1995 Bay-Delta WQCP
SWRCB Periodic Review

Salmon Protection
and
Delta Cross Channel Gate Closure

The Bay Institute
November 15, 2004

Salmon Protection: Why Doubling Criteria Are Needed For Each Run, Stream, and Basin

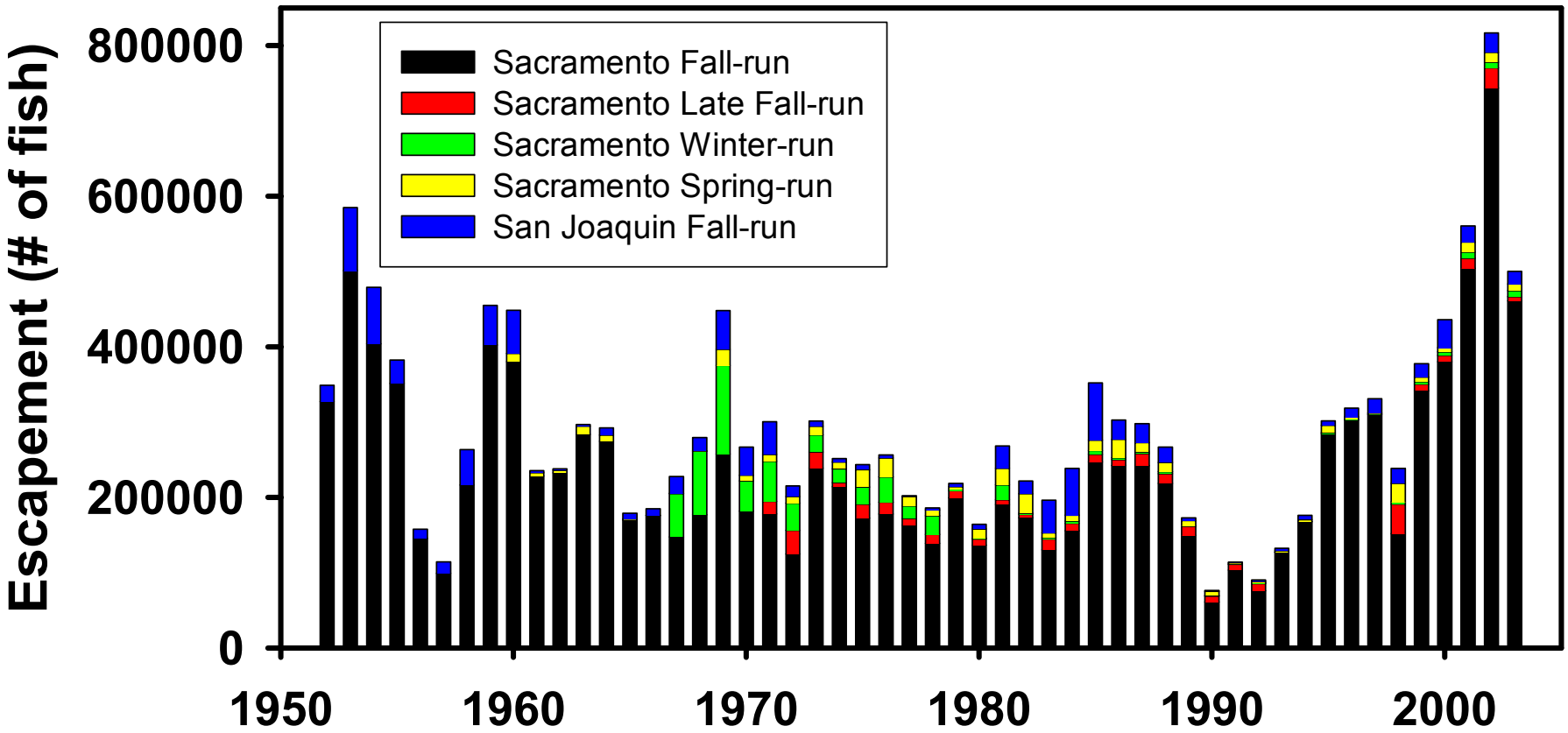
- **Genetic diversity**
  - **4 runs, multiple genetically distinct, independent populations**
- **Spatial structure**
  - **distributes risk, fosters genetic diversity**
- **Differential use of the watershed**
  - **space and time**
- **Different population trends**

	% of Goal	Trend	Observations
Sacramento			
Fall-run	**122%**	**Increase**	**Production concentrated in a few tributaries**
Late fall-run	**55%**	**Variable**	
Winter-run	**12%**	**Increase**	
Spring-run	**3-280%**	**Mixed**	**Sac. mainstem population decline, population increase in 1 of 3 tribs**
San Joaquin			
Fall-run	**54%**	**Mixed**	

Data Sources: “Grandtab”, CDFG; USFWS, 1995 Working Paper on Restoration Needs

Central Valley Chinook salmon

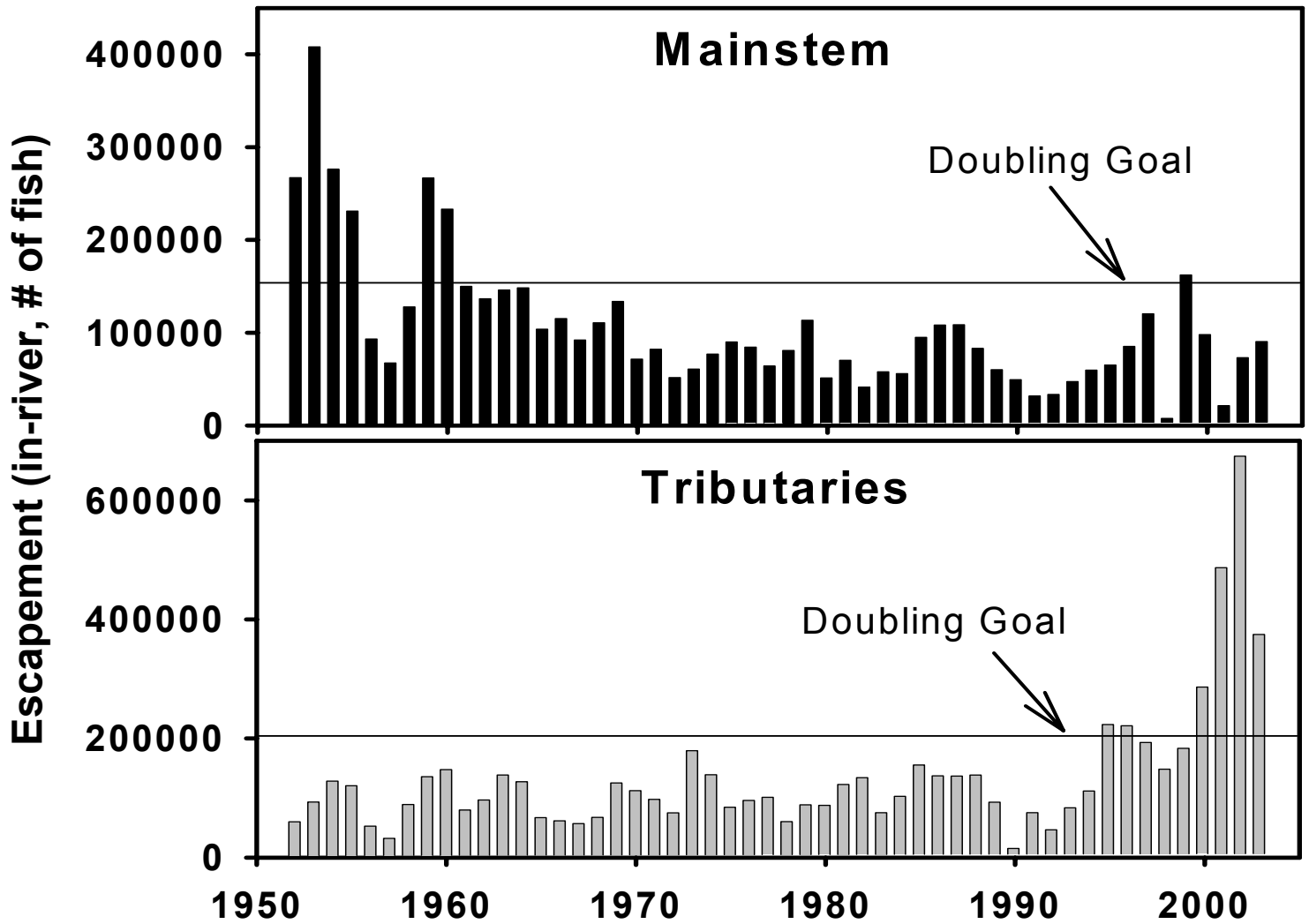
- **Dominated by Sacramento Fall-run**
- **Use of "total" salmon population to evaluate progress towards doubling is biologically meaningless**



Data Source: "Grandtab", CDFG

Sacramento Fall-run Chinook salmon

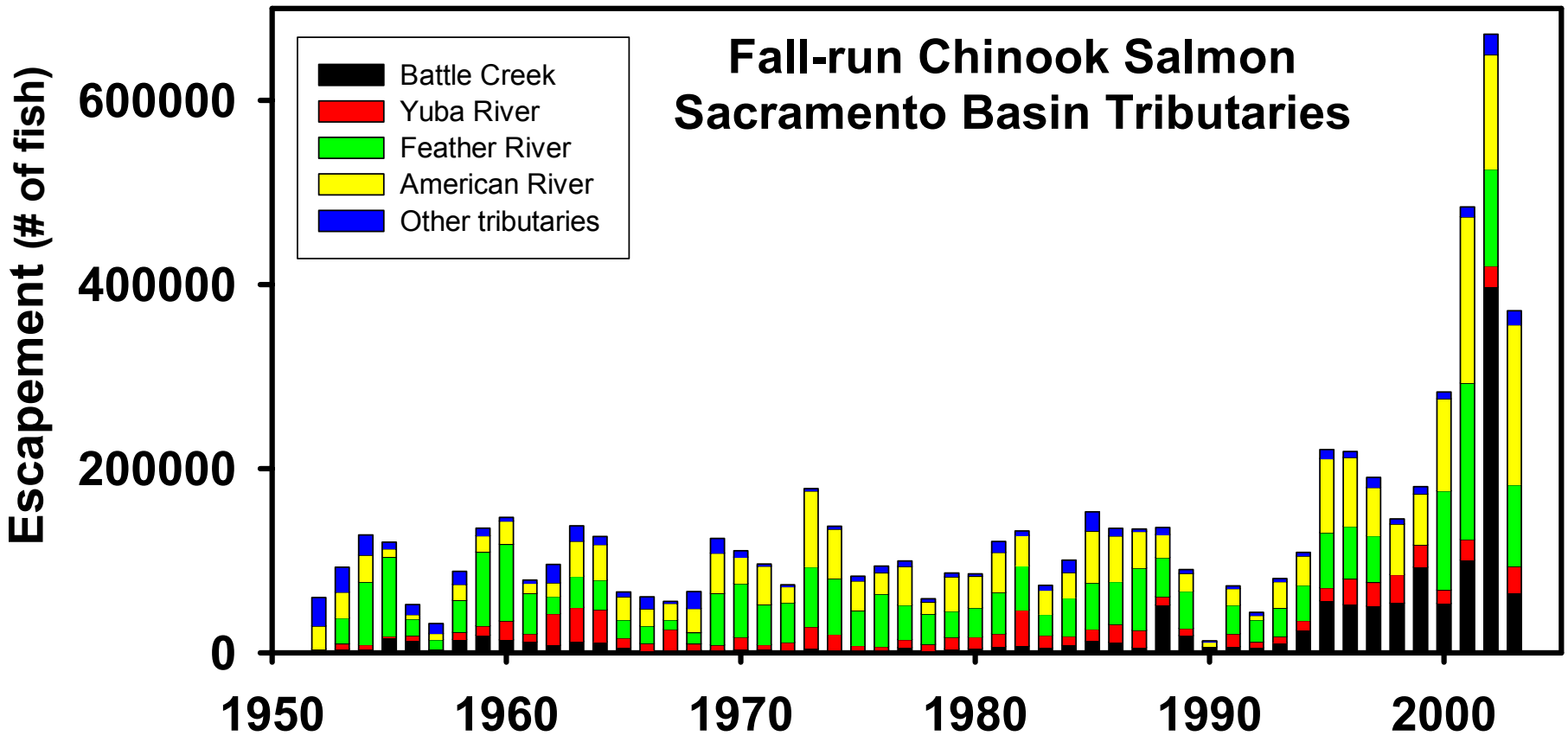
- **All population increase is in tributaries**



Data Sources: “Grandtab”, CDFG; USFWS, 1995 Working Paper on Restoration Needs

Sacramento Fall-run Chinook salmon

- **All population increase concentrated in 3 rivers: Battle Creek, American River, Feather River**



Data Source: “Grandtab”, CDFG

Achieving the Salmon Protection Objectives Will Require Multiple Actions - Upstream and Downstream (Delta)

Upstream Restoration Projects

Battle Creek – not implemented yet, funding issues

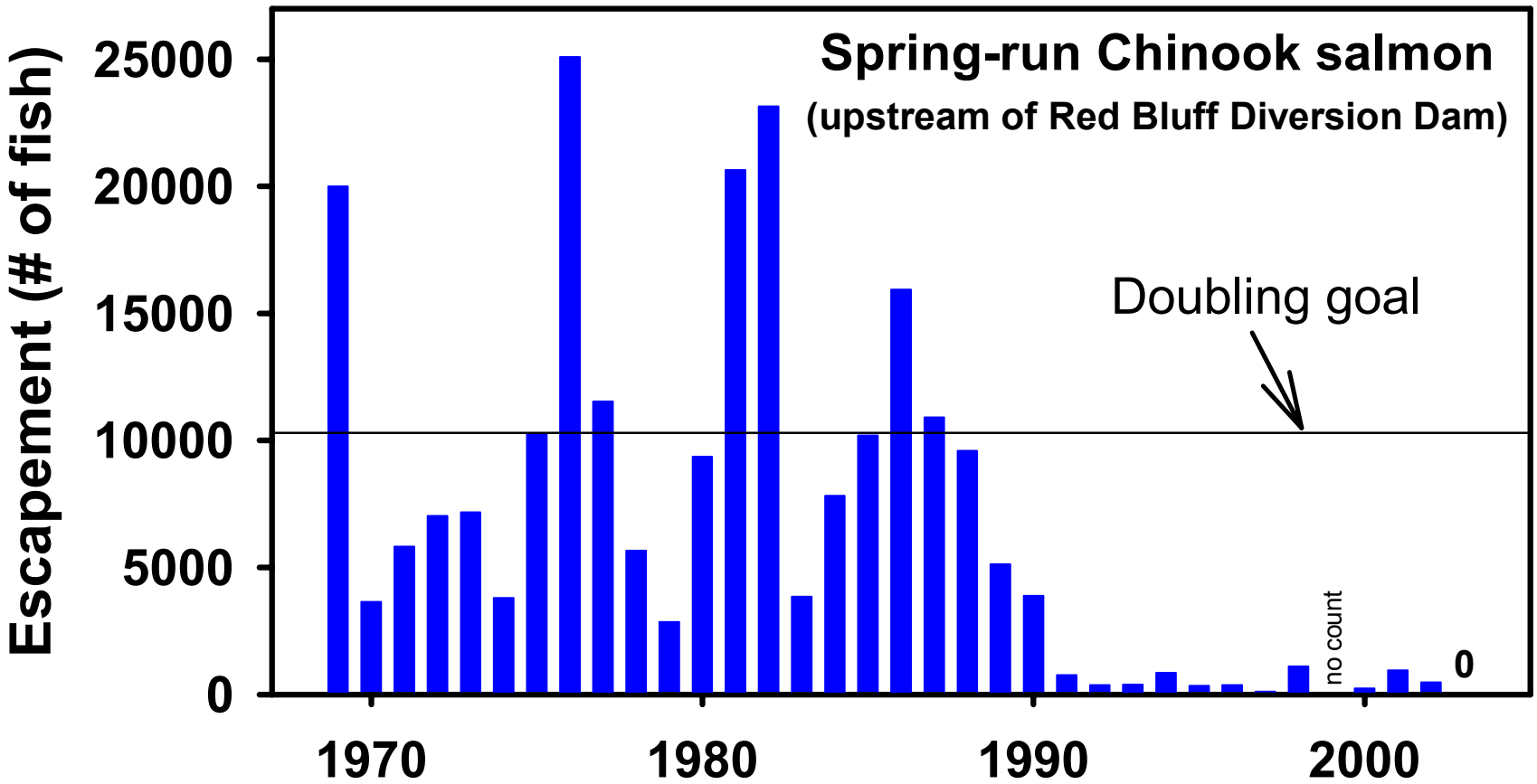
Butte Creek – improved passage and flow in lower reach, but flow in upper reach used by spring-run still inadequate. Population increased but high pre-spawning mortality common.

Clear Creek – passage improved and flows enhanced but spring-run blocked by Red Bluff Diversion Dam.

Sacramento River – fish screens installed but current winter-run requirements to be relaxed by USBR.

Fish Passage

Red Bluff Diversion Dam blocks 70% of adult spring-run returning to spawn on the upper mainstem Sacramento River.



Data Sources: “Grandtab”, CDFG; USFWS, 1995 Working Paper on Restoration Needs

Achieving the Salmon Doubling Objectives Will Require Multiple Actions - Upstream and Downstream (Delta)

Stream Flow Enhancement

USFWS/AFRP: Inadequate stream flows = key limiting factors for Chinook salmon in nearly all rivers and creeks in watershed.

AFRP recommended stream flows to achieve salmon doubling not implemented in most streams.

CVPIA (b)(2) water: <30% used for instream flow enhancements

CVPIA (b)(3) water: limited to VAMP and refuge supplies, funding not secure

CALFED EWP: not yet implemented, funding uncertain

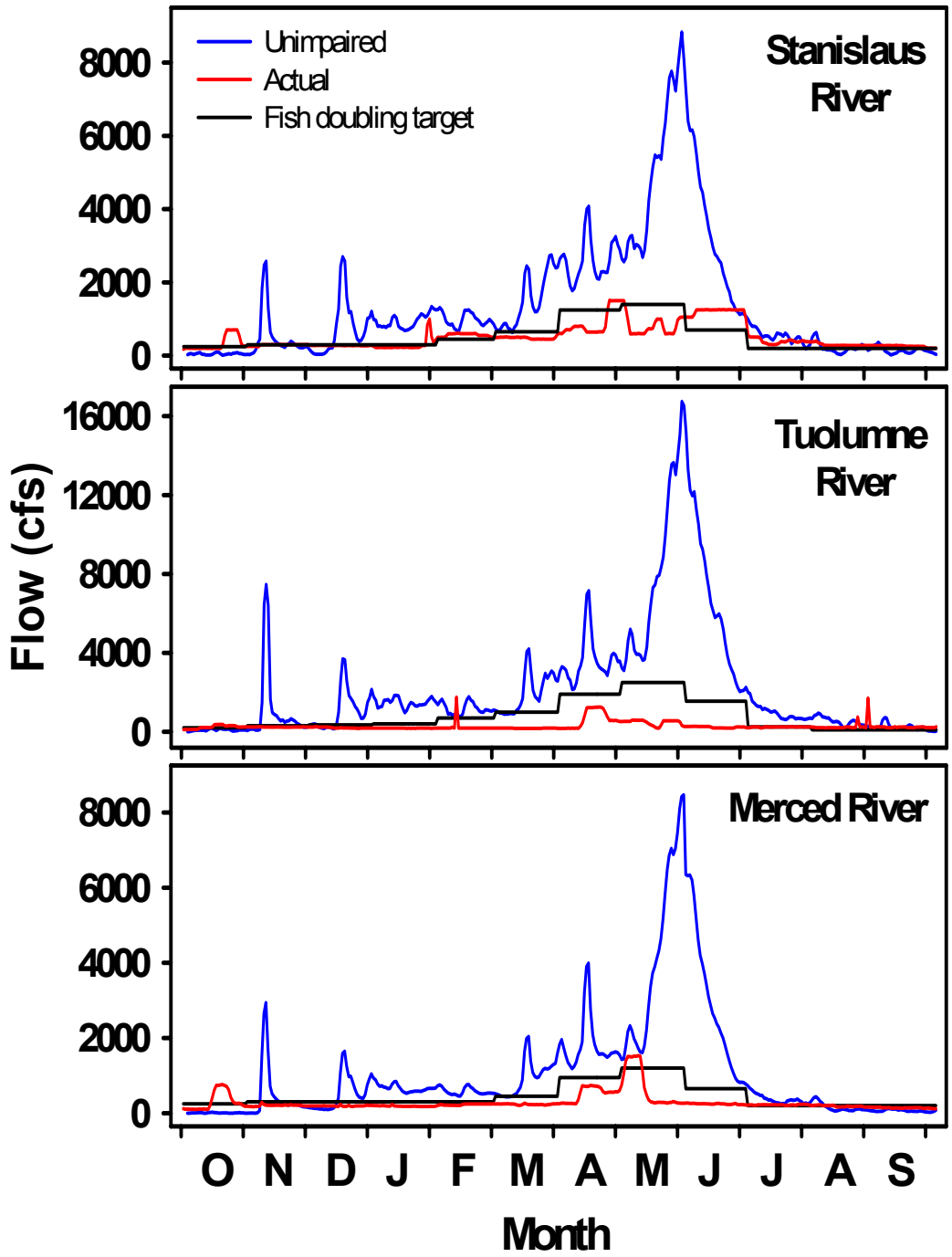
San Joaquin basin stream flows recommended by AFRP for salmon doubling are not being met.

Stanislaus
Pop. status: 68% of doubling
Trend: variable

Tuolumne
Pop. status: 49% of doubling
Trend: decline

Merced
Pop. status: 66% of doubling
Trend: increase

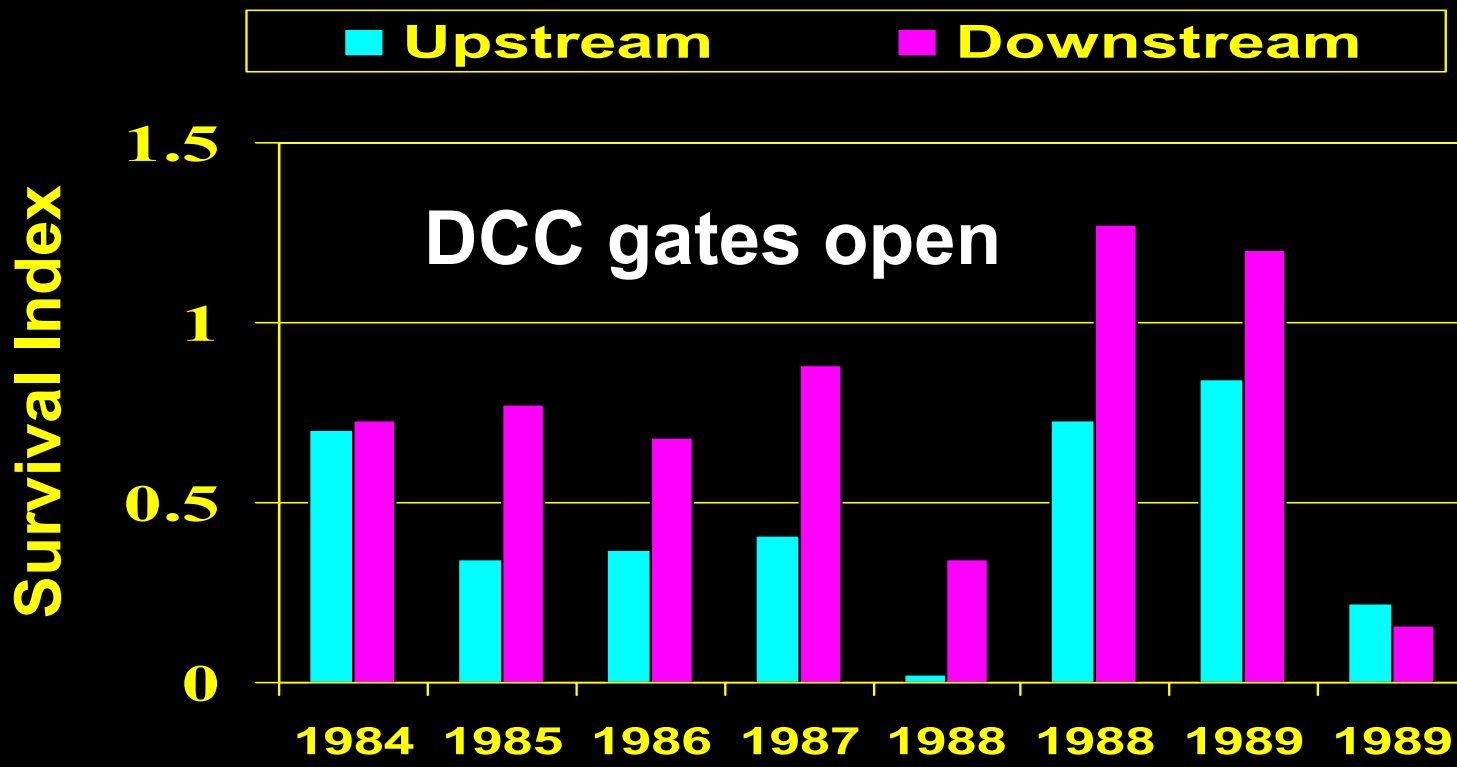
Data Sources: “Grandtab”, CDFG; USFWS, 1995 Working Paper on Restoration Needs; CDEC, CDWR



Delta Cross Channel

Survival of juvenile salmon entrained into the Central Delta through the DCC is reduced

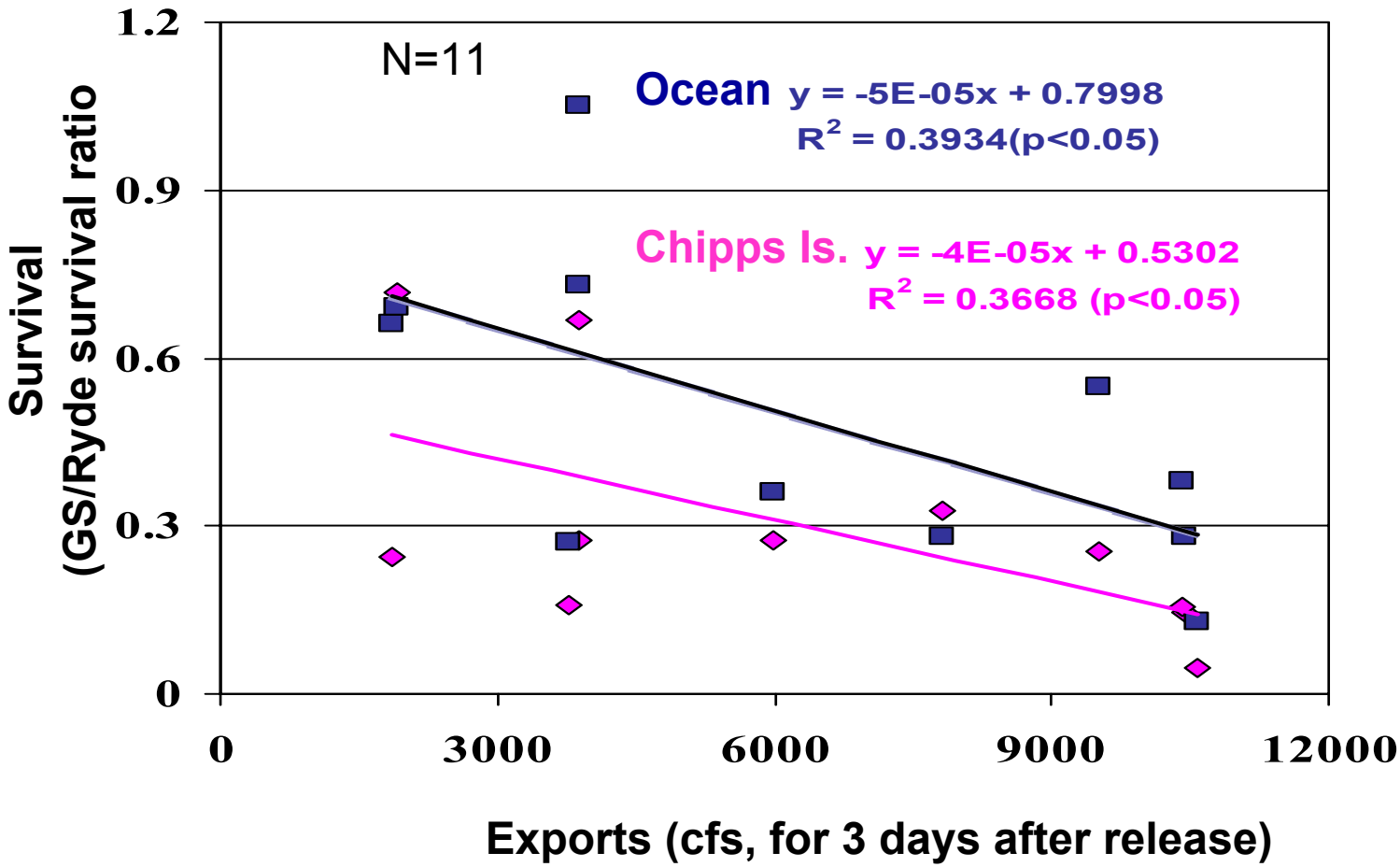
- Survival of marked juvenile salmon released downstream of the DCC is higher than survival of fish released upstream of the open DCC and Georgiana Slough



Source:
Pat Brandes,
CDFG

Salmon Survival in the Delta and Exports

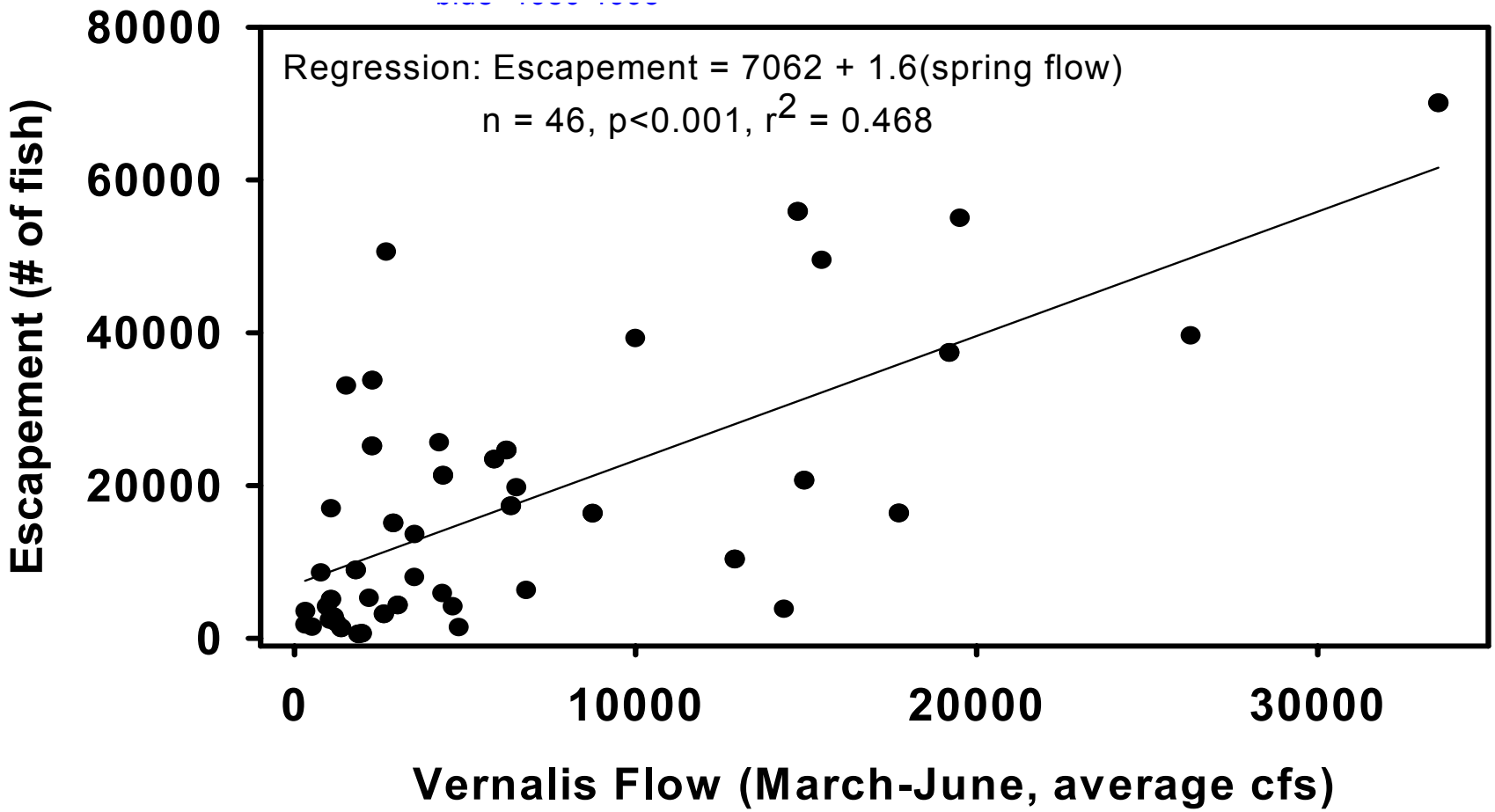
Survival of juvenile salmon entrained into the Central Delta through the DCC is further reduced when export rates are high.



Source:
Pat Brandes,
CDFG

Delta Inflow – San Joaquin at Vernalis

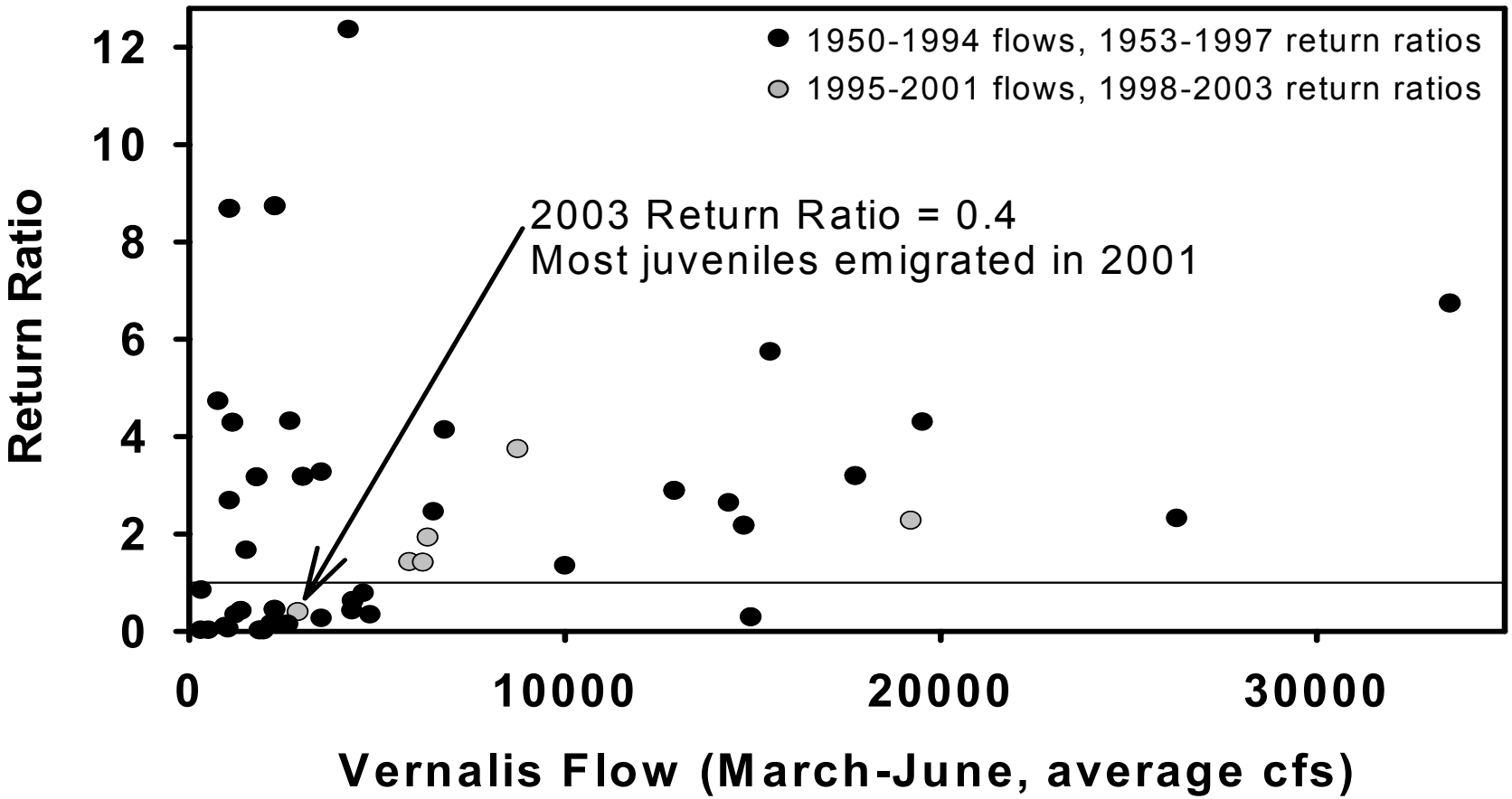
San Joaquin salmon population is higher when Vernalis flows during juvenile outmigration period are higher.



Data sources: “Grandtab”, CDFG; CDEC, CDWR

Delta Inflow – San Joaquin at Vernalis

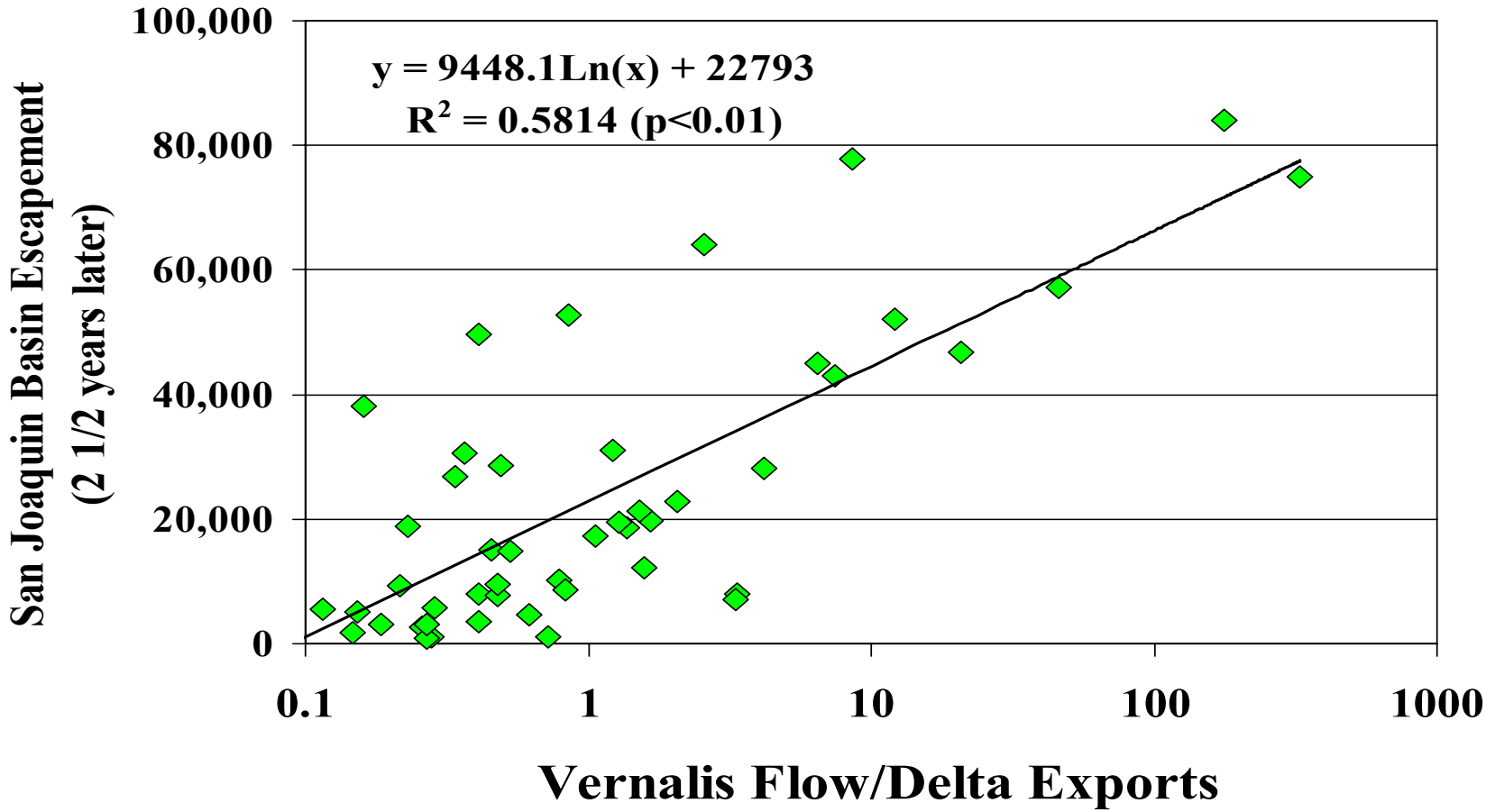
When Vernalis flows are low during juvenile outmigration, greater likelihood that San Joaquin salmon population will decline (return ratio < 1.0).



Data sources: “Grandtab”, CDFG; CDEC, CDWR

San Joaquin Flow at Vernalis and Exports

San Joaquin salmon population is higher when the Vernalis flow to export rate is high (high flow, low exports) and lower when the ratio is low (low flow, high exports).



Source: Pat Brandes, CDFG

Review: Why are Run, Stream, and Basin Doubling Criteria Needed to Achieve the Salmon Protection Objective?

- **Most runs on most streams are significantly short of doubling; most recent population increases come from Battle Creek and American River fall-run and Butte Creek spring-run.**
- **Each run and each stream faces a different mix of challenges.**
- **Habitat restoration and stream flow augmentation are concentrated in a few areas; inadequate stream flows and barriers to fish passage persist in most tributaries.**

Review: Why are Delta Objectives (DCC, Exports, and Vernalis Flows) important for Achieving Salmon Protection?

- Survival of juvenile Sacramento salmon increases as much as two-fold when the DCC is closed and exports are low (<4500 cfs) during migration through the Delta.

- Survival of juvenile San Joaquin salmon increases when Vernalis flows are high and exports rates are low. In 41% of years (1956-2001), flows were too low and exports too high to support positive population growth.

Setting Doubling Criteria and Adopting Doubling Requirements Can Be Prioritized in Several Ways

- Streams used by ESA-listed salmon runs (upper Sacramento River, Butte, Deer, and Mill Creeks).
- Basins, streams, or runs with low population size (San Joaquin basin, Sacramento River winter- and spring-run)
- Basins or streams where populations are declining (upper Sacramento River, San Joaquin basin)
- Streams used by multiple salmon runs or by both salmon and steelhead (upper Sacramento River, Butte, Deer, and Mill Creeks)
- Streams in which habitat restoration programs are least advanced (Deer and Mill Creeks).

Suggested Priorities Could Include:

- **Basin Doubling: San Joaquin basin**
- **Stream Doubling: Deer and Mill Creeks, upper Sacramento River**
- **Run Doubling: Sacramento Winter-run, Spring-run, and Late fall-run**