



## **A Collaborative Approach to Mine Reclamation**

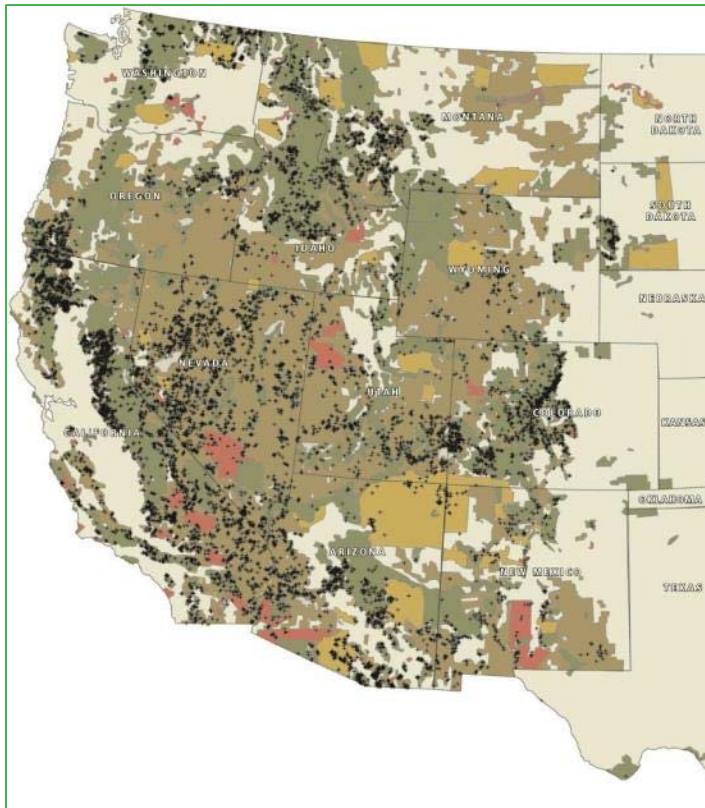
**Jason Willis**

Mine Restoration Project Manager

February 22, 2017 – Denver, Colorado  
Panel: Challenges and Solutions in Mining



## Mining Legacy in the Western United States



- Over 500,000 abandoned mines in the Western U.S.
- 40% of western headwaters are polluted with mine wastes
- Approximately 100,000 abandoned mines exist on public lands today in 13 western states
  - Estimated clean-up costs range between \$9.6 to \$21 billion dollars

# Mining Legacy in Colorado



- ✦ Colorado Department of Natural Resources estimates approximately 23,000 abandoned mines
- ✦ > 80% of Colorado's most impaired waterways are the result of mining operations.
- ✦ According to a CO Division of Reclamation Mining and Safety (DRMS) study:
  - 230 mines draining contaminated AMD
  - 47 addressed w/active treatments
  - 35 under investigation and/or being treated
  - 148 likely impacting WQ

# Mining Legacy in Colorado



- Estimated number of abandoned mines on BLM land:
  - 2,500
- Estimated number of abandoned mines on USFS land:
  - 2,605
- Total of 5,105 abandoned mines in Colorado
- Cost to clean-up this total ranges between \$493 million to \$1.1 billion

Sources: Center for Western Priorities "The Mining Burden" and DRMS Website

# Challenges to Cleaning Up Abandoned Mines



- No identifiable or responsible owner
- Lack of a dedicated funding source
- Liability concerns due to the Clean Water Act for Good Samaritan Organizations

Animas River Spill ([www.wired.com](http://www.wired.com))

# Point Sources Examples – Single source requiring NPDES permit



## Non-Point Source Examples – Not attributed to a single source





## What is TU's Role in Mine Reclamation Work?

- ✍ Focus on watersheds that exceed State water quality standards
  - Grant funded projects (CDPHE 319 NPS, NFF, CWCB, CSFS)
  - Private funding for match and construction
    - Freeport McMoRan Mining, Newmont Mining, and Tiffany & Co. Foundation
  - Federally and State funded projects (USFS, DRMS)
    - Forest and Regionally based USFS projects based on Master Agreement between TU/USFS
- ✍ TU is part of the mixed ownership group in Colorado
- ✍ Filling a non-profit, non-governmental organization (NGO) role in the mixed ownership group.
  - Brings alternative sources of funding to projects (private partnerships)
  - Flexibility in contracting
  - Engineering experience to assist in project development
  - Collaborative relationships with Federal, State, Private, and Local agencies



## TU Program Expansion and Recent Mine Reclamation Work



- ✦ Mine reclamation program expansion over past 4 years
  - Project design, engineering, contracting, management, oversight, and reporting
- ✦ 2012 – Kerber Creek Project
- ✦ 2016-17 – Santiago Mine and Mill, Lower Creek, Lion Creek, Akron Mine, Tiger Mine, and Minnie Lynch Mine Reclamation Projects
  - Over \$1.238 million spent during FY 2016 on construction alone in Colorado
    - All projects focused on WQ improvement or mine reclamation with components of stream restoration and revegetation

## 2016-17 TU Colorado Projects



- 🐟 Evans Gulch – Leadville, CO in Lake County (Design and Construction)
- 🐟 Minnie Lynch Mine – Bonanza, CO in Saguache County (Phase 3 Construction)
- 🐟 Leavenworth Creek/Santiago Mine – Georgetown, CO in Clear Creek County (EE/CA Development and Construction)
- 🐟 Lion Creek – Empire, CO in Clear Creek County (Construction)
- 🐟 Illinois Gulch – Breckenridge, CO in Summit County (Stream Channel Re-route)

## Collaborative Project Examples



- 👉 Lion Creek Project – TU, CCWF, NFF, USFS, CSM, USGS, Mtn. Pine Mfg.
- 👉 Leavenworth Watershed – TU, USFS, Freeport, NFF, DRMS, CDPHE, USGS, EPA
- 👉 Tiger Mine Project – TU, BLM, DRMS, CMC, Freeport



## Lion Creek (LC) – Project Update

- ✎ Located near Empire, CO upstream of the West Fork of Clear Creek.
- ✎ TU wrote grant to acquire NFF funding for following scope of work.
  - 600 CY of Tailings relocation from LC floodplain to adjacent repository
  - 400 CY of clean fill and 60 CY compost rough graded into floodplain
  - Revegetation of floodplain using native seed mix, 50 bales woodstraw, and 100 riparian plugs
  - Locally sourced logs, rootwads, and rocks installed for streambank and in-stream stabilization
- ✎ Jointly bid project with Clear Creek Watershed Foundation (CCWF). Award date was on 6/30/16 and construction completed over two weeks in November 2016
  - Removal actions completed in-conjunction with USFS

# Lion Creek – Project Update

👉 Before and after conditions



# Lion Creek – Project Update



## Leavenworth Creek Watershed – Project Update

- 👉 Headwaters above Georgetown, CO near Argentine Pass.
- 👉 2015 work in Waldorf Mine Site area
  - 2,500ft of riprap channel for drainage through tailings
  - Consolidation of 5,500 CY of tailings to 2 repositories
  - Wetland and 5,000ft of clean floodplain creation



## Waldorf Dispersed Tailings – Before and After Photos





# Waldorf Dispersed Tailings – Aerial Before and After



# Leavenworth Creek Watershed – Project Update



- ✍ 2016 work at historic Santiago Mine and Mill Site
- ✍ Coordination with State Historical Preservation Office (SHPO) for Ore bin 1 (OBI) preservation
  - TU essential in bridging gap between project partners and SHPO
- ✍ Construction broken up into seven tasks
  - Task 1 – Removal Action of 4,770 CY of tailings/waste and construction of 600ft of run/on run/off control ditch
  - Remaining tasks pertained to mobilization/demobe, preservation, stabilization, and decontamination of historic structures on site.
    - Mill building interior, water tank, ore bin 1&2, and truck drop

## Santiago Mine and Mill – Before and After Photos

Removal action of  
4,770 CY



OBI preservation  
work



# Santiago Mine and Mill – Before and After Photos



Clean-up and decontamination of Mill building interior



Construction of 600ft run-on-off channel



## Tiger Mine – Project Update

- ✎ Joint effort between TU, DRMS, and BLM.
  - Task 1 – Maintenance of three settling ponds
  - Task 2 – Reconstruction of 500ft of Tiger interceptor ditch
  - Task 3 – Culvert replacement between adit channel and interceptor ditch
  - Task 4 – Tiger repository maintenance



# Questions/Comments?

Thank You!  
Jason Willis  
Project Manager  
[jwillis@tu.org](mailto:jwillis@tu.org)  
[www.tu.org](http://www.tu.org)

