Glen Canyon Dam Adaptive Management Work Group
Agenda Item Information
August 29-30, 2012

Agenda Item

Grand Canyon Monitoring and Research Center (GCMRC) Updates

Action Requested

✓ This is an information item.

Presenter

Jack Schmidt, Chief, Grand Canyon Monitoring and Research Center, USGS
Scott Vanderkooi, Biology Program Manager, Grand Canyon Monitoring and Research Center, USGS
Bill Stewart, Statewide Aquatic Research Program Manager, Arizona Game and Fish Department

Previous Action Taken

N/A

Relevant Science

✓ See below.

Background Information

Update on Native and Non-Native Fish Populations

The Age Structured Mark Recapture (ASMR) maximum likelihood estimate of humpback chub age 4 and older was approximately 9,000 fish using data compiled through 2011. A revised adult humpback chub mortality estimate of 0.094 was less than the estimated mortality of 0.13 from previous ASMR estimates (Dr. Steven Martell written communication presented at the April 2012 Glen Canyon Dam Adaptive Management Program Technical Work Group meeting http://www.usbr.gov/uc/rm/amp/twg/mtgs/12apr16/Attach_03b.pdf). Based on revised adult mortality estimates, the adult humpback chub population is between approximately 9,000 and 12,000 fish. Further revisions to the ASMR model are being evaluated.

Based on 2012 US Fish and Wildlife Service spring monitoring and closed population estimates in the Little Colorado River (LCR), adult humpback chub population abundance is still stable. There was a very strong cohort of young-of-the-year and age-1 humpback chub in the LCR during spring and still evident in July. Abundance estimate of humpback chub 150-199 mm total length were far higher than the 910 fish specified in the Biological Opinion trigger.

We will not have an updated estimate of annual juvenile humpback chub survival in the reach from River Mile (RM) 63 – 64.5 until later in the year, after juvenile chub monitoring is completed.

Rainbow trout densities in April and July were extremely high in the Lees Ferry reach downstream to approximately House Rock rapid (RM 17) where they declined. Densities declined again at about

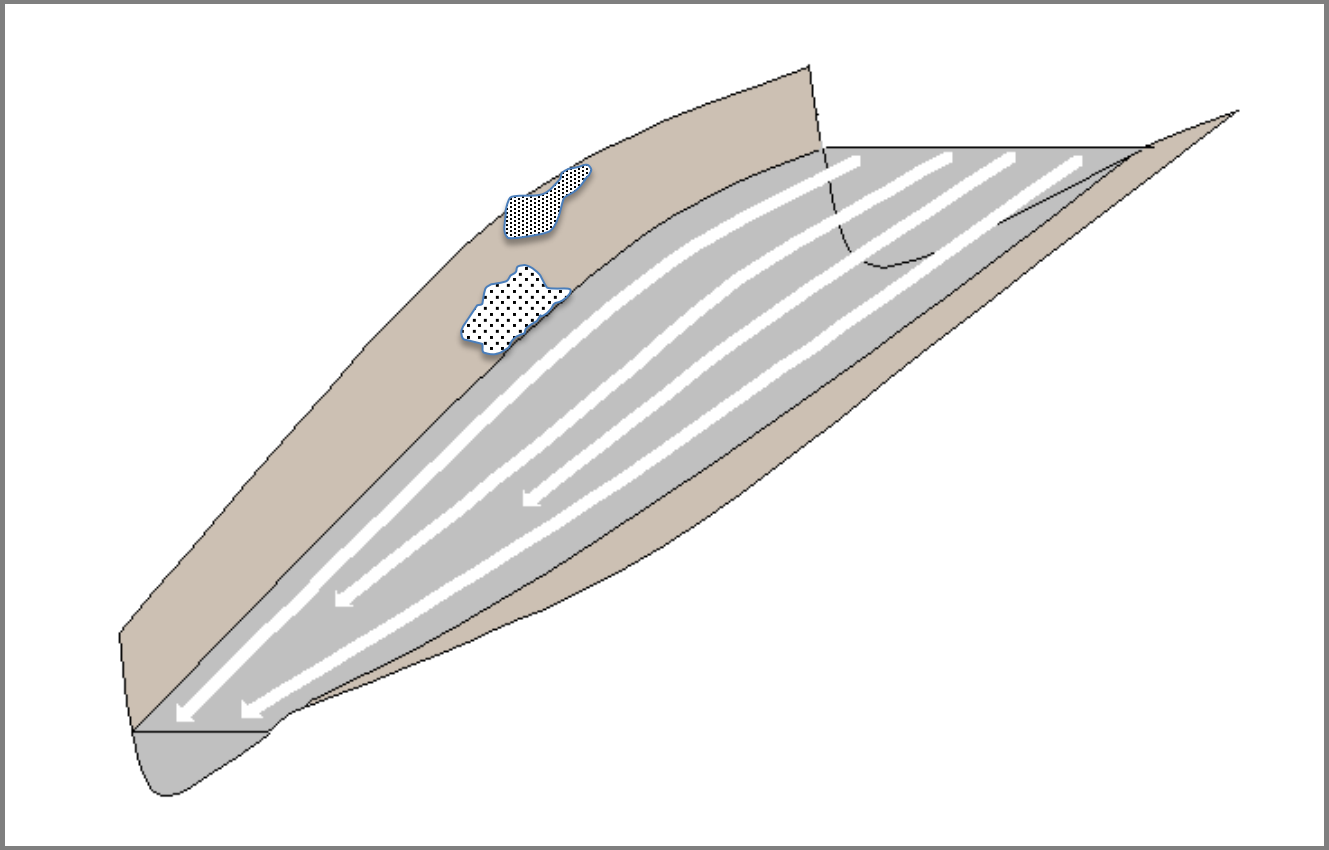
RM 40, and again at the confluence of the LCR. Estimated trout abundance during July 2012 in the reach downstream of the LCR (RM 63 – 64.5) was less than the 760 fish trigger.

Sediment Update
An update will be provided that will describe the magnitude of fine sediment inputs that have come from the Paria River since the May AMWG meeting, as well as the quantity of fine sediment that has been retained in Marble Canyon in relation to the amount that has been transported into Grand Canyon and towards Lake Mead. New software that allows users to access these data will also be illustrated.

Whirling Disease Update – Bill Stewart, Arizona Game and Fish Department
On May 16, 2012, the Arizona Game and Fish Department (AZGFD) received news that several of the rainbow trout samples from their October 2011 Lees Ferry survey tested positive for the presence of whirling disease. The Washington Animal Disease Diagnostic Lab at Washington State University confirmed that four of 18 pools of fish were infected with the disease. AZGFD have been testing for whirling disease annually since 1999, and this represents the second discovery in Lees Ferry. While the first detection occurred in 2007, follow-up surveys that year and annual surveys through 2010 did not detect the presence of the disease. Before the 2011 samples, many biologists surmised that the 2007 detection represented an exposure that had failed to become established in the population.

Compared to 2007, the 2011 samples showed that a higher proportion of samples tested positive and the disease was detected through the entire Lees Ferry reach. In light of the 2011 samples, it appears that the parasite is expanding from static low-undetectable population levels or is the result of a new recent exposure.

Whirling disease life cycle requires two hosts: a small tubifex worm and a salmonid fish species. The latter is primarily rainbow and cutthroat trout. The parasite can affect the nerves and cause cartilage damage that results in the outward signs of whirling disease. Trout are most susceptible to the disease at an earlier age, and after about four months old they become fairly resistant. The disease has been reported in 25 states and does not always result in a dramatic population loss. To our knowledge, Lees Ferry is the only whirling-disease-positive water in Arizona, and to date we have not observed losses of trout due to the disease.

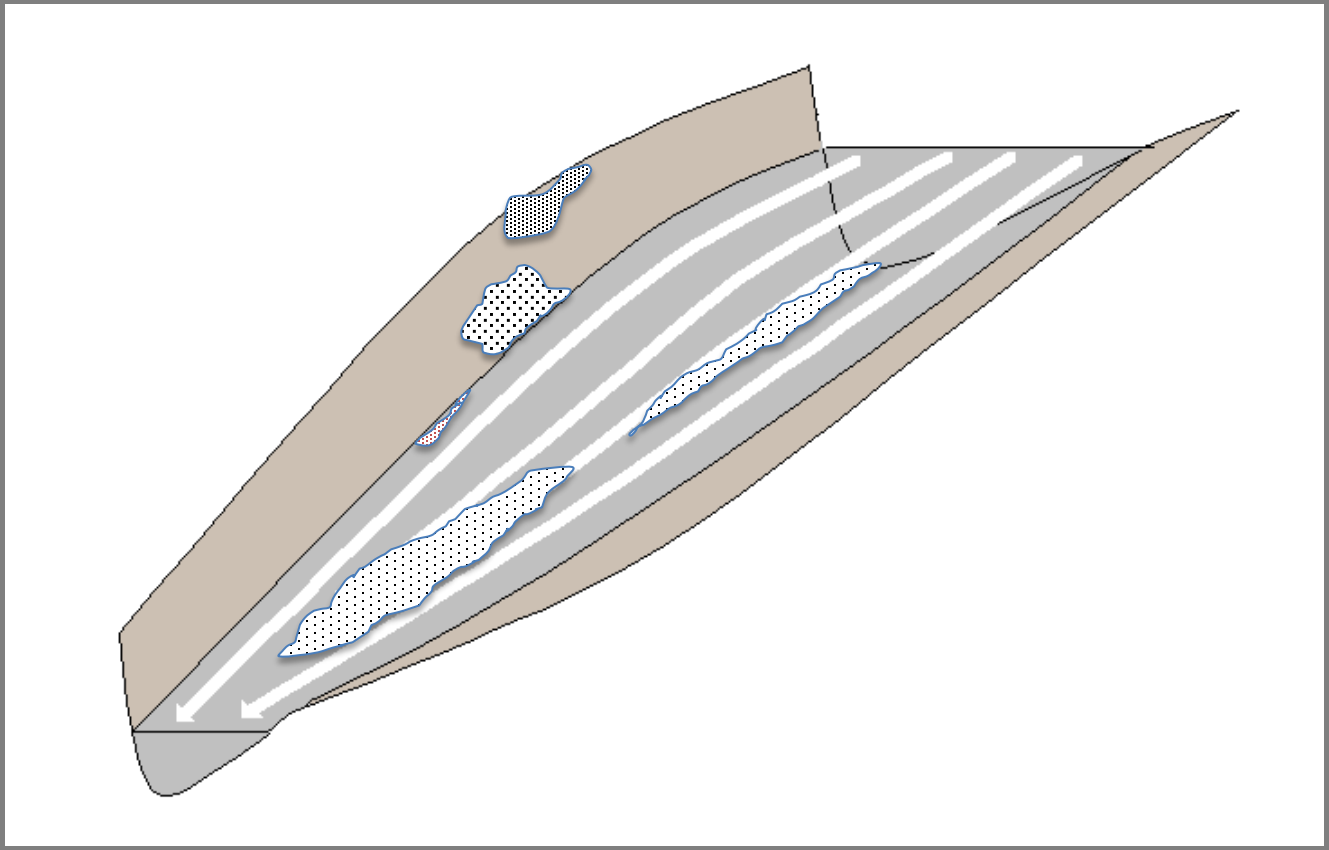


The physical system

Colorado River in Grand Canyon behaves like a pipe – a pipe with a very rough boundary

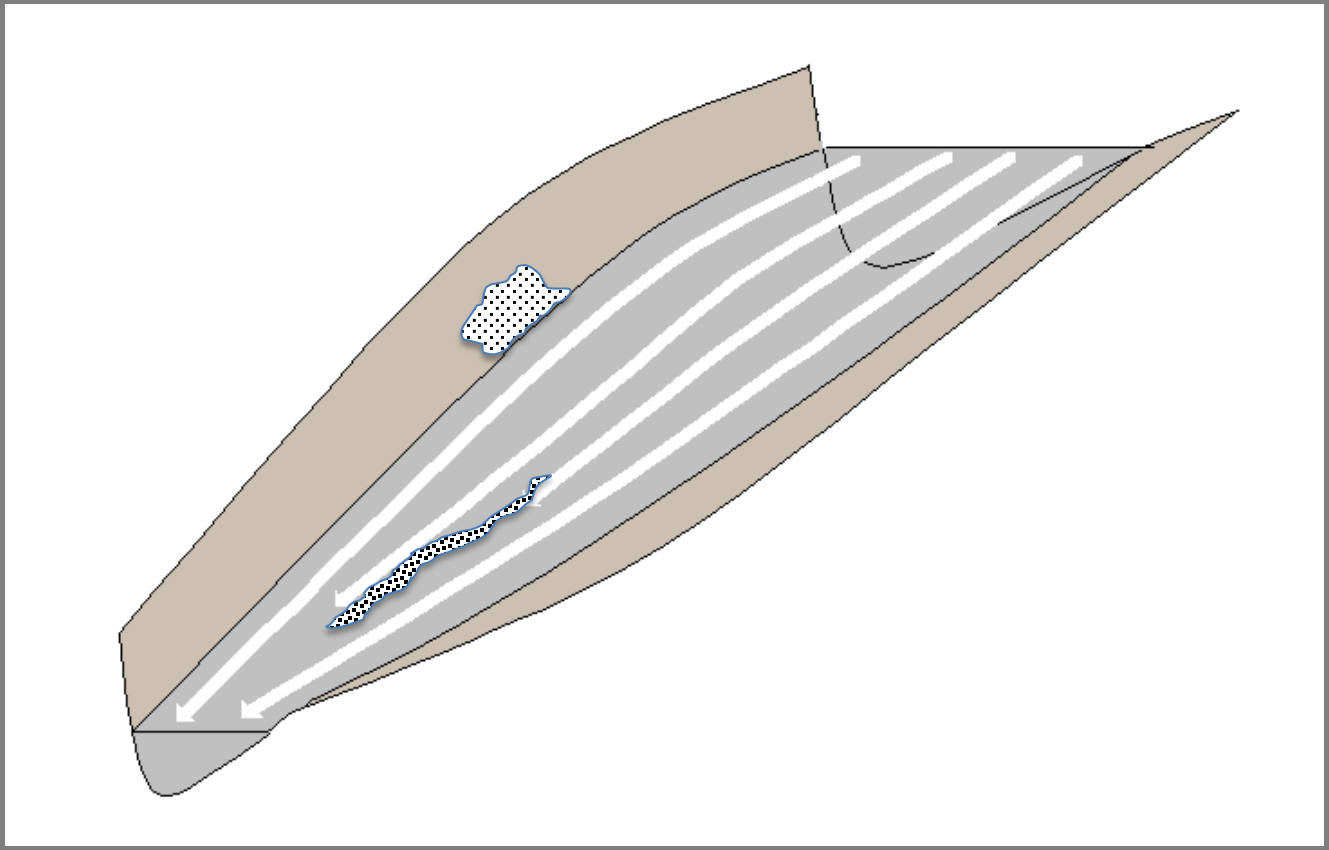
There are pockets of fine sediment, primarily sand, that occur in isolated pockets and as thin ribbons. Some of the very fine sand is blown by winds to higher elevation.

USGS



When fine sediment enters the river from tributaries (primarily the Paria River), the sand and mud is initially deposited on the channel bottom and at low elevation

USGS



This sand and mud is quickly transported downstream. The mud is transported most quickly and the sand that remains on the bed becomes coarser.

USGS

Fine sediment inputs and transport through Grand Canyon are measured at gages

Glen Canyon Dam
Paria River

Upstream boundary of
Grand Canyon
National Park

Lees Ferry
gage
(0-mile)

30-mile

166-mile

61-mile

Lake
Mead

Little Colorado
River

Grand Canyon gage
(87-mile)

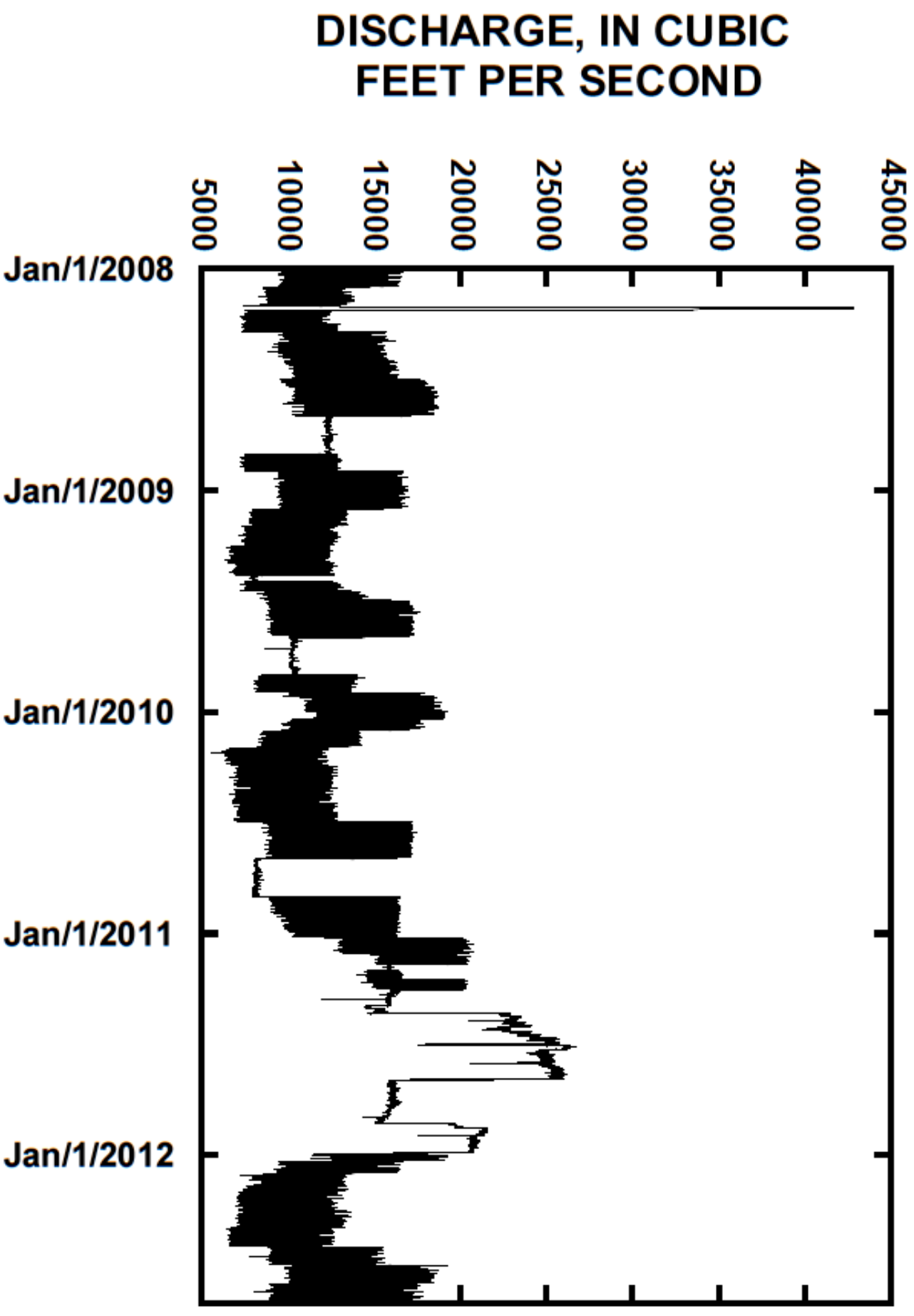
above Diamond Creek gage
(225-mile)

Kilometers
0 5 10 20 30 40 50

N
W E
S

Upper Marble Canyon fine sediment mass balance

Glen Canyon Dam
Paria River
Upstream boundary of Grand Canyon National Park
Lees Ferry gage (0-mile)
30-mile
166-mile
61-mile
Lake Mead
Little Colorado River
Grand Canyon gage (87-mile)
above Diamond Creek gage (225-mile)
Kilometers
0 5 10 20 30 40 50
N
W
E
S


DISCHARGE, IN CUBIC FEET PER SECOND
5000
10000
15000
20000
25000
30000
35000
40000
45000
Jan/1/2008
Jan/1/2009
Jan/1/2010
Jan/1/2011
Jan/1/2012

Summary of sand storage in August 2011

Reach	End of 2004 HFE to start of 2008 HFE (Antecedent condition for 2008 HFE)	Calendar year 2010 (Summer/fall 2010: large inputs)	End of 2008 HFE to Jan. 7, 2011	Jan. 1, 2011 to Aug. 2, 2011 (2011: evacuation)	End of 2008 HFE to Aug. 2, 2011
RM 0 to 30	1.2 ± 0.6	1.3 ± 0.3	1.4 ± 0.4	-1.5 ± 0.1	-0.6 ± 0.5
RM 30 to 61	0.5 ± 0.3	0.2 ± 0.1	-0.05 ± 0.15	-0.4 ± 0.2	-0.4 ± 0.3
RM 61 to 87	0.8 ± 0.7	0.5 ± 0.1	-0.35 ± 0.35	-0.8 ± 0.3	-1.1 ± 0.7
RM 87 to 225	0.9 ± 0.4	1.0 ± 0.3	0.35 ± 0.35	-0.3 ± 0.3	0.2 ± 0.7

Black = definitely positive
Orange = indeterminate, maybe positive

Blue = indeterminate, maybe negative
Red = definitely negative

Most of the sand exported from the canyon since January 1, 2011, was eroded from eddies, based on the sand grain-size distributions measured in suspension and Hazel and others (2006).

USGS

All values in million metric tons.

Preliminary results – subject to review and revision

Summary of sand storage in August 2011

	Antecedent condition for 2008 HFE	Summer/fall 2010: large inputs		2011: evacuation	
Reach	**End of 2004 HFE to start of 2008 HFE**	**Calendar year 2010**	**End of 2008 HFE to Jan. 7, 2011**	**Jan. 1, 2011 to Aug. 2, 2011**	**End of 2008 HFE to Aug. 2, 2011**
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Summary of sand storage in August 2012

Reach	End of 2004 HFE to start of 2008 HFE (Antecedent condition for 2008 HFE)	Calendar year 2010 (Summer/fall 2010: large inputs)	End of 2008 HFE to Jan. 7, 2011		End of 2008 HFE to Aug. 27, 2012 (2011: evacuation)
RM 0 to 30	1.2 ± 0.6	1.3 ± 0.3	1.4 ± 0.4		-0.9 ± 0.6
RM 30 to 61	0.5 ± 0.3	0.2 ± 0.1	-0.05 ± 0.15		
RM 61 to 87	0.8 ± 0.7	0.5 ± 0.1	-0.35 ± 0.35		
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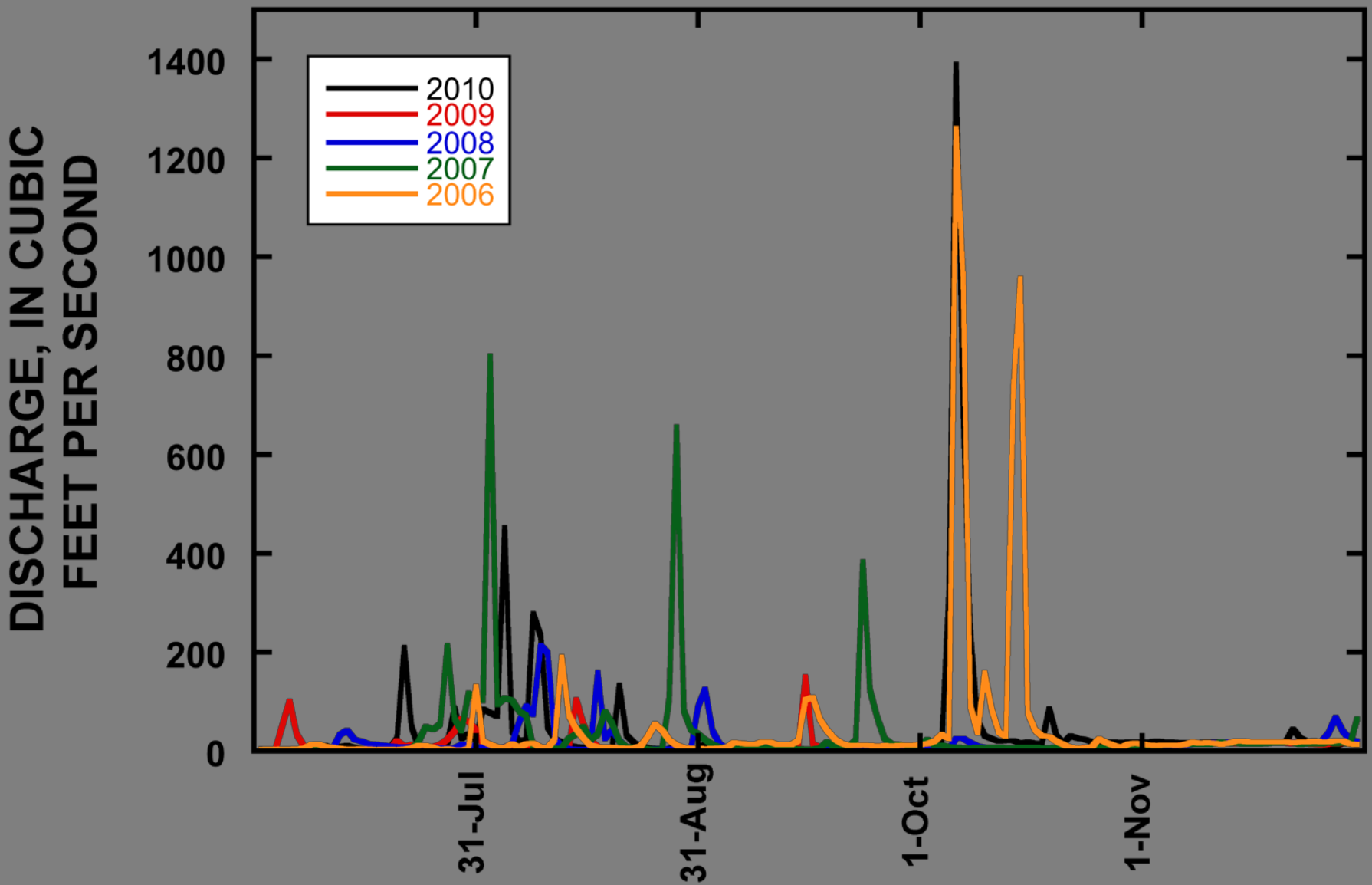
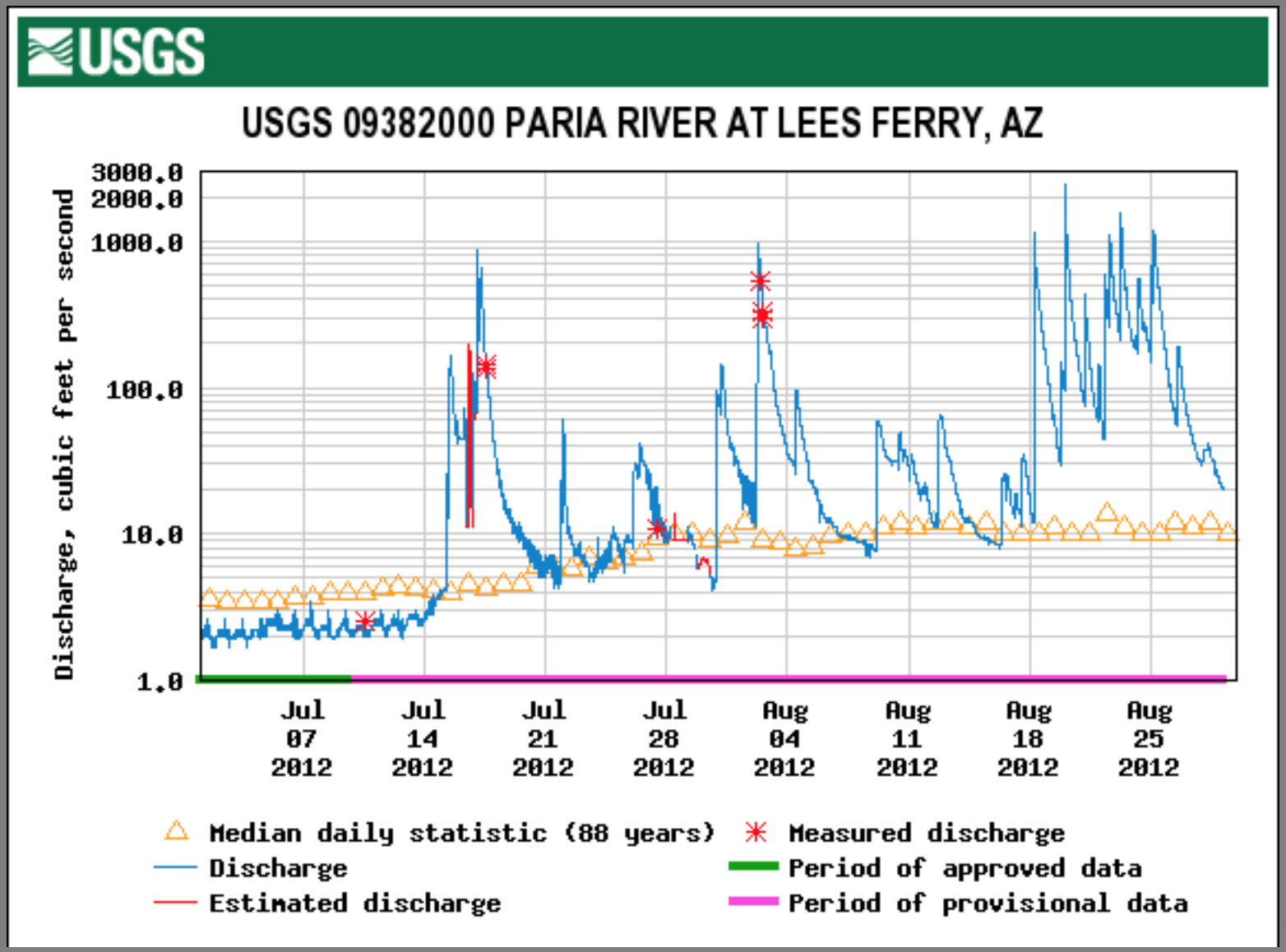
Preliminary results – subject to review and revision

Paria River floods vary greatly from year to year

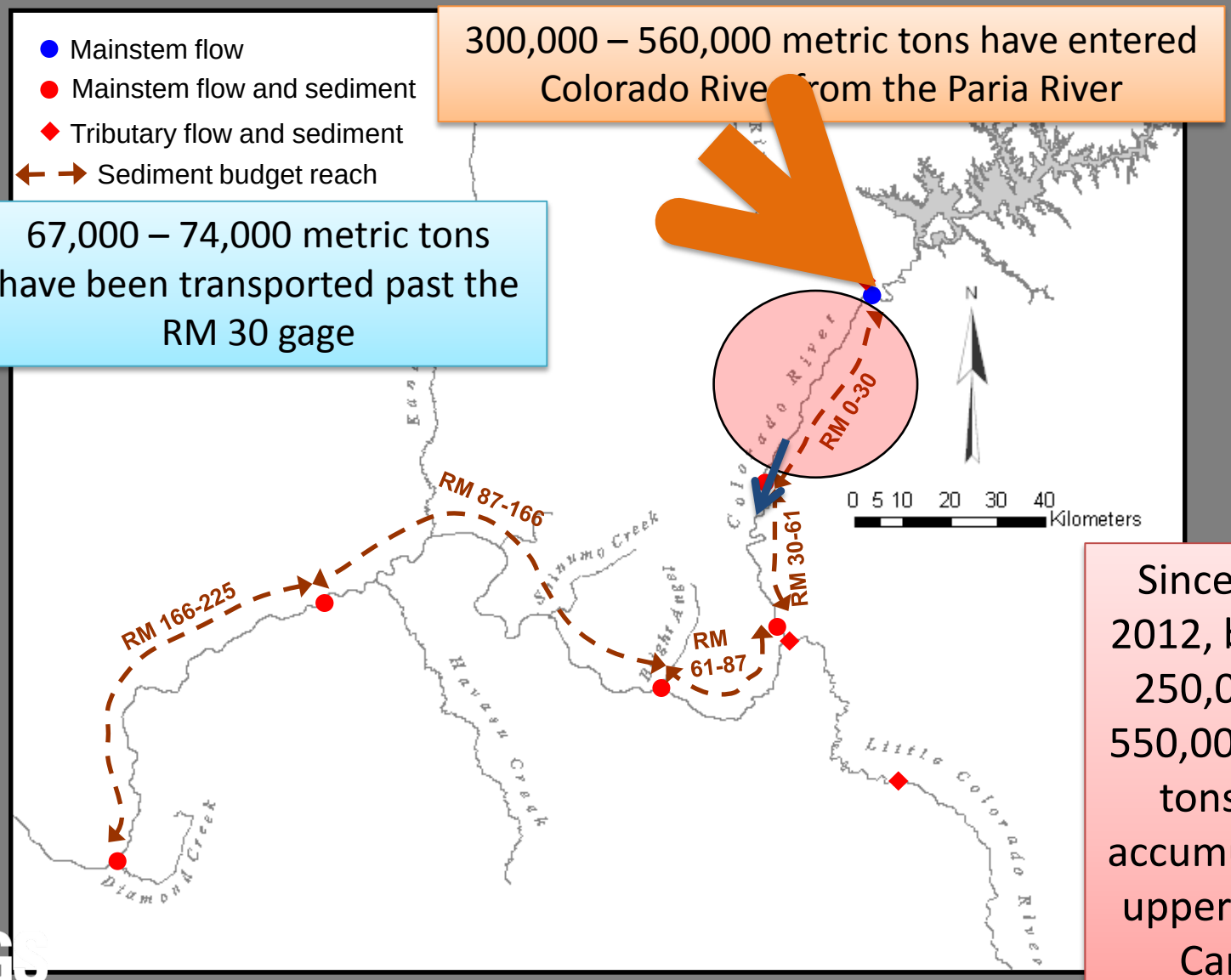




http://www.youtube.com/watch?v=iAw_zIg9BqI

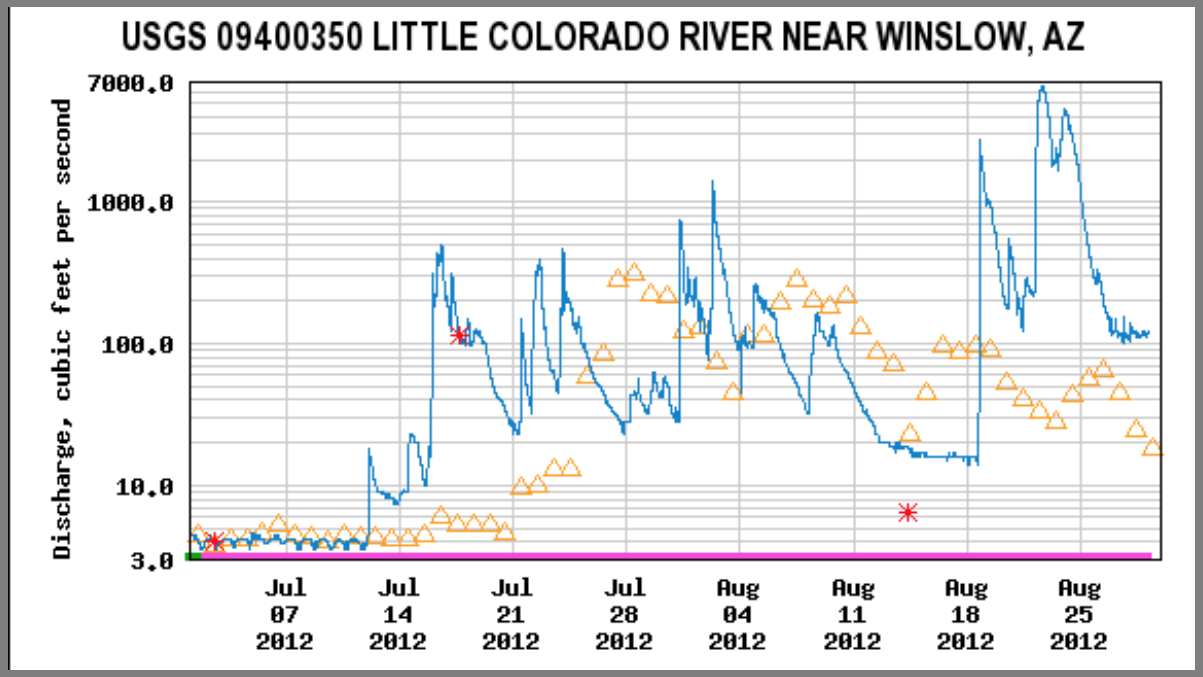
July 1, 2012 to Today	300,000 to 560,000 metric tons

Since July 1, 2012 …



Since July 1, 2012, between 250,000 and 550,000 metric tons have accumulated in upper Marble Canyon

USGS



Little Colorado River