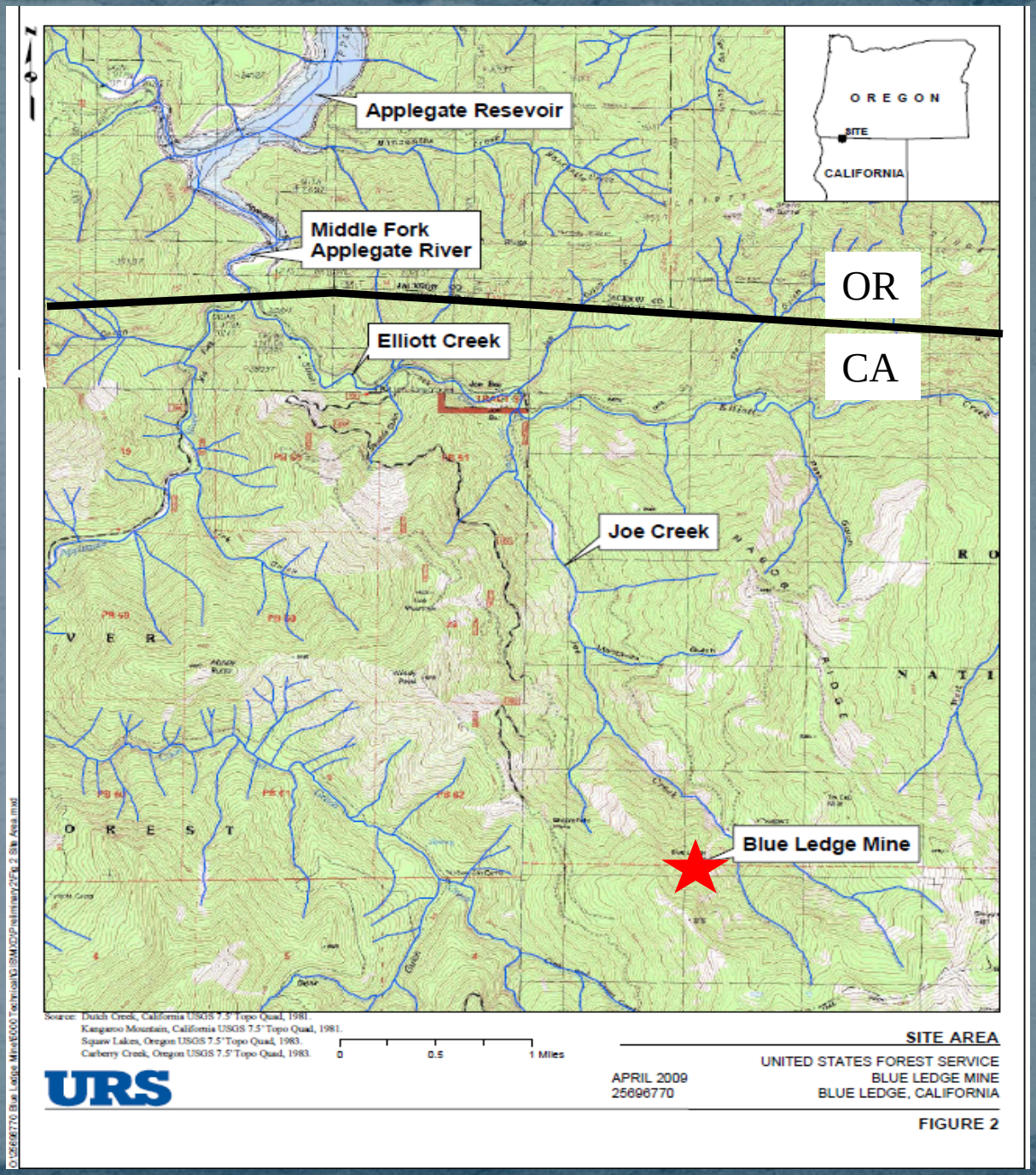
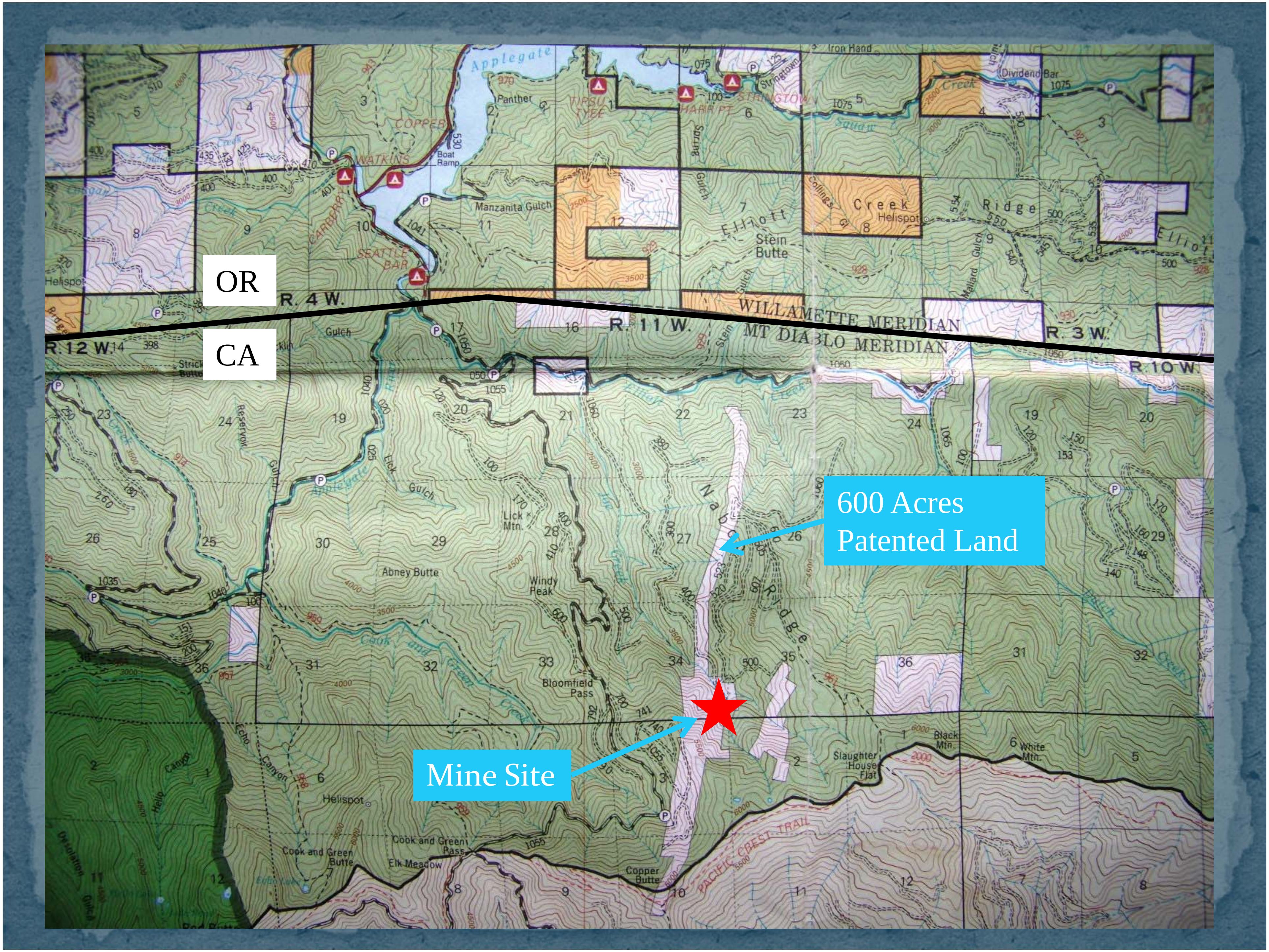
Blue Ledge Mine Superfund Site Presentation Overview

- 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

LOCATION


Applegate Resevoir
Middle Fork
Applegate River
Elliott Creek
Joe Creek
Blue Ledge Mine
OR
CA
OREGON
SITE
CALIFORNIA
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.
Carberry Creek, Oregon USGS 7.5' Topo Quad, 1983.
0
0.5
1 Miles
URS
APRIL 2009
25696770
SITE AREA
UNITED STATES FOREST SERVICE
BLUE LEDGE MINE
BLUE LEDGE, CALIFORNIA
FIGURE 2


OR
CA
600 Acres
Patented Land
Mine Site
R. 4 W.
R. 11 W.
R. 3 W.
R. 12 W.
R. 10 W.
WILLAMETTE MERIDIAN
MT DIABLO MERIDIAN
Applegate
Manzanita Gulch
Stein Butte
Abney Butte
Windy Peak
Bloomfield Pass
Slaughter House Flat
Black Mtn.
White Mtn.
Cook and Green Pass
Cook and Green Butte
Elk Meadow
Copper Butte
PACIFIC CREST TRAIL
Helispot

Mine Development

- 1898 Discovered
- 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
- High grade massive sulfide deposits mined for Cu, Zn, Au, Ag
- Ore hand sorted, sent to ASARCO smelter in Tacoma, WA
- >150,000 tons of sulfide-rich waste rock dumped on slopes/drainages
- No mill or associated tailings on Site


Blue Ledge Mine
Site Features
Copper Ore,
Namesake for
Blue Ledge Mine
10 . 17 . 2011

N

WRP

Creek

Ephemeral Drainageway

Waste Rock Pile

URS

Waste Rock Areas

US Forest Service
Blue Ledge Mine
Rogue/Siskiyou National Forest

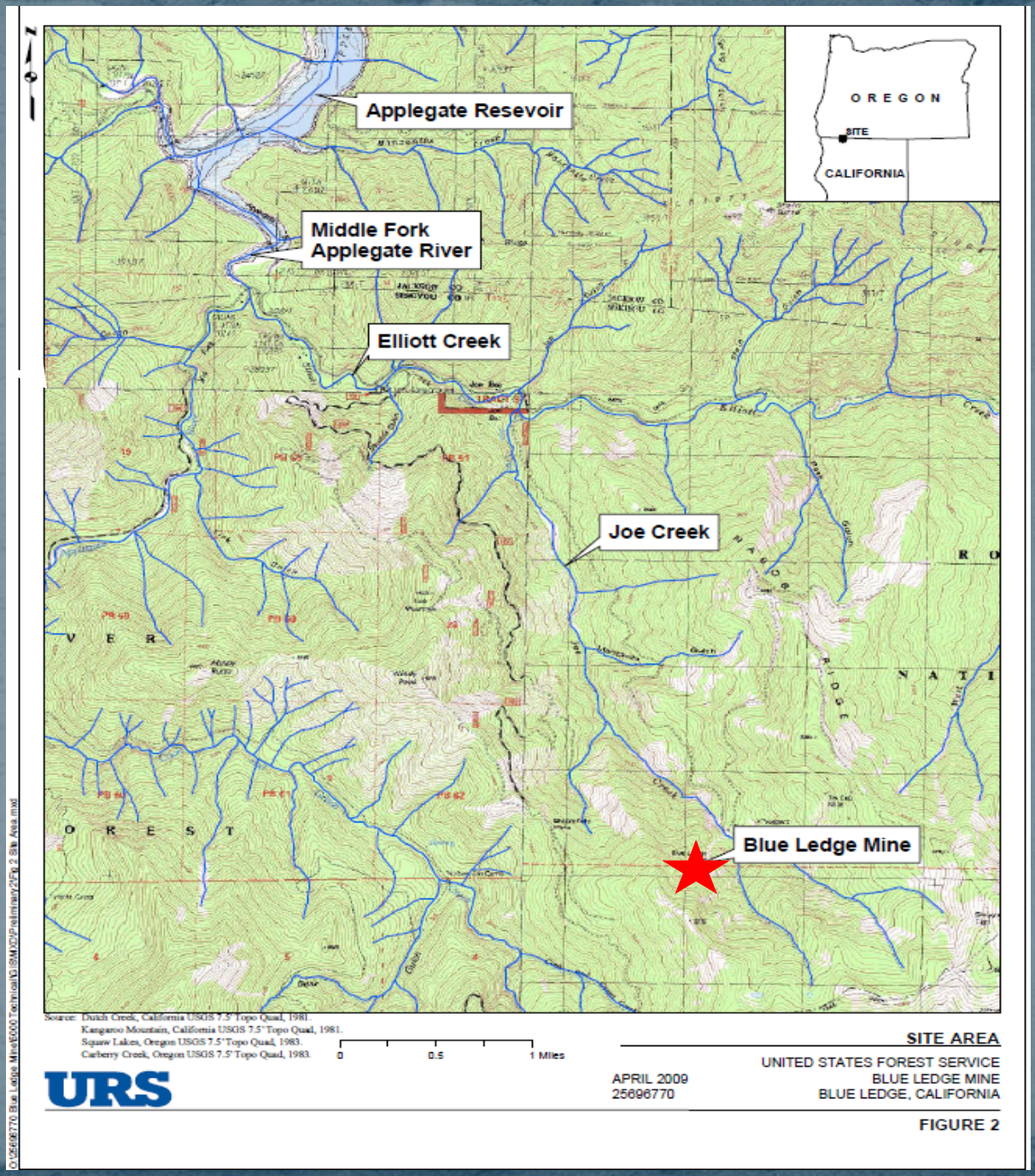
April 2009
25696770


August 2010
WRP 3
WRP 2
WRP 1
WRP 4

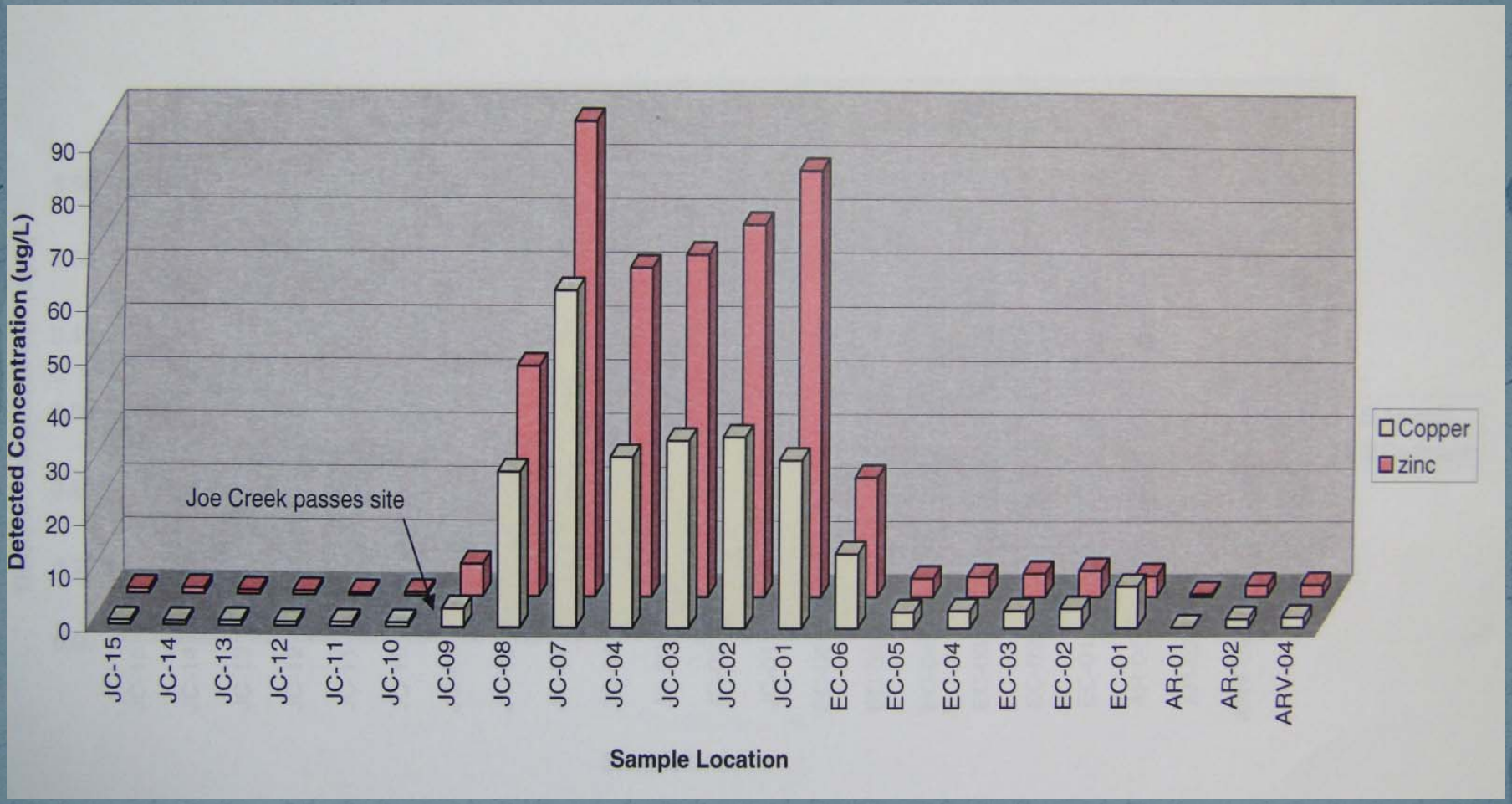
Blue Ledge Mine
Acid Mine Drainage
Discharged to the Environment


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

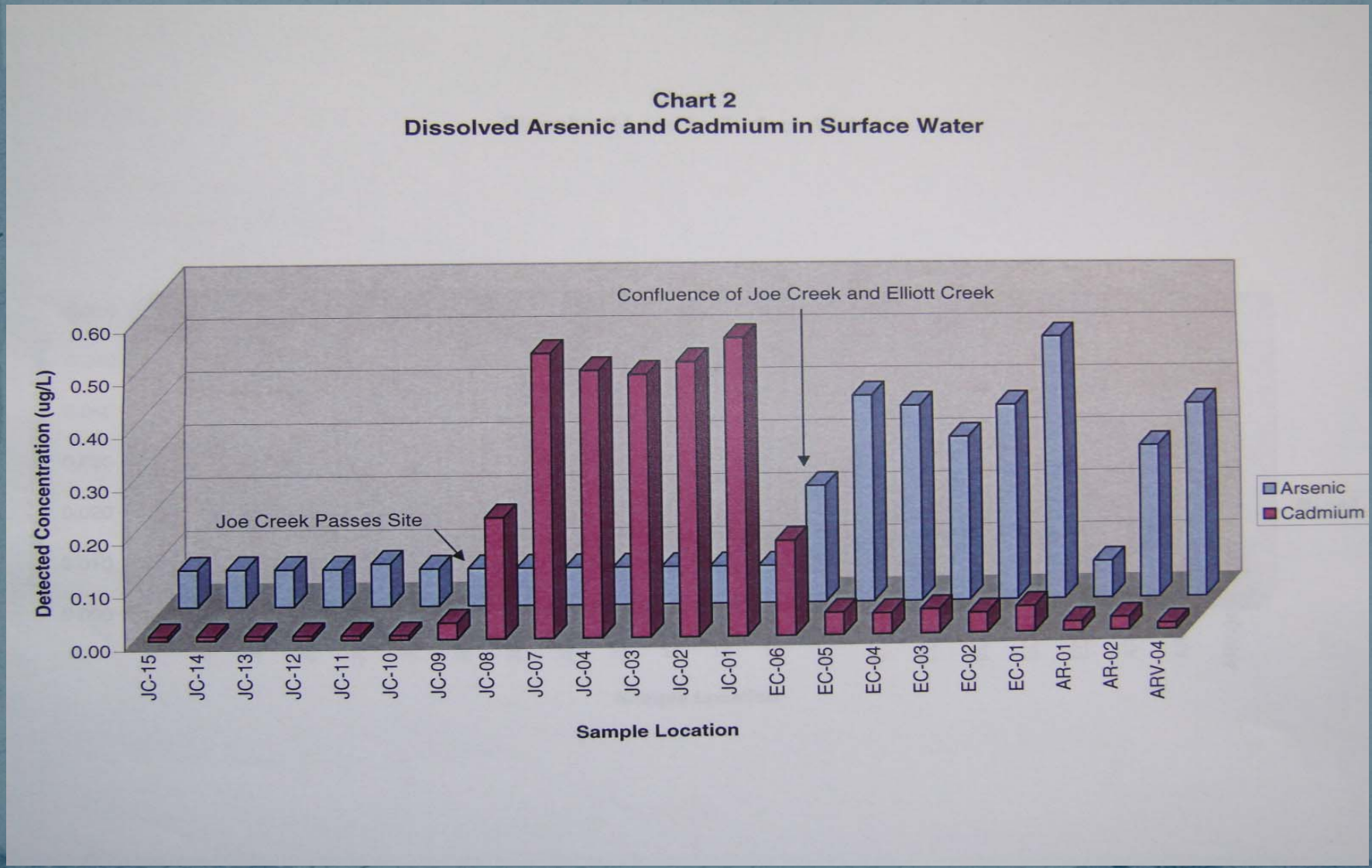
Surface Waters



Dissolved Copper & Zinc in Surface Water



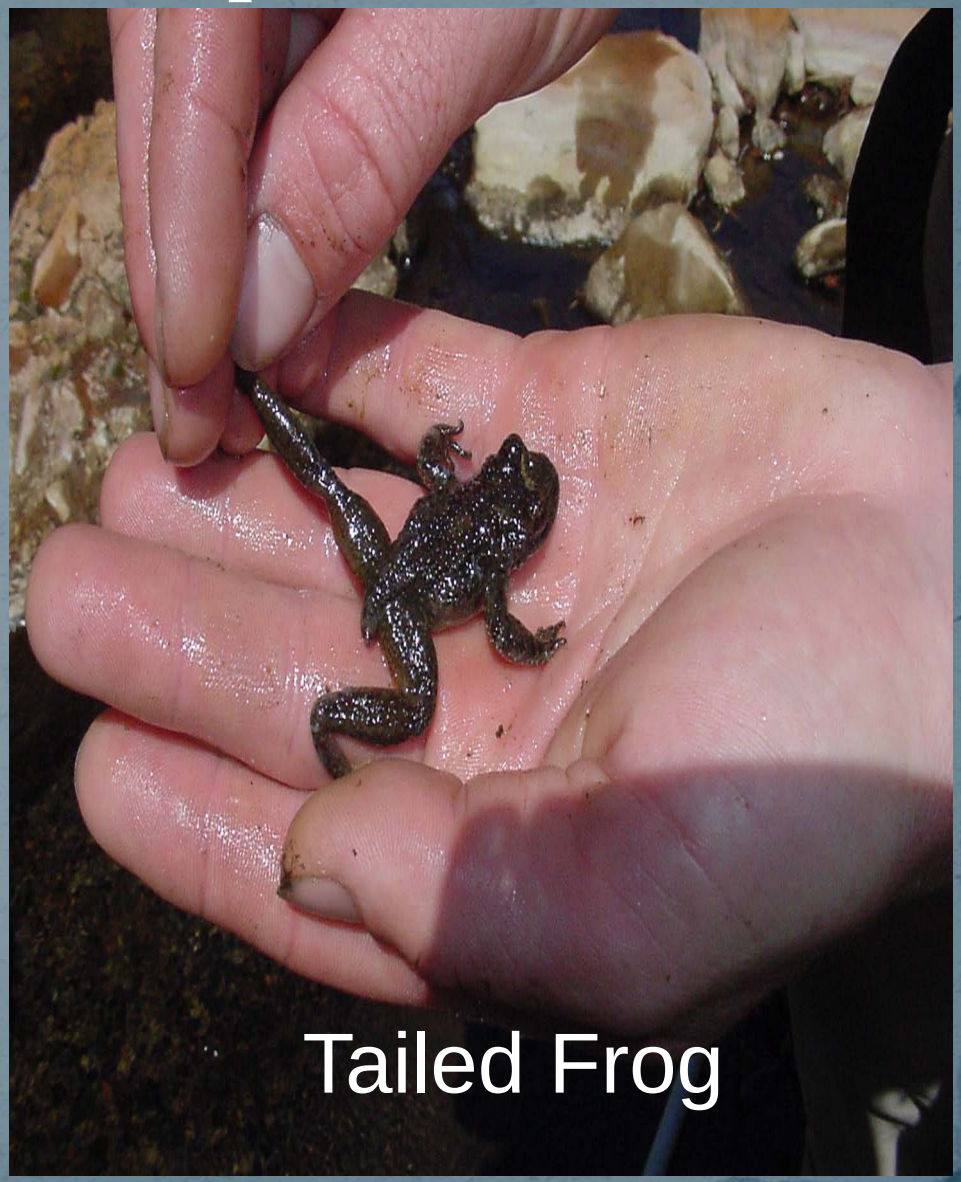
Arsenic & Cadmium in Water



Blue Ledge Mine
Impacts to the Ecosystem

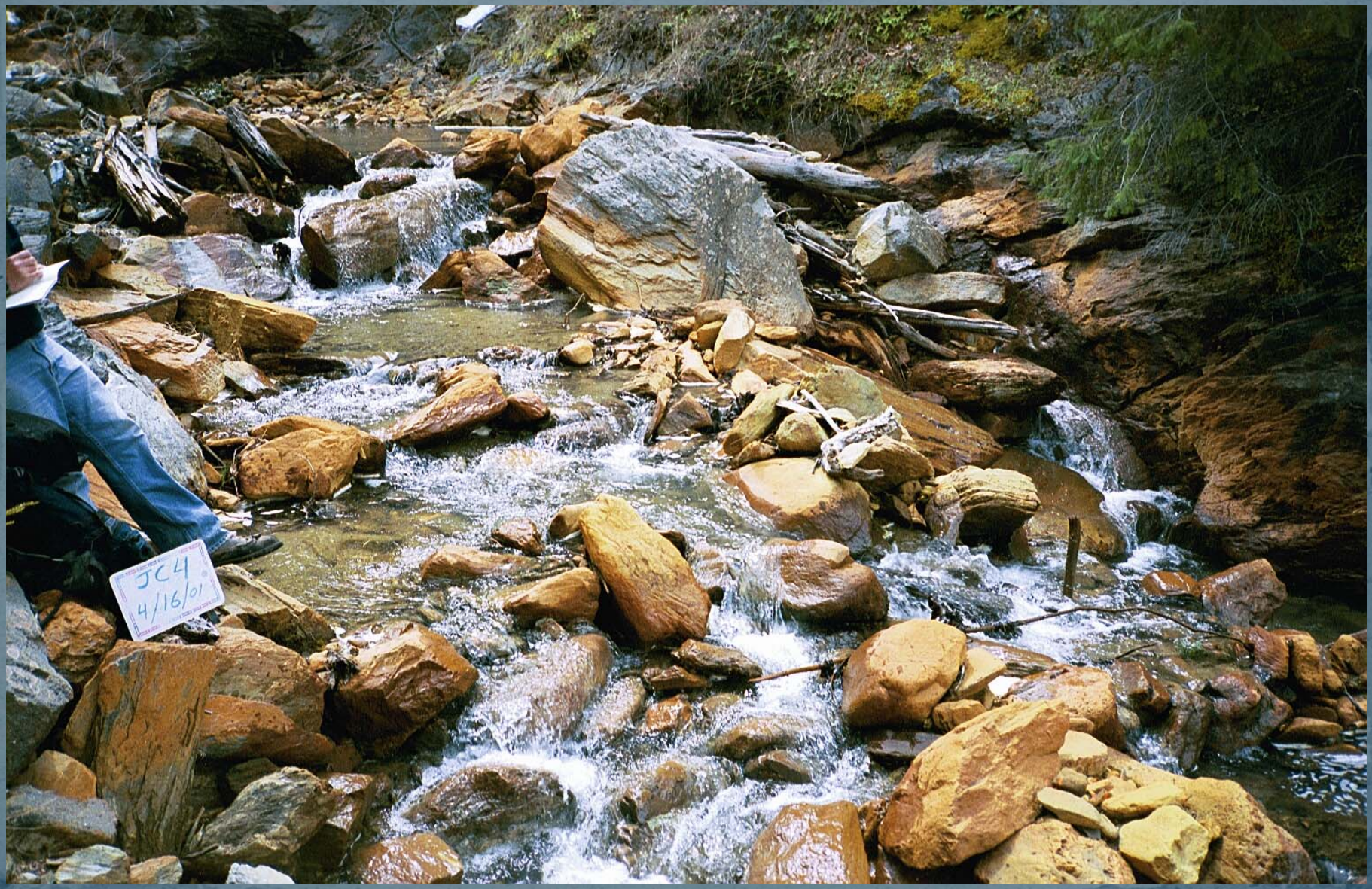
Abundant Aquatic Life Upstream of Mine

Pacific Giant Salamander

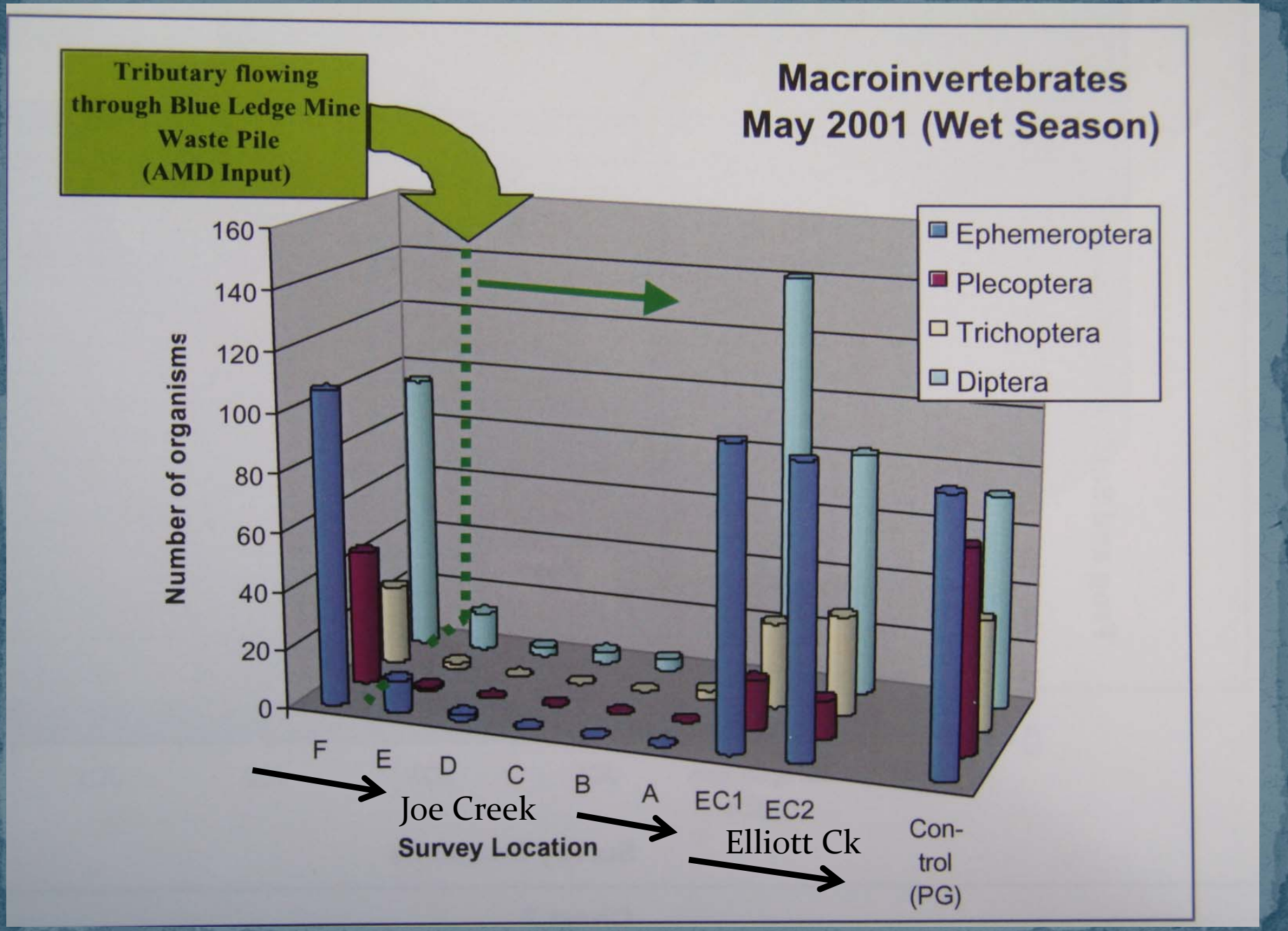


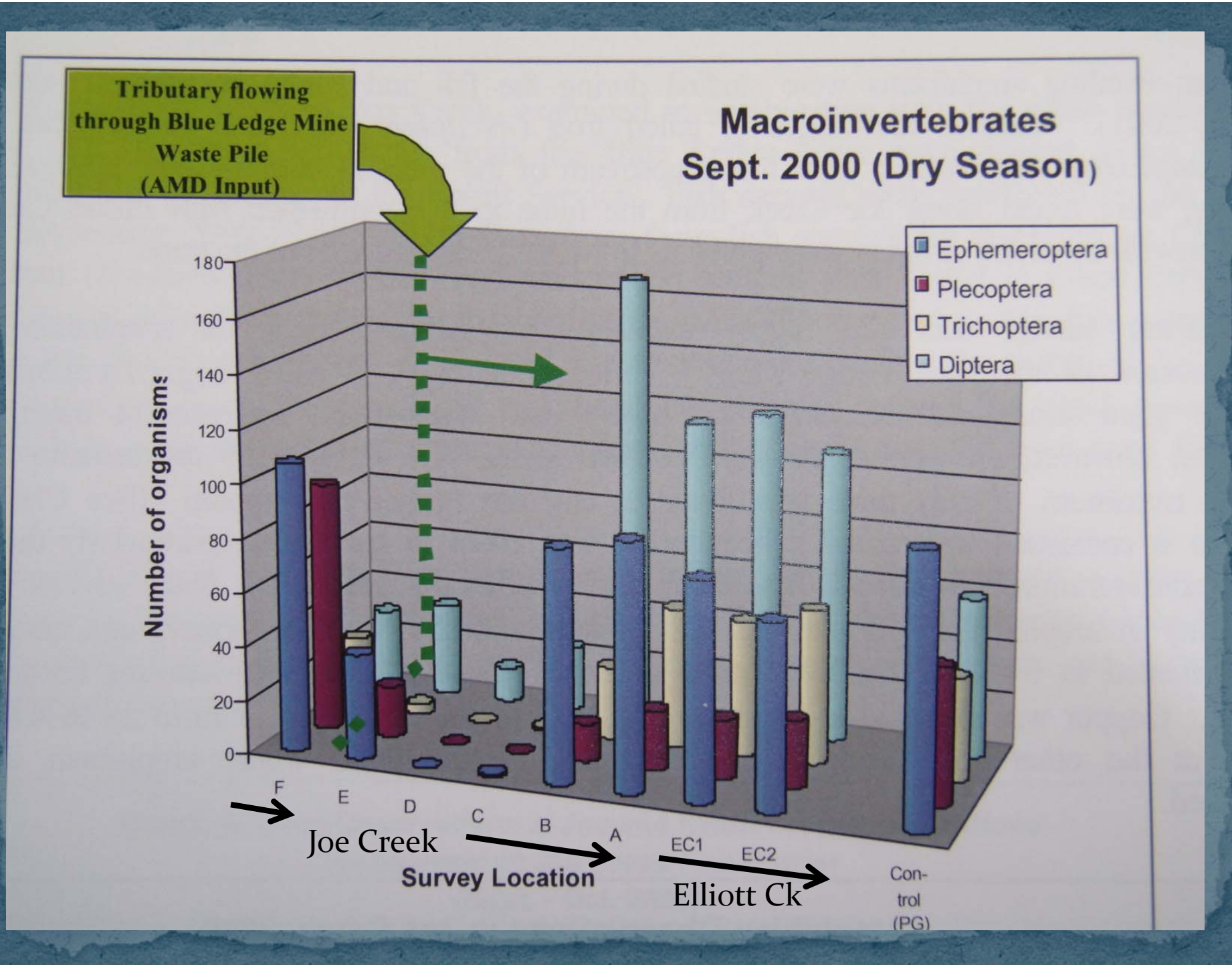
Tailed Frog

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)
Ephemeroptera
Plecoptera
Trichoptera
Diptera
Number of organisms
160
140
120
100
80
60
40
20
0
F
E
D
C
B
A
EC1
EC2
Con-
trol
(PG)
Joe Creek
Survey Location
Elliott Ck


Tributary flowing through Blue Ledge Mine Waste Pile (AMD Input)
Macroinvertebrates
Sept. 2000 (Dry Season)
Ephemeroptera
Plecoptera
Trichoptera
Diptera
Number of organisms
180
160
140
120
100
80
60
40
20
0
F
E
D
C
B
A
EC1
EC2
Con-trol (PG)
Joe Creek
Survey Location
Elliott Ck

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 30% Grades

Construct Repository on Ancient Landslide

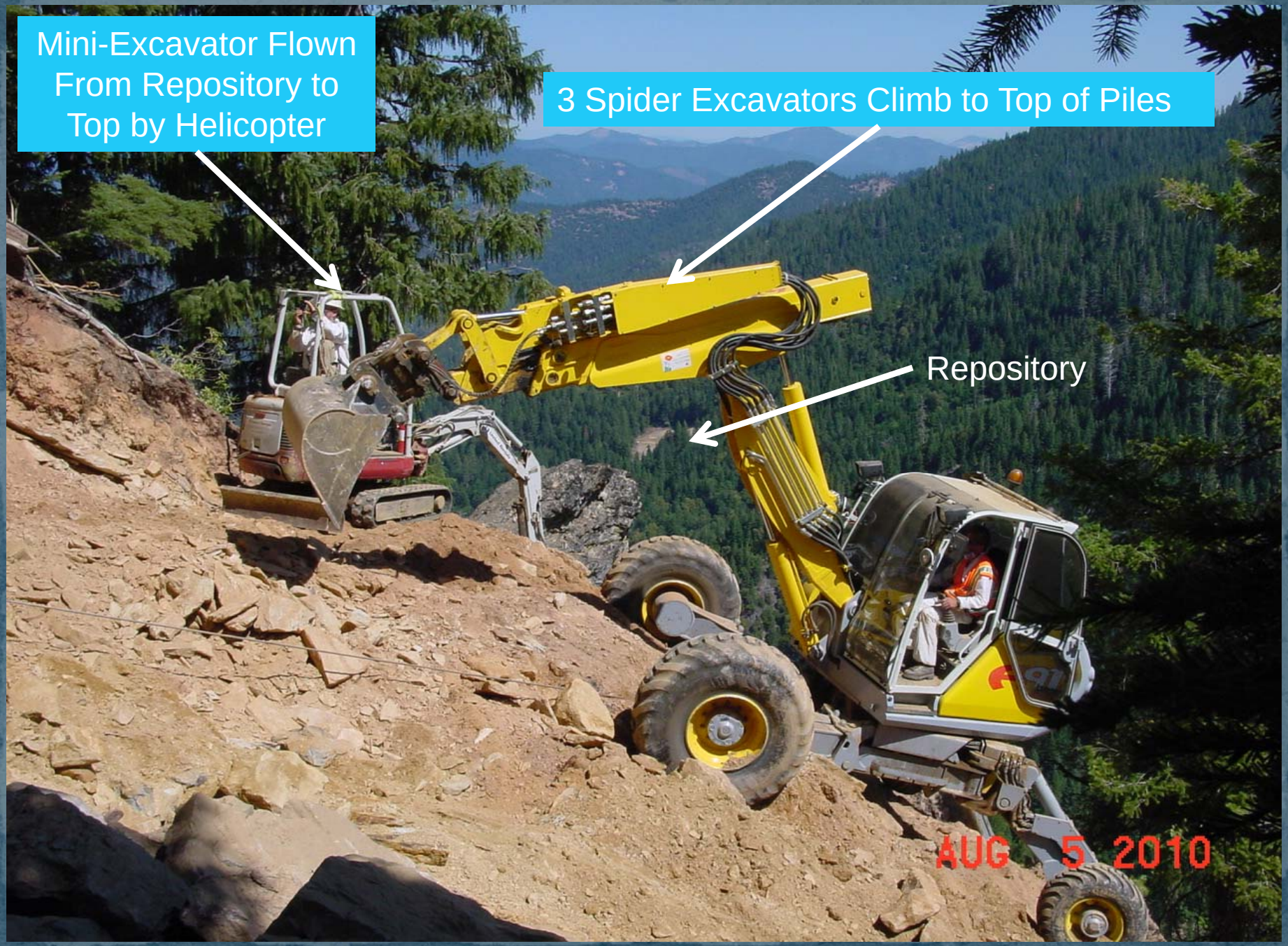

Excavate 45,000 Cubic Yards
GRANITE
CAT
JUL 13 2010

Prepare Repository Subgrade

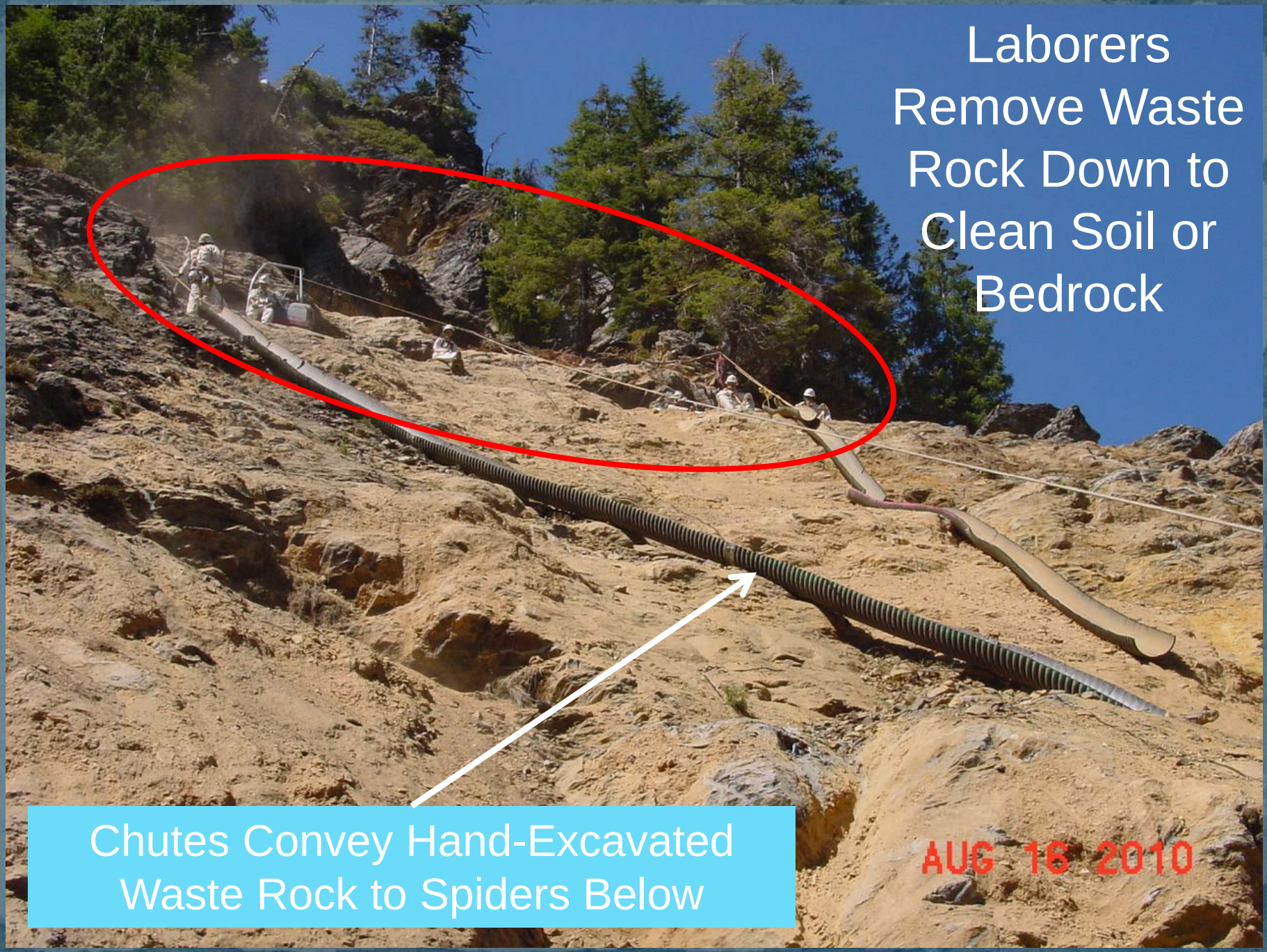
Install 60 mil Double-Textured HDPE Liner

Base of Repository System

Excavate Waste Rock by Machine *and* Manpower


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


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

D8 & D6 Push Surge Pile From Spiders


Excavator Loaded 35-Ton Haul Trucks
That Made 5,000 Trips to Repository
CATERPILLAR
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


Chute Cleaned by
Spiders And Laborers
AUG 16 2010

Aerial View After Removal

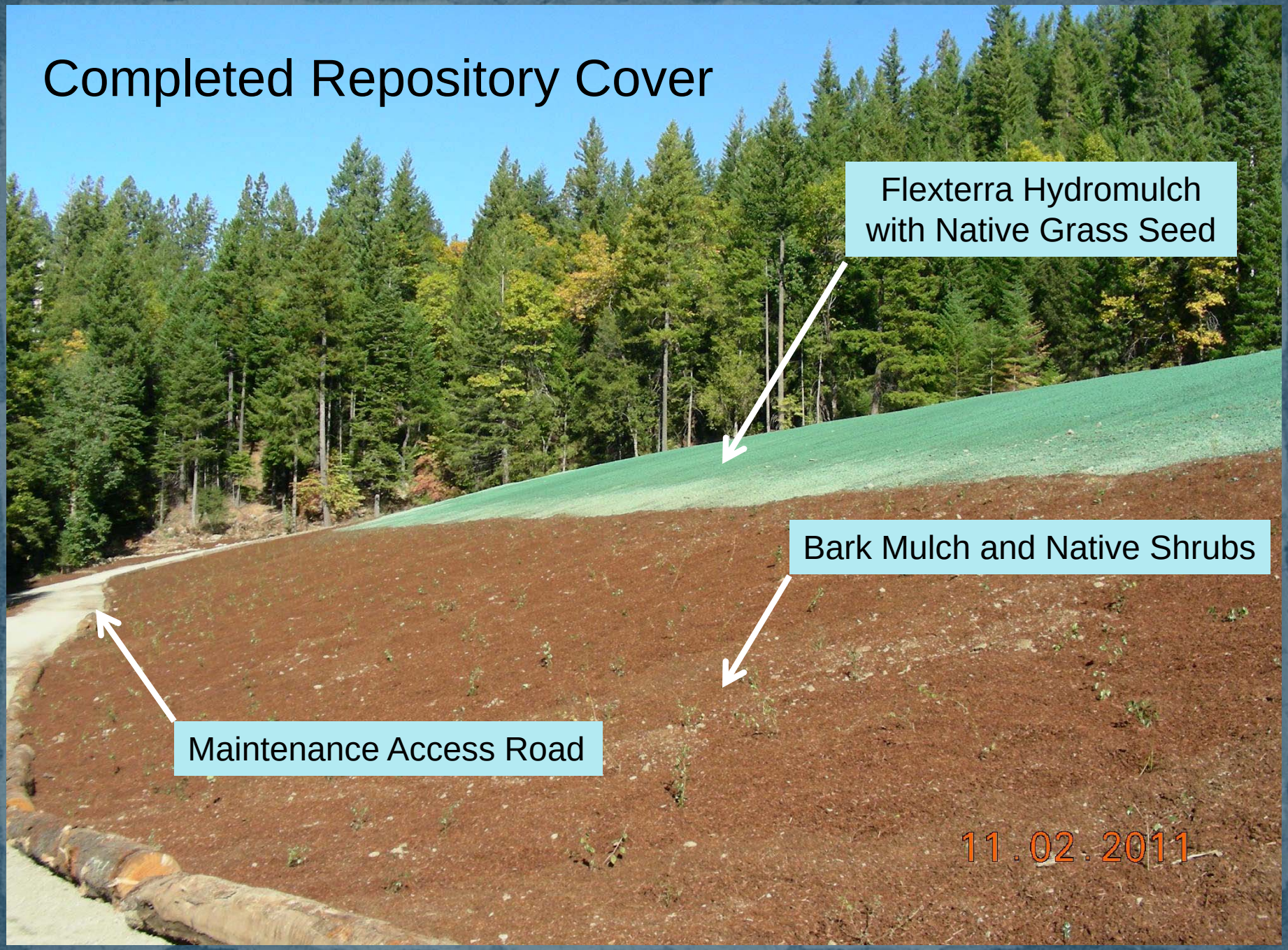
Blue Ledge Mine Reclamation

- Repository Cover
- Erosion Control Haul Roads
- Sediment/pH Treatment Basins
- Log & Straw Wattles on Residual Soil
- Plant 10,000 Native Plants, 18 Different Species
- Native Grass Seed
- Straw, Bark, Hydromulch, Slash
- Riprap Channel Banks
- Stabilize Channel Bank
- Install Bat Gates


66,500 CY of Waste Rock Placed in the Repository
60 mil Double-Textured
HDPE Repository Cover
Screened Cushion Soil
09.15.2011

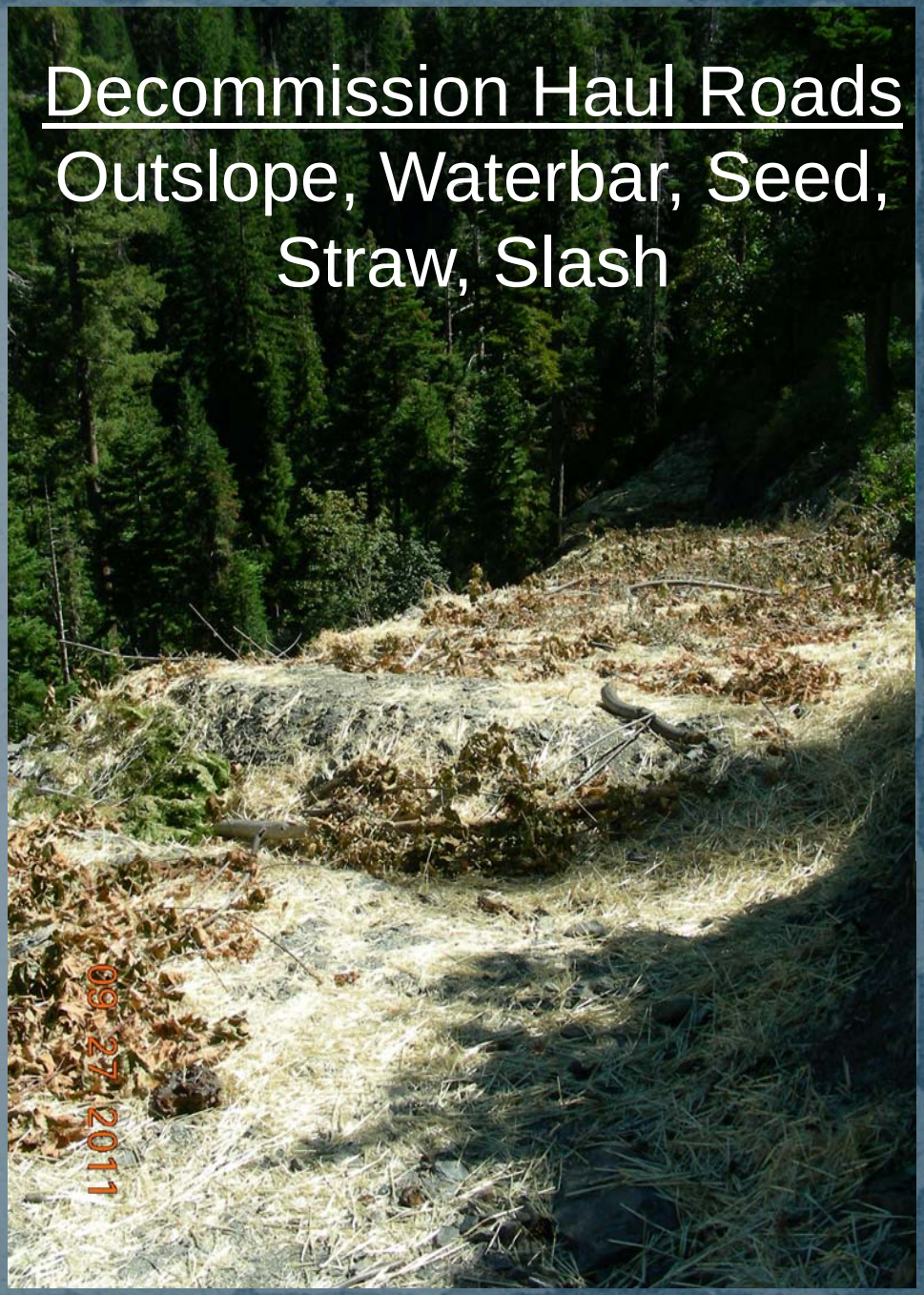
Repository Cover Drainage Layer

Completed Repository Cover

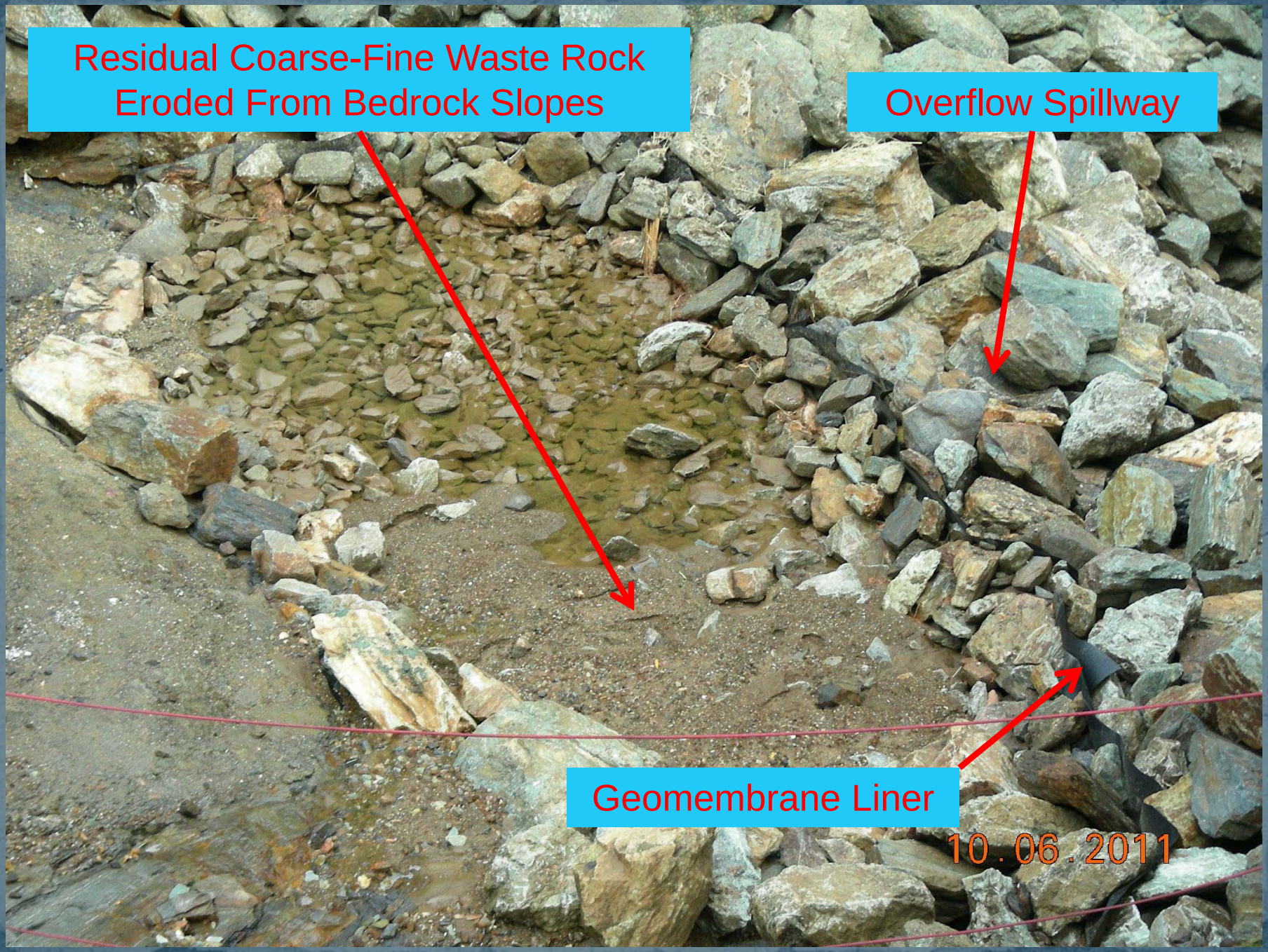


Pull Culverts
Riprap Creek Banks

<u>Decommission Haul Roads</u>
Outslope, Waterbar, Seed, Straw, Slash



Sediment/pH Treatment Basins


Residual Coarse-Fine Waste Rock
Eroded From Bedrock Slopes
Overflow Spillway
Geomembrane Liner
10.06.2011

<u>During Low Flows</u>

Seepage Through Limestone Sand in Basins Raises pH From 4 to 7

Copper and Other Metals Precipitate

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


50’ Spacing for Log Wattles
2 Rows of Straw Wattles Between
08 . 22 . 2011

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


10-Man Evergreen Reforestation Crew
Mix Lime Sand, Compost, Soil, Fertilizer
10.10.2011

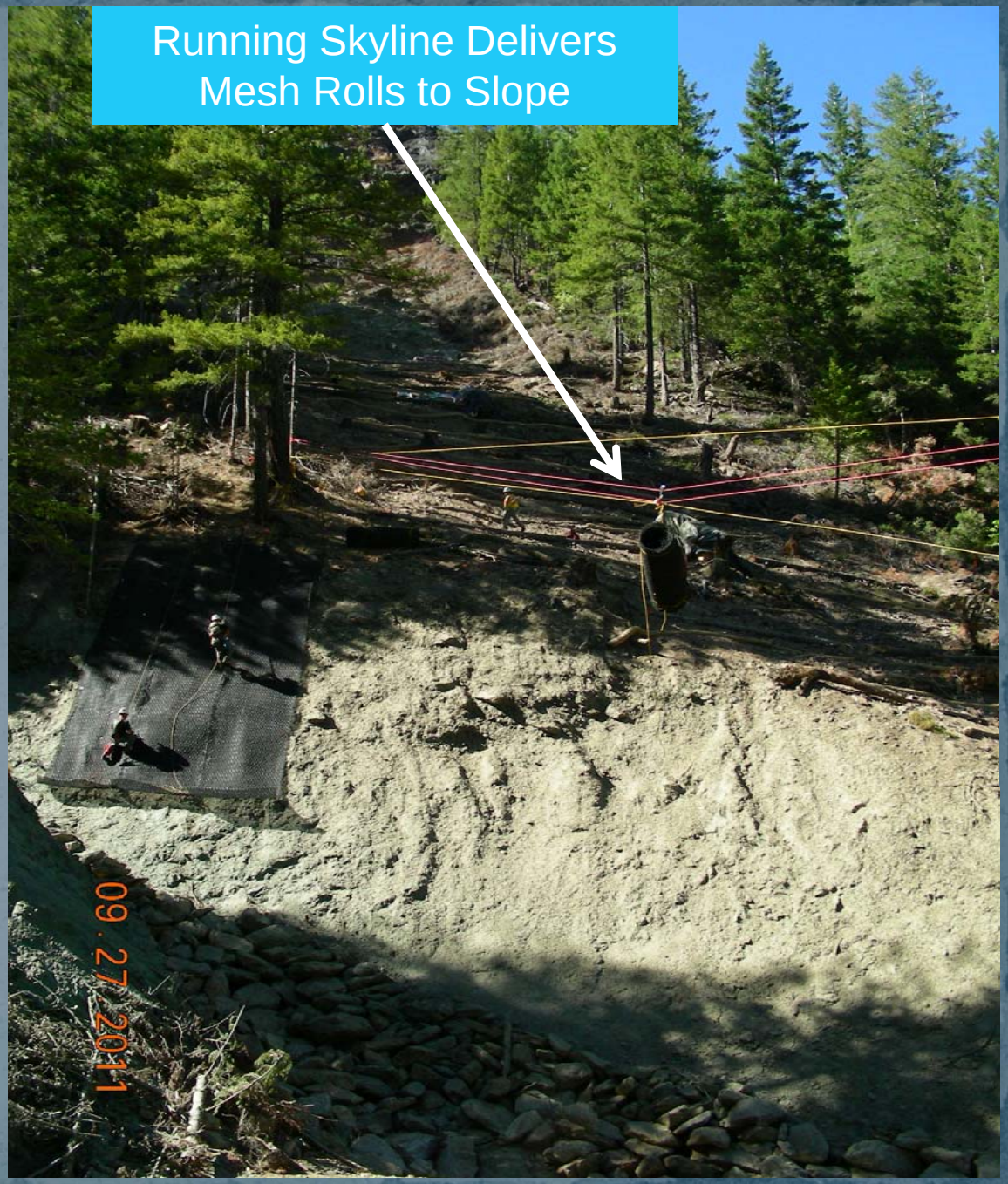

Conifers, Hardwoods, Shrubs, Straw Mulch
Flexterra Hydromulch, Channel Riprap
10.24.2011

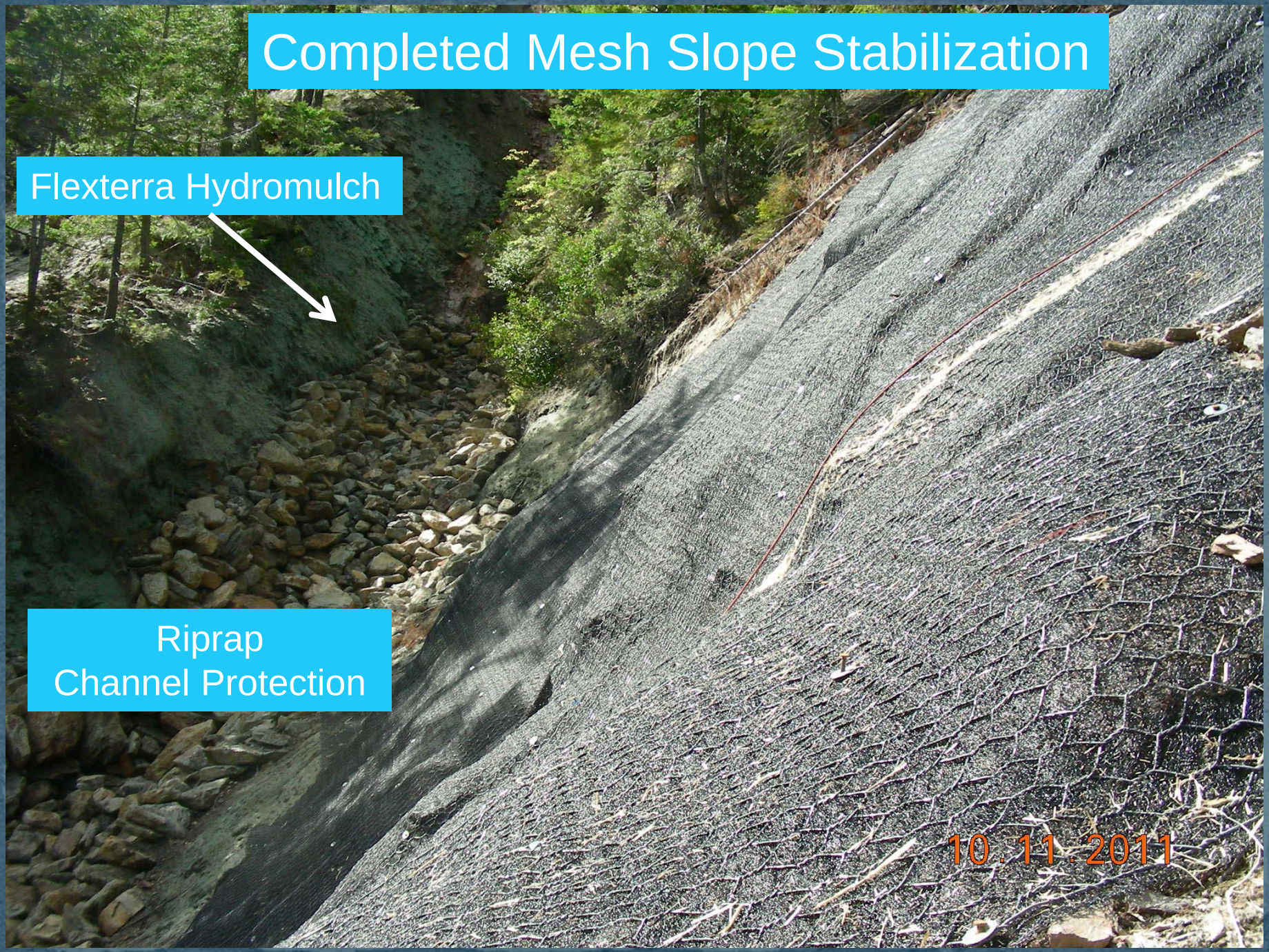

Stockpile Sites And All Disturbed Site
Planted, Bark Mulched, Hydromulched
CAUTION
10.31.2011

100% Slope Raveling Above Channel Needs Stabilization

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

Running Skyline Delivers Mesh Rolls to Slope




Completed Mesh Slope Stabilization
Flexterra Hydromulch
Riprap
Channel Protection
10.11.2011


Bat Gate Steel Members &
Welding Equipment Was
Transported by Helicopter to
10 Adits
09.06.2011


Drilled and Epoxied
Gate Anchors
Each Bat Gate Was
Custom Fit/Welded
Lock Box
09.06.2011


Completed Bat Gate
With Controlled Access
Removable Bar with Locks
09 . 15 . 2011

Operations/Maintenance/Monitoring
2011-May 2015

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

Blue Ledge Funding Sources

Removal Action Contract - $15 million

CY 2010 Funding Sources:

- American Recovery & Reinvestment Act - $12.4 million
- ASARCO Trust – CY '10 $1.4 million

CY 2011-2015 Funding Sources:

- ASARCO Trust – CY '11 $1 million
- ASARCO Bankruptcy Settlement (to EPA) $200k

CY 2015 & Beyond Funding Sources for EPA:

- ASARCO Bankruptcy Settlement (to EPA) $2.5 million
- Superfund Program Funds

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???

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pajones@fs.fed.us