



Effect of a Floating Fish Guidance Structure on Entrainment of Juvenile Salmon into Georgiana Slough

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and

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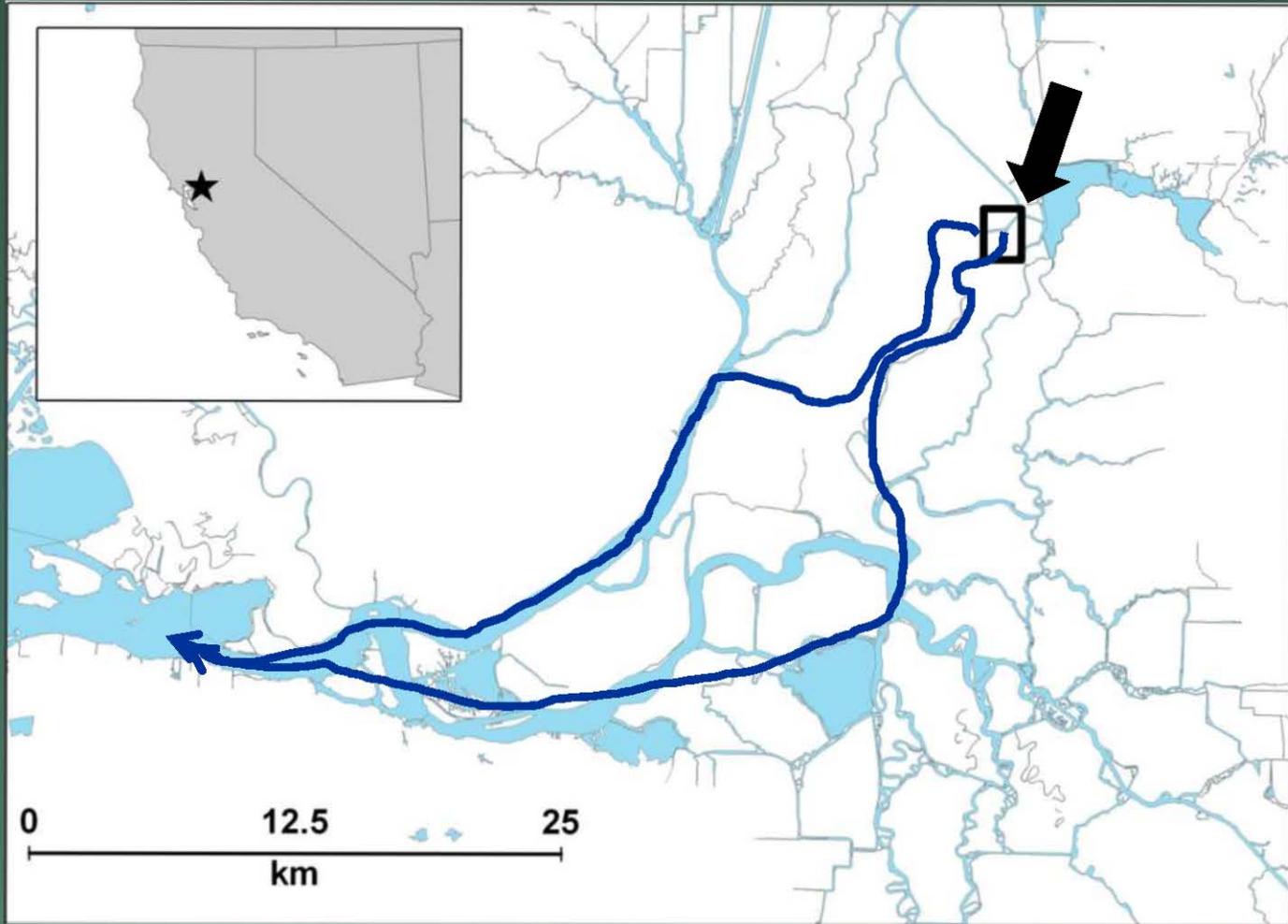
Overview

- Background on guidance structures
- Rationale for floating fish guidance structure
- 2014 Study using Acoustic Telemetry
- *Preliminary* results

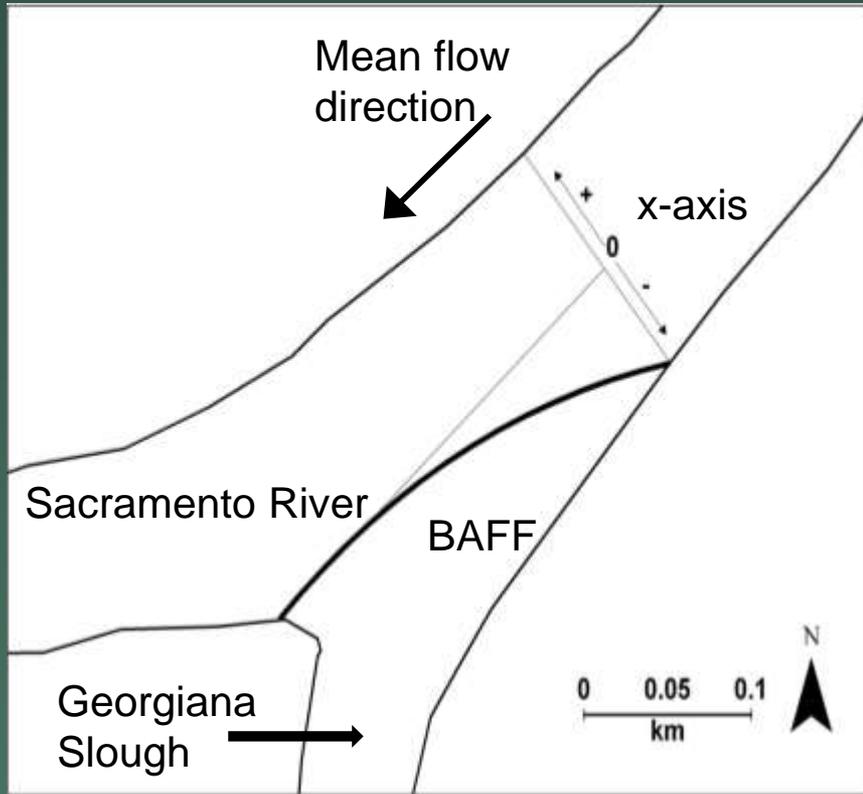
Background

- Low survival in interior Delta
- Salmon entrained in interior Delta via
 - Delta Cross Channel
 - Georgiana Slough
- Increase survival by:
 - 1) Closing Delta Cross Channel
 - 2) Guiding fish away from Georgiana Slough

Background



Bioacoustic Fish Fence (BAFF)



**Entrainment into Georgiana Slough:
from 22.3% to 7.7% in 2011
from 24.1% to 11.4% in 2012**

Bio-acoustic Fish Fence

- Drawbacks:
 - Expensive
 - Complex – many moving parts
 - Lots of maintenance
- Alternative guidance structures?
- Examine findings from BAFF study

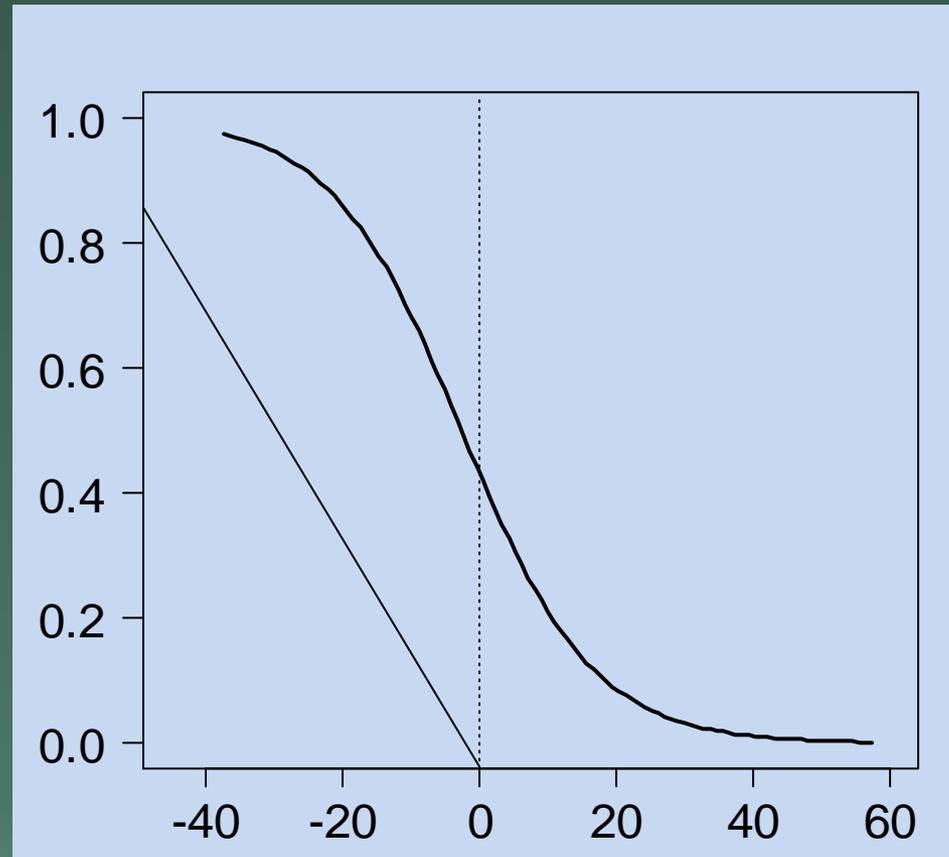
Location, location, location

Georgiana
Slough



Sacramento
River

Georgiana Slough
entrainment
probability



Fish location in cross section (m)

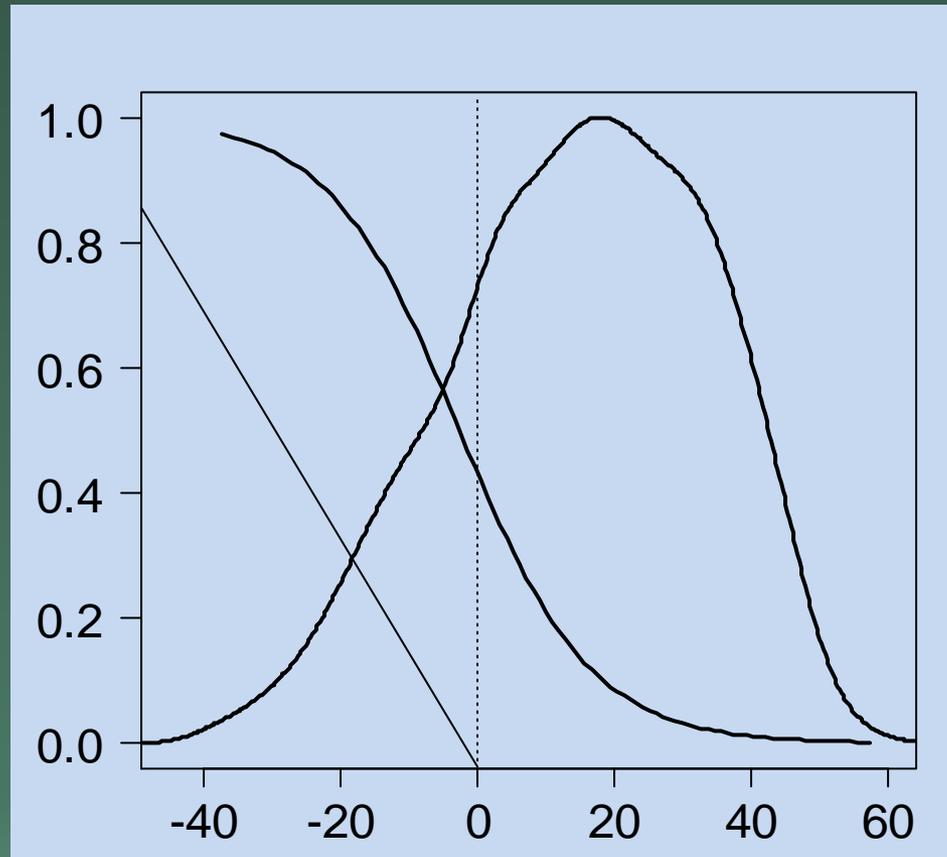
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Fish location in cross section (m)

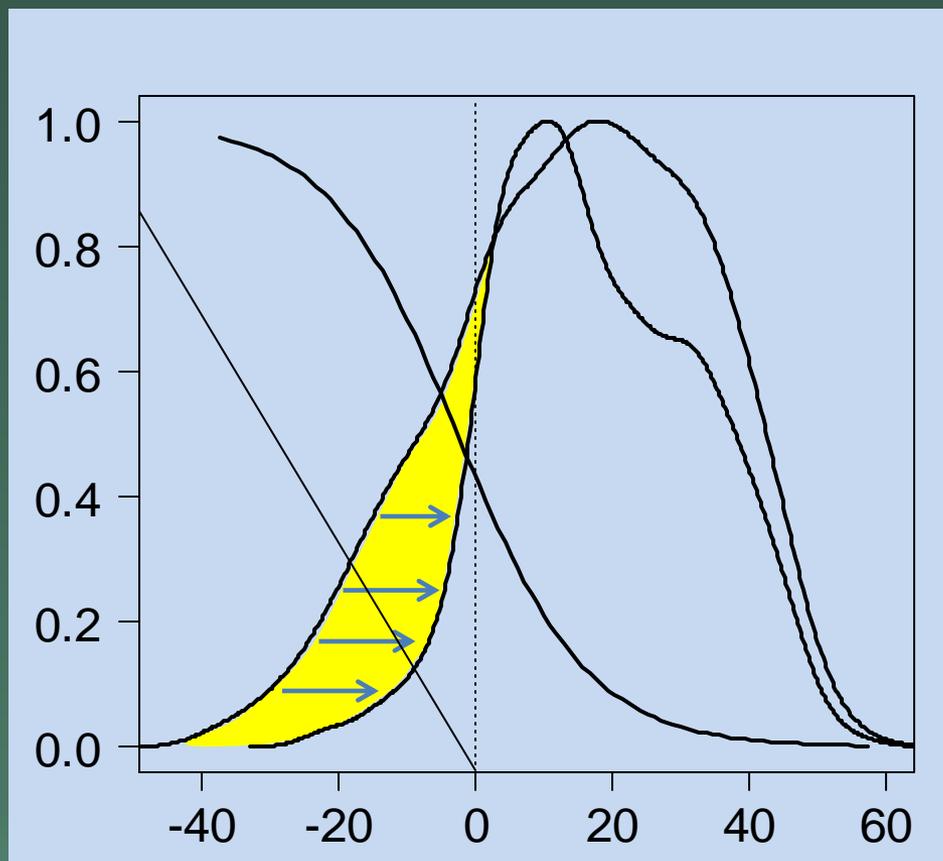
Shifting the spatial distribution

Georgiana
Slough



Sacramento
River

Georgiana Slough
entrainment
probability



Fish location in cross section (m)

Floating Fish Guidance Structure (FFGS)

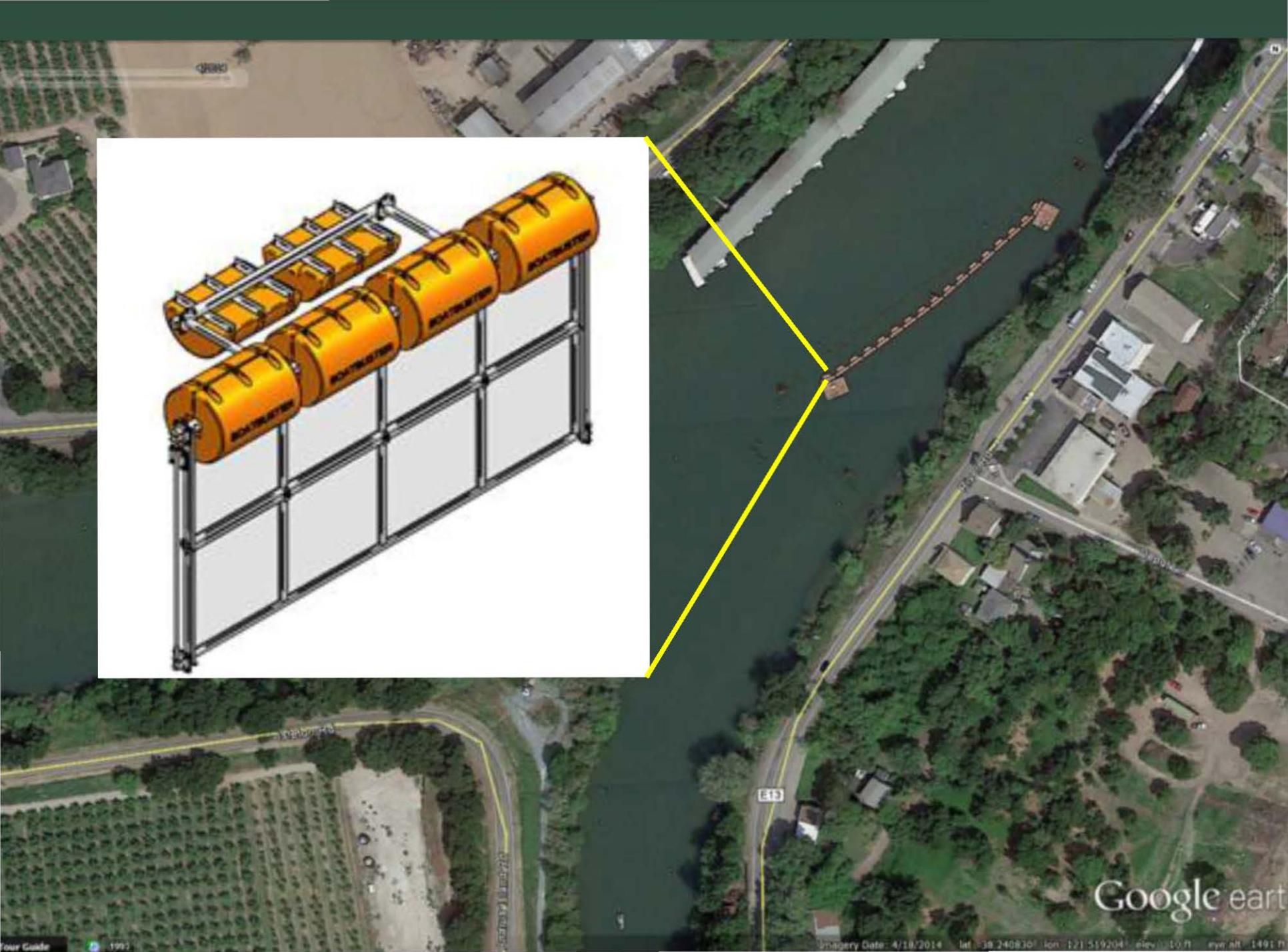


Sacramento River

Georgiana Slough

On

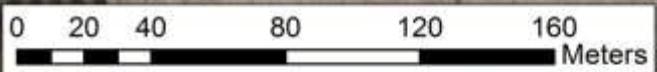
Off



Google earth

Methods

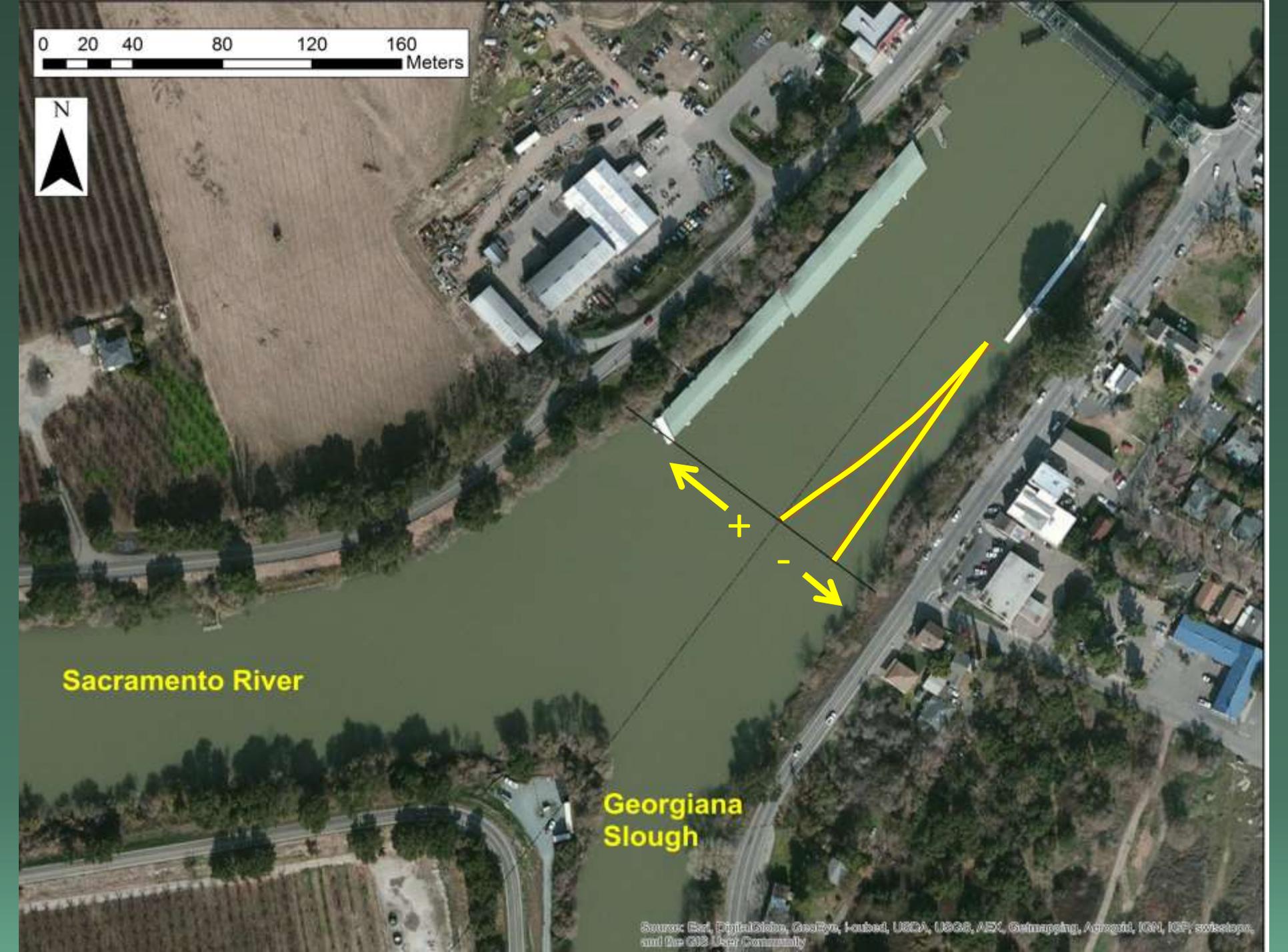
- 3,303 Late-Fall Chinook Salmon smolts
 - Acoustic tags
 - Released at Sacramento
 - Released March 1 – April 15 2014
- 1,684 arrived at FFGS
- Barrier operated
 - ~25 hours on, ~25 hrs off
 - based on tide cycle
- Discharge above Walnut Grove
 - 4,350 to 21,090 cfs

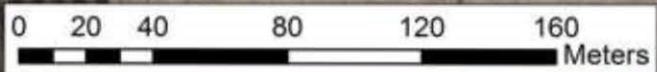


Sacramento River

Georgiana Slough

Source: Esri, DigitalGlobe, GeoEye, IGN, AerGRID, IGN, ICF, swisstopo, and the GIS User Community





Methods

Sacramento River

Georgiana Slough



Source: Esri, DigitalGlobe, GeoEye, Earthstar, United States, USDA, USGS, AeroGRID, IGN, IGP, swisstopo, and the GIS User Community

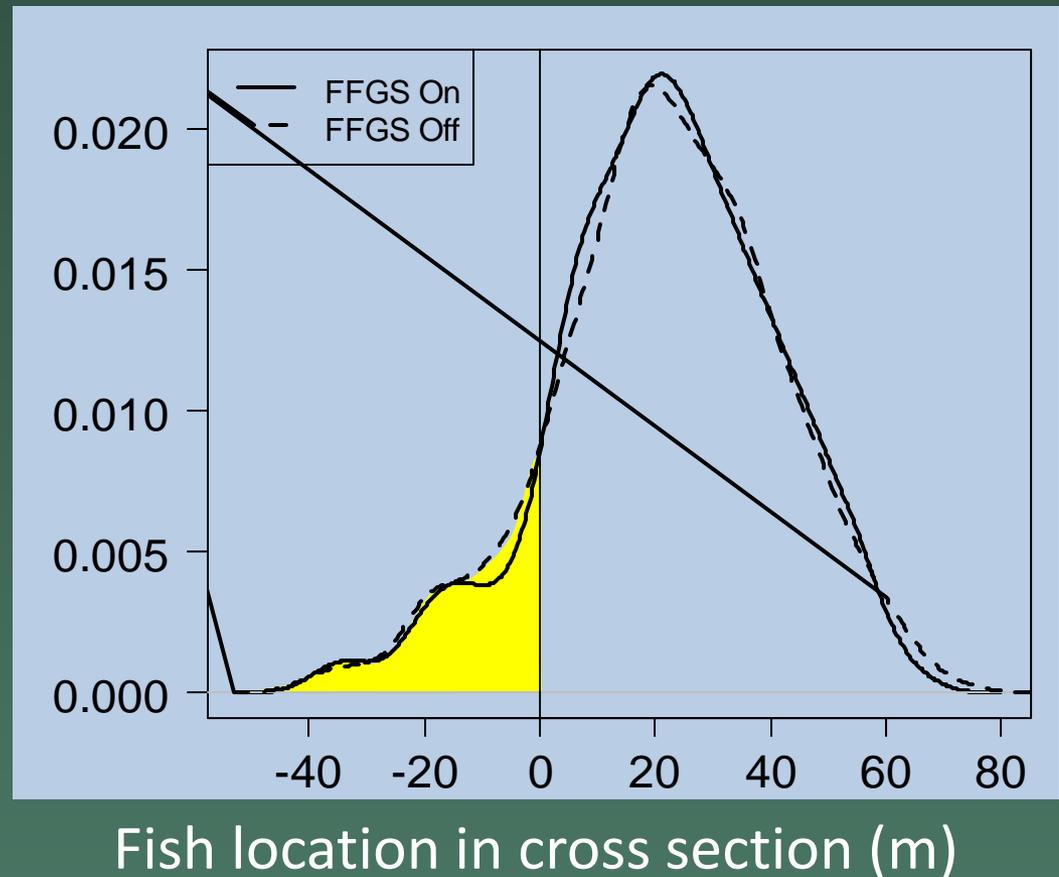
Statistical Analysis

- Logistic regression
- Probability of entering Georgiana Slough
 - Georgiana Slough = 1
 - Sacramento River = 0
- Covariates
 - Cross-stream position of fish
 - Streak line location
 - Discharge
 - FFGS position, On or Off

FFGS effect on spatial distribution

Probability
density

Percentage < 0:
Off = 12.4%
On = 10.6%

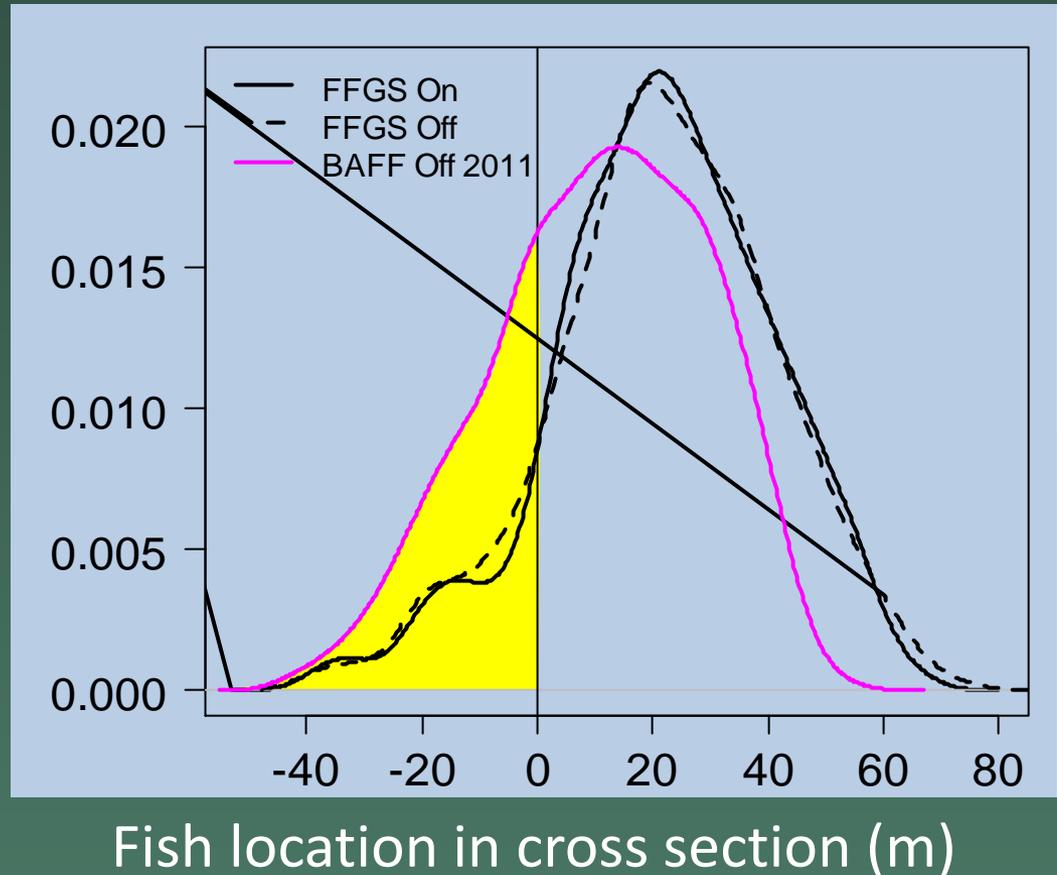


Compared to BAFF 2011

Probability density

Percentage < 0:
BAFF Off 2011 = 29.1%

Mean flow:
2011: ~29,000 cfs
2014: ~11,000 cfs



Model selection

Single parameter models

Variable	Number of parameters	AIC	Δ AIC	Significant?
Cross-stream location	2	1638.7	-186.0	Yes
Streak line	2	1671.3	-153.4	Yes
Discharge	2	1743.9	-80.8	Yes
Null	1	1824.7	0	--
FFGS	2	1826.7	2.0	No

Model selection

Single parameter models

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FFGS	2	1826.7	2.0	No

Percentage entering Georgiana Slough

FFGS Off: 23.3%

FFGS On: 23.0%

BAFF Off 2011: 22.3%

BAFF Off 2012: 24.1%

Summary of Preliminary Results

- No change in spatial distribution
- Low percentage interacted with FFGS
- No effect on routing

Many Questions to Be Answered

- Behavioral response?
 - Detailed analysis of 2D data awaits
- Implementation problem?
 - Location, length, angle, depth
- Confounded by support structures?
 - fixed pilings and buoys may have guided fish
- Jury is still out...

Acknowledgements



AECOM

Thank you
Questions?