

**Glen Canyon Dam Technical Work Group**  
**Agenda Item Information**  
**October 28-29, 2014**

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Agenda Item

Planning for a Fall 2014 High Flow Experiment

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Action Requested

Information item only

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Presenter

Glen Knowles, Chief, Adaptive Management Group, Environmental Resources Division, Upper Colorado Region, Bureau of Reclamation (Reclamation)

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Previous Action Taken

N/A

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Relevant Science

The Environmental Assessment and Finding of No Significant Impact for Development and Implementation of a Protocol for High-Flow Experimental Releases from Glen Canyon Dam, Arizona, 2011 through 2020 can be found here: <http://www.usbr.gov/uc/envdocs/index.html>

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Background Information

The Finding of No Significant Impact for the Development and Implementation of a Protocol for High-Flow Experimental Releases from Glen Canyon Dam, Arizona, 2011 through 2020 (HFE Protocol) was completed in May of 2012 along with a directive from the Secretary of the Interior on the implementation of the HFE Protocol and Non-native Fish Control in Grand Canyon. The directive and later guidance from the Assistant Secretary of the Interior for Water and Science, created the DOI Glen Canyon Leadership Team which is charged with determining when HFEs will be implemented under the HFE Protocol, and an HFE Technical Team that evaluates resource conditions and provides a recommendation to the DOI Glen Canyon Leadership Team on implementation of individual HFEs.

As of October 22, 2004, GCMRC estimated that 1.95 million metric tons of sand had entered the Colorado River from the Paria River since July 1, 2014. Based on that amount, GCMRC recommends conducting the largest HFE allowable under the HFE Protocol. Reclamation estimates that 7 of 6 units will be available at Glen Canyon Dam to conduct an HFE in November, and that a maximum of 37,500 cfs release will be possible given the outage of one unit and other factors such as the need to maintain 40 MW of system regulation. If a fall 2014 HFE were to occur, the HFE would be of 37,500 cfs magnitude for 96 hours, and would occur from November 10-15, 2014. The planning process and related materials will be reviewed in the presentation.

# RECLAMATION

*Managing Water in the West*

## Fall 2014 HFE Planning

Glen Knowles  
Bureau of Reclamation

Technical Work Group  
October 17, 2014



U.S. Department of the Interior  
Bureau of Reclamation

# HFE Decision Making Process

## 1. Planning and Budgeting Component

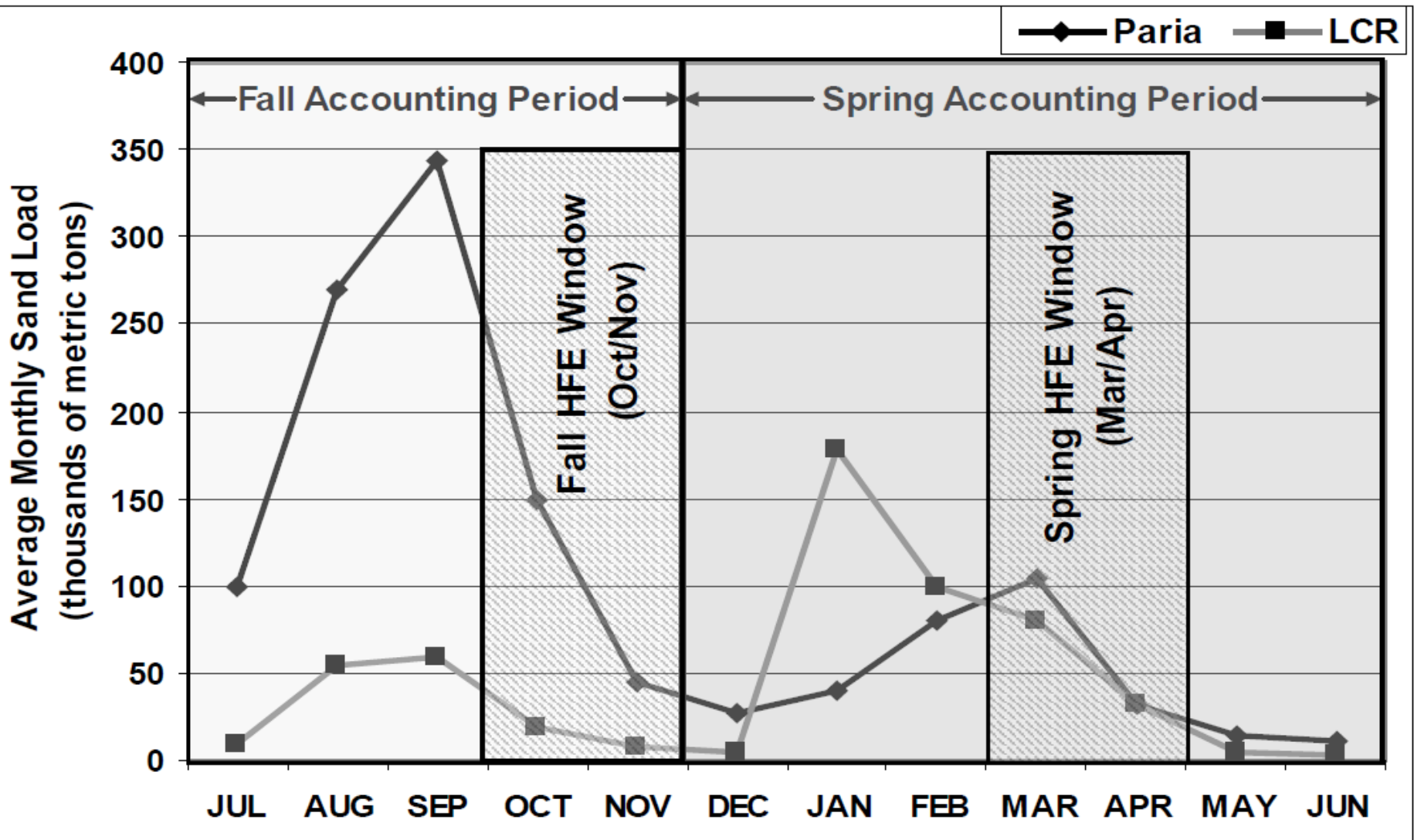
- Annual resource status assessment
  - Annual Agency Reporting
  - GCDAMP Budget and Work Plan Process

## 2. Modeling Component

## 3. Decision and Implementation Component

- Review Modeling Component
- Review Status of Resources
- Consultation with agencies and tribes, AMWG and TWG input
- Staff Recommendation/DOI GCD Leadership Team Recommendation

# Modeling Component



# HFE Protocol Parameters

## Possible Timing

- March-April and October-November through 2020
- Spring HFEs will not be considered until 2015

## Duration range

- 1 hr – 96 hrs (at full magnitude)
- 1 ½ days – 6 ½ days (including ramping)

## Magnitude range

- 31,500 cfs – 45,000 cfs (depends on maintenance)
- 2014 projected available release for November is 37,500 cfs (7 of 8 units available)

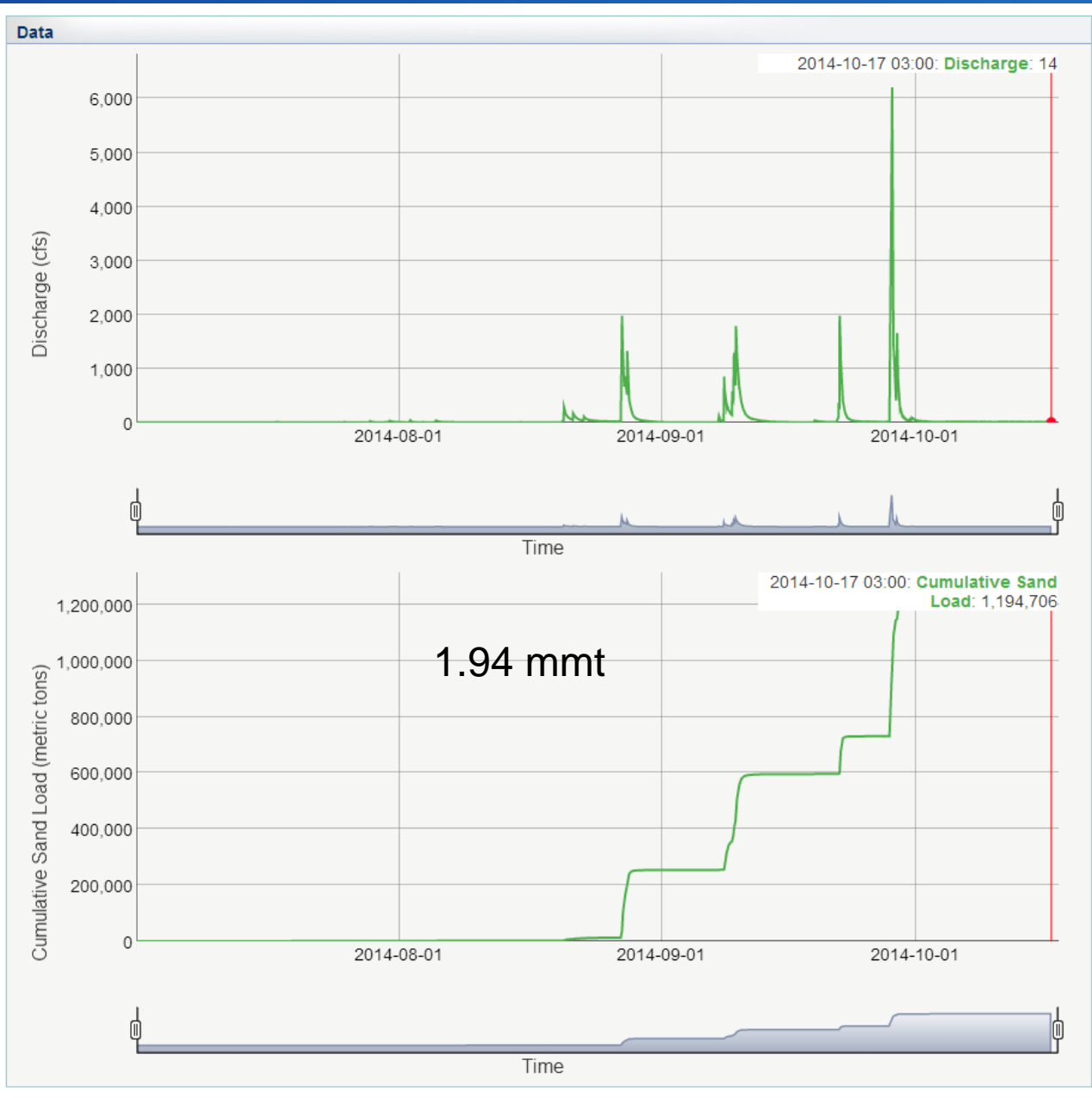
## Ramping rates

- Ramping rates are defined by 1996 ROD and 1997 Glen Canyon Dam Operating Criteria (62 FR 9447, 4,000 cfs up and 1,500 cfs down)

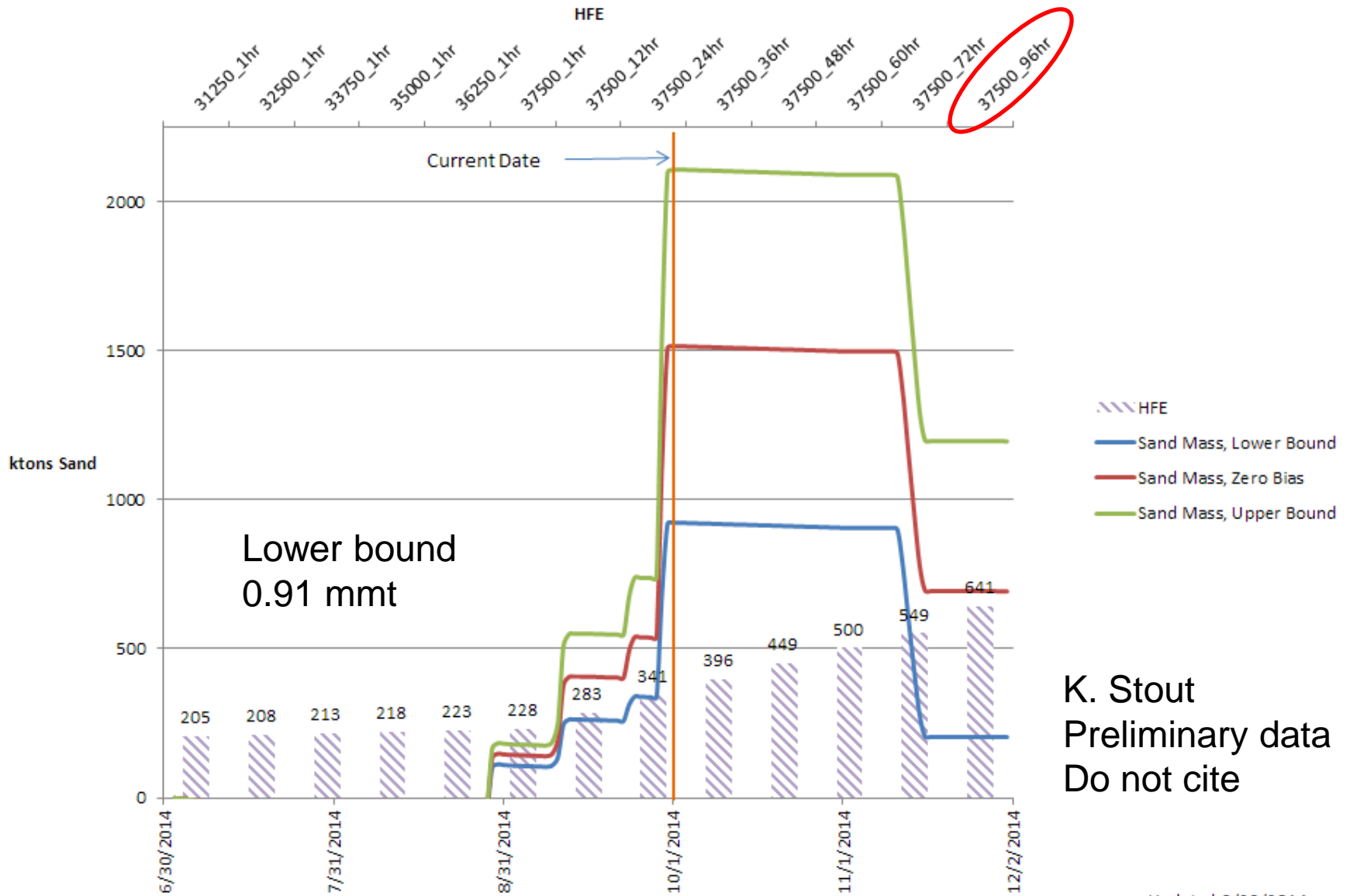
Current conditions from the GCMRC web page as of Oct. 17

Paria River at Lees Ferry discharge since July 1

Paria River at Lees Ferry cumulative sand load since July 1



# Sand Mass at Marble Canyon vs. 37,500 cfs HFE Load requirements

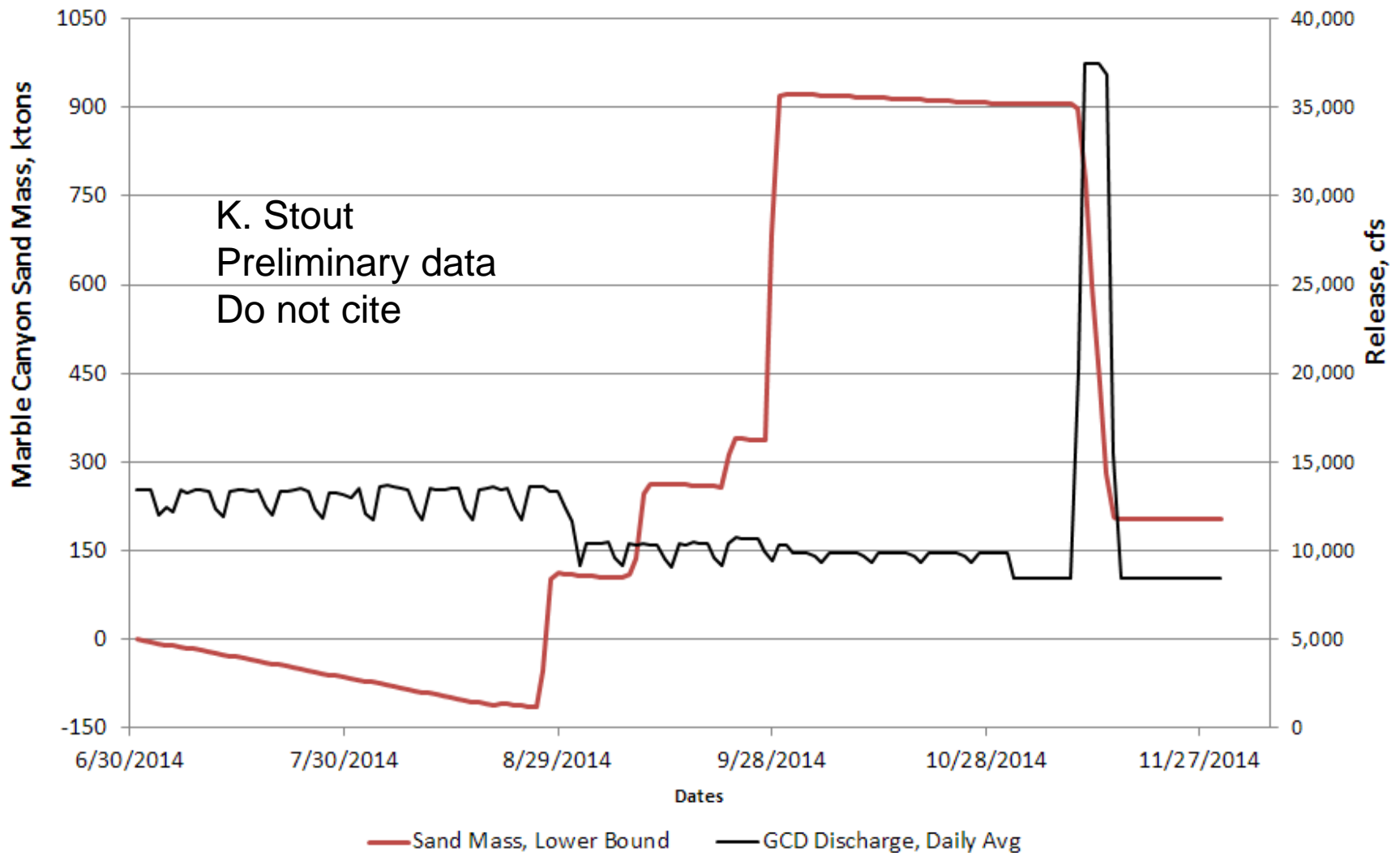


Lower bound  
0.91 mmt

K. Stout  
Preliminary data  
Do not cite

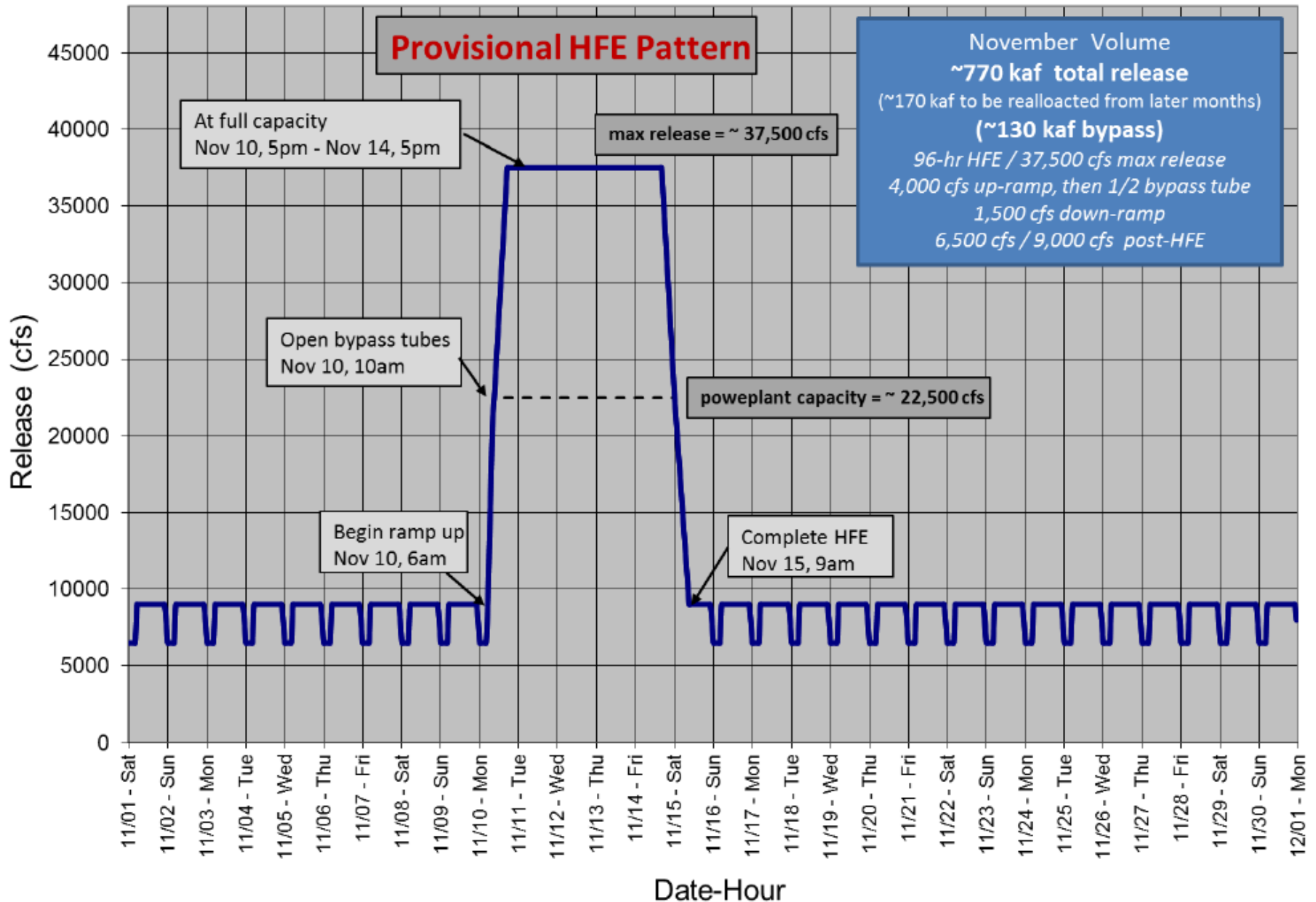
Updated 9/29/2014

Sand Budget Model Results, 2014 Jul - Nov  
Zero Future Paria Sand Input (10/01 - 11/30)  
96 hour 37500 cfs HFE





# Glen Canyon Dam Possible HFE Release Pattern



--- Powerplant capacity

— 96 hr

--- Powerplant capacity

— 96 hr

# Possible Monthly Release Volumes

Water Year 2015

2015 Most Probable (9.0 maf)							
	Typical MLFF Pattern	Possible 9.0 Hydrograph presented at AMWG	<i>Possible monthlies after maintenance considerations and discussions with Western (still maintaining 2015 Hydrograph targets)</i>				
			9.0 maf		8.23 maf		
			9.0 maf	96 hr HFE 9.0 maf	8.23 maf	96 hr HFE 8.23 maf	
October	600	600	600	600	600	600	600
November	600	600	600	770	600	770	770
December	800	900	950	865	950	865	865
January	800	900	950	865	950	865	865
February	650	700	600	600	600	600	600
March	650	650	650	650	600	600	600
April	600	600	600	600	565	530	530
May	650	700	700	700	565	525	525
June	800	800	800	800	600	600	600
July	1000	1050	1050	1050	800	875	875
August	1050	800	800	800	800	800	800
September	800	700	700	700	600	600	600
	9000	9000	9000	9000	8230	8230	8230

Monthly release patterns are provisional and subject to change.

# Resource Status Assessment

## *Sediment Resources*

In-channel sediment storage  
Sandbar campable area  
High-elevation sand deposits

## *Cultural Resources*

Archaeological site condition and stability  
Access to archaeological sites by tribes

## *Biological Resources*

Aquatic food base  
Lees Ferry trout population  
Lees Ferry fishery recreation experience quality  
Endangered humpback chub and other fish abundance  
Riparian vegetation

## *Hydropower and water delivery*

Water quality  
Water delivery  
Dam maintenance  
Hydropower production and marketable capacity

# Cultural Resources

- HFE-caused erosion is a consideration, most sites already mitigated.
- The HFE MOA requires reporting and consultation after HFEs
- No impacts to sites were identified from the 2012 HFE, no reports of issues with access to sites
- The MOA for the HFE Protocol requires notification to all the consulting parties at least 30 days in advance of a HFE and will consult with tribes to resolve any issues
- A 30-day notification letter notifying MOA signatories of a possible HFE in November



Reclamation met with MOA signatories Feb. 12, 2014 to review effects of 2013 HFE and found none

# Hydropower/Socioeconomic Impacts

- HFEs impact hydropower production:
  - Water released during an HFE counts against the annual release and is not available to be programmed in peaking releases during high demand months (HFE windows of Mar/Apr and Oct/Nov are low-demand shoulder months).
  - 30-40% of HFE releases bypass the power plant.
  - Lake Powell is lowered, reducing hydrologic head.



**Western Area Power Administration estimates annual hydropower impacts of \$1.777M from Fall 2014 HFE**

RM 22 R – Returned to pre-HFE size by February (about same response as 2012)



# RM 51 L – Still larger in May 2014 (not a “gainer” for 2012 HFE)



# Sandbar Response to 2013 HFE based on Analysis of Images from Remote Cameras

- **Response immediately after 2013 HFE**
  - Substantial Gain (deposition): 21 sandbars (50% of sites)
  - No substantial change: 16 sandbars (38% of sites)
  - Substantial Loss (erosion): 5 sandbars (12% of sites)
- **2013 HFE compared to 2012 HFE**
  - Sandbar larger after 2013 HFE: 9 sandbars (27% of sites)
  - Sandbar larger after 2012 HFE : 2 sandbars (6% of sites)
  - About the same: 22 sandbars (67% of sites)

*Response to 2013 HFE similar to previous HFEs: substantial deposition followed by erosion of about half the new deposits with 6 months*

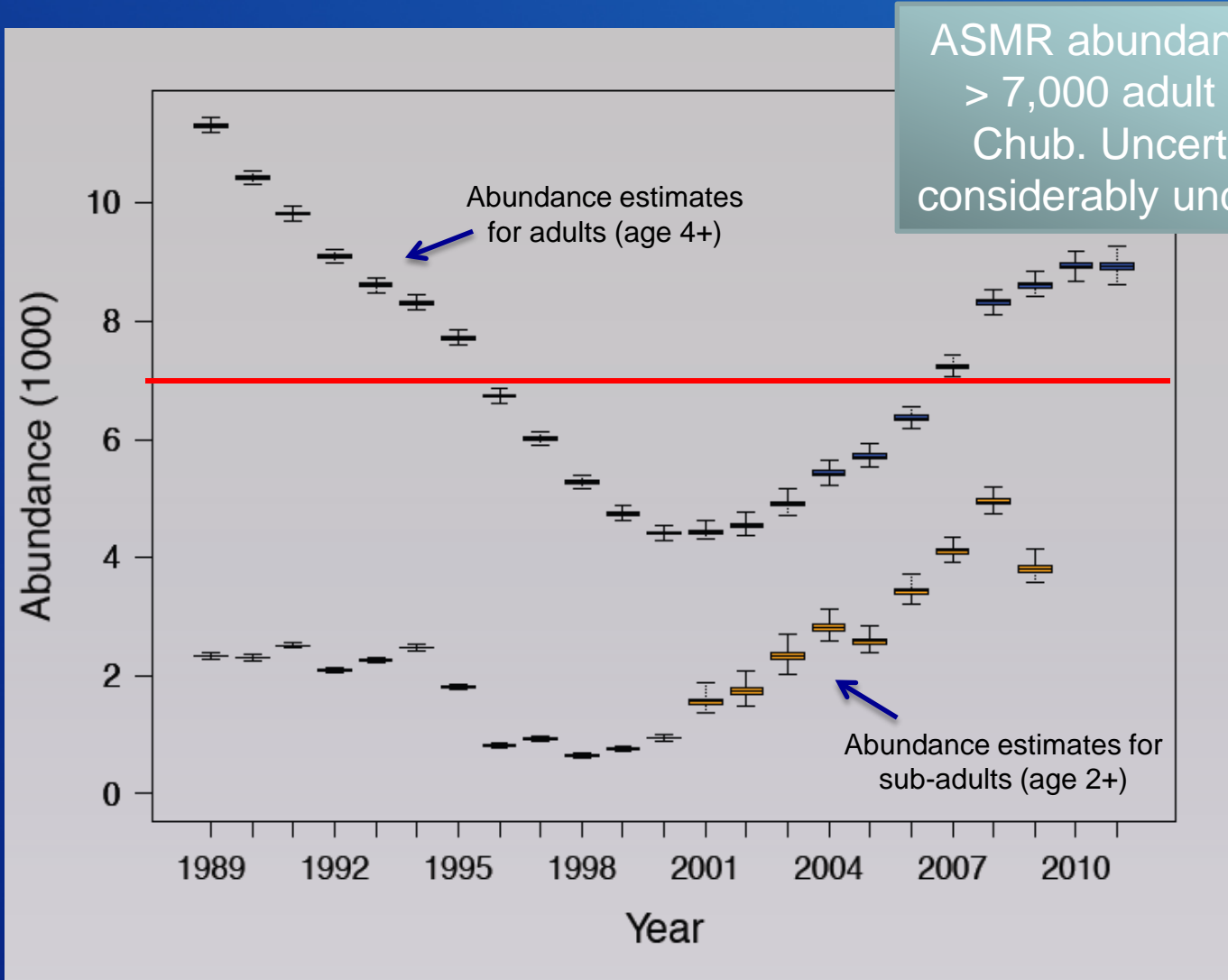
*Preliminary data*



RECLAMATION

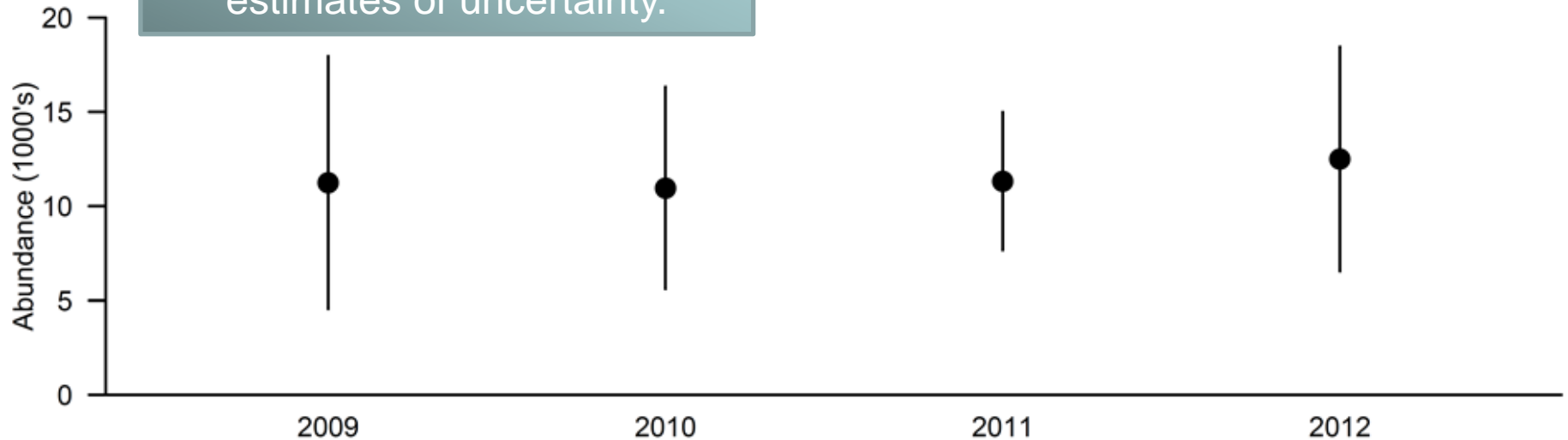


# Adult and Sub-Adult Humpback Chub Abundance Estimates



# Adult Humpback Chub Abundance Estimates: Multistate Population Model

Suggests adult Humpback Chub abundance stable from 2009 – 2012. Confidence intervals provide reasonable estimates of uncertainty.

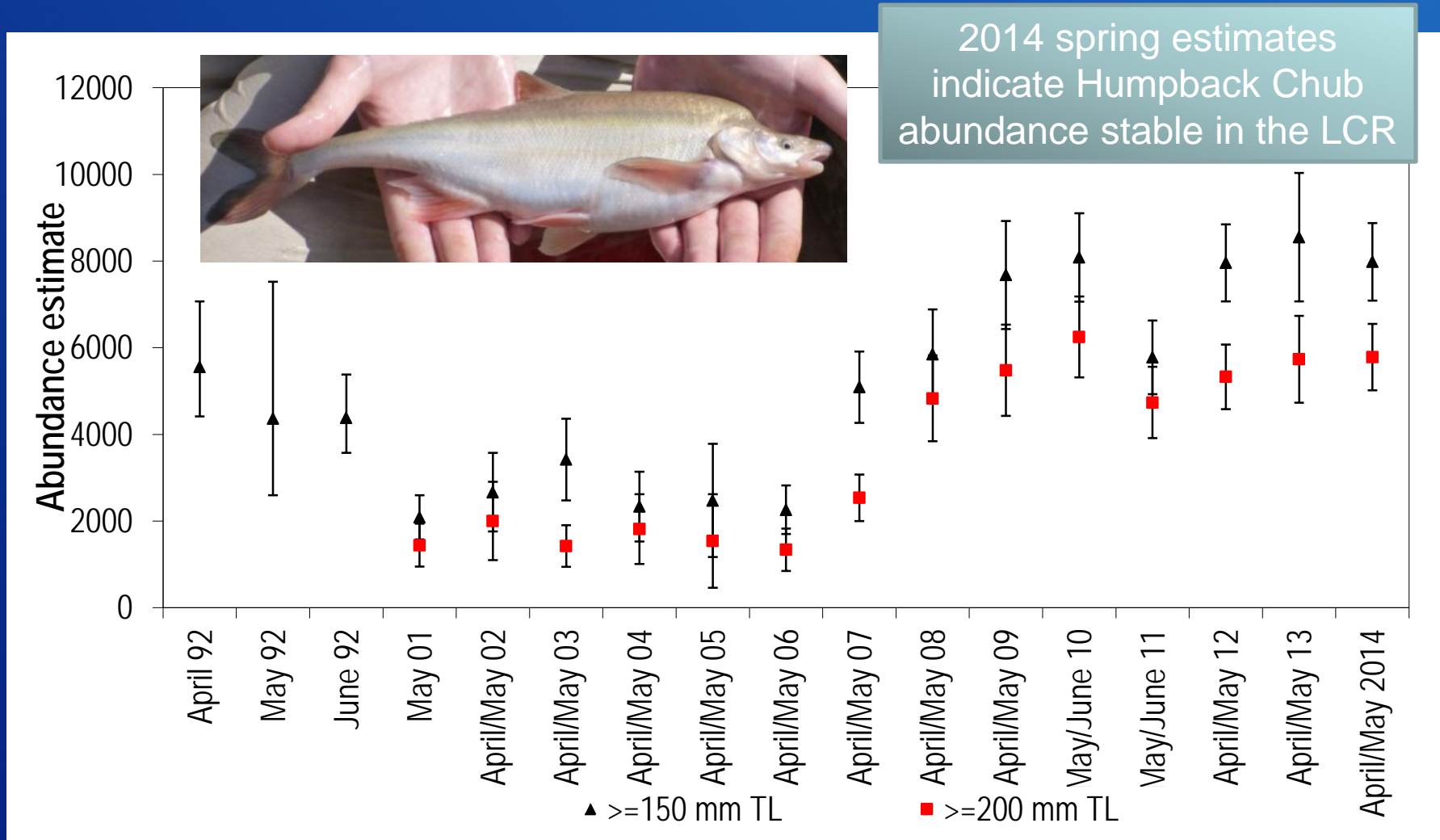


(Yackulic et al. 2014)



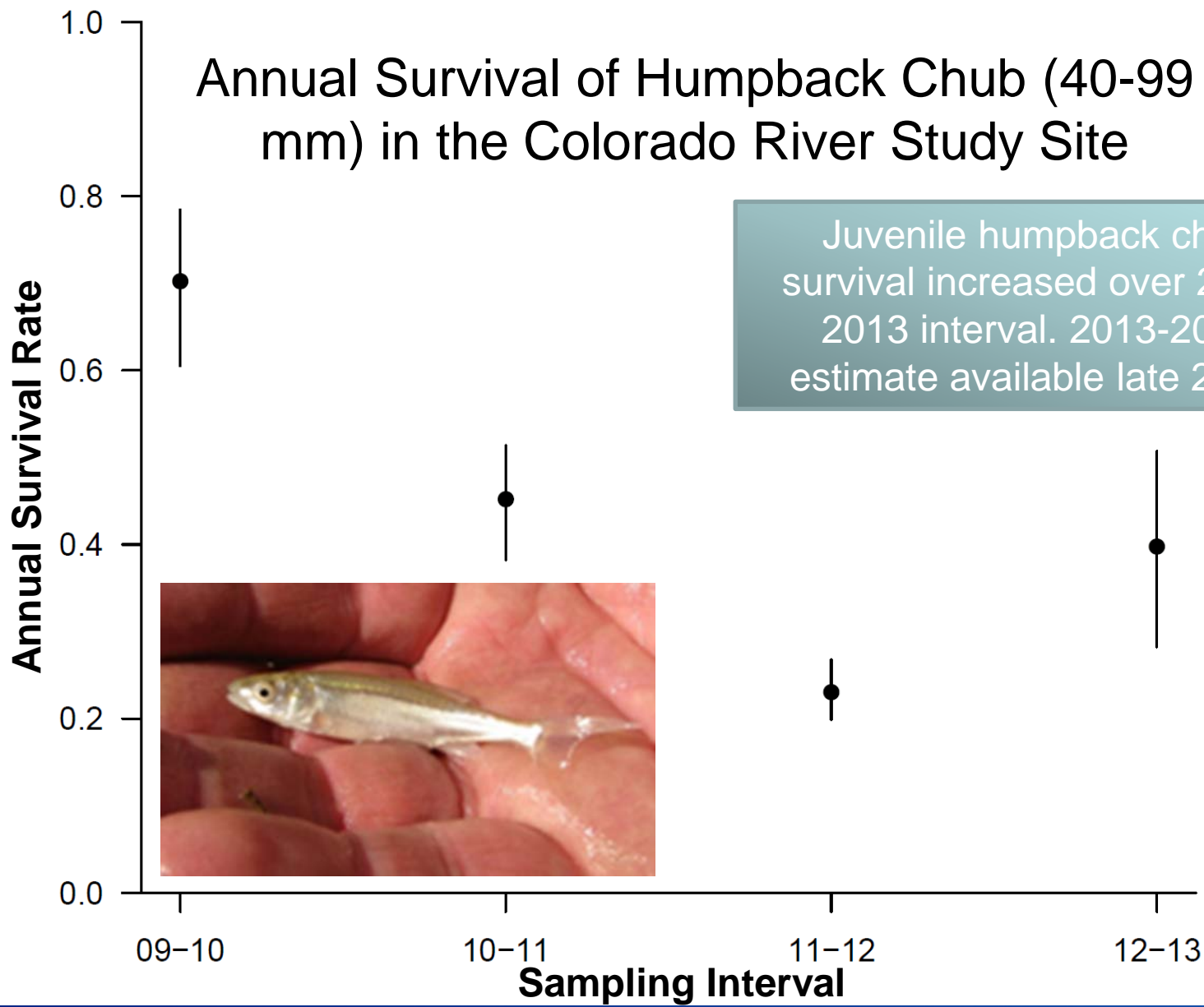
RECLAMATION

# Annual spring abundances of humpback chub $\geq 150$ mm and $\geq 200$ mm in lower 13.6 km of LCR



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

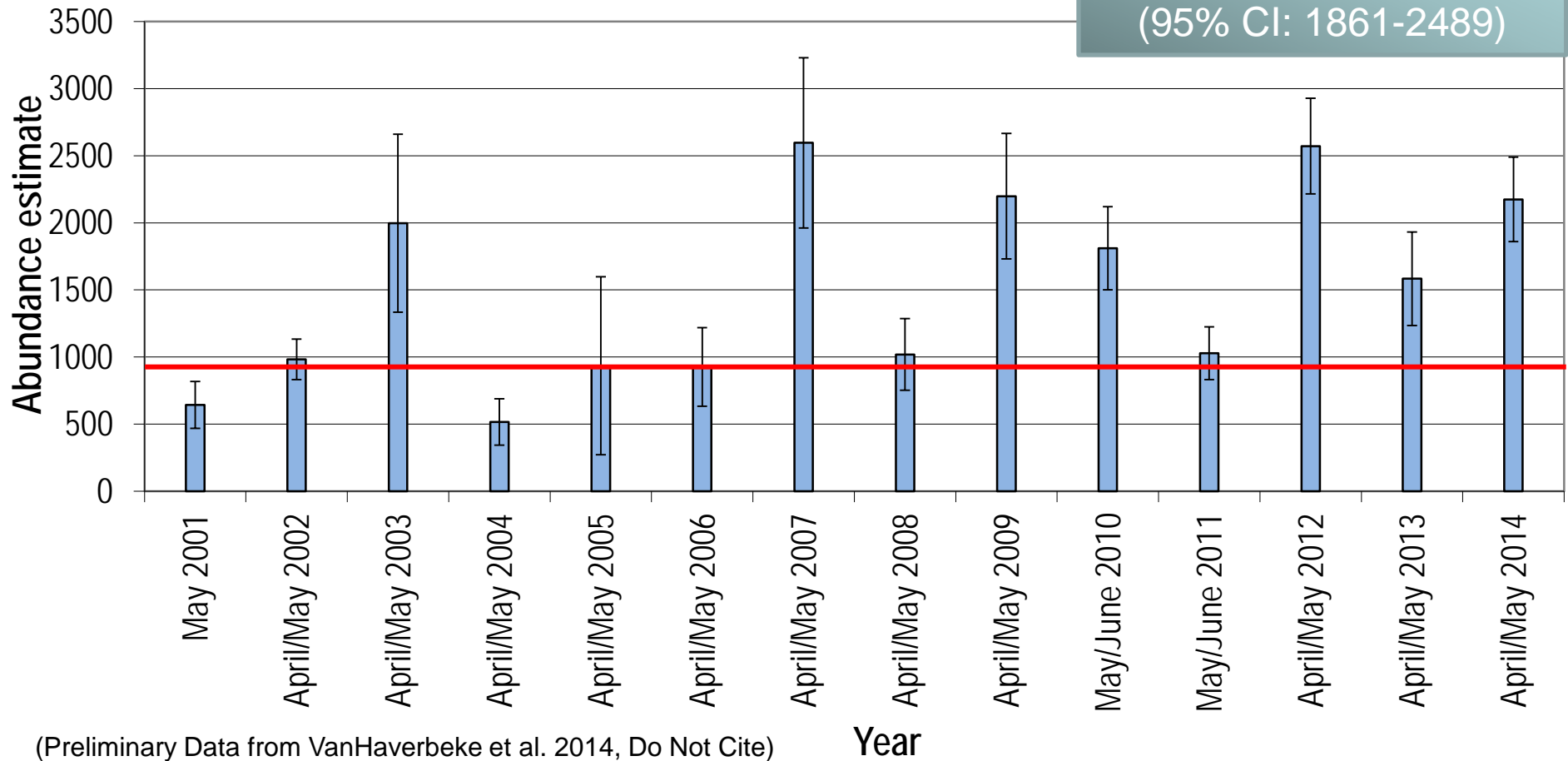
# Annual Survival of Humpback Chub (40-99 mm) in the Colorado River Study Site



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

# Spring LCR 150-199 mm humpback chub abundance estimates

2014 spring abundance estimate of 150-199 mm HBC = 2175 (95% CI: 1861-2489)

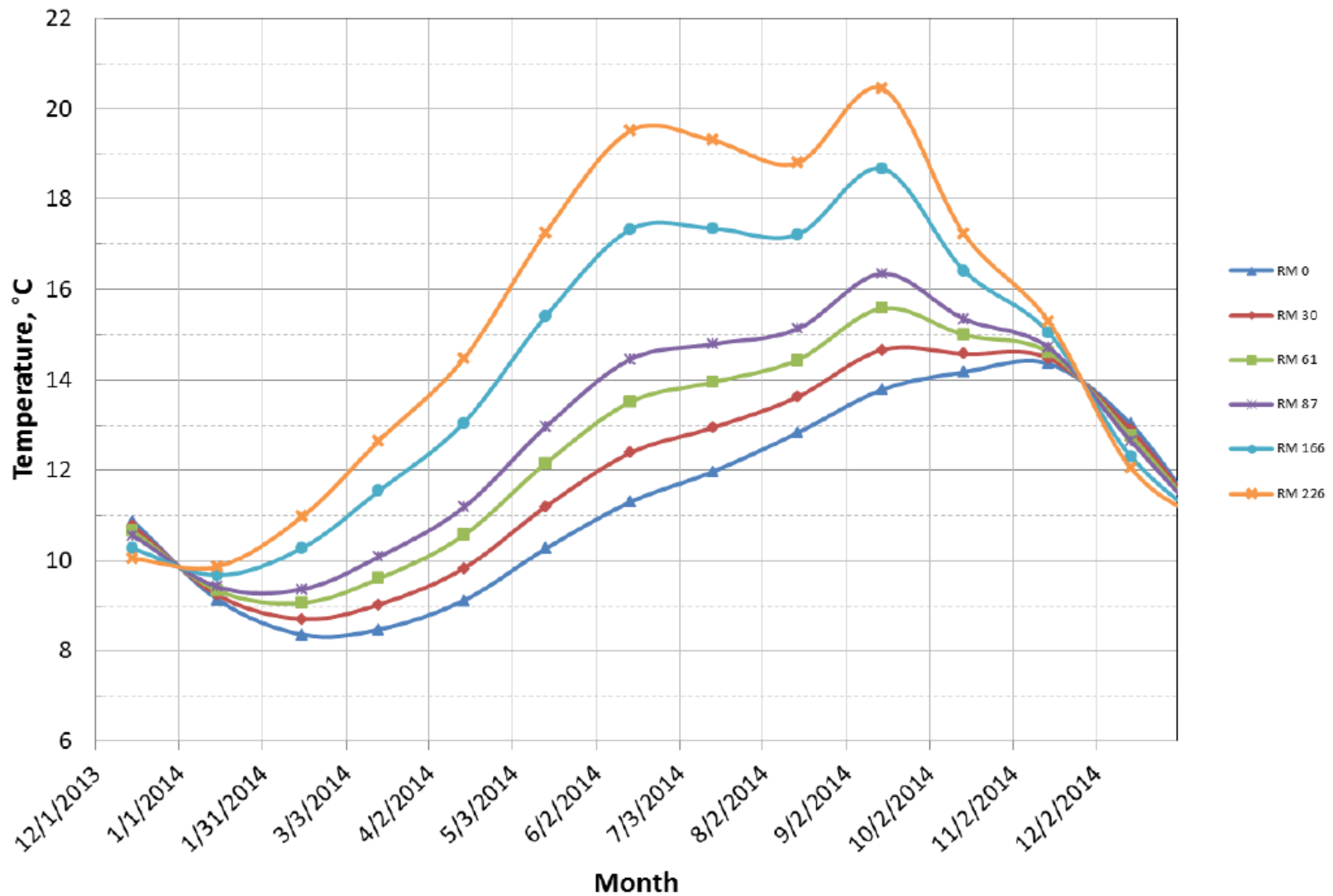


(Preliminary Data from VanHaverbeke et al. 2014, Do Not Cite)

Year

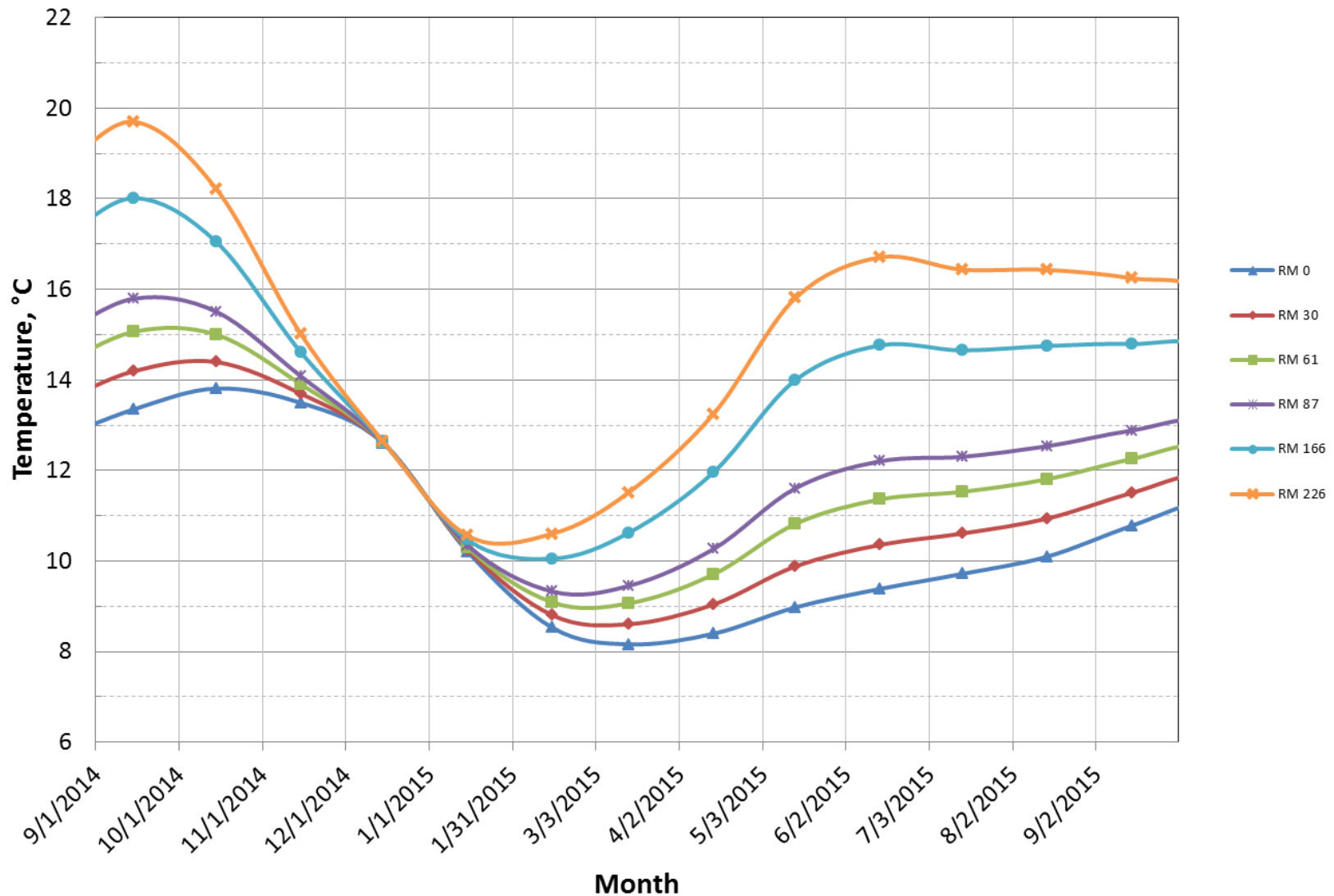
# Colorado River, Grand Canyon Water Temperatures

Projections based on September 2014, Most Probable Hydrology

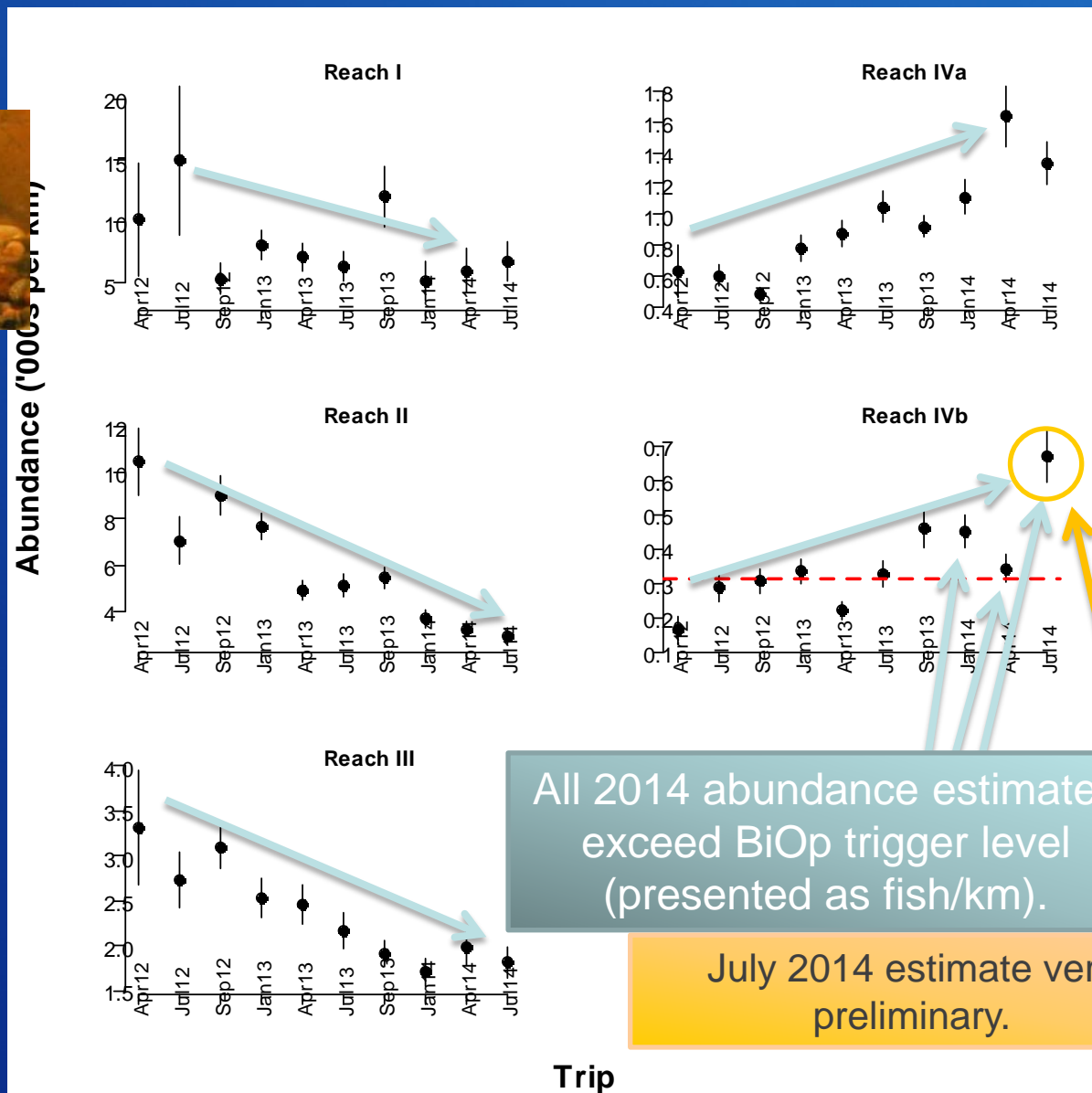


# Colorado River, Grand Canyon Water Temperatures

## Projections based on October 2014, Most Probable Hydrology



# Rainbow Trout Abundance By Reach



All 2014 abundance estimates exceed BiOp trigger level (presented as fish/km).

July 2014 estimate very preliminary.

- I – Glen Canyon/Lees Ferry
- II – House Rock
- III – Buck Farm
- IVa – Upstream of LCR
- IVb – Downstream of LCR



# 2011 USFWS Biological Opinion Non-native Fish Control Trigger

- Adult humpback chub <7000 fish? **No**
- OR
- ALL THREE? **No**
  - 3 of 5 years 150-199 mm humpback chub in the LCR drops below 910? **No**
  - Temperature <12° C for 2 consecutive years at LCR? **No**
  - Annual survival of 40-99 mm humpback chub in JCM drops 25% from preceding year? **TBD**

# 2011 USFWS Biological Opinion Non-native Fish Control Trigger

- **AND**

- **Rainbow trout abundance over 760?**

**Yes**

- **AND**

Open model estimates exceed threshold  
for all trips to date in 2014  
(Korman and Yard, preliminary data)

- **Brown trout abundance over 50?**

**Unknown**

2014 catches lower than in 2013, only 7 total  
caught in Jul. 2014 – catches too low to  
generate abundance estimate  
(Yard and Korman, preliminary data)

# 2014 HFE Summary and Next Steps

1. Resource conditions support a 2014 HFE
2. 37,500 cfs for 96 hours, early-mid Nov. 2014
3. Timing TBD, week of Nov. 9
4. 30-day HFE MOA letter has gone out
5. TWG Webinar Oct. 17 11am-1pm mdt
6. Leadership Team meeting week of Oct. 20
7. US Fish and Wildlife Service report in December
8. If an HFE occurs in FY 2014, convene a workshop to review results of first 3 HFEs in 2015