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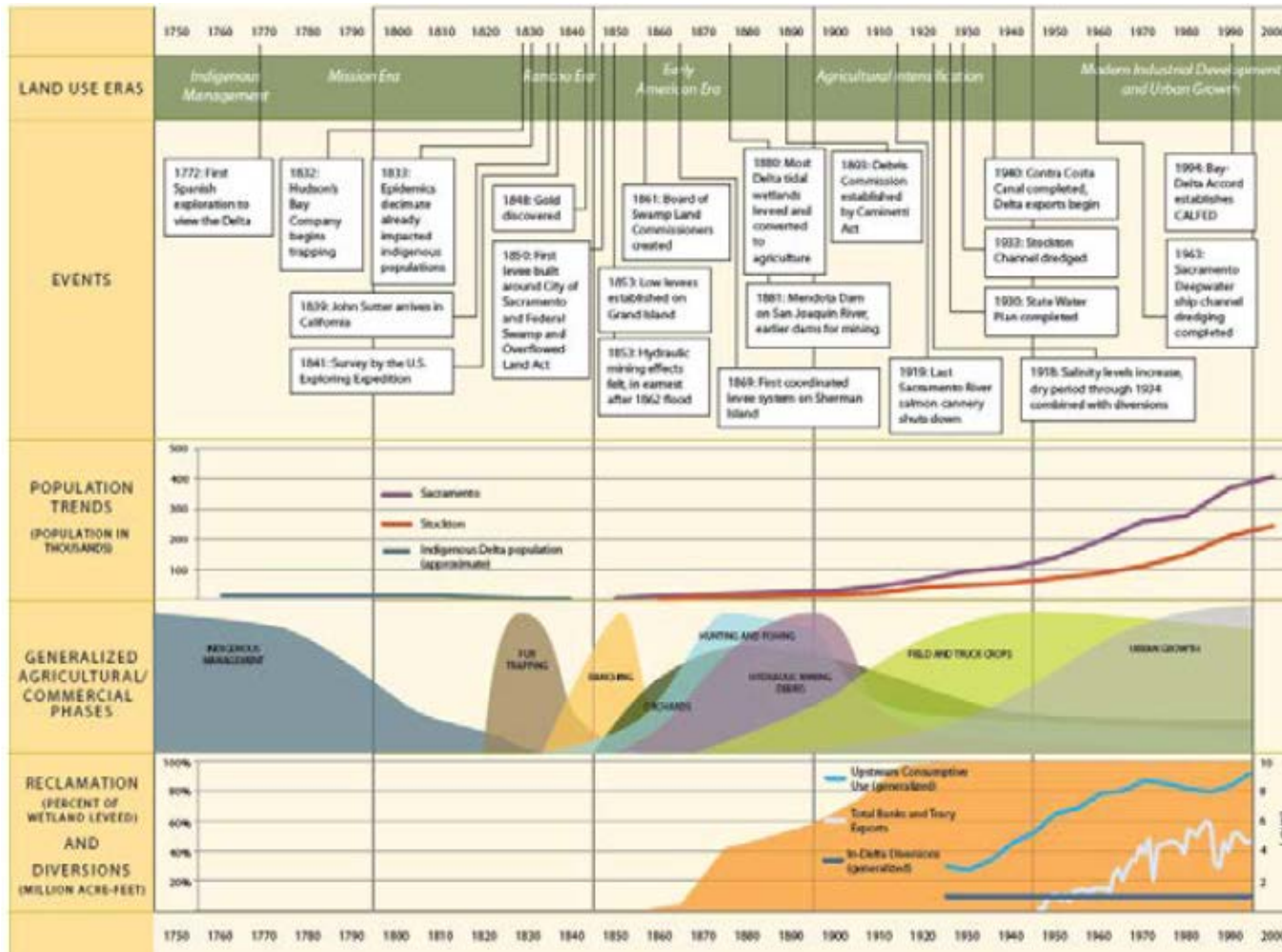
JUVENILE CHINOOK SALMON SURVIVAL

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Juvenile Chinook Salmon Survival

TIMELINE OF DELTA CHANGES



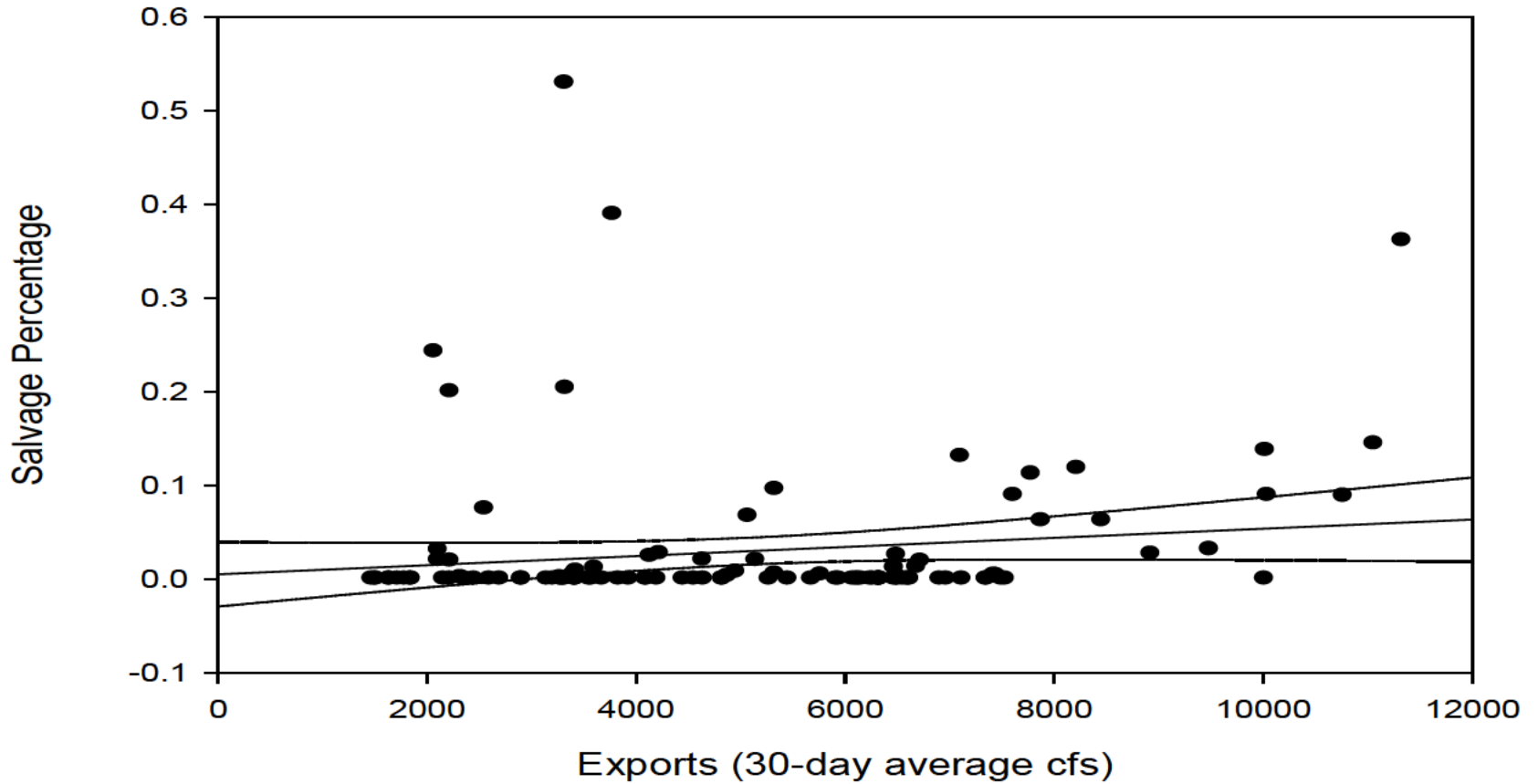
Whipple *et al*, 2012.

Examples of Factors Affecting Salmon Abundance

- Ocean conditions;
- Water project operations;
- Diversions;
- Habitat loss;
- Contaminants;
- Loss of historic floodplains and tidal marsh Invasive species;
- Predation;
- Climate change; and
- Reduced food production.

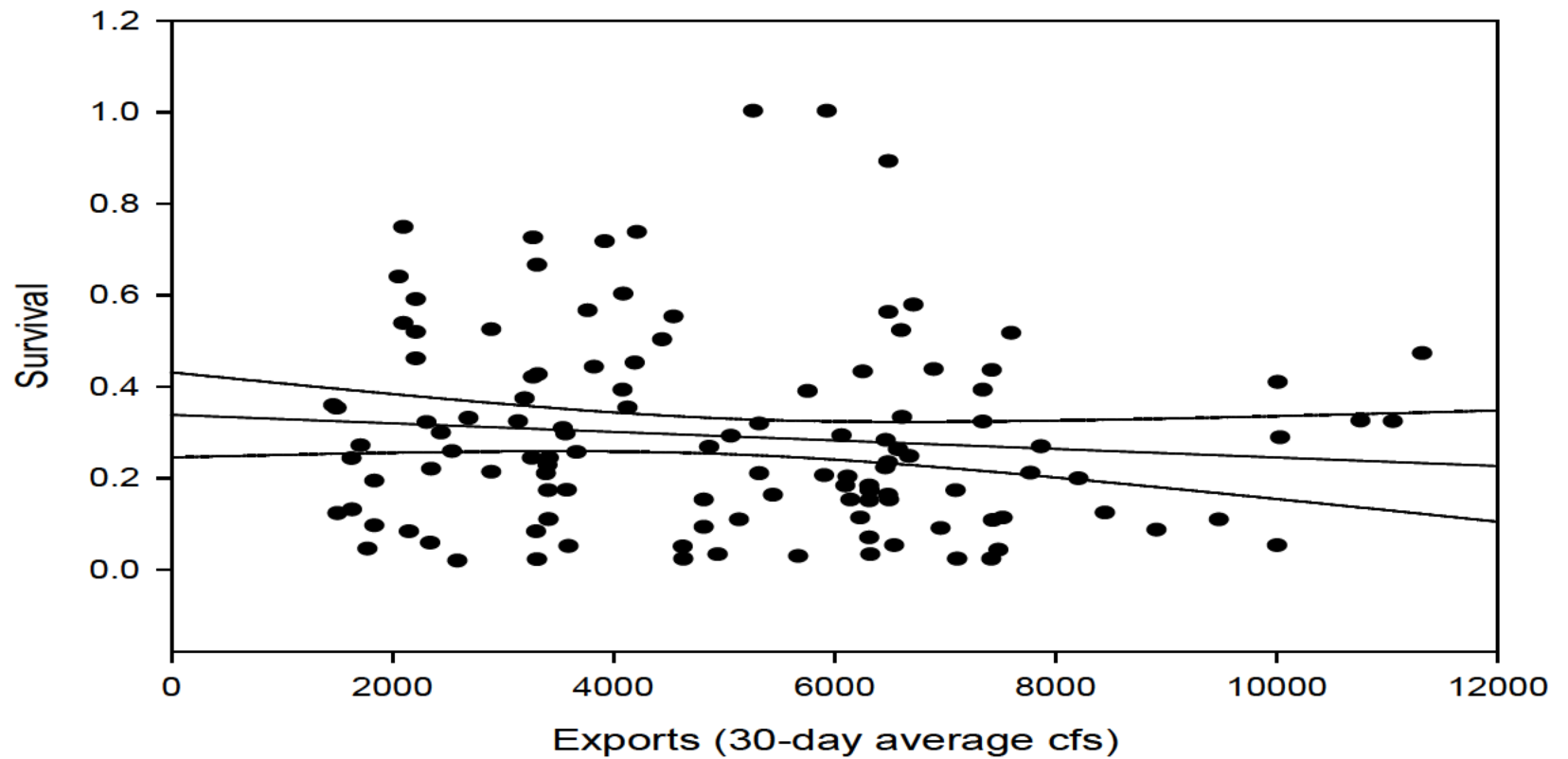
SWP and CVP exports (30-day average) and percentage salvage

Coefficients:
Intercept = $5.33e-3$
Slope = $4.86e-6$
 $r^2 = 0.02$



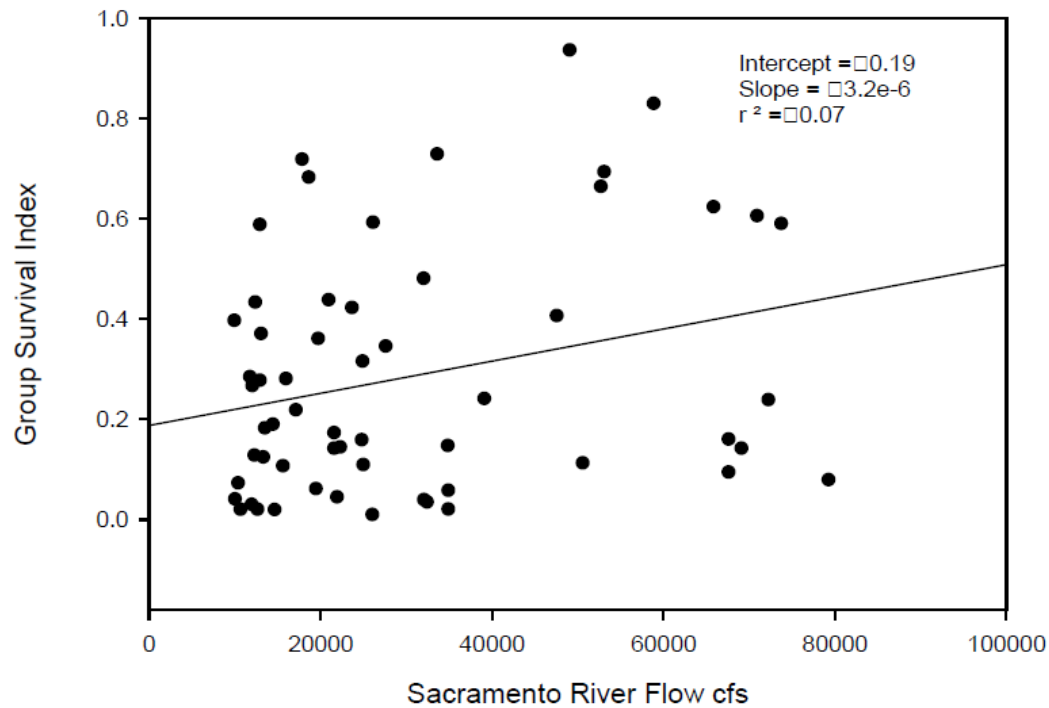
SWP and CVP exports (30-day average) and Delta salmon survival

Coefficients:
Intercept = 0.34
Slope = -9.33×10^{-6}
 $r^2 = 0.01$



Exports

- SWP and CVP export rates contributed a small incremental amount to explaining total juvenile salmon survival.



Relationship between average Sacramento River flow at Freeport over a 14 -day period after release and juvenile fall-run salmon survival to Chipps Island for CWT fish released in the vicinity of Sacramento (Data source: USFWS unpubl. Data).

- The relationship between Sacramento River flow rates and juvenile salmonid survival is weak (large changes in river flow are needed to achieve even a small change in salmonid survival in the Sacramento River and Delta) with high uncertainty (low R^2 values); and
- Multiple authors have concluded that flow alone cannot be used to restore the Delta. As stated by the NAS, “The Delta as it existed before large-scale alteration by humans cannot be recreated.” Buchanan *et al.* (2018) also concluded that increased flow alone will not be sufficient to resolve the low salmonid survival in the Delta.

Population-Level Effects

- Statistical uncertainty and variability in the population level response of salmonids to changes in factors such as SWP and CVP export rates, reverse flows within Delta channels, habitat restoration, etc; and
- Lifecycle models and advanced methods for analyses are starting to address uncertainty in complex relationships.