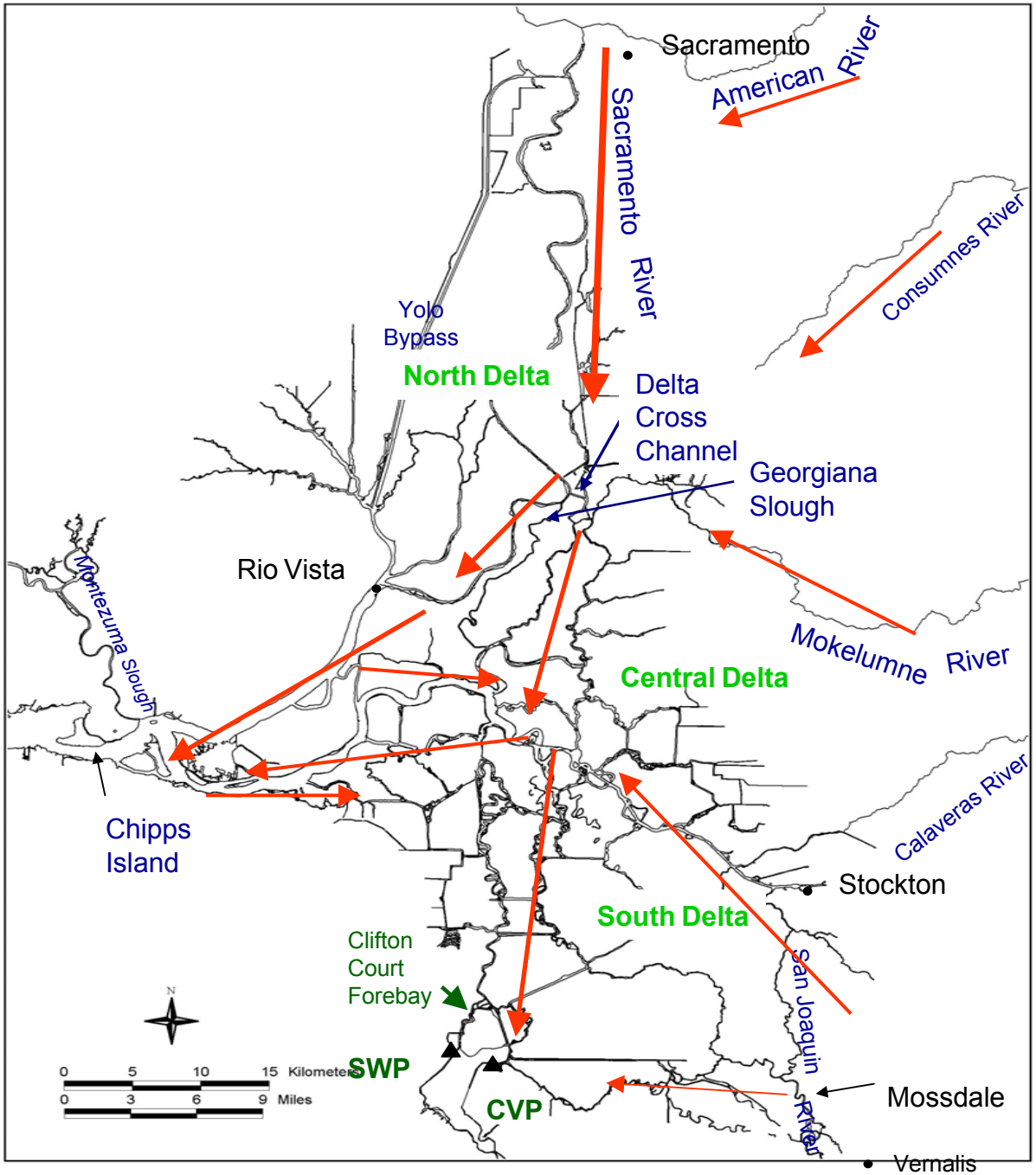
Salmon Conceptual Model and Basis for EWA Decisions

EWA Workshop

September 8, 2004

Pat Brandes - USFWS

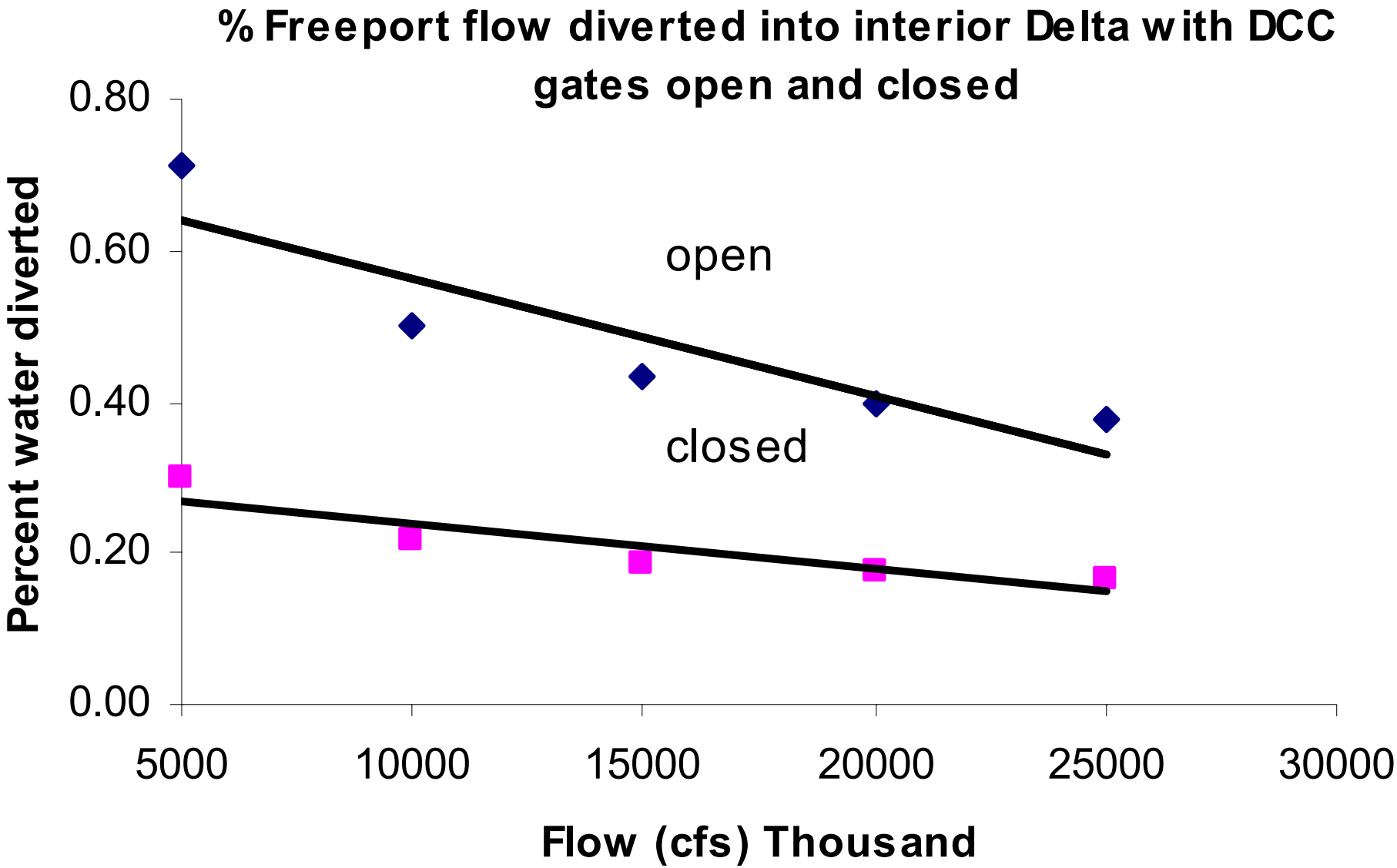


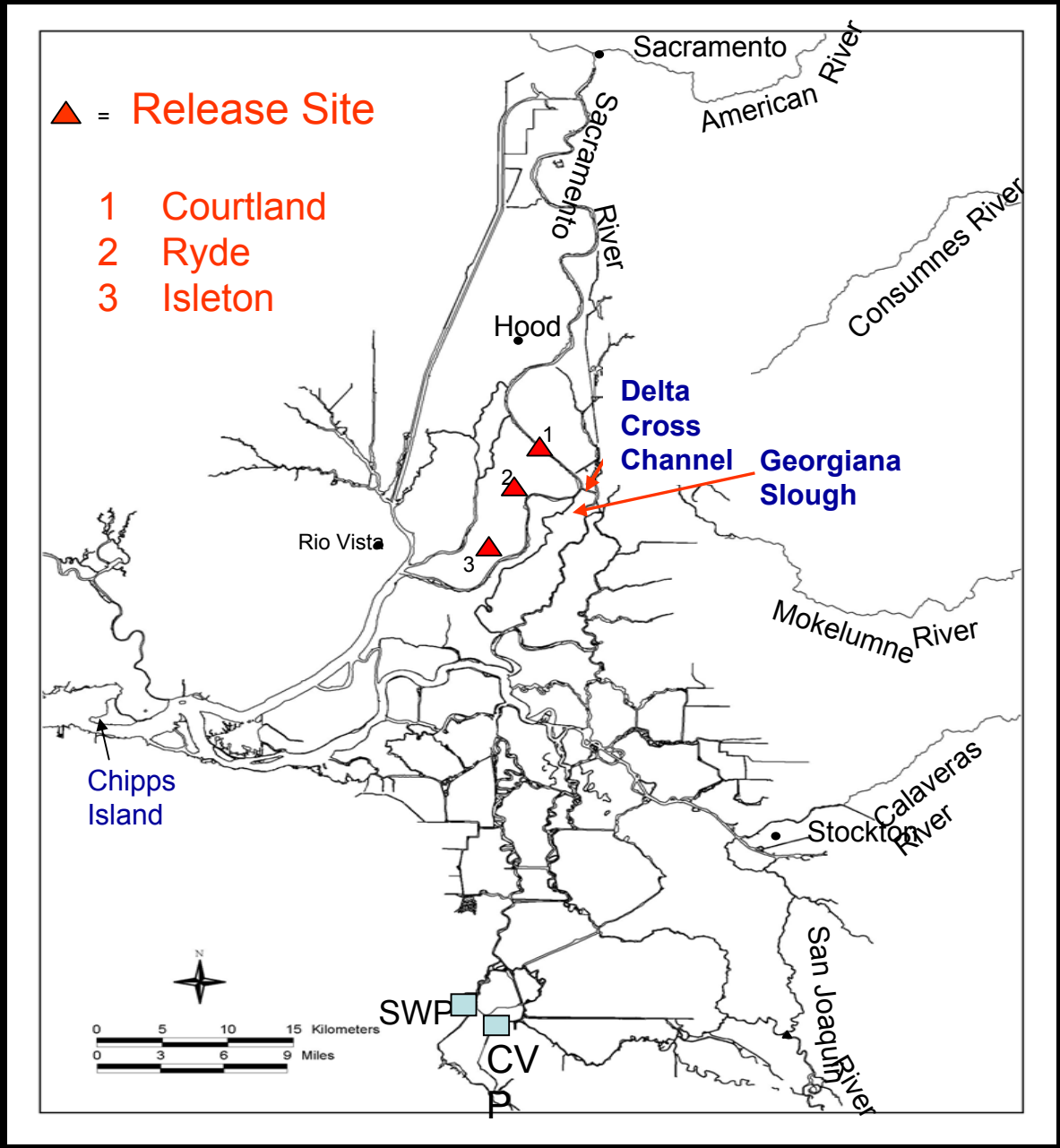
Conceptual Model of juvenile salmon migration through the Delta

Sac Basin salmon are diverted into interior Delta through the open DCC and GS

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

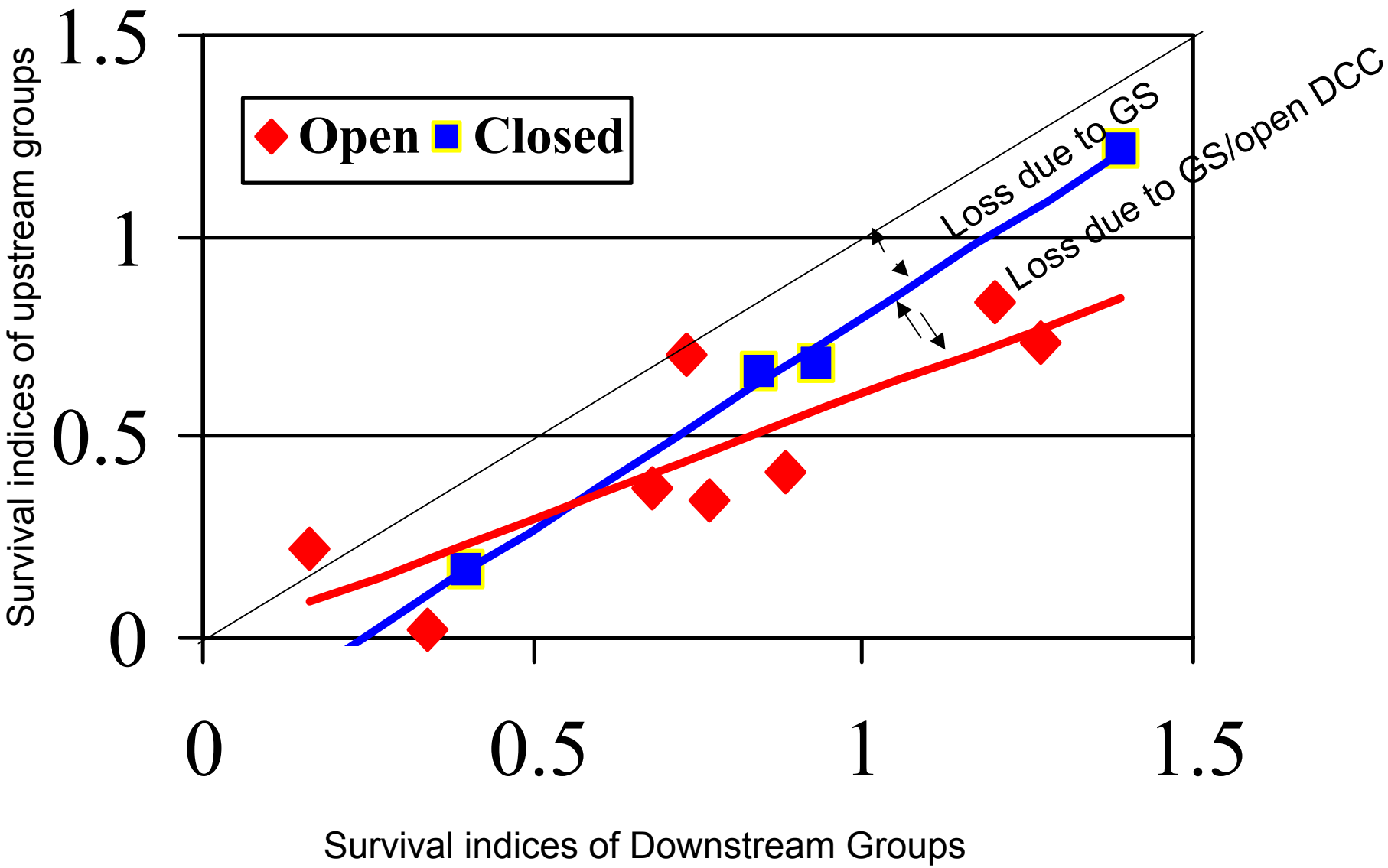
Survival is lower for S.J. Basin smolts migrating through upper Old River, and survival will increase with increased flow/exports

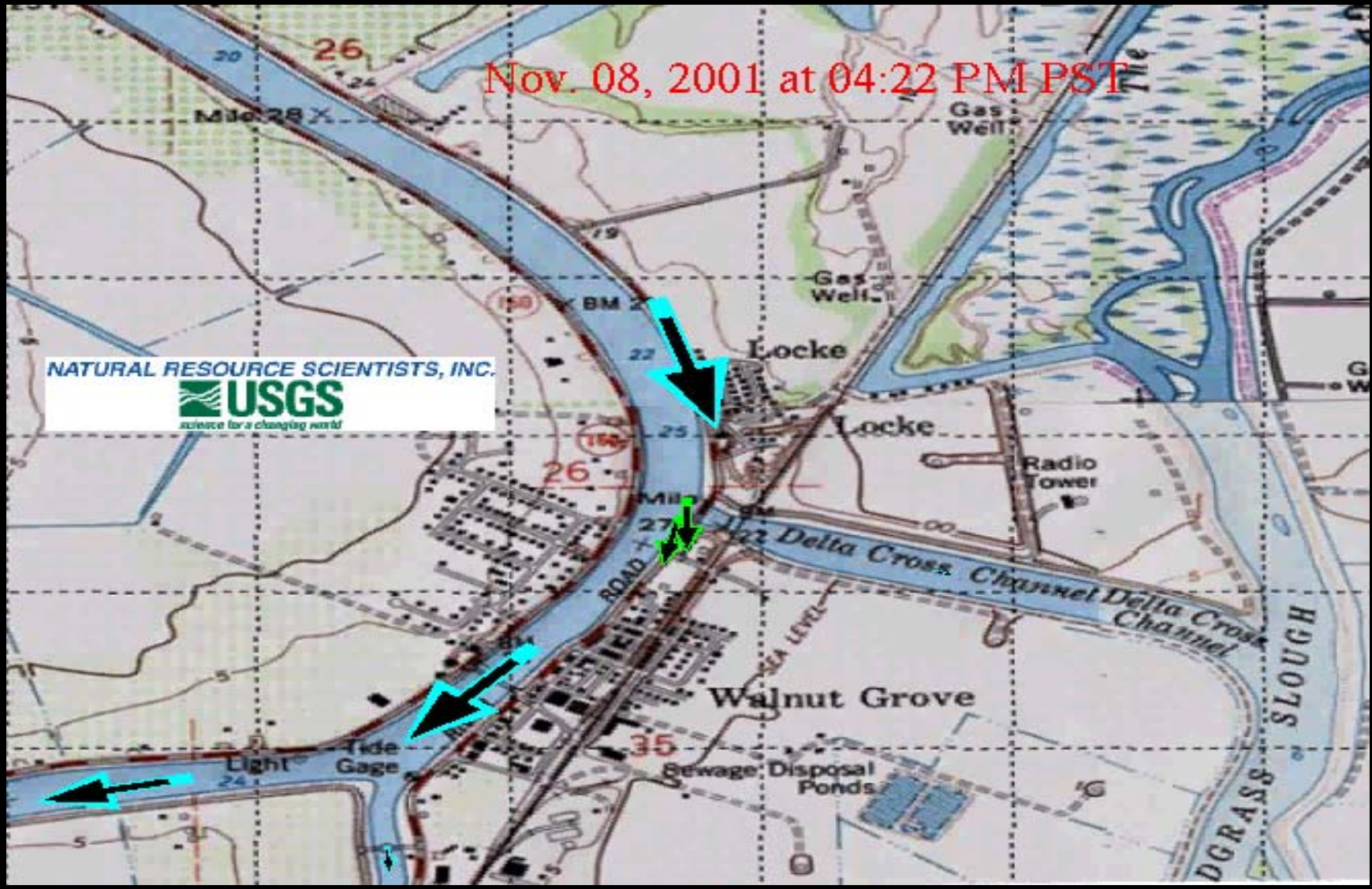

% Freeport flow diverted into interior Delta with DCC gates open and closed
Percent water diverted
0.80
0.60
0.40
0.20
0.00
open
closed
5000
10000
15000
20000
25000
30000
Flow (cfs) Thousand



Release sites for marked salmon released on Sacramento River

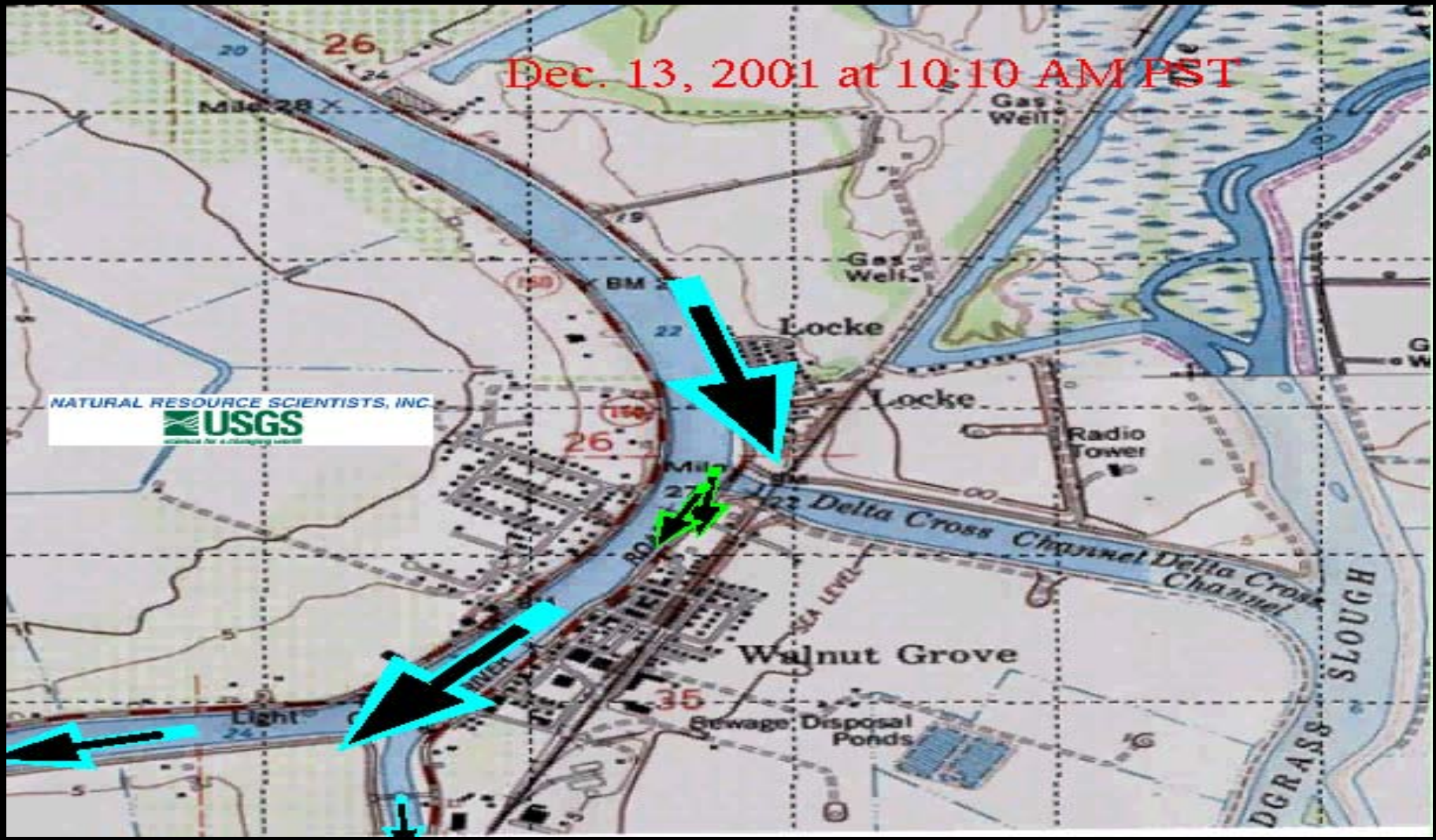
Survival indices to Chipps Island of marked juvenile salmon released upstream and downstream of the Delta Cross Channel and Georgiana Slough with DCC gates open and closed





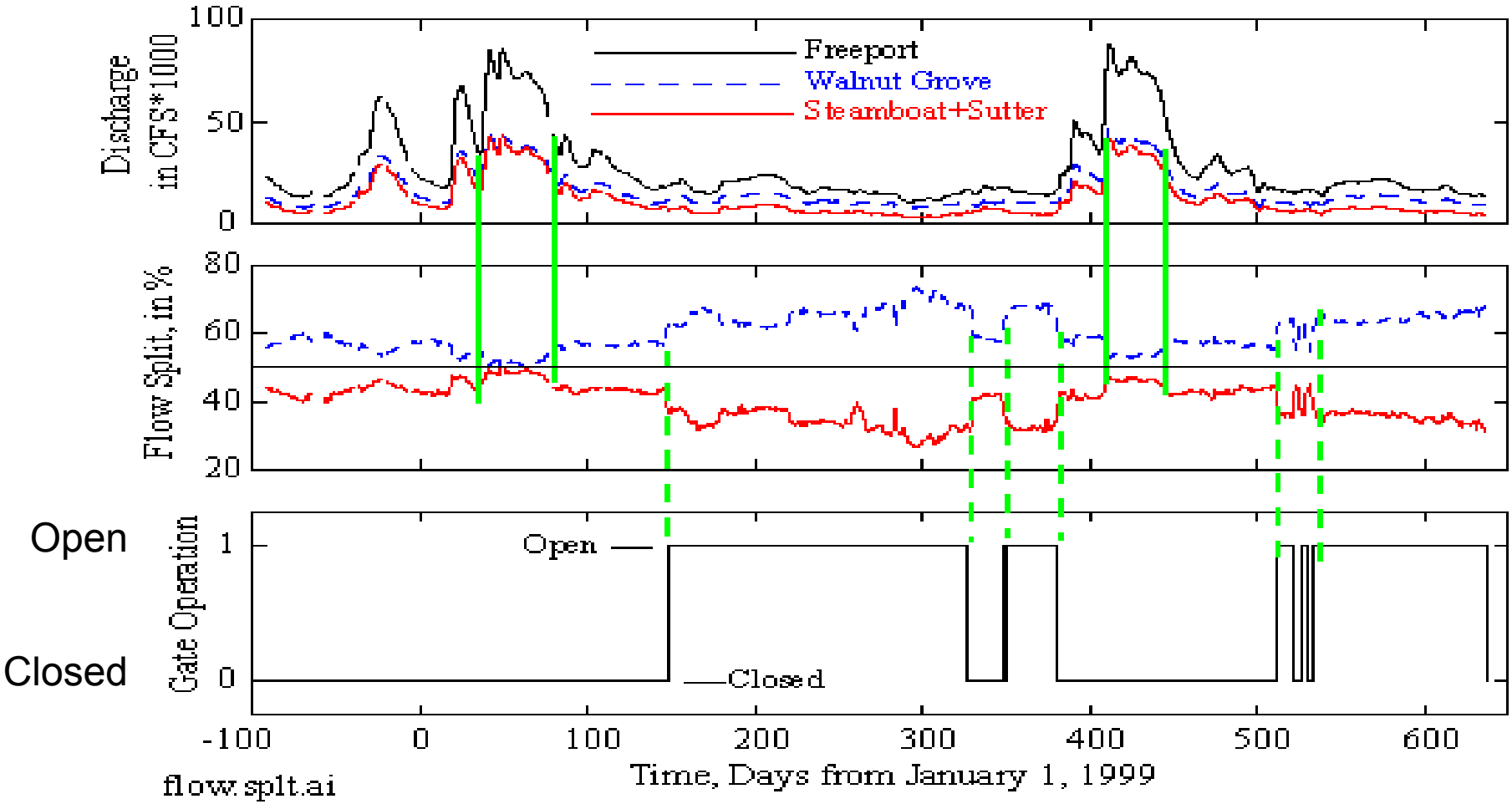
DCC Gates open Ebb to flood

Source:Dave Vogel, 2002 Asilomar presentation



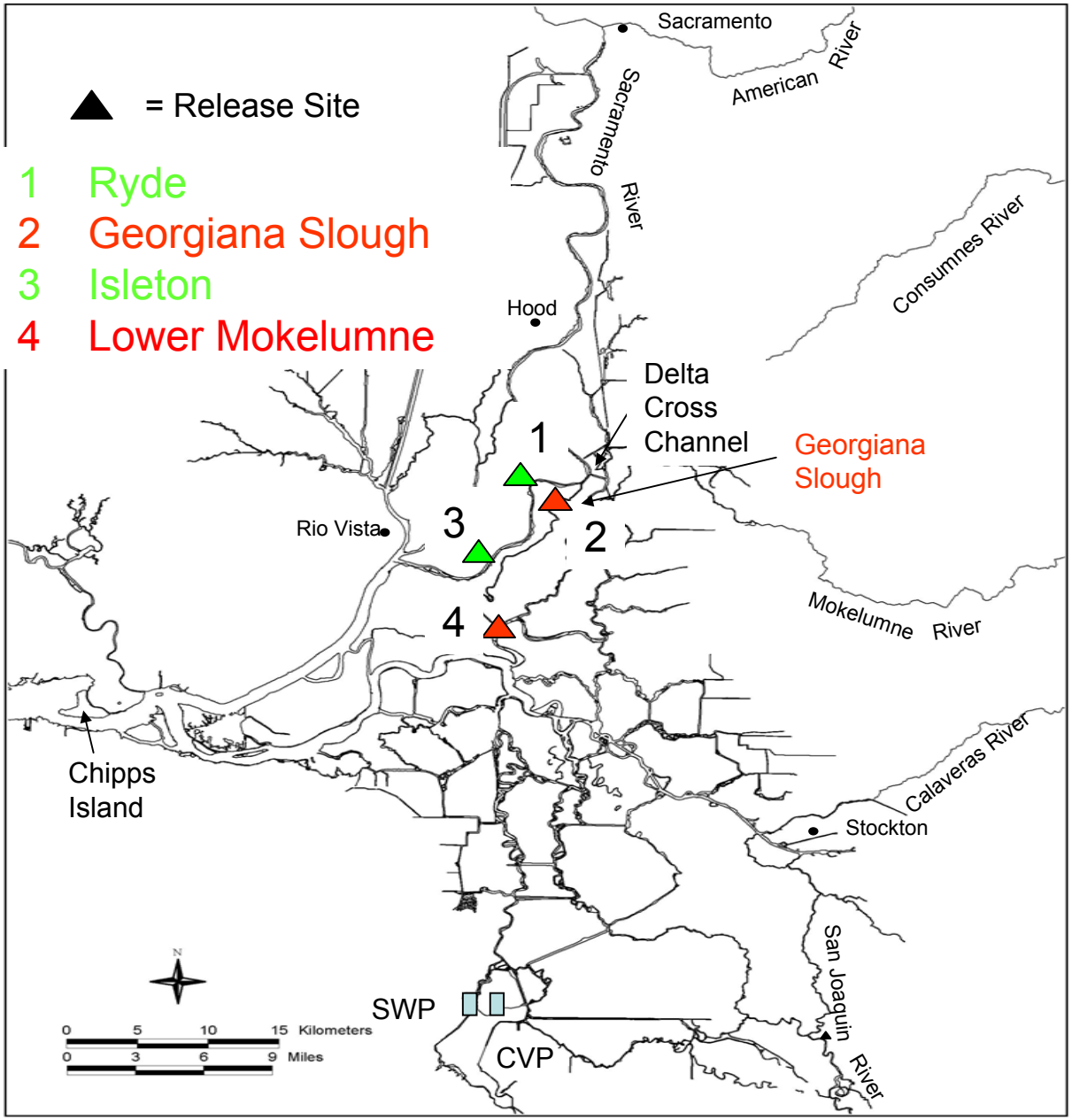
DCC gates closed Ebb to flood

Source: Dave Vogel, Asilomar presentation 2002

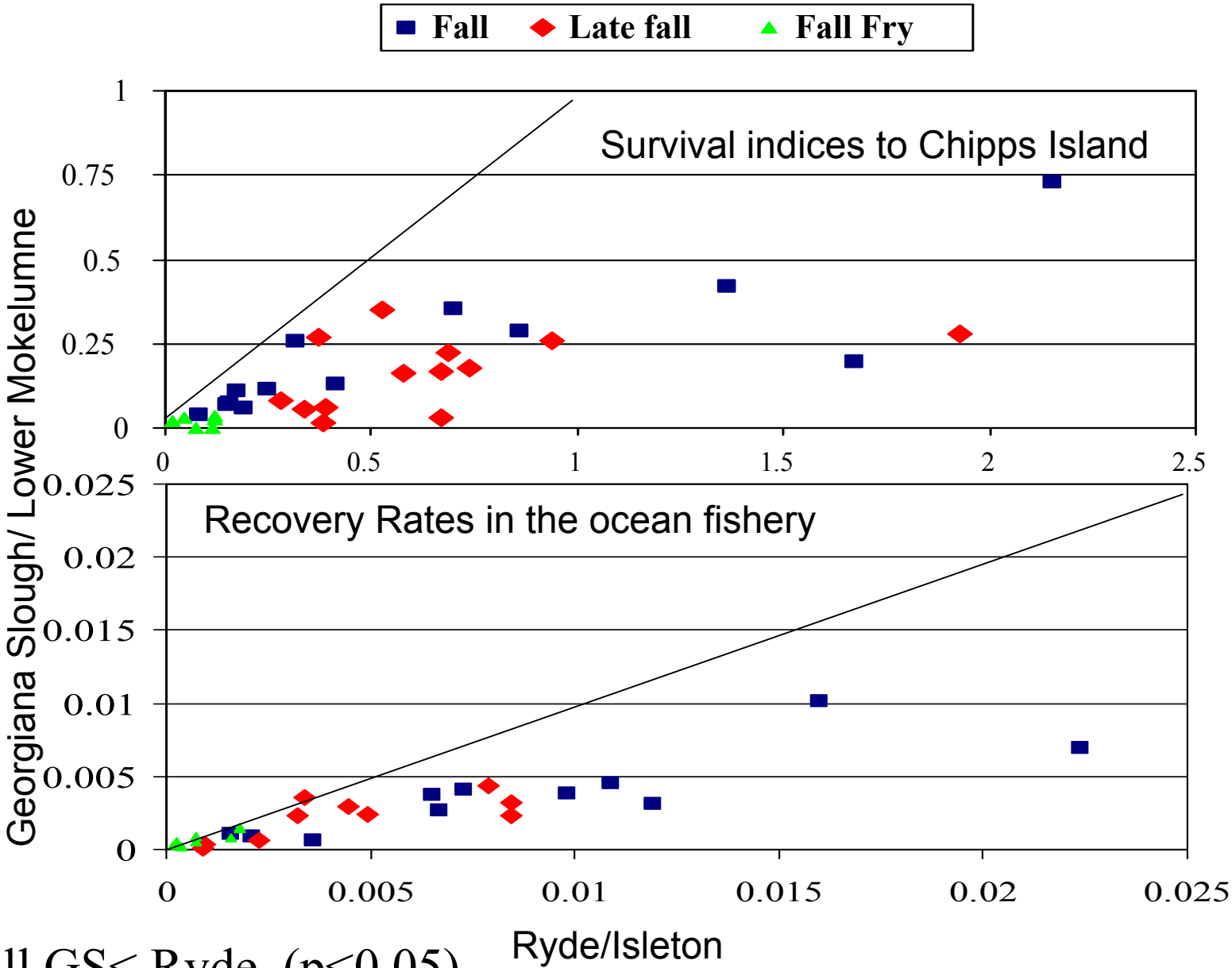


Flows in the Sacramento River at Freeport (black), and above Walnut Grove (blue) and the combined flow in Steamboat and Sutter Sloughs (red), (middle) the percentage of the Freeport flow that flows past Walnut Grove and through Steamboat and Sutter Sloughs, and (bottom) DCC gate operation (0=closed, 1=open).

Source: Burau, 2002

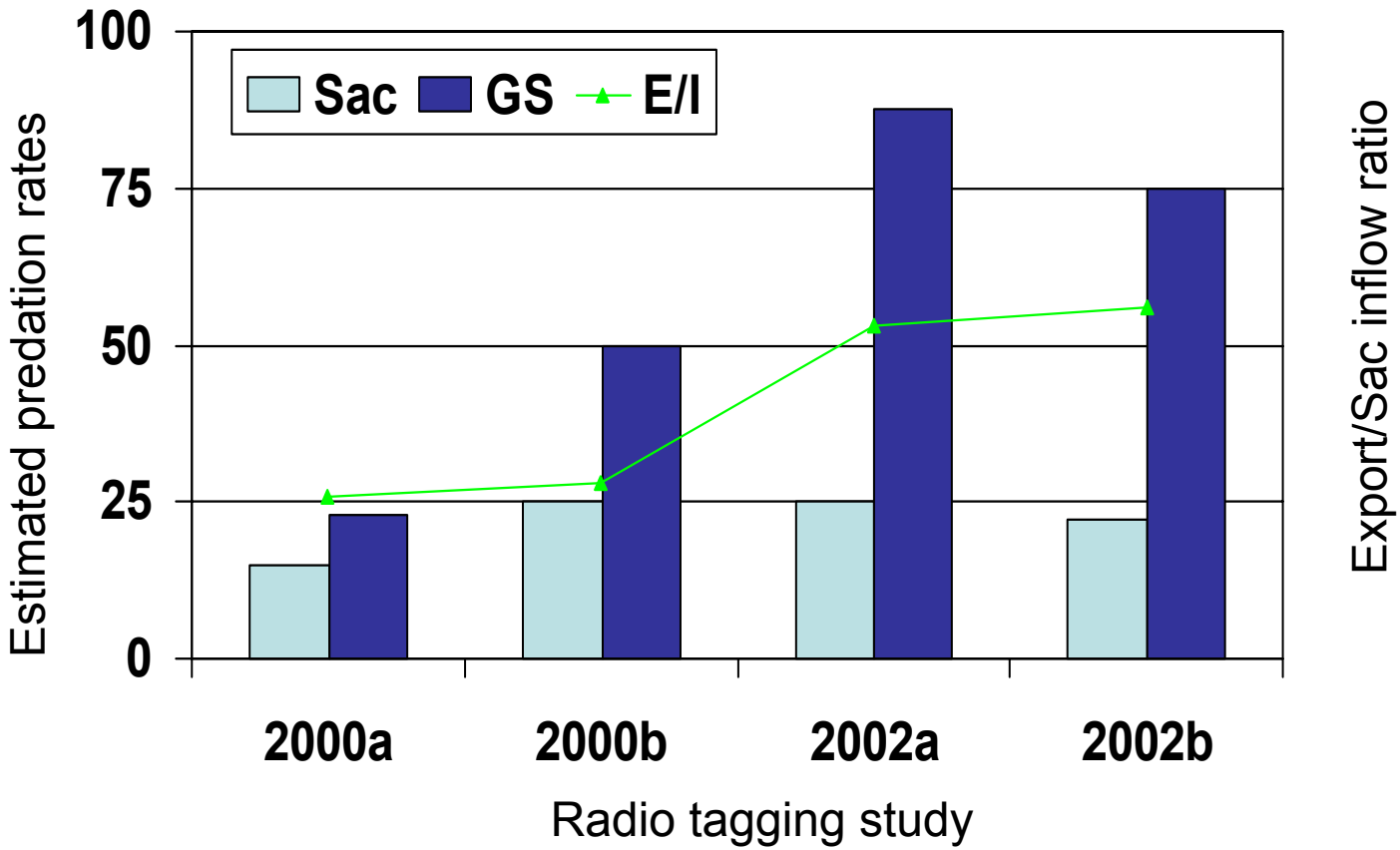


Release sites for marked salmon released on Sacramento River and interior Delta



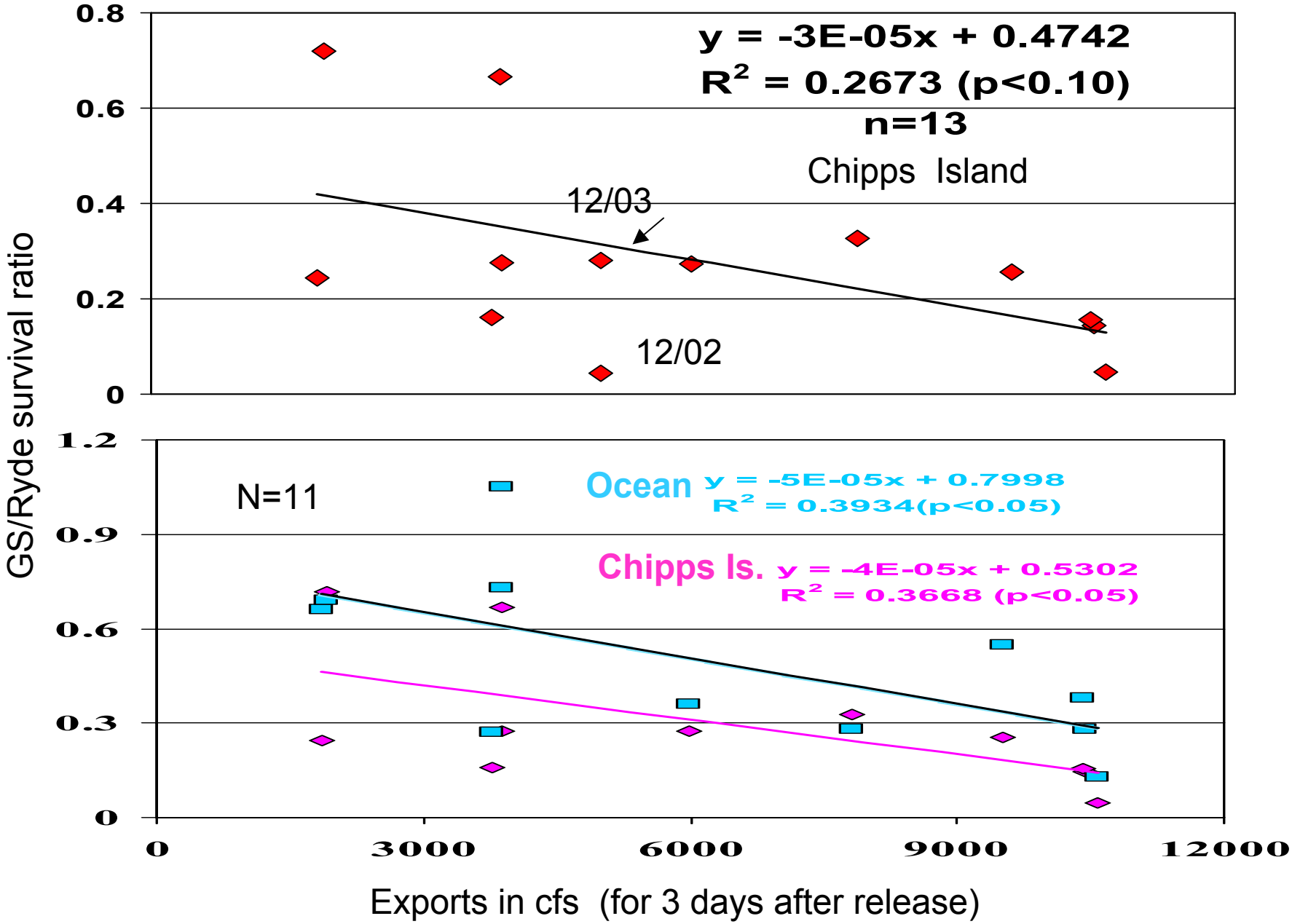
Fall GS< Ryde ($p<0.05$)

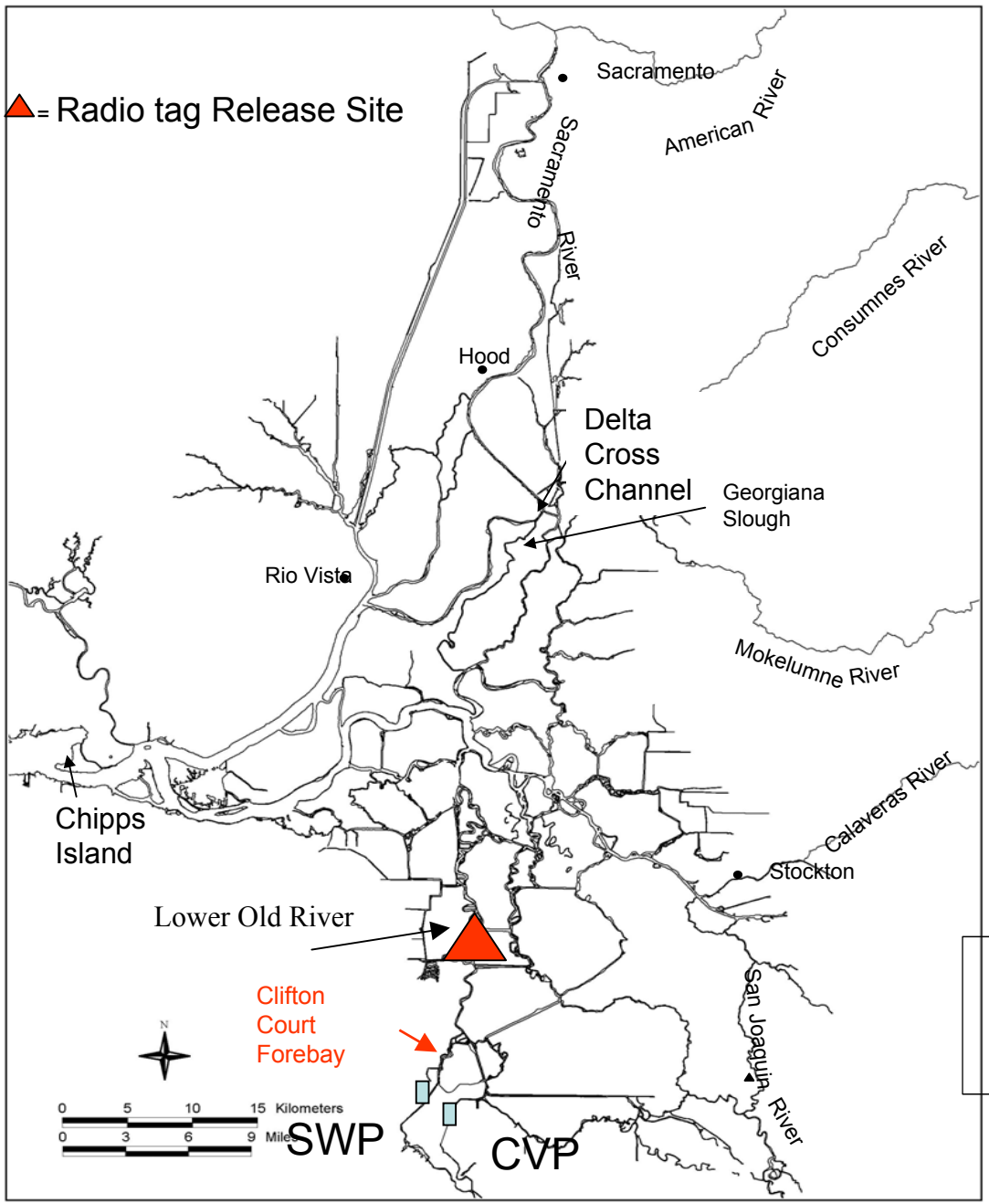
Late-fall GS<Ryde ($p<0.05$)



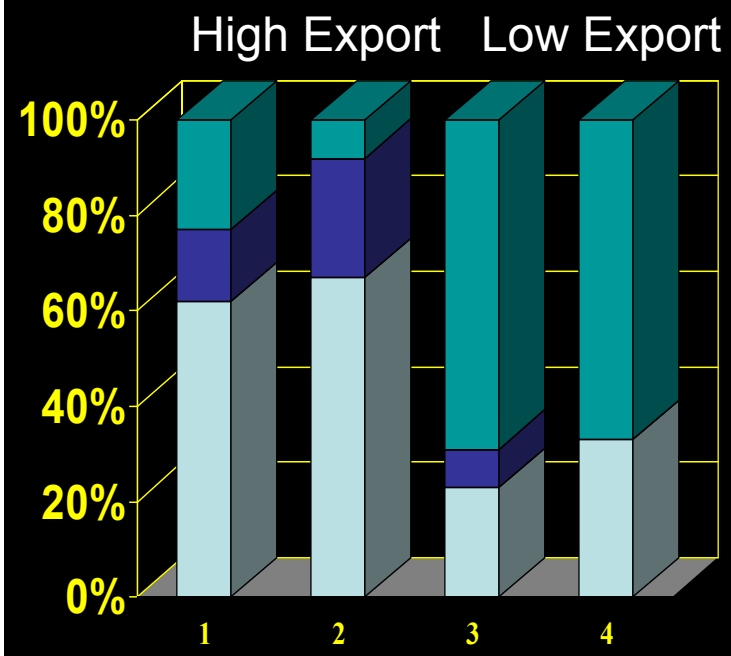
Estimates of predation rates for radio-tagged, late-fall salmon released into the Sacramento River at Ryde and those released into Georgiana Slough and corresponding export/inflow ratio

Source: Vogel 2001 and 2004


y = -3E-05x + 0.4742
R² = 0.2673 (p<0.10)
n=13
Chipps Island
12/03
12/02
0.8
0.6
0.4
0.2
0
N=11
Ocean y = -5E-05x + 0.7998
R² = 0.3934(p<0.05)
Chipps Is. y = -4E-05x + 0.5302
R² = 0.3668 (p<0.05)
1.2
0.9
0.6
0.3
0
0
3000
6000
9000
12000
GS/Ryde survival ratio
Exports in cfs (for 3 days after release)

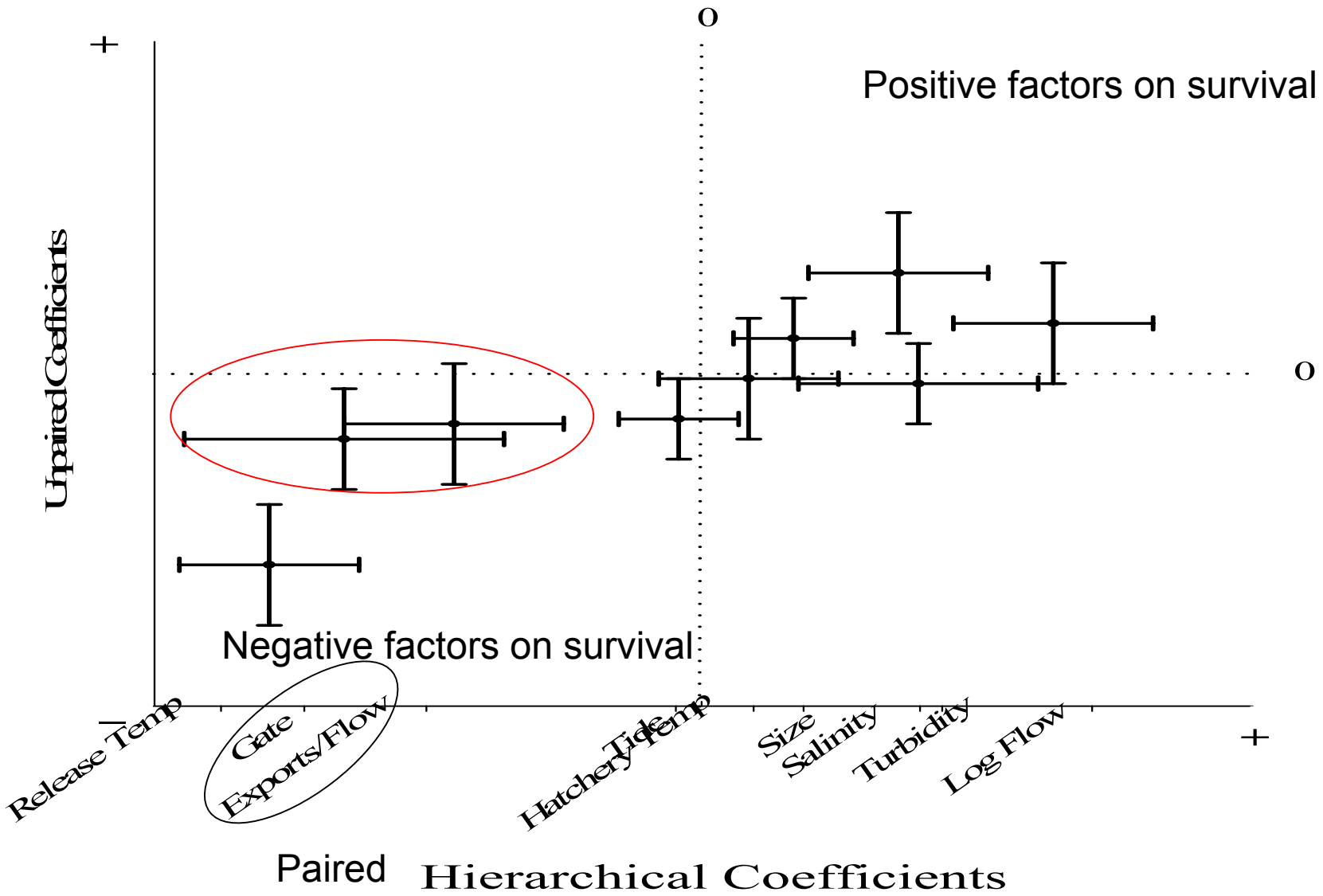


Late-fall radio tagged salmon released in 2000-2001



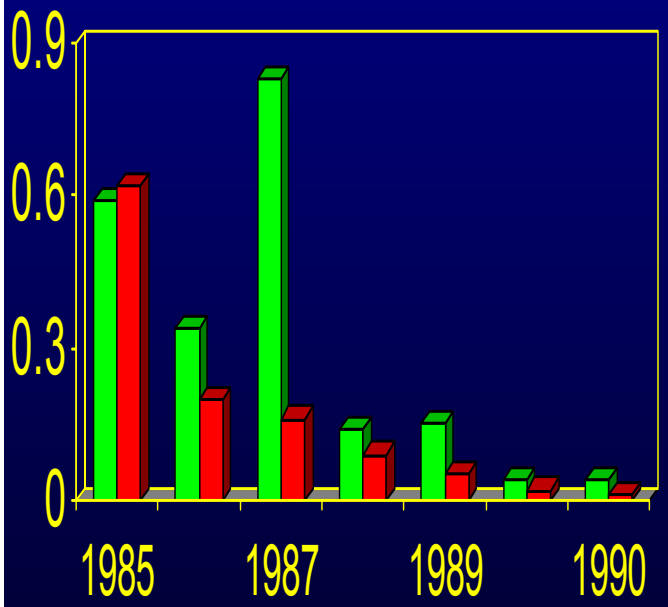
High Export = 8-11,000 cfs,
Low Export = ~3000 cfs

DCC gate closure statistically significant in both cases ($p<0.05$)
Exports statistically significant with hierarchical model

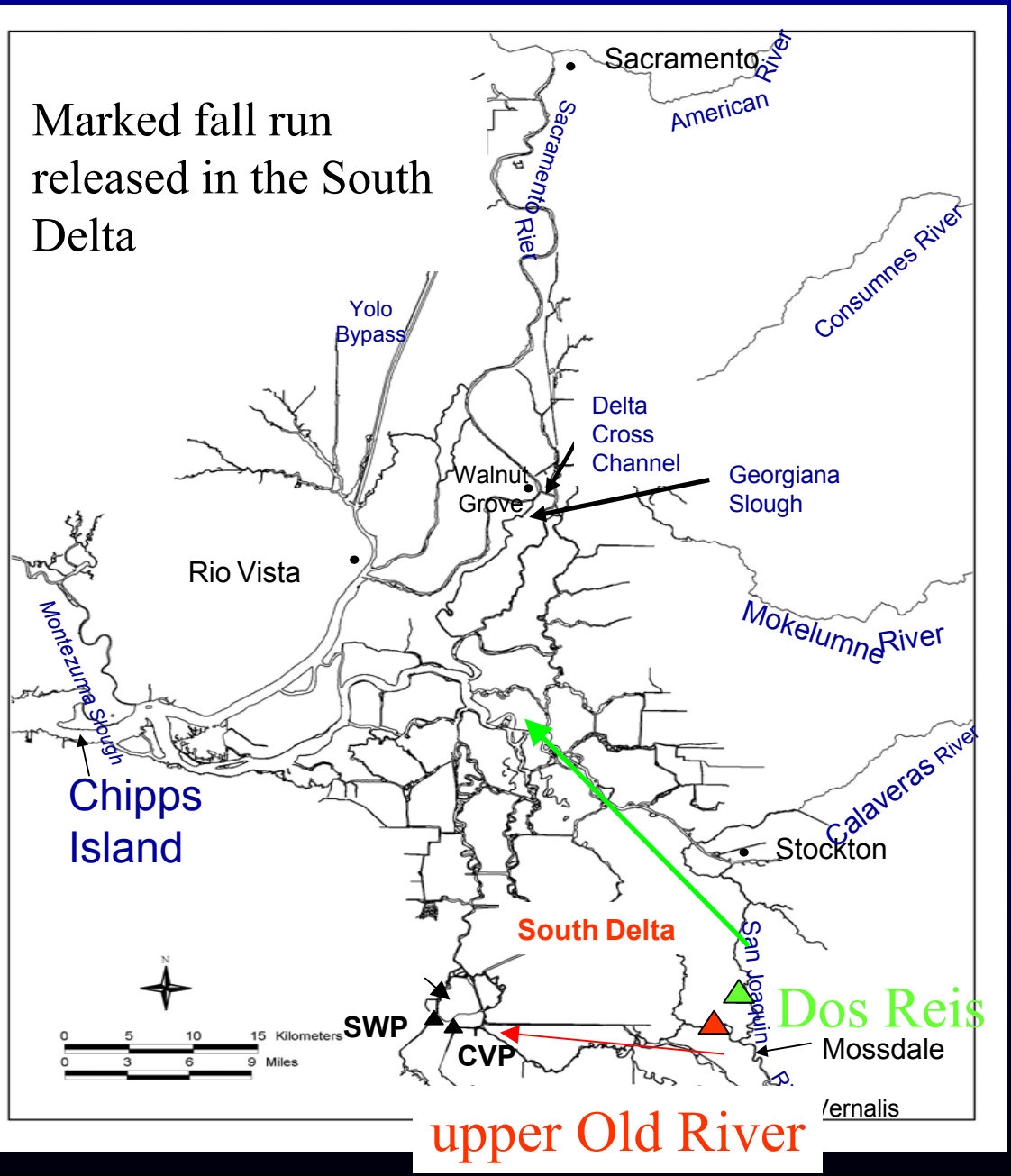


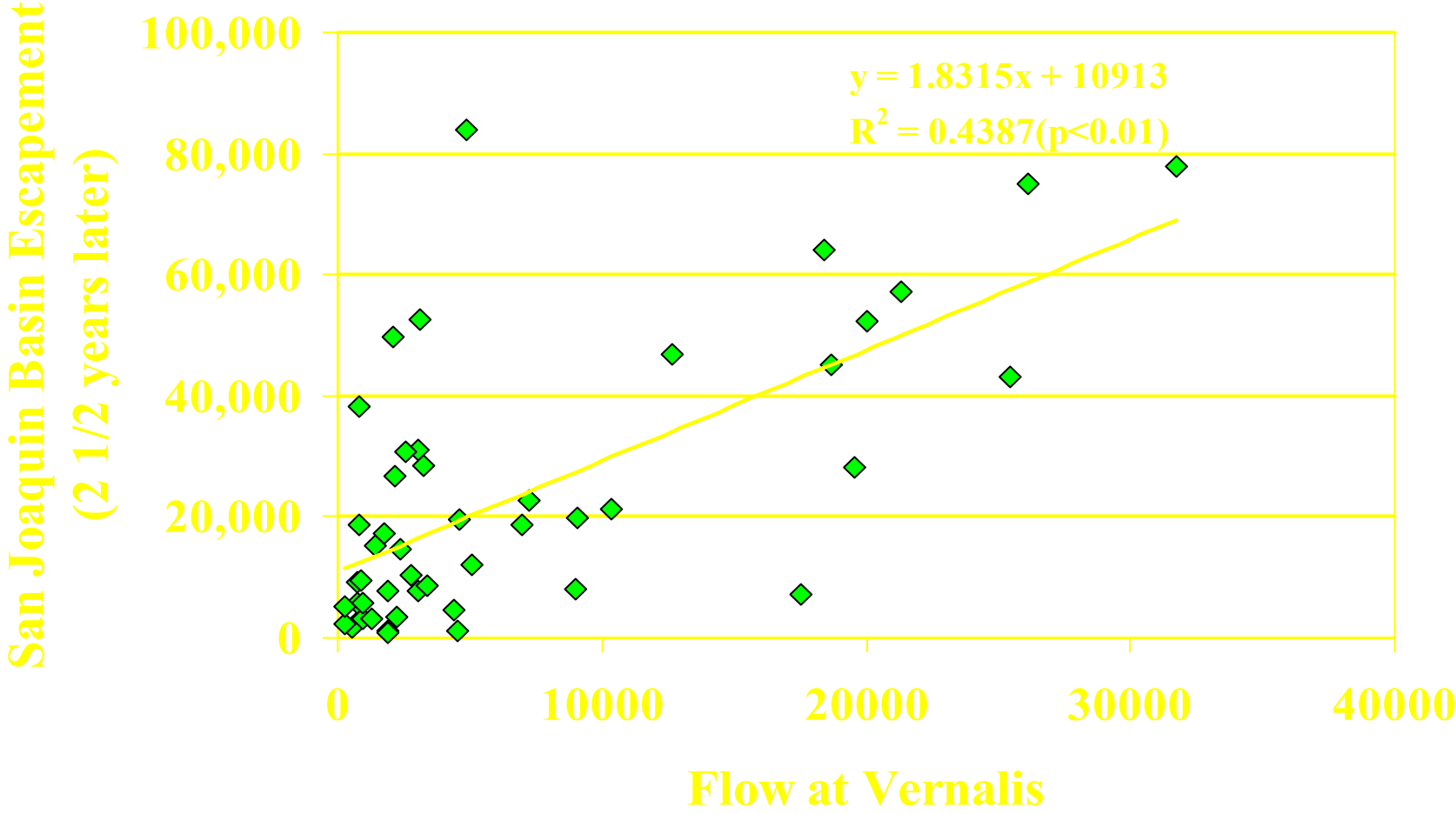
Standardized coefficients and +/- 2 standard errors of two separate Newman models estimating fall run salmon smolt survival through the Delta

Smolt Survival Indices to Chipps Island 1985-1990

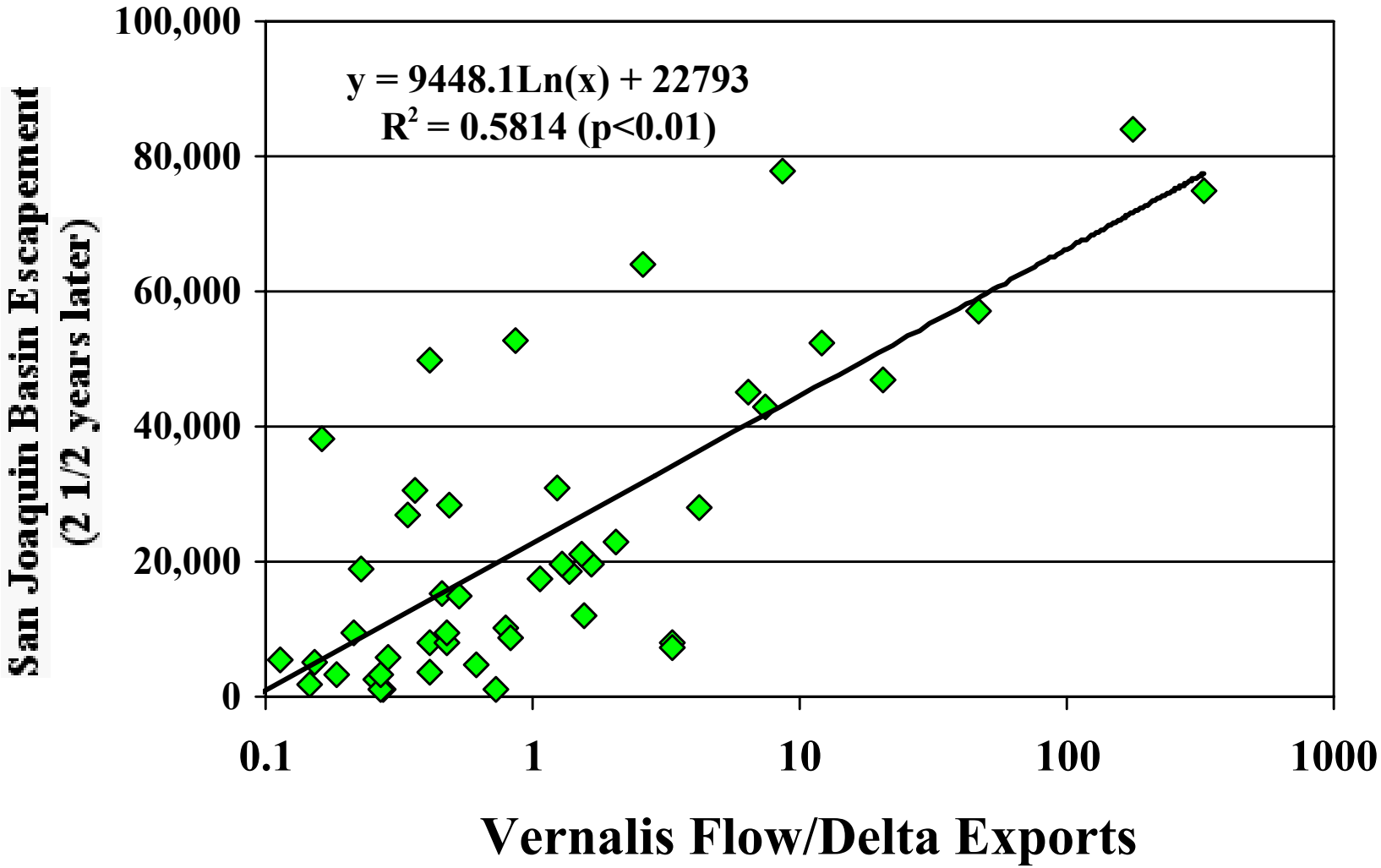


Results suggest higher survival for smolts that stay in the San Joaquin River. Not statistically significantly at $p<0.05$. (n=7)

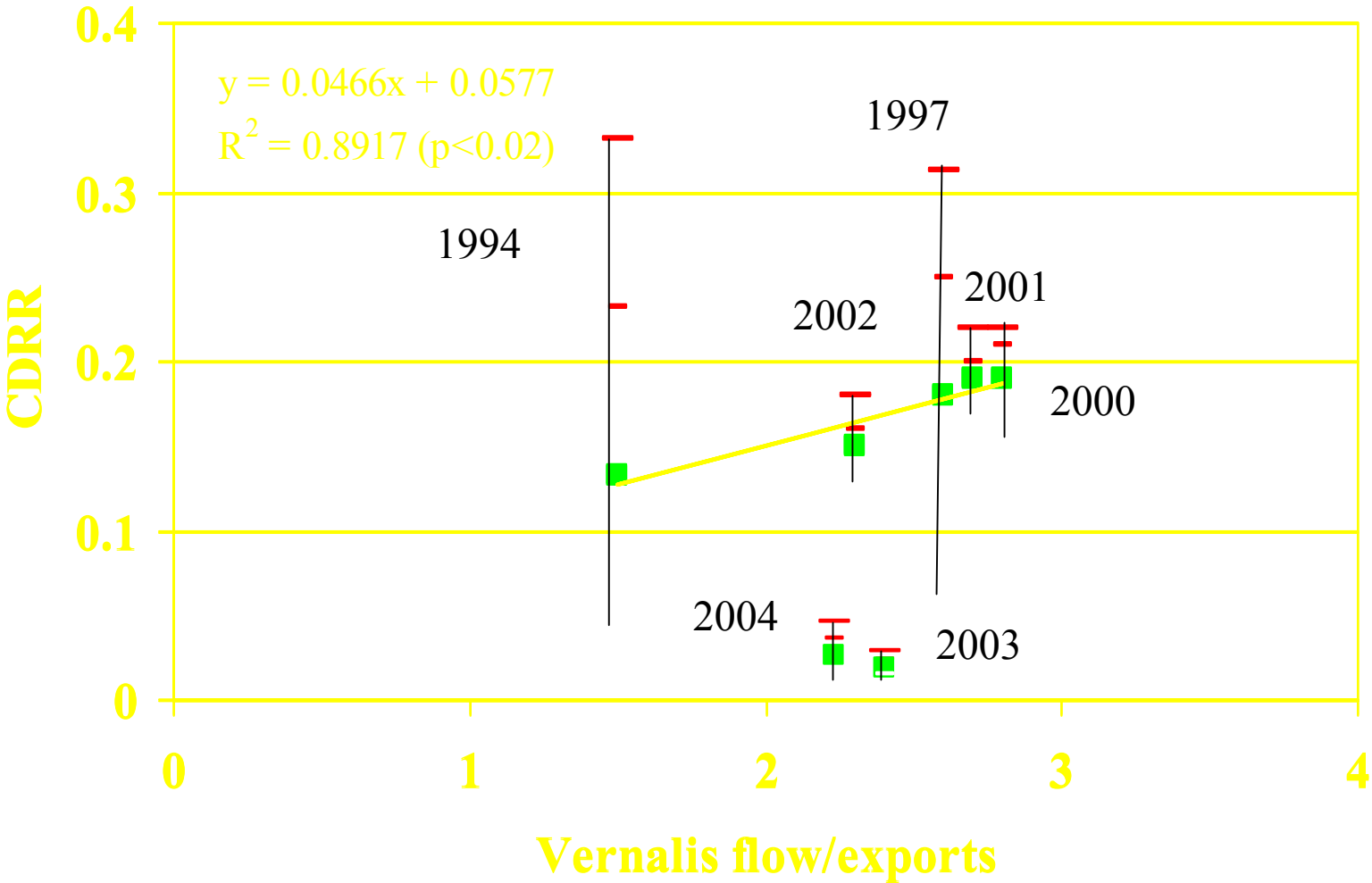




Flow at Vernalis (mean April 15 - June 15) between 1951- 1998 versus San Joaquin Basin Escapement 2 1/2 years later



Mean spring flows /Delta exports (mean April 15- June 15) between 1951-1998 and San Joaquin Basin Escapement (2 1/2 years later).



Combined Differential Recovery Rate (CDRR) and (+/- 1 and 2 Standard Errors) from Durham Ferry and Mossdale to Jersey Point with the HORB in place, versus inflow at Vernalis / exports, 1994, 1997 and 2000-2004. Regression line without 2003 and 2004 data.

The basis of fish protective actions in Delta for juvenile salmon (including EWA)

is based on the body of evidence that indicates:

closing the DCC,
reducing exports,
increasing flows/exports
and installing a HORB

will increase the survival of juvenile salmon through the Delta