

**THE INITIAL ASSESSMENT OF THE  
CHEHALIS BASIN WATERSHED**

**BY  
JOY P. MICHAUD**

## **OVERVIEW**

---

The 1998 Washington State legislative session established the Watershed Management Act (ESHB 2514) to address diminishing water availability and quality, and the loss of critical habitat for fish and wildlife in the state. The Act was designed to encourage collaboration among local citizens and governments, tribes, and state agencies to develop watershed management plans. These plans would focus on solving water-related issues, such as satisfying water supply needs for people, maintaining stream flows at a level to fully support fish use, and improving water quality. The Chehalis Basin was one of the first to begin this watershed planning process.

In December 2000, the first step in the planning process was accomplished. A team of scientists, lead by Envirovision Corporation, and supported by Technical and Citizen committees from the Basin, completed the Initial Watershed Assessment for the Chehalis Basin. The outcome of this effort is a report that is a tremendous source of information and analysis. However, it is 4 inches thick and over 350 pages long; a bit more than most people have time to read. This article provides a summary of the process that was used in developing this initial assessment and results of the assessment. The Initial Watershed Assessment report also has a Technical Summary chapter that provides a more detailed overview of results. Lee Hansmann, at Grays Harbor County, is the coordinator for the watershed planning process. She can be contacted to obtain a copy of this summary (360) 249-4222.

The first task for the project was to assemble available information on the Basin and begin creation of a permanent library and a master list of documents. Next, the consulting team conducted an all day workshop with technical experts, local agencies, and citizens to discuss issues and concerns pertaining to the Basin. The outcome of the workshop was development of a technical approach for conducting the Initial Watershed Assessment. This approach was approved by the Chehalis Basin Partnership (CBP); a group of representatives from local and State agencies and citizens formed to oversee development of the Watershed Plan. As a consequence, from the very beginning of the process, information and opinions were collected from throughout the basin to provide direction for the assessment process.

## **BASIN DESCRIPTION**

---

The Chehalis Basin covers 2,520 square miles, and is second in size only to the Columbia Basin in the State of Washington. It is bound 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. Given the size of the basin, it was more useful to divide it into smaller pieces for assessment. Therefore, the Basin was divided into 30 subbasins according to major tributaries. Most of the data accumulated during the study (precipitation, size, land use, water flows, water rights, etc.) is reported for each subbasin. In addition, 5 of the 30 subbasins were selected for more detailed analysis. These 5 subbasins were chosen to represent the diversity of natural and manmade conditions in the Chehalis Basin. Together, they represent a wide range in basin size, land use, climate, water use, and geology. A summary of key characteristics for the 5 subbasins is provided in Table 1.

**Table 1. Key Characteristics of the 5 subbasins chosen for detailed analysis.**

Subbasin	Size (mi <sup>2</sup> )	Geography	Annual Precip. (in)	Runoff (cfs per mi <sup>2</sup> )	Geology	Land Use % Forestry/ % Agriculture
Chehalis Headwaters	116	Mid-elevation Willapa Hills	89	5	basalt-upper, alluvium-lower	96/3.1
Newaukum	156	Cascade foothills	52	3-5	volcanic-upper; glacial outwash-lower	80.5/17.3
Cloquallum Creek	70.3	Low elevation	68	4	glacial till-headwaters; glacial & alluvial-lower	90.9/3.3
Lower Mainstem Chehalis	94	Valley floor	59	3-4	alluvial valley floor; side slopes sedimentary rock	78.9/4.9
Humptulips	244.3	Olympic Mountains, coastal	127	10	volcanic-headwaters, alluvial & glacial drift-lower	96.2/1.4

The Chehalis Basin has several distinct geologic regions with unique geologic history. Thus, bedrock of volcanic and sedimentary origin are represented as well as glacial deposits and alluvial material. Much of the Basin possesses glacial deposits from at least four different glaciations. The complex geologic history dictates to a large degree the distribution, quantity, and movement of groundwater, adequacy of wells, connections between groundwater and surface water, and many other factors.

There is also a wide variation in precipitation levels throughout the Chehalis Basin. As shown in Table 1, precipitation in the 5 subbasins ranged from 52 inches per year in the Newaukum subbasin (near Chehalis) to more than twice that in the Humptulips subbasin. The amount of precipitation, along with soils and geology, influences how much of this water soaks into the land and how much leaves as surface water runoff. The estimated range in surface water runoff from the 5 subbasins was from 3 cubic feet per second/square mile (cfs/mi<sup>2</sup>) along the low lying valley bottom areas, to 10 cfs/mi<sup>2</sup> in the upper watersheds draining the Olympic Mountains.

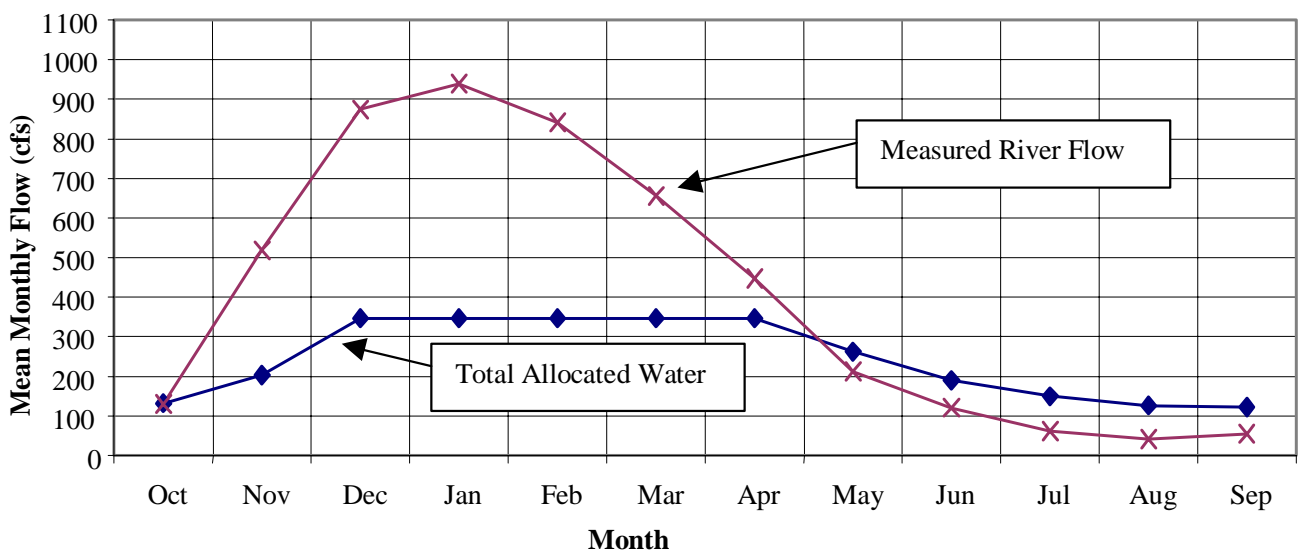
Another important factor contributing to surface water runoff is human development, which can cause huge changes in hydrology. Ditching, draining, diverting, damming, soil disturbance and loss, and increases in hard surfaces such as pavement and buildings, are a few of the activities that contribute to changing hydrology. These activities have occurred throughout the Chehalis Basin. In the Upper Basin (upstream of Montesano) these activities have been proliferated by urban development and agricultural activities, while in the Lower Basin (Grays Harbor area) forestry activity is probably the greater culprit.

# WATER AVAILABILITY

Assessing the amount of water available in a river is like balancing a checkbook. First, it is necessary to know your beginning account balance. Then you must subtract the amount of money designated for checks that have not cleared, subtract for future savings, and then subtract the minimum balance that must be maintained in the account. The money remaining is what is available to spend or use. In this example, in terms of water availability, the beginning account balance can be represented by measured river flows. Uncleared checks can be represented by the amount of water allocated for human use via water rights and other permits. Future savings would be the amount of water that needs to be set aside to allow for future population growth. The minimum balance can be represented by the term “instream flow”. Instream flows are set and regulated by the State and are a representation of the amount of water needed to support fish in all life stages. After allocated water, future needs, and instream flows are subtracted from measured flows, the amount remaining is what can be withdrawn from the system for other uses. All of this information was gathered, compared, and analyzed in the Initial Watershed Assessment.

Once all of the necessary information was gathered a graph depicting the water availability for the river was drawn. Figure 1 below portrays this information for the Upper Chehalis River as measured near the town of Porter. Monthly average river flows are shown in the figure by the red line with the crosses. The blue line with the diamonds shows the amount of water that has been allocated through water rights plus what has been set aside to protect fish habitat (i.e. instream flow). When the red line is greater than the blue line, there is water to spare. When the reverse is true, it indicates that water has been over-allocated. This graph demonstrates that the combination of instream flow and water allocation for human use exceeds the average monthly flows for the river from May through September. Unfortunately, this problem exists in much of the Chehalis Basin. This is why the issue of watershed planning and assessments is so important. The State Department of Ecology can not continue to approve new water rights when the river is already over-allocated.

**Figure 1. Chehalis River at Porter Regulated Mean Monthly Flows**



Luckily, this over-allocation is to some extent a “paper problem”. Obviously the river does not run dry from May through September each year. This is because the amount allocated for human use does not reflect the true amount being used. For example, there may be a water right for as much as 100 units of water, but the water right holder may only be using 1 unit of water. In the Chehalis as well as throughout the state, the amount allocated is not an accurate reflection of what is actually being used or needed. Preliminary estimates of actual water use were made for the Initial Watershed Assessment, more extensive estimates should be a priority for future work.

## **WATER QUALITY**

---

One of the preliminary steps of the water quality assessment was to get agreement from the CBP and others on which water quality parameters and locations would be the focus of the work. The parameters eventually agreed upon were selected because they are most closely linked to the objectives of watershed planning. They are either directly related to fish habitat and flow problems (dissolved oxygen and temperature), or are good indicators of water pollution (total phosphorus and total suspended solids), or important in the Basin since they are tied to a commercial industry (fecal coliform bacteria). This is not meant to imply that other pollutants, such as heavy metals or pesticides, are not a concern. These pollutants may be prioritized for analysis at a later date.

The selected parameters were assessed a number of ways. Monitoring results were compared to State water quality standards. Comparisons were also made between sites or locations, and over time, to look for obvious trends in the data. A pollutant load and yield analysis was also performed to enhance comparisons between watersheds.

Every two years the EPA provides a “List of Impaired Waterbodies” in the nation. This is referred to as the “303(d) list” because that is the subsection of the Clean Water Act that requires this listing. The most frequently used method for assessing whether a water body (a stream or stream segment) is impaired, is by comparison to water quality standards. Therefore, EPA’s 303(d) list provides one method for summarizing the Basin condition in terms of water quality standards. Within the Chehalis Basin there are 25 segments of streams or rivers that are on the 303(d) list. These are listed due to violations of temperature, and/or dissolved oxygen concentrations, and/or fecal coliform bacteria. Of the 25 listings, 19 were due to elevated fecal coliform levels, 11 were due to low summer dissolved oxygen concentrations, and 9 were due to elevated summer temperatures. The majority of the listings are in the Upper Basin. The combination of generally higher temperatures and lower oxygen concentrations experienced in the Chehalis during late summer represents a critical set of conditions for fish.

Although it is informative to know whether water quality standards are being met, it is also interesting to know whether water quality has changed since monitoring began in the 1970’s. Long-term trends were assessed for temperature, dissolved oxygen, and fecal coliform bacteria. On a seasonal average basis, no significant trends were noted in the mainstem of the Chehalis River, for these parameters. This tells us these problems do not appear to be either improving or deteriorating.

The pollutant loading analysis indicated that nonpoint sources of pollution were probably the most significant. (Nonpoint pollution sources are those not associated with a direct discharge such as from a wastewater treatment plant or industrial facility. The pollutant yield analysis indicated that suspended

solids yields were notably higher than in subbasins with higher runoff and precipitation. However, the same trend was not apparent for other parameters.

## **CONDITIONS OF FISH STOCKS AND FISH HABITAT**

---

A total of two spring chinook stocks, seven fall chinook stocks, two chum stocks, seven coho stocks, two summer steelhead stocks, eight winter steelhead stocks, one bull trout/Dolly Varden stock and two coastal cutthroat stocks have been identified in the Chehalis Watershed. No pink salmon or sockeye salmon stocks have been identified in the area. Of the thirty-one stocks identified, twenty are classified as “healthy”, four as “depressed”, and seven as “unknown”.

While the condition of habitat varies widely between subbasins, some basin-wide patterns are clear. As a result of past and present land use practices, stream channels in the Chehalis Basin show a consistent pattern of riparian vegetation removal, shade reduction, and reduction in streambank stability leading to bank erosion and elevated levels of instream sediments. Available information indicates that instream woody debris levels are either non-existent or much lower than historic levels. While information about loss of side channel and wetlands habitats is more anecdotal, patterns of timber harvest and agricultural practices have left stream channels in a more simplified state than in pre-settlement periods. This has contributed to streambank instability, lower shading, and poor instream habitat. Although summer water temperatures in the basin may naturally be somewhat high due to relatively low elevations of many of the streams, riparian vegetation removal, lowered shading levels, and degradation of streambanks have most likely contributed to an increase in the magnitude and range of this problem. In a few subbasins, habitat conditions may be in partial recovery from past damages. This is most likely on forested lands managed under federal or state forest practices where protection of riparian corridors has become the rule during the last few decades.

## **CONCLUSION**

---

In the next few years, difficult decisions will need to be made about how water is allocated and used in the Chehalis Basin. As documented in the Assessment report, besides being very large, the Chehalis Basin is also naturally more diverse and complex than other basins. The 30 subbasins identified, have different background conditions of geology, precipitation and topography. They have experienced a different set of historical uses, and currently have different land use and water use patterns. This diversity means that priorities and needs will be different between the subbasins. The consultant team has recommended that future assessment work be done on a subbasin scale to enhance its use for decision-making and eventual development of a Chehalis Basin Watershed Plan.

The *Chehalis Basin Level 1 Assessment* is a preliminary step in the planning process set up through the Watershed Management Act. It is a great first step in collecting and assessing information on the Basin, and reflects a tremendous amount of work by the consulting team, the citizens and scientists on the advisory committees, and the Chehalis Basin Partnership. However, the work has just begun. Although there is never a bad time to become involved in this process, right now is a particularly good time as we move into the next phase of planning. Lee Hansmann at Grays Harbor County is spearheading this process. She can provide information on who your local representative is, and also how to become involved. Lee can be reached at 360-249-4222.