

# ENTIAT RIVER WATERSHED INITIAL ASSESSMENT

DRAFT

February 1995

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 resulted in the water rights allocation process becoming very complex and controversial.

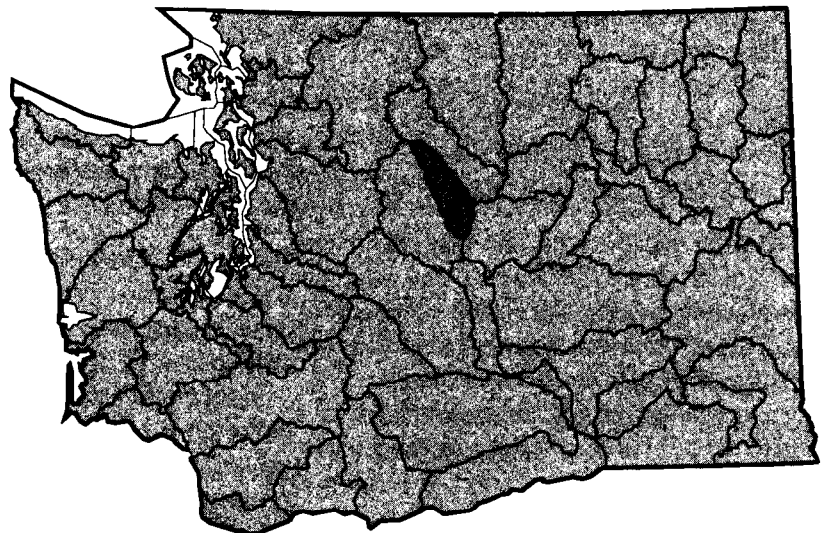
In order to expedite decisions about pending water rights, it is vital that we accurately assess the quality and quantity of surface and ground water resources within Washington. The Washington Department of Ecology (Ecology) recognizes that water right decisions must be based upon accurate scientific data. Ecology has hired consultants to assist with special studies called Initial Watershed Assessments throughout the state; Ecology and the consultants will jointly compile and evaluate existing data in selected watersheds known as Water Resource Inventory Areas (WRIAs).

The assessments will describe existing water rights, stream flow, precipitation, geology, hydrology, water quality, fisheries resources and land use characteristics. Some assessments will 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, the water management decision making process will require coordination with local and regional planning processes.

This summary document outlines information presented in a detailed technical report, called an

Montgomery Water Group  
**Adolfson Associates, Inc.**  
and associated firms

Prepared in cooperation with the  
**Washington Department of Ecology**



What are the water allocation issues?

- There are 19 applications for water rights pending in the Entiat Watershed, requesting a total appropriation of 612 acre-feet. All applications are for usage downstream of the USGS gaging station near Ardenvoir.
- Ground water was found to be in continuity with surface water. Additional pumping of ground water will likely reduce flow in the Entiat River.
- For much of the year, Entiat River flows do not meet recommended instream flows.
- The Entiat River spring chinook stock has been classified as depressed and the Entiat River summer steelhead has been designated in one study as at risk.

What is a watershed?

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

Where does the water come from?

Precipitation is the main source of recharge for both ground water and surface water within the Entiat Watershed. The higher elevations in the northwest portion of the watershed receive about 100 inches of precipitation annually, most of which occurs as snow. The lowest elevations, near the town of Entiat, receive about 10 inches of precipitation.

Melt water from the snowpack supplies most of the stream flow in spring and early summer. Melt water volumes can vary greatly from year to year. Nearly all of the precipitation runoff and snowmelt occurs during the months of April through July.

Runoff within the watershed can vary widely from one year to the next. For instance, stream gage data from 1972 indicated runoff was 451,140 acre-feet. The next year, runoff was measured at 178,970 acre-feet, a reduction of 272,170 acre-feet. (Note: Acre-feet is a volume that equals the amount of water contained in a one-acre area with a water depth of one foot.)

What are the major surface water sources?

The Entiat River is the major surface water source in the watershed. In addition to the Entiat River, there are dozens of small creeks and streams tributary to the river (see map, right).

What are the major ground water sources?

Ground water is primarily generated through infiltrating rain and melt water. Most of the wells in the Entiat River Watershed are developed in the shallow alluvial or glacial sediments. Water yields in the sediments are substantially higher than from the bedrock.

Studies of the ground water system, or aquifer, indicate most of the area is underlain with weathered bedrock ranging from 13 to 110 feet thick, with areas of significantly thicker bedrock below the weathered zone. This bedrock generally occurs from 50 to 100 feet below the surface. In the river valley, the bedrock is covered with sediment composed of sand, gravel, cobbles and occasional finer **grained** material. These layers of sediment serve as the primary aquifer for the Entiat watershed and contain the vast majority of the area's ground water, although the bedrock can produce modest quantities of water.

How are surface and ground water connected?

A hydrologic connection between surface water and ground water is possible when the soil structure dividing them is porous enough to allow the waters to mingle. In the Entiat Watershed, there is strong connection between the ground water system and the Entiat River, particularly in the sediments.

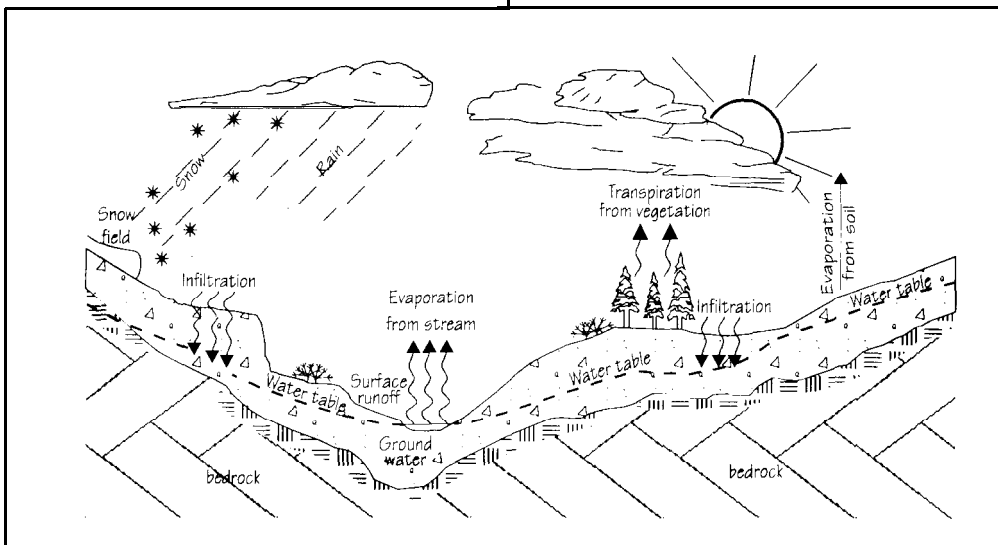
Because there is a permeable soil layer composed of coarse sands, gravels and cobbles separating the Entiat River aquifer from the river, fairly unrestricted interaction between the surface water and the aquifer is likely to occur.

Each season, a significant portion of the melt waters, and some of the rain water, infiltrates downward through the soil to become ground water. This ground water discharges to the Entiat River and its tributaries, supplying much of the stream flow from later summer through winter.

How does land use affect water?

Land use can affect the demand for and use of water. Some land uses, such as irrigated agriculture, require large amounts of water on a seasonal basis. Other land uses, such as timber production or range lands, require less water.

Land use in the Entiat Watershed has not changed much over the last century. As the watershed is 87% forested, timber is the largest land use. Agricultural uses, both irrigated and non-irrigated, are the second biggest land uses. Most of the irrigated agricultural use is located along the Entiat River and downstream from the town of Ardenvoir. There are also 9,000 acres of range land, mostly located in the lower part of the watershed near the town of Entiat. Residences and businesses are mostly found in the southeastern portion of the watershed near the towns of Ardenvoir and Entiat.



The hydrologic cycle in the Entiat River Watershed (modified from Walters and Nassar).

# ENTIAT WATERSHED

WRIA 46



There are no significant industrial uses in the watershed. Recreational uses (hunting, fishing, camping, etc.) occur primarily updrainage of Ardenvoir.

Irrigated agriculture is an example of how land use affects water movement. Irrigation demands are highest in the late summer months, when surface water flows are lowest. When surface water is diverted for irrigation needs, the river flow is lowered further, resulting in more ground water being drawn into the river.

In the future, the Entiat Watershed may see an increase in timber harvesting, along with more residential and recreational use. The amount of land used for irrigated agriculture is also expected to increase.

What are the water quality issues in the Entiat River Watershed?

The Entiat River on occasion does not meet water quality requirements for pH and temperature as specified by the the Federal Clean Water Act (CWA).

The CWA is designed to protect the nation's water supply from pollution and misuse. Each state is required by the CWA to give EPA a list of those surface water bodies that are not expected to attain water quality standards after pollution controls have been implemented. Based on very limited data, the Entiat River has exceeded pH (acidity) standards and temperature standards, and therefore the river was added to EPA's list, also known as the 303d list.

Are our fish resources stable?

Recent studies indicate chinook and steelhead stocks in the Entiat River are "depressed", meaning fish production is below expected levels, Steelhead stock is also categorized as "high risk", meaning there is a high risk of extinction.

There have been a number of recent studies on the health of fish stocks in Washington State. Data from two of the more prominent

studies were used to evaluate fishery issues in the Entiat River. These studies are referred to as the "AFS study", (published as "Pacific Salmon at the Crossroads"), and the "SASSI" (the Salmon and Steelhead Stock Inventory), which was prepared by the Washington Departments of Fisheries and Wildlife, with assistance from 23 Indian Tribes and Tribal organizations.

The Entiat River supports spring chinook salmon and summer steelhead. According to the SASSI report, both the chinook and steelhead stocks are "depressed", meaning fish production is below expected levels based on available habitat and natural survival rates, but above the level where permanent damage to the stock is likely. The AFS study rates the steelhead stock as "high risk". High risk species have fewer than one adult fish returning to spawn from each parent spawner.

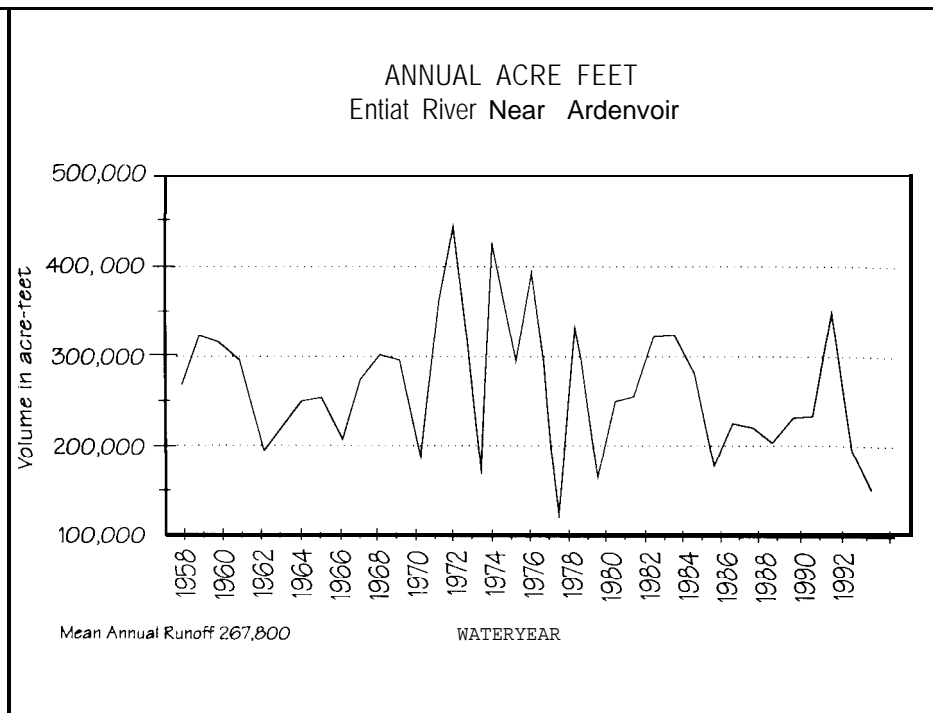
#### Stream Flows in the Entiat River

Recent research indicates that on an average annual basis, recommended flows to sustain fisheries are not met for 260 days of the year. Recommended flows generally are met during the months of April through July, when high runoff occurs.

**IFIM**, or Instream Flow Incremental Method, is used to assess how fish habitat varies over a range of flows. Ecology has completed **IFIM** studies at several sites on upper and lower reaches of the Entiat River. Based on these studies, Ecology and the Department of Fish and Wildlife have proposed flows that are needed to protect fish habitat on the river. These flow recommendations have not been adopted into rules.

In the upper reach of the river, recommended flows are:

July 1 to March 15	275 cfs
March 16 to April 15	325 cfs
April 16 to May 31	375 cfs
June 1 to June 30	325 cfs



Annual runoff volume in the Entiat River, recorded at the USGS gaging station near Ardenvoir from 1958 to 1993. The runoff measured represents 75% of the total volume of runoff in the Entiat River Watershed.

In the lower reach of the river, recommended flows are:

July 1 to March 15	185 cfs
March 16 to April 15	250 cfs
April 16 to May 31	325 cfs
June 1 to June 30	250 cfs

Comparisons between recorded flow data and recommended flows for the Entiat River indicate that the river flows are below recommended flows for much of the year. Flow data recorded since 1957 indicates that for the time period from July 1 to March 15, river flows are below recommended flow levels for 221 days or 86% of the time.

#### 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

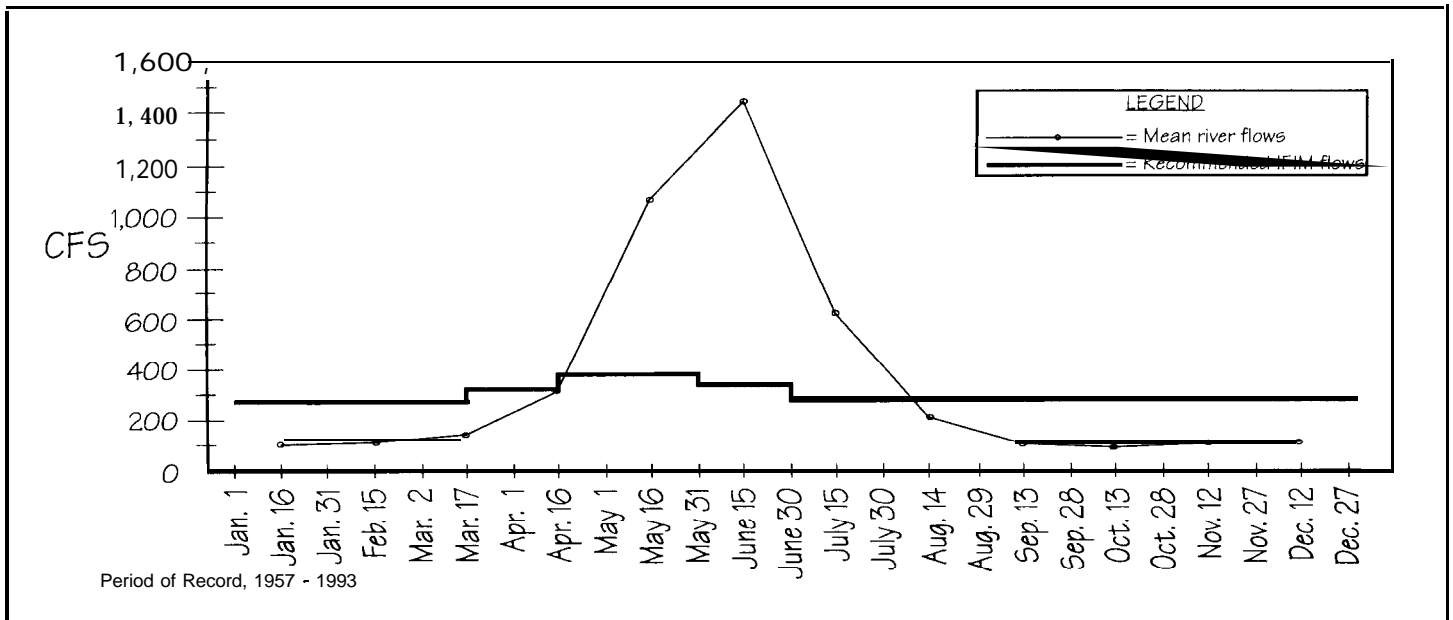
form of a water right permit or certificate.

Water right claims are different from state-issued water rights. Claims represent old rights filed under the Water Right Claim Registration Act, and predate state water law. Claims are not confirmed water rights.

Every surface water user is required to have an approved water right before appropriating waters of the state. For ground water users, it is not necessary to apply for a water right if the proposed use is 5,000 gallons or less of ground water each day for watering stock, watering a lawn or garden less than one-half acre in size, or a single or group domestic or industrial well.

#### 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.



Mean monthly flows vs. recommended flows for the lower reach of the Entiat River. Most of the river's annual flow is received in spring and early summer, when water demand is lowest.

What are the conflicts in the watershed?

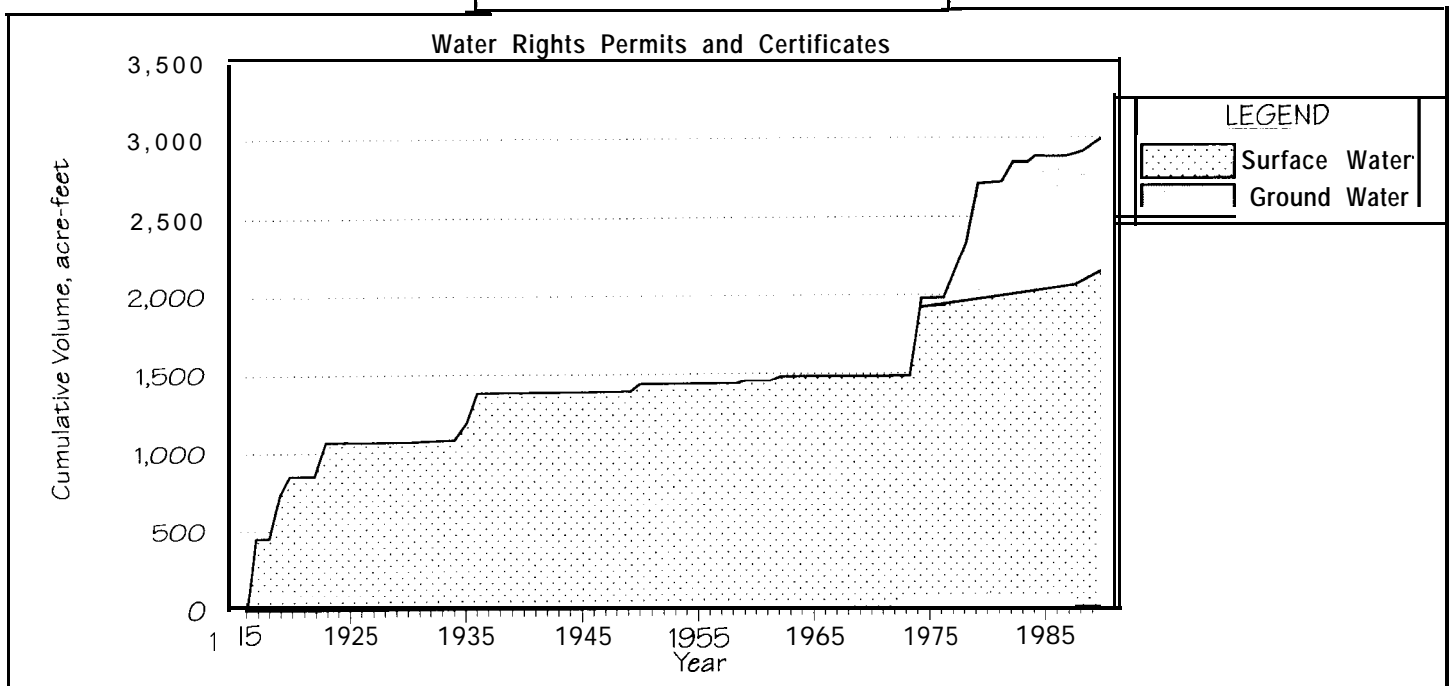
In the Entiat Watershed, the river flows do not meet instream flow recommendations for most of the year, yet there is continued interest in obtaining water rights.

Water use conflicts can occur when the available water supply is insufficient to maintain instream flows and at the

same time fulfill existing water rights and claims. Competing interests can also occur between existing rights and the need to maintain flows for existing and proposed future uses.

Records indicate annual flow in the Entiat River Watershed averages 267,800 acre-feet at Ardenvoir. If flow were measured at the mouth of the Entiat River, the average annual flow would be about 355,900 acre-feet.

Existing water claims and rights combined equal an allocation of 18,490 acre-feet per year. Applications are on file with Ecology for an additional 612 acre-feet. The allocated 18,490 acre-feet, combined with recommended stream flows, still leaves an apparent abundance of water in the watershed. The problem is, most of the annual flow is received during spring and early summer runoff, and is not available to meet year round water uses.

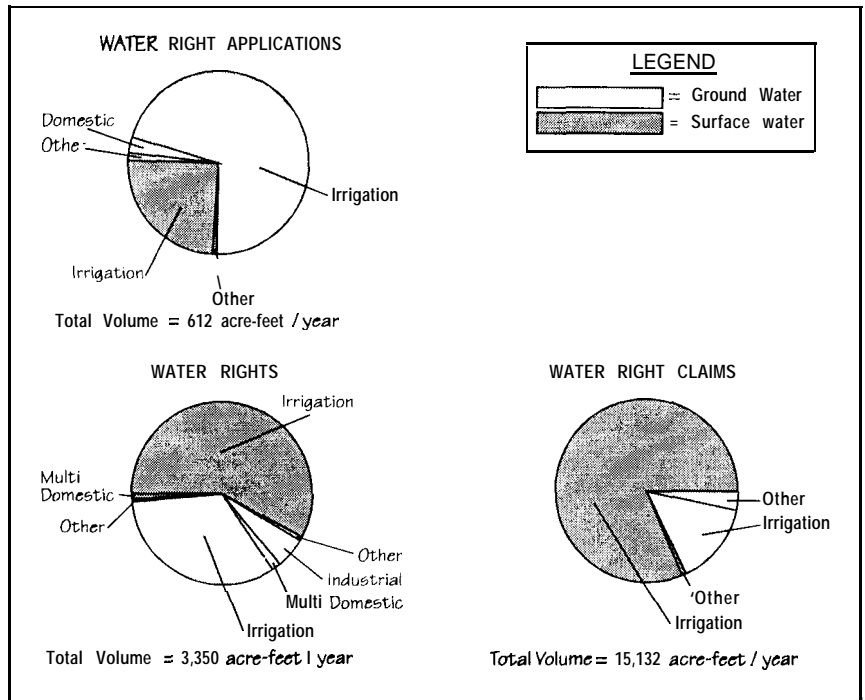


What are the current and future major water uses in the watershed?

Irrigated agriculture is the major water use in the watershed. Most of the water is taken from surface water sources. Water use distribution is shown on the figures at the right. Location of rights by section are shown in the figures below.

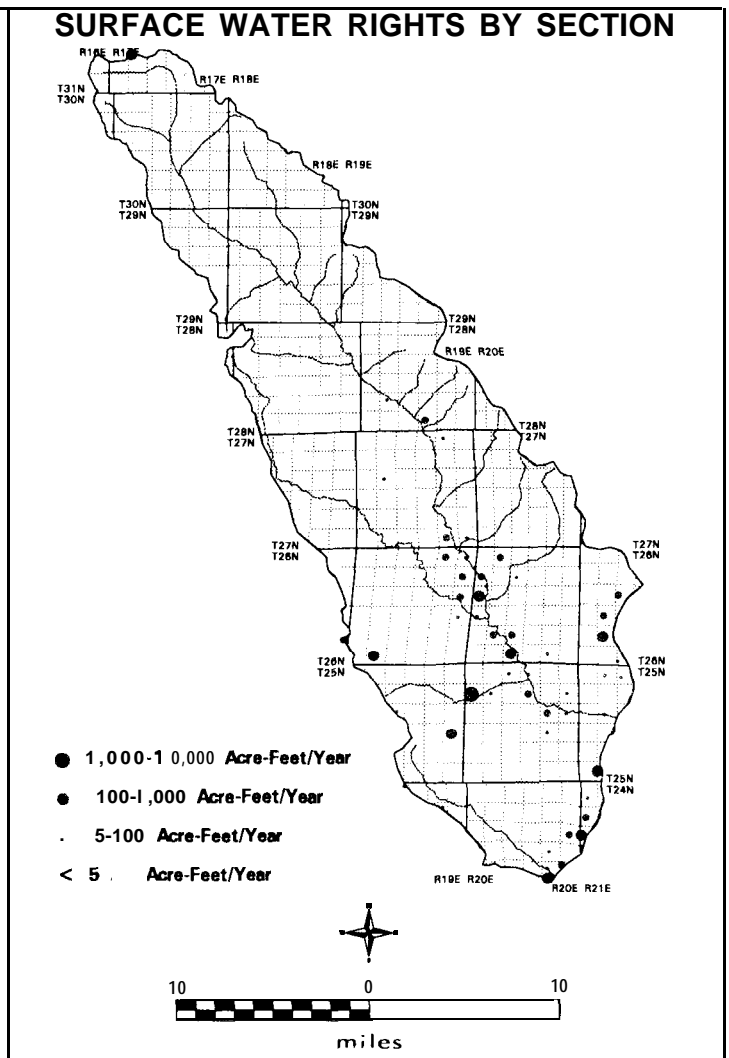
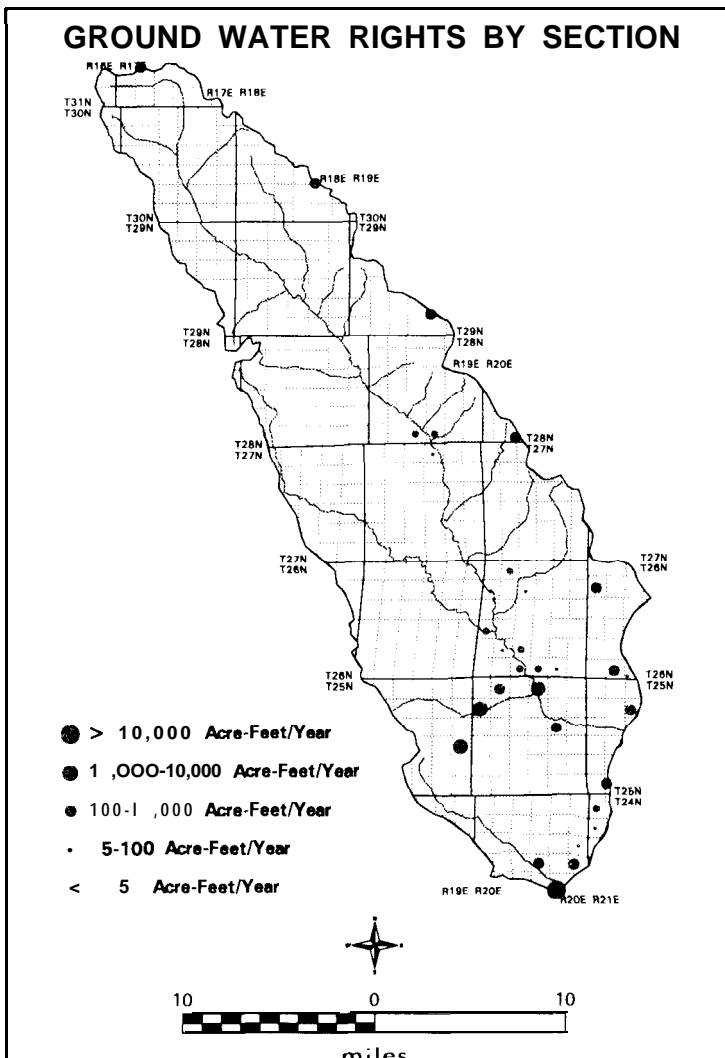
There are 161 ground water claims and 142 surface water claims on file for the Entiat Watershed. Certifications and permits have been issued for 30 ground water rights and 75 surface water rights.

Currently, Ecology has applications for 12 ground water permits and seven surface water permits on file. All applications are below the USGS gaging station near Ardenvoir.



Existing ground water rights in the Entiat Watershed by section.

Existing surface water rights in the Entiat Watershed by section.



## 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.

### Continue to hold pending applications for surface and wafer permits until instream flows have been established by rule.

- Pro: -Will ensure full public participation prior to decisions on instream flows as instream flows will be set by regulation.
- Con: -Applicants will be delayed in obtaining permit decisions until the instream flows have been adopted.

### Proceed with decisions on all pending applications based upon recommended IFIM flows and existing data.

- Pro: -Applicants would get permit decisions in 1995, subject to the recommended flow levels.
- Con: -No public participation in the setting of instream flow requirements.

### Develop wafer storage facilities in the watershed.

- Pro: -Total runoff in the Entiat River watershed is greater than current and projected demand.
- Con: -Few obvious or accessible sites exist.  
-Engineering and construction costs are very high.  
-Potential water quality and habitat impacts could result.

### Develop bedrock wells.

- Pro: -May provide flexibility in water management not otherwise available by developing low volume bedrock wells to use in conjunction with storage and interruptible sources.
- Con: -Bedrock well construction is more costly than shallower wells drilled in glacial or river sediments.  
-Water yield is often very low; multiple wells may be required.

### Install and maintain a telemetric stream gage near the town of Entiat.

- Pro: -Real time data would allow greater certainty for ground and surface water resources subject to minimum instream flow requirements.
- Con: -Funding for installation and maintenance is not currently available.

### Undertake additional studies/data collection and analysis of existing data before issuing more wafer rights.

- Pro: -Water management decisions based upon definitive scientific data.
- Con: -Studies of sufficient scope to provide meaningful new perspective would be expensive and time consuming.  
-Current understanding of the watershed allows for adequate planning level analysis.

**Where do we go from here?**

**Ecology** will hold a public workshop to discuss the available information for the Entiat River Watershed and the decision options, Ecology will then choose a course of action leading to water right decisions.

What additional information is available on the Entiat River Watershed?

If you would like to learn more about water rights issues in the Entiat River Watershed, the following studies and

technical reports are available:

*"Initial Watershed Assessment, Entiat River Watershed", 1995. Washington Department of Ecology.*

*"Pacific Salmon at the Crossroads: Stocks at Risk from California, Oregon, Idaho, and Washington", March-April 1991. Fisheries.*

*"1992 Washington State Salmon and Steelhead Stock Inventory", March 1993. Washington Department of Fish and Wildlife.*

**For more information ...**

Contact **Darlene Frye** at (509) 5752800 or write Department of Ecology, Water Resources Section, 3601 W. Washington Avenue, Yakima, Washington 98903-1164.

Ecology does not discriminate in its services. If you have special **accomodation** 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