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Brett Harvey, DWR Aquatic Ecology

State Water Resources Control Board
Workshop II: Bay-Delta Fishery Resources
- October 1, 2012 -



Russell Stein
Acting Deputy Director, Delta and Statewide Water Management

Brett Harvey
Division of Environmental Services, Environmental Scientist

Gardner Jones
Division of Environmental Services, Staff Environmental Scientist

Dennis McEwan
Division of Environmental Services, Environmental Program Manager I

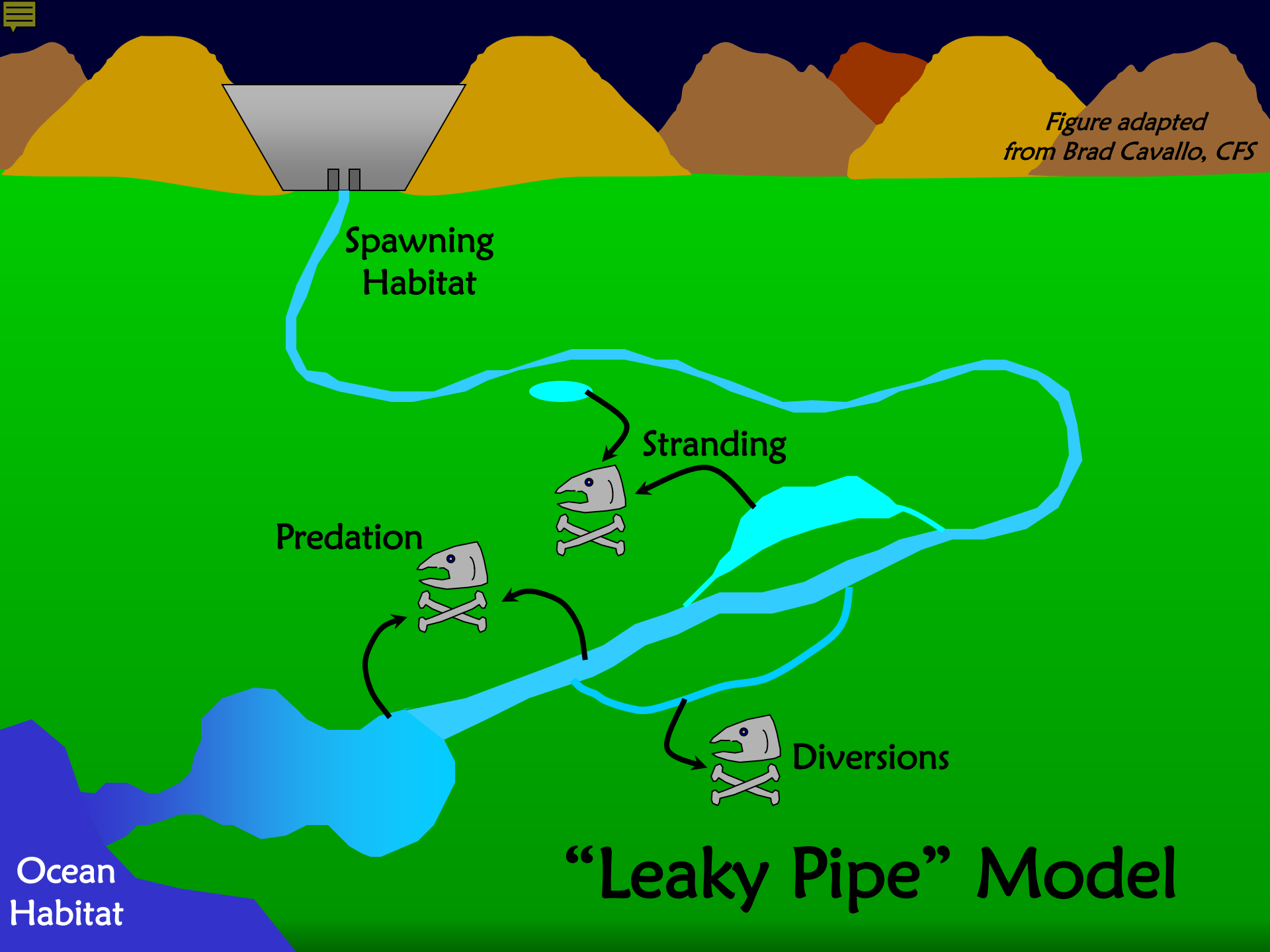
Figure adapted
from Brad Cavallo, CFS
Spawning
Habitat
Stranding
Predation
Diversions
Ocean
Habitat
"Leaky Pipe" Model

Hatchery
Supplementation

Fish Trucking

Gate
Closures

Export
Restrictions

Ocean
Habitat

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Improved Hatchery Management

Stream Restoration

Riparian Corridors

Seasonal Floodplain

Brackish Marsh

Freshwater Tidal Wetlands

Gate Closures

Export Restrictions

Ocean Habitat

"Bet Hedging" Model

Coded Wire Tag survival studies: Inflow important – Export influence mixed

	Inflow	Export	CWT survival study
San Joaquin	✓		Baker and Morhardt 2001
	✓		CDFG 2005
	?		SJRGA 2007
	✓		Newman 2008
	⊘		Zeug and Cavallo in review
Sacramento	✓		Kjelson and Brandes 1989
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✓ = significant effect
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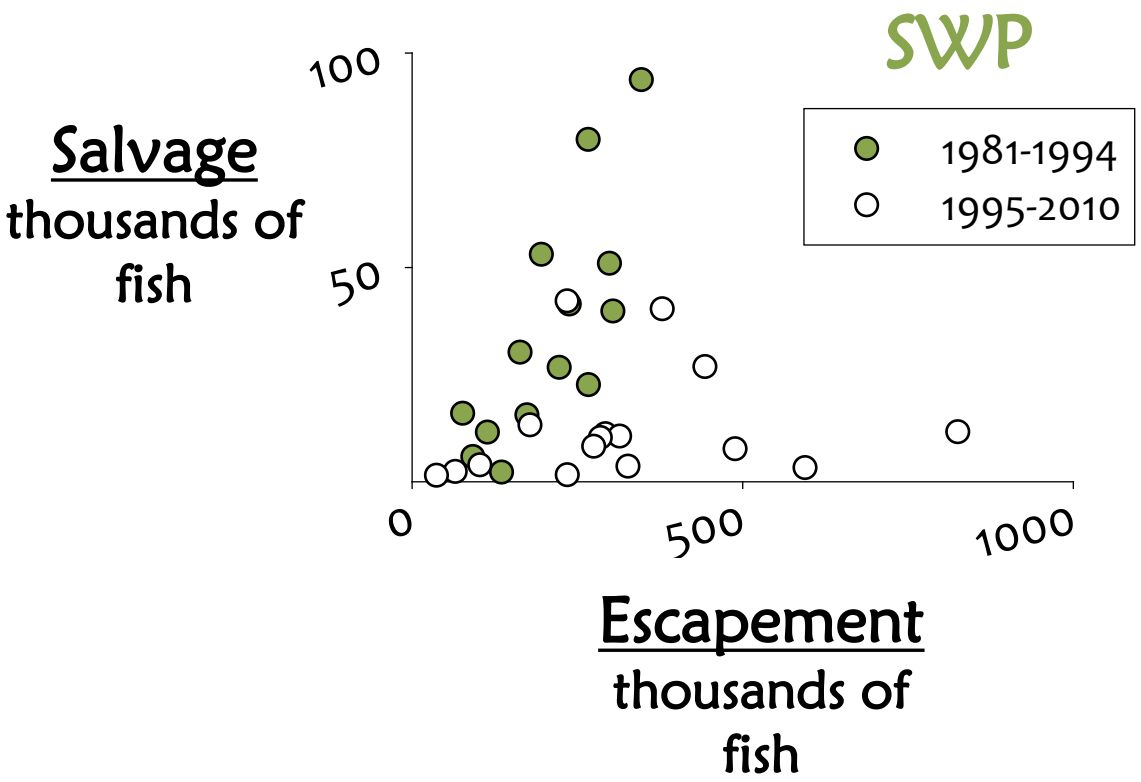
Lower Salvage Rate at SWP since Bay-Delta Accord



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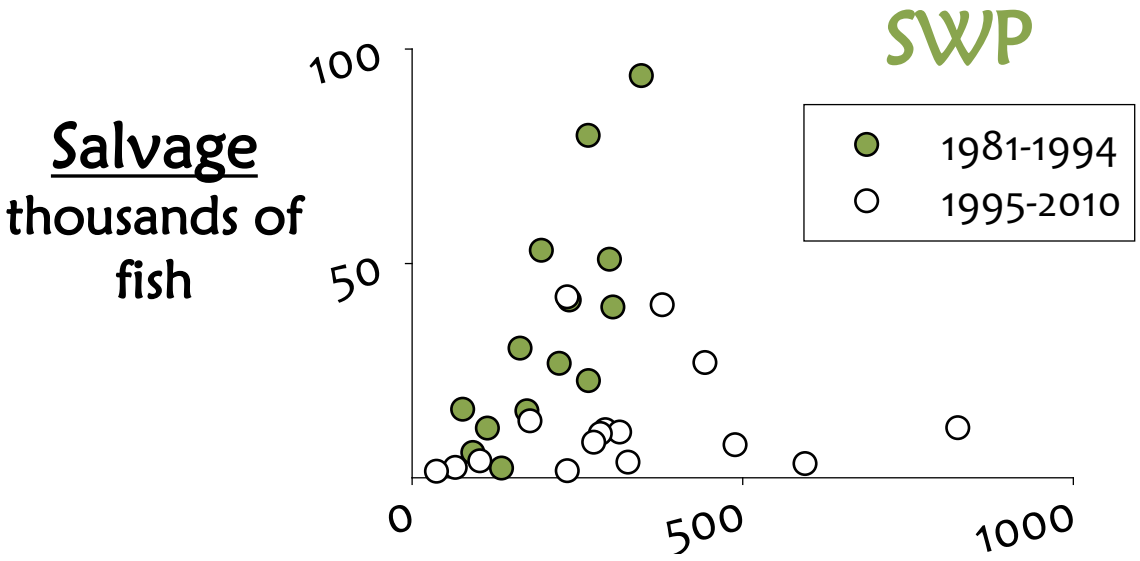
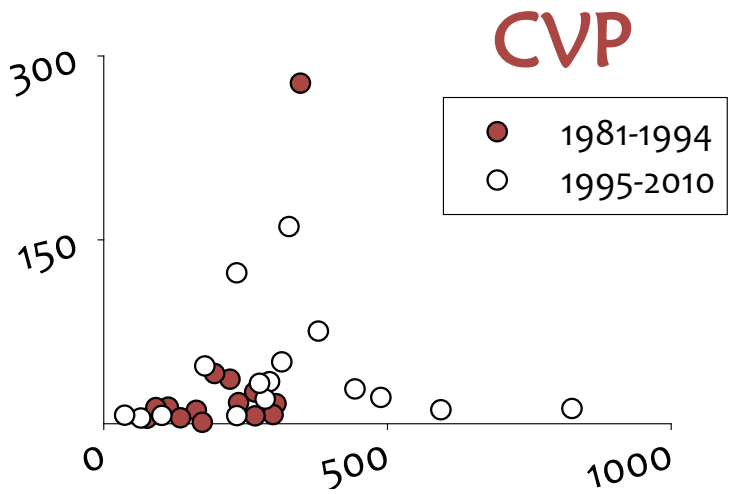
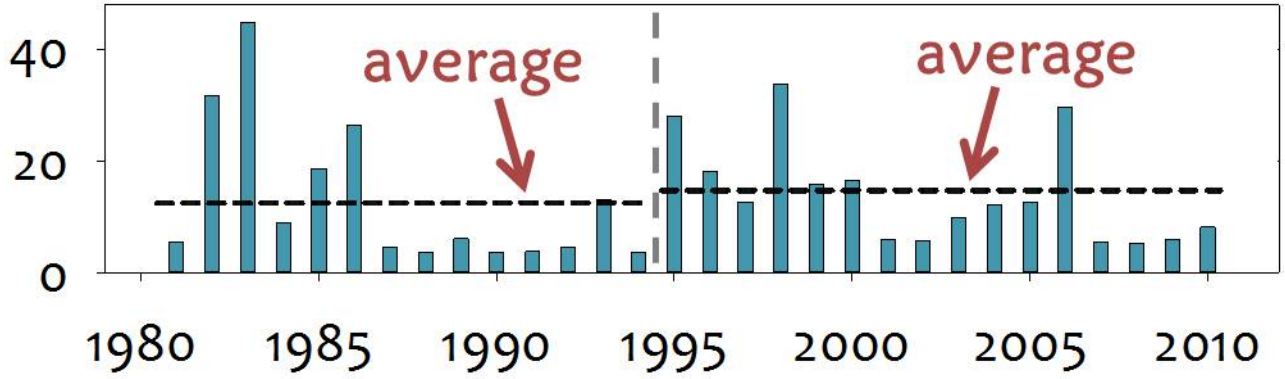


Escapement
thousands of fish



Lower February-June E:I ratio since Bay-Delta Accord

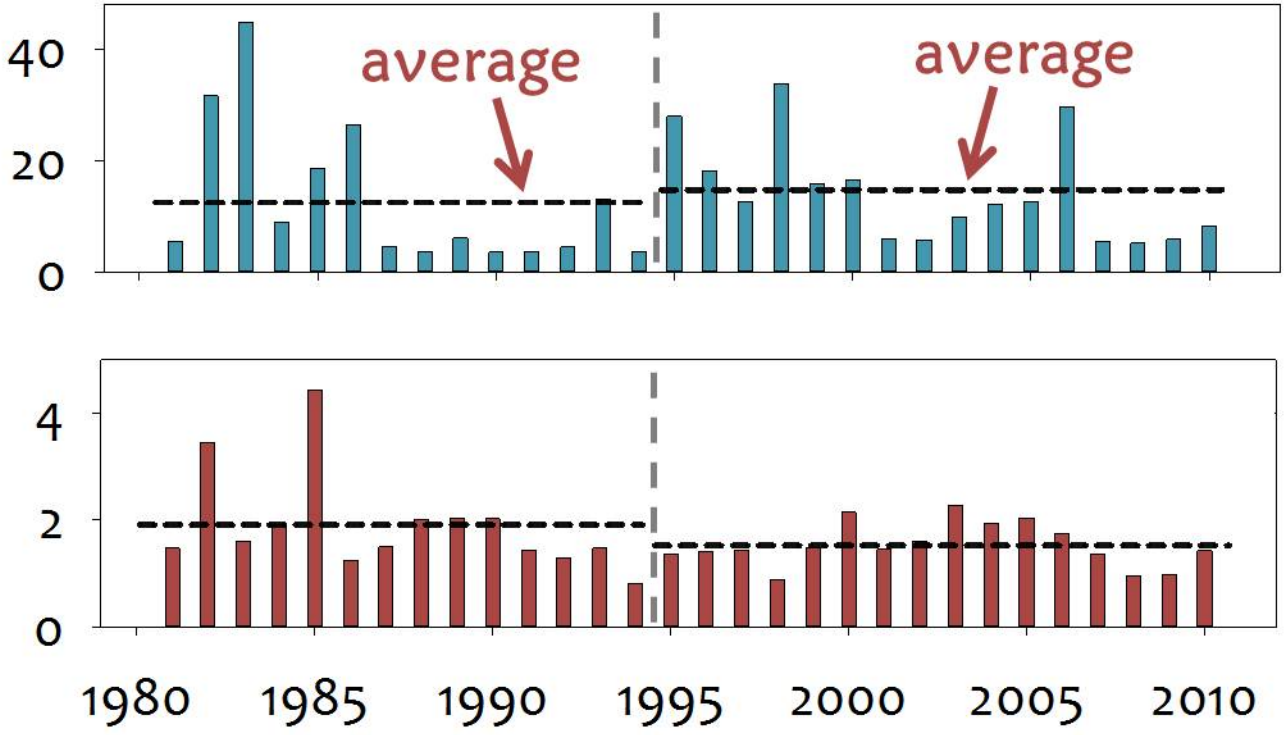
Inflow
millions acre feet



Lower February-June E:I ratio since Bay-Delta Accord

Inflow
millions acre feet

Export
millions acre feet



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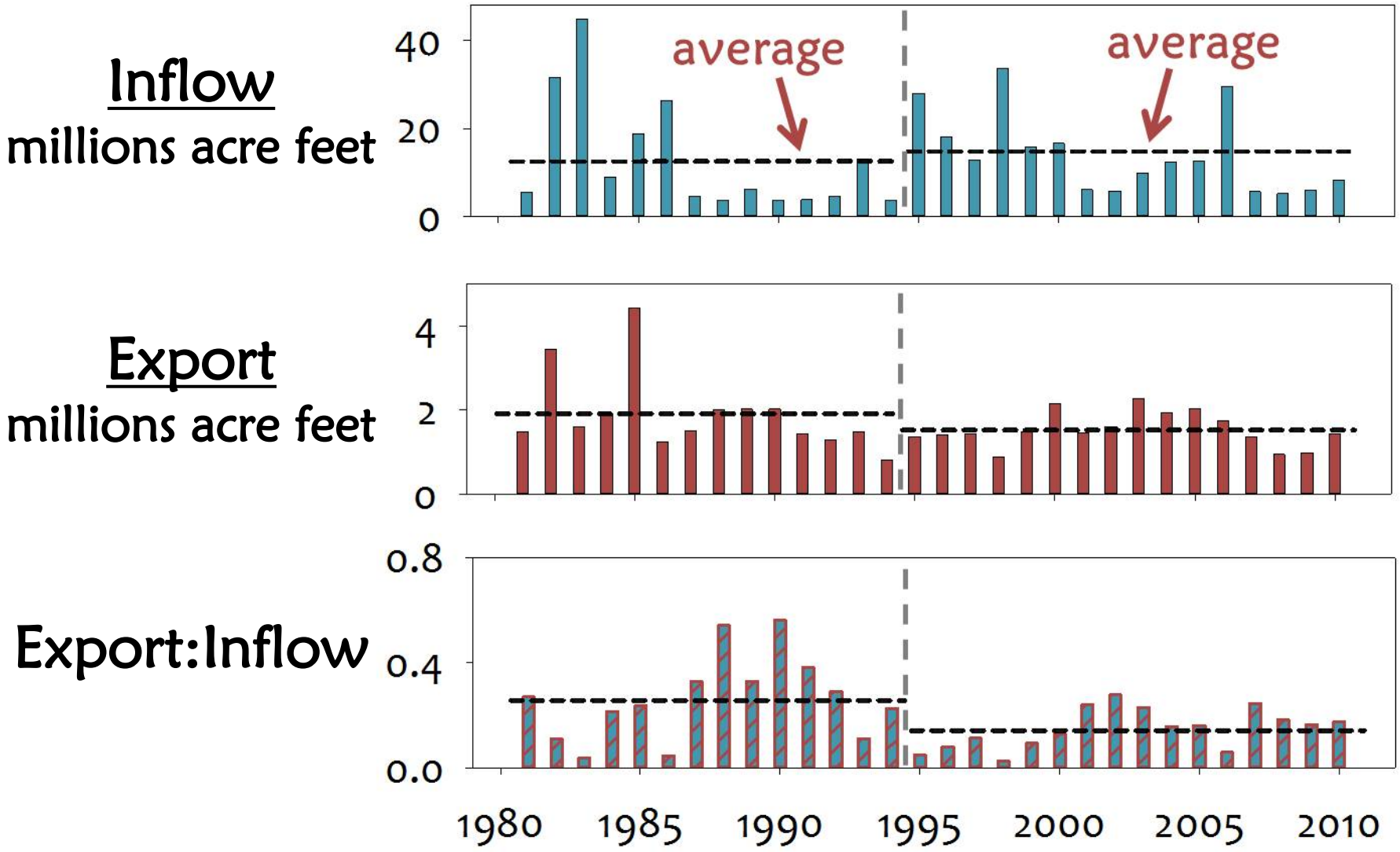
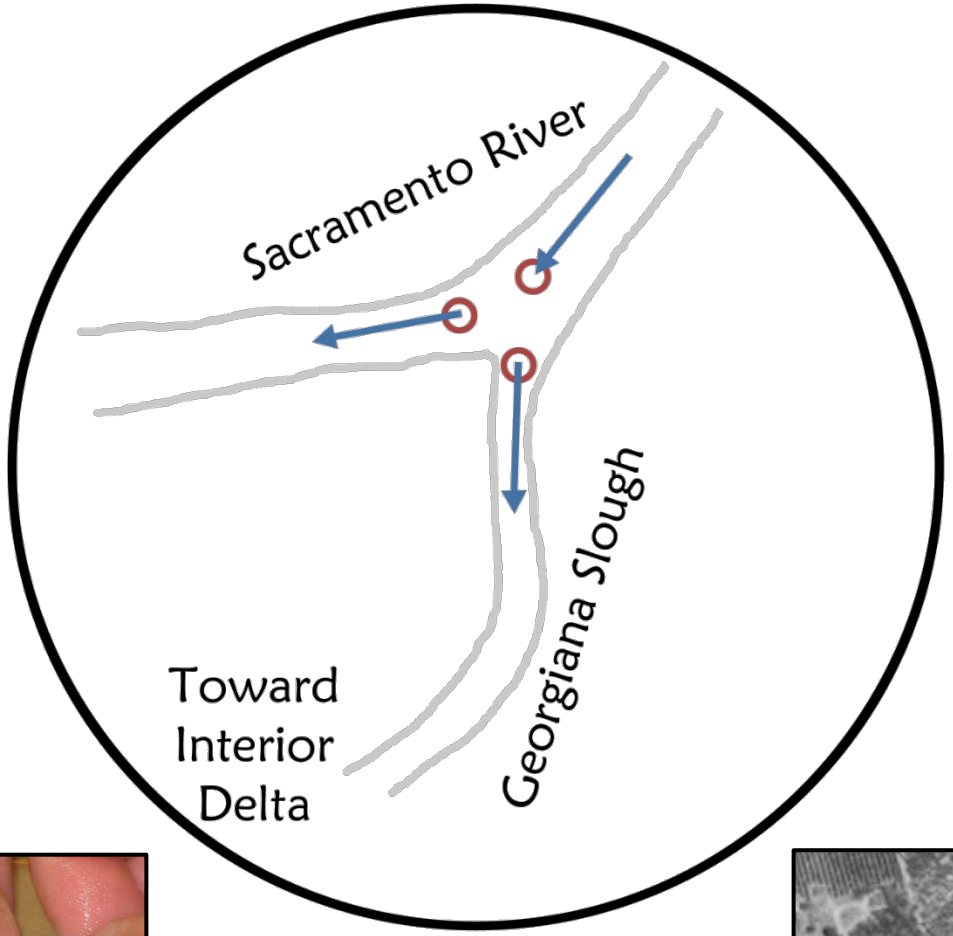
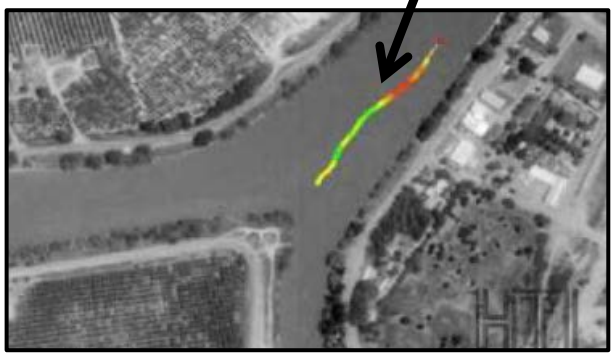


Telemetry shows juveniles "go with the flow"

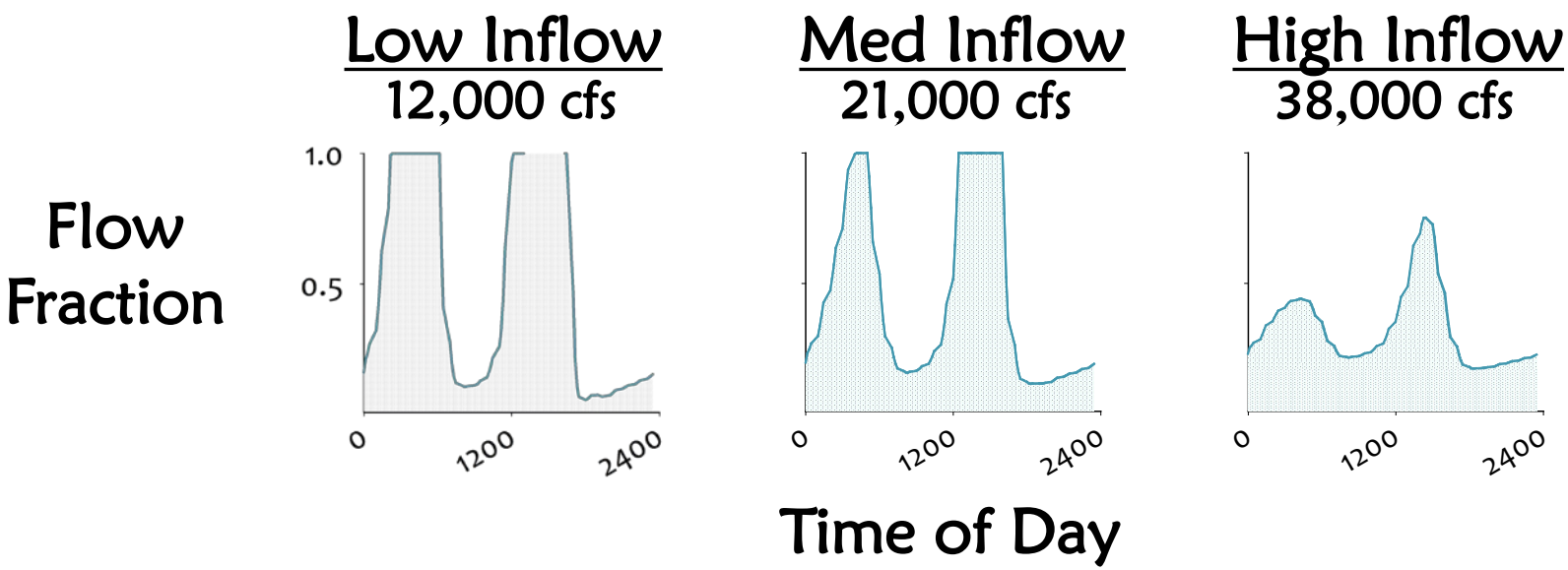


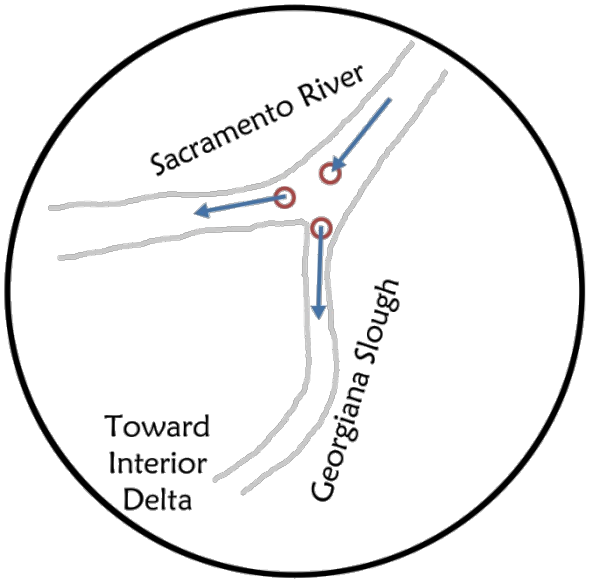
telemetry tag

telemetry trace



Inflow affects flow fraction into Georgiana Slough





Cavallo et al. (in prep)

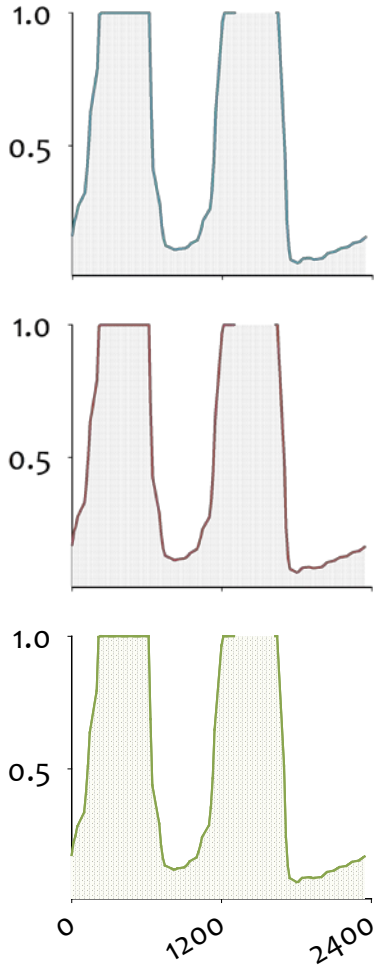
Exports have minimal effect on flow split

Low Inflow
12,000 cfs

Low Export
2,000 cfs

Med Export
6,000 cfs

High Export
10,000 cfs



Cavallo et al. (in prep)

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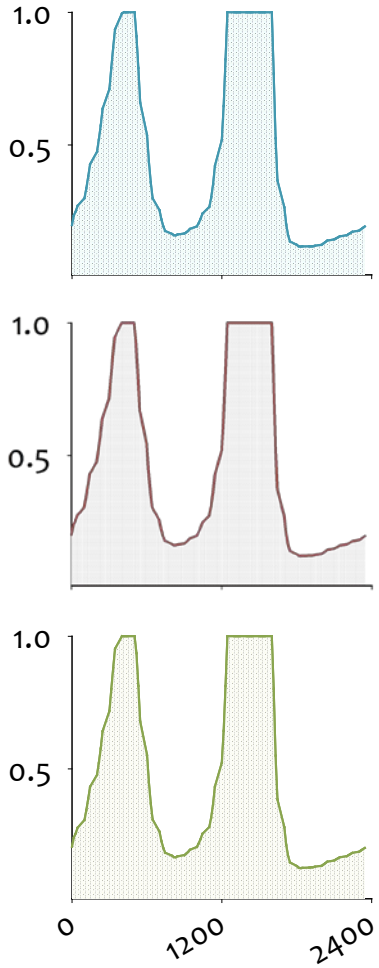
Med Inflow
21,000 cfs

Low Export
2,000 cfs

Med Export
6,000 cfs

High Export
10,000 cfs



Cavallo et al. (in prep)

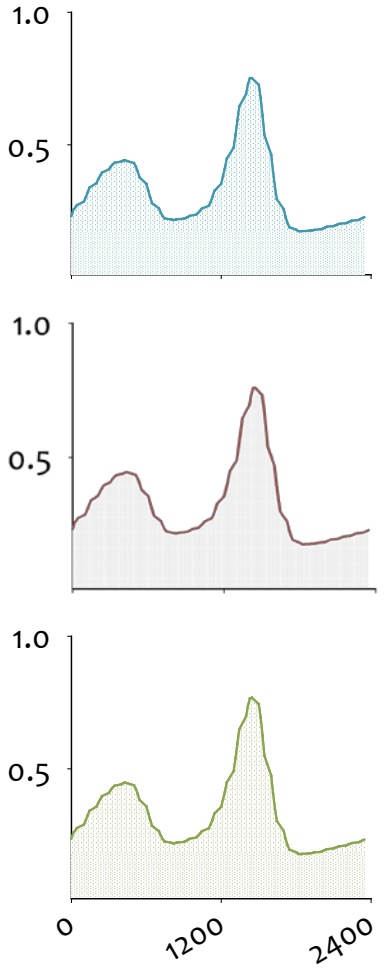
Exports have minimal effect on flow split

High Inflow
38,000 cfs

Low Export
2,000 cfs

Med Export
6,000 cfs

High Export
10,000 cfs



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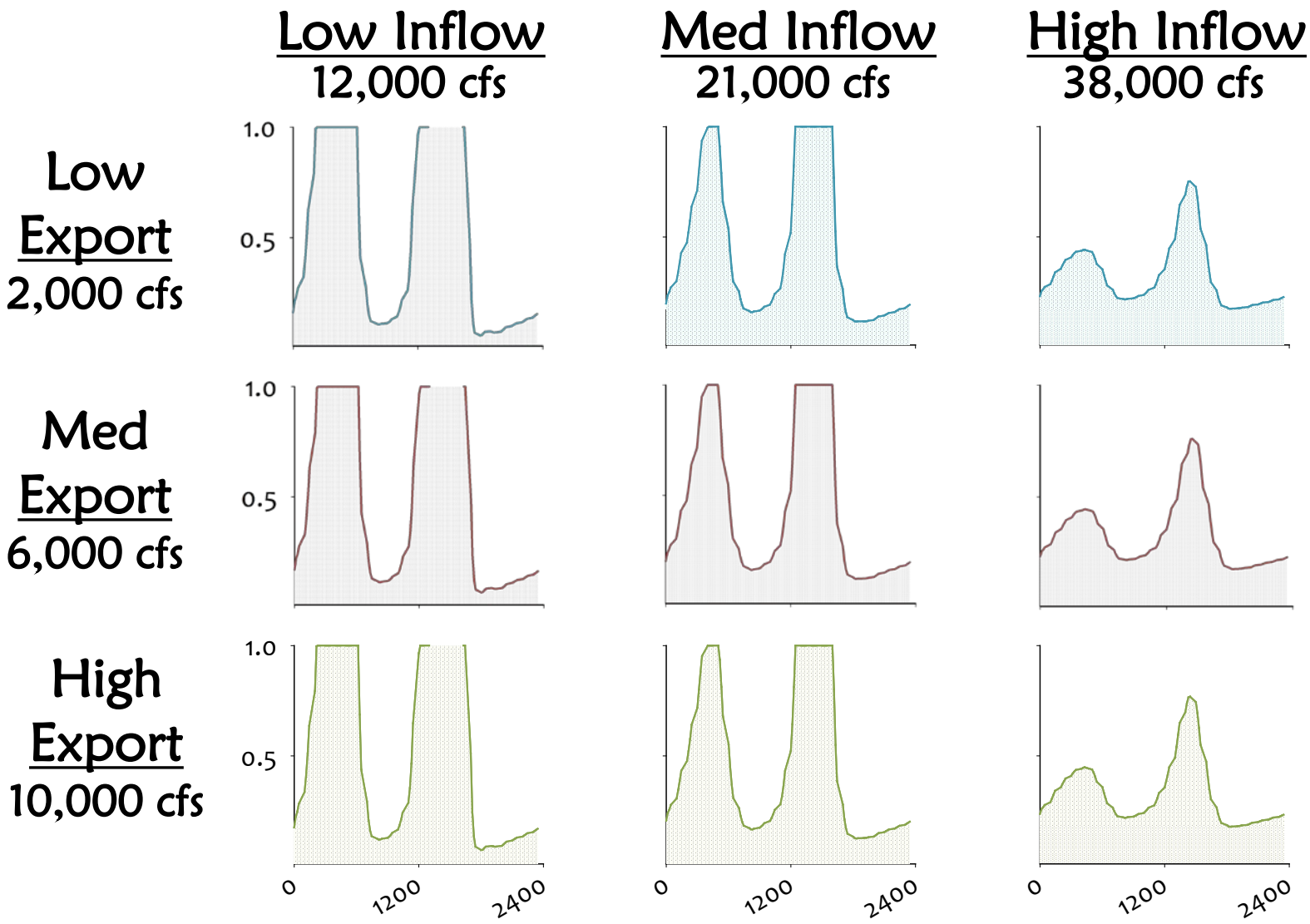

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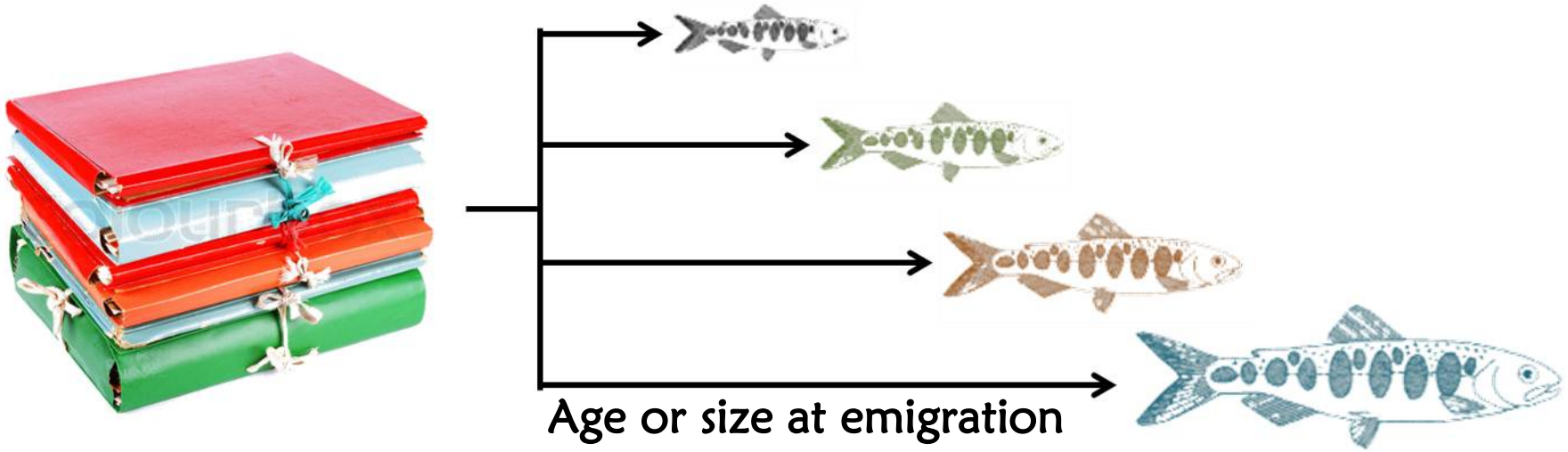
Life history diversity: a diversified asset portfolio for salmon



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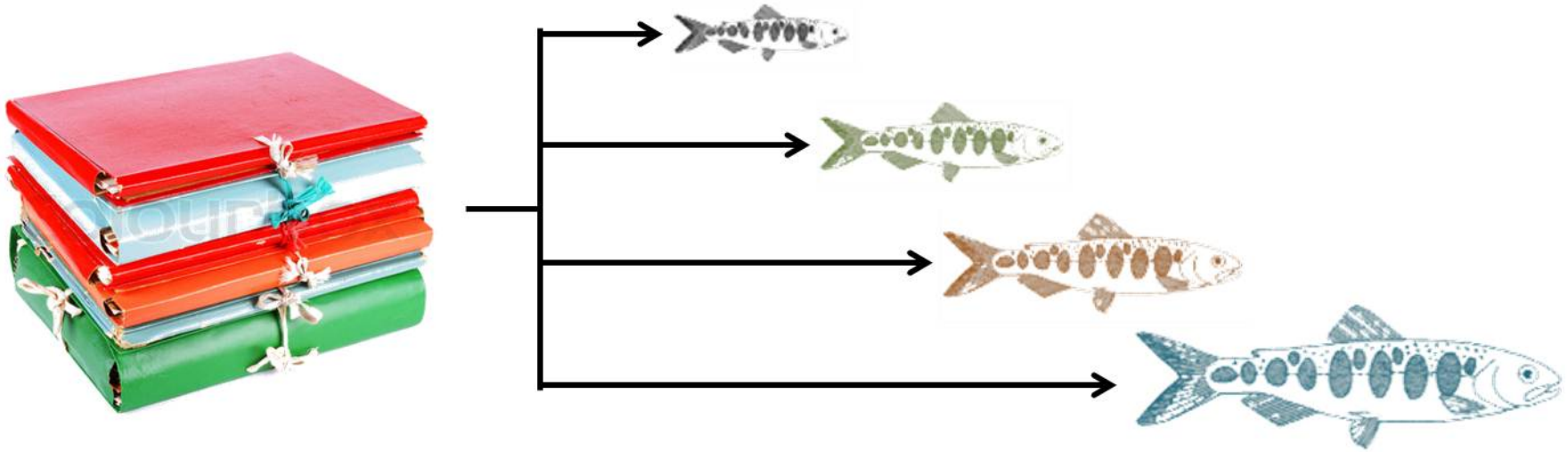
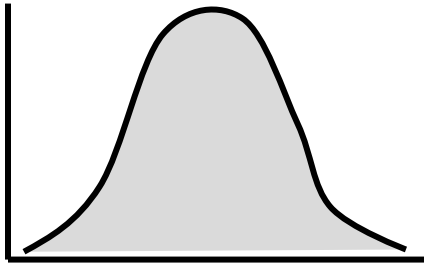


Life History Distribution

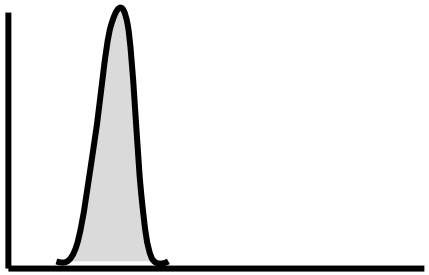
Broad



Timing of Ocean Entry

VS.

Narrow



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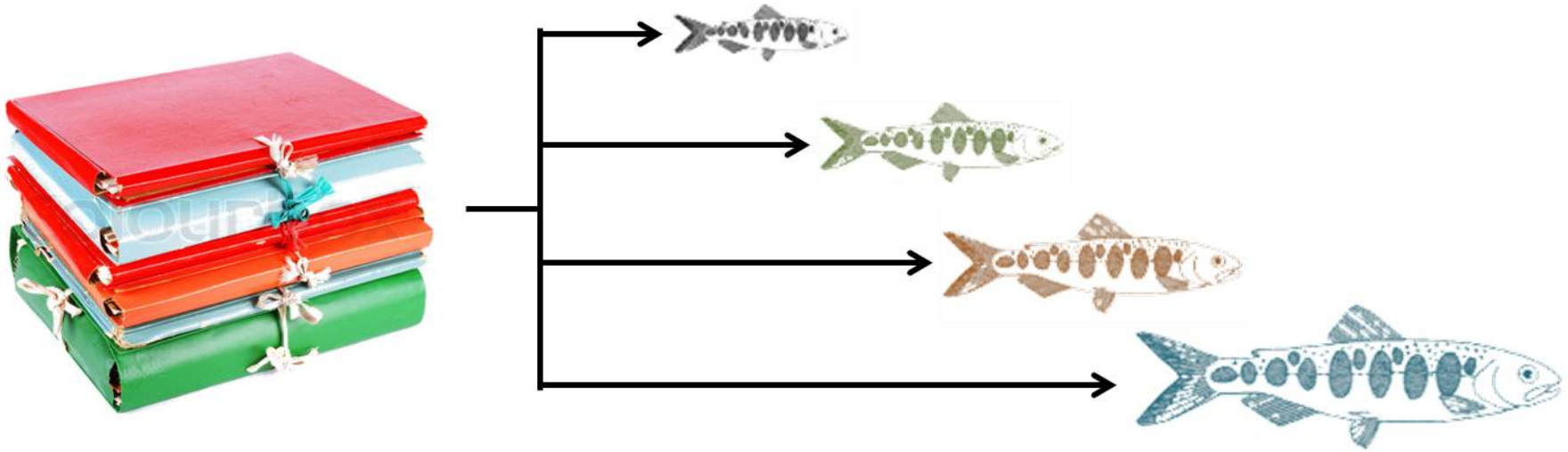

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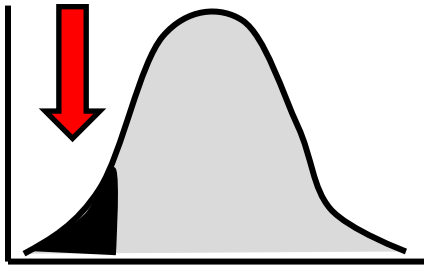

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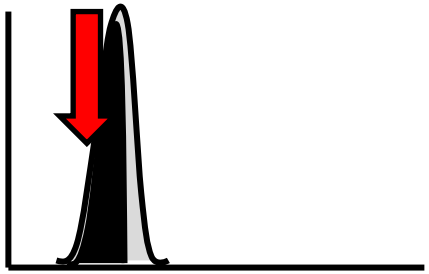
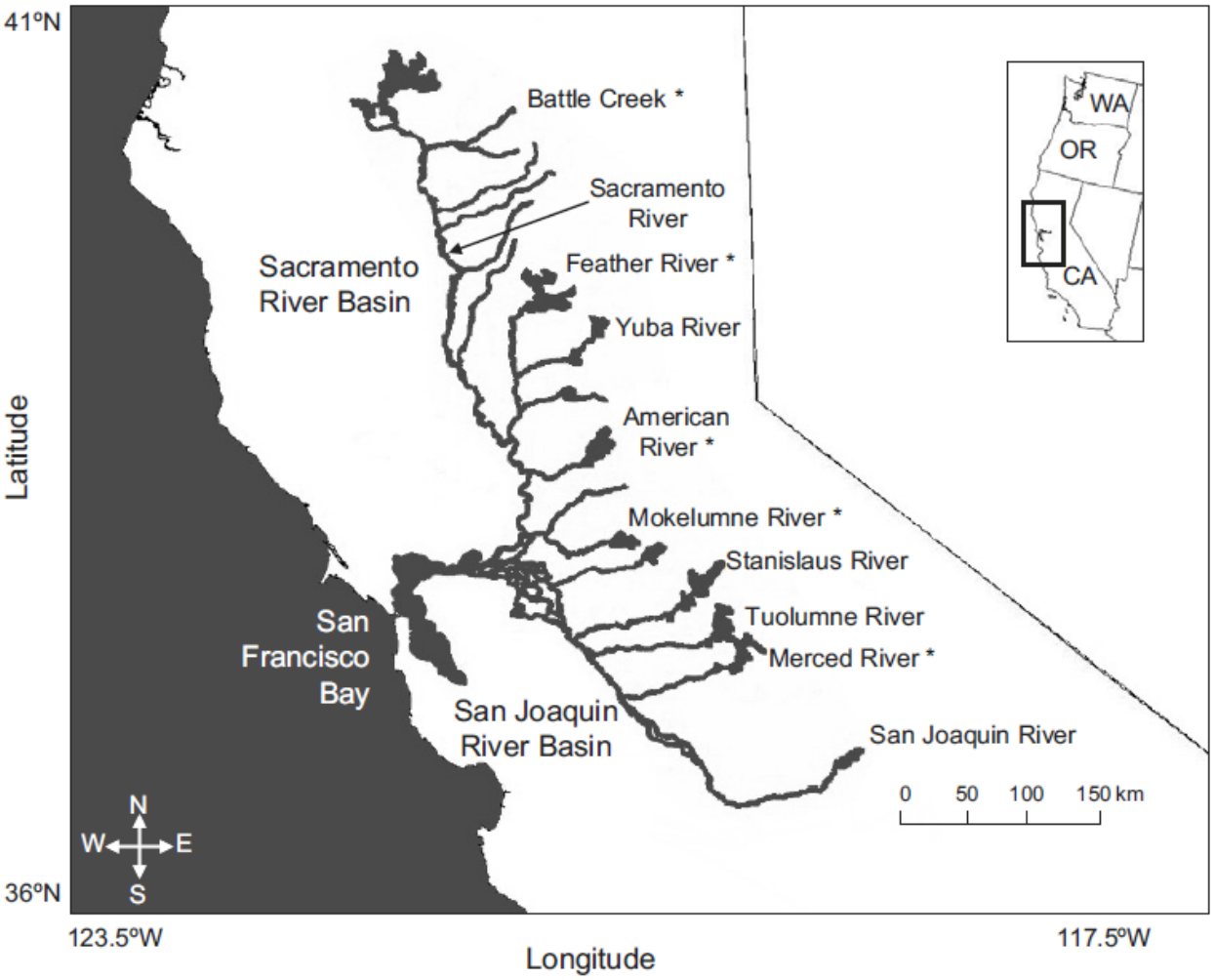


Timing of Ocean Entry

Weakened portfolio effect in a collapsed salmon population complex

Stephanie Marie Carlson and William Hallowell Satterthwaite

Can. J. Fish. Aquat. Sci. 68: 1579–1589 (2011) doi:10.1139/F2011-084 Published by NRC Research Press



Adapted from Carlson and Satterthwaite (2011)

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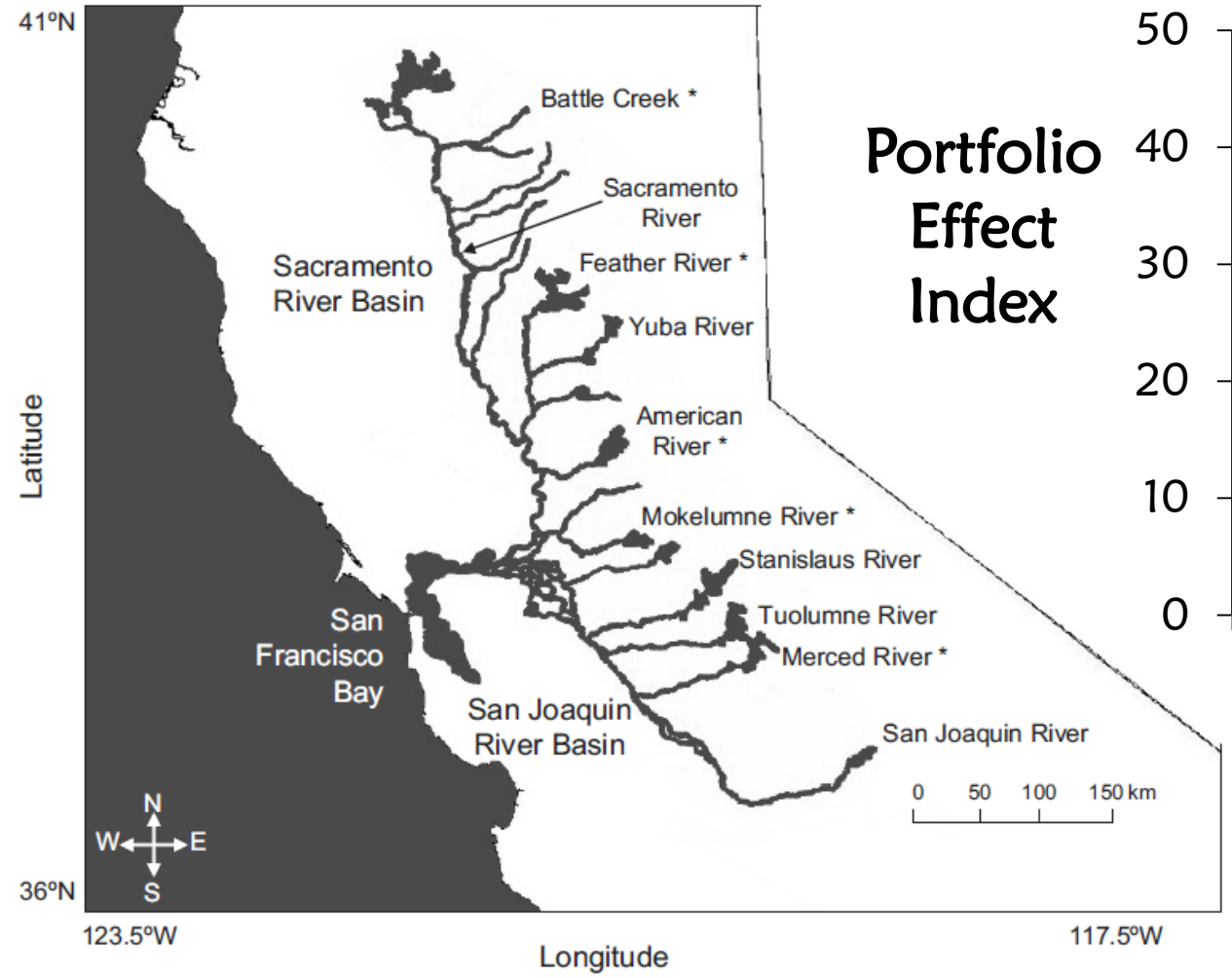
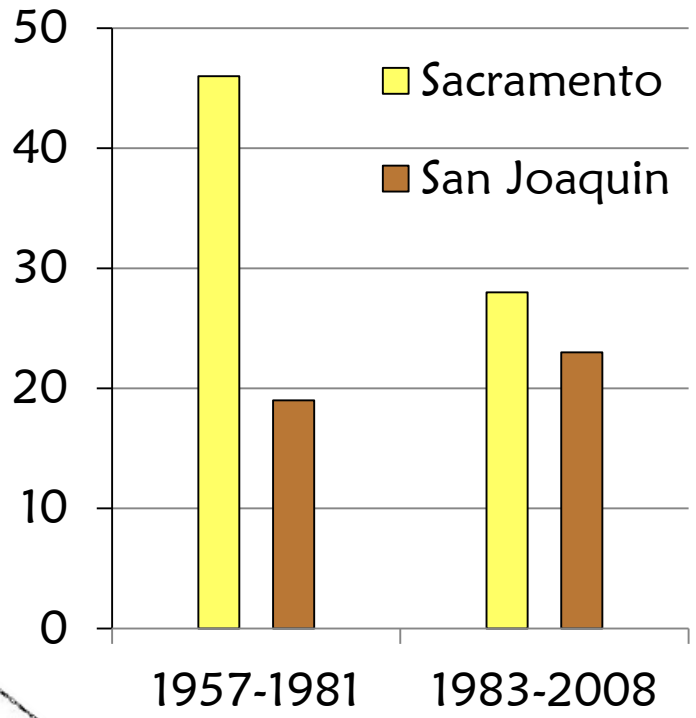


Portfolio Effect Index



Adapted from Carlson and Satterthwaite (2011)

Delta rearing is more important than previously understood

Coded Wire Tag Fry

Delta residence time

55-58 days

(Sommer et al. 2001)

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Delta residence time
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Fry are
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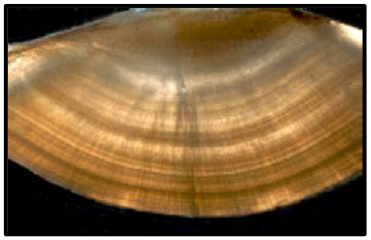
(Miller et al. 2010)

Otolith Studies



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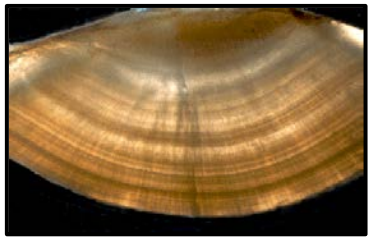
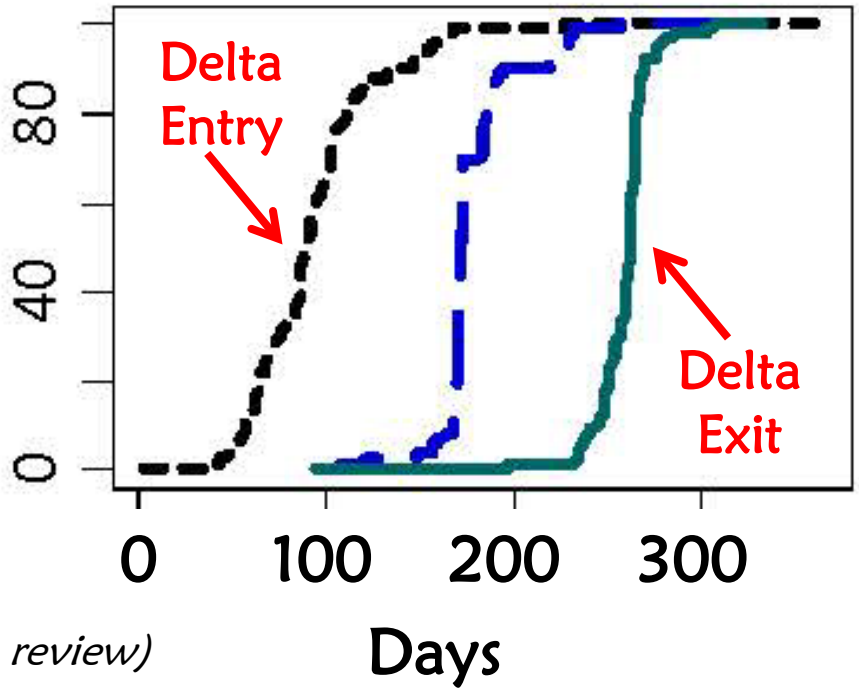
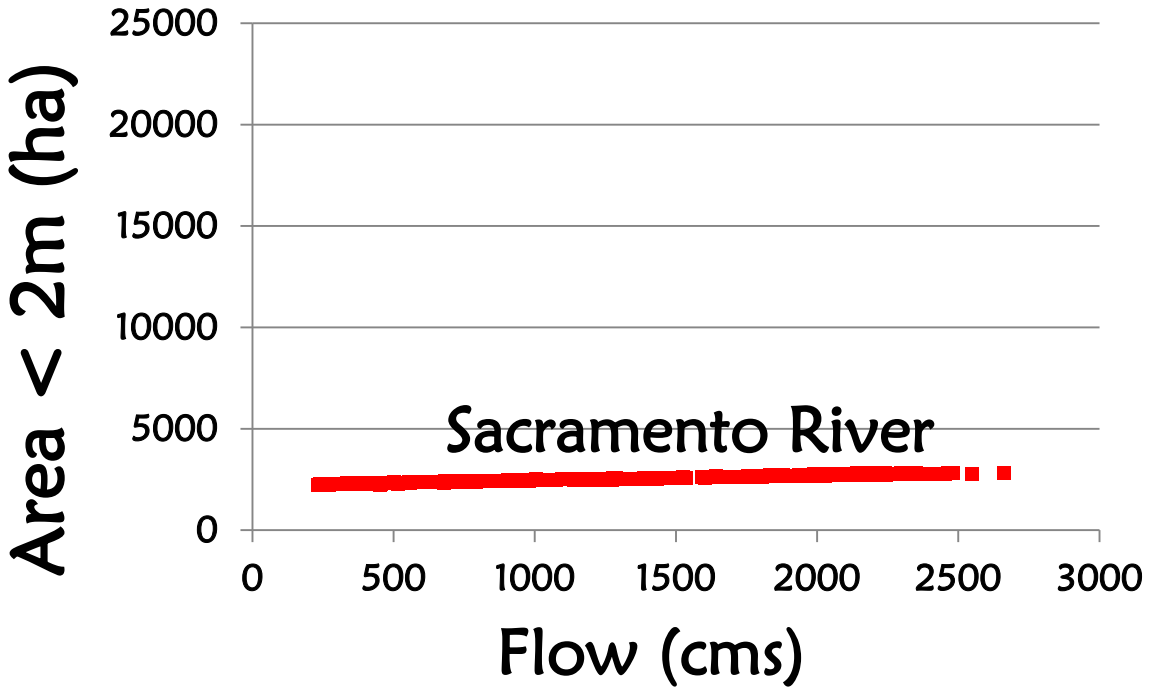


Winter-run sized fish



(del Rosario et al. in review)

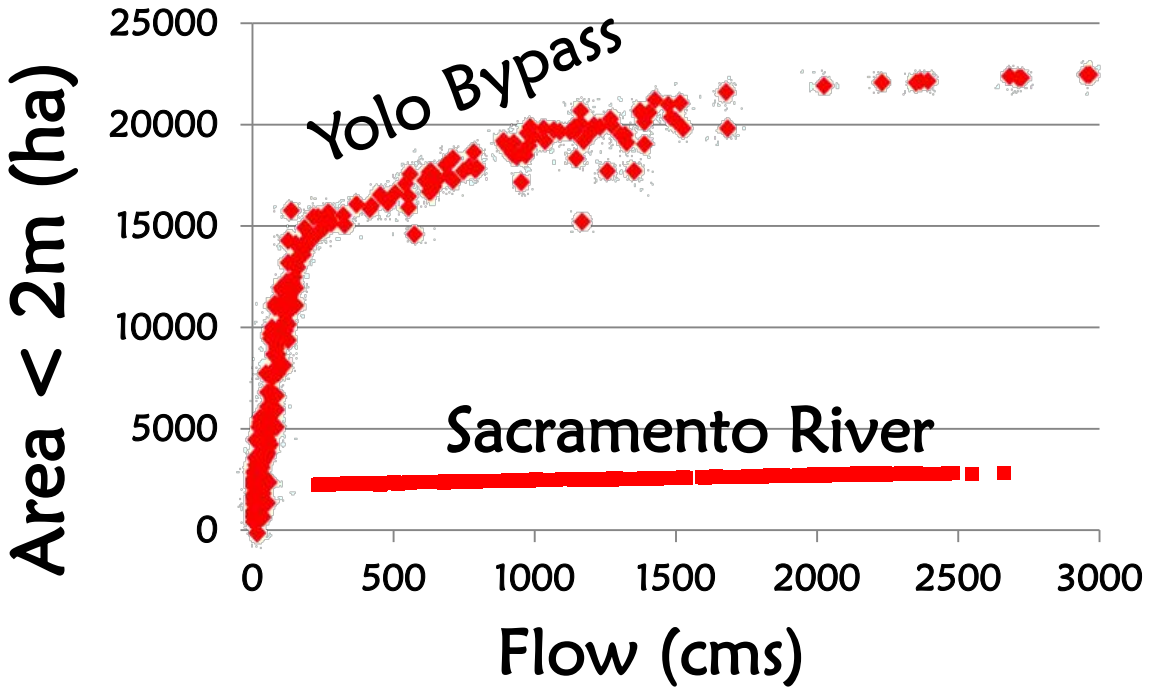
Flow has little effect on habitat area in the lower Sacramento River



Steep Banks = Little Habitat At All Flows

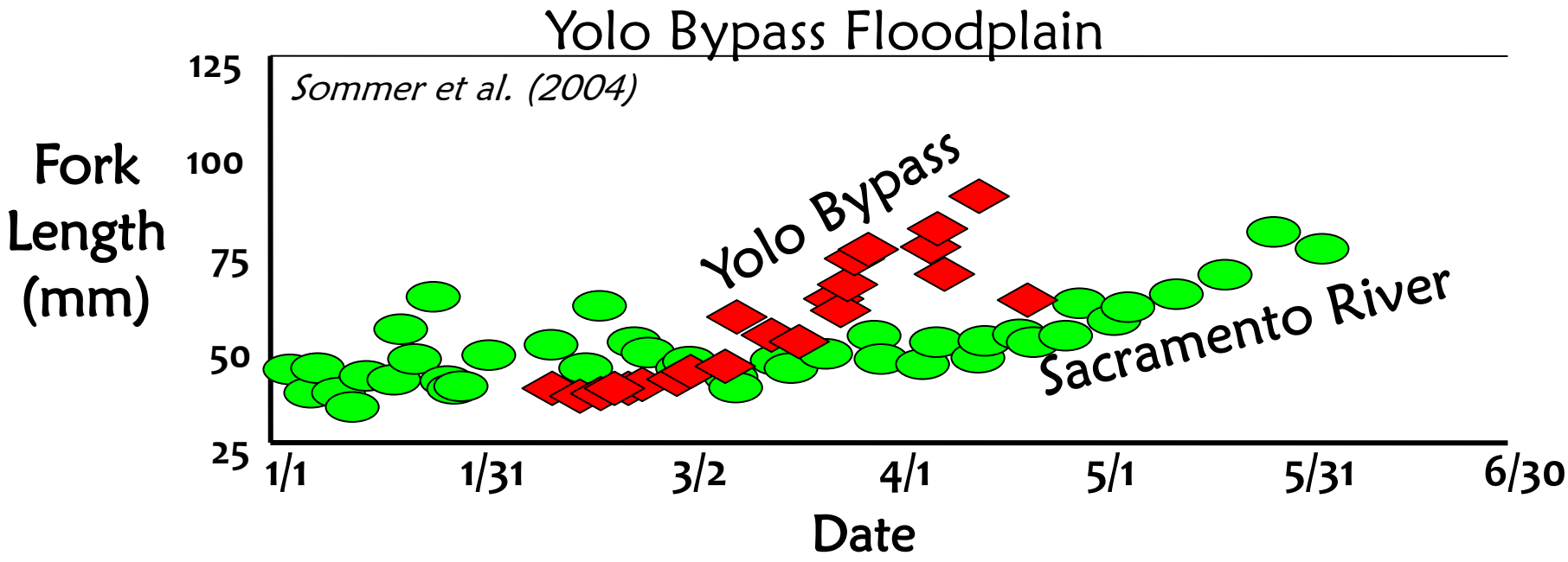
Sommer et al. (2004)

By contrast, even modest Yolo Bypass flows create huge habitat areas



Sommer et al. (2004)

Floodplains support exceptional salmon growth



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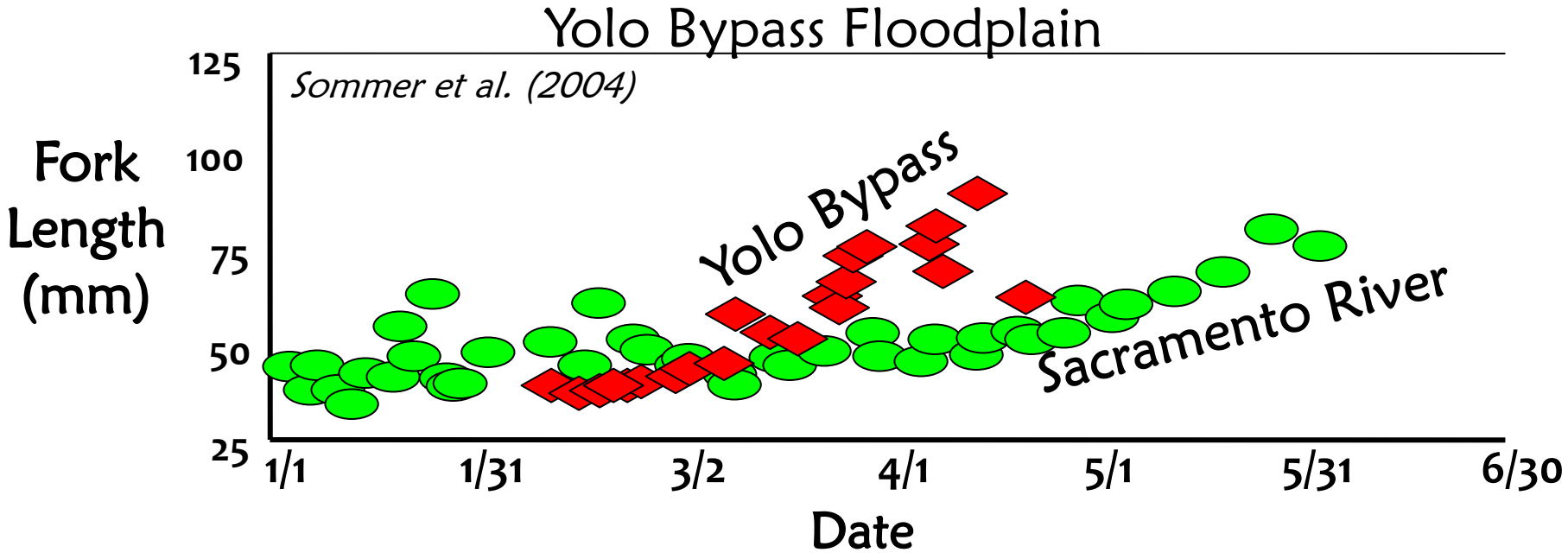
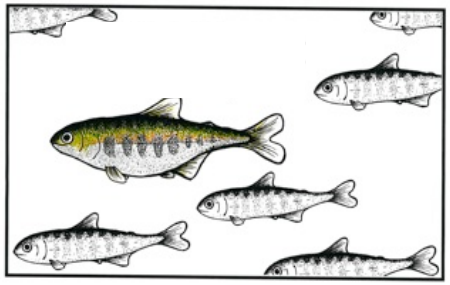


Jeffres et al. (2007)

Rip-Rap is poor rearing habitat for salmon



Young salmon avoid rip-rap

Garland et al. (2002)

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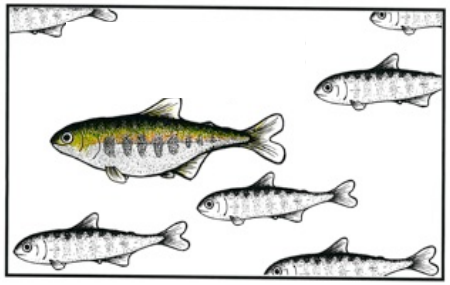

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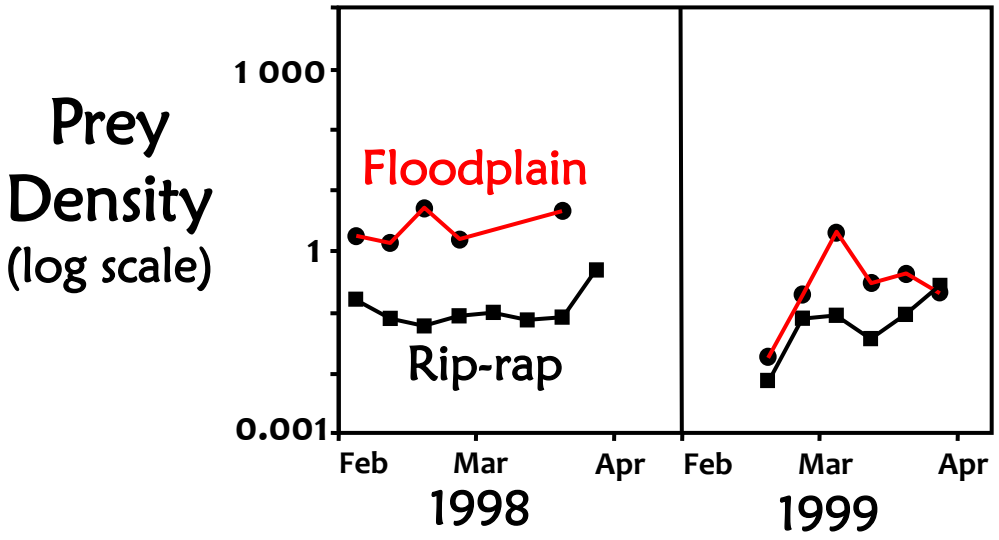
Garland et al. (2002)

Low food in rip-rap channels



Sommer et al. (2001)

Evidence that tidal wetlands are important rearing habitat for salmon

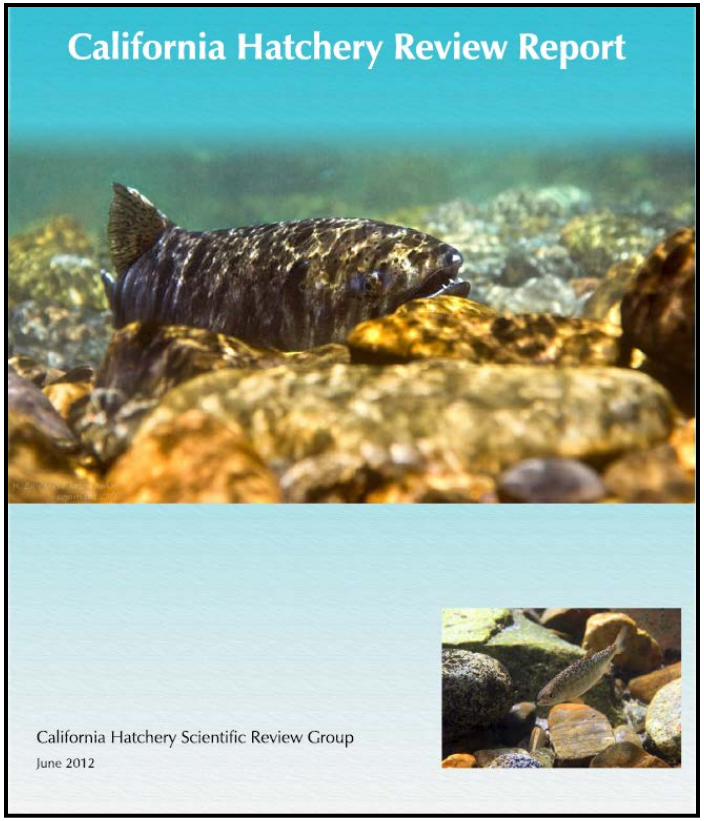
Liberty Island

McLain and Castillo (2010)

Northwestern Estuaries

Shreffler et al. (1990)
Miller and Simenstad (1997)
Bottom et al. (2005a,b)

Hatchery practices need improvement



THE SACRAMENTO BEE sacbee.com

Report recommends changes at California salmon hatcheries

mweiser@sacbee.com

PUBLISHED WEDNESDAY, AUG. 08, 2012

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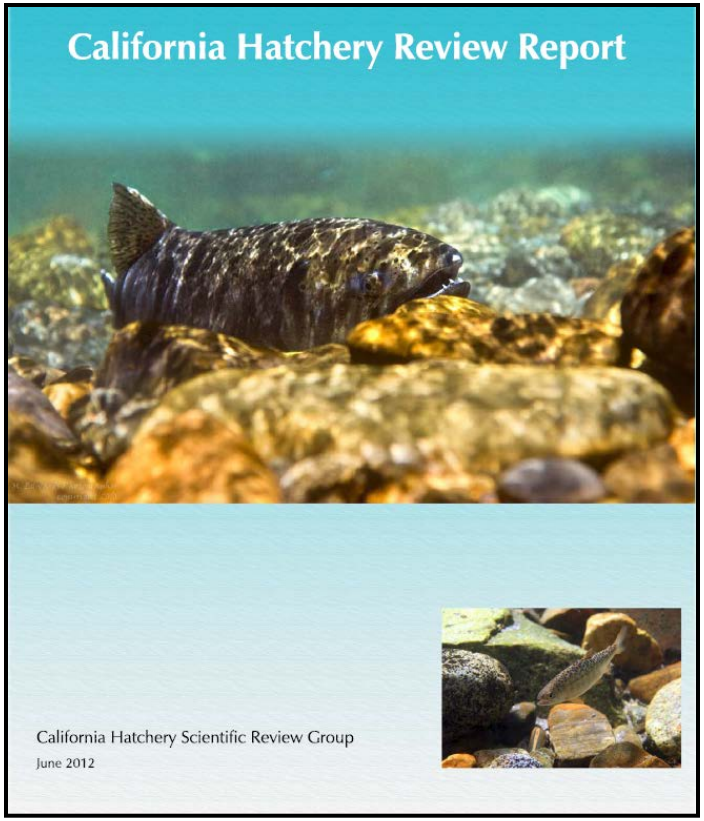

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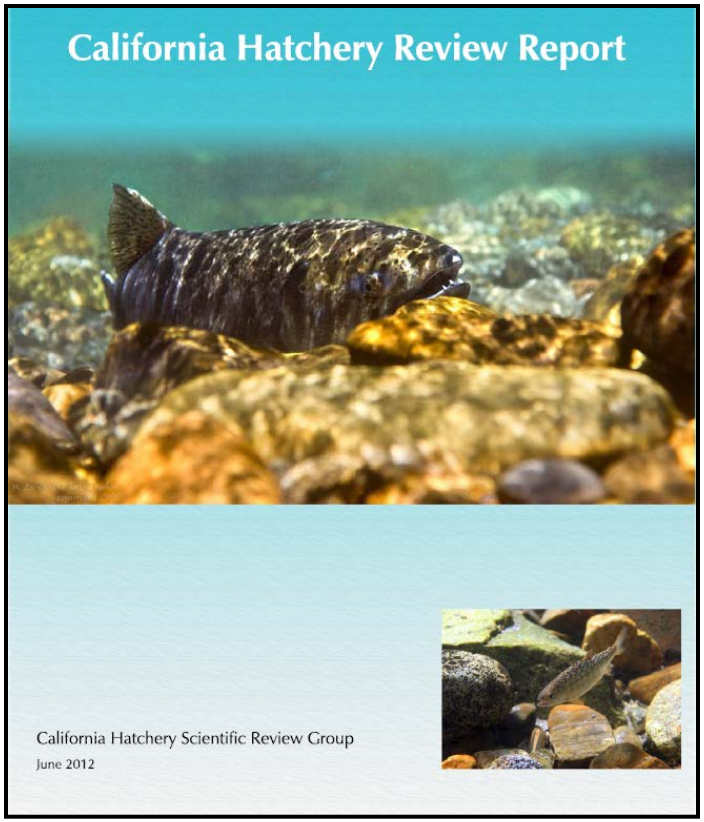
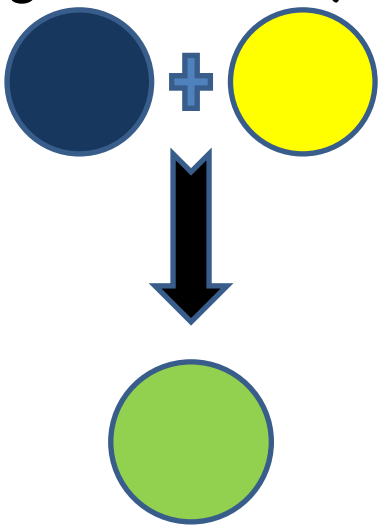


Segregated hatchery & wild



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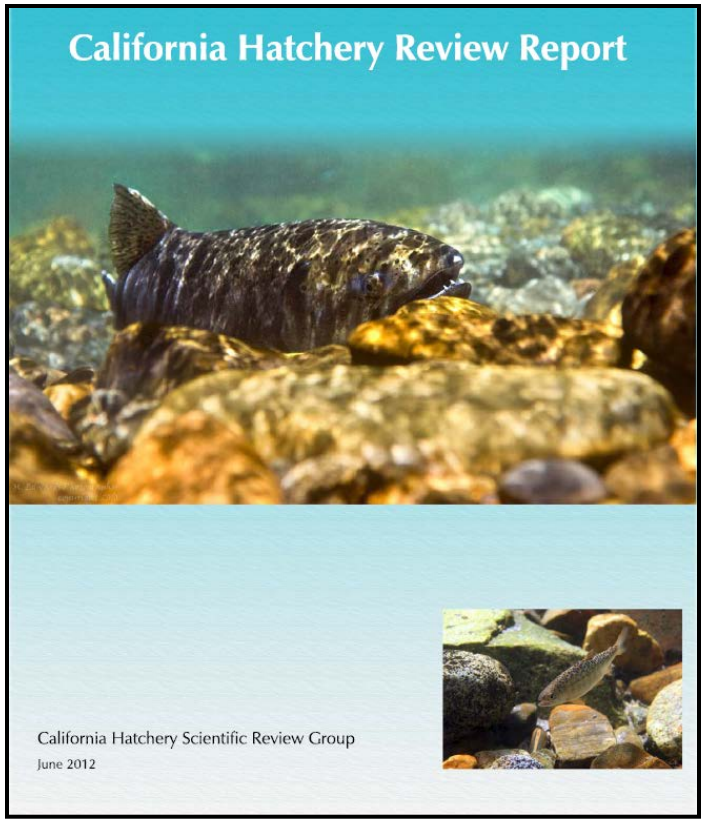

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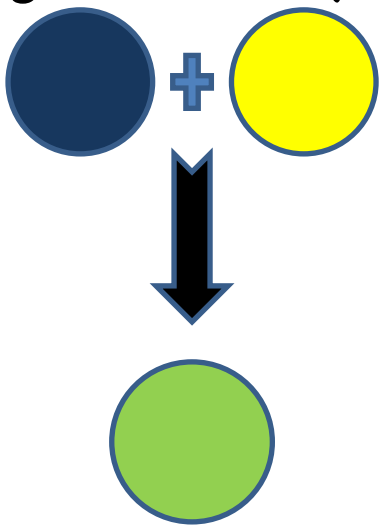

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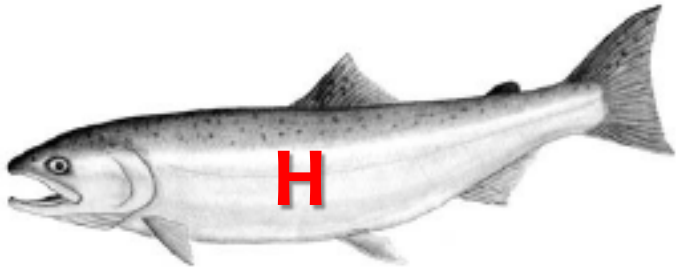

100% Marked

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