Willow Creek Watershed Environmental Activities

WCRC Willow Creek Reclamation Commitee Creede, Colorado

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY

CDPHE CO

COLORADO Hazardous Materials & Waste Management Division Department of Public Health & Environment

May 2015

Cleanup activities in Willow Creek Watershed

There are a number of environmental cleanup projects in the Willow Creek Watershed **being conducted by different groups, using different funding sources.** Some projects are still in the planning stages, while others are complete or underway.

Nelson Tunnel/ Commodore Waste Rock Pile Superfund Site

This is the only environmental cleanup project listed on the National Priorities List

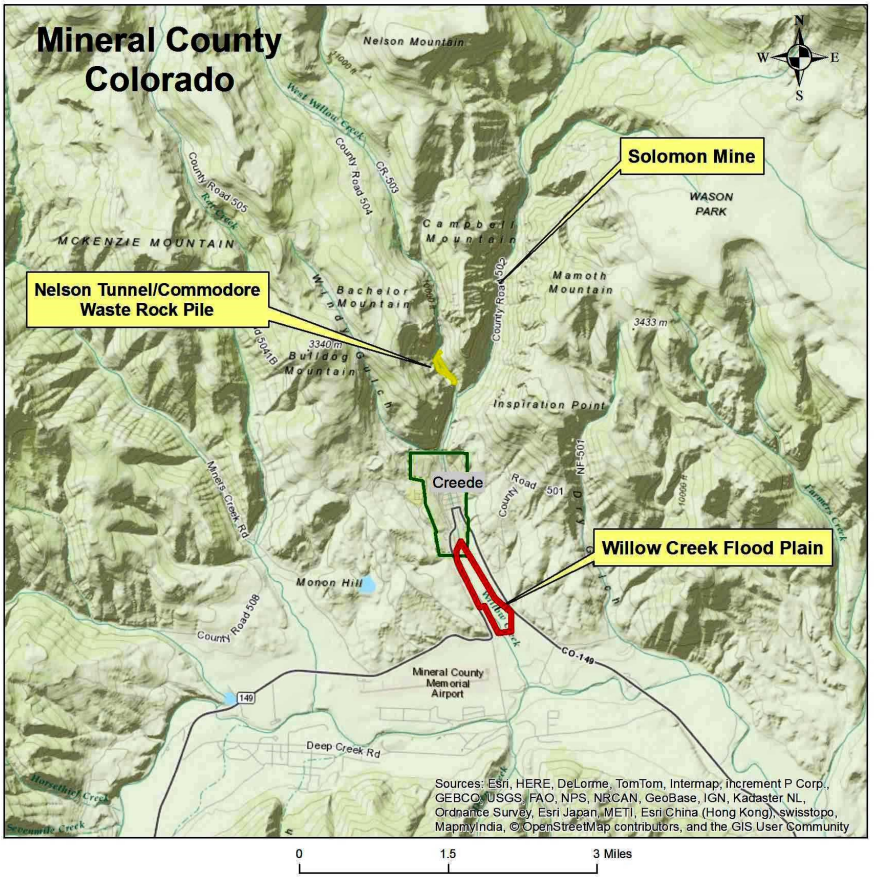
No other sites are being considered for listing in the area.

Solomon Mine

Nonpoint Source Program Project

Willow Creek Floodplain Work

Brownfields/Voluntary Cleanup/Nonpoint Source Program Projects



Historic Work on the Willow Creek Watershed

Area History

The Willow Creek Watershed lies just north of Creede, Colorado. It drains approximately 40 square miles, and includes two prominent tributaries – East Willow Creek and West Willow Creek. Elevations in the watershed range from 14,000 feet where the Continental Divide forms the northern boundary to 8,600 feet at the confluence of Willow Creek with the Rio Grande River. The main stem of Willow Creek flows through the City of Creede in a mortar flume and exits the flume on the Lower Willow Creek Floodplain. The creek travels three miles through the floodplain before meeting the Rio Grande.

The Watershed encompasses the Creede Mining District which was the site of mining related activity from 1892-1985. Mining activities disturbed the native rock, exposing metal sulfides to air and water resulting in the generation of acid mine drainage which is acidic, metal laden water (including arsenic, manganese, lead and zinc) with high dissolved solids and sulfate concentrations.

Willow Creek Reclamation Committee

The Willow Creek Reclamation Project grew out of the determination of a small group of local citizens in Creede, Colorado to deal with historic mine contamination in the watershed without government intervention. The Committee conducted an assessment of the mining impacts, prioritized the major sites impacting water quality and successfully implemented multiple remediation projects within the watershed. The Willow Creek Reclamation Committee has grown to include a wide variety of public and private interests. Monthly open meetings typically draw an impressive suite of scientific experts and dedicated citizens wholeheartedly committed to the cause to preserve and protect Willow Creek and the Rio Grande River.

Willow Creek Reclamation Committee – monthly meetings are attended by:

- Local volunteers – retired professionals, miners, the former mayor, a county commissioner, a city councilman, historic preservationists, etc.
- CO Dept. of Public Health and Environment • CO Div. Minerals & Geology
- CO Geological Survey • U.S. Forest Service • U.S. Fish and Wildlife Service
- Natural Resource Conservation Service • U.S. Environmental Protection Agency

Solomon Mine Project – Nonpoint Source Program

The Willow Creek Reclamation Committee has been collecting water quality data for East Willow Creek since 1999. The Solomon Mine Complex, which includes a draining mine adit, is the largest source of cadmium, zinc and lead in East Willow Creek.

- A bioreactor, or passive wetlands system, was constructed at the site in 1992-1993 to address the metals loading source from the adit.
- The system was initially very effective at removing metals, but eventually was impacted by an avalanche and is still considered a priority for reconstruction.
- The Willow Creek Reclamation Committee applied for and was selected for Nonpoint Source funding.
- This system will allow the Willow Creek Reclamation Committee to identify any further sources of heavy metal loading downstream from the Solomon Mine Complex.
- The project fulfills the nonpoint source definition:
  - It is directly related to drainage from Abandoned Mine Land sites for which there are no remaining financially viable responsible parties as identified in the 2012 Colorado Nonpoint Source Management Plan.
- The Water Quality Control Division of the Colorado Department of Public Health and Environment administers the Nonpoint Source program.

The proposed Solomon Mine adit bioreactor reconstruction is anticipated to:

- Use sulfate reduction to reduce heavy metal concentrations from the Solomon Mine drainage.
- Will remove 80% of the aluminum, cadmium, iron, lead and zinc load from the Solomon Mine.

Although the project was selected for funding, the project has been put on hold until the continued avalanche risk has been addressed.

Lower Willow Creek Floodplain – Voluntary Cleanup and Redevelopment Program

The Willow Creek Floodplain was historically used as a storage site for mine waste from the Humphrey Mill and Emperius Mill. It receives sediment input from natural processes as well as mine wastes from the upstream Creede Mining District.

Lower Willow Creek Restoration Company was formed by the City of Creede and Creede Resources Inc. to jointly oversee the activities of the Lower Willow Creek Restoration Project, and manage and administer the funding for the project. The Company:

- Entered into a **Voluntary Cleanup and Redevelopment Program** plan with the Hazardous Materials and Waste Management Division of the Colorado Department of Public Health and Environment for cleanup of the floodplain.
- Received funding for the project from a number of sources, including the **Nonpoint Source Program** administered by the Water Quality Control Division of the Colorado Department of Public Health and Environment. This project meets the Nonpoint Source category of restoration and prevention by implementing a stream corridor management strategy for the floodplain area of Willow Creek.
- Worked with the Colorado Water Conservation Board to manage the Water Supply Reserve Account grant that supported the project.
- Received financial support from the Colorado Division of Reclamation Mining and Safety for channel construction. This state division also served as a technical advisor on the project.
- Was awarded funds by the Colorado Brownfields Foundation for construction activities.

Lower Willow Creek Channel During 2012 Construction

Lower Willow Creek Restoration Project – addresses Nonpoint Source pollutants of concern: cadmium, lead and zinc. The project success is based in part on surface water chemistry. However, because the site's surface water chemistry is greatly influenced by the water chemistry of the Nelson Tunnel adit discharge, other metrics are used to indicate project success including improved and stable stream function, improved water quality, reduced contact with contaminated soils, and improved riparian conditions.

Project Goal:

The goals of the Lower Willow Creek Restoration Project incorporate a well planned and executed watershed approach through best management plans outlined in the Willow Creek Watershed Plan. Implementation of restoration activities have resulted in improved water chemistry, riparian habitat, hydraulic function, and sediment transport.

Nelson Tunnel/Commodore Waste Rock Pile Superfund Site

Comprehensive Environmental Response, Compensation and Liability Act (CERCLA) – Commonly called Superfund, this is the federal government's program to clean up the nation's uncontrolled hazardous waste sites by investigating and addressing actual and threatened releases of hazardous substances or contaminants.

- The site was listed on the National Priorities List (NPL) on September 3, 2008.
- The site boundaries remain the same as when listed.
- No other locations are currently being investigated for NPL listing in the Willow Creek Watershed.

2008 – West Willow Creek channel

Commodore Waste Rock Pile – Operable Unit 1

Surrounding the Nelson Tunnel and Commodore Five Tunnel portals is a waste rock pile from the past mining of these mine tunnel systems.

- The waste rock contains elevated levels of arsenic, cadmium, lead, manganese and zinc.
- In 2005, a less-than-20-year flood event caused a partial collapse and washout of the waste rock pile into West Willow Creek, washing away a previous water conveyance structure and leaving the remaining waste rock in an unstable condition.
- EPA conducted a CERCLA Removal Action in 2009, which included regrading the pile and constructing a clean rip rap channel to convey West Willow Creek water around the waste rock pile.
- The rip rap channel includes a drop and pool structure to reduce the energy of the flowing creek in high water and minimize the potential for further erosion of the waste rock pile.

2009 – New West Willow Creek channel construction

(Continued on page 6)

Nelson Tunnel/Commodore Waste Rock Pile Superfund Site

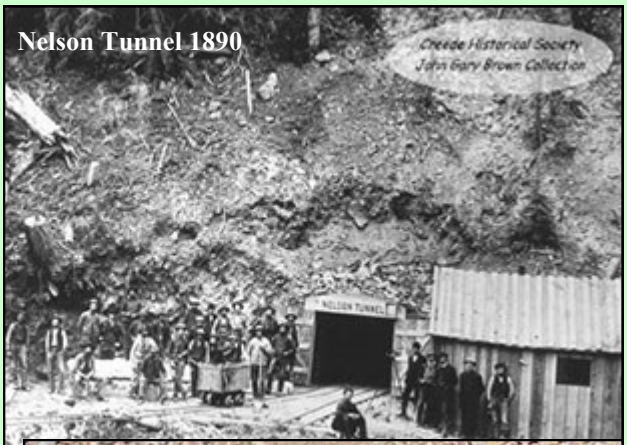
(Continued from page 5)

Nelson Tunnel – Operable Unit 2

The collapsed Nelson Tunnel adit drains acid mine drainage (AMD) from the mine workings to West Willow Creek.

The Remedial Investigation (RI) report was completed and is available on EPA's website and at the Creede Town Hall.

- The next step in the Superfund Remedial Process is the Feasibility Study (FS) and it is in process, but progress has slowed for several reasons:



Nelson Tunnel 1890

Nelson Tunnel Today

◊ Remedy options differ, depending on whether or not the Bulldog Mine is dewatered for future mining operations; therefore, EPA and the CO Department of Public Health and Environment have slowed the decision making process while Rio Grande Silver, the company that intends on mining the Bulldog Mine, works through the mine permitting process.

◊ Water quality standards for segments of Willow Creek and the segment of Rio Grande River below the confluence with Willow Creek have been modified since RI was completed. The initial evaluation of treatment options in the FS process focused primarily on zinc and cadmium. Due to the new and different water quality standards in the impacted stream segments, the EPA must conduct further analysis on treatment options. These include additional sampling of the streams in low and high water conditions because the new water quality standards are flow dependent.

◊ The local watershed group has continued to do work in the floodplain by making improvements to aquatic habitat resulting in anticipated reduction in metals loading. These improvements may influence the type of treatment required for the Nelson Tunnel water. (See the Nonpoint Source and Brownfield projects.)

Nelson Tunnel/Commodore Waste Rock Pile Superfund Site

(Continued from page 6)

- EPA and the Colorado Department of Public Health and Environment are considering if hydraulic controls in the tunnel system or other types of source control are feasible, or if long-term, perpetual treatment of the water will be necessary.
- To further the understanding of the contaminated water sources and flow, EPA and the Colorado Department of Public Health and Environment have conducted additional studies and data collection including:
    - ◊ Isotopic hydrologic investigations – also known as 'age dating' to assist in determining sources of water in the mine workings.
    - ◊ Monitoring wells, which were installed in fall of 2013 in the Commodore Waste Rock Pile to investigate possible metal loading from the pile to West Willow Creek.
    - ◊ A monitoring well installed near confluence of East and West Willow Creeks, which is intended to investigate subsurface sources of metals that may enter the creek system in that area.
- Seasonal surface water sampling events will continue in East and West Willow Creeks, Willow Creek and the Rio Grande River to capture seasonal variation, verify metals loadings and continue to gather baseline data to compare with post-remedy data in the future.

Next Steps

- Once sufficient information is gained on the changing conditions in the watershed the FS will be completed.
- A Proposed Plan will be developed with the recommended remedy for public review and comment.
- The remedy will be selected based on the Feasibility Study and the comments on the Proposed Plan and will be documented in a Record of Decision.

Future Use

Tourism and recreation have become the town's economic backbone. Fishing is an important part of recreation for visitors and the local community. It is anticipated that the future remedy selected for the Nelson Tunnel/CWRP will protect the fishery in the Rio Grande River, downstream of the confluence with Willow Creek. This segment of the Rio Grande is included in a state-designated Gold Medal fishery area.

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Solomon Mine Project – Nonpoint Source Program

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Nelson Tunnel/Commodore Waste Rock Pile Superfund Site

Web page: http://www2.epa.gov/region8/nelson-tunnel-commodore-waste-rock

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Willow Creek Floodplain Project – Voluntary Cleanup and Redevelopment Program

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