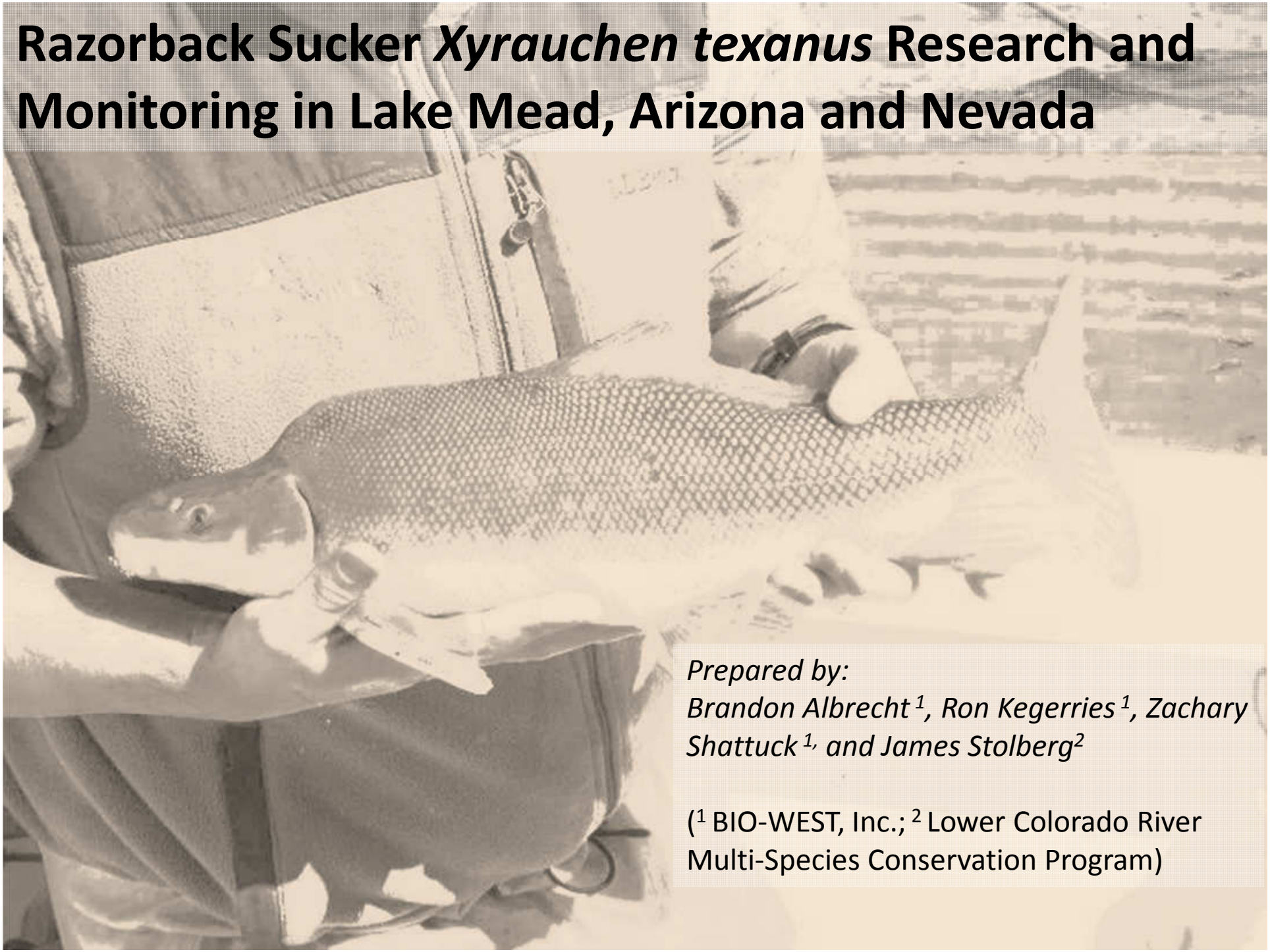
Razorback Sucker *Xyrauchen texanus* Research and Monitoring in Lake Mead, Arizona and Nevada



Prepared by:
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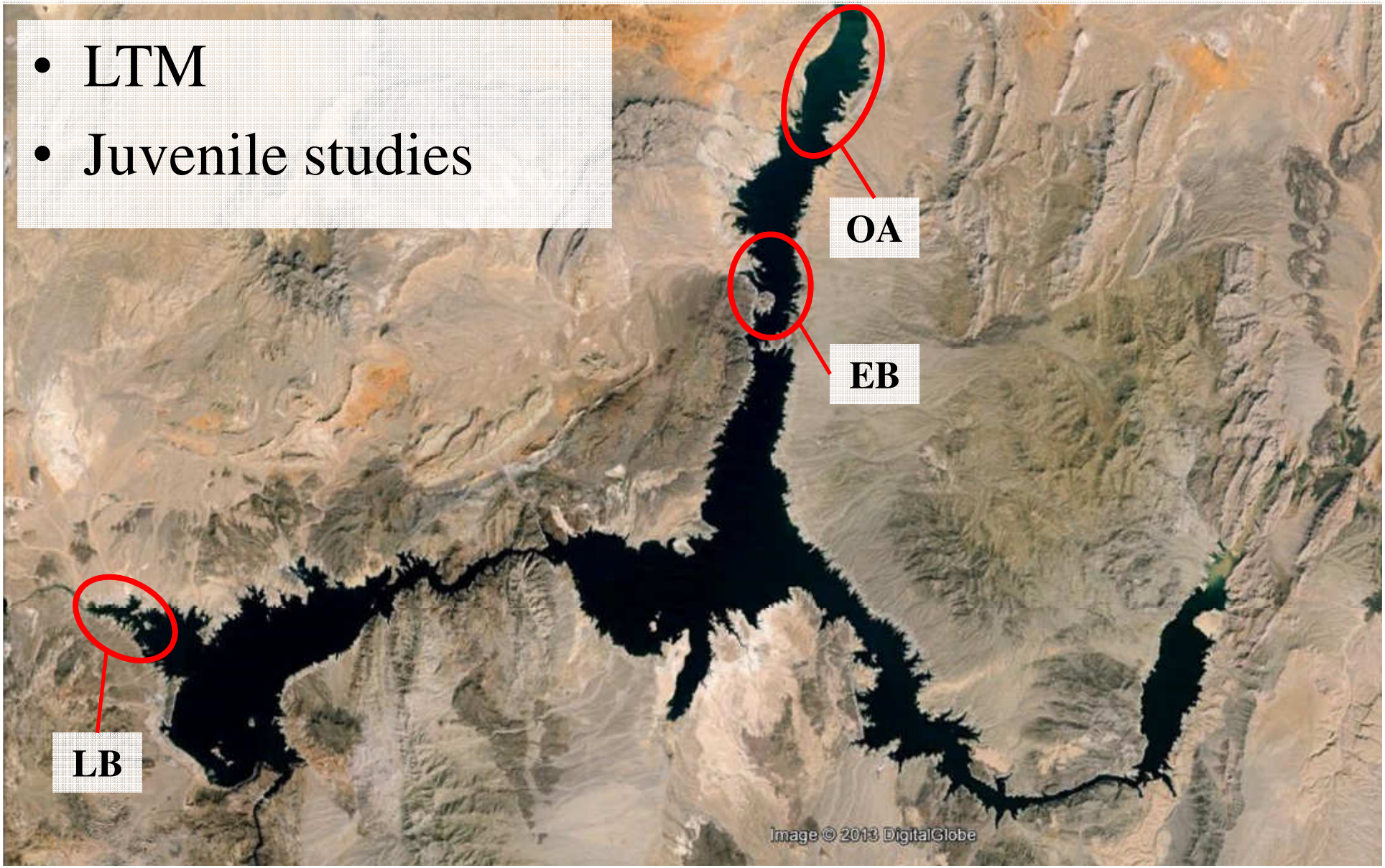
([1] BIO-WEST, Inc.; [2] Lower Colorado River Multi-Species Conservation Program)

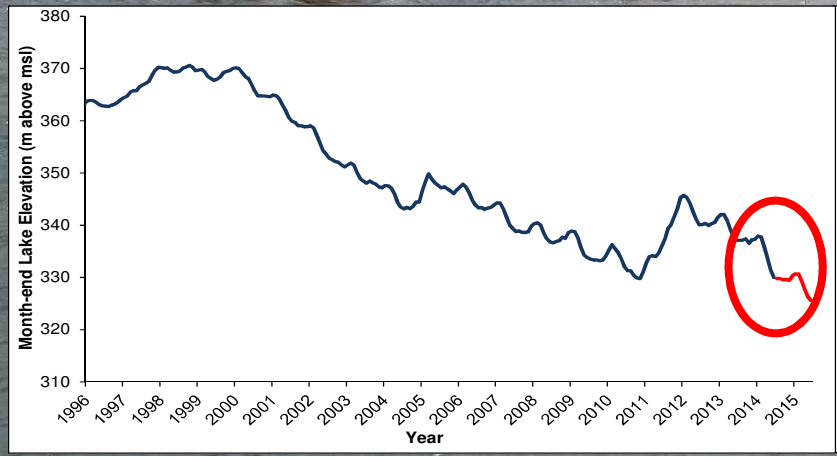
Collaboration is key…
Federal, State, Private, Upper and Lower Colorado Basins

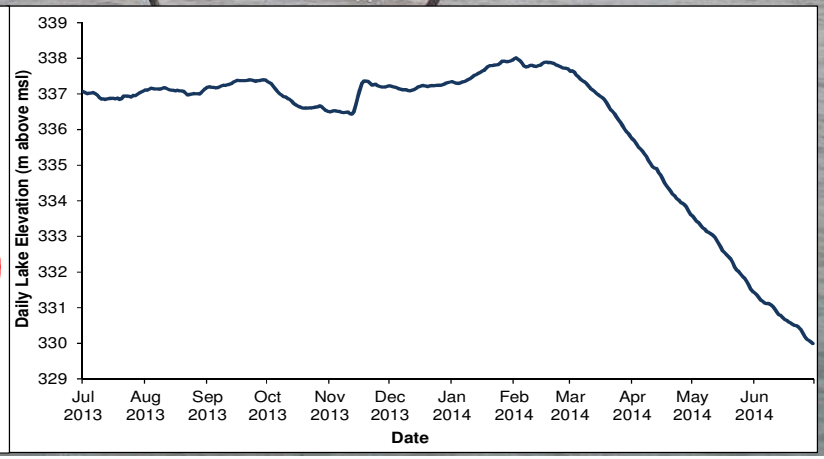
Study Area



Lake Mead Conditions:

Declining overall!





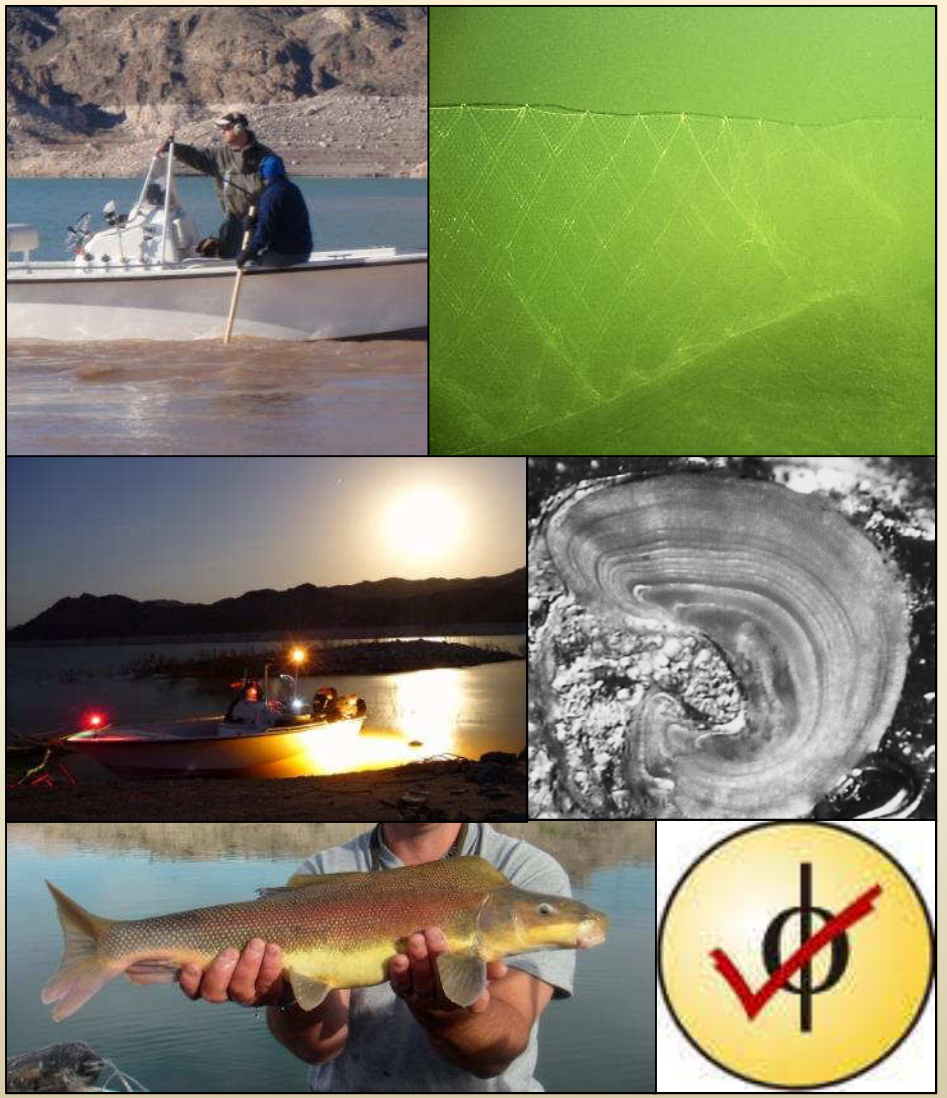
LTM Methods

Field

- Sonic telemetry
- Trammel netting
- Larval sampling

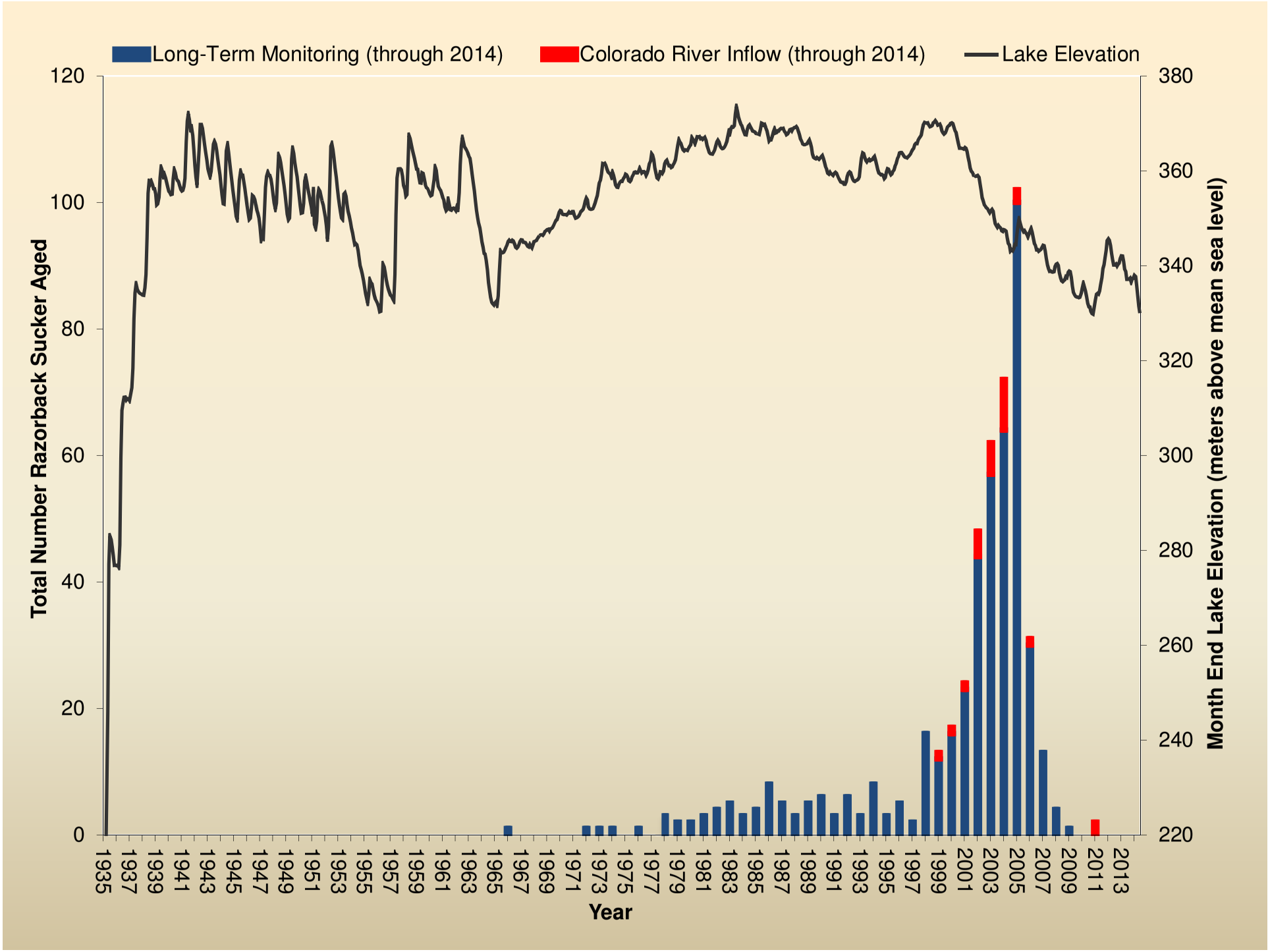
Laboratory

- Age determination
- Population estimation
- Survival estimation



Summary of RBS in Lake Mead

- 18 years of study (1996-2014)
- 1,255 total captures
- 4 areas of known, established reproduction in Lake Mead (Las Vegas Bay, Echo Bay, Overton Arm, Colorado River Inflow)
  - Continued evidence of spawning and recruitment at all study locations
  - 2014 was a great year for RBS in Mead (85 RBS captured, about 50% new wild fish, CPUE for larval and netting similar to past study years)
- Nonlethal aging to understand recruitment : 498 individuals aged (2-36 years old)
- 2014 Lake-wide population estimate 589 (CI 370-808), stable
- Lake-wide apparent survival rate estimate 0.77 (CJS, adults >450mm, 95% CI 0.73-0.80)
- Documented population of naturally recruiting Razorback Sucker in Colorado River Basin
  - Direct capture of ~100 wild, juvenile fish!


Long-Term Monitoring (through 2014)
Colorado River Inflow (through 2014)
Lake Elevation
Total Number Razorback Sucker Aged
Month End Lake Elevation (meters above mean sea level)
Year
0
20
40
60
80
100
120
220
240
260
280
300
320
340
360
380
1935
1937
1939
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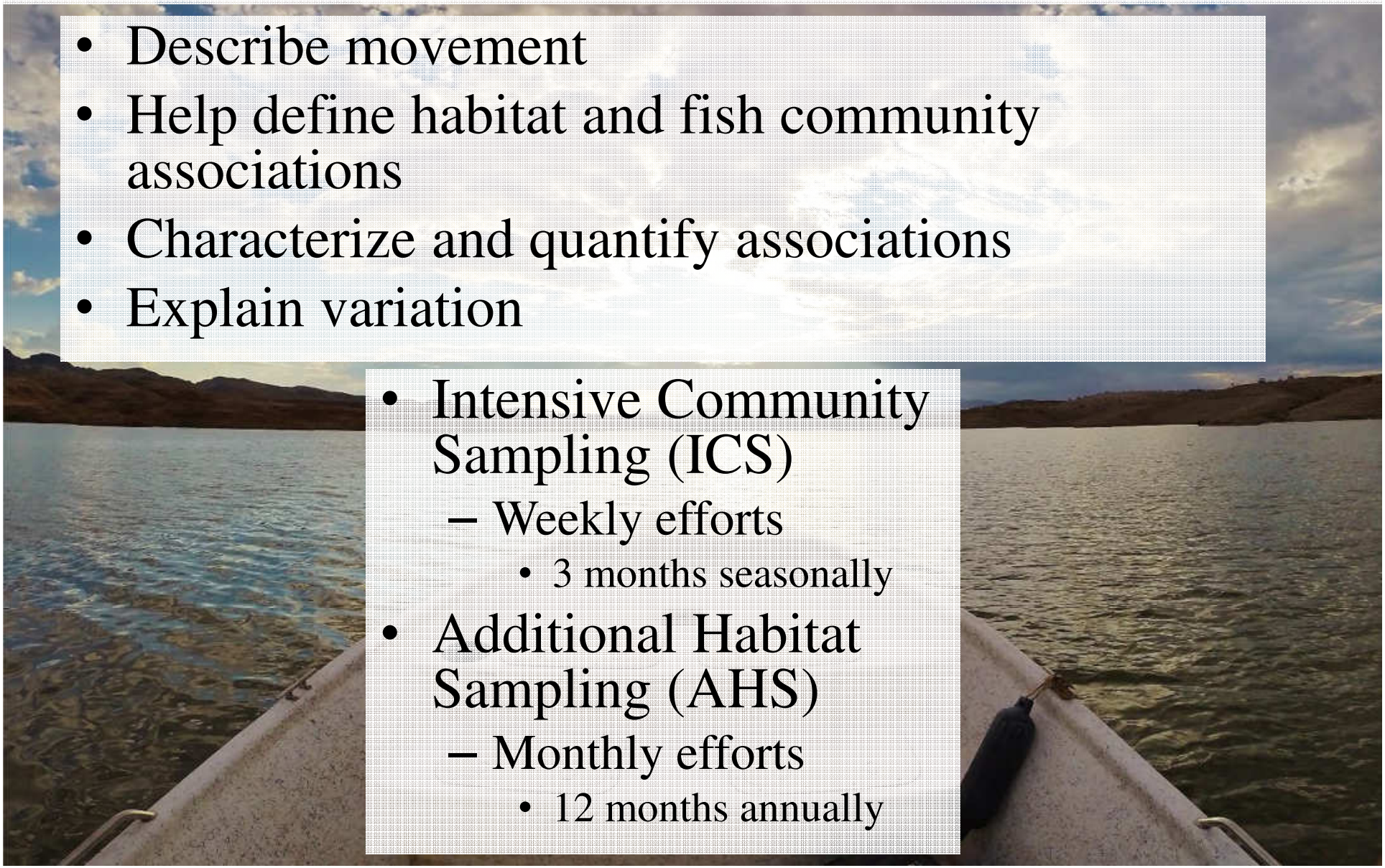
2007
2009
2011
2013

To date:

- **Thanks to LTM, juveniles known to be present**
- **MSCP research of this rare life-stage , kudos for being adaptive and trying to learn about this species while possible**

Sonic Telemetry and Habitat Use of Juvenile Razorback Suckers in Lake Mead 2014–2015 Midyear Update

Objectives/Methods



- Describe movement
- Help define habitat and fish community associations
- Characterize and quantify associations
- Explain variation

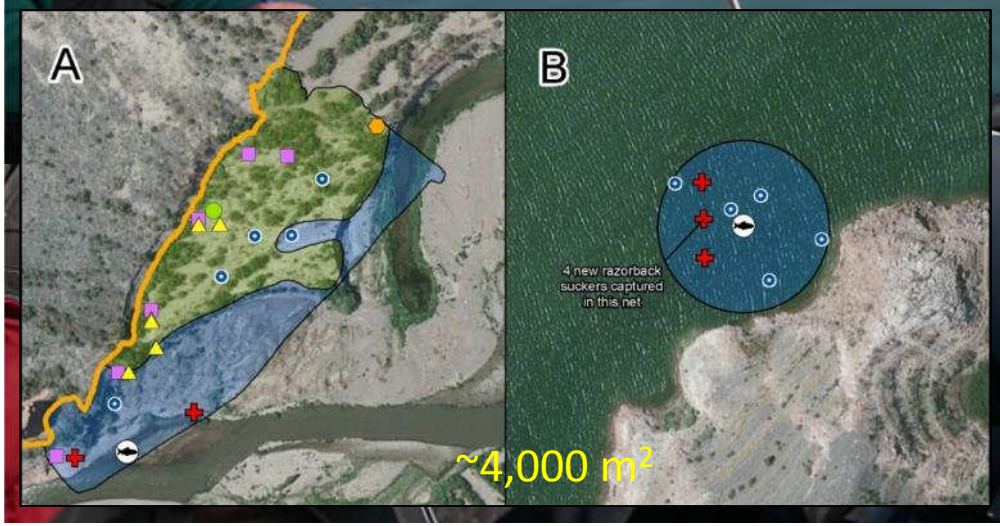
- Intensive Community Sampling (ICS)
  - Weekly efforts
    - 3 months seasonally
- Additional Habitat Sampling (AHS)
  - Monthly efforts
    - 12 months annually

Sonic Telemetry

- Key part of juvenile study
- 36 sonic-tagged juvenile RZ
  - 24, 12-month IBT-96-6
  - 12, 3-month PT-4
  - LB, EB, OA
- 7 SURs

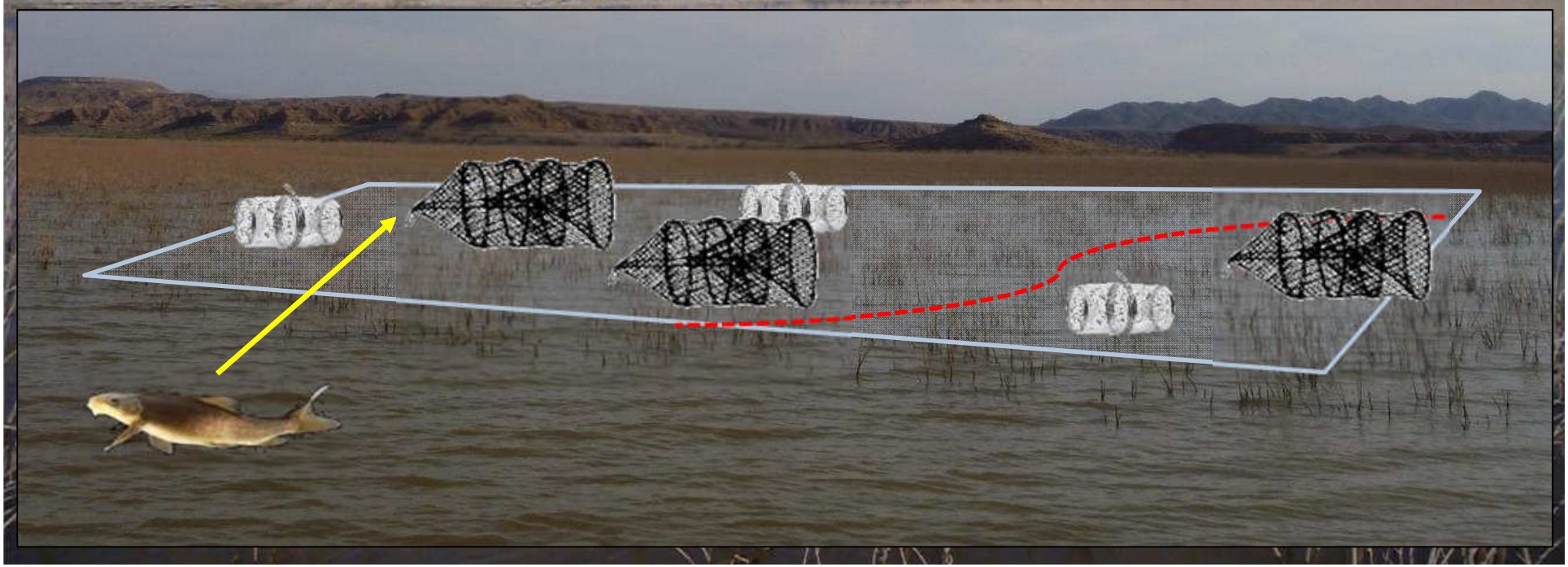
Physicochemical Quantification

- 1–5 sampling points
- Water quality
- Substrate composition
- Cover composition
- Depth (m)



Fish Community Sampling

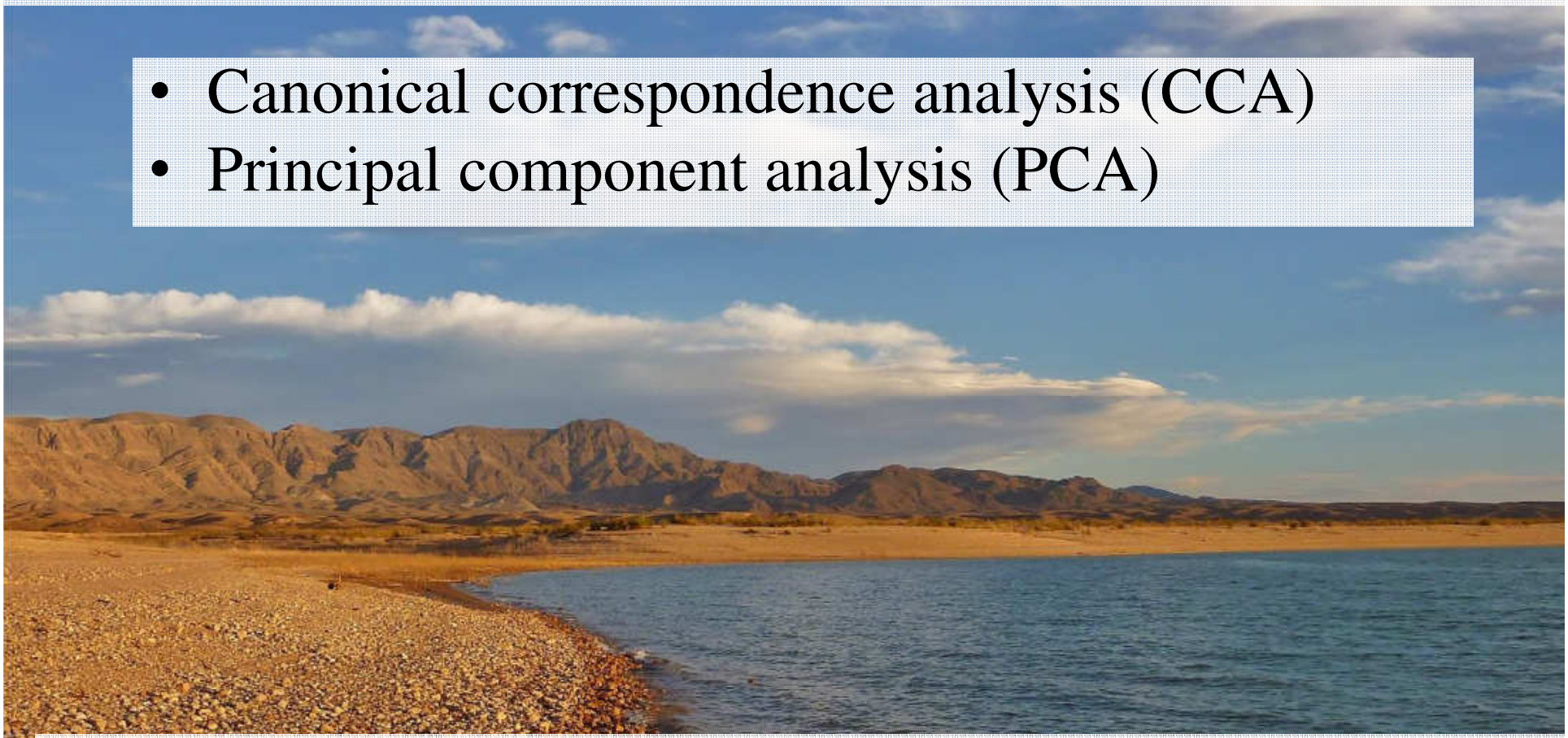
- Trammel nets, hoop nets, minnow traps, fyke nets, seines, electrofishing
  - In aggregate around sonic-tagged juvenile RZ
  - Nearshore or offshore



Summary of 2013–2014

- Several hundred habitat association replicates through active telemetry
- Seasonal movements from shallow to deep
- Seasonal habitat associations with IV, turbidity (seek cover)
- 2013 (ICS) = 4 new RZ (521–561 mm TL, 7–12 years)
- 2014 (ICS) = 11 RBS, only 2 recaps, 1 juv FMS, and lots of GZ, BG, CP

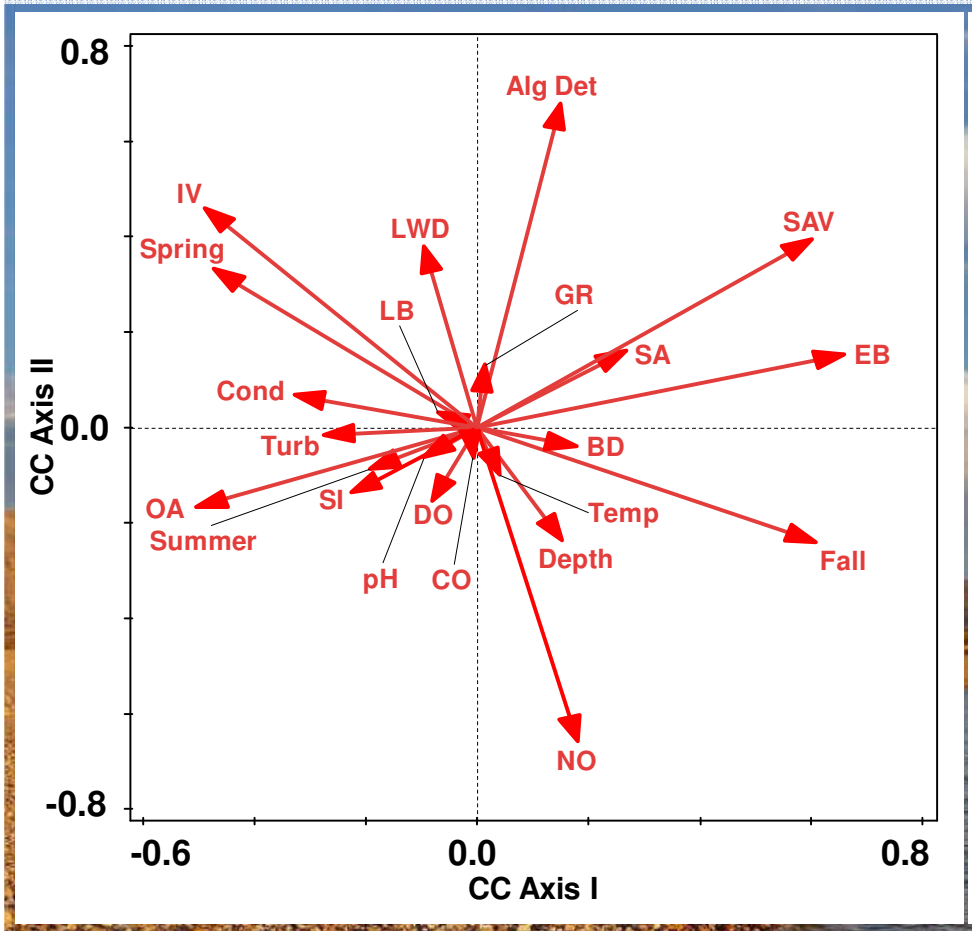
Statistical Analyses

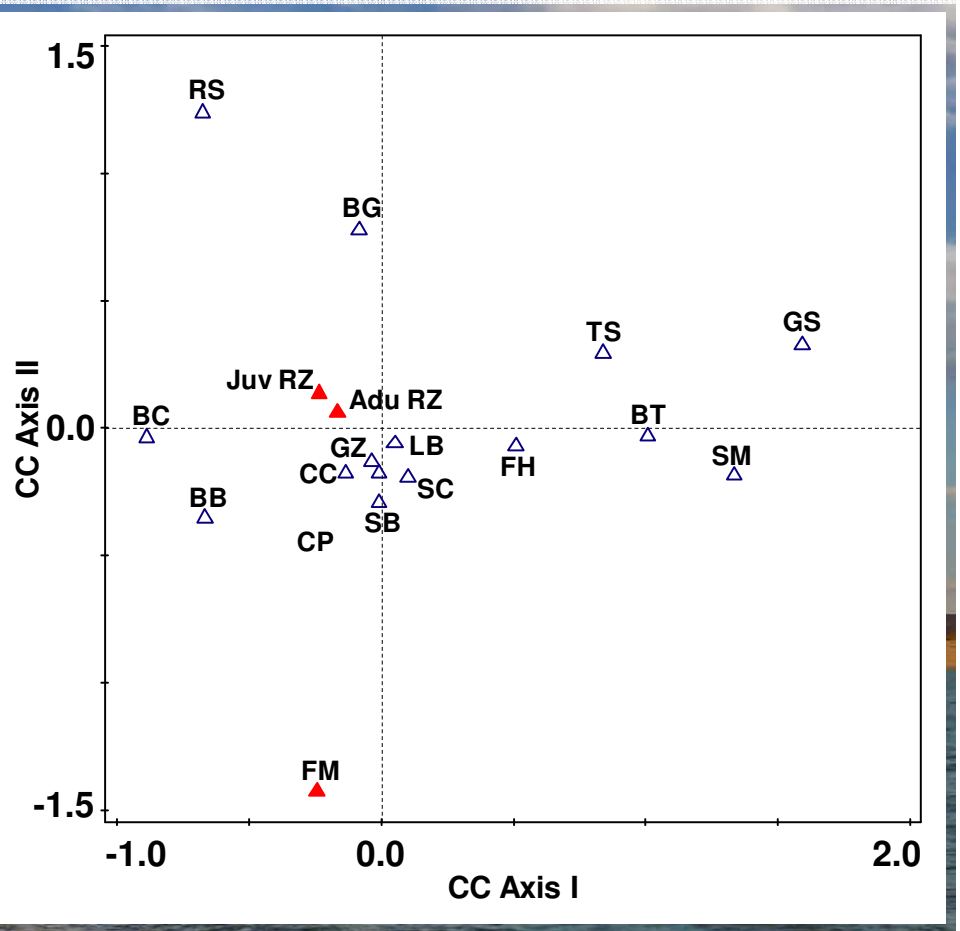


- Canonical correspondence analysis (CCA)
- Principal component analysis (PCA)

- September–November, 2014 (ICS)
- Similar to 2013 (seasonal movements)
- Spring = inshore habitat (shallow, silt, IV, algae and detritus)
- Fall = offshore habitat (deep, variety of substrate, no veg cover)
- Better description of transition during fall with more sonic-tagged juveniles

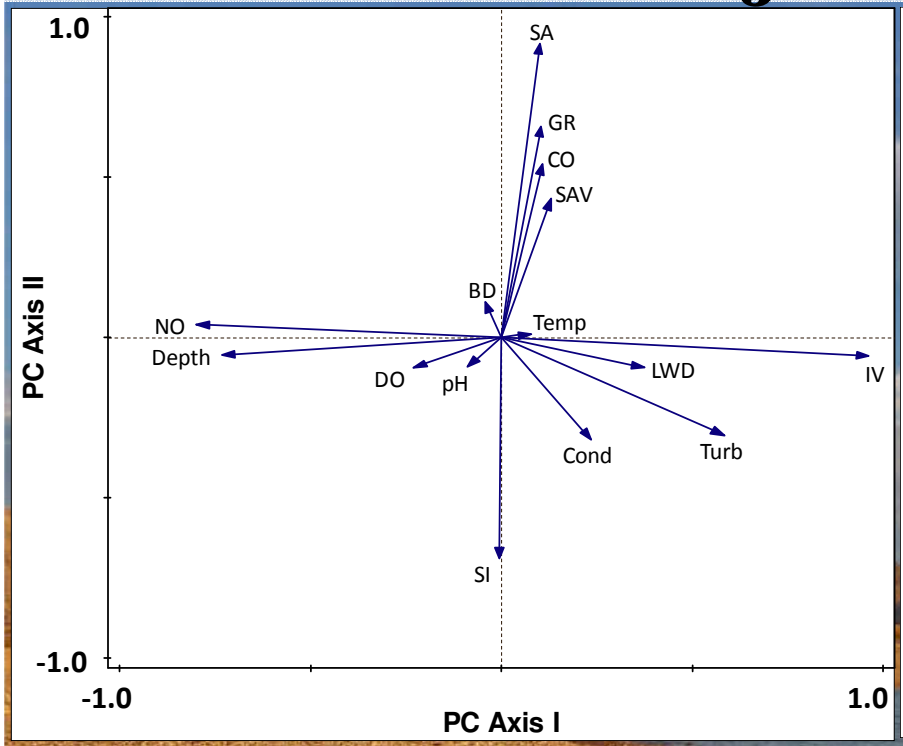
CCA- broad ecological relationships

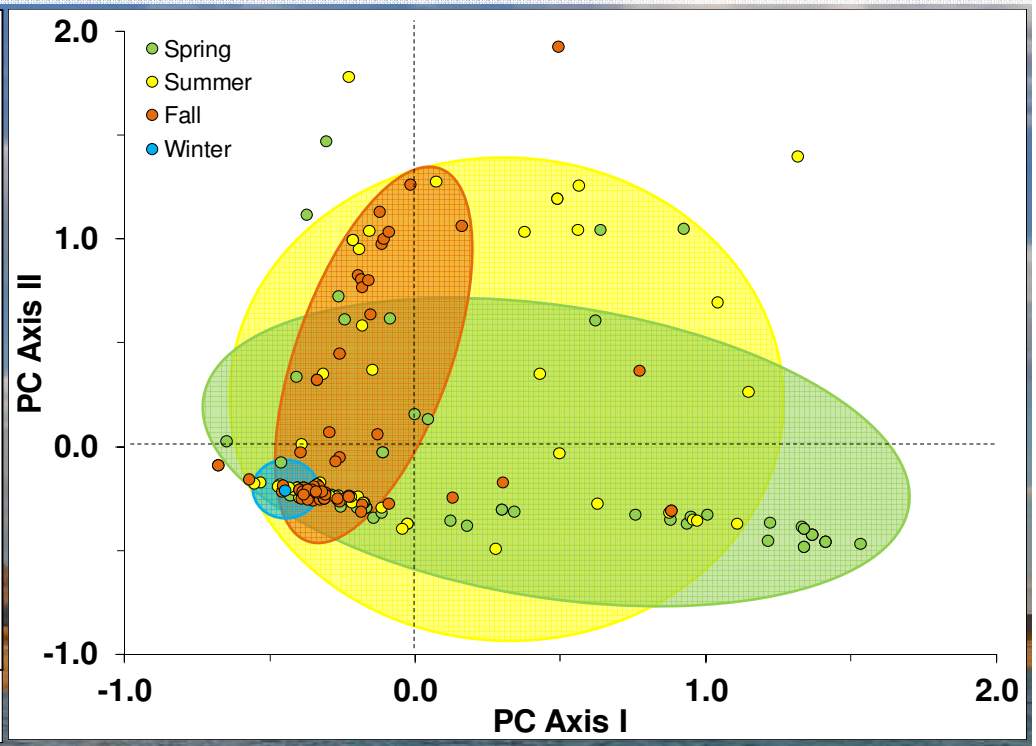




- Canonical correspondence analysis (CCA)
  - Significantly explained 27.0% of the variability within fish assemblage
  - CC axis I describes a site, season-cover type gradient
  - CC axis II describes a algae and detritus, cover type-depth gradient

PCA- environmental gradients specific for juvenile RBS





- Principal component analysis (PCA)
  - Significantly explained 56.5% of total variation in environmental variables among habitats associated with juvenile RZ
  - PC axis I describes a depth, cover, and turbidity gradient
  - PC axis II describes a substrate, conductivity, and turbidity gradient
  - Seasonal overlap seen; yet, distinct patterns in seasons

Interesting observations

- One 2014 recaptured RBS was a previously tagged juvenile that grew ~200 mm in 18 months (indicative of a survival strategy?)
- Highly cryptic life-stage, relatively minimal movement (compared to adults), associate strongly with dense cover, turbidity, or depth depending upon season (another survival strategy?)
- Juvenile RBS do associate with adult RBS, and apparently do school, for at least a portion of the year

Continuing Efforts

- Finish data analysis
- Compare 2013–2014 and 2014–2015
- Produce annual report, anticipated spring 2015
- Look specifically at winter/spring in 2015-2016, continue to gather additional data during rest of year
- Ultimately we will end up with a better understanding of this rare life stage, areas important for recruitment identified, and most importantly the ingredients for recruitment in Lake Mead will be quantified, hopefully knowledge that can be used in other locations for benefit of species

Conclusions

- Biological and physical change at Lake Mead
  - Fluctuating lake elevations, nonnative fish competition and predation factors, habitat diversity particularly at inflows
- Near-annual recruitment with new, wild fish
- Opportunity to investigate juvenile RBS
- Lake Mead population characterized as being…
  - Wild population, young, recruiting, resilient
  - CRI/LGC/Lake Mead interaction—provides additional insight/excitement

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.
- Please see Ron and Steve's talks…

Baser Bend Photo Credits: Pat Nelson and Rich Valdez

Lake Mead Colorado River Inflow


Thank you!
Questions?