

# Interior's Recommendations to the SWRCB re: DCC Gate Operations

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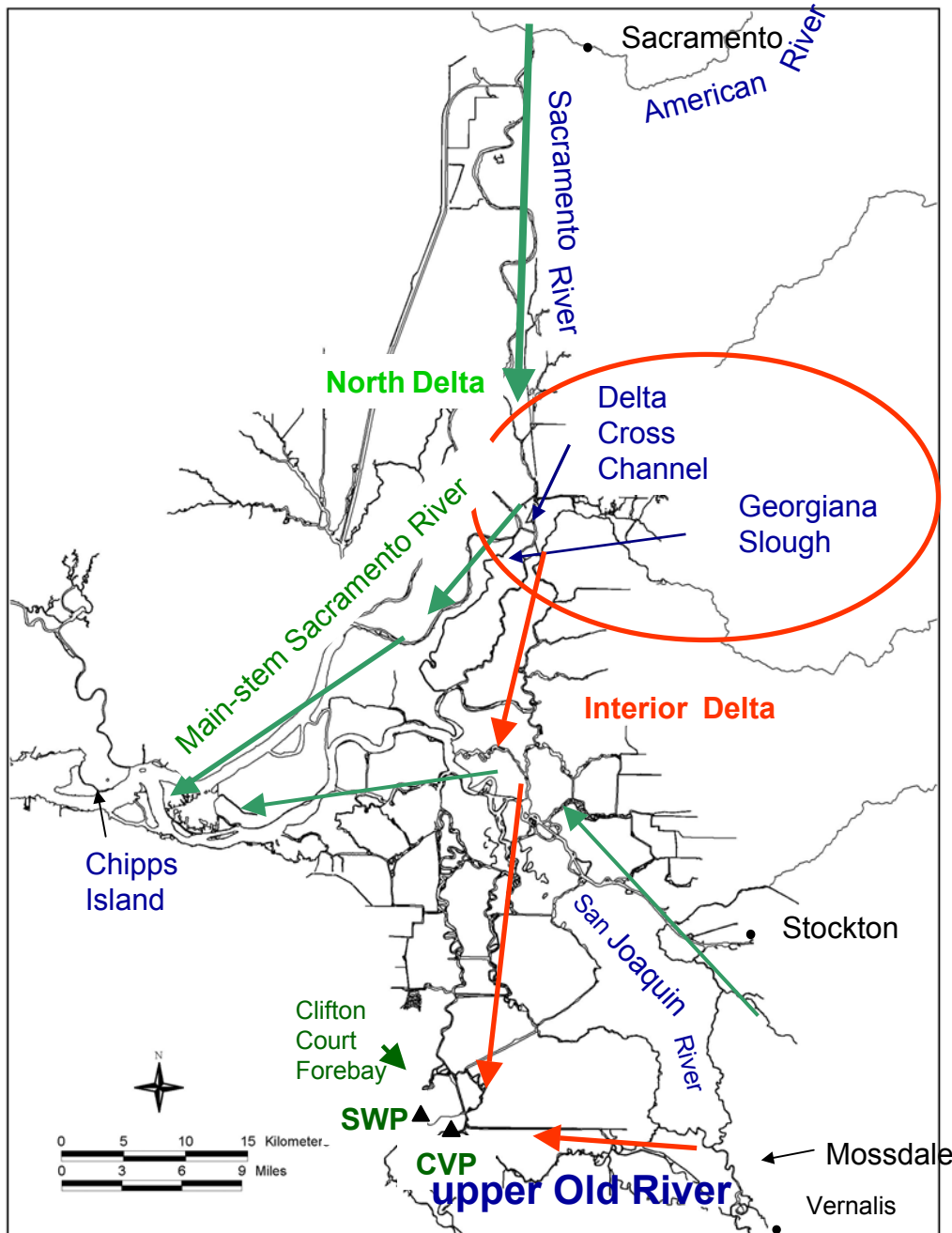
# Salmon Conceptual Model and Basis for DCC Closures

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

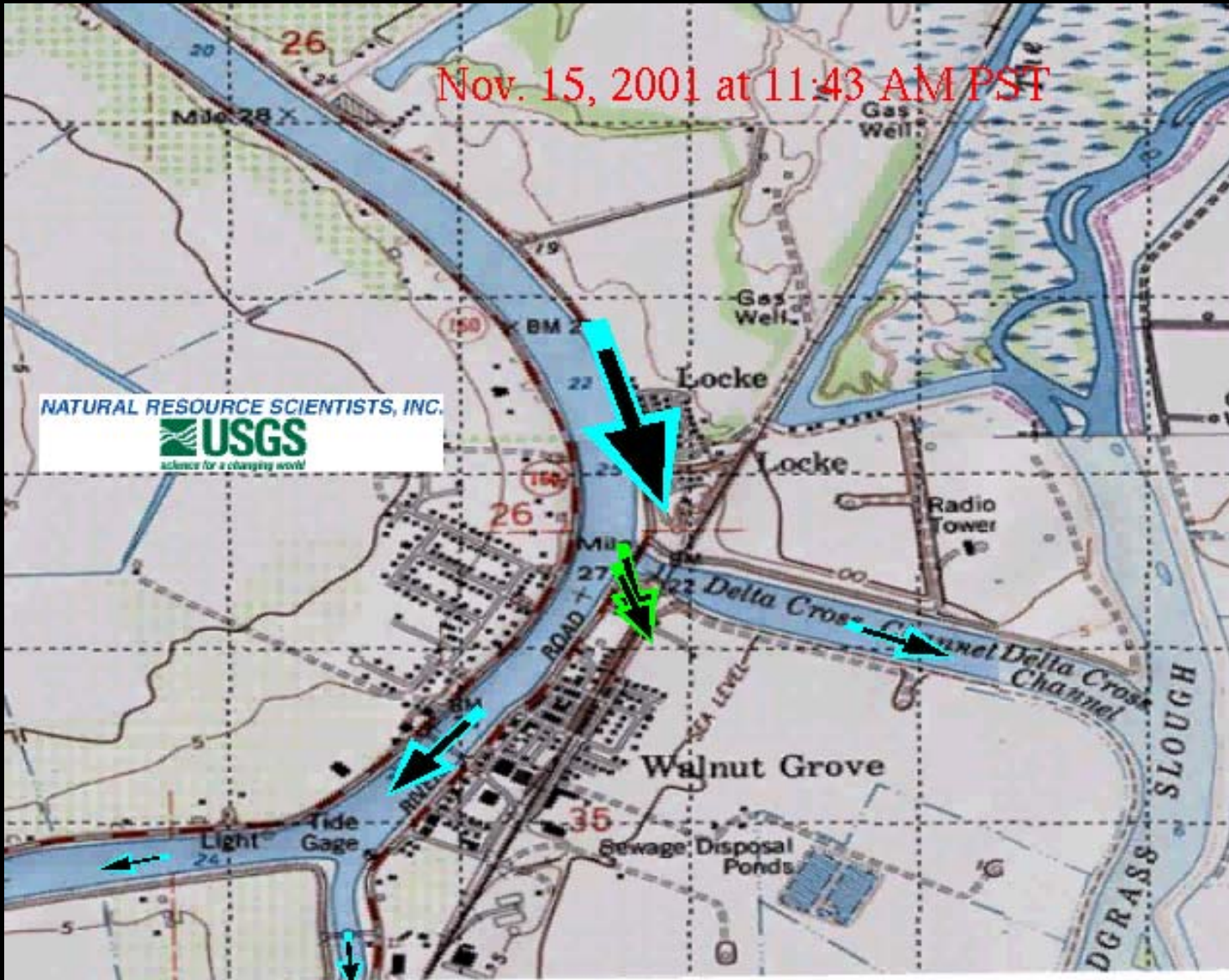
- in the interior Delta their survival is lower  
- and a function of exports

- Vulnerable to entrainment during emigration

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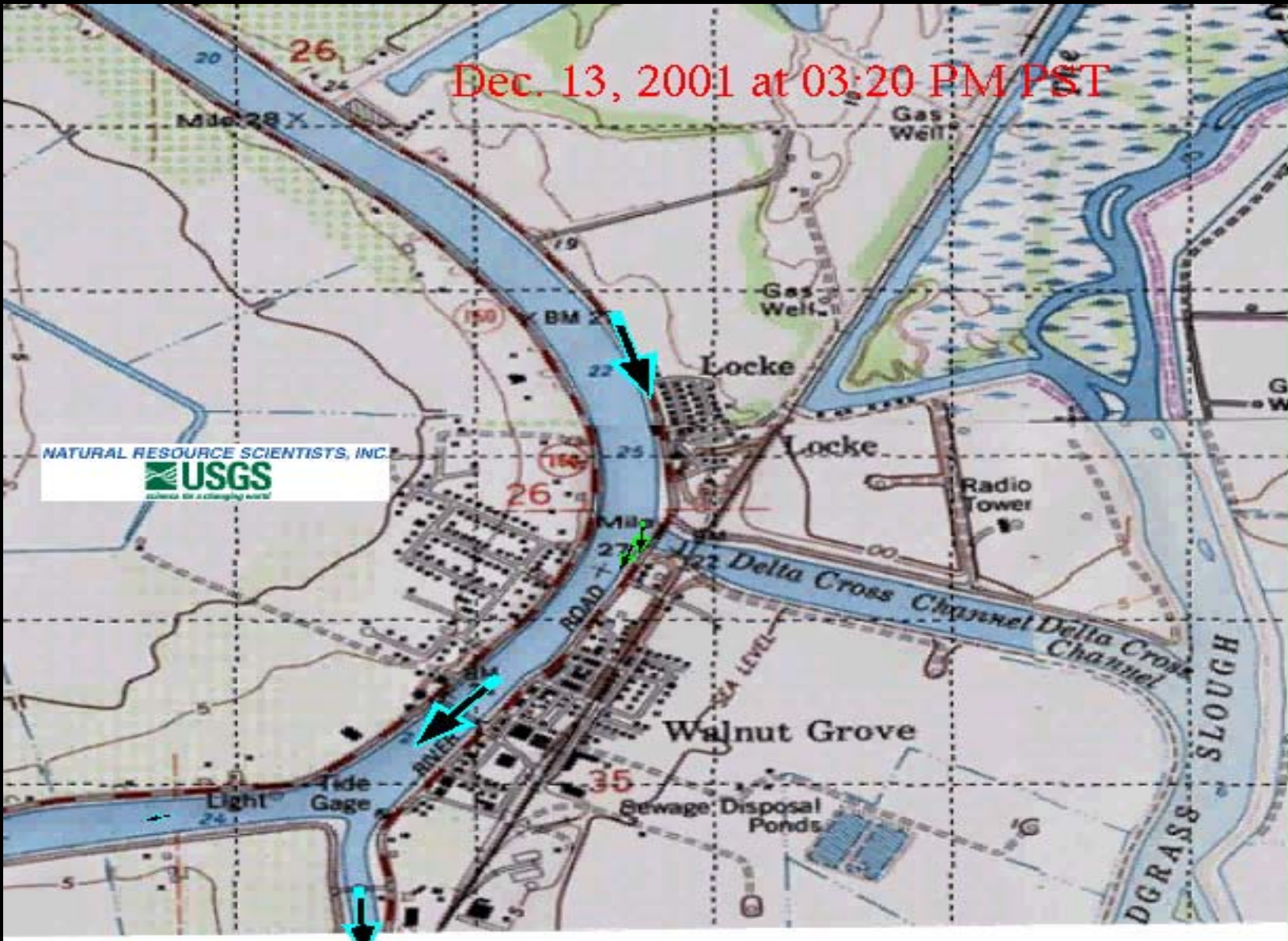
Nov. 15, 2001 at 11:43 AM PST



**Flood Tide**

**Gates open**

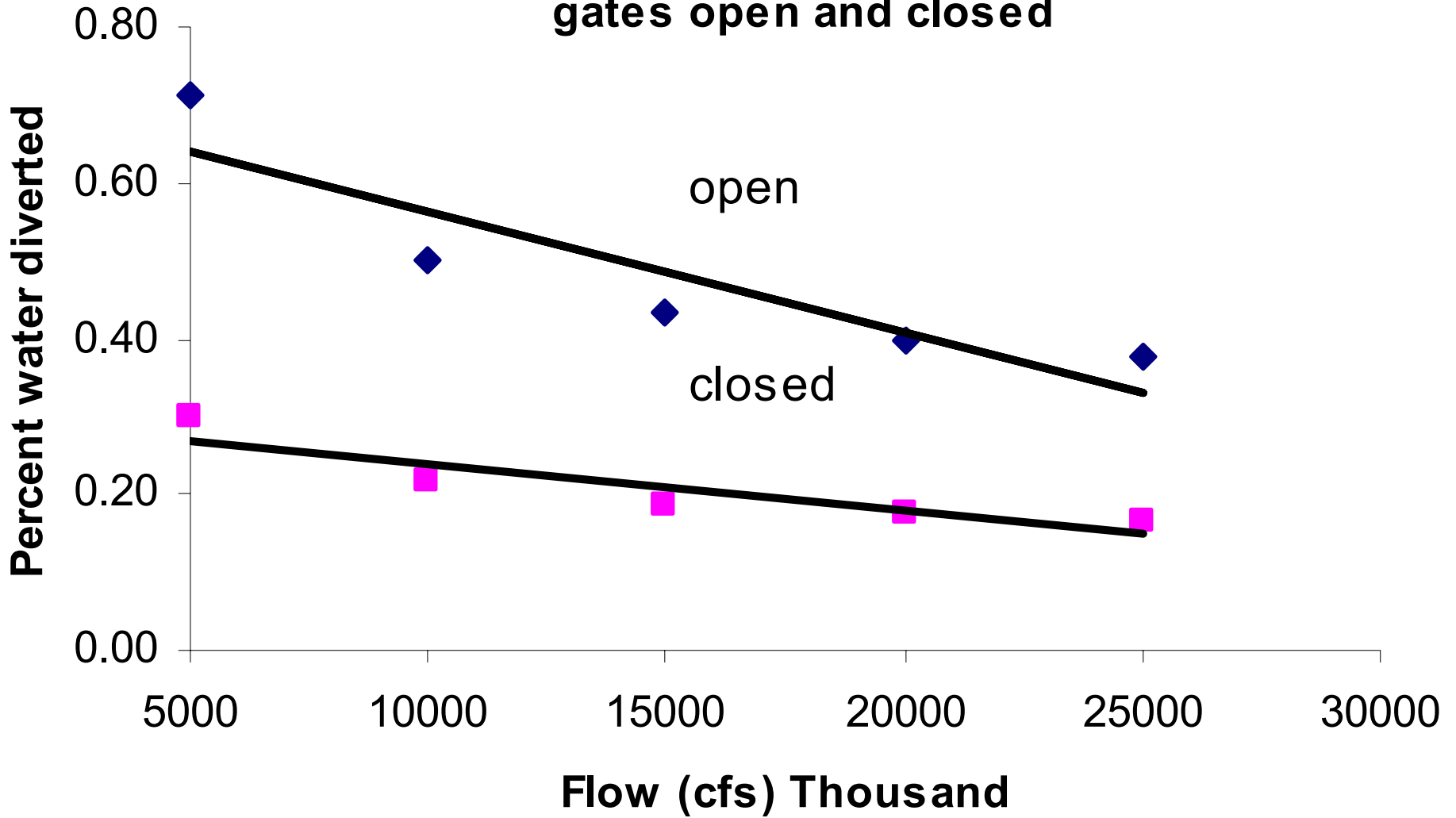
Dec. 13, 2001 at 03:20 PM PST



**EBB Tide**

**DCC gates closed**

# % Freeport flow diverted into interior Delta with DCC gates open and closed



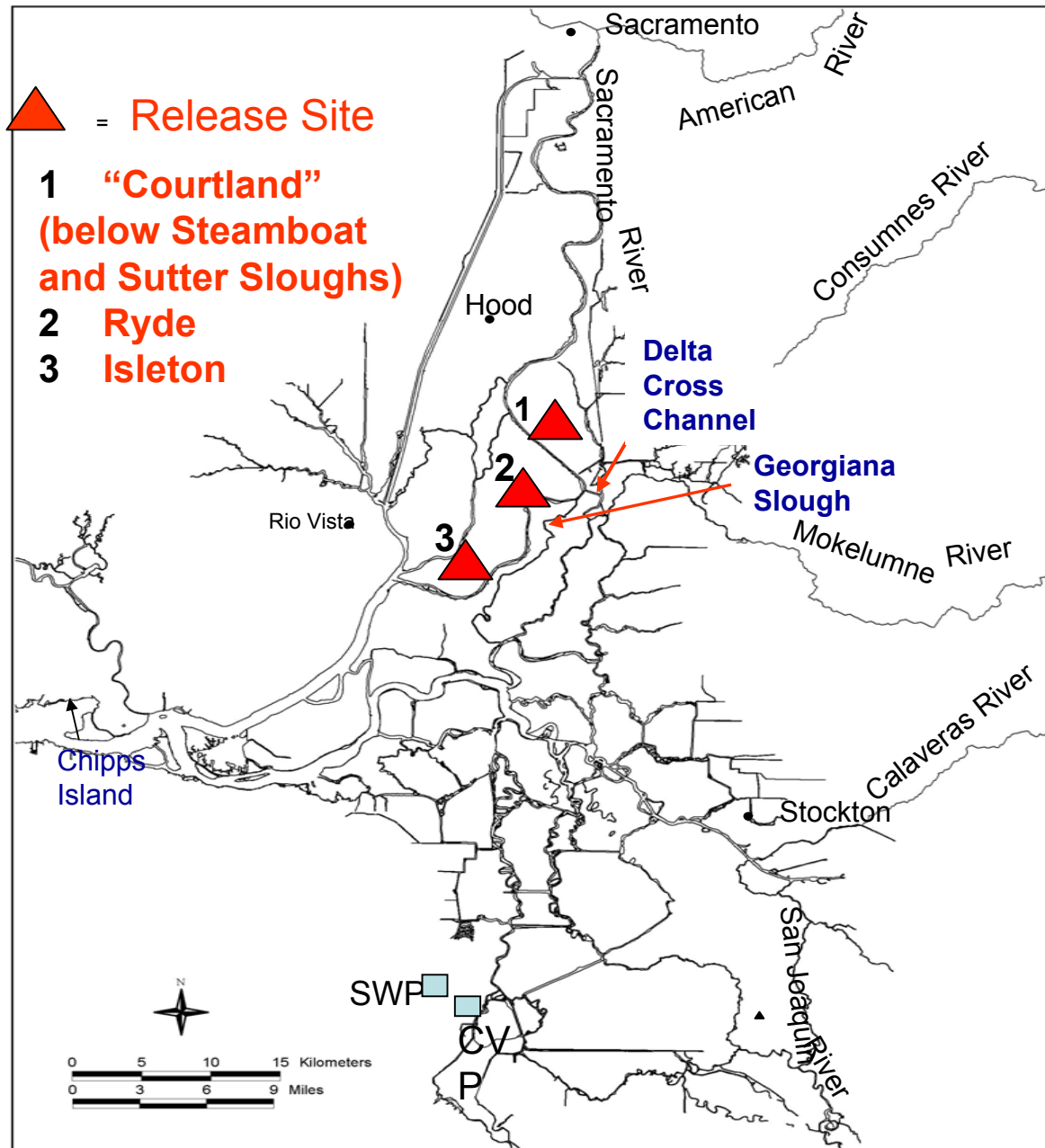
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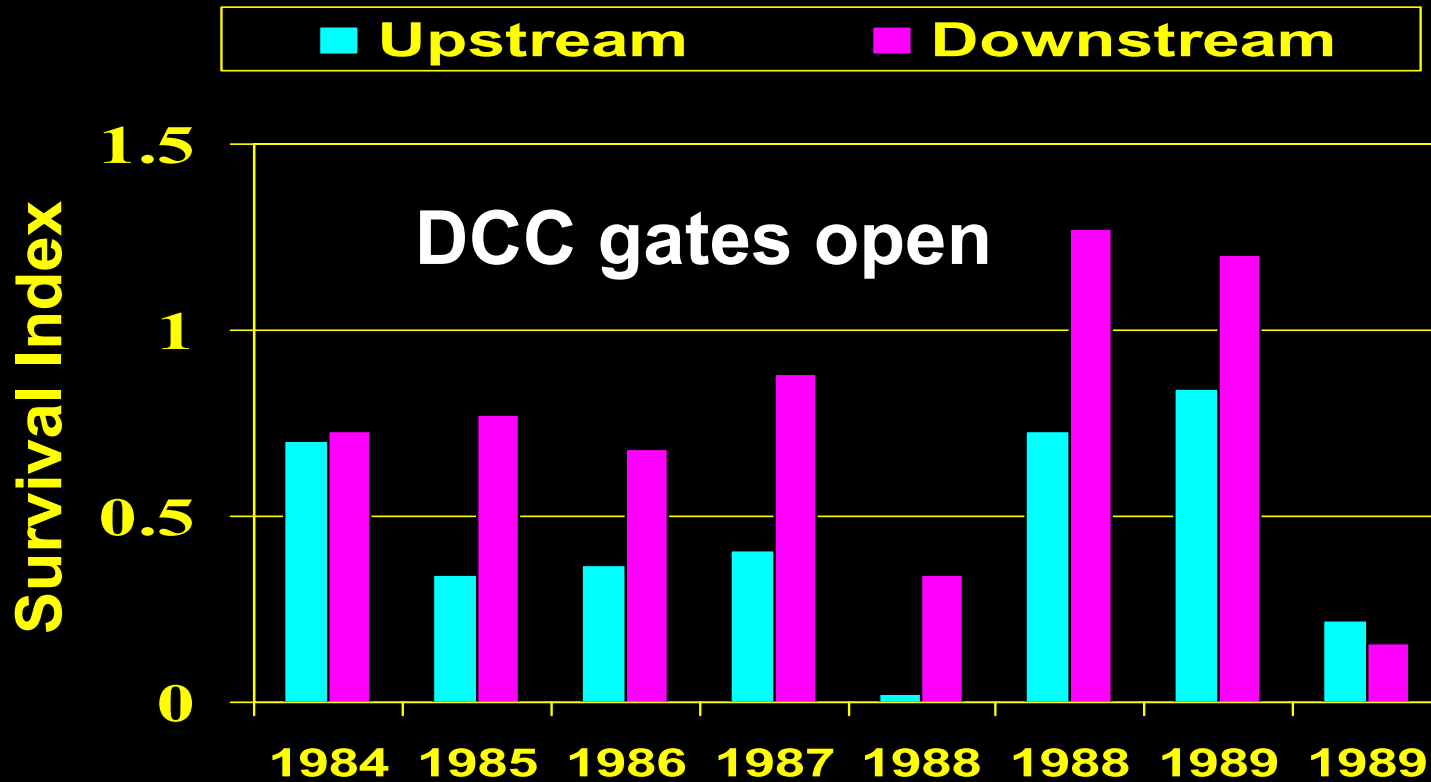
**-Survival is lower in the interior Delta**





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

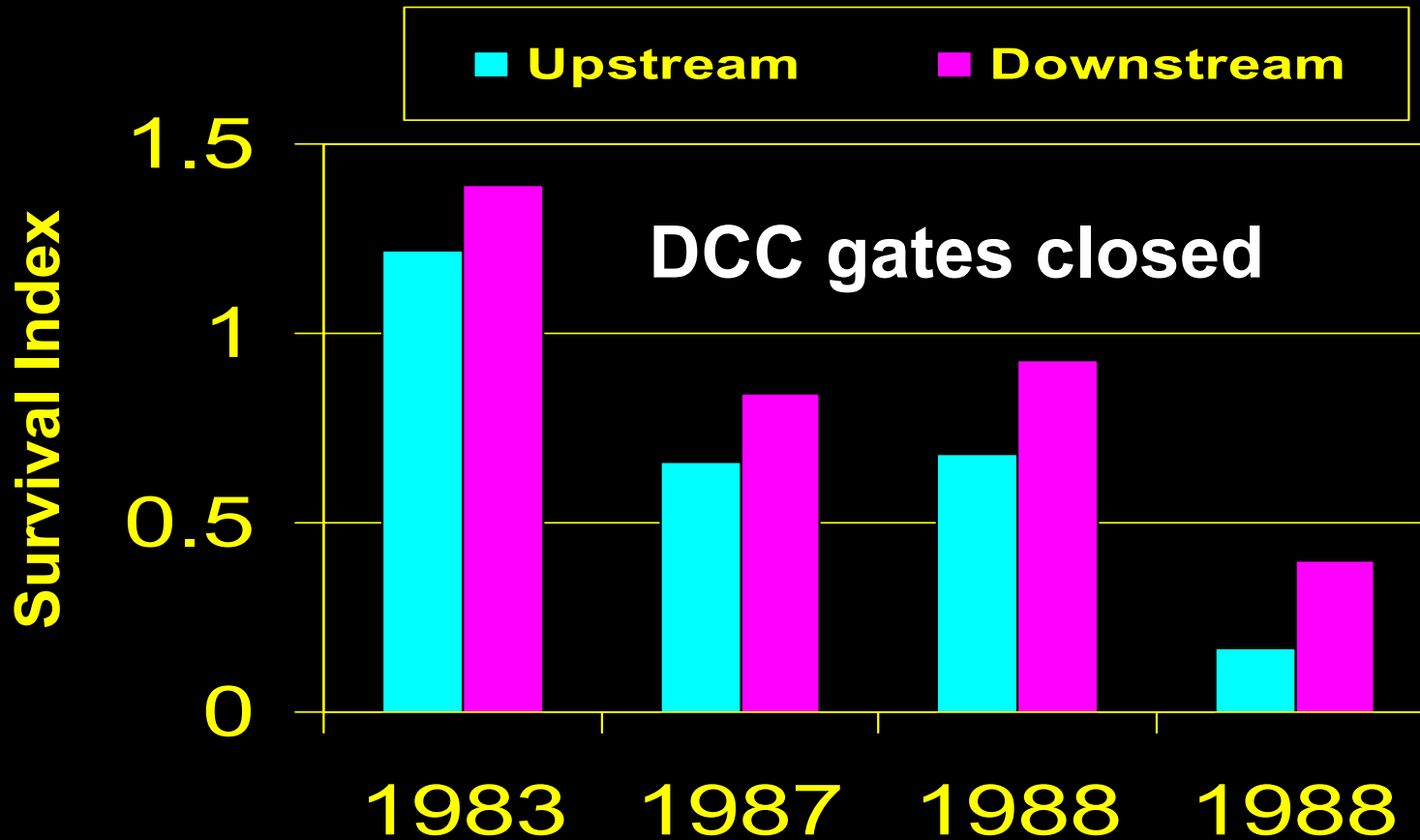
# Survival indices to Chipps Island of marked juvenile salmon released upstream and downstream of the Delta Cross Channel and Georgiana Slough



**Upstream < downstream (p<0.05)**

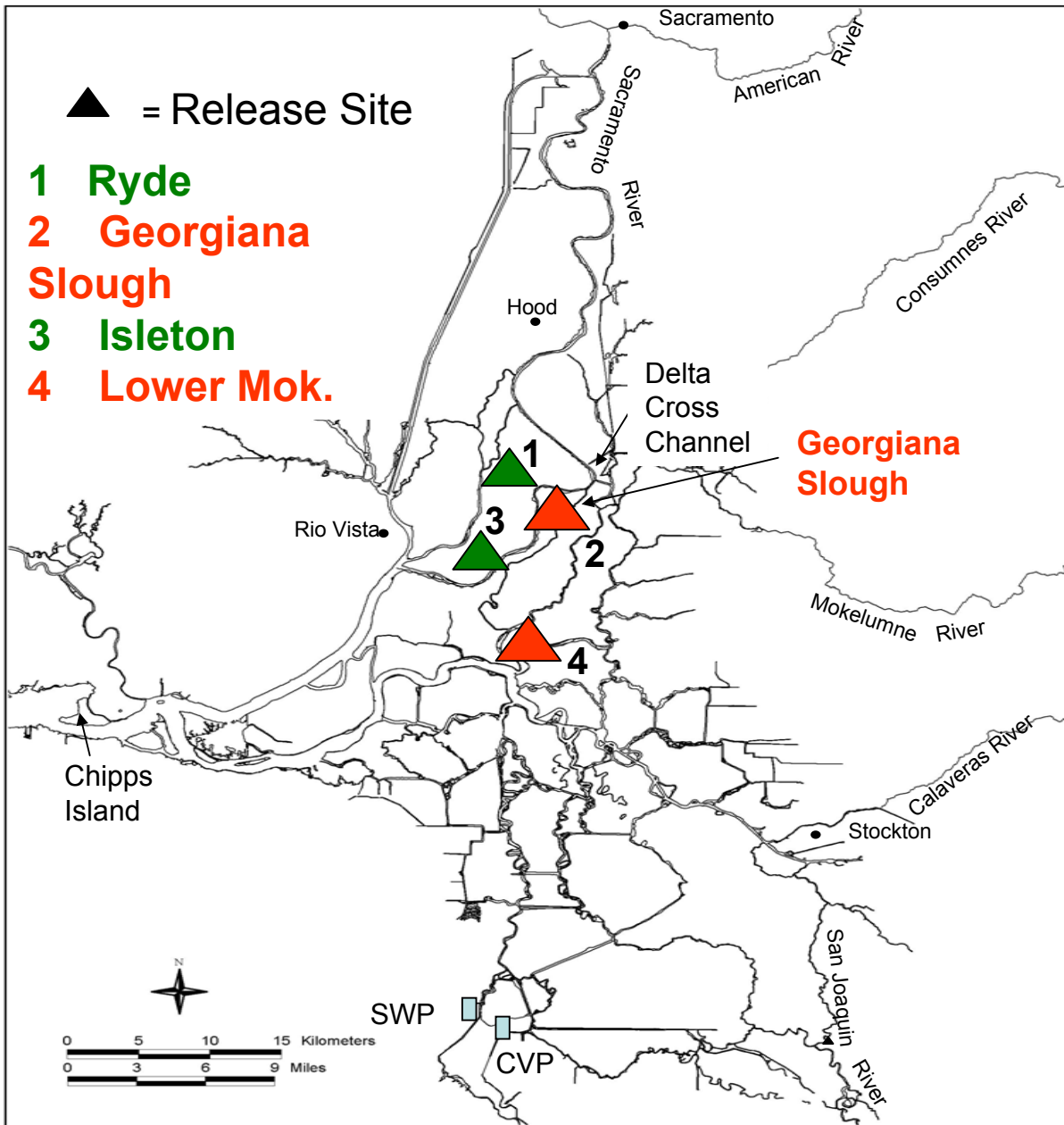
Data would infer additional mortality of upstream group due to some entering DCC and GS

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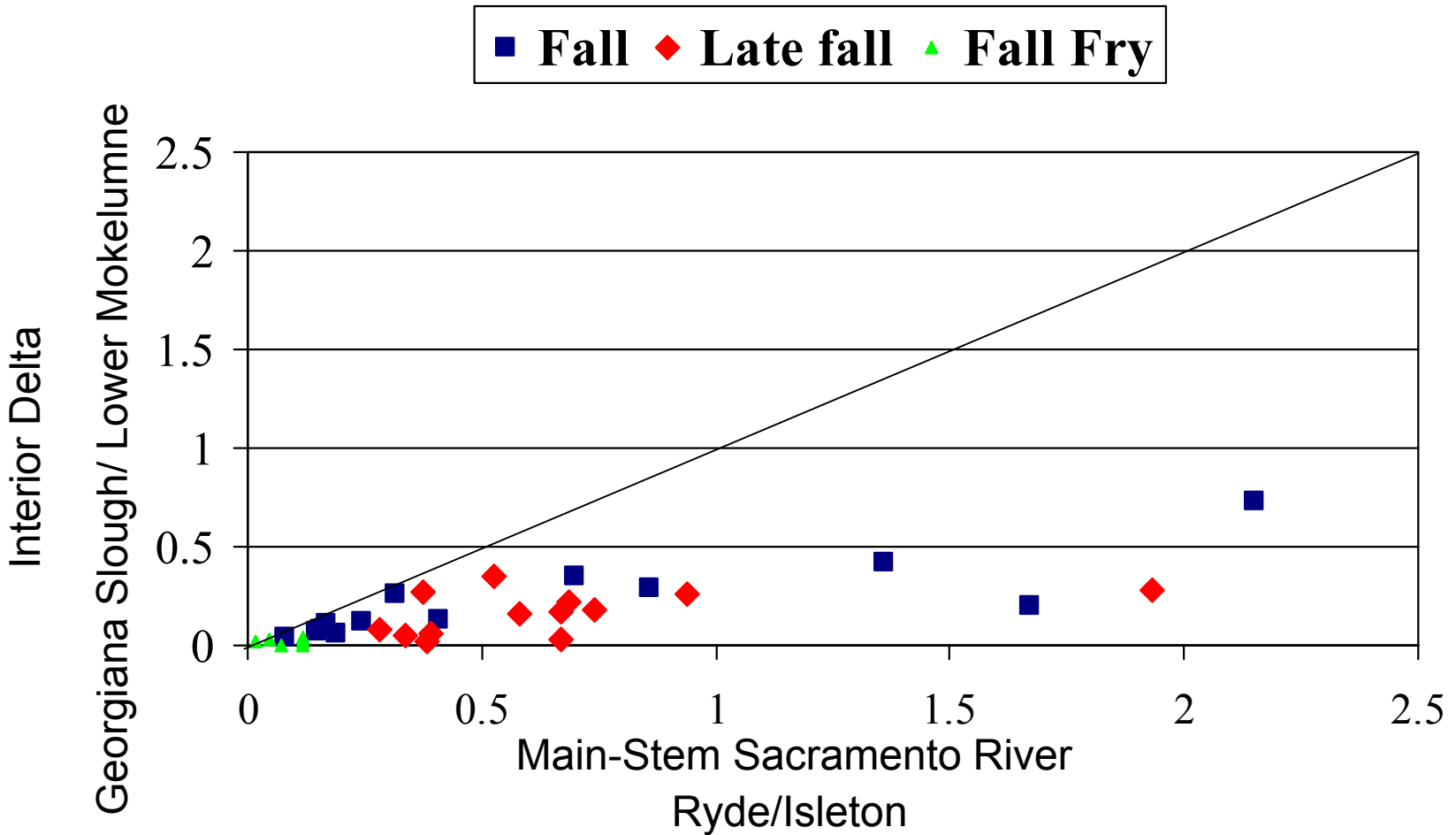
**Upstream < downstream (p<0.05)**

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)**

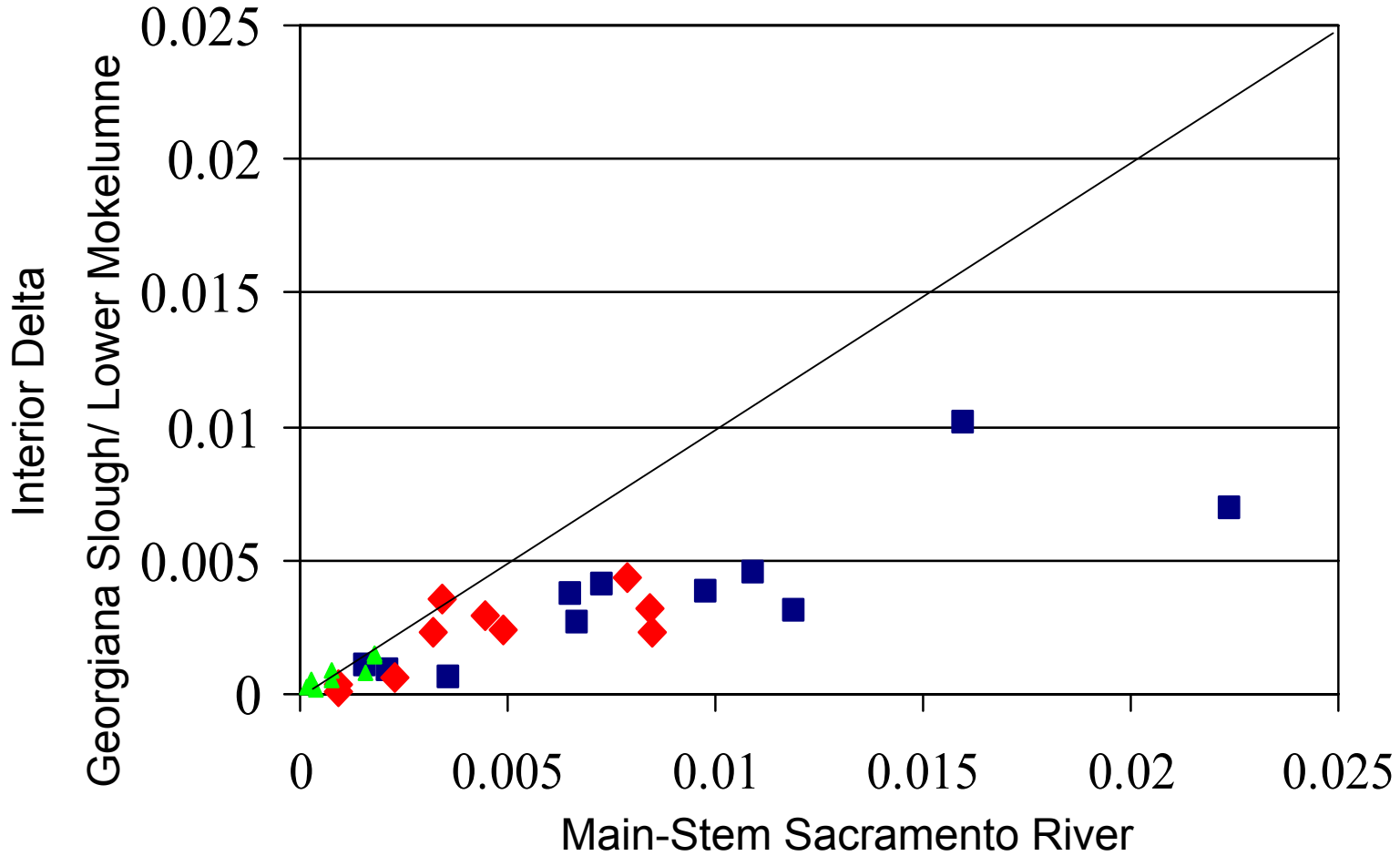
# Survival indices to Chipps Island



Fall GS < Ryde ( $p < 0.05$ )

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

# Recovery Rates in the ocean fishery



Fall GS < Ryde (p < 0.05)

Late-fall GS < Ryde (p < 0.05)

Ryde/Isleton

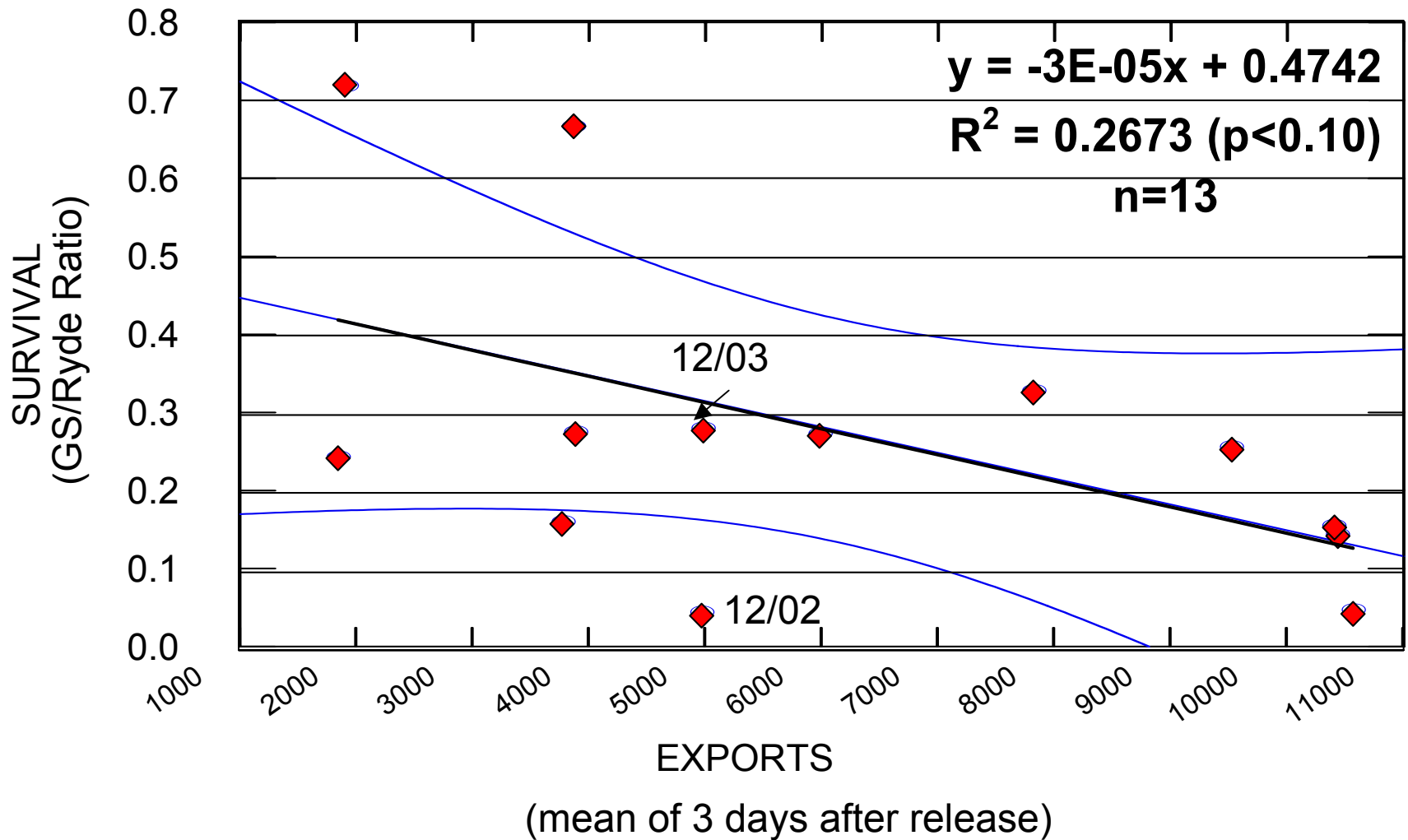
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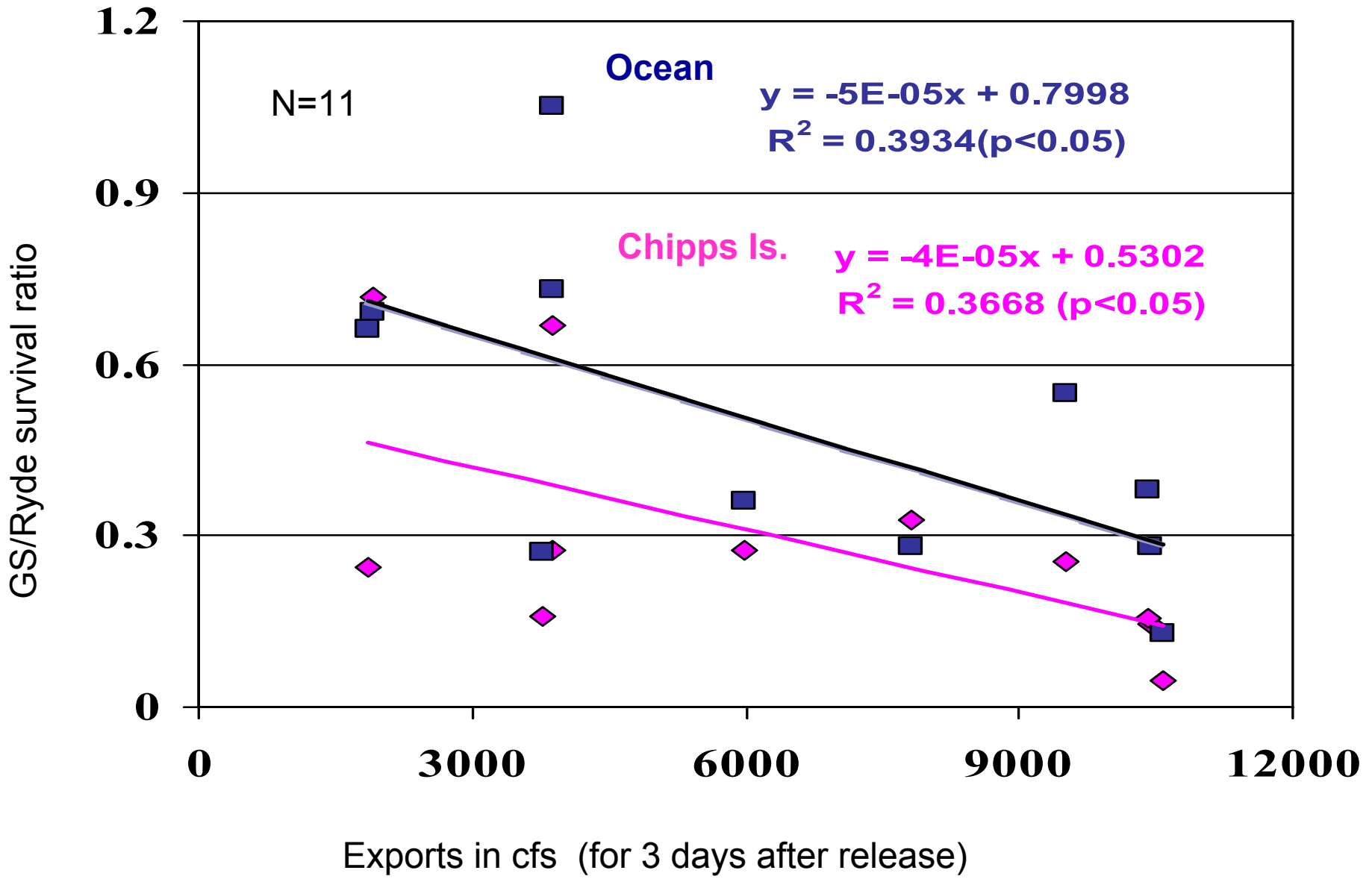
-Survival is lower In the interior Delta

-and a function of exports



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



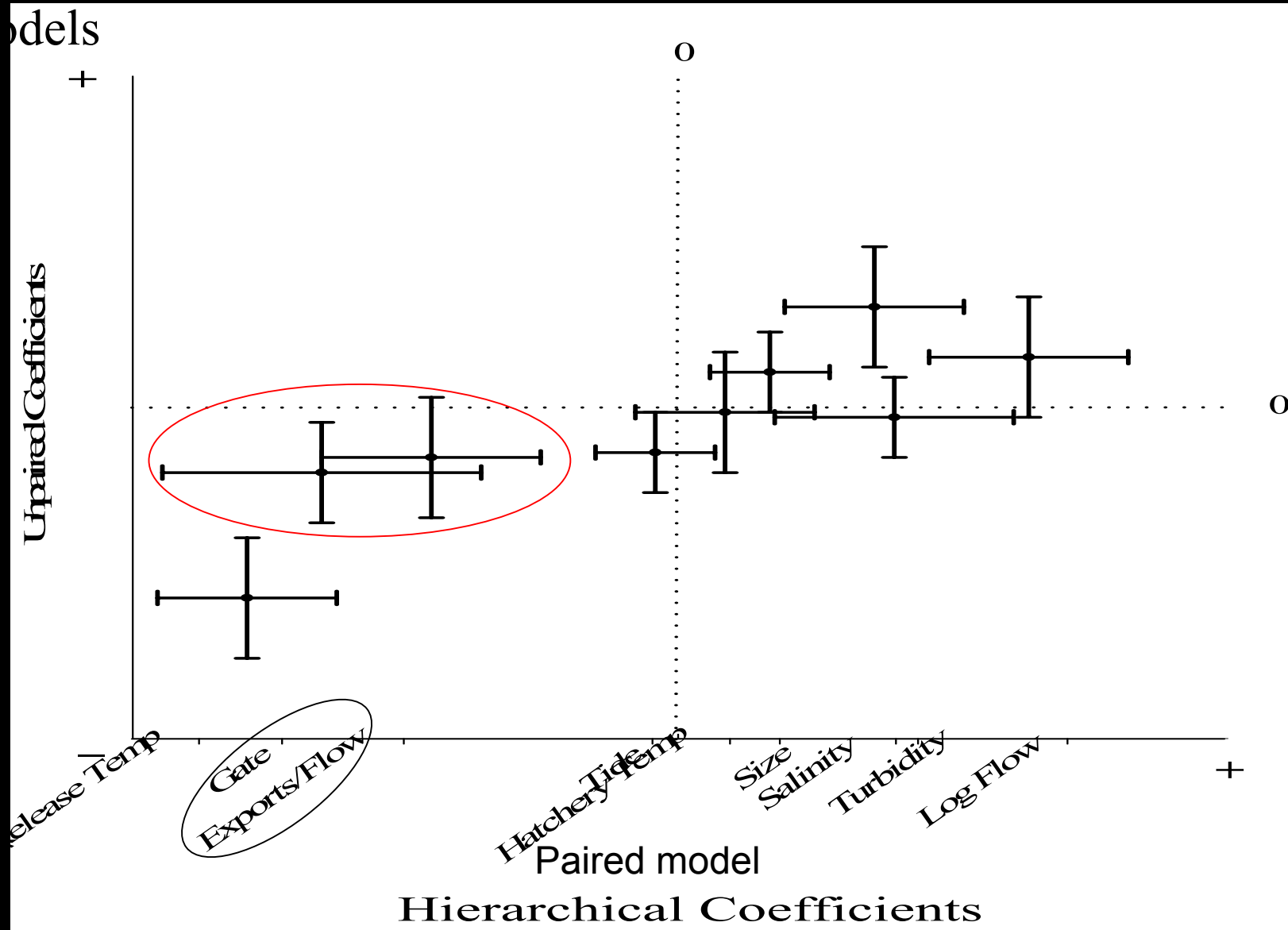


Relationships between GS/Ryde survival ratio and CVP/SWP exports

# Conceptual Model of juvenile salmon migration through the Sacramento Delta

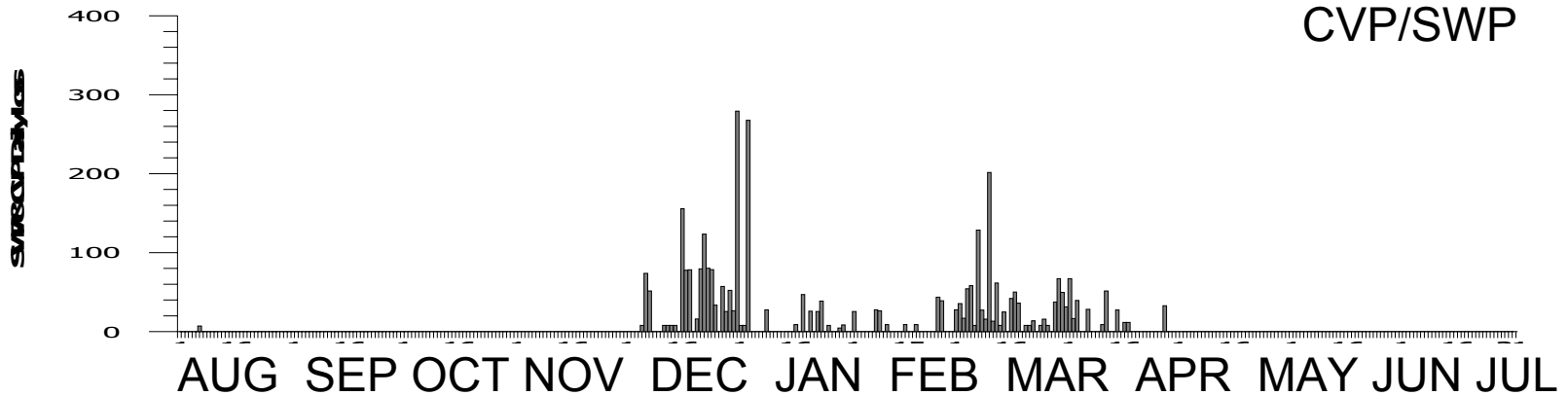
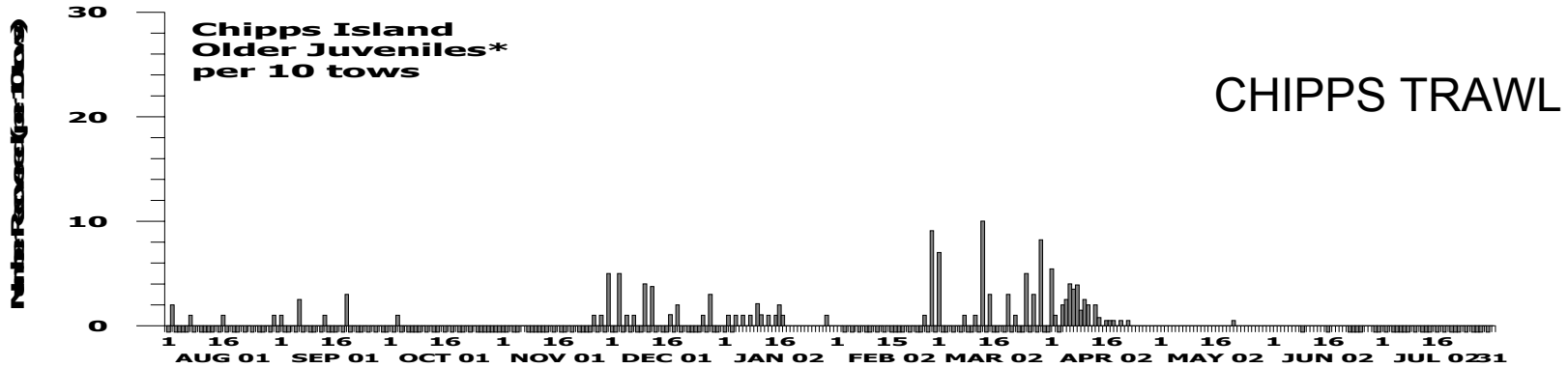
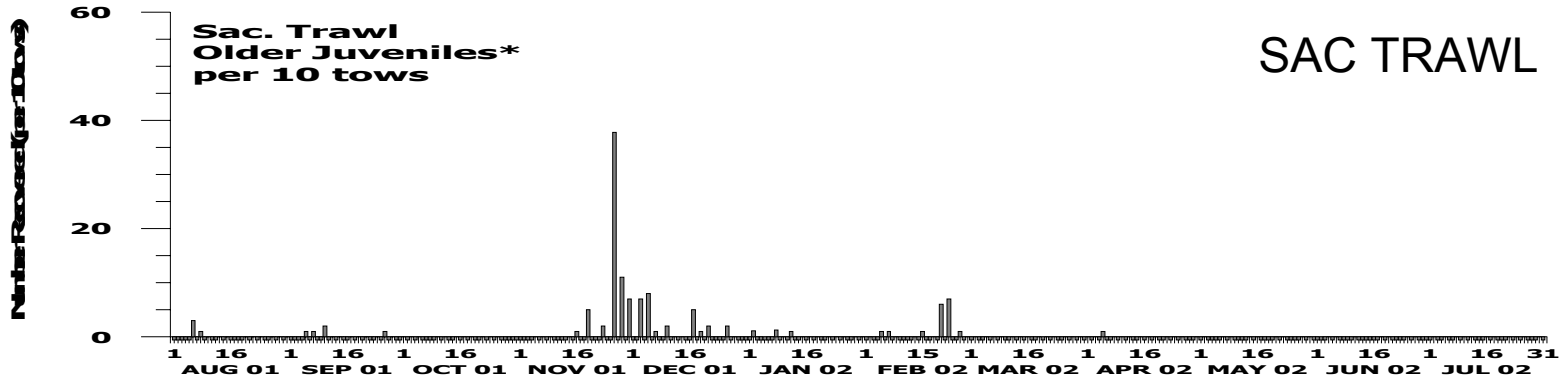
- Sac Basin salmon move into interior Delta through the open DCC and GS
- More move into interior Delta with gates open
- In the interior Delta, their survival is lower
- and a function of exports

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



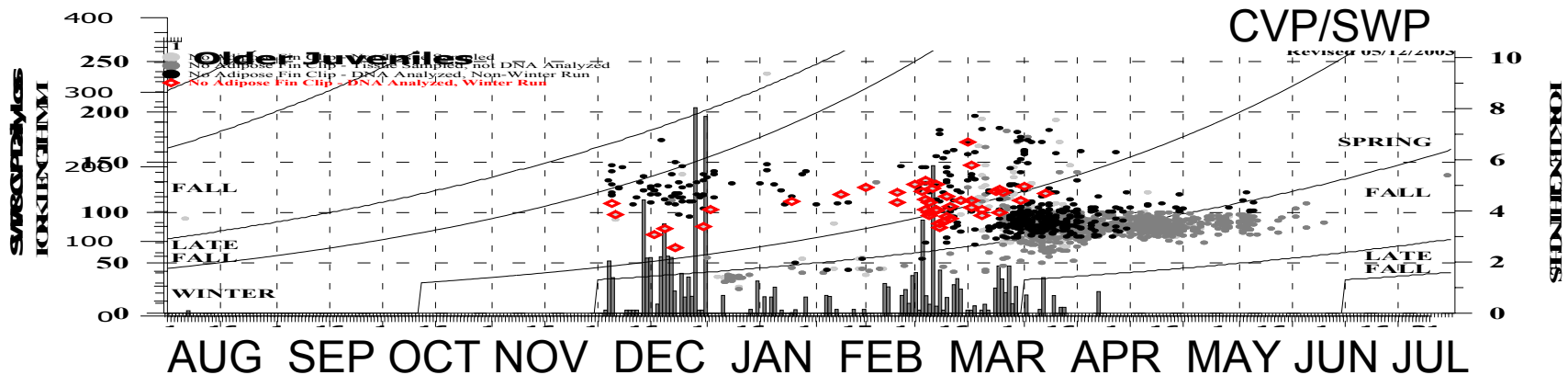
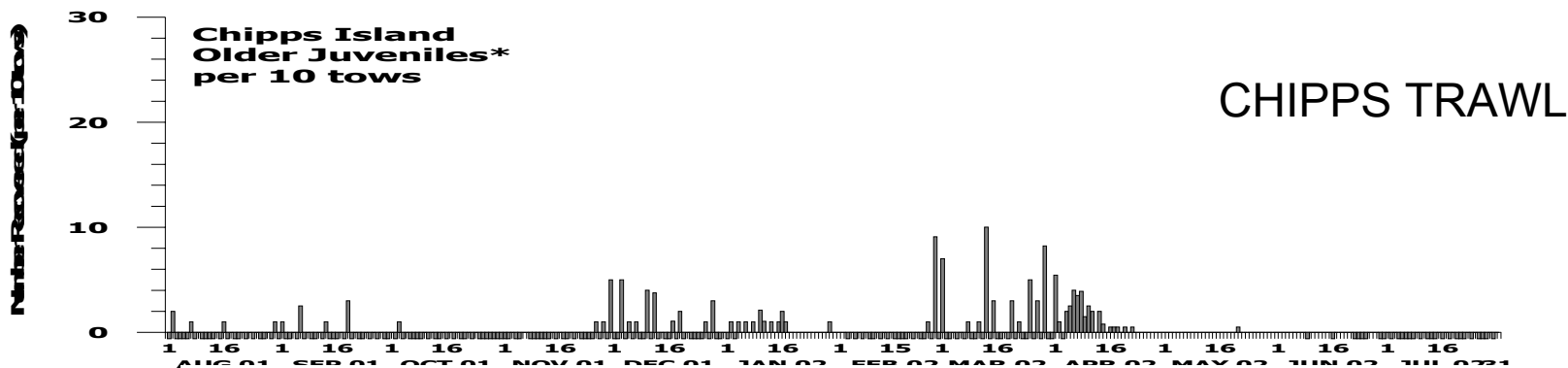
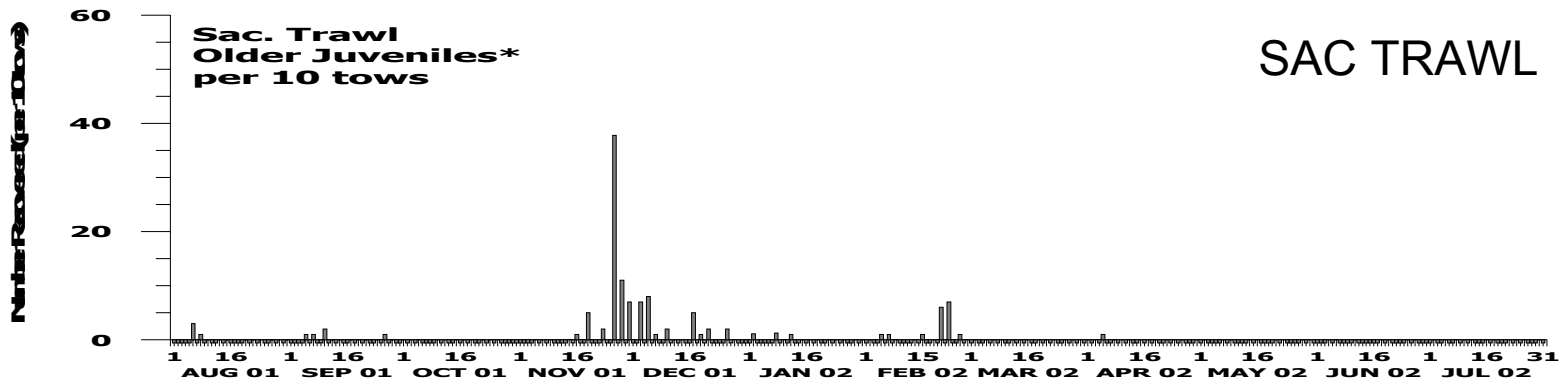
# OLDER JUVENILES

2001-2002



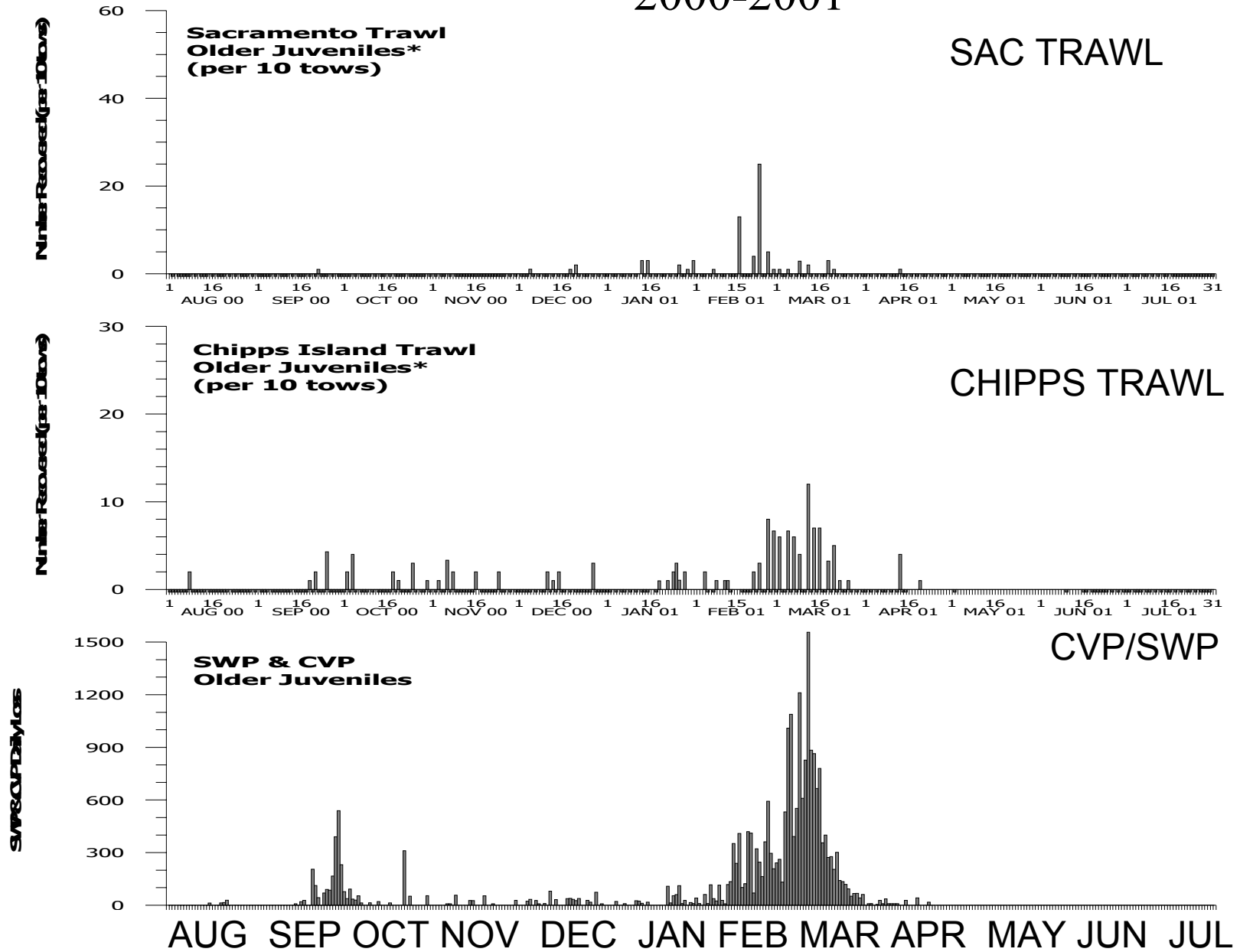
# OLDER JUVENILES/ WINTER RUN

2001-2002



# OLDER JUVENILES

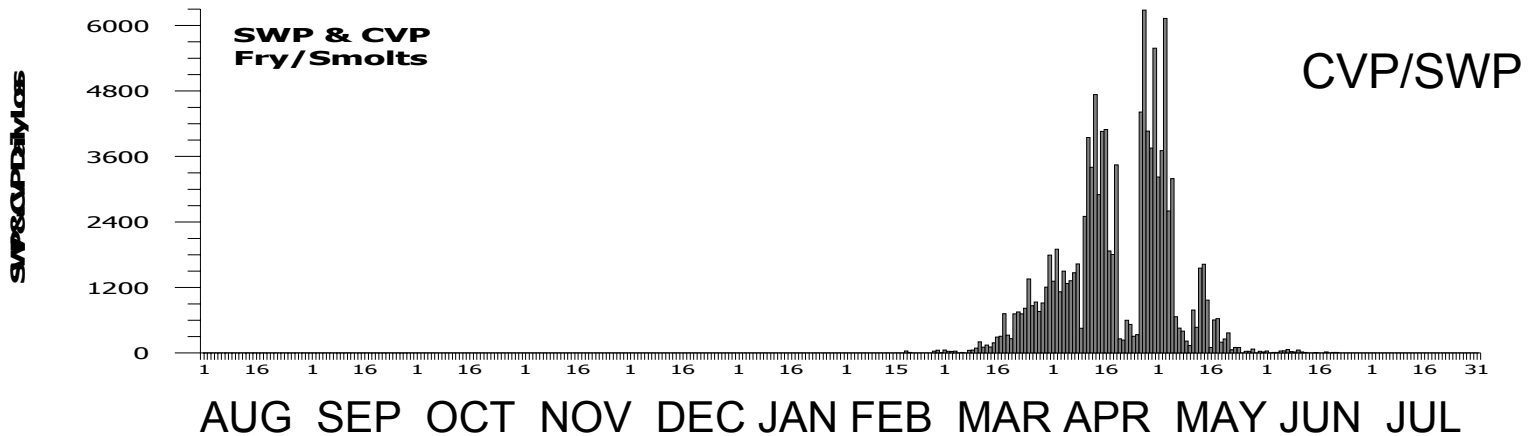
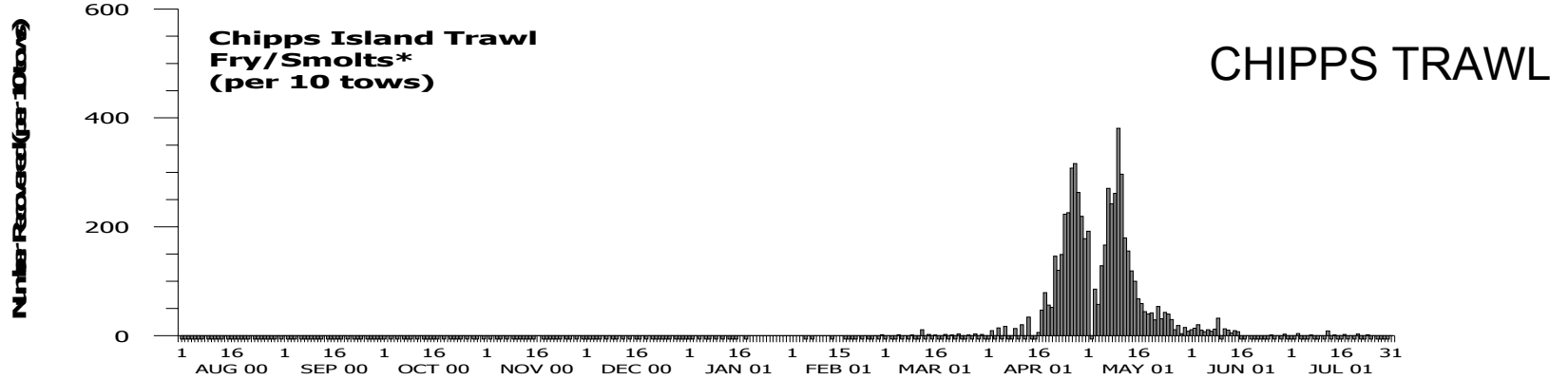
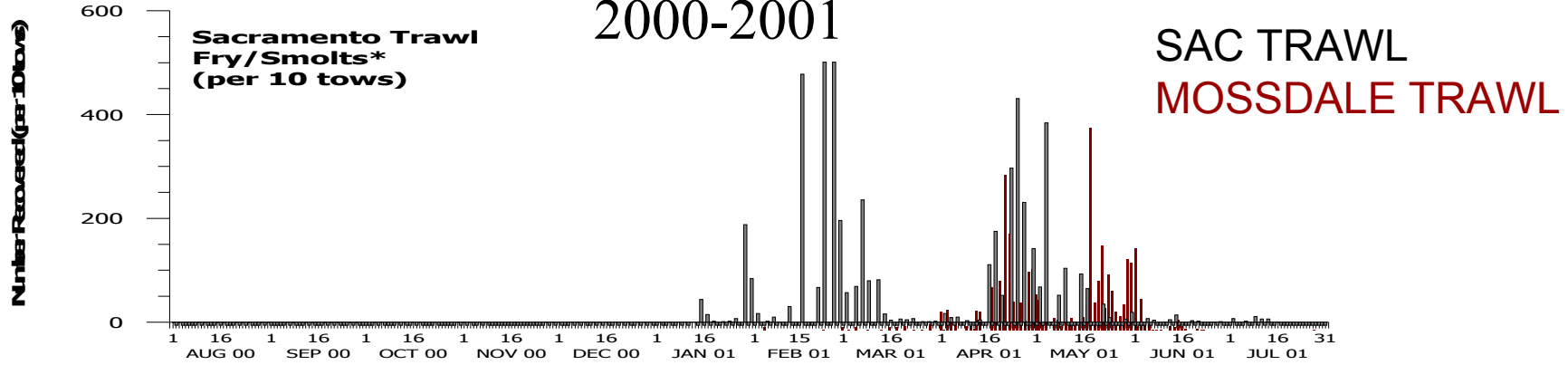
## 2000-2001





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

2000-2001





# **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**

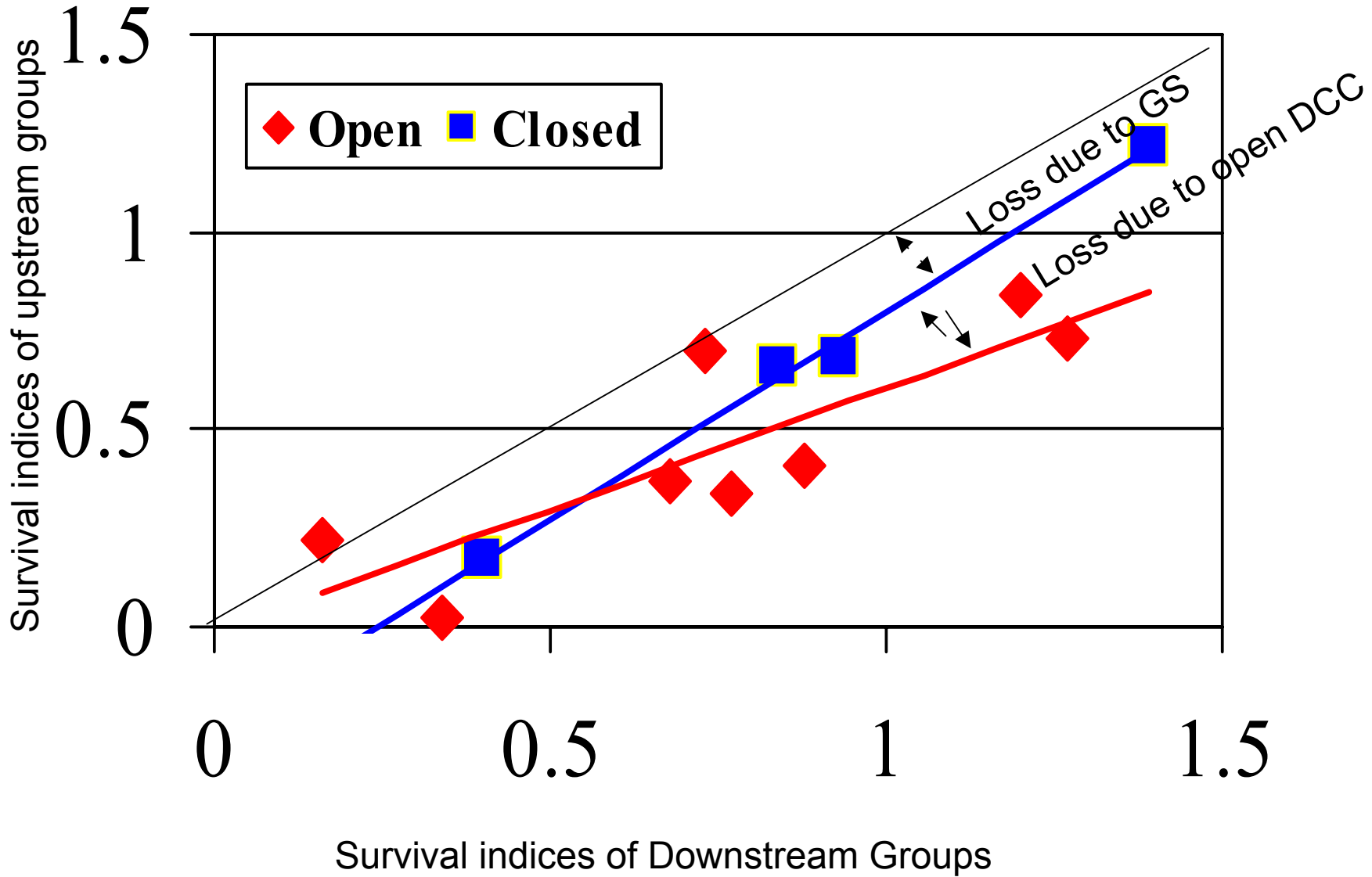
**The timing of action is designed to increase survival during periods of high abundance of the various races/runs**

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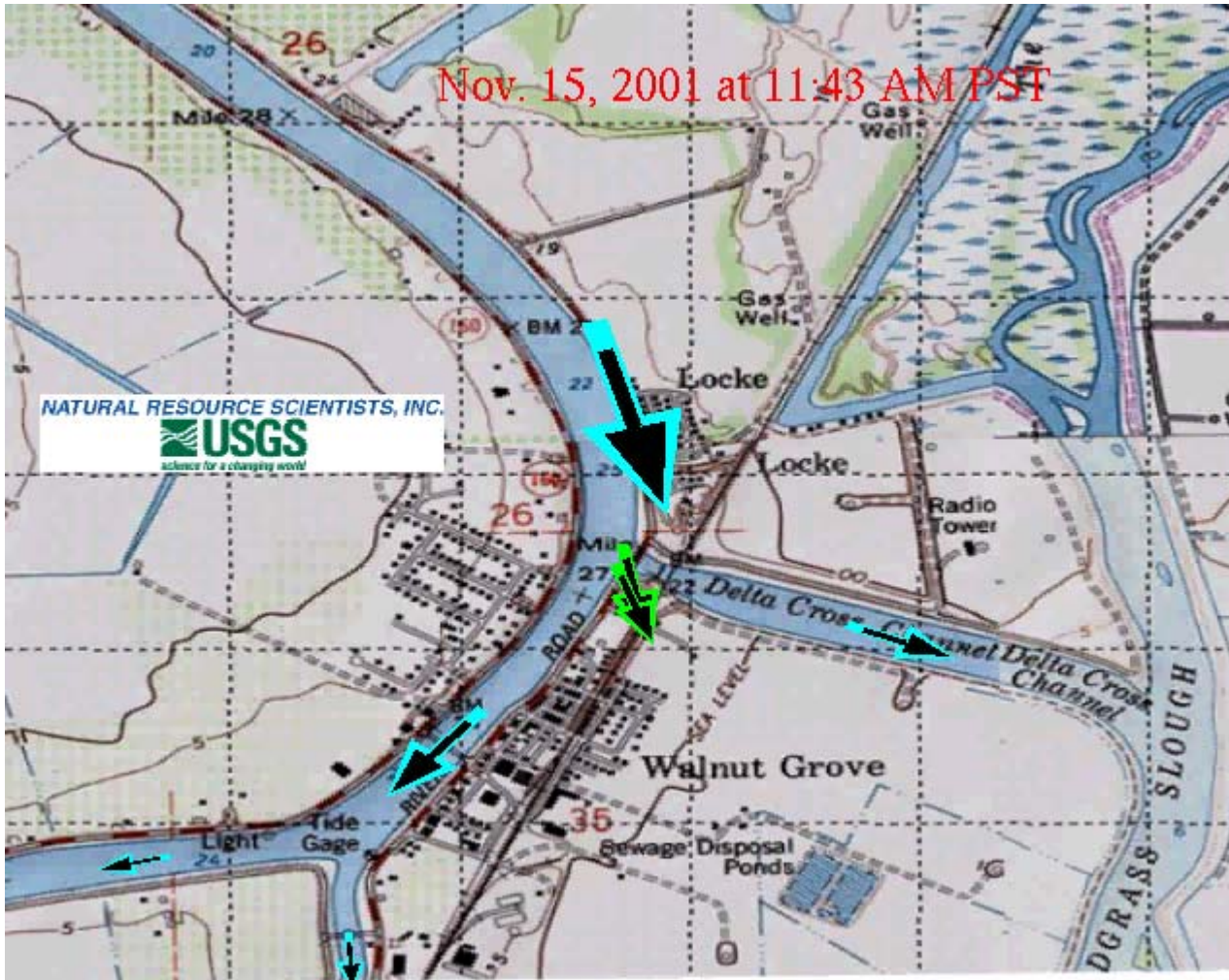


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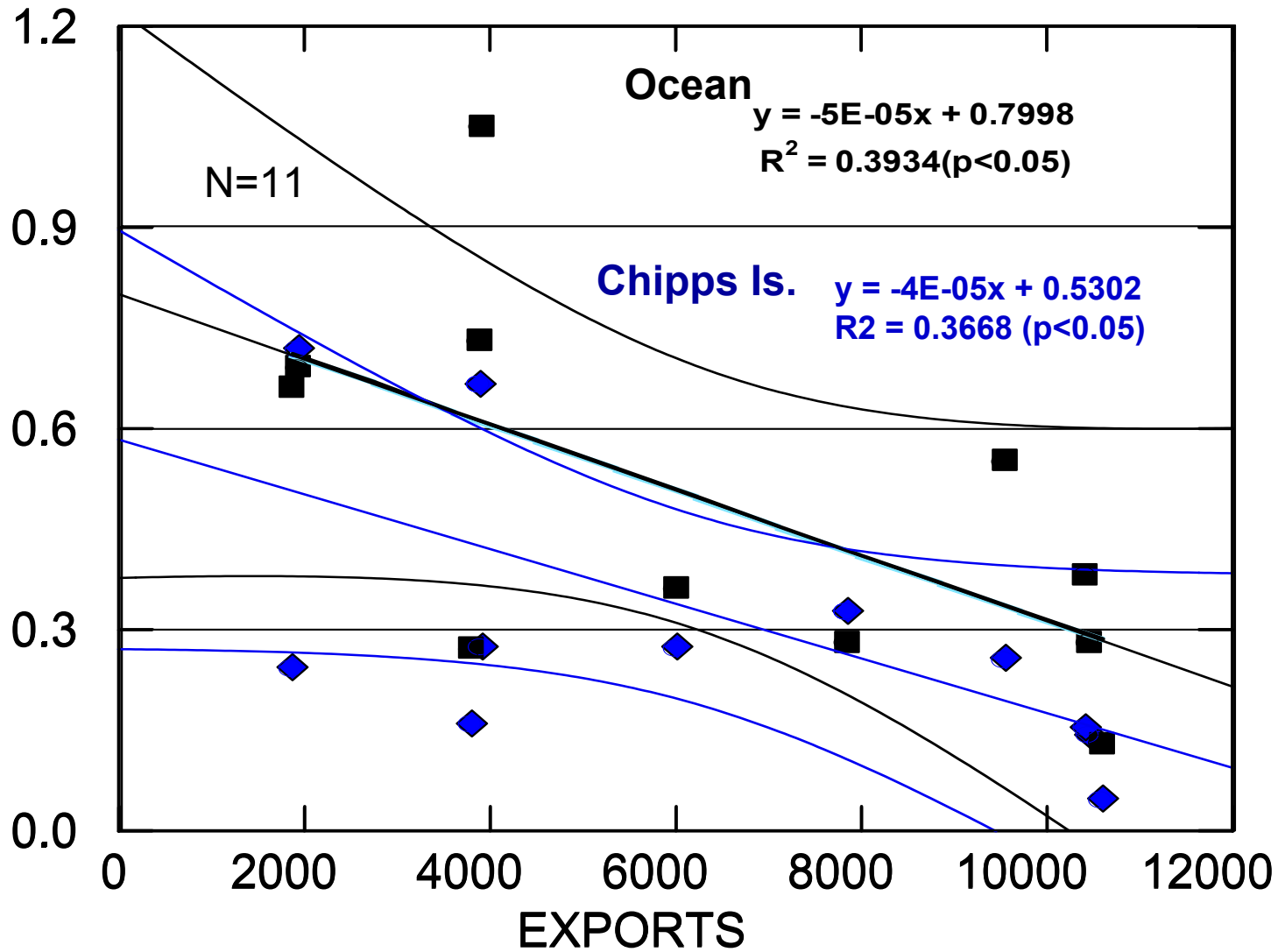


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NATURAL RESOURCE SCIENTISTS, INC.  
**USGS**  
science for a changing world



GS/Ryde Survival Ratio (with 95% confidence intervals)



Exports in cfs (for 3 days after release)