CHAPTER 5
UMPQUA BASIN BIOLOGICAL CRITERIA TMDL

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OVERVIEW AND LISTED WATERBODIES

To address the 303(d) listings for biological criteria for the Umpqua Basin, DEQ will take a similar approach to previous EPA-approved biocriteria TMDLs from Oregon. As in those other TMDLs, analysis shows that implementing the Waste Load Allocations and Load Allocations for other water quality-limiting parameters as well as making improvements in habitat and flow conditions should recover biological communities to expected compositions. This TMDL will address all the biocriteria listings for the Umpqua Basin. (see Figure 5.1 and Table 5.1)

Figure 5.1 Umpqua Basin stream locations with biocriteria listings

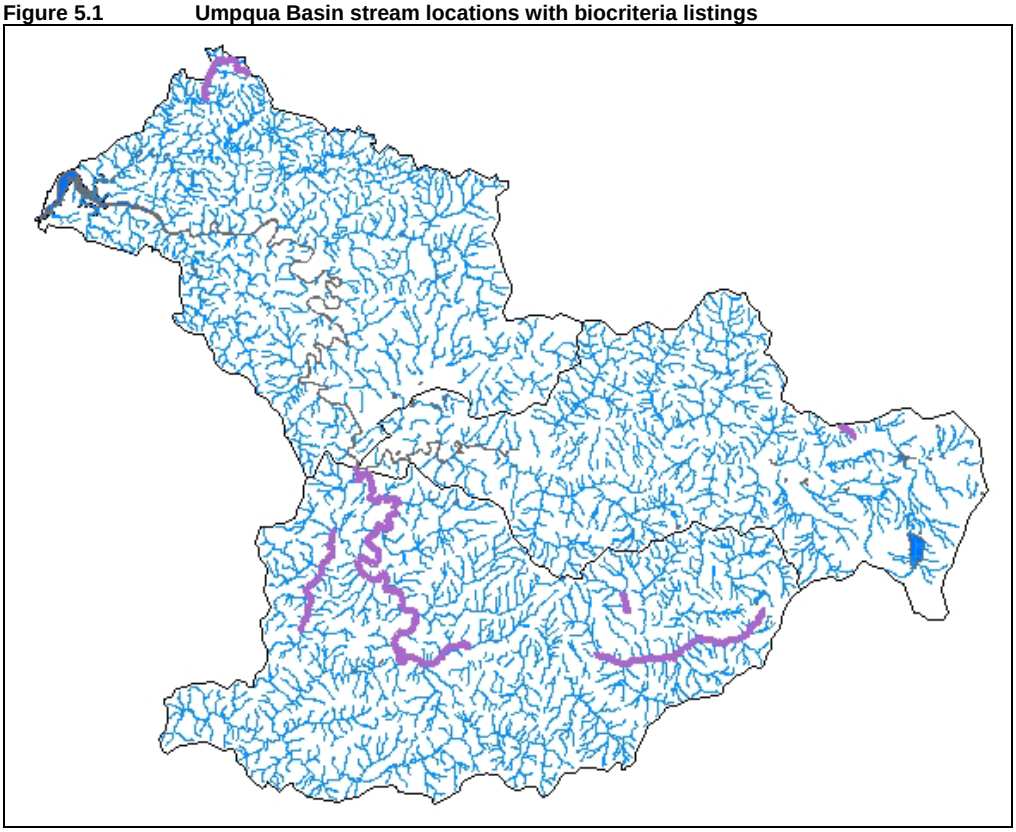

Table 5.1 2002 303(d) List: Umpqua Basin Biological Criteria Listed Streams

Stream Segment	Listed Parameter	Applicable Rule	Miles Affected
North Fork Smith River River Mile 19.1 to 31.8	Biological Criteria	OAR 340-041-0011	12.7
Dumont Creek River Mile 0 to 2.9	Biological Criteria	OAR 340-041-0011	2.9
Jackson Creek River Mile 0 to 25	Biological Criteria	OAR 340-041-0011	25
Olalla Creek River Mile 0 to 15.6	Biological Criteria	OAR 340-041-0011	15.6
South Umpqua River River mile 0 to 15.9	Biological Criteria	OAR 340-041-0011	15.9
Stream Segment	**Listed Parameter**	**Applicable Rule**	**Miles Affected**
South Umpqua River River Mile 15.9 to 57.7	Biological Criteria	OAR 340-041-0011	41.8
Potter Creek River Mile 0 to 2.7	Biological Criteria	OAR 340-041-0011	2.7
		Total Stream Miles Listed for Biological Criteria	116.6

BENEFICIAL USES

The beneficial uses affected in the Umpqua Basin by the biological criteria impairments include Resident Fish and Aquatic Life and Salmonid Fish Rearing as noted in Table 320A of OAR 340-041-0320.

Table 5.2 Biological Criteria Impacted Beneficial Uses in the Umpqua Basin

(OAR 340–041–0320, Table 320A) *Biological Criteria sensitive beneficial uses are marked in gray*			
Beneficial Use	***Occurring***	***Beneficial Use***	***Occurring***
Public Domestic Water Supply	✓	Anadromous Fish Passage	✓
Private Domestic Water Supply	✓	Salmonid Fish Spawning	✓
Industrial Water Supply	✓	Salmonid Fish Rearing	✓
Irrigation	✓	Resident Fish and Aquatic Life	✓
Livestock Watering	✓	Wildlife and Hunting	✓
Boating	✓	Fishing	✓
Aesthetic Quality	✓	Water Contact Recreation	✓
Commercial Navigation & Trans.		Hydro Power	

TARGET CRITERIA IDENTIFICATION

At the time the streams in the Umpqua Basin were placed on the 303(d) list for Biological Criteria parameter (1998), the standard was in OAR 340-41-027 applicable to all basins statewide. It read:

> *"Waters of the state shall be of sufficient quality to support aquatic species without detrimental changes in the resident biological communities."*

The water quality limited criteria language read:

> *"Aquatic communities (primarily macroinvertebrates) which are 60% or less of the expected reference community for both multimetric scores and multivariate model scores are considered impaired. Streams with either multimetric scores or multivariate scores between 61% and 75% of expected reference communities are considered as streams of concern. Stream greater than 75% of expected reference communities using either multimetric or multivariate models are considered unimpaired. – or- Where monitoring methods determined a Biotic Condition Index, Index of Biotic Integrity, or similar metric rating of poor or a significant departure from reference conditions utilizing a suggested EPA biomonitoring protocol or other technique acceptable to DEQ."*

The current Biocriteria standard in OAR 340-041-0011 retains the narrative standard for biocriteria:

> *"Waters of the state shall be of sufficient quality to support aquatic species without detrimental changes in the resident biological communities."*

Currently there are no numeric criteria for biocriteria. DEQ is in the process of developing numeric biological criteria and is currently re-analyzing its data against the draft numeric criteria.The numeric criteria will be different than the values used in previous 303(d) lists. Water bodies placed on the 1998 303(d) list based on interpretation of the narrative biological criterion will be maintained on the 303(d) list unless a TMDL addressing the listing has been approved by EPA.

EXISTING SOURCES

Long term effects of natural catastrophic events such as flood, fire and landslides periodically alter ecosystems, adding another evaluation variable when trying to determine what might be an expected reference macroinvertebrate community.

Human-caused impacts on water quality over time involved land management activities altering natural conditions. Native Americans were reportedly the first to alter natural conditions, using fire as a land management tool and harvesting activities. European settlement in the Umpqua Basin included development of travel corridors, land clearing for animal husbandry, mineral mining, timber harvest and various levels of landscape and riparian area alterations. As demand for timber products increased, additional landscape changes occurred on federal lands, including road and rail building and timber harvest activities. As the basin became more developed, more water withdrawals reduced stream flows during summer months. This reduced the streams' power and altered historic channel maintenance conditions. This loss of flow reduces the amount of stream habitat and may be an additional macroinvertebrate limiting factor to consider in areas having more water withdrawals such as the South Umpqua River.

CURRENT CONDITIONS

Biological criteria listings in Dumont, Jackson, Ollalla, Potter Creeks, the North Fork Smith River and South Umpqua River in two reaches,are predominantly the direct result of impairments in macroinvertebrate communities. Aquatic macroinvertebrates are the substrate lifeforms commonly found in streams. Macroinvertebrates play an important role in maintaining the health of the aquatic ecosystem by processing dead and decaying plant and animal life, converting these in-stream nutrients into higher levels of energy in the aquatic food web . This process provides an important food source for fish and other aquatic organisms. These macroinvertebrates are good indicators of watershed health since overall water and habitat quality determines which types of macro-invertebrates can survive in a body of water. Commonly some form of biological index is developed and compared to the expected community to determine the degree of severity of impairment of the macroinvertebrate community.

LOADING CAPACITY AND ALLOCATIONS

Watershed Specific Analysis

The following discussion by stream denotes the data submitted or reviewed for placing these stream segments on the 303(d) list for not attaining biological criteria requirements. Stressors reducing the potential macroinvertebrate communities can be numerous and those noted below are associated with some sort of measured assessment of stream condition. There may be additional stressors that have not yet been assessed.

North Fork Smith River

The criteria used for assessing the North Fork Smith River included a Discriminant Score of less than 61 points. The Discriminant Score for the North Fork Smith River was 44.

Besides being listed for biological criteria, the North Fork Smith River is water quality limited for temperature and was previously listed for flow and habitat modification. The lack of sufficient flow and reduced in-stream habitat complexity along with elevated temperatures would contribute to less than expected macroinvertebrate communities. Attainment of system potential vegetation on this stream and tributaries will decrease stream temperatures in the future. Increased stream complexity will likewise help macroinvertebrate communities to recover to anticipated levels. See discussion from Siuslaw National Forest WQRP regarding biological criteria.

Dumont Creek

The documentation for listing Dumont Creek came from the Umpqua National Forest:

> Cumulative score for Dumont Creek indicated moderately impaired values suggesting habitat or water quality limitations (Dumont Creek Watershed Assessment, 1995 Supplement, USFS).

Besides being listed for biological criteria, the lower 2.9 miles of Dumont Creek is water quality limited for temperature. The lower 9.5 miles of stream was previously on the 303(d) list for habitat modification for not meeting Coastal Salmon Restoration Initiative (CSRI) benchmarks for Large Woody Debris (LWD) and pool frequency. The Oregon Department of Fish and Wildlife (ODFW) stream survey notes below indicate the condition of the channel when surveyed:

> Reach 1: Length 1913 m. Reach one began at the confluence with the South Umpqua River and ended just after the confluence with Budd Creek. This reach was constrained by moderate v - shaped hill slopes. The valley width index average was 1.2 (range 1.0-2.0). Average unit gradient was 1.9 percent. Stream habitat was dominated by scour pools (65%) and riffles (22%). The wetted width to depth ratio of riffles was 31.1. Residual pool depth was 0.79 m. Stream substrate was dominated by cobble (41%) and gravel (31%). There were 7% fines and 35% gravel in riffle units. There were 2.0 pieces and 5.5 m^3 of wood per 100 m of stream channel. The most frequently occurring trees >15 cm dbh within 30 m of the stream channel were conifers. Riparian conifers >50 cm dbh occurred at densities of 3.0/100 m^2 in riparian transects in this reach. Open sky was 17% for the reach. There were 13 pools greater than 1.0 m in depth in this reach.

As part of its stream restoration efforts in the South Umpqua, the Umpqua National Forest introduced some large woody debris into the lower 3 mile reach of Dumont Creek during the fall of 2002. This should increase stream bed complexity and collect gravels, creating hyporheic flow that should provide cooler stream temperatures and habitat conditions that should foster greater macroinvertebrate abundance and diversity. The increased stream complexity will also help to direct or intercept excessive nutrients and place this source into a higher trophic level in the food chain. This will reduce potential nutrient loadings for periphyton algal communities in the South Umpqua, which experiences pH exceedances due to excessive periphyton algal growth.

Jackson Creek

The documentation for placing Jackson Creek on the list came from the Umpqua National Forest:

Scores for riffle samples ranged from 32 to 52 from 1989 - 1992 indicating moderately to severely impaired conditions (Jackson Creek Watershed Analysis, 1995).

Besides being listed for biological criteria, this same 25 mile reach is water quality limited for the parameters of temperature, pH, sedimentation and habitat modification for not meeting CSRI benchmarks for LWD and pool frequency. Increasing stream complexity, reaching system potential temperature and pH via attainment of system potential effective shade and reduction in sedimentation should support recovery of anticipated macroinvertebrate communities. See additional discussion on sedimentation, pH, and temperature.

Olalla Creek
The criteria used for assessing Olalla Creek included a Discriminant Score of less than 61 points. The Discriminant Score for Olalla Creek was 44.

Besides being listed for biological criteria, this same 15.6 mile reach is water quality-limited for temperature and flow modification. Increasing stream complexity and reaching system potential temperature via attainment of system potential effective shade should support recovery of anticipated macroinvertebrate communities. Additional reductions in non-point source contributions of bacteria and nutrients will also help support a more robust macroinvertebrate community. This drainage is a medium priority for streamflow restoration as determined by the Water Resources Department and the Oregon Department of Fish and Wildlife as part of the Oregon Plan. Improvements in streamflow will also assist the macroinvertebrate communities.

Potter Creek
The documentation for placing Potter Creek on the list included the following from the PacifiCorp North Umpqua Cooperative Watershed Analysis:

Report stated invertebrate samples collected in 1995 show the total abundance of aquatic macroinvertebrates in erosional (riffle) habitats was 48 percent lower downstream of diversion than upstream of diversion. The total abundance of in stream margin habitats was 67 percent lower downstream of diversion.

Potter Creek is a tributary to the North Umpqua River. The flow of this stream was diverted to a canal during the construction of the North Umpqua hydro-project. The flow diversion impacted invertebrate samples collected in 1995 showing the total abundance of aquatic macroinvertebrates in erosional (riffle) habitats was 48 percent lower downstream of the diversion than upstream of the diversion. The total abundance of instream margin habitats was 67 percent lower downstream of the diversion.

Oregon Water Resources Department, as part of a re-licensing settlement agreement, has directed PacifiCorp, the current managing entity, to redirect all natural flows to the historic channel. Some riparian plantings are part of the settlement agreement as well. The re-establishment of natural flow and recovery of riparian vegetation should return the biological community of this stream to the expected reference condition. Monitoring over time will document conditions.

South Umpqua River RM 0 to 15.9
The documentation placing this reach of the South Umpqua on the list included DEQ Data (Site 404348; RM 7.5), which showed a Bioassessment Index score of 62% of reference site conditions based on DEQ data collected in 1991 (DEQ, 1992).

Besides being listed for biological criteria, the lower 15.9 miles of river is water quality limited for multiple parameters including temperature, aquatic weeds or algae, dissolved oxygen, pH, phosphorus, chlorine, fecal coliform and flow modification. Limits set by NPDES permits for chlorine and attainment of Wasteload and Load Allocations for temperature and nutrients as noted in those TMDLs should provide for recovery of macroinvertebrate communities to expected levels.

South Umpqua River RM 15.9 to 57.7
The documentation placing this reach of the South Umpqua on the list included DEQ Data (Site 404348; RM 7.5), which showed a Bioassessment Index score of 69% of reference site conditions based on DEQ data collected in 1991 (DEQ, 1992).

The reach of the South Umpqua above river mile 15.9 is water quality-limited for multiple parameters as well that include temperature, aquatic weeds or algae, dissolved oxygen, pH, fecal coliform, chlorine, habitat and flow modification. Limits set by NPDES permits for chlorine and attainment of Wasteload and Load Allocations for temperature and nutrients as noted in those TMDLs should provide for recovery of macroinvertebrate communities to expected levels.

SUMMARY

This Umpqua Basin TMDL does not impose additional Wasteload and Load Allocations for biological criteria. The TMDL Wasteload and Load Allocations established to meet temperature and where appropriate other water quality standards such as pH, dissolved oxygen, bacteria and nutrient (using riparian shade and other appropriate treatments) are expected to restore the condition of the biological communities in the listed reaches of the streams and rivers throughout the Basin. Although Habitat Modification and Flow Modification listings no longer require a TMDL, many of the listed reaches lack channel complexity. Over time, these conditions will improve, providing additional physical habitat along with improvements in water quality and possibly quantity.

In conclusion, meeting the Wasteload and Load Allocations for parameters besides biocriteria will restore the listed streams to sufficient water quality to support aquatic species without detrimental changes in the resident biological communities.