Basin Description

The Chehalis River Basin is the largest river basin in western Washington. With the exception of the Columbia River basin, it is the largest in the state. The basin extends over eight counties. It encompasses large portions of Grays Harbor, Lewis, and Thurston counties, and smaller parts of Mason, Pacific, Cowlitz, Wahkiakum, and Jefferson counties. For purposes of water resources planning under the Washington State Watershed Planning Act of 1998, the Chehalis Basin was divided into two Water Resource Inventory Areas (WRIAs), WRIA 22 and WRIA 23, depicted here with surrounding WRIA numbers and in relation to the whole state of Washington.

Chehalis Basin Watershed – County Land Areas

County	*Area (sq.mi.)*	*Area (acres)*	*Percentage*
Grays Harbor	1,390	889,711	50.3%
Thurston	323	206,446	11.7%
Lewis	770	493,103	27.9%
Mason	206	132,146	7.5%
Pacific	66	42,040	2.4%
Cowlitz	8	5,427	0.3%
Jefferson	2	1,259	0.07%
Wahkiakum	.1	37	0.002%
Total	**2,766**	**1,770,169**	

Source: Chehalis Watershed GIS

WRIA 22

WRIA 23

Watershed Boundaries

The basin is bounded on the west by the Pacific Ocean, on the east by the Deschutes River Basin, on the north by the Olympic Mountains, and on the south by the Willapa Hills and Cowlitz River Basin. Elevations vary from sea level at Grays Harbor to the 5,054-foot Capitol Peak in the Olympic National Forest. The basin consists of approximately 2,766 square miles. The Chehalis River system flows through three distinct eco-regions before emptying into Grays Harbor near Aberdeen (Omernik, 1987):

- The Cascade ecoregion (including the Olympic Mountains) is characterized by volcanic/sedimentary bedrock formations.
- Puget Lowland is characterized by glacial and alluvial sediment. Glacial sediments are layers of sand, gravel, silt and clay deposited by the ancient movement of glaciers; alluvial sediments are deposited by moving water throughout the river valleys.
- The Coast Range is also characterized by volcanic/sedimentary bedrock.

The description of the basin is adapted from the Level 1 Assessment and the *Chehalis River Basin Action Plan* (Chehalis River Council, 1992).

Water Resources and Wildlife

The streams and lakes in the Chehalis Basin provide vital habitat for numerous species of fish. Streams range in character from cold, swift-flowing, high elevation tributaries, to warmer, meandering, lowland valley rivers. The 180 lakes, ponds, and reservoirs in the lowland waters of the basin support a variety of fish and wildlife species. The existing anadromous and shellfish resources of the basin are of regional and national significance to sport, tribal, and, commercial fishing. The basin provides migratory and wintering area for waterfowl in the Pacific Flyway.

Geology and Hydrogeology

The geology and associated hydrogeologic conditions of the Chehalis Basin vary widely and reflect the complex geologic history of the area. The basic geology of the basin consists of older bedrock of both sedimentary and volcanic origin that is exposed on hill slopes and ridges. More recent depositions of glacial and alluvial sediments overly these rock units in the valley bottoms and lowland prairies. Groundwater is present in substantial quantities in the glacial deposits as well as alluvial sediments in the major river valleys.

Five major soil groups are found in the Chehalis Basin. (See table below.) These soil groups exemplify the diverse landscape, precipitation patterns, and vegetation communities across the basin.

Major Soil Groups of the Chehalis Basin

Soil Group	*% Land*	*Location*	*Geographic Description*	*Dominant Vegetative Species*
Group A	6	Southern Olympic slope in the northern basin tip	Steep & very steep well-drained soils	True fir, mountain hemlock
Group B	1	Coast from Grayland - Westport & north beach area - Copalis	Deep, sandy, poorly-drained deposits; tidal estuaries	Shore pine; Sitka spruce, western red cedar, western hemlock adjacent to estuaries
Group C	27	Eastern third of the basin, Chehalis-Centralia urban area	Steep glacial plains & rolling grassy prairie terrain	Douglas fir & Oregon white oak interspersed with prairie areas; Scotch broom increasing
Group D	19	Chehalis floodplain & major tributaries	Level & gently sloping alluvial soils	Western red cedar, red alder, black cottonwood & willow on poorly drained floodplain fringes, cropland, & pastures; some Douglas fir on better drained soils
Group E	47	Western two thirds of the basin between Thurston County line & coast	Forested foothills & steep slopes	Sitka spruce; western hemlock; western red cedar along coast; Douglas fir or western hemlock in eastern part of basin

Climate

Mild summer and winter temperatures characterize the Chehalis Basin. During January average temperatures range from 38˚ to 40˚ F; in July temperatures range from 59˚ to 64˚ F. As a result of these temperatures, except for mountainous locations, the frost-free season varies from 163 to more than 190 days and snow rarely accumulates over any prolonged period of time.

Wet winters and dry summers also characterize the basin. Annual precipitation varies from a minimum of 40 inches in the central portions of the basin (Chehalis/Centralia) to a high of 220 inches in the headwaters of the Wynoochee and Humptulips Rivers in the Olympic Mountains. Precipitation usually falls as rain except in the higher elevations of the Olympics which receive snow. River discharge peaks between December and March. Approximate average annual discharge of the entire basin is 11,208 cubic feet/second (cfs). Delayed runoff from snowmelt is relatively minor and is likely restricted to the Wynoochee, Satsop, and Humptulips Rivers.

Chehalis River

Rivers in the Basin

The mainstem and South Fork Chehalis drain uplands south and west of Chehalis. Two major tributaries in mid-basin, the Newaukum and Skookumchuck Rivers, have their headwaters in the foothills of the Cascade Range. Another mid-basin tributary, the Black River, originates in wetlands near Black Lake. The largest tributaries, the Satsop and Wynoochee Rivers, arise in southern extensions of the Olympic Mountains and join the mainstem shortly before its terminus at Grays Harbor. The Humptulips, the Hoquiam and the Wishkah Rivers also have their headwaters in the southern Olympic Mountains and flow into Grays Harbor; the Humptulips into North Bay, the Hoquiam into the inner estuary of Grays Harbor, and the Wishkah into the Chehalis River near the mouth. The Johns and Elk Rivers flow into the South Bay of Grays Harbor. The terminus of all rivers is where they enter another river or Grays Harbor (saltwater influence).

Black River

The dams and diversion structures on the rivers of the basin include the following:

- The Hoquiam and Wishkah Rivers have diversion structures to supply municipal and industrial water to the Hoquiam/Aberdeen area. These structures allow Hoquiam to remove 2.5 cfs from the Hoquiam River and Aberdeen to divert 10 cfs from the Wishkah River.
- The Wynoochee Dam on the Wynoochee River provides water for fish and wildlife habitat, irrigation, recreation, flood control, and municipal and industrial water supply for the City of Aberdeen. The reservoir has a maximum retention capacity of 70,000 acre-feet.
- The Bloody Run Dam on the Skookumchuck River supplies up to 54 cfs for use in the Centralia Steam Electric plant.

Hoquiam River

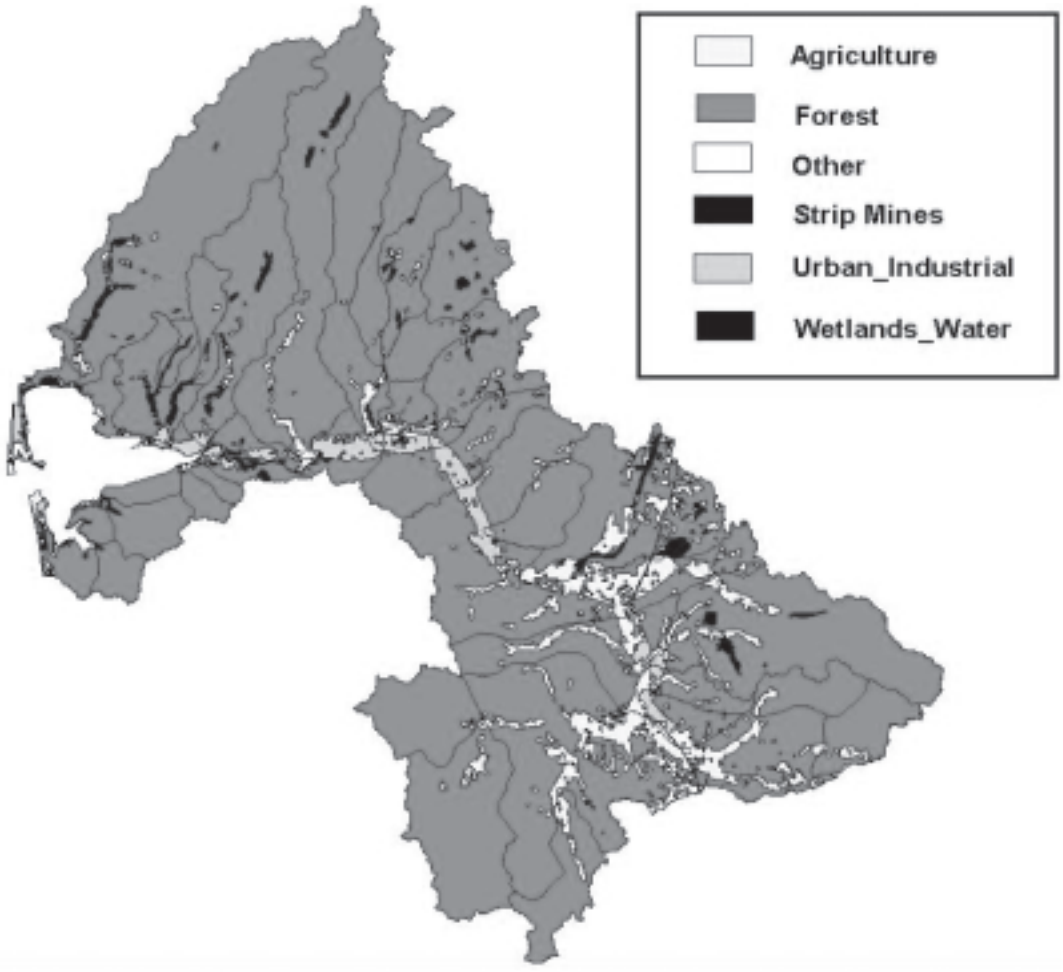
- A dam on the North Fork of the Newaukum River contributes municipal and industrial water (up to 7 cfs) to the cities of Chehalis and Centralia.

Other small dams scattered throughout the basin contribute to rural water supplies (USGS, 1992).

Land Uses in the Basin

DEVELOPMENT IS concentrated in areas close to important basin streams and rivers; this proximity can have adverse impacts on both water quantity and water quality.

The majority of the basin (87%) is forestland. Although the Chehalis Basin has a high proportion of forestlands, development is concentrated in areas close to important basin streams and rivers; this proximity can have adverse impacts on both water quantity and water quality. While only 11 percent of the basin as a whole is in agricultural, urban or industrial uses, this figure climbs to 42 percent in those areas within one mile of the major Chehalis rivers. The developed segments of these water bodies account for almost half the length of the major rivers in the basin.[1] The map below depicts general land use throughout the basin.[2]



1. These streams are the Chehalis main stem, South Fork Chehalis, Newaukum, North Fork Newaukum, South Fork Newaukum, Skookumchuck, Black, and Satsop main stem.

2. Lee Daneker, EPA Region 10 and Steering/Technical Committeee Member, provided this map using Level 1 Assessment data.

Most forested acres are either privately owned or government-owned (federal and state). Available data do not indicate what proportion of the forested area is mature forest as opposed to lands that have recently been harvested. The government-owned woodlands in the basin include the Capitol State Forest and portions of the Mt. Baker-Snoqualmie National Forest and the Olympic National Forest.

Forestlands in the Chehalis Basin

The Chehalis Basin is extensively forested. USGS land use data from the Level 1 Assessment indicate that 87 percent of the basin is forestland.[3] These forestlands are an important asset from a water resource perspective because well managed forestry as a land use provides favorable conditions for water quality and water resource integrity.

The Partnership did not attempt to assemble information on the management of forestlands throughout the Basin. Accordingly, we do not know what practices have been applied to Chehalis Basin forestlands in the past or the current conditions of those lands (e.g., the extent to which basin lands have been harvested, when areas were replanted, or the extent to which regrowth is occurring in the harvested areas). The Partnership also did not assemble information on the extent of various types of ownership of forestlands. Ownership information is important because different owners of forestland (federal, state, private) are required to follow different forest management practices.

Over the past decade, Washington forest practices have changed, particularly in response to Endangered Species Act concerns pertaining to native salmon and trout (salmonids) and wildlife (the marbled murrellet and the spotted owl). The resulting improvements to forestry requirements are intended to allow recovery and to protect water quality and quantity. Notwithstanding the new requirements, legacies of past forest management will likely have an influence on water resource quality in some Chehalis subbasins for a period of time.

The Chehalis Basin Partnership is aware of two major systems of forest management in the basin. These are the Washington Forests and Fish Rules (FFR - also commonly referred to as the Washington forest practices rules) and three Habitat Conservation Plans (HCPs)[4] that have been adopted by land owners in the Basin.[5] The HCPs meet or exceed the standards required by

3. Although the basin is predominantly forested, more intensive land uses that are less likely to provide water quantity and quality benefits are common in lowland areas in proximity to the Chehalis River and other major streams.

4. The National Marine Fisheries Service approves HCPs pursuant to the Endangered Species Act.

5. Chehalis Basin landowners that have adopted HCPs are the Simpson Timber Company, Port Blakley Timber Company, and the Washington Department of Natural Resources. Port Blakely Tree Farms has also gone to a longer rotation than the typical 35 to 45 years with one or two commercial thins between clear cutting.

Washington forest practices rules and are designed to assure that they are protective of species listed under the Endangered Species Act. The Partnership has not had the resources to develop estimates of the amount of forestland in the Basin that is managed under the different systems. This would be important to know because it would form a basis to assess the impact of new requirements on water resources in the Basin.

Older practices under which timber harvest has occurred in the state and the basin were less protective than current Washington forest practices rules, which is why the state replaced the former requirements with new rules. The new practices have not been in place long enough to generate a significant improvement in water resources throughout the basin. To the extent that there will be measurable beneficial effects of the new requirements at the basin scale, these will be manifest in the future, probably no sooner than 2025 or later.[6] However, localized improvements from new practices to minimize sediment contribution from haul roads should be evident almost immediately after construction is completed.[7]

Data gaps which could be addressed during the implementation phase of the Chehalis Basin Partnership Watershed Management Plan are as follows:

- Condition of basin forestlands (e.g. the extent of harvests, replanting, regrowth, etc.);
- Ownership of basin forestlands;
- Comparison of practices/requirements under Washington forest practices rules and the HCPs;
- Determination of the extent to which some landowners in the basin are applying practices voluntarily in addition to those that are required by Washington forest practices rules (e.g., longer rotations); and
- Determination of the extent to which harvest units within the basin are complying with Washington forest practices rules and the HCPs.

Agriculture

Seven percent of the land base is agriculture. Commercial dairy, livestock and crop farming operations are located mainly in the low-lying valleys adjacent to the Chehalis River and its major tributaries, including the South Fork Chehalis, Newaukum, Skookumchuck, Black, Satsop and Wynoochee Rivers, and Scatter Creek. Principal crops include hay and silage, with some vegetables and small grains. Land is also used for pasture.

The remaining land base is spread among rangelands, lakes and reservoirs, urban and rural residential, commercial, industrial, and other minor categories. (See above.) *The table on page III-8 indicates the dominant land use by sub-basin.*

6. Personal communication, Dave Kloempken and Chad Stussy, Washington Department of Fish and Wildlife, August 2003.

7. Ibid.

Population Centers and Trends

The total population of the basin is approximately 140,000 people. While only 1.5% of the Chehalis Basin's land-base is urbanized, more and more land is being converted to residential use as population continues to grow. The average rate of population growth from 2000 to 2025 for subbasins in the Chehalis watershed is projected to be 52%. The basin's location halfway between Puget Sound and the Columbia River, the proximity of major transportation routes, a rich natural resource base, and the aesthetic beauty of the area are factors that contribute to its rapidly expanding population base. For example, the portions of Thurston County in the upper basin are undergoing rapid development along the I-5 corridor and around Black Lake.

The major population centers are Chehalis (~6,000) and Centralia (~12,000) in the upper basin, and Aberdeen (~16,000) and Hoquiam (~9,700) at the mouth of the Chehalis. These cities depend on surface waters for a portion of their municipal and industrial supplies. The Chehalis Indian Reservation is also located near the mouth of the Black River. Although the Quinault Tribe's reservation was established outside the Chehalis Basin boundaries, the tribe has fished and hunted in the Chehalis Basin for centuries and has recognized treaty rights.

Industrial development is focused mostly in the Chehalis/Centralia and Aberdeen/Hoquiam areas and the coal mine/power plant site south of Bucoda, with isolated industrial facilities located throughout the basin. The principal industrial use of water is in the manufacturing of wood, pulp and paper products. Grays Harbor has historically provided access to cities and ports up the Chehalis River for commercial shipping.

THE AVERAGE RATE
of population growth from 2000 to 2025 for subbasins in the Chehalis watershed is projected to be 52%.

Predominant land use by sub-basin[8]

Name	*Primary*	*%*	*Secondary*	*%*	*Tertiary*	*%*	*Total % of 3 Major Land Uses*
Chehalis Headwaters	Forest	96%	Agriculture	3%	Urban/Industrial	1%	99.83%
Elk Creek	Forest	99%	Agriculture	1%			99.32%
SF Chehalis	Forest	89%	Agriculture	10%	Urban/Industrial	1%	99.62%
Upper Chehalis	Forest	82%	Agriculture	17%	Urban/Industrial	1%	99.56%
SF Newaukum	Forest	91%	Agriculture	6%			96.99%
NF Newaukum	Forest	95%	Agriculture	5%			100.00%
Newaukum River	Forest	69%	Agriculture	28%	Urban/Industrial	2%	99.47%
Salzer Creek	Forest	84%	Agriculture	13%	Urban/Industrial	3%	100.00%
Skookumchuck	Forest	88%	Agriculture	8%	Urban/Industrial	2%	97.58%
Middle Chehalis #1	Forest	69%	Agriculture	21%	Urban/Industrial	9%	99.87%
Black River	Forest	71%	Agriculture	18%	Wetlands/Water	7%	95.48%
Cedar Creek	Forest	96%	Agriculture	2%	Urban/Industrial	2%	100.00%
Middle Chehalis #2	Forest	78%	Agriculture	15%	Urban/Industrial	6%	99.32%
Collquallum Cr.	Forest	91%	Urban/Industrial	4%	Agriculture	4%	98.15%
EF Satsop	Forest	96%	Wetlands/Water	4%			99.41%
Decker Creek	Forest	93%	Agriculture	4%	Wetlands/Water	2%	99.30%
MF Satsop	Forest	99%					99.39%
Satsop River	Forest	94%	Agriculture	3%	Urban/Industrial	1%	99.19%
Lower Chehalis #1	Forest	79%	Urban/Industrial	15%	Agriculture	6%	99.40%
Wynoochee River	Forest	95%	Agriculture	3%	Wetlands/Water	1%	99.59%
Wishkah River	Forest	93%	Wetlands/Water	3%	Urban/Industrial	2%	99.01%
Hoquiam River	Forest	89%	Wetlands/Water	7%	Urban/Industrial	5%	100.00%
MF Hoquiam	Forest	90%	Wetlands/Water	10%			100.00%
EF Hoquiam	Forest	97%	Urban/Industrial	1%	Wetlands/Water	1%	99.32%
Humptulips River	Forest	96%	Wetlands/Water	2%	Agriculture	1%	99.45%
Elk River	Forest	99%	Wetlands/Water	1%			100.00%
Johns River	Forest	97%	Wetlands/Water	3%	Agriculture	1%	99.73%
Newskah Creek	Forest	97%	Agriculture	2%			99.34%
Charley Creek	Forest	94%	Agriculture	5%			99.01%
Lower Chehalis #2	Forest	66%	Urban/Industrial	24%	Wetlands/Water	6%	96.47%
Grays Harbor	Forest	68%	Urban/Industrial	12%	Other	6%	85.44%

8. This table was created by Lee Daneker in April 2002 for the Steering/Technical Committee; the information is derived from the Level 1 Assessment GIS Land Use Land Cover data.

Chehalis Basin: Glimpses of the Past

Introduction

In contrast to the technical reports and analysis that provide the foundation for much of this Plan, this section seeks to shed light on the Chehalis Basin through anecdotes, personal remembrances, and informally-collected information from the basin's past. It is based on interviews with a few long-time residents who reflect different perspectives and on notes from various Internet websites. The information from the interviews is presented first, followed by information from the Internet. This section is intended to provide glimpses of the past that that will enrich our understanding and appreciation of the past and the present and help to inform decisions about the future.

Interviews with Chehalis Basin Residents

Lyle Hojem

Mr. Hojem has lived in the Chehalis basin for nearly 80 years. He has lived in the upper basin (Thurston & Lewis counties) for all but three months of his life. During this interview Mr. Hojem told stories about a wide range of topics, in brief anecdotal form. Each bullet below contains a separate incident.

Flooding

- Soldiers who walked from Ft. Lewis to Ft. Vancouver in late 1880's through early 1900's, camping every seven miles, referred to the Chehalis area as the Big Swamp. They would get Indians to canoe them across in the winter.
- There used to be a cable-drawn ferryboat set up by a farmer to get across the Chehalis River floodplain just to feed his cattle. Soldiers used that too to cross.
- An "old Greek man" strung a cable across the Chehalis, knowing it would flood, and caught logs and harvested them by boat to use or sell.
- In the flood of 1932 (or maybe 1934) a boat could run up Tower Avenue in Centralia.

Timber

- In the upper Chehalis basin, down to Porter, all of the creeks and the Skookumchuck River were all completely dammed with splash dams to catch timber that had just been cut. The area behind the dam filled with cedar blocks. Then they'd bust the dam and drive the cedar downstream to mills.

- The South Bend Railroad Branch ran from Chehalis to South Bend. At one time - up to 1920 or so when the Luddinghouse (?) brothers dammed the Chehalis to establish a big mill at Dryad, it handled more forest products than any other railroad spur line in the country. After that, the railroad no longer needed to take timber elsewhere for milling. Natives would go to the dam at Dryad to load up their wagons with salmon since the fish couldn't swim any further upriver and take the carcasses upstream to use as fertilizer on fruit trees.

Agriculture and its Impacts

- People frequently built small dams on creeks to get water for crops.
- It was common practice to clear land by slashing all winter/spring. Then in the latter part of August "you'd set it all on fire and go to the fair."
- In the early 1920's there was no herd law in Lewis County so people would run stock on the hills in the spring. They'd burn the land to make grass for their stock in the spring. These spring burns covered more than 20,000 acres at times, which led to a very sudden runoff of water from rainfall. Locals would go fight the fires that got out of control. Then the herd law forced folks to keep their stock penned, and the fires and land clearing dwindled so runoff into the river slowed.
- There were so few people in the area then that there was no such word as "pollution." Cesspools were built with outlets into a creek or a ditch. Almost all roads were gravel or dirt. Everyone in the basin lived on a family farm. Everyone raised a garden and tried to raise hay. The only sales were of eggs or of cattle in the fall, but few farms were commercial. The impact of these farms was spread out and small, not like large corporate farms today that can create larger problems.

Rain, Fire

- There was a time in the 1840's when areas of the Chehalis basin didn't get rain for 19 months, over a year and a half.
- A huge fire in 1902 burned through the area so hard that it killed the timmemory relates to the Cowlitz, Mr. Hojem thinks it had to be the same in the Chehalis.)

River's adaptability

- The river changed courses during the 1930's, 1940's and 1950's.
- Every farmer took all the rock he needed from gravel bars in the summer during the break after planting and before harvesting. This may have kept the river from changing course; the gravel bars are huge now and rivers get pushed out of their beds.

Fish

- One flood in the early 1940's up Big Hatterford Creek took the creek out of its banks. There were salmon in the field that were lost. Deep Creek had splash dams in it for years, with debris keeping salmon from getting up it. Now, those dams are gone and salmon have returned. Elk Creek and other creeks that were blocked now have salmon back, within 10 years or so.
- I never saw bull trout; they were never here.

"***VISION***"

is a compelling image of an achievable future.

Lyle Hojem

J. Roach

J. Roach has lived in Black Lake area for 30 years. Approximately 155 homes now line the banks of the lake. The Black Lake fire district is home to about 10,000 residents. An unnamed, year-round stream tributary to Black Lake runs across Mr. Roach's property. Some years ago, because the number of salmon returning to this stream continued to decline, he went to work to figure out why.

History of Black Lake & Black River

Located about three miles southwest of Olympia, Black Lake is just under three miles long. It is bordered on the west by a basalt ridge of the Black Hills and on the east by marshy lowlands that extend to the lower Deschutes River watershed. There are five year-round streams that flow into the lake in addition to several small, intermittent seasonal drainages around the lake. The lake is fed by subsurface artesian springs nearby that originate in the Black Hills and flow north and south.

With a surface elevation of about 130 feet above sea level, Black Lake has historically formed the headwater of the Black River, which is tributary to the upper Chehalis River. Much earlier, the lake and adjacent wetlands to the east were under the head of a much larger river, with a flow estimated to be four times that of the present Columbia River. This was the outlet of glacial Lake Russell, which covered much of southern Puget Sound before sea water re-intruded when the ice retreated.[1]

During the most recent (Wisconsonian) glaciation, approximately 10,000 years ago, the ice shield's southern limit stopped just south of the Chehalis River itself. The ice shelf was approximately a mile high. The runoff from the ice created a "splash hole" that became Black Lake, and water rose to a level above the Black Hills around the lake. When the glacier retreated, it left a huge basalt shelf just north of Black Lake.

A Navigation Dream: Puget Sound to Grays Harbor via the Chehalis (from *South Puget Sound Afoot & Afloat,* Marge & Ted Mueller, The Mountaineers Press, 1983, pp. 195-197)

To transport Olympic Peninsula timber to Puget Sound markets, in 1933 the Washington State Canal Commission recommended a canal route that would begin at the head of Budd Inlet and follow Percival Creek to Black Lake. This canal route would then follow the Black River south to the Chehalis River, eventually heading west into Grays Harbor and the Pacific Ocean. The proposed canal route would require dredging of Grays Harbor and Willapa Bay for deep channels; more than a dozen locks would be installed to accommodate ocean-going ships.

Funding for this proposal was never allocated, though another major government study of this proposed waterway took place in the early 1960's with recreation as the primary impetus. Developers envisioned throngs of pleasure boaters traversing the waterway, with "touristvilles" along the route providing services. As recently as 1972 the idea again surfaced, but with soaring construction costs and increasing awareness of the environmental consequences of such dredging and dozing it seems unlikely that this particular dream will ever be realized.

1. *Chasing the Ghost Smelt of Black Lake*, John R. Heimburg, The Evergreen State College, 2002

In 1922-23, the Consolidated Drainage Improvement District #101[2], opened a ditch at the north end of Black Lake to limit the seasonal maximum lake levels and to permit construction of a bridge to allow more direct passage by road to Tumwater. This "overflow" ditch was channeled into Percival Creek, about a mile upstream from Capitol Lake, which flows to Puget Sound.

The ditch created the largest island in the United States – the Olympic Peninsula: 6,667 square miles (bigger than all the Hawaiian Islands combined) - *see photo: "Island Signs."*

The channel at the north end of the lake decreased the quantity of water flowing out to the south via the Black River. This, combined with changes in vegetation brought about by logging along the upper river, permitted denser deciduous plants to grow in the river's flood channel. This condition was exploited and exacerbated by beavers, further limiting Black Lake's outflow via the Black River and inhibiting fish passage up the river to the lake and tributary streams.

By 1936, wetlands were gone around Black River. Salmon runs via the Black River, which once reached the five tributary streams, declined significantly. As part of his investigations into the causes, J. Roach purchased aerial photos from the Washington Departments of Natural Resources and Transportation. These aerial photos became the origin of the Data Viewer, a CD ROM available as an appendix to this Plan.

The beaver dams built after the pipeline caused a rise of about four feet in the mile between the south end of the lake and pipeline. As a result, nutrients from these dams now wash north into the lake, resulting in algae blooms.

Some salmon (coho) do manage to get past the beaver dams and pipeline. However, the smolts born of these fish are blocked by the beaver dams from swimming back south to the Chehalis River. Some south Puget Sound salmon come south into Black Lake too, mixing those species and Chehalis River stocks.

The Washington Department of Ecology has estimated that the Black River is missing 40-50% of its water now. On July 14, 2003 Mike McGinnis, a biologist working for the Confederated Tribes of the Chehalis, noted that "the Black River is 303(d) listed for temperature and gave his opinion that flow going out the north end could make a difference and eliminate the Black from the list."[3] Mr. Roach has stated that "Science must determine what to

2. Between 1918 and 1922, through a petition, the Consolidated Drainage Improvement District #101 (CDID 101) of Thurston County was formed. At that time, drainage easements were granted to Thurston County for and on behalf of the CDID 101 petitioned for by J.W. Dent and others, known as CDID 101. Resolution No. 5201, August 17, 1976, abandoned CDID 101 and stated that all property now owned or held in trust for the use or use and benefit of CDID 101 be conveyed to and accepted by Thurston County. (source - memo from Wayne McBrady, County ROW Agent, 1991)

do with the current situation. But it must be known that Black Lake drained south prior to human intervention and that fish runs have suffered since the ditch was dug at the north end." He noted that 2003 marked the lowest amount of water he has seen in the stream in his 30 years on his property.

South of Black Lake, the Black River refuge (part of the Nisqually National Wildlife Refuge) covers about 4,600 acres, over 2,000 of which have been purchased through the Partnership using Salmon Recovery Board funds. The "Rails-to-Trails" program is converting the rail line to a trail, which will allow recreational boaters to portage canoes and kayaks south from Black Lake past the beaver dams to Black River.

Margaret Rader

Margaret Rader and her brother Pete Holm live on Holm Farm, at the end of Holm Road by the railroad bridge. Their property, purchased in 1921, includes the curve of a large oxbow in the Black River, readily identifiable on maps near Gate in the southwestern corner of Thurston County.

Gate is just a dot on the map today. At one time, when the Black Hills were being logged for the first time, it was quite a substantial community. Even as late as the 1950's, there was a post office and a railroad station. You could get on the Northern Pacific and take the train anywhere you liked.

When the family purchased the farm in about 1920, there was a settlement of Swedish and Finnish people in the area who were drawn there because it was wooded, like the old country, and because there was plenty of water. At that time, most area residents had small farms. Margaret's father had a dairy farm with about 35 cows. Other folks worked in the woods or various parts of the lumber industry. In the Gate area today, people make their living in aquaculture, turf farming, and blueberry farming, among other occupations.

When Margaret Rader's family moved here, the Black River did not have nearly as many weeds in the summer as it does now, and the flow was greater. At that time agriculture discharged wastes directly into the river, so the Black River may be cleaner today. Even so, the river seems less attractive for swimming than it did in the 1950's since there is less water, more weeds, and a well-known swimming hole, Big Rock, has been closed because the property owner has built a house nearby.

An increasing number of houses are being built in the near vicinity, mostly by people from Olympia. Fortunately for the Black River's health, the extensive wetland system has discouraged development along the riverbanks.
Margaret and Pete grew up on the 100-acre family farm, milking the cows, haying, and working hard. Their father appreciated the natural beauty of the land and the importance of leaving a buffer between the land and the river. He left trees in the pasture to provide shade for the animals. He rotated crops to avoid exhausting the soil. In short, he practiced what we now call responsible stewardship. Lots of neighboring farmers also had the

conservation ethic. They based their actions on years of experience and "plain old common sense."

Pete and Margaret learned early about the importance of protecting the native plants on the banks of rivers. When they heard about a strategy for protecting land called a conservation easement, they decided to take steps to preserve the natural beauty and resources of their family farm for future generations. *[NOTE: Conservation easements are described at the end of the Recommendations section.]*

Flooding

The worst flood Margaret ever saw was in February 1996. "For several days it was impossible to go from Gate to Rochester. I think we could go around through Littlerock and then over to highway 5. Our pastures were flooded, but the area where the houses are was high and dry. The old timers knew how to site their house above the flood plain. There were high spots for the cows and horses, and we used a canoe to take hay out to them. Water came over a dike and essentially cut the lower end of the ox-bow off from the upper portion. We didn't really suffer any damage at all. Generally there is water in our pastures most winters."

Salmon (probably winter Chinook) spawn on a gravel bar near the lower end of Holm farm. She recalled that there is supposed to be a secret chum spot known only to the Indians near here. People fish but not for salmon, as they are pretty beat up by the time they get up here. They fish for cutthroat trout but mostly get suckers. In the early days an old Indian man used to come around selling fish, but no more.

Brady Engvall

Mr. Engvall is an oyster farmer who has been in that business about 30 years. His address is in Aberdeen but his home is closer to Westport where he has lived about 70 years.

Aberdeen was originally established as a salmon salting area, before the timber cutting began. Westport began as a tourist destination, to dock riverboats that would run down the Chehalis. Wealthy folks (timber industrialists) had summer homes here. There were some small farms and dairies, too. Then razor clam digging caught on, and lots of folks came here for that. In the depression, folks lived in shacks, poached clams or deer; some made moonshine. People were living by the seat of their pants.

The biggest change he has seen in his years there is that there are far more people, probably twice as many. However, the population of the cities of Aberdeen and Hoquiam has actually gone down since he was a kid. (This is primarily because timber has been the main industry. There is less logging now and the whole business is more efficient so fewer folks work at it.)

The population growth has come outside those towns, with lots more homes than there used to be in the uplands of the Wishkah River valley. Anywhere that didn't need filling is built up. Mr. Engvall recalls that Ocean Shores had no houses until 1962, only a single "little white shack."

The first pulp mill came to the Aberdeen area in 1929, producing pulp in 1931. At the time "they just dumped everything right in the river, so the [Grays Harbor] estuary was a sewer." The production waste went right into the bay. The quality of the bay was pretty bad. There were lots of fish dying and big shellfish kills on occasion. In the early 1960s, another pulp mill came, but right about then the industry started cleaning up its act since folks were paying more attention.

Mr. Engvall pays close attention to water quality since it affects his livelihood — oyster farming — depends on clean water. Because of regulations and human health, he noted, these days everyone pays more attention to water quality. About half of Grays Harbor is inhospitable to growing oysters due to pollution: everything west of a north-south line is OK for shellfish. That division is further sub-divided into "approved" and "conditional" areas; if one full downgrade were to occur, the conditional area would be off limits. He observed that the water quality of Grays Harbor has actually gotten better in recent years with regard to chemicals, but contamination from fecal bacteria has increased due to high seal populations, human development and septic systems.

He commented that the oyster industry has been there since the 1930's and pollution has always been an issue. Oyster farmers have been asking cities and industrial polluters to clean up ever since.

About 1/3 of the wetlands of Grays Harbor are gone due to development, and this brings pollution. Early 1930's they did some diking to make pastureland, which took quite a bit of wetland out of production.

Weather/Flooding

Around Grays Harbor, occasional November/December floods come from extreme high tides coupled with a storm. But flooding is not so much of an issue. Between Montesano and Aberdeen, there is some natural flood control afforded by wetlands and braided streams. This area is called the "surge plain."

Erosion is a problem on the outer beaches at Ocean Shores and at Half Moon Bay (near the City of Westport). The "Deep Draft" project by the Army Corps in the early 1990's straightened, deepened and widened Grays Harbor to allow large log exports. This now allows large ocean swells to come all the way into the Grays Harbor, which move around sand spits and destroy oyster beds.

CARBURYL & SAND SHRIMP: A COMPLEX ISSUE

Oyster growers use a compound called carburyl to kill sand shrimp that destabilize the oyster beds in Grays Harbor, but environmentalists protested against this and the growers will have to stop in 2012. Ironically, these sand shrimp also kill the eelgrass beds prized by those environmentalists for the fish habitat they provide. Ending the use of carburyl in this case will likely result in an increase in sand shrimp and therefore, possibly, a loss in salmon habitat.

Fishing

In Grays Harbor, there are not many shellfish besides oysters. On the ocean beaches in the area there are razor clams. Grays Harbor has a bait fishery (anchovies for commercial and sport fishing bait), and there are herring spawning areas in the Harbor. The bait fish catch has revived since the 1970's, which indicates the water quality is probably better. A shrimp fishery in Westport (little pink) operates but is challenged by prices from the Canadian east coast. A whiting fishery still works out of the area, with a million pounds per day capacity. Commercial and sport salmon fishing tours operate out of the area also.

There used to be a whale catching fleet in the early 1900's.

Mr. Engvall wryly noted that "in the old days, everything was better. There was a lot more of all the natural resources. Salmon fishing was better, oysters were more plentiful." [This highlights a paradox of the Chehalis Basin: the natural resources bring population growth, and population growth negatively impacts the natural resources. This Plan hopes to help the local citizens and governments of the Chehalis Basin handle the inevitable population growth with less damage, or even increased health, to natural resources.]

Terry Willis: Lower Satsop River: Erosion, Gravel Removal, Channel Migration

Terry is a dairy farmer near Montesano whose family has owned property in the lower Satsop River valley for over half a century. She supplied information focused on gravel in the Satsop River, written via interviews with storytellers. The exact dates and sequences vary in interpretation of what the storyteller said. Interviewees/storytellers included:

- *Glenn Sundstrom, who built his home overlooking the Satsop valley from the sandstone cliff just northeast of the Satsop bridges*
- *Ray Scott, who has been on his farm on the east side of the Satsop since the 1950's*
- *Greg Willis, whose family has owned and made a living in agriculture for five generations on the west side of the Satsop*
- *Jim Bordon, who resides on the west side of the river on a piece of farm property owned for many years by his father*

Mr. Scott said the first gravel removal from the Satsop began in the 1960's, when a company named Asphalt Paving Engineers got a permit and opened the first gravel pits. Ray remembers seeing earthmovers actually driving in the river bed. Before this work began, a local resident named Dale Willis supported his family by harvesting gravel off a gravel bar named Worman Bar on the east side of the Satsop. Mr. Willis worked the Worman Bar by removing the gravel in a gradual layer from just above the water line back to a point just before the trees. Each winter the river would transport new gravels and sand, partially rebuilding the fish habitat.

Mr. Sundstrom built the driveway for his home using gravel from the Satsop that was intended for SR 12 but because it was incorrectly crushed, it was sold to the locals at a fraction of the price. He noted that when people live in an active floodplain, "the river is the owner." Mr. Sundstrom built his own home up on the sandstone cliff so that neither erosion nor flooding would be a concern. He mentioned how residents in the Wynoochee area built their houses "up on stilts" to avoid property damage from flooding.

One story shows how river fluctuations occur over time in response to both natural and manmade changes. This story involved Ray Scott and his neighbor Dale Willis. A natural logjam on Mr. Willis' property, combined with gravel harvest practices and some broken cement Mr. Willis had on his property, pushed the Satsop River onto Mr. Scott's property, causing erosion. Mr. Scott asked Mr. Willis if he could remove the logjam; Mr. Willis refused. So Mr. Scott put in riprap, using public money available at the time. This bank armament in turn pushed the Satsop back into the logjam on Mr. Willis' property, which began eroding. Mr. Willis then requested removal of the same logjam that Mr. Scott had earlier requested be removed. By that time Mr. Scott thought it would be fine for the logjam to "just stay where it is."

Jim Bordon remembers coming down to the mouth of the Satsop in about 1956, to where the Fuller Bridge now is (the original Fuller Bridge was further east), for hydroplane races. These hydros were about eight feet long and held one person; they were homemade by the local boys, many of whom went on to become prominent businessmen in Grays Harbor.

Greg Willis' family has owned property in the Satsop Valley since the early 1900's. He described early attempts to control erosion and channel migration. Over the years, many of the Satsop Valley landowners have lost significant portions of their property to erosion. In the old days, Greg's dad and grandfather got help from the neighbors to use a logging cable to tie fallen and existing trees to a big spruce in their field to use it as a tail-hold to stabilize the bank. Other times they used a couple of old car bodies to try and stabilize the bank. In the late 1970s, when Greg was older he began farming more and his grandfather retired. At that time the Satsop was a quarter mile away from their property, way over on the other side of the meander channel, so Greg unhooked the tail-holds and removed the spruce tree to farm more actively. This was against the advice of his grandfather, who told him not to remove the cables. Since the river was so far away, Greg removed them - and now the river is back.

The mouth of the Satsop has moved at least once from one side of the channel to the other, and at one point it shot straight across the railroad tracks on the east side of the valley. Each time it moved, it would erode the tree line along the tracks until the sandstone bluff was readily visible. As the mouth moved around, it would "bounce" off the southern sheer cliff of the valley and cause erosion of the farmland on the opposite side. Channel migration and bank erosion are ongoing issues for lower Satsop Valley property owners.

Information from the Internet (various sites)

History & Culture of Natives of the Chehalis (from Chehalistribe.org)

For many centuries prior to the coming of white people to the Chehalis River area, groups of Salish-speaking people lived along this major waterway and its tributary rivers and creeks. Their permanent villages, occupied steadily during the winter months, consisted of large cedar plank-houses built with the ends facing the water. The rivers provided a major source of food, with several species of salmon, steelhead and eels migrating upstream and back to the ocean. In addition, there was an abundance of freshwater clams and crayfish. The rivers were also highways for traveling in shallow shovel-nose canoes.

The two principal tribes in the territory between Grays Harbor and the headwaters of the Chehalis River were the Lower Chehalis and the Upper Chehalis. These two tribes spoke distinct yet related Salish languages and maintained close ties through visiting, trade and intermarriage. The Copalis, Wynoochee and Humptulips people were affiliated with the Lower Chehalis; the Satsop seem to have been considered Lower Chehalis politically but spoke a dialect closer to Upper Chehalis. The name "Chehalis" (meaning "sand") originally referred to a village near the present-day town of Westport and later came to be applied to the river and to the people living upriver.

The Lower Chehalis people relied heavily on the resources of the sea, capturing fish with a variety of nets, weirs, traps and harpoons, hunting seals and gathering huge quantities of clams and other shellfish along the ocean beaches. They traded products such as dried sturgeon, dried clams and seal oil to their inland neighbors.

The Upper Chehalis inhabited the territory from Cloquallum Creek to the upper reaches of the Chehalis River. The name they gave to themselves was qwaya; they called the river nsul. There were originally at least five bands of Upper Chehalis. There are two distinct dialects of the Upper Chehalis language, one spoken from Grand Mound east and the other west of there.

The Upper Chehalis had a strong river-based economy, but they also depended to some extent on the edible roots and berries gathered in the mountains and on the prairies. Overland travel often combined a canoe trip with travel on foot or horseback. At some time before 1800 the Upper Chehalis acquired the horse, probably through trade with Klickitats of eastern Washington.

Village Sites

Principal village sites were located at the mouths of rivers and creeks. Tribal elders identified major village sites as they recalled them, including the mouths of Lincoln Creek, Scatter Creek, Skookumchuck River, Black River, Cedar Creek and at Grand Mound.

One tribal story tells how a young man learned his lesson about fishing the hard way. His grandmother told him to make a spear and get ready for the salmon in Scatter Creek. He thought that was not necessary since the creek was so dry there was nothing but grass in it. But a few days later the creek was flowing right out on the open prairie; its banks had almost disappeared. The water came roaring down from the head of the creek and the salmon immediately started up. The young man got so excited he cut himself while trying to whittle a spear. This was why people said you must be prepared for the salmon in Scatter Creek and should not rush about it.

A very large settlement once stood at Grand Mound; its name was aqaygt, meaning "long prairie". About a mile above the mouth of the Skookumchuck was a village called tewtn, meaning "fording place". Where the Black River enters the Chehalis near Oakville there was a village called sacelt, or "made lake". Continuing down river, there were villages at the mouth of Cedar Creek and below Porter. Near Malone was nsxakwm "carrot place", indicating a place where wild carrots were plentiful.

Trade & Economic Activity

The first economic activity in what is now Lewis County was trade. The Chehalis Indians had developed an extensive trading system between the many sub-tribes that they consisted of, and with other peoples from quite a distance away. Both tribes were river-dependent; that is, they relied upon the rivers for the mainstay of their diet: salmon. Consequently, they developed into expert canoeists and fishermen.

Salmon, particularly dried salmon, was their main food and their primary export. The Chehalis developed a trading route from the Cowlitz River system to the Chehalis river system. This canoe route with its relatively easy portages was used well into the 19th century (by whites as well as Native Americans) when the first road was built from Fort Vancouver to Fort Nisqually by the U.S. military.

Although the [historical] Native American population in Lewis County is hard to determine, one report indicates that a gathering of the Upper Chehalis tribe at Ford's Prairie in 1855 was 5,000 strong. Twenty years later, Sydney Ford, an early settler and Indian Agent whose district included Lewis County, lamented that the Indian population in western Washington south of Puget Sound had decreased to only 1,200 people. Small pox, measles, influenza, venereal disease, and alcohol-related health problems had decimated the once thriving river communities. The bulk of the Indian people had been moved to the Chehalis Reservation in adjacent Grays Harbor County in 1864.

History & Culture of Quinault Indians

(adapted from http://64.91.104.204/documents/CulturalResource.pdf)

The people known as the Quinault lived on the Olympic Peninsula as members of individual family groups thousands of years before a small portion of their ancient lands became the Quinault Indian Reservation. The Quinault

had no formal government; in each village there was a headman, sub spokesman, or man of high rank but it was not until the signing of treaties that chiefs were chosen.

The Quinault met their material needs through the ocean, rivers and land. Elder men taught the boys necessary fishing and hunting skills. Elder females taught the girls skills on gathering and the preparation and cooking of food. Stories were told around the fire about one's family and the history of the village. Lessons were taught using surrounding resources. Ceremonies focused on events and rituals such as funerals, marriage, puberty rites, whaling, sealing and elk hunting.

The cedar tree was one of the most valuable resources of the Quinault people. Quinault houses were made from large cedar trees split into planks with gable roofs measuring 30-60 feet in length and 20-40 feet in width. The house frame was made of large logs set upright in the ground and notched at the top to receive the logs that comprised the roof frame. Split cedar planks were tied to the framework vertically and horizontally. Roof planks were gouged out and laid with the edges overlapping.
Longhouses were occupied by two or more families including parents, grandparents, brothers and sisters. Each family's space was partitioned with mats of cattail leaves or wooden screens. The door faced the river, and one small door to the rear of the house was used for escape in case the village was raided.

Transportation was by way of the ocean and rivers via canoe. Canoes ranged from huge ocean and whaling canoes to sealing or small ocean canoes, river canoes, shovelnose or duck canoes, and sea otter canoes. The Quinault were the furthest tribe south to hunt whales. They also hunted seal. A hunting crew was selected on the basis of skills and ability; strength, good eyesight, ability to throw a spear accurately and run a long distance. The runner would return to the village in advance of the hunting party to inform the village to prepare for the catch.

To gather food, entire families would travel to fishing stations, berry fields, beaches, mountains and prairies. Temporary houses were erected with poles and cattail mats. When the men were hunting, the women gathered ferns, roots, berries and basket grasses. When these were dried, they were stored away in baskets. Elk was cleaned and dried and packed in wood boxes carried down the mountain.

Fishing was one of the main resources of the Quinault. Fish weirs were constructed up and down the river and stations were owned by individual families. Nets were made from fibers of cedar and nettle plant. During high tides, fishing was done using dip nets. Besides anadromous fish, seafood collected by the Quinault included razor clams, mussels, oysters, mud clams, sea anemones, smelts, crab, and halibut.

Boxes, bowls, dishes and platters were carved from alder or soft maple. Stone mauls and hammers, wedges of wood bone and horn were used for splitting cedar. Other tools were made of stone and bound on sticks or warped with wild cherry bark or rawhide. Fire and wet sand were used to hollow out and smooth wood, respectively. Digging sticks were made of yew, cedar or spruce. The list of other plants and natural objects used for function or fashion by the Quinault is extremely long (visit http://64.91.104.204/documents/CulturalResource.pdf for more details).

In the late 1700's, European explorers visited and influenced the Quinault Indians. By the turn of the century, the coming of the fur trade and white settlers brought many diseases to the Indians including small pox, measles and tuberculosis. The Quinault signed a treaty with the U.S. government on July 1, 1855 along with the Queets, Hoh and Quileute tribes. After changes due to objections by the Chehalis, Cowlitz and Shoalwater Indians at the Chehalis River Council, this treaty was finally proclaimed by the President on April 11, 1859.

Historical River Flows

http://www.crcwater.org/issues3/flows.html

Historical Rainfall

http://www.crcwater.org/issues3/rains.html

This was the beginning of great changes to the traditional Indian way of life in the lower Chehalis Basin. Aboriginal territory was now confined to reservation boundaries, and ceded areas were settled by white farmers. The Quinault people had to give up hunting and begin farming, while giant trees were cut down and cleared to make roads to and from the reservation.

The Quinault people to this day practice traditions and customs including tribal canoe journeys, potlatches, fish bakes and ceremonies. Hunting, fishing and razor clam digging are regulated by the Tribe in agreement with the State under rules: hunting begins in July and ends in December with a limit of two elk and one deer; fishing is regulated on a seasonal basis and with a per catch limit. The Quinault Cultural Center offers cultural classes for the community including basketry, carving, clam sacks, dip net making, etc.

Information about Centralia/Chehalis area

The Centralia/Chehalis area was well known for flooding from the earliest pioneer days. Because the land was so thickly forested, early development followed the rivers. Steam-powered paddle boats brought settlers, goods and materials. The next path of development were the railroads, which linked the Chehalis Basin to settlements in the Puget Sound and along the Columbia River.

Centralia was founded by George Washington, an African-American pioneer. Through his adoptive (white) father, Washington staked a claim for 640 acres where the Skookumchuck River flows into the Chehalis River. It wasn't until 1857 that Washington was allowed to own the land under his own name.

Centralia grew slowly, hampered at first by the great depression of the early 1890s. By 1900, its population was 1,600. By the early 1900s, however, it

became a commercial center as the Northern Pacific railway established a main station on its Portland-Seattle run at Centralia. In addition, many logging companies built saw mills and shingle mills in the surrounding area, creating employment for thousands of people. The first of these mills was the Martin Lumber Co. plant, which was the first sawmill in Lewis County (originally built by the Gilchrist brothers). As a result, Centralia's population grew to 8,000 by 1910.

Many of these companies went out of business during the Great Depression, as both natural resources and product demand dwindled. Today, the economy depends in large part upon agriculture and manufacturing.

Overview of Technical Information Base

This Watershed Plan was developed based on existing information related to the Chehalis Basin. Several key documents that make up the bulk of this existing information are summarized in this section. These include the following:

- *Chehalis Basin Salmon Habitat Restoration and Preservation Work Plan* – the most current and comprehensive habitat information. This document provides guidance related to the Salmon Recovery Fund (SRF) for project planners who develop projects and activities that address salmon habitat recovery. This guidance includes how to develop effective projects and recommendations as to how project developers fund effective and competitive projects, whether that is before the SRF Board or another funding agency or organization. This Work Plan is based on, and captures much of the information contained in two other significant habitat studies, the Salmon and Steelhead Limiting Factors: Chehalis Basin and Nearby Drainages, Water Resource Inventory Areas 22 and 23 (2001) and the Salmon and Steelhead Stock Inventory (SASSI) (1993). These two documents are included in the Watershed Plan Appendix.
- *Subbasin Evaluation and Prioritization* – documents the prioritization of subbasins for further study conducted by the Chehalis Basin Partnership Steering/Technical Committee. This prioritization was based on the identified at-risk status of each subbasin in categories related to instream flow, water allocation, development pressure, water quality, and habitat.
- *Level 1 Assessment* (2000) – a compilation of existing watershed data, as of 2000. This report summarizes existing information related to geologic, hydrologic, hydrogeologic, water rights, water use, water quality, and habitat data. It identifies significant data gaps in each of those topical areas. A GIS project was also developed in conjunction with the Level 1 Assessment, including data layers for hydrology, water quality, and water rights data.
- *Water Quantity Evaluation* – includes a generalized, basinwide water balance, and more detailed analysis of water quantity, water allocation, and water use in the area comprising the Newaukum and Skookumchuck Rivers,the Centralia/Chehalis reach of the Chehalis River, and Salzer Creek. Further development of the Chehalis Watershed GIS project was conducted through this project. The data available through that GIS is described in a subsequent section.

- *Summary of Water Quality Study* – sets forth a framework watershed monitoring program that provides for for local participation and influence. This program addresses established agency monitoring programs, as well as locally-initiated monitoring efforts. It provides a organizational model for plan implementation.
- *Instream Flow Study* – addresses the instream flow element by providing stream flow data for previously ungauged sites and complies existing stream flow data for site with historical flow data.
- *Multipurpose Water Storage Assessment* – assesses the potential feasibility of 20 water storage projects. A reconnaissance assessment is provided for projects in two categories: high and low yield.
- *Summary of GIS Data for Chehalis Basin Project* – includes a table that describes the data categories, source, and boundary for the data collected from the GIS work included as part of the Chehalis Basin Watershed Management Plan.

Other important information, not contained in these key documents, was used in developing the Watershed Plan. This information is described in individual issue papers or throughout the body of the Watershed Plan.

Habitat[1]

The Watershed Planning Act stipulates that if initiating governments choose to include a habitat component in their watershed plan, the plan must be coordinated or developed to protect or enhance fish habitat within the management area. Any habitat planning conducted under provisions of the act must be integrated with strategies developed under other processes to respond to potential and actual listings of salmon and other fish species as threatened or endangered under the federal Endangered Species Act. In watersheds where salmon habitat restoration activities are being undertaken under provisions of the Salmon Recovery Act (Chapter 77.85 RCW), such activities are to be relied upon as the primary nonregulatory fish habitat component for watershed plans (RCW 90.82.100).

The focus of this section is to identify and provide a brief overview of the laws, regulations, policies, and programs related to habitat restoration in the Chehalis Basin.

The Endangered Species Act

After decades of declining wild salmonid and steelhead populations in the Pacific Northwest, the National Marine Fisheries Service (NMFS) began a comprehensive review process in 1991 to assess the possible listing of salmonids under the Endangered Species Act (ESA). The destruction and alteration of habitat, as well as the impacts of hatcheries, hydropower, and harvesting, have put salmonids in a precarious position in many watersheds in Washington State. The eventual outcome of the review, in March 1999, was the listing of several salmonids in several geographic areas as a "threatened" species under the ESA. The US Fish and Wildlife Service added bull trout for all regions of the state in November 1999. Both agencies will be developing recovery plans in the near future to recover salmonid populations in the Pacific Northwest so they no longer need legal protection to prevent their extinction.

Salmon Recovery, Chapter 77.85 RCW

Because an ESA listing could have such a significant economic impact on the state, the Washington Legislature responded to the ESA review process by passing ESHB 2496 in 1998 and 2E2SSB 5595 in 1999. Together, these two laws became Chapter 77.85, Salmon Recovery, under of the Revised Code of Washington (RCW). The intent of this chapter was "to retain primary responsibility for managing the natural resources of the state rather than abdicate those responsibilities to the federal government." The state would accomplish this by "integrating local and regional recovery activities into a statewide plan that can make the most effective use of provisions of federal laws

1. Source: Section One-A Framework for Salmonid Habitat Restoration in the Chehalis Basin, in The Chehalis Basin Salmon Habitat Restoration and Preservation Work Plan for WRIAs 22 and 23, May 2003. Available on Grays Harbor County's website http://www.co.grays-harbor.wa.us/info/pub_svcs/ChehalisBasin/WorkPlan/Introduction.htm

allowing for a state lead in salmon recovery." Furthermore, Chapter 77.85 RCW expands upon the ESA purpose of preventing salmonid extinction by instructing the "office of the governor to coordinate state strategy to allow for salmon recovery to healthy and sustainable population levels with productive commercial and recreational fisheries." It is important to note that this state law is not a replacement for the ESA process. Instead, the law seeks to make the state a proactive partner in the ESA recovery planning effort.

One of the central themes of Chapter 77.85 RCW focuses on habitat as a vital component of the salmon recovery effort. To do this, the Chapter states that salmon recovery be accomplished "in a coordinated manner and to develop a structure that allows for the coordinated delivery of federal, state, and local assistance communities for habitat projects that will assist in the recovery and enhancement of salmon stocks." It is also important to note, however, that the law specifically entrusted voluntary "lead entities" consisting of counties, cities, and tribal governments to develop the projects necessary for restoring and protecting fish habitat within the state's 62 Water Resource Inventory Areas (WRIAs).

To institute salmon recovery, Chapter 77.85 RCW set up an organizational framework to guide and implement salmon recovery through salmonid habitat restoration and protection. This framework involves three main participants:

- The Salmon Recovery Office
- The Salmon Recovery Funding Board
- Local Lead Entities

The Salmon Recovery Office

Chapter 77.85 RCW established the Salmon Recovery Office in the Office of the Governor for the purpose of establishing and coordinating a statewide strategy for salmon recovery. The Salmon Recovery Office, working with the Governor's Joint Natural Resources Cabinet, accomplished this initial task in September 1999 when it issued its statewide salmon recovery strategy, *Extinction is Not an Option.* The focal point of the plan is its vision to: "Restore salmon, steelhead and trout populations to healthy and harvestable levels and improve habitat on which fish rely."

Implementing this vision rests on four main areas of emphasis – Habitat, Harvest, Hatcheries, and Hydropower. These four areas, under human control, influence the health of salmonids within Washington's 62 WRIAs. The statewide salmon recovery strategy includes analysis about how each of the four areas of emphasis impact salmonids and proposes goals, objectives, and solutions to address them.

In addition, Chapter 77.85 RCW also requires the Governor to submit biennially to the Legislature a "State of the Salmon Report." The most recent one is a three-volume report for 2002.

The Salmon Recovery Funding Board

The Salmon Recovery Funding Board (SRFB) plays a leading role under Chapter 77.85 RCW for making grants and loans to local lead entities for salmon habitat projects and activities. The SRFB has 10 members appointed by the Governor, and the Interagency Commission for Outdoor Recreation provides staff support and administrative assistance to the Board.

Chapter 77.85 RCW clearly outlines the procedures and criteria for the SRFB to evaluate, rank, and fund salmon habitat projects and activities. The SRFB must give preference to projects that:

- Rely on a prepared limiting factors analysis;
- Provide greater benefit to salmon recovery based upon the stock status information from the Salmon Stock Inventory (SASSI) and the salmon and steelhead habitat inventory and assessment project (SSHIAP), and any comparable science-based assessment when available;
- Benefit a listed species;
- Preserve high quality salmonid habitat;
- Are cost-effective;
- Have the greatest matched or in-kind funding; and,
- Will be implemented by a sponsor with a successful record.

In its own strategy, *Mission, Roles, Responsibilities, and Funding Strategy*, the SRFB states that it will accomplish this in a manner "consistent with the state salmon strategy *Extinction is Not an Option*." The SRFB requires each Lead Entity to have:

- An assessment of current and potential conditions (limiting factors analysis);
- Goals and strategies for salmon habitat recovery in the affected WRIA;
- A project list consistent with the strategy;
- A monitoring program for determining if a project is effective or not; and,
- Adequate funding to implement the project.

Furthermore, the SRFB requires lead entities to use the best science available to guide all decisions and actions in the development of habitat project lists.

Local Lead Entities for Salmon Recovery/ Habitat Restoration

Chapter 77.85 RCW authorizes counties, cities, and tribal governments to voluntarily join and designate a Lead Entity responsible for submitting habitat project lists to the SRFB for funding consideration.

The law requires the *designated* Lead Entity to establish a committee of people from the planning area representing counties, cities, conservation districts, tribes, environmental groups, business interests, landowners, citizens, volunteer groups, regional fish enhancement groups, and other habitat interests. The purpose of this Lead Entity Committee is "to provide a citizen-based evaluation of the projects proposed to promote salmon habitat." The committee is supposed to "compile a list of habitat projects, establish priorities for individual projects, define the sequence for project implementation, and submit these activities as the habitat project list. The committee shall also identify potential federal, state, local, and private funding sources."

The Lead Entity Committee must develop a habitat project list and habitat work schedule that, according to Chapter 77.85 RCW "ensures salmon habitat projects will be prioritized and implemented in a logical sequential manner that produces habitat capable of sustaining healthy populations of salmon." Using the critical pathways methodology, the Lead Entity:

- Prepares a limiting factors analysis for salmonids;
- Identifies habitat projects that sponsors are willing to undertake;
- Identifies how to monitor and evaluate projects;
- Reviews monitoring data, evaluates project performance; and,
- Outlines the adaptive management strategy used in its WRIAs.

Assisting the Lead Entity Committee in its work is the Technical Advisory Group, a group of private, tribal, federal, state, and local government personnel with appropriate scientific expertise. The Conservation Commission[2] invites these TAG members, in consultation with local governments and tribes, to help bring the best available science to the overall local decision-making process. At a minimum, Chapter 77.85 RCW gives the Technical Advisory Group two main jobs in assisting the Lead Entity Committee. In the case of the Chehalis Basin, those tasks are to:

- Develop the limiting factors analysis for WRIAs 22 and 23; and,
- Review monitoring data; evaluate project performance, and make recommendations.

The Chehalis Basin Partnership

The Chehalis Basin Partnership (Partnership) designated Grays Harbor County to act as the Lead Entity for WRIAs 22 and 23. The Partnership, in

2. The Washington State Conservation Commission was created in 1939 with the passage of Chapter 89.08 Revised Code of Washington, more commonly known as the Conservation Districts Law. Conservation Commission staff is directed by a ten-member board. The Conservation Commission exists to assist and guide conservation districts. The Conservation Commission help districts coordinate programs, facilitate productive working relationships with other organizations, and help districts be successful. In 1998, the Washington State Conservation Commission was tasked in House Bill 2496 with assessing the habitat-based factors limiting the success of salmonids in Washington State. The Commission's role is now encoded in the revised Code of Washington Chapter 77.85.070. Habitat limiting factors are assessed for individual resource inventory areas (WRIAs.)

turn, serves as the Lead Entity Committee. In addition, the Partnership has a Technical Advisory Group who aided in the preparation of the limiting factors analysis and who continue to provide assistance in technical planning, review, and monitoring tasks.

In June 2001 the Conservation Commission published *Salmon and Steelhead Habitat Limiting Factors, Water Resource Inventory Areas 22 and 23*, by Carol Smith PhD. and Mark Wenger. This comprehensive document compiles data and provides technical analysis on limiting factors for wild salmonid habitat in the Chehalis Basin.

The Partnership published its first *Plan for Habitat Restoration* in April 2001. That planning effort focused on interpreting data from the limiting factors analysis to prioritize subbasins in the two WRIAs and provide guidance to future project sponsors as to the type of projects each subbasin needs to overcome limiting factors and achieve the plan's goals.

Since that time, the Partnership has facilitated the development of four habitat project lists for SRFB consideration. The first effort proved successful; the SRFB has funded 22 salmon habitat projects and activities totaling $3.5 million in the two WRIAs. However, the complexity of the process prompted the Lead Entity Committee (the Partnership) to revisit and refine the first *Plan for Habitat Restoration*. The result is the *Chehalis Basin Salmon Habitat Restoration and Preservation Work Plan.* This workplan is the Lead Entity's strategy for providing guidance to planners who develop projects and activities that address salmon habitat recovery in Water Resource Inventory Areas (WRIAs) 22 and 23.

Source: Section One-A Framework for Salmonid Habitat Restoration in the Chehalis Basin, in The Chehalis Basin Salmon Habitat Restoration and Preservation Work Plan for WRIAs 22 and 23, May 2003.

Available on Grays Harbor County's website http://www.co.grays-harbor.wa.us/info/pub_svcs/ChehalisBasin/WorkPlan/Introduction.htm

Sub-basin Evaluation and Prioritization

One of the single largest projects undertaken in developing this Plan was work done by the Partnership's Steering/Technical Committee (STC) to prioritize the 31 subbasins that comprise the Chehalis Basin in terms of the risks to their water resources. STC members provided technical information resources for the prioritization process and evaluated each subbasin. The subbasins that were evaluated to be at the greatest risk in terms of water quantity were recommended to be the subject of a pilot project to evaluate water quantity issues.

The process the STC used was as follows. STC focused on the following components and subcomponents in evaluating the subbasins:

- **Risk to Fish** – The STC used technical resources such as the Salmon and Steelhead Stocks Inventory, Salmon Recovery Strategy, and the Limiting Factors Analysis to categorize the level of risk fish faced in each subbasin. Based on these findings, the STC then assigned an overall level of risk for each subbasin: high (a rating of 1), medium (a rating of 2), or low (a rating of 3). This rating system was used for all factors.
- **Risk to Humans** – Those subbasins with the highest number of water right applications, claims, and permits/certificates, and the highest instantaneous water demand were considered at risk of not having enough water to supply growing human populations. Those subbasins were then ranked high, medium, or low.
    - Available data show 160 total water right applications in the Chehalis Basin for an instantaneous demand of 89.55 flow in cubic feet per second (cfs).
    - Available data show 13,041 total water right claims in the Chehalis Basin, with no estimate of the instantaneous flow.
    - Available data show 4030 total water right permits and certificates in the Chehalis Basin for a total instantaneous flow of 3016 cfs.
- **Meeting Regulatory Instream Flow Levels?** - Regulatory flows were set for many streams and rivers in the Chehalis Basin in 1976. While stream flow data do not exist for many of these, where existing data show a stream usually meets the regulatory flows, the stream was assigned a rating of 2. Streams that have not often met regulatory flows were assigned a rating of 1.
- **Protected Land** – Subbasins with a high percentage of protected land (40% or more was protected, for instance, National Park or wilderness areas) were rated a 3. Subbasins with lower percentages of protected land (10-39%)) were rated a 2. The basins with least amount of protected land (less than 10%) were rated a 1.

- **Land Use** – The evaluation considered primary, secondary and tertiary land use for each subbasin. The land use categories included:
  - Forest
  - Agriculture
  - Wetlands/Water
  - Urban/Industrial
  - Other

The vast majority of the Chehalis basin is forestland. Other lands uses, in decreasing order, are agriculture, wetlands/water and urban/industrial. Subbasins with the highest amount of urban/industrial development were considered to have the greatest impact on water resources and were rated a 1. Subbasins with a medium amount of development were rated a 2. Subbasins that were primarily forestland and agriculture were considered to have the least impact on water resources and were rated a 3.

- **Growth Pressure** - For this category, the STC examined projected population growth and population density for each subbasin. Those subbasins with the highest projected growth and density were rated a 1; those with medium population growth and density, a 2; and those with the least population growth and density, a 3.

These rankings were added together to select which subbasin or combination of subbasins should be the subject of a pilot project to evaluate water quantity issues. The rankings for each risk factor and the total rankings were compiled in a comprehensive matrix designed to establish a priority order for studying water resource conditions and needs in the various subbasins of the Chehalis. The Level 2 Selection Table is included in Section VII on page VII-69 (lower numbers correlate to higher need/risk).

The subbasin ranked as having the highest risk was the Newaukum River subbasin. The STC may study the following adjoining basins if funding is available :

1. Wishkah River in the lower Chehalis basin (WRIA 22)
2. Black River in the upper Chehalis basin (WRIA 23)

Evaluation of Subbasin Prioritization Process and Results

The STC feels that the above process and results provide an excellent framework for future technical or policy efforts. The STC suggests that this Plan include the following related recommendations:

1. The subbasin prioritization effort was used for initial selection of water quantity study area. The priority list should be used as the basis for future similar water quantity evaluations, starting with the Wishkah subbasin and followed by the Black River subbasin. Future water quantity studies should select subbasins, alternating between the Upper Basin and the Lower Basin, based on overall priority.

2. Recognizing that there may be additional factors to consider, the resulting priority list should be used to inform future technical and policy decisions.
3. Because of the large size of the Chehalis basin, technical and specific policy efforts should consider using subbasins as pilot to make limited resources go further and to test techniques on a small scale. The subbasin priority list should be the basis for selecting study areas.

Summary of Chehalis Basin Level 1 Assessment

Background

The *Chehalis Basin Level 1 Assessment*, published in December 2000 (Envirovision et al., 2000), presents extensive analysis of the basin characteristics that need to be understood for the Chehalis Basin Watershed planning effort. Excerpts from the Detailed Summary of the Level 1 Assessment presented below focus on basin-wide and WRIA-wide findings and recommendations.[1]

The key topics summarized are as follows:

- Geology/Hydrology
- Water Rights/Water Use
- Water Quality
- Fish Habitat and Fish Stock Condition

Basin-Wide Findings

Geology and hydrology:

- Groundwater discharges to the Chehalis River along most of the river's length, making hydraulic continuity an issue everywhere in the watershed.
- Stream-flow records indicate a wide range in annual unit runoff (amount of runoff from one square mile) across the Chehalis Basin. The Level 1 Assessment divides the Chehalis Basin into six areas of approximately similar hydrology, with annual unit runoff ranging from 3 to 12 cubic feet per second of stream flow per square mile of drainage area (cfs/mi2).
- Long-term trends in climate and stream flow in the Chehalis Basin closely correspond to trends across the Pacific Northwest.

Water rights and water use:

- Irrigation and domestic use are the primary purpose for the largest number of water rights. Power generation and domestic use are the primary purpose for rights with the highest total instantaneous withdrawal rates. Municipal supply and irrigation are the primary purpose for rights with the highest total annual volume limit.
- The six largest of the 47 commercial water rights in the basin account for 86 percent of the total instantaneous withdrawal allocation.

1. Detailed information for subbasins is available in the Detailed Summary of Chehalis Basin Level 1 Assessment.

- The sum of instream flow requirements and allocated water rights at Montesano exceeds the river's normal flow (50-percent exceedance) for seven months of the year and the river's low flow (90-percent exceedance) year-round (see Figure ES-1).

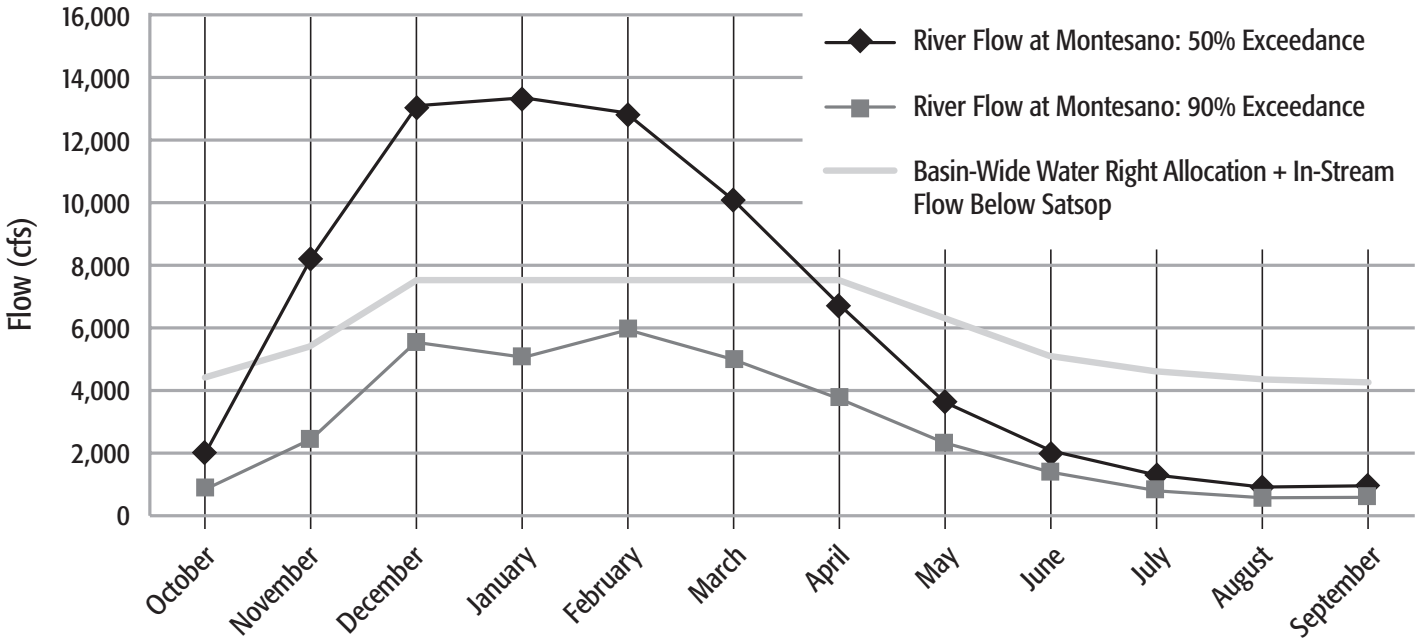


Figure ES-1. Chehalis River Flow at Montesano Compared to Sum of Water Rights and In-Stream Flow

- The maximum-day domestic water demand (double the average demand) for 2000 is well below the total of allocated water rights for domestic use and municipal use. Even with projected population growth through 2020, the maximum-day demand remains well below the allocated water rights.

Water quality:

- Most of the surface waters in the Chehalis Basin have a state water quality classification of A (excellent). A few reaches of the Chehalis and its tributaries are Class AA (extraordinary) waters or Class B (good) waters.
- Although the waters basin-wide generally attain water quality standards when data are averaged over the long term, individual measurements have failed to meet the standards often enough that 24 water bodies or stream segments in the basin are considered to be impaired and are included on the state's 303(d) listing of impaired water bodies.
- Pollutant concentrations and loads, as well as dissolved oxygen concentrations, are lower during the dry season than during the wet season, and temperatures are higher.
- Pollutant yield (the average pollution load per acre) for the Chehalis River is similar to that found in other Western Washington river basins.

- With 83 percent of the basin forested, logging is likely a major contributor of total suspended solids. Agriculture, a contributor of fecal coliform bacteria and nutrients, makes up 11 percent of basin land use. Urban areas, which contribute suspended solids, nutrients and bacteria, make up less than 2 percent of the drainage area upstream of Montesano.

Critical fish species:

- Stream channels throughout the Chehalis Basin show a consistent pattern of riparian vegetation removal for farming and logging, shade reduction and reduced stream bank stability, high levels of sediment in the water and increased water temperatures.
- In some areas, habitat conditions may be recovering from past damages, especially on state and federal forested lands.
- Of 32 identified salmonid stocks in the basin, 21 are considered healthy, three are considered depressed, seven have a condition that is unknown, and one has a condition that is disputed.

WRIA-Wide Findings for Upper Chehalis Basin

Hydrology:

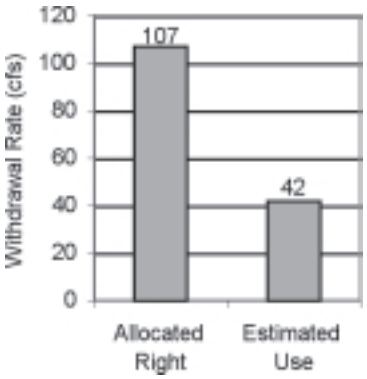
- The stream-flow gauge on the Chehalis River near Porter effectively measures flow for all of WRIA 23, as it is at the point where the river leaves the upper basin.
- Flows measured at the station do not represent natural flows (flows unaffected by human activities), as there are 54 dams in the upper basin, whose effect on downstream flows has not been analyzed.

Water rights and water use:

- Irrigation and domestic use are the primary purposes for the largest number of water rights. Irrigation and power generation are the primary purposes for rights with the highest total instantaneous withdrawal rates. Irrigation, fish propagation and power generation are the primary purposes for rights with the highest total annual volume limit.
- Twenty-two of the 1,828 water rights in the upper basin account for 40 percent of the total allocated instantaneous withdrawal. The largest of these are 140 cfs and 80 cfs rights held by Pacific Power and Light for withdrawal from the Skookumchuck River.
- The sum of instream flow requirements and allocated water rights at Porter exceeds the river's normal flow for seven months of the year and the river's low flow year-round.
- Figure ES-2 compares upper basin water right allocations to Level 1 estimates of actual consumption for domestic use, irrigation and livestock watering. Allocated rights for each of these purposes greatly exceed the current estimated use.

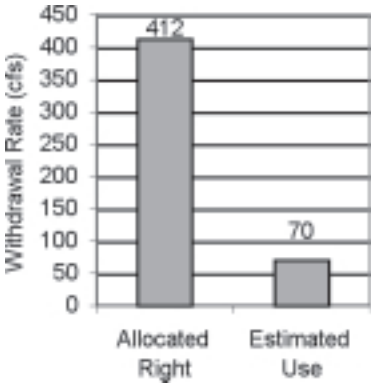
Domestic Use

Allocated right for domestic + municipal use; estimated use = 2000 maximum-day



Irrigation Use

Estimated use assumes 5,765 acres of irrigated pasture land with an irrigation efficiency of 50 percent



Livestock Use

Estimated use based on County agricultural census data

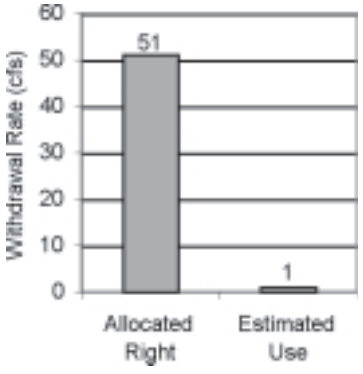
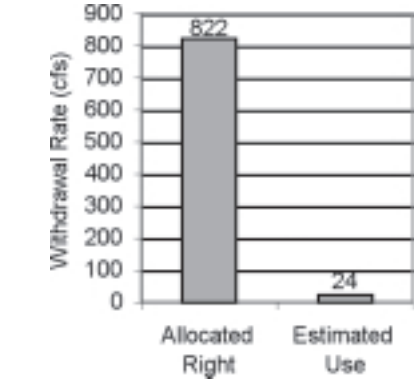


Figure ES-2. *Allocated Water Rights and Estimated Actual Water Use in the Upper Chehalis Basin for Domestic, Irrigation and Livestock Uses*

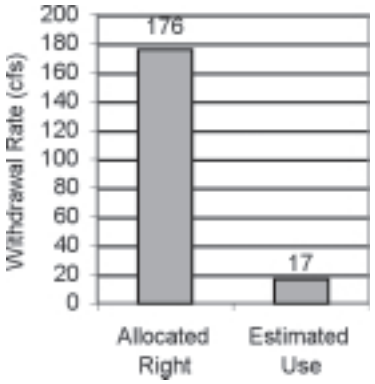
Domestic Use

Allocated right for domestic + municipal use [p. B-4]; estimated use = 2000 maximum-day [p. B-14]



Irrigation Use

Basis for estimated use is not defined in Level 1 Assessment [p. B-22]



Livestock Use

Estimated use based on County agricultural census data [p. B-25]

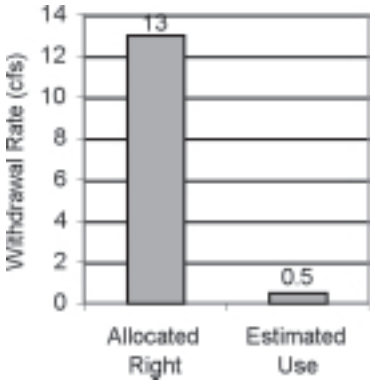


Figure ES-3. *Allocated Water Rights and Estimated Actual Water Use in the Lower Chehalis Basin for Domestic, Irrigation and Livestock Uses*

Water quality:

- Twenty of the Chehalis Basin's 24 water bodies on the 303(d) list are in the upper basin.
- Violations of dissolved oxygen standards during the dry season led to a Total Maximum Daily Load (TMDL) study for WRIA 23 in 1994, and temperature standard violations led to another TMDL study in 1999.
- Field observations have indicated that removal of trees and other vegetation along much of the upper river has reduced shading, which contributes to high dry-season temperatures. The TMDL study recommends increasing vegetative shading along the Chehalis River and its tributaries.

Critical fish species:

- Of the eight Chehalis fish stocks identified in the Level 1 Assessment, five are considered to be healthy. The condition of the other three stocks is unknown.

WRIA-Wide Findings for Lower Chehalis Basin

Water rights and water use:

- Irrigation and domestic uses are the primary purposes for the largest number of water rights. Power generation and domestic use are the primary purposes for rights with the highest total instantaneous withdrawal rates. Municipal uses and power generation are the primary purposes for rights with the highest total annual volume limit.
- Thirty of the 769 water rights in the lower basin account for 90 percent of the total allocated instantaneous withdrawal. The largest of these is a 1,400-cfs right for hydroelectric power generation on the Wynoochee River.
- Figure ES-3 compares lower basin water right allocations to Level 1 estimates of actual consumption for domestic use, irrigation and livestock watering. Allocated rights for each of these purposes greatly exceed the current estimated use.

Critical fish species:

- It was estimated in 1986 that gravel mining removed 10 times as much gravel each year as would be naturally replenished in these river systems. Such operations were reported in 1975 to have seriously reduced available spawning areas for chinook salmon on the Satsop, Humptulips and Wynoochee Rivers.

Recommendations

The Level 1 Assessment recommended establishing long-term water quality monitoring stations and the following investigations and analyses as part of a Level 2 Assessment:

- The interaction of groundwater with surface water
- Undepleted stream flows (not affected by human activities) and the influence of dams on flow
- The established requirements for in-stream flows
- The effect of land use on hydrology
- Options for augmenting stream flows
- The accuracy of the Washington State Department of Ecology's Water Rights Accounting and Tracking System
- Actual water use relative to allocated water rights
- Water quality by sub-basin
- Pollutant yields in priority sub-basins
- The priority of potential water quality improvement actions
- Fish habitat conditions in the basins south of Grays Harbor and in the Wishkah and Hoquiam River basins
- Restoration opportunities for side channels, wetlands and sloughs.

Water Quantity Evaluation

The Water Quantity Evaluation was done as a Level 2 study, under Phase 2 of the watershed planning process.

This study addresses the magnitude and distribution of consumptive water use in the basin. Water use information represents the most significant data gap identified in previous Chehalis Basin studies. Data compiled to date indicate that water allocations in the basin exceed the actual stream flow in the river between April and October. However, since the river still flows during these months, it can be concluded that actual consumption is less than the amount legally allocated. An understanding of allocated water rights and actual consumptive use, and the difference between the two, is critical in implementing the watershed management plan. Since the current state of knowledge suggests that water in the basin is over-appropriated, it leaves little opportunity for developing new management strategies.

The distribution of the allocated and actual uses throughout the watershed is also important to understand. If a city is looking for a new water supply, its search pertains to a specific geographic area. Likewise, the Department of Ecology evaluates water supply requests on a site-specific basis. For this reason, it is necessary to better understand the "drain" on the river system from consumptive uses for fairly small geographic regions. This evaluation must be done at the subbasin (or smaller) scale.

This study consisted of two major tasks:

- Prepare a general basin-wide water balance to provide a better understanding of water budget issues in the basin.
- Conduct a pilot water quantity evaluation for the group of Chehalis subbasins identified as "Priority Group 1:"
  - Subbasin 5, South Fork Newaukum River
  - Subbasin 6, North Fork Newaukum River
  - Subbasin 7, Newaukum River
  - Subbasin 8, Salzer Creek
  - Subbasin 9, Skookumchuck River
  - Subbasin 10, Middle Chehalis River #1

The pilot study involved geographic location of water rights in the targeted subbasins to the extent practicable, review of selected large water rights, estimate of water usage, estimate of exempt wells, and analysis of water balance issues.

The primary products of the water quantity evaluation are the findings presented in a report and GIS datasets that were compiled.

Summary of Water Quality Study

In November, 2002 the Chehalis Basin Partnership (Partnership) authorized use of Ecology grant funding to conduct water quality studies in the Chehalis Basin. The nature of this study was threefold:

- **A Water Quality Assessment** – to update the water quality information in the Level 1 Assessment and address data for Grays Harbor
- **Development of a Coordinated Watershed Monitoring Program** for the Chehalis Basin, to be documented in a Quality Assurance Project Plan
- **Conduct of and Report on Fecal Coliform Sampling in Grays Harbor and Lower Basin Tributaries**

The results are summarized below.

Water Quality Assessment

This report discusses the new state water quality standards and their potential impact in the Chehalis Basin. The biggest impacts will probably be related to the temperature standards. The new standards will essentially lower the temperature standard by one degree during the summer months, a time when Chehalis Basin stream temperatures have been considered impaired in many locations under the old water quality standards.

Fecal coliform data for monitoring stations in Grays Harbor are presented. These data show one exceedance of the water quality standard for the inner harbor (100 organisms per 100 milliliters) over a three-year monitoring period. The standard for the outer harbor is much lower (14 organisms per 100 milliliters) and this standard would be violated frequently if concentrations in the outer harbor area were at the level of those in the inner harbor.

New stream temperature data are also presented for three continuous recording stations on the Humptulips River and on the Chehalis River at Porter and Dryad. These data are intended to further assess temperature issues in the Chehalis Basin and identify if restorative measures are working. Data collected so far at these stations seem to be confirming the existence of temperature issues at these locations.

The results of two recent water quality studies in the upper Chehalis Basin are summarized in this assessment. The first is a best management practices or BMP evaluation project completed by Ecology. This study concluded that BMPs must be regularly and properly maintained to remain effective. The second study is a stream survey/assessment for small, headwater-area streams. This study concluded that the streams surveyed were quite healthy, with the exception of some impacts from forest harvesting activities.

Quality Assurance Project Plan, Coordinated Watershed Monitoring Program for the Chehalis Basin

The Coordinated Watershed Monitoring Program was developed through a process that entailed the following steps:

1. A vision of what this monitoring program could/should achieve was developed based on input from the Chehalis Basin Partnership (Partnership) and the Steering/Technical Committee (STC)
2. Current and recent monitoring programs within the basin were identified and documented
3. Outreach was conducted through the Partnership, STC, and to specific stakeholders such as the Quinault Nation, the Confederated Tribes of the Chehalis, the Ecology TMDL program, and the Chehalis River Council.
4. A workshop was conducted to formulate goals and objectives, identify needs, develop a concept of the organizational structure and function of the watershed monitoring program, and to discuss possible future monitoring activities. Further review/work sessions occurred with the Water Quality Committee to refine the project organization and define next steps in the project.
5. A document was drafted to document the project organization, schedule, goals and objectives, historical data, and possible future monitoring activities.

The organizational structure for the project calls for a Monitoring Program Coordinator to manage the program. It places the Partnership in the role of providing direction and policy guidance as well as supervising the Monitoring Program Coordinator. The Monitoring Program Coordinator will work with the Water Quality Committee on monitoring issues. Most monitoring activities will continue to be conducted by separate groups, but the Monitoring Program Coordinator, along with data management personnel, will make sure that monitoring results are made available to all interested parties throughout the watershed.

Probable future monitoring activities include a data accessibility project which that will seek to increase the availability of existing data to the general public. Monitoring the effectiveness of TMDL implementation will be a second major set of monitoring efforts.

During the first year of the program, the Water Quality Committee will seek to secure a Monitoring Program Coordinator, prioritize future monitoring projects, and develop a workplan for the second year.

Fecal Coliform Monitoring in Grays Harbor County: Summary Report of Monitoring Results for 2000-2003

This report documents the results of fecal coliform monitoring conducted by Grays Harbor Conservation District in the Humptulips, Satsop, and Wynochee Rivers. The purpose of this sampling program was to provide current data on fecal coliform concentrations in tributaries to Grays Harbor and the Chehalis River in relation to the Grays Harbor Water Cleanup Plan (TMDL).

The sampling program consisted of monthly sampling at 21 sites (five on Humpulips, 11 on Satsop, and five on Wynoochee). Sampling at normal flows was sought; if a high flow event coincided with sampling, a second sample was collected during the event.

Most of the results from the sampling program showed fecal coliform concentrations well below water quality standards. The few high concentrations measured were believed to be the result of collection during storm events.

Instream Flow Study

Regulatory minimum instream flows were established by the Washington Department of Ecology for 31 control points in the Chehalis Basin in 1976. These flows represented the lowest flows that Ecology believed should occur at these 31 points for the stream system to continue to be healthy for fish. Streamflow levels have not been monitored to determine if the regulatory minimum flows established in 1976 have been or are being met. In May, 2002, the Chehalis Basin Partnership authorized use of Ecology grant funds to conduct an Instream Flow Study in the Chehalis Basin to collect summer/fall streamflow data at sites where no historical data existed.

This study had two major components:

1. Update flow exceedance hydrographs for control stations where historical flow data do exist.
2. Establish temporary stream gauging stations at 12 sites, collect data, and report results

Results of the study showed that actual streamflows dropped below the regulatory minimum flows at most stations. Flows were below the regulatory minimum flows most of the monitoring period at the following stations:

- Chehalis River at Highway 602
- Black River
- Newskah Creek
- East Fork Hoquiam River
- East Fork Wishkah River

Flows were above regulatory minimum flows before dropping below in August at the following stations:

- South Fork Chehalis River
- Middle Fork Satsop River
- Wishkah River

Flows at the following stations did not drop below the regulatory minimum:

- Cedar Creek
- Decker Creek
- Johns River
- West Fork Hoquiam

Early in the season, streamflow at most sites was above the regulatory minimum. Weather conditions during the June – October monitoring period were characterized by wet conditions through June, then very dry conditions that persisted into mid-November. Measured streamflows in other nearby streams showed very low flows in the late summer and fall, indicating that streamflows measured in the September through November period are likely to represent very low flow conditions.

Water Storage

Executive Summary

The TetraTech/KCM and Triangle Associates consulting team conducted a multipurpose water storage analysis on behalf of the Chehalis Basin Partnership for the Chehalis Basin Watershed Management Plan. The purpose of the analysis was to identify potential projects to store excess wintertime runoff for use in the drier summer months to increase instream flows. Storage could be accomplished either by providing additional water for consumption or by directly augmenting instream flows. This was a survey-level study, based on a review of existing information, to determine projects that warrant further consideration. Because no new analyses were conducted for this report, the level of detail for specific projects in this report depended on the information available.

All of the projects would require considerably more investigation before a final determination could be made as to their feasibility. In addition, before a list of projects can be established, an analysis is needed of the basin's overall water requirements for the future, the areas where the water is needed, and instream flow needs. Once these are known, the scale of projects can be estimated and used to help refine the selection process.

Criteria for Project Selection

- Ease of implementation,
- Water storage ability,
- Potential cost,
- Potential benefits/detriments,
- Potential fish benefit, and
- Habitat potential.

Flow releases higher in the watershed would benefit longer reaches of streams and rivers and would place the water above more areas that may require water in the future.

Categories of projects examined in this analysis

Five different kinds of projects were investigated. The results for each category are presented below.

- **Surface Water Storage** – This category includes new reservoirs and modifications to existing reservoirs. The analysis concluded that new reservoirs may not be realistic because of impacts on fish. Modifications to existing facilities were deemed infeasible at the Aberdeen Lake Dam. A project is underway at the Wynoochee Reservoir that has the

potential to increase spring and summer flows, but any change in the operation of the dam or adding more storage is considered unlikely to be implemented. The Skookumchuck Dam has an active project that may have the opportunity for increasing storage 8500 acre-feet above what is called for in the current project. Negotiations with the Federal Energy Regulatory Commission (FERC) should emphasize the need to consider low-flow augmentation as part of operation of the dam.

- **Wetland Restoration** — While a wetland stores water on the surface, its primary benefit with respect to water storage is to maintain high groundwater levels that help enhance base flows. Wetland restoration encompasses many types of projects, including increasing habitat diversity, riparian revegetation, and floodplain reconnection. The projects presented in this report would increase the volume of storage in a wetland, increase the wet area of a wetland, or increase the time that a wetland contains water. Such projects include reconnecting overbank areas to the floodplain, inundating historical wetland areas, and increasing the water depth in existing wetlands.

  Ten sites were identified through an analysis of existing documents. Others may prove suitable. The estimated per acre cost of wetland creation ranged from $170,000 to $1,445,000. Additional work should be done to examine additional projects on a basin-wide scale.

- **Aquifer Storage and Recovery (ASR)** — This category examines the possibility of injecting excess water into an existing groundwater aquifer for storage until it is needed and then pumping it. In the Chehalis Basin, ASR would most likely use a well field for both the recharge and extraction of the water. Negative environmental impacts are typically minimal because withdrawals occur during wet winter months when water in streams or rivers is plentiful. Infrastructure necessary for ASR generally is minimal

  Preliminary investigations into the watershed's aquifers indicated that the most promising aquifer for ASR is the Newaukum Artesian aquifer. At many places within this aquifer, well yields of several hundred gallons per minute are possible (Weigle and Foxworthy, 1962). Several factors, including the presence of a confining layer that would inhibit contamination, the well yields, and the aquifer's proximity to major population areas (Napavine, Centralia, and Chehalis) make it a candidate for further study.

  Considerable additional study of the aquifer would be needed before an ASR pilot project could be implemented. The characteristics of the aquifer would have to be evaluated in further detail, including the storage amount (specific storage) that the aquifer could hold and the rate at which water travels in the subsurface. These characteristics determine the rate at which water can be injected and recovered.

ASR costs elsewhere in the US for one million gallons of water per day range from $327,000 to $586,000.

- **Programmatic Projects** — This category consists of programs and policies to reverse negative impacts on groundwater recharge that have occurred as a result of current land use practices. The four project types investigated aimed at promoting basinwide infiltration to promote groundwater recharge and, thereby, increase summer base flows. The four investigated are described below:
  - Conservation/restoration of forests
  - Blockage of agricultural drainages
  - Support for beaver populations
  - Low-impact development

  Forest Conservation/Restoration

  The recommended project has two components. First, a staff position would be created to serve as a "forest watershed steward" who would
  - monitor forest practices activities throughout the Chehalis Watershed to provide a watershed-scale view of forestry activities;
  - document successes and areas needing improvement in forest land management; and
  - provide a liaison role between forest land managers and the Chehalis Basin Partnership.

  Second, further research would be conducted into the effects of decreased forest cover on infiltration, groundwater, and base flow in the basin. By quantifying the effects of deforestation and forest harvesting on base flows, new regulations can be fairly developed and administered or the proper mitigation can be specified.

  Block Agricultural Drainages

  Agricultural drainage is the removal of excess water from the soil surface or the soil profile of cropland by gravity or by artificial means. The recommended project includes the following elements:
  - Establish a public information campaign that might consist of mailings and workshops focused on the effects of drainages and of the opportunities available.
  - Establish a database and compile data about known drainage systems. Methods for identifying drainages include examining aerial photographs, examining NRCS records, and interviewing landowners. The database would serve as a means to track the extent of known drainage systems, their condition, and the current land use.
  - Encourage landowners to voluntarily block existing drainages no longer needed or request assistance from their county in blocking

drainages. Further investigation into the incentives, benefits, and funding sources available to landowners is also necessary.

Beaver Reintroduction

Beaver populations, which historically were common and abundant throughout the basin, have been severely reduced by trapping and hunting. Beavers are important regulators of aquatic and terrestrial ecosystems, with effects far beyond their food and space requirements. Beavers modify stream morphology and hydrology by cutting wood and building dams. This, in turn, influences a variety of biological responses within and adjacent to stream channels.

Beavers are often viewed as a nuisance species by landowners because of the impacts they have on streams. However, many people may not be aware of the important role beavers play in the ecosystem. Therefore, the recommended alternative contains the following elements:

- Emphasize the benefits of beavers in public information;
- Encourage landowners not to automatically remove beavers when they are found in an area; and
- Establish a relocation program for nuisance beavers.

Efforts to restore riparian areas could include elements that would support beaver. By ensuring an adequate food supply with willow stakes and coniferous plantings, the beaver population should naturally expand to fill habitat over time. This would essentially be restoring a creek or stream to its natural condition that would promote instream flows.

Low-Impact Development (LID)

Extensive regional and national research shows a clear link between development in a watershed and degradation of aquatic resources. Since the Chehalis Basin is primarily forest covered and development densities tend to be low outside of the basin's cities, a policy of LID could be implemented to reduce the impact from future development in the basin.

LID policies could be adopted as part of the construction permitting process in the basin. A model ordinance should be developed that could be modified or directly adopted by municipalities. The cost benefits of LID should be documented and made available to the public as well as to developers. Given its broad participation, the Chehalis Basin Partnership would be a good forum to develop the coordination needed to initiate an LID program.

Estimated Cost of Programmatic Projects

Project	*Estimated Cost*
Block Agricultural Drainages	$207,000
Low-Impact Development	$120,000
Beaver Reintroduction	$170,000
Forest Conservation/ Restoration	$300,000

Programmatic Project Cost Estimates

Estimated costs for the programmatic solutions, based on a five-year timeline are presented in the table to the left. These costs include public information and policy activities but do not include costs for specific on-the-ground projects that might be developed.

Non-Storage Projects

The following projects were reviewed that do not store water but are of interest because they can decrease consumptive needs and reduce peak demands on the basin's supply.

- **Washington Water Acquisition Program**: This is a voluntary program to increase stream flows in watersheds with vulnerable salmon and trout populations. Program participants are holders of water rights who sell or lease to the state all or part of their water right or donate all or part of the water right on a permanent or temporary basis.
- **Water Rights Trades or Loans**: This voluntary program would be similar to the Water Acquisition Program, but instead of water rights being sold or leased to the state, they would be traded or leased to other private entities. This could have the effect of meeting water demand in areas that lack further water rights without any increase in overall water rights in the basin.
- **Irrigation Efficiency**: Increasing agricultural irrigation efficiency could reduce the amount of withdrawal from surface water and groundwater sources, leading to higher instream flows. Grants administered by local conservation districts are available to assist with increasing efficiency, based on demonstrated need and environmental benefit.
- **Water Conservation**: Increased water conservation reduces the amount of water being withdrawn from surface water and groundwater sources, leading to higher instream flows. Adjusting water rate structures can promote conservation by charging more for water usage above a specified volume. Such a rate structure would be designed to encourage larger water consumers to use water more efficiently.
- **Recycled Wastewater**: Recycled wastewater (gray water) can be used in lieu of other water withdrawals for the irrigation of agricultural or landscaped areas. The City of Chehalis is currently designing a regional wastewater treatment plant that incorporates recycled wastewater. This project could be used as a model for future treatment plants.

Evaluation and Recommendations

Projects evaluated were divided into high-yield and low-yield categories. The high-yield category compared projects that have the potential to provide significant quantities of stored water. The low-yield category compared projects that would not provide large quantities of stored water but would be very beneficial to the overall health of the watershed.

- The projects in the high-yield category included Aquifer Storage and Recovery, Skookumchuck Dam Modifications, and Wynoochee Dam Modifications.
- The projects in the low-yield category included the wetland restoration projects and the programmatic projects.

Summary of Data Contained in Chehalis Basin GIS Project

Data Category	*Source of Data*	*Whole Basin*[1]	*Priority Group 1 Subbasins*[1]
Political boundaries	Level I Assessment	Cities Counties	Cities Counties
Watershed boundaries, including subbasins	DNR	WRIA23_bound WRIA22_bound	grp1_subbasins
Hydrology (Stream types 1-5, + unclassified)	DNR	Hydrolin (WRIA 22 and 23 CDs)	hydrography
Highways and roads	Level I Assessment	mj_roads	(see below)
Highways and roads	WSDOT	Locrd, strd (WRIA 22 and 23 CDs)	Locrd, strd (WRIA 23 CD)
Orthophoto (Year 2000)	DNR	Dnrortho.sid (WRIA 22 and 23 CDs)	Dnrortho.sid (WRIA 23 CD)
Township, Range, Section survey boundaries	Level I assessment	Township, sections	grp1_sections_clipped
2000 census data	DOH	cb22_23	grp1_censusblk
2000 population by section	DOH		pop_by_trs
2000 population by subbasin	DOH		pop_by_subbasin
Average annual precipitation contour map, monthly precipitation contour maps	University of Oregon, Spatial Climate Analysis Service (formerly OCS)	wa_ann, wa_jan, wa_feb, wa_mar, wa_apr, wa_jun, wa_jul, wa_aug, wa_sep, wa_oct, wa_nov, wa_dec	wa_ann
Average annual precipitation by subbasin	Level I Assessment (base data)/ Tt/KCM (GIS)		avg_precip_by_subbasin
Water purveyor service area boundaries	Water purveyors, counties	service_areas_nofut	grp1_service_areas
Type A and B water system wells	DOH	dohwells (WRIA 22 and 23 CDs)	dohwells (WRIA 23 CD)
Active streamflow gauges	EPA	i_f_cs_pts	i_f_cs_pts

1. Additional and more detailed data were developed for "Priority Group 1" subbasins [Newaukum, Skookumchuck and mainstem Chehalis (Centralia/Chehalis reach), and Salzer Creek] during the Water Quantity Evaluation Study. All file names listed have an ".shp" extension unless otherwise noted.

Data Category	*Source of Data*	*Whole Basin*[1]	*Priority Group 1 Subbasins*[1]
USGS measured streamflows	USGS		usgs_measured_streamflows
Regulatory minimum flows	EPA	i_f_reaches	regulatory_baseflows
Land use/land cover	Level I Assessment (USGS/EPA)	lulc	grp1_lu
Topographic contours – 40 foot	DNR	cont_40ft (WRIA 23 and 23 CDs)	cont_40ft (WRIA 23 CD)
Water rights (points)	EPA	wtr_right_pts	
Water rights (by section)	EPA	Sum_Sections_all_p_c_s_j_a_c	grp1_wr_perm_cert_by_trs
Water rights (by subbasin)	EPA	Sum_Subbasin31_all_p_c_s_j_a_c	wr_perm_cert_by_subbasin
Water right claims (by section)	EPA (base data) /Tt/KCM (GIS)	Sum_Sections_all_p_c_s_j_a_c	claims_by_trs
Water right claims (by subbasin)	EPA	Sum_Subbasin31_all_p_c_s_j_a_c	claims_by_subbasin
Water right applications (by section)	EPA	Sum_Sections_all_p_c_s_j_a_c	wr_apps_by_trs
Water right applications (by subbasin)	EPA	Sum_Subbasin31_all_p_c_s_j_a_c	wr_apps_by_subbasin
Water treatment facilities	Level I Assessment, Tt/KCM	treat_fac	treat_fac
Estimated exempt wells by subbasin (Estimates based on intersections and calculations with other data sets such as census block data, service area boundaries, water rights, subbasin boundaries)	Tt/KCM		grp1_exempt_wells
Dams	DOE, Level I Assessment	Dams (WRIA 22 and 23 CDs)	Dams (WRIA 23 CD)
Water quality monitoring stations and data	DOE	Stations (WRIA 22 and 23 CDs)	Stations (WRIA 23 CD)
Background	EPA	background	

Accessibility of Data for Citizens in the Chehalis Basin

Data have been collected in the Chehalis Basin by many different parties for many different purposes. In addition, there have been many studies conducted which contain analyses, results, and recommendations. During development of this Watershed Plan, residents and stakeholders emphasized their desire for previous studies and data to be available and used.[1]

Who Collects and Stores Watershed Data in the Chehalis Basin?

Watershed data are collected by numerous sources, most often government agencies. In the Chehalis Basin, the following groups collect watershed data:

- **U.S. Geological Survey**: streamflow data
- **Washington Department of Ecology**: water quality and some sediment data; location and description of wells; description of permitted wastewater discharges, landfills, and hazardous waste sites. Other types of data such as streamflow, groundwater levels, and groundwater quality may be collected during the course of special studies
- **Washington Department of Fish and Wildlife**: Information pertaining to fish presence and use, habitat information
- **Washington Department of Health**: Information about public water suppliers, public water supply wells, pertaining to shellish
- **EPA**: Project specific information on water and environmental quality
- **Indian Nations**: Both the Confederated Tribes of the Chehalis and the Quinault Nation conduct monitoring and have watershed data housed at their offices.
- **Counties**: Land use information, including current and planned future land use, zoning, parcels. Most counties also have some limited streamflow and water quality information, often specifically pertaining to stormwater. Grays Harbor, Thurston, and Lewis Counties all maintain data within county Geographical Information Systems (GIS), making it possible to transfer information around in a spatial format. Counties also usually have information about areas that are served by sewer and water systems and areas that are not. County Health Departments also track potential health-related environmental data, such as failing septic systems and bacterial levels around shellfish beds.

1. There is some frustration that work has been done in the past and has ended up buried in files or on a shelf.

- **Natural Resource Conservation Service (NRSC)**: Agricultural practices and such data as number of acres in cultivation, types of crops grown, etc.
- **Conservation Districts**: Agricultural practices at a more detailed and local level than the NRCS. In addition, conservation districts often conduct studies that involve collection of watershed data, such as water quality and streamflow data.
- **Volunteer Organizations**: In the Chehalis Basin, two major volunteer groups collect watershed data: the Chehalis Basin Education Consortium and the Chehalis River Council. Both groups have focused primarily on water quality data.

Are these data available to the general public?

All data collected by government agencies within the U.S. (federal, state, and local) are considered public information and are available to anyone upon request. To obtain data results, a person needs to look for specific information, identify the agency or source who has the data, and make a request for the data. The data may be in "raw" form (tables, databases or spreadsheets), or they may be summarized and discussed in a report. A lot of information, including full reports, is available for downloading through the Internet at most agency websites.

For data collected by tribes, private entities, and volunteer organizations, it is the choice of the entity as to whether to make the data available.

How can these data be useful and widely used?

Beyond the question of whether the collected data are available to the general public is the question of whether basin residents and stakeholders are made aware of data without the considerable and deliberate effort of seeking out the information. This does occur to a limited extent through the following mechanisms:

- Press releases in newspapers or broadcast on the radio and television
- Agency briefings at intergovernmental meetings, such as the Partnership's
- Regulatory actions initiated by agencies
- Multidisciplinary planning efforts such as this Watershed Plan, that include compilation of available data for the watershed (i.e. the Level 1 Assessment, Detailed Summary of the Level 1 Assessment, Issue Papers, and the Watershed Plan itself)

In the Chehalis Basin, a basin-wide GIS project has been developed that is a powerful tool for both general assessment and detailed analysis work. This computer-based tool provides a single source for a long list of data categories from numerous sources. (See Table X and the diagram below). GIS can be thought of as a powerful mapping system; it allows you to view and use data in a spatial context. GIS is also the dominant tool for storing and using

data; most entities involved in data management have converted, or are in the process of converting, to GIS-based systems.

Working with GIS requires technical computer knowledge that most people do not possess. Because of this, it is desirable to make GIS data available, at least for viewing, through other means. Two such means are available.

- In the Chehalis Basin, a useful and innovative tool to help look at GIS data was developed through a partnership project between Chehalis Basin resident Mr. J. Roach and the Washington State Department of Natural Resources (funded in part through the Partnership). This tool, called "the Data Viewer" uses basic GIS software to allow a user to view the information contained within the GIS. The user can view but cannot make changes to the data files. The software needed to use the Data Viewer is free. The only drawback to the Data Viewer as a mechanism to provide widespread access to data is that the user still must become comfortable navigating within a basic version of the GIS computer program ARCVIEW. The Data Viewer is currently available on CD upon request from Mr. J. Roach.
- Another method of making GIS data available to the general public is to copy information contained within the GIS to a web-based data access system. Many counties, such as Thurston, Pierce, Kitsap, and King use such a system to provide information to residents about land parcels, critical areas, and emergency/hazard mapping. These systems are typically very user-friendly. Once again, a user is not allowed to change data within the system.

A variety of non-computer based data access vehicles are also important. In particular, it is important that local residents and policy-makers are regularly and reliably briefed on significant data sampling programs and results and emerging regulatory trends. This would include discussion through the Partnership, publication in "Drops of Water," publication in local newspapers, and broadcast through local radio and television.

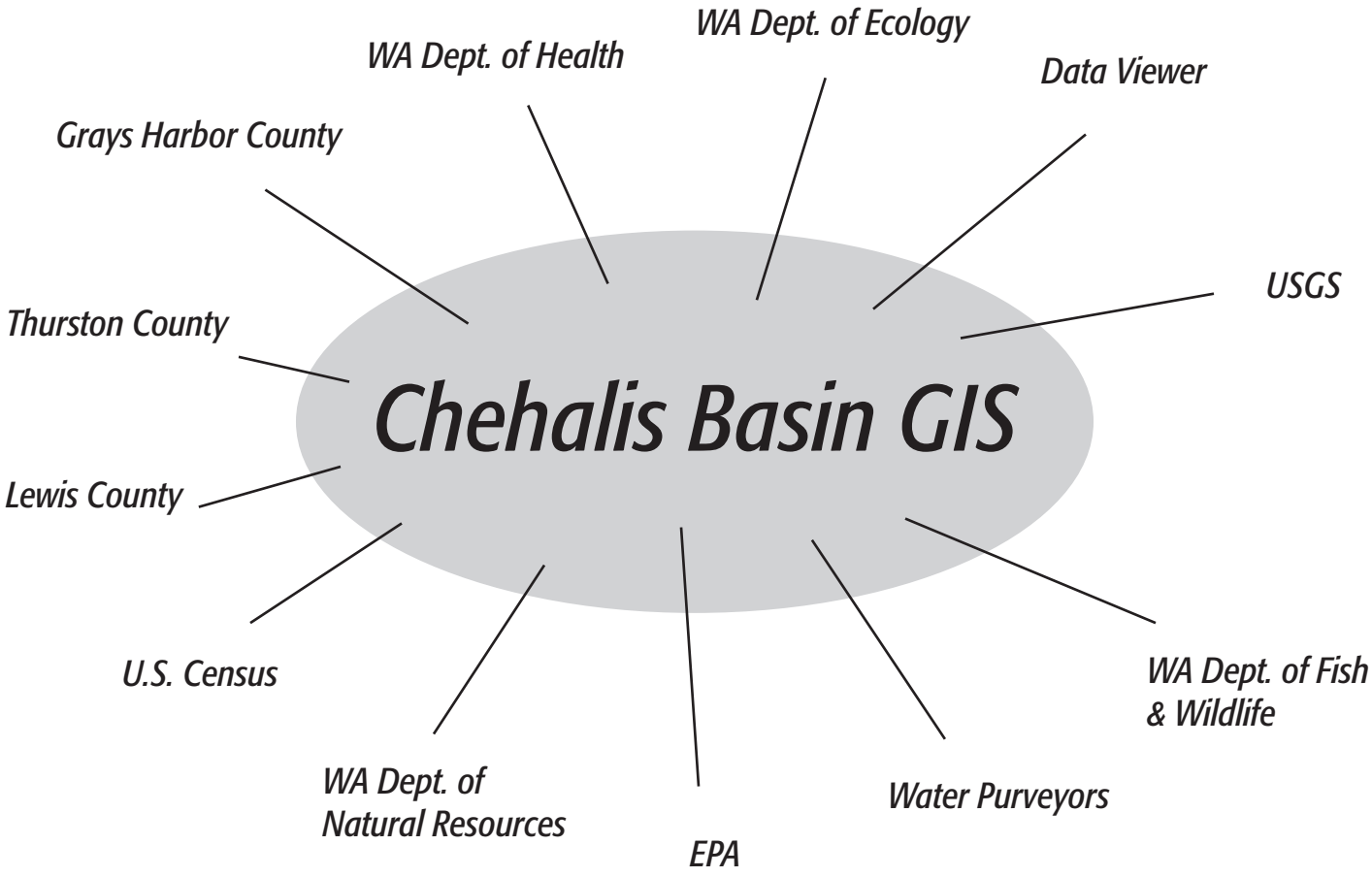
Recommendations Related to Chehalis Basin Data

The discussion above highlights several needs related to data and the use of data in the Chehalis Basin. Those needs are listed here and also as Watershed Plan recommendations.

1. Some forum for discussing watershed issues, such as the Partnership, should continue beyond adoption of the Watershed Plan. This is an effective forum for discussing watershed issues and for receiving briefings from scientific and regulatory staff related to new data findings or emerging regulatory trends.
2. Expanded availability and use of the Data Viewer should be explored. In particular, it may be beneficial to develop a menu-driven front end to assist with entering and navigating through the program and additional tutorial materials to help familiarize new users with the system. Setting

up public access Data Viewer stations at public libraries, schools, community centers, and other public locations should also be evaluated.

3. Updating the Data Viewer with GIS data developed for the Chehalis Basin GIS project as part of this Watershed Plan should also be explored. This effort would continue to build the Data Viewer as a comprehensive source of information about the watershed.
4. It will be necessary to identify a long-term custodian for the Chehalis Basin GIS project that was developed for this Watershed Plan. This could logically be one of the participating counties, since they already have GIS capabilities. Ideally, the custodian for this system would also have the resources and mandate to maintain and use the system and assist residents and stakeholders who want to access data contained within the system (which may also include establishing web-based data access capabilities).



Standardized Data Formatting

Watershed and environmental data that are collected by one group can be useful to anyone, as long as the user understands the source, quality, and any conditions on the shared data. These requirements fall under the topic of standardized data formatting.

There are two main considerations for standardized data formatting. The first pertains to adequate descriptive documentation about the data. Knowledge of this "backup" information about data allows much higher confidence in appropriate use of the data, even many years later. Useful descriptive information includes the following items:

- Group who conducted sampling
- Personnel who conducted sampling
- Sample location
- Date, time, and other general observations about sampling (weather, special conditions)
- Sample method used to collect and preserve sample
- Type of sample equipment
- Laboratory method for analysis (if applicable)
- QA/QC conducted
- Any additional information that may help in evaluating data

The second consideration deals with how the data are stored. In today's world, data are rarely stored in a manner that cannot be readily exchanged with others. Most agencies use spreadsheets, database systems, and GIS systems to store and manage data. With few exceptions, information housed in these systems is readily interchangeable.

Data Gaps

Ideally, management decisions should be based on accurate and complete information. In the world of resource management, however, available information is rarely complete. It can be difficult to overlook these deficiencies in information, and move forward with management decisions. Even without complete information, it is important to forge a path ahead.

In the Chehalis Watershed Plan, there are many data gaps. These data gaps are summarized here, not in an attempt to show that there is not enough information to recommend and implement management actions, but rather to illustrate some of the uncertainties related to recommended actions, as well as to emphasize the need for continued data collection and analysis.

The data gaps discussed below address the categories of water quantity, water quality, habitat, instream flow and other general data gaps. The discussion is general in nature, not intended to describe the specific study needed to fill the data gap (see the Level 1 Assessment and/or Detailed Summary for that discussion). This is also not a comprehensive list of data gaps; it represents those data gaps identified to be most critical to this Watershed Plan.

1. Streamflow data is inadequate in much of the basin. At a minimum, there should be streamflow data collected at each of the 31 regulatory control sites for which Ecology has regulatory minimum flows established. This gaging should be conducted year-round.
2. Groundwater information is inadequate for resource management purposes. Some detailed studies have been done, but it is not known how representative the results of these studies are for the entire watershed. Specifically, the following areas of uncertainty affect implementation of this plan:
   - **Characterization of Chehalis Basin aquifers** – Are there aquifers that have not been previously identified and/or explored?
   - **Ground and surface water interaction** – How closely is the ground and surface water connected throughout the watershed? Studies in specific areas have shown a close connection, but it is not known that this is the case throughout the basin. Where they are closely connected, are travel times between the two long enough that groundwater withdrawals could be timed to lessen the impact on surface water bodies.

     Also, does the interaction between surface and ground water cause water to flow from the surface water to ground water, or from ground water to surface water, or does it vary throughout the basin and/or throughout the year?
3. True legal appropriation of water through water rights – there are approximately 8,500 water right claims in the Chehalis Basin. Almost nothing is known about whether these claims are valid and actually being used.

4. Actual water use for most water users. The only group of water users that have actual water use data are public water suppliers who must meter their water withdrawal and distribution.
5. Exempt wells – the number of exempt wells used for residential supply was estimated as part of this Watershed Plan. The number of exempt wells used for industrial purposes and stockwater, or the quantity of water consumed from these wells for those purposes is not known. In addition, while the impact of exempt wells is believed to be insignificant when generalized over the entire basin, the impact of exempt wells in specific subbasins was determined to have potential for impact to surface water. Determining whether there is an impact in specific subbasins would require further analysis.
6. Information about what streamflows were before human activities began to impact them. This was referred to as "undepleted streamflows" in the Level 1 Assessment, and an attempt made to quantify these flows in four subbasins. Opinions vary widely as to whether attempting to reconstruct this information is a worthwhile exercise for several reasons:
    - After the reconstruction is complete, there is no way to verify its accuracy
    - Natural variables (such as forest fires) may have had as much or more impact on streamflows before human impacts began.
    - Sorting out all the probable variables that impact streamflow (climate regime, land cover, antecedent moisture conditions, etc.) from a time prior to good historical records would be a very difficult and tenuous exercise. Simply deducting the water rights allocated to each watershed would also not be appropriate at this time because of the large uncertainties related to legal water rights and actual use.
7. While much work related to water quality has been done in the basin, no coordinated, systematic planning, monitoring, and reporting has been established. Because of this, the results of many sampling programs are not widely known. The data gap identified here is the lack of coordination and local influence in monitoring.
8. Very little data exists to assess the watershed health in some of the more pristine areas of the watershed. Since it is the goal of this Watershed Plan to promote the preservation, and not allow degradation of those areas, it is necessary to have data demonstrating the characteristics of those areas.
9. Under the topic of salmon and steelhead habitat related to instream flow needs, very little data exists about specific flow requirements for fish in subbasins throughout the watershed.
10. Fish use and habitat conditions have not been well documented in the Elk River, Johns River, Newskah Creek, Charley Creek, the Hoquiam River, and Wishkah River.
11. A comprehensive survey of potential wetland restoration sites has not been done basinwide. Such a survey, including development of viable projects and pilot studies to evaluate the impact of wetland restoration activities, would benefit all elements of the Watershed Plan.