5.9. Element 9: Water Quality Assessment.

Information for this section contributed by Brad Prior, ODEQ.

Section 303(d) of the Clean Water Act of 1977, as amended by the Water Quality Act of 1987, provides direction for designation of beneficial uses and the limits of pollutants in surface waters.
These beneficial uses provide the basis for the assessment of water quality in the Jackson Creek watershed.

5.9.1. Beneficial Water Uses in Jackson Creek.

The Oregon Department of Environmental Quality (DEQ) designates beneficial uses of all tributaries of the Rogue River Basin, including the Jackson Creek watershed. The beneficial uses identified for Jackson Creek are:

- Industrial Water Supply
- Irrigation and Livestock Watering
- Anadromous Fish Passage, Rearing, and Spawning
- Resident Fish and Aquatic Life
- Wildlife

Of these listed beneficial uses, anadromous fish spawning and rearing and resident fish and aquatic life are most sensitive to degraded water quality. These species require cold, pure, oxygenated water and high quality habitats to support all stages of their life cycles. Once the water quality goals suitable for anadromous fish spawning and rearing and resident fish and aquatic life have been achieved, DEQ generally assumes that all other beneficial uses will be sufficiently protected as well.

5.9.2. Water Quality Parameters.

The principal water quality parameters of concern in this watershed are temperature and bacteria, and the RVCOG and DEQ monitor these parameters regularly. Other parameters (such as dissolved oxygen, sediment, and pH) have been judged to be within acceptable levels, or will be satisfied when temperature and bacteria standards are achieved.

5.9.2.1. Temperature. Stream temperature is influenced by riparian vegetation, stream morphology and hydrology, climate, geographic location, and irrigation practices. While climate and geographic location are outside of human control, the condition of the riparian area, channel morphology and hydrology have been degraded by human land use activities. Specifically, the elevated summertime stream temperatures measured throughout the Jackson Creek watershed result from:

1. Riparian vegetation disturbance that reduces stream surface shading.
2. Channel widening that increases the stream surface area exposed to heat inputs from

solar radiation.

3. Reduced summertime natural flows that may result from loss of saturated riparian and upslope soils that capture and slowly release cold stored water.
4. Return flows of high temperature irrigation water to the natural stream channel.
5. Urban run-off from increase in impervious surface areas in developed areas.

Degradation in the quality and quantity of riparian vegetation (such as has occurred all along the Jackson Creek stream channel) can lead to increased exposure of the water surface to solar radiation and higher stream water temperatures. Changes in channel morphology can also lead to increased stream temperatures, especially channel widening. As a stream widens, the surface area exposed to radiant heat sources and ambient air temperatures also increases, resulting in increased energy exchanged between the stream and its environment. Channel widening often is related to increased bank erosion and sedimentation of the streambed. Altered watershed hydrology can raise stream temperatures as natural instream flows are reduced. Stream water temperature is generally inversely related to natural flow volume; as flows decrease, stream temperatures tend to increase. Also, many land use activities that disturb riparian vegetation or the stream channel affect the connectivity of a stream to groundwater sources. Groundwater inflow tends to cool summertime stream temperatures and augment summertime flows. Reductions or elimination of groundwater inflow will have a warming effect on a stream such as Jackson Creek.

Jackson Creek, along with many other streams in the Bear Creek watershed, has been made an integral part of the irrigation water transport system for agricultural users. Large amounts of water (up to and including the entire stream flow) are repeatedly removed from the channel and replaced immediately downstream with water returned from irrigated fields. This irrigation return flow water, much of which has been allowed to flood over exposed, unshaded fields, is generally warmer than can be tolerated by salmon and other cold-water aquatic life.

5.9.2.2. Bacteria. Coliform bacteria are used as indicators of possible sewage contamination because they are commonly found in human and animal feces. Although they are generally not harmful themselves, they indicate the possible presence of pathogenic (disease-causing) bacteria, viruses, and protozoans that also live in human and animal digestive systems. Therefore, their presence in streams suggests that pathogenic microorganisms might also be present and that water contact might be a health risk. Since it is difficult, time-consuming, and expensive to test directly for the presence of a large variety of pathogens, water is usually tested for coliform organisms instead. Sources of fecal contamination to surface waters include wastewater treatment plants, on-site septic systems, domestic and wild animal manure, and storm runoff. In addition to the possible health risk associated with the presence of elevated levels of fecal bacteria, they can also cause cloudy water, unpleasant odors, and an increased oxygen demand.

A commonly tested fecal bacteria indicator is *Escherichia coli*, which is a single species in the fecal coliforms group. *E. coli* is a species of fecal coliforms bacteria that is specific to fecal material from humans and other warm-blooded animals. Studies conducted by EPA to determine the correlation between different bacterial indicators and the occurrence of digestive system illness at swimming beaches suggest that the best indicator of health risk from recreational water contact in fresh water is the presence of *E. coli.* Therefore, EPA now

recommends *E. coli* as the best indicator of health risk from water contact in recreational waters; in 1997 Oregon changed its water quality standards and began requiring monitoring for *E. coli* bacteria.

Since there are no wastewater treatment plants in the Jackson Creek watershed, the most likely sources of the high bacterial levels in the stream water are manure from wild and domestic animals (including pets and livestock), failing septic systems, runoff from urban areas, leaking or cross-connected municipal sewer systems, irrigation water imported from other subwatersheds, and return flows of irrigation water.

5.9.3. Water Quality Conditions.

DEQ is responsible for designating streams in the State of Oregon which fail to meet established water quality criteria for one or more beneficial uses and filing a report with the US Environmental Protection Agency. This list of "Water Quality Limited Streams" is often referred to as the "303(d) list."

Jackson Creek has been tested for bacteria, dissolved oxygen, nutrients, pH, sedimentation, and temperature, and was listed under 303(d) criteria in 1998 for fecal coliform bacteria (year round) and temperature (summer) from the creek mouth up to its headwaters. The criteria that must be met for these parameters to be in compliance with clean water standards are:[1]

- Bacteria (E. coli) -Beneficial Uses Affected: Water contact recreation
  Standard: (I) A 30-day log mean of 126 *E. coli* organisms per 100 ml based on a minimum of five samples;
  (II) No single sample shall exceed 406 *E. coli* organisms per 100 ml.

- Temperature - Beneficial Uses Affected: Resident fish and aquatic life, salmonid fish spawning and rearing.
  Standards Seven (7) day moving average of the daily maximum shall not exceed 64° F (17.8° C) June 1 through September 30: Spawning through fry emergence October 1 to May 31 or water body specific as identified by ODFW biologists, or unless specifically allowed under a DEQ approved basin surface water temperature management plan.

[1] Oregon Department of Environmental Quality 303(d) list Decision Matrix (P-574).

Figure 5.7. DEQ 303(d) Decision Matrix for Jackson Creek (Jackson Creek mouth to headwaters).

Parameter	Criteria for 303(d) listing	Season	Basis for Listing	Supporting Data or Information	Rationale for Not Listing	Listing Status
Bacteria	Water Contact Recreation; Fecal coliforms standard	Year Round	In 305(b) Report (DEQ 1994); RVCOG (1990)	Annual Average Fecal coliforms data ranging between 386-623 did exceed standard (400) between 1998-1990. (RVCOG 1990)		303(d) listed
Dissolved Oxygen (DO)	Salmonid Spawning Dissolved Oxygen 11mg/L.	October 1-March 31	DEQ Data	DEQ Data Site 402802 RM 1.5 17% (1 of 6) October through March values exceeded spawning dissolved oxygen standard (11 mg/l or 95% saturation with a minimum of 8.7 between 1988-1989 (Cold water fishery, spawning approximately, Oct-Mar)	Did not meet listing criteria	OK Not listed
Nutrients			NPS Assessment Segment 275: moderate, observation (DEQ 1988)		No supporting data or information	Need Data
pH		Fall- Winter-Spring	DEQ Data	DEQ Data (Site 402802; Rm 1.5): 0% (0 of 8) FWS values exceeded pH standard (6.5-8.5) between WY 1989-95	Did not meet listing criteria	OK Not listed
pH		Summer	DEQ Data	DEQ Data (Site 402802; Rm 1.5): 0% (0 of 8) FWS values exceeded pH standard (6.5-8.5) between WY 1989-1995.	Did not meet listing criteria	OK Not listed
Sedimentation			NPS Assessment- segment 275: moderate, data (DEQ, 1988)		No Supporting data.	Need Data
Temperature	Salmonid Rearing 64 F, (17.8 C)	Summer	Bear Creek Temperature Study (ODFW, 1992)	ODFW Data (2 sites: Lower near mouth and Upper): Monthly Average maximums of 75, 76 , 78, 70, 73, 74, no data in July, August, September, October 1992.		303 (d) listed

5.9.4. Findings, and Future Data Needs.

The most recent version of the Oregon 303(d) list shows that Jackson Creek fails to meet water quality standards for temperature 64° F, (17.8° C), and bacteria (fecal coliforms). Jackson Creek does currently meet water quality standards for (1) dissolved oxygen, (2) nutrients, (3) pH, and (4) sedimentation. Values for other water quality parameters for Jackson Creek such as: 1) aquatic weeds or algae, (2) biological criteria, (3) chlorophyl A, (4) habitat modification, (5) flow modification, (6) total dissolved gas, (7) toxics, and (8) turbidity are currently unknown. More data are needed to monitor any changes in the future.