flow Management Point
- WRIA 25/26 Boundaries
- WRIA 25/26 Subbasins
- Counties
- Major Highways
- Surface Water
- "Pilot" Subbasins Selected for Detailed Study
- Waterbodies



Pierce County

Upper Cowlitz River

Packwood

Randle

Morton

Mossyrock

Tilton River

Lewis County

Mayfield Dam

Lower Cowlitz River

Winlock

Vader

Toledo

Cispus River

Pacific County

Abernathy / Germany Creek

Grays River

Skamokawa Creek

Castle Rock

Toutle

Toutle River

Skamania County

Cathlamet

Wahkiakum County

Coweeman River

Elochoman River

Coal Creek / Longview Slough

Longview

Kelso

Cowlitz County

N

5 0 5 10 Miles

WRIA 25/26
Subbasins and Proposed
Flow Management Points

August 2004

ECONOMIC AND ENGINEERING SERVICES, INC.
Bellevue, Mount Vernon, Olympia, Portland, Tri-Cities

8/17/04 25-26(august 2004).apr

Appendix H
Existing Surface Water Source Limitations

Appendix H
Existing Surface Water Source Limitations

Table H- 1
Summary of Existing SWSLs for the Grays River Subbasin

Map Key	Stream Name	Description of Closure or Low Flow
25-1	Fossil Creek	Low flow of 1.0 cfs, based on letter from Dept. of Fisheries, July 6, 1952.

Table H-2
Summary of Existing SWSLs for the Elochoman River Subbasin

Map Key	Stream Name	Description of Closure or Low Flow
25-2	Elochoman River and all tributaries	Low flow restrictions defined as linear 300 cfs to 60 cfs from May 1 – June 15; 60 cfs from June 15 – Oct. 1; linear 60 cfs to 300 cfs Oct. 1 – Nov. 1. Within Section 31, Township 9 North, Range 5 West. This restriction has been in place on the Elochoman River since the Department of Fisheries letter dated June 29, 1973.

Table H-3
Summary of Existing SWSLs for the Lower Cowlitz River Subbasin

Map Key	Stream Name	Description of Closure or Low Flow
26-1	Arkansas Creek tributary to Cowlitz	Closure within Section 10, Township 9 North, Range 2 West. This restriction based on Department of Fisheries letter dated July 14, 1953; Nov 28, 1956; and Jan 29, 1975. SW cert 6636 (appl. 11904); SW appl. 13896 (canc); S2-23026.
26-2	Brim Creek tributary to Stillwater/Olequa	Low flow of 4.0 cfs within Section 24, Township 11 North, Range 3 West. This restriction based on indication of receipt of F&G recommendation on July 31, 1956. SW cert 6941 (appl. 13895).
26-3	Cowlitz River	Low flow of 1,350 cfs within Section 33, Township 11 North, Range 2 West. This restriction based on letter from the Department of Wildlife letter dated Feb 8, 1988. S2-27092.
26-6	Hazel Dell (Leckler Creek) tributary to Cowlitz	Closure within Section 3, Township 8 North, Range 2 West. This restriction based on letter from the Department of Fisheries and Game, dated Jan 14, 1953; Dec 11, 1974. SW permit 8683 (canc) (appl. 11786). S2-22381 (canceled).
26-7	Lacamas Creek tributary to Cowlitz	Low flow of 0.5 cfs within Section 1, Township 11 North, Range 2 West. This restriction based on letter from the Department of Fisheries dated July 11, 1956. SW cert 11167 (appl. 13802).
26-8	Mill Creek tributary to Cowlitz	Low flow of 1.5 cfs within Section 29, Township 13 North, Range 2 East. Low flow of 3.0 cfs within Section 1, Township 12 North, Range 1 East. This restriction based on letters dated Nov 22, 1944 and June 15, 1953. 1975.

Table H-3 (cont.)
Summary of Existing SWSLs for the Lower Cowlitz River Subbasin

Map Key	Stream Name	Description of Closure or Low Flow
26-10	McMurphy Creek tributary to Olequa	Low flow of 0.5 cfs within Section 29, Township 11 North, Range 2 West. This restriction based on letter from the Department of Fisheries dated Feb 19, 1951. SW cert 5048 (appl. 9985).
26-11	Olequa Creek	Closure within Section 9, Township 10 North, Range 2 West; Section 28, Township 12 North, Range 2 West; Section 4, Township 12 North, Range 2 West. This restriction based on letters from the Department of Fisheries dated Dec 17, 1952, Mar 28, 1955, Sept 7, 1951; and letter from the Department of Game dated Dec 25, 1967. SW cert 6200 (appl. 11686) SW appl. 19477 (canc) SW permit 7978 (canc) appl. 10399.
26-12	Unnamed Spring to Olequa Creek	Low flow of 5.0 cfs within Section 4, Township 12 North, Range 2 West. This restriction based on letters from the Department of Fisheries and Game dated Mar 19, 1946 and July 28, 1948. See Olequa Creek low flow for letters. SW cert 3361 (appl.8559).
26-13	King Creek tributary to Olequa	Low flow of 5.0 cfs within Section 28, Township 12 North, Range 2 West. This restriction based on letter from the Department of Fisheries dated Apr 15, 1952. SW cert 4814 (appl. 8904) SW cert 5739 (appl. 10944).
26-14	Stillwater Creek tributary to Olequa	Low flow of 4.0 cfs within Section 25, Township 11 North, Range 3 West. This restriction based on letter from the Department of Fisheries dated Mar 19, 1946. DOE file numbers: cert 4411 (appl. 6799).
26-15	Curtis Creek tributary to Olequa	Low flow of one half the flow within Section 5, Township 11 North, Range 2 West. This restriction based on letter from the Department of Fisheries dated Sept 24, 1948. SW cert 3937 (8465).
26-21	Unnamed Stream to Arkansas Creek	Closure within Section 6, Township 9 North, Range 2 West. This restriction based on letter from the Department of Fisheries and Game dated July 14, 1953; Nov 28, 1956; Jan 29, 1975. S2-00275 C (appl. 23526).
26-23	Salmon Creek tributary to Cowlitz	Low flow of 3.0 cfs within Section 20, Township 11 North, Range 1 West. This restriction based on letter from the Department of Fisheries and Game dated May 18, 1946, (4393); Jun 19, 1950, (4445); Nov 24, 1950, (4528). SW cert 4393 (appl. 9478); SW cert 4528 (appl. 9243).

Table H-4
Summary of Existing SWSLs and Recommendations for the Upper Cowlitz River Subbasin

Map Key	Stream Name	Description of Closure or Low Flow
26-5	Hall Creek	Closure. Within Section 33 and 22, Township 13 North, Range 9 East. This restriction was initiated on Hall Creek with the Department of Fisheries letter dated July 5, 1953.
26-16	Siler Creek	Low flow of 5.0 cfs. Within Section 27, Township 12 North, Range 7 East. This restriction was initiated on Siler Creek with SWC 9830 letter dated April 16,1957.
26-17	Silver Creek	Low flow of 10.0 cfs. Within Section 10, Township 12 North, Range 7 East. This restriction was initiated on Silver Creek with the Department of Fisheries letter dated April 16,1957.
26-18	Snyder Creek	Closure. Within Section 15, Township 13 North, Range 9 East. This restriction was initiated on Silver Creek with the Department of Fish and Game letter dated May 16,1955.

Table H-5
Summary of Existing SWSLs and Recommendations for the Tilton River Subbasin

Map Key	Stream Name	Description of Closure or Low Flow
26-9	Minnie Creek	Low flow of 1.0 cfs. Within Section 7, Township 12 North, Range 5 East. This restriction was initiated on Minnie Creek since the Department of Fisheries letter dated June 22, 1949.
26-20	Tilton River	Low flow of 3.0 cfs. Within Section 19, Township 13 North, Range 5 East. This restriction was initiated on the Tilton River since the Department of Fisheries letter dated January 7, 1955.

Table H-6
Summary of Existing SWSLs and Recommendations for the Mayfield Dam Subbasin

Map Key	Stream Name	Description of Closure or Low Flow
26-4	Frost Creek	Low flow of 0.20 cfs. Within Section 14, Township 12 North, Range 5 East. This restriction was initiated on Frost Creek with the Department of Fisheries letter dated Sept 29, 1960.
26-19	Sulphur Creek	Closure. Within Section 36, Township 12 North, Range 3 East. This restriction was initiated on Sulphur Creek with the Department of Game letter dated August 27, 1973.
26-22	Rainey Creek	Closure. Within Section 27, Township 12 North, Range 5 East. This restriction was initiated on Rainey Creek with the Department of Fisheries letter dated June 22, 1945.

Appendix I
Proposed Elements of Stream Flow Protection Rule

Appendix I
Proposed Elements of Stream Flow Protection Rule

Policy SFP-2 in Section 4.4.1 states that the Department of Ecology (Ecology) should adopt State Rules (WACs) under the Instream Resources Protection Program to restrict issuance of new water rights in WRIAs 25 and 26. This appendix contains supporting materials for the major elements of the proposed rules.

The following items are included in this appendix:

- Core Issues for Integrating Stream Flow Protection and Water Supply Policies

This policy document highlights issues and explores solutions that achieve an appropriate balance between protecting stream flows and ensuring adequate water supplies for future uses. The following issues and their solutions are discussed:

I. Protecting Stream Flows
II. Domestic Wells
III. Water Supply Reservations for Municipal, Industrial and other Purposes
IV. Off-setting and Mitigating Actions for Water Reservation Use
V. Extent of Tidal Reaches Excluded from Stream Closures
VI. Non-Reservation Water Right Applications
VII. Target Flows

- Table I-1 and Exhibit I-1 and I-2 Recommended Restrictions on Issuance of New Water Rights

This table and associated exhibits show the subbasins in each of the WRIAs, and describe the location of stream reaches by River Mile (RM), the proposed restrictions on the issuance of new water rights, and the basis of the proposed restrictions for each of the stream reaches. They also include the proposed upstream limit of the tidal reaches to be excluded from stream flow restrictions. As additional information, the table also shows the locations where some of the major public water suppliers currently divert water.

- Table I-2 Water Right Reservation Summary

This table shows amounts of water proposed to be reserved for future water supply and other beneficial uses of water and stream flow depletion allowances by subbasin. Tables I-2a and I-2b and I-2c contain supporting information for Table I-2. Also included are WDFW and Ecology flow recommendations to be reserved and the rationale for reserving these flow amounts for each subbasin in WRIAs 25 and 26 (WRIAs 27 and 28 are also discussed).

Estimated needs are presented for communities listed and other types of uses, from portions of the subbasins that have proposed stream flow restrictions. In order to make these amounts of water available for future water use in these subbasins with proposed streamflow restrictions, these amounts of water must be reserved for these uses. Parts III and IV of the Core Issues policy document describe this reservation process and the offsetting and mitigating actions required for water reservation use.

Future water uses that are projected for areas that are not within stream reaches with proposed stream flow restriction, such as the communities of Longview and Kelso, are not shown on this reservation table. Increased future water uses for these communities would not need to be reserved since there is no proposed stream flow restriction in this stream reach.

- Table I-3 Extent of Tidal Reaches Excluded from Stream Closures WRIAs 25 and 26

This table shows the locations of upstream limits of tidal influence for the Grays, Elochoman, Cowlitz and Coweeman rivers. These locations will be used in the decision-making process for future water right decisions by the Department of Ecology. It is intended that any future water rights that are issued in stream reaches that are downstream of these locations would not be subject to instream flows or closures. Upstream of these locations there will be stream flow restrictions as shown in Table I-1.

This table also shows the locations of major public water suppliers' existing withdrawal/diversion facilities to show whether or not future water rights obtained from these existing facilities would be subject to stream flow restrictions.

- Table I-4 Proposed Instream Flows

This table shows proposed instream flows on a monthly basis, the applicable stream reach, and the proposed location of the control station for three river systems in WRIAs 25/26, the Grays River, the Elochoman River and the Coweeman River. These instream flows are proposed to support stream closures in these watersheds and will be used in processing applications for change or transfers of existing water rights and applications for new water rights limited to high-flow periods of the year. Blocks of water reserved for domestic, municipal, and other beneficial uses shall not be subject to instream flows or closures.

Core Issues for Integrating Stream Flow Protection and Water Supply Policies

This policy document is intended to highlight issues and explore solutions that achieve an appropriate balance between protecting stream flows and ensuring adequate water supplies. The following issues and their solutions are discussed:

I. Protecting Stream Flows
II. Domestic Wells
III. Water Supply Reservations for Municipal, Industrial, and other Purposes
IV. Off-setting and Mitigating Actions for Water Reservation Use
V. Extent of Tidal Reaches Excluded from Stream Closures
VI. Non-Reservation Water Right Applications
VII. Target Flows

I. Protecting Stream Flows

Issue: The Planning Unit has consistently viewed closures as a preferred mechanism for surface water protection; however Ecology has suggested that use of instream flow rules are preferred because numeric instream flows are more legally defensible and because instream flow rules establish a river right that adds flexibility to potential intra-basin transfers.

***Solution*:** Merge aspects of closures and instream flows to utilize the best of each, while further integrating the water supply policy. Specific elements of a merged approach include:

- Ecology and Fish & Wildlife have recommended numeric stream flows in the Grays, Elochoman, and Coweeman basins based on stream gage data and IFIM/Toe-width modeling & best available science;
- The Planning Unit recommends Ecology promulgate an administrative rule utilizing the numeric flows as a basis for year-round closures with certain exceptions. Exceptions include predefined blocks of water reserved for domestic wells, predefined blocks of water reserved for municipal and other purposes, and in certain cases, interruptible seasonal rights. The justification for year-round closure is the hardship imposed by interruptible rights and lack of adequate, long-term enforcement of instream flow rules and stream gage data;
- Blocks of water reserved for domestic, municipal, and other purposes will not be subject to minimum instream flow conditions;
- The Planning Unit recommends interruptible rights be granted only in cases where a potential user can demonstrate a seasonal need for water *and* the use is likely not to interrupt habitat-forming flows;
- The Planning Unit recommends closure without numerical flows in other basins lacking sufficient stream gage data and IFIM analysis; and
- The Planning Unit recommends additional groundwater studies throughout the planning area to determine availability of groundwater that is not in continuity with surface water. This recommendation can help jurisdictions direct future growth into appropriate areas under the Growth Management Act or other planning processes.
- Some smaller streams and tributaries that drain directly to the Columbia River were not specifically analyzed in this watershed plan. The Planning Unit recommends that these streams not be closed, and that Ecology and Fish & Wildlife address these water bodies on a case-by-case basis in the future as applicants apply for new water rights. If, upon review, these streams are closed by administrative action, then it is recommended that a water right reservation should also be considered, to allow for domestic wells and potentially other uses. Such closures and recommendations would then be added to the formal rule at the next time the rule is updated.

II. Domestic Wells

Issue: The WRIAs 27 and 28 Planning Unit examined the impact from domestic wells through a pilot study in the Washougal basin. Based on study results and the social/economic significance of this use, the WRIAs 25 and 26 Planning Unit favors conditioning closure rules to provide for

domestic wells that are exempt from requirements to apply for a permit under the State Ground Water Code (Chapter 90.44.050RCW).

While excluded from the permit application process, domestic wells represent water rights that are junior to pre-existing senior rights within basins. Management of domestic wells is significant to the degree they may impair senior water rights or reduce instream flows to the detriment of fish or other wildlife species, especially in smaller tributaries at high development densities.

Ecology has argued that from a legal basis, domestic wells cannot be protected from a stream closure or interruptible water rights if they are in connectivity with surface water unless a reservation of water is defined within the rule. Therefore, the Planning Unit views the domestic well reservation as a protective measure for landowners to ensure domestic wells will continue to be allowed.

***Solution*:** Accept Ecology's recommendation and develop a reservation or block of water for the exclusive use by domestic wells.

- The Planning Unit will recommend numerical reservations by subbasin for domestic wells. The numerical reservation should be large enough to ensure consistency with predicted land use over a twenty-year time horizon. Small tributaries and other flow sensitive areas should be protected from increased development densities by maintaining existing zoning levels;
- The Planning Unit recommends Ecology manage the accounting system to track the total number of domestic wells in comparison with the number allowed by the reservation.
- The Planning Unit recommends domestic wells target confined aquifers, whenever possible; and
- The Planning Unit recommends that within urbanizing areas, new single-family households utilize water supplied by public purveyors, whenever available.

III. Water Supply Reservations for Municipal, Industrial and Other Purposes

***Issue*:** The Planning Unit recognizes increasing demand on public water supplies over the foreseeable future. It also recognizes the importance of protecting baseflow for fish and wildlife. While tension exists between these two sometimes conflicting needs, they are inextricably linked through the quality of life we enjoy and the economic vitality of the region.

For WRIAs 25 and 26, the key to meeting increased water supply demand is through greater utilization of groundwater that is not in connectivity with baseflow and expanded reliance on withdrawals from tidally-influenced areas or other areas of relatively abundant supply (i.e., the Lower Cowlitz River).

***Solution*:** Protect baseflows by avoiding direct use of instream flows and groundwater that is in hydrologic connectivity with instream flows. Establish 'reservations' of water that may be used for municipal, industrial, and other purposes use if no other option is feasible. Use of reservations requires off-setting actions.

- In cases where it is not feasible to avoid the use of groundwater in connectivity with surface water, a reservation of water will be reserved in rule to meet demand. The water rights applicant must evaluate all potential sources and demonstrate why use of the reservation is required;
- The reservation should indicate specific amounts of water by jurisdiction and basin. The jurisdiction may choose to allocate some or all of its allocation to commercial or industrial use;
- Responsibility for analysis of available water sources lies with the applicant;
- Application for the reservation will be reviewed, analyzed, and processed by Ecology in consultation by Fish & Wildlife; and
- Use of the reservation of water must be accompanied by a package of actions that off-set and mitigate for potential stream flow impairment (see Section IV below).

IV. Off-setting & Mitigating Actions for Water Reservation Use

***Issue*:** The Planning Unit's goal is to achieve a balance between the need for additional water supply and to protect baseflow. In cases where the water reservation is granted by Ecology, it is presumed that the use will impact baseflow. Since it is the goal of the Planning Unit to protect baseflow, it is important to recommend to Ecology a methodology to evaluate how these impacts can be eliminated or minimized.

***Solution*:** The Planning Unit recognizes the challenges public water purveyors face when trying to meet demand. Perfecting a water right is only one element; infrastructure costs in the form of equipment, distribution lines, and developing system redundancy represent significant resource needs. On the other hand, depletion of baseflow also has significant costs in terms of quality of life, liability under the Endangered Species Act, recreation, and watershed health. When the internal and external costs of baseflow reduction are factored into the equation, deep groundwater sources and tidal areas become attractive over the long-term.

The Planning Unit recommends that Ecology (in conjunction with Fish & Wildlife) evaluate requests for reservation use by reviewing the applicant's analysis of other alternatives and by evaluating the applicant's proposal in terms of off-setting and mitigating actions.

- The Planning Unit recommends that Ecology develop clear guidance for mitigation. A starting point for such guidance may be found in an Ecology publication entitled "Mitigation Measures used in Water Right Permitting" dated April 2003.
- The Planning Unit recommends that where an applicant applies for a water right under a reservation, they be required to mitigate the predicted stream flow depletion to the maximum extent practicable through flow-related actions. Practicable is meant to include both economic and logistic considerations.
- No less than half of the predicted stream flow depletion (see Table I-2a) must be offset through the acquisition of active upstream water rights. However, the Planning Unit recognizes there may be occasional exceptions where purchase of active upstream water rights may be infeasible or cost-prohibitive. In these limited cases, other types of mitigation

actions can be considered that may not include acquisition of active upstream water rights. For example, the Grays River subbasin has been identified by the Planning Unit as one area where offsetting actions may be infeasible, due to the lack of upstream water rights that could be acquired as a mitigation action. Even in these limited cases, the amount of stream flow depletion from new water rights issued under this policy shall be no greater than the quantity shown in Table I-2a, under the column heading "Net Stream Flow Depletion Allowance."

- The Planning Unit recommends that Ecology consider other mitigating actions to address impacts that cannot be practicably off-set (no more than half) through water-for-water actions. This includes actions such as the restoration of wetlands and side-channels that increase stream storage capacity;
- The Planning Unit recommends that Ecology consider habitat restoration actions other than the restoration of wetlands and side-channels using the following criteria:
  - habitat actions should focus upon projects that improve stream conditions impaired by flow (e.g., projects that improve width to depth relationships or improve landscape-level hydrologic processes, etc.);
  - habitat actions should address threats and limiting factors through priority actions identified in the Lower Columbia Salmon Recovery Plan;
  - habitat actions should be evaluated within the context of when baseflow impacts will occur and the expected timeframe of habitat project benefits;
- The Planning Unit recommends that Ecology (and Fish & Wildlife) consider cost to the applicant in terms of other supply alternatives, water supply total project cost, and the cost of the off-setting and mitigating actions. These costs should be reviewed within the context of other fish recovery actions that may be needed to compensate for impairment to baseflow;
- The Planning Unit recommends that Ecology consider allowing small community water systems to contribute money into a pooled mitigation fund, in lieu of implementing specific mitigation actions. Money could then be accumulated from small systems over time to support larger and more beneficial mitigation projects. Details regarding this concept should be examined during the implementation phase. Such details will include what entity manages the mitigation fund, the dollar amount to be contributed, etc.
- The Planning Unit recommends that Ecology consider allowing water users to "bank" mitigation credits for use in the future. In this way a community could implement mitigation activities prior to the need for accessing water rights contained in a reservation. Details regarding this concept should be examined during the implementation phase.
- The Planning Unit intends that domestic wells, including those serving multiple houses, be exempt from mitigation requirements.

V. Extent of Tidal Reaches Excluded from Stream Closures

***Issue*:** The Planning Unit supports the use of tidally-influenced areas of the Grays, Elochoman, Cowlitz, and Coweeman basins for meeting new water demands. Tidal influence on each of these basins is dynamic and changes daily and seasonally. Some points within the tidal areas are affected throughout the day, while other points may be affected only for minutes.

To accomplish the intent of using tidally-influenced areas effectively and within the context of minimizing impairment to fish and wildlife habitat, the Planning Unit recommends to Ecology the location where stream closure will take effect upstream and remain open downstream.

***Solution*:** Identify the point where tidal influence extends at mean daily low tide and the point at mean daily high tide. As an initial point of reference, determine the mid-point between the mean daily low tide and the mean daily high tide. Analyze the mid-point relative to potential impacts to fish habitat and impacts to existing community public water systems.

- Columbia River tide data was researched, reviewed, and analyzed relative to stream gradient for each of the identified basins. Recommendations were developed and presented to Fish and Wildlife for evaluation of habitat conditions in tidal reaches. Recommended locations along with other key points including cities or known well fields were developed in table format
- The Planning Unit, including Ecology and Fish & Wildlife, reviewed the results of the research and formulated a basin-by-basin recommendation for the lower-most limit to protective rule language (See Table I-3).

VI. Non-Reservation Water Right Applications

***Issue*:** Over time in closed basins, Ecology will receive applications for water rights that cannot be met through sources that are not in connectivity with surface waters and the applicant is not eligible to access a reservation of water. In these cases, Ecology may, at their discretion, grant a water right that is off-set by the retirement of an upstream active water right.

VII. Target Flows

***Issue*:** The Planning Unit has consistently supported the notion of non-regulatory 'target flows' to help set goals for stream flow management actions. Target flows (goals) can be set either to *protect* existing conditions and/or to *enhance* current conditions.

Solution: Define target flows in a qualitative manner that reflects the value of protecting and enhancing flow conditions in selected watersheds. State that the target is to at a minimum, maintain flows at the numerical levels described in the Plan for selected streams, and to improve flows where feasible through a range of management techniques including management of land use as well as water use.

Table I-1
Recommended Restrictions on Issuance of New Water Rights
WRIAs 25 and 26

Location	Restrictions on New Water Rights[1]	Water Supply Reservations	Notes
Grays River Subbasin			
Grays River Mainstem tidal reach (mouth to RM 5) (Tidal reach may be extended, pending additional field observations of habitat conditions at low flow stage)	No special restrictions. State Water Code applies.	Not applicable, since this reach is not closed to new water rights.	No major public water supplies in this reach.
Tributaries to Grays River tidal reach[3]	No special restrictions in tidally influenced reaches. Above tidally influenced areas, subject to future closures based on case-by-case decisions. Location of tidal influence to be determined through case-by case determinations on future applications.	No specific communities. General categories as part of overall Grays River Subbasin reservations See Table I-2 for more information	No major public water supplies in this reach.
Grays River mainstem above tidal reach	Closed to new water rights with exceptions as described in Policy SFP-2 and Core Issues document. In addition, minimum flows established as listed in Table I-4.	Wahkiakum PUD. General categories as part of overall Grays River Subbasin reservations See Table I-2 for more information	High importance for fish recovery goals (Rated Tier 1 and 2 in LCFRB Recovery Plan documents)[2]
Tributaries to Grays River above tidal reach	Same as mainstem above tidal reach.	No specific communities. General categories as part of overall Grays River Subbasin reservations See Table I-2 for more information	
All other tributaries to Columbia River[3]	No special restrictions in tidally influenced reaches. Above tidally influenced areas, subject to future closures based on case-by-case decisions. Location of tidal influence to be determined through case-by case determinations on future applications.	None	

Table I-1 (cont.)
Recommended Restrictions on Issuance of New Water Rights
WRIAs 25 and 26

Location	Restrictions on New Water Rights[1]	Water Supply Reservations	Notes
Skamokowa Creek Subbasin			
Skamokowa Creek Mainstem tidal reach (mouth to RM 0.5)	No special restrictions. State Water Code applies. Location of tidal influence to be determined through case-by case determinations on future applications.	Not applicable, since this reach is not closed to new water rights.	No major public water supplies in this reach.
Tributaries to Skamokowa Creek tidal reach[3]	No special restrictions in tidally influenced reaches. Above tidally influenced areas, subject to future closures based on case-by-case decisions.	No specific communities. General categories as part of overall Skamokowa Creek Subbasin reservations See Table I-2 for more information	No major public water supplies in this reach.
Skamokowa Creek mainstem above tidal reach	Closed to new water rights with exceptions as described in Policy SFP-2 and Core Issues document.	General categories as part of overall Skamokowa Creek Subbasin reservations See Table I-2 for more information	
Tributaries to Skamokowa Creek above tidal reach	Same as mainstem above tidal reach.	No specific communities. General categories as part of overall Skamokowa Creek Subbasin reservations See Table I-2 for more information	
All other tributaries to Columbia River[3]	No special restrictions in tidally influenced reaches. Above tidally influenced areas, subject to future closures based on case-by-case decisions. Location of tidal influence to be determined through case-by case determinations on future applications.		
Elochoman River Subbasin			
Elochoman River Mainstem tidal reach (mouth to RM 2.2)	No special restrictions. State Water Code applies.	Not applicable, since this reach is not closed to new water rights.	No major public water supplies in this reach.
Tributaries to Elochoman River tidal reach[3]	No special restrictions in tidally influenced reaches. Above tidally influenced areas, subject to future closures based on case-by-case decisions. Location of tidal influence to be determined through case-by case determinations on future applications.	No specific communities. General categories as part of overall Elochoman River Subbasin reservations See Table I-2 for more information	No major public water supplies in this reach.

Table I-1 (cont.)
Recommended Restrictions on Issuance of New Water Rights
WRIAs 25 and 26

Location	Restrictions on New Water Rights[1]	Water Supply Reservations	Notes
Elochoman River mainstem above tidal reach	Closed to new water rights with exceptions as described in Policy SFP-2 and Core Issues document. In addition, minimum flows established as listed in Table I-4.	Cathlamet General categories as part of overall Elochoman River Subbasin reservations See Table I-2 for more information	High importance for fish recovery goals (Rated Tier 1 and 2 in LCFRB Recovery Plan documents)[2]
Tributaries to Elochoman River above tidal reach	Same as mainstem above tidal reach.	No specific communities. General categories as part of overall Elochoman River Subbasin reservations See Table I-2 for more information	
All other tributaries to Columbia River[3]	No special restrictions in tidally influenced reaches. Above tidally influenced areas, subject to future closures based on case-by-case decisions. Location of tidal influence to be determined through case-by case determinations on future applications.		
Abernathy/Germany Creek Subbasin			
Abernathy and Germany Creeks and all other tributaries to Columbia River tidal reach	No special restrictions. State Water Code applies.	Not applicable, since this reach is not closed to new water rights.	No major public water supplies in this reach.
Tributaries to Abernathy/Germany Creek and other tributaries tidal reach [3]	No special restrictions in tidally influenced reaches. Above tidally influenced areas, subject to future closures based on case-by-case decisions. Location of tidal influence to be determined through case-by case determinations on future applications.	No specific communities. General categories as part of overall Abernathy/Germany Creek Subbasin reservations See Table I-2 for more information	No major public water supplies in this reach.
Abernathy and Germany Creeks and all other tributaries to Columbia River mainstems above tidal reach	Closed to new water rights with exceptions as described in Policy SFP-2 and Core Issues document.	General categories as part of overall Abernathy/Germany Creek Subbasin reservations See Table I-2 for more information	High importance for fish recovery goals (Rated Tier 1 and 2 in LCFRB Recovery Plan documents)[2]

Table I-1 (cont.)
Recommended Restrictions on Issuance of New Water Rights
WRIAs 25 and 26

Location	Restrictions on New Water Rights[1]	Water Supply Reservations	Notes
Tributaries to Abernathy and Germany Creeks and all other tributaries to Columbia River above tidal reach	Same as mainstems above tidal reach.	No specific communities. General categories as part of overall Abernathy/Germany Creek Subbasin reservations See Table I-2 for more information	
Coal Creek/Longview Slough			
Coal Creek and tributaries mouth to headwaters	No special restrictions. State water code applies	Not applicable since this reach is not closed to new water rights	No major public water supplies in this reach
Lower Cowlitz River Subbasin			
Cowlitz River Mainstem tidal reach (mouth to RM 6.7)	No special restrictions. State Water Code applies.	Not applicable since this reach is not closed to new water rights	Water supply intakes for Longview, Kelso and Cowlitz PUD are in this reach
Tributaries to Cowlitz River tidal reach [3]	No special restrictions in tidally influenced reaches. Above tidally influenced areas, subject to future closures based on case-by-case decisions. Location of tidal influence to be determined through case-by case determinations on future applications.	General categories as part of overall Lower Cowlitz River Subbasin reservations See Table I-2 for more information	
Cowlitz River mainstem from tidal reach to Mayfield Dam	Closed to new water rights with exceptions as described in Policy SFP-2 and Core Issues document	City of Castle Rock General categories as part of overall Lower Cowlitz Subbasin reservations See Table I-2 for more information	Flows in this reach are largely governed by releases from hydroelectric facilities under FERC license conditions
Tributaries to Cowlitz River from tidal reach to Mayfield Dam.	Closed to new water rights with exceptions as described in Policy SFP-2 and Core Issues document.	City of Winlock General categories as part of overall Lower Cowlitz River Subbasin reservations See Table I-2 for more information	Ecology has administrative closures and/or low flows in place already on Olequa, Arkansas, Lacamas, Leckler, Mill, & Salmon Creeks (see Table H-3 Exhibit 4-2). High importance for fish recovery goals in Lacamas, Mill, Salmon, Delameter, Ostrander Creeks (Rated Tier 1 and 2 in LCFRB Recovery Plan documents)[2]

Table I-1 (cont.)
Recommended Restrictions on Issuance of New Water Rights
WRIAs 25 and 26

Location	Restrictions on New Water Rights[1]	Water Supply Reservations	Notes
Mayfield Dam Subbasin			
Mainstem Cowlitz River and reservoirs (Mayfield and Riffe Lakes)	No special restrictions. State water code applies.	Not applicable since this reach is not closed to new water rights.	Flows and lake levels in this reach governed largely by releases from hydroelectric facilities under FERC license conditions
Frost Creek, Suphur Creek, Rainy Creek	Closed to new water rights	General categories as part of overall Lower Cowlitz River Subbasin reservations See Table I-2 for more information	Existing administrative low flows or closures. See Table H-5 and Exhibit 4-2
Other tributaries to Cowlitz River and reservoirs	No special restrictions. State water code applies.	Not applicable since this reach is not closed to new water rights	
Upper Cowlitz River Subbasin			
Mainstem from upstream end of Cowlitz Falls reservoir to headwaters and all tributaries	Closed to new water rights with exceptions as described in Policy SFP-2 and Core Issues document	City of Randle City of Packwood General categories as part of overall Upper Cowlitz River subbasin reservations. See Table I-2 for more information	High importance for fish recovery goals (rated Tier 1 and 2 in LCFRB Recovery Plan documents)[2]
Cispus River Subbasin			
Mouth of Cispus River to headwaters and all tributaries	Closed to new water rights with exceptions as described in Policy SFP-2 and Core Issues document	General categories as part of overall Cispus River subbasin reservations. See Table I-2 for more information	
Tilton River Subbasin			
Mouth of Tilton River to headwaters and all tributaries	Closed to new water rights with exceptions as described in Policy SFP-2 and Core Issues document	City of Morton General categories as part of overall Tilton River subbasin reservations. See Table I-2 for more information	Existing administrative closure. See Table H-5 and Exhibit 4-2
Toutle River Subbasin			
Mouth of Toutle River to headwaters and all tributaries	Closed to new water rights with exceptions as described in Policy SFP-2 and Core Issues document	General categories as part of overall Toutle River subbasin reservations. See Table I-2 for more information	High importance for fish recovery goals (rated Tier 1 and 2 in LCFRB Recovery Plan documents) [2]
Coweeman River Subbasin			
Coweeman River mainstem tidal reach (mouth to RM 3.5)	No special restrictions. State water code applies.	Not applicable since this reach is not closed to new water rights	No major public water supplies in this reach.

Table I-1 (cont.)
Recommended Restrictions on Issuance of New Water Rights
WRIAs 25 and 26

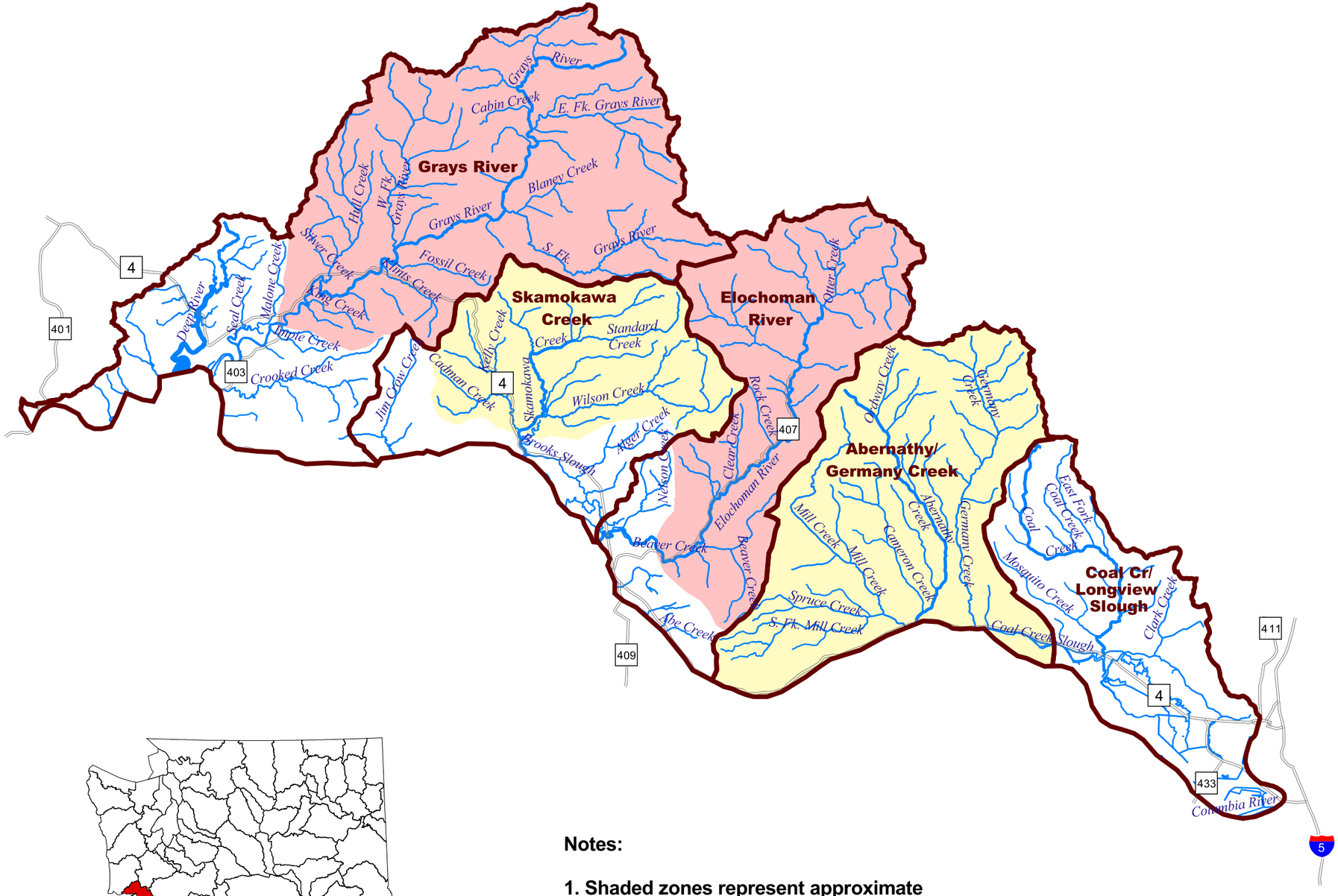
Location	Restrictions on New Water Rights[1]	Water Supply Reservations	Notes
Coweeman River mainstem and all tributaries above tidal reach	Closed to new water rights with exceptions as described in Policy SFP-2 and Core Issues document In addition, minimum flows established as listed in Table I-4.	General categories as part of overall Coweeman River subbasin reservations. See Table I-2 for more information	High importance for fish recovery goals (rated Tier 1 and 2 in LCFRB Recovery Plan documents) [2]

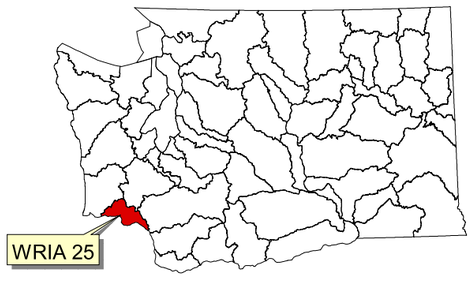
RM=River Mile

(1) Restrictions do not apply to existing water rights or selected additional uses as described in the watershed management plan.

(2) LCFRB's 2004 Interim Habitat Strategy ranks streams reaches throughout the region in four "Tiers". Tiers are based on a combination of a.) priority of each fish population for restoration and b.) potential for preservation or restoration or stream reaches. For purposes of the table above, it is assumed that all Tier 1 and Tier 2 reaches should have restrictions on issuance of new rights.

(3) It is expected that the stream reach downstream of the tidal influence location (TBD) would be open to appropriation with no restrictions. This location may be a very short reach of stream upstream of the mouth. These locations would be determined on a case-by-case basis as future water right applications are filed on these streams.





Washington State

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LEGEND

- Sub-Basin Boundary
- Roads
- Rivers and Streams

Closure Types

- Closures Only
- Closures with Instream Flows

Notes:

1. **Shaded zones represent approximate drainage areas affected by recommended restrictions. See Table I-1 for specifics.**

2. **Tidal reach areas have no recommended restrictions.**

EXHIBIT I-1
WRIA 25
Recommended Instream Flows and Closures

December 2004

Economic and Engineering Services, Inc.
Bellevue Mount Vernon Olympia Portland Tri-Cities

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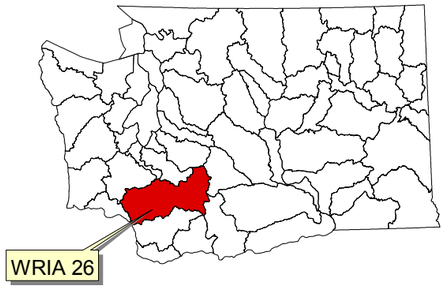

Washington State

Notes:

1. **Shaded zones represent approximate drainage areas affected by recommended restrictions. See Table I-1 for specifics.**

2. **Tidal reach areas have no recommended restrictions.**

Tilton River
Upper Cowlitz River
Lower Cowlitz River
Mayfield Dam
Cispus River
Toutle River
Coweeman River
Mill Creek
Jesse Creek
Bear Canyon
Tilton River
Connelly Creek
Lake Creek
E. Fk. Tilton River
Klickitat Creek
Sulphur Creek
Shelton Creek
Sand Creek
Frost Creek
Rainy Creek
Cedar Creek
Skook Creek
Blue Creek
Olequa Creek
Bear Creek
Lacamas Creek
Cowlitz River
Little Salmon Creek
Salmon Creek
Rapid Creek
Stillaguamish River
Deer Creek
Nickel Creek
Stevens Creek
Carlton Creek
Summit Creek
Cortright Creek
Dam Creek
Coal Creek
Skate Creek
Martin Creek
Silver Creek
Surrey Creek
Davis Creek
Williams Creek
Hager Creek
Johnson Creek
Dry Creek
Deception Creek
Smith Creek
Kiona Creek
Siler Creek
Woods Creek
Camp Creek
W. Fk. Cispus River
Crystal Creek
Iron Creek
Veta Creek
Big Creek
Pinto Creek
McCoy Creek
Yellowjacket Creek
Cat Creek
Pumice Creek
Muddy Fork
Killer Creek
East Canyon Creek
Walupt Creek
Devils Creek
Green
Cascade Creek
Elk Creek
Green River
Alder Creek
Cow Creek
North Fork Toutle River
South Fork Toutle River
Wakepish Creek
Goat Creek
Toutle River
Instant Creek
Sucker Creek
Ostrander Creek
Goble Creek
Coweeman River
Stillaguamish Creek
Campbell Creek
Monahan Creek
Arkansas Creek
Whittle Creek
Brim Creek
508
505
504
7
123
12
5
4

N

5 0 5 Miles

LEGEND

- Sub-Basin Boundary
- Roads
- Rivers and Streams

Closure Types

- Closures Only
- Closures with Instream Flows

EXHIBIT I-2
WRIA 26
Recommended Instream Flows and Closures

December 2004

ees Economic and Engineering Services, Inc.
Bellevue Mount Vernon Olympia Portland Tri-Cities

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Table I-2
Water Right Reservation Summary for WRIAs 25/26

Water User [1]	Net Stream flow Depletion Allowance (cfs) [2]
Grays River Subbasin	
Wahkiakum PUD	0.15
Small Systems and Domestic Wells	0.57
Subbasin Total	**0.72**
Skamokawa Creek Subbasin	
Small Systems and Domestic Wells	0.20
Subbasin Total	**0.20**
Elochoman River Subbasin	
Cathlamet	0.00[5]
Small Systems and Domestic Wells	0.38
Subbasin Total	**0.38**
Abernathy/Germany Creek Subbasin	
Wahkiakum County Portion	
Small Systems and Domestic Wells	0.07
Cowlitz County Portion	
Small Systems and Domestic Wells	0.36
Subbasin Total	**0.43**
Coal Creek/Longview Slough Subbasin	
Not Applicable (restrictions on new water rights not proposed)	
Upper Cowlitz River Subbasin	
Randle	0.02
Packwood	0.00[5]
Small Systems and Domestic Wells	0.20
Other Beneficial Uses	0.37
Subbasin Total	**0.59**
Cispus River Subbasin	
Lewis County Portion	
Small Systems and Domestic Wells	0.20
Other Beneficial Uses	0.19
Skamania County Portion	
Small Systems and Domestic Wells	0.20
Other Beneficial Uses	0.19
Subbasin Total	**0.77**
Tilton River Subbasin	
Morton	0.00[5]
Small Systems and Domestic Wells	0.20
Other Beneficial Uses	0.19
Subbasin Total	**0.39**
Mayfield Dam Subbasin	
Mossyrock	0.10
Small Systems and Domestic Wells	0.20
Other Beneficial Uses	0.19
Subbasin Total	**0.48**
Toutle River Subbasin	
Lewis County Portion	
Small Systems and Domestic Wells	0.20
Other Beneficial Uses	0.19
Cowlitz County Portion	
Small Systems and Domestic Wells	0.20
Other Beneficial Uses	0.19

Table I-2 (cont.)
Water Right Reservation Summary for WRIAs 25/26

Water User [1]	Net Stream flow Depletion Allowance (cfs) [2]
Skamania County Portion	
Small Systems and Domestic Wells	0.19
Other Beneficial Uses	0.19
Subbasin Total	**1.14**
Coweeman River Subbasin	
Small Systems and Domestic Wells	0.20
Subbasin Total	**0.20**
Lower Cowlitz River Subbasin	
Lewis County Portion	
Winlock	0.00[5]
Toledo	0.22
Vader	0.00
Small Systems and Domestic Wells	0.38
Other Beneficial Uses	0.56
Cowlitz County Portion	
Longview	NA [3]
Kelso	NA [3]
Cowlitz PUD	NA [3]
Castle Rock	0.00[5]
Small Systems and Domestic Wells	0.38
Other Beneficial Uses	0.37
Additional Allowance [4]	4.00
Subbasin Total	**5.92**

Notes:

(1) Categories of water users include:
Large Public Water Systems, which are listed individually.
Small Systems, which refers to Small Community Water Systems.
Domestic Wells, including those serving multiple homes but exempt from requirement to apply for a water right permit.
Other Beneficial Uses, such as self-supplied industrial uses.

(2) Calculated based upon an estimate of additional water rights needed to meet water demands through 2020. Incorporates the effects of offsetting and mitigation activities. The allowance applies only to mainstem flows; it is not intended to allow for extensive dewatering of smaller water bodies.

(3) Not applicable, due to location in tidally influenced area.

(4) An additional stream flow depletion allowance is provided for the Lower Cowlitz River, due to its potential as a future regional source of water supply. The additional 4.0 cfs is substantial enough to provide a regional-scale resource for industry and other uses, while still being adequately protective of habitat given the magnitude of late summer flows in the Cowlitz River.

(5) Current water rights are sufficient to meet needs through year 2020. Therefore, no reservation is established.

Table I-2a
Water Right Reservation Calculations for WRIAs 25/26

	Anticipated Needs [1]			Maximum Streamflow Depletion Allowance (cfs) [3]	Offset/ Mitigation (cfs) [4]	Net Streamflow Depletion Allowance (cfs) [5]
	No. of "Blocks" [2]	Qa (afy)	Qi (cfs)			
Grays River Subbasin						
Wahkiakum PUD	NA	0	0.30	0.30	0.15	**0.15**
Small Community Water Systems - Wahkiakum Co	2	200	0.75	0.75	0.37	**0.37**
Domestic Wells - Wahkiakum Co	NA	177	0.65	0.20	0.00	**0.20**
Subbasin Total						**0.72**
Skamokawa Creek Subbasin						
Domestic Wells - Wahkiakum Co	NA	177	0.65	0.20	0.00	**0.20**
Subbasin Total						**0.20**
Elochoman River Subbasin						
Cathlamet	NA	0	0.00	0.00	0.00	**0.00** [7]
Small Community Water Systems - Wahkiakum Co	1	100	0.37	0.37	0.19	**0.19**
Domestic Wells - Wahkiakum Co	NA	177	0.65	0.20	0.00	**0.20**
Subbasin Total						**0.38**
Abernathy/Germany Creek Subbasin						
Domestic Wells - Wahkiakum Co	NA	59	0.22	0.07	0.00	**0.07**
Domestic Wells - Cowlitz Co	NA	330	1.21	0.36	0.00	**0.36**
Subbasin Total						**0.43**
Coal Creek/Longview Slough Subbasin						
Not Applicable (restrictions on new water rights not proposed)						**NA**
Upper Cowlitz River Subbasin						
Randle	NA	11	0.04	0.04	0.02	**0.02**
Packwood	NA	0	0.00	0.00	0.00	**0.00** [7]
Small Community Water Systems - Lewis Co	1	100	0.37	0.37	0.19	**0.19**
Domestic Wells - Lewis Co	NA	2	0.01	0.01	0.00	**0.01**
Other Beneficial Uses - Lewis Co	2	200	0.75	0.75	0.37	**0.37**
Subbasin Total						**0.59** [8]
Cispus River Subbasin						
Small Community Water Systems - Lewis Co	1	100	0.37	0.37	0.19	**0.19**
Small Community Water Systems - Skamania Co	1	100	0.37	0.37	0.19	**0.19**
Domestic Wells - Lewis Co	NA	2	0.01	0.01	0.00	**0.01**
Domestic Wells - Skamania Co	NA	2	0.01	0.01	0.00	**0.01**
Other Beneficial Uses - Lewis Co	1	100	0.37	0.37	0.19	**0.19**
Other Beneficial Uses - Skamania Co	1	100	0.37	0.37	0.19	**0.19**
Subbasin Total						**0.77**
Tilton River Subbasin						
Morton	NA	0	0.00	0.00	0.00	**0.00** [7]
Small Community Water Systems - Lewis Co	1	100	0.37	0.37	0.19	**0.19**
Domestic Wells - Lewis Co	NA	4	0.01	0.01	0.00	**0.01**
Other Beneficial Uses - Lewis Co	1	100	0.37	0.37	0.19	**0.19**
Subbasin Total						**0.38**
Mayfield Dam Subbasin						
Mossyrock	NA	28	0.20	0.20	0.10	**0.10**
Small Community Water Systems - Lewis Co	1	100	0.37	0.37	0.19	**0.19**
Domestic Wells - Lewis Co	NA	5	0.02	0.01	0.00	**0.01**
Other Beneficial Uses - Lewis Co	1	100	0.37	0.37	0.19	**0.19**
Subbasin Total						**0.48** [8]
Toutle River Subbasin						
Small Community Water Systems - Lewis Co	1	100	0.37	0.37	0.19	**0.19**
Small Community Water Systems - Cowlitz Co	1	100	0.37	0.37	0.19	**0.19**
Small Community Water Systems - Skamania Co	1	100	0.37	0.37	0.19	**0.19**
Domestic Wells - Lewis Co	NA	2	0.01	0.01	0.00	**0.01**
Domestic Wells - Cowlitz Co	NA	6	0.02	0.01	0.00	**0.01**
Domestic Wells - Skamania Co	NA	0	0.00	0.00	0.00	**0.00**
Other Beneficial Uses - Lewis Co	1	100	0.37	0.37	0.19	**0.19**
Other Beneficial Uses - Cowlitz Co	1	100	0.37	0.37	0.19	**0.19**
Other Beneficial Uses - Skamania Co	1	100	0.37	0.37	0.19	**0.19**
Subbasin Total						**1.14**
Coweeman River Subbasin						
Small Community Water Systems - Cowlitz Co	1	100	0.37	0.37	0.19	**0.19**
Domestic Wells - Cowlitz Co	NA	8	0.03	0.01	0.00	**0.01**
Subbasin Total						**0.20**
Lower Cowlitz River Subbasin						
Longview	*(Not applicable, due to location in tidally influenced area.* [6] *)*					
Kelso	*(Not applicable, due to location in tidally influenced area.* [6] *)*					
Cowlitz PUD	*(Not applicable, due to location in tidally influenced area.* [6] *)*					

Table I-2a
Water Right Reservation Calculations for WRIAs 25/26

	Anticipated Needs [1]			Maximum Streamflow Depletion Allowance (cfs) [3]	Offset/ Mitigation (cfs) [4]	Net Streamflow Depletion Allowance (cfs) [5]
	No. of "Blocks" [2]	Qa (afy)	Qi (cfs)			
Castle Rock	NA	0	0.00	0.00	0.00	**0.00** [7]
Winlock	NA	0	0.00	0.00	0.00	**0.00** [7]
Toledo	NA	29	0.44	0.44	0.22	**0.22**
Vader	NA	0	0.00	0.00	0.00	**0.00** [7]
Small Community Water Systems - Cowlitz Co	2	200	0.75	0.75	0.37	**0.37**
Small Community Water Systems - Lewis Co	2	200	0.75	0.75	0.37	**0.37**
Domestic Wells - Cowlitz Co	NA	6	0.02	0.01	0.00	**0.01**
Domestic Wells - Lewis Co	NA	5	0.02	0.01	0.00	**0.01**
Other Beneficial Uses - Cowlitz Co	2	200	0.75	0.75	0.37	**0.37**
Other Beneficial Uses - Lewis Co	3	300	1.12	1.12	0.56	**0.56**
Additional Allowance[9]						**4.00**
Subbasin Total						**5.92** [8]

Notes:

Qa = Annual Allotment; Qi = Instantaneous Quantity; afy = acre-feet per year; cfs = cubic feet per second

[1] Anticipated needs are calculated in the following ways for four different types of water users:

Large Public Water Systems - Needs are based upon deficiencies in existing water rights to meet water demand growth projected to 2020.

Small Community Water Systems - Needs are noted in terms of "blocks" of water. The number of blocks assigned to each subbasin is based upon the general likelihood of future water demand growth by these types of consumers in that area (e.g., there will likely be more such growth in the Lower Cowlitz River Subbasin, than in the Upper Cowlitz River Subbasin, due to the land use differences in these two subbasins.)

Domestic Wells - Needs are based upon estimated growth in the number of domestic wells by 2020.

Other Beneficial Uses - Needs are noted in terms of "blocks" of water, using a similar rationale as applied to Small Community Water Systems.

[2] 1 "block" = 100 afy water right on a Qa basis (or approx. 90,000 gallons per day on an average day basis)
= 0.37 cfs water right, on a Qi basis (assuming a maximum day:average day peaking factor of 2.0, and an instantaneous:maximum day peaking factor of 1.33)

1 block of water can serve approximately 300 to 350 homes, assuming water usage of 250 to 300 gpd on an annual average basis.

[3] The Maximum Streamflow Depletion Allowance refers to the total amount of streamflow reduction allowed within the subbasin as a result of pumping or diversion. In some cases, the allowance is equal to the anticipated need (Qi). In other cases, the allowance is lower, recognizing that a portion or all of the need may be met using groundwater supplies. In these cases, the impacts to streams may be lower than the amount of water withdrawn from the aquifer. For domestic wells, the depletion allowance (or potential streamflow impact) is calculated as 30% of the anticipated need, taking into account that an estimated 70% of water pumped from such wells is returned to streamflows via septic system returns.

[4] Refers to the requirement of water users to offset 50 percent of their future water uses that are guaranteed within the context of this reservation. Does not apply to Domestic Wells.

[5] Calculated as the Maximum Streamflow Depletion Allowance minus the Offset/Mitigation Requirement. This allowance applies only to impacts upon mainstem flows; it is not intended to allow for extensive dewatering of smaller water bodies. Water right applicants must provide further evidence regarding potential impacts to smaller tributary creeks resulting from new or expanded water resource development.

Allowances are to be considered available only for the category to which they are assigned. However, every 5 years, Ecology and local parties should review the status and use of the allowances and may shift allowance quantities between categories to better address needs, so long as the subbasin total allowance does not change.

[6] The sources of water supply used by this purveyor are located within the tidally-influenced portion of the Lower Cowlitz River, which will remain open for new

[7] Current water rights are sufficient to meet needs through year 2020. Therefore no reservation is established.

[8] The size of reservations in the Upper Cowlitz, Mayfield Dam, and Lower Cowlitz Subbasins are under review by the Planning Unit. These reservations may be increased, recognizing that flows on the mainstem Cowlitz River greatly exceed minimum flows needed for aquatic habitat. For the same reason, mitigation requirements may be reduced to some extent for any new withdrawals affecting the mainstem Cowlitz River.

[9] An additional streamflow depletion allowance is provided for the Lower Cowlitz River, due to its potential as a future regional source of water supply. The additional 4.0 cfs is substantial enough to provide a regional-scale resource for industry and other uses, while still being adequately protective of habitat given the magnitude of late summer flows in the Cowlitz River

Table I-2b
WRIAs 25 and 26
Analysis of Projected Water Demands and Water Rights to 2020

Community	Existing Water Rights [1]		Water Demands				Additional Water Rights Needed to Support 2020 Demands		
			Year 2000 [2]		Year 2020 [2]				
	Qa (afy)	Qi (cfs)	Annual (afy)	Max Inst. [3] (cfs)	Annual (afy)	Max Inst. [3] (cfs)	Qa (afy) [4]	Qa (cfs) [5]	Qi [6] (cfs)
Cathlamet	ND	2.43	176	0.64	206	0.76	0	0.00	0.00
Wahkiakum PUD [8]	350	0.67	119	0.51	228	0.97	0	0.00	0.30
Castle Rock	2,898	4.66	560	2.07	1155	4.26	0	0.00	0.00
Morton	1,012	4.41	200	0.74	297	1.10	0	0.00	0.00
Winlock [7]	482	1.73	301	0.74	375	0.95	0	0.00	0.00
Toledo	144	0.20	105	0.39	173	0.64	29	0.04	0.44
Mossyrock	146	0.45	104	0.39	174	0.64	28	0.04	0.20
Vader	ND	0.50	72	0.27	118	0.43	0	0.00	0.00
Randle [9]	ND	ND	23	0.08	34	0.12	11	0.02	0.04
Packwood [10]	135	0.50	80	0.3	119	0.45	0	0.00	0.00

Notes:
ND = No Data Available; NA = No Analysis Conducted

[1] From Washington State Department of Ecology Water Rights Application Ttracking System (WRATS) database, Dec 2001.

[2] From Watershed Plan, Table 3-1 (April 2004), except in the case of Winlock, Wahkiakum PUD, Randle, and Packwood (see other notes for details).

[3] Maximum Instantaneous Demand calculated as Maximum Day Demand (in mgd) X 1.55 (to convert to cfs) X 24/18 (assuming source pump(s) and/or diversion(s)

[4] Calculated as 2020 Annual Demand (afy) - Qa (afy), except for Randle, for which the calculation is based solely on increase in demands (as no water right information was available for comparison).

[5] The result of the above calculation converted to cfs.

[6] Calculated as 2020 Max Inst Demand (cfs) - Qi (cfs), except for Randle, for which the calculation is based solely on increase in demands (as no water right information was available for comparison).

[7] Water demands are based on information obtained from the City's June 2004 Water System Plan Update.

[8] Water rights and water demand information obtained from the PUD's 1998 Water System Plan.

[9] No water right information was available. Water demands for 2000 are estimated based on information from Department of Health's Drinking Water Automated Information Network (DWAIN) system. Demands are projected to 2020 based on an annual growth rate of 2 percent, roughly the average of other communities in

[10] Water demands for 2000 are based on DWAIN data. Projections to 2020 are based on an annual growth rate of 2 percent.

Table I-2c
WRIAs 25/26
Analysis of Projected Water Demands for Domestic Wells to 2020

Subbasin [1]	Year 2000 [2] Population	ADD [6] (mgd)	MDD [7] (mgd)	Year 2020 [2] Population	ADD [6] (mgd)	MDD [7] (mgd)	Increases from 2000 to 2020 [3] Population	ADD [6] (mgd)	Qa [4] (afy)	MDD [7] (mgd)	Qi [5] (cfs)
Grays River (Wahkiakum Co)	3,845	0.42	0.85	5,277	0.58	1.16	1,432	0.16	177	0.32	0.65
Grays River (Pacific Co)	2,564	0.28	0.56	3,518	0.39	0.77	955	0.11	118	0.21	0.43
Skamakowa Creek (Wahkiakum Co)	3,845	0.42	0.85	5,277	0.58	1.16	1,432	0.16	177	0.32	0.65
Elochoman River (Wahkiakum Co)	3,845	0.42	0.85	5,277	0.58	1.16	1,432	0.16	177	0.32	0.65
Abernathy/Germany Creek (Wahkiakum Co)	1,282	0.14	0.28	1,759	0.19	0.39	477	0.05	59	0.11	0.22
Abernathy/Germany Creek (Cowlitz Co)	7,178	0.79	1.58	9,851	1.08	2.17	2,673	0.29	330	0.59	1.21
Coal Creek/Longview Slough (Cowlitz Co)	3,076	0.34	0.68	4,222	0.46	0.93	1,146	0.13	141	0.25	0.52
Upper Cowlitz River (Lewis Co)	351	0.04	0.08	366	0.04	0.08	15	0.00	2	0.00	0.01
Cispus River (Lewis Co)	351	0.04	0.08	366	0.04	0.08	15	0.00	2	0.00	0.01
Cispus River (Skamania Co)	312	0.03	0.07	325	0.04	0.07	13	0.00	2	0.00	0.01
Tilton River (Lewis Co)	702	0.08	0.15	731	0.08	0.16	29	0.00	4	0.01	0.01
Mayfield Dam (Lewis Co)	878	0.10	0.19	914	0.10	0.20	36	0.00	4	0.01	0.02
Toutle River (Lewis Co)	351	0.04	0.08	366	0.04	0.08	15	0.00	2	0.00	0.01
Toutle River (Cowlitz Co)	1,170	0.13	0.26	1,219	0.13	0.27	49	0.01	6	0.01	0.02
Toutle River (Skamania Co)	78	0.01	0.02	81	0.01	0.02	3	0.00	0	0.00	0.00
Coweeman River (Cowlitz Co)	1,560	0.17	0.34	1,625	0.18	0.36	65	0.01	8	0.01	0.03
Lower Cowlitz River (Cowlitz Co)	1,170	0.13	0.26	1,219	0.13	0.27	49	0.01	6	0.01	0.02
Lower Cowlitz River (Lewis Co)	878	0.10	0.19	914	0.10	0.20	36	0.00	4	0.01	0.02
Notes:					0	0					

ADD = Average Day Demand; MDD - Maximum Day Demand; mgd = million gallons per day; afy = acre-feet per year; cfs = cubic feet per second

[1] The following assumptions regarding numbers of domestic wells are used in this analysis (Note: This considers only those domestic wells located in the portions of the counties that are within WRIAs 25/26.):

Step 1 - Allocation by Counties within WRIAs

WRIA 25 - 50% of domestic wells are in Wahkiakum County; 40% are in Cowlitz County; 10% are in Pacific County

WRIA 26 - 50% of domestic wells are in Cowlitz County; 45% are in Lewis County; 5% are in Skamania County

Step 2 - Allocation by Subbasins within Counties

Wahkiakum County - 30% of domestic wells are in Grays River Subbasin; 30% are in Skamokawa Creek Subbasin; 30% are in Elochoman River Subbasin; 10% are in Abernathy/Germany Creek Subbasin

Pacific County - 100% of domestic wells are in Grays River Subbasin

Cowlitz County (WRIA 25 portion) - 70% of domestic wells are in Abernathy/Germany Creek Subbasin; 30% are in Coal Creek/Longview Slough Subbasin

Cowlitz County (WRIA 26 portion) - 40% of domestic wells are in Coweeman River Subbasin; 30% are in Lower Cowlitz River Subbasin; 30% are in Toutle River Subbasin

Lewis County - 25% of domestic wells are in Lower Cowlitz River Subbasin; 25% are in Mayfield Dam Subbasin; 20% are in Tilton River Subbasin; 10% are in Cispus River Subbasin; 10% are in Upper Cowlitz River Subbasin;

Skamania County - 80% of domestic wells are in Cispus River Subbasin; 20% are in Toutle River Subbasin

[2] From Watershed Plan, Table 3-1. WRIA-wide numbers apportioned to subbasins according to the assumptions under Note 1.

[3] Year 2020 value minus Year 2000 value.

[4] Qa (Annual Allotment) = ADD *1,121 (conversion from mgd to afy)

[5] Qi (Instantaneous Quantity) = MDD (in mgd) X 1.55 (to convert to cfs) X 24/18 (assuming source pump(s) and/or diversion(s) operate 18 hours a day).

[6] ADD is based on a water-use factor of 110 gallons per day per person.

[7] MDD is based on a MDD:ADD ratio of 2:1.

Rationale for WDFW-WDOE recommendations for flow reserves in WRIAs 25-28

Hal Beecher, WDFW

4 October 2004

WDFW and Ecology have worked to identify and protect instream flows to protect instream resources, including fish. For streams where we had IFIM/PHABSIM study results, we used those results for recommending instream flows. In other streams we used the toe-of-bank width ("toe-width") method.

If we had hydrological information, we used that to keep our recommendations consistent with hydrology, particularly during low flow in late summer and early fall (salmon and steelhead juvenile rearing and Chinook salmon spawning). We limit our instream flow recommendations to flows that are hydrologically realistic – they occur frequently enough (every few generations) for long enough (roughly a week) that they would have real benefit to the long-term survival of a population of fish. Thus we would expect these flows, though higher than normal, to benefit fish populations when the flows occur.

Late summer – early fall low flows limit fish habitat - Our concerns with the ceiling on our instream flow recommendations during low flow emphasize the importance of low flows as a limiting factor for fish. For both coho salmon and steelhead we have evidence that more flow during summer low flow results in better production of these fish. Conversely, less flow results in less production. Further reduction of flow in late summer and early fall can be expected to adversely impact production of these fish.

The magnitude of impact of flow reduction on fish is best estimated using the method used to recommend instream flows. In the case of IFIM/PHABSIM, the model produces an index, weighted usable area (WUA), for habitat at each flow of interest. The toe-width method does not produce an index for assessing habitat loss with flow. For sites with IFIM/PHABSIM studies, we can interpolate changes of WUA with change in flow and compare it to rates of change of flow; the two are similar in the range of flows occurring during the driest years at the dry season (late summer-early fall).

During late summer-early fall, we recommend instream flows to protect the full natural potential for fish habitat. This results in recommending flows that preclude additional out-of-stream water appropriation (new water rights) – i.e., closure.

Flow reserves – We recognize that protecting fish habitat through instream flows and closures may involve some compromise; flow reserves are such a compromise. How much water can be exempt from instream flows while still fulfilling the purpose of instream flows?

We considered the case of driest streams at the low flow season, the time when flows are the greatest stressor for fish. At such a season, it is difficult to say that any flow reduction is acceptable, but we evaluated several habitat or flow reductions. Habitat reductions of 50%, 25%, 10%, and 5% were considered too extreme under already severe conditions. Reductions of 1-2% were considered tolerable, although it does represent a real loss of fish, including ESA-listed species, and is only tolerable if additional flow protection (adoption and implementation of instream flows and closures) goes with it.

To determine an acceptable flow reserve, we determined flows that equate to 1-2% reductions in WUA for juvenile steelhead and Chinook salmon spawning at the 90% exceedence flows in September-October. Thus we are looking at the very dry conditions (9 out of 10 are as wet or wetter for that date) at the driest season. For fish (or any other water user) this is the most stressful condition. Because some streams did not have WUA (i.e., no IFIM/PHABSIM studies), we considered how flow might be used as a surrogate for the habitat index (WUA). At several study sites the relationship between WUA and flow was nearly linear, so we used flow as a surrogate for habitat where no IFIM/PHABSIM study was conducted; we used a 1-2% reduction in flow from the 90% exceedence flow at the low flow season as the reserve recommendation.

In small streams, we recommended no reserve. These small streams are too sensitive to flow reduction.

Summary – For late summer instream flow recommendations we focus on the wettest conditions to allow fish to benefit from relatively wetter conditions when they occur. For flow reserves, we focus on the driest late summer flows to assess worst-case (for fish) habitat impacts of exempting withdrawals from instream flows and closures.

Recommended flow reserves – The following table is excerpted and annotated from Steve Manlow's September 23 memo.

WRIA 25/26

Stream	Flow equating to 2% loss	Flow equating to 1% loss	Recommendation for flow reserve
Gray's River (RM 11)	1.0 cfs	0.5 cfs	0.5 cfs = 1% of 90% exceedence flow
Elochoman River (RM 4.5)	0.5 cfs	0.25 cfs	0.25 cfs = 1% of 90% exceedence flow
Skamakowa, Abernathy, Germany, Mill, & Coal creeks		< 0.05 cfs	0.0 cfs – these streams are too small to be subjected to additional withdrawal – NO RESERVE
Cowlitz River at Randle (RM 102.9)	11.2 cfs	5.6 cfs	5.6 cfs = 1% of 90% exceedence flow
Cispus River near Randle (RM 15.8)	6.4 cfs	3.2 cfs	3.2 cfs = 1% of 90% exceedence flow
Tilton River (RM 7.1)	1.3 cfs	0.6 cfs	0.6 cfs = 1% of 90% exceedence flow
Cowlitz River at Mayfield Dam (RM 50.6)	40.0 cfs (includes 11.2 from upper Cowlitz, Cispus, and Tilton, above)	20.0 cfs (includes 5.6 from upper Cowlitz, Cispus, and Tilton, above)	20.0 cfs = 1% of expected low flow under FERC license
Toutle River (RM 6.5)	5.8 cfs	2.9 cfs	2.9 cfs = 1% of 90% exceedence flow
Lower Cowlitz River at Castle Rock (RM 71.3)	45.8 cfs (includes 40 cfs from upstream on Cowlitz and from Toutle)	22.9 cfs (includes 20 cfs from upstream on Cowlitz and from Toutle)	22.9 cfs = 1% of 90% exceedence flow
Coweeman River (RM 7.0)	0.6 cfs	0.3 cfs	0.3 cfs = 1% of 90% exceedence flow

WRIA 27/28

Stream	Flow equating to 2% loss	Flow equating to 1% loss	Recommendation
Kalama River (RM 4.3-5.2)* **PHABSIM**	7.2 cfs for steelhead juveniles at 200 cfs 7.8 cfs for Chinook spawning at 200 cfs	3.6 cfs for steelhead juveniles at 200 cfs 3.9 cfs for Chinook spawning at 200 cfs	3.6 cfs
North Fork Lewis River at Ariel (RM 19.5)	24.0 cfs	12.0 cfs	12.0 cfs = 1% of expected lowest flow (subject to revision pending outcome of relicensing)
East Fork Lewis River (RM 10.8)* **PHABSIM**	1.4 cfs for steelhead juveniles at 40 cfs 0.6cfs for Chinook spawning at 40 cfs	0.7 cfs for juvenile steehead rearing at 40 cfs 0.3 cfs for Chinook spawning at 40 cfs	0.6 cfs
Salmon, Burnt Bridge, and LaCamas Creeks		< 0.02 cfs	0.0 cfs – these streams are too small and too heavily impacted to be subjected to additional withdrawal – NO RESERVE
Washougal River (RM 3.5)* **PHABSIM**	1.1 cfs for steelhead juveniles at 60 cfs 0.57 cfs for Chinook spawning at 60 cfs	0.55 cfs for steelhead juveniles at 60 cfs 0.28 cfs for Chinook spawning at 60 cfs	0.6 cfs
Columbia River Tributaries			0.0 cfs - these streams are too small to be subjected to additional withdrawal – NO RESERVE

Table I-3
Extent of Tidal Reaches Excluded from Stream Closures

River	Tidal Influence Location	Major Public Water Supplier Location	Rationale
WRIA 25			
Grays	Rosburg Bridge (RM 5)	Wahkiakum County PUD wells at Highway 4 bridge (RM 11.4)	Approximate mid-point of tidal influence zone; downstream of known spawning habitat (Section 18) for chum salmon; downstream of significant adult holding pools @ Grays River bend; downstream of Nikka and Thadbar Creek mouths (both of these streams are anadromous and passage has recently been restored.
Elochoman	Foster Road Bridge (RM 2.2)	Cathlamet water intake structure just downstream of first bridge crossing of Elochoman Valley Road (RM 4.2)	Approximate mid-point of tidal influence zone; pool/riffle sequences start at Foster Road bridge, which coincides with WDFW spawner index survey reach; redds typically not documented below this point, as habitat is unsuitable; habitat below this point is primarily rearing, but habitat availability would not be appreciably reduced with withdrawals; some sedimentation problems documented near the mouth of Elochoman Slough, but effects on upstream adult passage are not known.
WRIA 26			
Cowlitz	At railroad bridge crossing near Rocky Point and downstream of Lexington (RM 6.7)	Longview water intake structure (RM 5.2) Kelso water intake structure (RM 4.7)	Coincides with WDFW spawner index survey reach, and first known redds typically occur upstream of this point to Rocky Point; some side-channel rearing habitat available upstream of this point, and is affected by changing water elevations; available rearing habitat downstream of this point is not noticeably reduced with changing tidal elevations because of channel shape, flow volume, and confinement; no known passage problems.
Coweeman	Approximately ¾ miles upstream of most upstream I-5 bridge crossing (RM 3.5)	No major public water suppliers	First known spawning habitat occurs upstream of this point, near the Hill property; habitat availability in side channels upstream of this point would be reduced by withdrawals; available rearing habitat downstream of this point is not noticeably reduced with changing tidal elevations because of channel shape, flow volume, and confinement; no known passage problems.
Skamokawa Creek	0.5 miles upstream of mouth	Not reviewed	Downstream of first known spawning habitat which occurs upstream of the confluence of the West Fork Skamokawa Creek; also downstream from the mouth of the original Skamokawa Creek channel (which may be restored in the future and presently provides off channel rearing habitat). Redds are not typically documented below this point and migration is not a problem for adult or juvenile salmonids.

Table I-4
Proposed Instream Flows for WRIAs 25 and 26

Stream Reach	Proposed Instream Flows (cfs)[1]		Control Station
Grays River Mainstem RM 5 to headwaters and all tributaries in this reach	Oct 1-Nov 30	516	Control Station for proposed instream flows to be located at Covered Bridge Road crossing (about RM 10.5) and approximately one mile downstream from Highway 4 bridge crossing
	Dec 1-Mar 31	344	
	Apr 1-May 31	401	
	Jun 1-Jul 31	267	
	Aug 1-Sep 15	147	
	Sep 16-30	516	
Elochoman River Mainstem RM 2.2 to headwaters and all tributaries in this reach	Oct 1-Nov 30	355	Control Station for proposed instream flows to be located near the County Road Bridge, at about RM 4, with exact point TBD Proposed Control Station is expected to be located near the City of Cathlamet's existing diversion
	Dec 1-Mar 31	237	
	Apr 1-May 31	283	
	Jun 1-Jun 30	189	
	Jul 1-Jul 31	89	
	Aug 1-Aug 15	65	
	Aug 16-Aug 31	72	
	Sep 1-Sep 15	96	
	Sep 16-30	155	
Coweeman River Mainstem from RM 3.6 to headwaters and all tributaries in this reach	Oct 1-Nov 30	290	Control Station for proposed instream flows to be located in the vicinity of RM 5 with exact point TBD
	Dec 1-Dec 31	193	
	Jan 1-Mar 31	193	
	Apr 1-May 31	234	
	Jun 1-Jun 30	156	
	Jul 1-Jul 31	130	
	Aug 1-Sep 15	76	
	Sep 16-30	203	

[1] Instream flows are proposed to support stream closures and will be used in processing applications for changes or transfers of existing water rights. Blocks of water reserved for domestic, municipal, and other beneficial uses shall not be subject to instream flows or closures.