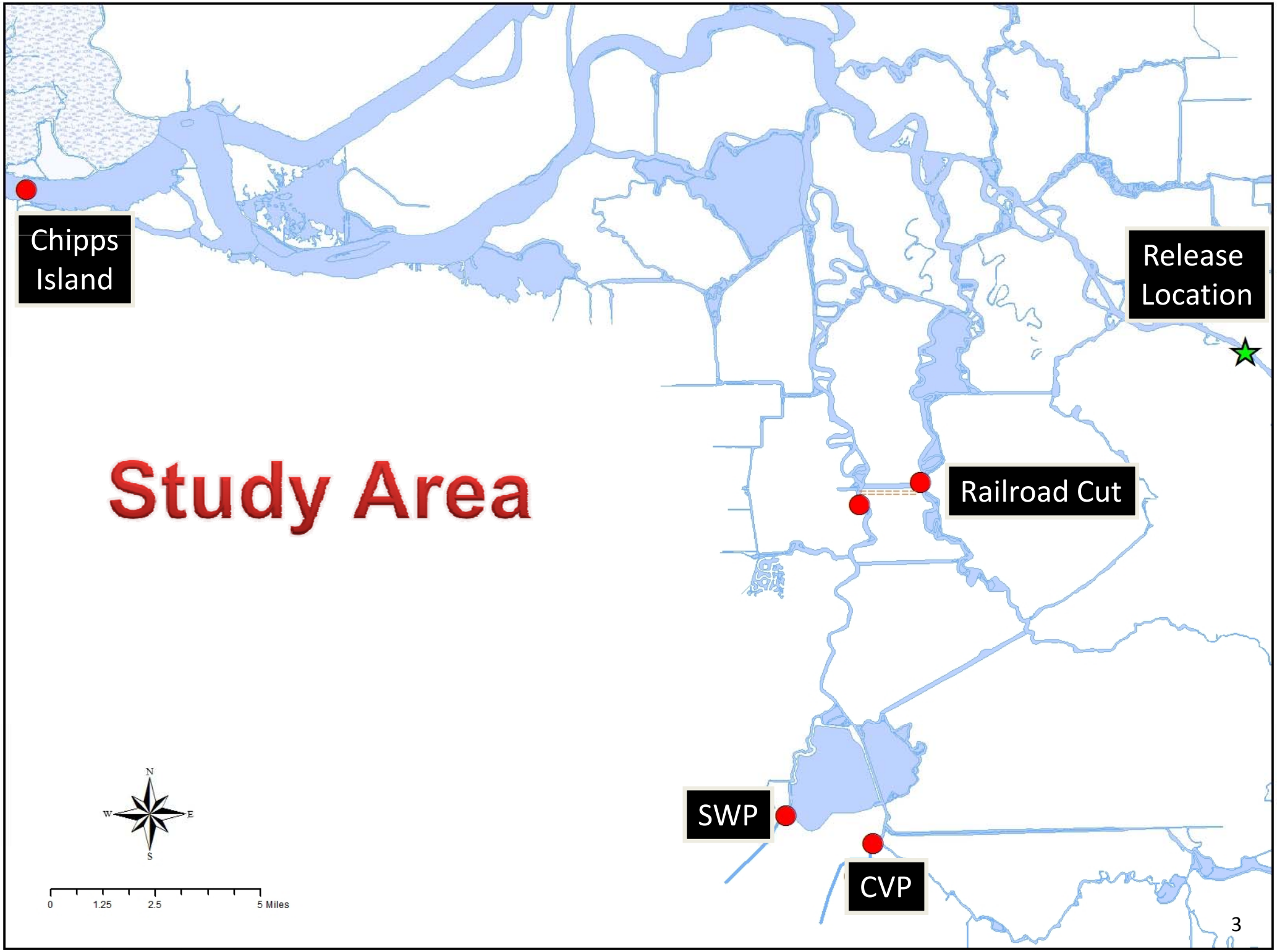
2012 Stipulation Acoustic Study Status Report

Kevin Clark
California Department of Water Resources
Project Manager and Co-Principal Investigator

Data Analysis by:
Cramer Fish Sciences
Brad Cavallo, Jenny Melgo, Paul Bergman, Kris Jones, & Phil Gaskill

Study Purpose

- Telemetered steelhead smolts used as “sentinels” for managing South Delta exports
- Test hypotheses about fish routing, behavior, and survival in the interior Delta
- Augment the 6 Year Acoustic Tag Study


Study Area
Chipps Island
Release Location
Railroad Cut
SWP
CVP
N
W
E
S
0
1.25
2.5
5 Miles

Timetable

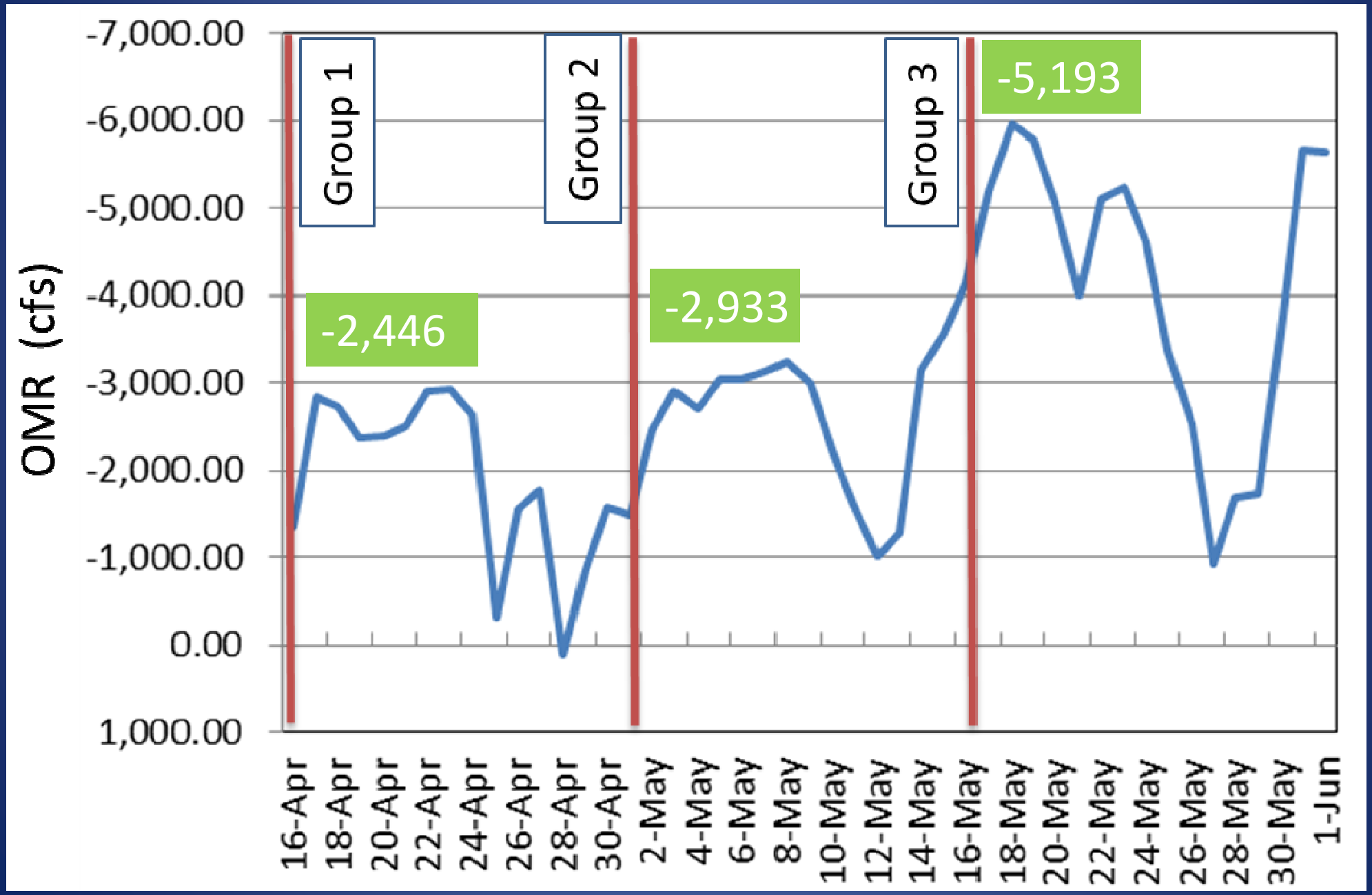
Stipulation Study

FEB 28 APR 15

Experimental Design

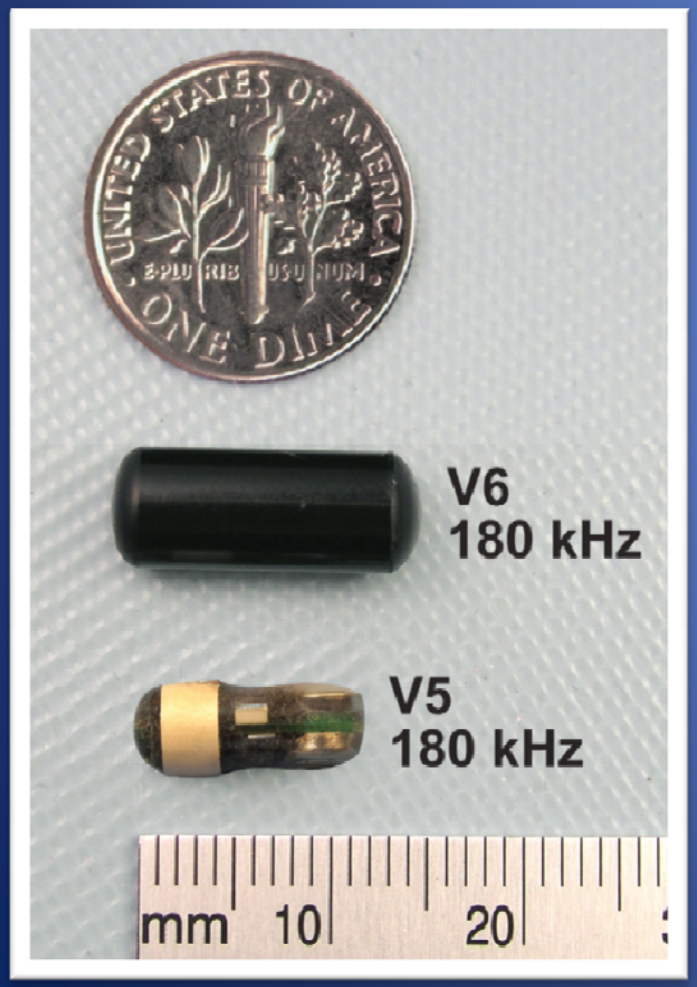
- Three groups of ~167 hatchery steelhead smolts released near Buckley Cove on the San Joaquin River
  - Each group 15 days apart (April 15th, May 1st , and May 15th)
- Experimental Railroad Cut "trigger" was used to adaptively manage Old and Middle River (OMR) flows
- Each group was to experience a different OMR level
  - -2500, -1250, -5000 cfs

Actual OMR for Study



Methodology

- Hatchery steelhead were surgically implanted with an acoustic tag following 6 Year Study SOP



Shortage of Trained Staff

1st Tagging Event Issues

- Tags arrived 48 hours before tagging event

1st Tagging Event Issues

- Tags arrived 48 hours before tagging event
- Weather conditions were brutal

1st Tagging Event Issues

Latest News

Storm Sets Rainfall Records, Triggers More Than 700 Lightning Strikes

April 13, 2012 12:05 PM

Like 29 Tweet 7 Share 20

View Comments
More Activity
Facebook Activity
What's this?
Add to Timeline - What's This
Click "Log in" to publish
what you read to Facebook
See what your friends have read
on CBS Local sites
Use "Remove" or "Turn off" to
disable at any time

Lightning strikes during a California thunderstorm (David McNew/Getty Images)

Filed under

Local, News

Related tags

BAy Area Storm, Lightning, Rain, Storm, weather

SAN FRANCISCO (CBS SF) – The storm that struck Thursday night triggered more than 700 lightning strikes around the Bay Area, set new records for rain

The National Weather Service recorded 750 lightning strikes overnight in the area extending from the North Bay to Monterey County, an unusually high num

1st Tagging Event Issues

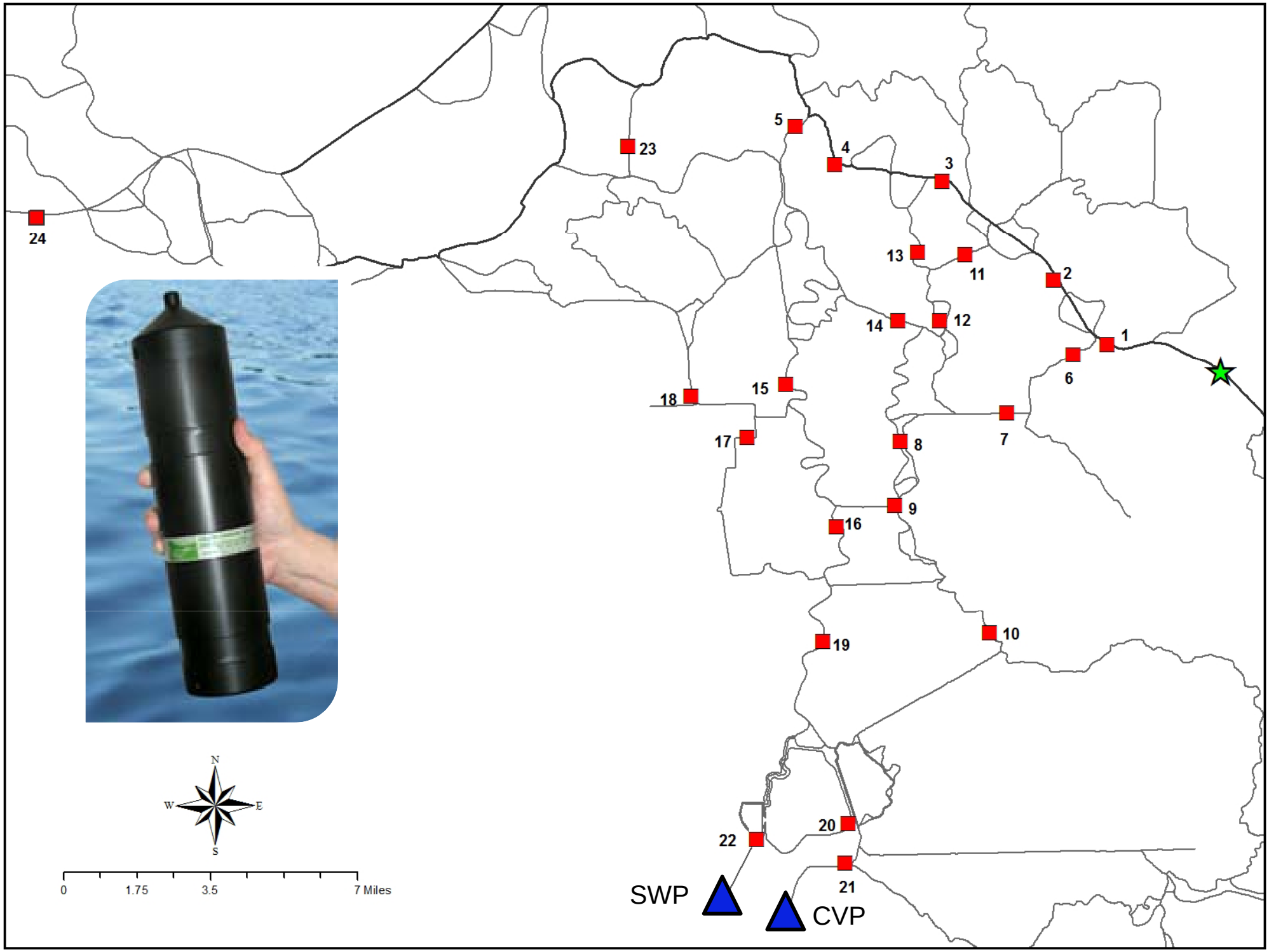
- Tags arrived 48 hours before tagging event
- Weather conditions were brutal
- Steelhead escaped from totes during transport and replacement steelhead had to be tagged

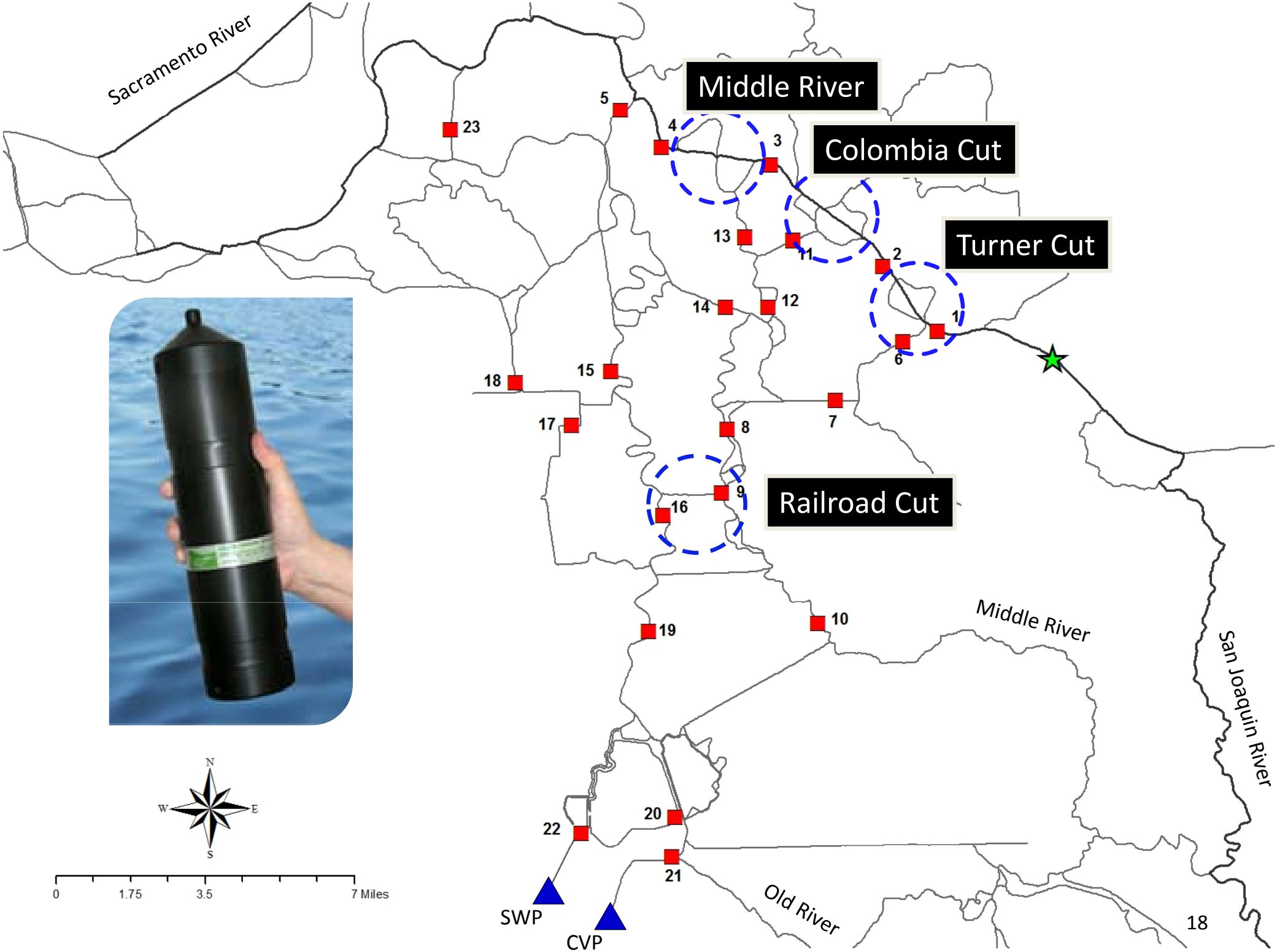
Fish Transport

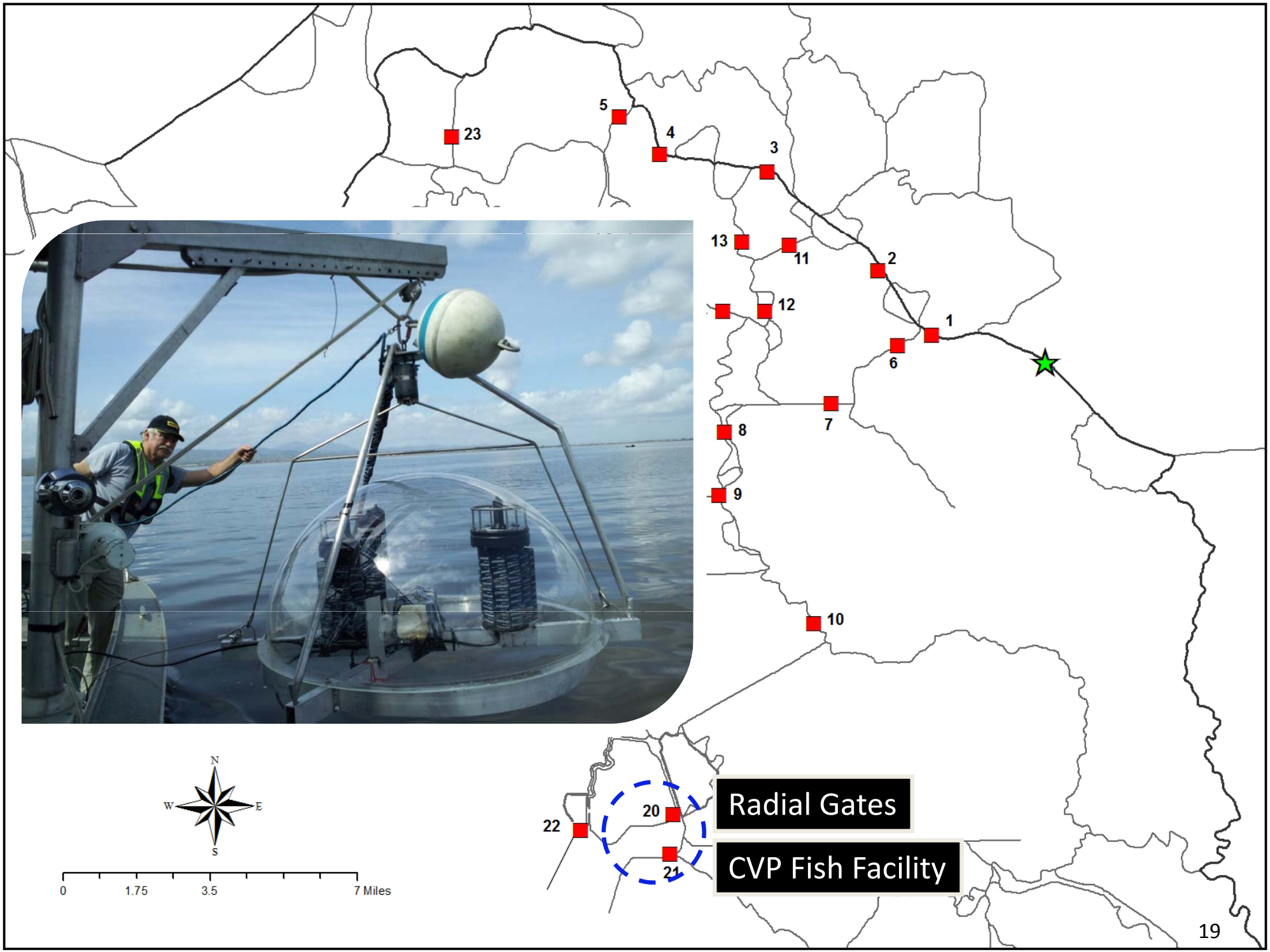
Fish Release Platform

MERCURY
CF 2207KL
NORTH RIVER
CF 4910
8
6
4
2
7
5
3

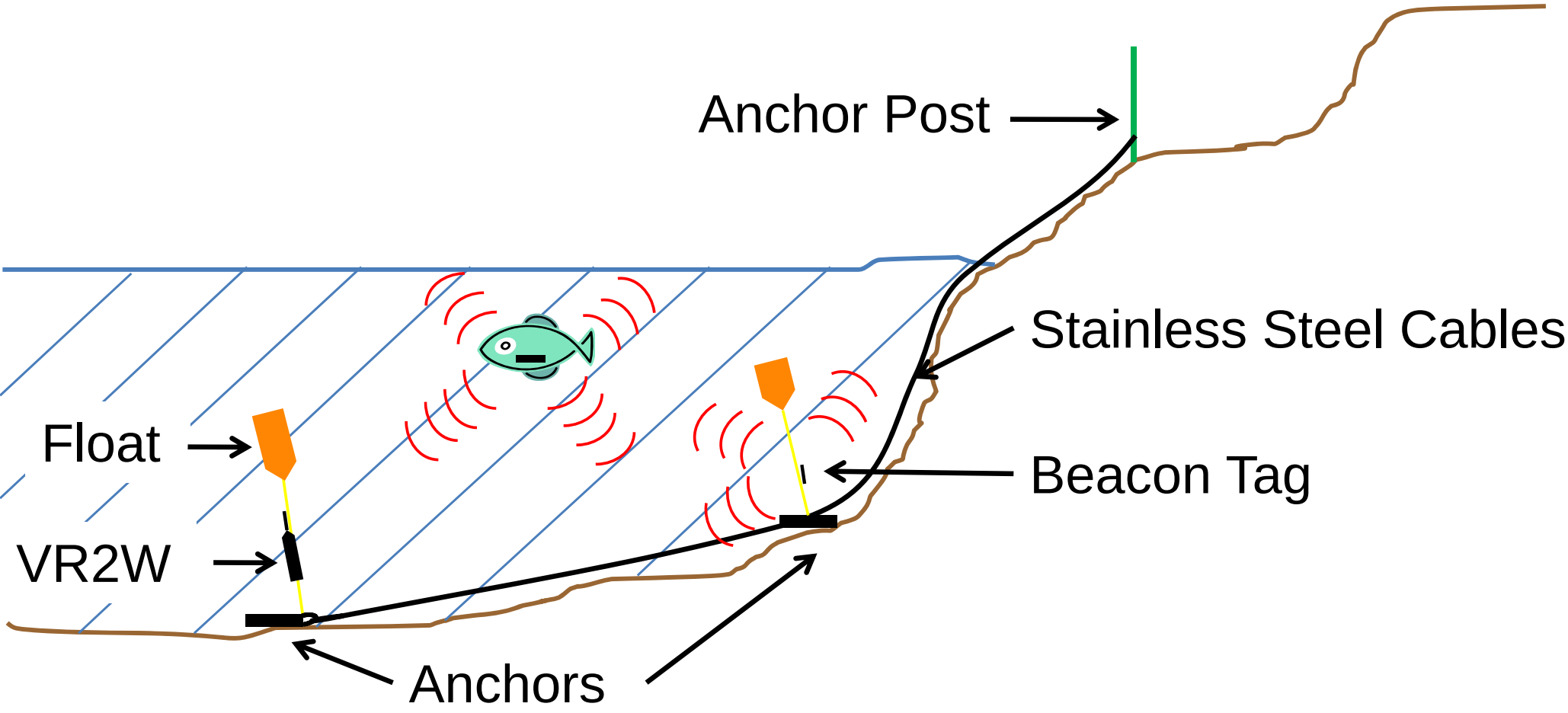
Fish Release Issues


24
23
5
4
3
13
11
2
14
12
1
6
18
15
7
17
8
9
16
10
19
20
22
21
SWP
CVP
N
W
E
S
0
1.75
3.5
7 Miles


Sacramento River
Middle River
Colombia Cut
Turner Cut
Railroad Cut
Middle River
San Joaquin River
Old River
SWP
CVP
1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
22
23
N
W
E
S
0
1.75
3.5
7 Miles


23
5
4
3
13
11
2
12
1
6
7
8
9
10
22
20
21
Radial Gates
CVP Fish Facility
N
W
E
S
0
1.75
3.5
7 Miles

Typical Receiver Deployment



Assumptions

- Detection probabilities at each location are assumed to be high (>80%)
- Detection probabilities may vary among arrays, but are assumed not to vary between release groups within arrays
- No predator detection filter applied, therefore, all detections are assumed to be live steelhead smolts

Assumptions (continued)

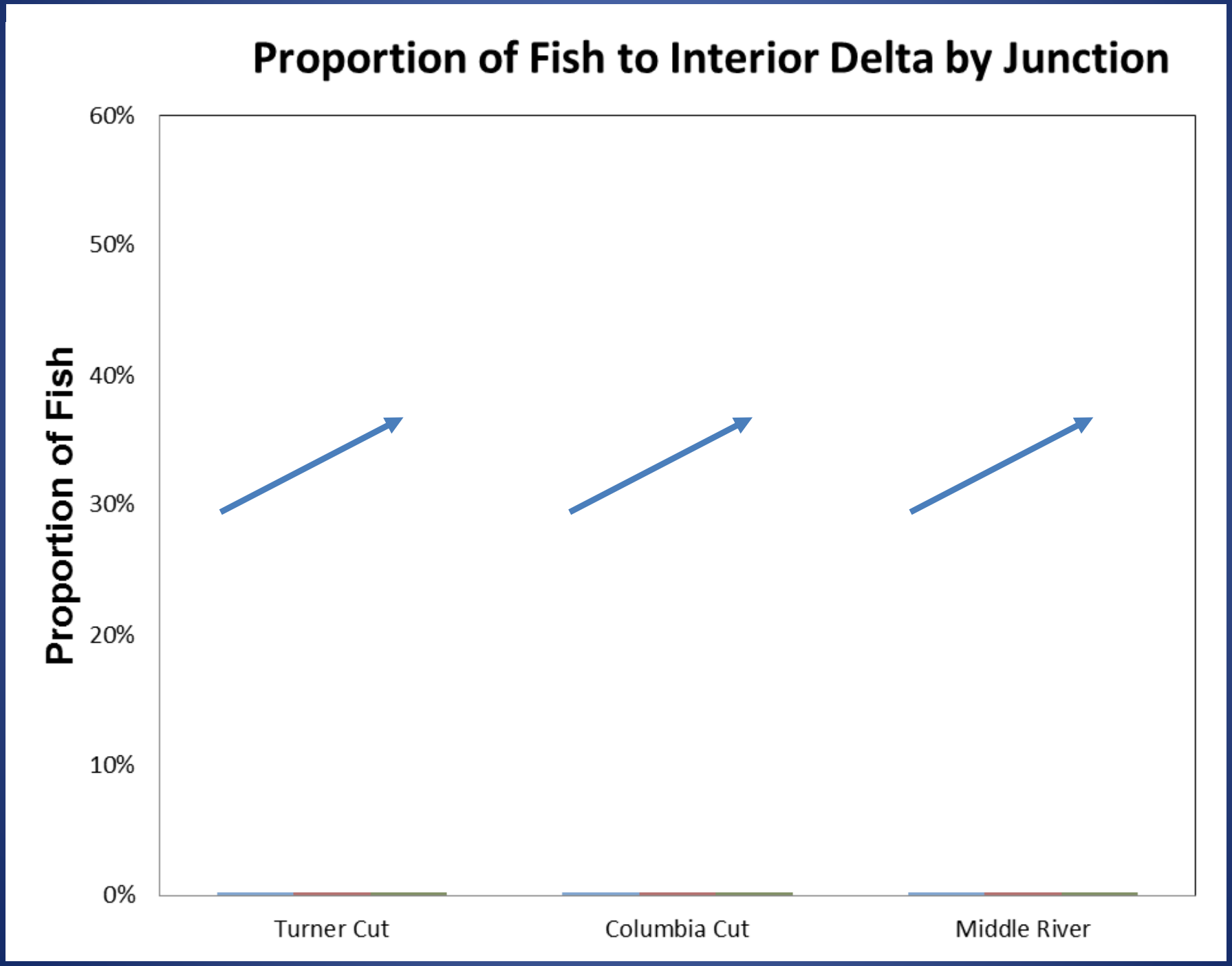
- OMR flow differences between group 3 and groups 1 & 2 provided a sufficient treatment effect to evaluate the effect of OMR flows on fish behavior between the release groups
- Sentinel steelhead behave similarly to wild steelhead
- Steelhead released in the tidal portion of the river behave as run of the river steelhead

Hypothesis Set #1

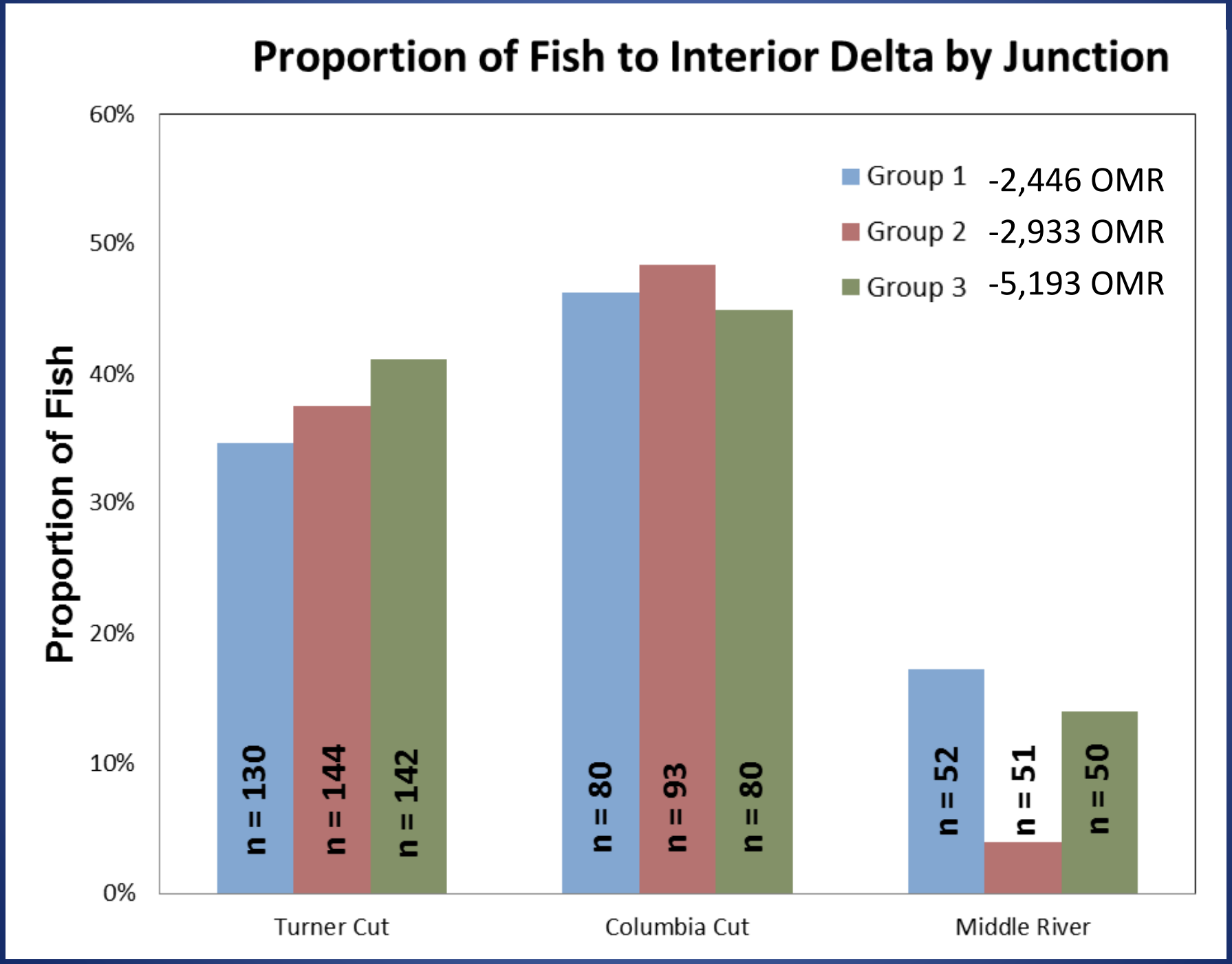
Routing to the interior Delta is influenced by OMR flows

Routing to the interior Delta is the same among three junctions

Expected (?)


Proportion of Fish to Interior Delta by Junction
Proportion of Fish
60%
50%
40%
30%
20%
10%
0%
Turner Cut
Columbia Cut
Middle River

Observed


Proportion of Fish to Interior Delta by Junction
Proportion of Fish
60%
50%
40%
30%
20%
10%
0%
Group 1 -2,446 OMR
Group 2 -2,933 OMR
Group 3 -5,193 OMR
n = 130
n = 144
n = 142
n = 80
n = 93
n = 80
n = 52
n = 51
n = 50
Turner Cut
Columbia Cut
Middle River

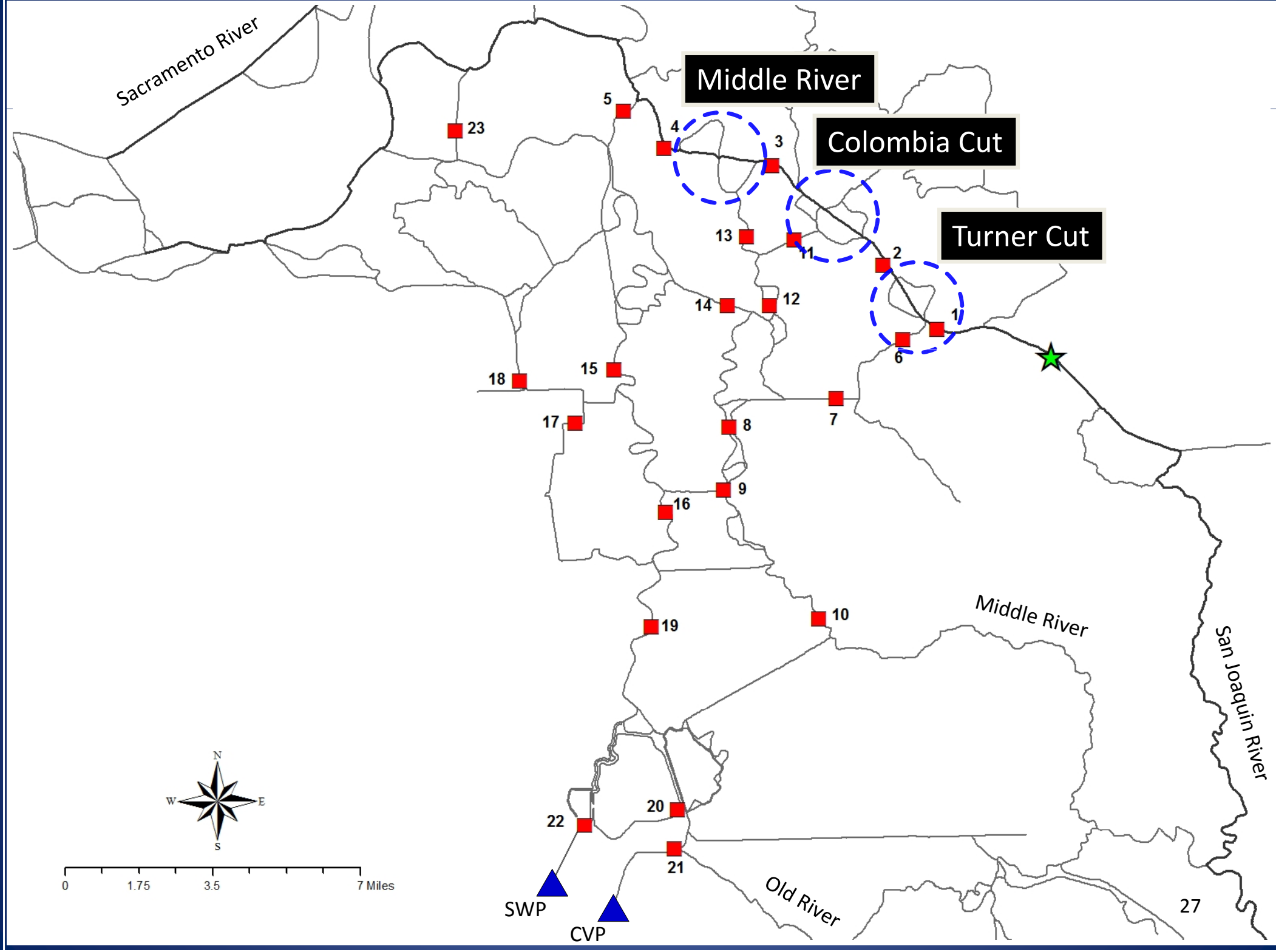
Hypothesis Set #1: Preliminary Findings

Is routing to the interior Delta influenced by OMR flows?

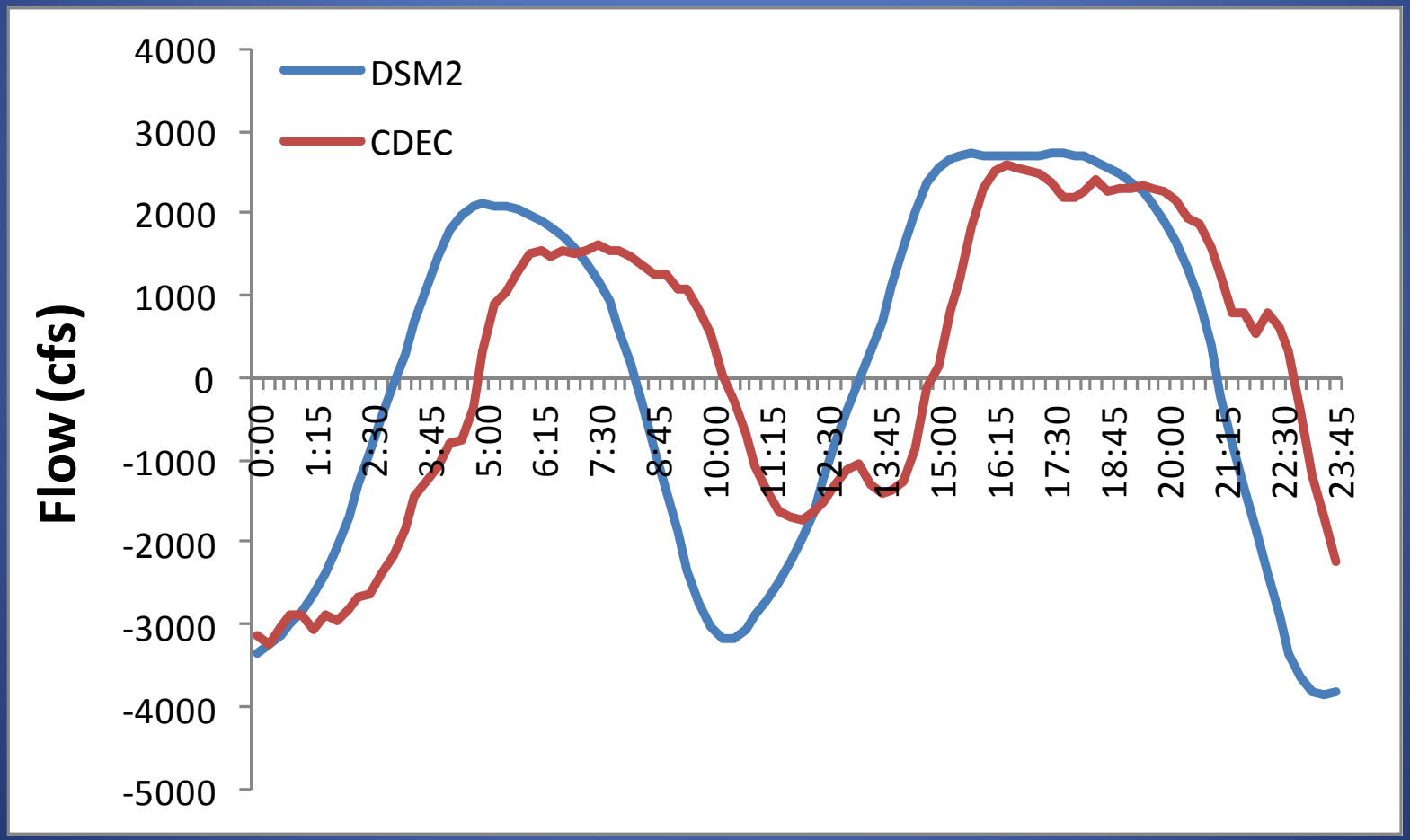
Not strongly. Some evidence of increasing trend at Turner Cut, but same pattern not seen at Colombia Cut or at Middle River.

Does routing to the interior Delta differ among three junctions?

Yes, Middle River junction entrained lower proportions of fish

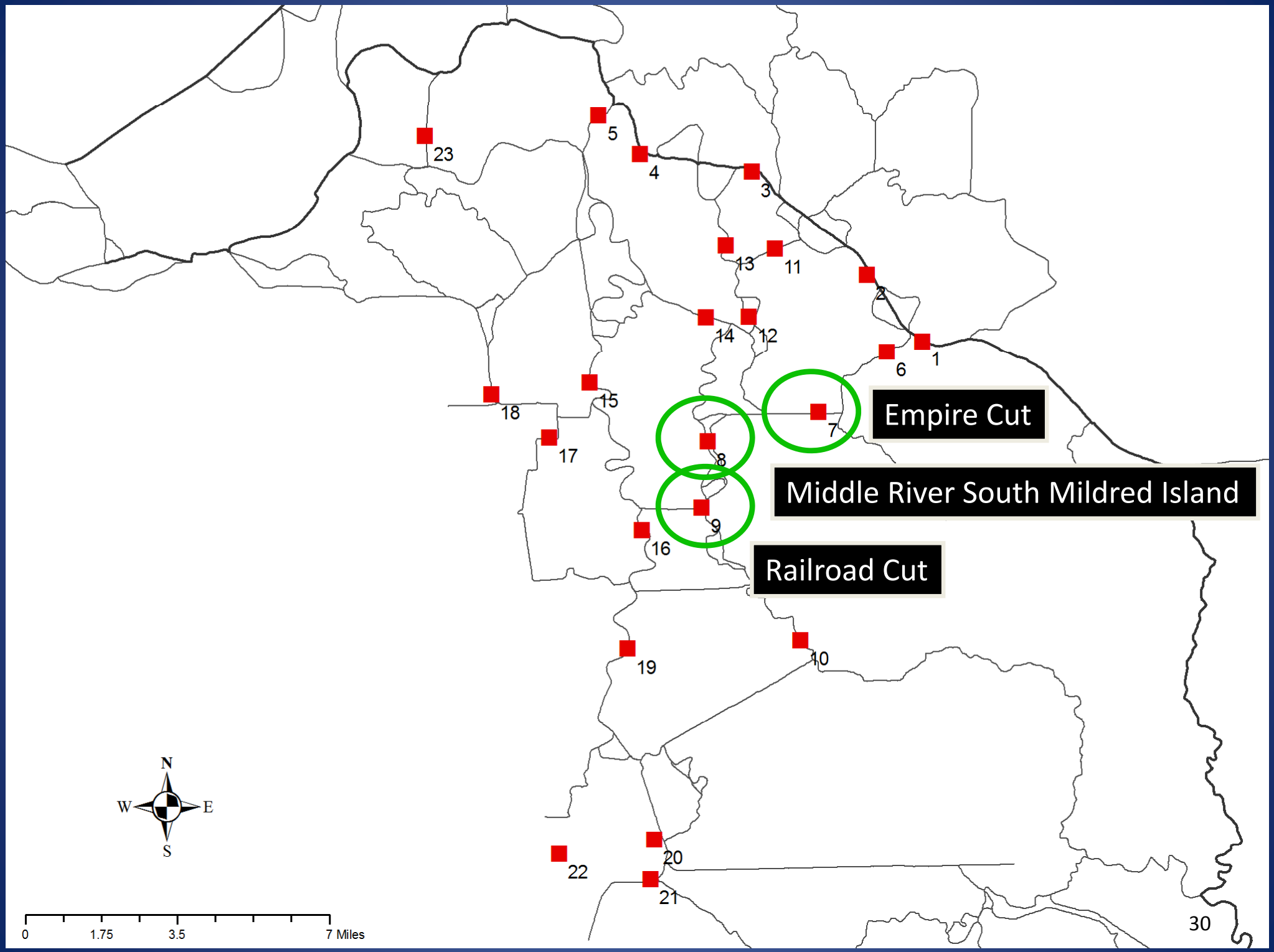

Sacramento River
Middle River
Colombia Cut
Turner Cut
Middle River
San Joaquin River
Old River
SWP
CVP
1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
22
23
27
N
W
E
S
0
1.75
3.5
7 Miles

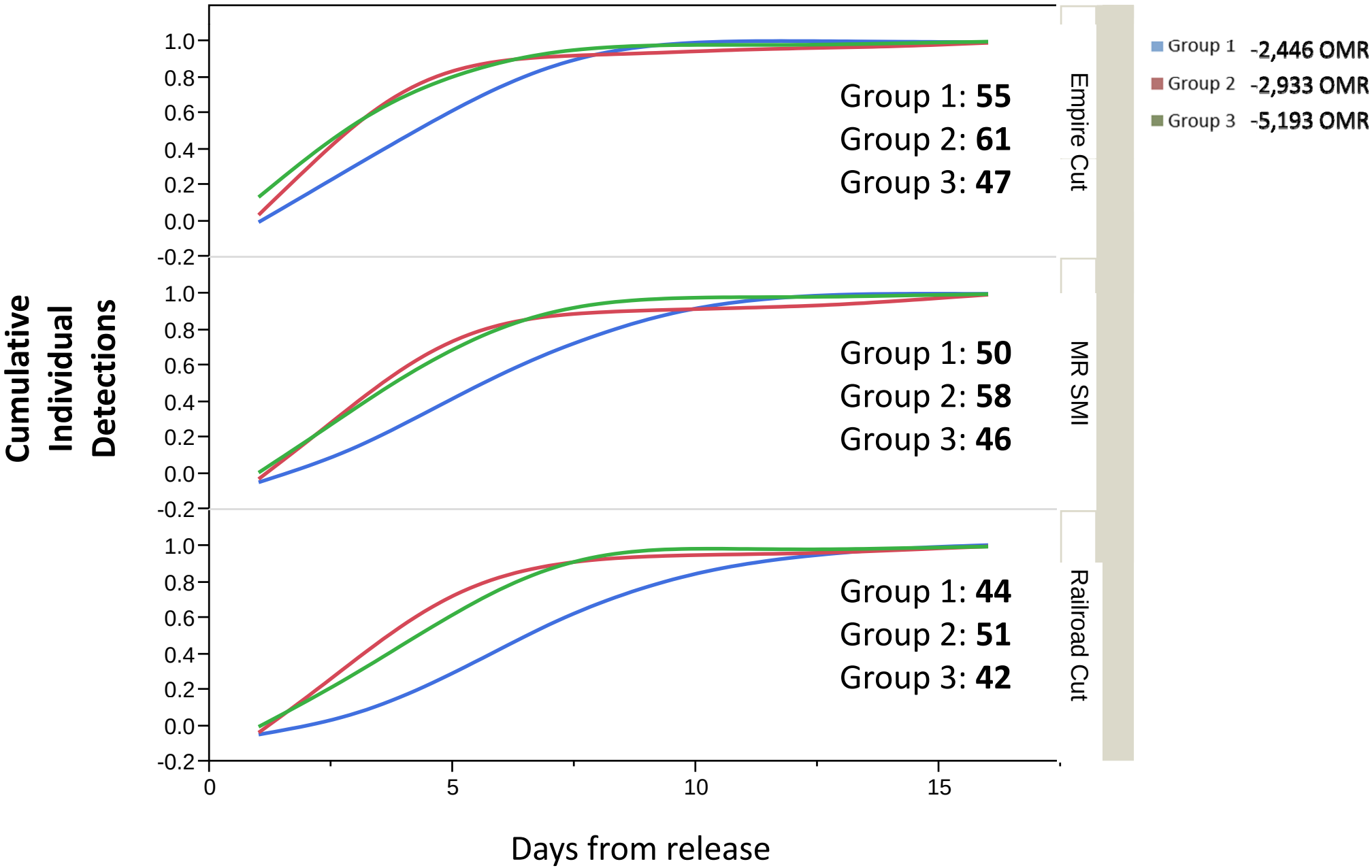
CDEC Versus DSM2 at Turner Cut

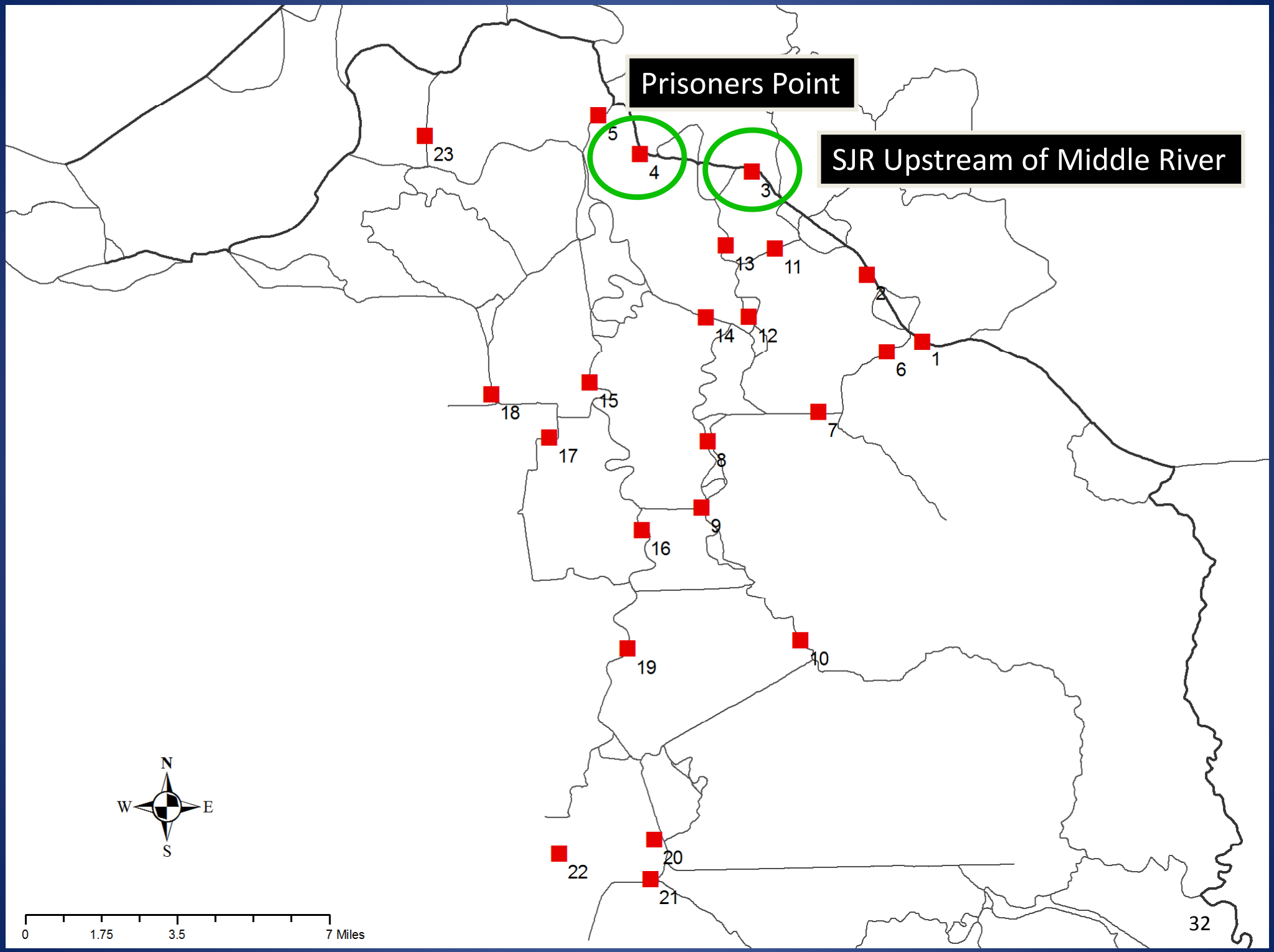


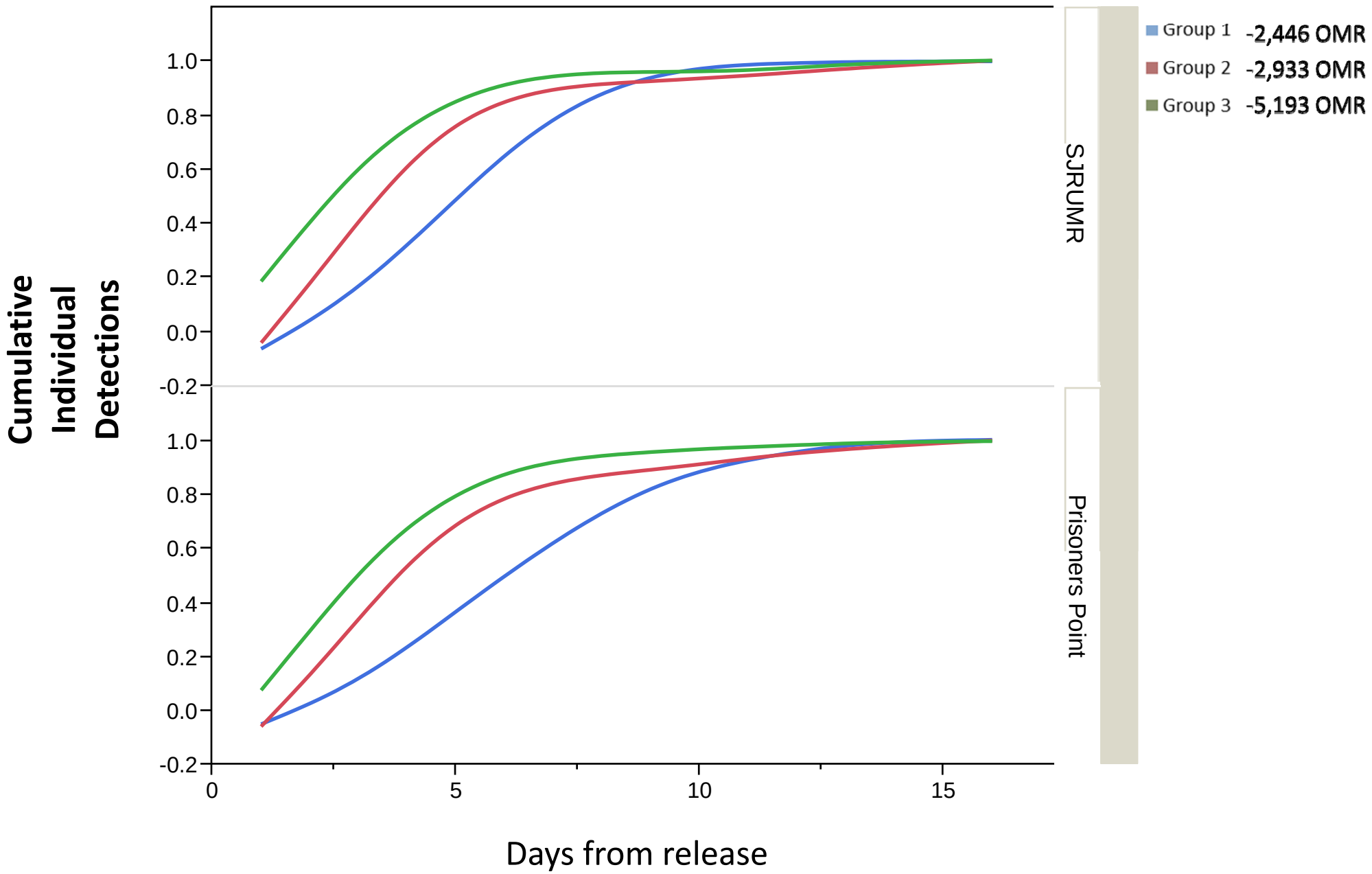
Hypothesis #2

Number and timing of fish arriving in the interior Delta will be influenced by OMR flows


Empire Cut
Middle River South Mildred Island
Railroad Cut
1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
22
23
30
N
W
E
S
0
1.75
3.5
7 Miles


Cumulative Individual Detections
1.0
0.8
0.6
0.4
0.2
0.0
-0.2
0
5
10
15
Days from release
Empire Cut
Group 1: 55
Group 2: 61
Group 3: 47
MR SMI
Group 1: 50
Group 2: 58
Group 3: 46
Railroad Cut
Group 1: 44
Group 2: 51
Group 3: 42
Group 1 -2,446 OMR
Group 2 -2,933 OMR
Group 3 -5,193 OMR


Prisoners Point
SJR Upstream of Middle River
23
5
4
3
13
11
2
14
12
1
6
15
18
7
17
8
9
16
10
19
20
22
21
32
N
W
E
S
0
1.75
3.5
7 Miles


Cumulative Individual Detections
1.0
0.8
0.6
0.4
0.2
0.0
-0.2
0
5
10
15
Days from release
SJRUMR
Prisoners Point
Group 1 -2,446 OMR
Group 2 -2,933 OMR
Group 3 -5,193 OMR

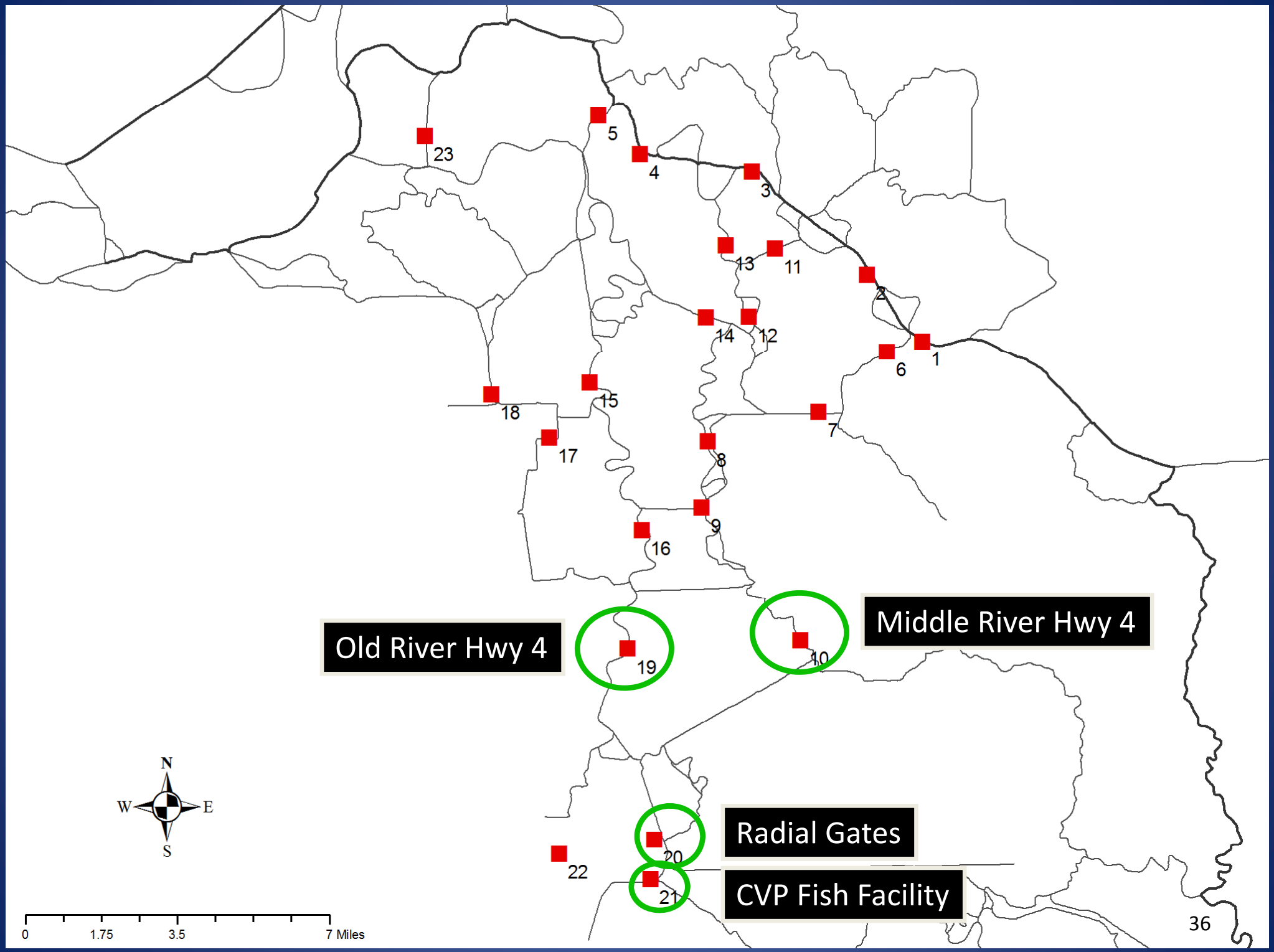
Hypotheses #2: Preliminary Findings:

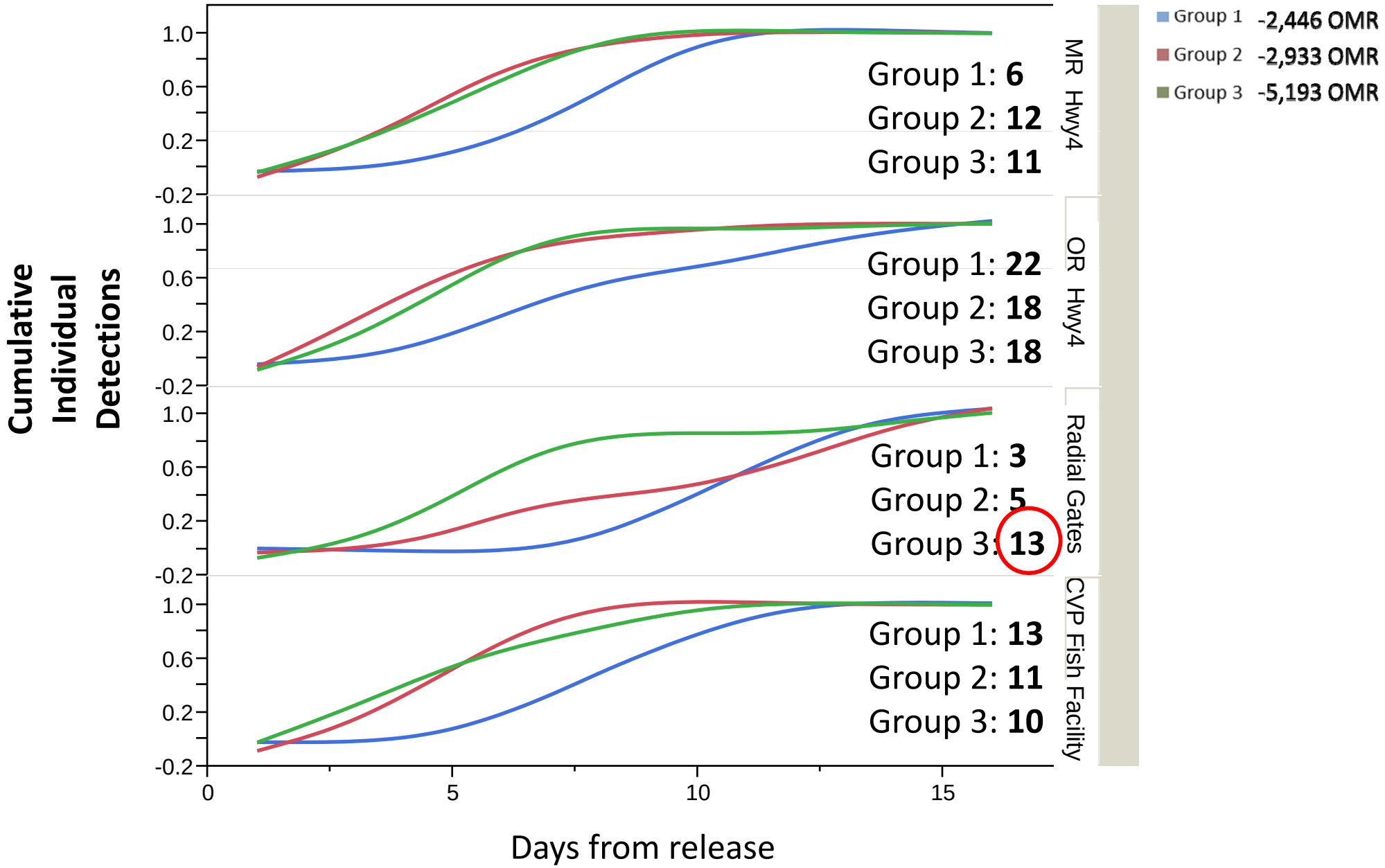
Number and timing of fish arriving in the interior Delta will be influenced by OMR flows

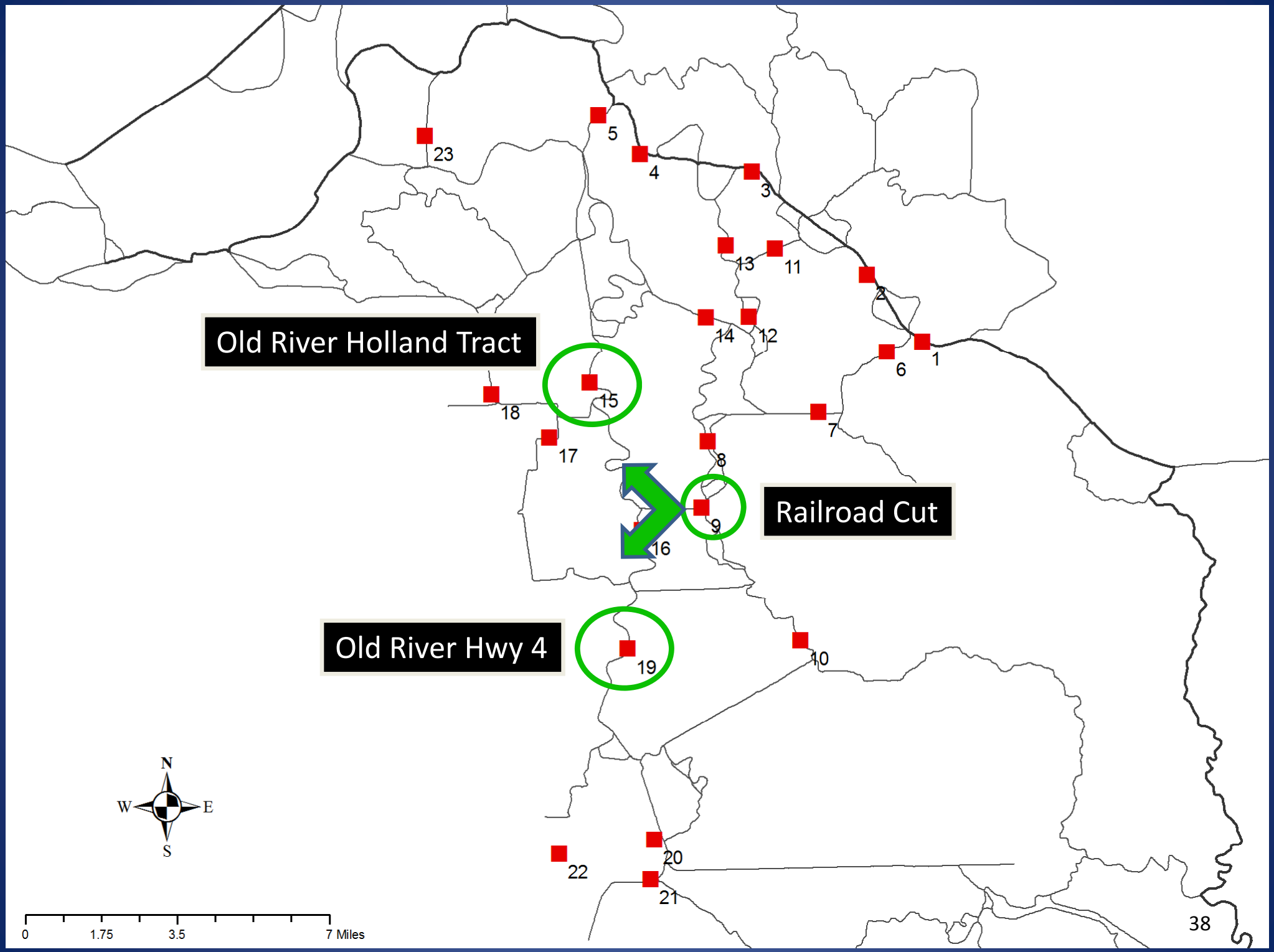
- *Not supported*
- *Timing and proportion between release groups were similar/not attributable to OMR*

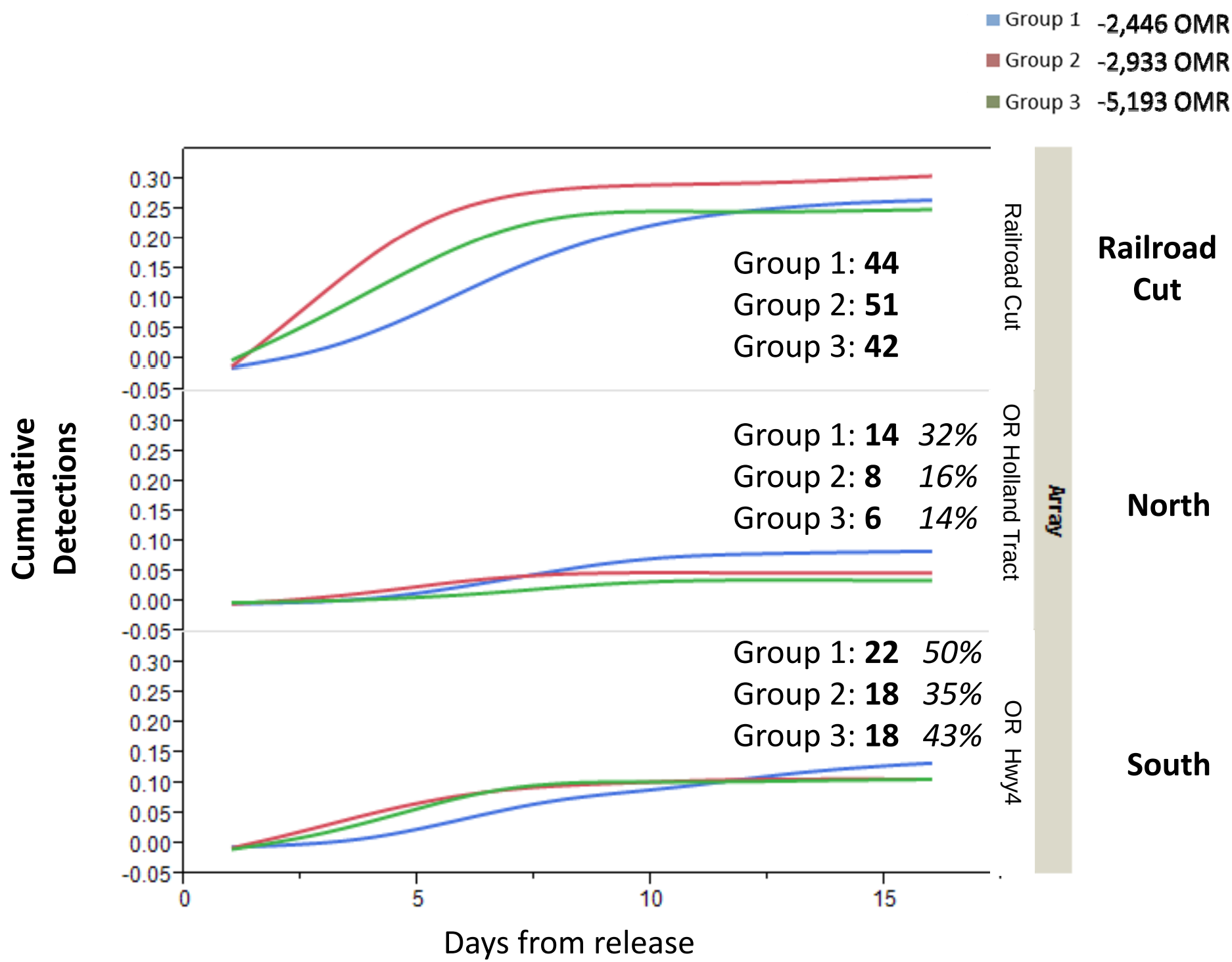
Hypothesis #3

Behavior of fish beyond Railroad Cut will be influenced by OMR flows


23
5
4
3
13
11
2
14
12
1
6
18
15
7
17
8
9
16
Old River Hwy 4
19
10
Middle River Hwy 4
N
W
E
S
Radial Gates
20
22
21
CVP Fish Facility
0
1.75
3.5
7 Miles


Cumulative Individual Detections
1.0
0.6
0.2
-0.2
0
5
10
15
Days from release
MR Hwy4
Group 1: 6
Group 2: 12
Group 3: 11
OR Hwy4
Group 1: 22
Group 2: 18
Group 3: 18
Radial Gates
Group 1: 3
Group 2: 5
Group 3: 13
CVP Fish Facility
Group 1: 13
Group 2: 11
Group 3: 10
Group 1 -2,446 OMR
Group 2 -2,933 OMR
Group 3 -5,193 OMR


Old River Holland Tract
Railroad Cut
Old River Hwy 4
1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
22
23
38
N
W
E
S
0
1.75
3.5
7 Miles


Group 1 -2,446 OMR
Group 2 -2,933 OMR
Group 3 -5,193 OMR
Cumulative Detections
Days from release
Array
Railroad Cut
OR Holland Tract
OR Hwy4
Railroad Cut
North
South
Group 1: 44
Group 2: 51
Group 3: 42
Group 1: 14 32%
Group 2: 8 16%
Group 3: 6 14%
Group 1: 22 50%
Group 2: 18 35%
Group 3: 18 43%

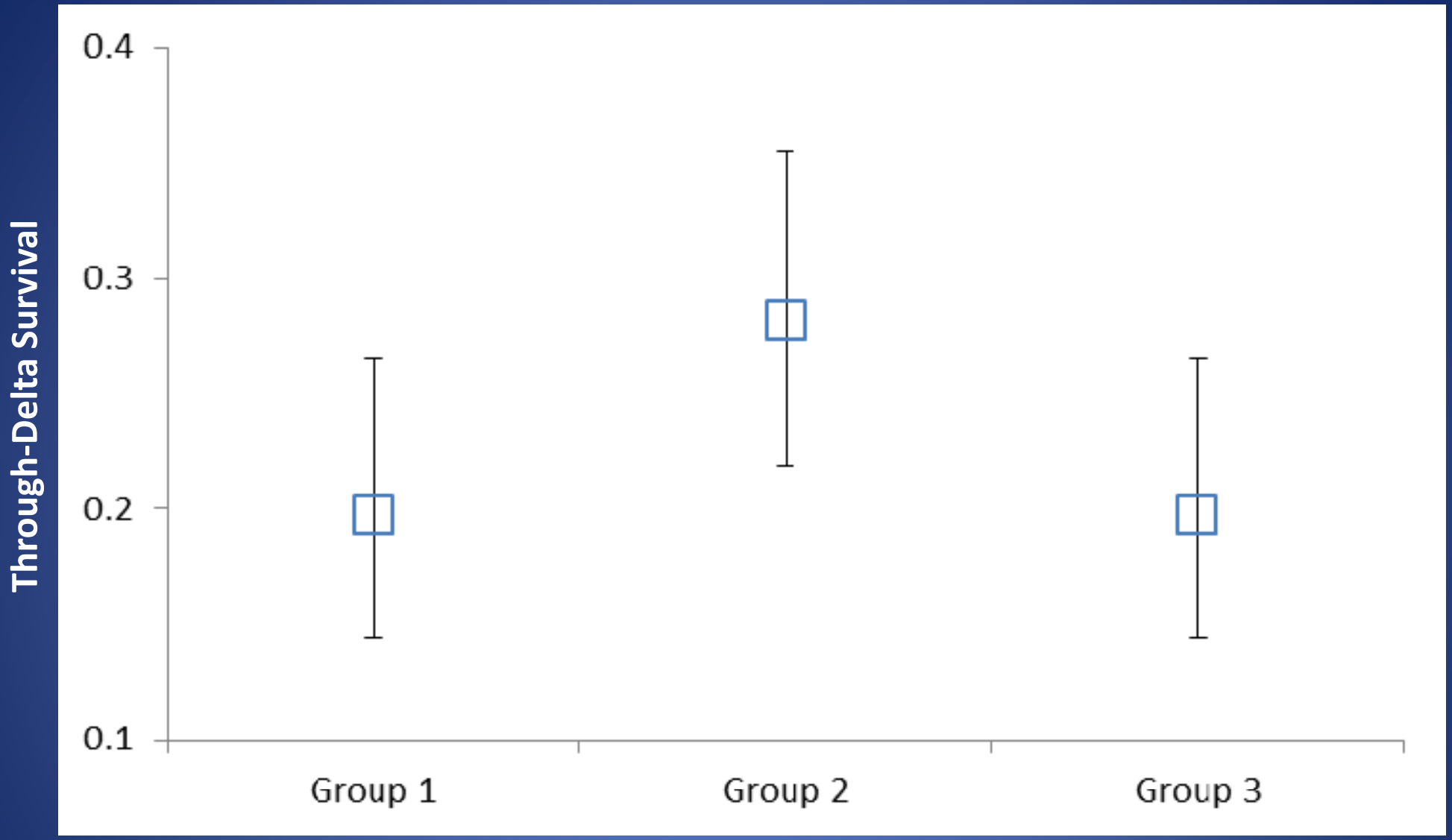
Hypothesis #3: Preliminary Findings

Behavior of fish beyond Railroad Cut will be influenced by OMR flows

- *No pattern in arrival at intermediate arrays (10 and 19)*
- *Increased entrainment at CCF Radial Gates (Array 20) at most negative OMR*
- *More fish moving South than North but movement South or North may or may not be dependent on OMR flows*

Hypothesis #4

Through-Delta survival will be influenced by OMR flows



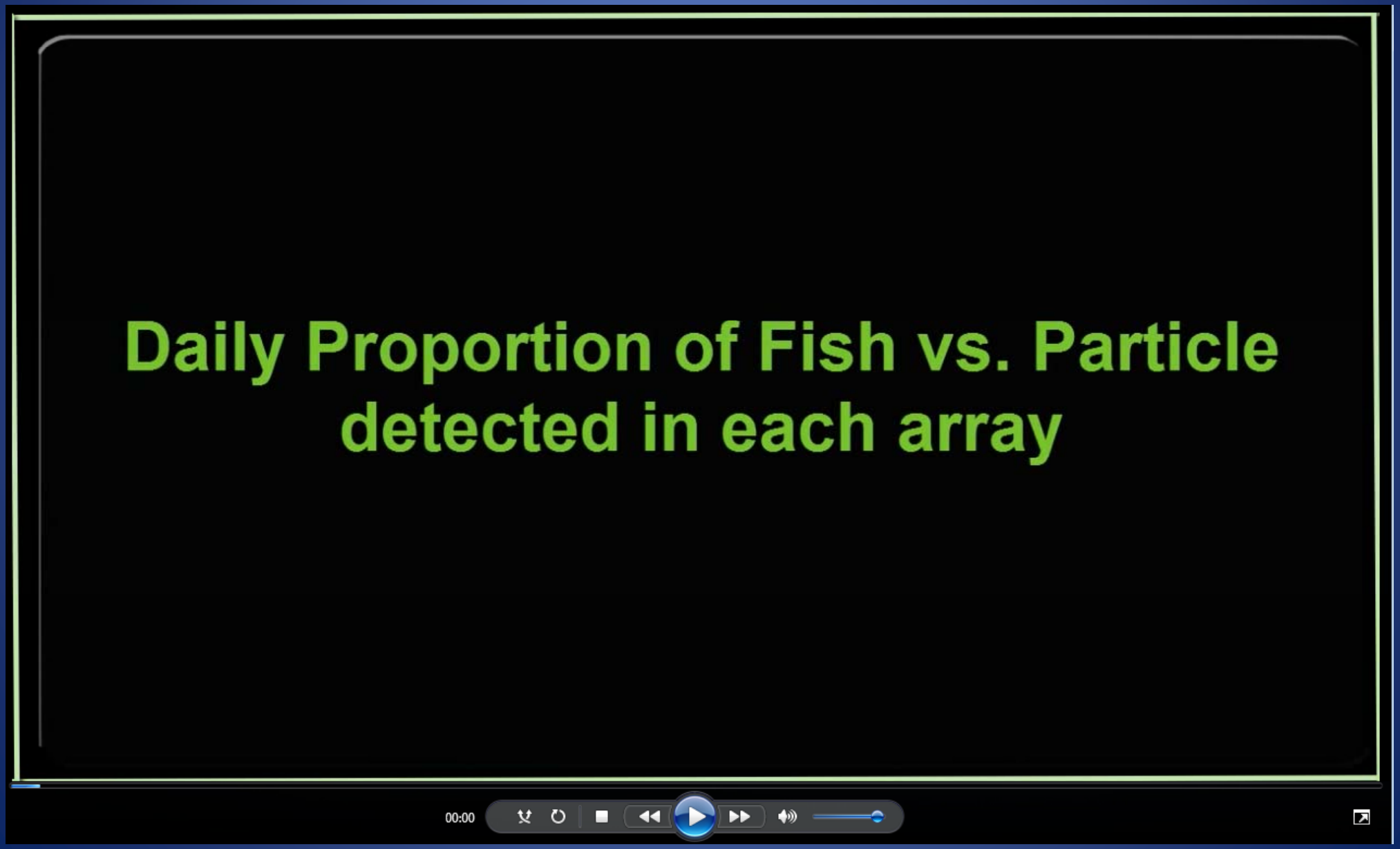
A group effect (i.e. OMR) was not supported by Cormack-Jolly-Seber survival model

Hypotheses #4: Preliminary Findings:

Through-Delta survival will be influenced by OMR flows

- *Not supported*
- *Route specific estimates may yield different results*

Fish Movements versus PTM



Fish Movements versus PTM

Conclusions and Next Steps

- *2012 stipulation study provided much new and very useful information*

- *Still much analysis needs to be done….*
  - *Refine results reported here*
  - *Statistical analysis relating behavior to daily and sub-daily hydrodynamic conditions*
  - *Full CJS model with routing probabilities and route specific survival rates*

Final Report Timetable

Stipulation Study

Fall 2013

Acknowledgements:

Agencies

Consultants

Questions?