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GCMRC Annual Reporting Meeting Update – part 2

Adaptive Management Work Group Meeting
February 24, 2016

Scott VanderKooi
Southwest Biological Science Center
Grand Canyon Monitoring and Research Center

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

Outline

- Riparian Vegetation Monitoring & Workshop
- Project 12
- Aquatic Foodbase
- Humpback Chub and Rainbow Trout Updates
- Creel and Economic Value of Angling
- Green Sunfish in Glen Canyon

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Riparian Vegetation Monitoring: *Accomplishments in 2015 and Plans for 2016*

- Riparian monitoring protocol submitted for review
- Functional trait data in review
- Glen Canyon sampling conducted for first time
- Restoration workshop convened - extended abstract in preparation
- Riparian flow-response guild identification and modeling in preparation, to be submitted April 2016
- Floristic patterns analysis in preparation, to be submitted for review May 2016

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Riparian Vegetation Workshop – June 2015 Objective and Approach:

Explore successes and challenges in nonnative vegetation control.

Seek recommendations for scientifically based vegetation control program.

Principles and Scales of Restoration

Local, River, Watershed, Monitoring

- **Local Scale – Canyon de Chelly, Yuma area, Grand Canyon, Glen Canyon**
- **River Scale – Rio Grande, Lower Colorado River, Upper Colorado River**
- **Watershed Scale – Gila Watershed, Dolores River, Verde Rivers**
- **Monitoring & Measuring Success – Principles, Site Monitoring, Citizen Science**

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Workshop Take Away

Identifying/defining resilience in the face of climate change and water demands

- What are the underlying biogeomorphic processes driving change?

Incorporation of genetic variability into restoration in the face of climate change

- Locally adapted today = Locally maladapted in the future.

Spectrum of restoration as a decision criteria

- Passive to active approaches tied to river resilience (coincident with resilience and costs)

Multi-partner communication and information sharing

- Keeping appraised of best practices and sharing success/failures

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Workshop Outcome

USGS Open-File Report Online – June 2016

- **Extended Abstracts for most presentation – in review/editorial**
- **Transcribed comments of last day identifying needs**
- **List of participants and contact information**

Workshop funded by WaterSMART funds to Southwest Biological Science Center

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Project 12 Progress Report

- This pilot project attempts to integrate TEK and western science through evaluating and documenting changes in 16 culturally-valued riparian plant species -- as reflected in matched pairs of past and current photographs.
- So far, 128 of 456 existing Stanton images have been examined (28%) – from base of GCD to LCR – covering approximately 32% of river corridor
- Total of 256 matched pairs analyzed (1889/1890 with early 1990s and early 1990s with 2010/2011)
- Photos show noticeable increases in riparian vegetation in both sets of matches (1890 to1990s and from early 1990s to 2010/11)
  - Where riparian changes can be reliably detected (n=116), only 7 matches (6%) do not show vegetation increase from 1890s to 1990s, and only 5 matches (4%) do not show increases from 1990s to 2010/2011

- Examples of documented changes in species that occur primarily above the LCR:
  - *Celtis reticulata* (Netleaf Hackberry) – number of individual trees increased between 1890s and 1990s, but no new recruitment evident in recent decades
  - *Falugia paradoxa* (Apache plume) – overall abundance remains similar from 1890s to 1990s but individual plants have thinned at higher elevations (above 100k cfs) and new ones have become established at lower elevations

Preliminary Results – Please Do Not Cite

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Little Colorado River bugs

- Little Colorado River: Home to Humpback Chub
- Chub eat bugs
- More bugs = More/fat chub?

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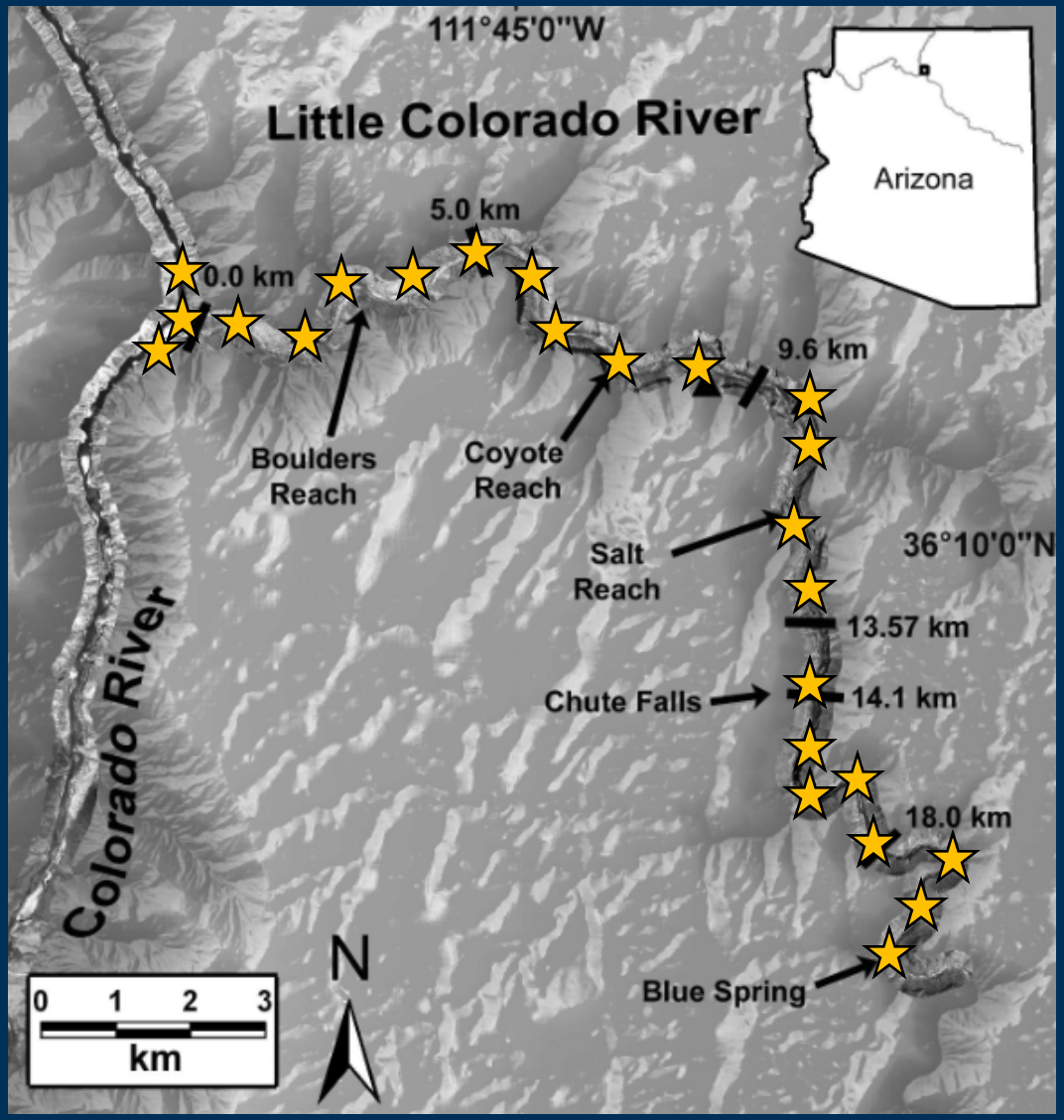
Insect sampling

- Sticky traps
  - Surrogate for in-water densities
  - Every river km, 5x per year



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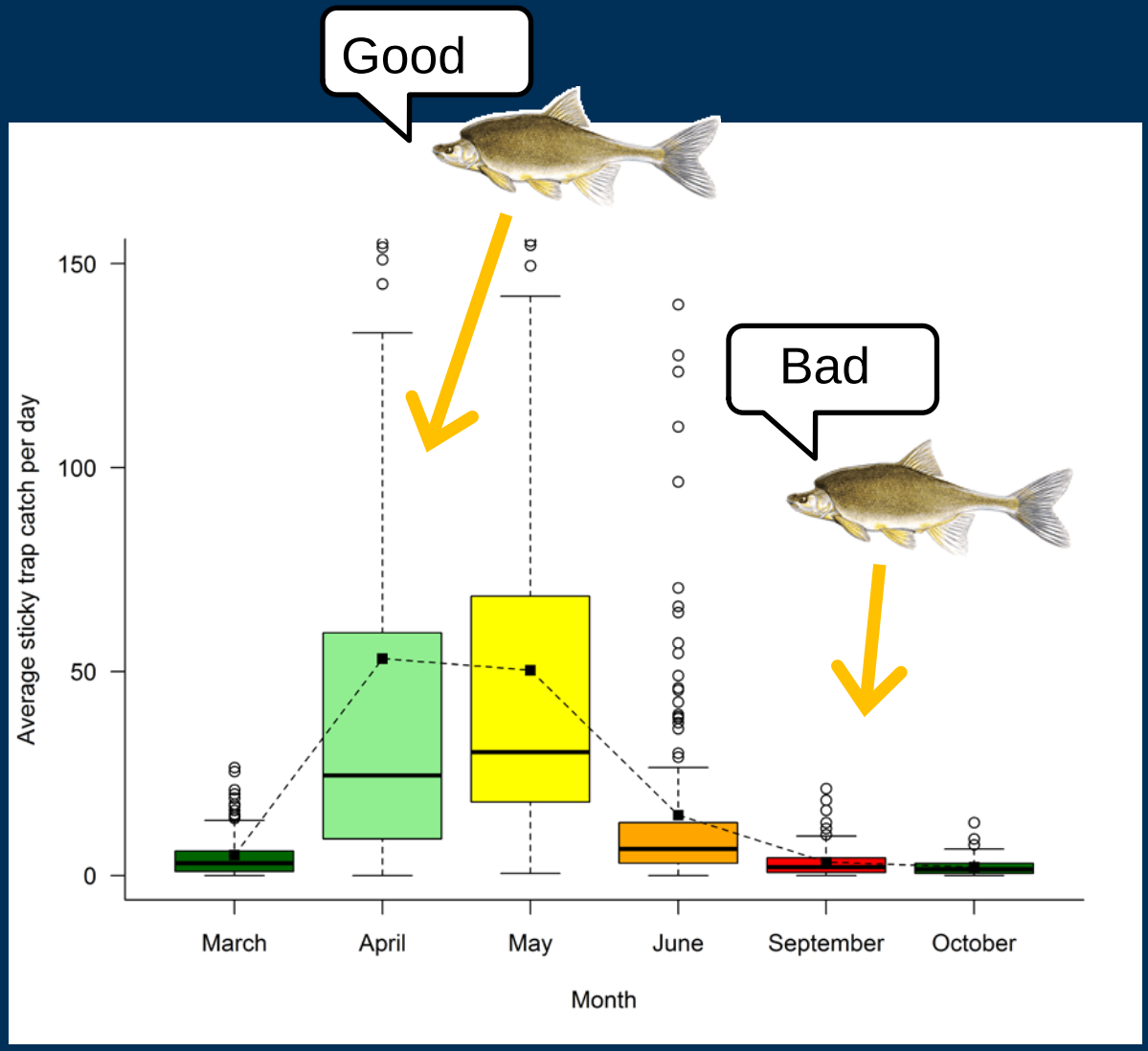
Seasonal feast or famine

- **Slim pickings outside of April/May**



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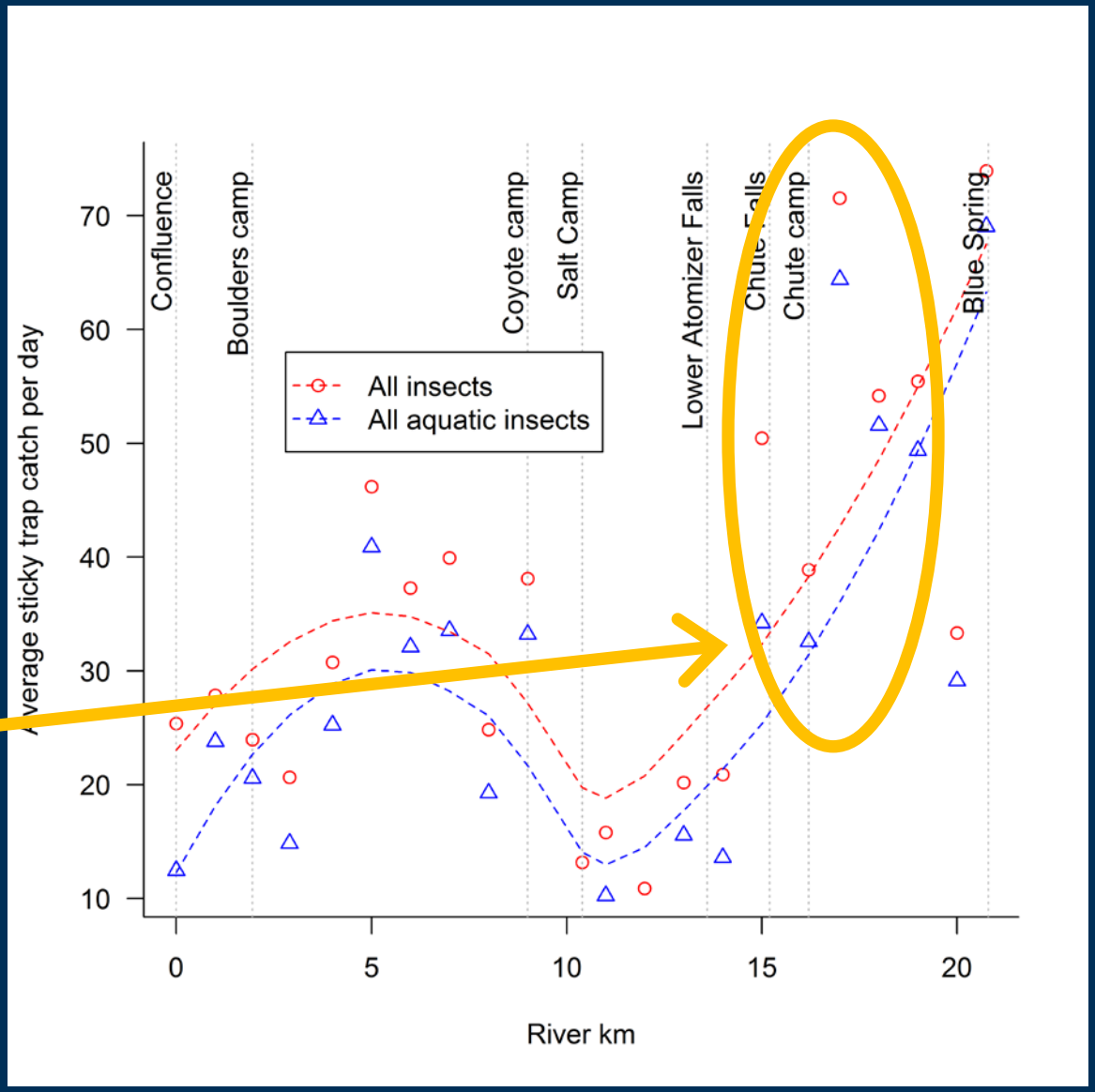
Preliminary data, do not cite.

Spatial variation in bug densities

Fat chub



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Preliminary data, do not cite.

Light controls: Turbidity v. Geography

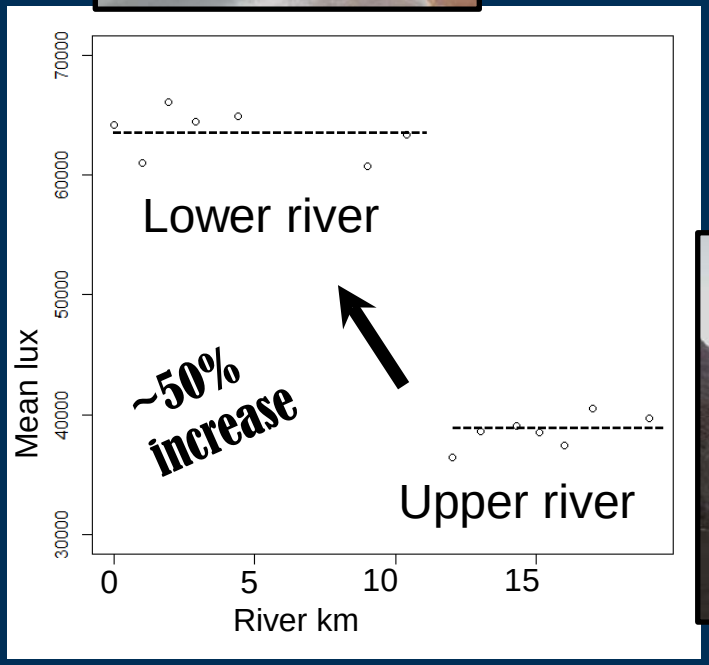
- **Under water**

Upper river

~50% decrease

Lower river

- **Water surface**



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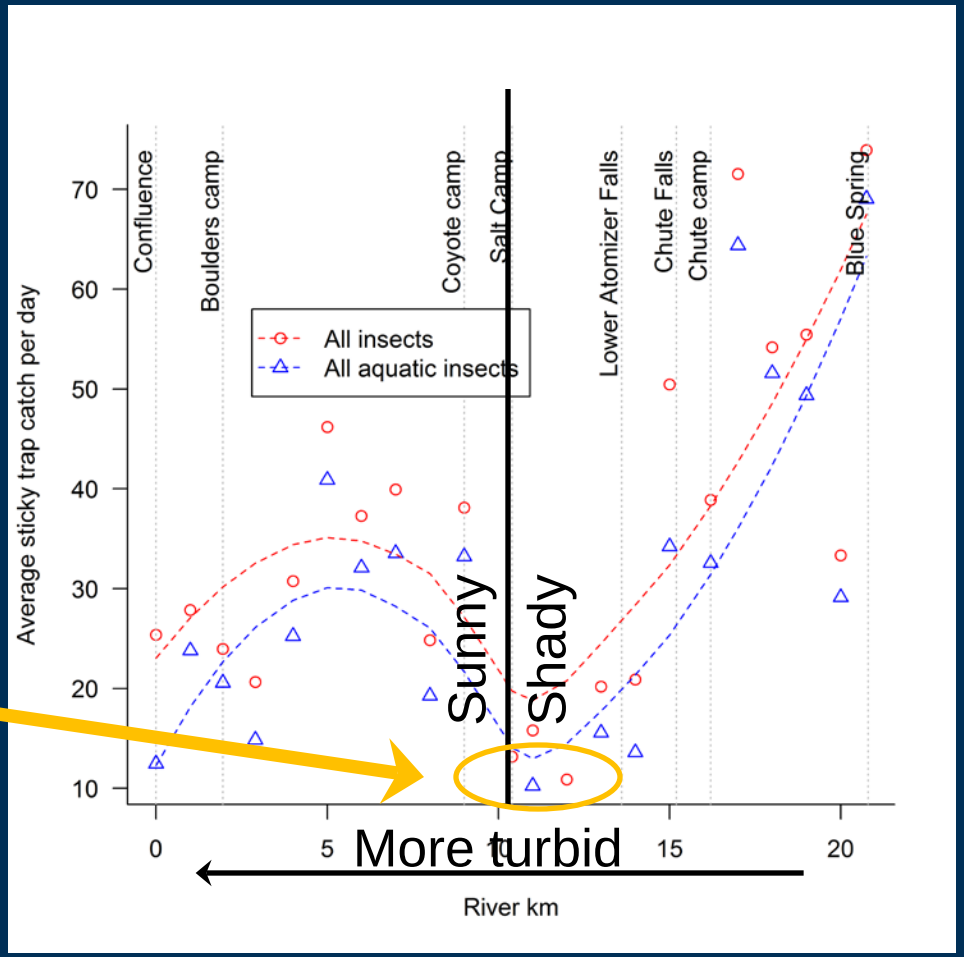
Preliminary data, do not cite.

Light effects on bug densities

- **Upstream:**
  - **Clear water, but shady**
- **Downstream:**
  - **Sunny, but turbid**

"Everything is just wrong"



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Preliminary data, do not cite.

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Glen Canyon/
Lees Ferry

Marble
Canyon

Little Colorado River
(LCR) and Confluence

Annual spring abundance estimates of Humpback Chub ≥ 150 mm and ≥ 200 mm in lower 13.6 km of LCR

2015 spring estimates considerably lower than recent years. Likely due to skipped spawning.

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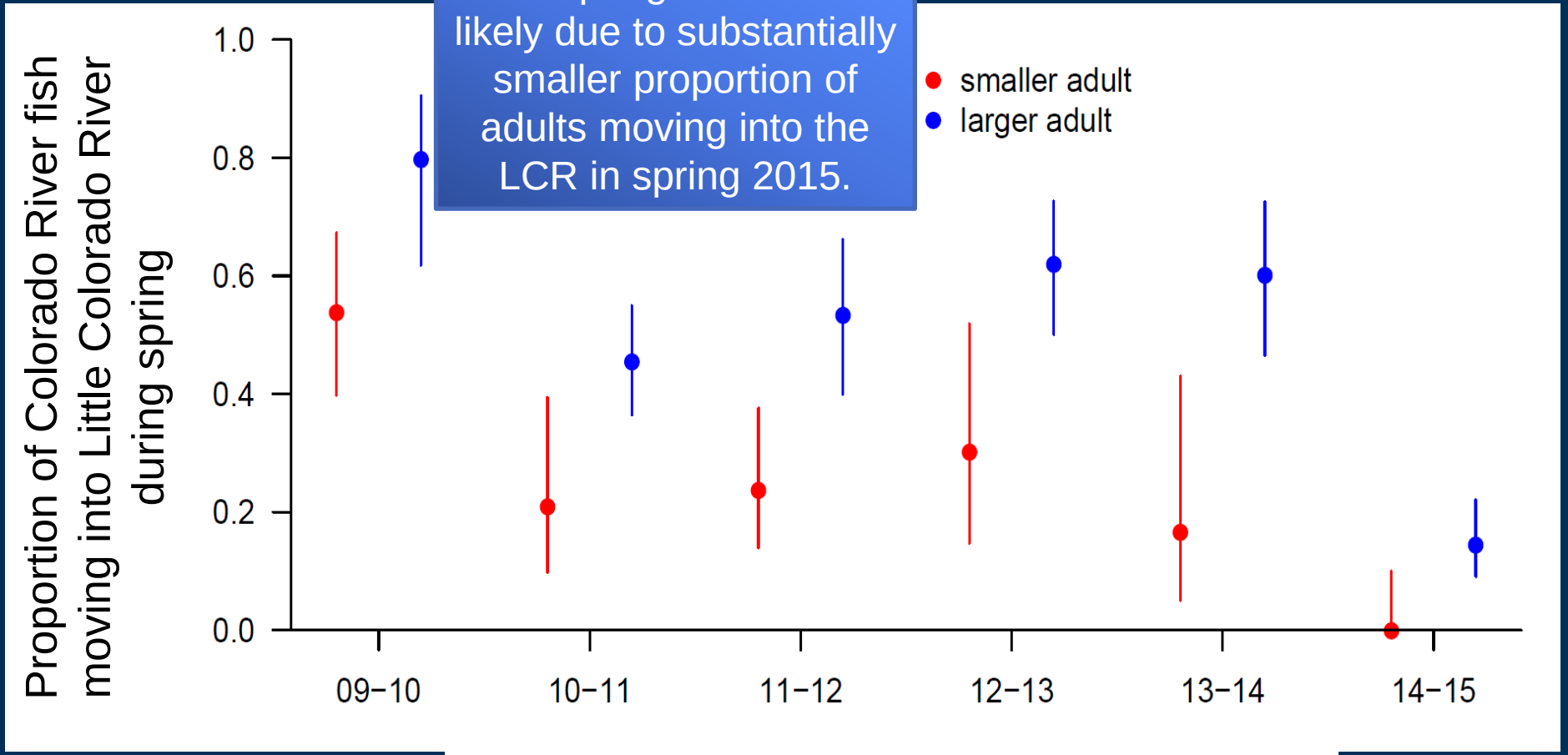
(Preliminary Data from VanHaverbeke et al. USFWS. 2015. Do Not Cite.)

Proportion of Colorado River fish moving into Little Colorado River during spring



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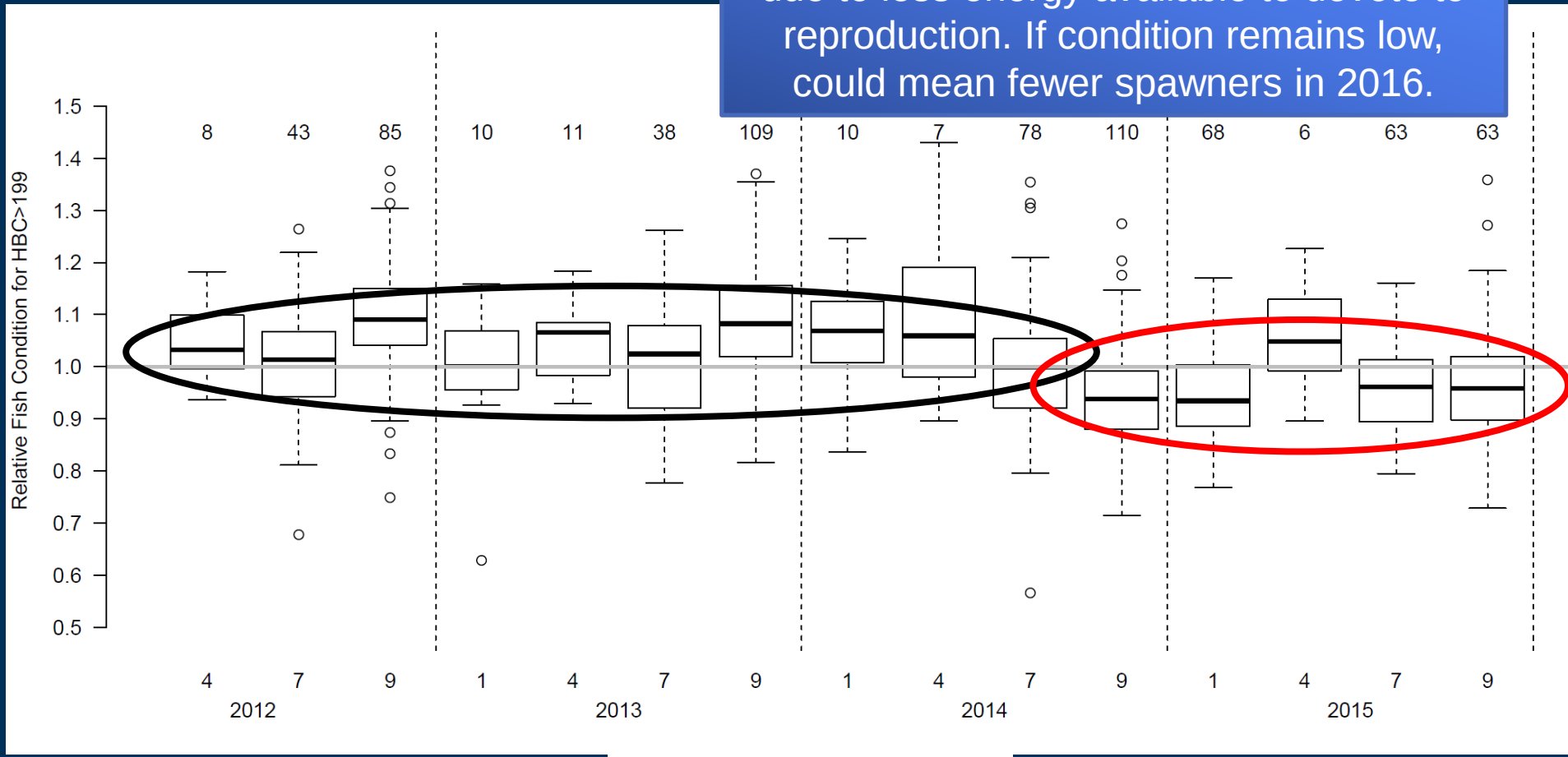
(Preliminary data from Yackulic 2016. Do Not Cite.)

Adult Humpback Chub condition: fat (> 1.0) or skinny (< 1.0)?

Lower condition observed since 2014 supports hypothesis of skipped spawning due to less energy available to devote to reproduction. If condition remains low, could mean fewer spawners in 2016.



Year and Month

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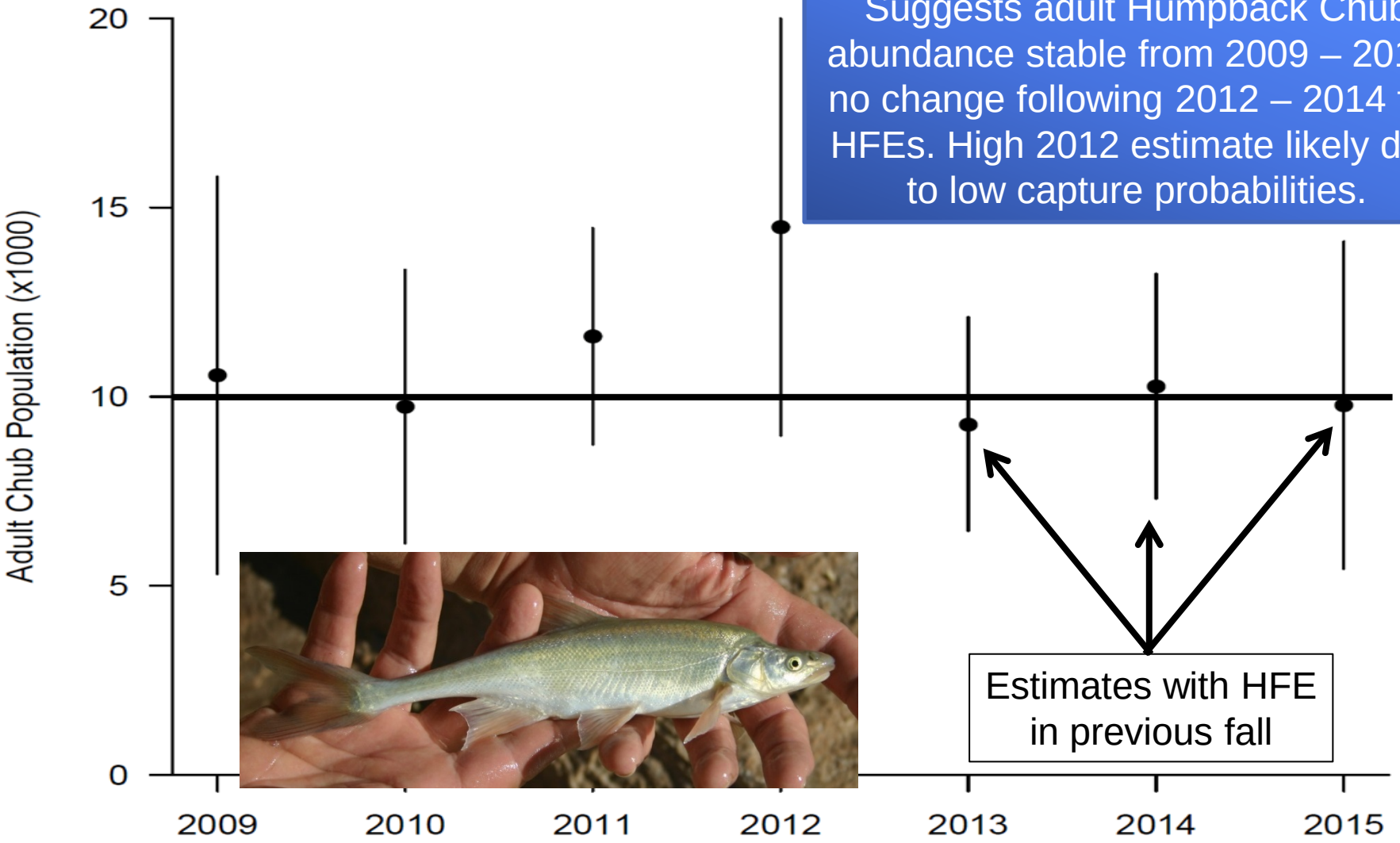
(Preliminary data from Yackulic and Korman 2015. Do Not Cite.)

Adult Humpback Chub Abundance Estimates: Multistate Population Model

Suggests adult Humpback Chub abundance stable from 2009 – 2015, no change following 2012 – 2014 fall HFEs. High 2012 estimate likely due to low capture probabilities.



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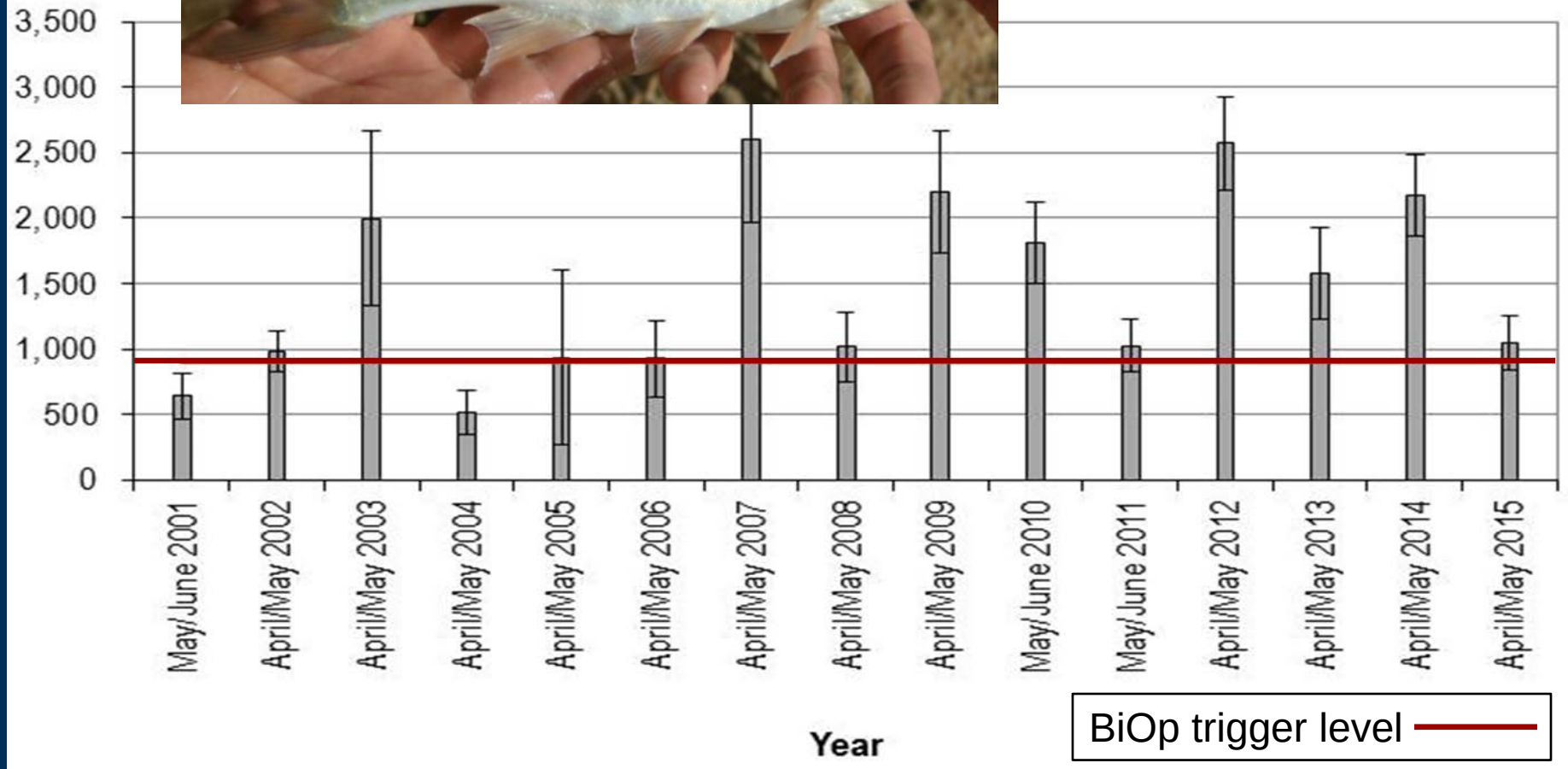
(Preliminary Data from Yackulic 2016. Do Not Cite.)

Spring LCR 150-199 mm Humpback Chub abundance estimates

2015 spring abundance estimate for sub-adults above BiOp trigger level



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(Preliminary Data from VanHaverbeke et al. USFWS. 2015. Do Not Cite.)

Juvenile Humback Chub Survival Rates

Juvenile humpback chub survival in the Colorado River study reach is variable regardless of flow.

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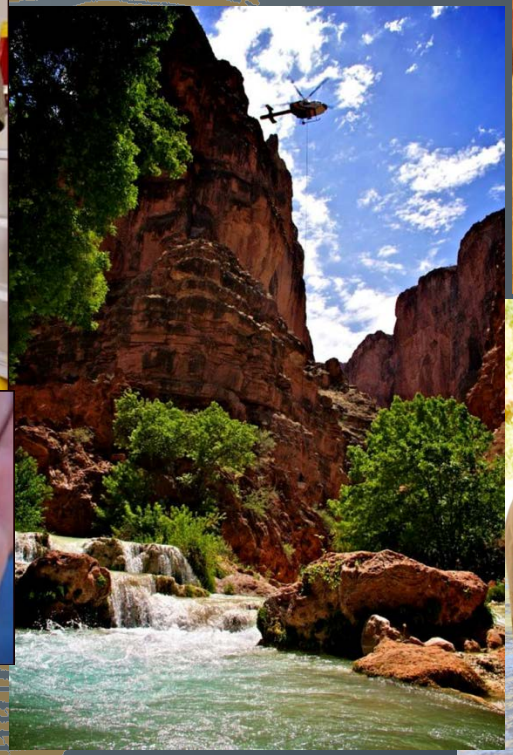
(Preliminary Data from Yackulic 2016. Do Not Cite.)

NPS Humpback Chub Translocations: Shinumo Creek



(Slide courtesy E. Omana Smith)

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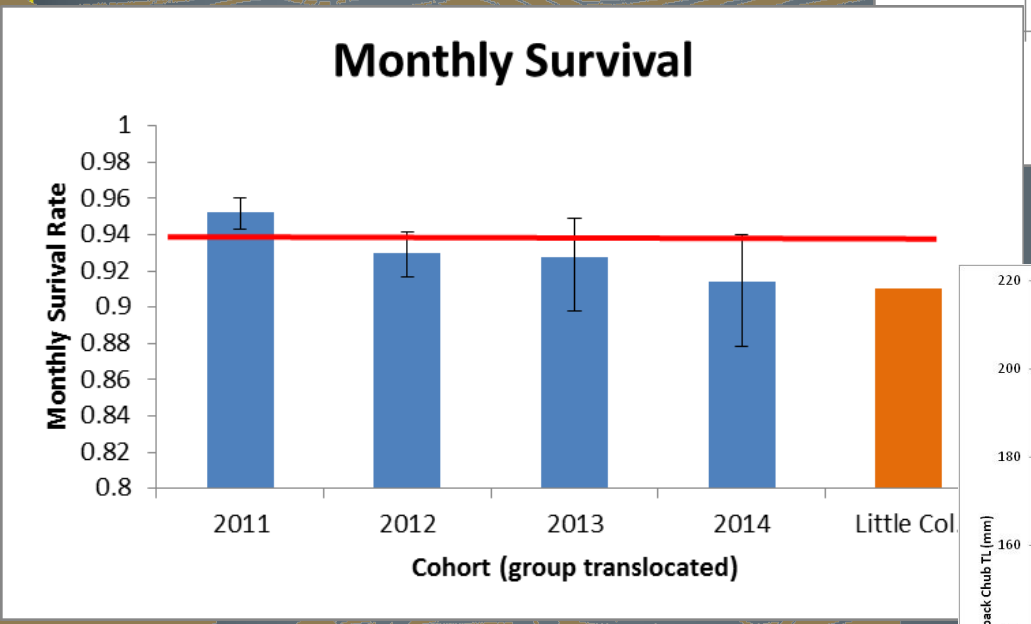
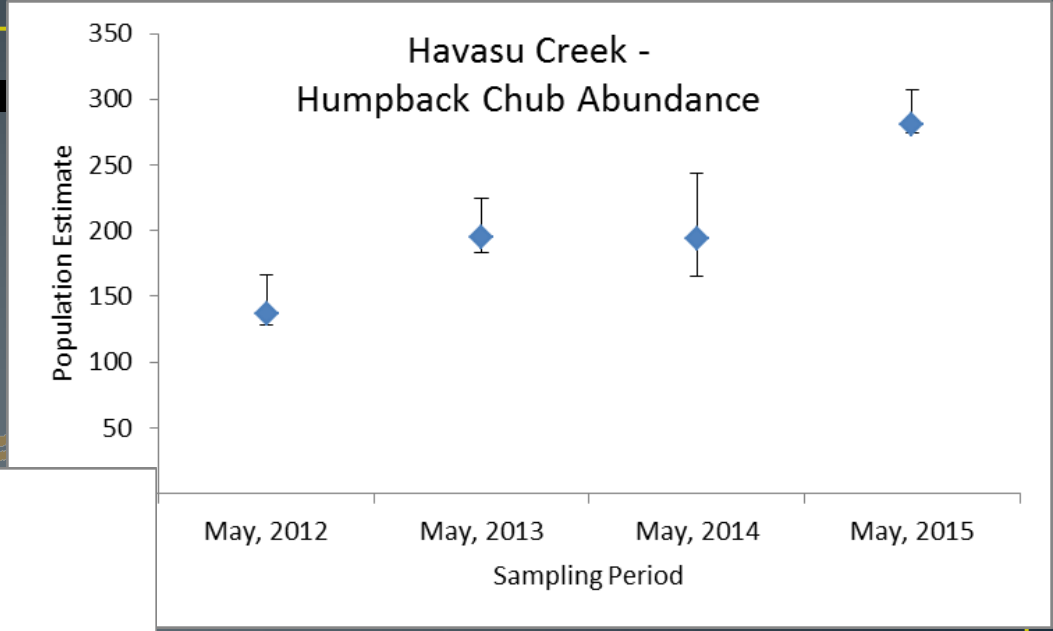
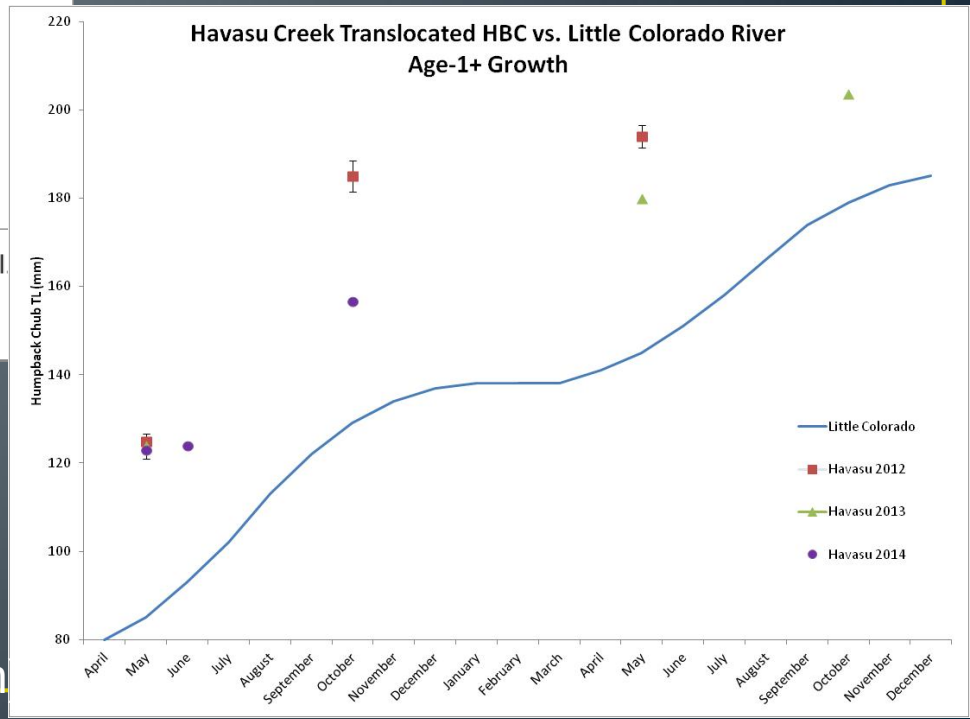
Retention

Apparent Survival



LCR estimate from Yackulic et al. 2014
Red line = average monthly survival of all translocated cohorts



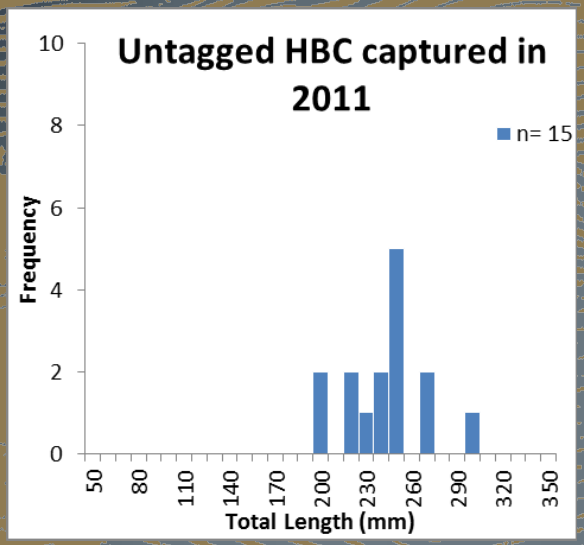


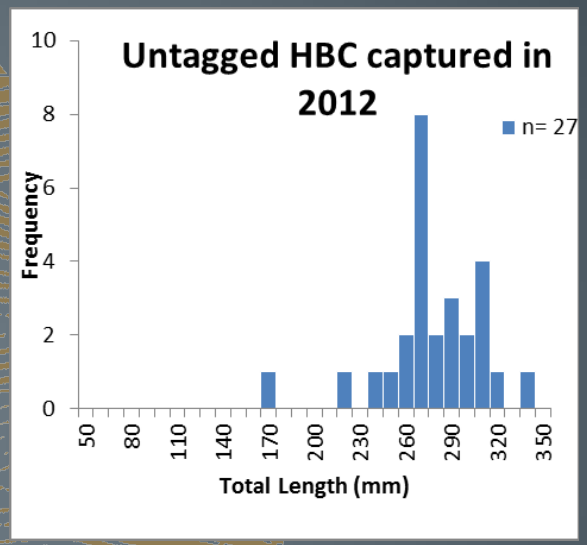
Growth

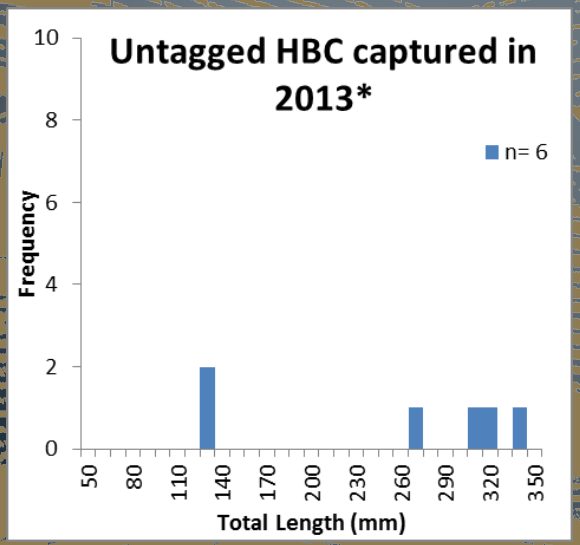
USGS (Slide courtesy E. Omana Smith)

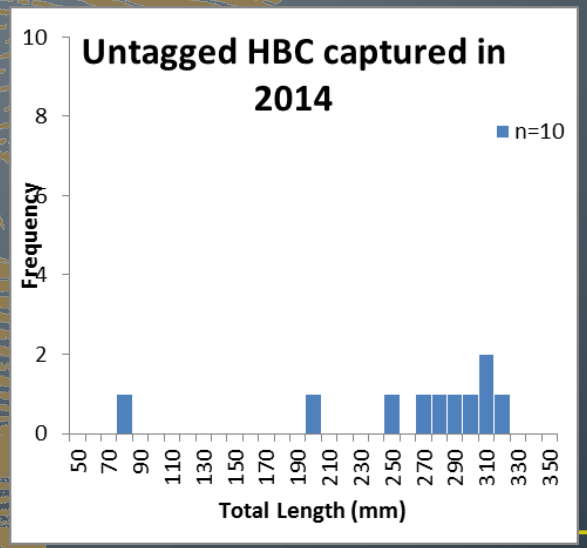
(Slide courtesy E. Omana Smith)

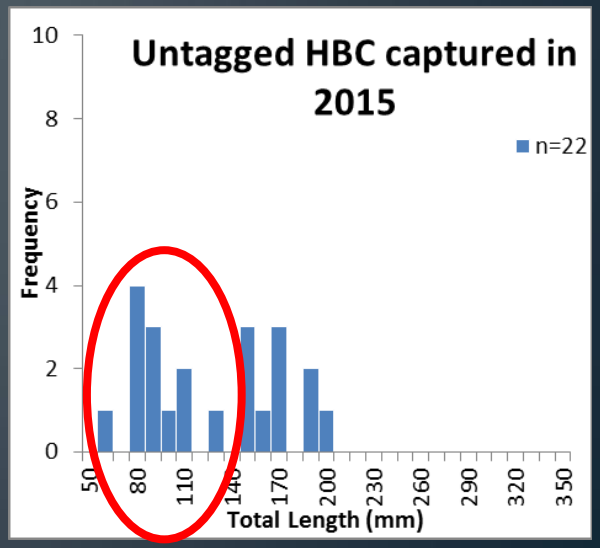
Evidence of Reproduction
Untagged HBC, by Capture Year











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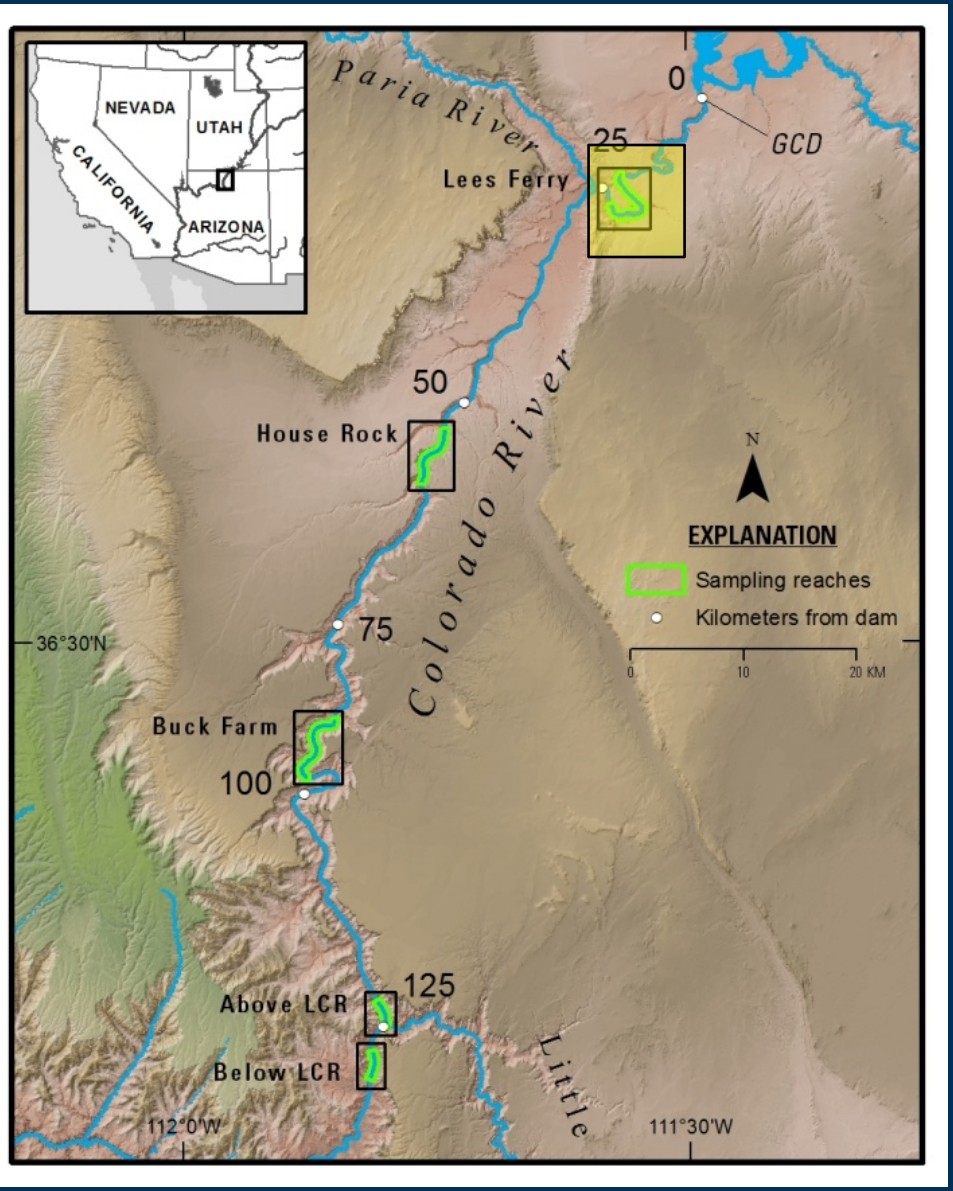
Rainbow Trout Natal Origins Study Sampling Design



- Annual age-0 marking trips from dam to Lees Ferry
  - Length >75 mm
  - ~ 10,000 marked/yr
  - Nov. 2011, Oct & Dec 2012, 2013, and 2014

- Quarterly trips for marking and tag recovery by reach
  - Jan, Apr, Jul, and Sept
  - LEES FERRY (I, -5.5 to -2.1 RM)
  - HOUSE ROCK (II, 17.2-20.6 RM)
  - BUCK FARM (III, 38.2 to 41.6 RM)
  - ABOVE LCR (IVa, 60.2 to 61.2 RM)
  - BELOW LCR (IVb, 63.4 to 64.9 RM)

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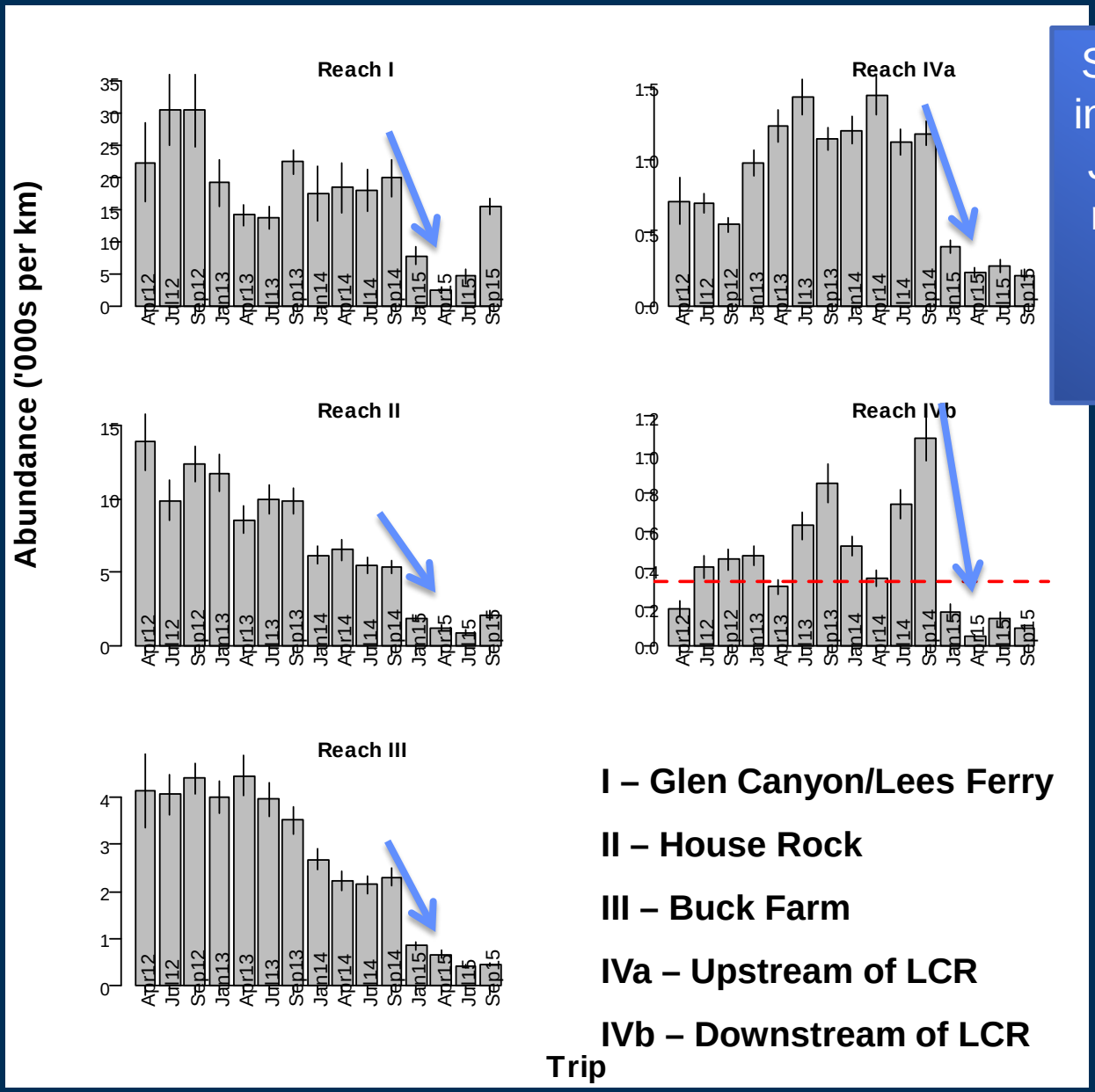
Rainbow Trout Abundance Estimates By Reach



I – Glen Canyon/Lees Ferry

II – House Rock

III – Buck Farm

IVa – Upstream of LCR

IVb – Downstream of LCR

Sharp declines in abundance in all reaches over Sept. 14 to Jan. 15 interval. Evidence of recruitment in Glen Canyon. All 2015 estimates downstream of LCR below NNFC trigger.

(Preliminary data from Yard and Korman 2016. Do Not Cite.)

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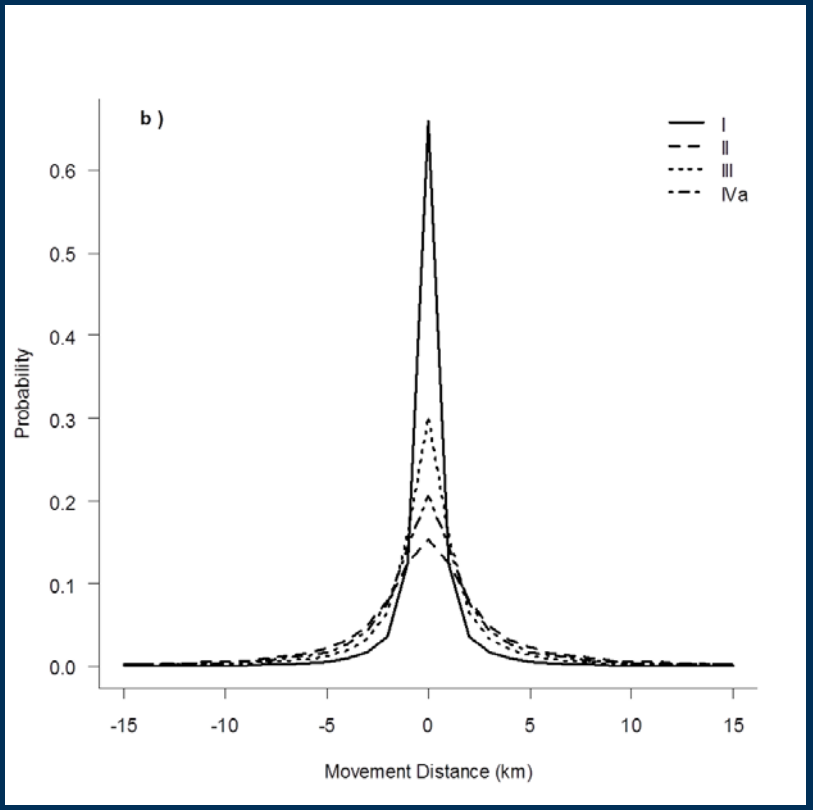
Rainbow Trout Movement

		Recapture Reach				
		GC	**II**	**III**	**IVa**	**IVb**
Release Reach	**GC**	5561	12	1	0	2
	II	34	2653	12	8	6
	III	8	9	2728	10	8
	IVa	1	0	2	1336	80
	IVb	1	0	1	12	572
Total recaptures					13,057	
Across-Reach Recaptures					207	1.6%
Across-Reach Recaptures (IVa-IVb)					115	0.9%



Very small proportions of tagged Rainbow Trout move to among study reaches.

Approximately equal upstream and downstream dispersal, except at LCR where downstream movement is more common.

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(Preliminary data from Korman and Yard 2016. Do Not Cite.)

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? No

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2011 USFWS Biological Opinion Non-native Fish Control Trigger

- **AND**
- **Rainbow trout abundance over 760?** **No**

  Open model estimates below threshold for all trips in 2015
  (Korman and Yard, preliminary data)
- **AND**
- **Brown trout abundance over 50?** **Unknown**

  2015 catches low, only 2 total caught in Sept. 2015 – catches too low to generate abundance estimate
  (Yard and Korman, preliminary data)

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Economic value of angling on the Colorado River at Lees Ferry: Using secondary data to estimate the influence of seasonality

Lucas Bair, U.S. Geological Survey
David Rogowski, Arizona Game and Fish Department
Chris Neher, University of Montana

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

Study Overview

- **Objective**: Estimate the seasonal variation in economic value of angling at Lees Ferry and identify angler preferences that influence their experience.
- **Methods**: Estimate economic value of angling utilizing the travel cost method
- **Data:** Arizona Game and Fish Department creel data from 2012 - 2014

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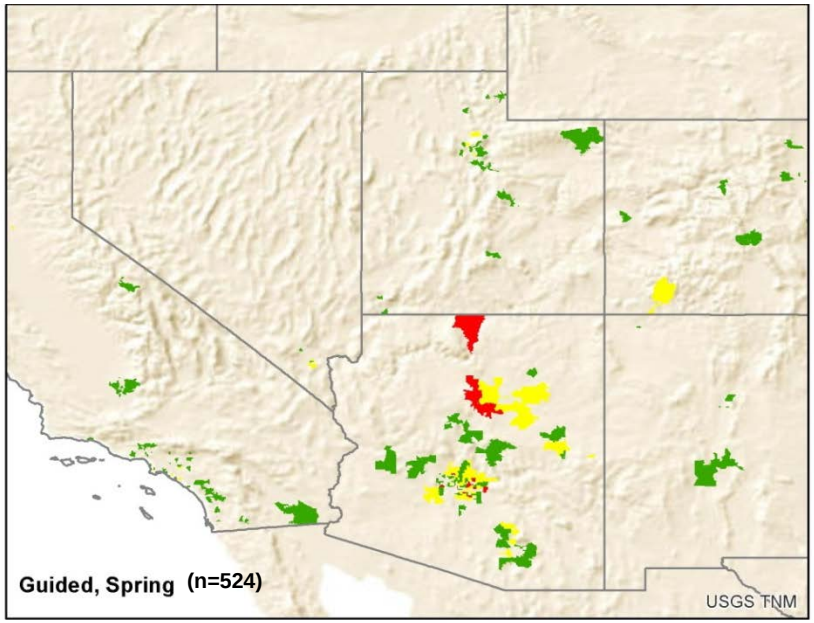
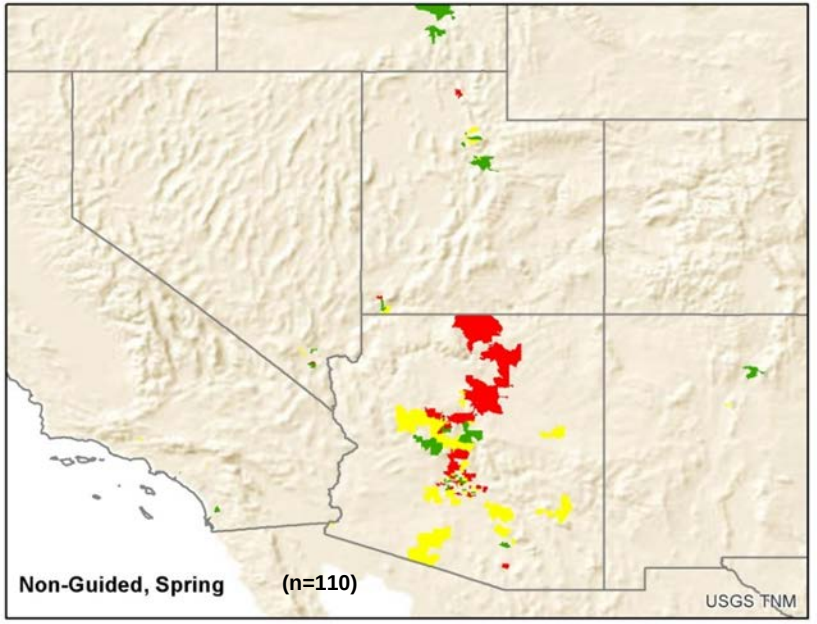
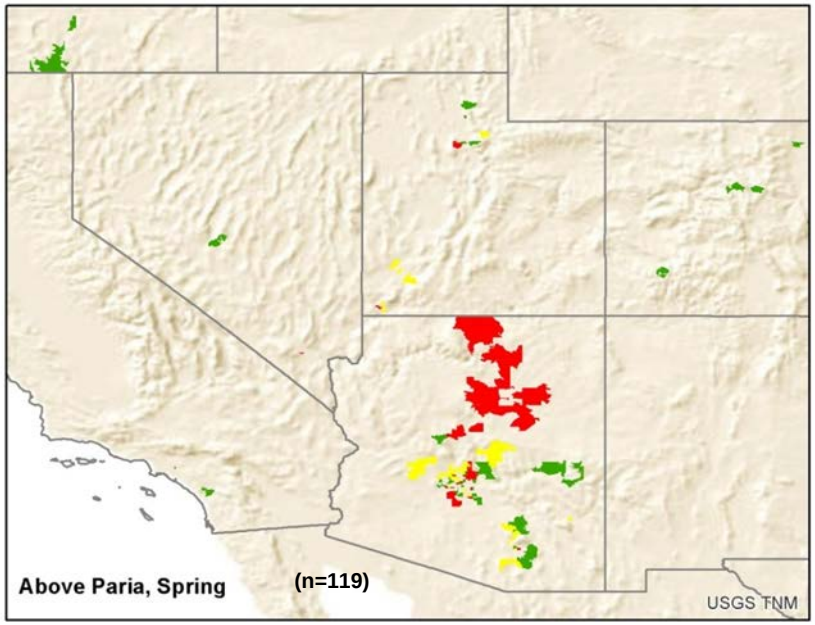
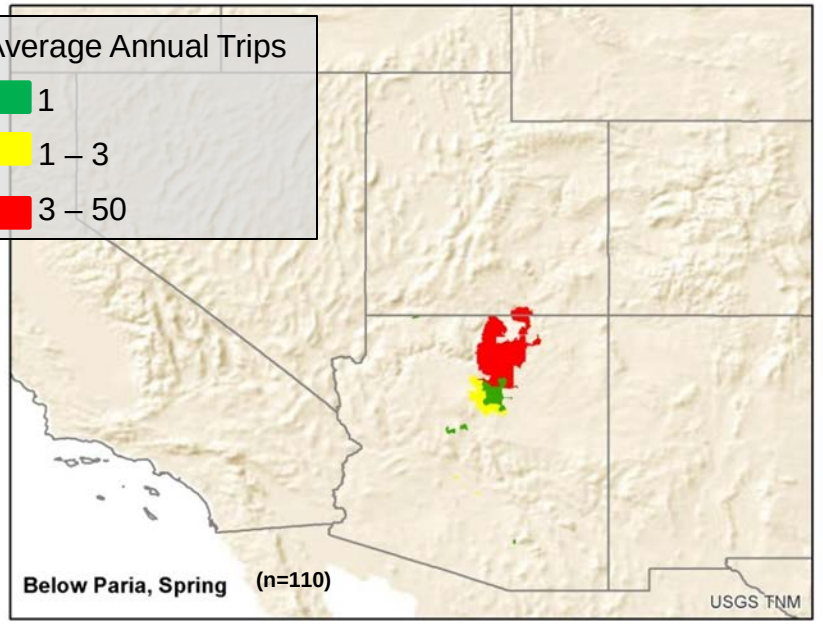
Angler Visitation in Spring





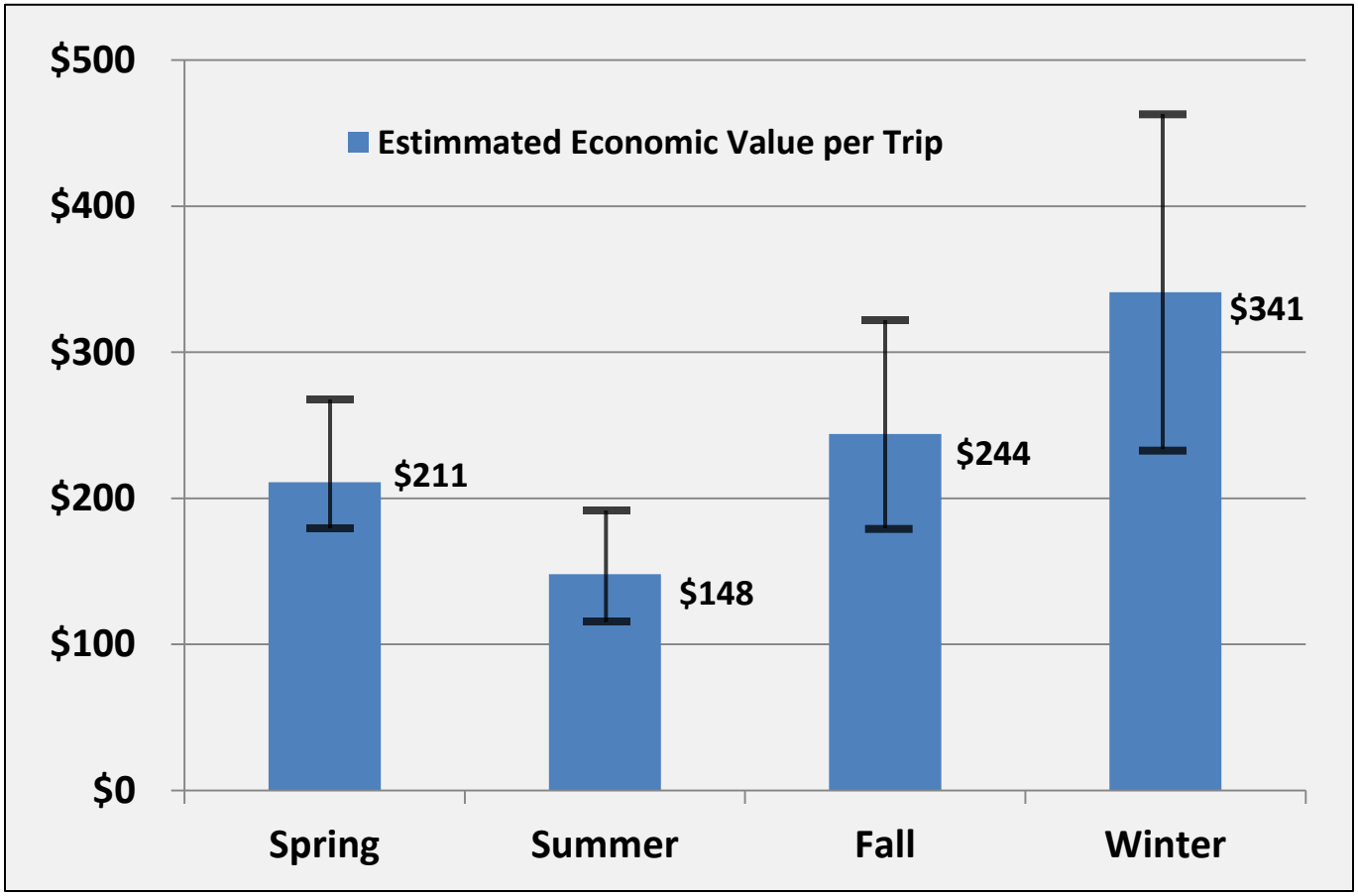




Average Annual Trips
- 1
- 1 – 3
- 3 – 50

Preliminary data, do not cite

Seasonal Economic Benefits*



Bootstrapped aggregate model seasonal benefit estimates at Lees Ferry with confidence intervals at the 95% level (2014 dollars)

***Preliminary data, do not cite**

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GREEN SUNFISH REMOVAL

Mike Anderson; AZ Game and Fish

Mark Anderson; Glen Canyon NRA

Melissa Trammell; NPS

Brian Healy; Grand Canyon NP

Rosemary Sucec; Glen Canyon NRA

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Cooperators

- Arizona Game and Fish Department
- National Park Service
  - Glen Canyon NRA
  - Grand Canyon NP
  - North Cascades NP
- US Geological Survey-GCMRC
- US Fish and Wildlife Service
- Bureau of Reclamation
- Western Area Power Administration
- Hopi, Hualapai, Kaibab Paiute, Navajo, and Zuni

Cooperative Effort

- **NPS:** Coordination, planning, compliance, communication, security, safety, logistics, labor
- **USGS-GCMRC:** Mechanical removal, risk assessment, hydrology, fish collection, otolith extraction, logistics, labor, macroinvertebrate survey
- **WAPA:** Steady flows
- **AGFD:** Coordination, Initial detection, mechanical removals, planning, permitting, emergency approval (commission), lead implementation, logistics, labor
- **FWS:** Compliance, guidance, labor
- **BOR:** Funding, steady flows, decision to forego HFE

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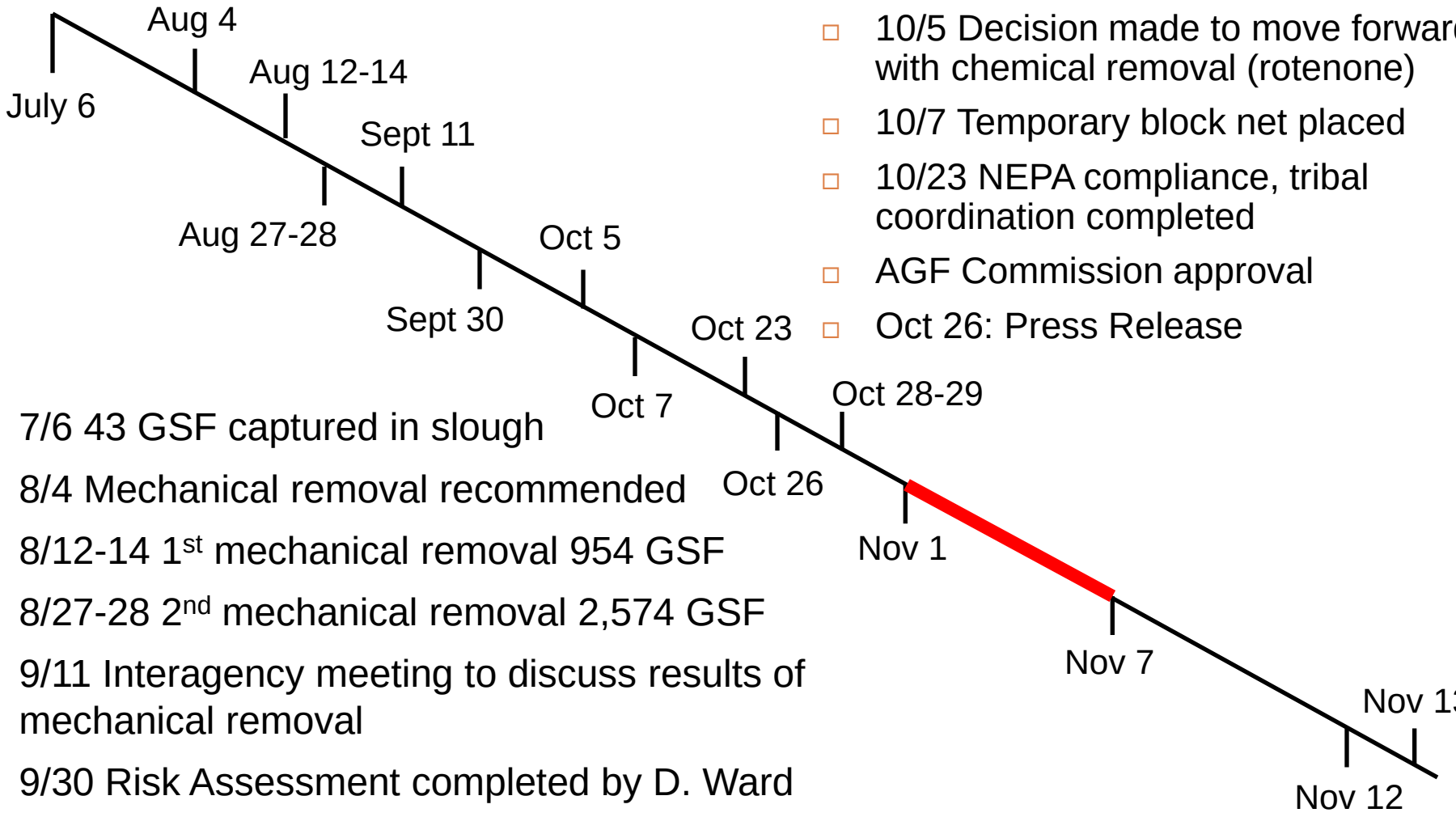
Treatment Timeline



- 7/6 43 GSF captured in slough
- 8/4 Mechanical removal recommended
- 8/12-14 1st mechanical removal 954 GSF
- 8/27-28 2nd mechanical removal 2,574 GSF
- 9/11 Interagency meeting to discuss results of mechanical removal
- 9/30 Risk Assessment completed by D. Ward

- 10/5 Decision made to move forward with chemical removal (rotenone)
- 10/7 Temporary block net placed
- 10/23 NEPA compliance, tribal coordination completed
- AGF Commission approval
- Oct 26: Press Release

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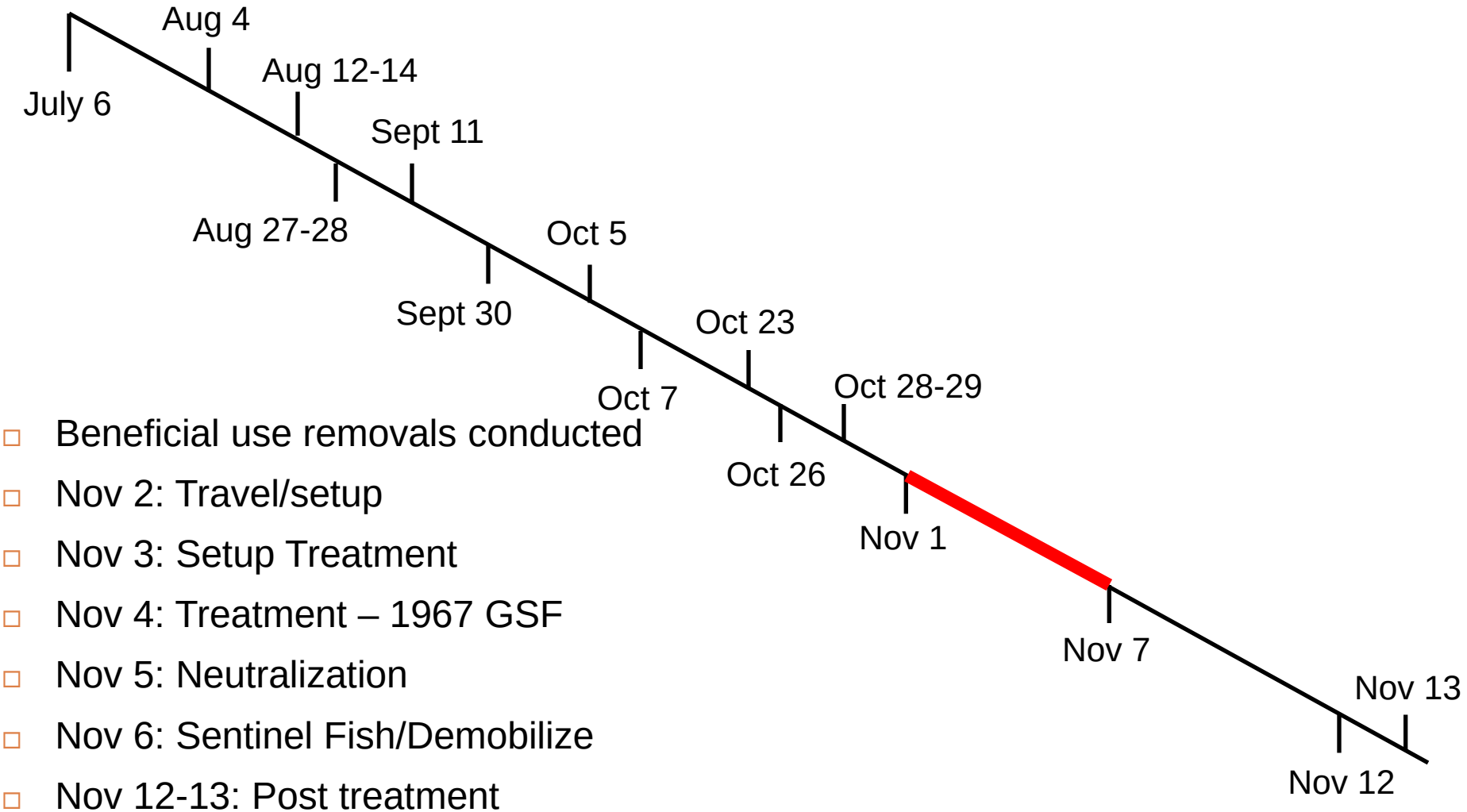
Treatment Timeline



- Beneficial use removals conducted
- Nov 2: Travel/setup
- Nov 3: Setup Treatment
- Nov 4: Treatment – 1967 GSF
- Nov 5: Neutralization
- Nov 6: Sentinel Fish/Demobilize
- Nov 12-13: Post treatment monitoring

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Acknowledgements

- Bureau of Reclamation and the Glen Canyon Dam Adaptive Management Program

- Arizona Game and Fish Department
- National Park Service
- US Fish and Wildlife Service
- Ecometric Inc.
- USGS-GCMRC

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Questions?