4b Analysis for Cow Creek

The Washington Department of Ecology (Ecology) Integrated Report (IR), which was submitted to EPA in May 2008, has excluded 29 listings for temperature, fecal coliform, dissolved oxygen, and pH in Cow Creek from the 303(d) list and placed these waterbodies in category 4b of the IR. These segments were in various categories on the 2004 IR. Those categories are shown in parentheses after each listing number. If no category is shown, it is a new listing based on new data. The specific listings are as follows:

- Temperature—40634 (5), 40635 (5), 40636 (5), 40637 (5), 40638 (5), 40639 (5), 40640 (5), 48398
- Fecal coliform—45958, 45969, 45990, 40661 (1), 40662 (5), 46020
- Dissolved oxygen—40643 (5), 40644 (5), 40645 (5), 40646 (5), 40647 (5), 40648 (5), 40649 (5), 47908, 47909
- pH—51176, 51177, 40653 (1), 40654 (1), 40656 (1), 40657 (1)

Ecology's basis for excluding these waterbodies from the 303(d) list is outlined in this evaluation.

Identification of Segment and Statement of Problem Causing Impairment

Cow Creek is located in Adams County in eastern Washington. It originates from Sprague Lake and flows 50 miles south through a region called the Channeled Scablands to its confluence with the Palouse River. Great ice age floods created the region's unique landscape of channels, coulees, and potholes. The upper portion of Cow Creek flows between basalt plateaus and occasionally forms small lakes. Cow Creek is an oasis of flora and fauna in this arid country.

The impaired segments are:

- 40638, temperature, on Cow Creek between river kilometers 0.9 and 1.6.
- 40661, fecal coliform, on Cow Creek between river kilometers 0.9 and 1.6.
- 40647, dissolved oxygen, on Cow Creek between river kilometers 0.9 and 1.6.
- 40656, pH, on Cow Creek between river kilometers 0.9 and 1.6.
- 40635, temperature, on Cow Creek between river kilometers 18.2 and 19.2.
- 45969, fecal coliform, on Cow Creek between river kilometers 18.2 and 19.2.
- 40644, dissolved oxygen, on Cow Creek between river kilometers 18.2 and 19.2.
- 40653, pH, on Cow Creek between river kilometers 18.2 and 19.2.
- 40639, temperature, on Cow Creek between river kilometers 28.9 and 30.9.
- 46020, fecal coliform, on Cow Creek between river kilometers 28.9 and 30.9.
- 40648, dissolved oxygen, on cow Creek between river kilometers 28.9 and 30.9.
- 40657, pH, on Cow Creek between river kilometers 28.9 and 30.9
- 40640, temperature, on Cow Creek between river kilometers 43.2 and 45.0.
- 40662, fecal coliform, on Cow Creek between river kilometers 43.2 and 45.0.
- 40649, dissolved oxygen, on Cow Creek between river kilometers 43.2 and 45.0.
- 47908, dissolved oxygen, on Cow Creek between river kilometers 47.1 and 50.3.
- 51176, pH, on Cow Creek between river kilometers 47.1 and 50.3
- 40637, temperature, on Cow Creek between river kilometers 50.3 and 50.5.
- 40646, dissolved oxygen, on Cow Creek between river kilometers 50.3 and 50.5.

- 40636, temperature, on Cow Creek between river kilometers 60.4 and 60.9.
- 45990, fecal coliform, on Cow Creek between river kilometers 60.4 and 60.9.
- 40645, dissolved oxygen, on Cow Creek between river kilometers 60.4 and 60.9.
- 40654, pH, on Cow Creek between river kilometers 60.4 and 60.9.
- 48398, temperature, on cow Creek between river kilometers 72.6 and 74.6.
- 45958, fecal coliform, on Cow Creek between river kilometers 72.6 and 74.6.
- 47909, dissolved oxygen, on Cow Creek between river kilometers 72.6 and 74.6.
- 51177, pH, on Cow Creek between river kilometers 72.6 and 74.6.
- 40634, temperature, on Cow Creek between river kilometers 74.8 and 76.9.
- 40643, dissolved oxygen, on Cow Creek between river kilometers 74.8 and 76.9.

The impaired segments in the upper portion of the watershed are shown on the map on page 7.

Monitoring data for the impaired segments is from 1997 through 2005. The highest daily temperature recorded during this time was 28.6 degrees Centigrade on July 29, 2004 in two segments—between river kilometers 60.4 and 60.9 and between river kilometers 72.6 and 74.6. The highest fecal coliform count recorded was 16,000 fecal coliform units/100 mL, on June 9, 2004 between river kilometers 0.9 and 1.6. The lowest dissolved oxygen recorded was 0.4 mg/L on August 25, 2004 and November 10, 2004 between river kilometers 72.6 and 74.6. The highest pH recorded was 9.9 on October 5, 1999 between river kilometers 47.1 and 50.3. The lowest pH recorded was 5.3 on August 25, 1998 and September 13, 2002 between river kilometers 72.6 and 74.6. As can be seen from the data, water quality problems were occurring throughout the watershed.

As the name would suggest, the Cow Creek watershed is cattle country. Livestock from some of the largest ranches in Washington graze vast areas. Unfortunately, the creek is the primary water source and cattle tend to spend a lot of time in the stream corridor. Trampling and overgrazing have damaged or removed many of the trees and shrubs along the stream banks. The creek has consistently failed to meet state water quality standards for temperature, fecal coliform, and dissolved oxygen, and more recently, for pH.

Livestock manure is a likely cause of the low dissolved oxygen and pH violations. Manure uses oxygen and lowers pH during decomposition by instream bacteria. Nutrients in the manure and from fertilizers stimulate excessive plant growth in the creek. This problem is exacerbated by high stream temperatures and an overabundance of sunlight exposure. Aquatic plants use oxygen for respiration at night and can raise the pH of the water during photosynthesis during the day. Controlling the excessive growth is key to meeting pH and dissolved oxygen criteria and improving the health of the aquatic community.

Description of Pollution Controls and How They Will Achieve Water Quality Standards

Water Quality Target

The designated uses for the temperature impaired segments in Cow Creek are spawning, rearing and migration, and the temperature criterion is 17.5 degrees Centigrade, year-round. Dissolved oxygen shall not drop below a lowest 1-day minimum of 8.0 mg/L. pH shall be within the range of 6.5 to 8.5 with a human-caused variation within the above

range of less than 0.5 units. The designated use for the fecal coliform impaired segments is primary contact recreation. Fecal coliform levels must not exceed a geometric mean value of 100 colonies/100mL, with not more than 10 percent of all samples (or any single sample when less than ten sample points exist) exceeding 200 colonies/100mL.

Controls that will achieve water quality standards

The Department of Ecology's Eastern Regional Office has established a Livestock and Water Quality Program that uses a unique collaborative approach to address livestock-related problems. Instead of using the standard process that starts with a Category 5 listing, establishing a TMDL for the stream, writing an implementation plan, and finally getting to actual implementation, this strategy goes straight to implementation. The strategy is applied in watersheds in which the cause of a water quality impairment is clear.

Ecology encourages implementation of a wide variety of best management practices, however, a primary focus of the program has been to restore degraded riparian corridors and eliminate unlimited animal access to streams. Healthy riparian areas can improve water quality and stream health in multiple ways, which make them a particularly valuable and cost-effective management practice. Healthy riparian areas

- Slow bank erosion by holding soil in place during periods of high water.
- Reduce flood damage and sedimentation by slowing runoff and capturing the sediment that would otherwise be carried downstream.
- Help keep water cool and reduce light exposure in summer by shading the stream.
- Improve water quality by capturing sediment, nutrients, pesticides, pathogens, and other pollutants before they reach the stream.
- Enhance summer stream flow by improving water infiltration and storage.
- Create fish and wildlife habitat.
- Limit livestock manure inputs to the creek and riparian areas.

Ecology has a three-step riparian restoration strategy, which allows the department to efficiently apply resources to priority problem areas. The first step is to address the source of degradation – unlimited livestock access to streams and winterfeeding operations in close proximity to the riparian corridor. Ecology relies primarily on livestock exclusion, and off-stream water supply to restrict livestock access to the riparian area. In implementing this BMP, Ecology uses NRCS riparian buffer standards, which requires a minimum 35 buffer between the livestock fence and the mean ordinary high water mark of the nearest stream bank. In many cases, the buffer width may be larger depending on the stream and site conditions.

By first addressing livestock access, Ecology seeks to abate the primary pollution sources—livestock in the stream, eroded streambanks, increased runoff, increased sedimentation, and subsequent transport of fecal matter. As vegetation naturally returns in the riparian area, site conditions become stabilized and the pollution sources are dramatically reduced. Also, this approach works to arrest morphological changes to the entire stream that are induced by erosion and sedimentation.

Ecology has spent much of its efforts and resources implementing this first step, in large part, because we have taken a holistic, watershed approach to protecting streams. By first

addressing the primary sources of pollution and geomorphic change, Ecology can establish the necessary site conditions for successful restoration. Moreover, Ecology ensures that, first and foremost, the root problems are addressed for *the entire stream*, before resources are focused on site or segment specific restoration.

The second step occurs after a majority of site conditions have been stabilized, and the stream's entire geomorphic integrity is no longer jeopardized by the adjacent management practices. Ecology conducts a reach by reach assessment to determine the appropriate trees and shrubs to be used for restoration. Ecology is currently partnering with universities to study the genetic make-up of local riparian seed banks. Ecology then establishes nurseries to propagate the site appropriate plant material. In some cases federal programs require revegetation as part of the cost-share program, and so restoration work occurs simultaneously with livestock exclusion.

The third step is to work with local land owners to promote continuous and proper management of upland grazing lands.

Ecology teams with conservation districts, local governments, and landowners to provide technical assistance and funding for implementation of best management practices. Ecology uses a traditional regulatory process only when collaborative efforts fail. Chapter 90.48 RCW gives Ecology the authority to take enforcement actions against nonpoint polluters. We have, in fact, issued enforcement orders to two landowners in watersheds in which we are implementing the Livestock and Water Quality Program.

The result of these partnerships has been the implementation of best management practices at hundreds of sites where water quality and fish habitat issues exist. By using a collaborative strategy, backed up by enforcement when necessary, Ecology has been able to create relationships and build trust with rural residents while improving water quality.

In the Cow Creek watershed, work with landowners began in 2003. Thirty two miles of riparian buffers were installed and ten additional miles are under construction. Most of the fencing was installed between 2006 and 2008. The creek was fenced to protect it from livestock, and off-stream water sources were developed. Thousands of native trees and shrubs were planted in the stream corridor to help stabilize banks and shade the stream. Buffers are constructed using Natural Resource Conservation Service standards, which require a minimum width of 35 feet. For buffers installed with state or federal financial assistance, we require an agreement with the landowner stipulating that the buffer and fence will be maintained for at least 10 years.

As shown on the map on page 7, fencing was generally installed adjacent to or upstream of the impaired segments. This was also done in the lower portion of the watershed, for which we presently do not have a map. We have also fenced portions of the stream where there are presently no Category 5 listings, but where there was unrestricted cattle access to the stream. Riparian buffers are left to revegetate naturally in those areas in which there is enough live native vegetation left to recover. In all other areas we are installing buffers by planting native plants.

Our experience has shown that it is not always necessary to create buffers on entire creeks in order to achieve compliance with standards. For instance, in this area, which is

largely arid, not all riparian areas can support trees and shrubs. Also, many small streams pass through areas of ravines and steep topography, which naturally limit animal access and at the same time shade the stream. There are also some areas where cattle are not grazed, so the riparian areas are in good shape now.

One thing we expect to learn through this program is exactly how much riparian restoration is required to get these streams into compliance with water quality standards and keep them in compliance. The intent of the Livestock and Water Quality Program is to restore the watershed so that all streams consistently comply with standards for all pollutants. We will continue installing buffers and other management practices until this goal is met.

Since the riparian buffers were installed, native vegetation is returning. Adams Conservation District, which collects water quality monitoring data twice a month, has found that fecal coliform concentrations and temperatures are starting to show improvement.

As the amount of fecal coliform delivered to the stream is reduced with healthy riparian corridors, we expect minimum dissolved oxygen concentrations and pH levels to meet water quality criteria. One cause of low dissolved oxygen and pH violations is livestock manure. Manure uses oxygen and lowers pH during decomposition by instream bacteria. Nutrients in the manure and from fertilizers stimulate excessive plant growth in the creek. This problem is exacerbated by high stream temperatures and an overabundance of sunlight exposure. Aquatic plants use oxygen for respiration at night and can raise the pH of the water during photosynthesis during the day. Controlling the excessive growth is key to meeting pH and dissolved oxygen criteria and improving the health of the aquatic community.

Description of requirements under which pollution controls will be implemented
It is Ecology's best professional judgment that the pollution controls that have been installed will result in the water quality standards being met. Maintenance of these controls has been ensured through 10-year landowner agreements that were established as part of the funding agreements for these projects.

Estimate or Projection of Time When Water Quality Standards Will be Met

It will take time for the riparian corridor to fully recover and for the stream to re-establish its natural geometry. Ecology estimates that the riparian buffers will have grown enough to be fully effective in 10 years, so Cow Creek will be meeting standards for temperature, fecal coliform, dissolved oxygen, and pH throughout the entire watershed by 2017.

Schedule for Implementing Pollution Controls

As described earlier in this report, Ecology has worked with the conservation district, local governments, and landowners to implement a variety of best management practices in the Cow Creek watershed. It is our best professional judgment that this work will remedy the pollution problems in the impaired segments. Even so, we are planning additional work in the watershed. Cattle producers are working to improve overall range health by cross fencing rangeland and placing water tanks in strategic locations. This can

help to ensure that livestock utilize more of their range and do not overgraze. This promotes healthier grass and improved forage. Because it is our intention to restore the entire watershed and to prevent future pollution problems, we will be using monitoring data to track water quality improvements and to identify any new problem areas so they can be addressed. It will be an on-going process to get water bodies into compliance and to keep them in compliance.

One other issue within the Cow Creek watershed is the invasion of non-native carp. During spawning season, these fish stir up sediment and cause water quality problems. It has been a difficult problem to solve, but landowners are currently working with state agencies in an effort to control the invader. Ecology's livestock and water quality program will continue to have an on-going presence in the watershed, and will continue working to achieve compliance with state water quality standards.

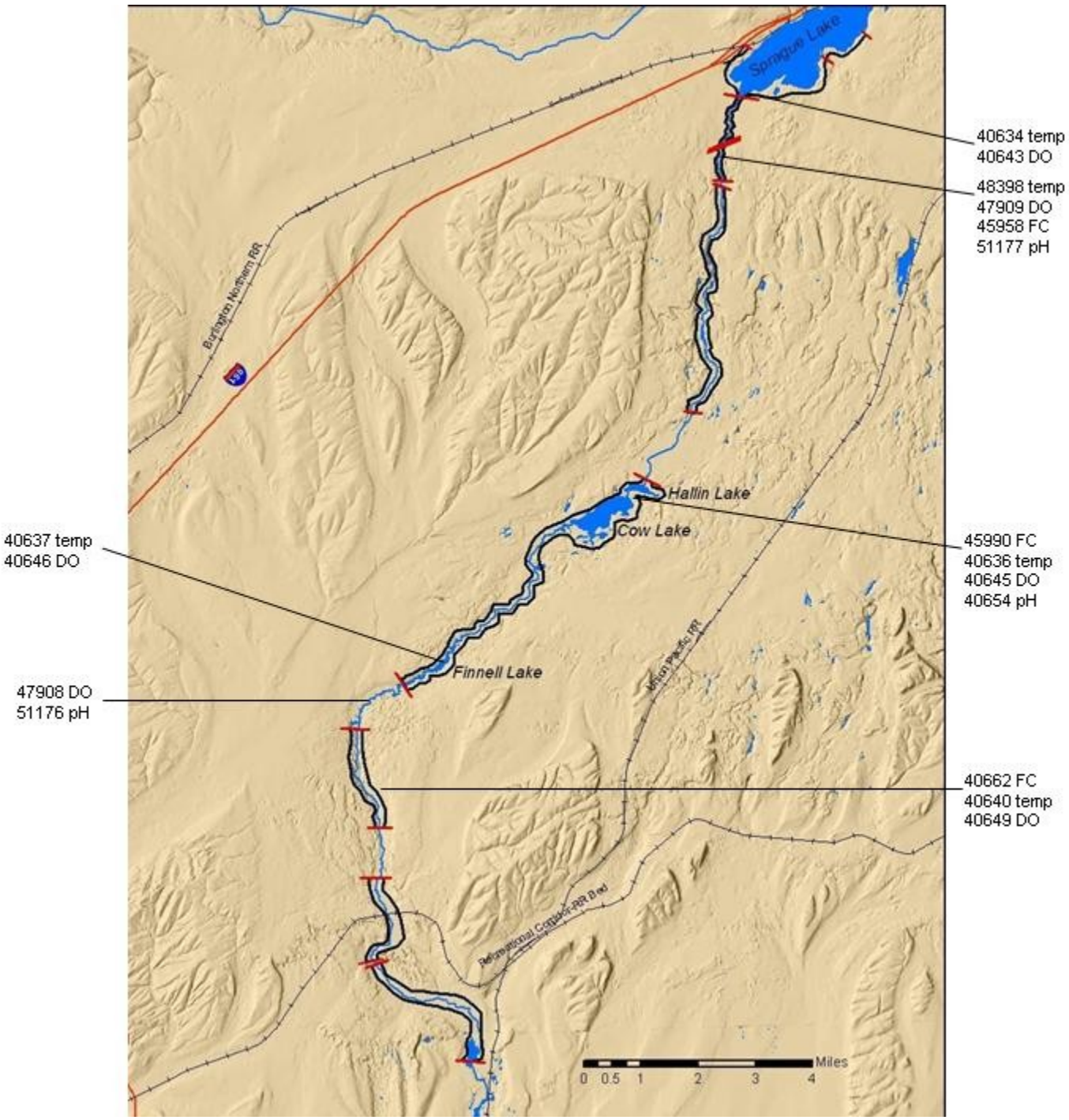
We will use monitoring data and evidence of additional work completed in this watershed to determine whether these listings will stay in Category 4b in the next Water Quality Assessment.

Monitoring Plan to Track Effectiveness of Pollution Controls

The Adams County Conservation District collects water quality data twice a month in Cow Creek to establish whether these projects are improving water quality and overall stream health. Monitoring data can also help to identify additional problem areas that should be addressed. Monitoring results will be reported to the public and EPA through Ecology's IR report development process. Monitoring/Capture of stream miles planted and growth/survival of riparian vegetation should also be recorded at some regular time period.

Commitment to Revise Pollution Controls as Necessary

Ecology will maintain a presence in the Alpowa Creek watershed to ensure that water quality continues to improve. We fully expect the Eastern Regional Office livestock and water quality program to achieve compliance with water quality standards. However, if it does not, Ecology will work with the conservation district, local governments, and landowners to determine other controls that could be used to achieve compliance.



Map shows locations of fencing installed in the upper portion of Cow Creek. The fencing is shown by black lines, which are not to scale. In areas in which some riparian vegetation was intact and expected to recover once cattle were removed, we are depending on natural revegetation. In all other areas, riparian buffers were installed by planting native plants. Part of the project is to continually assess the condition of the buffers and to plant or replant those that are not recovering quickly enough.

Category 4b listings are labeled by listing identification number and pollutant.