CHAPTER I
UMPQUA BASIN TMDL
OVERVIEW AND BACKGROUND

Prepared by

State of Oregon
Department of Environmental Quality

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INTRODUCTION

The following summary serves to introduce the Umpqua Basin drainage (Figure 1.1), discuss the purpose of this document and describe the goals and plans established within.

The Umpqua Basin has an area of 5,156 square miles and is located in southern Oregon. Three fourth field hydrologic units comprise the Umpqua Basin drainage: 1) the North Umpqua Subbasin, 2) the South Umpqua Subbasin, and 3) the Mainstem Umpqua/Smith Subbasin. The Umpqua Basin drainage lies almost entirely within Douglas County, with some overlap into Lane County to the north, and a very small portion in Coos County to the west. The headwaters of the North Umpqua River are located in the Umpqua National Forest. The River then flows generally west until it meets the South Umpqua River downstream from Roseburg.

The South Umpqua River also has headwaters in the Umpqua National Forest. The River generally flows west. It flows north after its confluence with Cow Creek, a major tributary. After it flows through the Umpqua Valley, the South Umpqua meets the North Umpqua downstream from Roseburg. Downstream from the confluence is the Umpqua mainstem, which flows generally west until it meets the Smith River at the Umpqua-Smith estuary before emptying into the Pacific Ocean at Winchester Bay. The Smith River's headwaters are in the forests of the Coast Range north of the main Umpqua River. The Smith River flows generally west to the Umpqua-Smith estuary.

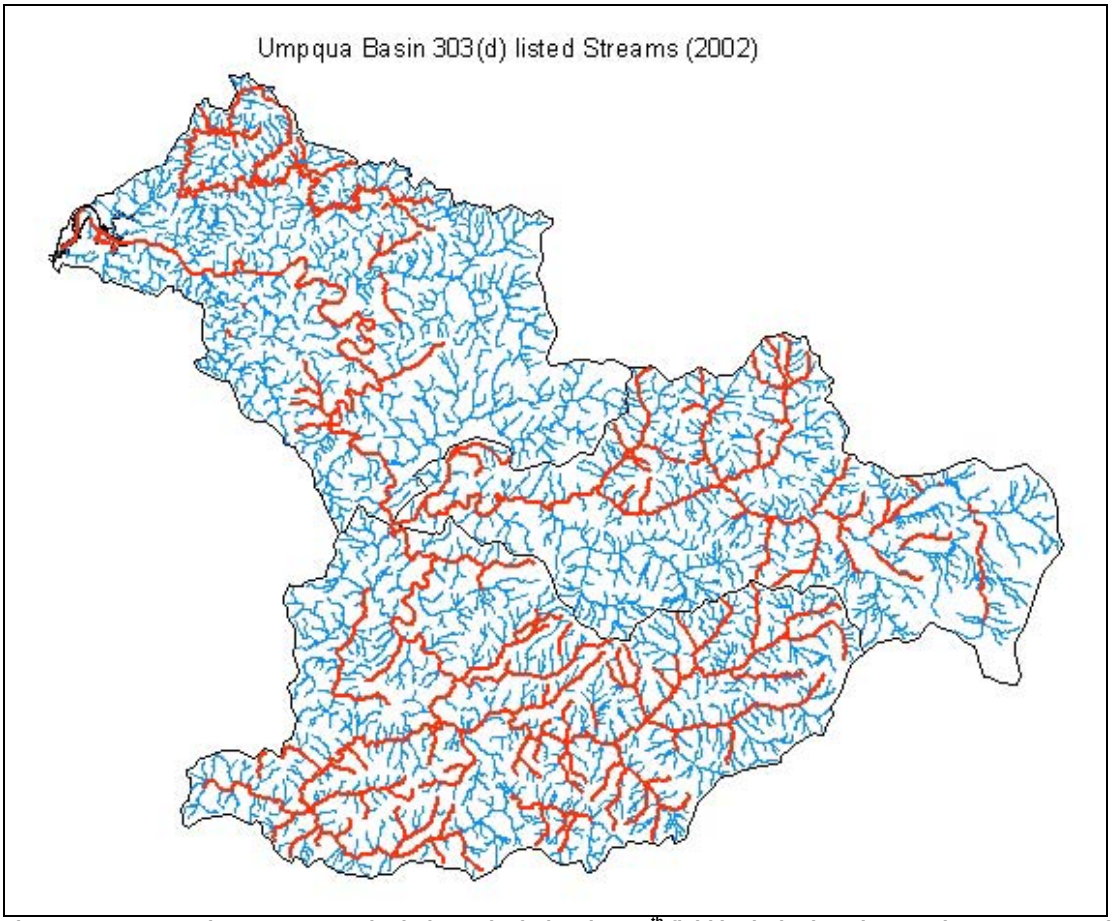

Figure 1.1 The Umpqua Basin drainage includes three 4th field hydrologic units: North Umpqua, South Umpqua, and mainstem Umpqua Subbasins.

The Umpqua Basin Total Maximum Daily Loads (TMDLs) establish water quality goals for streams and lakes of the Umpqua Basin. It also lays out steps toward meeting these goals. Water quality programs that lead to TMDL attainment will advance Oregon's commitment to complying with State and Federal Law. To accomplish this, the State has promoted a path that progresses towards water quality standard compliance, with protection of the beneficial uses of waters of the State the primary goal. The data review and analysis contained in this document summarizes the varied data collection and study that has recently occurred in the Umpqua Basin It is hoped that water quality programs will utilize this TMDL to develop and/or alter water quality management efforts. In addition, this TMDL should be used to track water quality, instream physical parameters and landscape conditions that currently exist. In the future, it will be important to determine the adequacy of planned water quality improvement efforts.

Numerous streams do not meet Oregon water quality standards. Observation, history and research clearly indicate that near stream areas of the watershed have been modified through land cover disturbance and over use, stream straightening, diking, land re-surfacing and constriction due to management and diversion structures (see Chapter 3). Each TMDL contained in this document evaluates impairments and establishes TMDL numeric goals based on attainment of water quality standards.

This report presents the Umpqua Basin TMDLs for public review. It addresses the elements of a TMDL required by the U.S. Environmental Protection Agency (EPA). These elements include:

- A description of the geographic area to which the TMDL applies;
- Specification of the applicable water quality standards;
- An assessment of the problem, including the extent of deviation of ambient conditions from water quality standards;
- The development of a loading capacity including those based on surrogate measures and including flow assumptions used in developing the TMDL;
- Identification of point sources and nonpoint sources; development of Waste Load Allocations for point sources and Load Allocations for nonpoint sources;
- Development of a margin of safety; and
- An evaluation of seasonal variation.

The report is organized as follows:

Chapter 1 contains an overview and background of the TMDL process, the Umpqua Basin, and existing water quality programs.
Chapter 2 contains the Bacteria TMDL for the entire Umpqua Basin.
Chapter 3 contains the Temperature TMDL for the entire Umpqua Basin.
Chapter 4 contains the Algae/Aquatic Weeds, Dissolved Oxygen & pH TMDL, which includes algae and aquatic weeds, dissolved oxygen and pH.
Chapter 5 contains the Bio-criteria TMDL for the entire Umpqua Basin.
Chapter 6 contains the Diamond Lake and Lake Creek TMDL.
Appendices and attachments contain a more detailed description of the studies, computer modeling, references, and data analyses that were done to develop TMDLs or to address other parameters of concern.
A Water Quality Management Plan is presented in **Chapter 7**.

The Umpqua Basin has several noteworthy distinctions:

- The basin has 5,500 miles of stream.
- The basin is home to many species of salmonids, including Coho salmon, Fall and Spring Chinook salmon, Winter and Summer Steelhead, as well as anadromous cutthroat trout.
- The North Umpqua River is a “world-famous” salmon fishery.
- Diamond Lake, a large freshwater lake in the Cascade Mountains, has in the past provided recreational opportunities for many Oregonians and visitors, but has recently experienced problems with toxic algal blooms.
- The Partnership for the Umpqua Rivers, formerly known as the Umpqua Basin Watershed Council and before that the Umpqua Basin Fisheries Restoration Initiative, is one of the oldest watershed councils in Oregon.

OVERVIEW OF TOTAL MAXIMUM DAILY LOADS

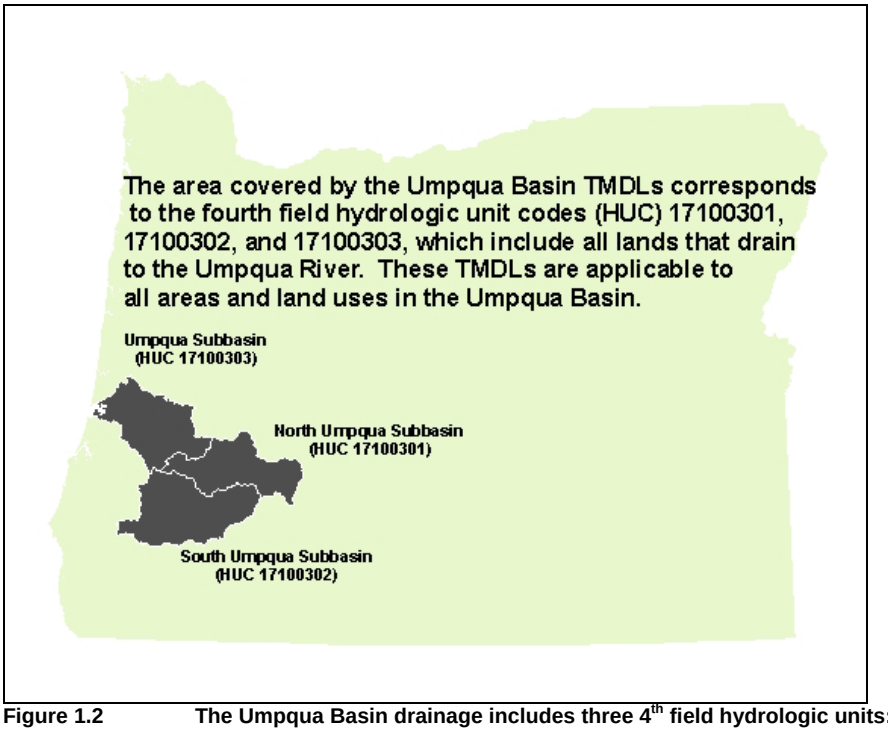

Figure 1.2 The Umpqua Basin drainage includes three 4th field hydrologic units: North Umpqua, South Umpqua and Mainstem Umpqua subbasins.

Elements of a TMDL

The quality of Oregon's streams, lakes, estuaries and groundwater is monitored by the Oregon Department of Environmental Quality (DEQ). This information is used to determine whether water quality standards are being violated and, consequently, whether the beneficial uses of the waters are impaired. Beneficial uses include fisheries, aquatic life, drinking water, recreation and irrigation. Specific state and federal plans and regulations are used to determine if violations have occurred: these regulations include the Federal Clean Water Act of 1972 and its amendments 40 Code of Federal Regulations 131, and Oregon's Administrative Rules (OAR, Chapter 340) and Oregon's Revised Statutes (ORS, Chapter 468).

The term "water quality limited" is applied to streams, lakes and estuaries where required treatment processes are being used, but violations of State water quality criteria occur. With a few exceptions, such as in cases where violations are due to natural causes, the State must establish a Total Maximum Daily Load or TMDL for any waterbody designated as water quality limited. A TMDL is the total amount of a pollutant (from all sources) that can enter a specific waterbody without violating the water quality standards.

The loading capacity is the greatest amount of a pollutant load a water body can assimilate without violating water quality standards. The loading capacity is the TMDL and is allocated to point, nonpoint, background and future sources of pollution along with a margin of safety. Wasteload Allocations are portions of the total load that are allotted to point sources of pollution, such as sewage treatment plants or industries. The Wasteload Allocations are used to establish effluent limits in discharge permits. Load Allocations are portions of the loading capacity that are attributed to either natural background sources, such as soils, or from nonpoint sources, such as urban, agriculture or forestry activities. Allocations can also be reserved for future uses. Simply stated, allocations are quantified measures that assure water quality standard compliance while distributing the allowable pollutant loads between nonpoint and point sources. The TMDL is the summation of all these developed wasteload and load allocations.

The U. S. Environmental Protection Agency (EPA) has the authority under the Clean Water Act to approve or disapprove TMDLs that states submit. When a TMDL is officially submitted by a state to EPA, EPA has 30 days to take action on the TMDL. In the case where EPA disapproves a TMDL, EPA would need to establish the TMDL within 30 days.

The required elements of a TMDL that must be submitted to EPA include:

- A description of the geographic area to which the TMDL applies;
- Specification of the applicable water quality standards;
- An assessment of the problem, including the extent of deviation of ambient conditions from water quality standards;
- Evaluation of seasonal variations
- Identification of point sources and nonpoint sources;
- Development of a loading capacity including those based on surrogate measures and including flow assumptions used in developing the TMDL;
- Development of Waste Load Allocations (WLA) for point sources, and Load Allocations(LA) for nonpoint sources;
- Development of a margin of safety.

Parameters not being addressed by a TMDL

The 303(d) List is intended to identify all waters not meeting water quality standards. EPA has interpreted that Total Maximum Daily Loads (TMDLs) are to be established only where a water body is water quality limited by a "pollutant."[1] In the case where the listings are for parameters such as for Habitat Modification or Flow Modification which are not pollutants[2], TMDLs would not need to be established and other approaches to address these concerns, such as through Management Plans, could be used to address these impairments. DEQ is currently developing new strategies to determine water quality impairment for excess sediment and to calculate sediment TMDLs. Therefore, no additional sedimentation TMDLs are proposed for the Umpqua Basin at this time.

DEQ has not developed temperature TMDLs that address spawning period listings in waterbodies with point sources or dams present in that waterbody or directly upstream of that waterbody. Only, the North Umpqua River has these conditions and is identified as impaired on the 2004/06 303(d) list during the spawning period. There is not sufficient data to determine the status during the spawning period on other streams and rivers with point sources or dams, specifically the South Umpqua River, Cow Creek, Olalla Creek, Elk Creek, Yoncalla Creek, Calapooya Creek, Umpqua River, and Scholfield Creek. Load allocations for temperature are sufficient to ensure that nonpoint sources of heat will be limited in all waterbodies and throughout the year. However, this TMDL does not include wasteload allocations for point sources during spawning periods. All other temperature listed segments are being addressed by this TMDL.

In the case of a Biological Criteria listing which could be due to a pollutant (e.g. excessive temperature, low dissolved oxygen or sedimentation), or some form of pollution (flow or habitat modification), the likely cause for the Biological Criteria exceedance needs to be determined (see Chapter 2). If pollutants were the likely cause, a TMDL would need to be established. If some other form of pollution was involved, other appropriate measures could be used.

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[1] Section 303(d)(1)(C) states that "each State shall establish for the waters identified in paragraph (1)(A) of this subsection, and in accordance with the priority ranking, the total maximum daily load, for those pollutants which the Administrator identifies under Section 304(a)(2) as suitable for such calculation.

[2] The term pollutant is defined in Section 502(6) of the CWA and in the proposed 40 CFR 130.2(d) as follows: "The term "pollutant" means dredged spoil, solid waste, incinerator residue, sewage, garbage, sewage sludge, munitions, chemical wastes, biological materials, radioactive materials, heat, wrecked or discarded equipment, rock, sand, cellar dirt and industrial, municipal, and agricultural waste discharged into water."

The 1998 303(d) list contains listings for waters in the Umpqua Basin drainage for habitat modification and flow modification, for which DEQ is not submitting TMDLs. A summary of the rationale for not developing TMDLs for these parameters follows:

Habitat Modification: Factors that were identified which affect fish assemblages include water quality, flow and habitat modification. TMDLs are being developed for temperature and dissolved oxygen throughout the subbasin which should address the water quality pollutants of concern and improve the water quality for the fish assemblages. Other factors such as habitat and flow modifications are not pollutants and a TMDL will not be developed. However, these factors will need to be addressed in management plans in order to have substantial improvements in the fish assemblages.

Flow Modification: In addition, where flow modifications affect other parameters such as nutrients and temperature, the impact of the modifications will be assessed in the TMDL for the specific parameters.

Sedimentation:

The 1998 the 303(d) list for streams with excessive sedimentation in the Umpqua Basin included nine stream reaches in North and South Umpqua sub-basins. The sedimentation listings were predominantly based on literature noted in United States Department of Agriculture, Umpqua National Forest Service Watershed Analysis documents. Most of the language noting impacts on stream biota due to excessive amounts of fines in streams sediments were of subjective nature and not based on quantitative information.

In 2001 EPA approved the Little River TMDLs which included TMDLs for temperature, pH and two stream reaches on Cavitt Creek and Little River for sedimentation. The TMDL cited excessive amounts of fine sediment being delivered to streams from increased slope failure rates on lands associated with past timber harvests.

The Little River Watershed sediment TMDLs targeted threshold literature values noted in other approved west coast TMDLs that supported successful Coho and Steelhead egg incubation in spawning gravels. An in-stream numeric target was selected and limited the amount of fines of <0.85 mm in size in riffle crests of fish bearing streams to be no greater than a total of 14%. As part of the Water Quality Management Plan Federal land managers and private timber interests developed Best Management Practices (BMPs) and strategies following their respective current Northwest Forest Plan guidelines and Forest Practice Act (FPA) rules to reduce anthropogenic sediment inputs.

Since development of the Little River TMDLs additional data was provided to DEQ by the Umpqua National Forest that analyzed stream spawning gravel conditions using sediment core samples from riffle crest sites. The mean % fine values <0.85 mm in size for five Little River sampling stations was 13.7% (below the 14% threshold) and 17.9% for the two locations sampled in Cavitt Creek.

Additional core sample and macroinvertebrate data was submitted to DEQ by the Umpqua National Forest Service seeking to de-list streams in Steamboat watershed for sedimentation. New riffle crest core sample data from spawning gravel locations indicated the percent of fine levels in all samples were less than 6 %. These values are well below the 12% level deemed properly functioning by National Marine Fisheries Services paper for “west-side streams”. DEQ proposes to de-list the four reaches noted in the Steamboat watershed based predominantly on the core sample data submitted.

Also, the DEQ is considering revising the criteria for determination of water quality parameter impairment related to sedimentation. Currently, sedimentation lacks quantitative listing criteria. A quantitative approach using relative bed stability will probably be proposed. To evaluate the fine sediment impacts on stream biota/spawning potential for the remaining three listed reaches of Jackson Creek, Beaver Creek and South Umpqua River additional data would have to be collected if using the relative bed stability approach. Until such data is collected it is suggested to place the remaining listings in a status of “concern” or insufficient data and the work to develop TMDLs for the remaining three listings will be placed on hold until criteria are selected and additional data is collected.

Since there are some uncertainties with the sedimentation parameter and additional data is deemed necessary to quantify stream sediment conditions, the DEQ sedimentation TMDLs for Little River will stand until further development. Federal entities (Umpqua National Forest and Roseburg Bureau of Land Management) will continue to reduce sediment loading. Private timber operators will still follow best management practices (BMPs) of the Forest Practice Act (FPA). The ongoing BMPs and sediment reducing strategies in the Little River watershed are appropriate and do not need to be changed at this time.

TMDL Implementation Via the Water Quality Management Plan (WQMP)

Implementation of TMDLs is critical to the attainment of water quality standards. The support of Designated Management Agencies (DMAs) in implementing TMDLs is essential. A DMA is any agency or entity responsible for affecting water quality through its management of land and/or water. In instances where DEQ has no direct authority for implementation, DEQ works with DMAs on implementation to ensure attainment of water quality standards. The DMAs in the Umpqua Basin include: US Forest Service, Bureau of Land Management, Oregon Departments of Agriculture and Forestry, Douglas County, and the cities of Roseburg, Myrtle Creek, Canyonville, Glendale, Sutherlin, Oakland, Reedsport, Yoncalla, Drain, Winston and Green. These agencies have developed or are in the process of developing implementation plans and/or are operating under NPDES permits.

DEQ intends to submit a TMDL WQMP to EPA concurrently with submission of TMDLs. Both the TMDLs and their associated WQMP will be submitted by DEQ to EPA as updates to the State's Water Quality Management Plan pursuant to 40 CFR 130.6. Such submissions will be a continuing update of the Continuing Planning Process (CPP).

The following are elements of the WQMP that will be submitted to EPA:

- Condition assessment and problem description
- Goals and objectives
- Identification of responsible participants
- Proposed management measures
- Timeline for implementation
- Reasonable assurance
- Monitoring and evaluation
- Costs and funding
- Citation to legal authorities

Chapter 7 contains the above elements for DMAs and contains schedules for when permits and management plans will be updated.

A Water Quality Management Plan (WQMP) is included as a companion document to the TMDLs. This document explains the roles of various land management agencies, federal, state, and local governments, as well as private landowners in implementing the actions necessary to meet the allocations in the TMDLs. It also includes directly or by reference the statutes, rules, ordinances, local plans, and all other known mechanisms for implementation. The WQMP for the Umpqua Basin focuses specifically on:

- State Forest Lands (Forest Practices Act)
- Private Forest Lands (Forest Practices Act)
- Federal Forest Lands (Northwest Forest Plan)
- Private Agricultural Lands (SB1010 Plan)
- Douglas County Lands (County Ordinances)

These documents and several public summary documents are: available upon request, at locations within the Umpqua Basin and can be found on the DEQ website: http://waterquality.deq.state.or.us/wq/. The TMDL and WQMP build upon the following land management programs in the Umpqua Basin:

- Oregon's Forest Practices Act (state and private forestlands)
- Senate Bill 1010 (agricultural lands)
- Oregon Plan (all lands)
- Many other programs (USFS, ODOT, Cities & County, NPDES, etc.)

The WQMP (Chapter 7) includes (1) schedules for evaluating and producing programs, rules or policy to implement TMDLs, (2) recommendations of best management practices to improve water quality, (3) discussion of costs, areas and impairments of emphasis, long-term monitoring, public involvement and maintenance of effort over time.

The Development Process

A wide variety of interests and interested organizations assisted DEQ in developing the Umpqua Basin TMDLs. Those assisting include representatives of various land uses and resources, including sewage treatment plants, agriculture, forestry, conservation and recreation, and continuing technical and other valuable assistance from the former Umpqua Basin Watershed Council, now called the Partnership for the Umpqua Rivers. Valuable contributions by these interests include review and comment concerning method development, data collection, data evaluation and study of the interaction between land use and water quality. The knowledge derived from these data collection efforts and discussion, some of which is presented in this document, has been used to design the enclosed protective and enhancement strategies that address water quality issues. Public meetings were held at various points in the TMDL development process, and comments made at that time have been considered in developing this document (see Response to Comments, a separate document).

Implementation and Adaptive Management Issues

The goal of the Clean Water Act and associated Oregon Administrative Rules is that water quality standards shall be met or that all feasible steps will be taken towards achieving the highest quality water attainable. This is a long-term goal in many watersheds, particularly where nonpoint sources are the main concern. To achieve this goal, implementation must commence as soon as possible.

Total Maximum Daily Loads (TMDLs) are numerical loadings that are set to limit pollutant levels such that in-stream water quality standards are met. DEQ recognizes that TMDLs are values calculated from mathematical models and other analytical techniques designed to simulate and/or predict very complex physical, chemical and biological processes. Models and techniques are simplifications of these complex processes and, as such, are unlikely to produce an exact prediction of how streams and other waterbodies will respond to the application of various management measures. It is also recognized that there is a varying level of uncertainty in the TMDLs depending on factors such as amount of data that is available and how well the processes listed above are understood. It is for this reason that the TMDLs have been established with a margin of safety. Subject to available resources, DEQ will review and, if necessary, modify TMDLs established for a subbasin on a five-year basis or possibly sooner if DEQ determines that new scientific information is available that indicates significant changes to the TMDL are needed.

Implementation plans are plans designed to reduce pollutant loads to meet TMDLs. DEQ recognizes that it may take some period of time—from several years to several decades-- after full implementation before management practices identified in a WQMP become fully effective in reducing and controlling certain forms of pollution such as heat loads from lack of riparian vegetation. In addition, DEQ recognizes that technology for controlling some pollution sources such as nonpoint sources and stormwater is, in many cases, in the development stages and will likely take one or more iterations to develop effective

techniques. It is possible that after application of all reasonable best management practices, some TMDLs or their associated surrogates cannot be achieved as originally established.

DEQ also recognizes that, despite the best and most sincere efforts, natural events beyond the control of humans may interfere with or delay attainment of the TMDL and/or its associated surrogates. Such events could be, but are not limited to, floods, fire, insect infestations, and drought.

In this TMDL, pollutant surrogates have been defined as alternative targets for meeting the TMDL for some parameters. The purpose of the surrogates is not to bar or eliminate human access or activity in the subbasin or its riparian areas. It is the expectation, however, that designated management agency (DMA) implementation plans will address how human activities will be managed to achieve the TMDL surrogates. It is also recognized that full attainment of pollutant surrogates (system potential vegetation, for example) at all locations may not be feasible due to physical, legal or other regulatory constraints. To the extent possible, implementation plans should identify potential constraints, but should also provide the ability to mitigate those constraints should the opportunity arise. For instance, at this time, the existing location of a road or highway may preclude attainment of system potential vegetation due to safety considerations. In the future, however, should the road be expanded or upgraded, consideration should be given to designs that support TMDL load allocations and pollutant surrogates such as system potential vegetation.

When developing water quality-based effluent limits for NPDES permits, DEQ will ensure that effluent limits developed are consistent with the assumptions and requirements of the wasteload allocation (CFR 122.44(d)(1)(vii)(B)). Similarly, DEQ will work with nonpoint sources in developing management plans that are consistent in meeting the assumptions and requirements of the load allocations. These permits and plans will be developed/modified within approximately 1-2 years following the development or modification of a TMDL and include but not be limited to the following (February 2000 MOA between DEQ and EPA):

- Management measures tied to attainment of the TMDL,
- Timeline for implementation (including appropriate incremental measurable water quality targets and milestones for implementing control actions),
- Timeline for attainment of water quality standards including an explanation of how implementation is expected to result in the attainment of water quality standards,
- Monitoring and evaluation

If a source that is covered by this TMDL complies with its permit, WQMP or applicable forest practice rules, it will be considered in compliance with the TMDL.

DEQ intends to regularly review progress of implementation plans to achieve TMDLs. If and when DEQ determines that TMDLs have been fully implemented, that all feasible management practices have reached maximum expected effectiveness and a TMDL or its interim targets have not been achieved, DEQ shall reopen the TMDL and adjust it or its interim targets as necessary. The determination that all feasible steps have been taken will be based on, but not limited to, a site-specific balance of the following criteria: protection of beneficial uses; appropriateness to local conditions; use of best treatment technologies or management practices or measures; and cost of compliance (OAR 340-41-026(3)(a)(D)(ii)).

The implementation of TMDLs and the associated implementation plans is generally enforceable by DEQ, other state agencies and local government. However, it is envisioned that sufficient initiative exists to achieve water quality goals with minimal enforcement. Should the need for additional effort emerge, it is expected that the responsible agency will work with land managers and permit holders to overcome impediments to progress through education, technical support or enforcement. Enforcement may be necessary in instances of insufficient action towards progress. In the case of nonpoint sources, this could occur first through direct intervention from land management agencies (e.g. ODF, ODA, counties and

cities), and secondarily through DEQ. The latter may be based in departmental orders to implement management goals leading to water quality standards.

In employing an adaptive management approach to this TMDL and WQMP, DEQ has the following expectations and intentions:

- Subject to available resources, DEQ will review and, if necessary, modify TMDLs and WQMPs established for a subbasin on a five-year basis or possibly sooner if DEQ determines that new scientific information is available that indicates significant changes to the TMDL are needed.

- When developing water quality-based effluent limits for NPDES permits, DEQ will ensure that effluent limits developed are consistent with the assumptions and requirements of the wasteload allocation (CFR 122.44(d)(1)(vii)(B)). In conducting this review, DEQ will evaluate the progress towards achieving the TMDL (and water quality criteria) and the success of implementing the WQMP.

- DEQ expects that each management agency will also monitor and document its progress in implementing the provisions of its component of the WQMP. This information will be provided to DEQ for its use in reviewing the TMDL.

- As implementation of the WQMP proceeds, DEQ expects that management agencies will develop benchmarks for attainment of TMDL surrogates, which can then be used to measure progress.

- Where implementation of the WQMP or effectiveness of management techniques are found to be inadequate, DEQ expects management agencies to revise the components of the WQMP to address these deficiencies.

EXISTING WATER QUALITY PROGRAMS

Oregon Forest Practices Act

The Oregon Forest Practices Act (FPA, 1994) contains regulatory provisions that include the objectives to classify and protect water resources, reduce the impacts of clearcut harvesting, maintain soil and site productivity, ensure successful reforestation, reduce forest management impacts to anadromous fish, conserve and protect water quality and maintain fish and wildlife habitat, develop cooperative monitoring agreements, foster public participation, identify stream restoration projects, recognize the value of bio-diversity and monitor/regulate the application of chemicals. Oregon's Department of Forestry (ODF) has adopted Forest Practice Administrative Rules (1997) that define allowable actions on State, county and private forestlands. Forest Practice Administrative Rules allow revisions and adjustments to the regulatory parameters it contains. Several revisions have been made in previous years and it is expected that the ODF, in conjunction with DEQ, will continue to monitor the success of the Forest Practice Administrative Rules and make appropriate revisions when necessary to address water quality concerns.

Senate Bill 1010

Senate Bill 1010 allows the Oregon Department of Agriculture (ODA) to develop Water Quality Management Plans for agricultural lands where such actions are required by State or Federal Law, such as TMDL requirements. The Water Quality Management Plan should be crafted in such a way that landowners in the local area can prevent and control water pollution resulting from agricultural activities. Local stakeholders are asked to take corrective action against identified problems such as soil erosion, nutrient transport to waterways and degraded riparian areas. It is ODA's intent to establish Water Quality Management Plans on a voluntary basis. However, Senate Bill 1010 allows ODA to use civil penalties when necessary to enforce against agriculture activity that is found to transgress parameters of an approved Water Quality Management Plan. ODA works with the local stakeholders and other State and Federal agencies to formulate and enforce approved Water Quality Management Plans.

In the Umpqua Basin, the Oregon Department of Agriculture has already approved the Umpqua Basin Agricultural Water Quality Management Plan. The plan is currently in the enforcement phase since it has been in effect for more than one year.

Oregon Plan

The State of Oregon has formed a partnership between Federal and State agencies, local groups and grassroots organizations, which recognizes the attributes of aquatic health and their connection to the health of salmon populations. The Oregon Plan considers the condition of salmon as a critical indicator of ecosystems (CSRI, 1997). The decline of salmon populations has been linked to impoverished ecosystem form and function. Clearly stated, the Oregon Plan has committed the State of Oregon to the following obligations: an ecosystem approach that requires consideration of the full range of attributes of aquatic health, focuses on reversing factors decline by meeting objectives that address these factors, develops adaptive management and a comprehensive monitoring strategy, and relies on citizens and constituent groups in all parts of the restoration process.

The intent of the Oregon Plan is to conserve and restore functional elements of the ecosystem that supports fish, wildlife and people. In essence, the Oregon Plan is different from the traditional agency approach, and instead, depends on sustaining a local-state-federal partnership. Specifically, the Oregon Plan is designed to build on existing State and Federal water quality programs, namely: Coastal Zone Nonpoint Pollution Control Programs, the Northwest Forest Plan, Oregon's Forest Practices Act, Oregon's Senate Bill 1010 and Oregon's Total Maximum Daily Load Program.

Northwest Forest Plan

In response to environmental concerns and litigation related to timber harvest and other operations on Federal Lands, the United States Forest Service (USFS) and the Bureau of Land Management (BLM) commissioned the Forest Ecosystem Management Assessment Team (FEMAT) to formulate and assess the consequences of management options. The assessment emphasizes producing management alternatives that comply with existing laws and maintaining the highest contribution of economic and social well being. The "backbone" of ecosystem management is recognized as constructing a network of late-successional forests and an interim and long-term scheme that protects aquatic and associated riparian habitats adequate to provide for threatened species and at risk species. Biological objectives of the Northwest Forest Plan include assuring adequate habitat on federal lands to aid the "recovery" of late-successional forest habitat-associated species listed as threatened under the Endangered Species Act (ESA) and preventing species from being listed under the Endangered Species Act.

UMPQUA BASIN OVERVIEW

Geology (Ecoregions)

The western portion of the Umpqua Basin is underlain by marine sedimentary rocks and the eastern portion by volcanic igneous rocks. Metamorphic rocks form a small area in the south-central area.

Oregon is divided into ecoregions identified based on climate, geology, physiography, vegetation, soils, land use, wildlife, and hydrology. Typically, watersheds within an ecoregion share similar patterns of form, function, and disturbance characteristics. There are four major ecoregions within the Umpqua basin, and smaller areas of ten others. Figure 1.3 depicts the ecoregions of the Umpqua Basin.

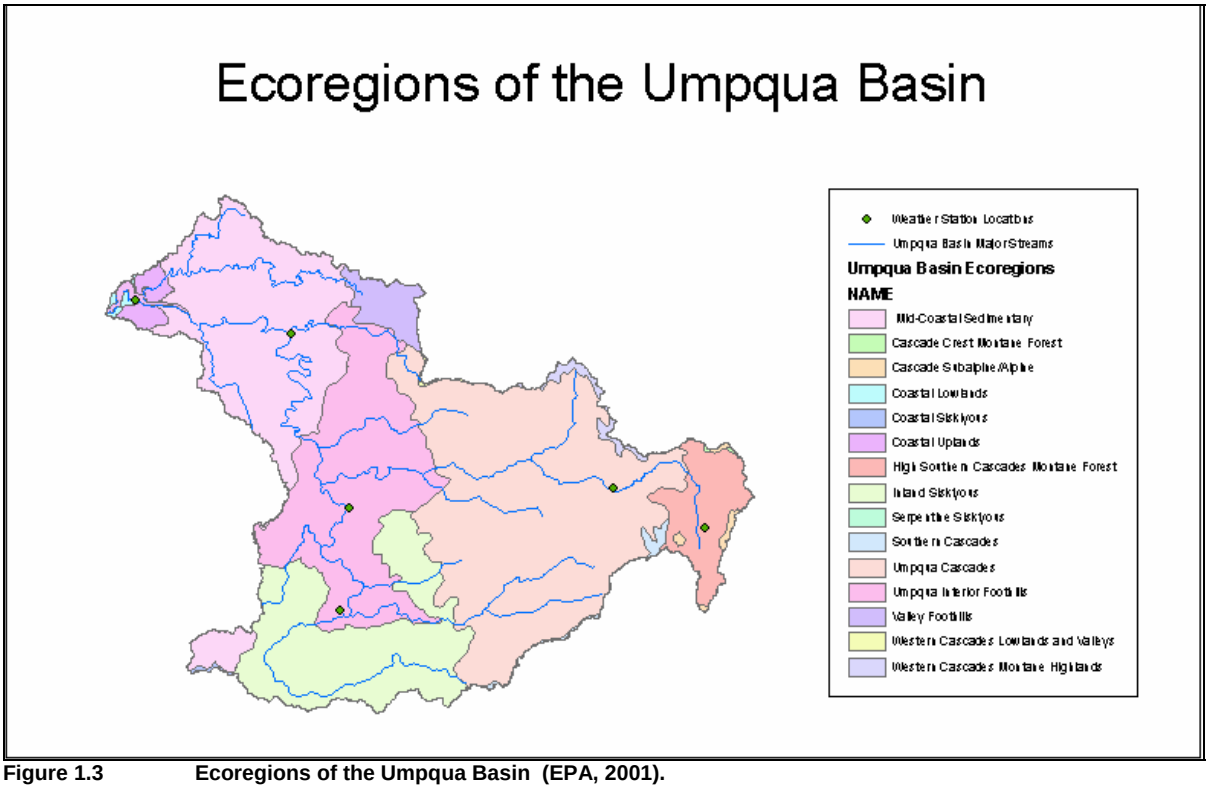


Figure 1.3 Ecoregions of the Umpqua Basin (EPA, 2001).

The headwaters of the North Umpqua begin near Diamond Lake and Lemolo Lake in the Cascade mountains. From there, the river flows generally west. Most of the headwaters are in the High Southern Cascades Montane Forest ecoregion. [3] Here, high elevation volcanic plateaus receive large amounts of precipitation on the western slope of the Cascades. Streams usually have a moderate gradient and occur at moderate density. The erosion rate is low. The very highest peaks in the headwaters are in the Cascade Subalpine/Alpine ecoregion. This region shows effects of volcanic activity and glaciation, with streams not supporting fish.

Most of the rest of the North Umpqua subbasin is in the Umpqua Cascades ecoregion, with elevations between 1,000 and 5,000 feet. This region is characterized by highly dissected mountains, with moderate to high stream gradients and high stream density. The erosion rate is moderate due to the combination

[3] A more thorough discussion of ecoregions in Oregon can be found in the Oregon Watershed Enhancement Board's Watershed Assessment Manual, Appendix A – Ecoregion Descriptions. This is available from the Oregon Watershed Enhancement Board or online at http://www.oweb.state.or.us/pdfs/wa_manual99/apdx1-ecoregions.pdf

of high precipitation and steep slopes. Snowpack in the ecoregion varies somewhat, with 50 to 120 inches of rain annually at higher elevations and on north-facing slopes on the eastern border. The snowpack stores water until the spring, sometimes contributing to high spring flows.

At approximately 106 miles from its headwaters, the North Umpqua River meets the South Umpqua River northwest of Roseburg. The Umpqua River then flows another 112 miles to the estuary and Pacific Ocean.

Much of the higher portions of the South Umpqua are also in the Umpqua Cascades ecoregion described above, with highly dissected mountains, moderate to high stream gradients and high stream density. Snowpack lasts until the spring melt.

The Cow Creek system, which drains to the South Umpqua, is in the Inland Siskiyous ecoregion, and is underlain by granitic rock, shale, or sandstone. Precipitation ranges from 35 to 70 inches, with up to 89 inches annually in the higher elevations.

Most of the rest of the South Umpqua Subbasin, and a portion of the North Umpqua and mainstem Umpqua subbasins, are in the Umpqua Interior Foothills ecoregion. Here there are narrow valleys, terraces, and steep foothills. Stream channels are of moderate gradient, and stream densities vary between moderate in areas of sandstone geology and low in basalt geology. The erosion rate is moderate. Many of the streams become intermittent during the summer due to low precipitation. Annual precipitation is only 30 to 50 inches.

The most southwesterly portions of the South Umpqua Subbasin are in the Southern Cascades ecoregion**,** which is an area underlain by basaltic lava flows. Here, mountains have moderate slopes and stream gradients are moderate. The stream density is low and there are many intermittent streams.

The South Umpqua travels generally west and then north, a total of 104 miles before it meets the North Umpqua and becomes the Umpqua River.

Much of the mainstem Umpqua Subbasin (Umpqua River downstream from the confluence of the North and South Umpqua Rivers, and the Smith River system) is in the Mid-Coastal Sedimentary ecoregion. The geology of this ecoregion is alternating beds of thin siltstone and thick sandstone which, together with abundant rainfall and steep slopes, results in high potential for erosion and landslides. While headwater streams are steep, medium and large streams are typically low gradient, and watersheds have a high stream density, with mean annual precipitation of 60 to 130 inches. Basins drain coastal valleys with peaks ranging to 9,184 feet at Mt. Thielsen in the Umpqua Basin. The Smith and Umpqua Rivers are both oriented west, dissecting the coast range and draining to the Pacific Ocean.

West of the Mid-Coastal Sedimentary ecoregion is the Coastal Uplands ecoregion. Here, headwater small streams and often steep gradient, while medium and large streams and some small streams are low gradient. Annual precipitation ranges from 70 to 125 inches, and even up to 200 inches in higher elevations of the Coast Range. Snowfall is minimal in this area. The erosion rate is high.

The westernmost portion of the basin is in the Coastal Lowlands ecoregion. Streams in this ecoregion are low gradient and often meander widely. Most streams are tidally influenced, and tidal marshes and lower meandering streams flow through flat floodplains. Heavy precipitation (60 to 85 inches annually) during the winter and relatively dry summers characterize this ecoregion.

Climate

The climate of the upper Umpqua Basin is generally characterized dry summers with high temperatures and wet winters with moderately low temperatures. Due to its location approximately west of the Cascade Mountain Range, it is in the path of storms originating in the north Pacific Ocean. Winter precipitation is derived from these storms.

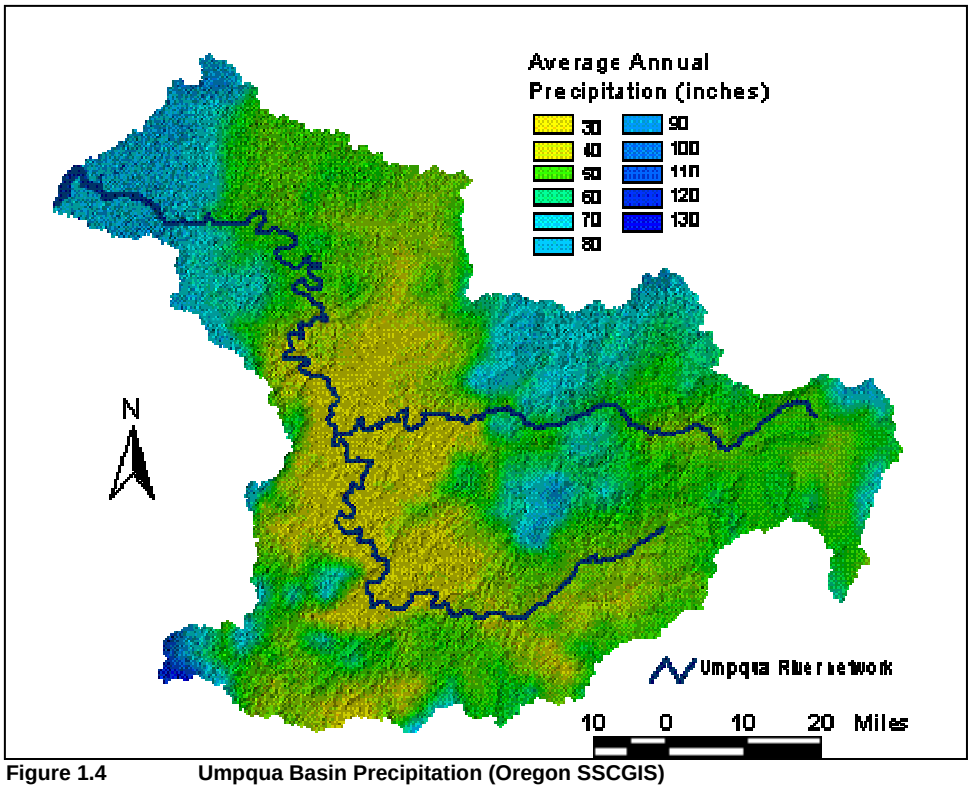
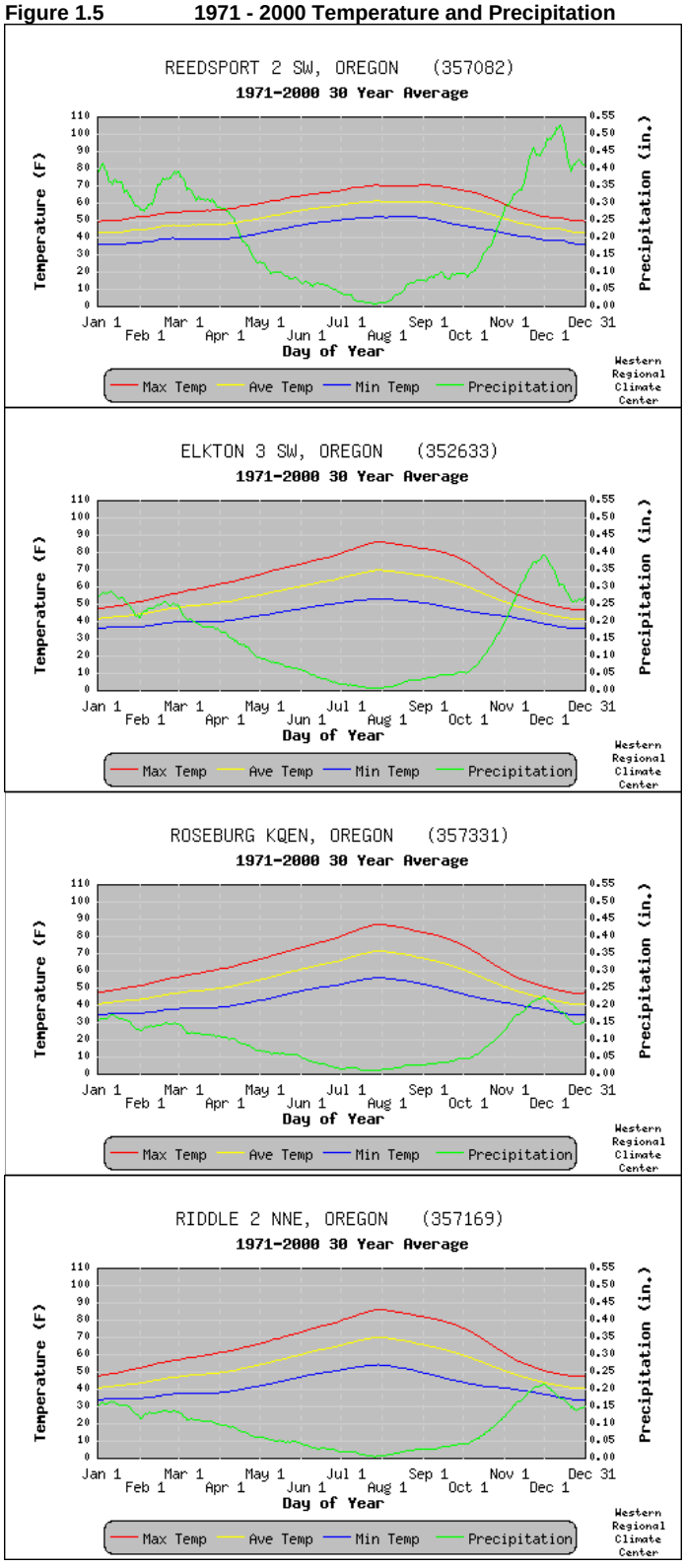


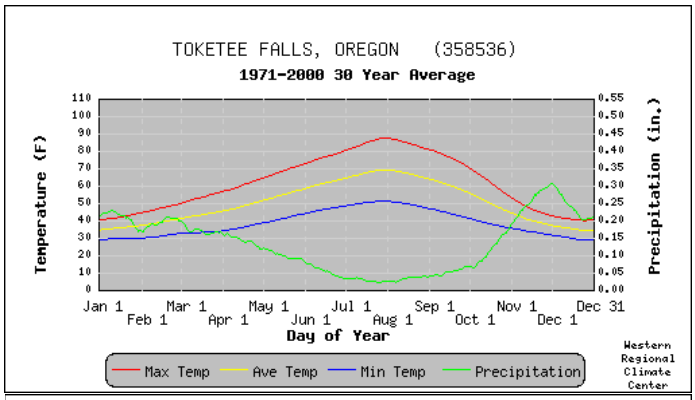
Figure 1.4 Umpqua Basin Precipitation (Oregon SSCGIS)

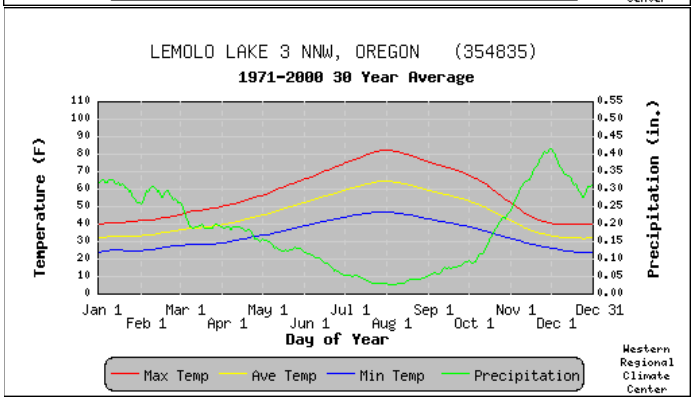
Charts of annual precipitation (Figures1.4 and 1.5) and temperature show many similarities throughout the Umpqua Basin but also some differences. Weather station locations are identified on Figure 1.3, Ecoregions of the Umpqua Basin. The chart for Reedsport is typical of coastal areas in the Umpqua Basin. Elkton's chart represents a little further up the Umpqua mainstem, showing less precipitation and somewhat higher summer temperatures.

The charts for Roseburg and Riddle are typical of the interior valley and show even lower precipitation and higher summer temperatures than areas further west. Tokatee Falls high up in the North Umpqua shows somewhat higher precipitation but summer temperatures nearly as high as Roseburg. At Lemolo Lake, near the headwaters of the North Umpqua River, rainfall is significantly higher than other areas, but summer temperatures are only a bit more moderate.

Figure 1.5 1971 - 2000 Temperature and Precipitation







Data is smoothed using a 29 day running average.

- Max. Temp. is the average of all daily maximum temperatures recorded for the day of the year between the years 1971 and 2000.

- Ave. Temp. is the average of all daily average temperatures recorded for the day of the year between the years 1971 and 2000.

- Min. Temp. is the average of all daily minimum temperatures recorded for the day of the year between the years 1971 and 2000.

- Precipitation is the average of all daily total precipitation recorded for the day of the year between the years 1971 and 2000.

Stream Flow

Low flows generally occur during the end of the summer months (July to October) due to decreased precipitation and increased agriculture water withdrawals.

Land Use and Ownership

Land ownership in the Umpqua Basin is divided between public ownership of significant portions of the basin and private ownership. Several large sections of the basin have the alternating private/public checkerboard pattern. The Umpqua National Forest on the east side of the basin occupies about one-quarter of the total area. The interior basin is primarily privately-owned. Checkerboard ownership predominates on the remainder of the basin. Figure 1.6 shows the distribution of land ownership in the Umpqua Basin.

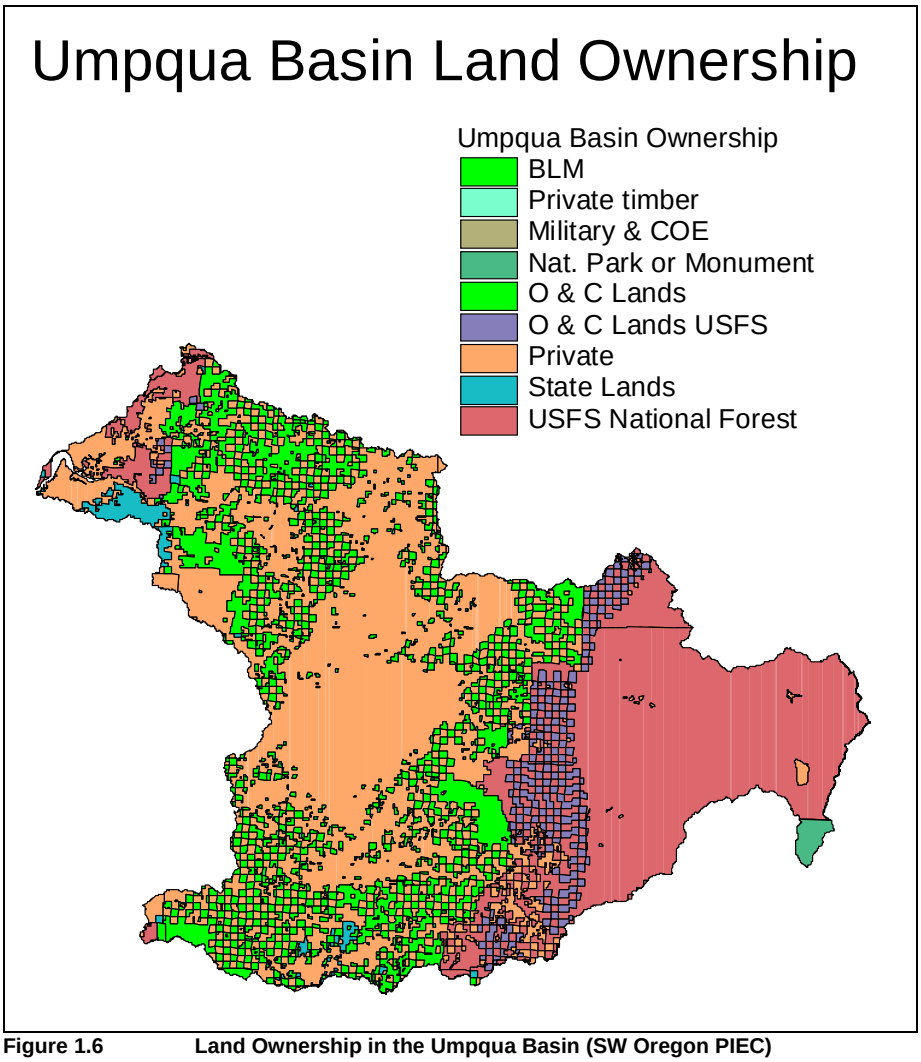


Figure 1.6 Land Ownership in the Umpqua Basin (SW Oregon PIEC)

Land use in the Umpqua Basin is overwhelmingly forested timberlands, accounting for 88% of the basin. Agriculture, primarily grazing, is the second largest land use, with about 7% of the land area.

Fisheries

A wide variety of fish species are present in the Umpqua Basin. The following list represents the major species found within the basin:

Steelhead Trout (Onchorhyncus mykiss)
Chinook Salmon (Oncorhynchus tshawytscha)
Coho Salmon (Onchorhyncus kisutch)
Coastal Cutthroat Trout (*Onchorhynchus clarki clark*i)
Chum salmon (Oncorhynchus keta)
Pacific lamprey (Lampetra tridentata)
River lamprey (*Lampetra ayresi*)
Western brook lamprey *(Lampetra richardsoni)*
American shad (Alusa sapidissima)
Eastern brook trout (*Salvelinus frontinalis*)
Brown trout (*Salmo trutta*)
Largescale sucher (Catostomus macrocheilus)
Umpqua chub (Oregonichthuys kalawatseti*)*
Fathead minnow (Pimephales promelas)
Tui chub (Gila bicolor)
White sturgeon *(Acipenser transmontanus)*
Umpqua squawfish (*Ptychocheilus umpquae*)
Striped bass (Morone saxatilis)
Smallmouth bass (Micropterus dolomieu)
Largemouth bass (Micropterus salmoides*)*
Pumpkinseed (Lepomis gibbosus)
Rainbow trout (*Oncorhynchus mykiss*)
Yellow perch (Perca flavescens)
Bluegill (Lepomis macrochirus)
Sculpin (*Cottus sp*.)
Redside shiner (Richardsonius balteatus)
Umpqua dace (Rhinicthys cataractae)
Long-nose dace (Rhinicthys cataractae)
Speckled dace (Rhinichthys osculus)
Umpqua pikeminnow (Ptychocheilus umpquae)
Brown bullhead (Ameiurus nebulosus)
Mosquitofish (Gambusia affinis)
White sturgeon (Acipenser medirostrus)

Key species of interest to this TMDL include the Steelhead Trout *(Onchorhyncus mykiss)*, the Chinook Salmon *(Oncorhynchus tshawytscha)*, Coho Salmon *(Onchorhyncus kisutch)* and the Coastal Cutthroat Trout *(Onchorhynchus clarki clarki)* Life stages periodicities for these key species are listed in Table 1.1.

It is important to note that the table below covers the entire Umpqua Basin, and fish use is different in the different subbasins.

Table 1.1 Umpqua Basin Fish Use (Source: Oregon Department of Fish and Wildlife, 2005)

Species	Life Stage	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Winter Steelhead	Adult migration	■	■	■	■	■							
	Adult Spawning	■	■	■	■	■	■						
	Adult Holding	■	■	■	■	■				■	■	■	■
	Eggs to Fry	■	■	■	■	■	■	■					
	Juvenile Rearing	■	■	■	■	■	■	■	■	■	■	■	■
	Juvenile migration	■	■	■	■	■	■						
Summer Steelhead	Adult migration			■	■	■	■	■	■	■	■	■	
	Adult Spawning	■	■	■	■						■	■	■
	Adult Holding			■	■	■	■	■	■	■	■		
	Eggs to Fry	■	■	■							■	■	■
	Juvenile Rearing	■	■	■	■	■	■	■	■	■	■	■	■
	Juvenile migration	■	■	■	■	■	■	■					
Fall Chinook Salmon	Adult migration							■	■	■	■	■	■
	Adult Spawning	■					■	■	■	■	■	■	■
	Adult Holding							■	■	■	■	■	■
	Eggs to Fry	■	■	■	■					■	■	■	■
	Juvenile Rearing		■	■	■	■	■	■	■	■	■		
	Juvenile migration		■	■	■	■	■	■	■	■	■		
Spring Chinook Salmon	Adult migration	■	■	■	■	■	■	■					
	Adult Spawning	■								■	■	■	■
	Adult Holding	■	■	■	■	■	■	■	■	■	■	■	■
	Eggs to Fry	■	■	■						■	■	■	■
	Juvenile Rearing	■	■	■	■	■	■	■	■	■	■	■	■
	Juvenile migration	■	■	■	■	■	■	■	■	■	■		
Coho Salmon	Adult migration	■							■	■	■	■	■
	Adult Spawning	■									■	■	■
	Adult Holding	■							■	■	■	■	■
	Emergence	■	■	■	■	■					■	■	■
	Juvenile Rearing	■	■	■	■	■	■	■	■	■	■	■	■
	Juvenile migration		■	■	■	■	■						
Searun Cutthroat Trout	Adult migration	■	■	■	■	■	■	■	■	■	■	■	■
	Adult Spawning	■	■	■	■	■	■	■	■	■	■	■	■
	Adult Holding		■	■	■	■	■	■	■	■	■		
	Emergence	■	■	■	■	■					■	■	■
	Juvenile Rearing	■	■	■	■	■	■	■	■	■	■	■	■
	Juvenile migration	■	■	■	■	■	■	■	■	■			