Ecological Role of Seasonal Tributaries in California

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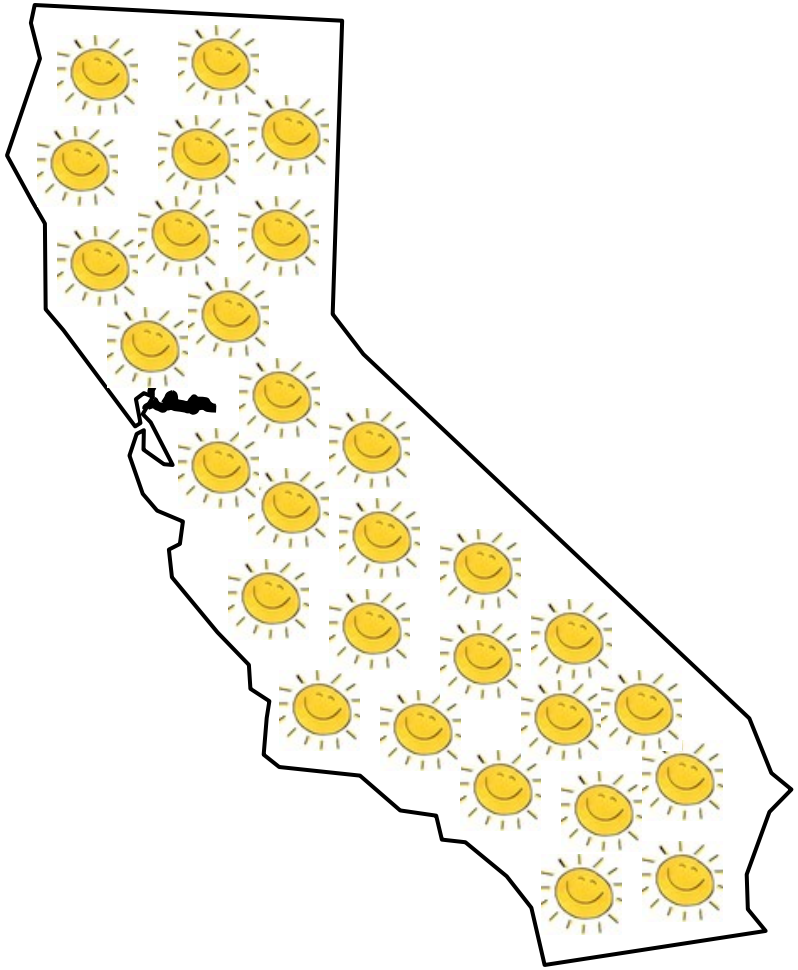
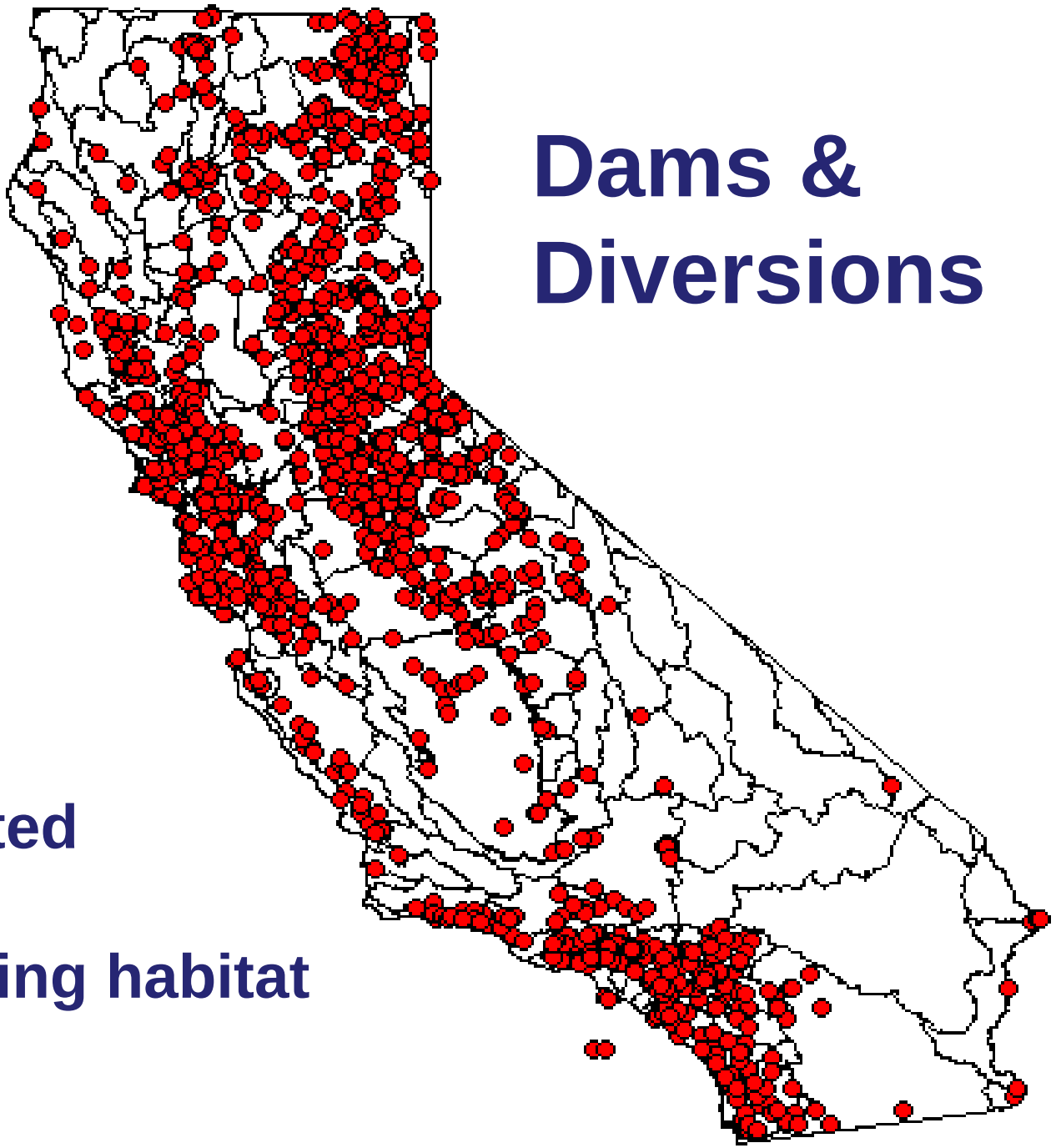
Mediterranean Climate

Cold wet

Hot dry



Extremely altered physical landscape



Dams & Diversions

>60% water diverted

lost >80% spawning habitat

Sacramento River has lost most of it's seasonal habitat

including off channel ponds

seasonal tributaries

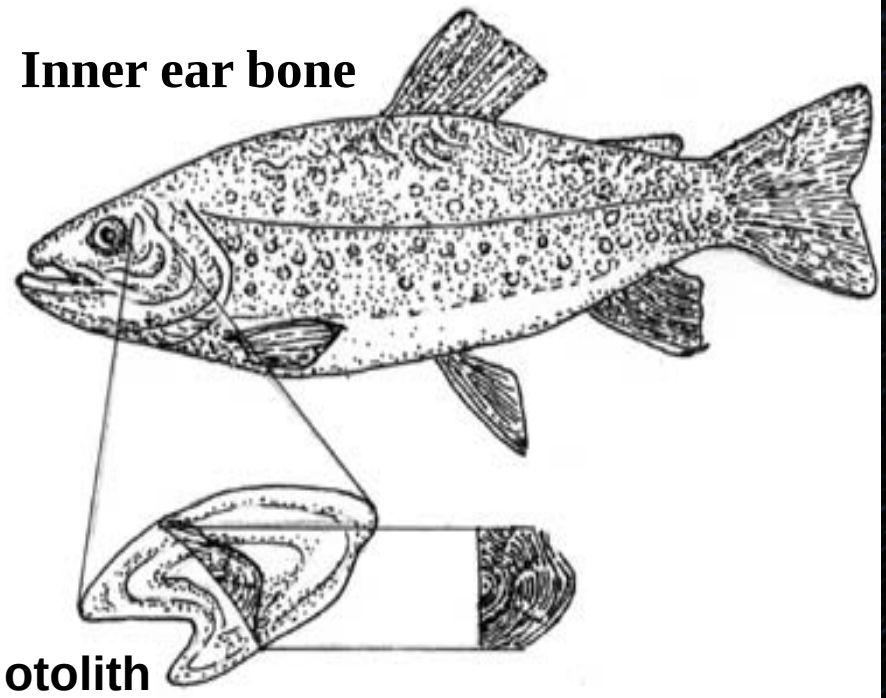
Importance of seasonal tributaries:

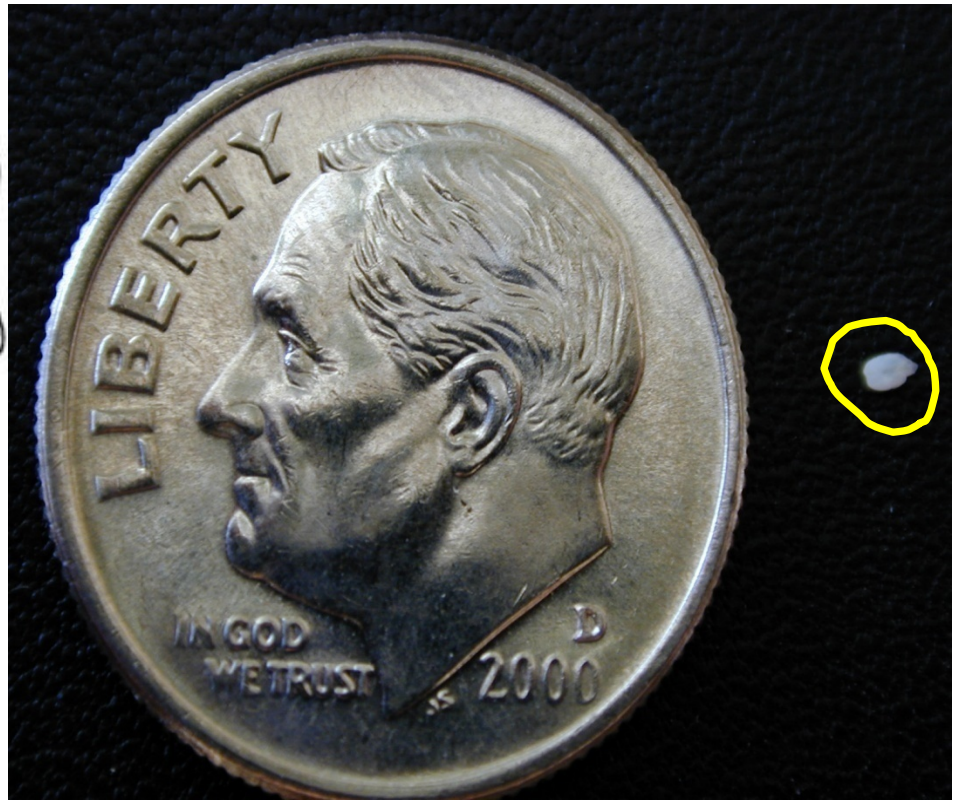
1. juvenile salmon growth
2. dist. & abund. fish larvae
3. macroinvertebrate communities
4. phenotypic plasticity of salmon

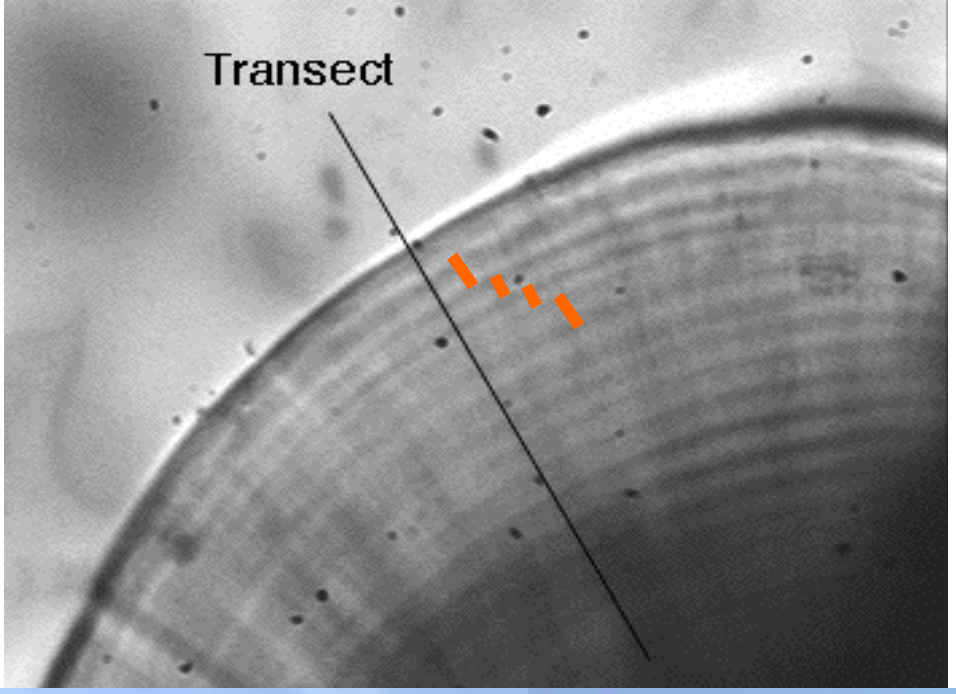
Juvenile Salmon Growth

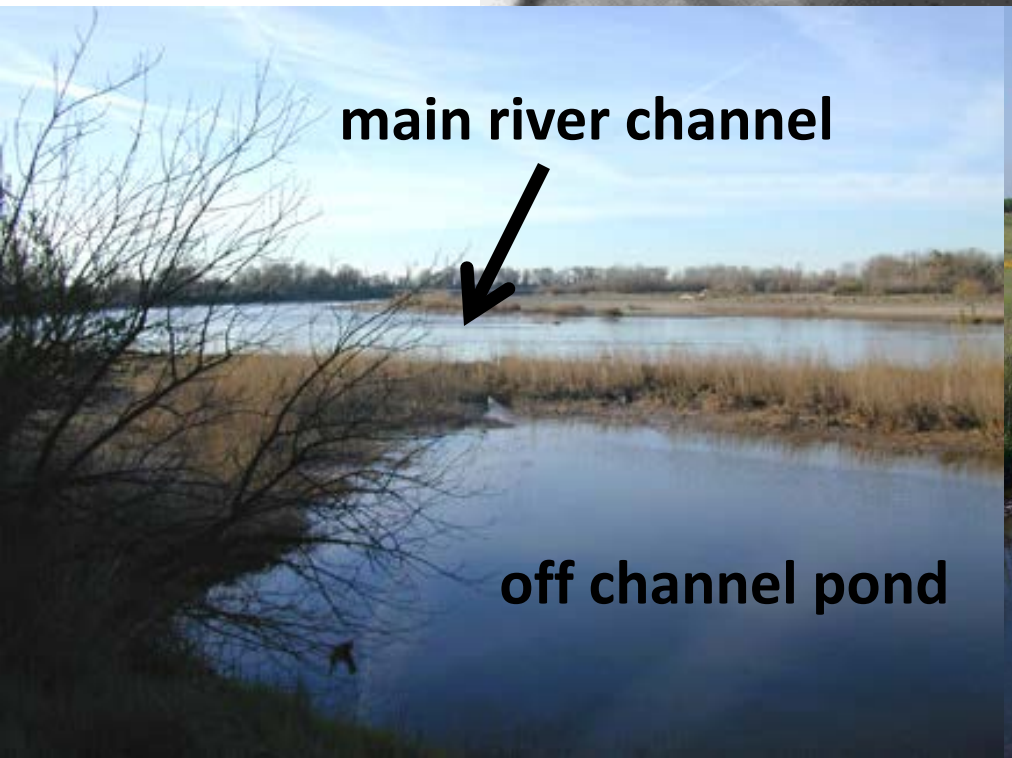
(Limm & Marchetti 2009)

Otolith Microstructure





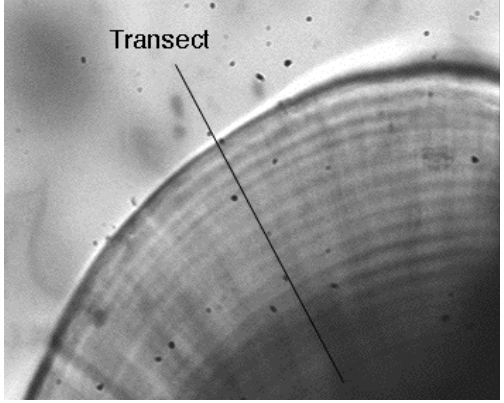

Transect


main river channel
off channel pond


seasonal tributary

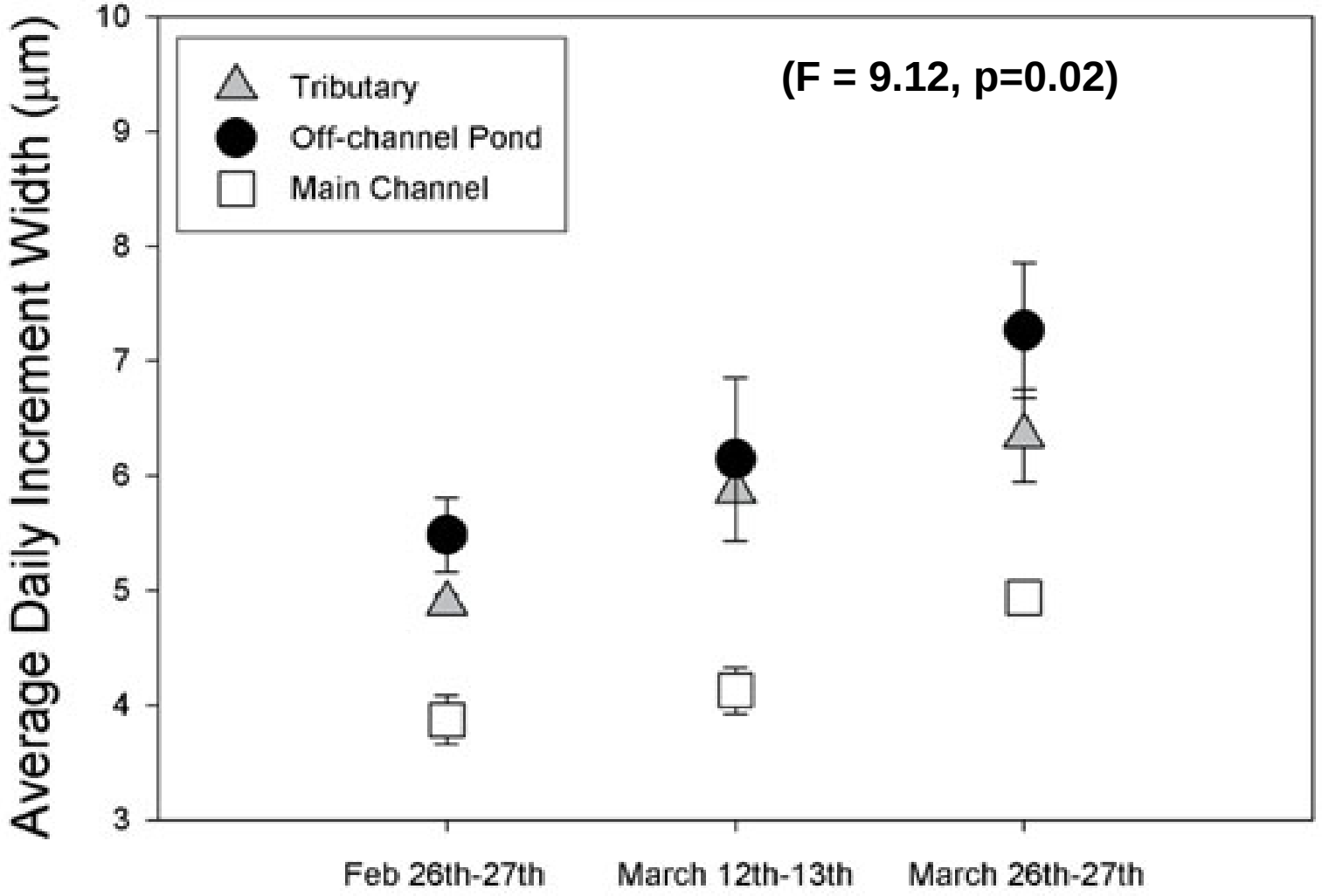
Examine :

1. growth rate (otoliths)

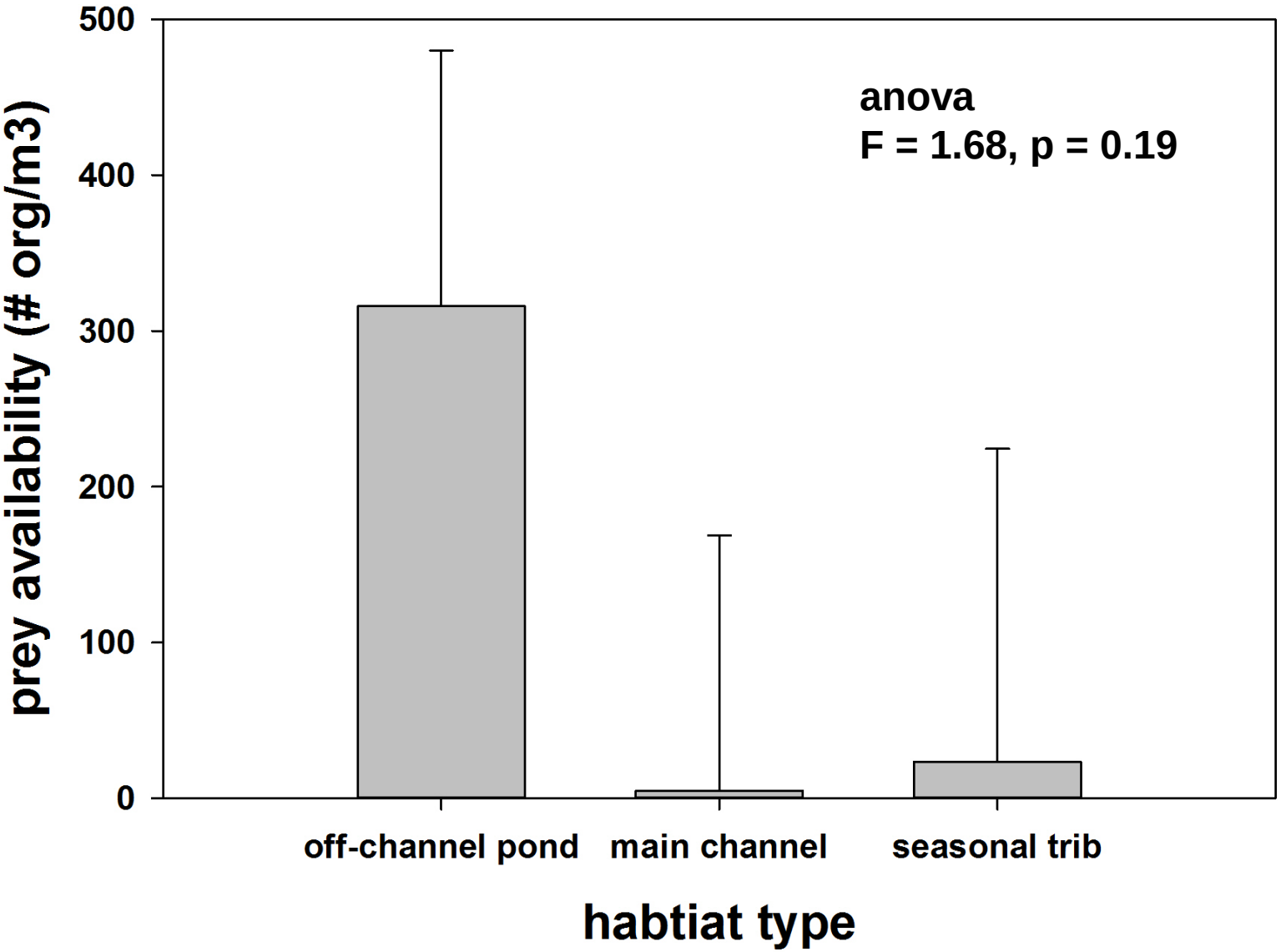


1. food availability (# aquatic insects)

Results: Growth

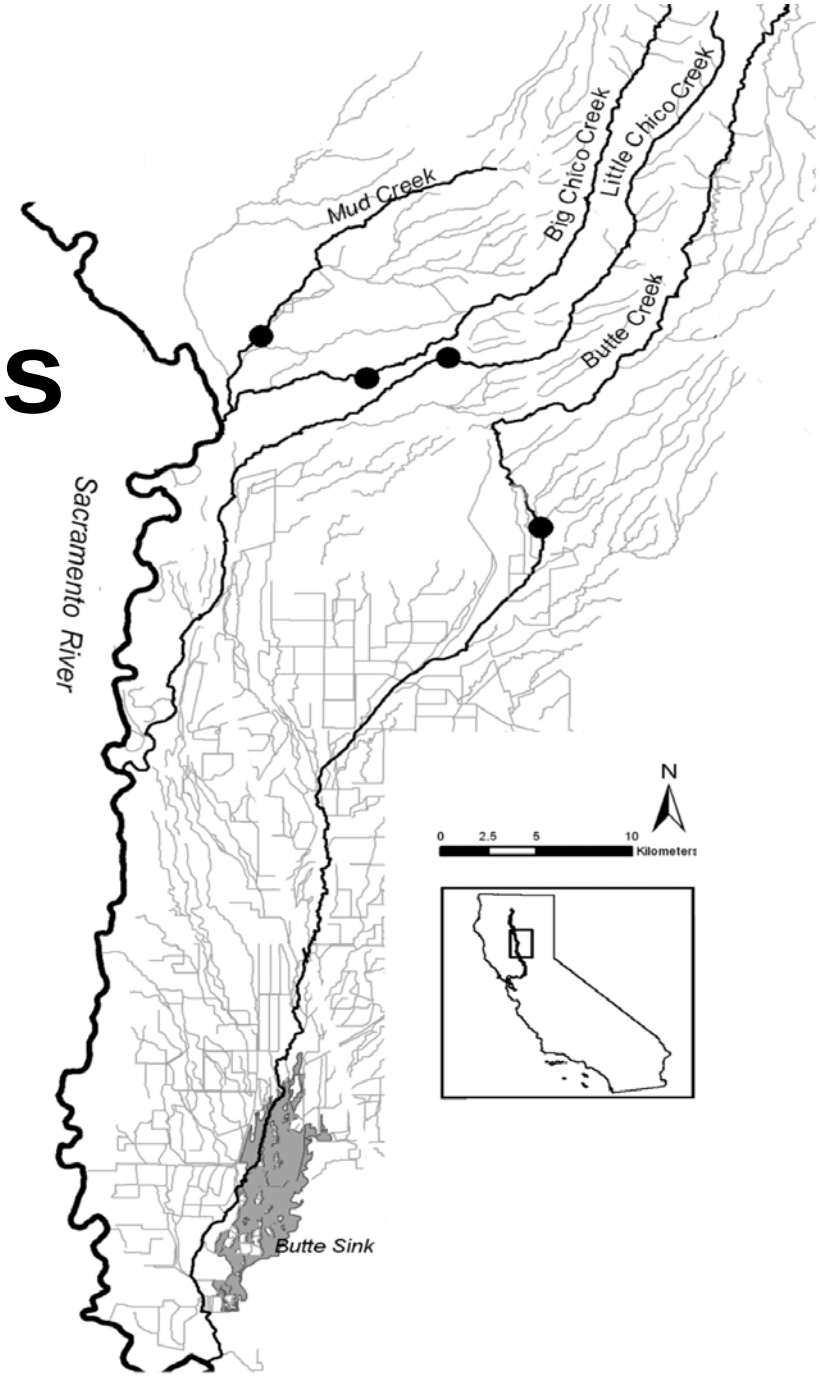


Prey availability

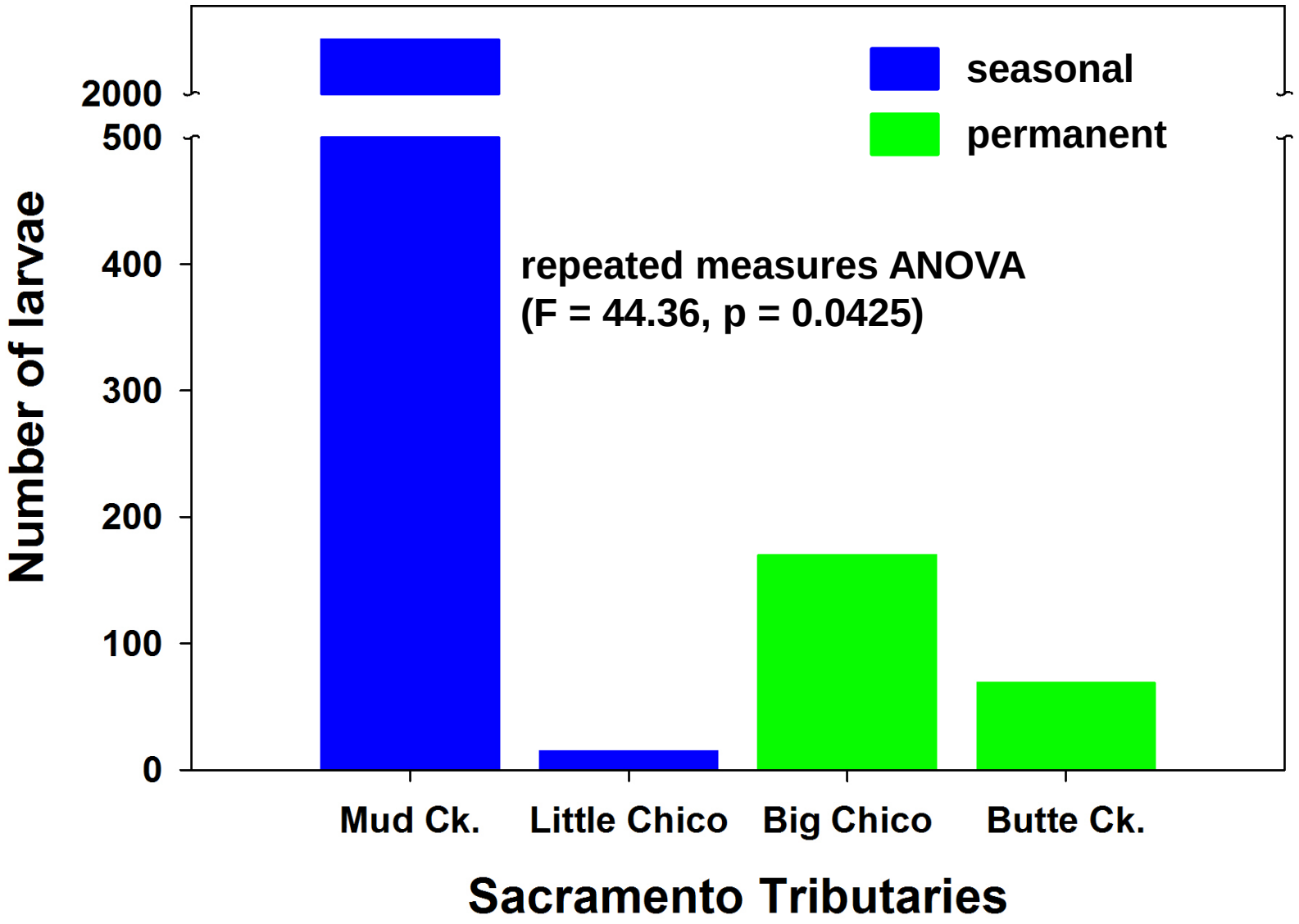


Larval fish in seasonal tributaries
(Lorig & Marchetti 2013)

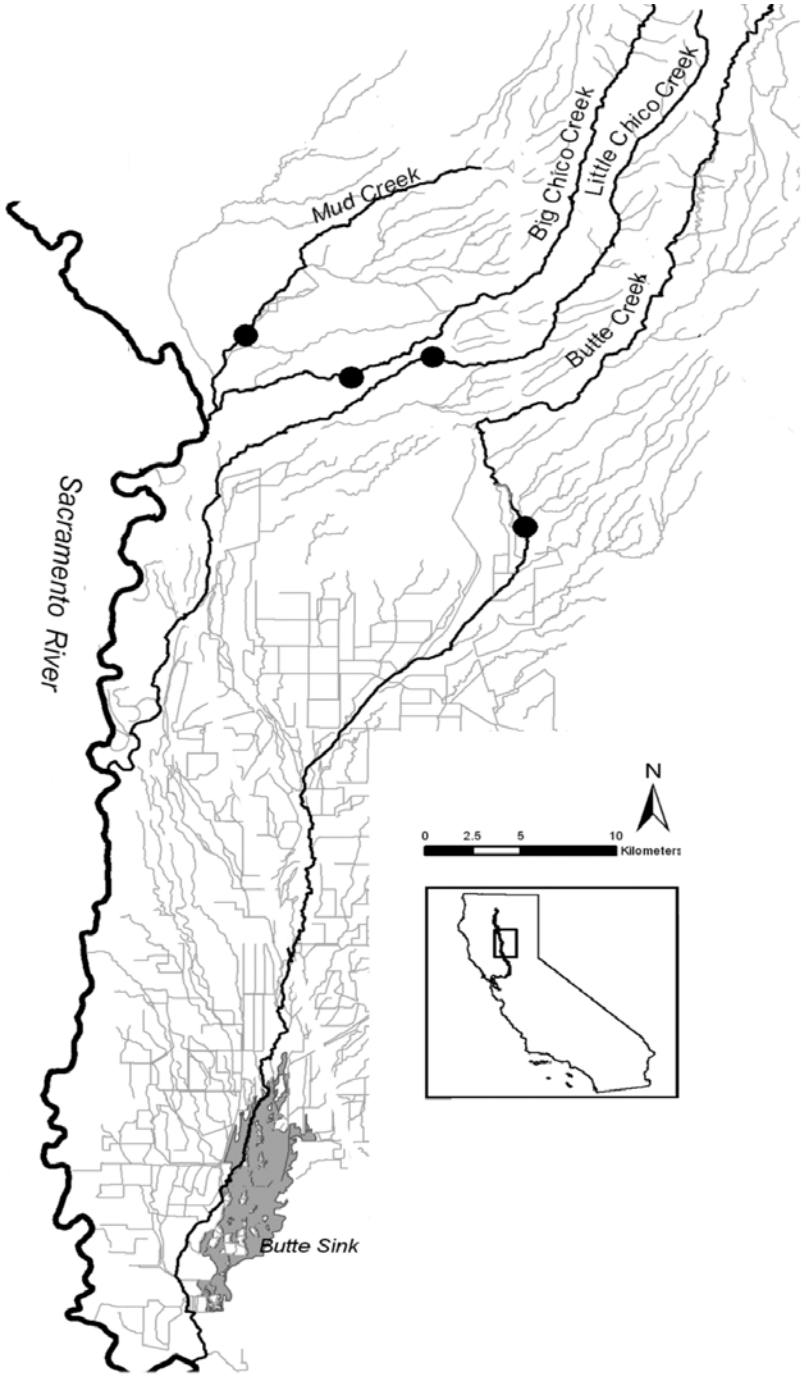
Compare of four streams



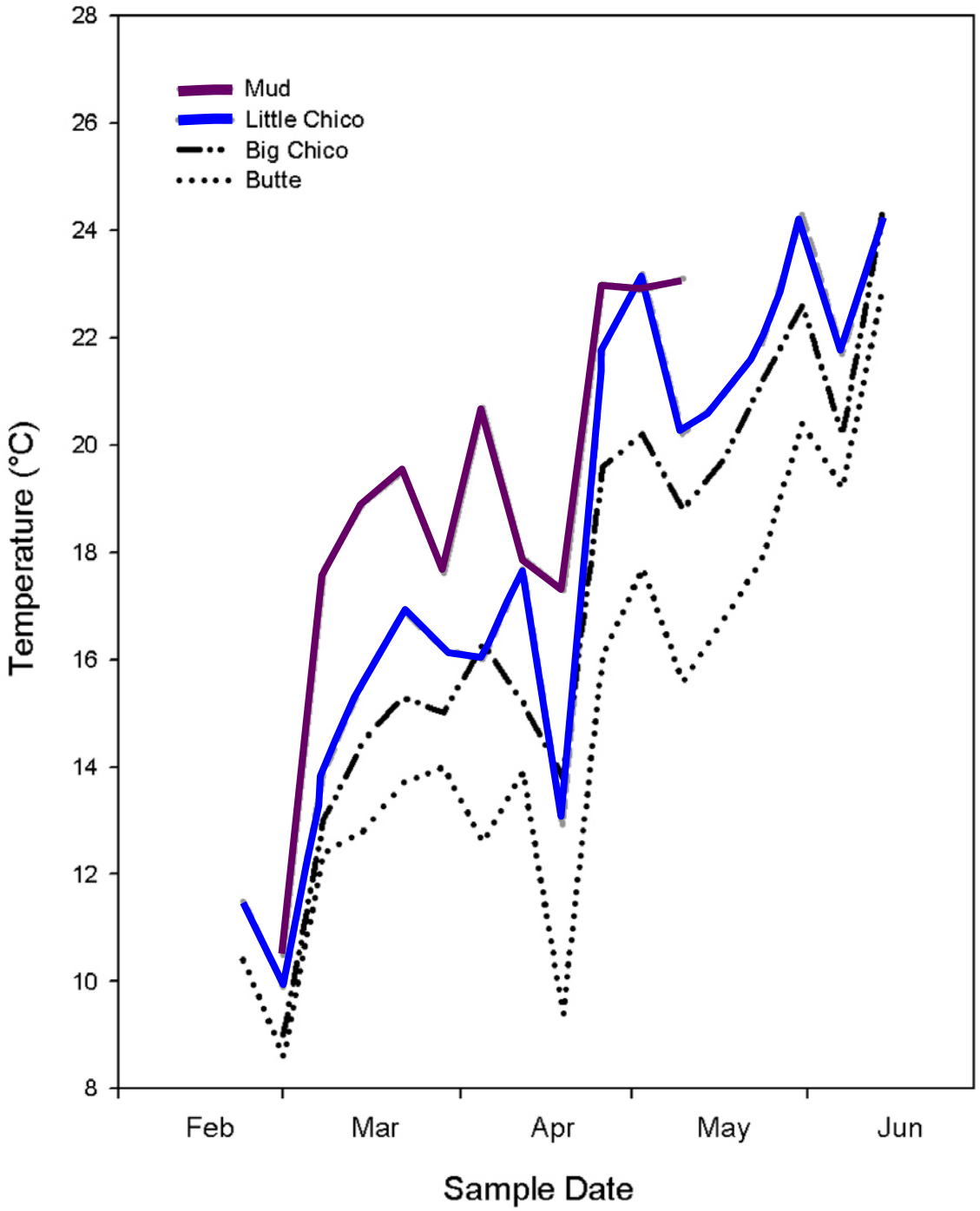
Total Number of Fish Larvae



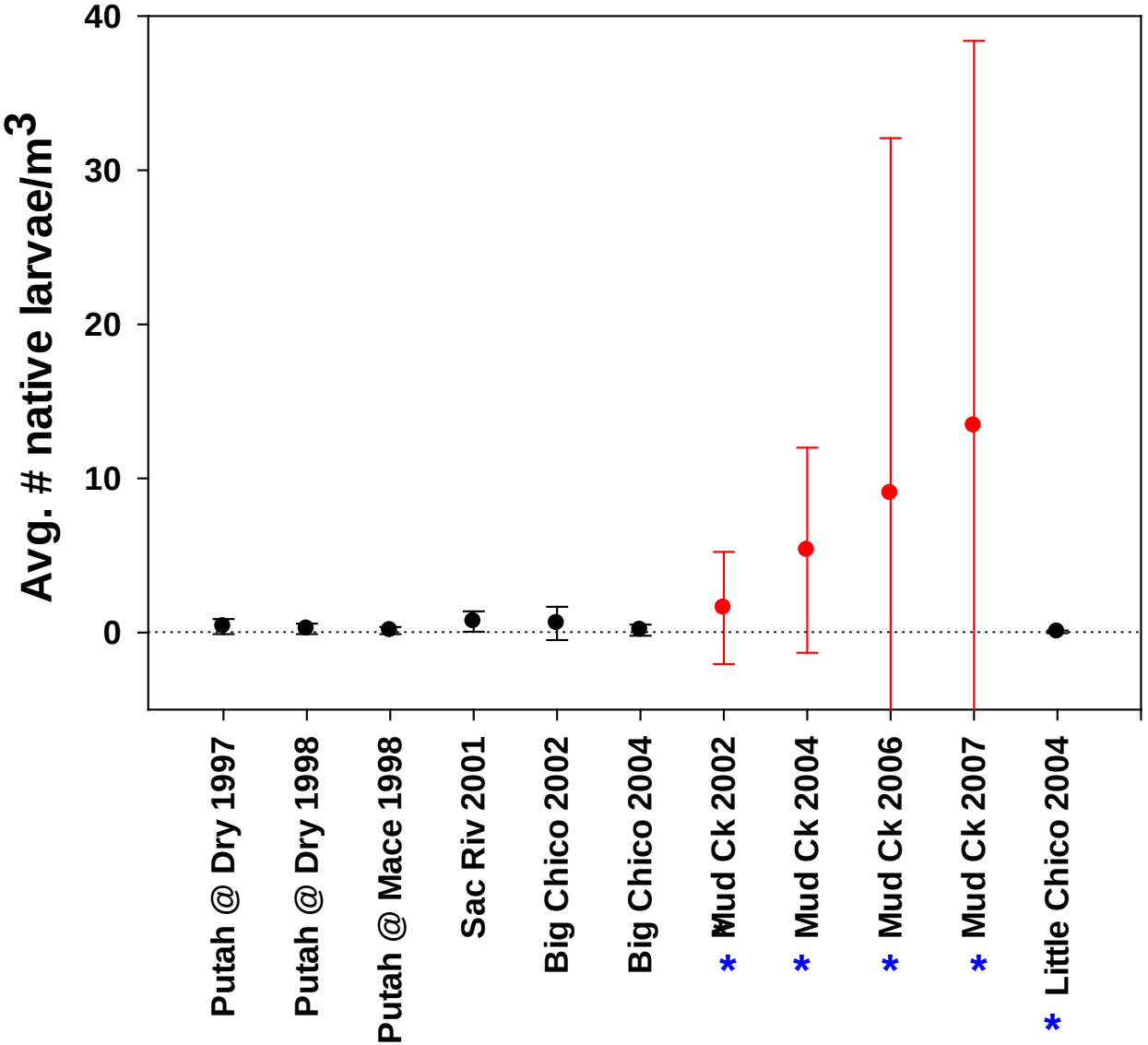
Distance to confluence makes a difference for seasonal streams



Consistent Temperature Differences



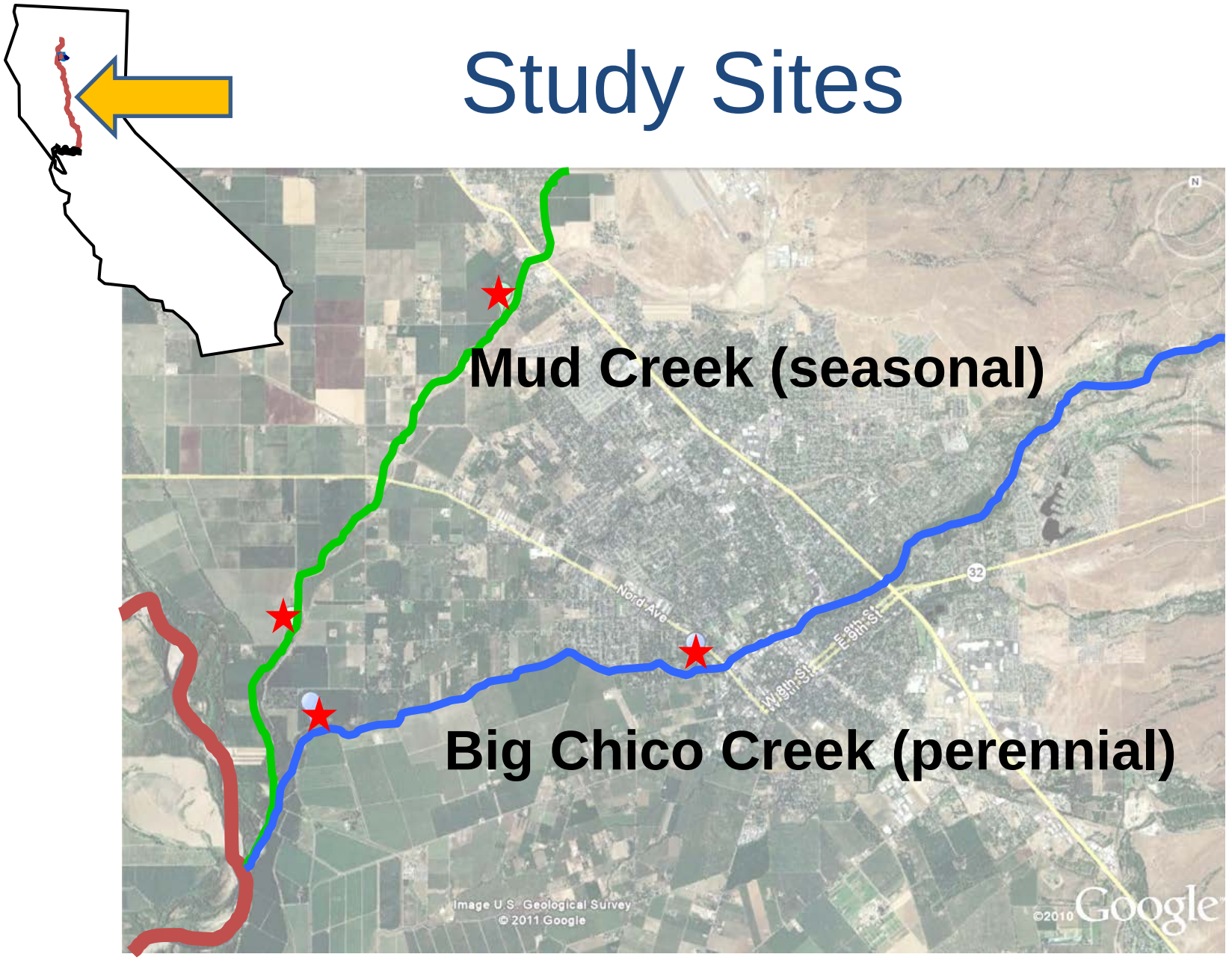
Average density fish larvae: N. CA streams



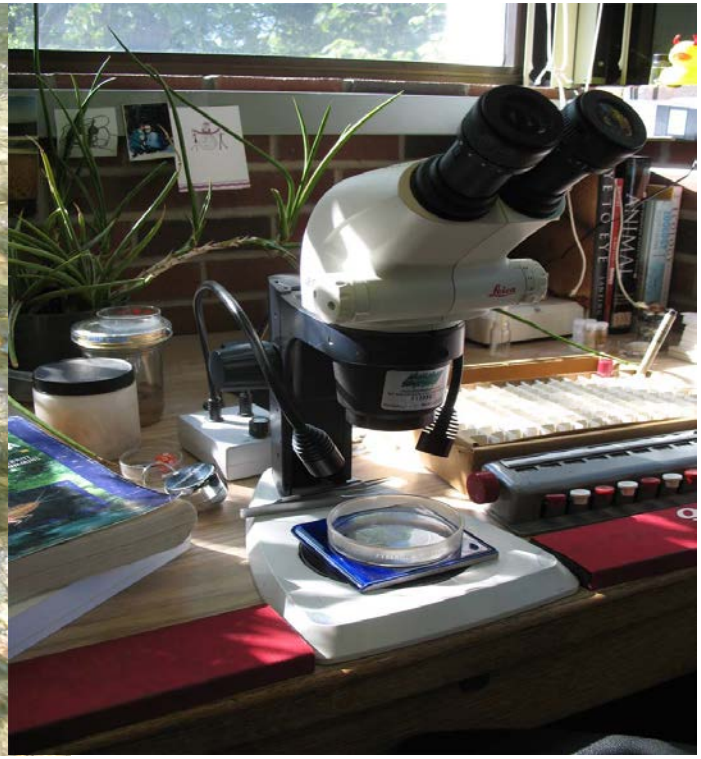
Macroinvertebrate drift communities in seasonal tributaries

(***Benigno & Marchetti 2016 in prep***)

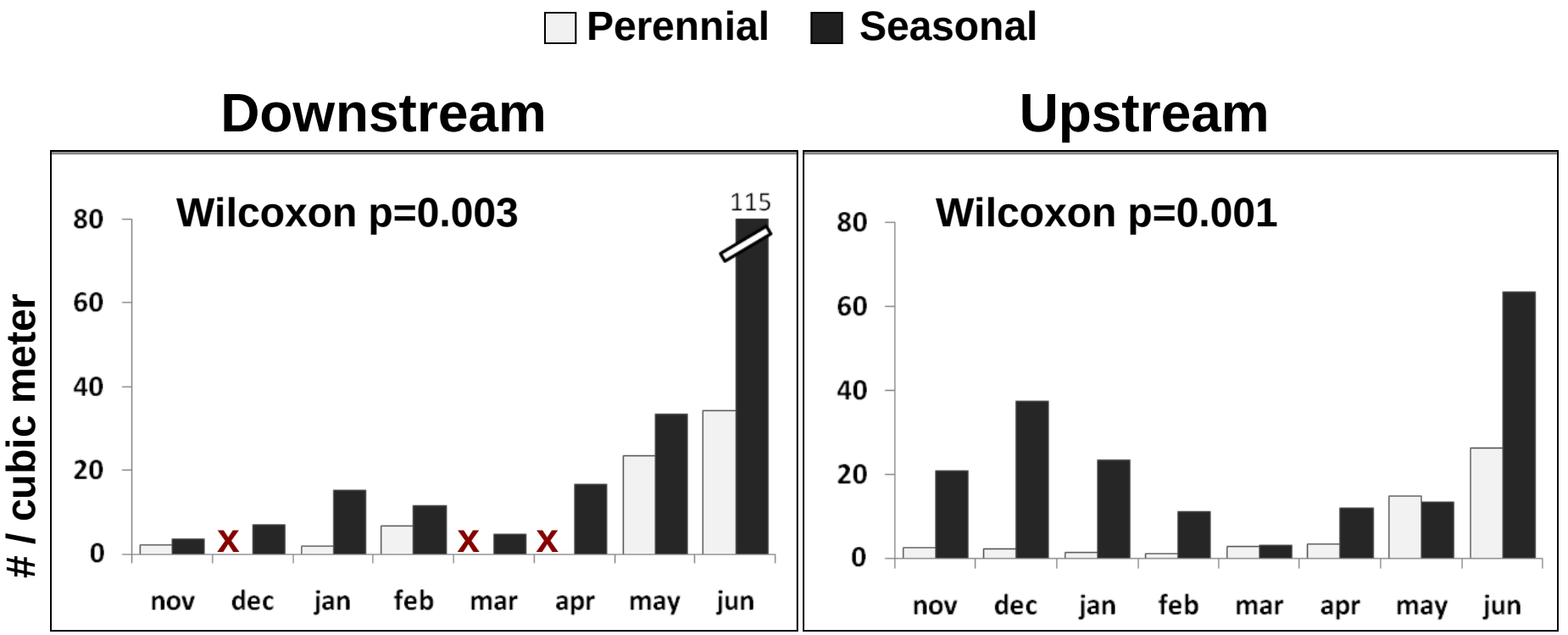
Study Sites


Mud Creek (seasonal)
Big Chico Creek (perennial)
Nord Ave
W 8th St
E 8th St
32
Image U.S. Geological Survey
© 2011 Google
©2010 Google

Drift samples
ID to genus

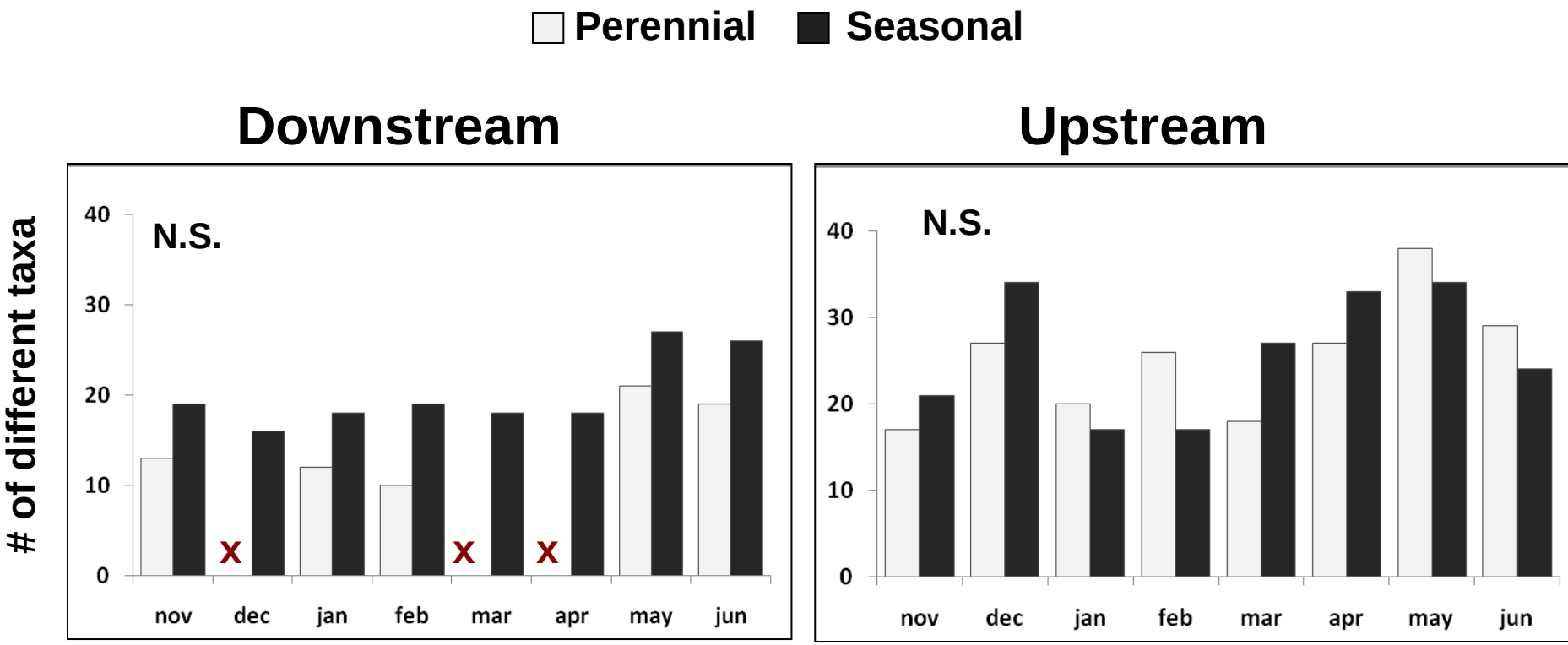


Drift Density



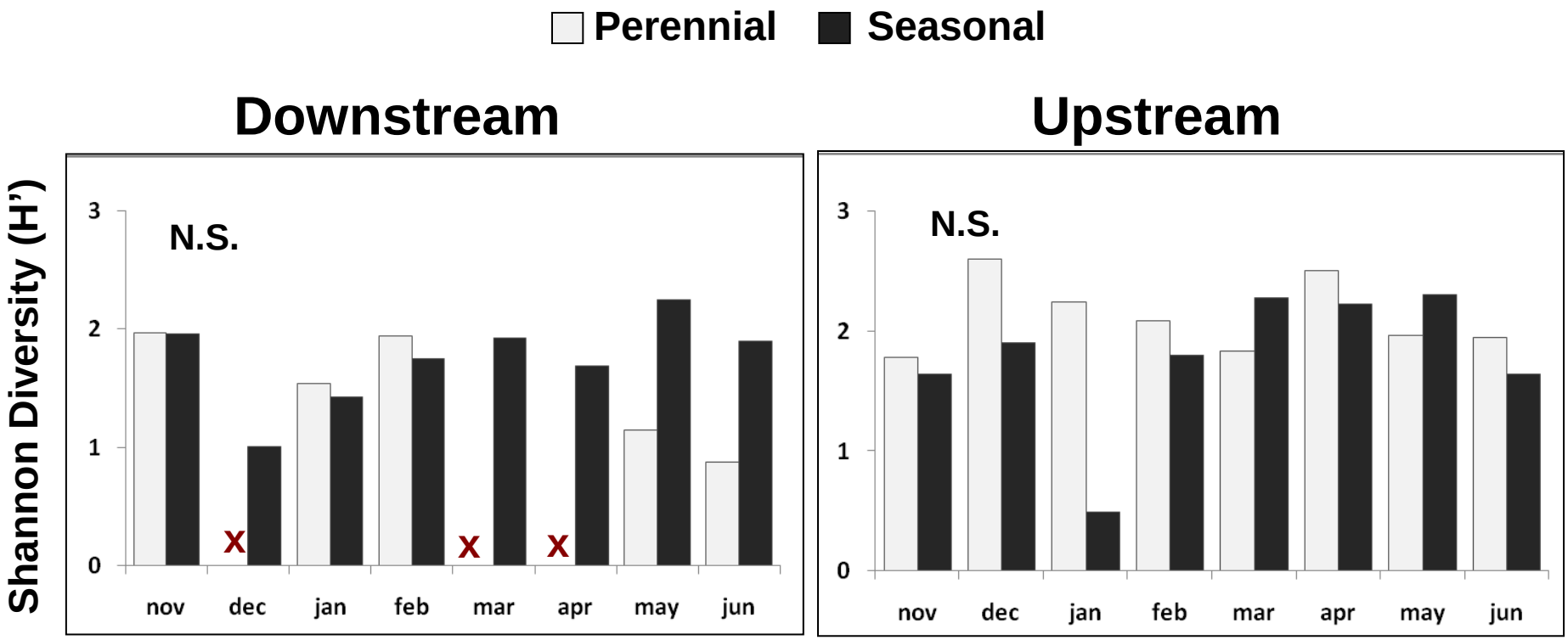
Higher in the seasonal tributary

Taxonomic Richness



N.S. - high taxonomic richness in both streams

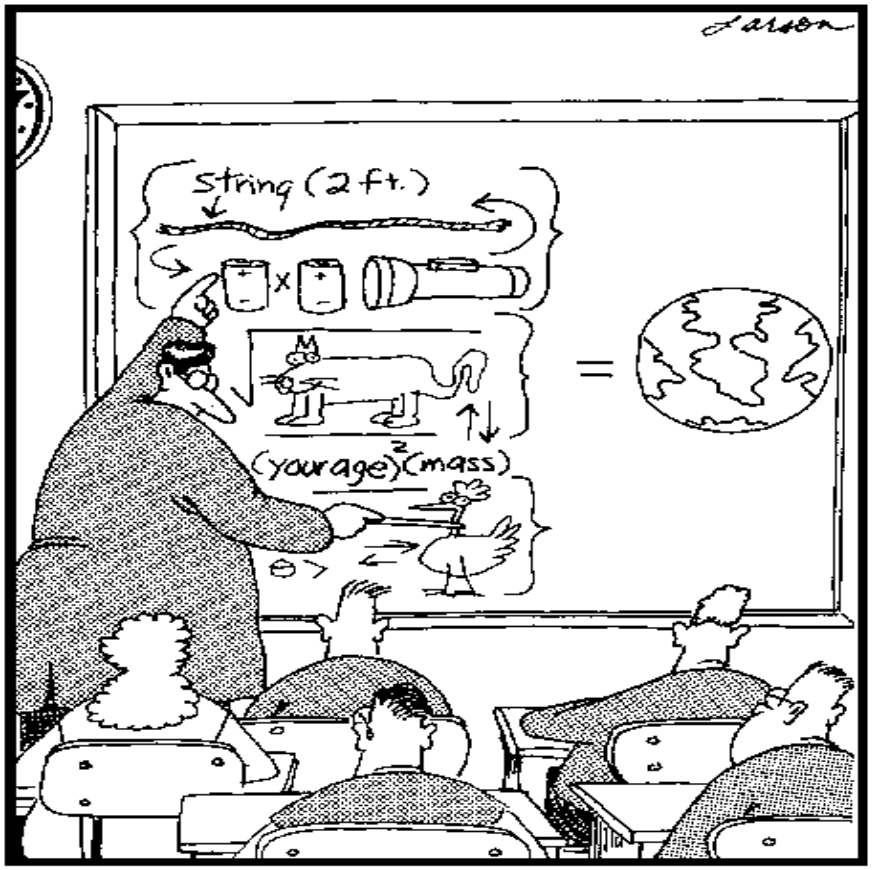
Shannon Diversity



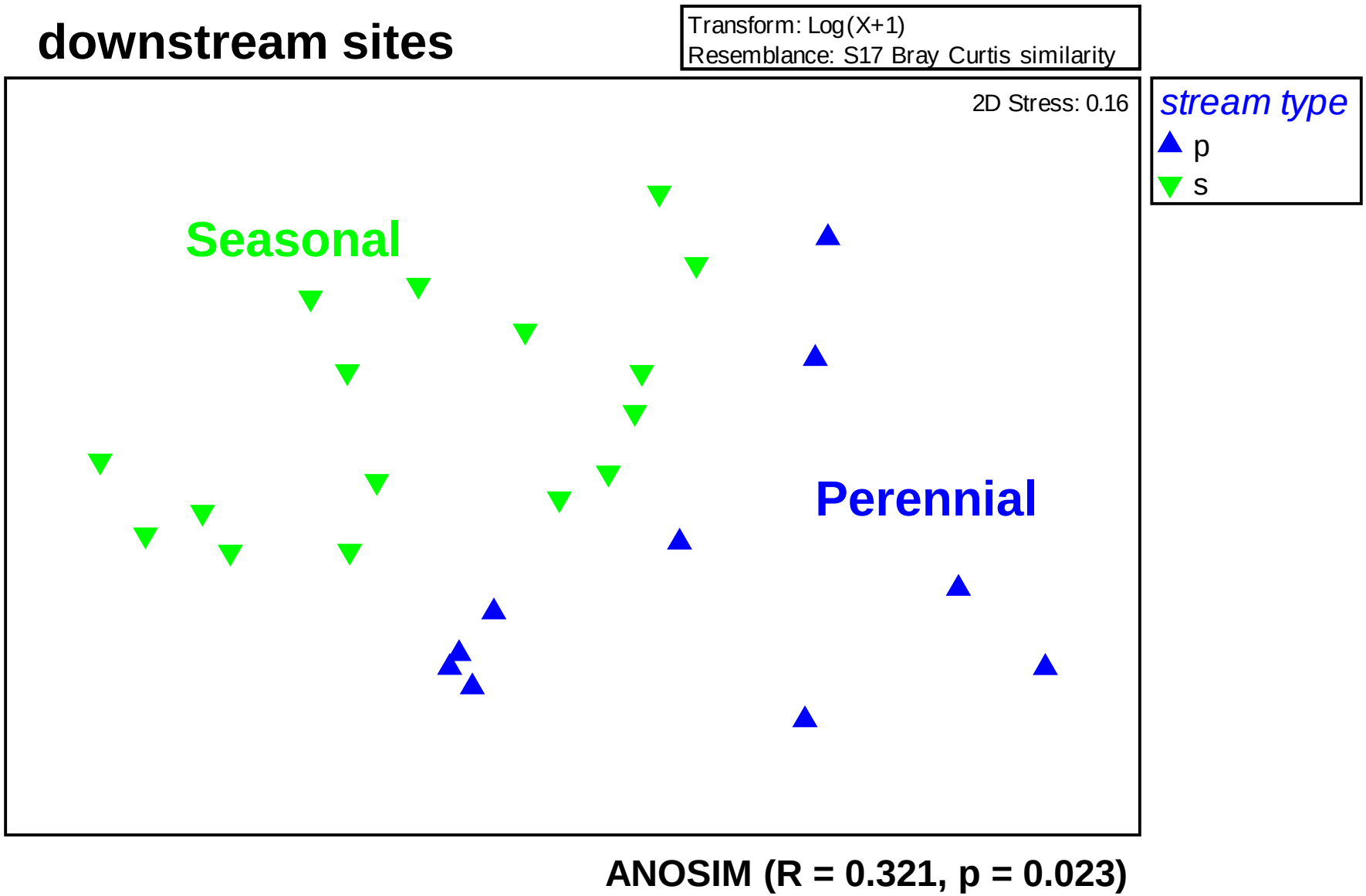
No major differences in diversity

Community Membership

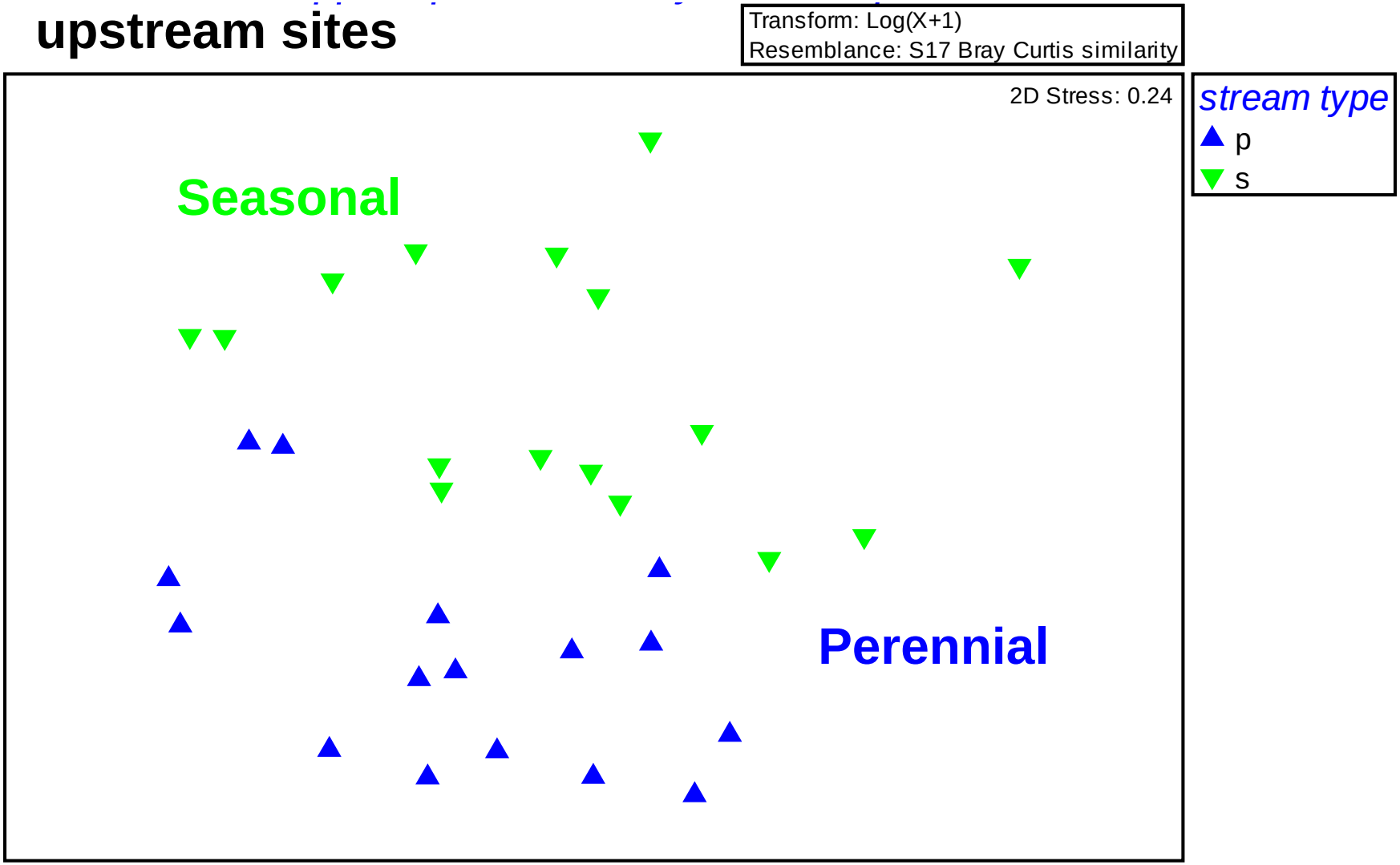
Nonmetric Multidimensional Scaling



Community membership - NMDS



Community membership - NMDS



Faunal Differences

Perennial

Terrestrial

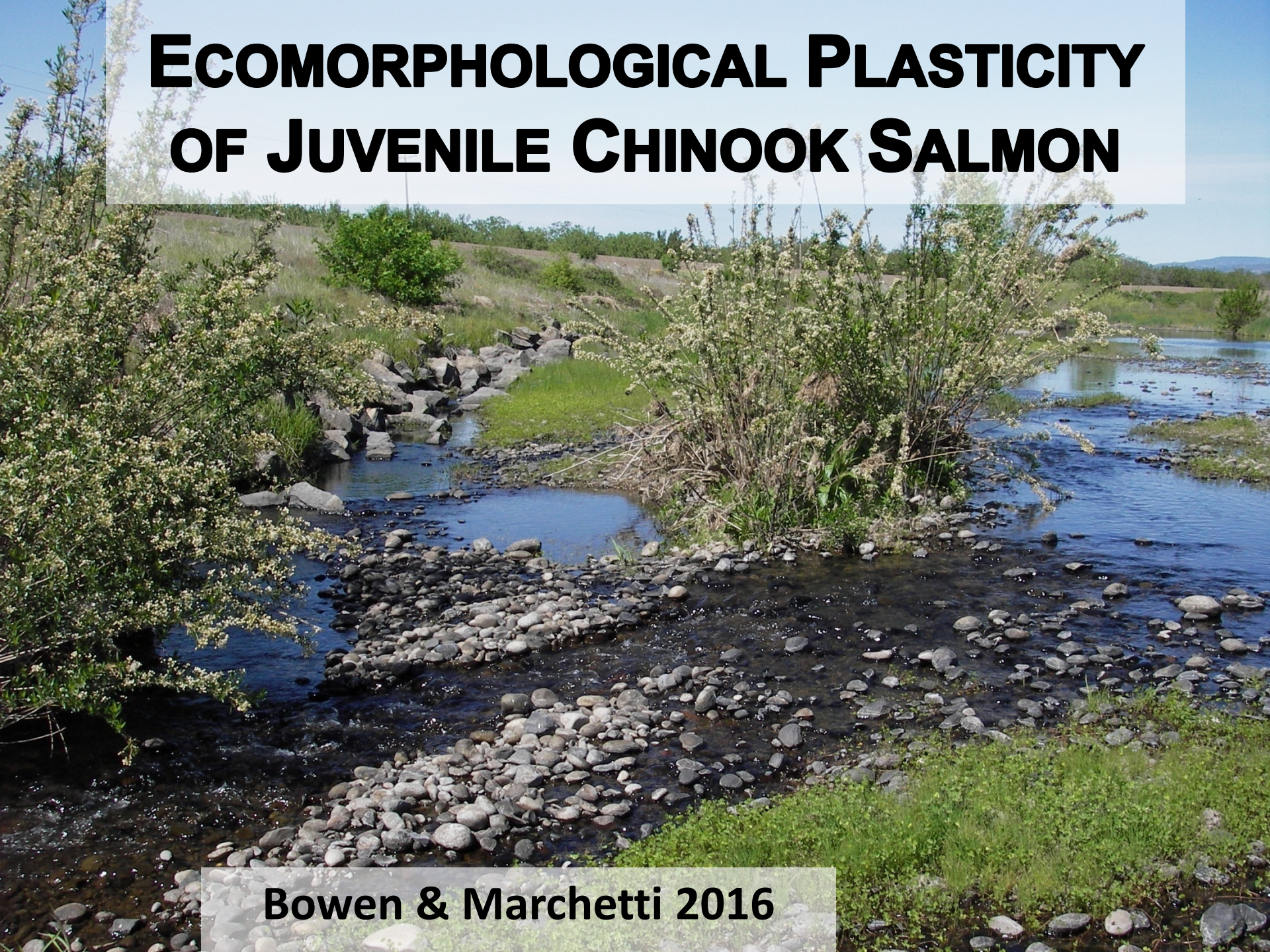
Seasonal

Chironomidae

Zooplankton

Ephemeroptera

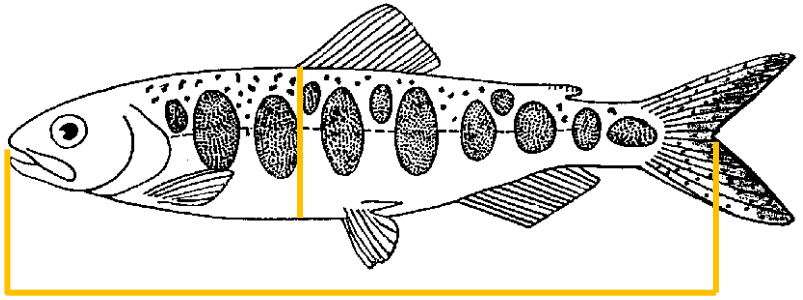
Ecomorphological Plasticity of Juvenile Chinook Salmon



Bowen & Marchetti 2016

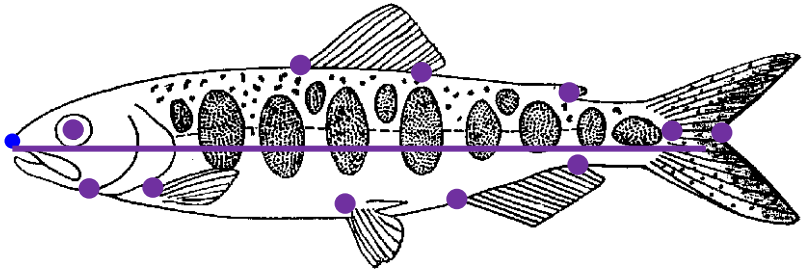
Geometric Morphometrics

multivariate statistical analysis of Cartesian coordinate data

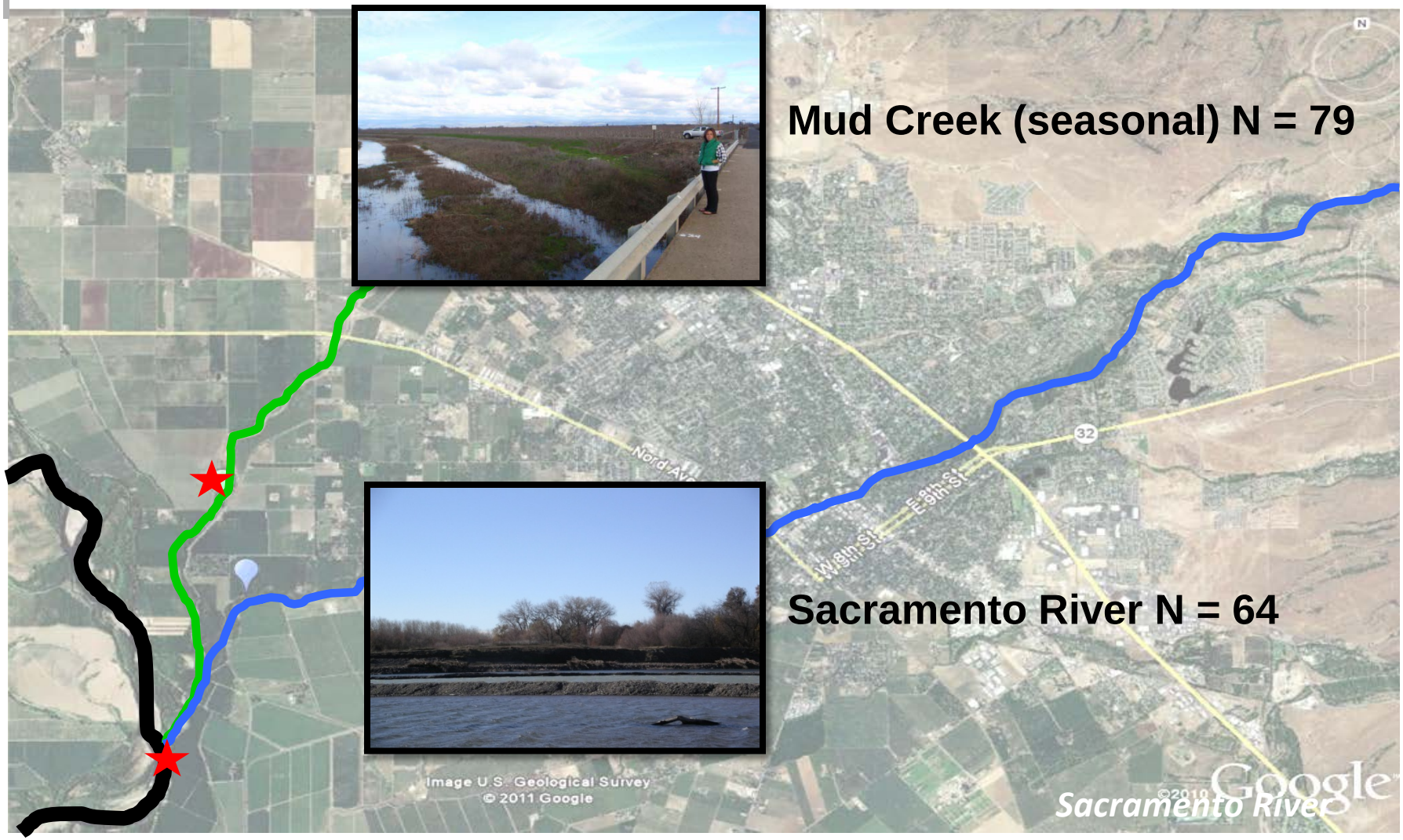


Rohlf and Marcus (1993)

- **Multiple anatomically homologous landmarks**



Compare Salmon morphology



Field Methods

Field Data Collection

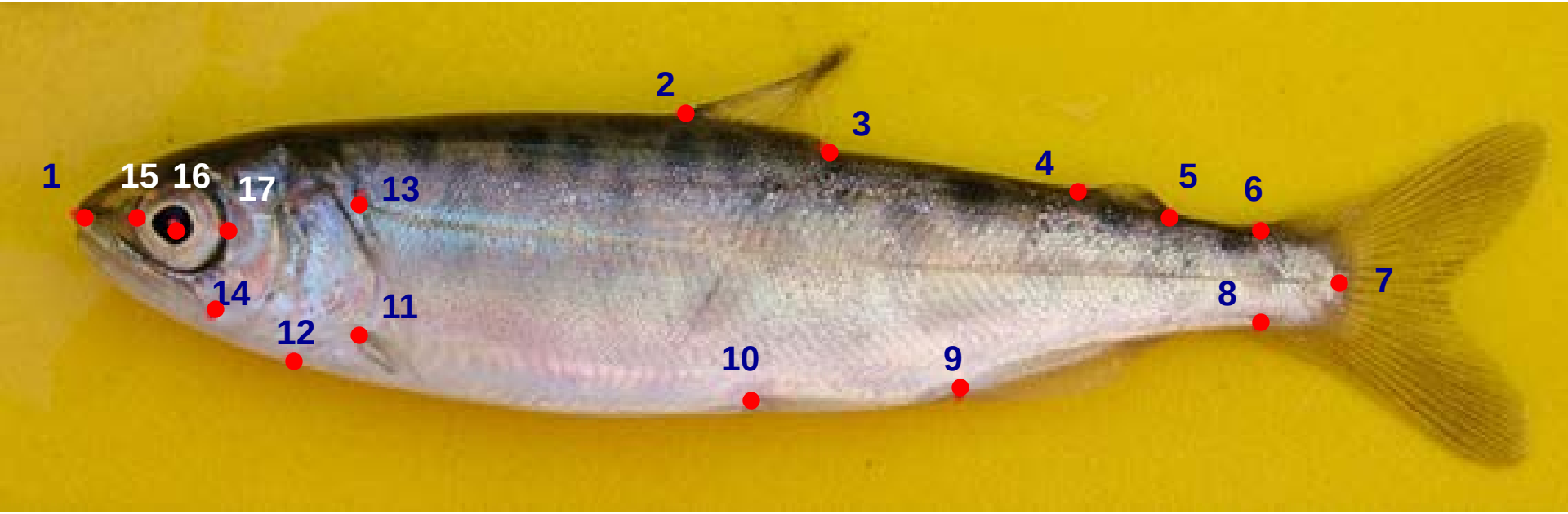
Juveniles collected,

sedated & photographed

Photos with tri-pod

Standard perpendicular position

Digitize Anatomical Landmarks

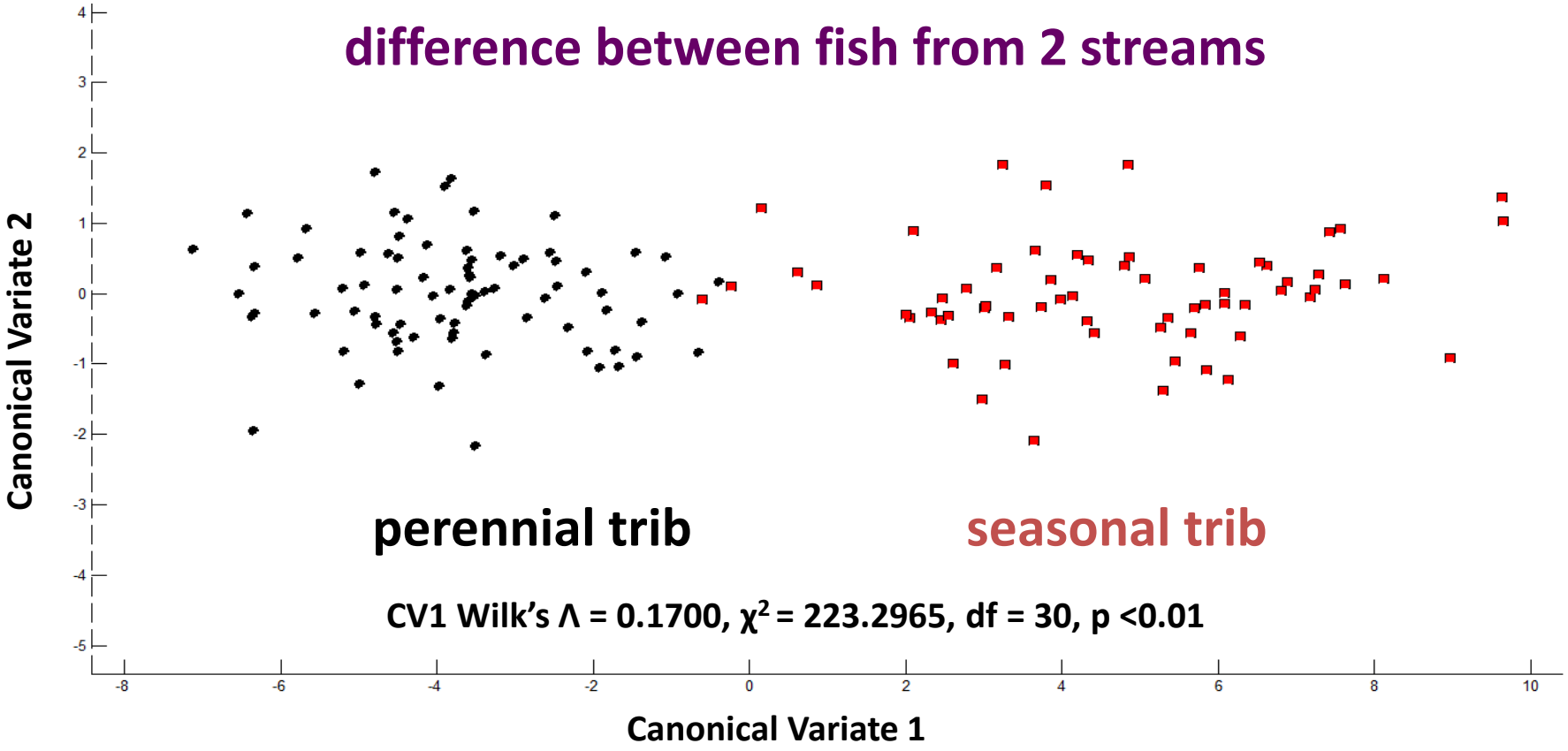


17 conservative/reproducible locations

Shape Analysis

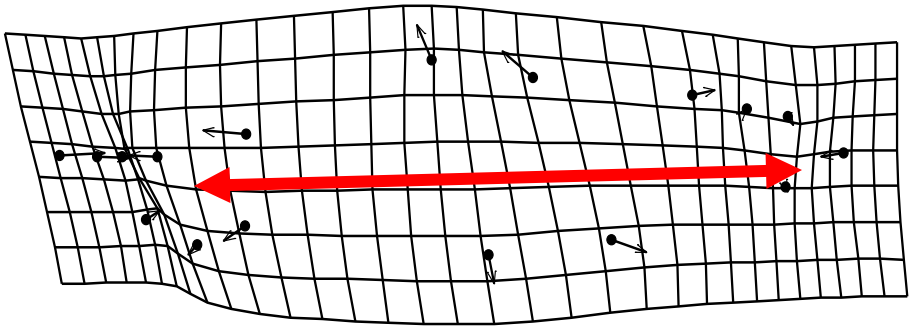
MANOVA

– using principle components of centroid size

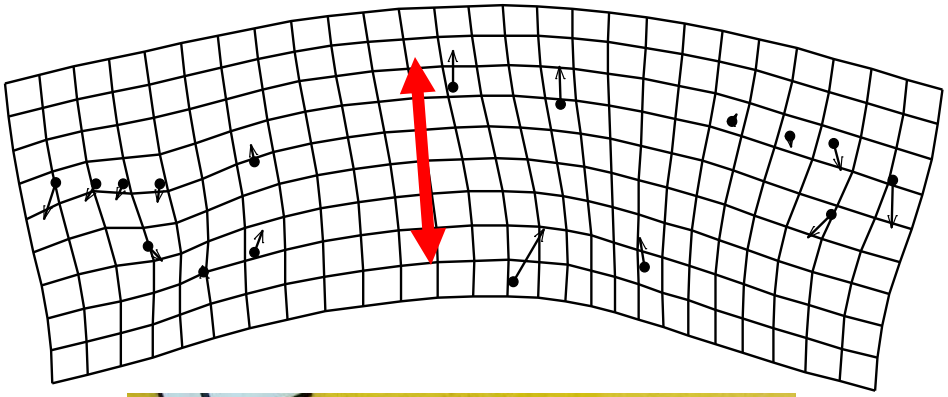


Shape Analysis -*thin-plate spine*

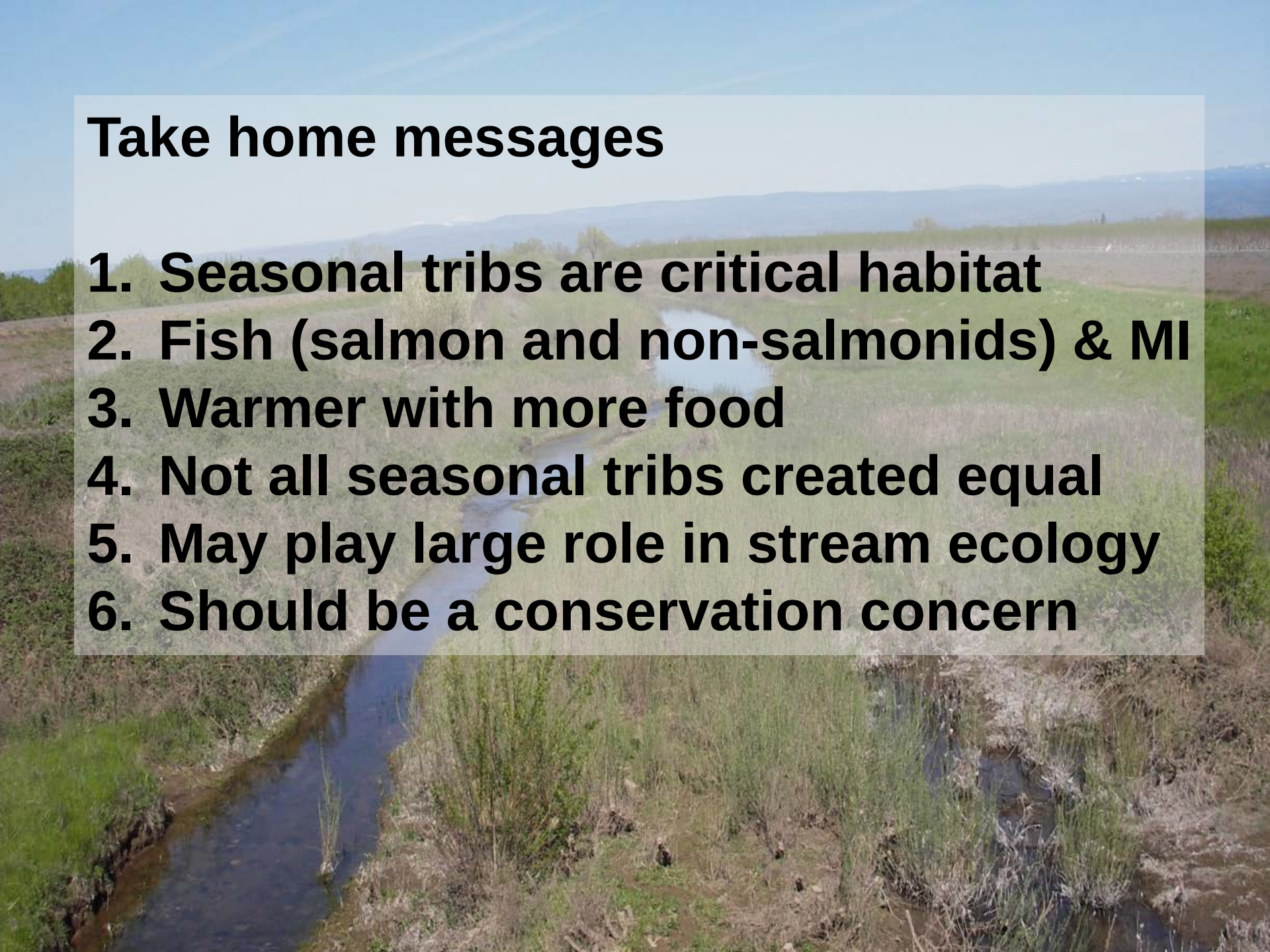
Perennial Stream
Sacramento River



Seasonal Stream
Mud Creek



	Sacramento (64)	Mud Creek (79)	F-Ratio
Procrustes Distances	0.03 ± 0.0	0.05 ± 0.0	236.9*
Centroid Size	65.69 ± 1.5	100.41±1.2	333.4*
			* denotes a p-value <0.001



Take home messages

1. Seasonal tribs are critical habitat
2. Fish (salmon and non-salmonids) & MI
3. Warmer with more food
4. Not all seasonal tribs created equal
5. May play large role in stream ecology
6. Should be a conservation concern

Acknowledgements

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