Snake River Watershed Plan

Executive Summary

The Snake River is the primary eastern tributary to the Blue River in Summit County Colorado. Much of the eastern edge of the Snake River watershed is along the west side of the Continental Divide. The Snake River watershed drains a heavily mineralized part of the central Rocky Mountains, an area that was heavily mined in the late 1800's and has had some ongoing mining related activities since then. The Snake River and several of its tributaries are on the Colorado 303(d) listing as streams that do not meet water-quality stream standards due to low pH and high concentration of four trace metals: dissolved cadmium, copper, lead and zinc. Much has been done to study the problems in the watershed, beginning at least in the early 1970s. Most of this work has focused in the tributary Peru Creek, which is home to the largest, longest serving mine in the watershed, the Pennsylvania Mine. This Mine has been targeted as the largest source of anthropogenic pollution in the watershed since the early-1970s studies. The Snake River Watershed Plan has been developed in an attempt to put the overall problem in some context, to summarize both the problems that exist and the work that has been and is being done to solve the water-quality problems in the watershed, to identify and prioritize the numerous sources of water-quality degradation and to study what successful remediation of the "most significant" water quality degrading sites might mean for the watershed.

The relevant watershed data indicate that the water-quality problems in the basin are a combination of natural "acid-rock drainage" and anthropogenic, mine related water-quality degradation. Parts of the upper watershed, particularly the upper Snake River and Cinnamon Gulch and Warden Gulch (tributaries of Peru Creek) are heavily impacted by natural water-quality degradation associated with the geology of the subwatersheds. The available data are not sufficient to definitely determine the relative contribution of the natural and anthropogenic sources watershed wide. Furthermore, this issue is complicated by recent water-quality data that show higher levels of trace metals in the water at most of the sampling sites in the watershed (post 2006). Interpreting this increase in metals concentrations is one of the ongoing projects in the watershed. Resolving and understanding this increase is critical to implementation of this Plan, because if the basin water quality is deteriorating naturally, for some yet undetermined reason, implementation of this Plan to remediate the most damaging man-made mining related sites, will not have as much impact as this Plan suggests.

This Plan identifies ten "Priority One" potential remediation-project sites that are significantly degrading the water-quality in the watershed. At each selected site, an estimate was made of the contribution of annual zinc load from that site. The Plan then proposes Best Management Practices (BMPs) at each of these sites and estimates the level of removal of zinc that might be possible if remediation were implemented. The estimated reduction in dissolved-zinc loads is about 18,900 lbs/y through implementation of these Priority One remediation projects. The Plan then calculates the potential water quality improvement that might occur at key stream locations in the watershed. The results of this assessment indicate that even if these ten sites were remediated, water-quality standards in the Snake River at Keystone, the end point for purposes of this Plan, would not be attained. However, water

quality standards (in terms of zinc concentrations) would be nearly met. Overall improvement in the lower portions of the watershed would be significant and might lead to improvement in the fishery in the lower basin above the confluence with the North Fork Snake River (NFSR). The Snake River above the NFSR and below Peru Creek does not sustain fish at this time.

This Plan should be considered a dynamic, working document with anticipated future revisions and enhancements. Consider it housed in a three-ring binder, so it can be modified as more data are collected, more data-assessment studies are completed, and initial remediation activities occur. The Plan has taken the available data and used it to the maximum to attempt to help understand the relationship between natural and anthropogenic sources. The remediation designs inherent in the analysis carry considerable uncertainty. More water-quality data are needed watershed wide, particularly tied to flow measurement to allow a better understanding of loading levels. Expectations need to be tempered until the watershed is better understood and some remediation has occurred. Nevertheless, there are a number of projects that need remediation and will have a positive impact on water-quality. Currently, those professionals that are involved in the watershed to improve its water-quality, and there are many, need to continue their investigations, in order to better characterize the watershed, along with the implementation of initial remediation projects.