Role of Spring Flow in Determining SJR Tributary Salmon Production

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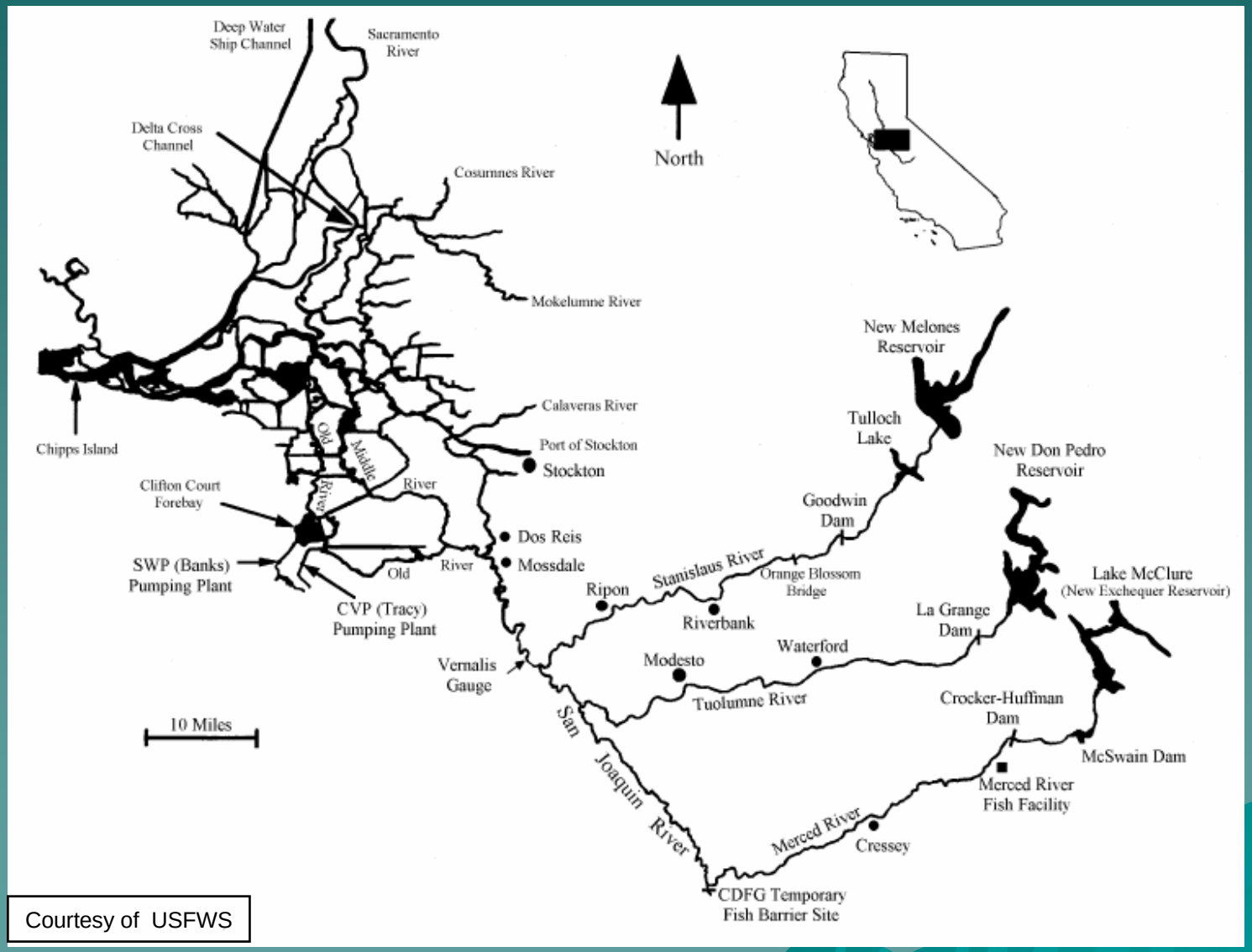
SJR Overview

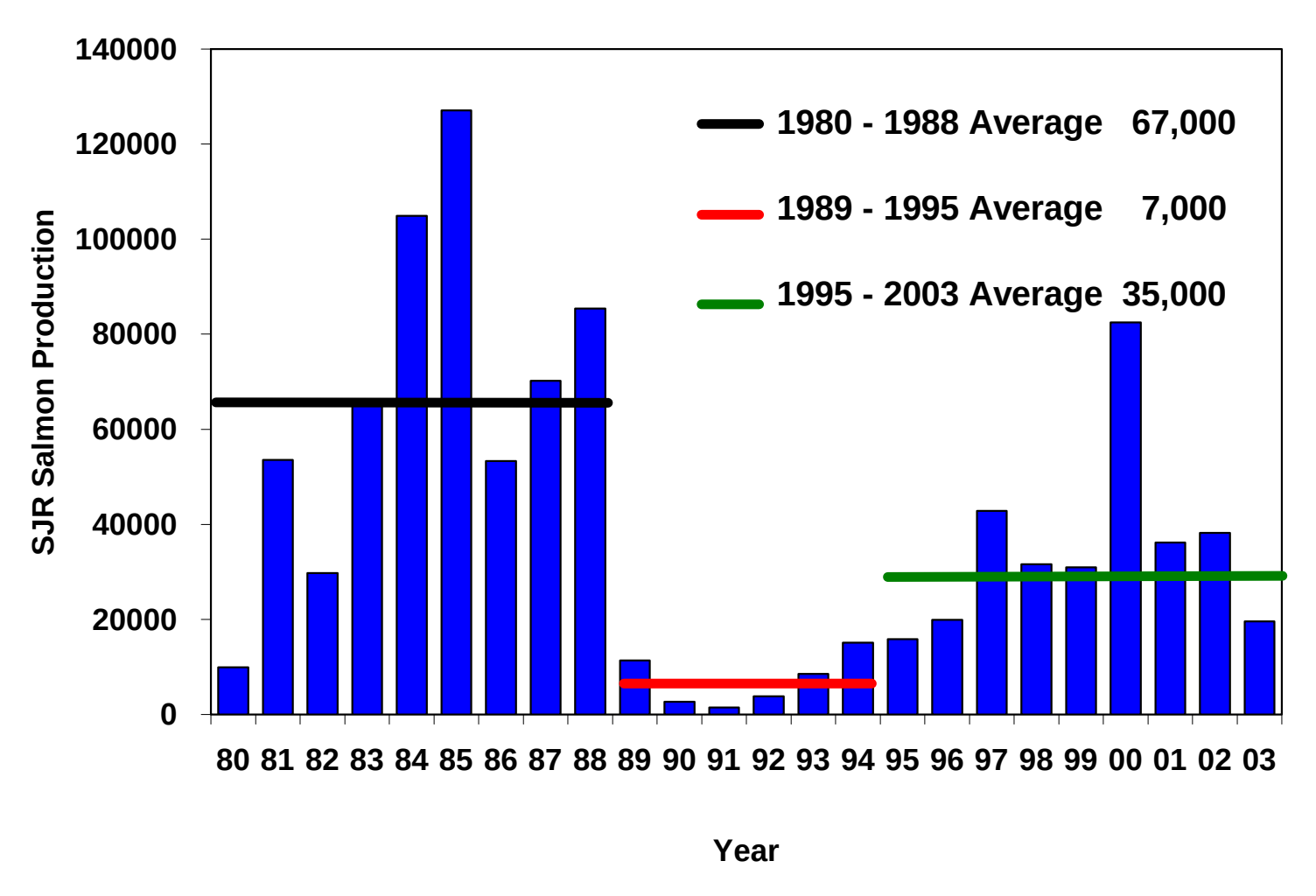
- Chinook Trend
- Pre & Post Drought Comparison
- Tributary Spring Flow
- Role of Non-Flow Factors
- Salmon Model
- Model Scenarios
- Recommendations & Conclusions
- EWA and Regulatory Actions

Geographic & Model Orientation

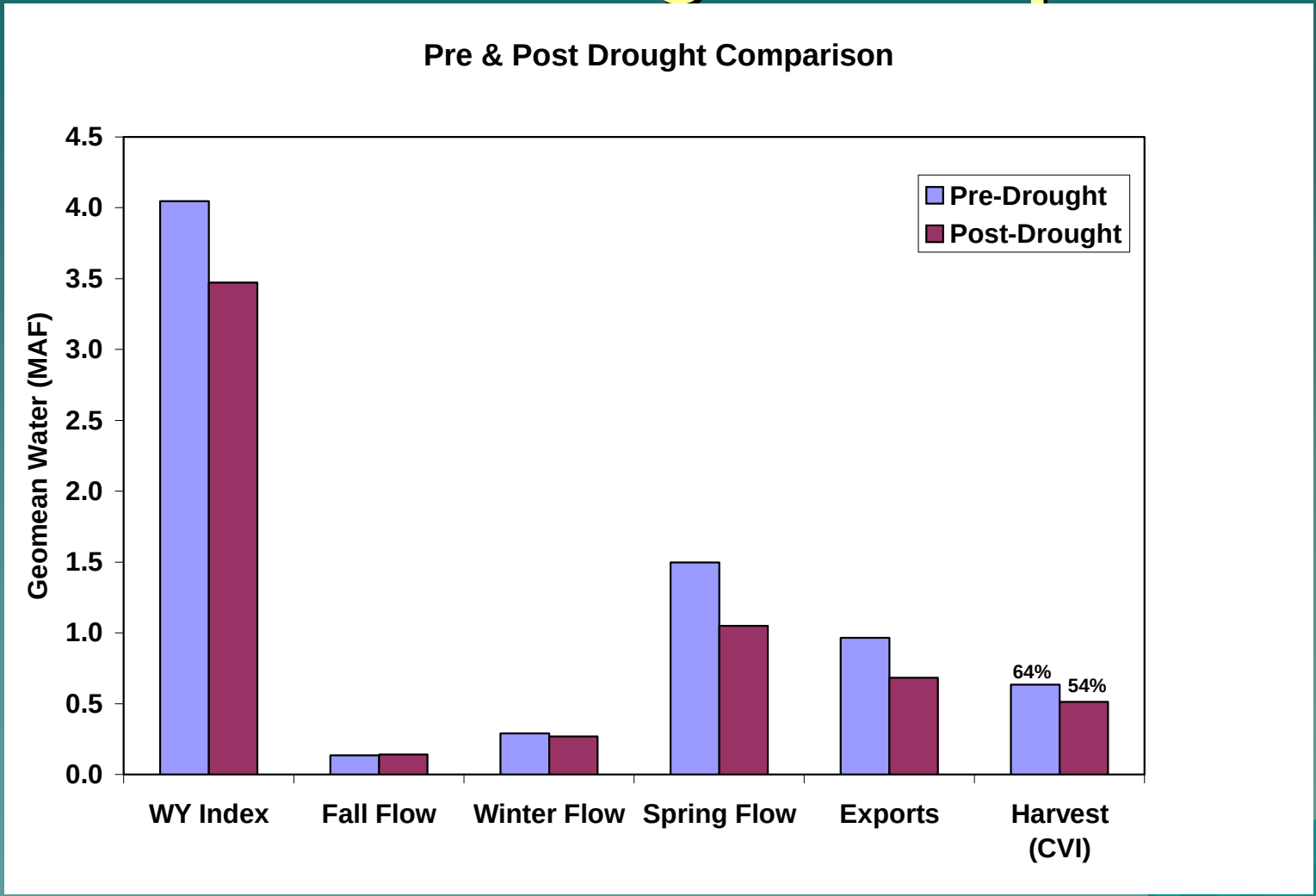


Courtesy of USFWS

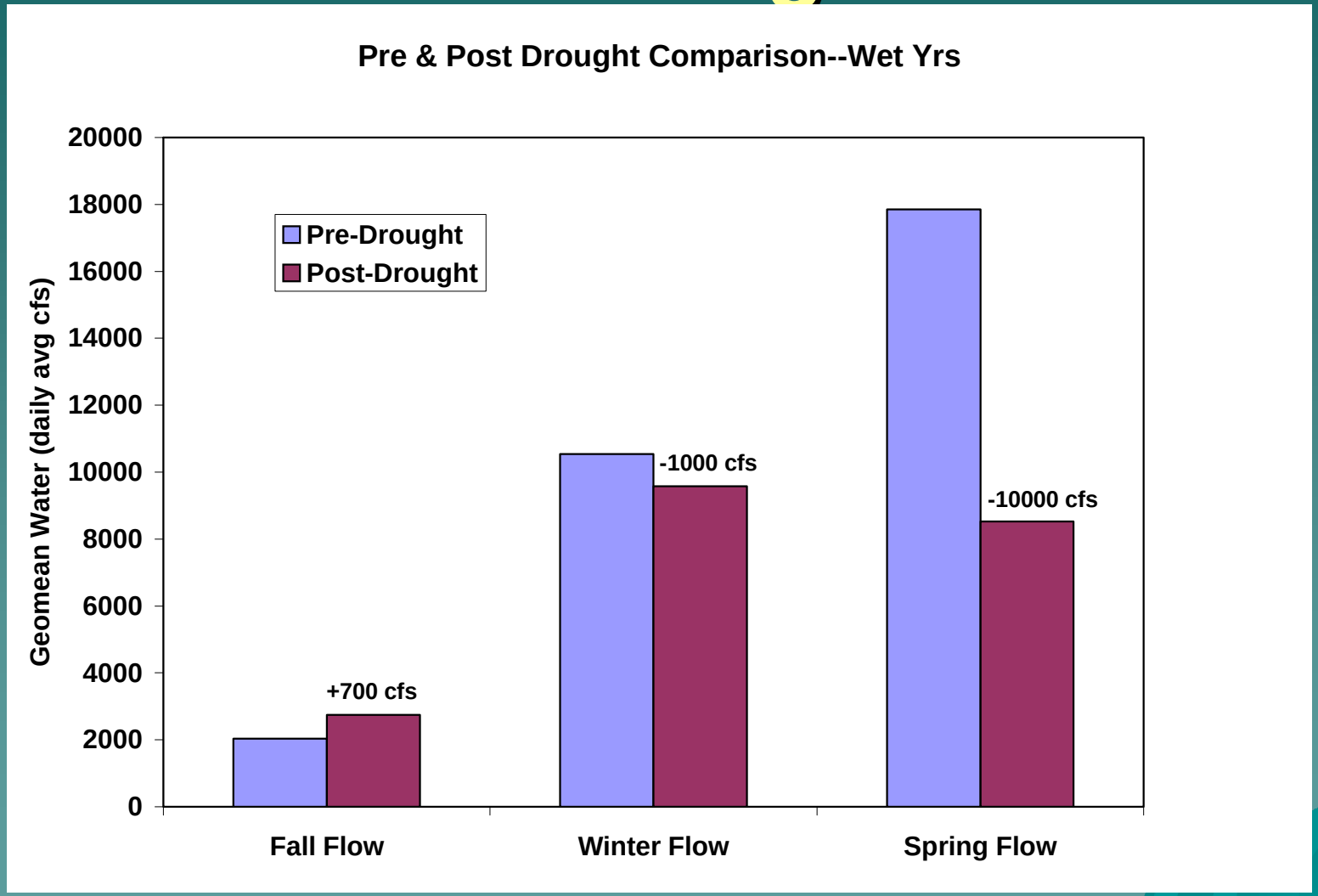
SJR Salmon Trend



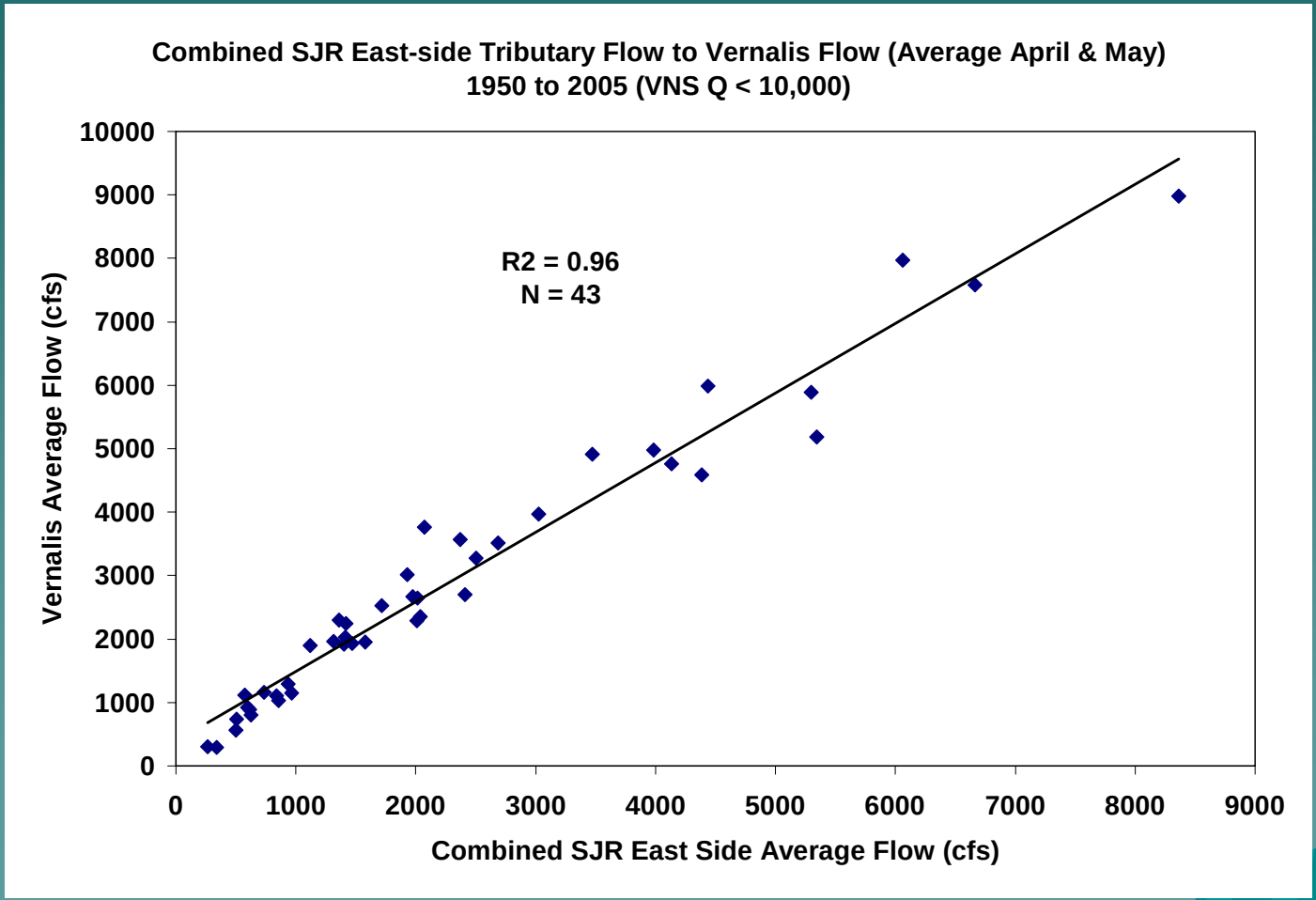
Pre & Post Drought Comparison



Pre & Post Drought Wet Yrs

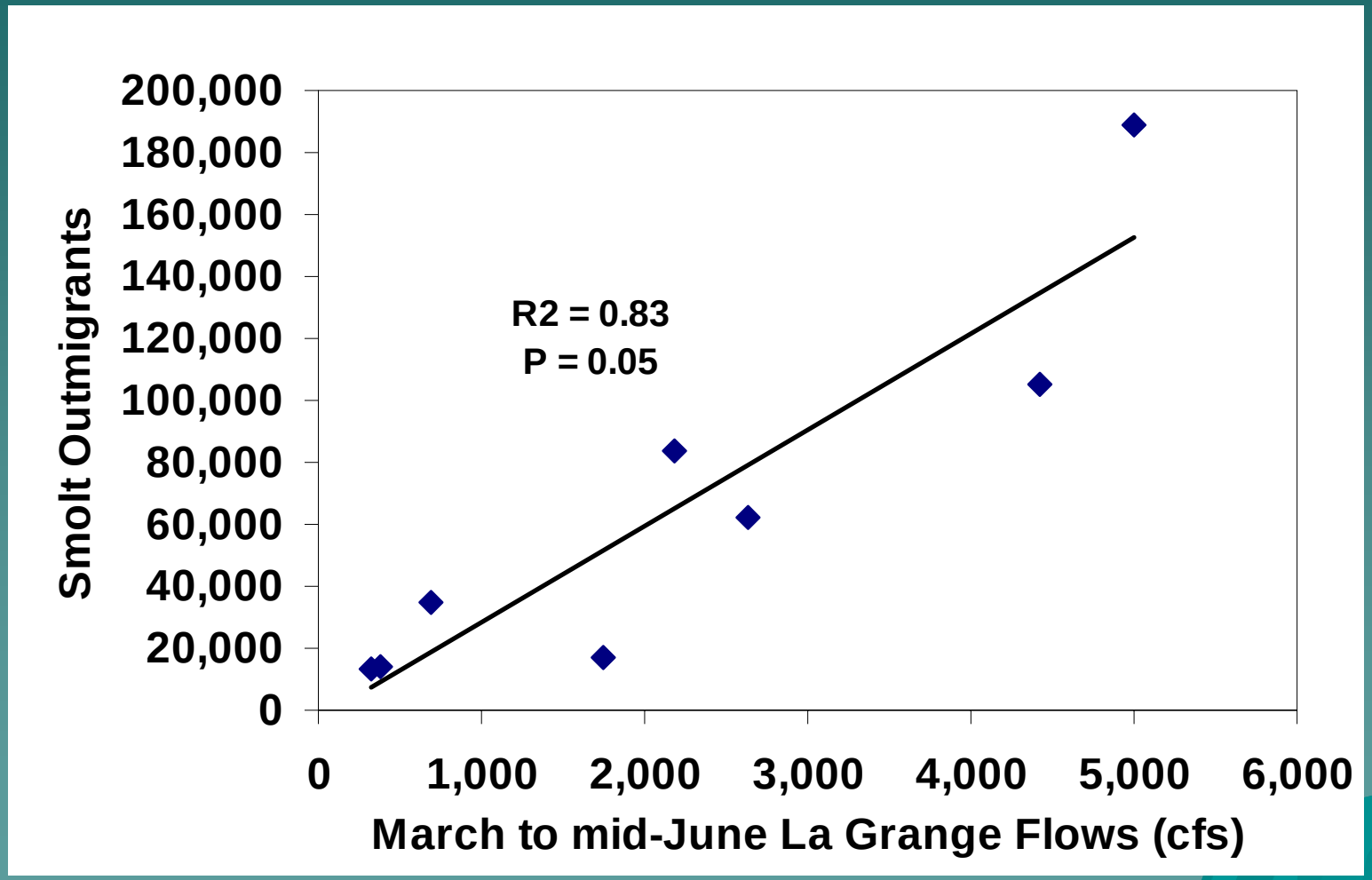


VNS & SJR Trib Flow



Role of Trib Spring Flow

Tuolumne River Smolts vs. Flow 1998 – 2005 (Preliminary Data)



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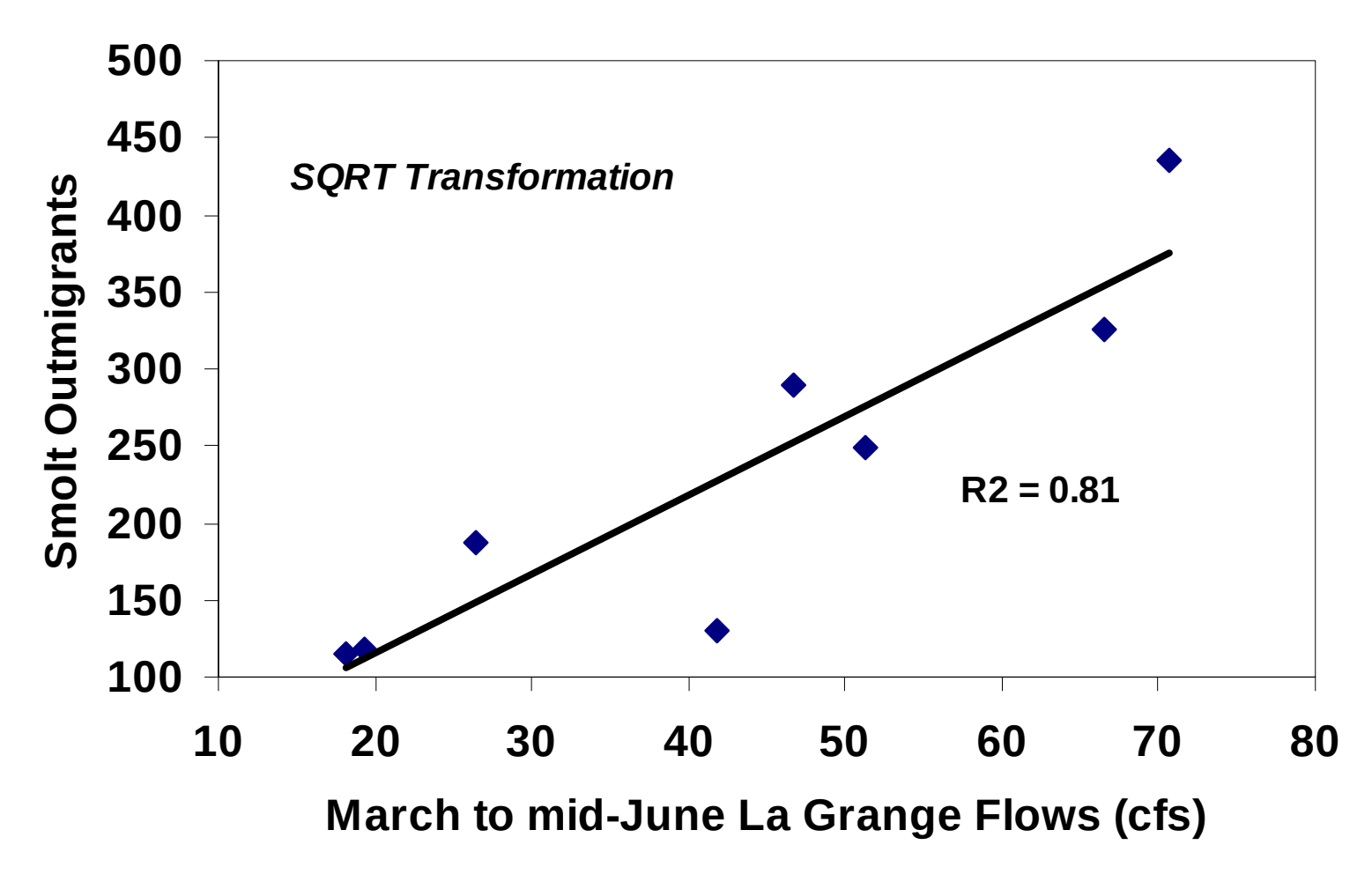
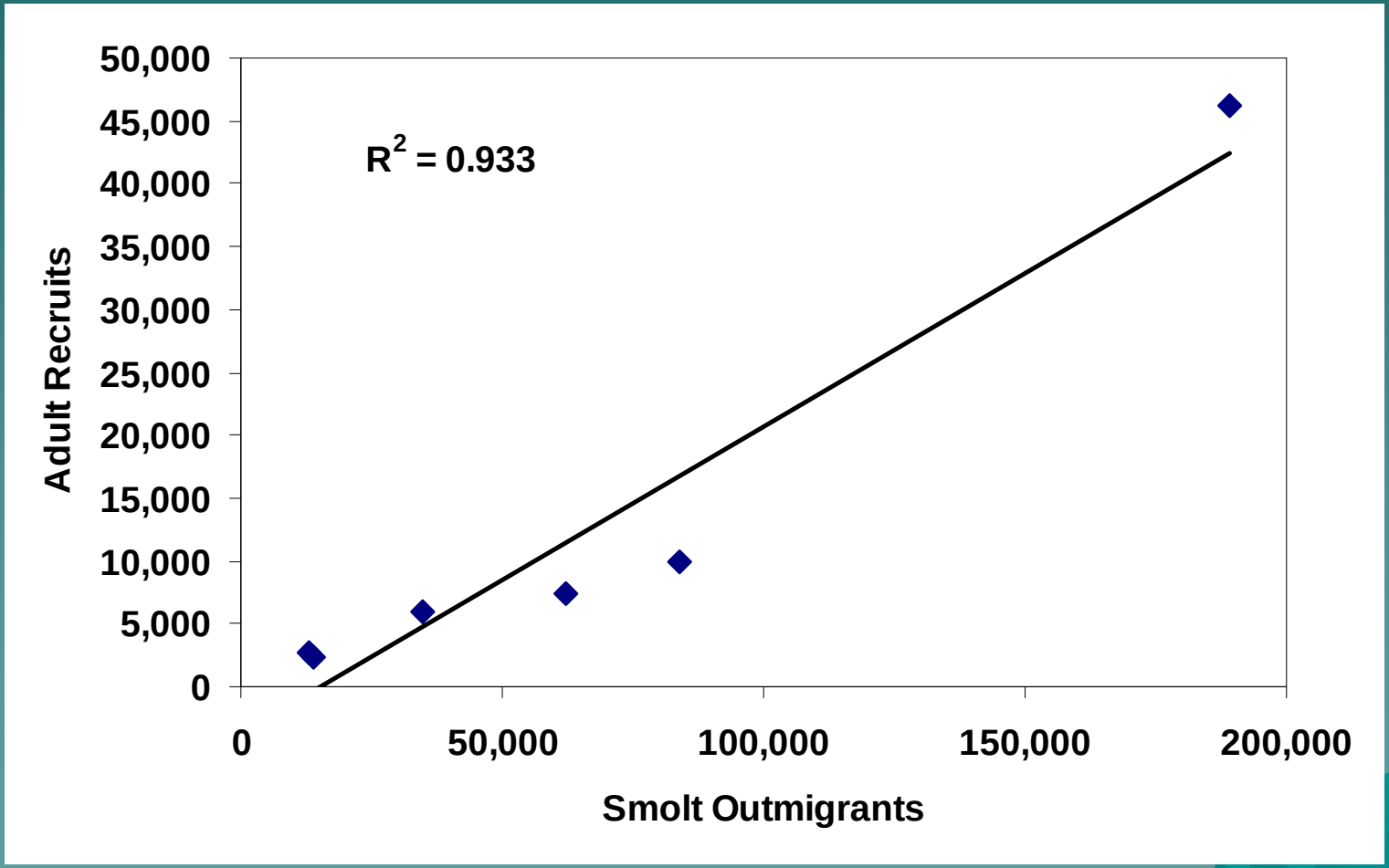


Tuolumne River Adults vs. Smolts 1998 – 2003 (Preliminary Data)



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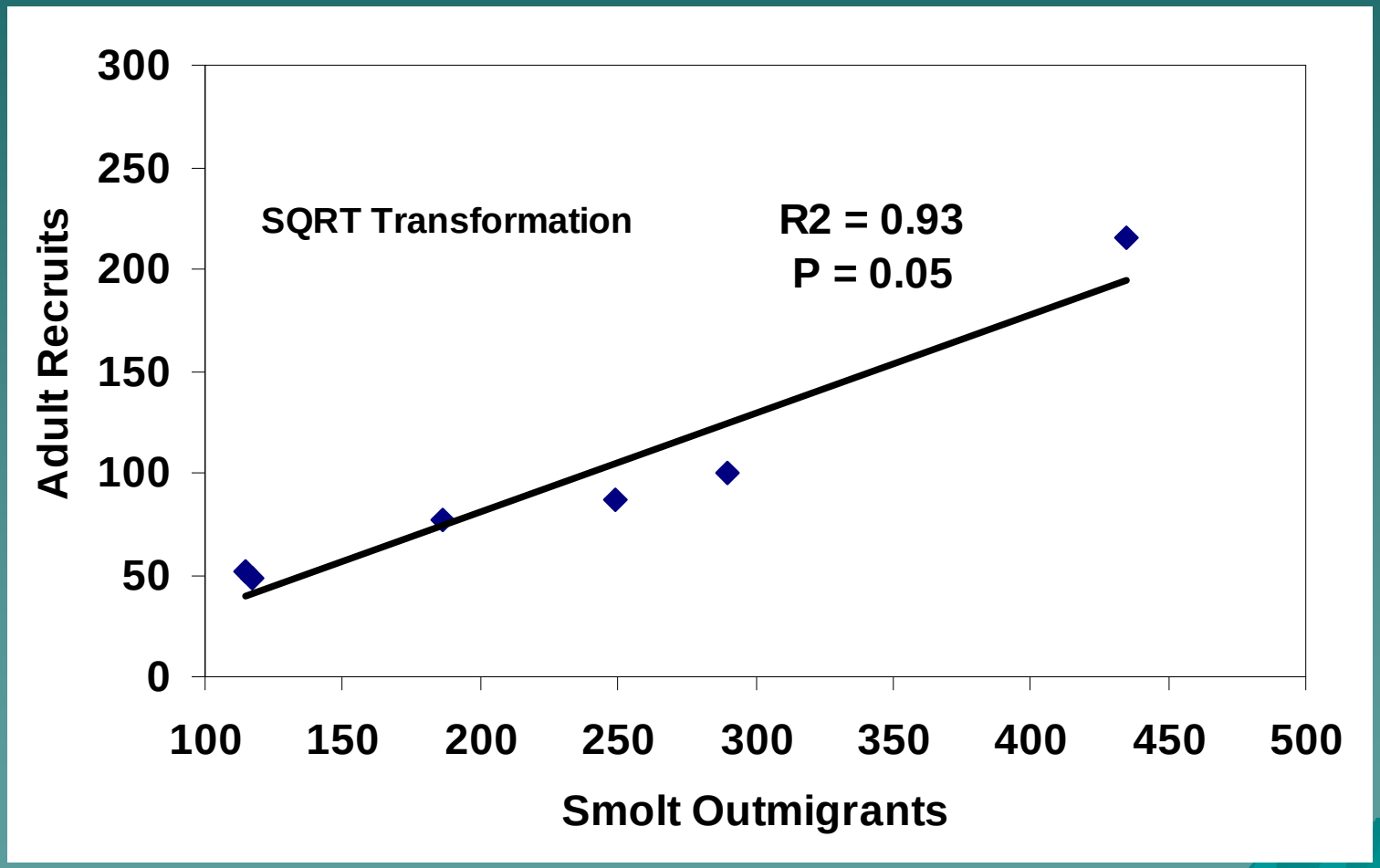
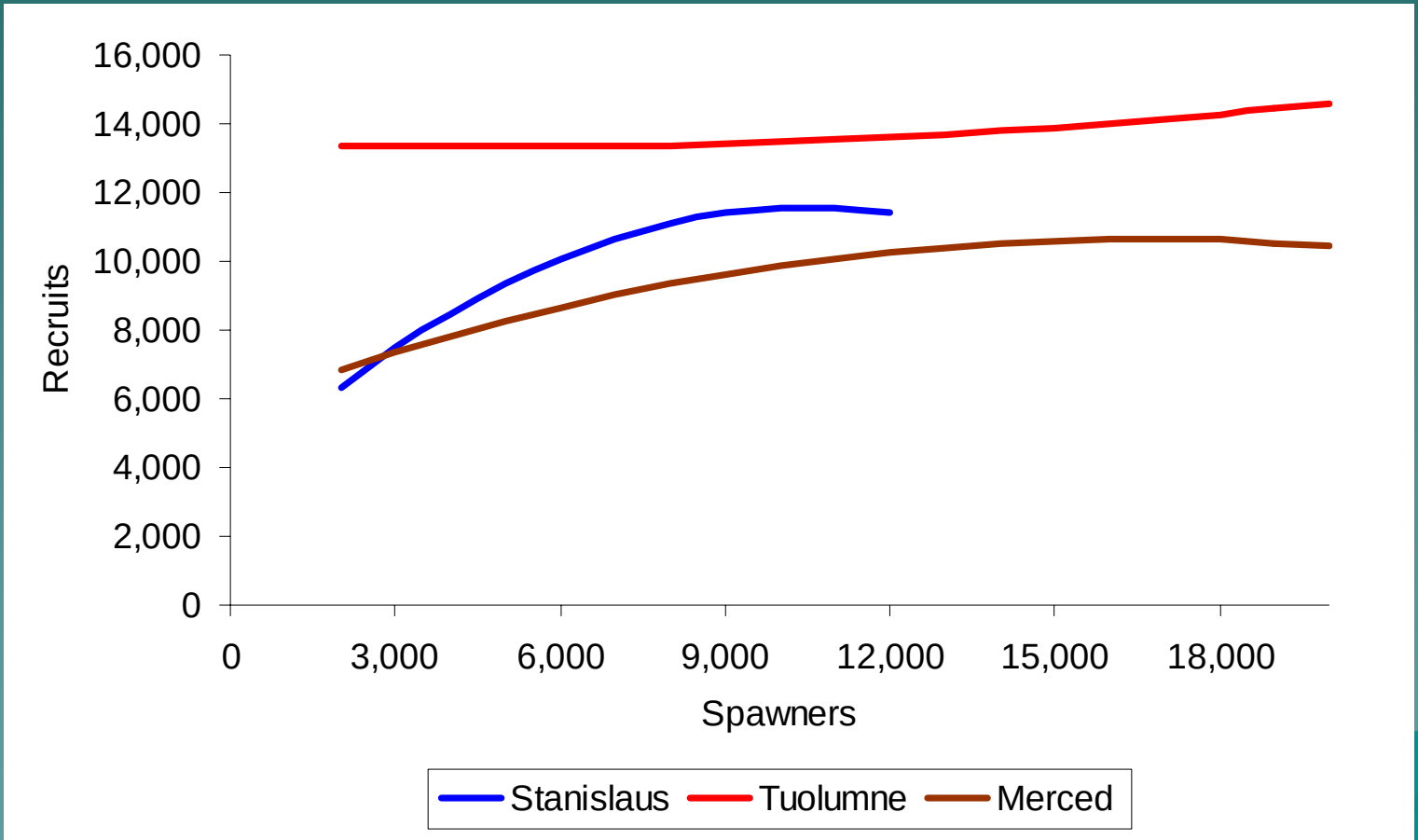
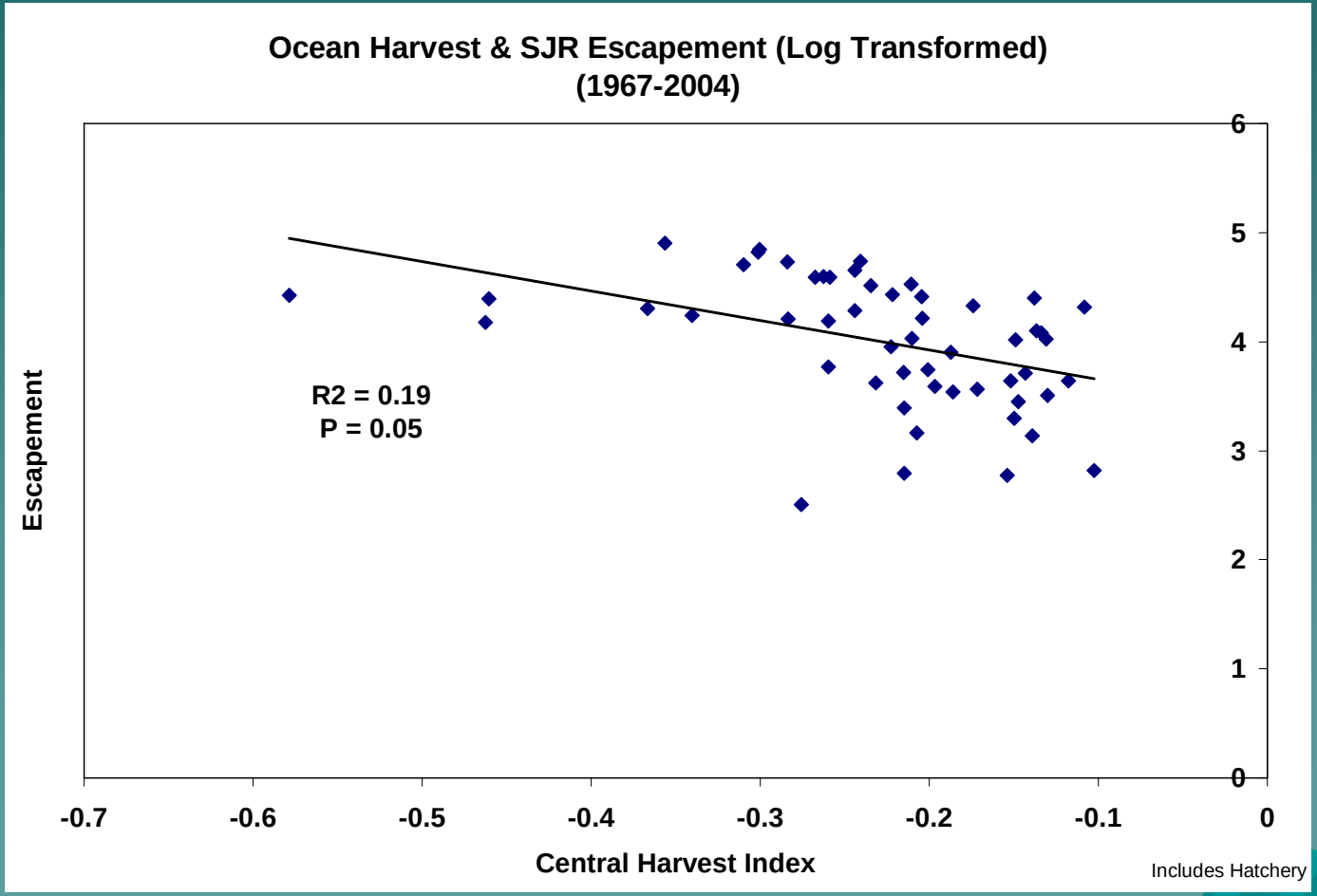


Non-Flow Parameters

Stock-Recruit Relationships 1983-2003



SJR Salmon & Ocean Harvest



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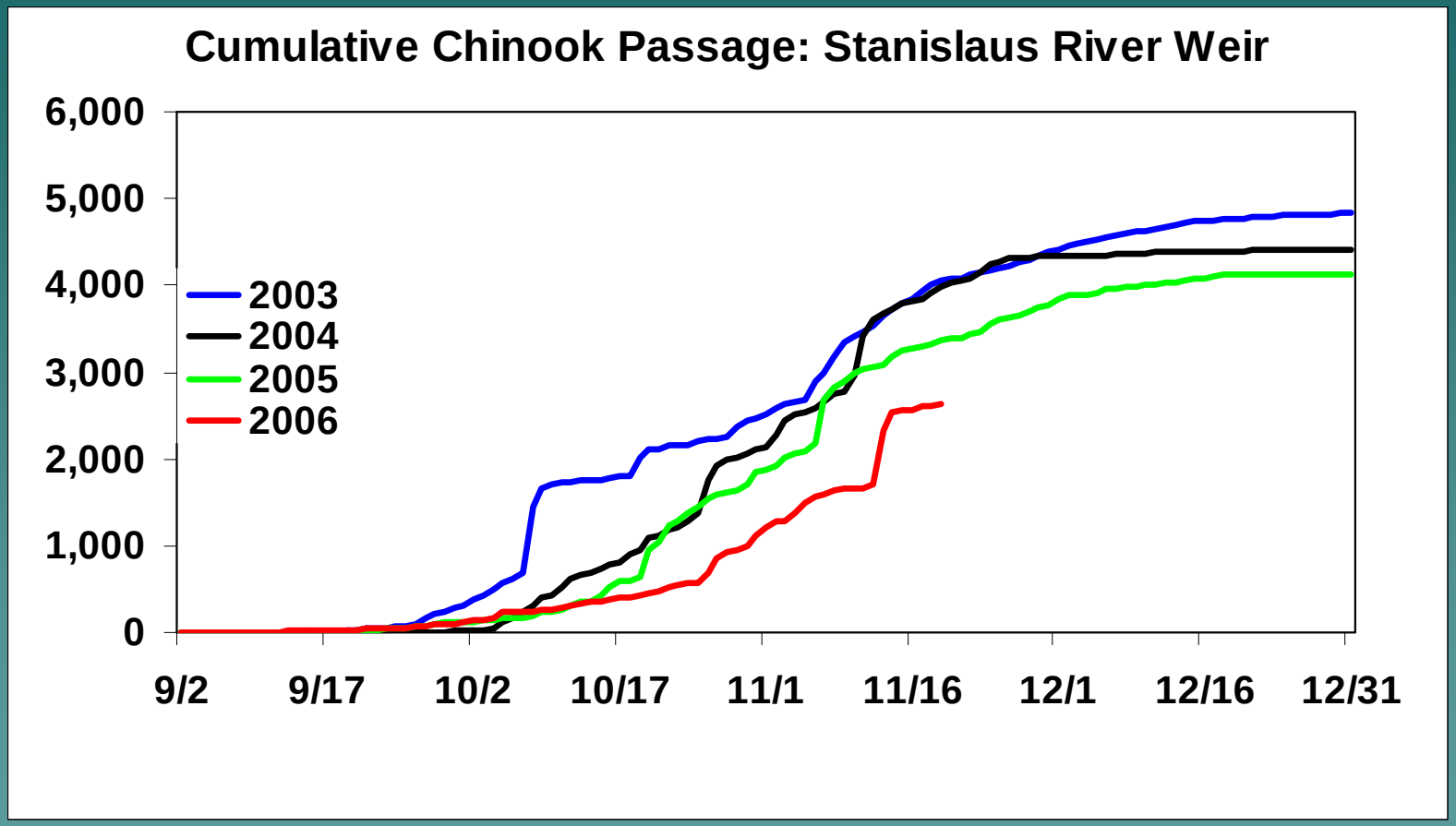
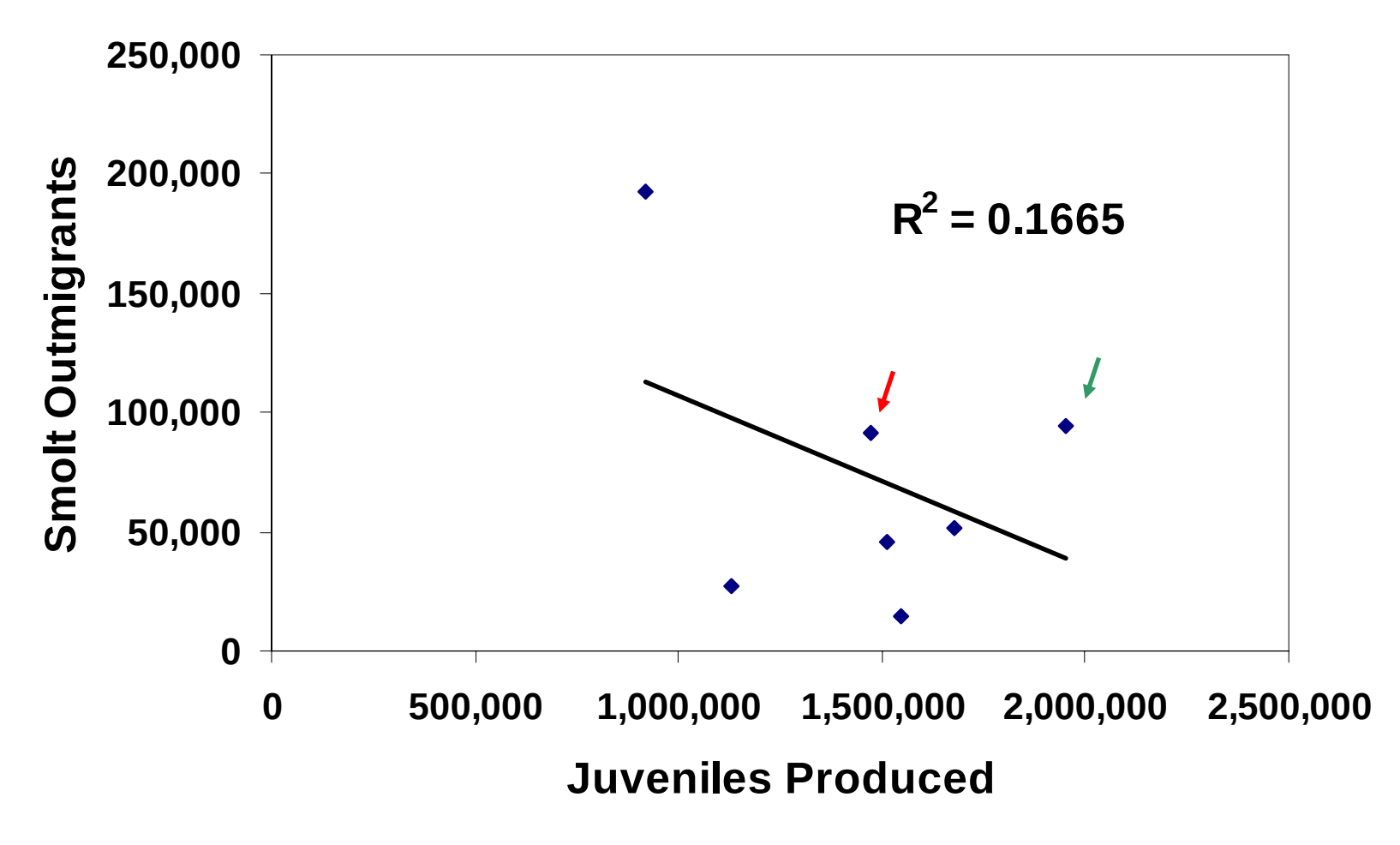
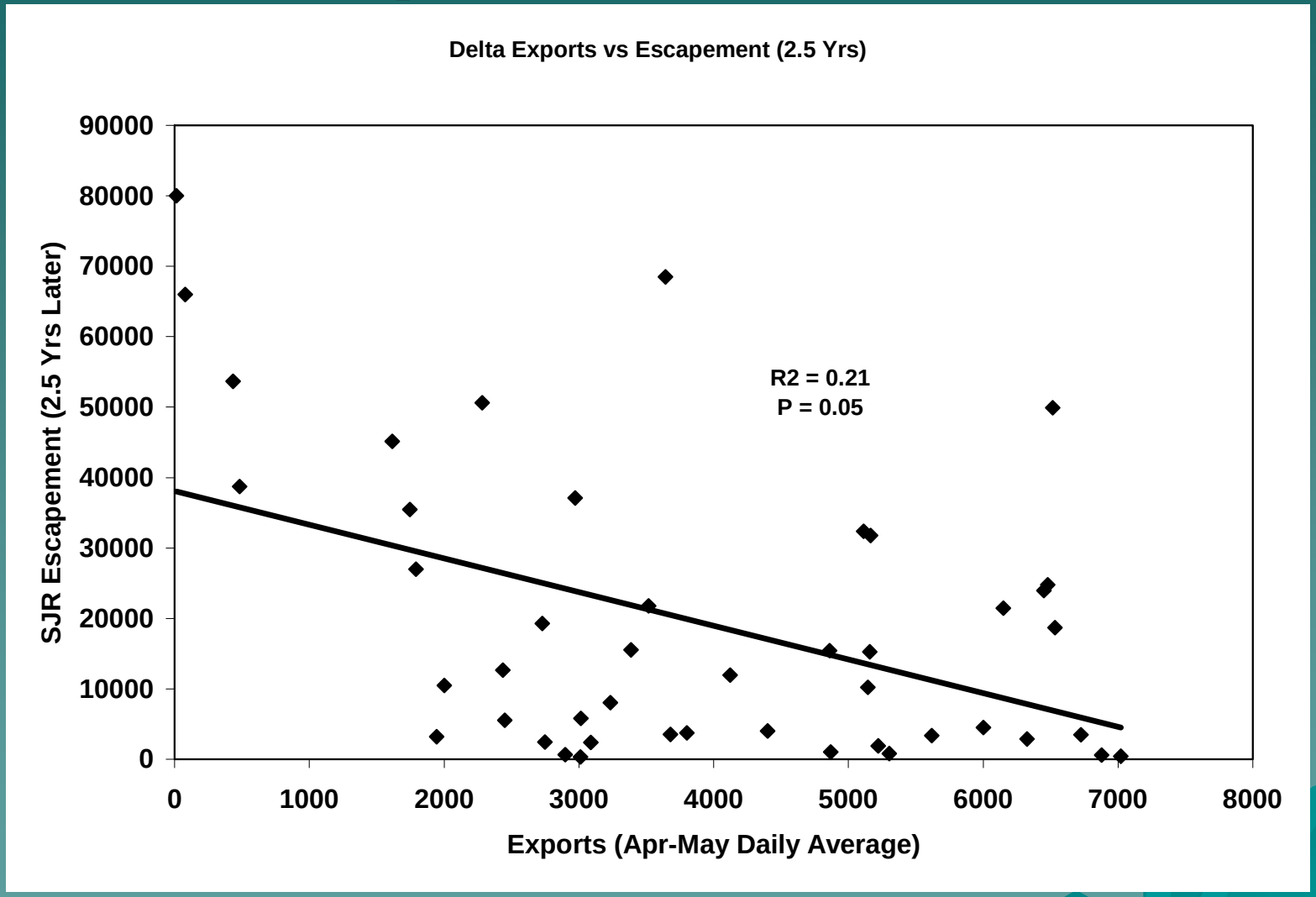


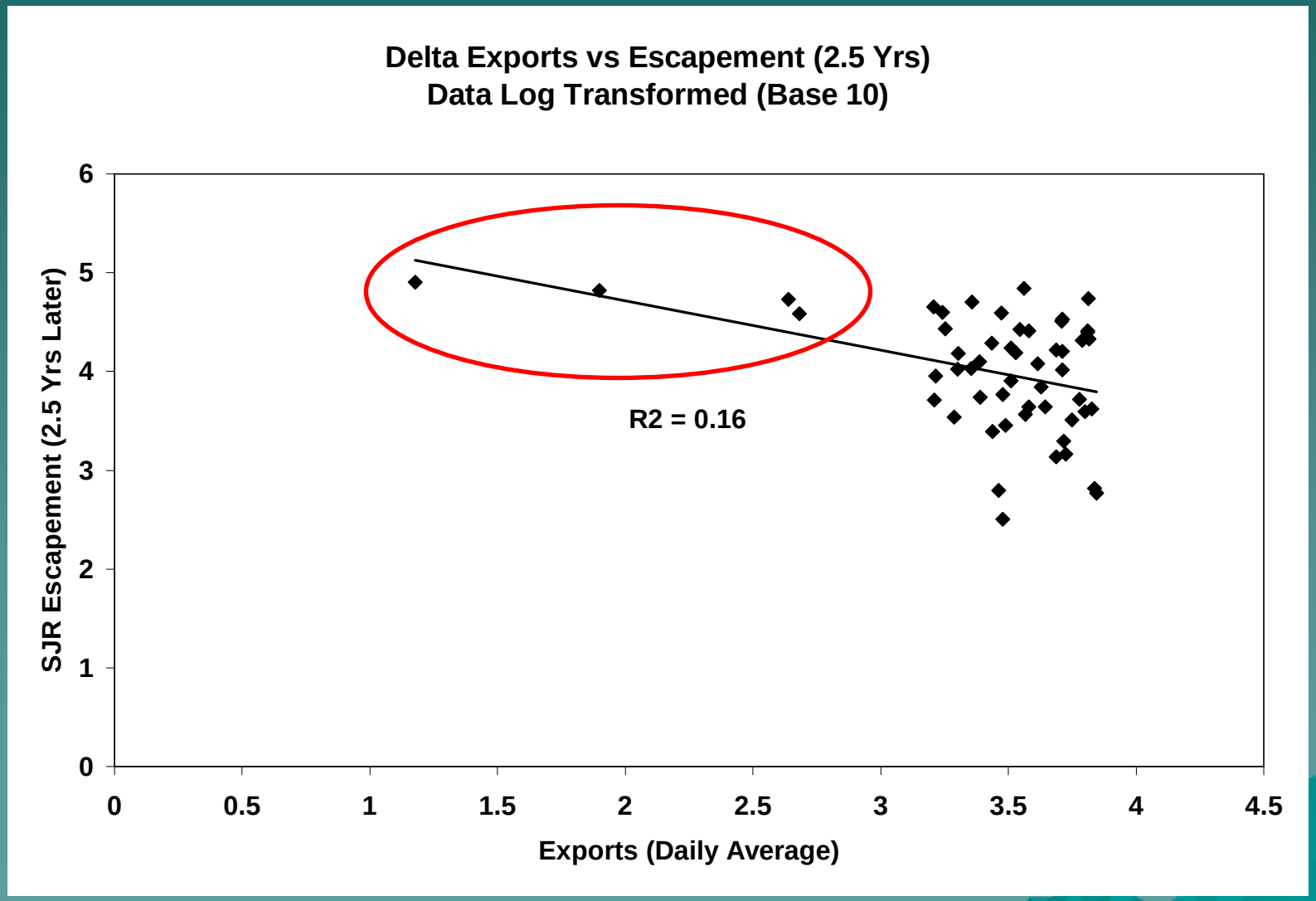
Spawning Habitat Quantity



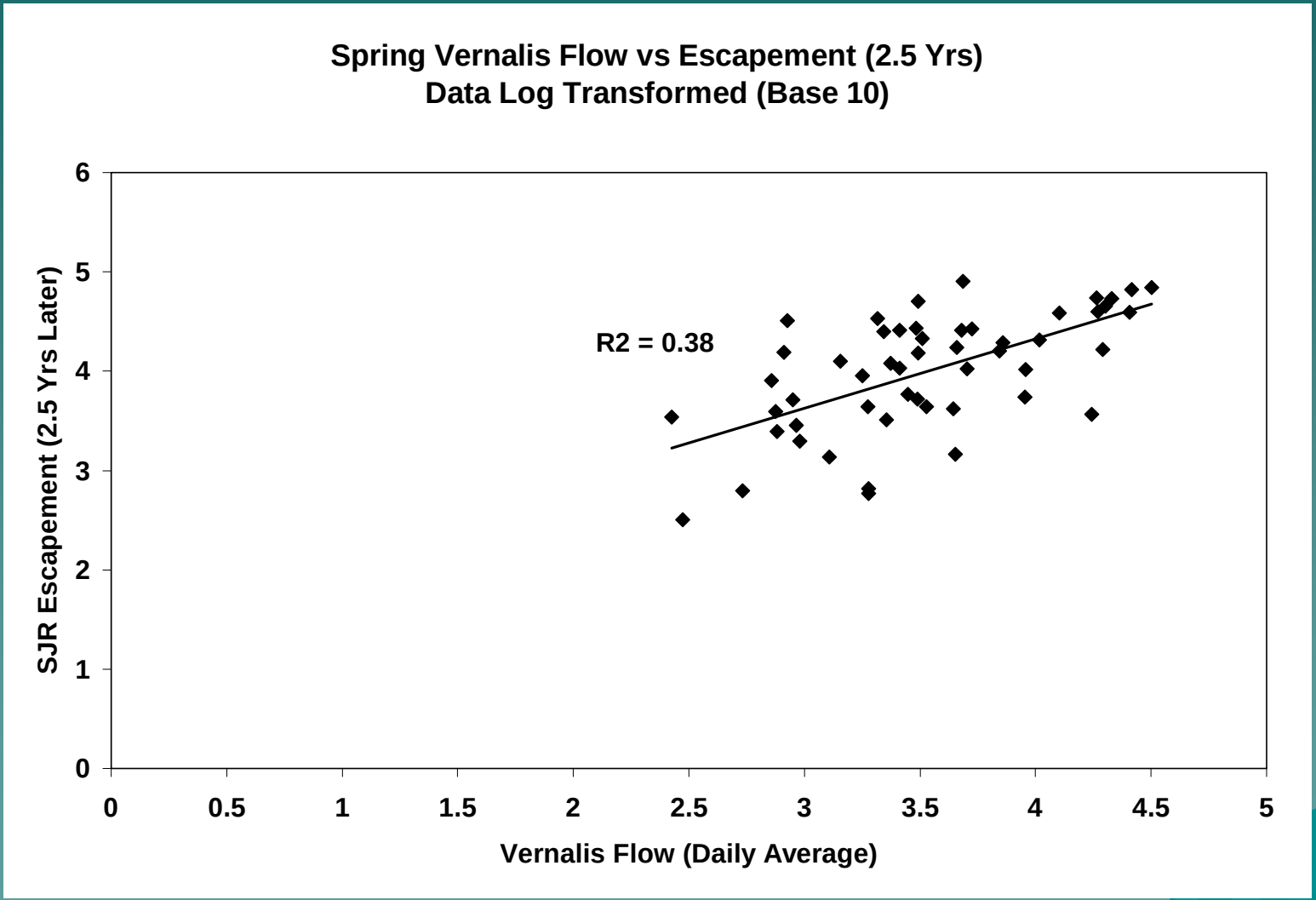
Delta Exports & SJR Salmon



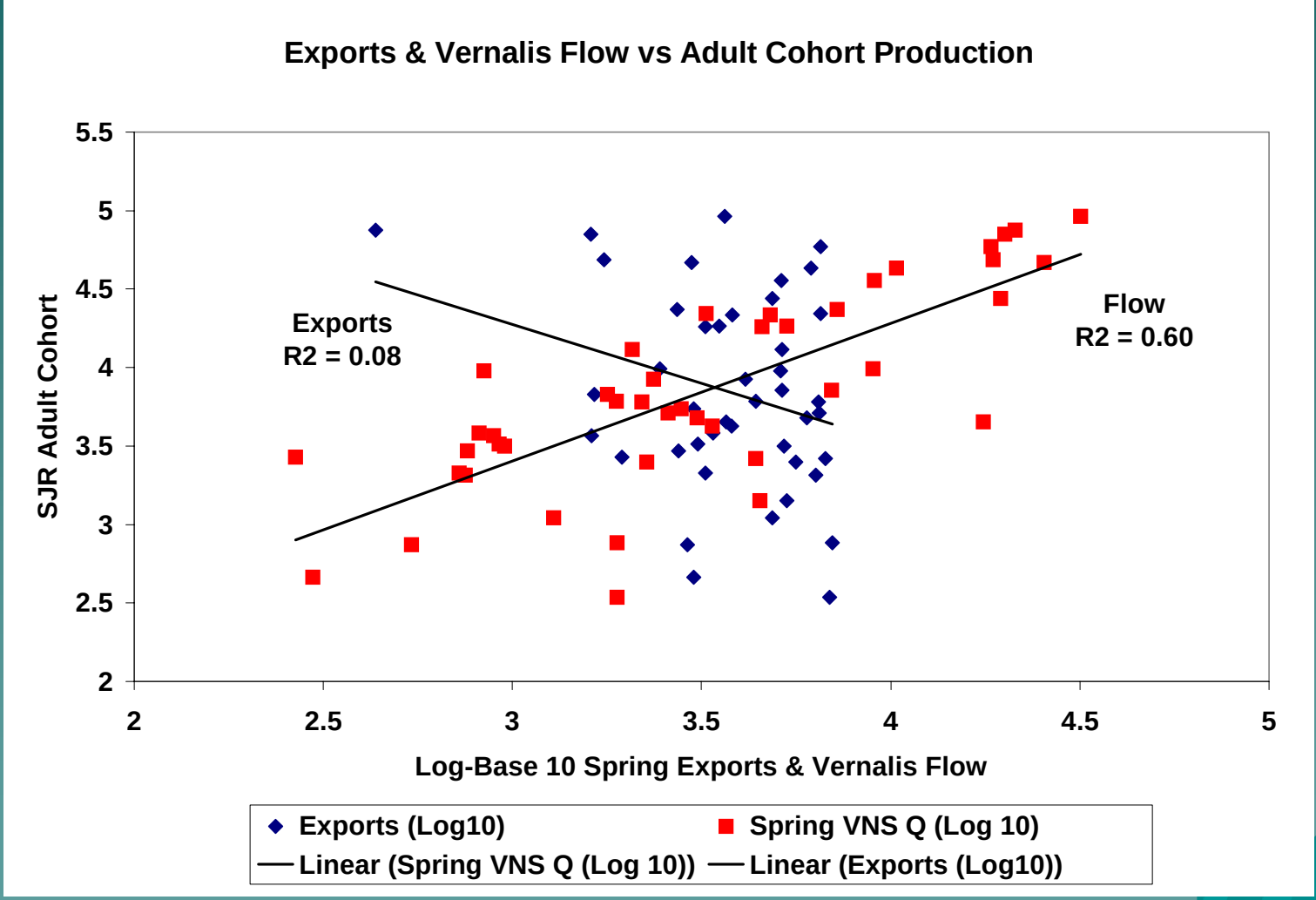
SJR Salmon & Delta Exports



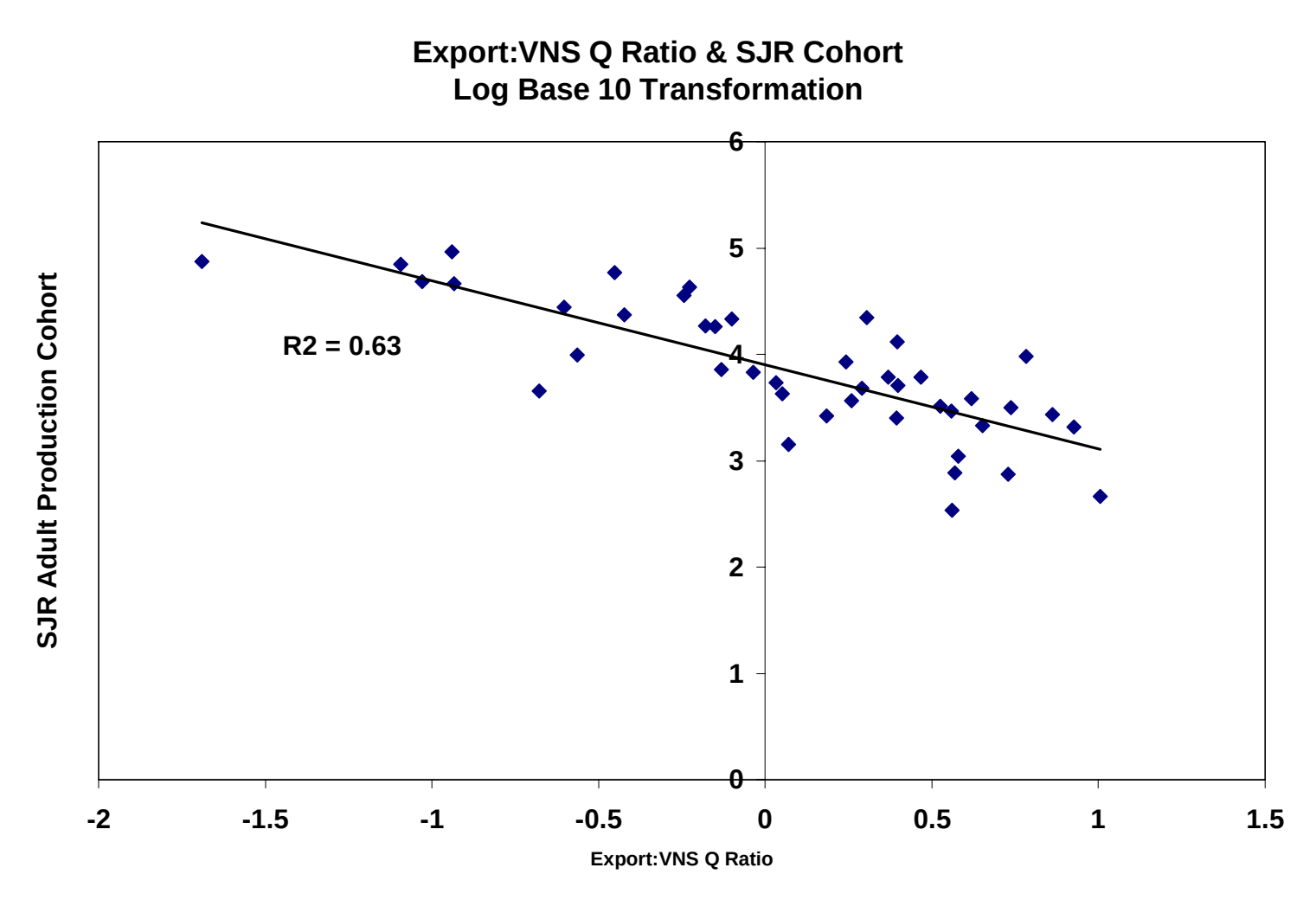
VNS Flow & SJR Salmon



Exports & Adult Cohort

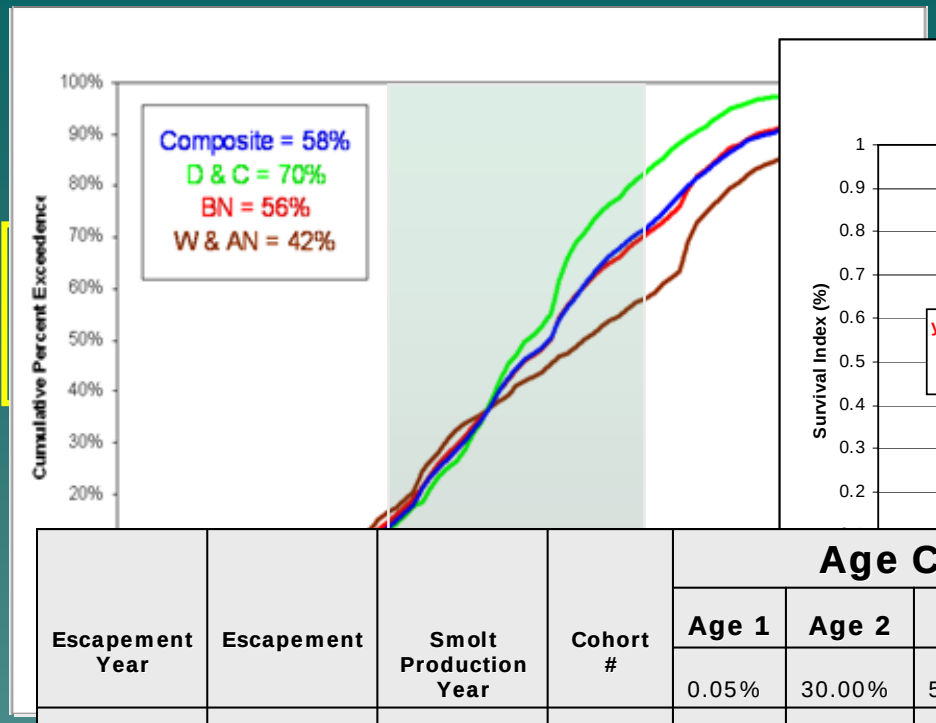


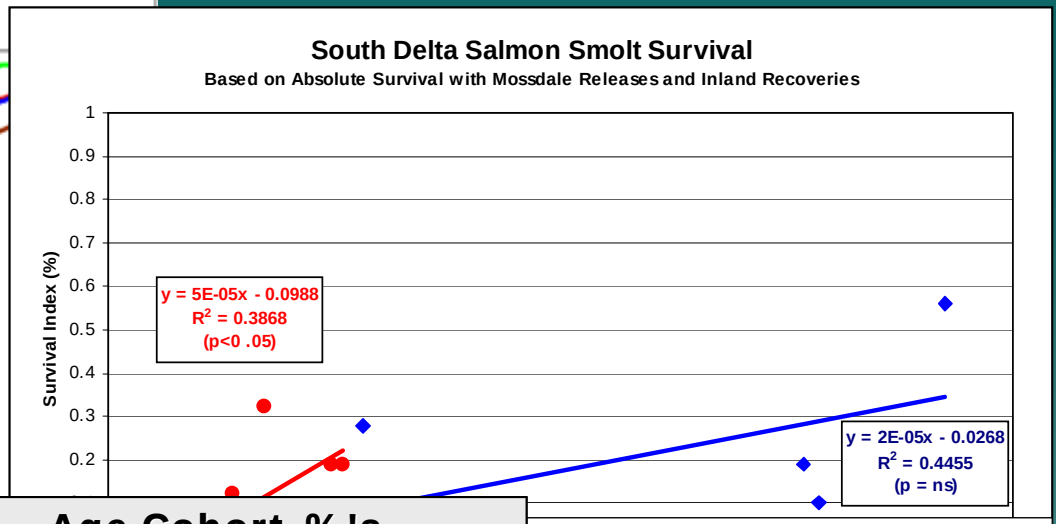
E:I Ratio & SJR Cohort

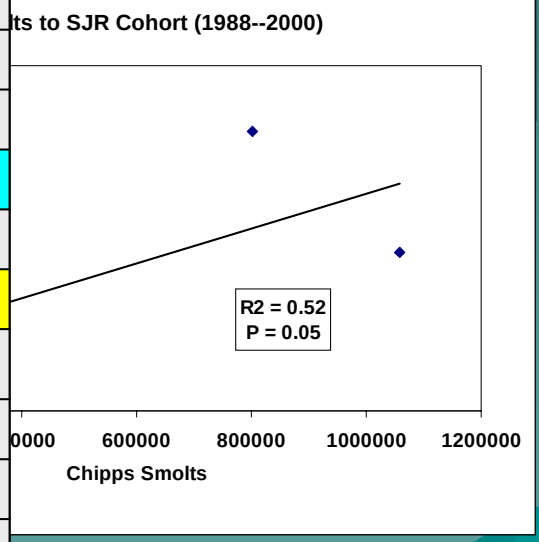


SJR Model

- Role of Spring Flow & Production
- Parameters (what's in & out)
  - Flow
  - Harvest
  - Exports
  - Spawning habitat
- Structure







Escapement Year	Escapement	Smolt Production Year	Cohort #	Age Cohort %'s				
				Age 1	Age 2	Age 3	Age 4	Age 5
				0.05%	30.00%	55.35%	14.00%	0.60%
1967		1968	276	0	83	153	39	**2**
1968		1969	98603	49	29,581	54,577	**13,804**	592
1969		1970	1403	1	421	**776**	196	**8**
1970		1971	1119	1	**336**	620	**157**	7
1971		1972	461	**0**	138	**255**	64	3
1972	**14,919**	1973	2638	1	**791**	1,460	369	16
1973	1,547	1974	3645	**2**	1,094	2,018	510	22
1974	**1,213**	1975	3304	2	991	1,829	463	20

Model Scenarios

- How might EWA H20 be used?
  - *Drier SJR WY Types (C, D, BN)*
- Extend VAMP window
- Increase VAMP magnitude
- Do both

Model Scenario Results

Model Results Summary					
Fish		**Water (TAF)**		**Fish/TAF**	
Magnitude	**3200**	**Magnitude**	**3200**	**Magnitude**	**3200**
4450	2	4450	74	4450	7
5700	3	5700	149	5700	7
7000	5	7000	226	7000	8
Duration	**30**	**Duration**	**30**	**Duration**	**30**
40	6	40	31	40	70
50	10	50	63	50	67
60	12	60	93	60	56
Both	**3200 (30)**	**Both**	**3200 (30)**	**Both**	**3200 (30)**
4450 (40)	7	4450 (40)	130	4450 (40)	22
5700 (50)	14	5700 (50)	310	5700 (50)	20
7000 (60)	21	7000 (60)	545	7000 (60)	17
Notes: Fish #'s are multiplicative (2 = two times more production)					

Flow Recommendations

- Extend Window
  - Does not complicate VAMP experiment
  - Late better than early
  - All tribs better than one trib
- Increase Magnitude
  - VAMP allows for change
  - Options:
    - One trib for all time period
    - Combo of tribs
- Benefits would occur with a late, but lower than VAMP level, release

Conclusions

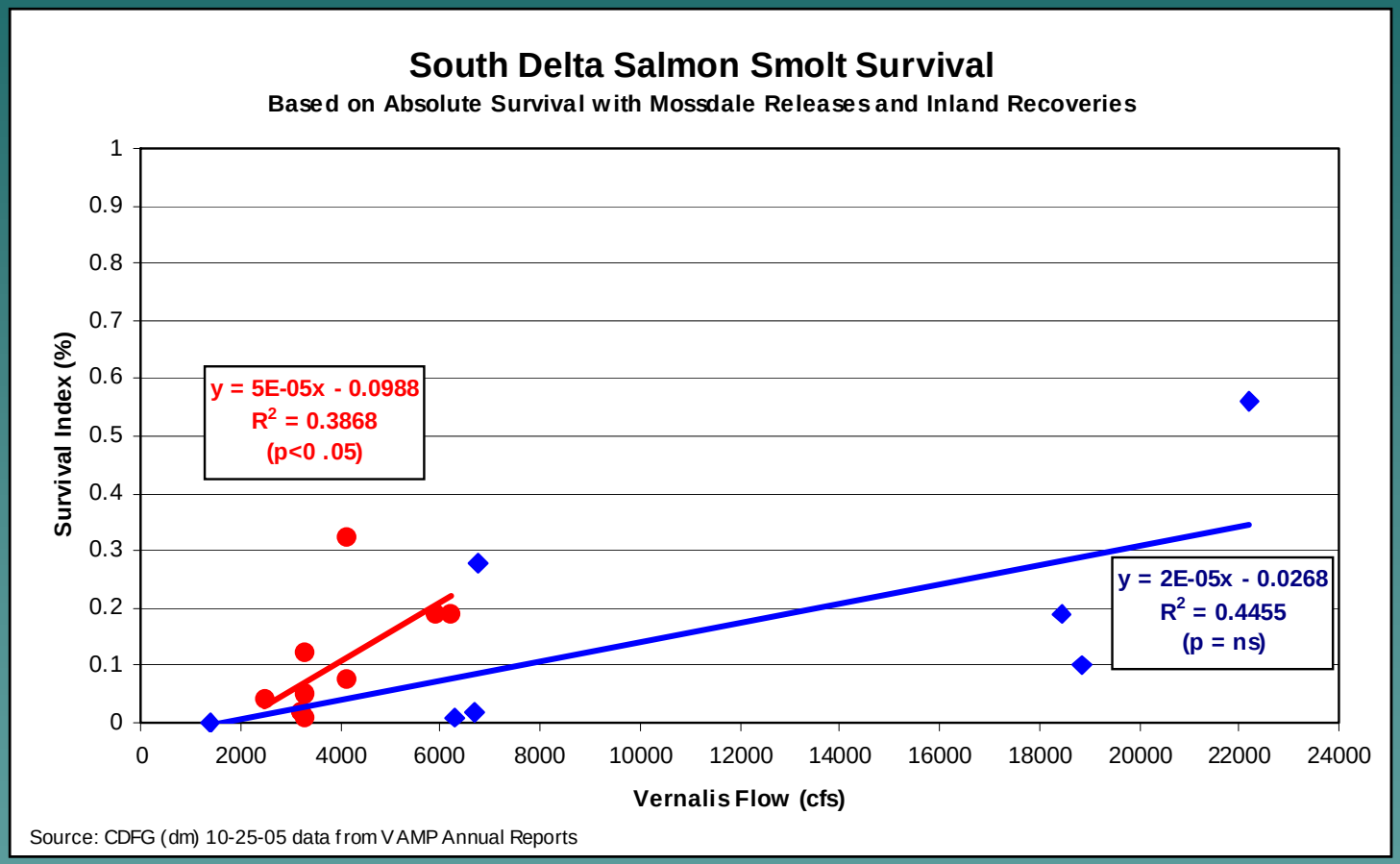
- Duration > Magnitude
- Late > Early
- Apr. 1 to May 31 window
- HORB in assumed

EWA & Regulatory Actions

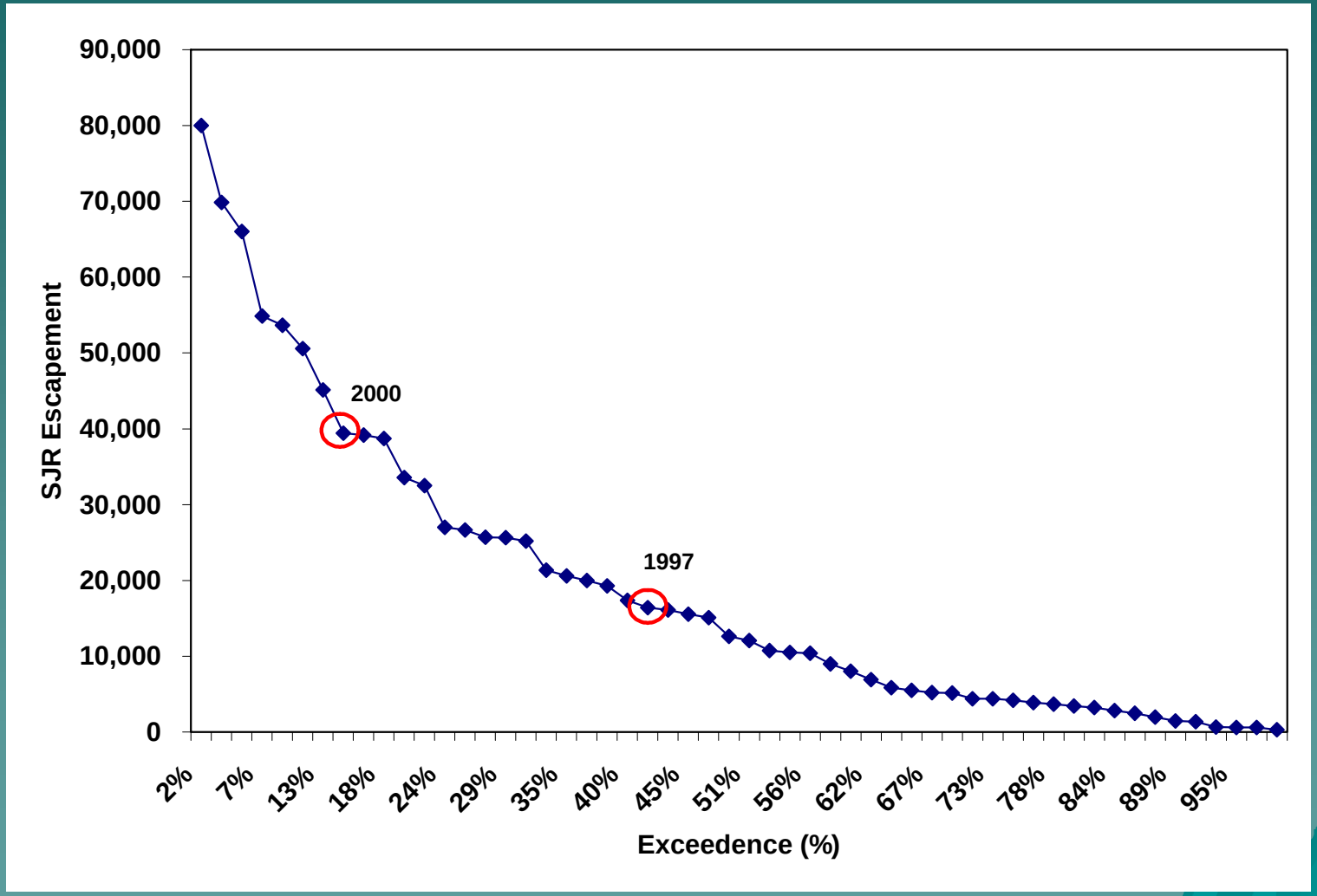
- SWRCB
  - Delta Plan
- New Melones ROP
- FERC
  - Tuolumne
- RWQCB
  - TMDL
  - Basin Plan

Questions

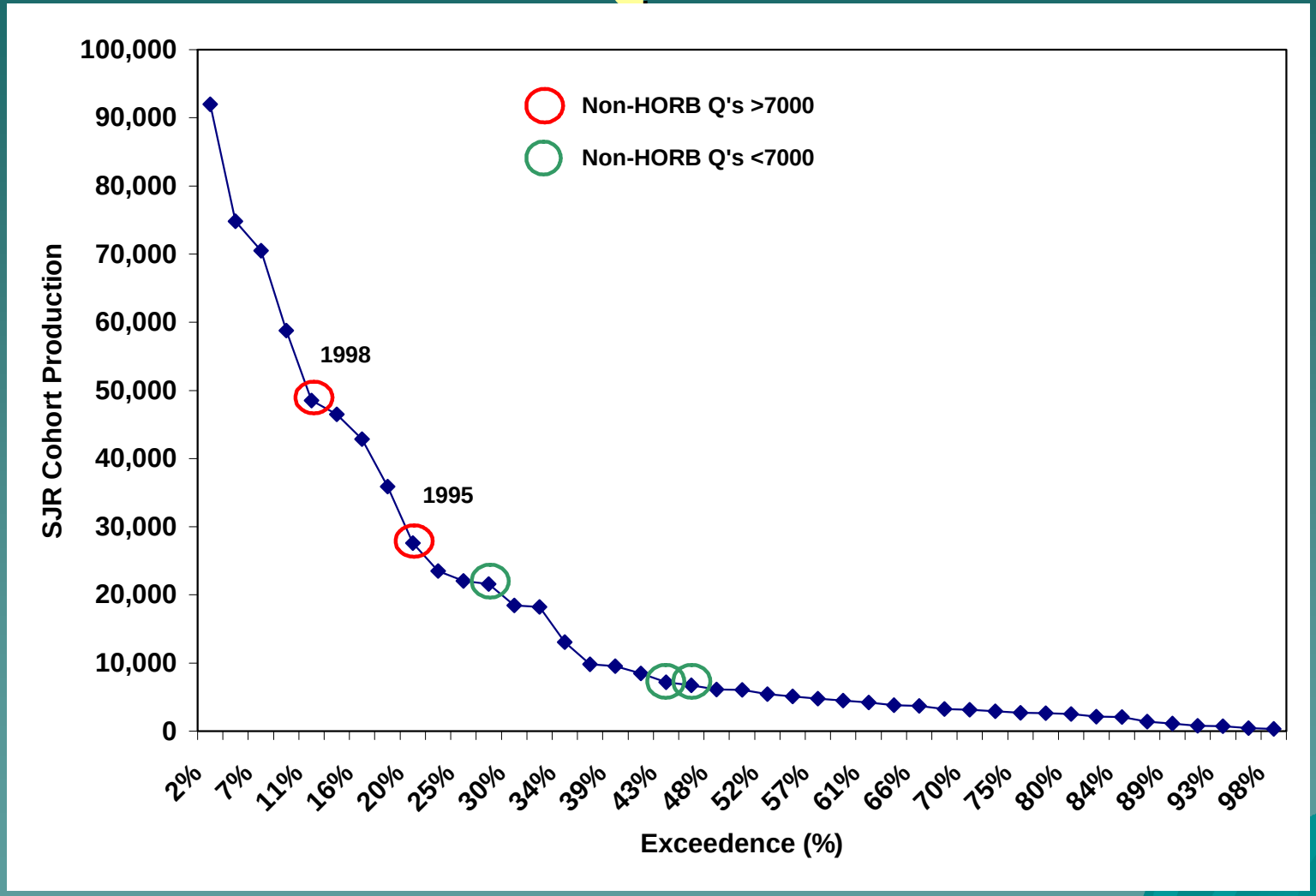
Non-HORB Survival



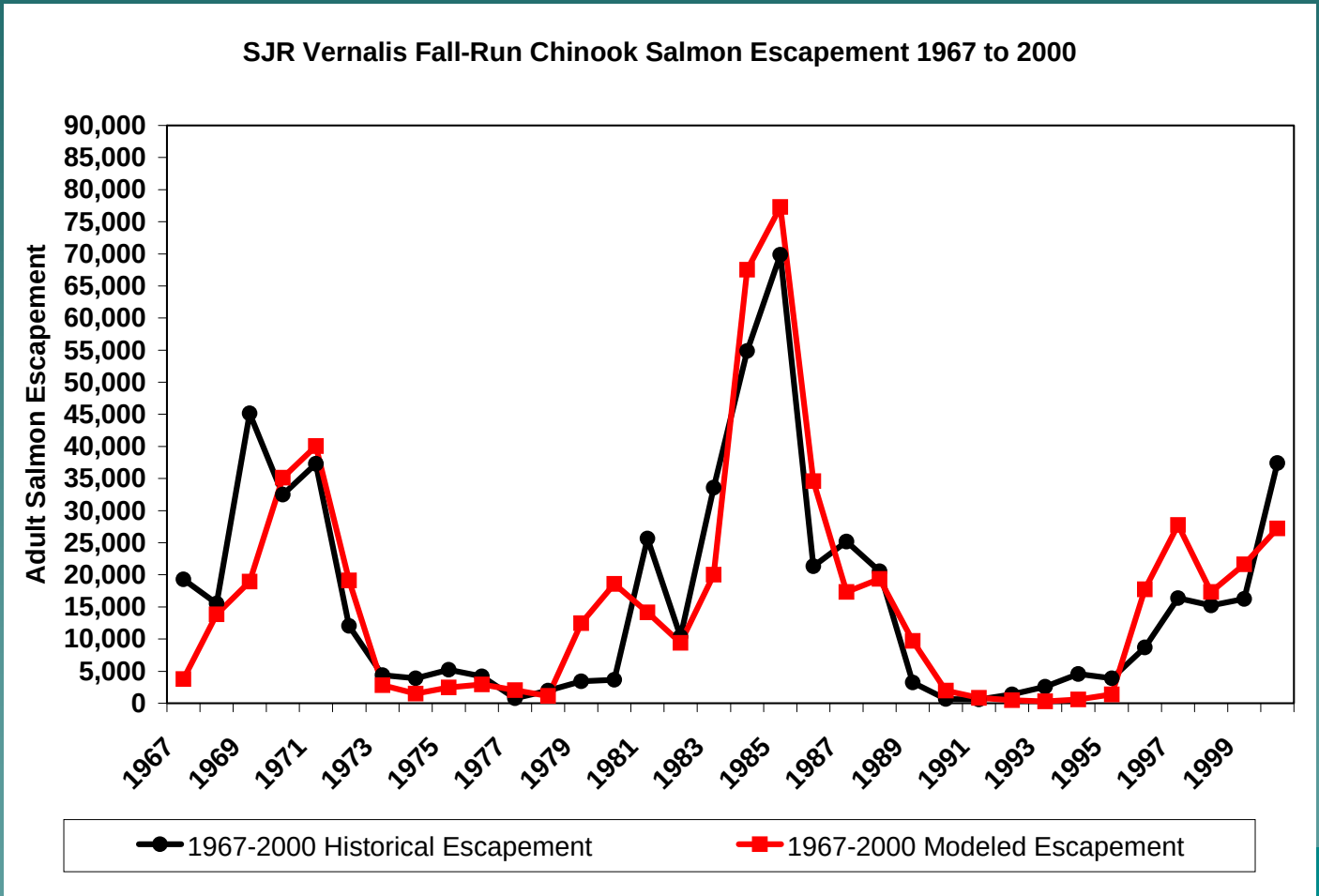
Non-HORB Q & Escapement



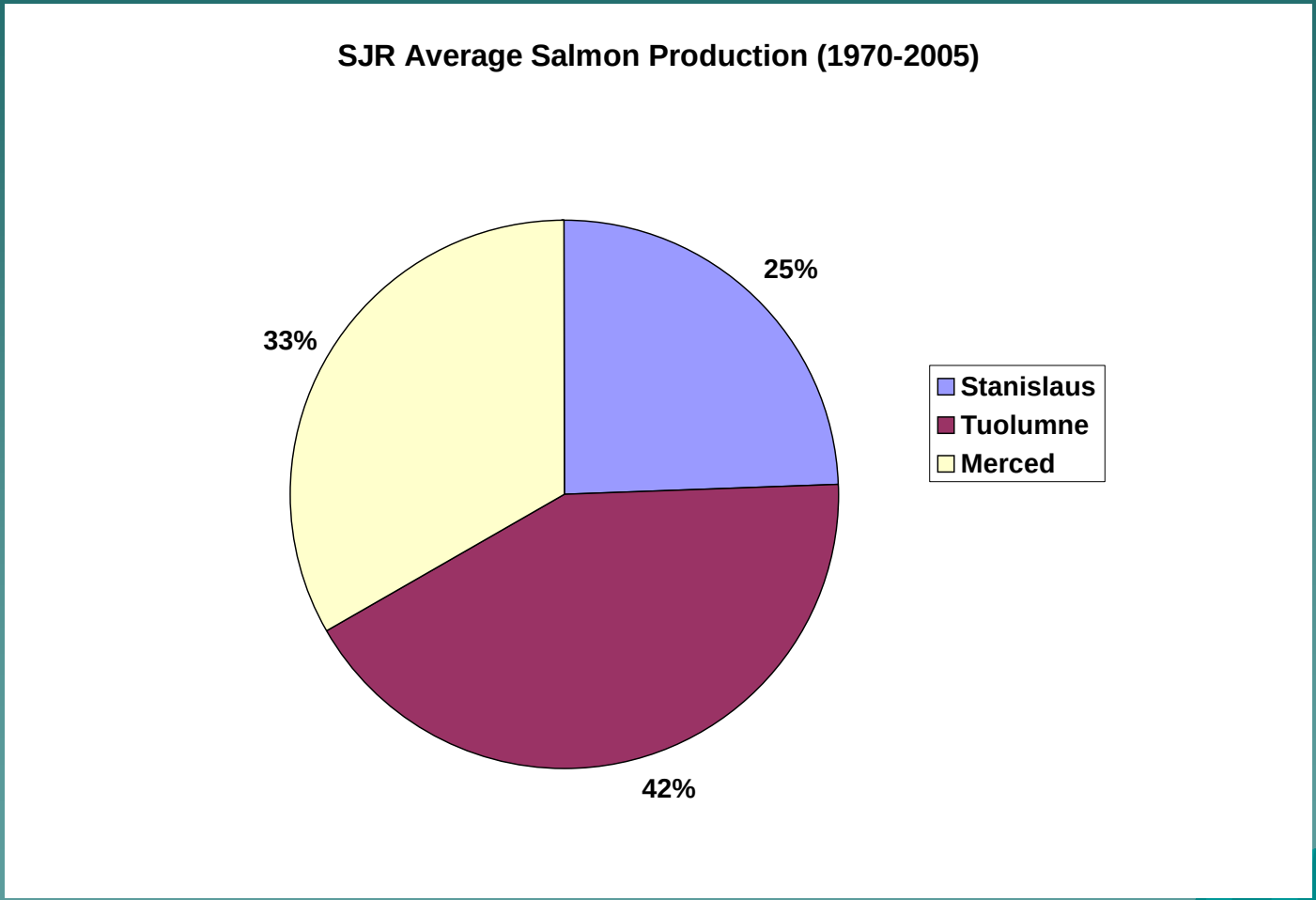
Non-HORB Q & BY Cohort



Calibration



SJR Tributary Escapement



Model Input (“knobs”)

- Regression Variables
- Age Composition
- HORB In/Out
- HORB Years/Duration
- Flow Magnitude/Duration
- Use of Hatchery Production

Model Output

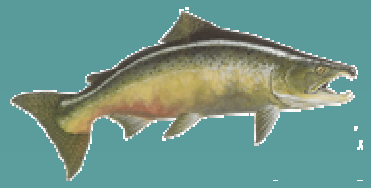
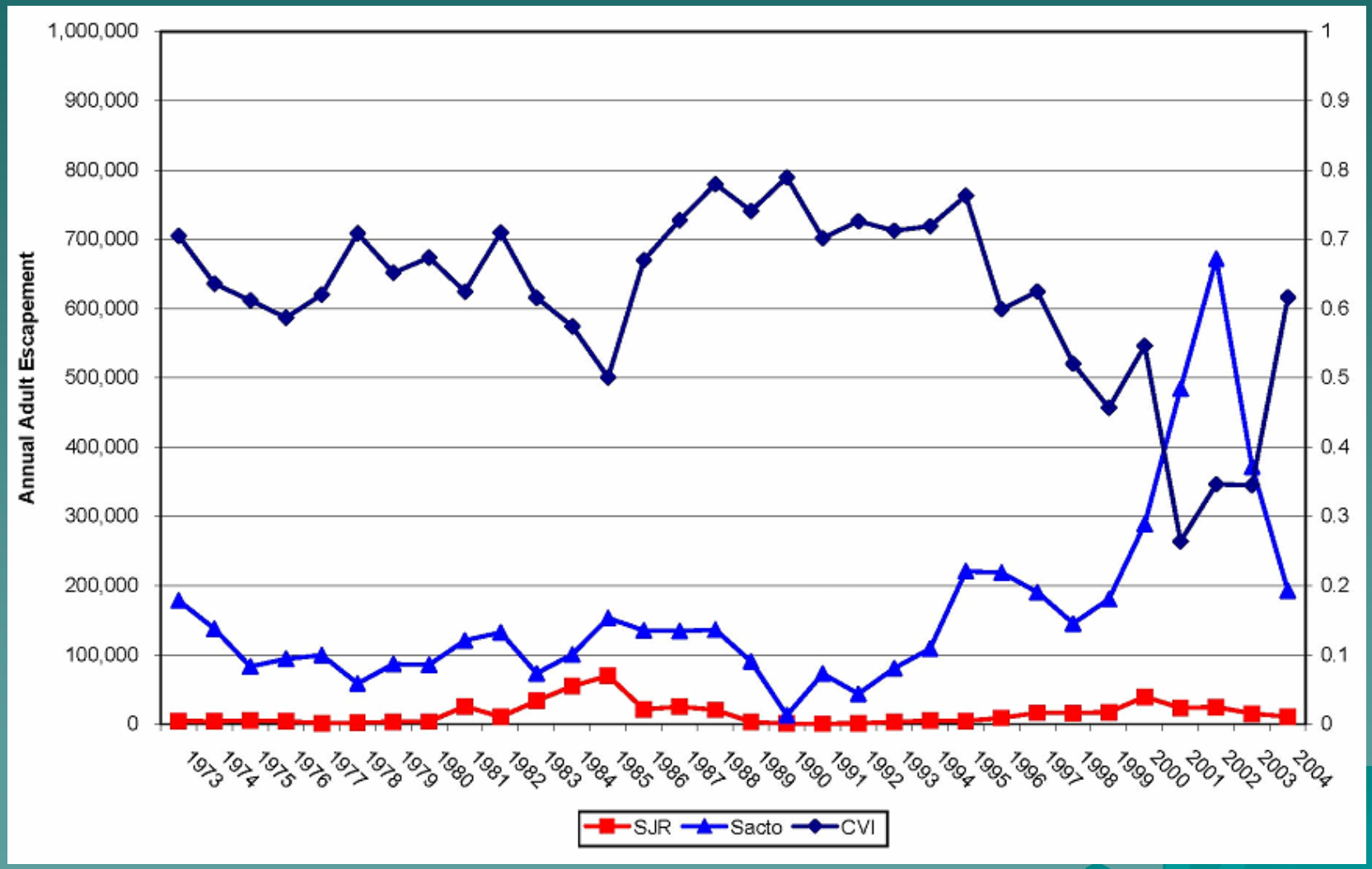
- **Water:**
  - Additional water (AF) by year and water year type for VNS and Tribs
- **Salmon:**
  - Escapement for SJR and Tribs by year and water year type
  - Replacement ratio
  - Hatchery Augmentation

Model Assumptions

- **Adult salmon population trend not substantially influenced by non-flow factors** *(Harvest, Pumps, Stock density)*
- **Smolt stage predominates adult cohort abundance**

Result

Spring Flow Levels		
Water Year Type	Vernalis Minimum Flow	Window Days
W	15000	70
AN	10000	60
BN	7000	50
D	5500	40
C	4000	30



Ocean Harvest