

Use Attainability Analysis of Sulphur Creek Sandoval County, New Mexico



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Introduction

Sulphur Creek has a drainage area of 38.0 square miles, mostly within the Valles Caldera National Preserve in the Valles Caldera of the Jemez Mountains. The perennial reach of this stream arises near a series of sulfur springs and flows southward for approximately three miles to its confluence with Redondo Creek. Redondo Creek discharges to San Antonio Creek, which discharges to the Jemez River and from there into the Middle Rio Grande. Sulphur Creek is currently classified in Segment 20.6.4.108 of the New Mexico water quality standards. This segment includes the Jemez River and all its tributaries upstream from State Highway 4 near the town of Jemez Springs and the Guadalupe River and all its tributaries. Classified uses for this segment are domestic water supply, fish culture, high quality coldwater fishery, irrigation, livestock watering, wildlife habitat and secondary contact.

When New Mexico streams were originally assigned to categories, little water quality data were available for many of the smaller headwater streams. It was assumed at the time that waters at similar elevations in a given watershed would have the same uses and essentially the same water quality. Thus all higher-elevation streams were classified as some subcategory of coldwater fishery. Sulphur Creek was assigned to the current segment 20.6.4.108 (segment 2-106 prior to 1995 and segment 2106 between 1995 and 2000) without the collection or review of any water quality data or even a site visit. The first water quality sampling of this stream occurred during the August 1987 survey of the Jemez River watershed conducted by Potter in cooperation with Jemez Pueblo. Water quality data collected during the 1987 survey and subsequent surveys in 1998 and 2001 reveal that the water quality, particularly pH values are well below the acceptable range for any subcategory of fishery, fish culture, domestic water supply or irrigation.

Some threatened and endangered species are found in the Jemez mountains including the Mountain Plover, *Charadrius montanus*, and Jemez Mountains Salamander, *Plethodon neomexicanus*. However, it is unlikely that these organisms would utilize Sulphur Creek, given its low pH values. With the exception of the acid tolerant benthic organisms noted in this text, no aquatic organisms were observed in Sulphur Creek during the course of the 1998 and 2001 water quality surveys. The Mountain Plover is a grassland species so would not be found in the forests, wooded riparian and bogs of the Sulphur Creek drainage.

The Sulphur Springs are the result of the geologically recent (< 50,000 years before present) eruption of the volcano that created the Jemez Mountains and resulted in numerous thermal springs. This document is intended to support a use modification for Sulphur Creek because this geological influence produces natural levels of pH that prevent attainment of the designated fishery, domestic water supply, fish culture and irrigation uses.

Results of Surveys:

Water quality data collected during the 1987 intensive survey by Potter are presented in Table 1. Results of this survey indicated that Sulphur Creek was highly acidic, with the pH during the four-day intensive water quality survey ranging from 4.31 to 4.52. An additional measurement taken in October 1987 yielded a pH of 4.27.

In 1998 a three-season intensive survey of the Jemez River watershed was conducted by the Surface Water Quality Bureau. The resultant water quality data, collected from station 1, are presented in Table 2. Measured pH values range from 3.03 to 7.77. All pH measurements were below 5.5 except for a measurement of 7.77 taken on July 14, 1998. This sample was accompanied by field notes from the principal investigator indicating that a heavy rain event had occurred just prior to sampling and that the creek was greatly swollen with runoff and rising.

USGS data from historic sampling and from samples collected concurrently with the 1998 survey are presented in Table 3. NMED samples were collected only from Station 1, while USGS collected samples from both stations 1 and 2. The single measurement for pH taken by USGS at station 1 was 5.1. Measurements of pH taken from station 2, which is much closer to the springs, ranged from 2.6 to 4.0. A map of Sulphur Creek is presented in Figure 1, showing the stations for which data are available. Photos of Sulphur Creek at Station 1 are presented in Figures 2 and 3.

In 2001 an intensive survey was made between May and October by the Surface Water Quality Bureau. The resultant water quality data collected at a station located at the Santa Fe National Forest boundary are presented in Table 4. Ten samples during this period revealed pH levels ranging between 2.16 and 3.73.

A review of water quality data collected from the source springs prior to 1965 indicate that pH varies from 1.4 to 3.1 (Summers 1965). Samples collected from the source springs between 1965 and 1974 indicate that pH varies from 1.4 to 2.4 (Summers 1976). USGS measured the discharge of Sulphur Creek from November 1981 through September 1985. The following table presents the monthly averages of daily flow of Sulphur Creek at Station 1 during that period.

Sulphur Creek
Average Daily Flow
(Gage 08319950)

Month	ft ³ /sec
January	0.90
February	1.47
March	5.98
April	22.53
May	14.37
June	4.16
July	2.02
August	2.15
September	1.41
October	1.49

November	1.09
December	0.86

As part of the 1998 survey of the Jemez watershed benthic samples were collected from Sulphur Creek. A preliminary report was prepared concerning the benthic community (Appendix A). The conclusion drawn from the analysis of the benthic community is that “[g]iven the low benthic standing crop it is extremely unlikely that this highly acidic stream could support any fishery.”

Causes of Impairment:

Surveys reveal that Sulphur Creek receives no discharges except for runoff during storm events. There are no active mining, industrial, municipal or other point source dischargers that impair or influence the pH of Sulphur Creek. Implementation of cost-effective and reasonable best management practices for nonpoint source control would not bring Sulphur Creek into compliance with the water quality standards because the source of pH impairment is a natural geologic condition.

Use Support Discussion:

Fish culture & high quality coldwater fishery are currently designated uses in segment 20.6.4.108. As has previously been discussed, the preliminary report prepared concerning the benthic community (Appendix A) concludes from the analysis of the benthic community that “[g]iven the low benthic standing crop it is extremely unlikely that this highly acidic stream could support any fishery.” This conclusion would apply to fish culture as well as the fishery use itself, and the fish culture use is not an existing use as defined by 40 CFR 131.3. A limited benthic aquatic life community does exist in these waters.

Domestic water supply is currently designated as a use for these waters. However, the surveys have concluded that this creek is not used as a domestic water supply by any individuals or households. Domestic water supply is therefore not an existing use as defined by 40 CFR 131.3. It is also unlikely that domestic water supply would be an attainable use due to its corrosive effects on plumbing.

Irrigation is currently designated as a use for these waters. Surveys have concluded that there is no existing irrigation use as defined by 40 CFR 131.3. In addition, EPA guidance indicates that to avoid undesirable effects in irrigation waters, the pH should not exceed a range of 4.5 to 9.0. Since the natural pH of the waters of Sulphur Creek are generally below 4.5, irrigation does not appear to be an attainable use.

Livestock watering is currently designated as a use for these waters. There is no evidence regarding the presence or absence of livestock watering use for Sulphur Creek. However, livestock watering is a use that is generally applied to all surface waters of New Mexico, and the use is one that should be included unless it is demonstrated that livestock cannot access the water or will not consume the water when accessible.

Secondary contact is designated as a use for these waters. Because the area is popular with hikers it should be presumed that some secondary contact may take place and that a secondary contact use is appropriate. According to EPA guidance (blue book), for most bathing and swimming waters, eye irritation is minimized and recreational enjoyment enhanced by maintaining the pH within the range of 6.5 and 8.3 except for those waters with a low buffer capacity where a range of pH between 5.0 and 9.0 may be tolerated. No primary contact use was documented as an existing use during the surveys, and due to the small size and low flow of the stream during most of the year, and because the natural pH of these waters is generally outside the EPA guidance ranges, primary contact use is not expected, though an upgrade to primary contact use could be considered if it is demonstrated to be an existing use at some later date. The present designation of secondary contact is therefore proposed to be maintained.

Conclusion:

Due to the natural pH level of Sulphur Creek, the only uses that appear to be existing or attainable are limited aquatic life, wildlife habitat, livestock watering and secondary contact. New Mexico therefore proposes to establish Sulphur Creek as a separate stream segment with those designated uses and criteria sufficient for their protection, and to remove the domestic water supply, fish propagation, high quality coldwater fishery and irrigation uses as not existing and not attainable due to the natural pH level of the stream.

References

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