Glen Canyon Dam Adaptive Management Work Group
Agenda Item Information
August 8-9, 2013

Agenda Item
Science Update: Fisheries

Action Requested
Information item only

Presenters
Scott Vanderkooi and staff, Grand Canyon Monitoring and Research Center

Previous Action Taken
N/A

Relevant Science

N/A

Background Information

As reported at the June meeting of the Technical Work Group, rainbow trout densities remain high in the upstream third of Marble Canyon and remain low near the confluence with the Little Colorado River. Juvenile humpback chub densities in the mainstem near the Little Colorado River are similar to the densities of humpback chub measured in July 2012.

Mark-recapture efforts in Glen Canyon during fall and winter 2012 indicate that most rainbow trout did not move far during that period. Approximately 90% of age-0 rainbow trout were recaptured within 0.25 miles of their initial release locations. Other studies indicate that there was some rainbow trout reproduction downstream from Lees Ferry.

Brown trout catches in the Tapeats Gorge near the confluence of the Little Colorado River (LCR) were higher in 2013 than in 2012, and recent catches were dominated by smaller fish (< 300 mm). These data may indicate that brown trout populations near the LCR are increasing. Brown trout are a highly piscivorous species known to eat humpback chub.

The population estimate for adult (> 200 mm) humpback chub in the LCR remains relatively stable in relation to measurements made in previous years. The spring USFWS adult (> 200 mm) humpback chub population estimate in the LCR was 5,734 (Standard Error ± 512).

Field and experimental studies indicate that it will probably be possible to track the movement of small, young humpback chub individuals in the future. Preliminary results of experimental tagging of humpback chub smaller than 100 mm with new, smaller PIT tags suggests good initial survival and tag retention. Experiments will continue through July.

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GCMRC Science Update – Fisheries

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

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

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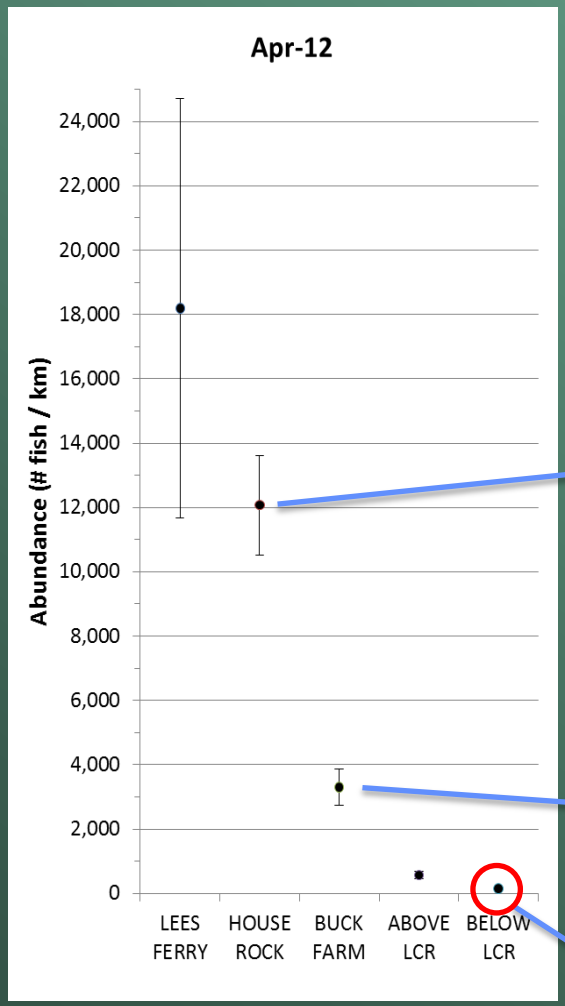

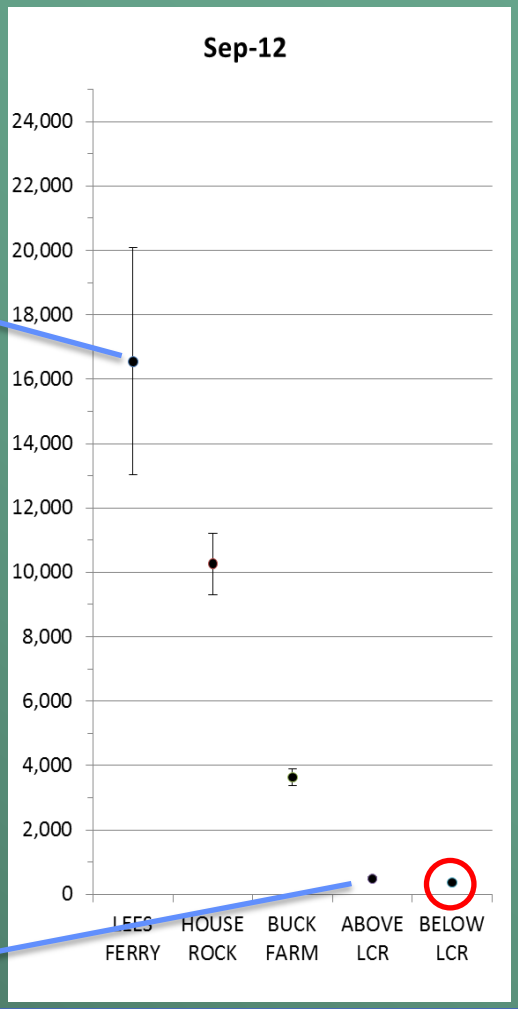

(Preliminary Data from Korman and Yard 2013. Do Not Cite.)

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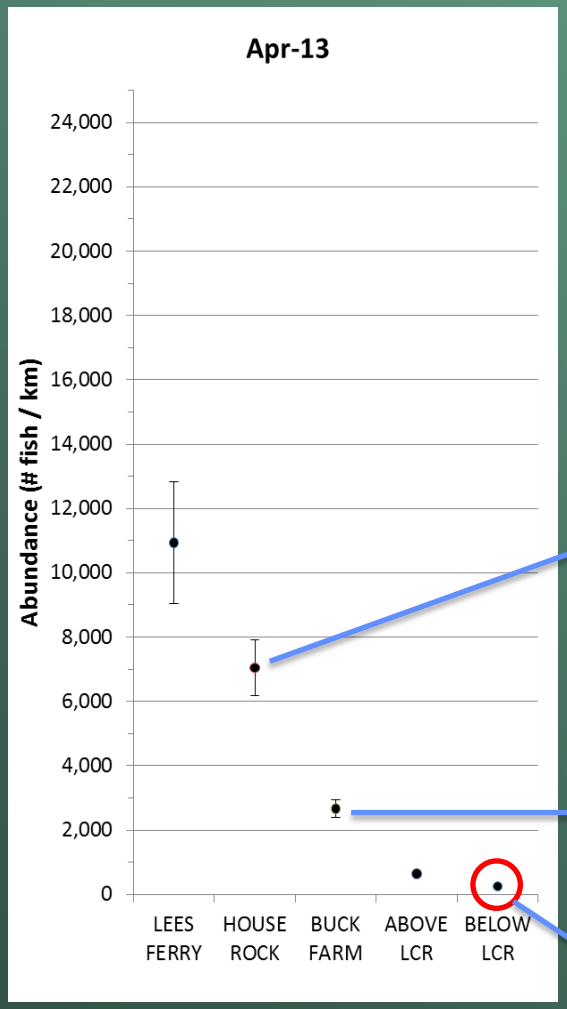
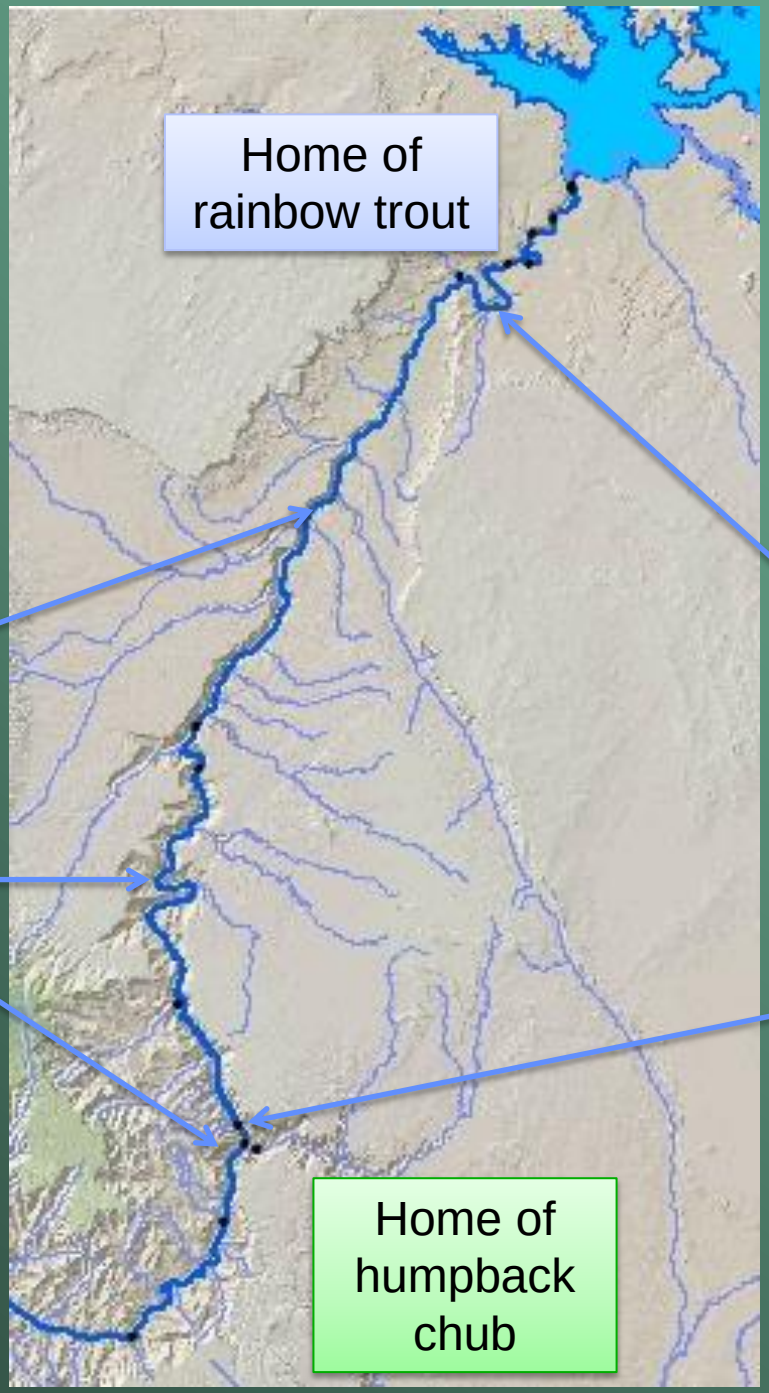
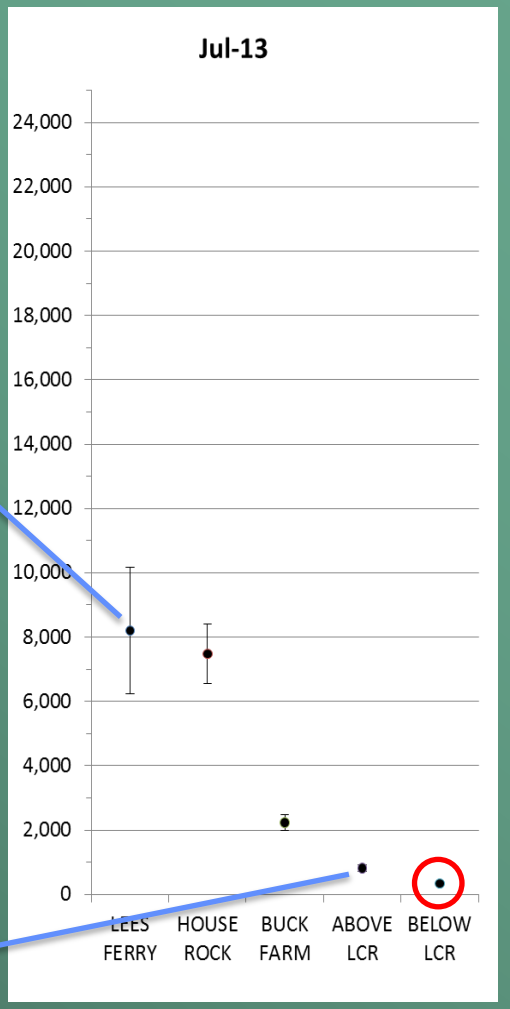
2012: Rainbow trout populations very high in the upstream third of Marble Canyon, but very low where humpback chub live







(Preliminary Data from Korman and Yard 2013. Do Not Cite.)

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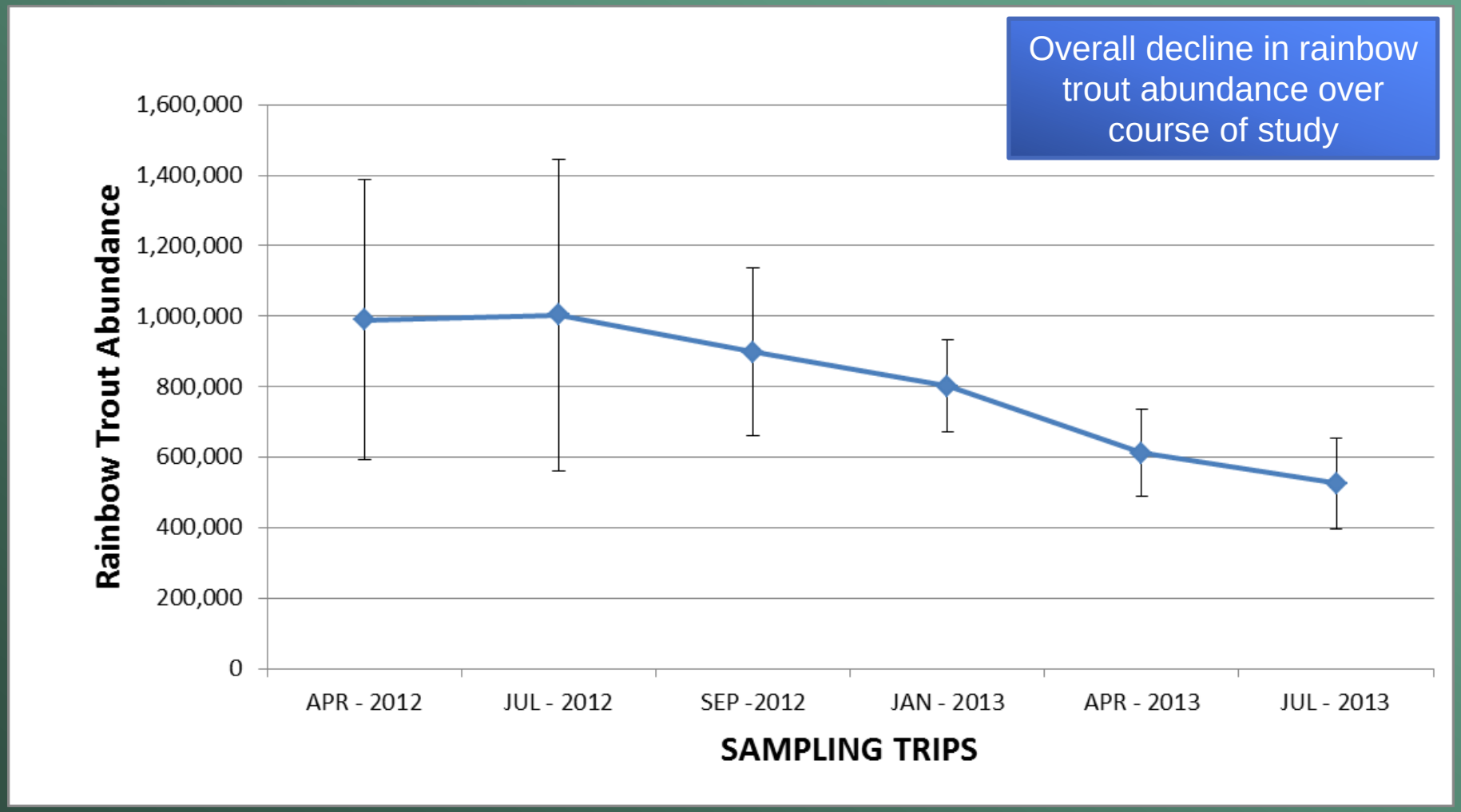
2013: Pattern continues, rainbow trout populations very high upstream, but very low where humpback chub live

Rainbow Trout Abundance Estimates:
Glen Canyon Dam – Below LCR



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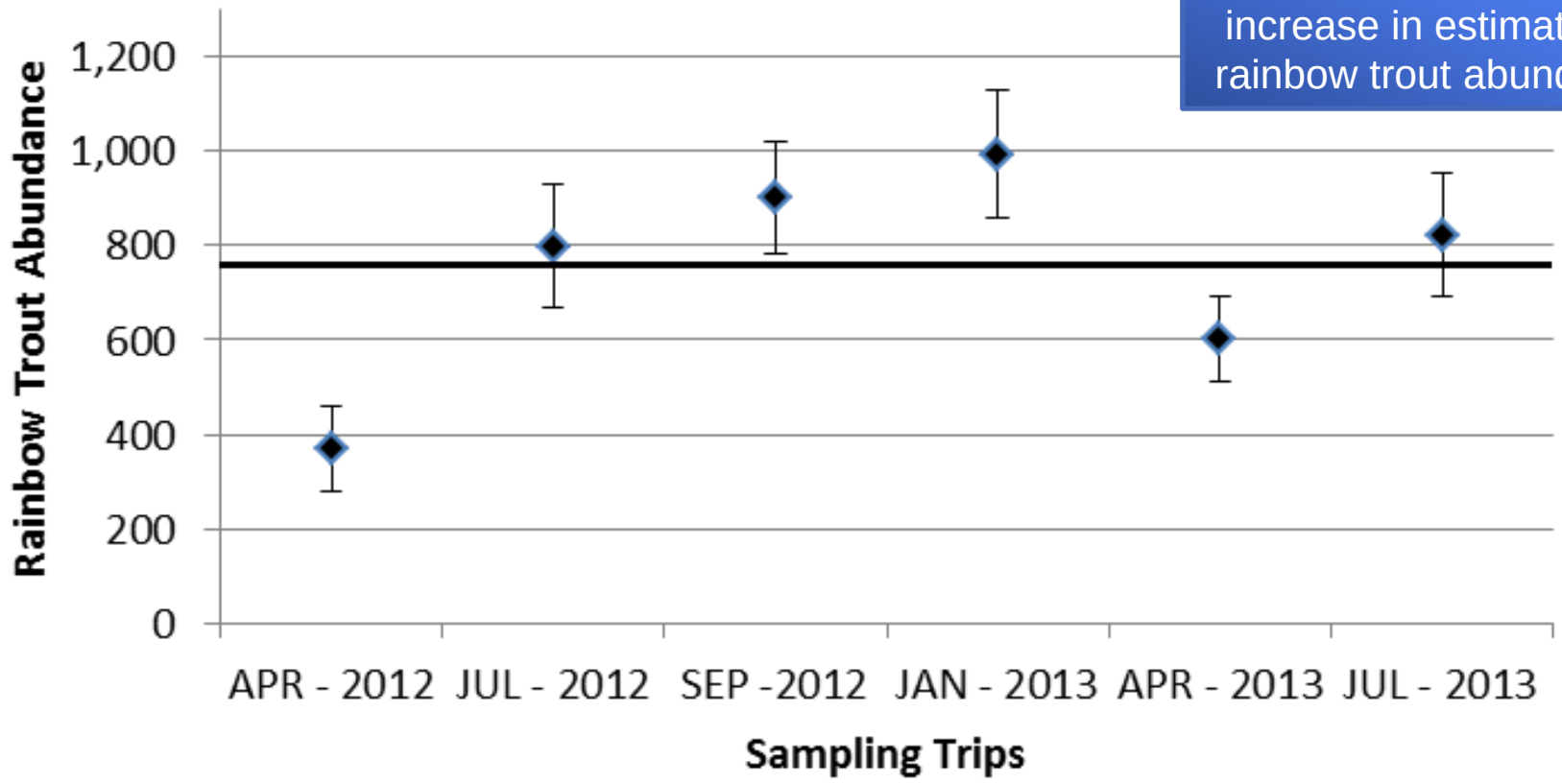
(Preliminary Data from Korman and Yard 2013, Do Not Cite)

Rainbow Trout Abundance Estimates: Below the Little Colorado River Reach



Use of open population models has resulted in an increase in estimates of rainbow trout abundance

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(Preliminary Data from Korman and Yard 2013, Do Not Cite)

Open versus Closed population models

- Closed
  - Estimates abundance.
  - Based on “capture histories” within a single trip. Can be calculated right after a trip.
  - Basic models assumes fish do not change behavior in response to capture (no “within trip behavioral response”).
  - More involved models (including ones that allow for within trip behavioral response) require more data.
- Open
  - Estimates apparent survival and abundance.
  - Based on “capture histories” among trips (doesn’t matter how many times caught within a trip). Requires at least 3 trips and survival estimates not available from most recent trip.
  - Unaffected by within trip behavioral response.

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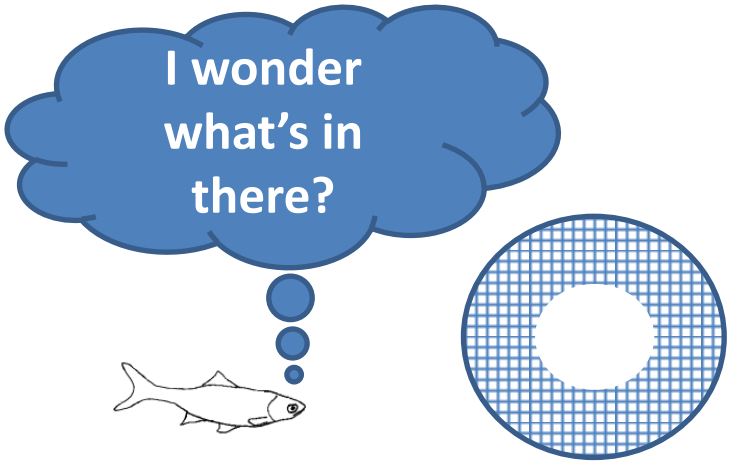
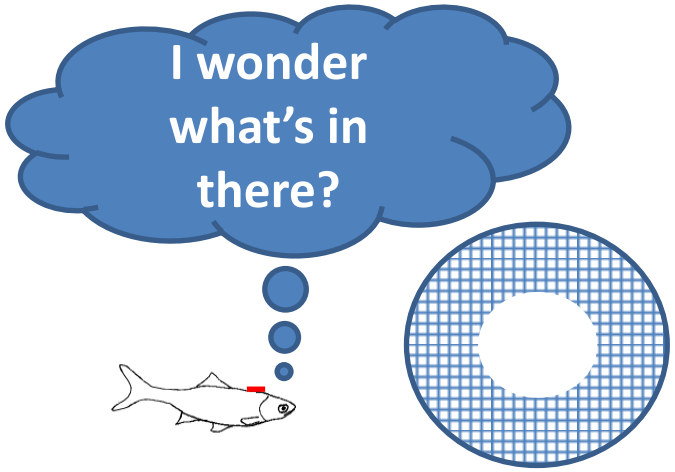
Simple closed models assume fish are unaffected by capture. So what we hope to see…

Naïve (not recently caught) fish encounters a hoop net



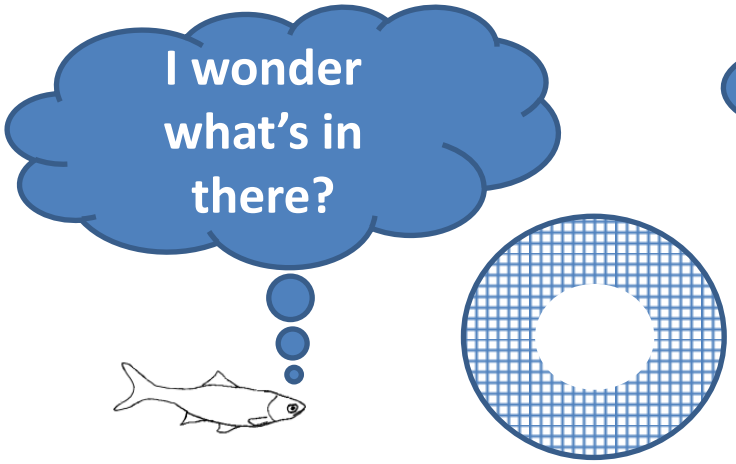
Previously caught fish encounters a net.



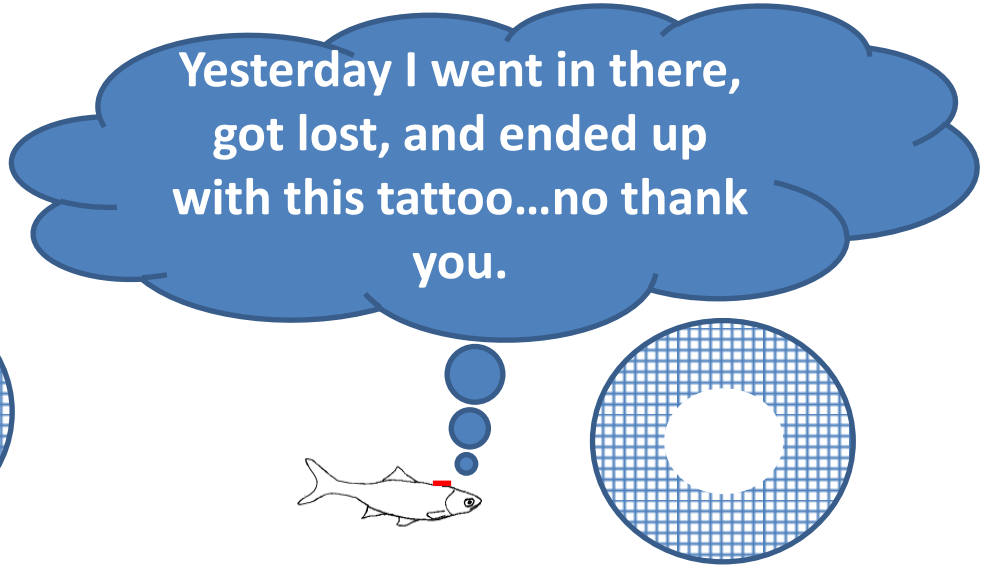
USGS

Simple closed models assume fish are unaffected by capture. But in the real world, we sometimes observe…

Naïve (not recently caught) fish encounters a hoop net



Previously caught fish encounters a net and is <u>less likely</u> to enter than naïve fish.



Trap-shy response – simple closed model <u>overestimates</u> abundance

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Simple closed models assume fish are unaffected by capture. But in the real world, we sometimes observe…

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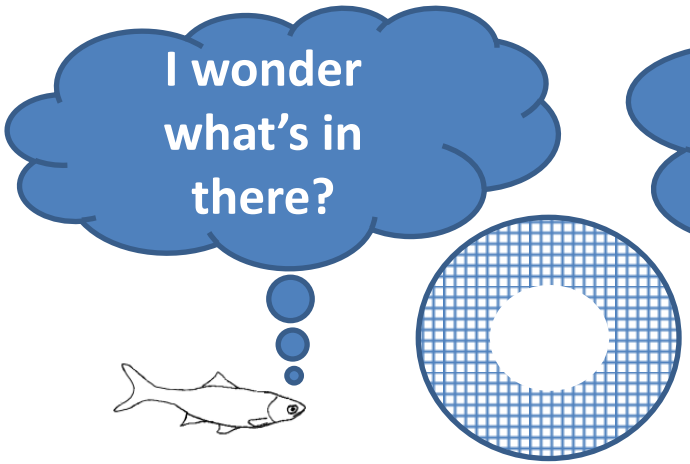
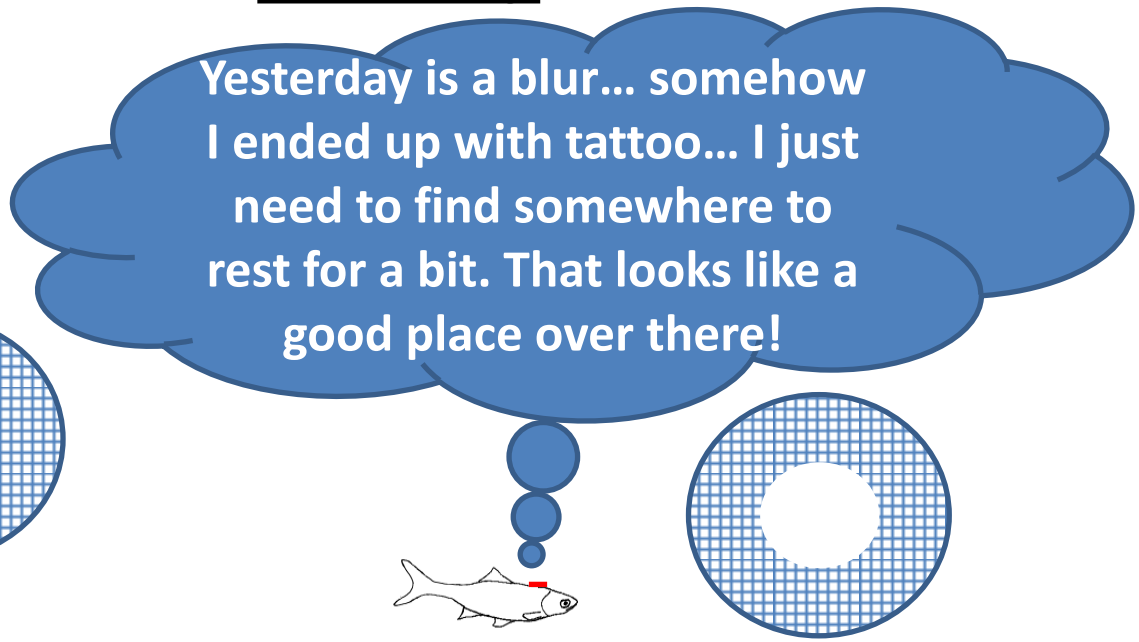


Previously caught fish encounters a net and is more likely to enter than naïve fish.



Trap-happy response – simple closed model underestimates abundance

Evidence this is occurring with rainbow trout in some reaches

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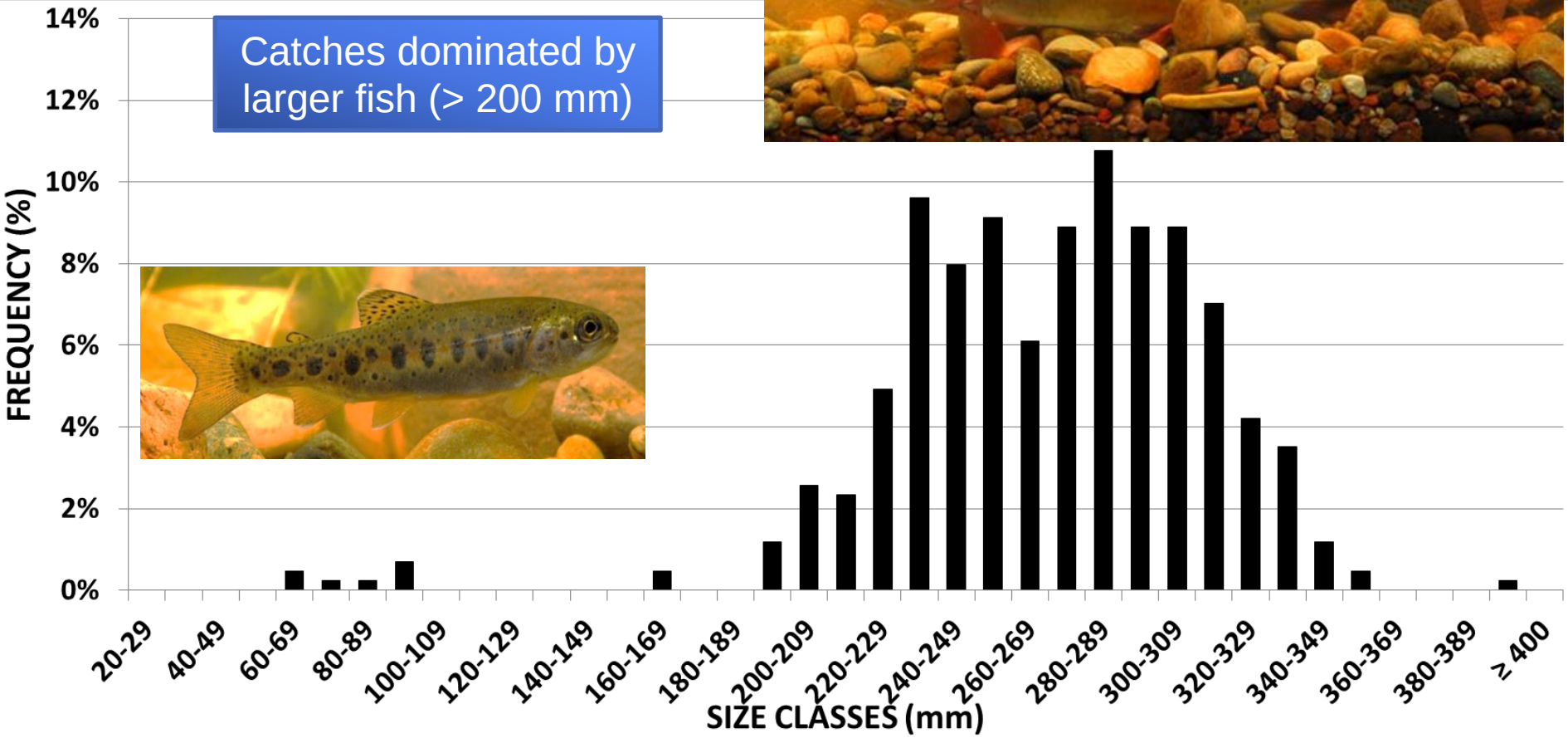
Rainbow Trout Length Frequency :

Below Little Colorado River Reach - July 2012

Catches dominated by larger fish (> 200 mm)



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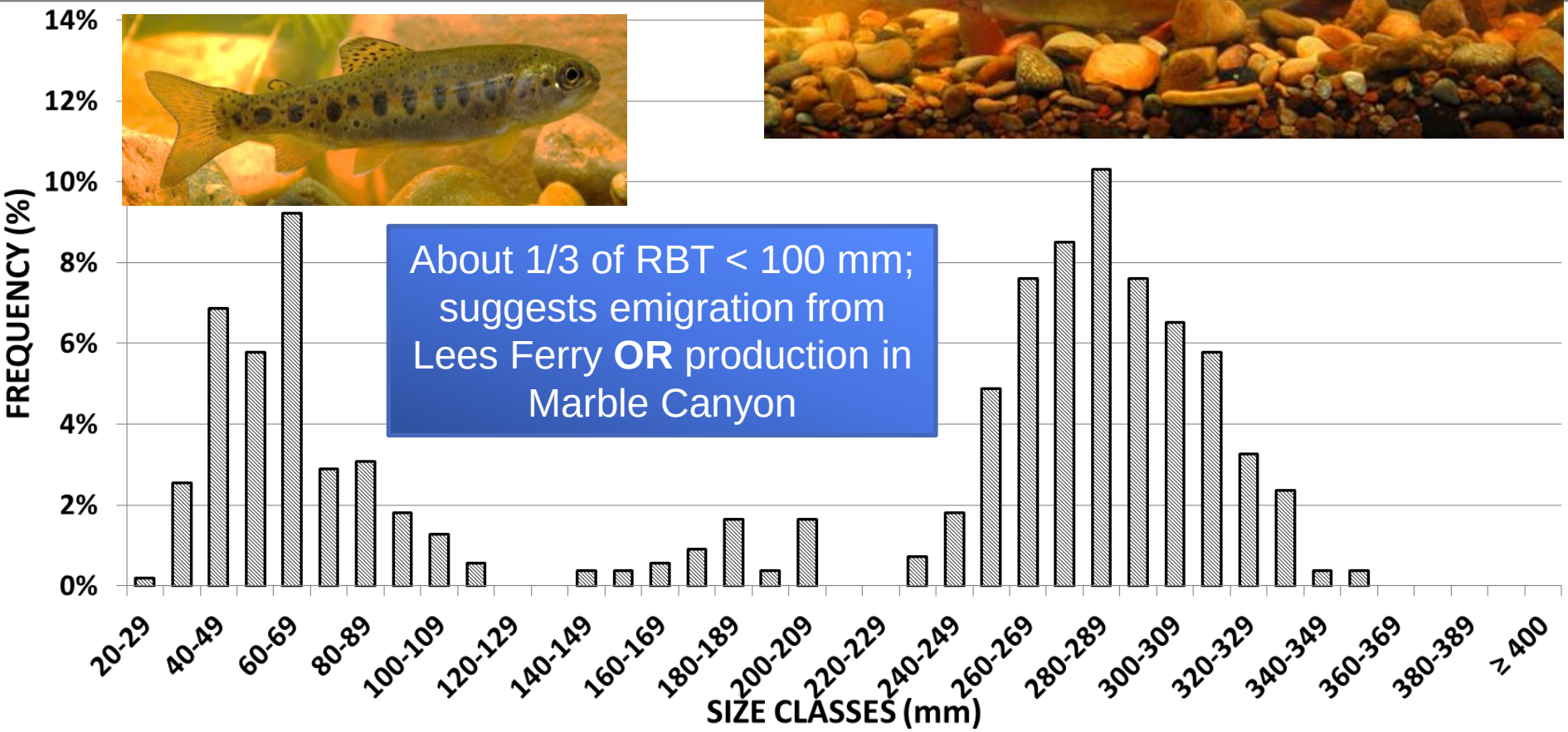
(Preliminary Data from Korman and Yard 2013, Do Not Cite)

Rainbow Trout Length Frequency :

Below Little Colorado River Reach - July 2013



About 1/3 of RBT < 100 mm; suggests emigration from Lees Ferry **OR** production in Marble Canyon

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(Preliminary Data from Korman and Yard 2013, Do Not Cite)

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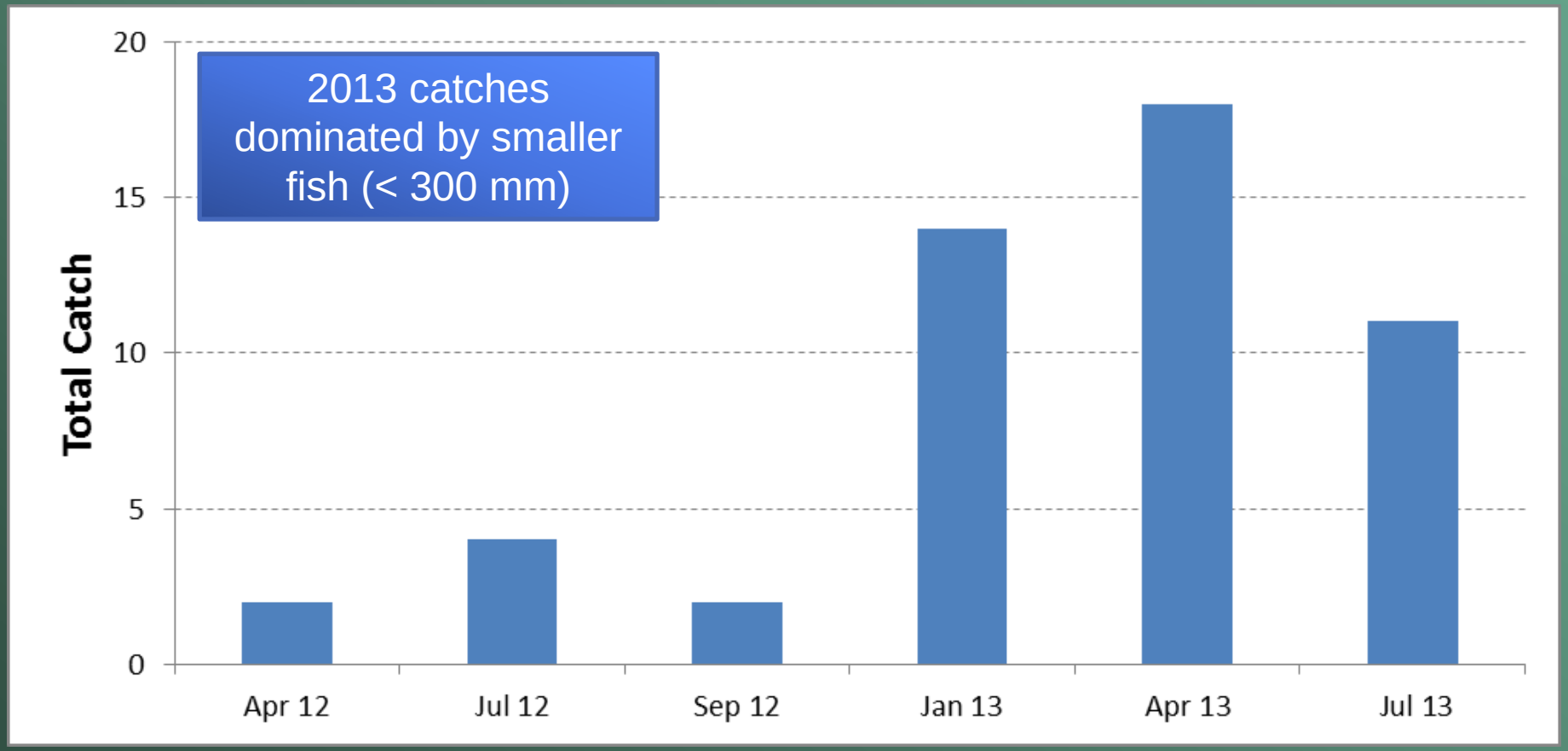
Brown Trout Catches:
Below the Little Colorado River Reach



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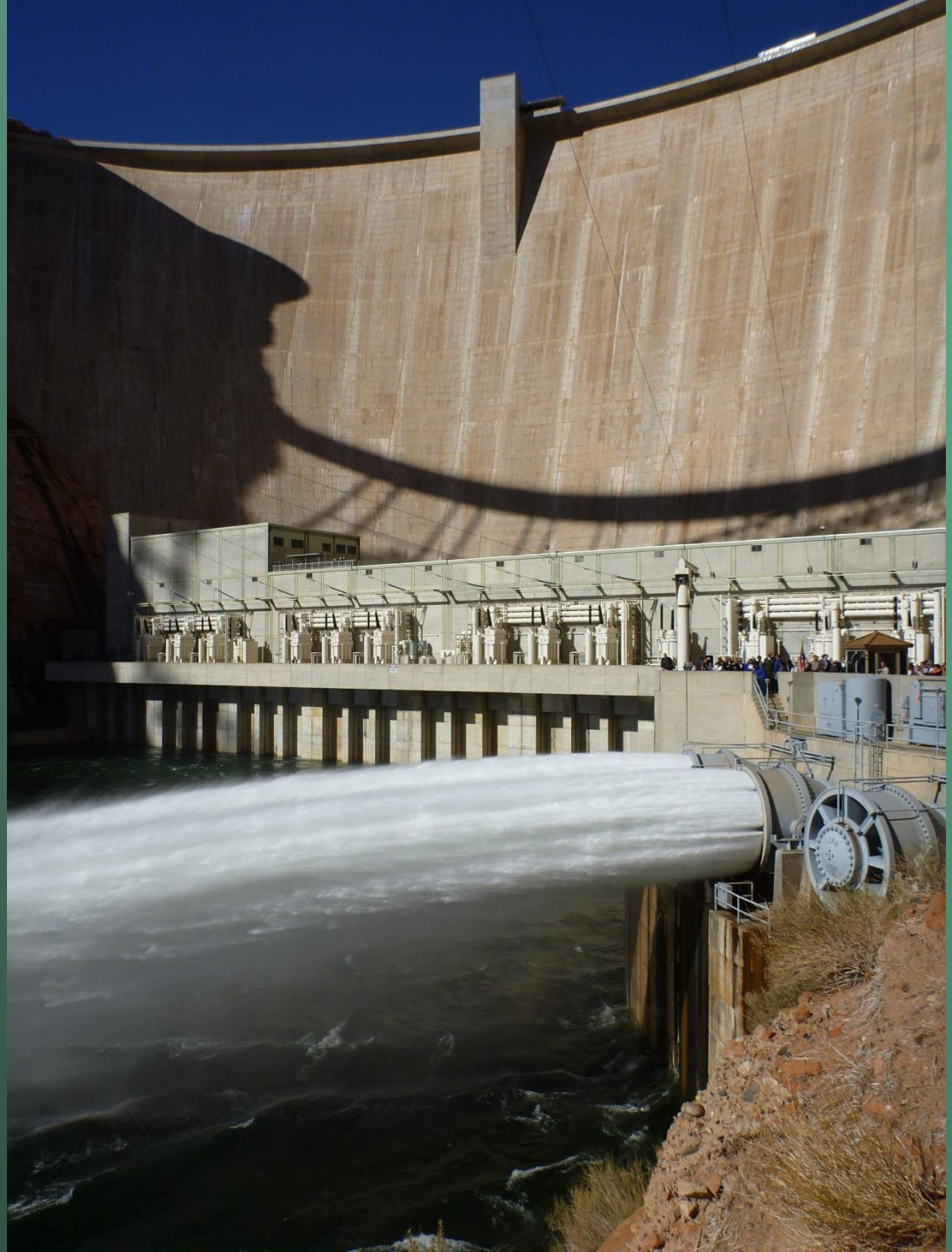

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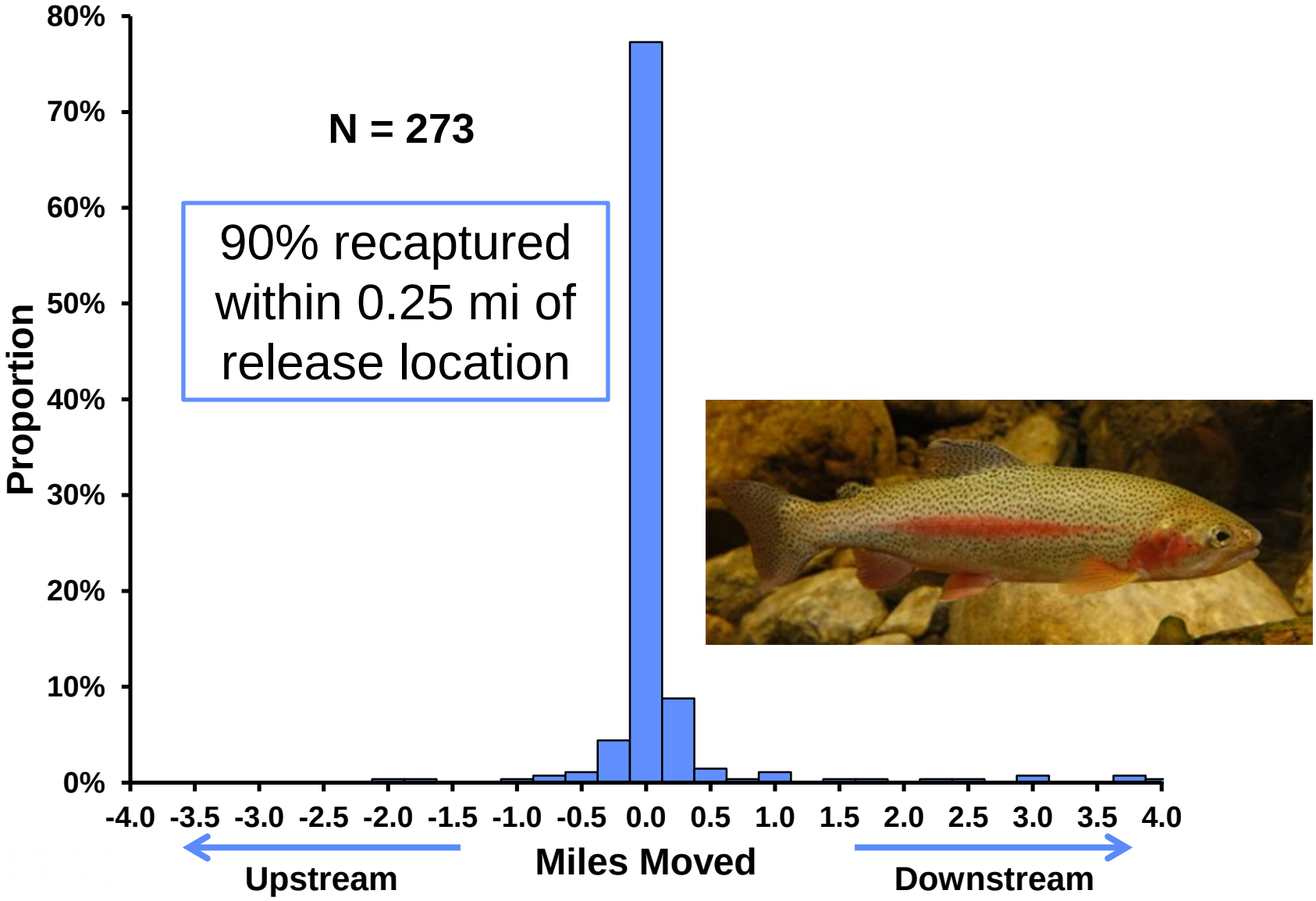
Age-0 Rainbow Trout Movement in Glen Canyon: October to December 2012



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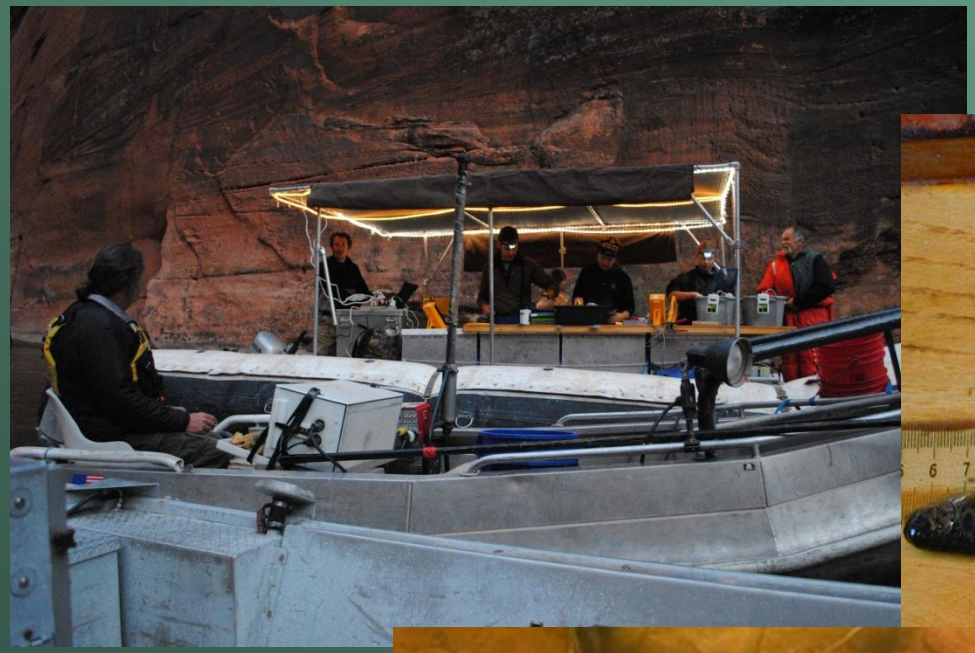
(Preliminary Data from Korman and Yard 2013, Do Not Cite)

Rainbow Trout Natal Origins: Glen Canyon and Marble Canyon



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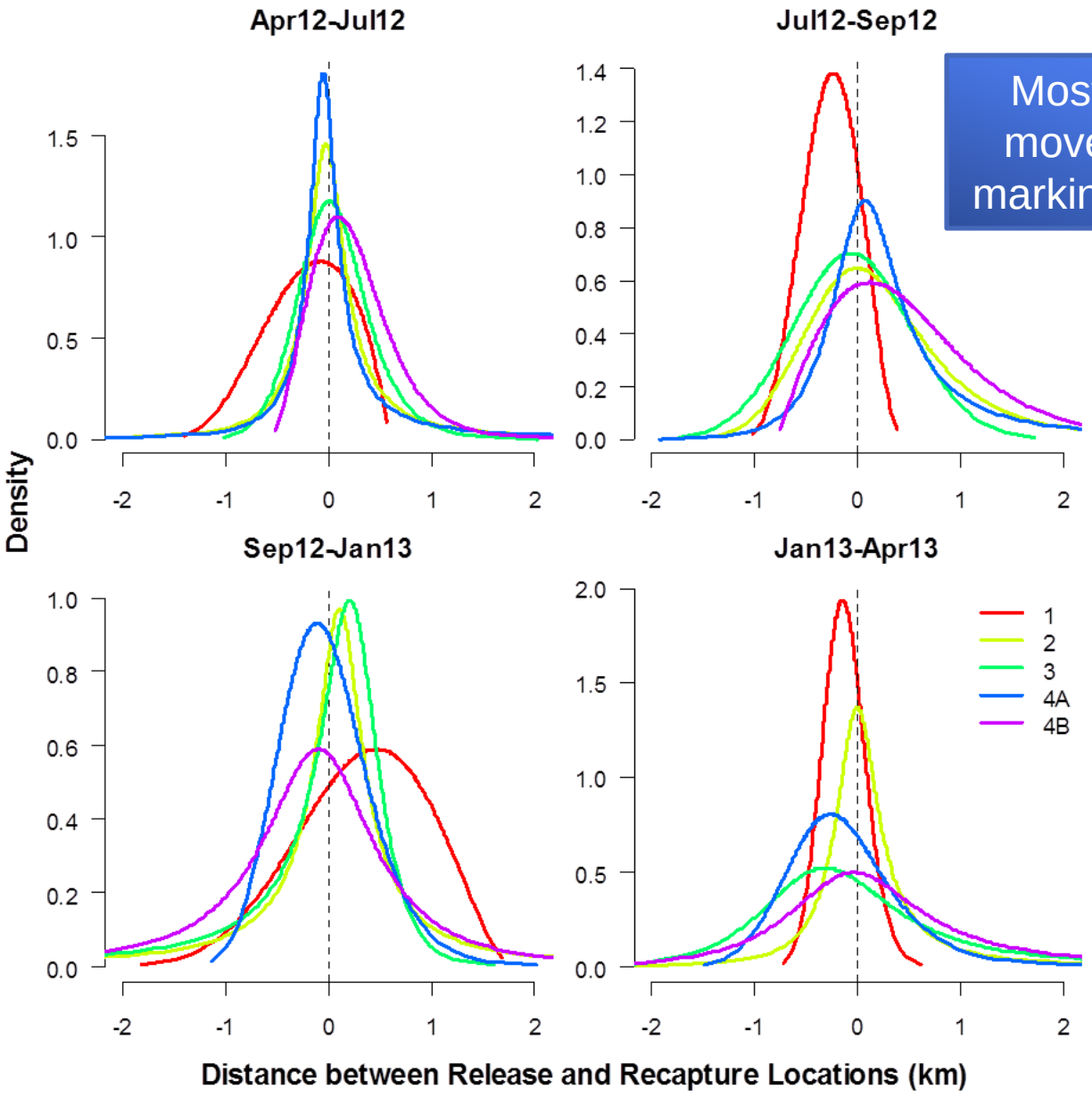
Rainbow Trout Movement



Most rainbow trout move little between marking and recapture

1 = Glen Canyon
2 = House Rock
3 = Buck Farm
4A = Above LCR
4B = Below LCR

(Preliminary Data from Korman and Yard 2013, Do Not Cite)

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Juvenile Chub Monitoring

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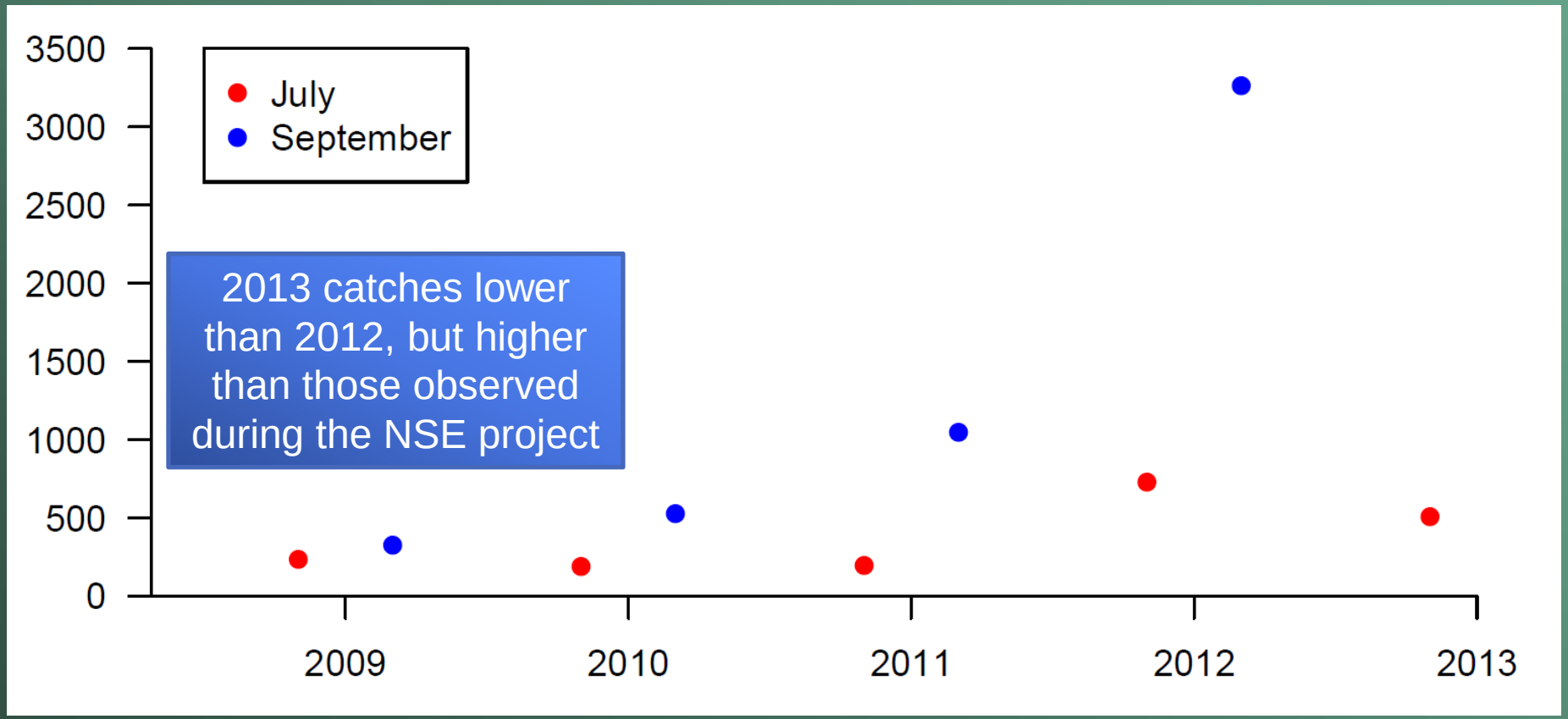
Juvenile Chub Monitoring:
Total Catch of Humpback Chub (40 - 100 mm)



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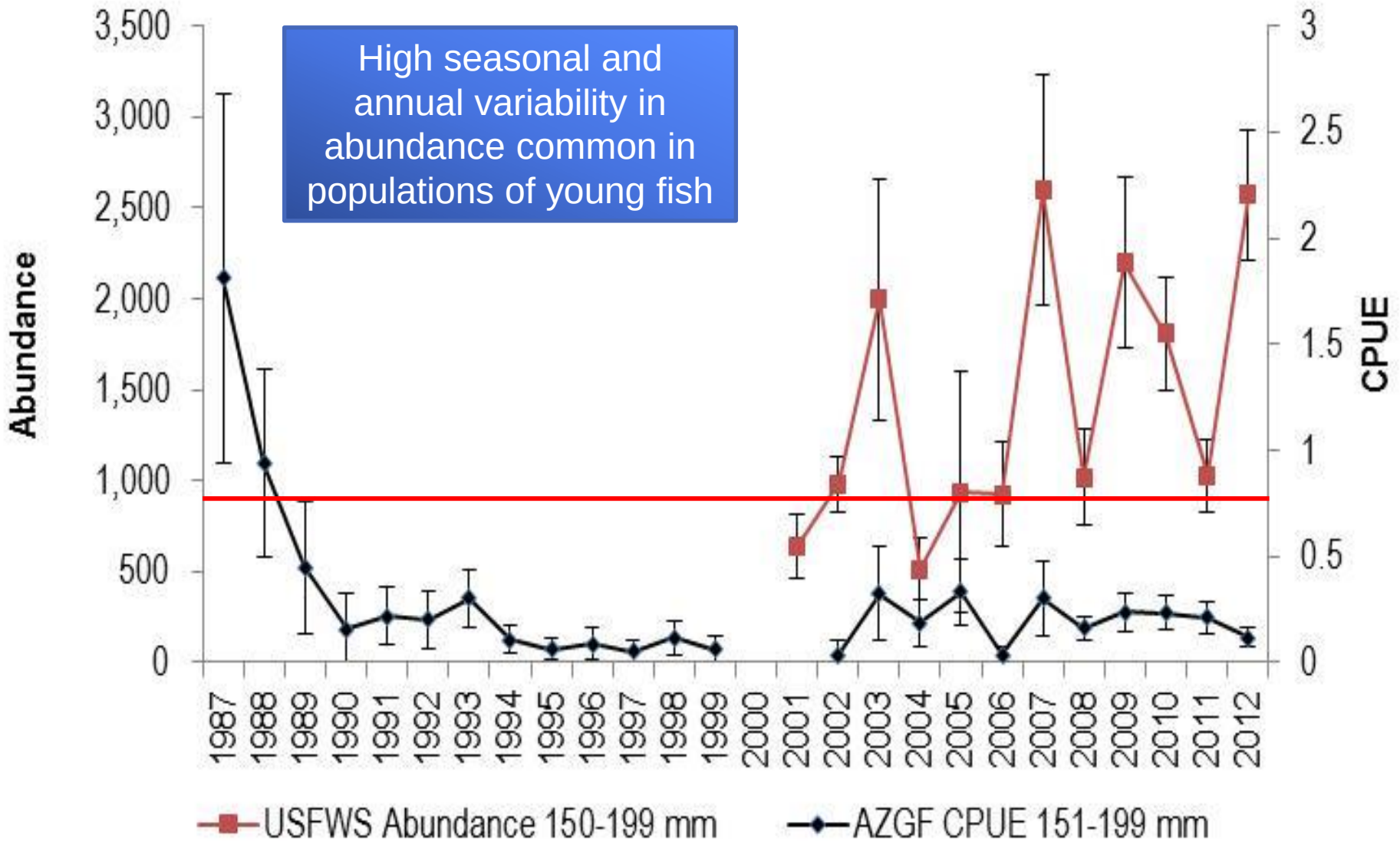
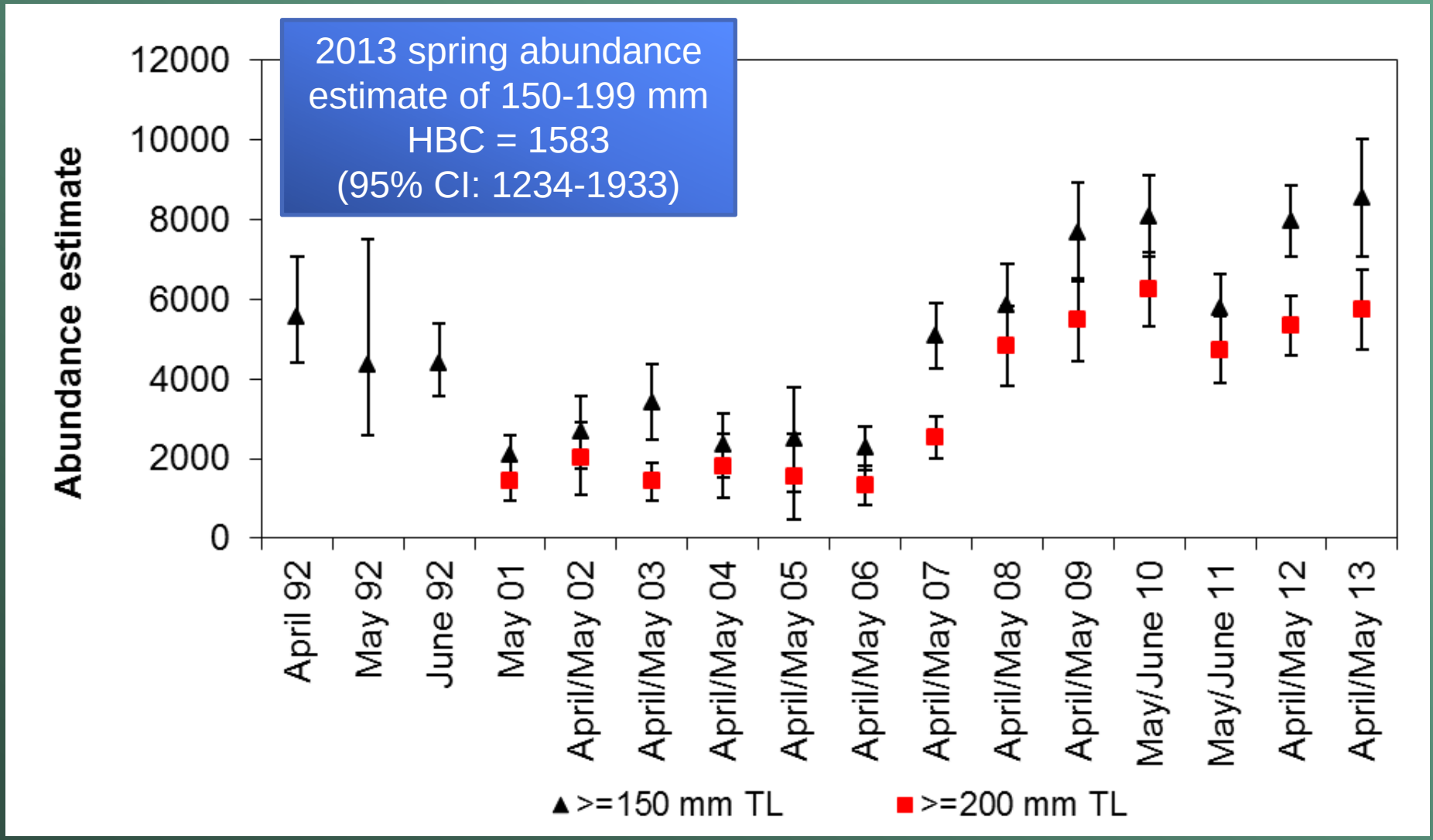
(Preliminary Data from Korman and Yard 2013, Do Not Cite)

Spring Abundance & CPUE of Humpback Chub (150-199 mm) in the Little Colorado River



(Preliminary Data from VanHaverbeke and Bunch 2013, Do Not Cite)

Spring Abundance Estimates of Humpback Chub in the Little Colorado River



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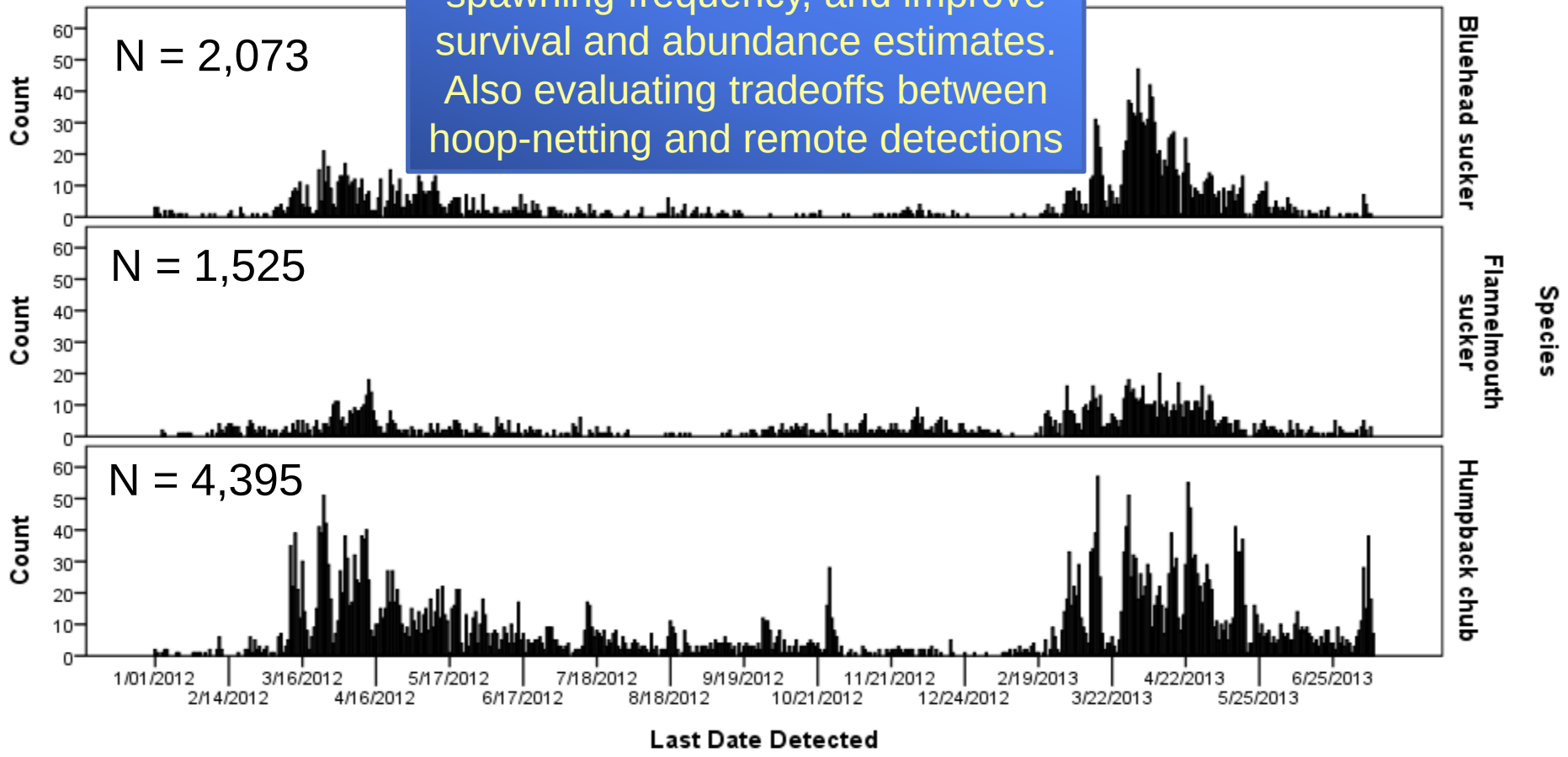
(Preliminary Data from VanHaverbeke 2013, Do Not Cite)

Number of unique fish detected by PIT-tag antenna array 2012 – 2013

Data used to determine run timing, spawning frequency, and improve survival and abundance estimates. Also evaluating tradeoffs between hoop-netting and remote detections



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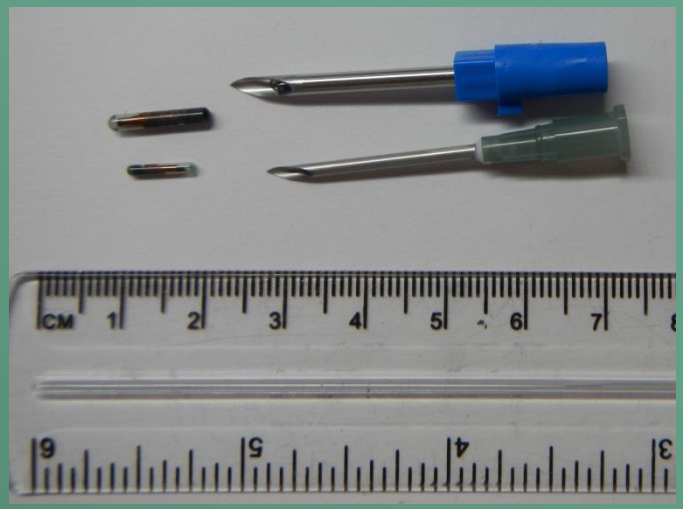
(Preliminary Data from Persons 2013, Do Not Cite)



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Evaluating the feasibility of tagging smaller fish and use of smaller PIT tags now available

Acknowledgements

- Aaron Bunch – AZG&F
- Josh Korman – Ecometric
- Randy Van Haverbeke – USFWS
- Mike Yard, Charles Yackulic, Bill Persons, and others – USGS-GCMRC

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Questions?