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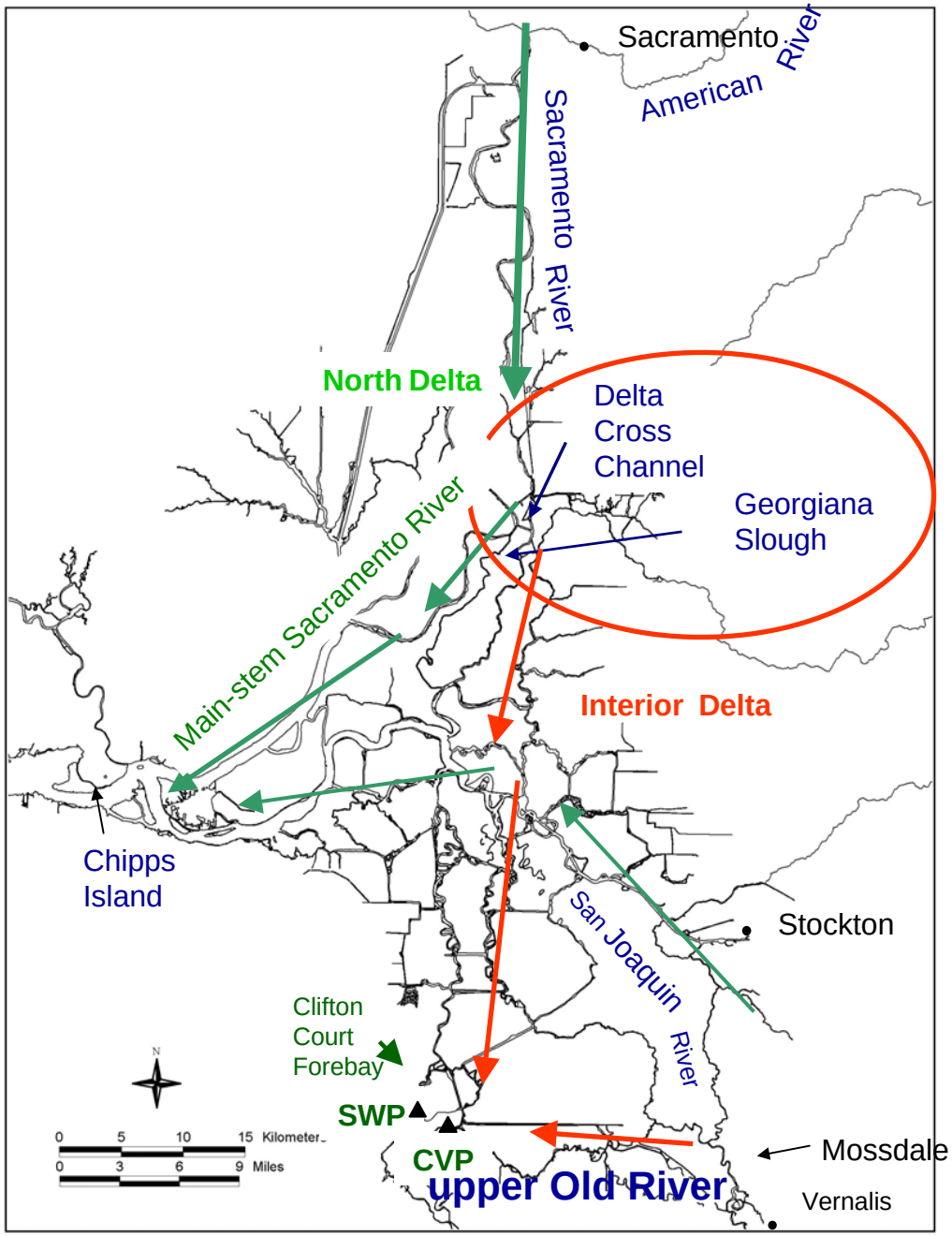
Salmon Conceptual Model and Basis for DCC Closures

SWRCB Periodic Review

November 15, 2004

Pat Brandes - USFWS

Conceptual Model of juvenile salmon migration through the Delta



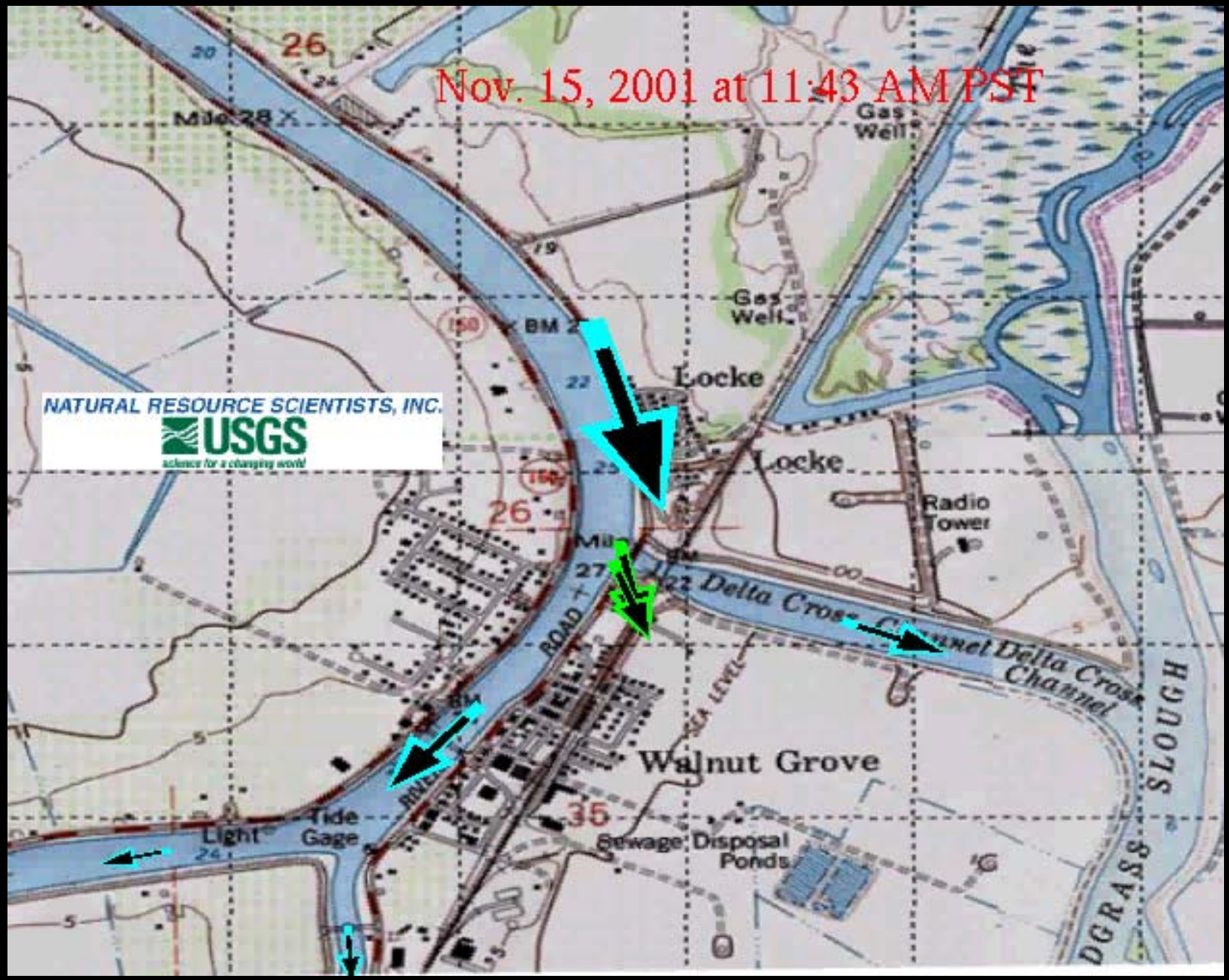
-Sac Basin salmon move into interior Delta through the open DCC and GS

- in the interior Delta their survival is lower
- and a function of exports

- Vulnerable to entrainment during emigration

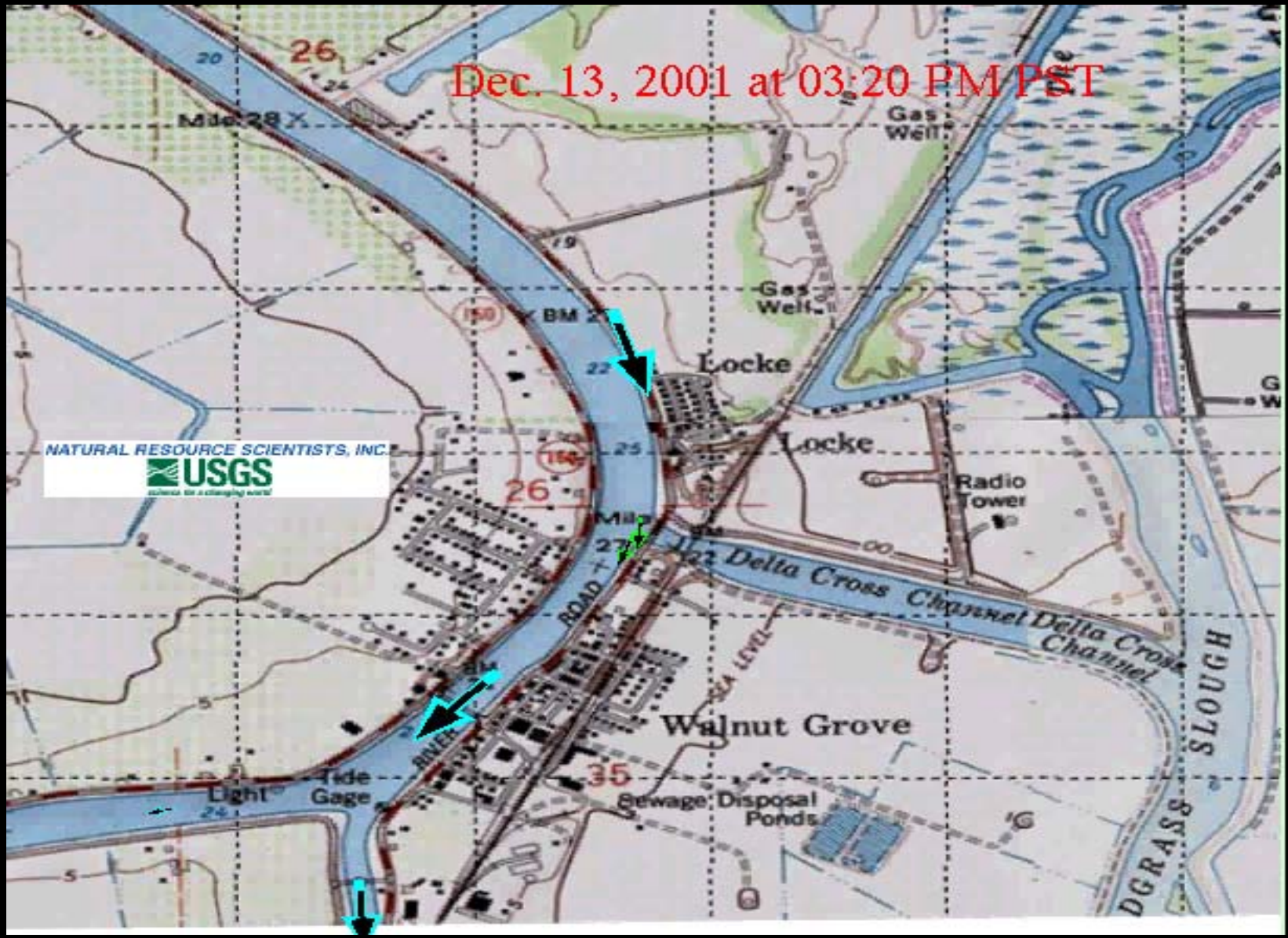
Conceptual Model of juvenile salmon migration through the Sacramento Delta

-Sac Basin salmon move into interior Delta through the open DCC and GS



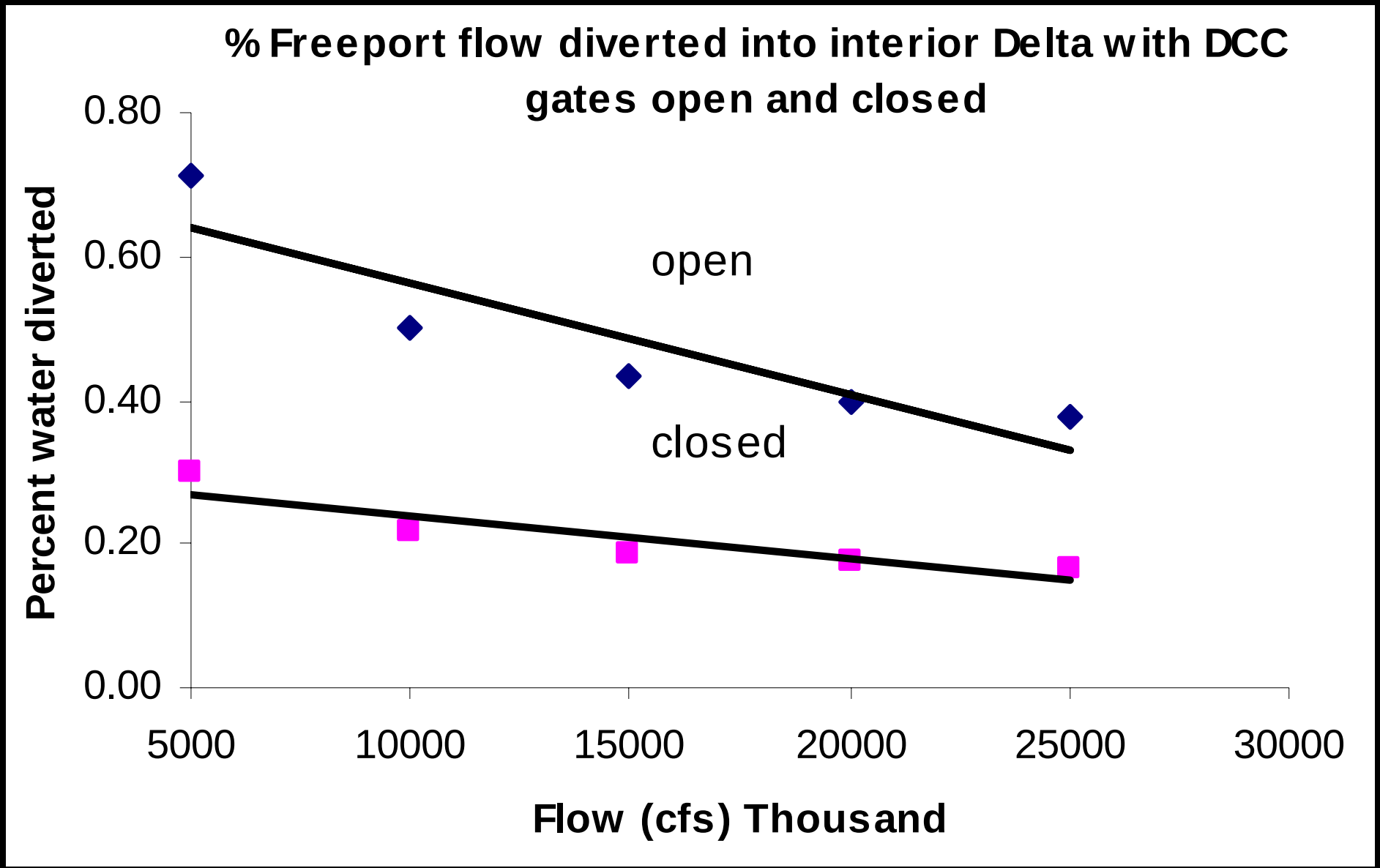
Flood Tide **Gates open**

Source: Vogel 2002 Asilomar Presentation



EBB Tide **DCC gates closed**

Source: Vogel, 2002 Asilomar Presentation


% Freeport flow diverted into interior Delta with DCC gates open and closed
Percent water diverted
0.80
0.60
0.40
0.20
0.00
open
closed
5000
10000
15000
20000
25000
30000
Flow (cfs) Thousand

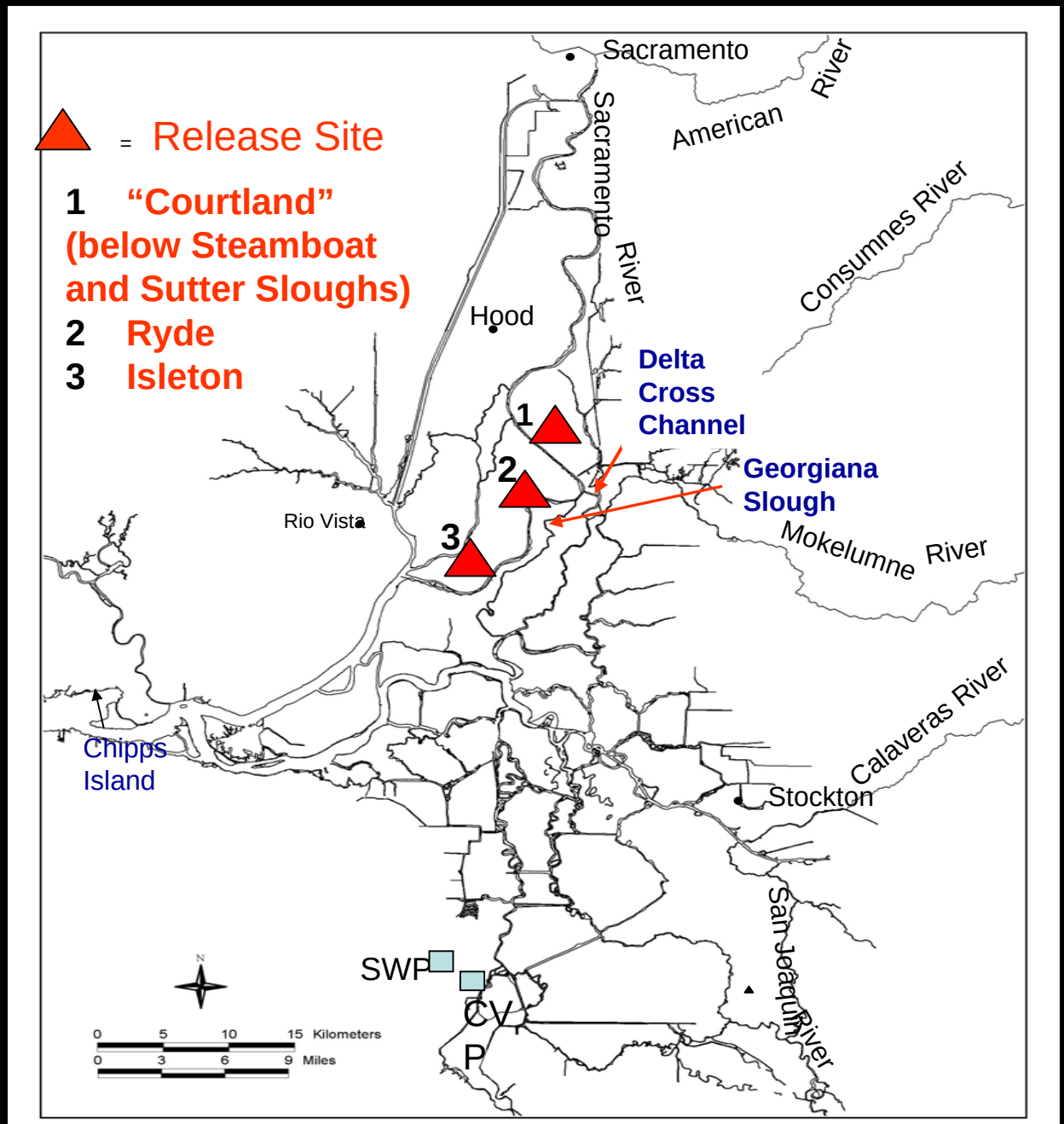
Conceptual Model of juvenile salmon migration through the Sacramento Delta

-Sac Basin salmon move into interior Delta through the open DCC and GS

-More move into interior Delta with gates open

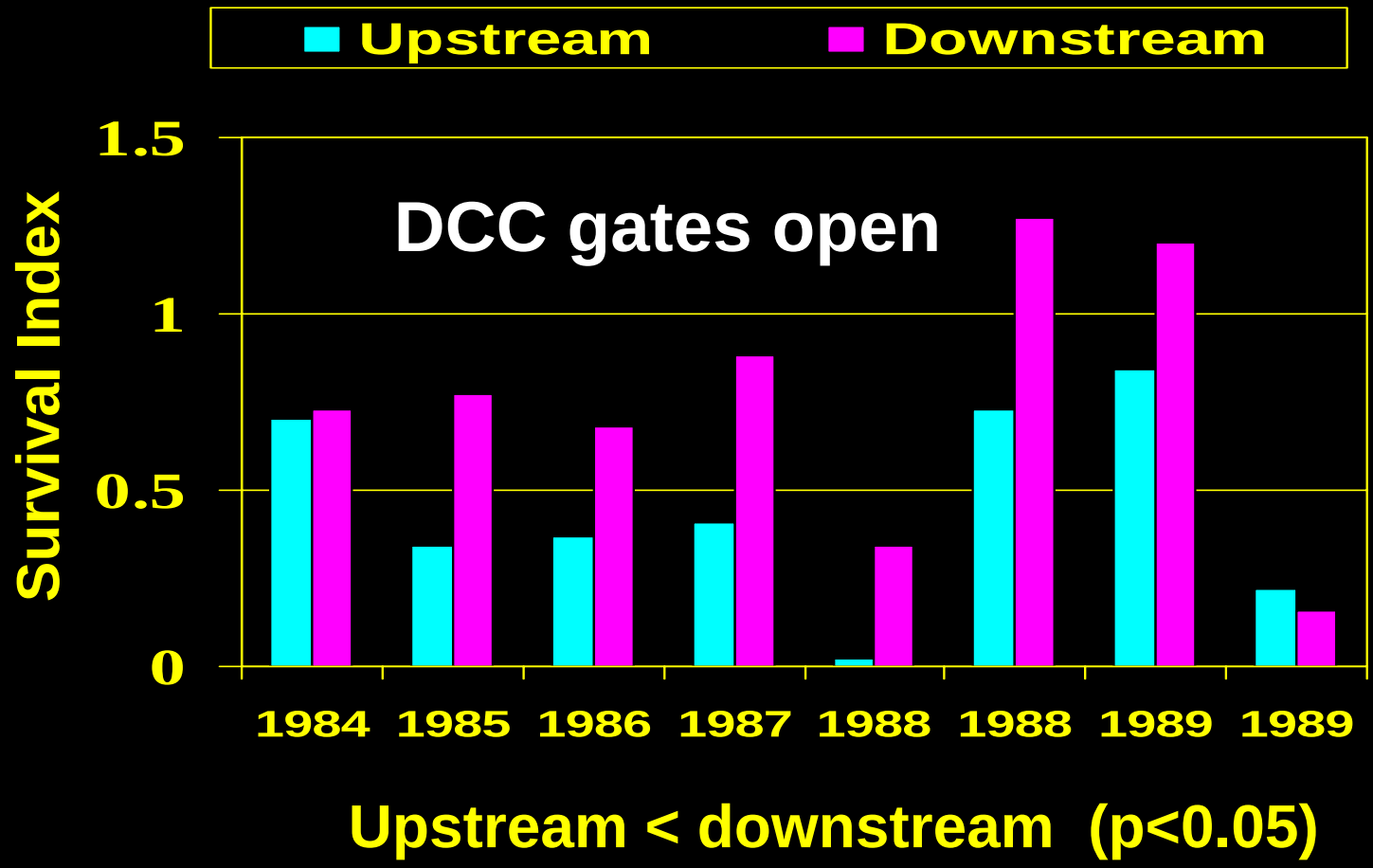
-Survival is lower in the interior Delta

Mossdale



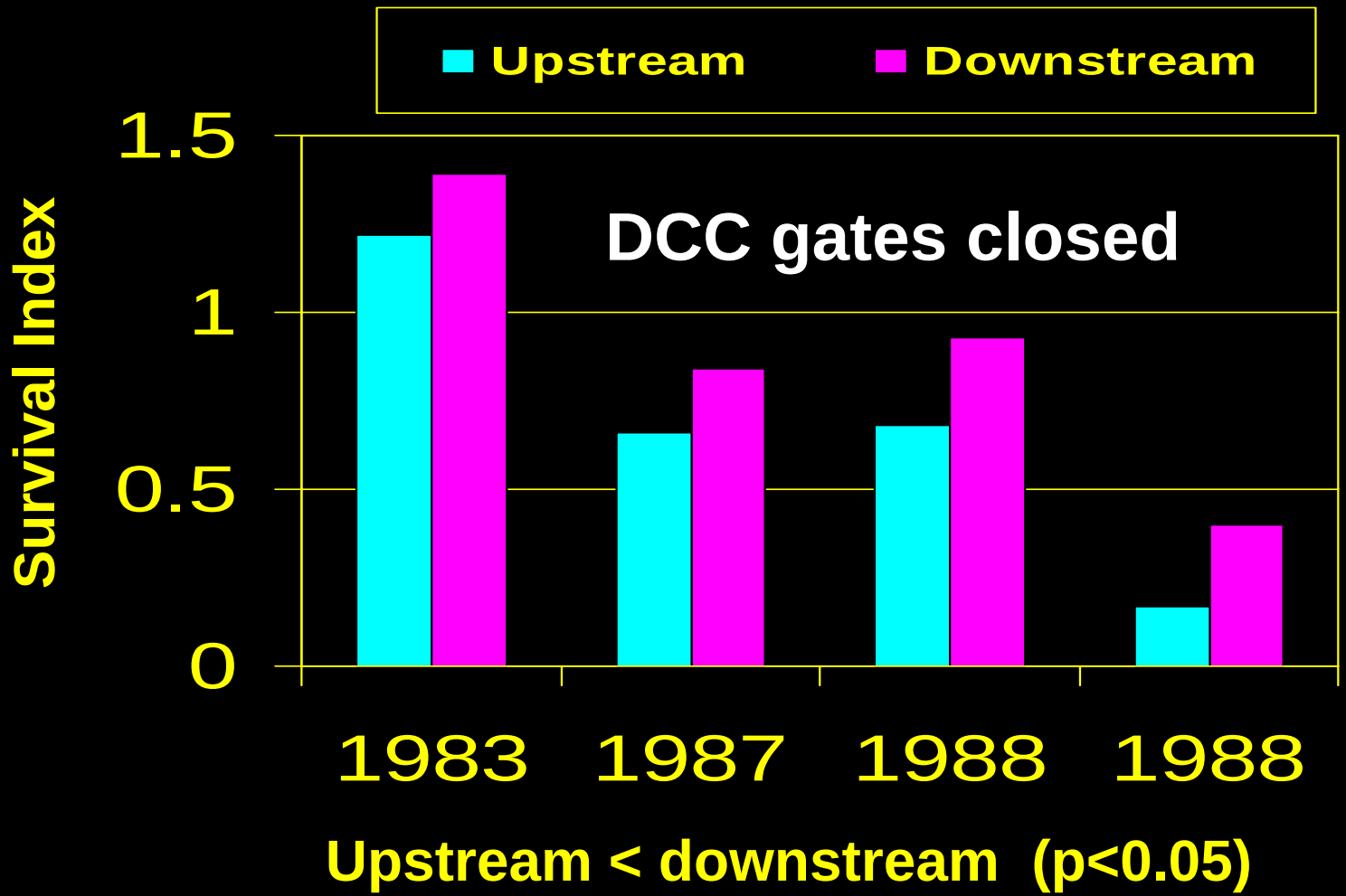
Marked juvenile salmon releases made on Sac River above and below the DCC and GS

Survival indices to Chipps Island of marked juvenile salmon released upstream and downstream of the Delta Cross Channel and Georgiana Slough



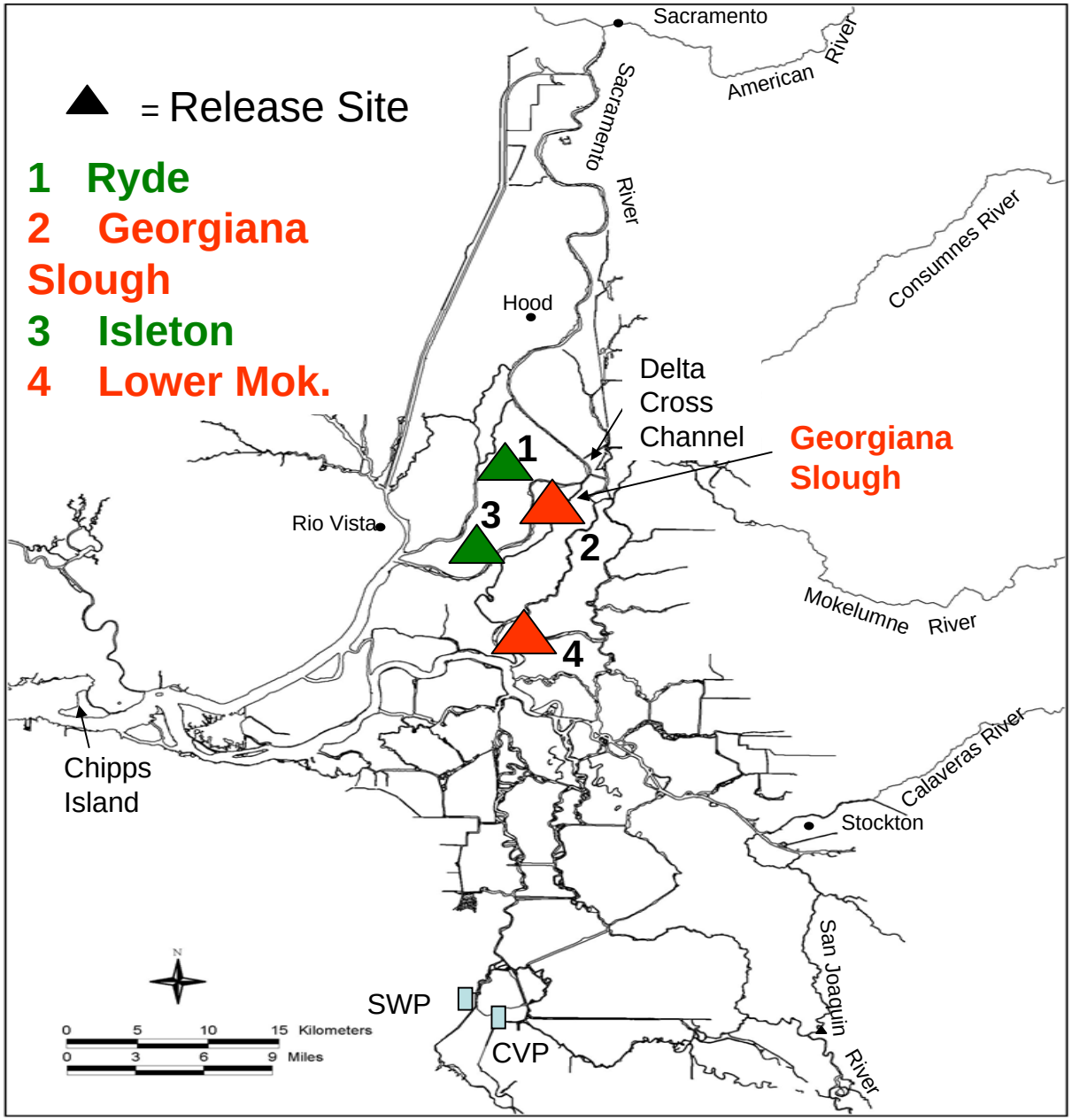
Data would infer additional mortality of upstream group due to some entering DCC and GS

Survival indices to Chipps Island of marked juvenile salmon released upstream and downstream of the Delta Cross Channel and Georgiana Slough



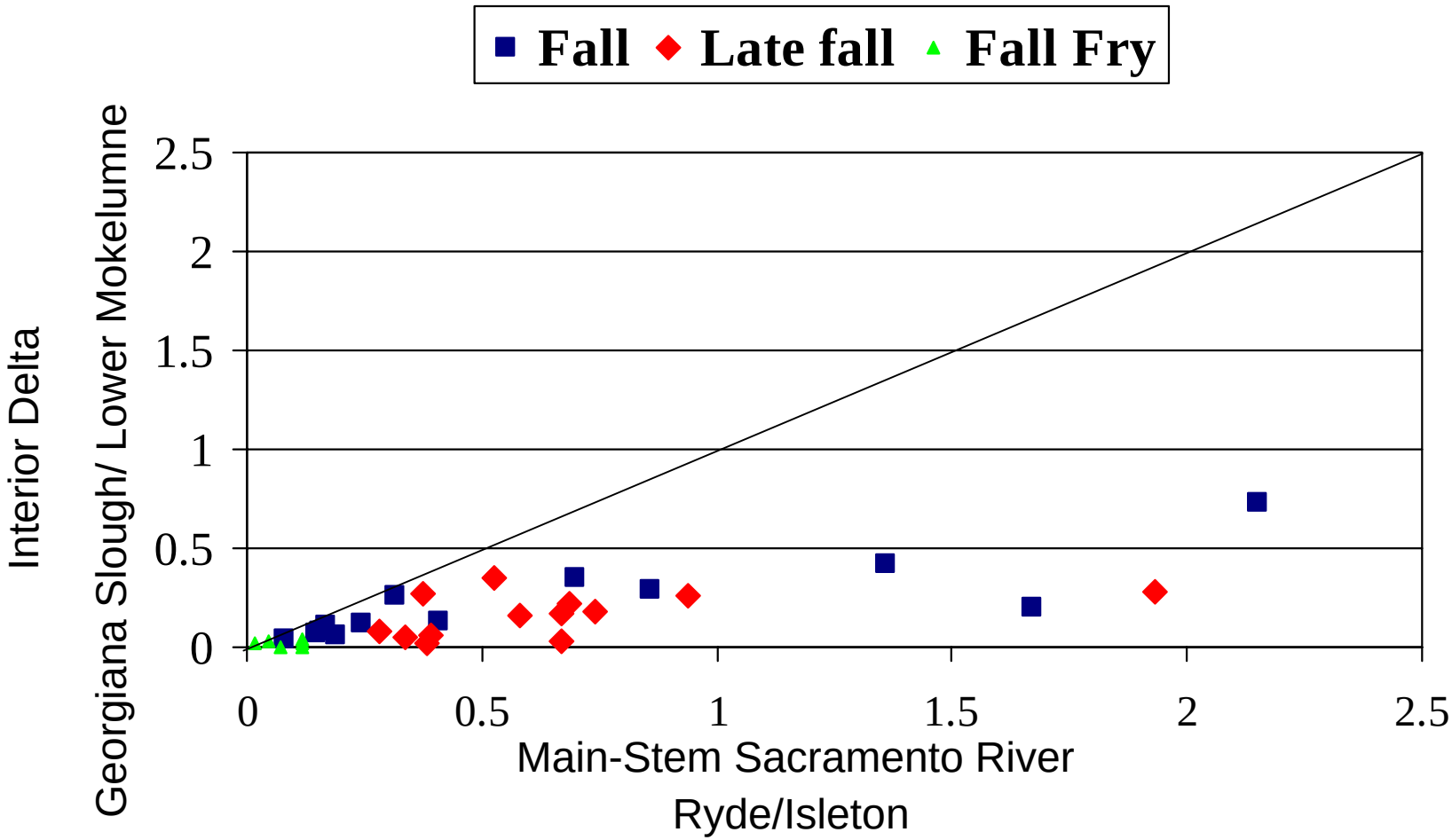
Upstream < downstream (p<0.05)

Data would infer additional mortality of upstream group due to some entering GS



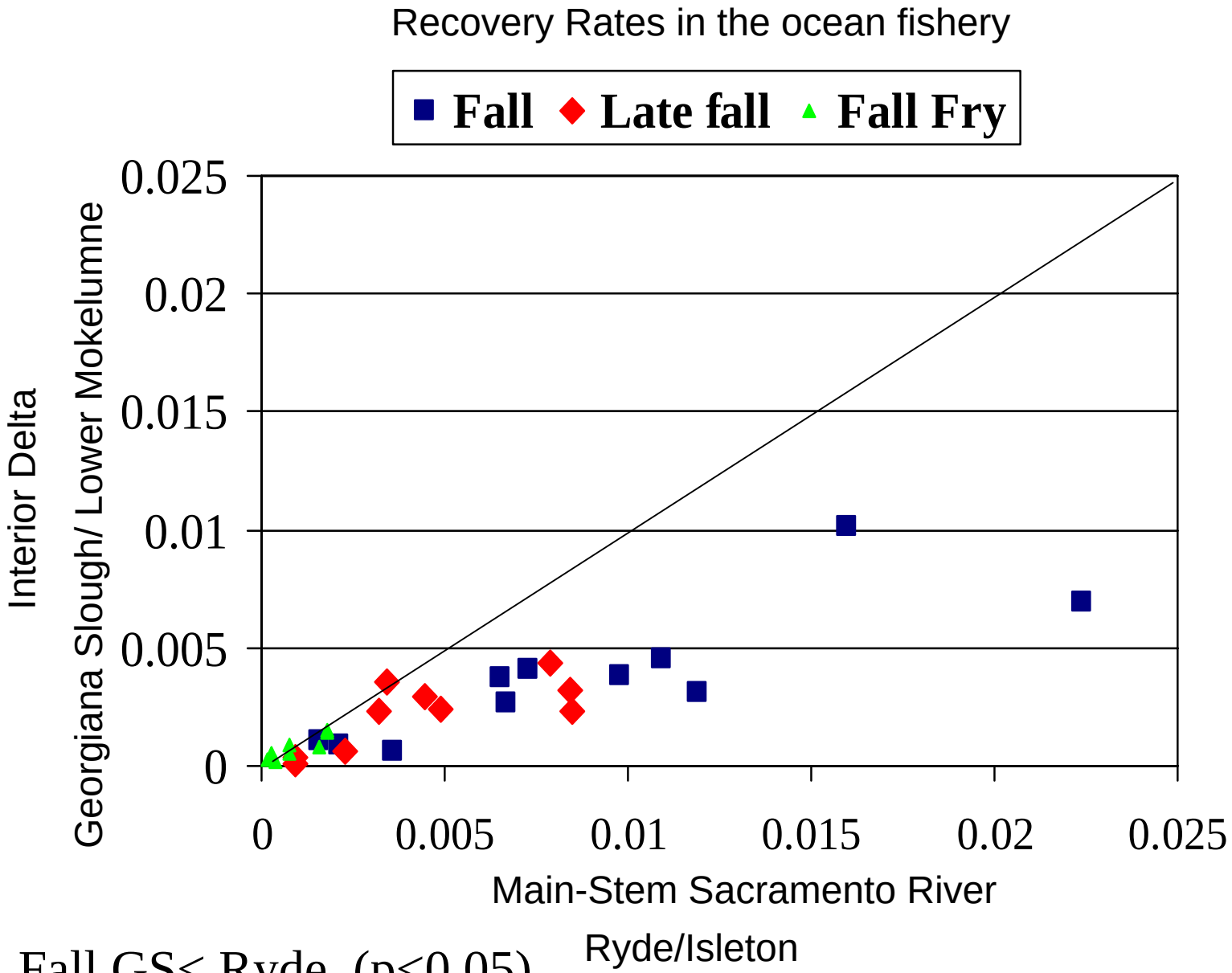
Release sites for marked salmon released on Sacramento River (Ryde and Isleton) and interior Delta (Georgiana Slough and Lower Mokelumne)

Survival indices to Chipps Island



Fall GS< Ryde ($p<0.05$)

Late-fall GS<Ryde ($p<0.05$)



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Conceptual Model of juvenile salmon migration through the Sacramento Delta

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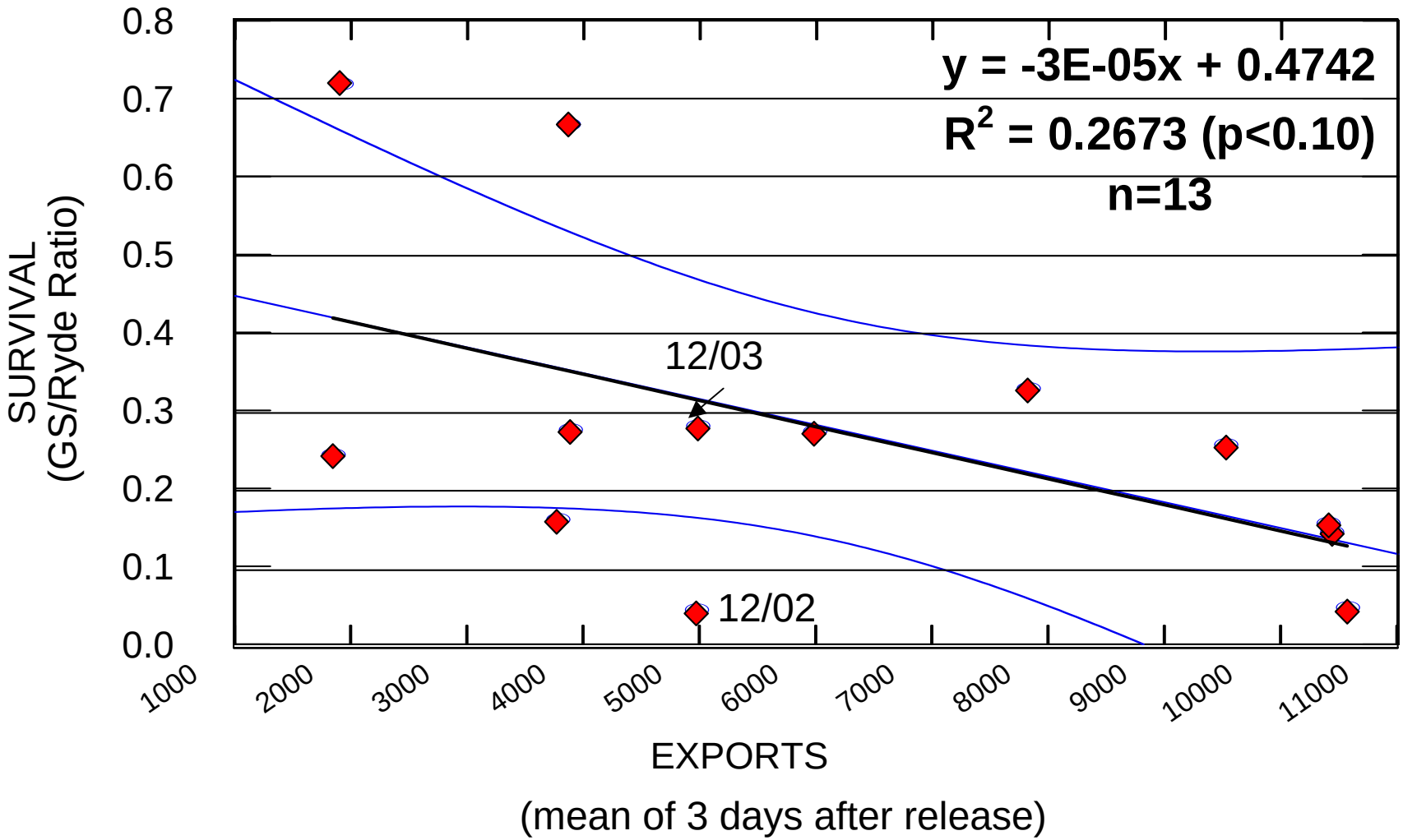
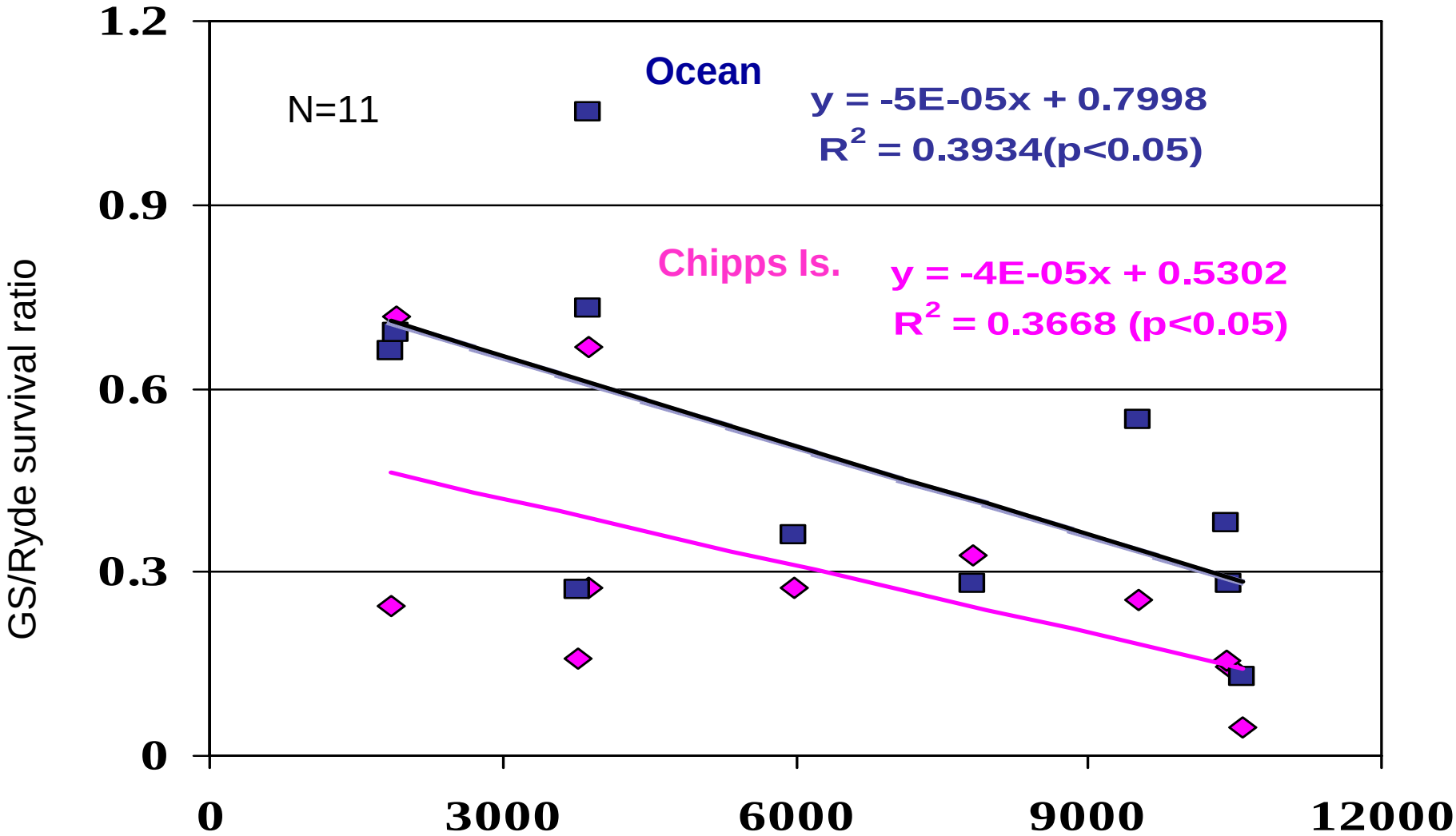
-Survival is lower In the interior Delta

-and a function of exports

Mossdale



Relationship between GS/Ryde survival ratio and CVP/SWP exports
with 95% confidence intervals



Relationships between GS/Ryde survival ratio and CVP/SWP exports

Conceptual Model of juvenile salmon migration through the Sacramento Delta

-Sac Basin salmon move into interior Delta through the open DCC and GS

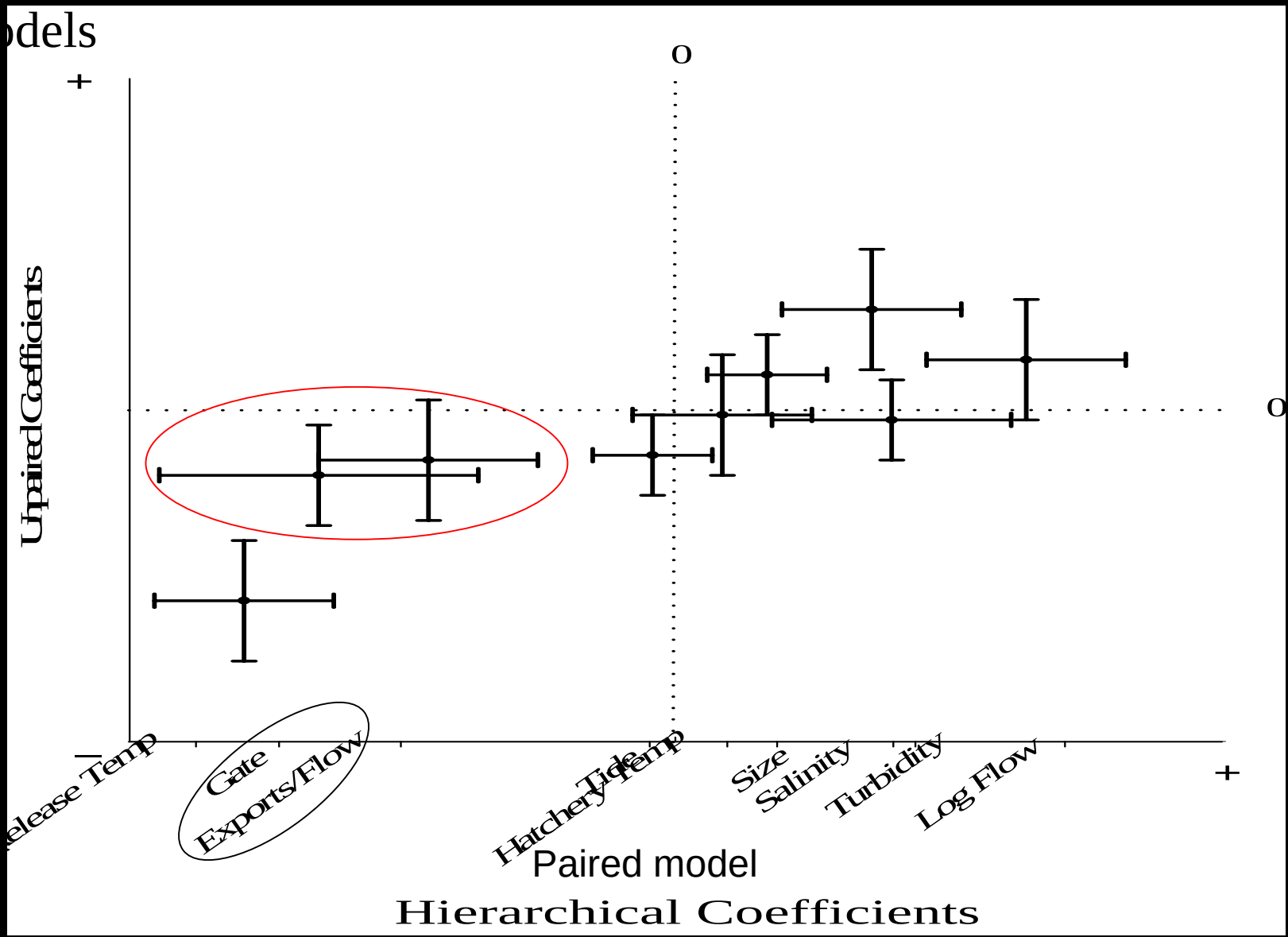
-More move into interior Delta with gates open

- In the interior Delta, their survival is lower

- and a function of exports

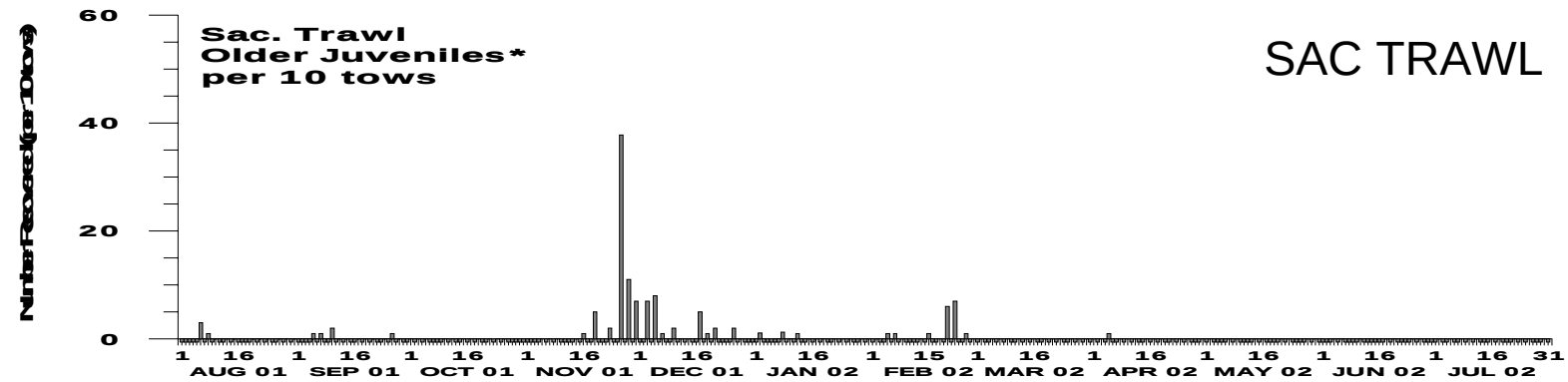
Statistical Modeling of fall run CWT recoveries is supportive of this conceptual model

Mossdale

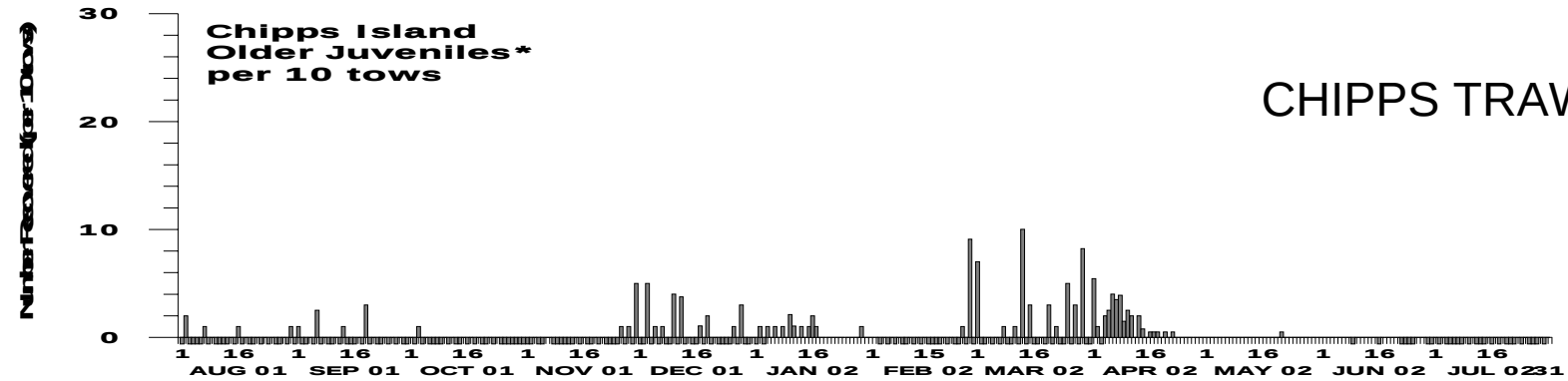

odels
+
0
0
+
Release Temp
Gate
Exports/Flow
Hatchery Temp
Tide
Size
Salinity
Turbidity
Log Flow
Paired model
Hierarchical Coefficients

OLDER JUVENILES

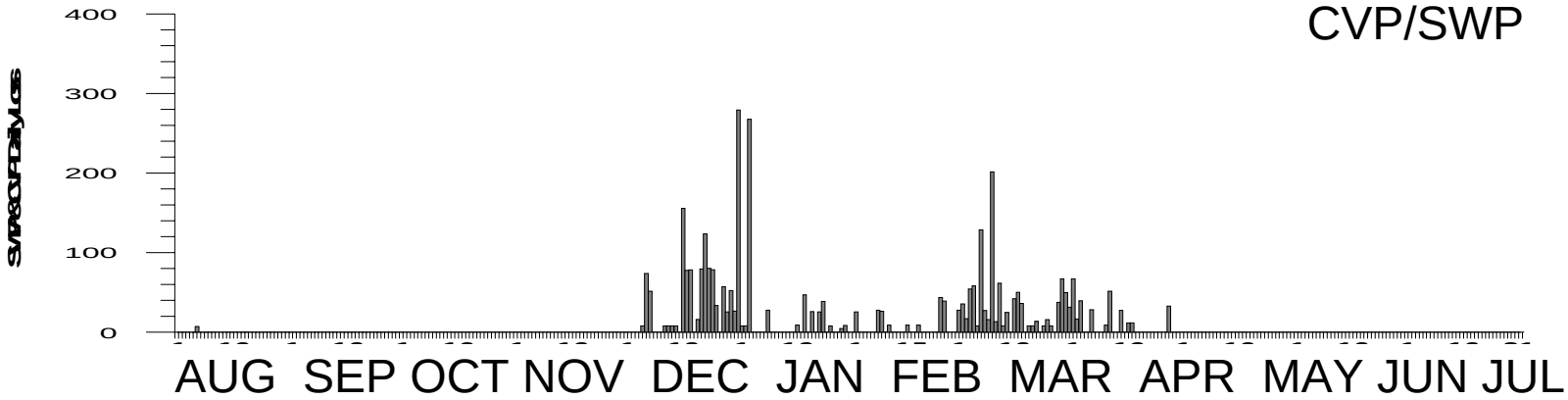
2001-2002



SAC TRAWL



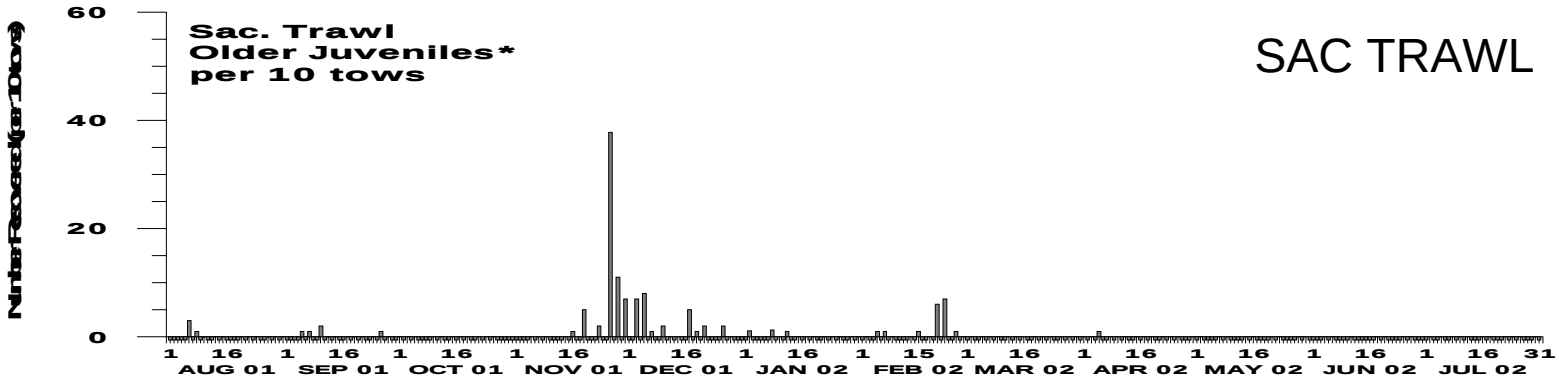
CHIPPS TRAWL



CVP/SWP

OLDER JUVENILES/ WINTER RUN

2001-2002



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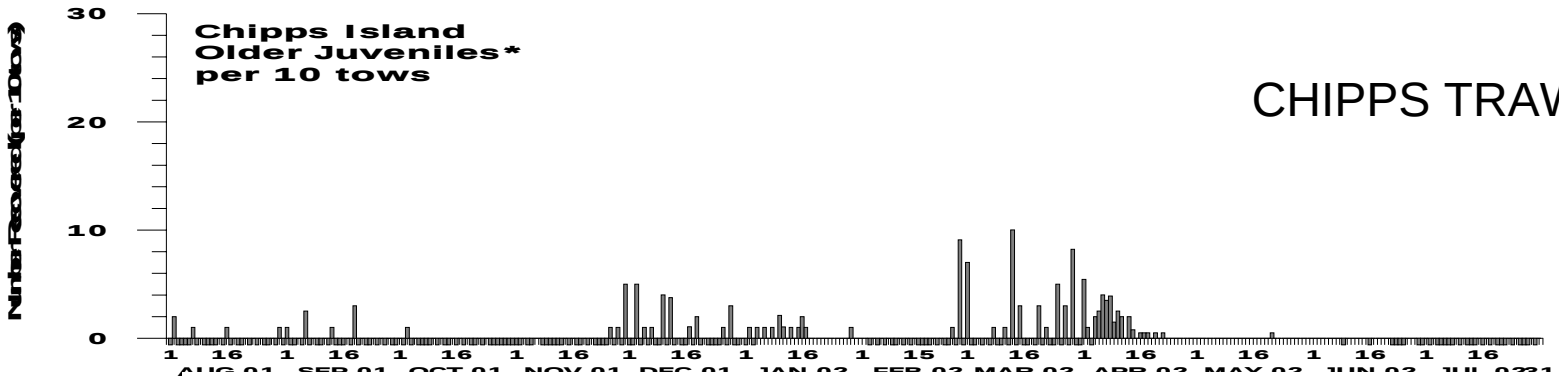
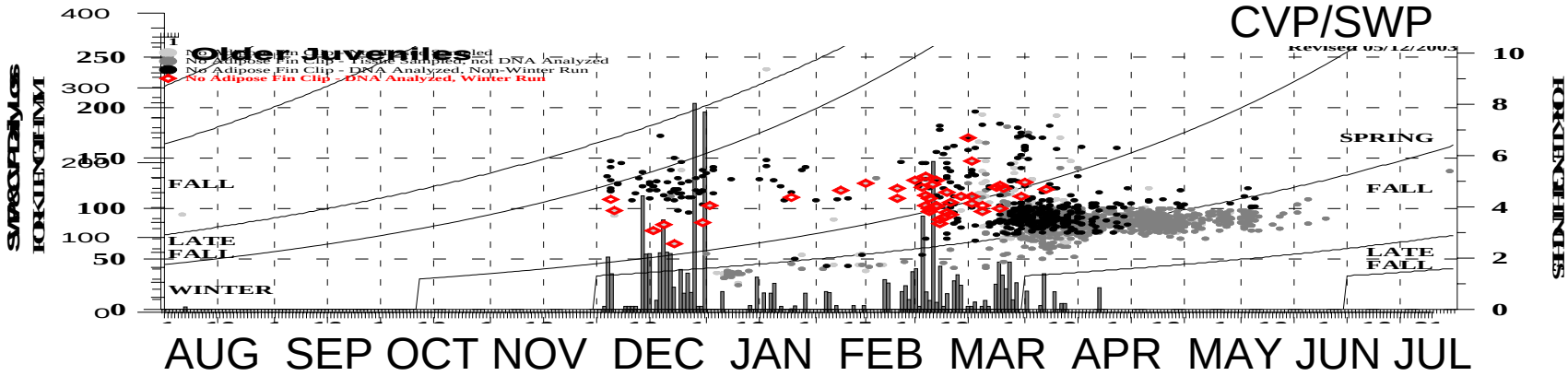


CHIPPS TRAWL



CVP/SWP

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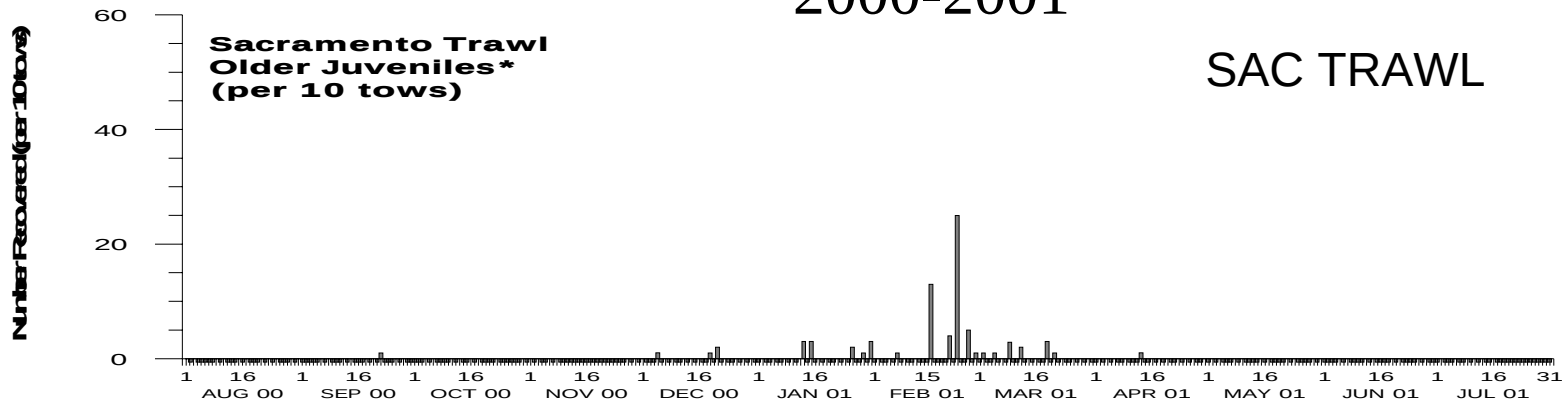

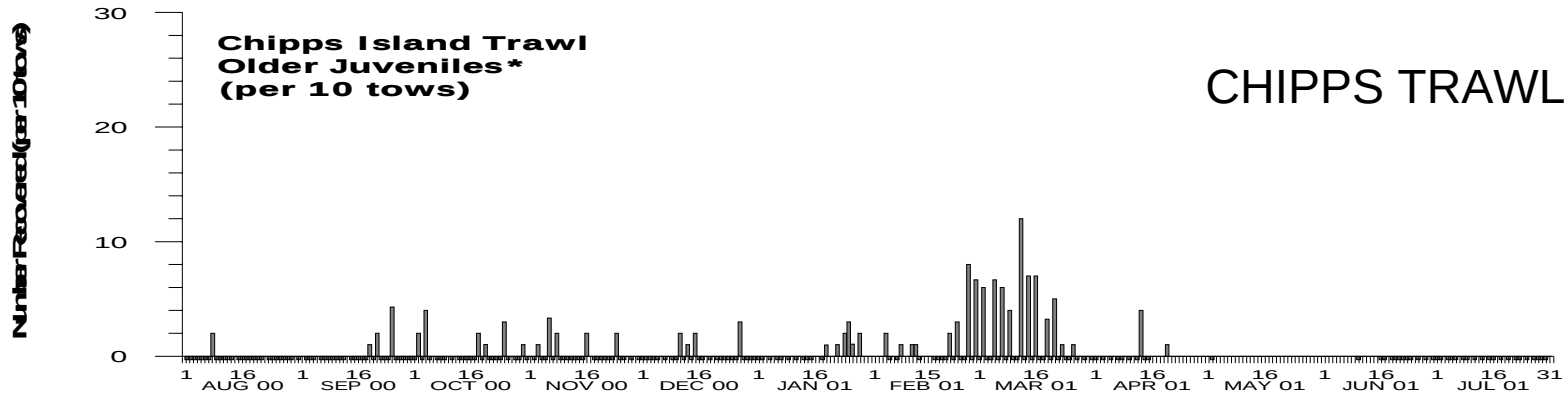

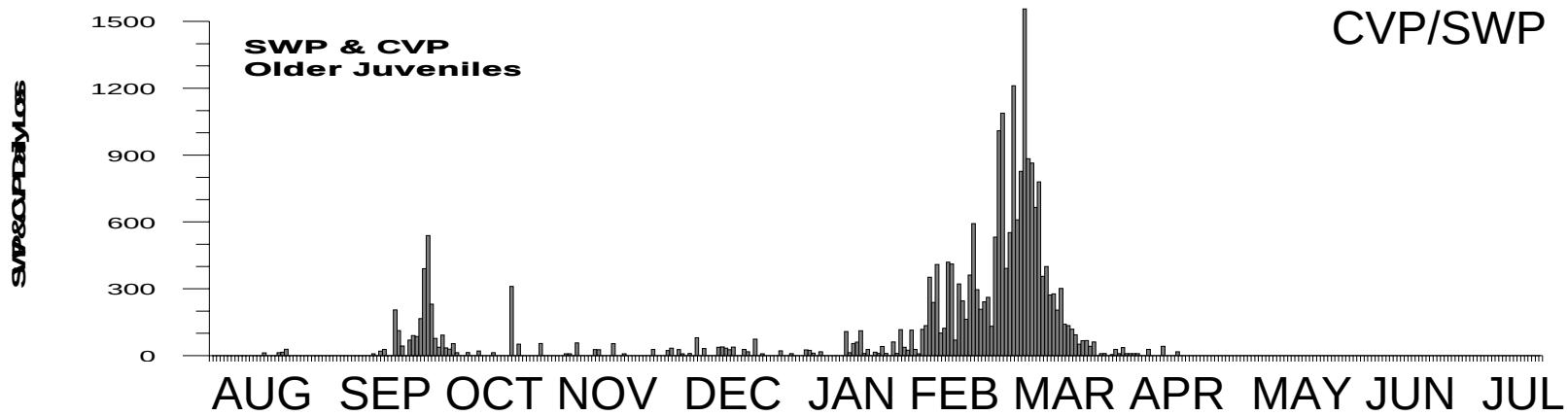

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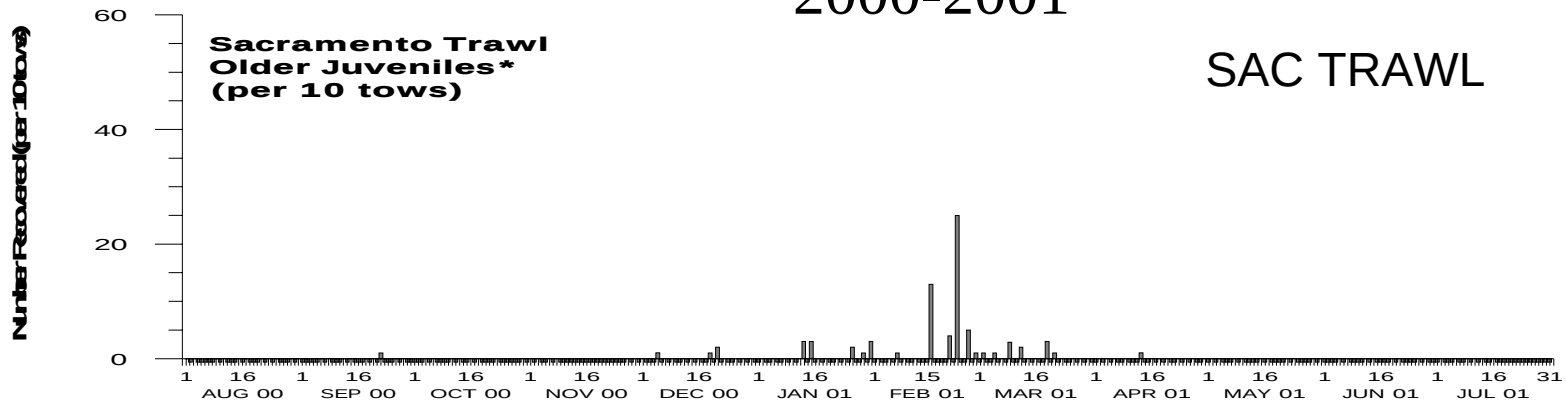

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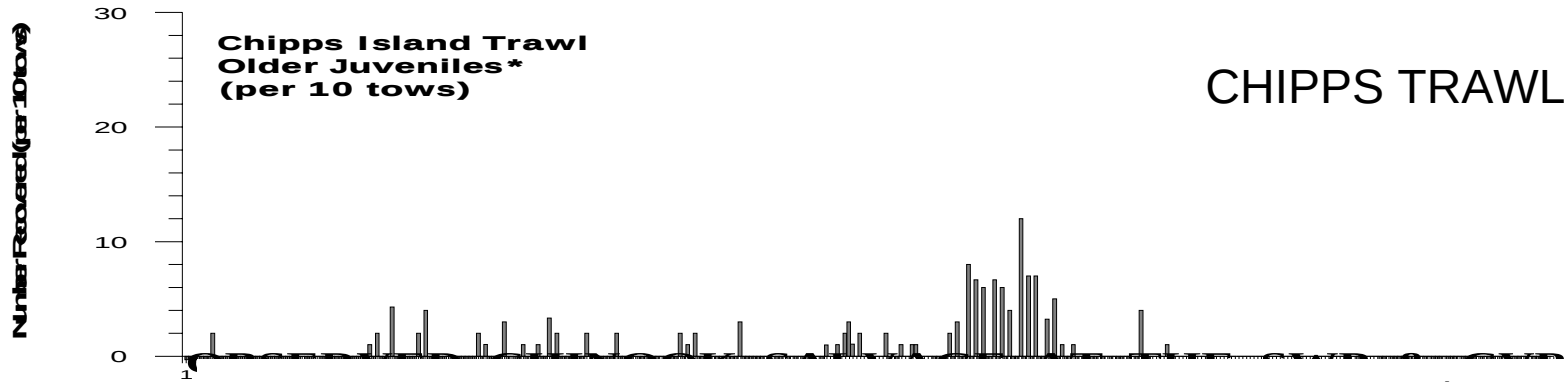

CHIPPS TRAWL

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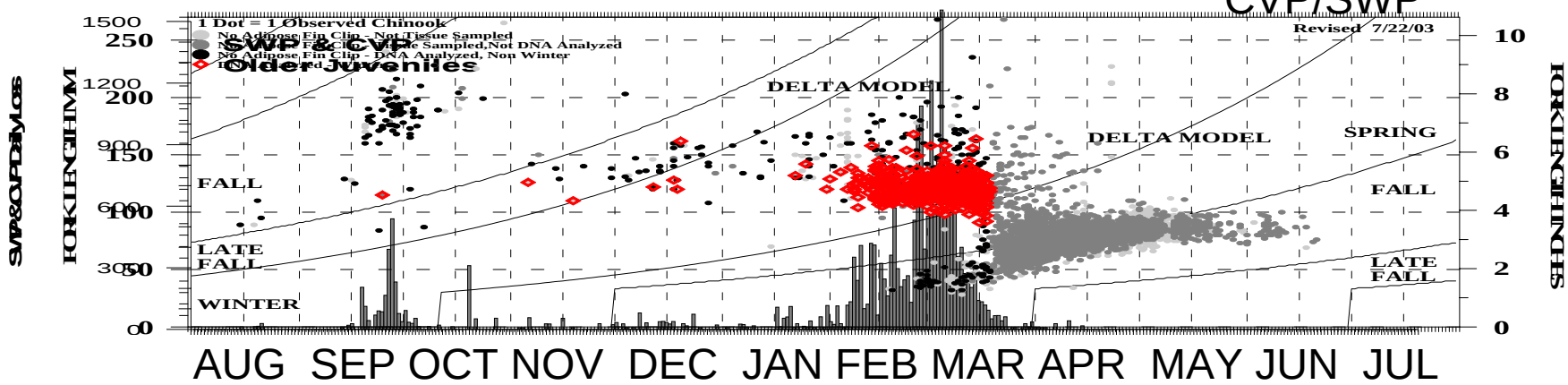
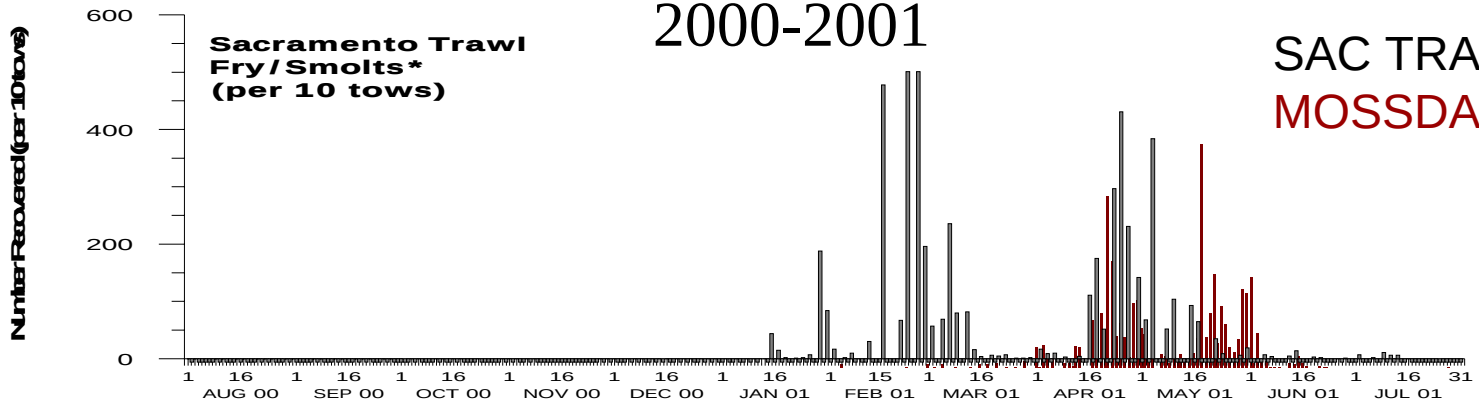


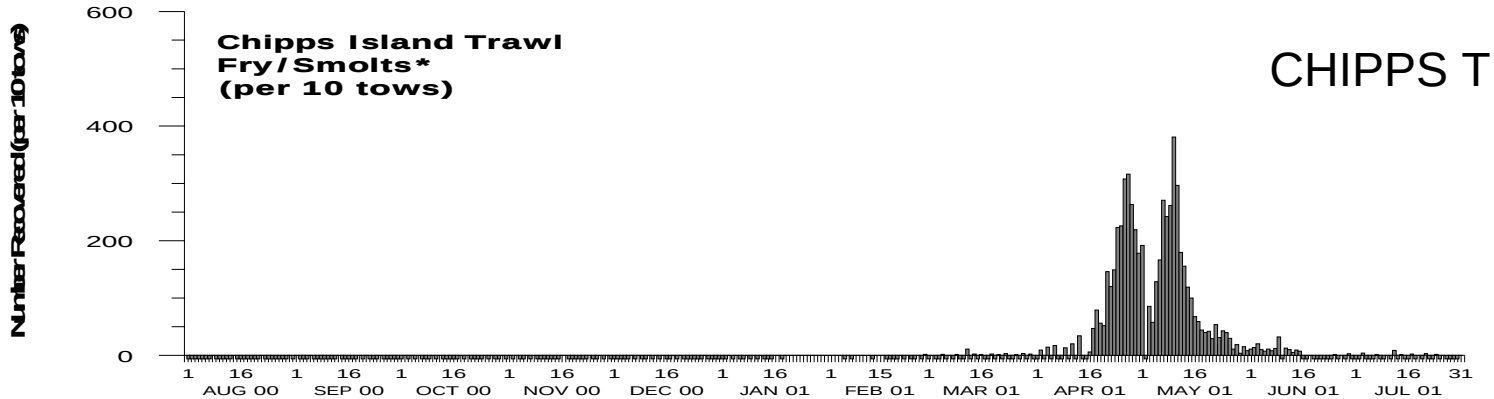
NUMBER OF FRY/SMOLT CHINOOK RECOVERED IN THE SACRAMENTO RIVER AND DELTA

2000-2001

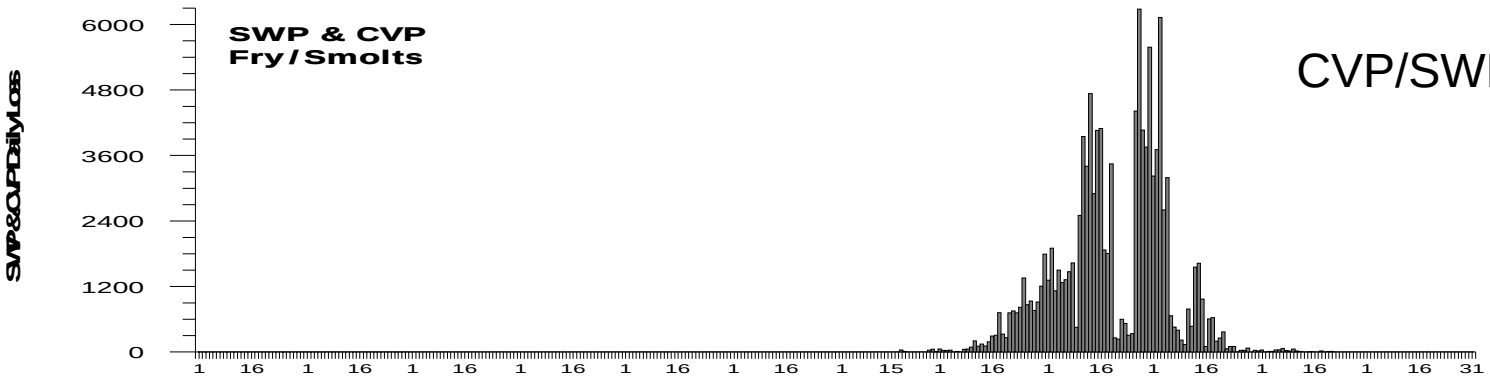


SAC TRAWL

MOSSDALE TRAWL



CHIPPS TRAWL



CVP/SWP

The basis of DCC fish protective actions in the Delta for juvenile salmon
is based on evidence that indicates:

-survival in the Delta is lower in the interior Delta

- and that with the DCC gates closed a lower percent of water and presumably juvenile salmon is diverted into the interior Delta

This action will likely increase the survival of juvenile salmon through the Delta

The timing of action is designed to increase survival during periods of high abundance of the various races/runs

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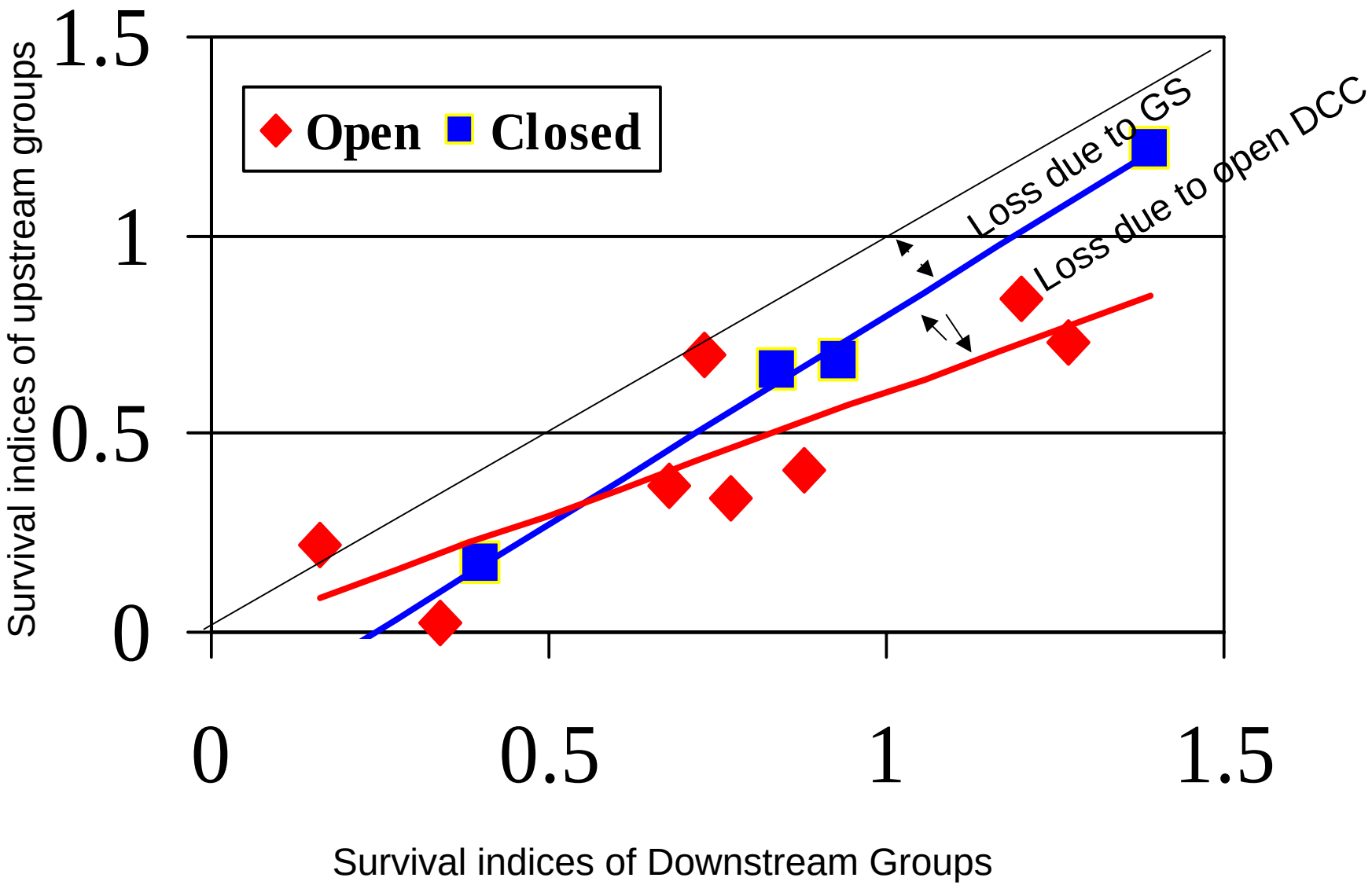
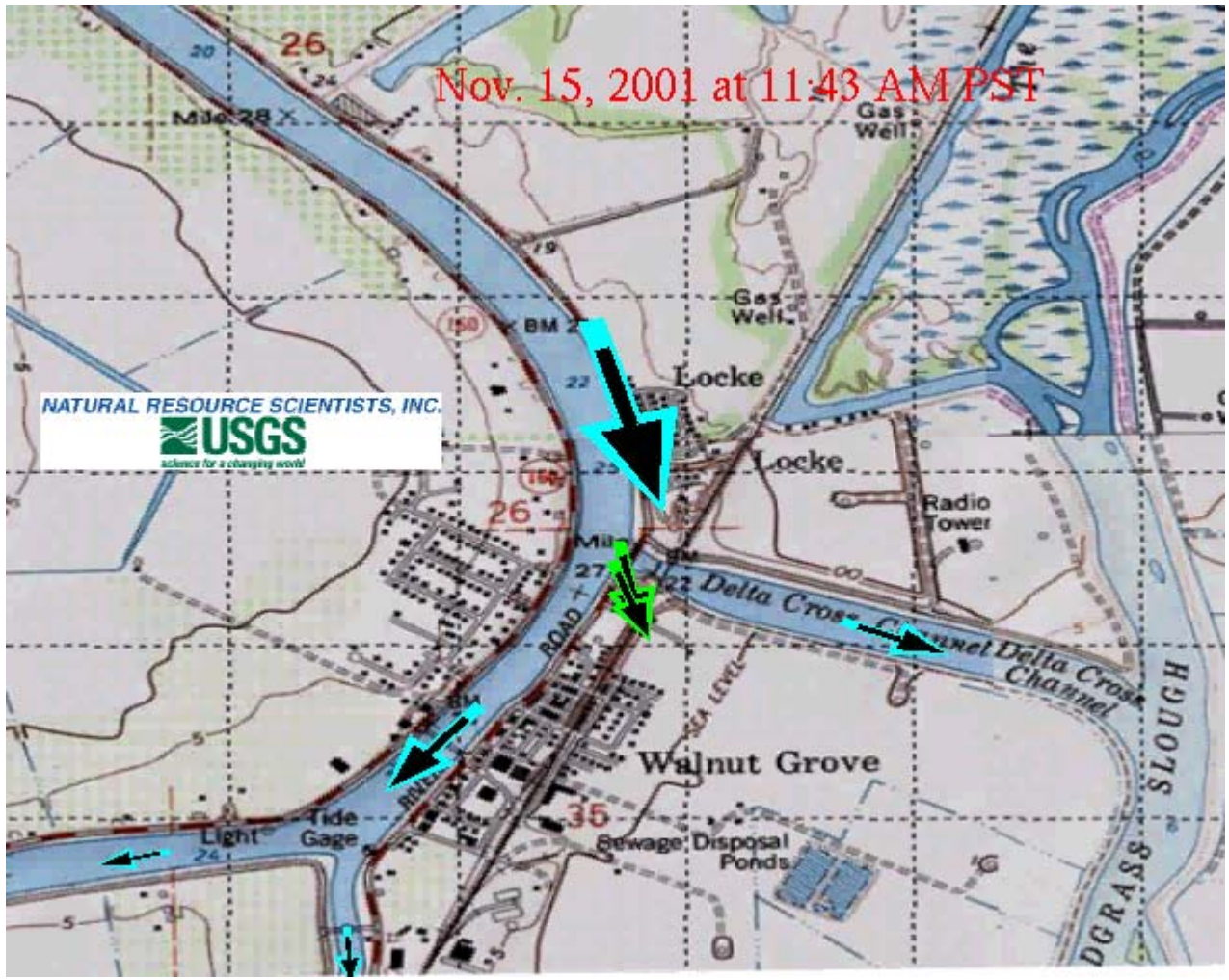
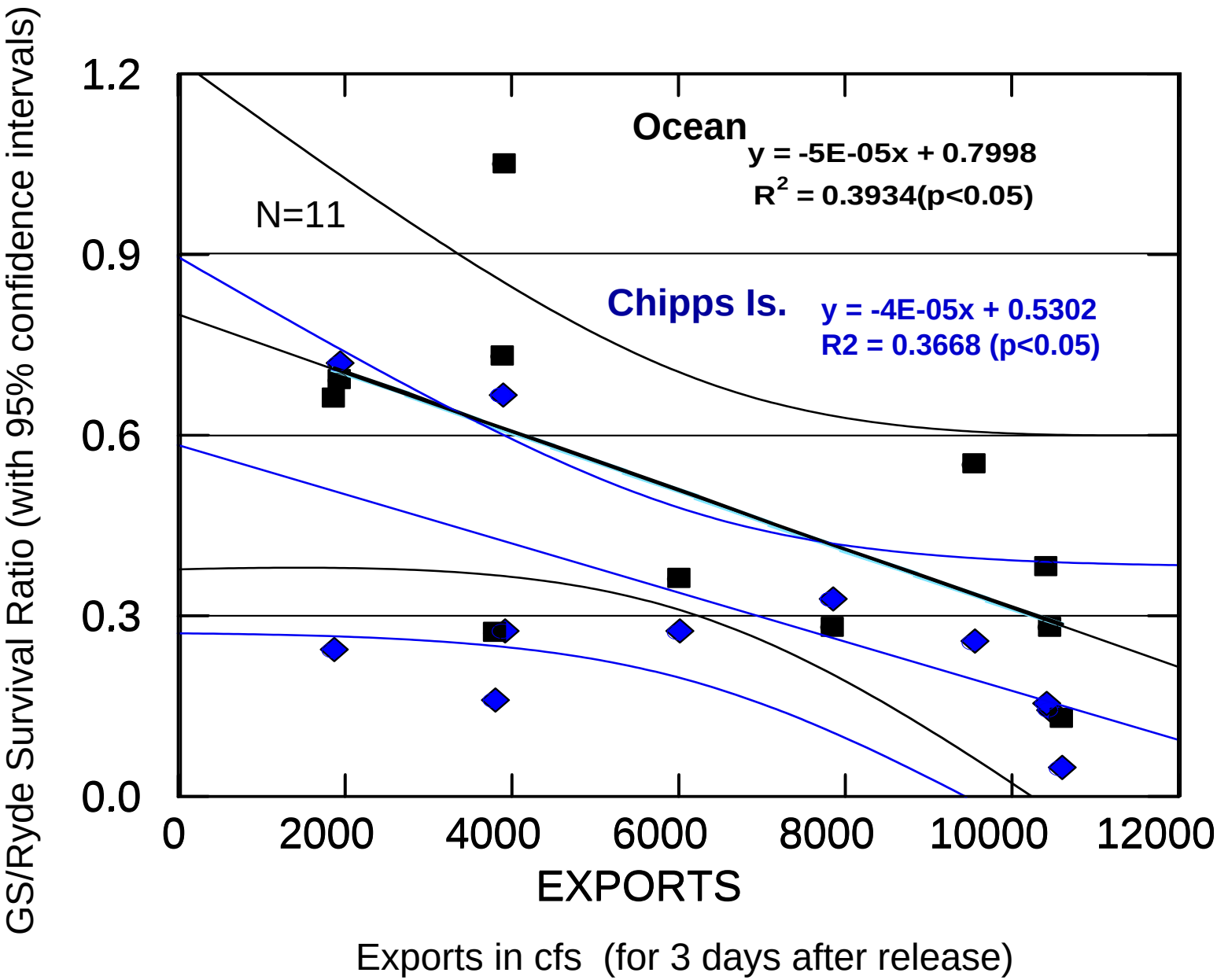



Nov. 15, 2001 at 11:43 AM PST
NATURAL RESOURCE SCIENTISTS, INC.
USGS
science for a changing world
Locke
Locke
Radio Tower
Gas Well
Gas Well
Delta Cross Channel
Delta Cross Channel
Walnut Grove
Tide Gage
Light
Sewage Disposal Ponds
DGRASS SLOUGH
ROAD
26
35


GS/Ryde Survival Ratio (with 95% confidence intervals)
1.2
0.9
0.6
0.3
0.0
Ocean
y = -5E-05x + 0.7998
R2 = 0.3934(p<0.05)
N=11
Chipps Is.
y = -4E-05x + 0.5302
R2 = 0.3668 (p<0.05)
0
2000
4000
6000
8000
10000
12000
EXPORTS
Exports in cfs (for 3 days after release)