County-Level Prioritization of Abandoned Mine Lands

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Empire Mine State Historic Park
Overview

Background:
- Abandoned Mines In California
- Community Contributions
- County-Level Prioritization
- Leveraging Resources
- Context of Impacts

Prioritization at the Source:
- 6 Variables & 6 Decision Trees
- Case Study: Nevada County
- Top Priority Sites
Legacy of Mine Impacts

From Sierra Nevada headwaters downstream to foothill reservoirs and Bay-Delta deposition zones

Contaminants May Not Stay Localized

Mine Sites are Numerous

47,000 Abandoned Mine Sites in California (DOC 2007)

2,500 Hundred Sites inventoried (DOC 2007)

Thousands of AMLs in the Sierra Nevada
Abandoned Mines: Statewide

Map Source:
DOC, AML
April 2010

Map Source:
Earthworks
A. Steimke, 2002,
Mineral Policy Center
Abandoned Mines: Nevada County

Map Source: Sierra Streams Institute, Nevada City, CA

Map Source: Wolf Creek Community Alliance, Grass Valley, CA
Community Contributions

Resources to Be Leveraged

- Local Knowledge: Land & History
- Local Networks & Manpower
- Local Land Use Authority: Permitting & Regulating

Benefits to Counties
Clear understanding of historic AML impacts within jurisdiction will serve as impetus for prudent permitting and regulation now and in the future.

Downtown Nevada City, Nevada County, CA
County-Level Prioritization

Counties benefit from reputable agency data because they can make informed decisions about AMLs within their jurisdiction.

Agencies benefit from County-Level site-specific knowledge to supplement data prior to field inventory (DOC, AML, 2009).

“The Pit,” Malakoff Diggins State Historic Park

Local Resources

State & Federal Level Funding and Research

Counties benefit from reputable agency data because they can make informed decisions about AMLs within their jurisdiction.
Leveraging Resources

What Resources Have Already Been Dedicated?

- Chemical & Physical Hazard
- Water Quality & Soil
- Fish Tissue
- Statistical Modeling
- Geo-Environmental Modeling
- Agency List-Status

Existing Data = Capital Costs Incurred

303(d) Listed South Yuba River at Bridgeport
Abandoned Mine Impacts

Sierra Nevada

Source (Headwaters)

Impact

Sierra Nevada & Foothills

Transport (Reservoirs)

Contaminant Transport

Bay/Delta

Deposition (Downstream)

Contaminant Transport

Waste Rock

Mine Water

Tailings

Processing Wastes

Metal Loaded Water

Acid Rock Drainage

Elemental Mercury

Bioaccumulation of Methylmercury

Metal Loaded Water

Sediment

Metal Loaded Water

Contaminated Fish

Sediment

Contaminated Fish

Impact

Impact

Impact

Methylation of Mercury
Prioritization at the SOURCE

SOURCE Decision Trees:
6 Exercises to Help Counties Prioritize Using Existing Data

1. Landowner
2. Watershed
3. Exposure
4. Physical Hazard
5. Chemical Hazard
6. Capital Costs

Case Study: Nevada County

Stamp Mill at Empire Mine State Historic Park
1. Land Owner Prioritization

Public versus Private
Differences in Capacity Among Landowners

- Funding Opportunities
- Historic Designations
- Locating PRPs

Empire Mine State Historic Park
Is the Land Owner Private? (1)

- NO
  - Land Owner is State Parks (2)
  - Land Owner is BLM (3)
  - Land Owner is USFS (4)
  - Assessment and remediation may require adherence to strict historic preservation code(s)

- YES
  - Is Land Owner PRP? (5)
    - YES
      - Priority 3
    - NO
      - Land Owner is Individual Party (6)
      - Priority 2
      - If PRP cannot be located, mine impacts are land owner’s responsibility. Limited funding exists for private property owners

Potential for public accessibility and recreation uses

Priority 1
2. Watershed Prioritization

- Principle Areas of Mine Pollution (PAMP) Analysis
- Hydrologic Transport Potential
- Recreational Use: Fish Tissue Data
- County Revenue
3. Exposure Prioritization

- Human Exposure Priority (DOC, 2007)
- Site Accessibility
- Proximity to Residential Area
- Current Land Use
- Future Land Use

Memorial Park, Grass Valley, CA, Downstream of the Magenta Drain, Empire Mine SHP
COUNTY EXPOSURE PRIORITIZATION

Is the land-use in proximity to the mine site residential? (6)
- **No**

Is the land-use in proximity to the mine site undeveloped? (3)
- **Yes**
- **No**

Is the AML or land-use in proximity to the mine site recreational? (4)
- **Yes**
- **No**

Is the AML publically accessible? (2)
- **Yes**
- **No**

Is the mine a Human Exposure Priority (DOC 2007)? (1)
- **Yes**
- **No**

Priority 1

Priority 2

Priority 3

Publically accessible land in undeveloped area, no recreational use

Is the land-use in proximity to the mine site agricultural? (7)
- **Yes**
- **No**

More land-use information required to prioritize

Potential for future development of land

Is the land-use likely to change in the future? (5)
- **Yes**
- **No**
4. Physical Hazard Prioritization

- Acute Physical Hazards: A Serious Risk to Human Life or Limb
- Shafts, Adits, Drifts, Tunnels
- Cited as a Physical Hazard (DOC 2000 or 2007)
Is the mine site ranked for Physical Hazard in DOC 2000? (1)

Is the mine site ranked a Physical Hazard Priority in DOC 2007? (2)

Was the site remediated between 2000 and 2007? (3)

Does the mine site have documented physical hazards? (4)

Can documented hazards be compared to data listed in DOC 2000 or 2007 and sites easily prioritized? (5)

Priority 1 sites represent sites for which capital costs have already been incurred for preliminary investigation or assessment. These sites present opportunities to leverage existing data and can be ranked based on DOC 2000 list or DOC 2007 priority number (Priority 1, 2, or 3).

Data is not comparable. Further assessment required to prioritize.
5. Chemical Hazard Prioritization

- ARD/AMD
- Mercury, Arsenic, Heavy Metals, Cyanide
- Cited for Chemical Hazard (DOC 2000)
- Water Quality Priority (DOC 2007)
County Chemical Hazard Prioritization

Is the mine site ranked for Chemical Hazard in DOC 2000? (1)

Priority 1

Is the mine site ranked a Water Quality Priority in DOC 2007? (2)

Yes

Was the site remediated between 2000 and 2007? (3)

No

Priority 2

Data is not comparable. Further assessment required to prioritize.

Yes

Does the mine site have documented chemical hazards? (4)

Yes

Can documented hazards be compared to data listed in DOC 2000 or 2007 and sites easily prioritized? (5)

No

Priority 3

Yes

Priority 1 sites represent sites for which capital costs have already been incurred for preliminary investigation or assessment. These sites present opportunities to leverage existing data and can be ranked based on DOC 2000 list or DOC 2007 priority (Low, Medium, High).
6. Capital Costs Prioritization

- Capital Costs Incurred (DOC 2007)
- Future Capital Costs (DOC 2007)
- Existing Data
- Long Term Costs: O&M
County Capital Costs Prioritization

Is the mine ranked in a Financial Tier (DOC 2007)?

- Yes
  - Have capital costs already been incurred at the site?
    - Yes
      - Long-Term O&M Costs
    - No
      - Priority 2
- No
  - Is there existing data for the site?
    - Yes
      - Priority 1
    - No
      - Priority 3

SOURCE
Case Study: Nevada County

How do 40 Mines Rank on the 6 Variables:

1. Landowner
2. Watershed
3. Exposure
4. Physical Hazard
5. Chemical Hazard
6. Capital Costs
Sorting Priority Sites

**Landowner:**
12 Public Sites, 11 Public/Private Sites, 14 Private Sites

**Watershed:**
Priority Watersheds: Yuba and Bear

**Exposure:**
12 Public or Public/Private Sites with published Exposure data

**Physical Hazard:**
14 Public or Public/Private Sites with published Physical Hazard data

**Chemical Hazard:** 19 Public or Public/Private Sites with published Chemical Hazard data

**Capital Costs:** 12 Public or Public/Private Sites with published Capital Costs data

“The Pit,” Malakoff Diggins State Historic Park
# Priority Sites in Nevada County

<table>
<thead>
<tr>
<th>Mine Name</th>
<th>Land Owner</th>
<th>Watershed</th>
<th>Exposure</th>
<th>Physical Hazard</th>
<th>Chemical Hazard</th>
<th>Capital Costs</th>
</tr>
</thead>
<tbody>
<tr>
<td>Johnson Sink</td>
<td>USFS</td>
<td>South Yuba</td>
<td>High</td>
<td>Priority 1</td>
<td>WQ Priority: Medium</td>
<td>Tier 3b ($375k)</td>
</tr>
<tr>
<td>Last Chance</td>
<td>USFS</td>
<td>South Yuba</td>
<td>No Data</td>
<td>Priority 1; #84</td>
<td>#92</td>
<td>$10,000</td>
</tr>
<tr>
<td>Giant King</td>
<td>USFS</td>
<td>South Yuba</td>
<td>No Data</td>
<td>Priority 1</td>
<td>No Data</td>
<td>$20,000</td>
</tr>
<tr>
<td>Steephollow</td>
<td>USFS</td>
<td>Bear River</td>
<td>No Data</td>
<td>Priority 2; #25</td>
<td>#96</td>
<td>No Data</td>
</tr>
<tr>
<td>Blue Lead</td>
<td>USFS/Private</td>
<td>Bear River</td>
<td>No Data</td>
<td>Priority 3; #82</td>
<td>#88</td>
<td>No Data</td>
</tr>
<tr>
<td>Le Duc</td>
<td>BLM/Private</td>
<td>South Yuba</td>
<td>No Data</td>
<td>Priority 2</td>
<td>#93</td>
<td>No Data</td>
</tr>
<tr>
<td>Red Dog/You Bet</td>
<td>BLM/Private</td>
<td>Bear River</td>
<td>No Data</td>
<td>Priority 2; #88</td>
<td>#33</td>
<td>No Data</td>
</tr>
</tbody>
</table>
Can the source of impact be traced to an AML within the county?

- **YES**
  - Is the impact in-stream?
    - **YES**
      - Is there a downstream reservoir (checkpoint)?
        - **YES**
          - See TRANSPORT Decision Trees
        - **NO**
          - See DEPOSITION Decision Trees
    - **NO**
      - Can the impact be retained on-site?
        - **YES**
          - Impact remediation will involve removal and disposal
        - **NO**
          - See DEPOSITION Decision Trees
- **NO**
  - Can the impact be traced to upstream source(s)?
    - **YES**
      - See SOURCE Decision Trees
    - **NO**
      - Further historical analysis required to begin prioritization process

**Coordinate**

IS MULTIPLE-COUNTY COORDINATION NECESSARY TO ASSESS AND ADDRESS IMPACTS?
Questions?

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All Photographs and Diagrams:
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(unless otherwise noted)

County-Level Prioritization Protocol Document
& Decision Trees will be available post-conference at www.reclaimingthesierra.org as a 2015 Conference Outcome