

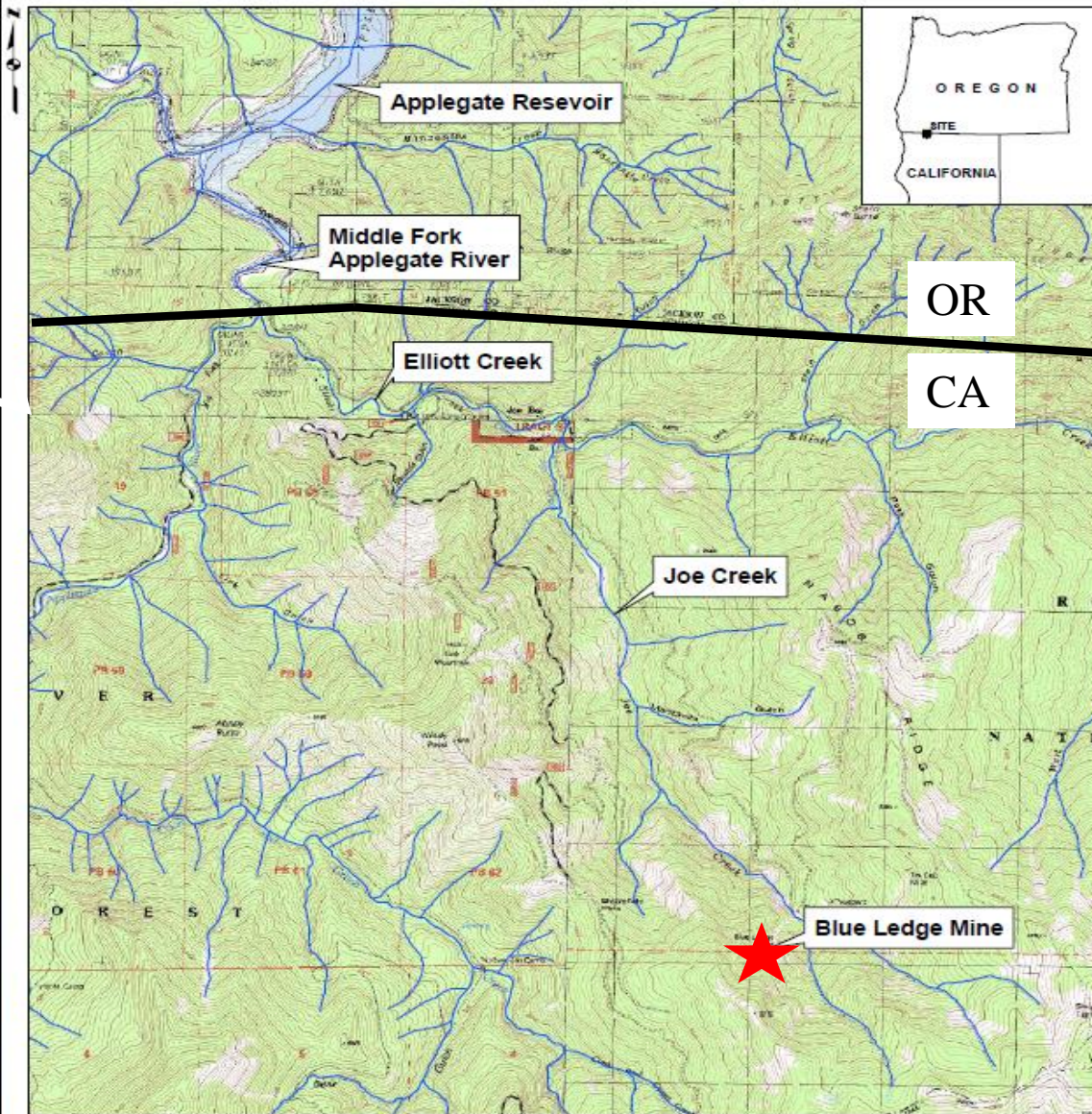
Blue Ledge Mine Superfund Site Presentation Overview



- Location
- Mine Development
- Site Features
- Acid Mine Drainage
- Distribution of Metals Contamination
- Impacts to Ecosystem
- 2010-11 USFS Non-Time-Critical Removal Action
- Q&A

SEP 9 2010

LOCATION AND SURFACE WATERS



Source: Dutch Creek, California USGS 7.5' Topo Quad, 1981.
Kangaroo Mountain, California USGS 7.5' Topo Quad, 1981.
Squaw Lakes, Oregon USGS 7.5' Topo Quad, 1983.
Calfrey Creek, Oregon USGS 7.5' Topo Quad, 1983.



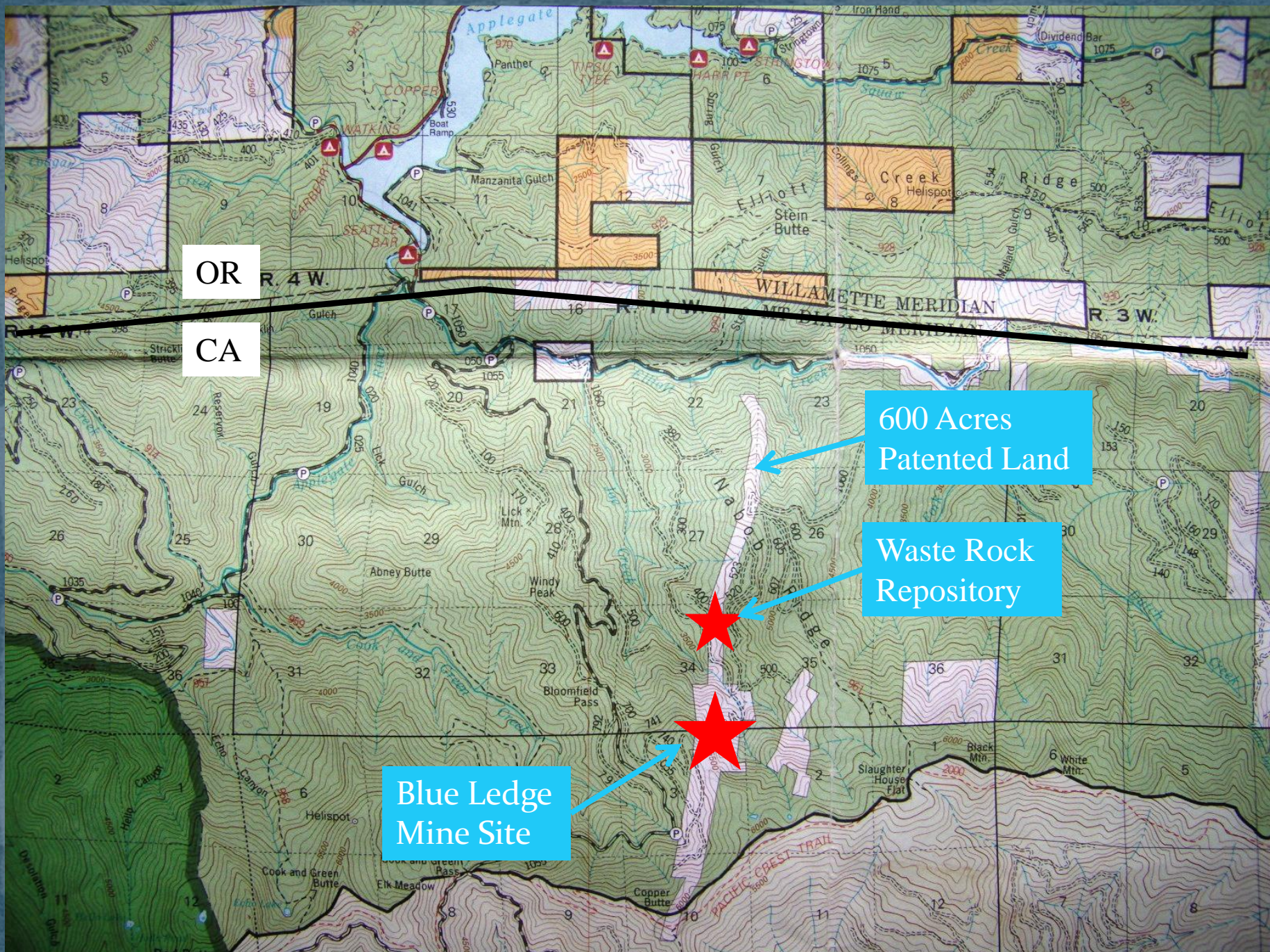
0 0.5 1 Miles

APRIL 2009
25696770

SITE AREA
UNITED STATES FOREST SERVICE
BLUE LEDGE MINE
BLUE LEDGE, CALIFORNIA

FIGURE 2

D:\25696770 Blue Ledge Mine\000 Technical\GIS\MO\Z\ preliminary\Fig. 2 Site Area.mxd



OR

CA

R. 4 W.

WILLAMETTE MERIDIAN

R. 3 W.

600 Acres
Patented Land

Waste Rock
Repository

Blue Ledge
Mine Site

Mine Development

- ❑ 1898 Discovered high-grade massive sulfide deposit
- ❑ Mined for Cu, Zn, Au, Ag
- ❑ 1904-1909 Developed
- ❑ 1918-1920 8,000 tons shipped in support of WW I
- ❑ 1930's 2,500 tons shipped
- ❑ Over 2 miles of underground workings on ten levels
- ❑ 13 adits and one shaft
- ❑ Ore hand sorted, sent to ASARCO smelter in Tacoma, WA
- ❑ No mill or associated tailings on Site
- ❑ >150,000 tons of sulfide-rich waste rock dumped on slopes/drainages



Blue Ledge Mine Site Features

Copper Ore,
Namesake for
Blue Ledge Mine

10.17.2011



N
WRP

— Creek
- - - Ephemeral Drainageway
Waste Rock Pile

URS

April 2009
25696770

Waste Rock Areas
US Forest Service
Blue Ledge Mine
Rogue/Siskiyou National Forest

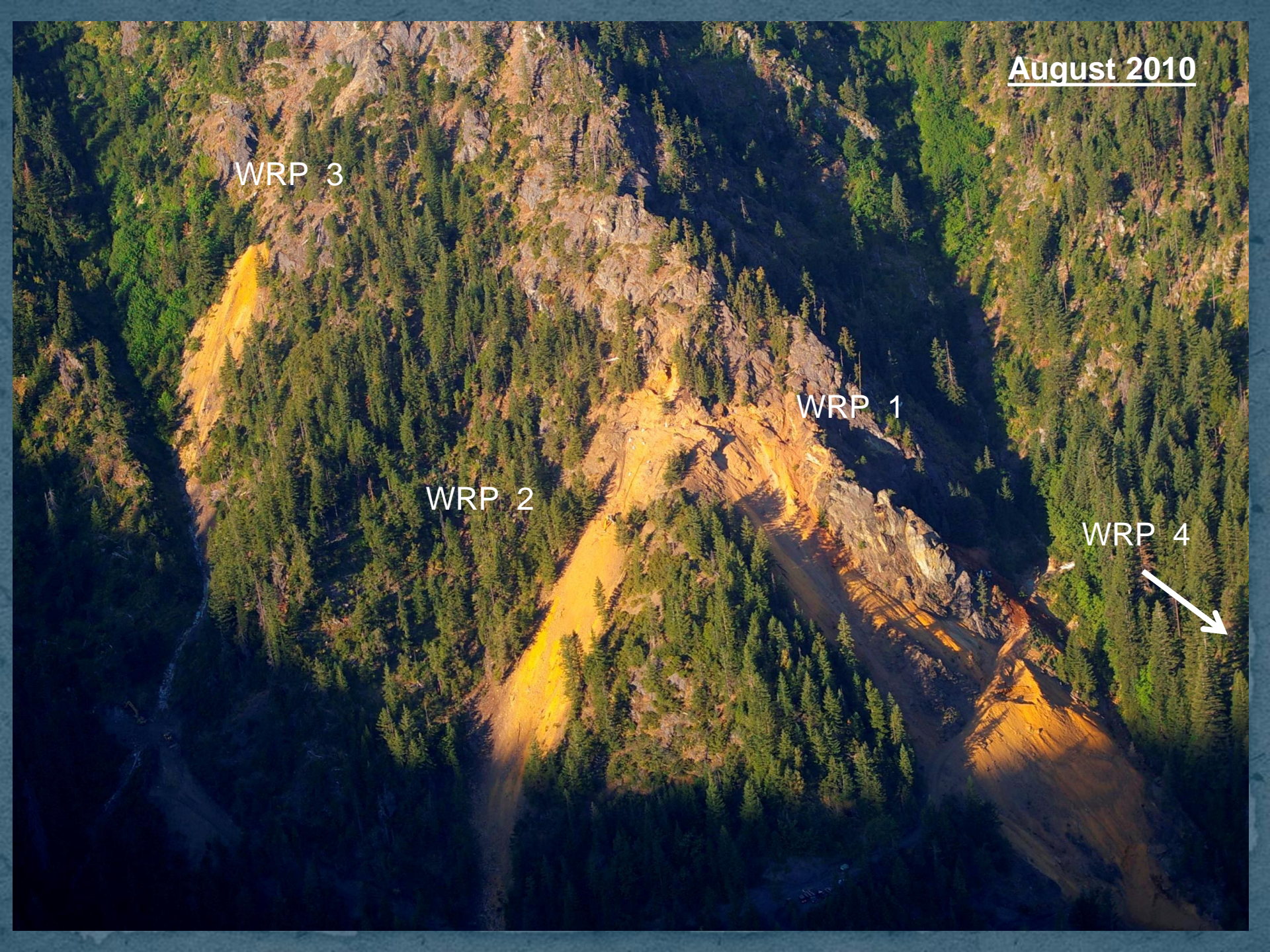
August 2010

WRP 3

WRP 1

WRP 2

WRP 4

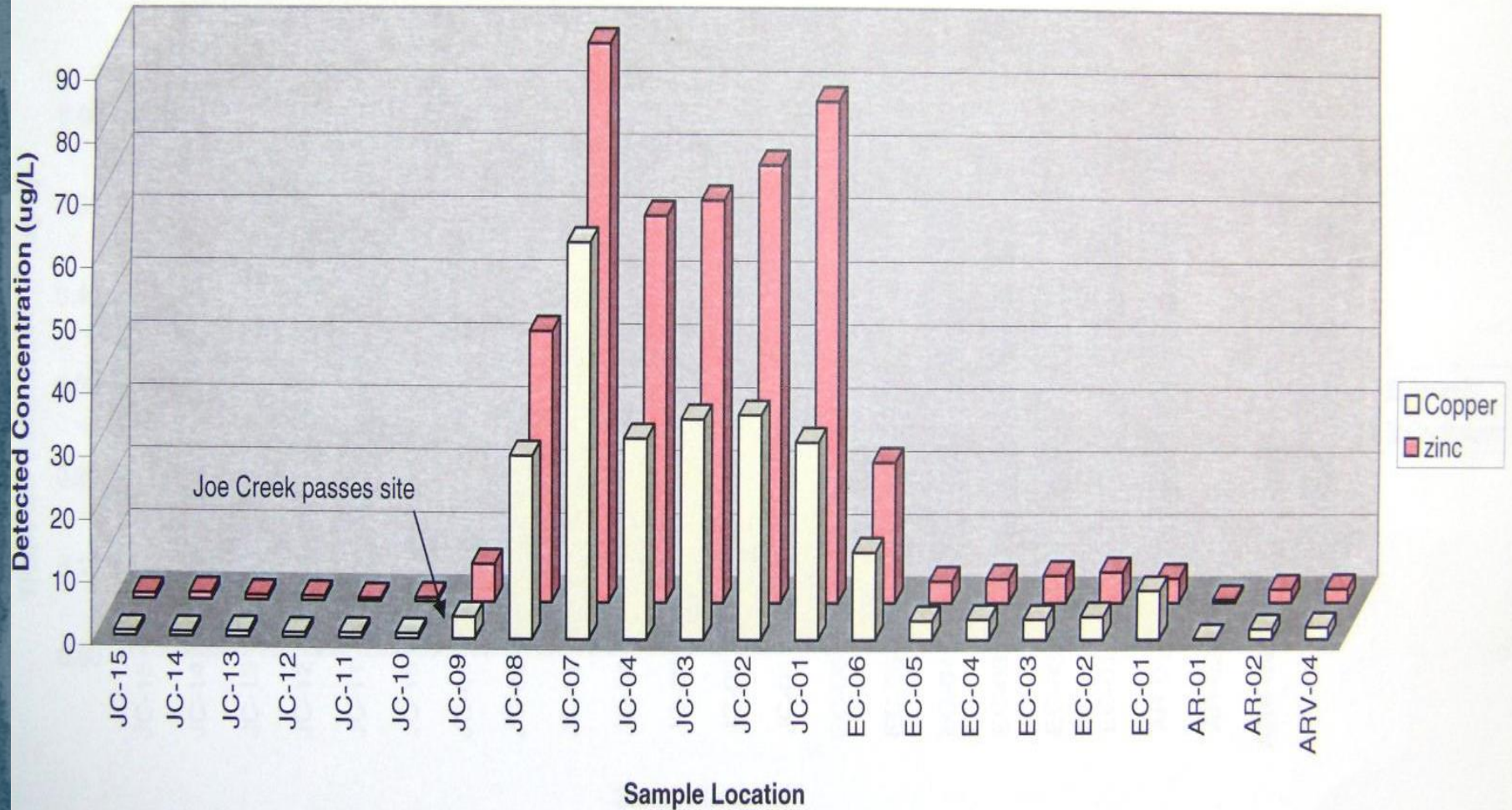


Blue Ledge Mine
Acid Mine Drainage
Discharged to the Environment

500k g/p/d AMD Entered Joe Creek in Spring

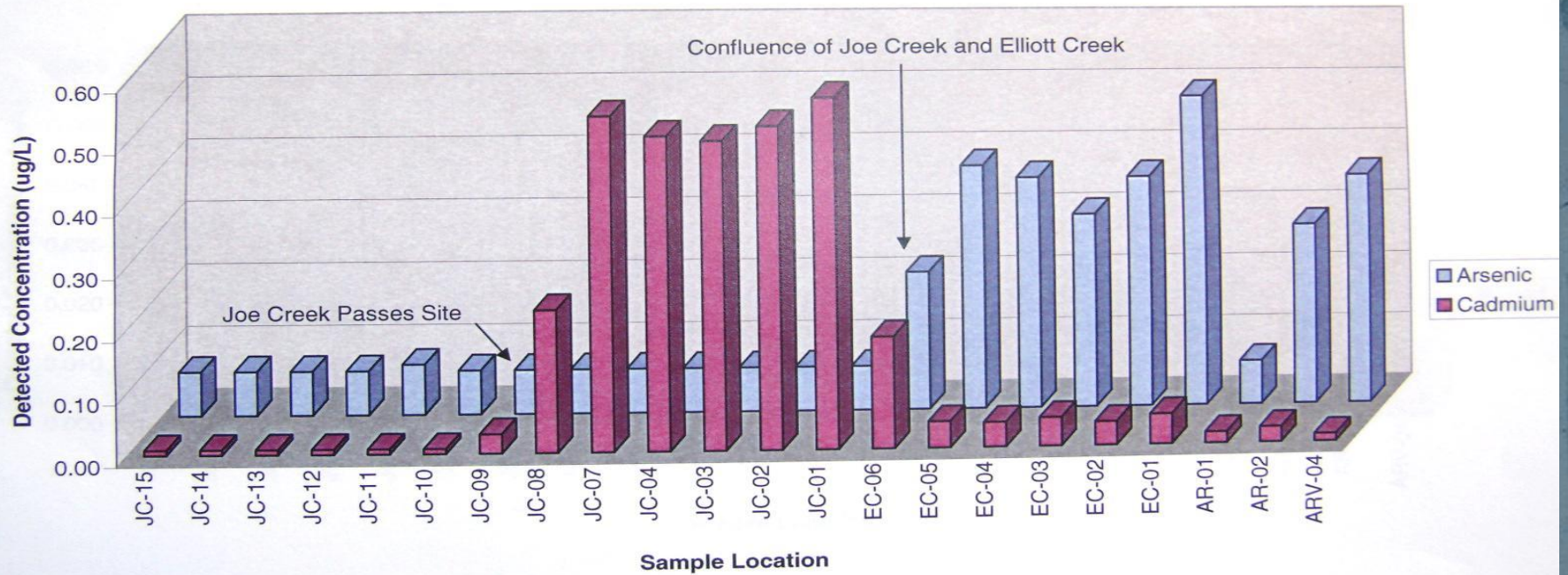


Dissolved Copper & Zinc in Surface Water



Arsenic & Cadmium in Water

Chart 2
Dissolved Arsenic and Cadmium in Surface Water

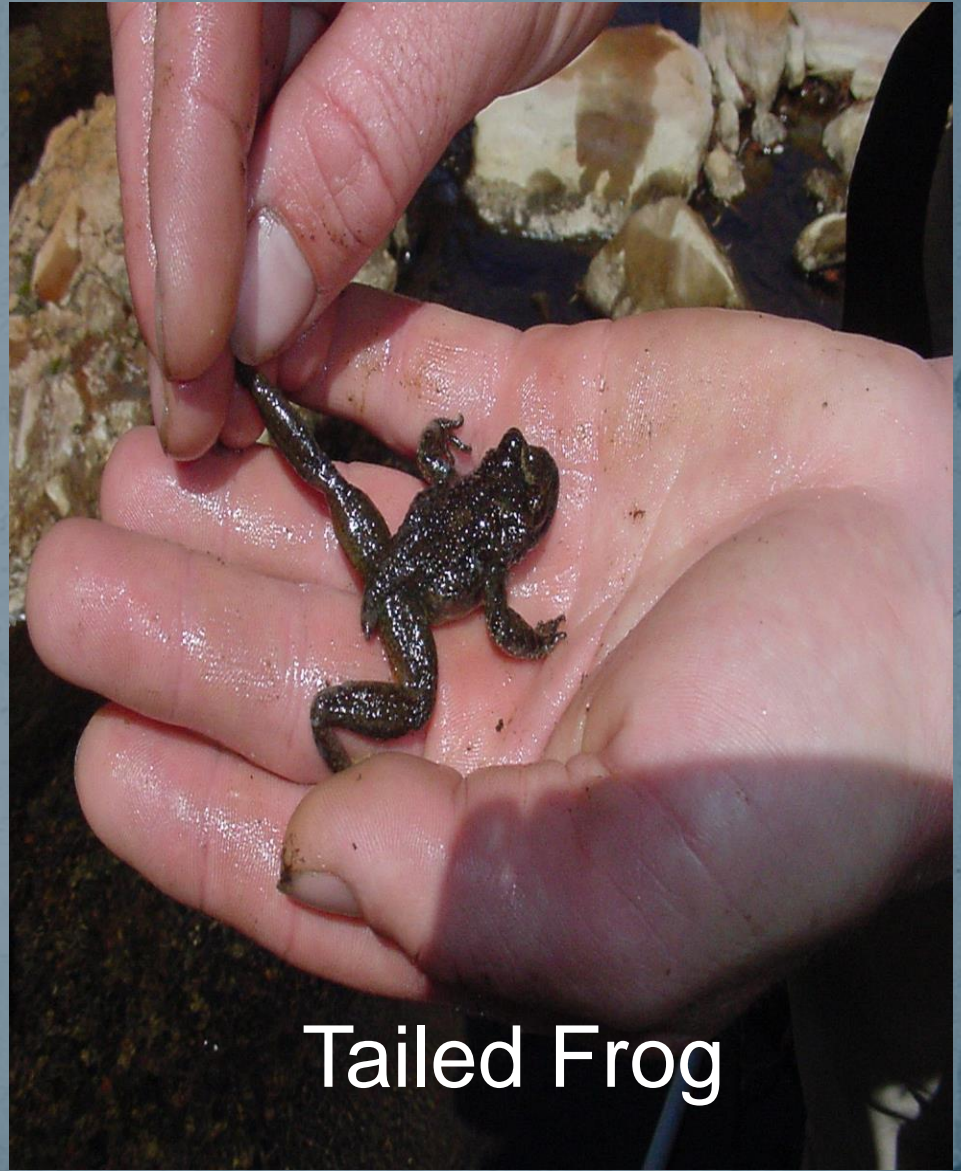


Blue Ledge Mine Impacts to the Ecosystem

Abundant Aquatic Life Upstream of Mine



Pacific Giant
Salamander



Tailed Frog

4 Miles of Sterile Stream Below Waste Rock Piles

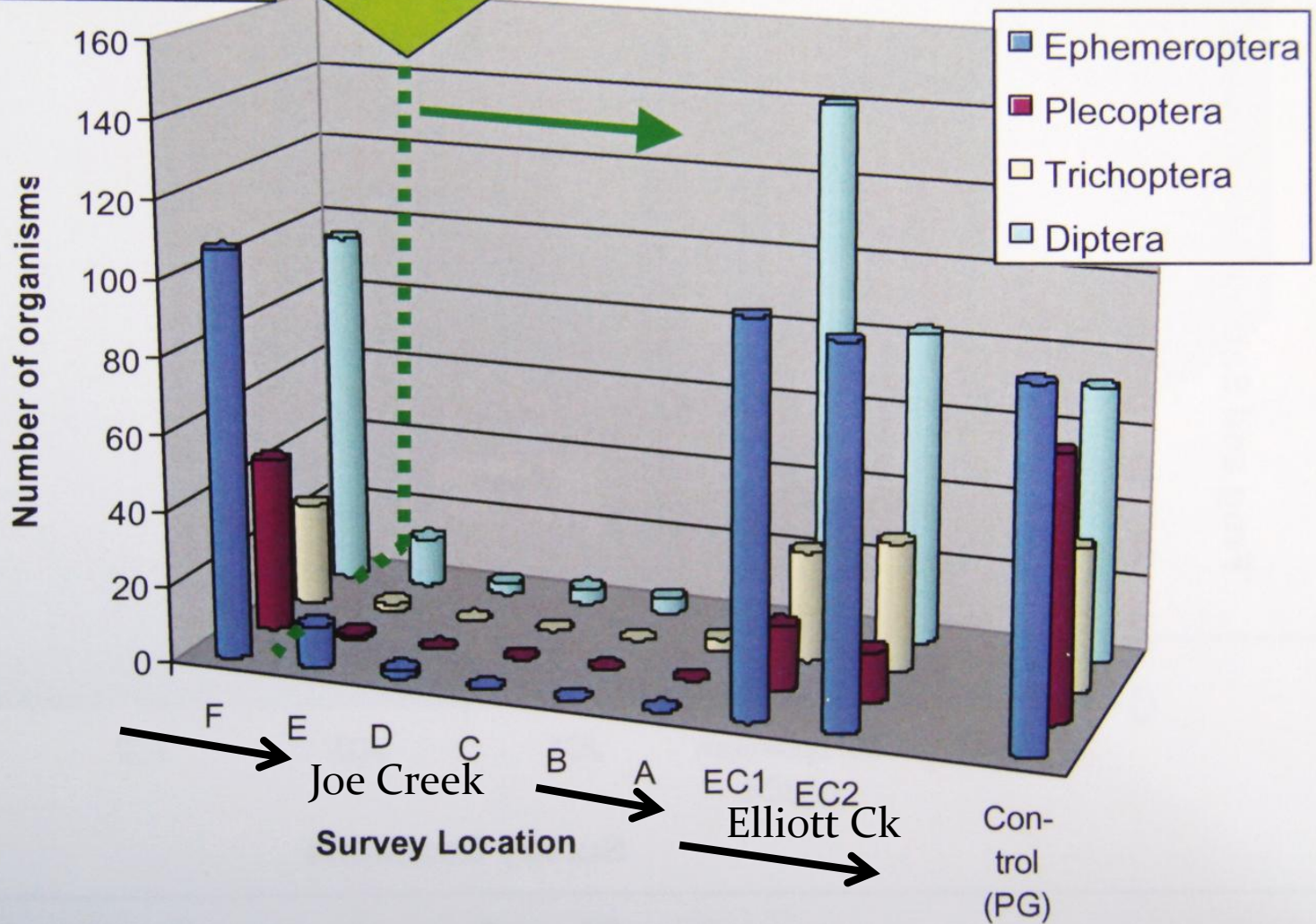


One Mile Below Mine
Brown Algal Mat is Only Living Organism



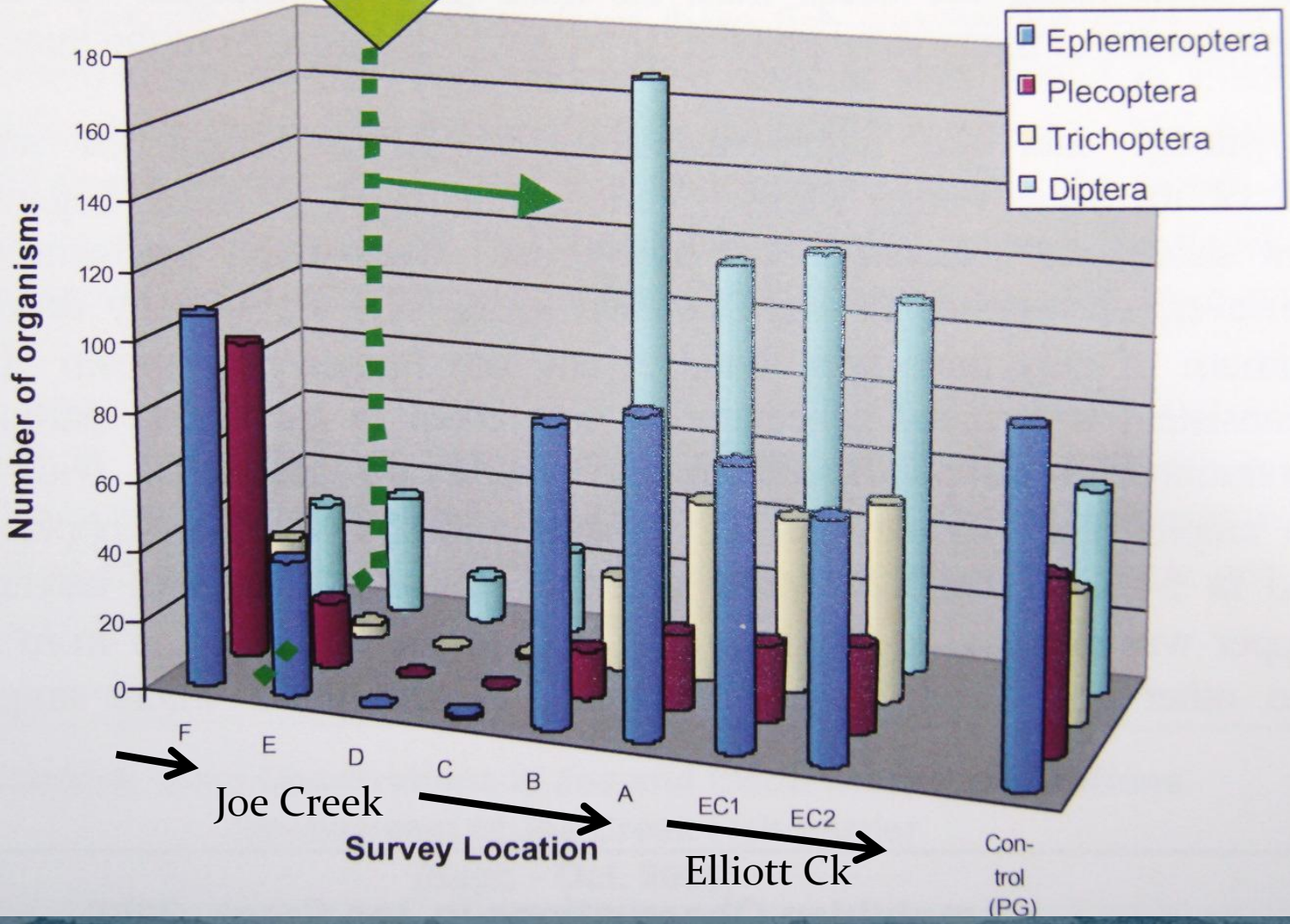
Tributary flowing through Blue Ledge Mine Waste Pile (AMD Input)

Macroinvertebrates May 2001 (Wet Season)



Tributary flowing through Blue Ledge Mine Waste Pile (AMD Input)

Macroinvertebrates Sept. 2000 (Dry Season)



2010-11

US Forest Service
Non-Time-Critical
Removal Action

Emphasis on AMD Source Control by Removing Waste Rock Piles



Solid Rock Excavation For Haul Road at 34% Grades



AUG 18 2010

Construct Repository on Ancient Landslide

BL Mine



JUL 8 2010



Excavate 45,000 Cubic Yards
For Repository, Cover Soil



Prepared Repository Subgrade

BL Mine



AUG 5 2010

Install 60 mil Double-Textured HDPE Liner



Repository Components

60 mil Liner

Drain Rock



Leachate Collection Tank and Riser

Separation Geotextile

Cushion Soil



Waste Rock

AUG 27 2010



Excavate Waste Rock by Machine *and* Manpower



Helicopter Lifting Mini-Excavator From Repository to Top of WRP 1



WRP 1

JAN 1 2000

Mini-Excavator Flown
From Repository to
Top by Helicopter

3 Spider Excavators Climb to Top of Piles



Repository

AUG 5 2010

Spiders Excavated
Waste Rock, Uncovered
6 Unknown Buried Adits
and 1 Shaft

SEP 2 2010

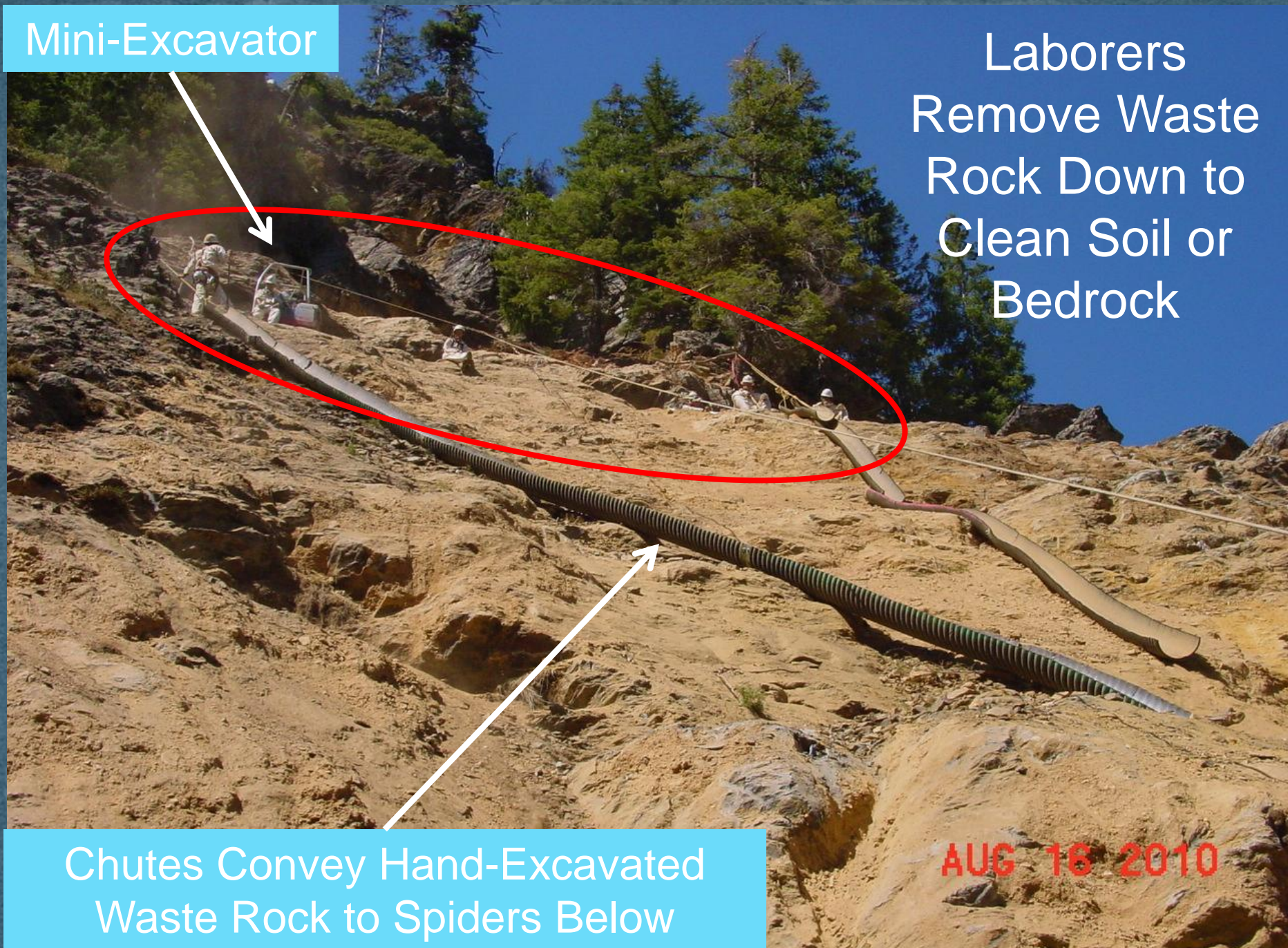


Mini-Excavator

Laborers
Remove Waste
Rock Down to
Clean Soil or
Bedrock

Chutes Convey Hand-Excavated
Waste Rock to Spiders Below

AUG 16 2010





Adits

Scalers Remove Rock Above
Before Waste Excavation Below

AUG 20 2010

Laborers With Hand Tools Clean to Bare Rock



D4 Joins Spiders to Push Surge Pile to Excavator & Haul Trucks Below



Spider Winch Cable

AUG 24 2010

D4 Joins Spiders to Push Surge Pile to Excavator & Haul Trucks Below



SEP 17 2010

D8 & D6 Push Surge Pile From Spiders



SEP 15 2010

-Excavator Loaded 35-Ton Haul Trucks
-Trucks Made 5,000 Trips That Dropped
600'-1,000' Elevation to Repository



SEP 17 2010

Current Stream Channel



Cleaning Unknown Old Stream Channel Buried by Mine Waste



OCT 20 2010





Final Cleaning of
35'-Deep Pre-Mining Era
Drainage Channel

OCT 22 2010

A photograph of a steep, rocky mountain slope. The foreground and middle ground are dominated by large, reddish-brown, layered rock formations. A dirt path or road runs diagonally up the slope, flanked by a cable line on the left. The background shows a clear sky and some evergreen trees on the right side of the slope. A blue text box is overlaid in the upper left corner, and a red date stamp is in the lower right corner.

Chute Cleaned by
Spiders And Laborers

AUG 16 2010

Aerial
View
After
Removal



Adits

Pre-
mining
stream
path

66,500 CY of Waste Rock Placed in the Repository

60 mil Double-Textured
LLDPE Repository Cover

Screened Cushion Soil

09.15.2011



Repository Cover Drainage Layer

Geocomposite Top Deck



1' Pea Gravel On Slopes



09.20.2011

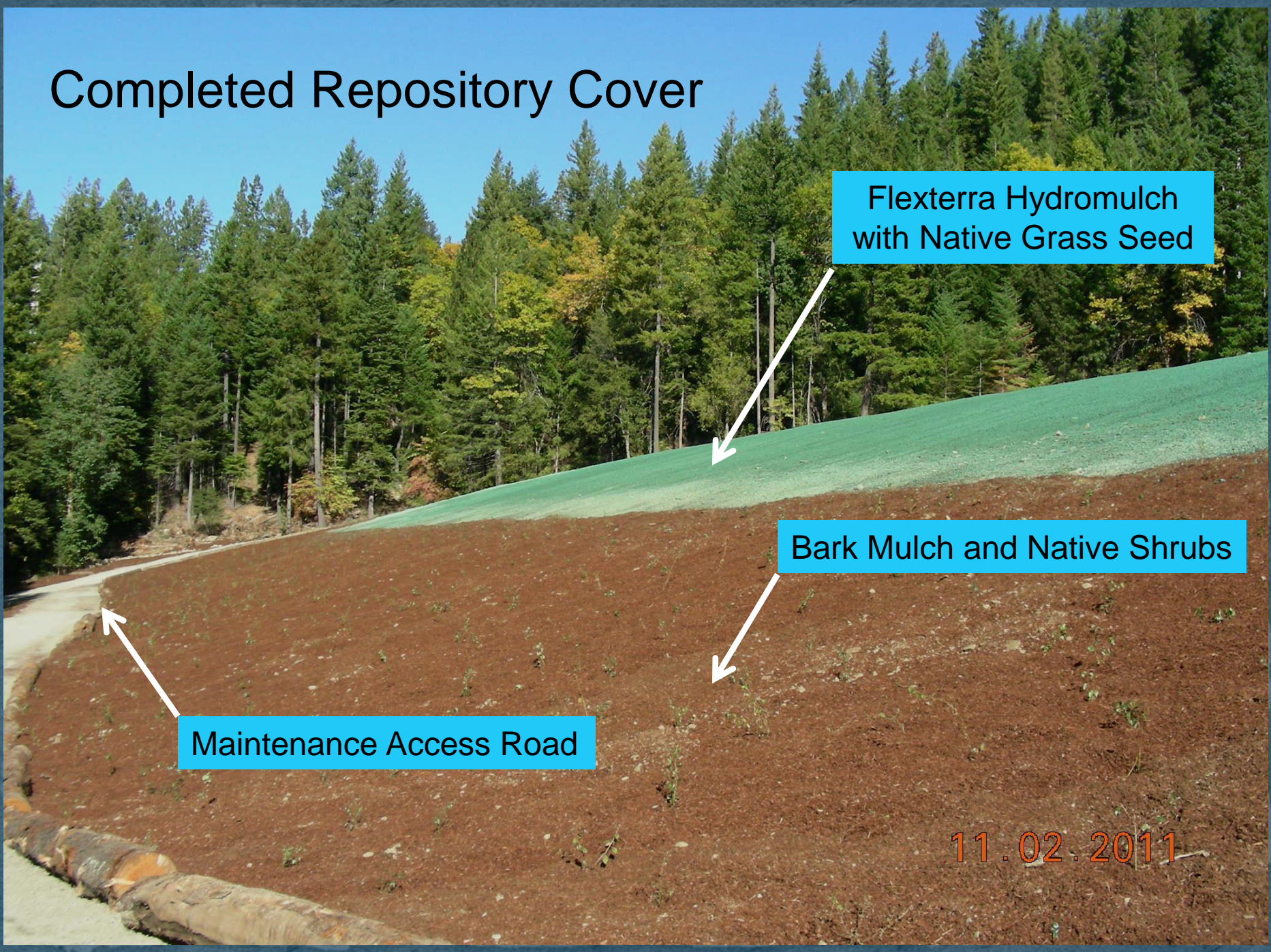
Completed Repository Cover

Flexterra Hydromulch
with Native Grass Seed

Bark Mulch and Native Shrubs

Maintenance Access Road

11.02.2011



Decommission Haul Roads
Outslope, Waterbar, Seed,
Straw, Slash



09 27 2011

Fall
2011



Summer
2012

07 17 2012

Sediment/pH Treatment Basins

Geomembrane Liner w/Drain Holes

Rock
Buttress

Limestone
Sand

Geotextile Cover
Over Lime Sand

09.22.2011

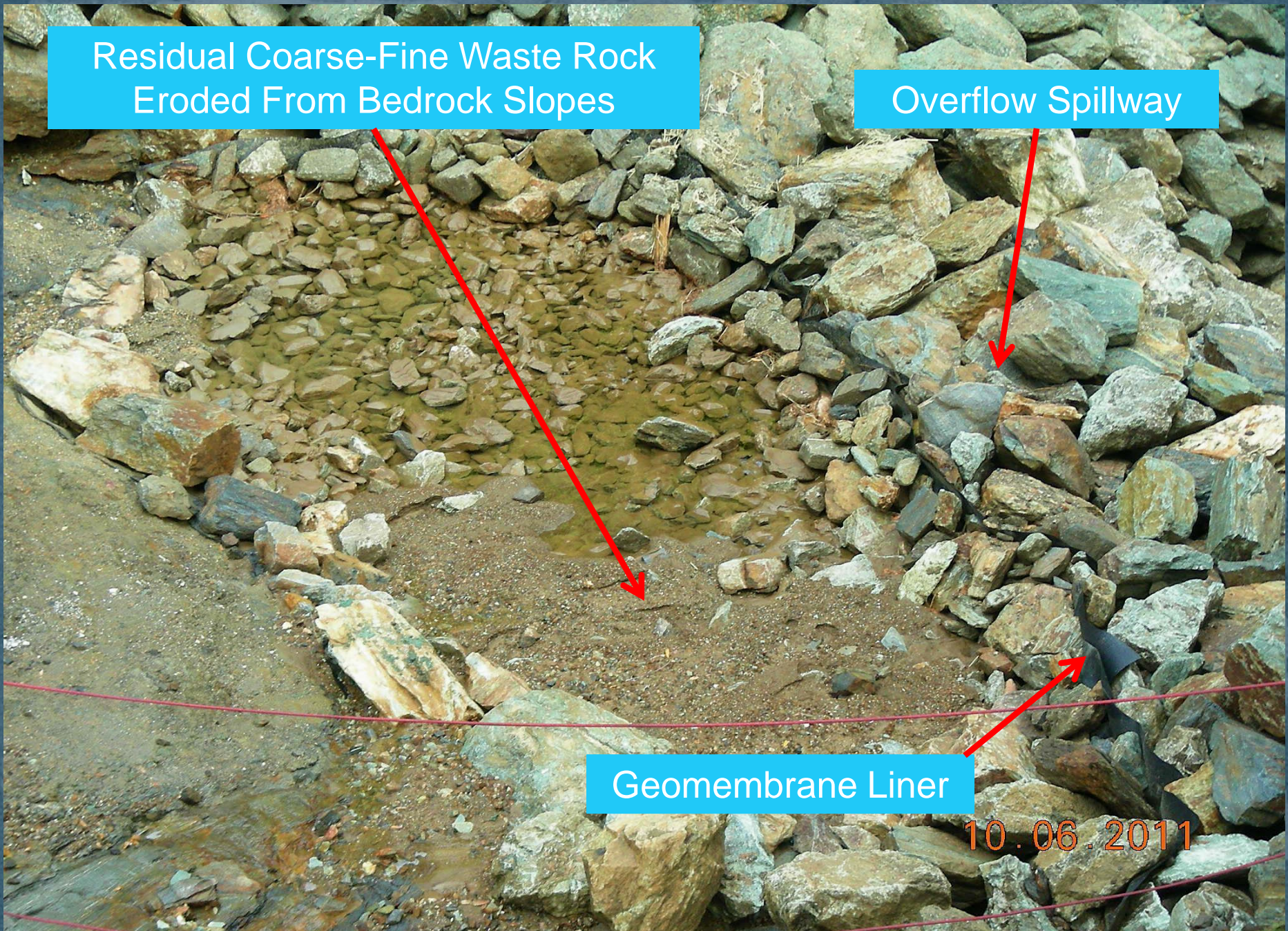


Residual Coarse-Fine Waste Rock
Eroded From Bedrock Slopes

Overflow Spillway

Geomembrane Liner

10.06.2011





During Low
Flows

Seepage
Through
Limestone
Sand in
Basins

Raises pH
From 4 to 7


Copper and
Other Metals
Precipitate

08.08.2012

80%-90% Slopes Underlying Waste Rock Piles 3, 4
Needed Short/Long-Term Erosion Control Measures



08.23.2011



Waste Rock Pile 3
Residual Soil
Before Reclamation

50' Spacing for Log Wattles
2 Rows of Straw Wattles Between



08.22.2011

Planting Supplies Were Air-Lifted to Steep, Challenging Reclamation Sites



10-Man Evergreen Reforestation Crew
Mix Lime Sand, Compost, Soil, Fertilizer, Mycorrhizae



10.10.2011

Power Augers, Picks, Shovels to Create Planting Holes in Rocky Soils

Power Auger



10.10.2011



Reclaimed
Waste Rock Pile 4
After One Season



Stockpile Sites And All Disturbed Site
Planted, Bark Mulched, Hydromulched



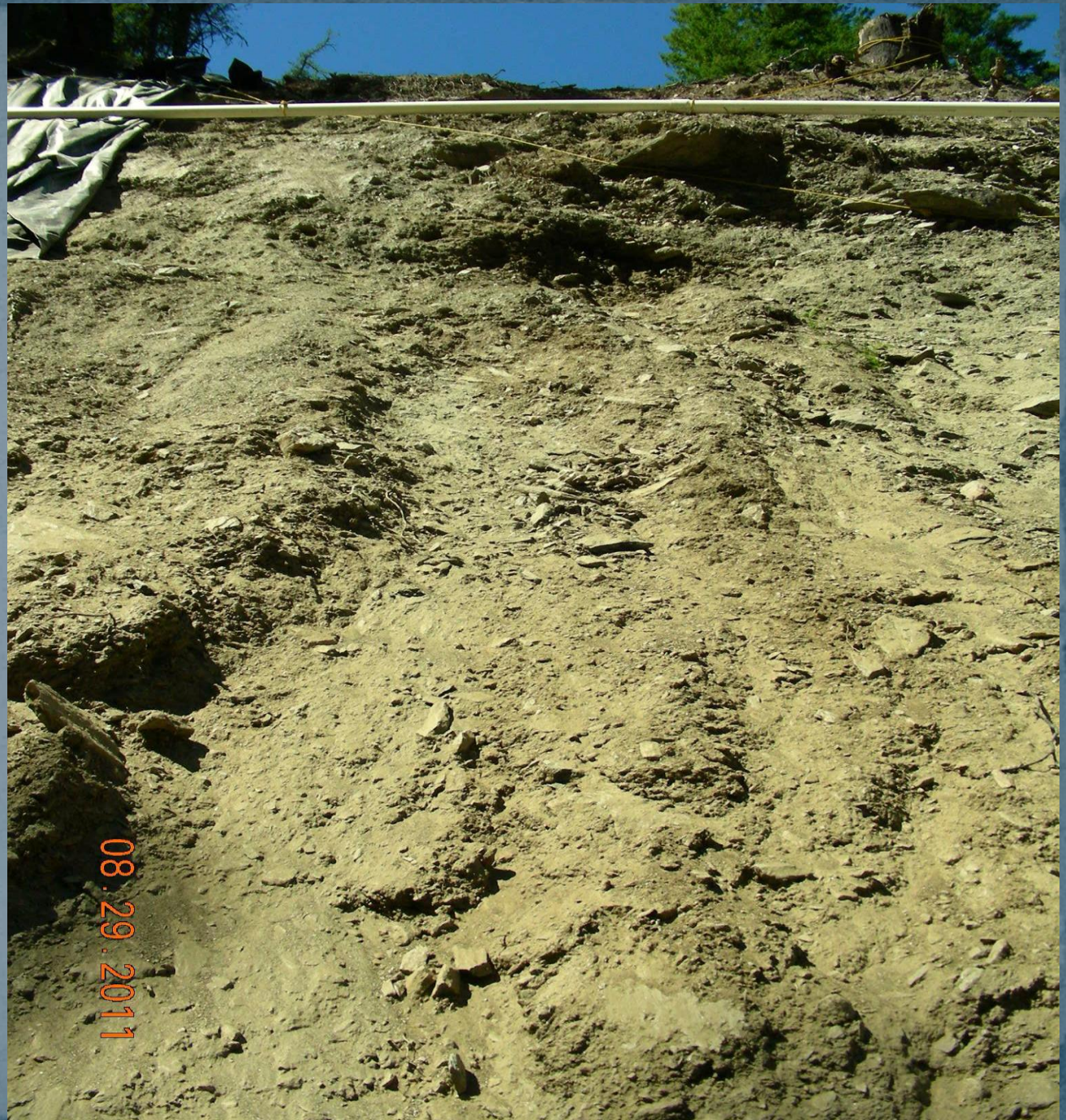
07.03.2012

Riparian Reclamation Planting After 1 Year



07.03.2012

100% Slope
Raveling Above
Channel Needs
Stabilization



Double-Twisted PVC-Coated
Steel Mesh With Lofted
Polypropylene Netting



09.27.2011

Running Skyline Delivers
Mesh Rolls to Slope



09.27.2011

Completed Mesh Slope Stabilization Slope Revegetation

07.03.2012



Bat Gate Steel Members &
Welding Equipment Was
Transported by Helicopter to
10 Adits

09.06.2011



Each Bat Gate Was Custom Fit/Welded

Drilled and Epoxied Gate Anchors

Lock Box



09.06.2011



Completed Bat Gate
With Controlled Access

Removable Bar with Locks

09.15.2011

Sulfuric Acid Mist
Corrosion After
8 Months



05.07.2012

Operations/Maintenance/Monitoring 2011-May 2015

- Repository leachate sampling
- Sediment/pH basin cleaning
- Erosion control
- Revegetation monitoring
- Surface water sampling
- Stream sediment sampling
- Macroinvertebrate and fish sampling
- Residents water well sampling

CONTRACTORS

Prime Contractor: Engineering/Remediation Resources Group, LLC Martinez, CA

Earthworks Contractors: Granite Construction, Sacramento, CA

All Mountain Construction, Breckenridge, CO

Carlson's Construction, Yreka, CA

D & E Construction (Liner), Visalia, CA

Site Inspection, EE/CA, Removal Design: URS Corp, Portland, OR

Independent Quality Assurance: JBR Environmental, White City, OR

*Over 75 workers and support staff put to work under the American Recovery and Reinvestment Act

*More than \$4 million spent in the local economy, with some of the highest unemployment rates in the nation

Questions???

Pete Jones

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