National Park Service
U.S. Department of the Interior

Grand Canyon National Park

# Bright Angel Brown Trout Removal and Humpback Chub Translocations

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Joe Tomelleri Illustrations



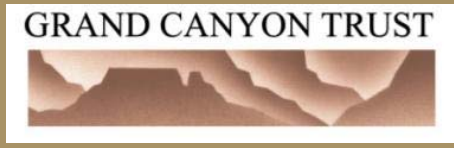



Previous cooperators





- Funded by Reclamation and NPS
- Volunteers



# Goals and Objectives

- 1996 ROD/1994 Bi-Op: “Establish a 2nd spawning aggregation…downstream of Glen Canyon Dam.”
  - Valdez et al. (2000) plan: Recommended tributaries (Havasu, Shinumo), but recognized carrying capacity is low in tributaries.
  - Tributary and Mainstem Option: Bright Angel would be only tributary that would allow access to and from the mainstem, but not considered due to “…large populations of non-native fish predators…..”
- HBC Translocations/NNF Control: Glen Canyon Dam Conservation Measures, USFWS Biological Opinions, 2008, 2011, 2016

# Goals and Objectives

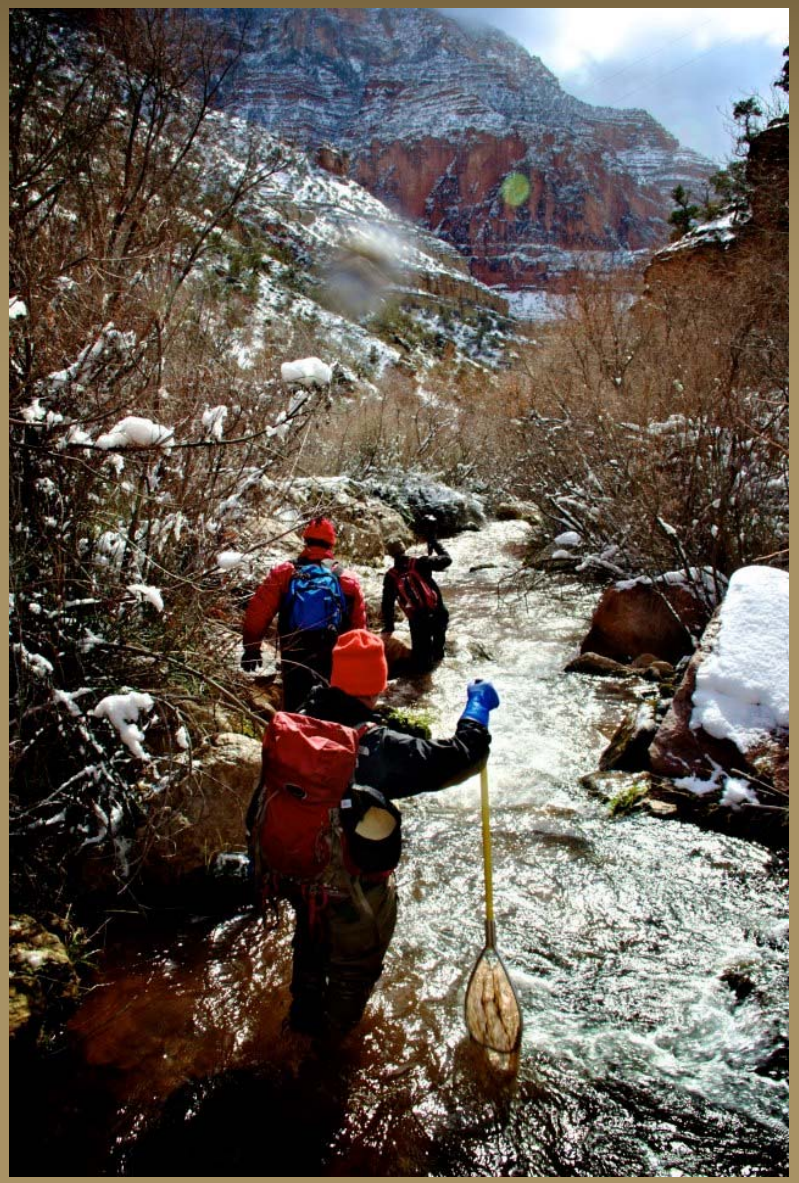
- NPS Comprehensive Fisheries Management Plan (2013):
  - Bright Angel Ck - Nonnative Trout Control Objective:
    - Reduce non-native trout by 80% or more.
  - Humpback Chub Translocations Objective:
    - Applies to Shinumo, Havasu, and Bright Angel creeks
    - Establish a spawning aggregation of humpback chub, while maintaining genetic integrity.
      - For Bright Angel: after trout control objective is met.
  - Overall Objective:
    - Maintain stable or increasing populations of other native species (native suckers and speckled dace).

# Control Methods

Bright Angel Creek:

5th-year of Adaptive Management Strategy:

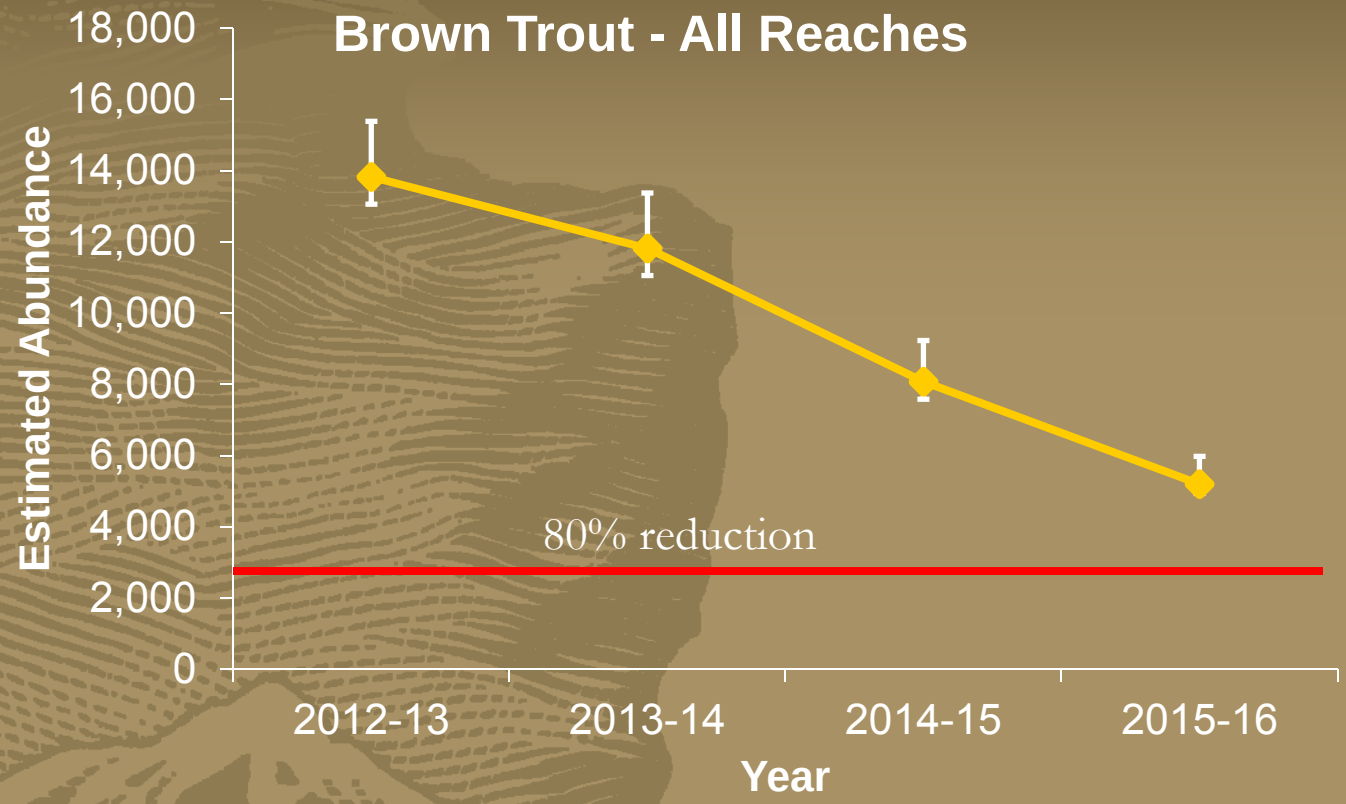
- Fall 2012- Spring 2017
- Weir operation
  - October - February
- Boat-electrofishing
  - Up to 5 miles of Colorado River
- **Backpack electrofishing**
  - **12-13 miles of stream**
- Beneficial Use-fish removed



# Bright Angel Creek Annual Electrofishing Effort

- Electrofishing conducted over ≈ 12 miles of creek
  - Excluding Ribbon Falls Creek confluence
- 2012-2017 (2016-17 in progress)
- Multiple monitoring metrics: Abundance, survival, recruitment

# Electrofishing- Results: Brown Trout

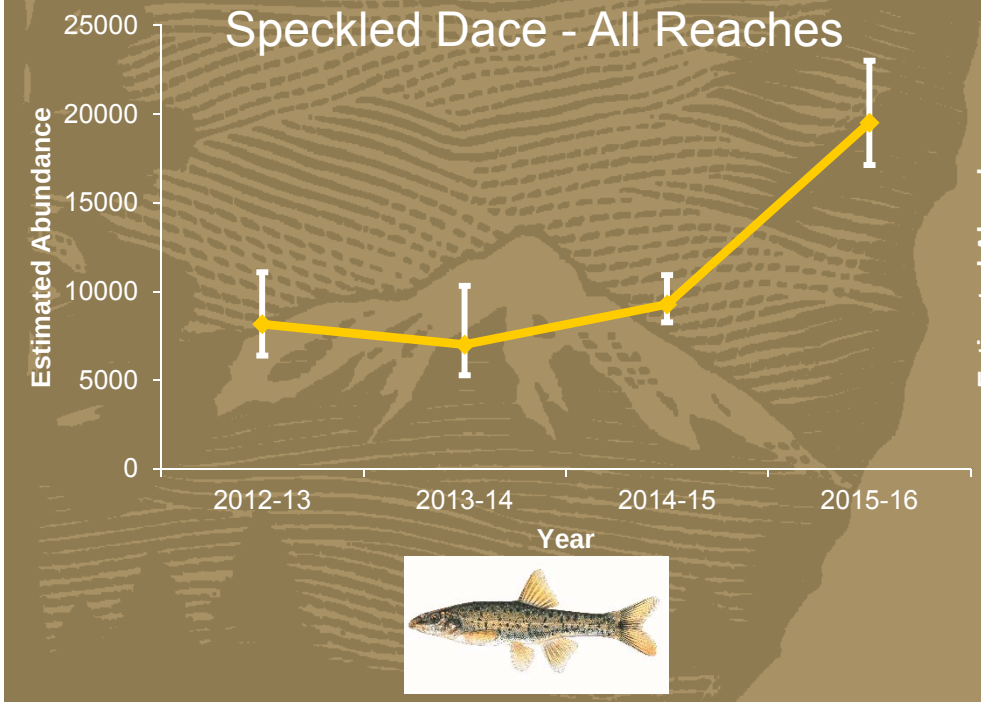



- 62% Overall reduction through the beginning of 2015
- Based on trend, objective could be met in 2016 (In progress)

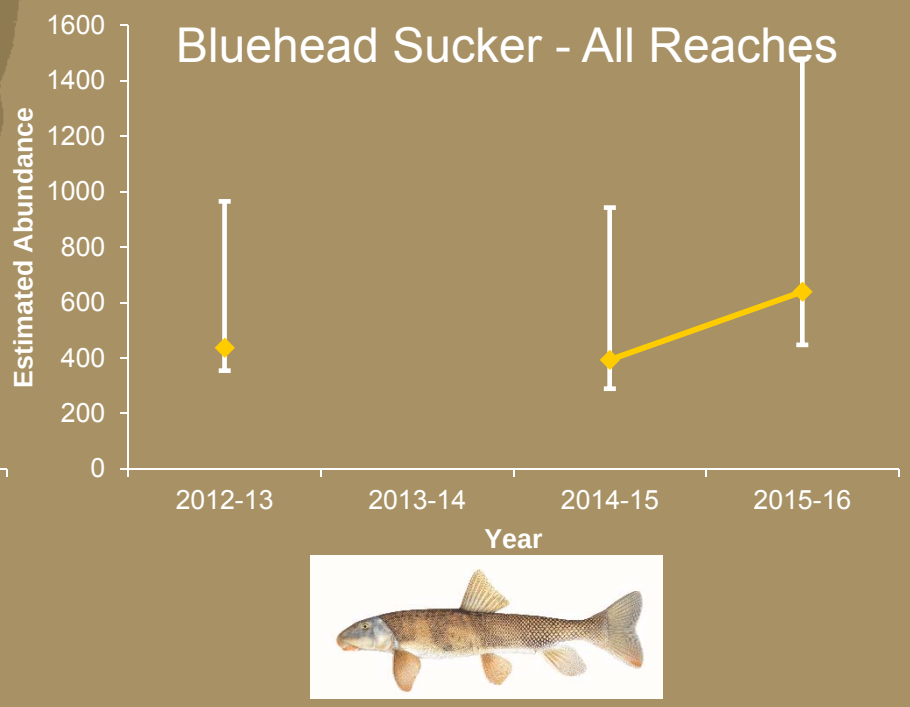
# Electrofishing- Results: Native Fish

- Objective: Maintain stable/increasing populations
- Metrics: Abundance, Survival, and Recruitment

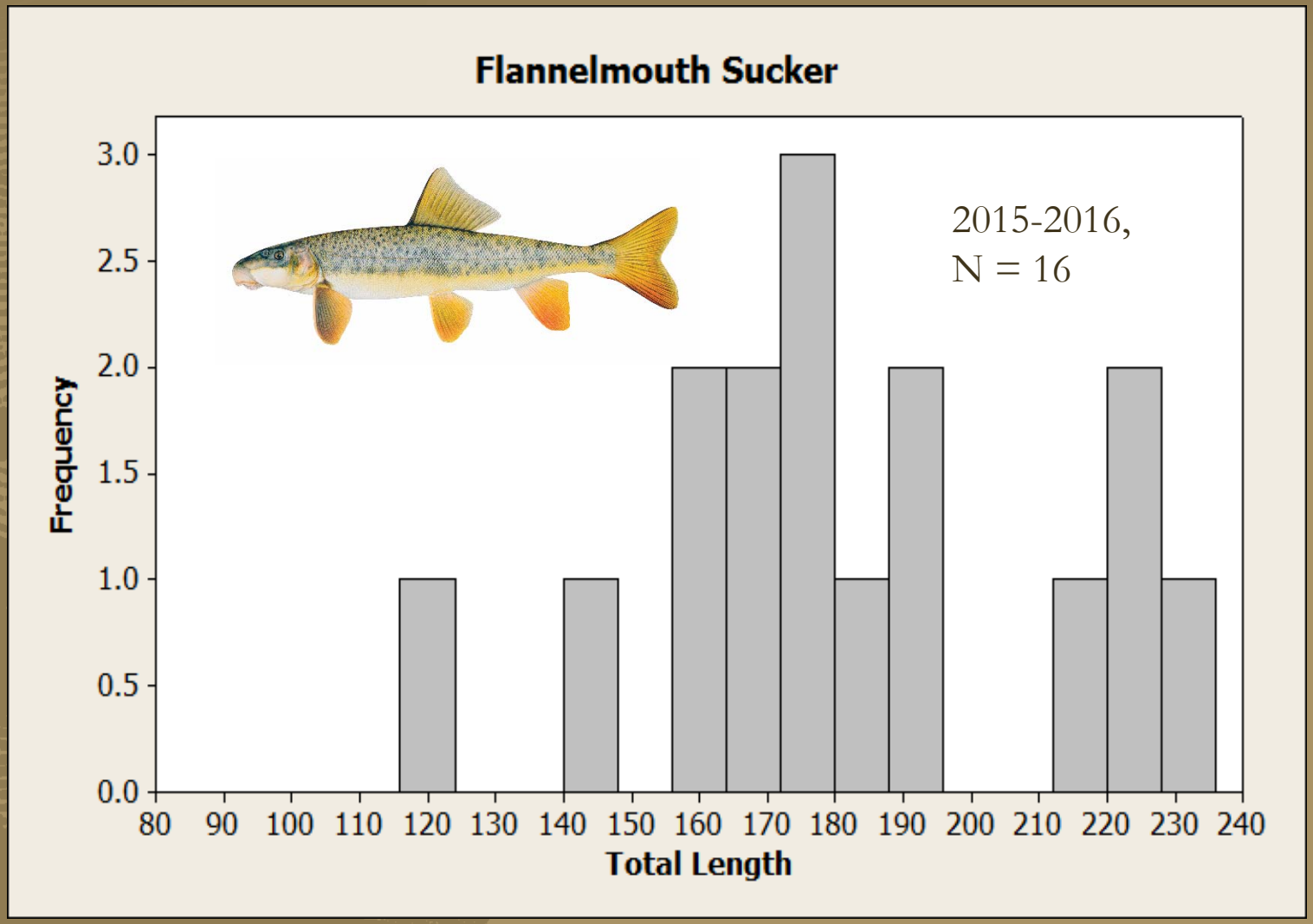
- Abundance: Meeting Objective (Speckled Dace)





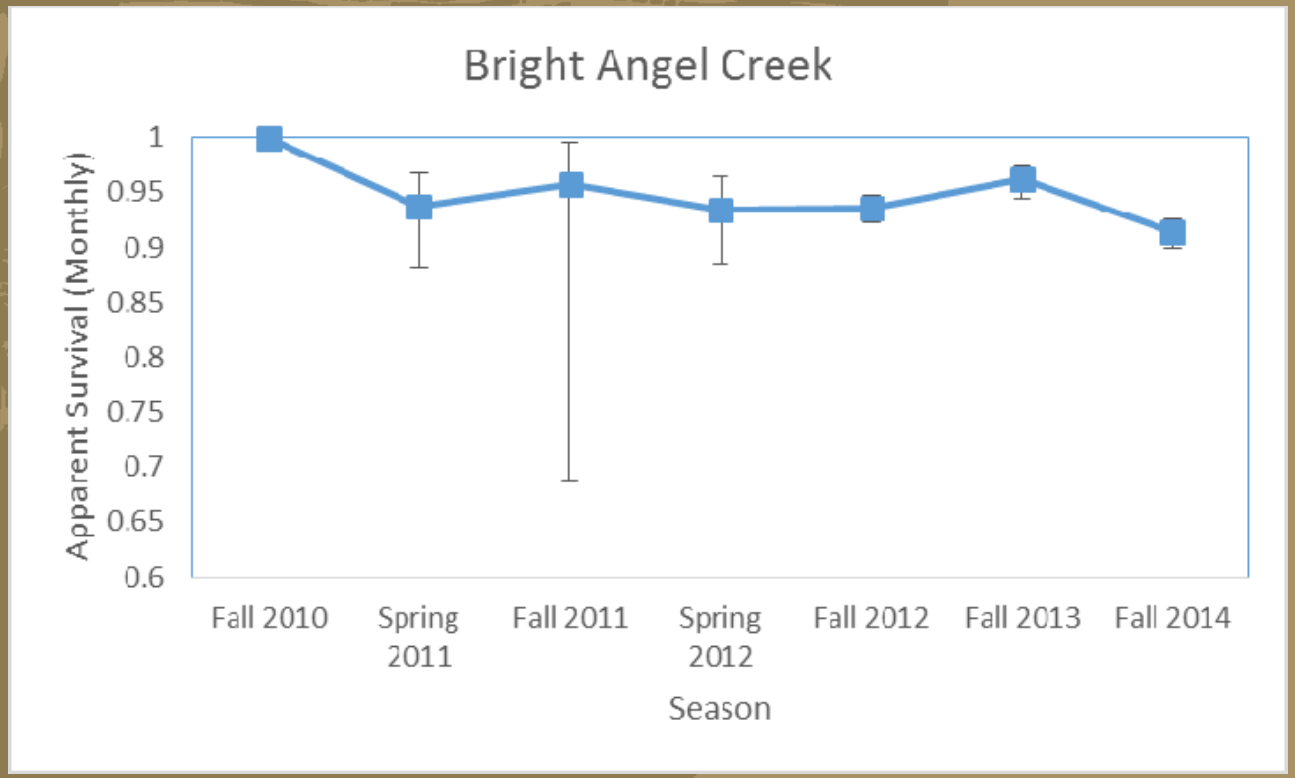
# Bright Angel Creek –E-fishing Results



# Electrofishing- Results: Native Fish

- Objective: Maintain stable/increasing populations
- Metrics: Abundance, Survival, and Recruitment

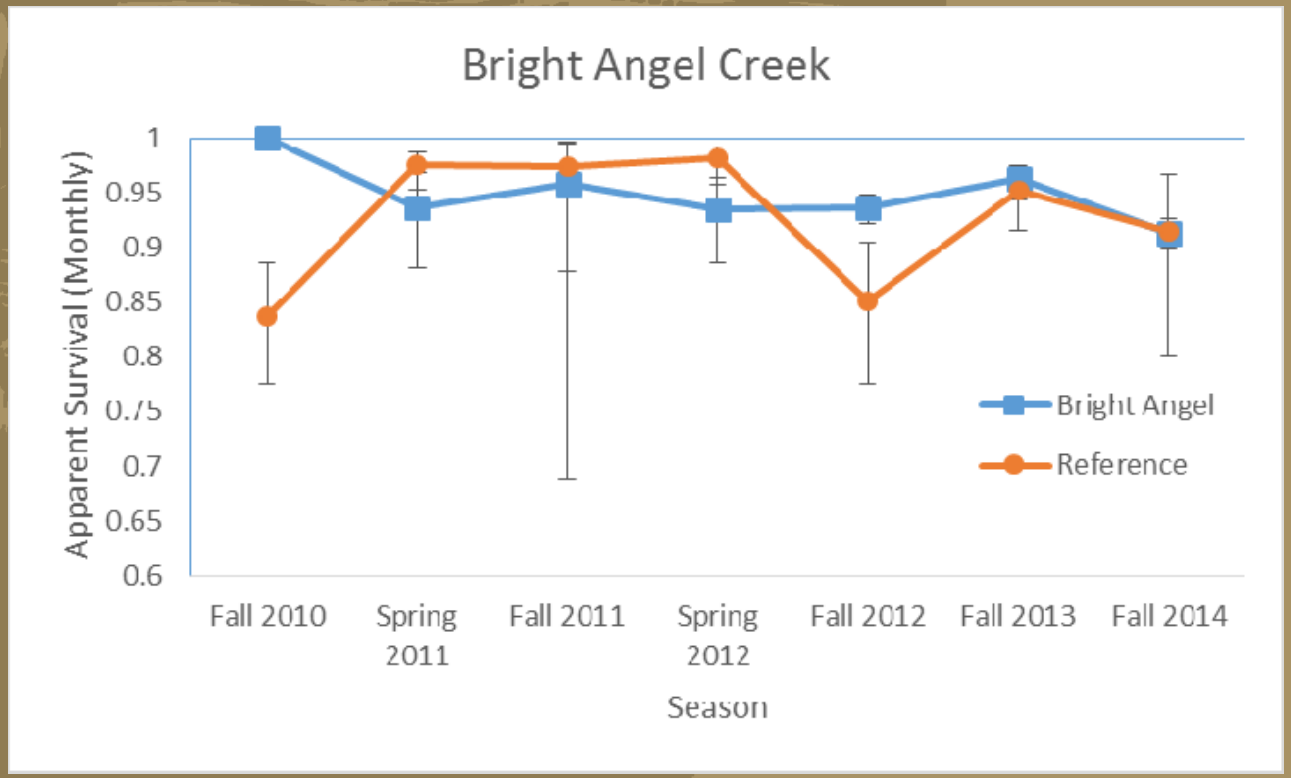
- Survival:



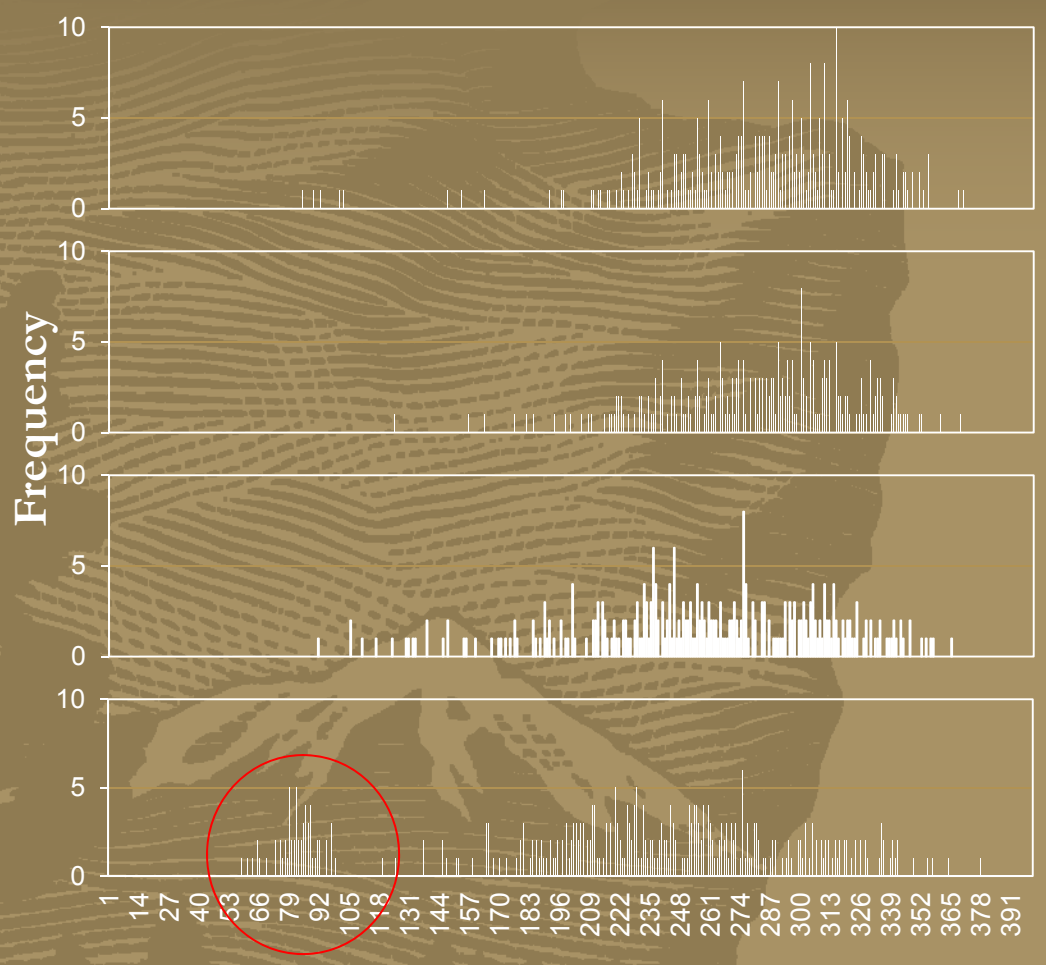

# Electrofishing- Results: Native Fish

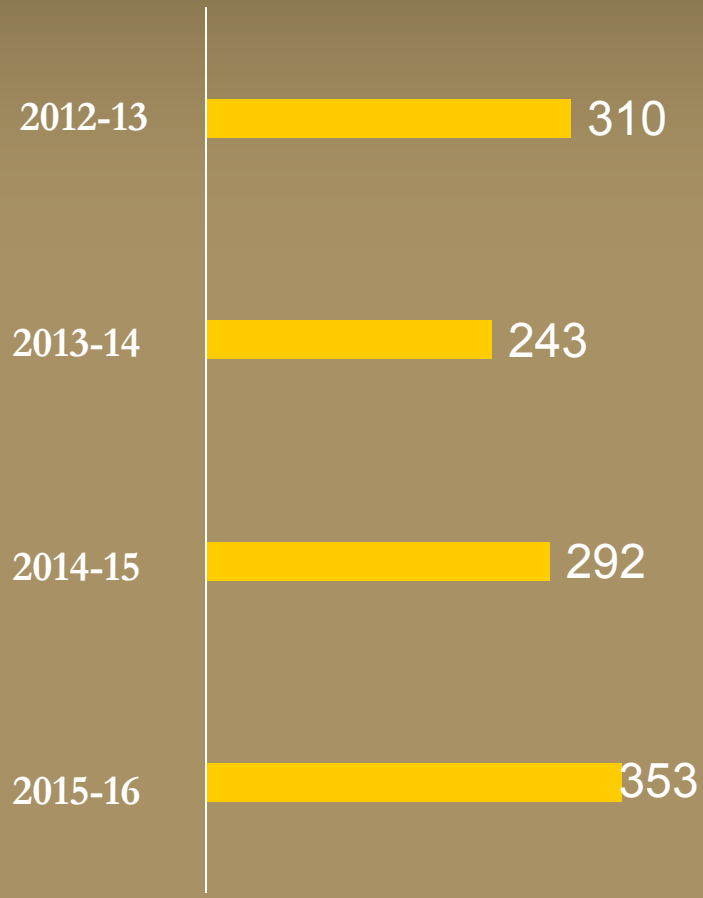
- Objective: Maintain stable/increasing populations
- Metrics: Abundance, Survival, and Recruitment

- Survival: No significant difference to reference stream




# Metric: Bluehead Sucker Recruitment



# Trout Control: Key Findings

- Brown trout reductions are on track to meet 80% reduction objectives if trend continues (2016-17 in progress).
- Speckled dace and flannelmouth sucker have increased in abundance as trout abundance declined.
- Bluehead sucker abundance trend (uncertain), survival remained stable- recent recruitment apparent.
- Supports assumption that nonnative trout removal may benefit native species

# Bright Angel Creek – Next Steps

- Currently in 5th year of 5-year Strategy
- Adaptive Management Strategy, in 2017:
  - Review of 5-years of data, decision on future operations
  - Future options for consideration may include the following:
    - Translocate juvenile Humpback Chub
    - Mechanical Removal of trout at current effort
    - Reduced or increased effort in an experimental context (reduce effort review results in 5 years)
    - Use of chemical piscicides (e.g., rotenone) to remove 100% of trout
  - Additional compliance may be necessary for some options

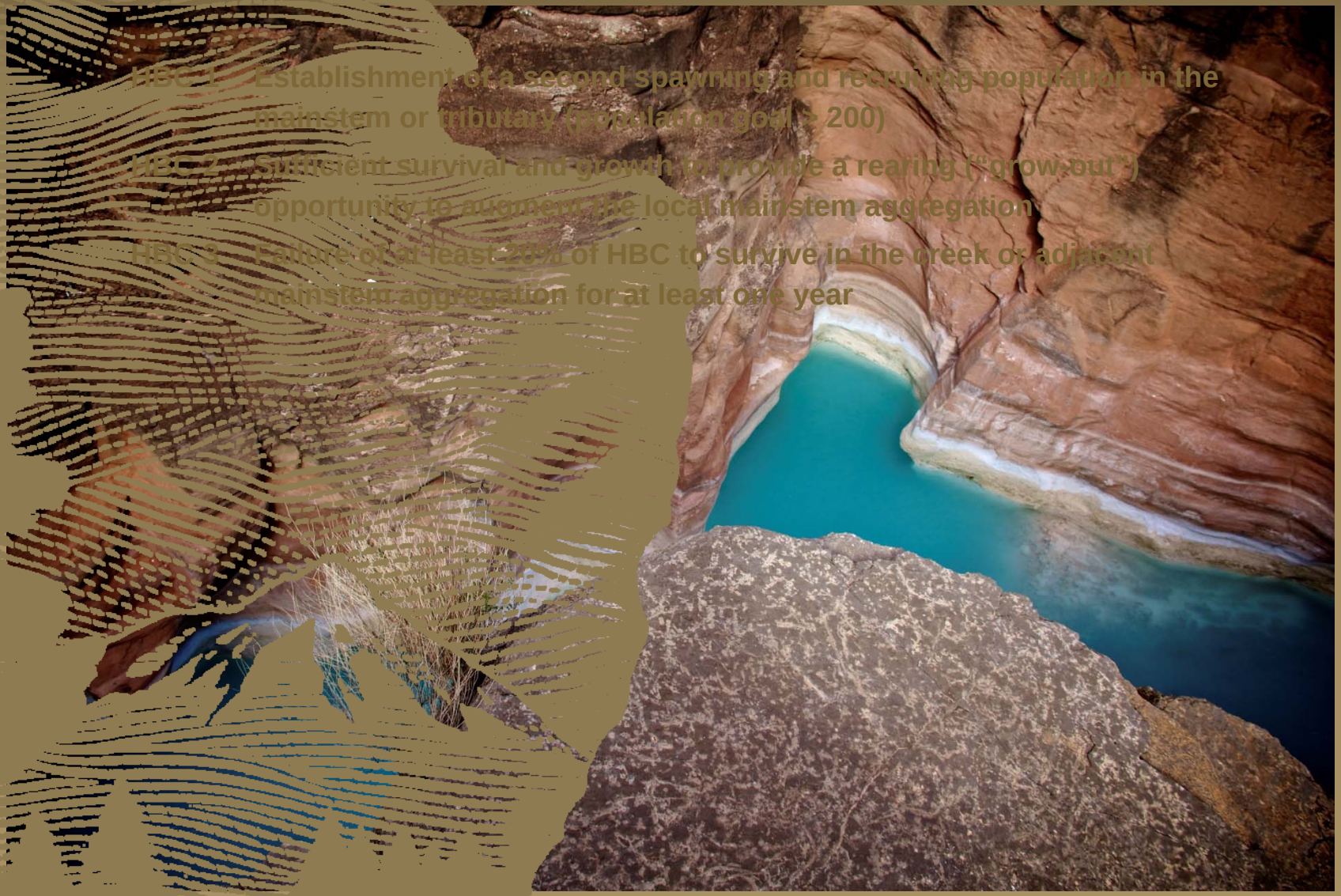
# Humpback Chub Translocations to Havasu Creek, Grand Canyon National Park

# Havasu Creek Translocations

| Hatchery Tagging Date | Average Length (mm) | Average Weight (g) | Release Date | Number Translocated |
|---|---|---|---|---|
| May 5, 2011 | 86.1 | 4.8 | June 28, 2011 | 243 |
| May 10, 2012 | 124.7 | 16.7 | May 13, 2012 | 298 |
| May 14, 2013 | 123.1 | 14.9 | May 9, 2013 | 300 |
| May 9, 2014 | 123 | 16.4 | May 14, 2014 | 300 |
| May 9, 2014 | 124 | 16.4 | June 5, 2014* | 209 |
| May 13, 2015 | 131 | 20.3 | May 20, 2015** | 300 |
| May 10, 2016 | 130 | 18.5 | May 18, 2016 | 305 |

**Total= 1955 translocated Humpback Chub**

# Possible Translocation Outcomes



HBC 1 – Establishment of a second spawning and recruiting population in the mainstem or tributary (population goal > 200)

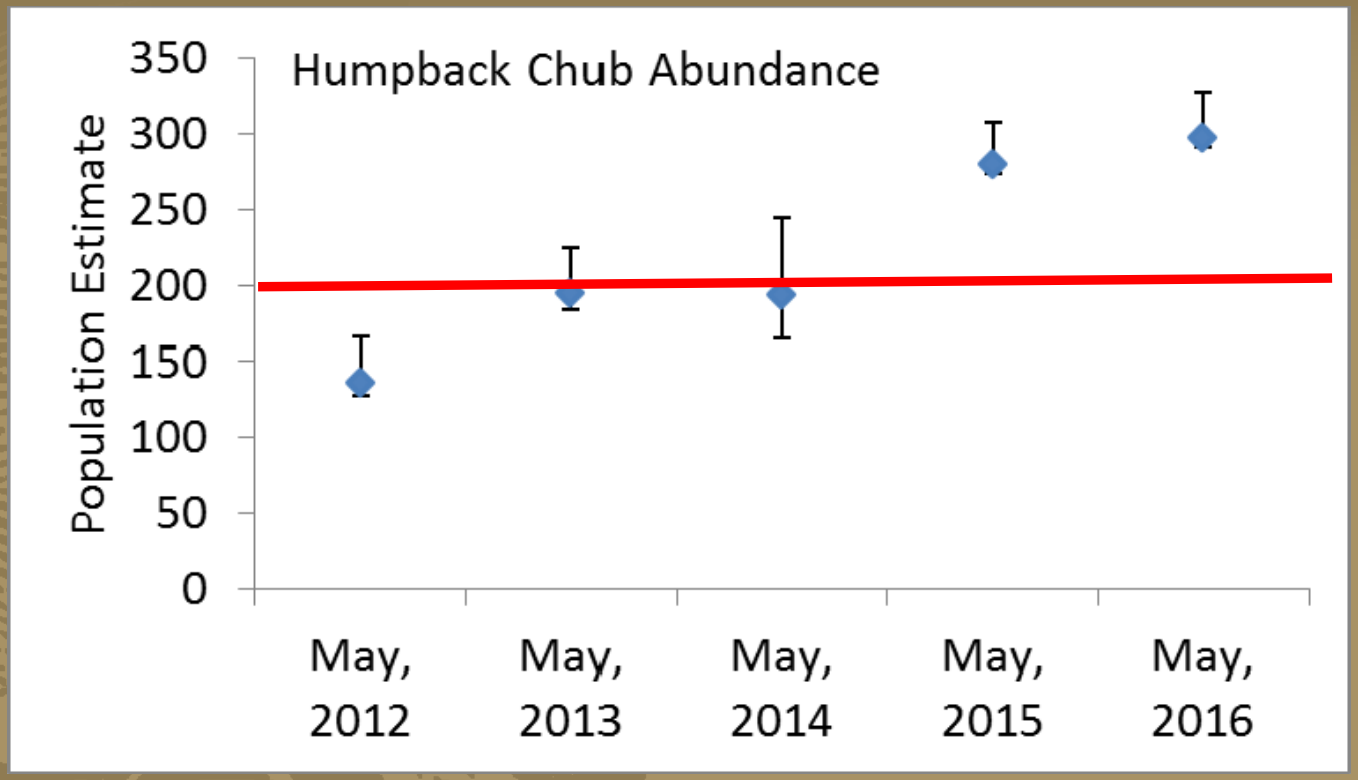
HBC 2 – Sufficient survival and growth to provide a rearing ("grow-out") opportunity to augment the local mainstem aggregation

HBC 3 – Failure of at least 20% of HBC to survive in the creek or adjacent mainstem aggregation for at least one year

NPS Comprehensive Fisheries Management Plan 2013, Trammell et al. 2012

# Results

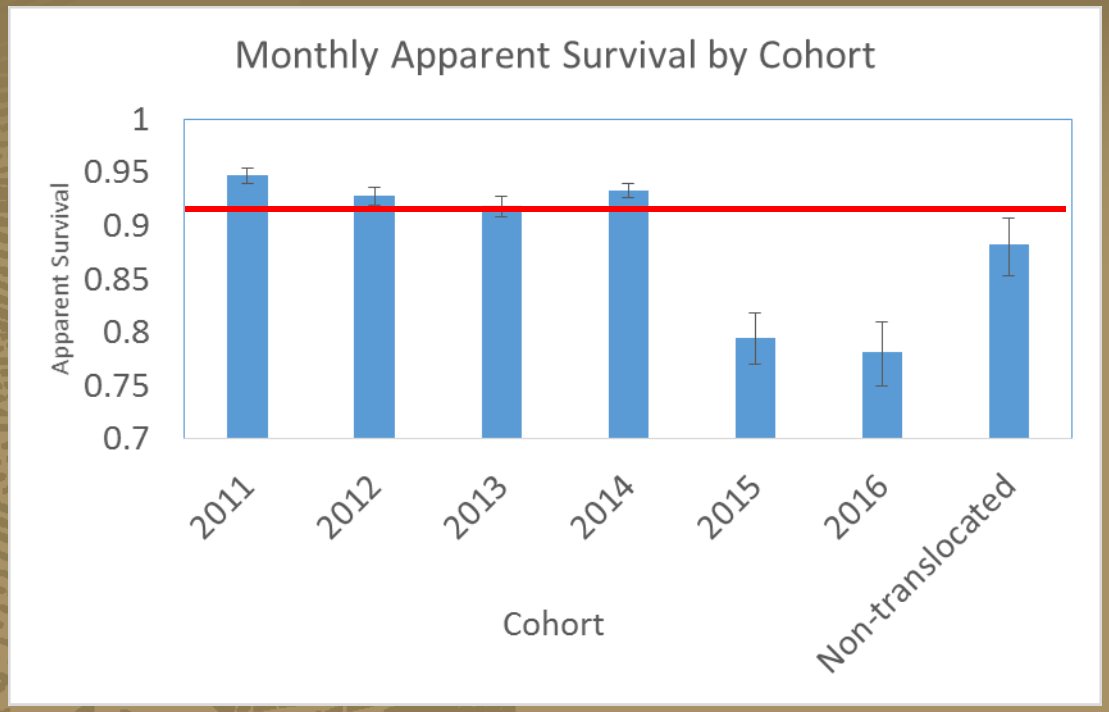
# Abundance of Humpback Chub




- Fisheries Management Plan Goal = Maintain a minimum of 200 HBC

√ Retention over the first year

# Survival relative to Little Colorado HBC

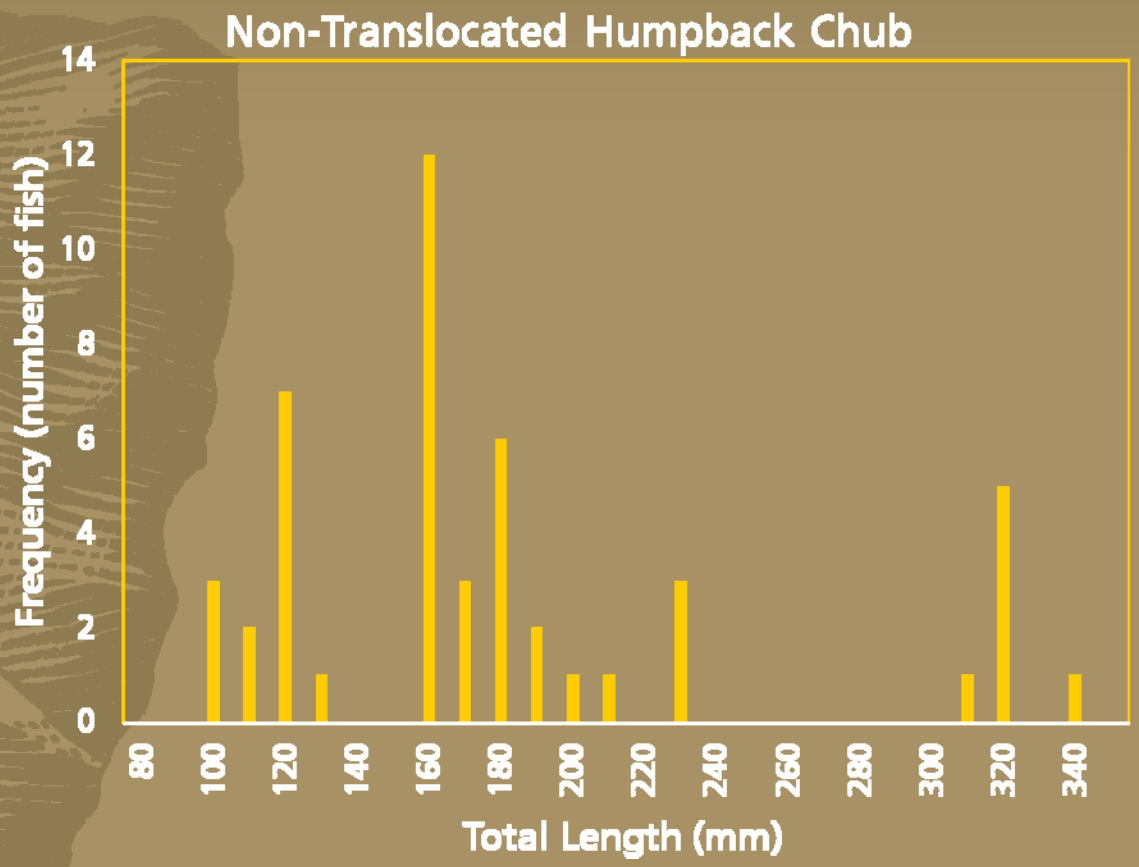



*0.91, LCR estimate from Yackulic et al. 2014*
*Red line = average monthly survival of all translocated cohorts*

- √ **Most years: Similar survival relative to Little Colorado River (Yackulic et al. 2014)**
- √ **Survival can be variable year to year**

# Evidence of Reproduction & Recruitment to Maturity

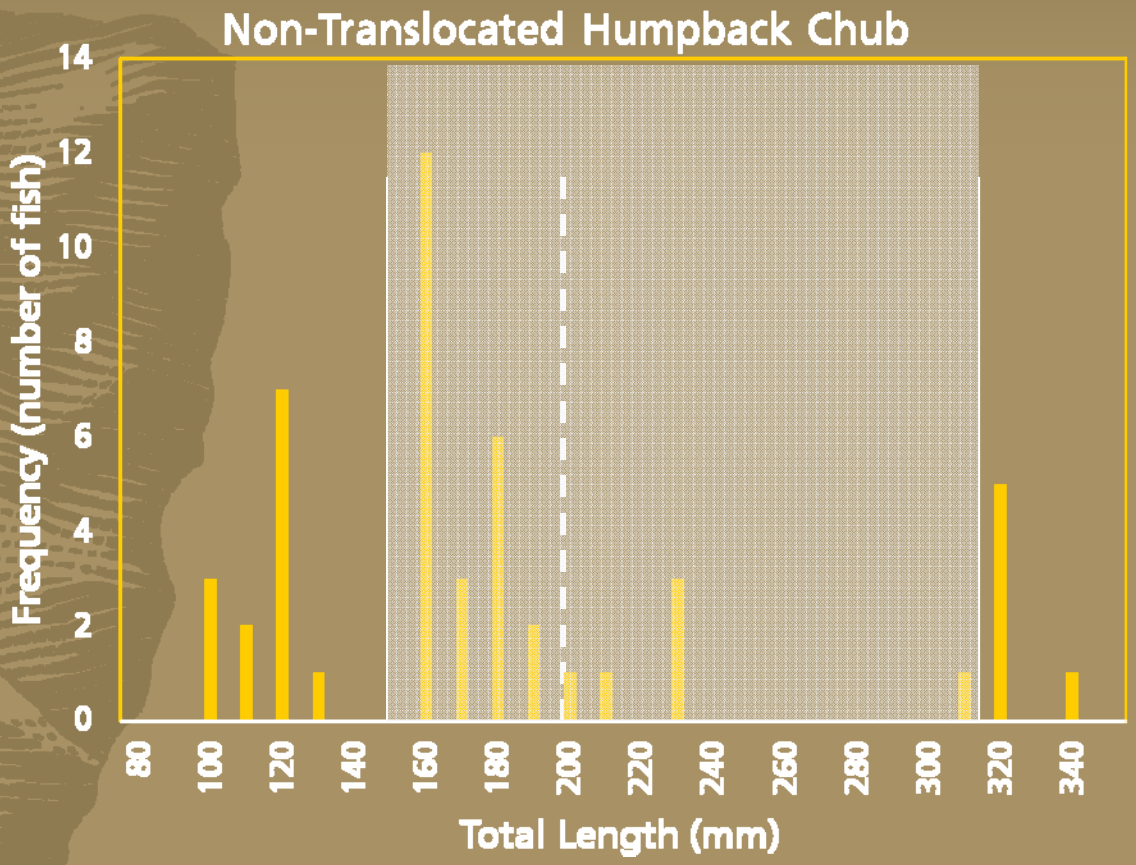
- Young-of-year captured since 2013




√ Reproduction and recruitment

# Evidence of Reproduction & Recruitment to Maturity

- Young-of-year captured since 2013
- "Mature" size = 200 mm
- Size range of all spawning fish: 155-318 mm




√ Reproduction and recruitment

# Translocations: Key Findings

- Havasu Creek humpback chub translocations meeting objectives for:
  - Abundance (>200 fish)
  - Reproduction: Consistent evidence of spawning since 2012
  - Recruitment: fish produced in Havasu recruited to “mature size” and in spawning condition


# Translocations– Next Steps

- No translocations planned to Havasu in 2017
  - However, collections of larvae may occur for 2018 translocations (Havasu, Shinumo, Bright Angel?)
- Monitoring of both Havasu and Shinumo creeks will continue
  - To maintain genetic integrity, minimum population goals
  - Shinumo Creek habitat recovering from fire/flooding
- Analysis of native fish abundance, survival, recruitment