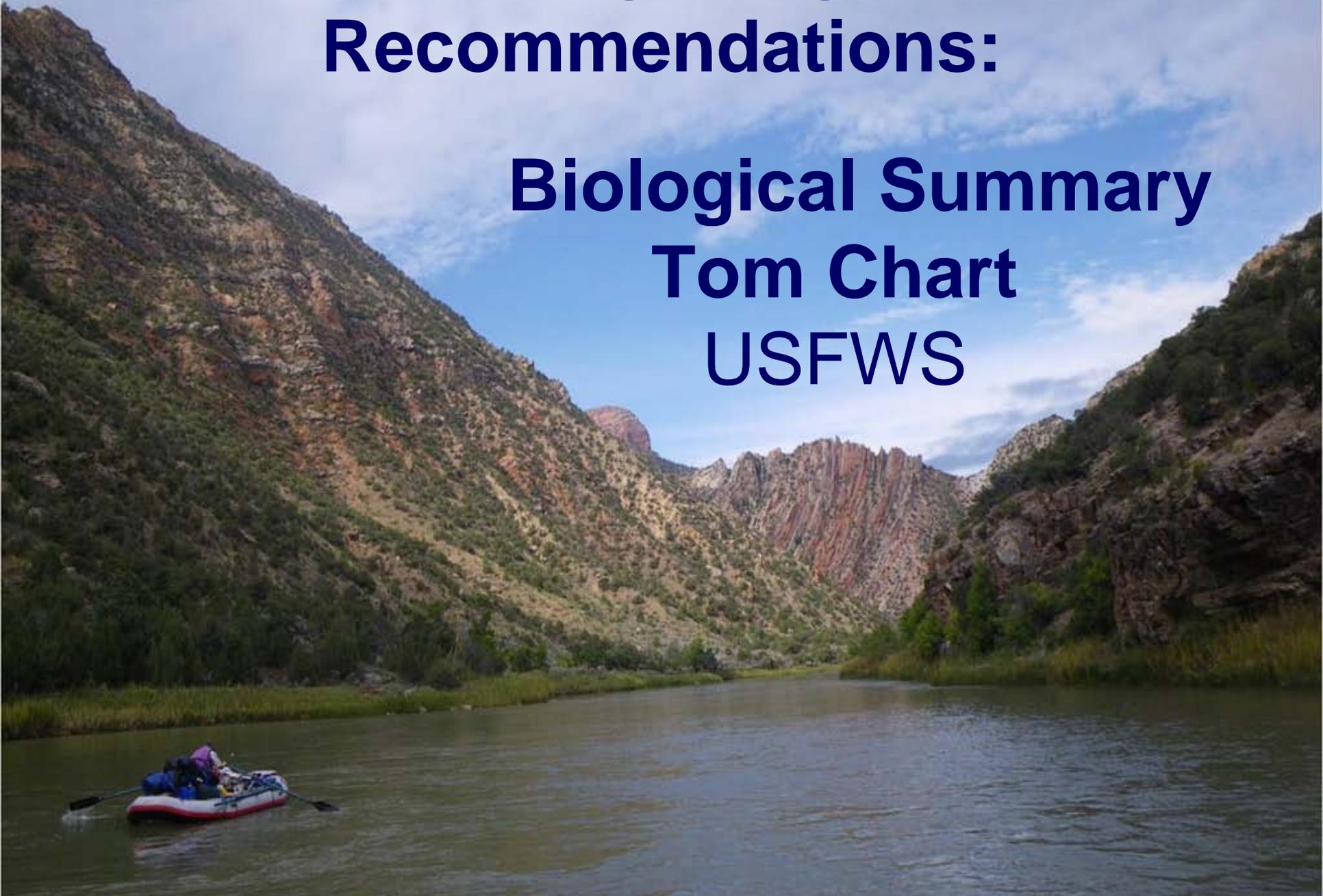


# **2011 Flaming Gorge TWG Flow Recommendations:**

**Biological Summary  
Tom Chart  
USFWS**

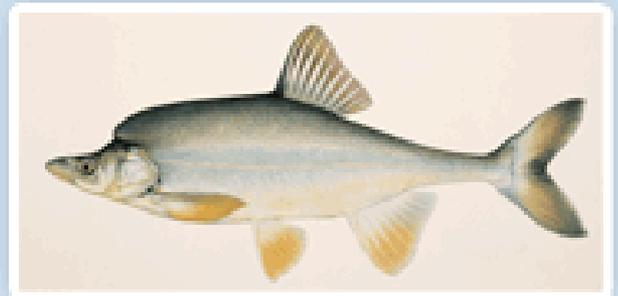




# Upper Colorado River Endangered Fish Recovery Program

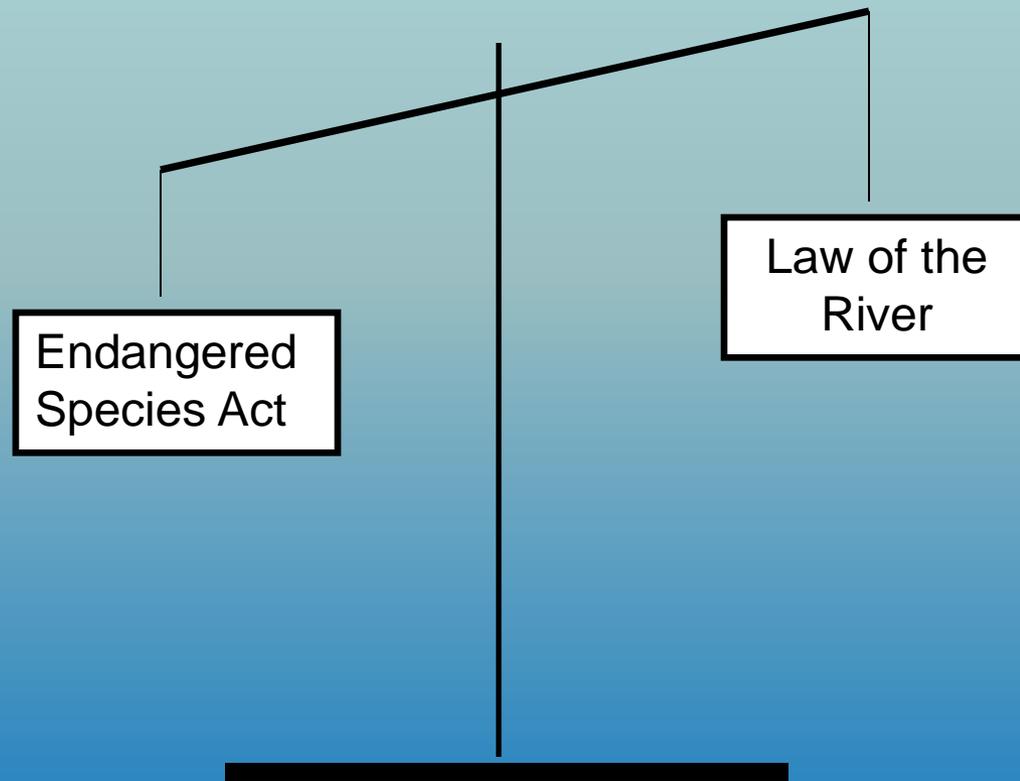
- Partners

- 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



# 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.



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

		<b>Historic Depletions</b>	<b>New Depletions</b>	<b>Totals</b>
<b>State</b>	<b>Number of Consultations</b>	<b>Acre-feet / yr</b>	<b>Acre-feet / yr</b>	<b>Acre-feet / yr</b>
<b>Colorado</b>	<b>1,126</b>	<b>1,915,322</b>	<b>205,936</b>	<b>2,121,258</b>
<b>Utah</b>	<b>202</b>	<b>517,670</b>	<b>85,908</b>	<b>603,578</b>
<b>Wyoming</b>	<b>241</b>	<b>83,498</b>	<b>33,833</b>	<b>117,332</b>
<b>Regional*</b>	<b>238</b>	<b>(regional)</b>	<b>(regional)</b>	<b>0</b>
<b>Total</b>	<b>1,807</b>	<b>2,516,490</b>	<b>325,677</b>	<b>2,842,168</b>

\* Amount included in individual state's new depletions

# Recovery Elements

Habitat development



Habitat flow management



Research and monitoring

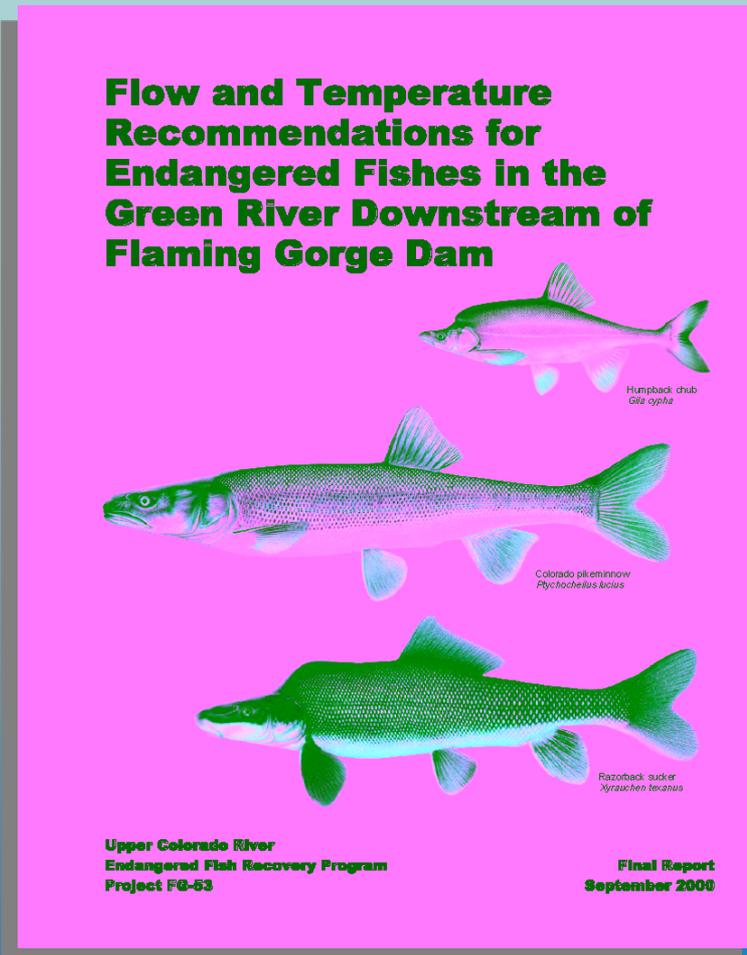
Managing nonnative fish



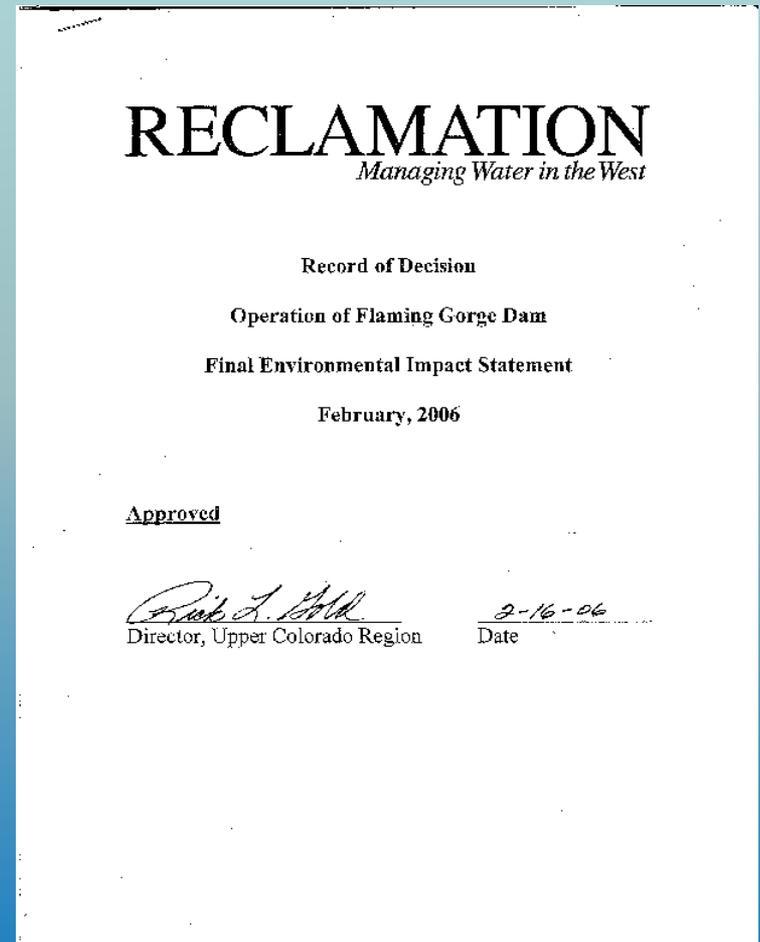
Stocking endangered fish



Each Year the FGTWG provides BOR a technical  
(biological and physical) interpretation of:



+

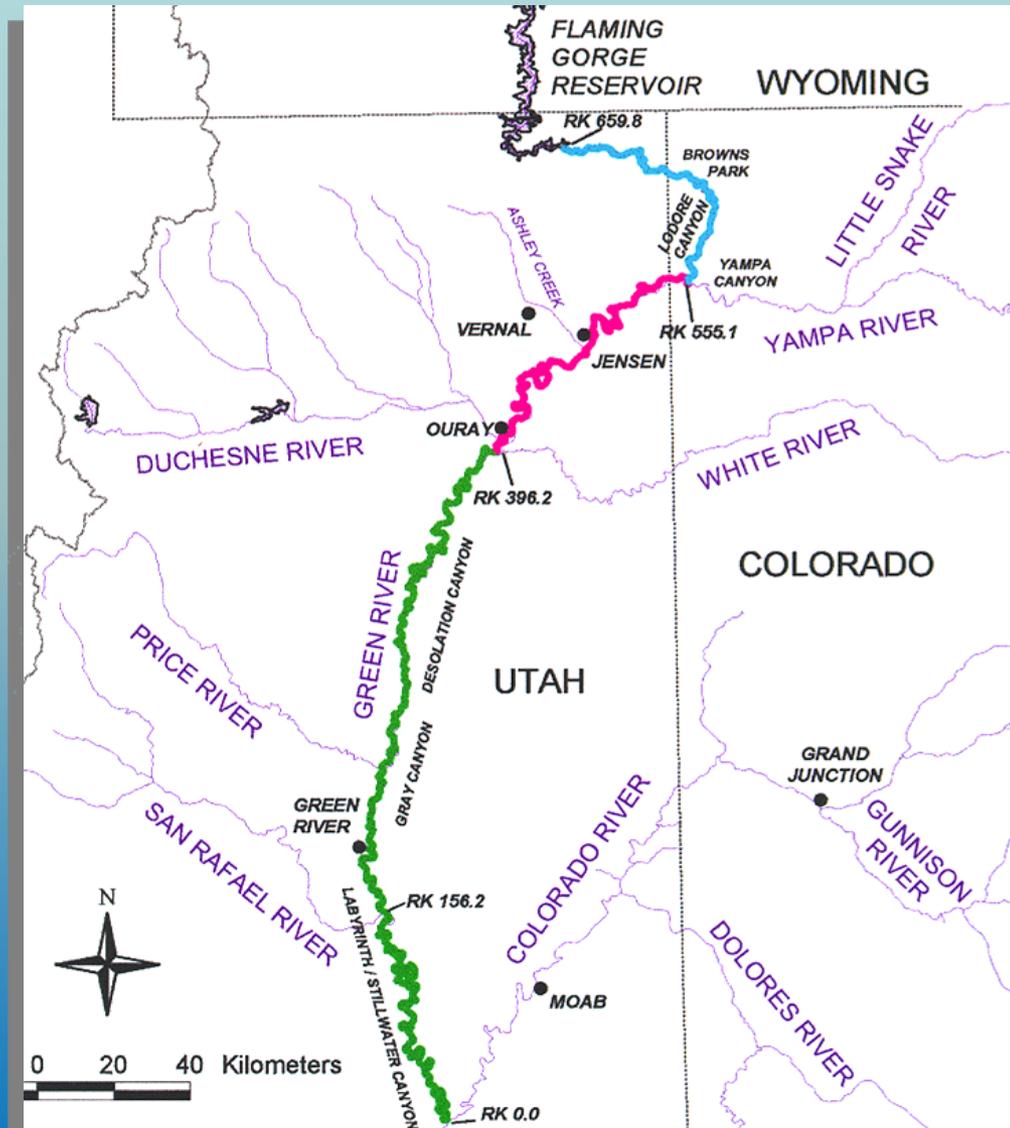


*Muth et al. 2000*

*BOR's Record of Decision*

# Green River Reaches

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

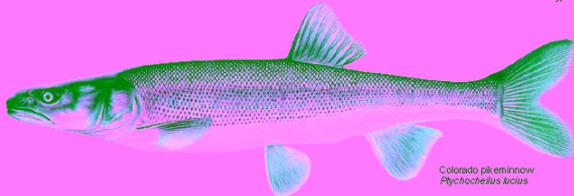


# Recovery Program's 2011 Spring Flow Request focused on:

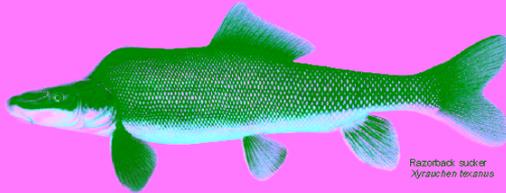
## Flow and Temperature Recommendations for Endangered Fishes in the Green River Downstream of Flaming Gorge Dam



Humpback chub  
*Gila cypha*



Colorado pikeminnow  
*Ptychocheilus lucius*



Razorback sucker  
*Xyrauchen texanus*

Upper Colorado River  
Endangered Fish Recovery Program  
Project F0-63

Final Report  
September 2000

- 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)

# 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.*

**SYNTHESIS OF FLOOD PLAIN WETLAND  
INFORMATION: TIMING OF RAZORBACK SUCKER  
REPRODUCTION IN THE GREEN RIVER, UTAH,  
RELATED TO STREAM FLOW, WATER TEMPERATURE,  
AND FLOOD PLAIN WETLAND AVAILABILITY**

By

K. R. Bestgen, G. B. Haines, and A. A. Hill

Larval Fish Laboratory  
Department of Fish, Wildlife, and Conservation Biology  
Colorado State University  
Fort Collins Colorado 80523 (KRB, AAH)

U. S. Fish and Wildlife Service  
Vernal, Utah (GBH)

Draft Final Report

Colorado River Recovery Implementation Program Projects 22F and FR-FP  
Synthesis  
Larval Fish Laboratory Contribution 162  
March 2011

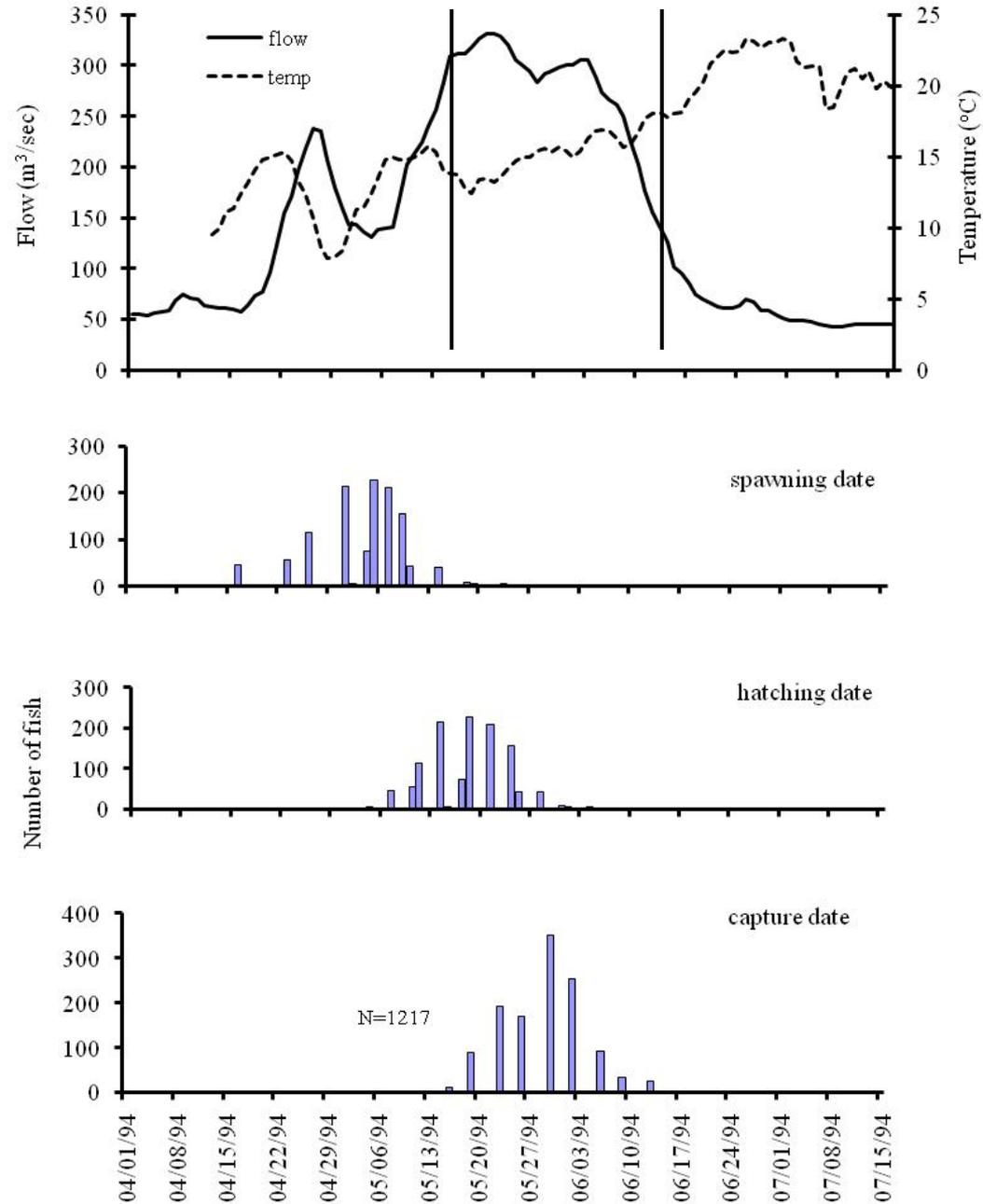
# Reproduction of razorback sucker, Green River, 1993-2010

- Coincident with increasing water temperature (8-18 C), increasing or peak flows, earlier when warm, later if cool
- Once started, mean spawning date is 3 weeks after first spawning, mean hatching is 2 weeks after mean spawn, and mean capture time 2 weeks after that.
- Long reproductive period in cold water!



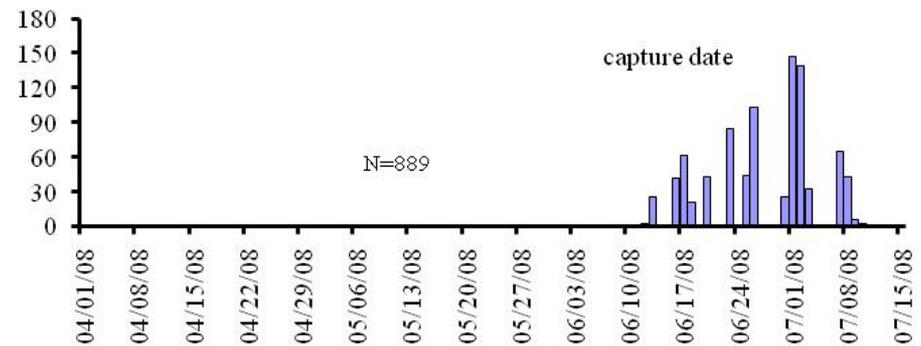
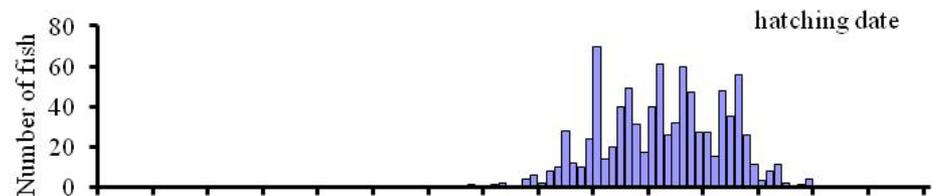
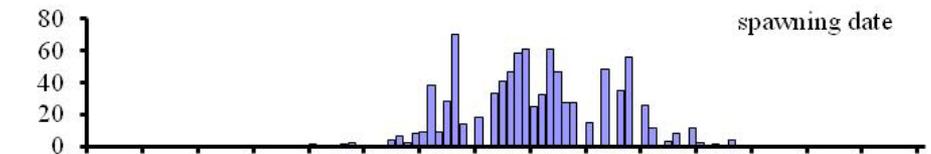
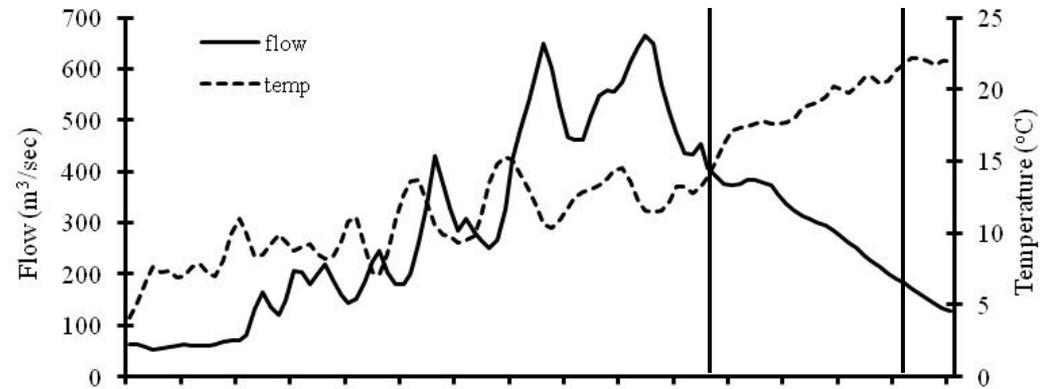
# Timing of reproduction, MG, 1994

1994 Middle Green River



# Timing of reproduction, MG, 2008

2008 Middle Green River



# Peak Flows: 2011

## Recovery Program Research Request :

### Address 3 Critical Uncertainties:

1. Can timing of the spring peak discharge from Flaming Gorge dam be altered to maximize overlap with the abundance of wild razorback sucker larvae in Reach 2 of the Green River?
2. Given changes in floodplain habitats since the flow recommendations were developed, what flows are necessary to result in successful entrainment of wild larvae in floodplains in Reach 2?
3. Are these wetlands successful in promoting survival of razorback suckers (both fall and over-winter survival)?

# Peak Flows: 2011

## Recovery Program Research Request :

- **Primary Objective:** Time Flaming Gorge releases to connect floodplains when wild produced razorback sucker larvae are present in the Green River.
  - Once larval suckers are present, and if hydrology remains **Wet-Average, Moderately Wet or Wet Categories** (<40% exceedance) we request flows that maintain 18,600cfs or greater for two weeks or more in Reach 2. *[with contingencies for drier conditions]*
- **Secondary Objective:** Assist in meeting the objectives of Recovery Program Project No.C6 RZ-RECR: *Razorback emigration from the Stirrup floodplain*
  - Recovery Program therefore requests 15,000cfs for 5 consecutive days in Reach 2 to assist in meeting these project objectives

# Stirrup Wetland



**15,000 cfs = passable by endangered fish**



# Stirrup: 2008-2010 results

- 1) 2008 results
  - a) antenna trouble
  - b) 3 razorback sucker
  - c) 3 Colorado pikeminnow
  - d) 1 bonytail (rare; stocked 2007)
  - e) 1 roundtail chub
  - f) **7 unique endangered fish**
- 2) 2009 results
  - a) 31 razorback sucker
  - b) 5 bonytail (rare; stocked 2008)
  - c) 4 Colorado pikeminnow
  - d) **40 unique endangered fish**
- 3) 2010 results
  - a) 31 razorback sucker
  - b) 5 bonytail
  - c) 6 Colorado pikeminnow
  - d) **42 unique endangered fish**

# **Base Flow Request :**

## **USFWS Utah Field Office, in cooperation with Recovery Program**

- 1. Reclamation selects reach 1 target according to ROD base flow range**
- 2. Base flow target is then augmented by as much as 40% according to ROD allowances through September 30<sup>th</sup>**

# Colorado pikeminnow



# YOY Colorado pikeminnow



# Base Flow Request :

## YOY Colorado pikeminnow habitat

- In general, higher flows and other flow-dependent variables correspond with higher recruitment
- But it is a complex relationship involving
  - Multi-year effects of flows (peak and base)
  - Non-native species
  - Habitat characteristics (backwater volume & area)

# Young-of-year pikeminnow collections : 2000 - 2010

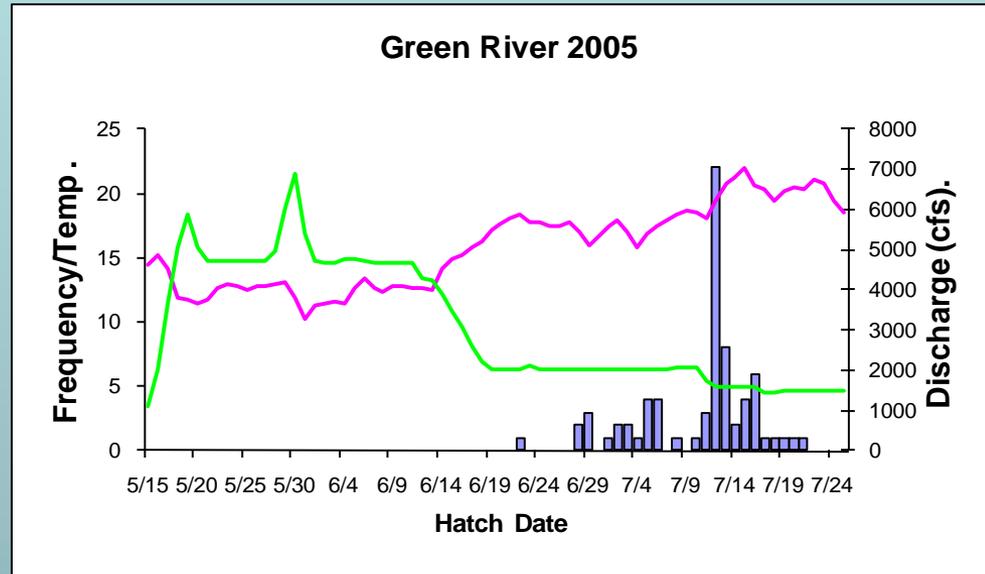
Year	# of age-0 pikeminnow collected	Average flow between July 15 and September 30	Years base flows dropped below 1000 cfs
2000	31	1423	
2001	8	1073	X
2002	0	876	X
2003	2	1101	X
2004	60	1367	
2005	8	1958	
2006	5	1213	X
2007	3	1122	X
2008	18	2376	
<b>2009</b>	<b>325</b>	<b>2610</b>	
<b>2010</b>	<b>454</b>	<b>2292</b>	

# Smallmouth Bass – Nonnative Predator

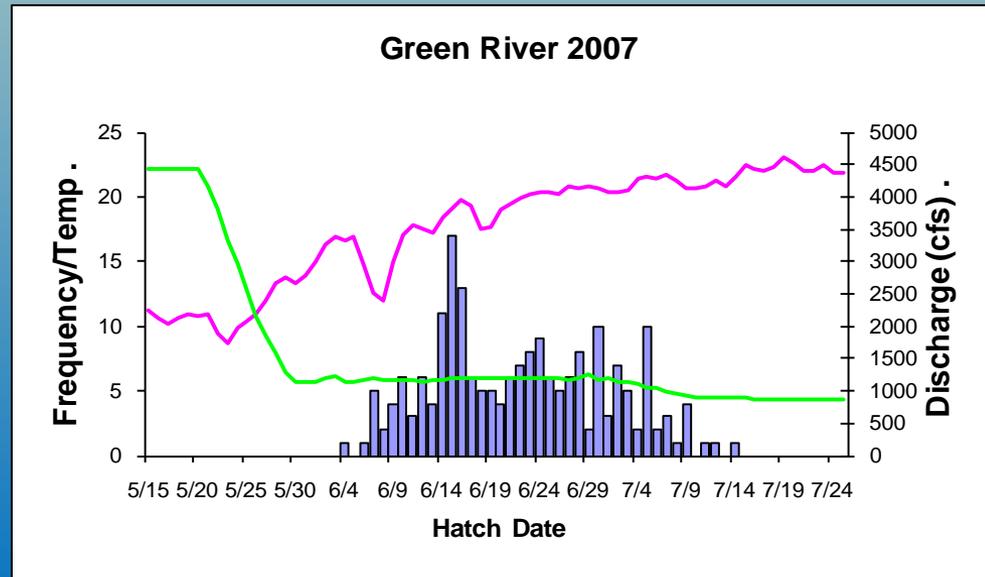


# SMB Spawning Time as a Function of Flow and Temp:

Wet Year



Dry Year

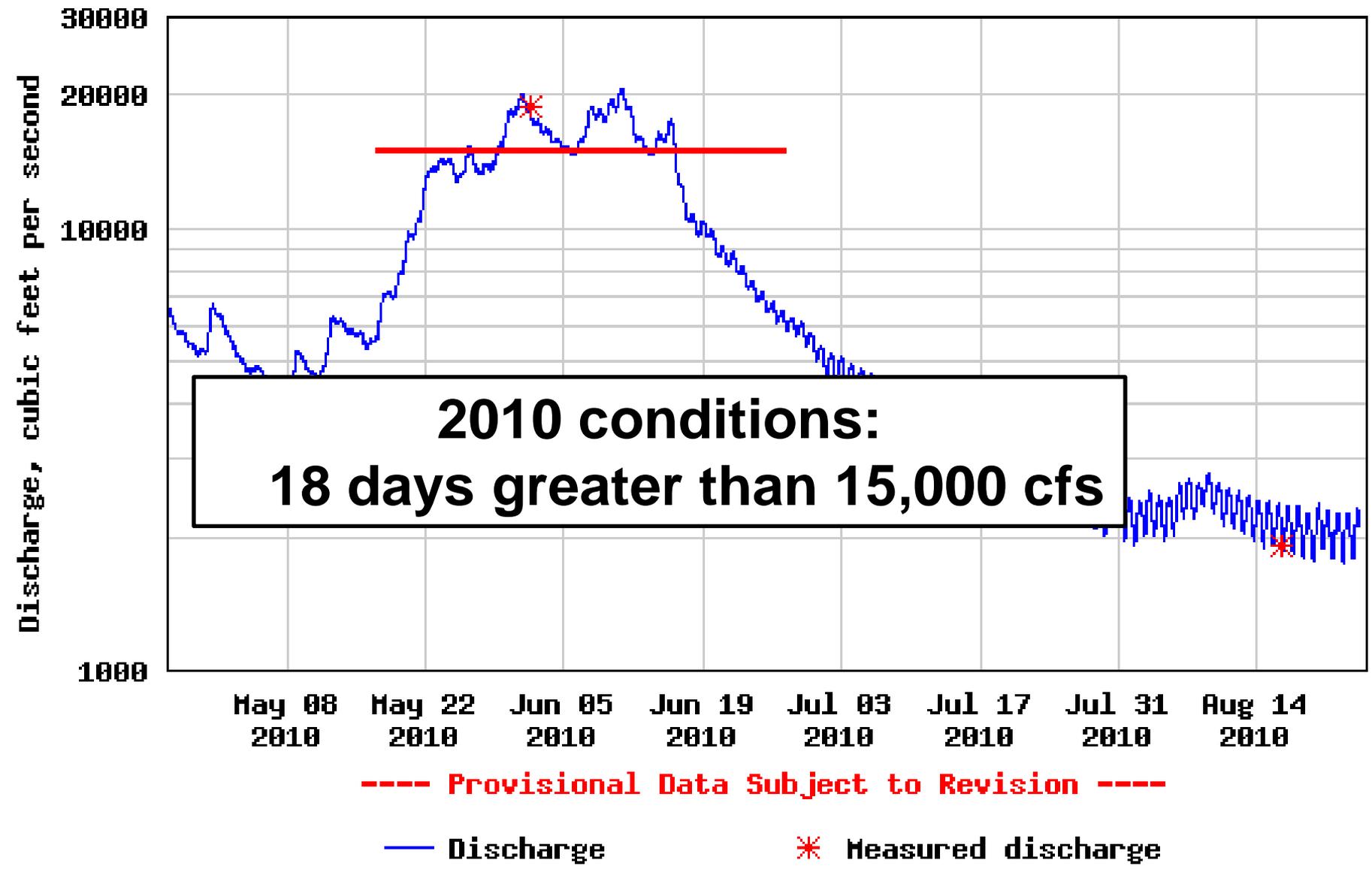


# Thanks...

**BOR, FGTWG, UDWR, USFWS (Vernal,  
UT), Dr Kevin Bestgen**



# USGS 09261000 GREEN RIVER NEAR JENSEN, UT



# Stirrup wetland experiment

## Biological Purpose:

Provide connection to the Stirrup wetland so that razorback sucker (and other fish) escapement could be monitored via a pass-thru PIT array.







# Peak Flows

## Recovery Program Research Request : Stirrup wetland experiment

1. Maintain dam releases to achieve a minimum flow of 15,000 cfs for a minimum of 5 days in reach 2 (dry and moderately dry)
2. If 5 days not possible, then maintain peak flows at 15,000 cfs for as long as possible

**2010 conditions:  
18 days greater than 15,000 cfs**





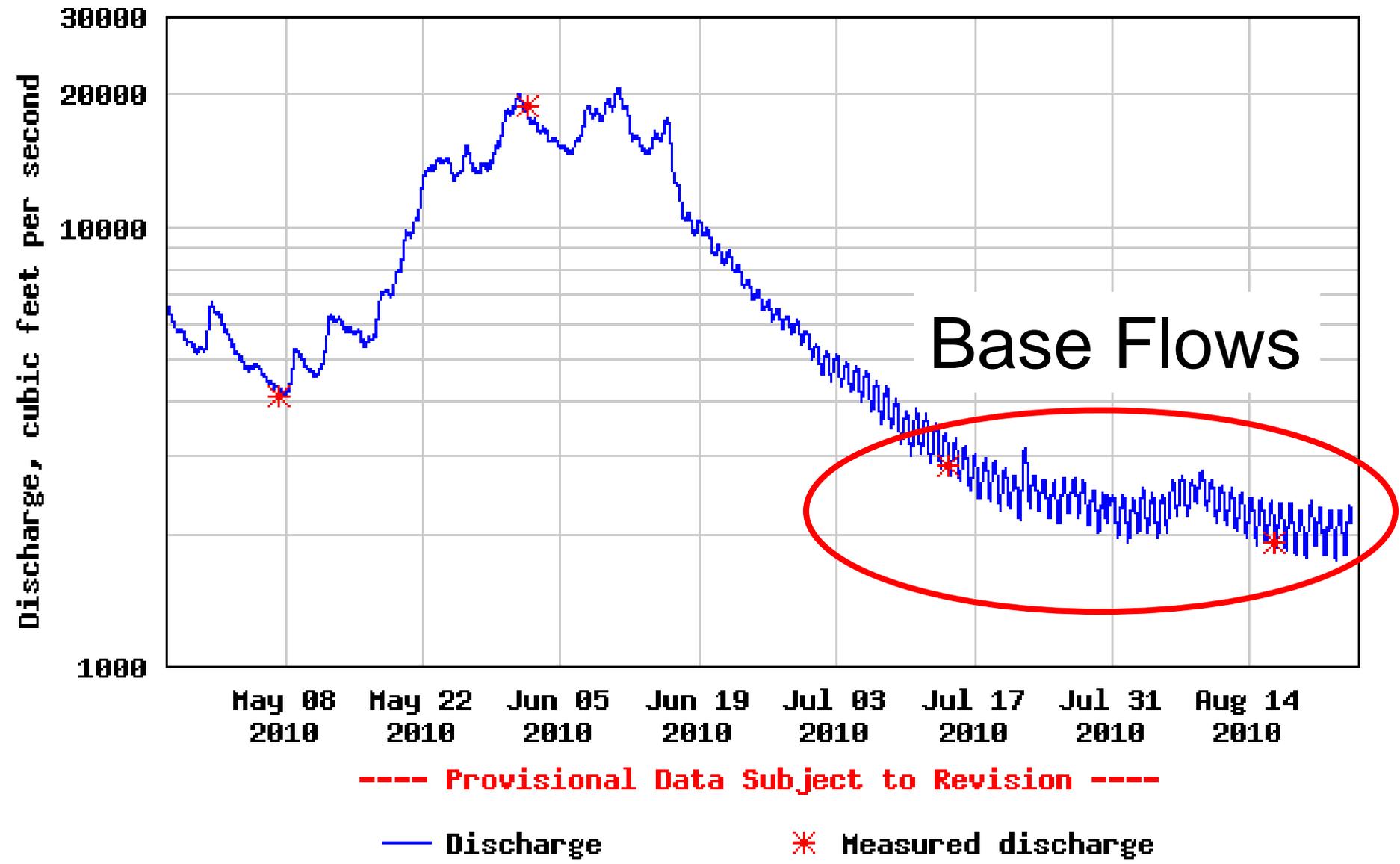
**15,000 cfs = passable by endangered fish**



# Stirrup: 2008-2010 results

- 1) 2008 results
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  - c) 4 Colorado pikeminnow
  - d) **40 unique endangered fish**

# USGS 09261000 GREEN RIVER NEAR JENSEN, UT



# **Base Flow Request :**

## **Biological purpose**

**“maintaining adequate base flows in the forecasted dry year should be the primary goal” in order to:**

- a) provide quality Colorado pikeminnow habitat**
- &**
- b) disadvantage smallmouth bass**

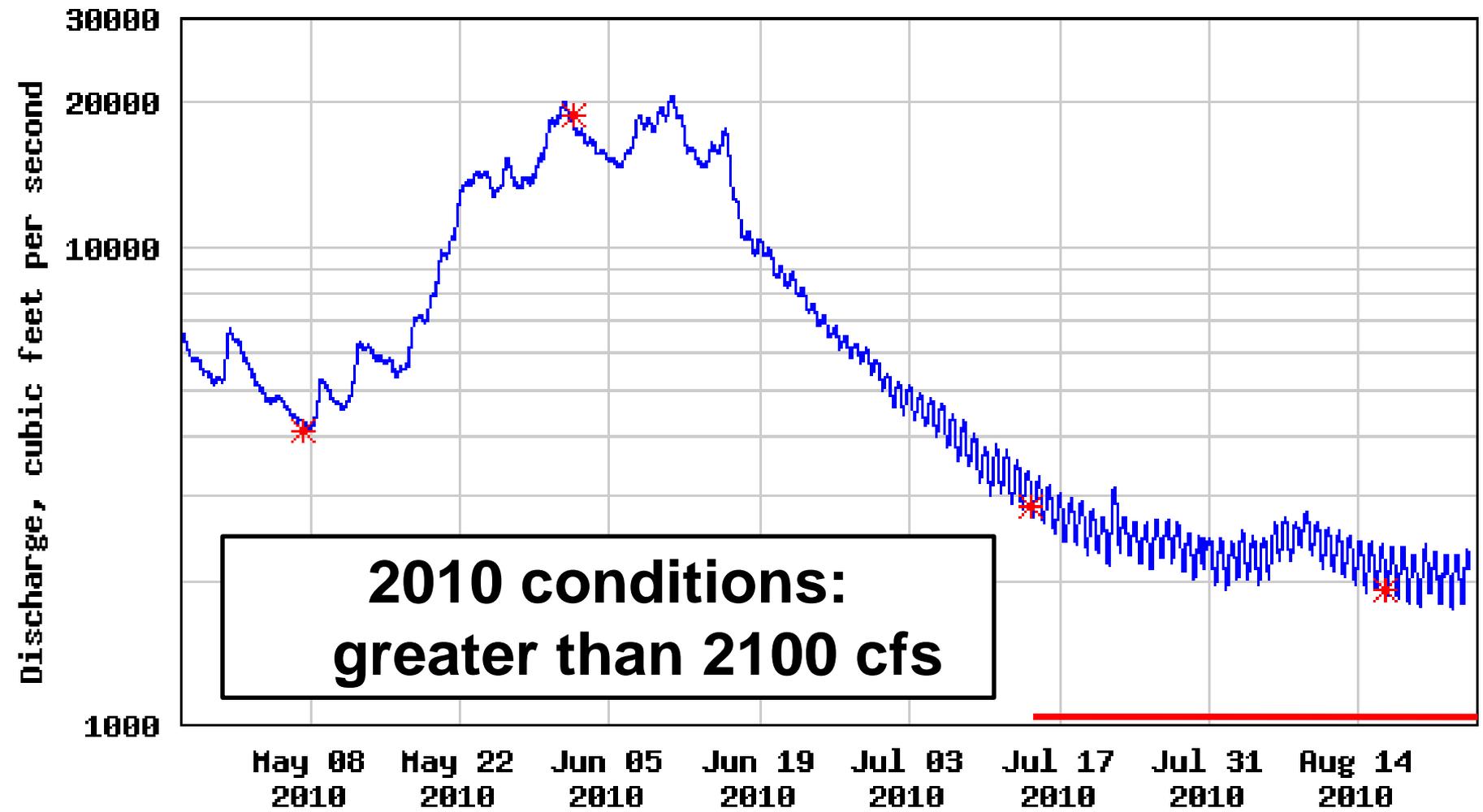
# Young-of-year (YOY) pikeminnow collections in relation to flow

Year	# of age-0 pikeminnow collected	Average flow between July 15 and September 30	Years base flows dropped below 1000 cfs
2000	31	1423	
2001	8	1073	X
2002	0	876	X
2003	2	1101	X
2004	60	1367	
2005	8	1958	
2006	5	1213	X
2007	3	1122	X
2008	18	2376	
2009	325	2610	

# Juvenile Colorado pikeminnow habitat, Jensen/Ouray



# USGS 09261000 GREEN RIVER NEAR JENSEN, UT



---- Provisional Data Subject to Revision ----

— Discharge

\* Measured discharge

# 2010 base flows

- Maintain Jensen gauge at ~2100 cfs through September 30<sup>th</sup>
  - Flaming Gorge will offset declining Yampa flows
  - Recovery Program will release Elkhead water
- Preserve habitat to best of our ability
- Avoided low flow days (less than 1000 cfs)

# Argonne National Lab

## Backwater data collection

- Argonne NL collected spatial data in backwaters at Ouray NWR and demonstrated that these flows preserved habitat size
  - Surface area and volume
- Habitat conditions near 2009 conditions
  - Largest YOY pikeminnow collections
- Provides more data for habitat vs. YOY abundance

# Future Directions

- Colorado State University & Argonne NL are working on a synthesis of the relationships between backwaters / flows and YOY abundance
  - Very long data set
  - Comprehensive analysis
- Clarify the complex relationships between habitat conditions, controlling factors, and fish success

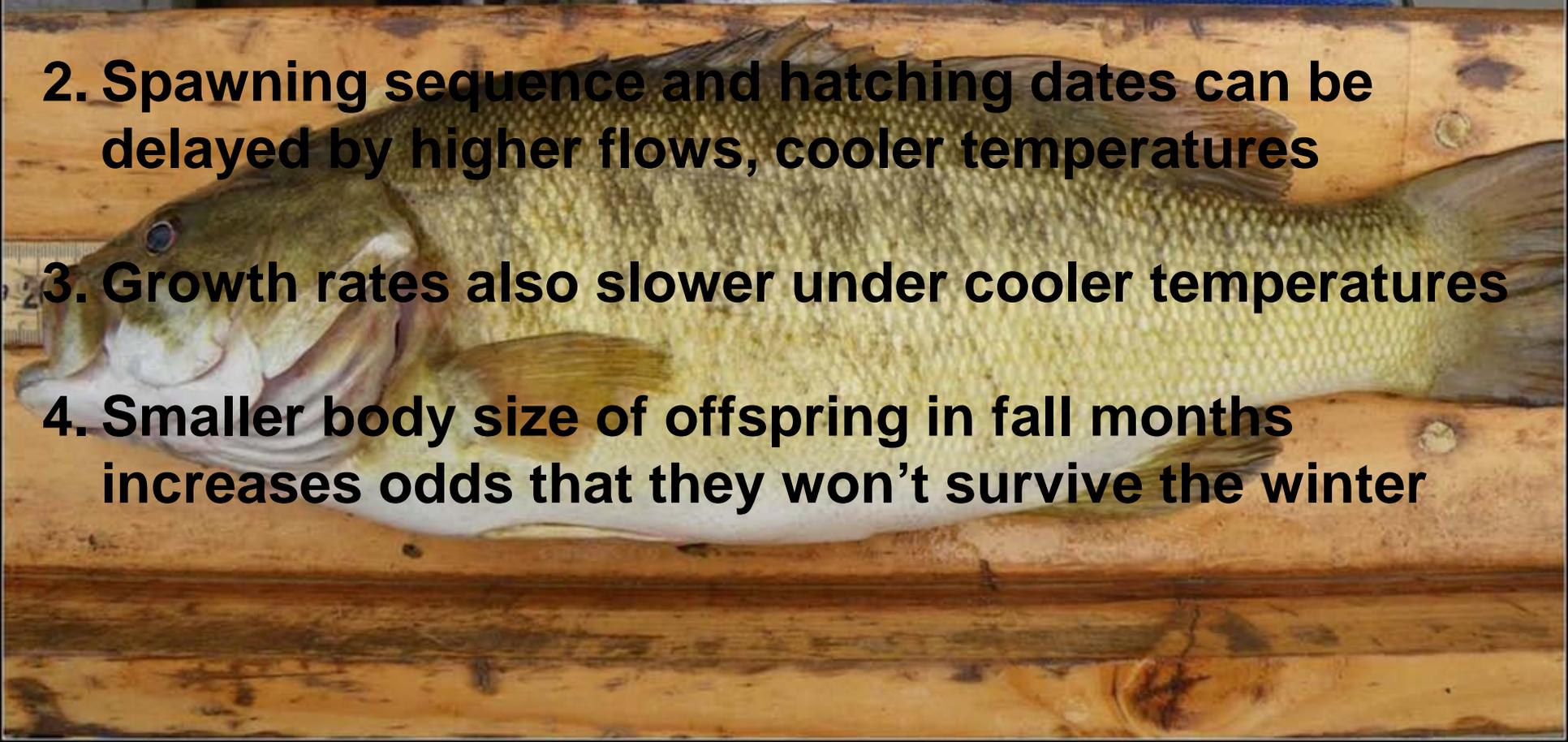
# **Base Flow Request : Smallmouth Bass**

**1. Spawning temperature 16 C (61 F)**

**2. Spawning sequence and hatching dates can be delayed by higher flows, cooler temperatures**

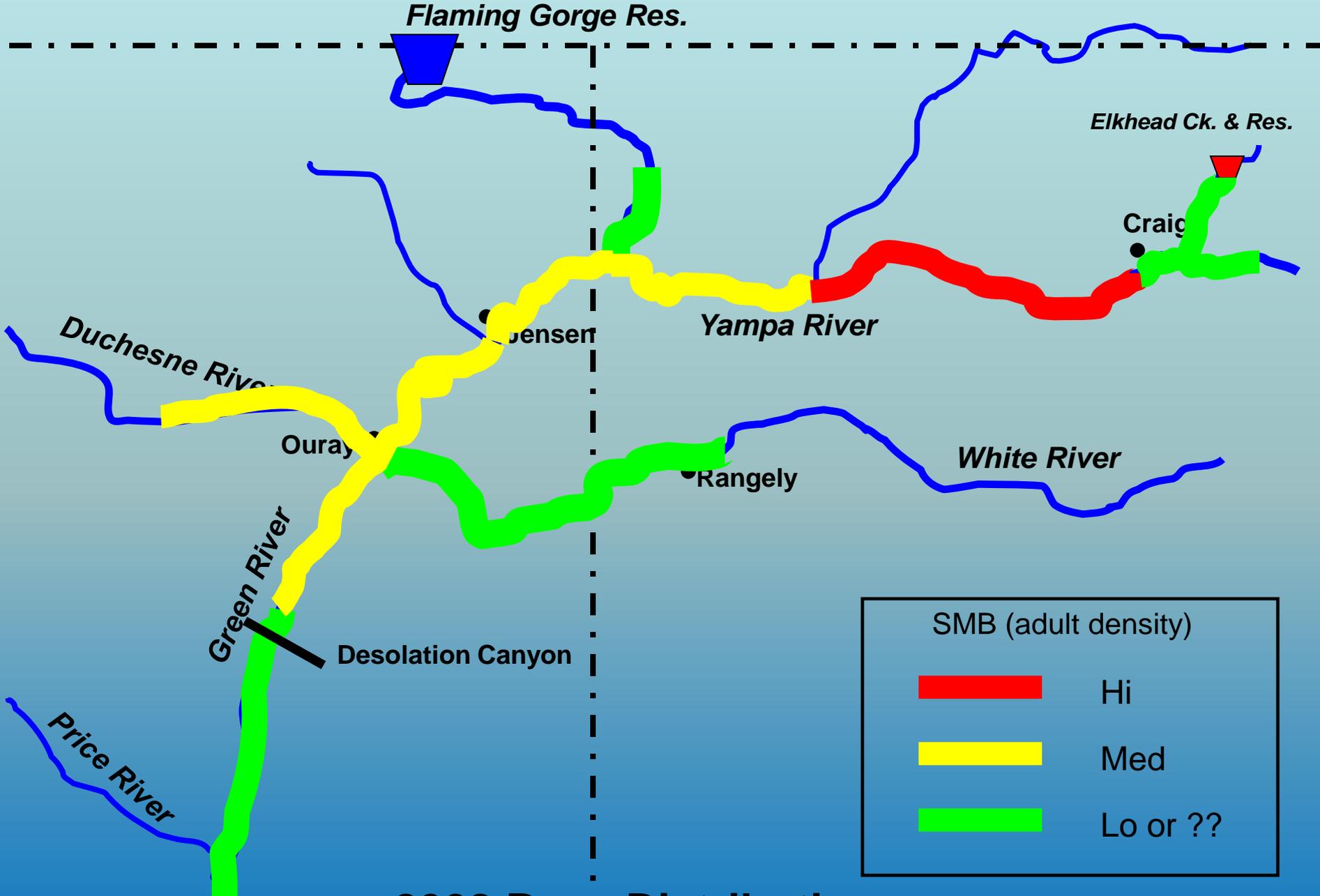
**3. Growth rates also slower under cooler temperatures**

**4. Smaller body size of offspring in fall months increases odds that they won't survive the winter**



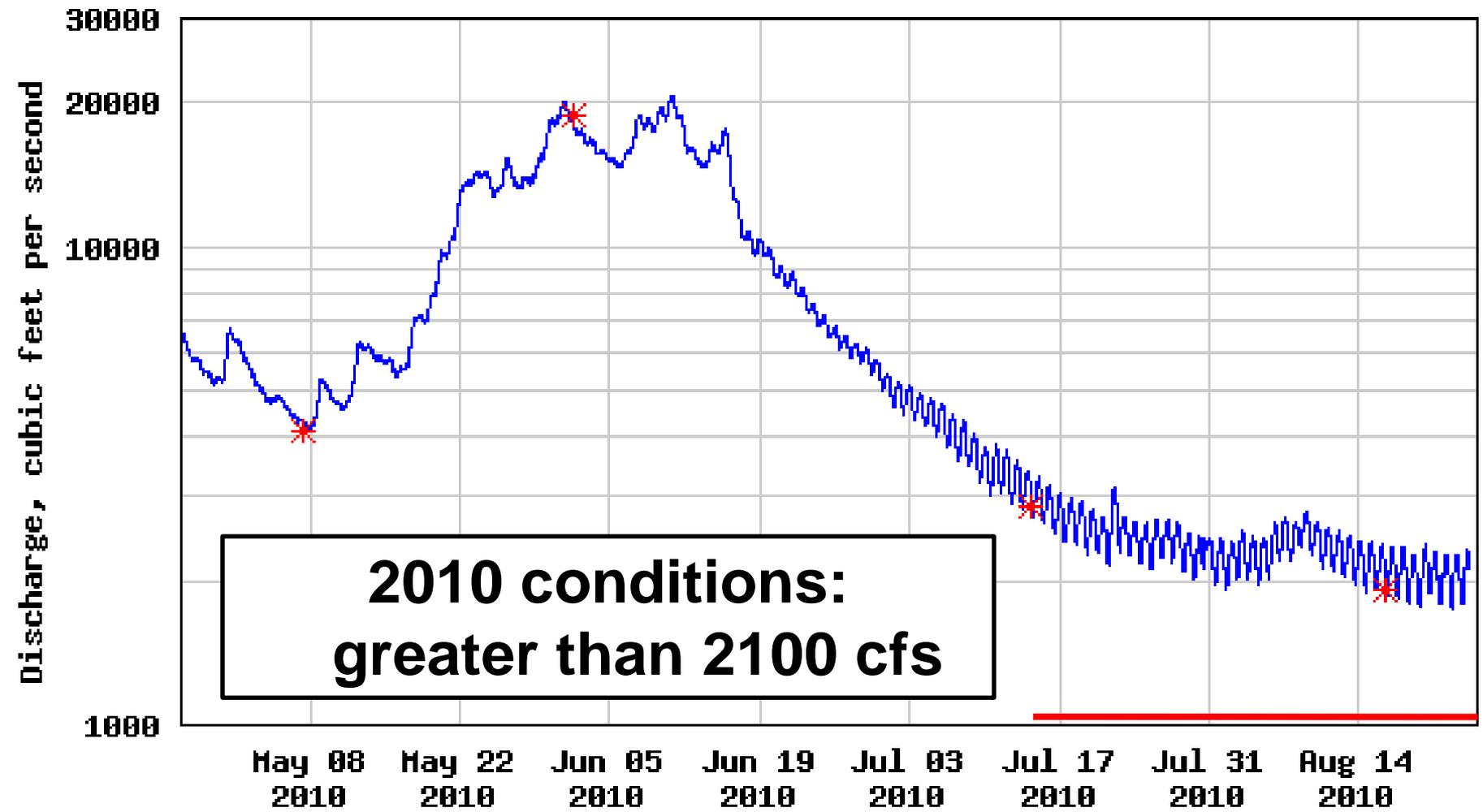
# Importance of 2010 in Smallmouth Bass removal efforts

- **Maturation of large cohort produced in 2007**
- **Efforts doubled or tripled in problematic areas this year**
  - (such as Yampa)
- **Efforts in Green continued**
  - (Lodore to Sand Wash and below)



**2008 Bass Distribution**

# USGS 09261000 GREEN RIVER NEAR JENSEN, UT



---- Provisional Data Subject to Revision ----

— Discharge

\* Measured discharge

# Results of 2010 Smallmouth Bass removal efforts

- **Efforts ongoing into September**
- **Data analysis will follow**
- **Optimistic that removal efforts and flows will disadvantage the large cohort**

# In other news.....

- Burbot found in Green River on 7/28
  - UDWR has no tolerance policy for burbot



Please remove,  
save, and report  
burbot to UDWR



535 mm, 970g  
1.5 mi upstream of Split Mtn boat ramp

# USGS 09261000 GREEN RIVER NEAR JENSEN, UT

