# The Recovery Program's 2016 Green River Flow Request
## Flaming Gorge Work Group
## Vernal, Utah: June 23, 2016

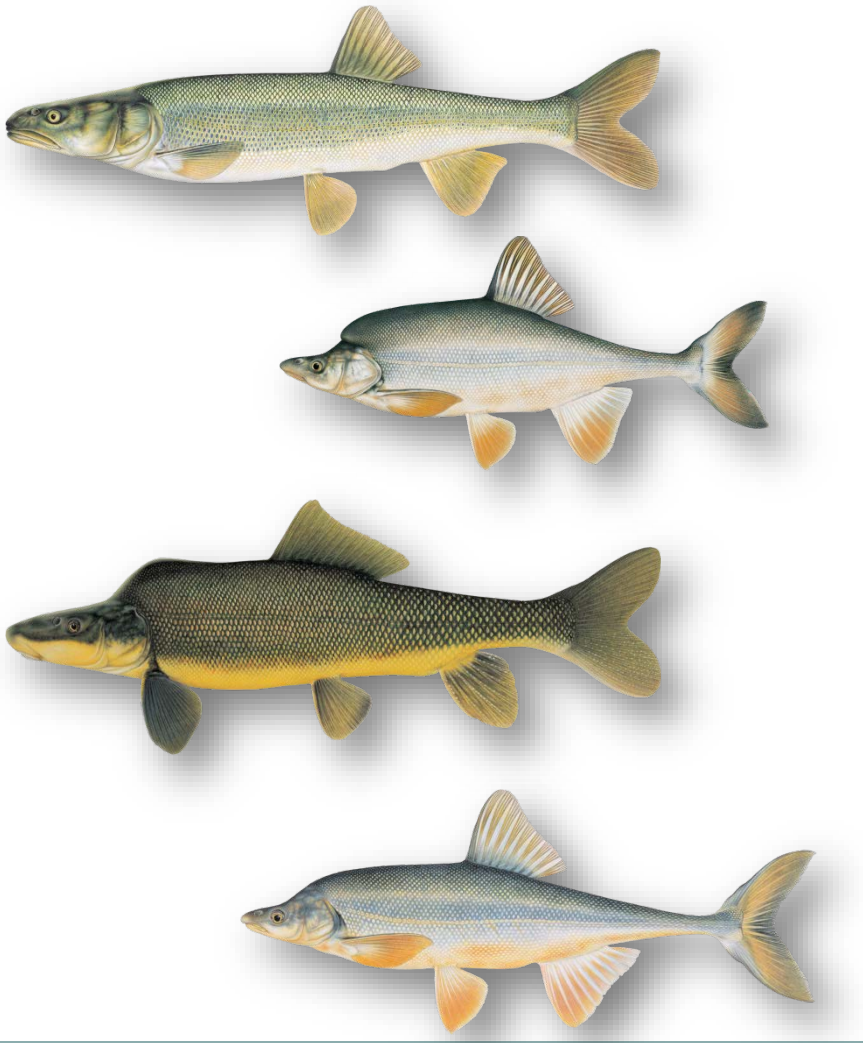
Upper Colorado River
Endangered Fish Recovery Program

**Outline**:

1. Program Basics
2. Flow Recommendations – a review
3. New Information Leads to new specific requests
    a. Spring peak – larval trigger
    b. Post peak – spike flow
    c. Elevated Summer Base Flows

# Upper Colorado River Endangered Fish Recovery Program

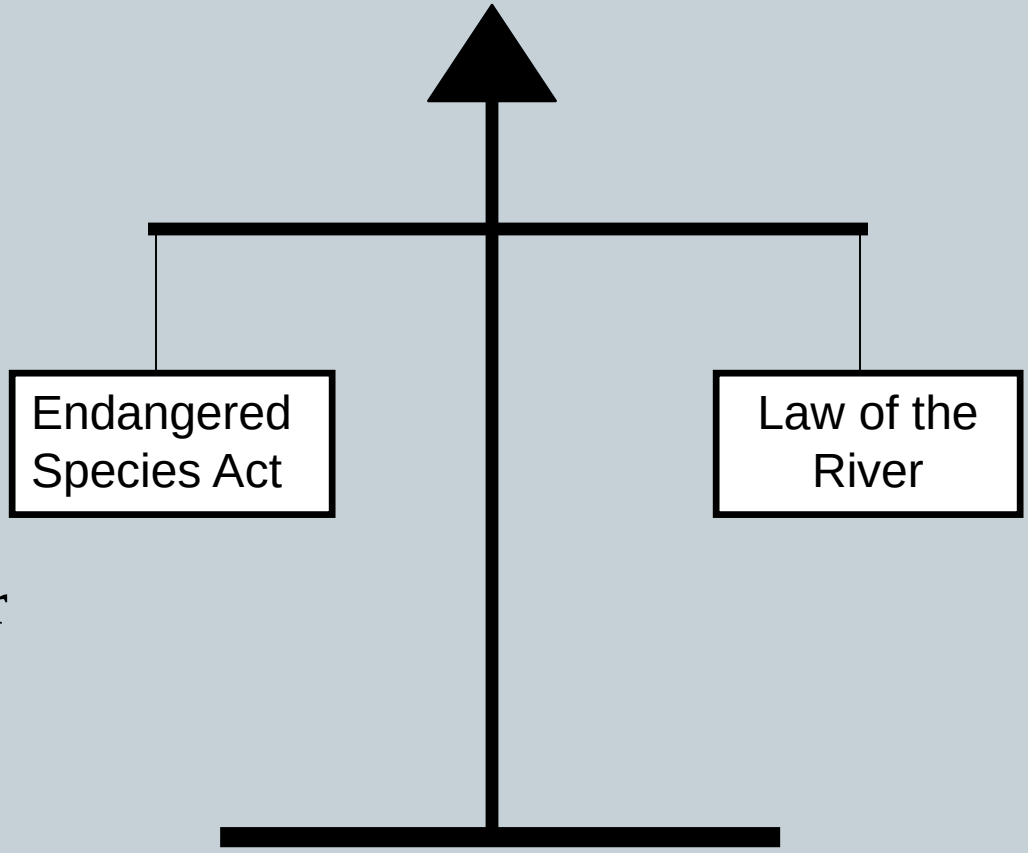
- Established in 1988
- Partners
  - State of Colorado
  - State of Utah
  - State of Wyoming
  - Bureau of Reclamation
  - Colorado River Energy Distributors Association
  - Colorado Water Congress
  - National Park Service
  - The Nature Conservancy
  - U.S. Fish and Wildlife Service
  - Utah Water Users Association
  - Western Area Power Administration
  - Western Resource Advocates
  - Wyoming Water Association



Fish Illustrations by Joe Tomelleri

# The Goal of the Recovery Program

- The purpose of this Recovery Program is to recover the endangered fishes while water development proceeds in compliance with all applicable Federal and State laws.
- Providing Endangered Species Act compliance for federal, tribal, state and private existing and new water projects throughout the Colorado River Basin above Lake Powell.



# Recovery Program Provides ESA compliance for Historic and New Water Depletion Projects

**Upper Colorado River Endangered Fish Recovery Program**
**Summary of Endangered Species Act Section 7 Consultations**
**1/1988 through 12/31/2015**

| | | Historical Depletions | New Depletions | Total |
|---|---|---|---|---|
| State | Number of Projects | Acre-Feet/Yr | Acre-Feet/Yr | Acre-Feet/Yr |
| Colorado | 1216 | 1,915,682 | 207,192 | 2,122,873 |
| Utah | 242 | 517,670 | 97,317 | 614,987 |
| Wyoming | 405 | 83,498 | 35,724 | 119,223 |
| CO/UT/WY | 238[1] | (Regional) | (Regional) | |
| **Total** | **2,101** | **2,516,850** | **340,233** | **2,857,083** |

[1]Small depletion projects (<100 acre-feet per year) consulted on between July 3, 1994, and October 1, 1997, when the Recovery Program did not track the number of these projects by state. Depletion totals associated with these 238 projects are captured by state under new depletions.

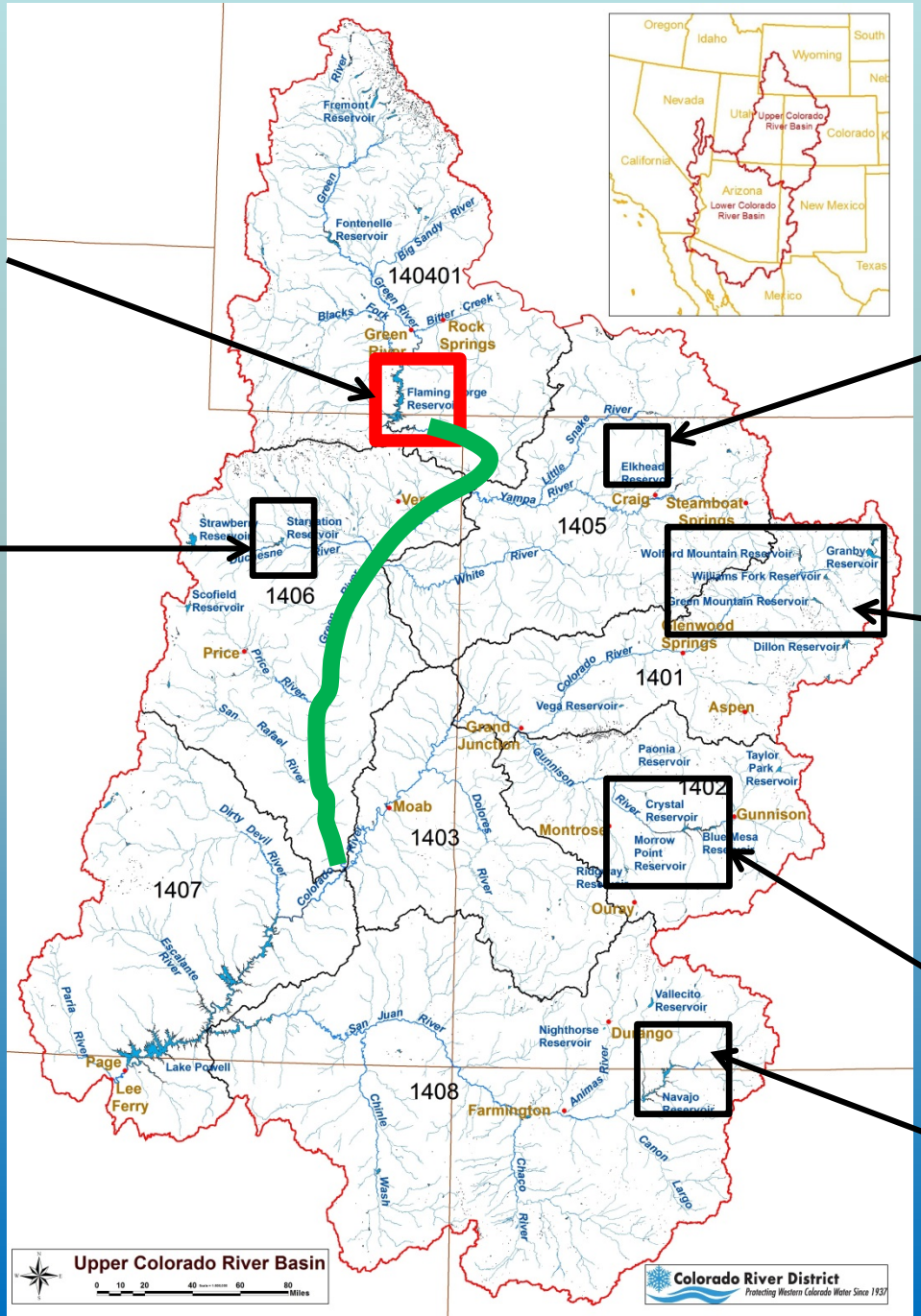
* Amount included in individual state's new depletions

# Recovery Elements





# Instream Flow Management Occurs Throughout the Upper Basin




**Flaming Gorge Reservoir (Green River)**:
Cooperators: BOR

**Duchesne River Reservoirs**:
Cooperators: CUWCD, BOR

**Elkhead Reservoir (Yampa River)**:
Cooperators: CRWCD, City of Craig, TriState Power

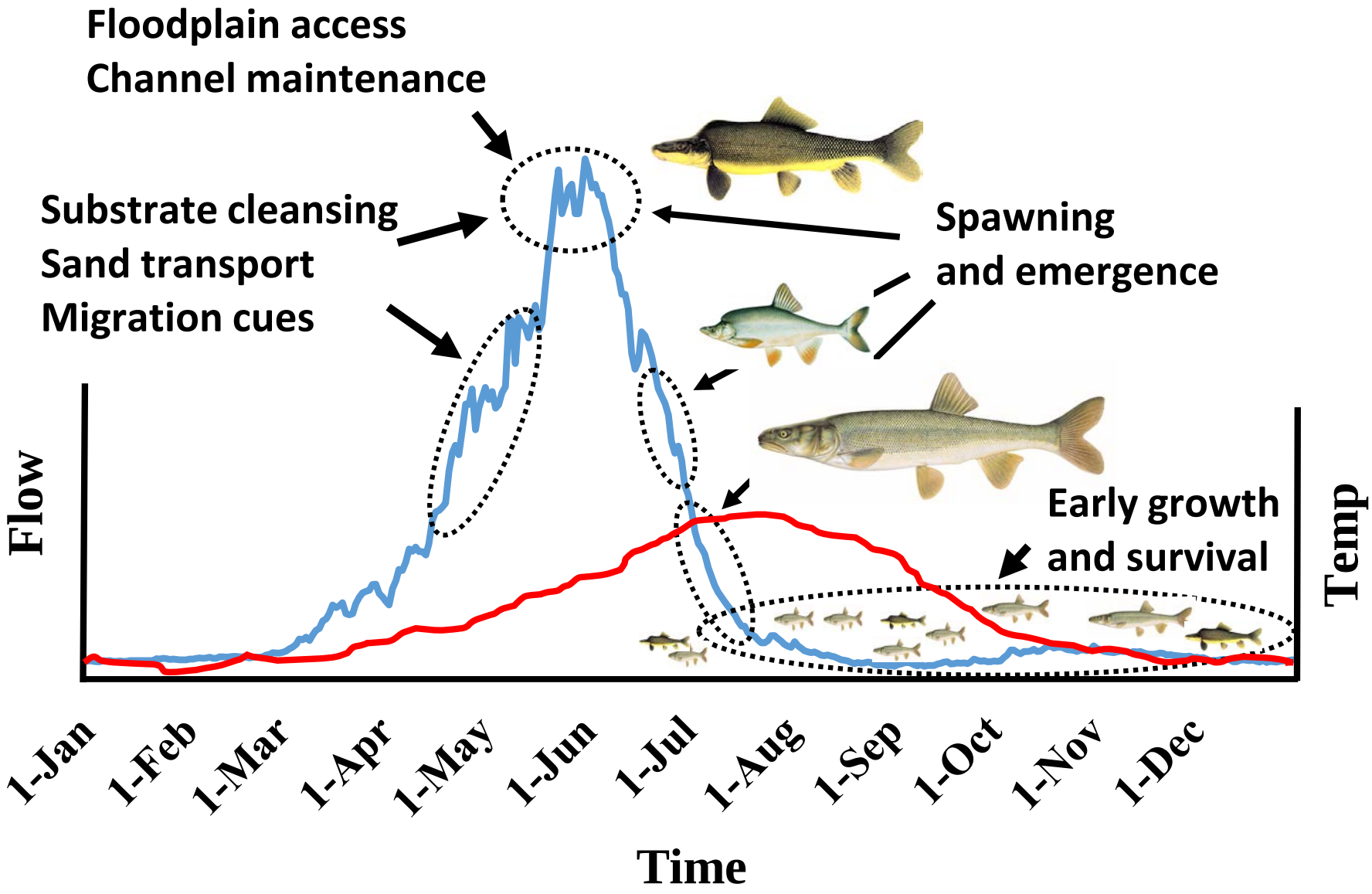
**Upper Colorado Reservoirs**:
Cooperators: CRWCD, East Slope Water Users (NoCWCD, City of Denver, Colorado Springs), West Slope Water Users (Cities of Grand Junction, Palisade), BOR, Grand Valley irrigators

**Aspinall Unit (Gunnison River)**:
Cooperators: BOR

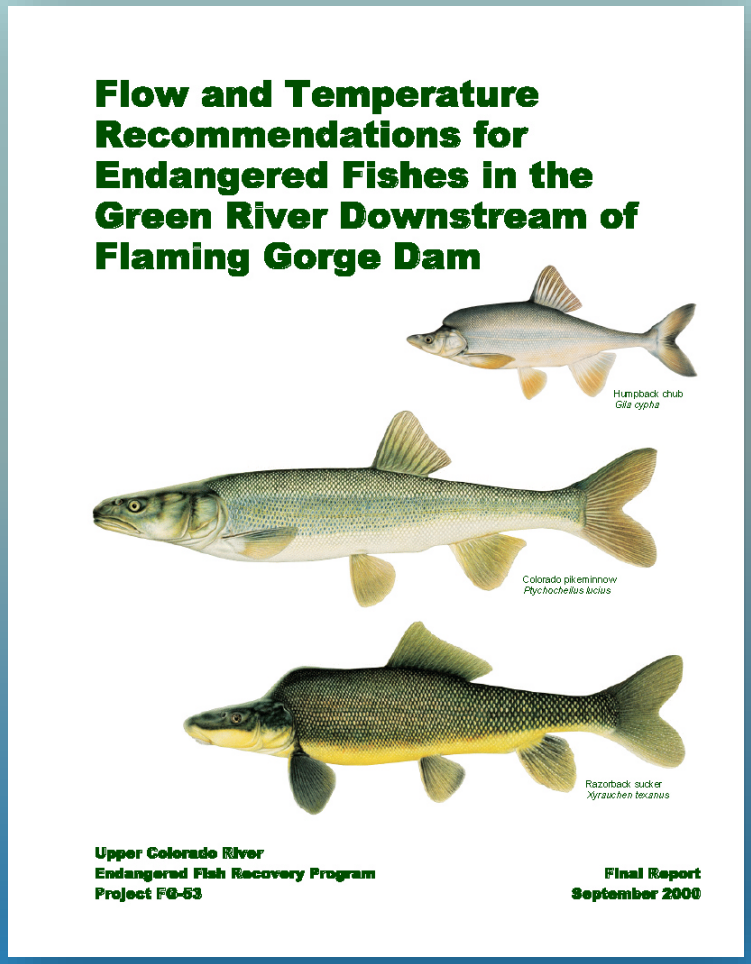
**Navajo Reservoir (San Juan River)**:
Cooperators: BOR

*Points of flow control*

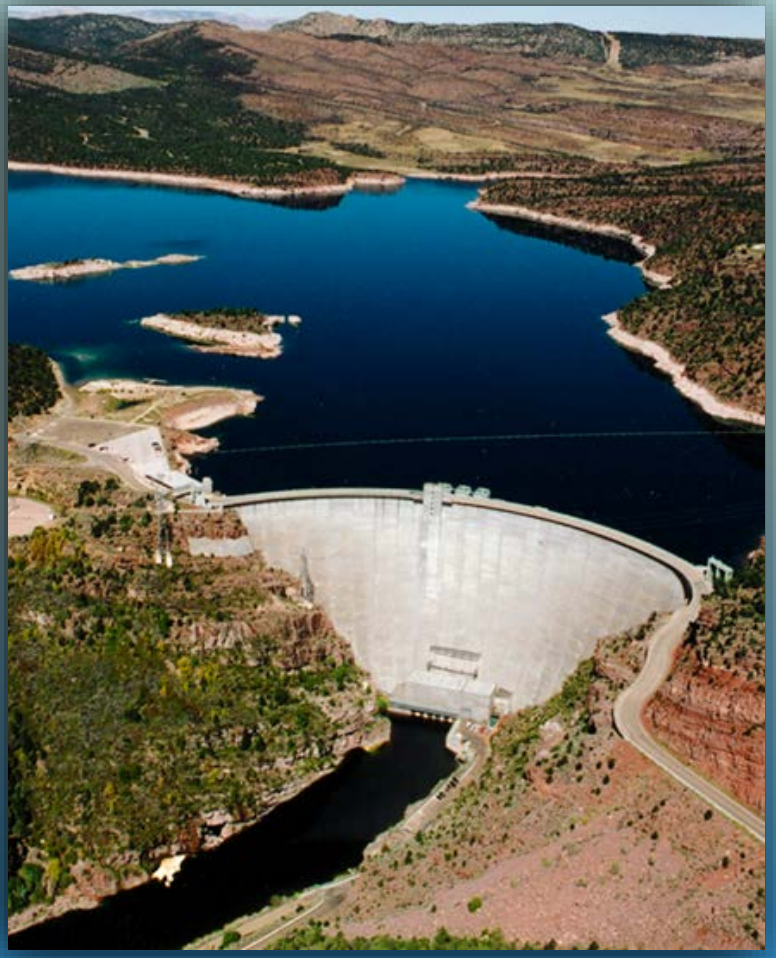
# Flow, Temperature, Fish Ecology



# Green River Flow Management :



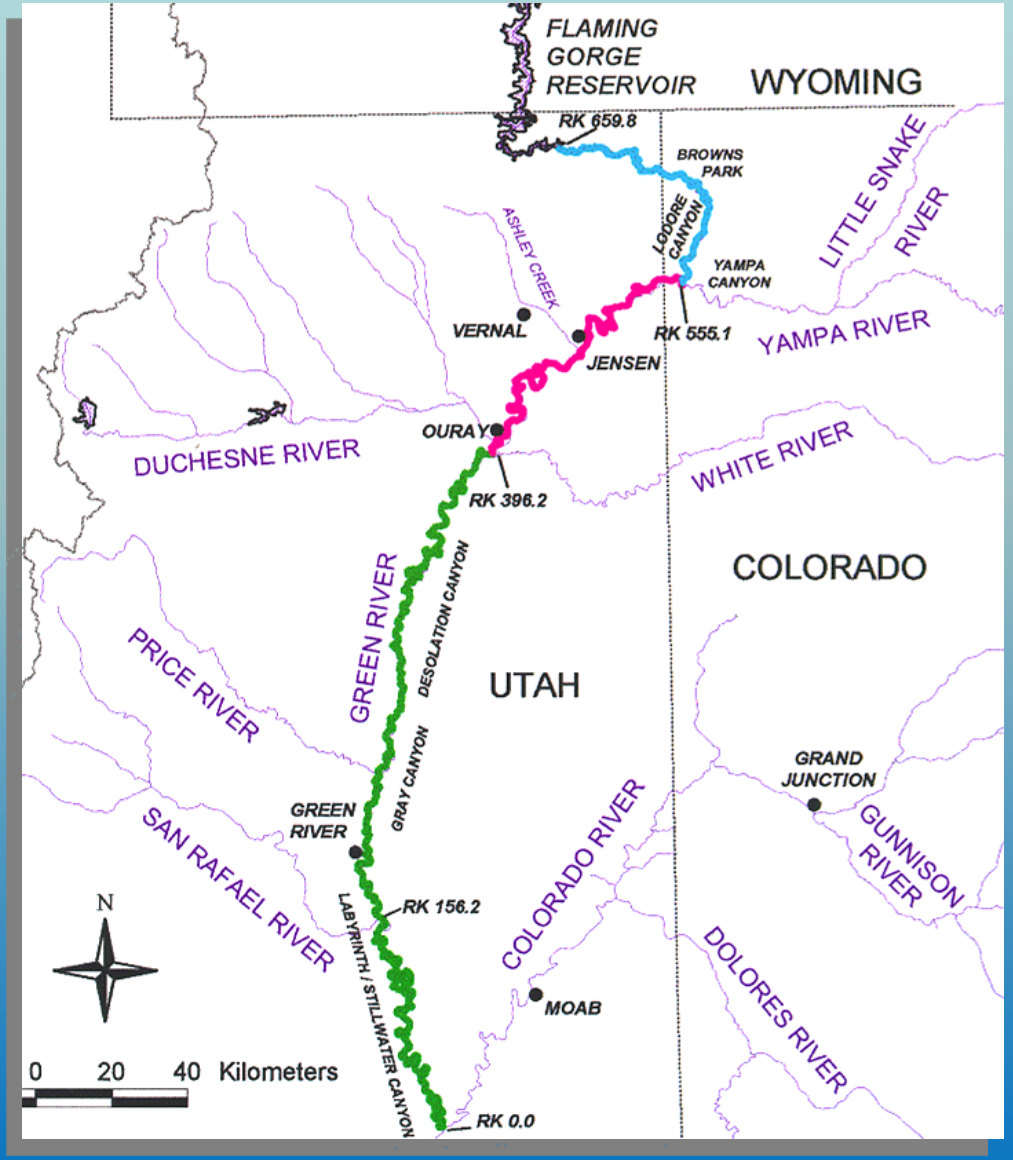

*Muth et al. 2000*



*Flaming Gorge Dam*

# Green River Reaches

- **Reach 1**: Flaming Gorge Dam to Yampa River (~65 miles)
  - adult CPM in Lodore
- **Reach 2**: Yampa to White River (~100 miles)
  - RBS spawning
  - RBS and CPM nursery habitat
  - adult HBC in upper portion
- **Reach 3**: White to Colorado River (~245 miles)
  - HBC in Desolation and Gray canyons
  - CPM (RBS) spawning
  - RBS and CPM nursery habitat



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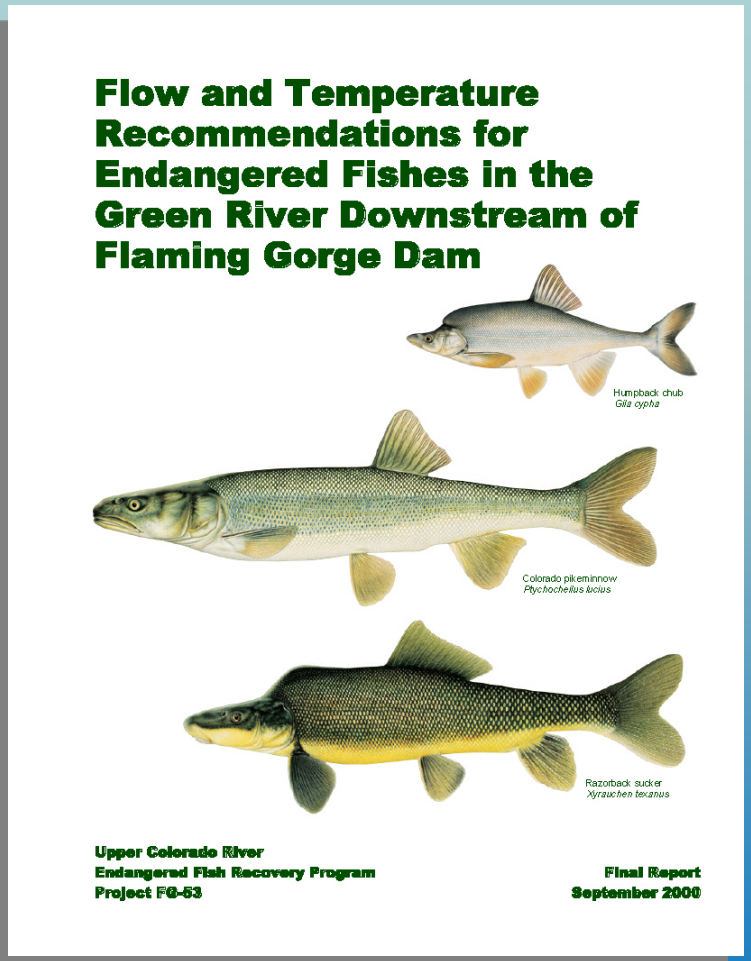
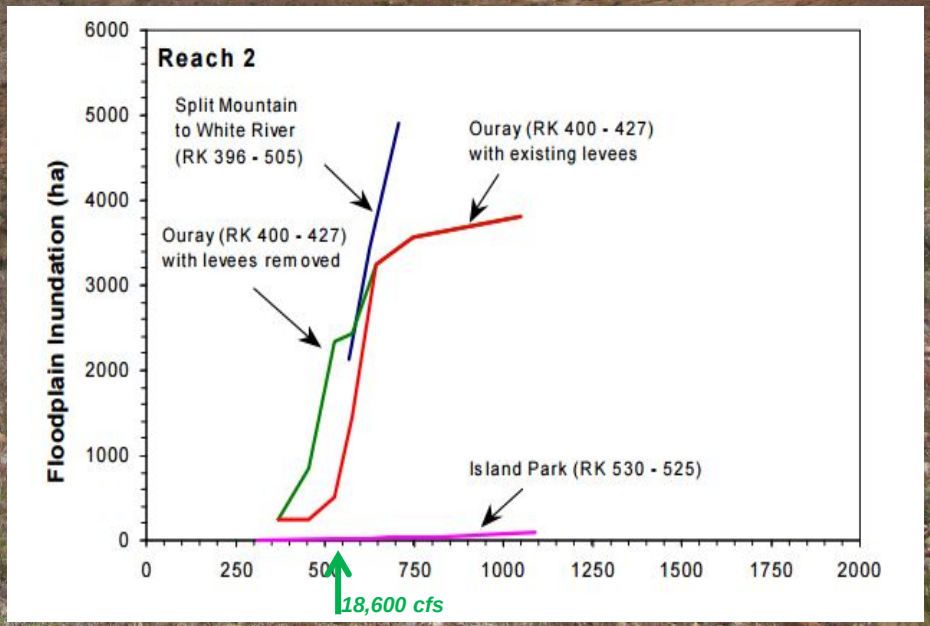
# Flow Recommendations - Spring Peaks should focus on:




- Importance of 18,600 cfs in Reach 2 in avg or wetter years = significant floodplain connection in the ONWR
- FGD releases should be timed to match peak, or immediate post-peak of the Yampa River
- FGD releases should be timed to coincide with presence of sucker larvae (many other timing factors)

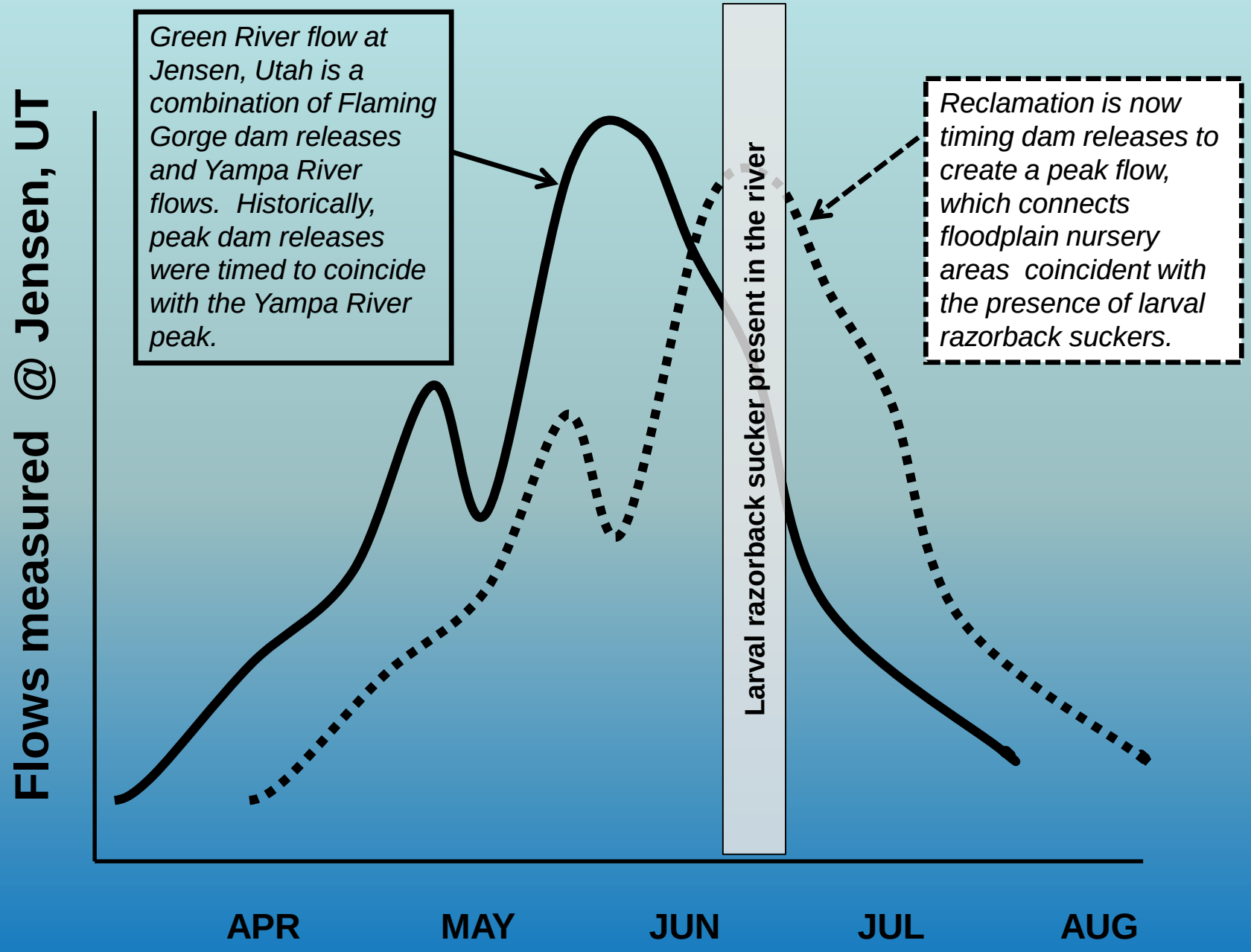
*Johnson Bottom on the Ouray National Wildlife Refuge: June 6, 2016 @ ~18,400cfs*



# Bestgen et al. 2011 - a “Floodplain Synthesis” Provides New Information:

- *Report reviews various aspects of razorback sucker life history*
- *Reviews FGD operations and Yampa River flows in relation to presence of larval razorback sucker (1992 – 2009) in the Uintah Basin*
- *Determines that to provide critical nursery habitat for larval razorback sucker (flooded wetlands), FGD releases will need to occur after the Yampa River peak in most years.*

# Floodplain wetlands are a better environment for larvae than the main channel


Flows measured @ Jensen, UT
Green River flow at Jensen, Utah is a combination of Flaming Gorge dam releases and Yampa River flows. Historically, peak dam releases were timed to coincide with the Yampa River peak.
Reclamation is now timing dam releases to create a peak flow, which connects floodplain nursery areas coincident with the presence of larval razorback suckers.
Larval razorback sucker present in the river
APR
MAY
JUN
JUL
AUG

# Dry and Moderately Dry year study sites

**Stewart Lake near Jensen**
**(outlet entrains at 5,000-8,000 cfs)**

**Old Charley near Ouray**
**(not currently available)**

**Above Brennan**
**(~13,000 cfs)**

**Johnson Bottom (Ouray NWR)**
**(~8,800 cfs?)**

# Importance of Stewart Lake Management: Low water LTSP applications, non-native exclusion

**Weir and trap system at outlet gate**

**Picket weir at inlet gate**

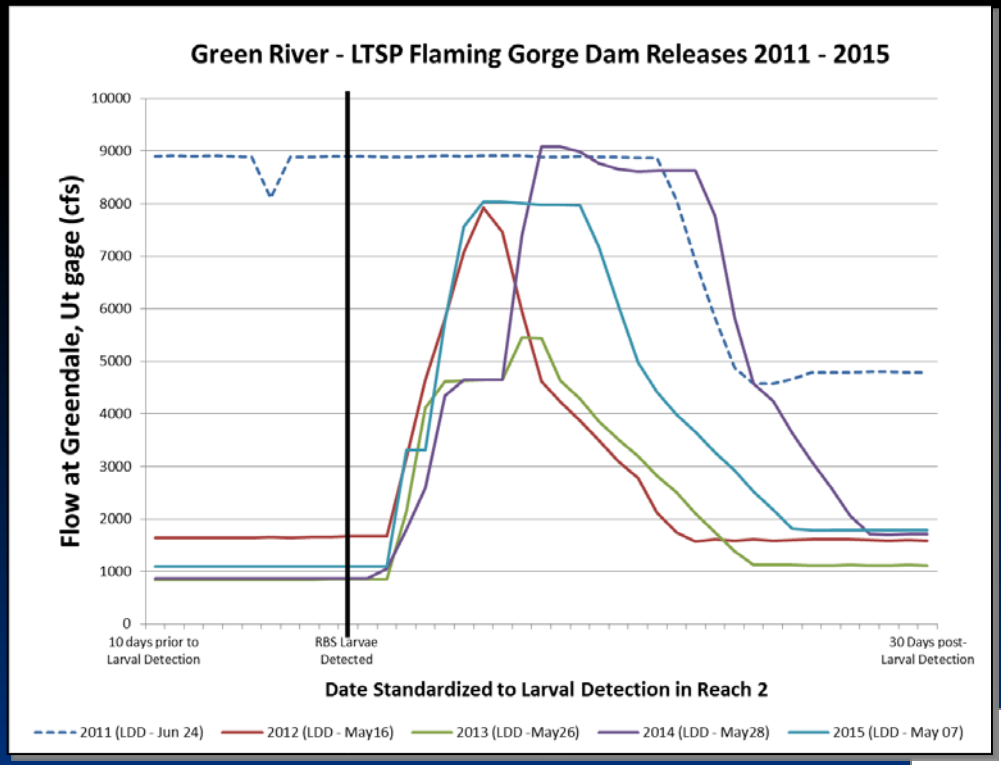
# Larval Trigger Study Plan Matrix

| Peak Flow (x) as Measured at Jensen, Utah | Proposed Study Wetlands[a, b] | Number of Days (x) Flow to Be Exceeded and Corresponding Hydrologic Conditions [c] | | |
|---|---|---|---|---|
| | | 1 ≤ x < 7 | 7 ≤ x < 14 | x ≥14 |
| **8,300 ≤ x < 14,000 cfs** | Stewart Lake (f), Above Brennan (f), Old Charley Wash (s)[d] | Dry | Moderately dry | Moderately dry and average (below median) |
| **14,000 ≤ x < 18,600 cfs** | Same as previous plus Escalante Ranch (f), Bonanza Bridge (f), Johnson Bottom[e] (s), Stirrup (s), Leota 7 (s) | Average (below median) | Average (below median) | Average (below median) |
| **18,600 ≤ x < 20,300 cfs** | Same as previous | Average (above median) | Average (above median) | Average (above median) |
| **20,300 ≤ x < 26,400 cfs** | Same as previous plus Baeser Bend (s), Wyasket (s), additional Leota units (7a and 4), Sheppard Bottom (s) | Moderately wet | Moderately wet | Moderately wet |
| **x ≥ 26,400 cfs** | Same as previous | Wet | Wet | Wet |

# Larval Razorback Sucker Sampling w/ Light Traps

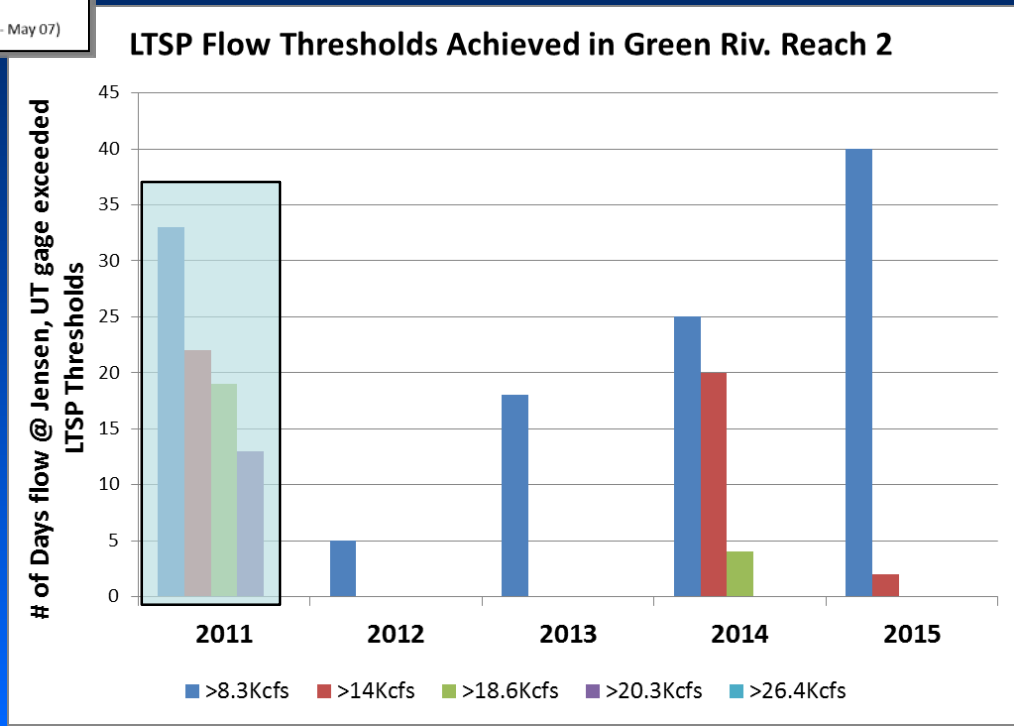
## Larval Razorback Sucker: Range of Recorded First Capture Dates (1992 – 2015)

| Year | 1st Larval Capture Date | Yampa Peak (cfs) | Yampa Peak Date |
|---|---|---|---|
| 2015 | 07 May | 10,400 | 08 May |
| 2016 | 28 May | 15,600 | 16 May |
| 2011 | 24 June | 27,400 | 09 June |

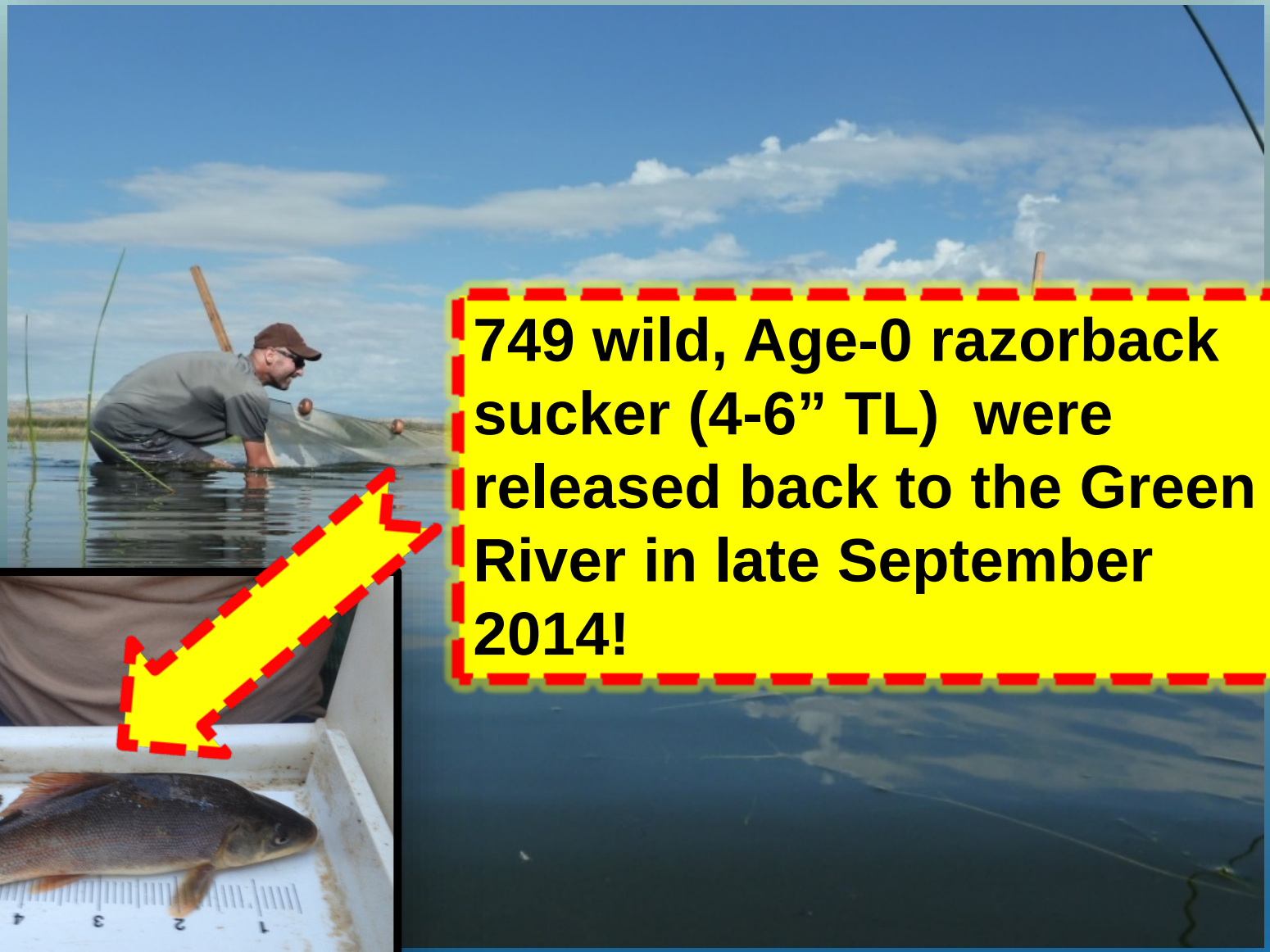



*Larval Triggered operations at FGD – Reach 1*

*Resultant Larval Triggered outcomes in Reach 2, below the confluence with the Yampa River*



# Juvenile Razorback Sucker Sampling w/ Seines @ Stewart Lake



**749 wild, Age-0 razorback sucker (4-6” TL) were released back to the Green River in late September 2014!**

# Larval Trigger Study Plan Matrix

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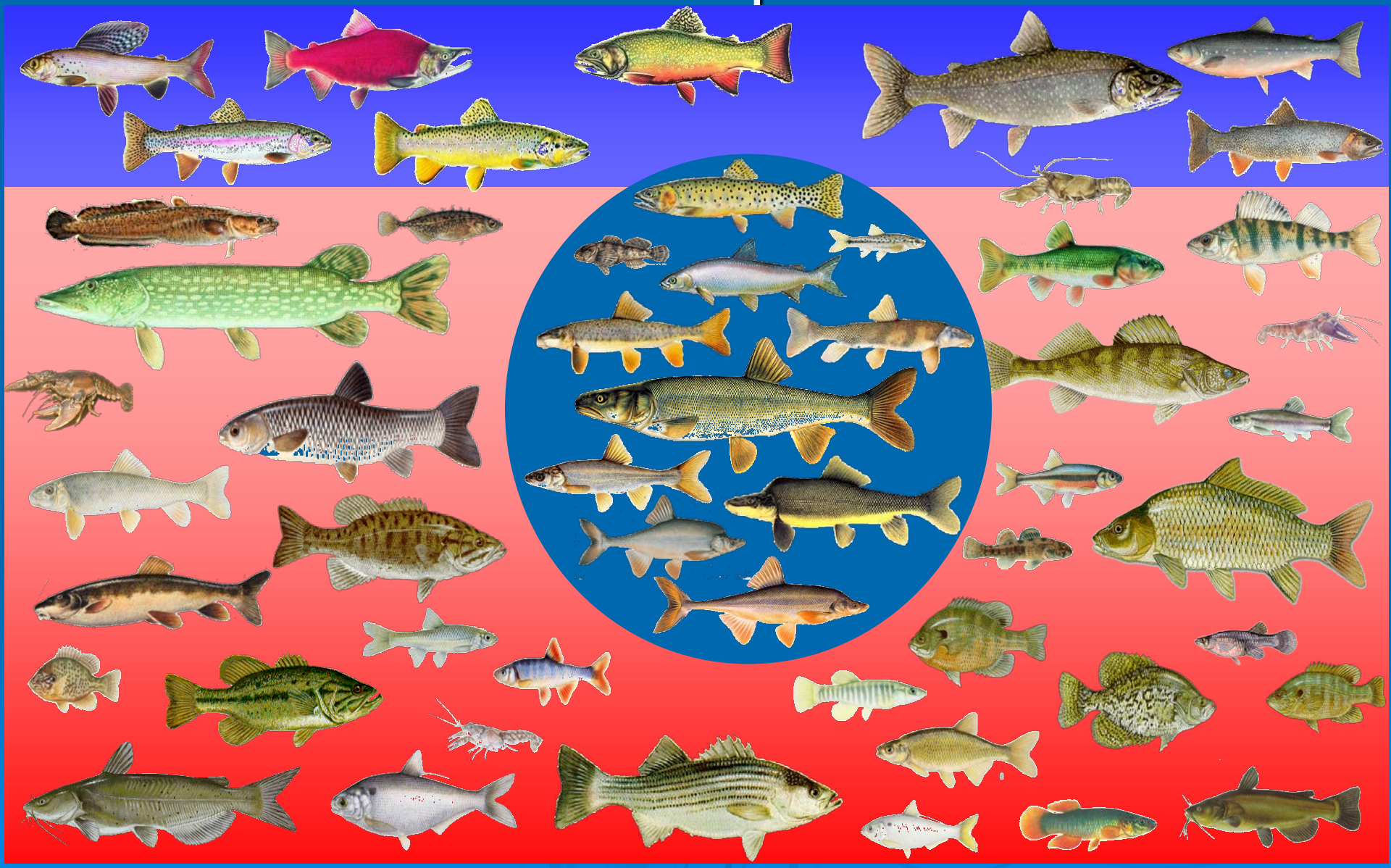
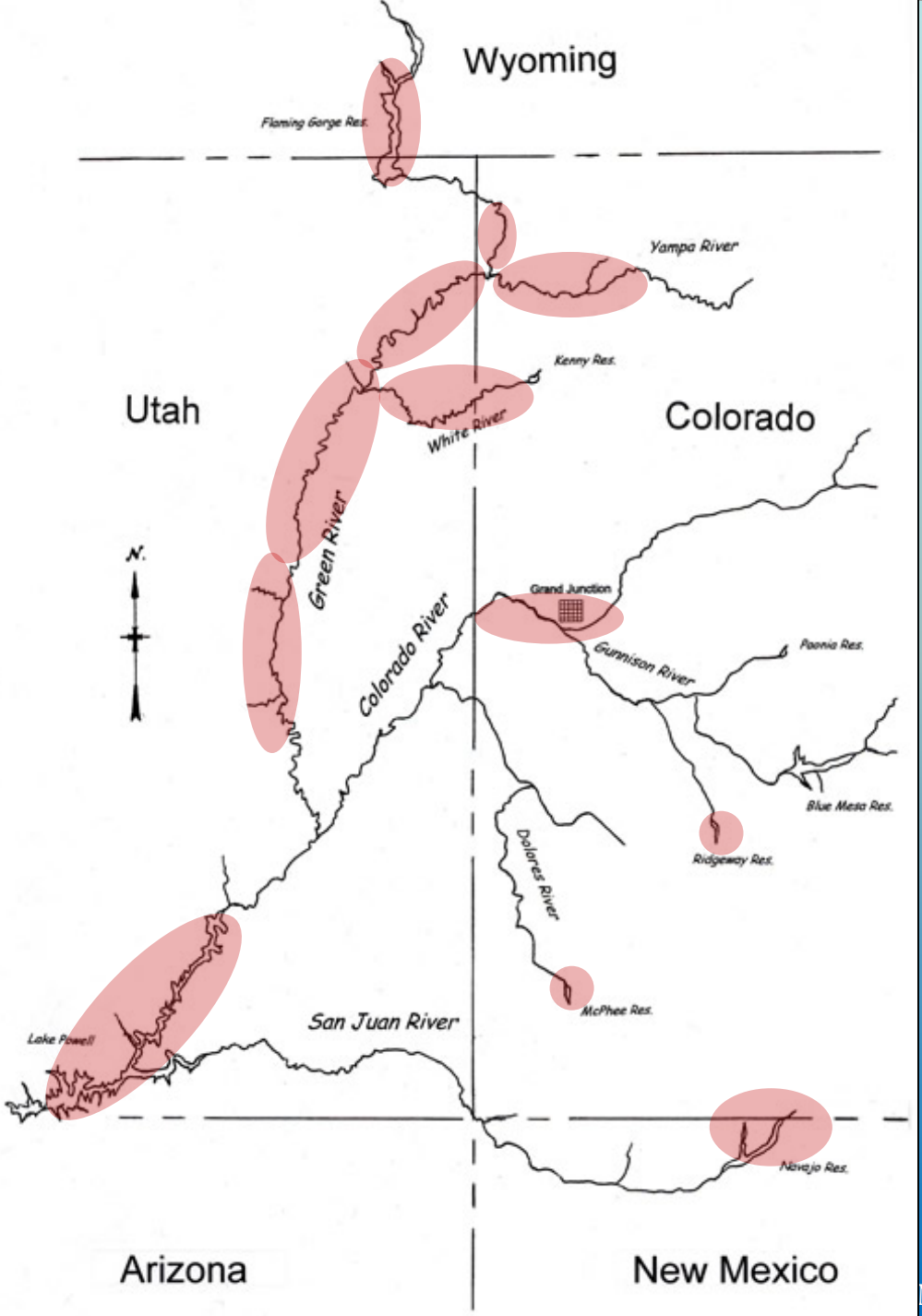
# Upper Colorado River Major Threat: Invasive species

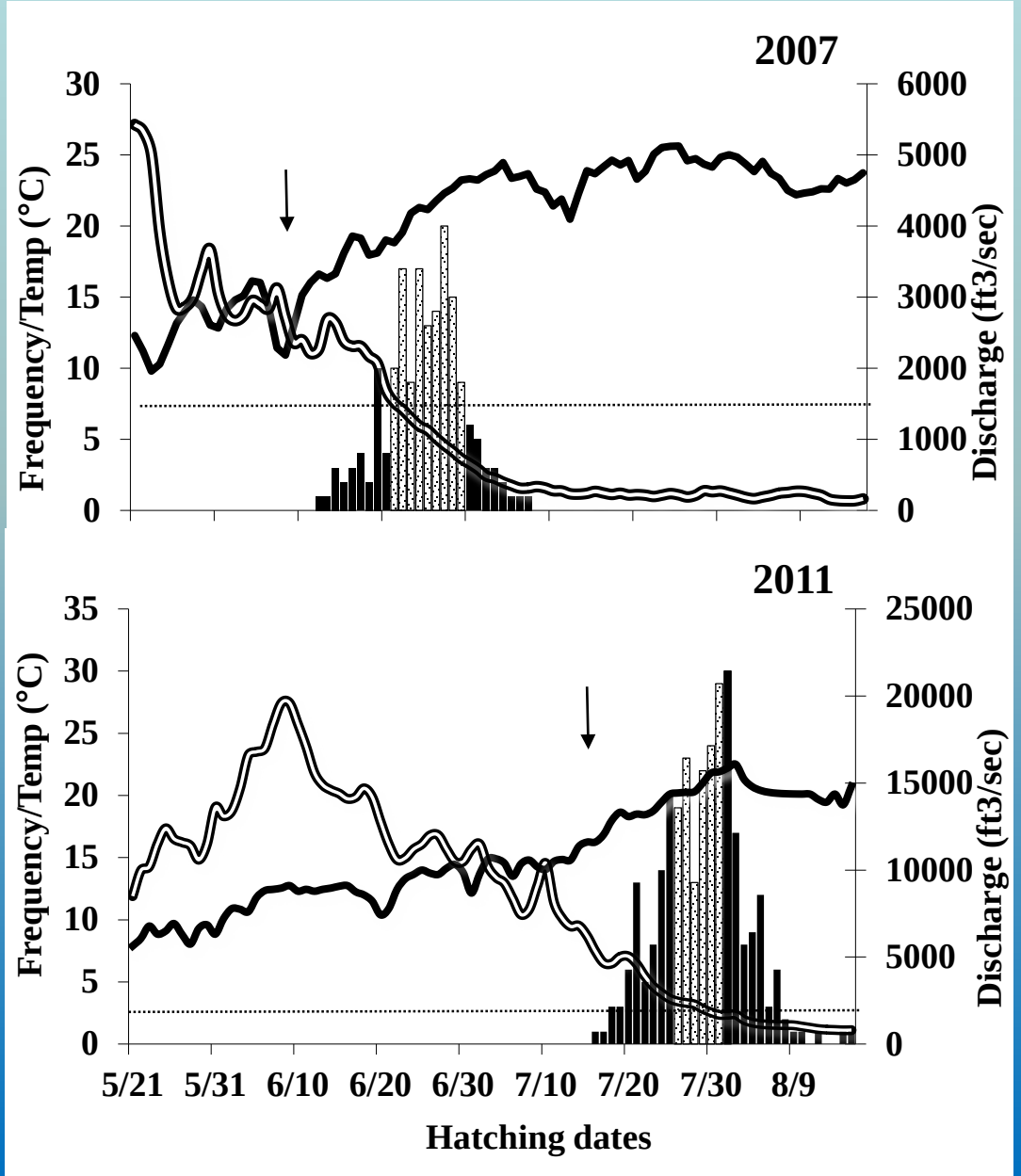


# Upper Colorado River Basin Smallmouth Bass Distribution




MB)

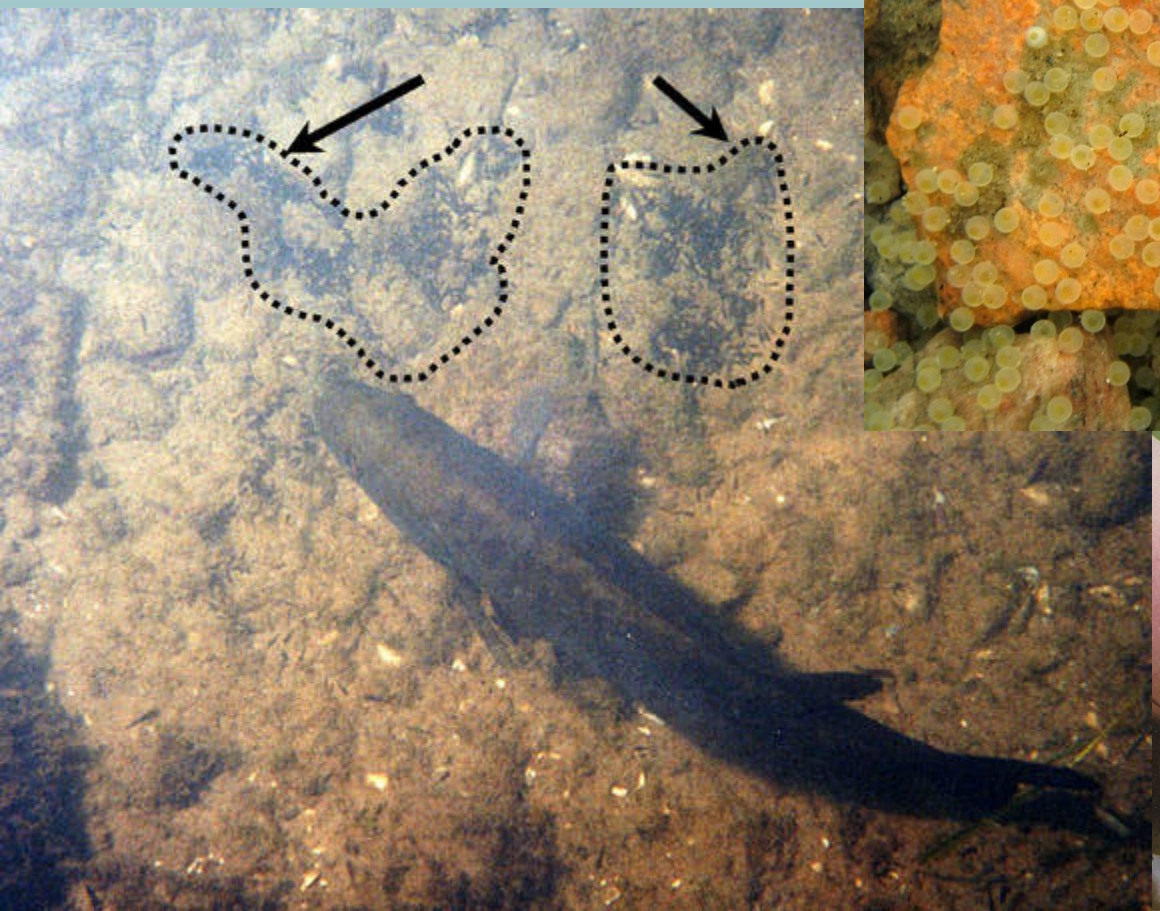
# SMB hatching dates affected by water year

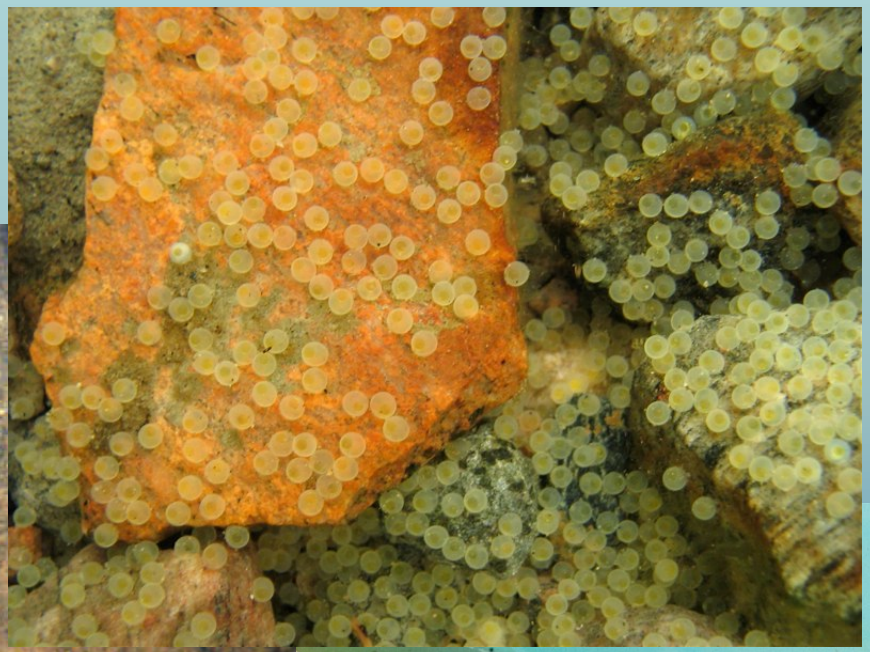



— *Low Flow year*

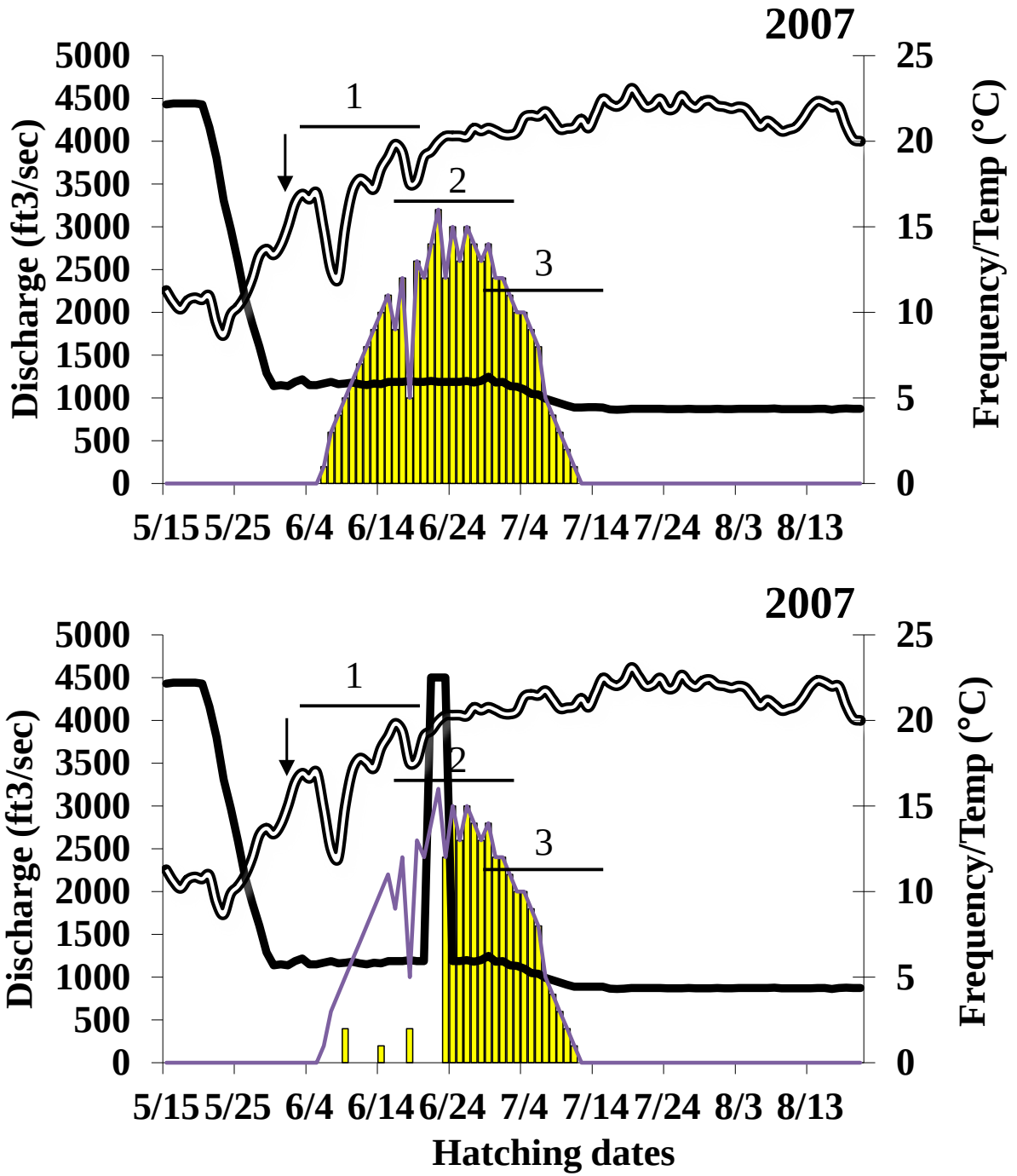
— *Hi Flow year*

# Smallmouth bass larvae are susceptible to spikes in flow and turbidity





# A Spike Flow could eliminate the earliest spawned SMB



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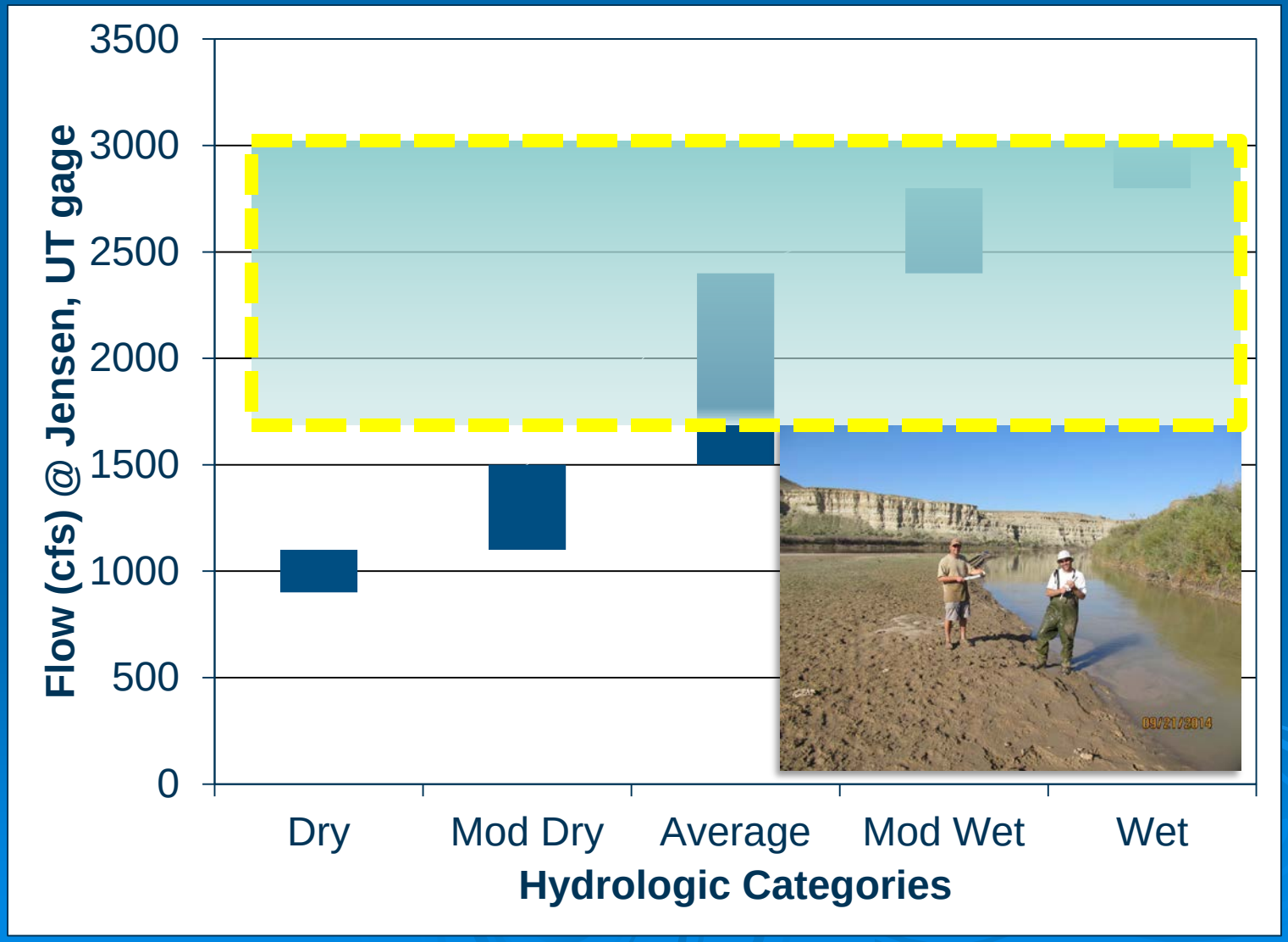
# Colorado Pikeminnow: a complicated life history

**Age-0 Colorado pikeminnow (*Ptychocheilus lucius*)**

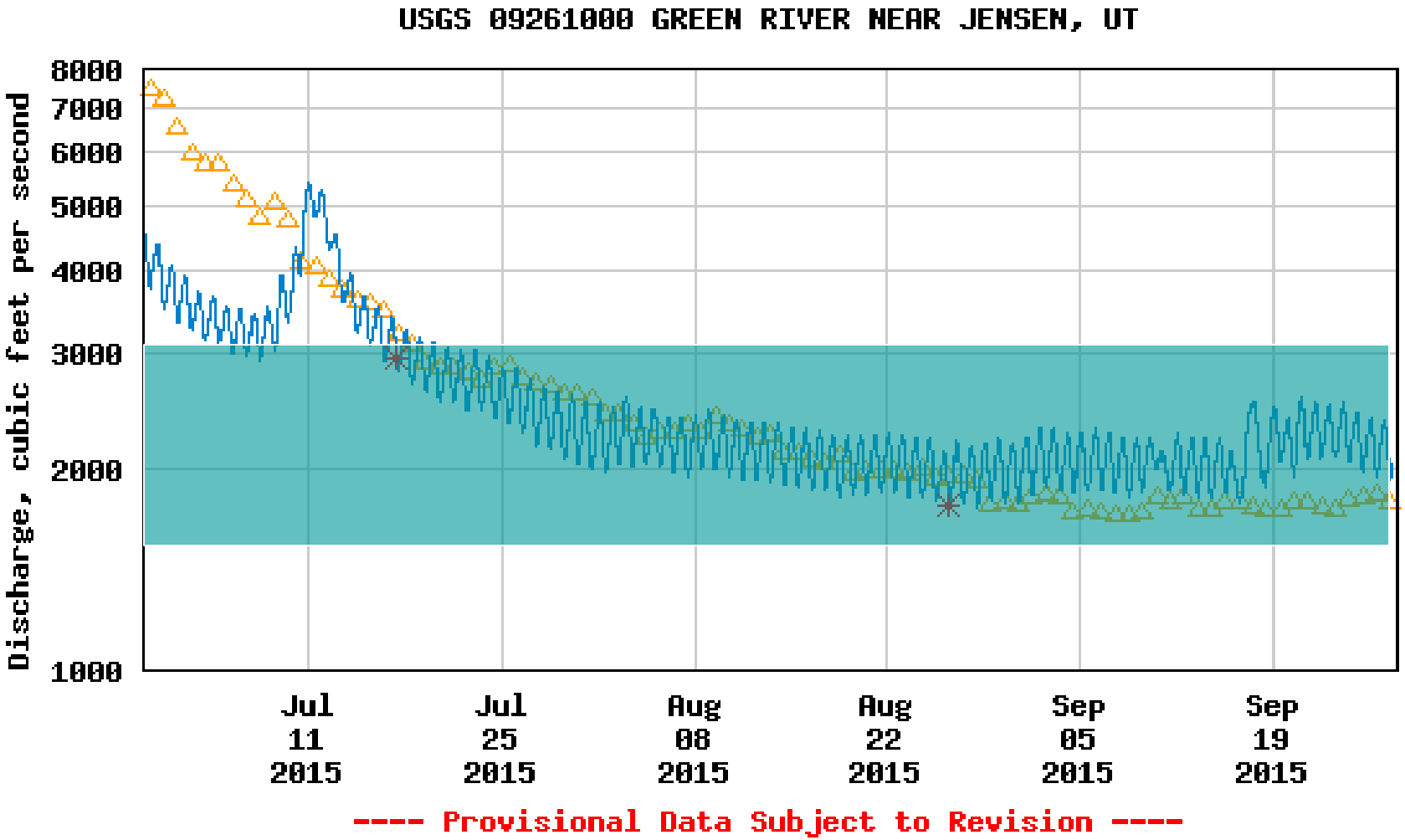
# Age-0 pikeminnow density & flow
# Middle Green River, 1979-2012

# Middle Green River Base Flows (*Muth et al 2000*) :

***Preliminary New Information from Bestgen and Hill (in draft)***

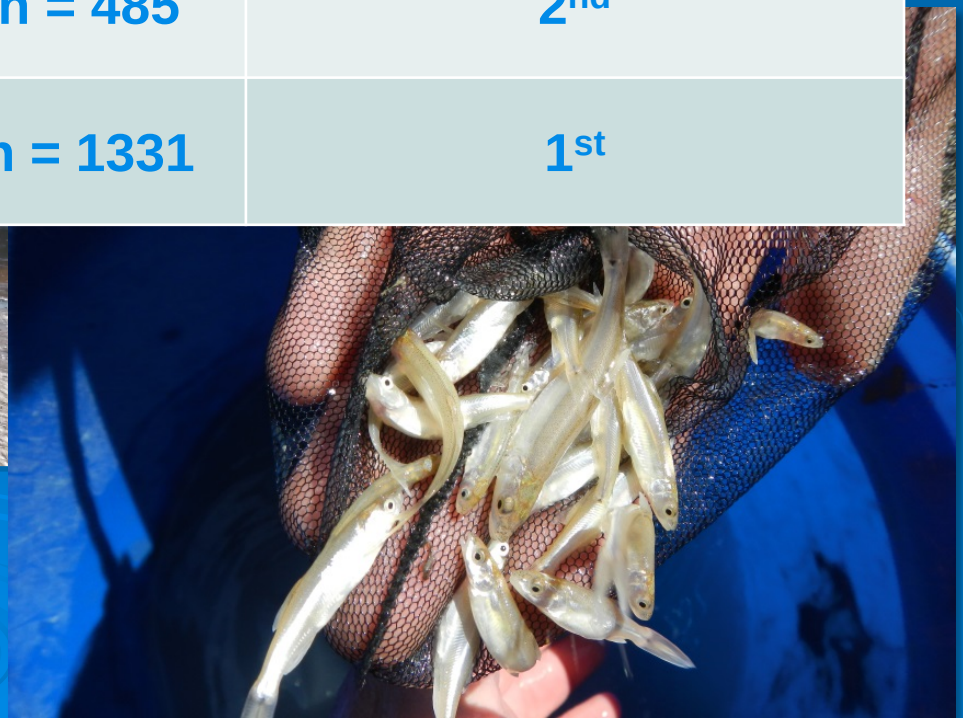


# Middle Green River Baseflows: 2015



# YOY CPM Sampling in 2015

| REACH | REACH LENGTH | # if YOY Collected | Rank of Catch in past 20 yrs (reach specific) |
|---|---|---|---|
| **Middle Green** | **104 RMs** | **n = 275** | **3rd** |
| **Lower Green** | **120 RMs** | **n = 485** | **2nd** |
| **Lower Colorado** | **110 RMs** | **n = 1331** | **1st** |



**Outline**:

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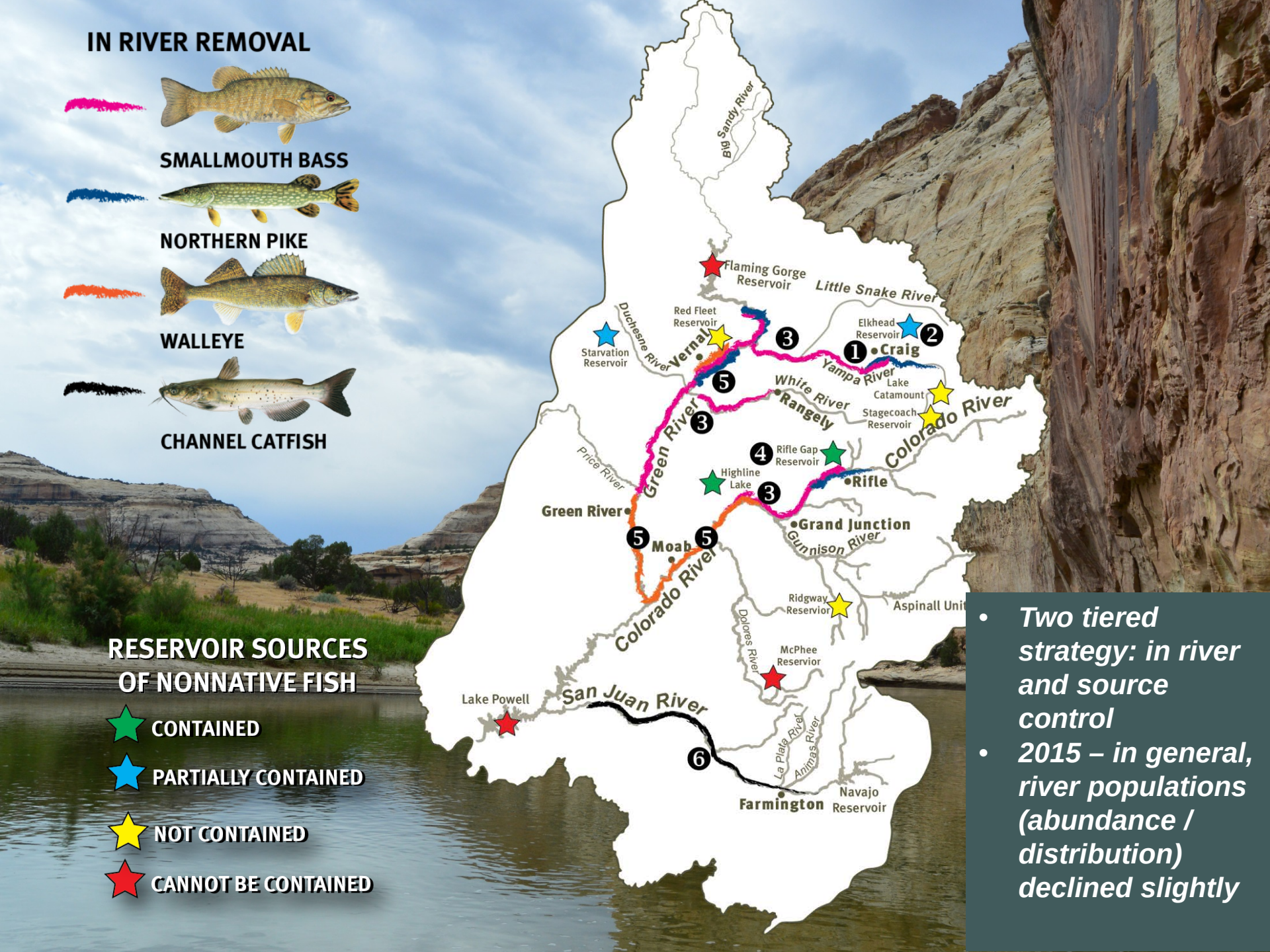
    a. Spring peak – larval trigger – ***included in 2016 request***
    b. Post peak – spike flow – implementation to be determined
    c. Elevated Summer Base Flows – ***included in 2016 request***


Questions??


IN RIVER REMOVAL
SMALLMOUTH BASS
NORTHERN PIKE
WALLEYE
CHANNEL CATFISH
RESERVOIR SOURCES OF NONNATIVE FISH
CONTAINED
PARTIALLY CONTAINED
NOT CONTAINED
CANNOT BE CONTAINED
Big Sandy River
Flaming Gorge Reservoir
Little Snake River
Red Fleet Reservoir
Duchesne River
Starvation Reservoir
Vernal
Elkhead Reservoir
Craig
Yampa River
Lake Catamount
Stagecoach Reservoir
White River
Rangely
Colorado River
Green River
Price River
Rifle Gap Reservoir
Highline Lake
Rifle
Green River
Grand Junction
Gunnison River
Moab
Colorado River
Ridgway Reservior
Aspinall Unit
Dolores River
McPhee Reservior
Lake Powell
San Juan River
La Plata River
Animas River
Farmington
Navajo Reservoir
• Two tiered strategy: in river and source control
• 2015 – in general, river populations (abundance / distribution) declined slightly

# *A Cooperative Recovery Initiative (CRI) Project: Johnson Bottom*