

Figure B2 - 2. Total cyanide (mg/L) in water samples from Whale Tail Pit since 2014.

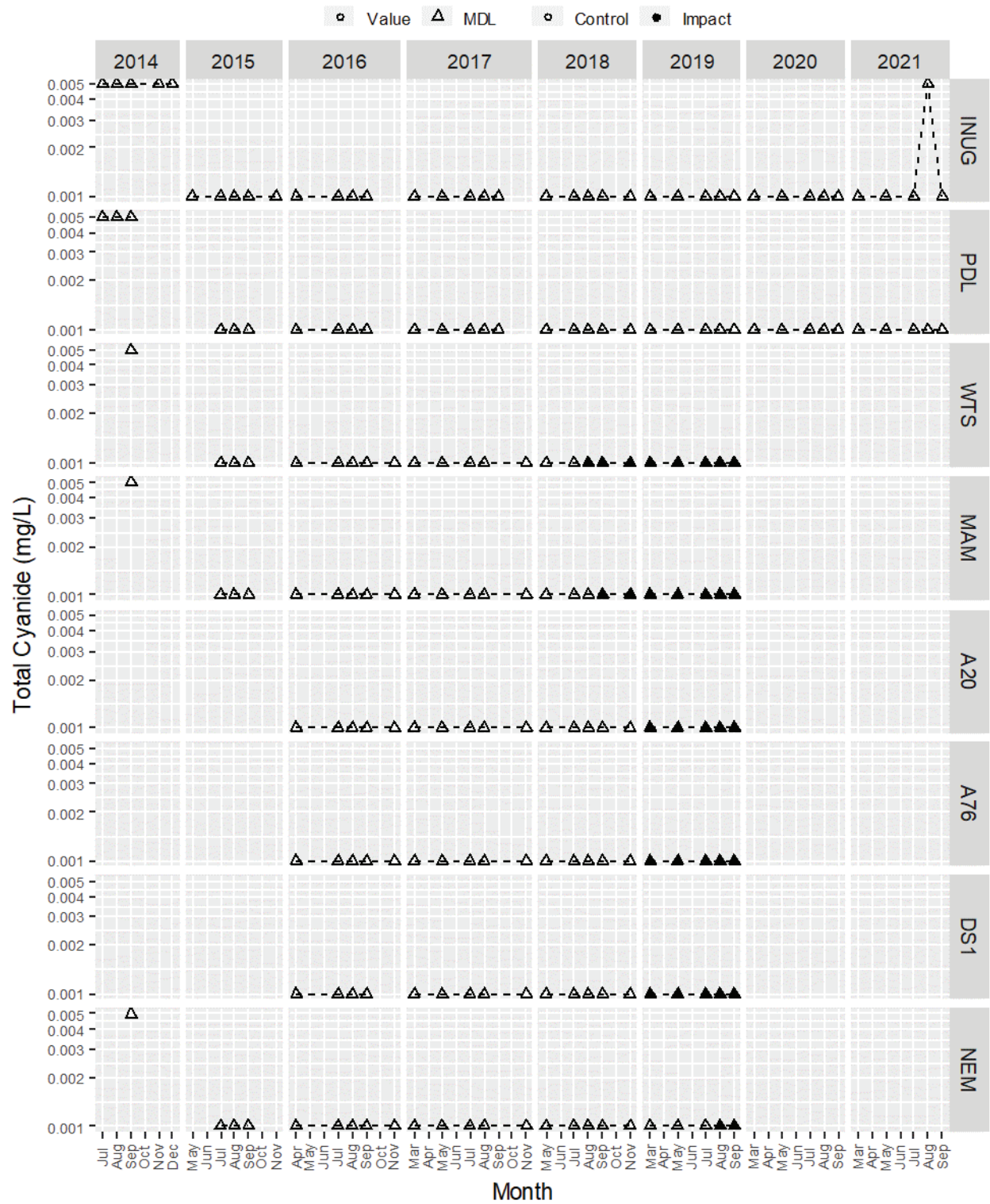
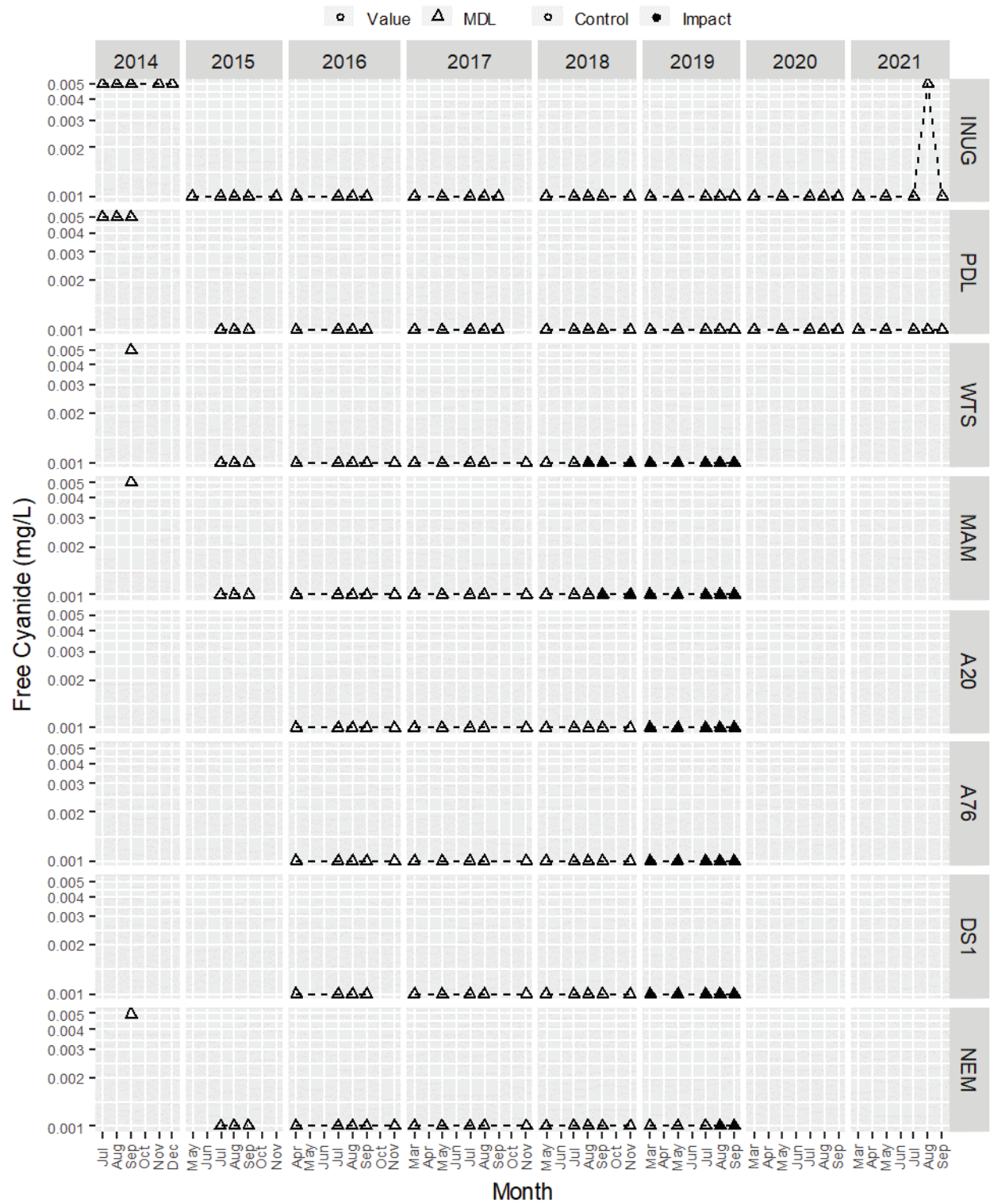
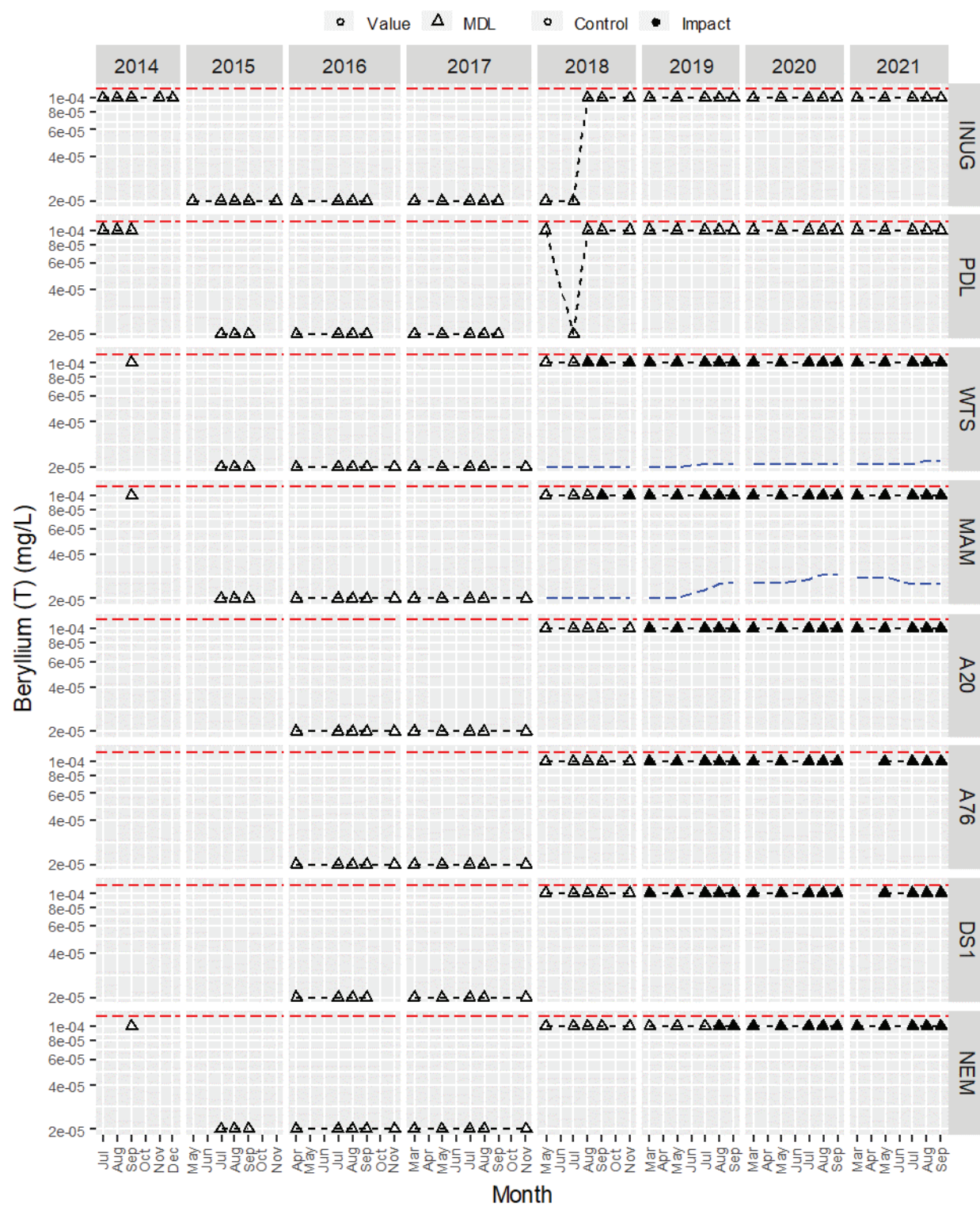


Figure B2 - 3. Free cyanide (mg/L) in water samples from Whale Tail Pit since 2014.



**Figure B2 - 4. Total beryllium (mg/L) in water samples from Whale Tail Pit since 2014.**

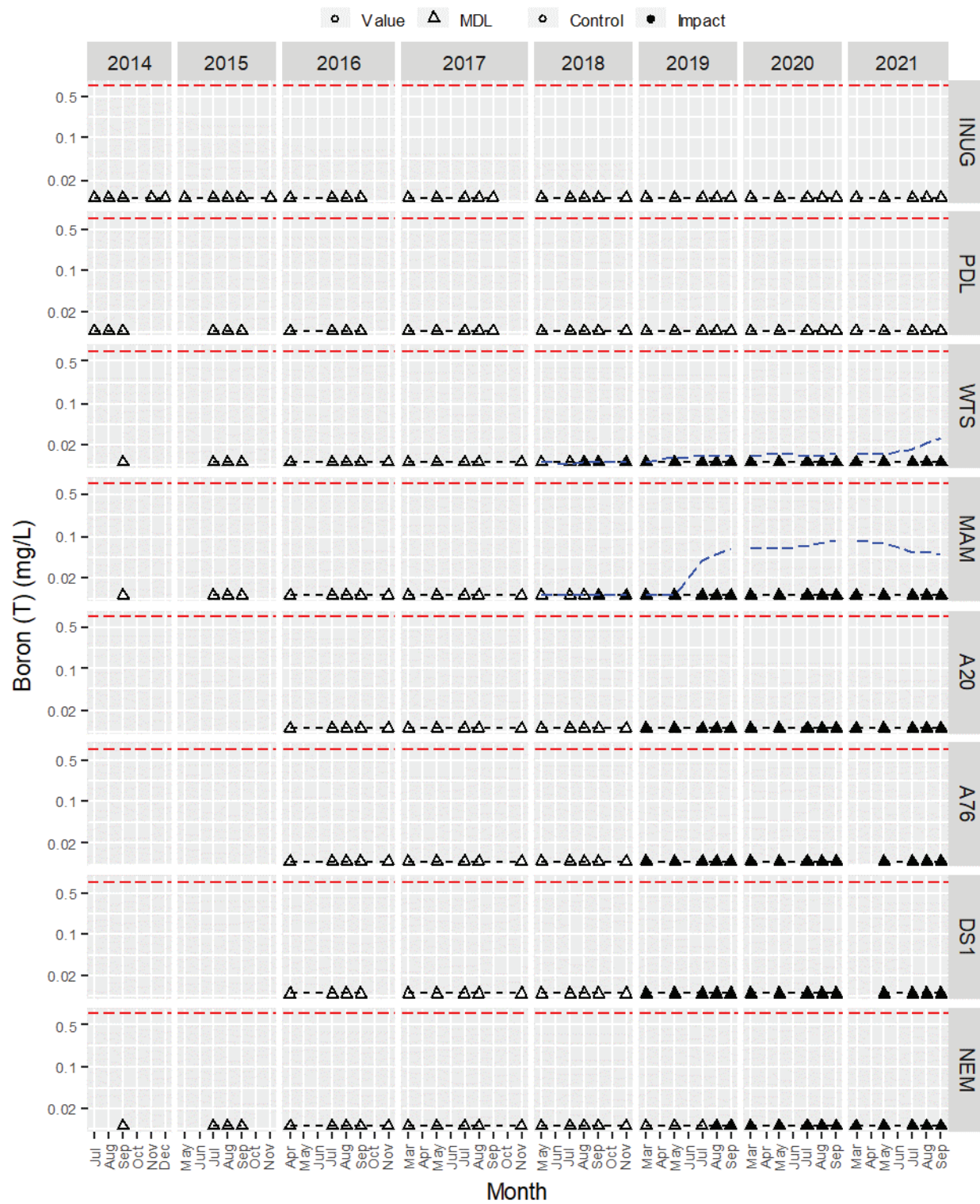
Note: The red dashed line = trigger value. The blue dashed line = FEIS screening prediction.





**Figure B2 - 5. Total boron (mg/L) in water samples from Whale Tail Pit since 2014.**

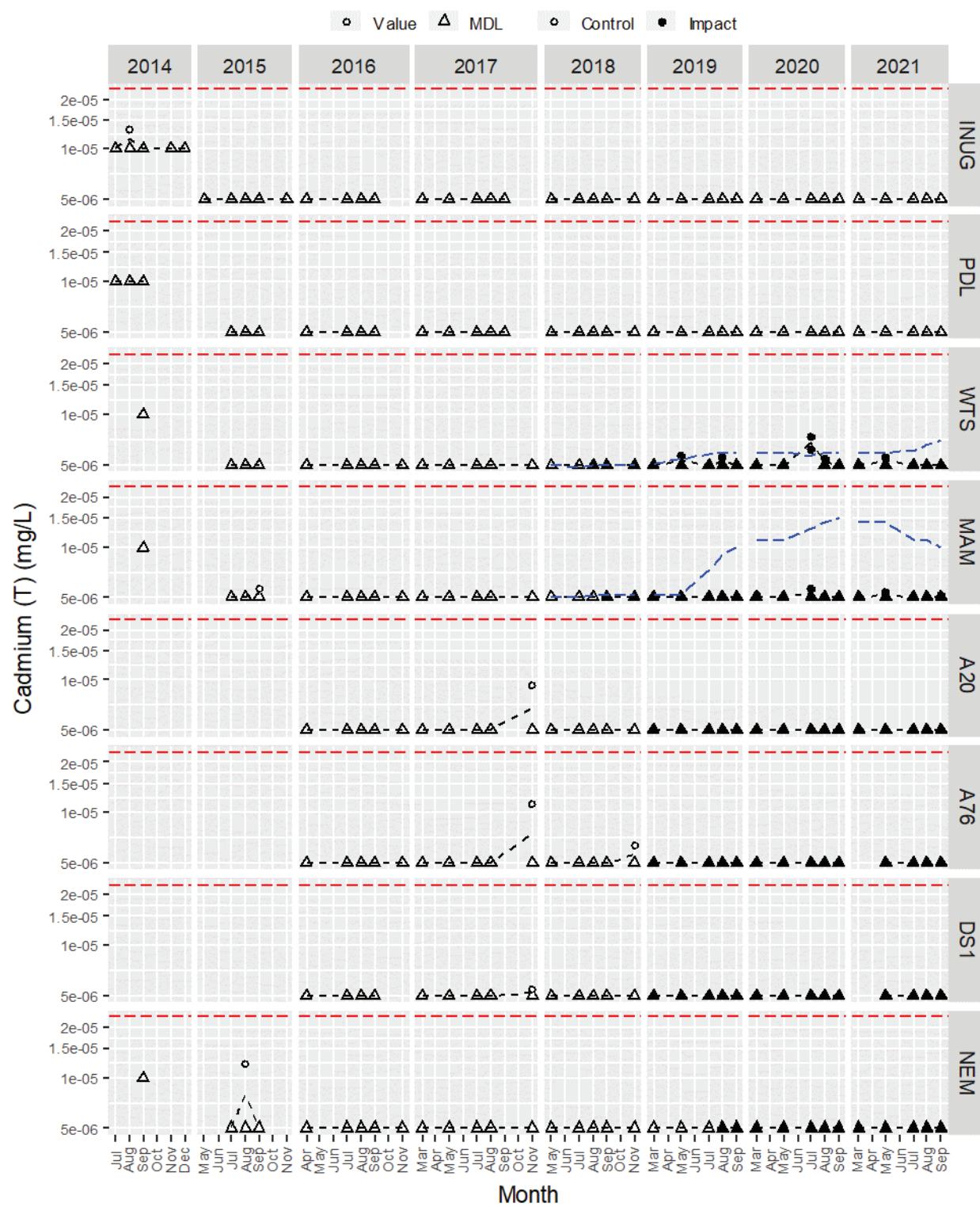
Note: The red dashed line = trigger value. The blue dashed line = FEIS screening prediction.





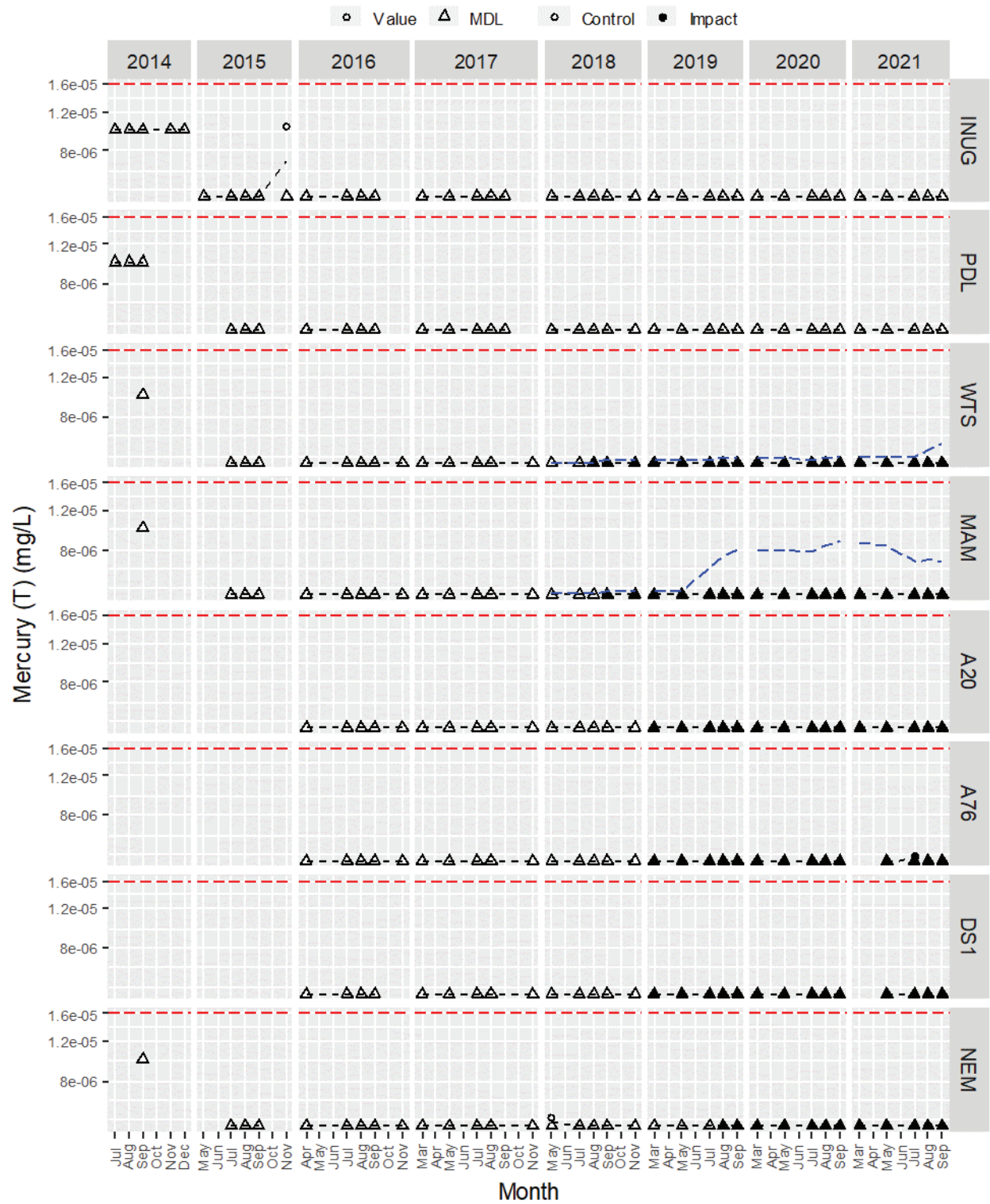
**Figure B2 - 6. Total cadmium (mg/L) in water samples from Whale Tail Pit since 2014.**

Note: The red dashed line = trigger value. The blue dashed line = FEIS screening prediction.



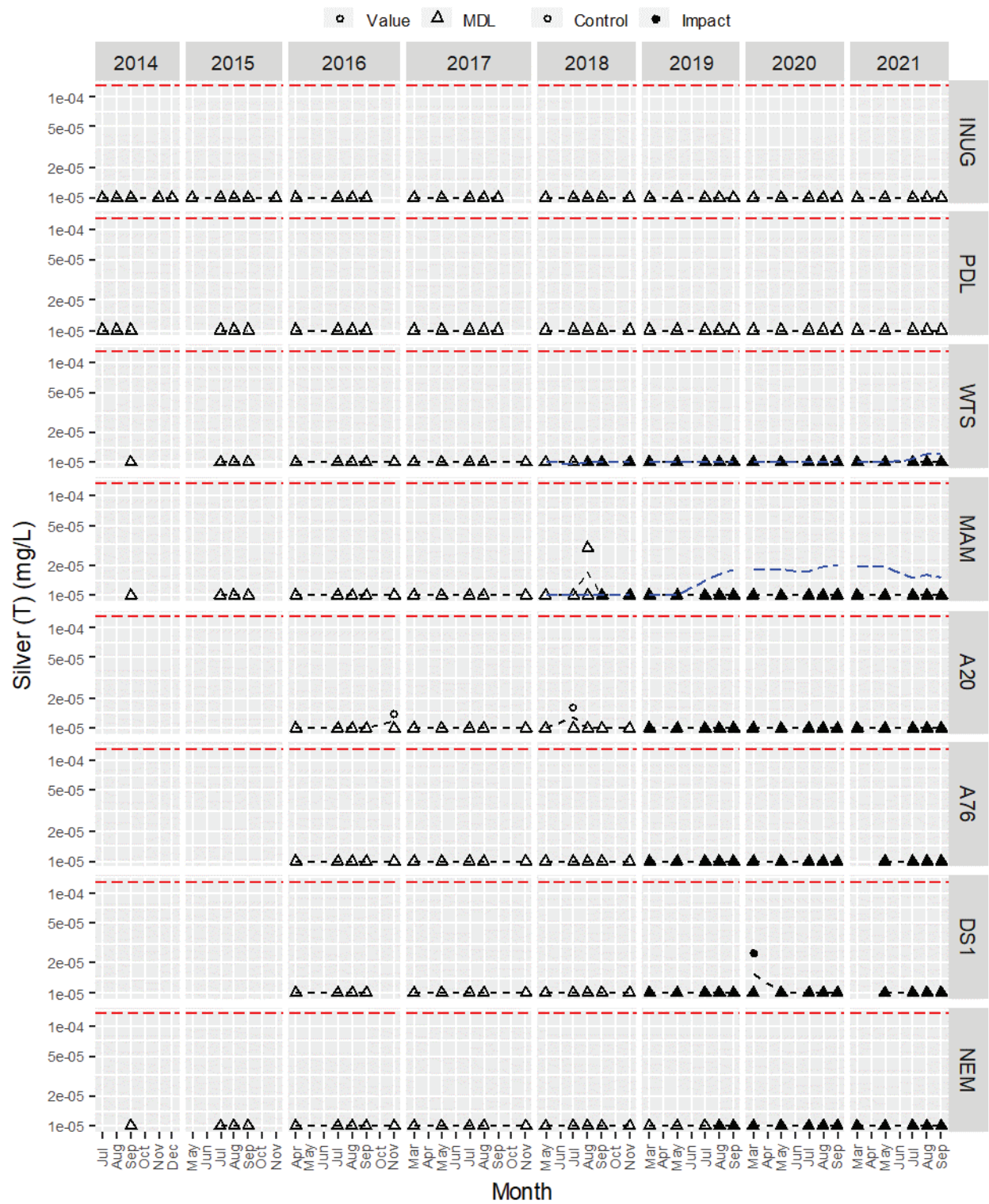
**Figure B2 - 7. Total mercury (mg/L) in water samples from Whale Tail Pit since 2014.**

Note: The red dashed line = trigger value. The blue dashed line = FEIS screening prediction.



**Figure B2 - 8. Total silver (mg/L) in water samples from Whale Tail Pit since 2014.**

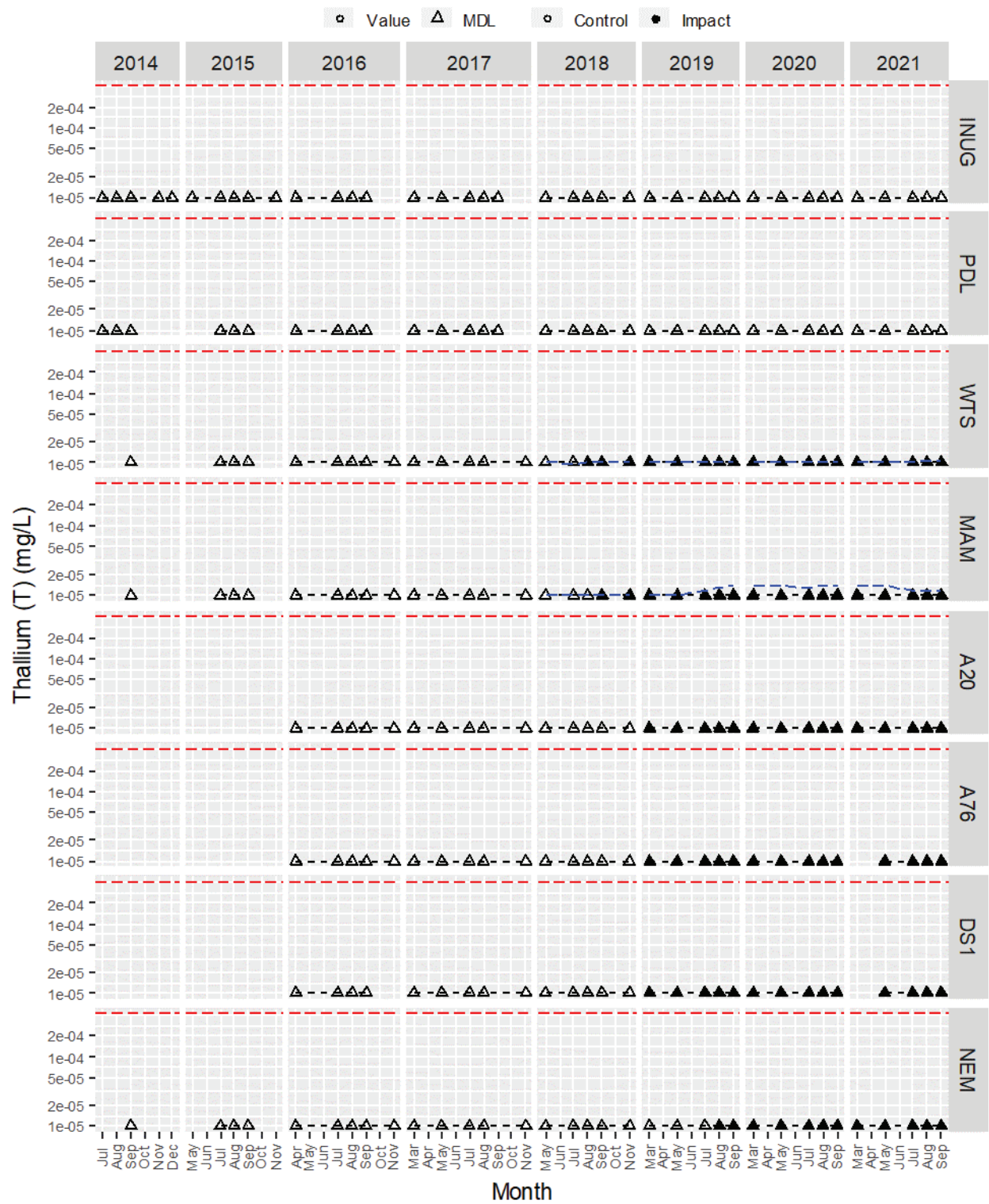
Note: The red dashed line = trigger value. The blue dashed line = FEIS screening prediction.





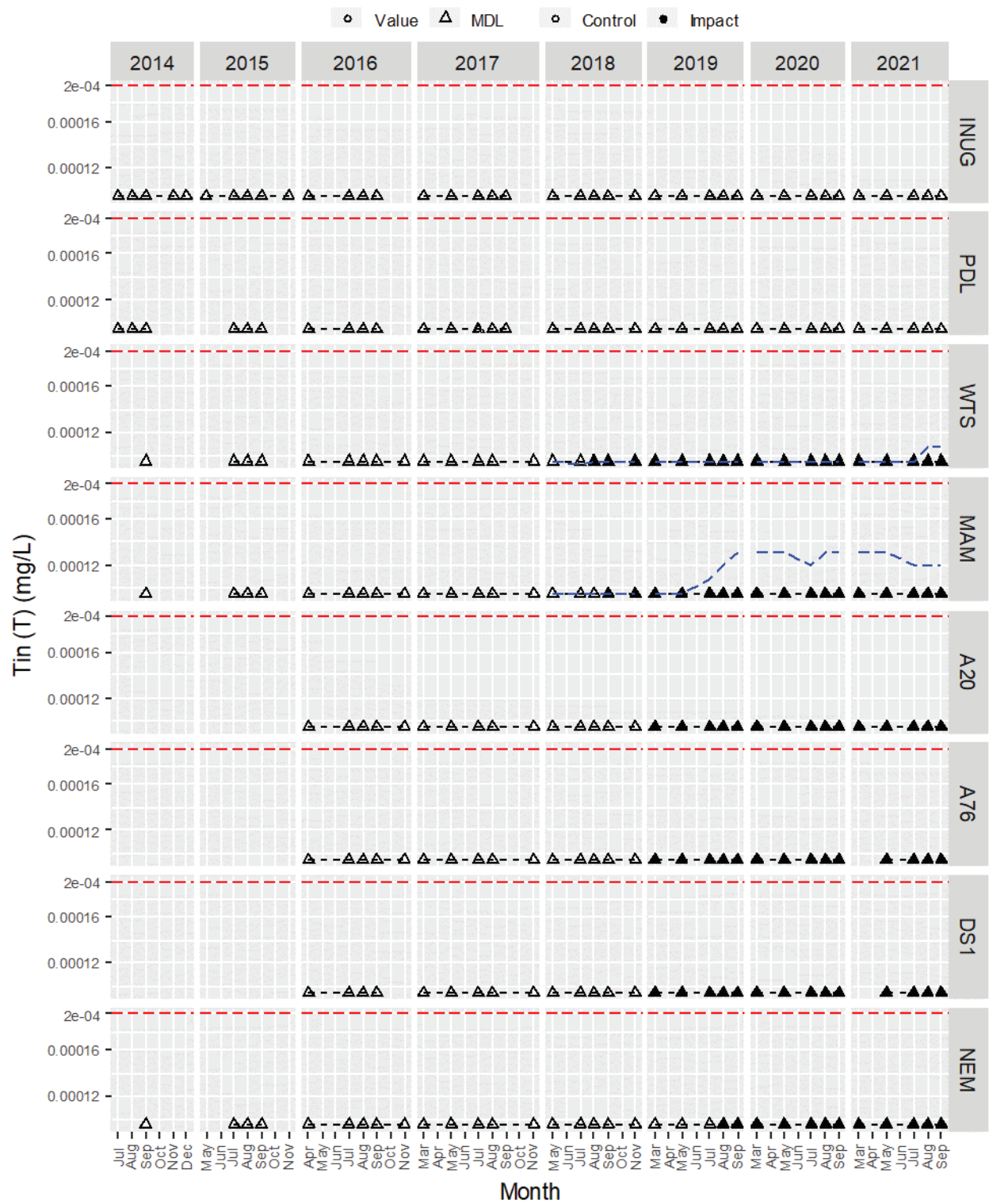
**Figure B2 - 9. Total thallium (mg/L) in water samples from Whale Tail Pit since 2014.**

Note: The red dashed line = trigger value. The blue dashed line = FEIS screening prediction.



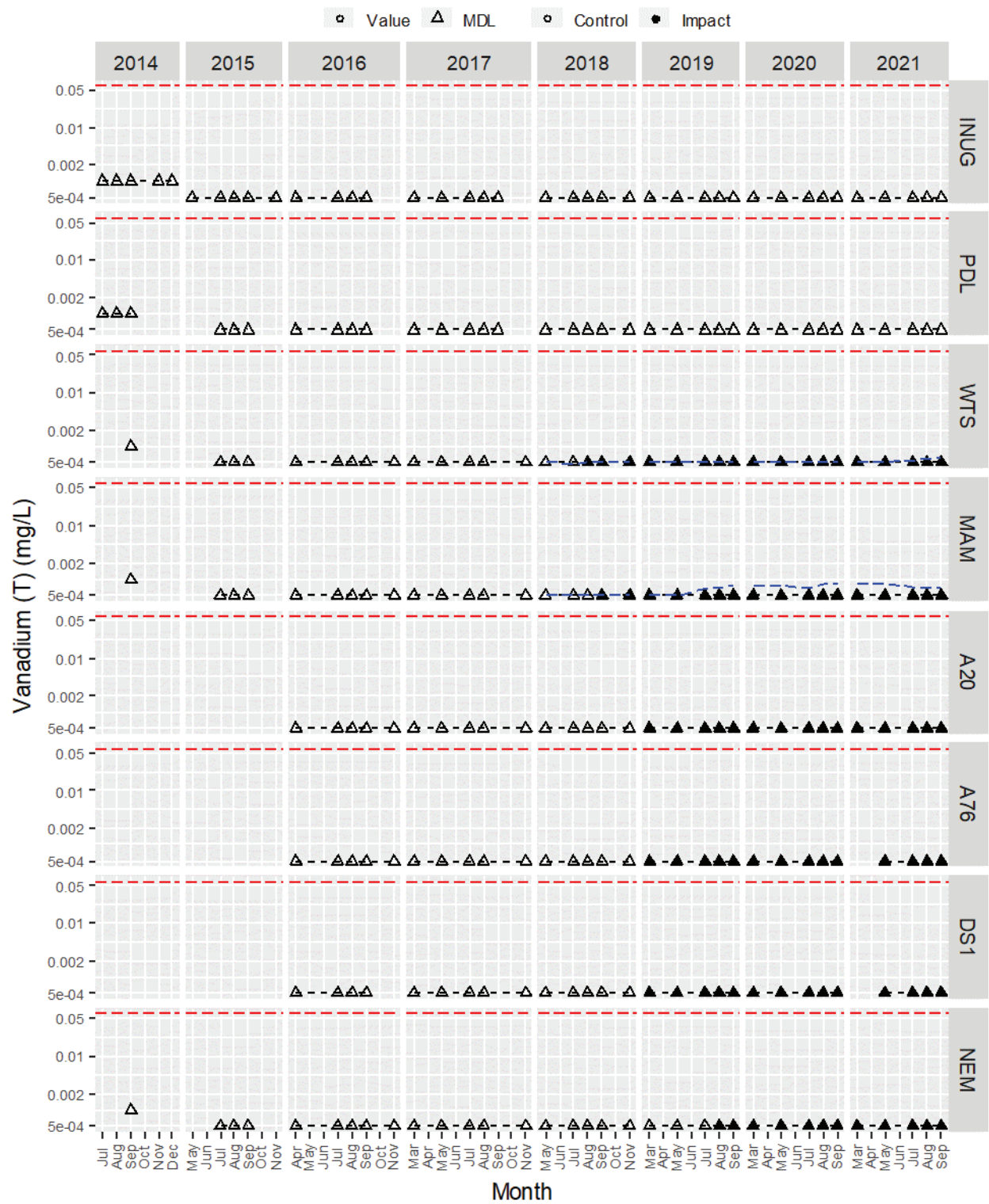
**Figure B2 - 10. Total tin (mg/L) in water samples from Whale Tail Pit since 2014.**

Note: The red dashed line = trigger value. The blue dashed line = FEIS screening prediction.



**Figure B2 - 11. Total vanadium (mg/L) in water samples from Whale Tail Pit since 2014.**

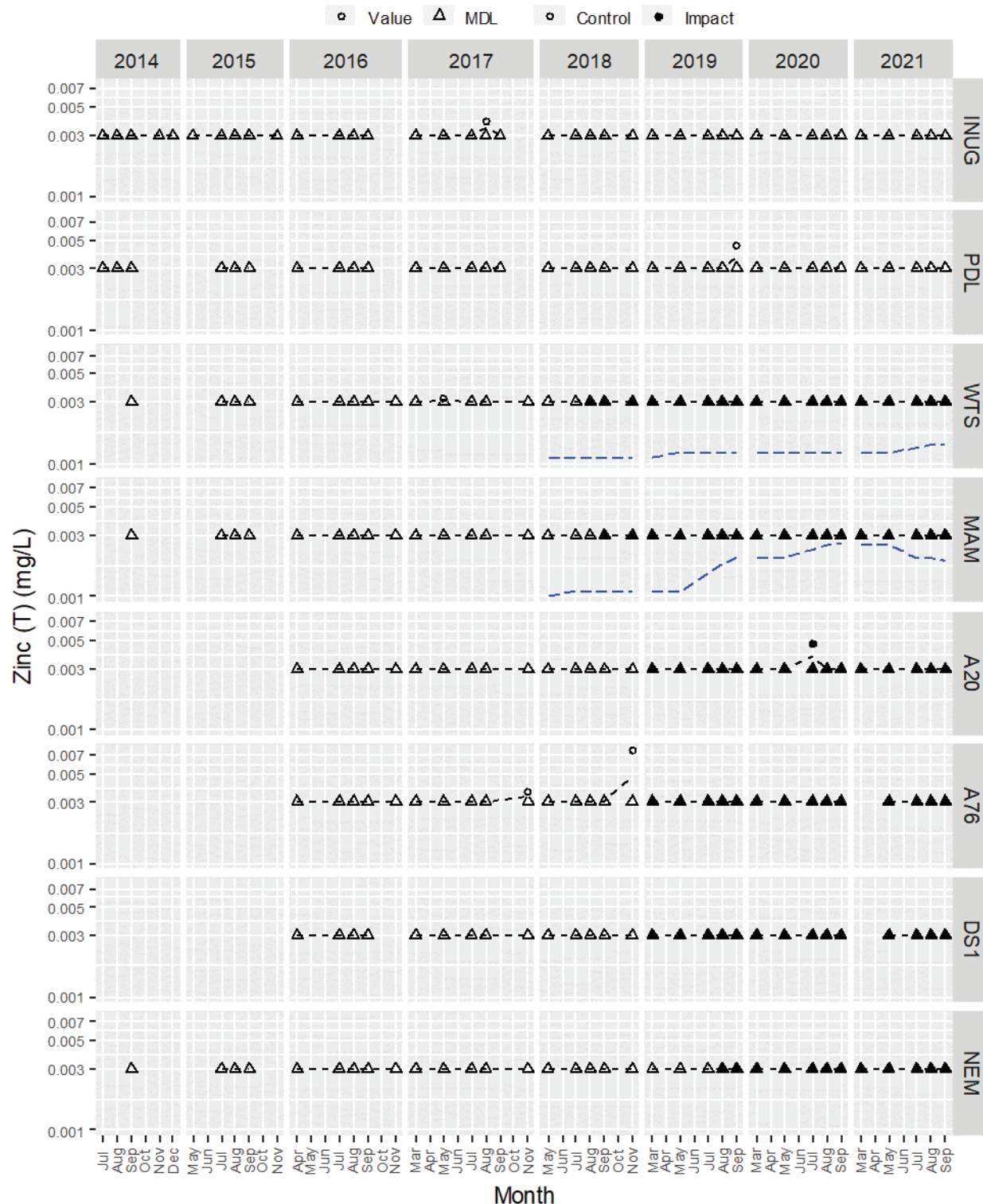
Note: The red dashed line = trigger value. The blue dashed line = FEIS screening prediction.





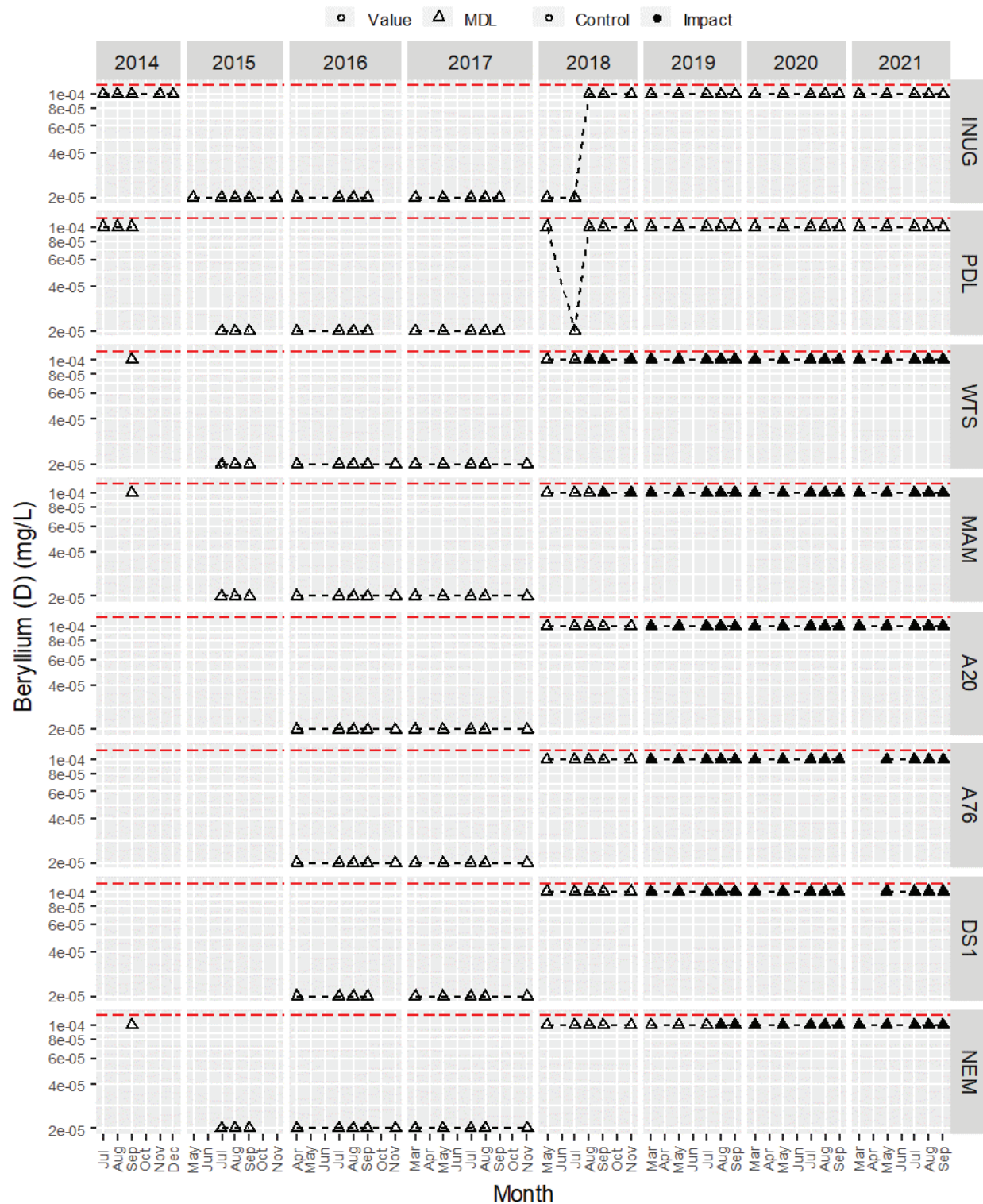
**Figure B2 - 12. Total zinc (mg/L) in water samples from Whale Tail Pit since 2014.**

Note: The blue dashed line = FEIS screening prediction.



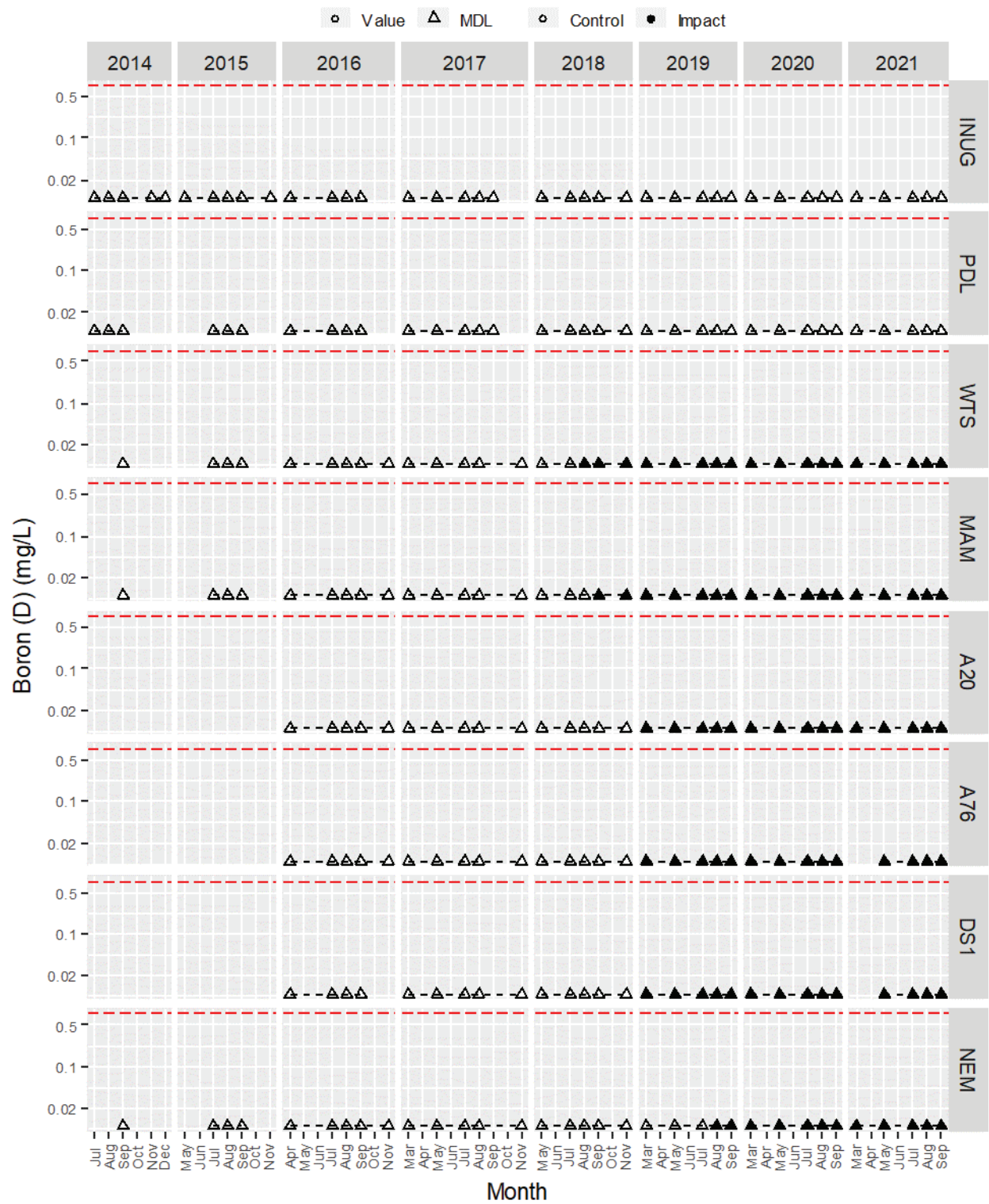
**Figure B2 - 13. Dissolved beryllium (mg/L) in water samples from Whale Tail Pit since 2014.**

Note: The red dashed line = trigger value.



**Figure B2 - 14. Dissolved boron (mg/L) in water samples from Whale Tail Pit since 2014.**

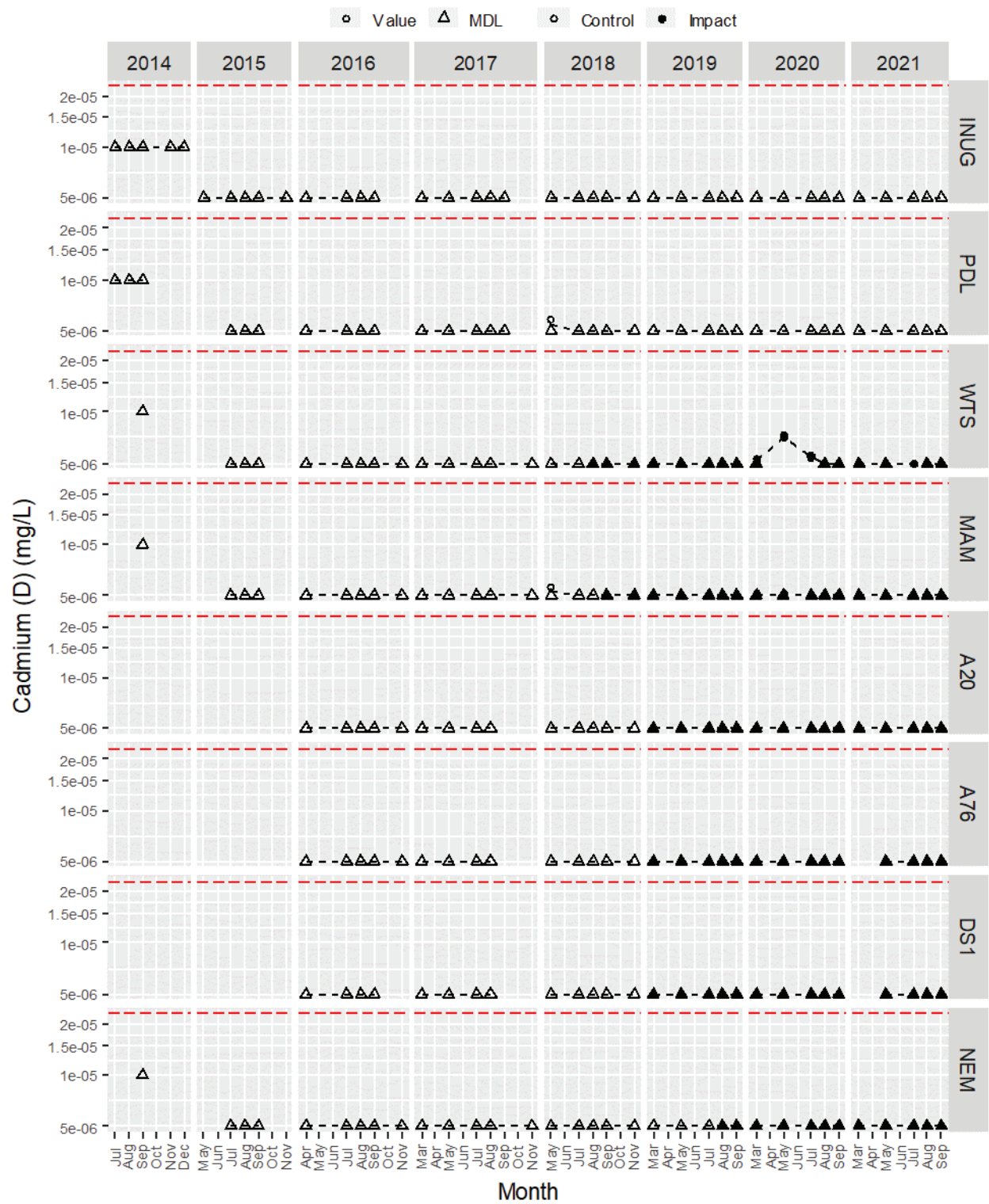
Note: The red dashed line = trigger value.





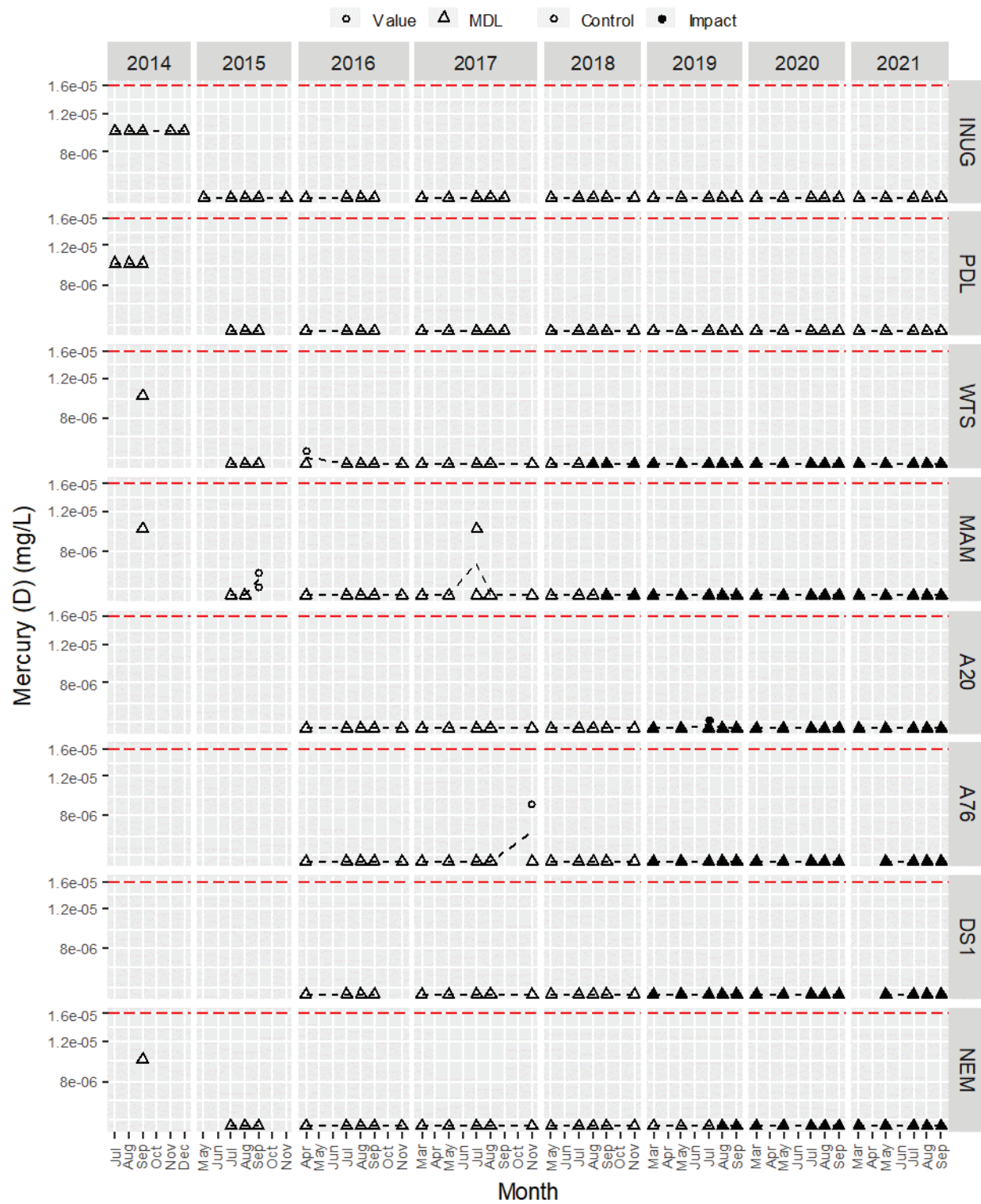
**Figure B2 - 15. Dissolved cadmium (mg/L) in water samples from Whale Tail Pit since 2014.**

Note: The red dashed line = trigger value.



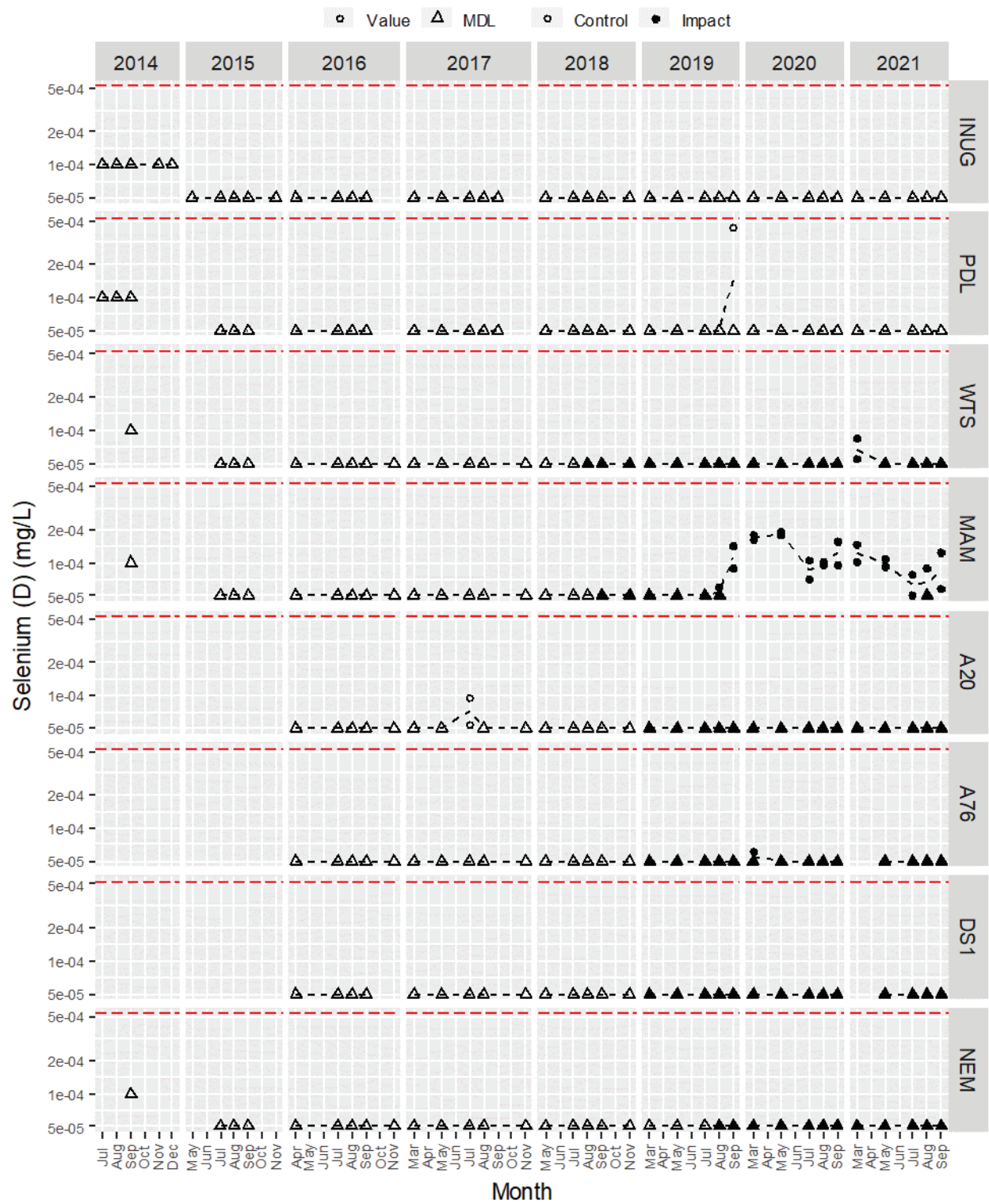
**Figure B2 - 16. Dissolved mercury (mg/L) in water samples from Whale Tail Pit since 2014.**

Note: The red dashed line = trigger value.



**Figure B2 - 17. Dissolved selenium (mg/L) in water samples from Whale Tail Pit since 2014.**

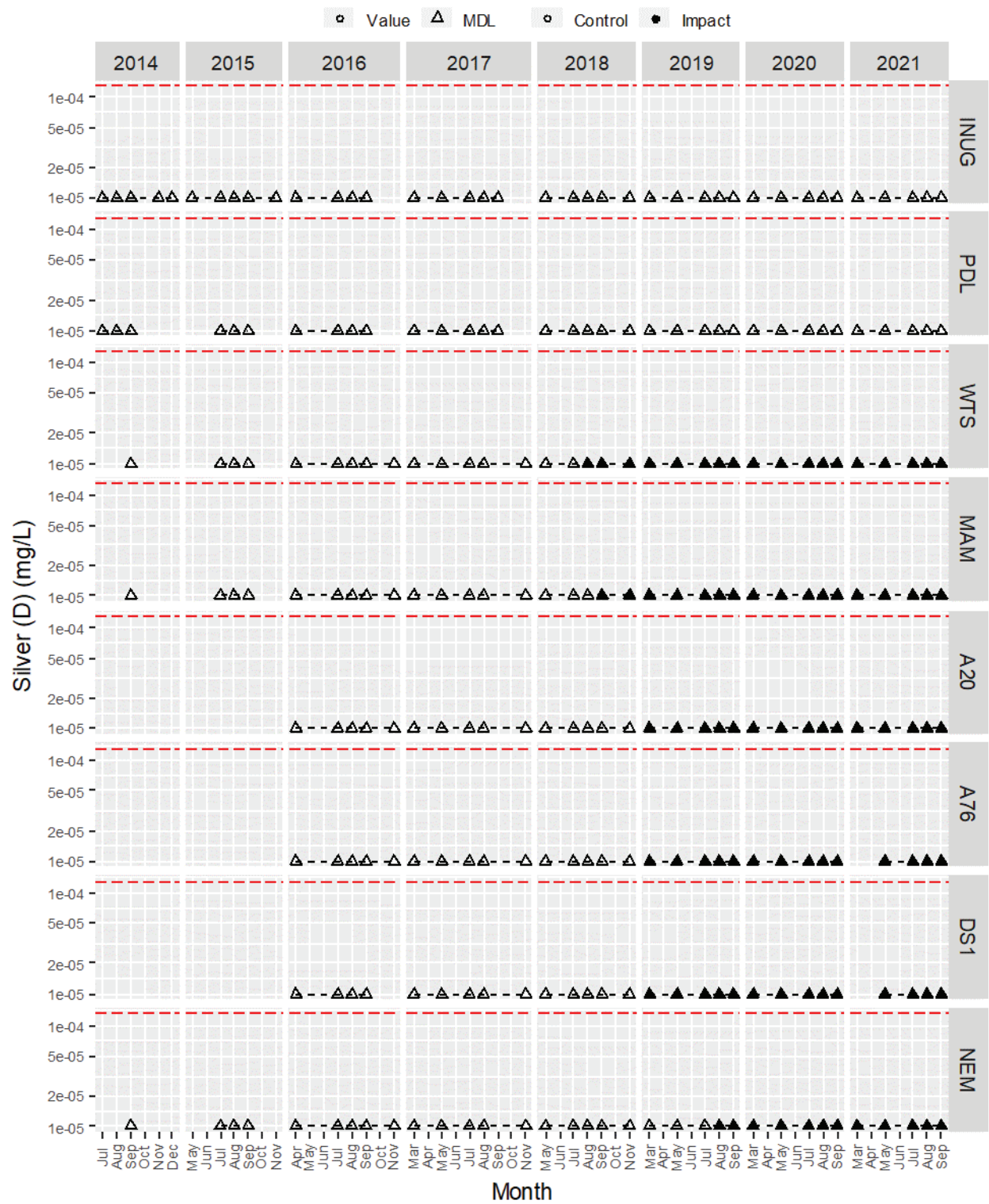
Note: The red dashed line = trigger value.





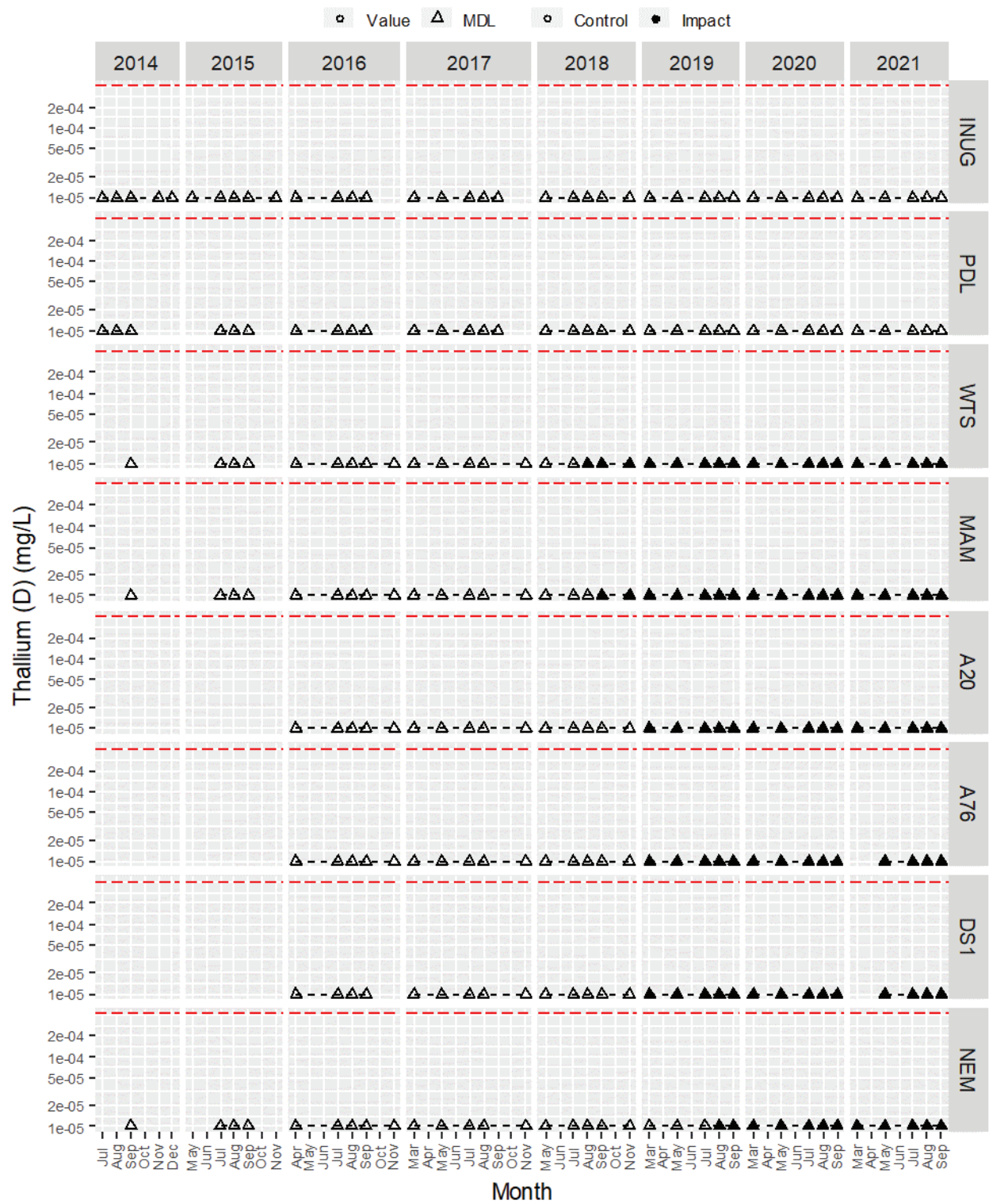
**Figure B2 - 18. Dissolved silver (mg/L) in water samples from Whale Tail Pit since 2014.**

Note: The red dashed line = trigger value.



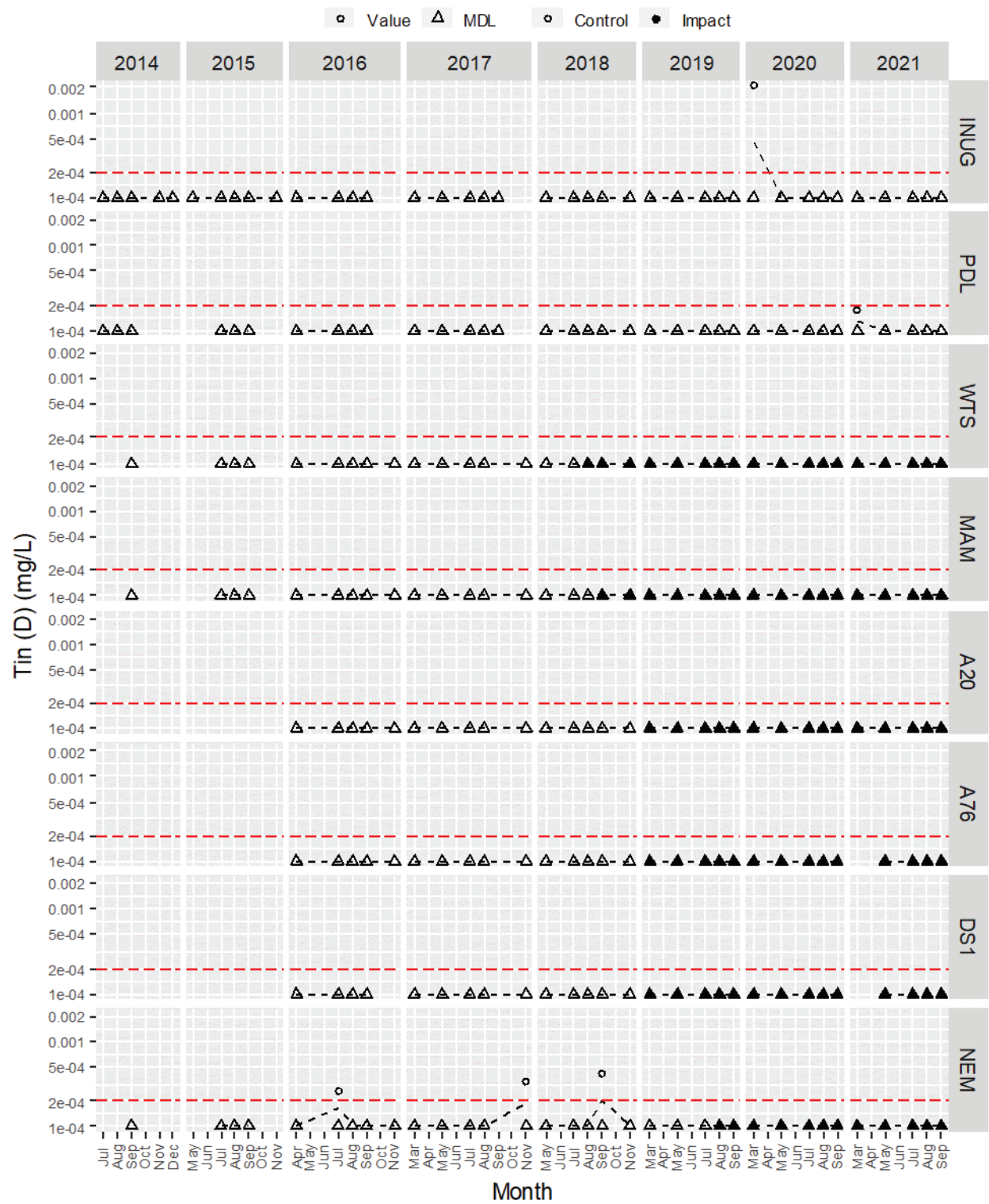
**Figure B2 - 19. Dissolved thallium (mg/L) in water samples from Whale Tail Pit since 2014.**

Note: The red dashed line = trigger value.



**Figure B2 - 20. Dissolved tin (mg/L) in water samples from Whale Tail Pit since 2014.**

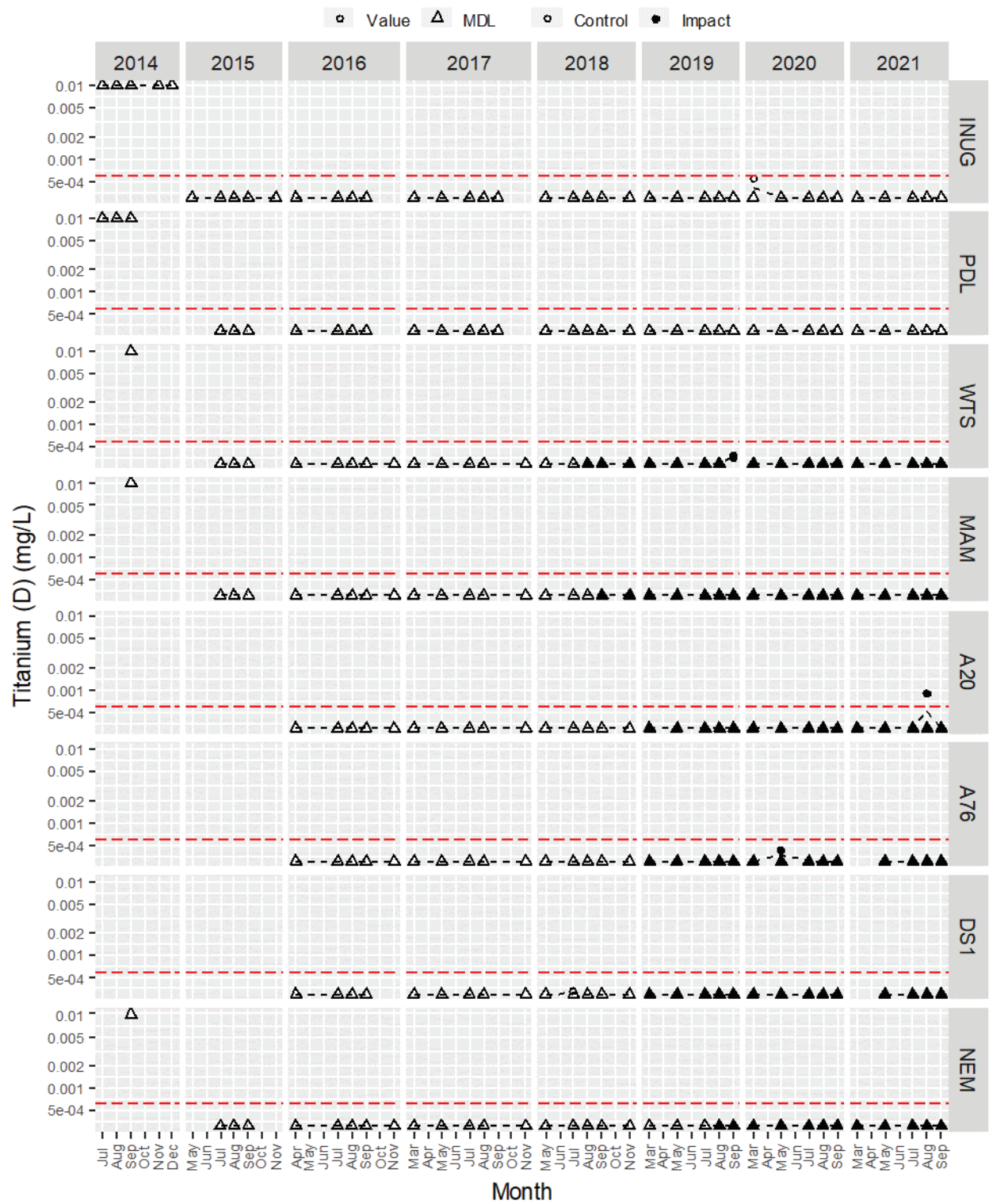
Note: The red dashed line = trigger value.





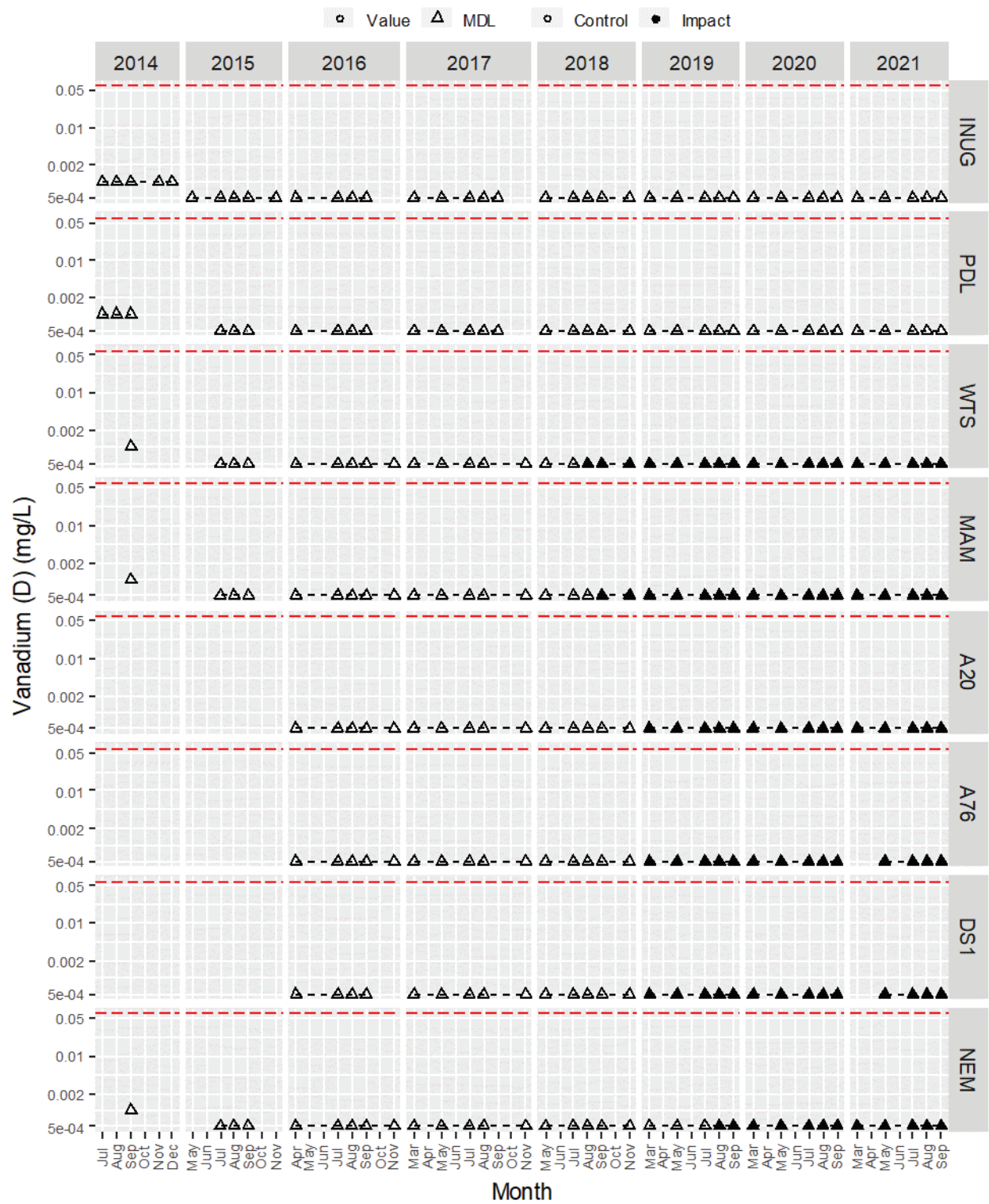
**Figure B2 - 21. Dissolved titanium (mg/L) in water samples from Whale Tail Pit since 2014.**

Note: The red dashed line = trigger value.



**Figure B2 - 22. Dissolved vanadium (mg/L) in water samples from Whale Tail Pit since 2014.**

Note: The red dashed line = trigger value.



## Appendix B3

### Water Chemistry – Baker Lake

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Table B0-1. Average quality results from 2016-2021

State & County	Number of students	Mathematics		Reading		Science		History		Art		Physical Education		Health		Career & Technical Education		Foreign Languages		Other	
		Proficiency	Standard Exceeded	Proficiency	Standard Exceeded	Proficiency	Standard Exceeded	Proficiency	Standard Exceeded	Proficiency	Standard Exceeded	Proficiency	Standard Exceeded	Proficiency	Standard Exceeded	Proficiency	Standard Exceeded	Proficiency	Standard Exceeded	Proficiency	Standard Exceeded
Alabama	1,234,567	15.2	12.5	18.7	15.8	10.1	8.9	12.3	10.5	14.6	12.1	16.8	14.2	11.9	10.3	13.5	11.7	17.4	15.6	19.2	16.5
Alaska	123,456	22.1	19.3	25.4	22.6	18.7	16.9	21.5	19.7	23.8	21.0	26.1	23.3	20.6	18.8	24.9	22.1	27.2	24.4	29.5	26.7
Arizona	2,345,678	12.8	10.1	16.5	13.8	9.7	7.9	13.2	11.4	15.1	13.3	17.0	15.2	12.6	10.8	14.4	12.6	18.3	16.5	20.1	18.3
Arkansas	987,654	11.5	9.8	14.2	12.5	8.9	7.2	12.1	10.4	13.8	12.1	15.5	13.8	11.2	9.5	13.0	11.3	16.7	15.0	17.4	15.7
California	3,456,789	14.3	11.6	17.8	15.1	11.2	9.5	14.5	12.8	16.2	14.5	18.0	16.3	13.7	12.0	15.4	13.7	19.1	17.4	20.8	19.1
Colorado	1,567,890	16.7	14.0	19.2	16.5	13.4	11.7	16.1	14.4	17.9	16.2	19.7	18.0	14.8	13.1	16.6	14.9	20.4	18.7	21.9	20.2
Connecticut	789,012	18.9	16.2	21.3	18.6	15.5	13.8	18.4	16.7	20.2	18.5	22.0	20.3	16.9	15.2	19.6	17.9	23.1	21.4	24.6	22.9
Delaware	456,789	20.5	17.8	23.0	20.3	16.8	15.1	19.9	18.2	21.7	20.0	23.5	21.8	17.6	15.9	20.4	18.7	24.2	22.5	25.7	24.0
Florida	2,890,123	13.6	10.9	16.0	13.3	9.4	7.7	13.0	11.3	14.9	13.2	16.8	15.1	12.5	10.8	14.3	12.6	18.0	16.3	19.5	17.8
Georgia	1,678,901	12.1	9.4	15.3	12.6	8.6	6.9	12.4	10.7	14.2	12.5	16.0	14.3	11.8	10.1	13.6	11.9	17.2	15.5	18.7	17.0
Hawaii	234,567	24.3	21.6	26.7	24.0	19.8	17.1	23.2	20.5	25.1	22.4	27.0	24.3	21.9	19.2	25.8	23.1	28.7	26.0	30.6	27.9
Idaho	567,890	17.4	14.7	19.8	17.1	14.0	12.3	17.6	15.9	19.4	17.7	21.2	19.5	15.3	13.6	18.1	16.4	21.9	20.2	23.4	21.7
Illinois	3,012,345	14.8	12.1	17.1	14.4	10.5	8.8	14.0	12.3	15.9	14.2	17.8	16.1	13.0	11.3	14.9	13.2	18.6	16.9	20.1	18.4
Indiana	1,890,123	11.9	9.2	14.8	12.1	8.3	6.6	12.0	10.3	13.9	12.2	15.8	14.1	11.5	9.8	13.4	11.7	16.3	14.6	17.8	16.1
Iowa	1,123,456	19.2	16.5	20.7	18.0	16.0	14.3	18.9	17.2	20.4	18.7	22.1	20.4	17.4	15.7	20.9	19.2	22.6	20.9	24.1	22.4
Kansas	901,234	16.3	13.6	18.4	15.7	13.5	11.8	17.3	15.6	19.1	17.4	20.9	19.2	15.0	13.3	18.0	16.3	21.0	19.3	22.5	20.8
Kentucky	1,345,678	10.8	8.1	13.7	11.0	7.8	6.1	11.9	10.2	13.5	11.8	15.2	13.5	10.9	9.2	12.8	11.1	15.7	14.0	16.2	14.5
Louisiana	1,234,567	11.2	8.5	14.1	11.4	8.0	6.3	12.2	10.5	14.0	12.3	15.9	14.2	11.6	9.9	13.5	11.8	16.4	14.7	17.9	16.2
Maine	345,678	21.6	18.9	23.1	20.4	17.3	14.6	20.8	18.1	22.3	19.6	24.0	21.3	18.2	15.5	21.9	19.2	25.4	22.7	26.9	24.2
Maryland	1,567,890	17.8	15.1	19.3	16.6	14.2	12.5	18.5	16.8	20.1	18.4	21.7	20.0	16.1	14.4	19.0	17.3	22.2	20.5	23.7	22.0
Massachusetts	2,345,678	23.4	20.7	25.6	22.9	19.8	17.1	23.9	21.2	25.3	22.6	27.0	24.3	21.4	18.7	25.8	23.1	28.7	26.0	30.6	27.9
Michigan	2,789,012	13.9	11.2	16.2	13.5	9.6	7.9	13.1	11.4	15.0	13.3	16.9	15.2	12.7	11.0	14.6	12.9	18.1	16.4	19.6	17.9
Minnesota	1,678,901	18.5	15.8	20.6	17.9	15.7	13.0	19.4	16.7	21.3	18.6	23.2	20.5	17.6	14.9	21.5	18.8	24.4	21.7	26.3	23.6
Mississippi	987,654	9.7	7.0	12.6	9.9	6.7	5.0	11.5	9.8	13.4	11.7	15.0	13.3	10.4	8.7	12.5	10.8	15.6	13.9	16.3	14.6
Missouri	2,123,456	14.5	11.8	17.4	14.7	10.8	9.1	14.1	12.4	16.0	14.3	17.9	16.2	13.1	11.4	15.0	13.3	18.9	17.2	20.4	18.7
Montana	456,789	20.1	17.4	22.3	19.6	16.5	13.8	20.9	18.2	22.8	20.1	24.7	22.0	17.9	15.2	22.6	19.9	25.5	22.8	27.4	24.7
Nebraska	1,234,567	16.0	13.3	18.9	16.2	14.0	12.3	18.2	16.5	19.8	18.1	21.4	19.7	15.5	13.8	18.9	17.2	21.9	20.2	23.4	21.7
Nevada	789,012	12.4	9.7	15.4	12.7	8.5	6.8	12.5	10.8	14.4	12.7	16.1	14.4	11.9	10.2	13.8	12.1	16.8	15.1	17.4	15.7
New Hampshire	345,678	22.8	20.1	24.0	21.3	18.2	15.5	23.7	21.0	25.6	22.9	27.5	24.8	21.7	19.0	26.4	23.7	29.3	26.6	31.2	28.5
New Jersey	2,567,890	15.1	12.4	17.1	14.4	10.5	8.8	14.0	12.3	15.9	14.2	17.8	16.1	13.0	11.3	14.9	13.2	18.6	16.9	20.1	18.4
New Mexico	1,123,456	10.3	7.6	13.2	10.5	7.1	5.4	11.8	10.1	13.6	11.9	15.5	13.8	11.3	9.6	13.1	11.4	16.0	14.3	17.5	15.8
New York	4,567,890	14.2	11.5	17.0	14.3	10.4	8.7	13.9	12.2	15.8	14.1	17.7	16.0	12.9	11.2	14.8	13.1	18.7	17.0	19.2	17.5
North Carolina	2,345,678	12.7	10.0	15.7	13.0	9.2	7.5	12.8	11.1	14.7	13.0	16.6	14.9	12.2	10.5	14.1	12.4	17.0	15.3	18.5	16.8
North Dakota	456,789	19.6	16.9	21.0	18.3	16.2	13.5	20.5	17.8	22.4	19.7	24.3	21.6	18.5	15.8	22.8	20.1	25.7	23.0	27.6	24.9
Ohio	3,456,789	13.8	11.1	16.8	14.1	9.8	8.1	13.3	11.6	15.2	13.5	17.1	15.4	12.7	11.0	14.6	12.9	18.2	16.5	19.7	18.0
Oklahoma	987,654	11.0	8.3	14.0	11.3	7.9	6.2	12.1	10.4	13.9	12.2	15.8	14.1	11.6	9.9	13.4	11.7	16.3	14.6	17.8	16.1
Oregon	1,567,890	17.2	14.5	19.5	16.8	14.7	12.0	18.6	15.9	20.4	17.7	22.2	19.5	16.6	13.9	20.3	17.6	23.1	20.4	25.0	22.3
Pennsylvania	3,012,345	14.6	11.9	17.3	14.6	10.6	8.9	14.2	12.5	16.1	14.4	18.0	16.3	13.2	11.5	15.1	13.4	19.0	17.3	19.5	17.8
Rhode Island	345,678	21.3	18.6	23.2	20.5	17.4	14.7	22.1	19.4	24.0	21.3	25.9	23.2	19.1	16.4	24.0	21.3	26.9	24.2	28.8	26.1
South Carolina	1,234,567	10.6	7.9	13.5	10.8	7.4	5.7	12.0	10.3	13.8	12.1	15.7	14.0	11.7	10.0	13.6	11.9	16.5	14.8	17.0	15.3
South Dakota	456,789	18.8	16.1	20.7	18.0	15.9	13.2	19.6	16.9	21.5	18.8	23.4	20.7	17.6	14.9	22.5	19.8	25.4	22.7	27.3	24.6
Tennessee	2,123,456	12.0	9.3	14.6	11.9	8.1	6.4	12.3	10.6	14.1	12.4	16.0	14.3	11.8	10.1	13.7	12.0	16.6	14.9	17.1	15.4
Texas	4,567,890	13.5	10.8	16.5	13.8	9.5	7.8	13.0	11.3	15.0	13.3	16.9	15.2	12.6	10.9	14.5	12.8	18.4	16.7	19.0	17.3
Utah	1,123,456	16.4	13.7	18.6	15.9	13.8	11.1	17.5	14.8	19.4	16.7	21.3	18.6	15.6	12.9	18.5	15.8	22.4	19.7	24.3	21.6
Vermont	345,678	22.5	19.8	24.4	21.7	18.6	15.9	23.3	20.6	25.2	22.5	27.1	24.4	21.3	18.6	26.0	23.3	28.9	26.2	30.8	28.1
Virginia	2,345,678	14.1	11.4	17.0	14.3	10.4	8.7	13.9	12.2	15.8	14.1	17.7	16.0	12.9	11.2	14.9	13.2	18.6	16.9	19.2	17.5
Washington	1,567,890	17.6	14.9	19.6	16.9	14.8	12.1	18.7	16.0	20.5	17.8	22.3	19.6	16.7	14.0	20.4	17.7	23.2	20.5	25.1	22.4
West Virginia	456,789	15.7	13.0	17.7	15.0	12.9	10.2	17.2	14.5	19.1	16.4	21.0	18.3	15.2	12.5	18.8	16.1	21.7	19.0	23.6	20.9
Wisconsin	2,123,456	16.9	14.2	19.1	16.4	14.3	11.6	18.4	15.7	20.3	17.6	22.2	19.5	16.4	13.7	20.2	17.5	23.1	20.4	25.0	22.3
Wyoming	456,789	19.0	16.3	21.1	18.4	16.3	13.6	20.8	18.1	22.7	20.0	24.6	21.9	18.8	16.1	23.5	20.8	26.4	23.7	28.3	25.6

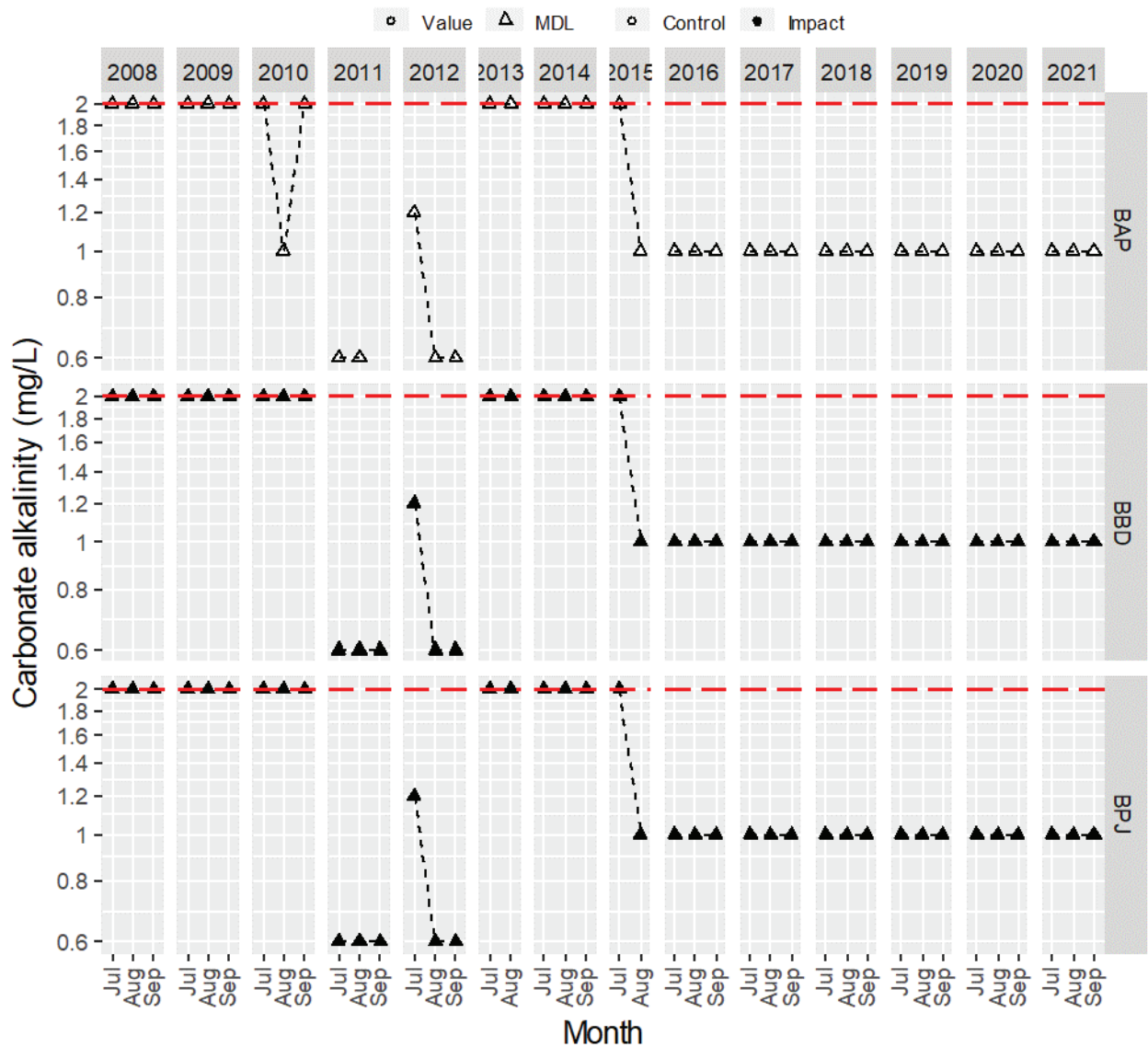
Note: 1. Data are based on the results of the assessment conducted by the state education agency for the assessment year. 2. Data are based on the results of the assessment conducted by the state education agency for the assessment year. 3. Data are based on the results of the assessment conducted by the state education agency for the assessment year. 4. Data are based on the results of the assessment conducted by the state education agency for the assessment year. 5. Data are based on the results of the assessment conducted by the state education agency for the assessment year. 6. Data are based on the results of the assessment conducted by the state education agency for the assessment year. 7. Data are based on the results of the assessment conducted by the state education agency for the assessment year. 8. Data are based on the results of the assessment conducted by the state education agency for the assessment year. 9. 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Data are based on the results of the assessment conducted by the state education agency for the assessment year. 42. Data are based on the results of the assessment conducted by the state education agency for the assessment year. 43. Data are based on the results of the assessment conducted by the state education agency for the assessment year. 44. Data are based on the results of the assessment conducted by the state education agency for the assessment year. 45. Data are based on the results of the assessment conducted by the state education agency for the assessment year. 46. Data are based on the results of the assessment conducted by the state education agency for the assessment year. 47. Data are based on the results of the assessment conducted by the state education agency for the assessment year. 48. Data are based on the results of the assessment conducted by the state education agency for the assessment year. 49. 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Data are based on the results of the assessment conducted by the state education agency for the assessment year. 66. Data are based on the results of the assessment conducted by the state education agency for the assessment year. 67. Data are based on the results of the assessment conducted by the state education agency for the assessment year. 68. Data are based on the results of the assessment conducted by the state education agency for the assessment year. 69. Data are based on the results of the assessment conducted by the state education agency for the assessment year. 70. Data are based on the results of the assessment conducted by the state education agency for the assessment year. 71. Data are based on the results of the assessment

## FIGURES

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**Figure B3 - 1. Carbonate alkalinity (mg/L) in water samples from Baker Lake since 2008.**

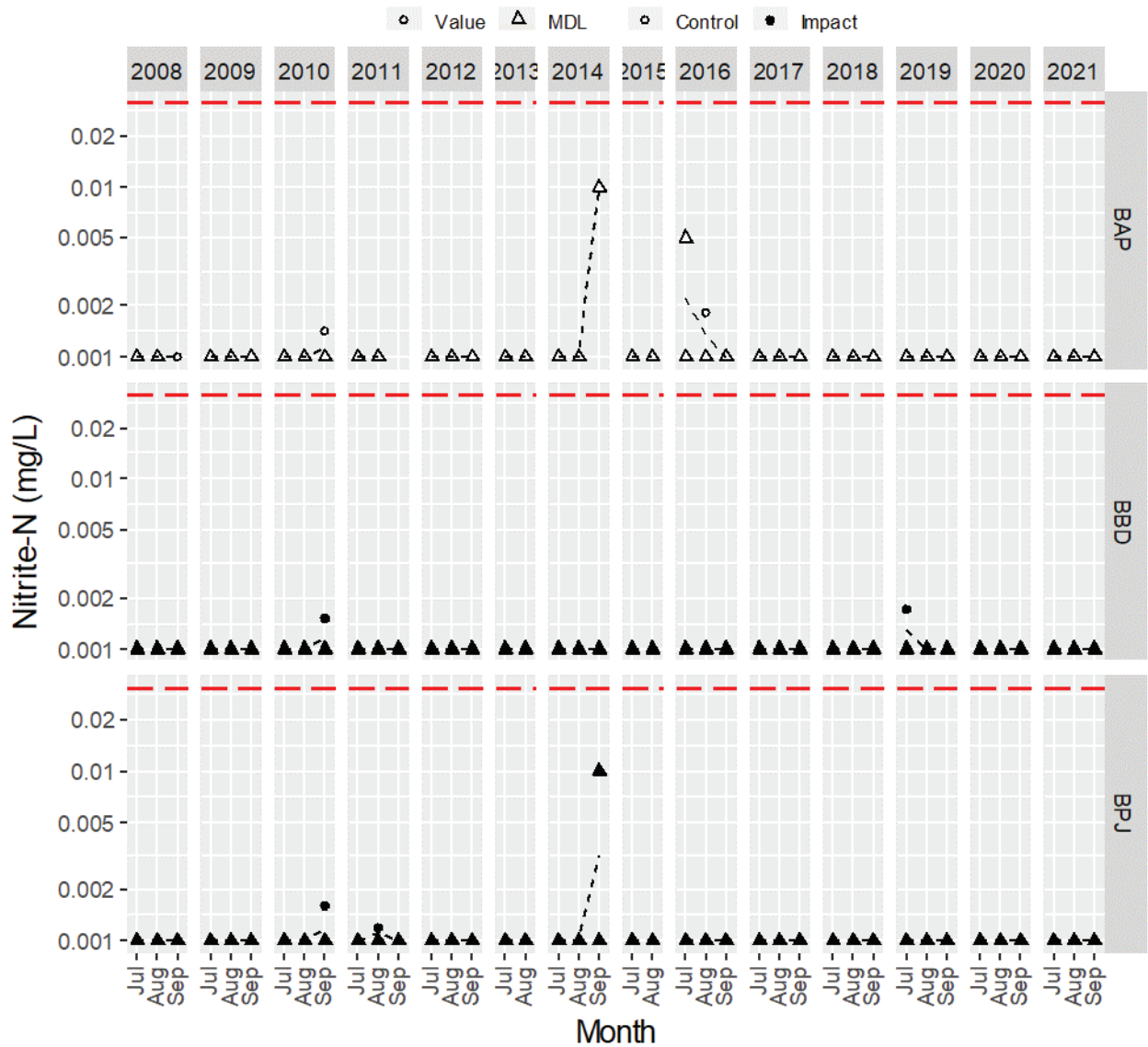
Note: The red dashed line = trigger value.



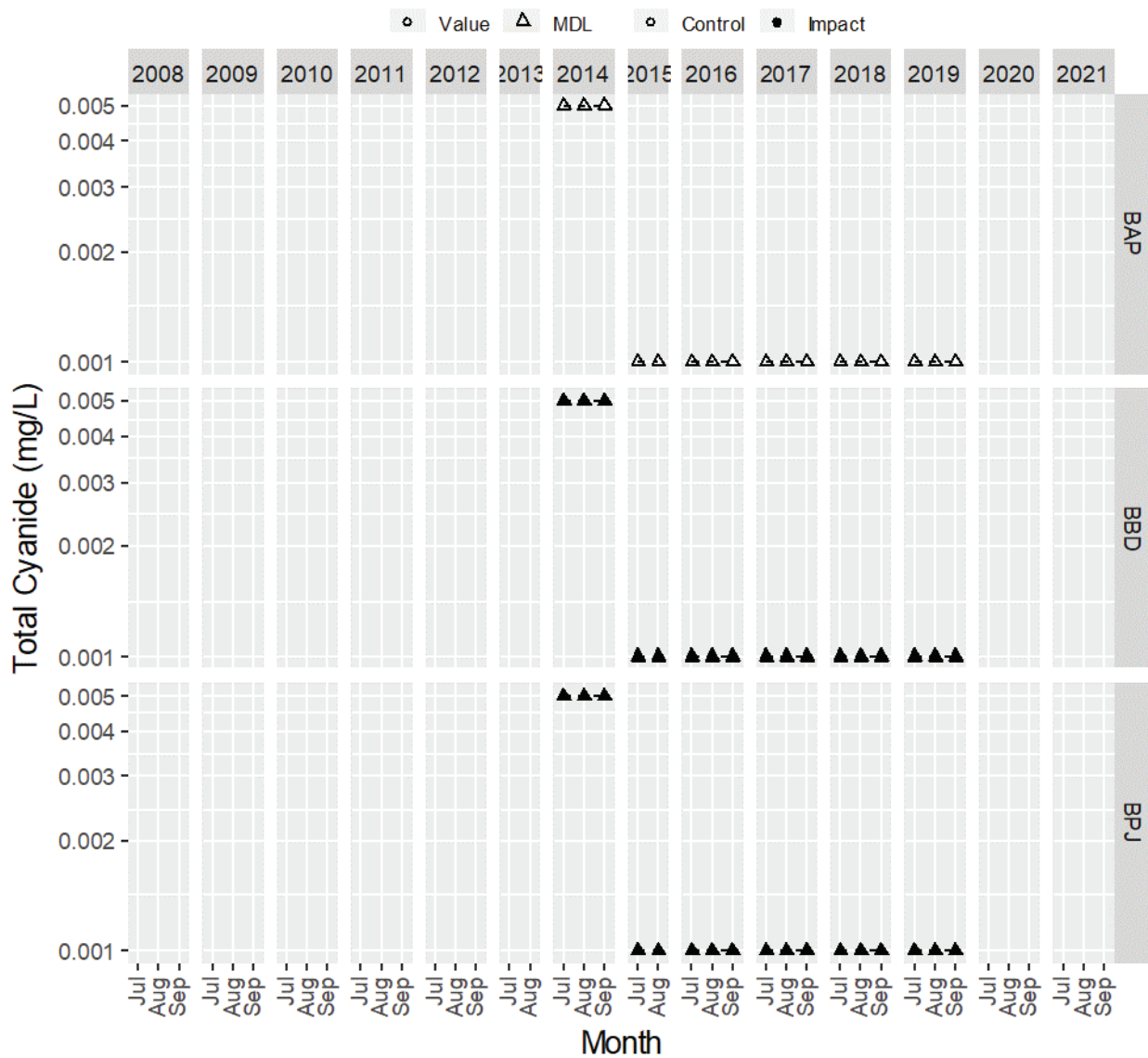


**Figure B3 - 2. Nitrite-N (mg/L) in water samples from Baker Lake since 2008.**

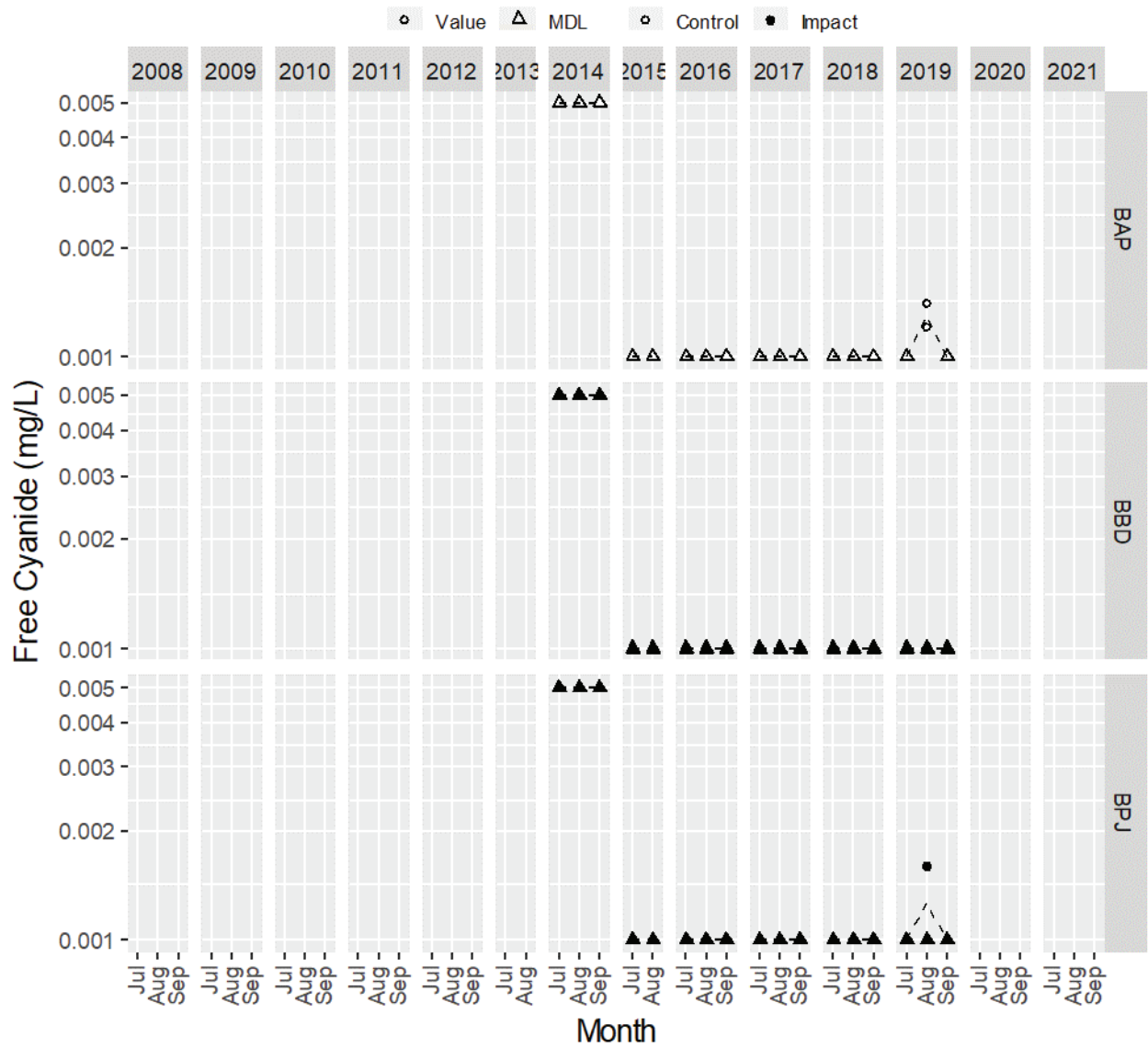
Note: The red dashed line = trigger value.



**Figure B3 - 3. Total cyanide (mg/L) in water samples from Baker Lake since 2008.**

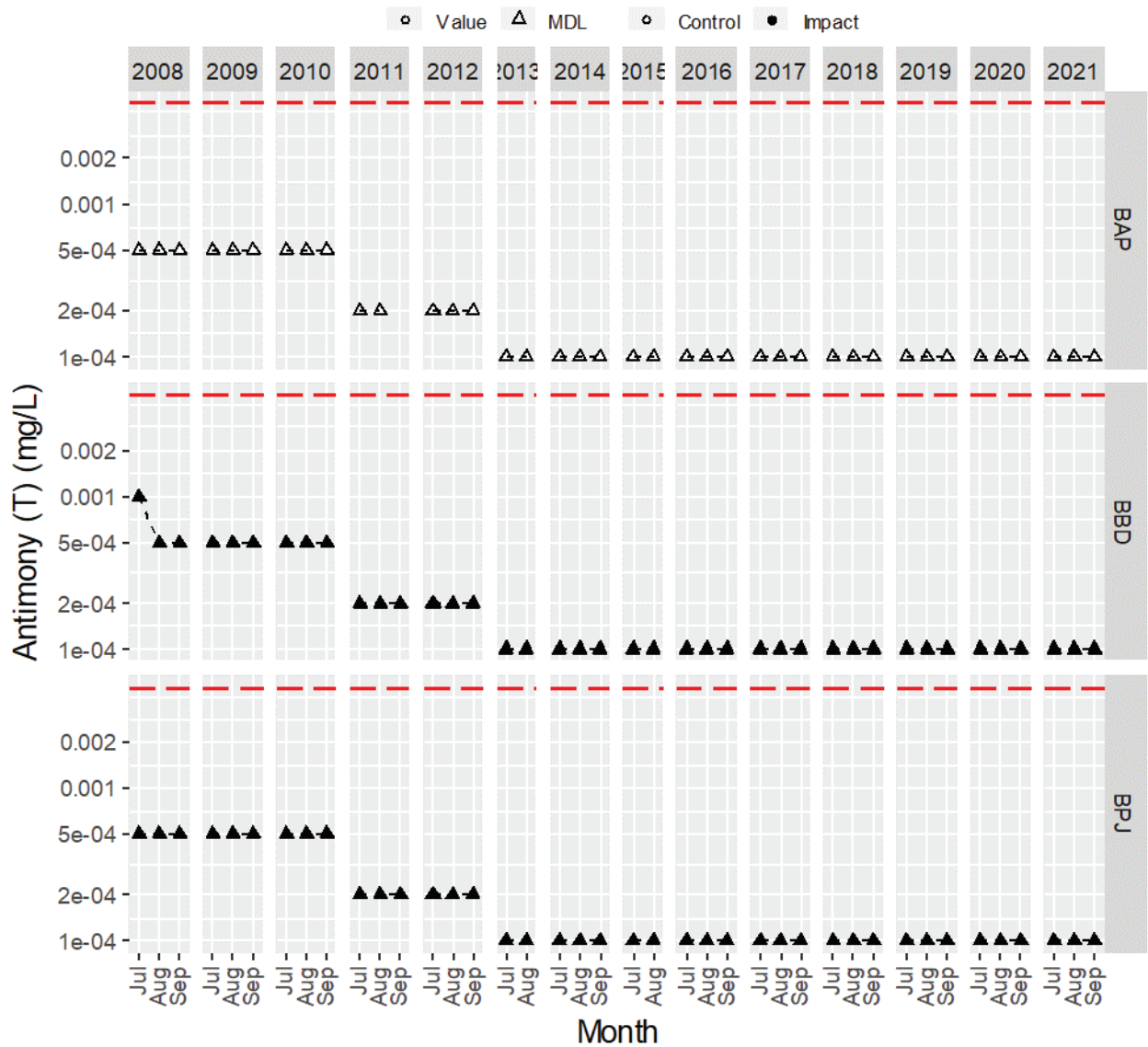


**Figure B3 - 4. Free cyanide (mg/L) in water samples from Baker Lake since 2008.**



**Figure B3 - 5. Total antimony (mg/L) in water samples from Baker Lake since 2008.**

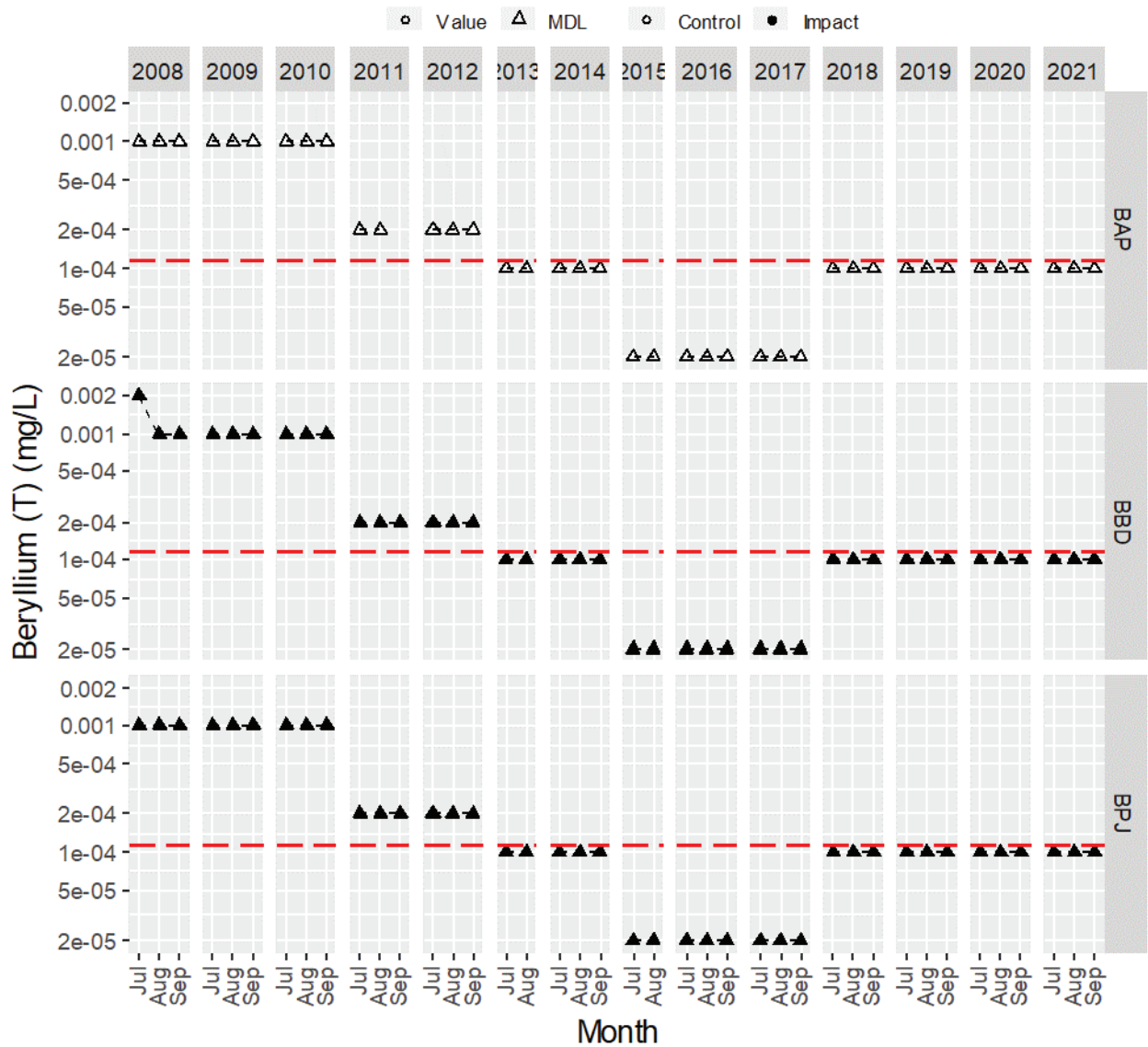
Note: The red dashed line = trigger value.





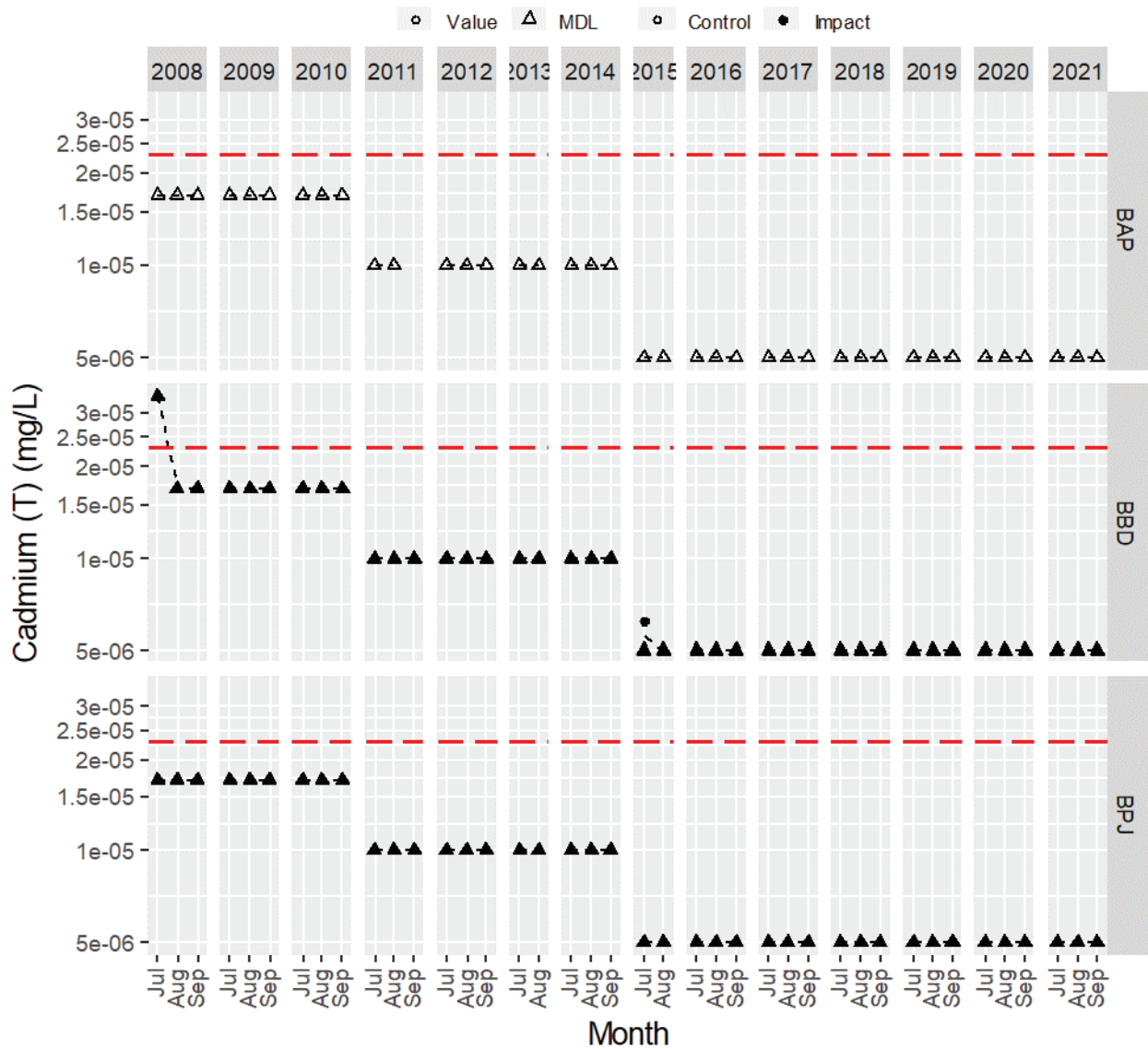
**Figure B3 - 6. Total beryllium (mg/L) in water samples from Baker Lake since 2008.**

Note: The red dashed line = trigger value.



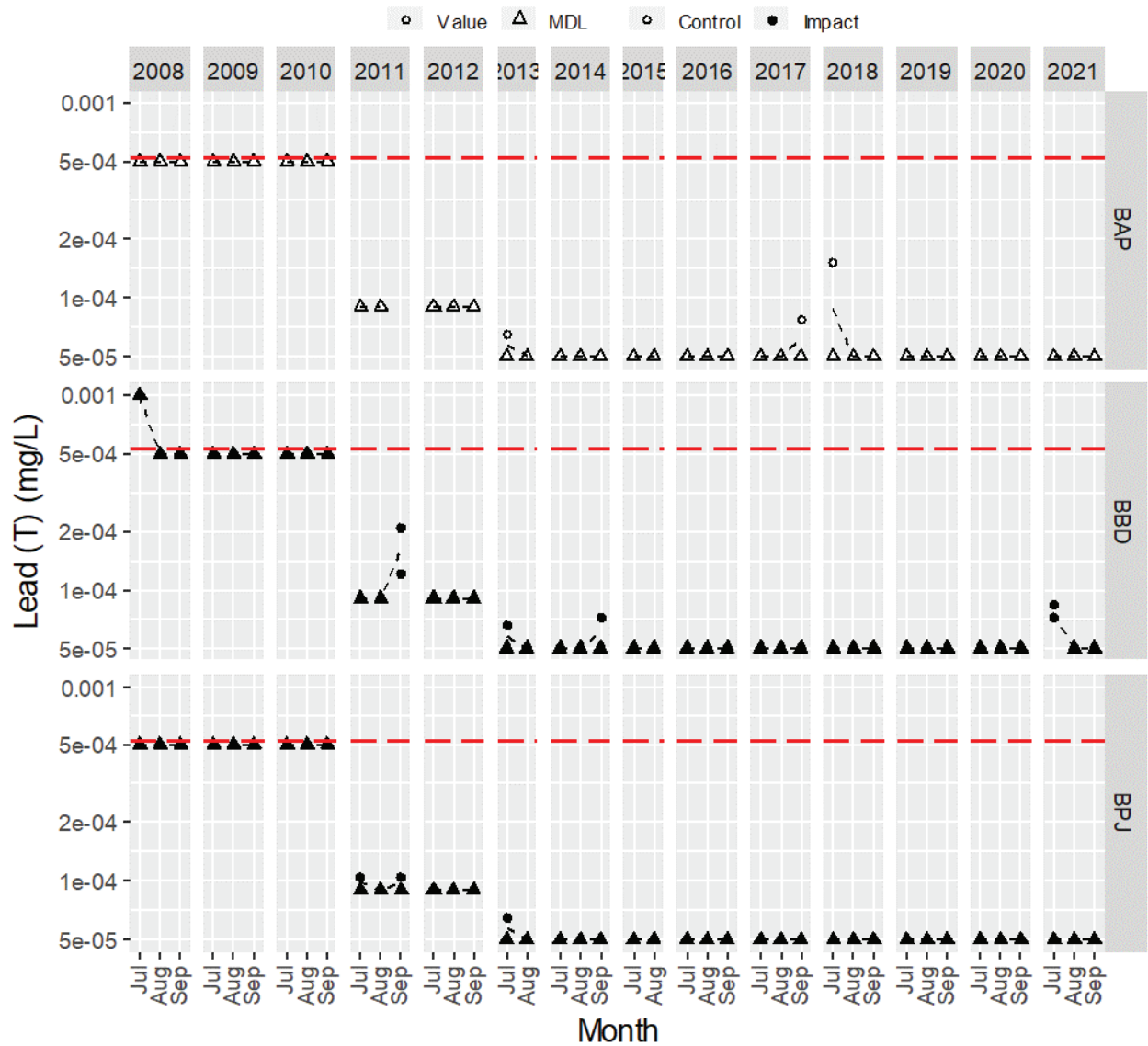
**Figure B3 - 7. Total cadmium (mg/L) in water samples from Baker Lake since 2008.**

Note: The red dashed line = trigger value.



**Figure B3 - 8. Total lead (mg/L) in water samples from Baker Lake since 2008.**

Note: The red dashed line = trigger value.



**Figure B3 - 9. Total mercury (mg/L) in water samples from Baker Lake since 2008.**

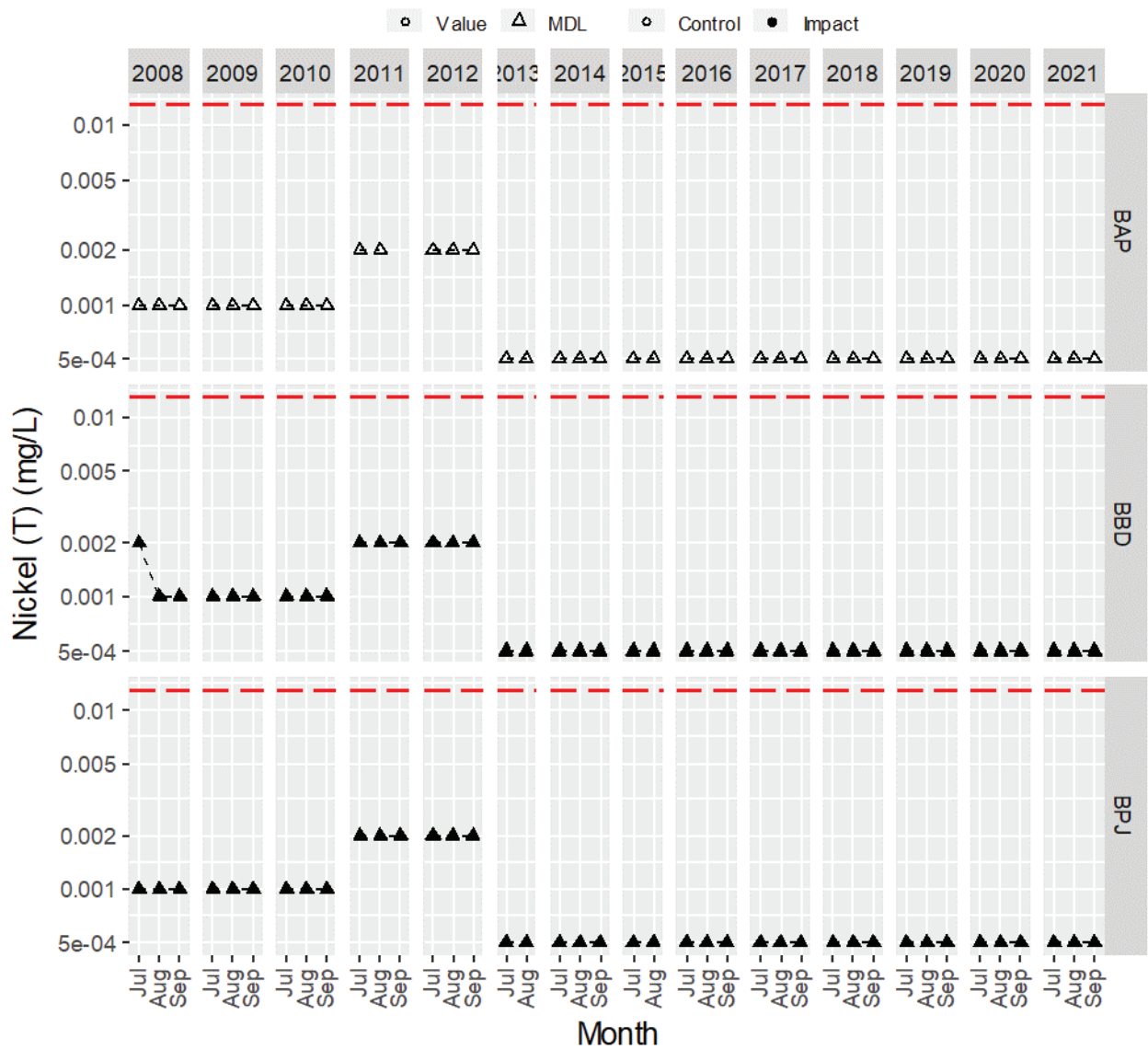
Note: The red dashed line = trigger value.





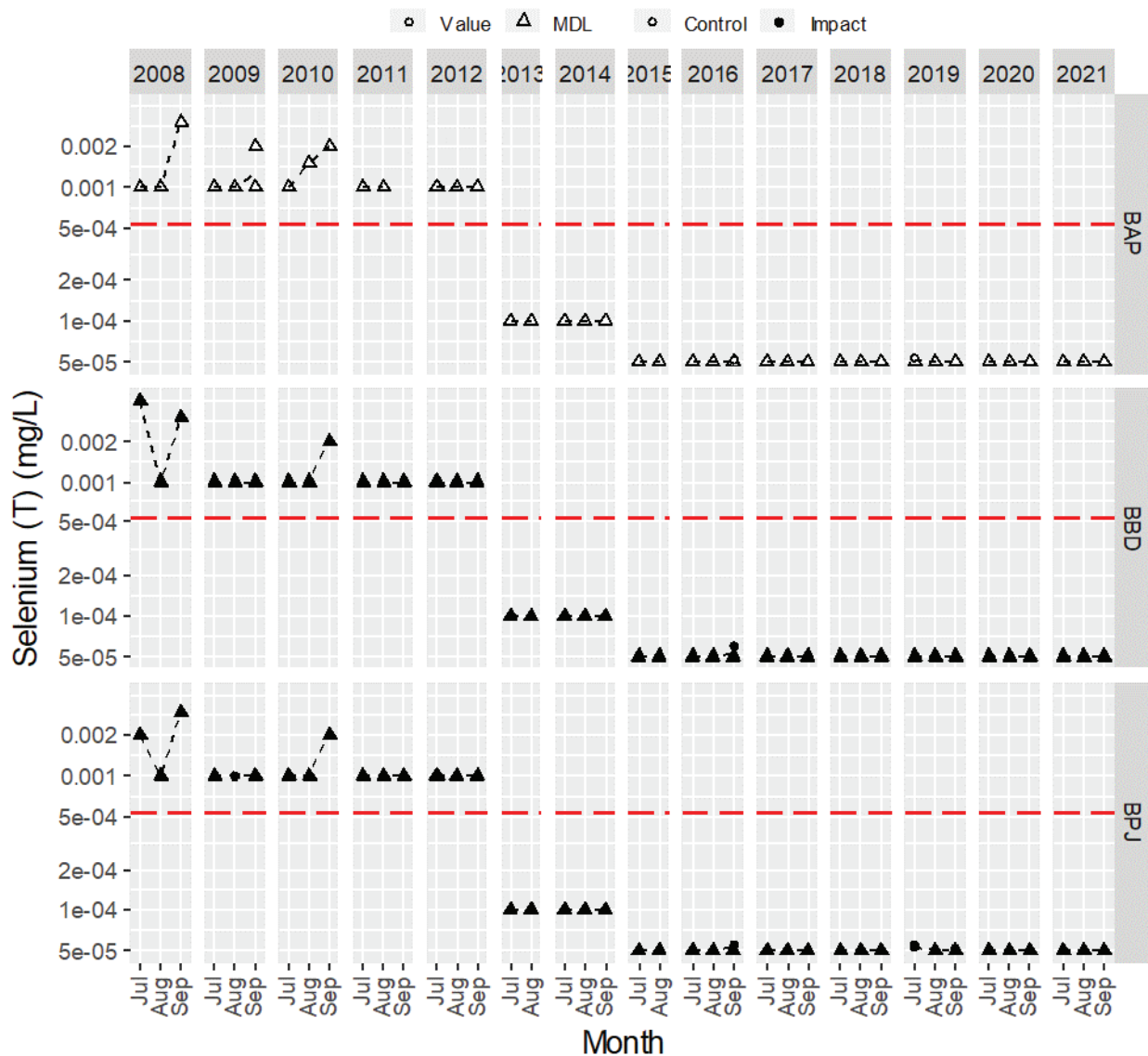
**Figure B3 - 10. Total nickel (mg/L) in water samples from Baker Lake since 2008.**

Note: The red dashed line = trigger value.



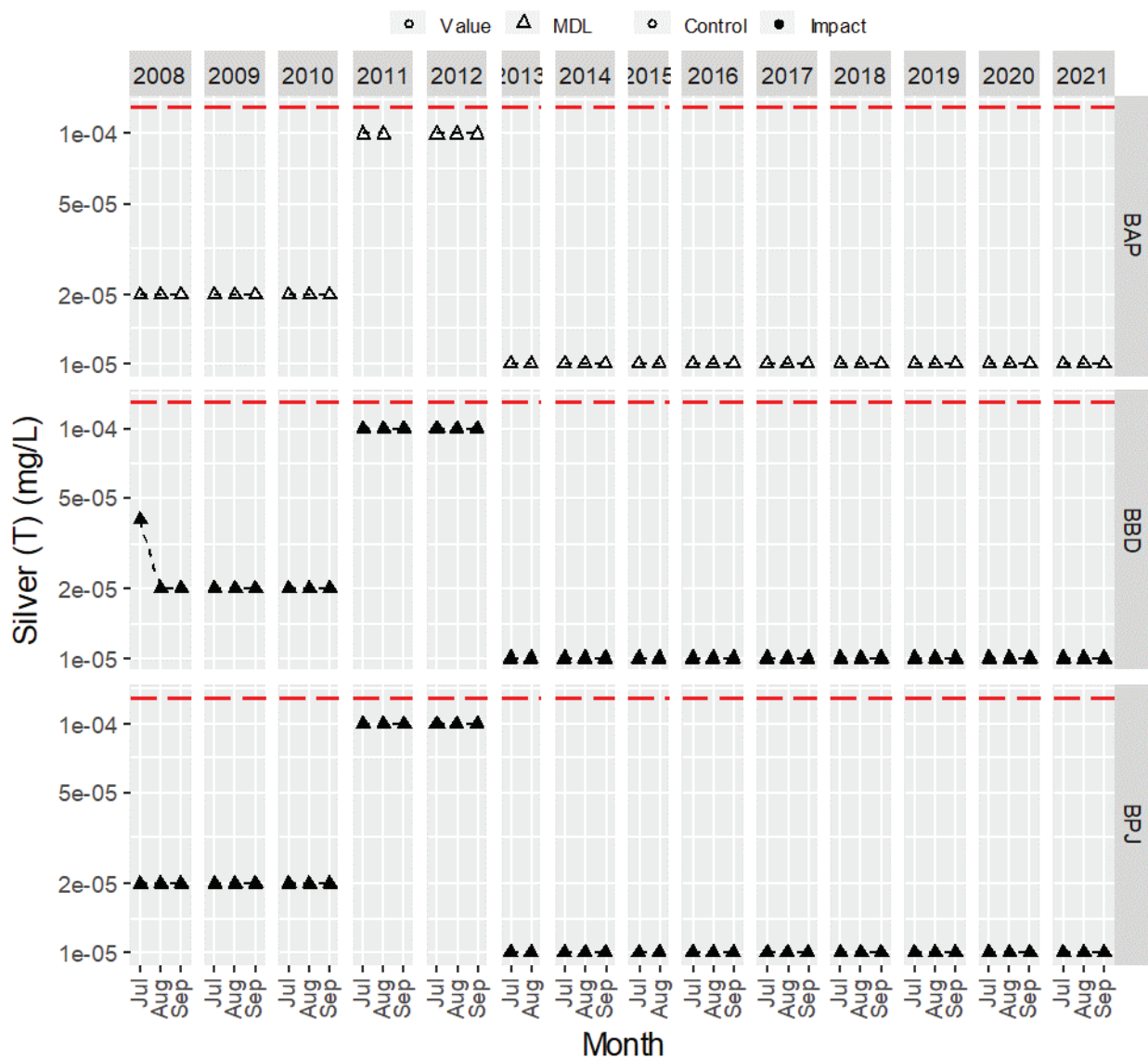
**Figure B3 - 11. Total selenium (mg/L) in water samples from Baker Lake since 2008.**

Note: The red dashed line = trigger value.



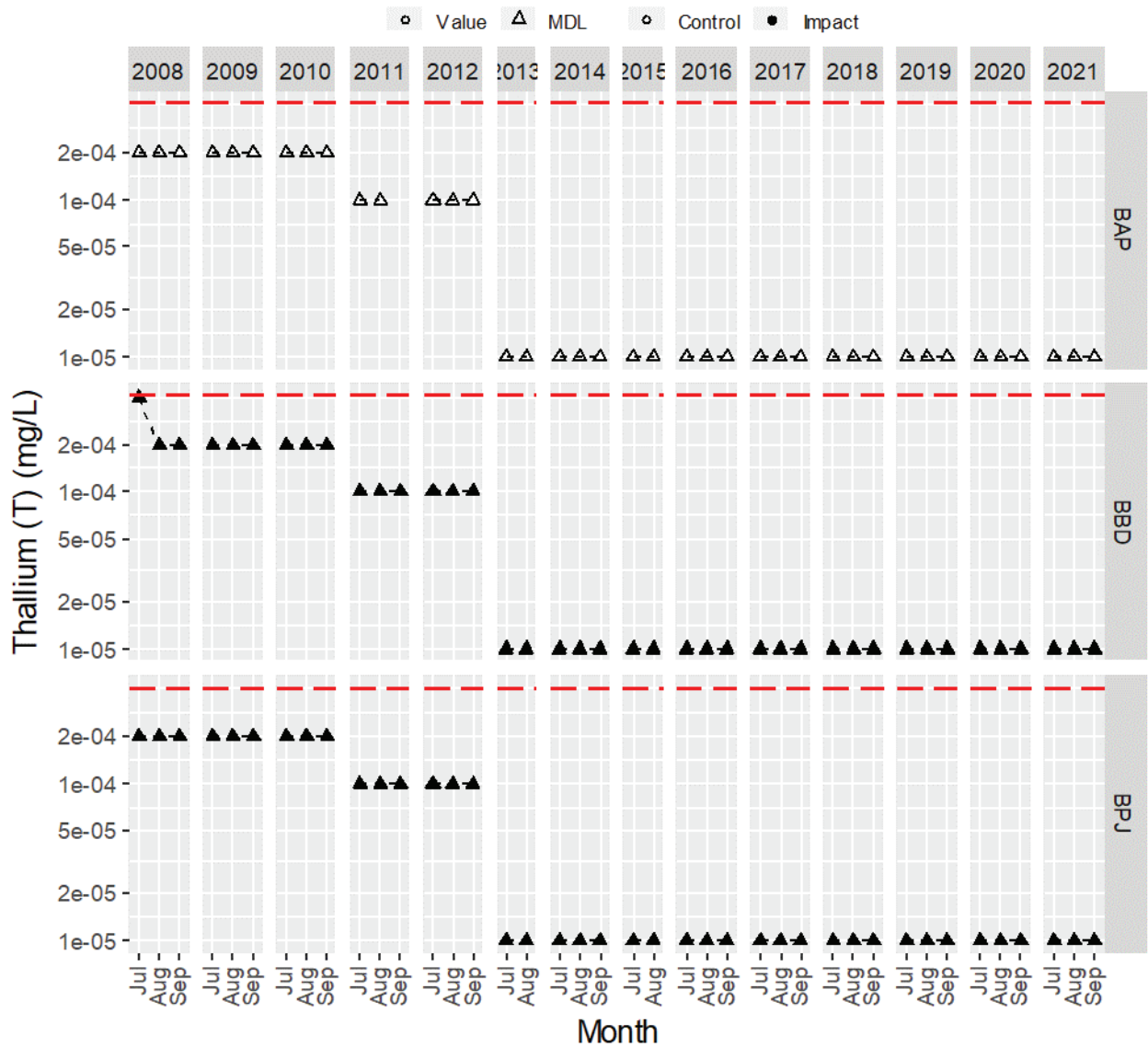
**Figure B3 - 12. Total silver (mg/L) in water samples from Baker Lake since 2008.**

Note: The red dashed line = trigger value.



**Figure B3 - 13. Total thallium (mg/L) in water samples from Baker Lake since 2008.**

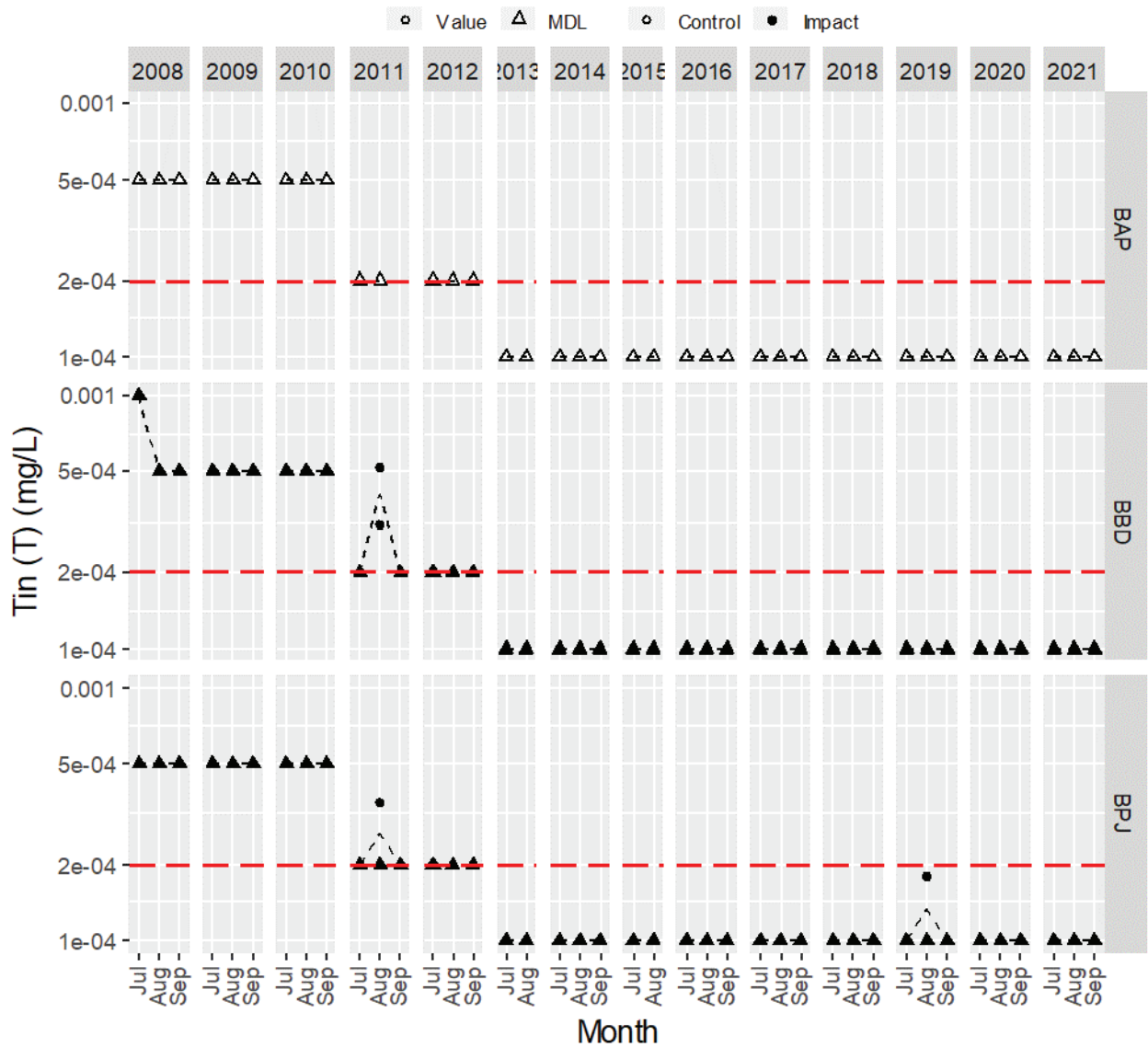
Note: The red dashed line = trigger value.





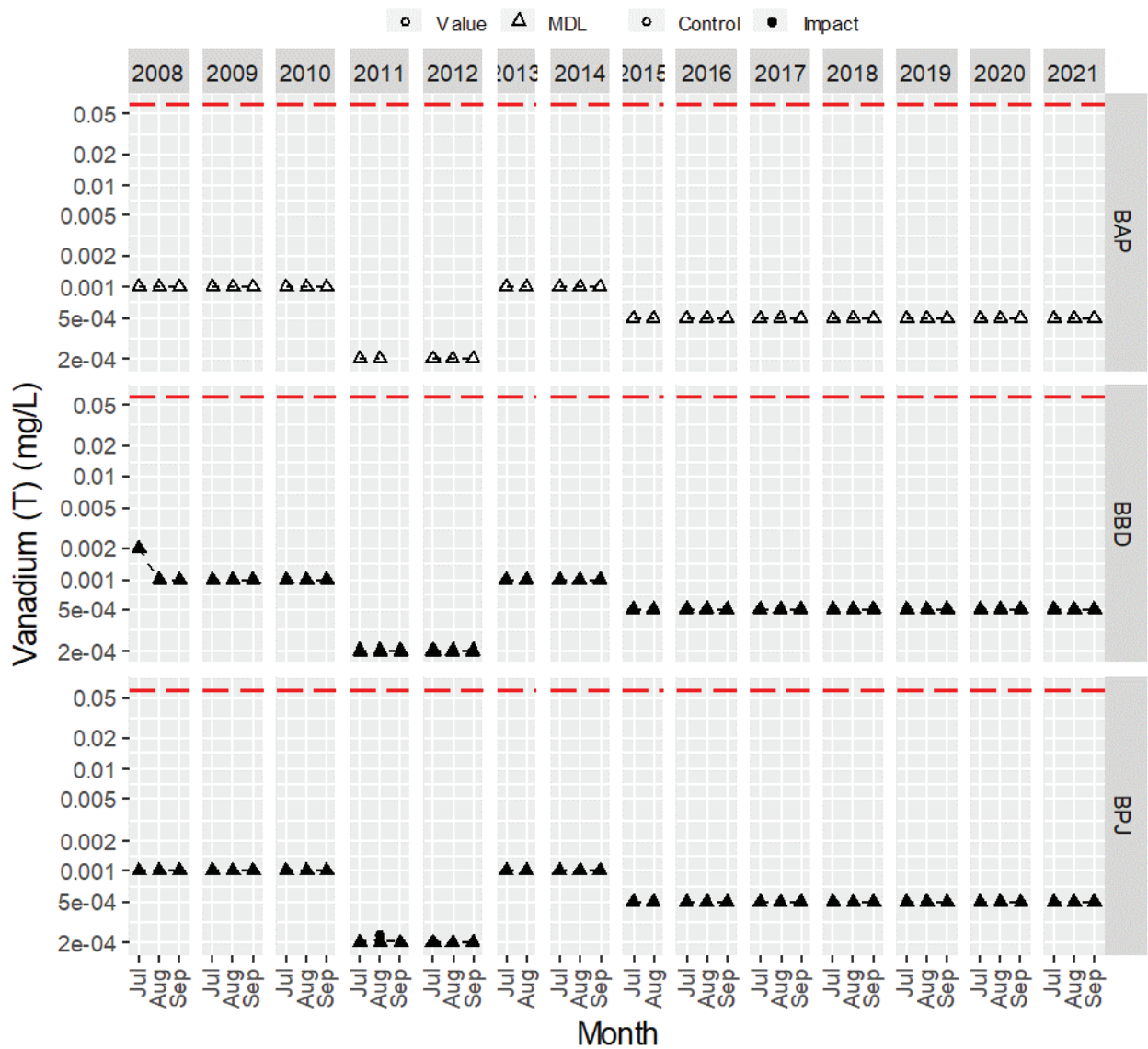
**Figure B3 - 14. Total tin (mg/L) in water samples from Baker Lake since 2008.**

Note: The red dashed line = trigger value.

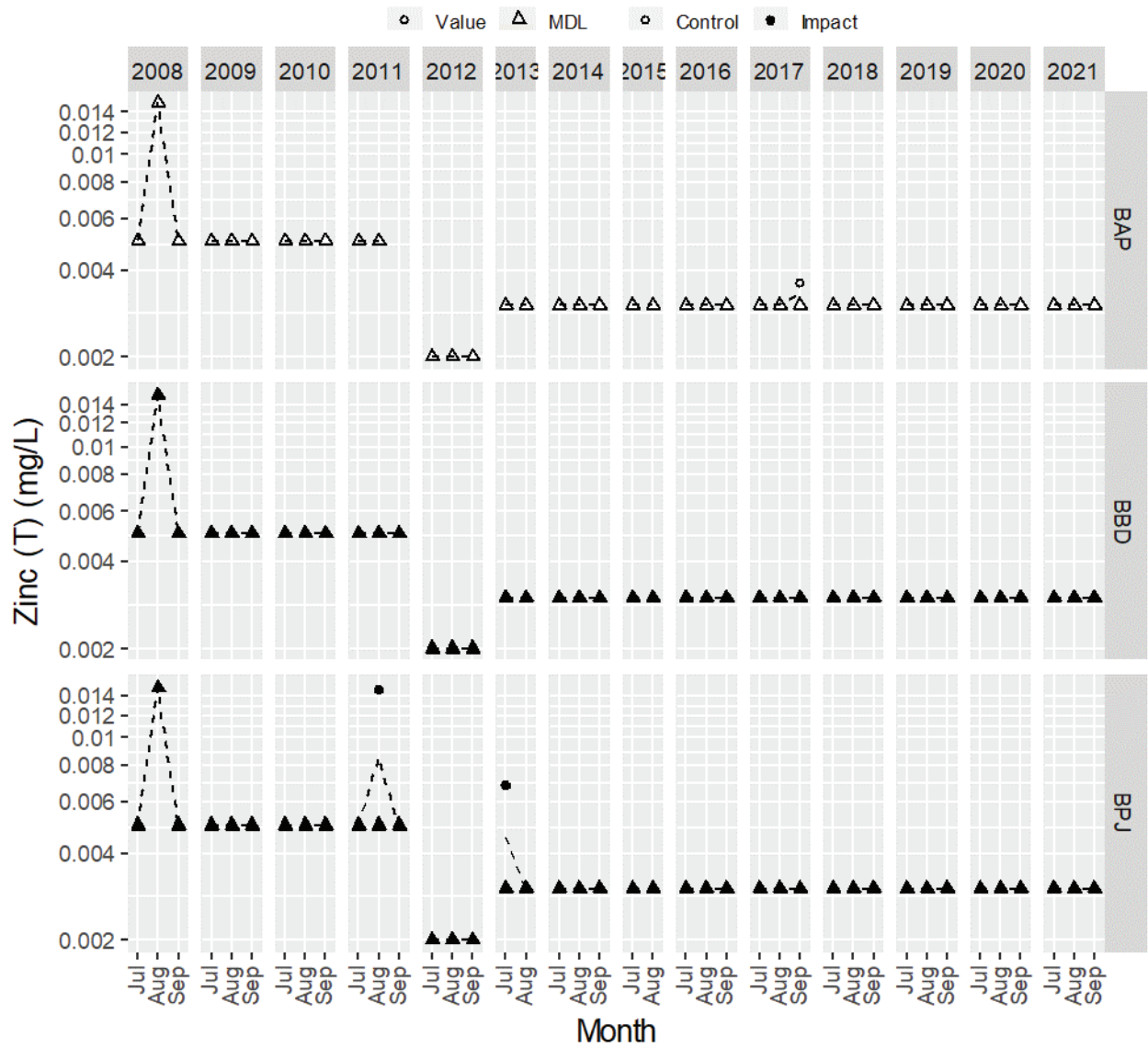


**Figure B3 - 15. Total vanadium (mg/L) in water samples from Baker Lake since 2008.**

Note: The red dashed line = trigger value.

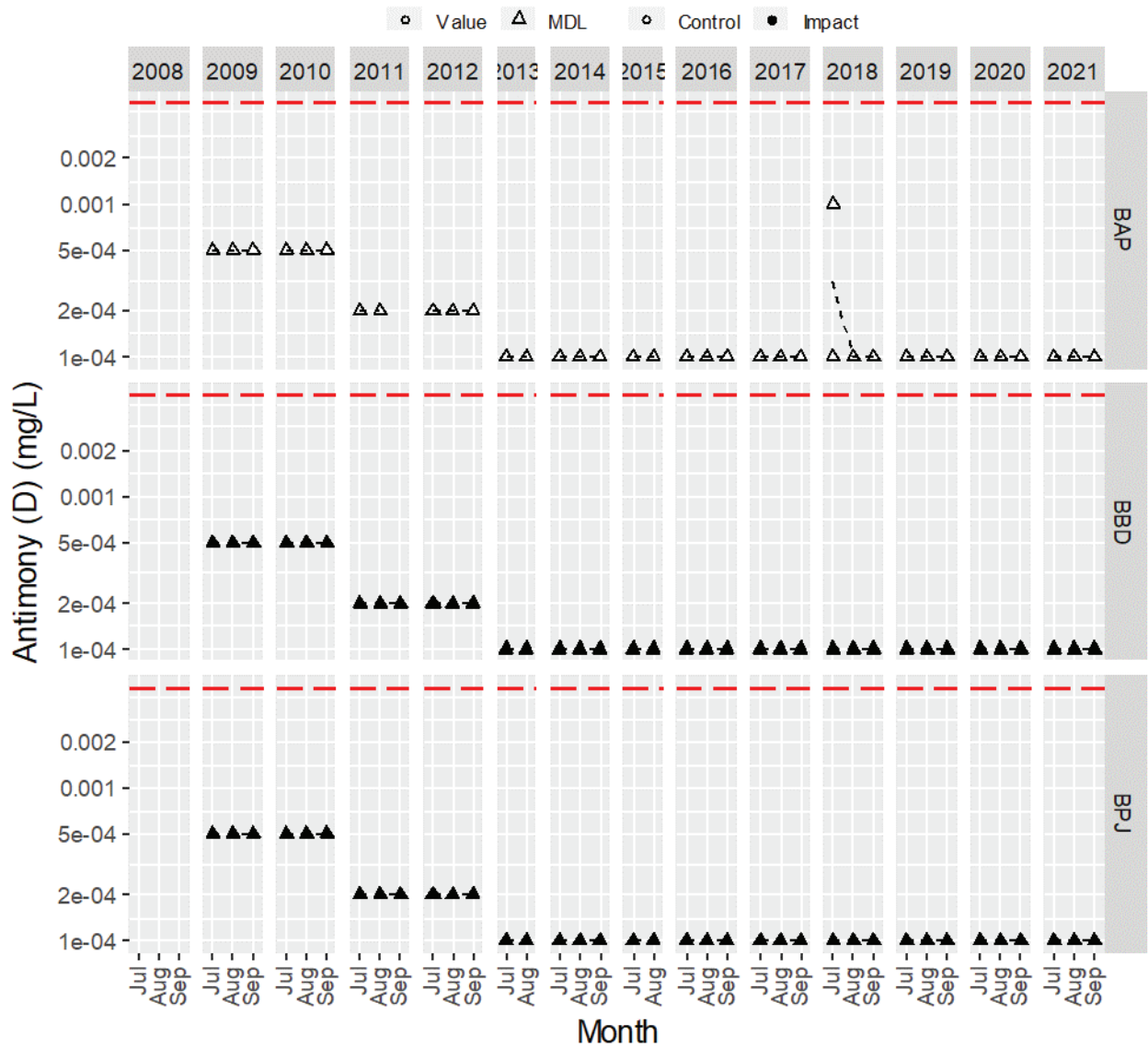


**Figure B3 - 16. Total zinc (mg/L) in water samples from Baker Lake since 2008.**



**Figure B3 - 17. Dissolved antimony (mg/L) in water samples from Baker Lake since 2008.**

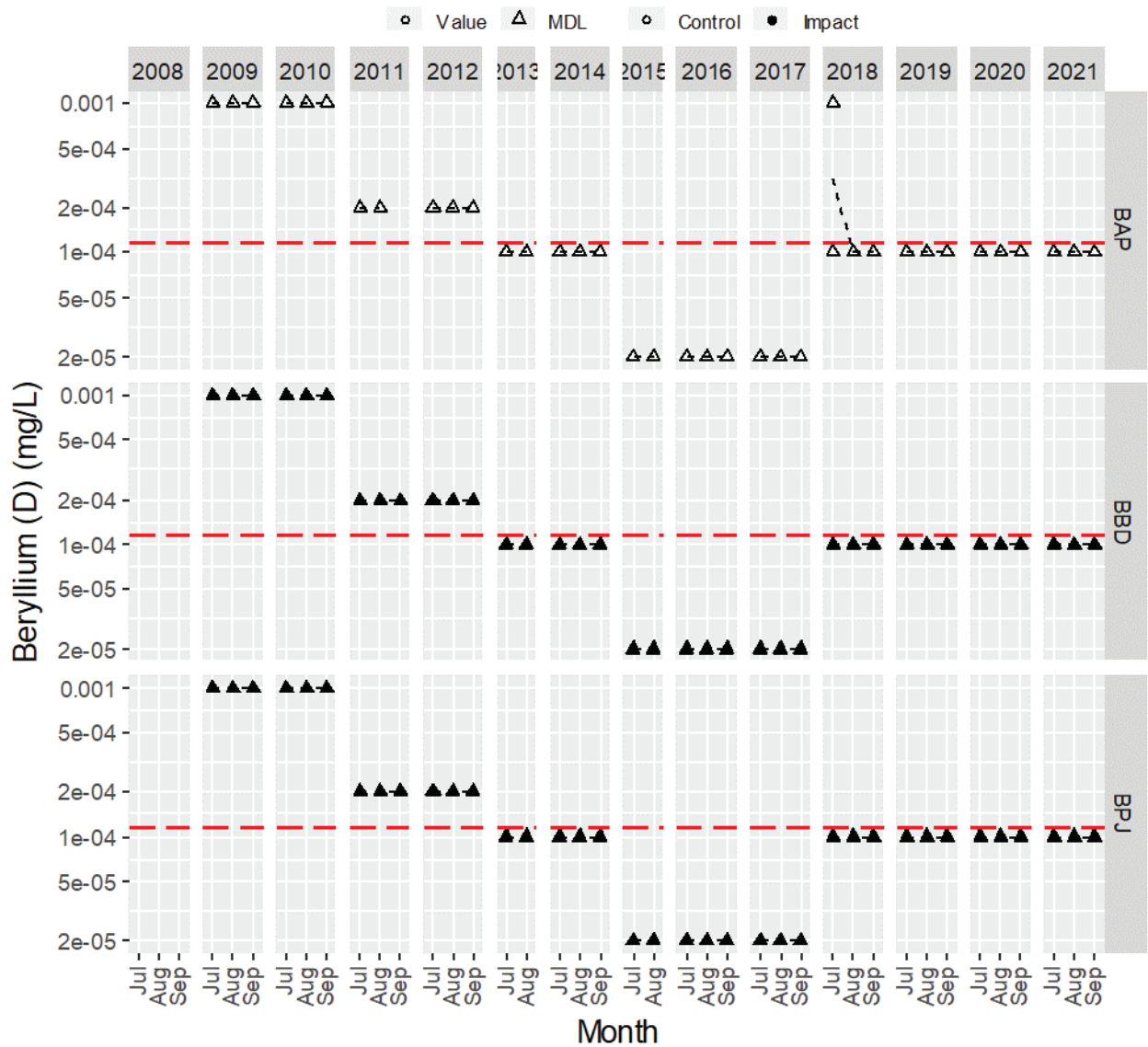
Note: The red dashed line = trigger value.





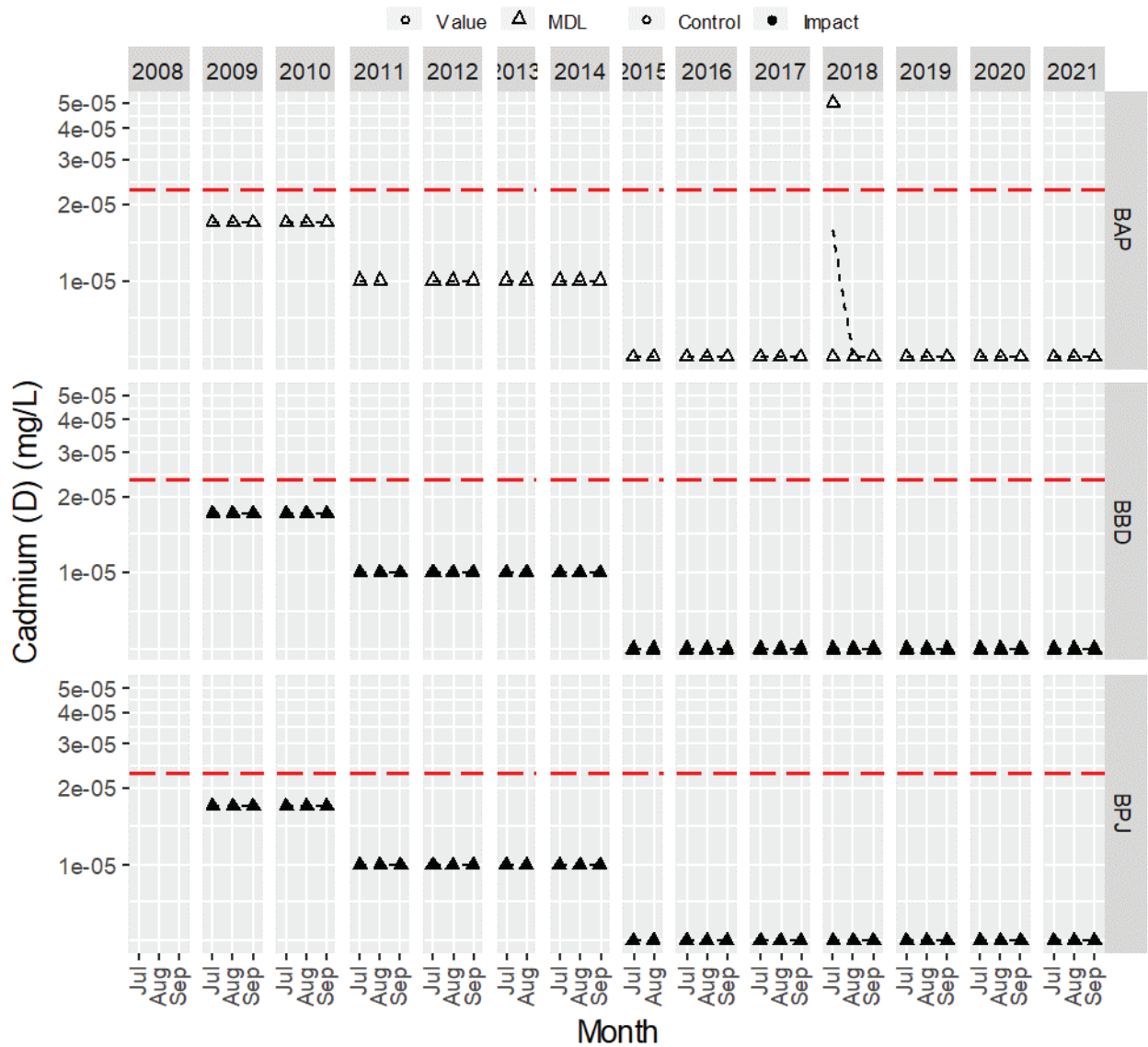
**Figure B3 - 18. Dissolved beryllium (mg/L) in water samples from Baker Lake since 2008.**

Note: The red dashed line = trigger value.



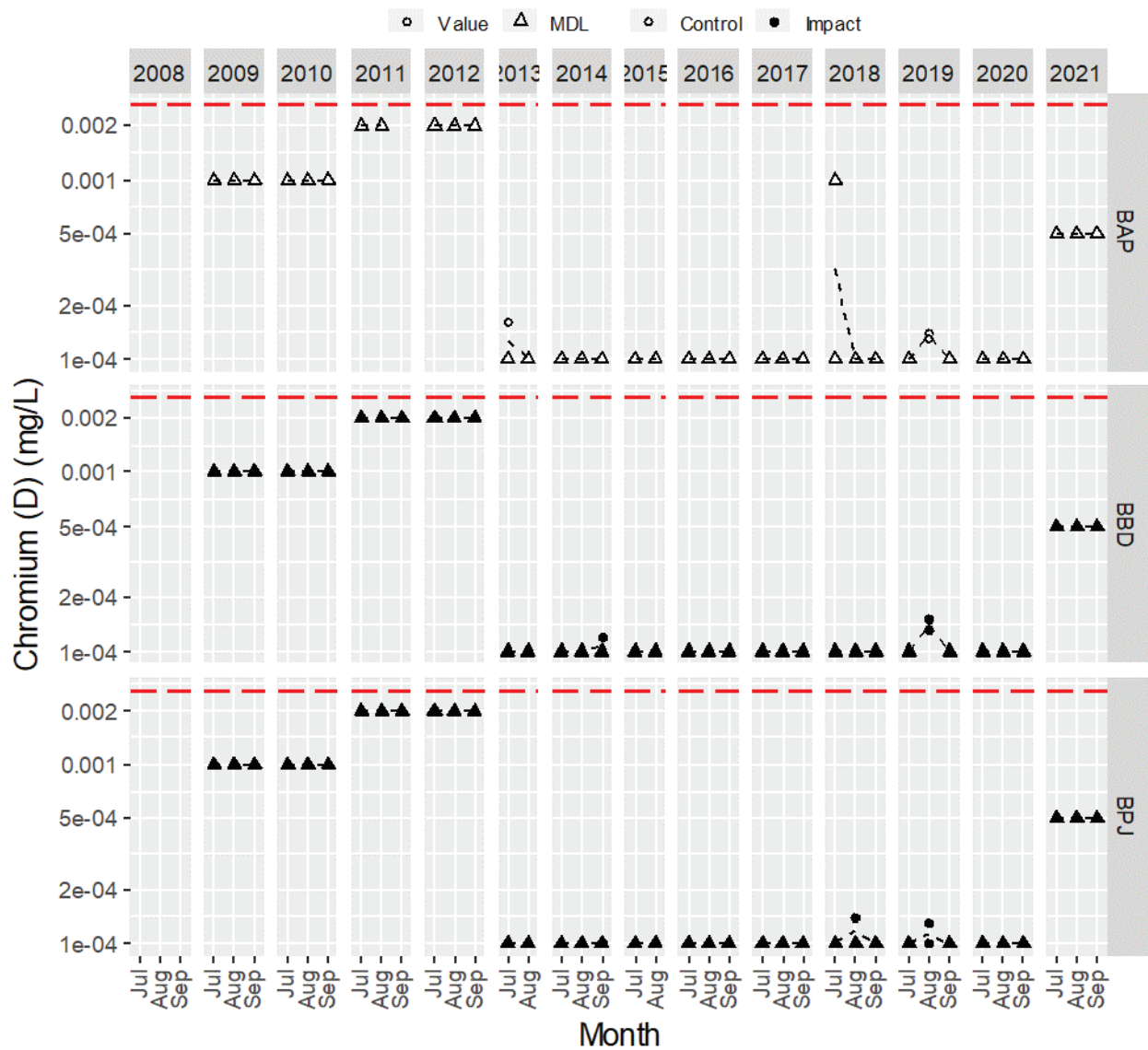
**Figure B3 - 19. Dissolved cadmium (mg/L) in water samples from Baker Lake since 2008.**

Note: The red dashed line = trigger value.



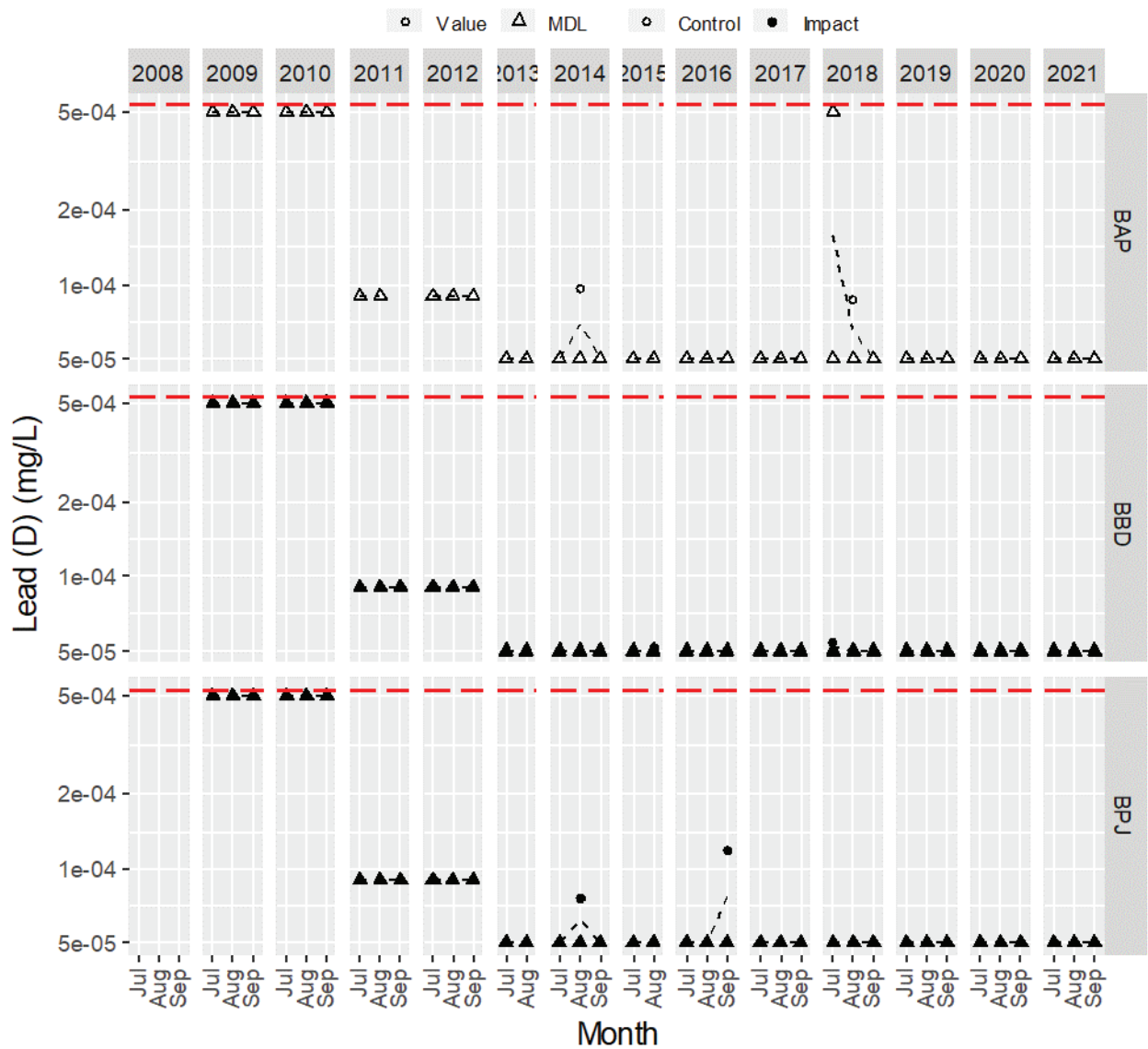
**Figure B3 - 20. Dissolved chromium (mg/L) in water samples from Baker Lake since 2008.**

Note: The red dashed line = trigger value.



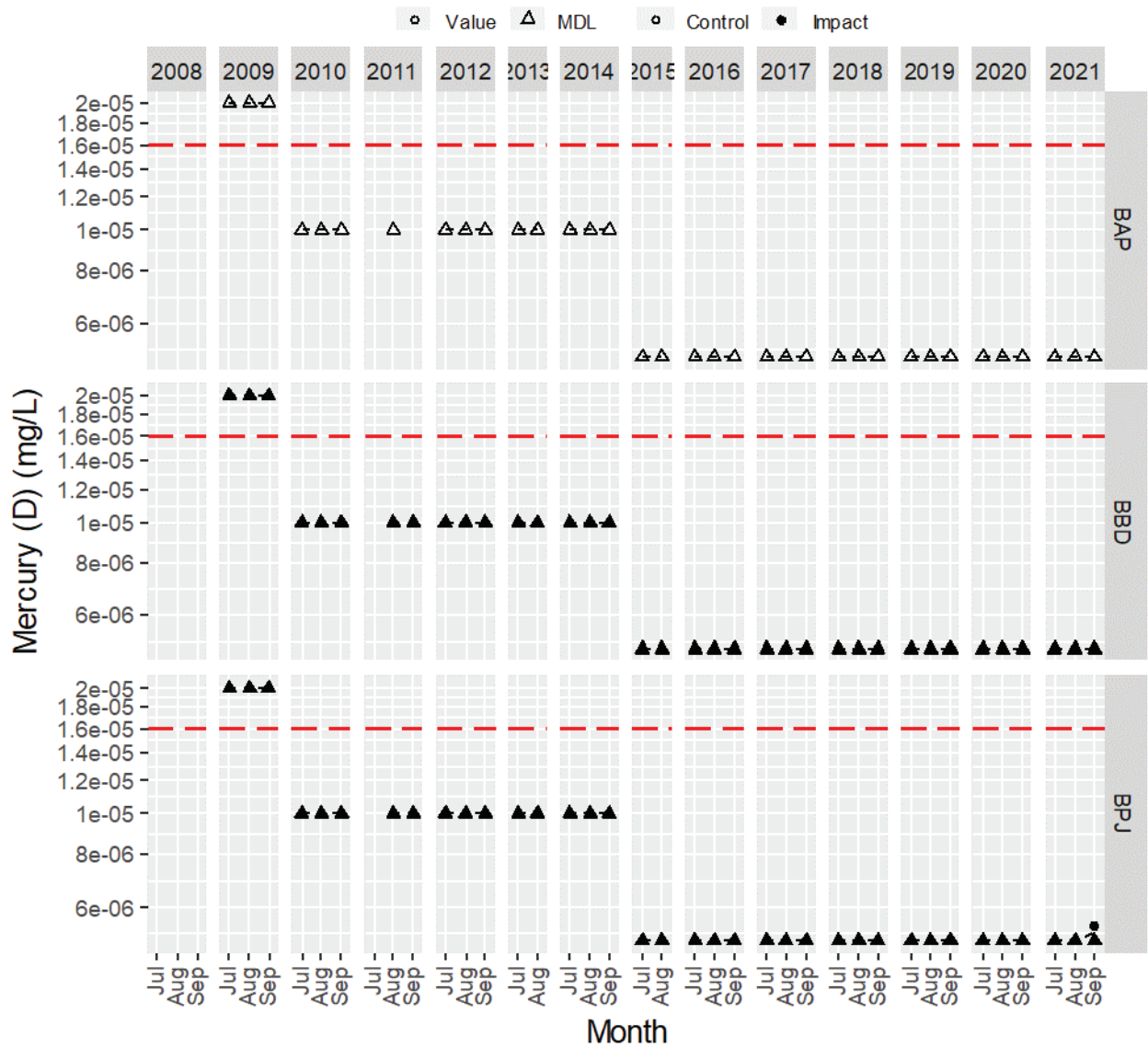
**Figure B3 - 21. Dissolved lead (mg/L) in water samples from Baker Lake since 2008.**

Note: The red dashed line = trigger value.



**Figure B3 - 22. Dissolved mercury (mg/L) in water samples from Baker Lake since 2008.**

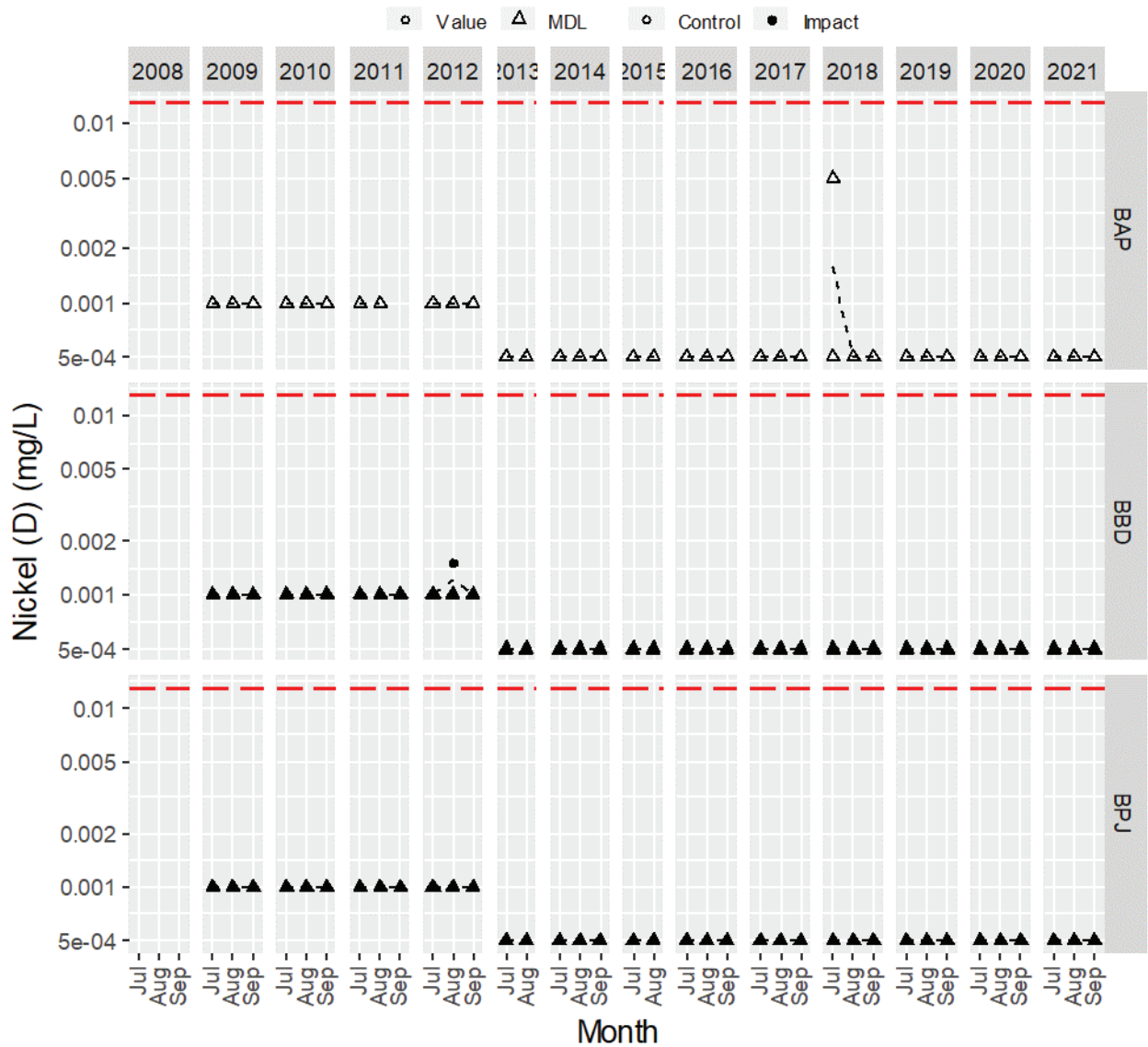
Note: The red dashed line = trigger value.





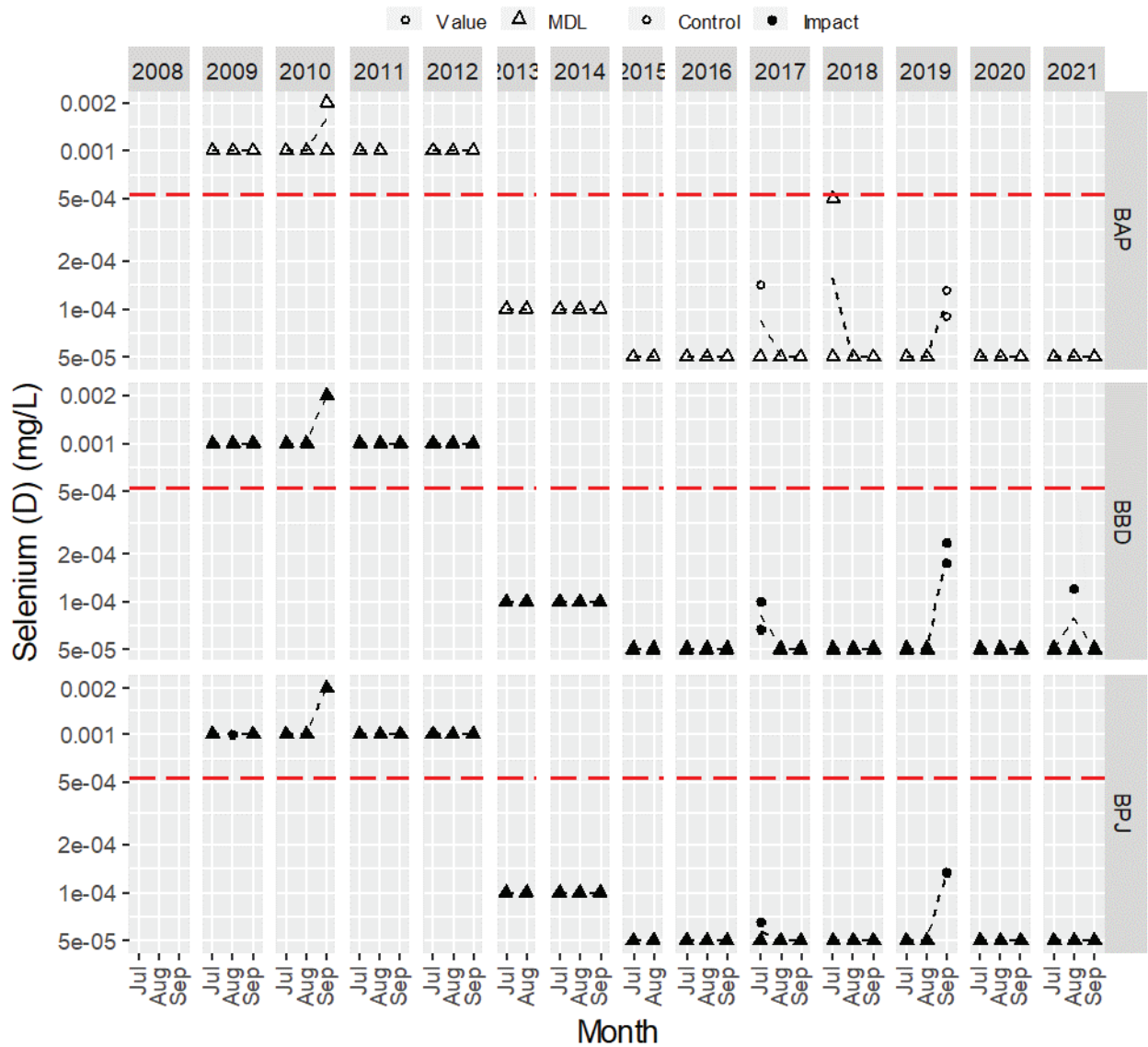
**Figure B3 - 23. Dissolved nickel (mg/L) in water samples from Baker Lake since 2008.**

Note: The red dashed line = trigger value.



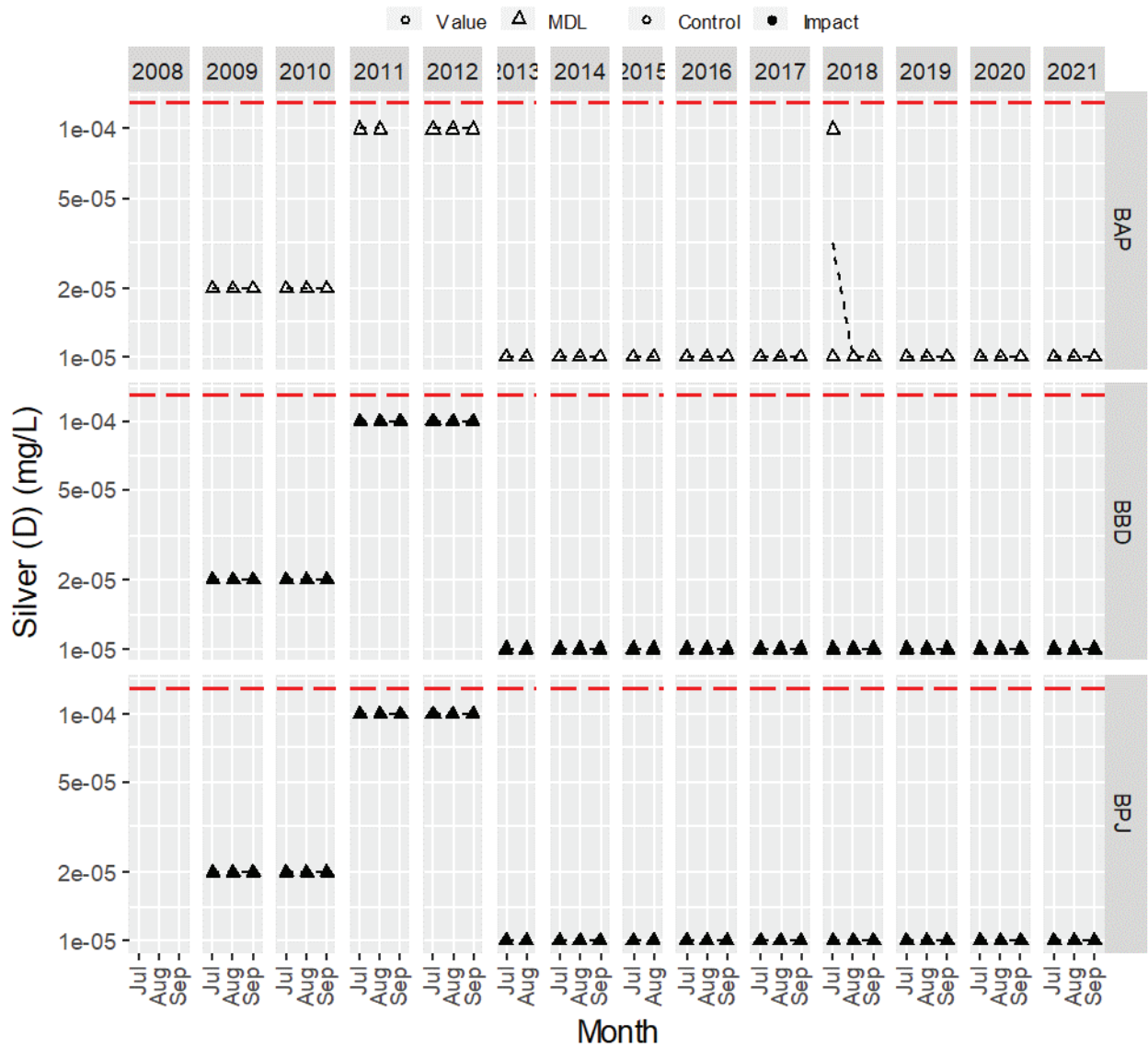
**Figure B3 - 24. Dissolved selenium (mg/L) in water samples from Baker Lake since 2008.**

Note: The red dashed line = trigger value.



**Figure B3 - 25. Dissolved silver (mg/L) in water samples from Baker Lake since 2008.**

Note: The red dashed line = trigger value.



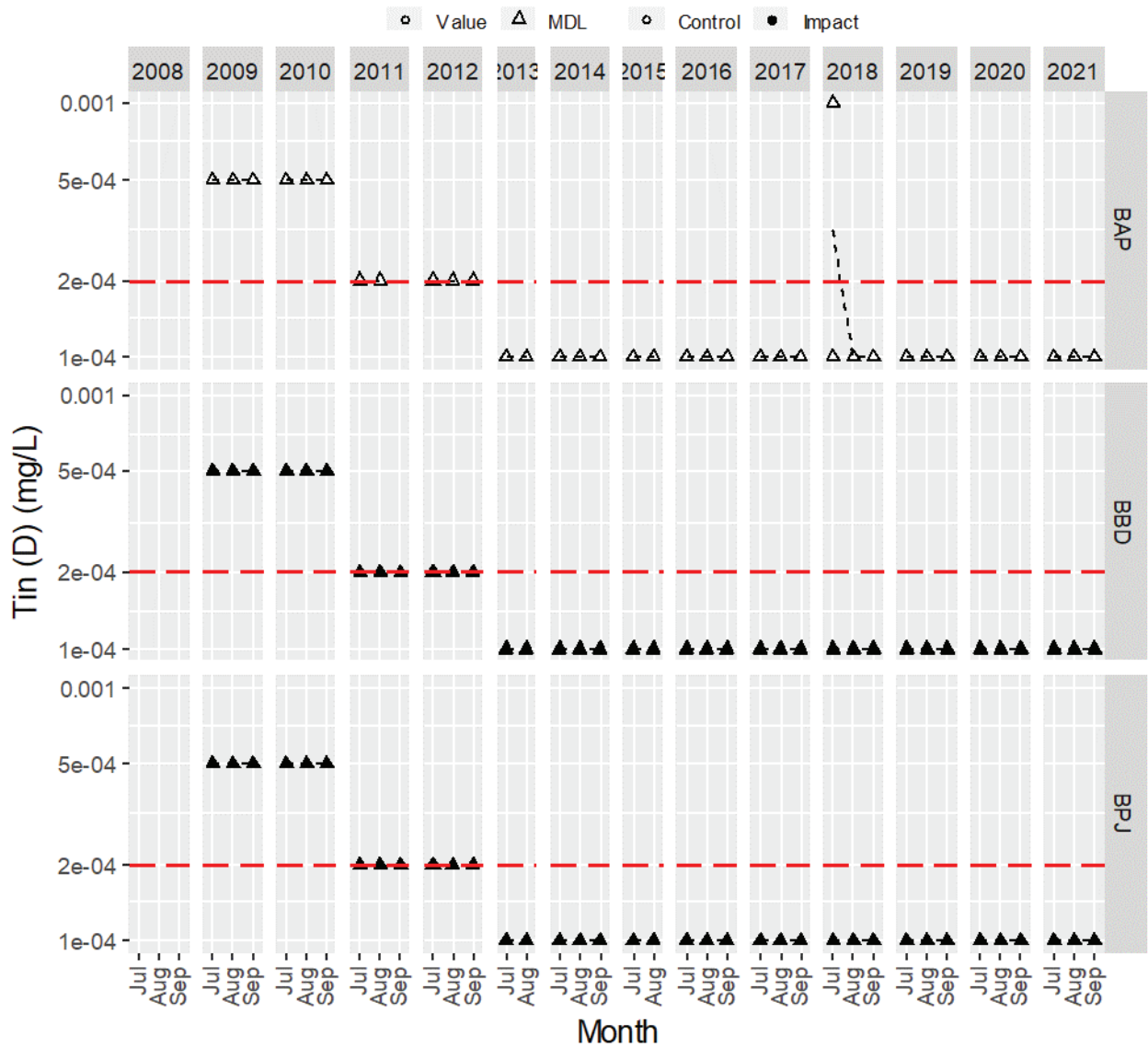
**Figure B3 - 26. Dissolved thallium (mg/L) in water samples from Baker Lake since 2008.**

Note: The red dashed line = trigger value.



**Figure B3 - 27. Dissolved tin (mg/L) in water samples from Baker Lake since 2008.**

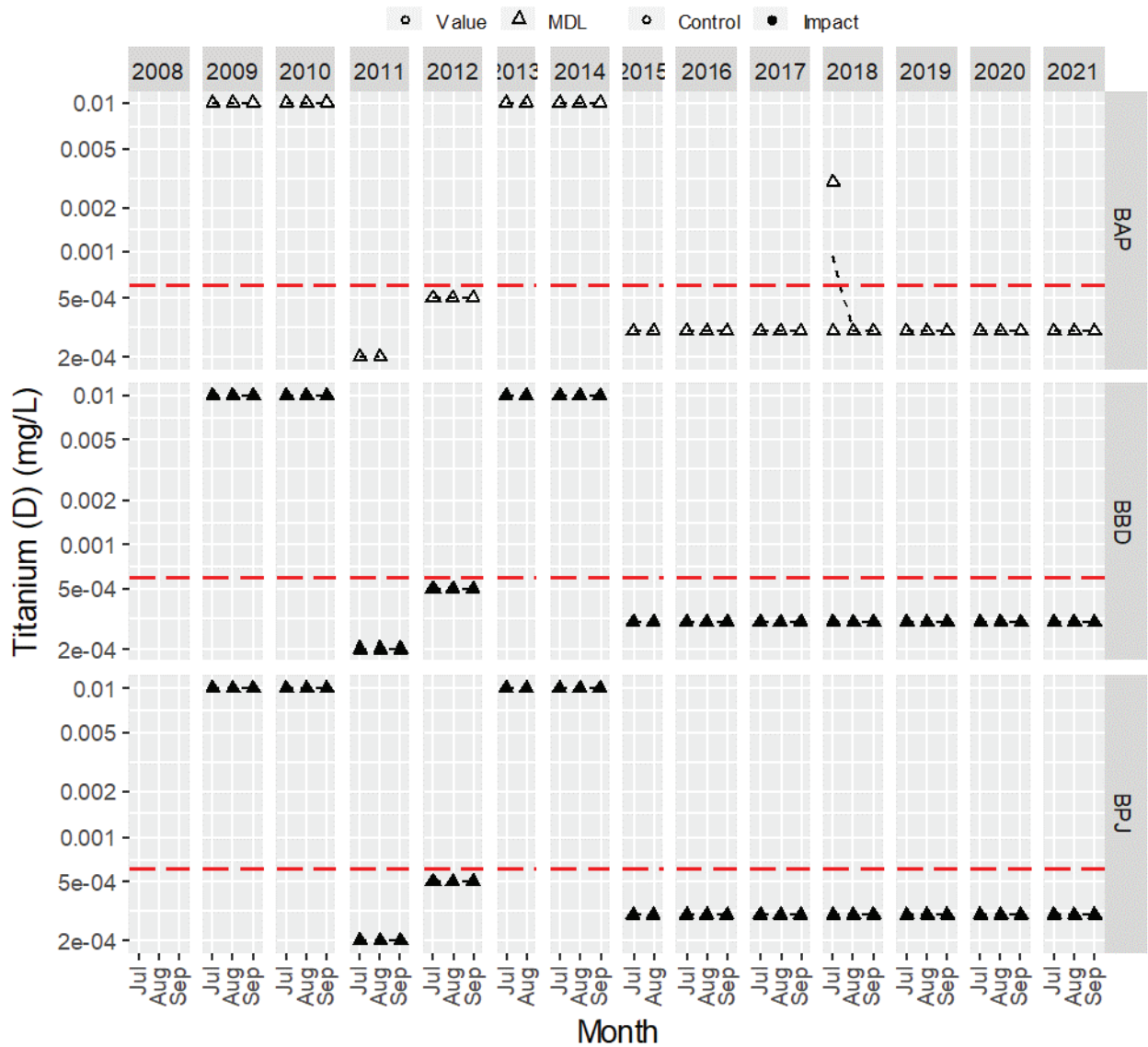
Note: The red dashed line = trigger value.





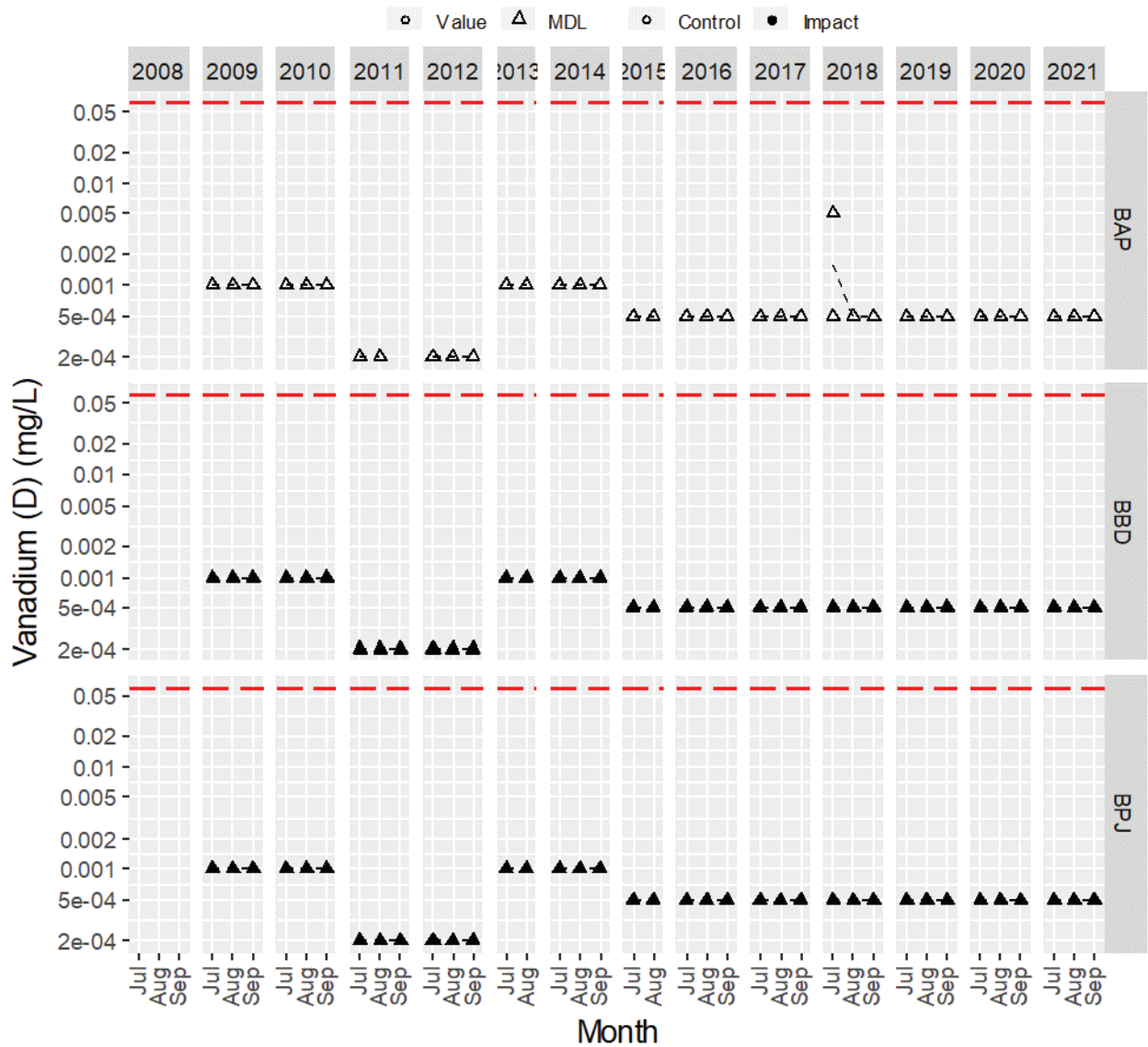
**Figure B3 - 28. Dissolved titanium (mg/L) in water samples from Baker Lake since 2008.**

Note: The red dashed line = trigger value.



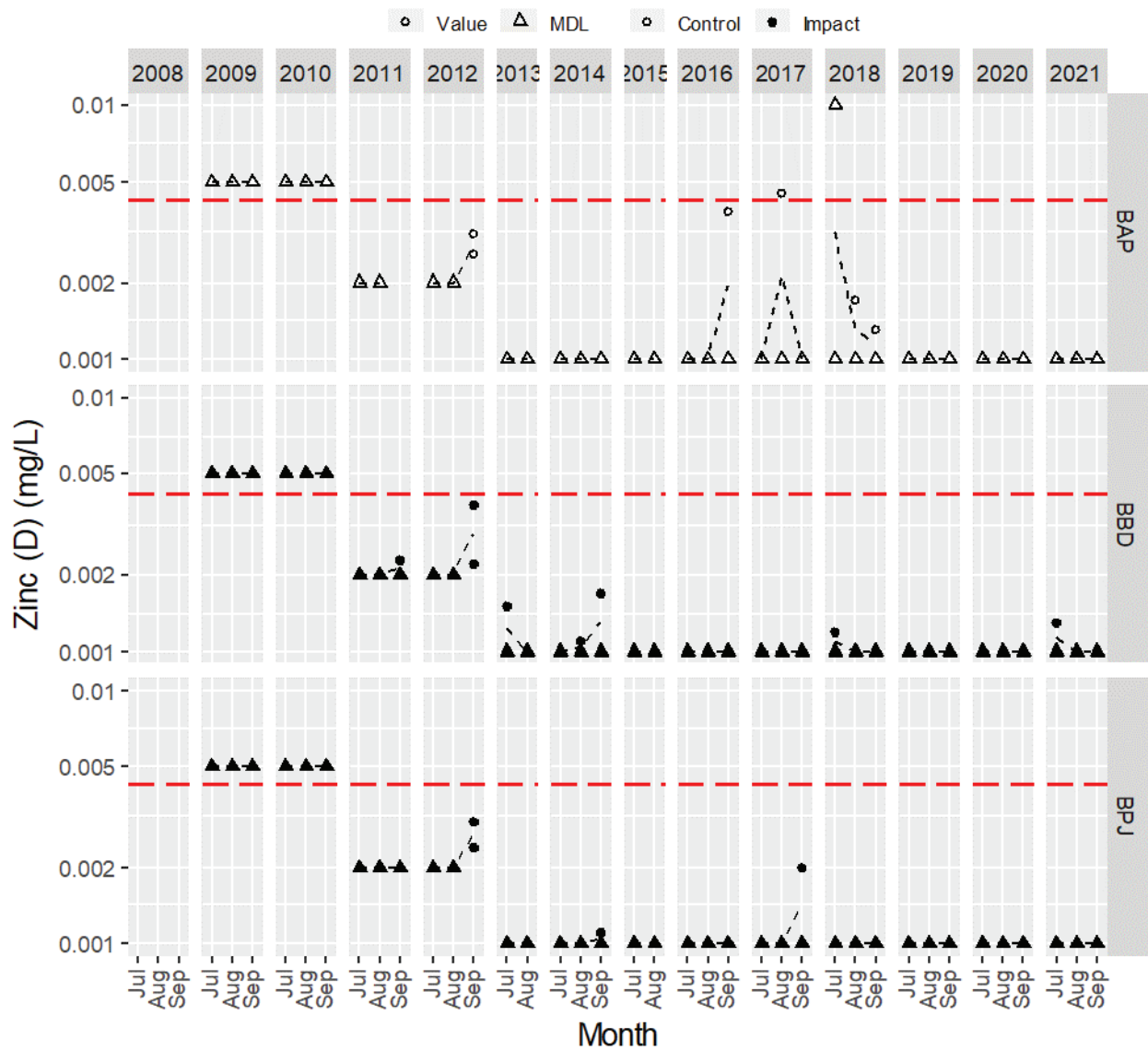
**Figure B3 - 29. Dissolved vanadium (mg/L) in water samples from Baker Lake since 2008.**

Note: The red dashed line = trigger value.



**Figure B3 - 30. Dissolved zinc (mg/L) in water samples from Baker Lake since 2008.**

Note: The red dashed line = trigger value.



## APPENDIX C

### SEDIMENT CHEMISTRY DATA

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## Appendix C1

### Sediment Chemistry – Meadowbank Study Area Lakes

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Table C1-1. Sediment grab chemistry results, Meadowbank study lakes, 2021.

Lake & Basin		Screening Criteria				Third Portage Lake - East Basin (TPE)					Third Portage Lake - North Basin (TPN)				Second Portage Lake (SP)				
Area-Replicate ID	MRK Triggers <sup>2</sup>	MRK	WAL	Thresholds <sup>3</sup>	TPE-1	TPE-2	TPE-3	TPE-4	TPE-5	TPN-1	TPN-2	TPN-3	TPN-4	TPN-5	SP-1	SP-2	SP-3	SP-4	SP-5
ALS Sample ID	Date				8-Aug-21	8-Aug-21	8-Aug-21	8-Aug-21	8-Aug-21	7-Aug-21	7-Aug-21	7-Aug-21	7-Aug-21	7-Aug-21	6-Aug-21	6-Aug-21	6-Aug-21	6-Aug-21	5-Aug-21
VA21B0915-019	VA21B0915-019	VA21B0915-020	VA21B0915-021	VA21B0915-022	VA21B0915-023	VA21B0915-013	VA21B0915-014	VA21B0915-015	VA21B0915-016	VA21B0915-001	VA21B0915-002	VA21B0915-003	VA21B0915-004	VA21B0915-005					
Physical Tests																			
Moisture (%)	86	86	86	79	81	38	80	84	46	33	85	85	85	86	85				
pH	5.8	5.9	6.1	5.8	5.7	6.1	5.6	5.5	5.9	6.2	5.9	6.1	6.0	6.0	5.7				
Particle Size (%)																			
CLAY (<0.06mm)	31	26	30	35	35	29	14	17	34	19	28	24	26	26	27				
SILT (0.06mm-0.085mm)	68	73	67	33	61	26	54	64	38	38	28	25	25	21	21				
SAND (0.085mm-0.25mm)	8	1	3	9	4	5	32	19	5	5	38	20	23	20	20				
gravel (>2mm)	<2.0	<2.0	<2.0	<2.0	<2.0	15	<2.0	<2.0	<2.0	14	<2.0	<2.0	<2.0	<2.0	<2.0				
Organic Carbon																			
TOC (% dw)	3.4	3.6	3.5	2.6	2.7	0.21	3.2	3.9	0.68	0.26	4.0	3.9	4.0	4.0	3.8				
Total Metals (mg/kg dwt)																			
Aluminum	24500	27000	27600	33000	31700	-	-	-	-	-	27600	25900	26600	28900	27700				
Antimony	0.20	0.26	0.25	0.25	0.28	-	-	-	-	-	0.32	0.28	0.28	0.28	0.25				
Arsenic*	121	45	22	24	25	-	-	-	-	-	42	28	52	27	42				
Barium	109	124	130	174	135	-	-	-	-	-	134	124	120	130	131				
Beryllium	1.6	1.8	1.9	2.3	2.3	-	-	-	-	-	2.1	2.0	2.0	2.3	2.3				
Bismuth	2.2	2.4	2.5	3.2	3.1	-	-	-	-	-	2.3	2.4	2.5	2.5	2.5				
Boron	8.1	9.9	10	10	9.8	-	-	-	-	-	10	9.1	8.1	11	11				
Cadmium*	1.1	0.66	0.18	0.13	0.15	-	-	-	-	-	0.26	0.26	0.24	0.26	0.24				
Calcium	2130	2360	2280	2200	2160	-	-	-	-	-	2620	2500	2200	2320	2440				
Chromium*	135	61	142	148	136	-	-	-	-	-	97	86	83	89	90				
Cobalt	15	17	17	19	20	-	-	-	-	-	16	16	20	16	17				
Copper*	83	257	46	52	54	69	65	-	-	-	76	73	79	79	77				
Iron	42000	44200	45000	56500	57400	-	-	-	-	-	67200	68800	86600	60600	76600				
Lead +	25	37	23	27	26	-	-	-	-	-	23	23	23	24	23				
Lithium	42	48	50	64	62	-	-	-	-	-	47	47	47	49	48				
Magnesium	10900	11500	11400	13200	17400	-	-	-	-	-	10500	10100	9900	10500	10500				
Manganese	1730	2260	2720	1980	2230	-	-	-	-	-	4400	2410	2340	1830	1570				
Mercury	0.10	0.12	0.019	0.021	0.018	-	-	-	-	-	0.036	0.032	0.028	0.030	0.030				
Molybdenum	3.5	4.0	4.3	5.3	5.4	-	-	-	-	-	8.1	6.2	7.8	7.0	8.0				
Nickel	73	92	108	74	70	-	-	-	-	-	72	64	65	68	64				
Phosphorus	45	46	45	46	46	-	-	-	-	-	45	45	45	45	45				
Potassium	3820	4320	4450	5950	5920	-	-	-	-	-	4520	4210	3300	4520	4570				
Selenium	0.59	0.76	0.79	0.31	0.45	-	-	-	-	-	0.74	0.65	0.71	0.50	0.62				
Silver	<0.10	0.10	<0.10	<0.10	<0.10	-	-	-	-	-	0.18	0.16	0.12	0.13	0.12				
Sodium	162	180	180	164	158	-	-	-	-	-	199	175	166	191	188				
Strontium	18	21	21	23	20	-	-	-	-	-	27	24	20	26	24				
Sulfur	1900	2000	2000	1400	1600	-	-	-	-	-	1700	1500	1600	1800	1600				
Thallium	0.35	0.43	0.46	0.49	0.46	-	-	-	-	-	0.39	0.37	0.39	0.41	0.40				
Tin	<2.0	<2.0	<2.0	<2.0	<2.0	-	-	-	-	-	<2.0	<2.0	<2.0	<2.0	<2.0				
Titanium	636	786	818	1030	1010	-	-	-	-	-	814	720	670	777	755				
Tungsten	<0.50	0.61	0.70	0.62	0.77	-	-	-	-	-	0.75	0.77	0.70	0.72	0.55				
Uranium	14	16	19	29	27	-	-	-	-	-	24	23	24	26	25				
Vanadium	35	41	42	53	50	-	-	-	-	-	41	39	39	41	40				
Zinc +	114	142	123	143	127	-	-	-	-	-	118	113	126	124	125				
Zirconium	3.0	2.4	2.5	4.5	3.6	-	-	-	-	-	1.9	2.4	2.6	2.4	2.5				

**Notes:**

- CCME (Canadian Council of Ministers of the Environment) Canadian Sediment Quality Guidelines for the Protection of Aquatic Life, 1999, updated in 2002.
- CCME interim sediment quality guidelines; PEL - probable effect level
- Trigger values developed in the *CCME Design Document 2012* (Adimith, 2012d) were updated in 2017. Trigger values were developed for Wally Lake (WAL) separate from the other Meadowbank project lakes.
- Thresholds are set equal to CCME BGS guidelines, where available.
- CCME guideline not used as threshold value because threshold value would be lower than trigger value.
- CCME guideline not used as threshold value at Wally Lake.
- CCME guideline not used as threshold value because threshold value would be lower than trigger value.
- 123** Bolded and shaded concentrations also exceed the threshold value.
- Italicized numbers are below detection limits.

Table C1 - 2. Hydrocarbon and PAH results for composite sediment grabs at Meadowbank study lakes, 2021.

Area-Replicate ID	CCME Sediment Quality Guidelines <sup>1</sup>		TPE-COMP	TPN-COMP	SP-COMP
Date			8-Aug-21	7-Aug-21	6-Aug-21
ALS Sample ID	ISQG	PEL	VA21B6915-024	VA21B6915-018	VA21B6915-006
<b>Physical Parameters</b>					
Moisture (%)	-	-	84	49	86
<b>Aggregate Organics (mg/kg)</b>					
Mineral Oil and Grease	-	-	<500	<500	710
<b>Hydrocarbons (mg/kg)</b>					
EPH10-19	-	-	<300	<200	<280
EPH19-32	-	-	<300	<200	<280
LEPH	-	-	<300	<200	<280
HEPH	-	-	<300	<200	<280
<b>Polycyclic Aromatic Hydrocarbons (mg/kg)</b>					
acenaphthene	0.0067	0.089	<0.0148	<0.0050	<0.0143
acenaphthylene	0.0059	0.13	<0.0148	<0.0050	<0.0143
acridine	-	-	<0.015	<0.010	<0.014
anthracene	0.047	0.25	<0.0148	<0.0040	<0.0143
benz(a)anthracene	0.032	0.39	<0.015	<0.010	<0.014
benzo(a)pyrene	0.032	0.78	<0.015	<0.010	<0.014
benzo(b+j)fluoranthene	-	-	<0.015	<0.010	<0.014
benzo(b+j+k)fluoranthene	-	-	<0.021	<0.015	<0.020
benzo(g,h,i)perylene	-	-	<0.015	<0.010	<b>0.027</b>
benzo(k)fluoranthene	-	-	<0.015	<0.010	<0.014
chrysene	0.057	0.86	<0.015	<0.010	<0.014
dibenz(a,h)anthracene	0.0062	0.14	<0.0148	<0.0050	<0.0143
fluoranthene	0.11	2.36	<0.015	<0.010	<0.014
fluorene	0.021	0.144	<0.015	<0.010	<0.014
indeno(1,2,3-c,d)pyrene	-	-	<0.015	<0.010	<0.014
methylnaphthalene, 1-	-	-	<0.015	<0.010	<0.014
methylnaphthalene, 2-	0.020	0.20	<0.015	<0.010	<0.014
naphthalene	0.035	0.39	<0.015	<0.010	<0.014
phenanthrene	0.042	0.52	<0.015	<0.010	<0.014
pyrene	0.053	0.88	<0.015	<0.010	<0.014
quinoline	-	-	<0.015	<0.010	<0.014
<b>PAH Surrogates (%)</b>					
acridine-d9	-	-	96	101	92
chrysene-d12	-	-	104	109	101
naphthalene-d8	-	-	100	101	96
phenanthrene-d10	-	-	97	99	93

**Notes:**

1. Canadian Sediment Quality Guidelines for the Protection of Aquatic Life, 1999, updated in 2002.

ISQG = Interim freshwater Sediment Quality Guideline; PEL = probably effect level concentration

**Bolded concentrations exceed the ISQG guideline.**

*Italicized numbers are below detection limits.*

## Appendix C2

### Sediment Chemistry – Whale Tail Study Area Lakes

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Table C2-1. Sediment grab chemistry, Whale Tail Pit R1 study/lakes, 2021.

Lake & Basin Sample ID Date	Screening Criteria		Whale Tail Lake - South Basin (WTS)		Lake A76		Nemo Lake (NEM)		Nemo Lake (NEM)		Nemo Lake (NEM)	
	COE <sup>1</sup>	Threshold <sup>2</sup> (µl/Lake)	WTS Triggers	WTS Triggers	WTS Triggers	WTS Triggers	WTS Triggers	WTS Triggers	WTS Triggers	WTS Triggers	WTS Triggers	WTS Triggers
ALS Sample ID	BSOG	PRL	WTS Triggers	WTS Triggers	WTS Triggers	WTS Triggers	WTS Triggers	WTS Triggers	WTS Triggers	WTS Triggers	WTS Triggers	WTS Triggers
Physical Tests												
Moisture (%)			81	82	89	88	83	92	88	88	91	84
pH			5.8	5.8	5.5	5.5	5.4	5.8	5.1	5.5	6.1	6.4
Particle Size (%)												
clay (<0.04mm)			15	14	20	17	17	21	25	22	6.8	5.9
silt (0.04mm - 0.044mm)			16	15	21	18	17	21	25	22	17	16
sand (0.04mm - 0.08mm)			18	16	3.9	3.4	5.9	<1.0	3.0	<1.0	1.1	2.3
Gravel (>2mm)			<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Organic Carbon												
TOC (%) (w)			3.9	3.9	6.2	5.9	4.5	9.4	5.2	5.3	6.9	8.5
Total Metals (mg/kg dw)												
Antimony			15900	16100	15900	15900	15900	25600	24200	24100	24100	10900
As			0.26	0.27	0.25	0.24	0.24	0.45	0.40	0.41	0.38	0.41
Arsenic*			49	57	13	127	138	68	587	492	33	56
Barium			99	88	126	112	91	242	206	200	195	88
Beryllium			1.6	1.2	1.3	1.4	1.6	1.6	1.6	1.3	1.2	1.6
Bismuth			0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02
Boron			7.9	6.6	13	8.6	6.4	16	7.7	7.1	8.3	8.6
Cadmium*			0.60	0.60	0.33	0.31	0.12	0.31	0.21	0.26	0.31	0.25
Calcium			0.24	0.14	0.30	0.11	0.24	0.68	0.40	0.33	0.50	0.50
Chromium*			37	80.6	85	73	75	103	2520	2570	3600	3100
Cobalt*			85	73	82	72	75	124	123	114	99	120
Copper*			45	83	41	41	42	91	86	78	84	81
Iron			36	197	36	48.5	76	45200	143000	134000	81500	21200
Lead			35	91	35	24.0	26	22	21	21	17	22
Lithium			18	16	18	14	14	19	18	17	16	18
Magnesium			1570	1570	1570	1570	1570	310	840	840	840	310
Manganese			1620	1620	1620	1620	1620	310	840	840	840	310
Mercury			0.17	0.49	0.17	0.123	0.064	0.064	0.035	0.048	0.053	0.048
Molybdenum			3.5	2.2	2.0	3.9	5.5	5.9	6.6	6.3	3.3	6.1
Nickel			69	47	60	67	52	100	113	107	83	96
Non-halogen			2480	2480	2480	2480	2480	3460	3460	3460	3460	3460
Phosphorus			0.62	0.44	0.56	0.66	0.64	0.92	1.1	1.0	0.71	0.90
Potassium			0.18	0.17	0.35	0.11	0.24	0.68	0.40	0.33	0.50	0.50
Selenium			134	131	171	146	120	205	158	159	178	182
Silver			134	131	171	146	120	205	158	159	178	182
Sodium			134	131	171	146	120	205	158	159	178	182
Sulfur			134	131	171	146	120	205	158	159	178	182
Titanium			134	131	171	146	120	205	158	159	178	182
Vanadium			134	131	171	146	120	205	158	159	178	182
Zinc*			123	315	123	156	94	120	125	115	95	123
Zirconium			1.23	315	123	156	94	120	125	115	95	123

NOTES

- COE (Canadian Council of Ministers of the Environment) Canadian Sediment Quality Guideline for the Protection of Aquatic Life
- COE = interim sediment quality guideline for the protection of aquatic life

\* COE guideline not used as threshold value because threshold value would be lower than trigger value.

123 Based concentrations exceed the lake specific trigger.  
Thresholds and sediment concentrations also exceed the threshold if threshold is greater than lake specific trigger.  
Threshold numbers are a below detection limit.

**Table C2-2. Hydrocarbon and PAH results for composite sediment grabs at Whale Tail Pit study lakes, 2021.**

Area-Replicate ID	CCME Sediment Quality Guidelines <sup>1</sup>		WTS-COMP	A76-COMP	NEM-COMP
Date			05-Aug-21	07-Aug-21	05-Aug-21
ALS Sample ID	ISQG	PEL	VA21B6915-036	VA21B6915-042	VA21B6915-030
<b>Physical Parameters</b>					
Moisture (%)	-	-	85	90	91
<b>Aggregate Organics (mg/kg)</b>					
Mineral Oil and Grease	-	-	910	<500	3460
<b>Hydrocarbons (mg/kg)</b>					
EPH10-19	-	-	<290	<560	<570
EPH19-32	-	-	<290	<560	<570
LEPH	-	-	<290	<560	<570
HEPH	-	-	<290	<560	<570
<b>Polycyclic Aromatic Hydrocarbons (mg/kg)</b>					
acenaphthene	0.0067	0.089	<0.0143	<0.0281	<0.0286
acenaphthylene	0.0059	0.13	<0.0143	<0.0281	<0.0286
acridine	-	-	<0.014	<0.028	<0.028
anthracene	0.047	0.25	<0.0143	<0.0281	<0.0286
benz(a)anthracene	0.032	0.39	<0.014	<0.028	<0.028
benzo(a)pyrene	0.032	0.78	<0.014	<0.028	<0.028
benzo(b+j)fluoranthene	-	-	<0.014	<0.028	<0.028
benzo(b+j+k)fluoranthene	-	-	<0.020	<0.040	<0.040
benzo(g,h,i)perylene	-	-	<0.014	<0.028	<0.028
benzo(k)fluoranthene	-	-	<0.014	<0.028	<0.028
chrysene	0.057	0.86	<0.014	<0.028	<0.028
dibenz(a,h)anthracene	0.0062	0.14	<0.0143	<0.0281	<0.0286
fluoranthene	0.11	2.36	<0.014	<0.028	<0.028
fluorene	0.021	0.144	<0.014	<0.028	<0.028
indeno(1,2,3-c,d)pyrene	-	-	<0.014	<0.028	<0.028
methylnaphthalene, 1-	-	-	<0.014	<0.028	<0.028
methylnaphthalene, 2-	0.020	0.20	<0.014	<0.028	<0.028
naphthalene	0.035	0.39	<0.014	<0.028	<0.028
phenanthrene	0.042	0.52	<0.014	<0.028	<0.028
pyrene	0.053	0.88	<0.014	<0.028	<0.028
quinoline	-	-	<0.014	<0.028	<0.028
B(a)P total potency equivalents [B(a)P TPE]	-	-	<0.020	0.034	0.034
IACR (CCME)	-	-	0.17	0.33	0.33
<b>PAH Surrogates (%)</b>					
acridine-d9	-	-	84	74	86
chrysene-d12	-	-	115	107	115
naphthalene-d8	-	-	110	102	110
phenanthrene-d10	-	-	109	97	114

**Notes:**

1. Canadian Sediment Quality Guidelines for the Protection of Aquatic Life, 1999, updated in 2002.

ISQG = Interim freshwater Sediment Quality Guideline; PEL = probably effect level concentration

**Bolded concentrations exceed the ISQG guideline.**

*Italicized numbers are below detection limits.*

APPENDIX D  
PHYTOPLANKTON TAXONOMY DATA AND SUPPLEMENTAL  
PLOTS

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## Appendix D1

### Phyto Data – Meadowbank Study Area Lakes

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Table D1-1. Phytoplankton density (cells/L), biomass (mg/m3), and diversity by major taxa group, Meadowbank study lakes, 2021.

Area-Replicate	Date	Phytoplankton Biomass (mg/m <sup>3</sup> )					Taxa Richness		Simpson's Diversity		
		Cyanophyte	Chlorophyte	Euglenophyte	Chrysophyte	Diatom	Cryptophyte	Dinoflagellate		TOTAL	
Inuggugayualik Lake											
INUG - 128	10-Mar-21	0	0.53	0	19	0.47	10	2.2	32	17	0.77
INUG - 129	10-Mar-21	0	0.45	0	23	0.63	7.0	3.1	34	19	0.64
INUG - 130	11-May-21	0.14	0.34	0	8.6	0.32	6.7	2.9	19	14	0.78
INUG - 131	11-May-21	0	0.70	0	13	0.027	6.1	7.3	27	15	0.78
INUG - 132	27-Jul-21	0.40	1.1	0	117	33	12	8.7	173	29	0.79
INUG - 133	27-Jul-21	0.37	3.4	0	104	26	13	3.3	150	31	0.81
INUG - 134	18-Aug-21	0.20	6.3	0	85	11	5.4	10	118	32	0.85
INUG - 135	18-Aug-21	0.20	4.6	0	102	14	8.8	16	146	34	0.86
INUG - 136	4-Sep-21	1.6	3.9	0	146	26	4.5	5.8	188	34	0.89
INUG - 137	4-Sep-21	3.2	3.4	0	106	20	13	18	163	35	0.87
Percent Density or Biomass		0.59	2.4	<0.1	69	13	8.2	7.4			
Pipedream Lake											
PDL - 93	20-Mar-21	0.42	0.83	0	17	1.7	7.5	8.4	36	18	0.78
PDL - 94	20-Mar-21	0.73	1.7	0	15	3.2	5.0	8.6	35	19	0.78
PDL - 95	9-May-21	0.074	0.40	0	12	0.81	2.9	15	31	14	0.80
PDL - 96	9-May-21	0.081	0.91	0	11	0.31	5.0	69	86	14	0.69
PDL - 97	27-Jul-21	0.090	1.9	0	151	15	15	35	218	31	0.77
PDL - 98	27-Jul-21	0.14	1.9	0	109	26	11	21	170	29	0.77
PDL - 99	16-Aug-21	0.34	3.6	0	194	27	7.0	3.5	236	35	0.83
PDL - 100	16-Aug-21	0.35	1.5	0	131	22	3.7	3.3	162	31	0.79
PDL - 101	4-Sep-21	2.1	5.6	0	95	17	7.4	2.5	129	33	0.90
PDL - 102	4-Sep-21	1.5	3.5	0	126	15	11	7.4	164	34	0.89
Percent Density or Biomass		0.46	1.7	<0.1	68	10	6.0	14			
Third Portage Lake - East Basin											
TPE - 140	29-Mar-21	0.12	1.2	0	21	2.2	11	2.4	38	20	0.77
TPE - 141	29-Mar-21	0.20	1.1	0	8.6	3.3	6.3	2.2	22	19	0.83
TPE - 142	10-May-21	0	0.26	0	9.7	0.20	4.0	3.6	18	11	0.81
TPE - 143	10-May-21	0.017	0.71	0	4.7	0.72	6.4	0.61	13	14	0.79
TPE - 144	23-Jul-21	1.0	5.4	0	70	5.6	7.4	11	101	23	0.77
TPE - 145	23-Jul-21	0.76	2.1	0	99	8.3	2.8	9.7	123	25	0.67
TPE - 146	13-Aug-21	0.24	4.8	0	101	25	6.1	12	149	34	0.85
TPE - 147	13-Aug-21	0.34	5.1	0	99	29	6.7	6.6	147	34	0.83
TPE - 148	17-Sep-21	1.6	7.0	0	125	34	10	21	199	34	0.80
TPE - 149	17-Sep-21	1.3	7.5	0	131	39	9.2	3.3	192	39	0.79
Percent Density or Biomass		0.56	3.5	<0.1	67	15	7.0	7.2			

Table D1-1. Phytoplankton density (cells/L), biomass (mg/m3), and diversity by major taxa group, Meadowbank study lakes, 2021.

Area-Replicate	Date	Phytoplankton Biomass (mg/m <sup>3</sup> )					Taxa Richness			Simpson's Diversity	
		Cyanophyte	Chlorophyte	Euglenophyte	Chrysophyte	Diatom	Cryptophyte	Dinoflagellate	TOTAL		
Third Portage Lake - North Basin											
TPN - 140	29-Mar-21	0.54	0.99	0	31	3.3	5.2	1.9	42	21	0.82
TPN - 141	29-Mar-21	0.50	2.4	0	19	2.8	11	0	35	19	0.81
TPN - 142	10-May-21	0.062	1.4	0	10	0.27	9.3	2.4	24	15	0.80
TPN - 143	10-May-21	0.014	0.55	0	14	1.7	8.9	3.0	28	19	0.76
TPN - 144	29-Jul-21	0.72	2.8	0	99	4.0	3.4	6.6	117	25	0.78
TPN - 145	29-Jul-21	0.81	2.8	0	88	4.7	8.9	22	128	29	0.80
TPN - 146	10-Aug-21	0.27	1.9	0	92	8.0	5.3	44	151	32	0.76
TPN - 147	10-Aug-21	1.9	0.43	0	100	16	5.5	3.3	127	28	0.82
TPN - 148	17-Sep-21	2.4	9.5	0	98	40	10	17	177	37	0.84
TPN - 149	17-Sep-21	3.9	14	0	126	28	11	17	201	36	0.84
Percent Density or Biomass		1.1	3.6	<0.1	66	11	7.7	11			
Third Portage Lake - South Basin											
TPS - 65	10-May-21	0	0.27	0	5.0	0.087	6.6	0.61	13	11	0.76
TPS - 66	10-May-21	0	0.38	0	7.0	0.10	4.1	9.4	21	13	0.76
Percent Density or Biomass		<0.1	2.0	<0.1	36	0.56	32	30			
Second Portage Lake											
SP - 140	18-Mar-21	0	0.81	0	12	1.6	9.2	0.97	24	14	0.72
SP - 141	18-Mar-21	0.051	1.3	0	22	5.9	6.6	3.1	39	19	0.79
SP - 142	9-May-21	0	0.072	0	4.2	1.7	7.5	12	25	13	0.73
SP - 143	9-May-21	0.015	0.57	0	8.3	5.7	1.7	0.95	17	16	0.66
SP - 144	11-Jul-21	0	1.4	0	136	11	5.8	16	171	23	0.79
SP - 145	11-Jul-21	0	0.53	0	115	41	10.0	16	182	23	0.74
SP - 146	6-Aug-21	2.4	7.9	0	61	21	6.1	8.1	106	28	0.90
SP - 147	6-Aug-21	1.2	3.1	0	78	24	12	3.7	121	31	0.84
SP - 148	3-Sep-21	0.72	3.4	0	99	14	4.2	6.6	128	28	0.82
SP - 149	3-Sep-21	0	7.6	0	92	30	3.5	5.6	139	32	0.83
Percent Density or Biomass		0.46	2.8	<0.1	66	16	6.9	7.6			



Table D1-1. Phytoplankton density (cells/L), biomass (mg/m3), and diversity by major taxa group, Meadowbank study lakes, 2021.

Area-Replicate	Date	Phytoplankton Biomass (mg/m <sup>3</sup> )					Diatom	Cryptophyte	Dinoflagellate	TOTAL	Taxa Richness	Simpson's Diversity
		Cyanophyte	Chlorophyte	Euglenophyte	Chrysophyte							
Tehek Lake												
TE - 100	9-Mar-21	0.72	0.43	0	37	1.6		5.5	0.61	46	17	0.80
TE - 101	9-Mar-21	0.32	0.55	0	16	0.58		7.5	0.97	25	18	0.75
Percent Density or Biomass		1.5	1.4	<0.1	74	3.1		18	2.2			
Tehek Lake - Far-field												
TEFF - 52	9-Mar-21	0.024	1.9	0	11	0.70		5.3	14	32	19	0.74
TEFF - 53	9-Mar-21	0.88	1.4	0	20	1.3		4.5	5.4	34	23	0.76
Percent Density or Biomass		1.4	5.0	<0.1	47	3.0		15	29			
Wally Lake												
WAL - 109	18-Mar-21	0	1.4	0	16	1.0		6.6	0.61	26	18	0.74
WAL - 110	18-Mar-21	0	1.3	0	13	3.8		6.3	2.2	27	20	0.74
WAL - 111	9-May-21	0	0.59	0	2.3	1.3		0.84	0	5.0	12	0.74
WAL - 112	9-May-21	0.20	0.88	0	4.6	0.36		6.1	2.7	15	14	0.77
WAL - 113	11-Jul-21	0	2.5	0	200	11		9.4	29	252	26	0.73
WAL - 114	11-Jul-21	0	1.4	0	177	12		16	31	238	27	0.74
WAL - 115	10-Aug-21	0.28	7.6	0	155	17		25	12	217	35	0.85
WAL - 116	10-Aug-21	2.5	7.0	0	171	30		17	2.2	230	33	0.85
WAL - 117	3-Sep-21	0.56	18	0	87	18		9.1	14	146	36	0.88
WAL - 118	3-Sep-21	0.53	27	0	116	38		19	21	222	37	0.88
Percent Density or Biomass		0.29	4.9	<0.1	68	9.6		8.4	8.3			
All 2021 Locations												
Relative Density or Biomass (%)		0.57	3.2	<0.1	67	12		7.7	9.6			



Table D1-1. Phytoplankton density (cells/L), biomass (mg/m3), and diversity by major taxa group, Meadowbank study lakes, 2021.

Area-Replicate	Date	Phytoplankton Density (cells/L)					TOTAL	
		Cyanophyte	Chlorophyte	Chrysophyte	Diatom	Cryptophyte		Dinoflagellate
Inuggugayulik Lake								
INUG - 128	10-Mar-21	0	35,861	322,695	7,492	58,938	400	425,386
INUG - 129	10-Mar-21	0	500	439,716	14,384	31,069	200	485,870
INUG - 130	11-May-21	900	39,107	145,390	4,246	44,153	200	233,997
INUG - 131	11-May-21	0	63,930	152,482	300	47,299	1,200	265,211
INUG - 132	27-Jul-21	1,000	7,584	1,566,328	417,704	75,040	1,200	2,068,856
INUG - 133	27-Jul-21	600	17,368	1,421,448	351,848	103,376	400	1,895,040
INUG - 134	18-Aug-21	1,200	175,016	1,267,384	156,264	44,504	1,000	1,645,368
INUG - 135	18-Aug-21	1,200	159,248	1,165,808	96,392	80,224	1,600	1,504,472
INUG - 136	4-Sep-21	7,000	245,856	1,507,056	408,104	30,136	800	2,198,952
INUG - 137	4-Sep-21	119,744	109,360	1,068,032	311,128	109,560	9,584	1,727,408
Percent Density or Biomass		1.1	6.9	73	14	5.0	0.13	
Pipedream Lake								
PDL - 93	20-Mar-21	1,900	145,490	336,880	15,184	53,892	1,800	555,146
PDL - 94	20-Mar-21	3,300	241,635	237,589	51,545	35,961	4,746	574,776
PDL - 95	9-May-21	500	60,384	166,667	22,577	15,084	2,500	267,711
PDL - 96	9-May-21	500	46,699	166,667	1,600	33,315	11,400	260,181
PDL - 97	27-Jul-21	400	30,336	1,642,168	245,336	48,504	4,200	1,970,944
PDL - 98	27-Jul-21	600	36,120	1,253,232	316,192	12,984	3,200	1,622,328
PDL - 99	16-Aug-21	2,000	108,960	1,864,456	287,992	58,272	600	2,322,280
PDL - 100	16-Aug-21	2,000	115,944	1,443,200	195,200	8,984	600	1,765,928
PDL - 101	4-Sep-21	34,736	205,152	850,112	129,728	38,520	600	1,258,848
PDL - 102	4-Sep-21	11,784	217,320	1,253,216	199,968	81,624	1,200	1,765,112
Percent Density or Biomass		0.47	9.8	75	12	3.1	0.25	
Third Portage Lake - East Basin								
TPE - 140	29-Mar-21	600	39,507	379,633	57,538	78,814	400	556,492
TPE - 141	29-Mar-21	1,000	85,806	205,674	85,806	43,253	400	421,940
TPE - 142	10-May-21	0	39,007	102,837	200	29,169	600	171,813
TPE - 143	10-May-21	100	32,015	113,475	1,300	40,607	100	187,597
TPE - 144	23-Jul-21	3,800	101,518	1,051,864	190,584	31,336	1,600	1,380,702
TPE - 145	23-Jul-21	2,800	14,968	1,395,896	142,696	8,384	1,600	1,566,344
TPE - 146	13-Aug-21	1,400	217,920	1,309,088	289,192	31,136	1,800	1,850,536
TPE - 147	13-Aug-21	2,000	208,736	1,230,664	280,424	38,320	1,600	1,761,744
TPE - 148	17-Sep-21	7,200	219,920	1,193,376	993,008	101,776	2,400	2,517,680
TPE - 149	17-Sep-21	5,200	218,520	1,268,200	1,090,200	66,656	600	2,649,376
Percent Density or Biomass		0.18	9.0	63	24	3.6	<0.1	



Table D1-1. Phytoplankton density (cells/L), biomass (mg/m3), and diversity by major taxa group, Meadowbank study lakes, 2021.

Area-Replicate	Date	Phytoplankton Density (cells/L)						TOTAL
		Cyanophyte	Chlorophyte	Chrysophyte	Diatom	Cryptophyte	Dinoflagellate	
Third Portage Lake - North Basin								
TPN - 140	29-Mar-21	200	280,542	117,321	143,244	4,046	0	545,353
TPN - 141	29-Mar-21	400	258,965	340,926	119,221	35,761	0	755,273
TPN - 142	10-May-21	200	74,868	260,165	36,461	33,115	1,300	406,109
TPN - 143	10-May-21	100	110,429	216,512	93,699	62,084	1,100	483,924
TPN - 144	29-Jul-21	1,400	424,256	834,389	147,480	24,552	2,000	1,434,077
TPN - 145	29-Jul-21	400	144,480	1,177,192	141,496	9,184	2,400	1,475,152
TPN - 146	10-Aug-21	30,736	246,456	715,616	319,696	24,152	8,784	1,345,440
TPN - 147	10-Aug-21	2,200	102,176	606,456	305,328	72,840	2,400	1,091,400
TPN - 148	17-Sep-21	2,600	103,376	513,664	325,880	23,152	600	969,272
TPN - 149	17-Sep-21	2,200	80,424	405,104	528,032	30,736	800	1,047,296
Percent Density or Biomass		0.42	19	54	23	3.3	0.20	
Third Portage Lake - South Basin								
TPS - 65	10-May-21	0	49,745	131,506	1,000	47,499	100	229,850
TPS - 66	10-May-21	0	49,745	113,475	3,746	35,961	1,000	203,928
Percent Density or Biomass		<0.1	23	56	1.1	19	0.25	
Second Portage Lake								
SP - 140	18-Mar-21	0	21,777	404,255	29,769	51,245	200	507,246
SP - 141	18-Mar-21	300	70,922	414,994	67,630	36,561	200	590,607
SP - 142	9-May-21	0	7,192	88,653	1,600	51,245	2,000	150,690
SP - 143	9-May-21	100	17,731	195,236	17,984	7,692	200	238,943
SP - 144	11-Jul-21	0	43,304	1,497,688	206,968	71,840	1,400	1,821,200
SP - 145	11-Jul-21	0	43,104	1,509,056	191,800	94,792	2,400	1,841,152
SP - 146	6-Aug-21	28,736	496,896	648,160	322,096	10,584	1,000	1,507,472
SP - 147	6-Aug-21	14,368	80,424	1,138,072	310,528	75,240	400	1,619,032
SP - 148	3-Sep-21	7,184	245,256	1,191,360	203,368	30,336	1,400	1,678,904
SP - 149	3-Sep-21	0	281,976	1,109,936	521,864	8,784	1,200	1,923,760
Percent Density or Biomass		0.43	11	69	16	3.7	<0.1	



Table D1-1. Phytoplankton density (cells/L), biomass (mg/m3), and diversity by major taxa group, Meadowbank study lakes, 2021.

Area-Replicate	Date	Phytoplankton Density (cells/L)						TOTAL
		Cyanophyte	Chlorophyte	Chrysophyte	Diatom	Cryptophyte	Dinoflagellate	
Tehok Lake								
TE - 100	9-Mar-21	3,200	70,922	397,163	60,684	39,507	100	571,576
TE - 101	9-Mar-21	1,400	95,845	258,865	24,923	57,038	200	438,270
Percent Density or Biomass		0.46	17	65	8.5	9.6	<0.1	
Tehok Lake - Far-field								
TEFF - 52	9-Mar-21	100	266,058	220,258	28,469	36,261	1,600	552,746
TEFF - 53	9-Mar-21	4,800	78,514	316,003	14,584	32,315	3,846	450,063
Percent Density or Biomass		0.49	34	53	4.3	6.8	0.54	
Wally Lake								
WAL - 109	18-Mar-21	0	18,231	290,780	30,069	40,007	100	379,187
WAL - 110	18-Mar-21	0	32,015	276,696	37,261	23,377	100	369,448
WAL - 111	9-May-21	0	35,661	81,560	8,692	3,846	0	129,760
WAL - 112	9-May-21	3,546	39,707	95,745	4,646	53,992	400	198,036
WAL - 113	11-Jul-21	0	72,240	2,175,216	264,488	73,640	3,200	2,588,784
WAL - 114	11-Jul-21	0	44,304	2,287,344	240,352	145,680	3,000	2,720,680
WAL - 115	10-Aug-21	600	368,984	1,708,408	99,592	254,440	1,800	2,433,824
WAL - 116	10-Aug-21	29,136	418,472	1,564,928	82,840	127,328	400	2,223,104
WAL - 117	3-Sep-21	2,600	470,560	1,195,344	79,040	52,288	2,000	1,801,832
WAL - 118	3-Sep-21	2,200	433,256	1,278,168	133,344	145,880	9,784	2,002,632
Percent Density or Biomass		0.26	13	74	6.6	6.2	0.14	
All 2021 Locations								
Relative Density or Biomass (%)		0.46	12	68	15	4.4	0.15	



Figure D1-1. Cyanophyte biomass (mg/m<sup>3</sup>) from Meadowbank study lakes since 2006.

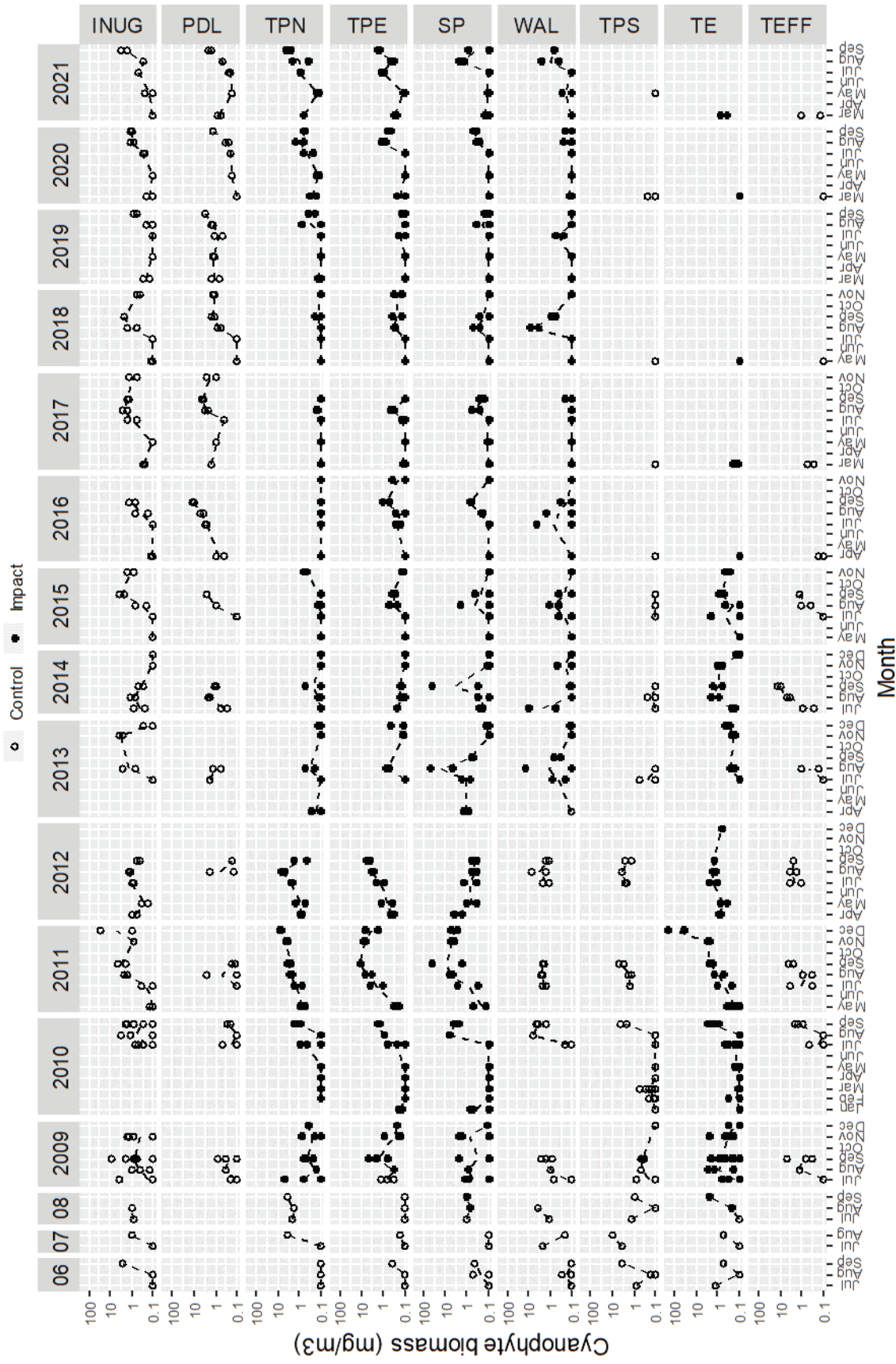


Figure D1-2. Chlorophyte biomass (mg/m<sup>3</sup>) from Meadowbank study lakes since 2006.

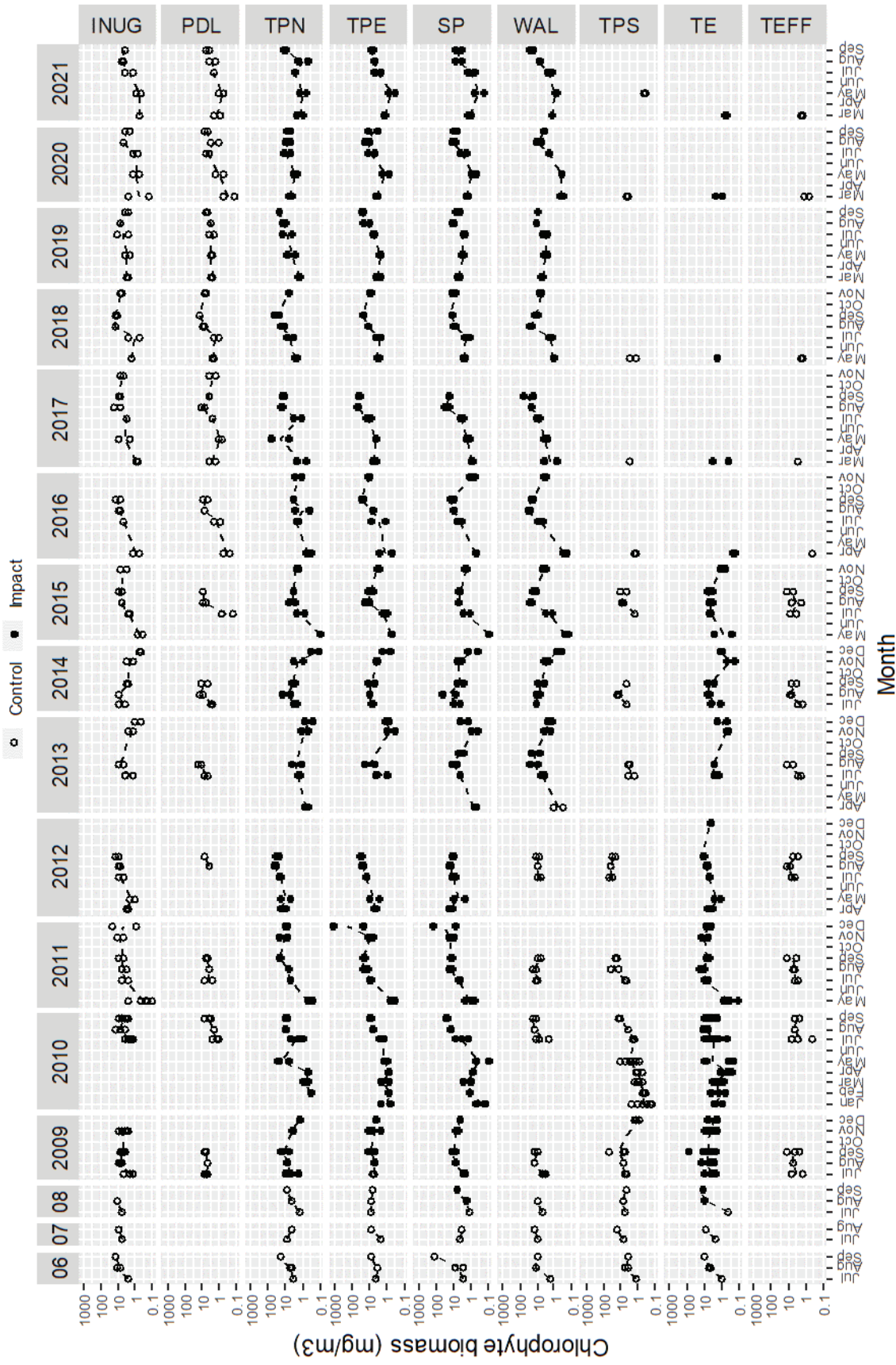
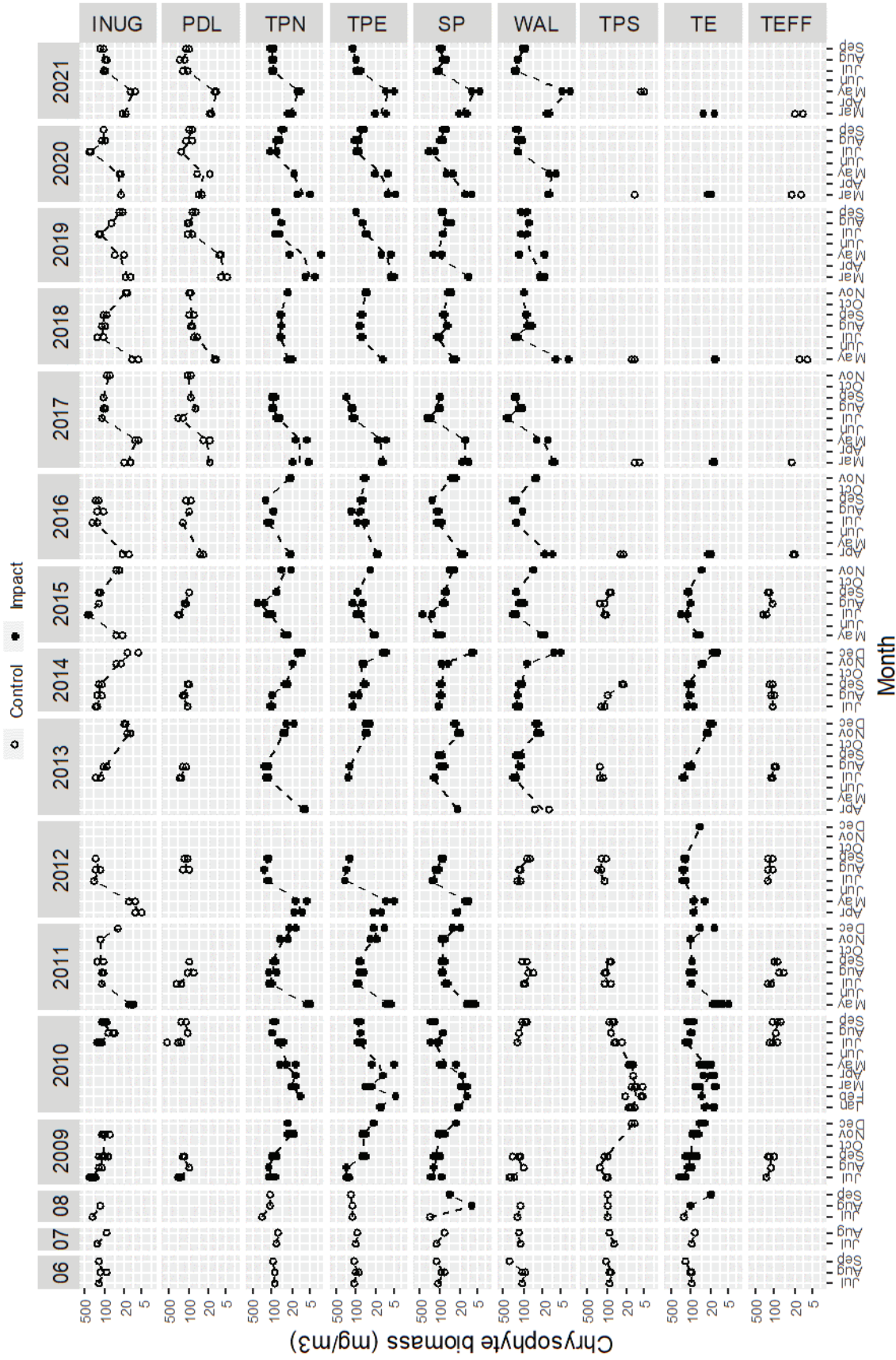


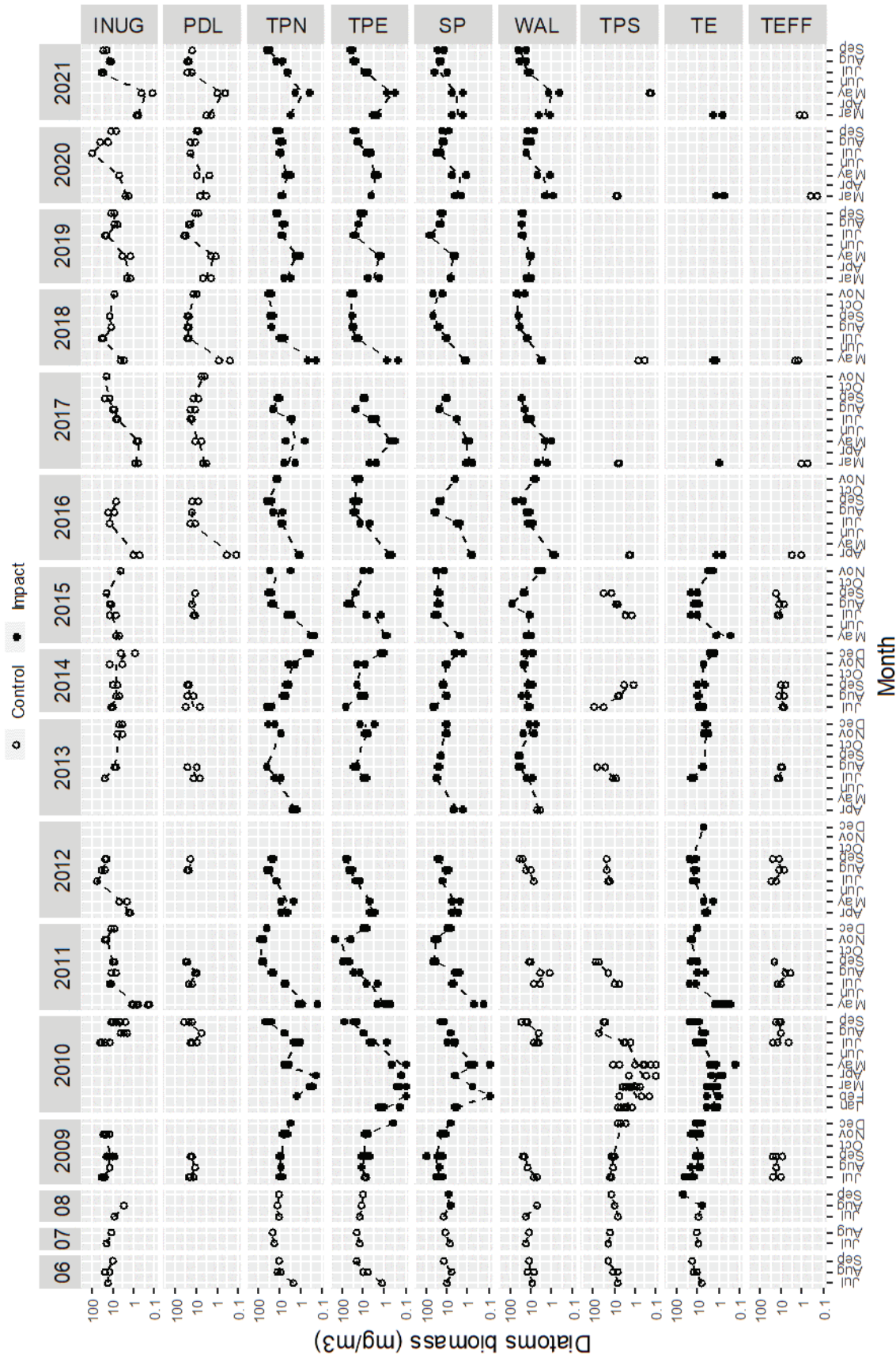


Figure D1-3. Chrysophyte biomass (mg/m<sup>3</sup>) from Meadowbank study lakes since 2006.



Appendix D1:

Figure D1-4. Diatom biomass (mg/m<sup>3</sup>) from Meadowbank study lakes since 2006.

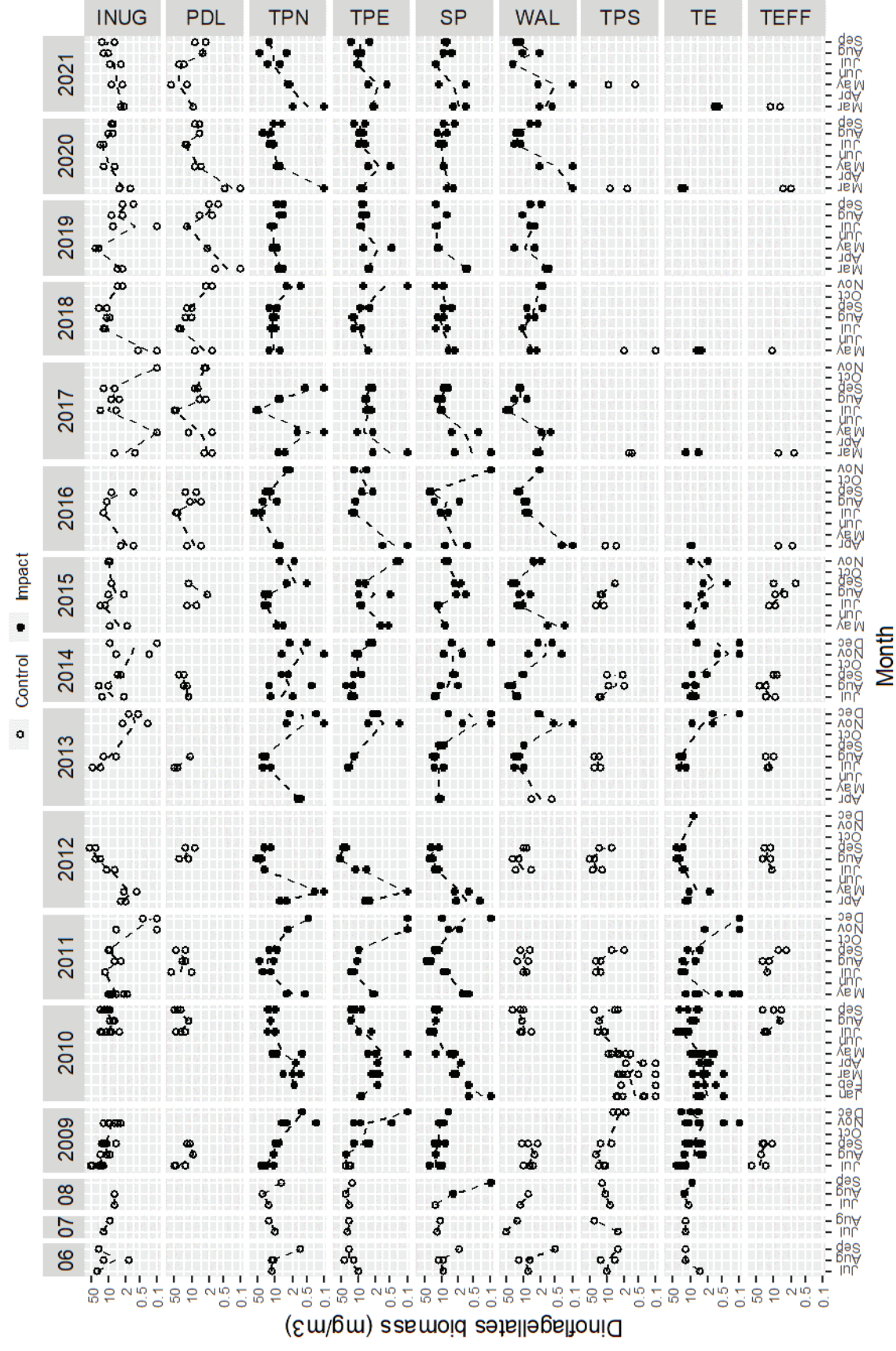


## Phytoplankton Taxonomy – Meadowbank Study Area Lakes

**Figure D1-5. Cryptophyte biomass (mg/m<sup>3</sup>) from Meadowbank study lakes since 2006.**





Figure D1-6. Dinoflagellate biomass ( $\text{mg}/\text{m}^3$ ) from Meadowbank study lakes since 2006.

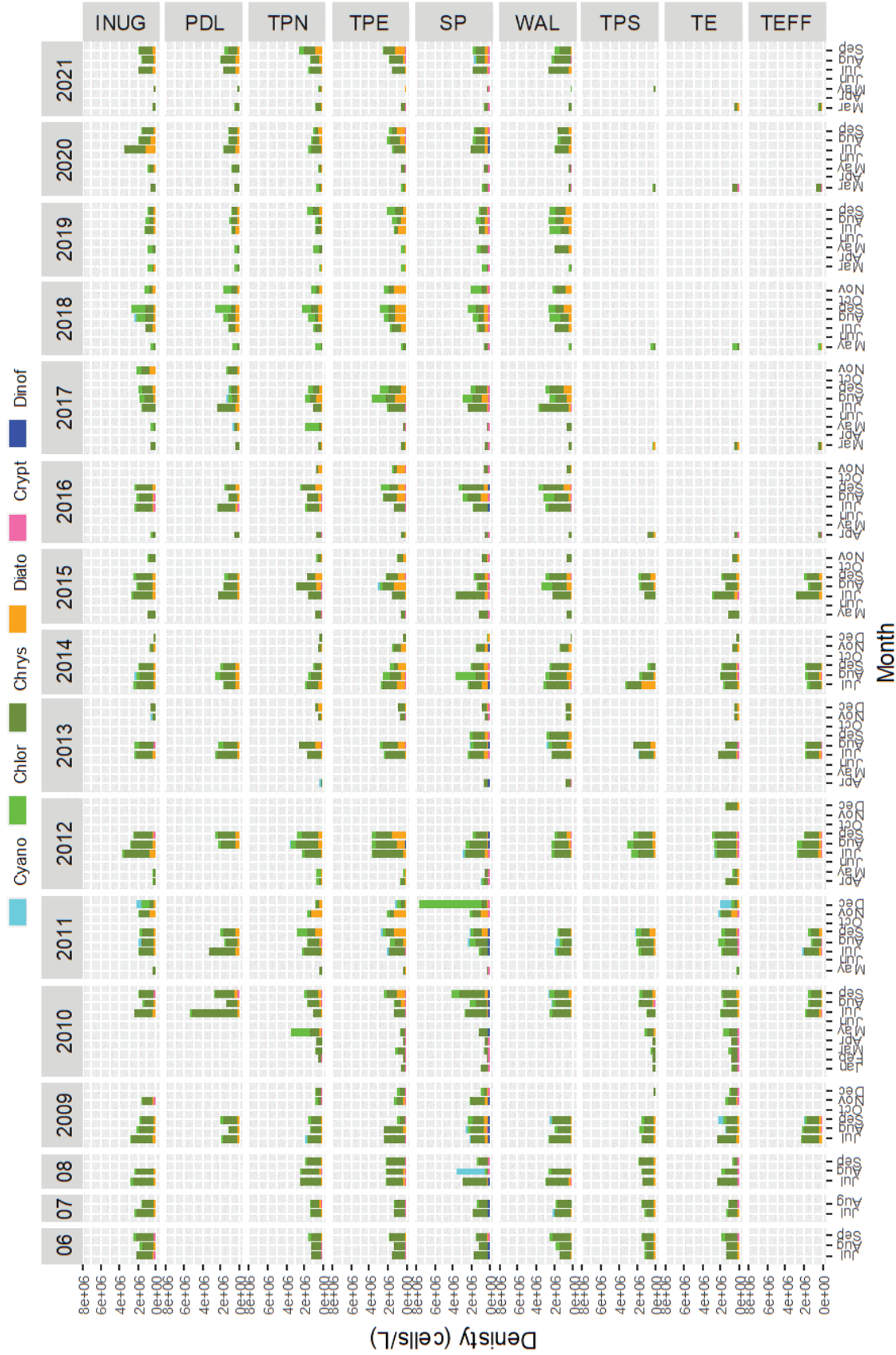
Appendix D1:

Phytoplankton Taxonomy – Meadowbank Study Area Lakes

March 2022

Figure D1-7. Phytoplankton density (cells/L) by major taxa group from Meadowbank study lakes since 2006.

Note: High chlorophyll value in December 2011 at TPE omitted.





Appendix D1:

Phytoplankton Taxonomy – Meadowbank Study Area Lakes

March 2022

Figure D1-8. Relative phytoplankton density by major taxa group from Meadowbank study lakes since 2006.

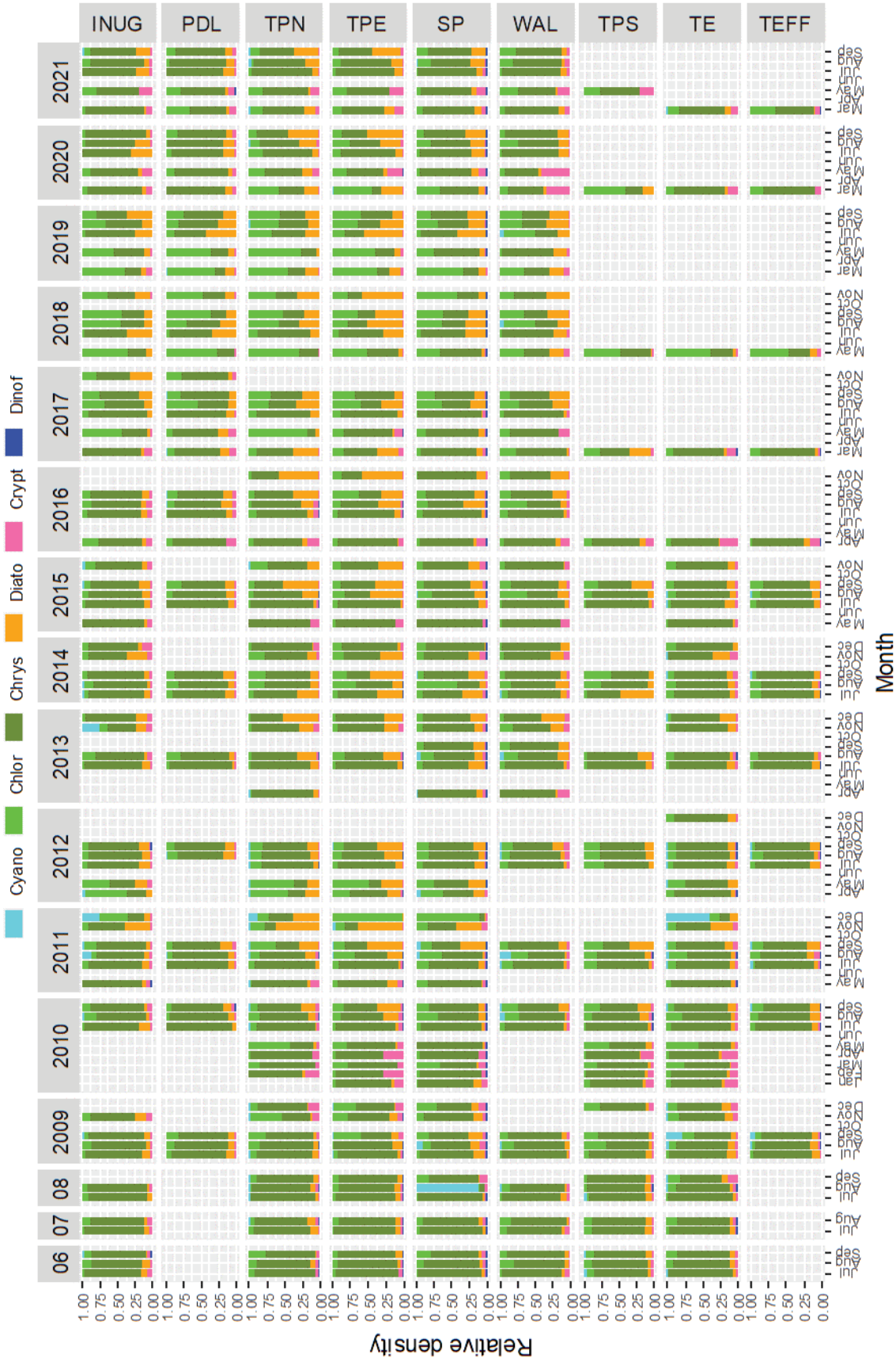
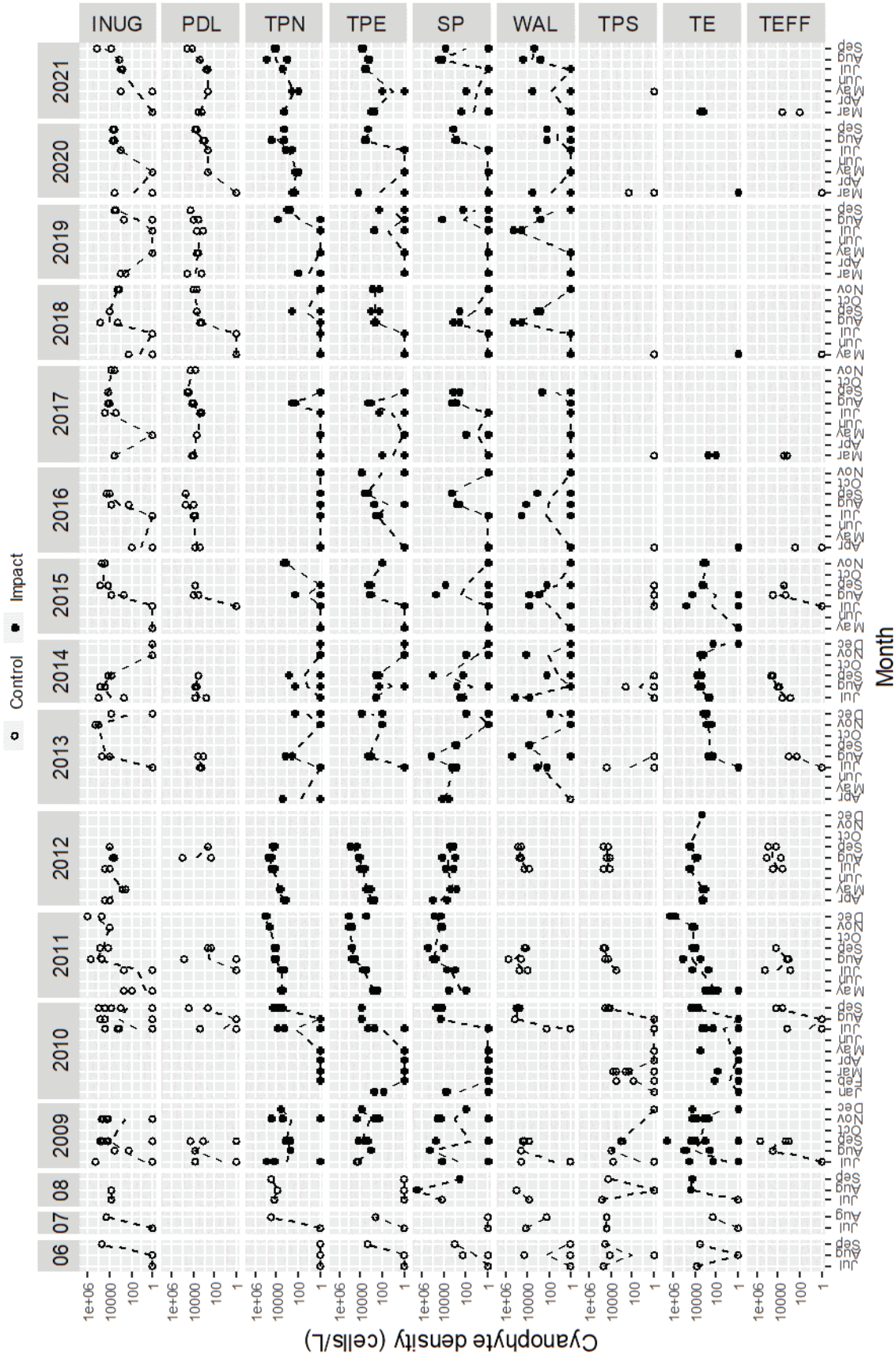
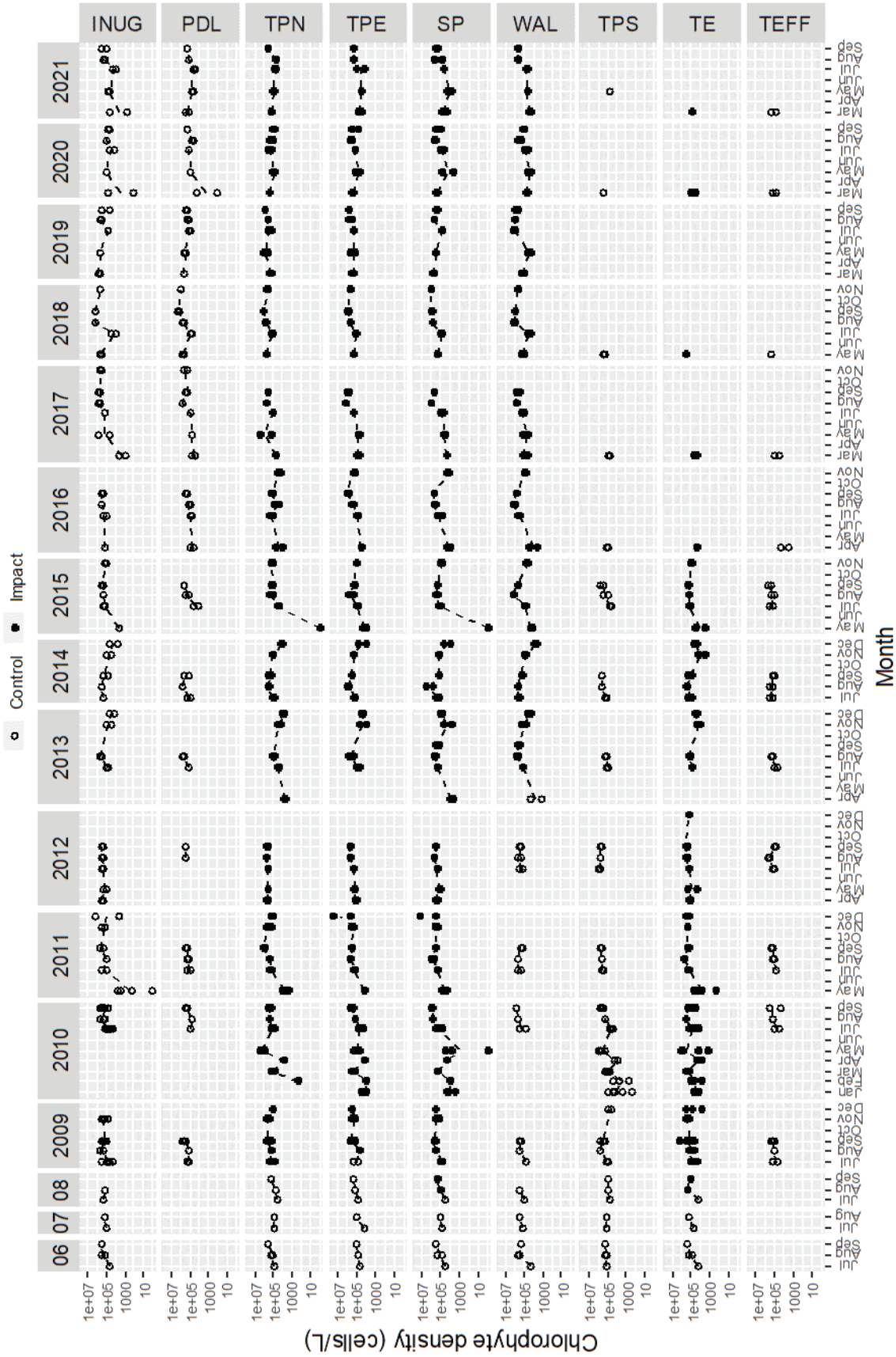


Figure D1-9. Cyanophyte density (cells/L) by major taxa group from Meadowbank study lakes since 2006.



Appendix D1:

Figure D1-10. Chlorophyte density (cells/L) by major taxa group from Meadowbank study lakes since 2006.



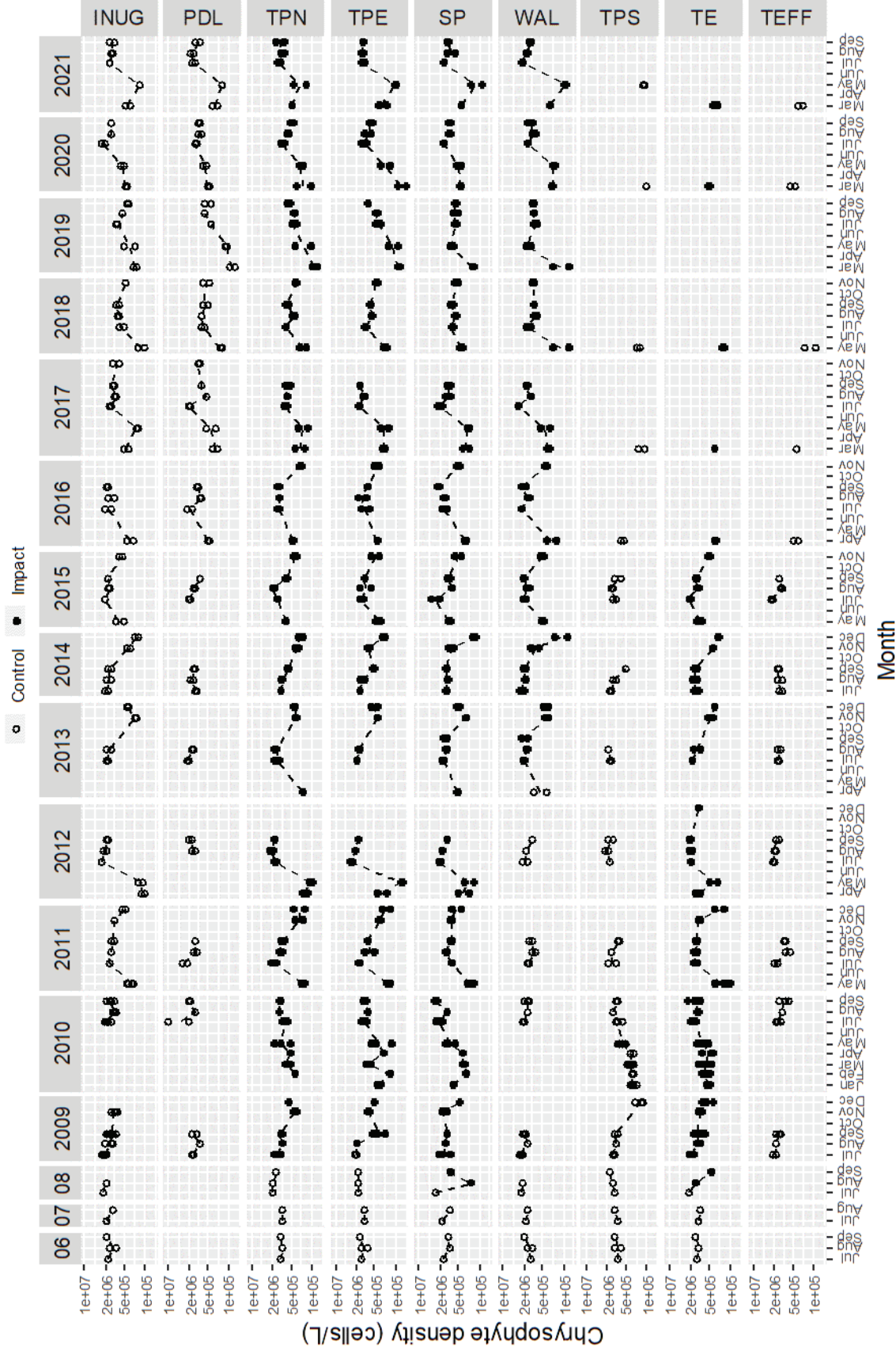


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Phytoplankton Taxonomy – Meadowbank Study Area Lakes

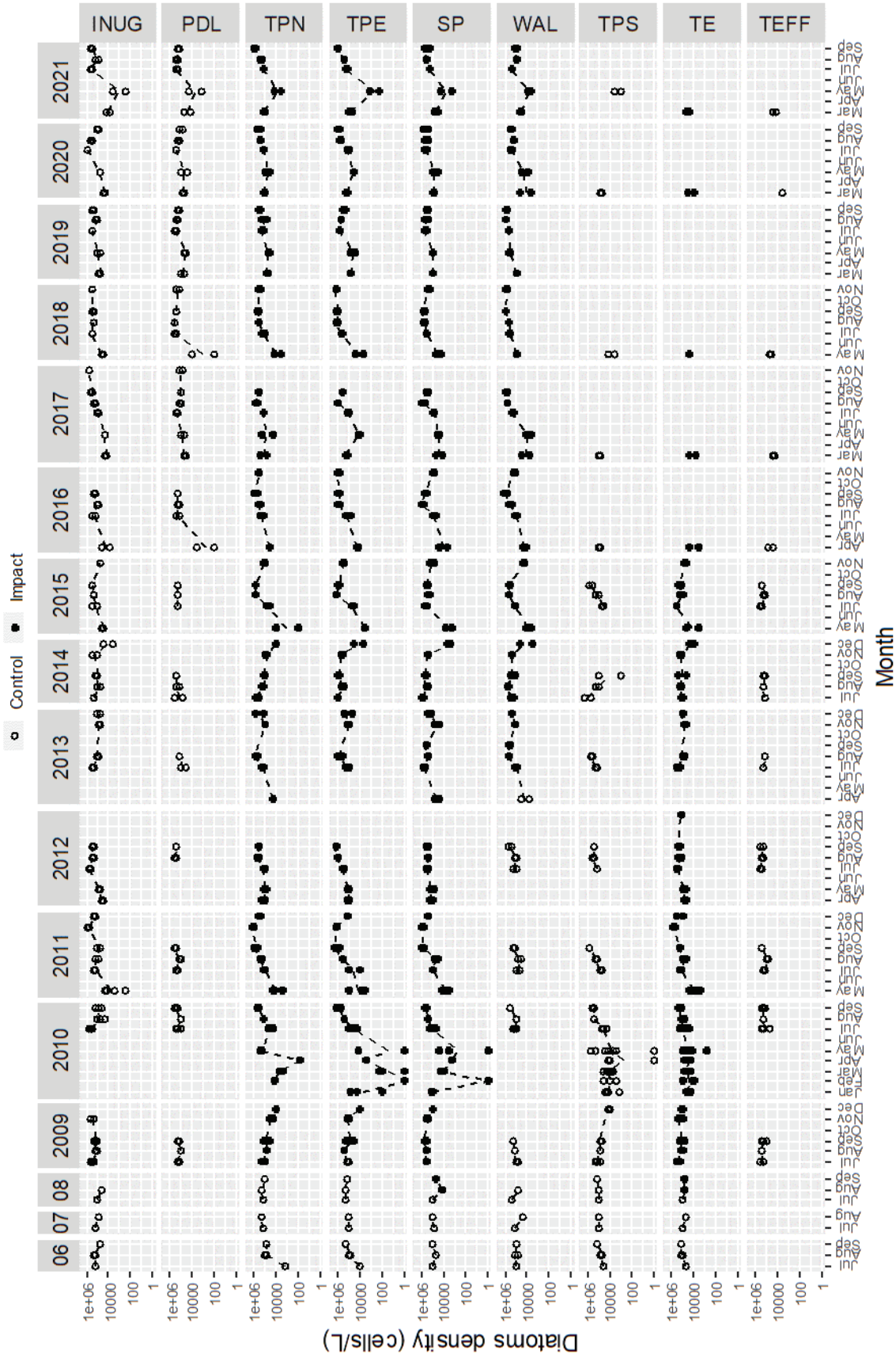
March 2022

**Figure D1-11. Chrysophyte density (cells/L) by major taxa group from Meadowbank study lakes since 2006.**



Appendix D1:

Figure D1-12. Diatoms density (cells/L) by major taxa group from Meadowbank study lakes since 2006.



# Appendix D1:

Phytoplankton Taxonomy – Meadowbank Study Area Lakes

March 2022

Figure D1-13. Cryptophytes density (cells/L) by major taxa group from Meadowbank study lakes since 2006.

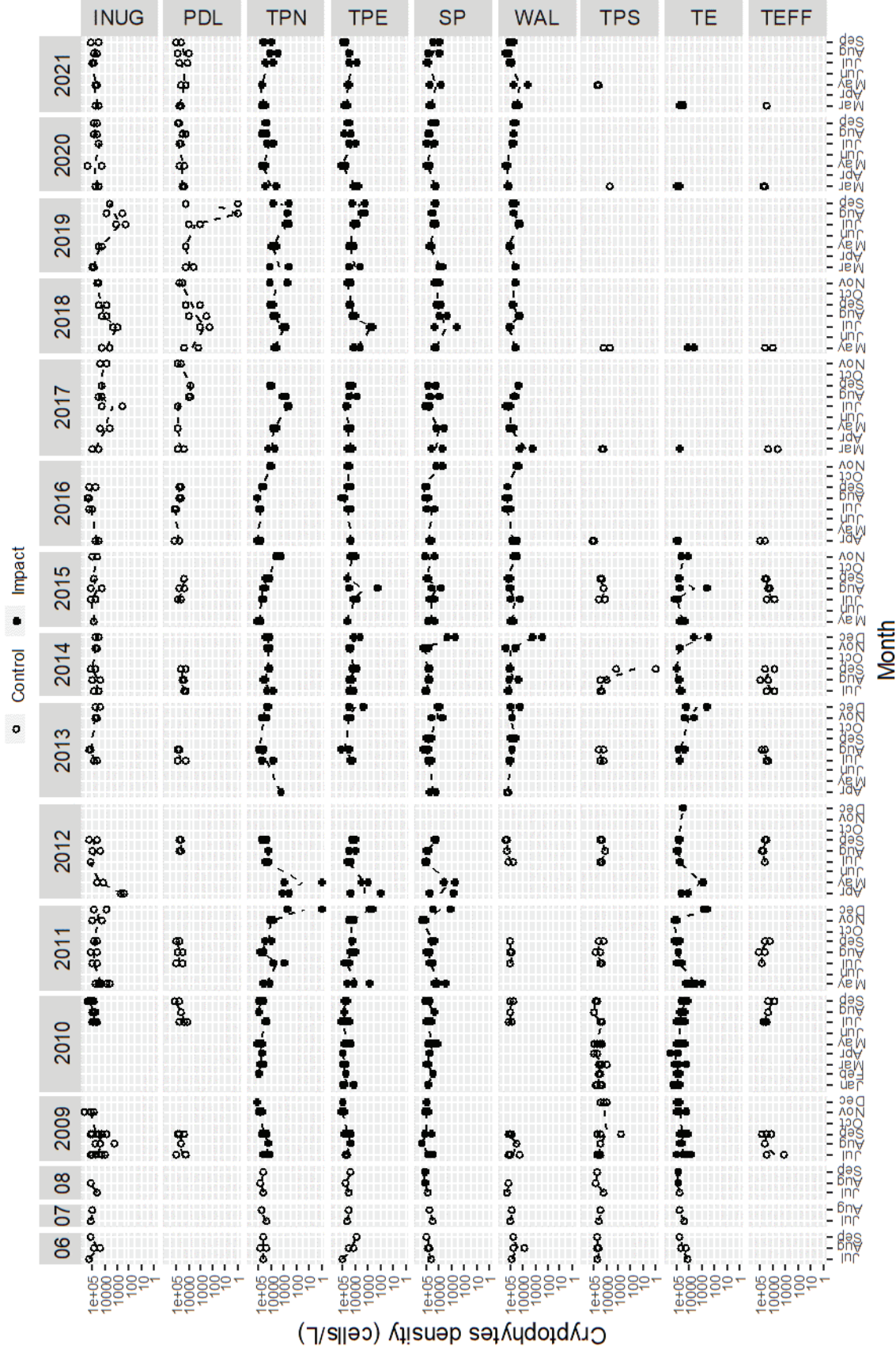




Figure D1-14. Dinoflagellates density (cells/L) by major taxa group from Meadowbank study lakes since 2006.

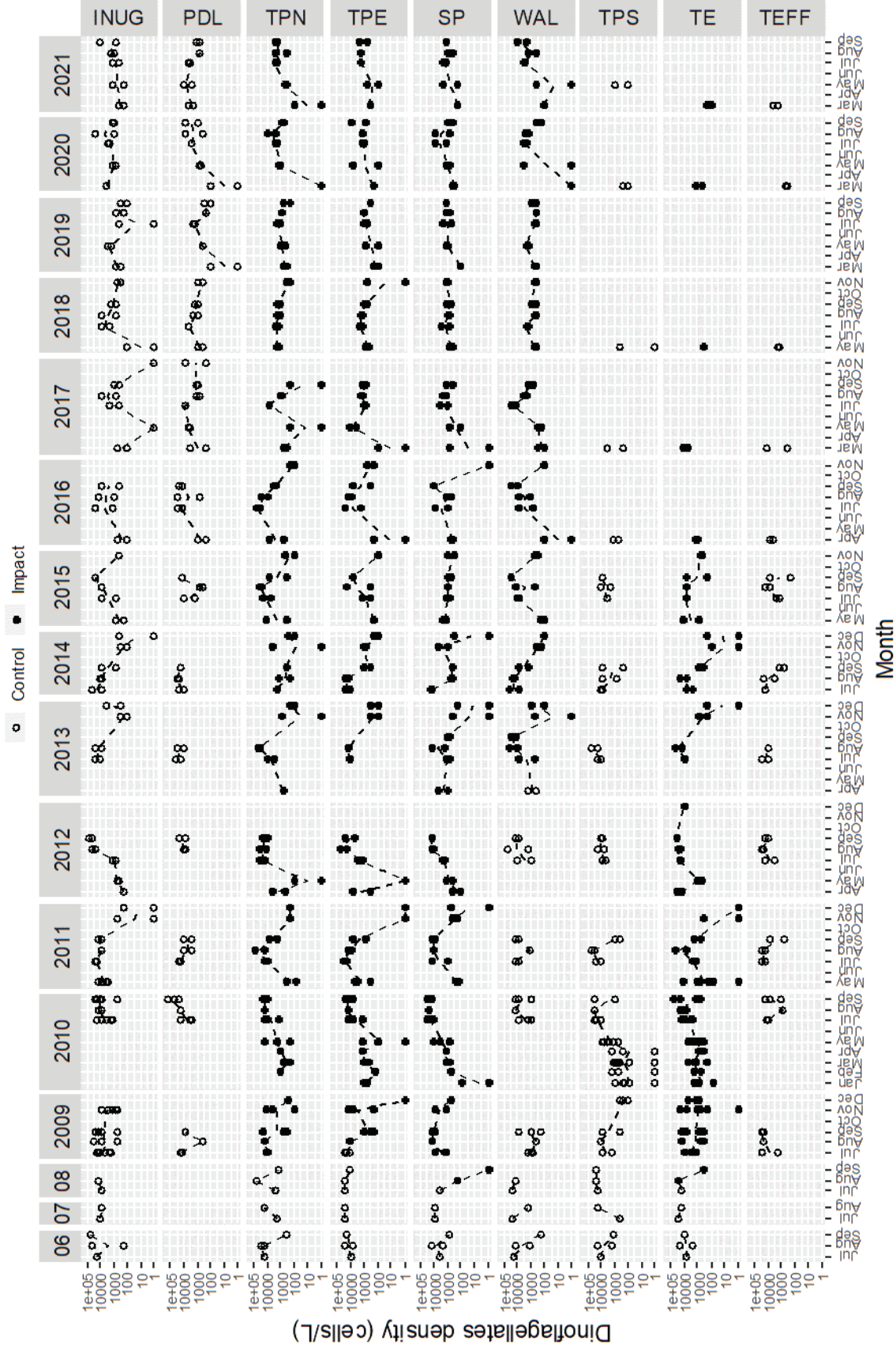
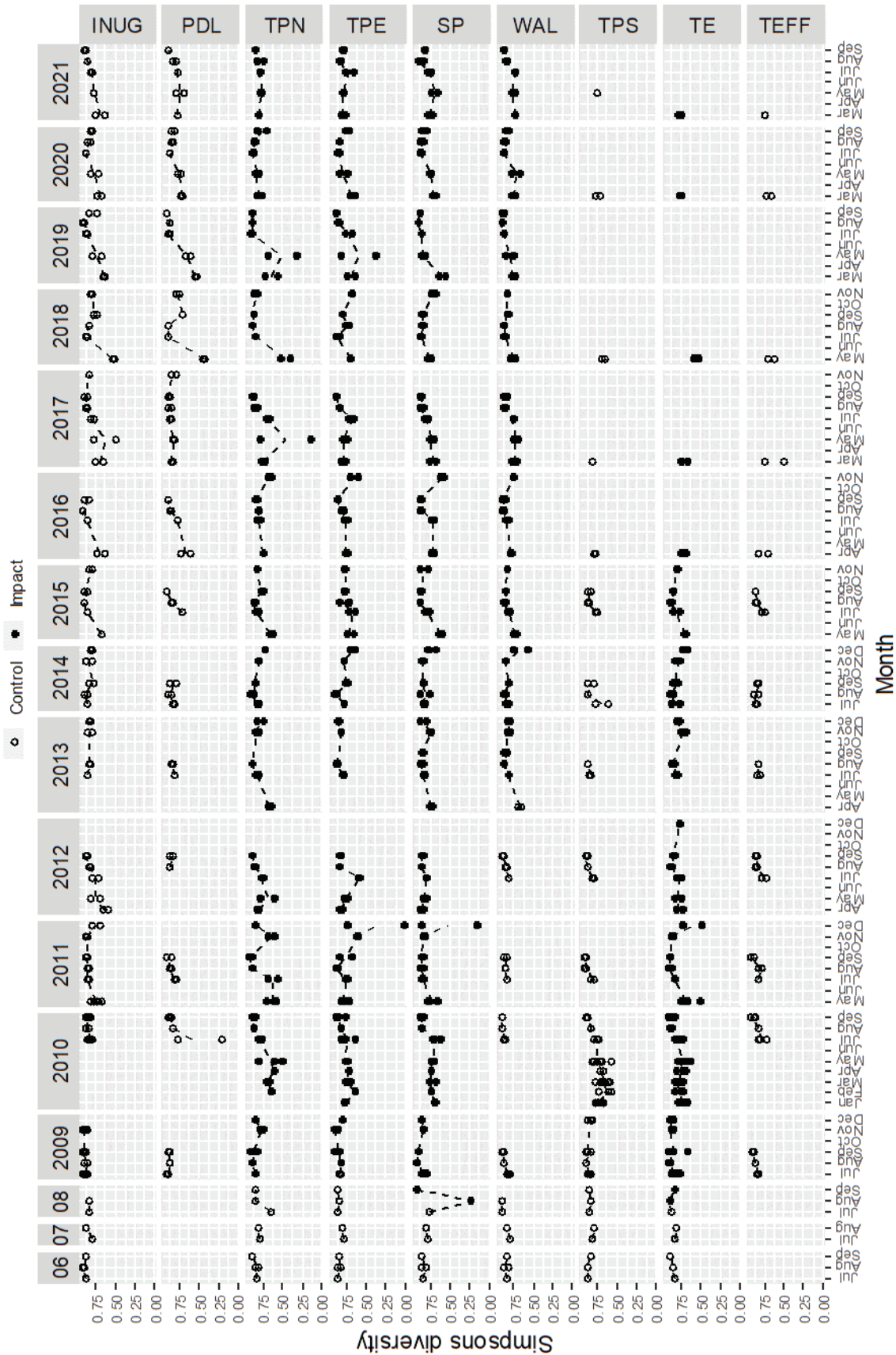


Figure D1-15. Simpsons' Diversity for the phytoplankton community from Meadowbank study lakes since 2006.



## Appendix D2

### Phyto Data – Whale Tail Study Area Lakes

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Table D2-1. Phytoplankton density (cells/L), biomass (mg/m3), and diversity by major taxa group, Whale Tail Pit study lakes, 2021.

Area-Replicate	Date	Phytoplankton Biomass (mg/m <sup>3</sup> )					TOTAL	Taxa Richness	Simpson's Diversity	
		Cyanophyte	Chlorophyte	Chrysophyte	Diatom	Cryptophyte				Dinoflagellate
Mammoth Lake										
MAM - 57	25-Mar-21	0	0.22	11	3.8	7.6	13	36	16	0.80
MAM - 58	25-Mar-21	0	0.67	17	3.9	11	6.3	39	16	0.79
MAM - 59	12-May-21	0	2.8	15	2.8	6.6	4.6	32	14	0.74
MAM - 60	12-May-21	0	0.51	13	2.8	9.8	7.0	33	18	0.74
MAM - 61	9-Jul-21	0	2.4	414	24	22	22	485	24	0.87
MAM - 62	9-Jul-21	0	0	450	31	35	32	548	19	0.87
MAM - 63	7-Aug-21	0	1.9	429	139	55	5.6	631	28	0.63
MAM - 64	7-Aug-21	0	4.8	454	144	67	5.8	674	29	0.69
MAM - 65	9-Sep-21	0	4.4	1,072	253	36	2.9	1,369	27	0.62
MAM - 66	9-Sep-21	0	7.8	867	215	26	0.74	1,117	31	0.61
Percent Density or Biomass		<0.1	0.52	75	17	5.6	2.0			
Nemo Lake										
NEM - 57	24-Mar-21	0	0.60	25	2.3	42	86	156	24	0.75
NEM - 58	24-Mar-21	0	2.4	11	0.87	62	95	171	17	0.59
NEM - 59	6-May-21	0	3.2	54	1.2	3.5	33	46	16	0.75
NEM - 60	6-May-21	0	0.53	10	2.4	15	16	44	13	0.79
NEM - 61	10-Jul-21	0	1.7	77	55	4.0	9.1	147	22	0.81
NEM - 62	10-Jul-21	0	0.52	171	66	18	12	268	23	0.84
NEM - 63	7-Aug-21	0	5.7	63	93	10	2.1	174	24	0.73
NEM - 64	7-Aug-21	0	6.7	84	85	12	0	188	25	0.75
NEM - 65	9-Sep-21	0	21	156	96	19	29	322	31	0.89
NEM - 66	9-Sep-21	0.10	23	147	122	24	1.4	318	33	0.89
Percent Density or Biomass		<0.1	3.6	41	29	11	15			
Whale Tail South										
WTS - 57	25-Mar-21	0	1.2	18	0.55	0.80	0.61	21	11	0.62
WTS - 58	25-Mar-21	0	0.18	12	0.18	3.1	1.6	17	15	0.75
WTS - 59	12-May-21	0	0.25	13	0.79	1.2	1.2	17	11	0.71
WTS - 60	13-May-21	0	0.47	14	0.71	1.2	4.9	21	14	0.74
WTS - 61	8-Jul-21	0	3.7	236	10	31	5.3	286	28	0.82
WTS - 62	8-Jul-21	0	1.0	200	7.7	50	9.8	268	27	0.82
WTS - 63	10-Aug-21	0.10	12	279	47	108	10	457	37	0.82
WTS - 64	10-Aug-21	0	14	326	96	115	8.8	560	35	0.85
WTS - 65	8-Sep-21	0	8.6	127	134	71	36	376	36	0.82
WTS - 66	8-Sep-21	0	16	127	155	86	41	425	39	0.84
Percent Density or Biomass		<0.1	2.4	55	18	19	4.9			



Table D2-1. Phytoplankton density (cells/L), biomass (mg/m3), and diversity by major taxa group, Whale Tail Pit study lakes, 2021.

Area-Replicate	Date	Phytoplankton Biomass (mg/m <sup>3</sup> )					Taxa Richness	Simpson's Diversity		
		Cyanophyte	Chlorophyte	Chrysophyte	Diatom	Cryptophyte	Dinoflagellate		TOTAL	
Lake A-20										
A20 - 51	24-Mar-21	0	0	17	0.33	5.1	0	22	10	0.62
A20 - 52	24-Mar-21	0	0.087	15	0.78	54	8.8	79	16	0.66
A20 - 53	12-May-21	0	0.095	11	0.87	24	29	66	12	0.72
A20 - 54	12-May-21	0	0.17	24	3.4	29	4.3	61	17	0.72
A20 - 55	11-Jul-21	0	2.7	524	23	37	44	631	28	0.90
A20 - 56	11-Jul-21	0	0.37	534	9.7	82	16	642	23	0.89
A20 - 57	10-Aug-21	0	7.5	888	13	67	26	1,001	28	0.85
A20 - 58	10-Aug-21	0.045	4.1	905	16	72	15	1,012	30	0.87
A20 - 59	9-Sep-21	0	1.2	613	143	51	24	833	32	0.76
A20 - 60	9-Sep-21	0	2.8	573	164	55	24	820	33	0.79
Percent Density or Biomass		<0.1	0.37	79	7.2	9.2	3.7			
Lake A-76										
A76 - 51	7-May-21	0	2.0	13	4.6	10	7.0	37	20	0.81
A76 - 52	7-May-21	0	2.8	19	6.4	8.2	8.8	45	19	0.83
A76 - 53	17-Jul-21	0	0.060	156	34	38	16	245	20	0.85
A76 - 54	17-Jul-21	0	0.87	165	31	37	23	256	21	0.86
A76 - 55	7-Aug-21	0	3.5	320	319	26	6.5	675	32	0.70
A76 - 56	7-Aug-21	0.18	2.5	247	141	29	5.3	425	30	0.73
A76 - 57	12-Sep-21	0	2.7	576	271	61	16	927	32	0.74
A76 - 58	12-Sep-21	0	2.1	564	267	50	13	896	35	0.70
Percent Density or Biomass		<0.1	0.47	59	31	7.4	2.7			
Lake DS-1										
DS1 - 49	7-May-21	0	1.9	293	4.3	11	31	341	26	0.72
DS1 - 50	7-May-21	0	1.7	240	6.2	16	33	297	24	0.74
DS1 - 51	19-Jul-21	0	1.5	234	40	6.3	31	313	29	0.82
DS1 - 52	19-Jul-21	0	2.7	201	12	18	21	255	31	0.83
DS1 - 53	15-Aug-21	0	5.6	111	3.5	14	8.9	143	37	0.83
DS1 - 54	15-Aug-21	0	8.4	74	2.8	6.3	5.0	97	33	0.79
DS1 - 55	12-Sep-21	0.068	4.9	110	19	15	50	199	41	0.85
DS1 - 56	12-Sep-21	0	3.4	101	12	21	24	161	36	0.83
Percent Density or Biomass		<0.1	1.7	75	5.6	6.0	11			
All 2021 Locations										
Relative Density or Biomass (%)		<0.1	1.1	68	17	9.1	5.0			



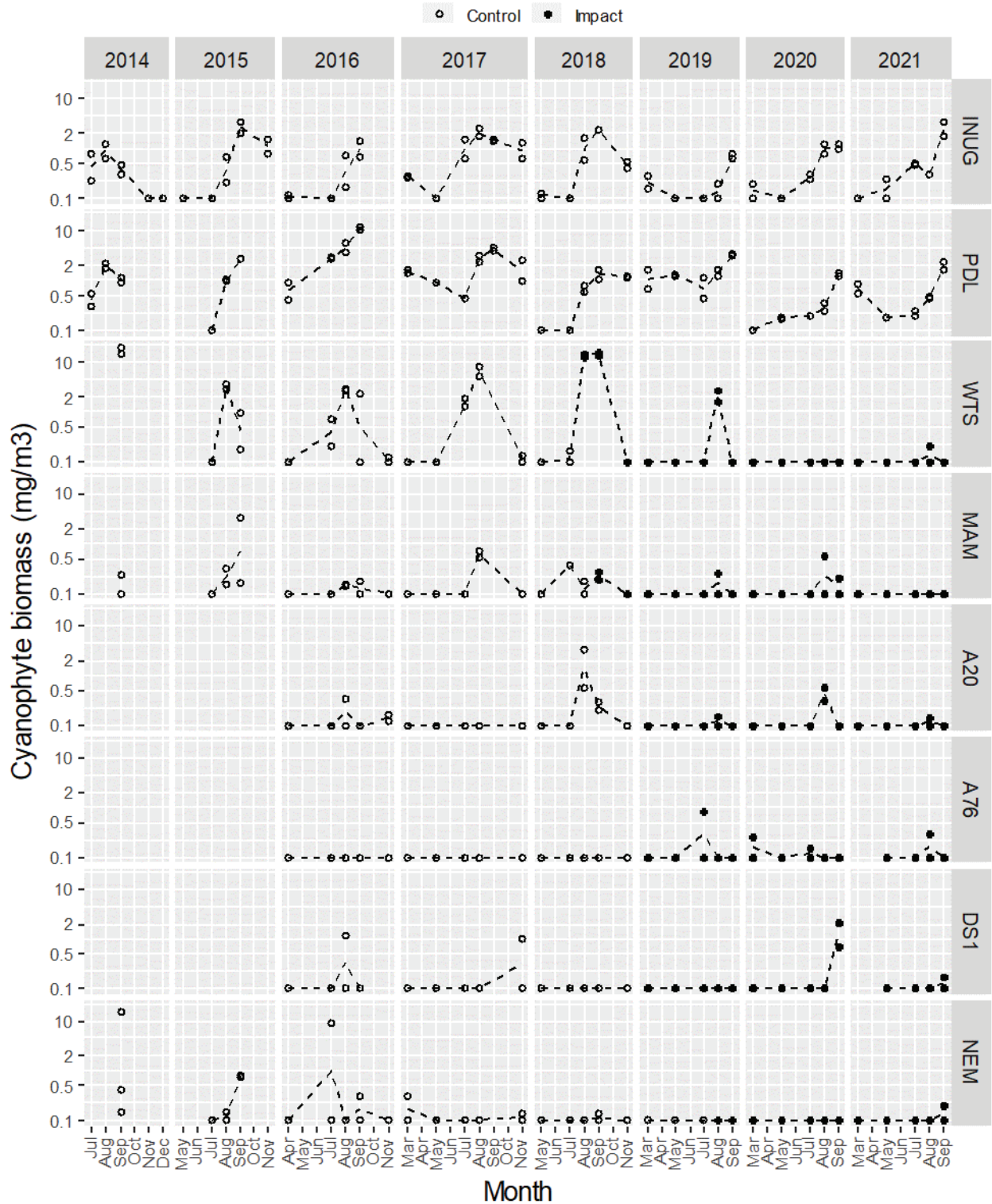
Table D2-1. Phytoplankton density (cells/L), biomass (mg/m3), and diversity by major taxa group, Whale Tail Pit study lakes, 2021.

Area-Replicate	Date	Phytoplankton Density (cells/L)						TOTAL
		Cyanophyte	Chlorophyte	Chrysophyte	Diatom	Cryptophyte	Dinoflagellate	
Mammoth Lake								
MAM - 57	25-Mar-21	0	17,731	219,858	61,884	47,699	5,446	352,618
MAM - 58	25-Mar-21	0	3,546	273,150	41,607	72,322	4,146	394,771
MAM - 59	12-May-21	0	134,752	248,227	20,831	36,261	700	440,770
MAM - 60	12-May-21	0	88,653	205,774	40,561	38,461	1,100	374,548
MAM - 61	9-Jul-21	0	36,920	2,967,288	396,568	74,056	3,800	3,478,632
MAM - 62	9-Jul-21	0	0	3,114,968	672,760	121,960	4,400	3,914,088
MAM - 63	7-Aug-21	0	158,048	1,934,040	3,343,504	48,552	1,400	5,485,544
MAM - 64	7-Aug-21	0	395,120	2,527,112	3,692,736	67,520	1,400	6,683,888
MAM - 65	9-Sep-21	0	193,968	4,398,424	6,841,080	33,368	600	11,467,440
MAM - 66	9-Sep-21	0	288,360	3,658,592	6,097,512	28,168	200	10,072,832
Percent Density or Biomass		<0.1	3.1	46	50	1.3	<0.1	
Nemo Lake								
NEM - 57	24-Mar-21	0	18,031	323,095	26,223	322,549	16,446	706,343
NEM - 58	24-Mar-21	0	10,938	237,589	39,507	476,877	14,300	779,212
NEM - 59	6-May-21	0	138,398	109,929	39,807	18,231	3,700	310,065
NEM - 60	6-May-21	0	67,376	131,306	43,553	89,353	2,100	333,687
NEM - 61	10-Jul-21	0	29,536	1,489,704	1,133,352	22,752	800	2,676,144
NEM - 62	10-Jul-21	0	35,920	1,498,088	864,360	119,344	1,800	2,519,512
NEM - 63	7-Aug-21	0	309,712	635,592	1,525,640	19,968	200	2,491,112
NEM - 64	7-Aug-21	0	167,432	993,792	1,330,672	20,568	0	2,512,464
NEM - 65	9-Sep-21	0	835,544	1,756,296	711,680	45,320	200	3,349,040
NEM - 66	9-Sep-21	200	906,784	1,741,928	664,008	54,304	200	3,367,424
Percent Density or Biomass		<0.1	13	47	33	6.2	0.21	
Whale Tail South								
WTS - 57	25-Mar-21	0	3,546	290,880	7,192	3,946	100	305,665
WTS - 58	25-Mar-21	0	31,915	343,972	3,646	32,315	300	412,148
WTS - 59	12-May-21	0	3,546	216,412	32,015	3,946	200	256,119
WTS - 60	13-May-21	0	17,731	248,227	21,477	3,946	800	292,180
WTS - 61	8-Jul-21	0	71,840	2,391,288	145,096	271,608	1,000	2,880,832
WTS - 62	8-Jul-21	0	57,472	1,994,968	94,608	261,256	1,800	2,410,104
WTS - 63	10-Aug-21	200	891,016	3,923,464	302,336	257,736	1,600	5,376,352
WTS - 64	10-Aug-21	0	985,008	4,067,744	382,008	260,936	1,600	5,697,296
WTS - 65	8-Sep-21	0	474,744	1,811,568	2,057,520	279,224	1,400	4,624,456
WTS - 66	8-Sep-21	0	619,024	2,135,048	2,145,760	200,032	2,200	5,102,064
Percent Density or Biomass		<0.1	12	64	19	5.8	<0.1	

Table D2-1. Phytoplankton density (cells/L), biomass (mg/m3), and diversity by major taxa group, Whale Tail Pit study lakes, 2021.

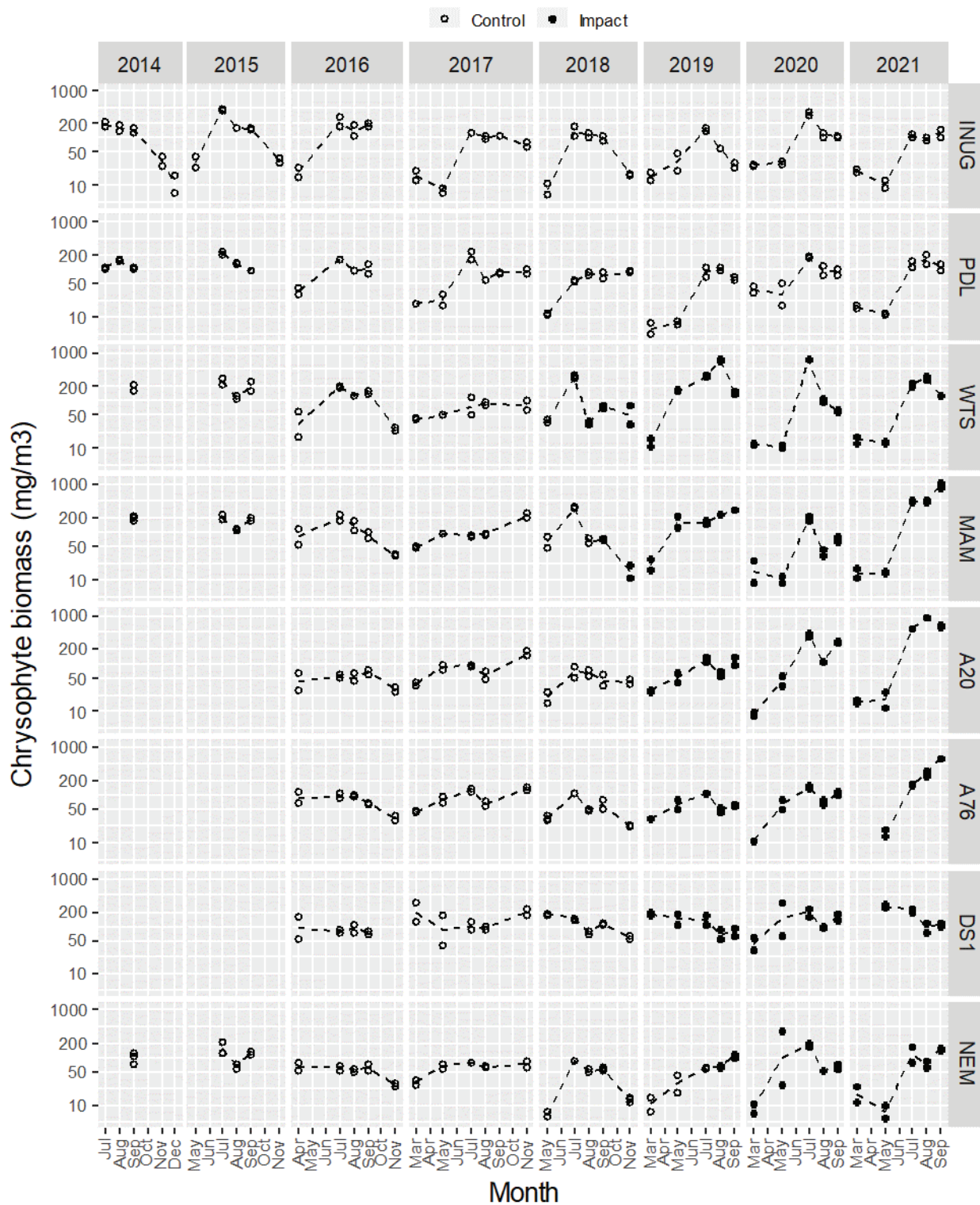
Area-Replicate	Date	Phytoplankton Density (cells/L)						TOTAL
		Cyanophyte	Chlorophyte	Chrysophyte	Diatom	Cryptophyte	Dinoflagellate	
Lake A-20								
A20 - 51	24-Mar-21	0	0	329,787	7,392	26,523	0	363,702
A20 - 52	24-Mar-21	0	3,546	291,080	3,846	303,334	1,100	602,907
A20 - 53	12-May-21	0	3,546	187,943	32,915	108,237	4,600	337,241
A20 - 54	12-May-21	0	7,192	453,901	53,992	140,052	700	655,836
A20 - 55	11-Jul-21	0	107,960	3,100,096	230,352	225,120	7,000	3,670,528
A20 - 56	11-Jul-21	0	79,024	3,110,496	115,592	173,496	2,400	3,481,008
A20 - 57	10-Aug-21	0	346,632	1,529,832	14,600	140,944	12,584	2,044,592
A20 - 58	10-Aug-21	200	194,768	1,409,336	18,600	205,400	3,400	1,831,704
A20 - 59	9-Sep-21	0	72,240	3,476,600	157,608	75,088	3,200	3,784,736
A20 - 60	9-Sep-21	0	107,960	3,213,376	209,712	104,224	3,400	3,638,672
Percent Density or Biomass		<0.1	4.5	84	4.1	7.4	0.19	
Lake A-76								
A76 - 51	7-May-21	0	138,798	204,682	33,338	38,061	1,100	415,979
A76 - 52	7-May-21	0	159,575	230,597	36,138	43,553	1,400	471,263
A76 - 53	17-Jul-21	0	14,368	1,822,984	357,712	108,592	2,400	2,306,056
A76 - 54	17-Jul-21	0	57,472	1,895,024	318,776	120,160	2,400	2,393,832
A76 - 55	7-Aug-21	0	151,664	1,777,096	2,416,032	48,520	1,600	4,394,912
A76 - 56	7-Aug-21	800	86,608	1,271,416	1,583,744	49,920	1,200	2,993,688
A76 - 57	12-Sep-21	0	129,512	3,333,104	3,775,376	121,392	2,000	7,361,384
A76 - 58	12-Sep-21	0	87,208	3,063,112	3,986,880	81,672	1,400	7,220,272
Percent Density or Biomass		<0.1	3.0	49	45	2.2	<0.1	
Lake DS-1								
DS1 - 49	7-May-21	0	57,472	1,406,128	78,456	88,808	3,400	1,634,264
DS1 - 50	7-May-21	0	28,736	1,191,992	91,024	132,312	3,600	1,447,664
DS1 - 51	19-Jul-21	0	15,768	3,176,744	509,080	31,336	4,600	3,737,528
DS1 - 52	19-Jul-21	0	23,352	2,920,504	150,680	52,904	3,600	3,151,040
DS1 - 53	15-Aug-21	0	237,672	1,655,320	77,640	75,240	2,000	2,047,872
DS1 - 54	15-Aug-21	0	496,296	1,732,144	11,784	30,336	1,200	2,271,760
DS1 - 55	12-Sep-21	400	123,528	1,499,272	160,264	28,952	7,200	1,819,616
DS1 - 56	12-Sep-21	0	151,664	1,346,408	214,736	107,176	3,600	1,823,784
Percent Density or Biomass		<0.1	6.3	83	7.2	3.1	0.16	
All 2021 Locations								
Relative Density or Biomass (%)		<0.1	6.4	59	31	3.9	0.10	



**Figure D2-1. Cyanophyte biomass (mg/m<sup>3</sup>) from Whale Tail Pit lakes since 2015.**

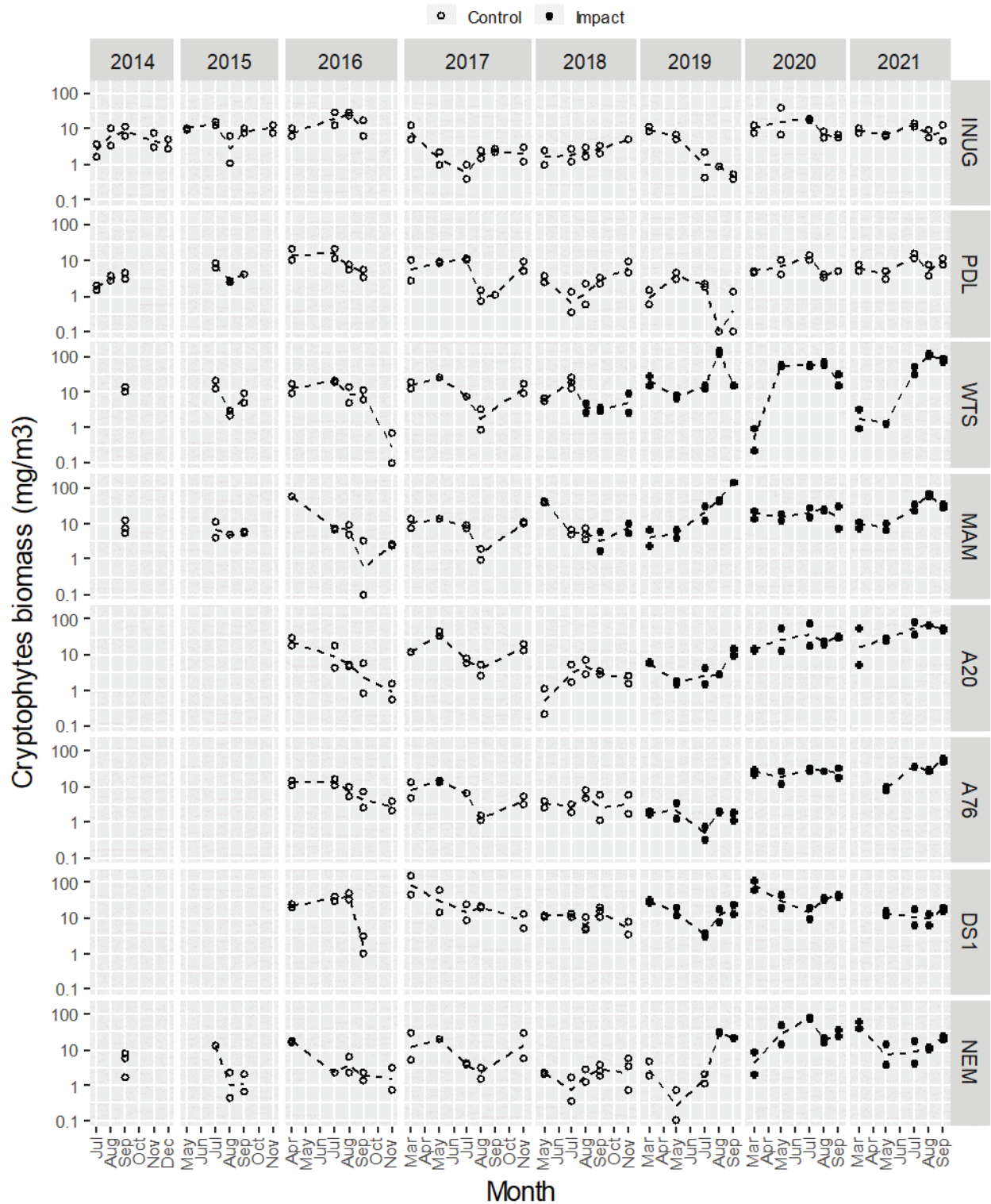




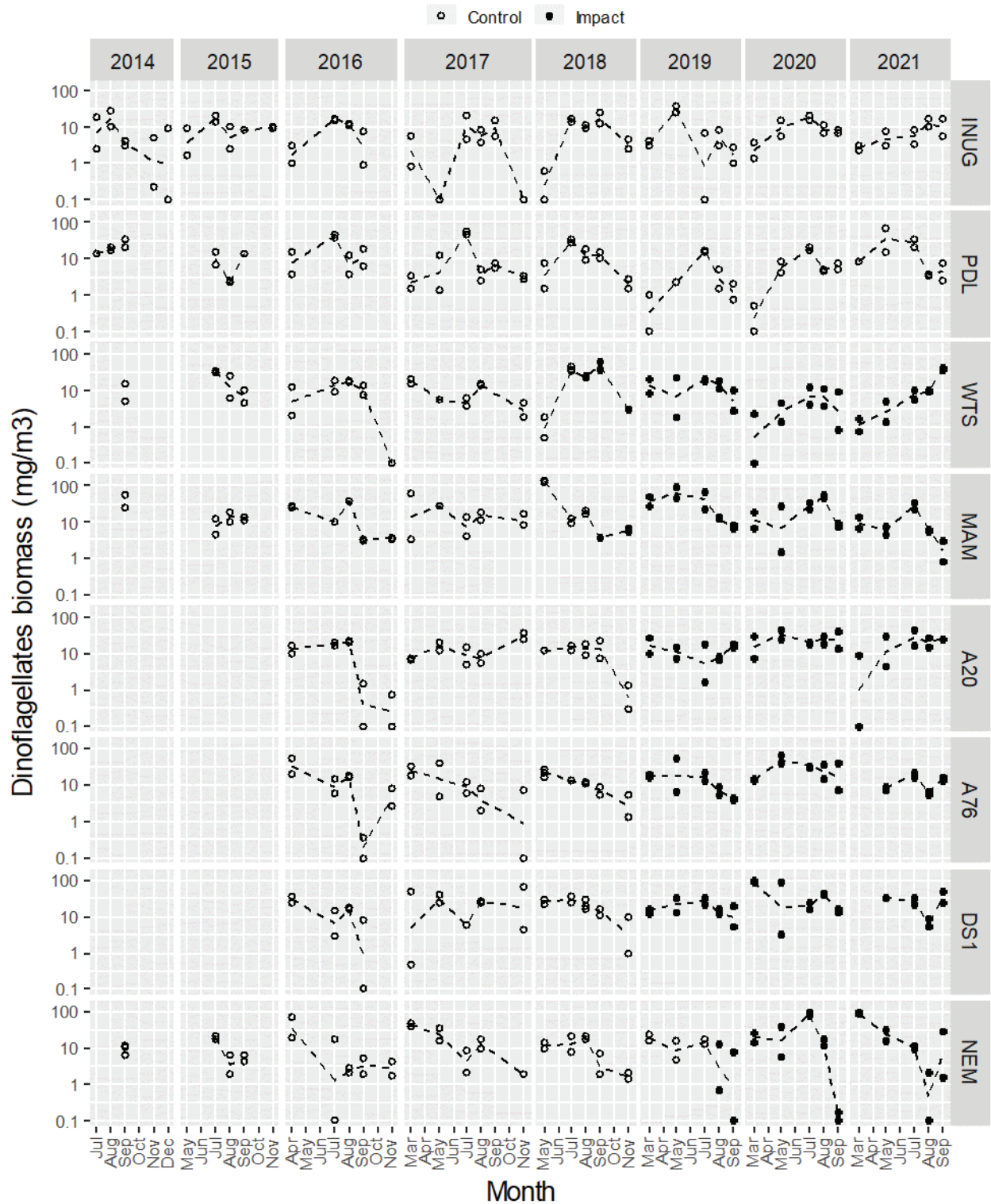
**Figure D2-3. Chrysophyte biomass (mg/m<sup>3</sup>) from Whale Tail Pit lakes since 2015.**



**Figure D2-5. Cryptophytes biomass (mg/m<sup>3</sup>) from Whale Tail Pit lakes since 2015.**

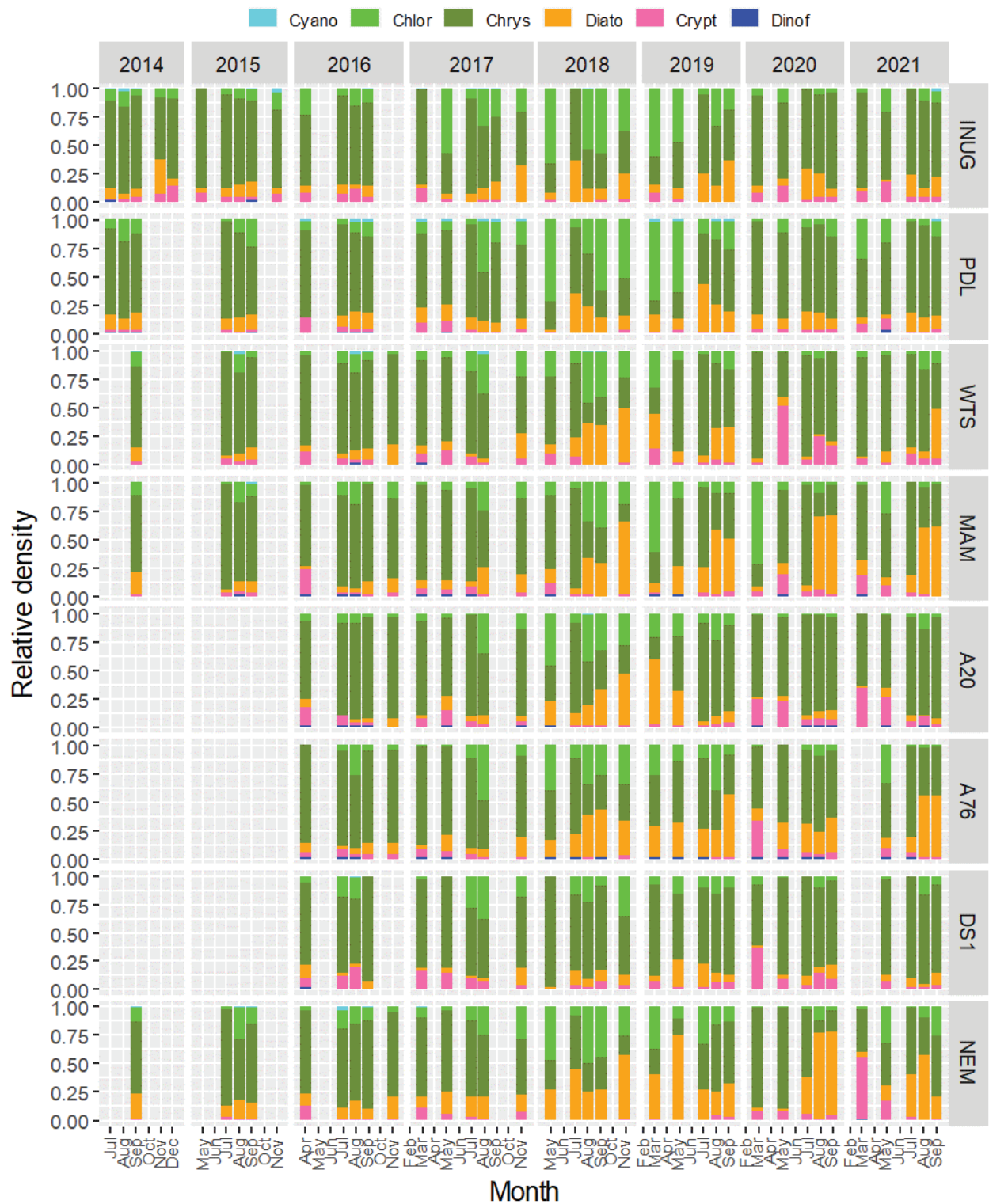


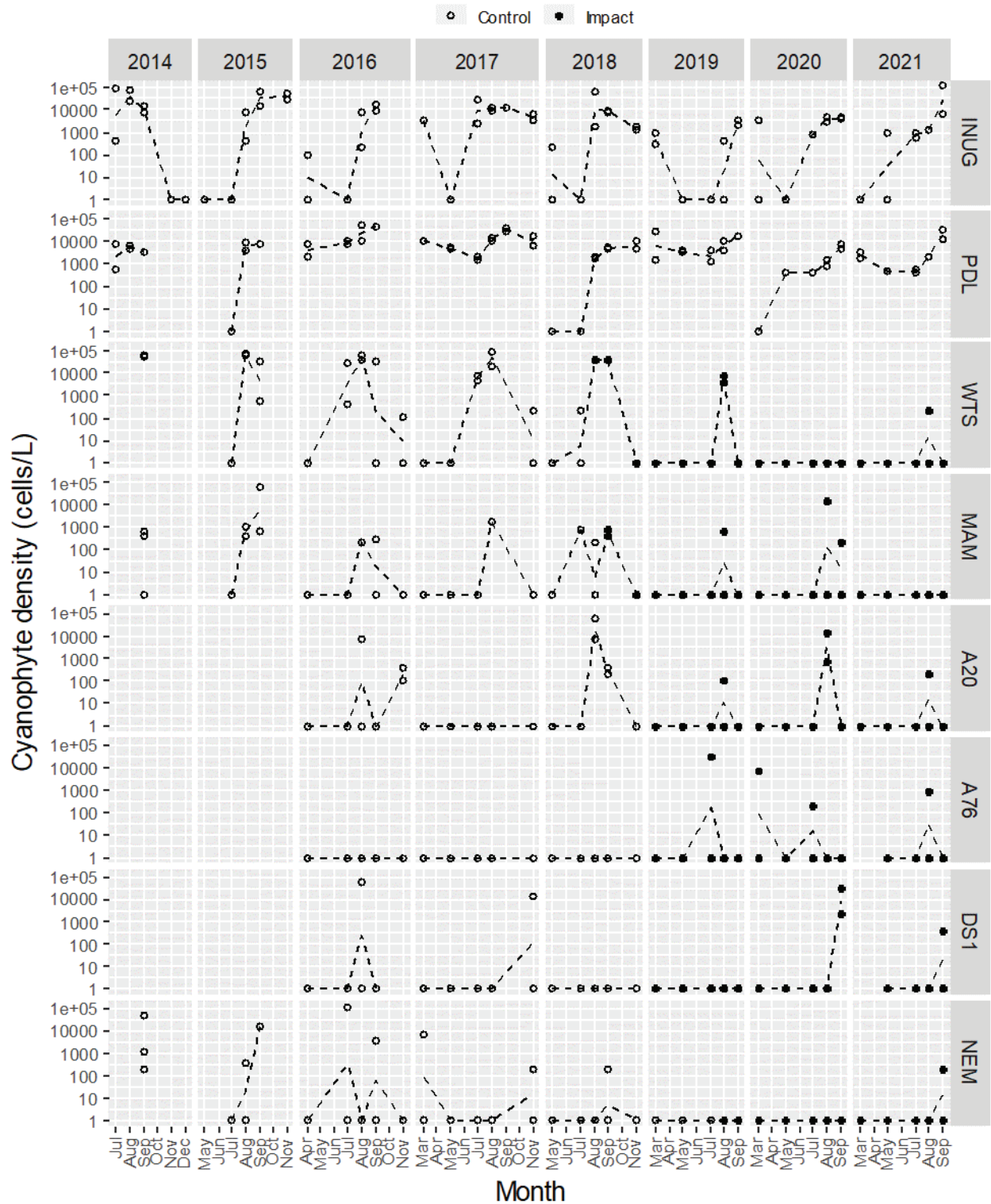


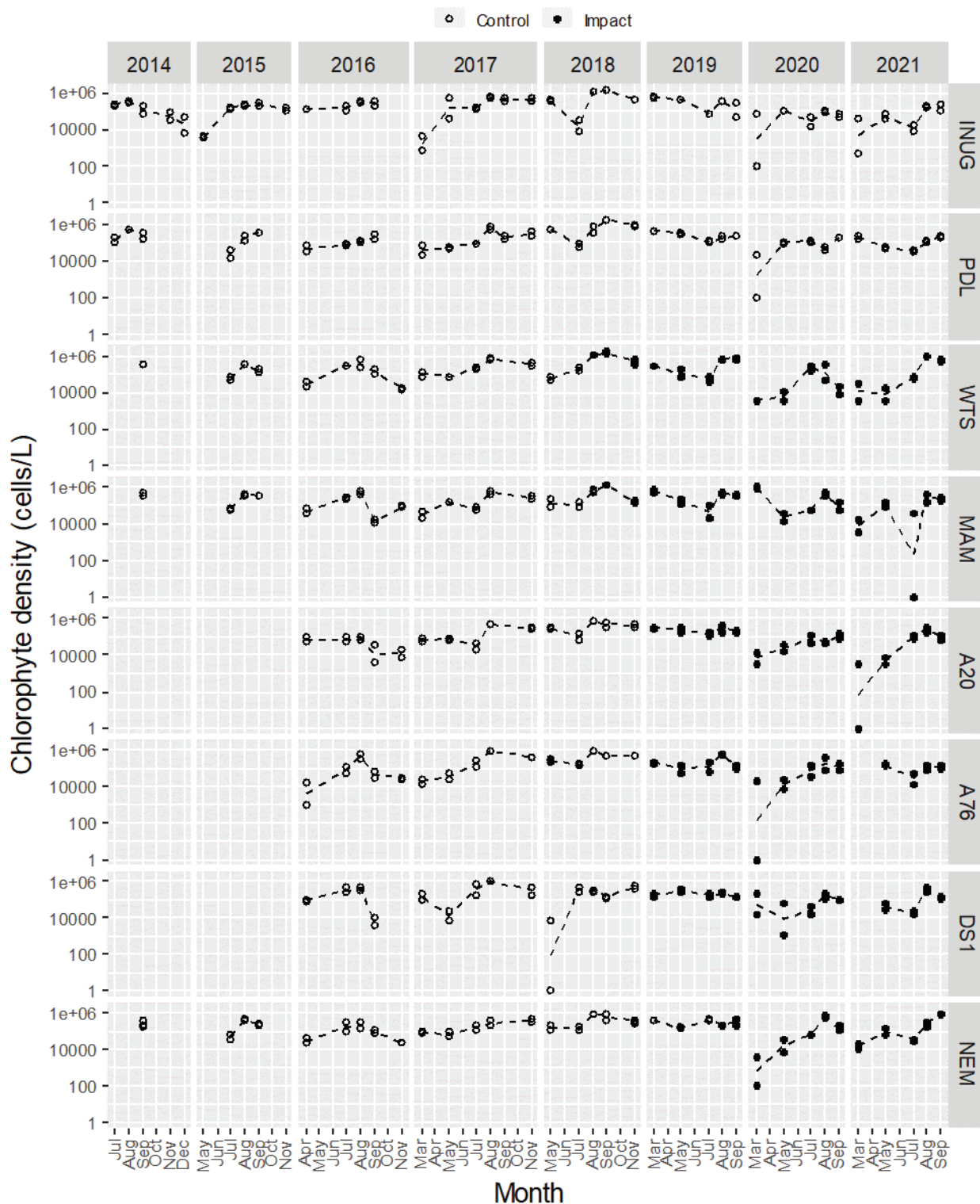
**Figure D2-6. Dinoflagellates biomass (mg/m<sup>3</sup>) from Whale Tail Pit lakes since 2015.**

**Figure D2-7. Phytoplankton density (cells/L) by major taxa group from Whale Tail Pit lakes since 2015.**

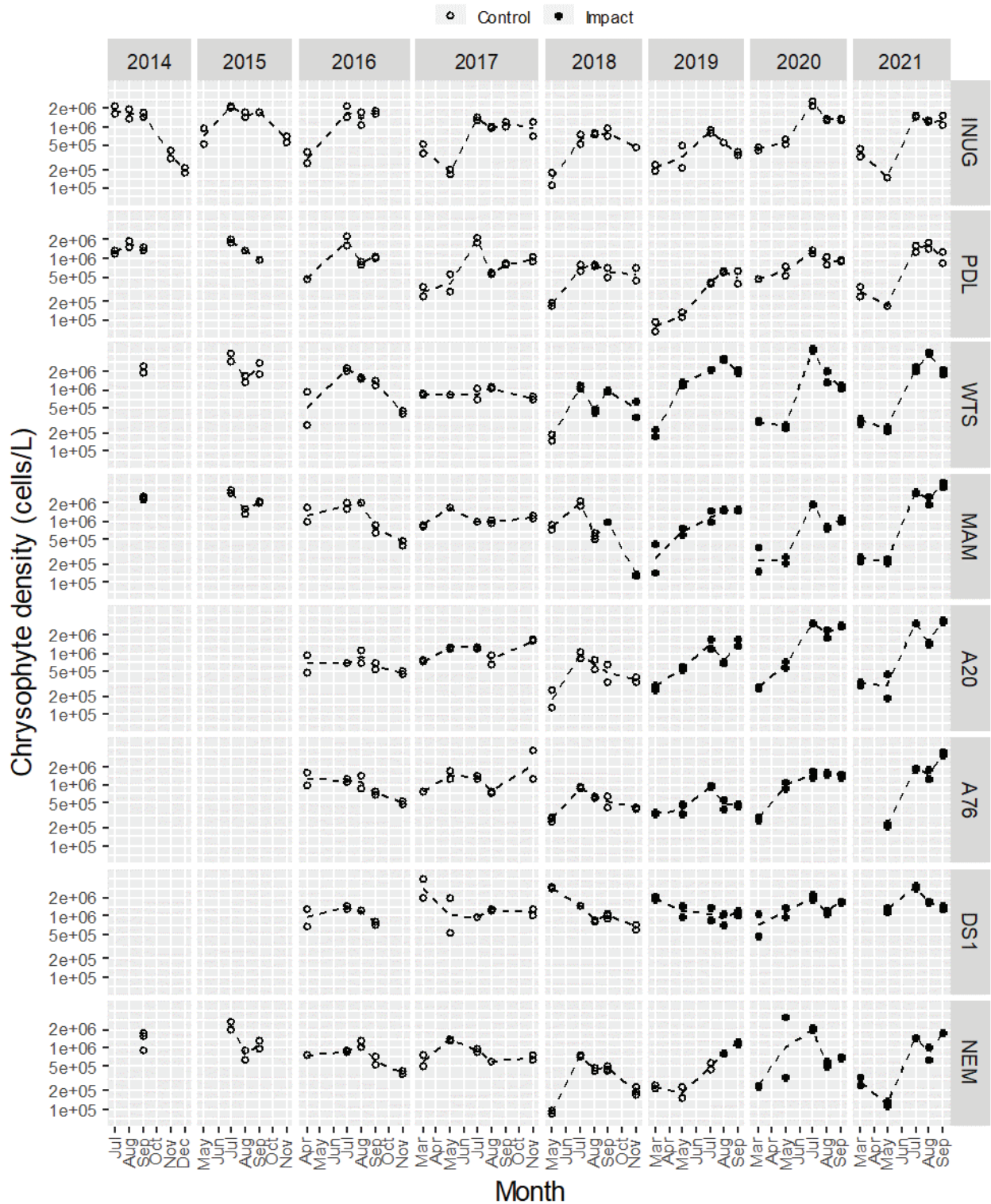


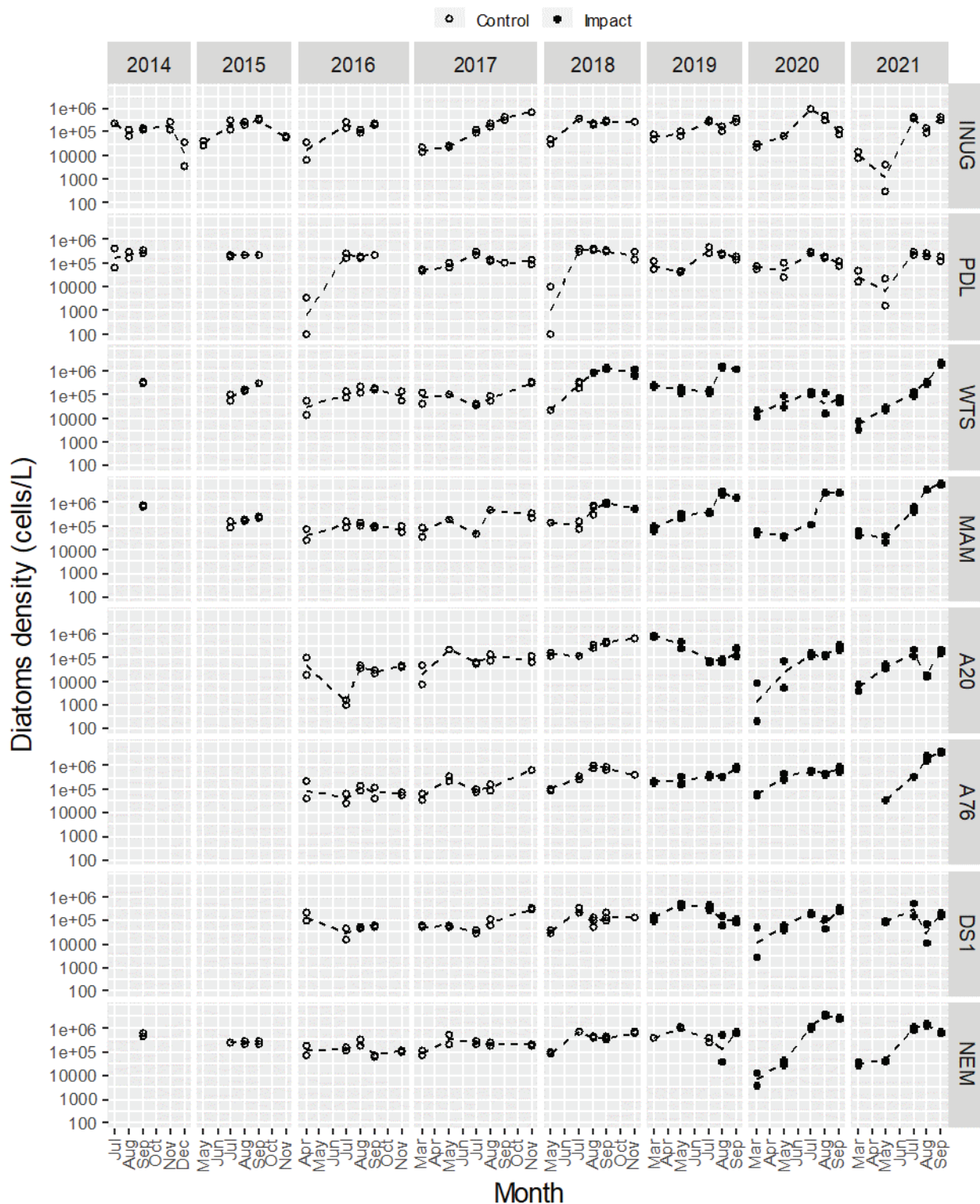
**Figure D2-8. Relative phytoplankton density from Whale Tail Pit lakes since 2015.**

**Figure D2-9. Cyanophyte density (cells/L) from Whale Tail Pit lakes since 2015.**

**Figure D2-10. Chlorophyte density (cells/L) from Whale Tail Pit lakes since 2015.**

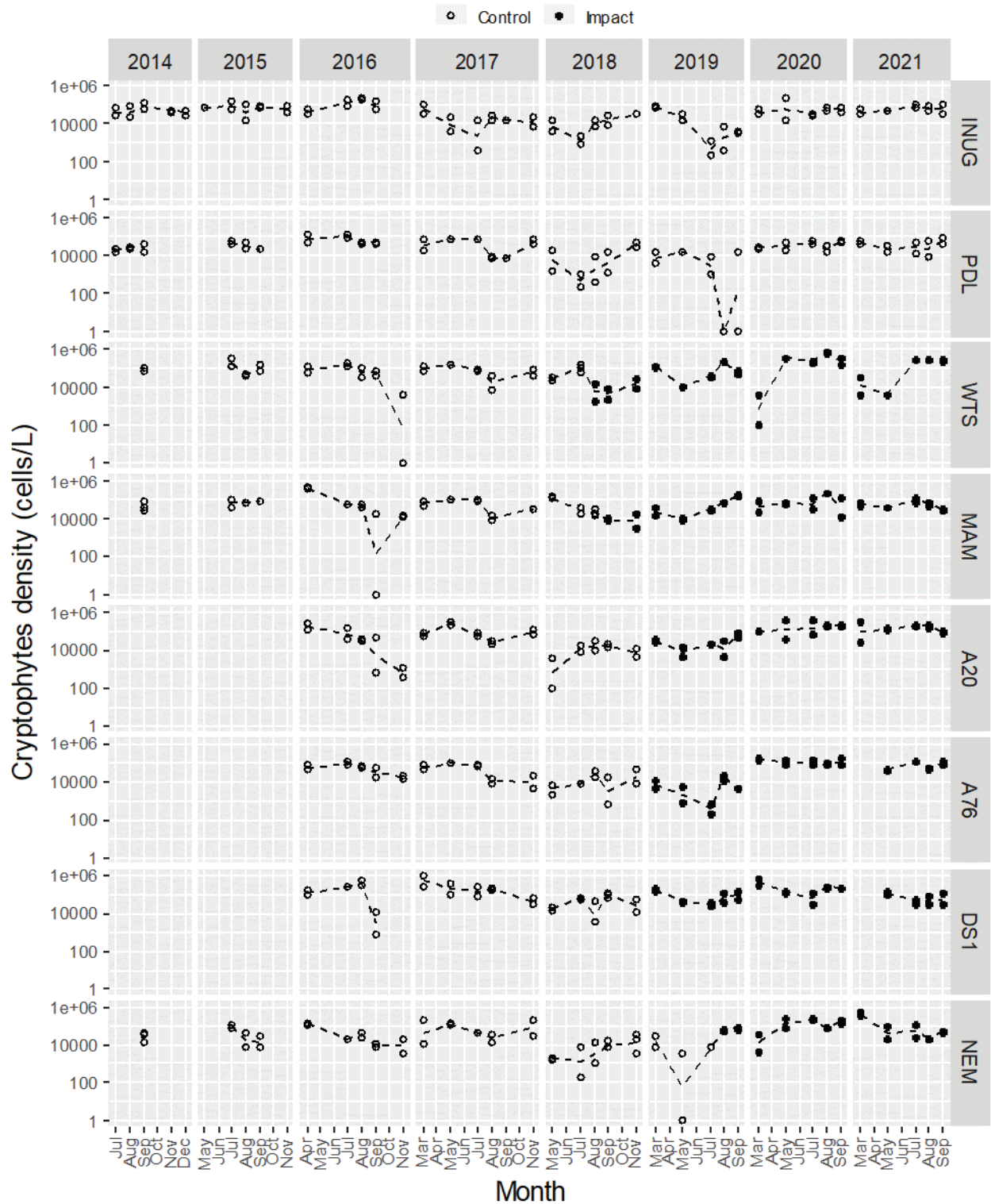


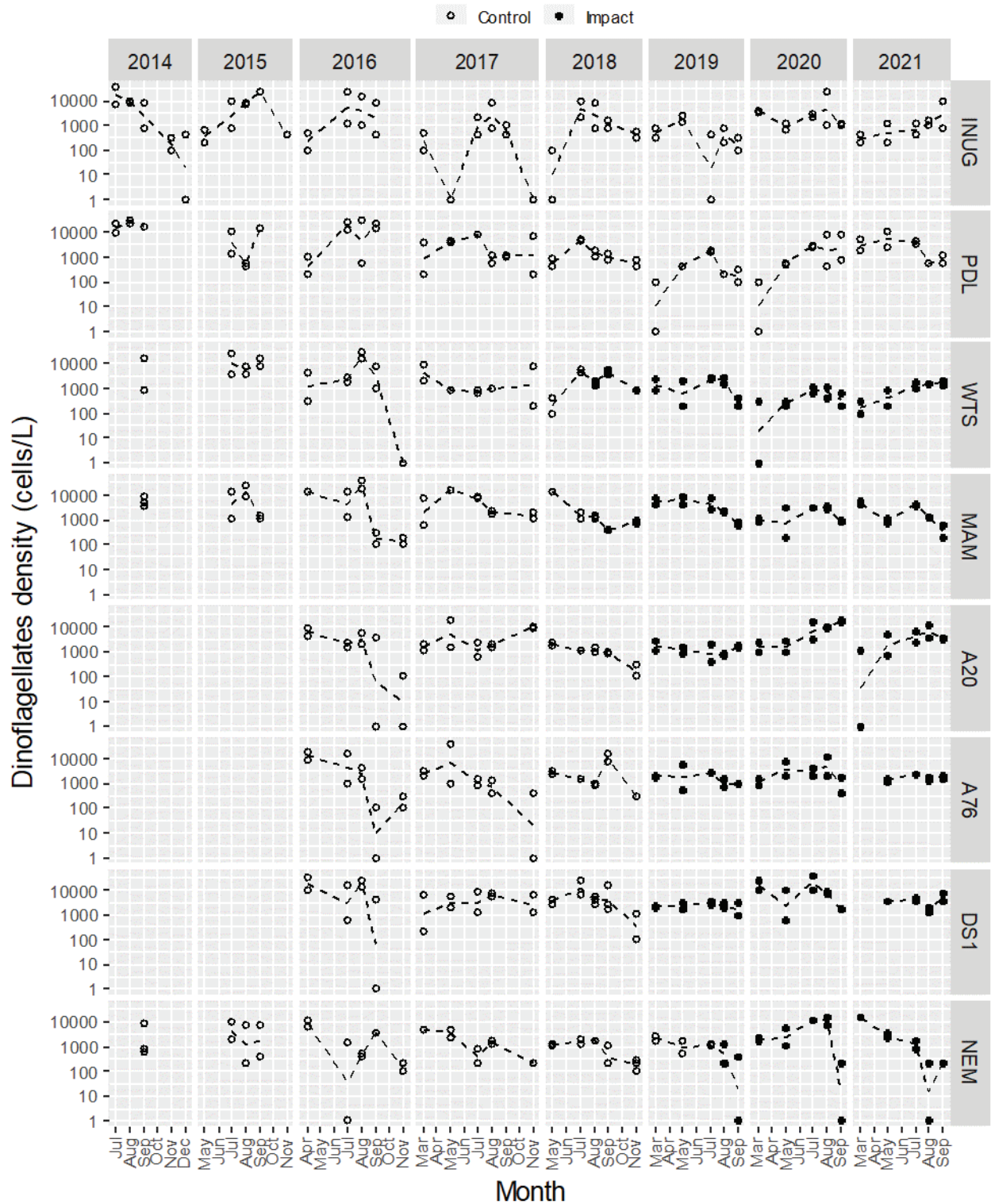
**Figure D2-11. Chrysophyte density (cells/L) from Whale Tail Pit lakes since 2015.**

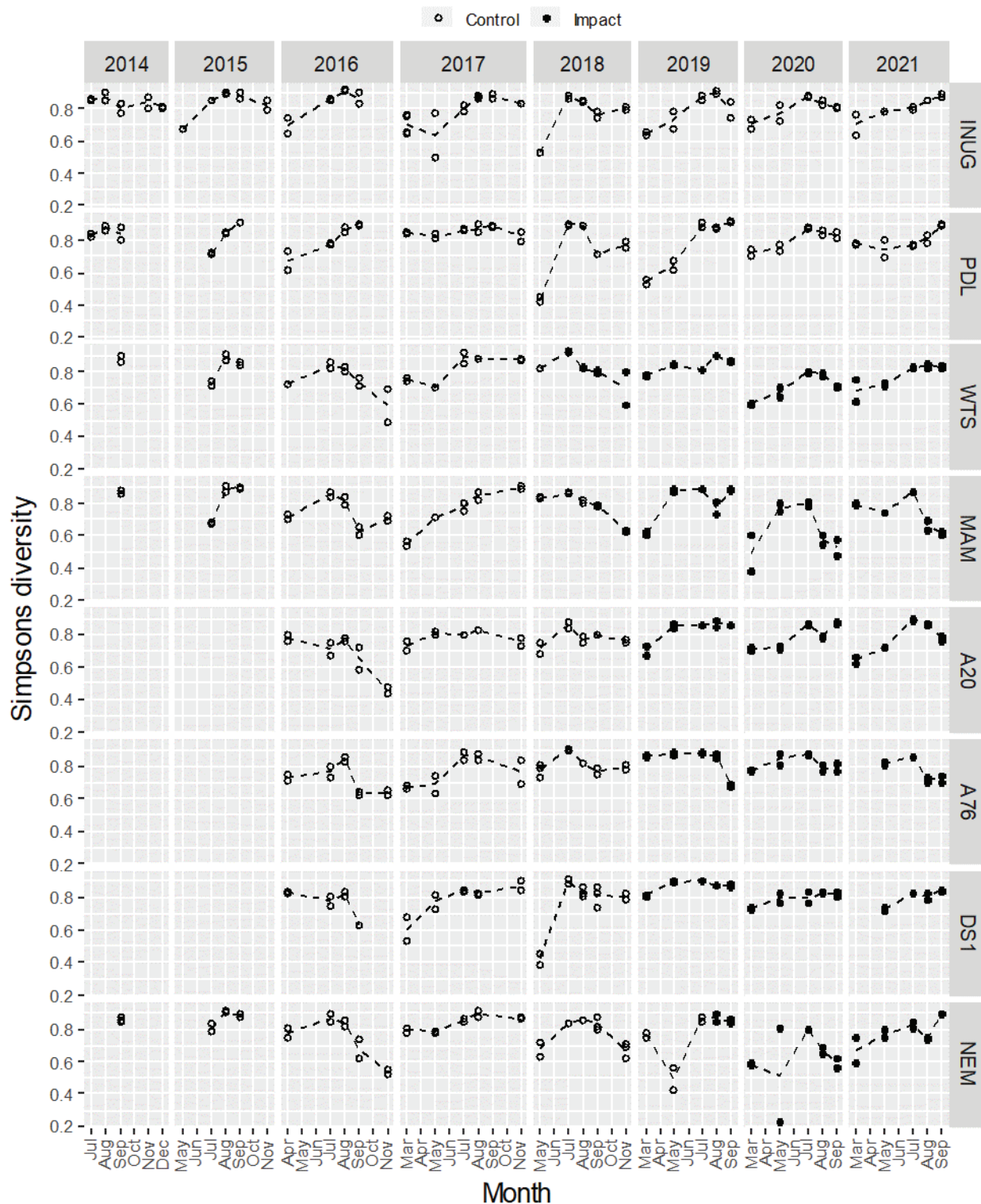
**Figure D2-12. Diatoms density (cells/L) from Whale Tail Pit lakes since 2015.**



**Figure D2-13. Cryptophytes density (cells/L) from Whale Tail Pit lakes since 2015.**



**Figure D2-14. Dinoflagellates density (cells/L) from Whale Tail Pit lakes since 2015.**

**Figure D2-15. Simpsons' Diversity for the phytoplankton community from Whale Tail Pit lakes since 2015.**

## Appendix D3

### Phyto Data – Baker Lake

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Table D3-1. Phytoplankton density (cells/L), biomass (mg/m3), and diversity by major taxa group, Baker Lake, 2021.

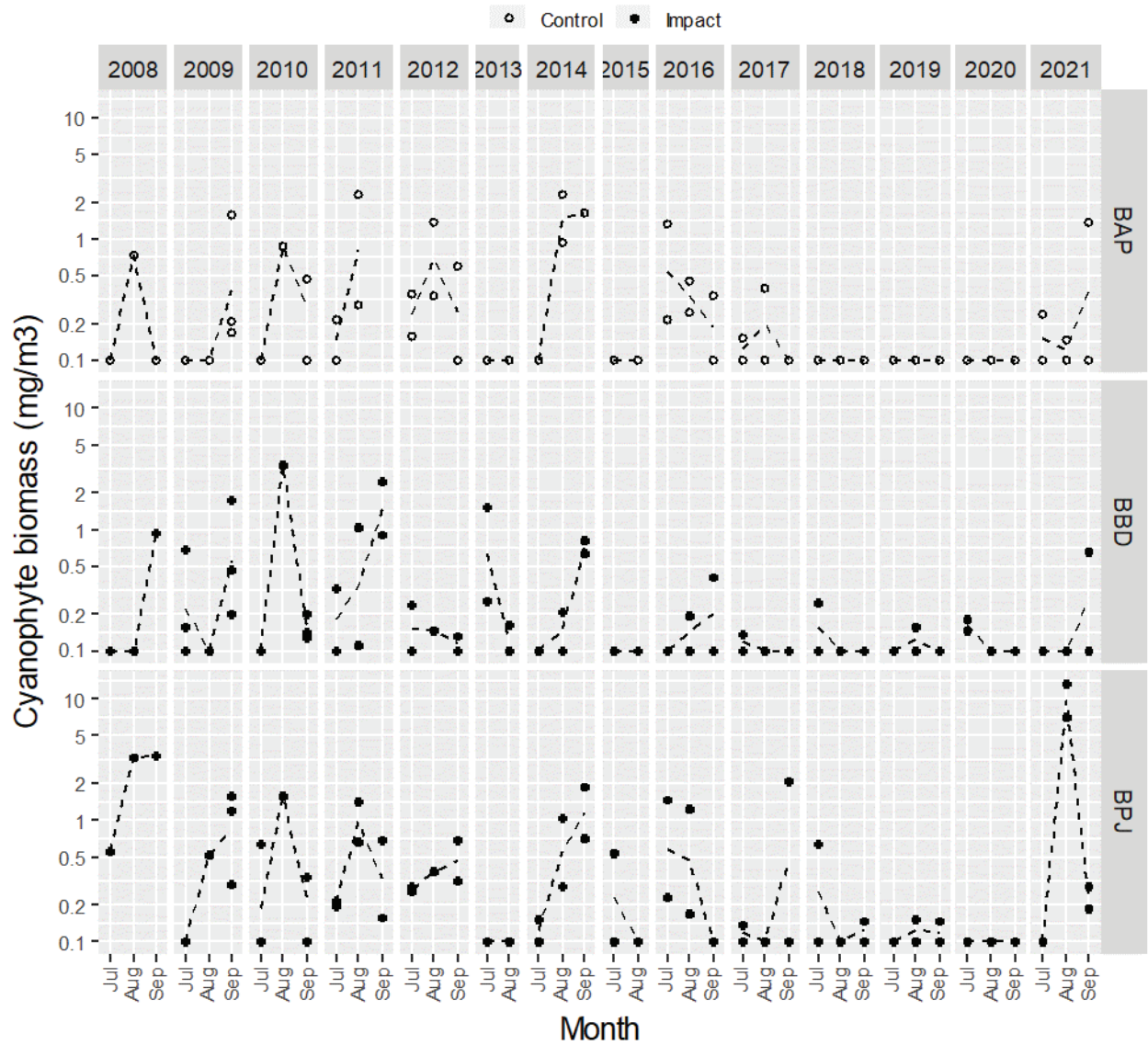
Area-Replicate	Date	Phytoplankton Biomass (mg/m <sup>3</sup> )						TOTAL	Taxa Richness	Simpson's Diversity
		Cyanophyte	Chlorophyte	Chrysophyte	Diatom	Cryptophyte	Dinoflagellate			
Baker Akilahaarjuk Point										
BAP - 73	30-Jul-21	0	2	81	28	34	12	157	32	0.81
BAP - 74	30-Jul-21	0	0	60	28	37	5	130	29	0.81
BAP - 75	14-Aug-21	0	7	95	16	31	22	170	29	0.83
BAP - 76	14-Aug-21	0	4	55	7	24	4	94	28	0.84
BAP - 77	18-Sep-21	0	2	40	94	47	42	225	38	0.79
BAP - 78	18-Sep-21	1	3	67	140	70	26	307	33	0.79
Percent Density or Biomass		0.13	1.6	37	29	22	10			
Baker Barge Dock										
BBD - 73	30-Jul-21	0	2	102	28	67	32	231	32	0.83
BBD - 74	30-Jul-21	0	4	115	29	54	32	233	32	0.82
BBD - 75	14-Aug-21	0	3	143	69	107	12	334	34	0.87
BBD - 76	14-Aug-21	0	4	131	99	89	20	343	32	0.87
BBD - 77	18-Sep-21	0	3	59	88	32	3	185	34	0.83
BBD - 78	18-Sep-21	1	5	75	79	27	6	193	33	0.84
Percent Density or Biomass		<0.1	1.4	41	26	25	6.9			
Baker Proposed Jetty										
BPJ - 73	30-Jul-21	0	0	131	47	25	5	209	29	0.77
BPJ - 74	30-Jul-21	0	1	109	74	22	28	235	29	0.79
BPJ - 75	14-Aug-21	13	12	90	20	35	4	173	40	0.87
BPJ - 76	14-Aug-21	7	7	92	22	26	9	162	39	0.88
BPJ - 77	18-Sep-21	0	4	62	83	52	16	216	34	0.79
BPJ - 78	18-Sep-21	0	4	57	93	42	11	208	29	0.75
Percent Density or Biomass		1.7	2.2	45	28	17	6.1			
All 2021 Locations										
Relative Density or Biomass (%)		0.60	1.7	41	27	22	7.6			

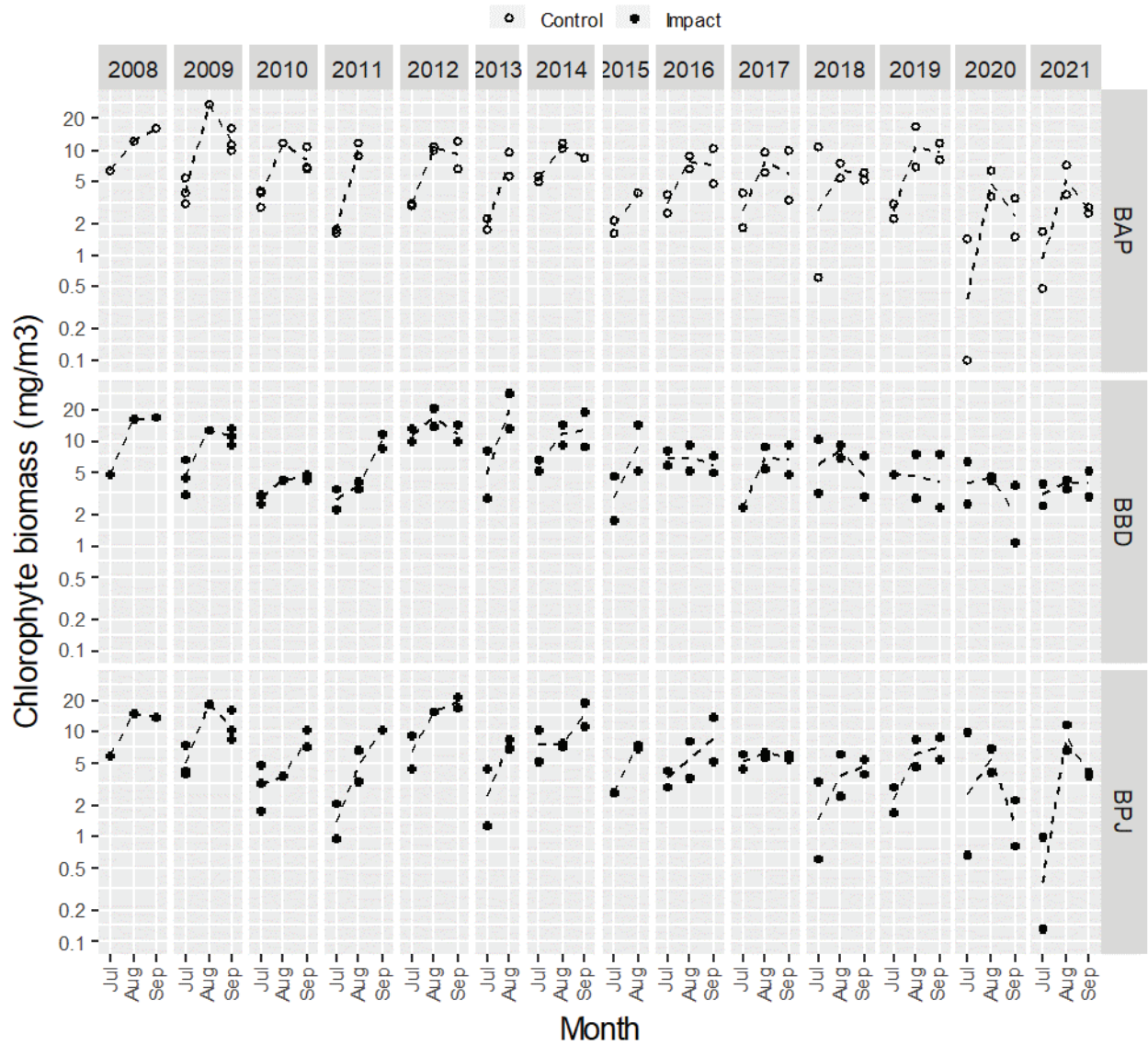


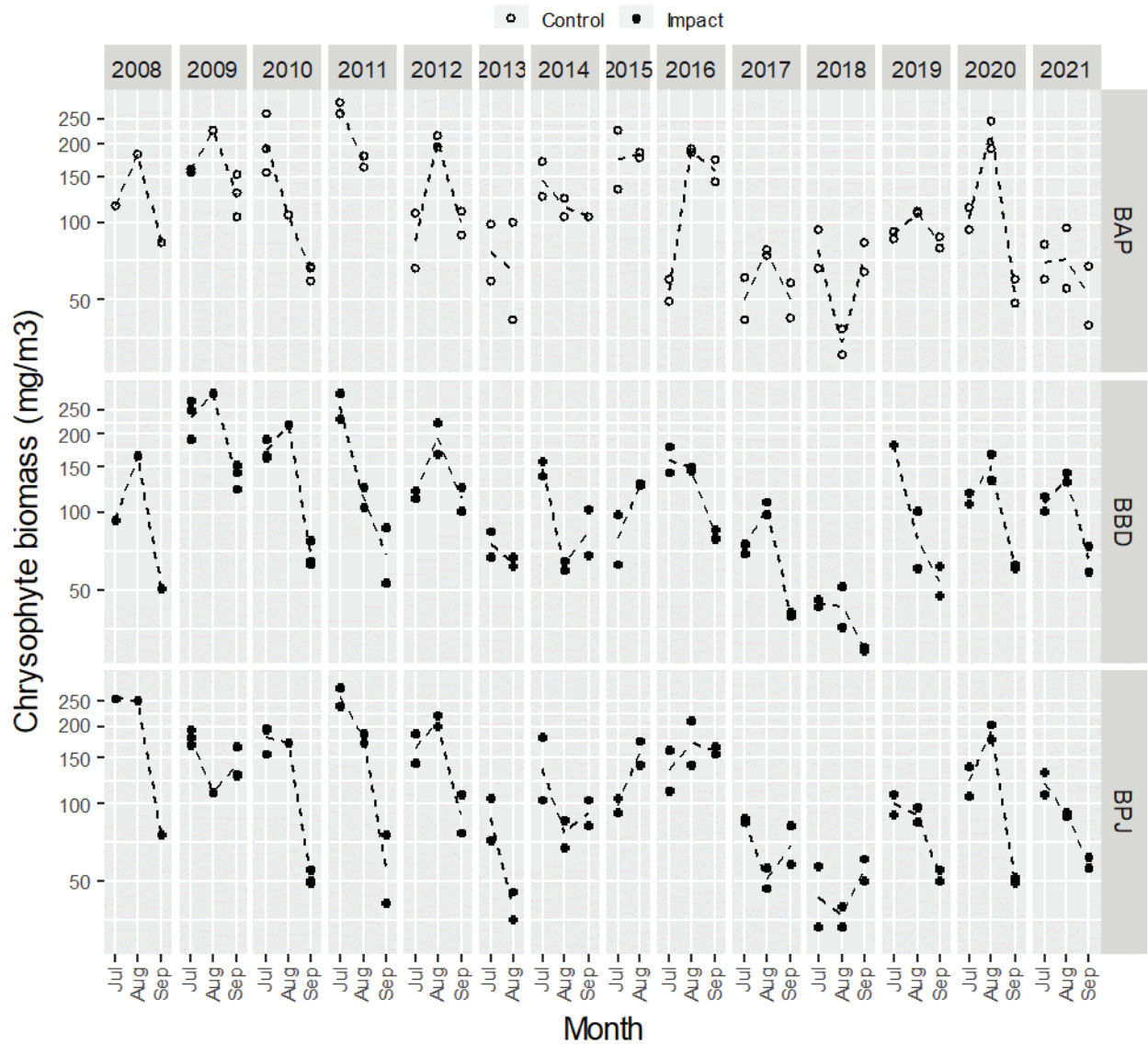
Table D3-1. Phytoplankton density (cells/L), biomass (mg/m3), and diversity by major taxa group, Baker Lake, 2021.

Area-Replicate	Date	Phytoplankton Density (cells/L)						TOTAL
		Cyanophyte	Chlorophyte	Chrysophyte	Diatom	Cryptophyte	Dinoflagellate	
Baker Akilahaarjuk Point								
BAP - 73	30-Jul-21	600	86,208	1,374,344	222,136	190,584	1,400	1,875,272
BAP - 74	30-Jul-21	0	129,312	1,100,152	122,360	204,952	800	1,557,576
BAP - 75	14-Aug-21	0	129,912	1,193,344	133,160	185,800	17,168	1,659,384
BAP - 76	14-Aug-21	200	79,224	869,664	167,664	141,296	800	1,258,848
BAP - 77	18-Sep-21	0	93,792	1,037,696	145,472	283,976	2,200	1,563,136
BAP - 78	18-Sep-21	200	86,408	1,000,976	143,472	361,616	3,200	1,595,872
Percent Density or Biomass		<0.1	6.4	69	9.8	14	0.27	
Baker Barge Dock								
BBD - 73	30-Jul-21	0	101,376	1,654,920	228,400	406,104	3,400	2,394,200
BBD - 74	30-Jul-21	0	173,416	1,763,280	280,472	292,760	2,800	2,512,728
BBD - 75	14-Aug-21	0	71,840	1,434,216	560,424	553,200	1,400	2,621,080
BBD - 76	14-Aug-21	0	93,392	1,298,920	544,056	451,424	2,400	2,390,192
BBD - 77	18-Sep-21	0	215,920	921,752	90,736	249,256	600	1,478,264
BBD - 78	18-Sep-21	14,368	151,264	822,376	84,752	158,864	800	1,232,424
Percent Density or Biomass		0.11	6.4	63	14	17	<0.1	
Baker Proposed Jetty								
BPJ - 73	30-Jul-21	0	7,184	1,922,528	168,864	119,144	600	2,218,320
BPJ - 74	30-Jul-21	0	21,552	1,763,480	221,200	71,656	3,400	2,081,288
BPJ - 75	14-Aug-21	3,400	560,552	1,294,920	150,776	172,632	600	2,182,880
BPJ - 76	14-Aug-21	1,800	395,120	1,165,808	173,896	120,944	1,200	1,858,768
BPJ - 77	18-Sep-21	800	115,144	993,192	100,520	246,272	2,000	1,457,928
BPJ - 78	18-Sep-21	400	101,176	1,058,448	86,952	194,584	1,600	1,443,160
Percent Density or Biomass		<0.1	11	73	8.0	8.2	<0.1	
All 2021 Locations								
Relative Density or Biomass (%)		<0.1	7.8	68	11	13	0.14	

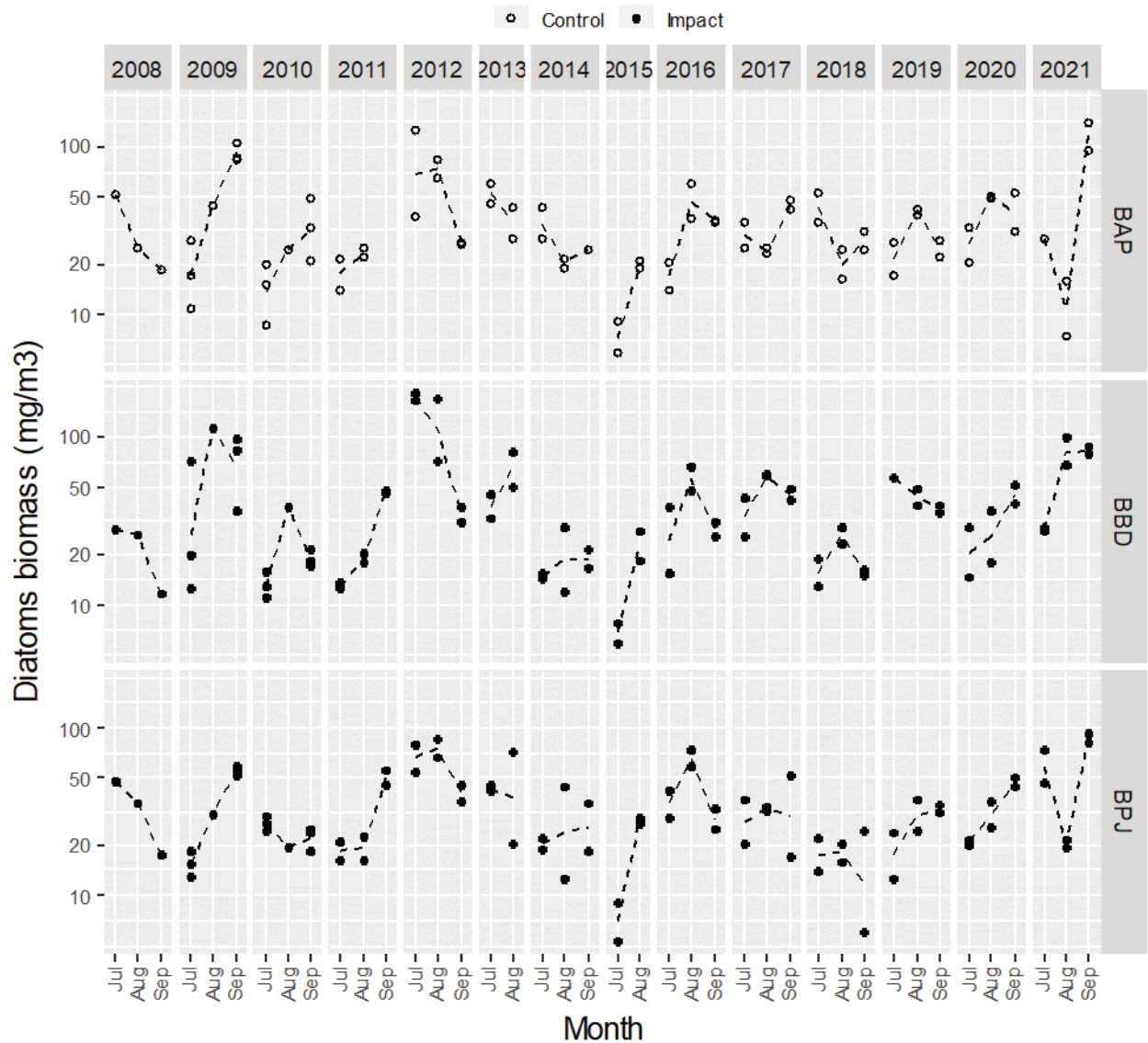


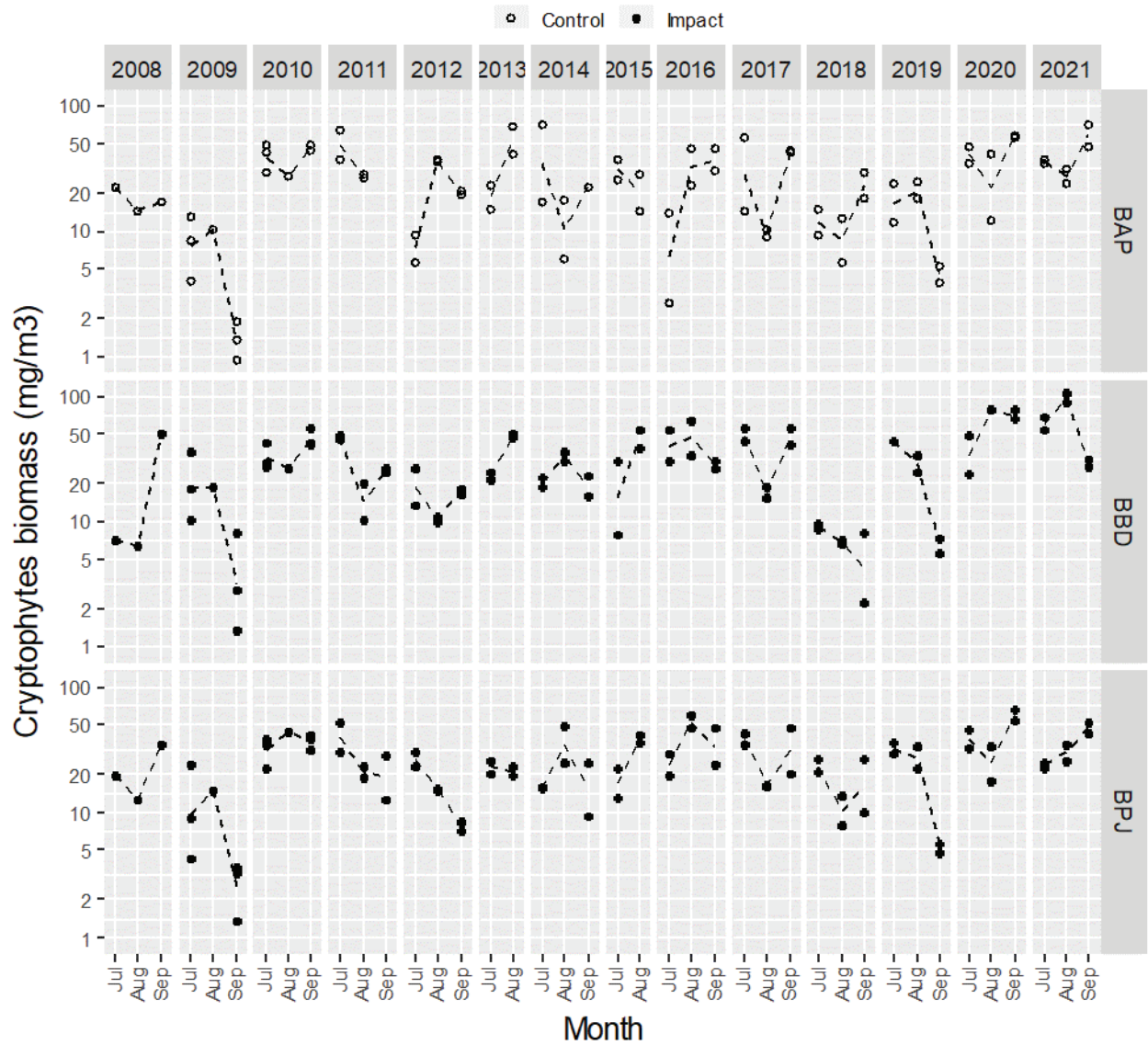
**Figure D3-1. Cyanophyte biomass (mg/m<sup>3</sup>) from Baker Lake since 2008.**

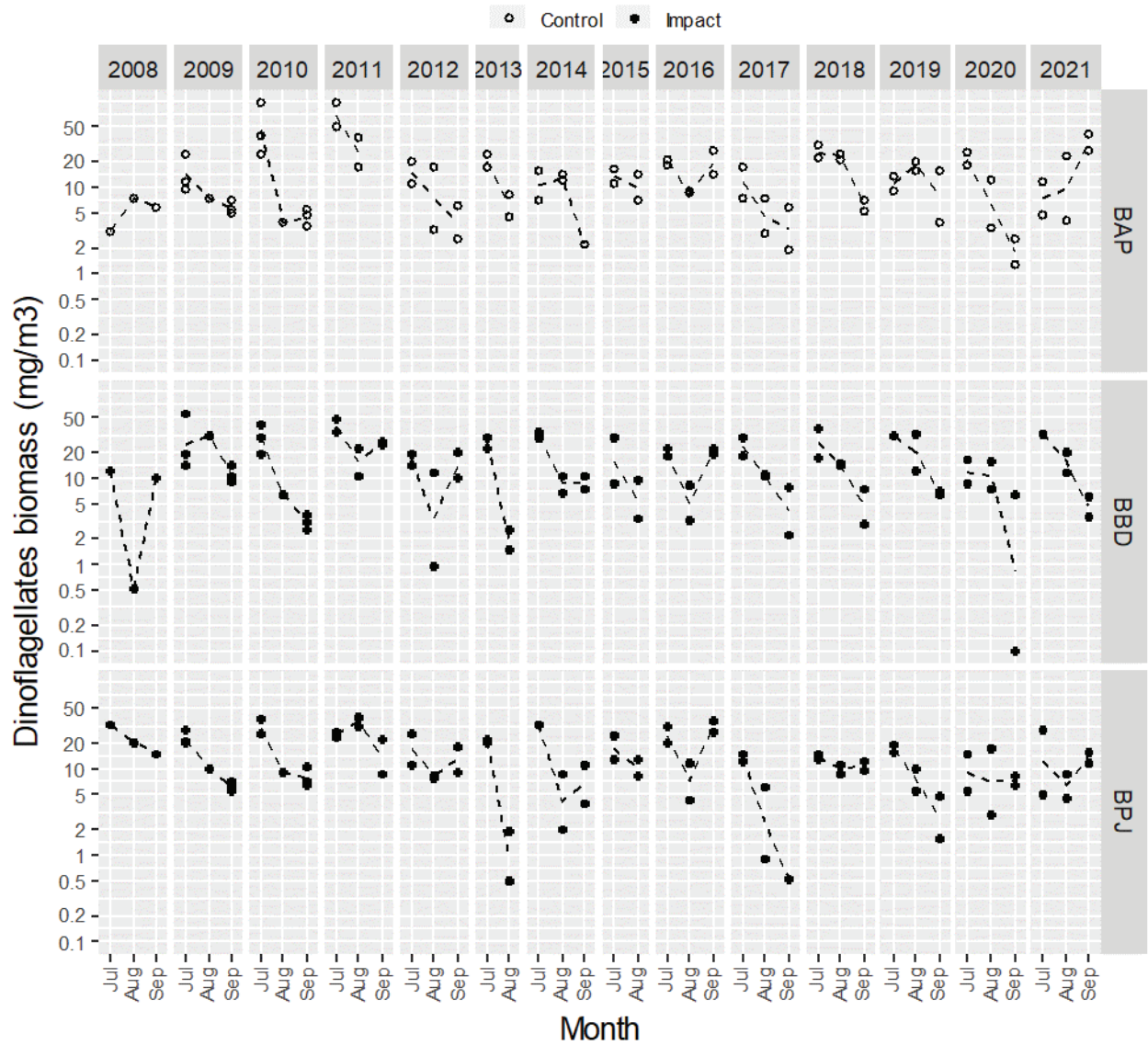
**Figure D3-2. Chlorophyte biomass (mg/m<sup>3</sup>) from Baker Lake since 2008.**

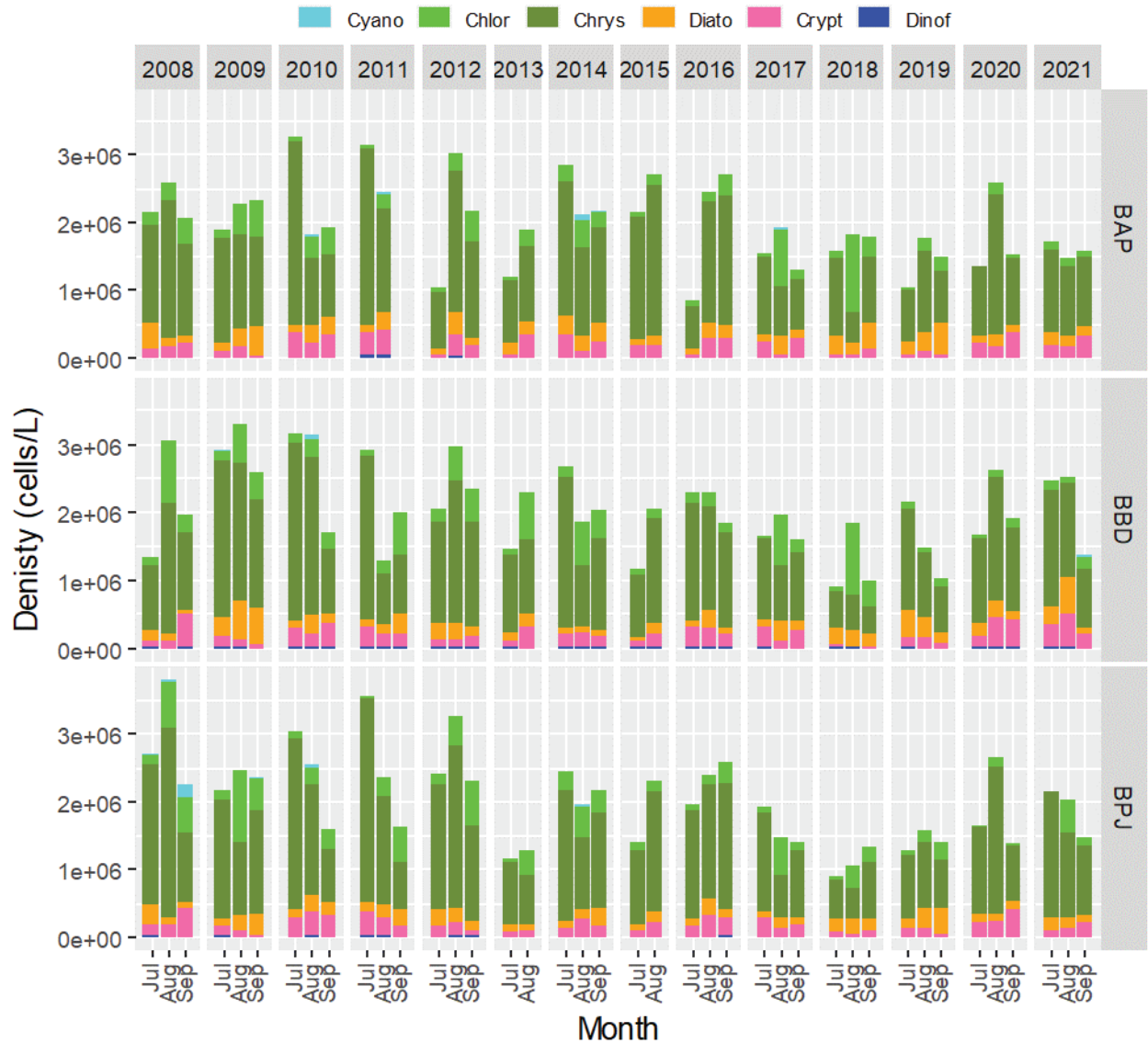
**Figure D3-3. Chrysophyte biomass (mg/m<sup>3</sup>) from Baker Lake since 2008.**

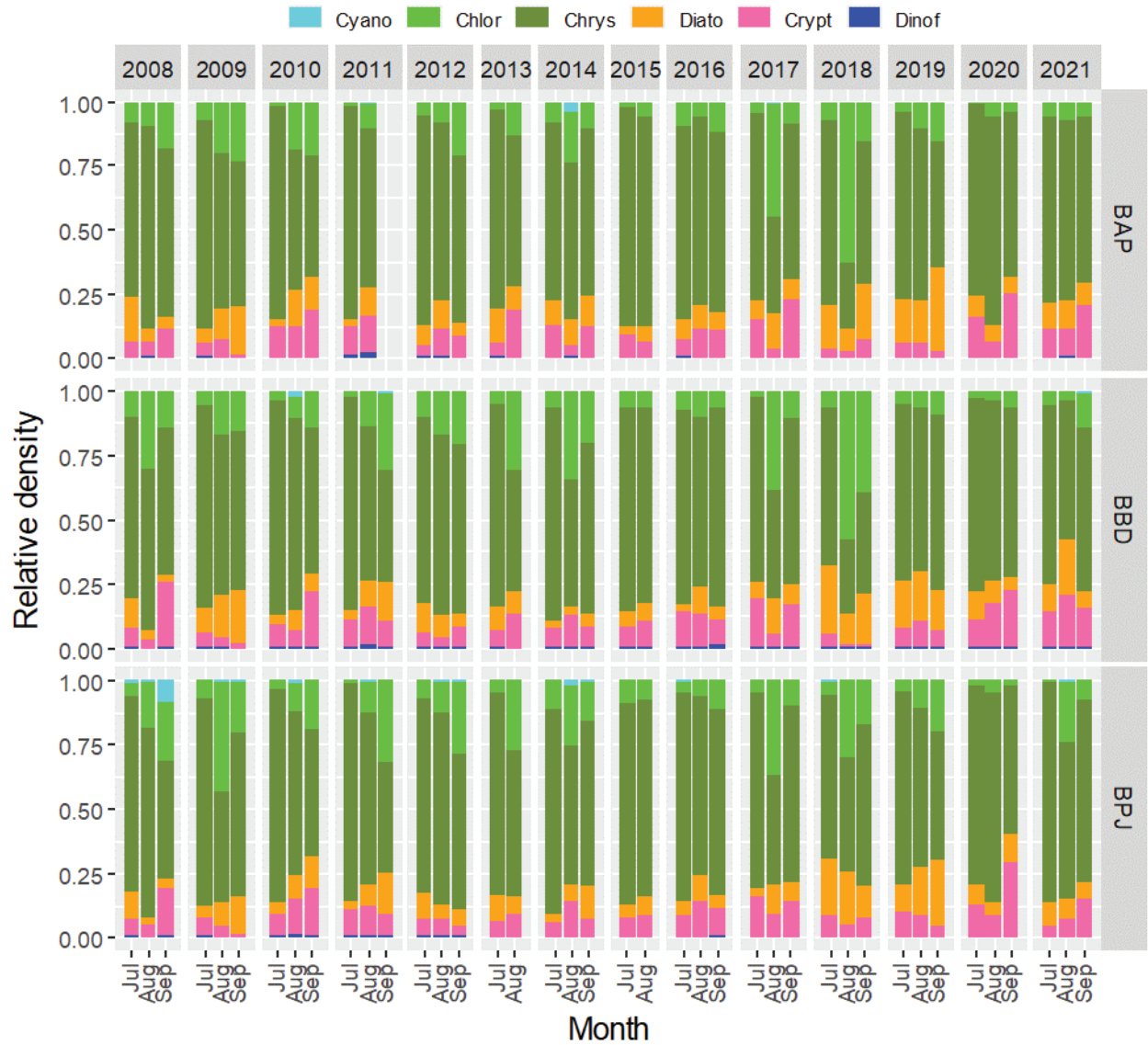


**Figure D3-4. Diatoms biomass (mg/m<sup>3</sup>) from Baker Lake since 2008.**

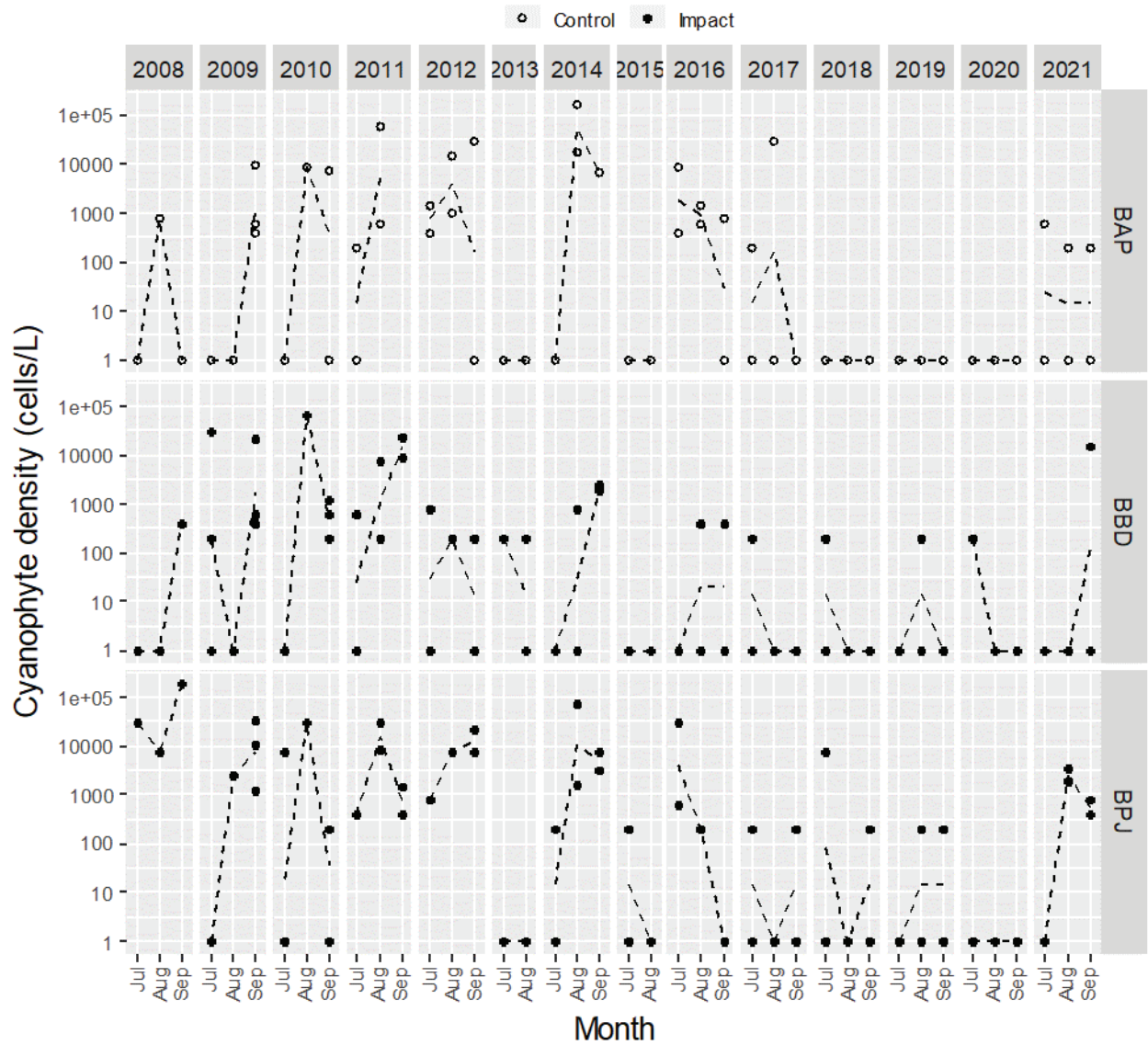
**Figure D3-5. Cryptophytes biomass (mg/m<sup>3</sup>) from Baker Lake since 2008.**

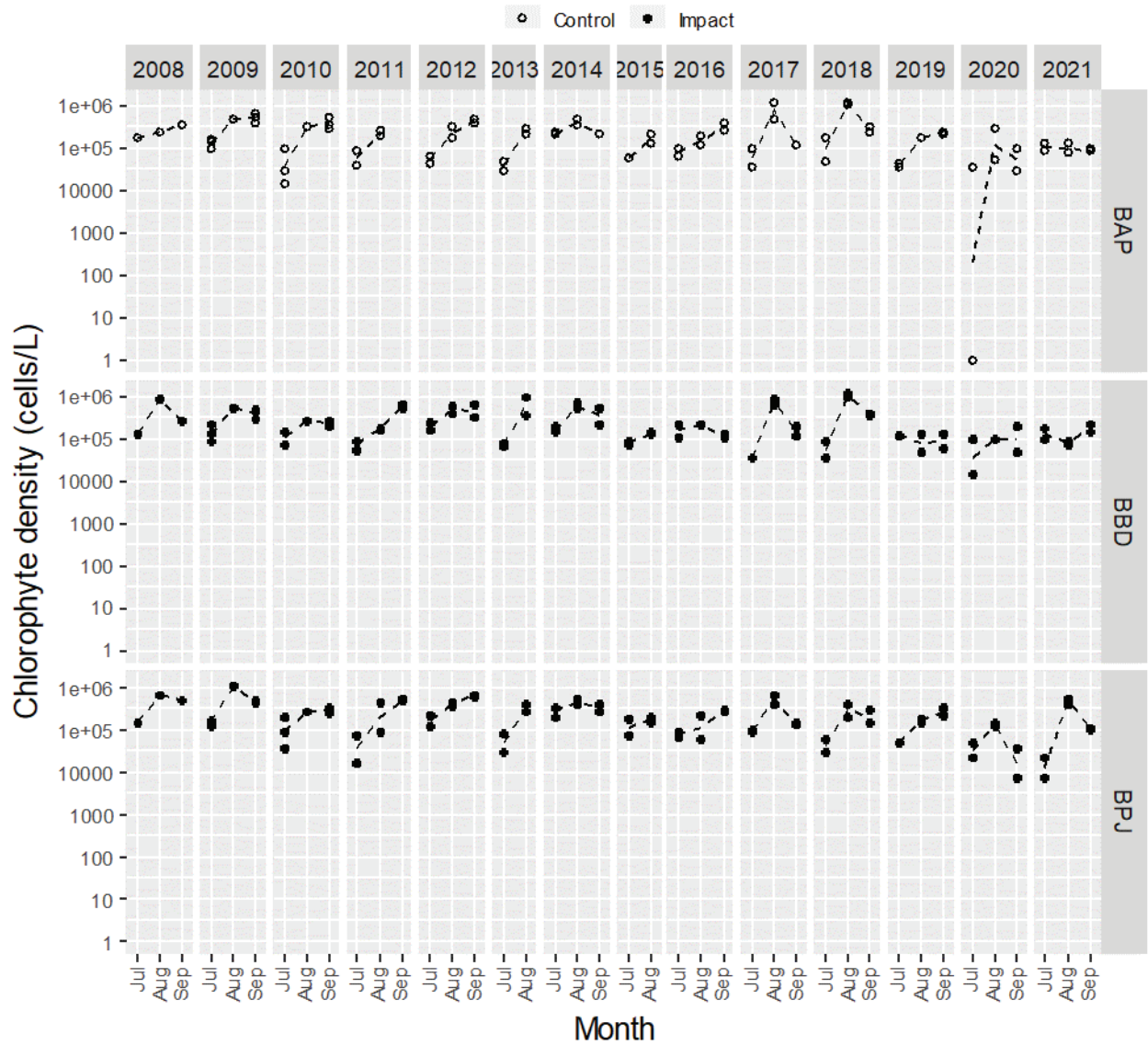
**Figure D3-6. Dinoflagellates biomass (mg/m<sup>3</sup>) from Baker Lake since 2008.**

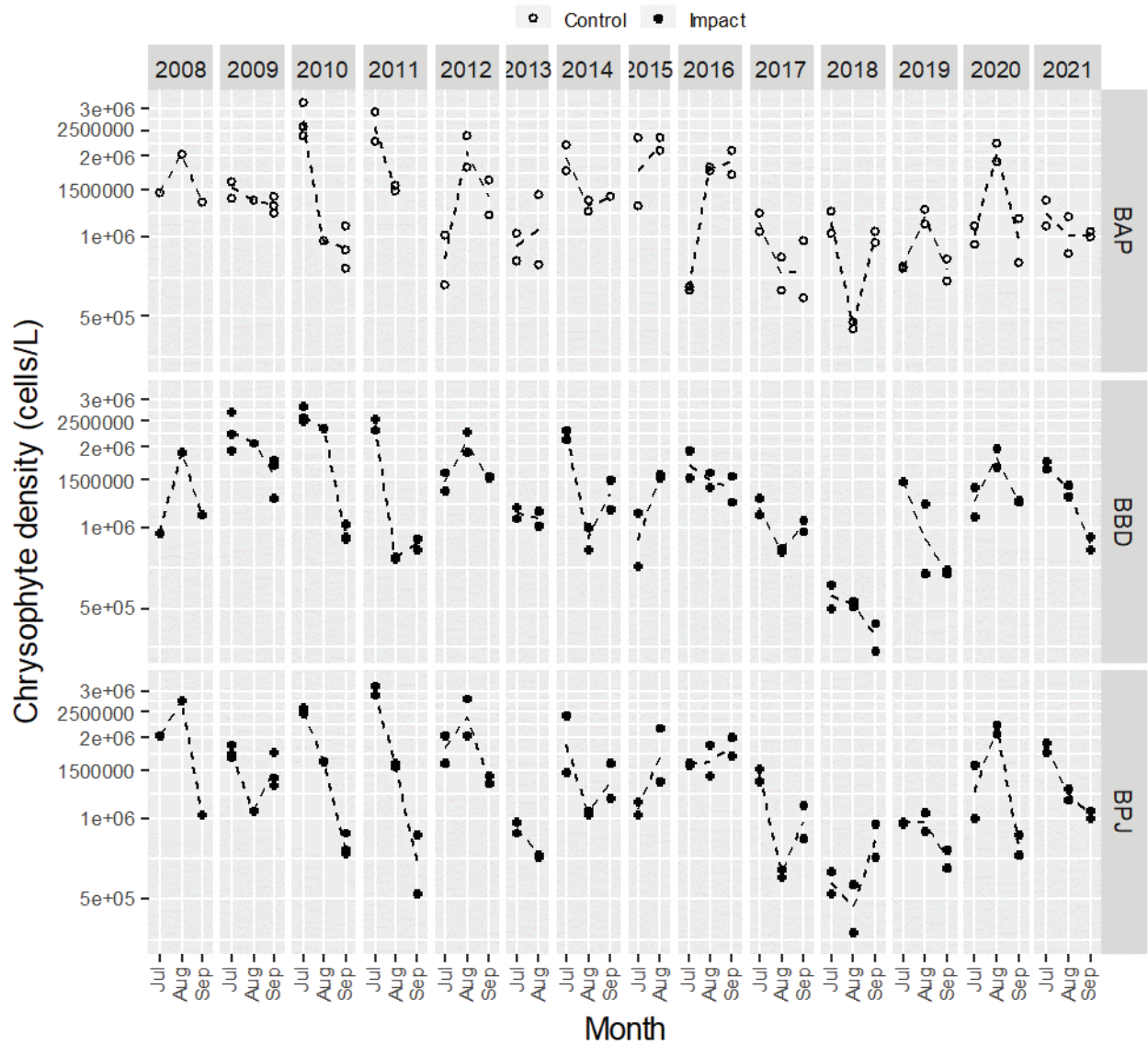
**Figure D3-7. Phytoplankton density (cells/L) by major taxa group from Baker Lake since 2008.**

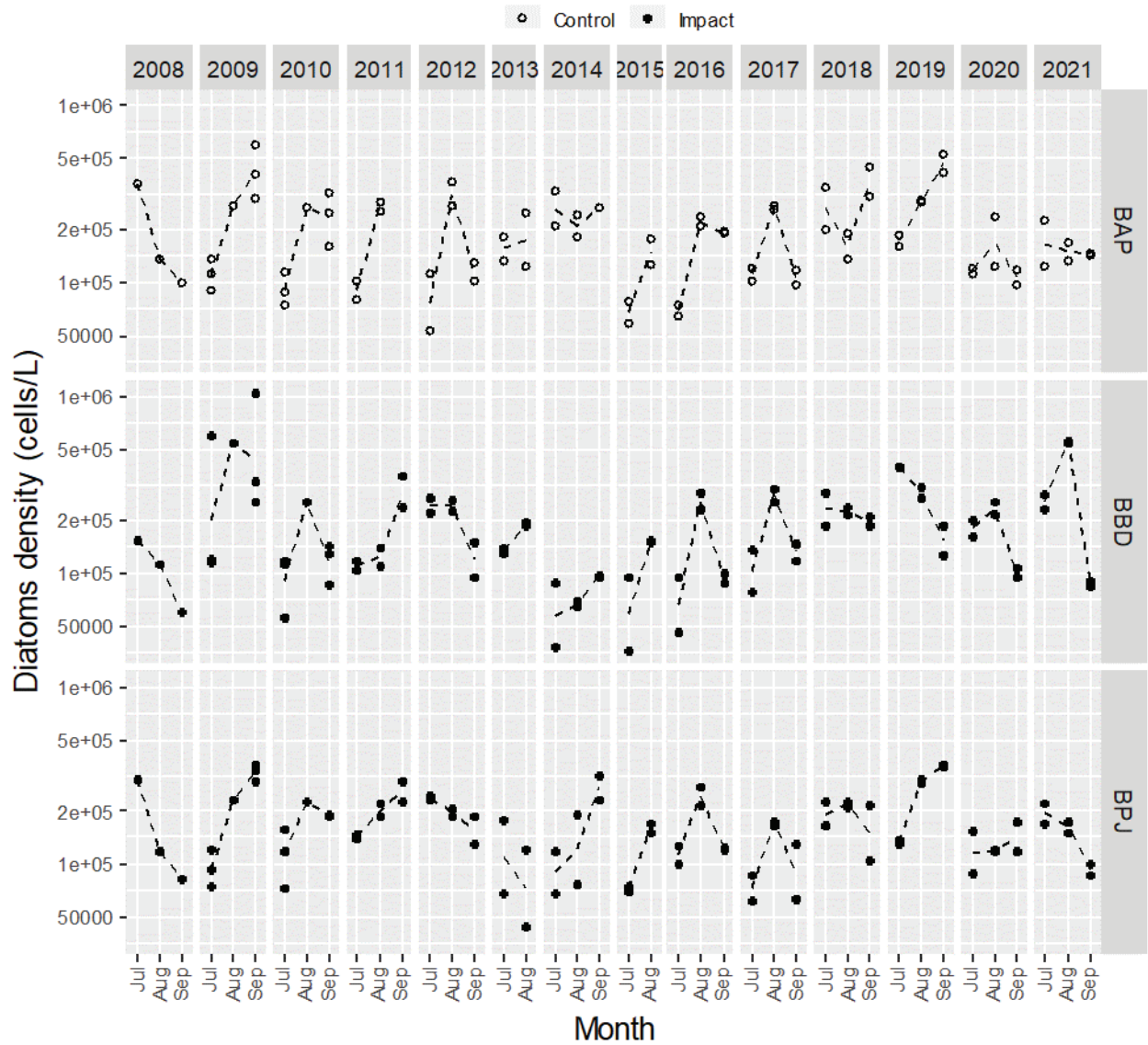
**Figure D3-8. Relative phytoplankton density from Baker Lake since 2008.**



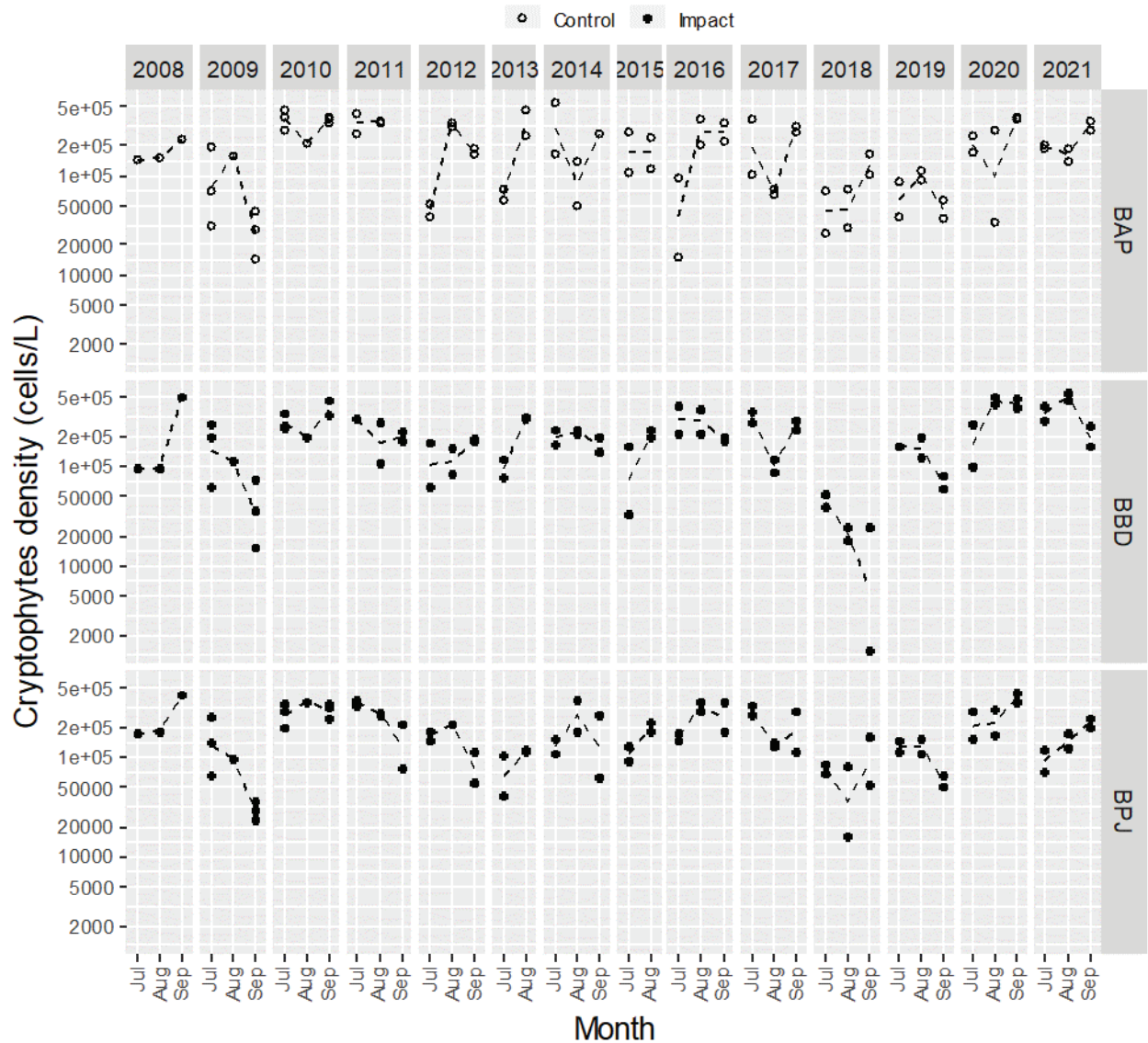
**Figure D3-9. Cyanophyte density (cells/L) from Baker Lake since 2008.**

**Figure D3-10. Chlorophyte density (cells/L) from Baker Lake since 2008.**

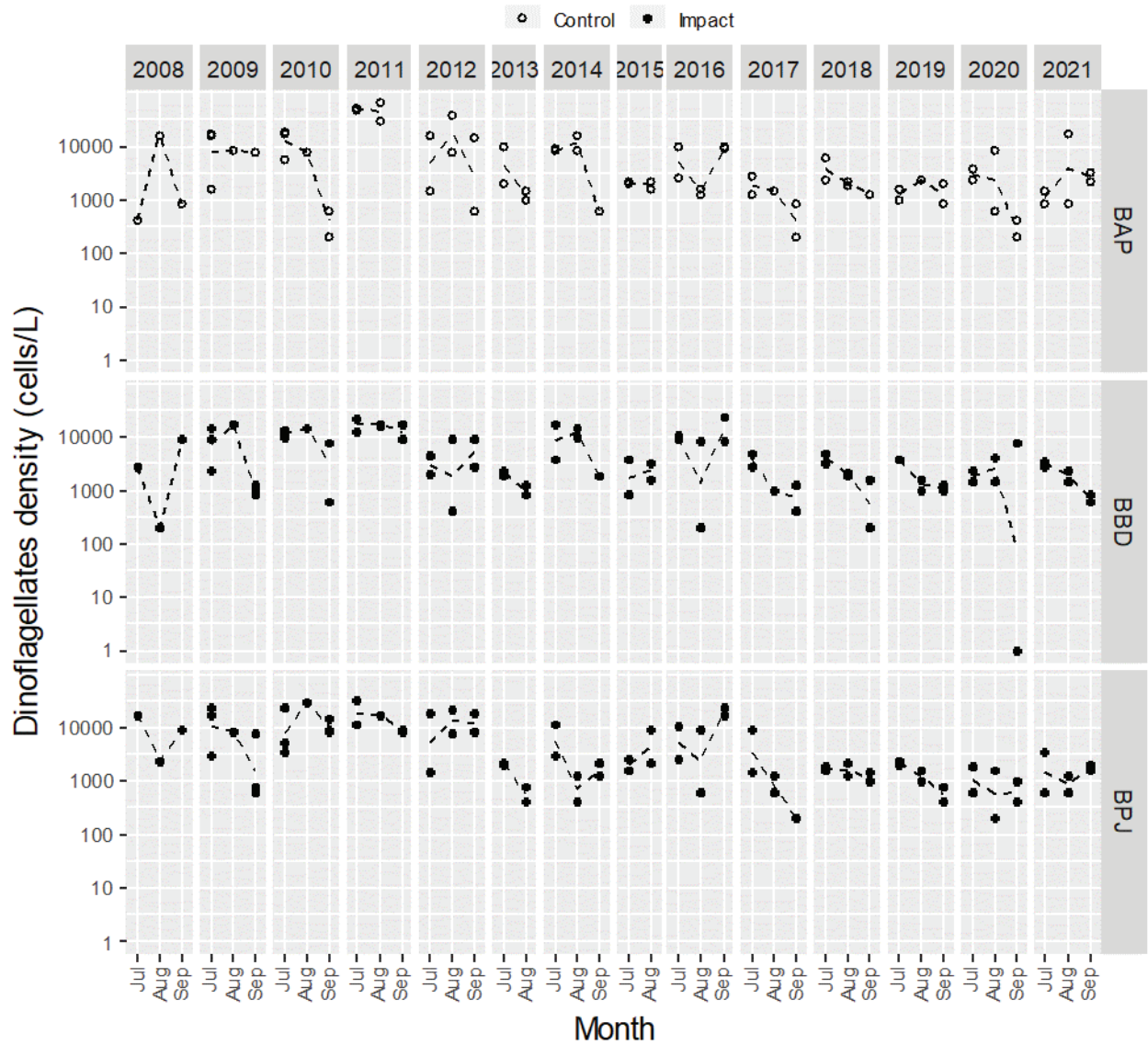
**Figure D3-11. Chrysophyte density (cells/L) from Baker Lake since 2008.**

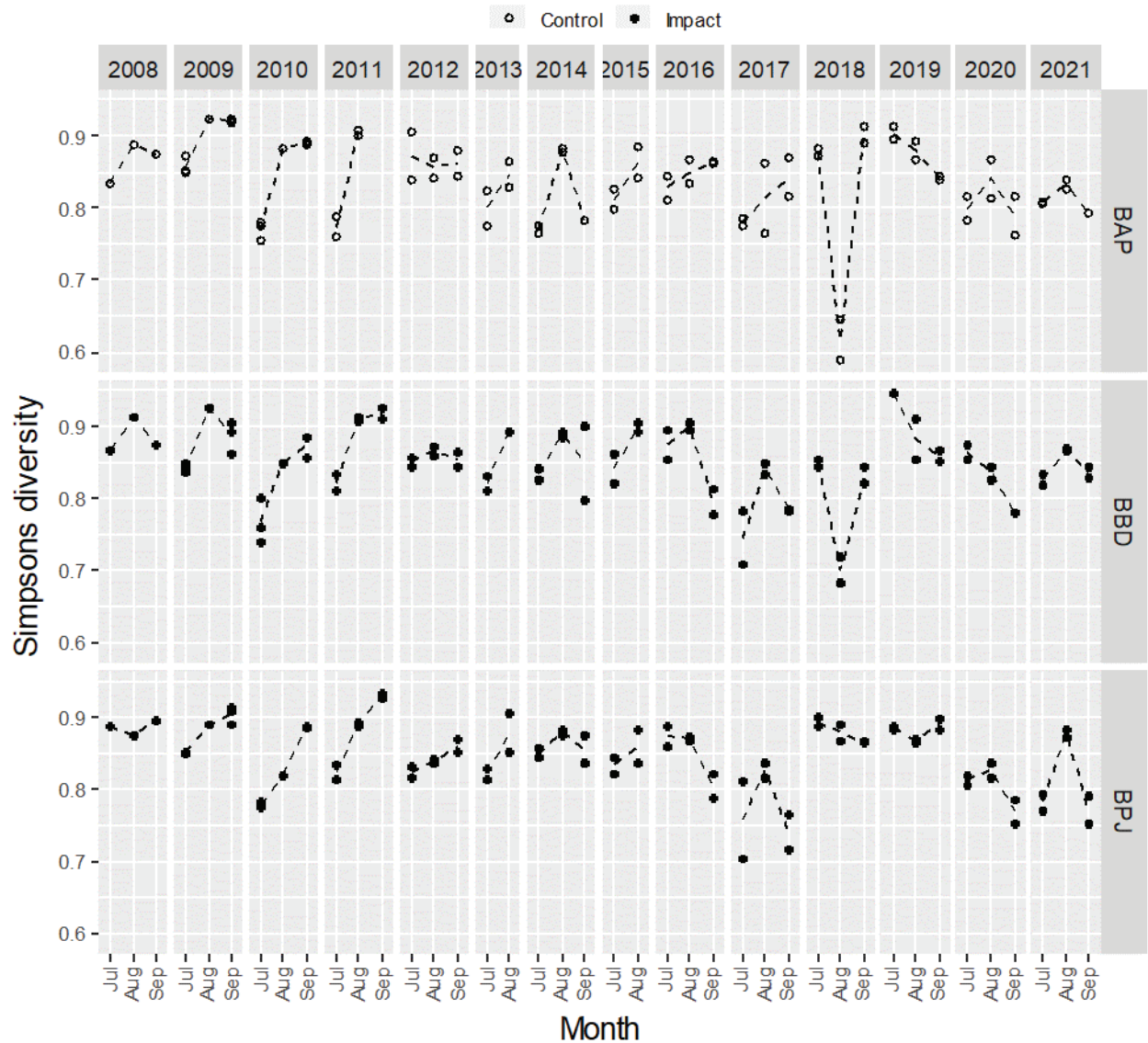
**Figure D3-12. Diatoms density (cells/L) from Baker Lake since 2008.**



**Figure D3-13. Cryptophytes density (cells/L) from Baker Lake since 2008.**



**Figure D3-14. Dinoflagellate density (cells/L) from Baker Lake since 2008.**

**Figure D3-15. Simpsons' Diversity for the phytoplankton community from Baker Lake since 2008.**

## APPENDIX E

### BENTHOS TAXONOMY DATA AND SUPPLEMENTAL PLOTS

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## Appendix E1

### Benthos Data – Meadowbank Study Area Lakes

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Table E1-1. Benthic invertebrate abundance (#/m2) and richness (# taxa) by major taxa group, Meadowbank study area lakes, 2021.

Area-Replicate	Date	Depth (m)	Abundance (#/m <sup>2</sup> )			Richness (# taxa)			Simpson's Diversity	Bray-Curtis Index				
			Oligochaetes	Insects	Molluscs	Other Taxa <sup>1</sup>	TOTAL	Oligochaetes			Insects	Molluscs	Other Taxa <sup>1</sup>	TOTAL
Inugugayualik Lake														
INUG-1	14-Aug-21	8.2	65	457	239	65	826	2	10	3	1	16	0.94	0.21
INUG-2	14-Aug-21	8.4	22	2,587	696	22	3,326	1	7	3	1	12	0.79	0.32
INUG-3	14-Aug-21	8.5	0	804	152	130	1,087	0	10	1	3	14	0.92	0.31
INUG-4	14-Aug-21	8.6	0	652	348	109	1,109	0	5	2	2	9	0.78	0.25
INUG-5	14-Aug-21	8.8	87	891	522	109	1,609	2	9	3	1	15	0.87	0.16
Area Mean			35	1,078	391	87	1,591	1.0	8.2	2.4	1.6	13.2	0.86	0.25
Pipedream Lake														
PDL-1	16-Aug-21	7.7	22	457	283	0	761	1	4	1	0	6	0.77	0.18
PDL-2	16-Aug-21	8.0	0	609	304	0	913	0	7	1	0	8	0.82	0.17
PDL-3	16-Aug-21	8.1	109	891	196	0	1,196	1	6	1	0	8	0.79	0.19
PDL-4	16-Aug-21	8.0	0	500	174	0	674	0	4	1	0	5	0.71	0.10
PDL-5	16-Aug-21	8.1	43	478	174	0	696	2	6	1	0	9	0.81	0.17
Area Mean			35	587	226	0.0	848	0.8	5.4	1.0	0.0	7.2	0.78	0.16
Second Portage Lake														
SP-1	6-Aug-21	9.2	0	1,022	239	65	1,326	0	12	1	2	15	0.89	0.31
SP-2	6-Aug-21	8.9	43	957	435	87	1,522	1	9	1	3	14	0.86	0.40
SP-3	6-Aug-21	9.0	65	761	326	87	1,239	2	10	2	3	17	0.89	0.29
SP-4	6-Aug-21	9.3	22	1,196	152	22	1,391	1	9	1	1	12	0.83	0.51
SP-5	5-Aug-21	8.8	0	587	196	0	783	0	8	2	0	10	0.86	0.40
Area Mean			26	904	270	52	1,252	0.8	9.6	1.4	1.8	13.6	0.87	0.38
Third Portage Lake - East Basin														
TPE-1	8-Aug-21	8.1	130	3,348	630	0	4,109	3	11	2	0	16	0.89	0.59
TPE-2	8-Aug-21	9.2	391	4,652	1,261	87	6,391	2	12	3	1	18	0.86	0.71
TPE-3	8-Aug-21	9.3	174	3,913	696	0	4,783	1	12	1	0	14	0.88	0.69
TPE-4	8-Aug-21	9.0	22	1,174	370	22	1,587	1	8	2	1	12	0.88	0.42
TPE-5	8-Aug-21	9.3	43	1,826	783	0	2,652	2	10	2	0	14	0.87	0.46
Area Mean			152	2,983	748	22	3,904	1.8	10.6	2.0	0.4	14.8	0.88	0.57
Third Portage Lake - North Basin														
TPN-1	7-Aug-21	8.7	22	1,130	22	22	1,196	1	14	1	1	17	0.90	0.49
TPN-2	7-Aug-21	8.3	65	2,826	478	130	3,500	3	10	2	2	17	0.85	0.49
TPN-3	7-Aug-21	8.3	65	3,000	761	22	3,848	2	10	2	1	15	0.84	0.54
TPN-4	7-Aug-21	7.4	43	1,826	326	43	2,239	2	10	2	1	15	0.85	0.45
TPN-5	7-Aug-21	7.5	0	1,543	152	22	1,717	0	8	2	1	11	0.83	0.61
Area Mean			39	2,065	348	48	2,500	1.6	10.4	1.8	1.2	15.0	0.85	0.52
Wally Lake														
WAL-1	10-Aug-21	8.9	22	1,065	826	43	1,957	1	10	3	2	16	0.83	0.32
WAL-2	10-Aug-21	7.4	43	1,109	717	87	1,957	1	7	2	1	11	0.85	0.32
WAL-3	10-Aug-21	8.9	0	1,283	848	43	2,174	0	9	2	1	12	0.82	0.38
WAL-4	10-Aug-21	8.6	0	283	478	22	783	0	5	2	1	8	0.77	0.23
WAL-5	10-Aug-21	8.4	0	804	457	0	1,261	0	7	3	0	10	0.82	0.30
Area Mean			13	909	665	39	1,626	0.4	7.6	2.4	1.0	11.4	0.82	0.31

Notes:

1. "Other taxa" includes flatworms (Turbellaria) and arthropods (Acalyptonotidae, Hygrobatidae, Lebertiidae, Oxidae, Plonidae, Harpacticoida, O. Notostraca, and Gammaracanthidae).



Table E1-2. Raw benthic invertebrate data from the Meadowbank Study Lakes 2021.

Program Location Station Control/Impact? Replicate Date Sample Depth (m)	Meadowbank									
	Inuguguyalik Lake INUG Control					Pipedream Lake PDL Control				
	1	2	3	4	5	1	2	3	4	5
	14-Aug-21 8.2	14-Aug-21 8.4	14-Aug-21 8.5	14-Aug-21 8.6	14-Aug-21 8.8	16-Aug-21 7.7	16-Aug-21 8.0	16-Aug-21 8.1	16-Aug-21 8.0	16-Aug-21 8.1
<b>ROUNDWORMS</b>										
<i>P. Nemata</i>	2	-	-	1	3	1	1	2	1	1
<b>FLATWORMS</b>										
<i>P. Platyhelminthes</i>										
<i>Cl. Turbellaria</i>										
indeterminate	3	-	3	4	-	-	-	-	-	-
<b>ANNELIDS</b>										
<i>P. Annelida</i>										
<b>WORMS</b>										
<i>Cl. Oligochaeta</i>										
<i>F. Enchytraeidae</i>	-	-	-	-	-	-	-	-	-	-
<i>F. Naididae</i>	-	-	-	-	-	-	-	-	-	-
<i>S.F. Tubificinae</i>										
<i>Limnodrilus hoffmeisteri</i>	-	-	-	-	-	-	-	-	-	-
<i>Potamothenix bavaricus</i>	-	-	-	-	-	-	-	-	-	-
<i>Slovinia appendiculata</i>	-	-	-	-	-	-	-	-	-	-
<i>Tassembioides americanus</i>	1	-	-	-	-	-	-	2	-	-
immatures with hair chaetae	-	-	-	-	-	-	-	3	-	1
immatures without hair chaetae	-	-	-	-	-	-	-	-	-	-
<i>S.F. Rhyacodrilinae</i>										
<i>Rhyacodrilus coccineus</i>	2	-	-	-	2	-	-	-	-	-
<i>Rhyacodrilus montana</i>	-	-	-	-	-	-	-	-	-	-
<i>F. Lumbriculidae</i>										
<i>Lumbriculus</i>	-	1	-	-	2	1	-	-	-	1
<b>ARTHROPODS</b>										
<i>P. Arthropoda</i>										
<b>MITES</b>										
<i>Cl. Arachnida</i>										
<i>O. Acarina</i>	-	-	-	-	-	-	-	-	-	-
<i>F. Acaryptotidae</i>										
<i>Acalyptonotus</i>	-	-	1	-	-	-	-	-	-	-
<i>F. Hygrobatidae</i>										
<i>Hygrobatas</i>	-	-	-	-	-	-	-	-	-	-
<i>F. Lebertidae</i>	-	-	-	1	5	-	-	-	-	-
<i>Lebertia</i>	-	-	-	-	-	-	-	-	-	-
<i>F. Oxidae</i>										
<i>Oxus</i>	-	1	2	-	-	-	-	-	-	-
<i>F. Plonidae</i>										
indeterminate	-	-	-	-	-	-	-	-	-	-
<b>HARPACTICIDS</b>										
<i>O. Harpacticoida</i>	-	-	-	-	-	-	-	-	-	-
<b>SEED SHRIMPS</b>										
<i>Cl. Ostracoda</i>	-	-	-	1	11	1	3	6	1	5
<b>FAIRY SHRIMP</b>										
<i>O. Notostira</i>	-	-	-	-	-	-	-	-	-	-
<i>Lepidurus arcticus</i>	-	-	-	-	-	-	-	-	-	-
<b>WATER SCUDS</b>										
<i>O. Amphipoda</i>										
<i>F. Gammaracanthidae</i>	-	-	-	-	-	-	-	-	-	-
<i>Gammaracanthus</i>	-	-	-	-	-	-	-	-	-	-
<b>INSECTS</b>										
<i>Cl. Insecta</i>										
<b>CADDISFLIES</b>										
<i>O. Trichoptera</i>										
<i>F. Apataniidae</i>	-	-	-	-	-	-	-	-	-	-
<i>Apatania</i>	-	-	-	-	-	-	-	-	-	-
<i>F. Limnephilidae</i>	-	-	-	-	-	-	-	-	-	-
<i>Grenia proterita</i>	-	-	-	-	-	-	-	-	-	1
<b>TRUE FLIES</b>										
<i>O. Diptera</i>										
<b>MIDGES</b>										
<i>F. Chironomidae</i>										
chironomid pupae	-	-	5	1	3	2	3	2	1	1
<i>S.F. Chironominae</i>										
<i>Chironomus</i>	-	-	-	-	-	-	-	-	-	-
<i>Cladotanytarsus</i>	-	-	-	-	-	-	-	-	-	-
<i>Constempellina</i>	-	-	-	-	-	-	-	-	-	-
<i>Corynocera ambigua</i>	-	-	-	-	-	-	-	-	-	-
<i>?Corynocera aliveri</i>	-	-	-	-	-	-	-	-	-	-
<i>Dicrotendipes</i>	1	-	1	-	1	-	-	-	-	-
<i>Microseta</i>	1	1	5	-	3	-	3	-	-	-
<i>Microtendipes</i>	-	-	2	-	2	-	-	-	-	-
<i>Parachironomus</i>	-	-	-	-	-	-	-	-	-	-
<i>Paraclopedina</i>	-	-	-	-	-	-	-	-	-	-
<i>Paratanytarsus</i>	2	-	7	-	1	-	-	-	-	-
<i>Polypedium</i>	-	-	-	-	-	-	-	-	-	-
<i>Sergentia</i>	-	-	-	-	-	-	-	-	-	-
<i>Stempellina</i>	-	-	2	-	-	-	1	1	-	-
<i>Stictochironomus</i>	5	46	3	21	20	9	10	22	14	11
<i>Tanytarsus</i>	2	22	2	1	3	-	1	-	-	-
<i>S.F. Diamesinae</i>										
<i>Pagastia</i>	-	-	-	-	-	-	-	-	-	-
<i>Protanytarsus</i>	-	-	-	-	-	-	-	-	-	-
<i>Psithosia</i>	-	-	-	-	-	-	-	-	-	-
<i>Pseudodiamesa</i>	-	-	-	-	-	-	-	-	-	-
<i>S.F. Orthocladinae</i>										
<i>Abiskomyia</i>	-	-	-	-	-	-	4	-	-	1
<i>Corynoneura</i>	-	42	-	-	-	-	-	-	-	-
<i>Cricotopus</i>	-	-	-	-	-	-	-	-	-	-
<i>Cricotopus/Orthocladus</i>	-	-	-	-	-	-	-	-	-	-
<i>Heterotrissocladius</i>	1	-	7	2	2	2	1	3	1	1
<i>Hydrobaenus</i>	-	-	-	-	-	-	-	-	-	-
<i>Mesocricotopus</i>	-	-	-	-	-	-	-	-	-	-
<i>Nanocladius</i>	-	-	-	-	-	-	-	-	-	-
<i>Paracloadius</i>	-	-	-	-	-	-	-	-	-	-
<i>Parakiefferiella</i>	-	-	-	-	-	-	-	-	-	-
<i>Psectrocladius</i>	2	2	2	-	1	-	-	2	1	-
<i>Zalutschia</i>	-	-	-	-	-	-	-	-	-	-
Orthocladinae Genus "Greenland"	-	-	-	-	-	-	-	-	-	-
indeterminate	-	-	-	-	-	-	-	-	-	-
<i>S.F. Procladius</i>										
<i>Procladius</i>	2	1	-	3	3	1	-	2	-	5
<i>S.F. Tanypodinae</i>										
<i>Abalabesmyia</i>	1	-	-	-	-	-	-	-	-	-
<i>Procladius</i>	4	5	1	2	3	7	5	9	6	2
<i>Thienemannimyia</i> complex	-	-	-	-	-	-	-	-	-	-
<b>F. Empididae</b>										
<i>Chelifer/Mezochela</i>	-	-	-	-	-	-	-	-	-	-
<i>Climocera</i>	-	-	-	-	-	-	-	-	-	-
pupae	-	-	-	-	-	-	-	-	-	-

Table E1-2. Raw benthic invertebrate data from the Meadowbank Study Lakes 2021.

Program Location Station Control/Impact? Replicate Date Sample Depth (m)	Meadowbank									
	Inuggugyusatik Lake INUG Control					Pipedream Lake PDL Control				
	1	2	3	4	5	1	2	3	4	5
	14-Aug-21 8.2	14-Aug-21 8.4	14-Aug-21 8.5	14-Aug-21 8.6	14-Aug-21 8.8	16-Aug-21 7.7	16-Aug-21 8.0	16-Aug-21 8.1	16-Aug-21 8.0	16-Aug-21 8.1
<b>MOLLUSCS</b>										
<b>P. Mollusca</b>										
<b>SNAILS</b>										
Cl. Gastropoda										
<b>F. Valvatidae</b>										
Valvata	-	-	-	-	-	-	-	-	-	-
<b>CLAMS</b>										
Cl. Bivalvia										
<b>F. Sphaeriidae</b>										
Psidium/Cyclocalyx	5	26	-	5	14	-	-	-	-	-
Psidium (Cyclocalyx/Neopisidium)	5	4	7	11	8	13	14	9	8	8
Sphaerium nitidum	1	2	-	-	2	-	-	-	-	-
<b>R (Richness) - totals <sup>2,3</sup></b>										
Total	16	12	14	9	15	6	8	8	5	9
Oligochaete	2	1	0	0	2	1	0	1	0	2
Insect	10	7	10	5	9	4	7	6	4	6
Mollusc	3	3	1	2	3	1	1	1	1	1
Other <sup>4</sup>	1	1	3	2	1	0	0	0	0	0
<b>Abundance (raw) - totals <sup>5,6</sup></b>										
Total	38	153	50	51	74	35	42	55	31	32
Oligochaete	3	1	0	0	4	1	0	5	0	2
Insect	21	119	37	30	41	21	28	41	23	22
Mollusc	11	32	7	16	24	13	14	9	8	8
Other <sup>4</sup>	3	1	6	5	5	0	0	0	0	0
<b>N (Abundance) - #/m<sup>2</sup></b>										
Total	826	3,326	1,087	1,109	1,609	761	913	1,196	674	696
Oligochaete	65	22	0	0	87	22	0	109	0	43
Insect	457	2,587	804	652	891	457	609	891	500	478
Mollusc	239	696	152	348	522	283	304	196	174	174
Other <sup>4</sup>	65	22	130	109	109	0	0	0	0	0

**Notes:**

- Benthic invertebrate count data shown in this table are from composite of two grabs sieved to 500 µm.
- Richness totals exclude P. Nemata, Cl. Ostracoda, indeterminates (O. Acarina, F. Lumbriculidae), immatures (S.F. Tubificinae, O. Acarina), and pupae.
- Pupae and immatures (bolded values) are excluded from the richness totals if other life stages are present in the replicate sample.
- Other Taxa include: Cl. Turbellaria, F. Acalyptonotidae, F. Hygrobatidae, F. Lebertidae, F. Oxidae, F. Plonidae, O. Harpacticoida, O. Notostraca, and F. Gammaracanthidae.
- Abundance totals exclude P. Nemata and Cl. Ostracoda.
- Raw abundance from two grabs (grab area = 0.023 m<sup>2</sup>).

Table E1-2. Raw benthic invertebrate data from the Meadowbank Study Lakes 2021.

Program Location Station Control/Impact? Replicate Date Sample Depth (m)	Meadowbank									
	Second Portage Lake					Third Portage Lake - East Basin				
	SP Impact					TPE Impact				
	1 6-Aug-21 9.2	2 6-Aug-21 8.9	3 6-Aug-21 9.0	4 6-Aug-21 9.3	5 5-Aug-21 8.8	1 8-Aug-21 8.1	2 8-Aug-21 9.2	3 8-Aug-21 9.3	4 8-Aug-21 9.0	5 8-Aug-21 9.3
<b>ROUNDWORMS</b>										
<i>P. Nemata</i>	9	5	6	11	2	1	4	6	7	11
<b>FLATWORMS</b>										
<i>P. Platyhelminthes</i>										
<i>Cl. Turbellaria</i>										
indeterminate	-	1	1	-	-	-	-	-	-	-
<b>ANNELIDS</b>										
<i>P. Annelida</i>										
<b>WORMS</b>										
<i>Cl. Oligochaeta</i>										
<i>F. Enchytraeidae</i>	-	-	-	-	-	-	-	-	-	-
<i>F. Naididae</i>	-	-	-	-	-	-	-	-	-	-
<i>S.F. Tubificinae</i>										
<i>Limnodrilus hoffmeisteri</i>	-	-	-	-	-	-	-	-	-	-
<i>Potamothenis bavaricus</i>	-	-	-	-	-	-	-	-	-	-
<i>Slovinia appendiculata</i>	-	-	-	-	-	-	-	-	-	-
<i>Tassembiella americana</i>	-	-	-	-	-	-	-	-	-	-
immatures with hair chaetae	-	2	1	-	-	1	-	-	-	-
immatures without hair chaetae	-	-	-	-	-	-	-	-	-	-
<i>S.F. Rhyacodrilinae</i>										
<i>Rhyacodrilus coccineus</i>	-	-	-	-	-	1	16	8	-	1
<i>Rhyacodrilus montana</i>	-	-	-	-	-	-	-	-	-	-
<i>F. Lumbricidae</i>										
<i>Lumbriculus</i>	-	-	2	1	-	4	2	-	1	1
<b>ARTHROPODS</b>										
<i>P. Arthropoda</i>										
<b>MITES</b>										
<i>Cl. Arachnida</i>										
<i>O. Acarina</i>	-	-	-	-	-	-	-	-	-	-
<i>F. Acaryptotidae</i>										
<i>Acolyptonotus</i>	-	-	-	1	-	-	-	-	-	-
<i>F. Hygrobatidae</i>										
<i>Hygrobatas</i>	-	-	-	-	-	-	-	-	-	-
<i>F. Lebertidae</i>										
<i>Lebertia</i>	1	1	1	-	-	-	-	-	1	-
<i>F. Oxidae</i>										
<i>Oxus</i>	2	2	2	-	-	-	4	-	-	-
<i>F. Plonidae</i>										
indeterminate	-	-	-	-	-	-	-	-	-	-
<b>HARPACTICIDS</b>										
<i>O. Harpacticoida</i>	-	-	-	-	-	-	-	-	-	-
<b>SEED SHRIMPS</b>										
<i>Cl. Ostracoda</i>	4	5	3	1	-	118	122	32	27	19
<b>FAIRY SHRIMP</b>										
<i>O. Notostomatidae</i>										
<i>Lepidurus arcticus</i>	-	-	-	-	-	-	-	-	-	-
<b>WATER SCUDS</b>										
<i>O. Amphipoda</i>										
<i>F. Gammaracanthidae</i>										
<i>Gammaracanthus</i>	-	-	-	-	-	-	-	-	-	-
<b>INSECTS</b>										
<i>Cl. Insecta</i>										
<b>CADDISFLIES</b>										
<i>O. Trichoptera</i>										
<i>F. Apataniidae</i>										
<i>Apatania</i>	-	-	-	-	-	-	-	-	-	-
<i>F. Limnephilidae</i>										
<i>Grenia proterita</i>	1	-	-	-	-	-	-	-	-	-
<b>TRUE FLIES</b>										
<i>O. Diptera</i>										
<b>MIDGES</b>										
<i>F. Chironomidae</i>										
chironomid pupae	15	15	4	21	6	16	24	28	14	16
<i>S.F. Chironominae</i>										
<i>Chironomus</i>	-	-	-	-	-	-	-	-	-	-
<i>Cladotanytarsus</i>	-	-	-	-	-	-	-	-	-	-
<i>Constempellina</i>	-	-	-	-	-	-	-	-	-	-
<i>Corynocera ambigua</i>	-	-	-	-	-	-	-	-	-	-
<i>Corynocera oliveri</i>	-	-	-	-	-	-	-	-	-	-
<i>Dicrotendipes</i>	-	-	-	-	-	-	-	-	-	-
<i>Microseta</i>	3	3	-	4	1	8	18	14	7	5
<i>Microtendipes</i>	1	-	2	-	-	-	-	-	-	-
<i>Parachironomus</i>	-	-	-	-	-	-	-	-	-	-
<i>Paraclopedius</i>	-	-	-	-	-	-	-	-	-	-
<i>Paratanytarsus</i>	-	1	-	1	-	40	76	48	15	29
<i>Polypedium</i>	-	-	-	-	-	-	-	-	-	-
<i>Sergentia</i>	-	-	-	-	-	-	-	-	-	-
<i>Stempellina</i>	1	4	4	11	1	-	-	-	-	1
<i>Stictochironomus</i>	6	4	11	1	2	16	12	28	4	9
<i>Tanytarsus</i>	4	4	-	6	-	6	2	6	5	2
<i>S.F. Diamesinae</i>										
<i>Pagastia</i>	-	-	-	-	-	-	-	-	-	-
<i>Protanypus</i>	1	-	1	1	-	-	-	-	-	-
<i>Potthestia</i>	-	-	-	-	-	-	-	-	-	-
<i>Pseudodiamesa</i>	-	-	-	-	-	-	-	-	-	-
<i>S.F. Orthocladinae</i>										
<i>Abiskomyia</i>	-	-	-	-	-	7	2	-	-	-
<i>Corynoneura</i>	-	-	-	-	-	-	-	-	-	-
<i>Cricotopus</i>	-	-	-	-	-	-	-	-	-	-
<i>Cricotopus/Orthocladus</i>	-	-	-	-	-	-	-	-	-	-
<i>Heterotrissocladius</i>	-	-	1	-	1	-	14	8	1	4
<i>Hydrobaenus</i>	-	-	-	-	1	-	-	-	-	-
<i>Mesocricotopus</i>	-	-	-	-	-	-	2	-	-	-
<i>Nanocladius</i>	-	-	-	-	-	-	-	-	-	-
<i>Paracloadius</i>	-	-	-	-	-	-	4	2	-	-
<i>Parakiefferiella</i>	-	-	-	-	-	-	-	-	-	-
<i>Psectrocladius</i>	2	2	1	1	2	20	14	20	1	5
<i>Zalutschia</i>	1	-	3	1	-	-	-	-	-	-
<i>Orthocladinae Genus "Greenland"</i>	-	-	-	-	-	2	-	2	-	-
indeterminate	-	-	-	-	-	-	-	-	-	-
<i>S.F. Procladiusinae</i>										
<i>Procladius</i>	3	2	1	-	3	4	2	2	2	1
<i>S.F. Tanypodinae</i>										
<i>Abalabesmyia</i>	3	2	1	-	-	-	-	-	-	-
<i>Procladius</i>	6	7	6	8	10	31	42	18	5	11
<i>Thienemannimyia complex</i>	-	-	-	-	-	1	2	2	-	-
<i>F. Empididae</i>										
<i>Chelifer/Meiochela</i>	-	-	-	-	-	3	-	2	-	1
<i>Climacoptera</i>	-	-	-	-	-	-	-	-	-	-
pupae	-	-	-	-	-	-	-	-	-	-

Table E1-2. Raw benthic invertebrate data from the Meadowbank Study Lakes 2021.

Program Location Station Control/Impact? Replicate Date Sample Depth (m)	Meadowbank									
	Second Portage Lake					Third Portage Lake - East Basin				
	SP					TPE				
	Impact					Impact				
	1	2	3	4	5	1	2	3	4	5
	6-Aug-21	6-Aug-21	6-Aug-21	6-Aug-21	5-Aug-21	8-Aug-21	8-Aug-21	8-Aug-21	8-Aug-21	8-Aug-21
	9.2	8.9	9.0	9.3	8.8	8.1	9.2	9.3	9.0	9.3
<b>MOLLUSCS</b>										
<b>P. Mollusca</b>										
<b>SNAILS</b>										
Cl. Gastropoda										
<b>F. Valvatidae</b>										
Valvata	-	-	-	-	-	-	2	-	-	-
<b>CLAMS</b>										
Cl. Bivalvia										
<b>F. Sphaeriidae</b>										
Psidium/Cyclocalyx	-	-	1	-	2	7	4	-	5	15
Psidium (Cyclocalyx/Neopisidium)	11	20	14	7	7	22	52	32	12	21
Sphaerium nitidum	-	-	-	-	-	-	-	-	-	-
<b>R (Richness) - totals <sup>5,6</sup></b>										
Total	15	14	17	12	10	16	18	14	12	14
Oligochaete	0	1	2	1	0	3	2	1	1	2
Insect	12	9	10	9	8	11	12	12	8	10
Mollusc	1	1	2	1	2	2	3	1	2	2
Other <sup>4</sup>	2	3	3	1	0	0	1	0	1	0
<b>Abundance (raw) - totals <sup>5,6</sup></b>										
Total	61	70	57	64	36	189	294	220	73	122
Oligochaete	0	2	3	1	0	6	18	8	1	2
Insect	47	44	35	55	27	154	214	180	54	84
Mollusc	11	20	15	7	9	29	58	32	17	36
Other <sup>4</sup>	3	4	4	1	0	0	4	0	1	0
<b>N (Abundance) - #/m<sup>2</sup></b>										
Total	1,326	1,522	1,239	1,391	783	4,109	6,391	4,783	1,587	2,652
Oligochaete	0	43	65	22	0	130	391	174	22	43
Insect	1,022	957	761	1,196	587	3,348	4,652	3,913	1,174	1,826
Mollusc	239	435	326	152	196	630	1,261	696	370	783
Other <sup>4</sup>	65	87	87	22	0	0	87	0	22	0

**Notes:**

- Benthic invertebrate count data shown in this table are from composite of two grabs sieved to 500 µm.
- Richness totals exclude P. Nemata, Cl. Ostracoda, indeterminates (O. Acarina, F. Lumbriculidae), immatures (S.F. Tubificinae, O. Acarina), and pupae.
- Pupae and immatures (bolded values) are excluded from the richness totals if other life stages are present in the replicate sample.
- Other Taxa include: Cl. Turbellaria, F. Acalyptonotidae, F. Hygrobatidae, F. Lebertidae, F. Oxidae, F. Plonidae, O. Harpacticoida, O. Notostraca, and F. Gammaracanthidae.
- Abundance totals exclude P. Nemata and Cl. Ostracoda.
- Raw abundance from two grabs (grab area = 0.023 m<sup>2</sup>).



Table E1-2. Raw benthic invertebrate data from the Meadowbank Study Lakes 2021.

Program Location Station Control/Impact? Replicate Date Sample Depth (m)	Meadowbank									
	Third Portage Lake - North Basin					Wally Lake				
	TPN Impact					WAL Impact				
	1 7-Aug-21 8.7	2 7-Aug-21 8.3	3 7-Aug-21 8.3	4 7-Aug-21 7.4	5 7-Aug-21 7.5	1 10-Aug-21 8.9	2 10-Aug-21 7.4	3 10-Aug-21 8.9	4 10-Aug-21 8.6	5 10-Aug-21 8.4
<b>ROUNDWORMS</b>										
<i>P. Nemata</i>	4	8	1	5	2	4	1	-	3	2
<b>FLATWORMS</b>										
<i>P. Platyhelminthes</i>										
<i>Cl. Turbellaria</i>										
indeterminate	-	-	1	-	-	1	4	2	-	-
<b>ANNELIDS</b>										
<i>P. Annelida</i>										
<b>WORMS</b>										
<i>Cl. Oligochaeta</i>										
<i>F. Enchytraeidae</i>	-	-	-	-	-	-	-	-	-	-
<i>F. Naididae</i>	-	-	-	-	-	-	-	-	-	-
<i>S.F. Tubificinae</i>										
<i>Limnodrilus hoffmeisteri</i>	-	-	-	-	-	-	-	-	-	-
<i>Potamothenis bavaricus</i>	-	-	-	-	-	-	-	-	-	-
<i>Slovinia appendiculata</i>	-	-	-	-	-	-	-	-	-	-
<i>Tassembiella americana</i>	-	-	-	-	-	-	-	-	-	-
immatures with hair chaetae	-	1	2	1	-	-	-	-	-	-
immatures without hair chaetae	-	-	-	-	-	-	-	-	-	-
<i>S.F. Rhyacodrilinae</i>										
<i>Rhyacodrilus coccineus</i>	-	1	1	1	-	-	-	-	-	-
<i>Rhyacodrilus montana</i>	-	-	-	-	-	-	-	-	-	-
<i>F. Lumbricidae</i>										
<i>Lumbriculus</i>	1	1	-	-	-	1	2	-	-	-
<b>ARTHROPODS</b>										
<i>P. Arthropoda</i>										
<b>MITES</b>										
<i>Cl. Arachnida</i>										
<i>O. Acarina</i>	-	-	-	-	-	-	-	-	-	-
<i>F. Acaryptotidae</i>										
<i>Acolyptotus</i>	-	5	-	2	-	1	-	-	-	-
<i>F. Hygrobatidae</i>										
<i>Hygrobaters</i>	-	-	-	-	-	-	-	-	-	-
<i>F. Lebertidae</i>										
<i>Lebertia</i>	-	1	-	-	1	-	-	-	-	-
<i>F. Oxidae</i>										
<i>Oxus</i>	1	-	-	-	-	-	-	-	1	-
<i>F. Plonidae</i>										
indeterminate	-	-	-	-	-	-	-	-	-	-
<b>HARPACTICIDS</b>										
<i>O. Harpacticoida</i>	-	-	-	-	-	-	-	-	-	-
<b>SEED SHRIMPS</b>										
<i>Cl. Ostracoda</i>	18	14	11	21	18	2	1	10	4	6
<b>FAIRY SHRIMP</b>										
<i>O. Notostira</i>										
<i>Lepidurus arcticus</i>	-	-	-	-	-	-	-	-	-	-
<b>WATER SCUDS</b>										
<i>O. Amphipoda</i>										
<i>F. Gammaracanthidae</i>										
<i>Gammaracanthus</i>	-	-	-	-	-	-	-	-	-	-
<b>INSECTS</b>										
<i>Cl. Insecta</i>										
<b>CADDISFLIES</b>										
<i>O. Trichoptera</i>										
<i>F. Apataniidae</i>										
<i>Apatania</i>	-	-	-	-	-	-	-	-	-	-
<i>F. Limnephilidae</i>										
<i>Grensia proterita</i>	3	-	-	-	-	1	-	-	-	-
<b>TRUE FLIES</b>										
<i>O. Diptera</i>										
<b>MIDGES</b>										
<i>F. Chironomidae</i>										
chironomid pupae	11	21	35	34	19	7	13	12	-	11
<i>S.F. Chironominae</i>										
<i>Chironomus</i>	-	-	-	-	-	-	-	-	-	-
<i>Cladotanytarsus</i>	-	-	-	-	-	2	-	2	-	-
<i>Constempellina</i>	-	-	-	-	-	-	-	-	-	-
<i>Corynocera ambigua</i>	-	-	-	-	-	8	4	6	-	-
<i>Corynocera oliveri</i>	-	-	-	-	-	-	-	-	-	-
<i>Dicrotendipes</i>	-	-	-	-	-	-	-	-	-	-
<i>Microseta</i>	7	6	8	6	10	1	-	1	-	1
<i>Microtendipes</i>	-	-	-	-	-	-	-	-	-	-
<i>Parachironomus</i>	-	-	-	-	-	-	-	-	-	-
<i>Paraclopedius</i>	-	-	-	-	1	-	-	-	-	-
<i>Paratanytarsus</i>	1	2	3	3	6	1	-	1	-	-
<i>Polypedium</i>	-	-	-	-	-	-	-	-	-	-
<i>Sergentia</i>	1	-	-	-	-	-	-	-	-	-
<i>Stempellina</i>	-	-	-	-	2	-	1	-	-	2
<i>Stictochironomus</i>	4	53	52	11	-	18	20	28	8	16
<i>Tanytarsus</i>	3	18	21	8	6	4	-	1	1	-
<i>S.F. Diamesinae</i>										
<i>Pagastia</i>	-	-	-	-	-	-	-	-	-	-
<i>Protanytarsus</i>	-	-	-	-	-	-	1	-	-	-
<i>Psithalia</i>	-	-	-	-	-	-	-	-	-	-
<i>Pseudodiamesa</i>	-	-	-	-	-	-	-	-	-	-
<i>S.F. Orthocladinae</i>										
<i>Abiskomyia</i>	-	-	-	-	-	-	-	-	-	-
<i>Corynoneura</i>	-	-	-	-	-	-	-	-	-	-
<i>Cricotopus</i>	-	-	-	-	-	-	-	-	-	-
<i>Cricotopus/Orthocladus</i>	-	-	-	-	-	-	-	-	-	-
<i>Heterotrissocladius</i>	9	6	4	3	23	-	1	-	-	1
<i>Hydrobaenus</i>	-	-	-	1	-	-	-	-	-	-
<i>Mesocricotopus</i>	-	1	-	-	-	-	-	-	-	-
<i>Nanocladius</i>	-	-	-	-	-	-	-	-	-	-
<i>Paracloadius</i>	1	-	-	-	-	-	-	-	-	-
<i>Parakiefferiella</i>	-	3	-	-	-	-	-	-	-	-
<i>Psectrocladius</i>	1	-	4	-	-	-	-	-	-	1
<i>Zalutschia</i>	1	10	-	5	-	-	-	-	1	-
<i>Orthocladinae Genus "Greenland"</i>	-	-	1	-	-	-	-	-	-	-
indeterminate	1	-	-	-	-	-	-	-	-	-
<i>S.F. Procladius</i>										
<i>Procladius</i>	1	1	2	1	-	2	4	3	1	1
<i>S.F. Tanypodinae</i>										
<i>Abalabesmyia</i>	-	-	-	-	-	1	-	1	-	-
<i>Procladius</i>	7	9	6	7	3	4	7	4	2	4
<i>Thienemannimyia</i> complex	1	-	2	5	1	-	-	-	-	-
<b>F. Empididae</b>										
<i>Chelifer/Metachela</i>	-	-	-	-	-	-	-	-	-	-
<i>Climocera</i>	-	-	-	-	-	-	-	-	-	-
pupae	-	-	-	-	-	-	-	-	-	-

Table E1-2. Raw benthic invertebrate data from the Meadowbank Study Lakes 2021.

Program Location Station Control/Impact? Replicate Date Sample Depth (m)	Meadowbank									
	Third Portage Lake - North Basin					Wally Lake				
	TPN					WAL				
	Impact					Impact				
	1 7-Aug-21 8.7	2 7-Aug-21 8.3	3 7-Aug-21 8.3	4 7-Aug-21 7.4	5 7-Aug-21 7.5	1 10-Aug-21 8.9	2 10-Aug-21 7.4	3 10-Aug-21 8.9	4 10-Aug-21 8.6	5 10-Aug-21 8.4
<b>MOLLUSCS</b>										
<b>P. Mollusca</b>										
<b>SNAILS</b>										
Cl. Gastropoda										
<b>F. Valvatidae</b>										
Valvata	-	-	-	-	-	-	-	-	-	-
<b>CLAMS</b>										
Cl. Bivalvia										
<b>F. Sphaeriidae</b>										
Psidium/Cyclocalyx	1	10	12	4	1	7	11	13	8	5
Psidium (Cyclocalyx/Neopisidium)	-	12	23	11	6	30	22	26	14	15
Sphaerium nitidum	-	-	-	-	-	1	-	-	-	1
<b>R (Richness) - totals <sup>5,6</sup></b>										
Total	17	17	15	15	11	16	11	12	8	10
Oligochaete	1	3	2	2	0	1	1	0	0	0
Insect	14	10	10	10	8	10	7	9	5	7
Mollusc	1	2	2	2	2	3	2	2	2	3
Other <sup>4</sup>	1	2	1	1	1	2	1	1	1	0
<b>Abundance (raw) - totals <sup>5,6</sup></b>										
Total	55	161	177	103	79	90	90	100	36	58
Oligochaete	1	3	3	2	0	1	2	0	0	0
Insect	52	130	138	84	71	49	51	59	13	37
Mollusc	1	22	35	15	7	38	33	39	22	21
Other <sup>4</sup>	1	6	1	2	1	2	4	2	1	0
<b>N (Abundance) - #/m<sup>2</sup></b>										
Total	1,196	3,500	3,848	2,239	1,717	1,957	1,957	2,174	783	1,261
Oligochaete	22	65	65	43	0	22	43	0	0	0
Insect	1,130	2,826	3,000	1,826	1,543	1,065	1,109	1,283	283	804
Mollusc	22	478	761	326	152	826	717	848	478	457
Other <sup>4</sup>	22	130	22	43	22	43	87	43	22	0

**Notes:**

- Benthic invertebrate count data shown in this table are from composite of two grabs sieved to 500 µm.
- Richness totals exclude P. Nemata, Cl. Ostracoda, indeterminate (O. Acarina, F. Lumbriculidae), immatures (S.F. Tubificinae, O. Acarina), and pupae.
- Pupae and immatures (bolded values) are excluded from the richness totals if other life stages are present in the replicate sample.
- Other Taxa include: Cl. Turbellaria, F. Acalyptonotidae, F. Hygrobatidae, F. Lebertidae, F. Oxidae, F. Plonidae, O. Harpacticoida, O. Notostraca, and F. Gammaracanthidae.
- Abundance totals exclude P. Nemata and Cl. Ostracoda.
- Raw abundance from two grabs (grab area = 0.023 m<sup>2</sup>).

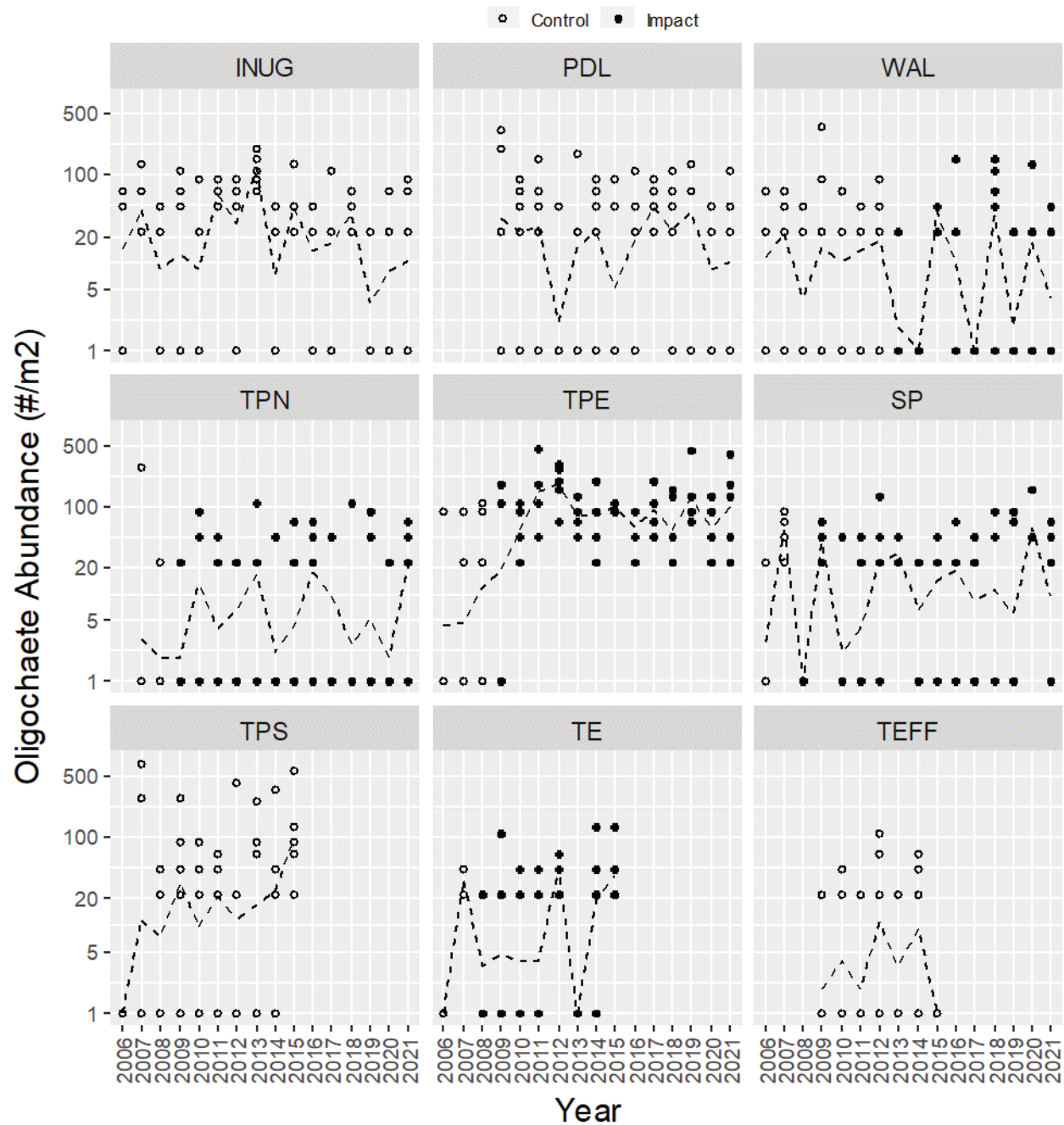
Figure E1-1. Oligochaete abundance (#/m<sup>2</sup>) from Meadowbank study lakes since 2006.

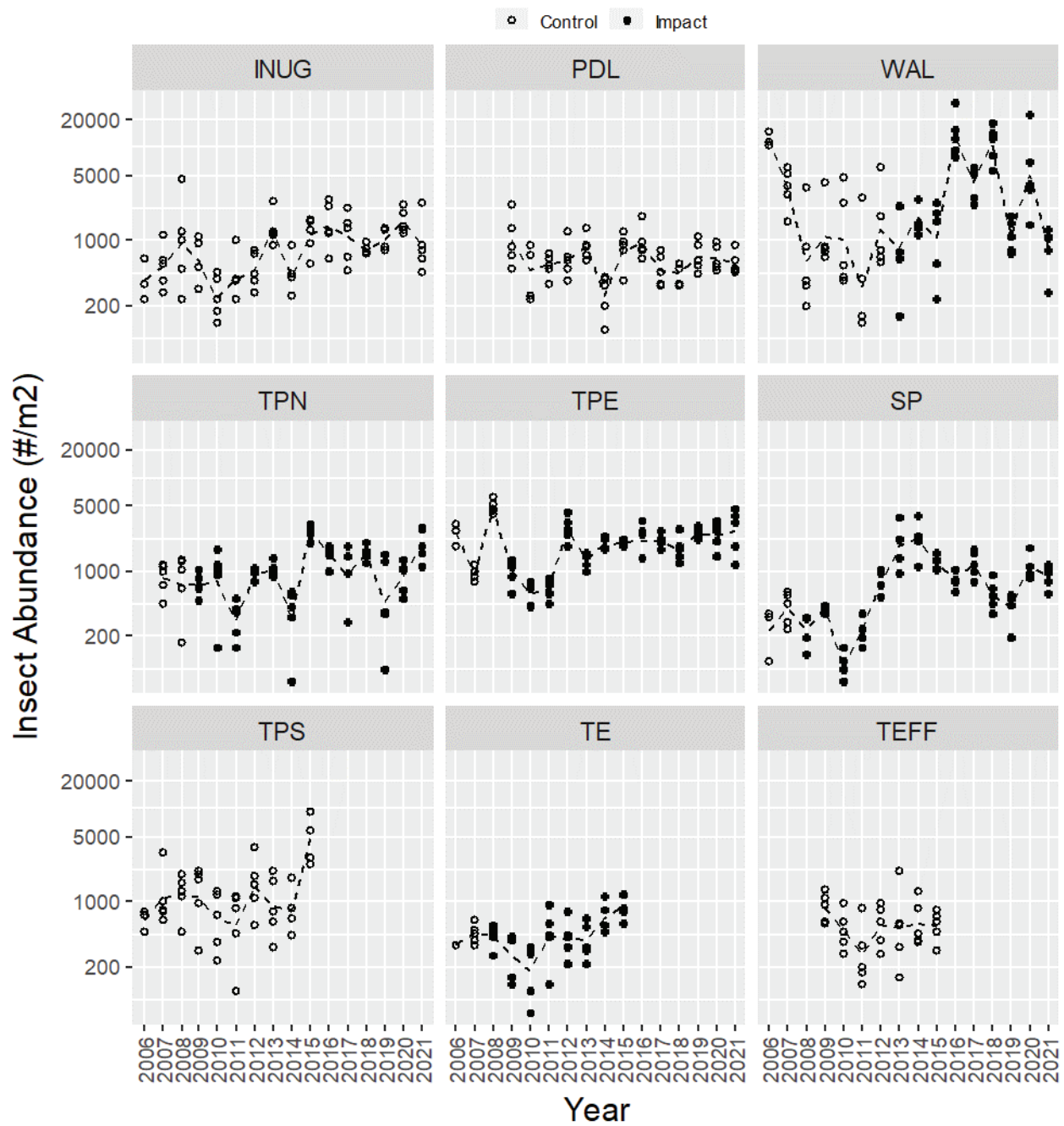
Figure E1-2. Insect abundance (#/m<sup>2</sup>) from Meadowbank study lakes since 2006.

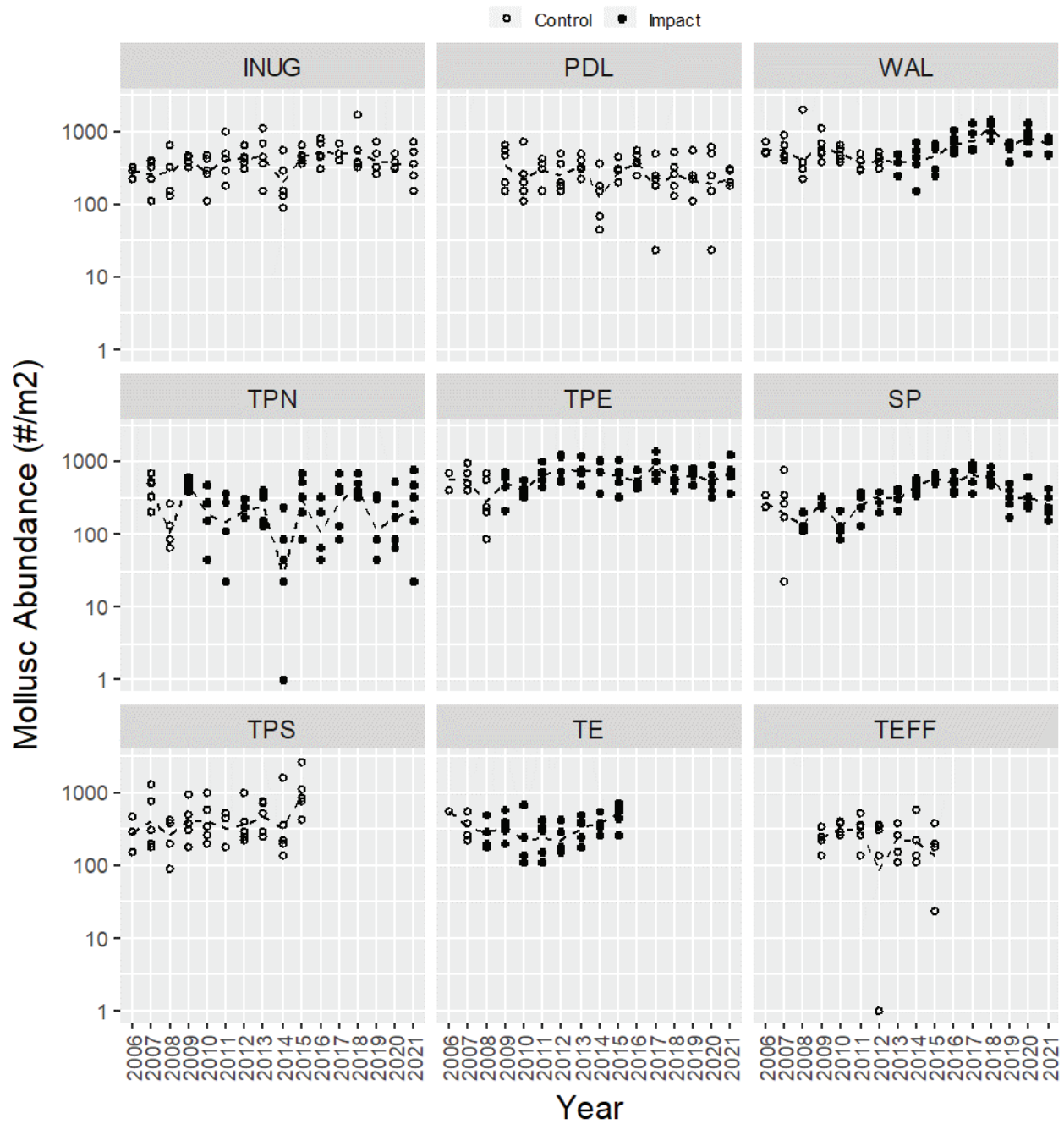
Figure E1-3. Mollusc abundance ( $\#/m^2$ ) from Meadowbank study lakes since 2006.



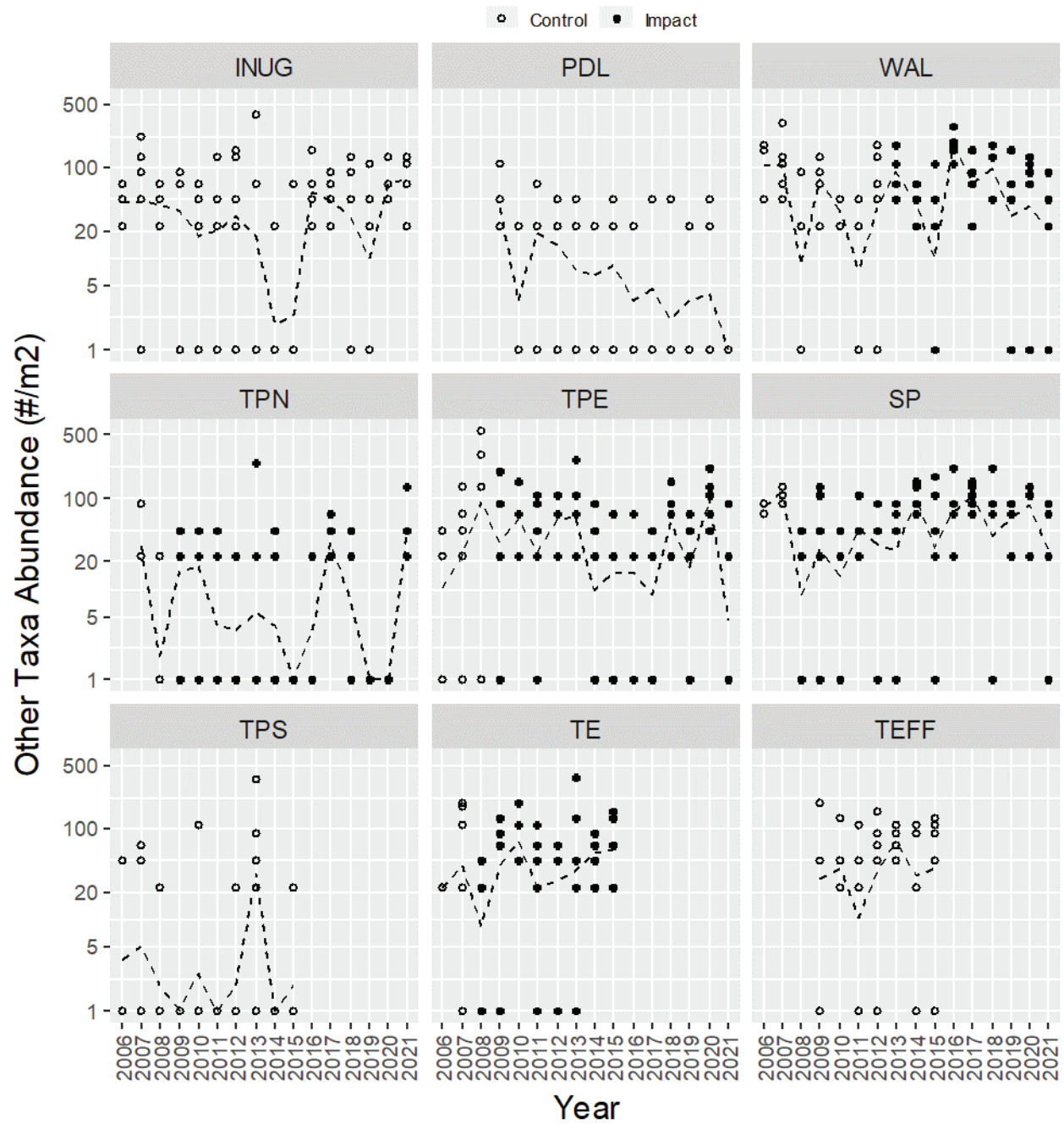
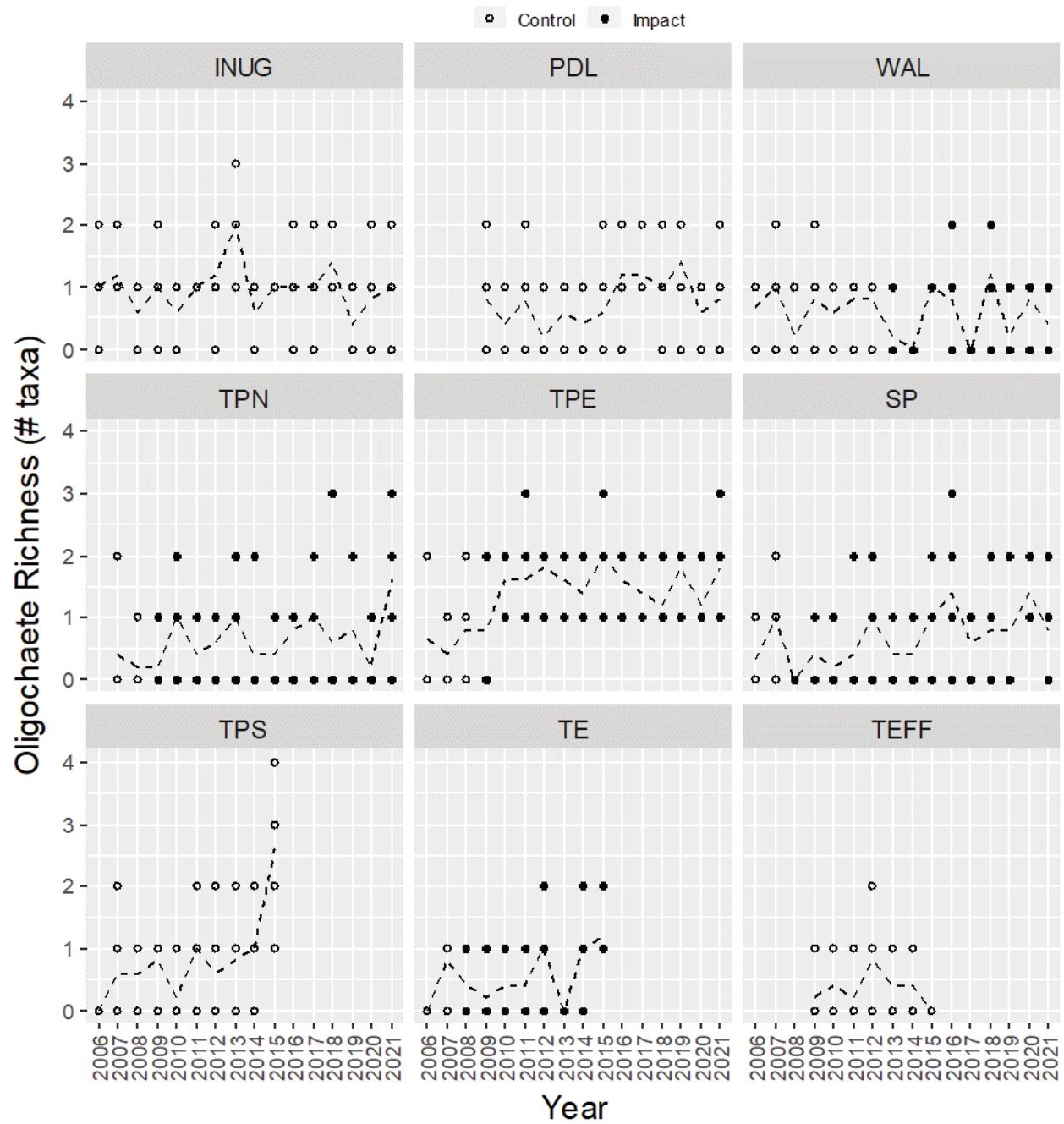
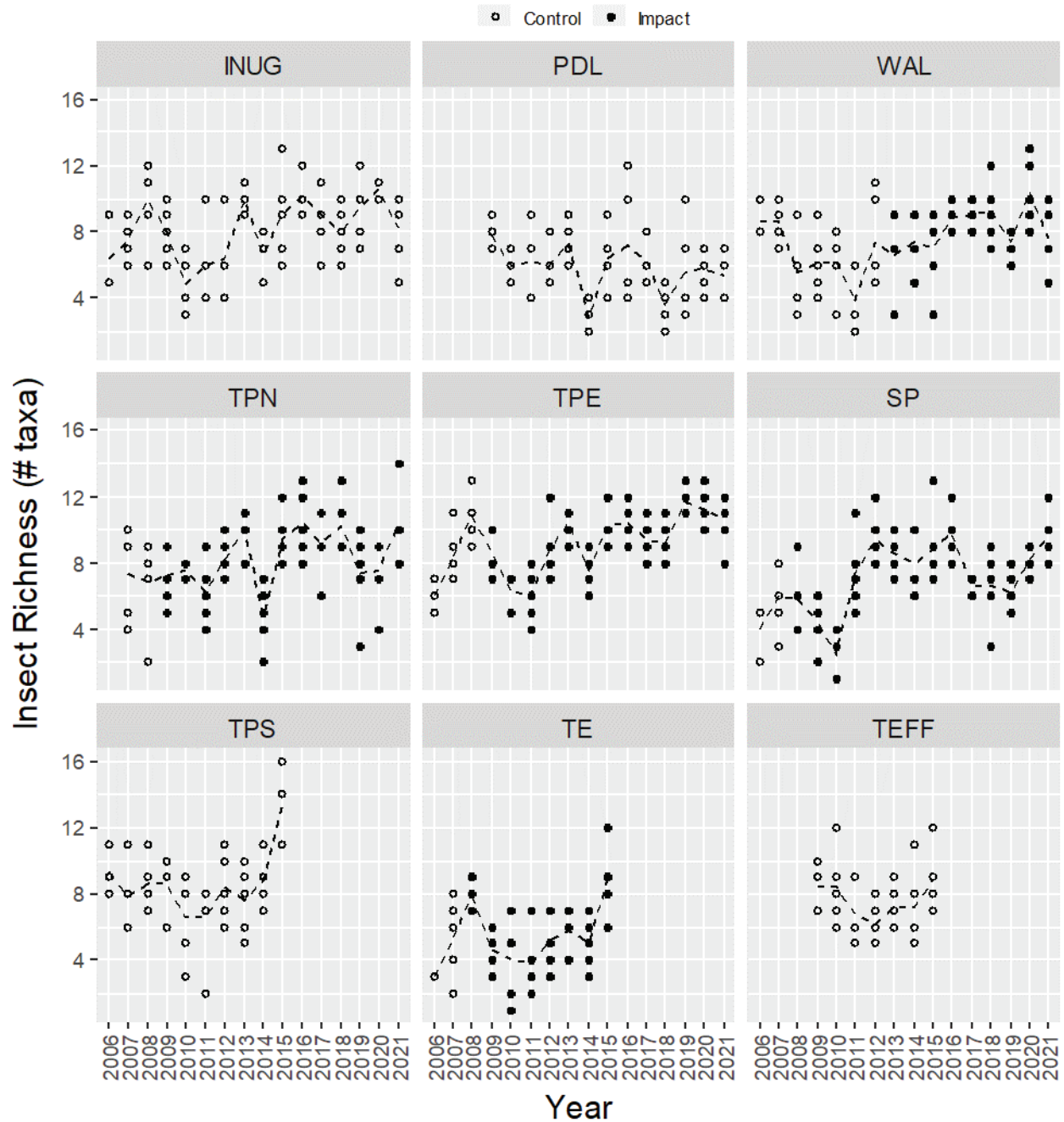
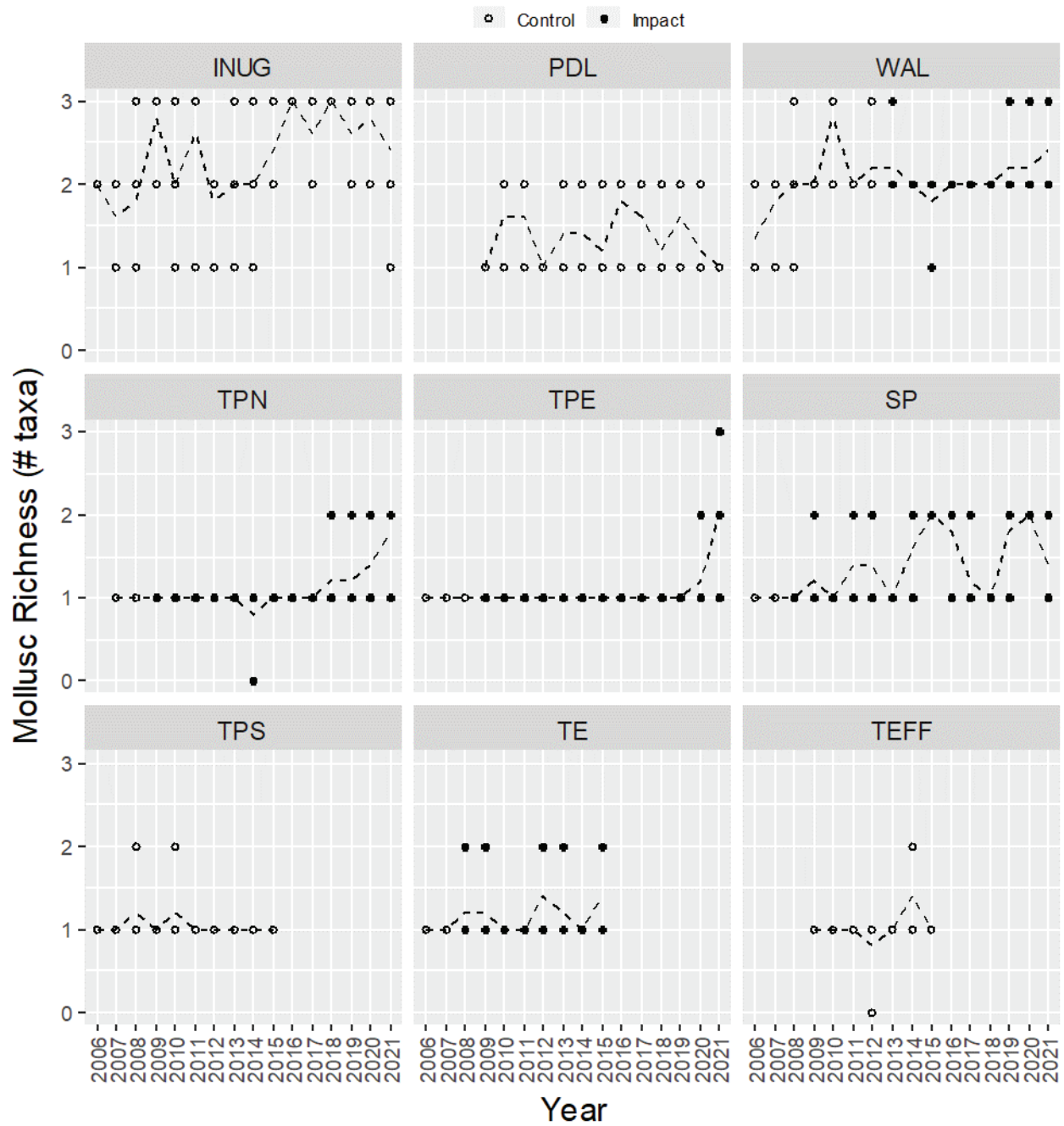
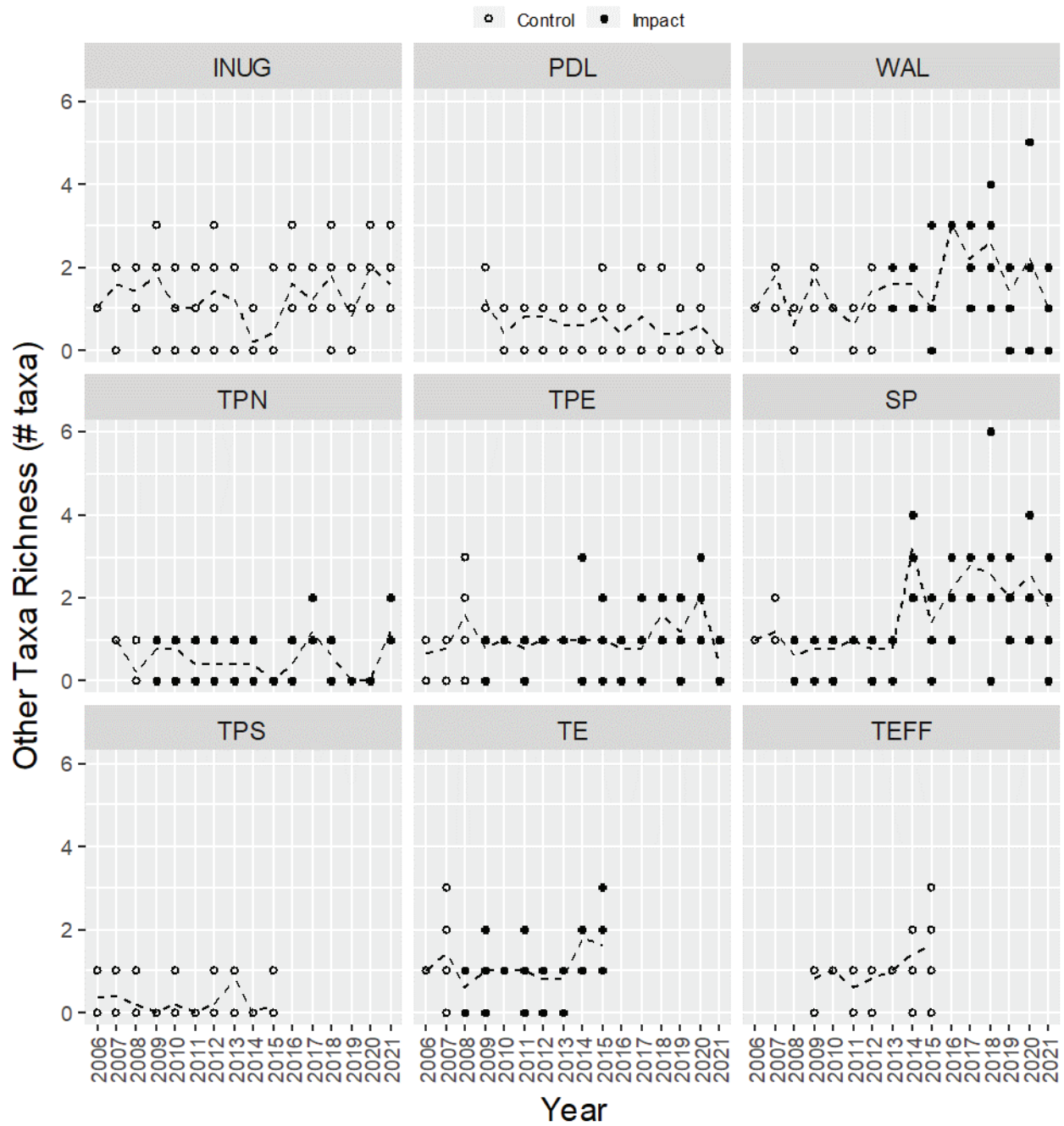
Figure E1-4. Other taxa abundance (#/m<sup>2</sup>) from Meadowbank study lakes since 2006.

Figure E1-5. Oligochaete richness (# of taxa) from Meadowbank study lakes since 2006.



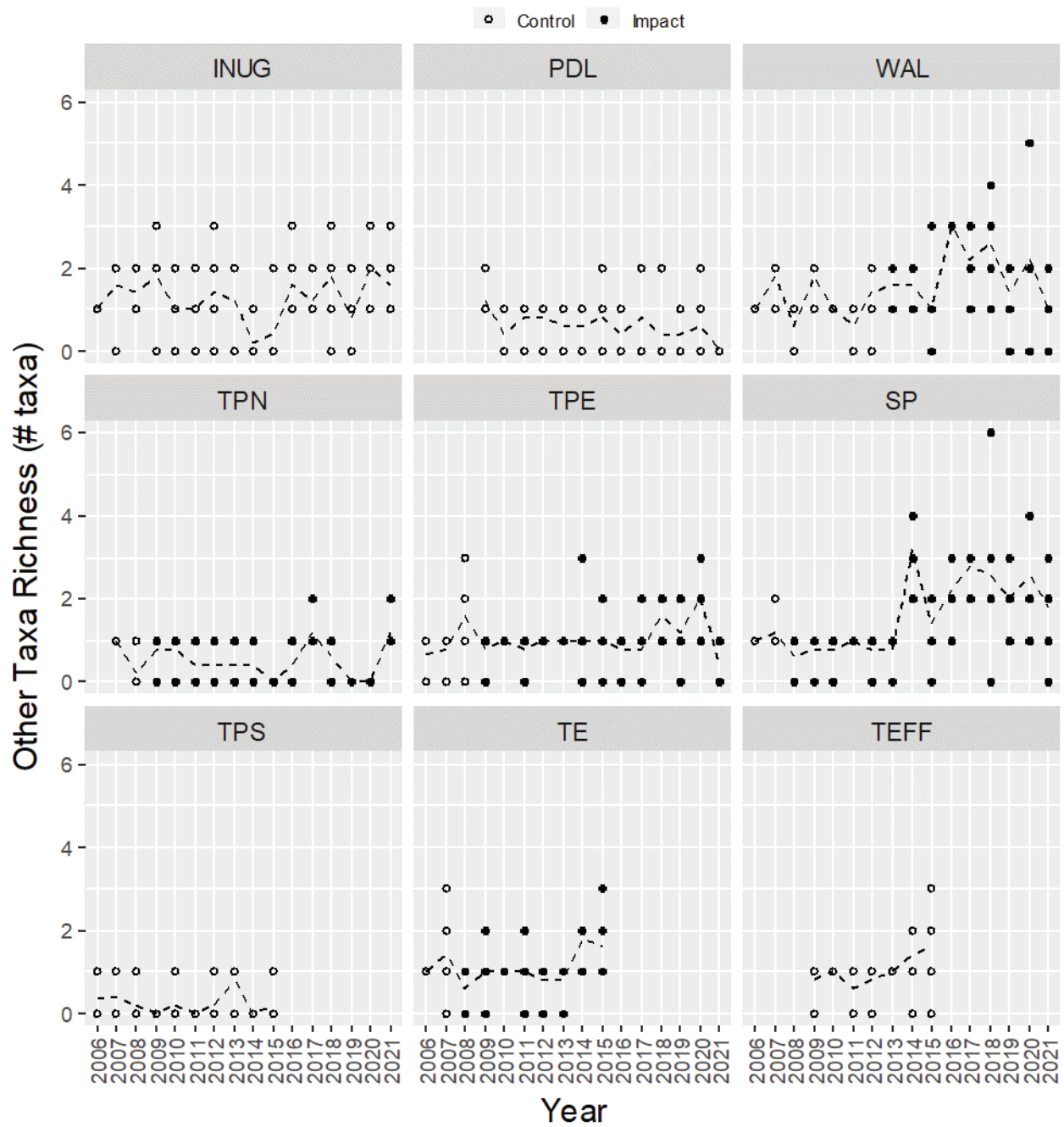
**Figure E1-6. Insect richness (# of taxa) from Meadowbank study lakes since 2006.**

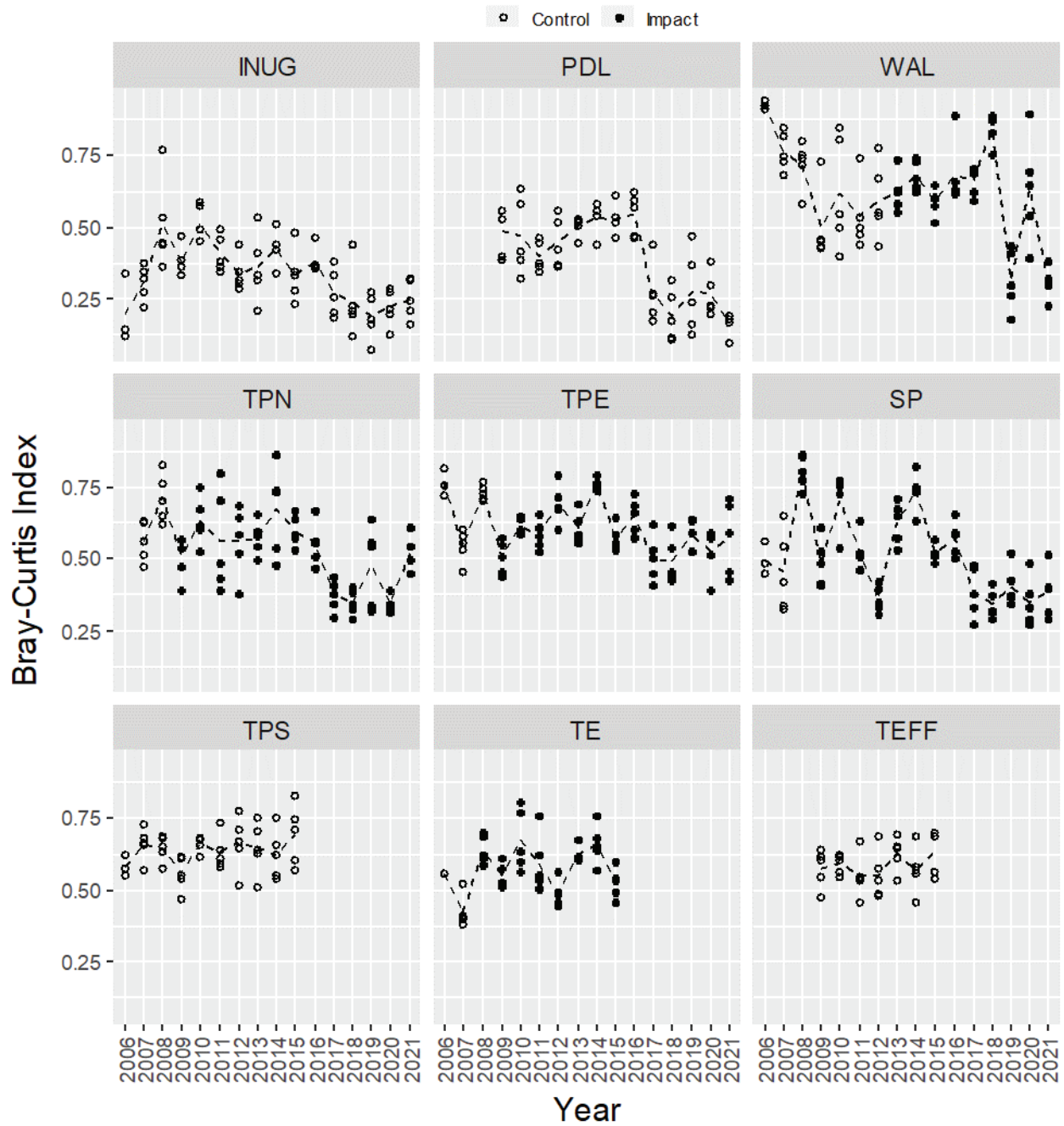
**Figure E1-7. Mollusc richness (# of taxa) from Meadowbank study lakes since 2006.**

**Figure E1-8. Other taxa richness (# of taxa) from Meadowbank study lakes since 2006.**



**Figure E1-9. Simpsons' Diversity for the benthic invertebrate community at the Meadowbank study lakes since 2006.**



**Figure E1-10. Bray-Curtis Index for the benthic invertebrate community at the Meadowbank study lakes since 2006.**

## Appendix E2

### Benthos Data – Whale Tail Study Area Lakes

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Table E1-1. Benthic invertebrate abundance (#/m2) and richness (# taxa) by major taxa group, Meadowbank study area lakes, 2021.

Area-Replicate	Date	Depth (m)	Abundance (#/m <sup>2</sup> )			Richness (# taxa)			Simpson's Diversity	Bray-Curtis Index				
			Oligochaetes	Insects	Molluscs	Other Taxa <sup>1</sup>	TOTAL	Oligochaetes			Insects	Molluscs	Other Taxa <sup>1</sup>	TOTAL
Inugugayualik Lake														
INUG-1	14-Aug-21	8.2	65	457	239	65	826	2	10	3	1	16	0.94	0.21
INUG-2	14-Aug-21	8.4	22	2,587	696	22	3,326	1	7	3	1	12	0.79	0.32
INUG-3	14-Aug-21	8.5	0	804	152	130	1,087	0	10	1	3	14	0.92	0.31
INUG-4	14-Aug-21	8.6	0	652	348	109	1,109	0	5	2	2	9	0.78	0.25
INUG-5	14-Aug-21	8.8	87	891	522	109	1,609	2	9	3	1	15	0.87	0.16
Area Mean			35	1,078	391	87	1,591	1.0	8.2	2.4	1.6	13.2	0.86	0.25
Pipedream Lake														
PDL-1	16-Aug-21	7.7	22	457	283	0	761	1	4	1	0	6	0.77	0.18
PDL-2	16-Aug-21	8.0	0	609	304	0	913	0	7	1	0	8	0.82	0.17
PDL-3	16-Aug-21	8.1	109	891	196	0	1,196	1	6	1	0	8	0.79	0.19
PDL-4	16-Aug-21	8.0	0	500	174	0	674	0	4	1	0	5	0.71	0.10
PDL-5	16-Aug-21	8.1	43	478	174	0	696	2	6	1	0	9	0.81	0.17
Area Mean			35	587	226	0.0	848	0.8	5.4	1.0	0.0	7.2	0.78	0.16
Second Portage Lake														
SP-1	6-Aug-21	9.2	0	1,022	239	65	1,326	0	12	1	2	15	0.89	0.31
SP-2	6-Aug-21	8.9	43	957	435	87	1,522	1	9	1	3	14	0.86	0.40
SP-3	6-Aug-21	9.0	65	761	326	87	1,239	2	10	2	3	17	0.89	0.29
SP-4	6-Aug-21	9.3	22	1,196	152	22	1,391	1	9	1	1	12	0.83	0.51
SP-5	5-Aug-21	8.8	0	587	196	0	783	0	8	2	0	10	0.86	0.40
Area Mean			26	904	270	52	1,252	0.8	9.6	1.4	1.8	13.6	0.87	0.38
Third Portage Lake - East Basin														
TPE-1	8-Aug-21	8.1	130	3,348	630	0	4,109	3	11	2	0	16	0.89	0.59
TPE-2	8-Aug-21	9.2	391	4,652	1,261	87	6,391	2	12	3	1	18	0.86	0.71
TPE-3	8-Aug-21	9.3	174	3,913	696	0	4,783	1	12	1	0	14	0.88	0.69
TPE-4	8-Aug-21	9.0	22	1,174	370	22	1,587	1	8	2	1	12	0.82	0.42
TPE-5	8-Aug-21	9.3	43	1,826	783	0	2,652	2	10	2	0	14	0.87	0.46
Area Mean			152	2,983	748	22	3,904	1.8	10.6	2.0	0.4	14.8	0.88	0.57
Third Portage Lake - North Basin														
TPN-1	7-Aug-21	8.7	22	1,130	22	22	1,196	1	14	1	1	17	0.90	0.49
TPN-2	7-Aug-21	8.3	65	2,826	478	130	3,500	3	10	2	2	17	0.85	0.49
TPN-3	7-Aug-21	8.3	65	3,000	761	22	3,848	2	10	2	1	15	0.84	0.54
TPN-4	7-Aug-21	7.4	43	1,826	326	43	2,239	2	10	2	1	15	0.85	0.45
TPN-5	7-Aug-21	7.5	0	1,543	152	22	1,717	0	8	2	1	11	0.83	0.61
Area Mean			39	2,065	348	48	2,500	1.6	10.4	1.8	1.2	15.0	0.85	0.52
Wally Lake														
WAL-1	10-Aug-21	8.9	22	1,065	826	43	1,957	1	10	3	2	16	0.83	0.32
WAL-2	10-Aug-21	7.4	43	1,109	717	87	1,957	1	7	2	1	11	0.85	0.32
WAL-3	10-Aug-21	8.9	0	1,283	848	43	2,174	0	9	2	1	12	0.82	0.38
WAL-4	10-Aug-21	8.6	0	283	478	22	783	0	5	2	1	8	0.77	0.23
WAL-5	10-Aug-21	8.4	0	804	457	0	1,261	0	7	3	0	10	0.82	0.30
Area Mean			13	909	665	39	1,626	0.4	7.6	2.4	1.0	11.4	0.82	0.31

Notes:

1. "Other taxa" includes flatworms (Turbellaria) and arthropods (Acalyptonotidae, Hygrobatidae, Lebertiidae, Oxidae, Plonidae, Harpacticoida, O. Notostraca, and Gammaracanthidae).





Table E1-2. Raw benthic invertebrate data from the Meadowbank Study Lakes 2021.

Program Location Station Control/Impact? Replicate Date Sample Depth (m)	Meadowbank									
	Inuguguyalik Lake INUG Control					Pipedream Lake PDL Control				
	1	2	3	4	5	1	2	3	4	5
	14-Aug-21 8.2	14-Aug-21 8.4	14-Aug-21 8.5	14-Aug-21 8.6	14-Aug-21 8.8	16-Aug-21 7.7	16-Aug-21 8.0	16-Aug-21 8.1	16-Aug-21 8.0	16-Aug-21 8.1
<b>ROUNDWORMS</b>										
<i>P. Nemata</i>	2	-	-	1	3	1	1	2	1	1
<b>FLATWORMS</b>										
<i>P. Platyhelminthes</i>										
<i>Cl. Turbellaria</i>										
indeterminate	3	-	3	4	-	-	-	-	-	-
<b>ANNELIDS</b>										
<i>P. Annelida</i>										
<b>WORMS</b>										
<i>Cl. Oligochaeta</i>										
<i>F. Enchytraeidae</i>	-	-	-	-	-	-	-	-	-	-
<i>F. Naididae</i>	-	-	-	-	-	-	-	-	-	-
<i>S.F. Tubificinae</i>										
<i>Limnodrilus hoffmeisteri</i>	-	-	-	-	-	-	-	-	-	-
<i>Potamothenix bavaricus</i>	-	-	-	-	-	-	-	-	-	-
<i>Slovinia appendiculata</i>	-	-	-	-	-	-	-	-	-	-
<i>Tassembiella americana</i>	1	-	-	-	-	-	-	2	-	-
immatures with hair chaetae	-	-	-	-	-	-	-	3	-	1
immatures without hair chaetae	-	-	-	-	-	-	-	-	-	-
<i>S.F. Rhyacodrilinae</i>										
<i>Rhyacodrilus coccineus</i>	2	-	-	-	2	-	-	-	-	-
<i>Rhyacodrilus montana</i>	-	-	-	-	-	-	-	-	-	-
<i>F. Lumbricidae</i>										
<i>Lumbriculus</i>	-	1	-	-	2	1	-	-	-	1
<b>ARTHROPODS</b>										
<i>P. Arthropoda</i>										
<b>MITES</b>										
<i>Cl. Arachnida</i>										
<i>O. Acarina</i>	-	-	-	-	-	-	-	-	-	-
<i>F. Acaryptotidae</i>										
<i>Acalyptotus</i>	-	-	1	-	-	-	-	-	-	-
<i>F. Hygrobatidae</i>										
<i>Hygrobatas</i>	-	-	-	-	-	-	-	-	-	-
<i>F. Lebertidae</i>	-	-	-	1	5	-	-	-	-	-
<i>Lebertia</i>	-	-	-	-	-	-	-	-	-	-
<i>F. Oxidae</i>										
<i>Oxus</i>	-	1	2	-	-	-	-	-	-	-
<i>F. Plonidae</i>										
indeterminate	-	-	-	-	-	-	-	-	-	-
<b>HARPACTICIDS</b>										
<i>O. Harpacticoida</i>	-	-	-	-	-	-	-	-	-	-
<b>SEED SHRIMPS</b>										
<i>Cl. Ostracoda</i>	-	-	-	1	11	1	3	6	1	5
<b>FAIRY SHRIMP</b>										
<i>O. Notostira</i>	-	-	-	-	-	-	-	-	-	-
<i>Lepidurus arcticus</i>	-	-	-	-	-	-	-	-	-	-
<b>WATER SCUDS</b>										
<i>O. Amphipoda</i>										
<i>F. Gammaracanthidae</i>	-	-	-	-	-	-	-	-	-	-
<i>Gammaracanthus</i>	-	-	-	-	-	-	-	-	-	-
<b>INSECTS</b>										
<i>Cl. Insecta</i>										
<b>CADDISFLIES</b>										
<i>O. Trichoptera</i>										
<i>F. Apataniidae</i>	-	-	-	-	-	-	-	-	-	-
<i>Apatania</i>	-	-	-	-	-	-	-	-	-	-
<i>F. Limnephilidae</i>										
<i>Grenia proterita</i>	-	-	-	-	-	-	-	-	-	1
<b>TRUE FLIES</b>										
<i>O. Diptera</i>										
<b>MIDGES</b>										
<i>F. Chironomidae</i>										
chironomid pupae	-	-	5	1	3	2	3	2	1	1
<i>S.F. Chironominae</i>										
<i>Chironomus</i>	-	-	-	-	-	-	-	-	-	-
<i>Cladotanytarsus</i>	-	-	-	-	-	-	-	-	-	-
<i>Constempellina</i>	-	-	-	-	-	-	-	-	-	-
<i>Corynocera ambigua</i>	-	-	-	-	-	-	-	-	-	-
<i>?Corynocera aliveri</i>	-	-	-	-	-	-	-	-	-	-
<i>Dicrotendipes</i>	1	-	1	-	1	-	-	-	-	-
<i>Microseta</i>	1	1	5	-	3	-	3	-	-	-
<i>Microtendipes</i>	-	-	2	-	2	-	-	-	-	-
<i>Parachironomus</i>	-	-	-	-	-	-	-	-	-	-
<i>Paraclopedina</i>	-	-	-	-	-	-	-	-	-	-
<i>Paratanytarsus</i>	2	-	7	-	1	-	-	-	-	-
<i>Polypedium</i>	-	-	-	-	-	-	-	-	-	-
<i>Sergentia</i>	-	-	-	-	-	-	-	-	-	-
<i>Stempellina</i>	-	-	2	-	-	-	1	1	-	-
<i>Stictochironomus</i>	5	46	3	21	20	9	10	22	14	11
<i>Tanytarsus</i>	2	22	2	1	3	-	1	-	-	-
<i>S.F. Diamesinae</i>										
<i>Pagastia</i>	-	-	-	-	-	-	-	-	-	-
<i>Protanytarsus</i>	-	-	-	-	-	-	-	-	-	-
<i>Polthestia</i>	-	-	-	-	-	-	-	-	-	-
<i>Pseudodiamesa</i>	-	-	-	-	-	-	-	-	-	-
<i>S.F. Orthocladinae</i>										
<i>Abiskomyia</i>	-	-	-	-	-	-	4	-	-	1
<i>Corynoneura</i>	-	42	-	-	-	-	-	-	-	-
<i>Cricotopus</i>	-	-	-	-	-	-	-	-	-	-
<i>Cricotopus/Orthocladus</i>	-	-	-	-	-	-	-	-	-	-
<i>Heterotrissocladius</i>	1	-	7	2	2	2	1	3	1	1
<i>Hydrobaenus</i>	-	-	-	-	-	-	-	-	-	-
<i>Mesocricotopus</i>	-	-	-	-	-	-	-	-	-	-
<i>Nanocladius</i>	-	-	-	-	-	-	-	-	-	-
<i>Paracloadius</i>	-	-	-	-	-	-	-	-	-	-
<i>Parakiefferiella</i>	-	-	-	-	-	-	-	-	-	-
<i>Psectrocladius</i>	2	2	2	-	1	-	-	2	1	-
<i>Zalutschia</i>	-	-	-	-	-	-	-	-	-	-
Orthocladinae Genus "Greenland"	-	-	-	-	-	-	-	-	-	-
indeterminate	-	-	-	-	-	-	-	-	-	-
<i>S.F. Procladius</i>										
<i>Procladius</i>	2	1	-	3	3	1	-	2	-	5
<i>S.F. Tanypodinae</i>										
<i>Abalabesmyia</i>	1	-	-	-	-	-	-	-	-	-
<i>Procladius</i>	4	5	1	2	3	7	5	9	6	2
<i>Thienemannimyia</i> complex	-	-	-	-	-	-	-	-	-	-
<b>F. Empididae</b>										
<i>Chelifer/Mezochela</i>	-	-	-	-	-	-	-	-	-	-
<i>Climocera</i>	-	-	-	-	-	-	-	-	-	-
pupae	-	-	-	-	-	-	-	-	-	-

Table E1-2. Raw benthic invertebrate data from the Meadowbank Study Lakes 2021.

Program Location Station Control/Impact? Replicate Date Sample Depth (m)	Meadowbank									
	Inuggugyusatik Lake INUG Control					Pipedream Lake PDL Control				
	1	2	3	4	5	1	2	3	4	5
	14-Aug-21 8.2	14-Aug-21 8.4	14-Aug-21 8.5	14-Aug-21 8.6	14-Aug-21 8.8	16-Aug-21 7.7	16-Aug-21 8.0	16-Aug-21 8.1	16-Aug-21 8.0	16-Aug-21 8.1
<b>MOLLUSCS</b>										
<b>P. Mollusca</b>										
<b>SNAILS</b>										
Cl. Gastropoda										
<b>F. Valvatidae</b>										
Valvata	-	-	-	-	-	-	-	-	-	-
<b>CLAMS</b>										
Cl. Bivalvia										
<b>F. Sphaeriidae</b>										
Psidium/Cyclocalyx	5	26	-	5	14	-	-	-	-	-
Psidium (Cyclocalyx/Neopisidium)	5	4	7	11	8	13	14	9	8	8
Sphaerium nitidum	1	2	-	-	2	-	-	-	-	-
<b>R (Richness) - totals <sup>2,3</sup></b>										
Total	16	12	14	9	15	6	8	8	5	9
Oligochaete	2	1	0	0	2	1	0	1	0	2
Insect	10	7	10	5	9	4	7	6	4	6
Mollusc	3	3	1	2	3	1	1	1	1	1
Other <sup>4</sup>	1	1	3	2	1	0	0	0	0	0
<b>Abundance (raw) - totals <sup>5,6</sup></b>										
Total	38	153	50	51	74	35	42	55	31	32
Oligochaete	3	1	0	0	4	1	0	5	0	2
Insect	21	119	37	30	41	21	28	41	23	22
Mollusc	11	32	7	16	24	13	14	9	8	8
Other <sup>4</sup>	3	1	6	5	5	0	0	0	0	0
<b>N (Abundance) - #/m<sup>2</sup></b>										
Total	826	3,326	1,087	1,109	1,609	761	913	1,196	674	696
Oligochaete	65	22	0	0	87	22	0	109	0	43
Insect	457	2,587	804	652	891	457	609	891	500	478
Mollusc	239	696	152	348	522	283	304	196	174	174
Other <sup>4</sup>	65	22	130	109	109	0	0	0	0	0

**Notes:**

- Benthic invertebrate count data shown in this table are from composite of two grabs sieved to 500 µm.
- Richness totals exclude P. Nemata, Cl. Ostracoda, indeterminates (O. Acarina, F. Lumbriculidae), immatures (S.F. Tubificinae, O. Acarina), and pupae.
- Pupae and immatures (bolded values) are excluded from the richness totals if other life stages are present in the replicate sample.
- Other Taxa include: Cl. Turbellaria, F. Acalyptonotidae, F. Hygrobatidae, F. Lebertidae, F. Oxidae, F. Plonidae, O. Harpacticoida, O. Notostraca, and F. Gammaracanthidae.
- Abundance totals exclude P. Nemata and Cl. Ostracoda.
- Raw abundance from two grabs (grab area = 0.023 m<sup>2</sup>).

Table E1-2. Raw benthic invertebrate data from the Meadowbank Study Lakes 2021.

Program Location Station Control/Impact? Replicate Date Sample Depth (m)	Meadowbank									
	Second Portage Lake					Third Portage Lake - East Basin				
	SP Impact					TPE Impact				
	1 6-Aug-21 9.2	2 6-Aug-21 8.9	3 6-Aug-21 9.0	4 6-Aug-21 9.3	5 5-Aug-21 8.8	1 8-Aug-21 8.1	2 8-Aug-21 9.2	3 8-Aug-21 9.3	4 8-Aug-21 9.0	5 8-Aug-21 9.3
<b>ROUNDWORMS</b>										
<i>P. Nemata</i>	9	5	6	11	2	1	4	6	7	11
<b>FLATWORMS</b>										
<i>P. Platyhelminthes</i>										
<i>Cl. Turbellaria</i>	-	1	1	-	-	-	-	-	-	-
<i>indeterminate</i>	-	-	-	-	-	-	-	-	-	-
<b>ANNELIDS</b>										
<i>P. Annelida</i>										
<b>WORMS</b>										
<i>Cl. Oligochaeta</i>										
<i>F. Enchytraeidae</i>	-	-	-	-	-	-	-	-	-	-
<i>F. Naididae</i>	-	-	-	-	-	-	-	-	-	-
<i>S.F. Tubificinae</i>										
<i>Limnodrilus hoffmeisteri</i>	-	-	-	-	-	-	-	-	-	-
<i>Potamothenis bavaricus</i>	-	-	-	-	-	-	-	-	-	-
<i>Slovinia appendiculata</i>	-	-	-	-	-	-	-	-	-	-
<i>Tassembiella americana</i>	-	-	-	-	-	-	-	-	-	-
<i>immatures with hair chaetae</i>	-	2	1	-	-	1	-	-	-	-
<i>immatures without hair chaetae</i>	-	-	-	-	-	-	-	-	-	-
<i>S.F. Rhyacodrilinae</i>										
<i>Rhyacodrilus coccineus</i>	-	-	-	-	-	1	16	8	-	1
<i>Rhyacodrilus montana</i>	-	-	-	-	-	-	-	-	-	-
<i>F. Lumbricidae</i>										
<i>Lumbriculus</i>	-	-	2	1	-	4	2	-	1	1
<b>ARTHROPODS</b>										
<i>P. Arthropoda</i>										
<b>MITES</b>										
<i>Cl. Arachnida</i>										
<i>O. Acarina</i>	-	-	-	-	-	-	-	-	-	-
<i>F. Acaryptotidae</i>										
<i>Acolyptonotus</i>	-	-	-	1	-	-	-	-	-	-
<i>F. Hygrobatidae</i>										
<i>Hygrobatas</i>	-	-	-	-	-	-	-	-	-	-
<i>F. Lebertidae</i>										
<i>Lebertia</i>	1	1	1	-	-	-	-	-	1	-
<i>F. Oxidae</i>										
<i>Oxus</i>	2	2	2	-	-	-	4	-	-	-
<i>F. Plonidae</i>										
<i>indeterminate</i>	-	-	-	-	-	-	-	-	-	-
<b>HARPACTICIDS</b>										
<i>O. Harpacticoida</i>	-	-	-	-	-	-	-	-	-	-
<b>SEED SHRIMPS</b>										
<i>Cl. Ostracoda</i>	4	5	3	1	-	118	122	32	27	19
<b>FAIRY SHRIMP</b>										
<i>O. Notostomatidae</i>										
<i>Lepidurus arcticus</i>	-	-	-	-	-	-	-	-	-	-
<b>WATER SCUDS</b>										
<i>O. Amphipoda</i>										
<i>F. Gammaracanthidae</i>										
<i>Gammaracanthus</i>	-	-	-	-	-	-	-	-	-	-
<b>INSECTS</b>										
<i>Cl. Insecta</i>										
<b>CADDISFLIES</b>										
<i>O. Trichoptera</i>										
<i>F. Apataniidae</i>										
<i>Apatania</i>	-	-	-	-	-	-	-	-	-	-
<i>F. Limnephilidae</i>										
<i>Grenia proterita</i>	1	-	-	-	-	-	-	-	-	-
<b>TRUE FLIES</b>										
<i>O. Diptera</i>										
<b>MIDGES</b>										
<i>F. Chironomidae</i>										
<i>chironomid pupae</i>	15	15	4	21	6	16	24	28	14	16
<i>S.F. Chironominae</i>										
<i>Chironomus</i>	-	-	-	-	-	-	-	-	-	-
<i>Cladotanytarsus</i>	-	-	-	-	-	-	-	-	-	-
<i>Constempellina</i>	-	-	-	-	-	-	-	-	-	-
<i>Corynocera ambigua</i>	-	-	-	-	-	-	-	-	-	-
<i>2Corynocera oliveri</i>	-	-	-	-	-	-	-	-	-	-
<i>Dicrotendipes</i>	-	-	-	-	-	-	-	-	-	-
<i>Microseta</i>	3	3	-	4	1	8	18	14	7	5
<i>Microtendipes</i>	1	-	2	-	-	-	-	-	-	-
<i>Parachironomus</i>	-	-	-	-	-	-	-	-	-	-
<i>Paraclopedina</i>	-	-	-	-	-	-	-	-	-	-
<i>Paratanytarsus</i>	-	1	-	1	-	40	76	48	15	29
<i>Polypedium</i>	-	-	-	-	-	-	-	-	-	-
<i>Sergentia</i>	-	-	-	-	-	-	-	-	-	-
<i>Stempellina</i>	1	4	4	11	1	-	-	-	-	1
<i>Stictochironomus</i>	6	4	11	1	2	16	12	28	4	9
<i>Tanytarsus</i>	4	4	-	6	-	6	2	6	5	2
<i>S.F. Diamesinae</i>										
<i>Pagastia</i>	-	-	-	-	-	-	-	-	-	-
<i>Protanypus</i>	1	-	1	1	-	-	-	-	-	-
<i>Psithyrus</i>	-	-	-	-	-	-	-	-	-	-
<i>Pseudodiamesa</i>	-	-	-	-	-	-	-	-	-	-
<i>S.F. Orthocladinae</i>										
<i>Abiskomyia</i>	-	-	-	-	-	7	2	-	-	-
<i>Corynoneura</i>	-	-	-	-	-	-	-	-	-	-
<i>Cricotopus</i>	-	-	-	-	-	-	-	-	-	-
<i>Cricotopus/Orthocladus</i>	-	-	-	-	-	-	-	-	-	-
<i>Heterotrissocladius</i>	-	-	1	-	1	-	14	8	1	4
<i>Hydrobaenus</i>	-	-	-	-	1	-	-	-	-	-
<i>Mesocricotopus</i>	-	-	-	-	-	-	2	-	-	-
<i>Nanocladius</i>	-	-	-	-	-	-	-	-	-	-
<i>Paracloadius</i>	-	-	-	-	-	-	4	2	-	-
<i>Parakiefferiella</i>	-	-	-	-	-	-	-	-	-	-
<i>Psectrocladius</i>	2	2	1	1	2	20	14	20	1	5
<i>Zalutschia</i>	1	-	3	1	-	-	-	-	-	-
<i>Orthocladinae Genus "Greenland"</i>	-	-	-	-	-	2	-	2	-	-
<i>indeterminate</i>	-	-	-	-	-	-	-	-	-	-
<i>S.F. Procladiusinae</i>										
<i>Procladius</i>	3	2	1	-	3	4	2	2	2	1
<i>S.F. Tanypodinae</i>										
<i>Abalatesmyia</i>	3	2	1	-	-	-	-	-	-	-
<i>Procladius</i>	6	7	6	8	10	31	42	18	5	11
<i>Thienemannimyia complex</i>	-	-	-	-	-	1	2	2	-	-
<i>F. Empididae</i>										
<i>Chelifer/Meiochela</i>	-	-	-	-	-	3	-	2	-	1
<i>Climacoptera</i>	-	-	-	-	-	-	-	-	-	-
<i>pupae</i>	-	-	-	-	-	-	-	-	-	-

Table E1-2. Raw benthic invertebrate data from the Meadowbank Study Lakes 2021.

Program Location Station Control/Impact? Replicate Date Sample Depth (m)	Meadowbank									
	Second Portage Lake					Third Portage Lake - East Basin				
	SP					TPE				
	Impact					Impact				
	1	2	3	4	5	1	2	3	4	5
	6-Aug-21	6-Aug-21	6-Aug-21	6-Aug-21	5-Aug-21	8-Aug-21	8-Aug-21	8-Aug-21	8-Aug-21	8-Aug-21
	9.2	8.9	9.0	9.3	8.8	8.1	9.2	9.3	9.0	9.3
<b>MOLLUSCS</b>										
<b>P. Mollusca</b>										
<b>SNAILS</b>										
Cl. Gastropoda										
<b>F. Valvatidae</b>										
Valvata	-	-	-	-	-	-	2	-	-	-
<b>CLAMS</b>										
Cl. Bivalvia										
<b>F. Sphaeriidae</b>										
Psidium/Cyclocalyx	-	-	1	-	2	7	4	-	5	15
Psidium (Cyclocalyx/Neopisidium)	11	20	14	7	7	22	52	32	12	21
Sphaerium nitidum	-	-	-	-	-	-	-	-	-	-
<b>R (Richness) - totals <sup>5,6</sup></b>										
Total	15	14	17	12	10	16	18	14	12	14
Oligochaete	0	1	2	1	0	3	2	1	1	2
Insect	12	9	10	9	8	11	12	12	8	10
Mollusc	1	1	2	1	2	2	3	1	2	2
Other <sup>4</sup>	2	3	3	1	0	0	1	0	1	0
<b>Abundance (raw) - totals <sup>5,6</sup></b>										
Total	61	70	57	64	36	189	294	220	73	122
Oligochaete	0	2	3	1	0	6	18	8	1	2
Insect	47	44	35	55	27	154	214	180	54	84
Mollusc	11	20	15	7	9	29	58	32	17	36
Other <sup>4</sup>	3	4	4	1	0	0	4	0	1	0
<b>N (Abundance) - #/m<sup>2</sup></b>										
Total	1,326	1,522	1,239	1,391	783	4,109	6,391	4,783	1,587	2,652
Oligochaete	0	43	65	22	0	130	391	174	22	43
Insect	1,022	957	761	1,196	587	3,348	4,652	3,913	1,174	1,826
Mollusc	239	435	326	152	196	630	1,261	696	370	783
Other <sup>4</sup>	65	87	87	22	0	0	87	0	22	0

**Notes:**

- Benthic invertebrate count data shown in this table are from composite of two grabs sieved to 500 µm.
- Richness totals exclude P. Nemata, Cl. Ostracoda, indeterminates (O. Acarina, F. Lumbriculidae), immatures (S.F. Tubificinae, O. Acarina), and pupae.
- Pupae and immatures (bolded values) are excluded from the richness totals if other life stages are present in the replicate sample.
- Other Taxa include: Cl. Turbellaria, F. Acalyptonotidae, F. Hygrobatidae, F. Lebertidae, F. Oxidae, F. Plonidae, O. Harpacticoida, O. Notostraca, and F. Gammaracanthidae.
- Abundance totals exclude P. Nemata and Cl. Ostracoda.
- Raw abundance from two grabs (grab area = 0.023 m<sup>2</sup>).

Table E1-2. Raw benthic invertebrate data from the Meadowbank Study Lakes 2021.

Program Location Station Control/Impact? Replicate Date Sample Depth (m)	Meadowbank									
	Third Portage Lake - North Basin					Wally Lake				
	TPN Impact					WAL Impact				
	1 7-Aug-21 8.7	2 7-Aug-21 8.3	3 7-Aug-21 8.3	4 7-Aug-21 7.4	5 7-Aug-21 7.5	1 10-Aug-21 8.9	2 10-Aug-21 7.4	3 10-Aug-21 8.9	4 10-Aug-21 8.6	5 10-Aug-21 8.4
<b>ROUNDWORMS</b>										
<i>P. Nemata</i>	4	8	1	5	2	4	1	-	3	2
<b>FLATWORMS</b>										
<i>P. Platyhelminthes</i>										
<i>Cl. Turbellaria</i>										
indeterminate	-	-	1	-	-	1	4	2	-	-
<b>ANNELIDS</b>										
<i>P. Annelida</i>										
<b>WORMS</b>										
<i>Cl. Oligochaeta</i>										
<i>F. Enchytraeidae</i>	-	-	-	-	-	-	-	-	-	-
<i>F. Naididae</i>	-	-	-	-	-	-	-	-	-	-
<i>S.F. Tubificinae</i>										
<i>Limnodrilus hoffmeisteri</i>	-	-	-	-	-	-	-	-	-	-
<i>Potamothenis bavaricus</i>	-	-	-	-	-	-	-	-	-	-
<i>Slovinia appendiculata</i>	-	-	-	-	-	-	-	-	-	-
<i>Tassembiella americana</i>	-	-	-	-	-	-	-	-	-	-
immatures with hair chaetae	-	1	2	1	-	-	-	-	-	-
immatures without hair chaetae	-	-	-	-	-	-	-	-	-	-
<i>S.F. Rhyacodrilinae</i>										
<i>Rhyacodrilus coccineus</i>	-	1	1	1	-	-	-	-	-	-
<i>Rhyacodrilus montana</i>	-	-	-	-	-	-	-	-	-	-
<i>F. Lumbricidae</i>										
<i>Lumbriculus</i>	1	1	-	-	-	1	2	-	-	-
<b>ARTHROPODS</b>										
<i>P. Arthropoda</i>										
<b>MITES</b>										
<i>Cl. Arachnida</i>										
<i>O. Acarina</i>	-	-	-	-	-	-	-	-	-	-
<i>F. Acaryptotidae</i>										
<i>Acolyptotus</i>	-	5	-	2	-	1	-	-	-	-
<i>F. Hygrobatidae</i>										
<i>Hygrobaters</i>	-	-	-	-	-	-	-	-	-	-
<i>F. Lebertidae</i>										
<i>Lebertia</i>	-	1	-	-	1	-	-	-	-	-
<i>F. Oxidae</i>										
<i>Oxus</i>	1	-	-	-	-	-	-	-	1	-
<i>F. Plonidae</i>										
indeterminate	-	-	-	-	-	-	-	-	-	-
<b>HARPACTICIDS</b>										
<i>O. Harpacticoida</i>	-	-	-	-	-	-	-	-	-	-
<b>SEED SHRIMPS</b>										
<i>Cl. Ostracoda</i>	18	14	11	21	18	2	1	10	4	6
<b>FAIRY SHRIMP</b>										
<i>O. Notostira</i>										
<i>Lepidurus arcticus</i>	-	-	-	-	-	-	-	-	-	-
<b>WATER SCUDS</b>										
<i>O. Amphipoda</i>										
<i>F. Gammaracanthidae</i>										
<i>Gammaracanthus</i>	-	-	-	-	-	-	-	-	-	-
<b>INSECTS</b>										
<i>Cl. Insecta</i>										
<b>CADDISFLIES</b>										
<i>O. Trichoptera</i>										
<i>F. Apataniidae</i>										
<i>Apatania</i>	-	-	-	-	-	-	-	-	-	-
<i>F. Limnephilidae</i>										
<i>Grensia proterita</i>	3	-	-	-	-	1	-	-	-	-
<b>TRUE FLIES</b>										
<i>O. Diptera</i>										
<b>MIDGES</b>										
<i>F. Chironomidae</i>										
chironomid pupae	11	21	35	34	19	7	13	12	-	11
<i>S.F. Chironominae</i>										
<i>Chironomus</i>	-	-	-	-	-	-	-	-	-	-
<i>Cladotanytarsus</i>	-	-	-	-	-	2	-	2	-	-
<i>Constempellina</i>	-	-	-	-	-	-	-	-	-	-
<i>Corynocera ambigua</i>	-	-	-	-	-	8	4	6	-	-
<i>2Corynocera oliveri</i>	-	-	-	-	-	-	-	-	-	-
<i>Dicrotendipes</i>	-	-	-	-	-	-	-	-	-	-
<i>Microseta</i>	7	6	8	6	10	1	-	1	-	1
<i>Microtendipes</i>	-	-	-	-	-	-	-	-	-	-
<i>Parachironomus</i>	-	-	-	-	-	-	-	-	-	-
<i>Paraclopedius</i>	-	-	-	-	1	-	-	-	-	-
<i>Paratanytarsus</i>	1	2	3	3	6	1	-	1	-	-
<i>Polypedium</i>	-	-	-	-	-	-	-	-	-	-
<i>Sergentia</i>	1	-	-	-	-	-	-	-	-	-
<i>Stempellina</i>	-	-	-	-	2	-	1	-	-	2
<i>Stictochironomus</i>	4	53	52	11	-	18	20	28	8	16
<i>Tanytarsus</i>	3	18	21	8	6	4	-	1	1	-
<i>S.F. Diamesinae</i>										
<i>Pagastia</i>	-	-	-	-	-	-	-	-	-	-
<i>Protanytarsus</i>	-	-	-	-	-	-	1	-	-	-
<i>Psithalia</i>	-	-	-	-	-	-	-	-	-	-
<i>Pseudodiamesa</i>	-	-	-	-	-	-	-	-	-	-
<i>S.F. Orthocladinae</i>										
<i>Abiskomyia</i>	-	-	-	-	-	-	-	-	-	-
<i>Corynoneura</i>	-	-	-	-	-	-	-	-	-	-
<i>Cricotopus</i>	-	-	-	-	-	-	-	-	-	-
<i>Cricotopus/Orthocladus</i>	-	-	-	-	-	-	-	-	-	-
<i>Heterotrissocladius</i>	9	6	4	3	23	-	1	-	-	1
<i>Hydrobaenus</i>	-	-	-	1	-	-	-	-	-	-
<i>Mesocricotopus</i>	-	1	-	-	-	-	-	-	-	-
<i>Nanocladius</i>	-	-	-	-	-	-	-	-	-	-
<i>Paracloadius</i>	1	-	-	-	-	-	-	-	-	-
<i>Parakiefferiella</i>	-	3	-	-	-	-	-	-	-	-
<i>Psectrocladius</i>	1	-	4	-	-	-	-	-	-	1
<i>Zalutschia</i>	1	10	-	5	-	-	-	-	1	-
<i>Orthocladinae Genus "Greenland"</i>	-	-	1	-	-	-	-	-	-	-
indeterminate	1	-	-	-	-	-	-	-	-	-
<i>S.F. Procladiusinae</i>										
<i>Procladius</i>	1	1	2	1	-	2	4	3	1	1
<i>S.F. Tanypodinae</i>										
<i>Ababesmyia</i>	-	-	-	-	-	1	-	1	-	-
<i>Procladius</i>	7	9	6	7	3	4	7	4	2	4
<i>Thienemannimyia</i> complex	1	-	2	5	1	-	-	-	-	-
<b>F. Empididae</b>										
<i>Cheliferia/Metachela</i>	-	-	-	-	-	-	-	-	-	-
<i>Climocera</i>	-	-	-	-	-	-	-	-	-	-
pupae	-	-	-	-	-	-	-	-	-	-

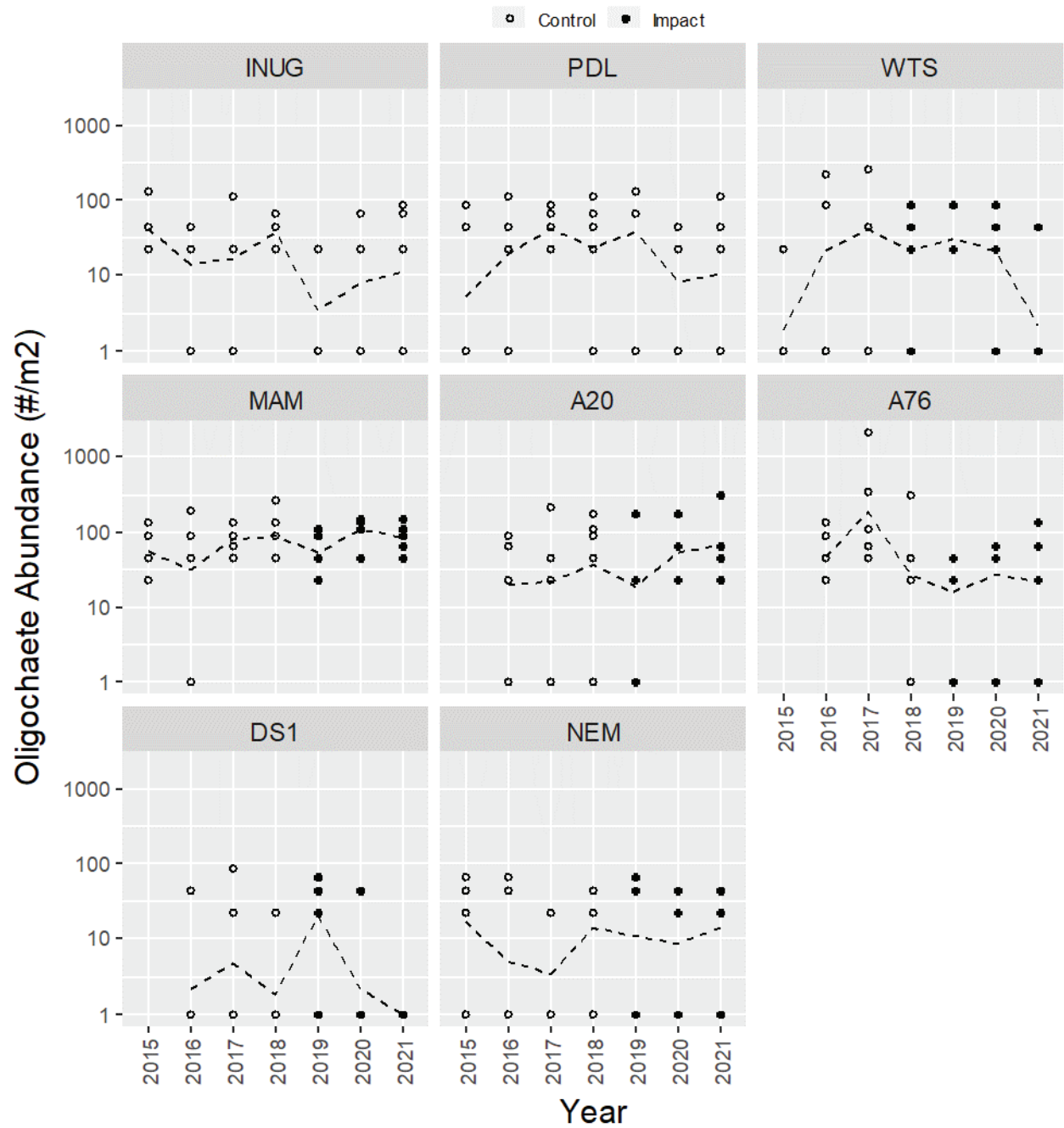


Table E1-2. Raw benthic invertebrate data from the Meadowbank Study Lakes 2021.

Program Location Station Control/Impact? Replicate Date Sample Depth (m)	Meadowbank									
	Third Portage Lake - North Basin					Wally Lake				
	TPN					WAL				
	Impact					Impact				
	1 7-Aug-21 8.7	2 7-Aug-21 8.3	3 7-Aug-21 8.3	4 7-Aug-21 7.4	5 7-Aug-21 7.5	1 10-Aug-21 8.9	2 10-Aug-21 7.4	3 10-Aug-21 8.9	4 10-Aug-21 8.6	5 10-Aug-21 8.4
<b>MOLLUSCS</b>										
<b>P. Mollusca</b>										
<b>SNAILS</b>										
Cl. Gastropoda										
<b>F. Valvatidae</b>										
Valvata	-	-	-	-	-	-	-	-	-	-
<b>CLAMS</b>										
Cl. Bivalvia										
<b>F. Sphaeriidae</b>										
Psidium/Cyclocalyx	1	10	12	4	1	7	11	13	8	5
Psidium (Cyclocalyx/Neopisidium)	-	12	23	11	6	30	22	26	14	15
Sphaerium nitidum	-	-	-	-	-	1	-	-	-	1
<b>R (Richness) - totals <sup>5,6</sup></b>										
Total	17	17	15	15	11	16	11	12	8	10
Oligochaete	1	3	2	2	0	1	1	0	0	0
Insect	14	10	10	10	8	10	7	9	5	7
Mollusc	1	2	2	2	2	3	2	2	2	3
Other <sup>4</sup>	1	2	1	1	1	2	1	1	1	0
<b>Abundance (raw) - totals <sup>5,6</sup></b>										
Total	55	161	177	103	79	90	90	100	36	58
Oligochaete	1	3	3	2	0	1	2	0	0	0
Insect	52	130	138	84	71	49	51	59	13	37
Mollusc	1	22	35	15	7	38	33	39	22	21
Other <sup>4</sup>	1	6	1	2	1	2	4	2	1	0
<b>N (Abundance) - #/m<sup>2</sup></b>										
Total	1,196	3,500	3,848	2,239	1,717	1,957	1,957	2,174	783	1,261
Oligochaete	22	65	65	43	0	22	43	0	0	0
Insect	1,130	2,826	3,000	1,826	1,543	1,065	1,109	1,283	283	804
Mollusc	22	478	761	326	152	826	717	848	478	457
Other <sup>4</sup>	22	130	22	43	22	43	87	43	22	0

**Notes:**

- Benthic invertebrate count data shown in this table are from composite of two grabs sieved to 500 µm.
- Richness totals exclude P. Nemata, Cl. Ostracoda, indeterminate (O. Acarina, F. Lumbriculidae), immatures (S.F. Tubificinae, O. Acarina), and pupae.
- Pupae and immatures (bolded values) are excluded from the richness totals if other life stages are present in the replicate sample.
- Other Taxa include: Cl. Turbellaria, F. Acalyptonotidae, F. Hygrobatidae, F. Lebertidae, F. Oxidae, F. Plonidae, O. Harpacticoida, O. Notostraca, and F. Gammaracanthidae.
- Abundance totals exclude P. Nemata and Cl. Ostracoda.
- Raw abundance from two grabs (grab area = 0.023 m<sup>2</sup>).

Figure E2-1. Oligochaete abundance (#/m<sup>2</sup>) from the Whale Tail Pit study lakes since 2015.

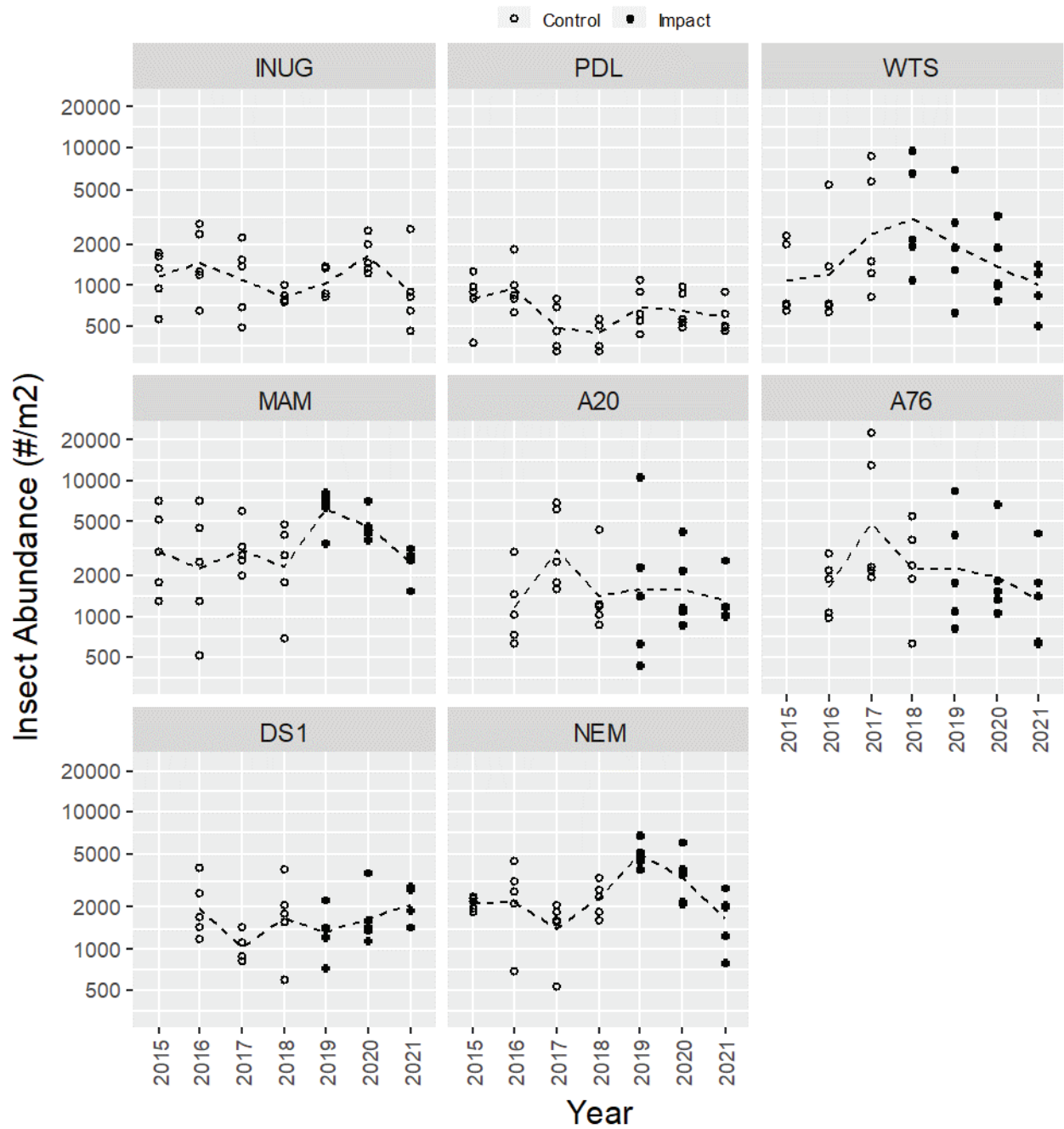
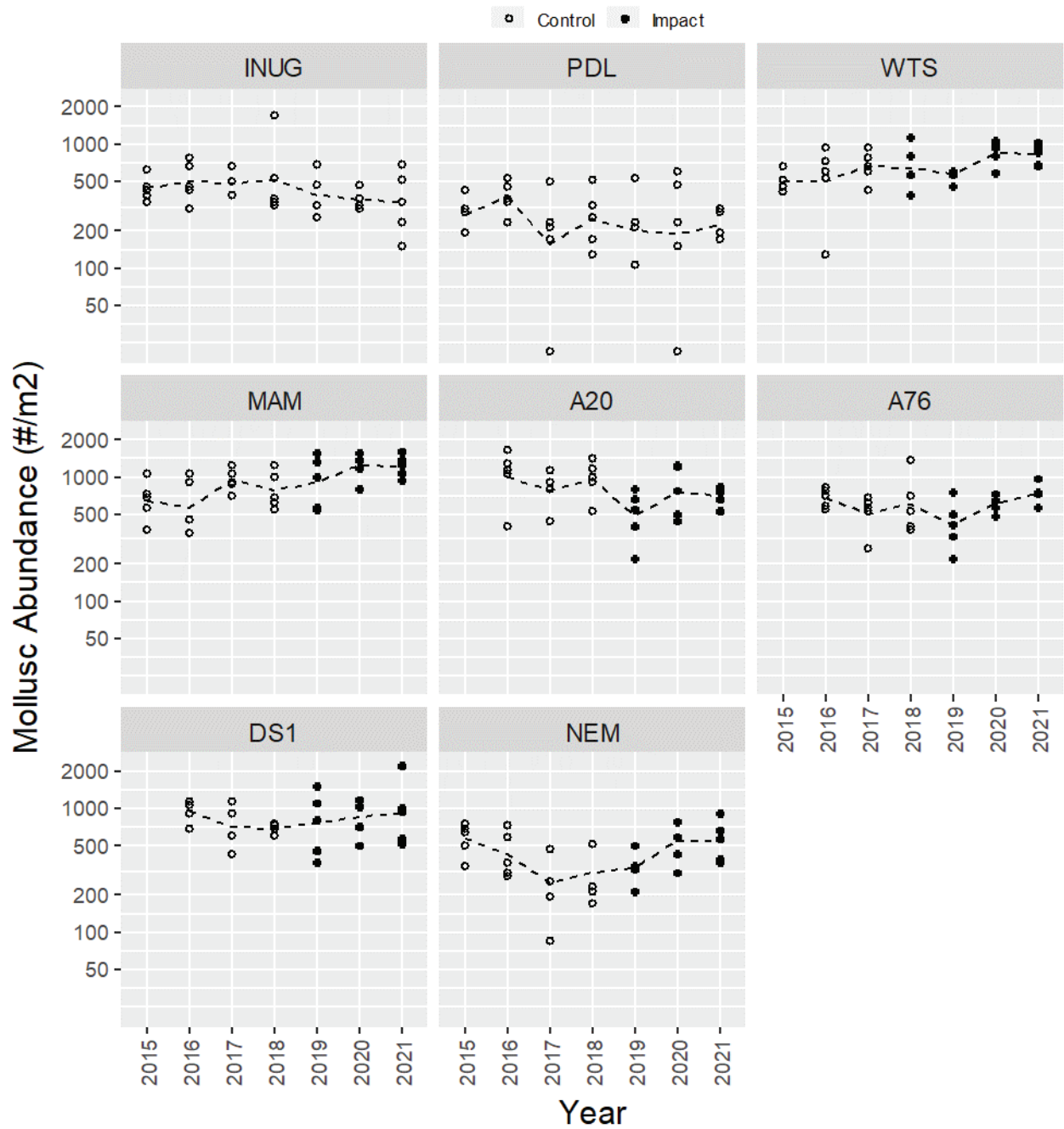
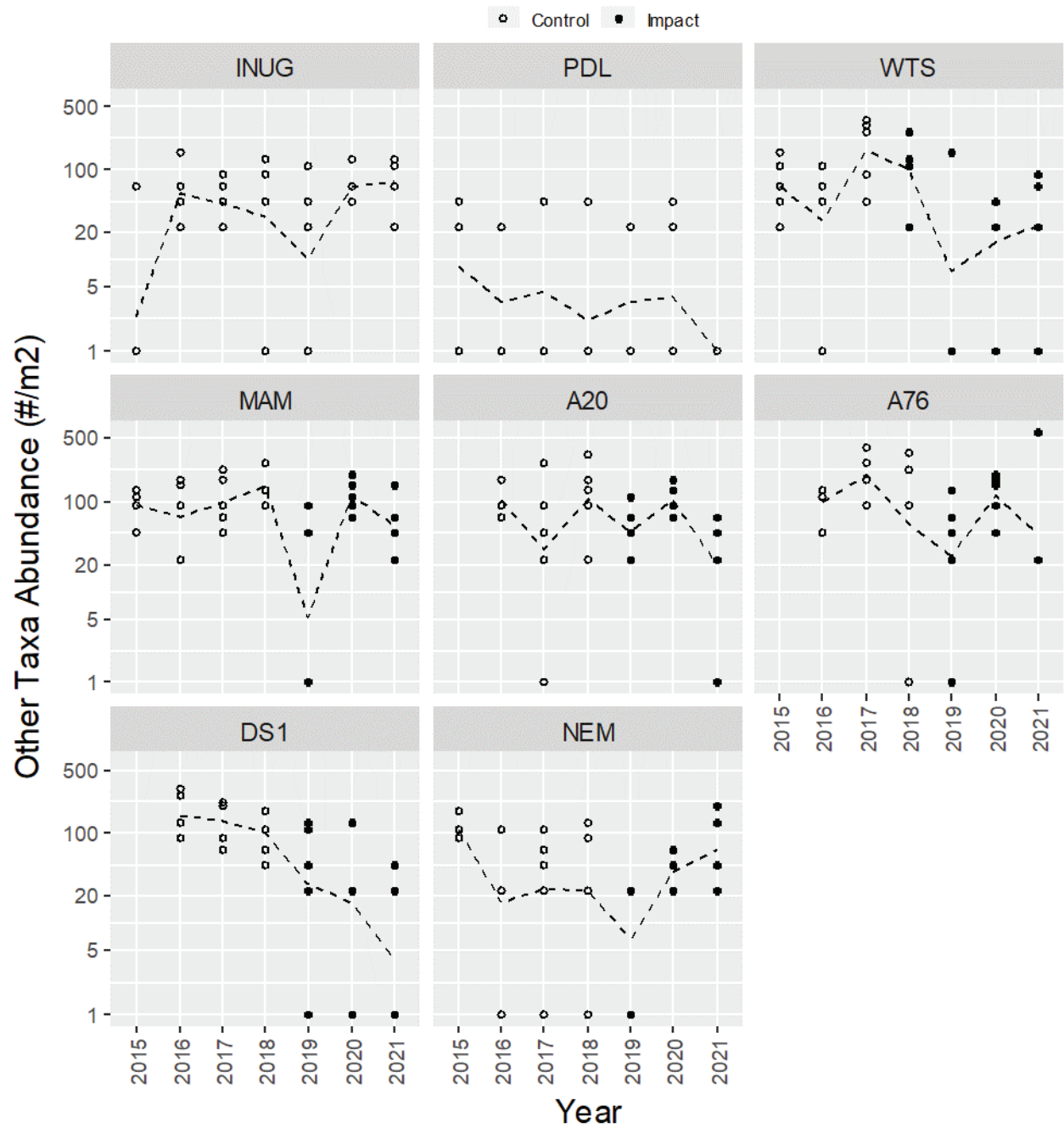
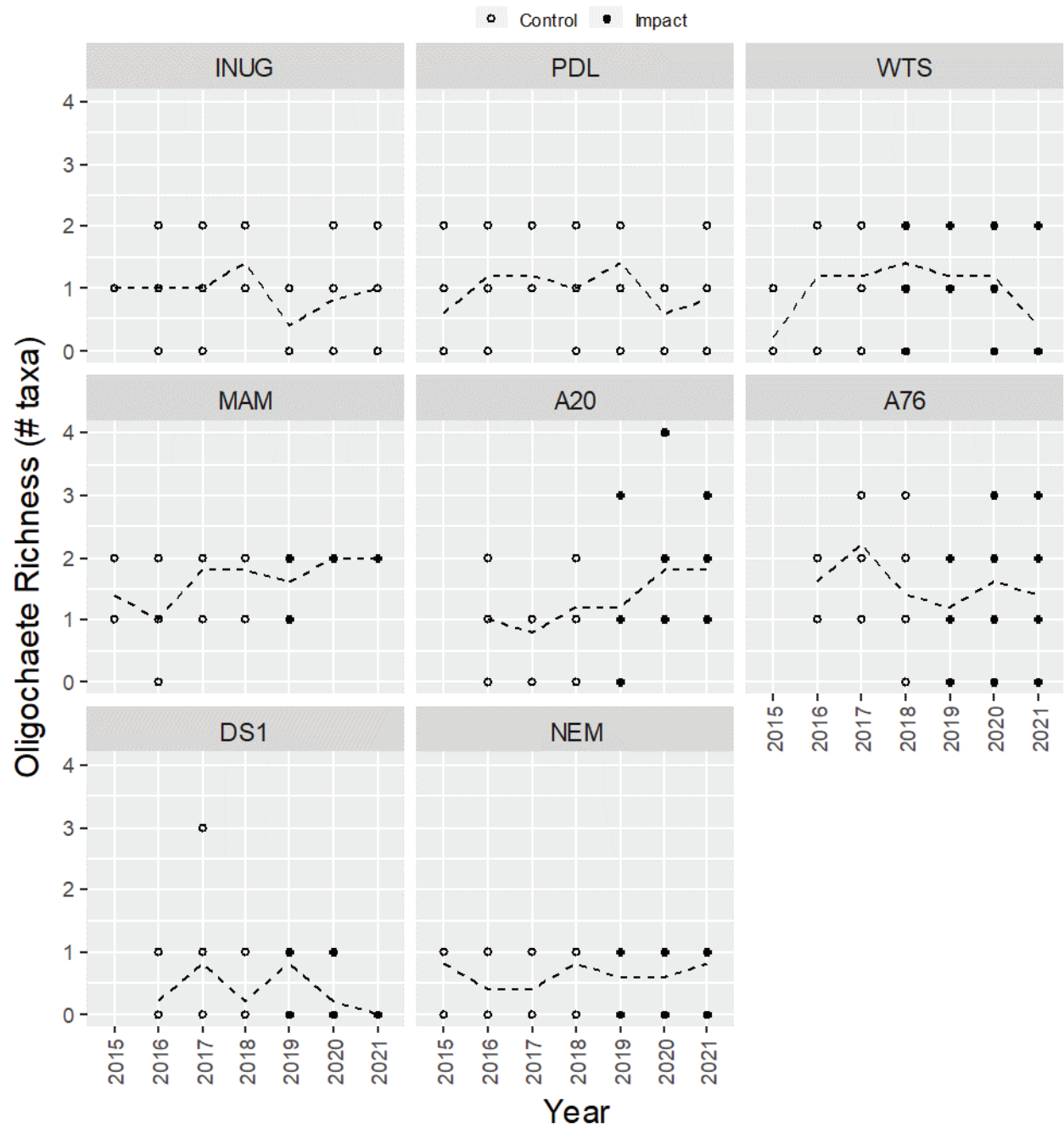
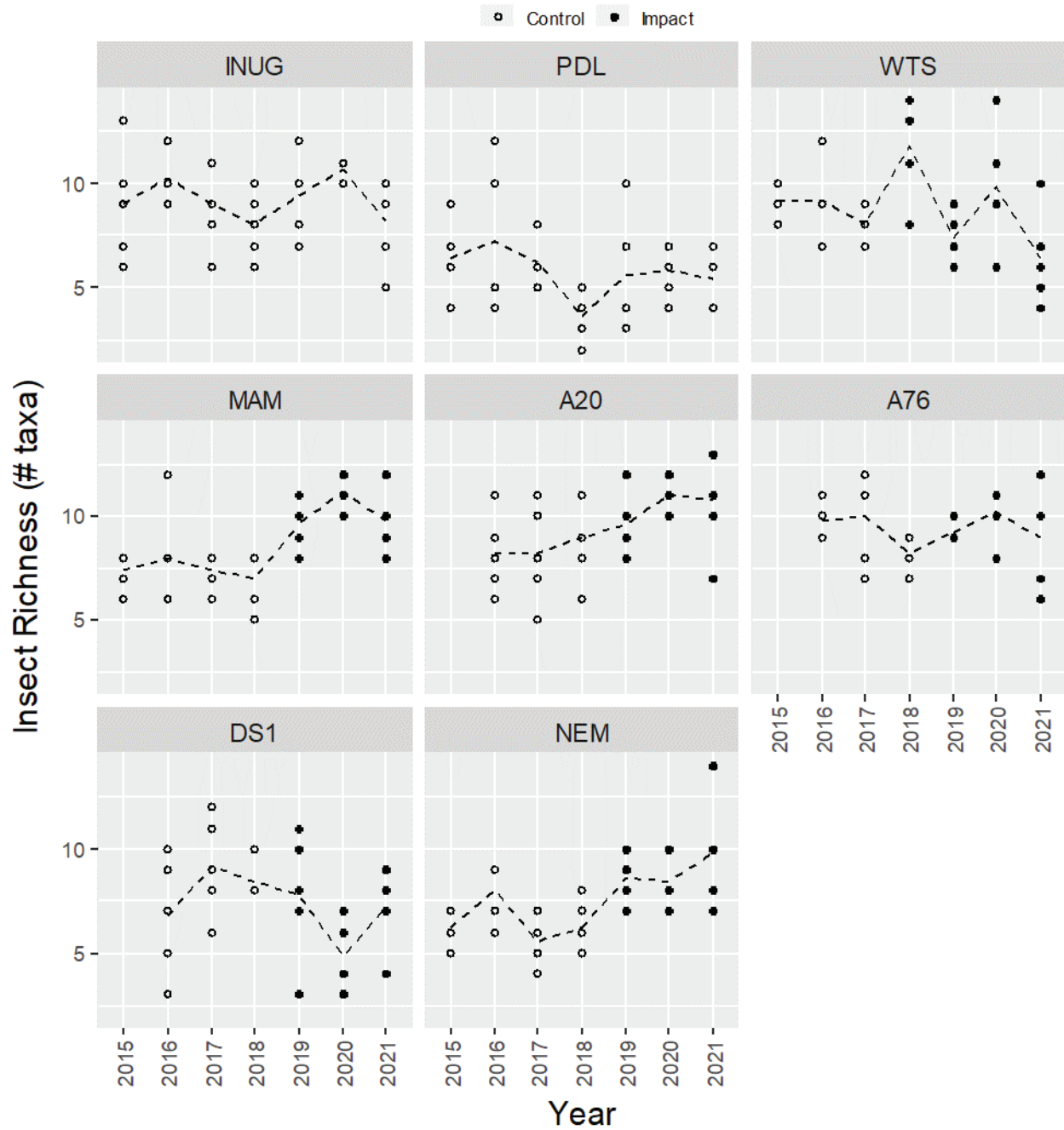
**Figure E2-2. Insect abundance (#/m<sup>2</sup>) from the Whale Tail Pit study lakes since 2015.**

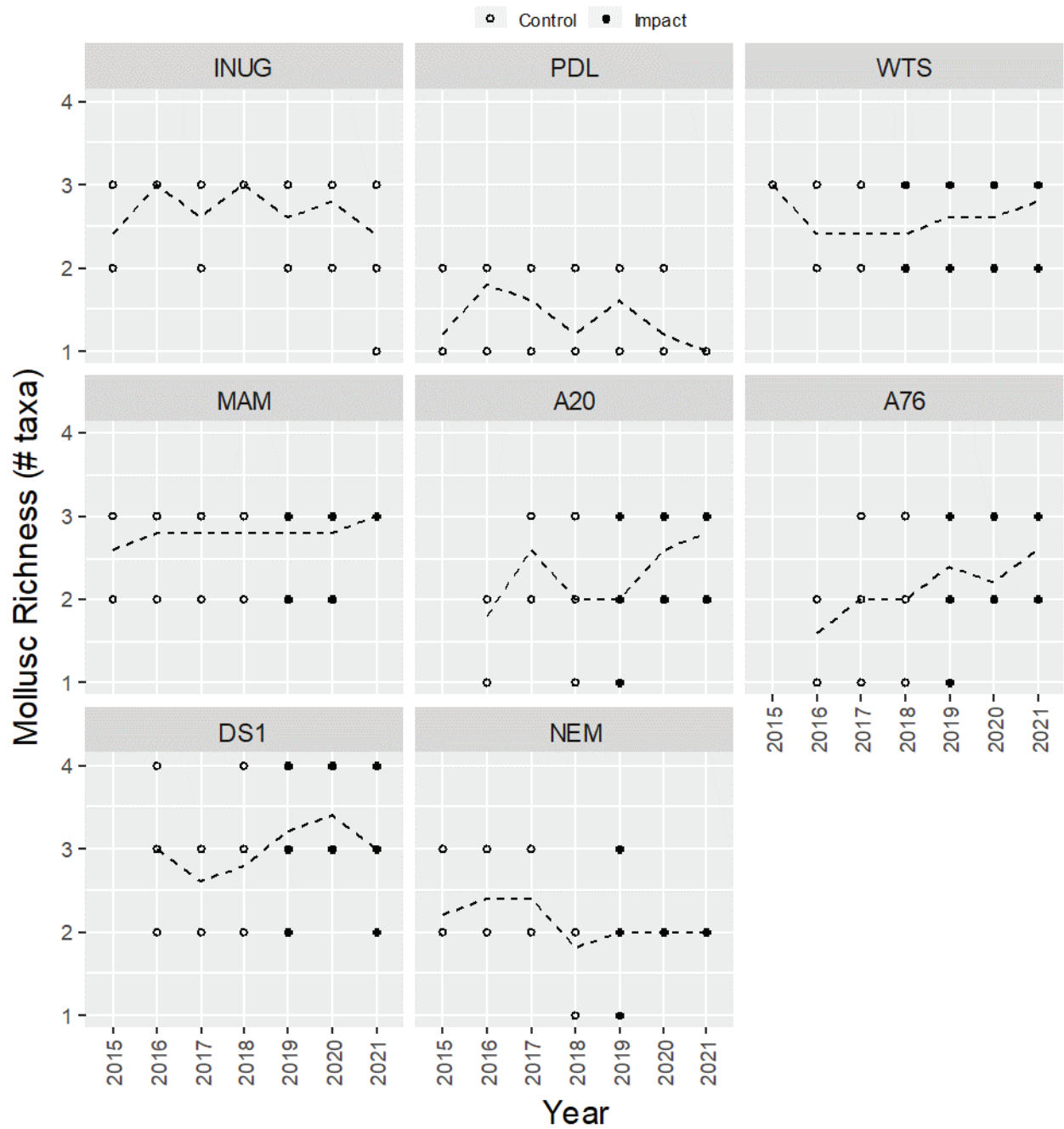
Figure E2-3. Mollusc abundance ( $\#/m^2$ ) from the Whale Tail Pit study lakes since 2015.

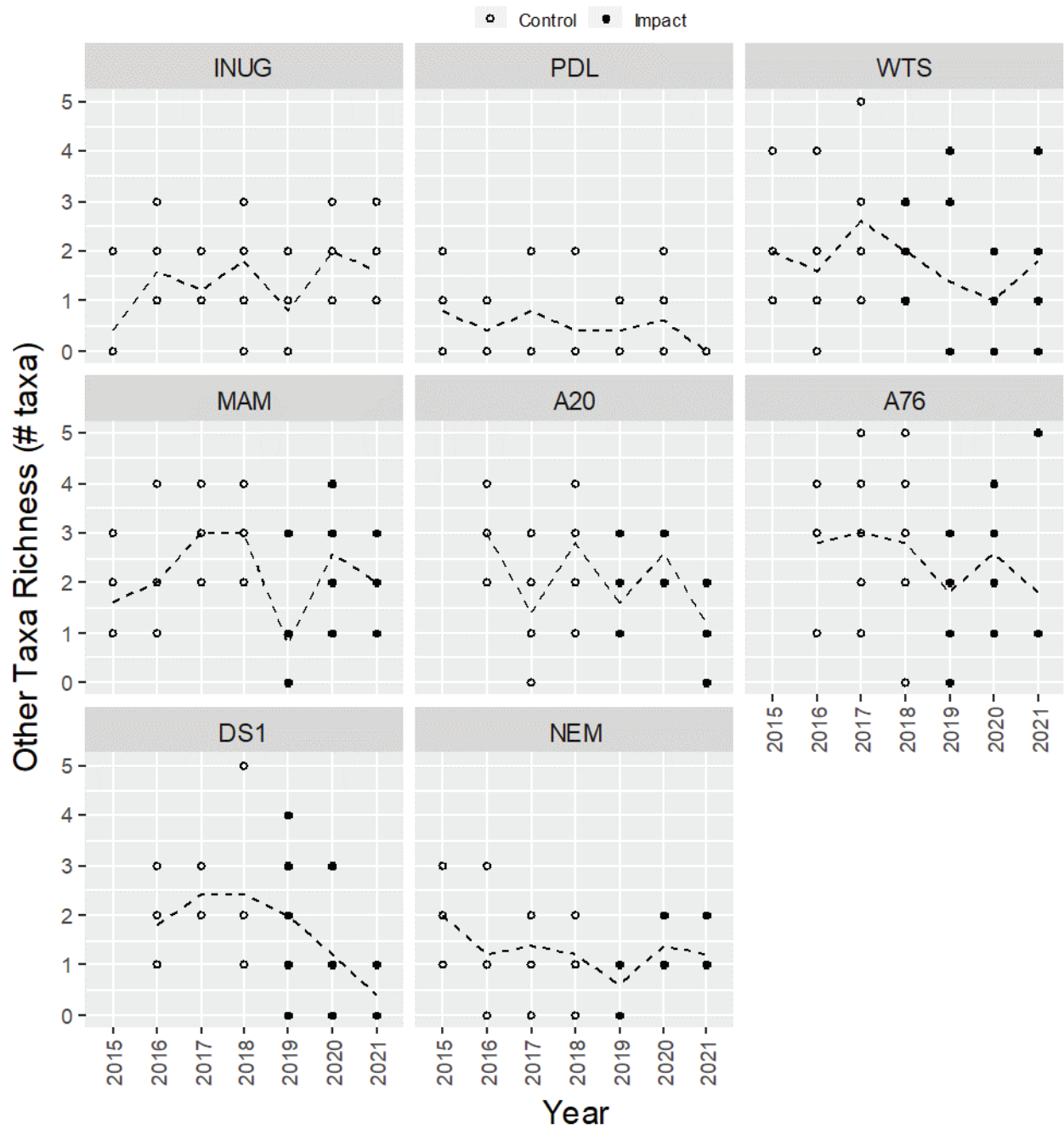
**Figure E2-4. Other taxa abundance (#/m<sup>2</sup>) from the Whale Tail Pit study lakes since 2015.**



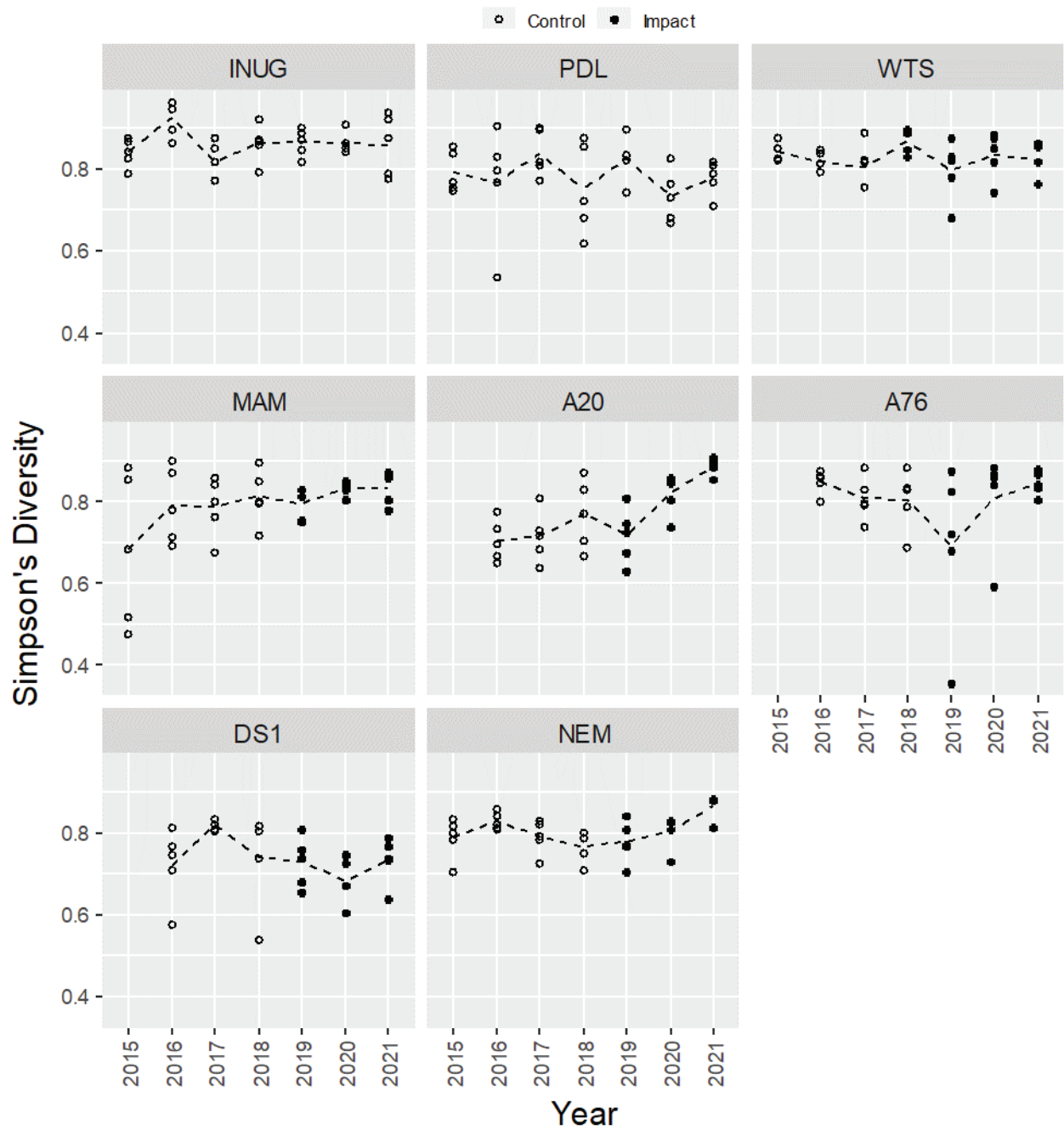
**Figure E2-5. Oligochaete richness (# of taxa) from the Whale Tail Pit study lakes since 2015.**

**Figure E2-6. Insect richness (# of taxa) from the Whale Tail Pit study lakes since 2015.**

**Figure E2-7. Mollusc richness (# of taxa) from the Whale Tail Pit study lakes since 2015.**

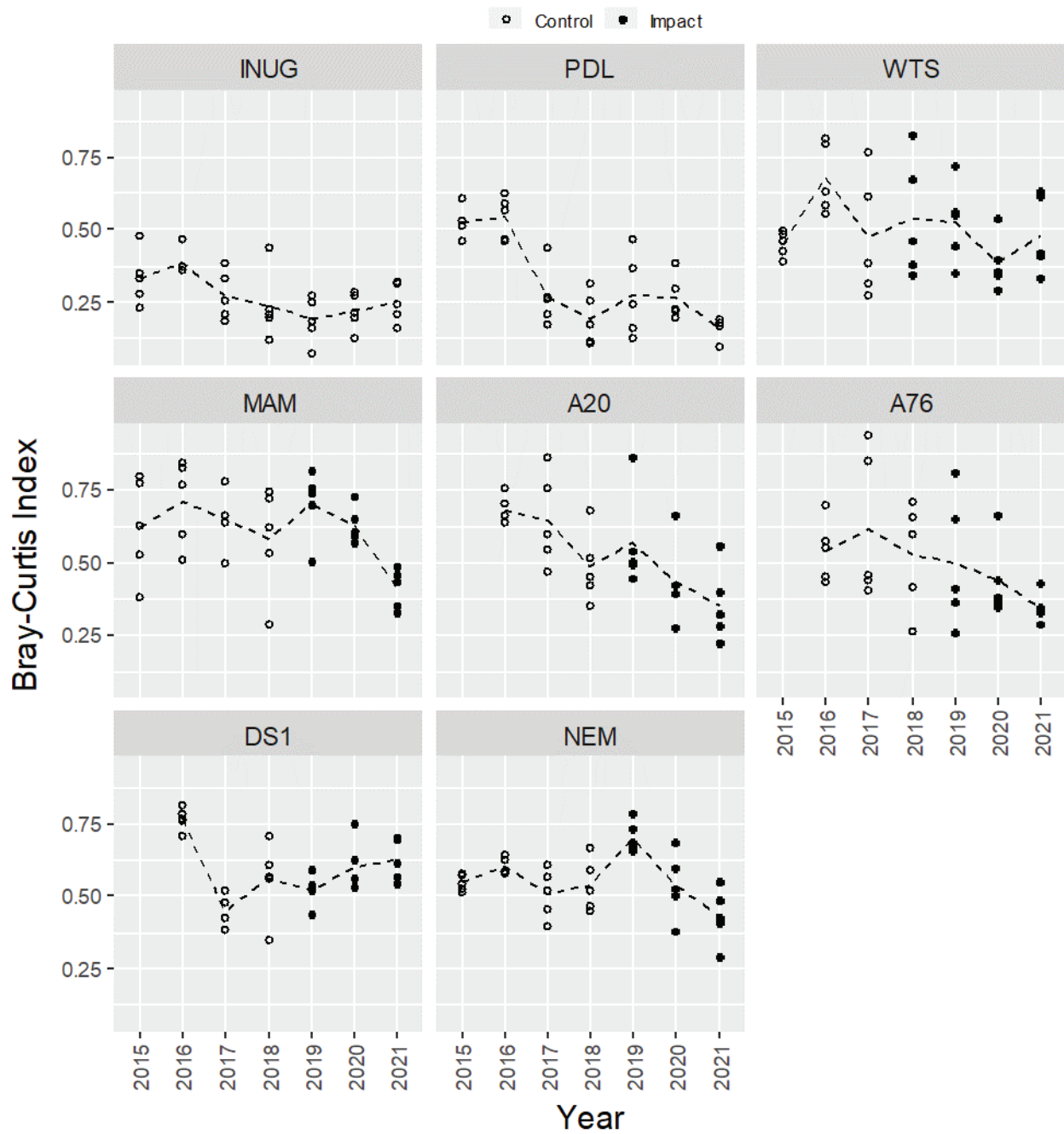
**Figure E2-8. Other taxa richness (# of taxa) from the Whale Tail Pit study lakes since 2015.**

**Figure E2-9. Simpson's Diversity for the benthic invertebrate community at the Whale Tail Pit study lakes since 2015.**





**Figure E2-10. Bray-Curtis Index for the benthic invertebrate community at the Whale Tail Pit study lakes since 2015.**



## Appendix E3

### Benthos Data – Baker Lake

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Table E3-1. Benthic invertebrate abundance (#/m2) and richness (# taxa) by major taxa group, Baker Lake, 2021.

Area-Replicate	Date	Depth (m)	Abundance (#/m <sup>2</sup> )				Richness (# taxa)				Simpson's Diversity	Bray-Curtis Index		
			Oligochaetes	Insects	Molluscs	Other Taxa <sup>1</sup>	TOTAL	Oligochaetes	Insects	Molluscs			Other Taxa <sup>1</sup>	TOTAL
Baker Akilaharjuk Point														
BAP-1	14-Aug-21	7.1	1,000	3,130	870	304	5,304	6	16	2	5	29	0.93	0.27
BAP-2	14-Aug-21	8.4	826	2,109	435	457	3,826	4	16	2	3	25	0.94	0.13
BAP-3	14-Aug-21	8.9	1,152	3,761	565	239	5,717	6	14	1	5	26	0.92	0.28
BAP-4	14-Aug-21	9.3	10,174	8,783	522	522	20,000	6	9	2	3	20	0.90	0.68
BAP-5	14-Aug-21	9.0	87	1,391	435	87	2,000	2	10	2	2	16	0.81	0.35
Area Mean			2,648	3,835	565	322	7,370	4.8	13.0	1.8	3.6	23.2	0.90	0.34
Baker Barge Dock														
BBD-1	15-Aug-21	9.2	65	6,022	457	43	6,587	1	13	2	1	17	0.75	0.52
BBD-2	15-Aug-21	8.4	0	1,783	0	43	1,826	0	12	0	1	13	0.78	0.32
BBD-3	15-Aug-21	9.2	65	7,630	43	43	7,783	3	12	1	1	17	0.55	0.67
BBD-4	15-Aug-21	9.1	43	8,652	22	22	8,739	2	12	1	1	16	0.59	0.69
BBD-5	15-Aug-21	9.4	217	6,957	1,000	65	8,239	2	11	3	2	18	0.81	0.57
Area Mean			78	6,209	304	43	6,635	1.6	12.0	1.4	1.2	16.2	0.70	0.55
Baker East Shore														
BES-1	16-Aug-21	9.3	43	1,283	196	348	1,870	1	9	1	3	14	0.91	0.15
BES-2	16-Aug-21	9	87	1,609	283	239	2,217	1	11	1	3	16	0.91	0.21
BES-3	16-Aug-21	9.3	43	1,130	261	435	1,870	2	10	1	4	17	0.91	0.25
BES-4	16-Aug-21	8.9	0	783	87	283	1,152	0	8	1	2	11	0.89	0.21
BES-5	16-Aug-21	8.5	0	630	413	435	1,478	0	9	1	3	13	0.85	0.28
Area Mean			35	1,087	248	348	1,717	0.8	9.4	1.0	3.0	14.2	0.89	0.22
Baker Proposed Jetty														
BPJ-1	15-Aug-21	8.8	152	2,957	0	478	3,587	2	13	0	2	17	0.87	0.39
BPJ-2	15-Aug-21	8.5	22	2,804	130	196	3,152	1	16	2	2	21	0.90	0.40
BPJ-3	15-Aug-21	8.1	87	2,370	0	22	2,478	3	10	0	1	14	0.87	0.40
BPJ-4	16-Aug-21	8.6	65	3,087	65	261	3,478	2	14	2	2	20	0.84	0.50
BPJ-5	15-Aug-21	8.4	87	2,283	543	543	3,457	1	12	2	2	17	0.89	0.29
Area Mean			83	2,700	148	300	3,230	1.8	13.0	1.2	1.8	17.8	0.87	0.40

**Notes:**

1. "Other taxa" includes flatworms (Turbellaria) and arthropods (Acalyptonotidae, Hygrobatidae, Lebertidae, Oxidae, Plonidae, Harpacticoida, O. Notostraca, and Gammaracanthidae).



Table E3-2. Raw benthic invertebrate data from the Baker Lake, 2021.

Program Location Station Control/Impact?	Baker Akilahazjuk Point					Baker Lake				
	BAP Control					BBD Impact				
	1	2	3	4	5	1	2	3	4	5
	Replicate	Replicate	Replicate	Replicate	Replicate	Replicate	Replicate	Replicate	Replicate	Replicate
	Date	Date	Date	Date	Date	Date	Date	Date	Date	Date
Sample Depth (m)	14-Aug-21	14-Aug-21	14-Aug-21	14-Aug-21	14-Aug-21	15-Aug-21	15-Aug-21	15-Aug-21	15-Aug-21	15-Aug-21
	7.1	8.4	8.9	9.3	9.0	9.2	8.4	9.2	9.1	9.4
<b>ROUNDWORMS</b>										
<i>P. Nemata</i>	7	11	8	104	1	4	9	6	10	1
<b>FLATWORMS</b>										
<i>P. Platyhelminthes</i>										
<i>Cl. Turbellaria</i>										
indeterminate	3	13	-	-	2	-	-	-	-	-
<b>ANNELIDS</b>										
<i>P. Annelida</i>										
<b>WORMS</b>										
<i>Cl. Oligochaeta</i>										
<i>F. Enchytraeidae</i>	8	-	2	20	3	-	-	1	1	-
<i>F. Naididae</i>										
<i>S.F. Tubificinae</i>										
<i>Limnodrilus hoffmeisteri</i>	6	4	2	-	-	-	-	-	-	-
<i>Potamothenis bavaricus</i>	2	4	-	19	-	-	-	-	-	-
<i>Slavina appendiculata</i>	2	-	-	39	-	-	-	-	-	-
<i>Tasserildrilus americanus</i>	-	-	2	-	-	-	-	-	-	-
immatures with hair chaetae	8	7	18	192	-	-	-	1	-	1
immatures without hair chaetae	6	-	5	97	-	-	-	-	-	-
<i>S.F. Rhyacodrilinae</i>										
<i>Rhyacodrilus coccineus</i>	-	6	7	39	-	-	-	-	-	-
<i>Rhyacodrilus montana</i>	13	17	15	58	1	3	-	1	1	9
<i>F. Lumbriculidae</i>										
<i>Lumbriculus</i>	1	-	2	4	-	-	-	-	-	-
<b>ARTHROPODS</b>										
<i>P. Arthropoda</i>										
<b>MITES</b>										
<i>Cl. Arachnida</i>										
<i>O. Acarina</i>	1	-	-	-	-	-	-	-	-	1
<i>F. Acarytonotidae</i>										
<i>Acalyptonotus</i>	3	1	1	4	-	-	-	-	-	-
<i>F. Hygrobatidae</i>										
<i>Hygrobatos</i>	-	-	2	-	-	-	-	-	-	1
<i>F. Lebertidae</i>										
<i>Lebertia</i>	6	7	2	-	2	2	2	2	1	2
<i>F. Oxidae</i>										
<i>Oxus</i>	1	-	3	-	-	-	-	-	-	-
<i>F. Pionidae</i>										
indeterminate	-	-	-	-	-	-	-	-	-	-
<b>HARPACTICODS</b>										
<i>O. Harpacticoida</i>	-	-	-	16	-	-	-	-	-	-
<b>SEED SHRIMPS</b>										
<i>Cl. Ostracoda</i>	5	3	11	28	-	21	4	16	5	11
<b>FAIRY SHRIMP</b>										
<i>O. Notostraca</i>										
<i>Lepidurus arcticus</i>	-	-	-	-	-	-	-	-	-	-
<b>WATER SCUDS</b>										
<i>O. Amphipoda</i>										
<i>F. Gammaracanthidae</i>										
<i>Gammaracanthus</i>	1	-	3	4	-	-	-	-	-	-
<b>INSECTS</b>										
<i>Cl. Insecta</i>										
<b>CADDISFLIES</b>										
<i>O. Trichoptera</i>										
<i>F. Apataniidae</i>										
<i>Apotania</i>	-	1	-	-	-	-	-	-	1	1
<i>F. Limnephilidae</i>										
<i>Grensia proterita</i>	-	-	-	-	-	-	-	-	-	-
<b>TRUE FLIES</b>										
<i>O. Diptera</i>										
<b>MIDGES</b>										
<i>F. Chironomidae</i>										
chironomid pupae	29	16	14	96	35	24	21	40	53	60
<i>S.F. Chironominae</i>										
<i>Chironomus</i>	-	-	-	-	-	-	-	-	-	-
<i>Cladotanytarsus</i>	-	-	-	-	-	-	-	-	-	-
<i>Constempellina</i>	5	6	14	-	1	26	-	4	8	17
<i>Corynocera ambigua</i>	-	-	-	-	-	-	-	-	-	-
<i>?Corynocera oliveri</i>	-	-	-	-	-	-	-	-	-	-
<i>Dicratandipes</i>	-	-	-	-	-	-	-	-	-	-
<i>Microspectra</i>	10	3	2	68	2	23	2	16	8	24
<i>Microtendipes</i>	-	-	-	-	-	-	-	-	-	-
<i>Parachironomus</i>	-	-	-	-	-	-	-	-	-	-
<i>Paraclopedipus</i>	1	4	5	-	3	2	1	-	-	-
<i>Paratanytarsus</i>	5	4	31	108	-	-	-	-	-	-
<i>Polypedilum</i>	1	-	-	-	-	5	5	-	2	-
<i>Sergentia</i>	-	-	-	-	-	-	1	-	-	-
<i>Stempellinella</i>	-	-	-	-	-	-	-	-	-	-
<i>Stictochironomus</i>	36	21	46	20	1	143	33	236	248	140
<i>Tanytarsus</i>	19	10	23	40	10	9	2	14	21	15
<i>S.F. Diamesinae</i>										
<i>Pagastia</i>	-	-	-	-	-	-	-	-	-	2
<i>Protanytus</i>	-	-	-	-	-	1	-	1	-	1
<i>Pothisia</i>	2	-	1	12	-	-	1	-	-	-
<i>Pseudodiamesa</i>	-	-	-	-	-	-	-	-	-	-
<i>S.F. Orthocladinae</i>										
<i>Abiskomyia</i>	-	2	-	-	-	19	-	12	10	28
<i>Corynoneura</i>	-	-	-	-	-	-	-	-	-	-
<i>Cricotopus</i>	-	-	-	-	-	-	-	-	-	-
<i>Cricotopus/Orthocladus</i>	-	-	-	-	-	-	-	-	-	-
<i>Heterotrissocladius</i>	7	3	7	-	5	6	3	9	26	6
<i>Hydrobaenus</i>	1	1	1	4	-	-	-	-	-	-
<i>Mesocricotopus</i>	-	3	9	-	2	-	3	2	-	-
<i>Nanocladius</i>										
<i>Paracloadius</i>	2	1	1	-	-	-	-	-	-	-
<i>Parakiefferiella</i>	-	-	-	-	-	-	1	-	-	-
<i>Psectrocladius</i>	-	-	-	-	-	-	-	-	-	-
<i>Zalutschia</i>	-	-	-	-	-	-	-	-	-	-
<i>Orthocladinae Genus "Greenland"</i>	-	-	-	-	-	-	-	-	-	-
indeterminate	1	-	-	8	1	-	-	-	-	-
<i>S.F. Prodiamesinae</i>										
<i>Monodiamesa</i>	4	1	1	-	1	2	5	2	6	-
<i>S.F. Tanyptodinae</i>										
<i>Ablobesmyia</i>	-	-	-	-	-	-	-	-	-	-
<i>Procladius</i>	16	15	11	44	3	12	4	11	12	24
<i>Thienemannimyia complex</i>	-	-	-	-	-	2	-	2	2	2
<i>F. Empididae</i>										
<i>Chelifer/Metachela</i>	4	4	4	4	-	2	-	2	1	-
<i>Clinocera</i>	-	1	-	-	-	-	-	-	-	-
pupae	1	1	3	-	-	1	-	-	-	-

Table E3-2. Raw benthic invertebrate data from the Baker Lake, 2021.

Program Location Station Control/Impact? Replicate Date Sample Depth (m)	Baker Akilahazariuk Point					Baker Lake				
	BAP Control					Baker Barge Dock BBD Impact				
	1	2	3	4	5	1	2	3	4	5
	14-Aug-21	14-Aug-21	14-Aug-21	14-Aug-21	14-Aug-21	15-Aug-21	15-Aug-21	15-Aug-21	15-Aug-21	15-Aug-21
	7.1	8.4	8.9	9.3	9.0	9.2	8.4	9.2	9.1	9.4
<b>MOLLUSCS</b>										
<b>P. Mollusca</b>										
<b>SNAILS</b>										
Cl. Gastropoda										
F. Valvatidae										
Valvata	-	-	-	-	-	-	-	-	-	1
<b>CLAMS</b>										
Cl. Bivalvia										
<b>F. Sphaeriidae</b>										
Pisidium/Cyclocalyx	21	7	-	8	5	7	-	-	1	15
Pisidium (Cyclocalyx/Neopisidium)	19	13	26	16	15	14	-	2	-	30
Sphaerium nitidum	-	-	-	-	-	-	-	-	-	-
<b>R (Richness) - totals <sup>2,3</sup></b>										
Total	29	25	26	20	16	17	13	17	16	18
Oligochaete	6	4	6	6	2	1	0	3	2	2
Insect	16	16	14	9	10	13	12	12	12	11
Mollusc	2	2	1	2	2	2	0	1	1	3
Other <sup>4</sup>	5	3	5	3	2	1	1	1	1	2
<b>Abundance (raw) - totals <sup>5,6</sup></b>										
Total	244	176	263	920	92	303	84	358	402	379
Oligochaete	46	38	53	468	4	3	0	3	2	10
Insect	144	97	173	404	64	277	82	351	398	320
Mollusc	40	20	26	24	20	21	0	2	1	46
Other <sup>4</sup>	14	21	11	24	4	2	2	2	1	3
<b>Abundance - totals (#/m<sup>2</sup>) <sup>5</sup></b>										
Total	5,304	3,826	5,717	20,000	2,000	6,587	1,826	7,783	8,739	8,239
Oligochaete	1,000	826	1,152	10,174	87	65	0	65	43	217
Insect	3,130	2,109	3,761	8,783	1,391	6,022	1,783	7,630	8,652	6,957
Mollusc	870	435	565	522	435	457	0	43	22	1,000
Other <sup>4</sup>	304	457	239	522	87	43	43	43	22	65

**Notes:**

- Benthic invertebrate count data shown in this table are from composite of two grabs sieved to 500 µm.
- Richness totals exclude P. Nemata, Cl. Ostracoda, indeterminates (O. Acarina, F. Lumbriculidae), immatures (S.F. Tubificinae, O. Acarina), and pupae.
- Pupae and immatures (bolded values) are excluded from the richness totals if other life stages are present in the replicate sample.
- Other Taxa include: Cl. Turbellaria, F. Acalyptonotidae, F. Hygrobatidae, F. Lebertidae, F. Ooidae, F. Pionidae, O. Harpacticoids, O. Notostraca, and F. Gammaracanthidae.
- Abundance totals exclude P. Nemata and Cl. Ostracoda.
- Raw abundance from two grabs (grab area = 0.023 m<sup>2</sup>).



Table E3-2. Raw benthic invertebrate data from the Baker Lake, 2021.

Program Location Station Control/Impact? Replicate Date Sample Depth (m)	Baker Lake									
	Baker East Shore BES Control					Baker Proposed Jetty BPJ Impact				
	1	2	3	4	5	1	2	3	4	5
	16-Aug-21 9.3	16-Aug-21 9.0	16-Aug-21 9.3	16-Aug-21 8.9	16-Aug-21 8.5	15-Aug-21 8.8	15-Aug-21 8.5	15-Aug-21 8.1	16-Aug-21 8.6	15-Aug-21 8.4
<b>ROUNDWORMS</b>										
<i>P. Nemata</i>	10	17	20	3	7	4	14	4	5	10
<b>FLATWORMS</b>										
<i>P. Platyhelminthes</i>										
<i>Cl. Turbellaria</i>	-	-	-	-	-	1	-	-	-	-
indeterminate	-	-	-	-	-	-	-	-	-	-
<b>ANNELIDS</b>										
<i>P. Annelida</i>										
<b>WORMS</b>										
<i>Cl. Oligochaeta</i>										
<i>F. Enchytraeidae</i>	2	-	1	-	-	-	-	2	1	-
<i>F. Naididae</i>										
<i>S.F. Tubificinae</i>										
<i>Limnodrilus hoffmeisteri</i>	-	-	-	-	-	-	-	-	-	-
<i>Potamothrix bavaricus</i>	-	-	-	-	-	1	-	-	-	-
<i>Slavina appendiculata</i>	-	-	-	-	-	-	-	-	-	-
<i>Tasserildrilus americanus</i>	-	-	-	-	-	-	-	-	-	-
immatures with hair chaetae	-	-	-	-	-	3	-	1	-	-
immatures without hair chaetae	-	-	-	-	-	-	-	-	-	-
<i>S.F. Rhyacodrilinae</i>										
<i>Rhyacodrilus coccineus</i>	-	-	-	-	-	-	-	-	-	-
<i>Rhyacodrilus montana</i>	-	4	1	-	-	3	1	1	2	4
<i>F. Lumbriculidae</i>										
<i>Lumbriculus</i>	-	-	-	-	-	-	-	-	-	-
<b>ARTHROPODS</b>										
<i>P. Arthropoda</i>										
<b>MITES</b>										
<i>Cl. Arachnida</i>										
<i>O. Acarina</i>	-	6	-	1	-	4	-	-	1	1
<i>F. Acarytonotidae</i>										
<i>Acalyptonotus</i>	1	2	2	1	1	-	-	-	-	1
<i>F. Hygrobatidae</i>										
<i>Hygrobatoides</i>	-	-	-	-	-	-	1	-	1	-
<i>F. Lebertidae</i>										
<i>Lebertia</i>	14	8	16	12	17	21	8	1	11	24
<i>F. Oxidae</i>										
<i>Oxus</i>	1	1	1	-	2	-	-	-	-	-
<i>F. Plonidae</i>										
indeterminate	-	-	-	-	-	-	-	-	-	-
<b>HARPACTICODS</b>										
<i>O. Harpacticoida</i>	-	-	-	-	-	-	-	-	-	-
<b>SEED SHRIMPS</b>										
<i>Cl. Ostracoda</i>	1	4	7	1	-	-	8	-	-	4
<b>FAIRY SHRIMP</b>										
<i>O. Notostraca</i>										
<i>Lepidurus arcticus</i>	-	-	-	-	-	-	-	-	-	-
<b>WATER SCUDS</b>										
<i>O. Amphipoda</i>										
<i>F. Gammaracanthidae</i>										
<i>Gammaracanthus</i>	-	-	1	-	-	-	-	-	-	-
<b>INSECTS</b>										
<i>Cl. Insecta</i>										
<b>CADDISFLIES</b>										
<i>O. Trichoptera</i>										
<i>F. Apataniidae</i>										
<i>Apatania</i>	-	-	-	-	1	-	-	-	-	-
<i>F. Limnephilidae</i>										
<i>Grensia proterita</i>	-	-	-	-	-	-	-	-	-	-
<b>TRUE FLIES</b>										
<i>O. Diptera</i>										
<b>MIDGES</b>										
<i>F. Chironomidae</i>										
chironomid pupae	12	19	11	7	2	24	31	27	52	29
<i>S.F. Chironominae</i>										
<i>Chironomus</i>	-	-	-	-	-	-	-	-	-	-
<i>Cladotanytarsus</i>	-	-	-	-	-	-	-	-	-	-
<i>Constempellina</i>	5	11	5	6	6	2	1	-	1	1
<i>Corynocera ambigua</i>	-	-	-	-	-	-	-	-	-	-
<i>?Corynocera oliveri</i>	-	-	-	-	-	-	-	-	-	-
<i>Dicratandipes</i>	-	-	-	-	-	-	-	-	-	-
<i>Micropectra</i>	-	-	-	-	-	4	18	11	8	14
<i>Microtandipes</i>	-	-	-	-	-	-	-	-	-	-
<i>Parachironomus</i>	-	-	-	-	-	-	-	-	-	-
<i>Paraclopedelma</i>	-	-	-	1	1	1	-	-	3	1
<i>Paratanytarsus</i>	-	1	-	-	-	2	-	6	-	-
<i>Polypedilum</i>	-	-	-	-	-	-	-	-	-	-
<i>Sergentia</i>	-	-	-	-	-	-	-	2	-	-
<i>Stempellinella</i>	-	-	-	-	-	-	-	-	-	-
<i>Stictochironomus</i>	-	-	-	-	-	39	8	13	3	22
<i>Tanytarsus</i>	10	11	4	5	5	18	11	23	31	8
<i>S.F. Diamesinae</i>										
<i>Pagastia</i>	-	-	-	-	-	-	-	1	-	-
<i>Protanytus</i>	-	-	-	1	-	-	-	-	-	-
<i>Poithasia</i>	-	-	-	-	-	-	-	-	-	-
<i>Pseudodiamesa</i>	2	-	-	-	-	-	-	-	-	2
<i>S.F. Orthocladinae</i>										
<i>Abiskomyia</i>	-	-	-	-	-	2	4	-	1	3
<i>Corynoneura</i>	1	-	-	-	-	-	-	-	-	-
<i>Cricotopus</i>	-	-	-	-	-	-	-	-	-	-
<i>Cricotopus/Orthocladus</i>	-	2	5	-	-	1	1	-	3	-
<i>Heterotrissocladius</i>	9	6	6	7	4	16	14	12	8	13
<i>Hydrobaenus</i>	-	-	-	-	-	-	1	-	-	-
<i>Mesocricotopus</i>	9	9	7	4	1	2	7	2	4	2
<i>Nanocladius</i>										
<i>Paracloadius</i>	3	6	5	-	2	-	2	-	-	1
<i>Parakiefferiella</i>	-	-	3	-	-	-	1	-	-	-
<i>Psectrocladius</i>	-	-	-	-	-	-	-	-	-	-
<i>Zalutschia</i>	-	-	-	-	-	-	1	-	-	-
<i>Orthocladinae Genus "Greenland"</i>	-	-	-	-	-	-	-	-	-	-
indeterminate	-	-	-	-	-	-	-	-	4	-
<i>S.F. Prodiamesinae</i>										
<i>Monodiamesa</i>	1	1	1	-	-	-	2	3	2	1
<i>S.F. Tanypodinae</i>										
<i>Ablobesomyia</i>	-	-	-	-	-	-	-	-	-	-
<i>Procladius</i>	7	4	3	4	5	21	21	9	18	8
<i>Thienemannimyia complex</i>	-	1	-	-	-	-	3	-	3	-
<i>F. Empididae</i>										
<i>Cheiffera/Metachela</i>	-	2	2	-	2	3	2	-	1	-
<i>Clinocera</i>	-	-	-	-	-	-	-	-	-	-
pupae	-	1	-	1	-	1	1	-	-	-

Table E3-2. Raw benthic invertebrate data from the Baker Lake, 2021.

Program Location Station Control/Impact? Replicate Date Sample Depth (m)	Baker Lake									
	Baker East Shore BES Control					Baker Proposed Jetty BPJ Impact				
	1	2	3	4	5	1	2	3	4	5
	16-Aug-21 9.3	16-Aug-21 9.0	16-Aug-21 9.3	16-Aug-21 8.9	16-Aug-21 8.5	15-Aug-21 8.8	15-Aug-21 8.5	15-Aug-21 8.1	16-Aug-21 8.6	15-Aug-21 8.4
<b>MOLLUSCS</b>										
<b>P. Mollusca</b>										
<b>SNAILS</b>										
Cl. Gastropoda										
F. Valvatidae										
Valvata	-	-	-	-	-	-	1	-	-	-
<b>CLAMS</b>										
Cl. Bivalvia										
<b>F. Sphaeriidae</b>										
Pisidium/Cyclocalyx	-	-	-	4	-	-	-	-	1	4
Pisidium (Cyclocalyx/Neopisidium)	9	13	12	-	19	-	5	-	2	21
Sphaerium nitidum	-	-	-	-	-	-	-	-	-	-
<b>R (Richness) - totals <sup>2,3</sup></b>										
Total	14	16	17	11	13	17	21	14	20	17
Oligochaete	1	1	2	0	0	2	1	3	2	1
Insect	9	11	10	8	9	13	16	10	14	12
Mollusc	1	1	1	1	1	0	2	0	2	2
Other <sup>4</sup>	3	3	4	2	3	2	2	1	2	2
<b>Abundance (raw) - totals <sup>5,6</sup></b>										
Total	86	102	86	53	68	165	145	114	160	159
Oligochaete	2	4	2	0	0	7	1	4	3	4
Insect	59	74	52	36	29	136	129	109	142	105
Mollusc	9	13	12	4	19	0	6	0	3	25
Other <sup>4</sup>	16	11	20	13	20	22	9	1	12	25
<b>Abundance - totals (#/m<sup>2</sup>) <sup>5</sup></b>										
Total	1,870	2,217	1,870	1,152	1,478	3,587	3,152	2,478	3,478	3,457
Oligochaete	43	87	43	0	0	152	22	87	65	87
Insect	1,283	1,609	1,130	783	630	2,957	2,804	2,370	3,087	2,283
Mollusc	196	283	261	87	413	0	130	0	65	543
Other <sup>4</sup>	348	239	435	283	435	478	196	22	261	543

**Notes:**

- Benthic invertebrate count data shown in this table are from composite of two grabs sieved to 500 µm.
- Richness totals exclude P. Nemata, Cl. Ostracoda, indeterminates (O. Acarina, F. Lumbriculidae), immatures (S.F. Tubificinae, O. Acarina), and pupae.
- Pupae and immatures (bolded values) are excluded from the richness totals if other life stages are present in the replicate sample.
- Other Taxa include: Cl. Turbellaria, F. Acalyptonotidae, F. Hygrobatidae, F. Lebertidae, F. Ooidae, F. Pionidae, O. Harpacticoids, O. Notostraca, and F. Gammaracanthidae.
- Abundance totals exclude P. Nemata and Cl. Ostracoda.
- Raw abundance from two grabs (grab area = 0.023 m<sup>2</sup>).

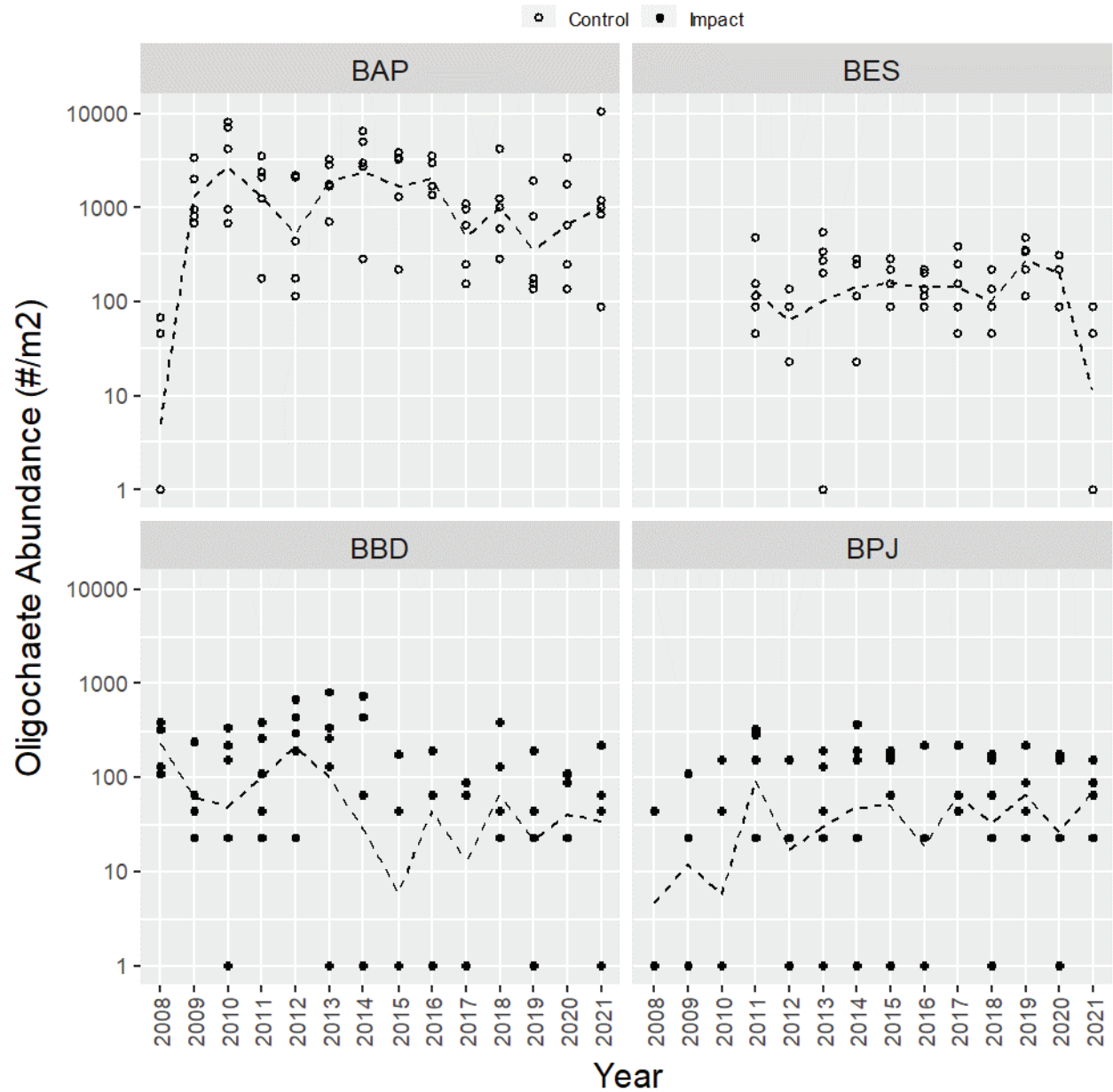
Figure E3-1. Oligochaete abundance (#/m<sup>2</sup>) from Baker Lake since 2008.

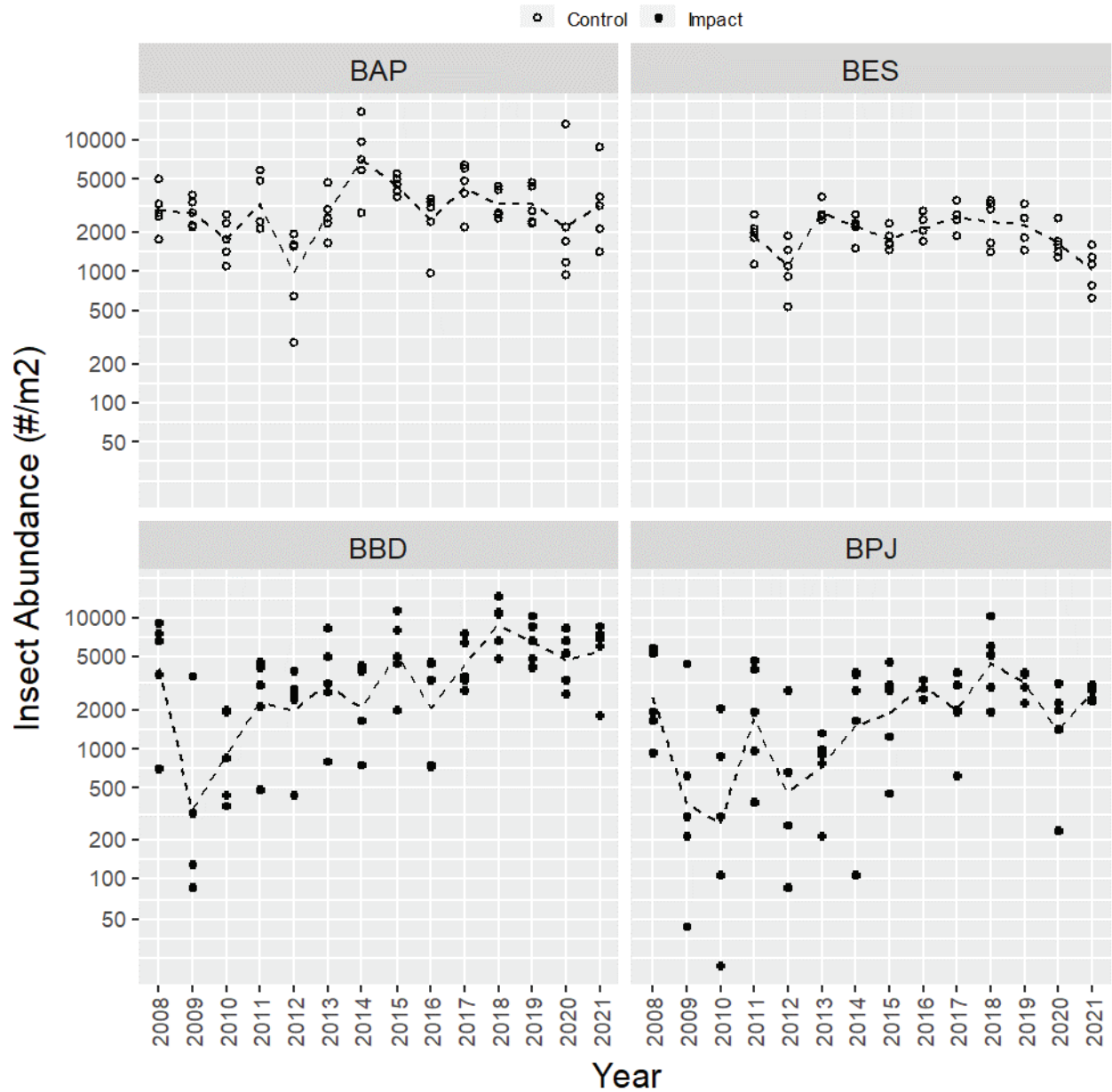
Figure E3-2. Insect abundance ( $\#/m^2$ ) from Baker Lake since 2008.

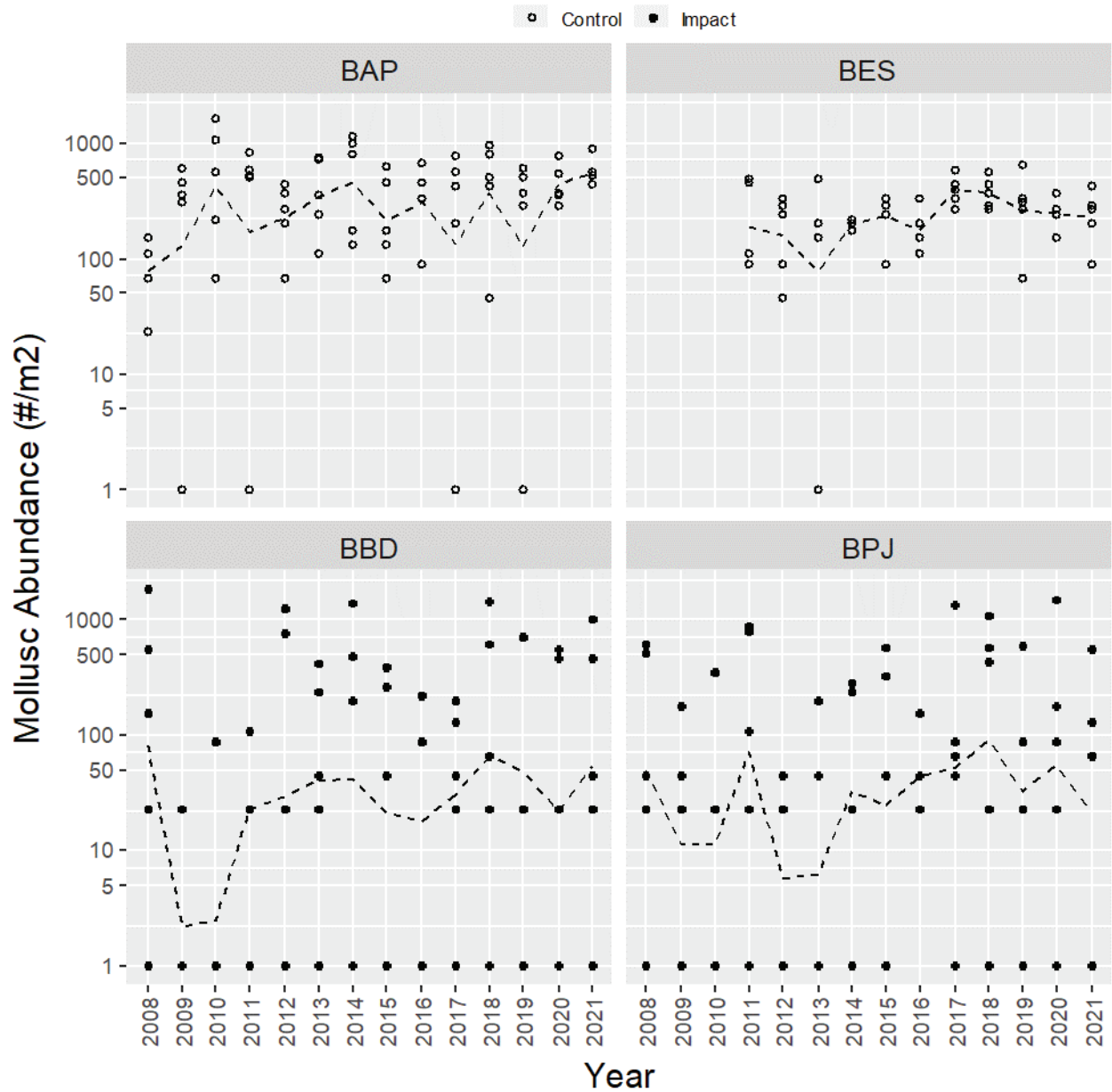
Figure E3-3. Mollusc abundance ( $\#/m^2$ ) from Baker Lake since 2008.

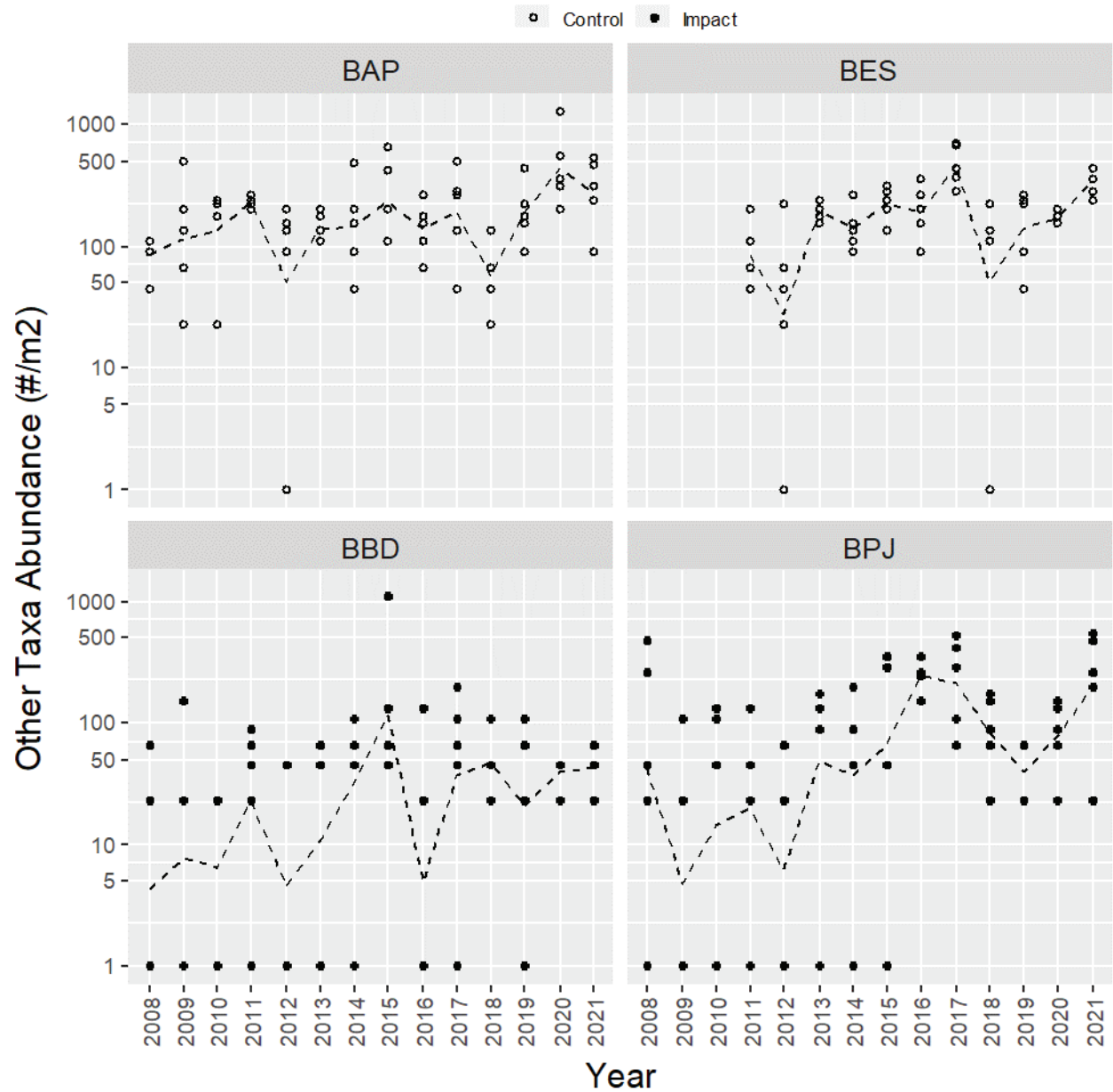
Figure E3-4. Other taxa abundance (#/m<sup>2</sup>) from Baker Lake since 2008.



Figure E3-5. Oligochaete richness (# of taxa) from Baker Lake since 2008.

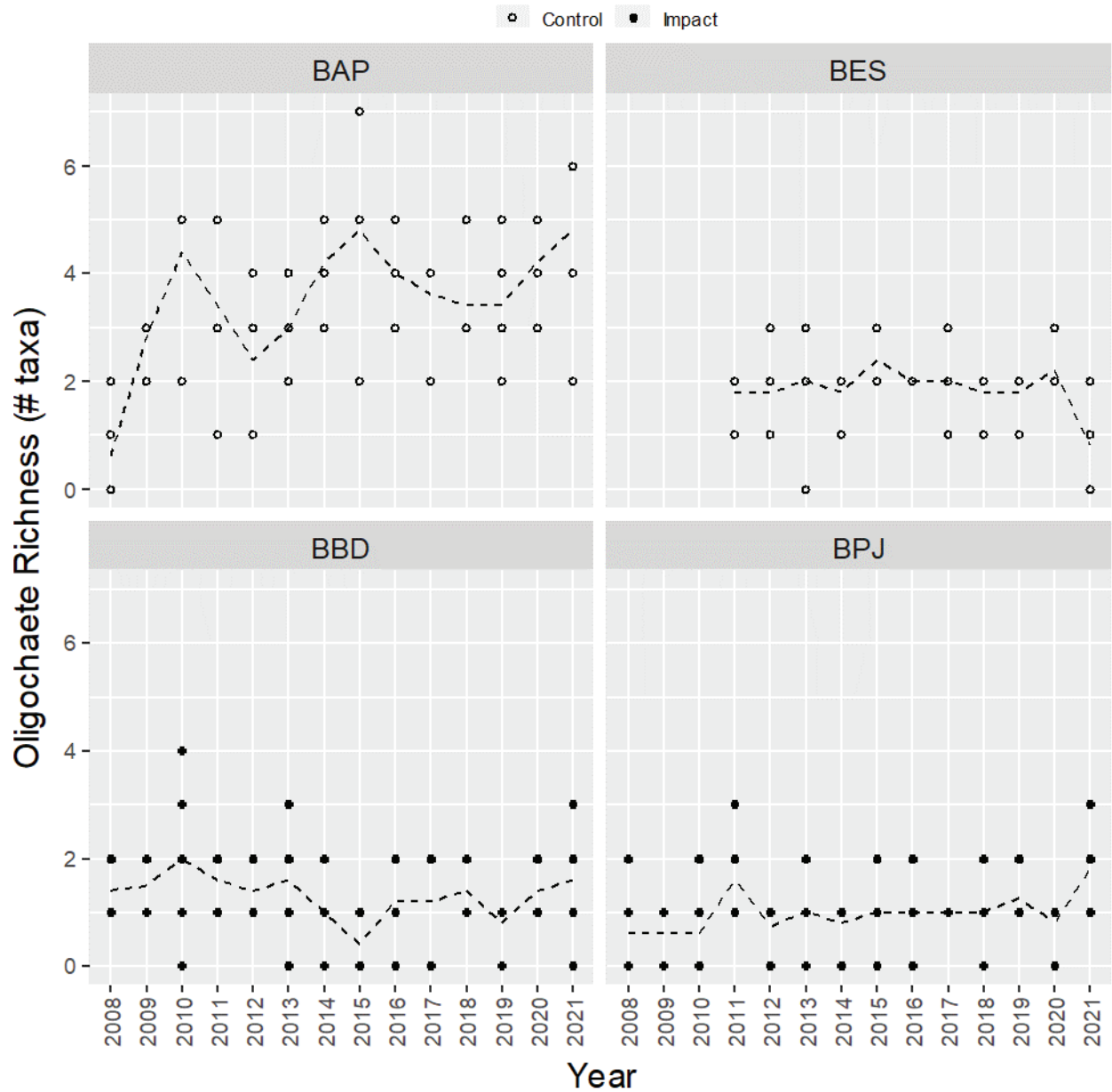


Figure E3-6. Insect richness (# of taxa) from Baker Lake since 2008.

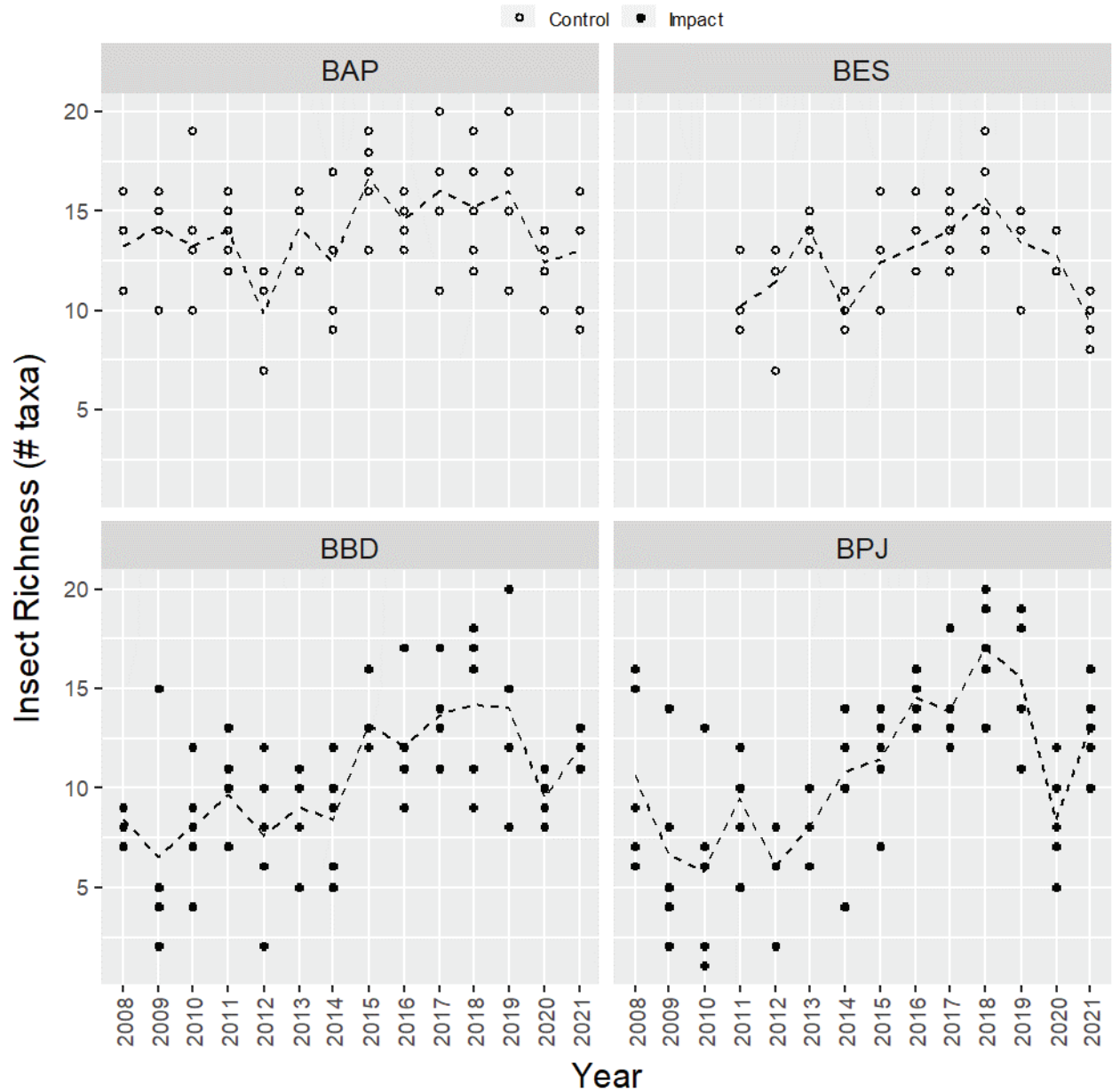


Figure E3-7. Mollusc richness (# of taxa) from Baker Lake since 2008.

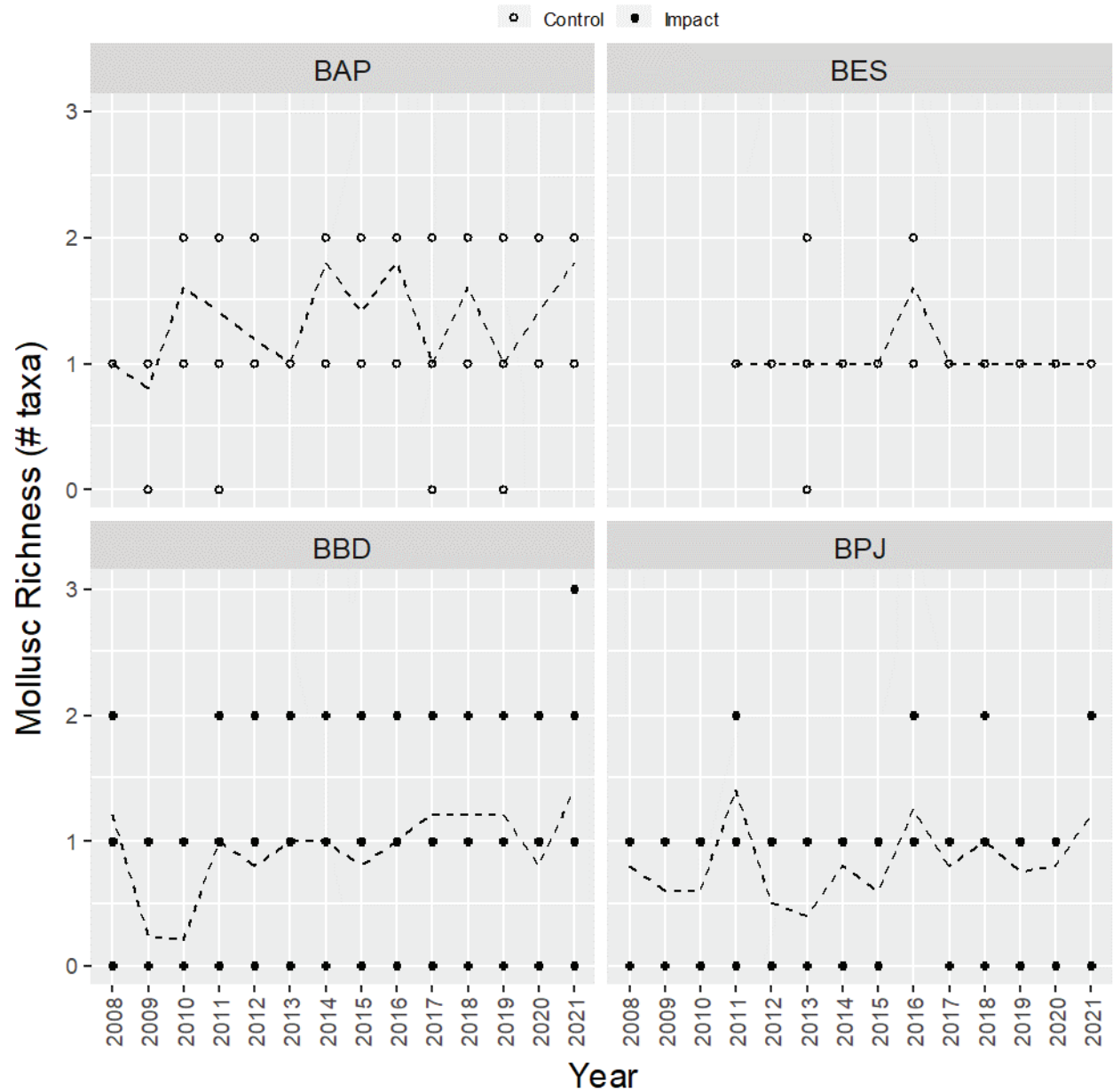
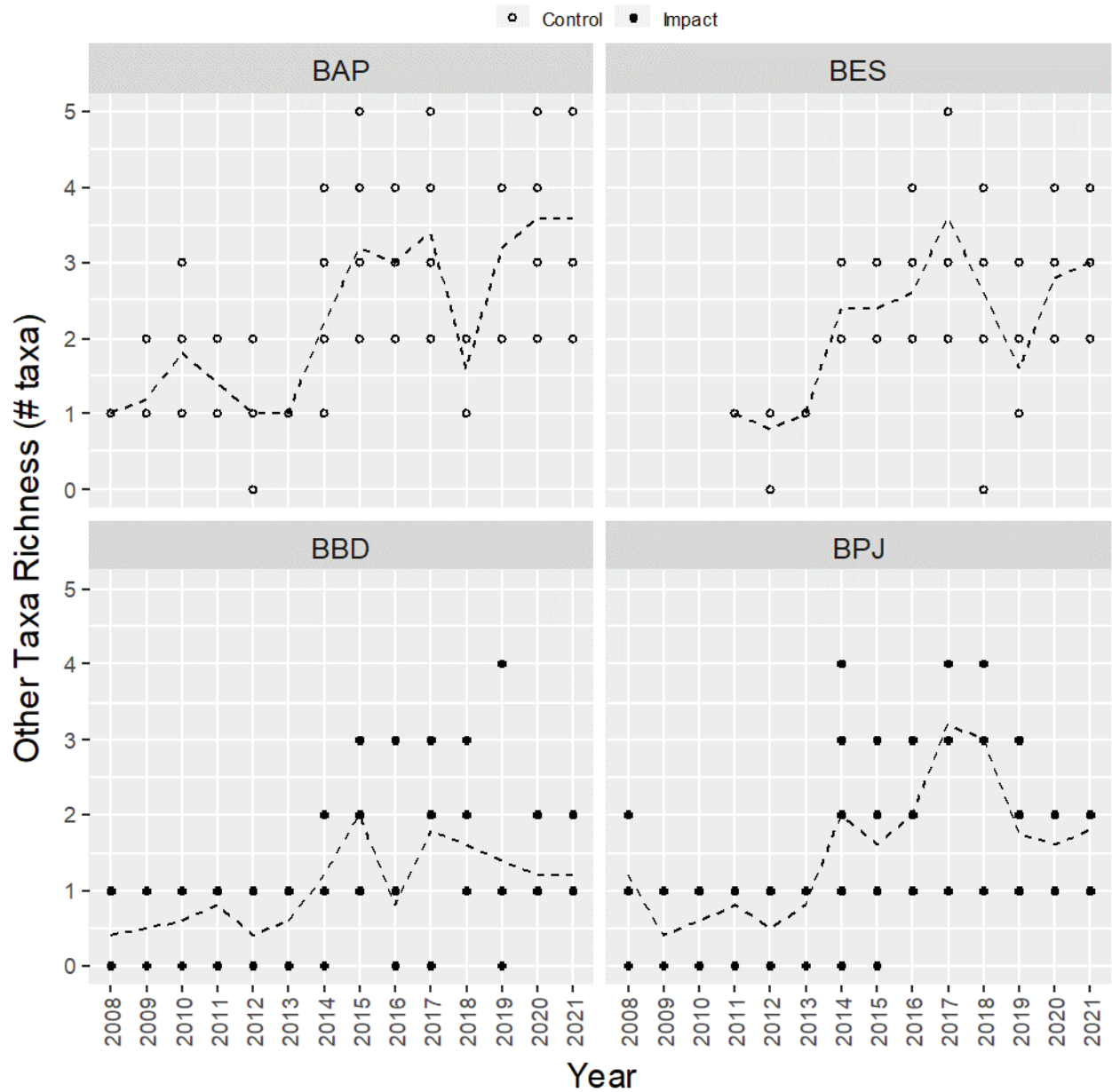
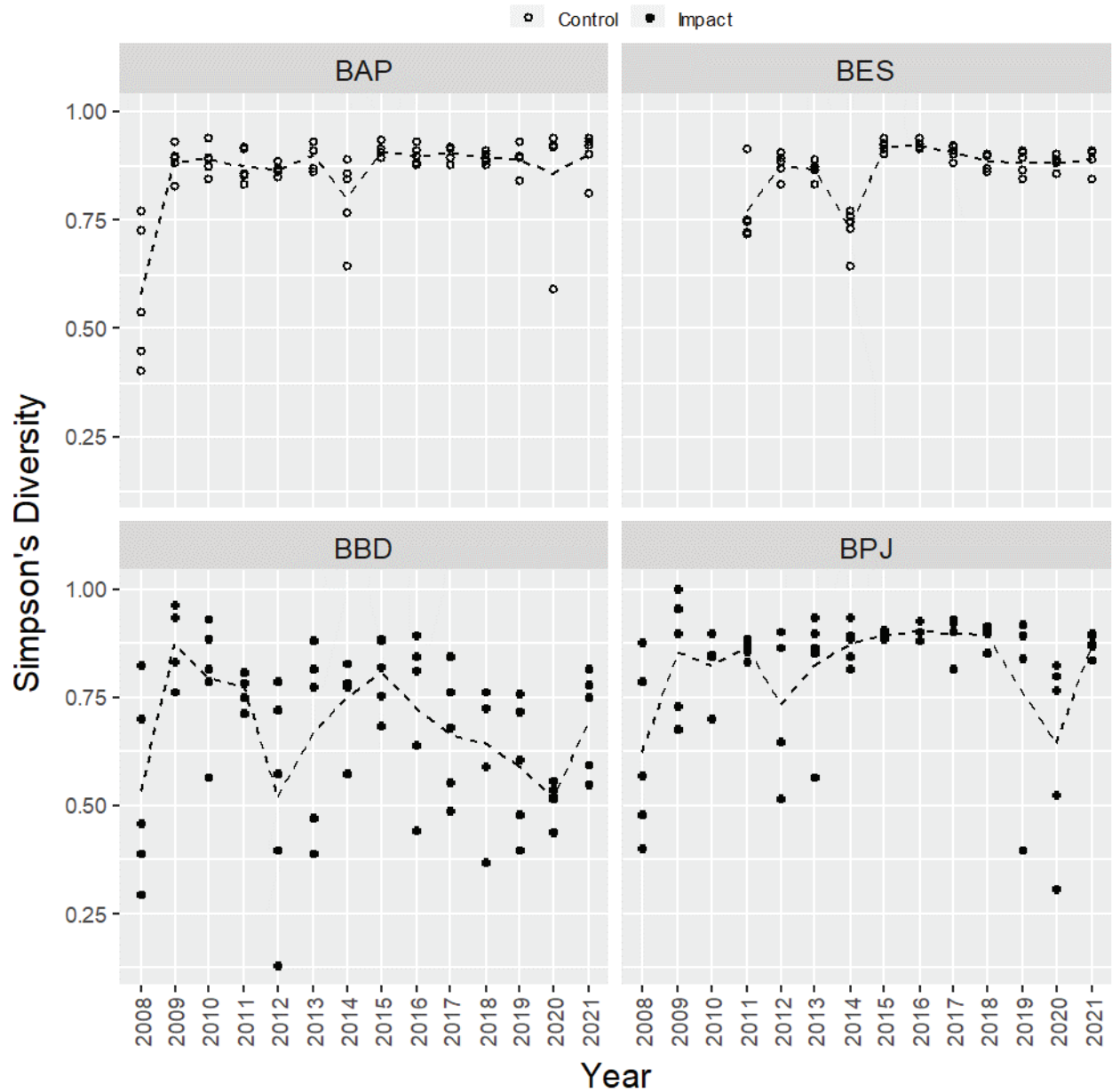
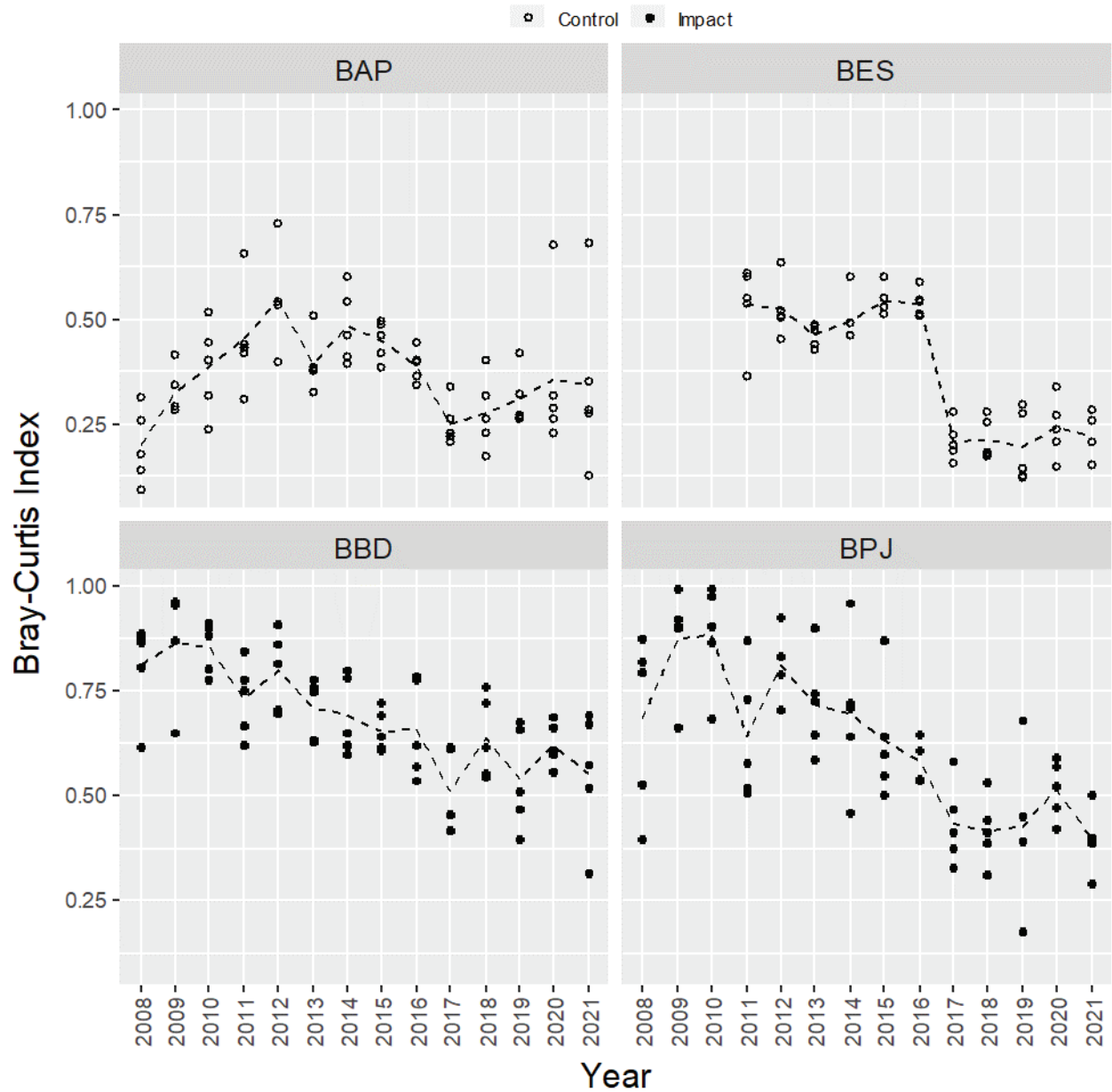


Figure E3-8. Other taxa richness (# of taxa) from Baker Lake since 2008.



**Figure E3-9. Simpsons' Diversity for the benthic invertebrate community at Baker Lake since 2008.**

**Figure E3-10. Bray-Curtis Index for the benthic invertebrate community at Baker Lake since 2008.**



APPENDIX F  
2019 WATER QUALITY EFFECTS ASSESSMENT

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## F.1 INTRODUCTION

This technical document was prepared by Azimuth Consulting Group Partnership (Azimuth) to provide context on the potential for adverse effects to lower trophic biota (i.e., phytoplankton, zooplankton and benthic invertebrates) due to changes in water parameters that do not have effects-based thresholds (e.g., water quality standards, guidelines or criteria).

### F.1.1 Background

The decision framework for the CREMP incorporates the use of *thresholds* (i.e., typically CCME water quality guidelines or effects-based equivalents from other jurisdictions) and *triggers* (i.e., early warning limits typically set between baseline/reference conditions and the threshold for parameters with effects-based guidelines, or set at the 95<sup>th</sup> percentile of the baseline/reference conditions; see [Appendix I](#) in the 2020 CREMP report for details). To date, for parameters with effects-based thresholds, CREMP monitoring has shown that receiving environment water quality in the Meadowbank and Whale Tail Pit study lakes meets both the trigger and threshold values (i.e., well below water quality guidelines).

Mining-related increases, particularly at NF study areas, have been observed for some parameters without water quality guidelines, including total dissolved solids (TDS), total alkalinity, conductivity, hardness, and certain major ions (i.e., calcium, magnesium, potassium, and sodium). Most of these parameters also exceed predicted concentrations presented in the Meadowbank Final Environment Impact Statement (FEIS) (Cumberland, 2005). In addition, total silicon, which was not routinely measured during the baseline period and shows little in the way of temporal trends, exceeds FEIS predictions. Because silicon was not routinely included in the suite of analyses in the baseline water chemistry samples, the baseline water quality values for Third Portage Lake, Second Portage Lake, and Wally Lake were set to 0 mg/L. This approach resulted in an underestimate of future concentrations for Third Portage Lake, Second Portage Lake, and Wally Lake. Silicon is not recommended as a parameter for evaluating the accuracy of the water quality model predictions for the Meadowbank study area lakes given the underestimate in baseline water chemistry.

As described in the main report, biological monitoring conducted under the CREMP targets the phytoplankton and benthic invertebrate communities. Results to date indicate that communities in the NF areas are functionally intact, with major indices such as taxonomic richness and abundance remaining relatively stable across the more than a decade of events. Thus, the biological data indicate that current water quality in the NF study areas is not adversely affecting

the health of phytoplankton and benthic invertebrate communities compared to baseline or reference conditions.

### F.1.2 Rationale

Notwithstanding the evidence showing phytoplankton and benthos communities are similar to baseline/reference conditions, the Kivalliq Inuit Association (KIA), in their review of the 2018 annual report, recommended<sup>1</sup> that Agnico Eagle complete the following:

- i. *Investigate the source of these parameter increases, their spatial extent and the reversibility of these trends.*
- ii. *Discuss the implications of increased conductivity, calcium, magnesium, potassium, sodium, TDS and alkalinity at the near-field sites on lower trophic levels, specifically in terms of the community composition of phytoplankton, zooplankton and benthic invertebrates.*
- iii. *In accordance with AEM Management Response Plan for the Meadowbank Mine Aquatic Environment Monitoring Program, that AEM increase monitoring frequency at the mid-field sites to determine the spatial extent of exceedances observed in the near-field during the open water season.*
- iv. *Conduct an investigation of cause study for the observed changes in water chemistry and determine possible management strategies.*

This technical memorandum is meant to address recommendations i) and ii) above by providing a review of available literature on the effects of selected conventional and ionic compounds on lower trophic level community composition. The outcome of this technical review will help determine if increased monitoring frequency (point iii) and/or investigation of cause studies (point iv) should be considered to help inform adaptive management decisions.

### F.1.3 Approach

As described in **Section F.1.1**, the following parameters have been shown to be exceeding baseline/reference conditions and/or FEIS predictions: total dissolved solids (TDS), total alkalinity, conductivity, hardness, certain major ions (i.e., calcium, magnesium, potassium, and sodium), and total silicon. Apart from total silicon, the rest of these parameters are inter-related to some extent or are not parameters of toxicological concern. Rationale for the approach used herein to cover the range of parameters is as follows:

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<sup>1</sup> Recommendation 22 in the 2018 Annual Report Comments.

- *TDS* – this parameter is a measure of all dissolved constituents in water, but is comprised primarily of inorganic salts (mainly calcium, potassium, magnesium, sodium, bicarbonates, chlorides, and sulphates). Consequently, it essentially includes total alkalinity (the measure of a solution’s ability to neutralize acid inputs), hardness (the sum of multivalent ions in solution), conductivity (the measure of a solution’s ability to conduct electricity; correlated to dissolved salts), and major ions (concentrations of individual ions in solution). While a site-specific approach that considers the ratios of individual major ions is preferred from a technical perspective, it is not practical for a literature approach due to the sheer number of permutations across these constituents. Consequently, the literature review for the parameters mentioned herein focused on primarily on TDS.
- *Conductivity* – as mentioned above, this parameter is related to TDS and could therefore be excluded for singular focus. However, as there is some effects-based information available (e.g., US EPA 2016), we have included it for additional context.
- *Total silicon* – this parameter plays an important role as an essential dissolved element consumed by the phytoplankton group of algae called diatoms. Relative abundance of this primary producer can have effects on higher trophic level organisms and as community changes occur in response to elevated or reduced silicon.

## F.2 LITERATURE REVIEW

A literature review was completed to assess the potential effects of TDS, conductivity and total silicon at different concentrations on fresh water aquatic life (e.g., phytoplankton, zooplankton, benthic invertebrates, and fish species) that may either reasonably be found in the Meadowbank study area lakes or be reasonably comparable. Preference was given to peer-reviewed literature and government sources including articles, studies, effects assessments, published guidance, and literature reviews. Other sources (e.g., unpublished “grey” literature) were also used where relevant.

### F.2.1 Total Dissolved Solids

Solids in water can be measured as total solids, total suspended solids (TSS), or total dissolved solids. Total solids is the measure of all both TSS and TDS. TDS is the measure of all dissolved constituents of a solution which may be of anthropogenic origin such as mining activities or road salt-contaminated runoff or natural influences such as soils or geology (Weber-Scannel & Duffy 2007). The measurement of TDS is conducted by the removal of suspended solids by filtration

through a 0.7-micron glass fiber filter followed by drying of the filtrate at 180 degrees Celsius. The dried filtrate residue is divided by the volume of water filtered to determine the concentration of TDS which is usually reported in mg/L (APHA 2017). TDS is comprised mainly of inorganic ions but can also include dissolved organic matter. The potential biological effects of TDS are, therefore, related to the specific composition of the ions, their speciation, and other solids present in water. TDS may also exhibit toxicity through osmotic stress (i.e., where cell desiccation occurs due to leakage Davies & Hall 2007). Except in conditions where ratios and speciation of ionic components are fairly stable, TDS may be a poor predictor of toxicity (Chapman & McPherson 2016).

Similar to conductivity, TDS may be used as a surrogate measure for salinity because this measure tends to provide an estimate of the ionic compounds present (USEPA 1999). While elevated concentrations of TDS may change the osmotic conditions whereby elevated concentrations of TDS leads to potential osmotic stress especially in ultra-oligotrophic lakes with naturally low TDS, the ratios of ions present in solution are important due to the presence of essential macro and micro-minerals (EPA 2002). Meadowbank and Whale Tail study areas feature ultra-oligotrophic lakes with naturally low TDS. Increased chemical density influences the osmotic regulation of metabolism and biotic distribution in aquatic communities (BC MOE 2013).

Due to the complex and variable composition of ions and dissolved solids measured as TDS, a generic TDS guideline for the protection of aquatic life must be overly protective to account for the most toxic potential combination to the most sensitive organisms and life stage (Weber-Scannell and Duffy 2007). Assigning a threshold concentration for TDS is difficult because the high site specificity of this parameter. This challenge is reflected in the absence of any federal water quality guideline, with the exception of an aesthetic objective of less than or equal to 500 mg/L, for TDS (Health Canada 1991). Regulation of TDS is also limited in other jurisdictions with few exceptions such as Alaska, where TDS may not exceed 500 mg/L without a special permit and 1,000 mg/L at any time (ADEC 2012).

The presence of dissolved ions in solution is essential for the survival of aquatic organisms and provides the basis for the lowest trophic residents in the form of mineral uptake. Macro-mineral uptake is required for the support of biochemical functions such as magnesium and potassium (EPA 2002). Another example of the important biological role of dissolved ions is the importance of chloride in osmoregulation (Elphick et al. 2010). Many communities have low sensitivity to TDS these may be more readily detected through biological monitoring which can detect the overall impact of changes of water quality in a system (Buikema et al. 1982). Toxicity is highly



dependent upon both the composition of the residents of the system and the components, speciation, and ratios of the dissolved analytes.

Weber-Scannell and Duffy (2007) reviewed TDS toxicity to aquatic life and recommend deriving ion-specific limits for aquatic life (i.e., rather than for TDS) although this may not satisfy the potential osmotic regulation concerns. Mount et al. (1997) prepared and tested the toxicity of over 2,900 ionic solutions on Daphnids (*Ceriodaphnia dubia* and *Daphnia magna*). Their results suggested the following descending relative ion toxicity: potassium, bicarbonate and magnesium, chloride, sulphate. Neither sodium nor calcium resulted in significant effects (Mount et al., 1997). However, Mount et al. (1997) also found that the potential toxicity of chloride, sulphate, and potassium were reduced in solutions enriched with more than one cation. The inability to identify to attribute the toxicity of a specific constituent of TDS is inherent to the nature of the complex mixture this parameter measures with potential for effect masking, additive toxic effects, and synergistic toxic effects (Goodfellow et al. 2009). Timpano et al. (2010) examined the relationship between benthic macroinvertebrate community metrics in coal field streams and TDS. They caution that impacts from mine-related TDS is confounded because elevated TDS rarely occurs independently of other stressors. This study indicated several benthic macroinvertebrate richness measures were inversely correlated with TDS. Relative species abundance showed no correlation to TDS. Concentrations of TDS in the study streams ranged from 27.8 to 791.6 mg/L. The dominance of sulphate as a constituent in this study may reduce its relevance given the historically low sulphate concentrations in the Meadowbank study area lakes; in addition, the TDS concentrations are also notably higher than those found in the Meadowbank study area lakes.

The TDS review paper by Weber-Scannell and Duffy (2007) showed effects at concentrations less than 250 mg/L with a reported global mean in rivers of 120 mg/L. A TDS receiving environment benchmark 500 mg/L was adopted at Diavik (WLWB, 2013). Scannell and Jacobs (2001) completed a detailed review on the effects of TDS on aquatic life including fish, aquatic invertebrates, and algae focusing on Alaskan waters and TDS components that would be similar to those found in mine effluent. They found no effects to invertebrate growth and survival at concentrations below 1500 mg/L, that there was no reported range of concentrations that caused a toxic response in algae, and that fertilization and hatching rates in salmonids was the most sensitive life stage with affects at concentrations around 750 mg/L. They also concluded that toxicity was due primarily to ionic properties rather than osmotic effects. Chapman, Bailey, and Canaria (1999) completed an assessment of TDS toxicity associated with two mine effluents on chironomid (midge) larvae and early life stages of rainbow trout. They found no toxicity for rainbow trout at concentrations below 2,000 mg/L but did observe effects on chironomids at concentrations greater than 1,100 mg/L. A 2013 Effects Assessment report for the Snap Lake

Mine for De Beers Canada Inc. included results from a site-specific toxicity testing on phytoplankton, zooplankton, benthic invertebrates, and fish species and concluded that *Ceriodaphnia dubia* (a planktonic flea species) was the most sensitive test species and was affected by concentrations of 560 mg/L. A statistical review of the relationship between TDS in the range of 128 to 1,545 mg/L and phytoplankton (chlorophyll-a) in 25 Canadian Lakes by Prepas (1983) did not find a correlation.

Laboratory analysis for the 2019 CREMP water chemistry was completed by ALS Environmental, Burnaby, BC. As reported in the 2019 CREMP (Azimuth 2020), the maximum reported concentration in 2019 was 52.2 mg/L at WAL in March, consistent with the magnitude of concentrations reported in 2018. TDS concentrations in 2019 at other Meadowbank NF stations were as follows: TPE had a maximum of 23.9 mg/L; TPN a maximum of 24.1 mg/L; and SP had a maximum of 32.6 mg/L. The literature cited above suggests that the concentrations of TDS observed in the Meadowbank study area lakes are well below the concentrations where effects will occur. Furthermore, phytoplankton biomass and taxa richness have remained stable as has benthic invertebrate biomass and taxa richness confirming that primary productivity within the study area lakes is not exhibiting adverse effects from elevated TDS.

### F.2.2 Conductivity

Much like TDS, specific conductivity has been used as a measurement of ionic strength (Cormier et al., 2012; USEPA, 2016). Conductivity is measured by passing an electrical current through a solution to determine conductance, or the reciprocal of resistance of a solution; therefore, it serves as an indirect measure of only ionic inorganic constituents. It does not have a relationship to dissolved organic compounds because these rarely dissociate (APHA 2018). The TDS method is applicable to waters that mostly contain calcium, magnesium, sodium, potassium, chlorate, sulphate, and chloride and TDS less than 2500 mg/L (APHA 2018). The concentration of all dissociated ions is inversely correlated to the electrical resistance of a solution. Because of the broad nature of TDS, the toxicity potential of a specific conductivity value depends on the toxicity of the ionic composition (USEPA 2016). There is no threshold for specific conductivity at the Meadowbank study area lakes and no federal guidelines.

Water quality parameters are useful indicators of potential effects of local environmental changes on freshwater ecosystems. Anthropogenic influences to water quality such as decreased dissolved oxygen is often correlated with a change in pH and an increase in conductivity, and nutrient concentrations (Leszczynska et al. 2019). The effects of these changes, especially if measured over time may not be detectable through biological monitoring. This is because aquatic communities acclimate to changes in water quality, especially those featuring natural seasonally or daily variability. Conductivity is an example of a naturally variable

parameter that not only includes highly variable toxicity but also varies in measured value in response to natural system input fluctuations (i.e. freshet, rainfall, groundwater influence) (USEPA, 2016; Hood et al. 2006).

As indicated in the 2019 CREMP, some Meadowbank study area lakes have exhibited an increase in conductivity relative to baseline/reference conditions. The mean conductivity in WAL in 2019 was 47.1  $\mu\text{S}/\text{cm}$  which was the highest mean value from the Meadowbank study area. The US EPA provided a draft field-based method for developing aquatic life criteria for specific conductivity in 2016. Cormier et al. used this approach and reviewed the relationship between specific conductivity in West Virginia coal field stream systems and macroinvertebrate health to create a species sensitivity distribution and derive a benchmark relationship. The authors determined that a bench mark of 300  $\mu\text{S}/\text{cm}$  was appropriate to prevent the extirpation of 95% of invertebrate genera in the study area. These results were confirmed in a separate study by Clements and Kotalik (2015).

Michelutti et al. (2002) examined the limnological conditions in 34 lakes and ponds on Victoria Island (arctic Canada) and provided a mean specific conductance of 96.4  $\mu\text{S}/\text{cm}$ . Dranga et al. (2017) reviewed and compiled limnological data from 1489 shallow lakes and ponds in northern Canada and found a range of conductivity with a low of 2.5  $\mu\text{S}/\text{cm}$  and a mean specific conductivity of 166  $\mu\text{S}/\text{cm}$ . The authors did not find an association between trophic level or vegetation cover and conductivity but did find conductivity was affected by geological area. In comparison, Ruhland et al. (2003) summarized limnological results from 21 Canadian arctic tundra lakes and found specific conductivity ranged from 7.3 to 98.8  $\mu\text{S}/\text{cm}$  with a mean of 17.8  $\mu\text{S}/\text{cm}$ . The results reported in the 2019 CREMP suggests that although conductivity in the near-field Meadowbank study area lakes may be elevated compared to baseline and reference, the conductivity remains relatively low compared to other arctic lakes.

### F.2.3 Silicon

Elemental silicon is highly abundant. It is relative stable and does not occur in its free form in nature but combines with oxygen and other elements to form oxides or silicates (CCME 2008). The term “silica” is often used to refer to silicon in natural waters and is usually represented by the hydrated form of the oxide (CCME 2008). It is also an essential micronutrient, particularly for diatoms. Silicon limitations can play an important role in phytoplankton dynamics (Shatwell et al. 2013; Saros et al. 2013). A change in the silicon concentrations may impact the succession of different phytoplankton species and the ratio of silicon with different nutrients may influence the ratio of cyanobacteria to diatoms. However, phytoplankton dynamics are also heavily influenced by other factors including temperature and photoperiod (Shatwell et al. 2013). As a primary producer, diatom abundance has cascading effects to higher trophic levels and in some

aquatic food chains silicon availability plays a significant role in energy transfer through effects on diatom productivity (Krause et al. 2018).

This literature review did not find any reports on potential toxic effects to aquatic receptors from low silicon concentrations similar to the concentrations observed in the Meadowbank study area lakes. In general, the conclusion of this the literature review was that there was little data to suggest potential toxicological effects from silicon to aquatic receptors at the range of concentrations that may reasonably be found in Canadian surface freshwater. There are no Canadian federal or provincial guidelines specifically for silicon in water to protect aquatic life. There are, however, several studies that report on the silica concentrations in Canadian surface waters including arctic regions. Natural silicon concentrations in Canadian surface waters are normally less than 5 mg/L silica but are highly variable ranging from 0.02 mg/L to 40 mg/L depending on region (CCME 2008). Antoniades et al. (2003) reported on chemical limnology of 24 ponds and one arctic lake from the Canadian high arctic. The authors did not report on silicon but did report that concentrations of silica ( $\text{SiO}_2$ ) ranged from 0.01 to 4.05 mg/L with a mean of 1.42 mg/L and a median of 1.18 mg/L. Hamilton et al. (2001) report the physical and chemical limnology of 204 Canadian arctic lakes. They report silicate ( $\text{SiO}_2$ ) concentrations for n=174 ranged from 0.05 to 6.7 mg/L with a mean of 1.1 mg/L.

The mean and median values from the arctic lake studies referenced above are higher than the silicon and silicate ( $\text{SiO}_2$ ) trigger concentrations for the Meadowbank study area lakes. The concentrations in the Meadowbank lakes have remained low despite a statistically significant increase over baseline/reference conditions. The range of silicon concentrations was generally below the trigger of 0.2 mg/L with the exception of SP, which ranged up to 0.23 mg/L, and INUG, which ranged up to 0.21 mg/L. Silicate as  $\text{SiO}_2$  was consistently below the trigger of 1.0 mg/L. Importantly, neither silicon nor silicate showed strong temporal trends associated with mining activity (see main report). Thus, the observed differences are more likely due to inherent spatial heterogeneity rather than to actual temporal changes.

The lack of substantial changes in total silicon (or silicate) suggest that changes to lower trophic communities at Meadowbank are unlikely. Based on this literature review the most likely impact from increases in total silicon would be to the phytoplankton assemblage. An increase in concentrations of silicon may favor diatoms whereas a decrease in silicon may favor cyanophytes. The species richness in the Meadowbank study area has remained relatively stable for all sample years, with no obvious changes in diatom biomass. Thus, the results of site-specific biological monitoring support the findings of the literature review that suggest changes to lower trophic communities are unlikely.

## F.3 CONCLUSIONS

This literature review was conducted to provide some additional context to help assess the ecological significance of mining-related changes to water quality for parameters without effects-based water quality guidelines. The review results corroborate the findings of site-specific biological monitoring conducted under the CREMP. While changes in the parameters of interest (TDS, conductivity and total silicon) can affect lower trophic level communities, concentrations of these parameters at Meadowbank and Whale Tail remain well below concentrations associated with adverse effects reported in the literature.

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