

## California's Legacy Abandoned Mines

### [Physical Hazards Assessment](#)

### [Environmental Hazards Assessment](#)

In 2000, the Department's Abandoned Mine Lands Program (AMLPL) published *California's Abandoned Mines: A Report on the Magnitude and Scope of the Issue in the State*. The report estimates that about 67 percent of legacy abandoned mines and associated features are located on federal land (primarily on Bureau of Land Management, National Park Service, and U.S. Forest Service property), 31 percent are on private lands, and about 2 percent are on State or local agency lands (Figure 3). Legacy abandoned mines are those mines that ceased operation before state and federal laws required reclamation of mined land. A feature is a single human-made object or disturbance associated with mining, such as a shaft or adit (vertical or horizontal opening), tailings, machinery, and facilities. A mine site can be comprised of one or more features. About 84 percent of abandoned mine sites include hazardous openings that could pose a threat to human life, and 11 percent may pose an environmental contamination threat. Figures 4 – 5 present the location, distribution, and percentage of legacy abandoned mines in the state by land ownership and by county.

The first step in identifying public safety and environmental hazards from legacy abandoned mines is documenting the types of hazards that are present. With this information, sites needing remediation can be prioritized based on the types of hazards and risks they pose.

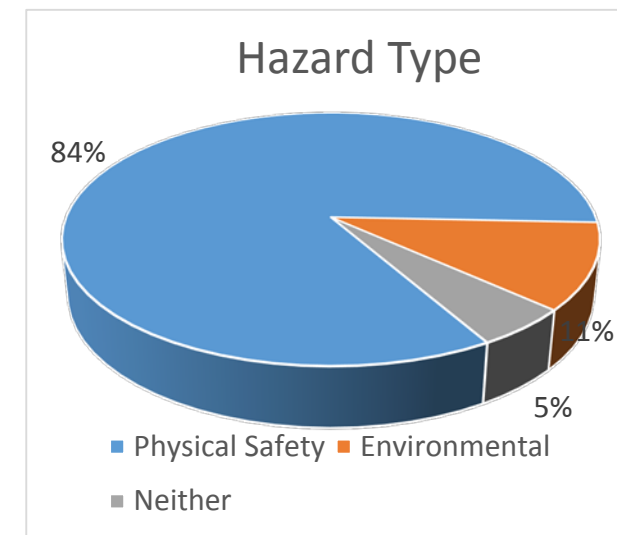
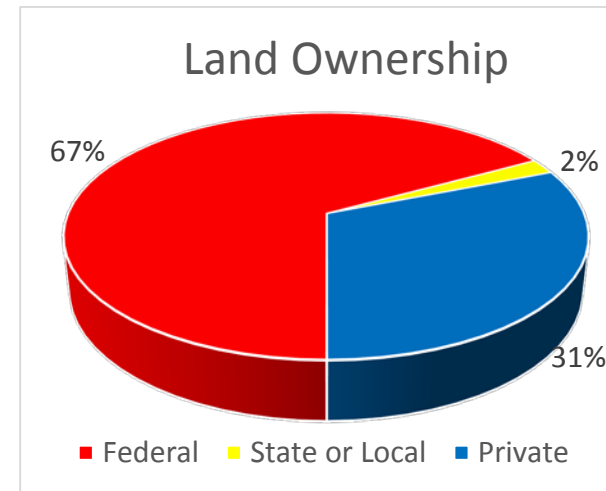
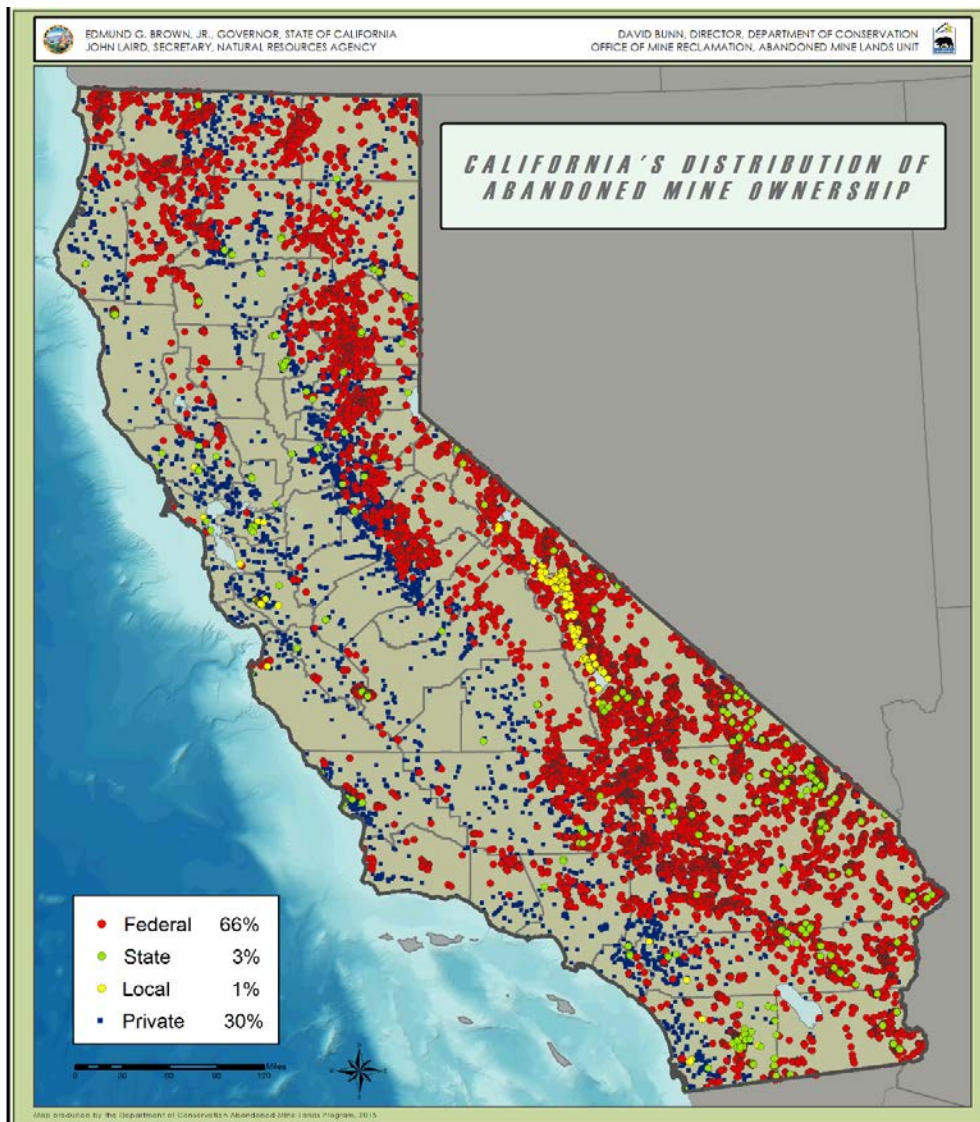


Figure 3. The statewide location and distribution of abandoned mines, based on USGS topographically occurring mine symbols, in California by land ownership category, and the percentage estimate of abandoned mines with either physical safety hazards or chemical contamination.

## Physical Hazards Assessment

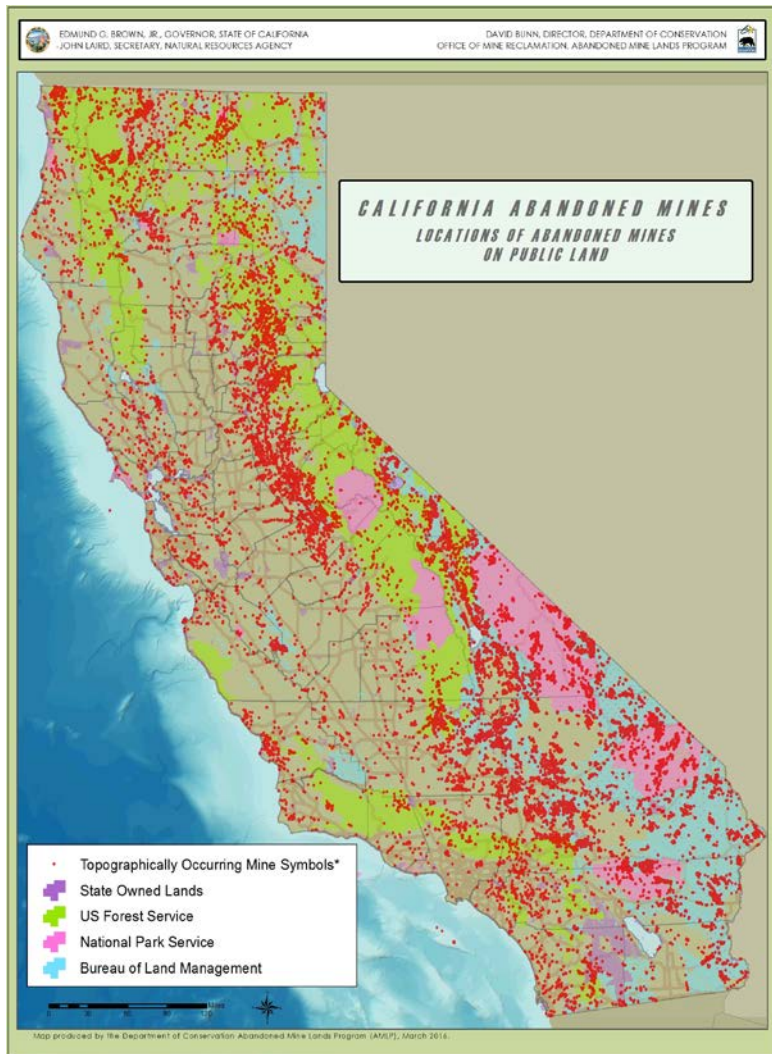
In rapidly urbanizing regions of the state as well as in heavily used recreational areas, these unsecured legacy abandoned mines may pose a significant threat to the health and safety of the human population and the environment. Each year people, pets, livestock, and wildlife are involved in accidents in which motorcyclists, other off-highway vehicles, hikers, children, or animals fall down unexpected mine shafts, die from lack of oxygen, or are otherwise harmed at abandoned mines, often located on public lands. Accident data at historic abandoned mines is not officially collected. However media reports indicate that in the past 15 years at least 18 people have died and 40 people have been injured at abandoned mines throughout mostly mountain and desert regions of California. This danger to the public also affects land-owning or managing public agencies that often bear large financial liabilities and impacts to public service programs when accidents occur. The legal costs from accidents impact the ability of agencies to deliver desired park, land management, or maintenance services to the California public.

### **How are hazardous mines and features identified?**

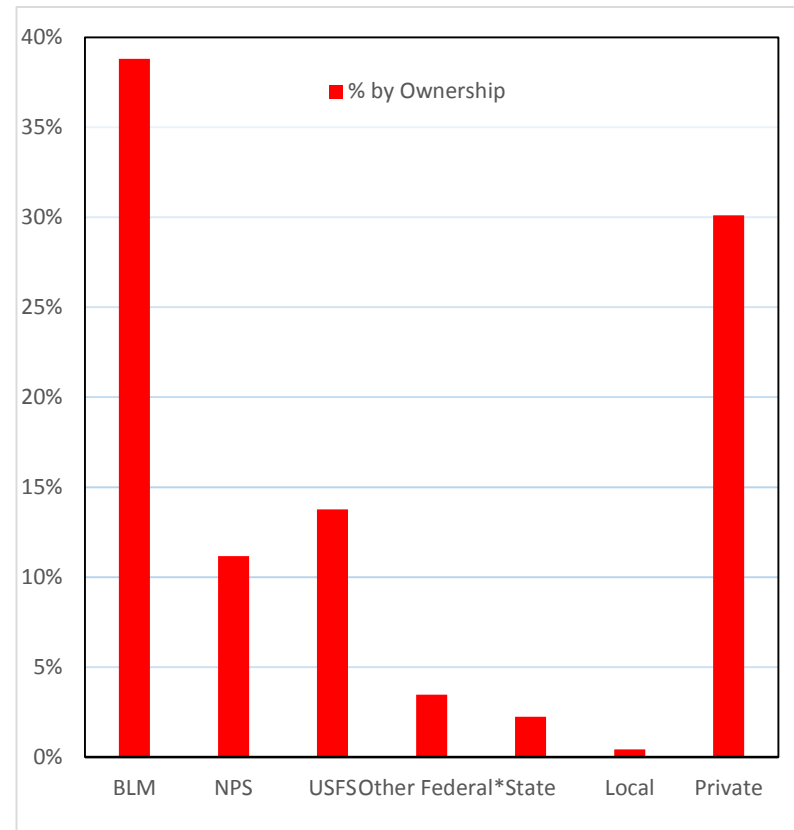
The low level of knowledge about the location and effects of abandoned mines on the well-being of local communities is becoming more evident. The 2020 General Plan adopted by the City of Grass Valley specifically calls out the hazards posed by subsurface mine-related workings, or tunnels, that underlay much of the planning area. Nevada County has instituted voluntary coordination with the Department of Toxic Substances Control to identify legacy mine-related hazards during land-use permitting and planning processes, leading to disclosure of such hazards, and facilitating voluntary cleanup. In order to address this enormous task in a logical fashion, the AMLP works with other federal and state agencies and local organizations to compile and consolidate knowledge about abandoned mine sites, and prioritize inventory and remediation activities based on areas having the highest potential threat to public health and safety, and to the environment. The AMLP uses a combination of sophisticated survey technologies, (for example, geographical information systems, global positioning systems, literature research, and field work.

Since its inception, the AMLP has increased the number of assessments and on-the-ground remediation through key partnerships with other state, federal, and local agencies. From 1997 to 2015, the program has closed 1,338 hazardous openings.

An inventory of hazards at an abandoned mine site begins with a visit based on its mapped location, information from the land-owning agency, or notification from a member of the public. The type, number, and size of mine features such as open shafts and adits (vertical and horizontal openings) are then documented and mapped. Factors used to prioritize relative physical hazard risks include public accessibility, proximity to population centers, and current land uses. Typical remedies to mitigate physical hazards include removal of hazardous structures and debris, installation of gates and cupolas on adits and shafts (designed to keep people out, but allow use by bats and other wildlife), fencing, backfilling, and closure using polyurethane foam.

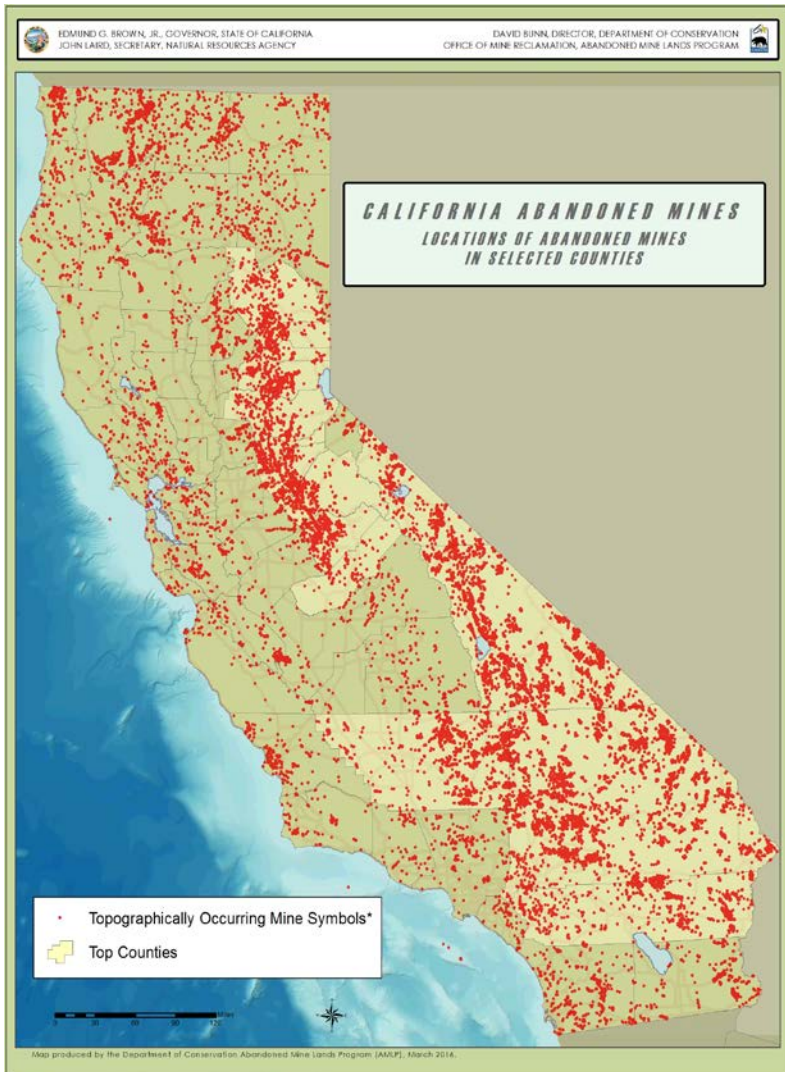


### Abandoned Mines by Ownership

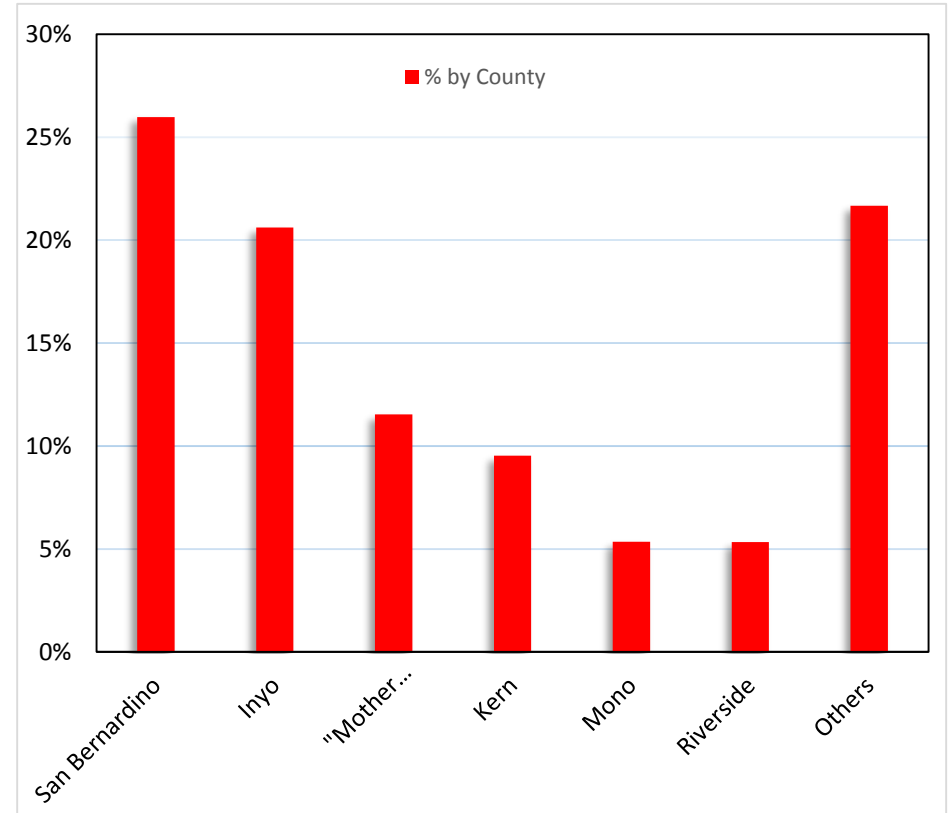


\*Bureau of Indian Affairs, Bureau of Reclamation, U.S. Fish and Wildlife, and Department of Defense

Figure 4. The location and distribution of abandoned mines by ownership category and percentage of agency and other land ownership in California.



## Abandoned Mines by County



\*Sierra, Nevada, Placer, El Dorado, Amador, Calaveras, Tuolumne, Mariposa, Plumas, and Madera Counties

Figure 5. The location and distribution of abandoned mines by county, and percentage in select counties in California.



### Environmental Hazards Assessment

Legacy abandoned mines in the state may introduce contaminants into air and water, resulting in harm to humans and wildlife. Contaminants in mine wastes and tailings may impair drinking water and other water resources by natural leaching processes and sediment transport. Such sites on public lands can also pose risks to people who come into direct contact with contaminated mill tailings and waste rock. If the possible harmful effects of these exposures have not yet been evaluated, the sites are treated according to federal and state hazardous waste and environmental clean-up laws and processes. These processes begin with evaluating the site for the presence of harmful contaminants in sediment, soil, or water (for example acid mine drainage, arsenic, copper, mercury, or lead) and then determining through additional sampling whether the contaminants are present at dangerous levels exceeding human and ecological exposure standards. Prioritizing relative environmental hazards includes evaluating accessibility, identifying potential receptors, proximity to population centers, land and water use, habitat values, and other factors.

Environmental remediation costs vary widely. Remediation approaches depend on the extent, volume, and concentration of each contaminant, the affected media and pathway, the threat to humans and the environment based on current land uses (e.g., residents, recreational users, or trespassers), and site conditions. Typical remedies to mitigate environmental hazards can include source removal, encapsulation, and treatment. Some remedies, such as those involving water treatment or encapsulation, can require long-term, often indefinite operation and maintenance.

Because contamination investigation and cleanup cost for environmentally contaminated sites typically requires a higher level of planning and cost, it's important to identify and prioritize environmental and human health threats posed by legacy abandoned mines. The need remains to continue assessments and prioritization of additional sites throughout the state as more information is obtained and environmental and human health threats are identified. The Department is developing the California Abandoned Mine Prioritization Tool, a more comprehensive tool for identifying and prioritizing the chemical contamination and physical safety risks posed by legacy mines around the state.