Apr 6th, 8:30 AM - 8:45 AM

Stable isotope analysis reveals different trophic niche spaces for wild and hatchery origin juvenile Chinook salmon in the Nisqually Delta

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Integrated diet analyses reveal different trophic niche spaces for juvenile Chinook salmon in the Nisqually River Delta

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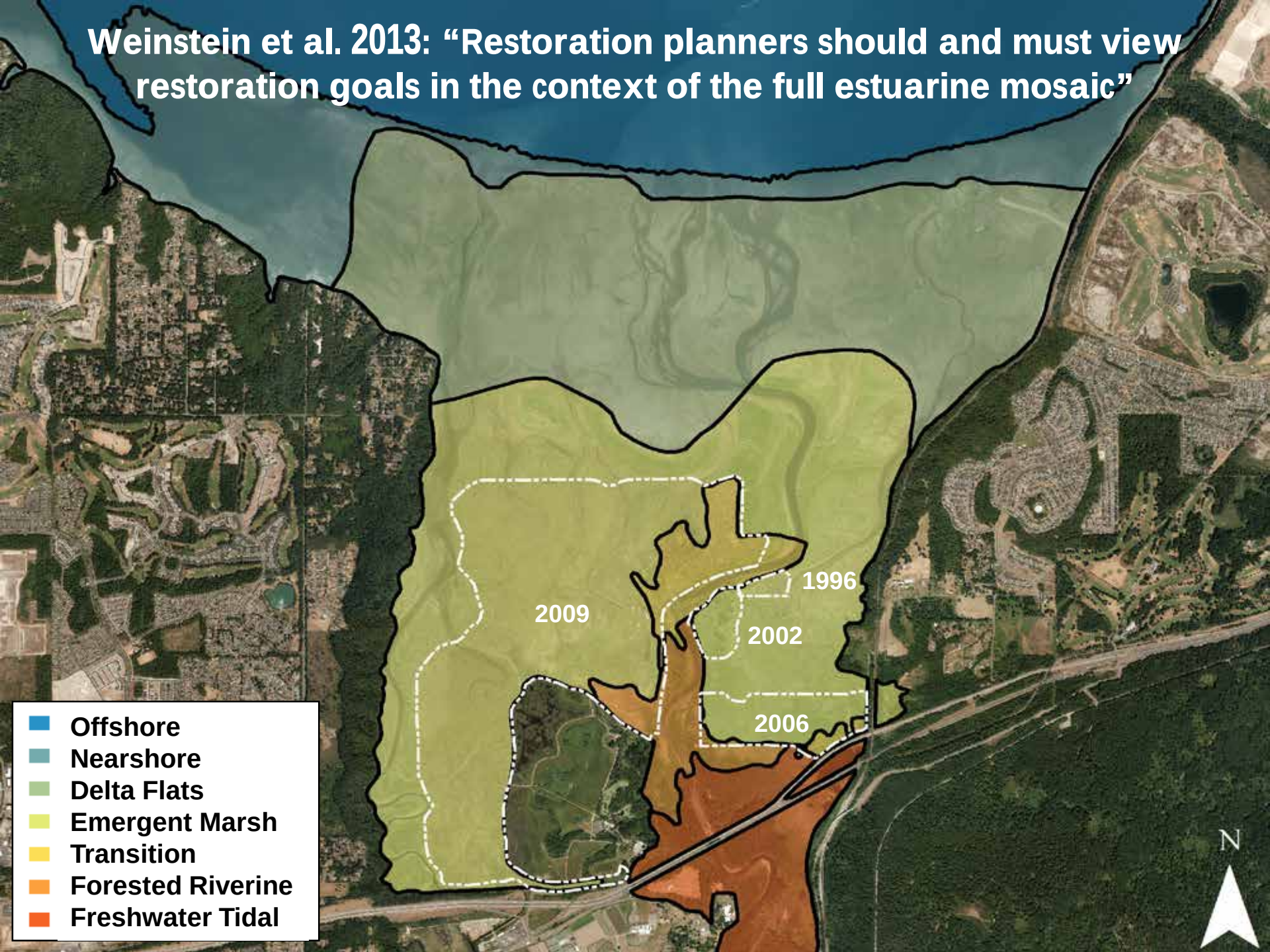
Photo: Russ McMillan


Weinstein et al. 2013: “Restoration planners should and must view restoration goals in the context of the full estuarine mosaic”
1996
2009
2002
2006
Offshore
Nearshore
Delta Flats
Emergent Marsh
Transition
Forested Riverine
Freshwater Tidal
N

How do juvenile salmon benefit from estuarine habitat?

RCO PRISM

How do juvenile salmon benefit from estuarine habitat?

WHO is eating WHAT, and WHERE?

WHO is eating WHAT, and WHERE?

1. Where are hatchery and unmarked juvenile Chinook salmon foraging?
2. What prey taxa are they eating?
3. What is the energetic quality of their diets?

Diet varies ontogenetically


7.41 kJ/g


2.96 kJ/g

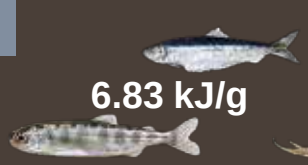

10.93 kJ/g


8.92 kJ/g


6.20 kJ/g

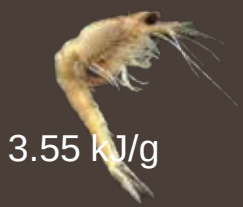

5.32 kJ/g

Higgs et al 1995, Bieber 2005, Gray 2005, Cordell et al. 2011


6.83 kJ/g

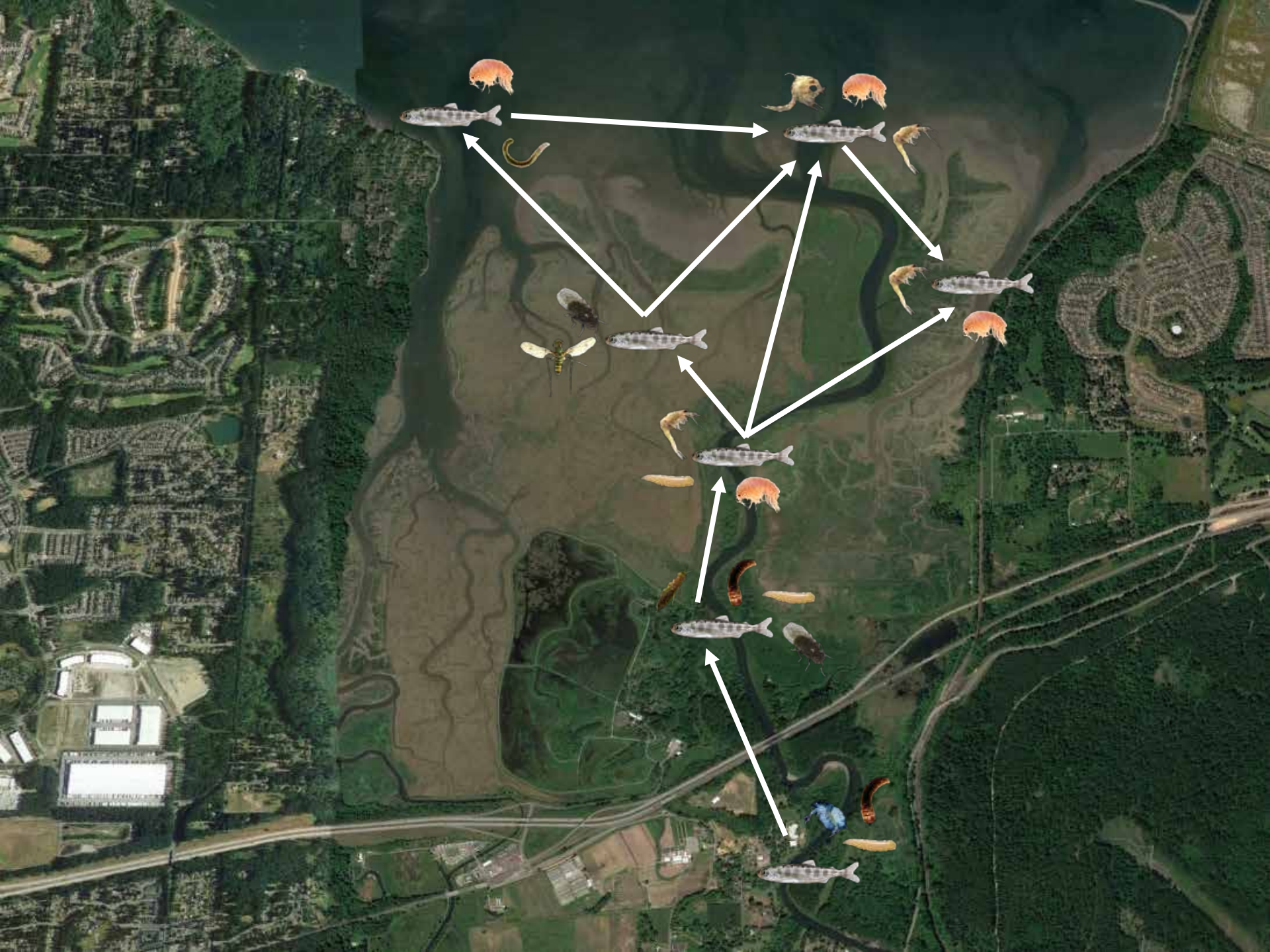

3.36 kJ/g

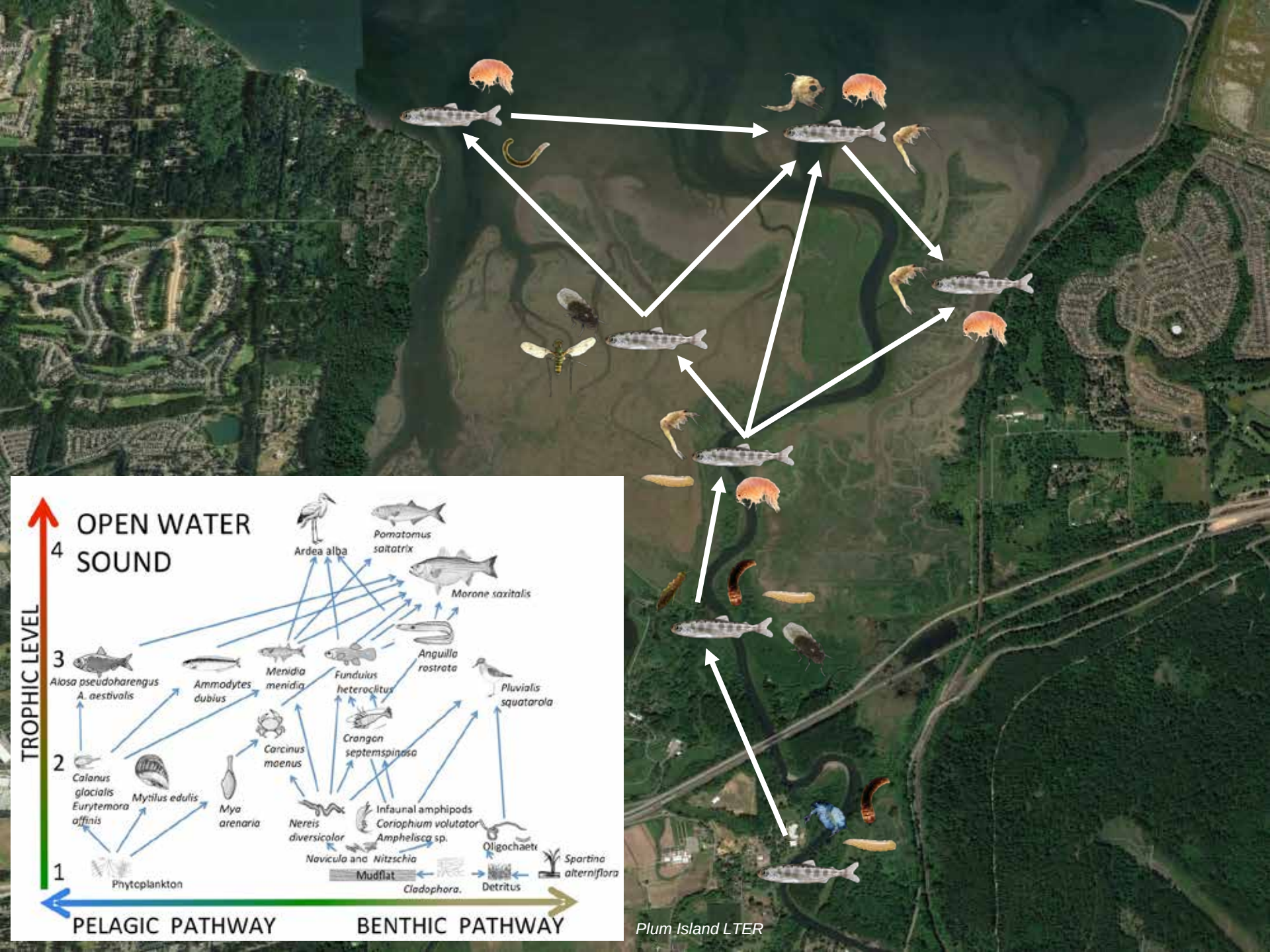

1.98 kJ/g


3.55 kJ/g


3.06 kJ/g


USGS





Plum Island LTER

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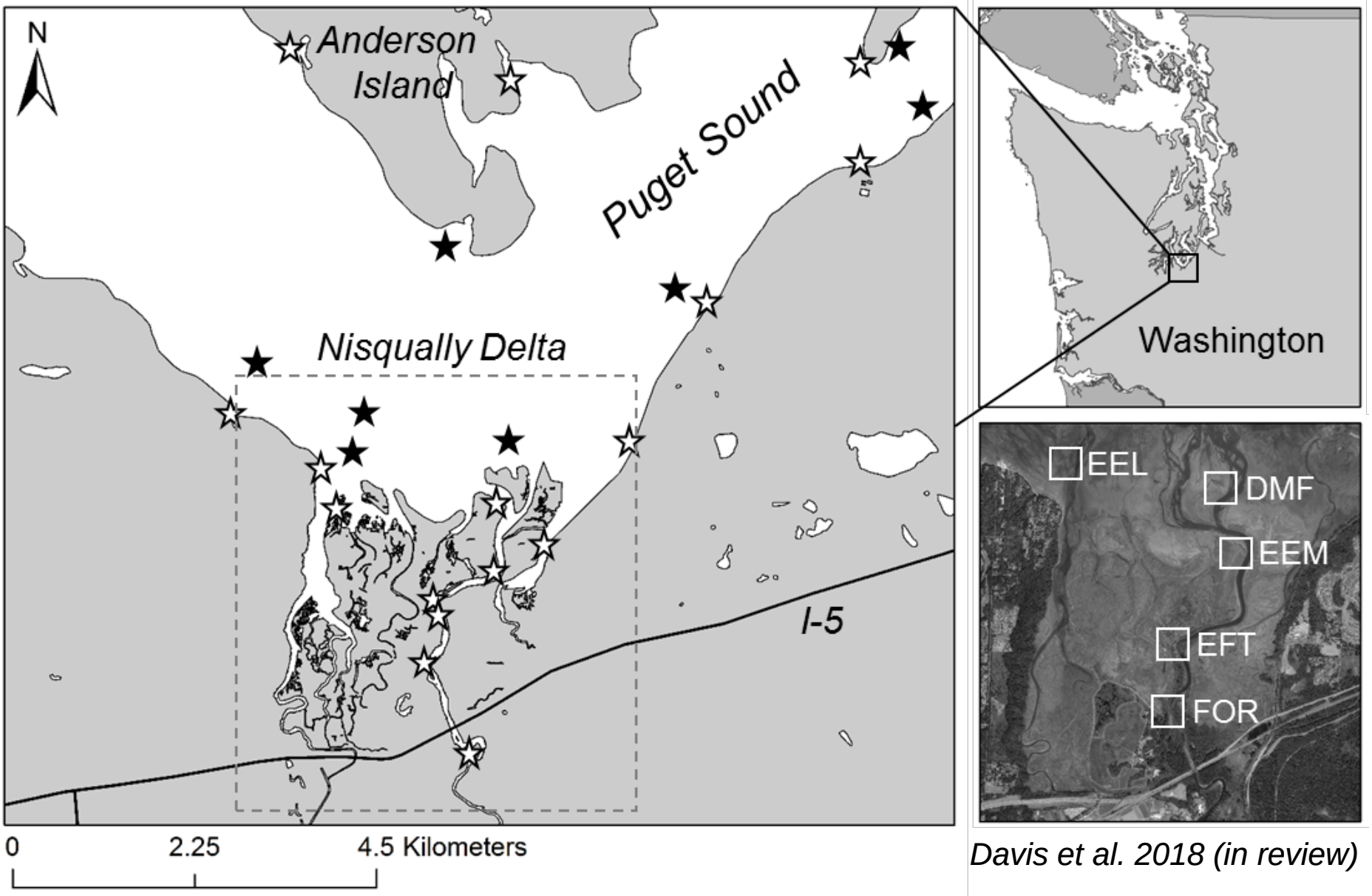
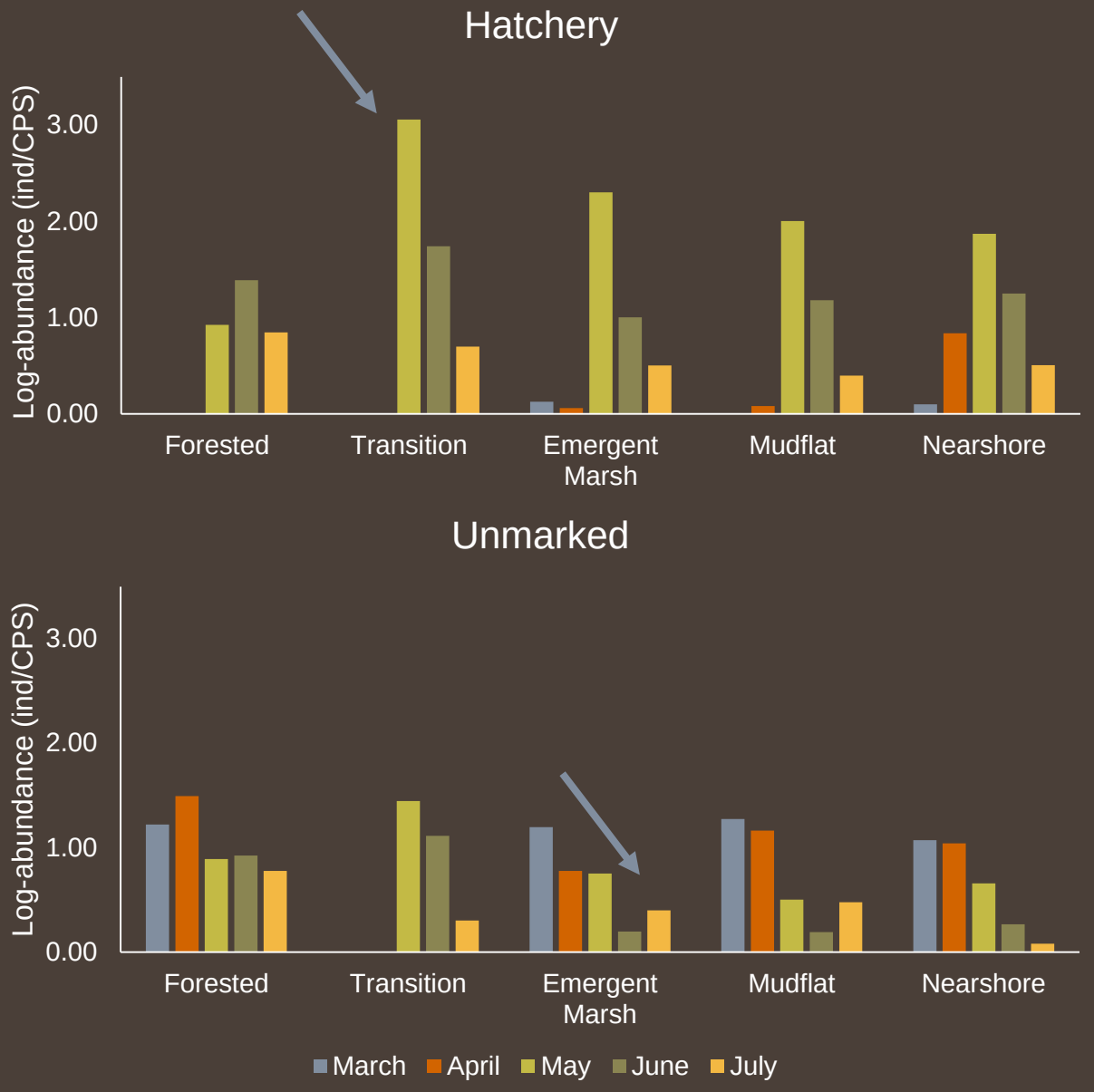
Nisqually Tribe DNR

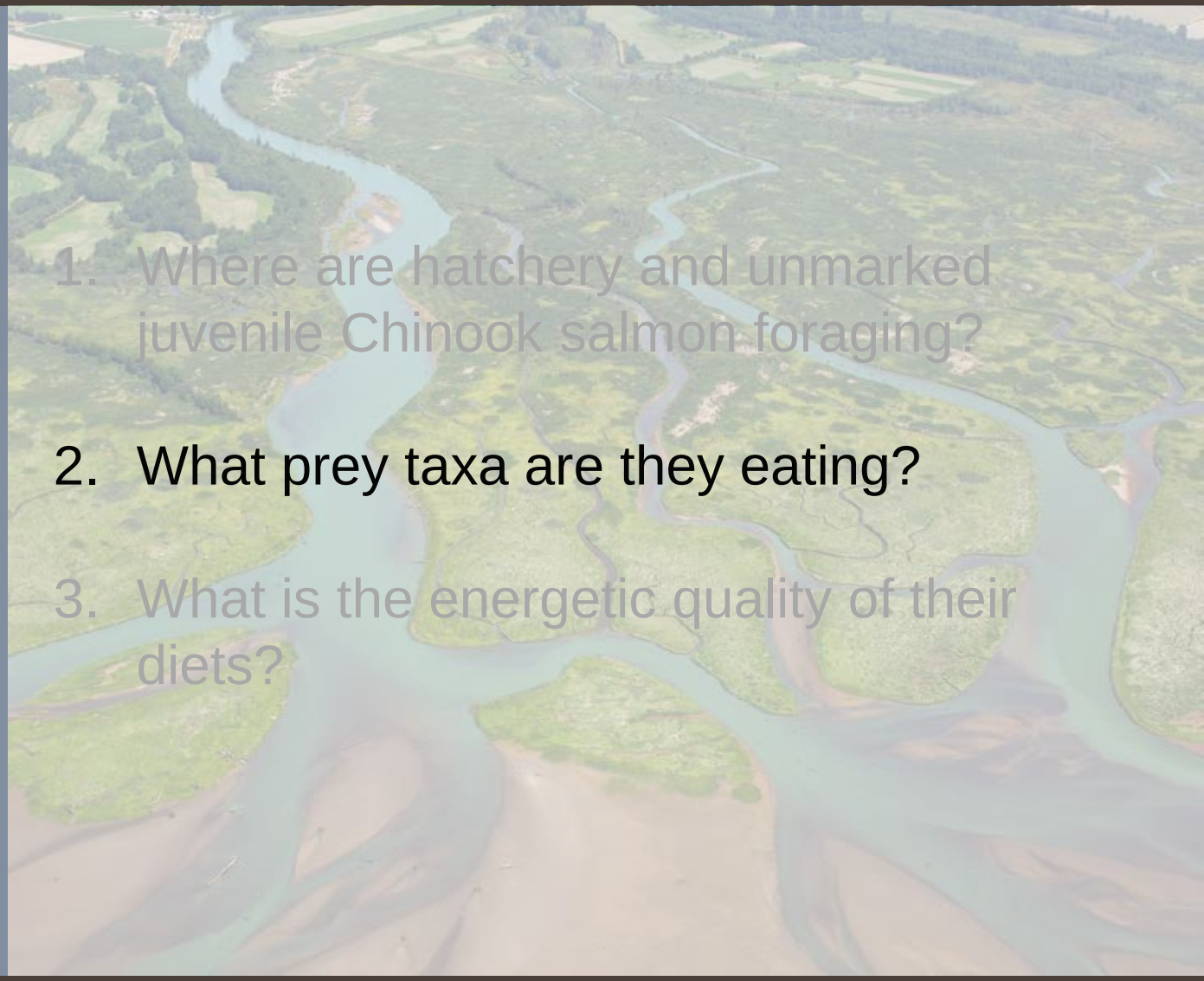


Davis et al. 2018 (in review)

Average catch-per-set by habitat type



WHO is eating WHAT, and WHERE?



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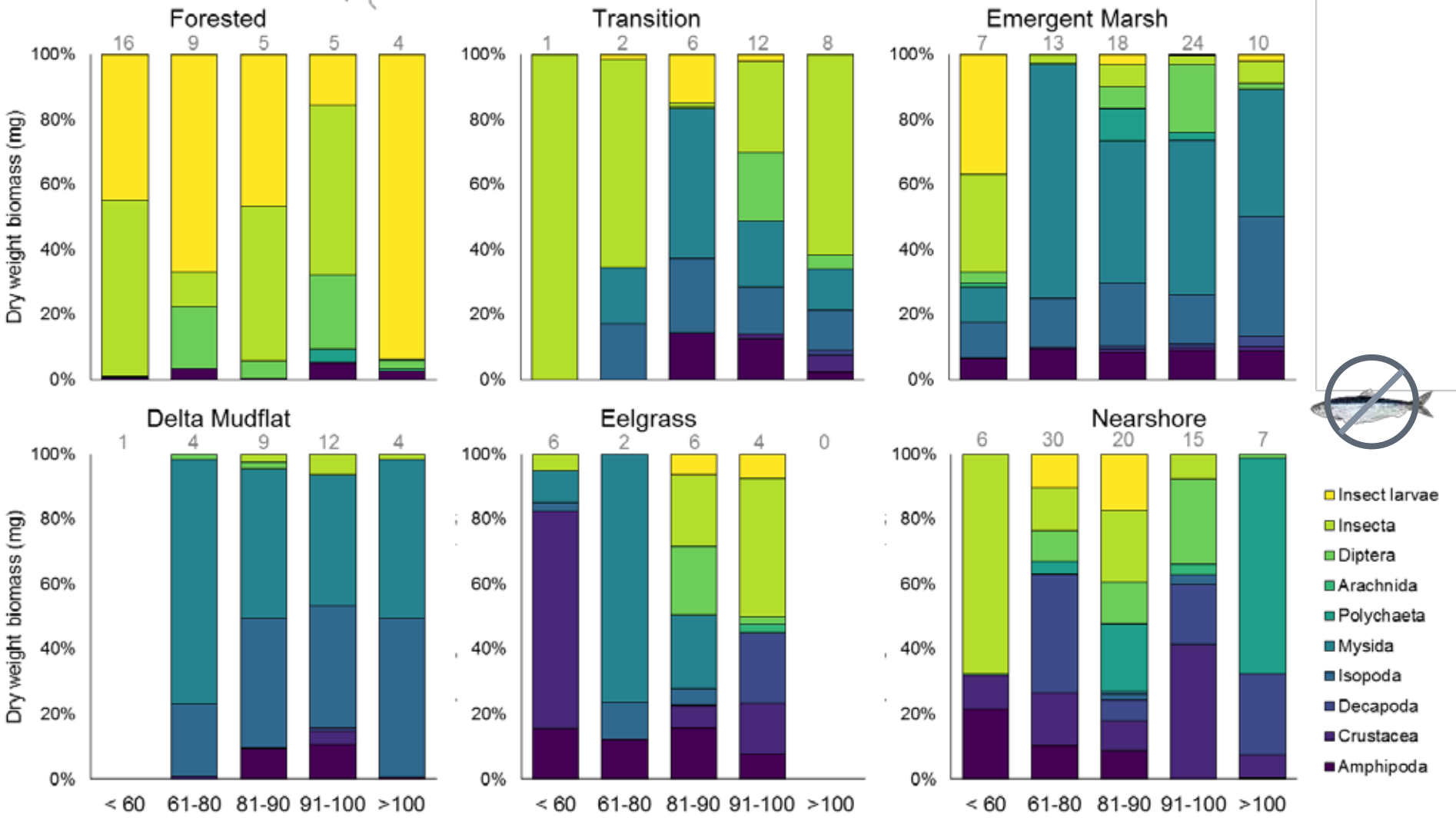
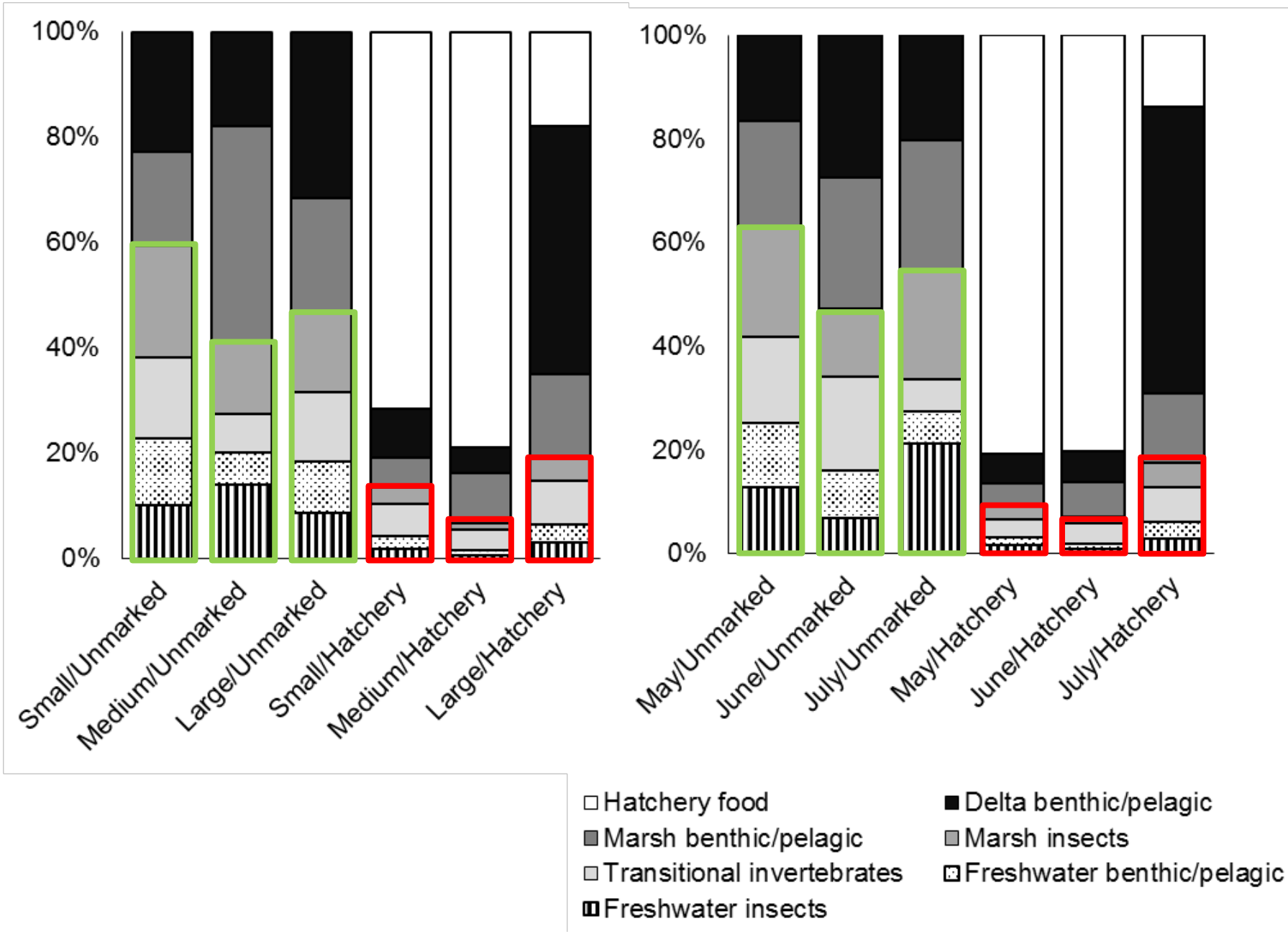


Davis et al. 2018 (in review)



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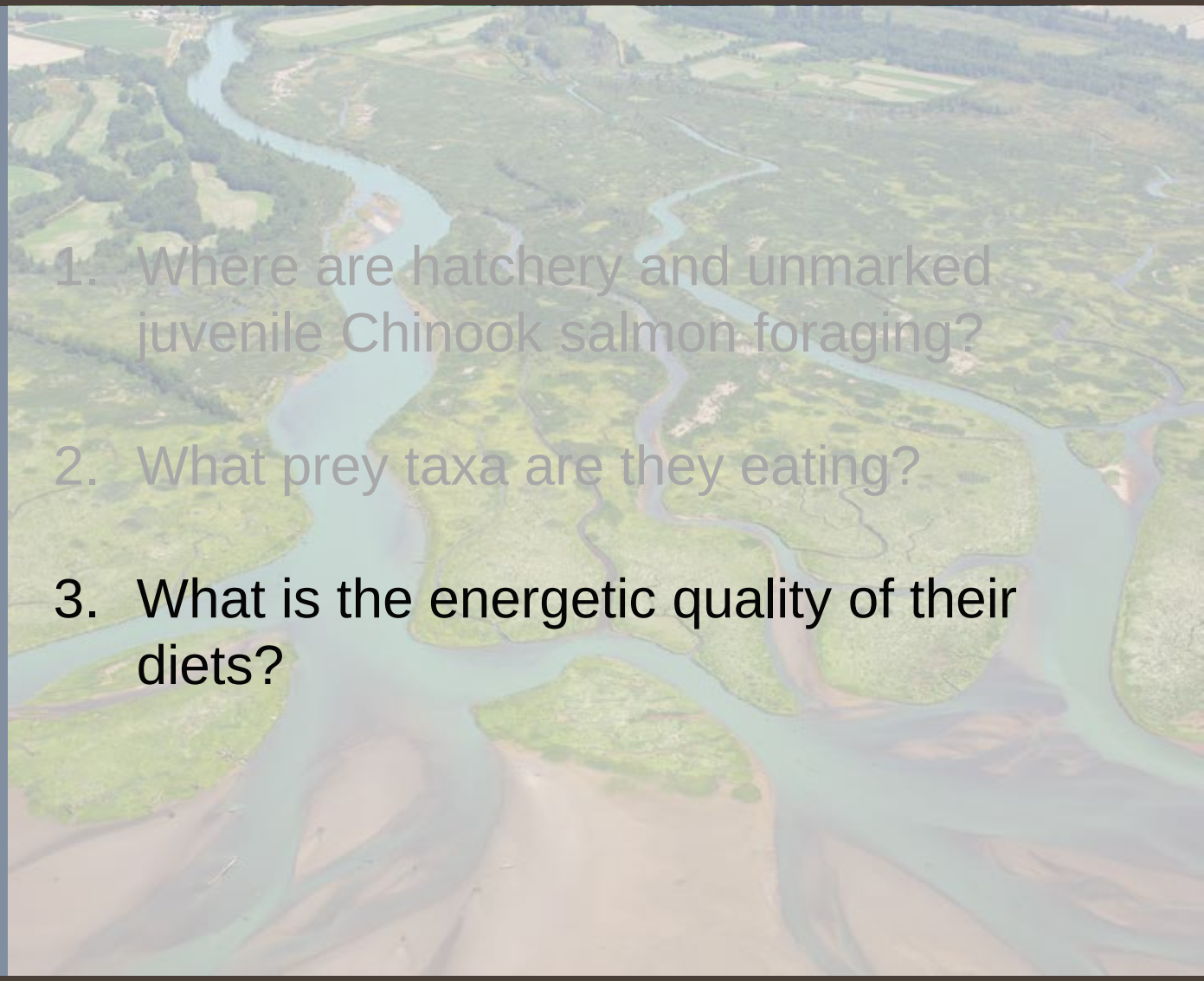

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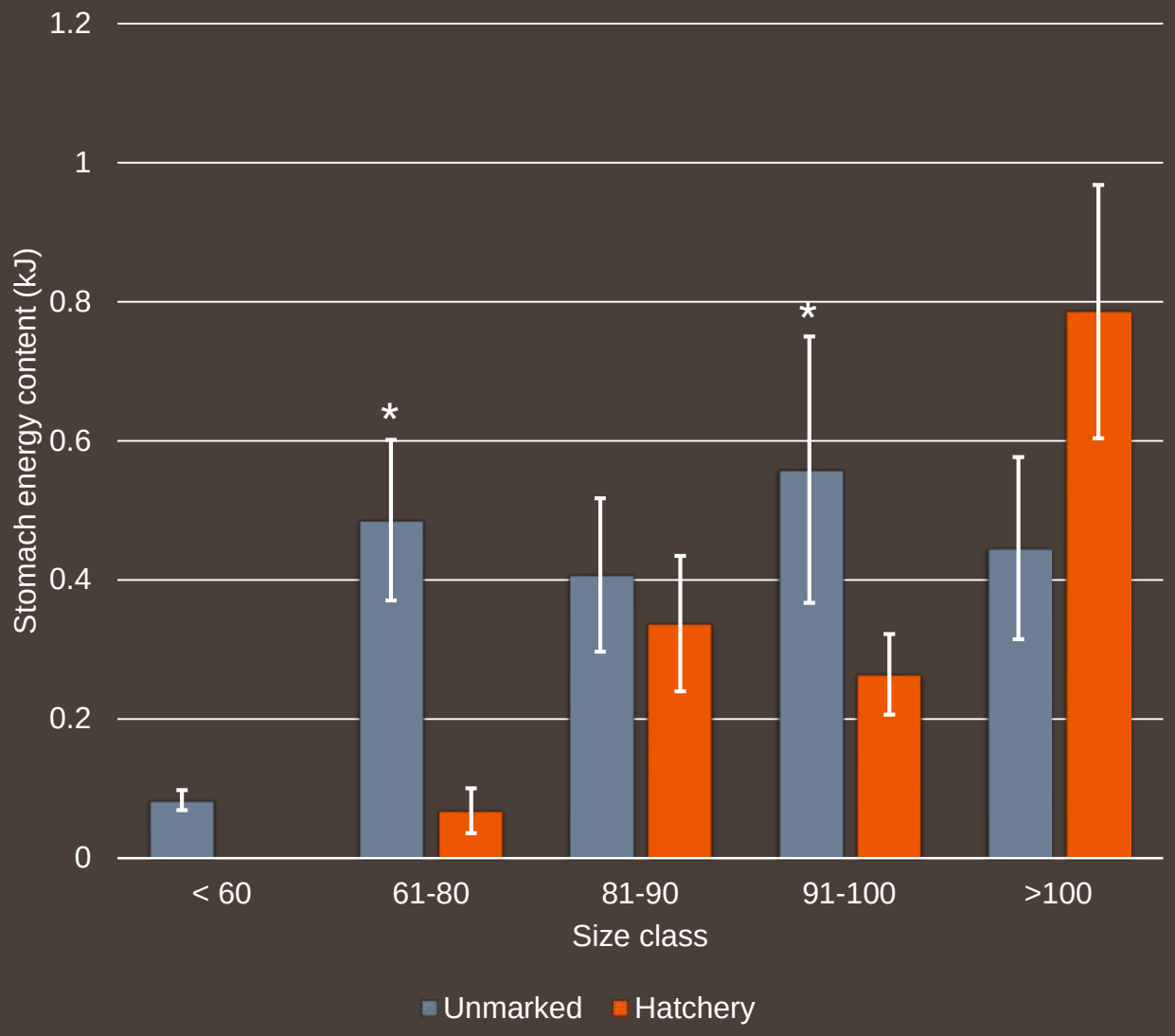
Dietary energy content



Conclusions

- Hatchery and unmarked (wild) fish occupy different niches in terms of:
    1) Outmigration timing
    2) Habitat use
    3) Prey consumption

- Hatchery fish are less likely to use tidal riverine forested marsh

- As a result, they may be missing out on high energy-density prey

Partners and Collaborators

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Nisqually Indian Tribe: Jennifer Cutler, Walker Duval, Emilio Perez, Aaron David

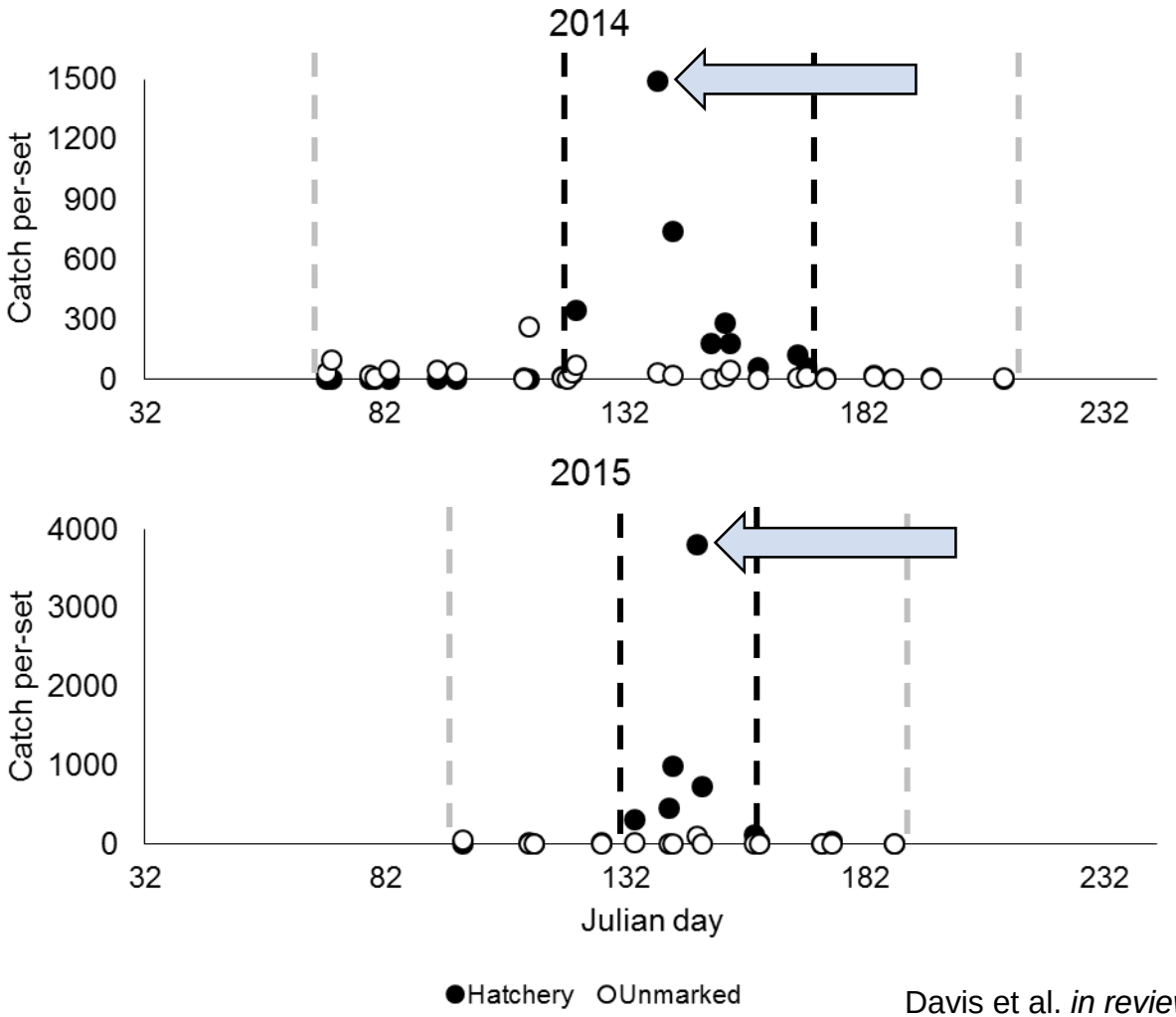
USFWS: Jesse Barham, Doug Roster, Marian Bailey, Jean Takekawa

Graduate Supervisory Committee: Dave Beauchamp, Julian Olden, Si Simenstad, Christian Torgersen




	Nooksack	Skagit	Snohomish	Nisqually
Juvenile Chinook populations:				
Total outmigrants	33,100 – 325,300	1,000,100 – 7,712,300	33,600 – 1,024,300	34,700 – 245,700
Fry outmigrants	300 – 43,400	444,400 – 6,553,000	26,200 – 432,900	3,500 – 93,800
Hatchery releases	610,000 – 1,940,000	150,000 – 890,000	1,820,000 – 4,300,000	3,350,000 – 4,246,000

Greene et al. 2018



Davis et al. *in review*

Hatchery juveniles:

- Released over a two-week period
- ~20 mm larger than unmarked (wild) fish
- Spend less time in the delta before moving to offshore
- Genetic/behavioral differences