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Resource Responses to Grand Canyon Experimental Flows

- Native and Nonnative Fishes
- Sediment Resources

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Southwest Biological Science Center
Grand Canyon Monitoring and Research Center

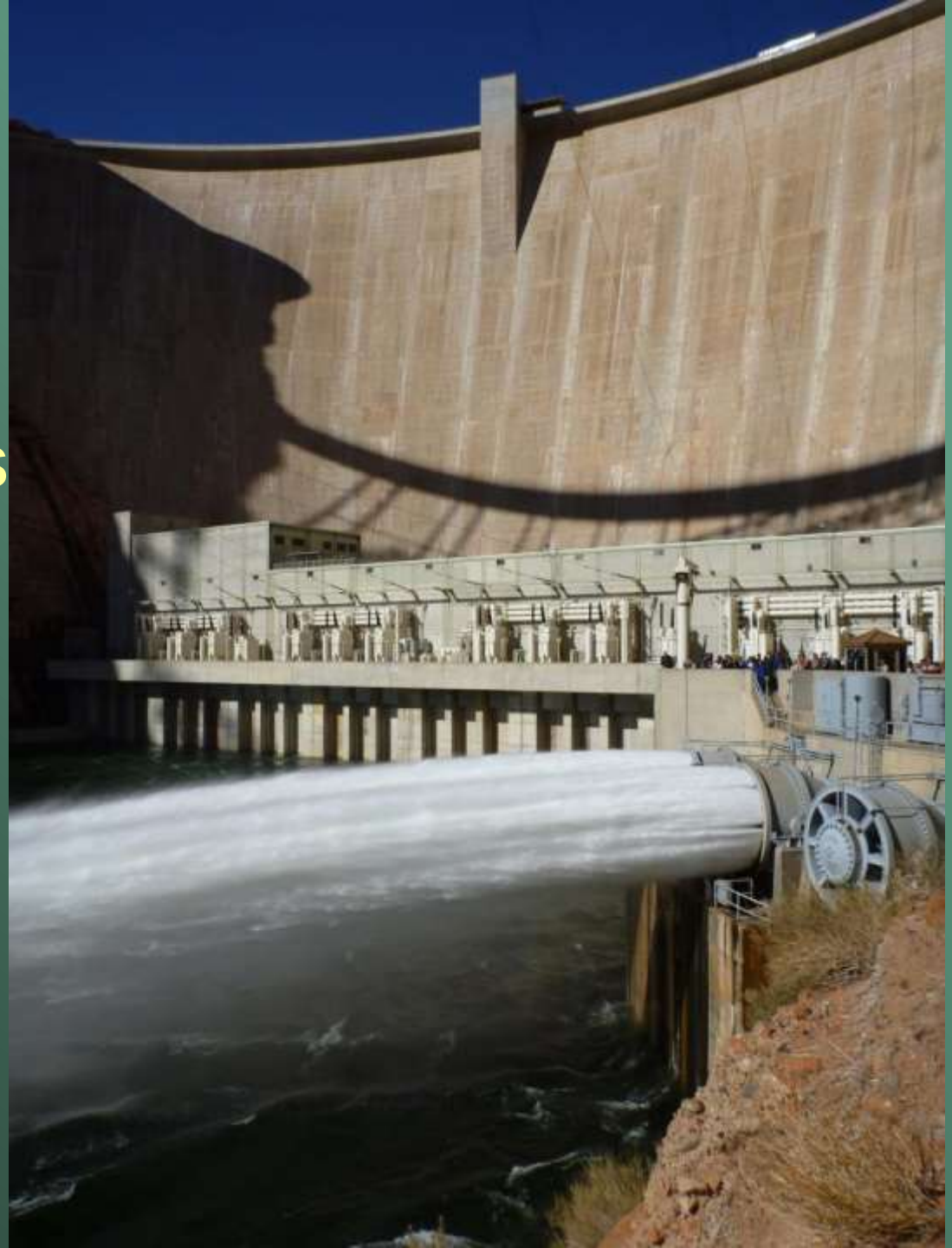
U.S. Department of the Interior
U.S. Geological Survey

Glen Canyon/
Lees Ferry

Marble
Canyon

Little Colorado River
and Confluence

Resource Responses to Fall High Flow Experiments



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Annual spring abundance estimates of humpback chub ≥ 150 mm and ≥ 200 mm in lower 13.6 km of the LCR

2013 spring estimates (post 2012 HFE) indicate humpback chub abundance stable or increasing in the LCR

(Preliminary Data from VanHaverbeke et al. 2014, Do Not Cite)

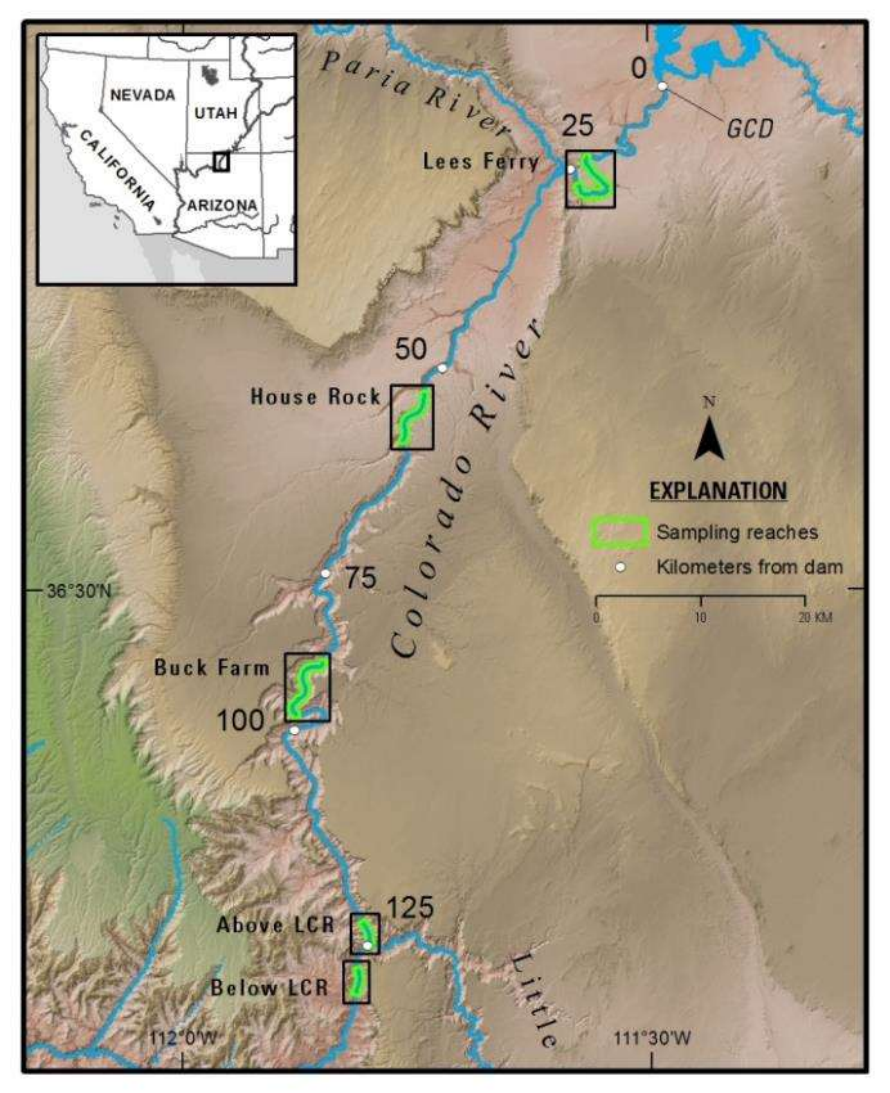
Annual Survival of humpback chub (40-99 mm) in the Colorado River Study Site

Juvenile humpback chub survival increased over 2012-2013 interval (includes 2012 HFE)

USGS

(Preliminary Data from Yackulic 2014. Do Not Cite.)

Rainbow Trout Natal Origins Study Sampling Design



- **5 Study Reaches**
  - LEES FERRY (-5.5 to -2.1 RM)
  - HOUSE ROCK (17.2-20.6 RM)
  - BUCK FARM (38.2 to 41.6 RM)
  - ABOVE LCR (60.2 to 61.2 RM)
  - BELOW LCR (63.4 to 64.4 RM)
- **Objective - Estimate abundance, survival, and movement rates within and among study reaches**
- **Quarterly trips for tag recovery and mark-recapture**
  - Jan, Apr, Jul, and Sep
  - Robust Design (2 km section)
  - Juvenile Chub Monitoring (Below LCR)
    - Electrofishing
    - Hoopnetting
- **Spatially referenced sampling**
  - Site length (250 m)
- **Annual fall marking trips (Oct-Dec)**
  - Age-0 (FL >75 mm)
  - ~ 10,000 marked animals
  - Glen Canyon Dam to Lees Ferry

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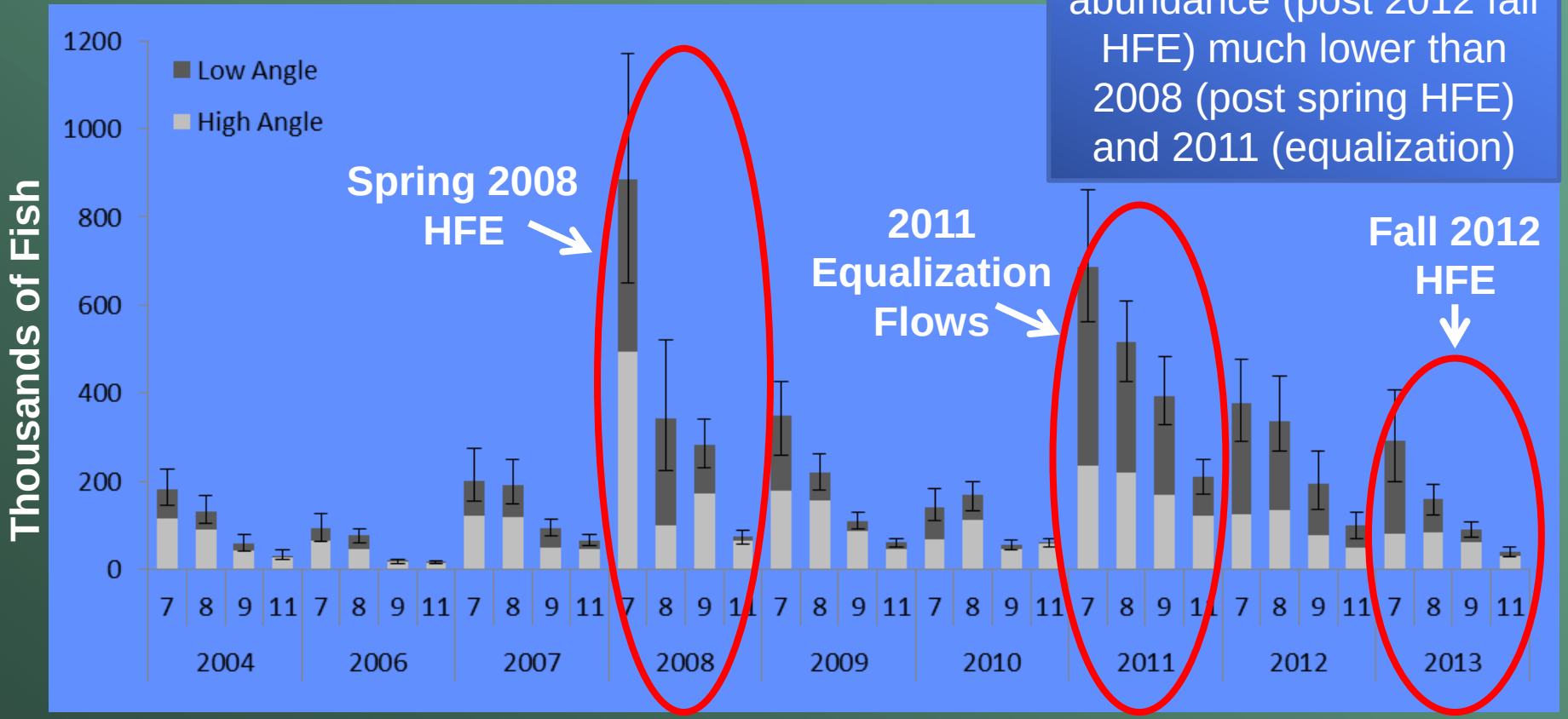
Rainbow Trout Early Life Stage Studies: Age-0 Population Estimates

2013 Age-0 RBT abundance (post 2012 fall HFE) much lower than 2008 (post spring HFE) and 2011 (equalization)



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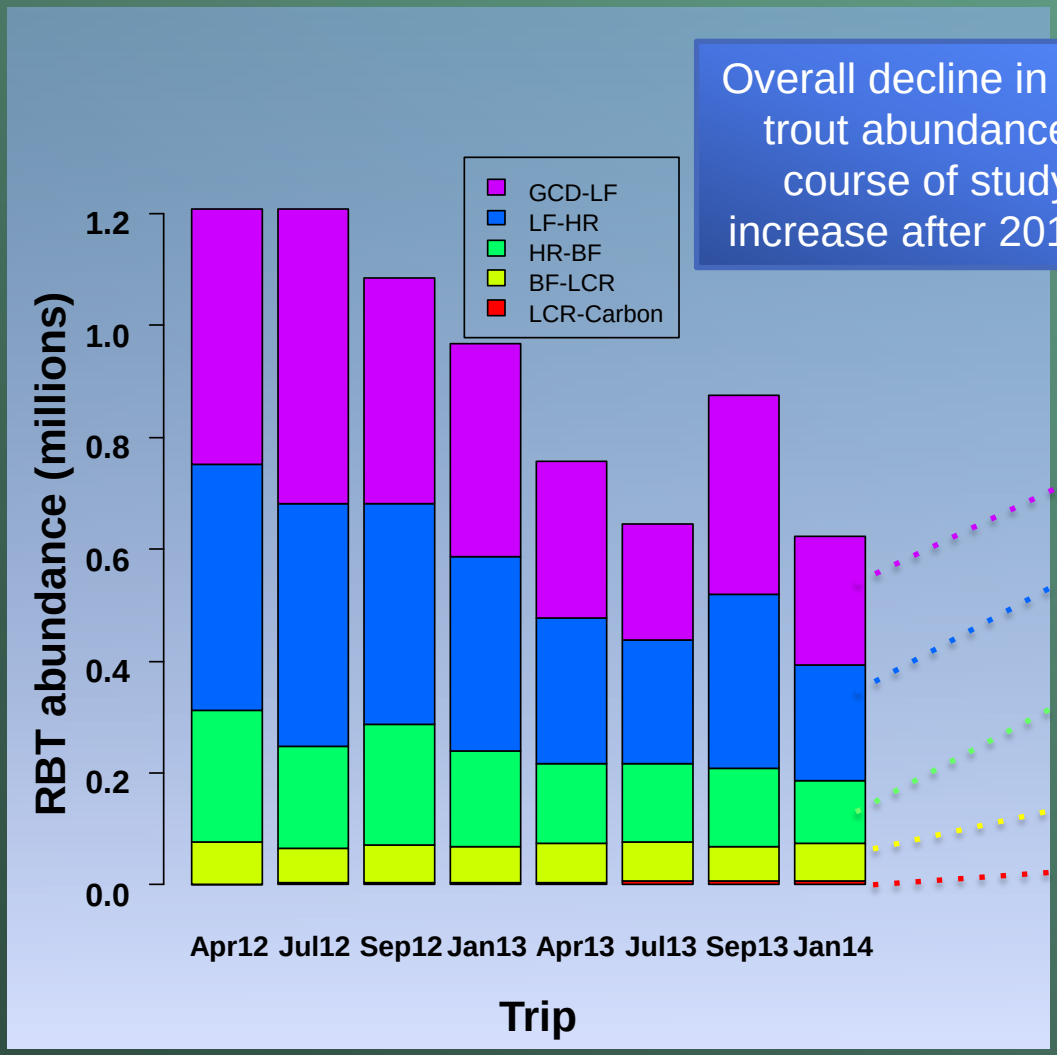
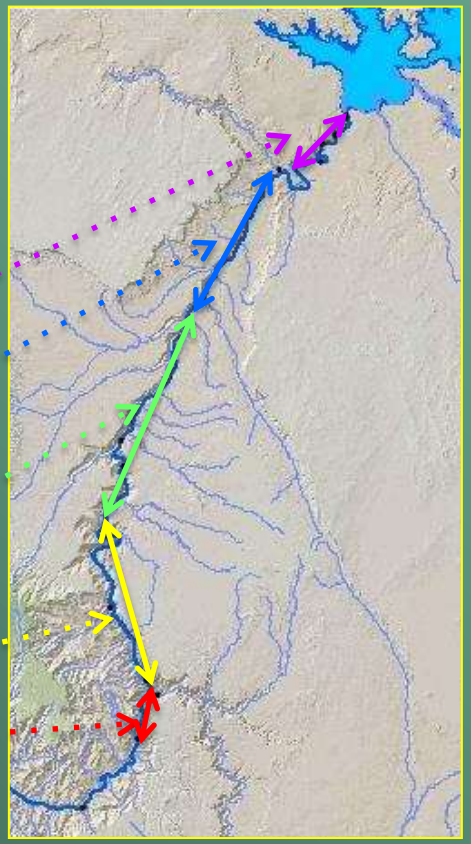
(Preliminary Data from Avery, Foster and Korman 2014. Do Not Cite.)

Rainbow Trout Populations in Glen and Marble Canyons

Overall decline in rainbow trout abundance over course of study. No increase after 2012 HFE.





(Preliminary Data from Korman and Yard 2014. Do Not Cite.)

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Rainbow Trout Within-Reach Movement

I – Glen Canyon/Lees Ferry

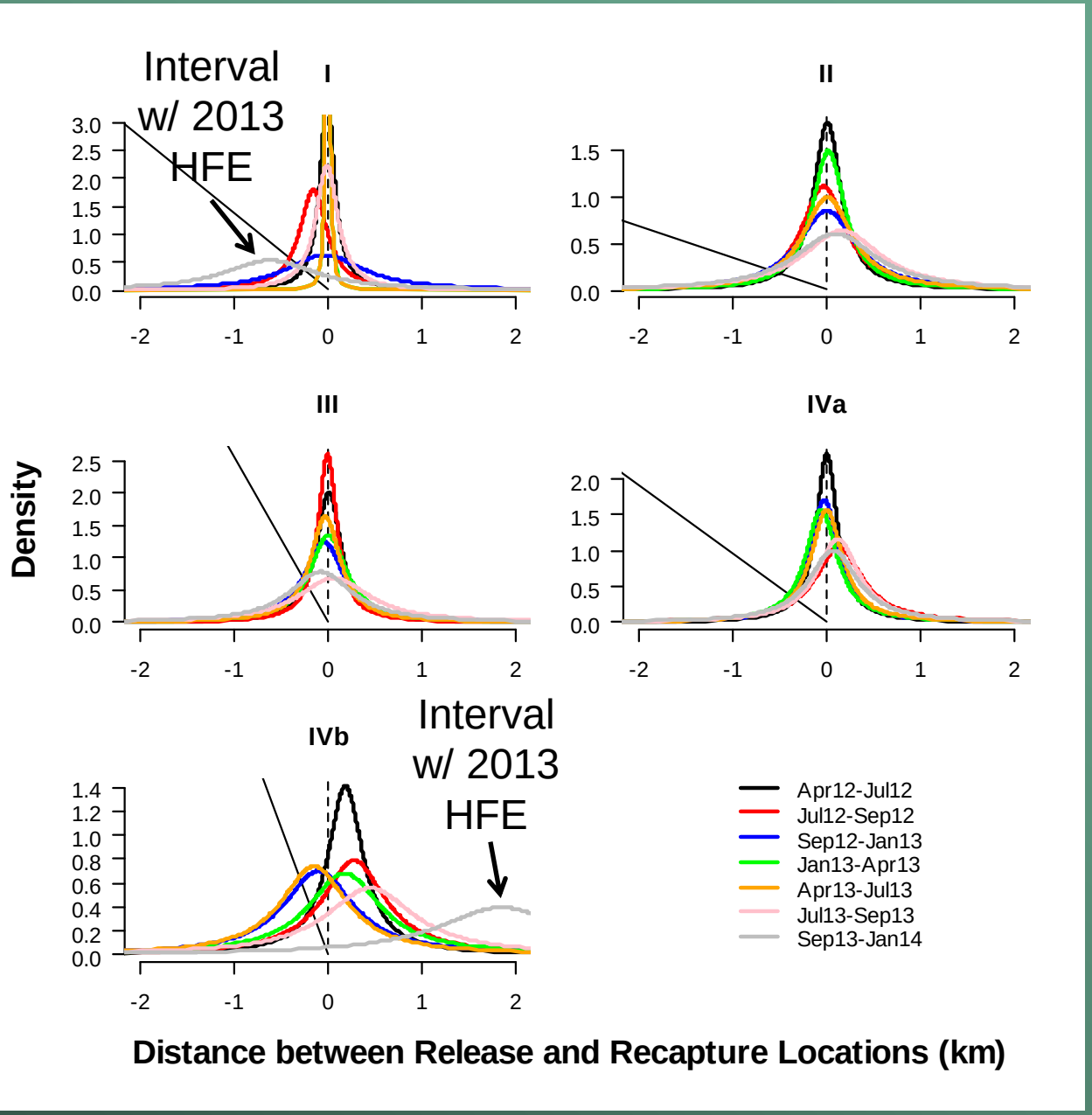
II – House Rock

III – Buck Farm

IVa – Upstream of LCR

IVb – Downstream of LCR

Most rainbow trout move little between marking and recapture



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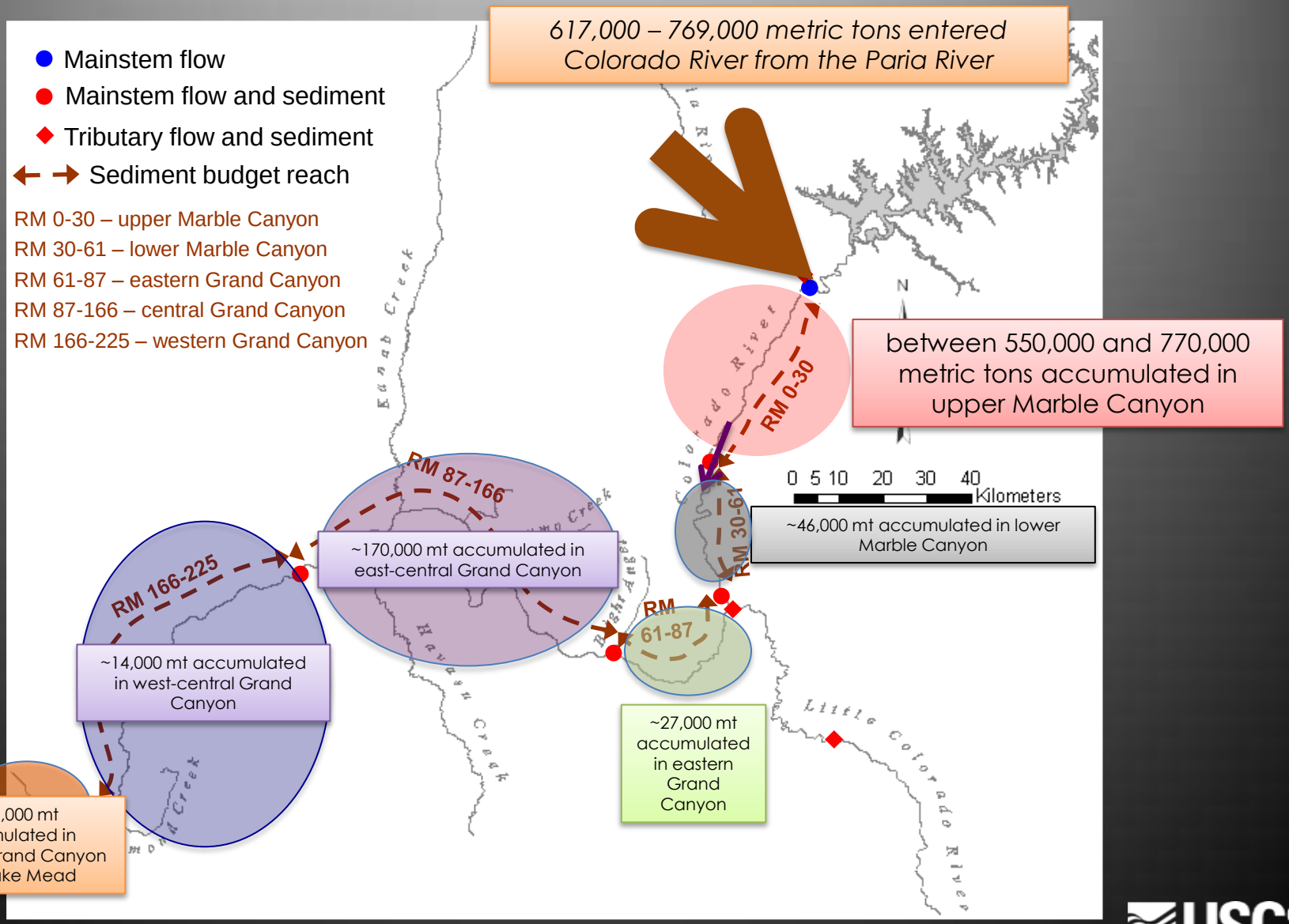
(Preliminary Data from Korman and Yard 2014. Do Not Cite.)

Between July 1 and November 17, 2012, …



(Preliminary Data. Do Not Cite.)

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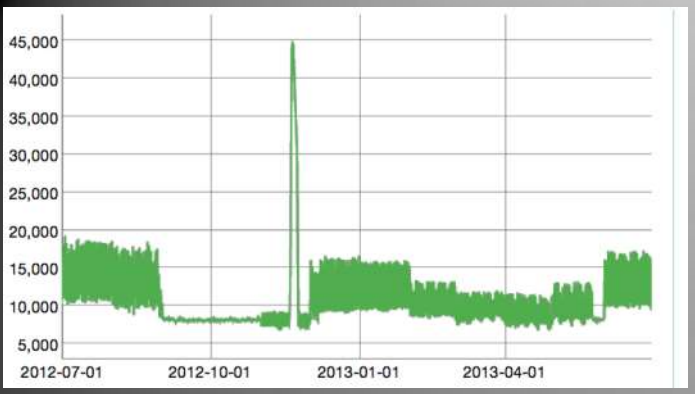
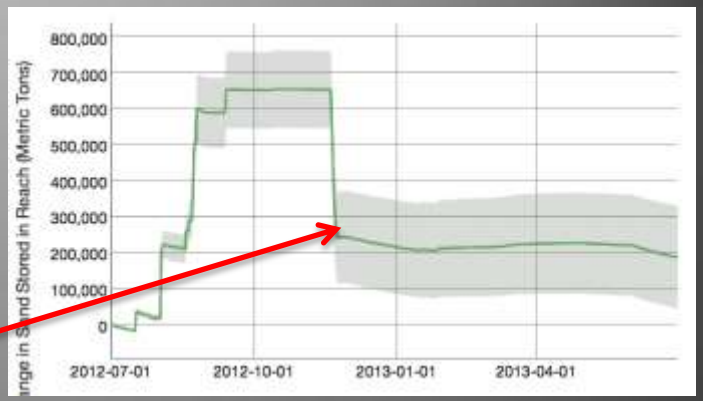
50,000
40,000
30,000
20,000
10,000
0
DISCHARGE, IN CUBIC FEET PER SECOND
-10
-5
0
5
10
15
20
TIME, IN DAYS RELATIVE TO DEPARTURE FROM NORMAL DAM OPERATIONS
1996
2004
2008
2012

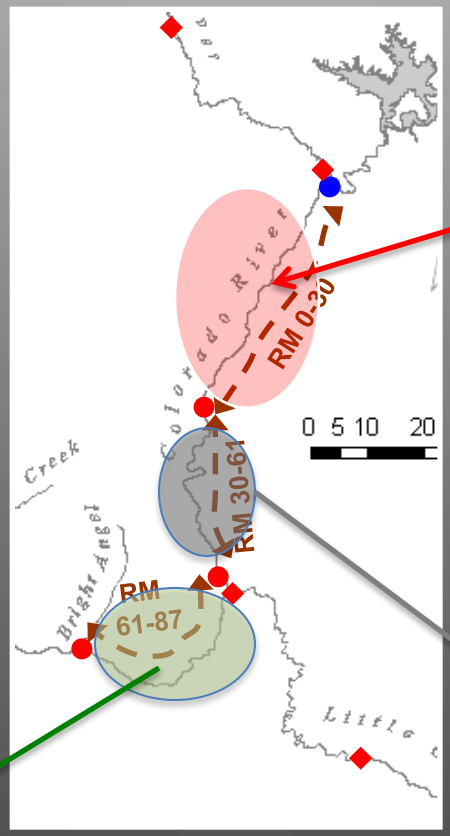
USGS



+ 190,000 mt

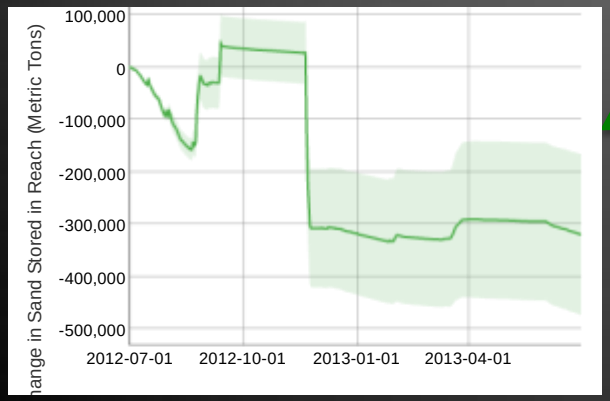


The 2012 HFE did not fully mobilize the sand available for redistribution

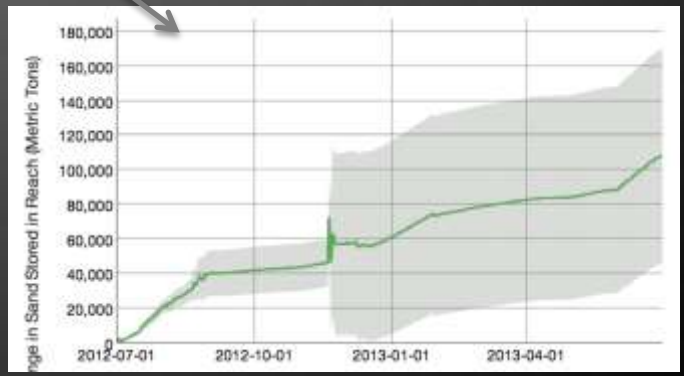


Sand mass balance
July 1, 2012, to June 30, 2013

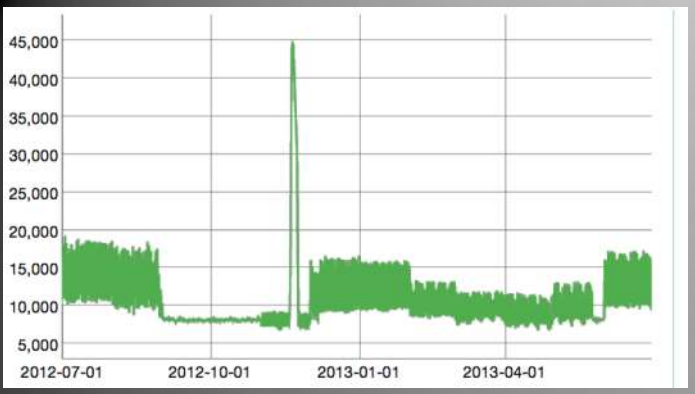
- 320,000 mt



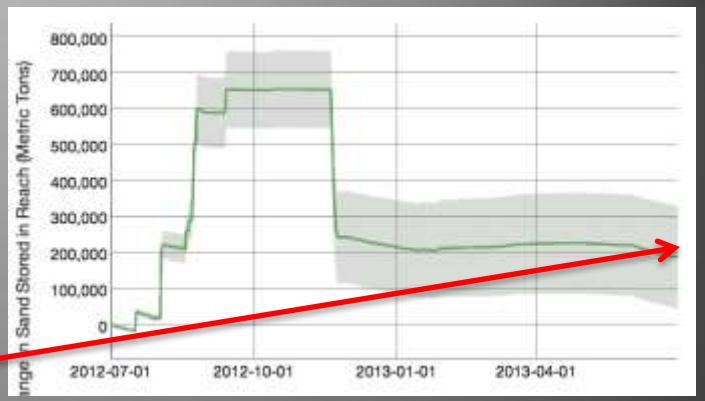
+ 110,000 mt

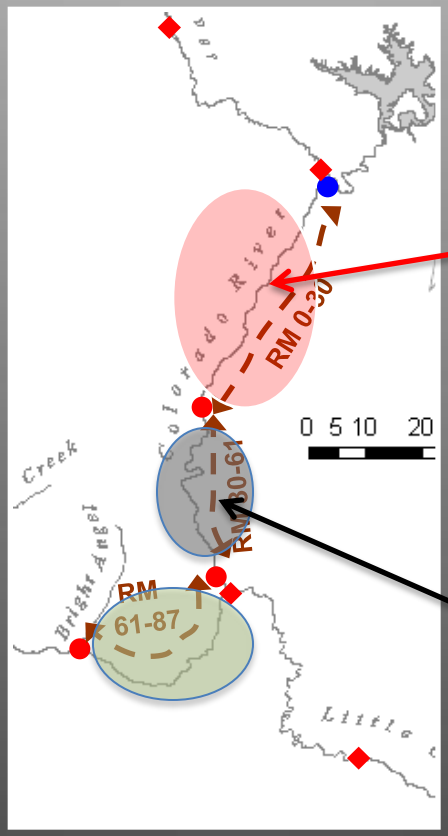


(Preliminary Data. Do Not Cite.)



+ 190,000 mt

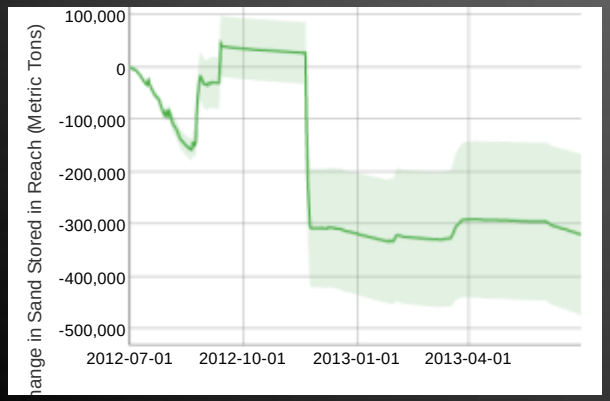




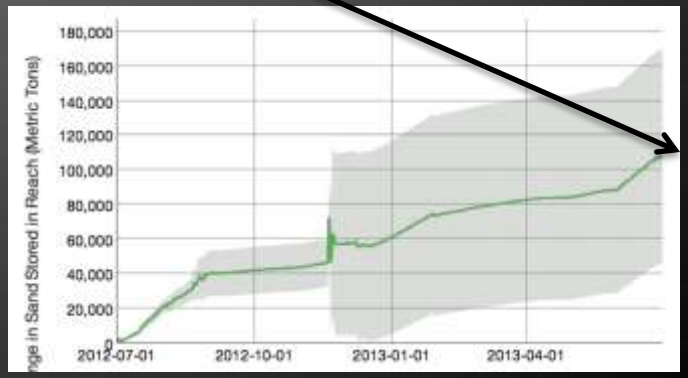
A small amount of the sand delivered during the 2012 fall season remained in Marble Canyon at the beginning of the 2013 accounting season

Sand mass balance
July 1, 2012, to June 30, 2013

- 320,000 mt



+ 110,000 mt



(Preliminary Data. Do Not Cite.)

Sandbar response to sediment-rich high flows

- November 2012 HFE
  - Images from remote cameras:
    - 52% (17 out of 33): noticeable gain
    - 39% (13 out of 33): no substantial change
    - 9% (3 out of 33): noticeable loss
  - Sandbar surveys: 54% of sites (27 out of 50) larger in Oct. 2013 than in Oct. 2011

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(Preliminary Data. Do Not Cite.)

RM 65 R (Carbon)

Newly deposited eddy bars are eroded by intervening flows

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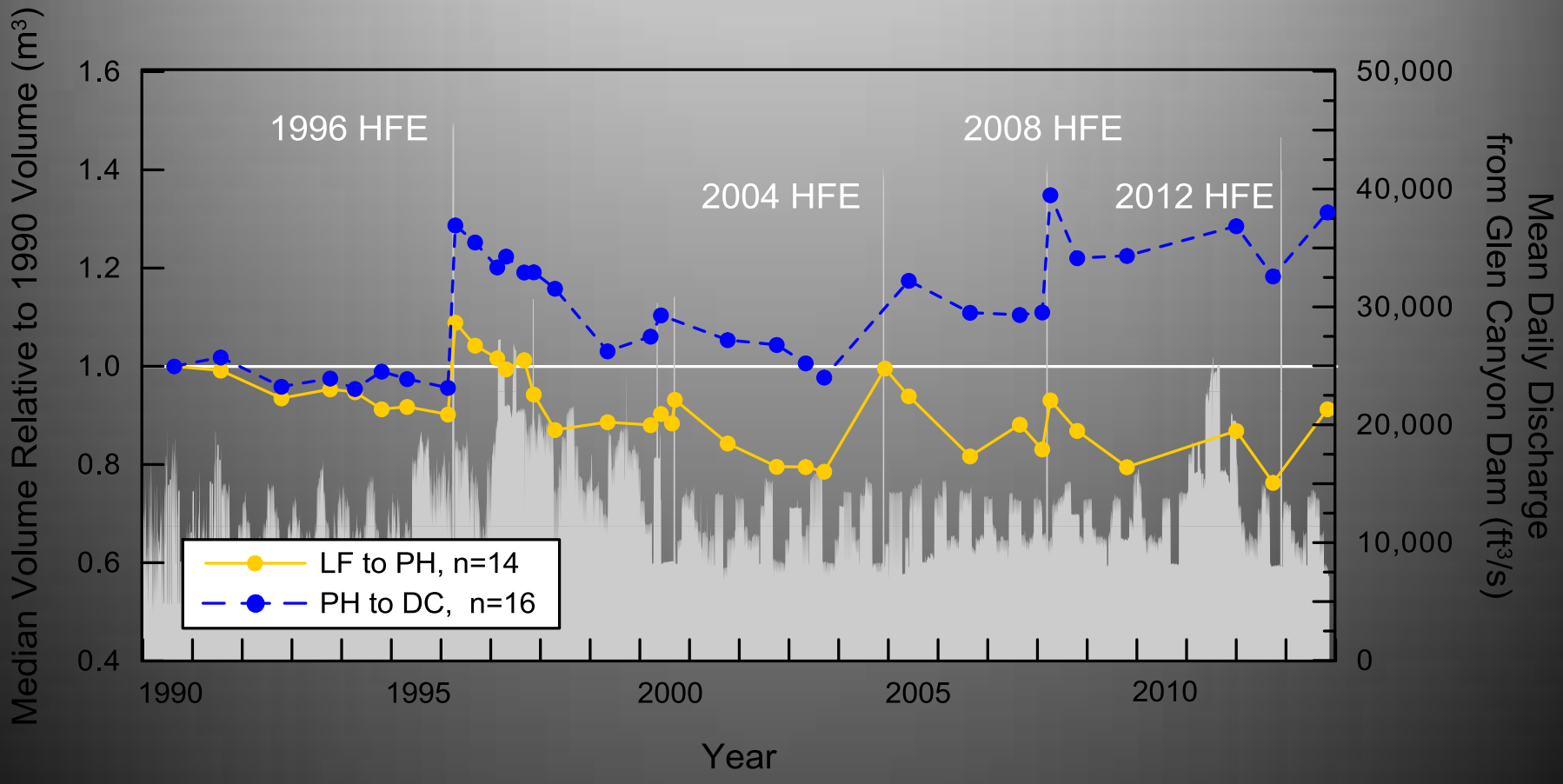
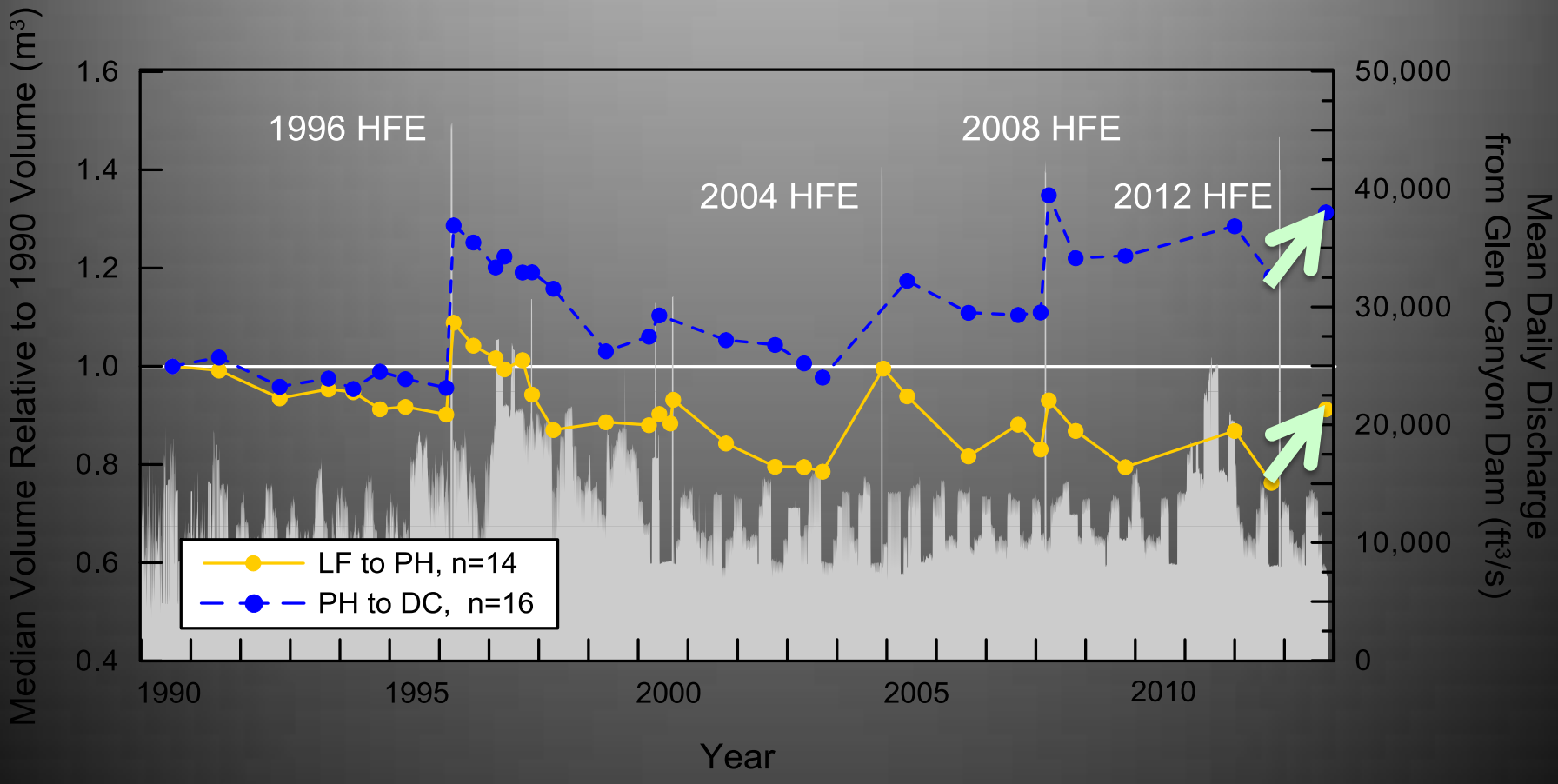
Long-term changes in sandbar volume in Marble and Grand Canyons, 1990-2013



(Preliminary Data. Do Not Cite.)

USGS

Net change in eddy sandbar volume was increased by the 2012 HFE



(Preliminary Data. Do Not Cite.)

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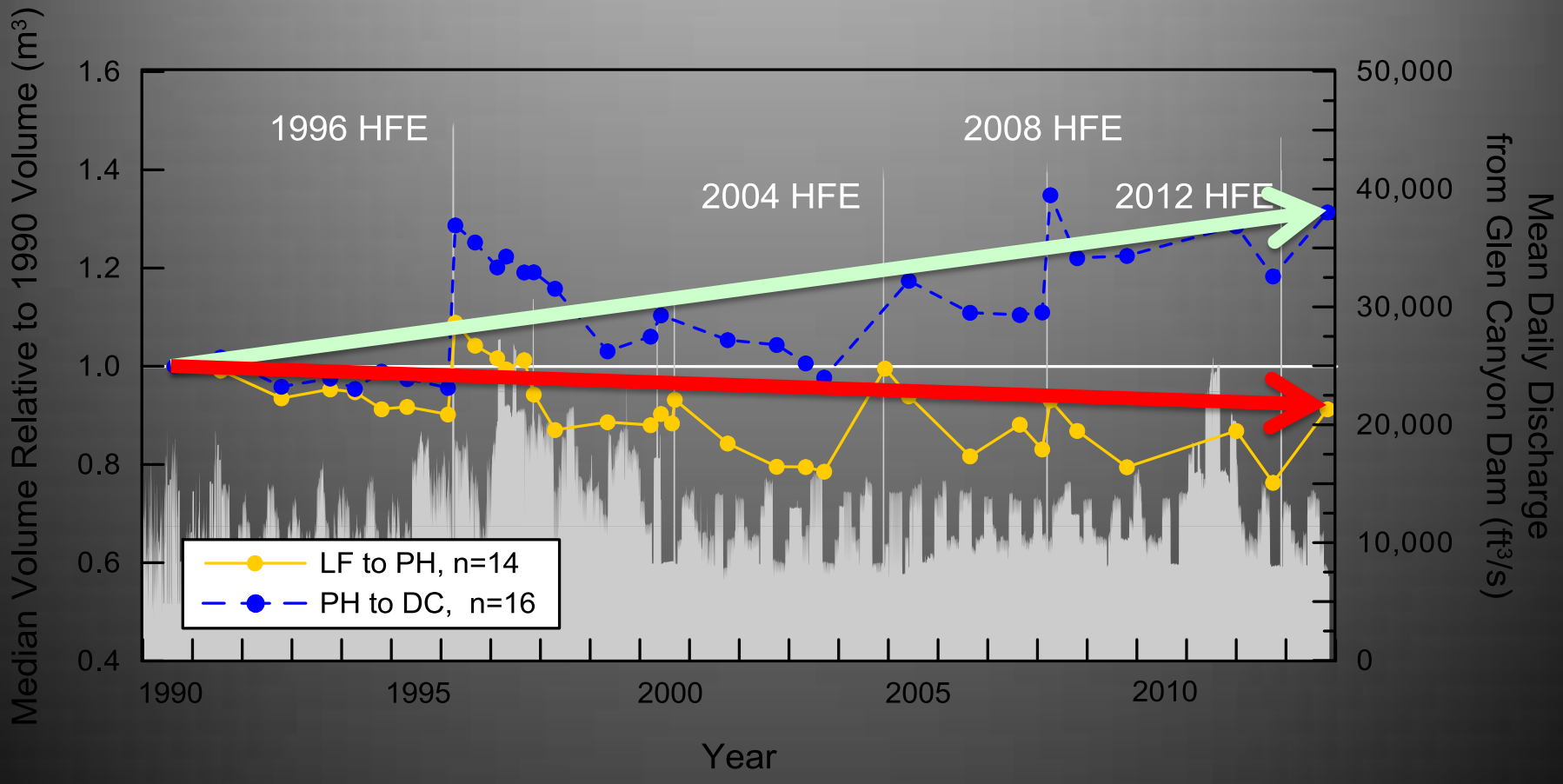
These changes improved the long-term trend



(Preliminary Data. Do Not Cite.)

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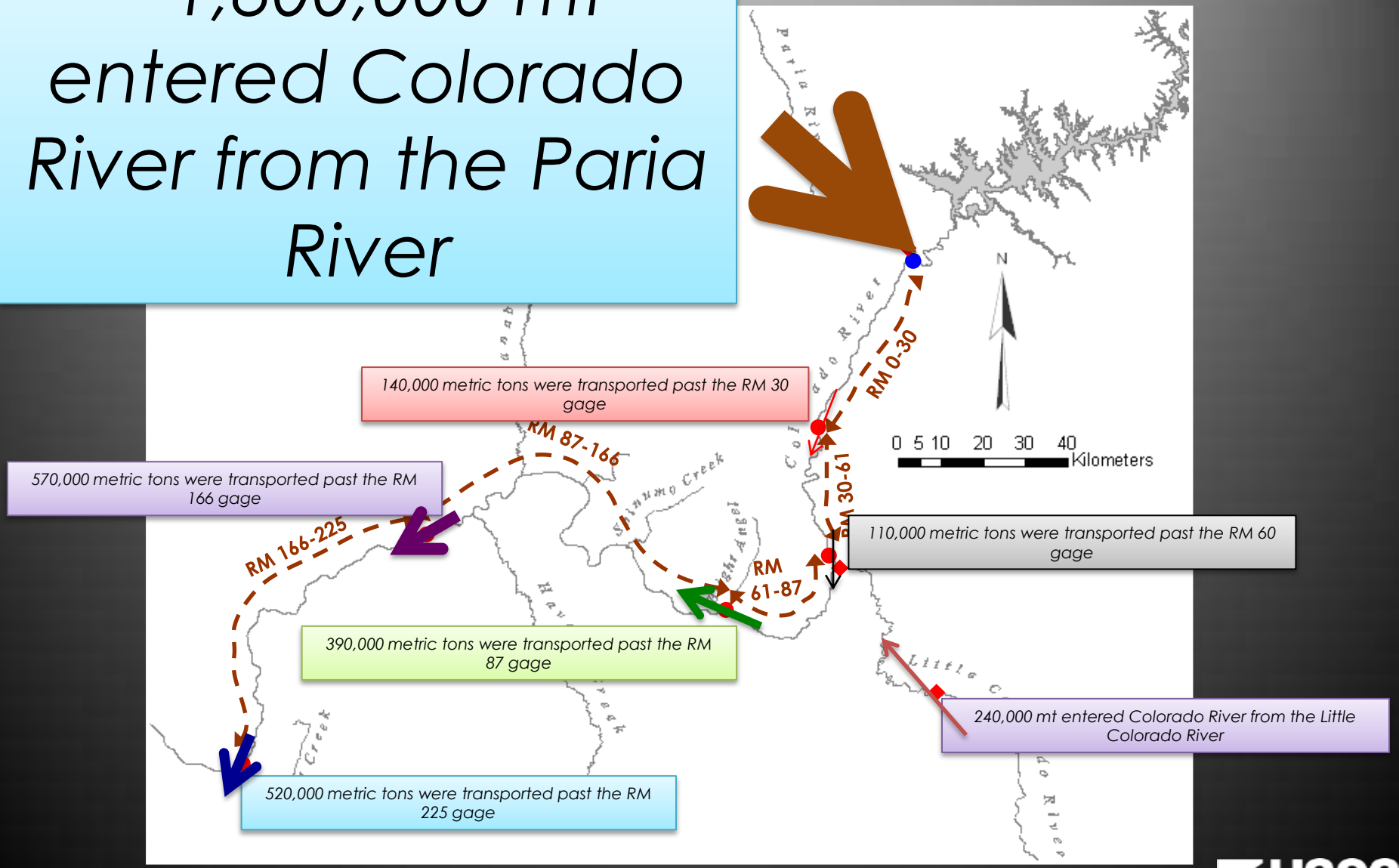
Between July 1 and November 10, 2013, …

~1,800,000 mt entered Colorado River from the Paria River



(Preliminary Data. Do Not Cite.)

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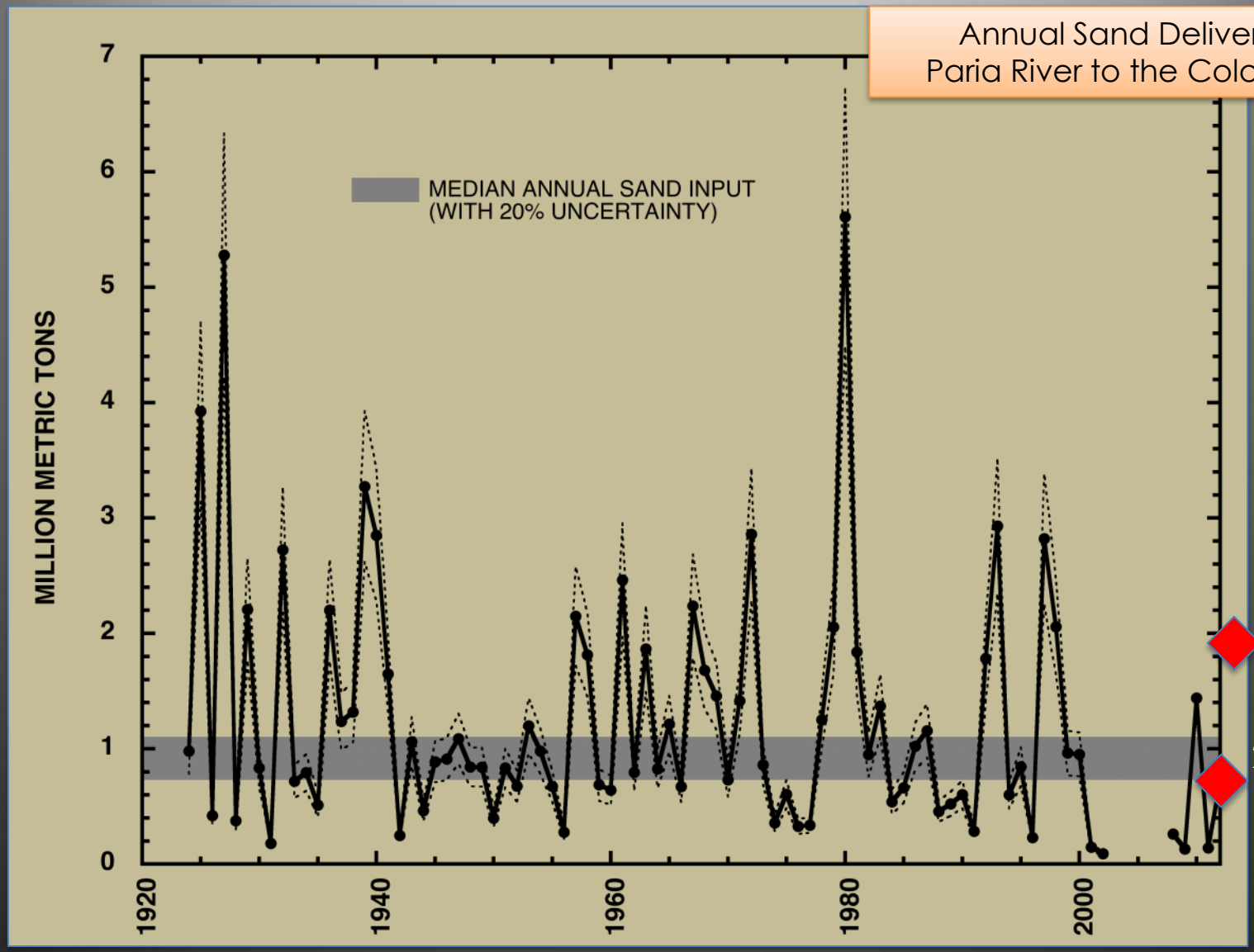
Annual Sand Delivery from the Paria River to the Colorado River



2012 was a typical year for sand inputs; 2013 was an unusually large input year

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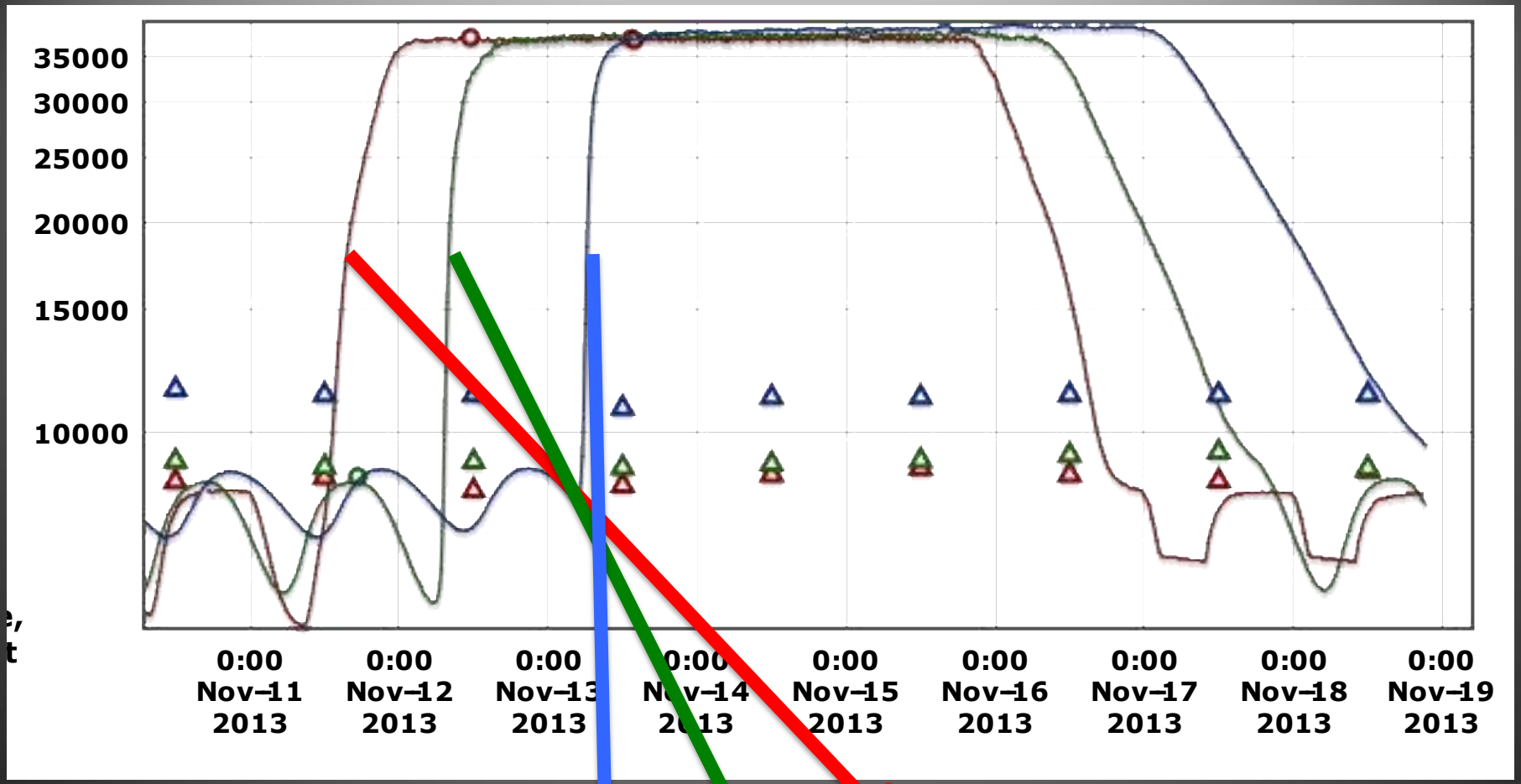

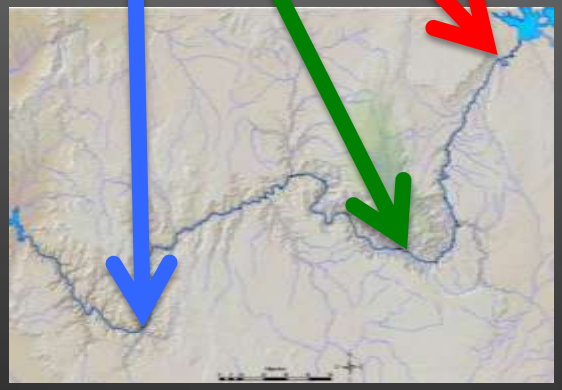

2013 Controlled Flood release

USGS

RM 9

RM 65 R (Carbon)

Sandbar response to sediment-rich high flows

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    - 18% (7 out of 40): noticeable loss

USGS

(Preliminary Data. Do Not Cite.)

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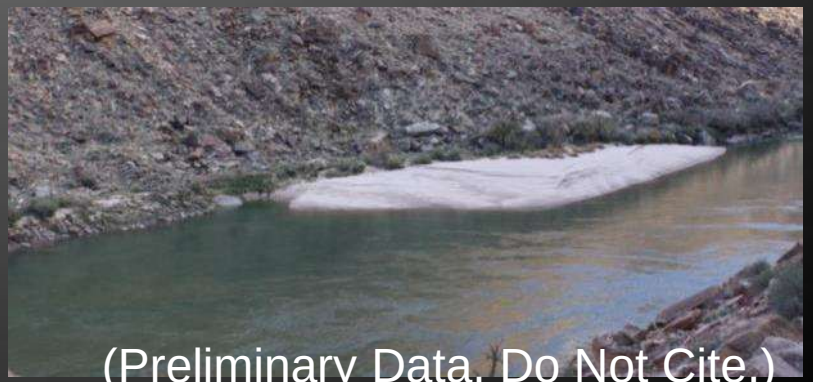

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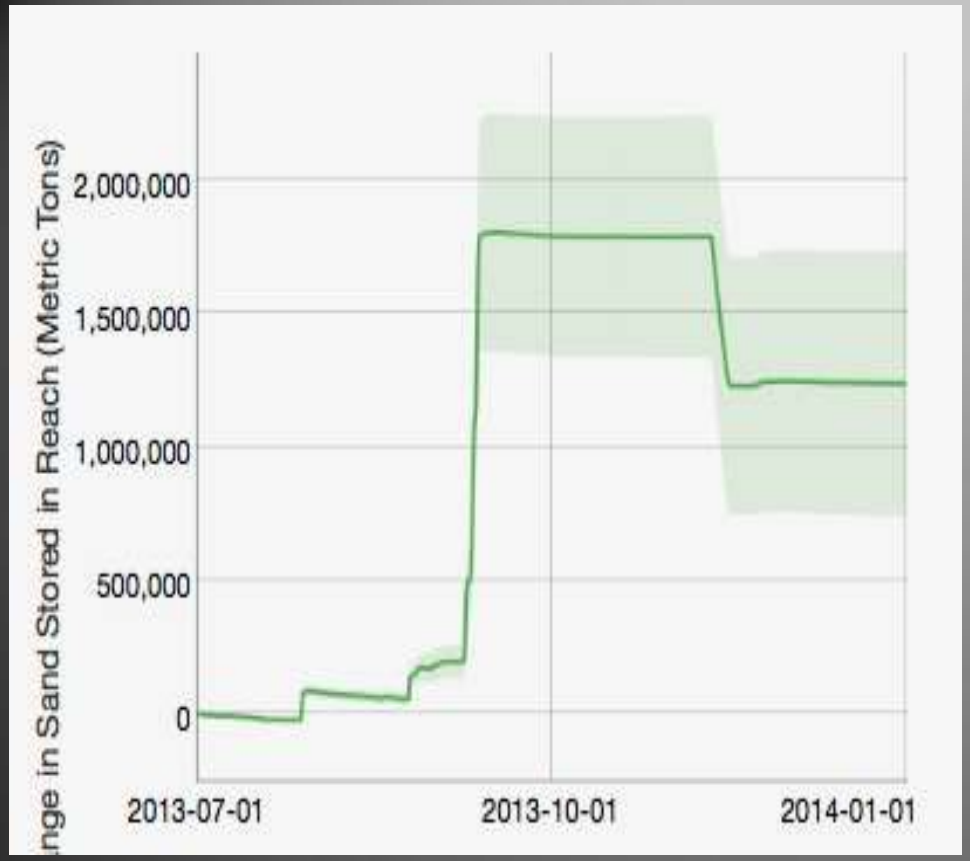
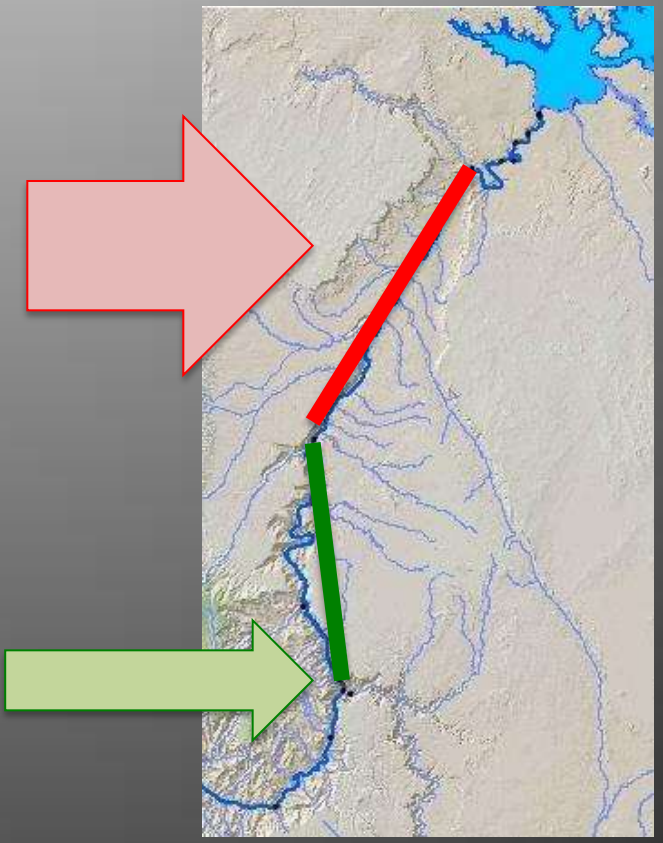
(Preliminary Data. Do Not Cite.)

The 2013 HFE mobilized a small part of the supply that was available for redistribution





Thus, the HFE duration needed to be longer to mobilize more of the sand supply in upper Marble Canyon

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(Preliminary Data. Do Not Cite.)

http://www.gcmrc.gov

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Welcome to the Grand Canyon Monitoring and Research Center

The U.S. Geological Survey's Grand Canyon Monitoring and Research Center (GCMRC) is the science provider for the Glen Canyon Dam Adaptive Management Program. In this role, the research center provides the public and decision makers with relevant scientific information about the status and trends of natural, cultural, and recreational resources found in those portions of Grand Canyon National Park and Glen Canyon National Recreation Area affected by Glen Canyon Dam operations.

Can't see Flash? Install Flash Player or use the HTML version.

Discharge, Sediment, and Water Quality Monitoring D

Photos: Sandbar Changes Caused by 2013 HFE

Photos: Sandbar Changes Caused by 2012 HFE

Publications

What We Do

Experimentation

Experiments are conducted to determine how releases from Glen Canyon Dam and other management actions can be used to meet key resource goals. The GCMRC is best known for a series of three high-flow experiments, or water releases designed to mimic natural seasonal flooding, conducted in 1996, 2004, and 2008, to learn if flows can be used to restore sandbars and wildlife habitat.

Monitoring

The GCMRC makes consistent, long-term repeated measurements using scientifically accepted protocols to measure status and trends of key resources, including native and nonnative fish, sandbars, water quality, aquatic food base, riparian vegetation, and cultural sites.

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Grand Canyon Reaches

Home > Discharge, Sediment and Water Quality > Grand Canyon Reaches

Reaches

Upper Marble Canyon
(Colorado River at Lees Ferry, AZ to Colorado River near river mile 30)

Lower Marble Canyon
(Colorado River near river mile 30 to Colorado River above Little Colorado River near Desert View, AZ)

Eastern Grand Canyon
(Colorado River above Little Colorado River near Desert View, AZ to Colorado River near Grand Canyon, AZ)

East Central Grand Canyon
(Colorado River near Grand Canyon, AZ to Colorado River above National Canyon near Supai, AZ)

West Central Grand Canyon
(Colorado River above National Canyon near Supai, AZ to Colorado River above Diamond Creek near Peach Springs, AZ)

Western Grand Canyon and the Lake Mead Delta
(Colorado River above Diamond Creek near Peach Springs, AZ to Pearce Ferry near river mile 280)

Style: Graphical Version | Text Version

USGS

Upper Marble Canyon

Home > Discharge, Sediment and Water Quality > Grand Canyon Reaches > 09380000 to 09999930

Adjustable Bedload

Bedload Coefficient for River Sand Loads

0% — 5% — 10%

Adjustable Uncertainty

Magnitude of Possible Persistent Bias in Measured River Sand Loads

0% — 5% — 25%

Magnitude of Possible Persistent Bias in Measured Major Tributary Sand Loads

0% — 10% — 25%

Uncertainty for Major Tributary Sand Loads 20% after 2013-05-25
Uncertainty for Major Tributary Sand Loads 40% after 2013-09-12

Magnitude of Possible Persistent Bias in Lesser Tributary Sand Loads

0% — 50% — 50%

Restore Defaults

Date Range

Records exist from 2002-08-11 through 2014-04-01

Start 2013-07-01

End 2014-04-01

Build Graph

Date

Change in Sand Mass

- Zero Bias Value: 950,000 Metric Tons
- Upper Uncertainty Bound: 1,500,000 Metric Tons
- Lower Uncertainty Bound: 390,000 Metric Tons

Location

Additional Information

Data provided by:

- USGS Grand Canyon Monitoring and Research Center
- USGS Arizona Water Science Center

Data Status

- End of complete lab-processed suspended-sediment record for Paria River: 2013-08-25
- Most recent suspended-sediment sample from Paria River used in calculations: 2013-09-12

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Firefox | Sandbar deposition following the 2013 h... | Back | Forward | www.gcmrc.gov/gis/sandbartour2013/index.html# | Reload | Stop | Bookmarks | Home | Google | Downloads

Sandbar deposition following the 2013 high flow on the Colorado River in Grand Canyon

A story map

The following images show changes at selected sandbar monitoring sites along the Colorado River in Marble Canyon and Grand Canyon.

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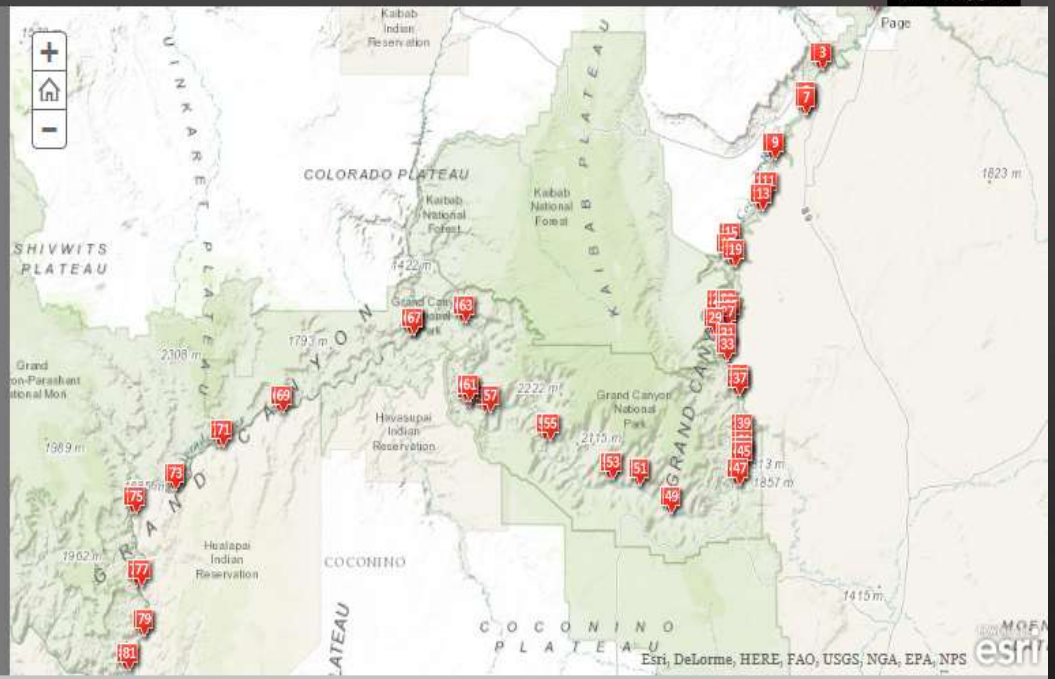

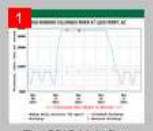
1 The 2013 high-flow experimental release from


2 Cathedral (RM 2.5L), before 2013 high flow


3 Cathedral (RM 2.5L), after 2013 high flow


4 Jackass (RM 8.1L), before 2013 high flow


5 Jackass (RM 8.1L), after 2013 high flow


6 9-Mile (RM 8.9L), before 2013 high flow


7 9-Mile (RM 8.9L), after 2013 high flow


8 Hot Na Na (RM 16.6L), before 2013 high flow


9 Hot Na Na (RM 16.6L), after 2013 high flow


10 22-Mile (RM 22R), before 2013 high flow


11 22

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Questions?
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