

# North American Green Sturgeon Impact Mitigation Measures in the Upper Sacramento River, California



Photo courtesy of USFWS



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# Orientation

## Northern California: Sacramento River:

Largest drainage in CA:  
486 'unobstructed' river kilometers.

## Red Bluff Diversion Dam (rk 391):

- USBR Facility
- Part of Central Valley Project
- In Operation 1966 - 2012.

## Existing Federal and State Storage and Conveyance Systems in California





# Orientation: **RBDD Gates Raised**



# Orientation: **RBDD Gates Lowered**



# SDPS Green Sturgeon Background

- Annual aggregations of green sturgeon in RBDD tailrace after spring gate closure
- Larval ST's sampled by RST's May-August in most years
- 2006 Federal ESA Listing of SDPS Green Sturgeon as Threatened
  - prompted greater level of concern by USBR
- 2007 Green sturgeon research/monitoring team formed (USBR/USFWS/UCD)
- 2009 NMFS Rewrites 2004 Biological Opinion on the Operation Criteria and Plan for the Central Valley Project



## The “Problem”: 2009 NMFS BO for CVP OCAP = Jeopardy

– Based on the best available scientific and commercial information, NMFS' final Opinion concludes that the **CVPI SWP operations are likely to jeopardize the continued existence of Federally listed:**

- Endangered Sacramento River winter-run Chinook salmon (*Oncorhynchus tshawytscha*),
- Threatened Central Valley spring-run Chinook salmon (*O. tshawytscha*),
- Threatened Central Valley steelhead (*O. mykiss*),
- Threatened Southern Distinct Population Segment (DPS) of North American green sturgeon (*Acipenser medirostris*), and**
- Southern Resident killer whales (*Orcinus orca*).

–NMFS also concludes that the proposed action **is likely to destroy or adversely modify the designated critical habitats of:**

- Central Valley spring-run Chinook salmon, and
- Central Valley steelhead, and
- proposed critical habitat for the Southern DPS of North American green sturgeon.**

# As a Result: Action Suite I.3 RBDD Operations

## 1.3.1 Operations after 5/14/12: Operate RBDD with Gates Out

- Construct Permanent Pumping Plant between 2009 and 2012.

## 1.3.2 Interim RBDD Operation (between 2009 and 2012)

- Gates In 2.5 months max
- Interim Pumping Plant 1.5 months
- No Emergency Closures

## 1.3.3 Interim Operations for Green Sturgeon

- Minimum Gate Height of 18" (allow safe downstream passage)





## As a Result: Action Suite I.3 RBDD Operations Continued

### 1.3.4 Measures to Compensate for Adverse Effects of Interim Operations on Green Sturgeon

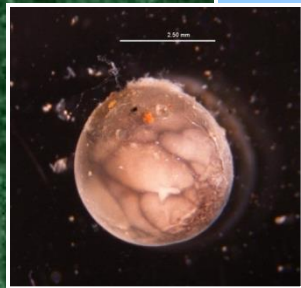
**Objective:** Offset short-term effects to green sturgeon due to interim gate operations by investing in geographically specific research needed to determine green sturgeon life history and recovery needs.



# As a Result: Action Suite I.3 RBDD Operations Continued

## 1.3.4 Measures to Compensate for Adverse Effects of Interim Operations on Green Sturgeon

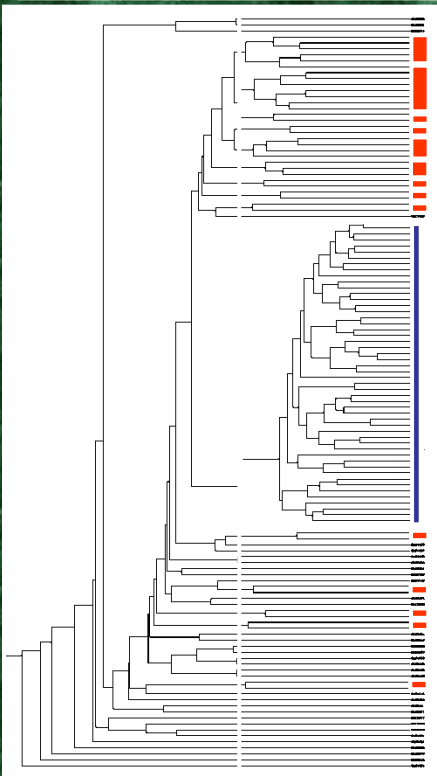
- 1a. Genetic Evaluations of Adults and Juveniles
- 1b. Telemetry of Adult Movements
2. Characterization of Spawning Grounds
3. Juvenile Telemetry and ID of Critical Rearing Habitat
4. Spawning of Wild Caught Adults (for use in task 3)
5. Larval/Juvenile Green and White Sturgeon Response Behavior to Fish Protection Screens and Louvers.



# As a Result: Action Suite I.3 RBDD Operations **Status:**

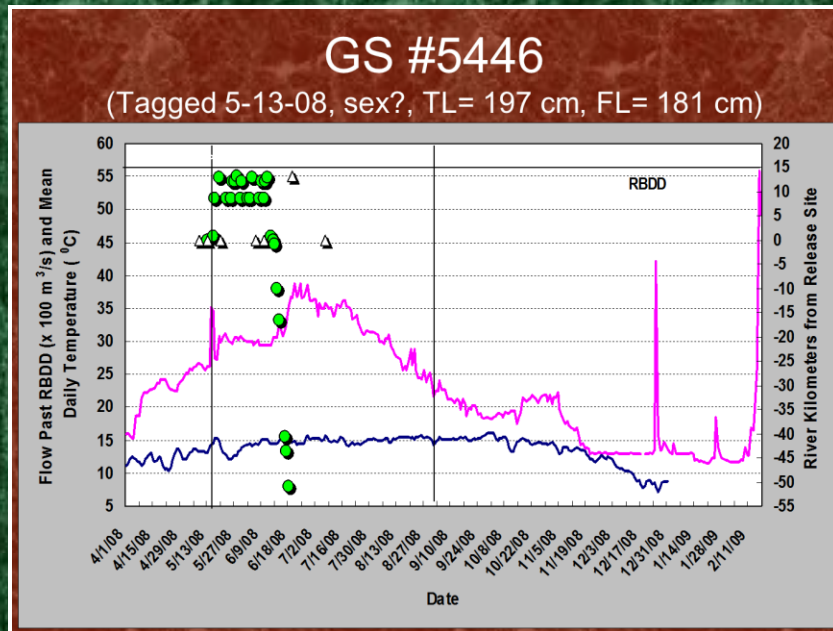
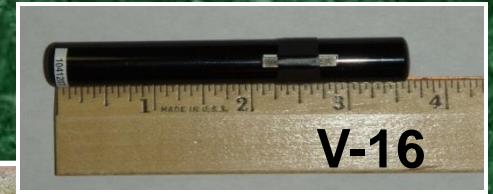
## 1.3.4 Measures to Compensate for Adverse Effects of Interim Operations on Green Sturgeon

- 1a. Genetic Evaluations of Adults and Juveniles (**In Progress**)
4. Spawning of Wild Caught Adults (**Stalled in Permitting**)
5. Larval/Juvenile Green and White Sturgeon Response Behavior to Fish Protection Screens and Louvers. (**In Progress**)



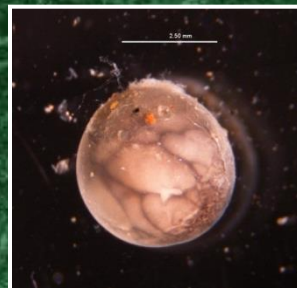
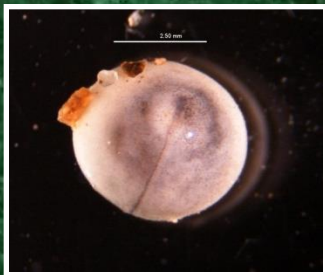
# 1b. Telemetry of Adult Movements

- ❖ 37 Adult Greens tagged
- ❖ Stationary and Mobile Tracking
- ❖ VPS System at RBDD
- ❖ Spawning Reach Movements
  - ❖ Spawning locations determined
  - ❖ Movement patterns acquired
  - ❖ Periodicity and Fidelity in progress

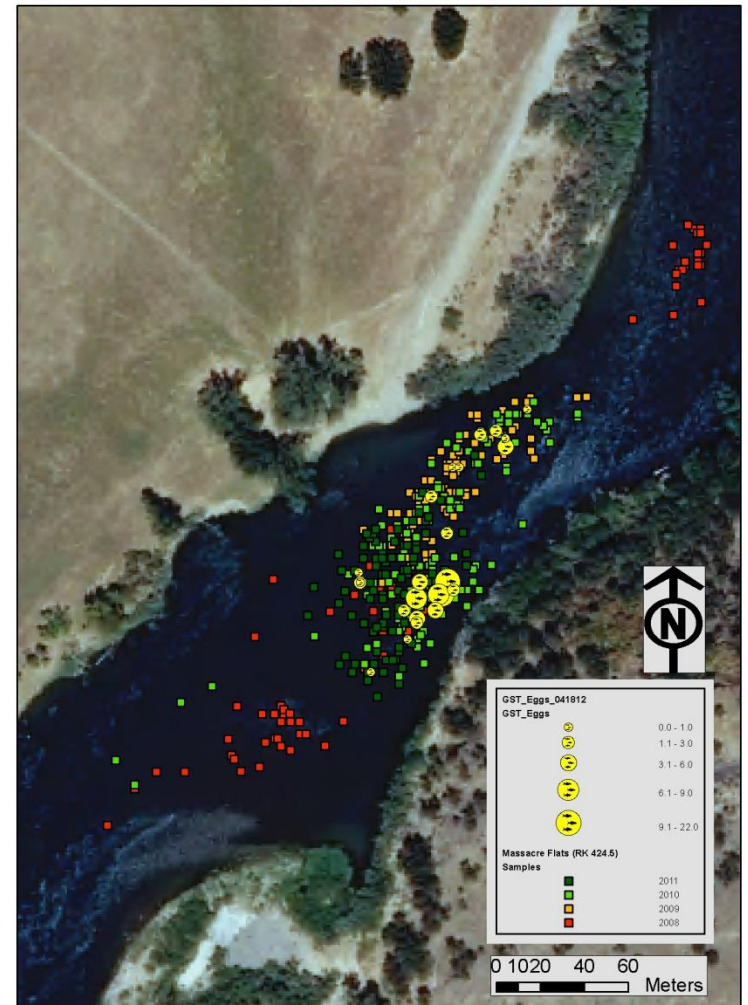


## 2. Spawning Habitat Characteristics:

- ❖ 7 of 11 sites confirmed
  - ❖ 94 river km reach
- ❖ 214 Green Sturgeon Eggs
- ❖ Spawning April to July
  - ❖ Above, at, and Below RBDD
- ❖ Substrate Analysis in progress
- ❖ Bathymetry in progress
- ❖ Velocity Profiling in progress

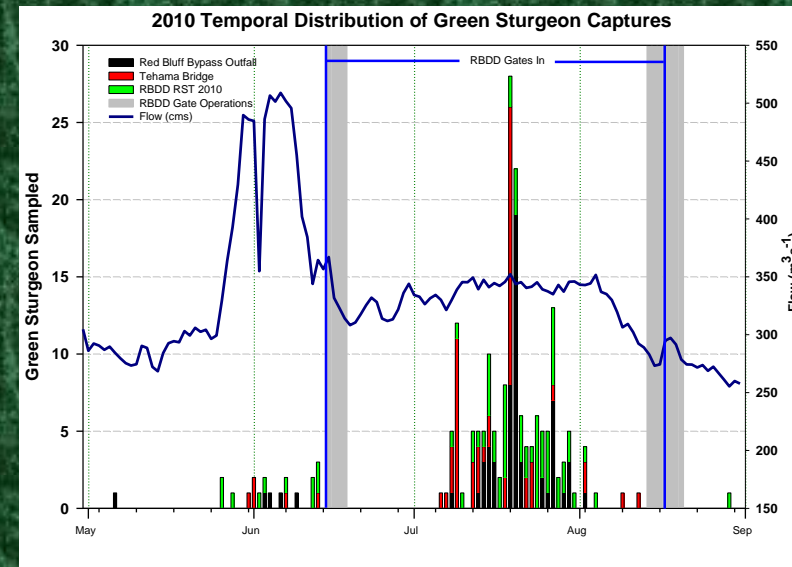


Massacre Flats (RK 424.5) Green Sturgeon Egg Samples 2008-2011



# 3. Juv. Movements/ ID of Critical Rearing Habitat

- ❖ 118 of 814 larvae sampled
  - ❖ D-net Samples
  - ❖ Transfer & Grow-out in Lab
  - ❖ Reared to 300 mm
    - ❖ 100 tagged and released
      - ❖ 2011 (6), 2012 (10), 2013 (70+)
- ❖ Drift Dynamics in Progress
  - ❖ 74 river km reach
  - ❖ Possible 2 step migration pattern
- ❖ Habitat Use Analysis in Progress



# Conclusions

- **Action Suite 1.3.2 and 1.3.3 : Effective**
  - Adults successfully passed under 18” gate openings in multiple years
  - Smaller proportion of spawning activity affected by June 15 gate closure
    - Greater access to upper river spawning sites
      - Allee effects minimized
      - Thermally optimal for late or dry year spawning
- **Action Suite 1.3.1** Employment of permanent pumping plant
  - Benefits to adults and larvae; salmonids too!
  - New (-) impacts????



# Avoid Jeopardy!



Gates Up Year Round :Permanent Pumping Plant (USBR)



# Conclusions

- **Appendix 2-B (1.3.4): Effective**
  - Conservation Measures (Life-history studies) **Very Beneficial**
    - Increased knowledge of green sturgeon habitat use
      - Spatial and temporal attributes
      - Reproductive cycle and productivity
      - Confirmed negative effects of RBDD
    - Data and Information will be beneficial for recovery planning
      - Inputs into life cycle models
      - Reduced uncertainty
      - Secondary population habitat needs (Feather and or Yuba?)



# Acknowledgements

