National Park Service
U.S. Department of the Interior
Grand Canyon National Park

Conserving Native Fish in Grand Canyon National Park

Emily Omana Smith & Brian Healy

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Native Fishes of Grand Canyon

Bonytail chub

Humpback chub

Roundtail chub

Flannelmouth sucker

Bluehead sucker

Razorback sucker

Colorado pikeminnow

Speckled dace

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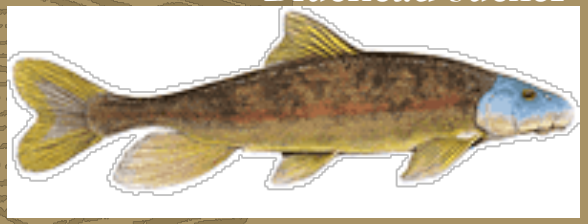

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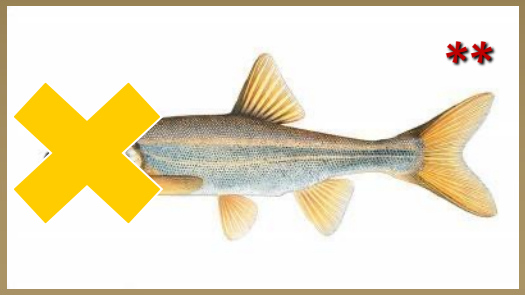

Roundtail chub

Flannelmouth sucker

Bluehead sucker

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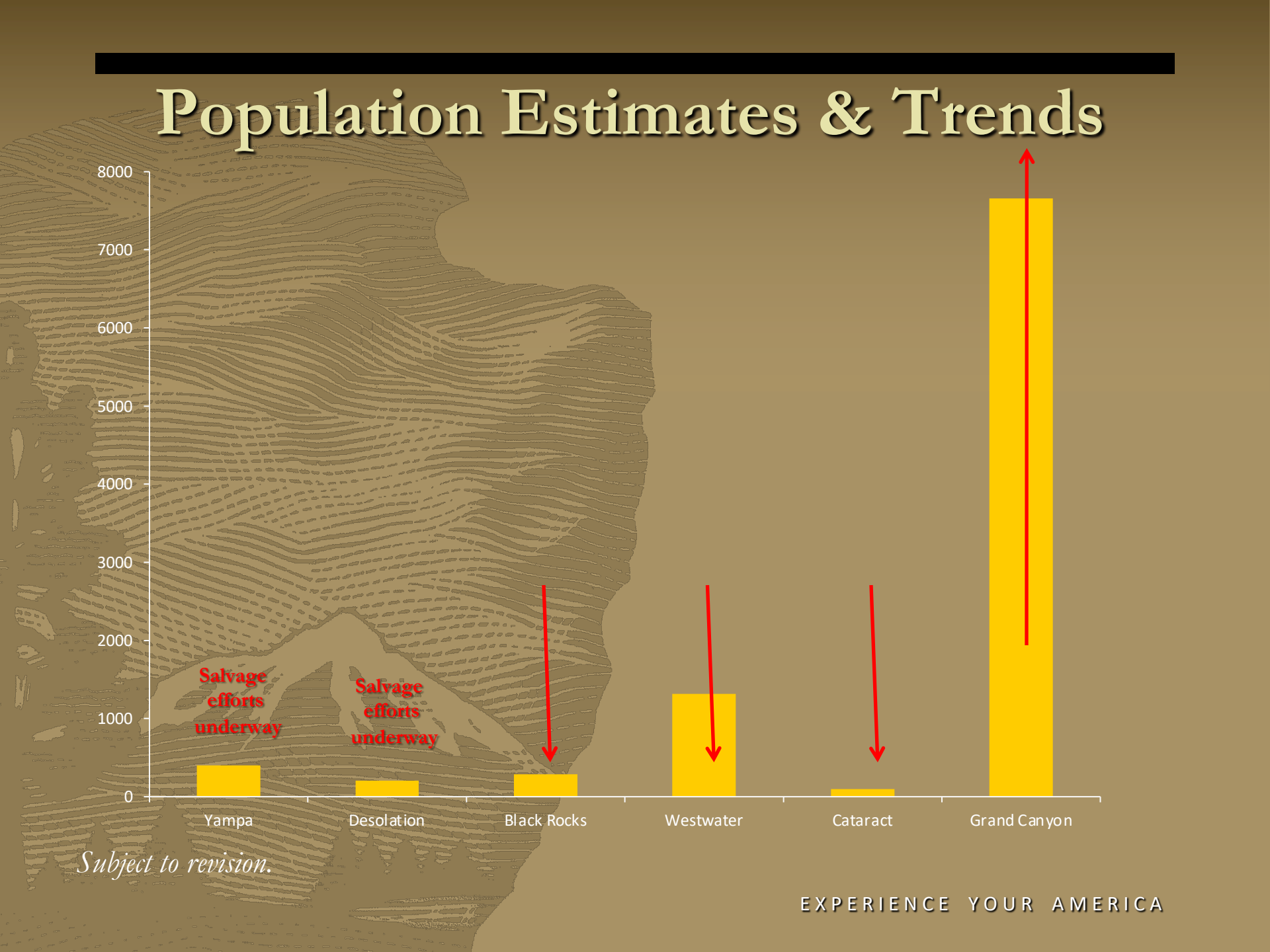
Endangered Humpback Chub

Photo by George Andjreko, AZ Game & Fish

Distribution of Humpback Chub

- Upper Colorado River basin (5)
- Grand Canyon (1)

Population Estimates & Trends



Subject to revision.

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Threats in Grand Canyon

Solutions?

- Non native fish control
  - Bright Angel Creek weir, angling, & electrofishing
  - Shinumo Creek angling & electrofishing

- Translocations into tributaries outside of the Little Colorado River
  - Shinumo Creek: 2009, 2010, 2011*
  - Havasu Creek: 2011*

Non-native Fish Control

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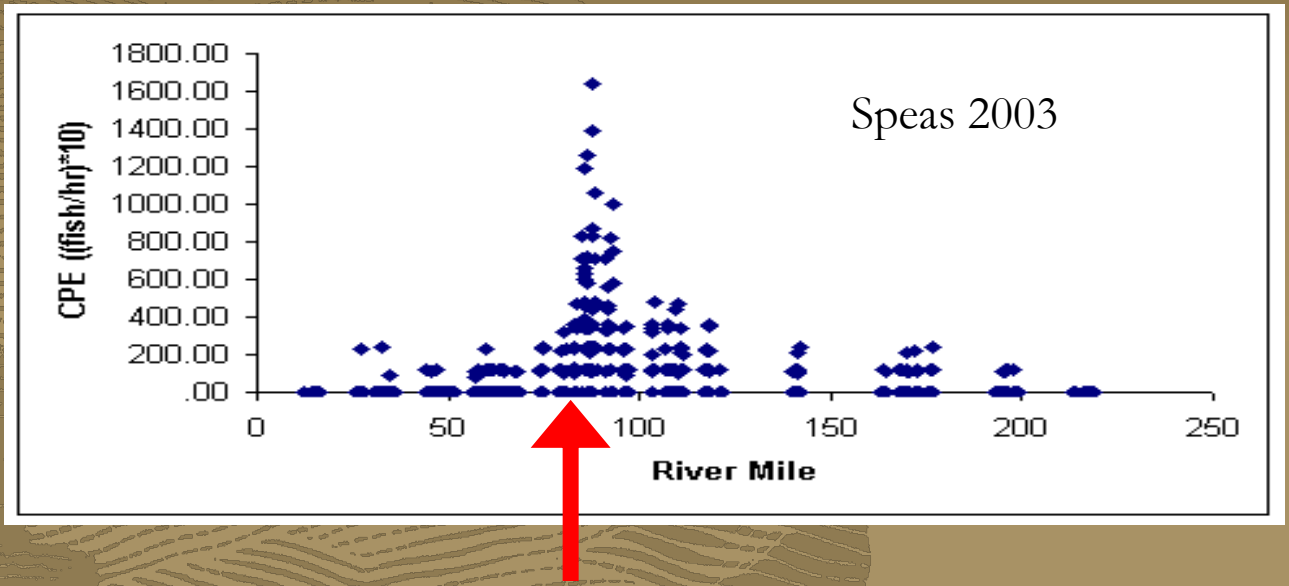
Beneficial Use

Bright Angel Creek Trout Reduction Project

Actions: Remove Brown and Rainbow Trout

1. **Install and operate a weir during spawning seasons**
2. **Electrofishing for fish population monitoring and trout removal**

Project Background & Purposes



Bright Angel Creek is the major source of brown trout

Purposes:

1. Benefit endangered humpback chub and other native fishes in the Colorado River.

2. Restore and enhance, to the extent feasible, native fishes that once flourished in Bright Angel Creek.

Native Fishes of Bright Angel Creek

Historical records

Humpback chub

Razorback sucker

Current residents

Flannelmouth sucker

Bluehead sucker

Speckled dace

Bright Angel Creek Weir

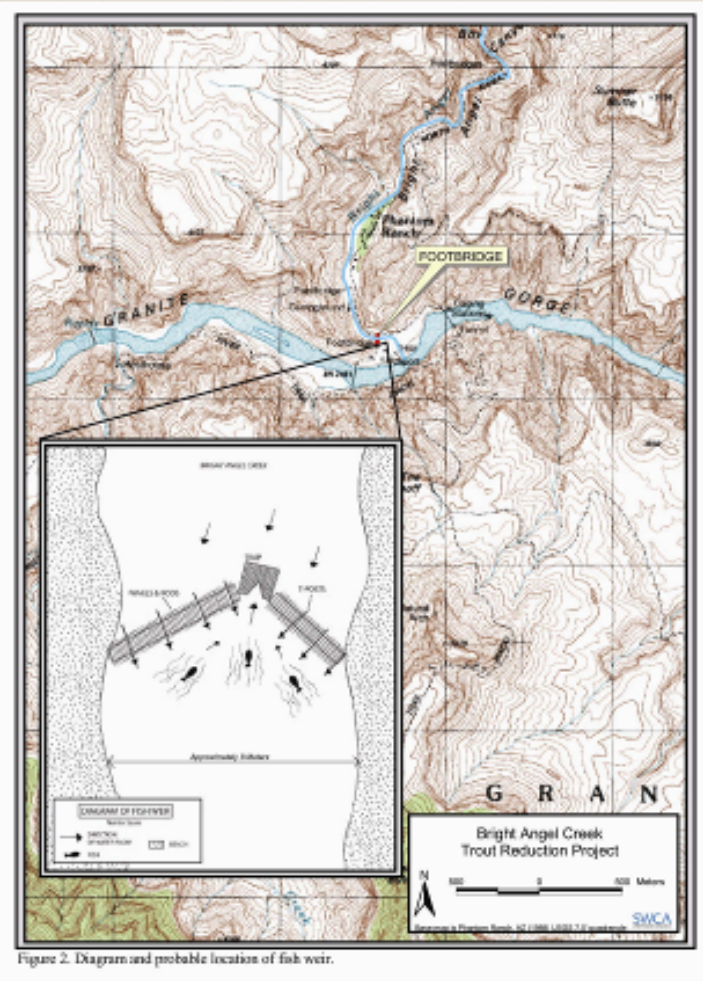


Figure 2. Diagram and probable location of fish weir.

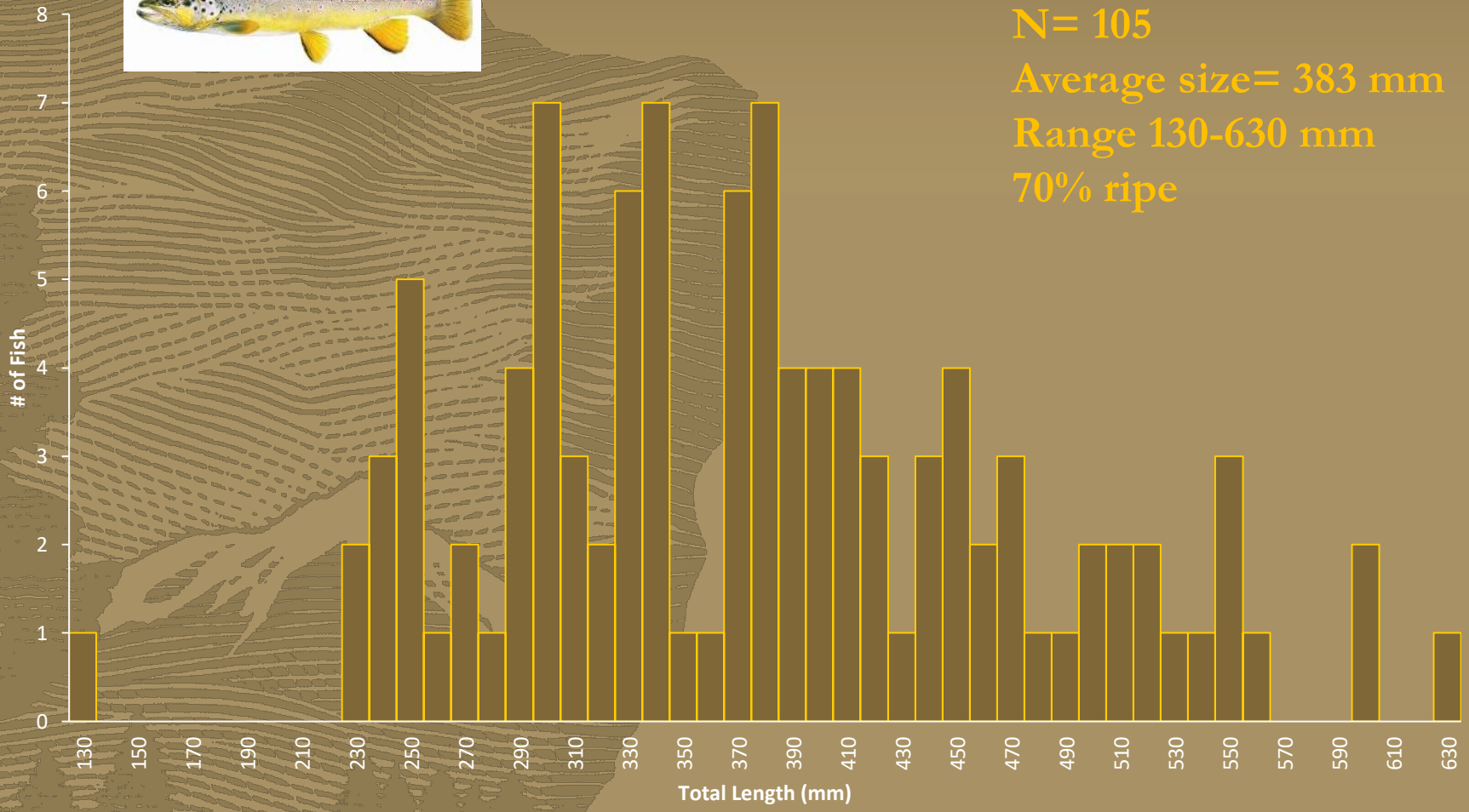
October 25, 2010- February 4, 2011*

Weir removed from December 21-26

Results

Weir- Brown Trout Length Frequency

N= 105
Average size= 383 mm
Range 130-630 mm
70% ripe



Joe Tomelleri Fish Art

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Weir- Rainbow Trout Length Frequency

N= 107
Average size= 358 mm
Range 220-590 mm
74% ripe

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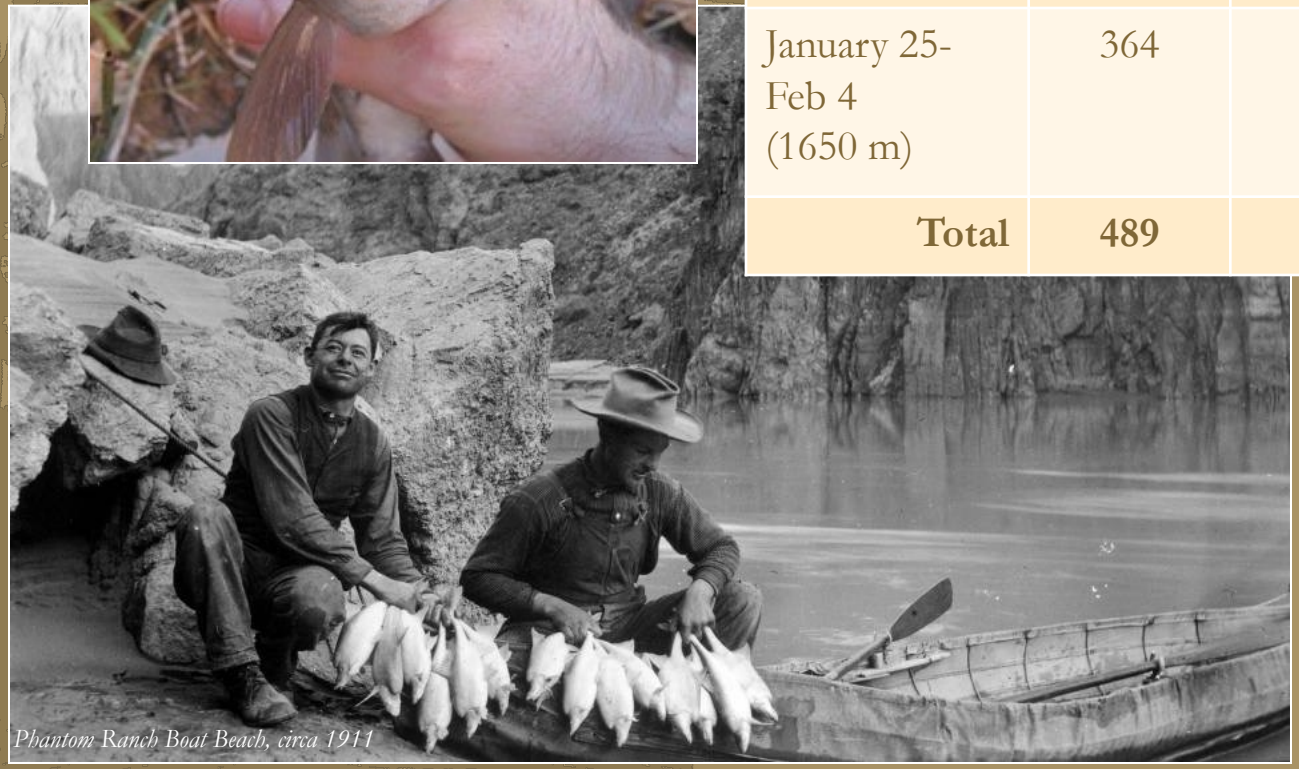
Electrofishing Results

	Brown trout*	Rainbow trout*	Bluehead sucker	Speckled dace
October 27-29 (602 m)	125	104	4	992
January 25-Feb 4 (1650 m)	364	243	37	1331
Total	**489**	**347**	**41**	**2323**

* Removed from creek



Phantom Ranch Boat Beach, circa 1911

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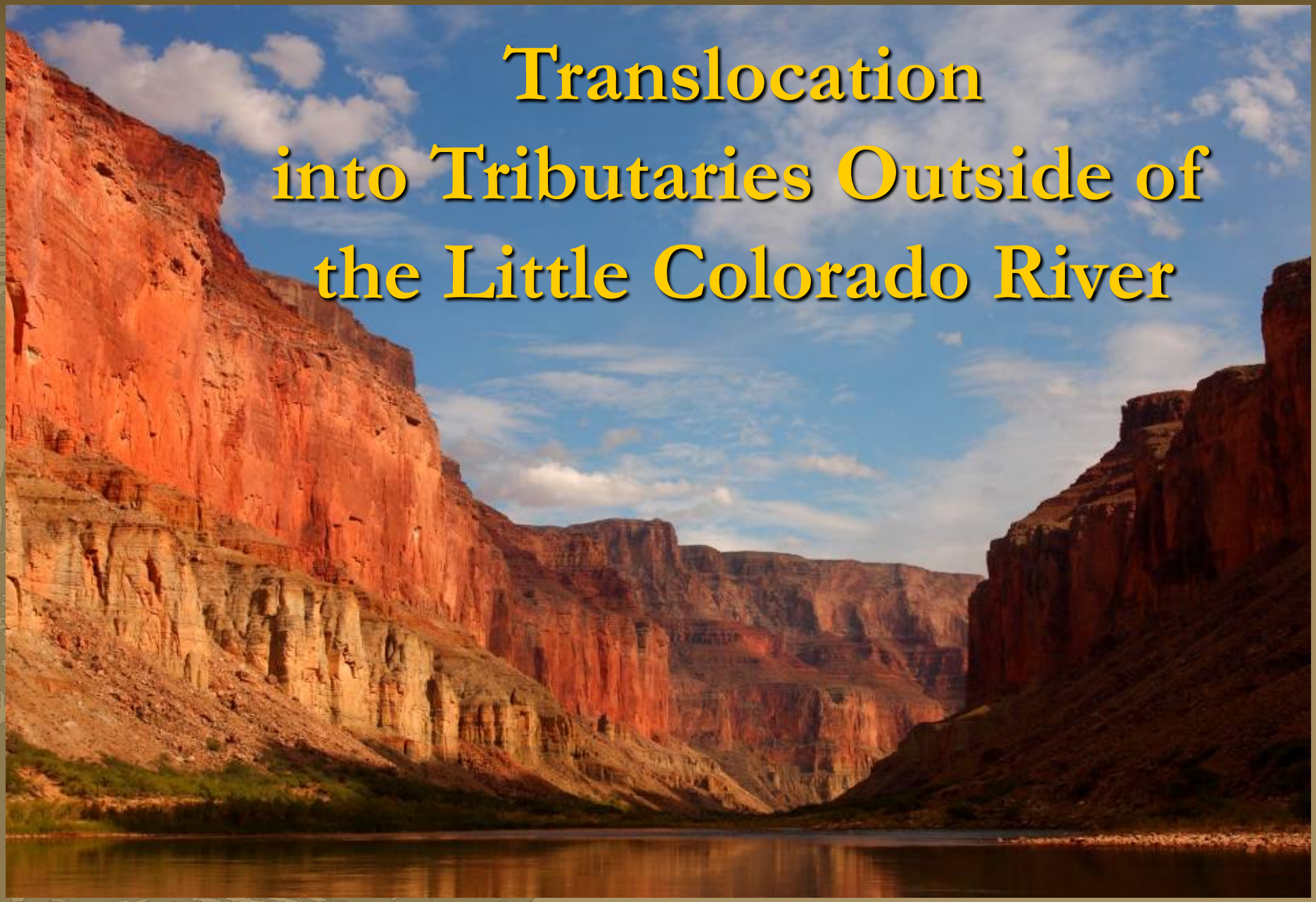

Translocation
into Tributaries Outside of
the Little Colorado River

Translocation

Tributary translocation may contribute towards:

- Establishing 2nd spawning population in Grand Canyon
  - "Population Redundancy"
- Providing rearing/grow-out habitat for juvenile humpback chub
- Augmenting Colorado River aggregations

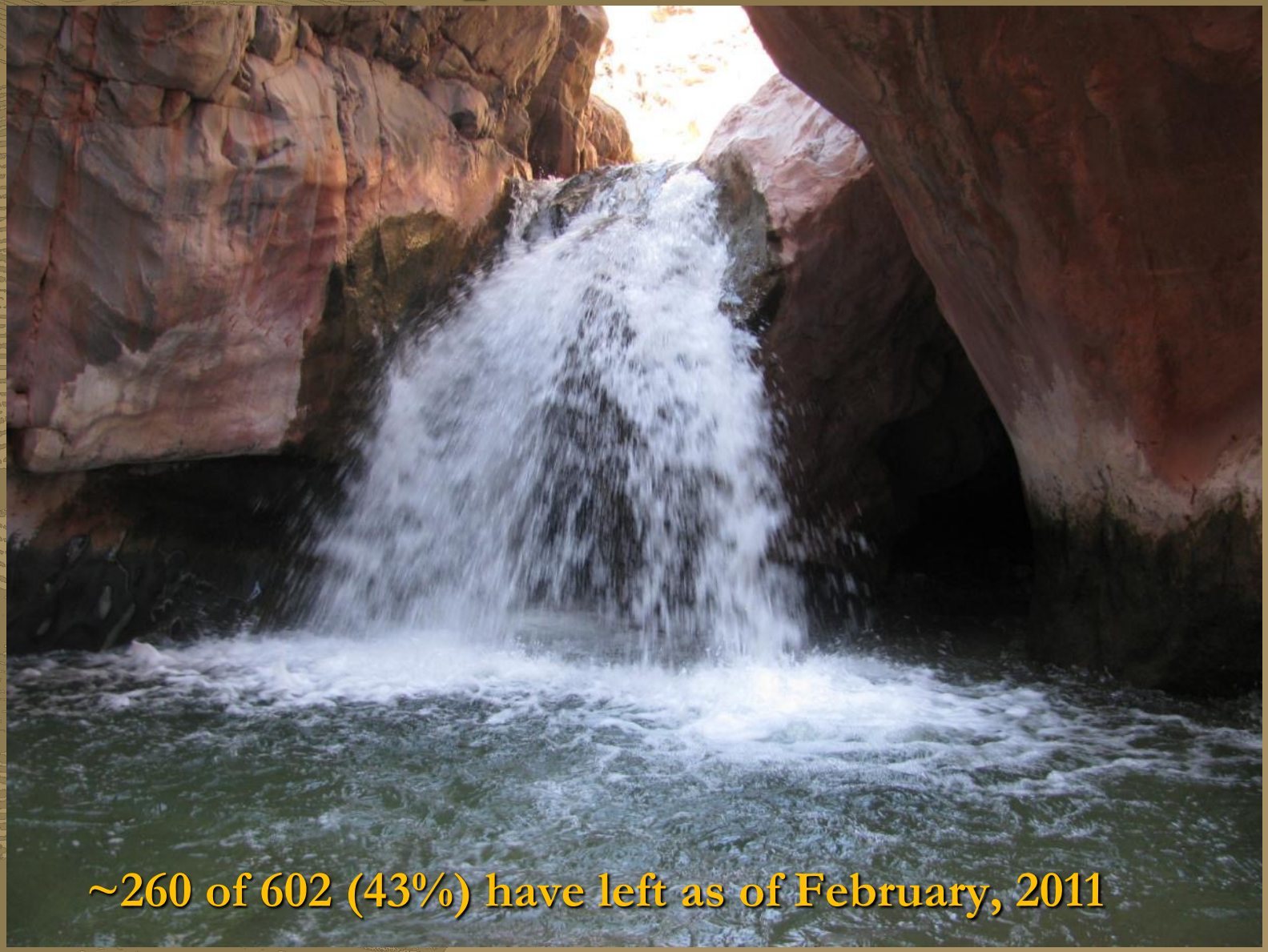
Shinumo Creek Translocation

302 in June 2009

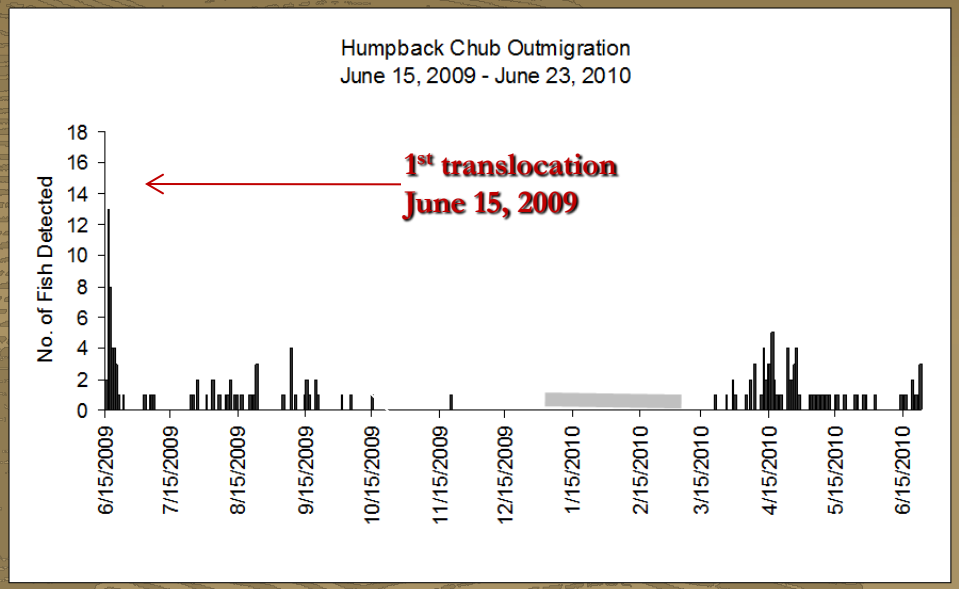
300 in June 2010

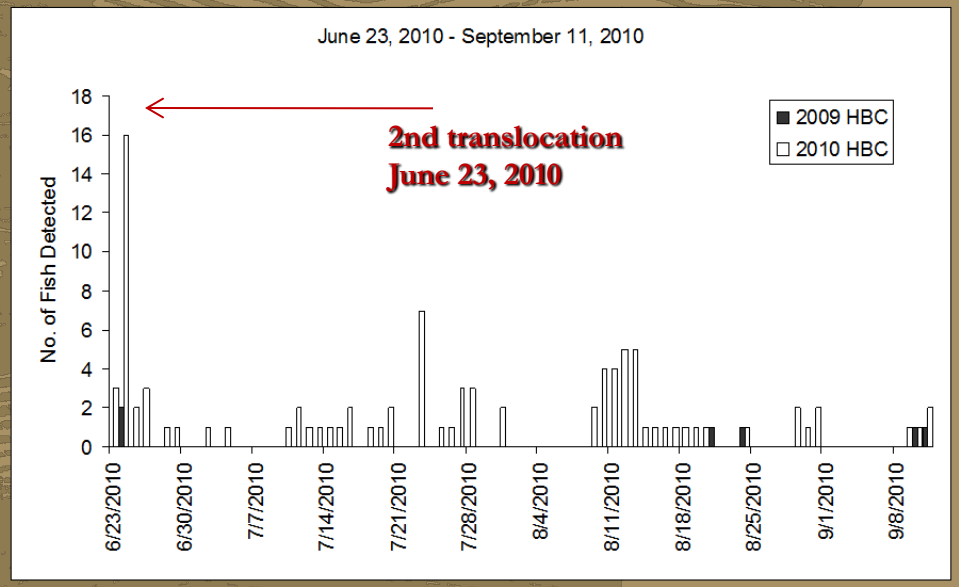
300 in June 2011*

Will Humpback Chub Remain?



What Factors Contribute to Emigration?

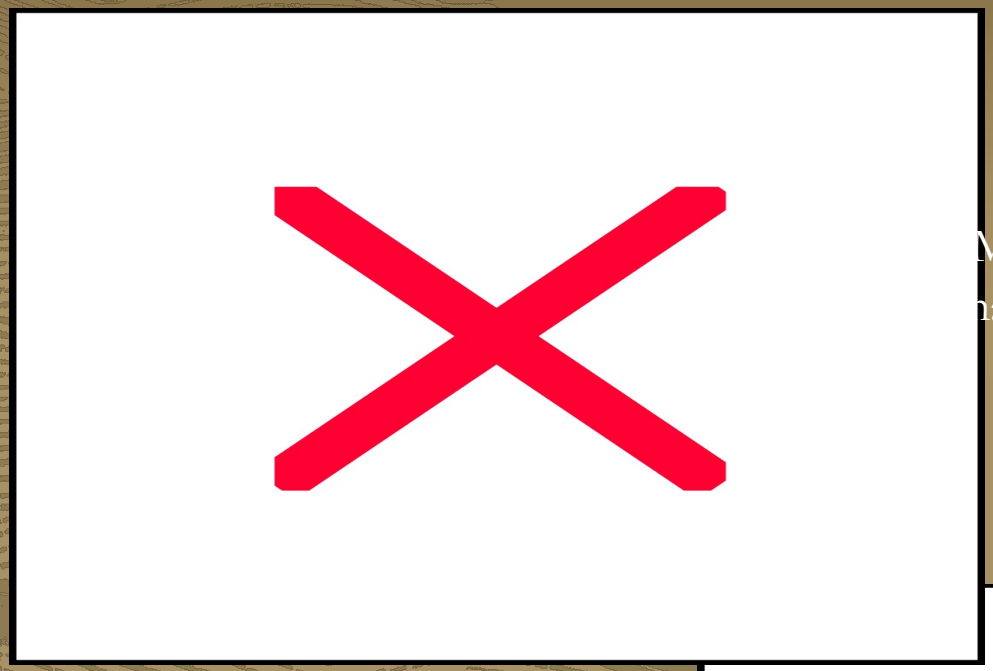




Timing.

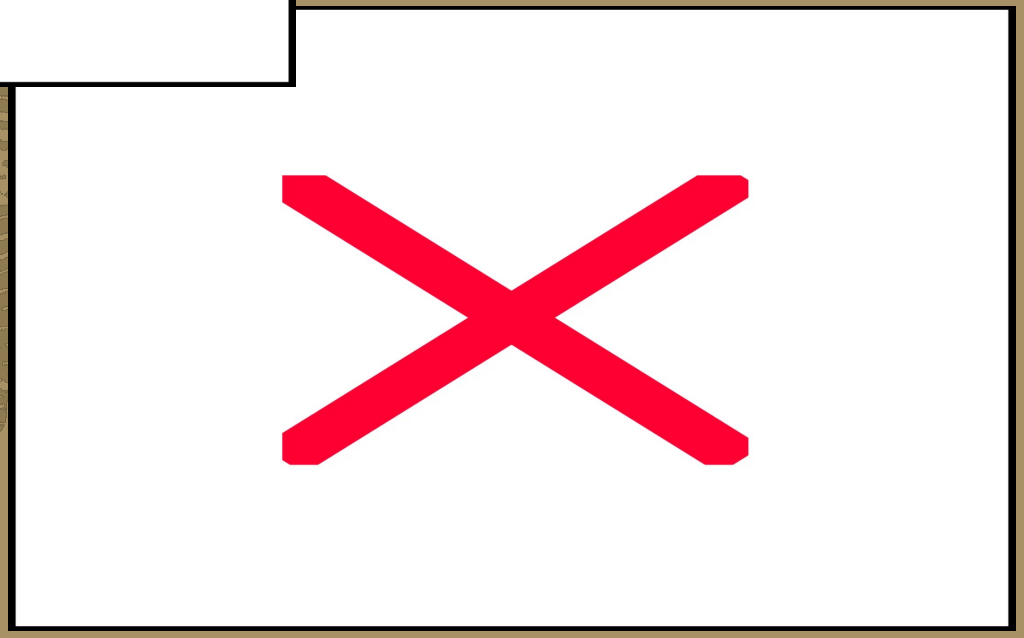
Largest pulses of outmigration occurred within the first 10 days after release.

What Factors Contribute to Emigration?



Timing.

Most emigration happens at night.



Size may matter.

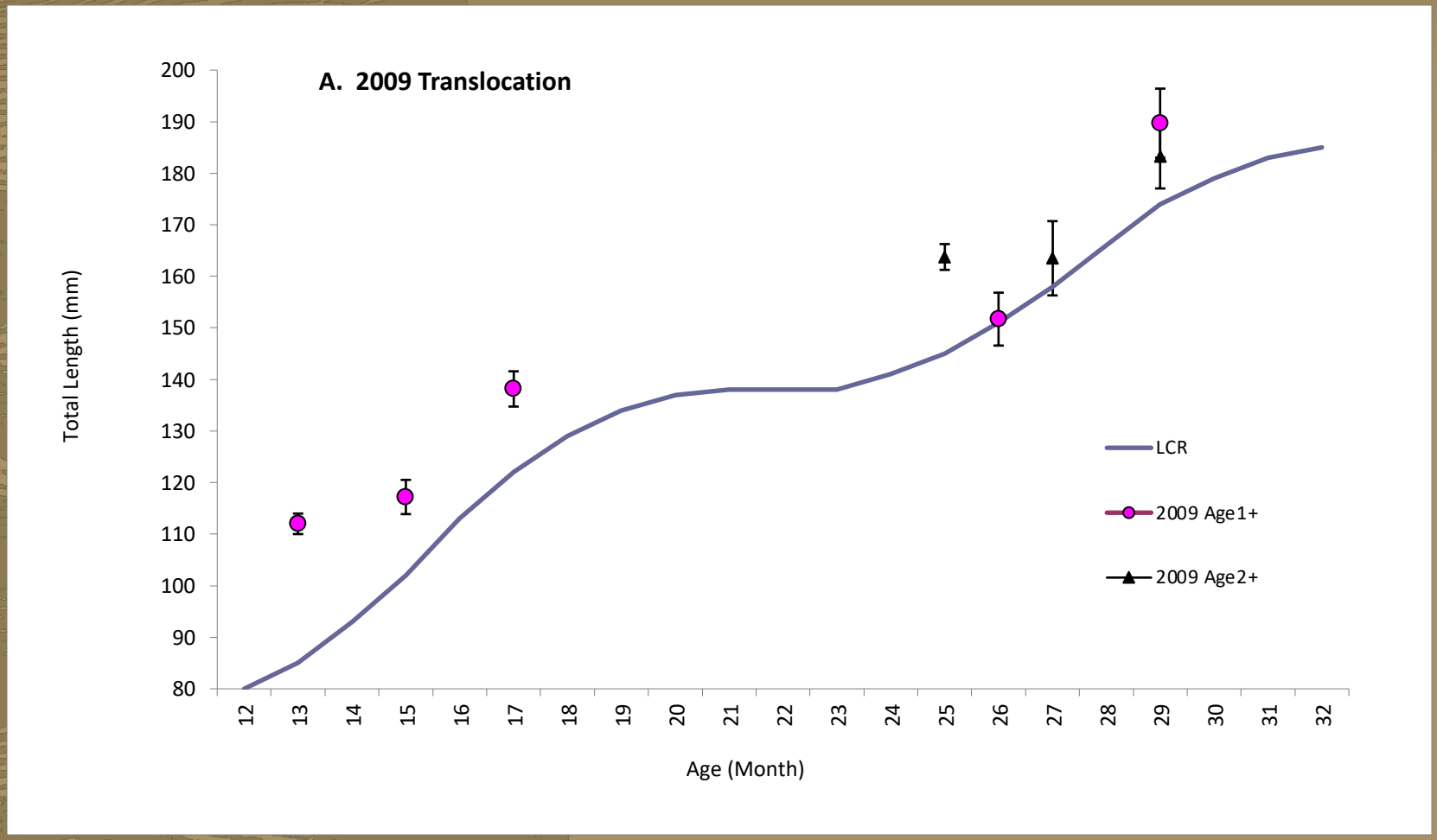
Smaller fish seem to be more likely to stay.

Can we estimate population size?

- Antenna estimates
  - *doesn't account for mortality*
- Mark-recapture estimates
  - *few recaptures= less reliable population estimates*

Next: developing a model to estimate annual abundance
(U. of Missouri)

How does growth compare to that in the Little Colorado River?



Theoretical LCR juvenile growth curve: Robinson and Childs 2001

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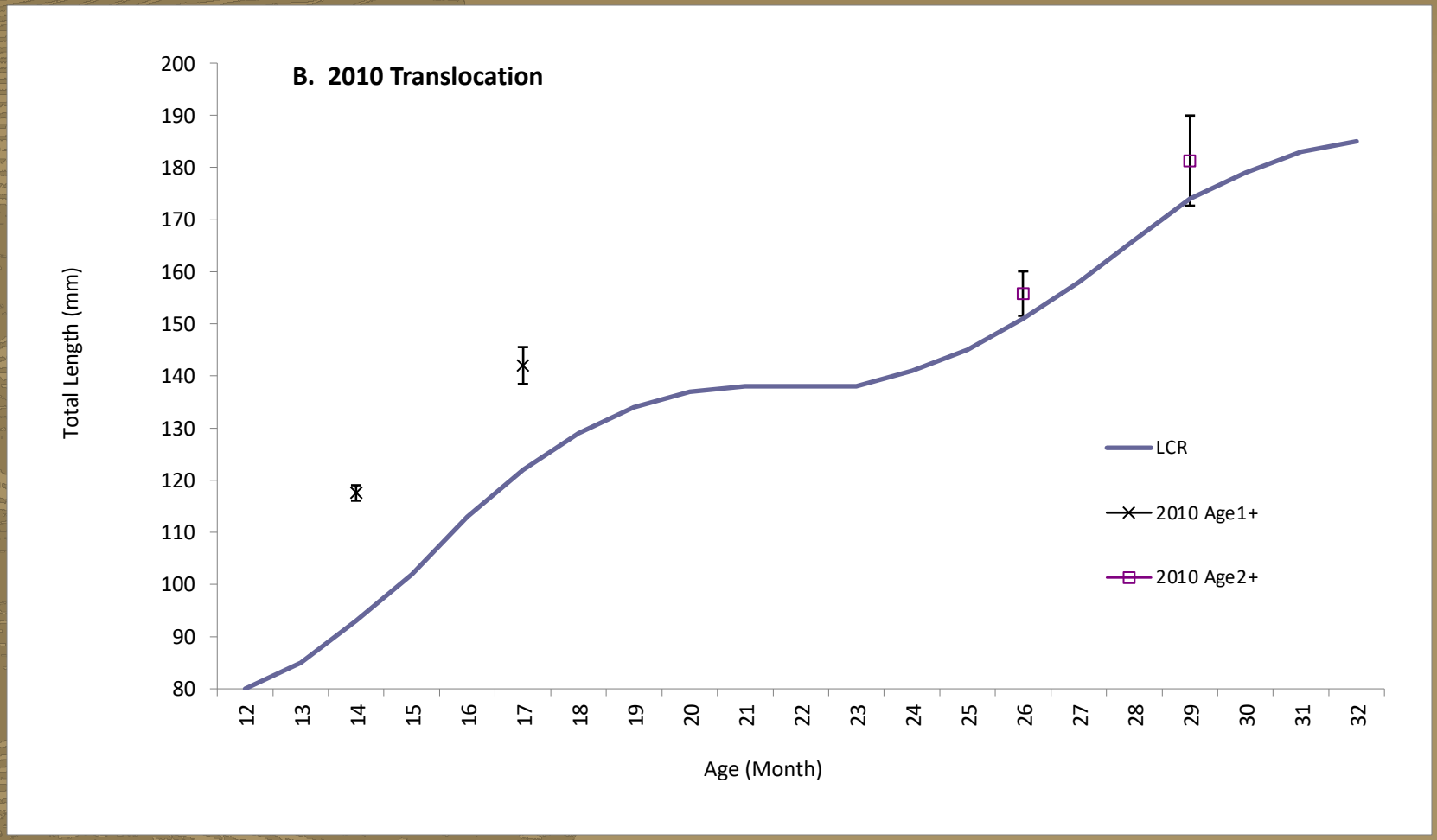


Theoretical LCR juvenile growth curve: Robinson and Childs 2001

Will Translocations Augment Colorado River Humpback Chub Aggregations?

GCMRC and USFWS conducted a trip in September 2010 to look at the 9 Grand Canyon mainstem aggregations.

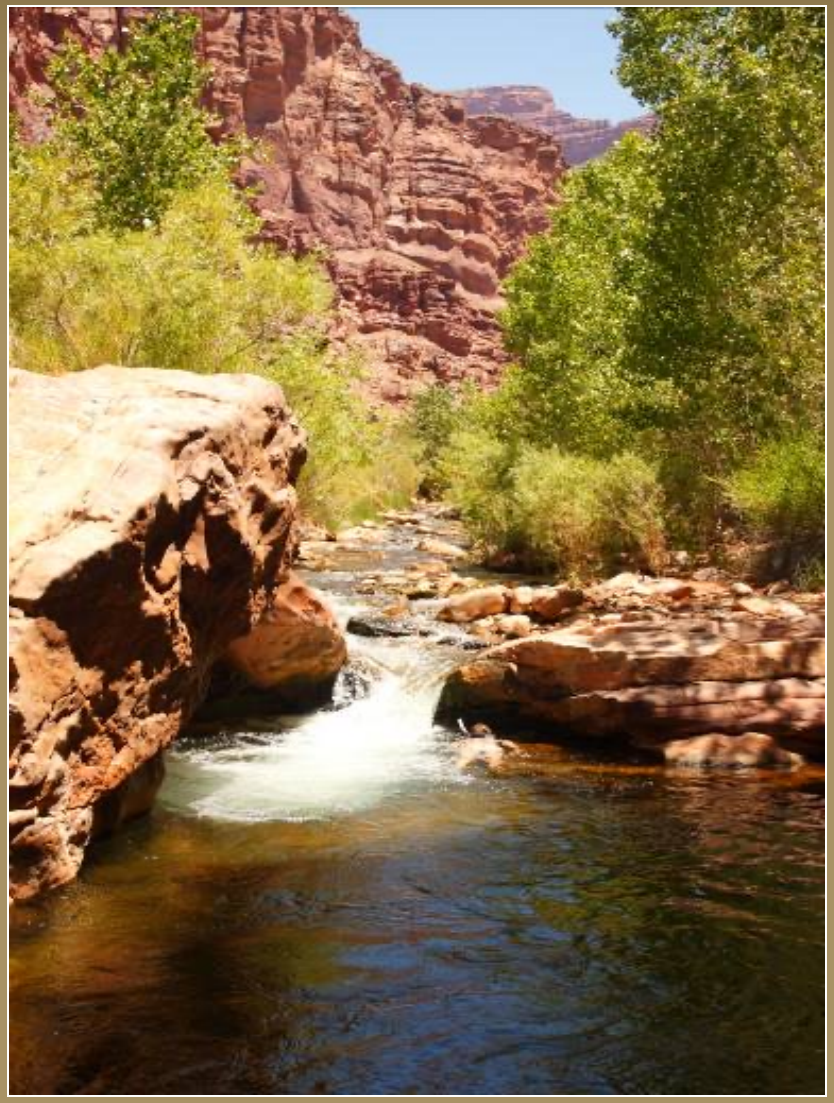
- 28% of all tagged humpback chub caught in the mainstem were from the Shinumo Creek translocations
- 68% of tagged chub caught around the Shinumo Creek inflow were from the translocations

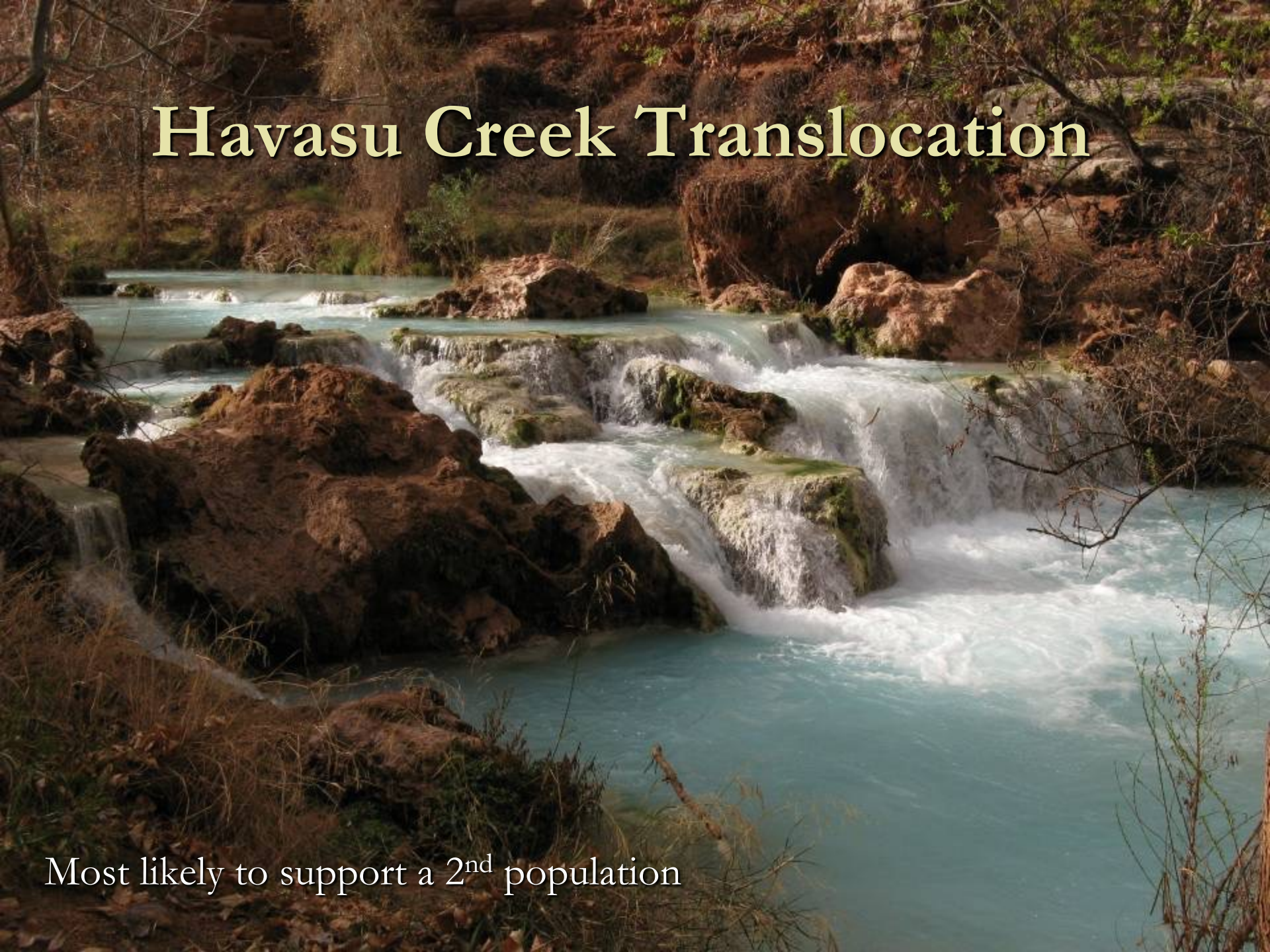
Translocated humpback chub that leave the tributary are surviving and potentially augmenting the mainstem aggregations.

Data Provided by USGS/GCMRC/USFWS.

Next Steps – Shinumo Creek

- Shinumo Creek Translocation III planned for June, 2011 (300 fish)
- Continue monitoring
- Rainbow trout control (removed 2,130 since 2009)
- Generate survival and population estimates, investigate food web using stable isotope studies, interactions with non-native fish, look for reproduction



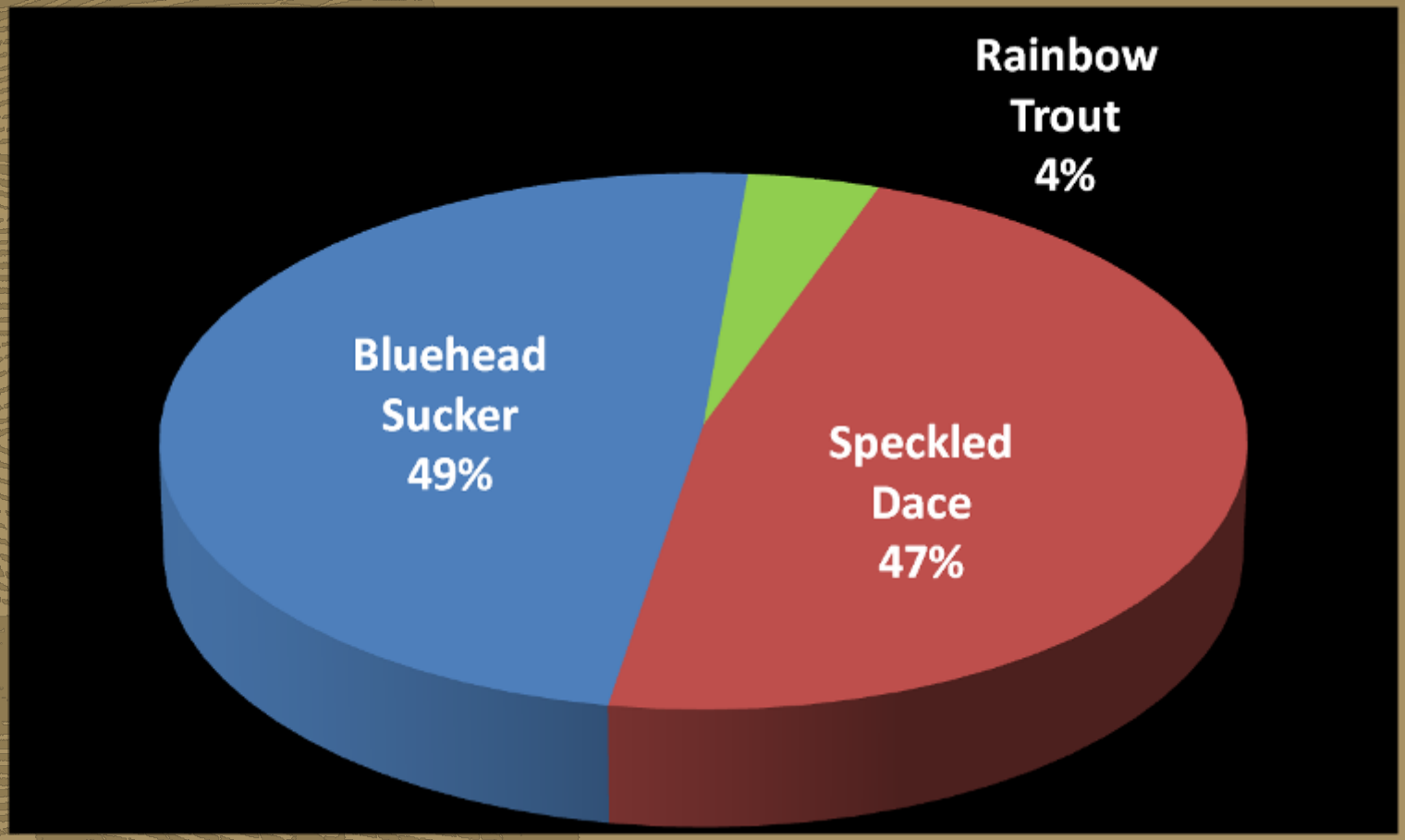


Havasu Creek Translocation

Most likely to support a 2nd population

Havasu Creek Baseline Survey

February 2010



New Zealand Mud Snail

- Grand Canyon in 2002 (mainstem)
- Can compete with native invertebrates and ultimately impact other resources
- Asexual reproduction- one snail can colonize!
- Transported on boats, equipment, clothing, shoes, etc.
- Concern: moving from mainstem to uninfected tributaries, as well as other waterways

- ✓ ~5mm
- ✓ coil to the right
- ✓ 5-6 whorls
- ✓ operculum

New Zealand Mud Snail

No technique is guaranteed to prevent the spread.
We can minimize the risks.

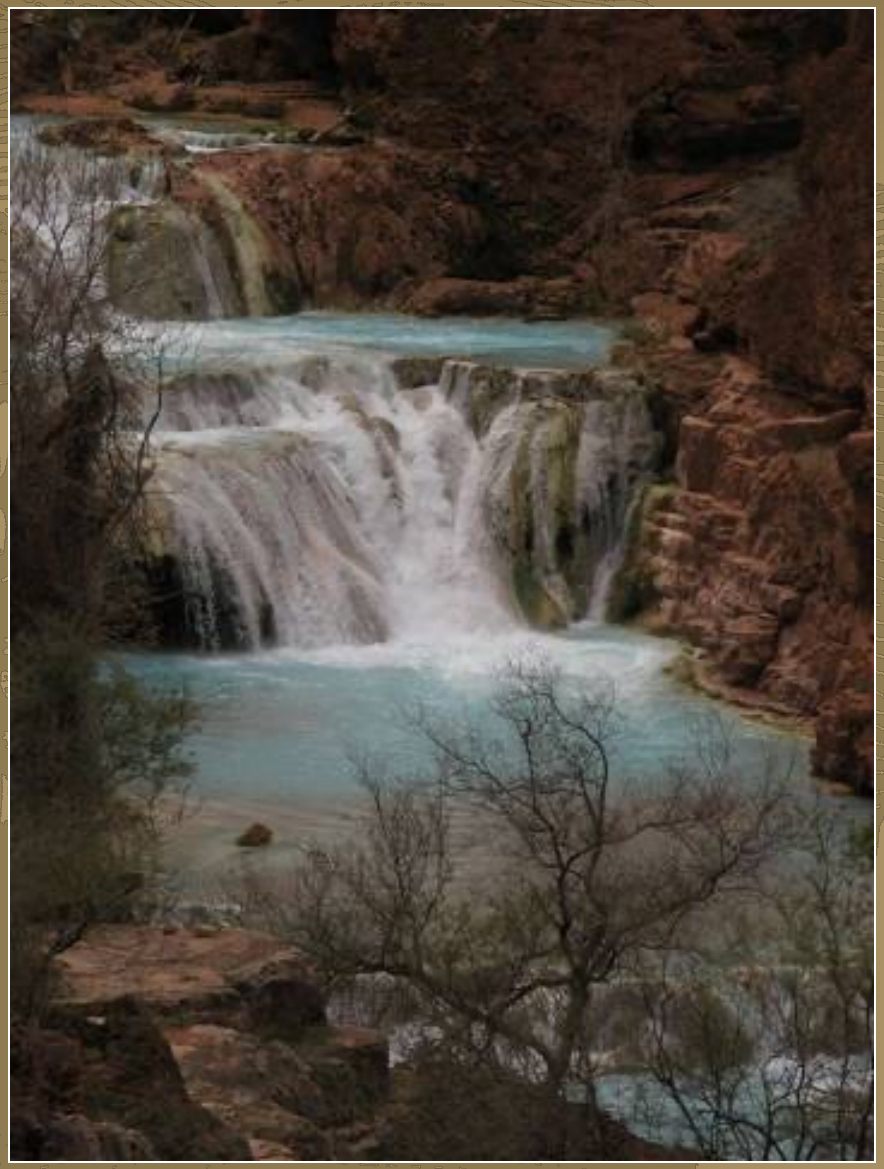
When traveling from the mainstem Colorado River to tributary or body of water :

❖ **Minimally, before you leave a body of water, scrub off any mud, plant material, and debris attached to your clothing and equipment. Check for attached organisms and remove them. Consider carrying a wire brush for this purpose. Empty accumulated water from all equipment.**

❖To disinfect gear, choose one of the following methods:

1. Boil for a minimum of 10 minutes *OR* freeze for a minimum of 24 hours.
2. Allow gear to ***completely*** dry for a minimum of 24 hours, checking all crevices and pockets for potential moist spots.
3. Chemically treat with undiluted bleach of Sparquat 256 solution. Rinse and dispose of chemicals appropriately, and ***away*** from the waterway.

Havasu Creek, 2011



- Finalize translocation plan
- Baseline sampling II
  - Below Beaver Falls
  - Baseline fish survey
  - Water quality
  - Non-native fish
  - Food base
- Translocation of 300 humpback chub in May if appropriate

Cooperators

- Funded by Reclamation and NPS
- Supported by many volunteers

Thank you!

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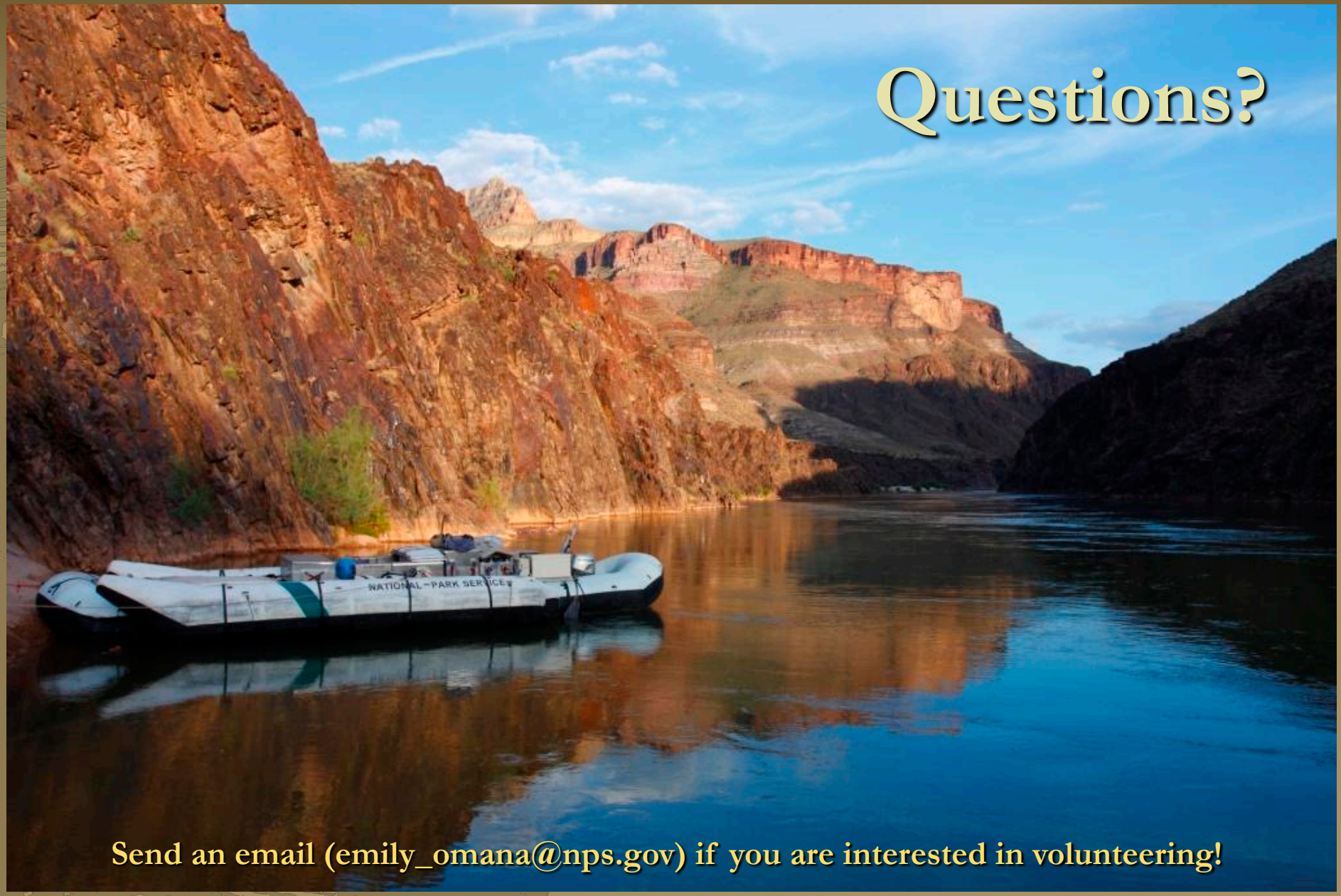
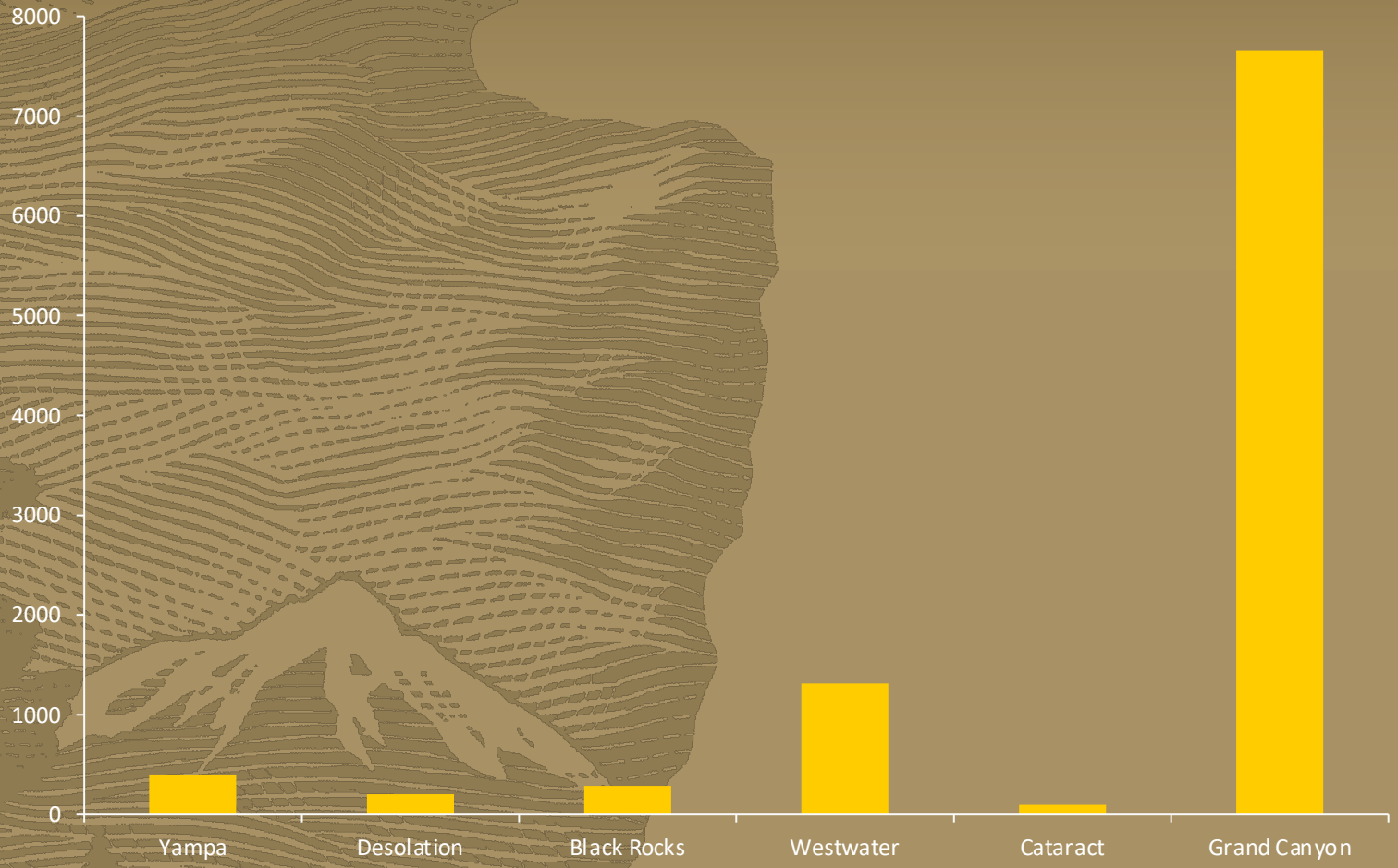

Questions?
NATIONAL PARK SERVICE
Send an email (emily_omana@nps.gov) if you are interested in volunteering!

Population Estimates



Subject to revision.

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Federal Legislative and Policy Mandates

- **NPS Management Policies (2006**) require national parks to maintain native plants and animals as parts of natural ecosystems, and ***to remove established populations of non-native species***. Furthermore, these policies call for the eradication of non-native species if those species interfere with the perpetuation of native species.

- **NPS Organic Act (1916)** mandates that national parks conserve the natural resources found therein and ***manage those resources to avoid their impairment.***

- NPS must comply with the **Endangered Species Act (1973**) and with the non-native fish control measures in the **USFWS recovery goals for the humpback chub (2008).**

- Objectives of the **Grand Canyon National Park's General Management Plan (1995**):
  - To the maximum extent possible, ***restore altered ecosystems to their natural conditions. In managing naturalized ecosystems,*** ensure the preservation of native components through the ***active management of non-native components*** and processes.
  - Manage ecosystems to preserve critical processes and linkages that ensure the preservation of rare, endemic, and specially protected (threatened/endangered) plant and animal species.

Non-native Fishes in Grand Canyon

- Brown trout (*Salmo trutta*) and Rainbow trout (*Onchorhnchus mykiss*) introduced by NPS into Grand Canyon tributaries beginning in 1920.

- NPS acknowledged that stocking non-natives was contrary to policy but felt "that recreational benefits overruled the biological disadvantages which are incidentally incurred."

- We now understand that introduced species can disrupt entire ecosystems and lead to the decline and extinction of native species.

Non-native Fish Control Methods

Weir Methods

- Checked morning and evening
- Recorded water temperature
- Fish data
  - Length
  - Weight
  - Spawning condition
  - # eggs
  - Tags
  - Stomach contents

Brown Trout Weir Captures

Joe Tomelleri Fish Art

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Rainbow Trout Weir Captures

Joe Tomelleri Fish Art

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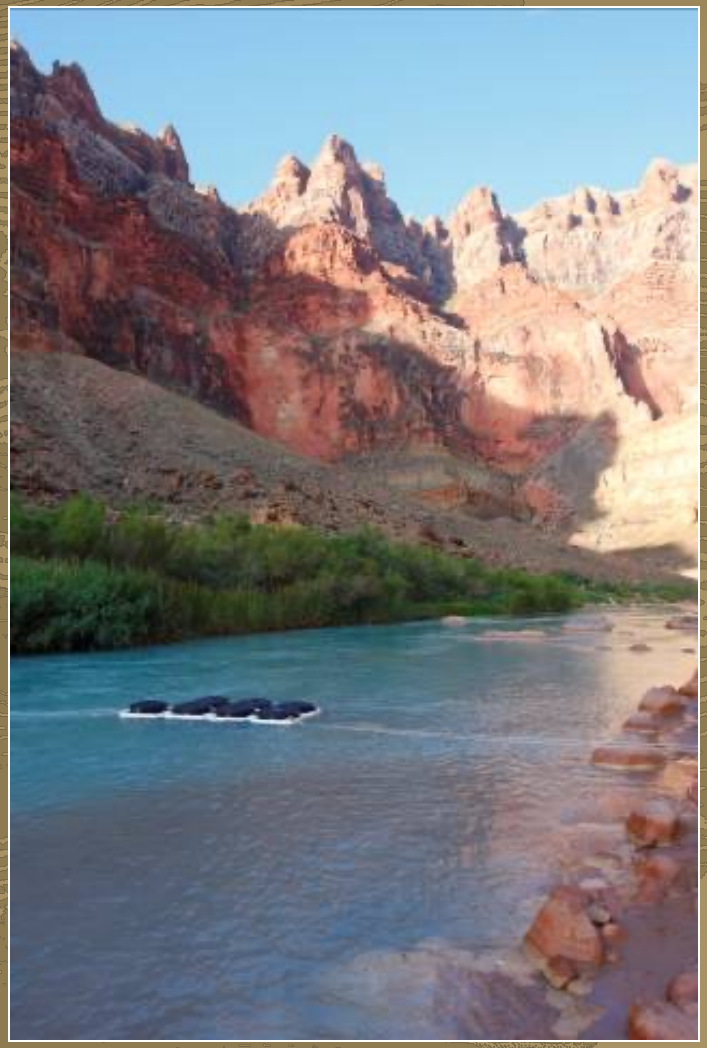
Electrofishing in Bright Angel Creek

Electrofishing Objectives

- Monitor the native and non-native fish community abundance and composition.
- Remove non-native fish upstream of the weir.
- Collect samples to assess trophic position of native and non-native fish.
- Interpret project objectives and methods to Phantom Ranch staff and park visitors.

Little Colorado River Collections



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Hatchery Activities

- Parasite & disease treatment
- Flow training
- Pit tagging
- Weight & length measurements

Questions

- Will humpback chub remain in Shinumo Creek?
  - Factors influencing emigration
  - Population estimates
- How does growth of translocated humpback chub compare to growth in the Little Colorado River?
- Will translocations augment Colorado River humpback chub aggregations?
- Ongoing: Survival, Reproduction, Interactions with non-native fish, Shinumo Creek food web

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Arizona

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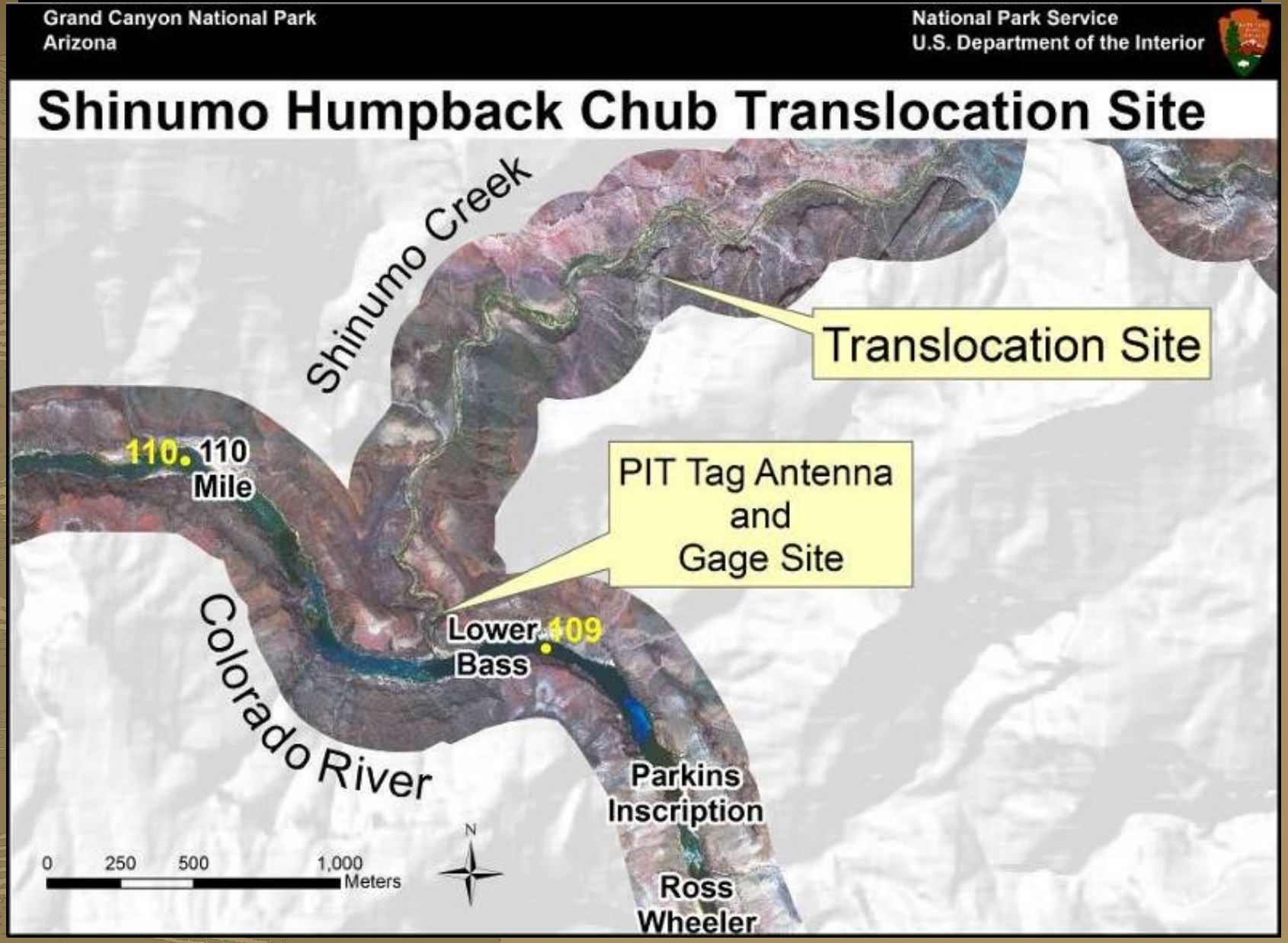
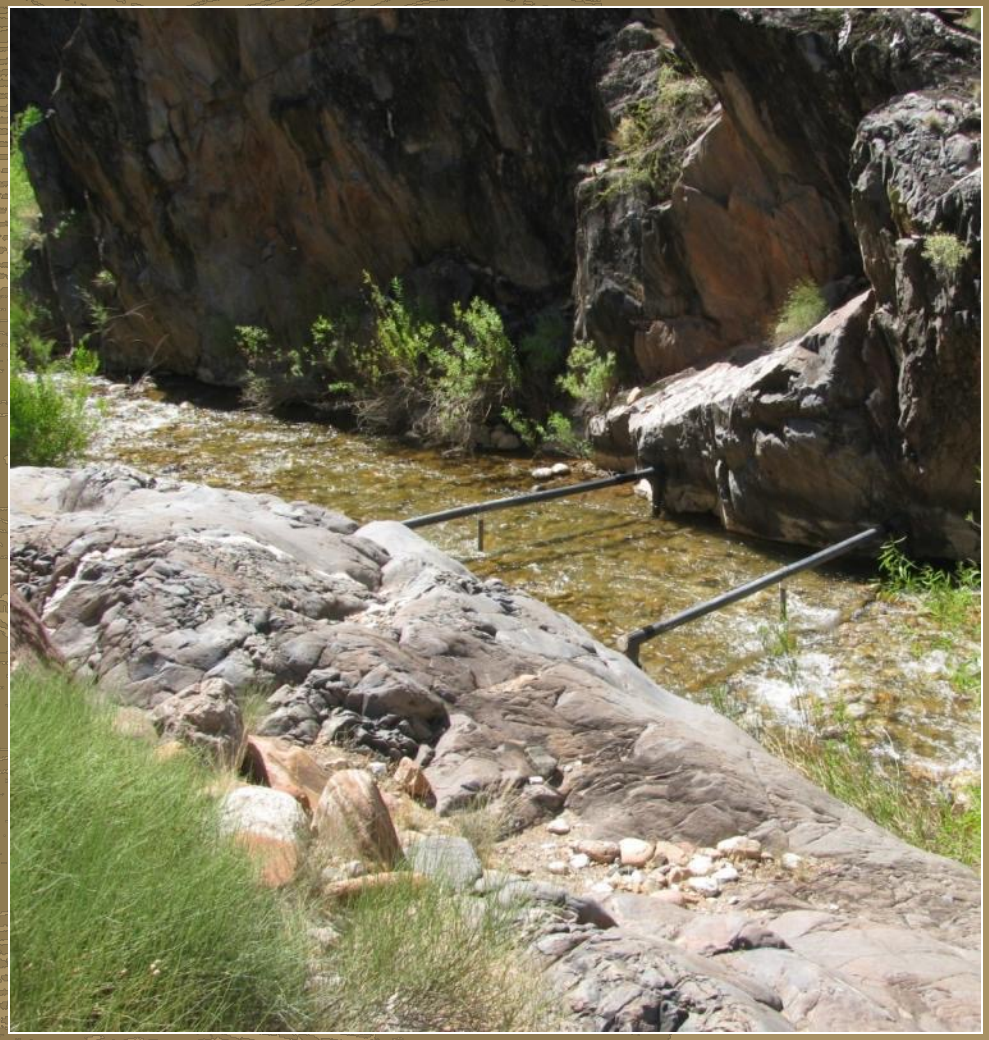
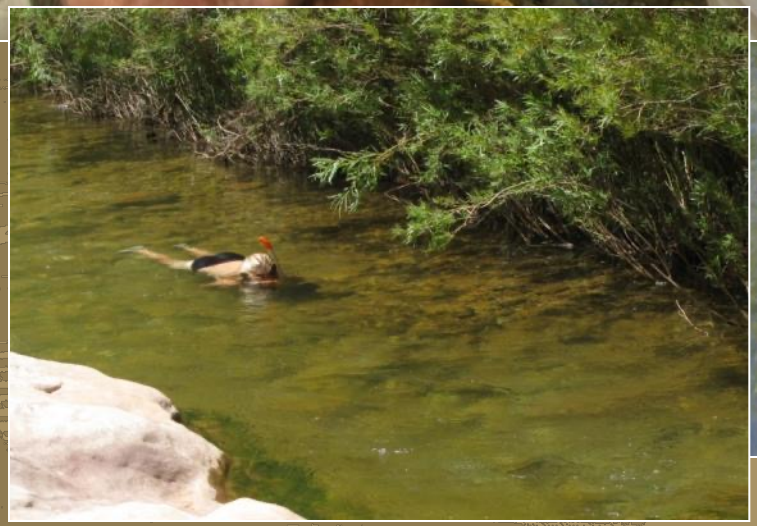


PIT Tag Antenna System



Translocation

Tempering and Release



Monitoring methods

Can we estimate population size?

- **Antenna estimates**
  - June: 151
  - September: 350

- **Mark-recapture estimates**
  - June: 33
    (95% C.I. 10-106)
  - September : 191
    (95% C.I. 82-450)

  ⇒*few recaptures= less reliable population estimates*

Next: developing a model to estimate annual abundance
(U. of Missouri)

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2010 NPS Fish Projects: Collections, Translocation, and a Weir- oh my!

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