

REPORT FROM THE CENTER #7

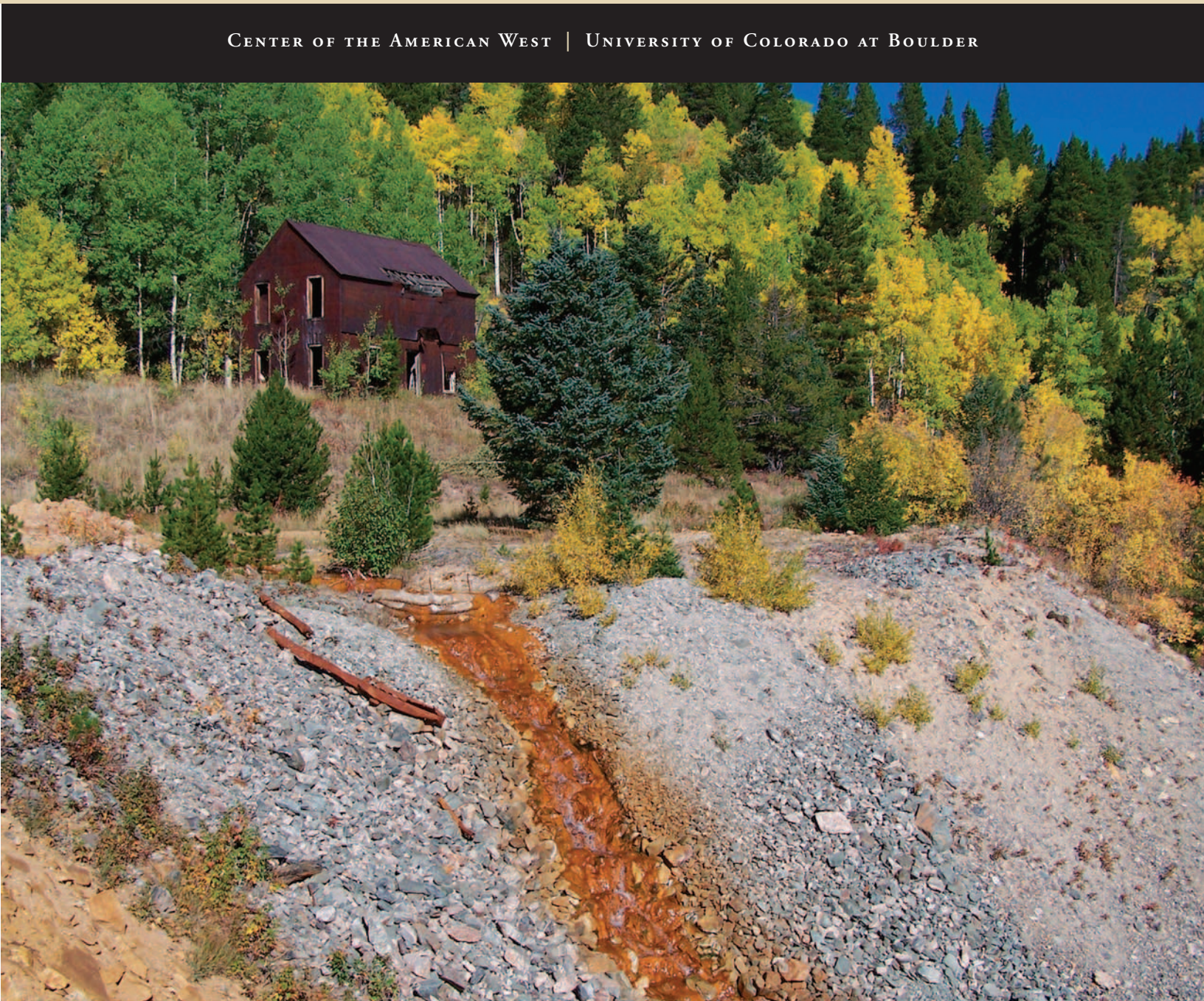
CLEANING UP ABANDONED HARDROCK MINES IN THE WEST

Prospecting for a Better Future

PATRICIA NELSON LIMERICK • JOSEPH N. RYAN

TIMOTHY R. BROWN • T. ALLAN COMP

CENTER OF THE AMERICAN WEST | UNIVERSITY OF COLORADO AT BOULDER





The Center of the American West: Its Purpose and Vision

THE CENTER OF THE AMERICAN WEST at the University of Colorado takes as its mission the creation of forums for the respectful exchange of ideas and perspectives in the pursuit of solutions to the region's challenges. We at the Center believe that an understanding of the historical origins of the West's difficulties, an emphasis on the common interests of all parties, and a dose of good humor are essential to constructive public discussion.

With the participation of ecologists and engineers, professors and policy makers, students and scientists, musicians and lawyers, foresters, filmmakers, and physicians, the Center's events have become a model of interdisciplinary debate. Information is exchanged, minds change, and conversations begin. Ultimately, we intend for these public discussions and our publications to help the citizens of the West to better understand and care for the unique place in which they live.

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Contents

<i>The West's Troubled Waters: Recognizing the Signs and Symptoms of a Treatable Condition</i>	I
What Is an Abandoned Mine?	4
<i>Information Overload, Compassion Fatigue, and a Certain Acidity of the Soul</i>	II
<i>Prescriptions for Treating the Acidic Soul and Other Worldly Ailments</i>	12
<i>The Earth's Biogeochemistry: What Is Acid Mine Drainage?</i>	16
Sulfide Minerals Plus Oxygen Plus Water Equals Acidity and Metals	16
Tough Times for Fish and Their Human Enthusiasts	19
<i>Why Aren't We Cleaning Up More Abandoned Mines?</i>	20
The Clean Water Act and Other Ways to Clean Up Our Act	20
The Keystone Parable: The Good Samaritan	23
Can an Environmental Good Samaritan Make a Profit?	24
The Good Samaritan Rebuffed	25
<i>Looking Eastward (!) for Solutions and Inspiration?</i>	28
The Commonwealth of Pennsylvania Takes a Risk	28
Cleaning Up in Coal Country	28
Why Don't Western States Follow Pennsylvania's Example?	29
<i>Prospecting for a Better Future</i>	31
Who Is Going to Pay for the Cleanups?	31
Prospecting for Money: Two Examples of Creative Funding	34
Who Should Pay? Getting the Financial Burden on the Right Shoulders	36
<i>What Congress Is Trying to Do about AMD</i>	37
Do We Have the Technology We Need?	39
How Do Westerners Get Involved?	40
<i>What Westerners Can Do to Further the Cause of Abandoned Mine Remediation in the West</i>	41
Suggestions for Further Reading and AMD Resources	42
Endnotes	45



A Fact of Consequence . . .

Acid mine drainage (AMD) is a big problem, but it is not a problem beyond solution. Working on the solution develops skills, strengths, and capacities that will serve you and your neighbors well in many dimensions of your lives. If you invest your attention and energy in this cause, the return on this investment will enrich you, your fellow Westerners, and Westerners of the future.

. . . and an Introduction

In this report, we seek to give you practical information and guidance on the key aspects of the abandoned mine problem. We will make the case for adjustments in federal legislation, in particular for a law that would allow environmental "Good Samaritans" to engage in voluntary efforts without exposing themselves to high financial risk; we will suggest certain strategies for funding remediation efforts; and we will explore the tricky question of what role the mining industry itself can play in curing the West of this ailment. The virtues and shortcomings of all of these recommendations may be debated by reasonable people. One thing, however, is clear. In the course of writing this report, we have come to realize that the success of cleaning up specific mine sites requires the formation of broad, cooperative coalitions of interested parties, including environmentalists; federal, state, and local government agencies; mining companies; real estate developers; scientists; citizens' groups; and local communities.

We invite and welcome your comments, suggestions, and criticisms. We relish the opportunity to discuss these issues further, in full knowledge that this report is only one part of an ongoing conversation and growing momentum to deal with this problem.

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THE WEST'S TROUBLED WATERS: RECOGNIZING THE SIGNS AND SYMPTOMS OF A TREATABLE CONDITION

YOU ARE DRIVING ON A MOUNTAIN HIGHWAY, or you're hiking on a trail next to a river or stream, and you enter an area that doesn't look right. The exact meaning of the term "a healthy landscape" is not easy to pin down, but you know that you are seeing its opposite: a landscape that is sick and afflicted, not feeling well and not able to cure itself. The vegetation along the stream or river thins out or even disappears altogether. Parts of the streambed display unnatural shades of red and orange that defy the ideal of a clear-running, sparkling Western stream. You may have a vague notion that those gaudy colors come from some kind of iron deposit. But what you are seeing is a symptom of a grave environmental disease: the toxic and acidic discharge from long-abandoned hardrock mines, a witch's brew that destroys aquatic life and pollutes waterways wherever it flows. This environmental ailment goes by the name of acid mine drainage (AMD).

Fellow Westerner, you have entered the territory in which the legacy of Western mining is at its most visible and consequential. The mining booms of the nineteenth and early twentieth centuries left behind a mixed heritage: families supported by wages, wealth acquired by some, a crucial contribution to our national prosperity and high standard of living, a folklore of color and adventure, and thousands of old mines that discharge highly toxic water pollution. The necessity of reckoning with the burdensome aspect of our mining history is now much on the minds of mining communities, managers of the public lands, environmental regulators, mining industry leaders, and environmental advocates.

If it holds the attention of some Westerners, the great majority of residents of this region do not notice or recognize this legacy, and that indifference makes its own contribution to the intractableness of the problem. Some of this indifference is plain ignorance. Many Westerners grew up around waterways that have been afflicted for a century. Since they've never seen their local stream in a healthy state, they consider its condition normal.



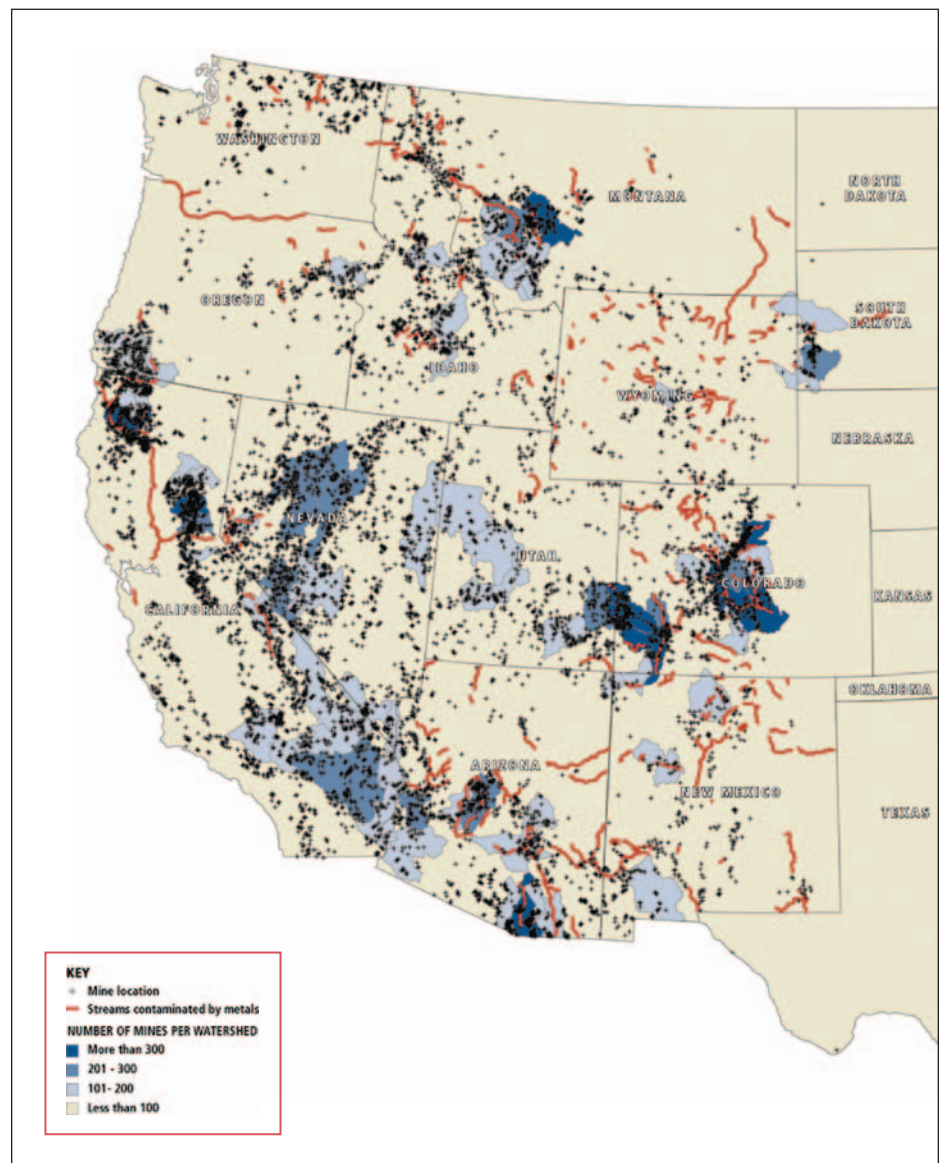
Left: East Willow Creek, Colorado. *Courtesy of the Colorado Division of Minerals and Geology.*

Below: Acid mine drainage from a mine entrance.
Courtesy of the Colorado Division of Minerals and Geology.



The good news about AMD is this: it is unlikely that your health or the health of your children will be *directly* affected by the water pollution flowing from old mines. True, there are some Western communities that may be exposed to elevated levels of mercury, lead, and other metals from acid mine drainage under extraordinary circumstances, but such pollution is readily treated or diluted to harmless levels before it reaches your tap. But do not let this reassurance cause you to stop reading this report. The costs of this pollution are very high. The U.S. Bureau of Mines estimated that 12,000 miles of the waterways of the Western United States, or about 40 percent, are contaminated by metals from acid mine drainage, mostly by abandoned mines, while 180,000 acres of lakes and reservoirs are tainted by abandoned mine runoff.¹ Such figures may be inflated. And we must remember that all rivers contain some amount of minerals from natural sources. But even if we lower our standards for what we call an impaired stream, we still come to the sobering realization that a great deal of wilderness, much of it located in National Forests and other public lands, is partially or wholly spoiled for fishing, hunting, and hiking. That means a great deal of lost revenue for communities whose economies depend on these outdoor pursuits. Anglers especially are affected by acid mine drainage and have become a strong voice in calling for the cleanup of abandoned mines. Their main organization, Trout Unlimited, now devotes significant resources to AMD cleanups.² Some municipalities must also spend hundreds of thousands of dollars to purify their water supply. The city of Golden,

Right: Distribution of abandoned mines and streams contaminated by metals in the western United States. *Courtesy of the Seattle Post Intelligencer.*





Right: These hikers encounter mine tailings in an otherwise scenic mountain valley. *Courtesy of the Colorado Division of Minerals and Geology.*

Below: Pennsylvania Mine near Keystone, Colorado. *Courtesy of the Colorado Historical Society.*



© Colorado Historical Society



Above: Hazardous mine entrance. *Courtesy of the Colorado Division of Minerals and Geology.*

Right: A common sight throughout the West. *Courtesy of the Colorado Division of Minerals and Geology.*

Colorado, was at one point spending \$250,000 annually to remove heavy metals and acid from Clear Creek.

Not just the outdoorsy crowd feels the effects of AMD. As the population in the West continues to grow and as people build homes in more remote areas, they are unwittingly choosing to live nearer to sources of pollution. Westerners are building subdivisions and ski chalets right next to highly polluted streams. There is an uncomfortable irony here. In their desire to live in a more natural setting, some people move closer to an environmental mess. The stream flowing through your new mountain property might not be as pastoral and benign as you thought. You might cast a fishing line into its pools only to find there are no living trout there.

Nor can we think that a polluted watershed does not affect neighboring ecological conditions and resource systems on which humans rely. We can visually appraise how acid mine drainage affects a particular river and lake, but it is much harder to know how much mine pollution has found its way into nearby underground aquifers. Old-timers knew not to drink water downstream from their stake, but we might be drinking groundwater “enriched” by AMD.

Finally, abandoned or inactive mines sometimes prove lethal, quite apart from their toxic discharge. The mineshafts can be irresistible to children or explorers, resulting in fatal accidents. Since 1950, more than forty people have died in mine accidents. The incidents of mine fatalities only heighten the sense that these mines and their discharge of toxic pollution call for prompt and positive action.³

What Is an Abandoned Mine?

Today’s mining operations can and do sometimes create new occasions for the production of acid mine drainage when their operations are not carefully managed. Miners are people, and their ethical and civic conduct varies from person to person as much as in any other social sector. But we leave for another day the issue of current mining operations to focus on those abandoned sites whose owners and operators have long since departed from this earth. There are quite enough abandoned mines to keep us busy.

Who is responsible today for the acid mine drainage coming from these historic mines? After the big land rush of a century ago when the West was divvied up among private individuals and federal agencies, somebody must own the land, right? Yes, this is true—it may be the former mine operator (if he’s still around), or someone who inherited the claim from the operator and who may not even know about the mining that once took place on the land. It may be someone who bought the land from the former operator and now plans to reactivate the mine. It may be a federal agency, like the U.S. Forest Service, the Bureau of Land Management, or even the National Park Service. In many cases, claims were made on





federal land, and some mining was done, but the claim was never transferred into private ownership and therefore ownership of the land reverted to a federal agency.

If old mines have owners, how can they be “abandoned?” Theoretically, the owner of a polluting mine is responsible for the water discharged from it. But regulatory agencies find it impractical to take legal action against the vast majority of private owners. Most of these owners unwittingly inherited the problem, and could not begin to pay for remediation. They are, by virtue of having little or no financial means, “judgment-proof” should someone sue them for environmental violations. Under current legal circumstances about which you will soon read, these private owners are often inclined to leave their mines alone. Old mines belonging to such private individuals must simply wait for some third party to clean them up.



Left: Vegetation killed by acid mine drainage.

Courtesy of the Colorado Division of Minerals and Geology.

Above: Abandoned mine and its plume of mineral colors.

Courtesy of the Colorado Division of Minerals and Geology.



Above: Miners seeking their fortune, or at least a decent wage. *Courtesy of the Colorado Historical Society.*

Below: Miners at Hahn's Peak in Colorado.
Courtesy of the Colorado Historical Society.



The Mixed Legacy of Mining in the American West

No other industry changed the West as rapidly and as profoundly as did the gold and silver rushes of the nineteenth century. The cowboy may have fought for and secured center stage in Western movies, but the miners played the crucial role in transforming the West, by demanding that the Western territories build and install the systems of governance, transportation, communications, and capital that made possible the pursuit of wealth.

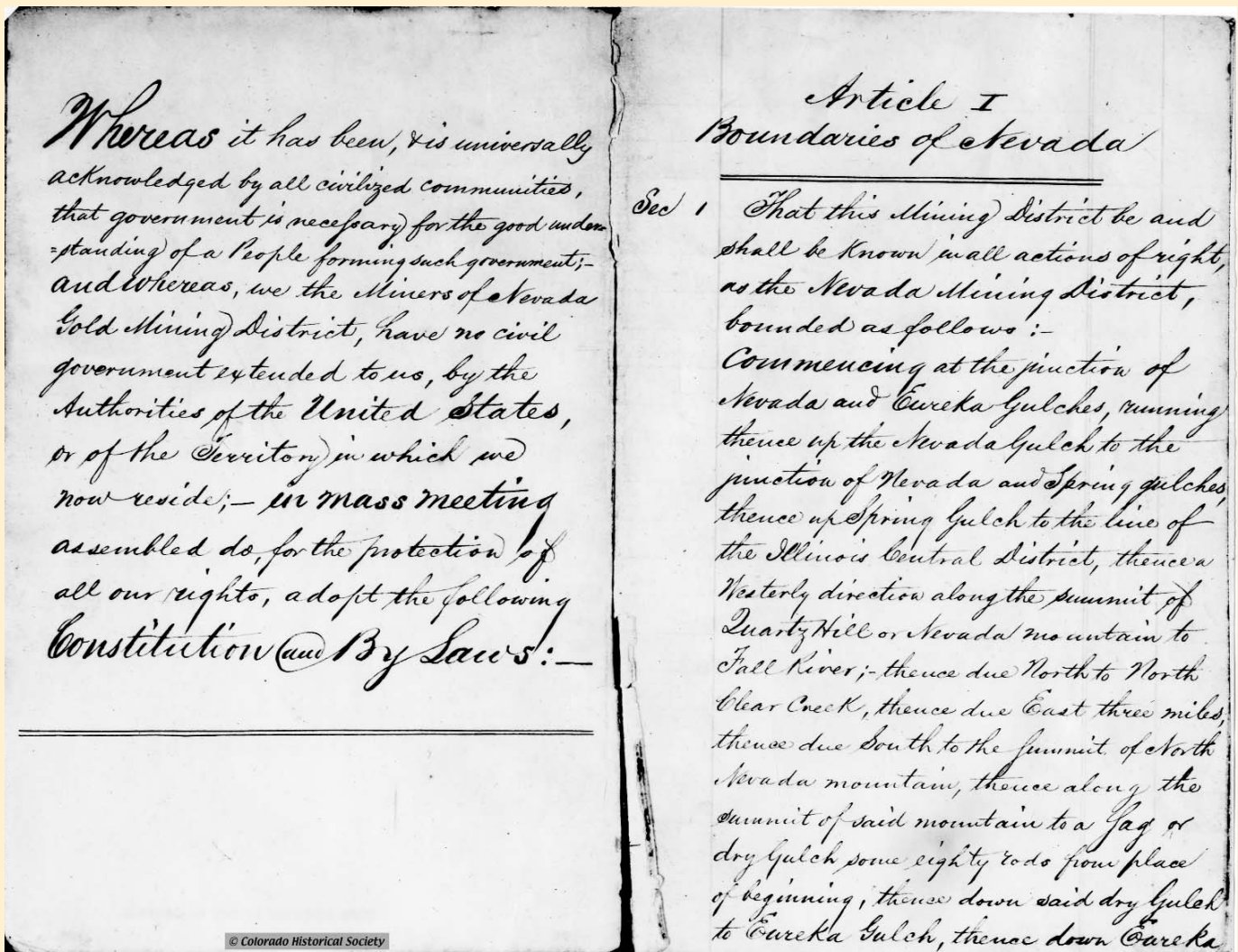
First, mining drove and accelerated migration to the West. The California Gold Rush of 1849 inspired thousands of Easterners, Southerners, and Midwesterners to make the difficult passage across the American interior. These fortune-seekers tied California to the Eastern United States by the sinews of family, money, politics, religion, and culture. The quest for precious metals then drew prospectors into the Western interior, with major rushes in 1859 to the areas that would become Colorado and Nevada. Gold and silver brought Americans to places they otherwise would have avoided or even fled. To those men intent on harvesting the providentially placed mineral bounty of the American West, the geographical constraints posed by treaties and Indian territorial boundaries carried little meaning. Thus mining imported and established American sovereignty in many areas of the Northwest, the Rockies, the Great Basin, and the Southwest.

Second, miners changed the West by both importing and inventing structures of governance and of property rights. Miners urgently needed a legal framework for the orderly conduct of their business. When a lucky miner chanced upon a promising stretch of river or a hillside, he had a compelling need to stake a legal claim to that site that other prospectors would respect. In a topographically complex region only poorly mapped and surveyed, establishing secure and clear mineral rights to a particular site frequently led to conflict and dispute. The "apex" laws, which gave the mineral rights for a particular vein of ore to the person who claimed that land where the vein most closely approached the surface, produced as much litigation as it did satisfactory adjudication. Claims procedures did not end disputes, but they did provide a channel for contention. The courtroom rather than a battleground became the preferred location for the resolution of



Left: Mural of a miners' court of law, location unknown. Courtesy of the Colorado Historical Society.

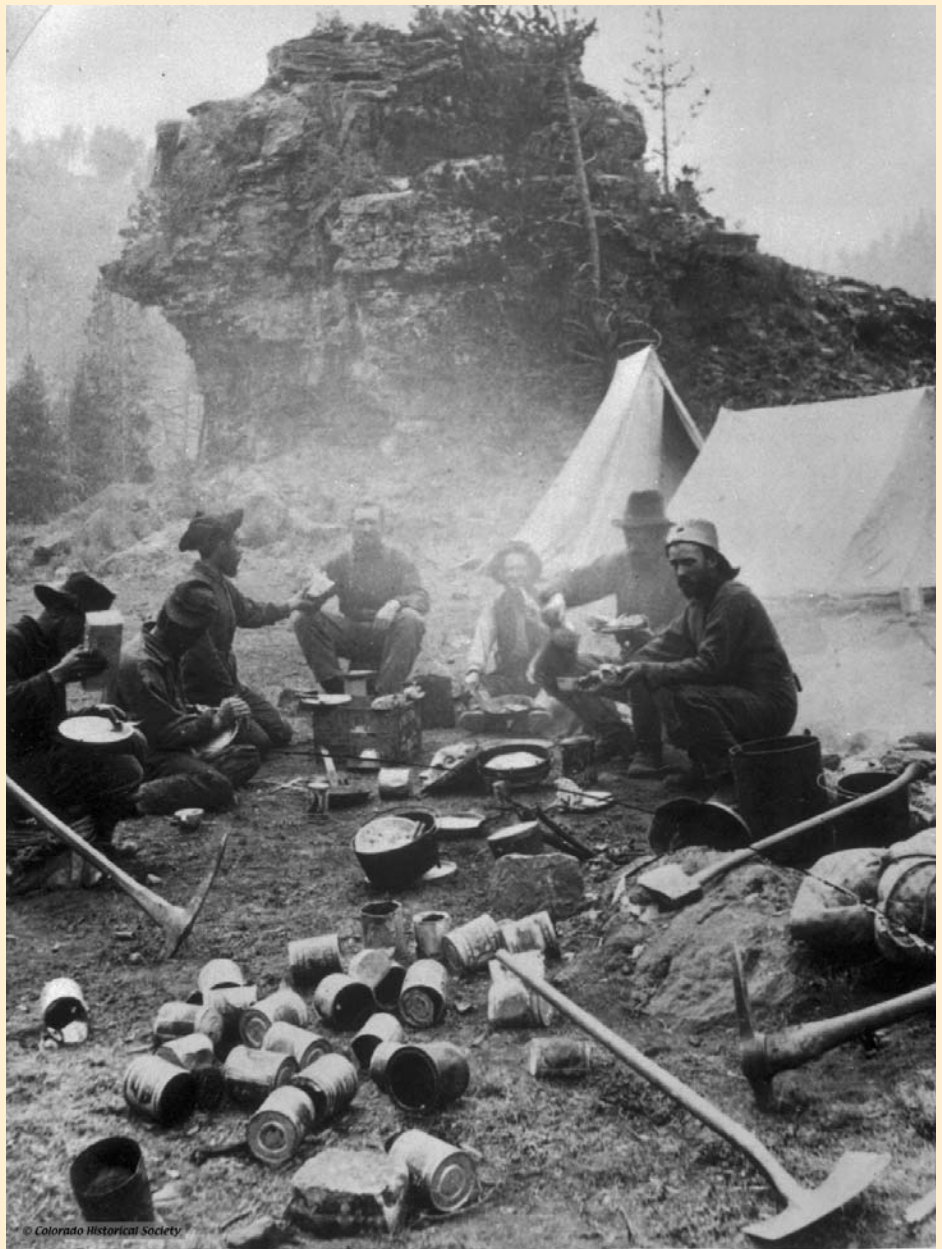
Below: Legal documents describing the boundaries of the Nevada Mining District. Courtesy of the Colorado Historical Society.



Right: Prospectors having a meal, likely beans and biscuits. *Courtesy of the Colorado Historical Society.*

Below left: Placer miners channeled a liquid suspension of sediment, gravel, and dirt through these “rockers.” The lighter material ran out the end, leaving the heavier gold in the trough’s ridges. *Courtesy of the Colorado Historical Society.*

Below right: Placer miners in Cripple Creek, Colorado. *Courtesy of the Colorado Historical Society.*





Above: Hydraulic mining. *Courtesy of the Colorado Historical Society.*

conflict, and the increase in legal actions over mining rights stood for the coming of civil society to the American West.

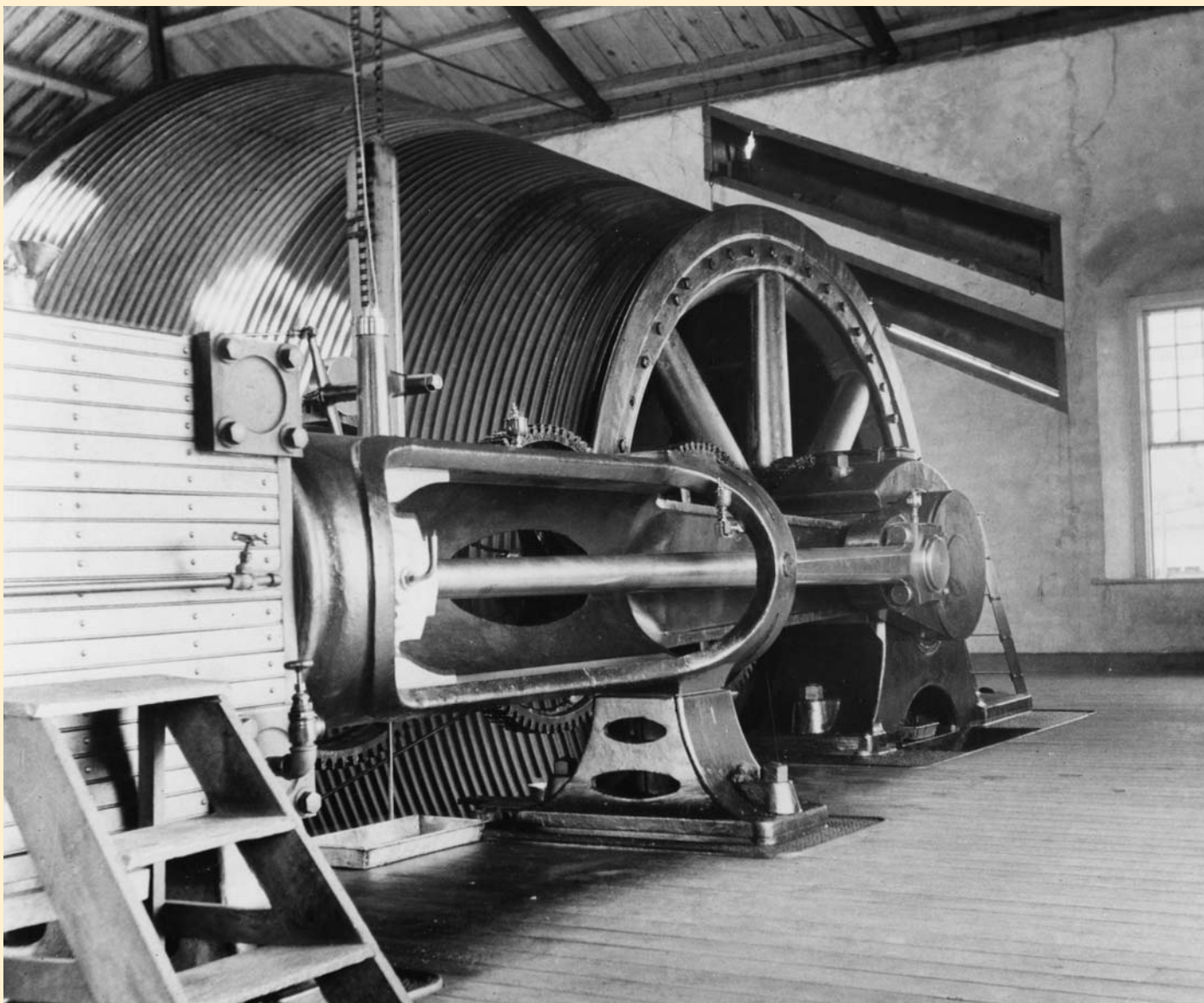
Miners also depended on the commercial trade networks that supplied them with the basics of subsistence and the equipment for their work. They lived mostly on a dreary diet of canned and preserved foods that could be shipped over long distances and stored without refrigeration. Thus, the appearance of a mining camp meant opportunity for farmers, ranchers, and merchants. Men like William Andrews Clark made their fortunes by conveying the right goods to the right place at the right time. Settling in Montana, Clark not only supplied miners with the basic items of subsistence and shelter; he also obtained the contract for local mail delivery, made loans to miners, traded in gold dust, and, logically, moved into banking. The most successful participants in gold and silver rushes often were those who avoided the troubles and trials of actual mining, and who chose instead to “mine the miners.”

For many of those drawn to the West by the promise of easy wealth, the dream delivered a solid dose of disappointment. Placer (from the Spanish word “pleasure,” an unlikely physical sensation for someone engaged in this activity) mining was hard work. Men stooped in the middle of streambeds, the snow runoff freezing their legs, and coaxed a little gold dust from the sand and gravel. They might spend weeks constructing a flume or slough only to have it washed away by a flash flood. A few placer miners did well enough to tempt others into the enterprise, but most invested their labor to little reward. Most men would have never taken work this difficult and for such a poor return back home. And yet human memory has its own curious chemistry; when nostalgia interacted with memories of tough times in mining camps, many of these men looked back with the greatest fondness on their time in the Western mines, considering it to be an era when adventure lit up their lives.

In the early stages of a gold rush, a shovel, a pick, and a pan provided a miner with his basic tools. But this placer mining soon gave way to the more equipment-intensive—and thus also capital-intensive—demands of hardrock tunneling and the extraction of minerals from ore. Simple flumes, sloughs, and hydraulic hoses disappeared with the construction of tunnels, shafts, adits, cart tracks, hoists, and elevators; ores were now crushed, refined, and chemically treated with expensive heavy equipment. Far from a backwater, hinterland economic activity, Western mining had a lead role in the industrialization of the nation, made possible by the availability of tools, parts, and technologies designed and manufactured hundreds of miles from the mine itself.

All this equipment and labor cost a lot of money, prompting the maxim that “it takes a mine to run a mine.”⁴ It took willing lenders and investors to supply the miners with the necessary capital. Ambitious Western mining entrepreneurs had to make periodic trips away from their claims to court Eastern investors, and they did not always resist the temptation to give an overoptimistic appraisal of their mines’ value. The information gap created by the geographical distance between the mines themselves and the Eastern offices of bankers and financiers created fine opportunities for misleading representations and gave all parties involved a chance to feel taken advantage of and generally beleaguered.

Migrants arriving at a mining district would often find that their best and only chance to support themselves lay in wage employment. Young men of modest origins came West expecting to participate in mining’s promised democratization of economic opportunity in which individual hard work would lead to a fortune. Instead, they found that mining had recreated the stratified labor hierarchy that they had left behind in Eastern factories. Struggling to make survival wages in the mining industry was a far cry from the imagined satisfaction of picking up nuggets of gold



Above: Modern times come to mining. *Courtesy of the Colorado Historical Society.*

from clear-running streambeds. California miners, the Forty-niner Bernard Reid lamented, were no better off than “convicts condemned to exile and hard labor.”⁵ As the industrialization of mining proceeded, mine workers who were injured in doing this dangerous work also confronted uncaring companies and hostile laws. Injured laborers stood little chance of winning compensation from a legal system that attributed most accidents to failures of “individual responsibility.” The combination of hardship and disillusionment led to a number of very bitter labor conflicts in the late nineteenth- and early-twentieth-century mining West.⁶

The enterprise of mining imported into the West the sophisticated practices and institutions of Eastern civil society. It also introduced a stark version of the market economy in which a man’s capacity to labor was bought and sold no differently than any other element in industrial production. Mining, in short, accelerated the conquest of the American West, transformed national economics, and revolutionized nearly all aspects of material life. The legacy of mining is everywhere we look: the clustering of Indian people on reservations; the location and dynamism of cities; the lines dividing states from each other; the “prior appropriation” system of water allocation; and the intense and often treasured memories and myths that many Westerners—as well as many Western tourists—hold of the color and energy of the mining booms.

INFORMATION OVERLOAD, COMPASSION FATIGUE, AND A CERTAIN ACIDITY OF THE SOUL

HAVING LEARNED ABOUT THE PROBLEM, anyone will readily agree that abandoned mines should be cleaned up to preserve the quality of our water, to restore wilderness ecosystems to health, and to reopen damaged areas to visitors. Cleaning up has much to recommend it. And yet, socially, politically and economically, this cause runs up against human-created obstacles and hindrances that make the job much harder.

Obstacle-overcoming is not a sport for the well-intentioned but naïve and unguided. But lucky you—you now hold in your hands a Center of the American West report providing directions for surmounting those impediments. There is every good reason, we believe, for Westerners to put their hearts, minds, souls, and even checkbooks into the cause of removing the barriers that prevent the well-intentioned from *acting* in positive and productive ways.

Ladies and gentlemen, cowboys and suburbanites, ardent outdoors sportspeople and committed couch potatoes, we invite you to enlist in a good cause—cleaning up abandoned mines and acid mine drainage.

But we are well aware that, as twenty-first-century Western people, you are besieged with invitations and exhortations to take up good causes. Thanks to newspapers, mail solicitations, radio and TV news, Internet postings, and encounters with advocates on street corners and at dinner parties, you can spend your day sinking ever deeper into a pool of gloom over the state of the natural environment. Many individuals and groups want to inform you of bad news: global warming, wildlife habitat under assault, species in jeopardy, industrial pollution plumes seeping into groundwater, National Parks overwhelmed by visitation, radioactive and chemical wastes seething at nuclear weapon plants, etc. Often, in these melancholy communications, the threats and problems are abundant, and the solutions are sparse.

The result of this barrage of bad news can be a mood that some would label “compassion fatigue,” but which, for the purposes of this report, we christen “a certain acidity of the soul”—a kind of poisoning that comes from excessive exposure to apocalyptic media reports, producing resignation, fatalism, or a sense that the world’s problems are overwhelming to the degree that refusing to pay attention to them is the path of wise and considered self-protection. Besides, aren’t there experts who are supposed to take care of these problems?

And now here we are, asking you to pay attention to abandoned mines and their drainage, a problem you may be encountering for the first time. Indeed, we would be inexcusably naïve if we didn’t expect many of you to respond, “Look, I already had a line-up of things to worry about, and you and your acid mine drainage can go straight to the end of the line. Don’t call me, and believe me, I won’t call you.”

But here’s our pitch: *the work that you do to find a remedy for acid mine drainage will also provide a remedy for a certain acidity of the soul.*

Acid Mind Brainage?

In the next section, we address people who do not know much, if anything, about the problem of abandoned mines and acid mine drainage. We are very aware of—more than that, we celebrate—the existence of Westerners who have studied this problem and who are already committed to finding solutions. And we figure that people who think a lot about this issue frequently have conversations that follow this pattern:

Query: “So what do you do?”

Answer: “I’ve been working with a group of people cleaning up acid mine drainage.”

Response: “What is that?”

Or, alternatively: “I thought they mined for gold and silver; I didn’t realize that acid comes from mines, too.”

Or: “Oh, it looks like my husband’s at the door with our coats. Nice meeting you!”

We figure veteran activists on this issue have had every opportunity to create and refine their techniques for explaining to the indifferent why they should care about this apparently obscure problem. (In our own work in this field, as an example of the less-than-household-name status of the problem, we have had an office of our university refer to this project as a study of “acid mind brainage,” a subject on which academics with life experience in the 1960s might indeed be expected to be experts.) Thus, we eagerly ask those experienced in this terrain to share their most successful techniques.

If you are a person who has worked in the field of acid mine drainage remediation over time, how do you respond when you meet “typical Westerners” whose minds are perfectly blank slates on this subject, and who may even be aggressively bored and indifferent? How do you persuade them to care?

Please send your answers to us at
info@centerwest.org.

Thanks!

PRESCRIPTIONS FOR TREATING THE ACIDIC SOUL AND OTHER WORLDLY AILMENTS

WORKING ON SOLUTIONS TO THE AMD PROBLEM permits individuals and communities to learn several lessons in the most down-to-earth way, lessons that can then be applied to a multitude of other challenges.

Lesson One

While explorations of history are often fascinating, wrestling with the past can turn rapidly into wallowing in the past. Thus, the best “life strategy” for dealing with a problem created for us by our predecessors and ancestors is this: look at the origins of the current problem, and then get on with the solutions. Most, if not all, of the people who caused the problem are long dead, and blaming them squanders your own life force and wastes your own time on this remarkable planet.

Below: Rocky Mountain Joe makes a breakfast of flapjacks for his visitors at the base of Arapahoe Peak at the Fourth of July Mine near Nederland, Colorado. Courtesy of the Colorado Historical Society.



Lesson Two

We are all beneficiaries of the mining business, as well as many other enterprises that rearranged the landforms and life forms of the planet in big ways, and no one—and we mean no one—is in a position to claim innocence and smug distance. When you trace the causes of the ease, safety, and comfort of modern life, “access to abundant minerals” ranks at the top of the list. Mining interest organizations such as the Mineral Information Institute are quite right when they remind us that mining provides key ingredients for innumerable necessities of modern life, everything from antacid tablets to car batteries to computers to those environmentally friendly florescent light bulbs.

Mining and Western Civilization: Talc for Your Baby’s Bottom

Now that you understood the potential for mining to generate nasty pollution, you might be tempted to argue that extracting those metals out of the ground is just not worth it. Some have, in fact, argued that gold mining, a sometimes very dirty business, serves very little industrial, scientific, or military purpose.⁷

This is the moment, then, to remind ourselves of the centrality of mining and its products in that mega-phenomenon we call Western Civilization, and here we don’t just mean horseshoes and branding irons. The development of the Western world since ancient times has closely followed humanity’s ability to extract metals and minerals from the ground and to forge them into ever more useful (or powerful) implements.

History professors get understandably excited when explaining to us how advances in mining techniques in the late Middle Ages allowed Europeans to more efficiently produce iron, giving them the raw material needed for the development of artillery and guns. Out of this military revolution of the fourteenth and fifteenth centuries came political and social changes that ushered in the modern period. In an example closer to home, molybdenum mined at the Climax Mine in Leadville, Colorado, was a key ingredient in the hardening of steel used in the manufacture of planes, tanks, and artillery during World War II. Silver and gold has also bought boots, guns, and rations, and paid the wages of the professional soldier. We may credit, for example, the state of Nevada with providing to the Union Army the silver it needed to vanquish the poorer Confederates. If mining enhanced the destructive power of war, it was equally a force of creation. The wealth reaped in the harvest of precious metals built great cities like San Francisco and Denver.

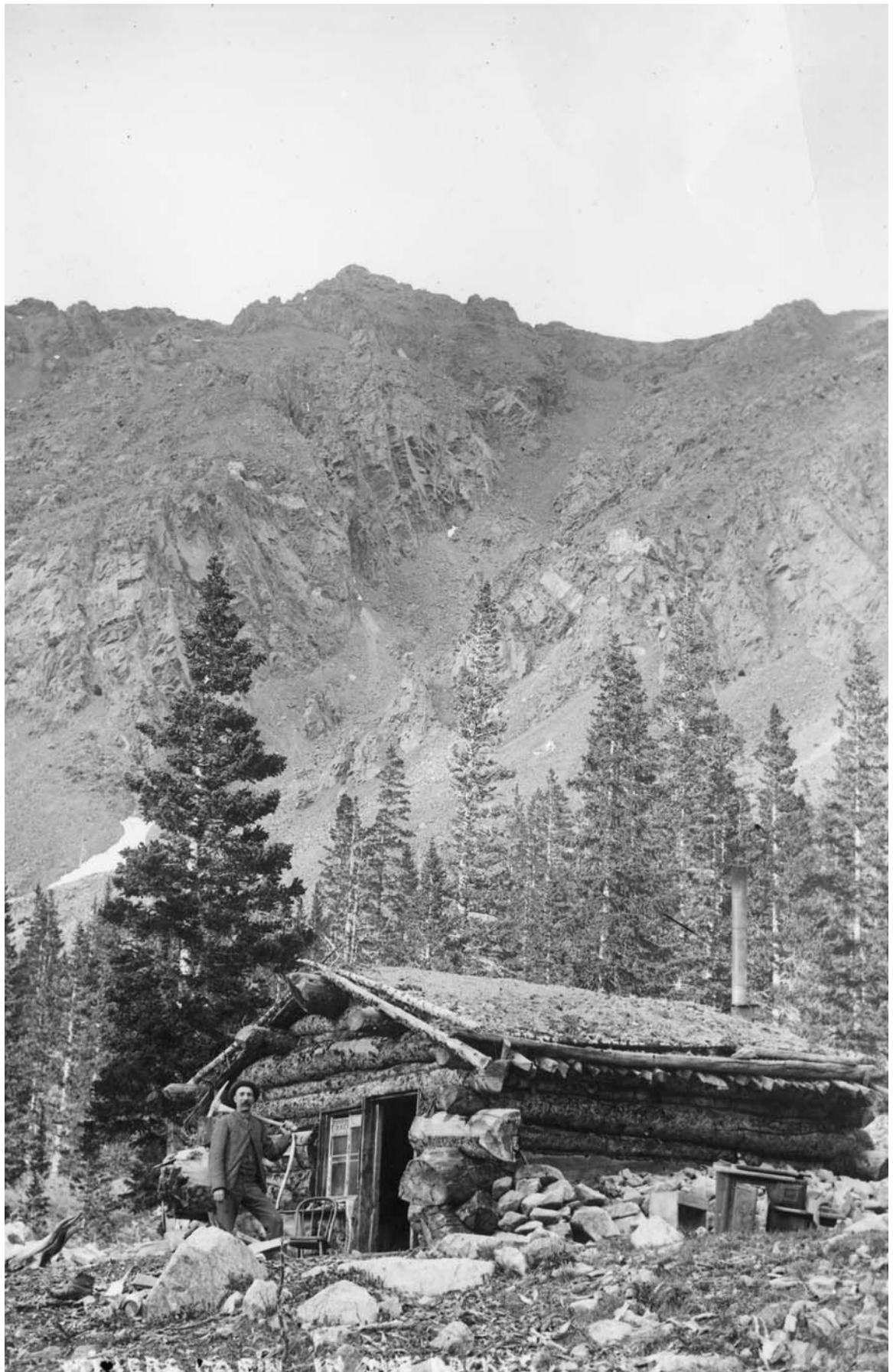
There are no inherent cultural or moral qualities in metal. We assign those values at the moment when we decide what object we shall fashion from it, whether a cannon, a sculpture, a wedding ring, or the steel springs in your Barcalounger. Society has accepted the environmental costs of mining so that we can surround ourselves with its products: copper pipes for our plumbing; fireworks on the Fourth of July; metal coinage; and talc for our babies’ bottoms. Although we may select products with environmental concerns in mind, and though we fully endorse good conservation and recycling practices, there is no denying our dependence on the commodity world of mining products.⁸

Even as we fret about acid mine drainage, we should also acknowledge that the extraction of metals at a certain moment and place may produce social benefits and values that exceed the long-term environmental costs of mining, and those benefits continue to be realized into the indefinite future. To take the earlier example, we might ask if the contribution of Leadville’s Climax Mine to the war effort in the 1940s was worth it. The reclamation of the Climax mine is taking millions of dollars and is not yet complete. Nonetheless, we needed its molybdenum to defeat Nazi Germany. How do we measure the ongoing and profound benefits of having won World War II against the environmental cost? It is, of course, an impossible question in any quantifiable sense. But if we decide that the benefits outweigh the costs, then we need not live with the gloomy notion that places like the Climax Mine represent a costly environmental mess and nothing more.⁹

Lesson Three

When opportunity presents itself for Americans to set a good example for the world, they should seize the chance. Asking the rest of the world to keep Americans comfortably supplied with raw materials while we regulate or reduce our own resource production raises our collective hypocrisy to dangerous levels if we do not show the world how to reckon with or correct environmental damage.¹⁰

Right: A Colorado miner's cabin, location unknown.
Courtesy of the Colorado Historical Society.



Lesson Four

The environmental laws of the 1960s and 1970s created a whole new world for the operations of extractive industries, and we are all beneficiaries of that transformation. And yet those laws were not written under divine inspiration. They are not sacred, infallible texts that will impart perfect wisdom for all time. Sometimes negotiation and compromise really can open the door to problem-solving, and *not* to insidious undermining of effective government regulation. Legislation designed to protect the environment can inadvertently harm it. Responsive adjustments to the law are not necessarily a regression in environmental practices. The exercise of amending environmental laws would be its own fine demonstration that flexibility can, in a good cause, overrule defensiveness and suspicion of a hidden agenda in reform.

Lesson Five

Very high goals and standards are in some ways admirable, but they have a certain capacity to curdle and undermine their own effectiveness. A perfect cleanup of the environment is an ideal to contemplate and dream of, but standards of perfection can prevent less comprehensive, but still meaningful improvement. “The perfect is the enemy of the good” may be on its way to the status of a platitude, but it is a “life truth” that acid mine remediation teaches with particular effectiveness. Working through this issue will help you reach a position of wisdom when it comes to deciding when you should hold to high standards and when you should relax those standards in the interests of getting things done.

Lesson Six

Though “blaming the feds” is a favorite Western sport, the fact that so many abandoned mines are on public lands provides its own great opportunity for us to explore the meaning of the concept “public service” in a time when it triggers more cynicism than it deserves. It is certainly not the fault of the Forest Service or the Bureau of Land Management personnel if their landholdings contain abandoned mines with AMD problems, and getting those agencies the best resources, support, and applause for dealing with this problem is a task that every citizen should support.

Lesson Seven

Having done a few things that are going to leave our descendants wishing they had had a better quality of ancestors, we may as well make an effort or two to get on posterity’s good side. Even though we are encouraging you to adopt a forgiving attitude toward our predecessors on the planet, there is really no reason to give those who will follow us a bad opinion of their ancestors. Cleaning up abandoned mines is an honorable and meaningful way to court posterity’s good opinion. It is also a good way to become nominated for the Center of the American West’s Honor Roll of Sustainable Heroism.

We recommend these seven prescriptions in healthy doses to strengthen your resolve and fortitude as you join us in our work of reckoning with the environmental legacy of mining. These prescriptions, we believe, will put you in a constructive and positive frame of mind as you think about and, perhaps, engage in the challenge of mine remediation.



Above: Drainage from an abandoned mine adit.
Courtesy of the Colorado Division of Minerals and Geology.

THE EARTH'S BIOGEOCHEMISTRY: WHAT IS ACID MINE DRAINAGE?

Sulfide Minerals Plus Oxygen Plus Water Equals Acidity and Metals

Acid mine drainage is water that typically carries unusually high concentrations of dissolved metals such as zinc, arsenic, cadmium, lead, copper, and selenium. It is also acidic, or low in pH, like soda pop. The water may come from inside the mine, draining out the mine entrances and tunnels, or from rainfall and stream water that come into contact with discarded ore at mining sites. The acidity and metals are released into the environment when oxygen and water react with metal sulfide minerals like pyrite. Pyrite is an iron sulfide that makes up a significant portion of most waste rock. The reaction of pyrite with oxygen and water is called "oxidation." Oxidation is the same process responsible for the rusting of iron or the tarnishing of silver. AMD formation is essentially the rusting of the iron-laden ore sitting in the open, a process which produces acidity and sulfate. The key point is that AMD is formed pretty much whenever pyrite is exposed to oxygen.

Most of the hardrock mining in the Western United States targeted veins of metal sulfides. These were the ores most sought after by miners. Operators recovered valuable

Below: A pile of sulfide ore at Illinois Gulch, Colorado. *Courtesy of the Colorado Division of Minerals and Geology.*



metals, especially gold and silver, from the ore by milling, smelting, and chemical processes, but the sulfide minerals with metals of little economic value were left behind as waste. Nineteenth-century miners left enormous amounts of waste rock exposed to the elements, some of it as large chunks, and some as milled, fine powders (tailings). Even some of the old miners observed with concern the changes in water color, even if they didn't understand the full environmental consequences.

Some refer to the process of sulfide mineral oxidation as acid *rock* drainage. Those who make this distinction want us to remember that undisturbed nature can and does generate acidic and metal-laden water without the intervention of miners. In the Animas River watershed in Colorado, much of the metal contamination in the water has been attributed to natural oxidation, or weathering, of the metal sulfide deposits. However, this “background” weathering produces for the most part only aluminum and iron, the other metals having long since leached out over the eons of geological time. Bringing long-buried



Left: Mill tailings. *Courtesy of the Colorado Division of Minerals and Geology.*



Below: A new channel at Willow Creek, Colorado, under construction to divert running water away from waste rock. *Courtesy of the Colorado Division of Minerals and Geology.*

Right: A diversion ditch to prevent exposure of water to mine tailings. *Courtesy of the Colorado Division of Minerals and Geology.*



ore out of the ground exposes higher-grade metal sulfides to the weathering process. As this metal-laden rock is broken into smaller fragments, its surface area greatly increases, allowing more oxygen and water to interact with the rock and further accelerating the decomposition of sulfides and the release of the toxic, dissolved form of metals. This happens on the surface in waste rock and tailings piles as well as in the underground portions of a mine. Operating mines needed to be well ventilated for the health of the workers, but these ventilation systems now serve as conduits that bring oxygen and water to the underground metal deposits.

One of the most fascinating aspects of acid mine drainage chemistry involves the “contribution” made by living creatures. A key step in the oxidation reaction is sped up by bacteria such as *Acidithiobacillus ferrooxidans*. This bacterium, which thrives in low pH conditions and gets its energy by oxidizing ferrous iron into ferric iron, can speed up the overall reaction by as much as a million times! So these bugs make a big difference in how fast the acidity and metals are generated. At this point, you might think we just need to use some antibiotic to kill these bacteria, and we’d solve the acid mine drainage problem. You would not be the only one holding that thought. For three or four decades, researchers have been trying to apply bactericides or to add competing bacteria to piles of waste rock and tailings to slow the generation of acid mine drainage. But it’s difficult to get the bactericides or the competing bacteria into all the nooks and crannies occupied by *A. ferrooxidans*, especially into long-abandoned underground mines, and these strategies have not yet proven effective on a scale sufficient to solve the problem. Research in this area is ongoing.

Tough Times for Fish and Their Human Enthusiasts

The aquatic life in the alpine streams bears the burden of acid mine drainage to a much greater extent than humans do. Only some of the dissolved metals in acid mine drainage—cadmium and lead, for example—are potentially harmful to humans. Fish, however, are much more susceptible to the toxicity of these metals. Fish have to live in the water; we only drink about two liters of water a day, according to the health risk calculations of the U.S. Environmental Protection Agency (EPA). The soluble metals, however, continually pass through and are absorbed by fishes' gills and gastrointestinal tracts. Add in the metals absorbed from the insects they eat, and it's not hard to see how fish in AMD-tainted water are highly vulnerable to these lethal poisons. The EPA says that we humans can tolerate copper in our drinking water at concentrations up to 5,000 micrograms per liter of water, but the fish in an alpine stream can tolerate only 65 micrograms per liter.

One of the tell-tale signs of acid mine drainage is the deposits of iron oxides that collect on the bottom of streams affected by acid mine drainage. The iron deposits come from the oxidation of pyrite. Like rusting iron, these deposits are yellow-orange in color. A careful observer might also detect white streambed deposits—aluminum oxides. As the pH of the drainage water increases, the iron precipitates first, then aluminum along with some other trace metals, like lead and cadmium. These deposits of the iron oxides form an impenetrable layer between the water and the sandy and gravelly sediments of the streambed. This “armoring” of the stream bottom prevents bugs from accessing their habitat and prevents fish from making their “nests” in the gravel bottoms and spawning. If the acid and metal content is high enough, and the damage to the streambed is bad enough, aquatic plant and animal life may entirely vanish, leaving a “dead” stream.



Left: This winter snow will melt and filter through the sulfide ore, taking with it acid and toxic metals. *Courtesy of the Colorado Division of Minerals and Geology.*

WHY AREN'T WE CLEANING UP MORE ABANDONED MINES?

The Clean Water Act and Other Ways to Clean Up Our Act

YOUR GROWING ENTHUSIASM AND ARDOR for redressing this environmental sorrow will now give you the strength to grapple with another dimension of the problem, one that certainly increases the complexity of treating acid mine drainage but that must also play a big role in the solution. Be warned! You are entering the tangled and changeable world of state and federal environmental laws. This is a world of acronyms, subsections, and government agencies of which you've never heard; it can be a thicket of information which might seem daunting if you did not have this report as a guide. Nonetheless, the cleanup of abandoned mines largely depends on the regulations and funding mechanisms prescribed by these laws. Your familiarity with this world will equip you to encourage your elected officials to amend existing laws and to enact new laws that will expedite the cleanup of abandoned mines.

We begin knee-deep in irony. One of the landmark environmental protection laws enacted by Congress in the late 1960s and early 1970s, the Clean Water Act of 1971, now stands as one of the principal obstacles for the treatment of acid mine drainage. In most other respects, it is very good at protecting the nation's waters. It has allowed the nation to clean up some of its most polluted waterways, especially those Eastern rivers that had been long used as open sewers. We live in a much better world because of the Clean Water Act, and we all owe a great debt of gratitude to its authors. And yet, when it comes to acid mine drainage from abandoned mines, the law has delivered up some unintended consequences.

The Clean Water Act creates both a mandate and an obstacle for cleaning up acid mine drainage. The Clean Water Act prohibits "the discharge of any pollutant by any person" without a permit, into "navigable waters from any point source." The law delegates to the states the responsibility of identifying streams that are impaired in terms of their designated uses. For many alpine streams affected by acid mine drainage, that designation is "Class 1 Cold Water Aquatic"—this means that the stream should support aquatic life, including species that may be sensitive to trace amounts of metal contamination. If the concentrations of metals exceed the standards for sustaining aquatic life, then the stream is "impaired," and some kind of remedial action is required by the Clean Water Act.

If it is your noble ambition to clean up polluted water issuing from a mine, you would be required in normal circumstances to obtain a Clean Water Act discharge permit (a National Pollutant Discharge Elimination System permit or NPDES). Here your difficulties begin: the permit requires that the treatment you undertake will meet Clean Water Act water quality standards, which are very stringent, and that whoever attempts the cleanup will remain responsible for the source of pollution in perpetuity (that could be you!). These two provisions have deterred many interested parties from cleaning up polluting mines. When a third party—a nonprofit organization, community group, government agency, or corporation—attempts to clean up acid mine drainage coming from an abandoned mine, that third party legally assumes liability for the mine's discharge. In other words, the party working to clean up the source of pollution becomes the legal "operator" of the mine, and at that point becomes vulnerable to a host of troubles, proving the point that few good deeds go unpunished. An environmental Good Samaritan may want to decrease the acid mine drainage, but perhaps because of cost limitations, cannot undertake a comprehensive remediation project that would satisfy Clean Water Act water quality standards. Current federal law allows for no such partial cleanup. A Good Sam has the choice of achieving the highest water quality standards or not undertaking the project at all.

An additional deterrent is the financial penalty that such an operator might incur under Clean Water Act provisions. Although it is up to the discretion of individual judges, an operator of a mine is liable to incur penalties of up to \$32,500 for every day that the mine discharges pollution. Would-be environmental Good Samaritans abandon their good mission because they cannot possibly risk these fines, assume the long-term financial liability, or meet the water quality standards dictated by the Clean Water Act.

Some argue that acid mine drainage and abandoned mines were not on the minds of the creators of the Clean Water Act, and that abandoned mines should not be covered by it. As John Whitaker recalls in the following sidebar, the Clean Water Act authors had a different kind of environmental offender in mind, principally those factories that dumped pollution directly into rivers and streams. Factory operators knew that the Environmental Protection Agency could fine them or shut their operations down using Clean Water Act provisions if they did not stop discharging pollution. But our old mines here in the West are indifferent to federal strictures and obstinately ignore the threat of fines and of being shut down—they go on emitting their pollution day after day.

The provisions of the law allowing regulators to force living operators of working facilities into compliance only serve as impediments to mine cleanups where human activity has long since ceased. When the current owner of an abandoned mine cannot be held responsible because of insufficient financial means, or when she or he has no plans to reactivate the mine in the future, third parties intent on reducing this pollution from the mine—environmental Good Samaritans—are the only ones available to undertake the cleanups.

Below: AMD pipe. *Courtesy of the Colorado Historical Society.*





Above: The Sunnyside Mill in Eureka, Colorado.
Courtesy of the Colorado Historical Society.

One of the principal dreams for advocates of abandoned mine remediation is to help Good Samaritans to find a way around the Clean Water Act impasse so that they might do their work without incurring penalties and punishment.

Fortunately, activists in abandoned mine remediation have also been very imaginative in using other environmental laws, like the Comprehensive Environmental Response Compensation and Liability Act (CERCLA) of 1980, which is known more simply as “Superfund.” Some of these laws even contain Good Samaritan provisions that would, in theory, provide protection from Clean Water Act liability. But no one is entirely sure. However creative these cleanup efforts are, they always must step nimbly around the Clean Water Act. Work on abandoned mines by Good Samaritans is proceeding through efforts to minimize the interaction of water with waste rock and tailings piles, and preventing the flow of water into mines, but always with the handicap of avoiding treatment of the acid, metal-laden water flowing from the mines. Many would-be doctors of sick mines report that they will not feel entirely safe until Congress enacts Good Samaritan legislation, whether as an amendment to the Clean Water Act, or as its own bill.¹¹

John Whitaker: Present at the Creation of the Clean Water Act

John Whitaker, environmental advisor and Undersecretary of the Interior during President Richard M. Nixon's last administration, here reflects on the circumstances and thinking that went into the creation of a key portion of the Clean Water Act, the Water Pollution Control Act of 1971.

When I and other White House staffers responsible for environmental initiatives during the Nixon administration recommended to the President new water pollution control strategies for congressional consideration, our focus was primarily on sewage treatment and industrial effluent, not the acid mine drainage problems from abandoned mines. We should have had more foresight.

Before we decided on a regulatory enforcement strategy, our initial inclination was to propose to President Nixon an effluent fee system, i.e., a market-oriented alternative to regulation by enforcement that relied on financial, not regulatory, incentives to clean the nation's waters.

The effluent fee concept was appealingly simple. The more an enterprise polluted, the more it paid. This way, the free market could set the cost of cleaner water, not a regulatory system, which often turned out to be based on unscientific assumptions with politically motivated goals that were impossible to meet.

However, the effluent fee concept died because there were serious political disadvantages. Congress had only given consideration over the years to a "tough cop" regulatory approach. "Sue the bastards" had a nice ring to it.

Also, effluent fees are a form of taxation, and the House Ways and Means Committee and the Senate Finance Committee would have claimed jurisdiction. Under those conditions, it was highly unlikely that Nixon's proposals would have ever seen the light of day because members of these committees saw taxation only as a means for increasing or decreasing revenue, not as a means of curing social ills such as water pollution.

In retrospect, one wonders what might have been. Later, in 1972, an EPA paper, "Alternative Strategies in Water Quality Management," concluded that an "effluent fee is the most effective alternative for national water quality objectives. It promises to be the most effective and simultaneously requires the least cost."

Eventually, bowing to political realities, we decided to go down the traditional regulatory path, which indeed turned out to be the proverbial slippery slope.

Impatient that Congress had sat on Nixon's proposed water quality legislation for almost a year (Congress held a few water pollution hearings, then spent most of its time on air pollution, solid waste, and ocean pollution legislation), we decided to revive the permit authority in the old 1899 Refuse Act that required a federal permit to discharge effluents into navigable waters. Later Congress incorporated this permitting authority into the Water Pollution Control Act of 1971.

However, Congress required that the water pollution control standard be "zero discharge." At the time, the Nixon Administration witnesses testified before Congress that the zero discharge provision was an impossible goal to achieve, and also an unreasonable financial impediment to clean water because of the very high cost of removing the last few percentages of effluents in relation to the benefit of the result. The stated goal reflected a lack of understanding of the scientific and technical aspects of water pollution control.

For example, a zero discharge provision ignores the nature of the river, lake, or ocean into which the discharge is flowing, and this oversight can lead to absurd results: water distilled to the zero discharge standard at great cost might be dumped into naturally saline or mineralized streams, altering them for the worse.

We did not envision at the time that the day would come when the zero discharge provision would prevent Good Samaritans from cleaning up acid mine drainage or when the onerous and costly federal permit requirements would snuff out any economic incentive to curb the acid mine drainage problem associated with abandoned mines.

So perhaps the time has come to take another look at the basic water quality laws and reconsider a market-based effluent fee approach.



The Keystone Parable: The Good Samaritan

When they are dealing with contemporary problems in environmental policy, university professors are not in the habit of reaching for the Bible for guidance. But in working on this project, we have had occasion to read and reread the Gospel of Luke, 10: 25–37. Of all the opportunities for religion and public policy to declare a truce in their long-running squabble and give each other a hand, the use of the Parable of the Good Samaritan strikes us as a prime opportunity. We are not sure how the term Good Samaritan got itself mixed up with efforts to remove a legal obstacle to the cleanup of abandoned mines, but it seems to us an inspired choice of terms and concepts.

Here is the biblical passage:

On one occasion an expert in the law stood up to test Jesus. “Teacher,” he asked, “what must I do to inherit eternal life?”

“What is written in the Law?” he replied. “How do you read it?”

He answered: “‘Love the Lord your God with all your heart and with all your soul and with all your strength and with all your mind’; and, ‘Love your neighbor as yourself.’”

“You have answered correctly,” Jesus replied. “Do this and you will live.”

But he wanted to justify himself, so he asked Jesus, “And who is my neighbor?”

In reply Jesus said: “A man was going down from Jerusalem to Jericho, when he fell into the hands of robbers. They stripped him of his clothes, beat him and went away, leaving him half dead. A priest happened to be going down the same road, and when he saw the man, he passed by on the other side. So too, a Levite, when he came to the place and saw him, passed by on the other side. But a Samaritan, as he traveled, came where the man was; and when he saw him, he took pity on him. He went to him and bandaged his wounds, pouring on oil and wine. Then he put the man on his own donkey, took him to an inn and took care of him. The next day he took out two silver coins and gave them to the innkeeper. ‘Look after him,’ he said, ‘and when I return, I will reimburse you for any extra expense you may have.’”

“Which of these three do you think was a neighbor to the man who fell into the hands of robbers?”

The expert in the law replied, “The one who had mercy on him.”

Jesus told him, “Go and do likewise.”

—*New International Version Bible*

Can an Environmental Good Samaritan Make a Profit?

The parable of the Samaritan traveling from Jerusalem to Jericho provides excellent but not wholly definitive criteria for defining an environmental Good Samaritan. Let’s begin by proposing that such an entity—whether an individual, a group, a government agency, or a complex coalition of groups—would be moved first and foremost by the desire to clean up an environmental mess; that to do so, it would bring its resources to bear, not just once, but until the problem was resolved; and finally, that it would understand this act as a moral obligation, believing that it is everyone’s responsibility to care for the global neighborhood. So far, we can unequivocally laud this kind of Good Samaritan. While we are ready to understand why our ancestors treated the earth as they did, we also don’t want to leave parts of our planet “half dead,” especially after having taken some of the riches. We respect and applaud Good Samaritans whether they help wounded individuals or injured ecosystems.

A trickier issue, however, arises when Jesus’s Good Samaritan *apparently* evinces no self interest in his actions. He acts, certainly, out of mercy, but did he have other motivations as well? Could we imagine that he hoped for some kind of benefit, if only to the health of his soul? The point of the parable was, after all, to show a path to eternal life, not a bad return on his investment of a little trouble and a few coins. Was the Samaritan thinking *primarily* of his standing with God even as he pulled the stranger from the ditch?

In terms of healing the environment, the issues of self-interest and a profit motive are also points of contention when trying to define who counts as a Good Samaritan. Some argue that an environmental Good Samaritan can only work on behalf of public welfare broadly defined. This means, in practical terms, that the redemptive actions must be governmental in nature because government, unlike most philanthropic enterprises, endeavors to balance the needs and desires of society’s many competing interests. Government agencies are also accountable to elected politicians and ultimately to the public. Others also worry that if environmental Good Samaritans are allowed to profit in some fashion from a clean up—as some mining companies now propose—the purpose of environmental cleanup will be lost in the pursuit of economic gain. Environmental groups for the most part resist industry solutions on the grounds that the miners’ historical role in the creation of the problem predicts that they would be little help in finding a solution today. By this logic, those who committed the crime should not be put in charge of correcting the situation.

On the other hand, some kind of profit incentive could dramatically accelerate the process of cleaning up abandoned mines. Private enterprise has an energy and drive that could have a very positive effect. Mining companies, after all, know how to work the sites. Government processes, on the other hand, do not enjoy a reputation for efficiency. Some argue that the government is good at conducting studies and writing reports, but the real technological know-how, the scientific brain power, and the right equipment are all found in the mining industry. Why exclude this expertise from the effort?

For now, we leave the question open for your contemplation: *Is a Good Samaritan environmental action compatible with some form of self-interest or profit incentive?*

The Good Samaritan Rebuffed

Environmental Good Samaritans have had to contend with the kind of obstacles that might have made the biblical Good Samaritan hurry past the man in the ditch. A fine example comes from California's Sierra Nevadas. In 1963, the East Bay Municipal Utility District (EBMUD), the Good Sam in this story, constructed the Camanche Reservoir in the foothills of the Sierra Nevadas for flood control, fisheries, and recreation. To construct the reservoir, EBMUD bought several parcels of land, one of which was immediately adjacent to an abandoned mine, the Penn Mine. The Penn miners recovered copper from massive sulfide deposits from the 1860s to the 1950s, and left behind a complex of discharging mine entrances, waste rock piles, and tailings ponds. Acid mine drainage from the Penn Mine was flowing into the Mokelumne River and eventually the Camanche Reservoir as it filled. After it became clear that the mine's former operators were not able to clean up the site, EBMUD voluntarily undertook construction of a dam and a series of detention ponds that precipitated out the toxic metals as the water passed through to the reservoir—most of the time.

During heavy rains, the acidic, metal-laden water in the detention ponds overflowed into the reservoir. Using the permitting provision of the Clean Water Act, environmental and sport-fishing groups sued EBMUD for these violations. In the case *Committee to Save the Mokelumne River v. East Bay Municipal Utility District*, the Ninth Circuit Court of Appeals ruled in 1993 that EBMUD was required to bring the Penn Mine discharge up to Clean Water Act standards and to treat the water in perpetuity. Eventually, EBMUD spent \$10 million to restore the site to “pre-mining” conditions, sealing the draining mine openings and placing the waste rock and tailings in a secure landfill. Most important, EBMUD reached an agreement with the EPA that this treatment would extricate EBMUD from the jurisdiction of the Clean Water Act and thereby relieve EBMUD of perpetual responsibility. Still, the costs of this Good Samaritan action were disproportionately borne by a water utility with no connection to past mining operations.



Left: The Penn Mine site before remediation.
Courtesy of the Colorado Division of Minerals and Geology.

Right: The Pennsylvania Mine near Keystone, Colorado. *Courtesy of the Colorado Division of Minerals and Geology.*



The cleanup was largely successful, but the case sent out a clear message to anyone who might get involved in abandoned mine remediation: under the Clean Water Act, if you try to help, you can be held responsible for both the cost of the cleanup and for the ongoing cost of water treatment in perpetuity. As a large public utility company, EBMUD had the resources to perform the cleanup, but communities or organizations simply interested in restoring a polluted watershed—interested, that is, in being environmental Good Samaritans—could not normally contemplate, or accept, this financial responsibility.

Would-be Good Samaritans took the EBMUD case to heart immediately. In the late 1980s, the Colorado Division of Minerals and Geology (DMG)—the Good Samaritan in this case—started designing and constructing a treatment system for the Pennsylvania Mine in Summit County, Colorado. The Pennsylvania Mine was discharging a couple hundred gallons per minute of highly acidic water into Peru Creek. Peru Creek flows into the Snake River, which the Keystone Ski Resort draws upon for snow-making, and the Snake River flows into Dillon Reservoir, a major water supply for the city of Denver. Most of the five miles of Peru Creek was and remains devoid of aquatic life. With the help of an

environmental group, Volunteers for Outdoor Colorado, the treatment project was nearing completion in 1993 when the DMG heard of the *East Bay Municipal Utility District*. At about the same time, the EPA issued a ruling that discharging adits require Clean Water Act permits. The combination of the court case and the EPA ruling forced the DMG to shut the Pennsylvania project down. The DMG felt that it simply could not expose itself to the kind of liability that had fallen on the East Bay Municipality District. An opportunity for a cleanup was forfeited. All over the West, other Good Samaritans who had planned cleanups at abandoned mines with discharging adits stopped their efforts for fear of Clean Water Act liability and permitting standards. They have, in general, altered their approach to mine cleanups by restricting remediation efforts to rerouting of water away from mines and waste rock tailings piles to remain outside of Clean Water Act jurisdiction.

LOOKING EASTWARD (!) FOR SOLUTIONS AND INSPIRATION?

The Commonwealth of Pennsylvania Takes a Risk



Above: The Vintondale wetlands. Courtesy of AMD&ART.

A CENTURY OR TWO OF MIFFED FEELINGS have made Westerners susceptible to crabbiness and defensiveness when we are told to learn from and follow the wise examples set by Easterners. In truth, Westerners have been patronized and condescended to by Easterners, though it is certainly true that we have given as good as we've gotten, patronizing and condescending right back. But the question of the Good Samaritan and abandoned-mine cleanup requires Westerners to take a deep breath and acknowledge that the Easterners are ahead of the game on this one. And anyone reluctant to admit that an Eastern state has set a model we might imitate can always point out that Easterners made their messes before we made ours, so they have had more time to come up with solutions.

Rather than waiting for federal Good Samaritan legislation, the state of Pennsylvania passed its own in 1999—the Environmental Good Samaritan Act.¹² This act presumably provides protection against liability for land owners and third parties (individuals, non-profit organizations, corporations, and government agencies) that take on abandoned mine reclamation and water-pollution abatement projects. By this legislation, as long as you don't make the problem worse, you will be shielded from liability under the Clean Water Act. All work must be conducted with the guidance and approval of the Pennsylvania Department of Environmental Protection.

At the same time, Pennsylvania's Governor Tom Ridge signed the Growing Greener legislation, which provides \$650 million from the state's general funds over five years to clean up critical environmental problems, including acid mine drainage from abandoned coal mines. State legislators recognized acid mine drainage as Pennsylvania's most pressing water quality problem, and they sought to provide both liability relief and the money to do the work of remediation.

Cleaning Up in Coal Country

Removing the obstacles of liability and insufficient funding has resulted in a proliferation of active watershed groups in Pennsylvania—the Pennsylvania Organization for Watersheds & Rivers lists about three hundred watershed alliances, associations, and friends—Friends of the Mingo Creek, of the Poquessing Watershed, of the Sinking Valley, of the Nescopeck Creek, of the Wissahickon Creek—just to name a few.

One of these Pennsylvania groups, AMD&ART, Inc., led by T. Allan Comp, our coauthor and a historian with the federal Office of Surface Mining, is completing an exemplary project in the old coal mining town of Vintondale in central Pennsylvania.¹³ Comp and his team, which included a landscape architect, a sculptor, a hydrologist, a bunch of AmeriCorps*VISTA volunteers, and many of the 600 residents of Vintondale, spent ten years and about \$1 million turning an abandoned colliery (coal mine) into a park that (1) treats a few hundred gallons per minute of acid mine drainage, (2) celebrates the coal mining heritage, and (3) provides recreation facilities for Vintondale's residents. AMD&ART strives to “artfully transform environmental liabilities into community assets,” and in Vintondale, that mission was accomplished.

Not all of the projects being undertaken in Pennsylvania are integrating history, arts, technology, and community as effectively as does AMD&ART in Vintondale, but it offers an example to follow. One of AMD&ART's most innovative ideas was to not hide the system treating the acid mine drainage. Instead, it became the focus of the park to increase public awareness of the need for cleaning up abandoned mines. The acid mine drainage

begins treatment in the “Litmus Gardens,” a series of trapezoidal, limestone-lined ponds that neutralize the acidity and remove metals and change the color of the water from reddish-orange to greenish-blue. The plantings surrounding the ponds were chosen to match the water’s color and to direct a visitor’s attention to the improving water quality. Vintondale’s success suggests not only the importance of thinking about environmental remediation in large terms, but also enlisting the power of state and local initiative.

Why Don’t Western States Follow Pennsylvania’s Example?

Pennsylvania has managed to relieve Clean Water Act liability, provide more than a half-billion dollars of funding for remediation projects, and encourage community participation in cleanups on a wide scale. Should Western states follow Pennsylvania’s example by passing their own Good Samaritan legislation?

The Pennsylvania model is not perfect. The problem with Pennsylvania’s strategy is that its Environmental Good Samaritan law should not be able to legally supersede the requirements and provisions of federal law. We would expect that the federal Clean Water Act would be the law of all the land, and it is unconstitutional for any state to adopt another that contradicts it. Pennsylvania Good Samaritan groups such as AMD&ART, Inc. presume that they are protected from Clean Water Act penalties and liability as they work under the auspices of their state’s Good Samaritan law. But it is possible that they are running a risk by putting a state law ahead of a federal law. They might still fear that a federal environmental standards enforcement agency, particularly the EPA, will step in and hold them to the stricter federal standards. In fact, EPA officials know that good work is being done in Pennsylvania; they want to see mines cleaned up and so are probably not going to interfere with the progress. The bigger risk to Pennsylvania Good Samaritans may come from citizen groups, especially environmentalists, who oppose any laws which allow an exception to or variance from the standards and provisions of the Clean Water Act. Under the law, citizens are allowed to bring a suit to force a mine operator to meet the strict water quality standards laid down by the Clean Water Act. There might be broad agreement on a reasonable approach to cleaning up a site, but it would take *only one* dissatisfied holdout to scuttle a project. Using the Clean Water Act, such a holdout might win a legal judgment against a Good Samaritan organization. There is no certainty that a Good Samaritan state law would provide legal protection in a courtroom. Nonetheless, many Appalachian watershed organizations are going ahead with abandoned mine projects.

Western state legislatures are well aware that any state-enacted Environmental Good Samaritan legislation might well conflict with and lose to the Clean Water Act, and so most have taken no action to follow Pennsylvania’s example. Would-be Good Samaritans in the West also fear that a state law would give them little shelter from liability. One experienced member of a Colorado watershed stakeholder group averred that he will not expose himself to Clean Water Act liability even if his state passed a Good Samaritan law. He is waiting for changes in federal law. For the time being, creative project managers avoid dealing with the mine water itself and instead focus on preventing water flow into mines and waste piles, and thereby avoid triggering Clean Water Act provisions.

And yet, states still have an important role to play. Upstart laws such as Pennsylvania’s help increase national recognition that such a federal law is needed. If several Western states passed laws that implicitly modified the Clean Water Act, then Congress would get the message that something needs to be done to give Good Samaritans relief. Meanwhile, the Western states have not been sitting idly, waiting for federal action. The Western Governors’ Association (WGA), a cooperative association of Western governors dedicated to the formulation of regional policies, has actively pressed for an amendment to the Clean Water Act, and came close to getting one through Congress in 1995. Subsequently, the WGA has worked hard to draft new federal Good Samaritan legislation, and continues to build support among state representatives, the EPA, the mining industry, and environmental groups. From the point of view of the WGA, what the Western states need is not a state law like Pennsylvania’s, but support from Eastern senators and representatives in enacting a federal

Good Sam law. Organizations like the WGA and Western state legislators are in fact leading the effort for a Good Samaritan law, and they would very much appreciate a little help from their Eastern colleagues.

The Pennsylvania example does hold an important lesson that should be taken to heart in the West. AMD&ART and Vintondale wisely protected themselves from legal challenges by creating as large and diverse a coalition as possible, one that included environmental groups and government agencies. By including all these interests and stakeholders in the process of recreating Vintondale, AMD&ART left no potential foe to bring a suit against the project. Westerners would do well to follow this model of cooperation and coalition building that encompasses the entire political spectrum.

Eastern coal country must also be given credit for facing up to the environmental consequences of mining, both past and present, and for establishing comprehensive legislative measures to ensure that the coal industry goes about its work in a more environmentally sound manner. Westerners, it must be said, have not yet confronted their own hardrock mining legacy in the same way. However they address the problem, Westerners must bring to the process their own traditions of civil engagement, independence, and regional pride.

The Stick or the Carrot: Water Regulations and the London Extension Mine

In the mid 1990s, Colorado identified a problem mine in the historic Mosquito Creek mining district. One mine tunnel in particular, the London Mine Extension near Fairplay, was found to produce 90 percent of the heavy metals affecting the watershed. The Colorado Department of Minerals and Geology (DMG), in cooperation with the mine's owner, designed and built a treatment plant that achieved a dramatic drop in the discharge of toxic metals. Elevated levels of zinc were brought below toxic levels. Each year, the treatment plant captures 8.5 tons of metals that would otherwise pollute the watershed, and the project managers expect a revitalization of the stream's aquatic life.

In order to accomplish the project, however, the DMG had to obtain permission from the Colorado Water Quality Control Division to discharge a level of metals higher than permitted by law. The London Mine Extension plant does not completely clean up the water, but it does dramatically improve it at very low cost. The plant itself cost only \$125,000 to construct and requires about \$20,000 in annual maintenance. In the world of active water treatment plants, this is a bargain. The Water Quality Control Division might have held the DMG to the highest water standards and levied fines on the London Mine owner, but such demands and penalties might have prevented the DMG from undertaking the cleanup at all, or forced them to spend millions of dollars on a larger plant. The DMG claims to have achieved, however, a cost-effective remedy that results in significant environmental improvement. According to Mike Holmes of the EPA, 30 percent of a cleanup budget removes 90 percent of the metals in a typical site. The remaining 70 percent of the budget is spent chasing the last 10 percent of the pollution. Given this cost-benefit analysis, it seems to us that it is not worth pursuing metal reduction past a certain point.

Is the State of Colorado right to make exceptions for owners of polluting mines? Is its leniency a necessary modification of water quality standards that are impossible to achieve, or is the state allowing too many financially capable mine polluters to evade their legal obligation to meet water quality laws? State water regulators must strike a delicate balance in their use of carrots and sticks as they try to encourage the cleanup of acid mine drainage.¹⁴

PROSPECTING FOR A BETTER FUTURE

Who Is Going to Pay for the Cleanups?

Clearly, the high cost of penalties, remediation of the site, and long-term maintenance are formidable obstacles to any party interested in acid mine remediation. And there are a lot of abandoned hardrock mines to clean up in the West. The Mineral Policy Center (now Earthworks), put the number at about 500,000 a few years ago, and it estimated cleanup costs in excess of \$30 billion. But those are very uncertain numbers, and perhaps unnecessarily discouraging ones, too. Although most states have not performed detailed or consistent inventories of abandoned mines, it seems clear that only a small fraction of the 500,000 abandoned mines are causing significant problems for water quality. The Western Governors' Association estimates that more than 80 percent of all abandoned mines do not pose an environmental problem.¹⁵ But even if only one mine in a hundred poses a water quality problem, that's still 5,000 abandoned mines. How much does it cost to clean up an abandoned mine? That depends on the individual site, of course. Some might be cleaned up for as little as \$50,000, using simple landscape grading that channels running water away from mine sites. Some mining districts, however, have contaminated entire watersheds. These require more intensive and ongoing remediation, including the construction of water treatment plants. These more difficult cases might each cost \$200 million just for the cleanup, plus millions annually for ongoing maintenance.

Below: This site is just one of thousands awaiting remediation. *Courtesy of the Colorado Division of Minerals and Geology.*



We can hope that the costs will drop as our science and technology improve and as we gain more experience in doing this work. The Colorado Division of Minerals and Geology has demonstrated at the London Extension Mine that the construction and operation of an acid drainage treatment plant need not cost millions if water quality standards are relaxed. This example provides some hope that the estimated costs of acid mine drainage abatement might come down as we get better at doing the work.

How will Good Samaritans find the money? Depending on the severity of a mine's pollution, its threat to public health, its environmental impact, and its location on public or private land, there are a variety of public funding sources and strategies available for cleanups. The obvious places to start are with established federal programs, without which virtually all acid mine cleanups would be impossible. Here is a very brief description of some of those programs:

Comprehensive Environmental Response, Compensation, and Liability Act

If the pollution poses an immediate threat to human health, the Environmental Protection Agency may designate a mine as a Superfund site under the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA). Signed into law in 1980, the Superfund statute initially provided funding through a tax on the chemical industry. Congress, however, failed to reauthorize this tax in 1995, terminating this source of cleanup funding. Now projects done under CERCLA authority depend in part on general congressional appropriations to various federal agencies such as the EPA.¹⁶

Brownfields Revitalization Act

Acid mine mitigators have been innovative in tapping other cleanup and redevelopment initiatives that were not originally intended for acid mine remediation. The Brownfields program, begun in 1995 under the administration of the EPA and as a part of CERCLA, seeks to assist states, communities, and other stakeholders in the reclamation and redevelopment of "brown fields"—those areas, usually located in industrialized cities, that were compromised by the presence of hazardous materials and other forms of industrial pollution. While initially conceived as a means of revitalizing economies in urban, formerly industrial, neighborhoods, the Brownfields program now also makes grants to acid mine remediation projects where restoration of the natural landscape is the primary concern. Brownfields grants emphasize the reclamation of disturbed land in contrast to those Clean

Right: Encroachment of mine waste into a meadow. Courtesy of the Colorado Division of Minerals and Geology.



Water Act Section 319 grants mentioned below, which are designed specifically for the remediation of water. Where both acreage and water need attention, Brownfields and Section 319 grants might be used in complementary fashion.

Brownfields, however, has limitations. Its funds are not currently applicable to Superfund sites, and loosening this restriction would allow many mitigators access to this funding source.

Clean Water Act Section 319 Non-Point Source Grants

These grants from the EPA are administered by the states for use by nonprofit organizations engaged in the design and implementation of watershed restoration projects. “Non-point” means those polluting sites where it is difficult to identify a single point, like a drainage pipe, from which the pollution flows. Mines often discharge pollution from tunnel openings, but polluted water can also emanate from the site through more diffuse seepages.

Surface Mining Control and Reclamation Act

Some states like Montana utilize industry tax funds collected under the Surface Mining Control and Reclamation Act (SMCRA, pronounced “smack-ra”). Enacted in 1977, SMCRA was designed to regulate every aspect of coal mining operations and to establish standards for the restoration of areas disturbed by coal extraction. It has had a profound effect on areas where coal was or is now being mined. SMCRA has also been stretched to assist in the cleanup of hardrock mining in certain areas. If a state can show that it has completed the remediation of its coal mine sites, then it becomes eligible to receive SMCRA funds for hardrock mine remediation (but not usually the acid drainage itself). However, SMCRA’s funding program may not be reauthorized at some point in the future. If Congress does not renew it, entire mine reclamation programs such as Montana’s will lose their funding and will likely vanish. The loss of SMCRA would be a severe setback to the cause of mine remediation.

Bureau of Land Management

In the 1990s, the BLM, in cooperation with various states, inventoried and assessed nearly 8,000 abandoned hardrock mines on its lands. Its inventory in hand, the BLM now is working to treat those sites that cause the most environmental damage to watersheds or pose the greatest risks to public health. Like other government entities, the BLM works cooperatively with other agencies and private owners to secure funds and undertake cleanups in those watersheds most in need of remediation. Besides receiving an annual congressional appropriation of around \$10 million for this work, the BLM also procures funds from other AMD-related federal programs. Through these efforts, about a dozen BLM abandoned mines are cleaned up each year.

U.S. Forest Service

National Forest watersheds are the single largest provider of municipal water for 66 million people in 33 western states,¹⁷ but some 7,600 abandoned mines threaten the quality of their water.¹⁸ The Forest Service receives about \$20 million annually from congress and federal programs for the assessment and cleanup of abandoned mines, and usually manages to treat between ten and forty projects each year.¹⁹

These federal programs mesh with the many state programs²⁰ in the effort to undertake voluntary cleanups of abandoned mines, and Western states establish their own programs and funding. Colorado’s Inactive Mine Reclamation Program, established in 1980, spent more than \$18 million on abandoned mine remediation in 2002.²¹

Prospecting for Money: Two Examples of Creative Funding

While not comprehensive, this list of federal funding sources represents some of the ways Good Samaritans and other mitigators can fund cleanups. Such projects can combine all these resources with private funds in quite complex configurations. In practice, each site presents its own set of constraints, needs, and possibilities. For example, the Snake River Watershed Task Force in Summit County, Colorado, brought various funding sources to bear on a historical mining district. Certain task force members such as Summit County Open Space and Trails, along with the EPA, were most interested in using Brownfields funds for the restoration of disturbed acreage at a mining site. They obtained two Brownfields grants, one for the assessment and evaluation, and one for the cleanup of the impaired area. These were matching grants, and the Colorado Department of Health and Environment stepped up with additional funds. Summit County also contributed in-kind services such as clerical support. Other members of the task force such as the Northwest Colorado Council of Governments pursued Clean Water Act Section 319 grants from the Colorado Non-Point Source Council because their interest lay primarily with the treatment of polluted water. These and other members of the task force coordinated their individual efforts to fund the acquisition of open space and the cleanup of a portion of the mining district. They are now entertaining bids from contractors for the cleanup, and hope to have work underway soon.

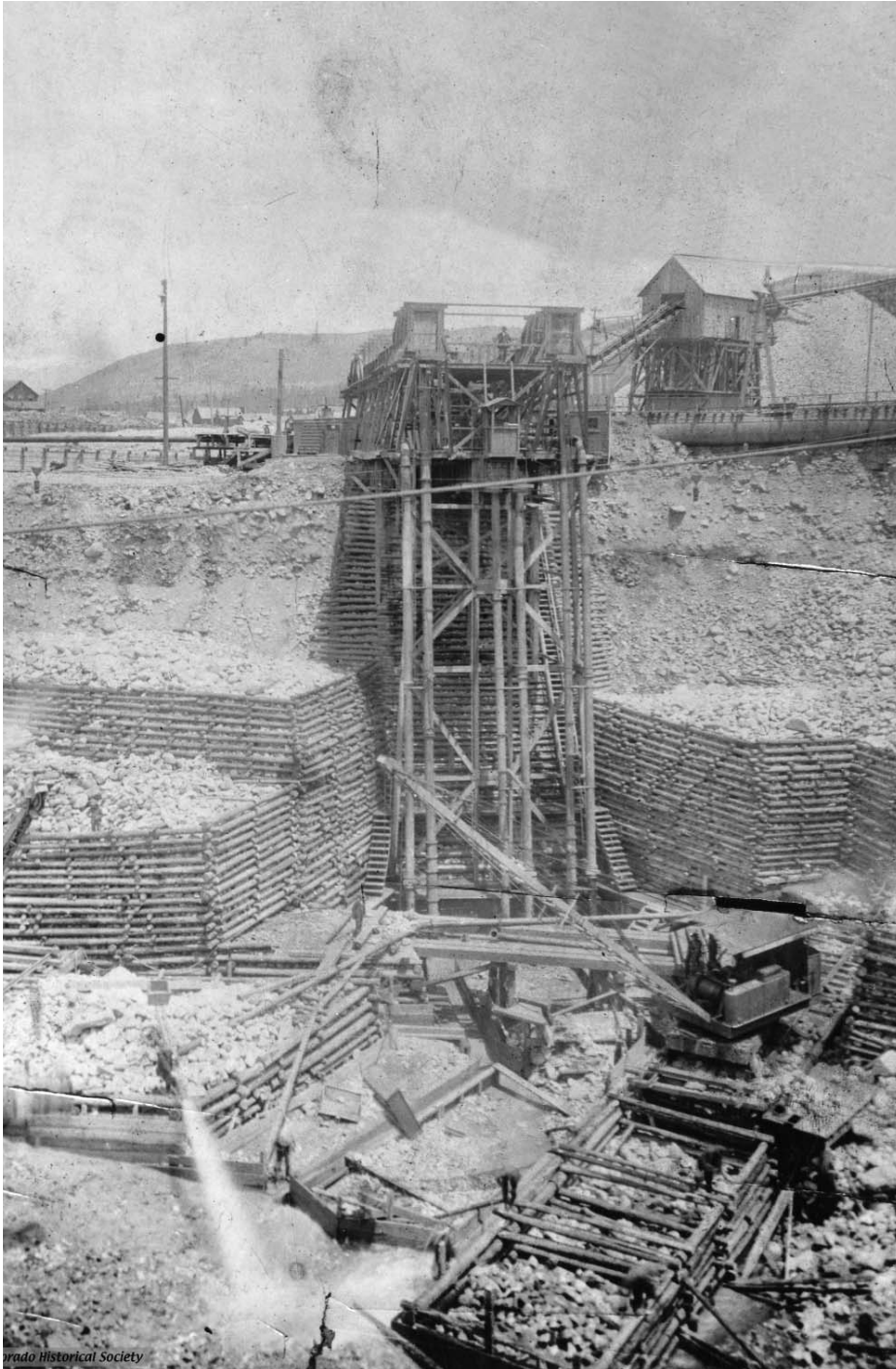
Below: The remediation of sites such as this requires creative collaboration between government agencies, private owners, mining companies, local interests, and, sometimes, developers. *Courtesy of the Colorado Division of Minerals and Geology.*

Other cleanups involve creative exchanges of real estate among mining companies, city and county governments, and real estate developers. The Oro and Wellington mines in the French Gulch district near Breckenridge, again in Summit County, Colorado, offer an interesting case in point. In 1995, federal and state water regulators determined that French



Gulch pollution was bad enough to qualify for Superfund status. Local officials and residents, however, forestalled the imposition of this federal process with their own initiative. (No one wants their backyard designated as a Superfund site, the perception being that it lowers real estate values, subjects the community to federal strictures, and gives the area a bad reputation.) Breckenridge and county leaders agreed to acquire the mine property from B & B Mines, the responsible party. In acquiring the land, the city and county agreed to assume the responsibility for cleaning up the abandoned mine. But where could they get the money for the cleanup?

One of the county's goals was to build affordable housing on a small part of the mining property. They identified a developer who purchased a parcel from the mining company, and part of the purchase price was diverted to the EPA to fund the cleanup. In essence, the



Left: A mine in the Breckenridge area. One cannot help but admire the timber retaining walls.

Courtesy of the Colorado Historical Society.

Colorado Historical Society

developer paid off a portion of the mining company's financial liability. The county and city of Breckenridge purchased the remaining acreage, some 1,800 acres, from the mining company, but again at a discounted price, with the difference covering the mining company's remaining liability. Here the party responsible for the pollution, having no other assets, had to trade the value of its land to meet its remediation obligations. Summit County and Breckenridge will now share the cost of constructing a low-maintenance water treatment plant, paying for it through open-space funds. They will save some money by using municipal water specialists already employed by the city of Breckenridge.

Not all of the funding of this project was local. Summit County received money from a Colorado State Lottery fund dedicated to the preservation of open space. The county also determined that it could sell a few acres of little open-space value to real estate developers.

In the end, the local community answered the area's need for affordable housing and recreational open space, and successfully funded the purchase and remediation of an abandoned mine site. But it took patient and creative cooperation among the mine owner, federal, state, county and city officials, a real estate developer, and the financial support of an entire community. Again, the best solutions in abandoned mine remediation rest on broad coalitions and community investment.

The Snake River and French Gulch examples demonstrate how each acid mine remediation project must be individually designed and tailored. One mixed federal grants with county and state funds, while the other achieved its goals primarily through development opportunities and a substantial commitment on the part of local taxpayers.

Who Should Pay? Getting the Financial Burden on the Right Shoulders

Federal and state funding programs must be carefully designed in order to place the financial burden of remediation on the right parties. SMCRA, for example, as it is currently written, depends on taxation of the coal mining industry, and this draws our attention to a contentious issue. SMCRA funds come from taxes levied on current coal mining operations. The coal industry has paid to date more than \$7.2 billion in fees to the SMCRA abandoned mine lands fund.²² Coal companies located in Wyoming, for example, pay taxes that are then partially redistributed to other states. Why should a Wyoming coal company help pay for mine remediation in Colorado or West Virginia? Even more puzzling, should this company help pay to clean up a hardrock mine that closed down in the late 1800s? The placement of tax burdens on the mining industry through programs like SMCRA requires careful consideration and committed diplomacy.

What is the moral and causal connection between past and present miners? Whatever their conduct in the present, today's miners have little in common with the Forty-niners except for the fact that they both sought to prosper by responding to consumer demand for their products. Consumers, we believe, have both an opportunity and obligation to acknowledge the extent to which they have driven mining enterprises, and accept responsibility for the environmental consequences for their consumption. Consumers have not seen the true cost of the mineral and metal commodities because the price of their goods has not included the environmental costs. That cost has been passed on to future inhabitants of this planet. In truth, we have turned out to be some of those future inhabitants, as our need for ample supplies of clean water becomes more acute. Part of an honest reckoning with the legacy of mining must be a willingness on the part of consumers to pay for abandoned mine remediation. Perhaps the proper place to raise revenue for acid mine remediation is a tax, not on mining production, but on the processing of metals into consumer products. Here the financial burden would fall more directly on consumers, on the members of a society that was built on and continues to prosper through the abundance of mineral commodities.

Hardrock miners also fear that any movement to tax their industry would have the effect of pricing their commodities out of the international marketplace. Such taxation might have the unintended and unfortunate effect of increasing the importation of minerals and metals from countries with few or no environmental controls. In this case, the environ-

mental problems associated with extractive industry would simply be exported to another country, as is already happening in the timber industry.

Western states should also be prepared to assume at least some of the financial and legislative responsibility themselves. In these times of tight budgets, creative sources of funding will have to be tapped. For example, Colorado uses lottery funds to maintain and improve state parks and open space, as we have seen at French Gulch. A state tourism tax might be considered because abandoned mine remediation restores aquatic habitat, and fishing is a major attraction for visitors in most Western states. In general, the financial responsibility of acid mine remediation must fall more broadly on those who have enjoyed mining's benefits, and that means average American consumers. How best to achieve that fairer distribution of financial responsibility is open to discussion, but it is time that we consumers take responsibility for our part in the environmental legacy of mining.

What Congress Is Trying to Do about AMD

As much as independent, hardy Westerners might like their own states to take the problem in hand, a federal Good Samaritan law seems to be an inescapable necessity in beginning to address the problem of acid mine drainage. It would seem that only a federal law can protect land owners and Good Samaritans against Clean Water Act liability.

And Congress is getting this message. No fewer than five Western members of Congress—Max Baucus, Mark Udall, Scott McInnis, Ken Salazar, and Ben Nighthorse Campbell—have introduced environmental Good Samaritan bills since 1999. The focus of all of the bills was relief from Clean Water Act liability for third parties taking on cleanup of abandoned mines. Some of the bills also proposed that royalties on hardrock mining be used to fund cleanups. But designing legislation with a double mission—providing for Clean Water Act liability exemption and setting up a funding mechanism—has thus far proven too difficult, and none of these bills succeeded. There is increasing sentiment that these two aspects of the problem should be tackled separately.

A partial solution to crafting a Good Samaritan bill is to separate the protection from liability from the funding issues. A bill designed to allow Good Samaritans to proceed with their work without incurring Clean Water Act liability could encounter much less opposition if it did not attempt to address the question of who will pay. Such a bill could allow individuals or organizations the ability to obtain a permit to undertake cleanups of hardrock mines according to adjusted environmental standards. Having gotten a Good Samaritan provision in place, Congress could then work on the right formula for funding such cleanups. If Congress were to amend the Clean Water Act, it should be careful not to impair the general integrity of this environmental law. As we've said, the Clean Water Act is generally very useful in protecting the environment from industrial pollution. This principal purpose should not be compromised in a revision of the Clean Water Act.

On the other hand, there is good reason to fight for a stand-alone Good Samaritan bill. Good Samaritans working under the shelter of this kind of legislation would still be executing a cleanup plan and meeting water quality standards, albeit lowered, approved by the Environmental Protection Agency. *Some improvement is better than no improvement.* But if we use adjusted standards, we must ask ourselves exactly what the goals of cleanup are and what constitutes a success. The recalibration of standards to allow Good Samaritan actions would need to consider, for example, whether the intention of the cleanup would be to return fish to a stream. Is a partial cleanup good enough for the fish? Failing this goal, what would other cleanup benchmarks be? Would those cleanup goals be too expensive to achieve in some areas? Such questions require us to think about the precise purposes of a cleanup and where it is feasible to achieve them.

There is already broad consensus on the need for Good Samaritan legislation across the political spectrum. Why hasn't Congress passed any such legislation yet? The problem lies in the details of how it should be crafted and how it addresses certain extraneous issues. Some environmentalists worry that an exemption from Clean Water Act liability for Good Samaritans would only be the first step in the dismantling of a landmark piece of environ-

mental legislation. For their part, mining companies have just as vigorously opposed or attempted to shape Good Samaritan bills that would tax their industry in order to pay for the cleanups. The mining industry would like to have legislation that would allow it to engage in the “re-mining” of an abandoned site, the practice of processing the ore remaining on site in order to extract its valuable metals. Re-mining, however, is not without its own potential environmental complications, especially when it involves the use of cyanide heap leaching. Industry critics argue that re-mining as a form of abandoned mine redemption only exchanges one environmental problem for another. There are many small but sharp thorns on which a Good Samaritan bill can get snagged.

Re-mining

In the course of researching this report, we were struck by the depth of passion aroused by the notion that the cleanup of abandoned mines might be part of a commercial, for-profit enterprise. Although such a prospect is a matter of deep concern to some environmental litigators, it seems to us premature to dismiss it. Re-mining is a possibility to consider. The National Mining Association describes re-mining as the processing of old mine waste in order to recover its mineral content, which older mining techniques were not able to extract, and to remove it as a pollution source. Miners can remove and relocate waste to existing operational facilities, remove it to repositories, or stabilize waste heaps with caps and covers that keep out water. In the best cases, re-mining benefits the company's bottom line, ameliorates the environmental problem, and saves the cost of other forms of AMD remediation.

But you surely know, by this point in the report, that there is no easy solution. Industry watchdogs worry that that mining companies could abuse re-mining liability exemption to escape from liabilities incurred from their own operations. And the process may not be practical. Re-mining generally requires that a large, financially healthy mining operation is already working in the same area as the abandoned, polluting mine. Such a company would only be interested in re-mining an old site if the ore was of sufficient quality, and if it did not cost too much to transport the ore to the processing facility. In the end, many abandoned mines may not be good re-mining candidates. Re-mining opponents may not have much to worry about after all.

Top: Waste rock being moved to a secure repository. *Courtesy of the Colorado Division of Minerals and Geology.*

Bottom: Who best knows how to remediate a site? Mining companies have the equipment and expertise, but can they put environmental concerns before economic ones? *Courtesy of the Colorado Division of Minerals and Geology.*



Do We Have the Technology We Need?

Pass Good Samaritan legislation and put appropriate limits on Clean Water Act liability, and then find major sources of funding to do the abandoned mine cleanups, and then the problem will be solved, right? Wrong. As we've said before, there is no easy cure for this environmental affliction. From the International Network for Acid Prevention (INAP), an international research consortium funded by mining interests, comes a depressing generality: "Effectively dealing with acid drainage has been—and continues to be—a formidable challenge for which no global solutions currently exist."²³ There are, however, effective methods for managing the environmental damage from mining and for making it less likely that we will create new conditions in which the pollution is produced.

For removing acidity and metals from acid mine drainage, there are two kinds of treatments: "active" or "passive."²⁴ Active treatment, which usually involves a large treatment facility, adds chemicals to neutralize the acidity and remove the metals. This method is very effective and reliable, but is usually expensive, both in construction and in operation and maintenance costs. Passive treatment takes many forms. One of the most prevalent passive methods involves constructing treatment ponds and wetlands that mimic natural purification processes. It is generally inexpensive and is a well-accepted method in Appalachian states.²⁵ These ponds neutralize the water's pH and cause the metals to drop out. But is often difficult to build holding ponds in the steep terrain where so many of the Western mines are located. For this reason, the East's passive techniques may have only limited application in the Western context.

Why not just plug up the mine? Plugging mine tunnels allows groundwater to fill the tunnels, displacing oxygen and reducing acid mine drainage formation. But plugging is rare in practice because such water-filled tunnels can develop high pressure, and have, not infrequently, resulted in catastrophic failure or "blowout" of the plug and rapid discharge of the tunnel water. Even if the plug holds, the acid mine drainage can find its way to the surface through seepages and springs.

One of the best strategies for controlling acid mine drainage is to prevent water from contacting the sulfide rock in the first place. Many successful, low-cost projects have simply diverted clean water away from the waste rock. These projects can be simple low-tech ditches that carry water around mine sites, or more sophisticated engineering projects that channel out water originating inside a mine before it becomes polluted.

The multiplicity of the technical methods for abating acid mine drainage reflects the reality that there is no one best practice, and that engineers and scientists must tailor a solution for each site. But the research into both active and passive treatment is ongoing, and we can expect that our environmental doctors will develop better therapies for this ailment.



Left: It will take cooperation among all parties if the effort to remediate abandoned mines is not to get mired in the challenges and complexity of the problem. *Courtesy of the Colorado Division of Minerals and Geology.*

How Do Westerners Get Involved?

Part of paying for abandoned mine remediation, and actually cleaning up, will involve convincing Westerners that this effort is worthwhile and that *we are the generation to do it*. Acid mine drainage is not going away in our lifetime, or in any lifetimes in the near future. It's instructive to note that some Roman mines in Europe are still discharging pollution.

So how do we convince Westerners, many of whom are justifiably skeptical of the cost and disruption involved in abandoned mine remediation, that the effort is worthwhile?

First, we ask Westerners to realize that acid mine drainage from abandoned mines, the legacy of more than a century of hardrock mining in the West, is our responsibility. The miners of the past were not villains—they simply seized on an extraordinary opportunity for economic, social, and cultural achievement while meeting society's demand for metals. There is little point in condemning the miners of a century ago.

Second, we need to follow the example of AMD&ART in Pennsylvania, in remembering that getting communities to contribute to the cleanups will require that the cleanups give something to the communities. Sure, cleanups will result in waterways with aquatic life, but the benefits must be clearer and more wide-ranging. The projects must enhance the communities through recreational opportunities, access to art, attractions for tourism, a deepened understanding of history, and a demonstration of the human capacity to face up to difficult problems and imagine solutions that are both inspired and practical.

Community involvement is needed to clean up many of the smaller abandoned mines, as shown by the success at Vintondale, Pennsylvania.²⁶ Descendants of the original miners still live in those towns. While treating the source of pollution, a cleanup in Leadville, Colorado, also found ways to highlight the historical and aesthetic interest of mining. A bike path now winds through the historical mining district, allowing tourists to get a close look at the remnants of the town's history.

But other Western communities are less well connected to the history of their region. In the West, high rates of mobility and transience have reduced this sense of personal connection to the mines. The mines were often short-lived in operation, and most of the current residents of mining districts are not related to miners of a century ago. In these communities, we can promote the benefits of acid mine remediation as a project of economic renewal. There are economic opportunities in the development and sale of abatement technologies, and in the mobilization of a community's underemployed workforce. Acid mine remediation offers a means of building a new economic base on the ruins of the old.

What Westerners Can Do to Further the Cause of Abandoned Mine Remediation in the West

- Support the introduction and passage of both state and federal Good Samaritan laws. When enough states pass Good Samaritan Laws, momentum will build for a federal law providing a national framework for these state-based efforts.
- Separate the Good Samaritan liability exemption from the requirement that currently operating mining companies foot the bill for the cleanup. Instead, launch positive and forward-looking discussions on possible funding strategies for the cleanup of abandoned mines, strategies that are not narrowly punitive in their approach to the current mining industry. One option might be a fee assessed on metal-processing facilities, and passed on to consumers.
- Do not overlook, however, existing federal law that would allow cleanups to proceed, especially under CERCLA, Brownfields, and SMCRA.
- Don't demonize the mining industry of the past; we are all too dependent on metals and minerals to get away with that.
- Consider procedures that result in partial cleanups in those cases where the requirement for full Clean Water Act compliance by Good Samaritans simply discourages any remediation efforts and brings the whole process to a halt. In each case, we need to identify the specific goals of a cleanup and determine if the costs of achieving such goals are reasonable. Remember, the perfect can be the enemy of the good.
- Consider the possibility of offering (or tolerating) an incentive by which mining companies could combine remediation of an abandoned mine with revenue-generating activities. Re-mining can yield mixed environmental results, but this fact should not deter us from exploring the hypothesis that abandoned mine cleanups could be compatible with profitable mining enterprises.
- Be aware that current mining operations can create the conditions for acid mine drainage production and other environmental problems. Today's miners should be mindful of the long-term impact of their actions, industry observers must be vigilant but fair, and consumers should not be profligate with our consumption of minerals and metals. As with all natural resources, we must use them sparingly, recycle, and conserve. Finally, when we do use them, integrity requires us to be aware of their true cost and to be willing to pay it.
- Build coalitions. The more diverse and inclusive the stakeholder group, the better chance that the complexities and complications of a site cleanup might be worked out for a sound environmental, economical, and community result. Negotiations within a large stakeholder group can take time and labor, but in the end they are worth it.

If you invest your time, attention, and energy in this cause, the West will be improved and your own persuasiveness, articulateness, persistence, and commitment will be sharpened and enhanced. The reckoning with abandoned mines provides us with the grounds for productive action, community-energizing teamwork, and a spirit of hope.

Suggestions for Further Reading and AMD Resources

Accounts of Abandoned Mine Cleanups

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- Stiller, D. M., *Wounding the West: Montana, Mining, and the Environment* (University of Nebraska Press, Lincoln, Nebraska, 2000).

Reviews of the Environmental Problems Posed by Abandoned Mines

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Acid Drainage Technology Initiative (ADTI), a consortium of state and federal government, academia, the mining industry, and consulting firms involved in technologies to manage metal-mine wastes in the United States, University of Nevada at Reno (www.unr.edu/mines/adti).

Australian Centre for Minerals Extension and Research (ACMER), a government organization focused on assisting the minerals industry to meet the challenges of sustainable development (www.acmer.com.au).

Earthworks, non-profit organization dedicated to protecting communities and the environment from the destructive impacts of mineral development, in the United States and worldwide (www.earthworksaction.org).

International Network for Acid Prevention (INAP), an organization of mining companies which work collaboratively to address acid mine drainage (www.inap.com.au).

Mine Environment Neutral Drainage (MEND) Program, a collaboration of Canadian mining companies and provincial, territorial, and federal governments devoted to reducing the liability of acid mine drainage (www.nrcan.gc.ca/mms/canmet-mtb/mmsl-lmsm/mend/default_e.htm).

National Association of Abandoned Mine Land Programs (NAAML), an organization of states and tribes addressing abandoned mine remediation in the United States (www.onenet.net/~naamlp).

National Coalition for Abandoned Mine Reclamation (NCAMR), a coalition dedicated to eliminating environmental, social, and economic problems caused by abandoned coal mine sites in the United States (web.infoave.net/~ncamr).

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Stakeholder and Community Groups Involved in Abandoned Mine Remediation

- Animas River Stakeholders Group, Durango, Colorado (www.waterinfo.org/arsg).
- Clark Fork Coalition, Missoula, Montana (www.clarkfork.org).
- Lefthand Watershed Oversight Group, Niwot, Colorado (www.lwog.org).
- Snake River Task Force, Keystone, Colorado (instaar.colorado.edu/SRWTF).
- Willow Creek Reclamation Committee, Creede, Colorado (www.willowcreede.org).

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2. See Trout Unlimited's recent publication by Russ Schnitzer and Rob Roberts, *Settled, Mined & Left Behind: The Legacy of Abandoned Hardrock Mines for the Rivers and Fish of the American West, and Solutions for Cleaning Them Up* (2004), also online at www.centerwest.org/acid_mine/reading-tu.pdf.
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