



CLEARING THE WATERS

A newsletter by the Surface Water Quality Bureau

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Success Story for the State of New Mexico

Cleaning Up Cold Springs Creek

By Daniel Guevara,
NMED SWQB - Water Resources
Professional

Pollution from past mining activities at the Royal John Mine in Grant County led the New Mexico Environment Department (NMED) to add Cold Springs



Creek to the list of impaired waters in 2012. The U.S. Forest Service, in conjunction with NMED, removed lead and cadmium pollution sources from the creek by moving historic mine tailings and waste rock away from the stream banks into a secure underground repository. Samples of these metals downstream of the mine went from elevated levels prior to reclamation to non-detectable levels after. As a result, NMED removed cadmium as a cause of water quality impairment in the 2022–2024 Integrated Report; data indicate that the lead impairment could be removed in the next reporting cycle.

Problem

Mining activities dating from 1916 to 1969 at the Royal John Mine and Mill site in southern New Mexico polluted Cold Springs Creek, a tributary to Hot Springs Creek and the Mimbres River (Figure 1). The approximately 2,000-acre mine site contained numerous adits, cuts, and waste rock piles from the historical mining operations. Mine tailings were piled on both the banks and the channel of the creek, at the on-site mill, and at a depository about a half mile downstream. Water quality samples collected in 2009 detected elevated levels

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of lead and cadmium. NMED listed Cold Springs Creek as impaired on the 2012 Integrated Report due to these metals interfering with the Cold Water Aquatic Life designated use. Portions of the upper watershed burned during the 2013 Silver Fire, which exacerbated erosion during intense summer rains. Site investigation by the U.S. Forest Service in 2014 and consultants in 2016 included conducting soil, sediment, and waste rock sampling, which showed elevated levels of lead and other heavy metals (aluminum, arsenic, cadmium, copper, iron, manganese, and zinc). These pollutants posed a significant threat to aquatic life and human health based on NMED soil screening levels and the potential for transport from the site via surface water runoff.



Figure 1. The historical Royal John Mine affected Cold Springs Creek in southern New Mexico.

Story Highlights

In 2018 the Forest Service hired the Engineering Remediation Resources Group, Inc. (ERRG) to remediate the Royal John mine and mill site. The goal was to reduce the potential for exposure of chemicals of concern in the waste materials and surface water. Crews moved the waste rock and tailings into an onsite consolidation cell on Forest Service land called the Cowboy Flat Repository. The Forest Service aimed to meet the NMED Industrial Soil Screening Levels rather than the more stringent residential levels, given that the site had background levels of naturally occurring lead and was not planned for residential uses. On-the-ground cleanup activities began in earnest in March 2019. The first steps included clearing access roads at the mine and clearing and stockpiling the topsoil at the repository. The crews constructed silt fences to prevent the tailings from washing into the creek during construction. A new temporary road was constructed to access the tailings that had been piped downstream in



Figure 2. Mine waste was buried under a vegetated earthen cap at the Cowboy Flat Repository.

the 1920s. Heavy equipment transported the mine and mill waste to the repository, where it was buried under an earthen cap with a silty clay layer and the topsoil to support native plants. This cap was designed to keep the underlying waste material mostly dry and minimize contaminant transport. A total of 24,476 cubic yards of contaminated mill tailings were removed from the banks of Cold Springs Creek. An additional 22,070 cubic yards of waste rock with elevated lead levels were removed from other areas of the mine. The waste materials were buried safely in Cowboy Flat Repository, thus greatly reducing the risk of exposure to hazardous materials (Figure 2). Some of the mine adits were sealed off completely; other adits were identified as important habitat for bats and were closed off with bat-friendly grates.

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Results

NMED staff sampled Cold Springs Creek for metals downstream of the Royal John Mine before and after reclamation (Figure 3; Table 1). After reclamation, samples from 2019 and 2020 showed a decrease in lead, and no cadmium was detected. In 2021, both cadmium and lead levels were below detection. Therefore, the NMED Surface Water Quality Bureau (SWQB) removed cadmium as a cause of water quality impairment in the 2022–2024 Integrated Report. Based on current data trends, it appears likely that the lead impairment could also be removed in the next reporting cycle.



Figure 3 (left). An NMED staff member collects samples from Cold Springs Creek, after reclamation.

Figure 3 (left). An NMED staff member collects samples from Cold Springs Creek, after reclamation.

Table 1 (below). Water quality data: Cold Springs Creek (2009–2021).

Partners and Funding

The primary partners on the cleanup of Royal John Mine and Cold Springs Creek were the Forest Service Regional Office, Gila National Forest, and their contractor, ERRG. The Forest Service funded the restoration effort (\$1,642,459 total). NMED’s SWQB and Ground Water Quality Bureau (GWQB) staff provided comments, guidance, and inspection during the planning and reclamation process through the Mining Environmental Compliance Section of GWQB. Staff from the SWQB conducted the water quality monitoring.

For any question related to this article please contact:

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Date	Lead (mg/L)	Cadmium (mg/L)
03/23/2009	0.012	0.001
07/20/2009	0.017586	0.002213
08/24/2009	0.015	0.002
11/17/2009	0.014	0.002
June 2013	Silver Fire	
10/22/2014	0.016	0.001
May 2019	Reclamation in progress	
06/05/2019	0.019	Nondetect
06/05/2019	0.011	Nondetect
09/17/2020	0.002	Nondetect
10/21/2021	Nondetect	Nondetect

Note: mg/L= milligrams per liter

A more in-depth article about Cold Springs Creek and the Royal John Mine was featured in a past issue of [Clearing the Waters](#) highlighting the watershed conditions, surface water quality impairments and mining history. The previous issue can be accessed by clicking the link above to read the Summer 2019 Volume 24, No. 2 issue.

Restoring Springs and Wetlands on State Trust Lands in the Lower Embudo Valley

By Jan-Willem Jansens, Ecotone Landscape Planning LLC

My company organized two workshops in the Embudo watershed on June 2 and 3, 2023, and I was invited to report on these in *Clearing the Waters*. The workshops were held as part of the Clean Water Act Section 319 project, “Restoring Springs and Wetlands on State Trust Lands in the Lower Embudo Valley.” Like many such projects, a diversity of complexities in the landscape, history, and communities determines the best approaches for environmental restoration. This article is meant to go beyond the nuts and bolts of the workshops and include more of this context.

Landscape Context

First, where are we? The lower Embudo watershed, and the area around Dixon in particular, is part of the heritage land of the Tiwa people dating from before 800 AD, and of the New Mexico Genizaro people since the 1600s. The area’s acequia agricultural history goes back more than 250 years. The landscape uniquely characterizes the western flank of the Sangre de Cristo Mountains with the sandstones of the Tesuque Formation (part of the Santa Fe Group) which were deposited between 15M-8M years ago. The project is located at the most northern tip of that sandstone landscape, which stretches to the Galisteo Basin to the south and the Abiquiu area to the west. This geologic formation uniquely produces numerous springs and spring-fed wetlands. In the project area south of Dixon more than fifty springs feed more than twenty-six acres of wetlands, the majority of which are on State Trust Land.

There probably were many more springs and wetlands a few hundred years ago, because we have seen signs of wetland vegetation without the presence of any surface flow and we have seen signs of the decline of wetlands that still carry surface water. Some local farmers and parciantes have expressed that the stream flow from the

wetlands still contributes to acequia flows as well, while Native American and traditional residents value the springs and wetlands as an important part of their cultural heritage in the Embudo valley.



Healthy cienega wetland in the bottom of Blackwater Spring canyon.

The water flowing from the springs and seeps is from before the atomic age and is dated to be thousands of years old. After the last Ice Age water began infiltrating in the mountain core and mountain front and flowed down over millennia to feed the springs and wetlands. The springs produce a base flow of more than eight acre-feet per year, enough to support 30-40 traditional households in the past, and perhaps 200 people.

In wet years, the springs are supplemented with additional precipitation and produce

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even more water. We may assume that they have supported Native and traditional settlements for thousands of years, and recently discovered artifacts seem to confirm this. The canyon morphology with its many springs, stretching over forty drainages across more than 8,100 acres south of the Rio Embudo, also support a unique world of wetland ecosystems with rushes, willows, cottonwoods, and also non-native plants. The wetlands also provide habitat for many of the area's iconic wildlife (e.g., bear, raccoon, deer, elk, and probably bobcat and mountain lions), numerous bird species, insects, reptiles, and amphibians. The canyon ecosystem is a very dynamic landscape where weather continues to shape the canyon geomorphology and ecosystem. Snowmelt, freeze-thaw effects, and rapid runoff from convective storms lead to intense natural weathering of the soft sandstone. Erosive products pile up as alluvial sediment plumes that can hold large amounts of water that support the wetlands.



View of the sandstone canyon landscape.

Yet, natural and human caused degradation leads to the transport of sediment downstream to the farming area, the Rio Embudo, and the Rio Grande. In the last few decades, this erosion and sediment transport volume has risen to alarming rates. Our research in the last ten years has found that the Rio Grande carries a disproportionate volume of sediments from this landscape; varying from twice to twenty times what you would expect based on the area's acreage.



NM State Land Office staff and Wood Sharks crew members pose at the end of a workday around a large Zuni bowl.

The wetland canyons generate many ecosystem benefits for downstream residents. Their protection and restoration would greatly enhance these benefits, and especially regarding sediment pollution on the land and in the Rio Embudo and Rio Grande.

The Workshops

The workshops were about stabilizing soil that otherwise would rapidly wash down and over time clog acequias, roads, fields, and the Rio Embudo and Rio Grande; and to use the limbs of piñon and juniper trees to cover the soil, boost water infiltration and plant regeneration, and improve the area's habitat. In the workshops, **thirty** community members, State Land Office employees (including Commissioner of

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Public Lands Stephanie Garcia Richard), and other volunteers learned about and built one-rock dams, Zuni bowls, wicker weirs, and log racks to slow stormwater runoff in small gullies and on slopes, to encourage sediment to settle and fill gullies, and to slow, spread, and sink storm flows into the sediment. We also covered the soil with slash to create a micro-climate that reduces erosion by the raindrops and stimulates plant regeneration and growth, and as a result, we worked to build living soil, keep more soil in place, hold more water in place, improve habitat for wildlife and plants, and reduce flash flood risks and sedimentation problems downstream. The Wood Sharks, LLC, a Taos-based forestry contractor with employees from several nearby communities had been working on the project for five weeks, and helped with logistics and training aspects of the workshops and built many more structures.



NM State Land Commissioner Stephanie Garcia Richard presents a log rack built during a workday in the Labyrinth Spring canyon on State Trust Land.

Isn't Erosion Natural?

The loosening and transport downhill of sandstone particles and soil (erosion) in the project area is largely a natural process. The natural erosion processes here are a combination of freeze-thaw processes and small-scale wind- and water erosion of the canyon walls and channel erosion of the canyons' headwaters and main channels. These gradual geologic processes, weather (rain, wind, frost heave, etc.), gravity, and animals conspire to constantly loosen and move soil particles. This type of soil loss, particularly in this erosive landscape, can be faster than

natural soil regeneration processes. The result is a combination of bare rock and gravel on canyon walls, steeper slopes, and gullies and sand and loam on lower terraces and channel bottoms. These forms of erosion have been going on for millennia and have formed this landscape. In fact, the erosion processes of the last 300,000 years have exposed some water-holding layers (aquifers) in the sandstone canyon walls. At locations where these layers were not clogged in some form, water from these aquifers started flowing out of the sandstone walls in the form of springs. The permanent flow of spring water soaked into the soil for thousands of years and supported wetland plants.



Wetland channel that eroded and became entrenched, leaving cottonwoods and willows high and dry and dying.

There is also erosion that is caused by people and that takes place much more rapidly than

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geologic erosion. That's why some people call it accelerated erosion. It's caused by the combined impacts over many years of mining, logging, roads and tracks, livestock trails and trampling, plant removal (grazing, tree cutting, and treading), and development.

In the landscape around Dixon, we have both types of erosion. We cannot slow down the forces of nature that cause erosion or undo some of what people have done; but we can slow down the erosion process by slowing, spreading, and sinking water. Even in a landscape that is predominantly erosive, parts of the landscape are not naturally erosive, such as the wetlands in some of these canyons. Therefore, and because of the wetlands buffer and slow the natural geologic erosion and sediment transport processes in the canyons and provide associated benefits to downstream landowners, slowing the erosion in the wetlands and restoring the wetland ecosystem are of great importance to the entire watershed. If we don't, the community will continue to suffer worse flash floods and sediment and debris flows which are costly to homeowners, parciantes, and those owning roads and driveways. Also, sediments will continue to degrade water quality in the Rio Embudo and Rio Grande at the current excessive levels and we may gradually lose the springs and wetlands and much of the wildlife that depend on them.

If we're successful, our efforts will slow the impacts of the changing climate and may have beneficial effects that last decades.

Readers can learn more about this project, and other Section 319 and River Stewardship Program projects in New Mexico, through the project list maintained at www.env.nm.gov/surface-water-quality/watershed-protection-section.



Workshop participants inspect their work at the end of the day building one-rock-dams and wicker weirs in the Labyrinth Spring canyon.

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EVENTS & ANNOUNCEMENTS

Funding Opportunity

Rio Grande Project Water Conservation and Ecological Restoration Initiative 2024 Request for Proposals

Description: The National Fish and Wildlife Foundation (NFWF) is announcing the first grant funding opportunity for the Rio Grande Project Water Conservation and Ecological Restoration Initiative. NFWF will award one or more grants to contribute to development and implementation of water conservation and ecological restoration projects within the Rio Grande Project (Project) area in collaboration with the U.S. Bureau of Reclamation (Reclamation), Elephant Butte Irrigation District, and the State of New Mexico. Up to \$300,000 will be available. Major funding is provided by Reclamation through Cooperative Agreement R23AC00424.



Grants will be awarded covering the following programmatic needs: planning and implementation of habitat restoration and enhancement for native riparian bird species associated with demand management projects, stormwater capture projects at Project sediment dams, and off-channel storage projects. In this Request for Proposals (RFP), NFWF is seeking to support projects that align with some combination, if not all, of the tasks described in the Program Scope of Work and Priorities below.

Due date: Thursday, April 25, 2024 by 9:59 PM MT

Eligible applicants: local, state, federal, and tribal governments and agencies (e.g., townships, cities, boroughs), special districts (e.g., conservation districts, planning districts, utility districts), non-profit 501(c) organizations, educational institutions

Cost-share requirement: These grants do not require matching contributions. Reporting of appropriate matching funds (either cash or in-kind) is encouraged, and matching funds must be non-federal in origin, with that distinction made in the Matching Funds section of the application.

Total funding amount: \$300,000

Events

April 20th. Santa Fe, NM. Earth Day: Caja Del Rio Hike and Clean-up. 9:00 am until 2:00 pm. Join us as we clean up the Caja! This year, we rally behind the theme "Invest in our Planet." For years, the Caja del Rio has suffered from illegal dumping, vandalism, and improper use from off-highway vehicles that leaves lasting scars on a land so many of us love and cherish. By dedicating our time, resources, and energy towards investing in our beloved New Mexico lands, we create a path forward towards a more sustainable, healthier future. For more information and to view the schedule visit <https://www.nmwild.org/events>.

June 1st. Silver City, NM. Gila Wilderness Centennial: Celebration Day at Gough Park 12:00 pm. We're celebrating the anniversary of America's first wilderness! Celebrate 100 years of Wilderness with those who hold it dear. Join the Gila National Forest, New Mexico Wild, and other organizations as we honor the Gila Wilderness on June 1st with a family-friendly event featuring live music, art, interactive games, and a cross-cutting competition. <https://www.fs.usda.gov/detailfull/gila/learning/history-culture?cid=fseprd1166703>.

Albuquerque Wildlife Federation's upcoming scheduled restoration projects;

2024 AWF Project Schedule

APRIL 12-14 - Ft. Union Ranch

MAY 17-19 - Rio Mora Wildlife Refuge

MAY 31- JUNE 2- Rito Peñas Negras

JUNE 21-23 - San Antonio Creek, Jemez Mtn

Check for more details on their website abq.nmwildlife.org/projects.html.