Bright Angel Creek
Non-Native Trout Reduction
Grand Canyon National Park

Brian Healy, Clay Nelson, Emily Omana Smith, Rebecca Koller, and David Ward
Cooperators

• Funded by Reclamation and NPS

• Volunteers (several thousand hours)
Project Background

- Trout initially introduced to GCNP, 1920’s and 1930’s
  - Greatest concentration of Brown Trout occurs in Bright Angel Creek and its confluence with the Colorado River
  - Brown Trout prey on and may compete with native fish (Whiting et al. 2014, Yard et al. 2011)

- Non-native trout control: Conservation Measure for Humpback Chub in Biological Opinion (USFWS 2008, 2011)

- NPS Comprehensive Fisheries Management Plan (CFMP) 2013
Objectives

- Conduct comprehensive trout reduction efforts in BAC and the BACI for 5 consecutive years.

- Through the reduction of non-native fish:
  - Enhance and restore native fish populations in BAC
  - Contribute to overall conservation of Humpback Chub

Components

- Installing and operating a weir
- Electrofishing for monitoring and removal in BAC
- Electrofishing for monitoring and removal in BACI
Monitoring Metrics

- Non-native fish:
  - Overall reduction of the non-native fish population in BAC
  - Changes in abundance and size structure over time

- Native fish:
  - Maintain or increase native fish
  - Evaluated by abundance, recruitment & survival

- Adaptive Management Strategy
  - Evaluation project results
  - Possible adaptation of methods to achieve desired outcomes

*All data presented are considered preliminary
Weir

- October 1st –March 1st
- Checked twice daily

<table>
<thead>
<tr>
<th>Year</th>
<th>BNT</th>
<th>RBT</th>
<th>BHS</th>
<th>FMS</th>
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<tbody>
<tr>
<td>2012-2013</td>
<td>NPS</td>
<td>176</td>
<td>36</td>
<td>0</td>
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<tr>
<td>2013-2014</td>
<td>NPS</td>
<td>13</td>
<td>12</td>
<td>0</td>
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<tr>
<td>2014-2015</td>
<td>NPS</td>
<td>71</td>
<td>53</td>
<td>12</td>
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<td>2015-2016</td>
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**Experience Your America**

**Project Background/Methods**

- Comprehensive trout reduction efforts will occur for 5 consecutive years—as an experiment.

**Evaluation of Project Results**

- Possible adaptation of methods to achieve desired outcomes (reduced nonnatives/maintain or increase in native survival, recruitment, and abundance)

**Actions**

- Installing and operating a weir
- Electrofishing for monitoring and removal in BAC
- Electrofishing for monitoring and removal in BACI

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**Bright Angel Creek Annual Electrofishing Effort**

- October – February
- 8-10 people, ~120 days
Bright Angel Creek Annual Electrofishing Effort

From Weir to Phantom Creek ~ 3000m

Bright Angel Creek = ~ 12 miles/20 km
Population Estimates

Population Estimates For All Species 2012-2013

Population Estimates For All Species 2013-2014

Meters x 1000 from the Mouth to Headwaters
Population Estimates

Population Estimates For All Species 2013-2014

Population Estimates For All Species 2014-2015

Meters x 1000 from the Mouth to Headwaters
Total Catch by Reach

Catch by Species for Reach and Year

Reach and Year

Number of Fish

- FMS
- BHS
- RBT
- SPD
- BNT

1          1          1          1
2          2          2          2
3          3          3          3
4          4          4          4
Total Catch by Reach

Catch by Species for Reach and Year

Reach and Year

Number of Fish

- FMS
- BHS
- RBT
- SPD
- BNT

1          2          3          4
Total Catch by Reach

Catch by Species for Reach and Year

Number of Fish

Reach and Year

- FMS
- BHS
- RBT
- SPD
- BNT

Total Catch by Reach

Catch by Species for Reach and Year

Reach and Year

Number of Fish


FMS BHS RBT SPD BNT
Total Catch by Reach

Catch by Species for Reach and Year

- FMS
- BHS
- RBT
- SPD
- BNT

Reach and Year

Number of Fish
Brown Trout Size Structure

2012-2013 Brown Trout Length Frequency
- N = 12,456

2013-2014 Brown Trout Length Frequency
- N = 10,565

2014-2015 Brown Trout Length Frequency
- N = 7,112

2015-2016 Brown Trout Length Frequency
- N = 4,500
Rainbow Trout Size Structure

2012-2013 Rainbow Trout Length Frequency

2013-2014 Rainbow Trout Length Frequency

2014-2015 Rainbow Trout Length Frequency

2015-2016 Rainbow Trout Length Frequency
Biomass of Trout Removed

Species and Year

- 2012-2013
- 2013-2014
- 2014-2015

- **Brown Trout**
  - 2012-2013: 985,592 g
  - 2013-2014: 640,347 g
  - 2014-2015: 438,675 g

- **Rainbow Trout**
  - 2012-2013: 124,603 g
  - 2013-2014: 79,835 g
  - 2014-2015: 69,606 g
Biomass of Trout Removed

35% and a 31% in biomass between years 1 and 2, and 2 and 3 for BNT. 55% reduction from year 1 to year 3 (January 12th)

### Biomass (g)

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35% and a 12% increase in biomass between years 1 and 2, and 2 and 3 for RBT. 44% reduction from year 1 to year 3 (January 12th).
Bluehead Sucker Size Structure

2012-2013 Bluehead Sucker Length Frequency

Number of Fish

Total Length (mm)

N = 338

2013-2014 Bluehead Sucker Length Frequency

Number of Fish

Total Length (mm)

N = 273

2014-2015 Bluehead Sucker Length Frequency

Number of Fish

Total Length (mm)

N = 261

2015-2016 Bluehead Sucker Length Frequency

Number of Fish

Total Length (mm)

N = 386
Bluehead Sucker Size Structure

2012-2013 Bluehead Sucker Length Frequency

N = 338

2013-2014 Bluehead Sucker Length Frequency

N = 273

2014-2015 Bluehead Sucker Length Frequency

N = 261

2015-2016 Bluehead Sucker Length Frequency

N = 386
Bright Angel Creek Inflow–Electrofishing

- Cooperative effort with GCMRC
  - Goal of 80% trout reduction = 10 depletions
  - 2013-2014 Pilot study and February 2015

- High Flow Experiments
- Flooding in tributaries = High turbidity
- Resulted in two trips conducted in high turbidity-confounding results
Bright Angel Inflow – Electrofishing

2013-2014

- BNT, 332
- FMS, 90
- PKF, 1
- FHM, 3
- CRP, 18
- BHS, 31
- BBH, 1
- HBC, 1

2014-2015

- RBT, 391
- BHS, 120
- SPD, 1
- BNT, 84
- FMS, 270
- CRP, 8
- PKF, 1
- BBH, 1
- HBC, 1

2013-2014

- BNT, 1375
- FMS, 270
- PKF, 1
- FHM, 3
- CRP, 18
- BHS, 31
- BBH, 1
- HBC, 1

2014-2015

- RBT, 391
- BHS, 120
- SPD, 1
- BNT, 84
- FMS, 270
- CRP, 8
- PKF, 1
- BBH, 1
- HBC, 1
Beneficial Use

- To date: > 49,000 trout to beneficial use
Summary –

- Completed 4th year of comprehensive trout reduction efforts, with 1 more year left.....
  - Efficiently removing trout in BAC using backpack electro-fishing
  - Decrease in overall abundance (pop estimates)
    - Size class shift
    - Decreased biomass
  - Electro-fishing doesn’t appear to be impacting native fish negatively
    - Bluehead Sucker survival is high
    - Speckled Dace abundance remains high
    - Increased abundance and distribution of SPD, BHS, and FMS
Questions?

Phantom Ranch Boat Beach, circa 1911