



# NONPOINT SOURCE SUCCESS STORY

## Arizona

### Remediating Abandoned Mines Improves Water Quality in Turkey Creek

#### Waterbody Improved

In 1992, two reaches of Turkey Creek were listed on Arizona's Clean Water Act section 303(d) list as impaired for cadmium, copper, lead and zinc. The Golden Belt and Golden Turkey mines, located on U.S. Forest Service (USFS) land, were identified as the primary sources of pollution. In 2002, the USFS completed an Engineering Evaluation/Cost Analysis for the sites and completed remediation in 2007. The Arizona Department of Environmental Quality (AZDEQ) completed a total maximum daily load (TMDL) for Turkey Creek metals in 2006 and found (using new data) that cadmium and zinc were erroneously listed. As a result of the remediation of the Golden Belt and Golden Turkey mines, copper concentrations have decreased 58% and lead concentrations by 80%.

#### Problem

Turkey Creek is an intermittent stream originating in the Bradshaw Mountains, about 80 miles north of Phoenix in Arizona's Middle Gila Watershed (Figure 1). Turkey Creek is in the Prescott Mining District, which has numerous abandoned and inactive mine sites.

Turkey Creek was initially listed as impaired in 1992 due to exceedances of total and dissolved arsenic and copper, as well as due to total cadmium, cyanide, lead, and mercury. After several years of data collection and assessments, it was determined that cadmium, cyanide, and mercury were erroneously listed in 1992; these were removed from Turkey Creek's list of impairments in 2006. Copper and lead remain the primary contaminants in the water body.

The Golden Belt and Golden Turkey mines, located along the banks of Turkey Creek, were identified as the major contributors to the copper and lead impairments. Elevated concentrations of copper and lead occur when runoff flows over and erodes abandoned tailings piles. A lead load is also originating from above the abandoned mine sites, but it is unknown if the load is from natural background or anthropogenic sources.

A small town and several homesteads lie within a 4-mile radius of Golden Belt and Golden Turkey mines. Recreation is commonplace in and near Turkey Creek and the mines.

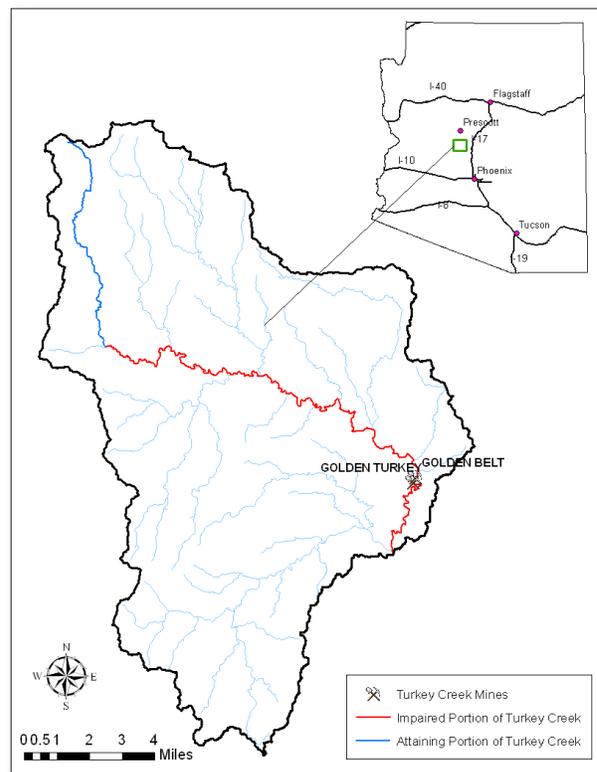


Figure 1. Pollutant loads in the impaired section of Turkey Creek have declined since mine land restoration occurred.

In 2006, AZDEQ completed a TMDL for Turkey Creek, which was determined to be non-attaining due to continued exceedances of copper and lead.



Figure 2. Photo of site before remediation work.



Figure 3. Photo of site after work was completed.

## Story Highlights

The USFS completed remediation on the Golden Belt and Golden Turkey mines in 2007. Before remediation, there were approximately 190,000 cubic yards of mine tailings and almost 54,000 cubic yards of waste rock along Turkey Creek. The USFS moved the contaminated mine tailings and waste rock away from the floodplain, and these contaminated piles were contained onsite using a variety of surface control measures. One such measure is a cap that was constructed for stabilization and to prevent any further runoff or erosion of the waste piles. Additional surface control measures implemented in the project area include regrading and revegetating, establishing proper drainage channels, minimizing runoff erosion, and aiding in restoring plant growth. AZDEQ has continued effectiveness monitoring following remediation in order to document water quality improvements. Figures 2 and 3 show the Turkey Creek floodplain before and after removal of mine tailings and waste rock.

## Results

Remediation of the Golden Belt and Golden Turkey mines has improved water quality in Turkey Creek. Removing the Golden Belt and Golden Turkey mine tailings and

waste rock piles from the Turkey Creek floodplain decreased copper and lead loads in Turkey Creek by 58% and 80%, respectively (Figure 4). Further water quality monitoring needs to be completed before Turkey Creek can be removed from the state's impaired waters list.

## Partners and Funding

The USFS was the primary party involved in remediation of the Golden Belt and Golden Turkey mines along Turkey Creek. AZDEQ has conducted effectiveness water quality monitoring.

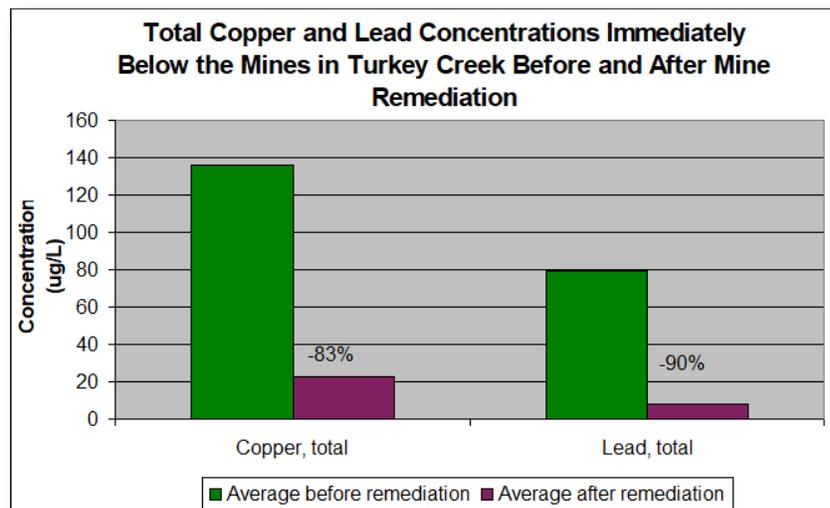


Figure 4. Total copper and total lead levels have declined in Turkey Creek.



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