Erosion and Sedimentation Control (Hydrology): Straight Creek Demonstration Project

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Contract Period: 1992 to 1995
NPS Funding: $121,718
Matching Funds: $86,373 plus maintenance costs

As part of a comprehensive watershed plan for Straight Creek – essentially the I-70 corridor from the Eisenhower Tunnel to the Town of Dillon – the Colorado Department of Transportation (CDOT), with assistance from the Colorado Department of Public Health and Environment (CDPHE), utilized an NPS grant for a demonstration project to evaluate best management practices (BMPs) to reduce accelerated sediment loading.

The Straight Creek watershed is approximately 6 miles long and 2.5 miles wide with a drainage area of about 12.8 square miles. The upper area of the watershed is alpine tundra with an elevation reaching 13,000 feet. The terrain is rugged and naturally erodible. The weather is often extreme, marked by strong winds, a short growing season, excessive evaporation and an annual snowfall of 26 feet. The lower portion of the watershed is subalpine vegetation and heavily forested. At the town of Dillon (9,300' elevation), Straight Creek joins the Blue River, a "Gold Medal" trout stream.

During the early 1970s, significant cut and fill slopes were created on grades approaching seven percent to accommodate the four lanes of I-70. Since the opening of the Eisenhower Tunnel in 1979, traffic has increased steadily.

Straight Creek is the primary water supply for the town of Dillon. The steep grades, erodible soils, increased traffic and highway sanding operations all contribute to accelerate sediment loading and serious stream degradation.

Significant amounts of material build up on the westbound lanes of I-70 near the tunnel over the winter. During spring runoff, these materials are washed into culverts leading to Straight Creek.

Headwaters of Straight Creek

The goal was to create a BMP for the westbound ditch section to slow the rate at which sand and sediment entered the system. Check dams were selected as the best solution. The purpose of a check dam is to decrease the rate of water flow, allowing sediments to settle behind the dam.

CDOT considered various designs for check dams taking into consideration federal highway requirements, environmental conditions, maintenance and safety issues. The result was a modified silt fence of fabric between two unistrut posts as well as a top and bottom rail. The check dams were 14' wide and two feet high.

Check dams along Interstate 70

Material build up behind check dams

The primary goal of the demonstration project was to collect and remove 10 percent of the sanding material placed on this portion of the highway during the winter months. Maintenance crews estimated the amount of material removed as they cleaned out the check dams during the summer months.

Three test sections were selected for construction for a total distance of 2.3 miles. In order to create a consistent, hard surface for the containment and recovery of the material, the full width of the ditch section and vehicle recovery zone adjacent to the westbound lanes (approximately 25' in width) was paved. The check dams were placed at 20-foot intervals.

During the summer of 1993, more than 1,100 tons of material were removed from the 180 installed check dams — an apparent removal of 14.4% of the material applied to the highway. In 1995, approximately 75 of the 220 check dams were cleaned out and 225 tons of material were removed.

By the end of 1994, approximately 90% of the modified silt fences required repair. Alterations were made to the silt fence design, but maintenance of the check dams was an ongoing issue.

Unfortunately, estimates from 1995 showed that of the material removed, there were approximately 3 tons of rock for every ton of sand. While the check dams were working, the volume of material other than sand created large demands on maintenance operations. In addition, the large volumes of material caused damage to the check dams.

In conjunction with the demonstration project, four small sediment ponds were constructed along the cut slope where space allowed. The ponds are effective in trapping material and easier to clean out than the check dams, but were undersized relative to the sediment load. The ponds filled so rapidly, crews were unable to keep up with material removal demands.

In addition to the demonstration project, CDOT developed additional BMPs for the Straight Creek corridor that included sweeping operations, more efficient sanding, concrete barriers along the toes of unvegetated slopes and collection of sand and sediment from guardrail, ditch and shoulder areas.

From the findings of the NPS study, it was determined that:

- The modified silt fence project should be discontinued.
- The remaining ditch sections of the westbound lanes should be paved where practical.

"The comprehensive watershed approach being used in the Straight Creek corridor encourages the implementation of projects that addresses a variety of concerns including slope erosion, BMP's to catch, collect and channelize runoff and sediment, and the improvement of maintenance operations."

- Additional areas are required for stockpiling or recycling "spent" material.
- The maintenance BMPs should be continued (sweeping, collection and removal of material).
- Liquid deicer should be evaluated.
- Additional funding would be required to increase maintenance efforts.
- The ditch sections should be widened where possible to increase the size of the sediment ponds.
- Additional sediment ponds were required.
- Experimentation should be continued to find new BMPs for the corridor.
- Efforts should continue to stabilize the cut slopes.

The overall remediation of the Straight Creek watershed is an immense task and will require continued experimentation. The terrain, cut slopes and extreme weather conditions make for a difficult challenge.

The reduction of sediment and sand loading from the demonstration project is only a small part of the overall task. The direct benefits to Straight Creek from the project are difficult to measure, but it is clear that any reduction in accelerated sediment loading is a step in the right direction.

The demonstration project helped call attention to these issues and is an important part of a comprehensive watershed approach.