

CVPIA Fisheries Science Integration Team Workshop



Wednesday, June 20, 8:30 to 1:00 PM

- | | |
|-------------|---|
| 8:30–9:00 | Welcome and introductions as needed |
| 9:00–10:00 | Update on watershed expert meetings (Shane)

Update on habitat decay, food for fish, and ocean survival proposals (Shane, Adam, and Jim)

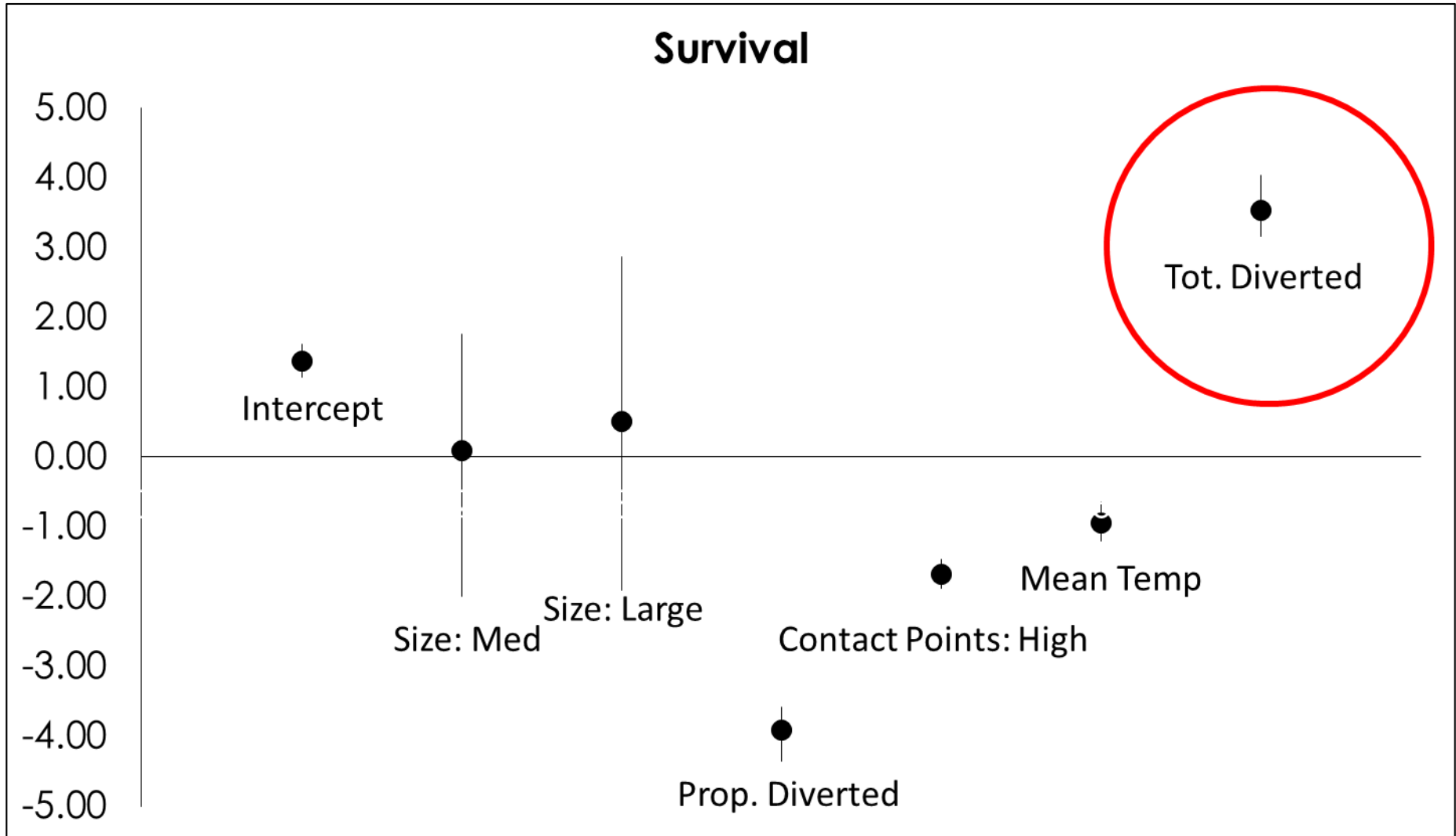
Update on fall run Chinook integrated analysis (Adam) |
| 10:00–10:20 | Break |
| 10:20–12:00 | Review current Chinook scenarios (Adam and Jim) |
| 12:00–1:00 | Lunch |

Update on integrated model

1. Water diversions
2. Spatial mismatch in rotary screw-trap locations and habitat data
3. Only 25% of hatchery fish are marked...How do we deal with this?
4. When were traps run multiple times in a day?
5. Pre-spawn mortality

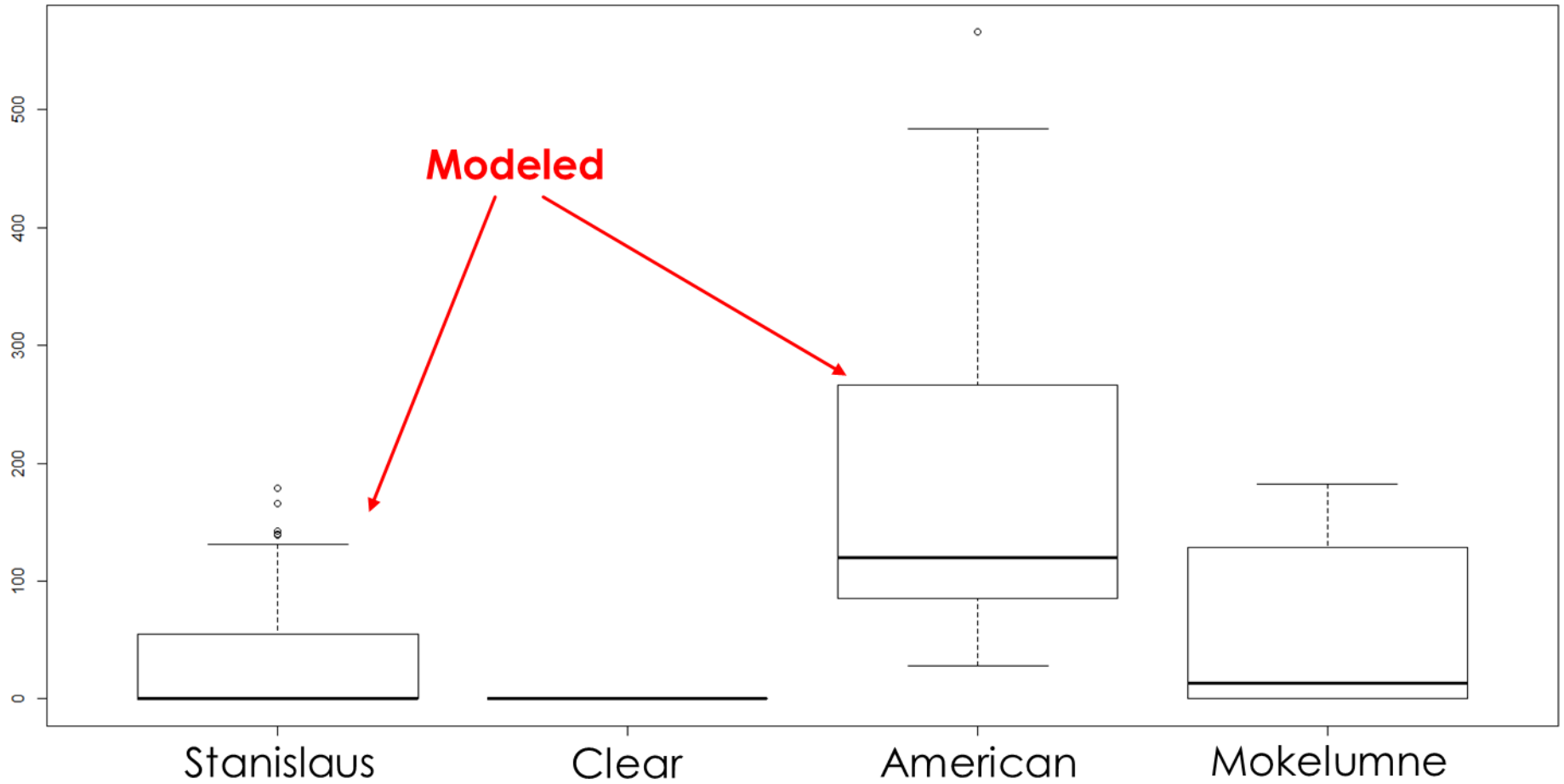
Model Application

Preliminary Results



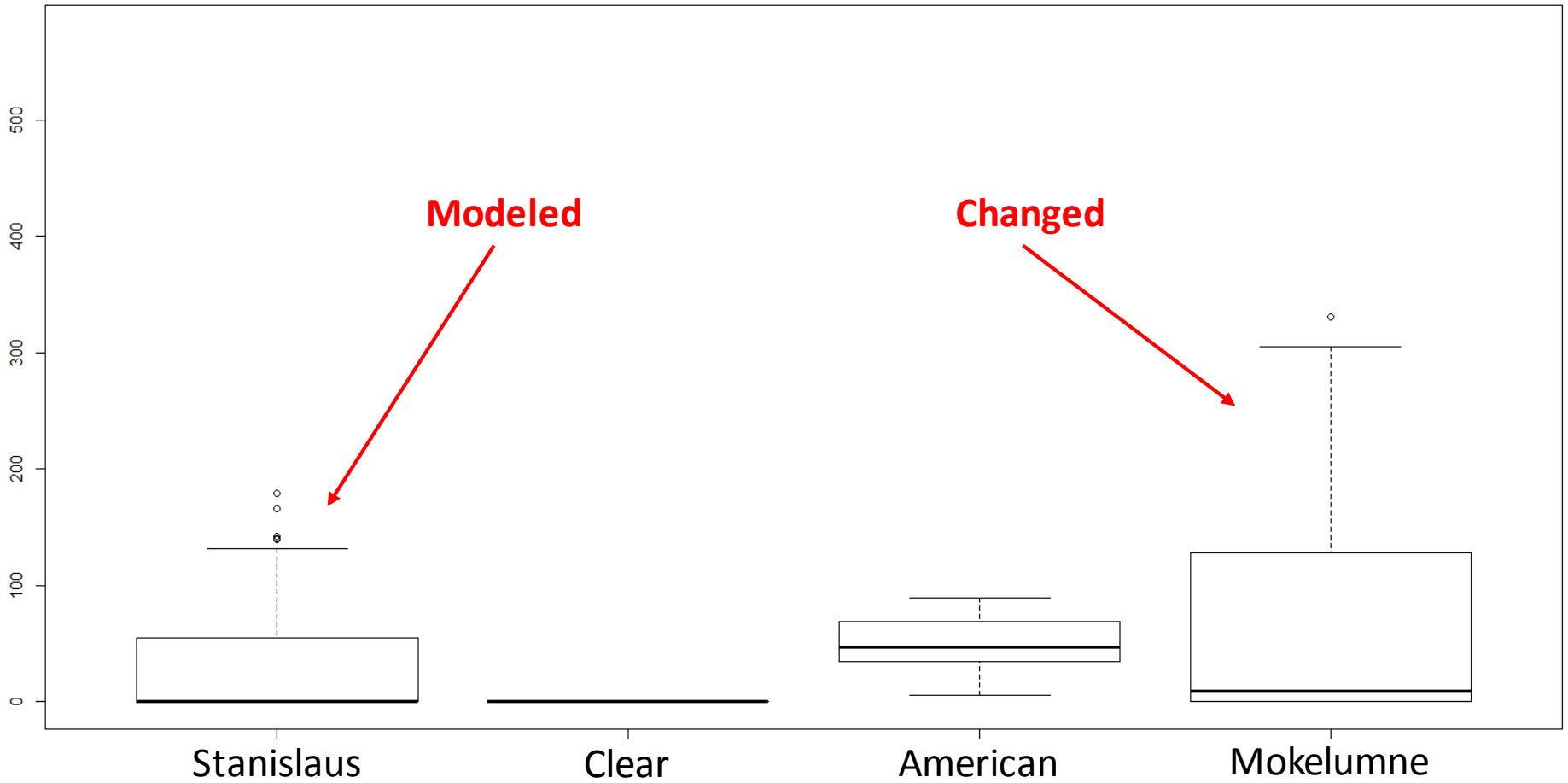
Total water diverted per site

Total diversions (cfs)

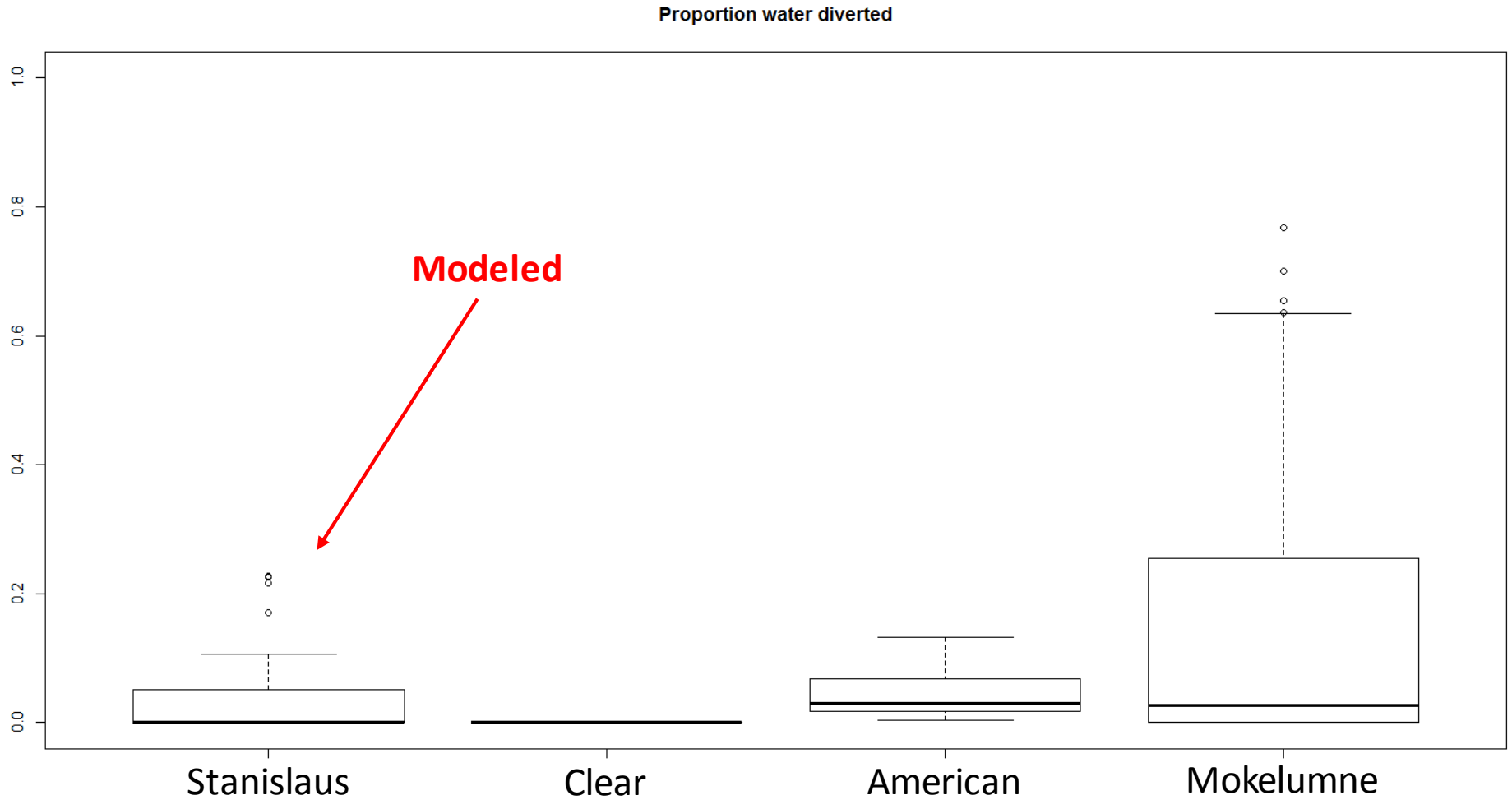


New total water diverted per site

Total water diverted (cfs)



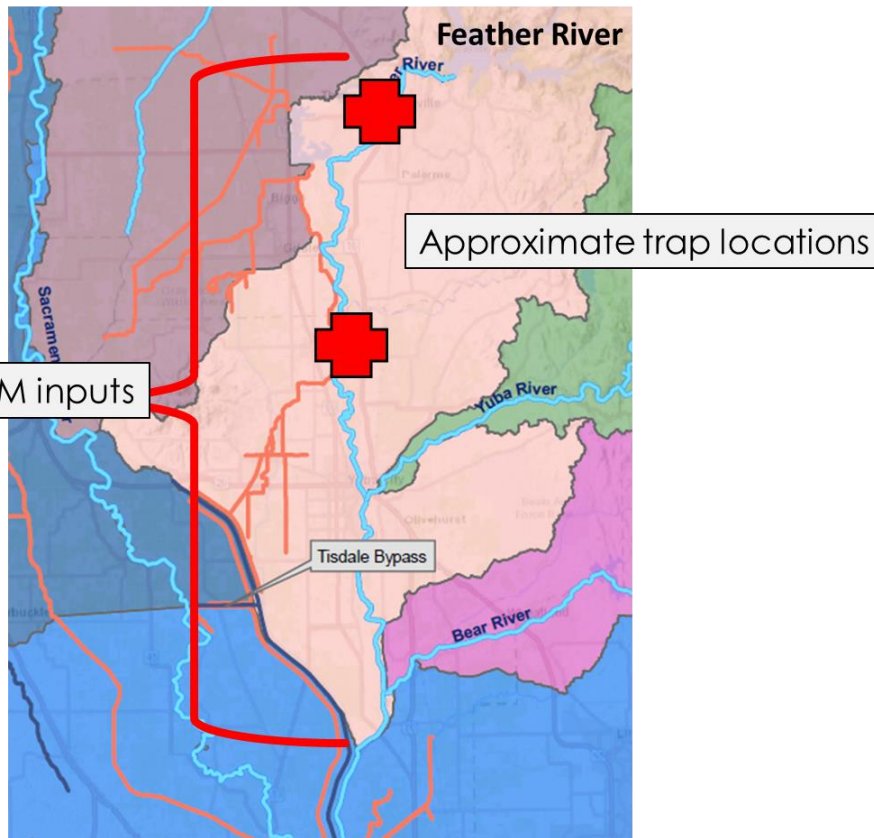
New proportion water diverted per site



Update on integrated model

- ~~1. Water diversions~~
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5. Pre-spawn mortality

Spatial mismatch



- It is a problem at multiple sites
- We tracked down the river mile of all trap locations
- Going to adjust habitat data to match RST locations and resolve the issue (Diversions?)

Update on integrated model

- ~~1. Water diversions~~
- ~~2. Spatial mismatch in rotary screw trap locations and habitat data~~
3. Only 25% of hatchery fish are marked...How do we deal with this?
4. When were traps run multiple times in a day?
5. Pre-spawn mortality

Hatchery fish

Only 25% marked...How do we deal with this on Mokelumne, American, and Feather?

Mokelumne River

- Release hatchery fish below the RSTs

American River

- ???

Feather River

- Release hatchery fish below the RSTs

Update on integrated model

- ~~1. Water diversions~~
- ~~2. Spatial mismatch in rotary screw trap locations and habitat data~~
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4. When were traps run multiple times in a day?
5. Pre-spawn mortality

Identifying days sampled

Steps...

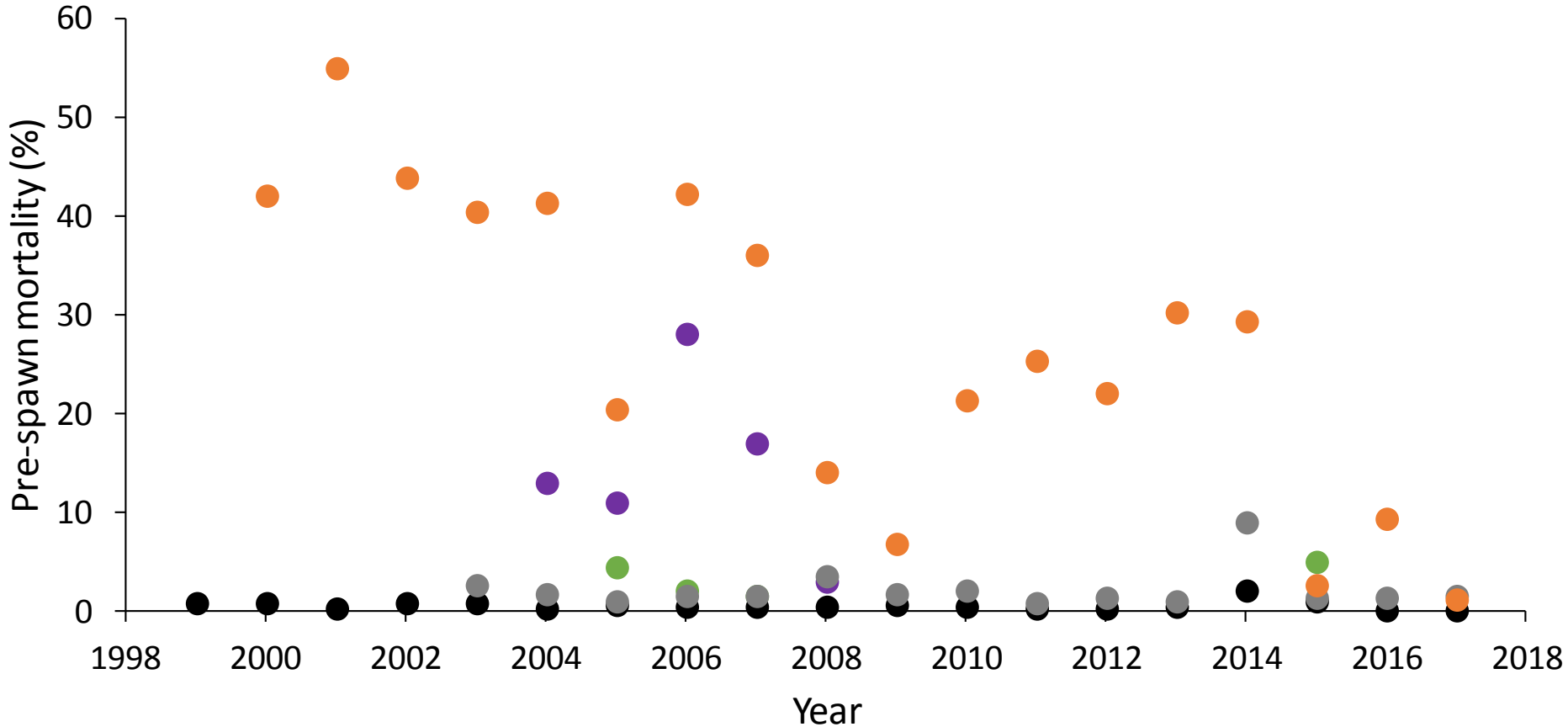
- Identified the sample minutes per unique combination of year, month, hour, and trap (remove duplicate inputs)
- If trap was checked in day t after 1200hrs, its catch data were associated with day $t+1$
- Summed the sample minutes per unique combination of year, month, day and trap
- Identify which traps were open for 24 ± 2 sample hours for each year, month, day, trap combination
- If **all** traps were open for 24 ± 2 sample hours (each) on a given day, that day was “sampled”

If I summarize at the monthly scale, how do we combine data with multiple traps?

Update on integrated model

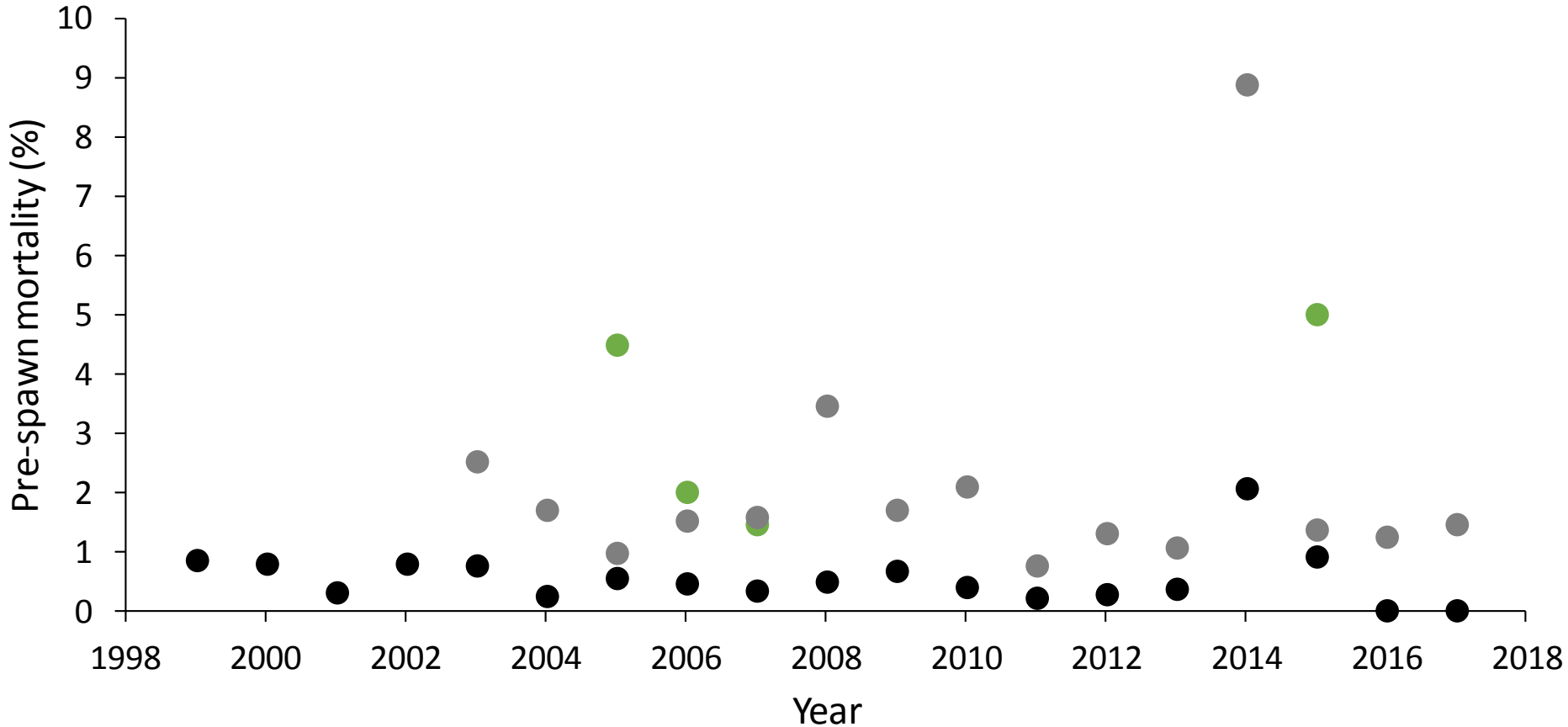
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- ~~4. When were traps run multiple times in a day?~~
5. Pre-spawn mortality

Pre-spawn mortality (%)



● Mokelumne 04-08 ● Stanislaus 05-07, 15 ● Clear 99-17 ● Sacramento 03-17 ● Feather 00-17

Pre-spawn mortality (%)



● Stanislaus 05-07, 15 ● Clear 99-17 ● Sacramento 03-17

American?

Update on integrated model

Next Steps

1. Thoroughly examine Feather River and Tuolumne River data
2. Continue to look for missing pre-spawn mortality data/estimates (American and maybe Tuolumne)
3. Continue to look for Stanislaus ~~and Feather~~ River water diversion data (maybe Tuolumne)
4. Evaluate habitat input – trap location overlap
5. Continue to look for answer: How to treat hatchery fish on the American River?
6. Incorporate uncertainty in fecundity
7. Refit the model

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Proposed units of effort (A & J strawdog)

Diversion screening

- 10 cfs
- 1 to 6 units (for scenarios)

Create spawning habitat

- 1.0 ac
- 1 to 6 units

Create perennial rearing habitat

- 2.0 ac
- 1 to 6 units

Create seasonally inundated (tributary) rearing habitat

- 1.00 ac
- 1 to 10 units

Create seasonally inundated (lowland) rearing habitat

- 10 ac
- 1 to 10 units

Want this to reach a max of 1,500 acres

Create delta rearing habitat

- 30 ac
- 1 to 6 units

Station screening/large diversions?

Waiting on diversion information



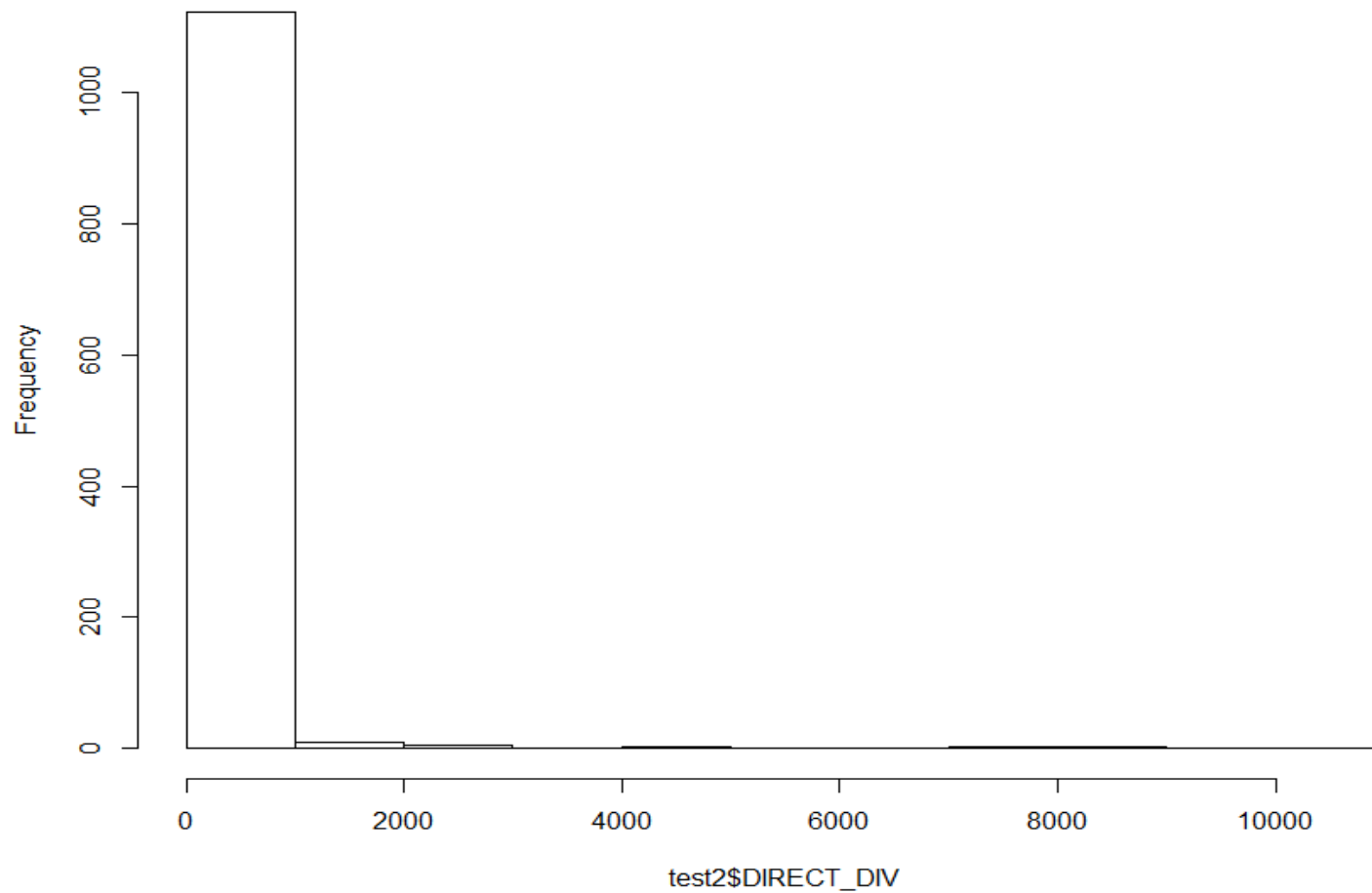
Water diversions

(Using the eWRIMS database tool)

Water diversions

(Using the eWRIMS database tool)

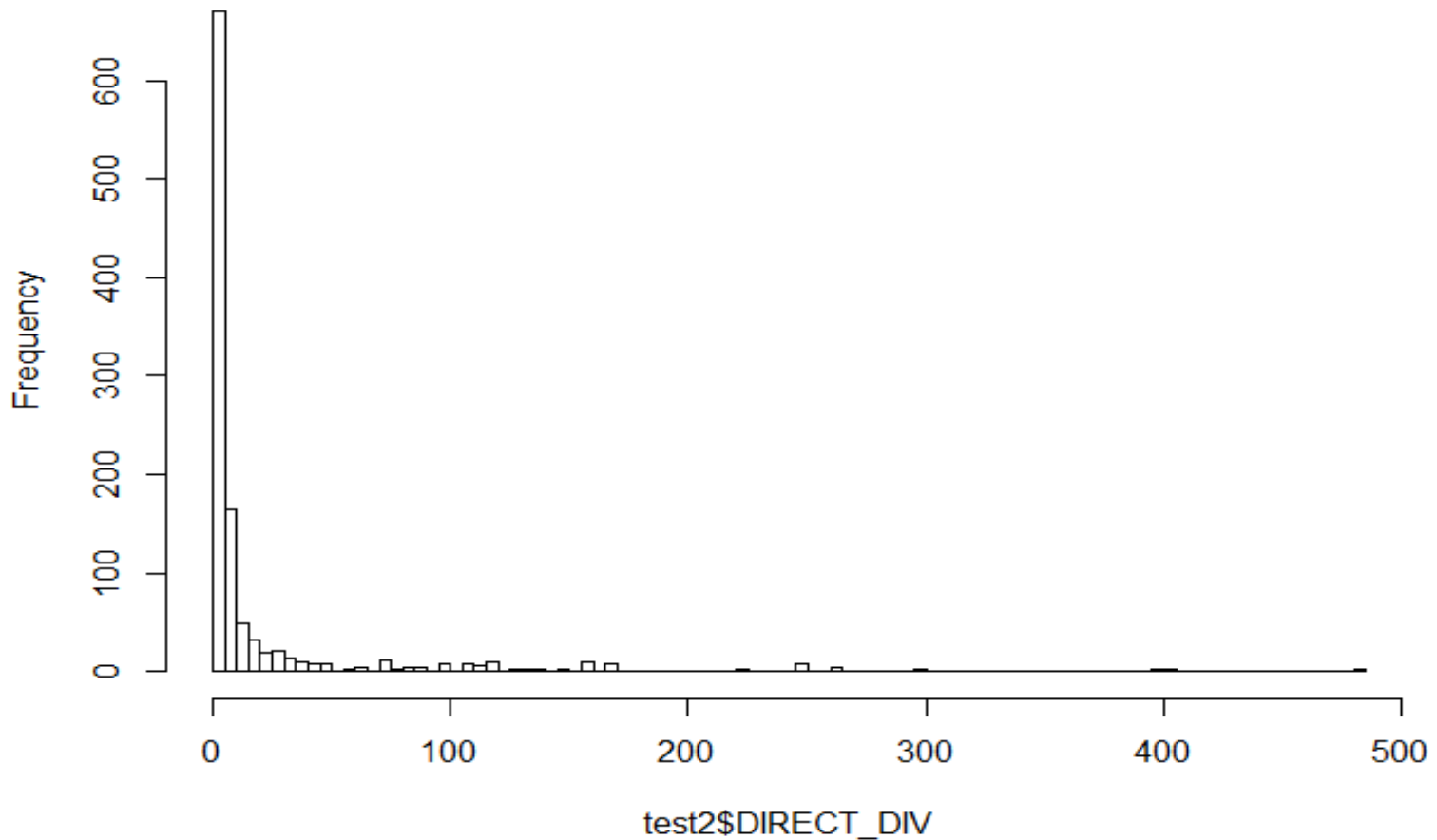
Histogram of test2\$DIRECT_DIV



Water diversions

(Using the eWRIMS database tool)

Histogram of test2\$DIRECT_DIV



Final units of effort*

Diversion screening

- 10 cfs
- 1 to 9 units

Station (large diversion) screening

- 100 cfs
- 1 to 5 units

Create spawning habitat

- 1.0 ac
- 1 to 6 units

Create perennial rearing habitat

- 2.0 ac
- 1 to 6 units

Create delta rearing habitat

- 30 ac
- 1 to 6 units

Create seasonally inundated (tributary) rearing habitat

- 1.0 ac
- 1 to 10 units

Create seasonally inundated (lowland) rearing habitat

- 150 ac
- 1 to 10 units

Chinook Scenarios

Scenario	Changes
Reduce water diversions (small and large separately) April and May (one month at a time) San Joaquin watersheds	See Unit of Effort Slide
Eliminate predator contact points Each watershed (individually)	**Tabled till results on predator contact points come in**
Increase habitat Seasonally inundated juvenile habitat each watershed (individually) at 2 yr freq (tributary and lowland separately)	See Unit of Effort Slide
Seasonally inundated juvenile habitat each watershed (individually) at 1 yr freq (tributary and lowland separately)	
Perennially inundated juvenile habitat each watershed (individually)	See Unit of Effort Slide
Spawning habitat each watershed (individually)	See Unit of Effort Slide
Hatchery fish management Reduce in-ocean survival using a mark selective fishery with 100% marking of hatchery fish in all months	See Table 4 of Pyper et al. 2012 for values
Delta hatcheries, eliminate other hatcheries Results in 0% stray rate and hatchery fish no longer compete with natural fish in the tributaries.	
100% trucking Results in higher stray rates for hatchery fish (i.e., a portion of hatchery fish return to all tributaries)	
Increase productivity Increase riverine productivity Feb – May by releasing water from rice fields and refuges	**No proposal, yet**

Chinook Scenarios

	Scenario	Changes
Actions in the delta	Increase carrying capacity in Central Delta in all months	See Unit of Effort Slide
	Increase in rearing habitat in the Central Delta	
	<p>Increase accessibility to rearing North Delta habitat, December – April</p> <p>Proportion fish routed to ND. See report for ER EIS. GATED NOTCH (for Notch scenarios water should be subtracted from Sac)</p>	See report for estimates
	Increase productivity Delta by draining wetlands, February – May by releasing water from Suisun Marsh (e.g. multiple duck club locations managed for bug production)	**No proposal, yet**
	<p>Route juvenile fish into high survival migratory corridors away from Georgiana Slough</p> <p>Non-physical barriers (lights, bubbles, and sound) and guidance structures to deter fish from going into Georgiana Slough.</p>	Reduced entrainment into Georgiana Slough by 2/3 when Sac. R. flows \geq 25,000 (measured at Freeport)

Chinook Scenarios

Scenario		Changes
Flow manipulation	Sacramento River 3-day pulse flow 17500 cfs, 1 week (during month)	Jan Feb March April
	Clear Creek Geomorphic pulse flows, 3,250 cfs mean daily flow for 1 day	Mid March – June
	Attraction pulse flows, 2 or 3 pulses of 200 cfs (base) to 400 cfs (pulse in May and June) or 800 cfs (pulse in June) released from Whiskeytown Reservoir, over 5 to 10 days (see 2016 Clear Creel Pulse Flow Document, Figure 6)	May – June
Mill Creek (drought year condition)	Pulse flows, 50 cfs over base or natural flows for a minimum of 24 hours	Mid April – mid June, min. of once every two weeks
	Base flows, 50 cfs	April – mid June
	Base flows, 25 cfs	Mid June – end of June
	Base flows, 50 cfs	Mid October – December
Deer Creek (drought year condition)	Pulse flow, Reduce diversions to provide at least 100 cfs at the Upper Deer Creek stream gage, for 36 hours followed by a declining ramping flow schedule such that each adjustment in flow reduction will not exceed 10 cfs, with a minimum 3-hour period between adjustments until a return to base flow level.	April – mid June 15, up to once every two weeks
	Base flows, 50 cfs	January – mid June
	Base flows, 50 cfs	mid June – end of June
	Base flows, 50 cfs	Mid October – December
Mokelumne River	Pulse flow, 14-day inundation of 1,500 cfs in March or a 3-day pulse of 2,000 cfs in April	April vs. March
Stanislaus River	Pulse flow, >1,000 cfs for 4 days in February with pulse flows ~3,000 cfs in April and May for 30 days	February, April and May

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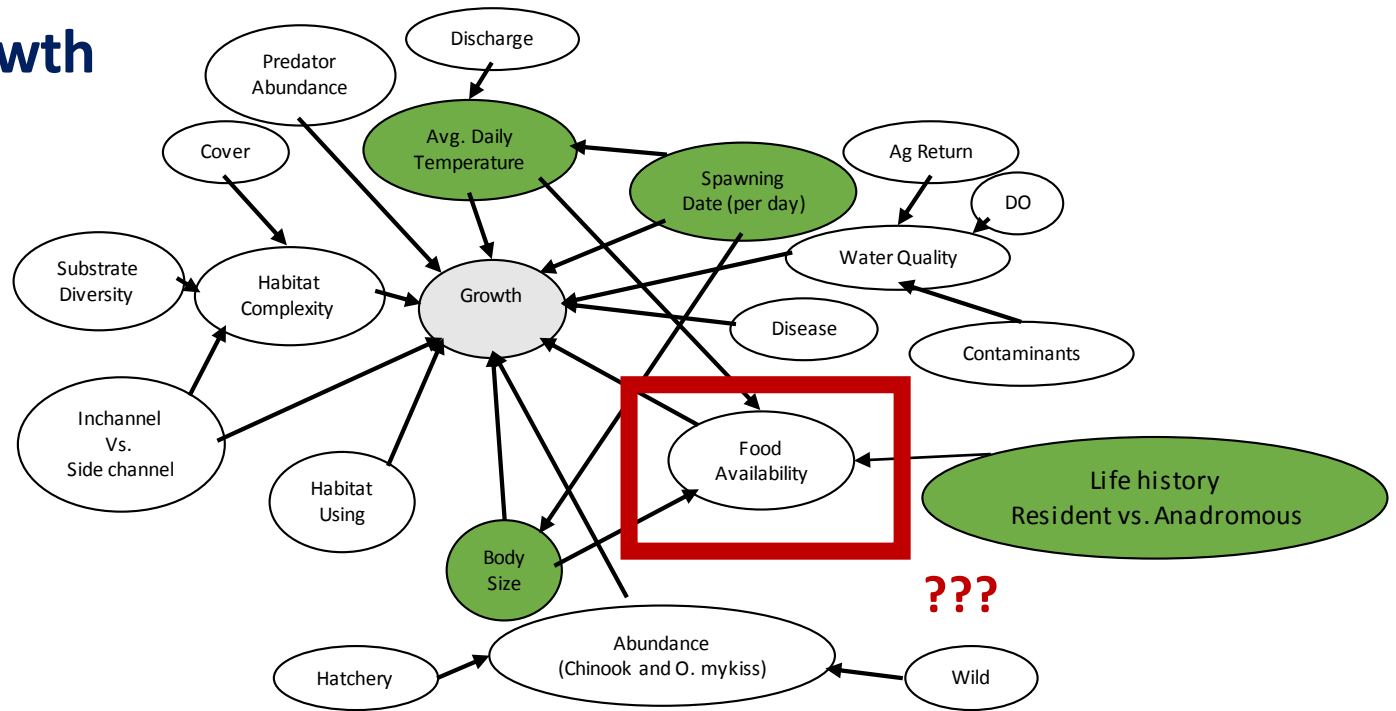
CVPIA Fisheries Science Integration Team Workshop



Wednesday, June 20, 1:00 to 4:30 PM

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|-----------|---|
| 1:00–2:30 | Discuss the use of CWT data to estimate ocean entry survival (Will Satterthwaite) |
| 2:30–3:10 | Update on GIS mapping, online database of restoration sites (John Hutchings) |
| 3:10–3:30 | Break |
| 3:30–4:30 | Update on modeling water temperatures across the Central Valley (Mike Wright) |
| | Update on <i>O. mykiss</i> and Chinook growth (Jim) |
| 4:30 | Adjourn |

O. mykiss Growth



Growth based on Sullivan et al. (2000) bioenergetics model; assumes full ration, i.e., $p_e=1$; parameterized using age length data for 1980-1999 from CV (Mitchell 2010; Merz 2002).

Stochasticity imposed assuming CV 0.29 based on synthesis of 4 *O. mykiss* growth studies, created growth transition matrices each tributary/segment, year and month (31 x 20 x 12)

Estuary/ocean growth seasonal, 0.429 (Mar-Aug), 0.2987(Sep-Nov), 0.32547(Dec-Feb) mm/day (Allen 1986; Hayes et al. 2008, Mitchell 2010). Transition matrices for stochasticity

CEDEN

California Environmental Data Exchange Network



Drift vs. benthic samples?

1211

A functional classification of the drift: traits that influence invertebrate availability to salmonids

Russell B. Rader

Transactions of the American Fisheries Society 133:777–788, 2004

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What's on the Menu? Evaluating a Food Availability Model with Young-of-the-Year Chinook Salmon in the Feather River, California

ELAINE M. ESTEBAN AND MICHAEL P. MARCHETTI*

*Department of Biology, California State University–Chico,
Chico, California 95929, USA*

Comparable data?
Quantitative estimates?
Timing?

An Introduction to SWAMP's Perennial Streams Assessment (PSA)

*Peter Ode, DFG-WPCL
Lead Bioassessment Scientist,
State Water Resources Control Board's
SWAMP Program*



Probabilistic
Quantitative
(standardized D-frame
kicknet)

18 Tributaries
May-Sept
2013-2105

Antelope Creek	Battle Creek	Bear River
Big Chico Creek	Butte Creek	Calaveras River
Clear Creek	Cosumnes River	Cow Creek
Deer Creek	Elder Creek	Feather River
Mill Creek	Mokelumne River	Stanislaus River
Stony Creek	Thomes Creek	Tuolumne River

Other tributaries?

CEDEN

California Environmental Data Exchange Network



Other quantitative standardized survey D-frame kicknet

American River, July 2013

Bear Creek, May 2013-2014

Merced River 2014

(upper) Sacramento River 2013

Cottonwood Creek May & Sept 2014

Yuba River Oct 2000

Develop prey availability scores

1211

A functional classification of the drift: traits that influence invertebrate availability to salmonids

Russell B. Rader

Weight density by availability
Normalize across tributaries

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| | Review Sturgeon conceptual models (Adam and Jim) |
| 10:00–10:20 | Break |
| 10:20–12:00 | Review Sturgeon conceptual models, continued (Adam and Jim) |
| | Discuss literature review for Sturgeon DSM parameters (Adam and Jim) |
| | Next steps for Sturgeon |
| | New Business |
| 12:00 | Adjourn |

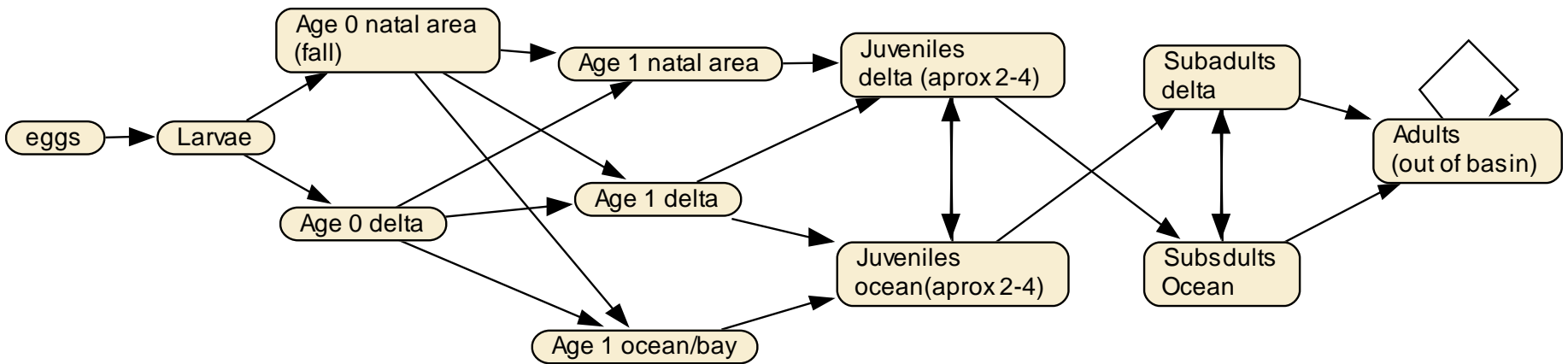
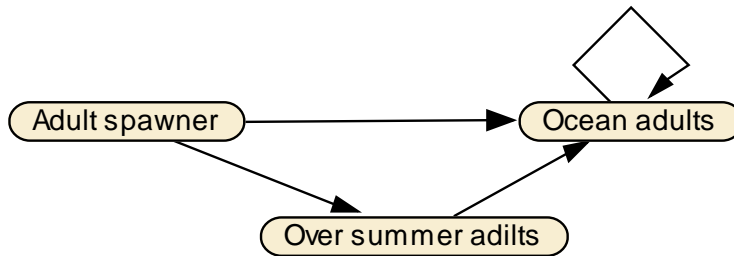
Green Sturgeon Base Model

1 month time step

Same spatial grain as Chinook DSM

Stage-based: larvae, age 0, age 1, juvenile, subadult, adults

Separate small adult and large adult?



Spawners

Green sturgeon

Periodicity 2-4 years

Females 15-17 yrs. old

(latter half) March- Aug.

Upper Sac. RKM 322 – 451 (Cow)

San Joaquin – RKM 119-143

Feather- upper 24 km (Barrier-Thermolito outlet) rm – 59-67

Yuba – confluence up to Dagurre 12 m

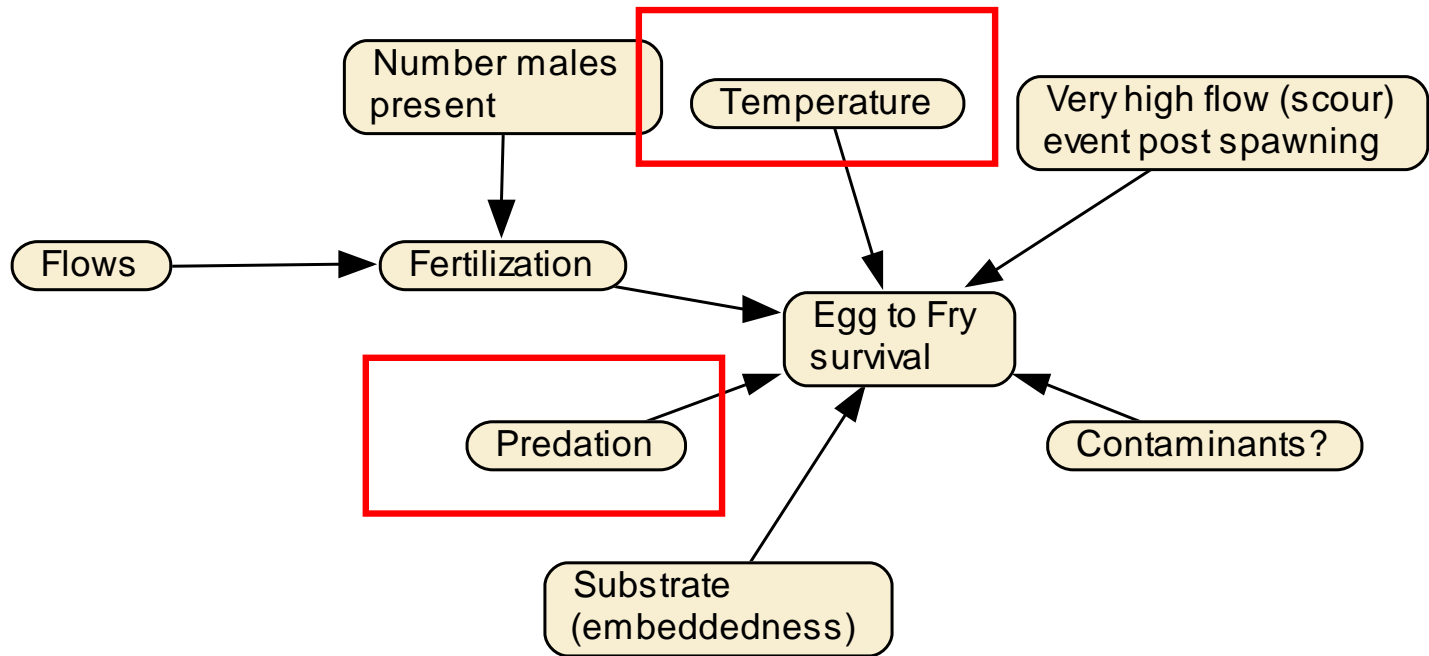
Bear River – look up

Sacramento and tribs. populations modeled separate from San Joaquin

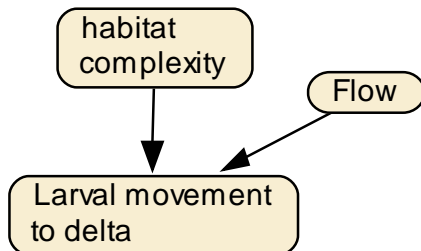
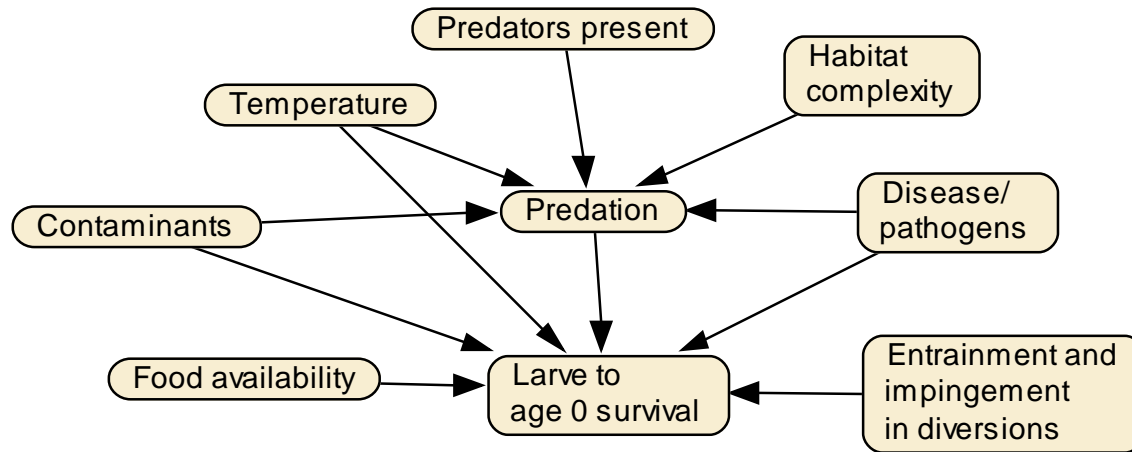
Spawners proportionally allocated by habitat availability



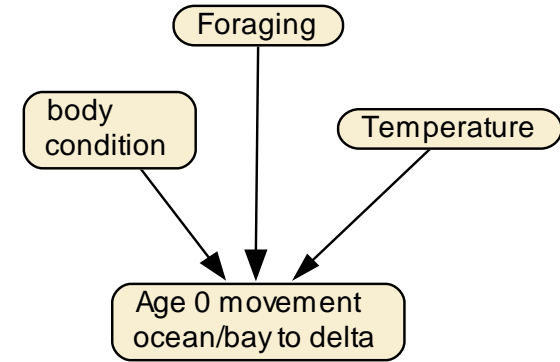
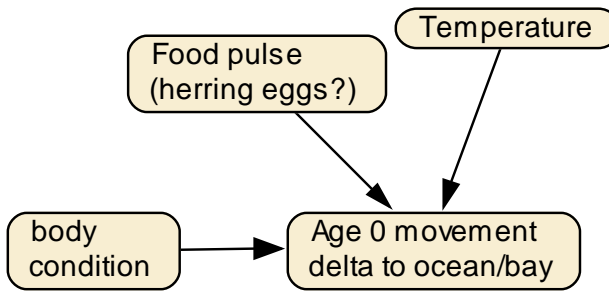
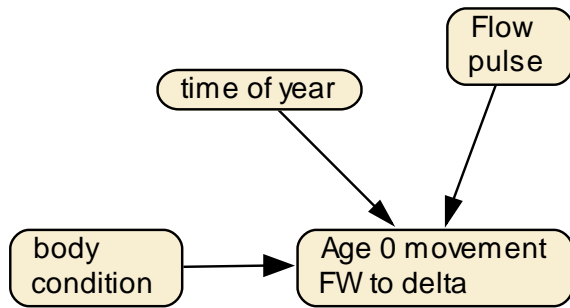
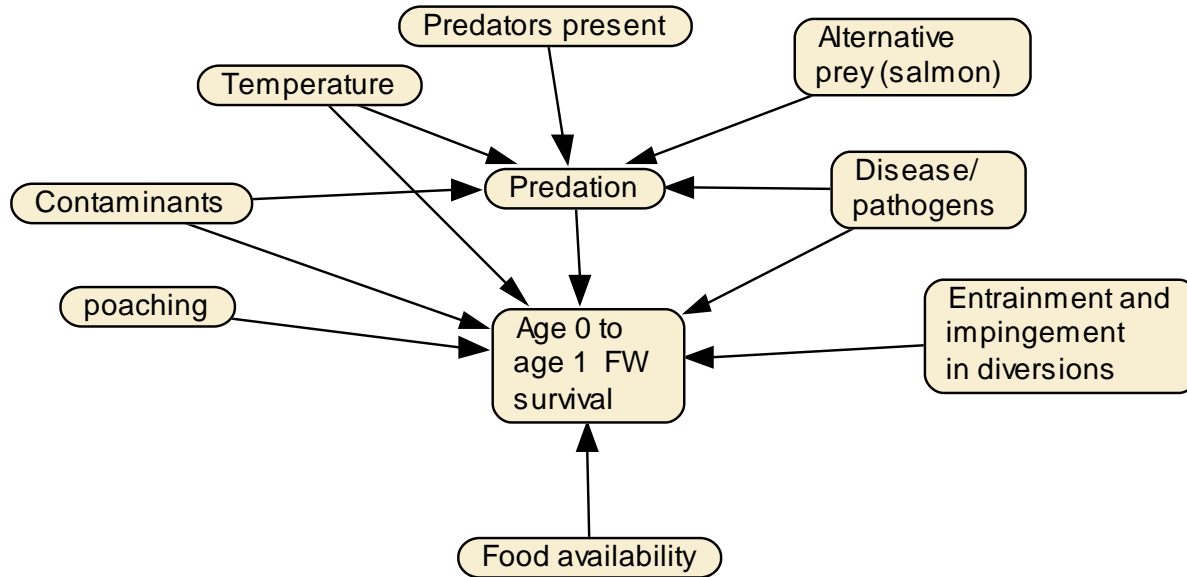
Egg to Fry Model



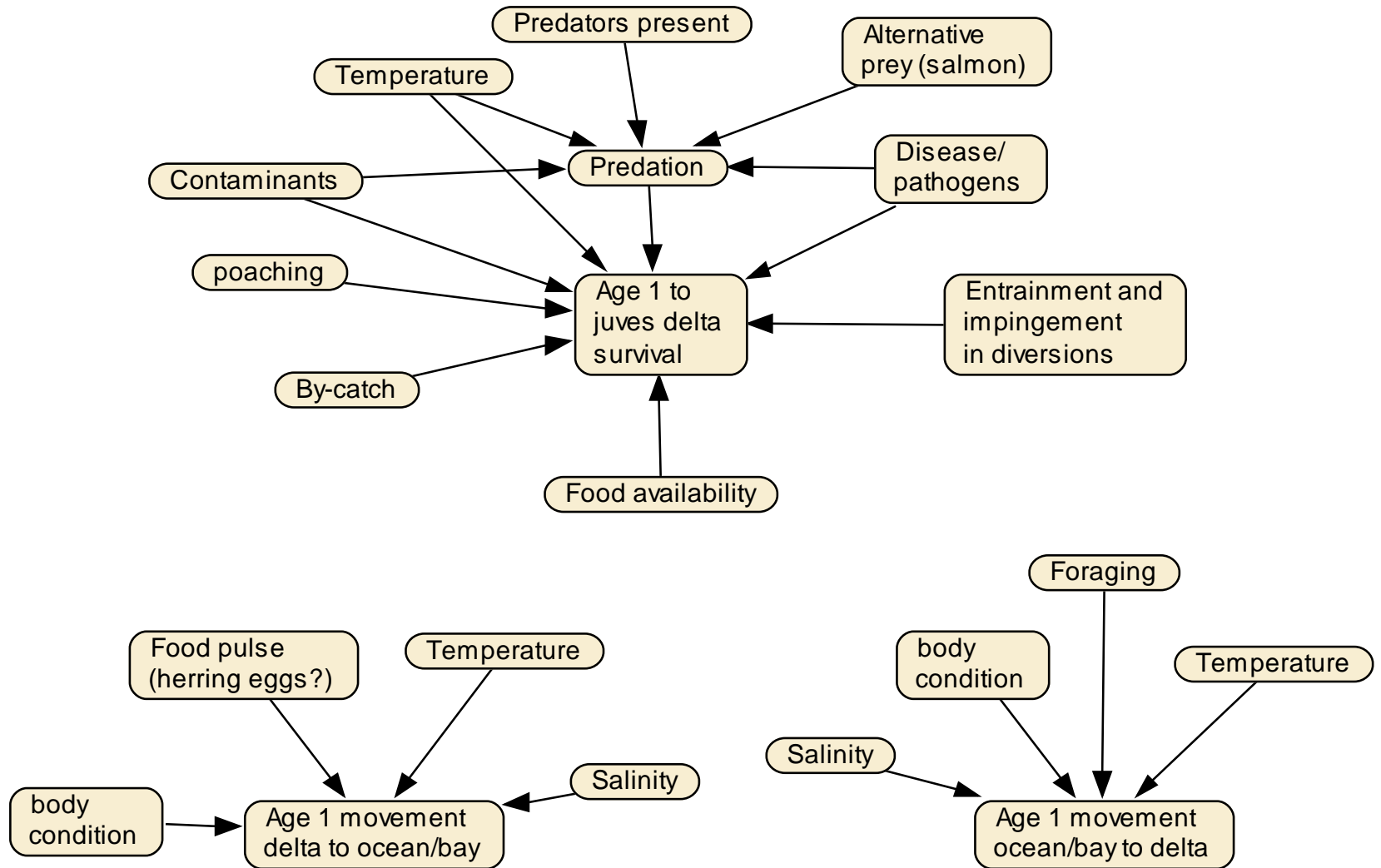
Larvae to age 0 survival and larvae movement models



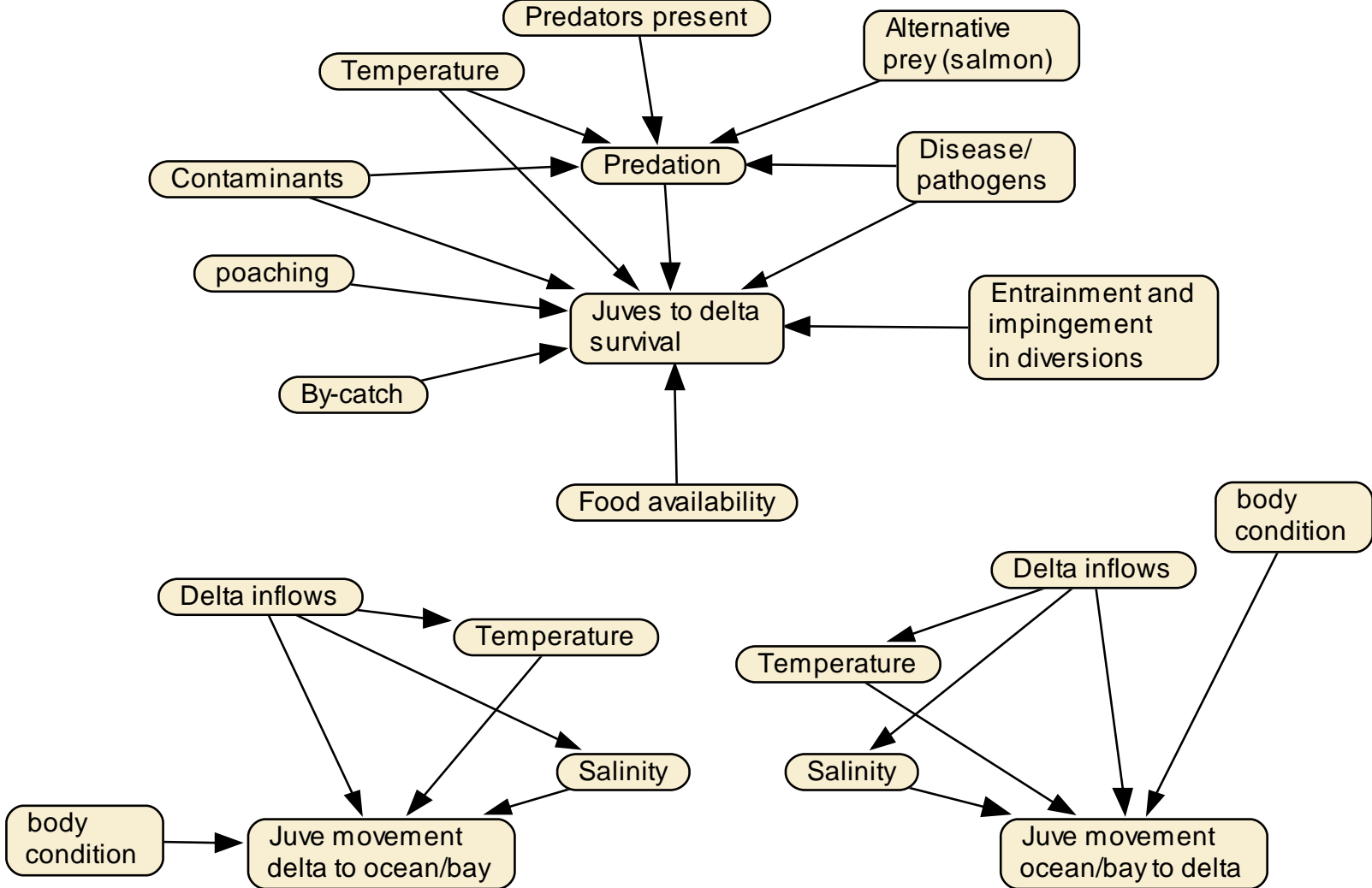
Age 0 to age 1 and age 0 movement models



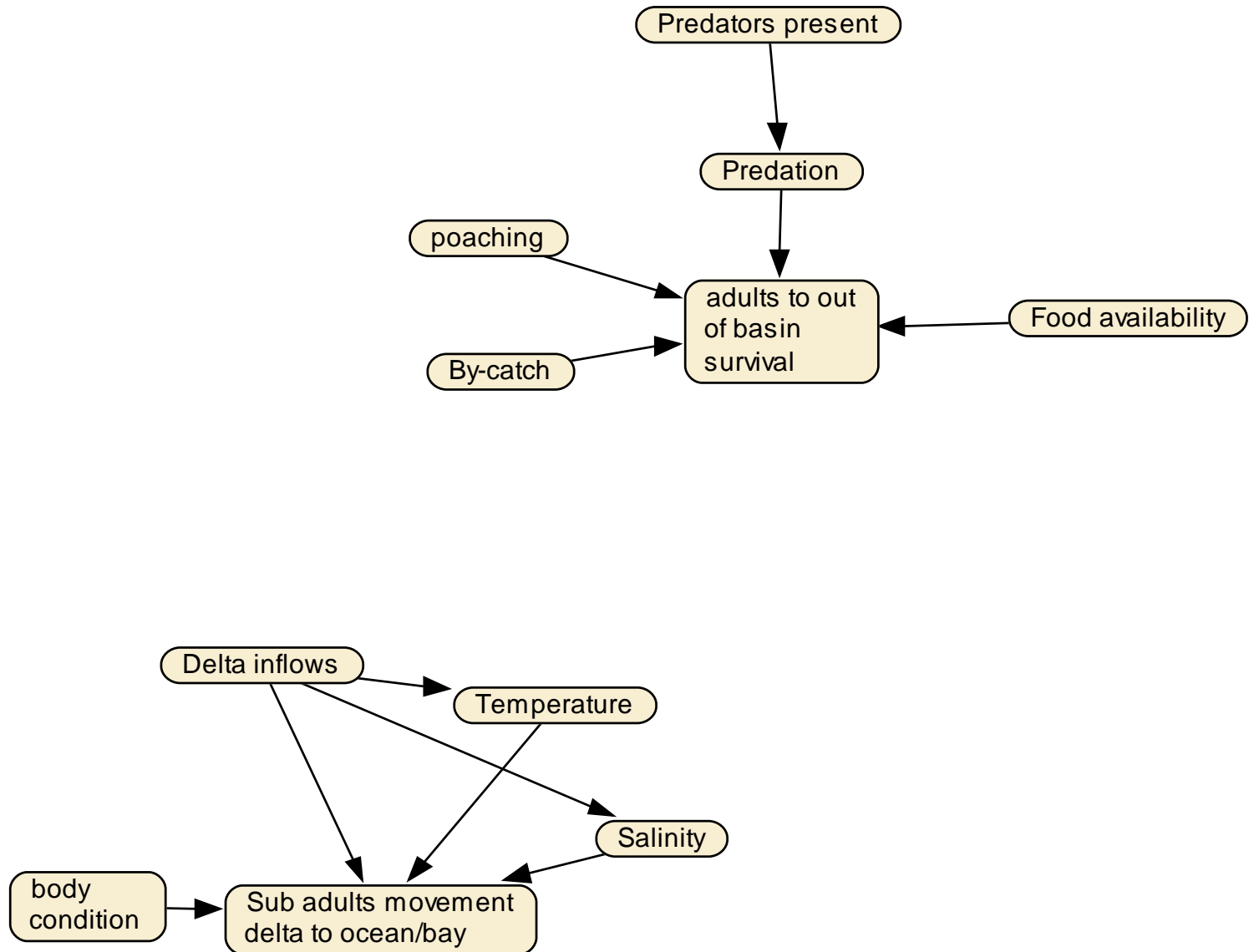
Age 1 to juvenile and age 1 movement models



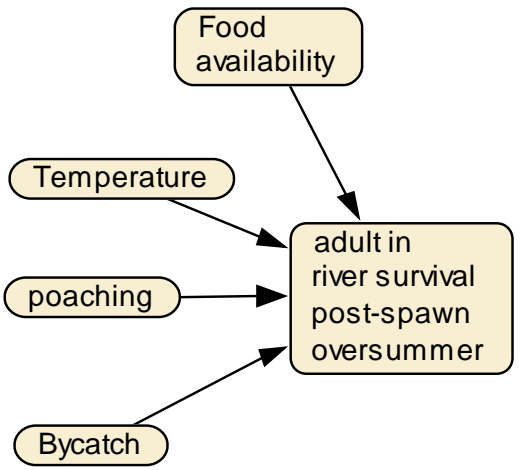
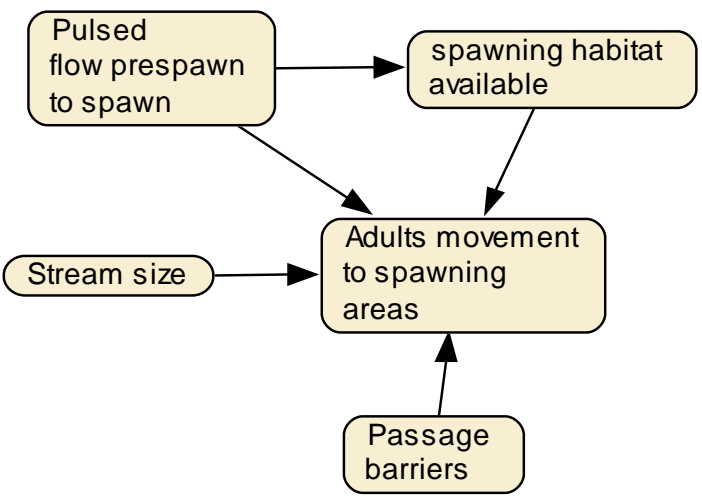
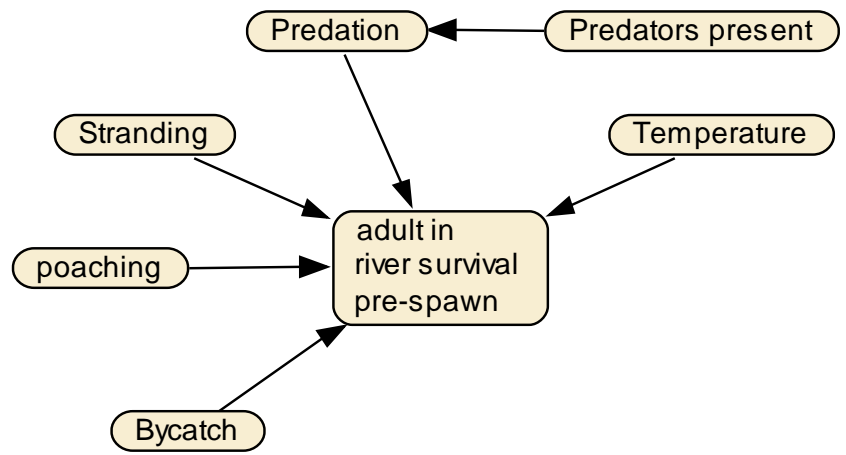
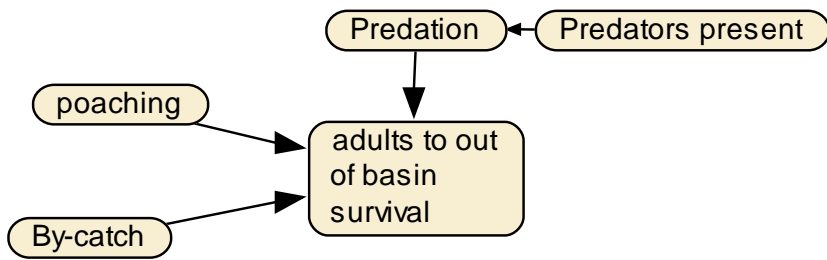
Juvenile survival and movement models



subadult movement and survival models



Adult survival and movement models



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10:00–10:20 Break

10:20–12:00 ~~Review Sturgeon conceptual models, continued (Adam and Jim)~~

Discuss [literature review](#) for Sturgeon DSM parameters (Adam and Jim)

Next steps for Sturgeon

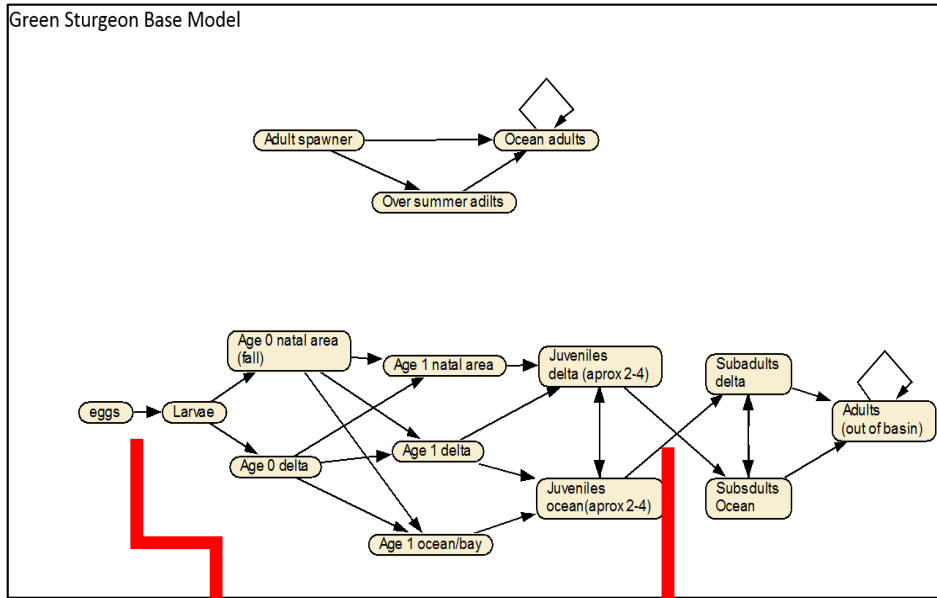
New Business

12:00 Adjourn

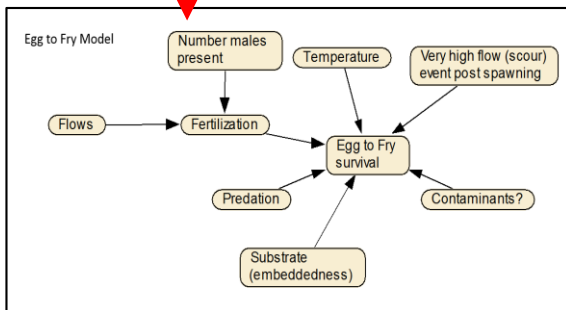
Next steps for Sturgeon...

1. Update Literature Review
2. Develop Prototype Quantitative DSM

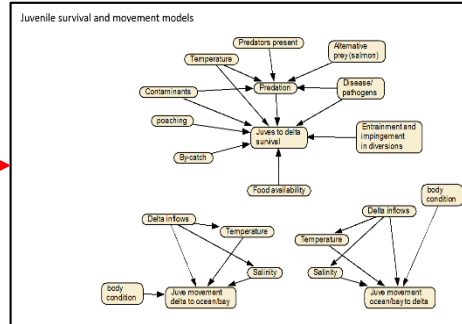
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Egg to Fry Model



Juvenile survival and movement models



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