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Action Effectiveness Monitoring and Research of Dredged Material Placement at Woodland Islands

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Pacific Northwest National Laboratory

Photo credit: USACE

U.S. DEPARTMENT OF ENERGY BATTELLE

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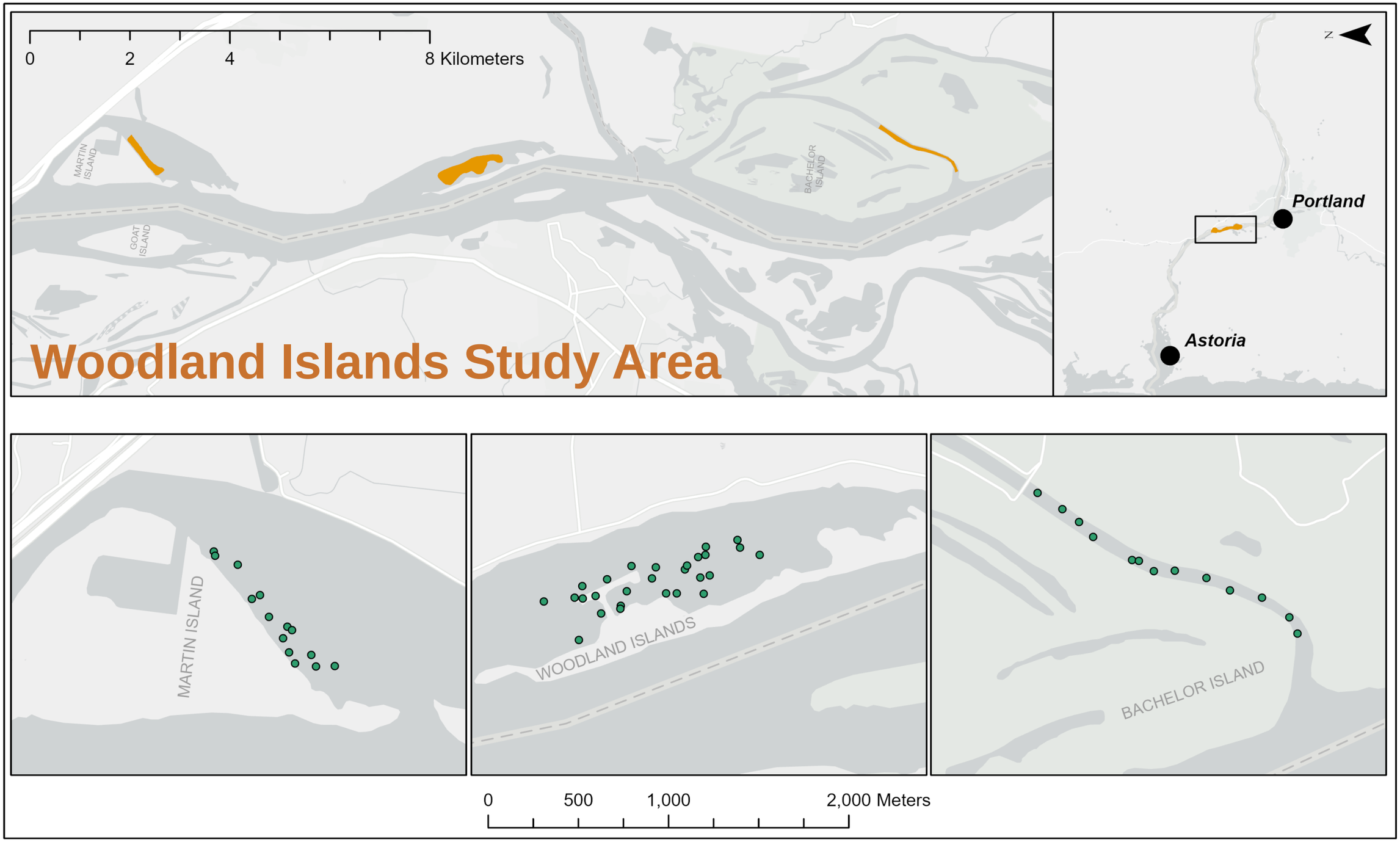
Outline

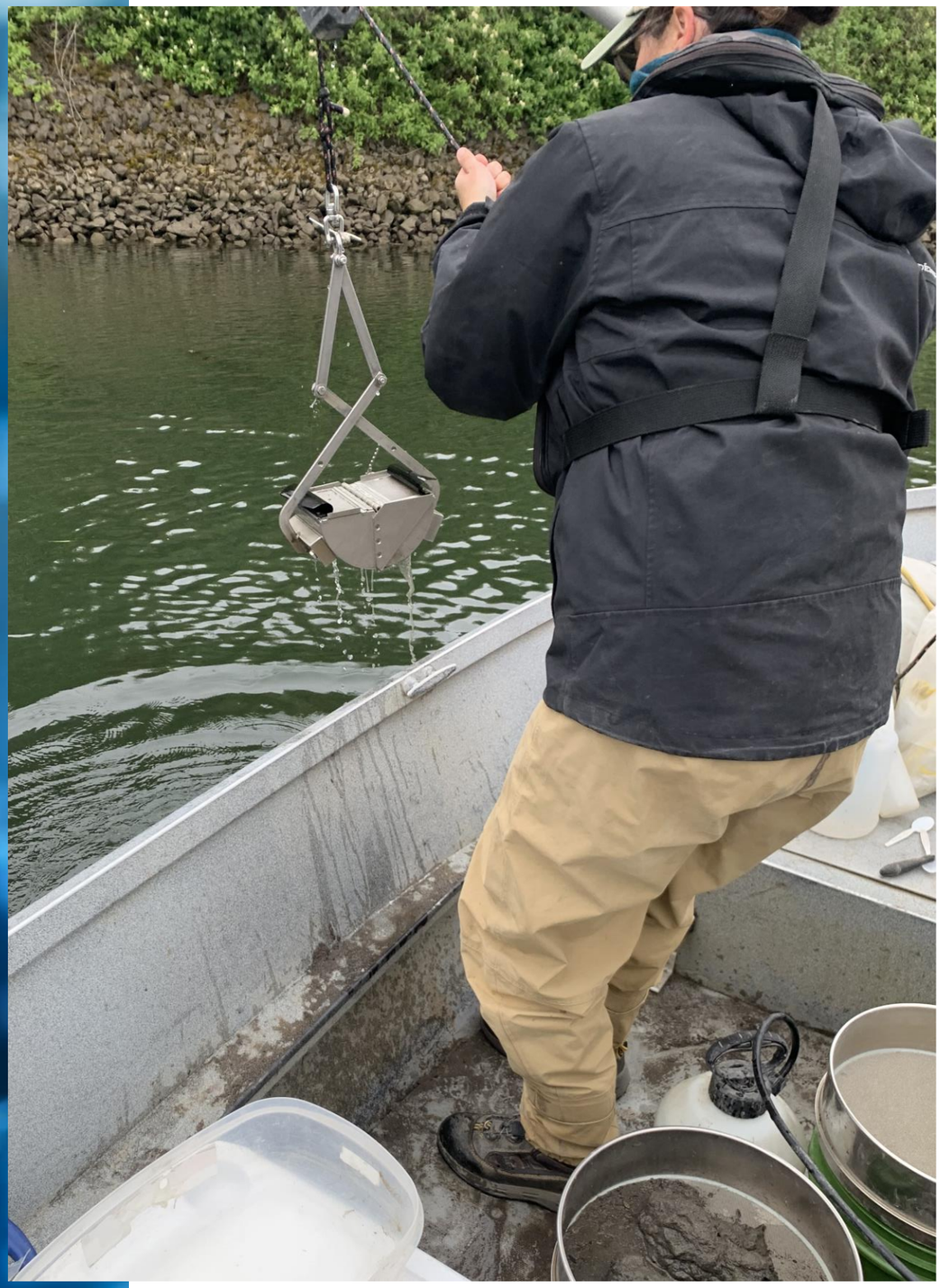
- Overview; study area, design, timeline
- Environmental conditions
- Benthic assemblage
- Before-After comparison
- Conclusions


Photo credit: USACE

Purpose and Rationale

- Evaluate the effects of dredge material placement at Woodland Islands
- Macroinvertebrates provide critical functions in aquatic ecosystems


0
2
4
8 Kilometers
MARTIN ISLAND
GOAT ISLAND
BACHELOR ISLAND
N
Portland
Astoria
Woodland Islands Study Area
MARTIN ISLAND
WOODLAND ISLANDS
BACHELOR ISLAND
0
500
1,000
2,000 Meters



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Pre-construction Research
April - July

2019

Pre-construction Research
April - July

2020

Dredged Material Placement
Sept - Oct

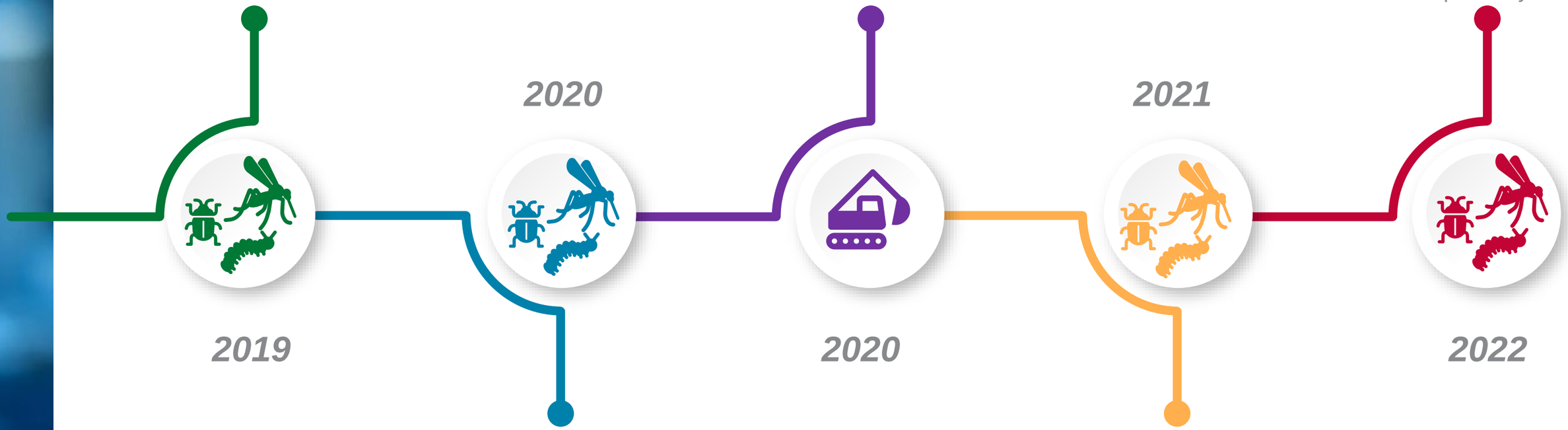
2020

Post-construction Research
April - July

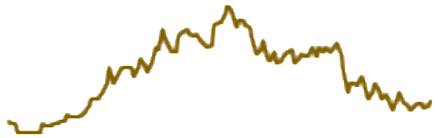
2021

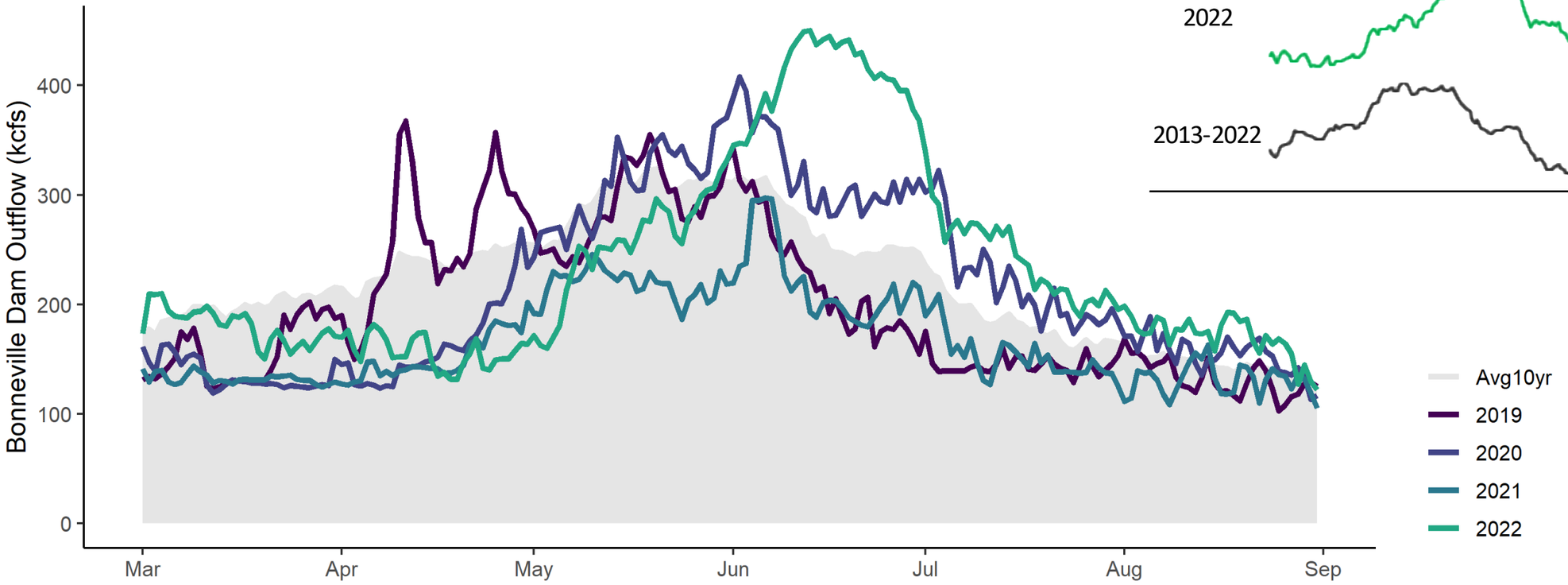
Post-construction Research
April - July

2022



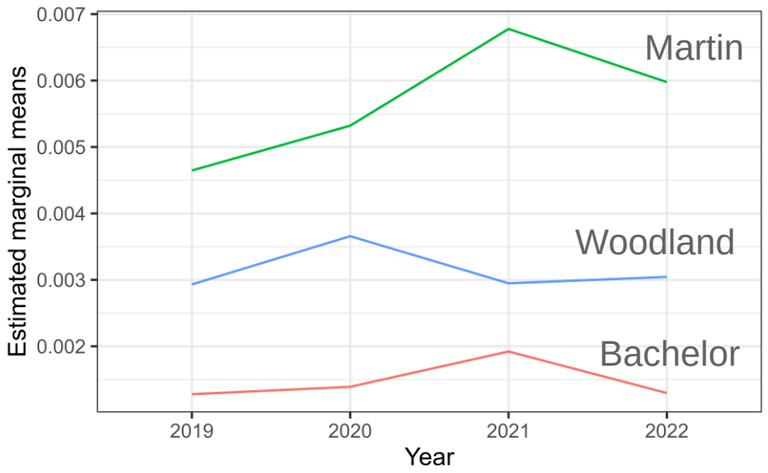
Bonneville dam outflow

Year	April - July Daily Outflow	April - July Mean Ouflow (kcfs)
2019		229.1
2020		254.6
2021		185.6
2022		264.6
2013-2022		246.8

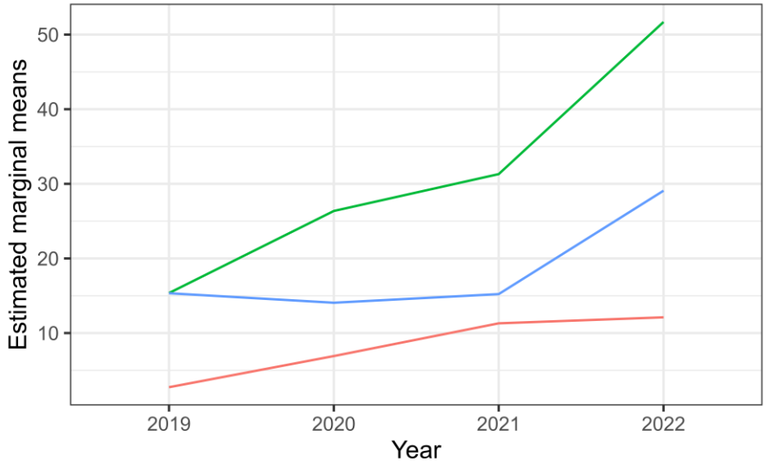


Sediment Conditions

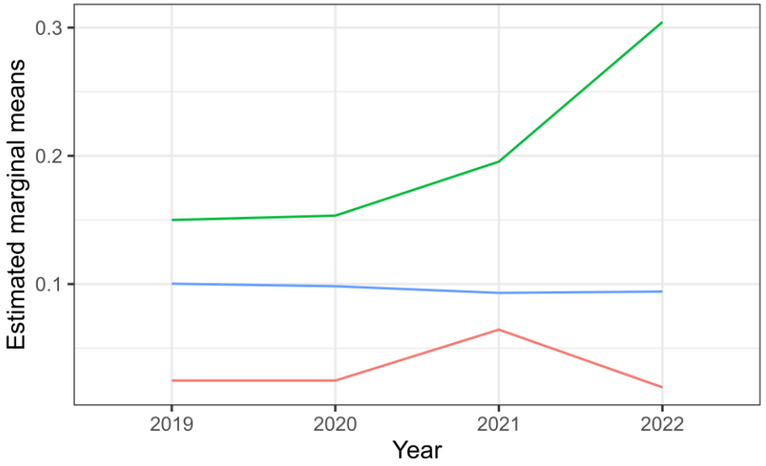
Carbon



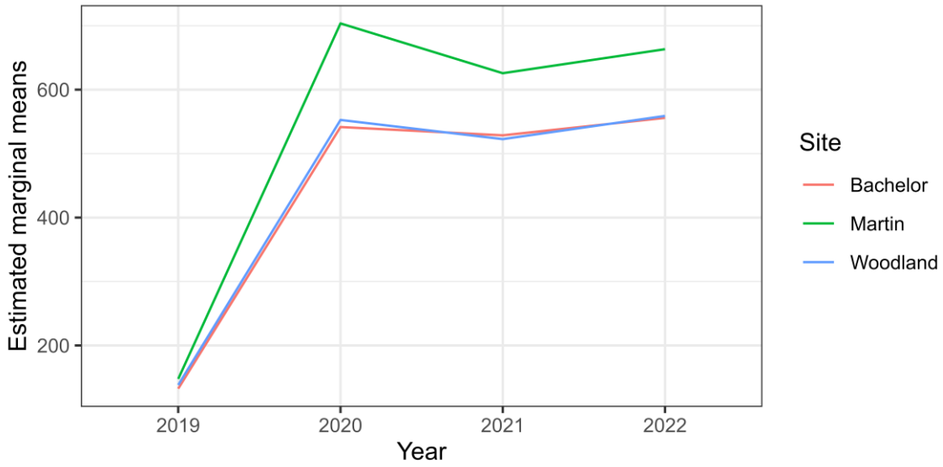
Ammonium



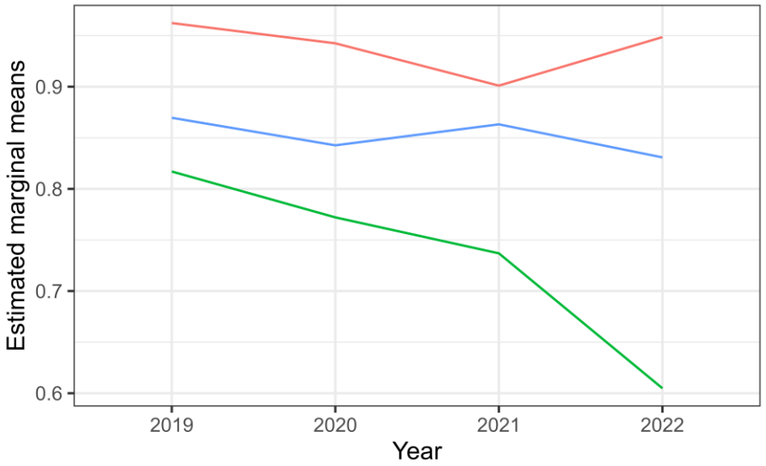
Silt



Phosphorous



Sand



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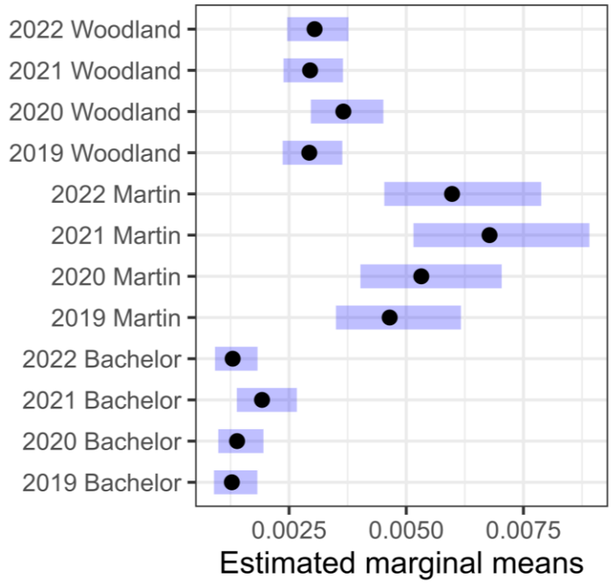
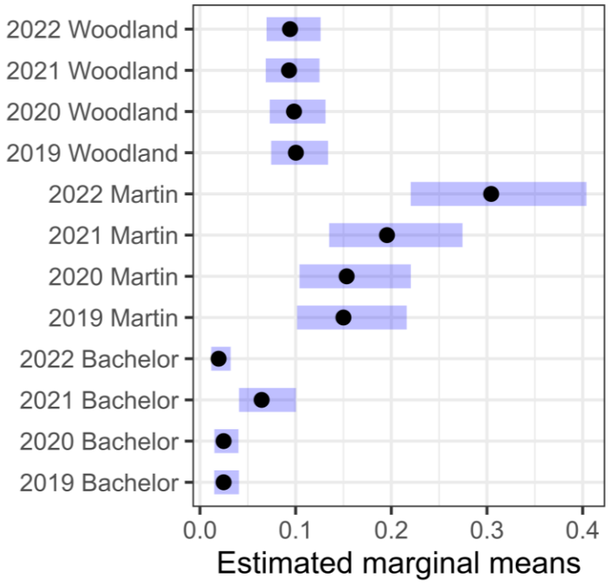
Carbon



Silt



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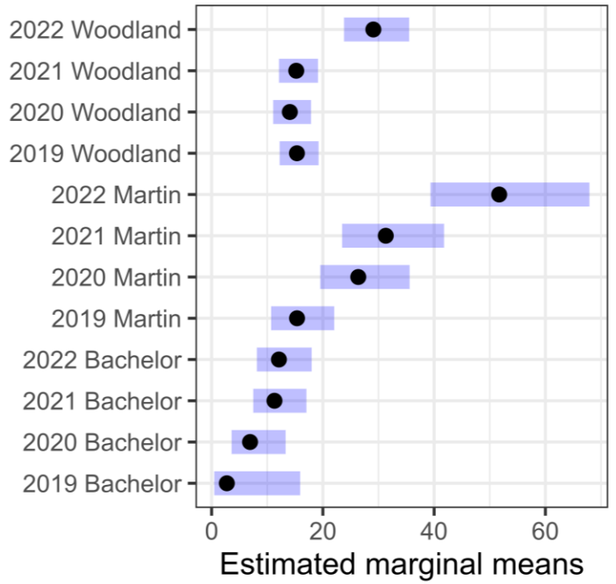
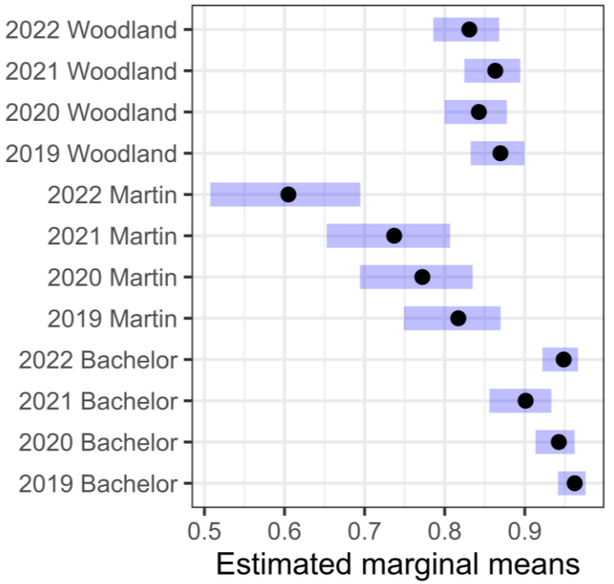
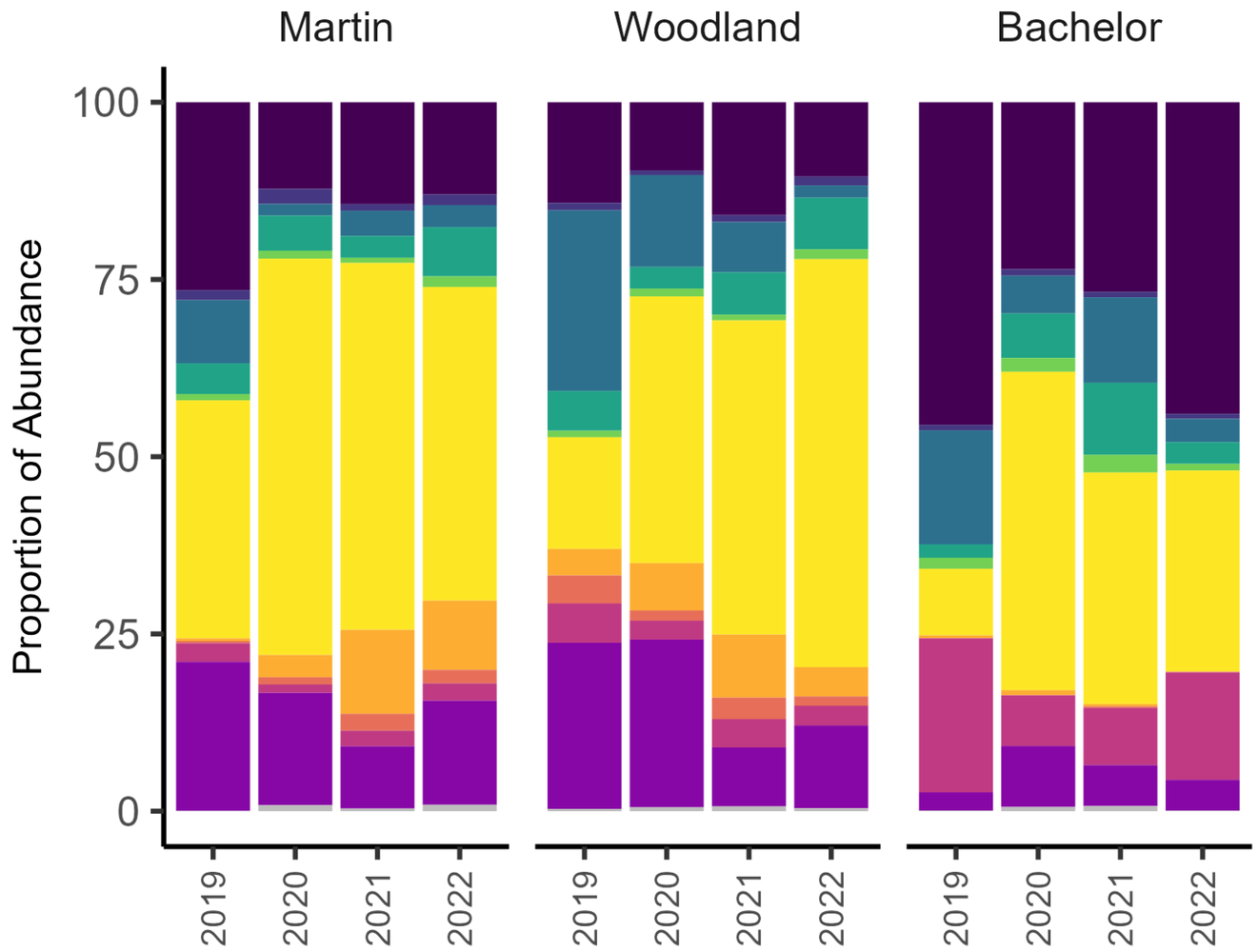


Sand



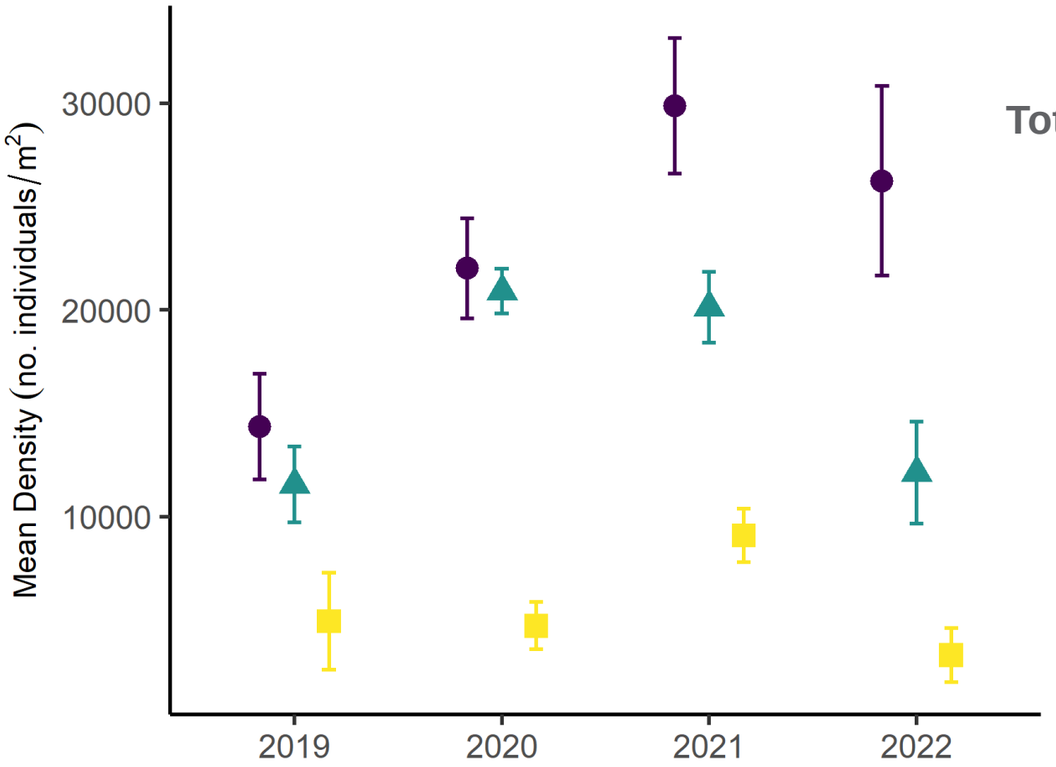
Benthic Assemblage

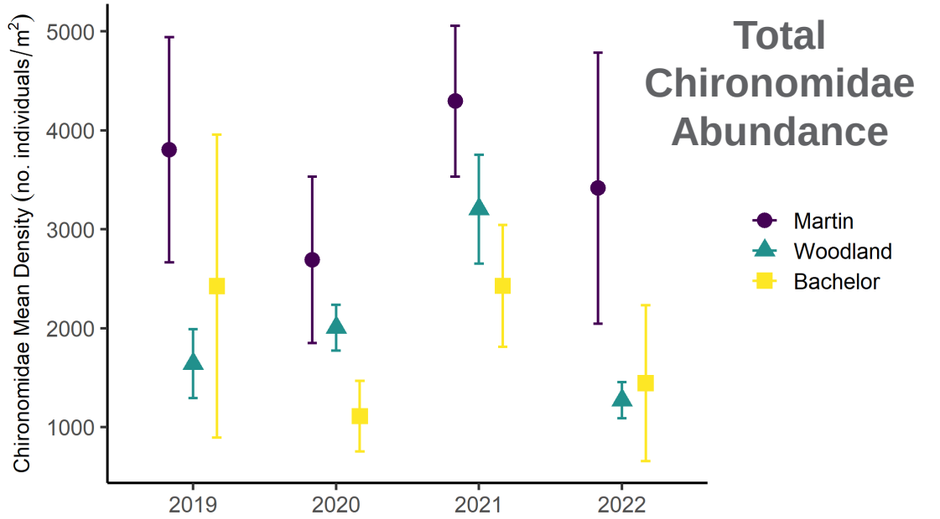


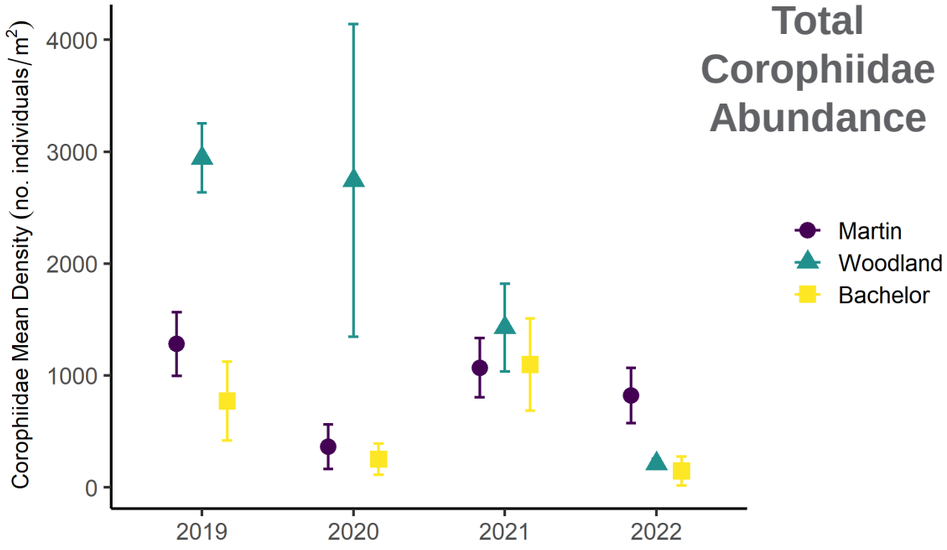
Ave. Frequency of Occurrence

Chironomidae	0.99
Insecta	0.59
Corophiidae	0.76
Crustacea	0.73
Acari	0.69
Oligochaeta	0.86
Annelida	0.36
Gastropoda	0.44
Bivalvia	0.92
Nematoda	0.80
Other	0.33

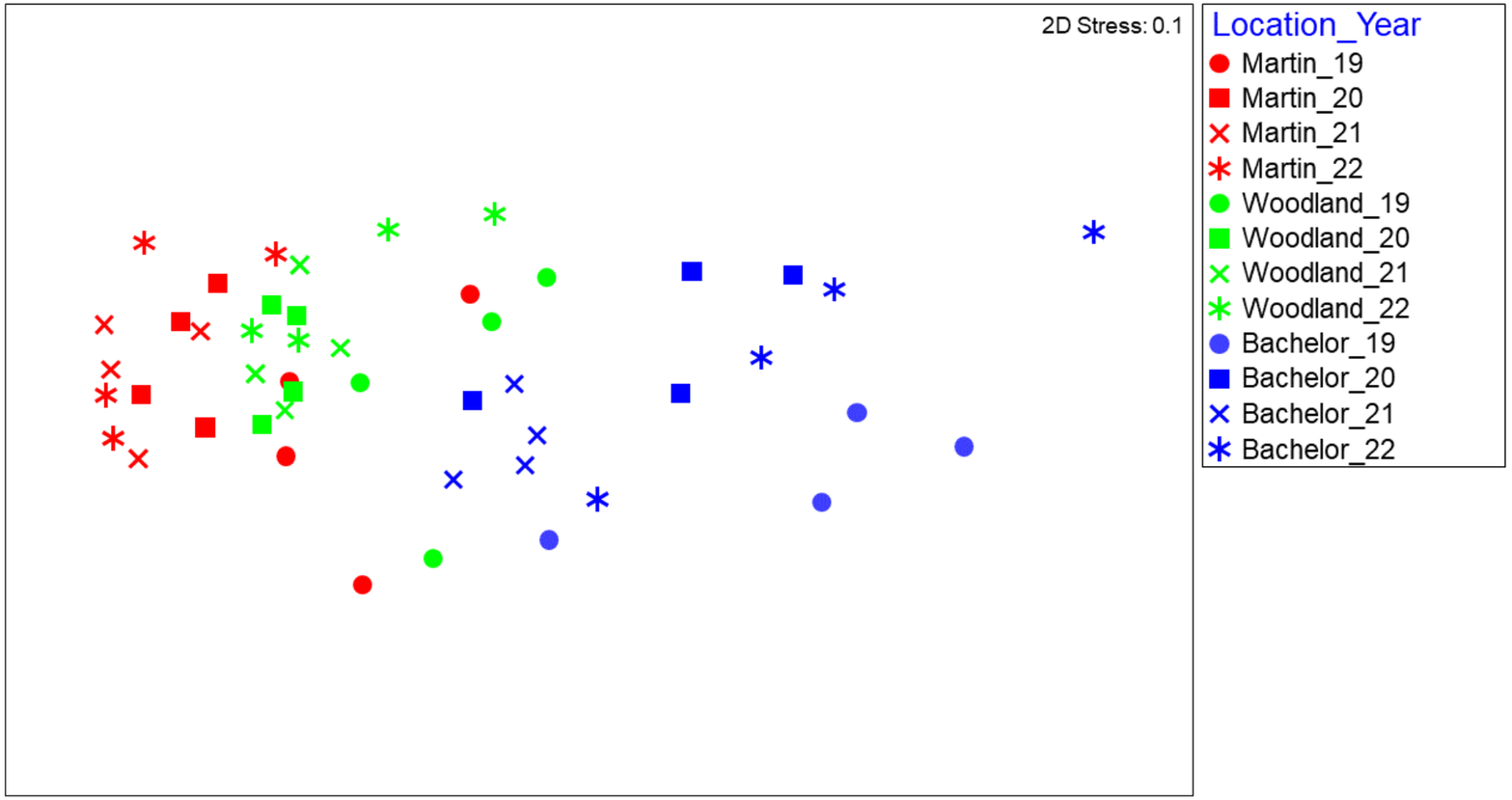
Invertebrate abundance





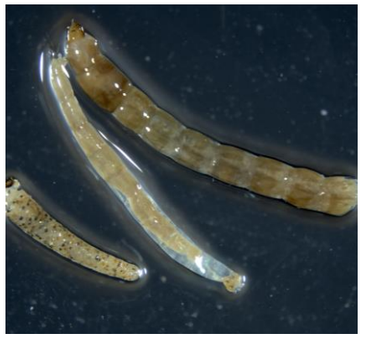


Benthic Assemblage



Corophium

Chironomid



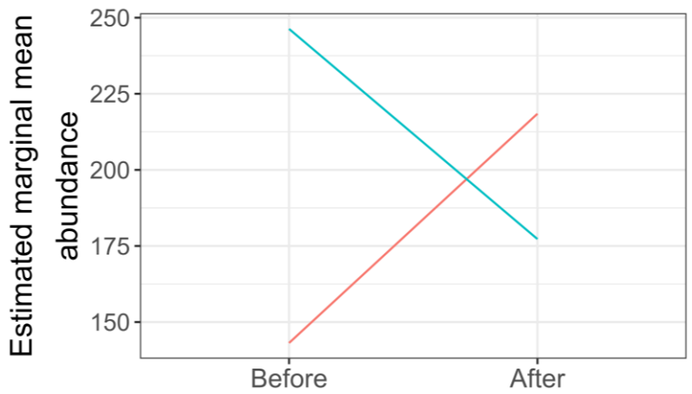
Corbicula sp.

Oligochaete

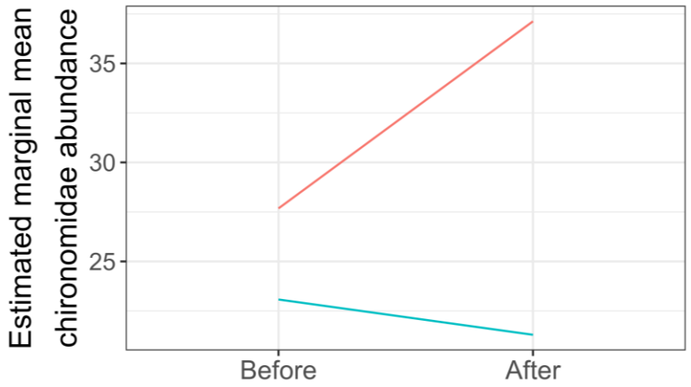
Nematode

Before-After-Control-Impact

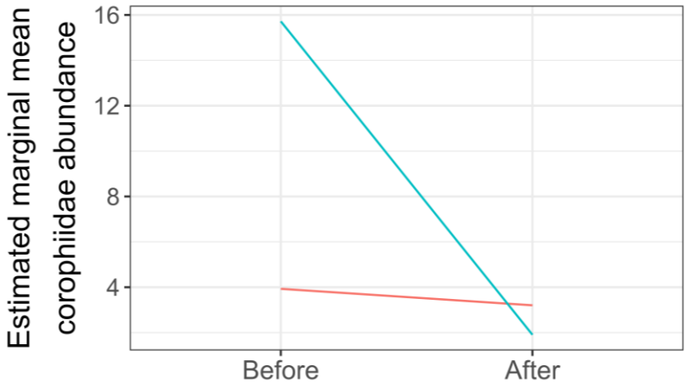
Total Invertebrates – 28% decrease



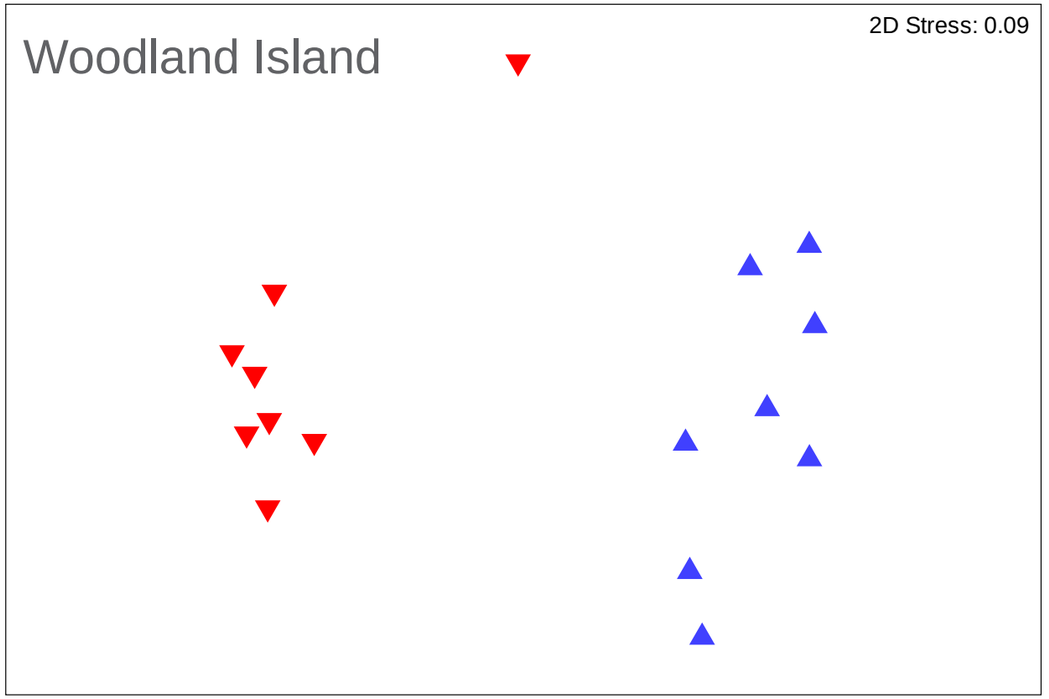
Total Chironomidae – 8% decrease

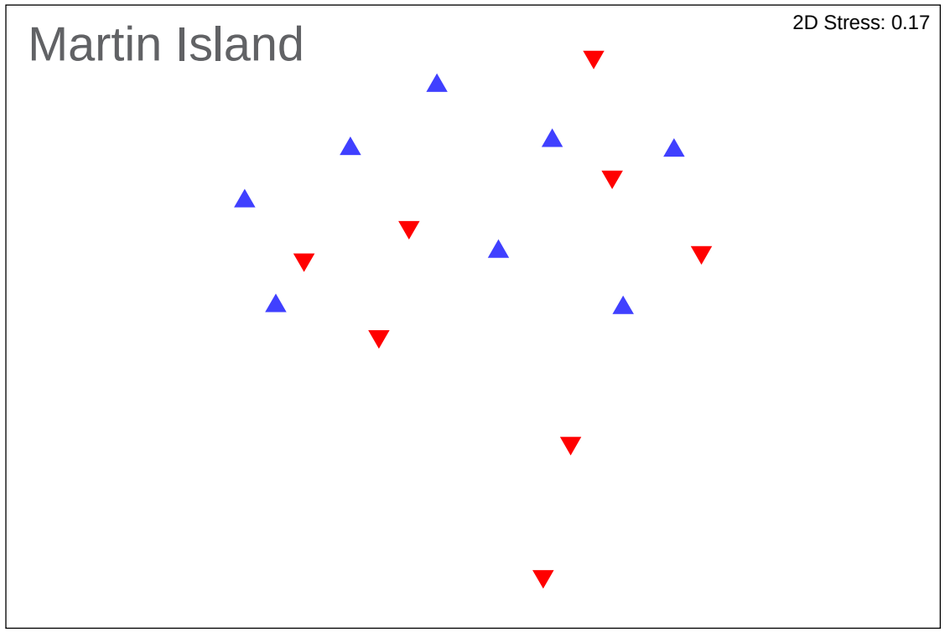


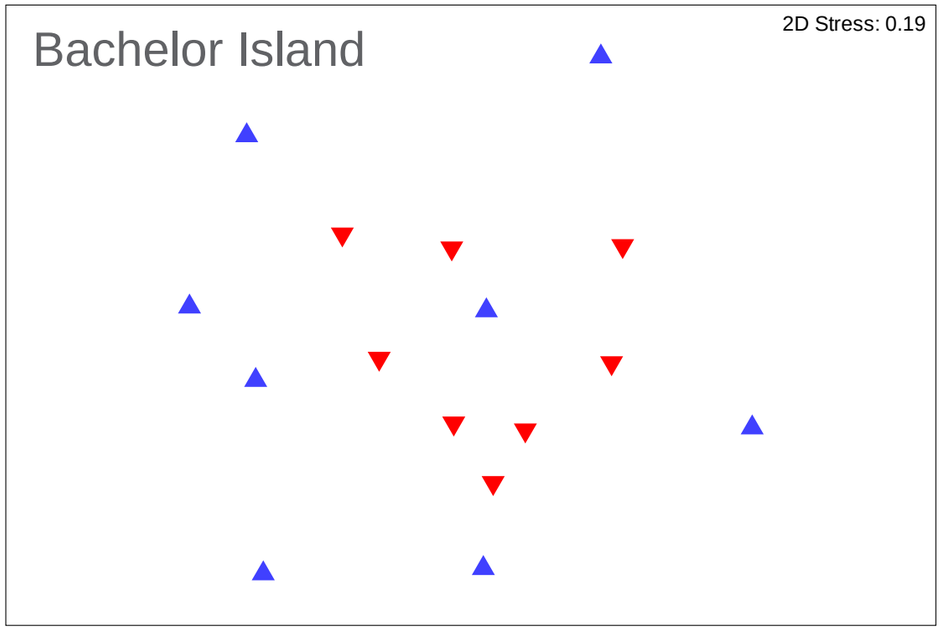
Total Corophiidae – 88% decrease

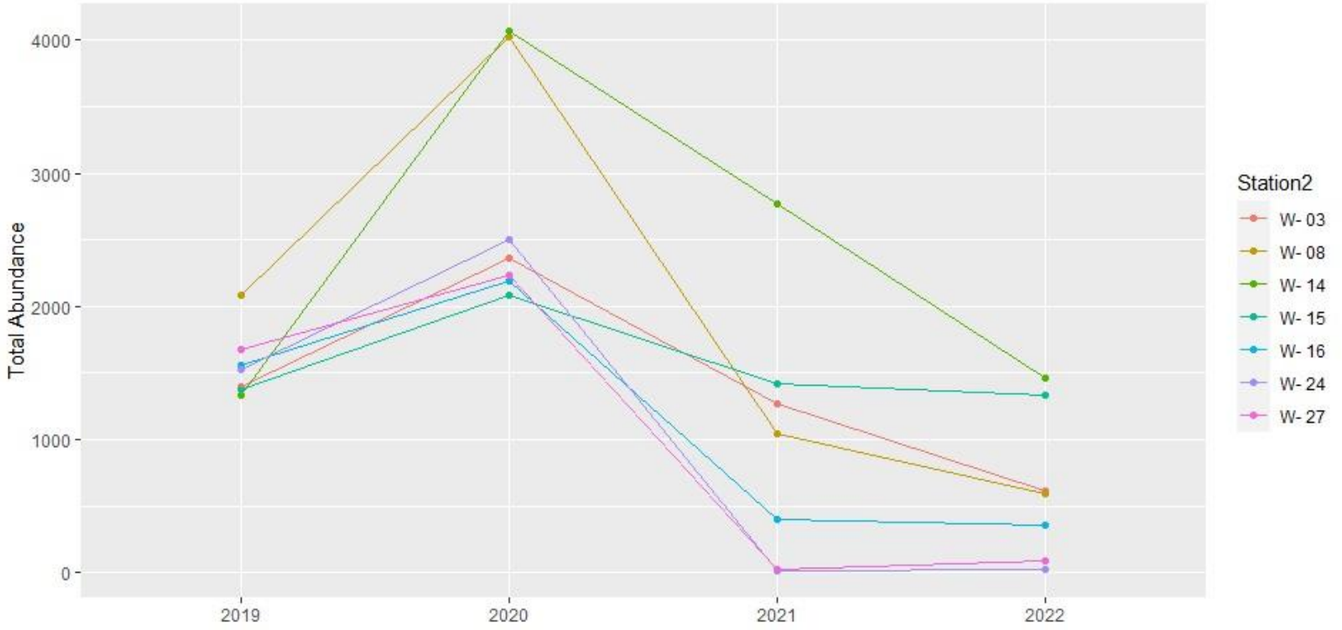


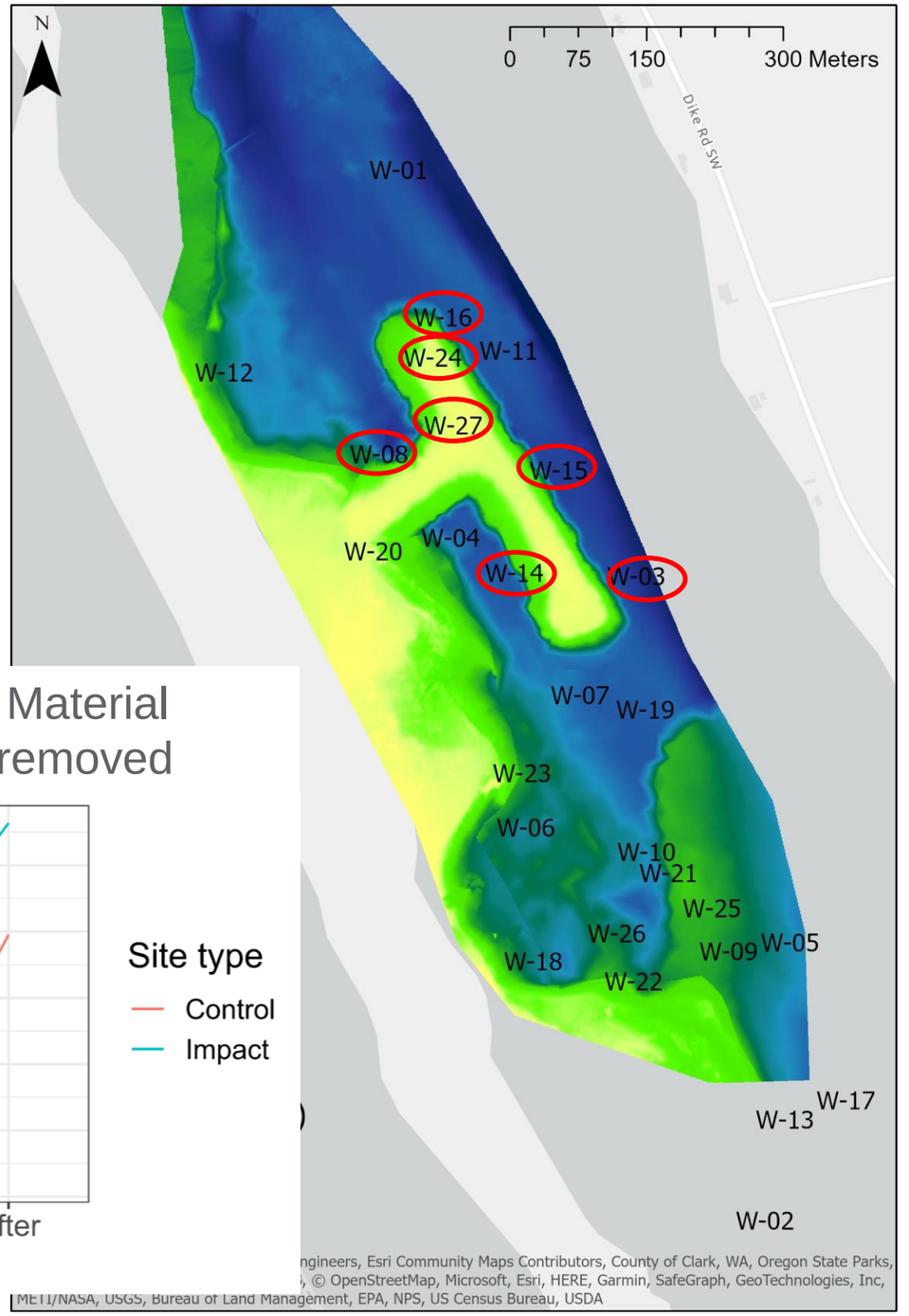
2nd Stage nMDS



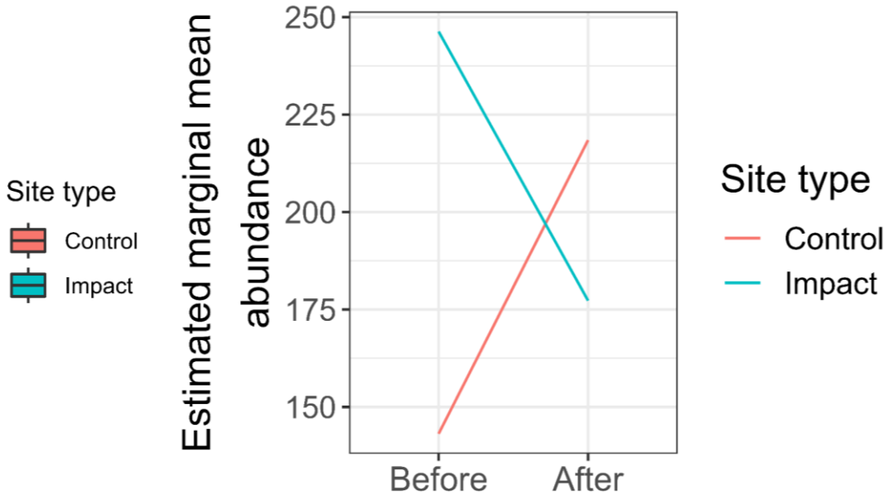




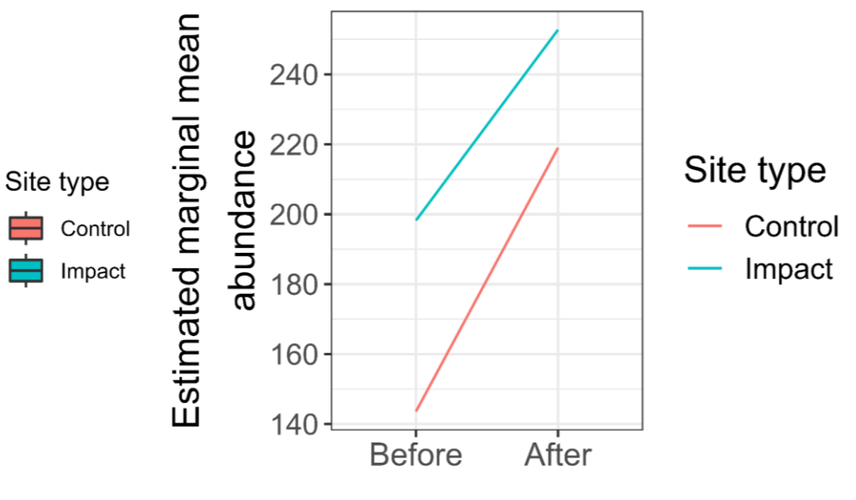




All Stations



Dredged Material Stations removed



Conclusion

- Benthic communities and some environmental variables were impacted by dredged material placement at Woodland Islands
- Reductions in benthic biota ranged from 8−88%, compared to before placement
- Off-channel habitats produce benthic invertebrates that are important foraging resources for juvenile salmon
- Considerations for future dredged material placement:
  - Spatial variation and habitat function: site selection, landscape ecology, connectivity among sites
  - Impacts may be limited to the vicinity of the dredged material footprint
  - Recovery rates, short-term losses vs long-term gains and relationship to overarching goals

Acknowledgements

- USACE
  - Ida Royer, Mark Bierman.
  - Chanda Littles
- PNNL
  - Eric Fischer
  - Madison Bowe
  - Shon Zimmerman
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