

# GREEN-DUWAMISH WATERSHED INITIAL ASSESSMENT

DRAFT

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With our multitudes of lakes, streams and rivers, Washington State seems to have an abundance of water. However, the demand for water resources has steadily increased each year, while the water supply has stayed the same, or in some cases, appears to have declined. This increased demand for limited water resources has made the water rights allocation process complex and controversial.

In order to expedite decisions about pending water rights, it is vital that we accurately assess the quality and quantity of our surface and ground water resource. The Department of Ecology recognizes that water right decisions must be based on accurate scientific information. Ecology has partnered with teams of consultants to conduct special studies called Initial Watershed Assessments throughout the state to evaluate existing data in selected watersheds known as Water Resource Inventory Areas (WRIAs).

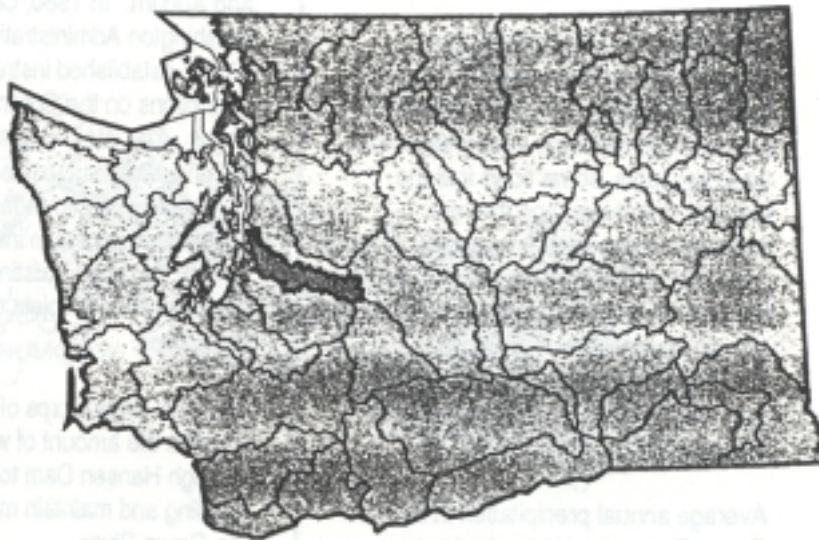
The assessments describe existing water rights, stream flow, precipitation, geology, hydrology, water quality, fisheries resources, and land use patterns. Some assessments provide straightforward results, allowing immediate water management decisions. In watersheds with little existing information, further studies will be necessary to acquire new data. In watersheds where major public policy conflicts exist, or where significant land use impacts are expected, water management decisions will be coordinated with local and regional planning processes.

This summary report outlines information presented in a detailed Ecology Open-File Technical Report No. 95-01.

*Science Applications International Corporation  
Shapiro and Associates  
Taylor Associates  
Environmental Systems Research Institute*

In partnership with the:  
*Washington Department of Ecology*

## *Green Duwamish Watershed Location Map*



### **What are the water allocation issues?**

- There are 54 ground water applications pending in the watershed requesting a total of 54,410 gallons per minute (gpm) and 8 surface water right applications pending for a total of 6.3 cubic feet per second (cfs).
- At both Palmer and Auburn, instream flow requirements were not met an average of 100 days or more per year between 1980 and 1992. There appeared to be an upward trend in the number of days instream flows were not met. Additional pumping of ground water throughout much of the watershed will further reduce flows in the Green River and its tributaries.
- Maintaining Green River flows is important to reduce the impact of pollutants and to support fish populations on a year-round basis.
- Water rights and claims do not provide an accurate picture of actual water use.
- The operation of the Hansen Dam and the subsequent removal of Green River water by the City of Tacoma are subject to different target instream flow requirements than those currently established by law.

## What is a watershed?

A watershed is an area of land where topographic features such as hills and valleys cause water to flow toward a single major river or other body of water.

## Where does the water come from?

Ultimately, all of the surface and ground water in the watershed comes from precipitation, as rain or snowmelt. Some of this recharge evaporates or is used by plants, some flows into the streams and rivers, and the rest infiltrates into the soil to become ground water. Some reaches of streams and rivers gain water from ground water that seeps into the channel and other reaches lose water that leaks through the streambed into the ground.

Average annual precipitation in the Green-Duwamish Watershed ranges from about 38 inches at Seatac to over 92 inches at Stampede Pass. Data from the Seatac and Tacoma weather stations shows that precipitation was higher than average from the mid-1940s through the mid-1970s and has been lower than average since that time.

## What are the major surface water sources?

The largest surface water source in the watershed is the Green River. The U.S. Geological Survey (USGS) operates stream gage stations to measure the amount of water that flows through the Green River near Palmer and Auburn. In 1980, Chapter 173-509 Washington Administrative Code (WAC) established instream flow restrictions on the Green at these two gages. The WAC states that at no time will diversions subject to regulation be continued when flows fall below the established minimum instream flow levels. Tacoma's existing diversion, however, is not subject to these restrictions.

The U.S. Army Corps of Engineers controls the amount of water that flows through Hansen Dam to control flooding and maintain minimum flows in the Green River.

The major water uses in the Green-Duwamish Watershed are municipal supply and irrigation. The City of Tacoma diverts water through a pipeline that starts just below Hansen Dam. Other important uses of surface water are for protection of water

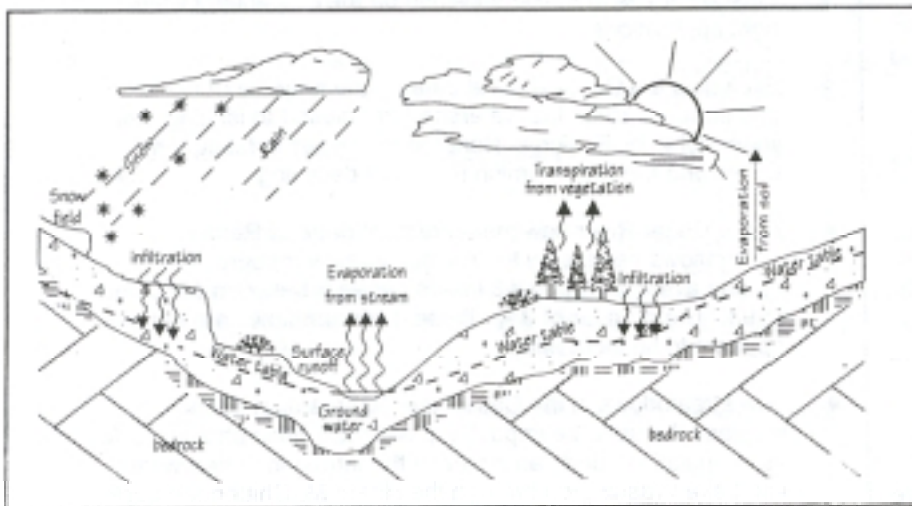
quality and fish populations. Surface water is also used in the Newaukum and Soos Creek Subbasins, but mainly for irrigation and livestock.

## What are the major ground water sources?

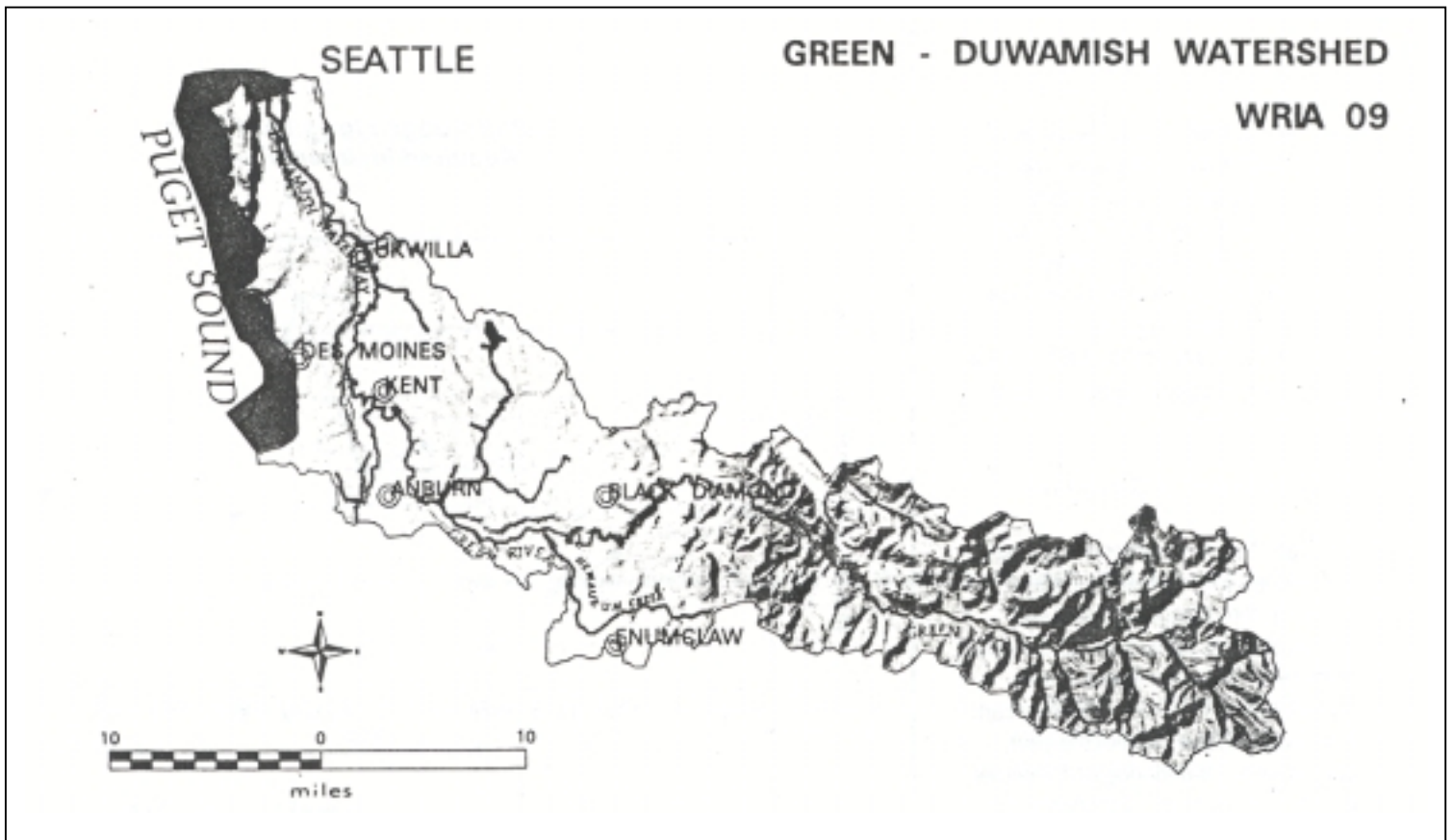
East of Palmer, in the upper part of the watershed, much of the geology is made up of the volcanic rocks of Mount Rainier and the Cascade Mountains. This geology does not form productive aquifers, so ground water is not the main source of water. Lower down, the glacial deposits of the Puget Sound area form better aquifers that do produce usable amounts of ground water. The major ground water sources are in the hills on either side of the Green River after it turns northward below Auburn and in the glacial and alluvial deposits in the valley.

## How are surface and ground water connected?

In areas where both surface water and ground water are used, the connections between the two sources become important. In some instances the ground water flows from the aquifer to the surface water, while in others the reverse occurs. Along Big Soos Creek, Newaukum Creek, and the lower reaches of the Green River, pumping from the upper 3 or 4 aquifers can have significant impacts on surface water flow and can lead to lower water levels in the river. In issuing future ground water rights, Ecology must consider these potential effects on other users.



A general representation of the hydrologic (water) cycle (modified from Walters and Nassar).



**How does land use affect water?**

Land use practices have profound effects on the amount and quality of water moving through the watershed. Logging operations can strip soils of vegetation, increasing the amount of runoff. Increased soil erosion from this runoff can cloud the water with sediment. In agricultural areas, chemicals and livestock wastes can drain into streams and rivers and irrigation can withdraw significant volumes of water.

In the lower reaches of the watershed, municipal and industrial consumers use the largest quantities of water and contribute pollutants. The expansion of impervious surfaces (roads, parking lots, buildings) increases the amount and rate at which surface runoff flows into streams. This increased runoff means less water enters the ground to recharge the aquifer. It may, in fact, produce increased flooding. Stormwater runoff can also carry pollutants from

these surfaces into local surface water bodies.

**What are the water quality issues in the Green-Duwamish Watershed?**

Water quality is closely tied to water quantity. Water supplies must be of high quality for municipal purveyors and to support fish and wildlife populations. At the same time, water quality may depend on preserving large quantities of clean water to dilute existing pollutants and maintain proper water temperatures for fish.

The major water quality problems in the Green River appear below the Auburn gage. Major pollutants include mercury and fecal coliform bacteria. Problems with dissolved oxygen and temperature, both critical to fish populations, have also been reported. Other problems have been reported for river sediments containing copper, lead, zinc, hydrocarbons, and PCBs. The main problem along Soos Creek has been

fecal coliform bacteria, probably coming from livestock along the streams. Stormwater runoff with high sediment loads has also affected water quality. Newaukum Creek has experienced problems with fecal coliform bacteria, as well as high nitrate and ammonia levels, again probably due to livestock.

**Are our fish resources stable?**

Anadromous salmonids in the Green-Duwamish Watershed include chinook, coho, and chum salmon, and steelhead trout. Pink salmon were once abundant but have not been reported in recent years. Chum runs have declined but the native population is being increased through a stocking program by the Muckleshoot Tribe.

Tacoma's diversion dam blocks all upstream migration of salmonids and no spawning occurs above the dam, but juvenile salmonids are planted in



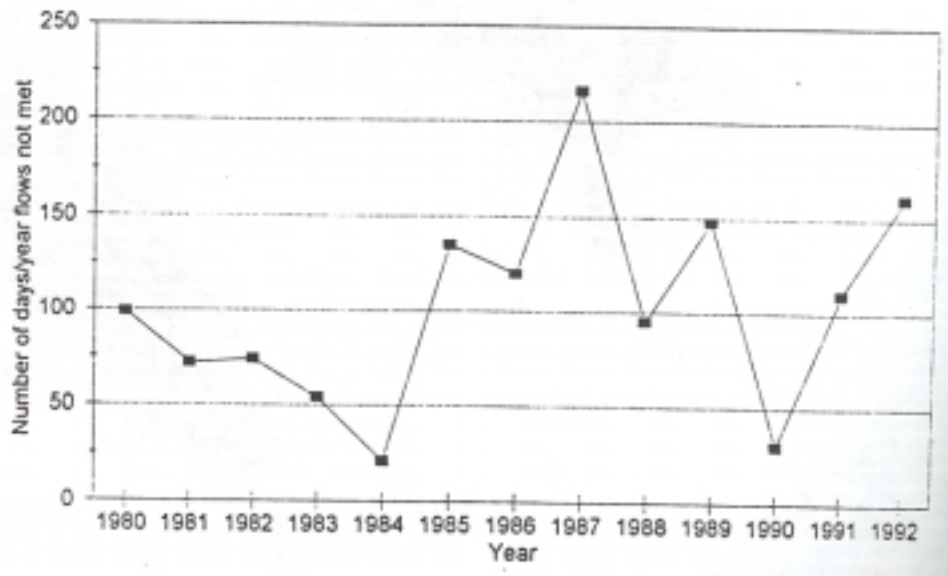
As different species and lifestages of fish coexist in the river system, no one time of the year is critical for fish populations and flows are necessary year-round. Adverse conditions affecting the migration of fish include poor water quality, high water temperatures, physical barriers (dams), destruction of spawning habitat, and low streamflows.

### Streamflows in the Green River

Instream flow requirements were not established for the Auburn Gage (figure at top of page 5) until 1980. The average monthly flows at the gage from 1962-1993 (the entire usable record) were above the 1980 instream flow requirements most of the year, and equal to them during mid-summer. Due to the day to day variation in the flows as well as environmental changes since 1980, however, instream flows were not met at the Auburn Gage an average of 103 days per year between 1980 and 1992. At the Palmer Gage, instream flow requirements were not met an average of 100 days per year during the same period. In both instances, there appeared to be an upward trend in the number of days that instream flows were not met.

In addition to the flow restrictions on the main stem of the Green River, all tributaries of the Green are closed to further surface water appropriations. Data from gages on Big Soos and Newaukum Creeks show significant summer flow declines within these two subbasins. These declines can be attributed to a combination of less precipitation, increased ground water withdrawal, and the paving of land surfaces. Paving land surfaces reduces the recharge to the aquifers which, in turn, reduces the ground water contribution to streams in summer.

**Auburn Gage Flows Less Than Required Instream Flows**



### What are water rights?

A water right is a legal authorization to use a certain amount of public water for specific beneficial purposes. The basis for water rights is "first in time, first in right." Washington State law requires most users of public water to receive approval from the State before using the water. This approval is granted in the form of a water right permit or certificate.

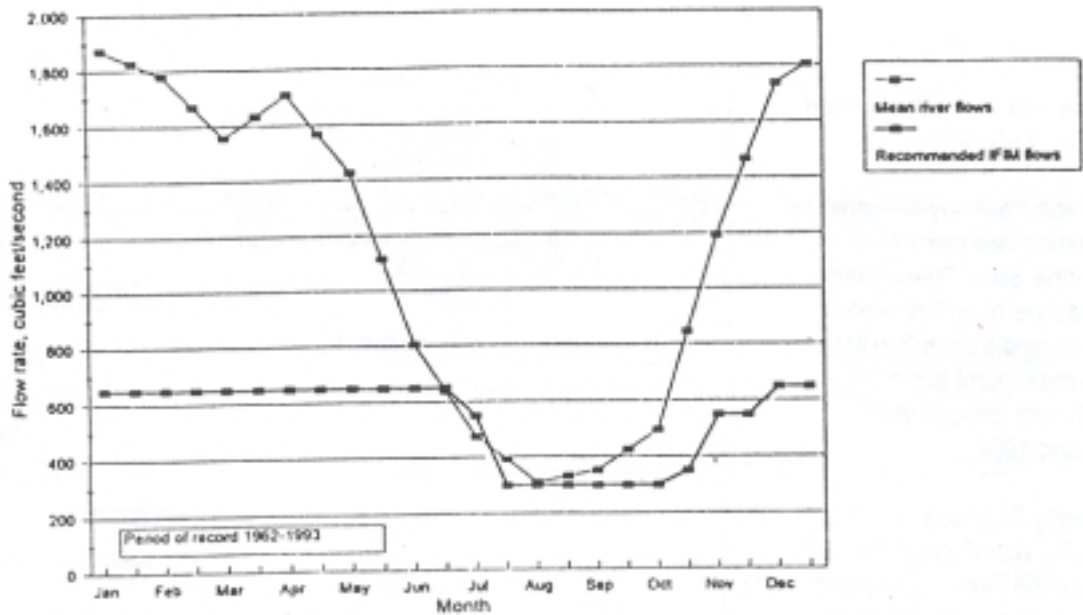
Every surface water user is required to have an approved water right before appropriating water of the state. Ground water users do not need to apply for a water right if the proposed use is 5,000 gallons or less each day and is used for watering stock, watering a lawn or garden less than one-half acre in size, or a single or group domestic or industrial well. Approximately 25 percent of the population of South King County draws water from small systems which are exempt from water right permits.

### Why are water rights important?

The water rights program ensures that Washington's water resources are appropriately allocated and managed. By effectively managing allocation of new water rights, we can protect senior water rights and benefit the overall public good.

### Water right claims

A water right claim on file with Ecology may or may not represent a valid water right. The validity of a water right cannot be determined unless an adjudication occurs. Within the watershed, a total of 3,350 unverified water right claims have been filed, for a total of 540 cfs (instantaneous maximum) and 11,216 acre-feet per year.



**Mean monthly flows vs. recommended flows for the Green-Duwamish Watershed**

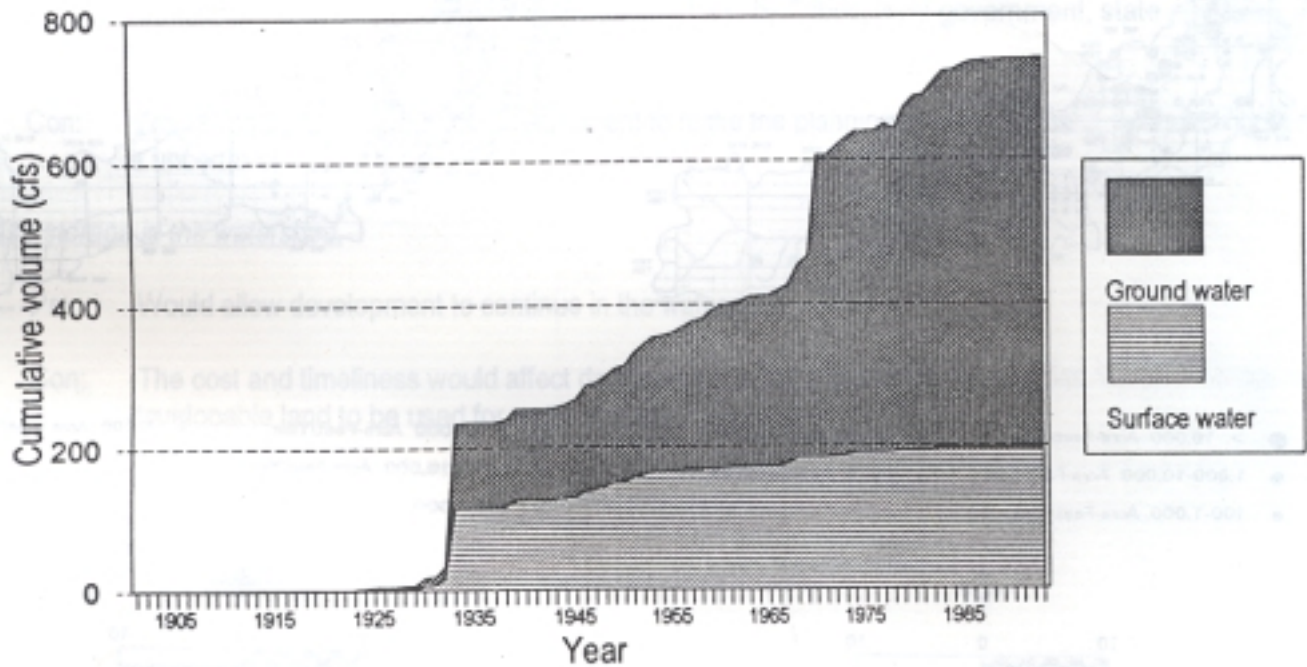
**What are the conflicts in the watershed?**

Maintaining Green River flows is important as a means of reducing the impacts of pollutants already found within the watershed and for supporting fish populations on a year-round basis. The total number of days that Auburn

and Palmer instream flows are not met is substantial. In addition to the flow restrictions on the main stem, all tributaries to the Green River are closed to further appropriations. Both surface water flows and ground water levels have declined in the closed portions of the watershed during recent years, and the two are interconnected.

Additional ground water pumping within much of the watershed will cause surface water flows to decline even more.

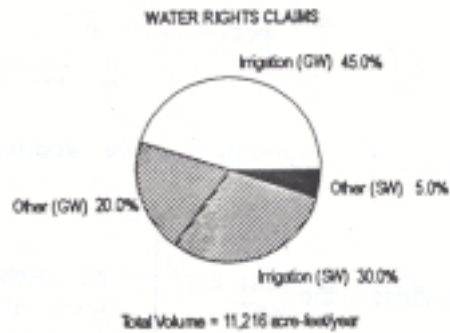
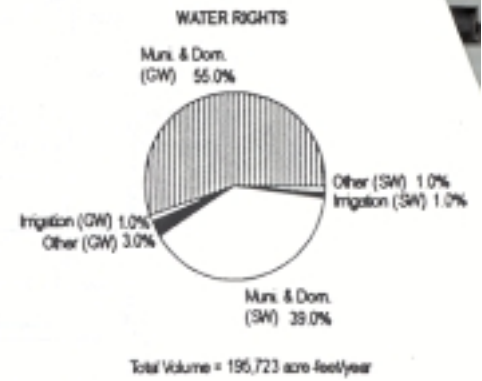
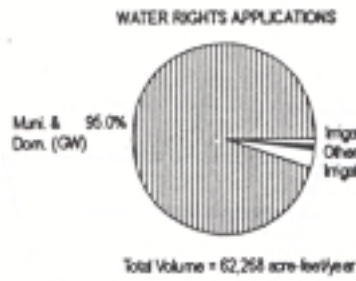
**Water Rights Permits & Certificates**



## What are the current and future major water uses in the watershed?

The amount of water already allocated in the entire watershed has risen dramatically. In the Soos Creek Basin alone, the allocations of ground water withdrawals increased from 5.3 to 40.8 cfs (instantaneous maximum) and from 1,412 to 19,297 acre-feet per year between 1967 and 1994.

There are currently 54 ground water applications on file with Ecology for water rights throughout the Green-Duwamish Watershed requesting a total of 54,410 gpm. Of these, 18 are for 1,000 gpm or more. There are 30 applications for water rights in the Soos Creek Subbasin alone, totaling 18,350 gpm, an amount equal to that already allocated.



Surface Water (SW)  
Ground Water (GW)

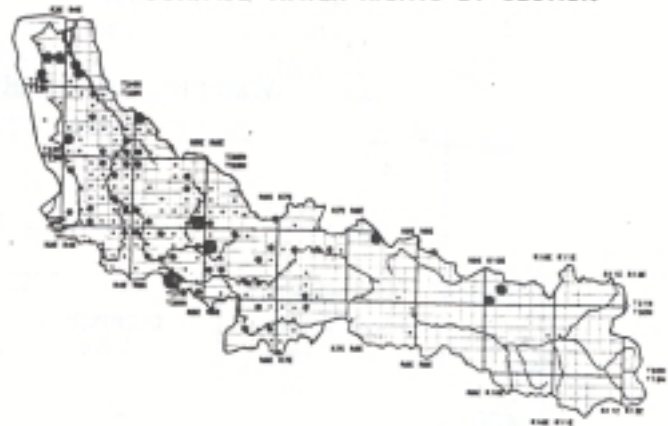
GROUND WATER RIGHTS BY SECTION



- > 10,000 Acre-Feet/Year
- 1,000-10,000 Acre-Feet/Year
- 100-1,000 Acre-Feet/Year
- 5-100 Acre-Feet/Year
- < 5 Acre-Feet/Year



SURFACE WATER RIGHTS BY SECTION



- > 10,000 Acre-Feet/Year
- 1,000-10,000 Acre-Feet/Year
- 100-1,000 Acre-Feet/Year
- 5-100 Acre-Feet/Year
- < 5 Acre-Feet/Year



## What decisions can be made?

Based on this assessment, Ecology considers the Entiat River Watershed to be a medium risk as defined in the proposed Hydraulic Continuity Policy. This risk classification allows Ecology a number of decision options, which are described below.

### At the conclusion of the Initial Watershed Assessment, make decisions on shallow ground water and surface water right applications in the watershed. The decisions would be to deny these types of water right applications.

Pro: -Applicants would have a timely decision and could assess other options for development dependent on water availability.

Con: -Other options for water may be very expensive, untried, or are dependent on the actions of others.

### Continue to hold deep well applications pending better understanding of the connection between ground and surface water.

Pro: -Better information would enable us to determine whether water is available and to protect existing senior rights.

Con: -Decisions on applications would be delayed until further studies are complete.

### Encourage coordinated use of surface and ground water to meet seasonal demand.

Pro: -May allow further development to take place in the watershed.

Con: -The cost and timeliness would affect all development in the watershed.

### Designate watershed for regional planning.

Pro: -Regional planning would create the best resolution of water management issues with the greatest participation with the residents of the watershed and by Tribes, local government, state agencies, and all interested groups.

Con: -Would require time and public involvement to make the planning effort successful. Availability of funding is uncertain.

### Increase storage in the watershed.

Pro: -Would allow development to continue in the watershed..

Con: -The cost and timeliness would affect development in the watershed. This option would also remove developable land to be used for water storage.

**Where do we go from here?**

Ecology will hold a public workshop to discuss the available information for the Green-Duwamish Watershed and discuss the issues and the decision options. Ecology will then choose a course of action leading to water right decisions.

**What additional information is available?**

If you would like to learn more about water rights issues in the Green-Duwamish Watershed, the following studies and technical reports are available:

King County, 1989a. King County Watershed Ranking Final Report. King County Natural Resources and Parks Division, King County Public Works Department, METRO, Muckleshoot

and Suquamish Indian Tribes, Seattle/ King County Environmental Health Department, WSU King County Cooperative Extension.

King County, 1989b. Draft Green-Duwamish Watershed Nonpoint Water Quality Early-Action Plan. Department of Parks, Planning, and Resources, and other members of the Green-Duwamish Watershed Management Committee.

South King County Ground Water Advisory Committee (SKCGWAC), 1989. South King County Ground Water Management Plan, Volumes I & II.

Ecology, 1980. Green-Duwamish River Basin Instream Resources Protection Program including Proposed Administrative Rules and Supplemental

Environmental Impact Statement (Water Resources Inventory Area 9).

Ecology, 1995, Initial Watershed Assessment, Water Resources Inventory Area 9, Green-Duwamish Watershed. Open-File Report 95-01.

**For more information...**

Contact Steve Hirschey at (206) 649-7000 or write to the Department of Ecology, 3190 160<sup>th</sup> Ave SE, Bellevue, Washington 98008.

If you have special communications needs, contact Lisa Newman at (360) 407-6604 (voice) or (360) 407-6006 (TDD).

Washington State Department of Ecology  
*Water Resources Public Outreach*  
Post Office Box 47600  
Olympia, Washington 98504-7600