

Superfund and Mining Megasites: Lessons Learned from the Coeur d'Alene River Basin

EPA has used generally sound scientific and technical practices to make decisions about human health risks at the Coeur d'Alene River Basin Superfund site in Idaho, and planned remediation efforts will likely reduce targeted human health risks. However, there are substantial concerns regarding EPA's plans to protect the environment including fish and wildlife—plans that account for about three-fourths of the proposed \$359 million in expenditures—particularly concerns about the long-term effectiveness of the proposed environmental remediation efforts.

For more than 100 years, the Coeur d'Alene River Basin has been known as “The Silver Valley” for being one of the most productive silver, lead, and zinc mining areas in the United States. Over time, high levels of metals (including lead, arsenic, cadmium, and zinc) were discovered in the local environment and elevated blood lead levels were found in children in communities near the metal-refining and smelter complex. In 1983, the U.S. Environmental Protection Agency (EPA) listed the Bunker Hill Mining and Metallurgical Complex in northern Idaho as a Superfund site on the National Priorities List.

Initial cleanup efforts focused on the areas with the most contamination and the greatest risk of health effects—a 21-square-mile “box” in the heart of the Coeur d'Alene River Basin.

In 1998, EPA began applying Superfund requirements beyond the original Bunker Hill box boundaries to areas throughout the 1,500-square-mile Coeur d'Alene River Basin project area. Soils, sediments, surface water, and groundwater are contaminated in areas throughout the basin, and a wide variety of studies indicate that this contamination poses increased risks to humans and wildlife in the area. In 2002, EPA issued a record

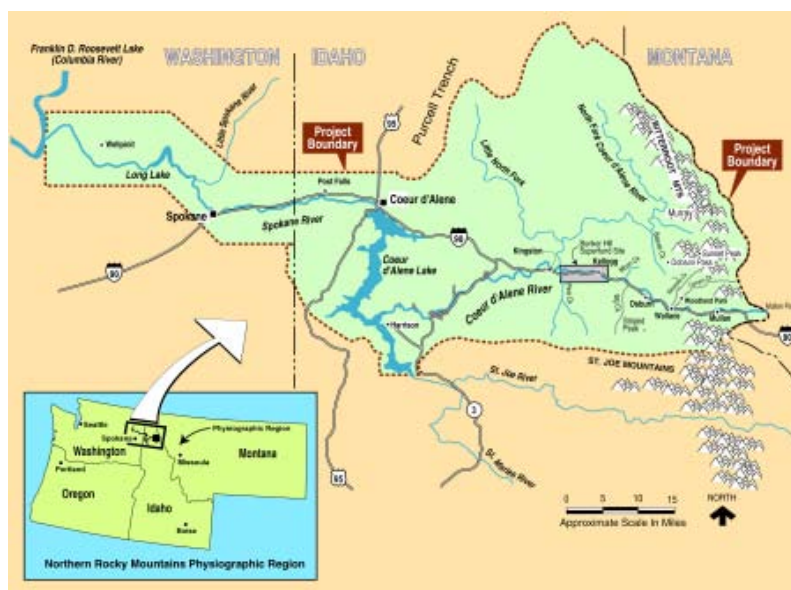


Figure 1. The area covered by the proposed cleanup efforts being reviewed includes the Coeur d'Alene River Basin (outside of the Bunker Hill Box), Lake Coeur d'Alene, and the upper reaches of the Spokane River, which drains Lake Coeur d'Alene. The total length of this system is 166 miles, and the study boundary includes an area of approximately 1,500 square miles. The final project area, however, is much smaller, including only the contaminated portions of the basin, lake, and Spokane River.

of decision (ROD) that addressed contamination-related human health and ecological risks in the entire Coeur d'Alene River Basin, excluding the area within the box.

Under Superfund, EPA has developed a plan to clean up the broader contaminated area that will cost an estimated \$359 million over approximately 30 years—and this effort is only the first step in the cleanup process. Approximately one-fourth of the expenditures are intended to address human health risks. The remaining three-fourths are to provide the first steps toward protecting the environment, including fish and wildlife, over approximately a thirty year period. Additional funds will be required over many decades to complete the cleanup.

Superfund and Mining Megsites: Lessons from the Coeur d'Alene River Basin, a report from the National Research Council, reviews and evaluates the scientific and technical basis of EPA's decisions about cleaning up the area. The conclusions and recommendations in the report pertain mainly to decisions made regarding contaminated areas within

the 1500-square mile project area outlined in Figure 1. The report also outlines lessons learned from the Coeur d'Alene River Basin site that can be applied to other large, complex mining Superfund sites in the nation and offers recommendations to help EPA manage such megasites.

Estimating Human Health Risks

EPA conducted a human health risk assessment that sought to estimate risks to human health associated with estimated concentrations of environmental contaminants, particularly lead and arsenic, and to calculate cleanup concentrations that would protect human health. EPA's risk assessment correctly concluded that environmental lead exposure poses elevated risk to the health of some Coeur d'Alene River Basin residents, particularly young children. Further, the report concurs with EPA's conclusion that although lead from old house paint probably contributed to the exposure of some children, lead-contaminated soil was the primary contributor to health risk from lead.

About This Study and Superfund

Remedial efforts within the Coeur d'Alene River Basin will require much time, a great deal of money, and a concerted effort by involved parties. Congress requested an independent evaluation by the National Academies to consider EPA's scientific and technical practices with regard to human and ecological assessment, remedial planning, and decision making. In response, the National Academies' National Research Council (NRC) convened the Committee on Superfund Site Assessment and Remediation in the Coeur d'Alene River Basin, composed of members with a wide range of backgrounds and expertise. These individuals serve on the committee as a public service, volunteering to the NRC and the nation, cognizant of the importance of providing timely and objective scientific advice.

During the study, the committee held public sessions in Washington, DC; Wallace, Idaho; and Spokane, Washington where local, state, tribal, and federal officials, as well as private sector and citizen groups presented their views to the committee. The committee's findings and recommendations reflect unanimous consensus and the committee's report was subject to a rigorous peer-review process overseen by the National Academies. The study was sponsored by the U.S. Environmental Protection Agency.

Superfund was established in 1980 through the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) as the Federal government's program to clean up the nation's uncontrolled hazardous waste sites. Under the Superfund program, abandoned, accidentally spilled, or illegally dumped hazardous waste that pose a current or future threat to human health or the environment are cleaned up. A Superfund site is any land in the United States that has been contaminated by hazardous waste and identified by the Environmental Protection Agency (EPA) as a candidate for cleanup because it poses a risk to human health and/or the environment. There are tens of thousands of abandoned hazardous waste sites in the U.S., and accidental releases occur daily.

A major controversy at the Coeur d'Alene River Basin site arose because EPA did not base its risk assessment and remediation decisions on actual measured blood lead levels but instead on a model known as IEUBK (Integrated Exposure Uptake Biokinetic). The IEUBK model is used at lead-contaminated Superfund sites primarily to estimate blood lead levels in children and also to determine soil lead cleanup levels in residential yards. Predictive blood lead models, such as the IEUBK model, are powerful tools for assessing pediatric risk from lead exposure, exploring lead risk management options, and crafting remediation strategies. The report concludes that the application of this model at the site was reasonable, but future assessment of health risks would benefit from greater collection and use of additional site-specific information. For example, information on the bioavailability of lead from the site's soil – that is, the amount of lead in soil that is actually absorbed by the body following ingestion – would improve the reliability of the model's predictions.

For arsenic, EPA collected no information about actual human uptake and based its risk assessment on arsenic concentrations in environmental samples. Biological indicators of actual human arsenic exposure would serve to strengthen future risk assessments at sites such as Coeur d'Alene, though the report recognizes the limitations of the currently available arsenic biomarkers.

Reducing Human Health Risks

Recognizing the importance of protecting current and future generations, remedial decisions regarding human health appropriately emphasized residential yard remediations. Given the prevalence of high concentrations of lead in soils of the studied communities and the potential for lead exposure of young children, the report concludes that universal blood lead screening of children age 1-4 years is warranted and that these screenings should coincide with other routine pediatric health care screenings.

As long as cleaned up residential areas aren't recontaminated by lead-contaminated sediments, for example, during flood events, it seems probable that the proposed remedies will reduce the targeted human health risks. However, long-term support of institutional-control programs (actions that

help minimize the potential for human exposure to contamination by ensuring appropriate land or resource use) should be provided to maintain the integrity of remedies intended to protect human health and guard against health risks from recontamination.

Environmental Protection

EPA's assessment of risks to the environment, including fish and wildlife, was generally in line with best scientific practices and was based on quality monitoring studies of metals in the environment conducted in conjunction with other federal agencies, the state of Idaho, and the Coeur d'Alene Tribe. However, there are substantial concerns regarding EPA's decisions about protecting the environment, including fish and wildlife, particularly dealing with the effectiveness of long-term plans for remediation. For environmental protection, EPA's site characterization provided a useful depiction of the metal concentrations in soils, sediments, and surface water over the large basin. However, the characterization did not adequately address groundwater—the primary source of dissolved metals in surface water—or identify specific locations and materials contributing metals to groundwater.

In addition, the report outlines concerns about the feasibility and potential effectiveness of the proposed clean-up actions for environmental protection. There are no appropriate repositories to hold excavated materials, and establishing them in the basin will probably be extremely difficult. EPA's plan also does not adequately take into account the basin's frequent floods, which could recontaminate areas with metal-contaminated sediments after they have been cleaned up. EPA should select strategies that are likely to withstand this danger and lessen the impact of these floods. Overall, downstream transport of lead-contaminated sediments can be addressed only by removing or stabilizing the contaminated sediments in the river basin.

The report recommends that EPA ascertain the specific sources contributing zinc to groundwater (and subsequently to surface water) and the largest, potentially mobile sources of lead-contaminated sediments, and set priorities for their cleanup. If it is found that zinc loading to groundwater

comes from subsurface sources that are too deep or impractical to be removed, groundwater should be addressed directly. EPA should consider more thoroughly the potential for recontamination and proceed with remedies that are most likely to be successful and durable. Because of the long-term and uncertain nature of the cleanup process, it is unrealistic to develop comprehensive remedial schemes and assess their effectiveness a priori. Hence, a phased approach to cleanup with defined goals, monitoring, and evaluation criteria such as an adaptive management* approach, is warranted.

Managing Superfund Megsites

In general, the Superfund process has a number of serious difficulties in addressing the complex contamination problems in mining megasites such as the Coeur d'Alene River Basin. Remediation involves long-term undertakings in which remedies will usually need to be developed over time, and efficient responses to the problems may require the implementation of programs outside the Superfund framework. EPA has demonstrated flexibility in applying Superfund to the Coeur d'Alene River Basin and other megasites and has established a process in the basin that incorporates some of the key characteristics in addressing the problems at such sites. However, it is unclear whether all the problems can be addressed efficiently and effectively within the constraints that govern the Superfund process.

*Adaptive management is an approach where remediation occurs in stages and the consequences of each stage or phase are evaluated and provide feedback for planning of the next phase.

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This brief was prepared by the National Research Council based on the committee's report. For more information, contact the Board on Environmental Studies and Toxicology at 202-334-3060. Copies of *Superfund and Mining Megsites: Lessons Learned from the Coeur d'Alene River Basin* are available from the National Academies Press, 500 Fifth Street, NW, Washington, DC 20001; 800-624-6242; www.nap.edu. This report is sponsored by the U.S. Environmental Protection Agency.



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