

Razorback Sucker *Xyrauchen texanus* Research and Monitoring in the Colorado River Inflow Area of Lake Mead and the Lower Grand Canyon, Arizona and Nevada

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(¹ BIO-WEST, Inc., ² American Southwest Ichthyological Researchers, LLC, ³ U.S. Bureau of Reclamation, Upper Colorado Region, ⁴ National Park Service, ⁵ Lower Colorado River Multi-Species Conservation Program)

Based on past studies and recent movements of sonic-tagged Razorback Suckers from Lake Mead into the lower Grand Canyon (LGC) section of the Colorado River, questions regarding this population have spurred further interest into the presence of wild individuals and their relationship between the river and reservoir. For more than 20 years, Razorback Suckers were thought to be extirpated within the Grand Canyon. This collaborative and holistic study included efforts to continue monitoring Razorback Sucker (all life stages) within the Colorado River inflow of Lake Mead (CRI) with the inclusion of sonic telemetry, small-bodied fish community, and larval fish community sampling from Lava Falls downstream to Pearce Ferry, in the LGC (RM 180-280). The specific objectives outlined for these efforts included; (1) conducting larval and small-bodied fish studies to quantitatively assess annual fish reproduction, spawning, and nursery areas in the LGC, (2) determining if Razorback Suckers were present in the study area and if they associated with habitat found within the LGC through telemetry and opportunistic adult sampling, and (3) identifying habitat associations, relative spawning and reproductive effort, and population trends of Razorback Sucker in the CRI. Specifically, this paper will present findings from the CRI portion of this multi-faceted study, particularly regarding natural recruitment observed within this population, with additional results from the LGC, as informed from small-bodied fish community sampling and adult Razorback Sucker telemetry efforts.

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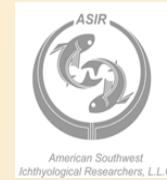
Brandon Albrecht¹, Ron Kegerries¹, W. Howard Brandenburg², Adam L. Barkalow², Steven P. Platania², Mark McKinstry³, Brian Healy⁴, Emily Omana⁴, and James Stolberg⁵

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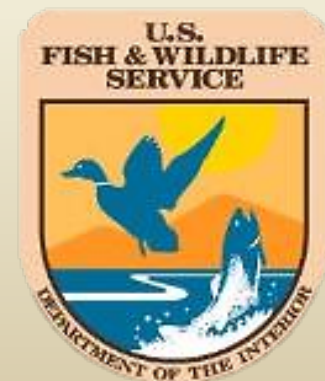


Collaboration is key...

Federal, State, Private, Upper and Lower Colorado Basins



**American Southwest
Ichthyological Researchers**



Increasing evidence of lake-wide movement of RBS

Nevada

Virgin River
Muddy River

Full Pool Level
(1225 feet above MSL)

Fish Island

2006 Lake Level
(1142 feet above MSL)

The Meadows

2010 Lake Level
(1103 feet above MSL)

Overton A

2011 Lake Level
(1096 feet above MSL)

Roger's B

Echo Bay

Echo Bay SUR

Boulder Wash Cove

Grand Wash Bay

Driftwood Cove

Iceberg Canyon

Colorado River Inflow

Blackbird Point

Las Vegas Bay

Gregg Basin

Boulder Basin SUR

Bonelli Bay

Pearce Ferry Bay

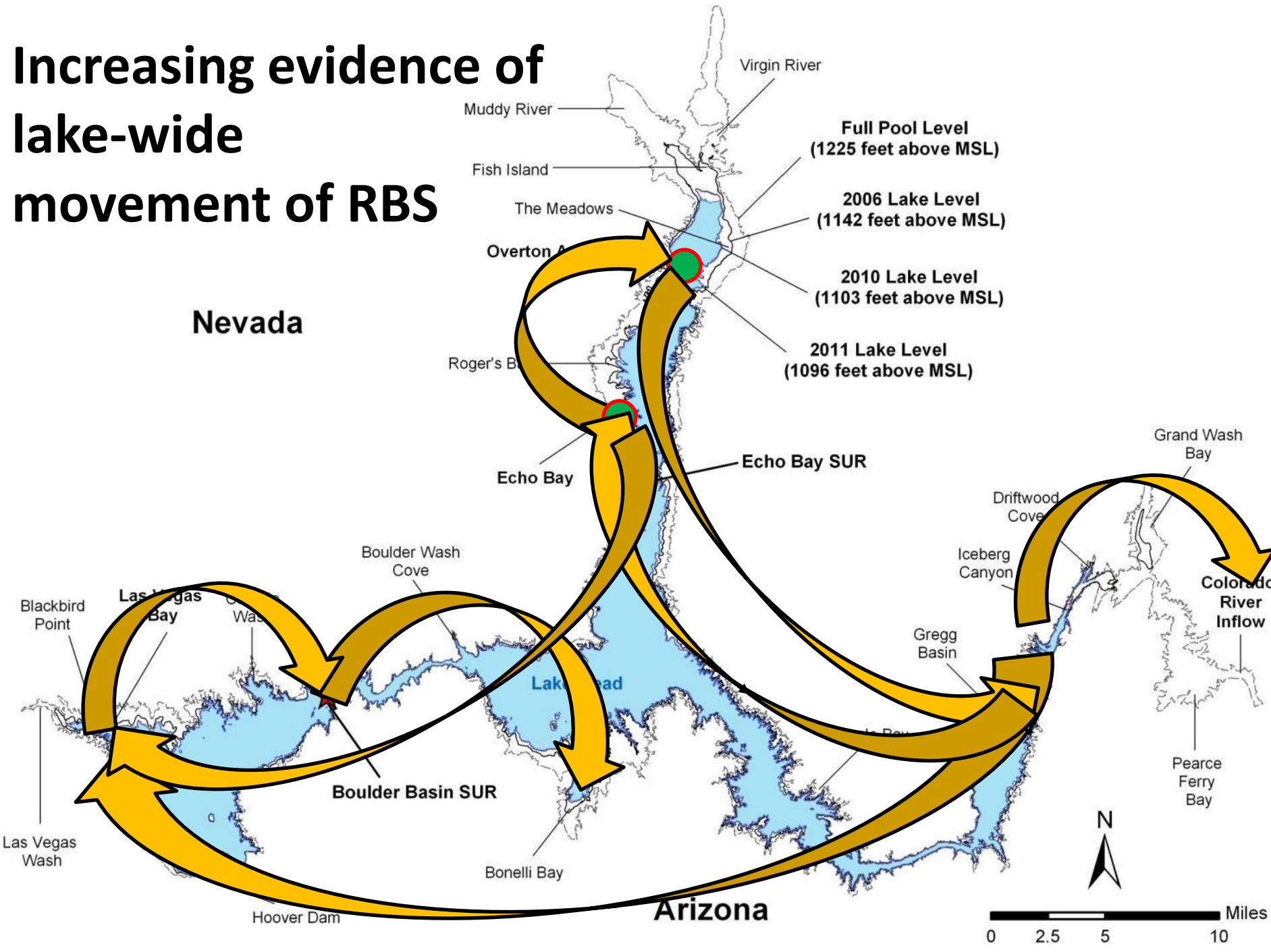


0 2.5 5 10 Miles

Arizona

Hoover Dam

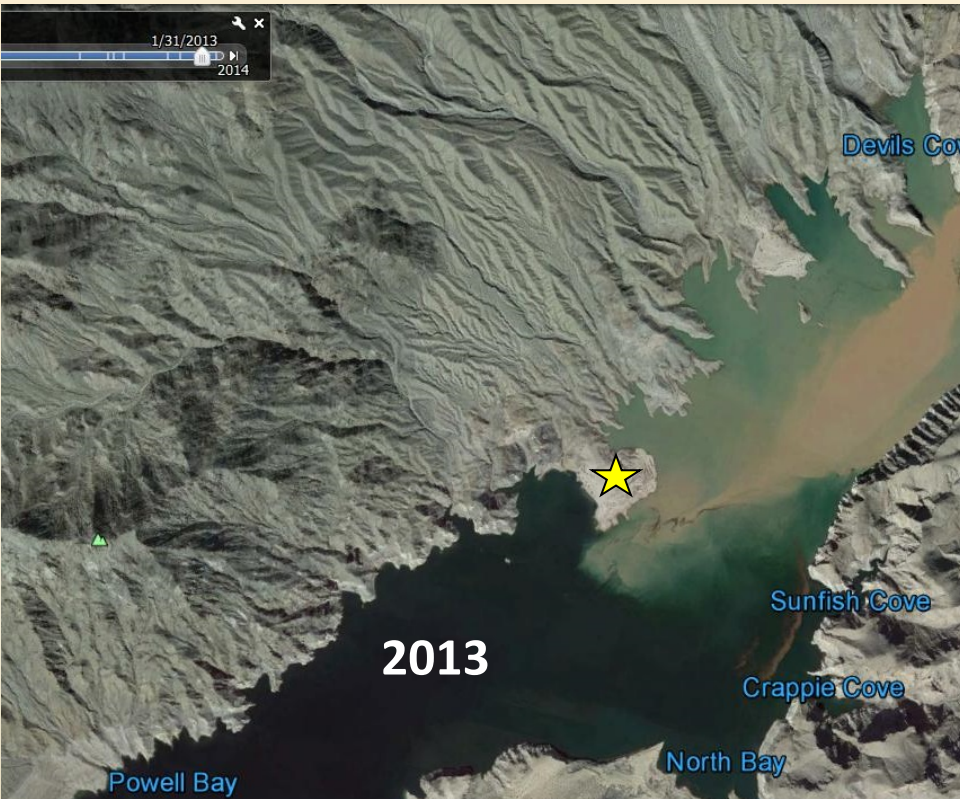
Las Vegas Wash



Colorado River inflow (CRI)

Dynamic!

One year of
change shown



Methods-Lake

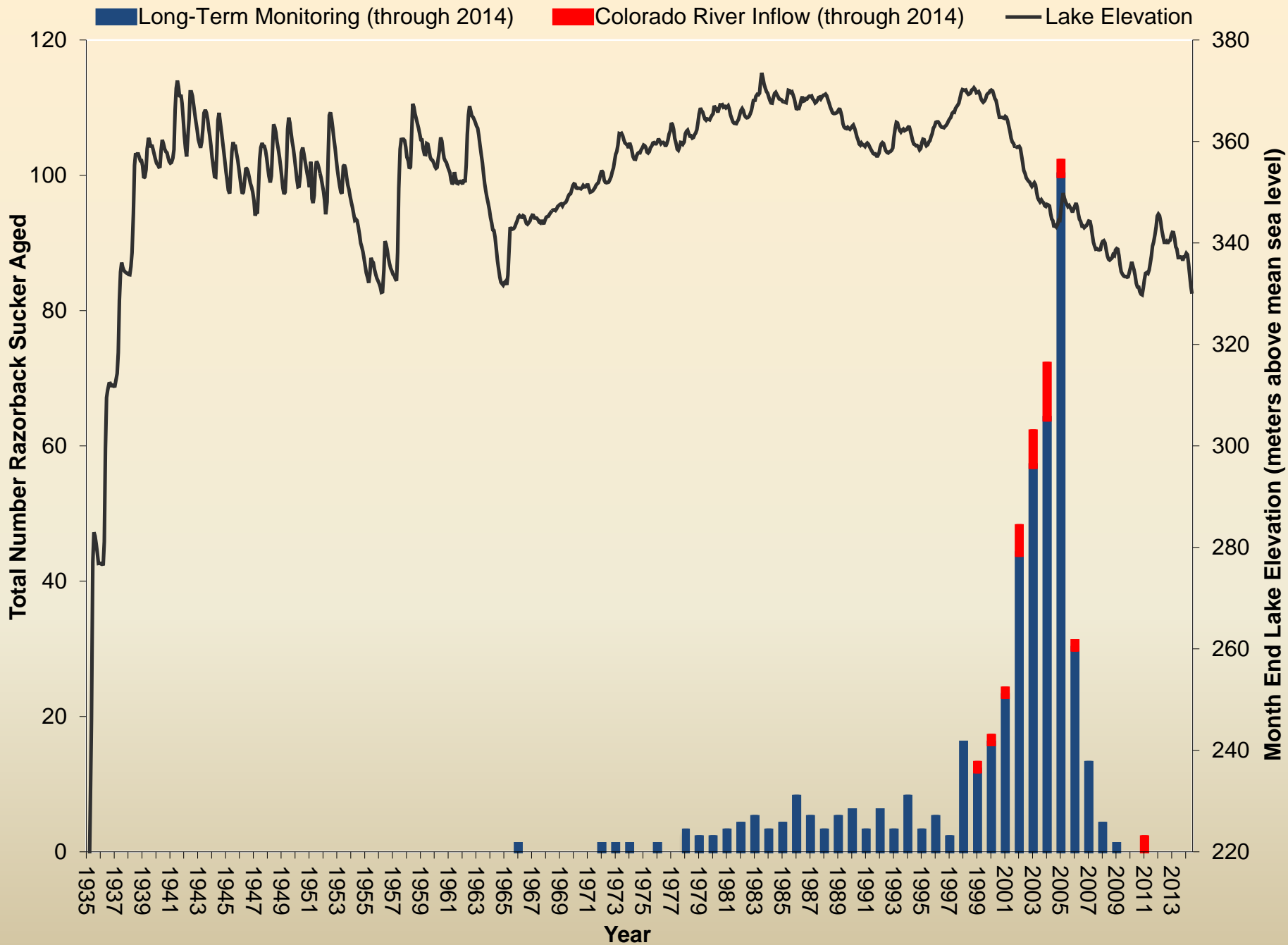
Field

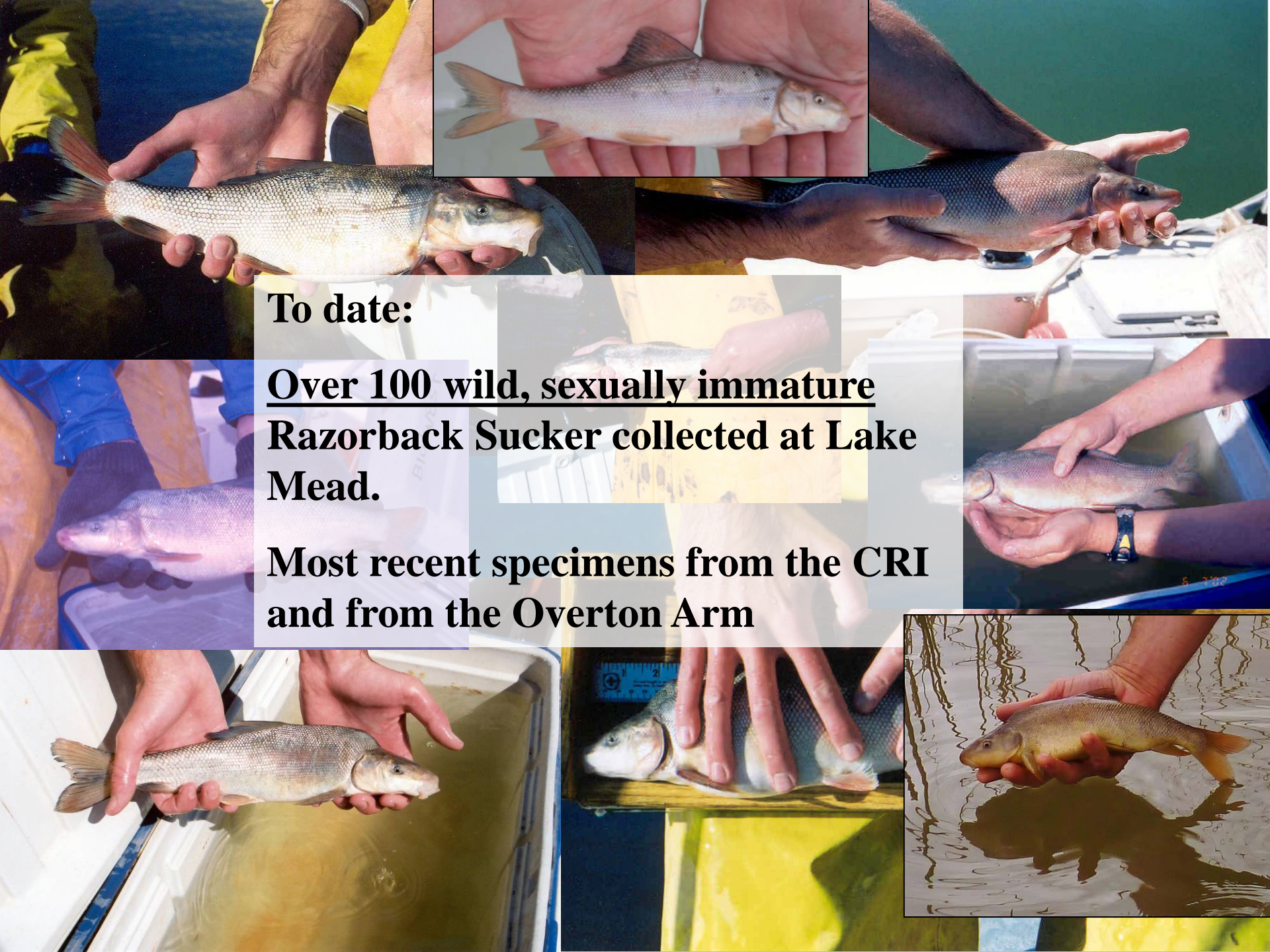
- Sonic telemetry
- Trammel netting
- Larval sampling

Laboratory

- Age determination
- Population estimation
- Survival estimation





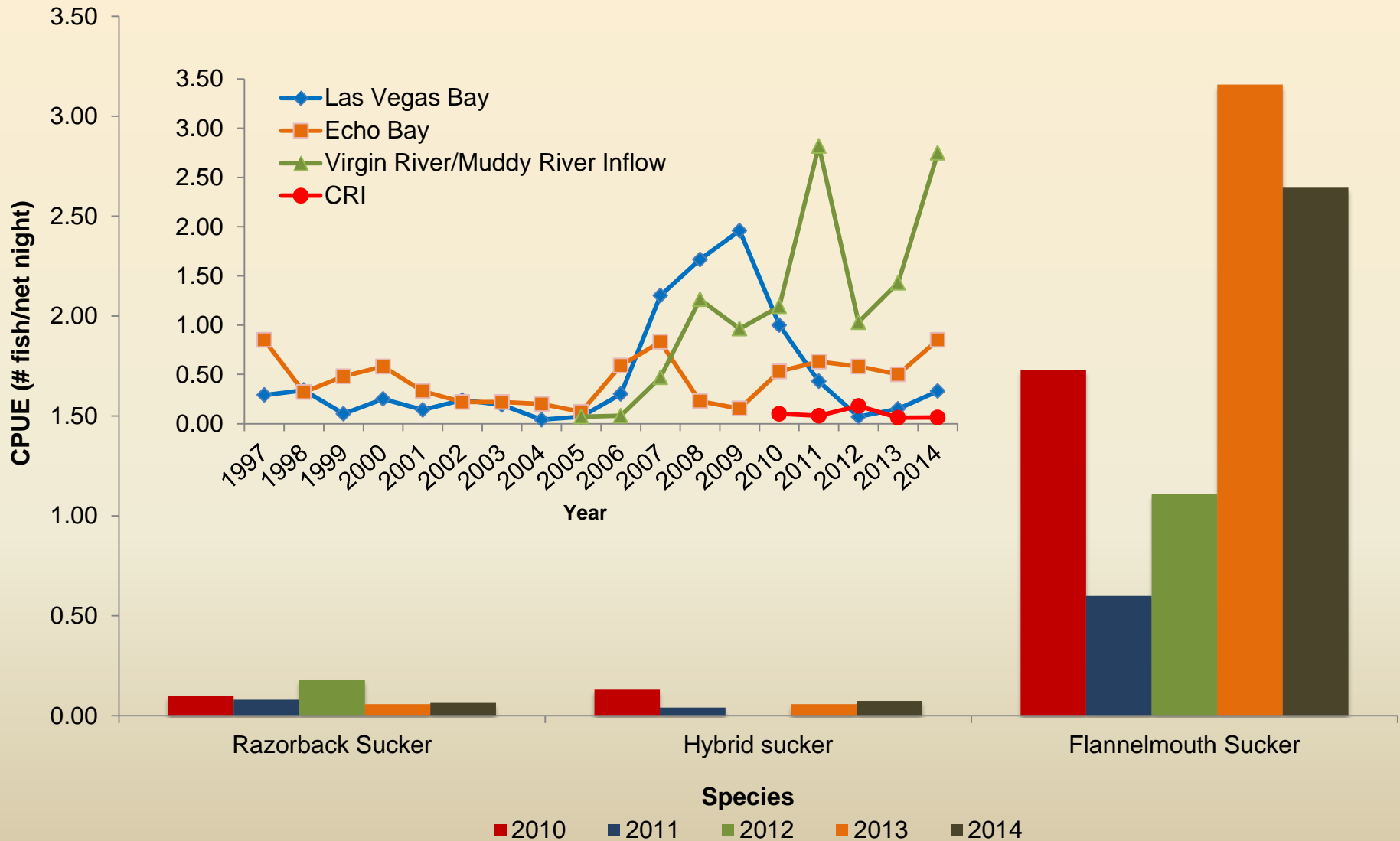


To date:

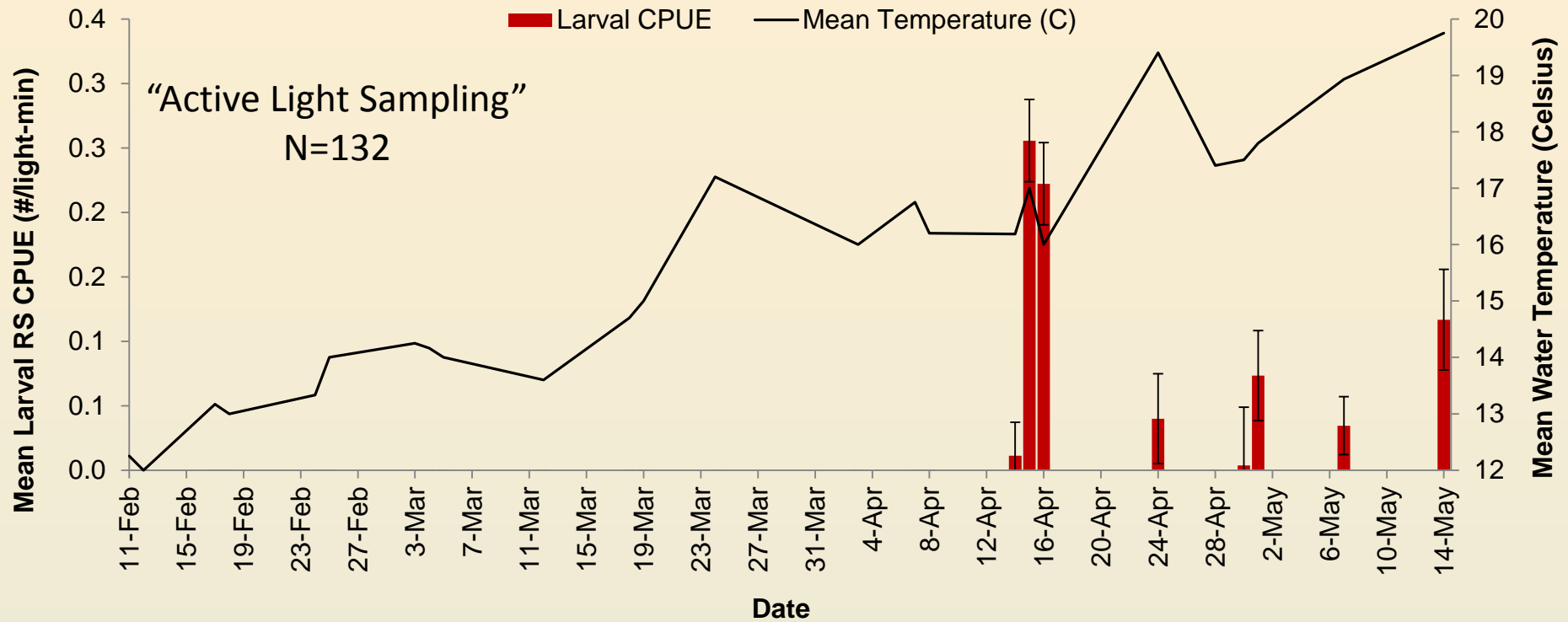
**Over 100 wild, sexually immature
Razorback Sucker collected at Lake
Mead.**

**Most recent specimens from the CRI
and from the Overton Arm**

Netting Catch Rates (CRI)

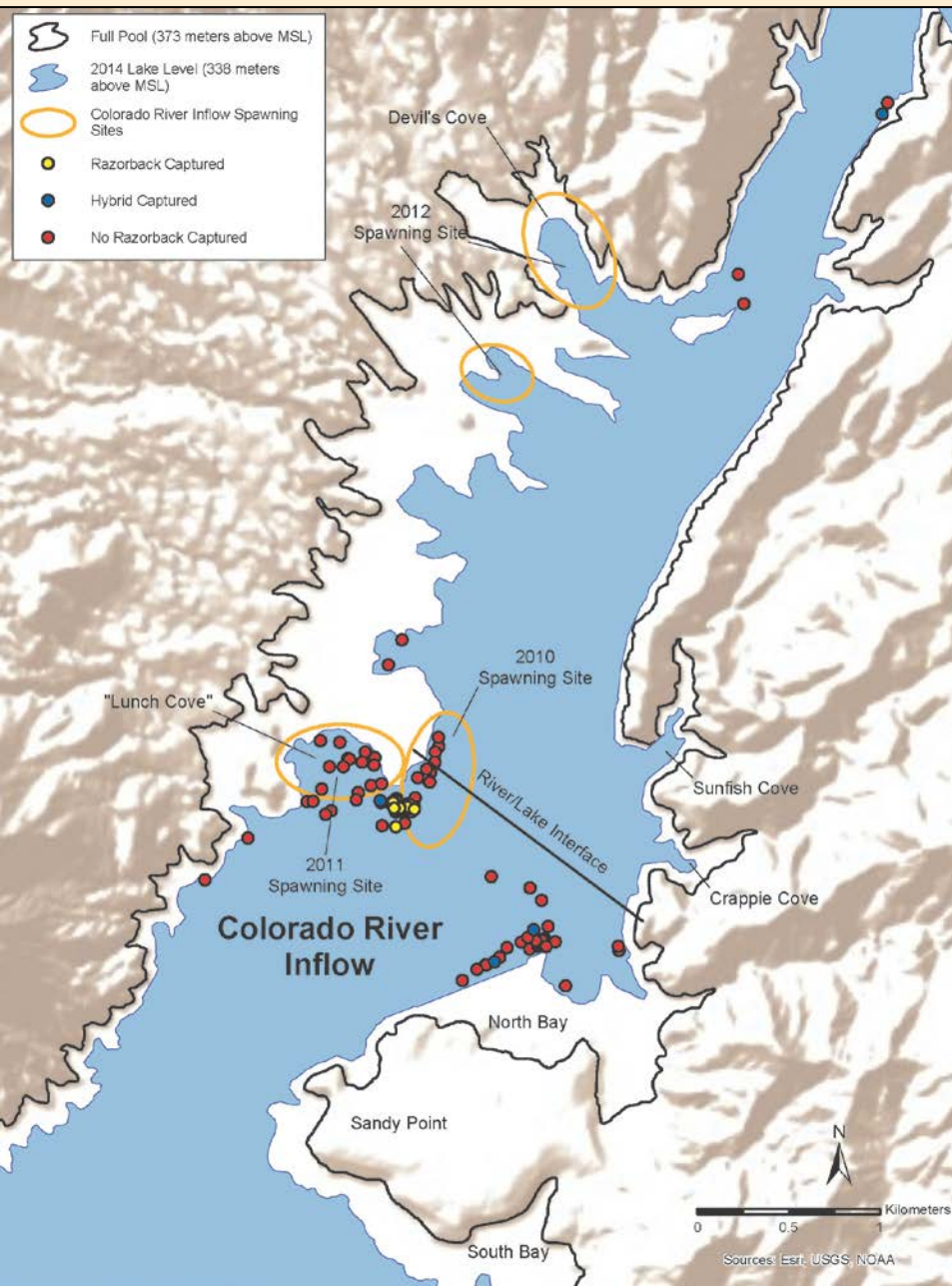


Larval Sampling (CRI)

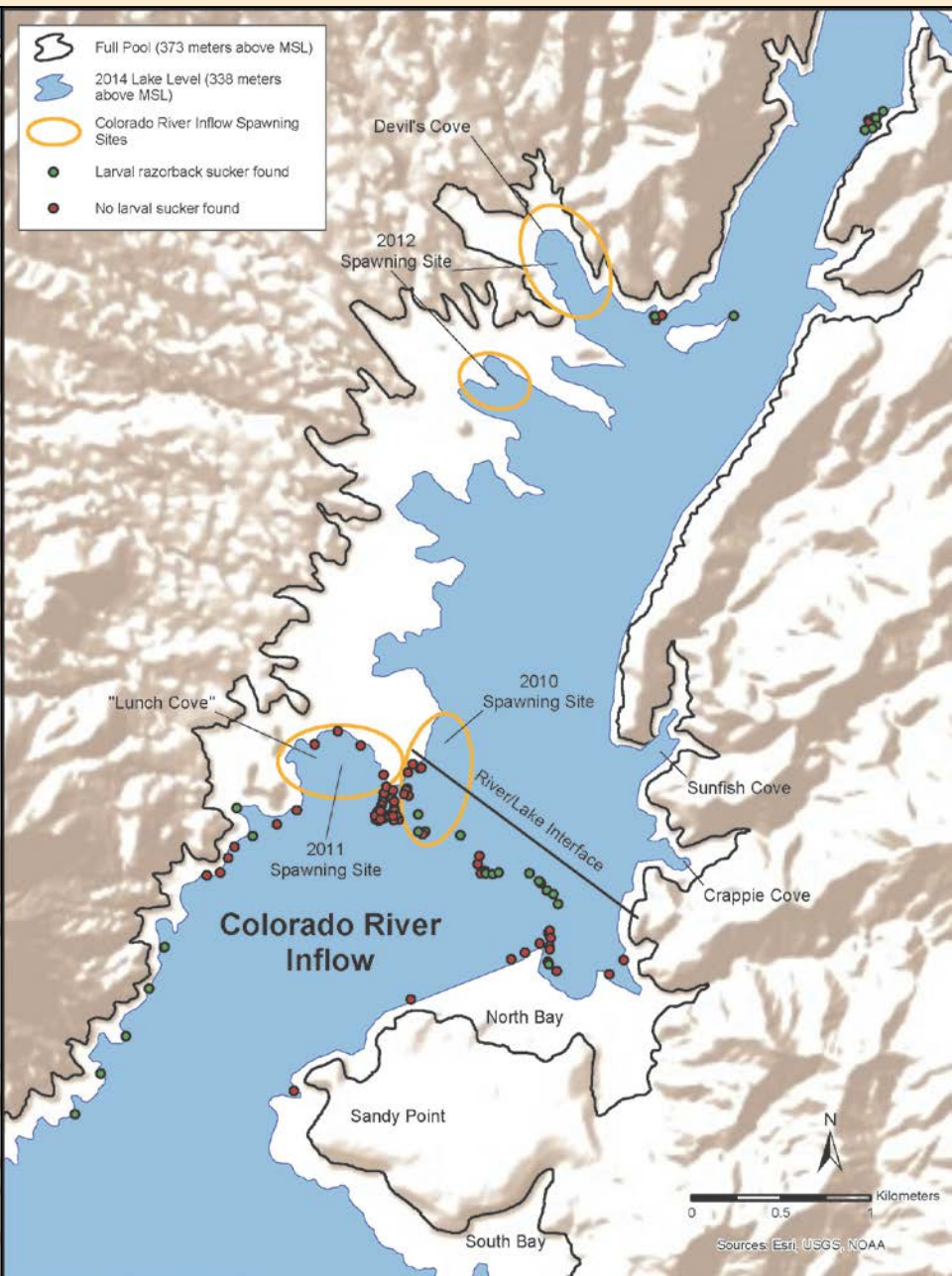


| LOCATION | 2007 | 2008 | 2009 | 2010 | 2011 | 2012 | 2013 | 2014 |
|-------------------------------------|-------|-------|-------|-------|-------|--------|-------|-------|
| Colorado River Inflow | -- | -- | -- | 0.002 | 0.007 | 0.0014 | 0.000 | 0.042 |
| Las Vegas Bay | 0.39 | 0.43 | 0.342 | 0.093 | 0.282 | 0.1791 | 0.391 | 0.427 |
| Echo Bay | 0.43 | 0.024 | 0.021 | 0.269 | 1.482 | 0.2197 | 0.019 | 0.090 |
| Virgin River/ Muddy River Inflow | 0.001 | 0.116 | 0.107 | 0.011 | 0.013 | 0.0036 | 0.205 | 0.265 |

Netting



Larval





**Movement of
tagged fish from
CRI into LGC**

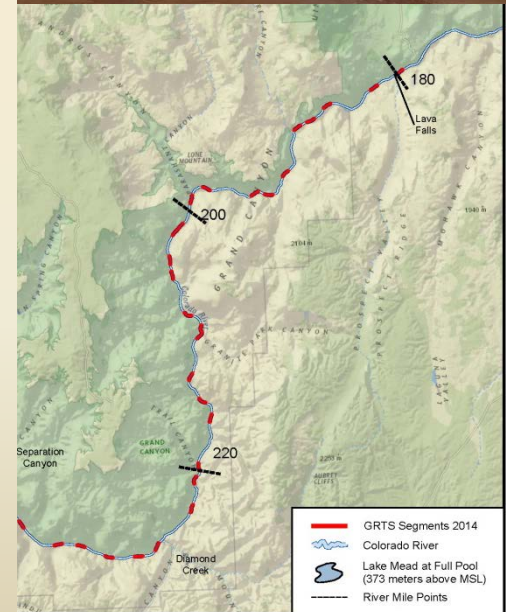
**Adult captures by
AZGFD**

Lower Grand Canyon

- Determine RBS presence and habitat use in LGC
 - Larval and **small-bodied fish community sampling within the LGC**
 - Assess reproduction, spawning, **habitat use, and distribution**
 - **Sonic telemetry, opportunistic adult sampling**
- Explore linkages between Lake Mead and LGC
- Continued CRI and LGC- Holistic perspective

LGC Small-bodied Sampling

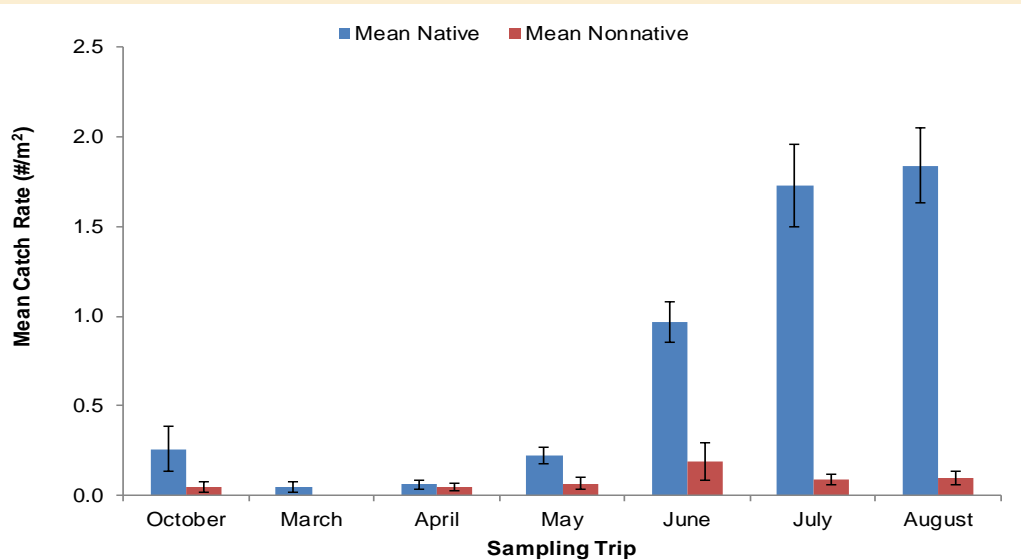
- 7 sampling trips per year
 - October, March-August 2014
 - Lava Falls to Pearce Ferry (RM 179-280)
- Sonic Telemetry
 - 9 RBS released near Lava Falls
 - SURs deployed every 5 miles
 - Active Listening
- Seining
- Generalized Random Tessellation Stratified (GRTS)



GRTS Sampling Design

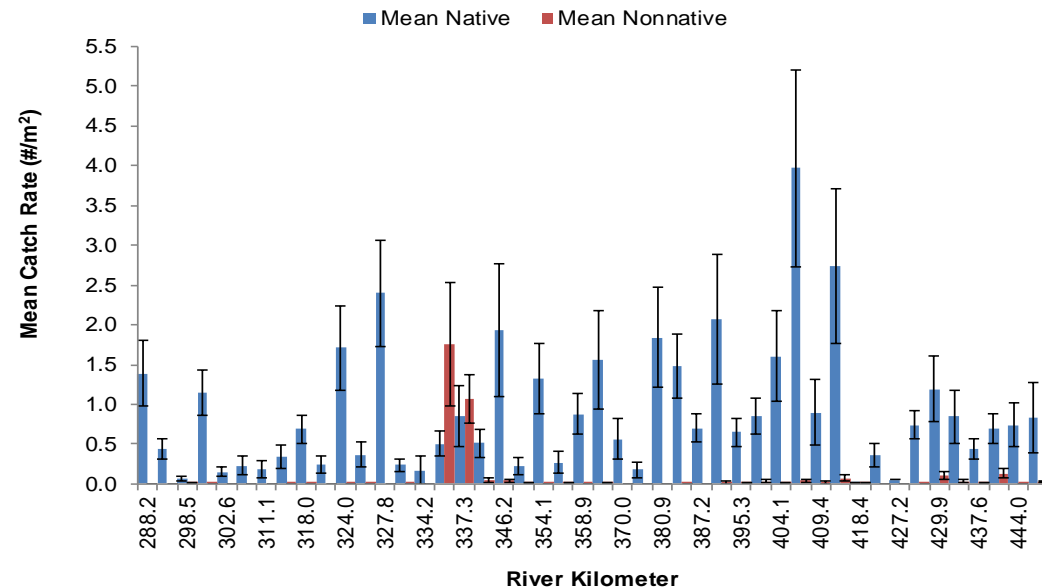
- Well established and used by NPS
- Ensures spatially balanced, random sampling while reducing sampler bias
- 100 RM reach was divided into 800 m segments
- S-Draw selected 40, spatially balanced, segments with an additional 10 replacements
- Sampling can occur anywhere within the segment
- Repeated sampling in each of the 40 segments each trip

LGC Small-Bodied Sampling



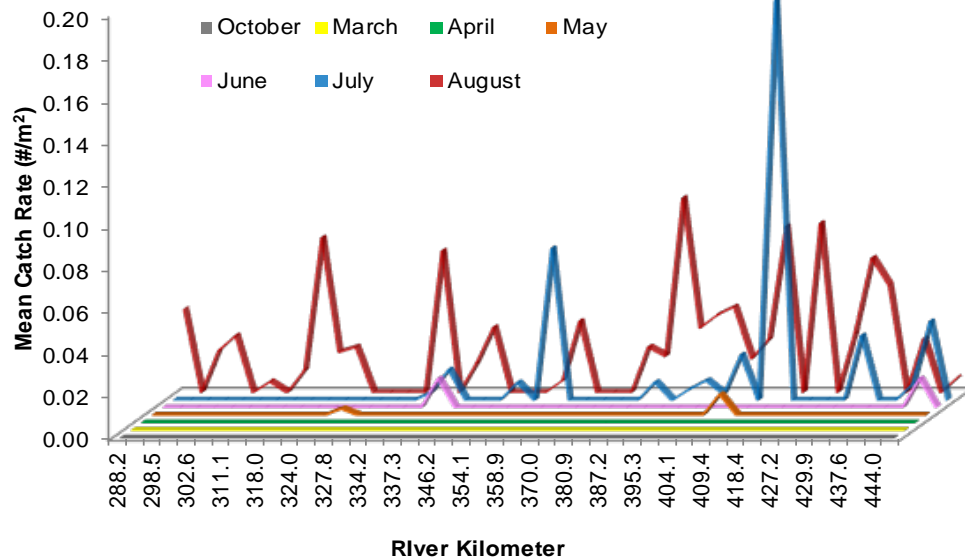
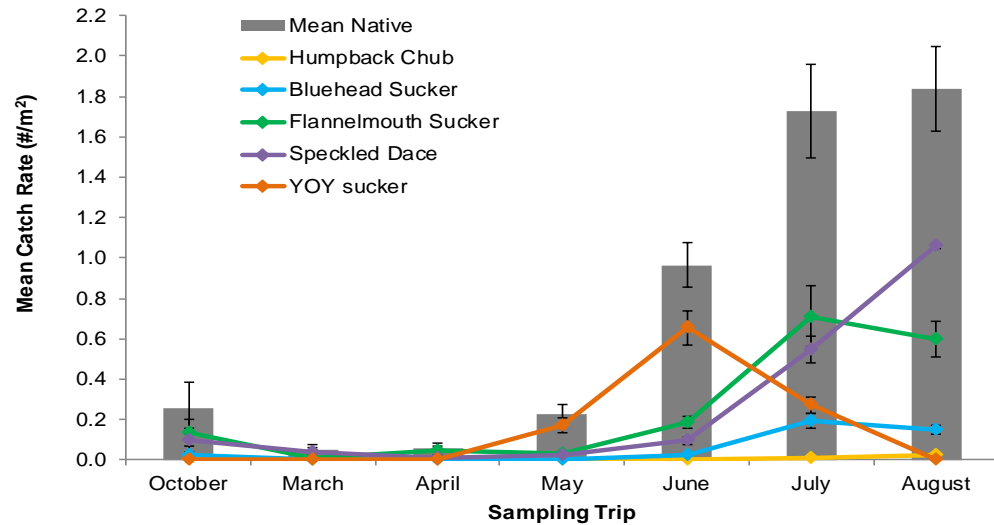
- No Razorback Sucker
- 4-native species
- Native dominance ($P < 0.0001$)

- Native abundance increase Jun.-Aug.
- Native fish present throughout
- Native dominance at nearly all segments



LGC Small-Bodied Sampling

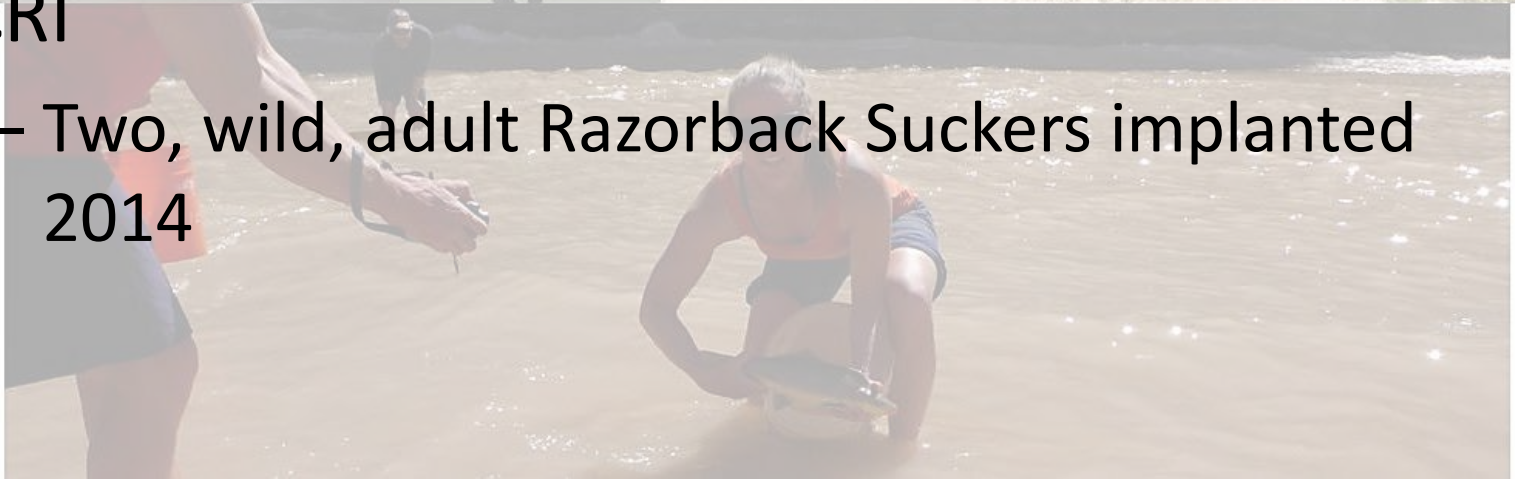
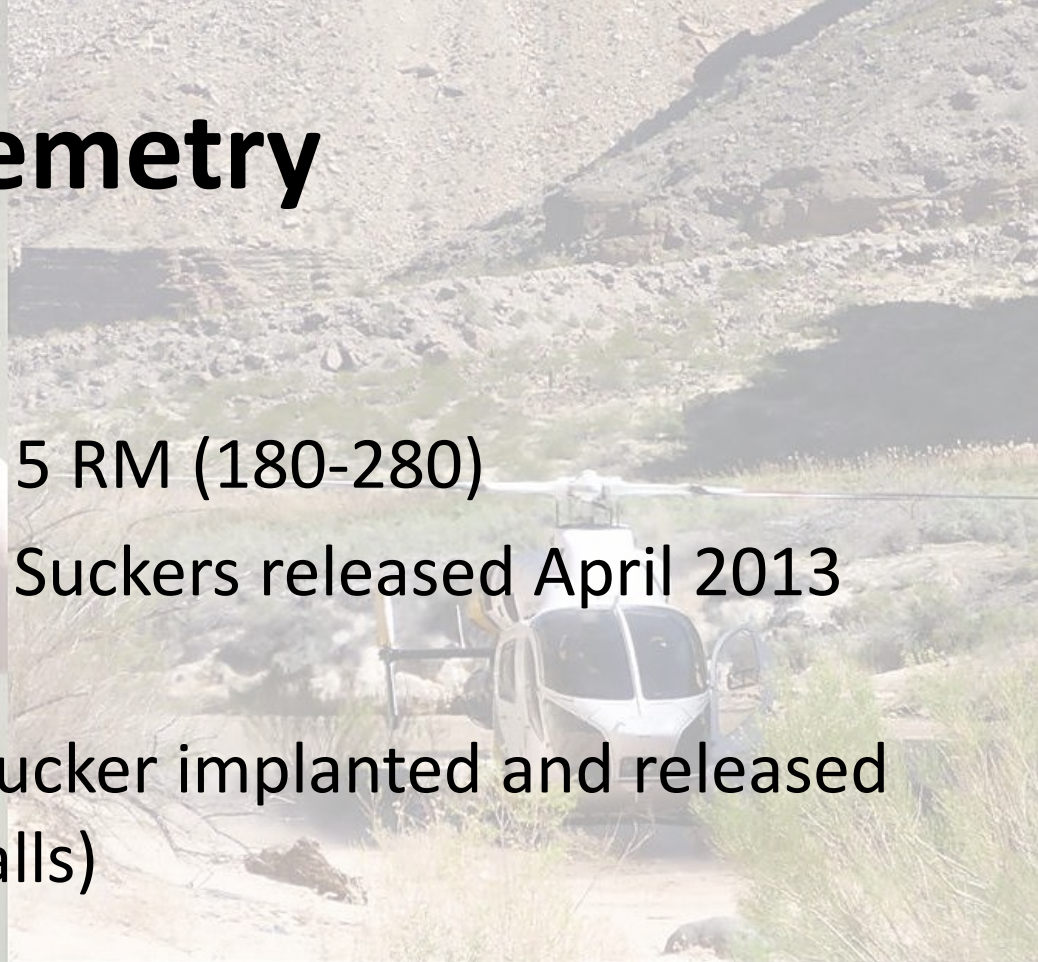
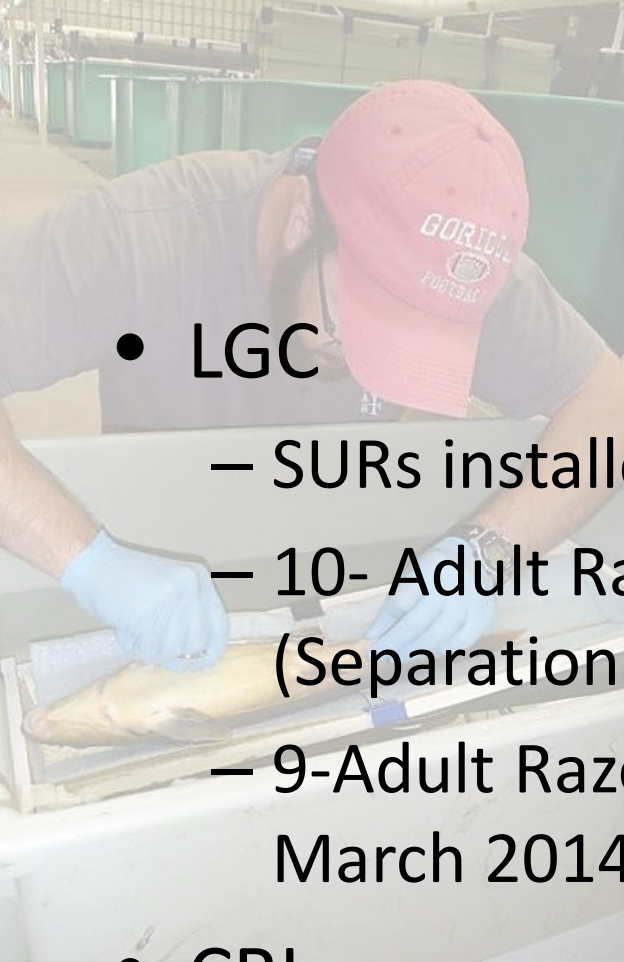
- YOY suckers dominated early
- YOY Humpback Chub present May-Aug. (N=144; 16-97mm)



- HC abundance increased throughout the summer
- Relatively even distribution by Aug.

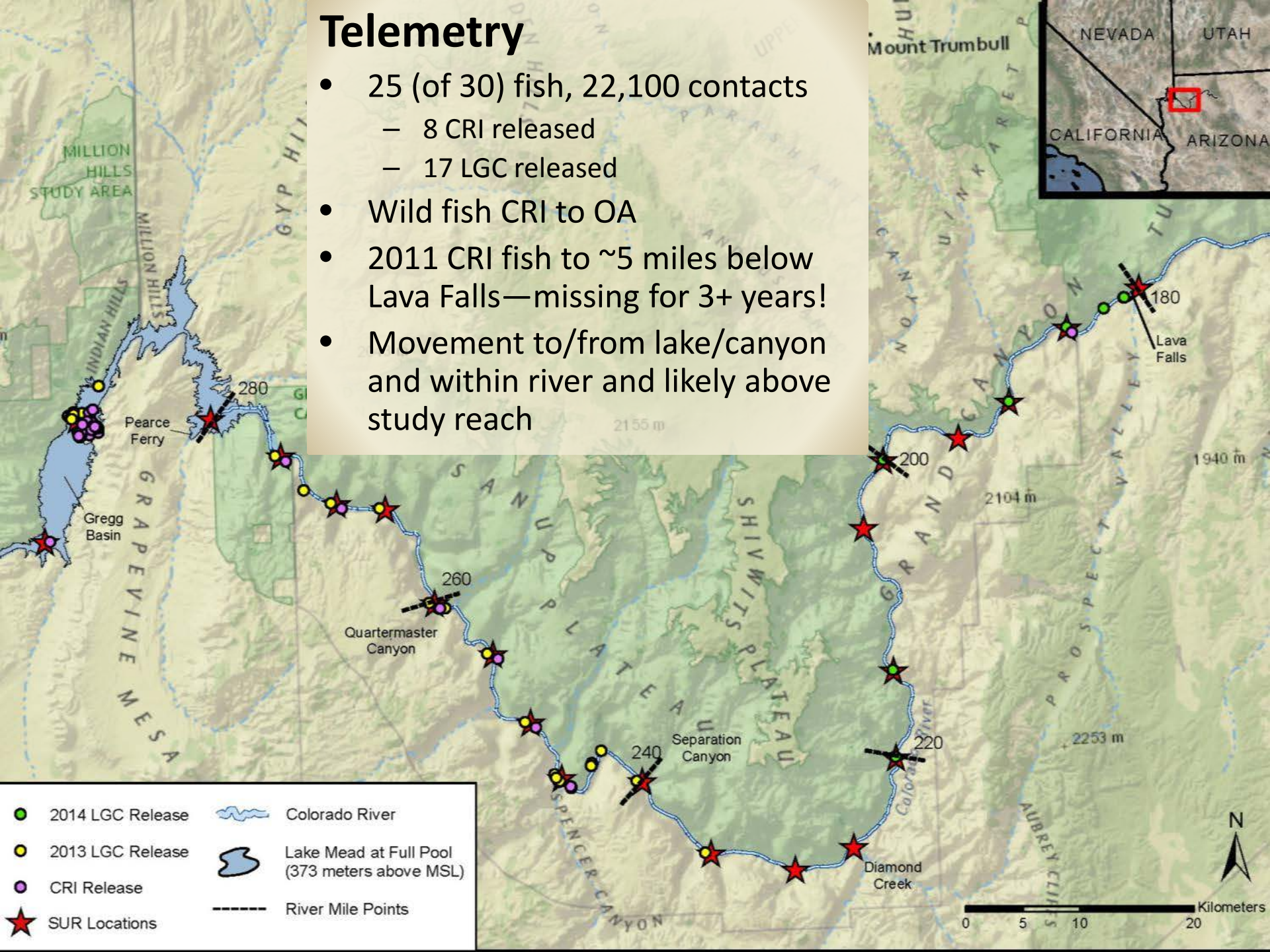
Telemetry

- LGC
 - SURs installed every 5 RM (180-280)
 - 10- Adult Razorback Suckers released April 2013 (Separation)
 - 9-Adult Razorback Sucker implanted and released March 2014 (Lava Falls)
- CRI
 - Two, wild, adult Razorback Suckers implanted 2014



Telemetry

- 25 (of 30) fish, 22,100 contacts
 - 8 CRI released
 - 17 LGC released
- Wild fish CRI to OA
- 2011 CRI fish to ~5 miles below Lava Falls—missing for 3+ years!
- Movement to/from lake/canyon and within river and likely above study reach





Conclusions and Considerations...

- **Razorback Sucker present at the CRI (5th year) and second immature RBS captured at CRI (age-3)**
- **No Razorback Suckers captured during LGC small-bodied sampling in 2014, but recently transformed Age-0 juveniles in Iceberg Canyon**
- **Telemetry identified movement between river and lake, but likely that movement occurring above Lava Falls above our study area**
- **GRTS sampling yielded similar species composition with higher native catch rates (better than opportunistic sampling)**
- **Capture of other small sucker species lends hope for capturing small, wild Razorback Suckers in the future**
- **Age-0 Humpback Chub fairly common from Lava Falls to Pearce Ferry (entire study reach)**
- **Hypothesize that combination of both habitats cumulatively allow for natural Razorback Sucker recruitment—dynamic!**

Next Steps...

- 7 trips in 2015
 - March-Sept
- Continued telemetry
- Continued small-bodied seining
 - GRTS
- Opportunistic adult sampling
- Opportunities for SURs upstream?



Reservoirs and Razorback Sucker recruitment...a historical perspective...

- Razorback Sucker becoming a star basin-wide, despite NNF predation.
- Floodplain habitats historically were and will continue to be important for Razorback Sucker recruitment, now working better in upper basin.
- Lake Mead and the LGC may be a contemporary version of recruitment/floodplain habitat for this species for the lower basin.
- Consider Lake Powell
- Stay tuned for Howard's talk next...



Baser Bend
Photo
Credits:
Pat Nelson
and Rich
Valdez



Lake Mead
Colorado
River Inflow

Thank you!

Questions?



Colorado River Inflow Adult, Larval and Sonic Summary (as of 4/2/2015)

| RZ | | | FM | | | HYB sucker | | | BH | | |
|---------------|-------|-----------|---------------|-------|-------|------------|-------|-------|-----------|-------|-------|
| New | Recap | Total | New | Recap | Total | New | Recap | Total | New | Recap | Total |
| 5 | 12 | 17 | 65 | 35 | 100 | 2 | 1 | 3 | 1 | 0 | 1 |
| TL=530-643 mm | | | TL=310-535 mm | | | TL=472-549 | | | TL=375 mm | | |

| Larval Fishing | |
|----------------|--------------------|
| Date | RZ Larvae Captured |
| 3/23/2015 | 1 |
| 3/24/2015 | 1 |
| 4/1/2015 | 6 |
| Total | 8 |

| Light Trapping | |
|----------------|--------------------|
| Date | RZ Larvae Captured |
| 3/17/2015 | 1 |

- Sonic fish continue to be heard in both the lake and the river using both active and passive gear.
- Three wild RZ were successfully sonic tagged at the CRI.
- A sonic juvenile fish from EB was contacted at the CRI SUR, demonstrating over 35 miles of movement.