Egg Survival Investigations 2011 and 2012 San Joaquin River

Fisheries Technical Feedback Group Meeting

March 1, 2013

Turlock, Ca.

Background

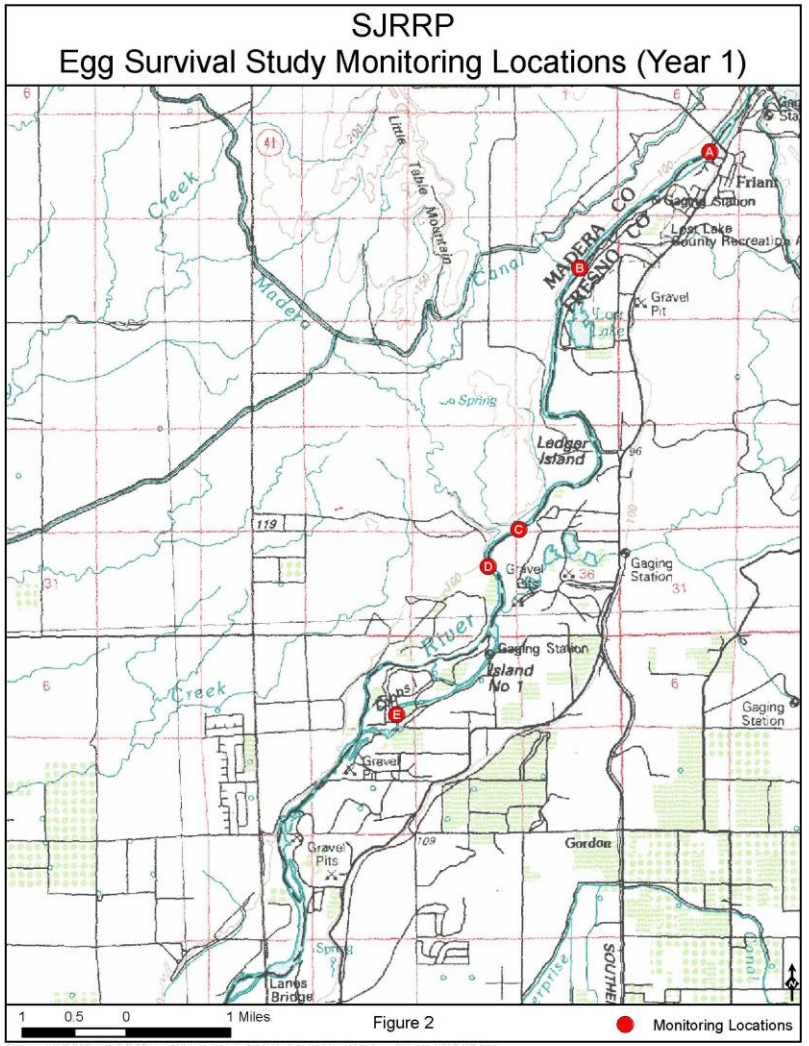
- Purpose: Evaluation of the survival of incubating salmonid eggs in existing gravel beds

- Study Elements:
  - Use existing model to predict egg survival based on particle size analysis
  - create 10 artificial redds from Friant Dam to Hwy 41
  - measure water quality (Dissolved Oxygen, Temperature, Permeability)
  - Bury egg tubes with eyed fall run chinook eggs
  - assess development and survival of embryos
  - Compare predicted v. empirical survival

- Management Implications
  - Predict survival estimates for reintroduced population
  - Determine appropriate spawning habitat restoration actions

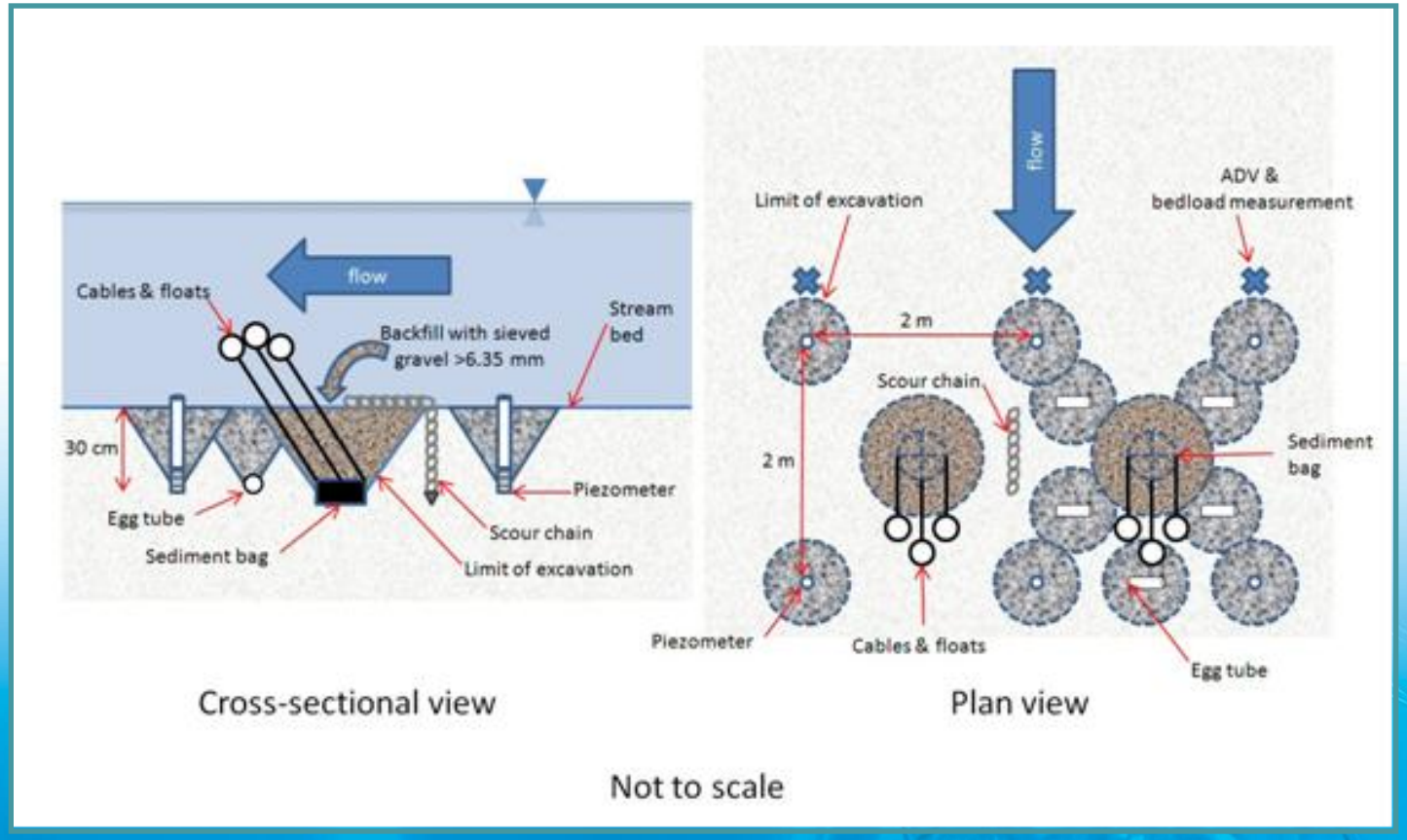
Methods

- Study Location:
  - Reach 1a
  - 5 locations from Friant Dam to Hwy 41
    - RM 266.8 – Below Friant
    - RM 264.5 – Lost Lake Riffles
    - RM 261.4 - Willow ER
    - RM 258.5- Oak Hollow
    - RM 255.7 – Hwy 41



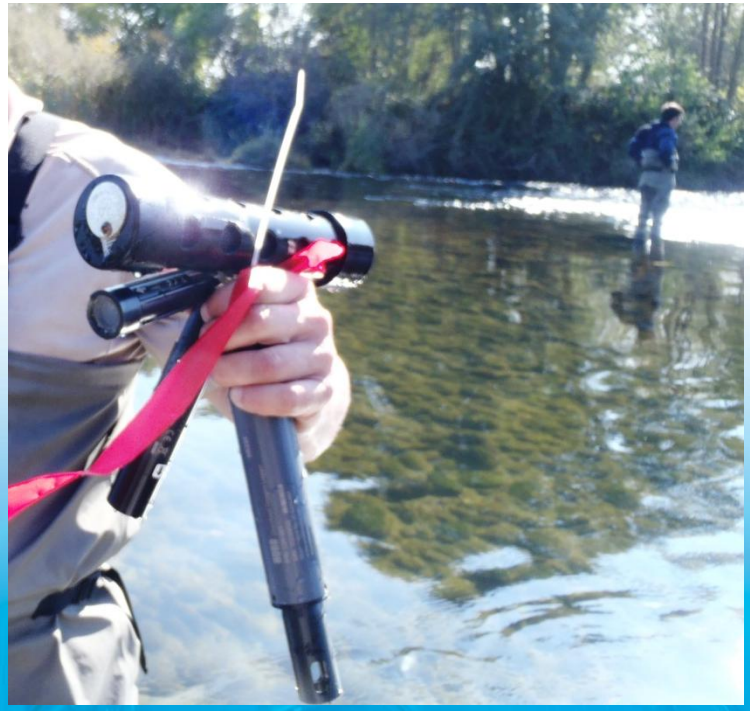
Methods

- Artificial Redds
  - Each location, 2 artificial redds
  - 5 ‘egg pockets’ in one redd
  - Each egg pocket – 1 egg tube with 50 eyed eggs from FRFH



Methods

- Measured Variables
  - Gravel size distribution – from DWR bulk samples and surface transects
  - Permeability – in situ peizometer measurements
  - Fine sediment accumulation – measured from sediment bag collections
  - Water Temperature
    - Surface and hyporheic
  - Dissolved Oxygen
    - Surface and hyporheic



Methods

- Egg Tubes
  - PVC tubes with drilled holes
  - Mesh screen liner
  - PVC caps
- Installation
  - 50 eyed eggs per tube
  - Buried 6-18 inches deep

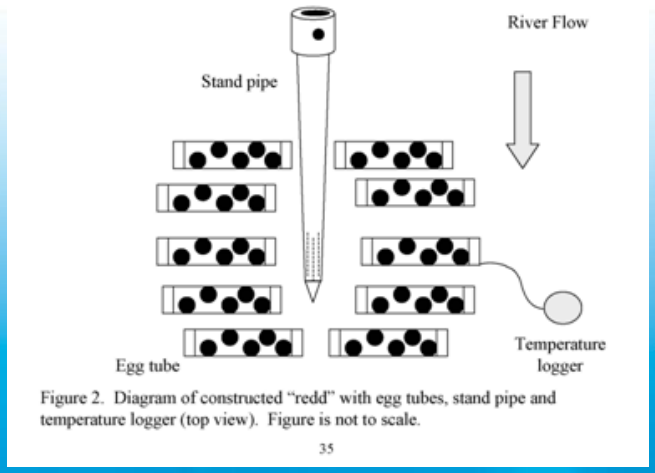


Figure 2. Diagram of constructed "redd" with egg tubes, stand pipe and temperature logger (top view). Figure is not to scale.

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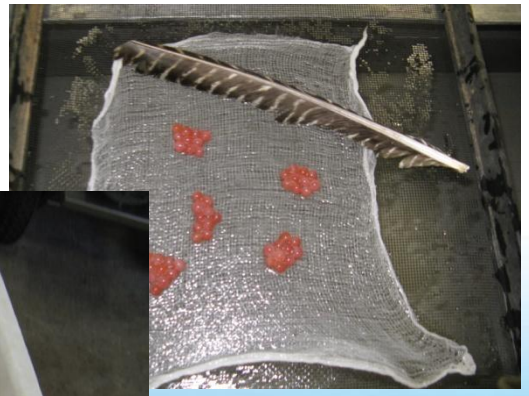
Methods

- Egg Collection and Handling
  - Eyed eggs from FRFH were packed in cheesecloth packets and transported in styrofoam carrier layered with non-chlorinated ice
  - 2 control groups
    - 1 stayed at FRFH in egg tubes held in Heath incubation trays
    - 1 traveled to SJR, then back to FRFH then held in Heath incubation trays



Methods

- Egg Tube Retrieval
  - Accumulated thermal units (ATU) used to determine hatching and emergence timing
  - Egg tubes were retrieved and contents emptied into trays and counted streamside
  - Embryos were rated for level of development
  - Mortalities were counted

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Results

- 2011 and 2012

2011 and 2012 Egg Survival in artificial redds in Reach 1A			
	2011	2012	Predicted
Location	Average Percent	Average Percent	Survival
Site A	49.99%	54.00%	90.35
Site B	35.87%	36.00%	63.09
Site C	13.46%	20.00%	40.50
Site D	28.57%	46.00%	48.68
Site E	34.78%	36.00%	0.00
Travel Control	66.47%	79%**	n/a
Non Travel Control	51.02%		n/a

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Results

- Sediment size classes

Summary of Bulk Substrate Sample Data and Predicted Salmonid Embryo Survival

Sample ID	**1A**	**7**	**12**	**22**	**25star**
Rivermile	**266.81**	**264.57**	**261.43**	**258.57**	**255.73**
Egg Survival Study Site	**A**	**B**	**C**	**D**	**E**
Total Bulk Sample Weight (g)	33848.6	53813.8	42263.9	61374.5	41888.3
Gravel %	98.44%	91.66%	90.74%	93.49%	77.77%
Sand %	1.55%	8.28%	9.09%	6.50%	22.15%
Mud %	0.01%	0.06%	0.17%	0.01%	0.07%
Composition Summary					
D10:	9.8	2.7	2.4	7.3	0.6
MEDIAN or D50:	59.4	30.6	41.9	54.6	21
D90:	135.7	93.6	138.7	146.8	72.5
D16:	15.1	7.2	8.6	15	0.9
D84:	122.2	77.3	118.4	129.8	60.6
D25:	22.9	13.4	16.1	25.6	4.2
D75:	109.9	58.2	94.9	98	47.9
D9.5mm:	35.45%	44.02%	48.27%	47.03%	58.46%
D0.85mm:	1.39%	8.29%	12.07%	10.72%	26.59%
Percent Survival (Chinook):	90.35	63.09	40.50	48.68	0.00
Percent Survival (Steelhead):	97.78	65.95	43.44	51.71	0.00

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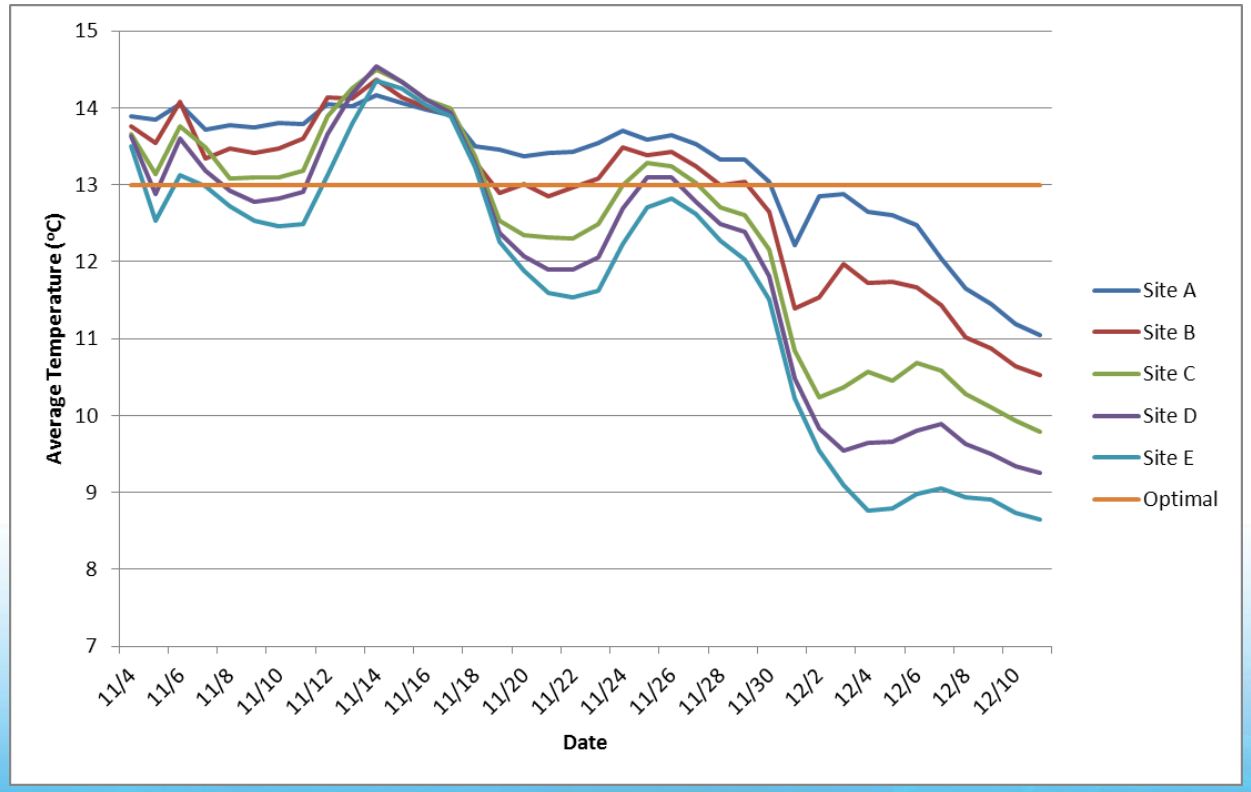
Results

- 2011 Hyporheic Temperature



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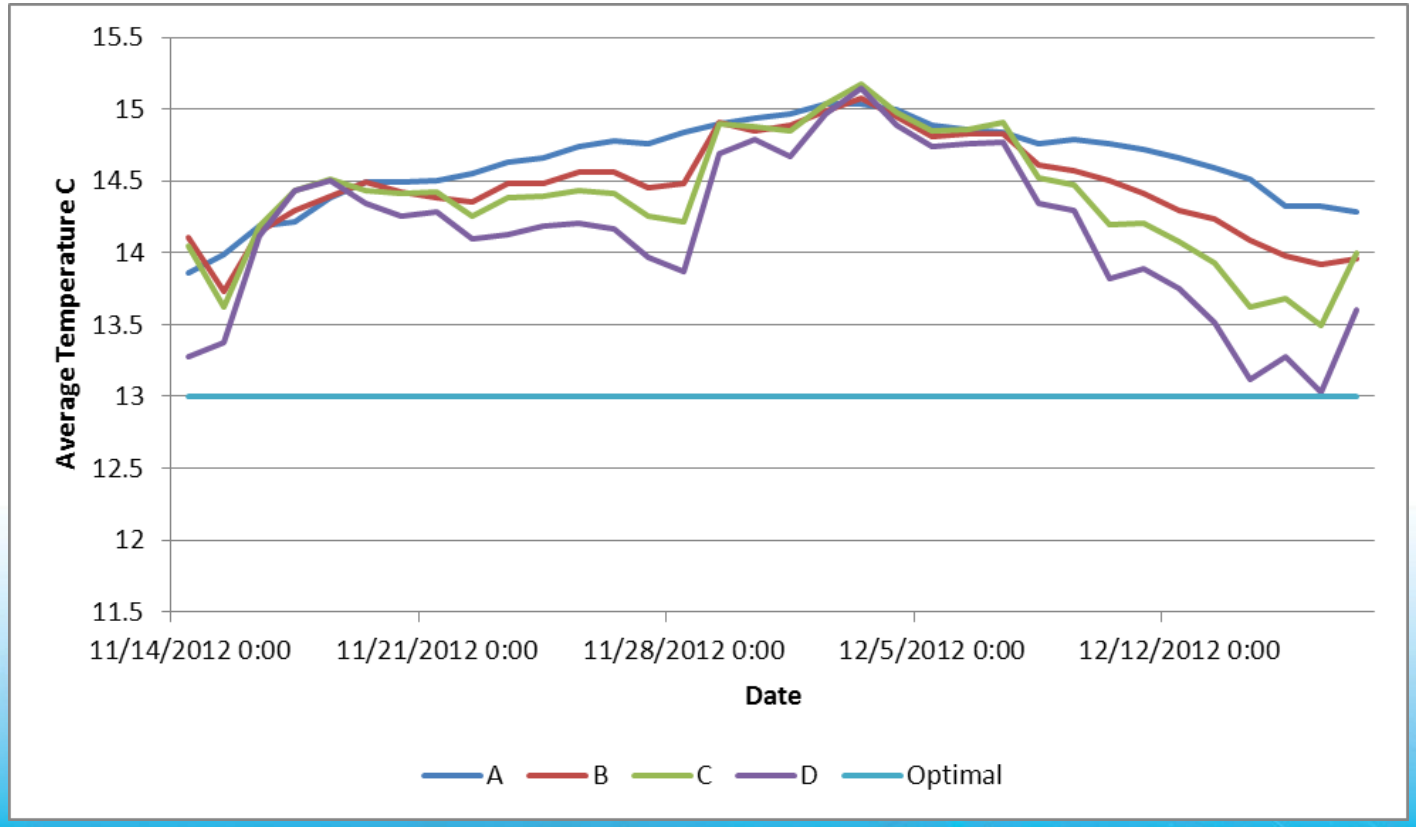
Results

- 2012 Hyporheic Temperature



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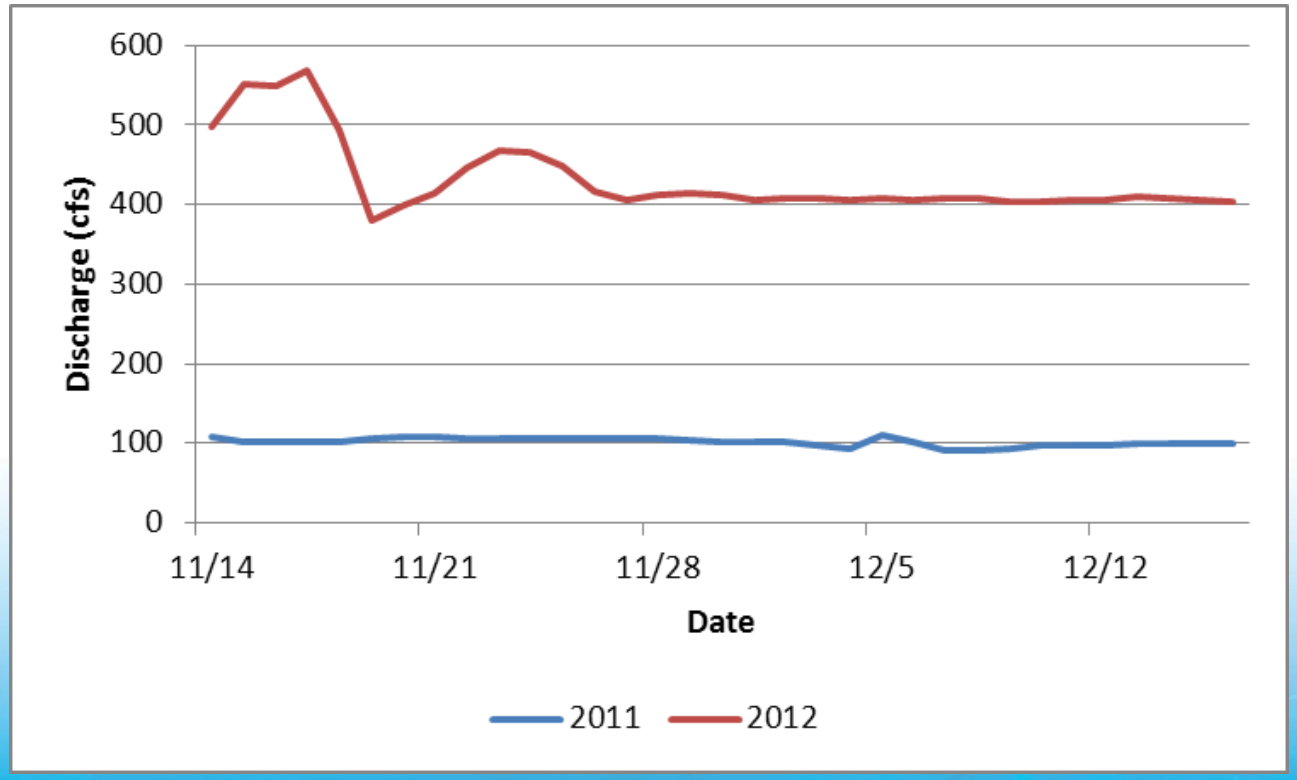
Results

- 2011 and 2012 discharge



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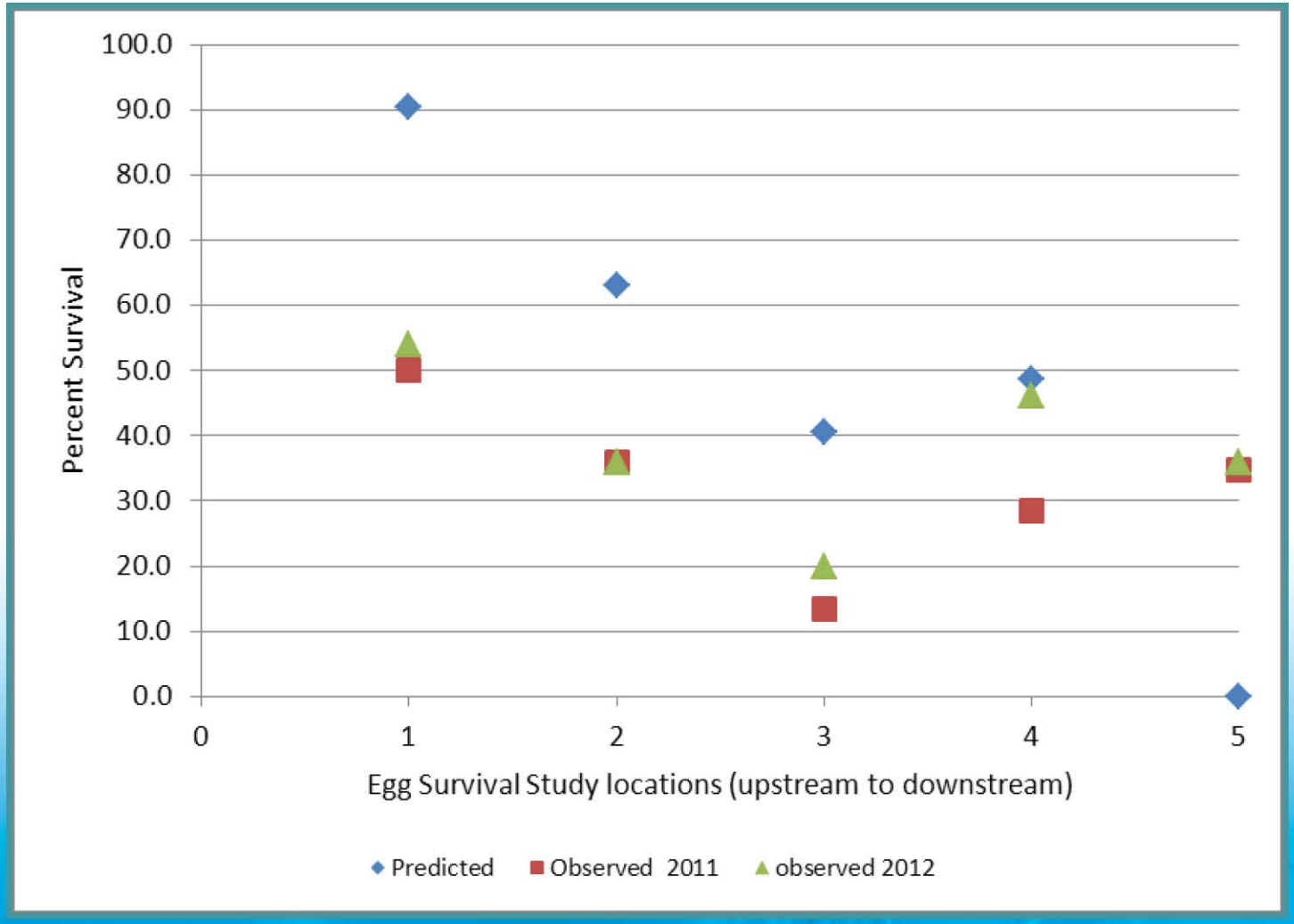
Results – Survival



Preliminary Interpretation

- Expected Survival at Site A
  - Large grain size (4-5”), minimal fine sediment predict ~90% survival

Sample ID	1A	7	12	22	25star
Rivermile	266.81	264.57	261.43	258.57	255.73
Egg Survival Study Site	A	B	C	D	E
Sieve Size mm					
256	0	0	0	0	0
180	1	0	0	0	0
128	29	6	9	2	0
90	36	6	28	20	0
64	15	6	22	21	14
45	9	11	19	22	20
32	3	28	11	9	15
22.6	6	16	4	7	12
16	4	16	4	6	10
11.3	1	7	2	6	11
8	0	5	2	6	8
5.7	0	3	3	1	6
4	0	1	0	1	2
2	0	1	0	0	1
<2	0	0	0	0	3

Preliminary Interpretation

- Expected Survival at Site E
  - Model predicts 0% survival
  - This site only has an unstratified substrate sample, so overall occurrence of fines is >75% in the sample

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Questions