

Addressing Threats from Abandoned Mines in California Communities

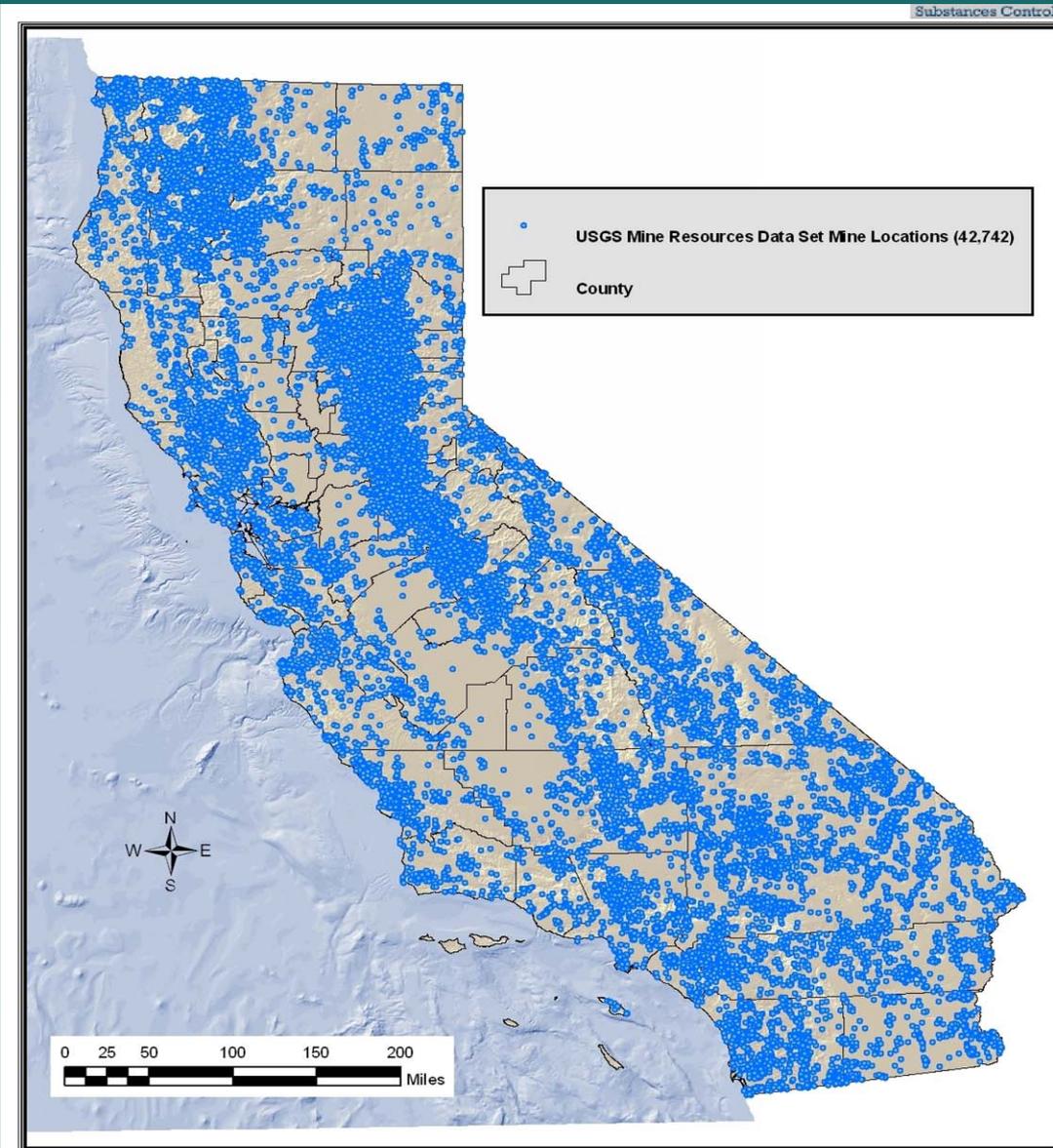


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Introduction



47,000 Abandoned Mines in California estimated by Department of Conservation.

Abandoned Mine Lands (AML) or Mine Scarred Lands are Brownfields

Addressing Threats from Abandoned Mines in California Communities

Discussion Topics

- ◆ Mine Waste Chemicals of Concern (COC)
- ◆ Human Exposure to Toxic Substances
- ◆ Environmental Impacts on Water Quality and Biota
- ◆ Abandoned Mine Lands as Brownfields in California
 - Current Issues
 - Approaches/Solutions
- ◆ DTSC AML Programs
- ◆ DTSC approaches to human health exposure in mining communities:
 - Community-Wide Assessment Grant Jackson/Sutter Creek
 - Training Research and Technical Assistance Grant: California Mine Scarred Lands Project (Arsenic Bioavailability Grant)

Mine Waste Chemicals of Concern

Types of Mine Wastes

- ◆ Mine Waste Rock
- ◆ Mill Tailings
- ◆ Acid Mine Drainage (AMD)
- ◆ Processing Chemicals
- ◆ Most common COC for Gold Mines: Arsenic, Mercury, and Lead



Human Exposure to Toxic Substances



Mesa De Oro, Sutter
Creek, Amador
County

Human Exposure to Toxic Substances

Assessing risk due to mine waste

- ◆ Toxicity of COC
- ◆ Concentration of COC
- ◆ Particle size and solubility
- ◆ Frequency and duration of exposure (land uses)
- ◆ Media - (water, soil, air)
- ◆ Route of exposure – (ingestion, inhalation, dermal)
- ◆ Sensitivity of person exposed –(child, pregnant women)
- ◆ Potential for bioaccumulation

Environmental Impacts on Water Quality and Biota



Copper Creek, Copperopolis, Calaveras County

Environmental Impacts on Water Quality and Biota

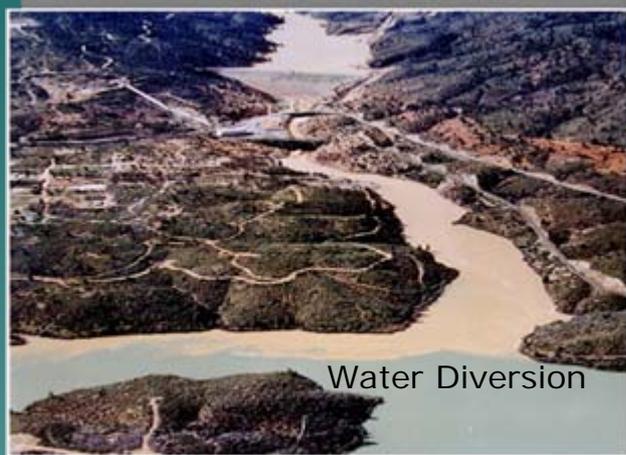
Biota Impacts



- ◆ Harmful to plants and animals, particularly fish and other aquatic organisms
- ◆ Concentration and toxicity thresholds for animals are often lower than for humans
- ◆ Effects to biota are often acute (fish kills)
- ◆ Effects to plants are long lasting (barren hill sides)

Environmental Impacts on Water Quality and Biota

Water Quality Impacts & Solutions

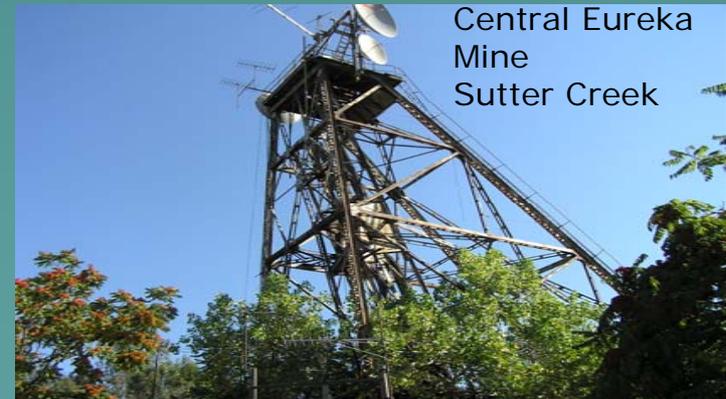


- ◆ Surface water – AMD and dissolved/suspended metals (including mercury and methyl-mercury)
- ◆ Potential threats to groundwater – dissolved metals
- ◆ Major impacts were identified early in California
- ◆ Solution- Water diversion and large scale treatment systems

Abandoned Mine Lands as Brownfields in California

Current Issues

- ◆ Development within Historical Mining Communities
 - Jackson and Sutter Creek, Amador County
 - Nevada City and Grass Valley, Nevada County
 - Infrastructure and Public Property
- ◆ Increased Recreational Land Uses
 - National & State Parks
 - Local Agencies
- ◆ Tribal Land Uses
 - Cultural/Ceremonial



Abandoned Mine Lands as Brownfields in California

Approaches/Solutions

- ◆ Collaboration with state, federal, and local agencies; tribal governments; universities; non-profit organizations; and private parties
- ◆ California Abandoned Mine Lands Agency Group and Abandoned Mine Lands Forum
- ◆ Abandoned Mine Lands Priority List
- ◆ Memorandum of Understanding - State/Federal Land Management Agencies (in progress)

Abandoned Mine Lands as Brownfields in California

Approaches/Solutions (Continued)

- ◆ Memorandum of Agreement - DTSC/California Regional Water Quality Control Boards
- ◆ Brownfields and other grant applications
- ◆ Letter of Intent - Tribes/DTSC (Cache Creek Watershed)
- ◆ DTSC AML Initiative Team

Picacho State Recreation Area, Imperial County



Abandoned Mine Lands as Brownfields in California

DTSC AML Programs

- ◆ Voluntary Cleanup Program
- ◆ State Orphan Sites
- ◆ Orders
- ◆ National Priorities List (NPL) Sites with U.S. Environmental Protection Agency (USEPA)
- ◆ Preliminary Assessment/Site Investigation via USEPA
- ◆ Targeted Site Investigation via USEPA



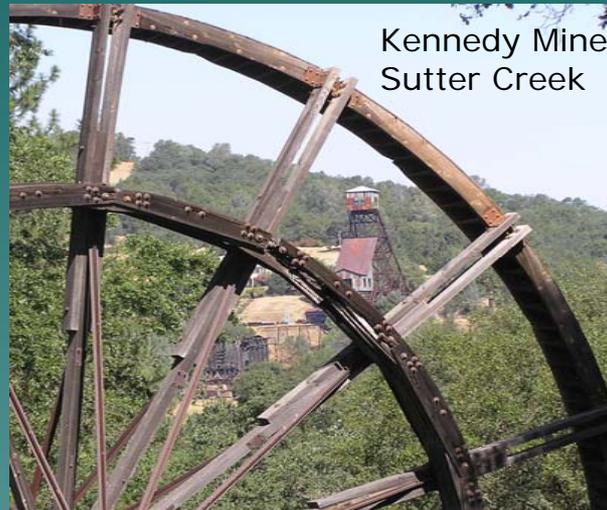
Abandoned Mine Lands as Brownfields in California

Two examples of approaches DTSC is taking in addressing the problem of human health exposure in mining communities:

- ◆ USEPA Brownfields Community-Wide Assessment Grant: Jackson/Sutter Creek
- ◆ USEPA Brownfields Training Research and Technical Assistance Grant: California Mine Scarred Lands Project (Arsenic Bioavailability Grant)

Community-Wide Assessment Jackson/Sutter Creek, Amador County

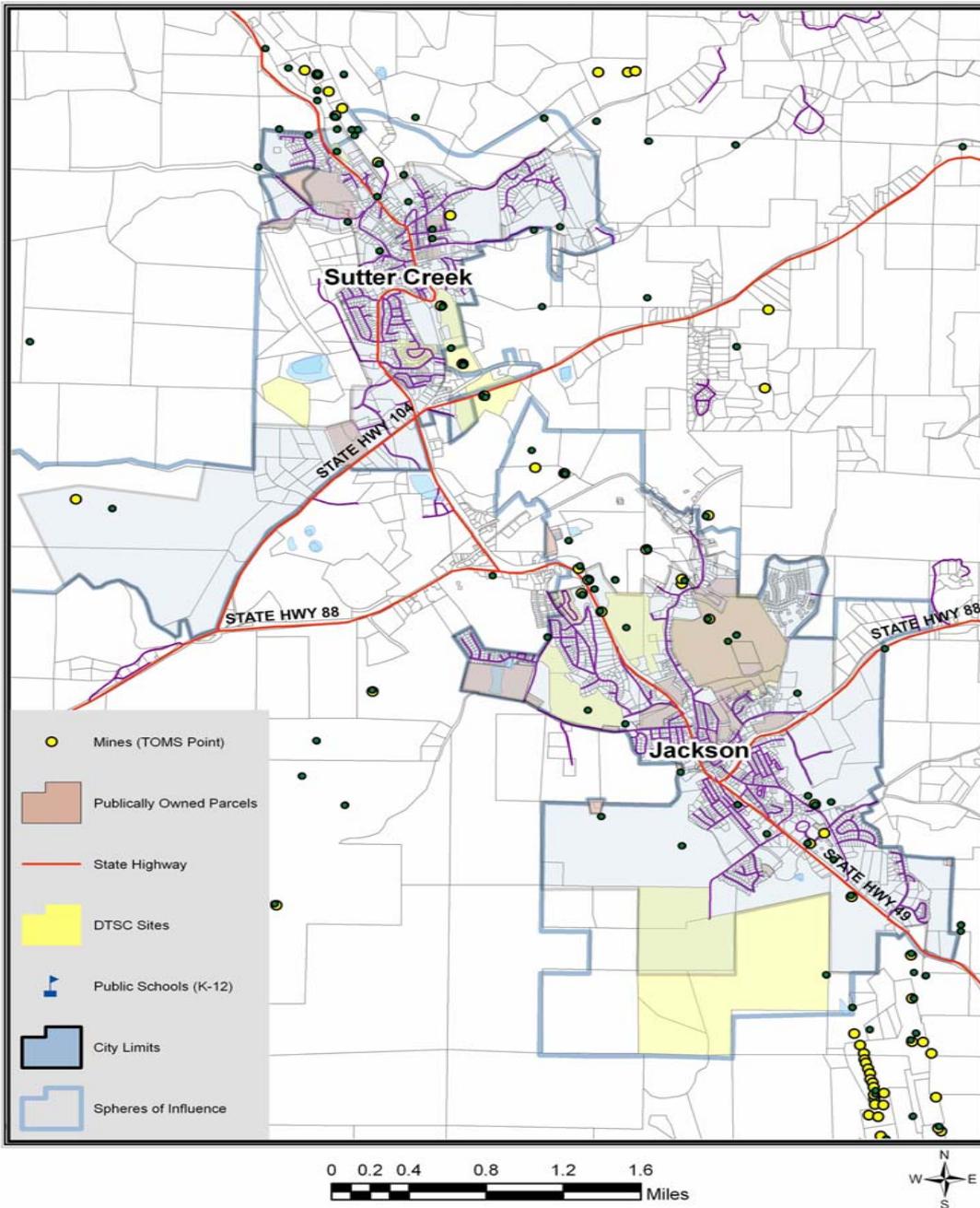
Scope of Project



- ◆ Assess public lands and high priority development sites
 - Public lands: schools, parks, roads, storm drain systems, and other public property
 - Private: sites where development is encroaching

Jackson/Sutter Creek

Mapping to date with abandoned mine sites, including public land and private land locations



Community- Wide Assessment Jackson/Sutter Creek

Elements

◆ Inventory

- Property information, historic land uses, and mine information from AML databases

◆ Initial Assessment

- Sample and determine general nature and extent of contamination. Screening level using XRF and limited surface water and sediment samples

◆ Selected Phase II Assessments

- Based on initial assessment results

Community- Wide Assessment Jackson/Sutter Creek

Elements (Continued)

◆ Cleanup Planning

- Recommendations for cleanup: cleanup levels for COC, cleanup alternatives (such as removal; capping), institutional controls to limit exposure (such as ordinances, land use covenants)



Community - Wide Assessment Jackson/Sutter Creek

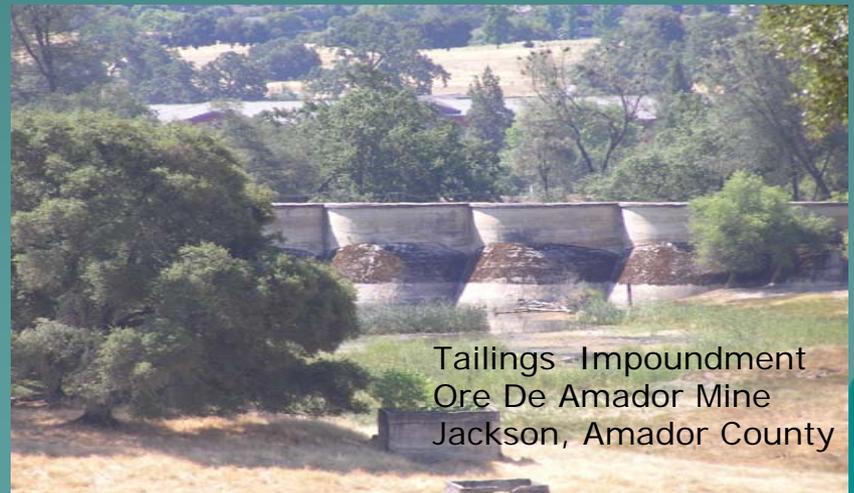
Products

- ◆ Consolidated Geographic Information System (GIS) Maps:
 - Historical mining operations & current location of mine waste
 - Nature of contamination in soils and impact on surface water
 - Chemical data from previous sites and assessments
- ◆ Cleanup guidance:
 - Threats to human health and water quality
 - Chemicals of concern & preliminary cleanup levels
 - Remediation alternatives & institutional controls

Community - Wide Assessment Jackson/Sutter Creek

Utilization

- ◆ Development planning
- ◆ Infrastructure management
- ◆ Cleanup needs



Tailings Impoundment
Ore De Amador Mine
Jackson, Amador County

Arsenic Bioavailability Grant

Bioavailability: "The amount of chemical that is actually absorbed into the body"



Issues

- ◆ Arsenic is typically the controlling COC for cleanup of gold mines
- ◆ Arsenic is often only partially bioavailable: 5% to 90%
- ◆ Generally poor correlation between in vivo (animal studies) and in vitro (lab methods – simulated gastro digestion)
- ◆ In vivo methods are expensive and time consuming
- ◆ Apparent relationship between various forms of iron oxide and arsenic

Arsenic Bioavailability Grant

Objectives



- ◆ Develop cost effective methods to determine arsenic bioavailability:
 - Correlate in vitro methods with with in vivo methods and corresponding mineralogy/various forms of iron oxide
 - Develop catalog of mine wastes and corresponding in vitro and mineralogy data
 - Establish methodology for implementation at other sites
- ◆ To better assess health risks and develop cost effective cleanup levels

References

U.S. EPA:

Brownfields Home Page:

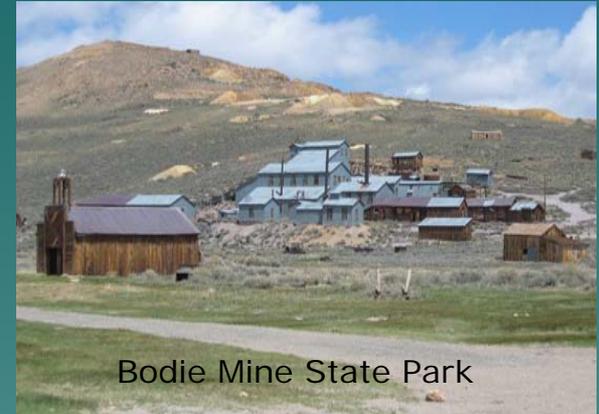
<http://www.epa.gov/brownfields/>

Brownfields Grants and Funding Information:

<http://www.epa.gov/brownfields/pilot.htm>

Brownfields Grant Applications Assistance Website:

<http://www.tabez.org/>



DTSC:

Brownfields Home Page:

<http://www.dtsc.ca.gov/SiteCleanup/Brownfields/index.cfm>

Loans and Grants Information:

http://www.dtsc.ca.gov/SiteCleanup/Brownfields/Loans_Grants.cfm

Voluntary Cleanup Program Information:

http://www.dtsc.ca.gov/SiteCleanup/Brownfields/index.cfm#CP_JUMP_13298

AML Preliminary Assessment Handbook:

http://www.dtsc.ca.gov/SiteCleanup/Brownfields/upload/aml_handbook.pdf

AML Site Discovery Process:

http://www.dtsc.ca.gov/SiteCleanup/Brownfields/upload/SMBRP_AML_Guidance.pdf

Addressing Threats from Abandoned Mines in California Communities

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