

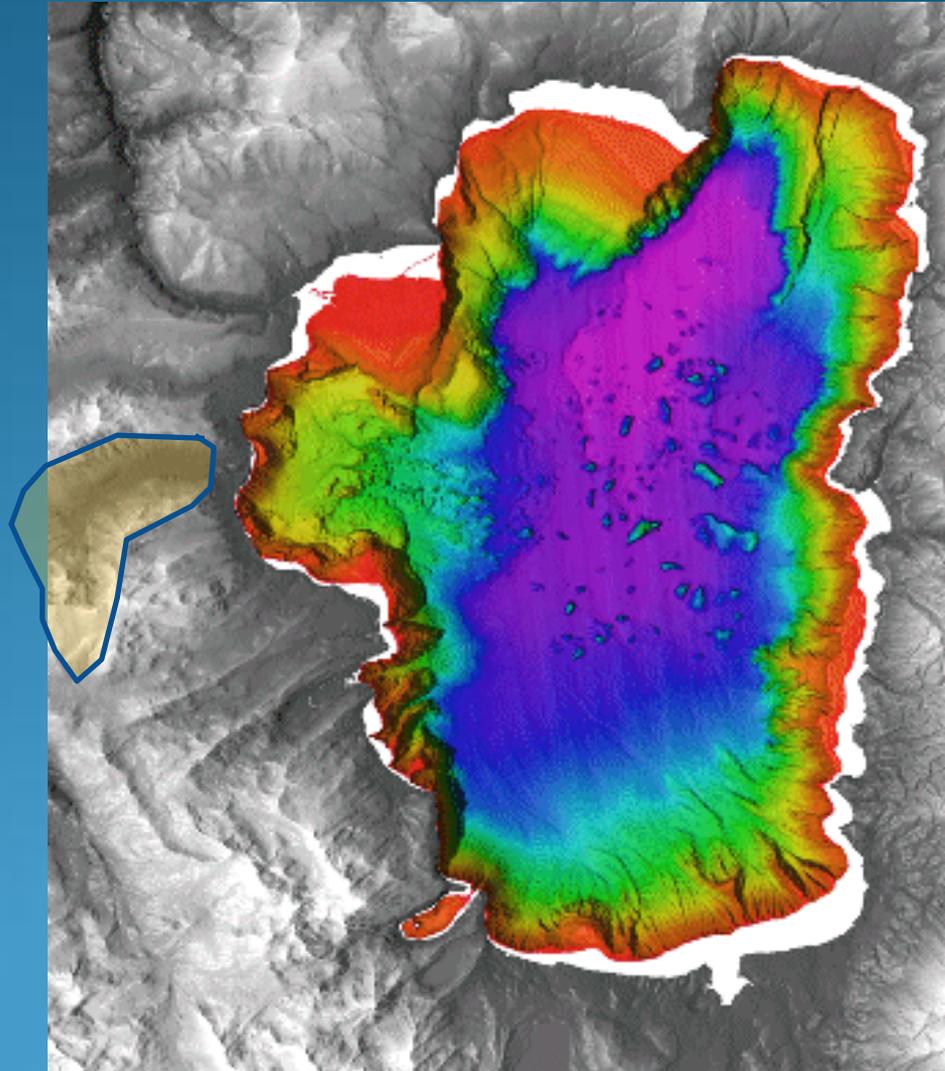
Blackwood Creek Channel Restoration

Projects Designed to Address
Cumulative Land Use Impacts
in a Dynamic Environment

Craig Oehrli, Hydrologist – USDA Forest Service
Lake Tahoe Basin Management Unit – Project Leader - Ecosystems

Watershed Characteristics

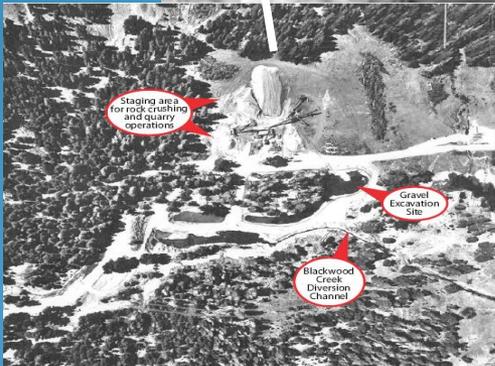
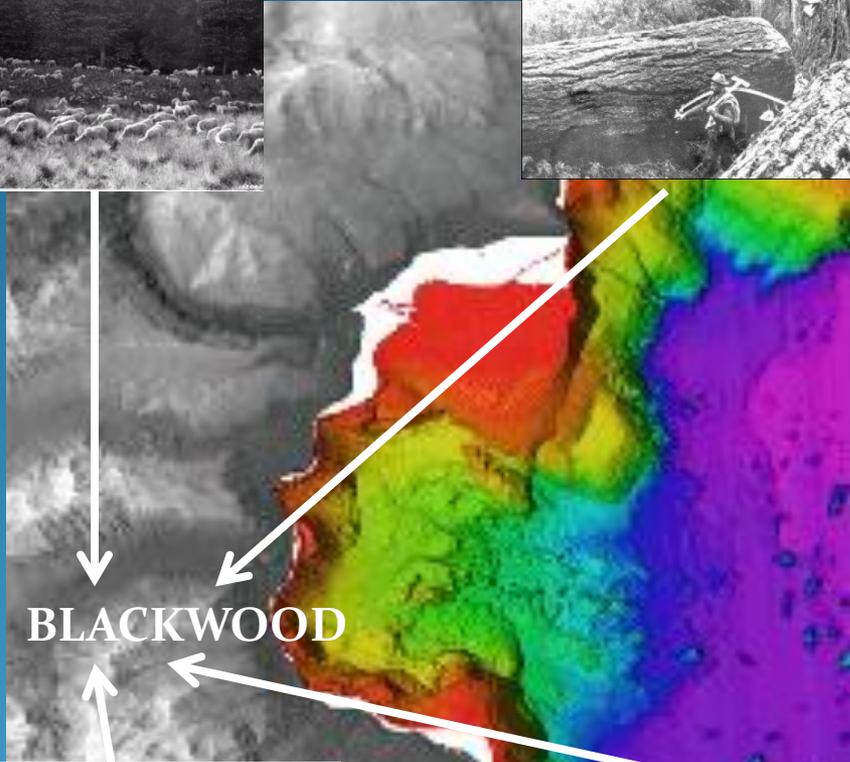
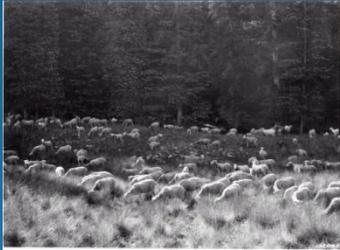
- 11.2² mile watershed
- Volcanic Geology
- Glaciated
- Faulted
- Prehistoric Landslides

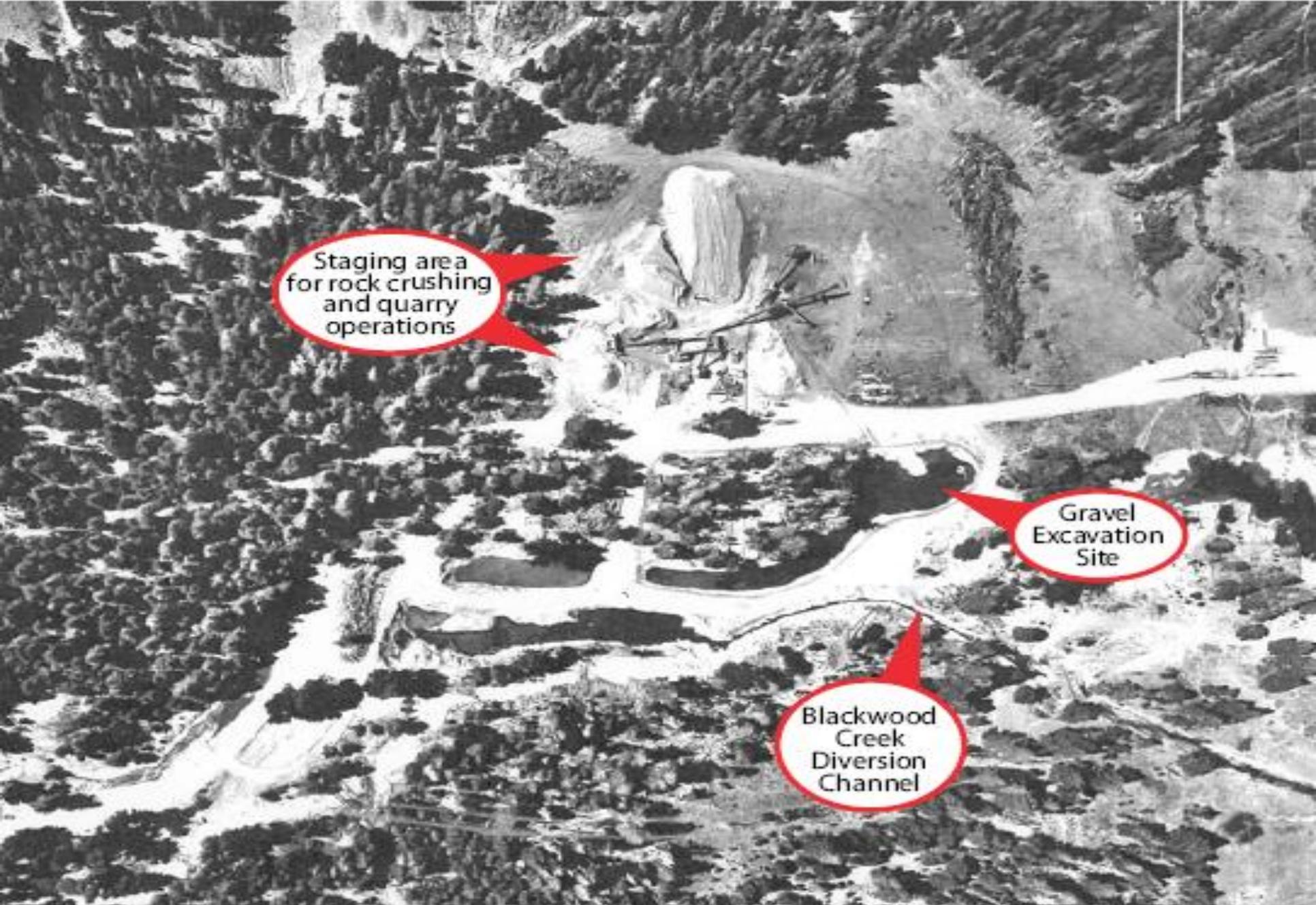


Blackwood Creek Watershed

Watershed Land use Statistics

- Sheep Grazing – 1880s to 1960
- Comstock Logging – lower 30% - 1800s
- Mechanized Logging – 1950s & 1960s
- Gravel mining - 1960 -1968





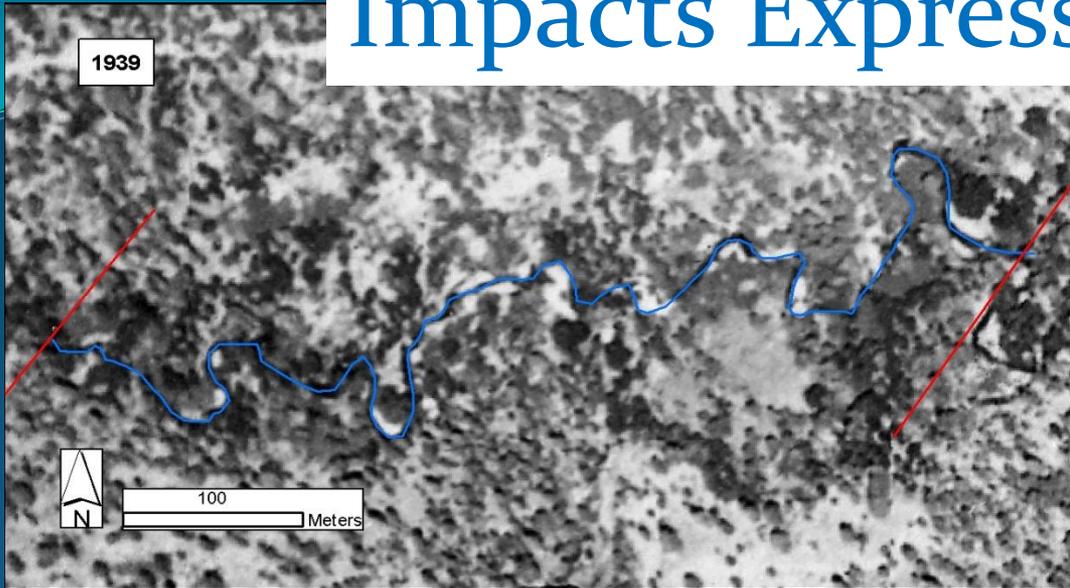
Staging area
for rock crushing
and quarry
operations

Gravel
Excavation
Site

Blackwood
Creek
Diversion
Channel

1964 – picture from TMDL Draft report - LWQCB,2007

Impacts Expression

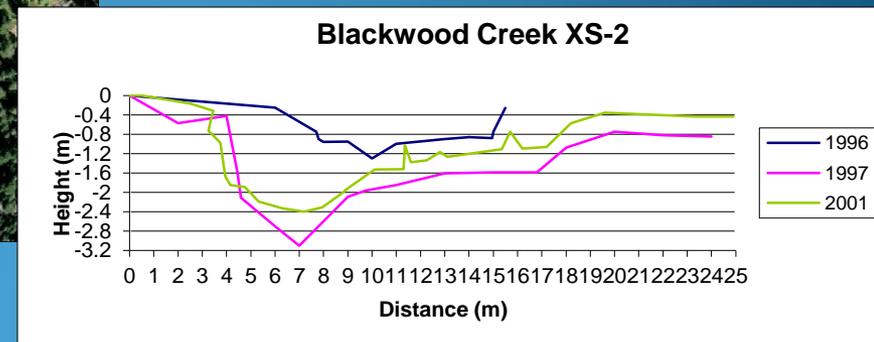


2008-09 Project Area
Channel & Floodplain
condition change in response
to mining and direct
floodplain logging...

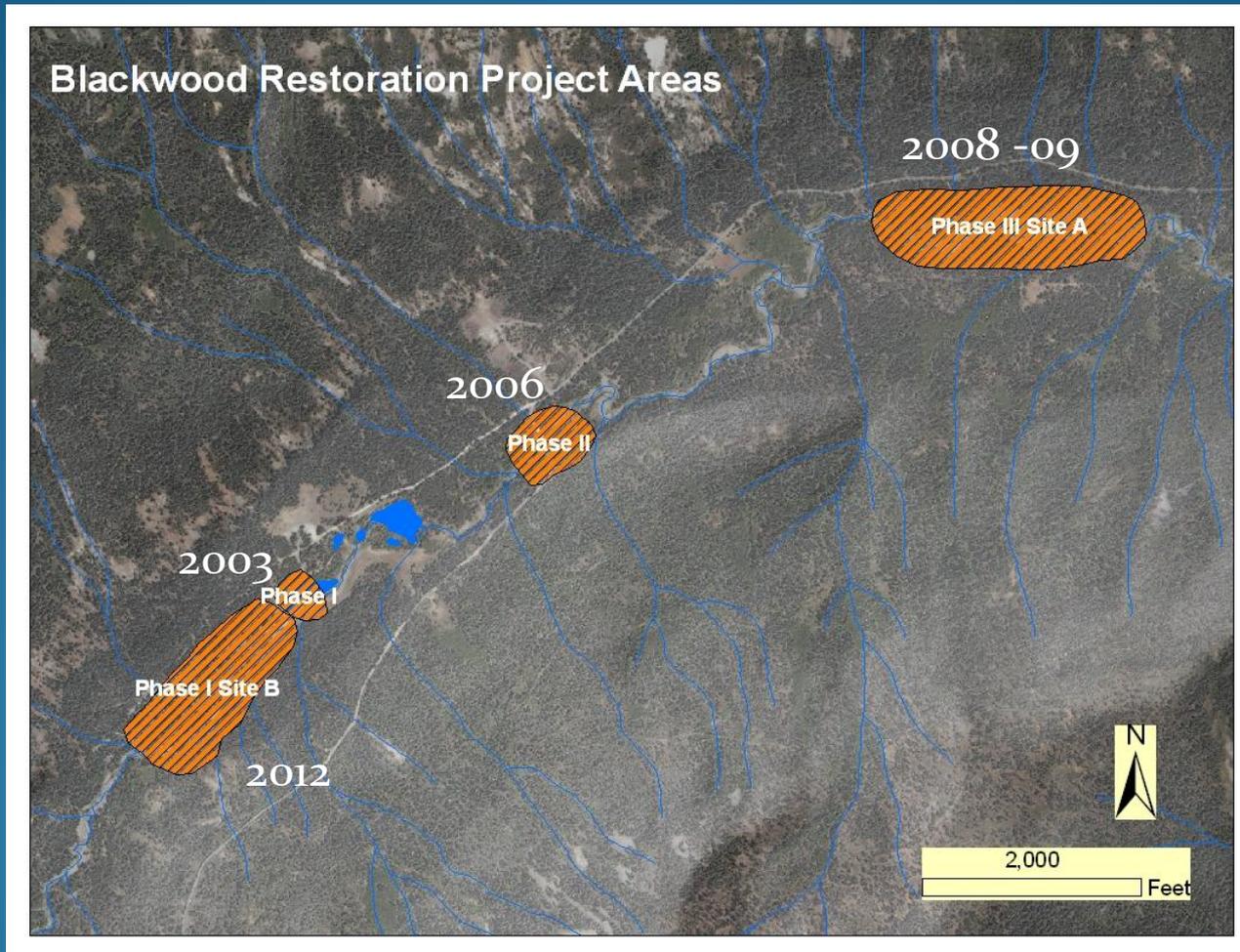
70% channel curvature reduction

Year	Channel Length (m)	Sinuosity
2007	674	1.23
2001	731	1.34
1995	777	1.42
1986	835	1.53
1969	894	1.63
1939	985	1.80

6+ feet of vertical erosion



2001 Watershed Analysis and Restoration Area Plan



Phase I - 760K -LTRA

Likely fish migration impairment (LWQCB, 2007)



Post Construction - 09-2003



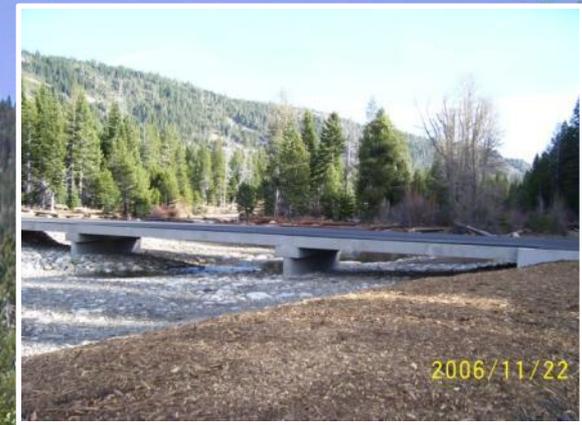
Phase I



Fish ladder site - post 12/31 flood

1-13-06

Phase II - 4,200K SNPLMA



Dashed line is channel bed elevation upstream

Likely fish migration impairment (LWQCB, 2007)



Pre Construction - Aug 2006

Phase II



100 year flood elev.



06-05-07



05-14-09

05-04-08

Phase IIIA - 2,340K SNPLMA

PROJECT AREA EROSION

1965 -2007 fine sediment release = 61 tons/yr.
1995 - 2001 fine sediment release = 235 tons/yr.

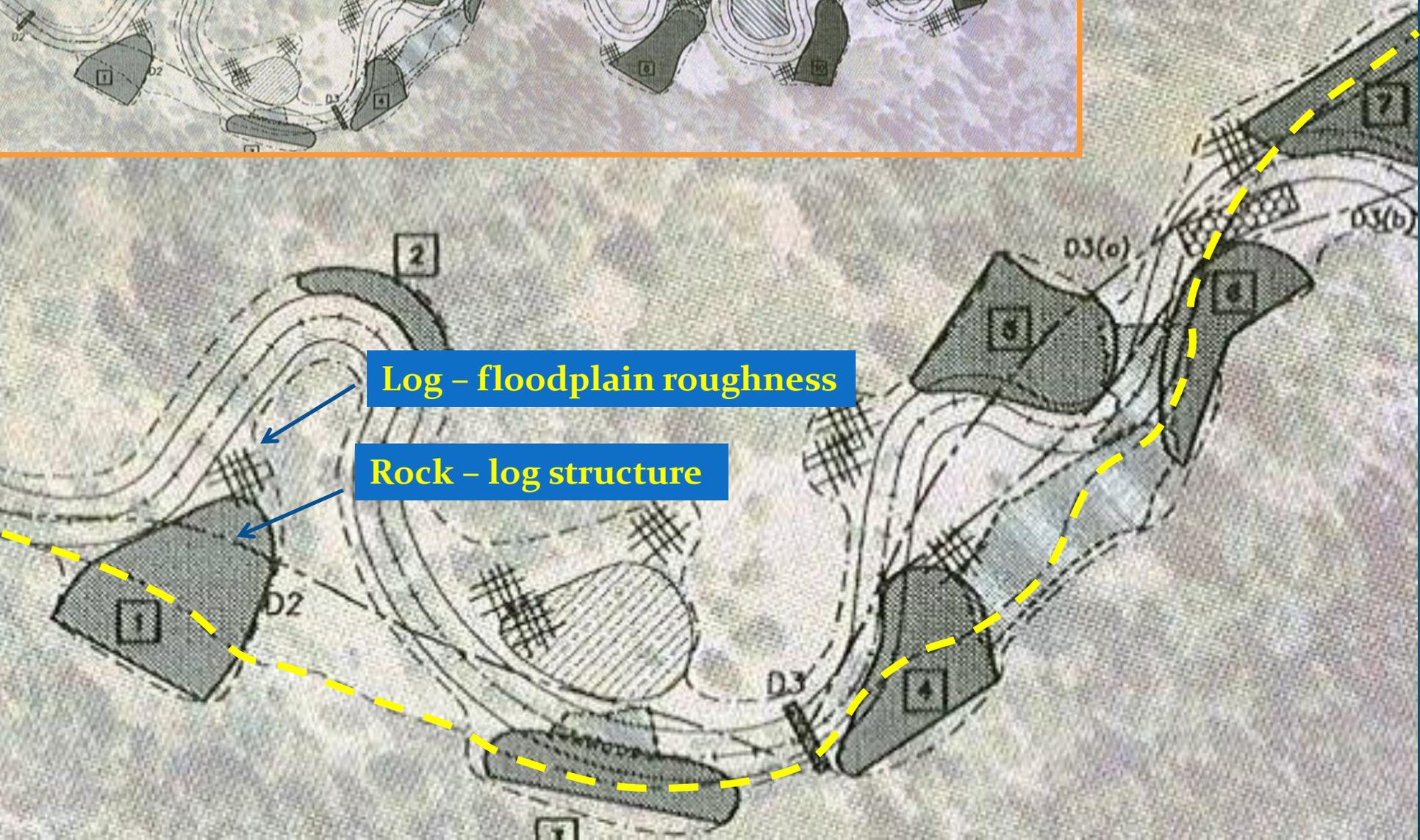


**BEDLOAD SEDIMENT
FORM AND FUNCTION
(WQO VIOLATION)**



Post 12/31/05 flood. Photo taken 7/2006

Phase IIIA - Design Layout



Log - floodplain roughness

Rock - log structure

Phase IIIA - Implementation



10/2008

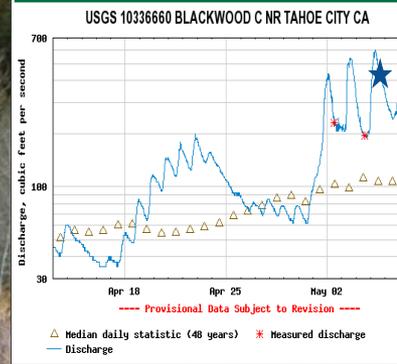


11/2008

09/2008

Phase IIIA - Initial Post Construction Response - May 2009

05-09-09



Rock & Log Structure



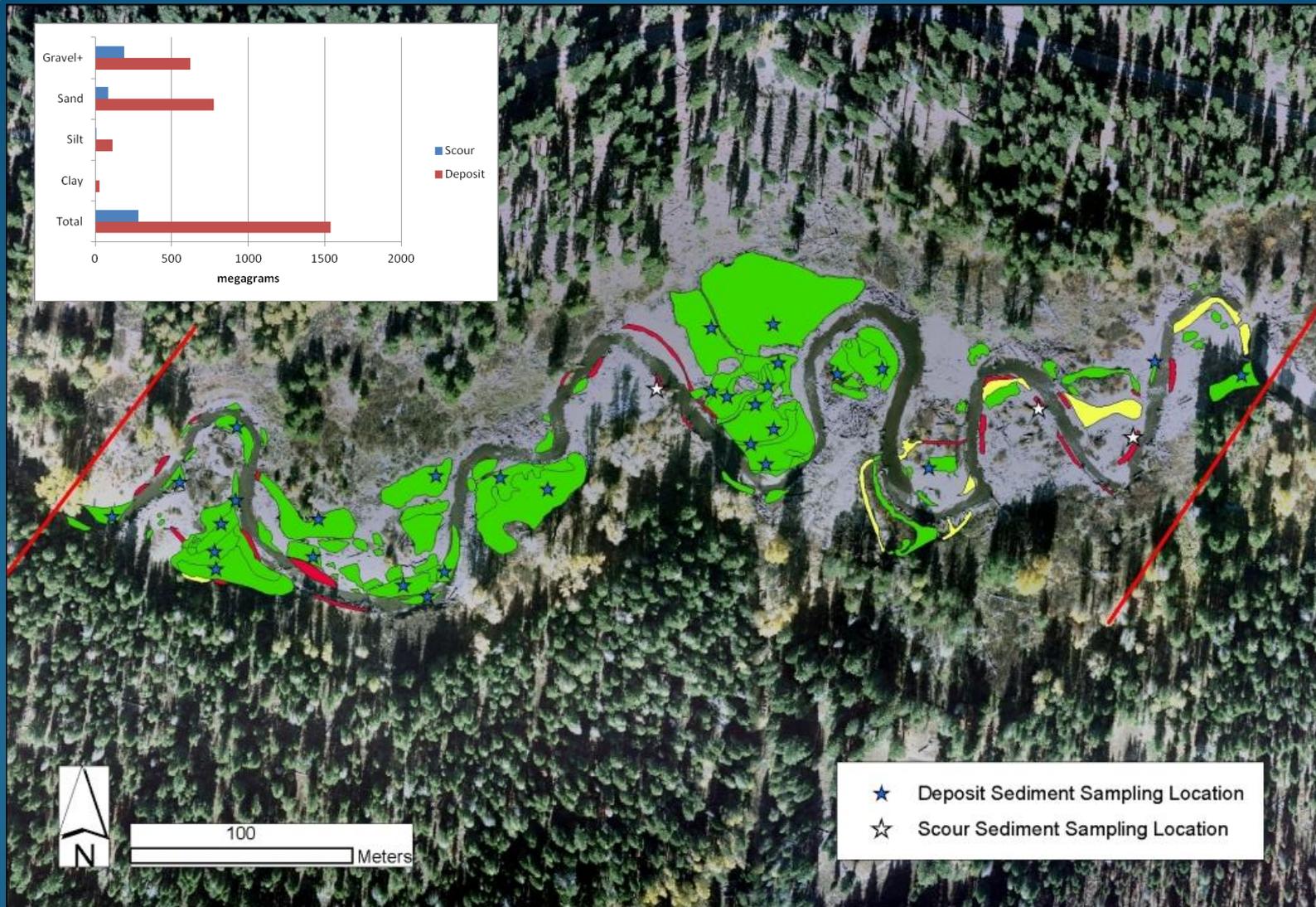
High water
mark

05/07/2009



05-05-09

Project Effectiveness Analysis - 2010 deposit / scour

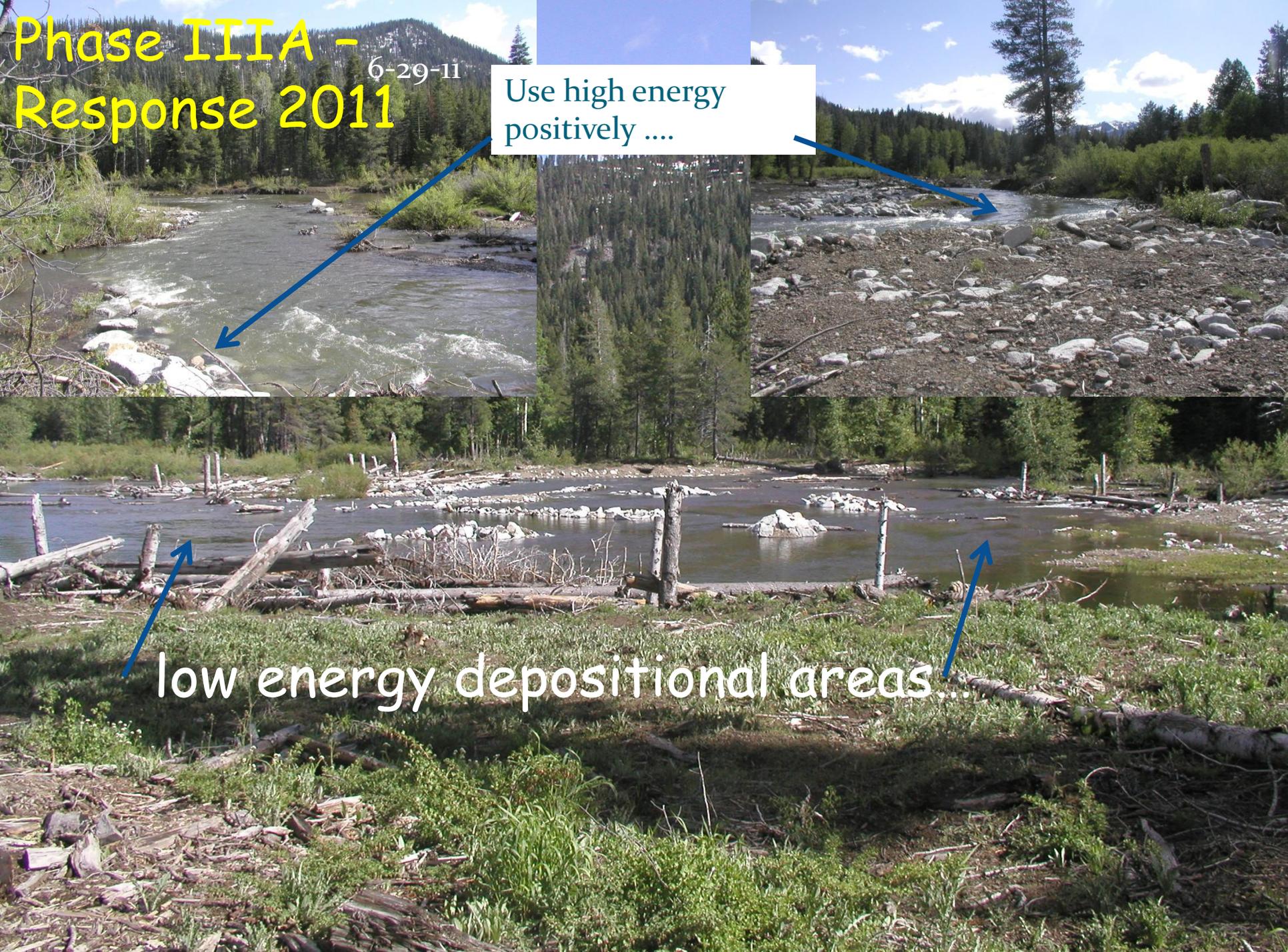


All Monitoring indicators at this time indicate positive restoration response...
2011 channel curvature = 2.1

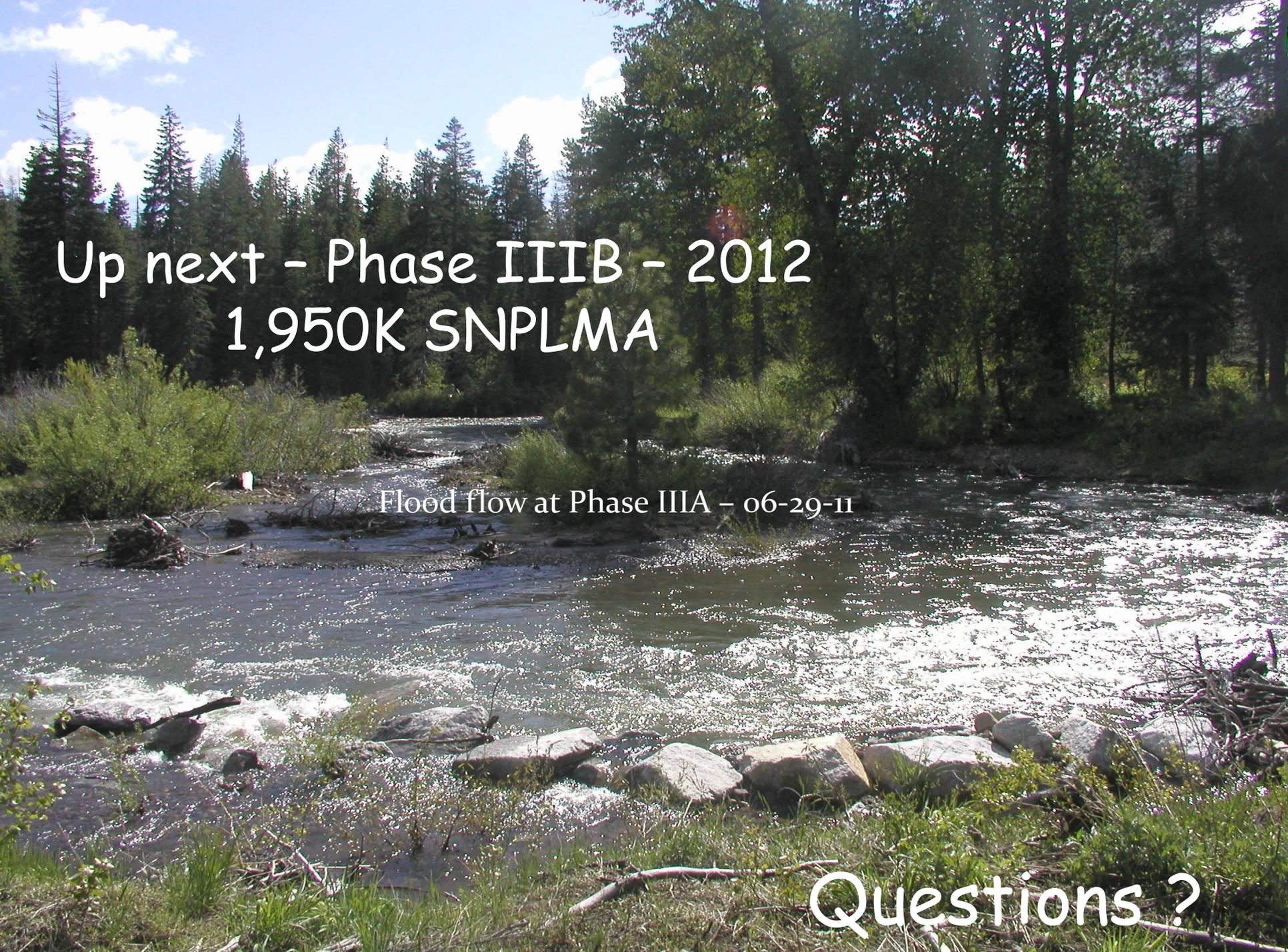
Phase IIIA - Response 2011

6-29-11

Use high energy
positively



low energy depositional areas...

A photograph of a river flowing through a dense forest. The river is turbulent, with white water rapids and large rocks in the foreground. The sky is blue with some clouds. The text is overlaid on the image.

Up next - Phase IIIB - 2012
1,950K SNPLMA

Flood flow at Phase IIIA - 06-29-11

Questions ?