

RECOVERY OF NORTH POTATO CREEK, COPPER BASIN, TENNESSEE

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1973



2007



Adaptive Management Strategy

- Characterize drainage and influences
- Divert unaffected drainage
- Capture and Treat affected drainage
- Sequester acid producing materials
- Mitigate remaining problems with passive systems
- Evaluate with Biologic Indicators



1990's





1970



2007



1993



2015



1973

Copper Basin



TN

NC

GA

1973



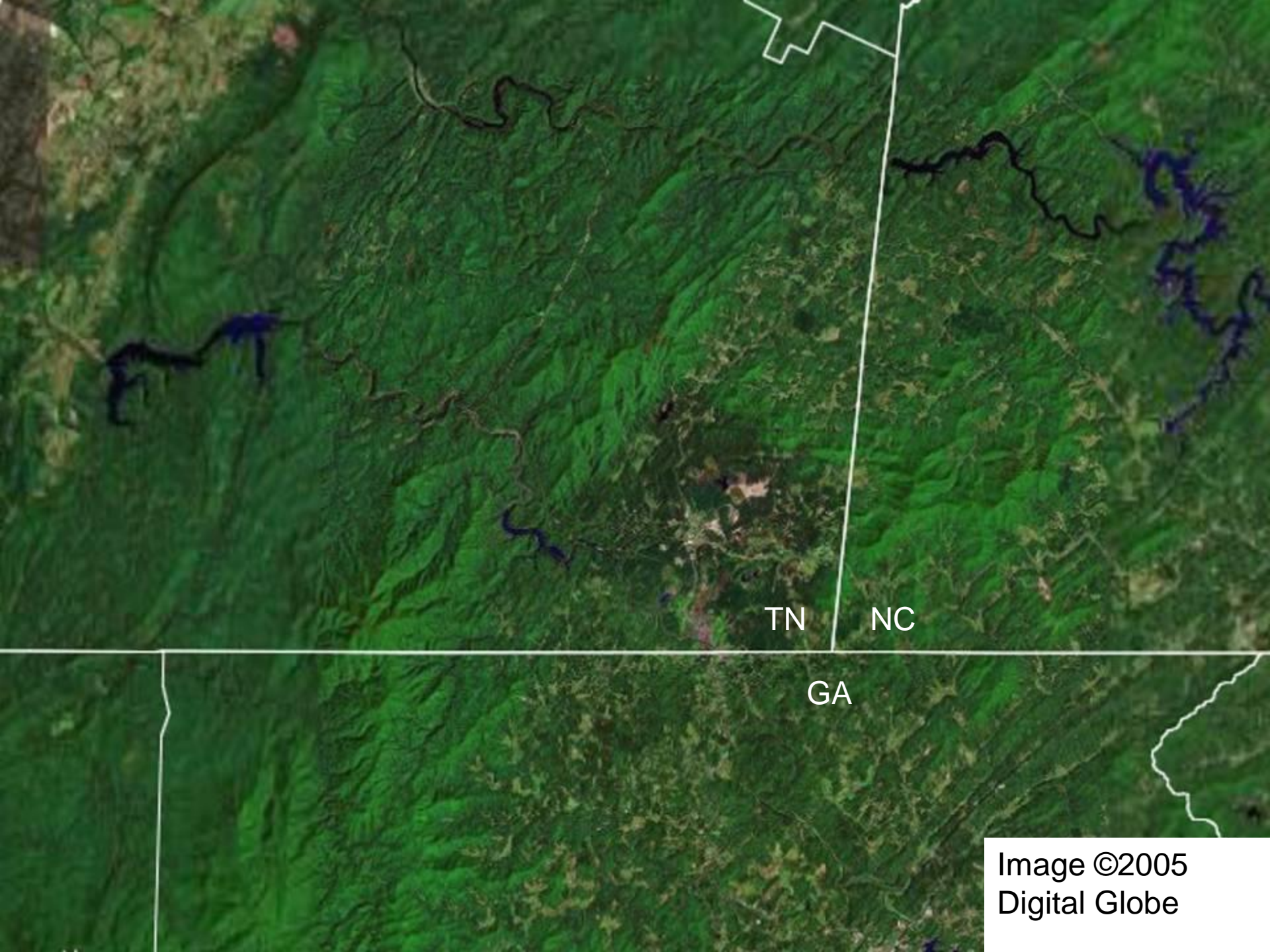


Image ©2005
Digital Globe

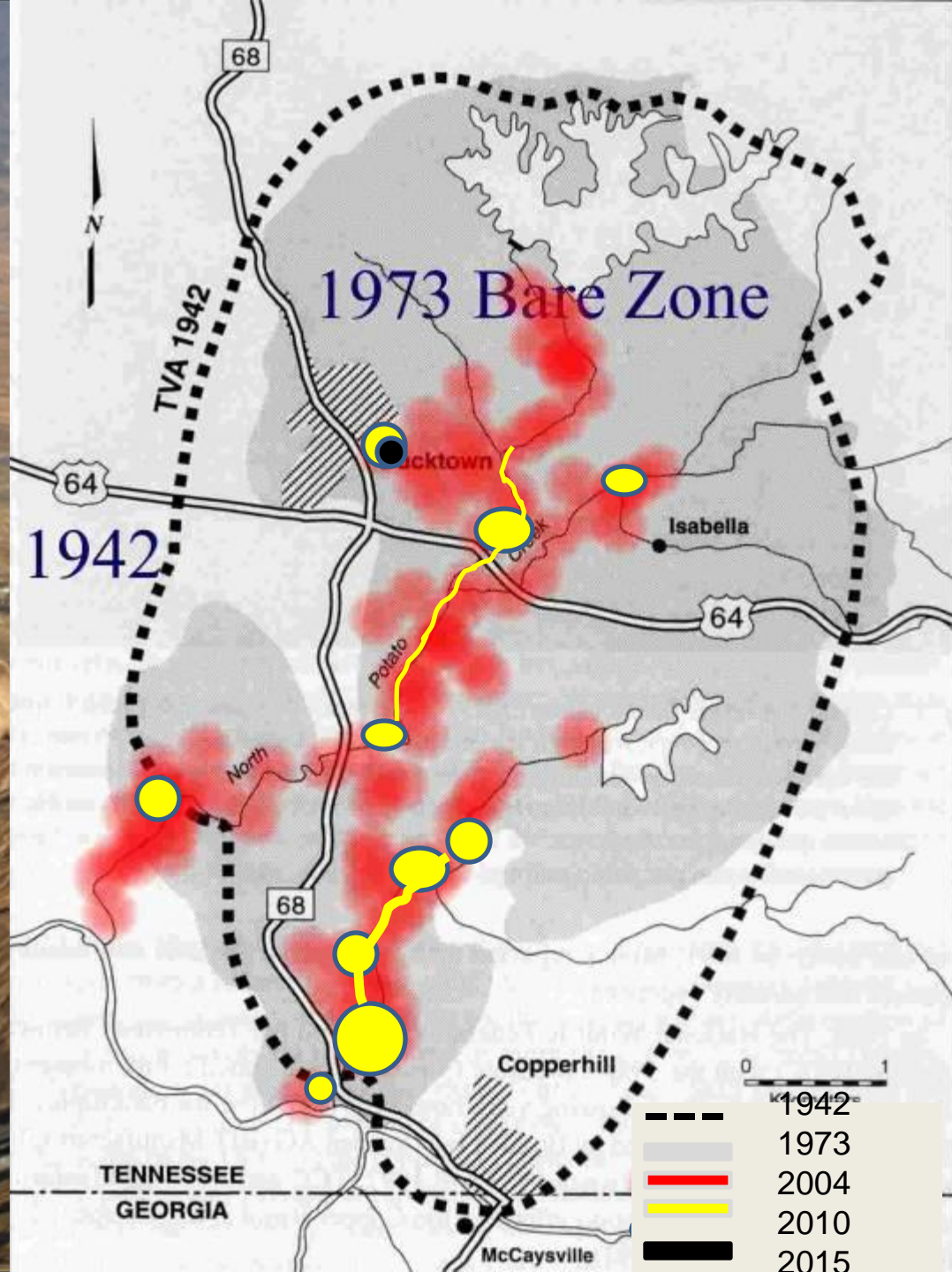


TN

NC

GA

Earthstar
Geographics
May, 2015



Copper Basin

- 13 deep mines
- 2 surface mines
- 4 flotation plants
- 3 smelters
- 2 sulfuric acid plants

32,000 acres (13,000 hectares) of vegetation affected by air emissions from roasting ore in the 1870-1906 time period.

This area includes 3,000 acres (1200 hectares) directly affected by mining and processing.

Regulatory Background

- Oxy USA Inc. (OXY) never owned the Site
- OXY, and its affiliate Glenn Springs Holdings, Inc. (GSH), agreed to voluntarily remediate the Site as a result of a series of acquisitions and divestitures.
- OXY, EPA and TDEC signed a Memorandum of Understanding and a series of Administrative Orders on Consent to remediate the Site
- The voluntary nature of this project has provided flexibility in the remedial approach

Protect the Ocoee River

Restore Biodiversity in North Potato Creek

Adaptive Management Strategy

- Characterize drainage and influences
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In the case of North Potato Creek remediation, adaptive management meant –

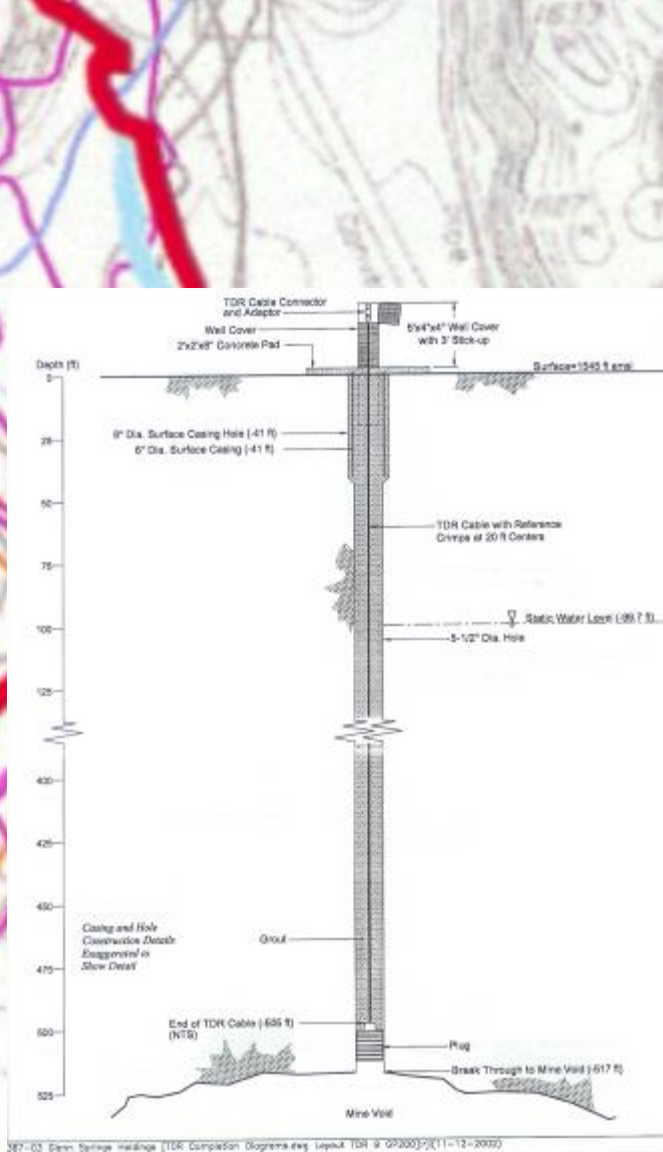
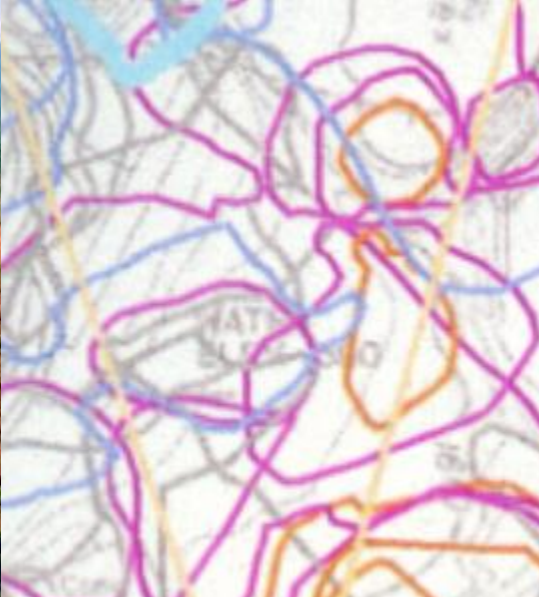
- First identifying those areas that were obviously in need of remediation
- Remediating those sites
- Monitoring the results and
- Evaluating need for additional remediation and monitoring

The National Academy of Science cited the Copperhill Project as an example of how using Adaptive Management can work on a large, complex mining site. NAS recommended Adaptive Management as the appropriate remedial process for reducing cost and achieving remedial objectives for large mining sites.

First, Safety

FENCING

02.14 16:15



587-03 Basin Springs.mxd [TDR Completion Diagram.dwg Layout TDR 9/05/2003] (11-12-2003)

Time Domain Reflectometry

TDR Hole #2

Waste Characterization & Drainage

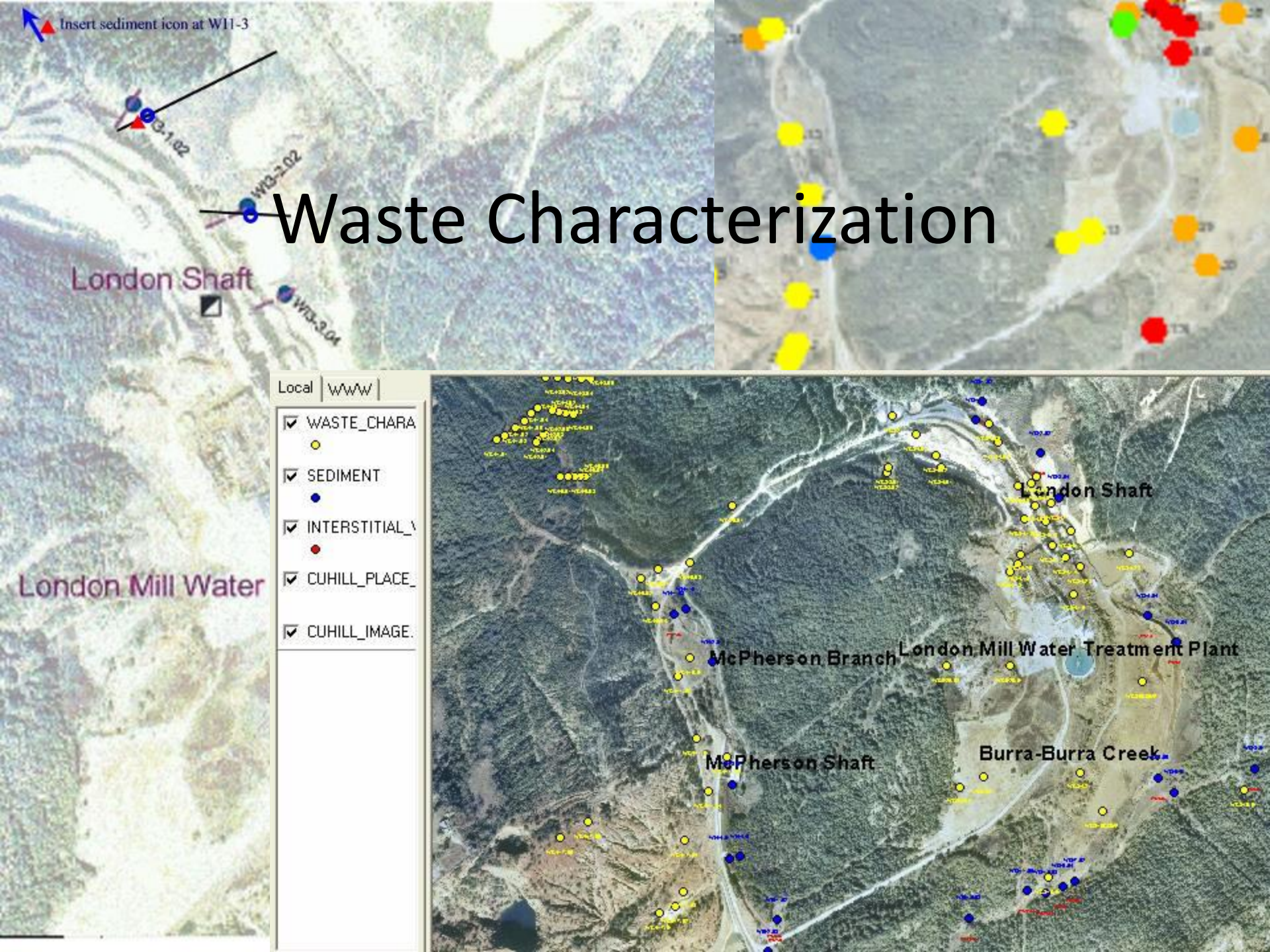


Waste Characterization



Interstitial Water







Strategy:

1. Reduce infiltration through waste material (impermeable cap)
2. Treat acidity, metals drainage from upstream sources (outside flood plain)



Passive Treatment Demonstration





Refuse Removal Area

Dam

Anaerobic unit

Aerobic unit

Rock filter

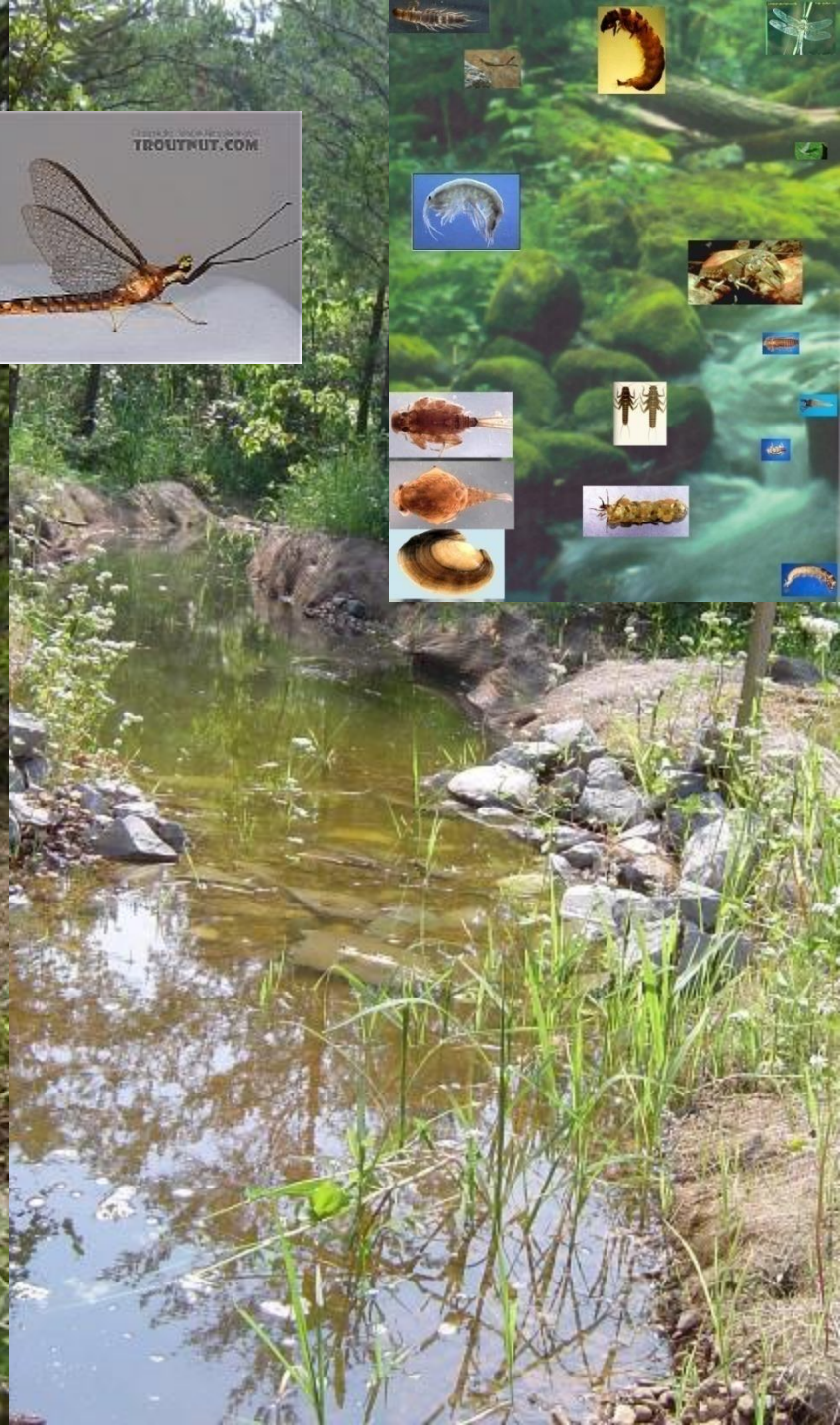
diversion

RSS

McPherson Branch Demonstration:
Reclamation
Passive System
Restored Stream Segment







Upper McPherson Wetlands



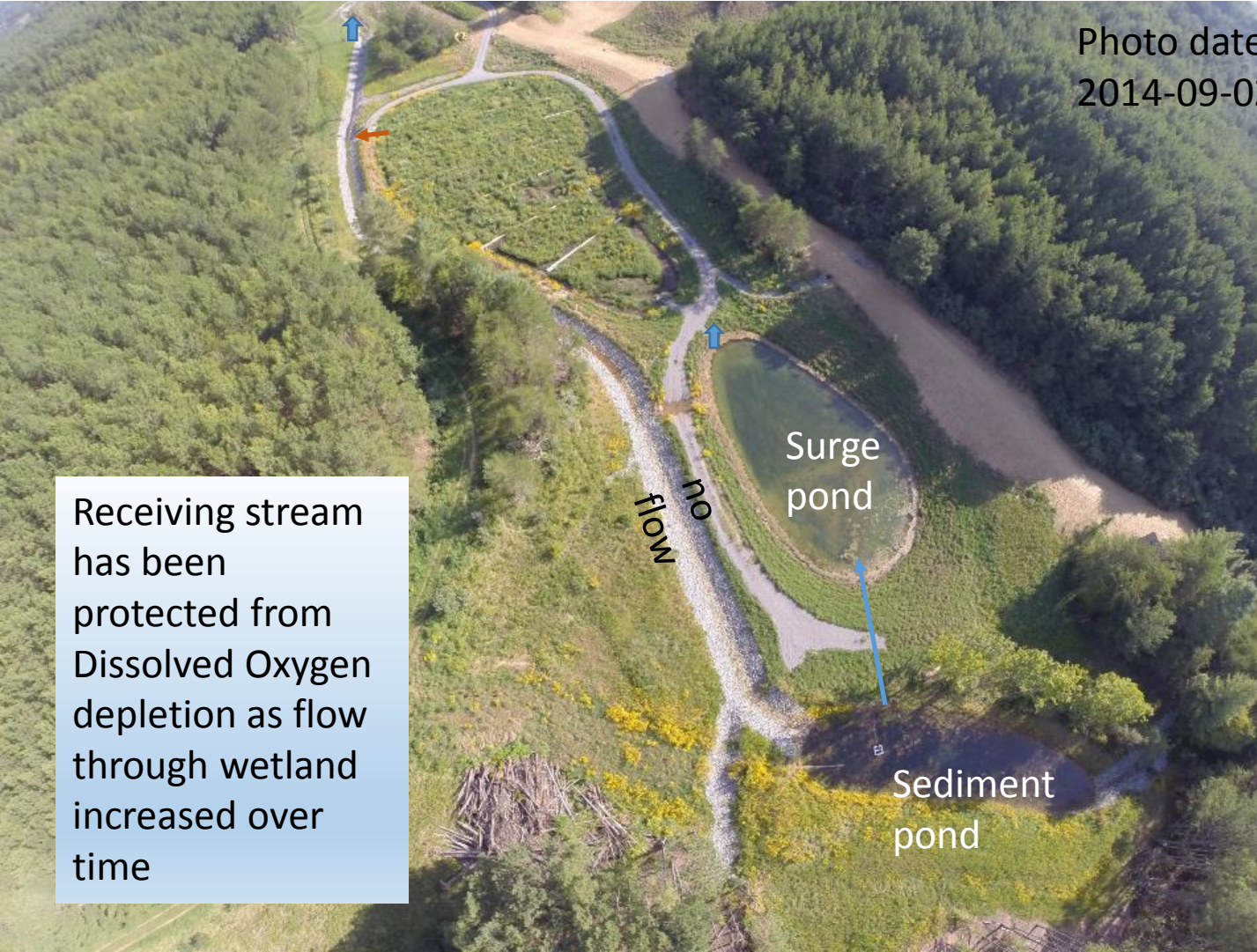


Photo date
2014-09-02

Upper McP Wetlands
2014-02 flow
introduced

(pumped to Lower Wetlands to ameliorate BOD)

2014-04 discharge to
McP Br. (monitored DO in McP
Branch since)

2014-09 Herbicide
Treatment

2014-11 Resumed
discharge

2015-02 criteria met
(no BOD)

Continue monitoring
effluent and stream
DO

Receiving stream
has been
protected from
Dissolved Oxygen
depletion as flow
through wetland
increased over
time

Copper Basin Mining District Site

Average Flow = 8,200 gpm
Metals Load ~ 800 lbs/day

LONDON
MILL WTP

4,000 acres
**North Potato Creek
Watershed**

NPCWTP

Ocoee River

3,115 acres
Davis Mill Watershed

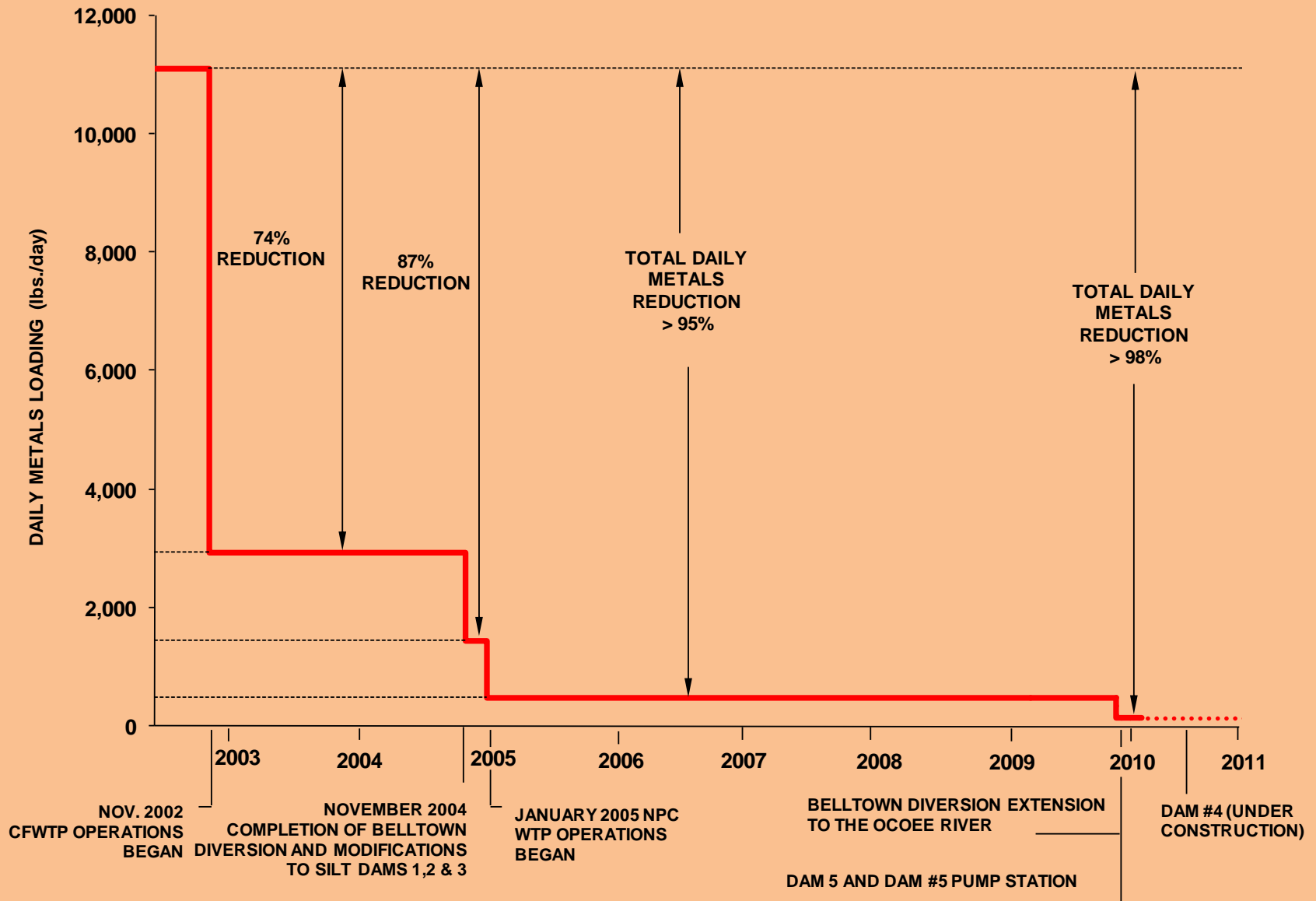
LIME PLANT

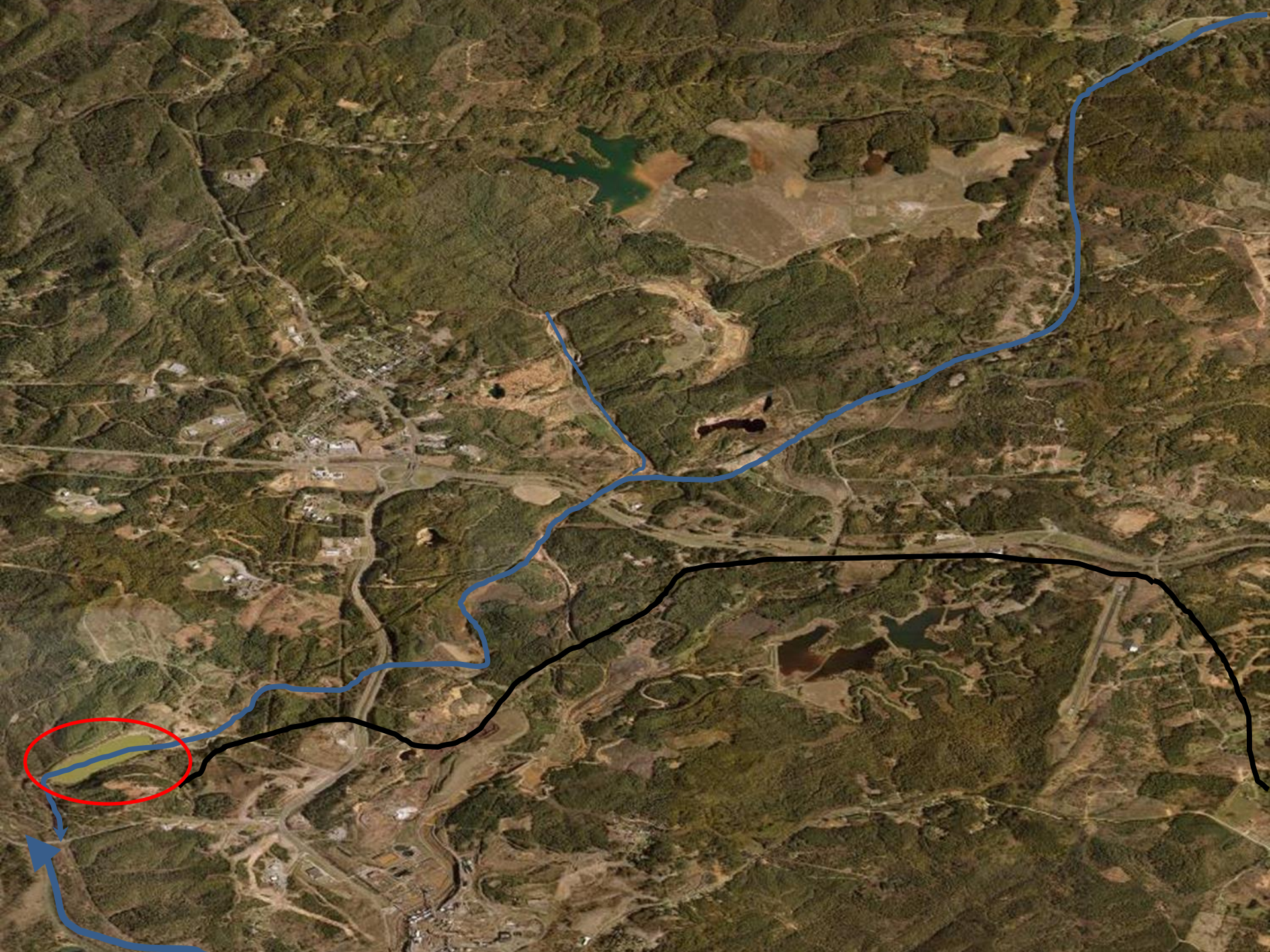
Average Flow = 2,440 gpm
Metals Load ~ 8,500 lbs/day





REDUCTION IN DAILY METALS LOADING FROM DAVIS MILL CREEK AND NORTH POTATO CREEK TO THE OCOEE RIVER

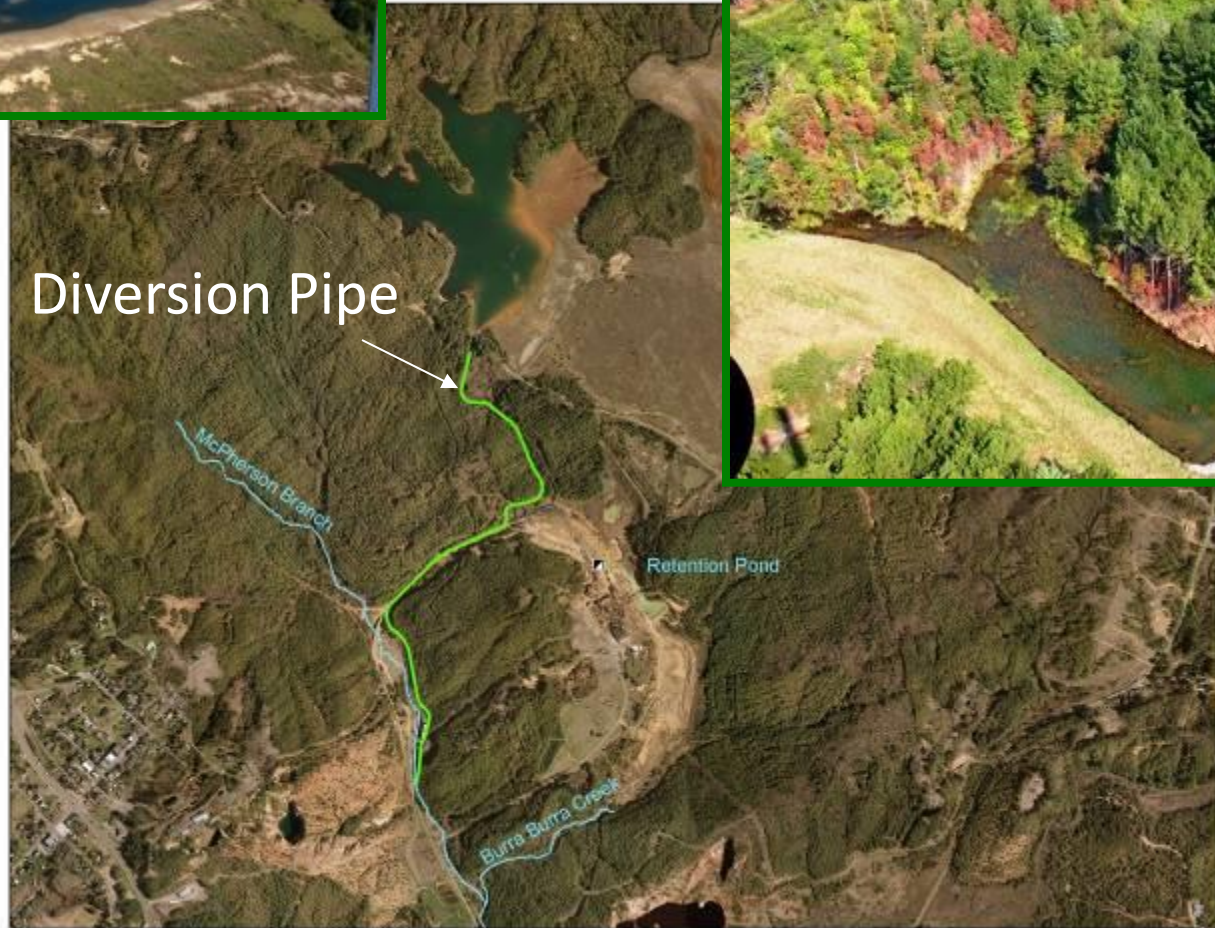




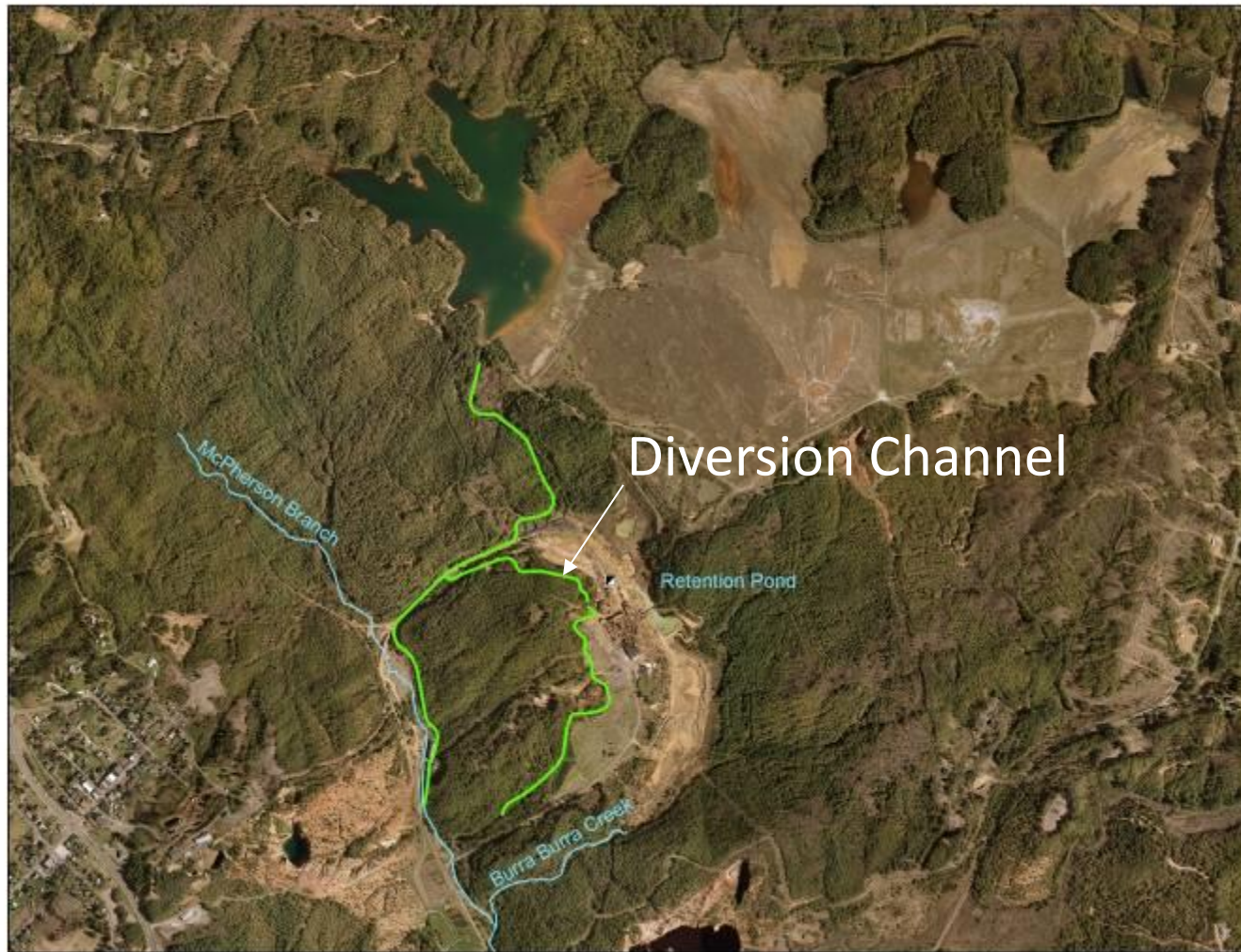


Diversion of base flow and storm runoff,
up to and including the 10-yr/24-hr storm

Diversion Pipe



Diversion of storm runoff, up to and including the 10-yr/24-hr storm





Lead Cap



Waste Disposal in the Isabella Collapse



The Isabella Collapse



1993



2009



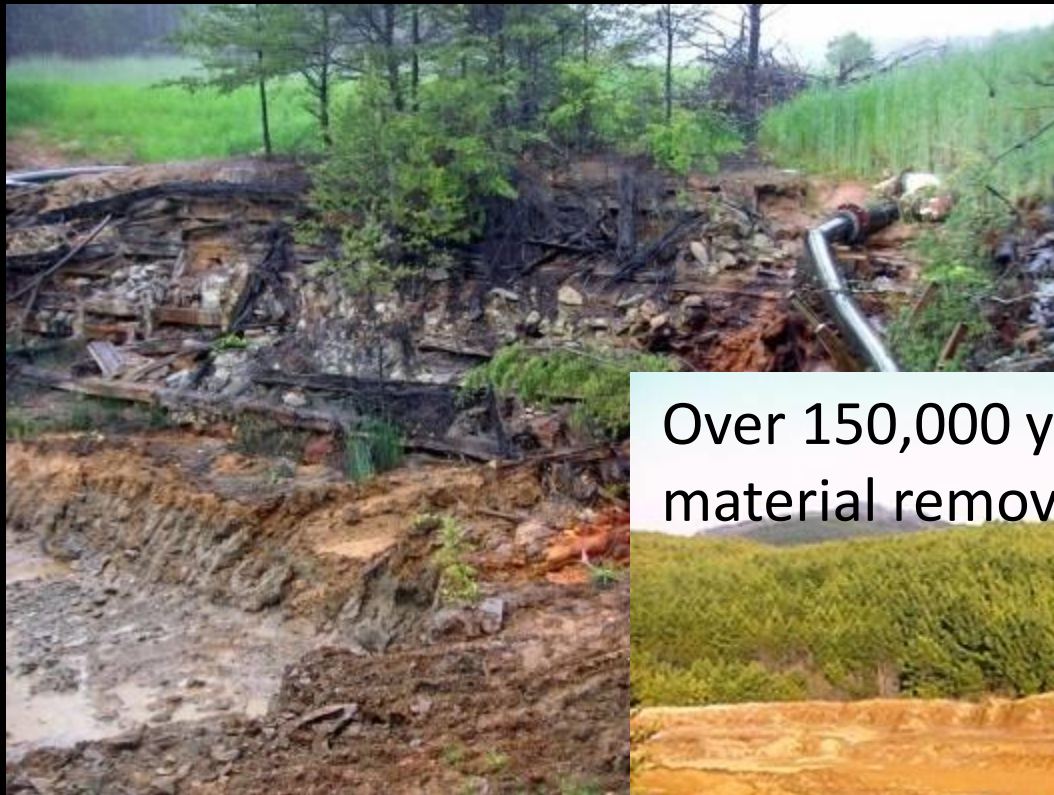


2008



2009





Over 150,000 yd³ of
material removed in 2008







02/07/2010



Long-Term NPC Actions:

Tailings Pond Revegetation







Buena Vista 1999





MAY 18 2005



2012.05.08







- C
- C
- M
- F





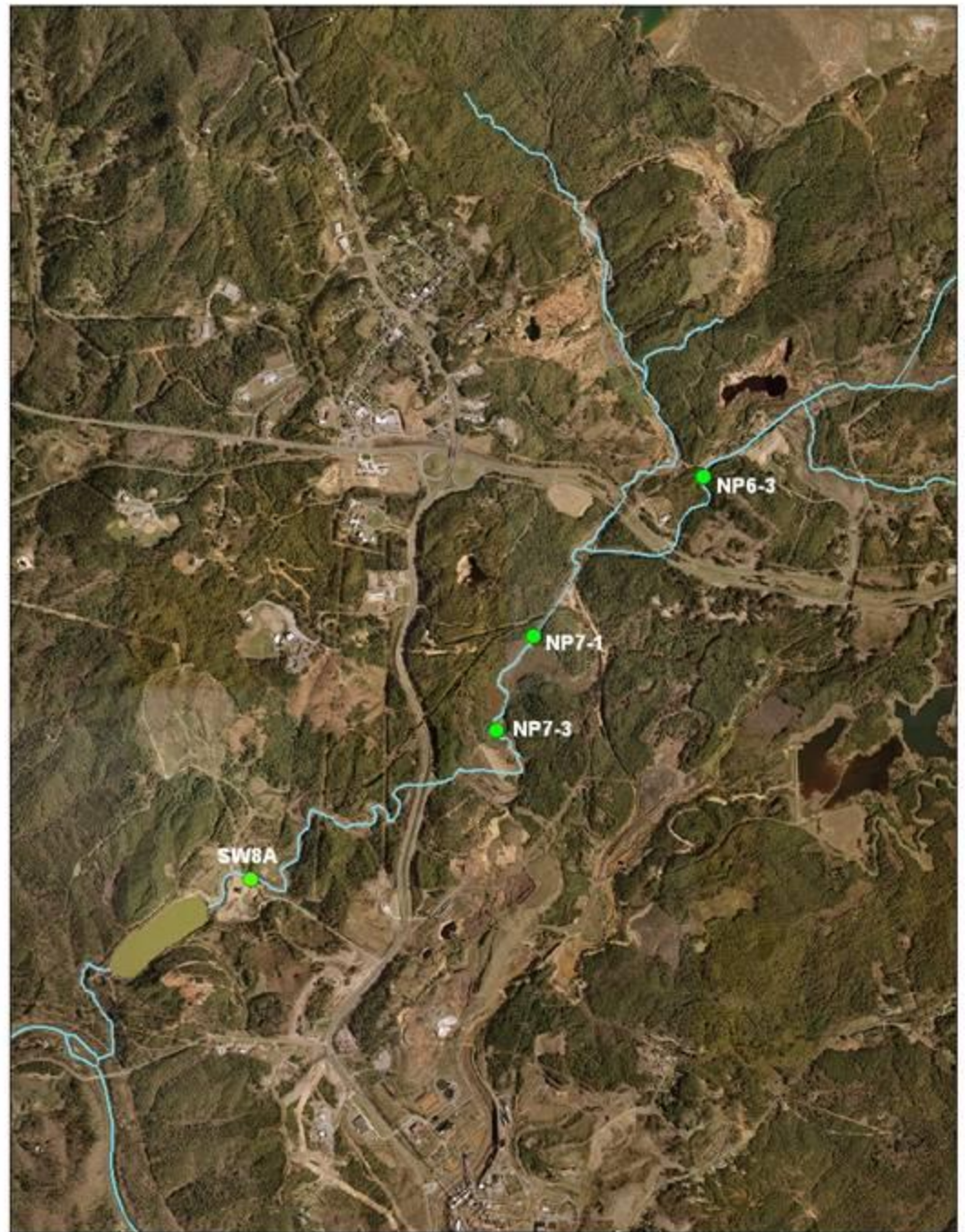
Eureka Roast Yard 2007
and 2009



North Potato Creek

October 2008 Storm Event

Comprehensive Surface-
Water Sample Locations

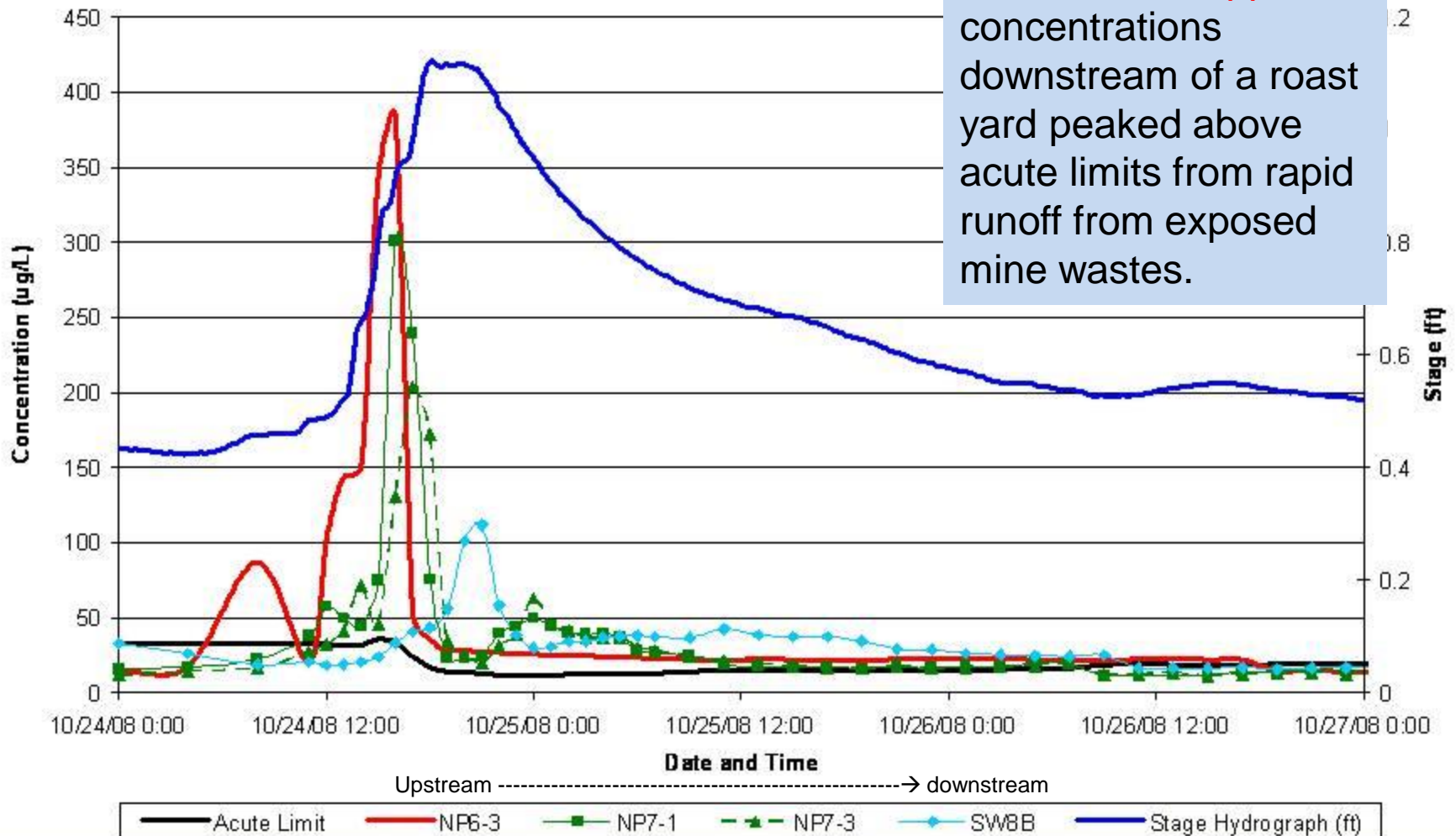




Dissolved Copper

North Potato Creek
October 2008 Storm Event
Dissolved Copper

As flow increases rapidly during this 2008 storm, **copper** concentrations downstream of a roast yard peaked above acute limits from rapid runoff from exposed mine wastes.



Developing Water
Management Strategy for
North Potato Creek



Developing Water
Management Strategy for
North Potato Creek



LONDON MILL WATER
TREATMENT PLANT



NPC WATER
TREATMENT PLANT



Developing Water
Management Strategy for
North Potato Creek



CLEAN WATER
DIVERSIONS

Developing Water Management Strategy for North Potato Creek



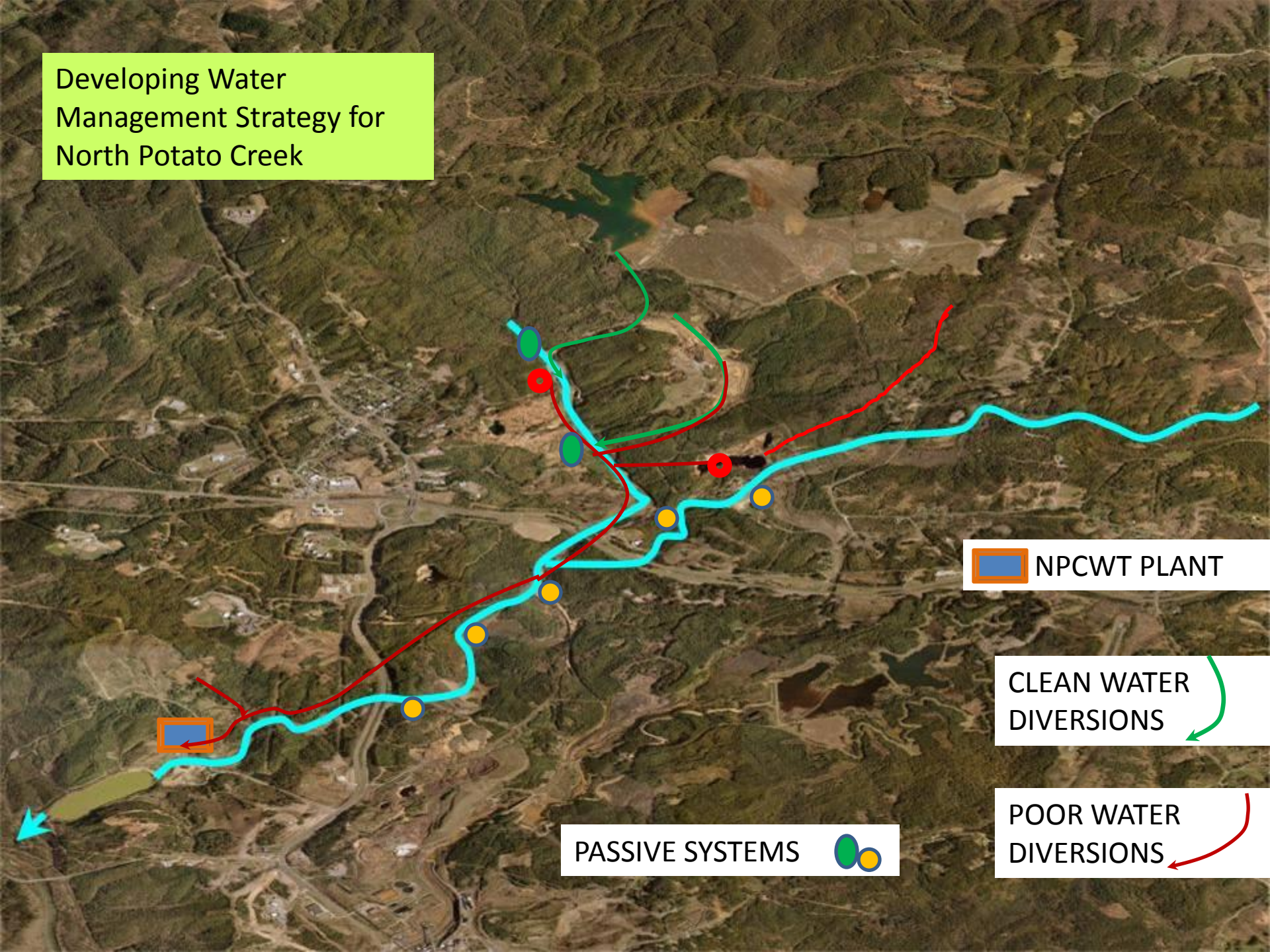
 NPCWTP

CLEAN WATER
DIVERSIONS 

POOR WATER
DIVERSIONS 

900 gpm gravity

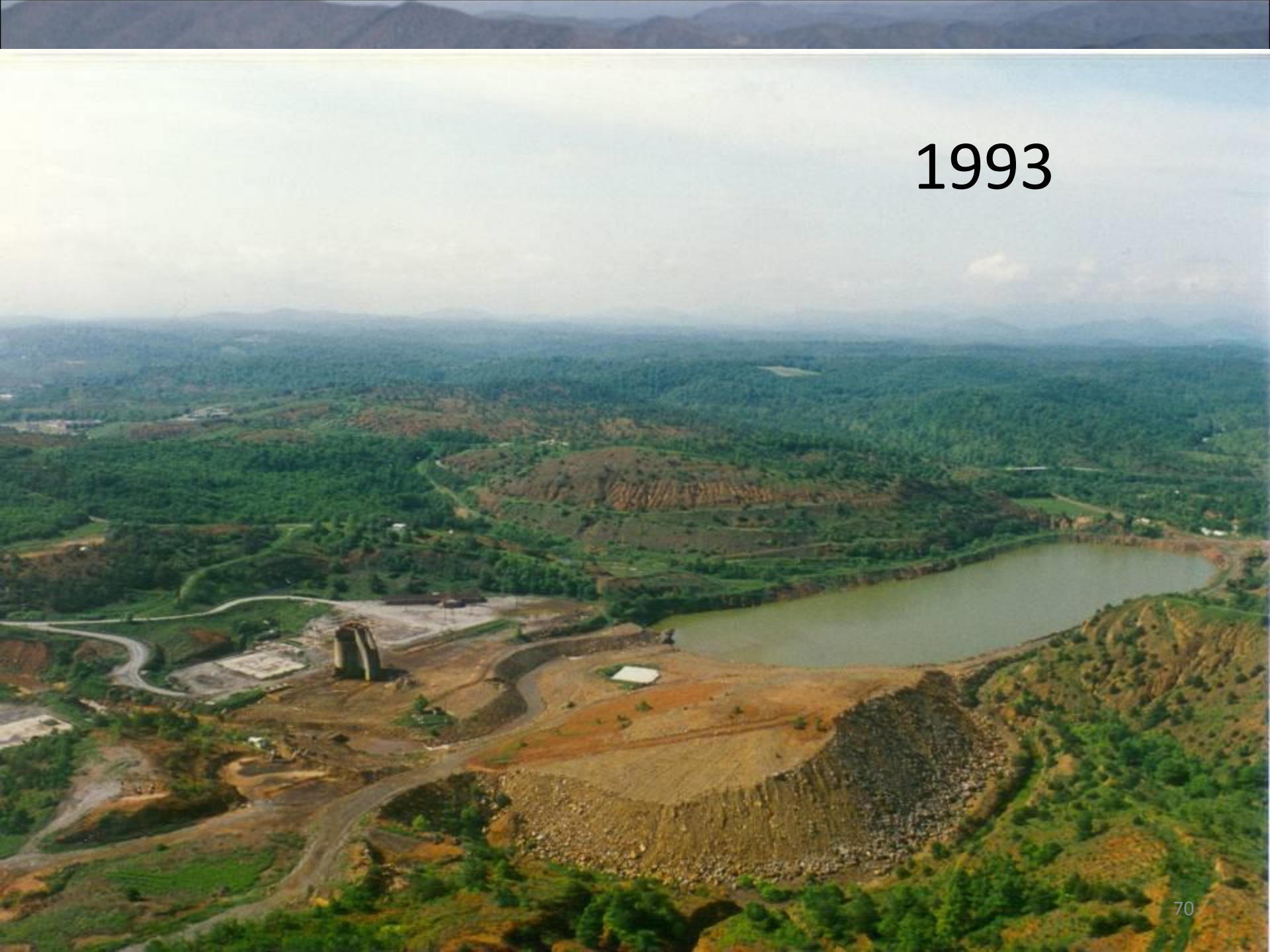
Developing Water Management Strategy for North Potato Creek



Objectives of NPC WTP

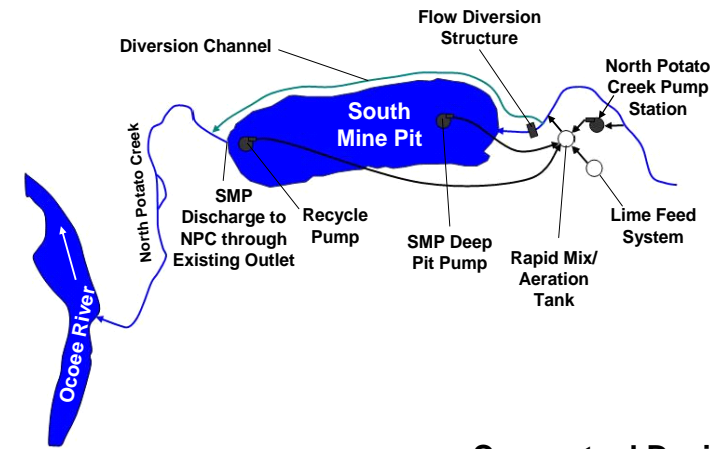
- 💧 Adequately treat groundwater flow (deep mine drainage into pit) and inlet flow (North Potato Creek) attributable to a 10yr/24 hr storm
- 💧 Address and alleviate the contaminant discharge from the pit into the Ocoee River

1993



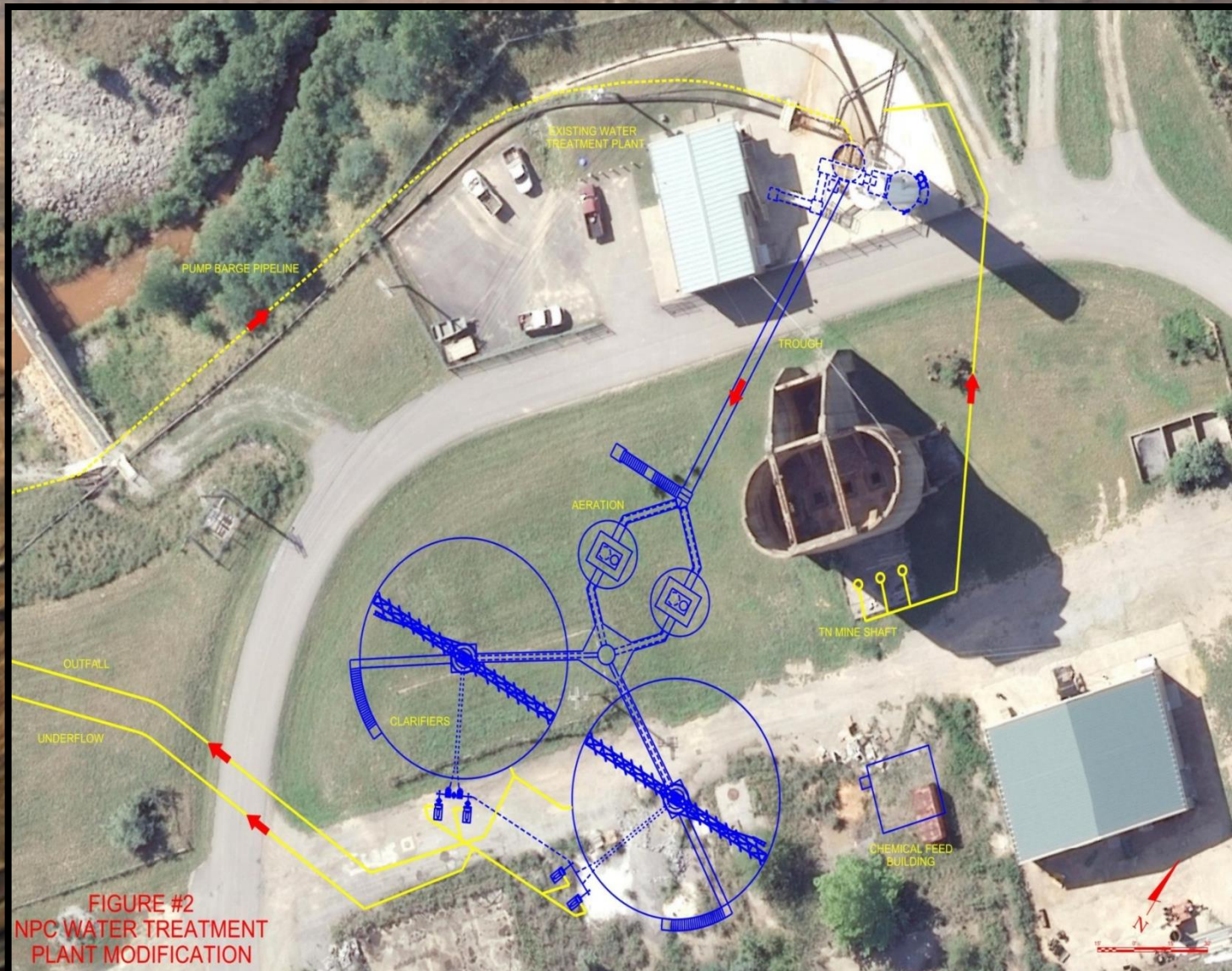
North Potato Creek Water Treatment Plant (NPCWTP)

The North Potato Creek Water Treatment Plant began treating water on January 10, 2005, and is removing 681 lbs. per day of dissolved metals from North Potato Creek prior to discharge to the Ocoee River



North Potato Creek Watershed

North Potato Creek Water Treatment Plant



North Potato Creek Watershed

North Potato Creek Water Treatment Plant And Bypass

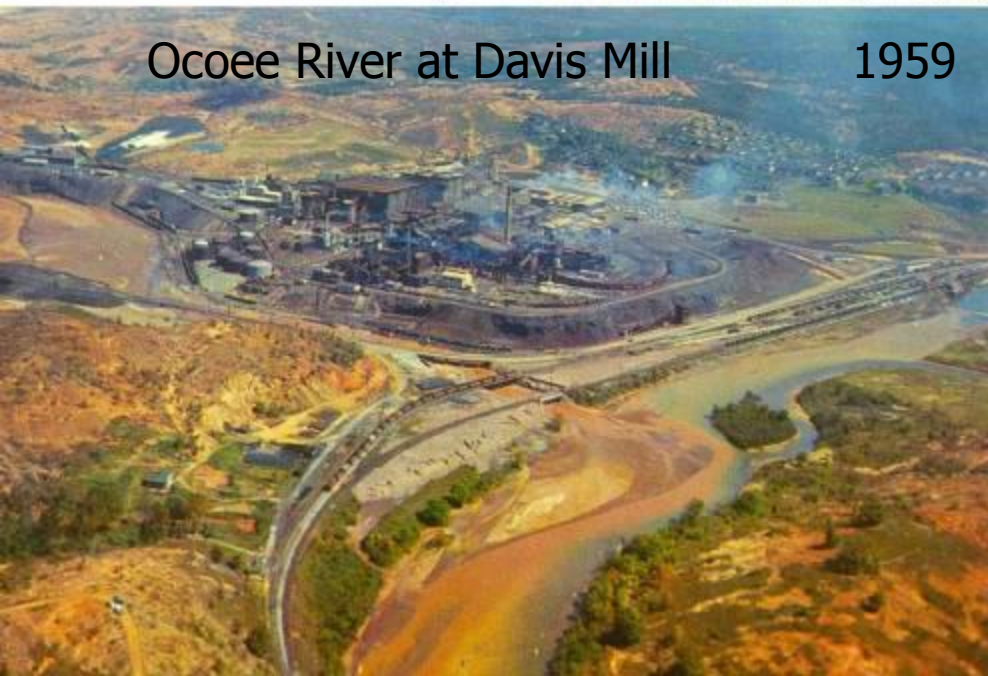


Ocoee River at North Potato Creek 2005



Ocoee River at Davis Mill

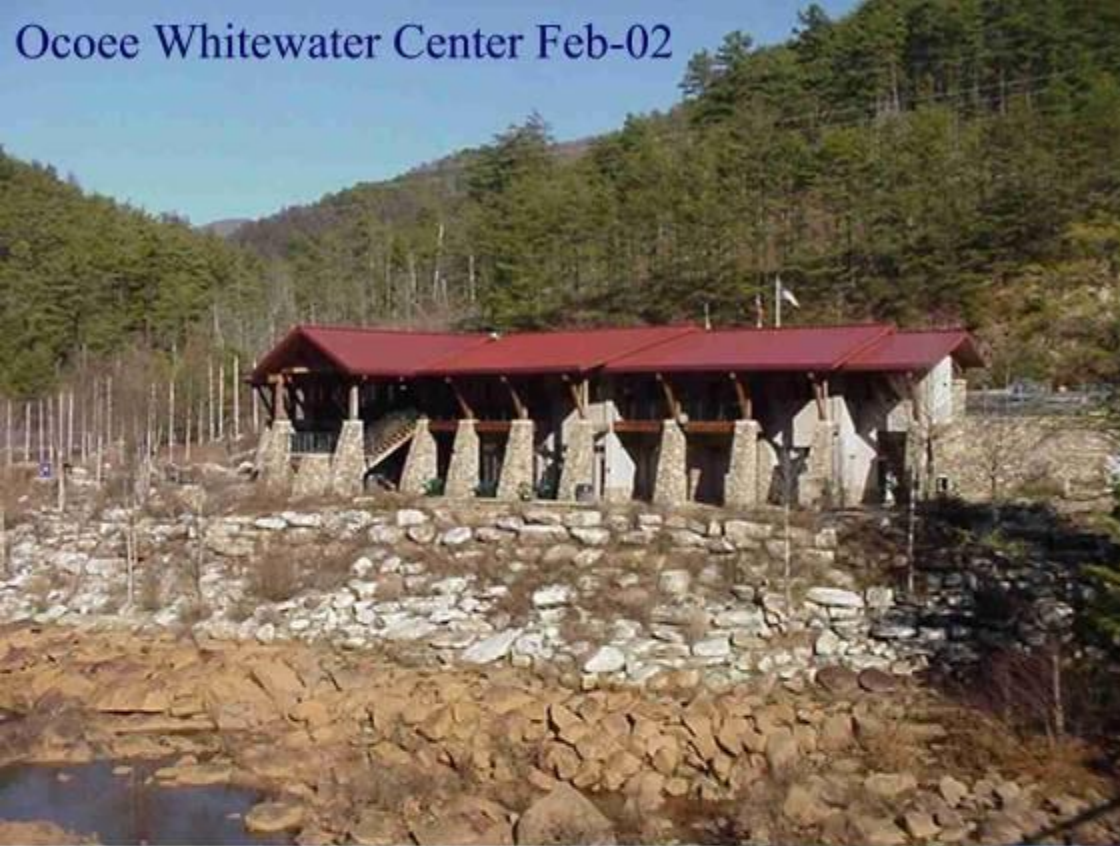
1959



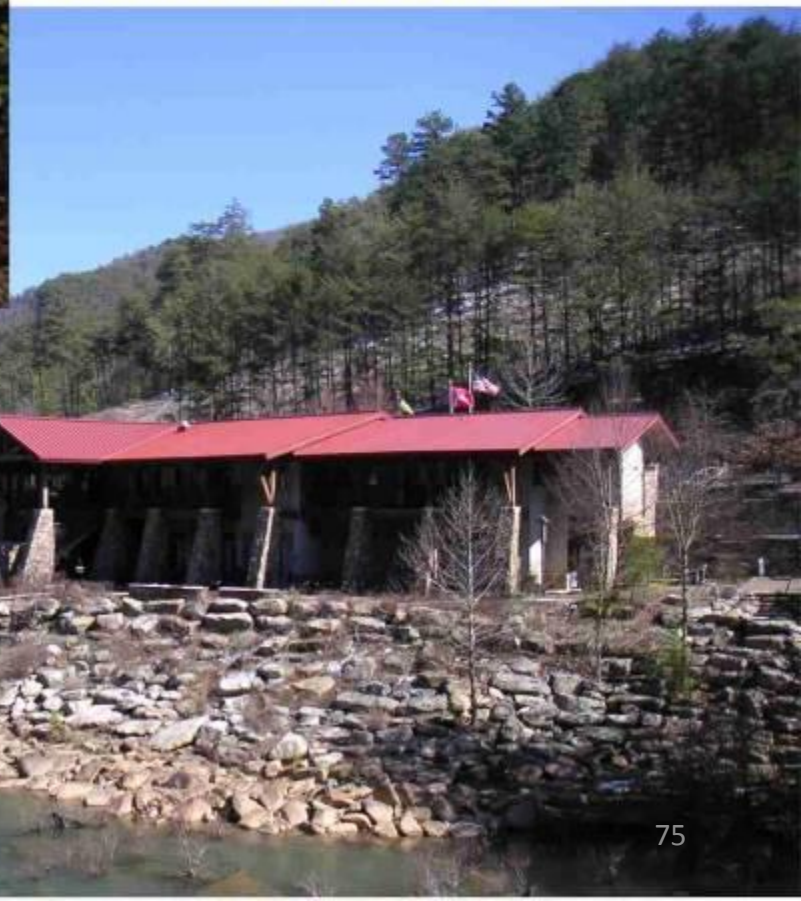
2005



Ocoee Whitewater Center Feb-02



Ocoee Whitewater Center Feb-05



Summer 03



Fish swimming again in Ocoee



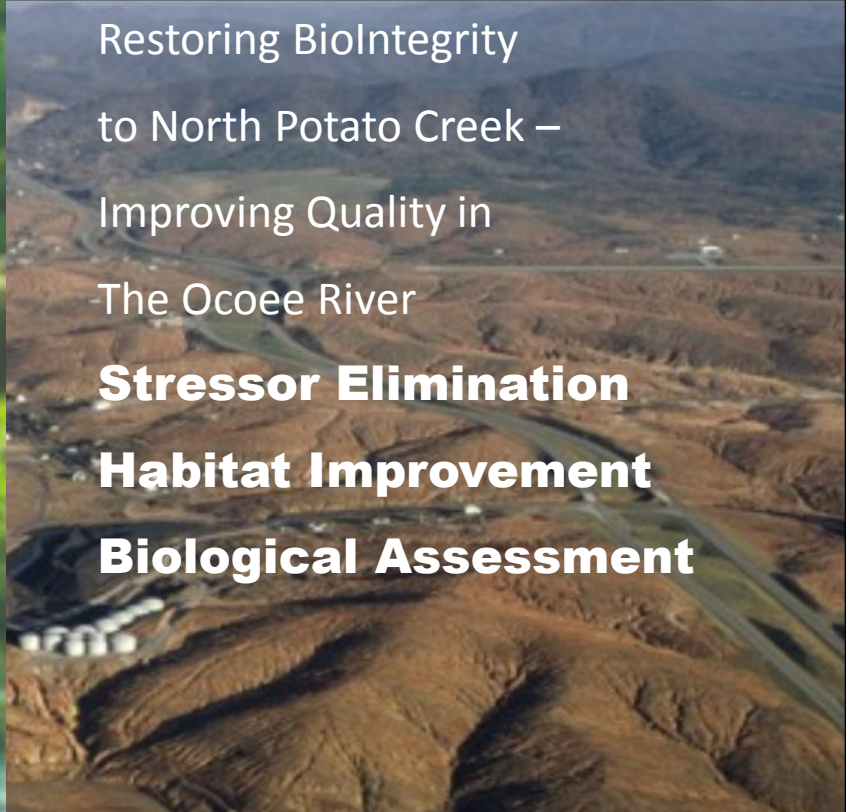
TVA aquatic monitors Amy Wales, left, and Heather Hamilton participate in a recent fish count in the Ocoee River just below the Ocoee Whitewater Center. Biologists say fish are returning to the Ocoee as the Copper Basin reclamation cleans the water and land.

Copper mining and acid production that started in the 1840s in Polk County killed the life in the Ocoee and its tributaries. But land and water reclamation have helped heal the river so fish can thrive.

"I've noticed more and more fish over the years with numbers in the thousands," said Jim Herrig, an aquatic biologist with the Cherokee National Forest.

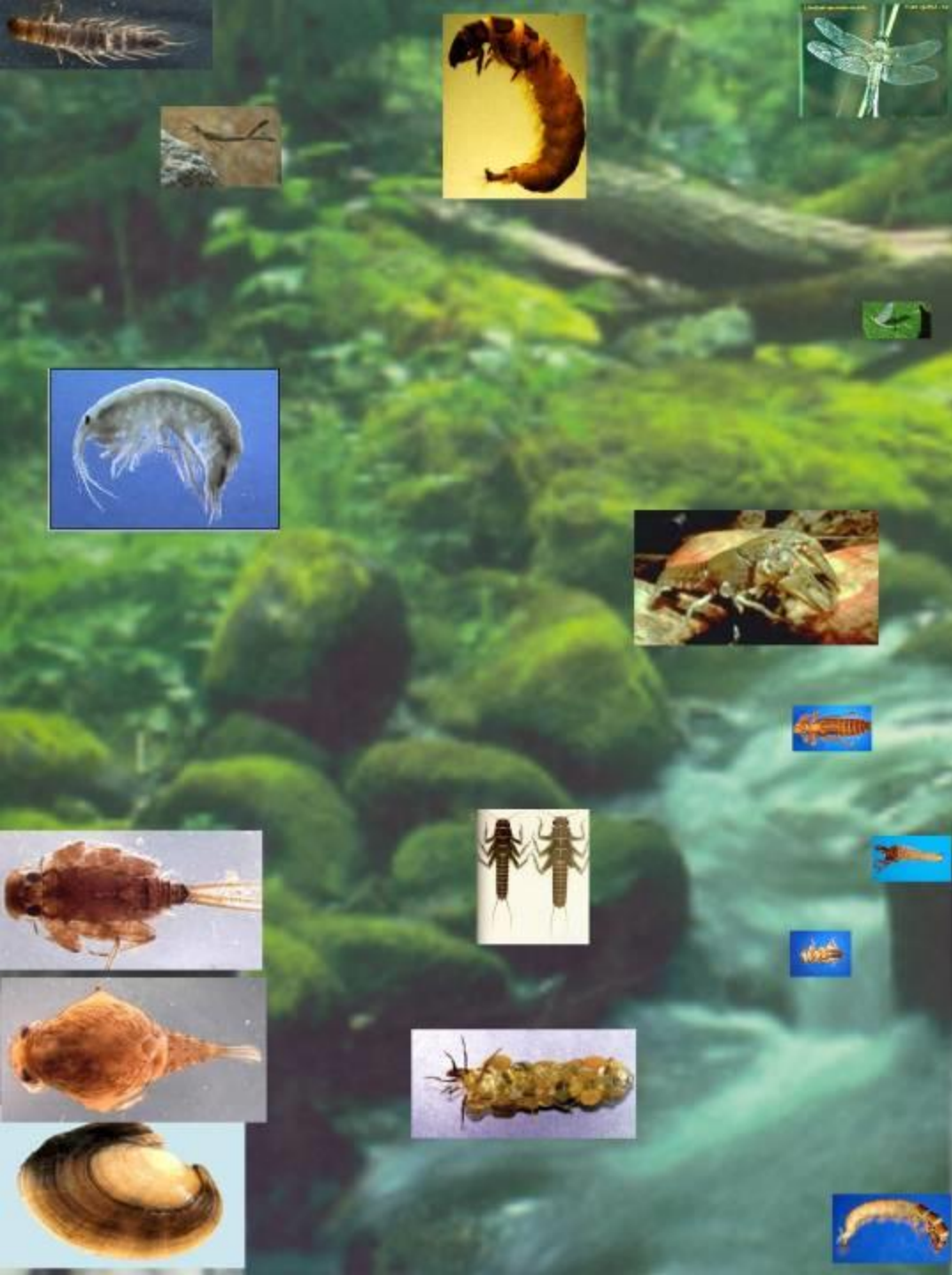


Annual Biosurvey

An aerial photograph of a river valley. The river flows through the center of the image, surrounded by brown, eroded hills and mountains. The sky is blue with some light clouds. The text is overlaid on the top half of the image.

Restoring BioIntegrity
to North Potato Creek –
Improving Quality in
The Ocoee River

Stressor Elimination
Habitat Improvement
Biological Assessment

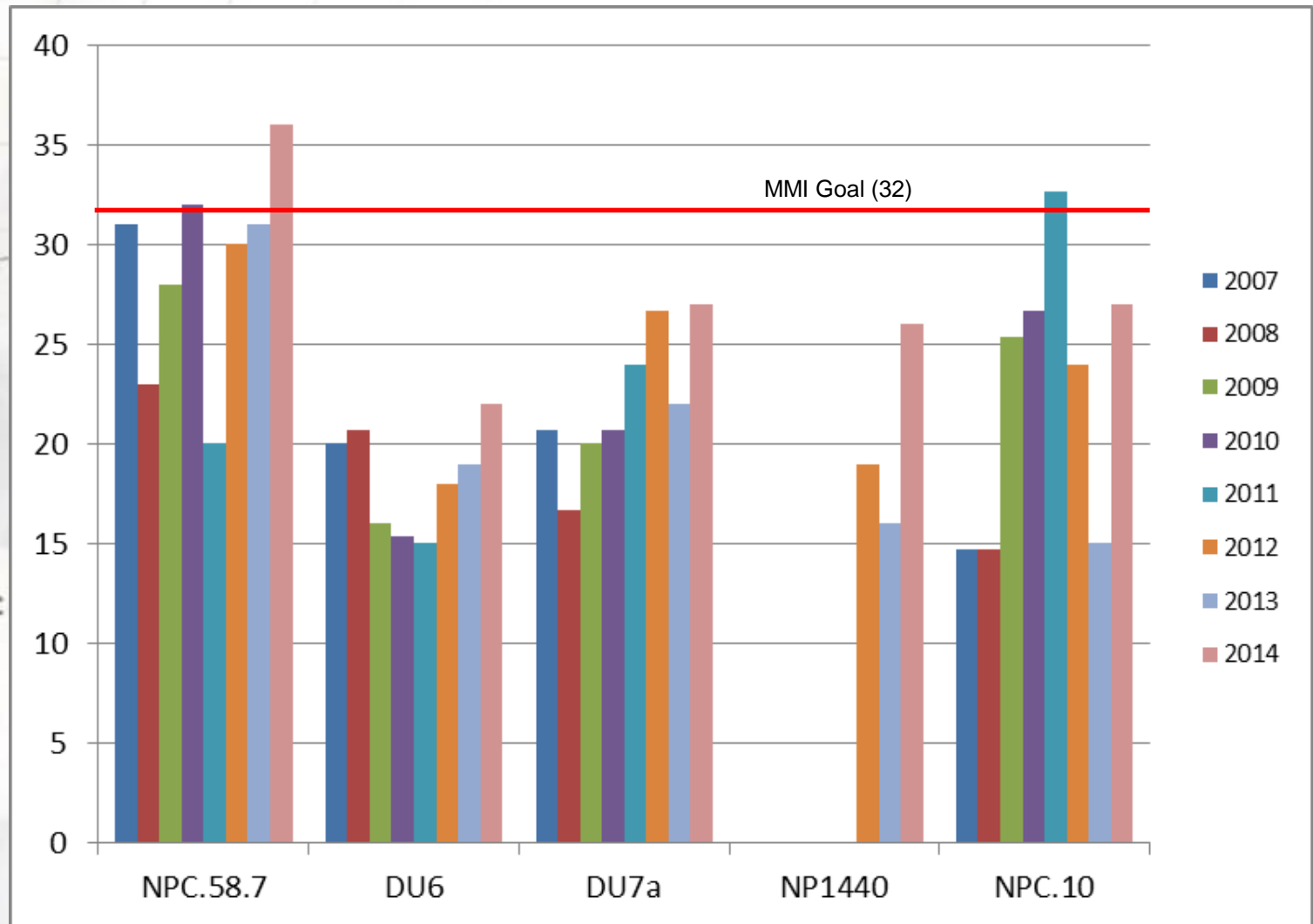


DU 10 (NPC.10) – Tennessee/Cherokee Area



Habitat:
Optimal 2014
No Iron Effects

TDEC MMI: Lower North Potato Creek





November 11, 2014



DU 11 – South Mine Pit Discharge Area



← 2004

2009 →



06/03/2009

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