Beaver Dam Analogs for Stream Reclamation: Influences on Food Web Structure, Function, and Water Quality

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WYNDD
Wyoming Natural Diversity Database

National Park Service

BBC Science Focus

Photos: Austin Quynn, TU

Questions

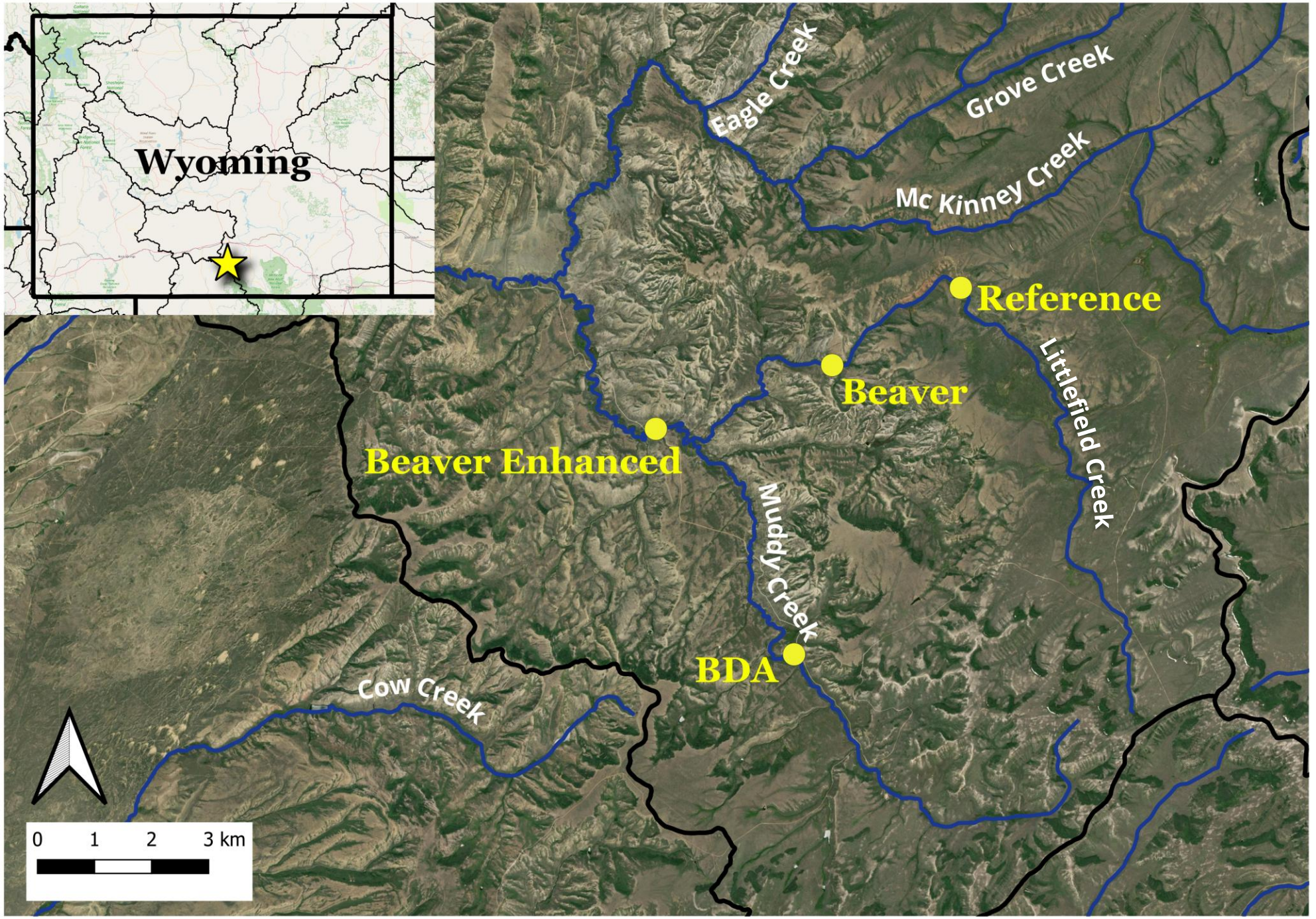
- How do fish, macroinvertebrate, and food web communities differ among reference reaches, beaver dams, and BDAs?
- How do beaver-related structures influence key water quality metrics compared to reference reaches?


BDA


Beaver Enhanced


Beaver


Reference


Wyoming
Eagle Creek
Grove Creek
Mc Kinney Creek
Reference
Littlefield Creek
Beaver
Beaver Enhanced
Muddy Creek
BDA
Cow Creek
0 1 2 3 km

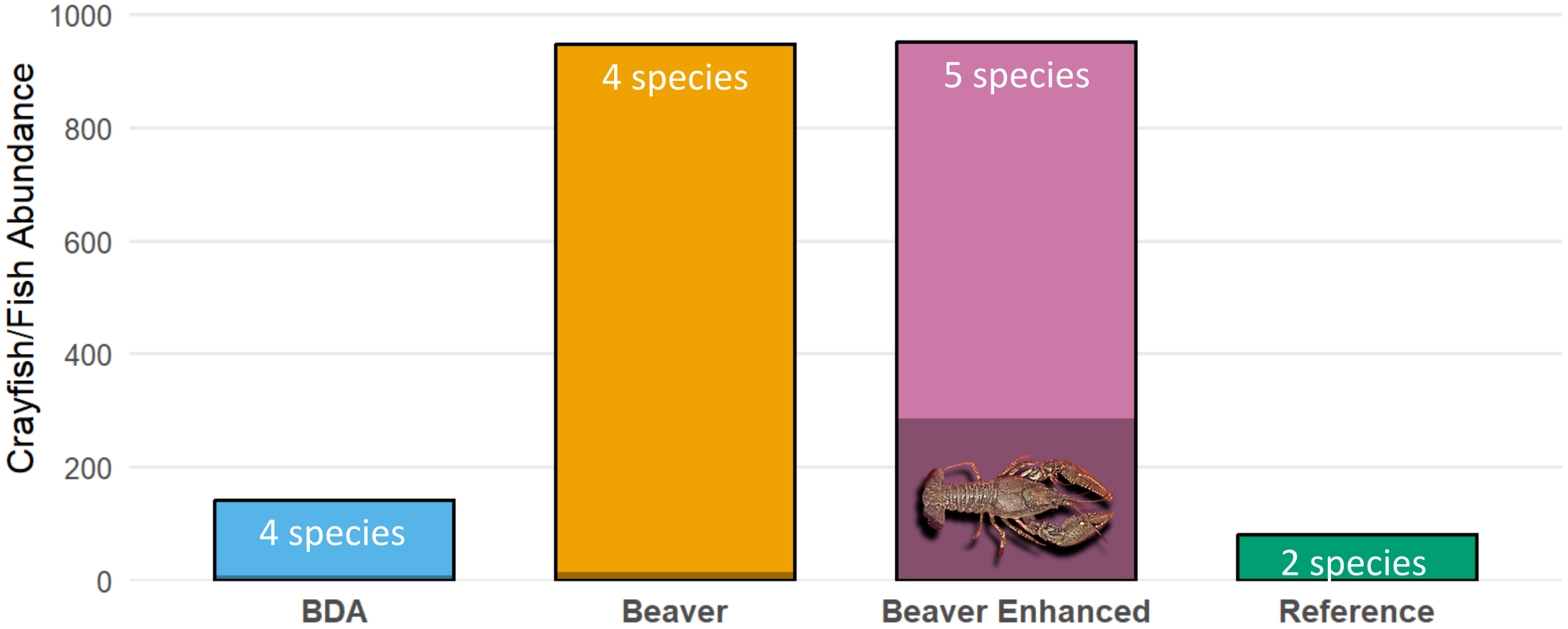

Colorado River Cutthroat Trout (CRC)


Roundtail Chub (RTC)

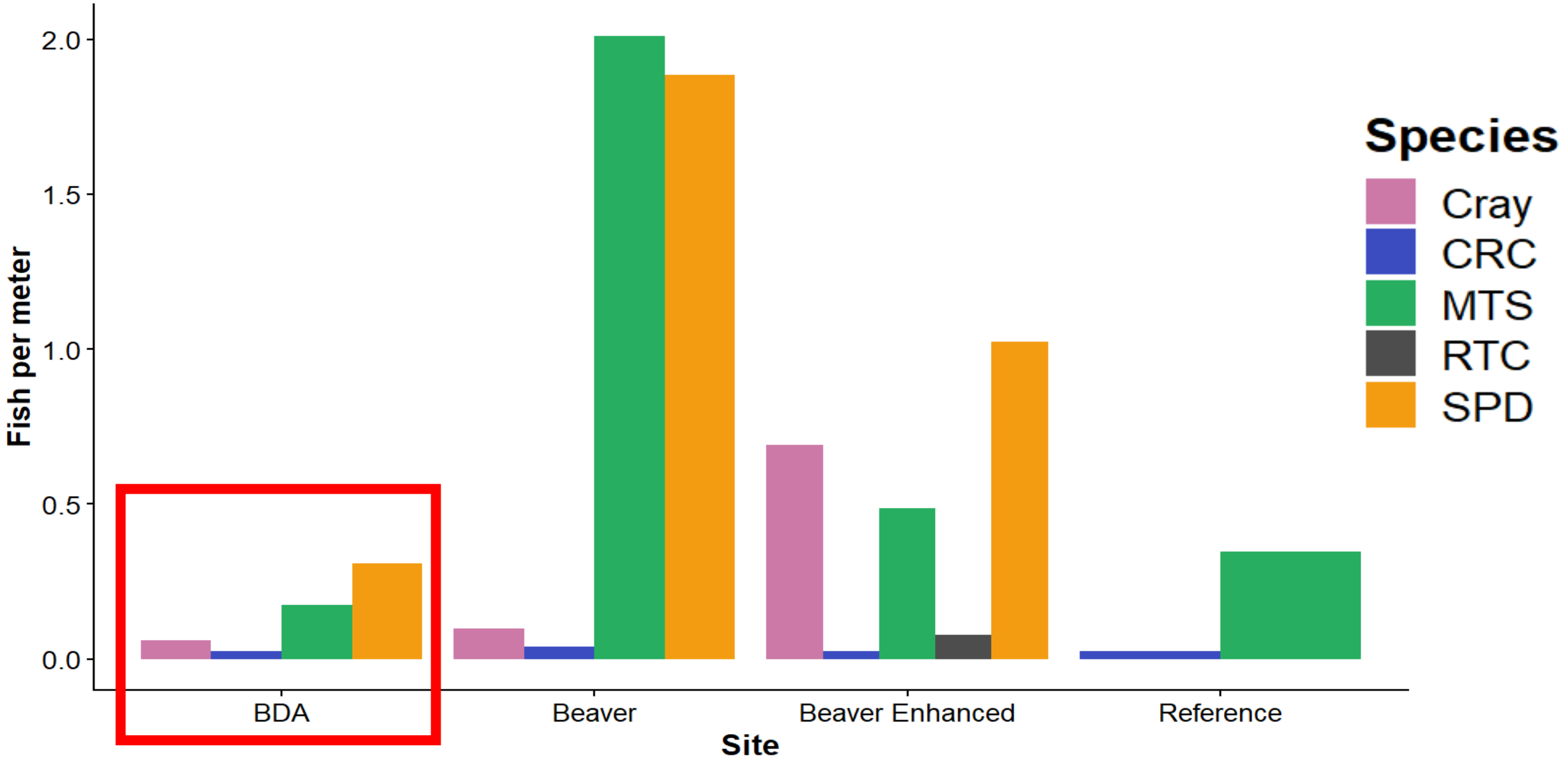

Speckled Dace (SPD)


Mountain Sucker (MTS)

Crayfish/Fish Abundance Per Site

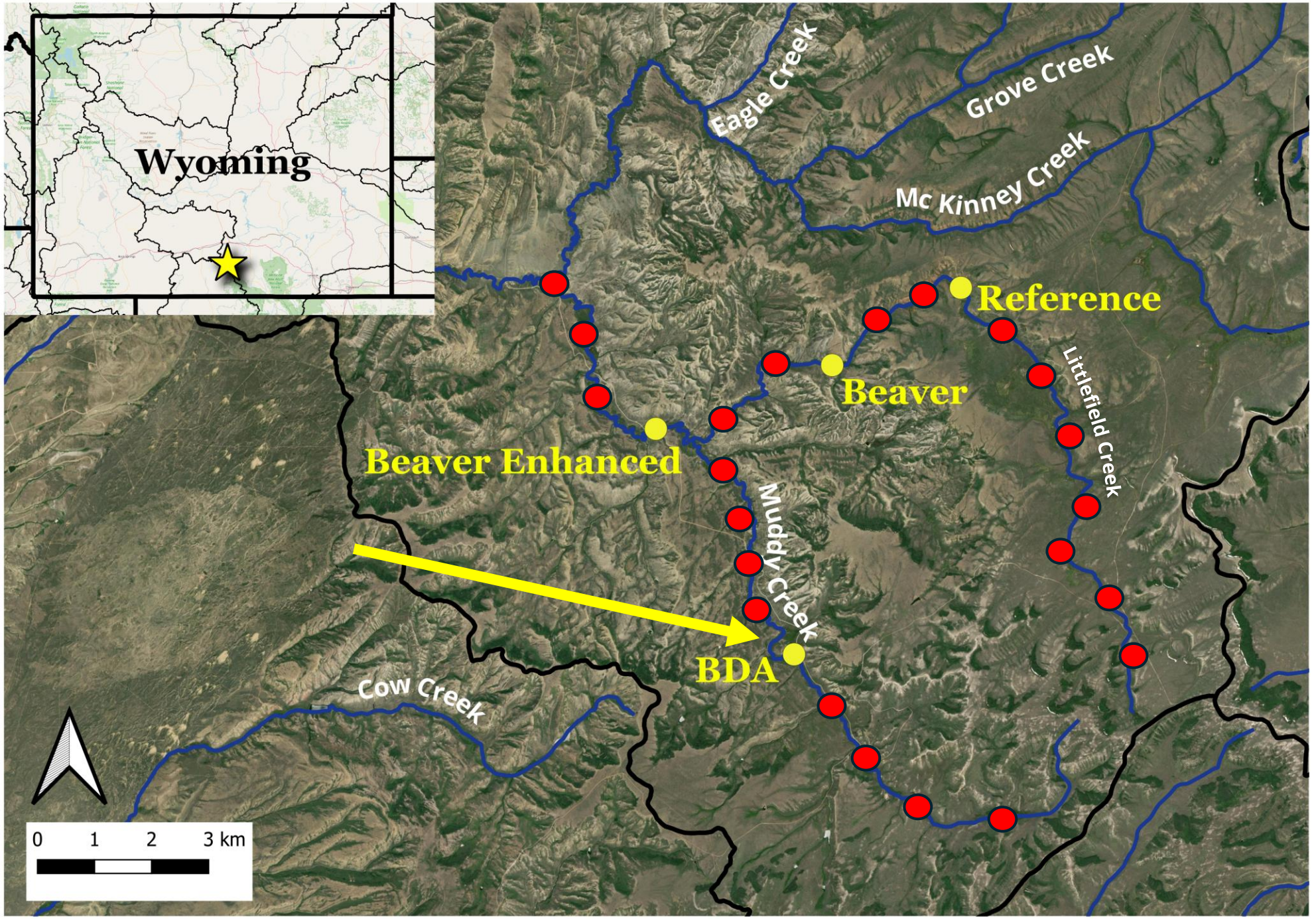


Takeaway: **Beaver** and **Beaver Enhanced** sites with highest abundance



Takeaway: **Beaver** site with the highest abundance, and **Reference** with the lowest abundance

Takeaway: Fish/Crayfish abundance increased by 173% in 6 weeks

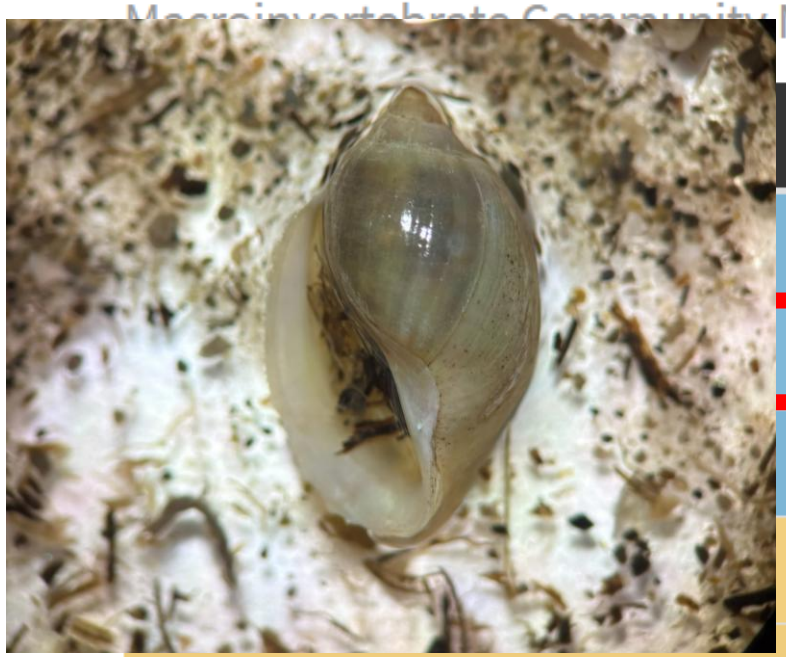

Wyoming
Eagle Creek
Grove Creek
Mc Kinney Creek
Reference
Beaver
Littlefield Creek
Beaver Enhanced
Muddy Creek
BDA
Cow Creek
0 1 2 3 km

Beaver Enhanced: Fish Density Over Time

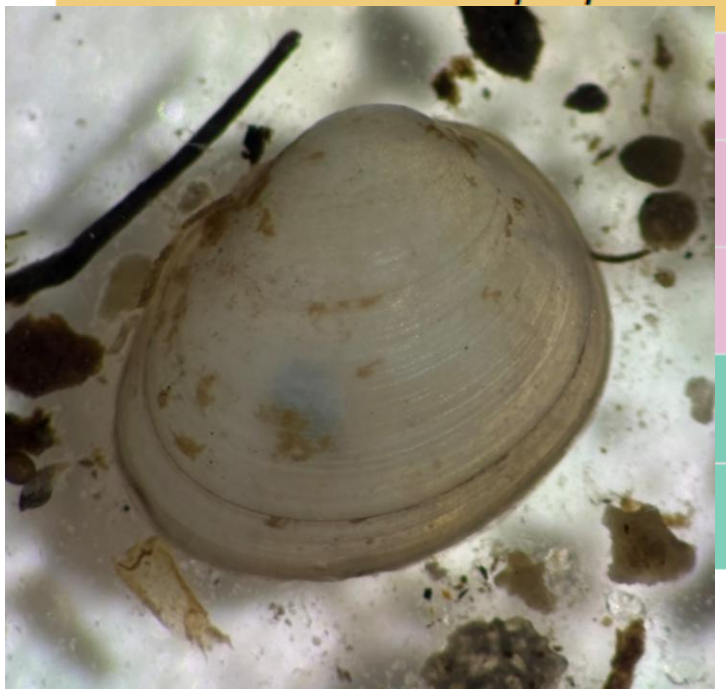
Takeaway: SPD abundance 2-3x, RTC and CRC moved in!

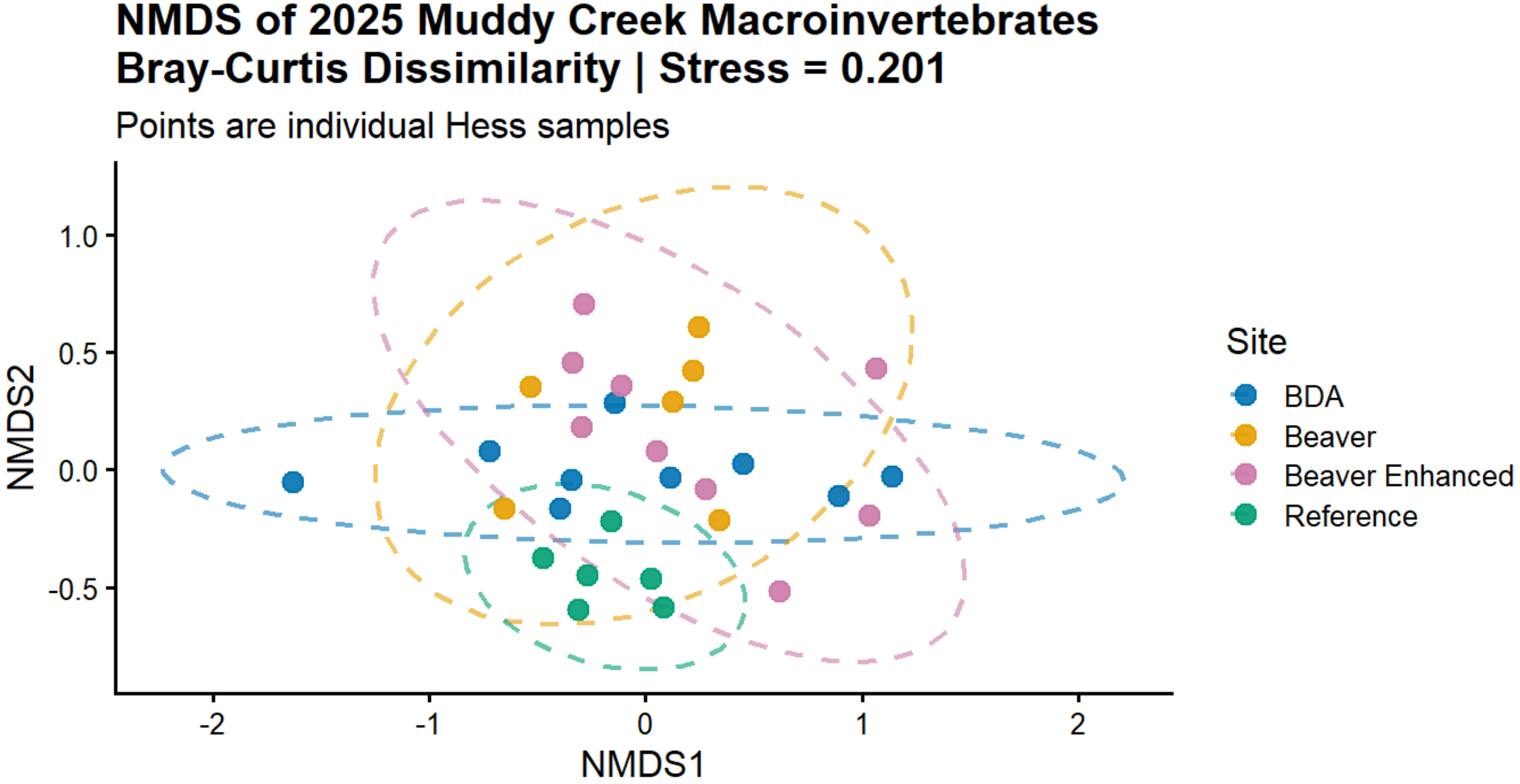
Aquatic Macroinvertebrates

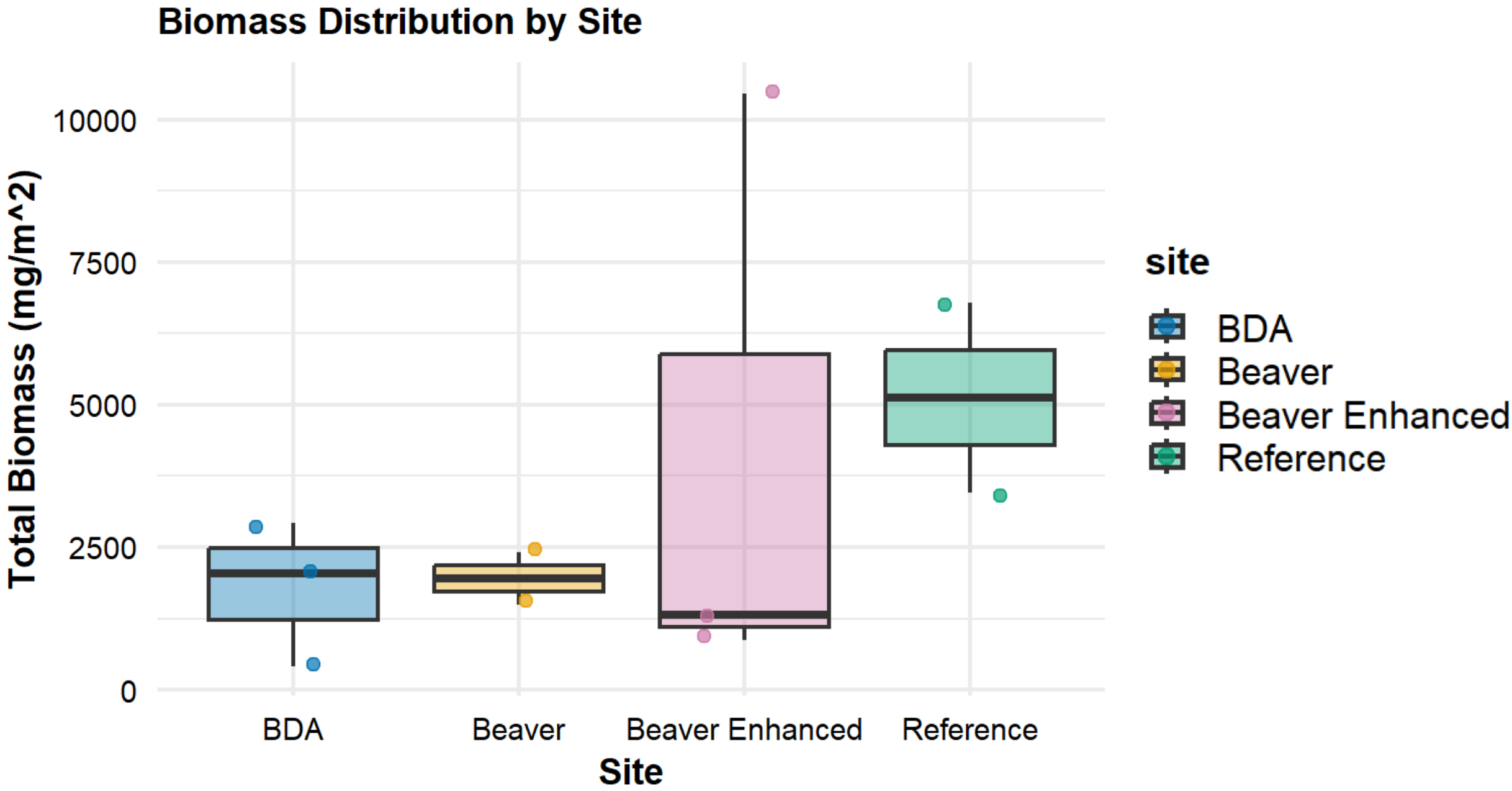
Macroinvertebrate Community Metrics

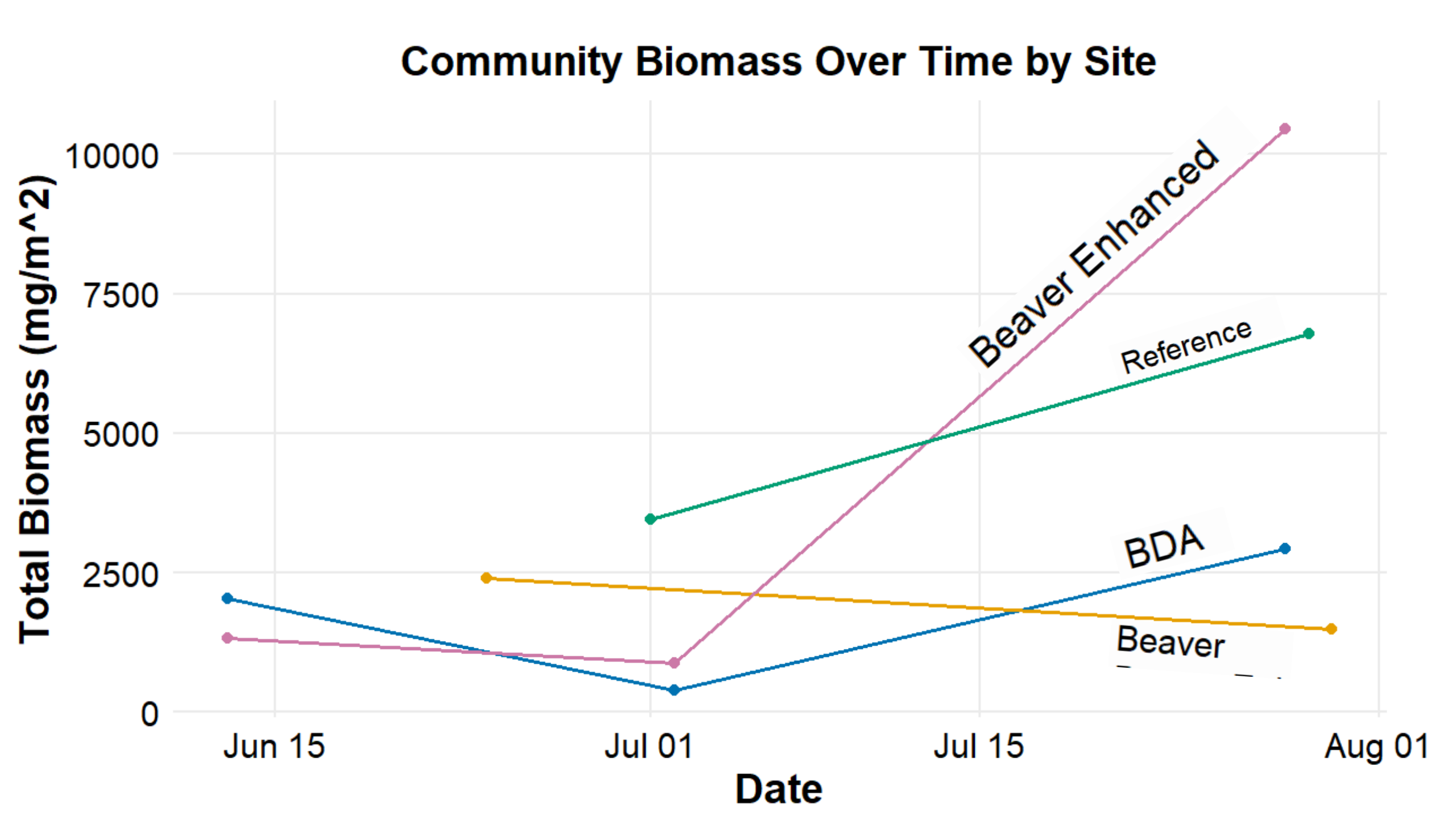


Beaver	7/30/2025	1826	14	5.30
		147		
		72		
		280		
		159		
		317		

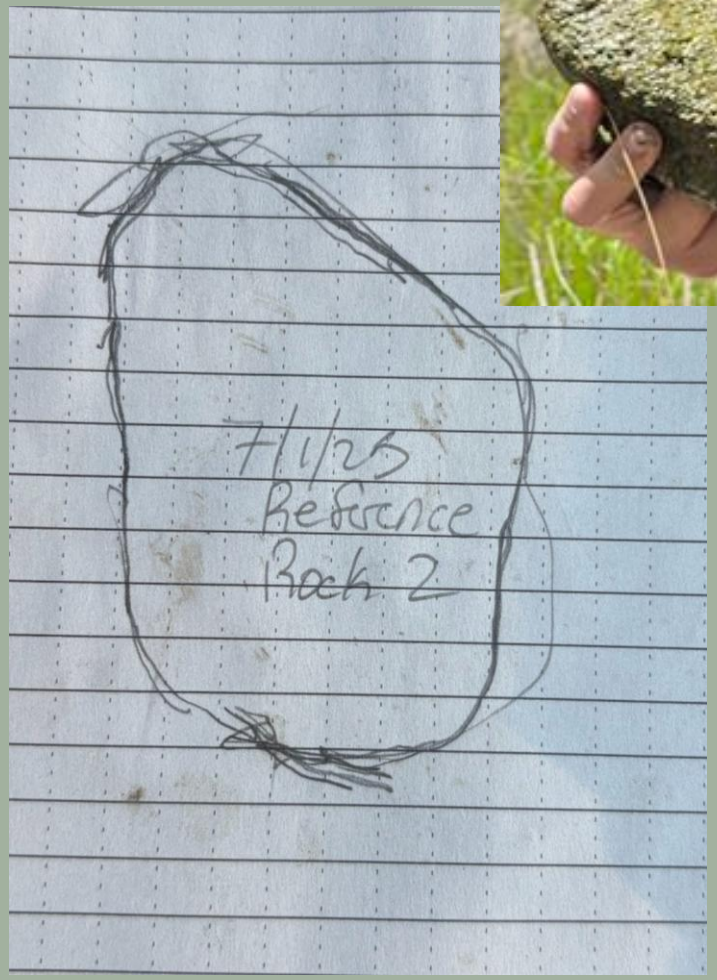


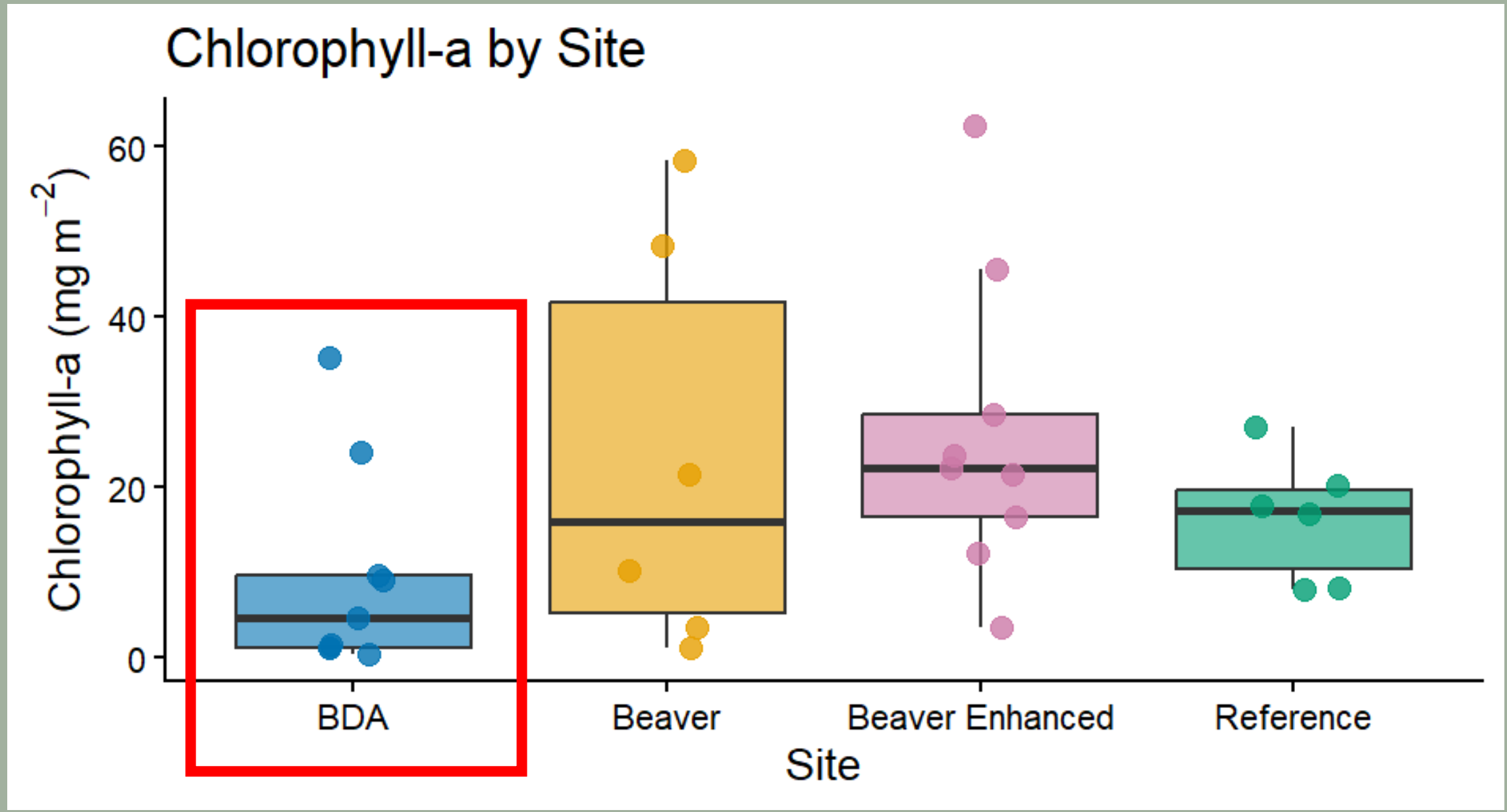

NMDS of 2025 Muddy Creek Macroinvertebrates
Bray-Curtis Dissimilarity | Stress = 0.201
Points are individual Hess samples
NMDS2
1.0
0.5
0.0
-0.5
-2
-1
0
1
2
NMDS1
Site
BDA
Beaver
Beaver Enhanced
Reference


Biomass Distribution by Site
Total Biomass (mg/m^2)
10000
7500
5000
2500
0
BDA
Beaver
Beaver Enhanced
Reference
Site
site
BDA
Beaver
Beaver Enhanced
Reference

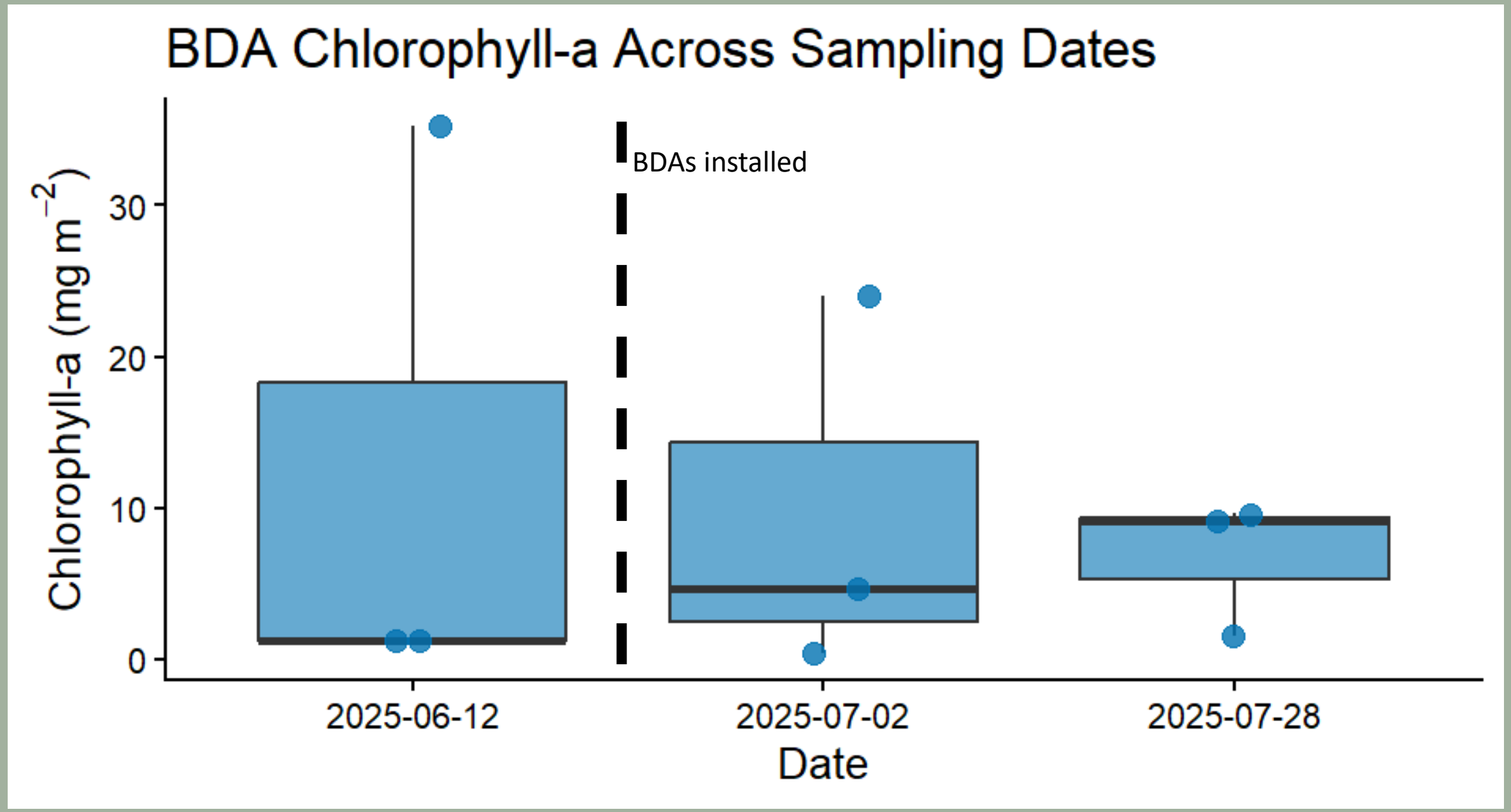

Community Biomass Over Time by Site
Total Biomass (mg/m^2)
10000
7500
5000
2500
0
Jun 15
Jul 01
Jul 15
Aug 01
Date
Beaver Enhanced
Reference
BDA
Beaver

Chlorophyll-a

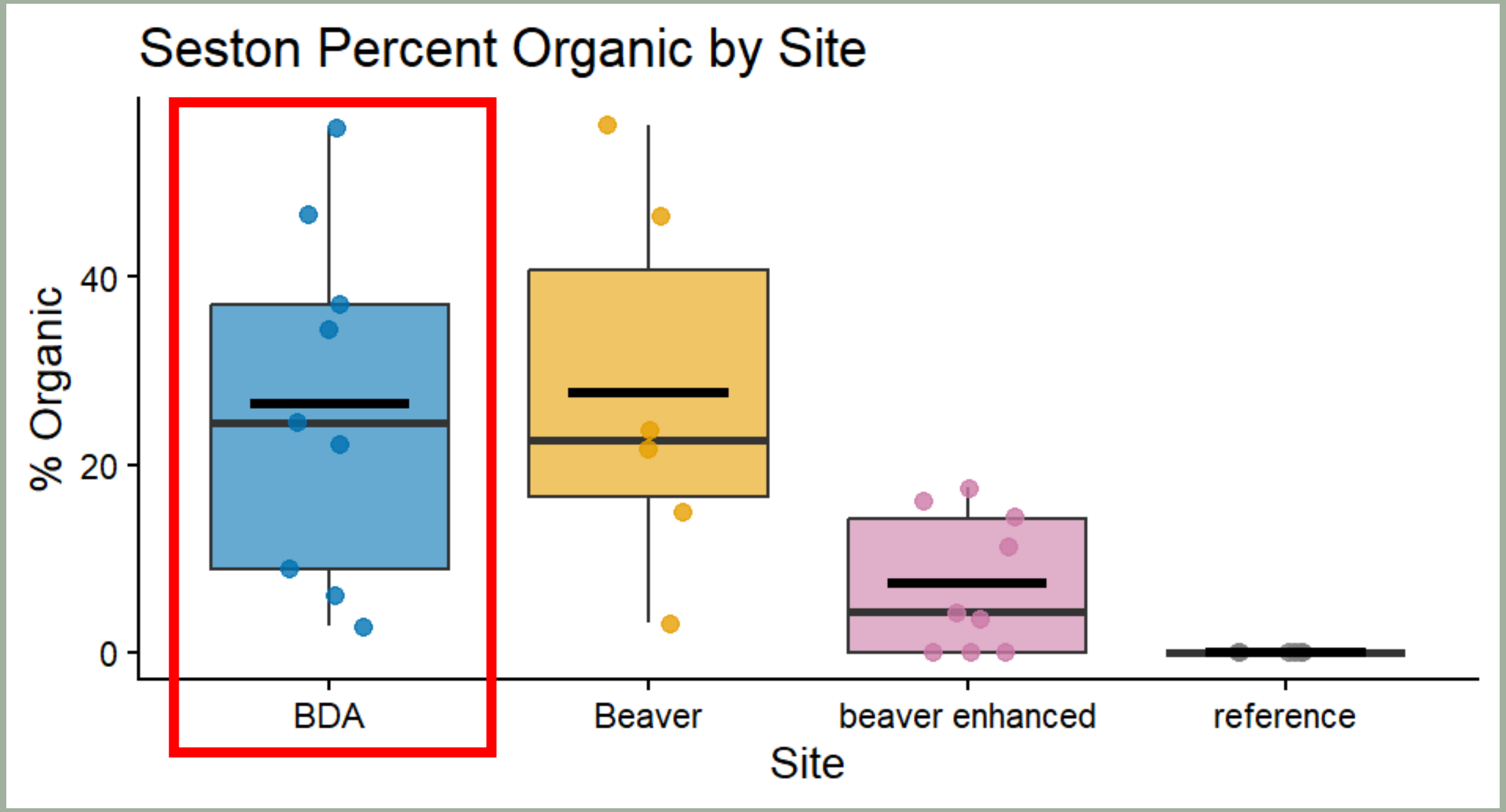




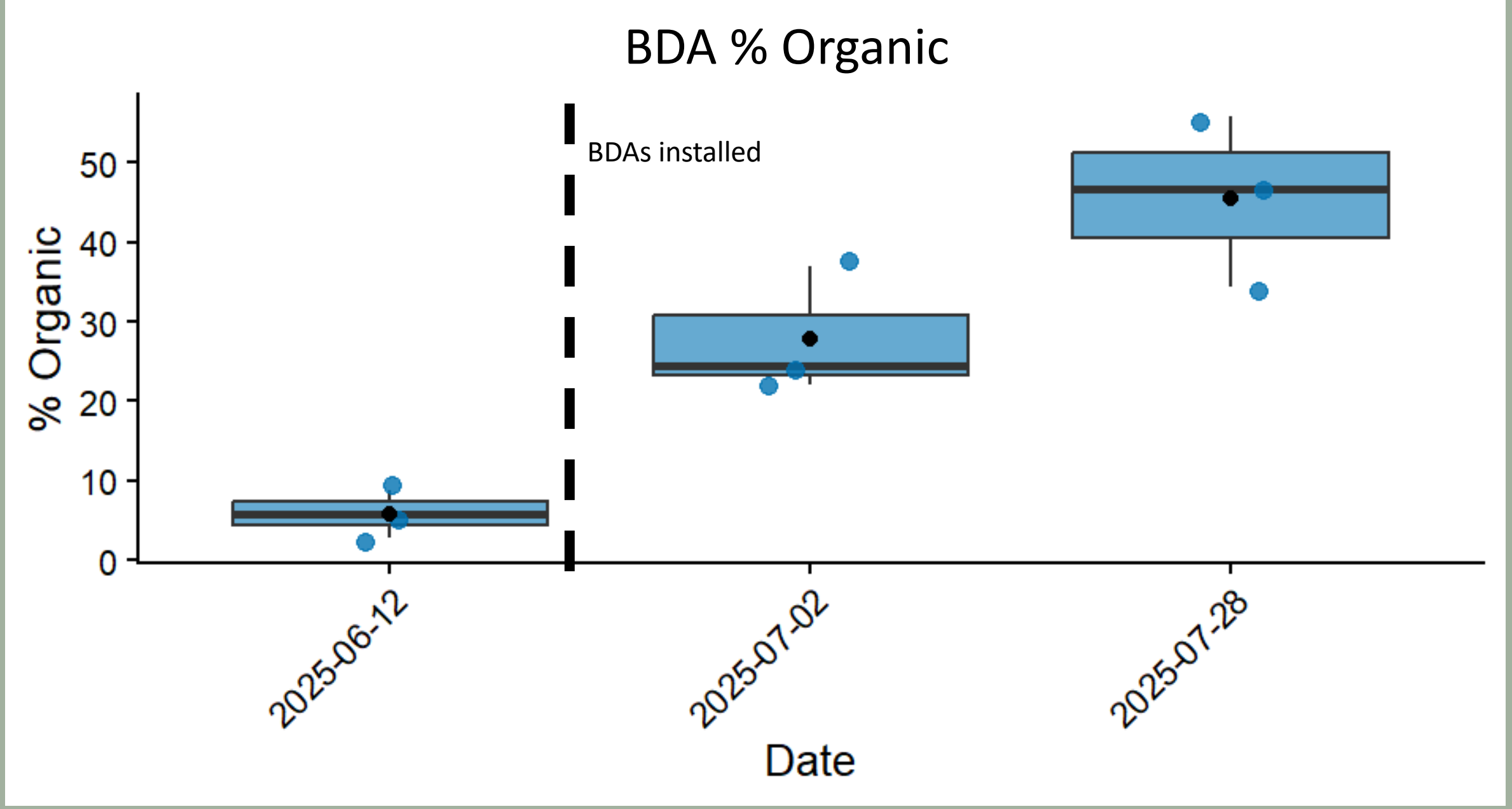
Takeaway: More variability with structure


BDA Chlorophyll-a Across Sampling Dates
BDAs installed
Chlorophyll-a (mg m^{-2})
30
20
10
0
2025-06-12
2025-07-02
2025-07-28
Date

% Organic of suspended solids

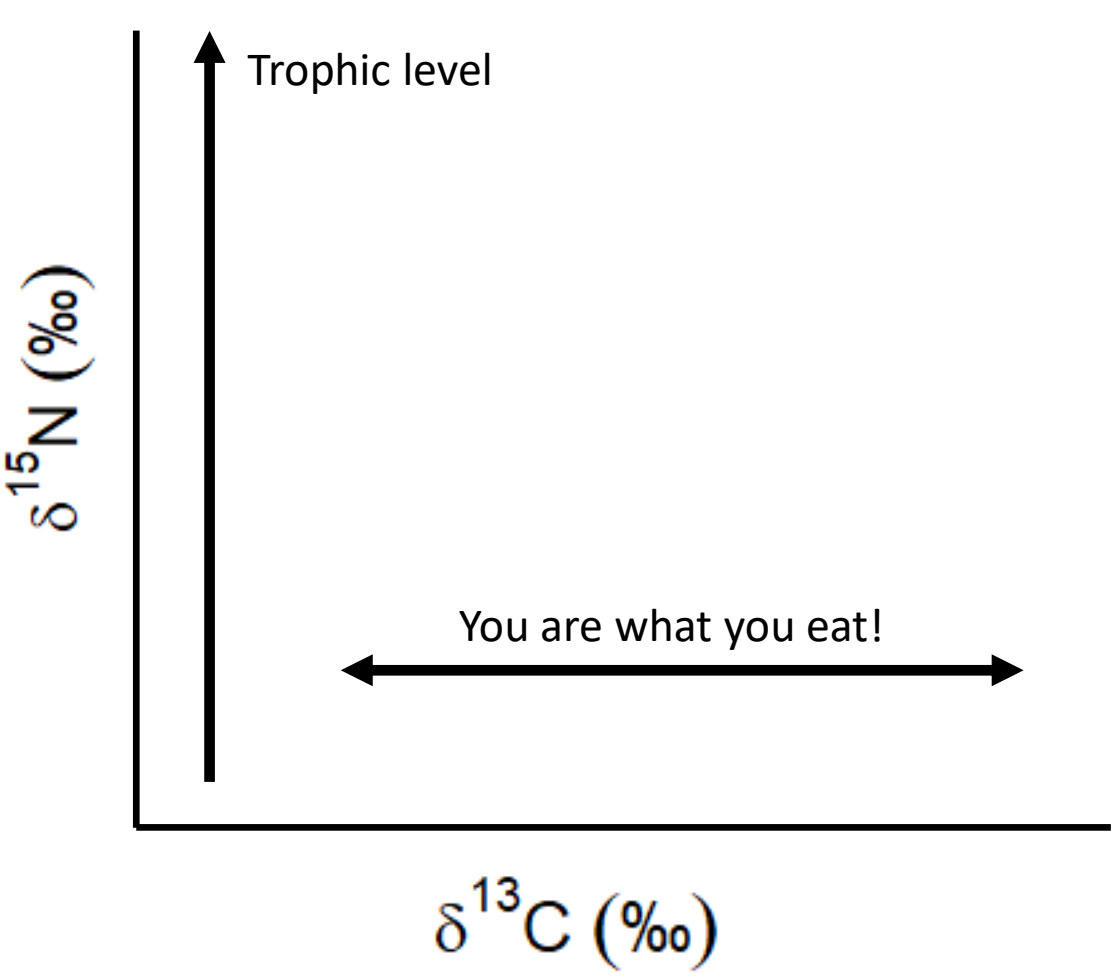


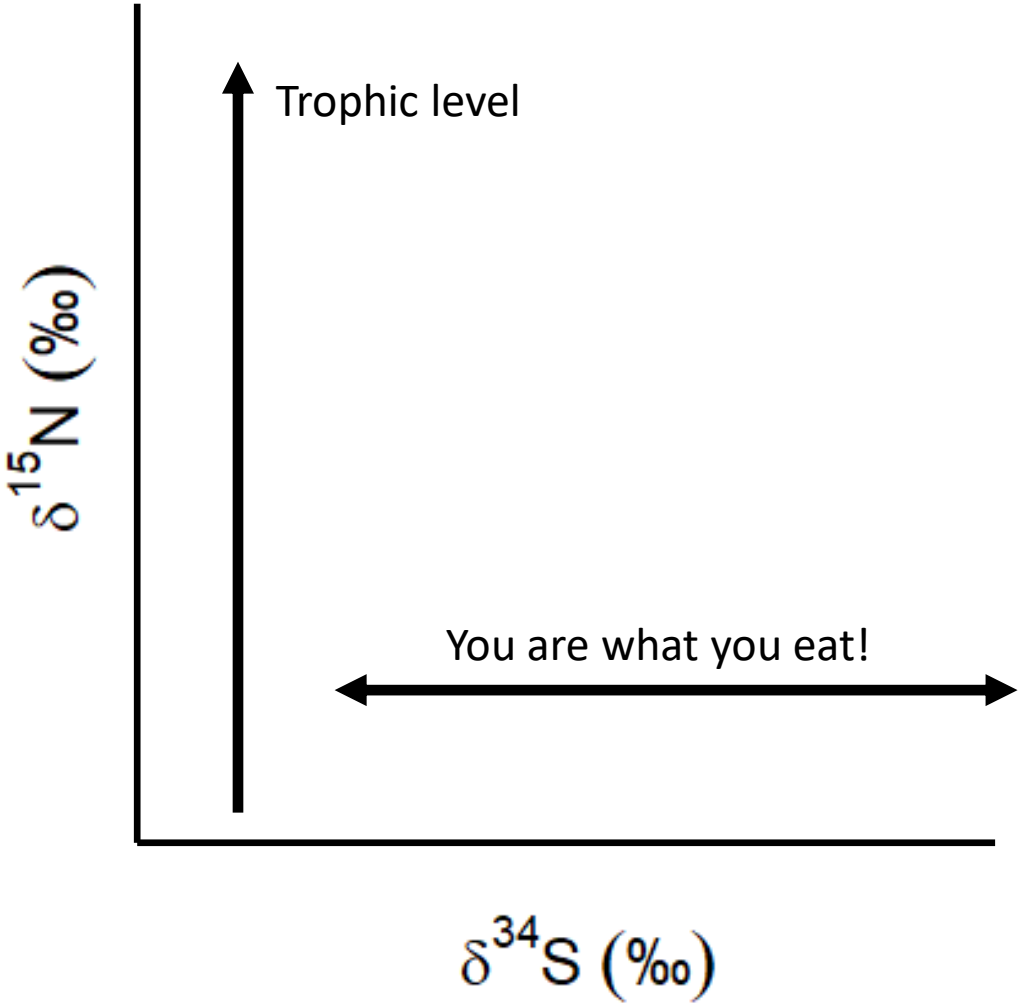
Takeaway: Structures trap organic material

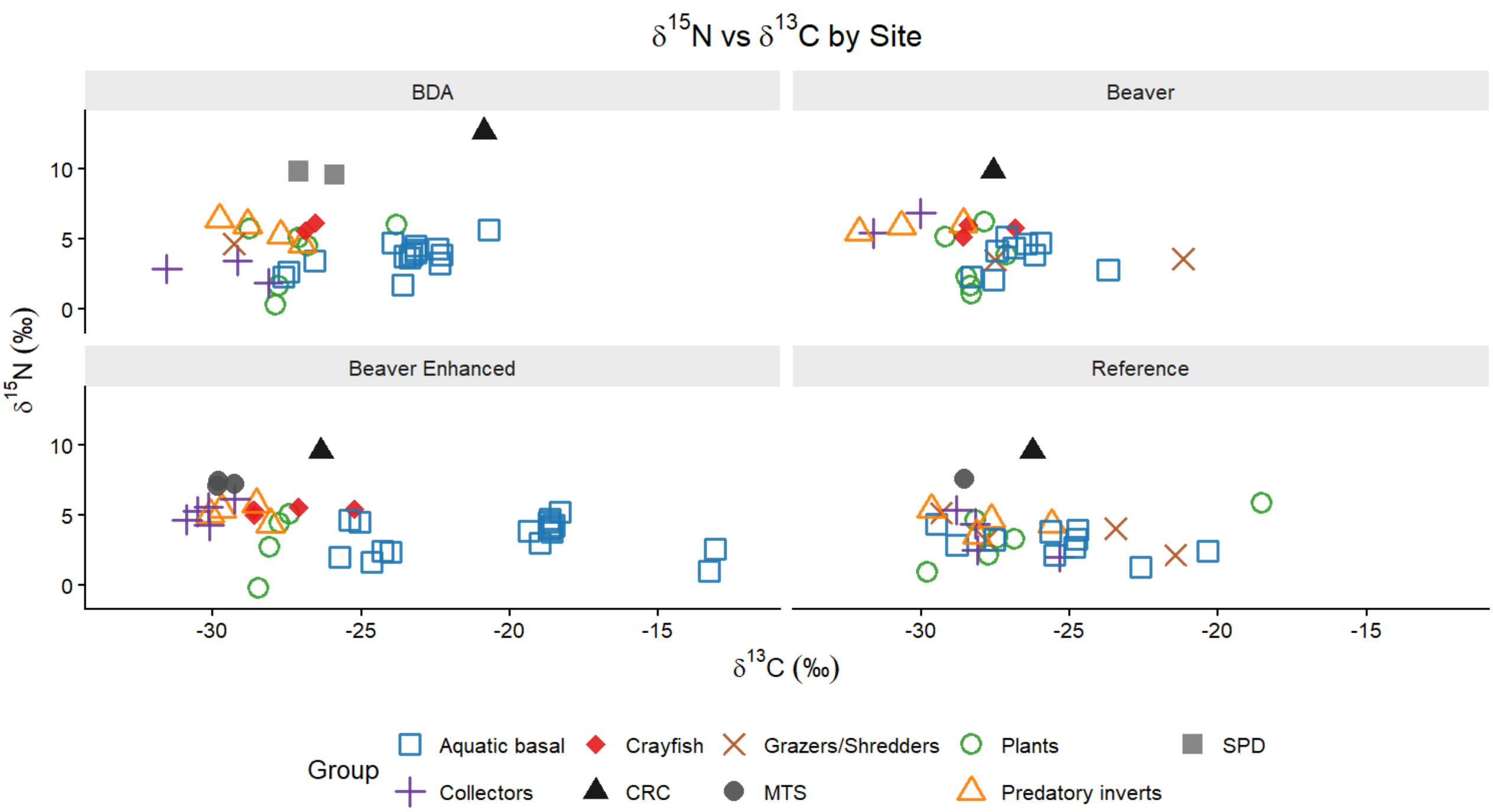


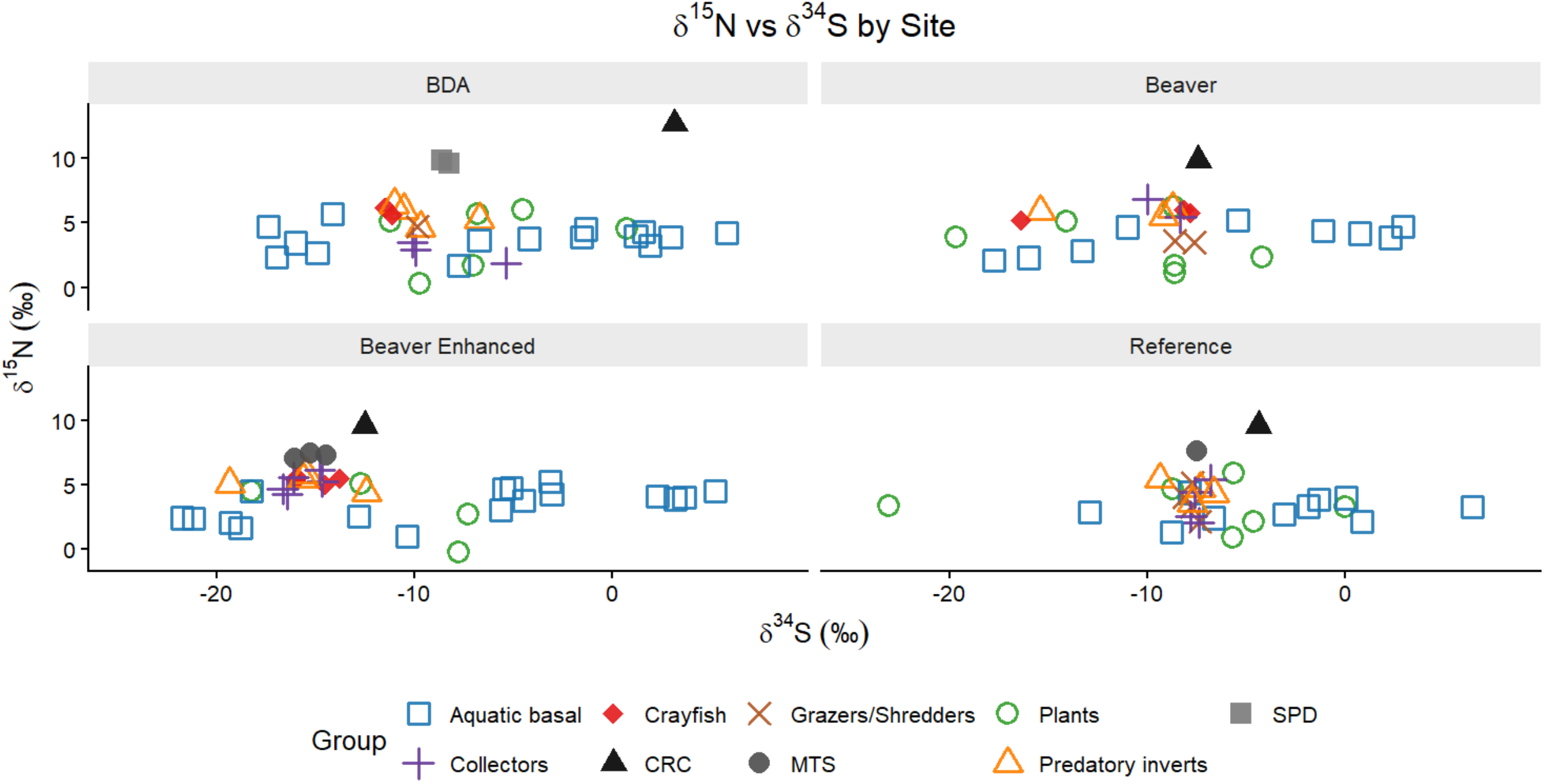
Takeaway: More organic material for food (ex. Filter feeders)

Food Web Isotopes


Trophic level
You are what you eat!
$\delta^{15}N$ (‰)
$\delta^{13}C$ (‰)


Trophic level
You are what you eat!
$\delta^{15}N$ (‰)
$\delta^{34}S$ (‰)


δ15N vs δ13C by Site
BDA
Beaver
Beaver Enhanced
Reference
δ15N (‰)
δ13C (‰)
10
5
0
-30
-25
-20
-15
Group
Aquatic basal
Crayfish
Grazers/Shredders
Plants
SPD
Collectors
CRC
MTS
Predatory inverts


δ15N vs δ34S by Site
BDA
Beaver
Beaver Enhanced
Reference
δ15N (‰)
δ34S (‰)
10
5
0
-20
-10
0
Group
Aquatic basal
Crayfish
Grazers/Shredders
Plants
SPD
Collectors
CRC
MTS
Predatory inverts

Conclusion & Takeaways

- BDAs have lag effect, recover quickly
  - Initial benefits are promising
- Beaver Enhanced site has a closer representation of natural beaver dams
- A diverse landscape will hold diverse communities
- Will be able to assess if CRC are occupying BDAs in 2026
- Do BDAs create suitable habitat for beavers?

Thank you!
Questions?

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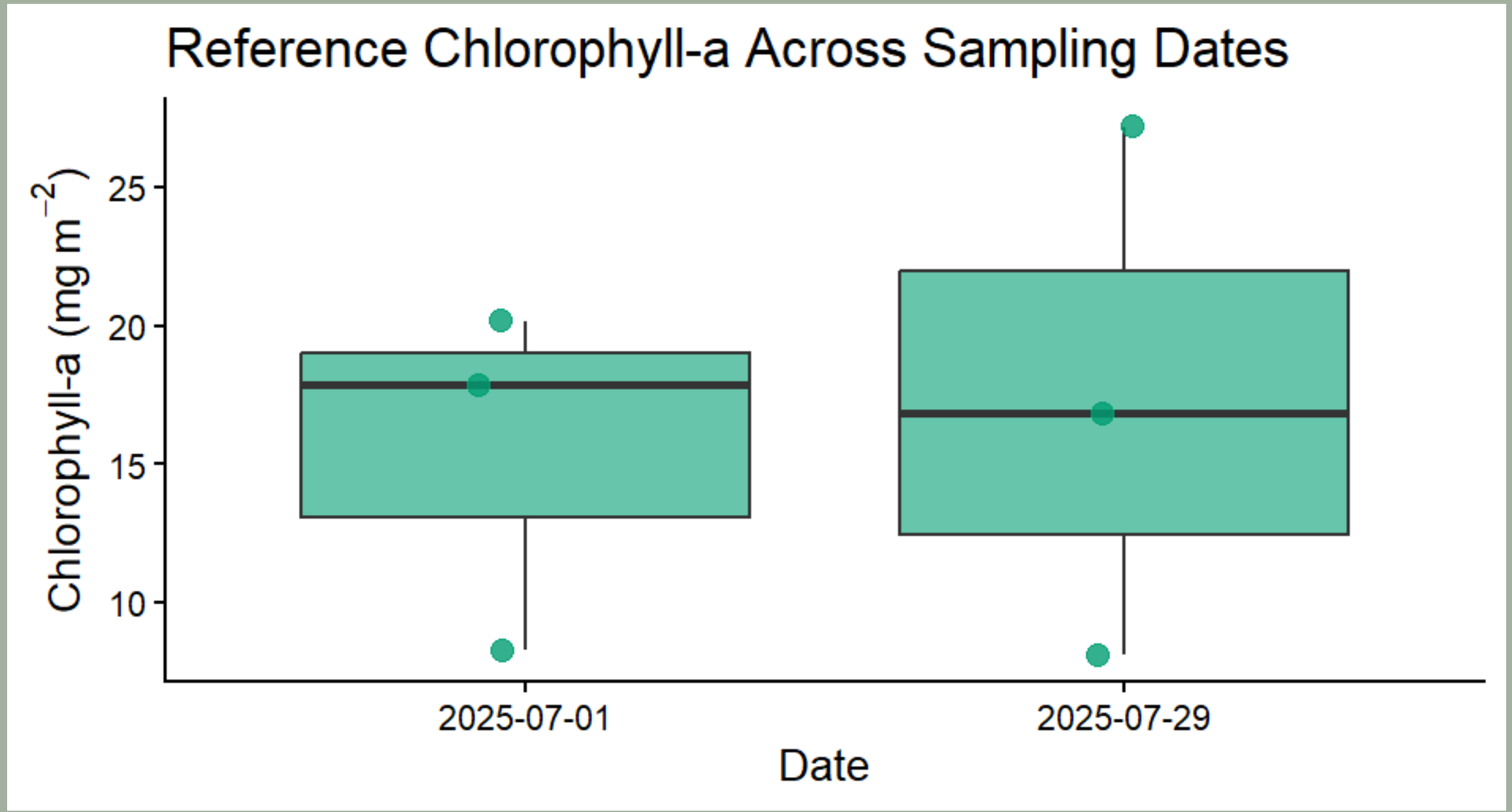
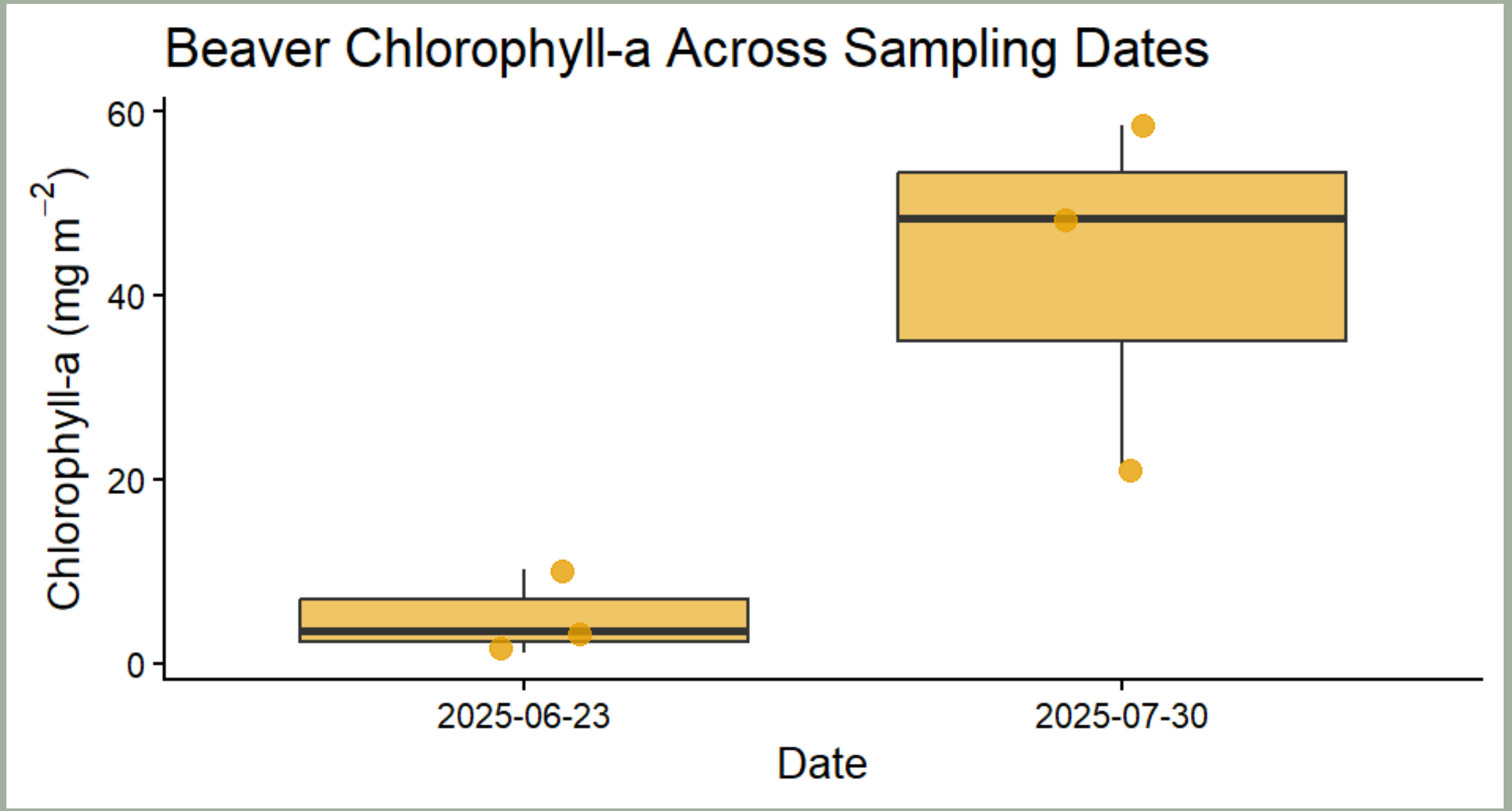
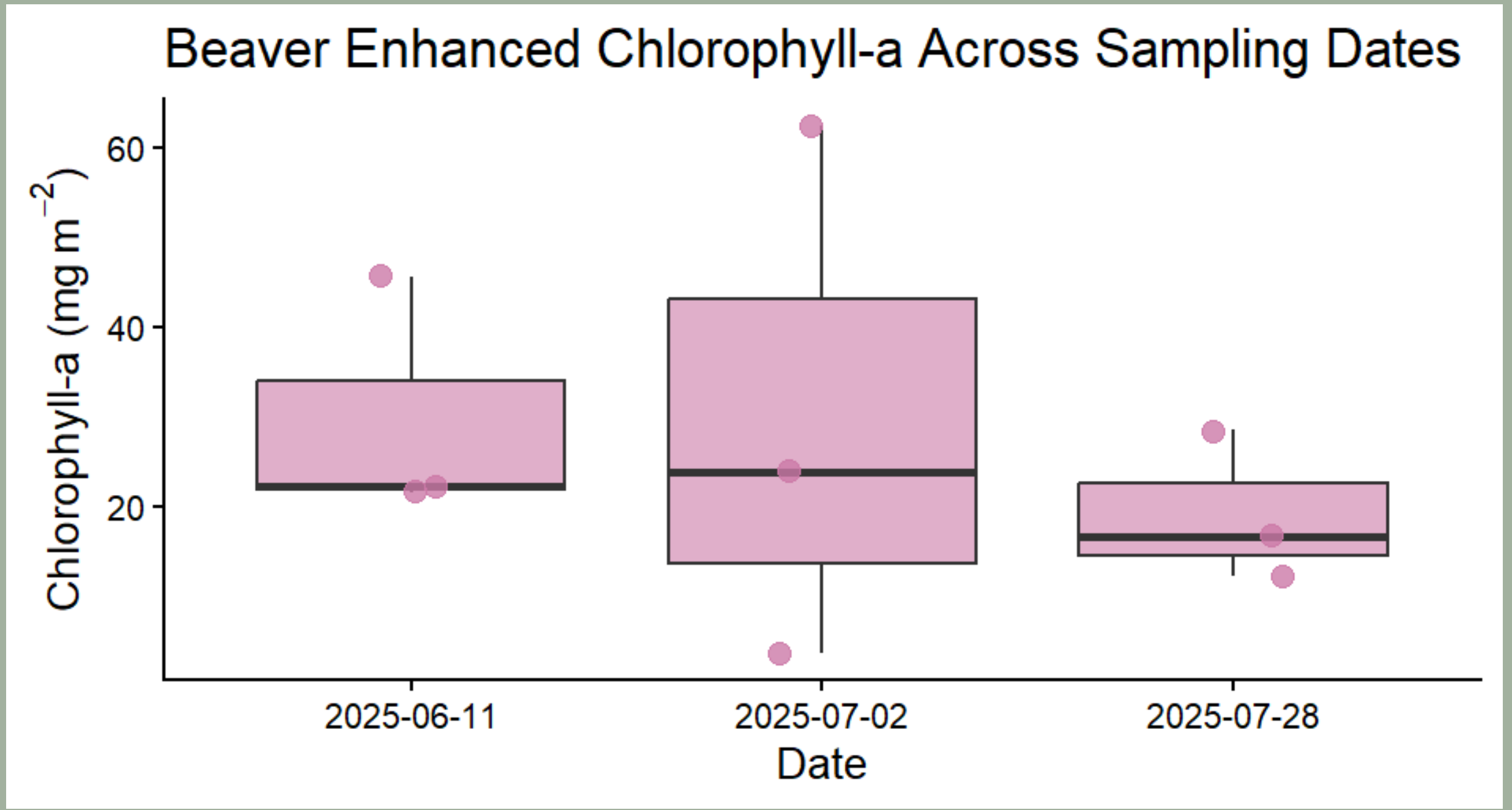
Supplemental Materials

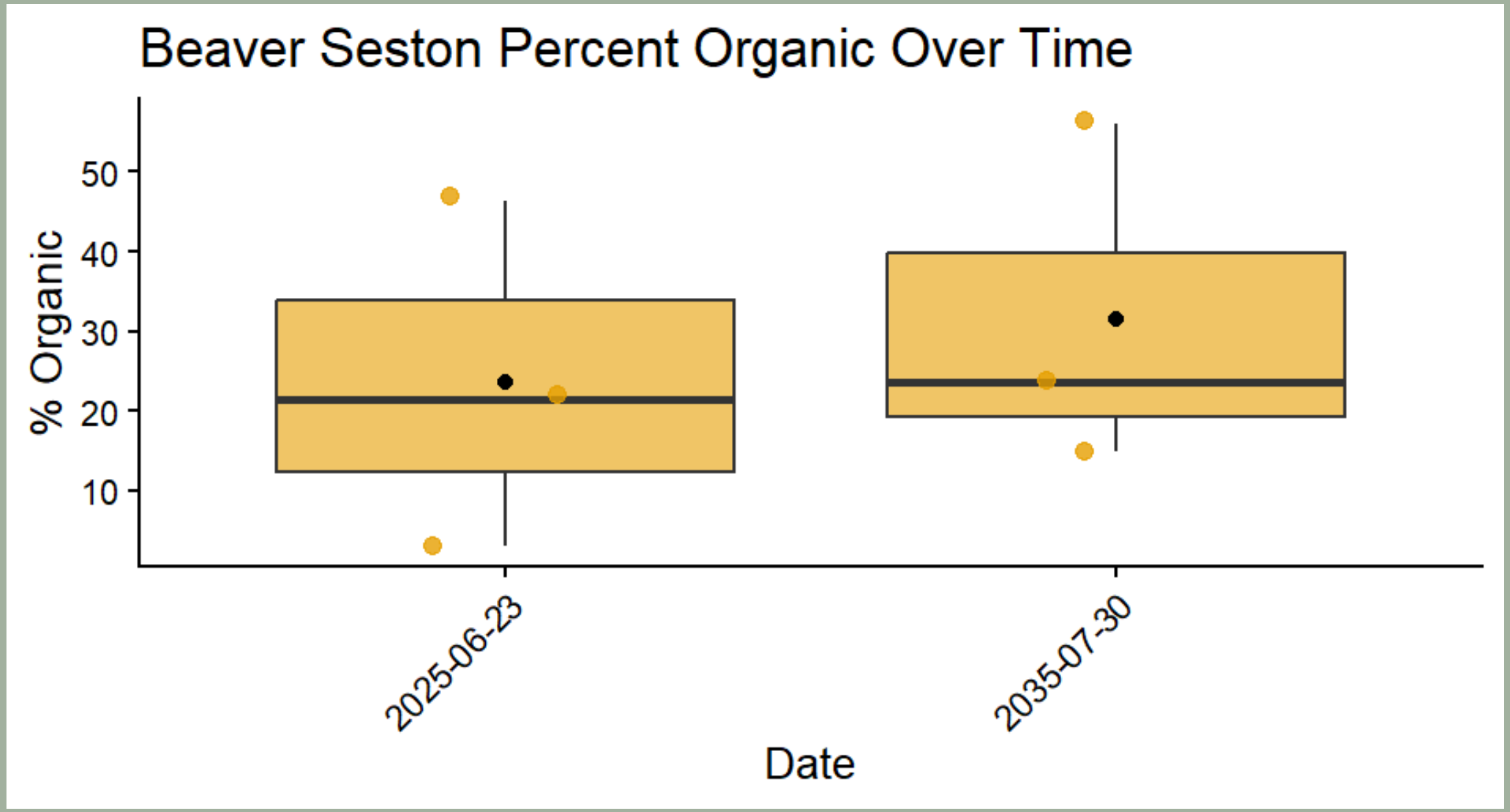
Other genera that moved into BDA site

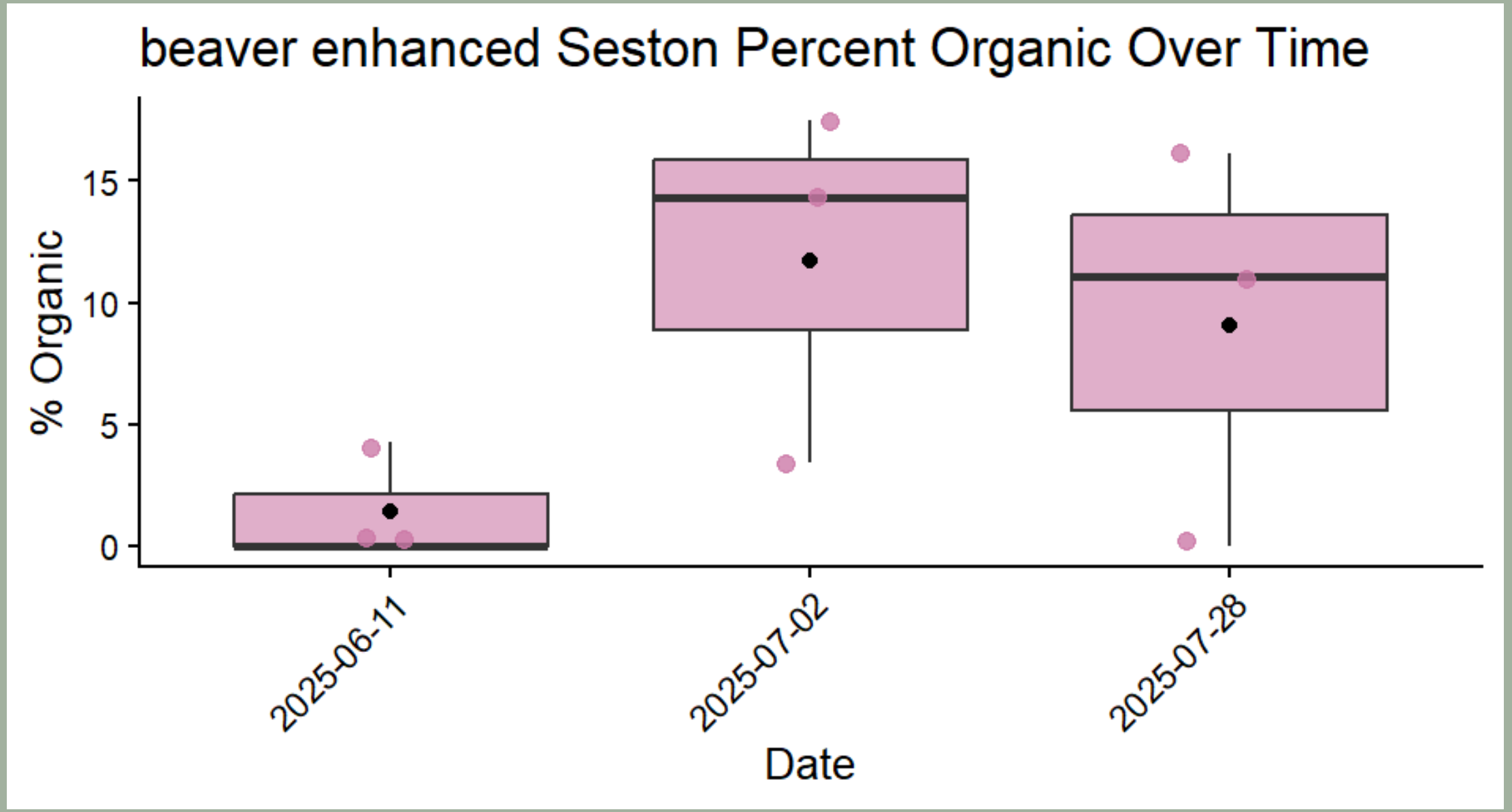
Genera that were undetected after BDA construction


Reference Chlorophyll-a Across Sampling Dates
Chlorophyll-a (mg m^{-2})
25
20
15
10
2025-07-01
2025-07-29
Date


Beaver Chlorophyll-a Across Sampling Dates
Chlorophyll-a (mg m^{-2})
60
40
20
0
2025-06-23
2025-07-30
Date


Beaver Enhanced Chlorophyll-a Across Sampling Dates
Chlorophyll-a (mg m^{-2})
60
40
20
2025-06-11
2025-07-02
2025-07-28
Date


Beaver Seston Percent Organic Over Time
% Organic
50
40
30
20
10
2025-06-23
2035-07-30
Date


beaver enhanced Seston Percent Organic Over Time
% Organic
15
10
5
0
2025-06-11
2025-07-02
2025-07-28
Date