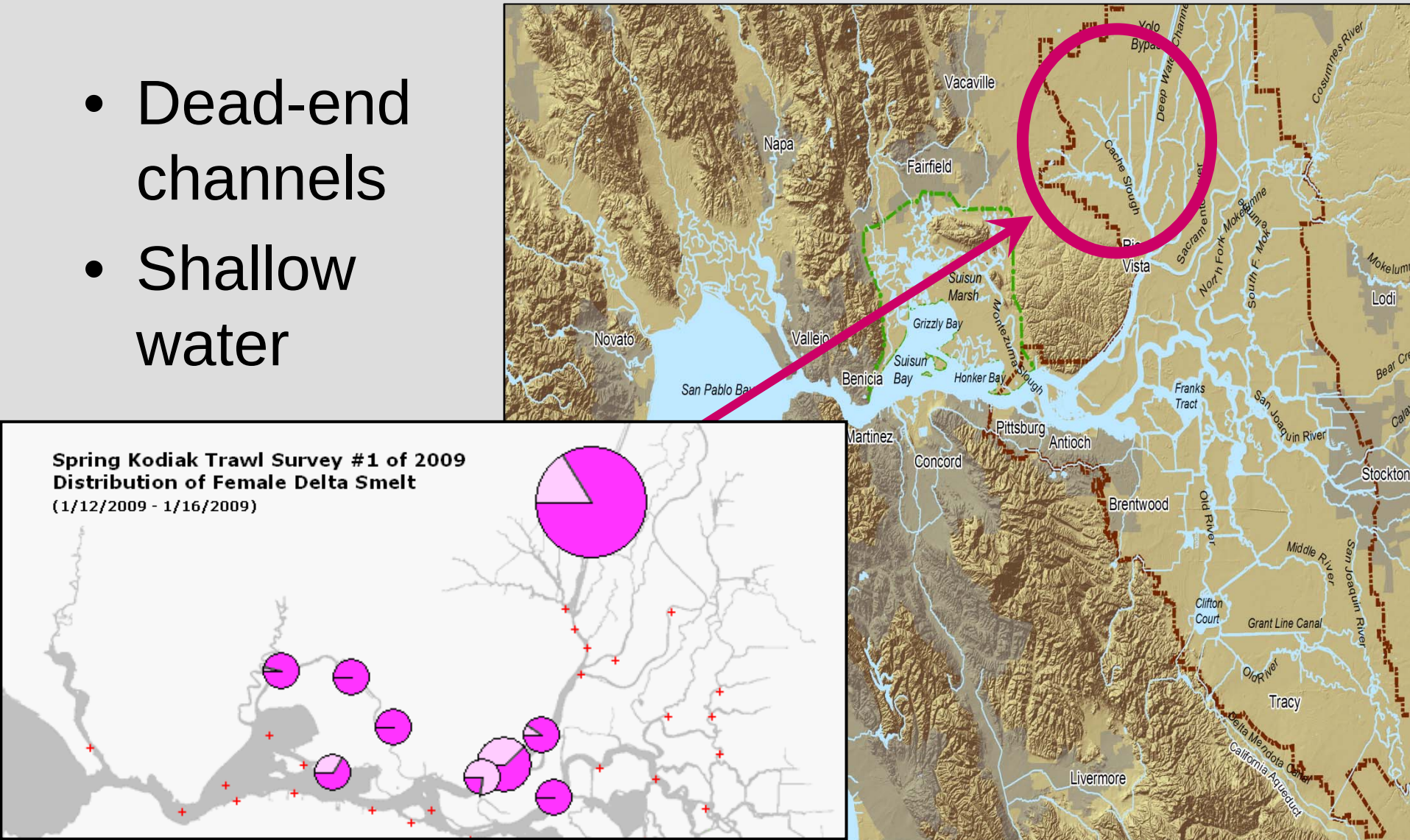
Effects of a Restored Freshwater Tidal Wetland Complex on Habitat for Imperiled Native Fish

Gina Benigno, Ted Sommer,
and Nick van Ark
CA Department of Water Resources

Frontiers in Delta Research

Delta smelt use the North Delta

- Dead-end channels
- Shallow water

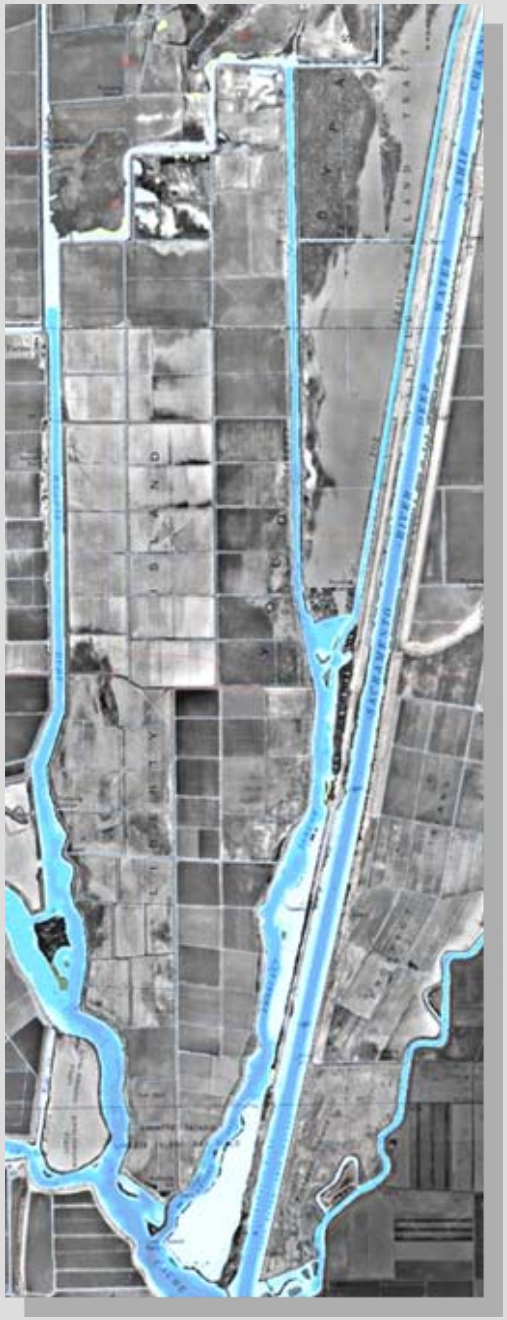


Habitat Restoration

- Tidal FW Wetlands
- Restoration rush
- Science?

Liberty Island

- Unintentional restoration
- Flooded in 1998
- Over 5,000 ac
- Supports native fish

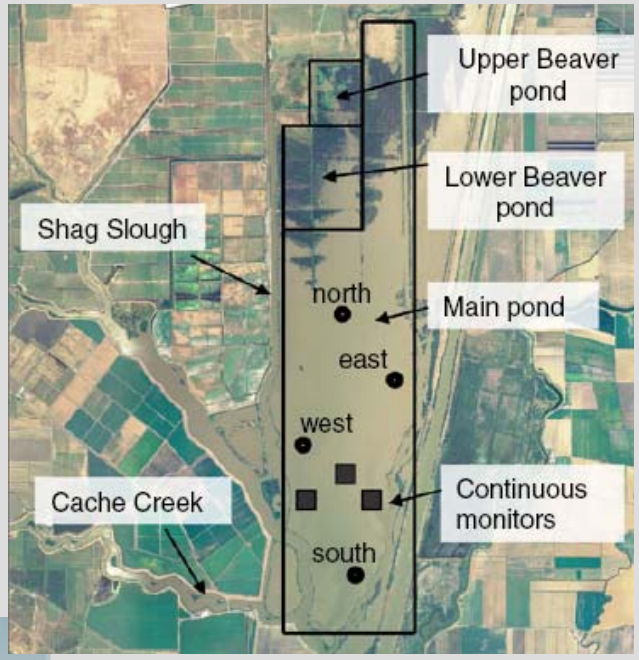


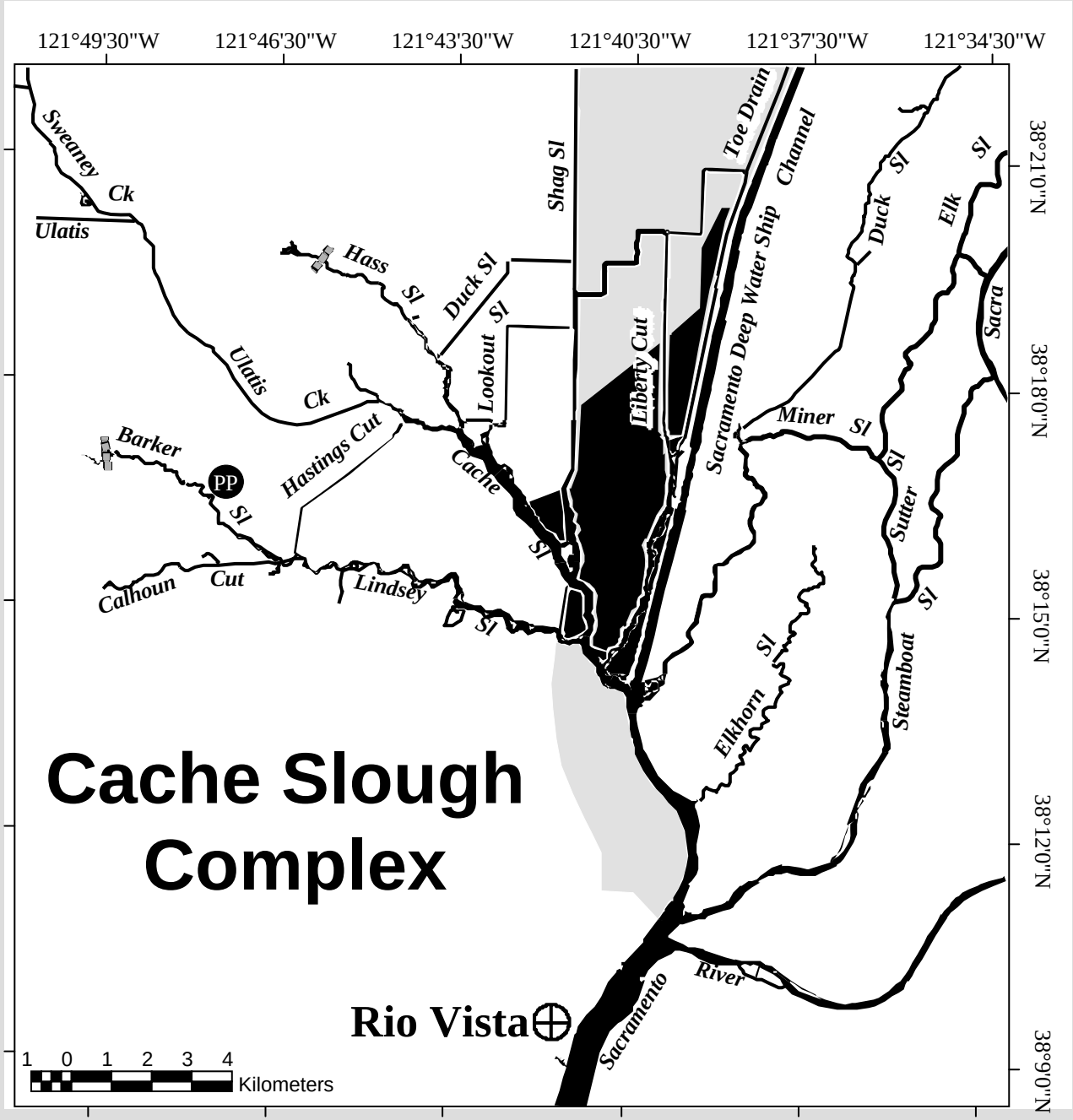
1970's

2002

Liberty Island Research

- FWS fish monitoring
- Seasonal and tidal flux
- Breach III




Cache Slough Complex
121°49'30"W
121°46'30"W
121°43'30"W
121°40'30"W
121°37'30"W
121°34'30"W
38°21'0"N
38°18'0"N
38°15'0"N
38°12'0"N
38°9'0"N
Sweaney Ck
Ulatis
Ulatis Ck
Hass Sl
Duck Sl
Lookout Sl
Shag Sl
Toe Drain
Channel
Sacramento Deep Water Ship
Liberty Cut
Duck Sl
Elk Sl
Sacra
Miner Sl
Sutter Sl
Steamboat Sl
Elkhorn Sl
Barker Sl
PP
Hastings Cut
Cache Sl
Calhoun Cut
Lindsey D Sl
Sacramento River
Rio Vista
1 0 1 2 3 4
Kilometers

Study Objectives

- Hypothesis:
  - Characteristics of Liberty Island have a large effect on fish habitat in the North Delta

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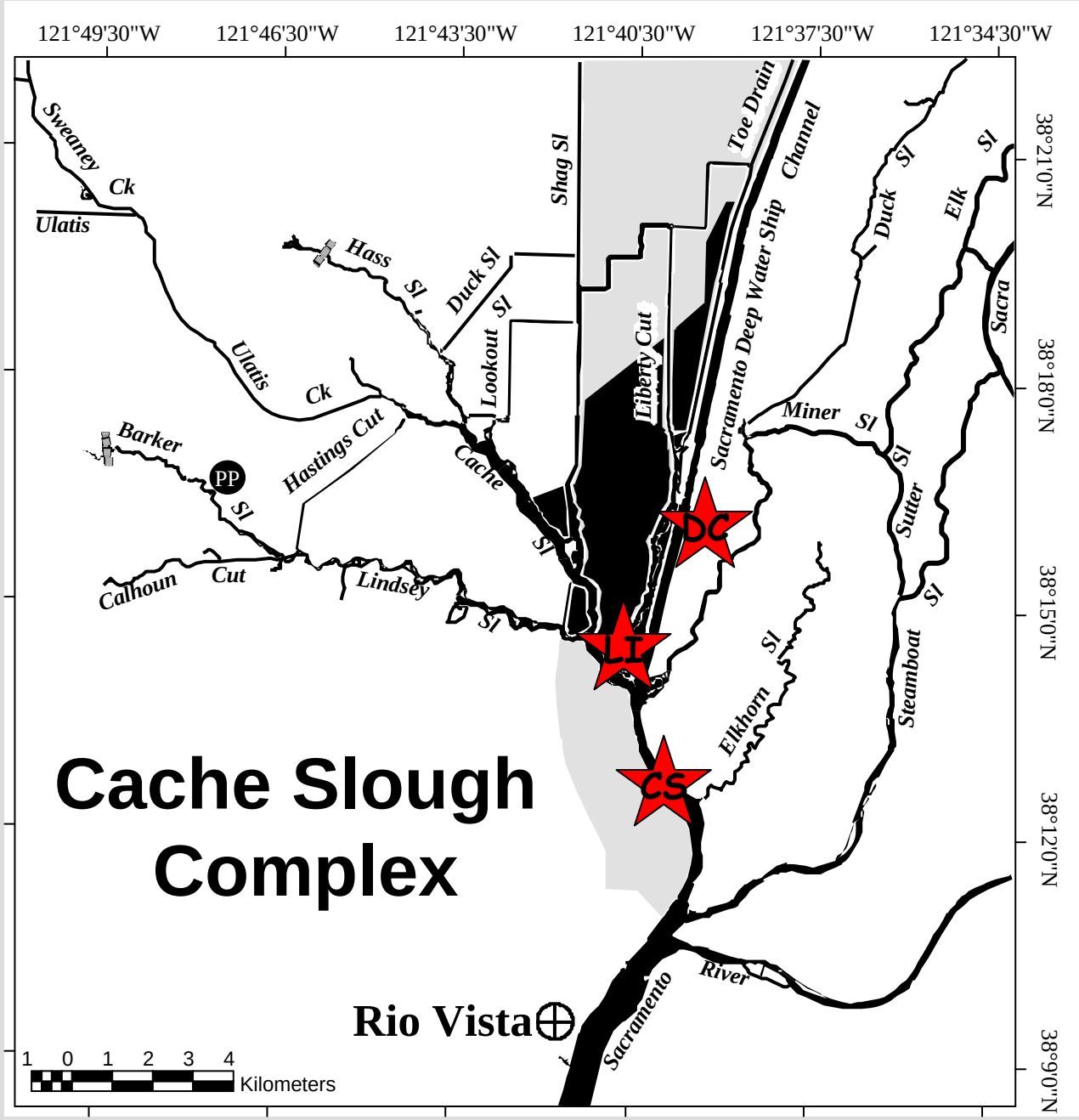
- Study question:
  - What are the spatial and temporal patterns of biological resources in the Cache Slough Complex?

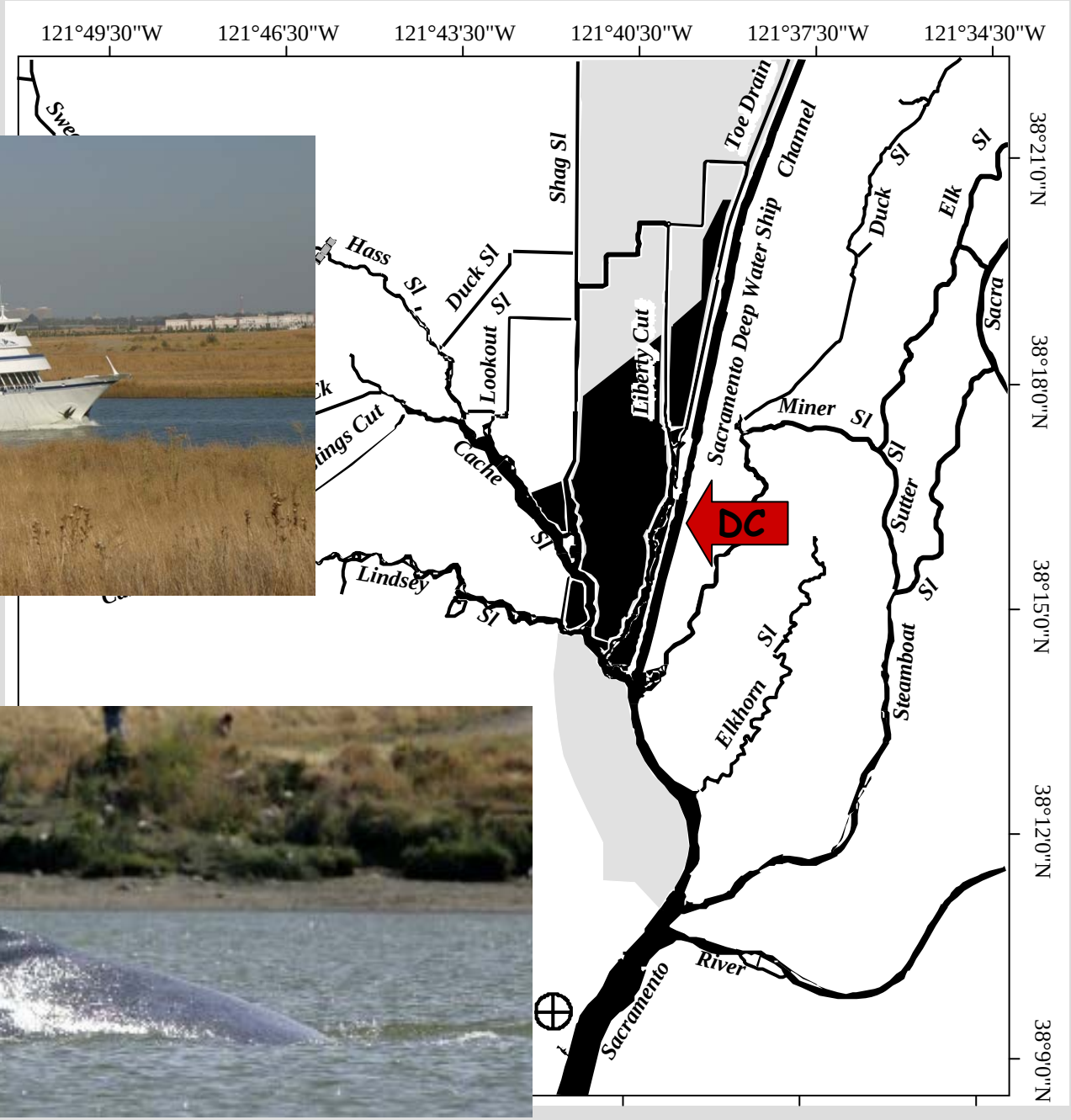
Study Design

- Summer 08 – Spring 09
- Spring and Neap tide
- 24-hour sampling

★ Sample sites



sacbee.com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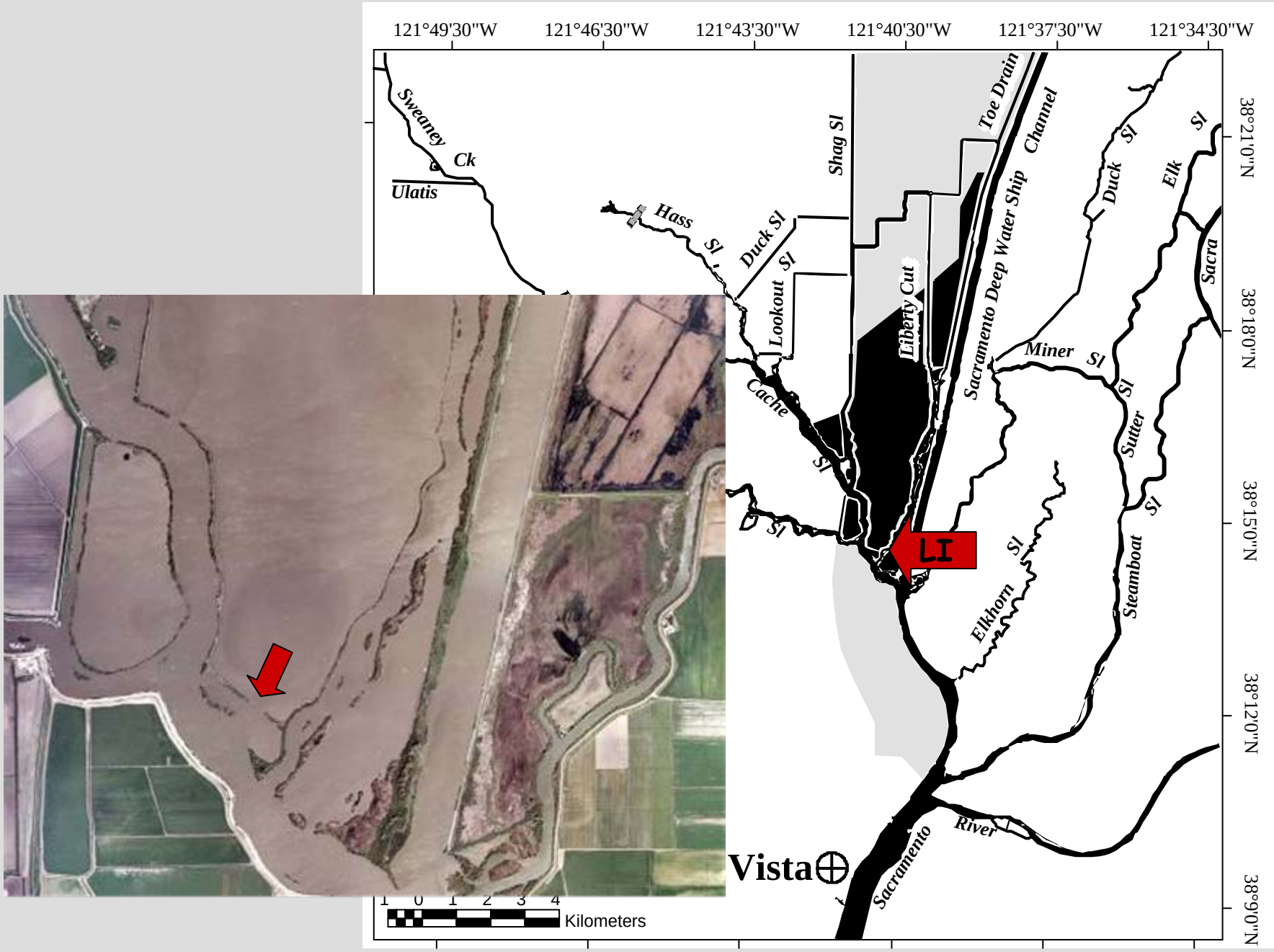
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Kilometers

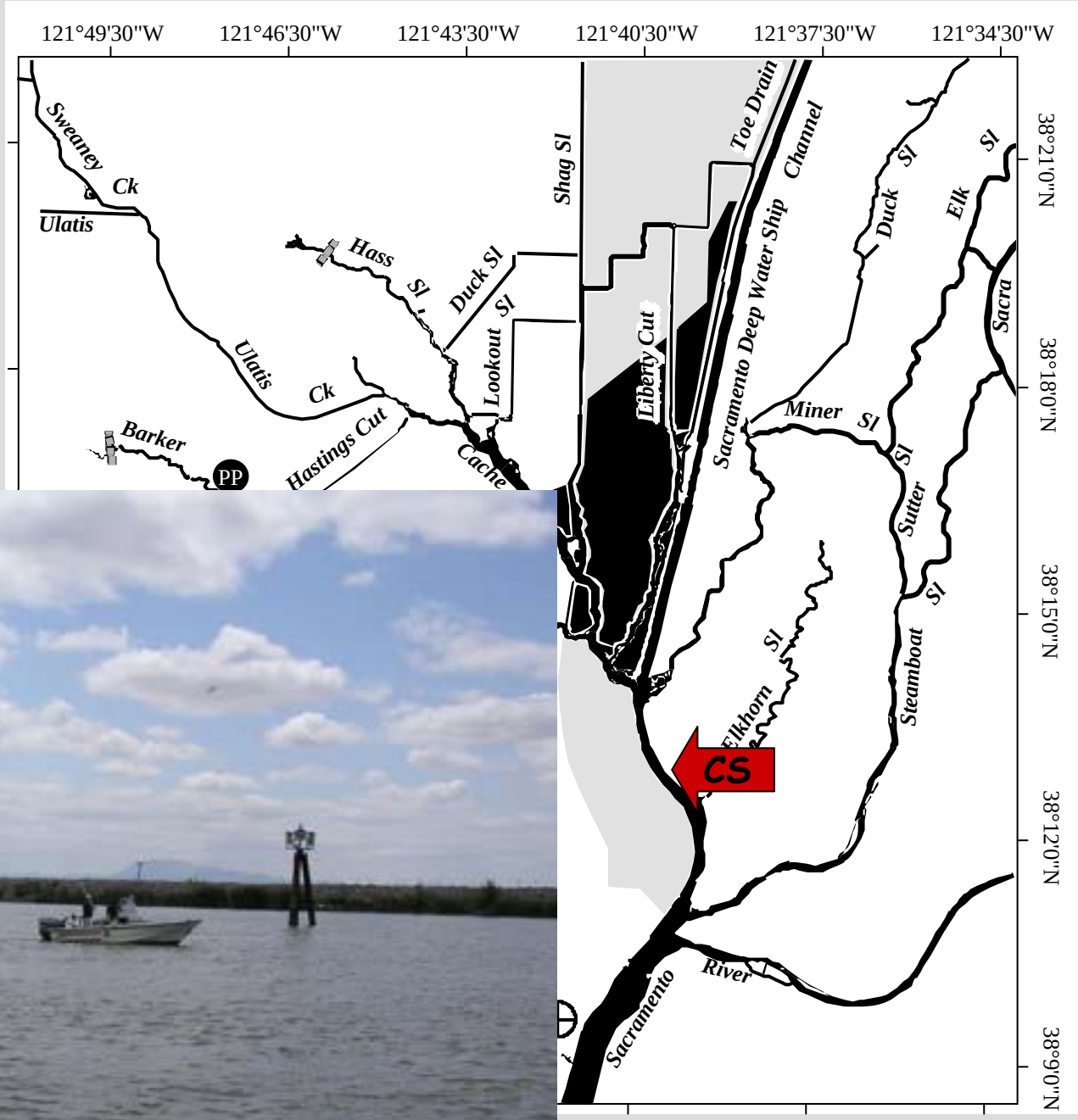
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Photo credit: Jodi Evans

- **Chlorophyll-*a* concentration**
- **Phytoplankton**
- **Zooplankton**
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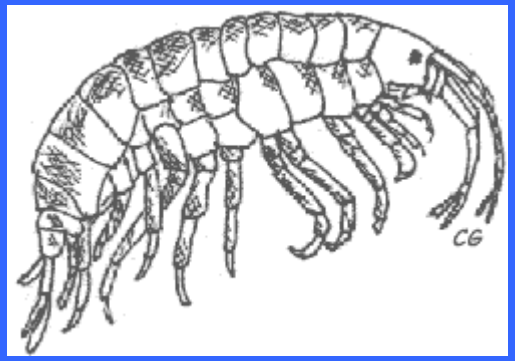
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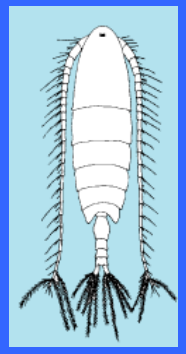

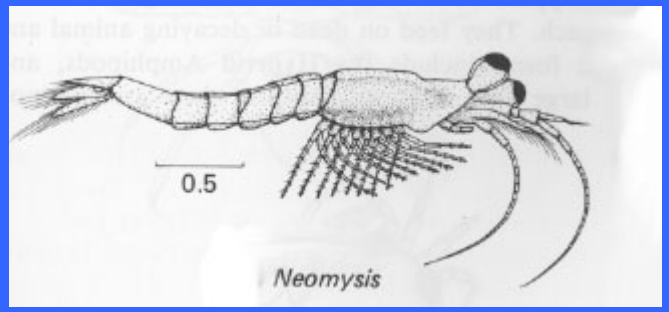
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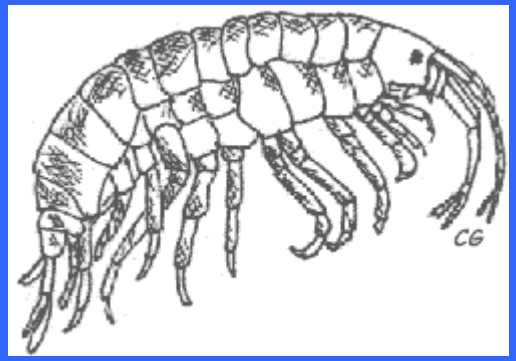
Neomysis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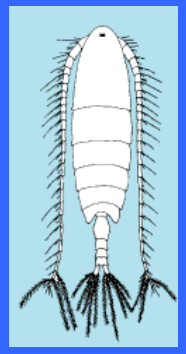

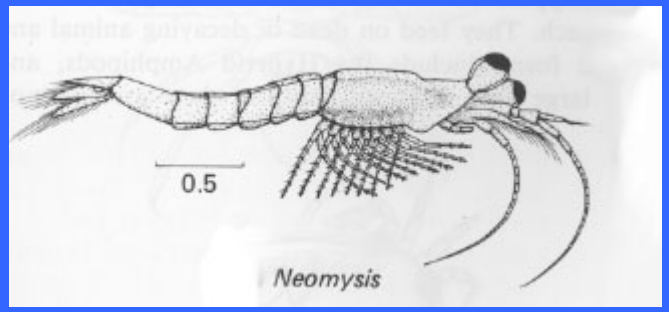
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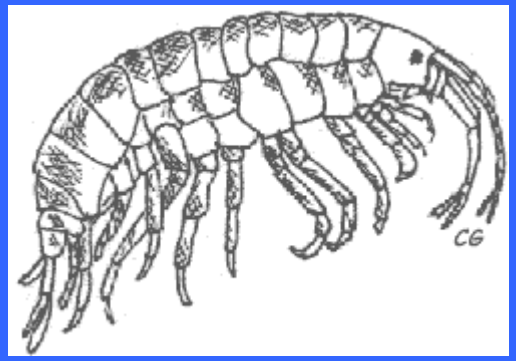
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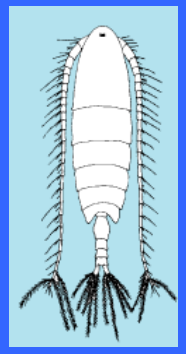

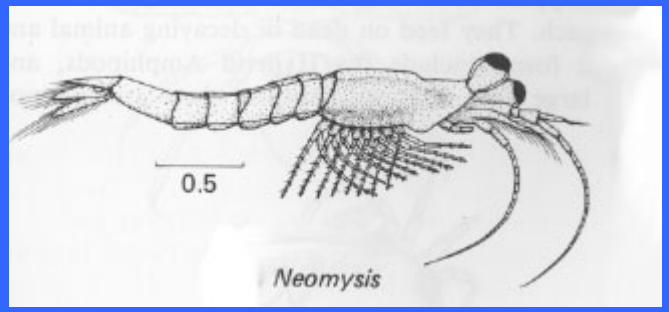
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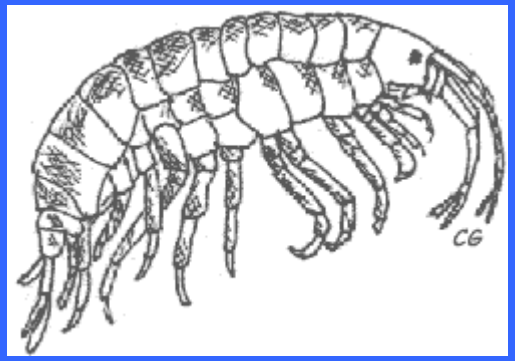
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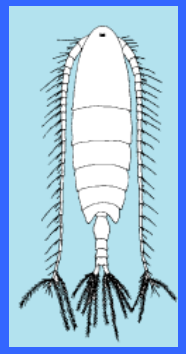

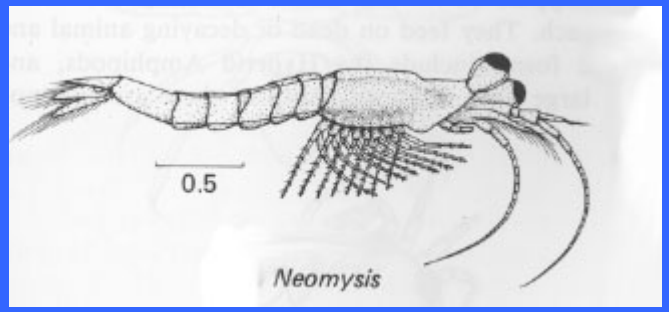
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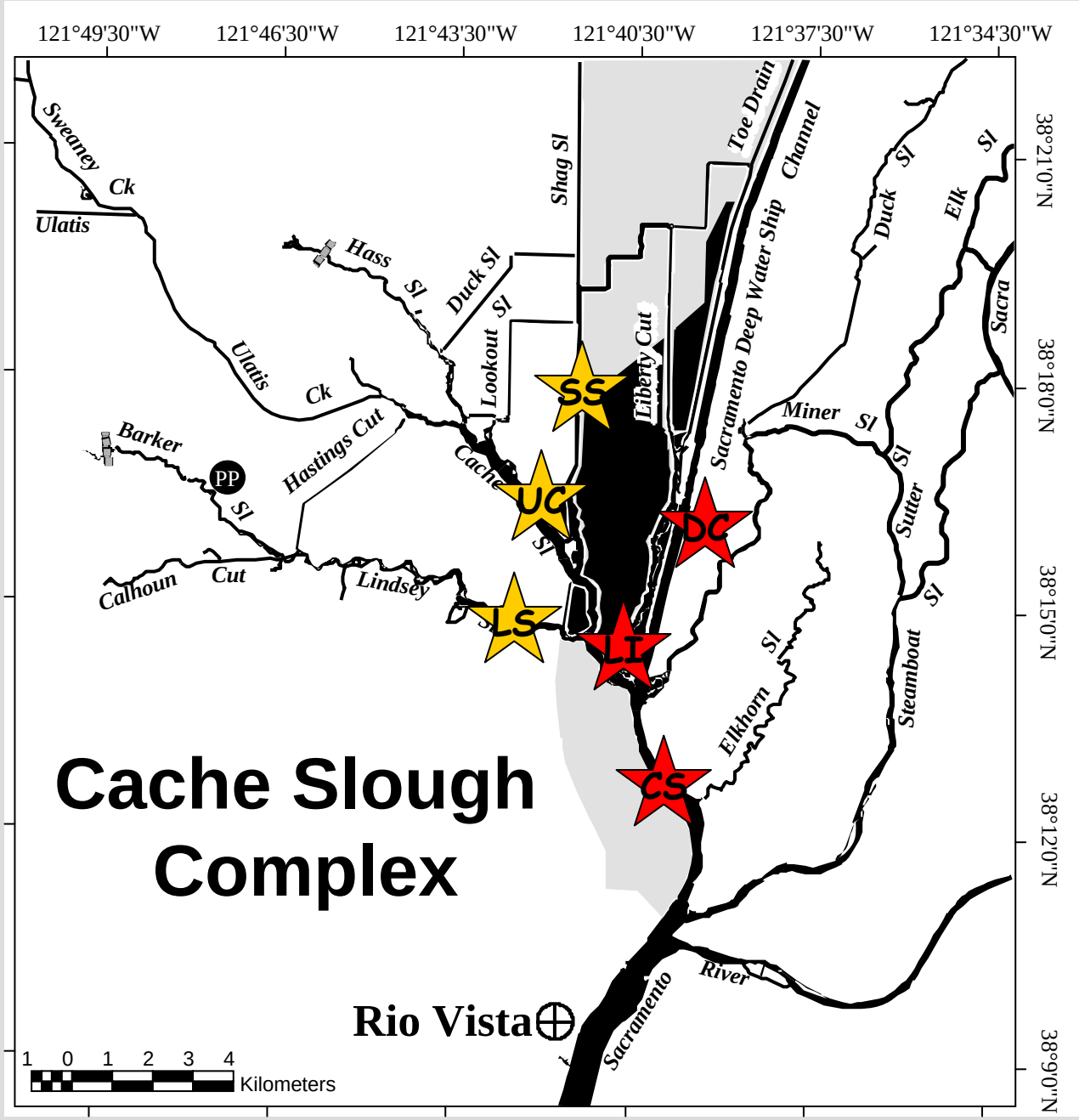
Sample sites

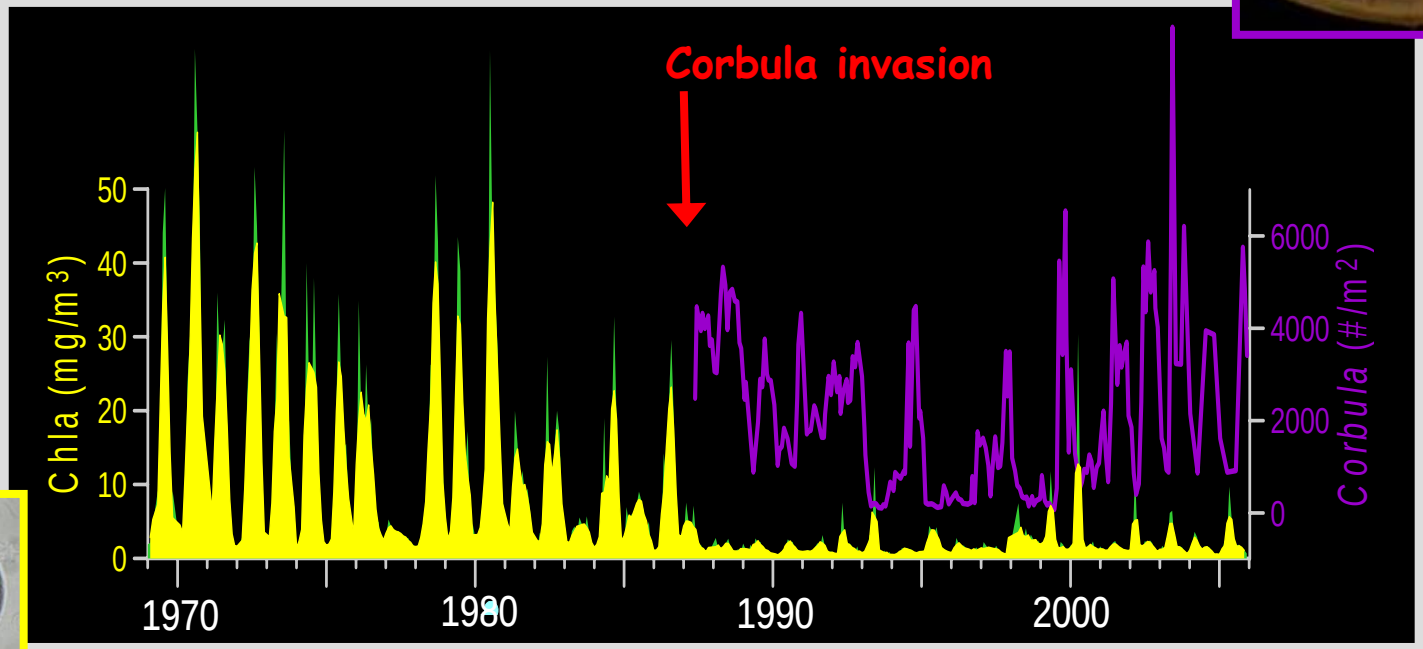
Chl-*a* only

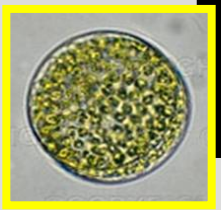


ISCO

Chlorophyll

- Very low in SFE
- Annual average < 5 µg/L
- Food limited at 10 µg/L

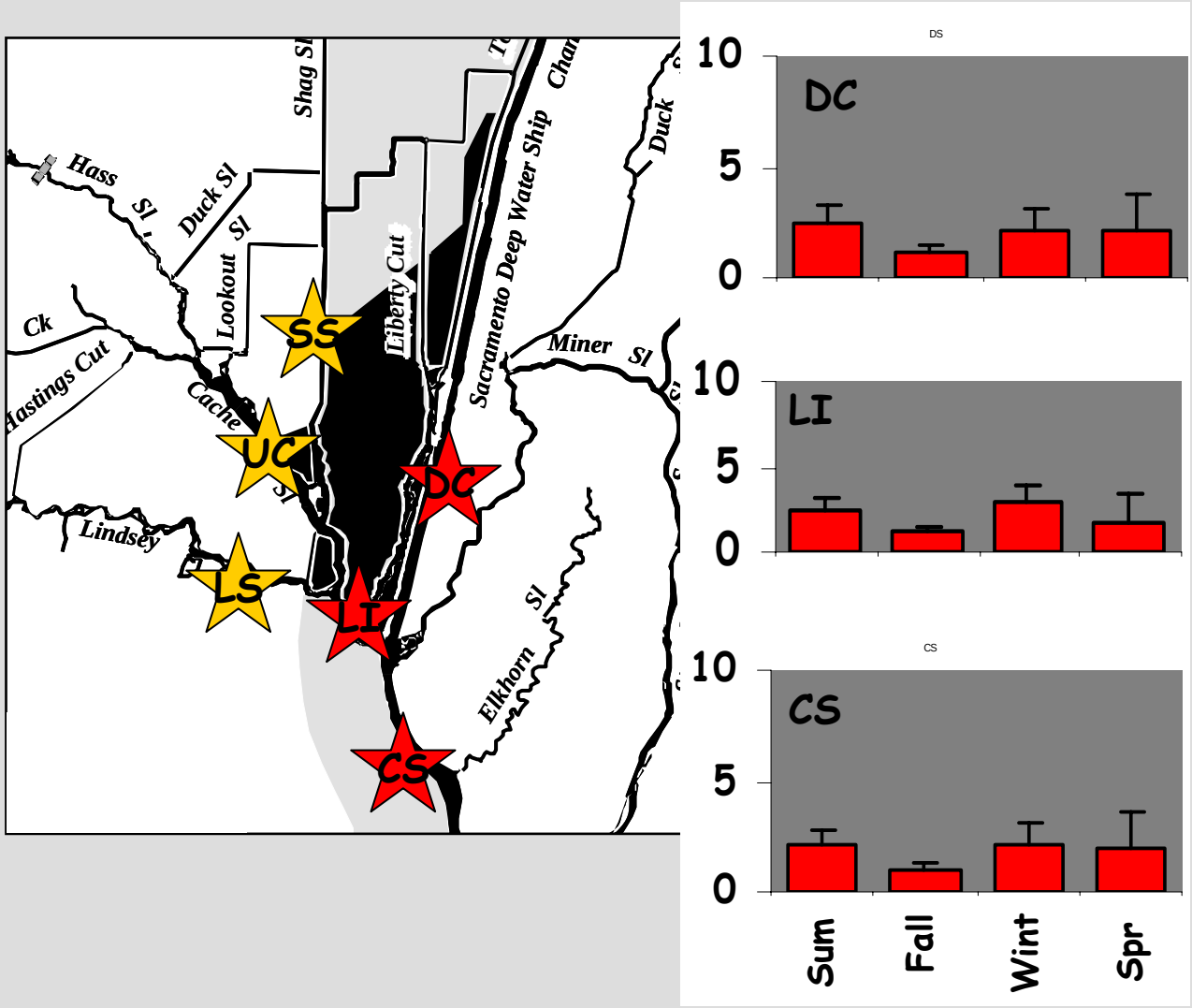




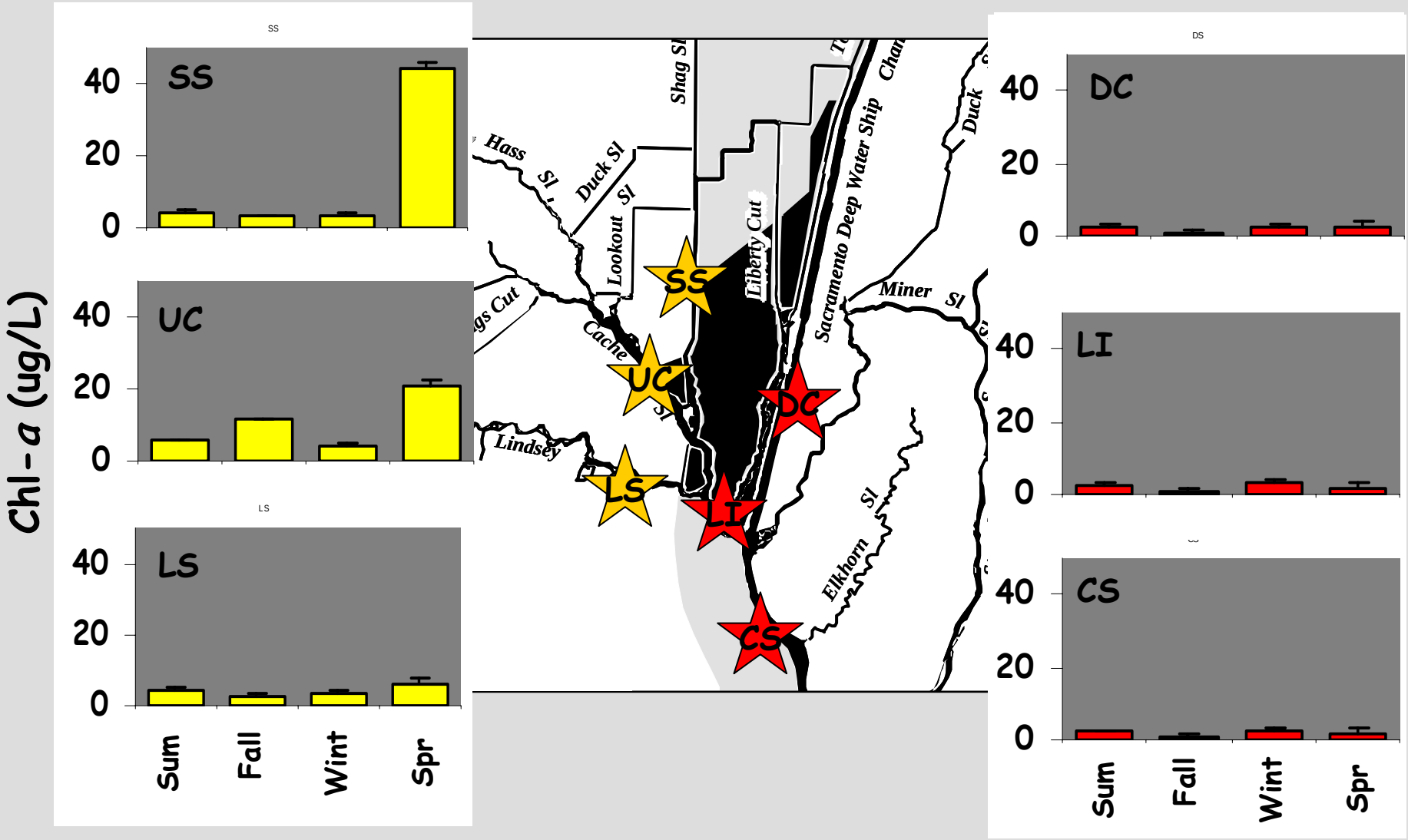
Source: J. Cloern (USGS), IEP data

Chl-*a* in main channels

Chl-*a* (ug/L)

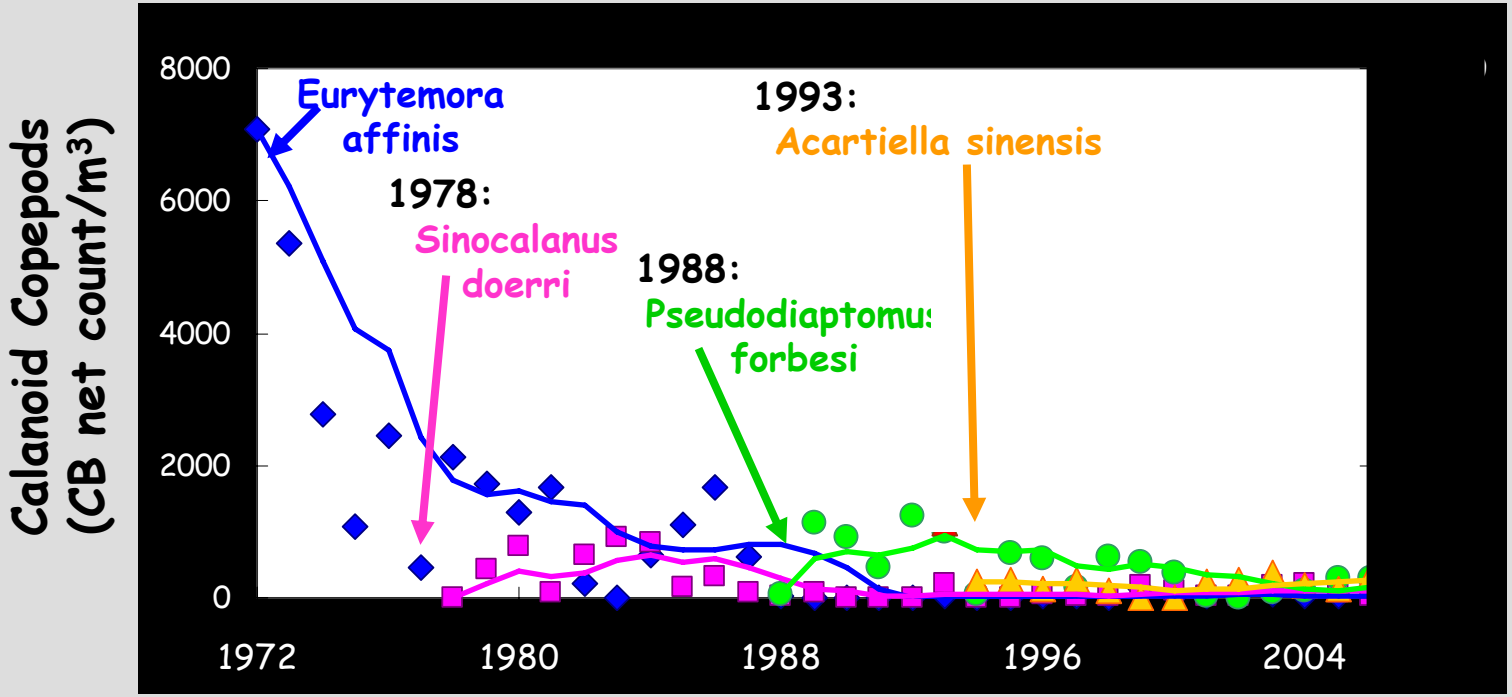


Higher Chl-*a* in western sloughs



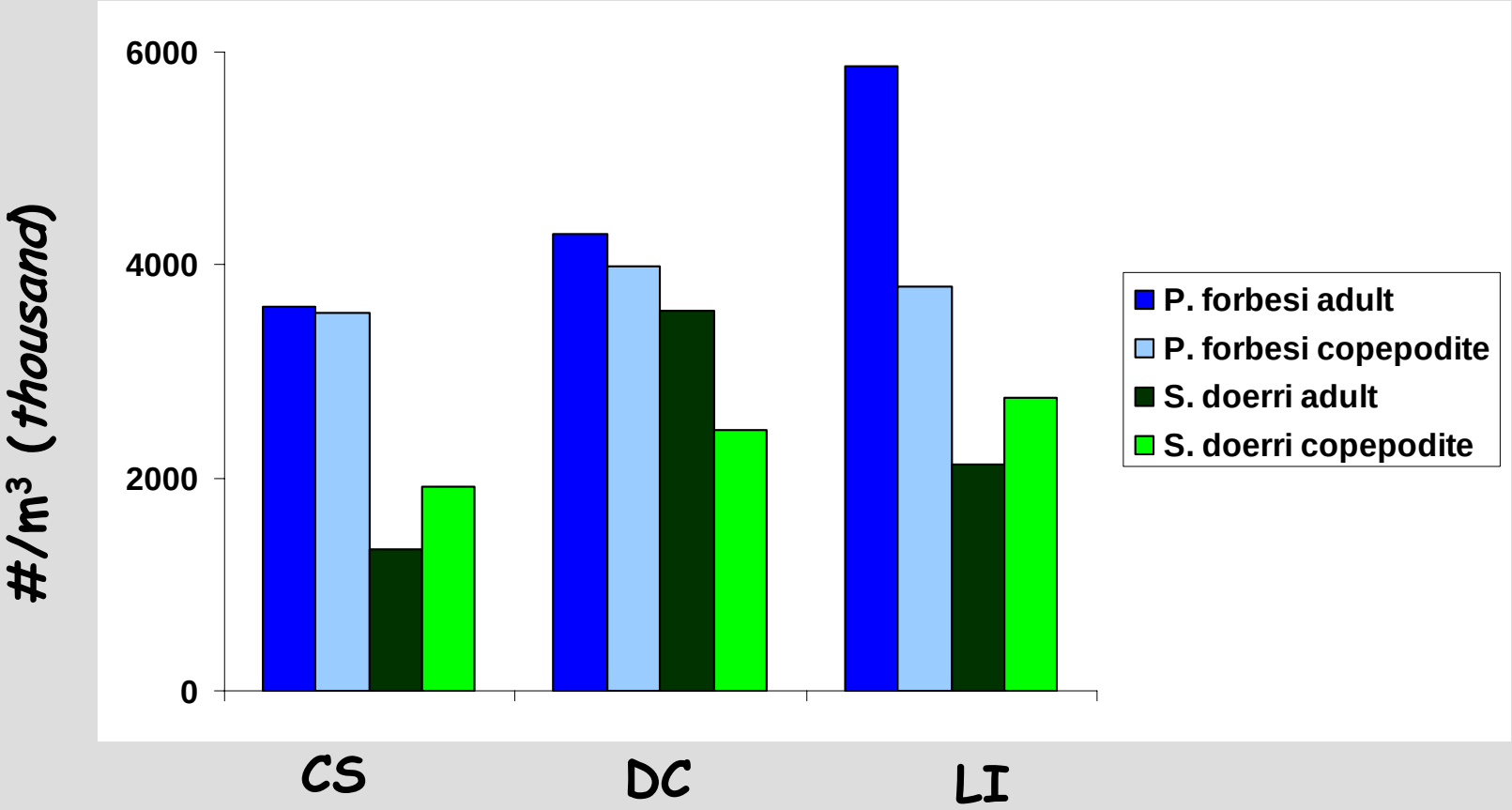
Zooplankton

- Waves of invasions
- Decline in abundance



Source: A. Mueller-Solger, IEP data

Zooplankton abundance is high in the Cache Slough Complex



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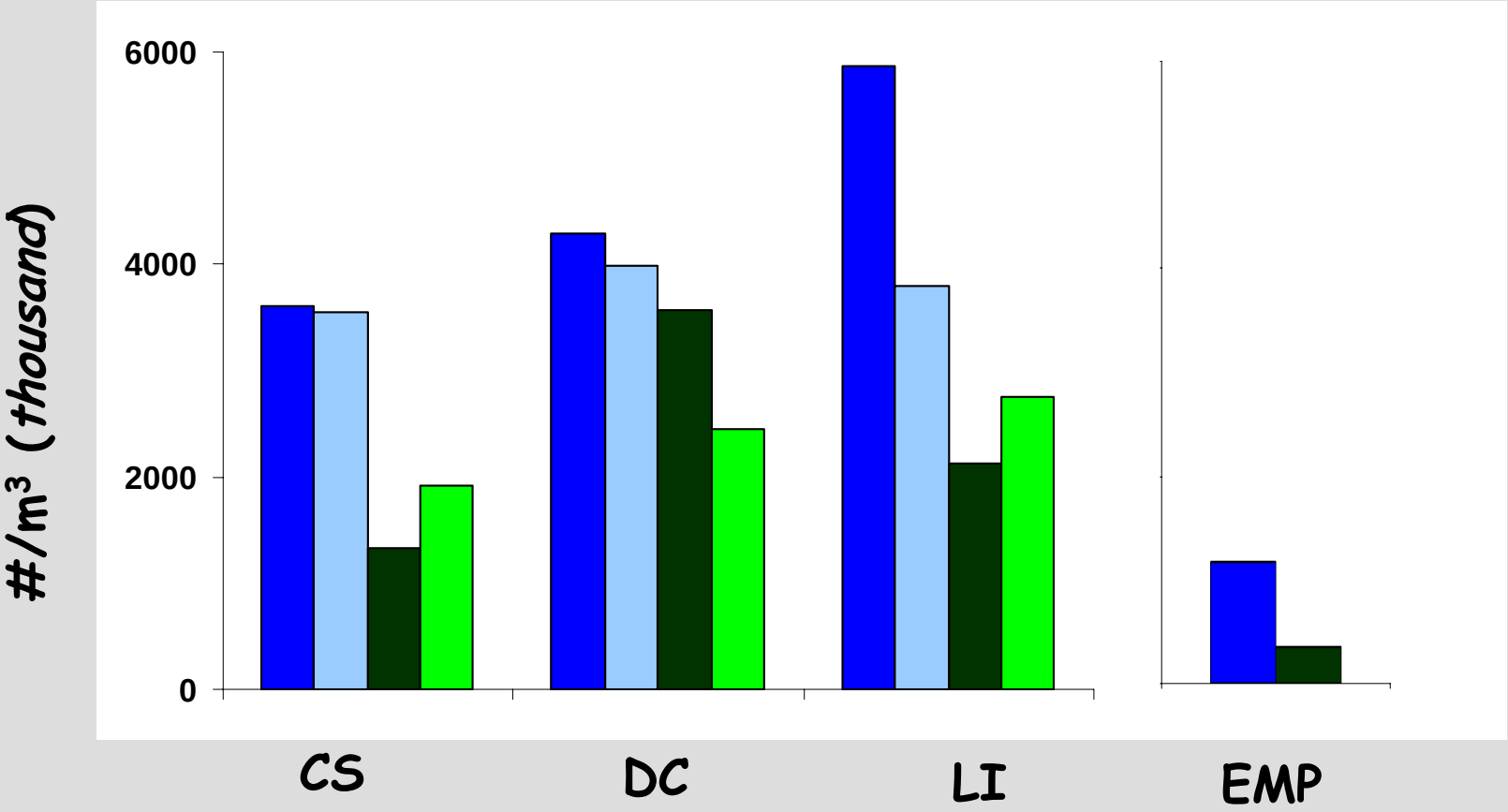
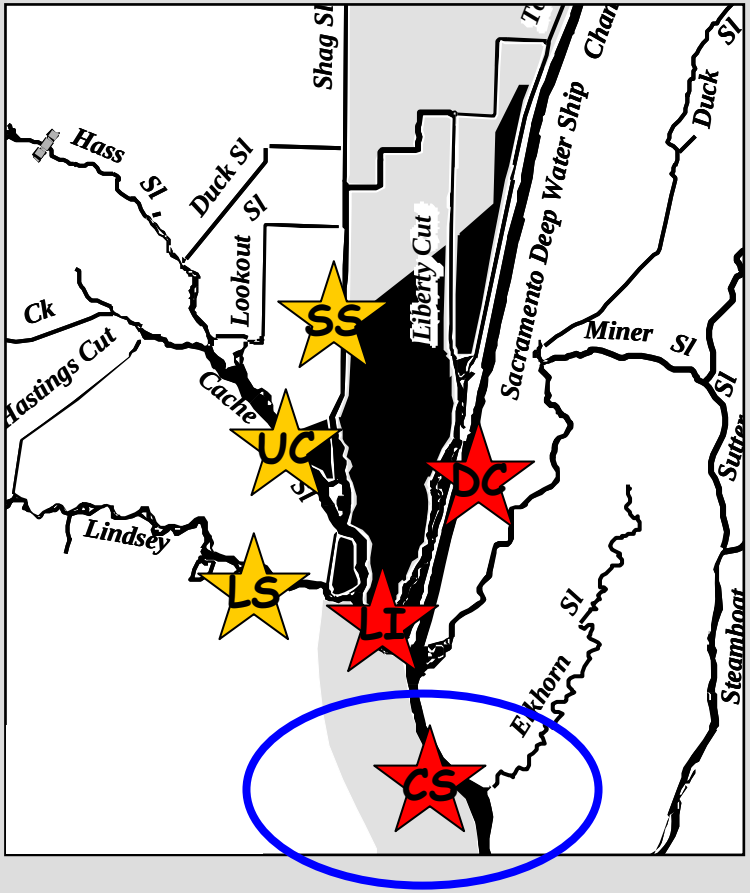
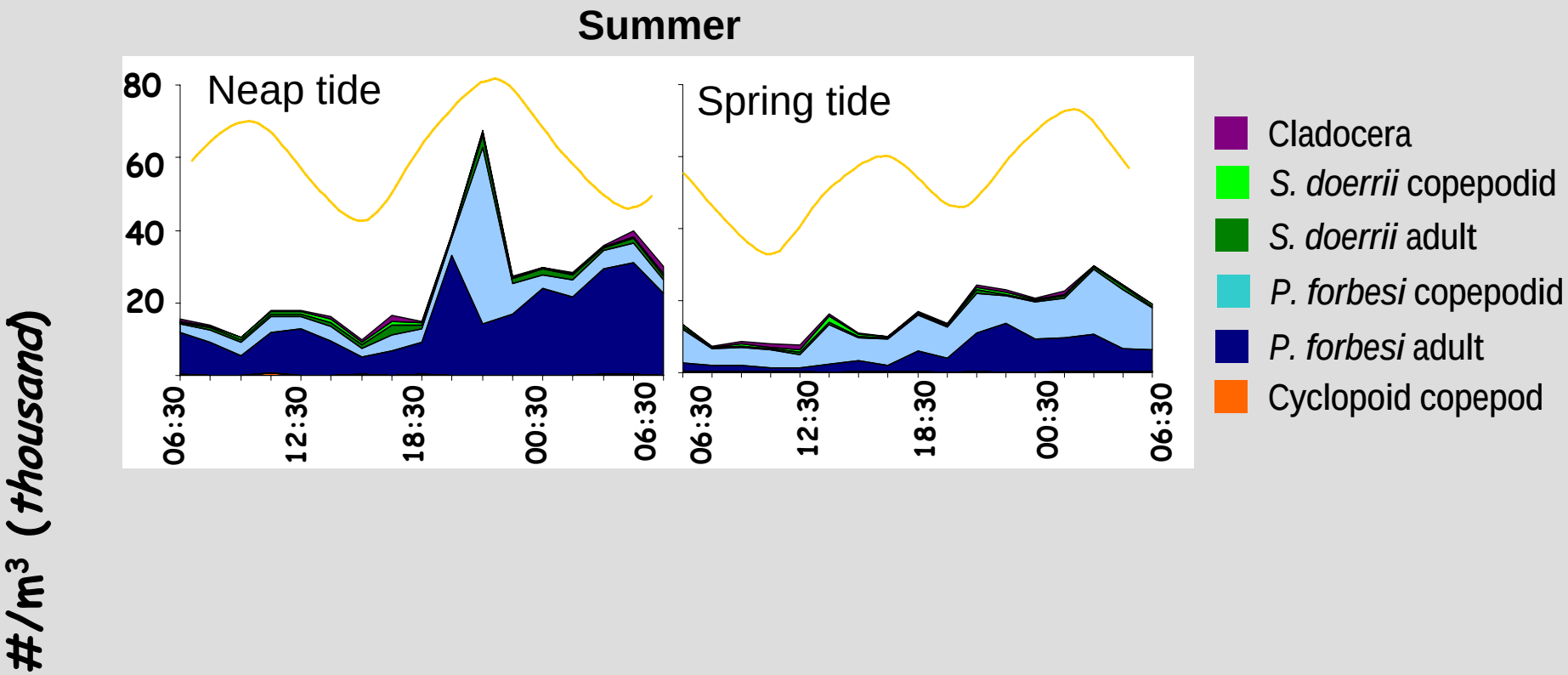


Zooplankton abundance patterns



Neap tide abundance peaks



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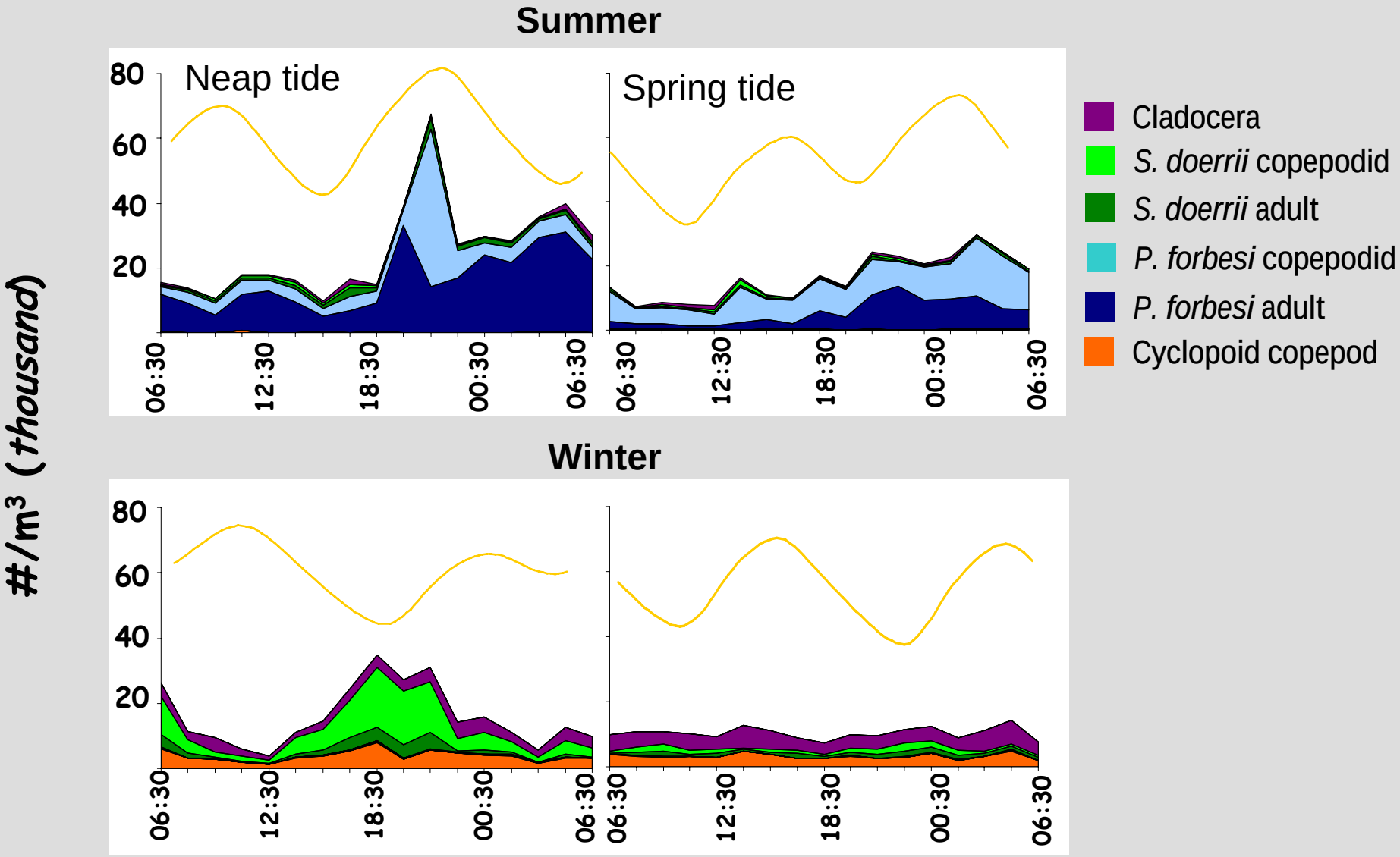
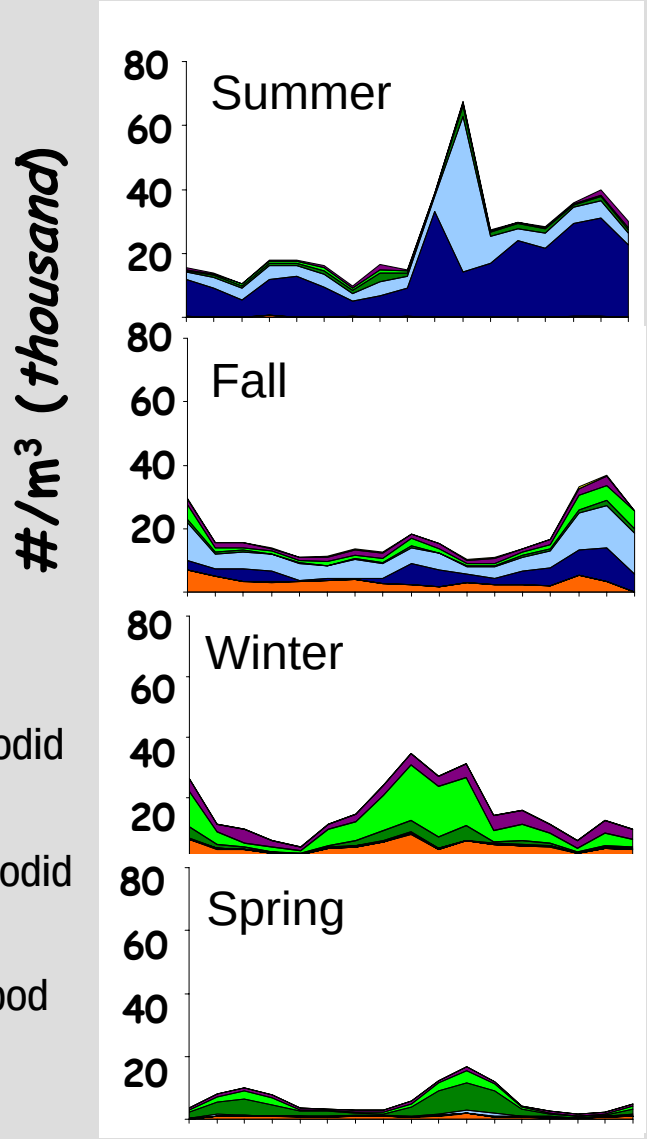


Seasonal community shifts



- Cladocera
- *S. doerrii* copepodid
- *S. doerrii* adult
- *P. forbesi* copepodid
- *P. forbesi* adult
- Cyclopoid copepod

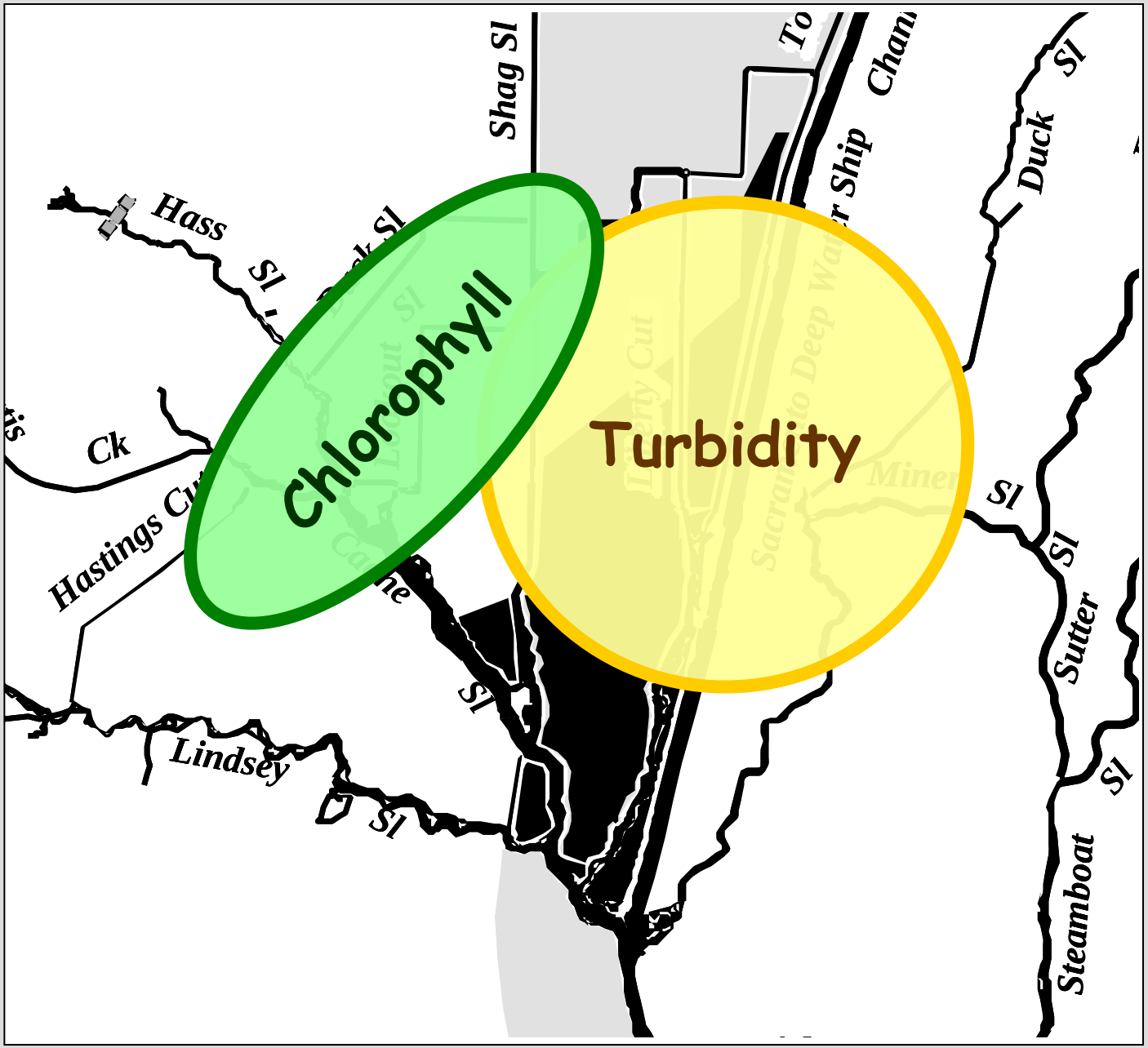
Photo: Cigdem Alemdar, Tenera Environmental

Study Question

What are the spatial and temporal patterns of biological resources in the Cache Slough Complex?

- High productivity
- Tidal and seasonal patterns

Turbidity
Shag Sl
Hass
Sl
Duck Sl
Sl
Lookout
Ck
Hastings Cut
Cache
Sl
Lindsey
Sl
Duck
Sl
Sl
Sl
Sutter
Sl
Steamboat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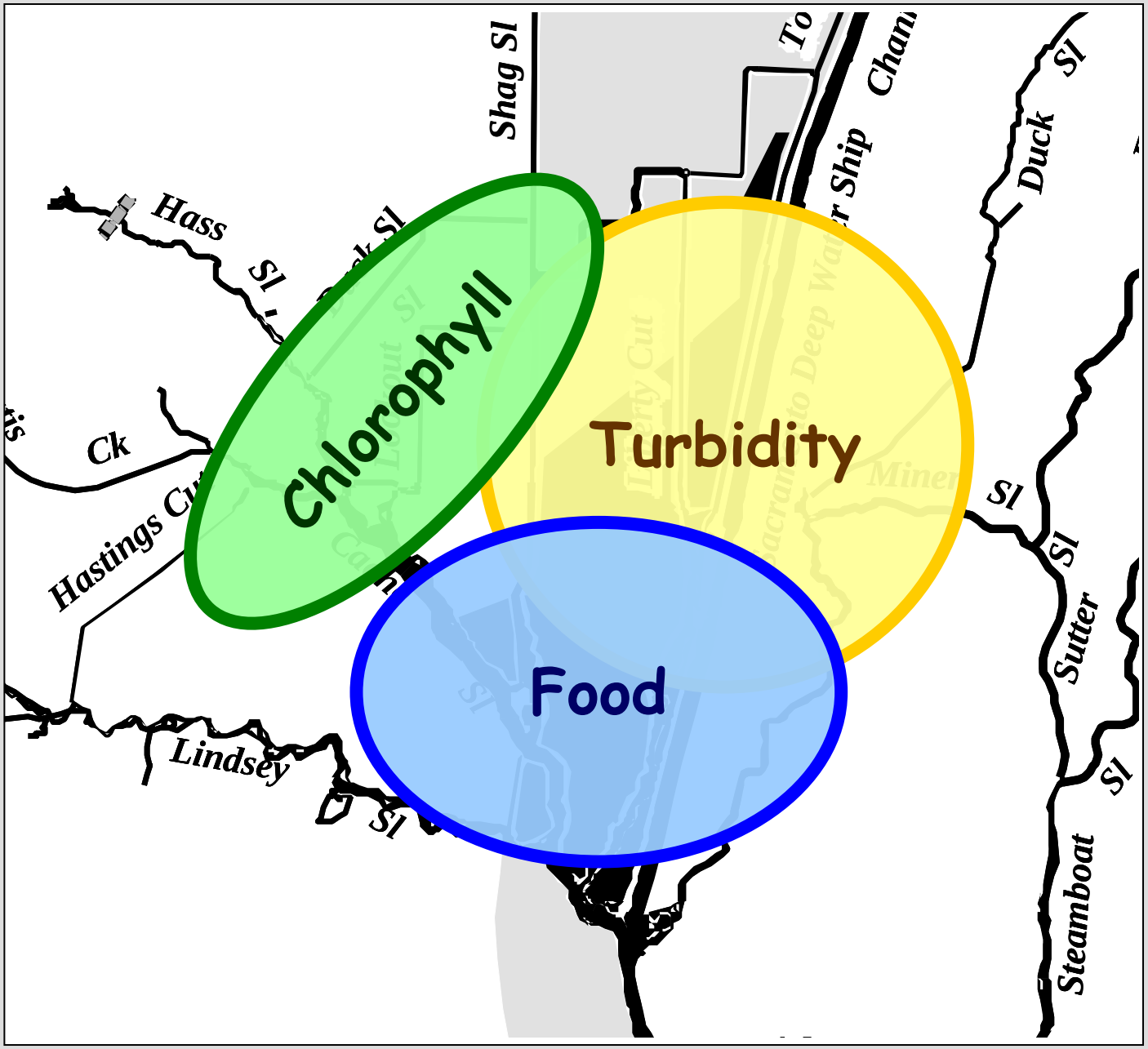
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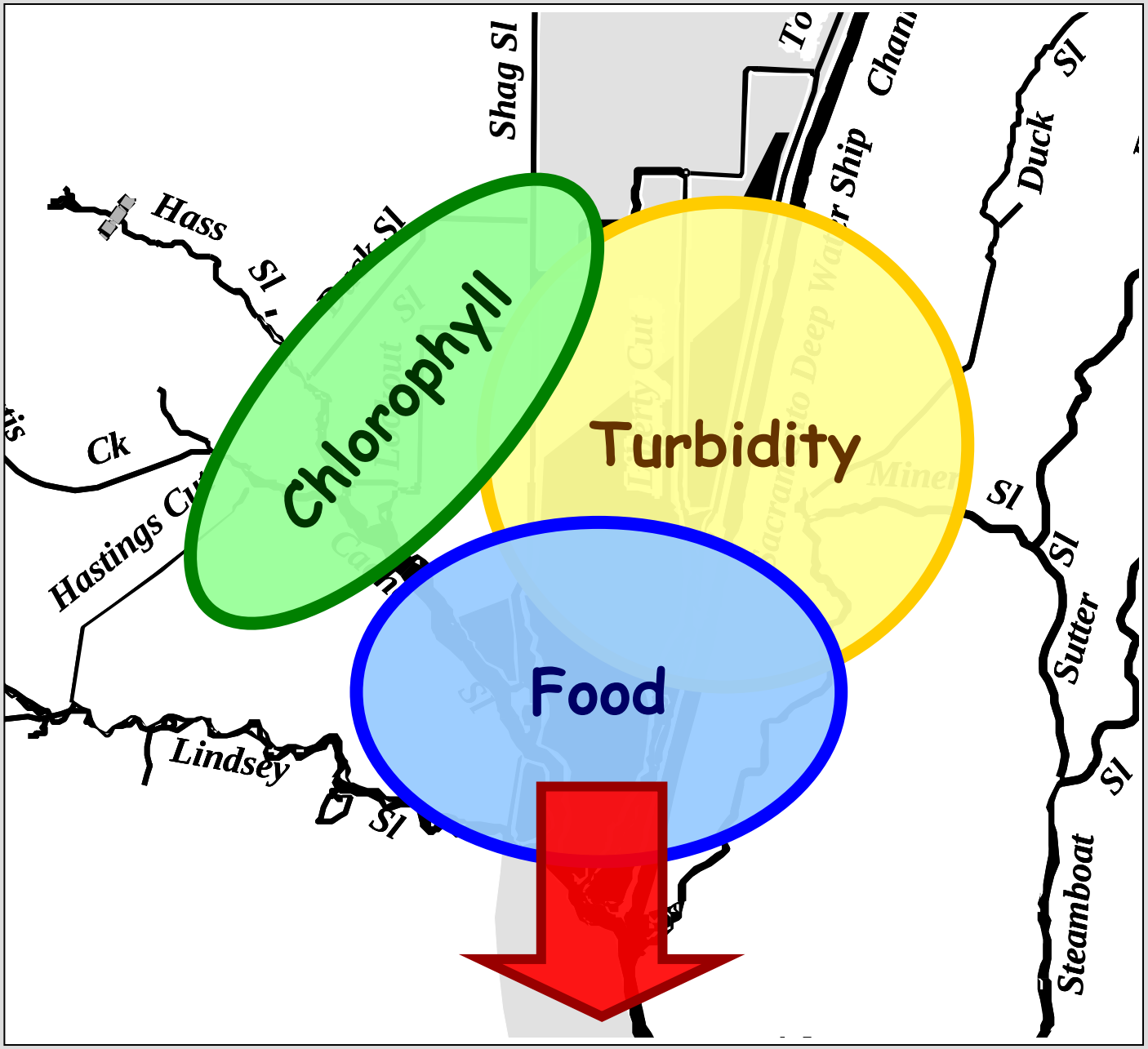
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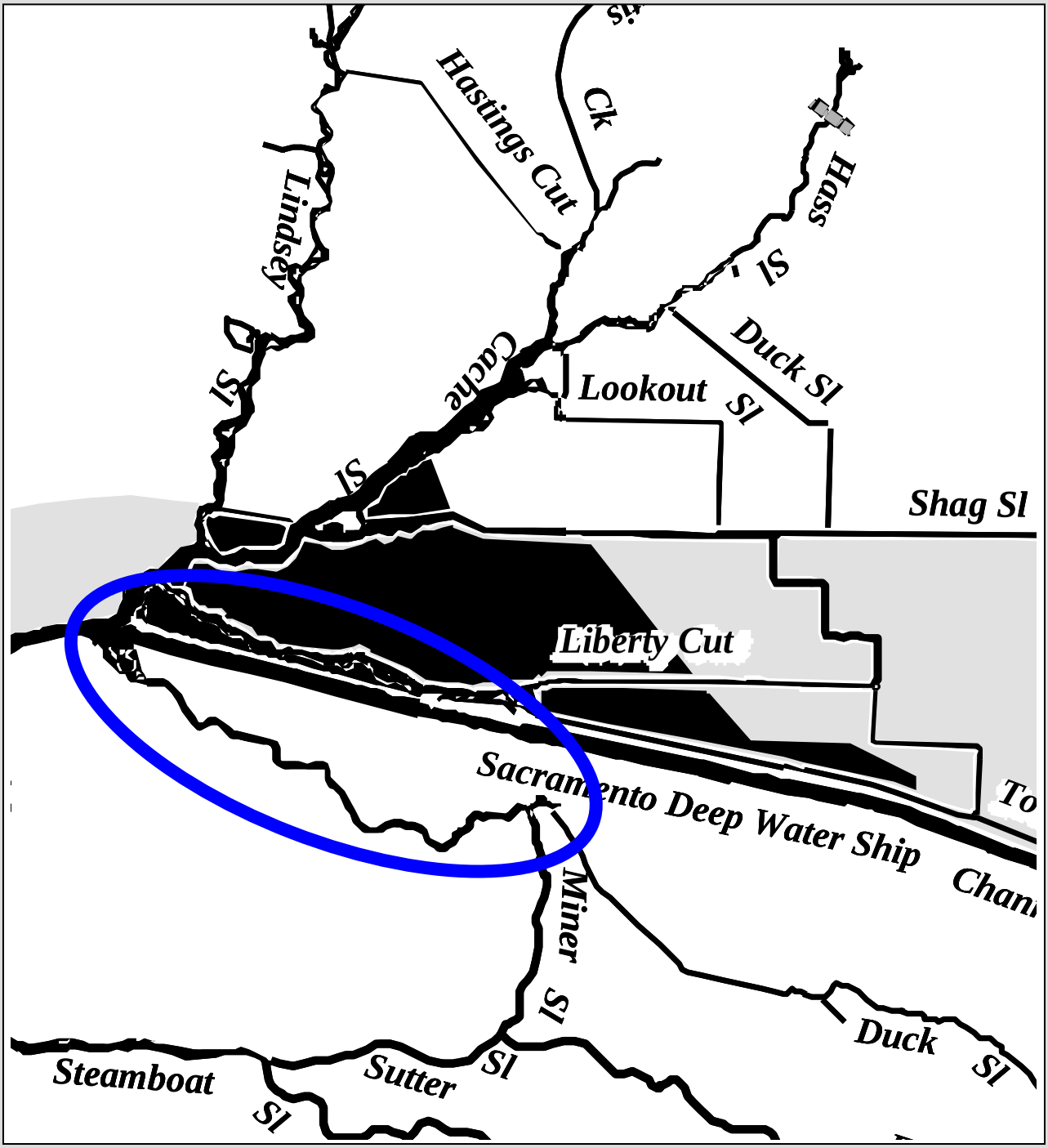
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IEP Research

Acknowledgements

Study collaboration:

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Jon Bureau

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Marianne Kirkland
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Dan Riordan
Erika Holland
Josh Martinez
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Sid Fong, DWR Bryte Lab
Cigdem Alemdar, Tenera

Thank You