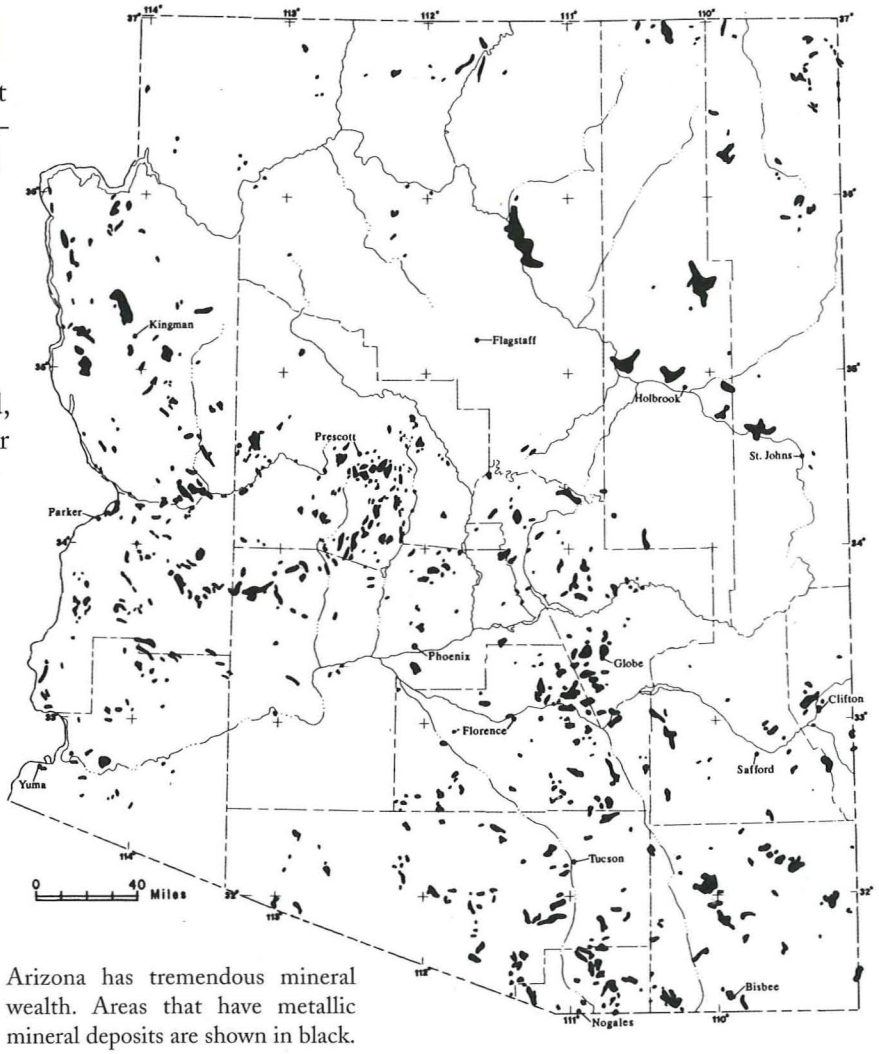
Abandoned Mines

Mineral Deposits And Mines

Arizona is endowed with abundant mineral resources, and for hundreds of years prospectors and geologists have looked for those scattered places where mineral deposits have formed. Our modern standard of living and economic prosperity have been made possible by utilizing natural resources from the earth.

Before resources can be exploited, they must be discovered. In exploring for mineral deposits, prospectors commonly dug holes in the bedrock to determine if mineralization indicated at the surface continued to greater depths. These relatively small holes are called "prospects". The majority of digging by prospectors consists of these prospects, from which no mineral production ever took place. Only if ore was discovered in great enough quantity and rich enough concentration during prospecting would any further digging take place. Larger holes, where valuable material was taken out in commercial quantities, are called mines. In most of these mines, ore eventually ran out or mining became uneconomical for other reasons and the mine was abandoned.



Arizona has tremendous mineral wealth. Areas that have metallic mineral deposits are shown in black.

Thousands of prospects and several hundred mines are scattered across Arizona. In most usage, prospects are lumped together with old mines of every size and all are referred to as "abandoned mines." These mines and prospects are shown on U.S. Geological Survey topographic maps with various symbols. Typically there are many more openings on the ground than are shown on the maps.

Hazards Associated With Abandoned Mines

Most mineral exploration has taken place on public land because private land is predominantly in valley areas where bedrock is not exposed. Until recently, if a valuable ore deposit was discovered, the public land containing the deposit could be converted to private land through a process called patenting. Today, all of Arizona's major mines are on private land, as are many

Mine Symbols used on USGS Topographic Maps

- × prospect
- adit (horizontal opening)
- shaft (vertical opening)
- pit or quarry
- waste rock or slag

of the abandoned mines. In many places, these patented areas are prime real estate because they are situated in the mountains, where views are spectacular.

As Arizona's population grows, development is encroaching into the margins of mountain ranges where numerous areas have been heavily prospected for minerals. As more houses are built near mountains, abandoned mines become a potential hazard or liability to property owners. The main concern with abandoned mines and prospects is that of public safety. Most important is the danger of a person falling into an opening and being injured. A fall of 5 to 10 feet can be serious, and a fall of more than 20 feet can be fatal.

In areas where extensive underground mining has occurred, collapse of workings may produce subsidence at the surface. Subsidence from mine collapse has become a problem in Tombstone, for example, where a labyrinth of drifts and stopes were dug directly under the town. Sinkholes have opened in streets where old workings collapsed.

There are many hazards inside abandoned underground mines. Collapse of loose rocks underground can crush a person or close off the opening, stranding the person. Timbers, although they may look like they are in good condition, are usually affected by dry rot and offer little protection against roof collapse. Inside underground mines, workings may include additional shafts, called winzes. A winze that is completely covered by planks is especially dangerous. A person who walks over the planks may not be aware that a shaft is beneath the boards. If the wood is rotten, it can collapse and cause a person to fall down a deep shaft.

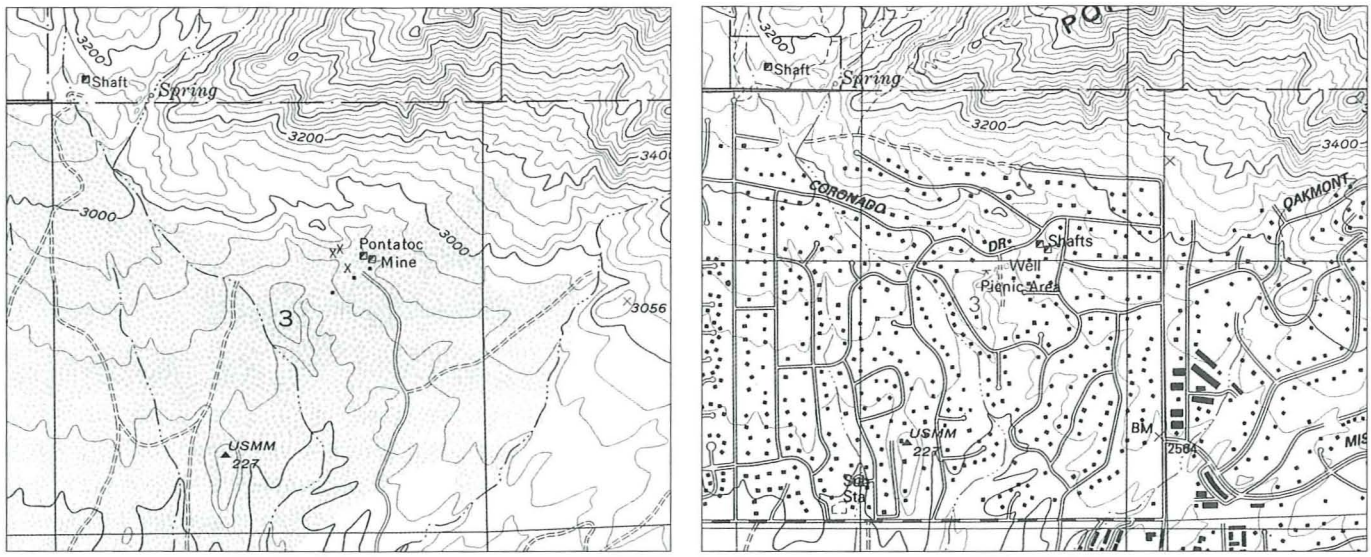
Water in a mine presents a danger from poisonous dissolved gases such as hydrogen sulfide, which can be released to the air by the stirring action from walking through the water. Water can completely fill a winze and make it look like a small puddle. An accidental fall into a water-filled winze can result in drowning.

Gases may accumulate in unventilated underground mines. Some gases, such as carbon dioxide and methane, can displace enough oxygen to make the air deadly. Other gases, such as hydrogen sulfide, are toxic at very low concentrations. By the time you become aware of dangerous gases, it is usually too late.

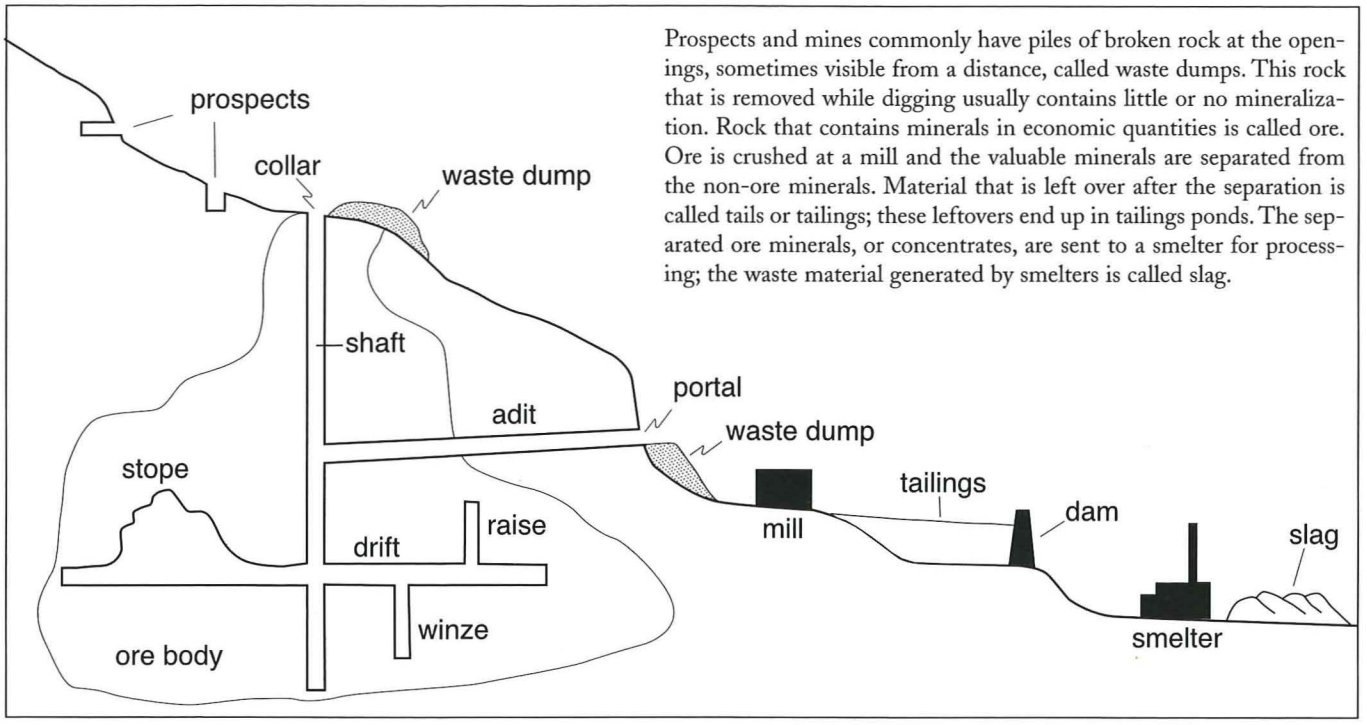
Explosives may be present in old mines. With age, these explosives become increasingly unstable and can explode with the slightest touch or vibration. Old explosives or primers should never be handled, nor should the containers they came in.

What To Do About Abandoned Mines

By Arizona law, landowners or claimants are responsible for maintaining safeguards against accidental injuries to people caused by abandoned mines. Even if a person is trespassing, an injury resulting from an aban-



These maps show encroachment of development into an area of north Tucson where numerous old mines exist. The map on the left is from 1957. The map on the right shows the same area in 1984. Houses are indicated by black dots.



Prospects and mines commonly have piles of broken rock at the openings, sometimes visible from a distance, called waste dumps. This rock that is removed while digging usually contains little or no mineralization. Rock that contains minerals in economic quantities is called ore. Ore is crushed at a mill and the valuable minerals are separated from the non-ore minerals. Material that is left over after the separation is called tails or tailings; these leftovers end up in tailings ponds. The separated ore minerals, or concentrates, are sent to a smelter for processing; the waste material generated by smelters is called slag.

Dangers associated with abandoned mines

Falling into an open shaft or pit
Falling rock or roof collapse
Rotten timbers and ladders
Lack of oxygen or buildup of toxic gases such as hydrogen sulfide
Dangerous animals (mountain lions, javelinas, rattlesnakes)
Explosives

doned mine may result in a lawsuit against the landowner. At a minimum, any opening should be properly fenced or sealed to prevent accidental falls into mine workings, and warning signs should be posted to protect a property owner against liability.

Mitigation is fairly easy for prospects and small mines. Material can be put in the opening to fill up the hole, and the surrounding area can be reshaped to the natural topography. In some cases a cement plug can be placed in the opening to reduce the amount of material needed to fill the hole.

Some prospects and mines are home to a variety of wildlife. Some animals are attracted to these openings because of water that may be present, the cool shade, or the safety of a deep hole in which to make a temporary shelter. Barn owls and bats are the most commons animals inhabiting abandoned mines. Grates or nets may be placed over openings to keep people out but still provide access by wildlife.

Where To Go For Information

The Arizona State Mine Inspector in Phoenix provides information about the location and mitigation of abandoned mines and prospects. For information about mineral resources and mines in Arizona, contact the Arizona Department of Mines and Mineral Resources in Phoenix. For information about the geologic character of mineral resources, contact the Arizona Geological Survey. To find areas where old prospects and mines are located, consult books about rockhounding, mining camps, and ghost towns.

A fall into an abandoned shaft can be fatal. Abandoned mines should be fenced to keep people out. *(Photo by Raymond C. Harris)*