Evaluation of Environmental Effects on Lower Trophic Levels in the Yolo Bypass

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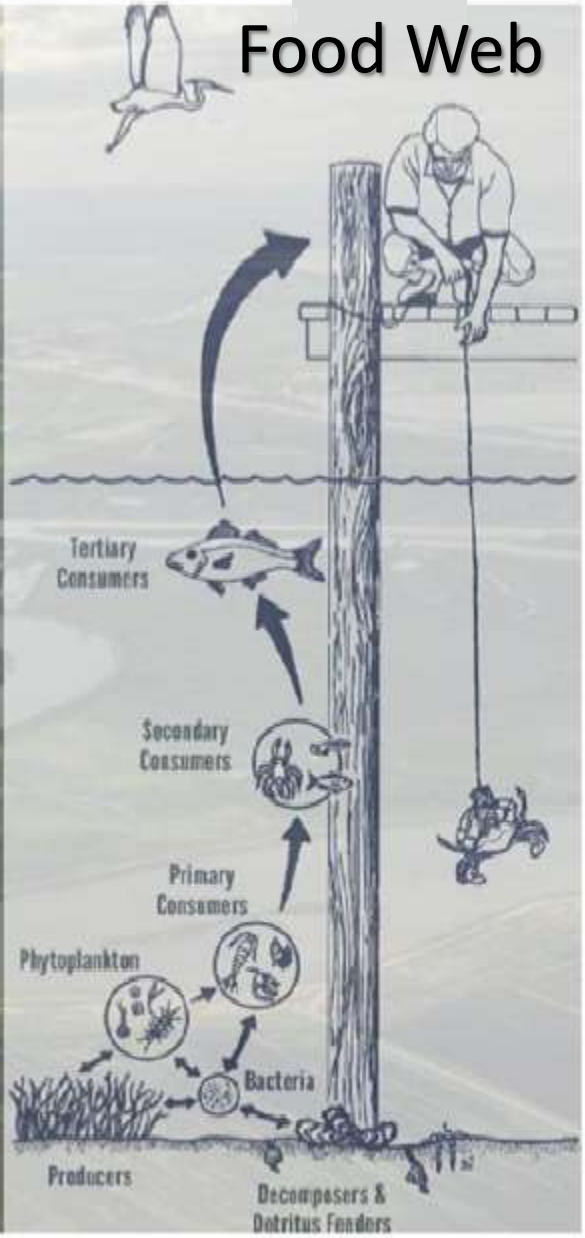
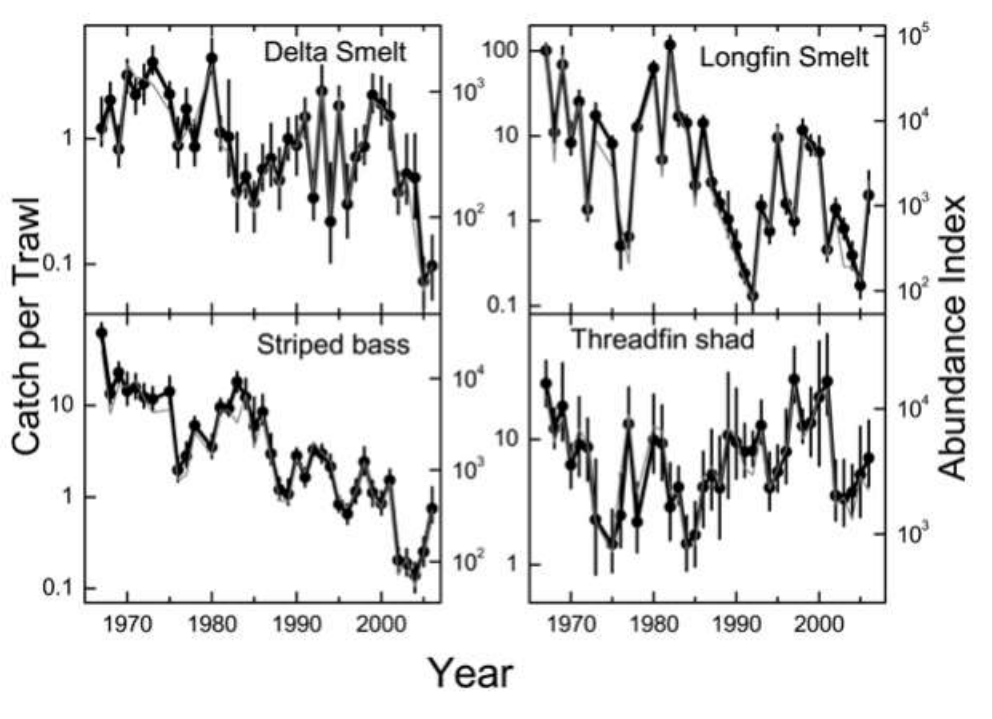
Food Web

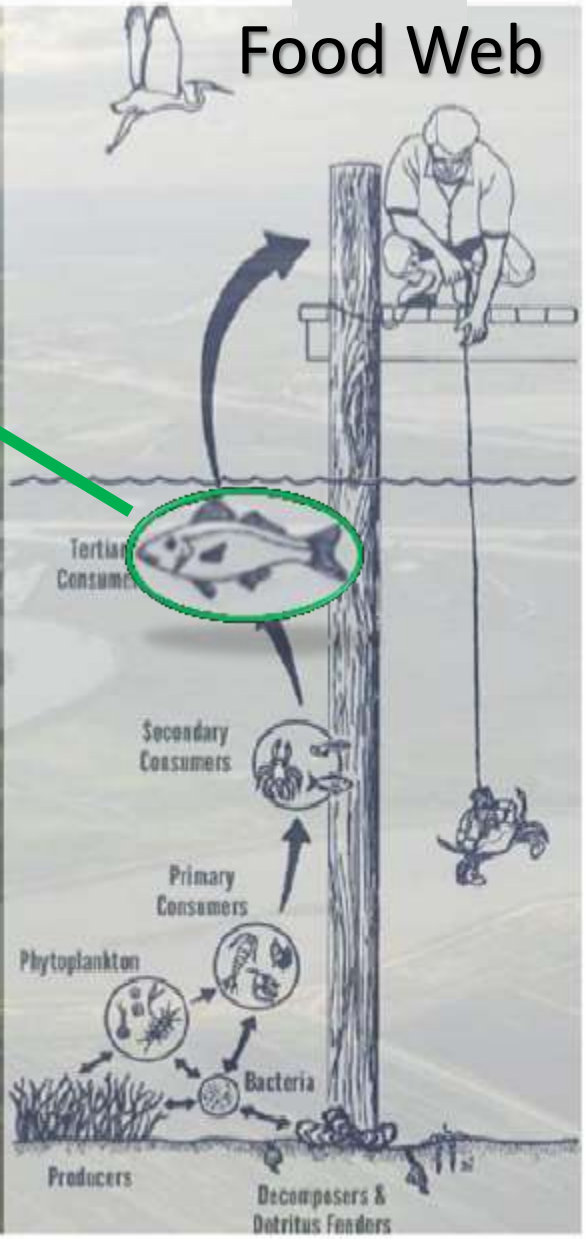

Tertiary Consumers
Secondary Consumers
Primary Consumers
Phytoplankton
Bacteria
Producers
Decomposers & Detritus Feeders

POD Declines

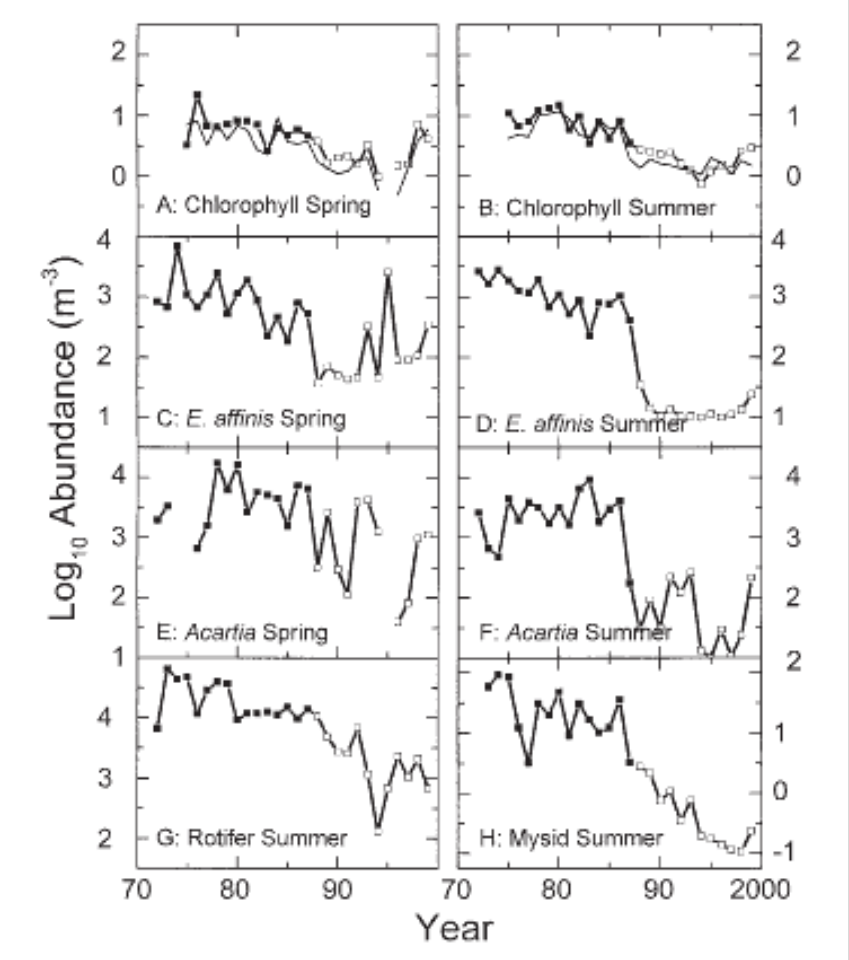


Sommer et al. 2007

Food Web

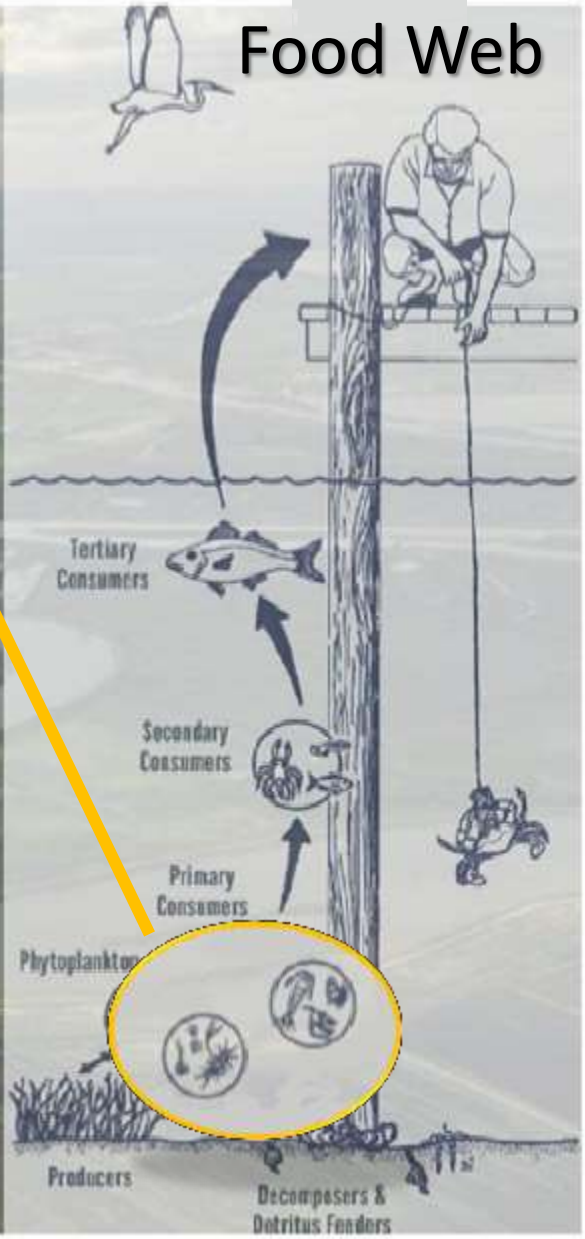


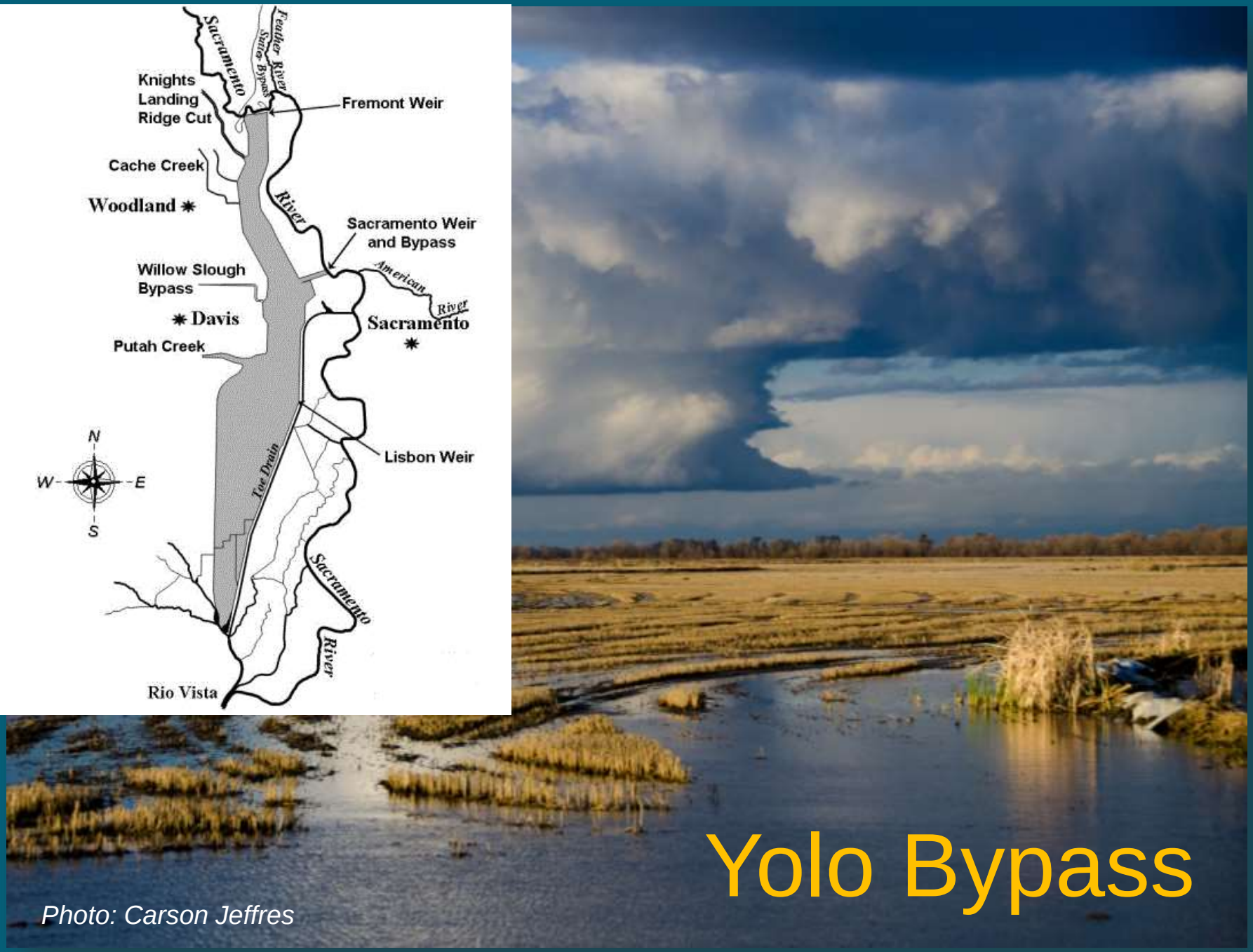
Lower Trophic Declines



Kimmerer 2006

Food Web

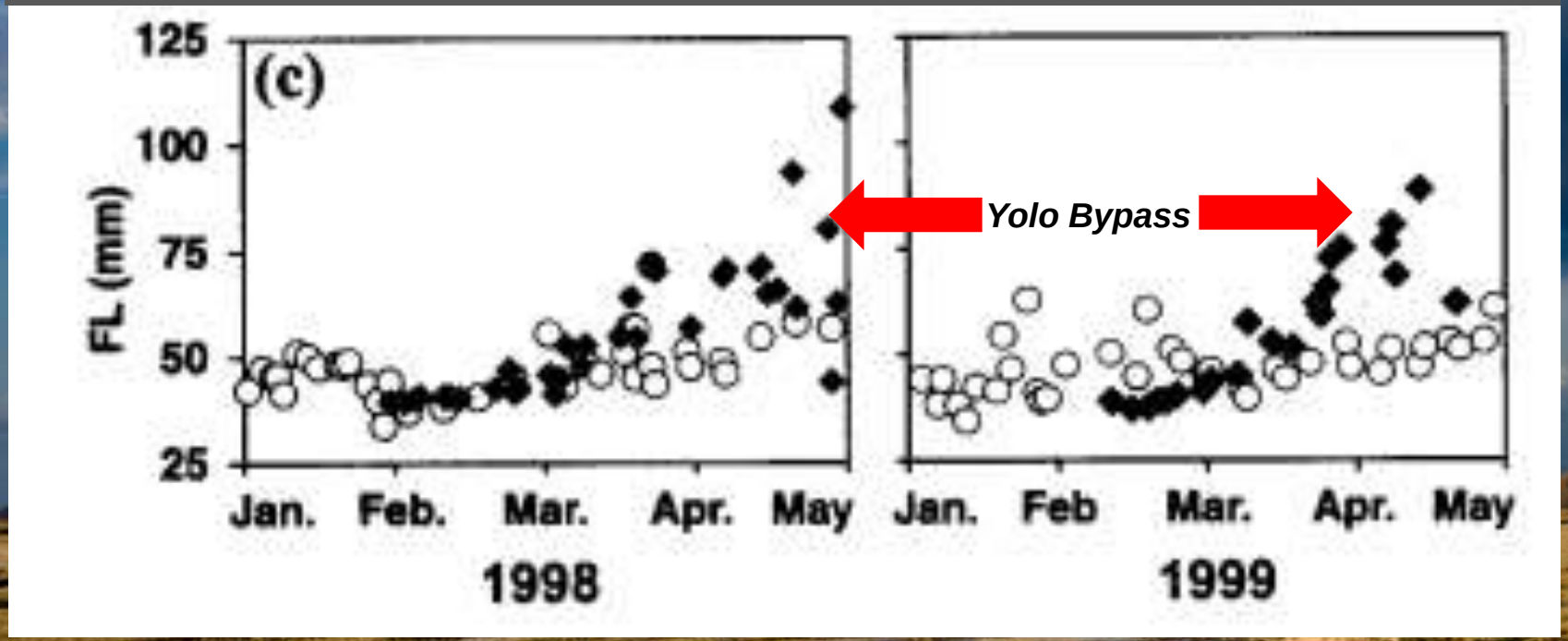




Yolo Bypass

Photo: Carson Jeffres

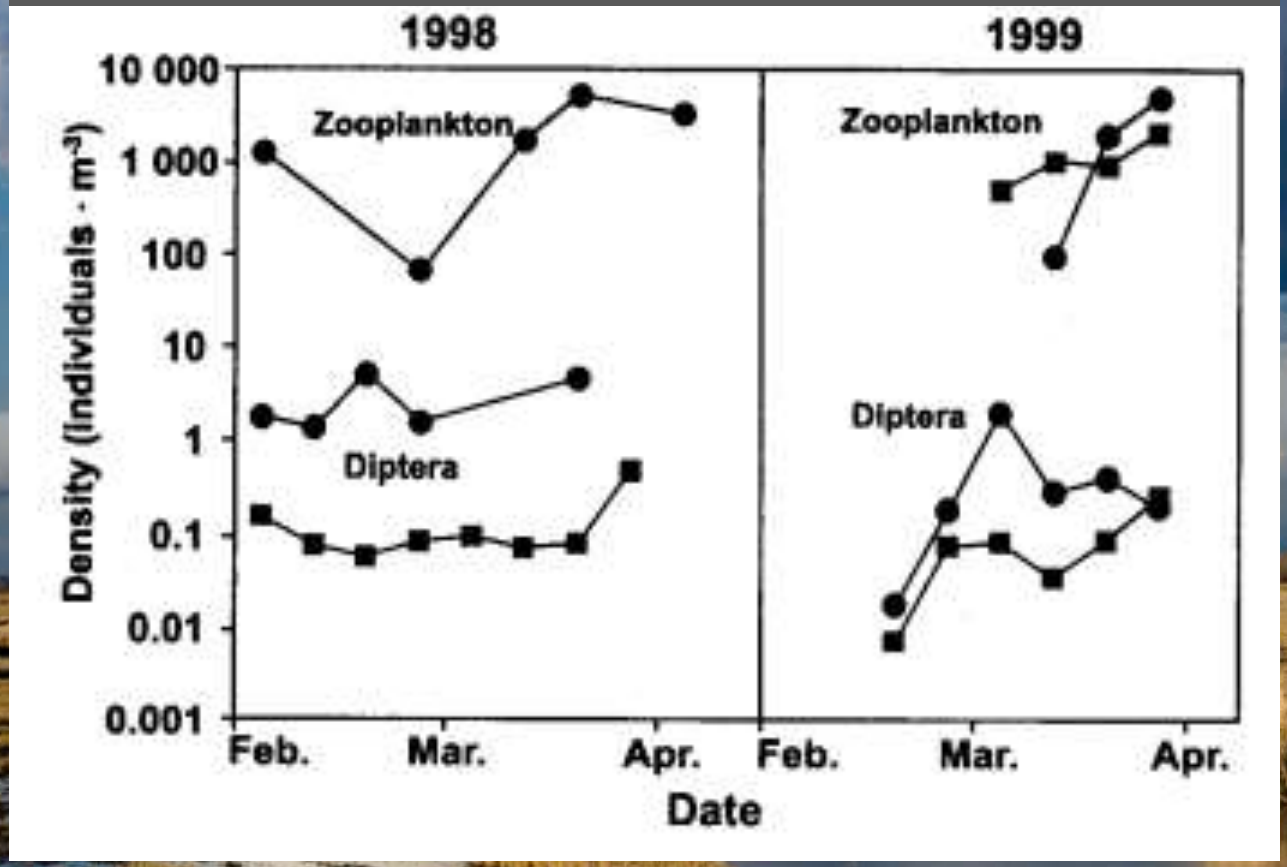
Improved Growth in Yolo Bypass



Sommer et al. 2001

Photo: Carson Jeffres

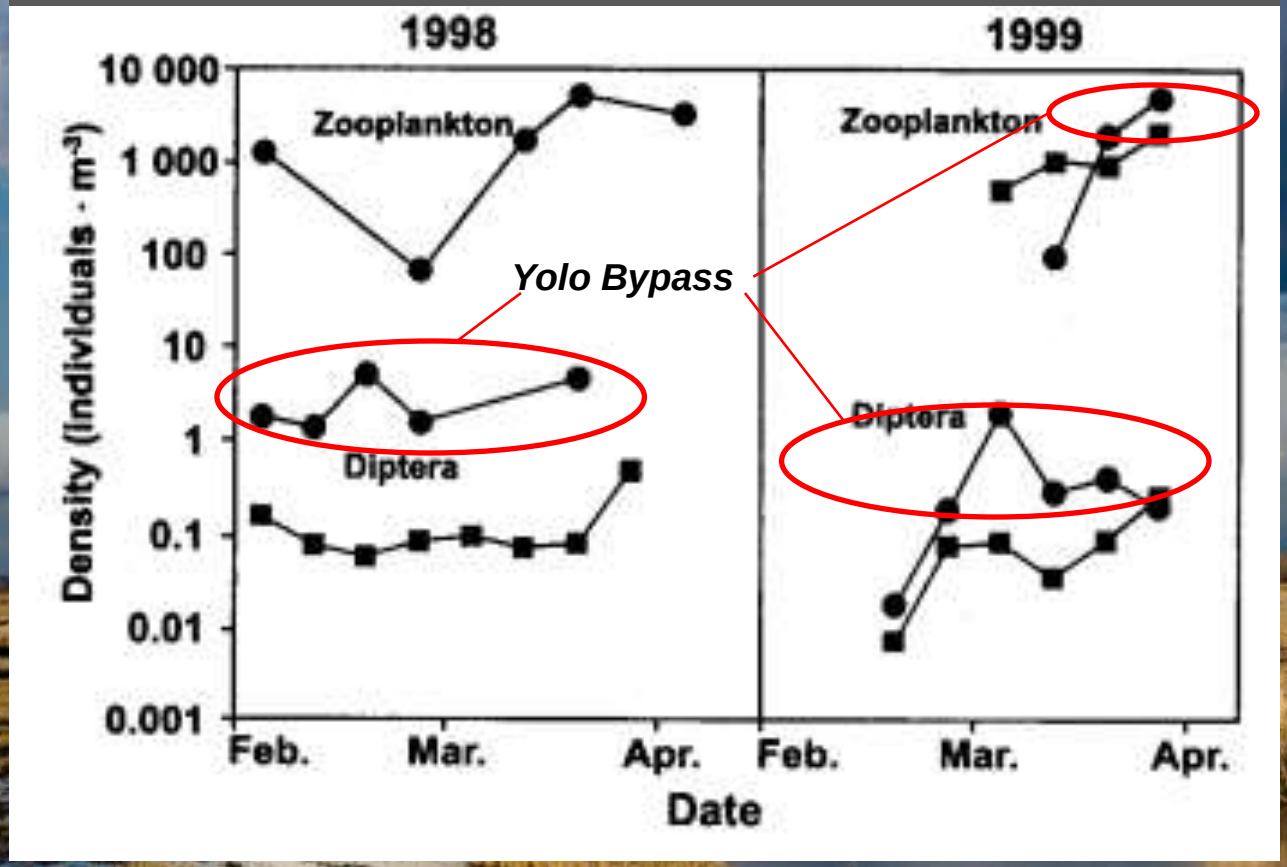
Greater Production on Floodplain



Sommer et al. 2001

Photo: Carson Jeffres

Greater Production on Floodplain



Sommer et al. 2001

Photo: Carson Jeffres

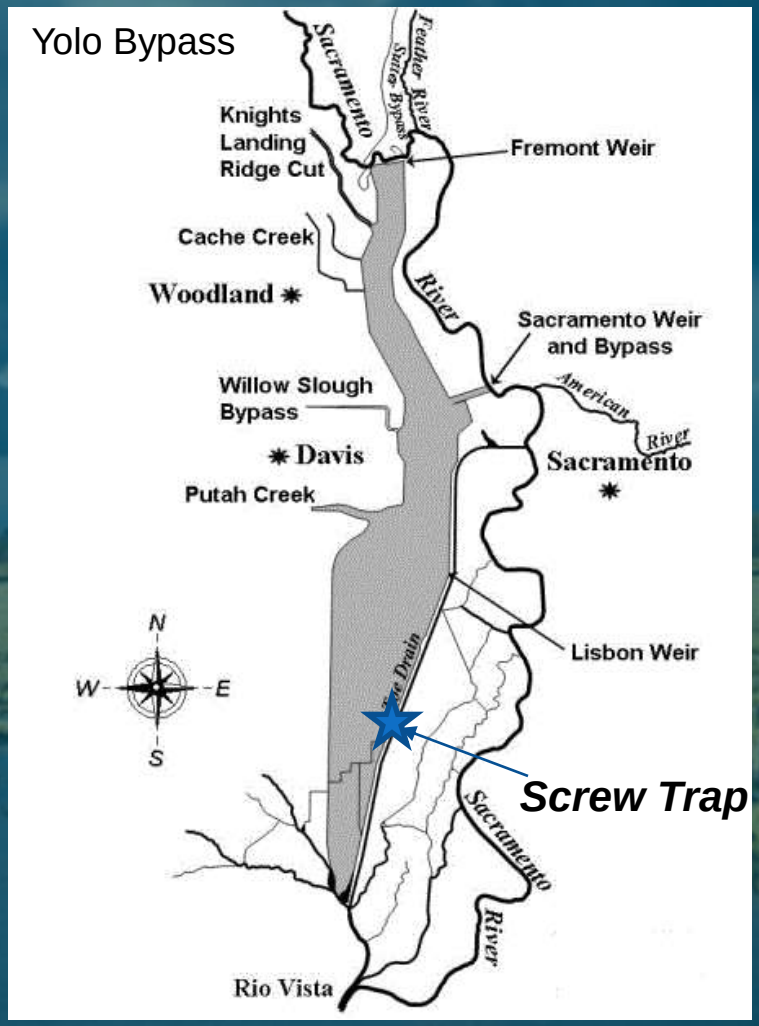
Study goals

1. Flow thresholds for phytoplankton
2. Bottom-up effects
3. Assemblage of zooplankton and drift invertebrates

Biological data

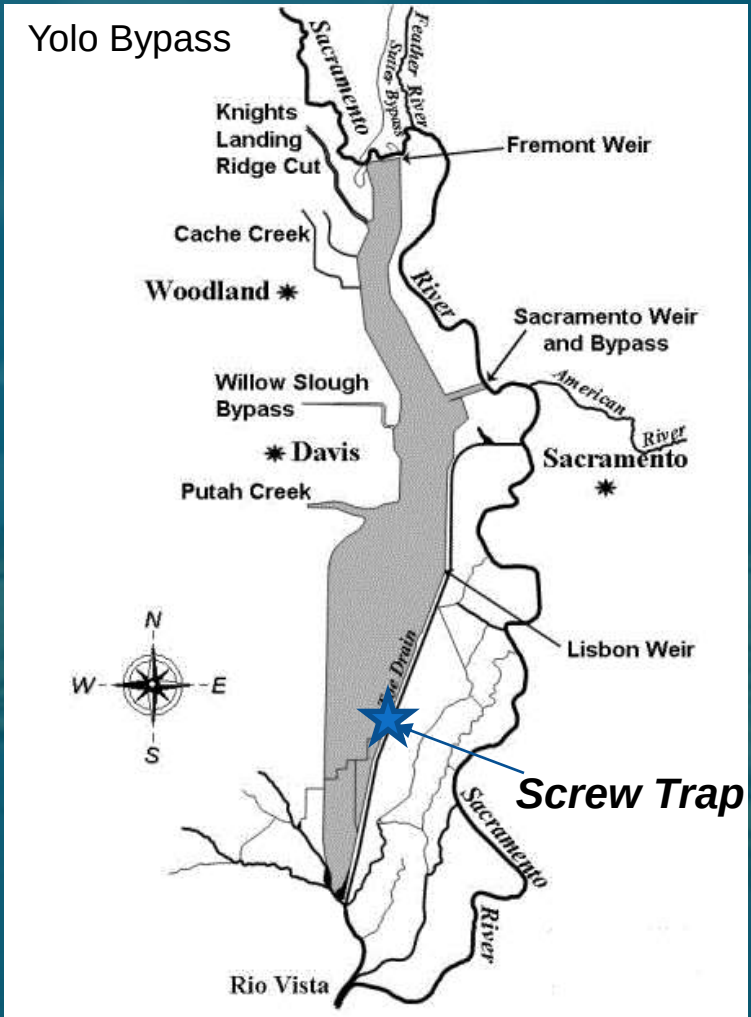
Measured weekly (2001-2012)

- Chlorophyll *a* (µg·L^{-1})
- Zooplankton (CPUE)
- Drift Invertebrates (CPUE)

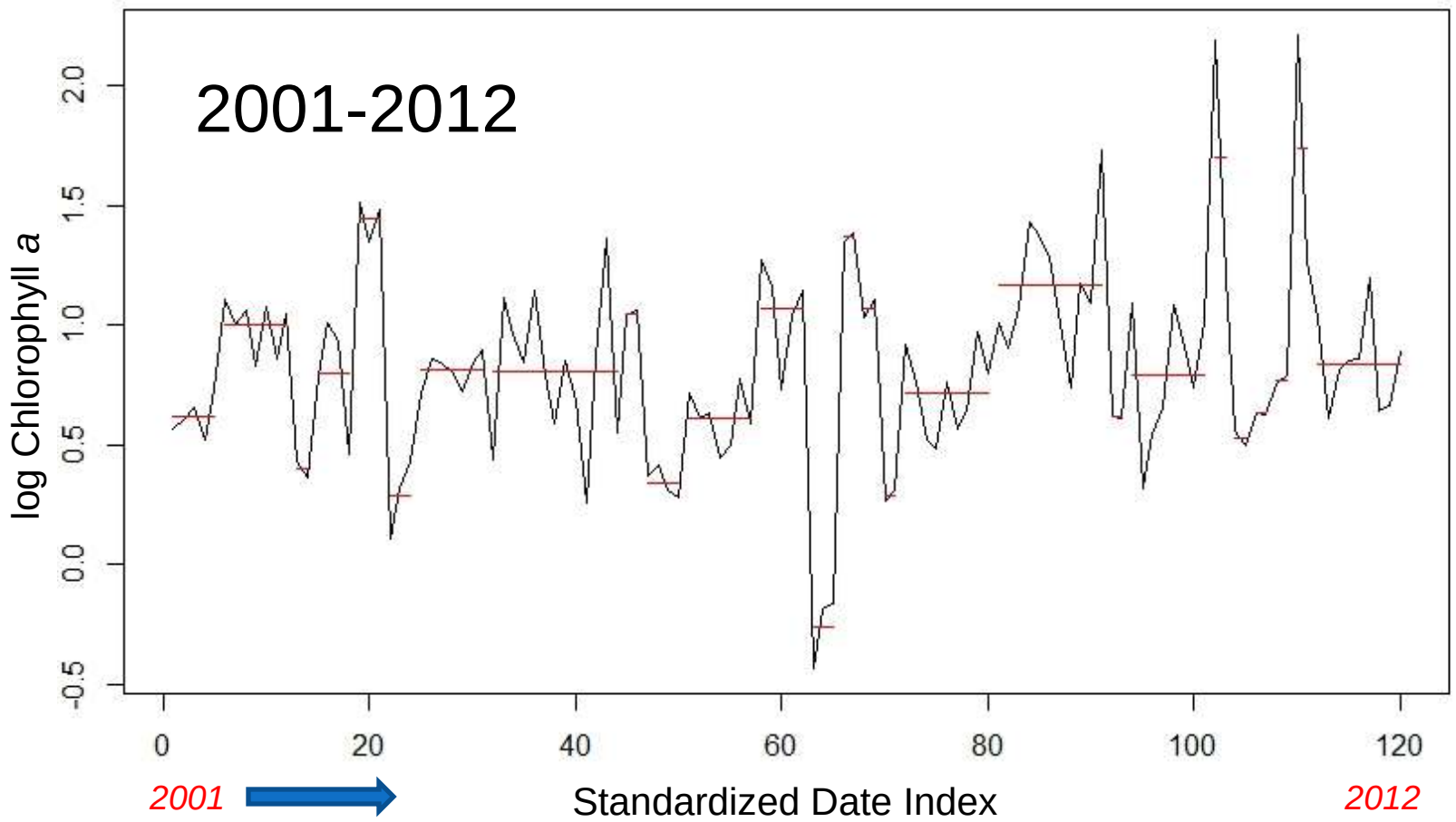


Environmental data

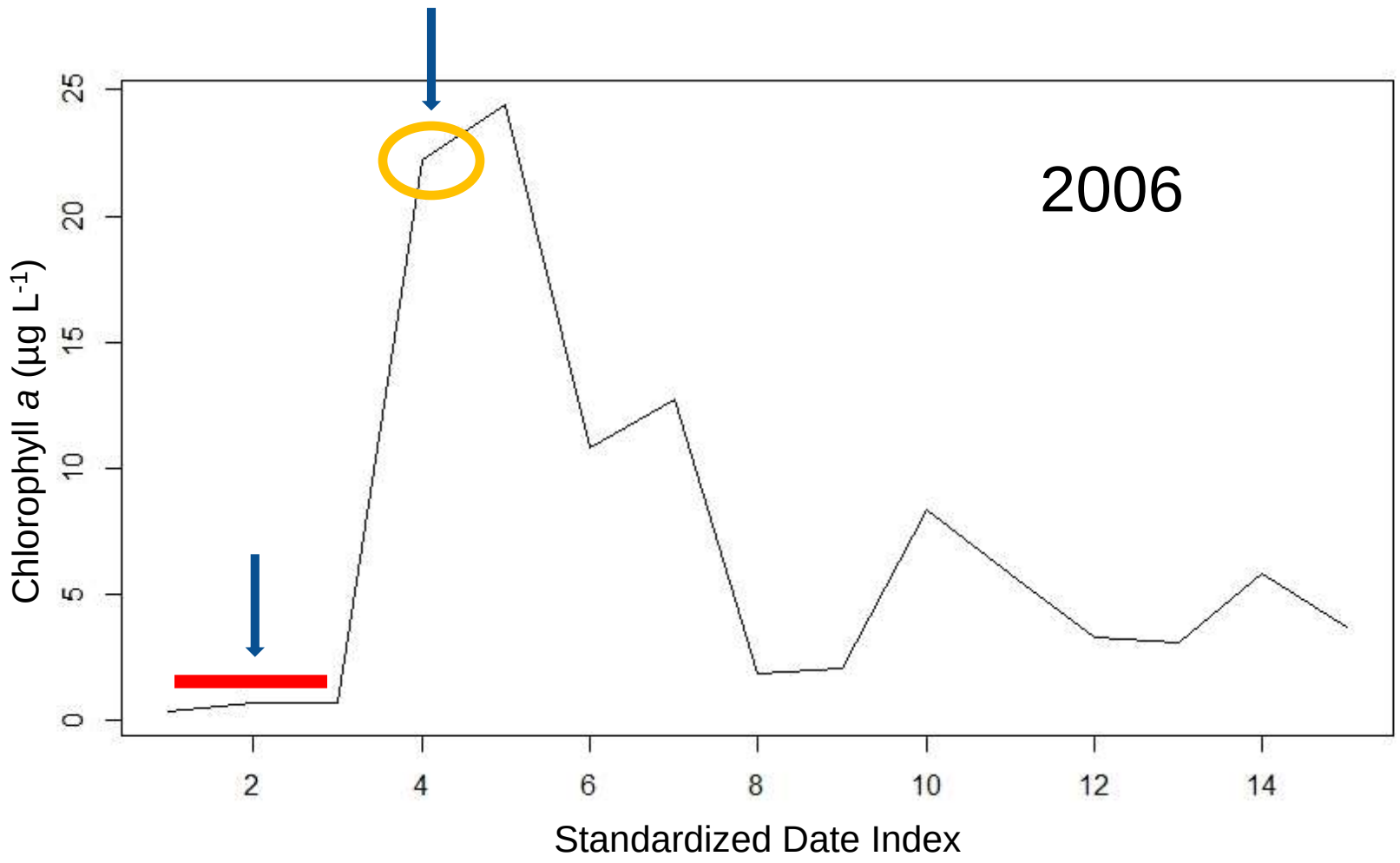
Data type	Source
Secchi Depth (m)	DWR food web sampling (Screw Trap)
Electrical Conductivity (µS/cm)	DWR food web sampling (Screw Trap)
Temperature (°C) *(Prior week max)*	DWR food web sampling (Screw Trap)
Stage (ft) *(Prior week max)*	Water Data Library (Lisbon Weir)



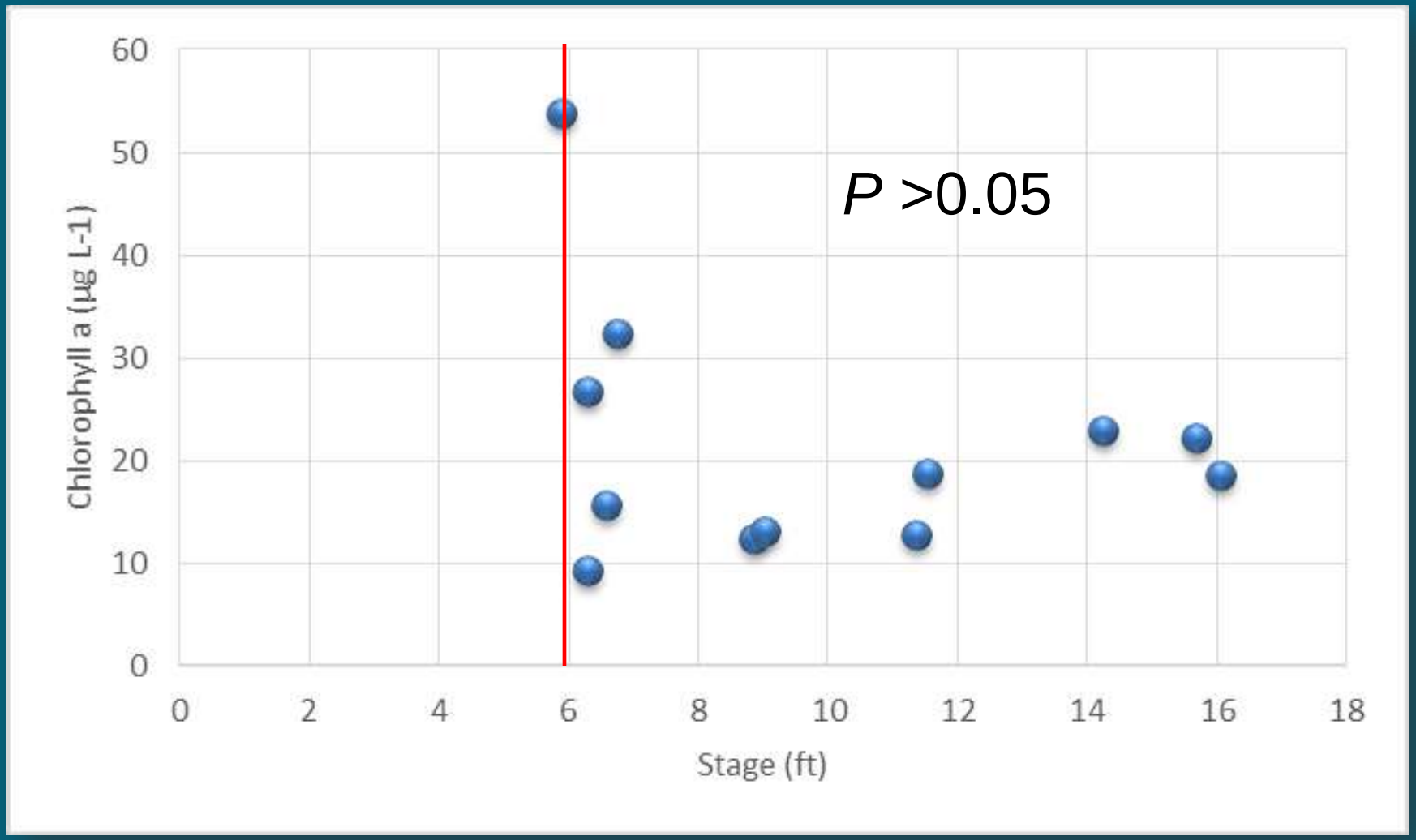
Flow threshold effects



Flow threshold effects

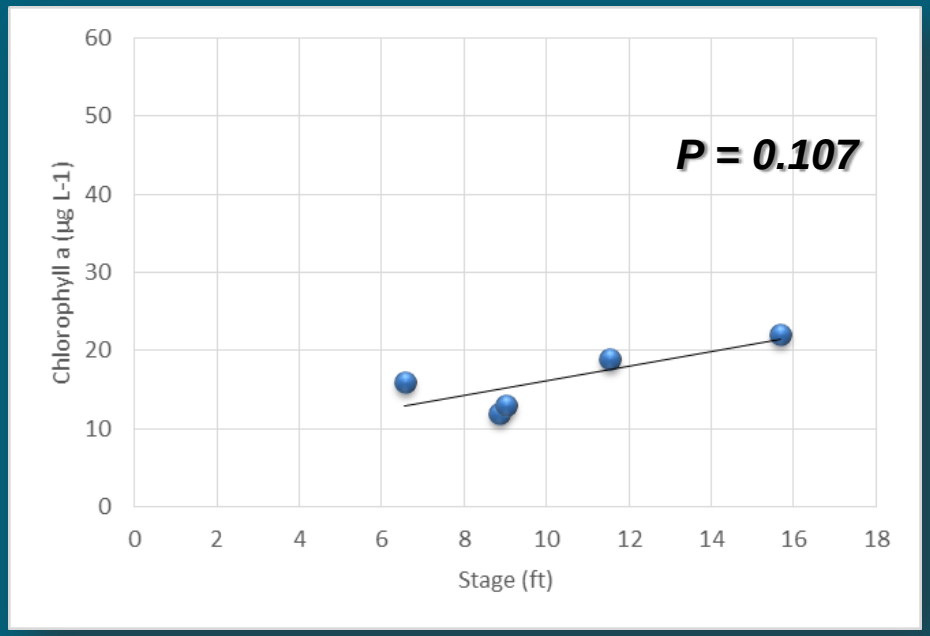


Flow threshold effects

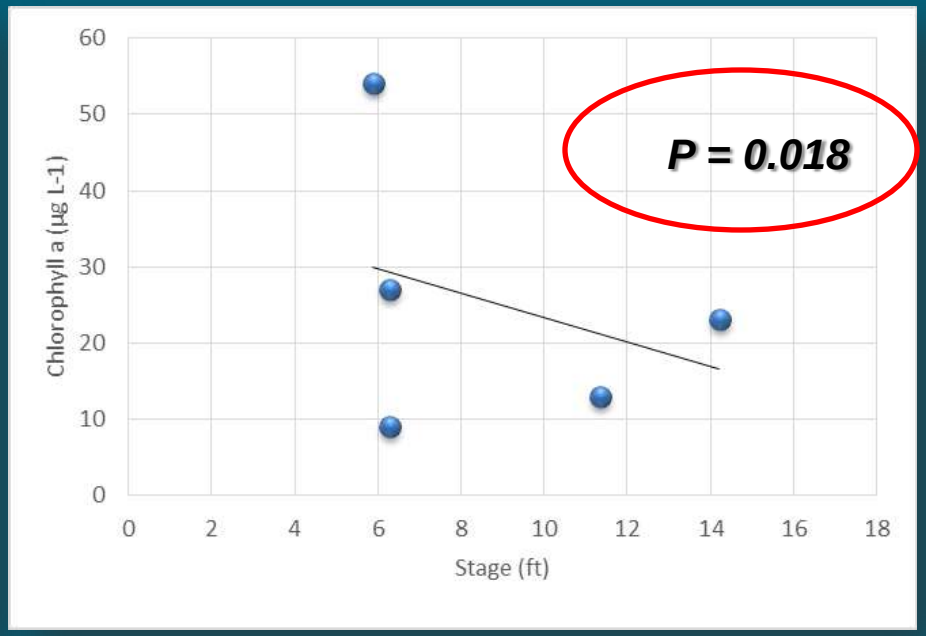


Flow threshold effects

Low Temperature Quartiles



High Temperature Quartiles

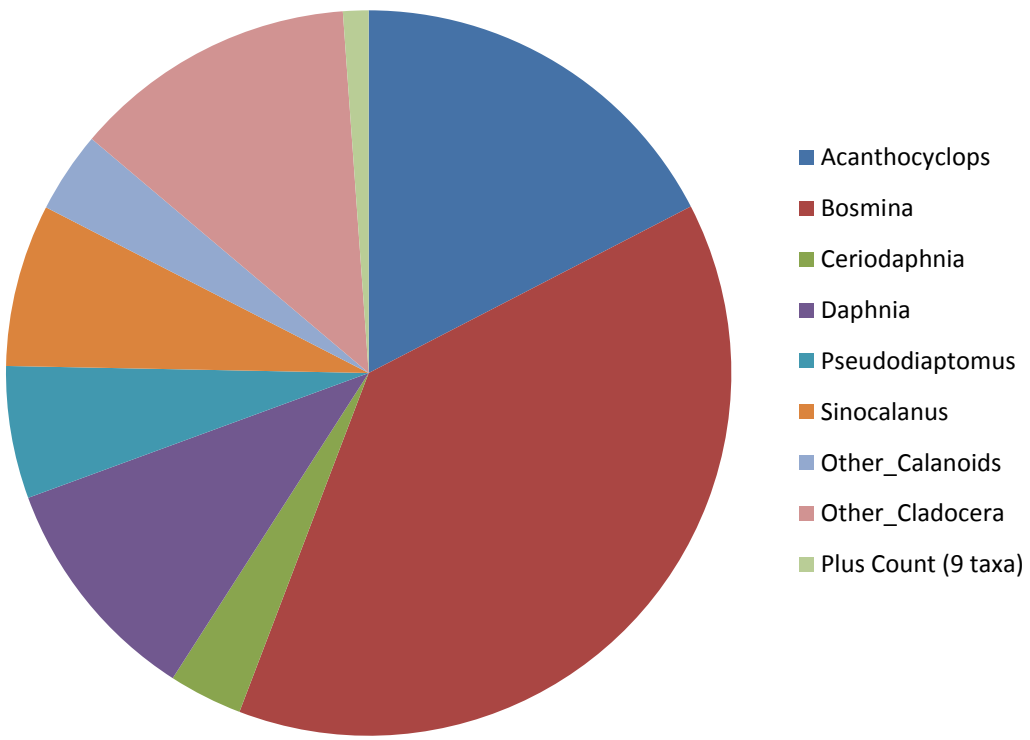


*Chl_a = Temp * Stage; P < 0.05*

Bottom-up effects

Zooplankton

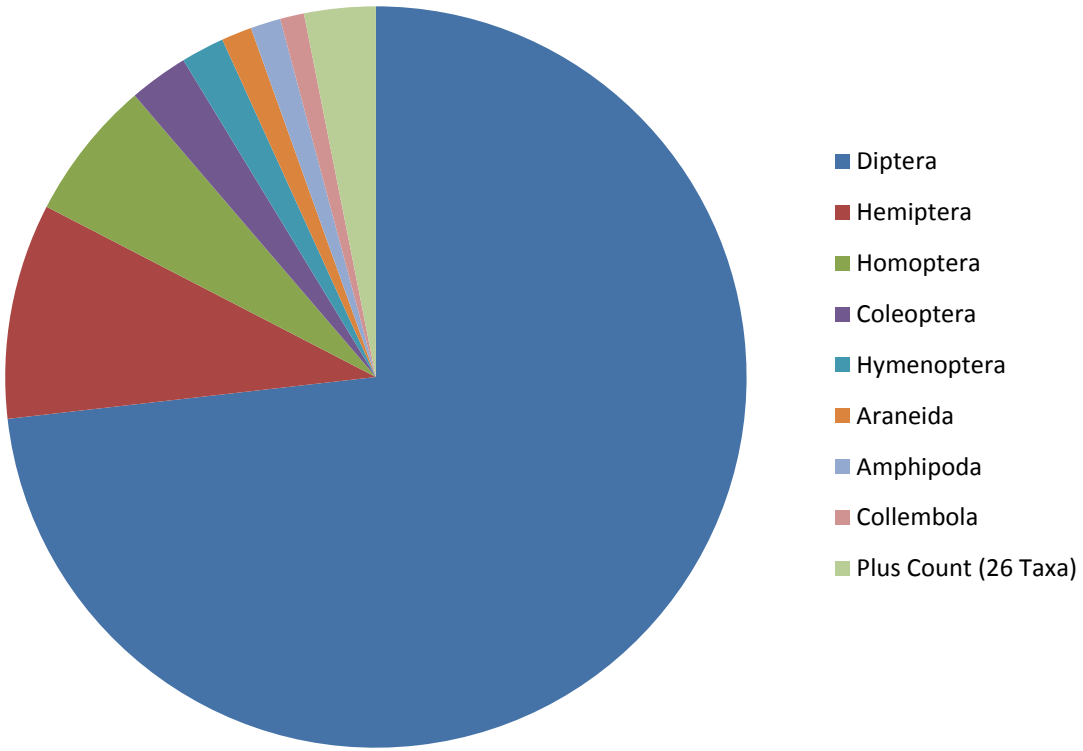
Plus Count = 1.5% of Total Catch (9 taxa)



Bottom-up effects

Drift Invertebrates

Plus Count = 3% of Total Catch (26 taxa)



Bottom-up effects

Zooplankton

Taxa	Chl_*a* (µg L^{-1})
Acanthocyclops	+
Bosmina	+
Ceriodaphnia	–
Daphnia	+
Pseudodiaptomus	–
Sinocalanus	+
Other Calanoids	+
Other Cladocera	+

significant ($P < 0.05$)

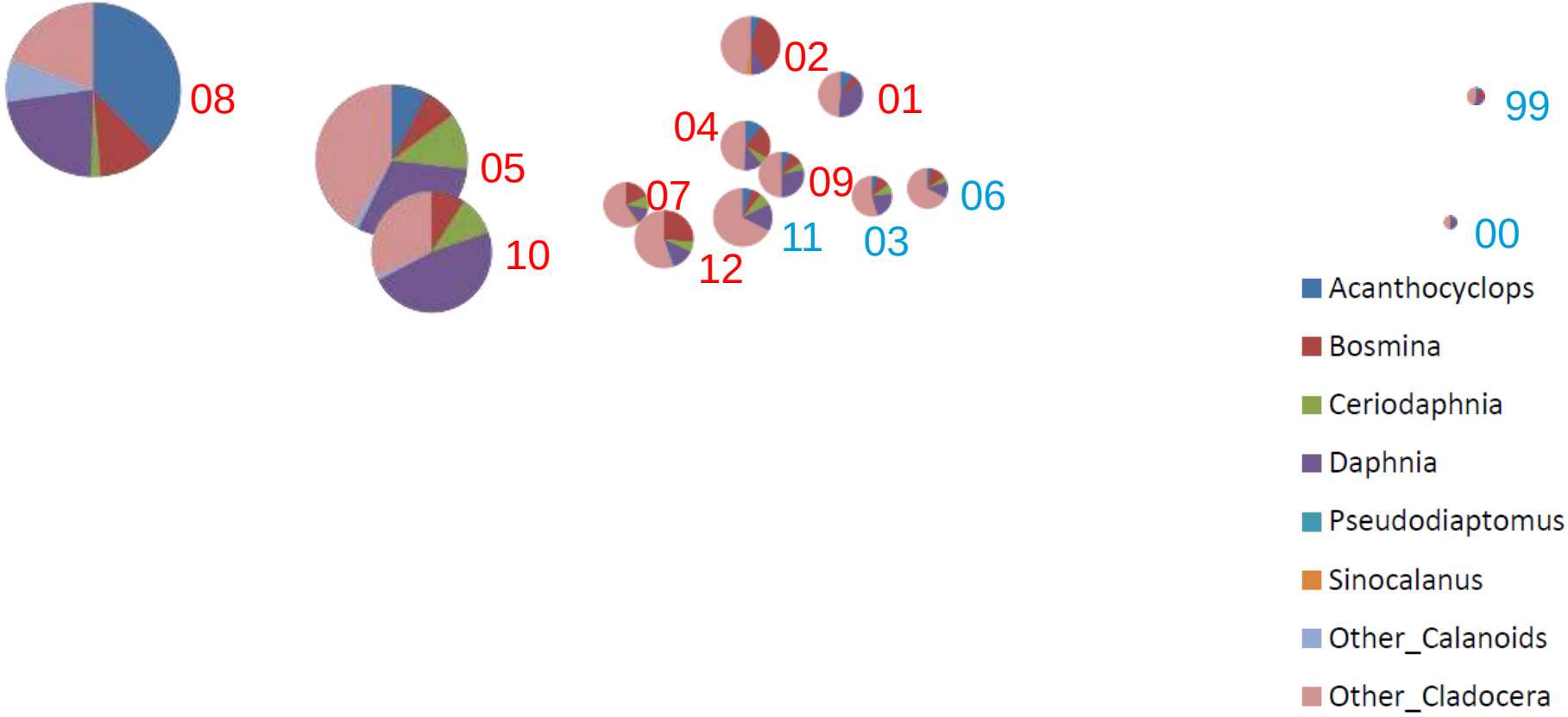
Bottom-up effects

Drift Invertebrates	
Taxa	**Chl_*a* (µg L^{-1})**
Amphipoda	–
Araneida	+
Coleoptera	+
Collembola	+
Diptera	+
Hemiptera	+
Homoptera	+
Hymenoptera	+

significant (P < 0.05)

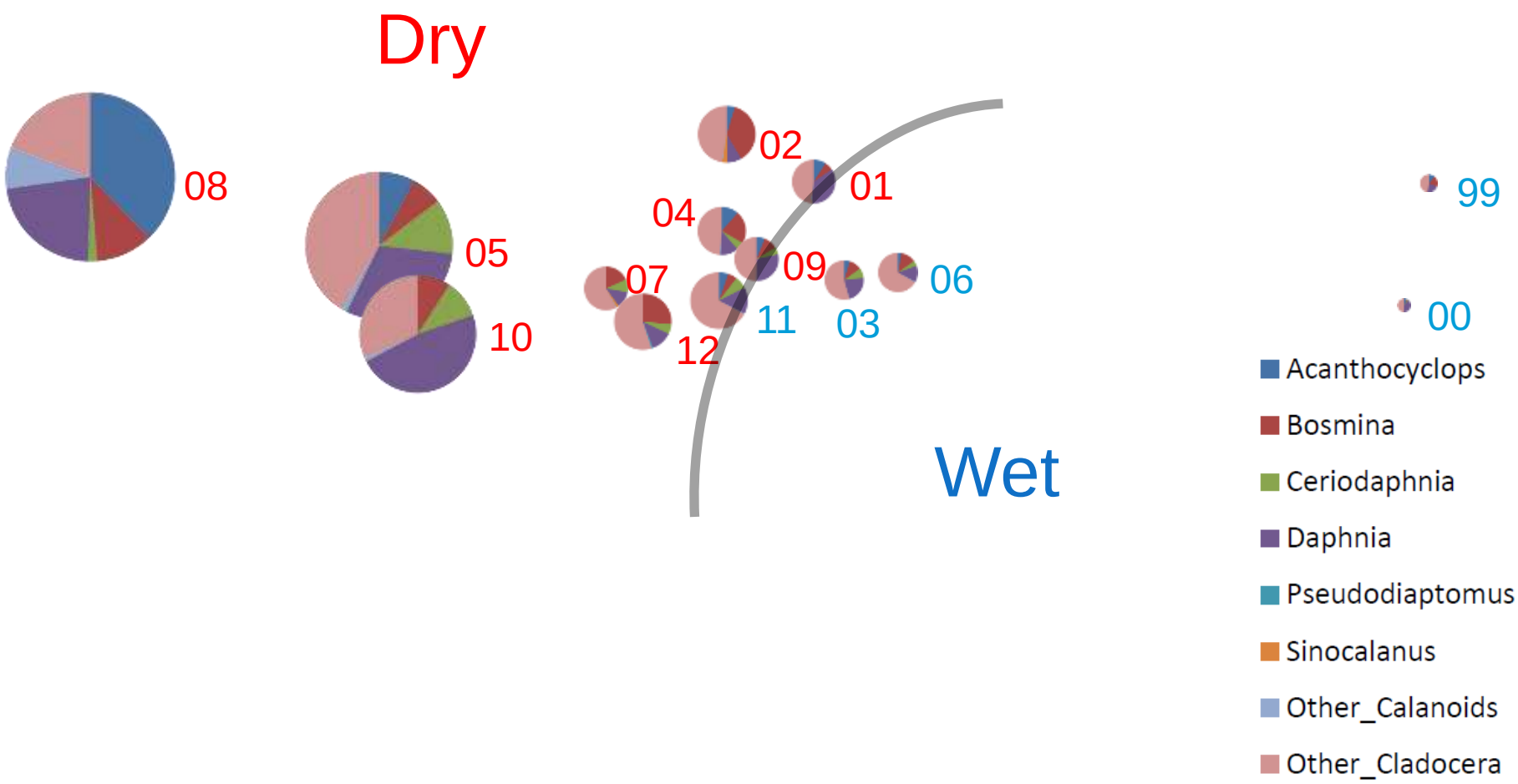
Assemblage patterns

Zooplankton



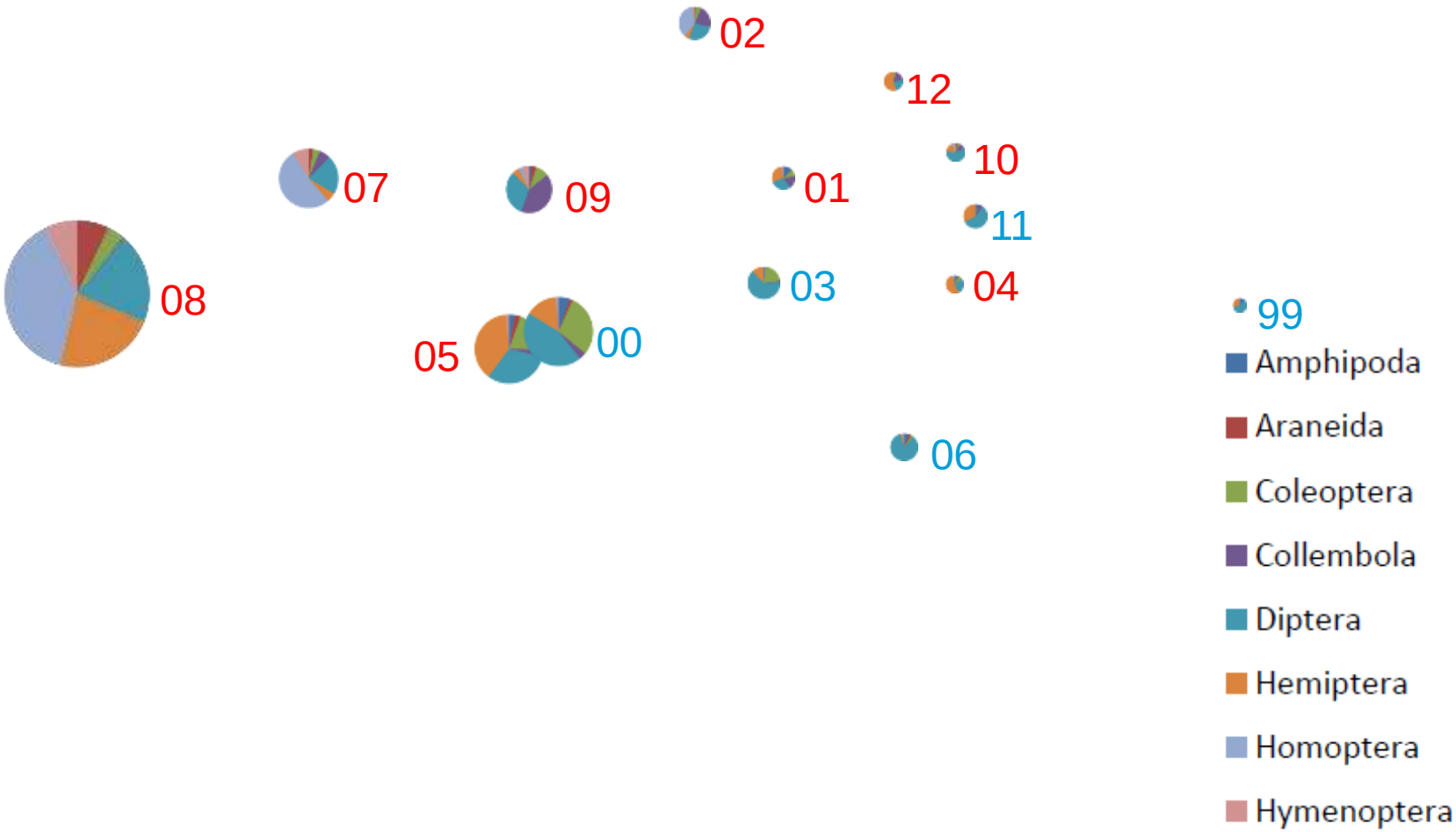
Assemblage patterns

Zooplankton



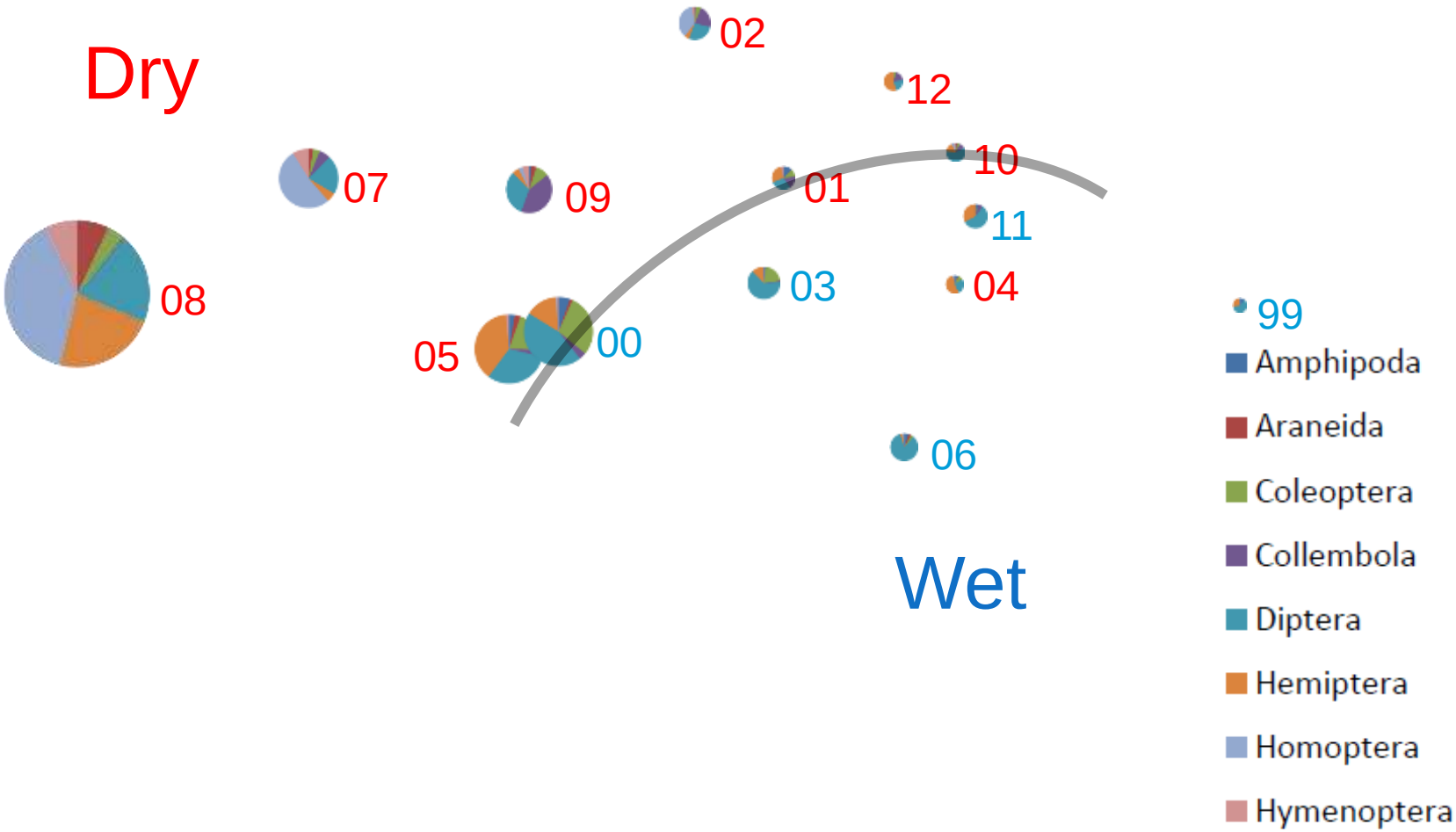
Assemblage patterns

Drift Invertebrates



Assemblage patterns

Drift Invertebrates



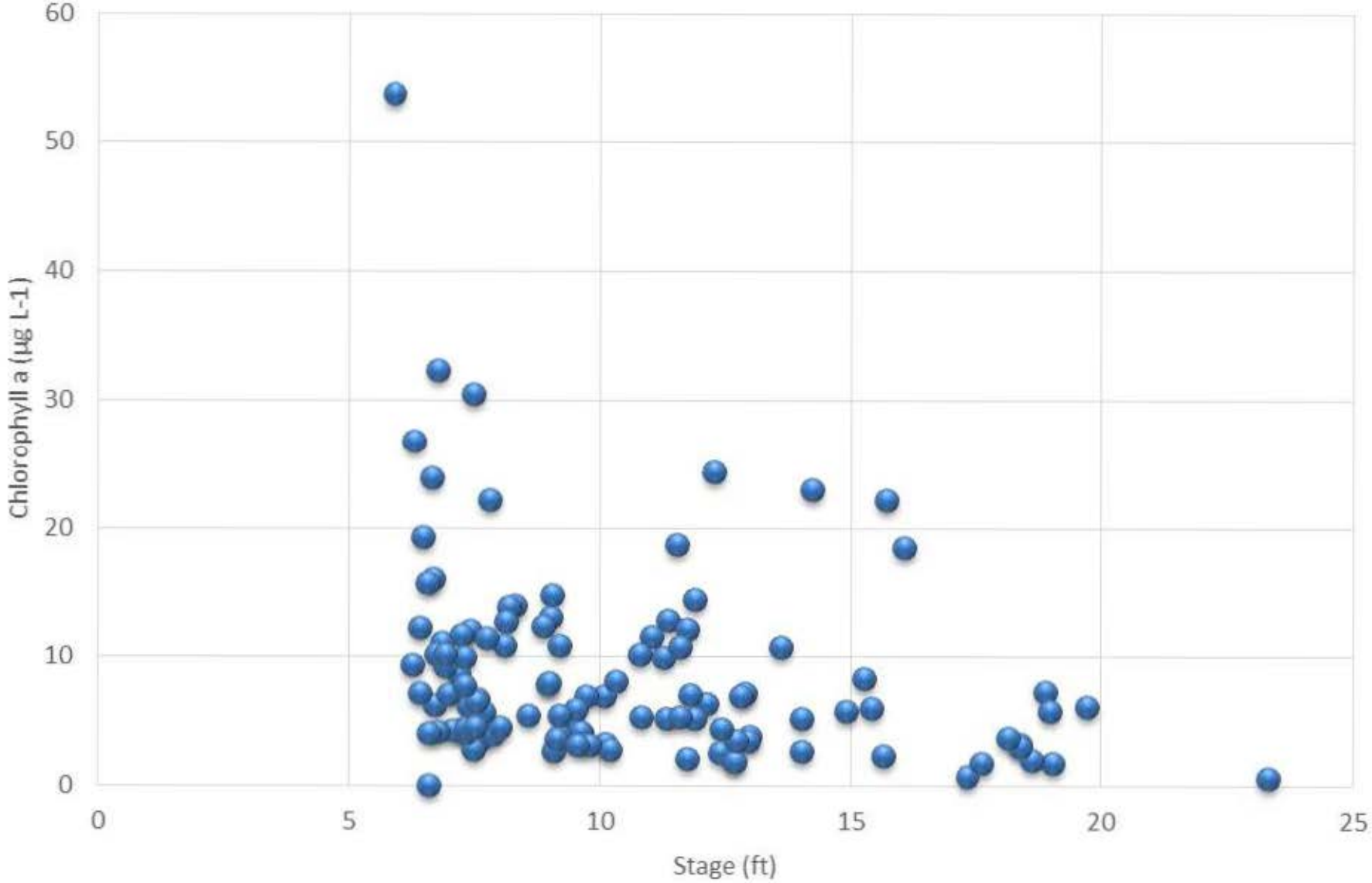
Conclusions

- No ‘one size fits all’ approach to managing flows for lower trophic levels
- Bottom-up effects—*YES*
- Temperature and stage appear to drive assemblage patterns

Acknowledgments

- Interagency Ecological Program (IEP)
- Ecosystem Restoration Program
- DWR's Aquatic Ecology Section
- EcoAnalysts, Inc. and Alemdar Consulting

Thank you!


60
50
40
30
20
10
0
Chlorophyll a (µg L-1)
0
5
10
15
20
25
Stage (ft)