Section 319
NONPOINT SOURCE PROGRAM SUCCESS STORY
Alaska

Restoring Mining Sites, Riparian Areas and the Stream Channel Reduces Turbidity in Slate Creek

Waterbody Improved

Hard rock mining activities (excavation of rock and ore) along Alaska's Slate Creek resulted in reduced sinuosity (a measure of the curve of a river; a river with higher sinuosity may support a greater diversity of aquatic species), a nonfunctioning floodplain, open pits and loose-sediment mining waste piles that reduced riparian function. Erosion of unstable areas created high levels of turbidity that violated water quality standards, prompting the Alaska Department of Conservation (ADEC) to add a 2.5-mile segment of Slate Creek to the Clean Water Act (CWA) section 303(d) list in 1994. In 1997-1998 and 2010, the National Park Service (NPS) and other partners implemented projects to restore damaged portions of Slate Creek by removing mining debris, removing tailings from the floodplain, and restructuring and replanting the floodplain. Recent monitoring shows that the creek now meets the turbidity water quality standard. As a result, ADEC has proposed to remove Slate Creek from the 2012 CWA section 303(d) list for its turbidity impairment; it will remain listed as impaired for metals.

Problem

Slate Creek (Figure 1), a tributary of Eldorado Creek, is in Denali National Park and Preserve in south central Alaska's Kantishna Hills. In the early 1900s, individual miners flocked to streams in the Kantishna Mining District, including Slate Creek, to seek their fortunes. The discovery of antimony (a metal) deposits along Slate Creek led to hard rock mining in the watershed, leaving behind open pits and surface cuts. During the 1970s and 1980s, miners used heavy equipment to excavate and transport materials. The companies left long rows of eroding tailing piles (waste materials produced from mining extraction processes) in the floodplain, as well as eroding stream banks that remained devoid of vegetation. All mining in Slate Creek ceased in 1983 after the area became part of the Denali National Park and Preserve, but the mined areas remained damaged.

Eroding sediment from tailing piles and unvegetated areas generated high levels of turbidity in Slate Creek. Alaska's water quality standard requires that turbidity not exceed 5.0 nephelometric turbidity units (NTU) above natural conditions when the natural turbidity is 50 NTU or less. Data collected downstream of the mined areas in 1983 and 1984 showed turbidity levels ranging as high as 39 NTU. The natural background level of turbidity in Slate Creek is between 1 NTU and 3 NTU. On the basis of these data, combined with best professional judgment concerning ongoing disturbances from past mining, ADEC added a 2.5-mile segment of Slate Creek to the 1994 Clean Water Act (CWA) section 303(d) list as impaired for turbidity.

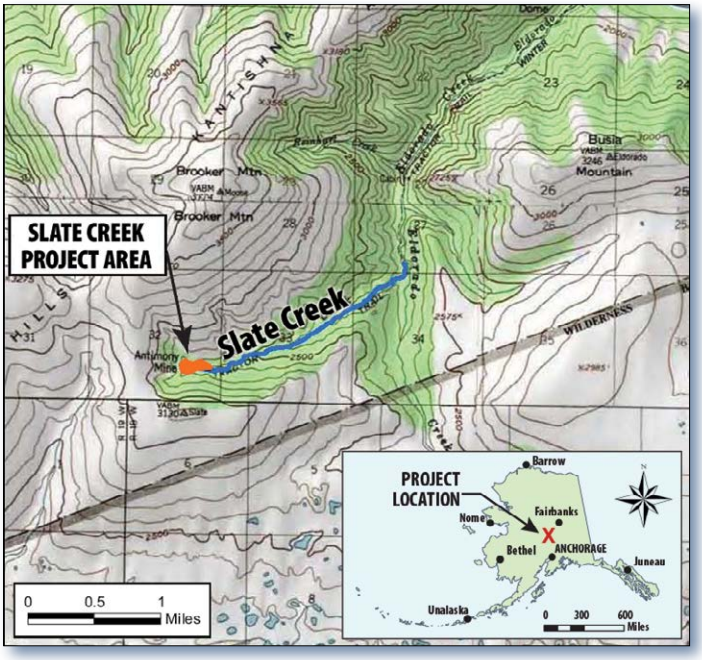

Figure 1. Slate Creek flows through Alaska's Denali National Park and Preserve.

Project Highlights

Slate Creek flows within the present-day boundaries of Denali National Park and Preserve. Congress created the park in 1917 as Mt. McKinley National Park. In 1980 Congress approved the Alaska National Interest Lands Conservation Act, which enlarged the park to 6.1 million acres and renamed it Denali National Park and Preserve. Because the Kantishna Mining District was enveloped by the expansion of the national park, mining slowed after 1980. A court-ordered Kantishna Mining District-wide mining injunction went into effect in 1985, pending an environmental impact statement study. After that study was completed in 1990, the NPS proceeded to acquire many valid mining claims through a federal takings process (reimbursing claim holders for the mineral value of their claims). As the NPS acquired the mined lands, the agency evaluated each site for possible restoration activities.

The NPS developed a waterbody recovery plan for Slate Creek in 1997 and began restoring four acres of disturbed upland and stream channel areas near an old antimony mine site. In 1997–1998 the NPS used tailings to reconstruct a portion of the floodplain and created an anoxic drain with geotextiles and 25,000 tons of limestone rock to intercept groundwater flow and buffer acid drainage from a small open mining pit. The NPS implemented an extensive restoration project in the summer of 2010. The project included moving an erosion-prone extended tailings pile away from the floodplain; installing erosion control materials; removing old mining and reclamation debris; re-contouring the floodplain; breaking up the surface of an old road to prevent motorized vehicle access; seeding, liming and fertilizing remaining tailing piles to establish vegetative cover and prevent erosion; and planting willow cuttings. The NPS also relocated a portion of the stream away from an area containing pit mines, constructing a new 400-foot-long stream channel using fabric-encapsulated stream bank treatments (Figure 2). The Slate Creek restoration project was completed in August 2010 (Figure 3).

Results

The restoration efforts have led to a decline in erosion and in the turbidity levels in Slate Creek. Substantial riparian revegetation has occurred along many of the disturbed reaches, resulting in increased bank stability and a lower erosion potential. Monitoring data collected by the U.S. Geological Survey (USGS) in Slate Creek from 2008 to 2011 show that turbidity levels consistently meet the standard of less than 5 NTU above background (Table 1). The creek's turbidity levels are now comparable to those of other streams studied by USGS in the Kantishna area. On the basis of these data, ADEC has proposed to remove the 2.5-mile segment of Slate Creek from the state's 2012 list of impaired waters for turbidity impairment.

Figure 2. A new section of the Slate Creek stream channel, under construction.

Figure 3. The new Slate Creek stream channel, shortly after project completion.

Table 1. Slate Creek Turbidity Data (Summer 2008–2011)

Date	Turbidity NTU
7/13/2008	< 2
8/21/2008	< 2
9/11/2008	< 2
6/2/2009	14[a]
7/28/2009	2.1
8/11/2009	5.3
9/9/2009	< 2
6/1/2010	4.4
7/13/2010	4.1
9/7/2010	< 2
6/7/2011	< 2
7/21/2011	< 2

[a] Single elevated turbidity reading attributed to disturbance of stream bottom while sampling.

Water quality monitoring data collected in 2008–2011 below the former antimony mine site showed that Slate Creek violates water quality standards for the metalloids arsenic and antimony, prompting the ADEC to propose adding Slate Creek to the state's 2012 list of impaired waters for metals. The NPS and its partners will continue working in the watershed to address the arsenic and antimony impairments.

Partners and Funding

The NPS implemented restoration efforts, worked with the USGS to track the progress of the water quality recovery, and shared the data with ADEC and the U.S. Environmental Protection Agency. The NPS provided $2.5 million to Denali National Park and Preserve in 2008–2010 for large-scale restoration efforts in the Kantishna Mining District; approximately $821,000 of that amount supported the reclamation efforts in Slate Creek.

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For additional information contact:

Chandra McGee, Alaska Department of Environmental Conservation
907-451-2140 • chandra.mcgee@alaska.gov

Denny Capps, Denali National Park and Preserve
907-683-9598 • denny_capps@nps.gov