

Appendix A

List of Abbreviations

BANKS	Bank stability (scored from 0-20)
BANKV	Bank vegetation (scored from 0-20)
CART	Classification and Regression Tree Analysis
CH_ALT	Channel alteration (scored from 0-20)
DO	Dissolved oxygen (mg/L)
EMBED	Embeddedness (scored from 0-20)
EPI_SUB	Epifaunal substrate (scored from 0-20)
FLOW	Stream flow (cfs)
GAM	General Additive Model
PCT_EPHEMEROPTERA	The number of Ephemeroptera individuals divided by the sample total
PCT_EPHEMEROPTERA_NO_BAETID	The number of Ephemeroptera individuals excluding individuals from Baetidae family divided by the sample total
PCT_EPT	The number of Ephemeroptera, Plecoptera, and Trichoptera (EPT) individuals divided by the sample total
PCT_INTOL_0_3	The number of Intolerant (tolerance values 0-3) individuals divided by the sample total
PCT_PLECOPTERA	The number of Plecoptera individuals divided by the sample total
RICH_CLING	The number of Clinger families
RICH_EPHEMEROPTERA	The number of Ephemeroptera families
RICH_PLECOPTERA	The number of Plecoptera families
RIFF	Riffle/run/pool ratio (scored from 0-20)
SED	Sedimentation (scored from 0-20)
SP_COND	Specific conductivity (umhos/cm)
TURB	Turbidity (ntu)

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Figures and Tables

Table A1. Analysis MS4 stations and selected attributes.

Jurisdiction	Location Name	Type	Latitude	Longitude	NHD Catchment	HUC12	HUC12 Name
Anne Arundel County	Parole Town Center	Outfall	38.9788	-76.5394	8377525	020600040302	Beards Creek-South River
	Church Creek	Instream	38.9747	-76.5409	8377525	020600040302	Beards Creek-South River
Baltimore City	Moores Run: Radecke Ave	Instream	39.3306	-76.5350	11689172	020600030702	Redhouse Creek-Back River
	Moores Run: Hamilton Ave	Outfall	39.3365	-76.5390	11689172	020600030702	Redhouse Creek-Back River
Baltimore County	Scotts Level Branch: SL03	Instream	39.3720	-76.7801	11689692	020600030902	Dead Run-Gwynns Falls
	Scotts Level Branch: SL02	Outfall	39.3836	-76.8165	11689692	020600030902	Dead Run-Gwynns Falls
Carroll County	Airpark Business Center: WPU02	Instream	39.6003	-76.9814	11687202	020600030802	Headwaters North Branch Patapsco River
	Airpark Business Center: WPU01	Outfall	39.6053	-76.9952	11687202	020600030802	Headwaters North Branch Patapsco River
Charles County	Acton/Hamilton: AH001	Instream	38.6387	-76.9013	4528417	020700110101	Piney Branch-Mattawoman Creek
	Acton/Hamilton: AH002	Outfall	38.6480	-76.9121	4528417	020700110101	Piney Branch-Mattawoman Creek
Frederick County	Urbana: Peter Pan Run	Instream	39.3489	-77.3502	8450422	020700090701	Bush Creek
	Urbana: Pond-R	Outfall	39.3382	-77.3491	8450492	020700090701	Bush Creek
Howard County	Red Hill Branch: BH02	Instream	39.2469	-76.8239	11905592	020600060202	Dorsey Run-Little Patuxent River
	Red Hill Branch: BH01	Outfall	39.2383	-76.8134	11905592	020600060202	Dorsey Run-Little Patuxent River
Montgomery County	Stewart-April Lane: PBPB104	Outfall	39.0464	-76.9776	22336379	020700100202	Paint Branch
	Stewart-April Lane: PBPB310A	Instream	39.0440	-76.9724	22336379	020700100202	Paint Branch
	Breewood: scbtinstream1	Instream	39.0340	-77.0294	22337457	020700100201	Northwest Branch Anacostia River
	Breewood: scbtoutfall1	Outfall	39.0357	-77.0272	22337457	020700100201	Northwest Branch Anacostia River
Prince George's County	Bear Branch: Contee Road	Instream	39.0902	-76.8848	11905786	020600060401	Horsepen Branch-Patuxent River
	Bear Branch: Chapel Cove Drive	Instream	39.0904	-76.8698	11905786	020600060401	Horsepen Branch-Patuxent River

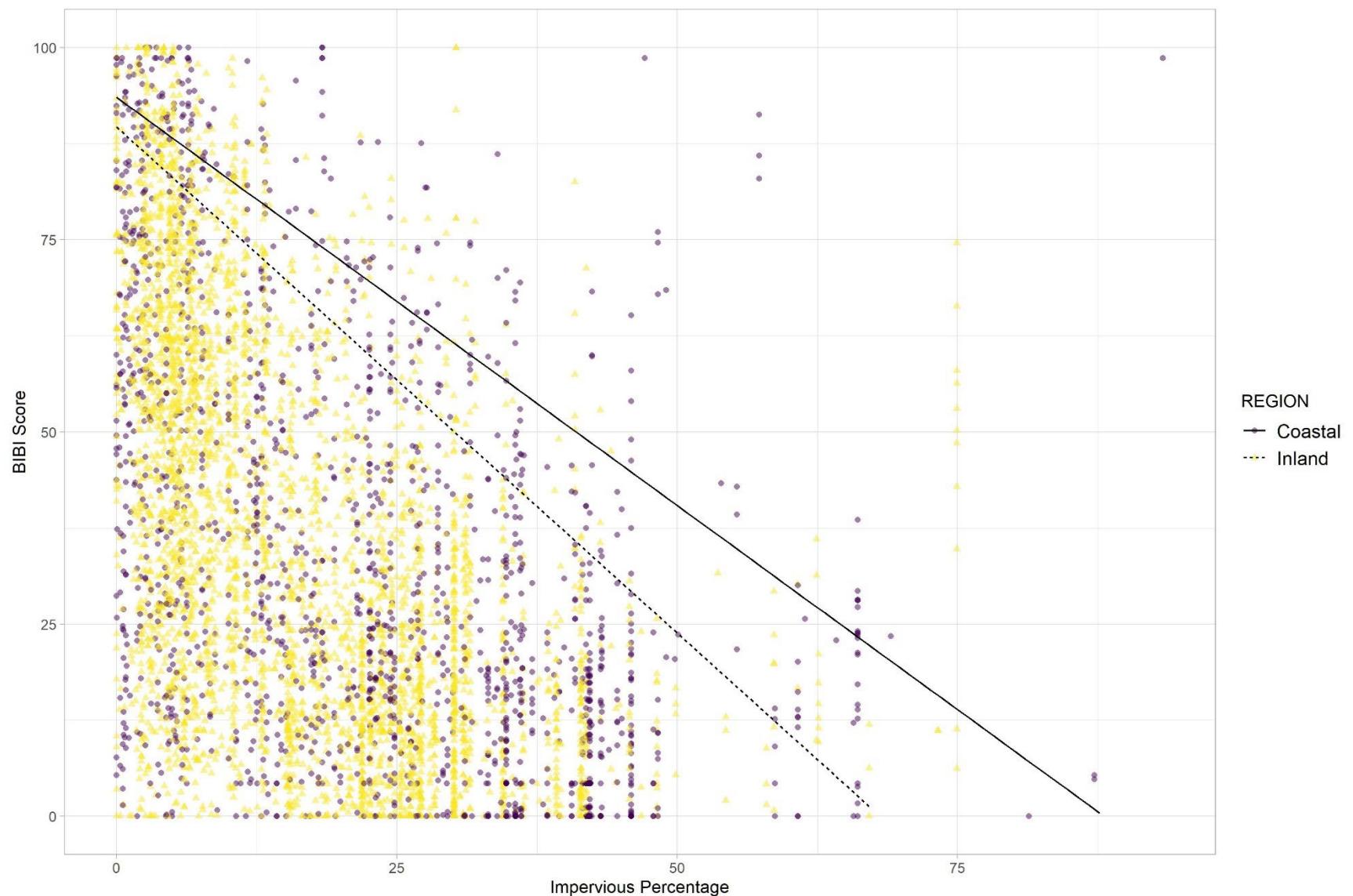


Figure A1. Chessie BIBI scores plotted against percent of impervious cover with quantile regression.

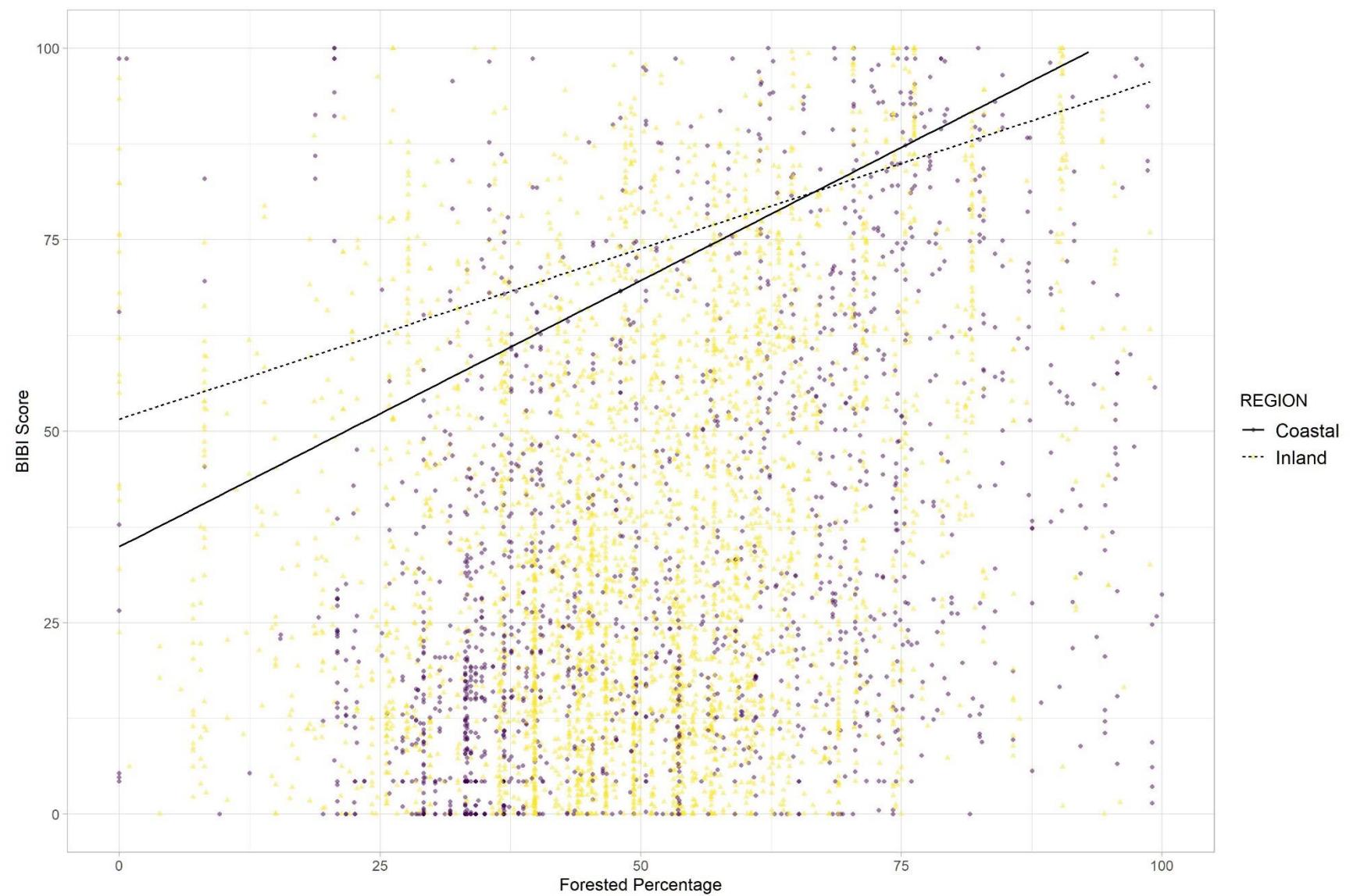


Figure A2. Chessie BIBI scores plotted against percent of forest with quantile regression.

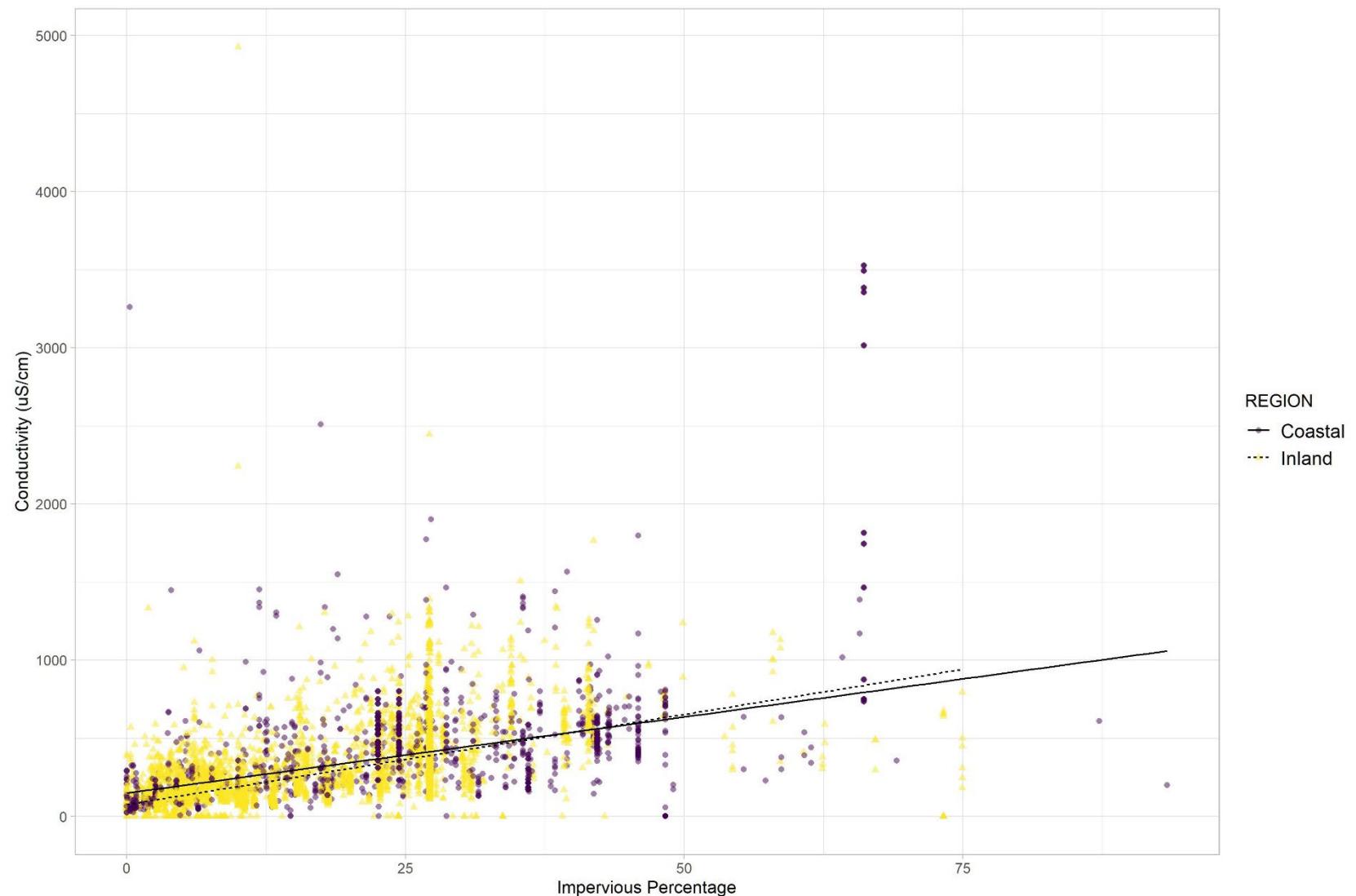


Figure A3. Conductivity plotted against percent of impervious cover with quantile regression.

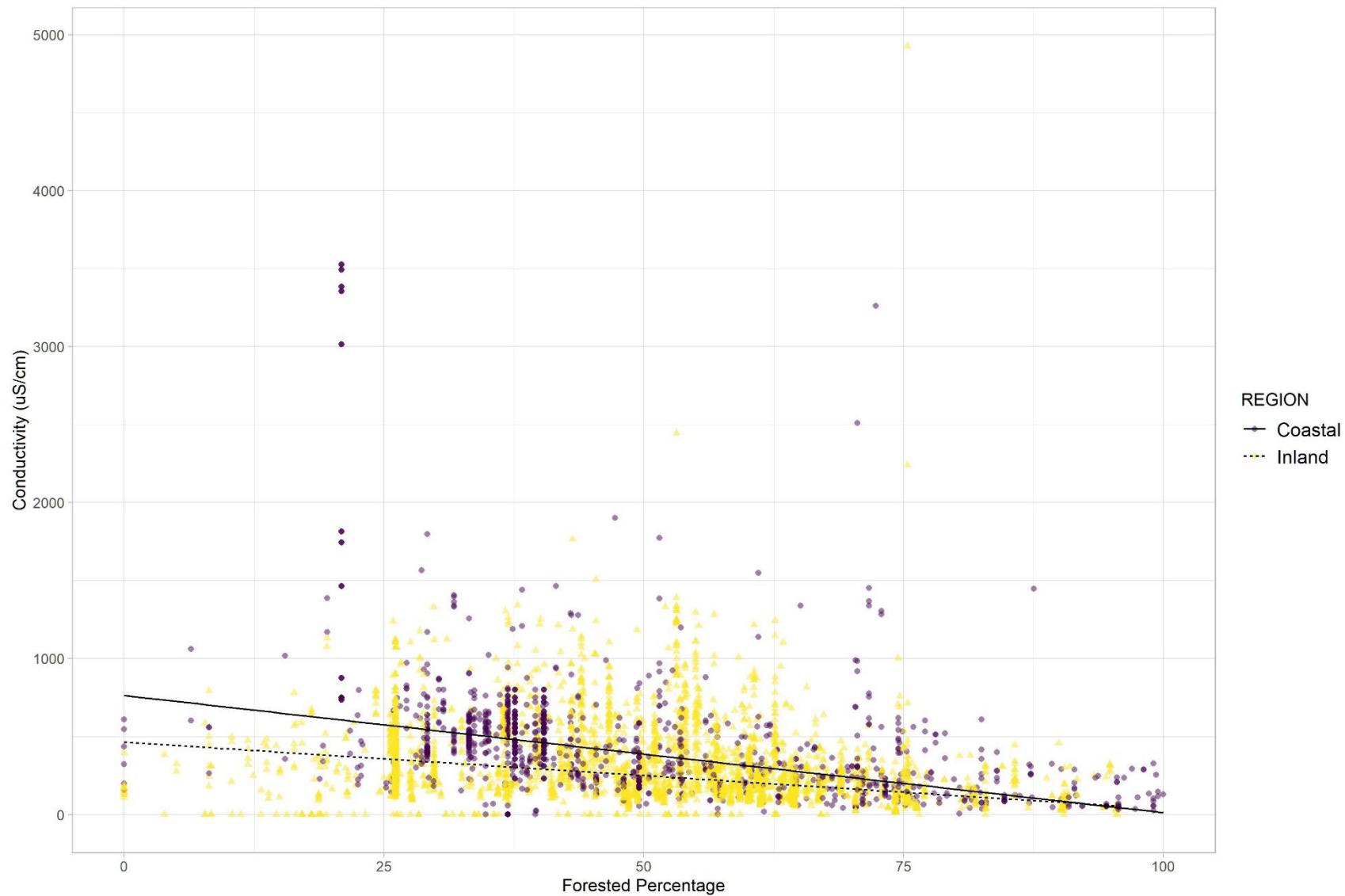


Figure A4. Conductivity plotted against percent of forest with quantile regression.

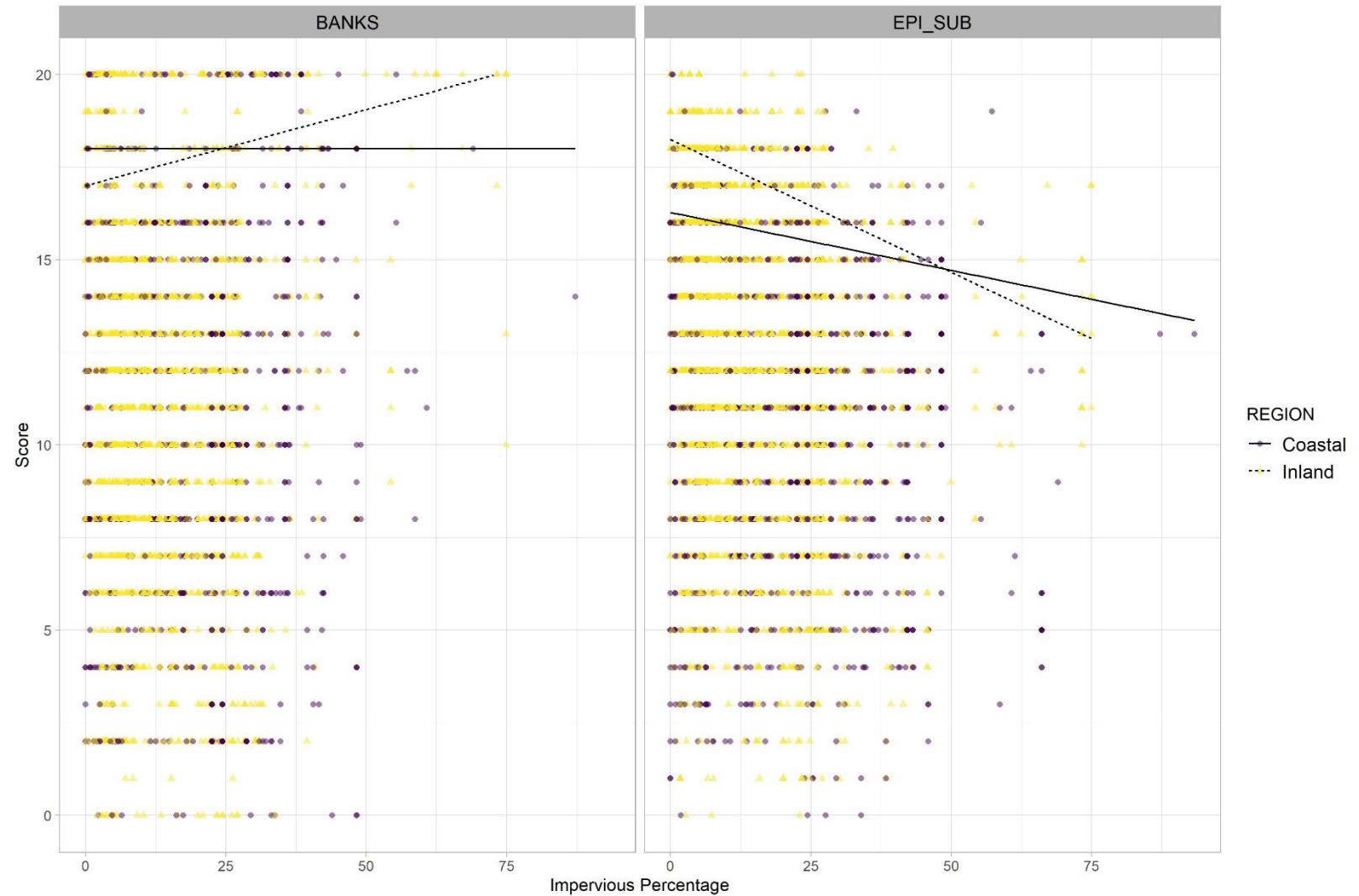


Figure A5. Bank stability (left) and epifaunal substrate (right) habitat scores plotted against percent of impervious cover with quantile regression.

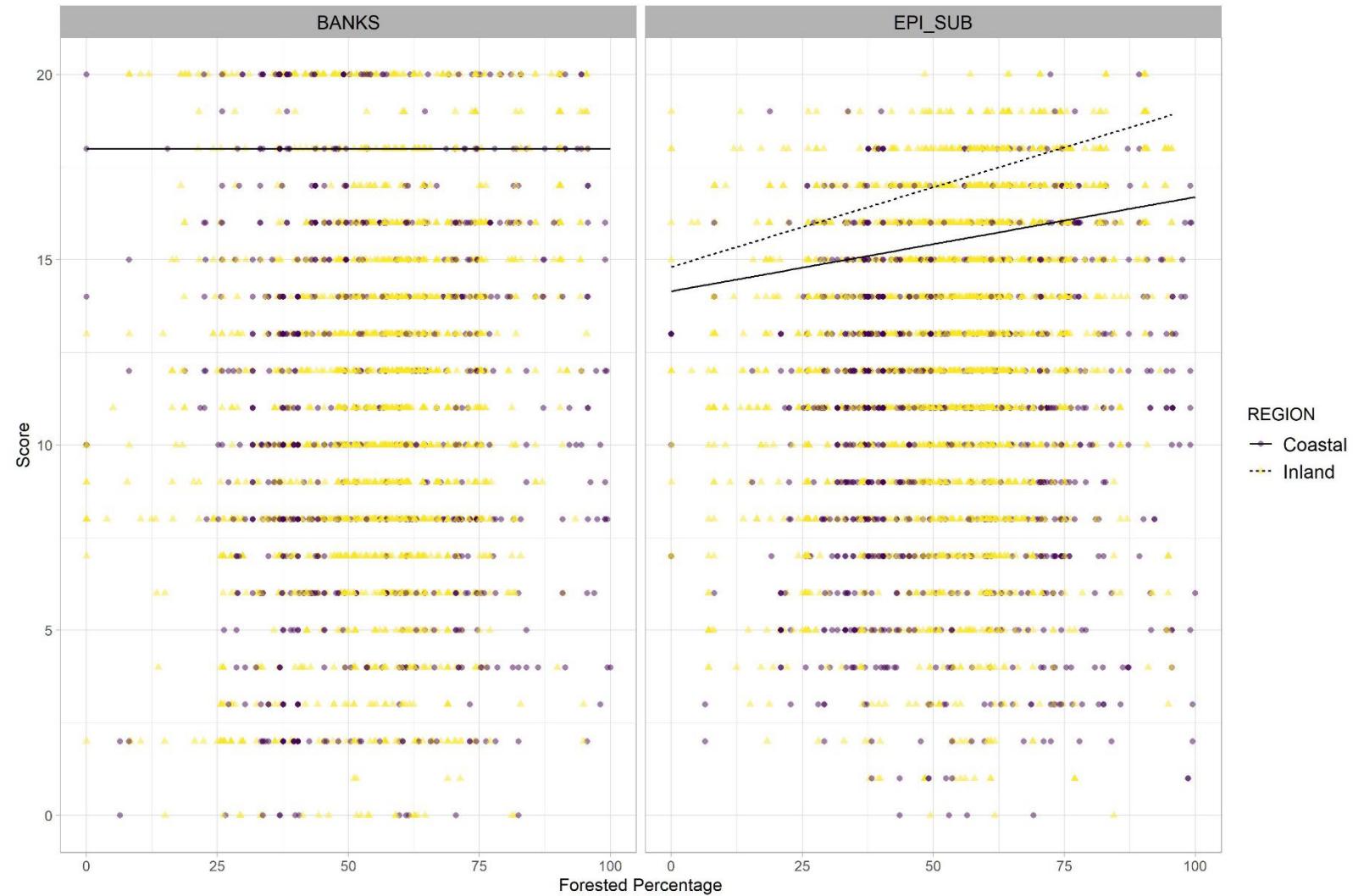


Figure A6. Bank stability (left) and epifaunal substrate (right) habitat scores plotted against percent of forest with quantile regression.

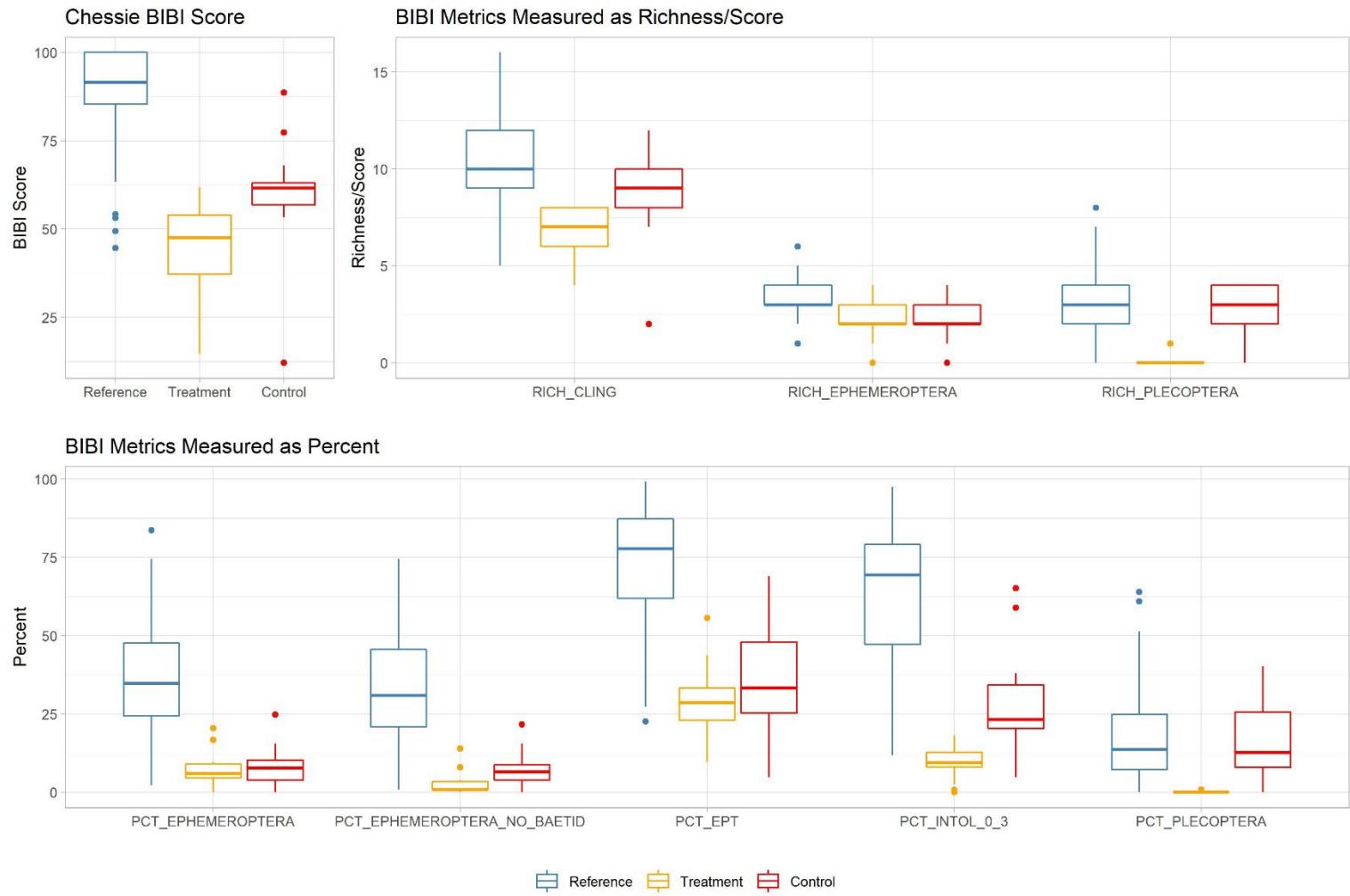


Figure A7. Airpark Business Center biology metrics.

Table A2. Median Chessie BIBI score and number of samples at Airpark Business Center.

Catchment Type	Median	N
Control	61.57	13
Reference	91.51	133
Treatment	47.46	13

Table A3. Median biological metric value by catchment type at Airpark Business Center.

Biological Metric	Catchment Type	Median	N
PCT_EPHEMEROPTERA	Control	7.75	13
	Reference	34.81	133
	Treatment	5.98	13
PCT_EPHEMEROPTERA_NO_BAETID	Control	6.55	13
	Reference	30.94	130
	Treatment	0.84	13
PCT_EPT	Control	33.33	13
	Reference	77.73	132
	Treatment	28.69	13
PCT_INTOL_0_3	Control	23.26	13
	Reference	69.39	133
	Treatment	9.38	13
PCT_PLECOPTERA	Control	12.7	13
	Reference	13.64	131
	Treatment	0	13
RICH_CLING	Control	9	13
	Reference	10	124
	Treatment	7	13
RICH_EPHEMEROPTERA	Control	2	13
	Reference	3	122
	Treatment	2	13
RICH_PLECOPTERA	Control	3	12
	Reference	3	124
	Treatment	0	13

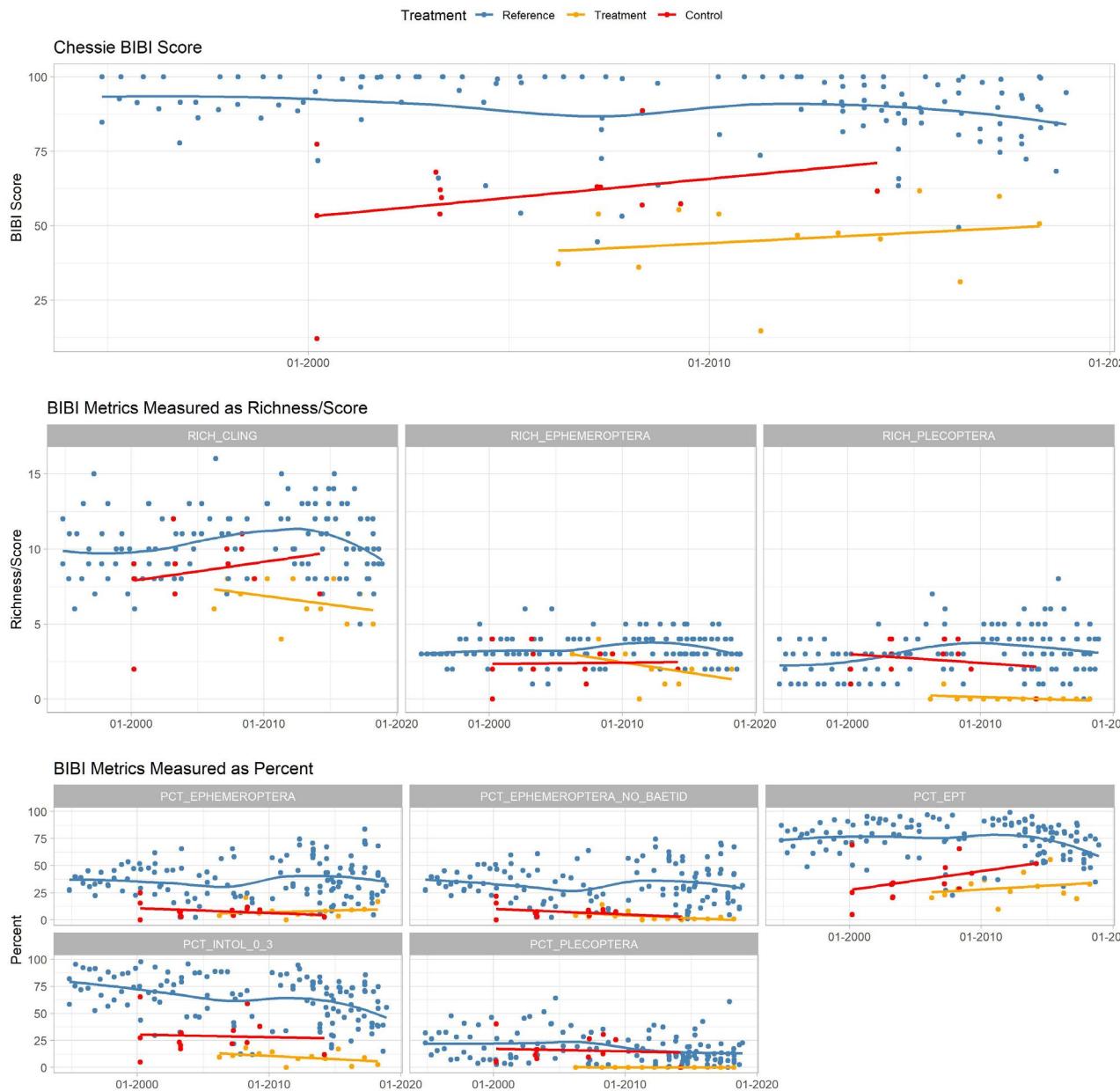


Figure A8. Airpark Business Center biology metrics over time.

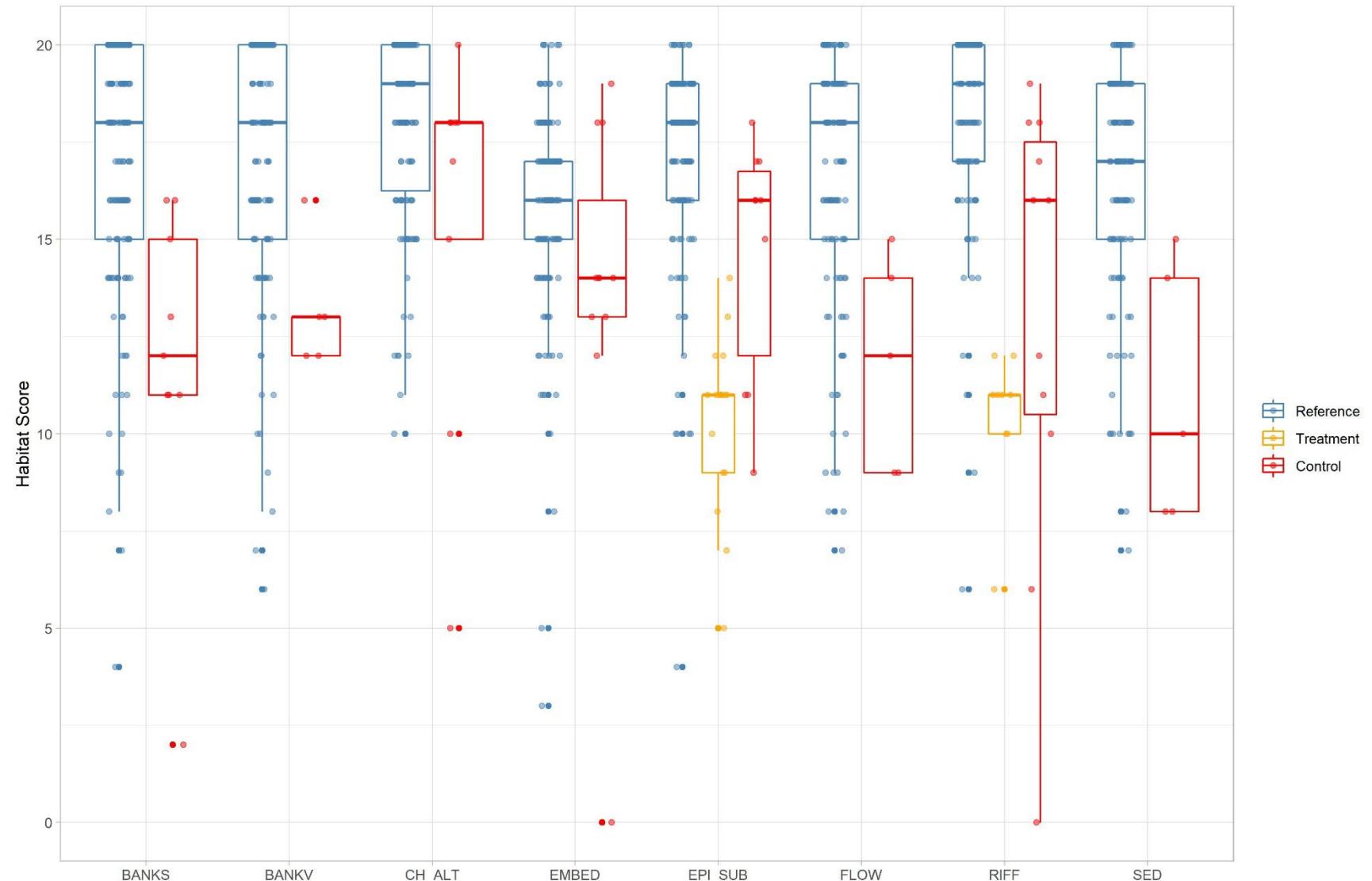


Figure A9. Airpark Business Center habitat metrics.

Table A4. Median value of habitat metrics at Airpark Business Center.

Habitat Metric	Catchment Type	Median	N
BANKS	Control	12	9
	Reference	18	136
BANKV	Control	13	5
	Reference	18	125
CH_ALT	Control	18	9
	Reference	19	126
EMBED	Control	14	11
	Reference	17	136
EPI_SUB	Control	16	10
	Reference	18	133
	Treatment	11	17
FLOW	Control	12	5
	Reference	18	125
RIFF	Control	16	11
	Reference	19	119
	Treatment	11	9
SED	Control	10	5
	Reference	17	127



Figure A10. Airpark Business Center habitat metrics over time

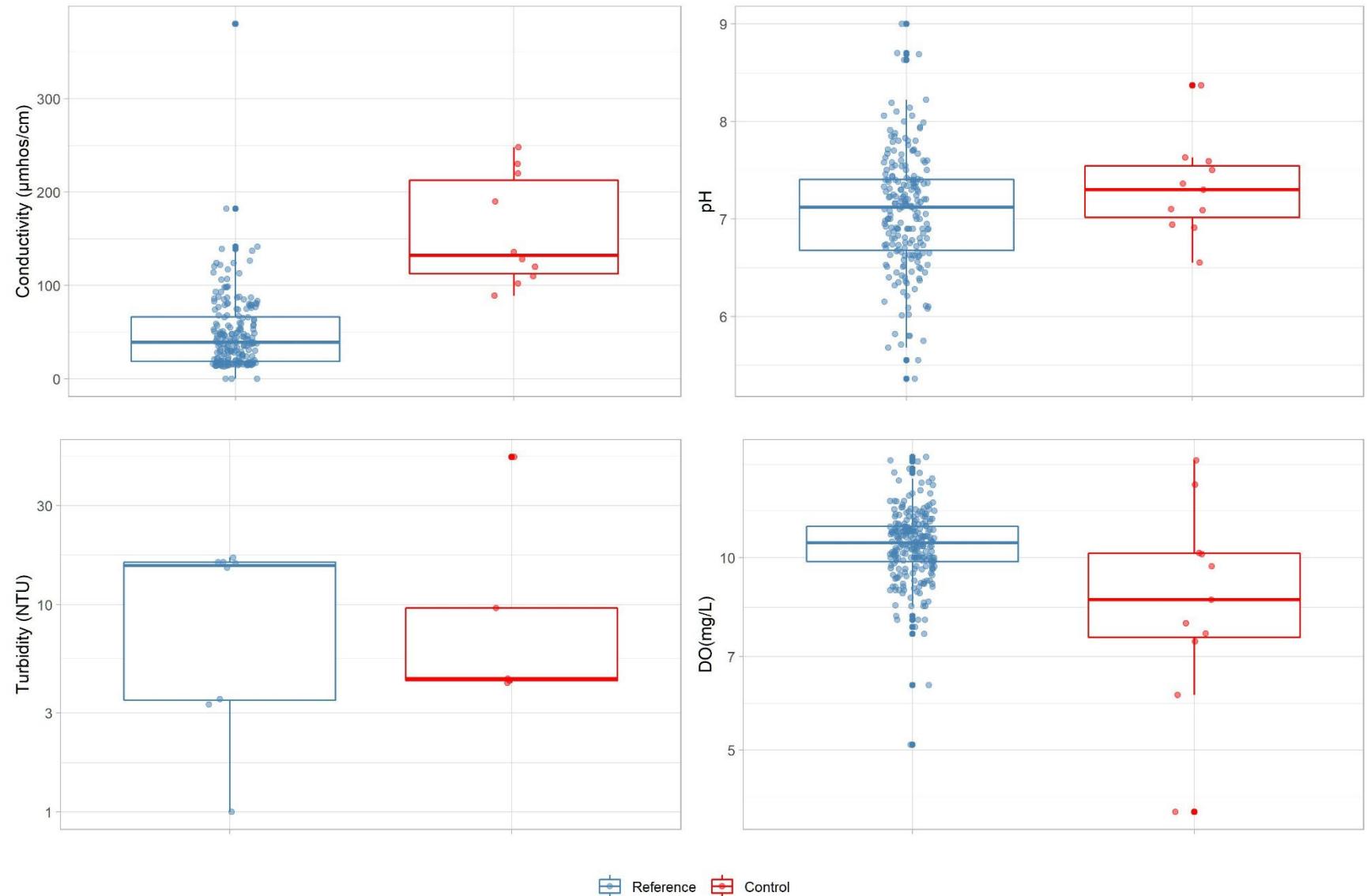


Figure A11. Airpark Business Center water quality metrics.

Table A5. Median value of water quality metrics at Airpark Business Center.

Water Quality Parameter	Catchment Type	Median	N
DO (mg/L)	Control	8.6	11
	Reference	10.55	247
PH	Control	7.3	11
	Reference	7.12	208
SPCOND (umhos/cm)	Control	132	10
	Reference	39	199
TURB_NTU (ntu)	Control	4.4	5
	Reference	15.4	8

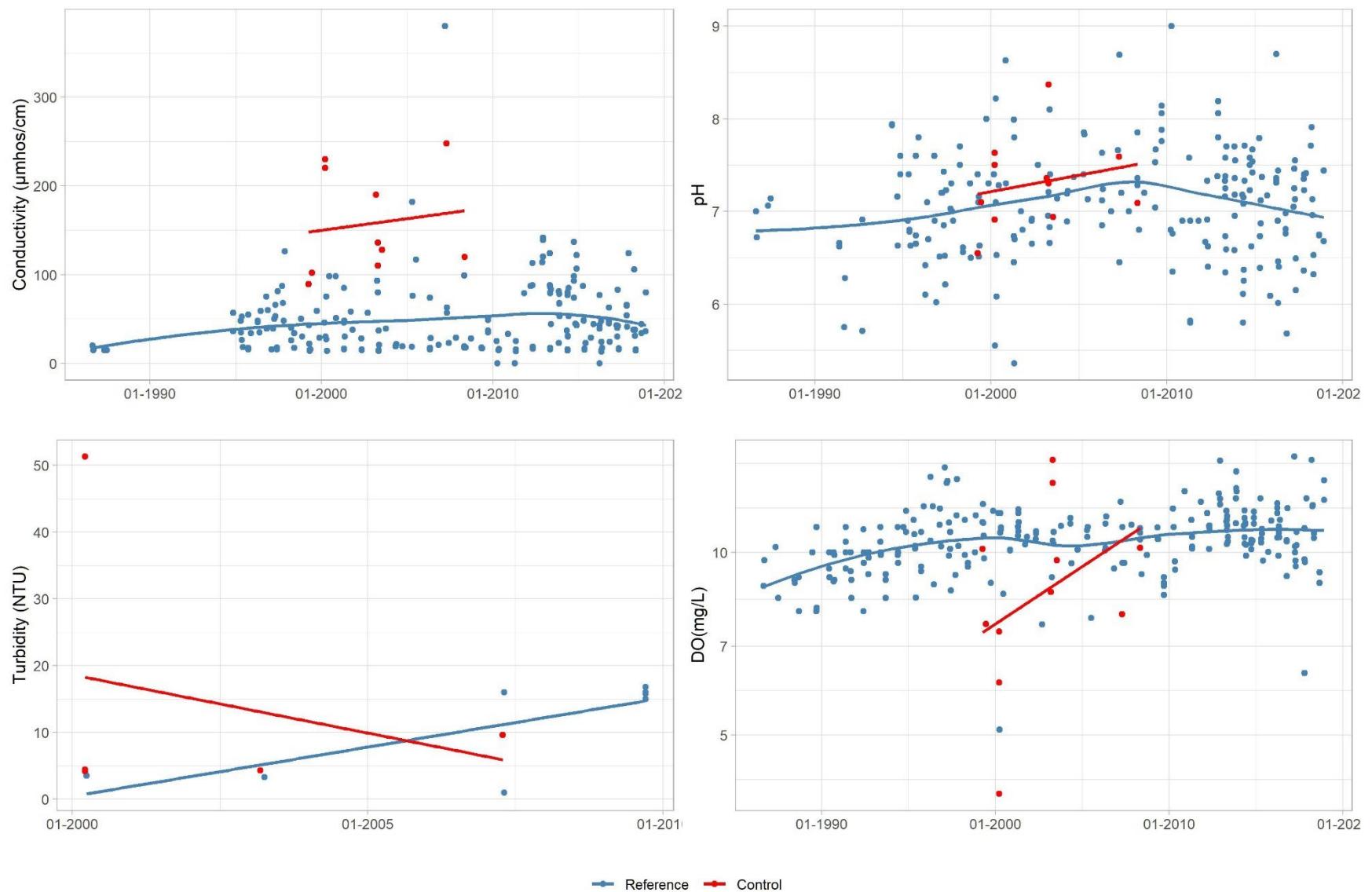


Figure A12. Airpark Business Center water quality metrics over time.

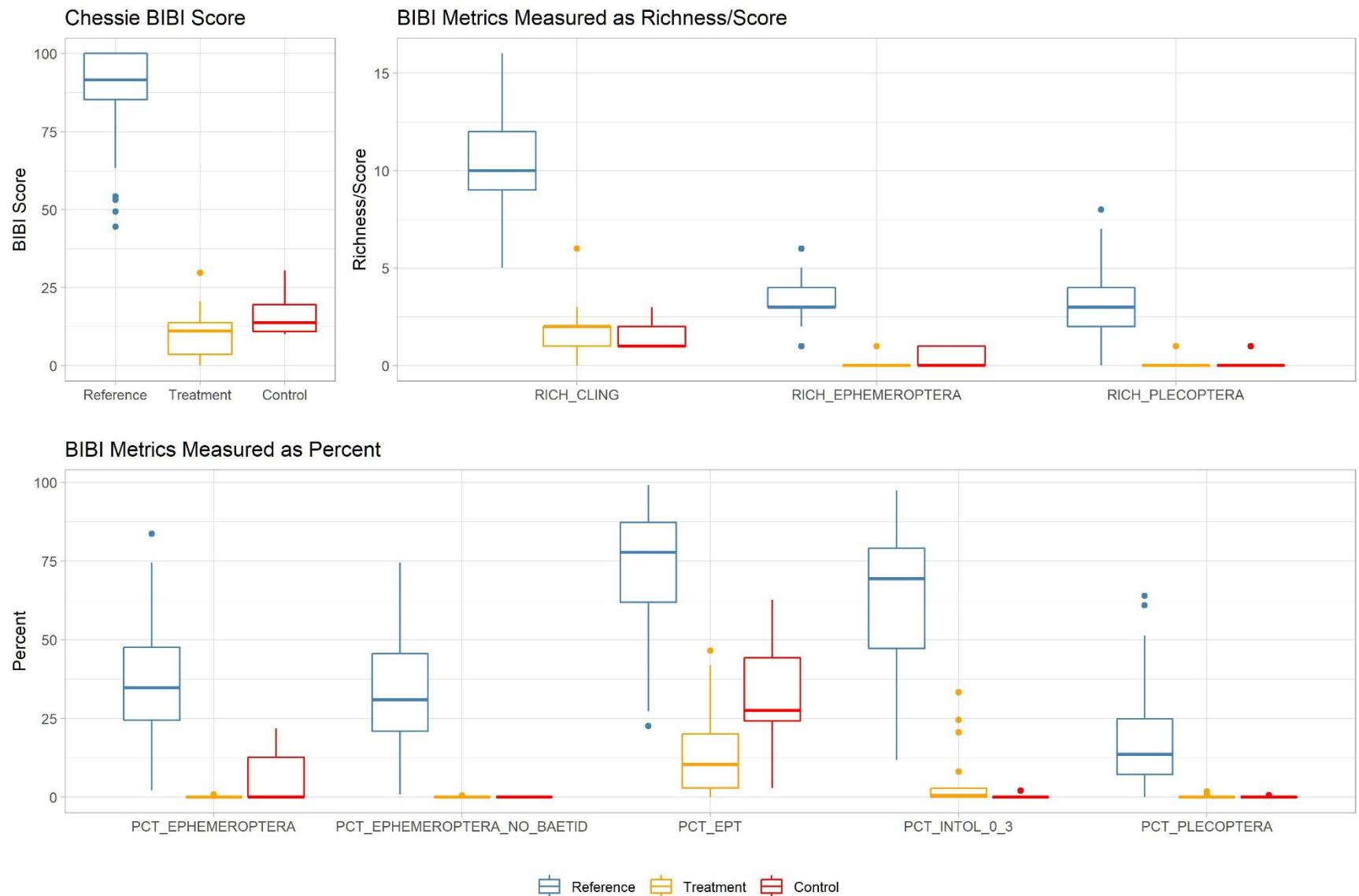


Figure A13. Breewood biology metrics.

Table A6. Median Chessie BIBI score and number of samples at Breewood.

Catchment Type	Median	N
Control	13.71	5
Reference	91.51	133
Treatment	11.11	32

Table A7. Median biological metric value by catchment type at Breewood.

Biological Metric	Catchment Type	Median	N
PCT_EPHEMEROPTERA	Control	0	5
	Reference	34.81	133
	Treatment	0	23
PCT_EPHEMEROPTERA_NO_BAETID	Control	0	5
	Reference	30.94	130
	Treatment	0	22
PCT_EPT	Control	27.59	5
	Reference	77.725	132
	Treatment	10.43	31
PCT_INTOL_0_3	Control	0	5
	Reference	69.39	133
	Treatment	0.5	25
PCT_PLECOPTERA	Control	0	5
	Reference	13.64	131
	Treatment	0	22
RICH_CLING	Control	1	5
	Reference	10	124
	Treatment	2	25
RICH_EPHEMEROPTERA	Control	0	5
	Reference	3	122
	Treatment	0	22
RICH_PLECOPTERA	Control	0	5
	Reference	3	124
	Treatment	0	22

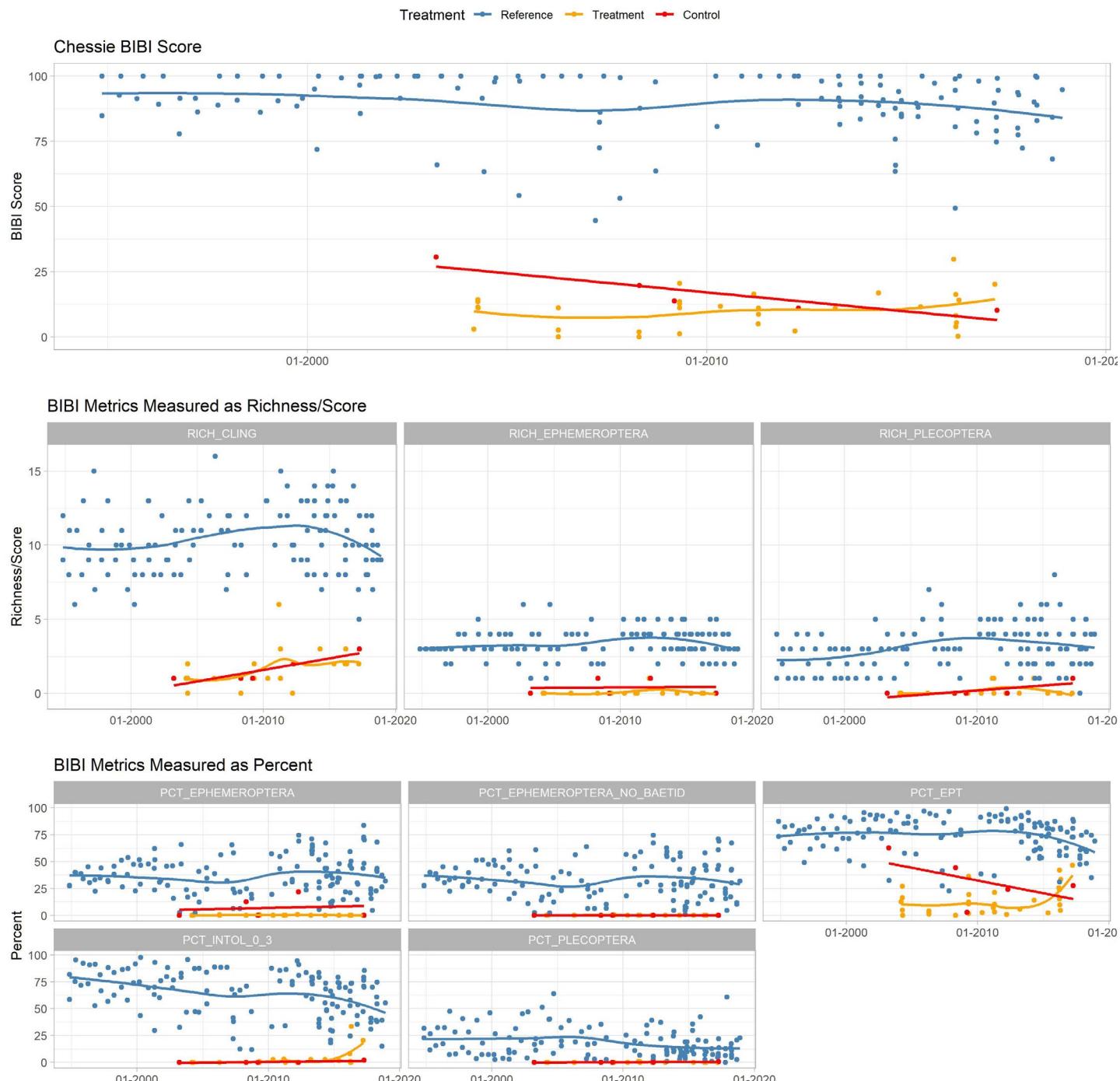


Figure A14. Breewood biology metrics over time.

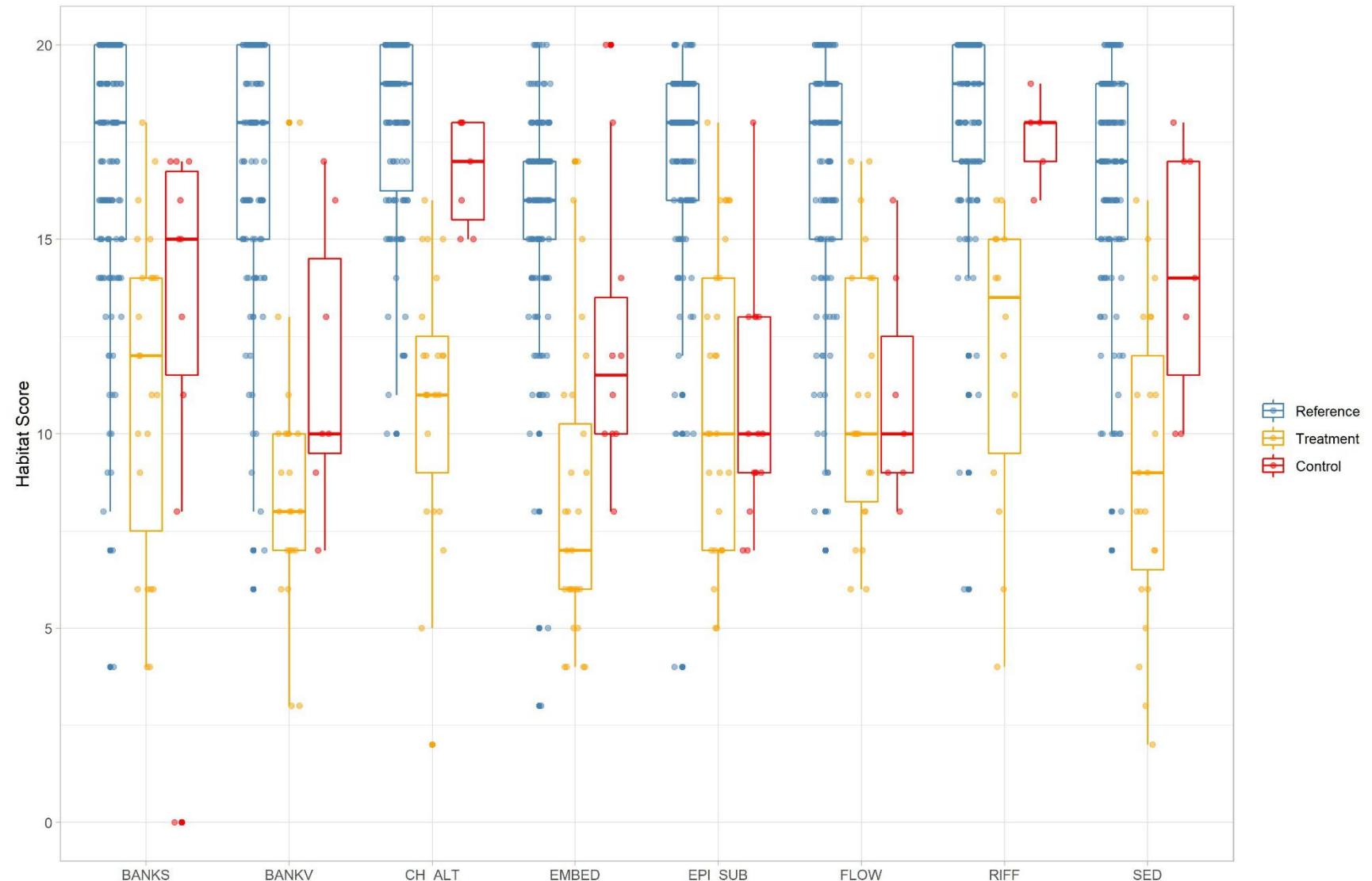


Figure A15. Breewood habitat metrics.

Table A8. Median value of habitat metrics at Breewood.

Habitat Metric	Catchment Type	Median	N
BANKS	Control	17	15
	Reference	18	136
	Treatment	12	23
BANKV	Control	10	7
	Reference	18	125
	Treatment	8	22
CH_ALT	Control	17	7
	Reference	19	126
	Treatment	11	23
EMBED	Control	12	13
	Reference	17	136
	Treatment	7	28
EPI_SUB	Control	10	15
	Reference	18	133
	Treatment	10	29
FLOW	Control	10	7
	Reference	18	125
	Treatment	10	22
RIFF	Control	18	5
	Reference	19	119
	Treatment	13.5	14
SED	Control	14	7
	Reference	17	127
	Treatment	9	23

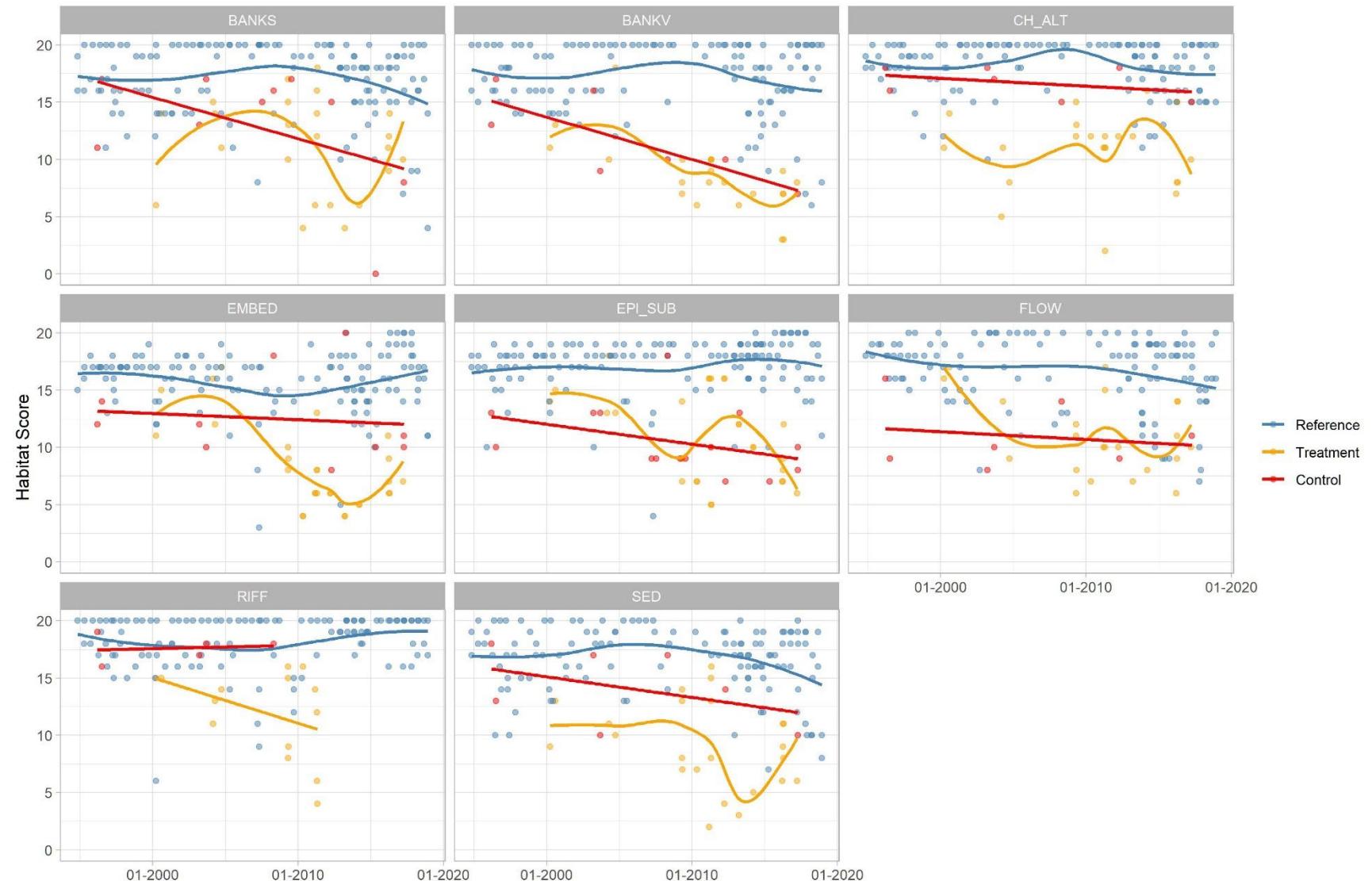


Figure A16. Breewood habitat metrics over time.

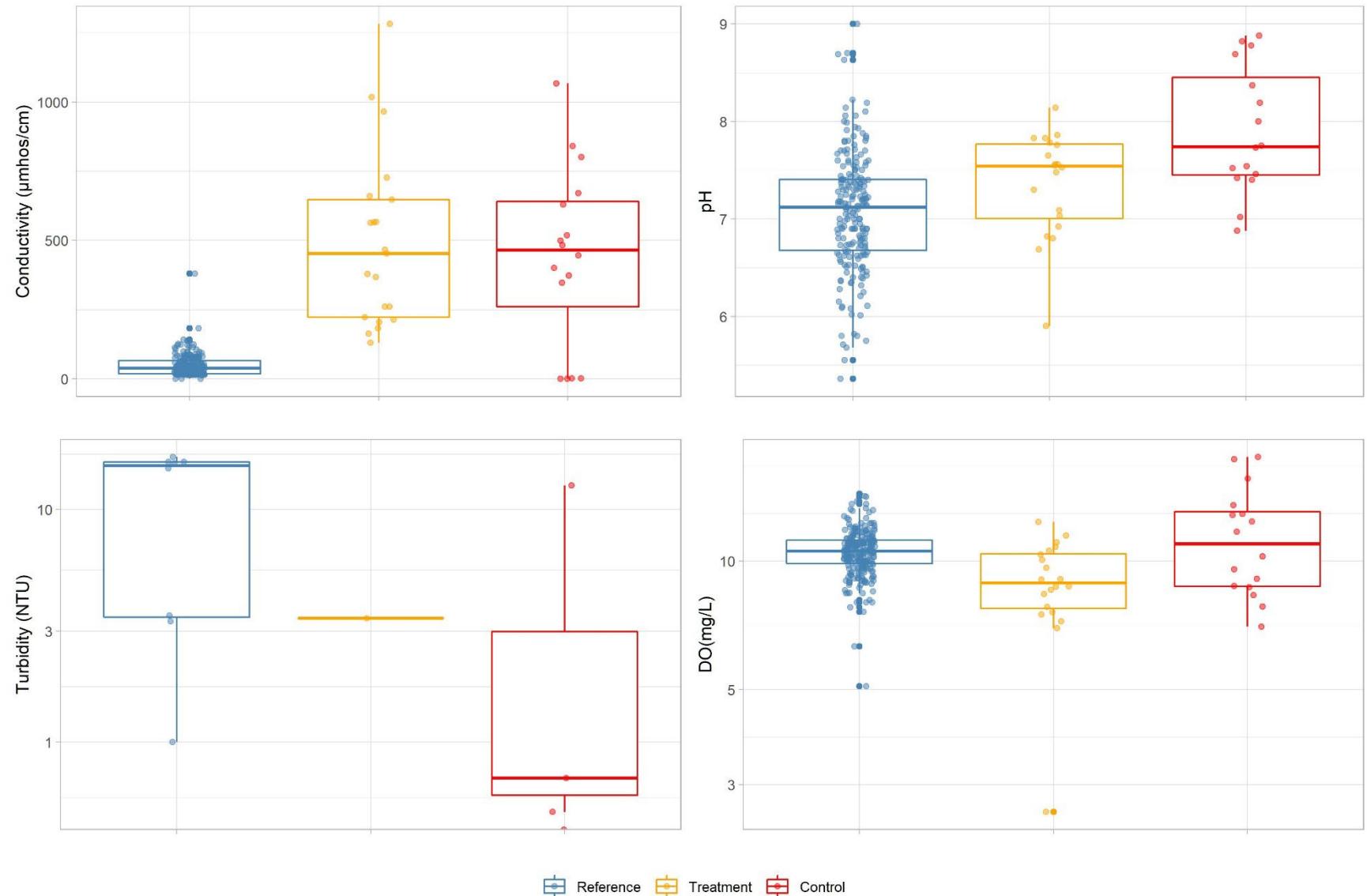


Figure A17. Breewood water quality metrics.

Table A9. Median value of water quality metrics at Breewood.

Water Quality Parameter	Catchment Type	Median	N
DO (mg/L)	Control	10.98	16
	Reference	10.55	247
	Treatment	8.89	20
PH	Control	7.74	16
	Reference	7.12	208
	Treatment	7.54	20
SPCOND (umhos/cm)	Control	464.5	16
	Reference	39	199
	Treatment	452	21
TURB_NTU (ntu)	Control	0.6	4
	Reference	15.4	8
	Treatment	3.4	1

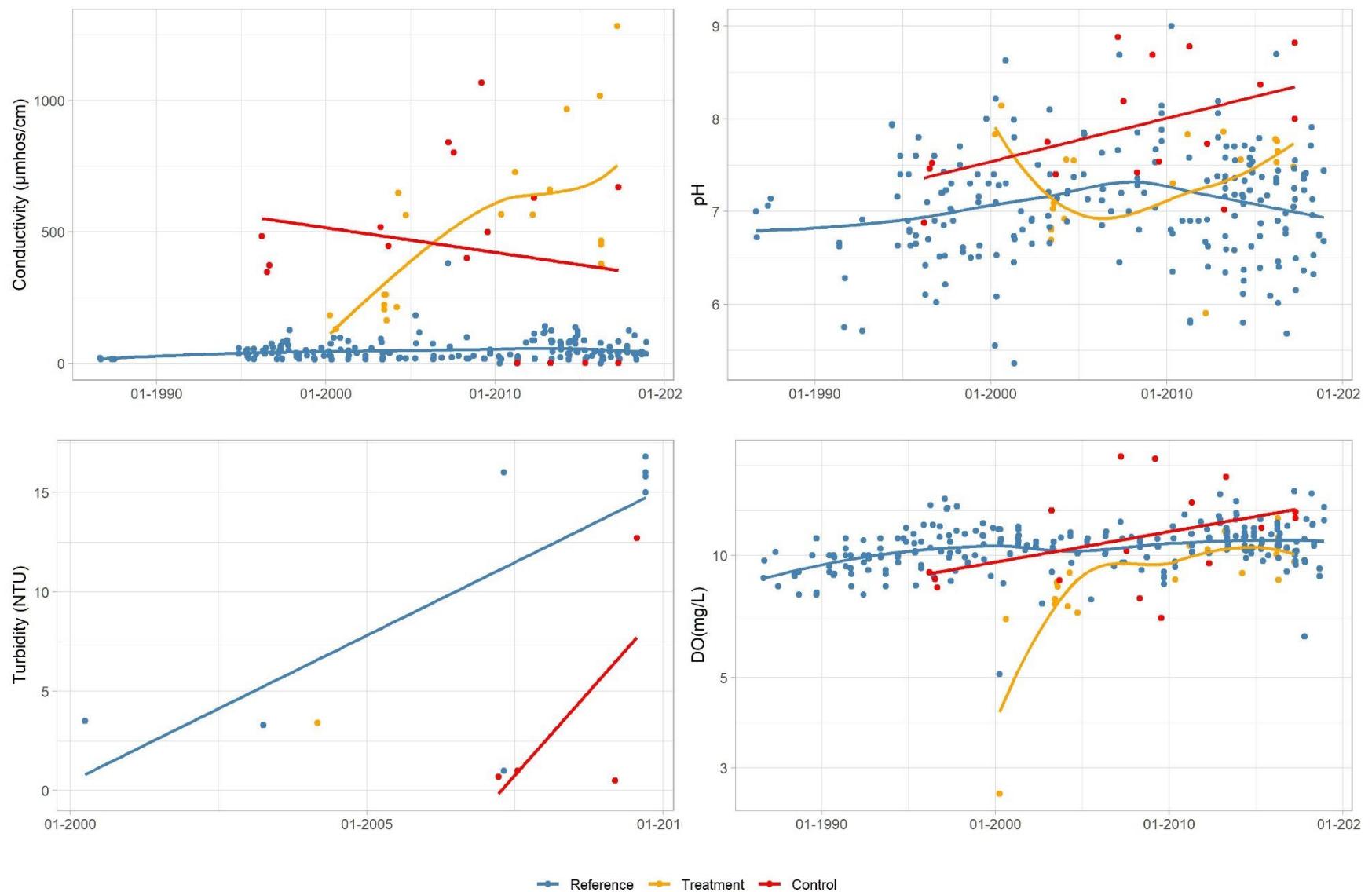


Figure A18. Breewood water quality metrics over time.

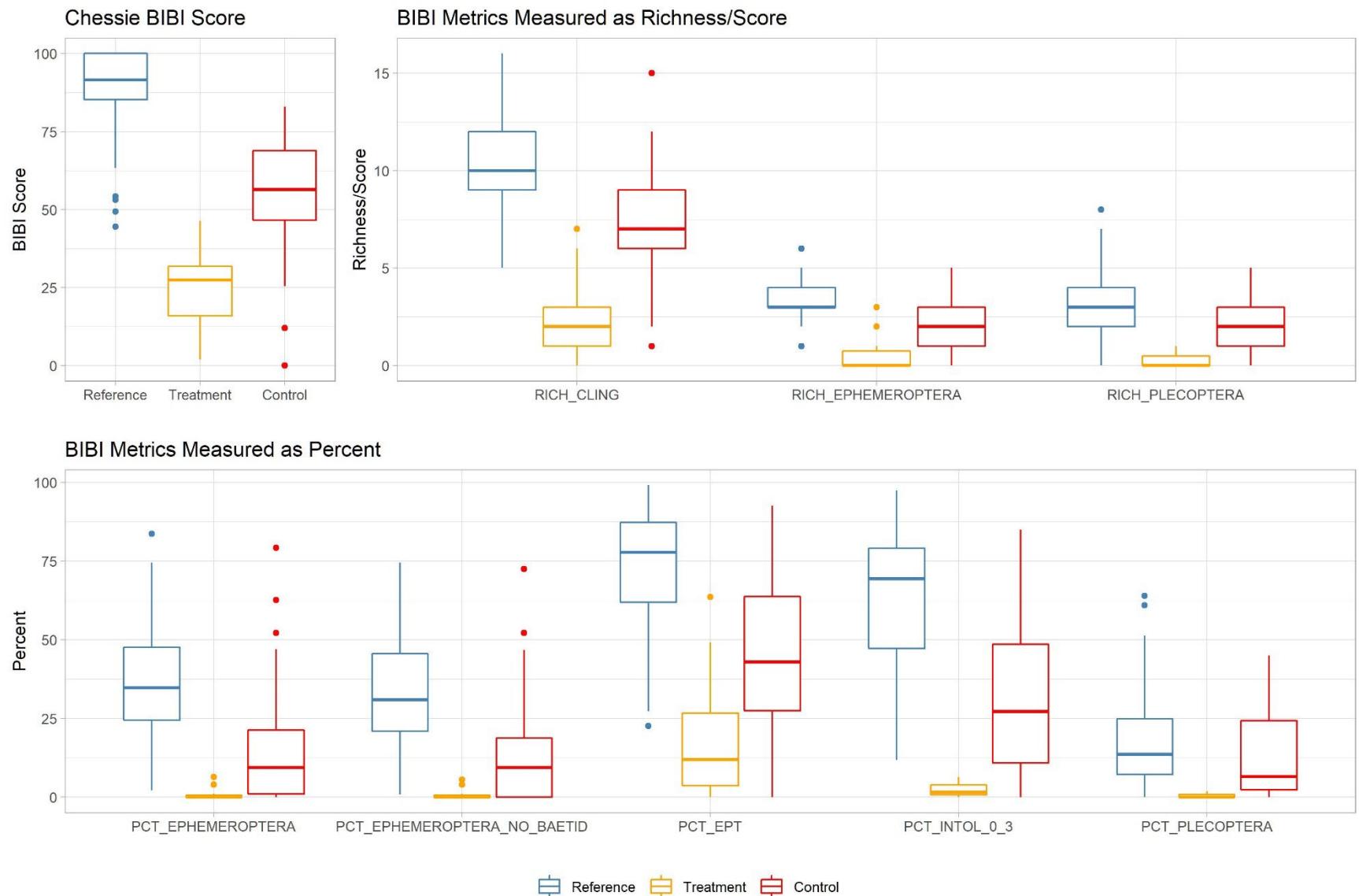


Figure A19. Red Hill Branch biology metrics.

Table A10. Median Chessie BIBI score and number of samples at Red Hill Branch.

Catchment Type	Median	N
Control	56.36	45
Reference	91.51	133
Treatment	27.43	26

Table A11. Median biological metric value by catchment type at Red Hill Branch.

Biological Metric	Catchment Type	Median	N
PCT_EPHEMEROPTERA	Control	9.4	43
	Reference	34.81	133
	Treatment	0	14
PCT_EPHEMEROPTERA_NO_BAETID	Control	9.4	43
	Reference	30.94	130
	Treatment	0	14
PCT_EPT	Control	42.98	45
	Reference	77.725	132
	Treatment	11.93	25
PCT_INTOL_0_3	Control	27.18	45
	Reference	69.39	133
	Treatment	1.63	23
PCT_PLECOPTERA	Control	6.54	45
	Reference	13.64	131
	Treatment	0	16
RICH_CLING	Control	7	43
	Reference	10	124
	Treatment	2	23
RICH_EPHEMEROPTERA	Control	2	41
	Reference	3	122
	Treatment	0	14
RICH_PLECOPTERA	Control	2	43
	Reference	3	124
	Treatment	0	15

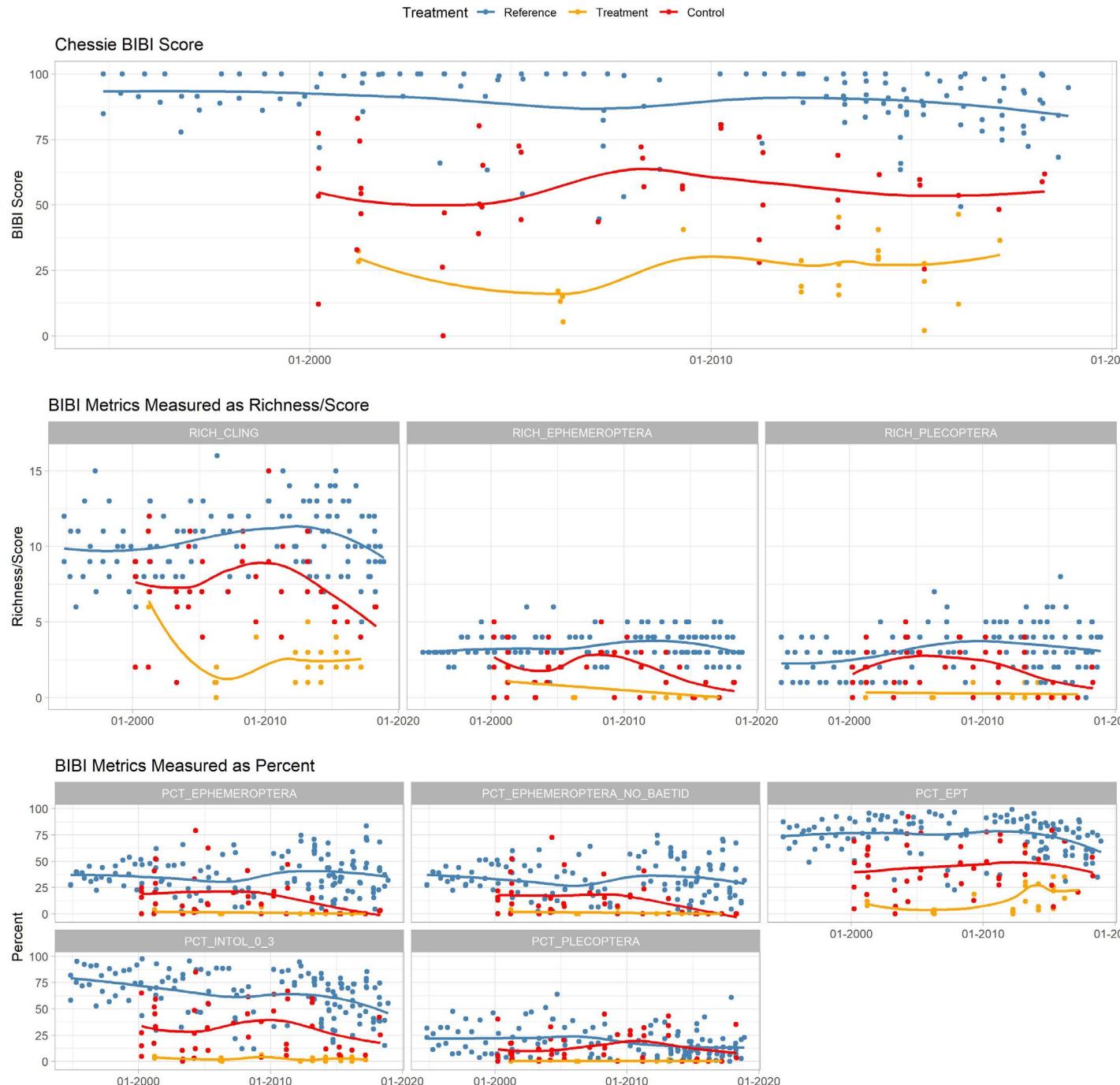


Figure A20. Red Hill Branch biology metrics over time.

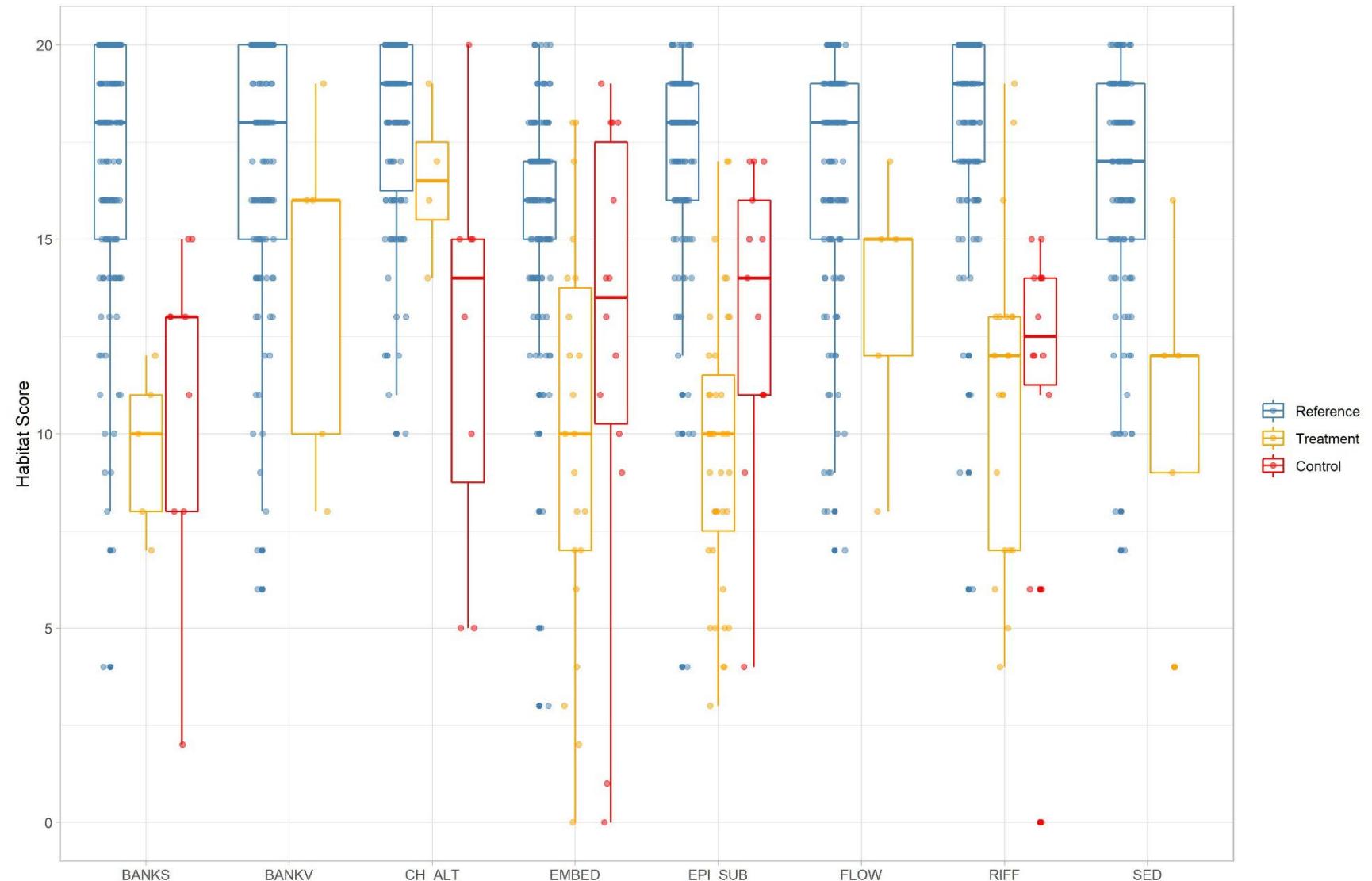


Figure A21. Red Hill Branch habitat metrics.

Table A12. Median value of habitat metrics at Red Hill Branch.

Habitat Metric	Catchment Type	Median	N
BANKS	Control	13	9
	Reference	18	136
	Treatment	10	5
BANKV	Reference	18	125
	Treatment	16	5
CH_ALT	Control	14	8
	Reference	19	126
	Treatment	16.5	4
EMBED	Control	13.5	14
	Reference	17	136
	Treatment	10	22
EPI_SUB	Control	14	13
	Reference	18	133
	Treatment	10	39
FLOW	Reference	18	125
	Treatment	15	5
RIFF	Control	12.5	14
	Reference	19	119
	Treatment	12	21
SED	Reference	17	127
	Treatment	12	5

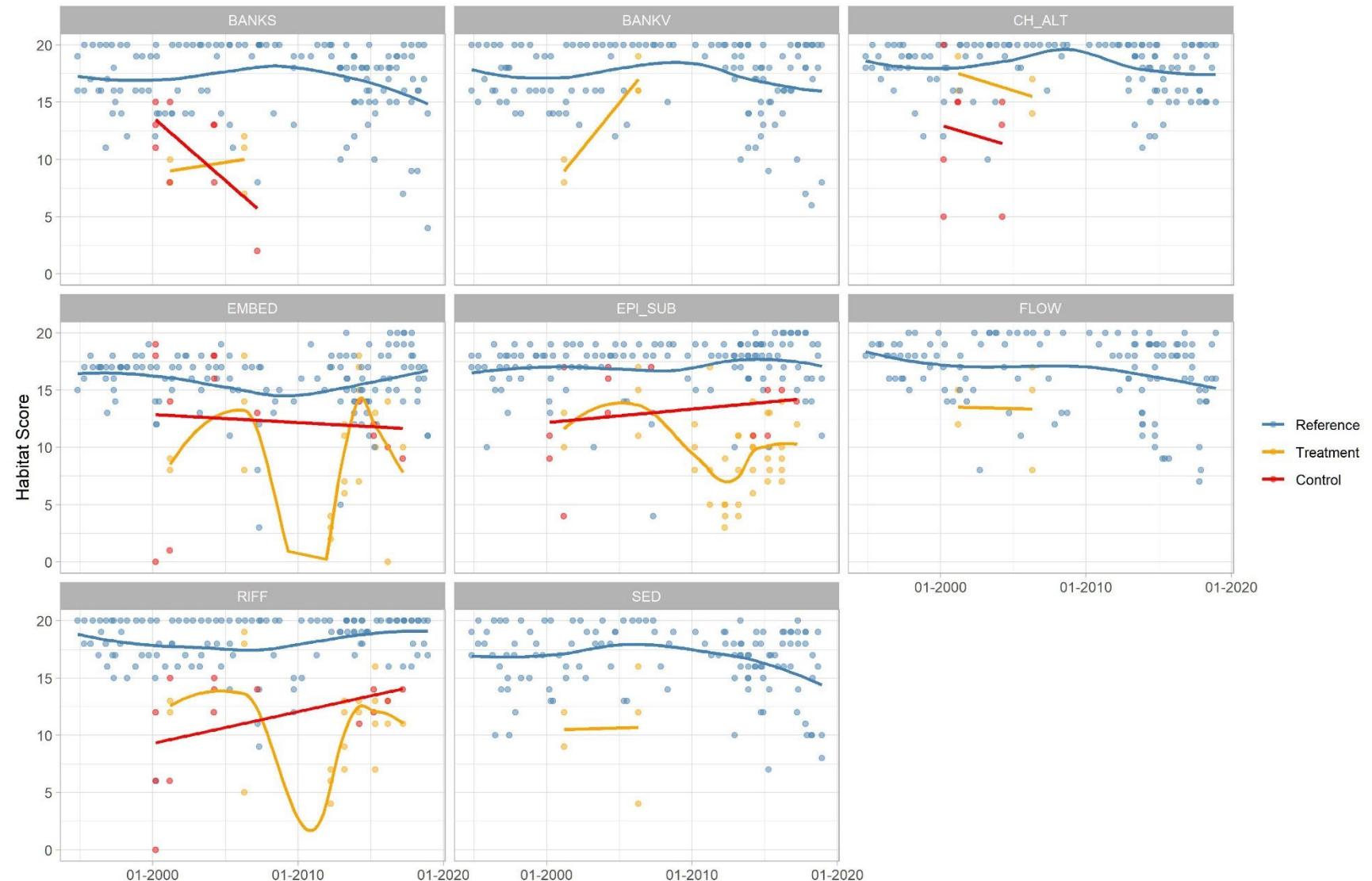


Figure A22. Red Hill Branch habitat metrics.

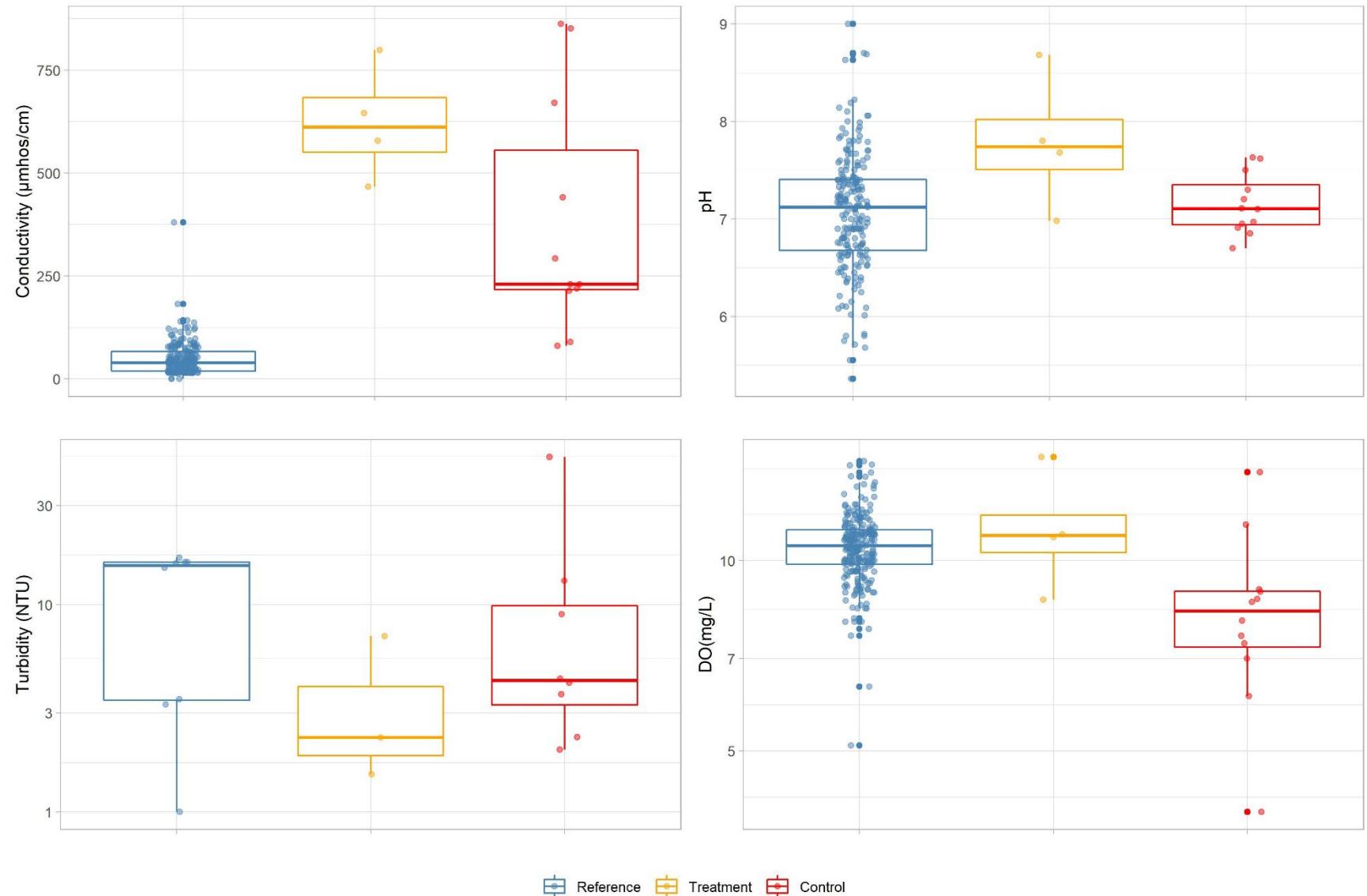


Figure A23. Red Hill Branch water quality metrics.

Table A13. Median value of water quality metrics at Red Hill Branch.

Water Quality Parameter	Catchment Type	Median	N
DO (mg/L)	Control	8.32	12
	Reference	10.55	247
	Treatment	10.95	4
PH	Control	7.10	12
	Reference	7.12	208
	Treatment	7.74	4
SPCOND (umhos/cm)	Control	230	11
	Reference	39	199
	Treatment	611.5	4
TURB_NTU (ntu)	Control	4.3	8
	Reference	15.4	8
	Treatment	2.29	3

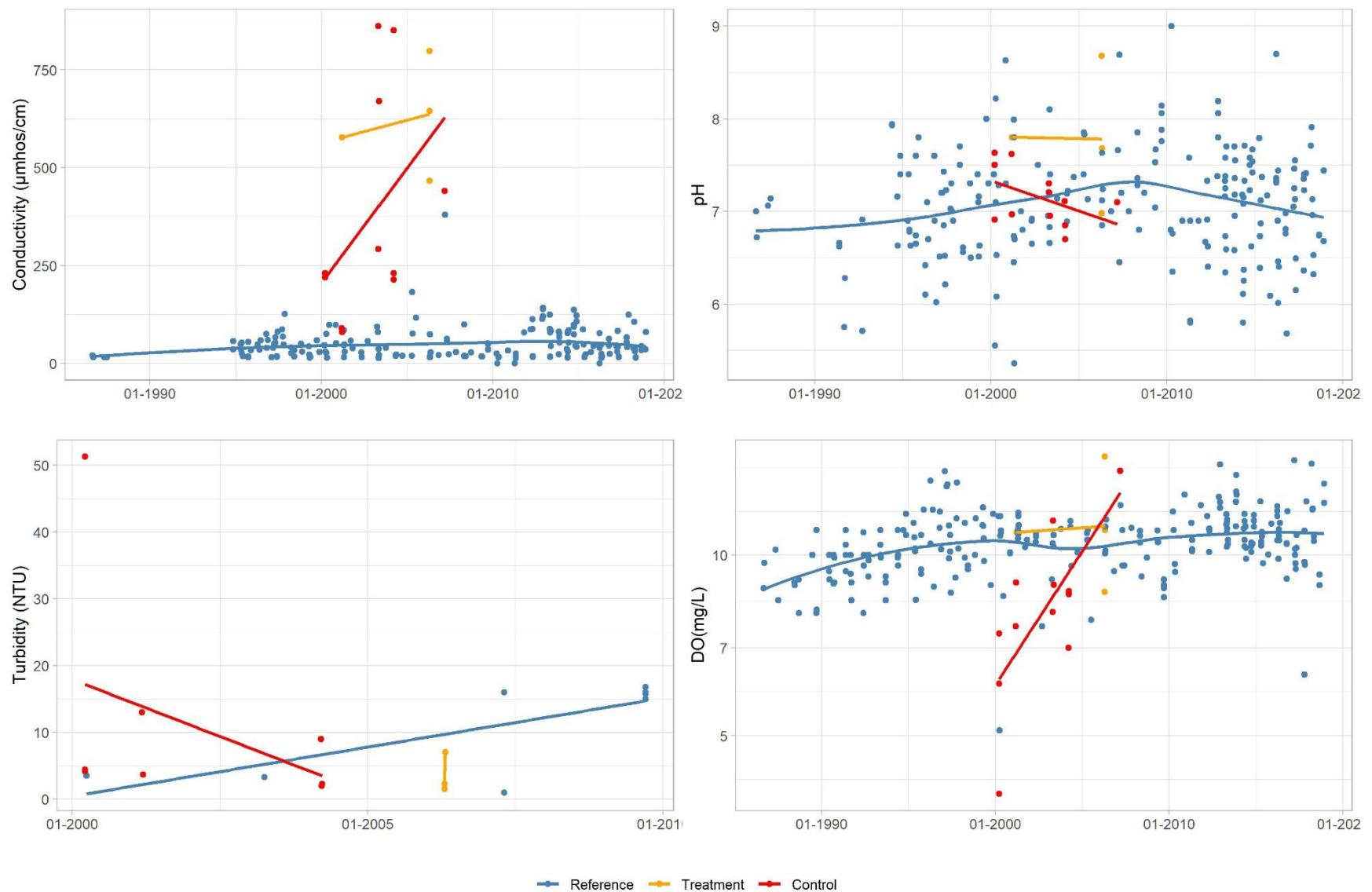


Figure A24. Red Hill Branch water quality metrics.

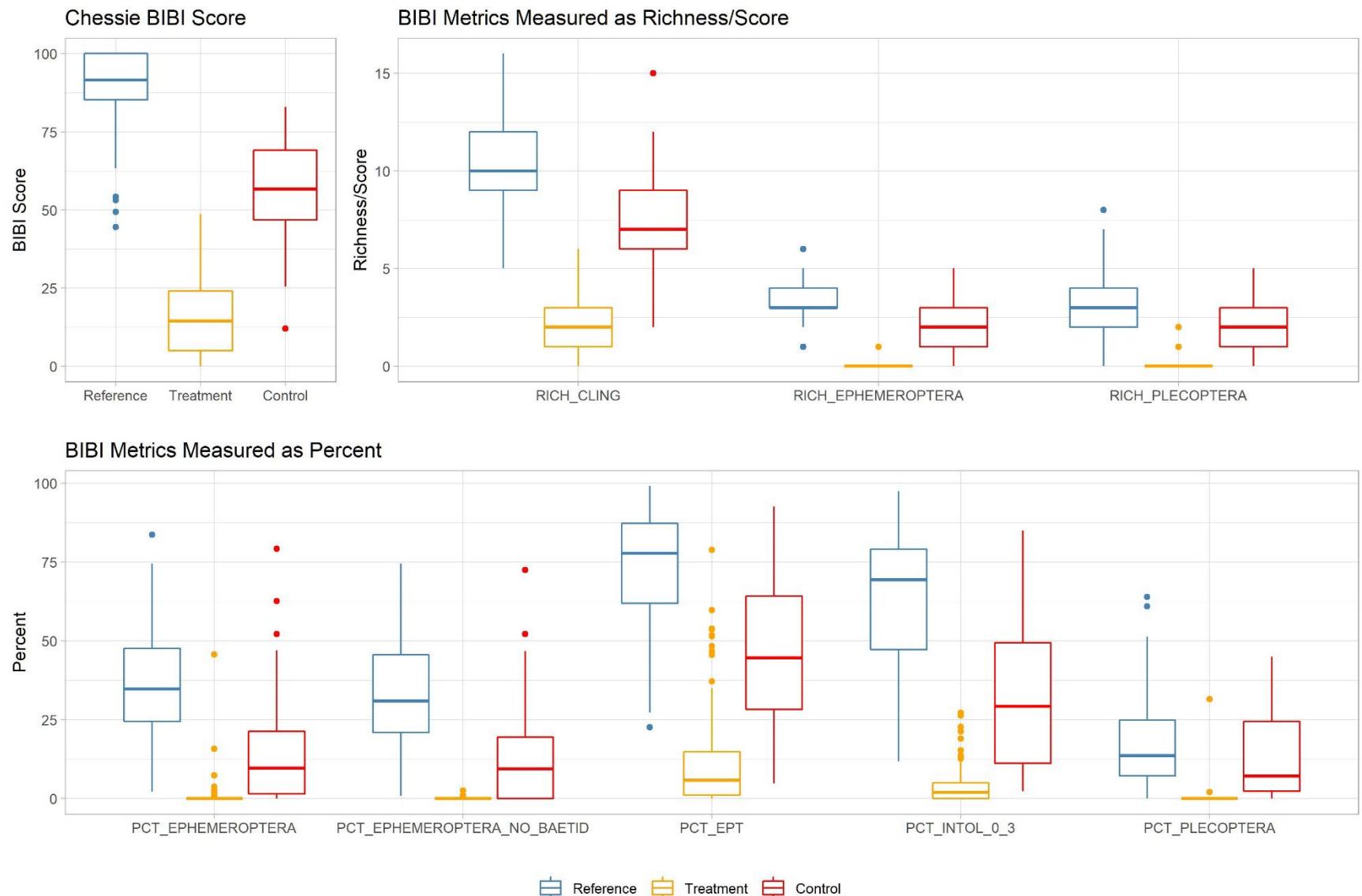


Figure A25. Scotts Level Branch biology metrics.

Table A14. Median Chessie BIBI score and number of samples at Scotts Level Branch.

Catchment Type	Median	N
Control	56.62	44
Reference	91.51	133
Treatment	14.41	137

Table A15. Median biological metric value by catchment type at Scotts Level Branch.

Biological Metric	Catchment Type	Median	N
PCT_EPHEMEROPTERA	Control	9.61	42
	Reference	34.81	133
	Treatment	0	69
PCT_EPHEMEROPTERA_NO_BAETID	Control	9.46	42
	Reference	30.94	130
	Treatment	0	62
PCT_EPT	Control	44.565	44
	Reference	77.725	132
	Treatment	5.855	134
PCT_INTOL_0_3	Control	29.29	44
	Reference	69.39	133
	Treatment	1.94	115
PCT_PLECOPTERA	Control	7.085	44
	Reference	13.64	131
	Treatment	0	61
RICH_CLING	Control	7	42
	Reference	10	124
	Treatment	2	108
RICH_EPHEMEROPTERA	Control	2	40
	Reference	3	122
	Treatment	0	66
RICH_PLECOPTERA	Control	2	42
	Reference	3	124
	Treatment	0	61

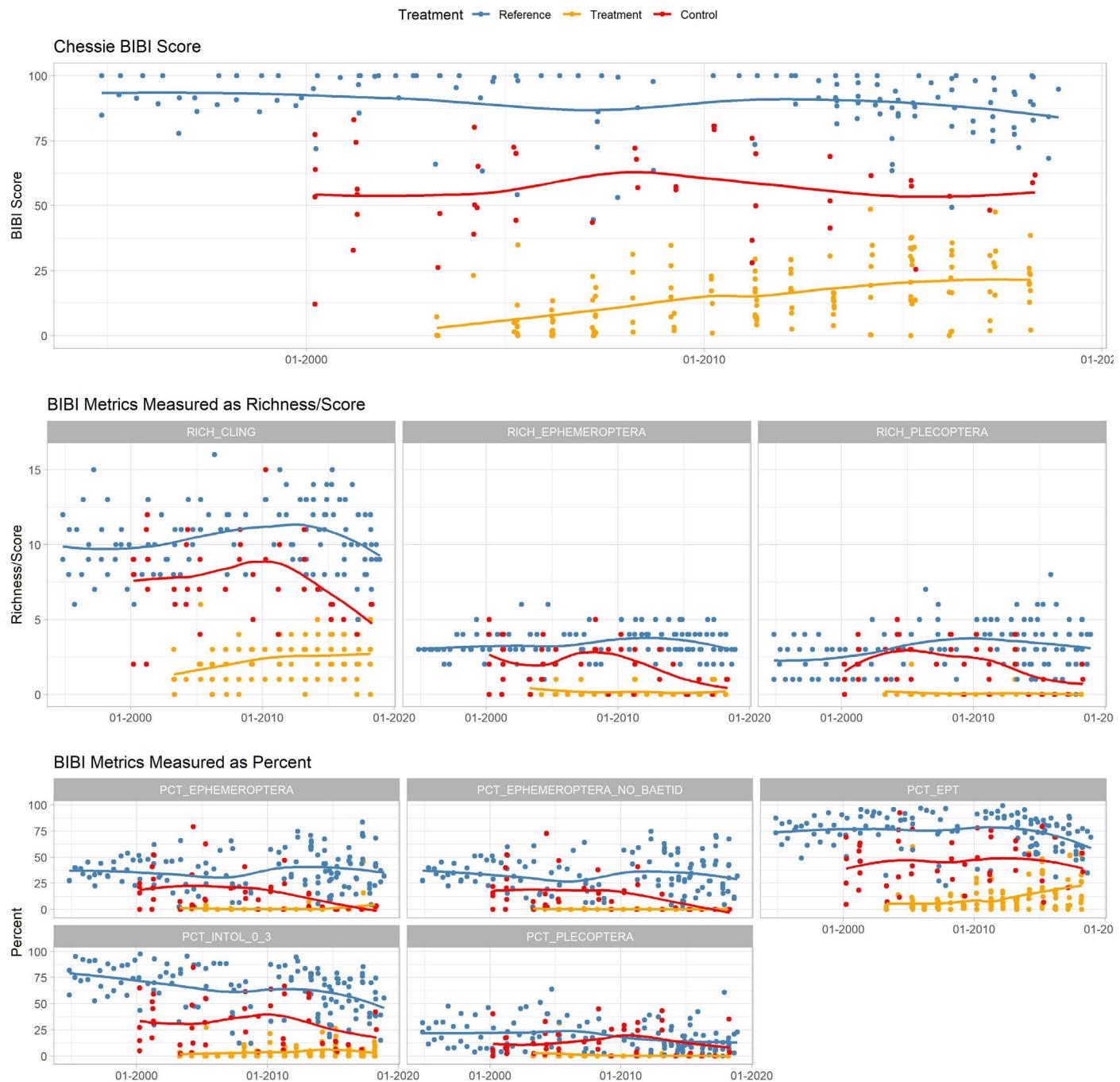


Figure A26. Scotts Level Branch biology metrics over time.

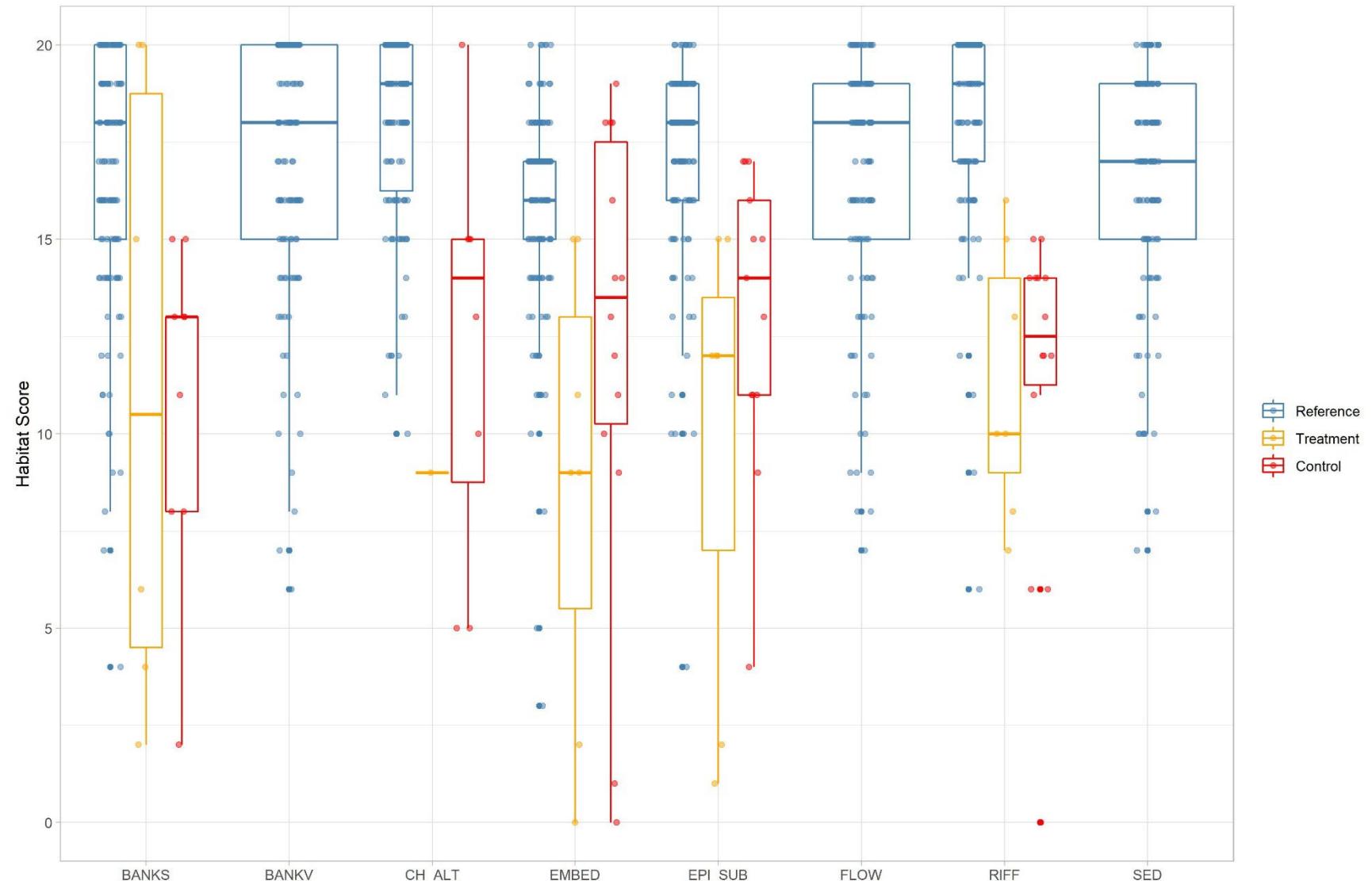


Figure A27. Scotts Level Branch habitat metrics.

Table A16. Median value of habitat metrics at Scotts Level Branch.

Habitat Metric	Catchment Type	Median	N
BANKS	Control	13	9
	Reference	18	136
	Treatment	10.5	6
BANKV	Reference	18	125
	Control	14	8
	Reference	19	126
CH_ALT	Treatment	9	1
	Control	13.5	14
	Reference	17	136
EMBED	Treatment	9	7
	Control	14	13
	Reference	18	133
EPI_SUB	Treatment	12	7
	Reference	18	125
	Control	12.5	14
FLOW	Reference	19	119
	Treatment	10	7
	Reference	17	127



Figure A28. Scotts Level Branch habitat metrics over time.

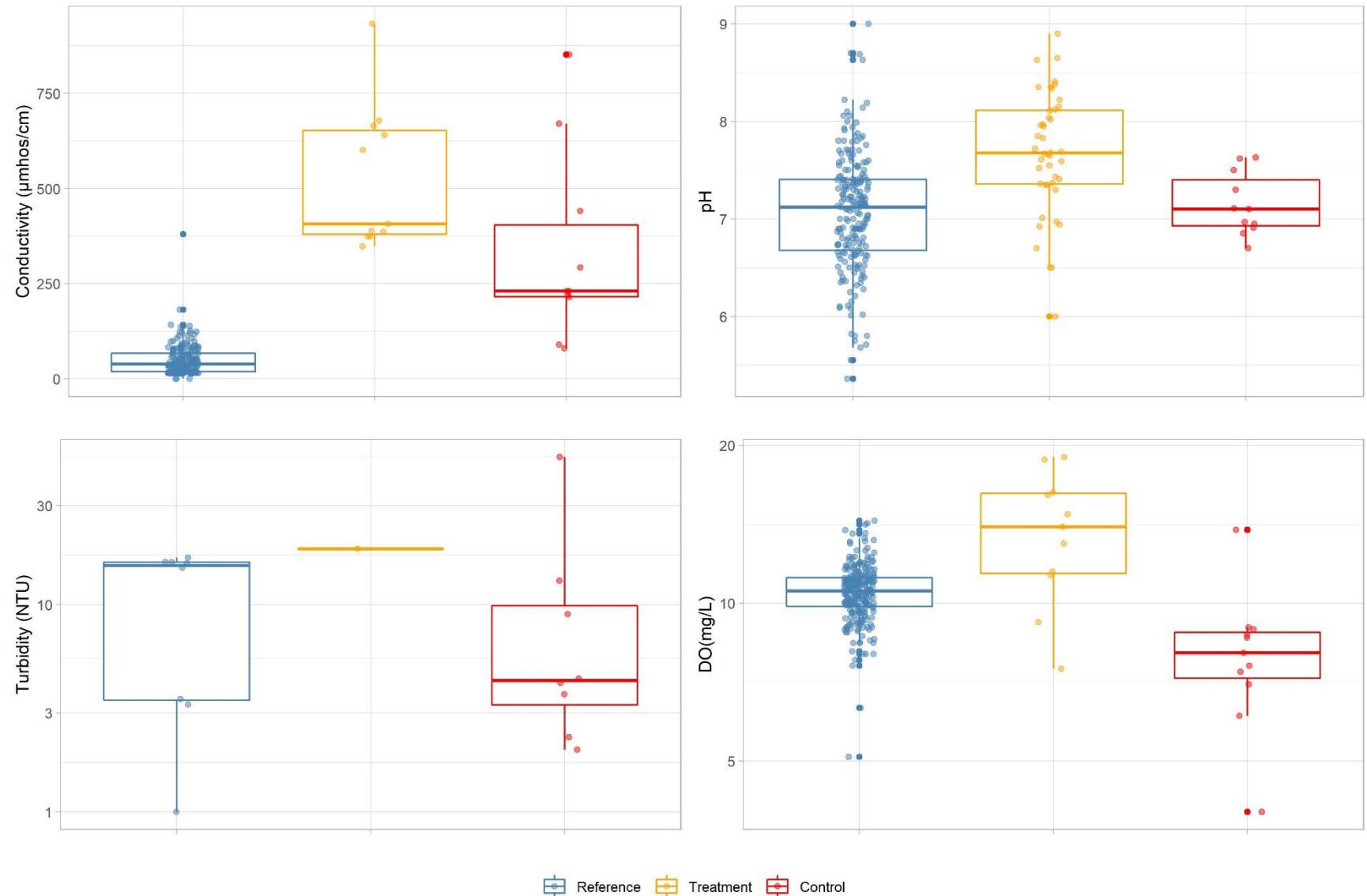


Figure A29. Scotts Level Branch water quality metrics.

Table A17. Median value of water quality metrics at Scotts Level Branch.

Water Quality Parameter	Catchment Type	Median	N
DO (mg/L)	Control	8.04	11
	Reference	10.55	247
	Treatment	14	11
PH	Control	7.1	11
	Reference	7.12	208
	Treatment	7.675	44
SPCOND (umhos/cm)	Control	230	10
	Reference	39	199
	Treatment	407	11
TURB_NTU (ntu)	Control	4.3	8
	Reference	15.4	8
	Treatment	18.5	1

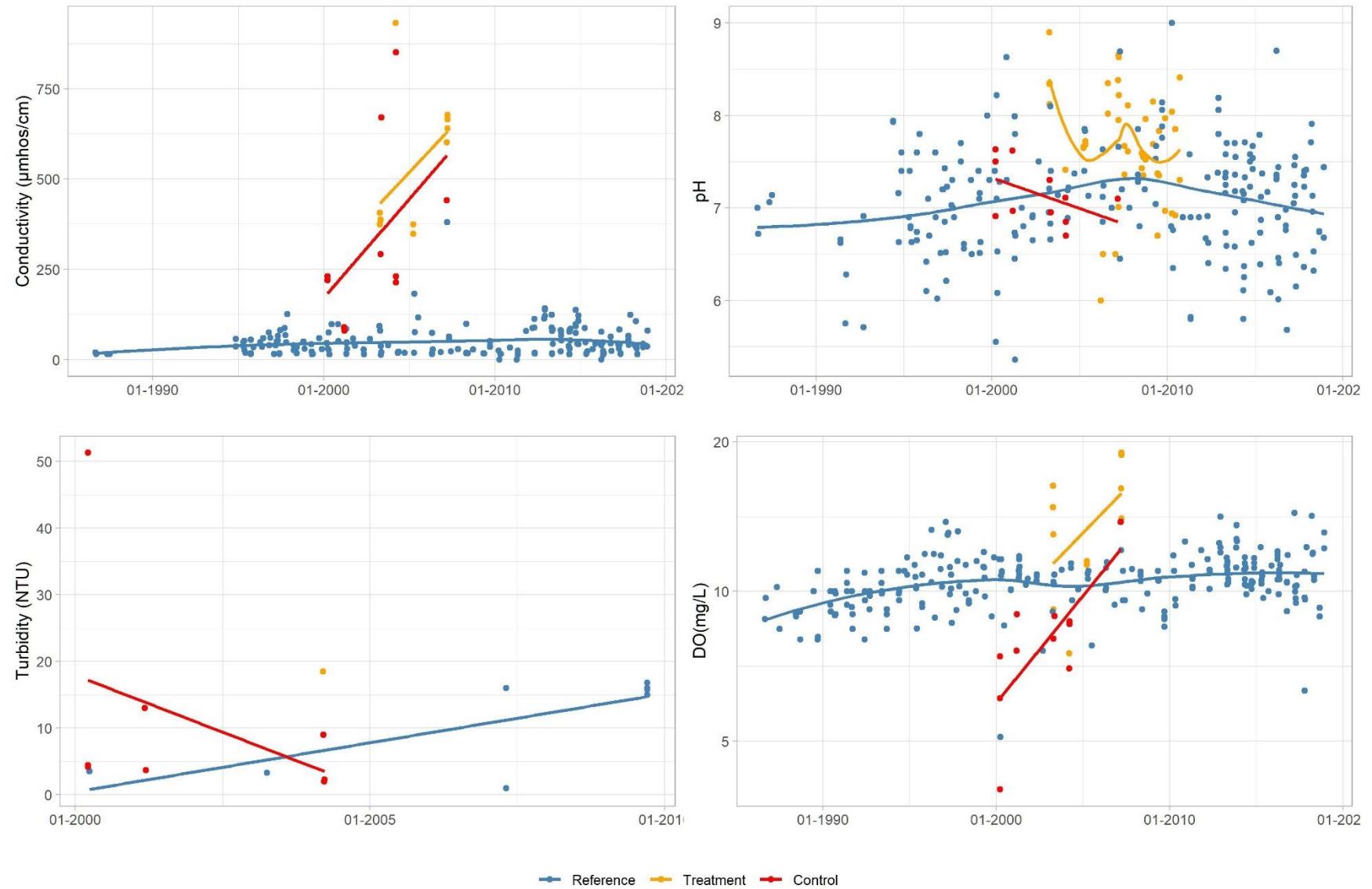


Figure A30. Scotts Level Branch water quality metrics over time.

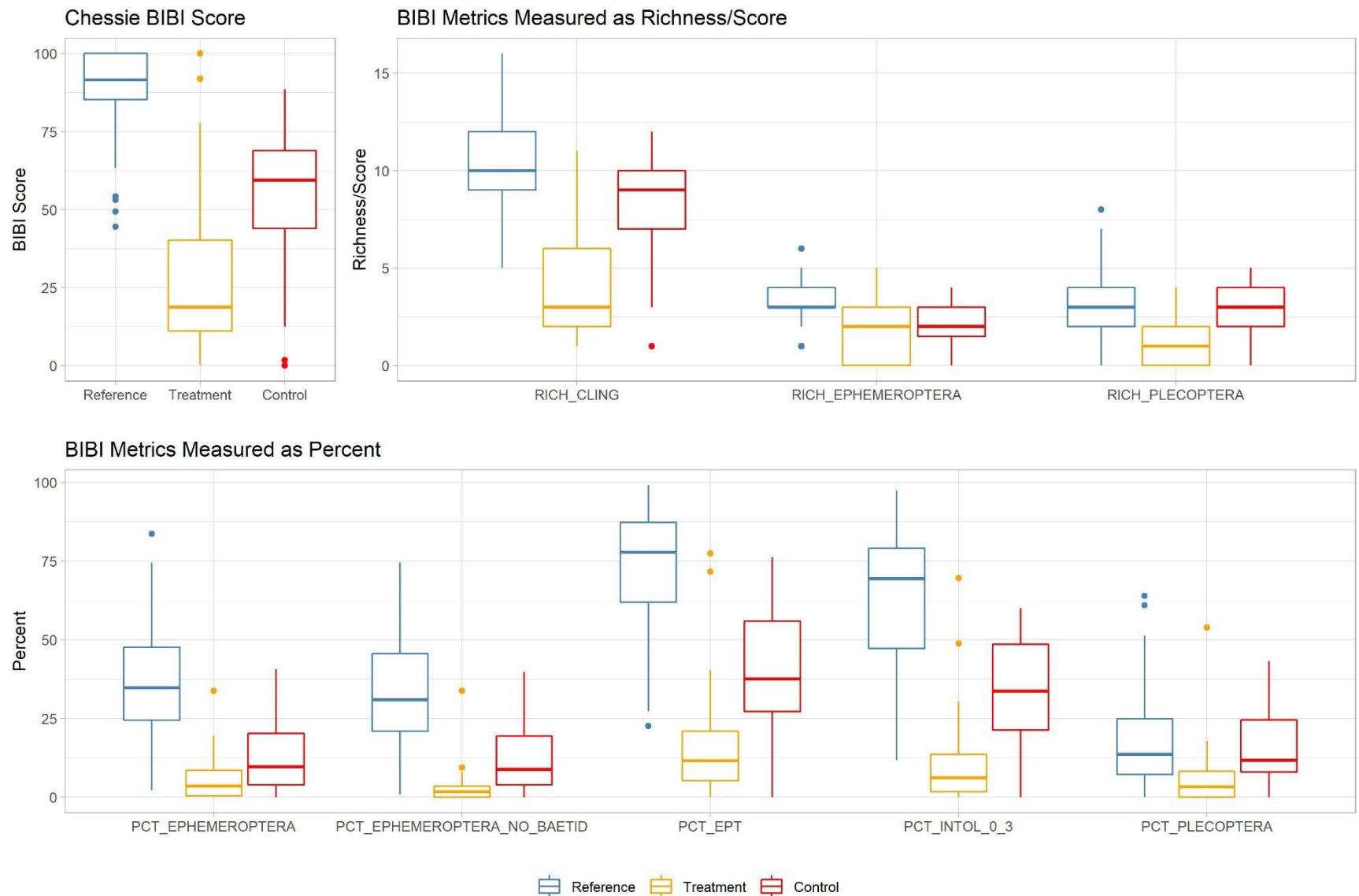


Figure A31. Peter Pan Run biology metrics.

Table A18. Median Chessie BIBI score and number of samples at Peter Pan Run.

Catchment Type	Median	N
Control	59.43	25
Reference	91.51	133
Treatment	18.675	76

Table A19. Median biological metric value by catchment type at Peter Pan Run.

Biological Metric	Catchment Type	Median	N
PCT_EPHEMEROPTERA	Control	9.71	25
	Reference	34.81	133
	Treatment	3.48	67
PCT_EPHEMEROPTERA_NO_BAETID	Control	8.77	25
	Reference	30.94	130
	Treatment	1.705	66
PCT_EPT	Control	37.5	25
	Reference	77.725	132
	Treatment	11.59	76
PCT_INTOL_0_3	Control	33.64	25
	Reference	69.39	133
	Treatment	6.215	76
PCT_PLECOPTERA	Control	11.65	25
	Reference	13.64	131
	Treatment	3.3	72
RICH_CLING	Control	9	25
	Reference	10	124
	Treatment	3	65
RICH_EPHEMEROPTERA	Control	2	23
	Reference	3	122
	Treatment	2	59
RICH_PLECOPTERA	Control	3	25
	Reference	3	124
	Treatment	1	60

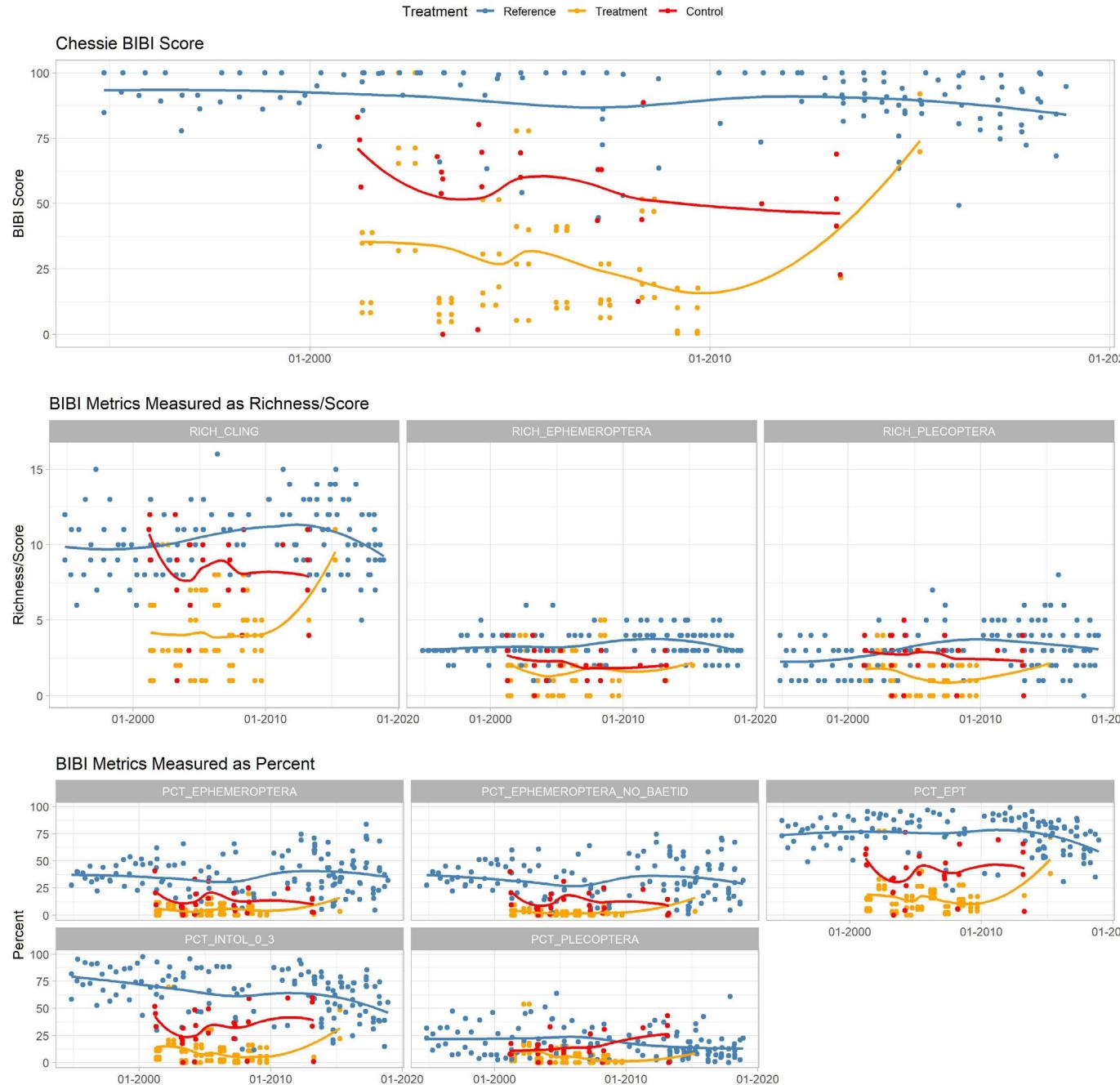


Figure A32. Peter Pan Run biological metrics over time.

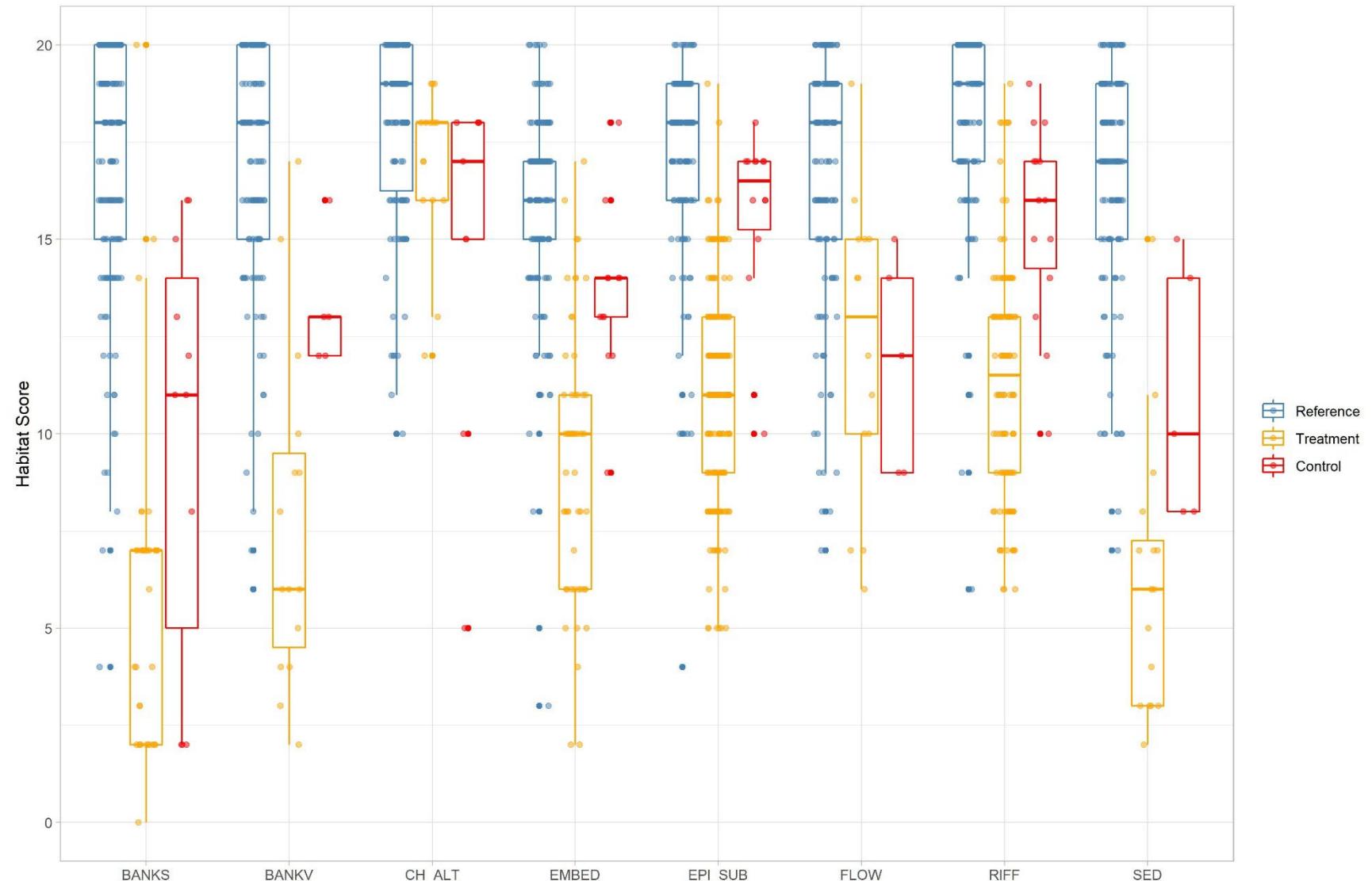


Figure A33. Peter Pan Run habitat metrics.

Table A20. Median value of habitat metrics at Peter Pan Run.

Habitat Metric	Catchment Type	Median	N
BANKS	Control	11	11
	Reference	18	136
	Treatment	7	37
BANKV	Control	13	5
	Reference	18	125
	Treatment	6	15
CH_ALT	Control	17	9
	Reference	19	126
	Treatment	18	15
EMBED	Control	14	14
	Reference	17	136
	Treatment	10	55
EPI_SUB	Control	16.5	14
	Reference	18	133
	Treatment	11	182
FLOW	Control	12	5
	Reference	18	125
	Treatment	13	14
RIFF	Control	16	14
	Reference	19	119
	Treatment	11.5	106
SED	Control	10	5
	Reference	17	127
	Treatment	6	16



Figure A34. Peter Pan Run habitat metrics over time.

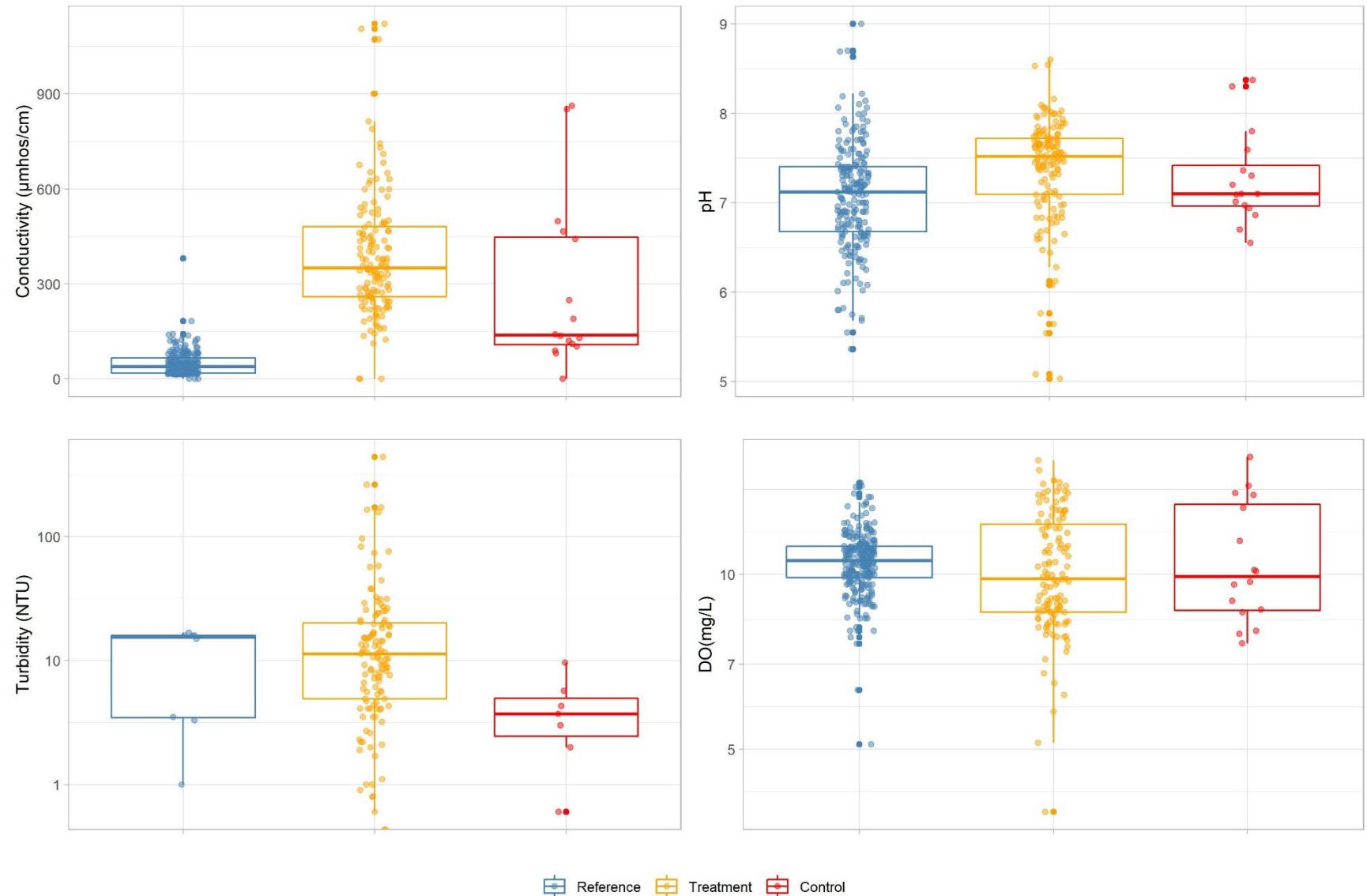


Figure A35. Peter Pan Run water quality metrics.

Table A21. Median value of water quality metrics at Peter Pan Run.

Water Quality Parameter	Catchment Type	Median	N
DO (mg/L)	Control	9.915	16
	Reference	10.55	247
	Treatment	9.82	131
PH	Control	7.1	16
	Reference	7.12	208
	Treatment	7.52	142
SPCOND (umhos/cm)	Control	138	16
	Reference	39	199
	Treatment	350.5	140
TURB_NTU (ntu)	Control	3.7	7
	Reference	15.4	8
	Treatment	10.55	128

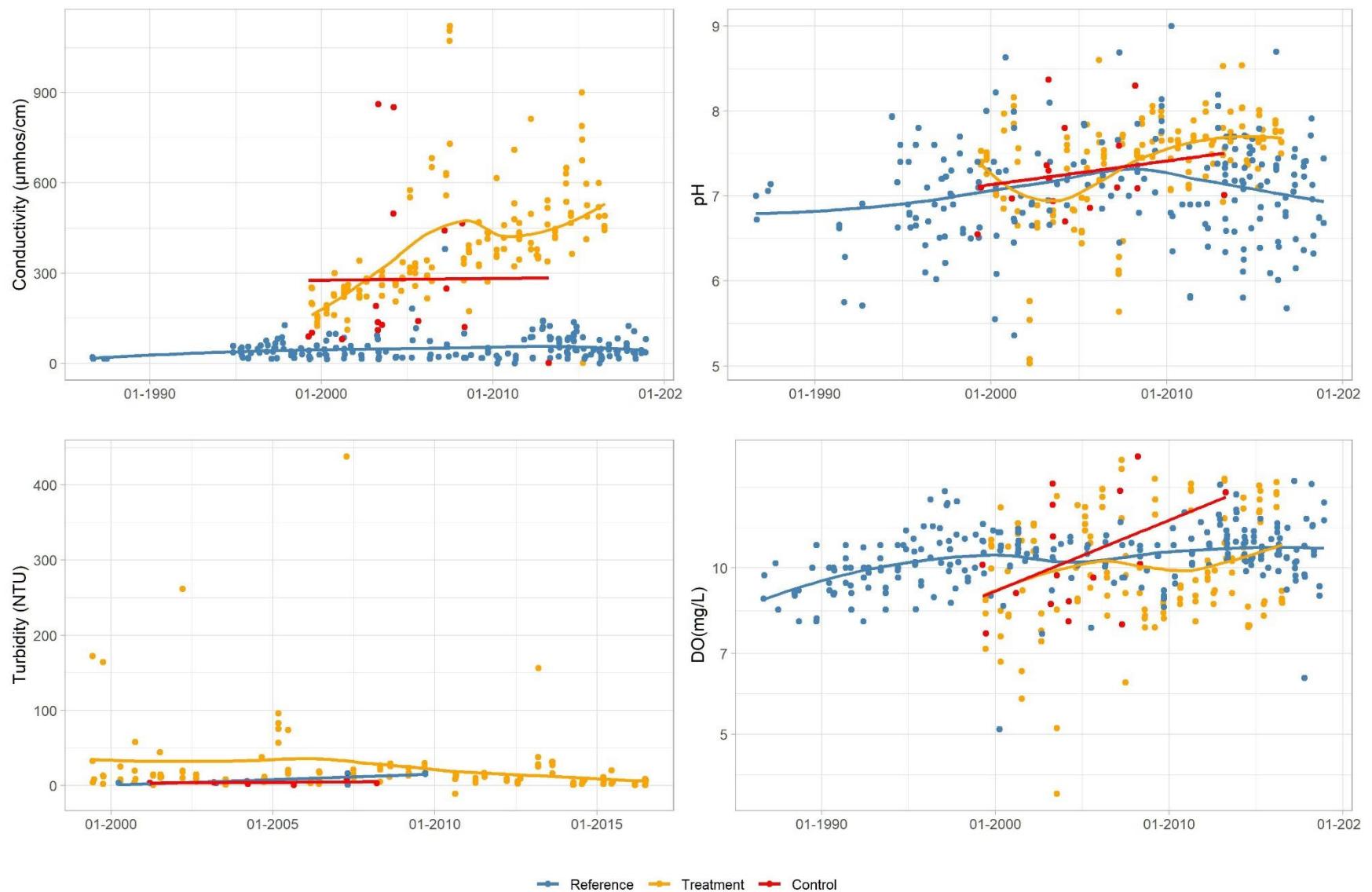


Figure A36. Peter Pan Run water quality metrics over time.

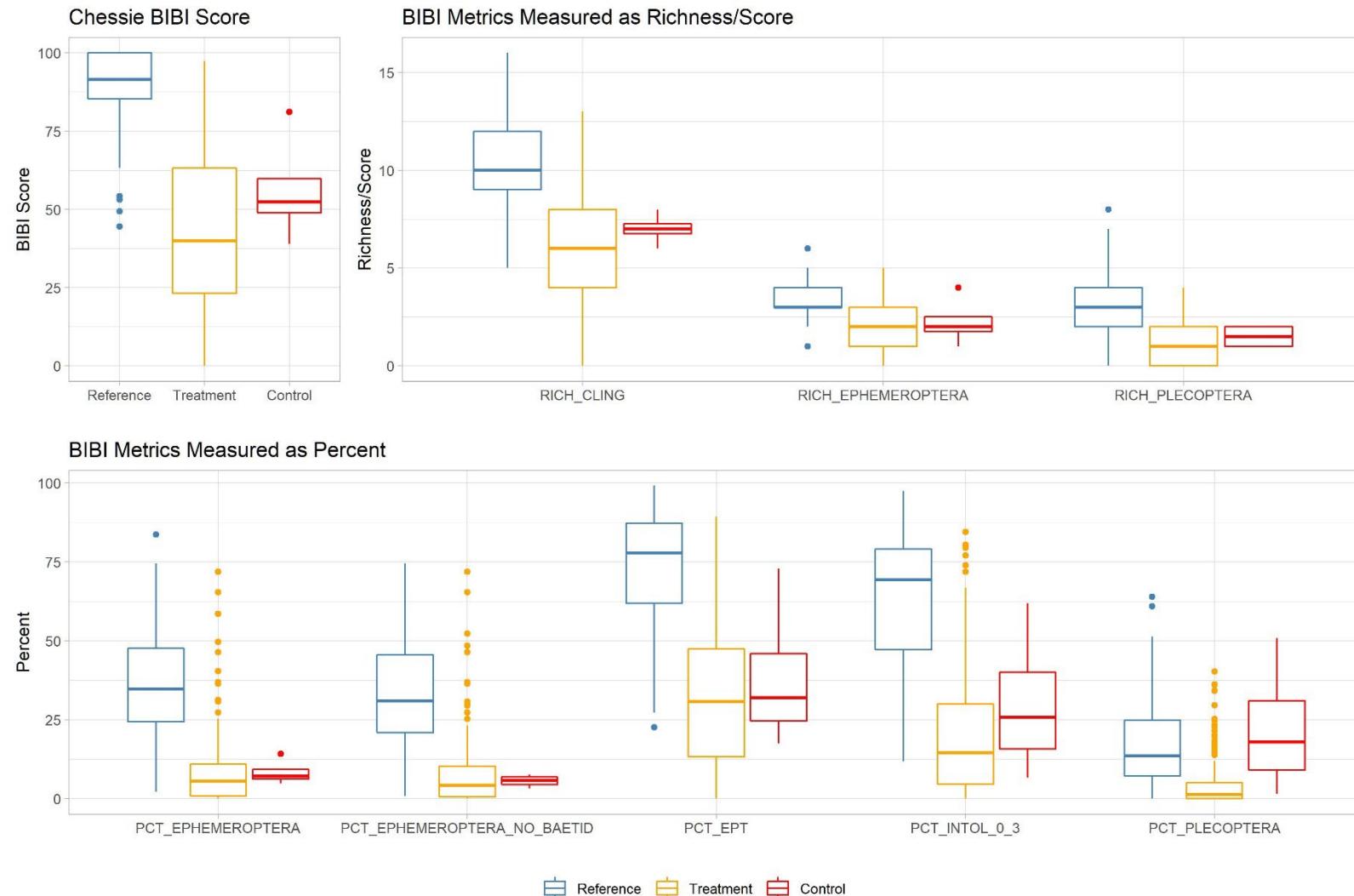


Figure A37. Stewart-April Lane biology metrics.

Table A22. Median Chessie BIBI score and number of samples at Stewart-April Lane.

Catchment Type	Median	N
Control	52.42	4
Reference	91.51	133
Treatment	39.90	247

Table A23. Median biological metric value by catchment type at Stewart-April Lane.

Biological Metric	Catchment Type	Median	N
PCT_EPHEMEROPTERA	Control	7.18	4
	Reference	34.81	133
	Treatment	5.59	232
PCT_EPHEMEROPTERA_NO_BAETID	Control	5.82	4
	Reference	30.94	130
	Treatment	4.26	227
PCT_EPT	Control	32.01	4
	Reference	77.73	132
	Treatment	30.77	247
PCT_INTOL_0_3	Control	25.81	4
	Reference	69.39	133
	Treatment	14.53	244
PCT_PLECOPTERA	Control	17.93	4
	Reference	13.64	131
	Treatment	1.43	219
RICH_CLING	Control	7	4
	Reference	10	124
	Treatment	6	222
RICH_EPHEMEROPTERA	Control	2	4
	Reference	3	122
	Treatment	2	188
RICH_PLECOPTERA	Control	1.5	4
	Reference	3	124
	Treatment	1	179

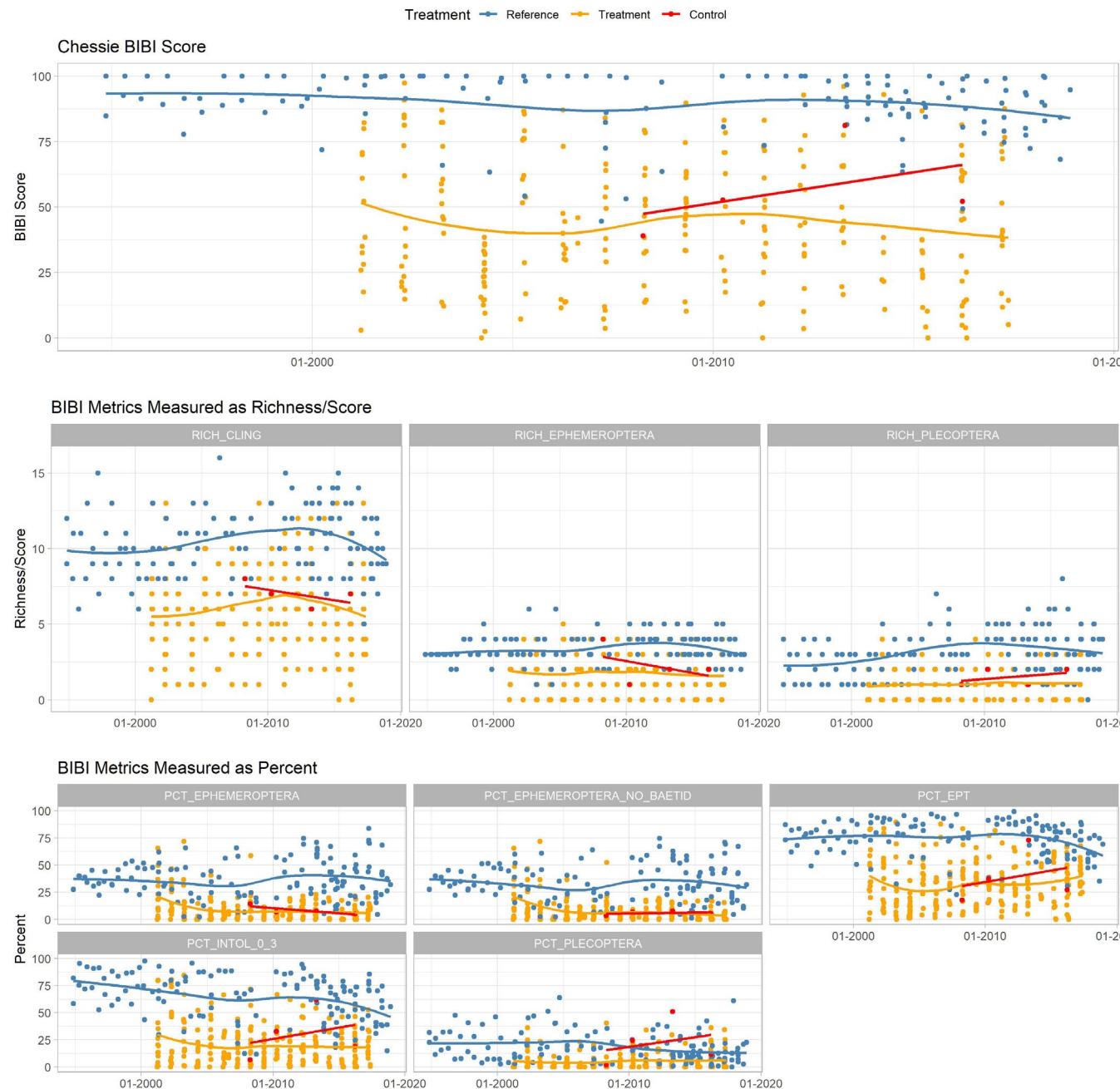


Figure A38. Stewart-April Lane biology metrics over time.

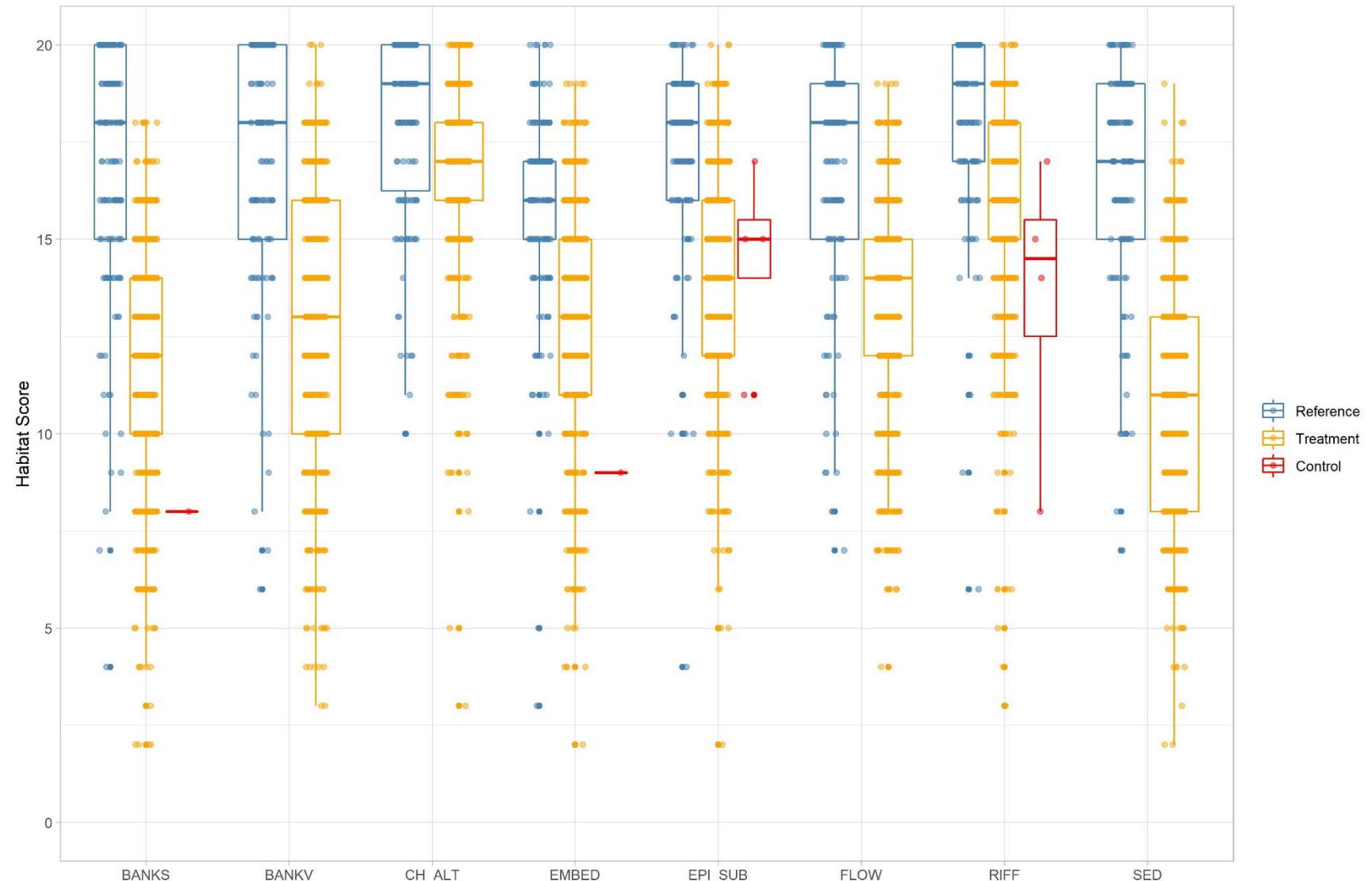


Figure A39. Stewart-April Lane habitat metrics.

Table A24. Median value of habitat metrics at Stewart-April Lane.

Habitat Metric	Catchment Type	Median	N
BANKS	Control	8	1
	Reference	18	136
	Treatment	12	514
BANKV	Reference	18	125
	Treatment	13	501
CH_ALT	Reference	19	126
	Treatment	17	473
EMBED	Control	32.5	4
	Reference	17	136
	Treatment	13	510
EPI_SUB	Control	15	4
	Reference	18	133
	Treatment	14	503
FLOW	Reference	18	125
	Treatment	14	505
RIFF	Control	14.5	4
	Reference	19	119
	Treatment	16	439
SED	Reference	17	127
	Treatment	11	521

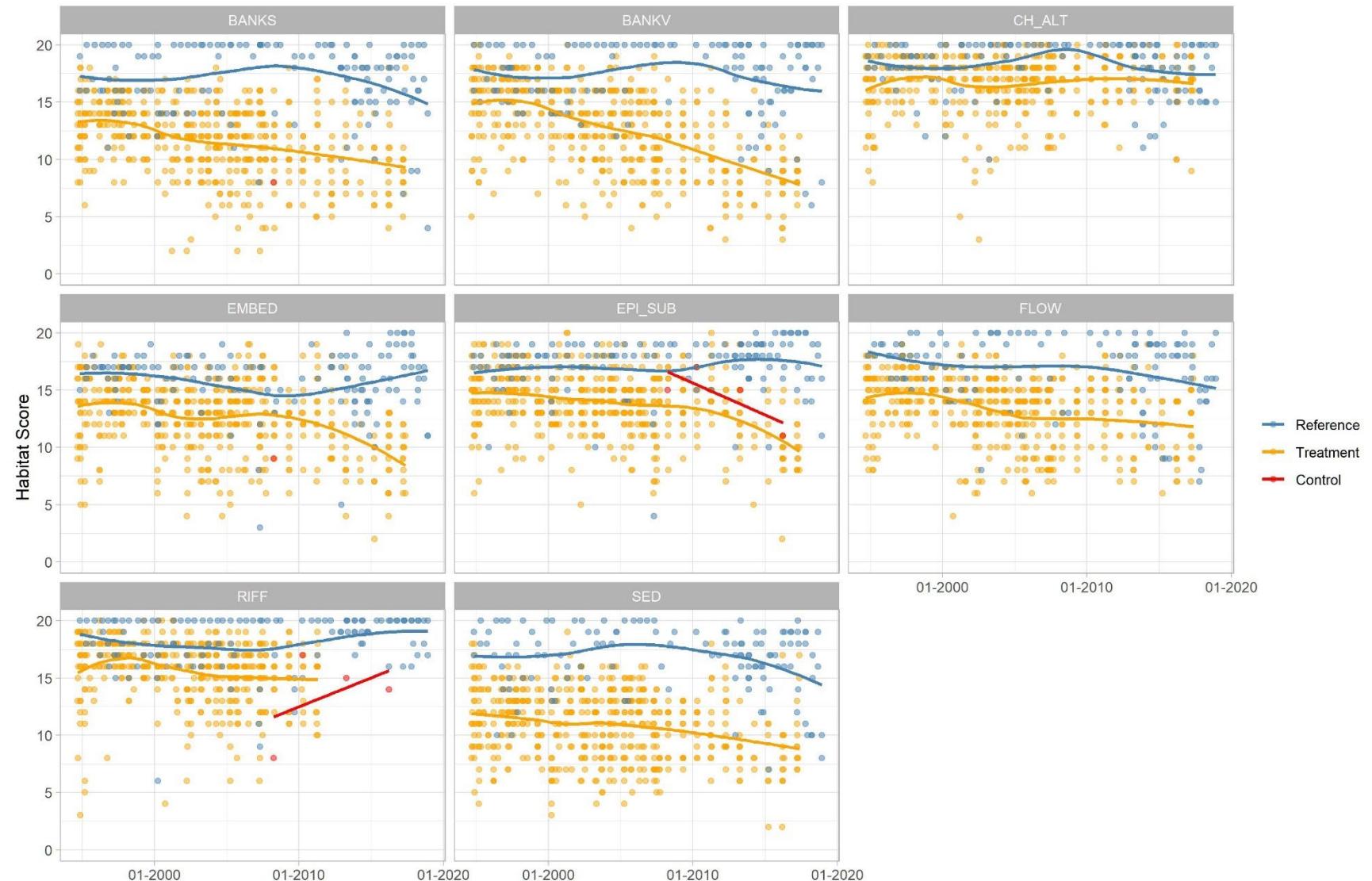


Figure A40. Stewart-April Lane habitat metrics over time.

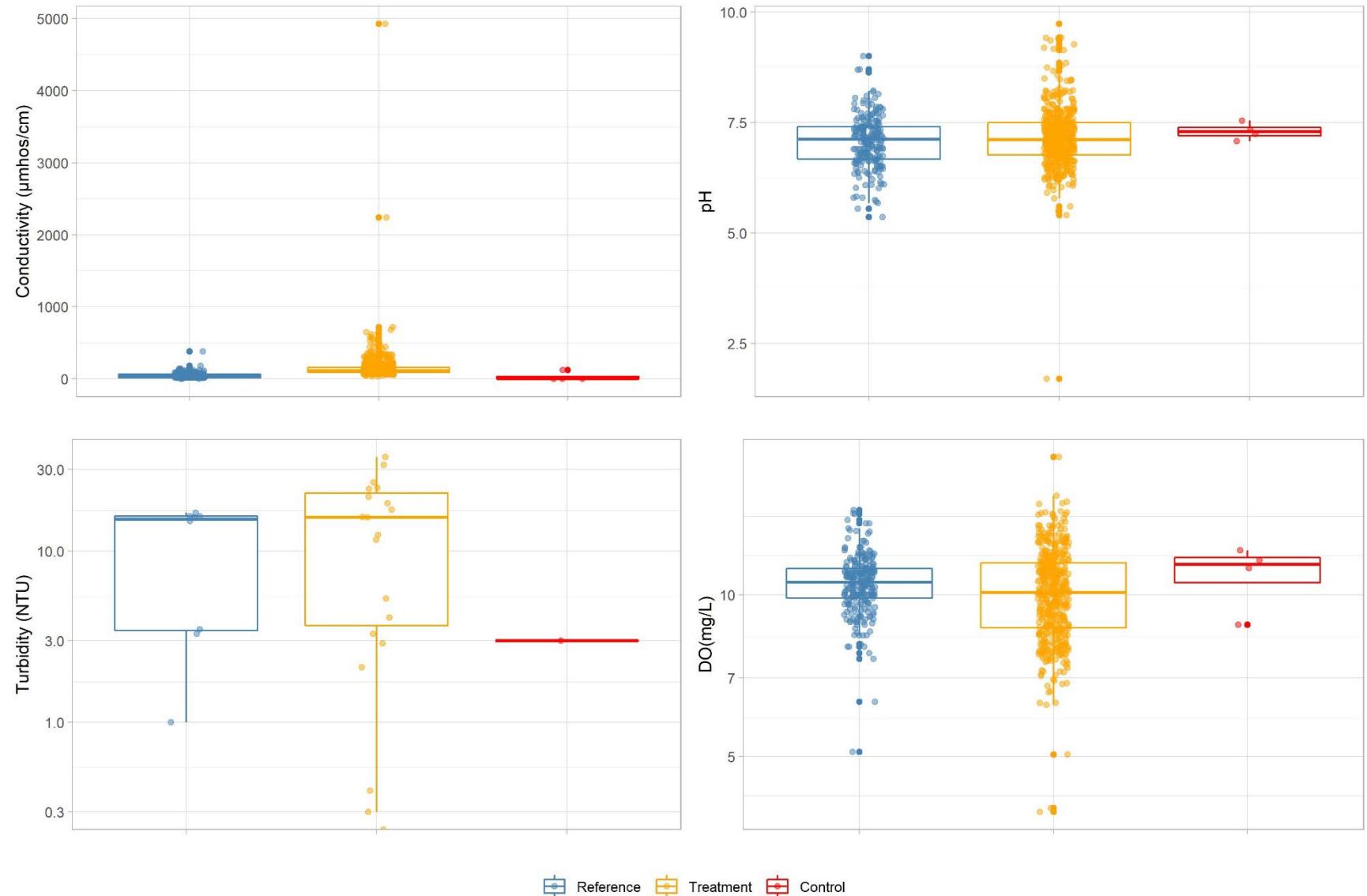


Figure A41. Stewart-April Lane water quality metrics.

Table A25. Median value of water quality metrics at Stewart-April Lane.

Water Quality Parameter	Catchment Type	Median	N
DO (mg/L)	Control	11.4	4
	Reference	10.55	247
	Treatment	10.1	464
PH	Control	7.29	4
	Reference	7.12	208
	Treatment	7.11	478
SPCOND (umhos/cm)	Control	0.18	4
	Reference	39	199
	Treatment	112	468
TURB_NTU (ntu)	Control	3	1
	Reference	15.4	8
	Treatment	11.7	23

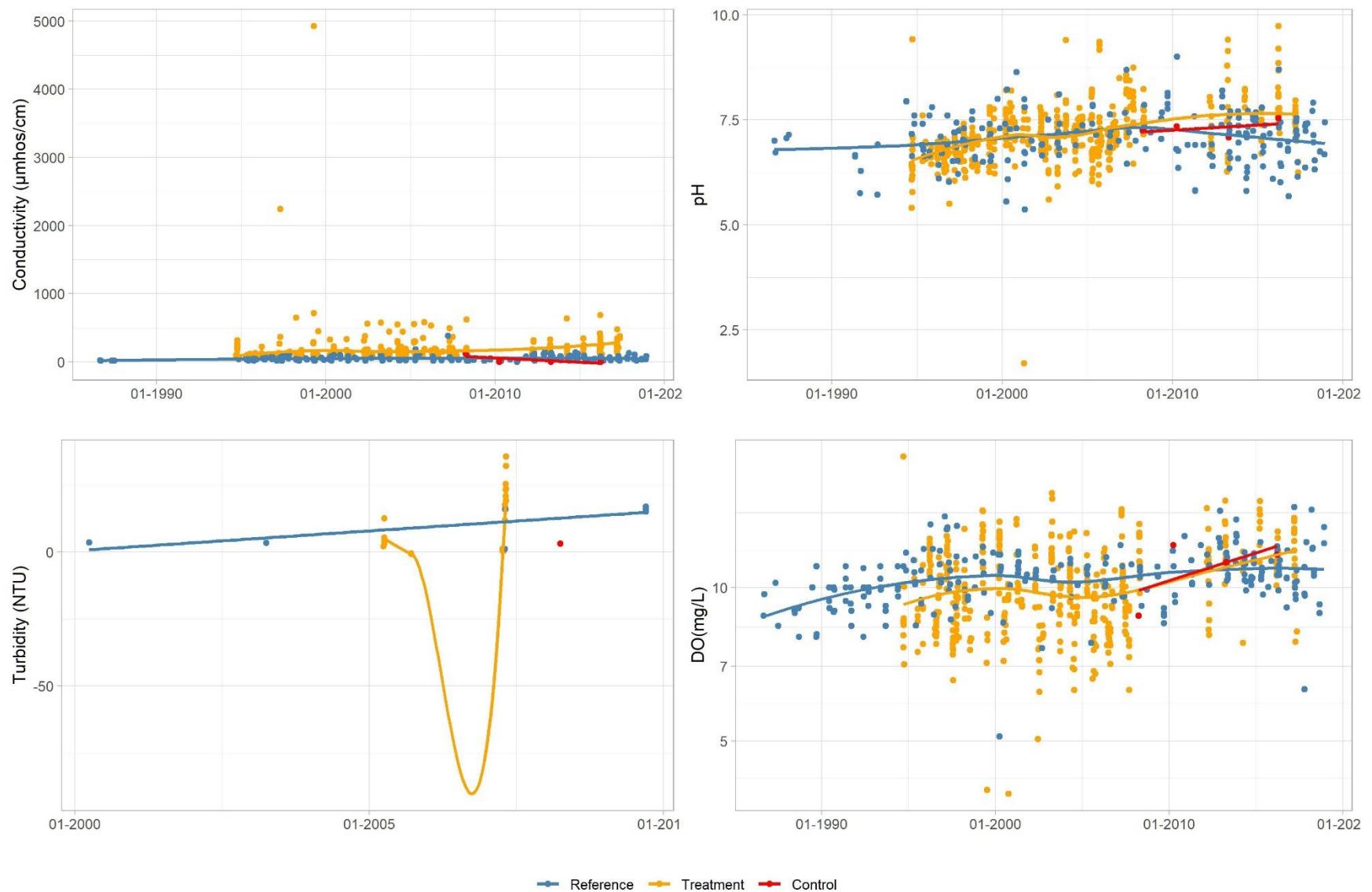


Figure A42. Stewart-April Lane water quality metrics over time.

Table A26. Stewart-April Lane upstream catchments impervious cover analysis.

Catchment ID	%IC	% of IC Captured by WQ BMPs	% of IC Treated by ED Only
22336295	11%	10%	4%
22336285	10%	43%	1%
22336305	13%	34%	10%
22336309	0%	N/A	N/A
22336333	18%	59%	9%
22336379	24%	11%	7%
22336323	21%	14%	9%
22336335	17%	51%	0%
22336291	10%	66%	22%
22336303	10%	41%	20%
22336307	13%	41%	22%
22336287	11%	39%	2%
22336293	11%	39%	30%

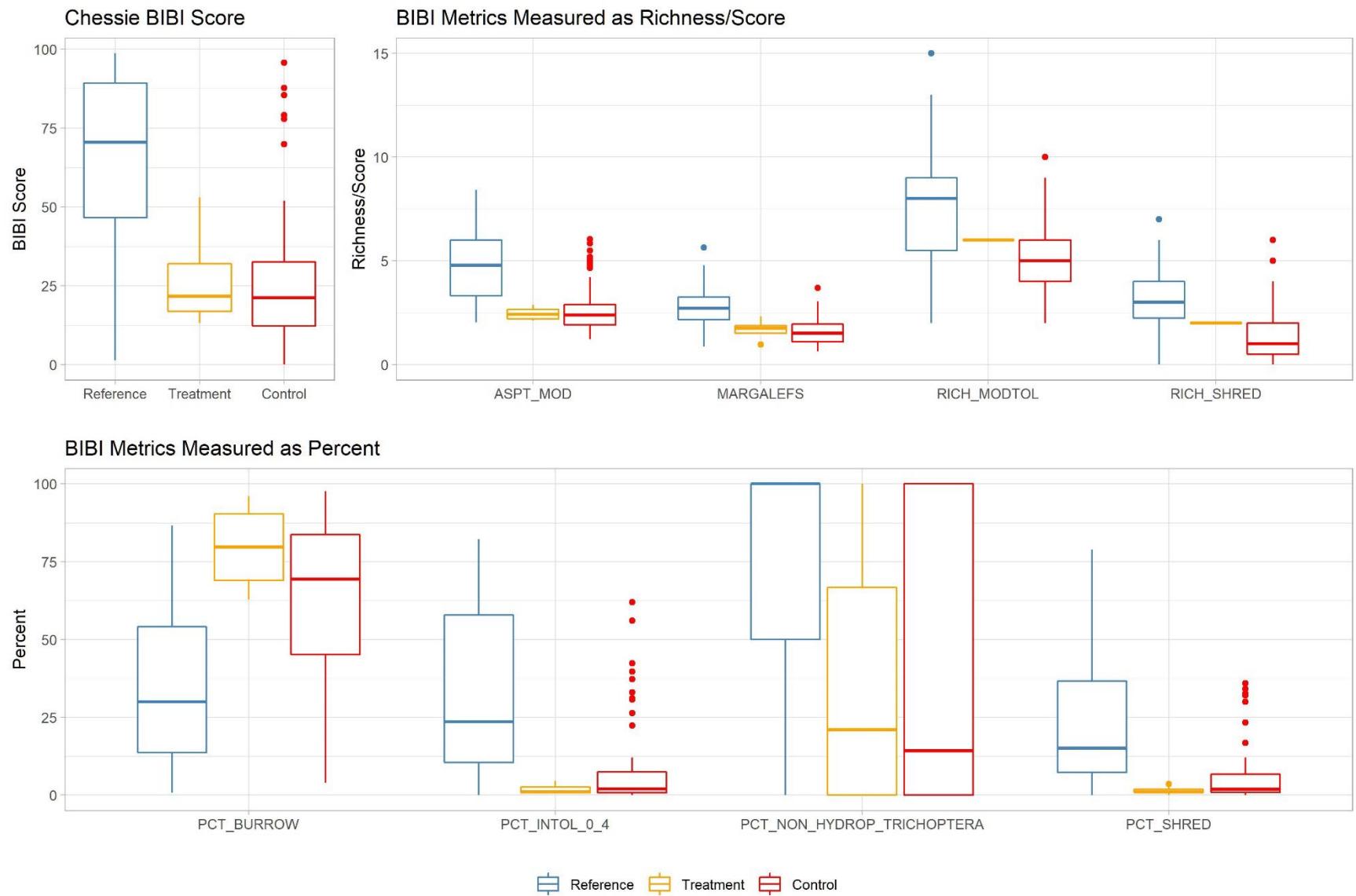


Figure A43. Acton/Hamilton biology metrics.

Table A27. Median Chessie BIBI score and number of samples at Acton/Hamilton.

Catchment Type	Median	N
Control	21.245	62
Reference	70.465	58
Treatment	21.7	13

Table A28. Median biological metric value by catchment type at Acton/Hamilton.

Biological Metric	Catchment Type	Median	N
ASPT_MOD	Control	2.38	61
	Reference	4.785	58
	Treatment	2.42	13
MARGALEFS	Control	1.52	58
	Reference	2.715	58
	Treatment	1.75	13
PCT_BURROW	Control	69.415	62
	Reference	29.995	58
	Treatment	79.65	13
PCT_INTOL_0_4	Control	1.96	59
	Reference	23.525	58
	Treatment	0.98	13
PCT_NON_HYDROP_TRICHOPTERA	Control	14.29	53
	Reference	100	52
	Treatment	21.05	13
PCT_SHRED	Control	1.82	59
	Reference	15.09	57
	Treatment	0.98	13
RICH_MODTOL	Control	5	57
	Reference	8	55
	Treatment	6	1
RICH_SHRED	Control	1	55
	Reference	3	54
	Treatment	2	1

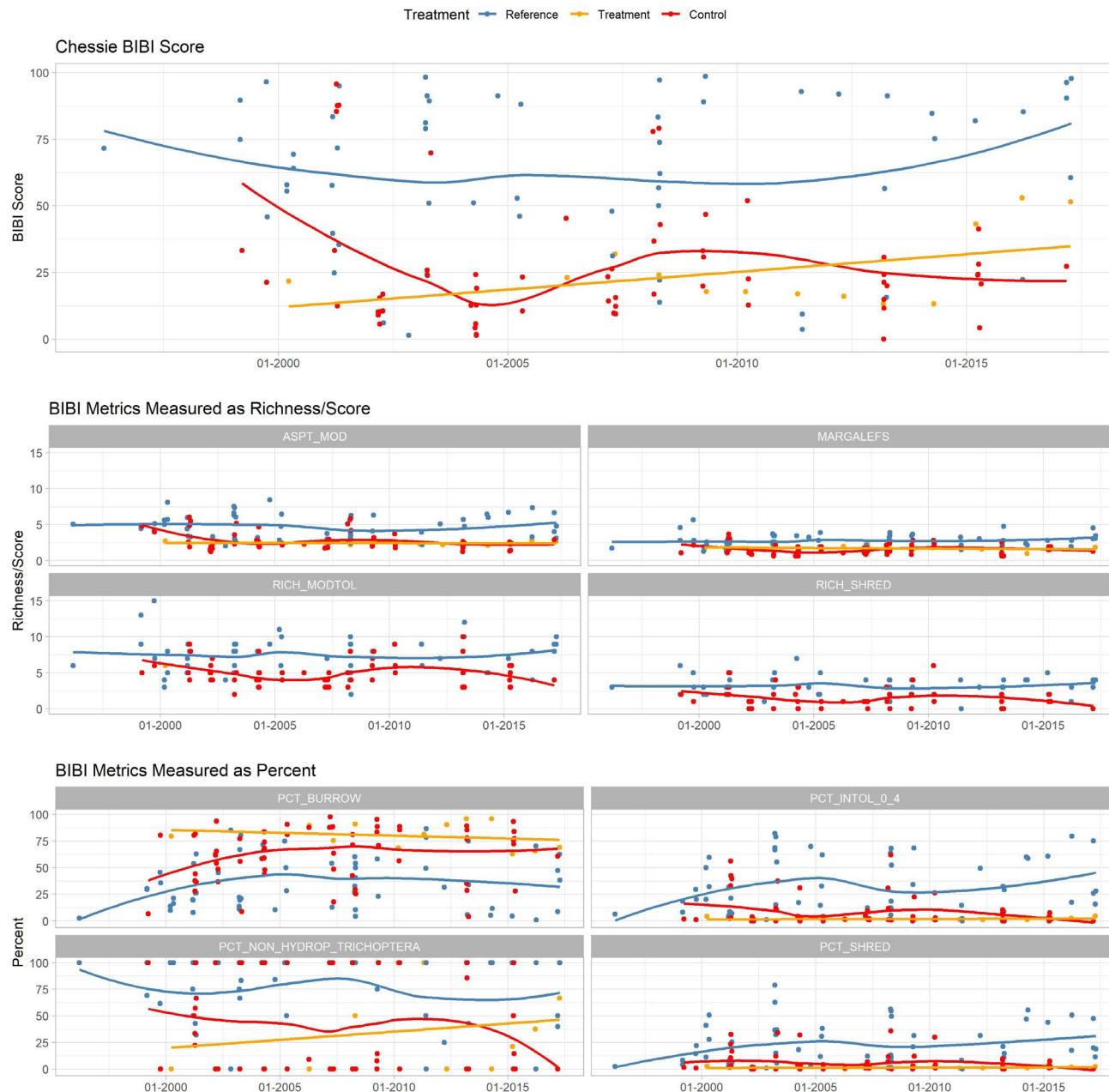


Figure A44. Acton/Hamilton biology metrics over time.

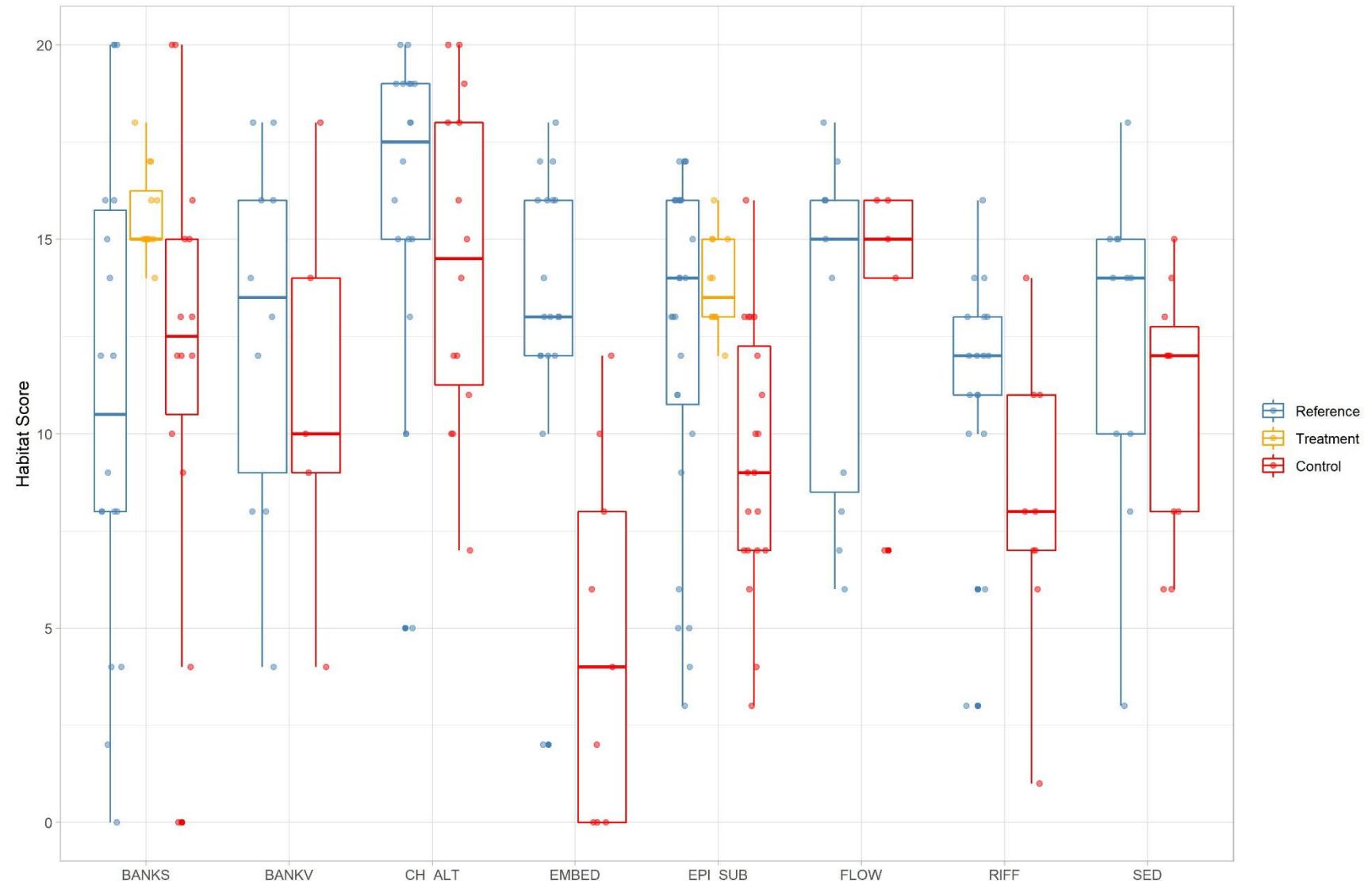


Figure A45. Acton/Hamilton habitat metrics.

Table A29. Median value of habitat metrics at Acton/Hamilton.

Habitat Metric	Catchment Type	Median	N
BANKS	Control	8	1
	Reference	18	136
	Treatment	12	514
BANKV	Reference	18	125
	Treatment	13	501
CH_ALT	Reference	19	126
	Treatment	17	473
EMBED	Control	32.5	4
	Reference	17	136
	Treatment	13	510
EPI_SUB	Control	15	4
	Reference	18	133
	Treatment	14	503
FLOW	Reference	18	125
	Treatment	14	505
RIFF	Control	14.5	4
	Reference	19	119
	Treatment	16	439
SED	Reference	17	127
	Treatment	11	521

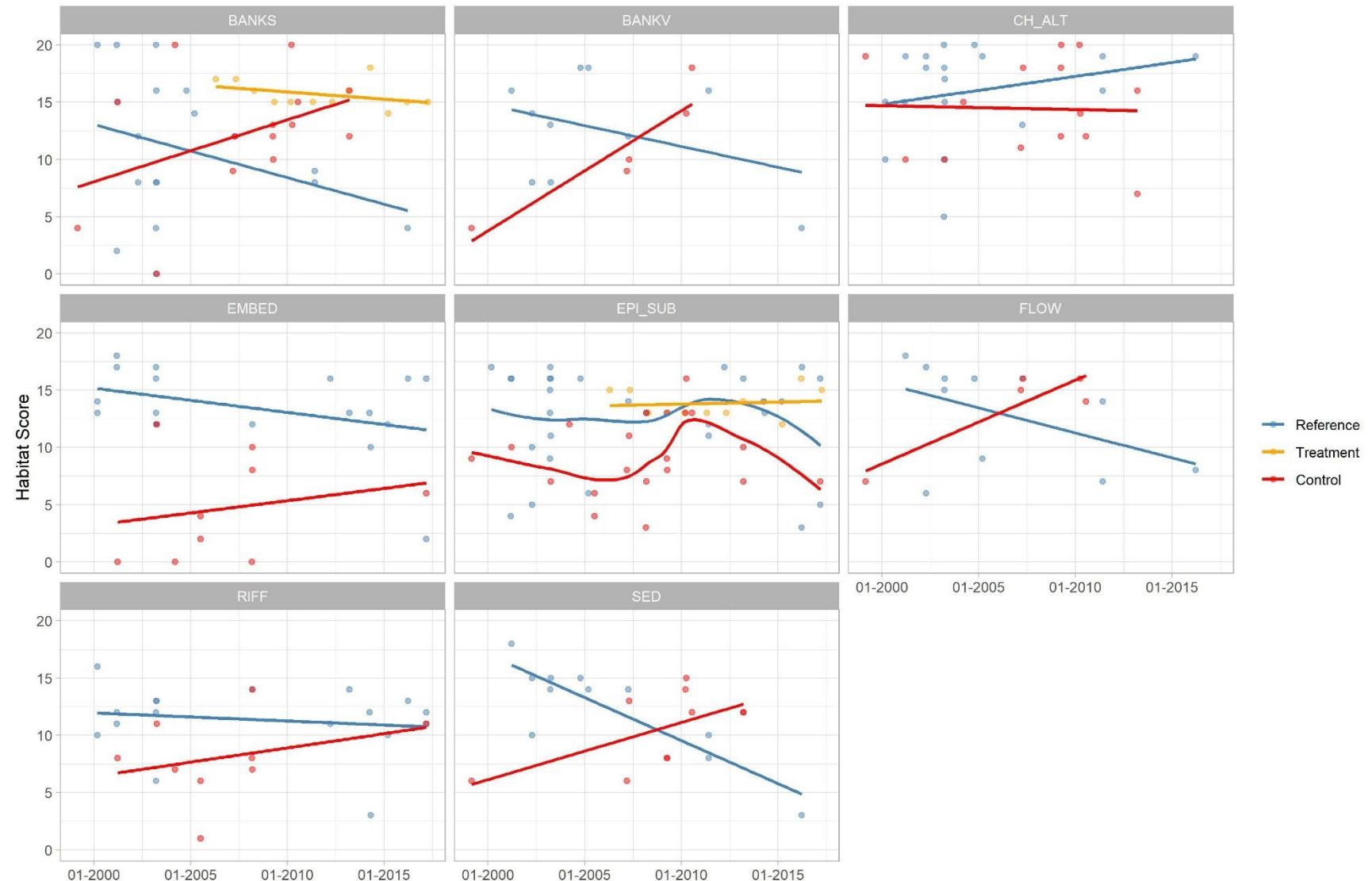


Figure A46. Acton/Hamilton habitat metrics over time.

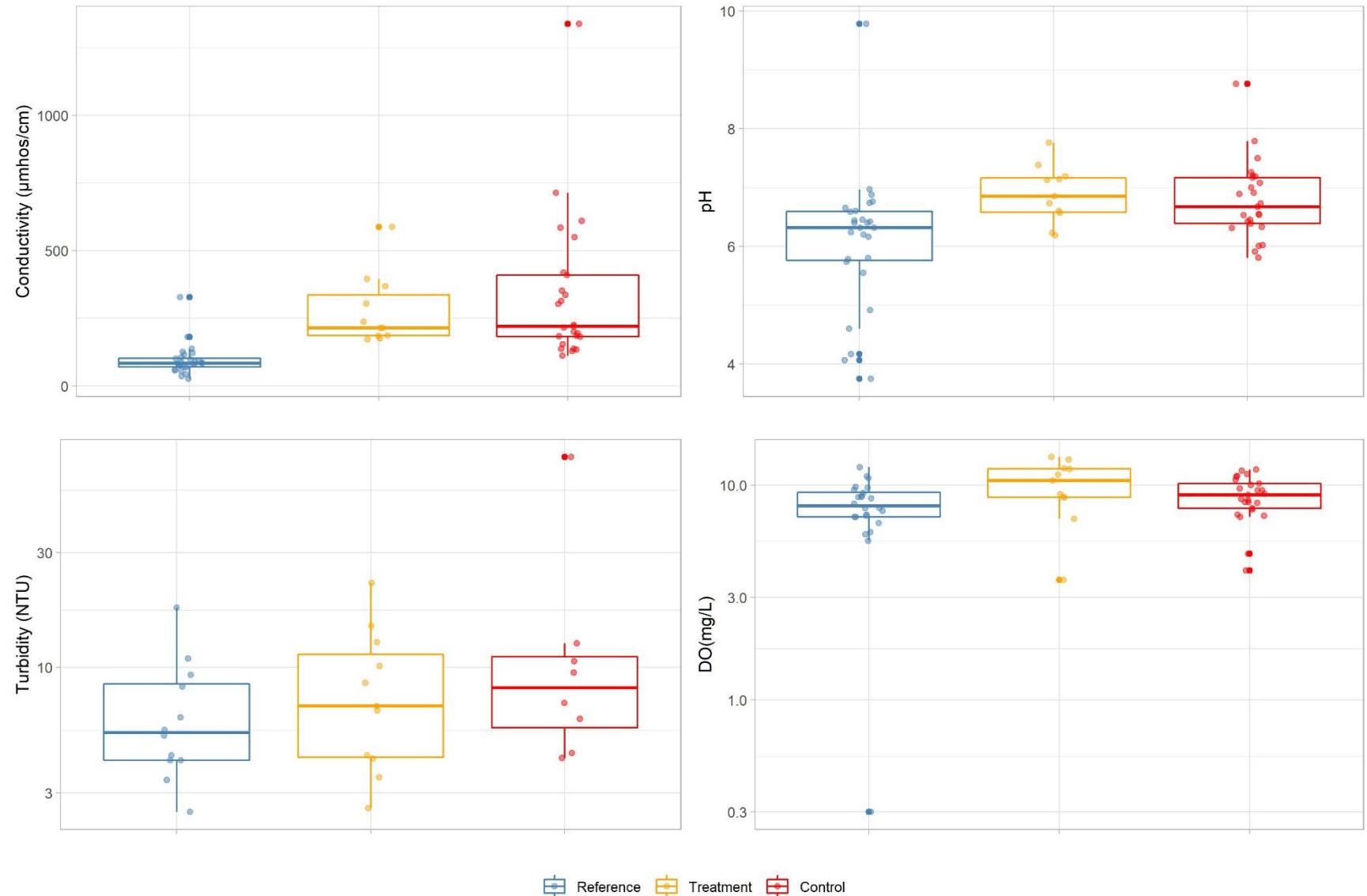


Figure A47. Acton/Hamilton water quality metrics.

Table A30. Median value of water quality metrics at Acton/Hamilton.

Water Quality Parameter	Catchment Type	Median	N
DO (mg/L)	Control	9	25
	Reference	8	24
	Treatment	10.52	11
PH	Control	6.67	25
	Reference	6.32	27
	Treatment	6.85	11
SPCOND (umhos/cm)	Control	219	25
	Reference	83.4	27
	Treatment	214.2	11
TURB_NTU (ntu)	Control	8.3	8
	Reference	5.35	12
	Treatment	6.9	11

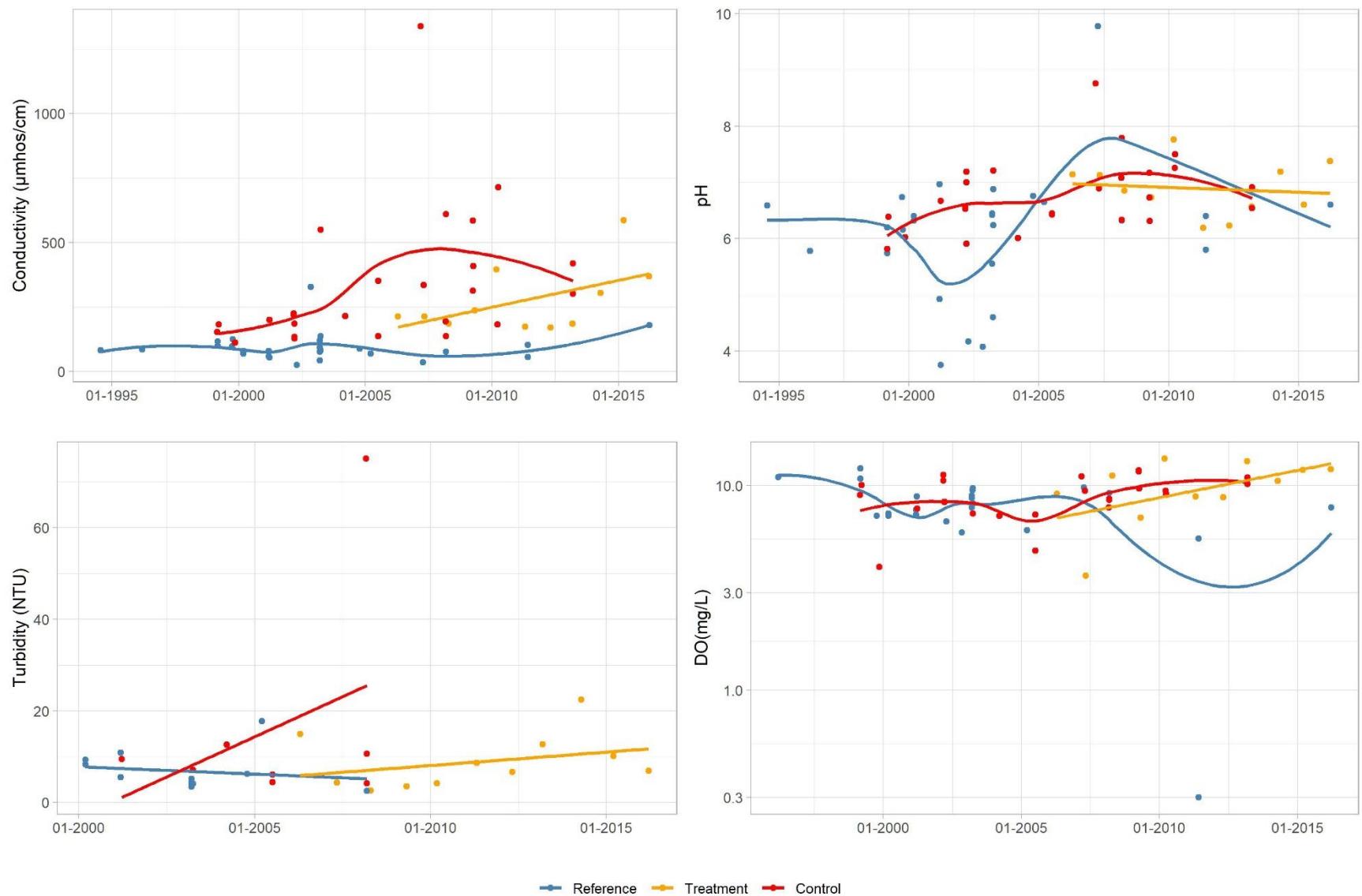


Figure A48. Acton/Hamilton water quality metrics over time.

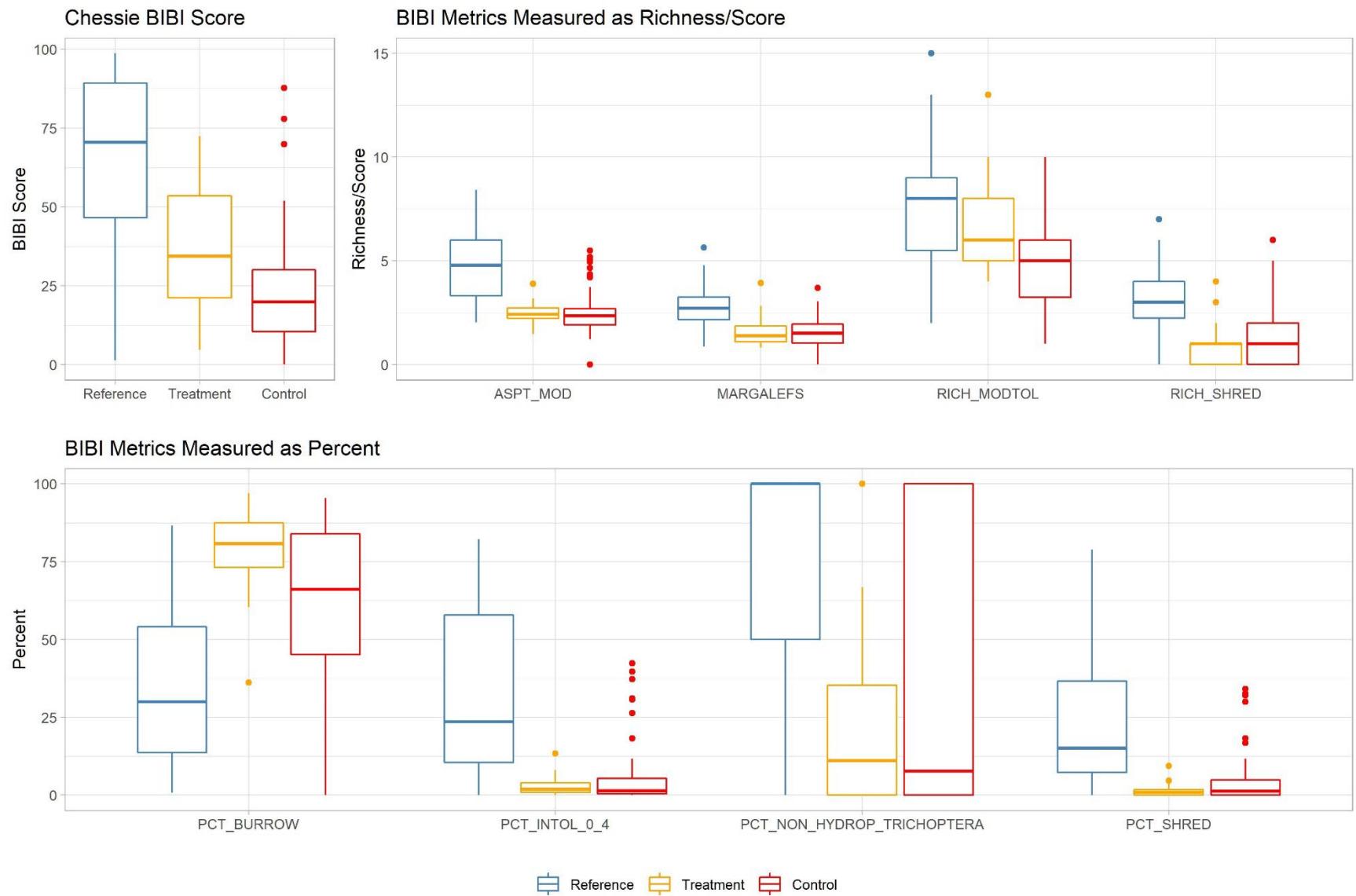


Figure A49. Bear Branch biology metrics.

Table A31. Median Chessie BIBI score and number of samples at Bear Branch.

Catchment Type	Median	N
Control	19.90	54
Reference	70.47	58
Treatment	34.30	55

Table A32. Median biological metric value by catchment type at Bear Branch.

Biological Metric	Catchment Type	Median	N
ASPT_MOD	Control	2.35	53
	Reference	4.785	58
	Treatment	2.43	31
MARGALEFS	Control	1.52	52
	Reference	2.715	58
	Treatment	1.39	47
PCT_BURROW	Control	66.08	54
	Reference	29.995	58
	Treatment	80.73	31
PCT_INTOL_0_4	Control	1.38	51
	Reference	23.525	58
	Treatment	1.87	31
PCT_NON_HYDROPT_TRICHOPTERA	Control	7.69	45
	Reference	100	52
	Treatment	11.11	29
PCT_SHRED	Control	1.32	51
	Reference	15.09	57
	Treatment	0.955	30
RICH_MODTOL	Control	5	50
	Reference	8	55
	Treatment	6	27
RICH_SHRED	Control	1	48
	Reference	3	54
	Treatment	1	25

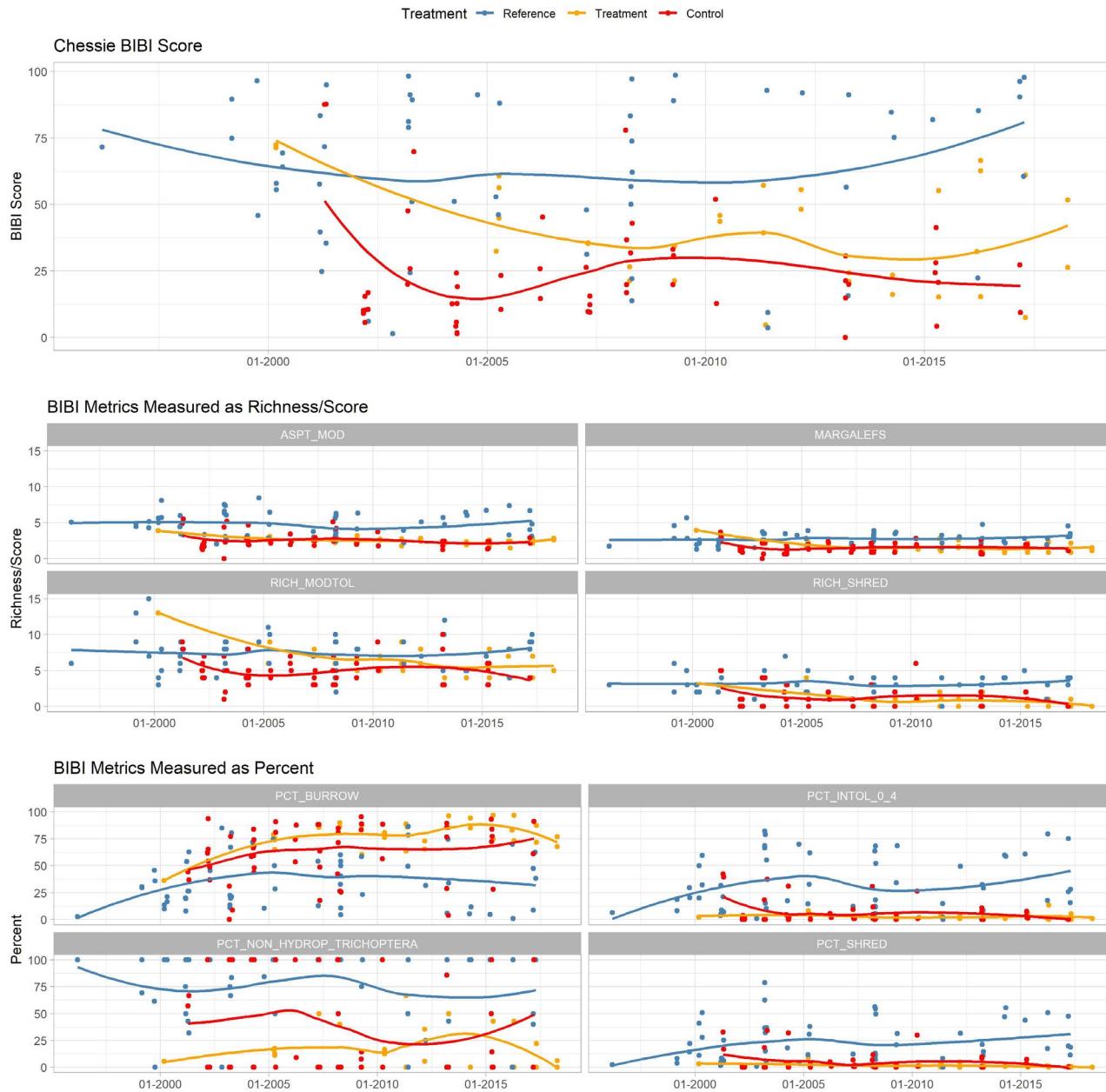


Figure A50. Bear Branch biology metrics over time.

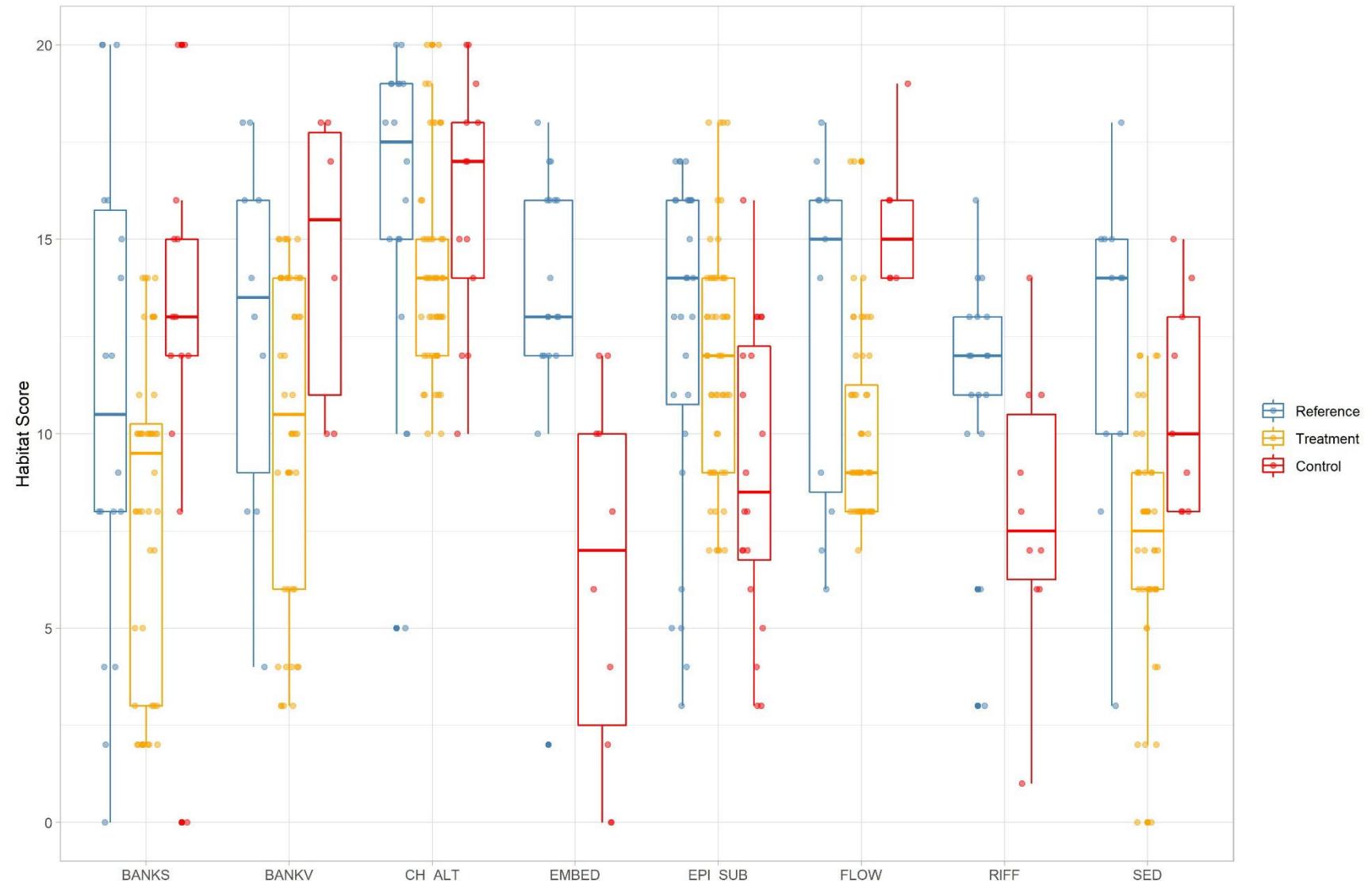


Figure A51. Bear Branch habitat metrics.

Table A33. Median value of habitat metrics at Bear Branch.

Habitat Metric	Catchment Type	Median	N
BANKS	Control	13	13
	Reference	10.5	18
	Treatment	9.5	48
BANKV	Control	15.5	6
	Reference	13.5	10
	Treatment	10.5	48
CH_ALT	Control	17	13
	Reference	17.5	18
	Treatment	14	51
EMBED	Control	7	10
	Reference	13	18
EPI_SUB	Control	8.5	20
	Reference	14	28
	Treatment	12	52
FLOW	Control	15	6
	Reference	15	11
	Treatment	9	52
RIFF	Control	7.5	10
	Reference	12	17
SED	Control	10	9
	Reference	14	11
	Treatment	7.5	48

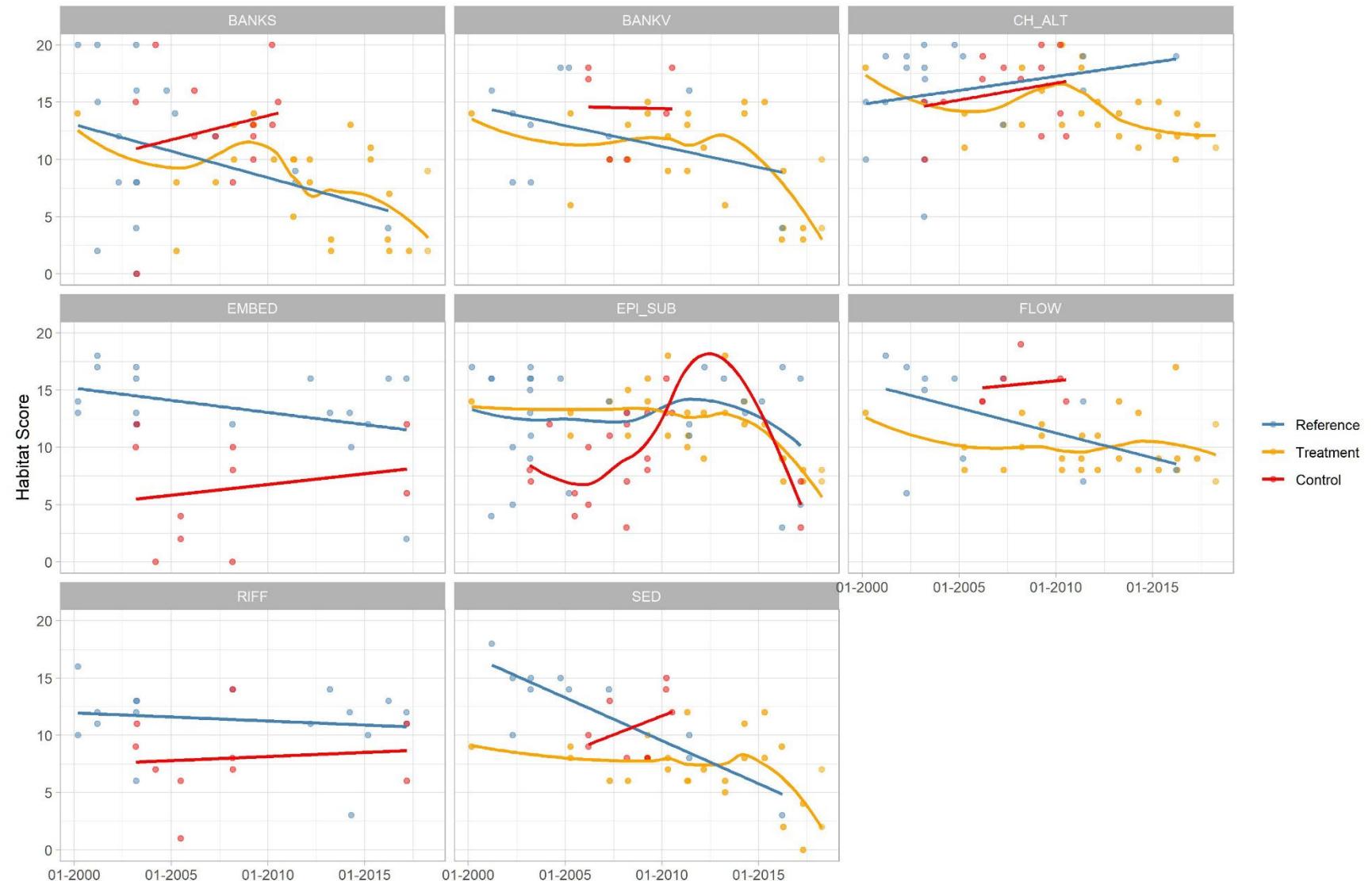


Figure A52. Bear Branch habitat metrics.

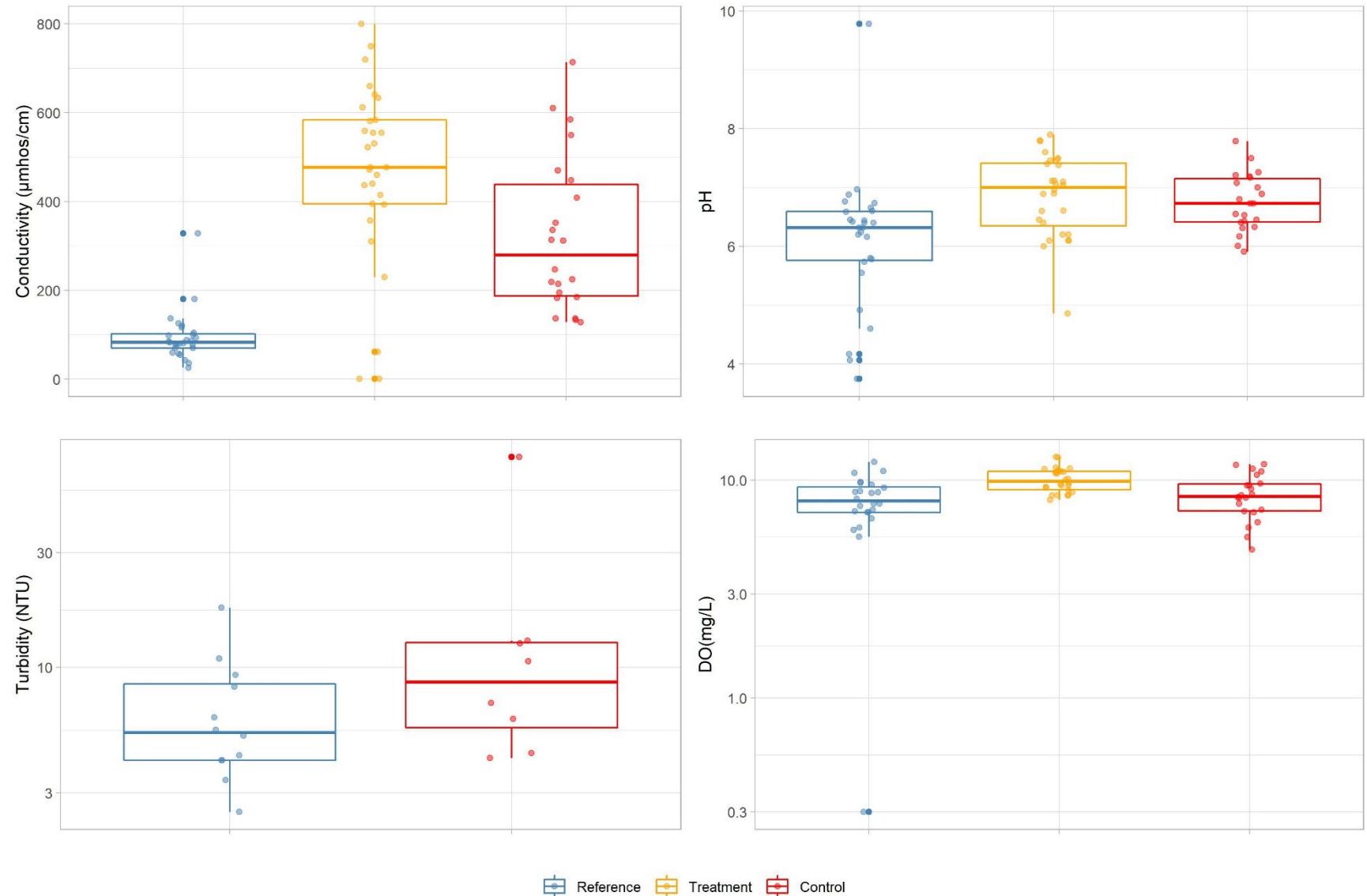


Figure A53. Bear Branch water quality metrics.

Table A34. Median value of water quality metrics at Bear Branch.

Water Quality Parameter	Catchment Type	Median	N
DO (mg/L)	Control	8.415	22
	Reference	8	24
	Treatment	9.87	26
PH	Control	6.73	22
	Reference	6.32	27
	Treatment	7	28
SPCOND (umhos/cm)	Control	279.5	22
	Reference	83.4	27
	Treatment	477	29
TURB_NTU (ntu)	Control	8.85	8
	Reference	5.35	12

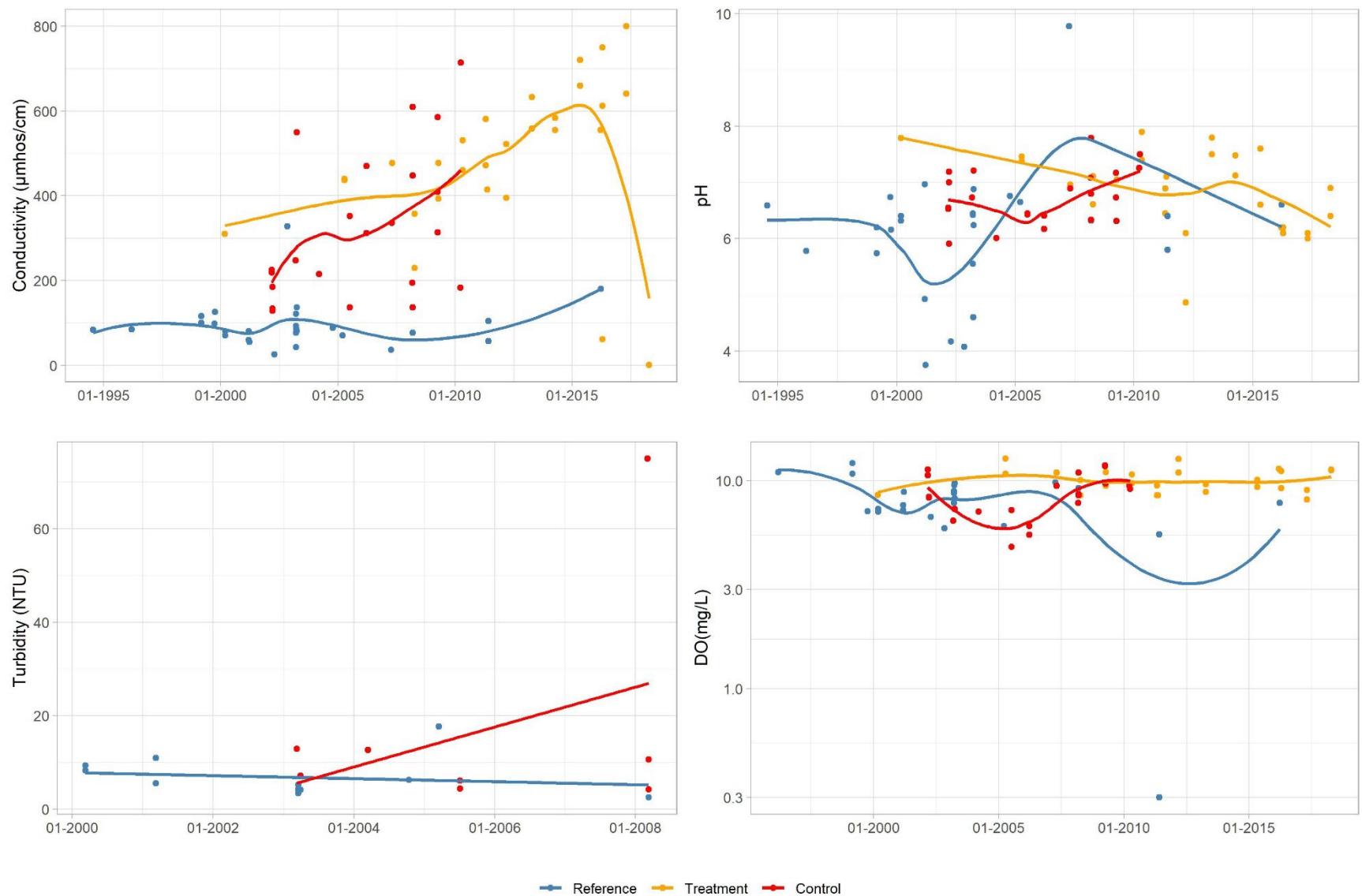


Figure A54. Bear Branch water quality metrics.

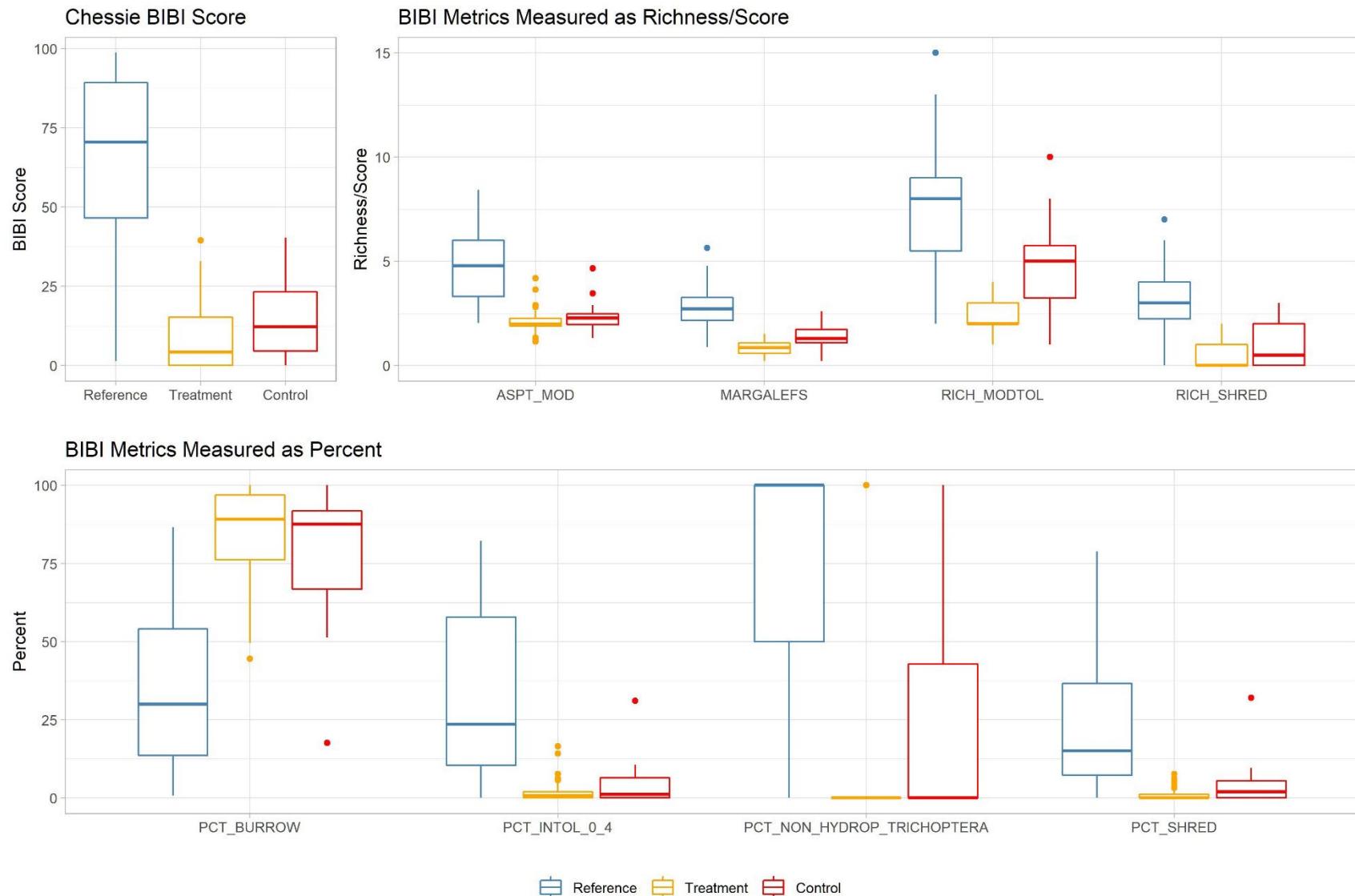


Figure A55. Moores Run biology metrics.

Table A35. Median Chessie BIBI score and number of samples at Moores Run.

Catchment Type	Median	N
Control	12.20	14
Reference	70.47	58
Treatment	4.23	80

Table A36. Median biological metric value by catchment type at Moores Run.

Biological Metric	Catchment Type	Median	N
ASPT_MOD	Control	2.275	14
	Reference	4.785	58
	Treatment	1.98	59
MARGALEFS	Control	1.3	13
	Reference	2.715	58
	Treatment	0.86	60
PCT_BURROW	Control	87.63	14
	Reference	29.995	58
	Treatment	89.13	57
PCT_INTOL_0_4	Control	1.09	13
	Reference	23.525	58
	Treatment	0.73	54
PCT_NON_HYDROPT_TRICHOPTERA	Control	0	11
	Reference	100	52
	Treatment	0	35
PCT_SHRED	Control	1.96	13
	Reference	15.09	57
	Treatment	0.1	52
RICH_MODTOL	Control	5	14
	Reference	8	55
	Treatment	2	50
RICH_SHRED	Control	0.5	12
	Reference	3	54
	Treatment	0	44

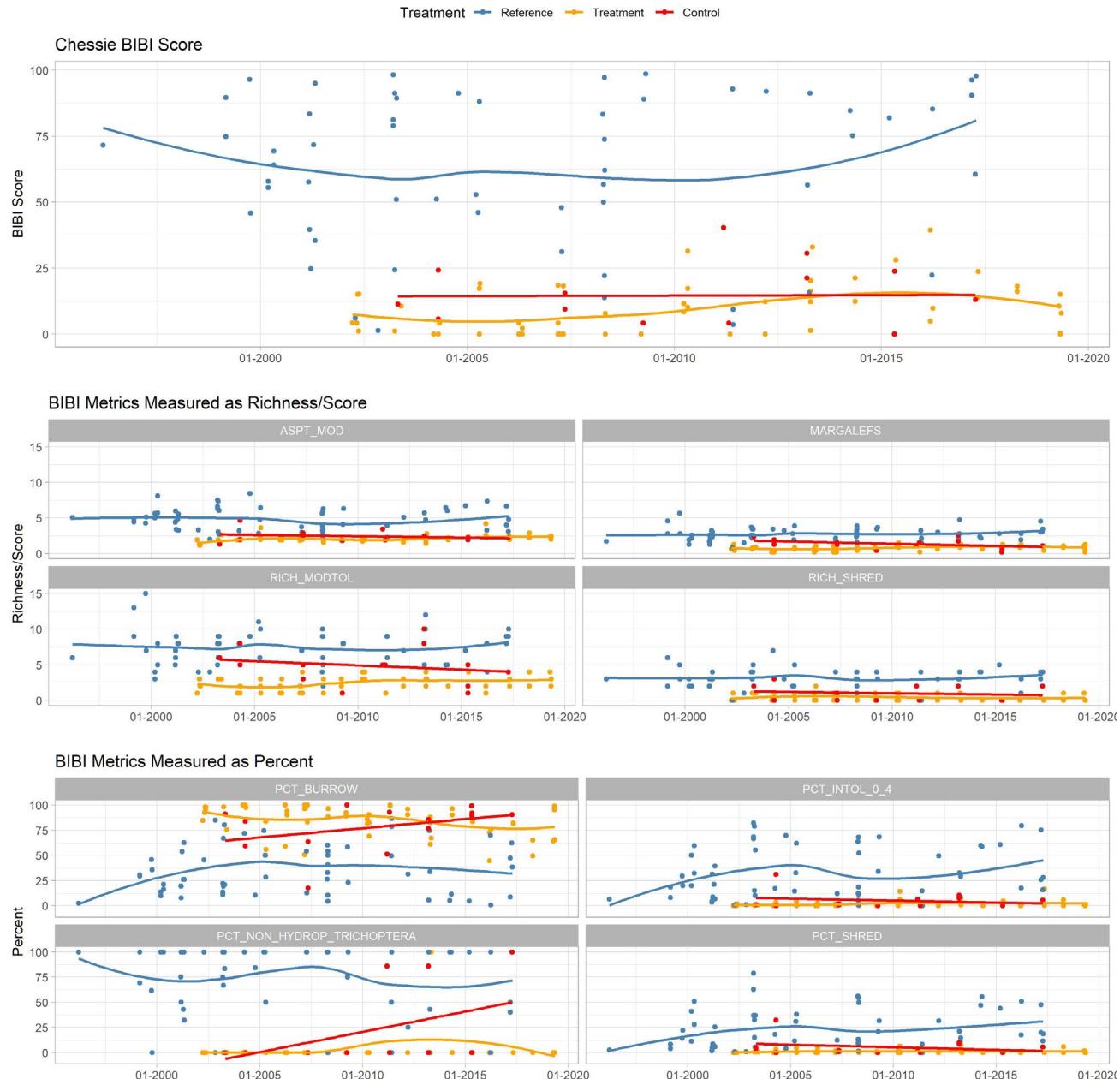


Figure A56. Moores Run biology metrics over time.

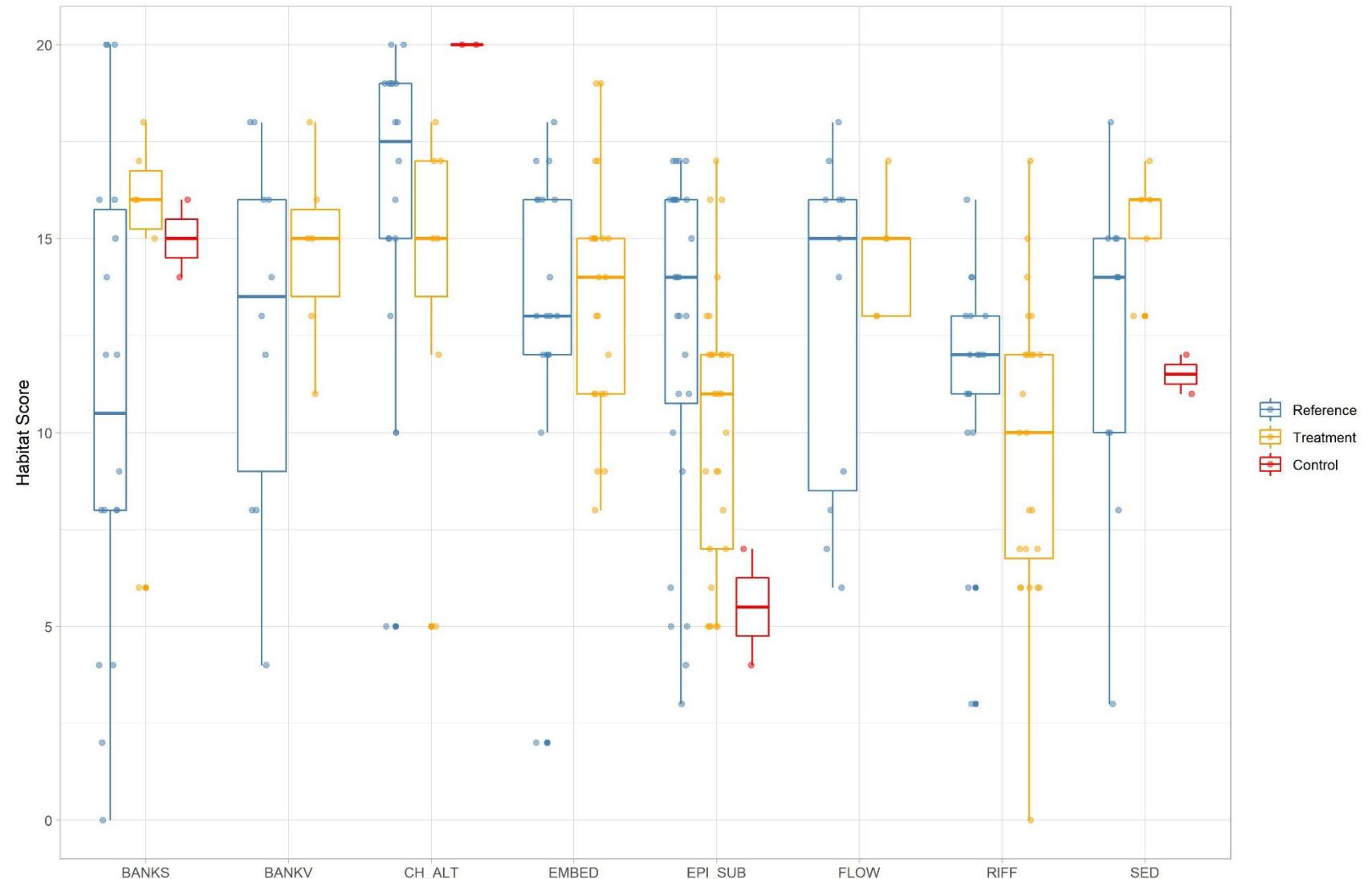


Figure A57. Moores Run habitat metrics.

Table A37. Median value of habitat metrics at Moores Run.

Habitat Metric	Catchment Type	Median	N
BANKS	Control	15	2
	Reference	10.5	18
	Treatment	16	6
BANKV	Reference	13.5	10
	Treatment	15	6
CH_ALT	Control	20	2
	Reference	17.5	18
	Treatment	15	7
EMBED	Reference	13	18
	Treatment	14	22
EPI_SUB	Control	5.5	2
	Reference	14	28
	Treatment	11	28
FLOW	Reference	15	11
	Treatment	15	5
RIFF	Reference	12	17
	Treatment	10	24
SED	Control	11.5	2
	Reference	14	11
	Treatment	16	5

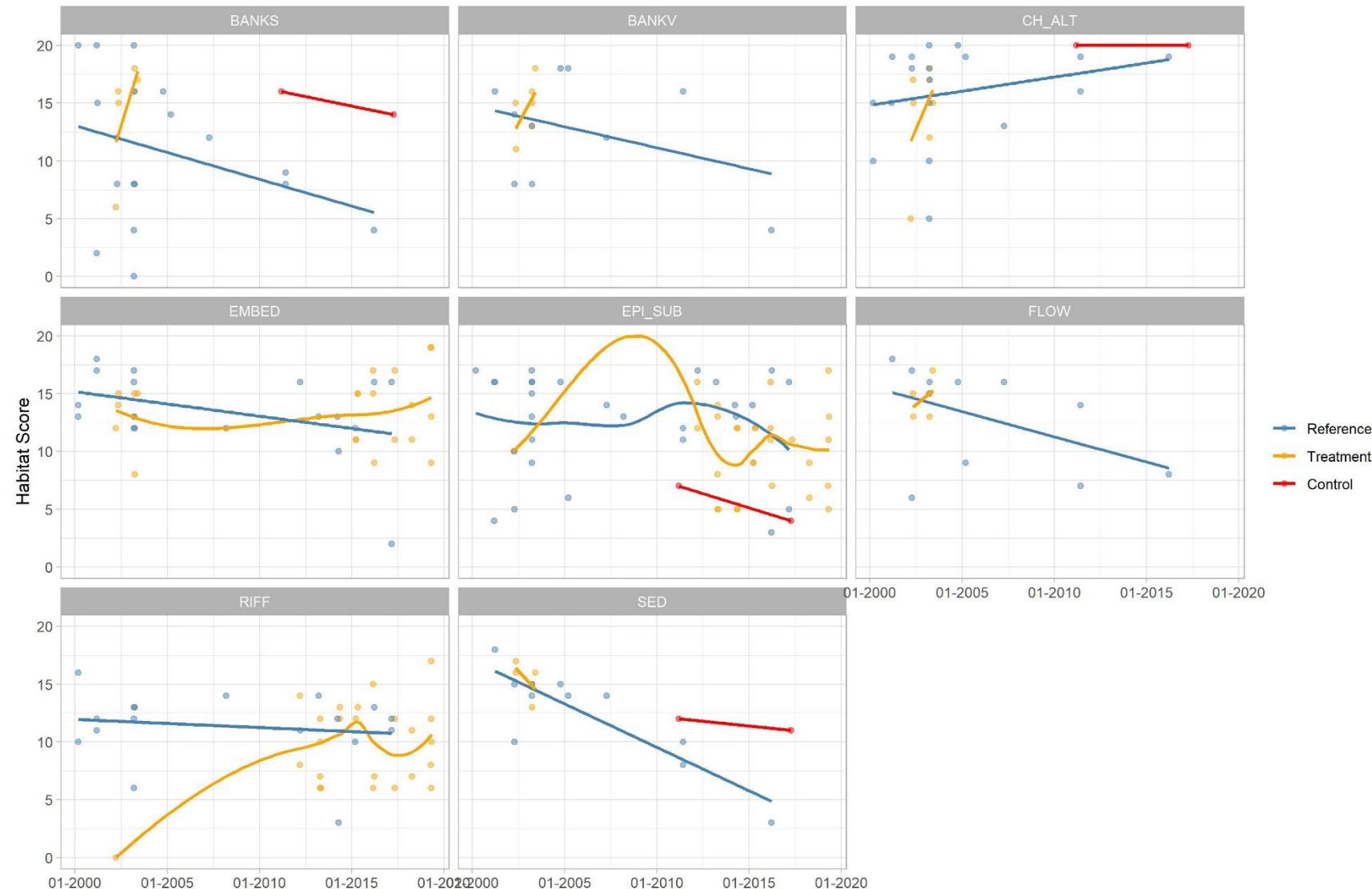


Figure A58. Moores Run habitat metrics.

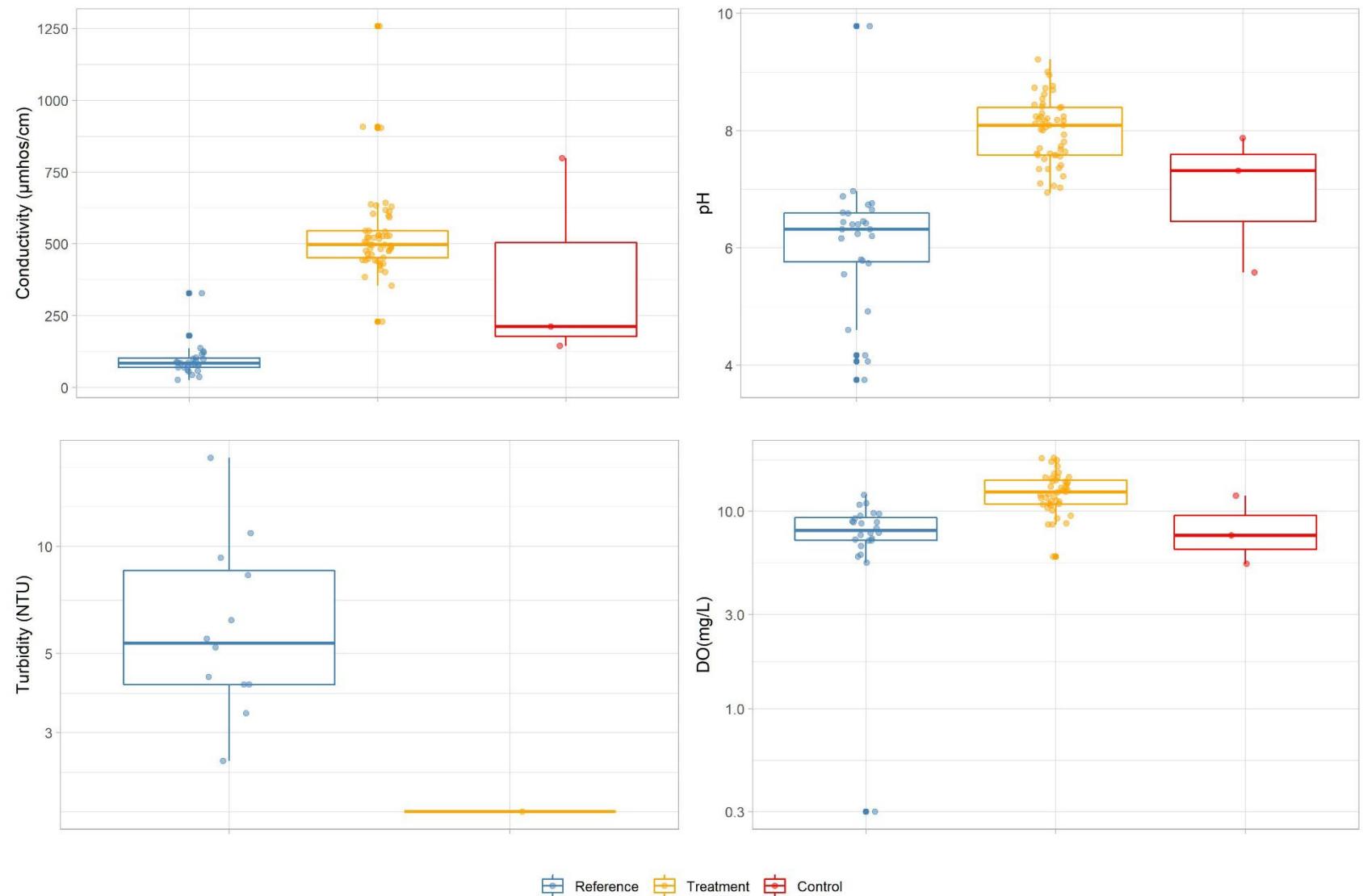


Figure A59. Moores Run water quality metrics.

Table A38. Median value of water quality metrics at Moores Run.

Water Quality Parameter	Catchment Type	Median	N
DO (mg/L)	Control	7.56	3
	Reference	8	24
	Treatment	12.52	45
PH	Control	7.32	3
	Reference	6.32	27
	Treatment	8.09	52
SPCOND (umhos/cm)	Control	211.9	3
	Reference	83.4	27
	Treatment	498	53
TURB_NTU (ntu)	Reference	5.35	12
	Treatment	1.8	1

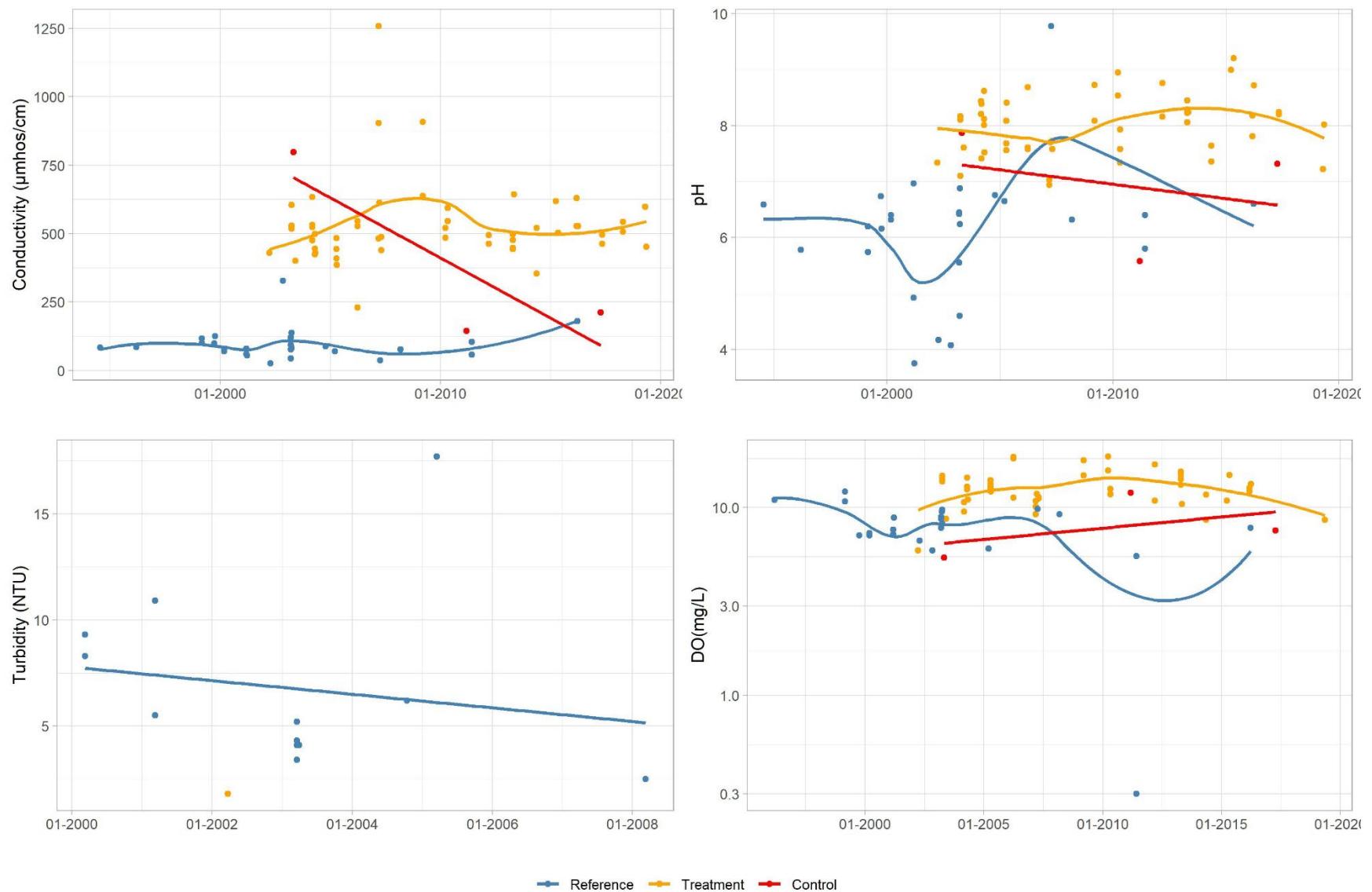


Figure A60. Moores Run water quality metrics over time.

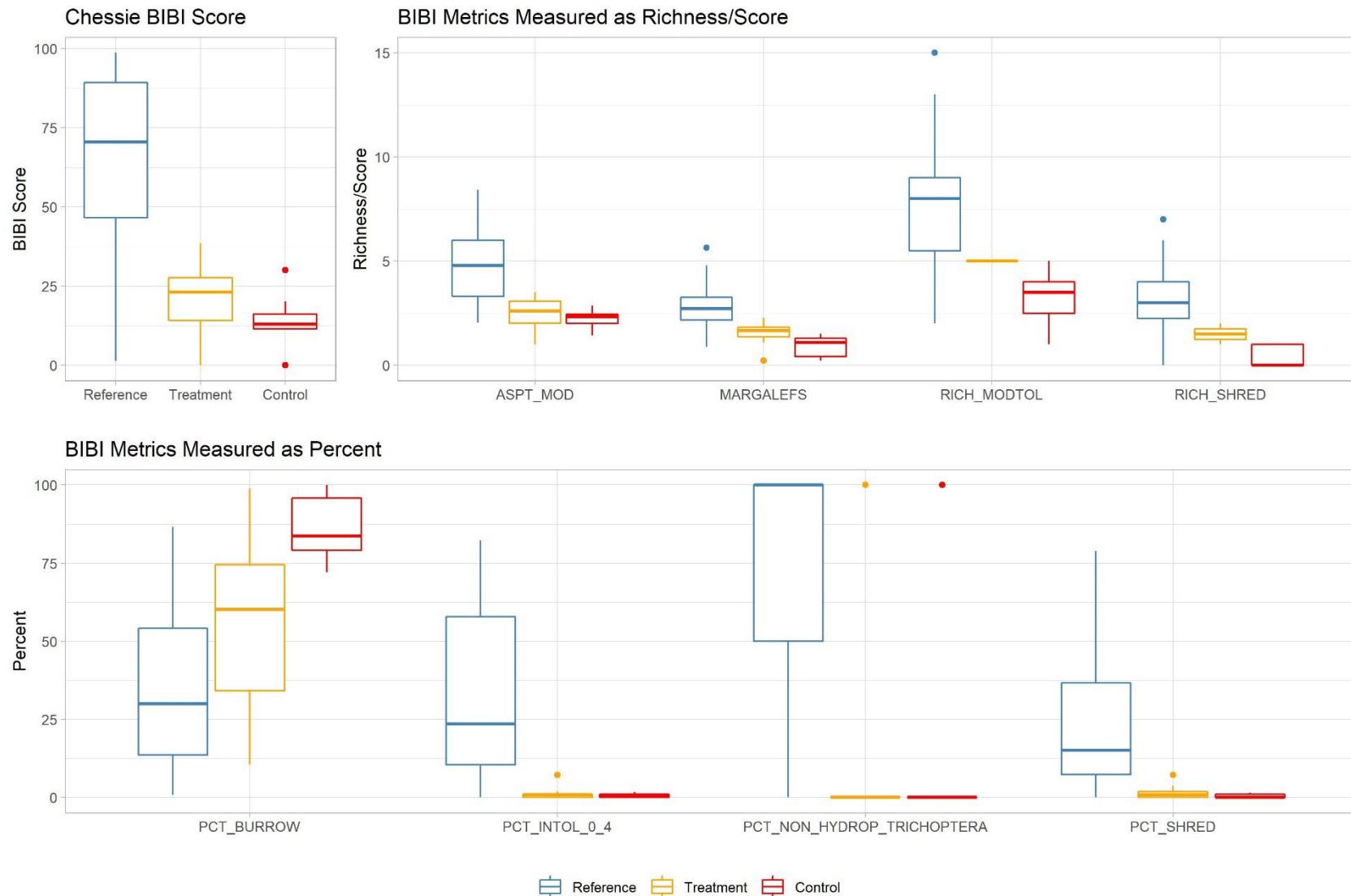


Figure A61. Parole Town Center biology metrics.

Table A39. Median Chessie BIBI score and number of samples at Parole Town Center.

Catchment Type	Median	N
Control	12.92	9
Reference	70.47	58
Treatment	23.16	23

Table A40. Median biological metric value by catchment type at Parole Town Center.

Biological Metric	Catchment Type	Median	N
ASPT_MOD	Control	2.34	9
	Reference	4.785	58
	Treatment	2.6	23
MARGALEFS	Control	1.09	9
	Reference	2.715	58
	Treatment	1.66	23
PCT_BURROW	Control	83.7	9
	Reference	29.995	58
	Treatment	60.19	23
PCT_INTOL_0_4	Control	0.78	9
	Reference	23.525	58
	Treatment	0.885	14
PCT_NON_HYDROPTER_TRICHOPTERA	Control	0	8
	Reference	100	52
	Treatment	0	8
PCT_SHRED	Control	0	9
	Reference	15.09	57
	Treatment	0.9	17
RICH_MODTOL	Control	3.5	8
	Reference	8	55
	Treatment	5	2
RICH_SHRED	Control	0	8
	Reference	3	54
	Treatment	1.5	2



Figure A62. Parole Town Center biology metrics over time.

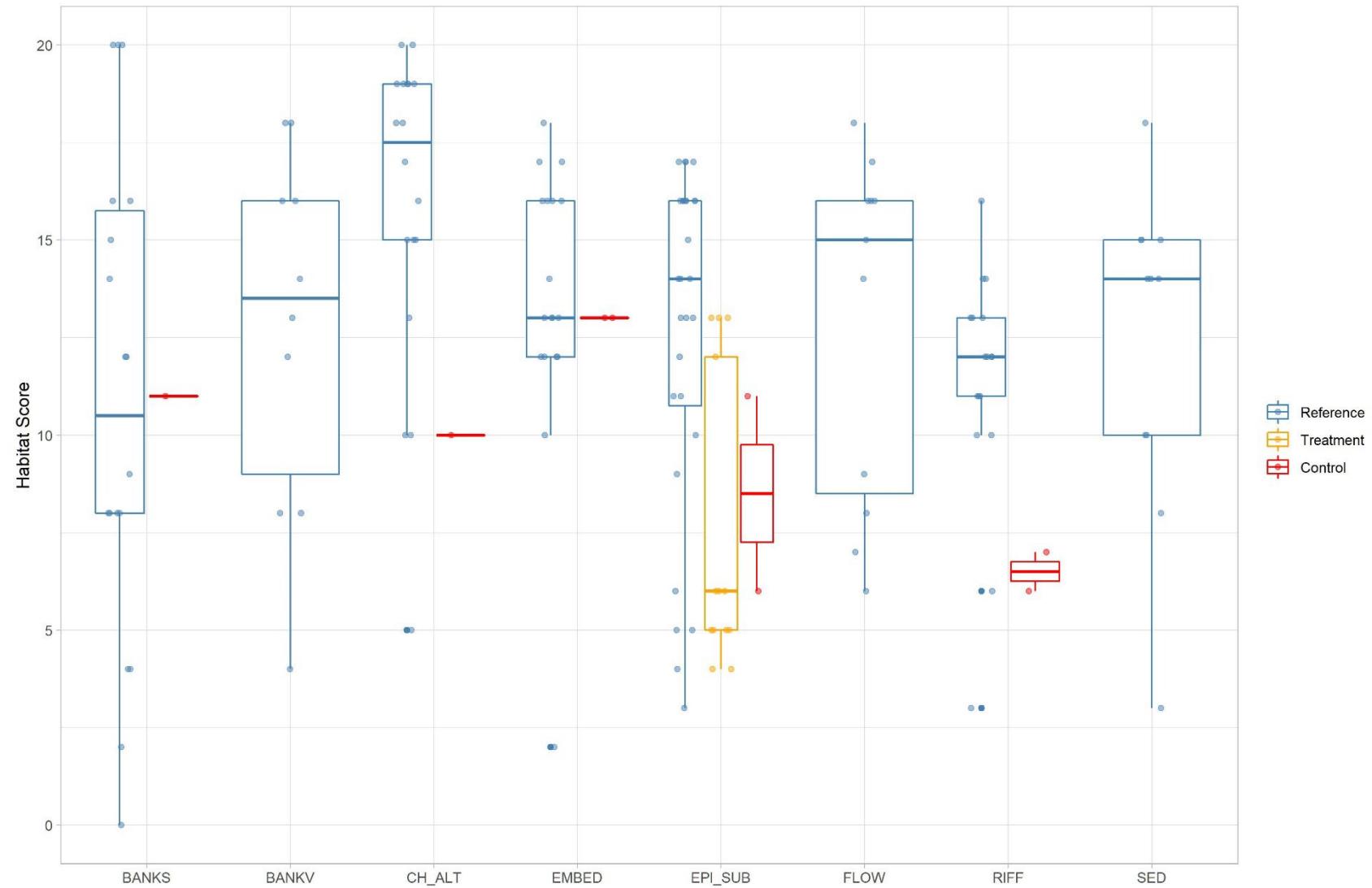


Figure A63. Parole Town Center habitat metrics.

Table A41. Median value of habitat metrics at Parole Town Center.

Habitat Metric	Catchment Type	Median	N
BANKV	Control	11	1
	Reference	10.5	18
	Reference	13.5	10
CH_ALT	Control	10	1
	Reference	17.5	18
EMBED	Control	13	2
	Reference	13	18
EPI_SUB	Control	8.5	2
	Reference	14	28
	Treatment	6	13
FLOW	Reference	15	11
	Control	6.5	2
RIFF	Reference	12	17
SED	Reference	14	11

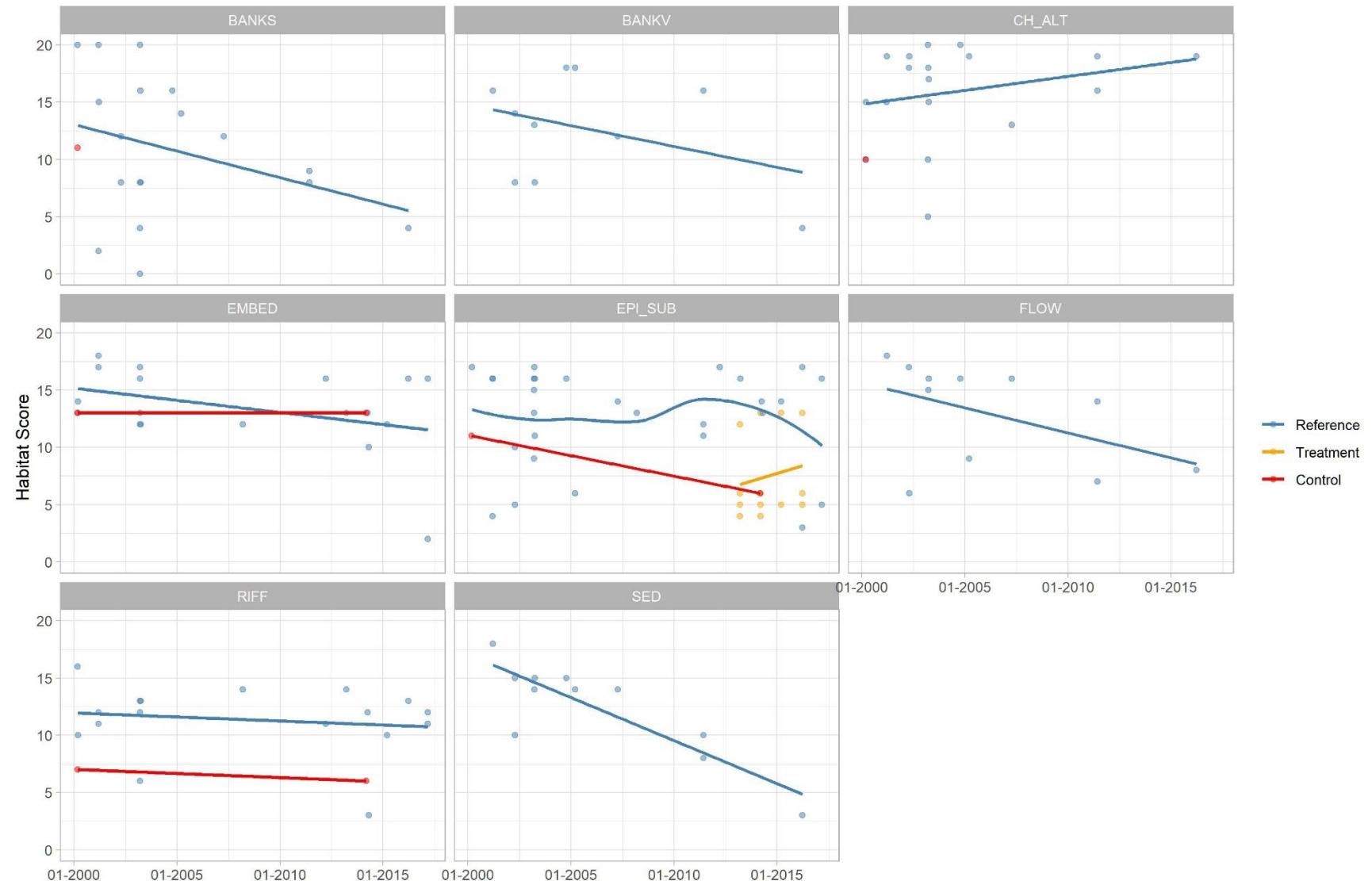


Figure A64. Parole Town Center habitat metrics over time.

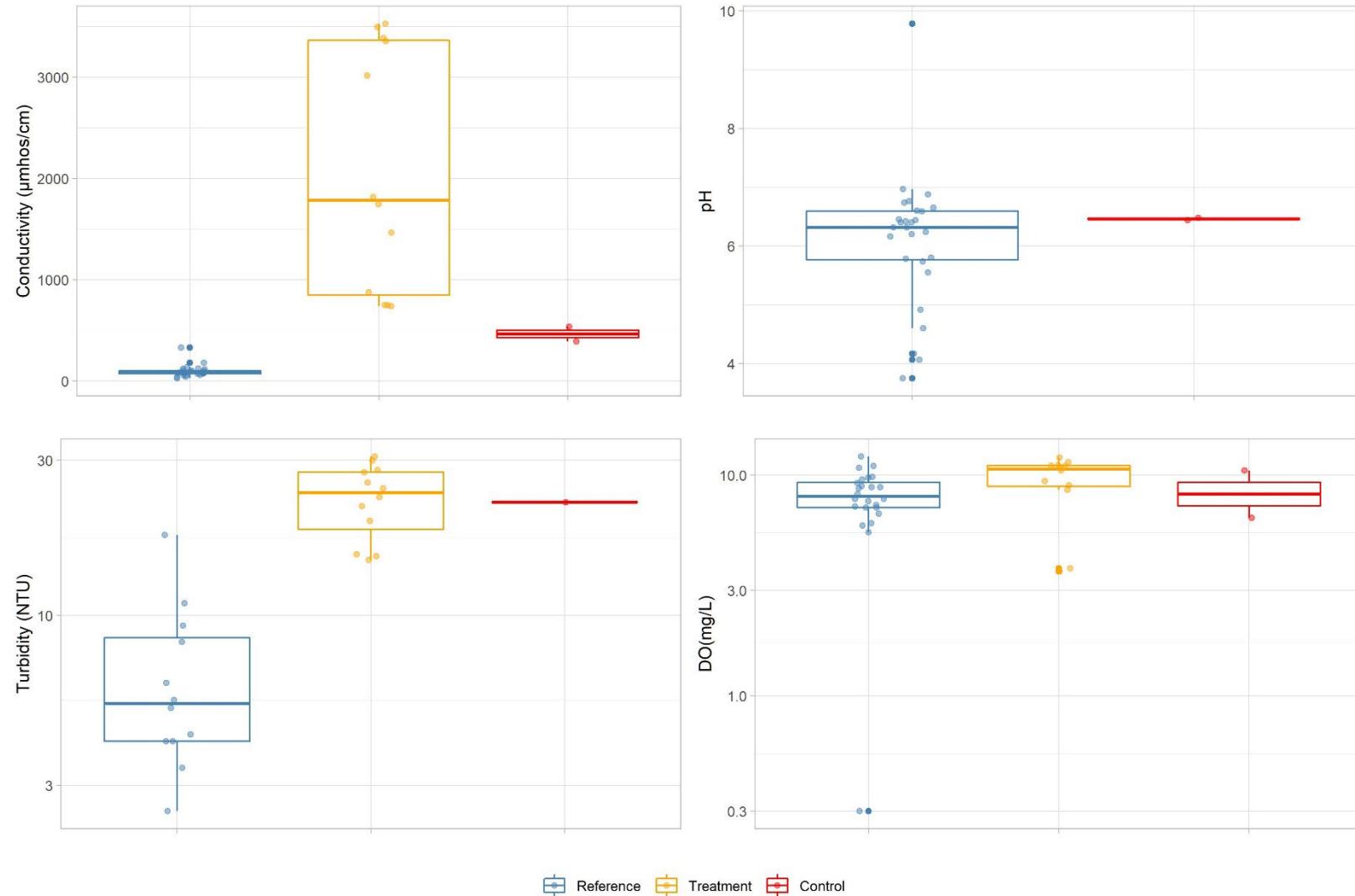


Figure A65. Parole Town Center water quality metrics.

Table A42. Median value of water quality metrics at Parole Town Center.

Water Quality Parameter	Catchment Type	Median	N
DO (mg/L)	Control	8.45	2
	Reference	8	24
	Treatment	10.66	12
PH	Control	6.46	2
	Reference	6.32	27
SPCOND (umhos/cm)	Control	463.5	2
	Reference	83.4	27
	Treatment	1781	12
TURB_NTU (ntu)	Control	22.3	1
	Reference	5.35	12
	Treatment	23.85	12

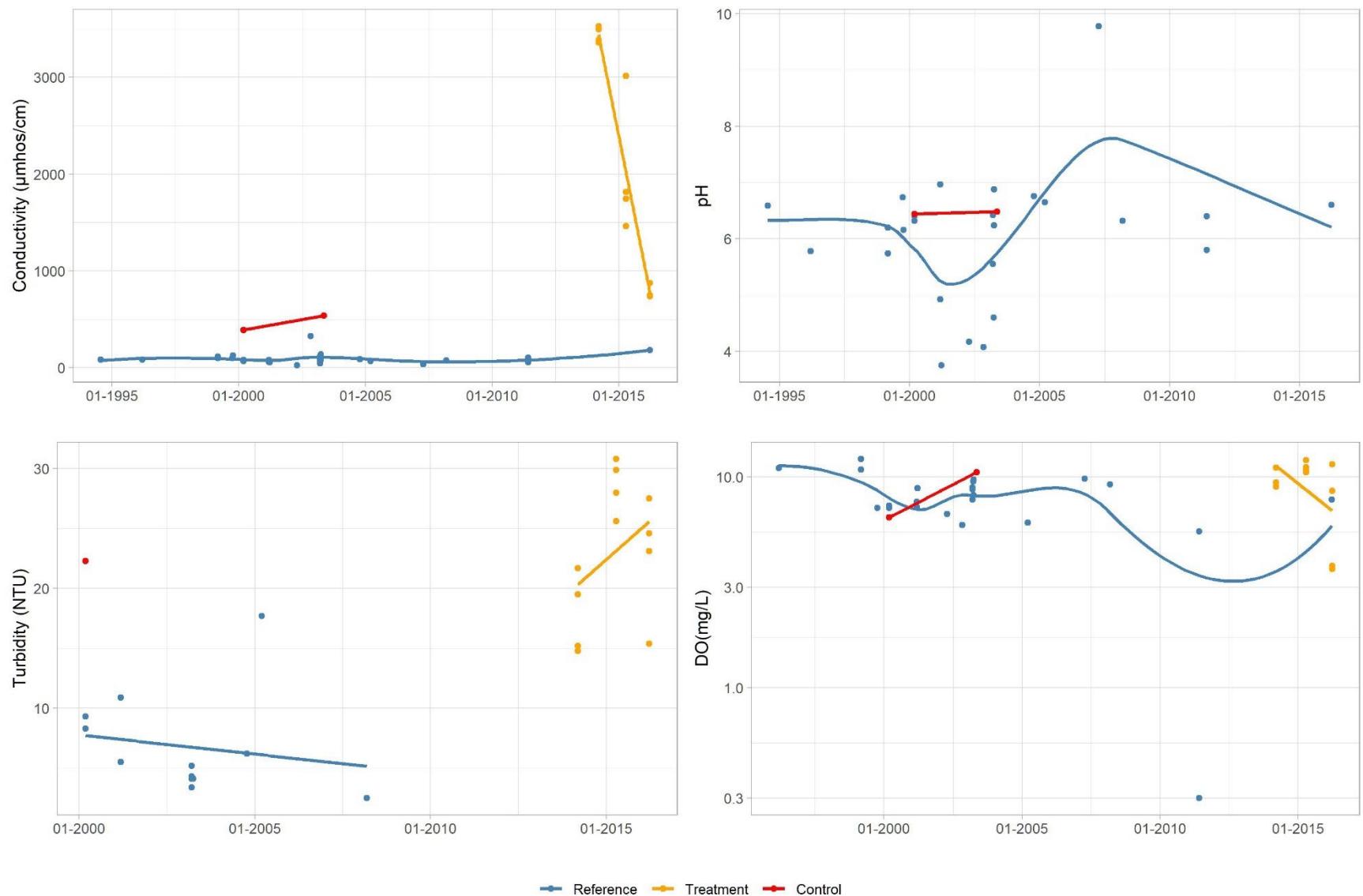


Figure A66. Parole Town Center water quality metrics over time.

Table A43. Summary of overall MS4 conditions.

Region	MS4	%IC	%Tree/ Shrub	WQ BMP (% of IC)	Stream Restoration (SR)	Watershed Changes	Median Values			
							WQ (SPCOND)	HABITAT (EPI SUB)	HABITAT (BANKS)	Biology (BIBI)
Northern Piedmont	Airpark Business Center	25%	8%	99%	NONE	Medium Growth High BMPs	N/A	11	N/A	47
	Breewood	26%	57%	48%	HIGH	Low Growth High SR	452	10	12	11
	Red Hill Branch	26%	36%	53%	MEDIUM	Low Growth Moderate SR	612*	10	10*	27
	Scotts Level Branch	29%	42%	8%	LOW	Low SR Low BMPs	407	12*	10.5*	14
	Urbana	25%	26%	46%	NONE	High Growth	351	11	7	19
	Stewart-April Lane/Paint Branch	16%	61%	34%	MEDIUM	Low Growth Moderate SR	112	14	12	40
South-eastern Plain	Acton/ Hamilton	36%	46%	47%	NONE	Low Growth	214.2	<u>13.5</u>	15	22
	Bear Branch	28%	23%	65%	LOW	Moderate Growth Low SR	477	<u>12</u>	9.5	<u>34</u>
	Moores Run	46%	34%	1%	NONE	None	498	11	16	4
	Parole Town Center/Church Creek	66%	21%	50%	MEDIUM	Moderate SR High BMP	1781	6	N/A	23

* Median based on fewer than 10 data points

Red shading: “Poor” condition indicated by any of the following: BIBI score is very poor; habitat score <=6; SPCOND >750; IC >35%; tree/shrub <25%; WQ BMP <25%; no or little stream restoration

Green shading: “Good” condition indicated by any of the following: BIBI score fair; habitat score >12; SPCOND<350; IC<25%; tree/shrub>50%; WQ BMP>=50%; large amount of stream restoration.

Large Bold text indicates significantly worse result than the control.

Large underlined text indicates significantly better result than the control.

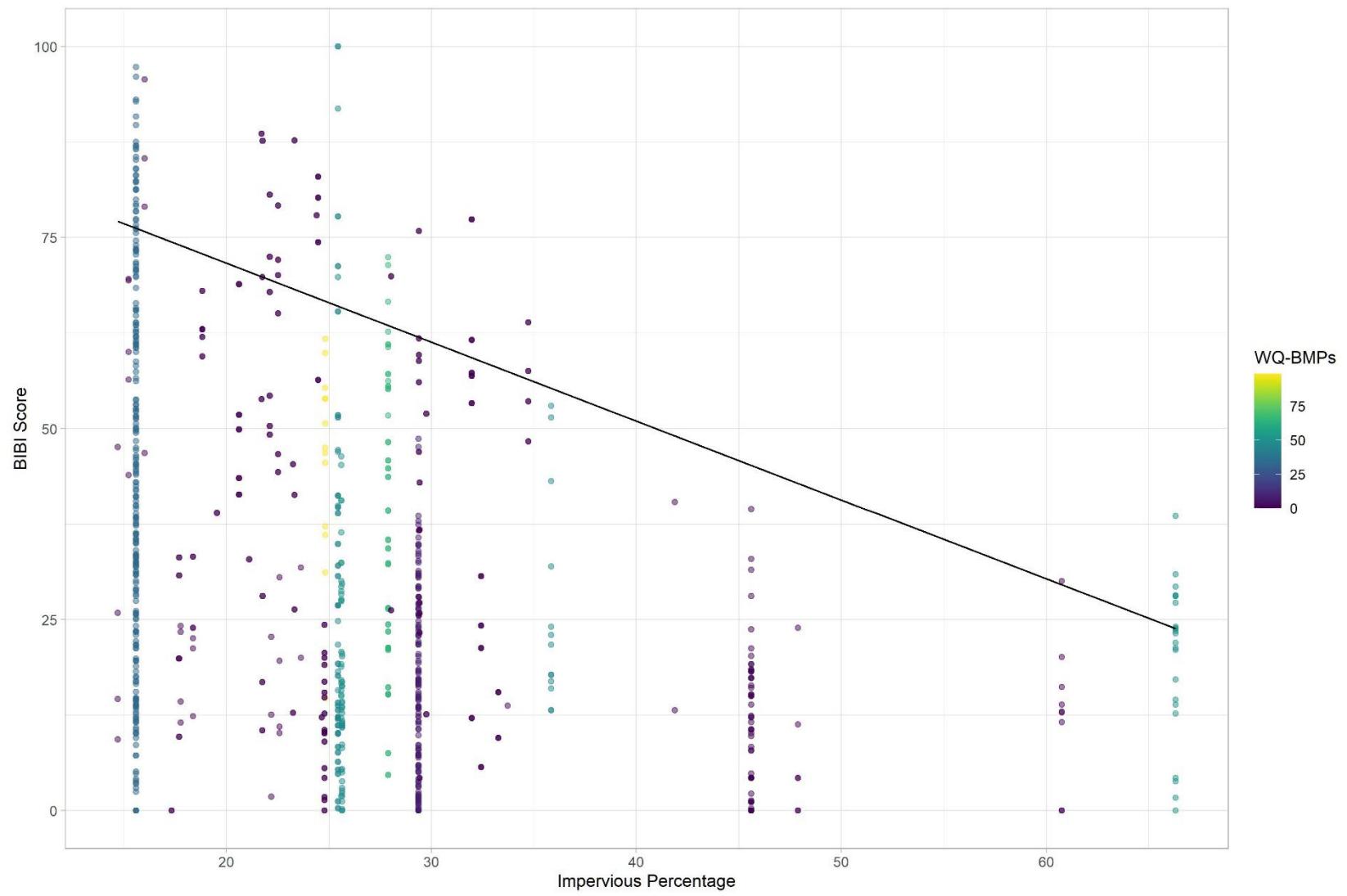


Figure A67. Chessie BIBI scores plotted against percent impervious cover. Color ramp shows the percentage of water quality BMPs in the local catchment.

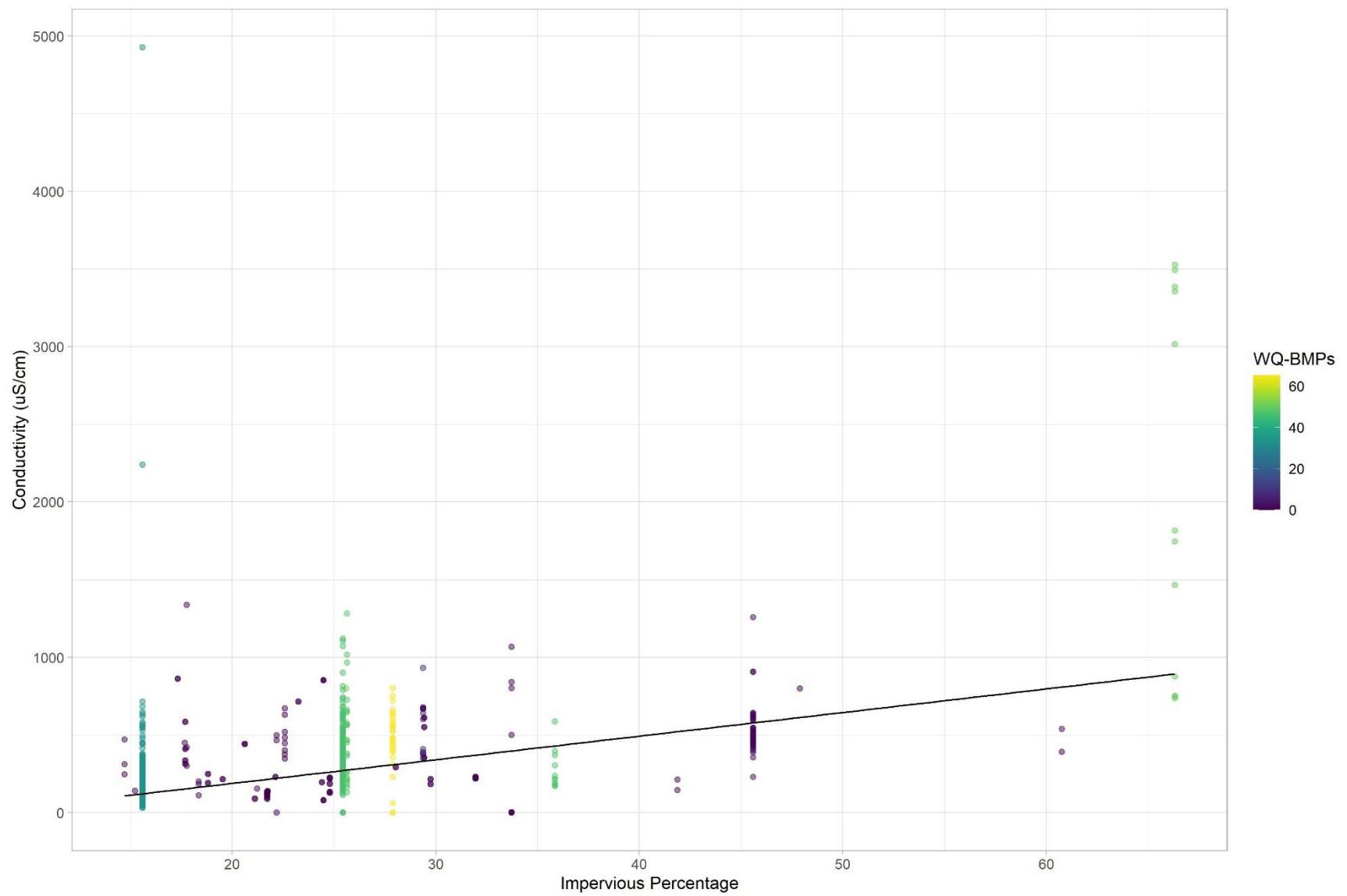


Figure A68. Conductivity plotted against percent impervious cover. Color ramp shows the percentage of water quality BMPs in the local catchment.

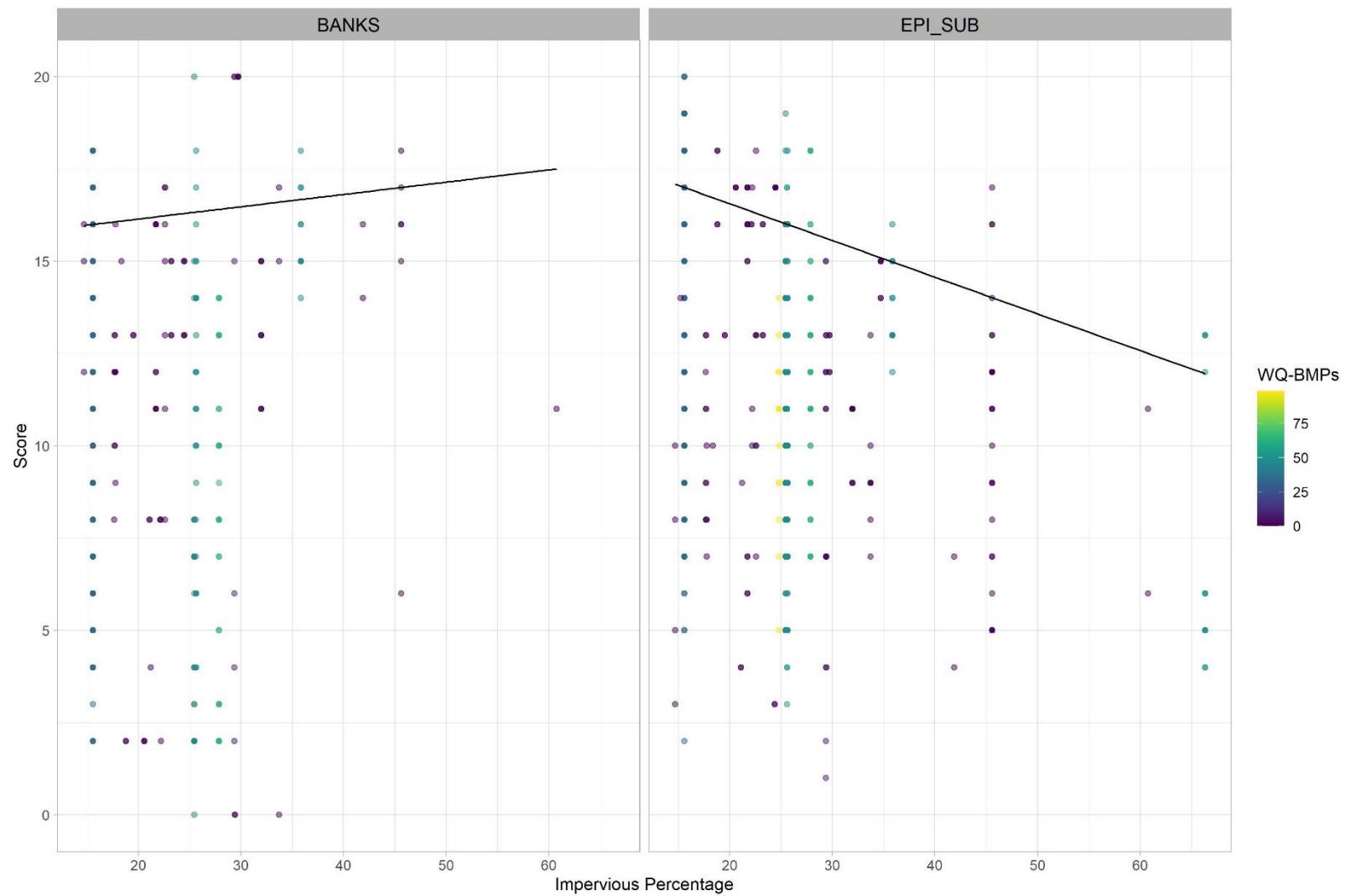


Figure A69. Bank stability (left) and epifaunal substrate (right) habitat scores plotted against percent impervious cover.
Color ramp shows the percentage of water quality BMPs in the local catchment.

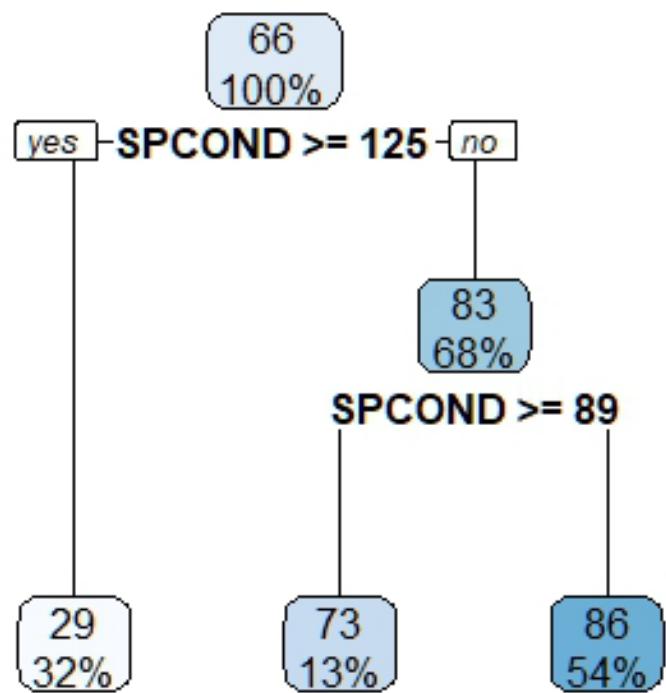


Figure A70. Classification and Regression Tree Analysis with biology, water quality, and habitat as explanatory factors.

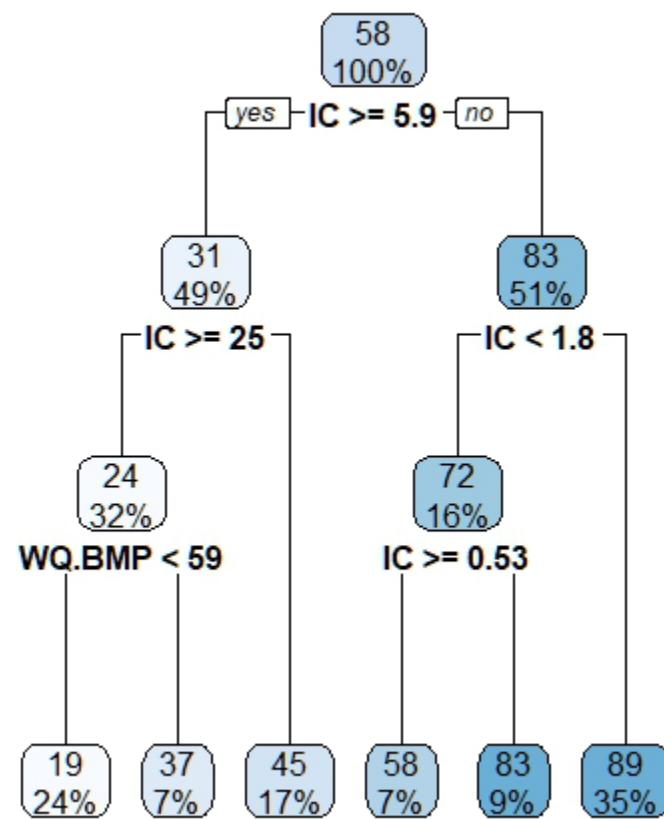


Figure A71. Classification and Regression Tree Analysis with biology, impervious cover, and water quality BMP cover as explanatory factors.

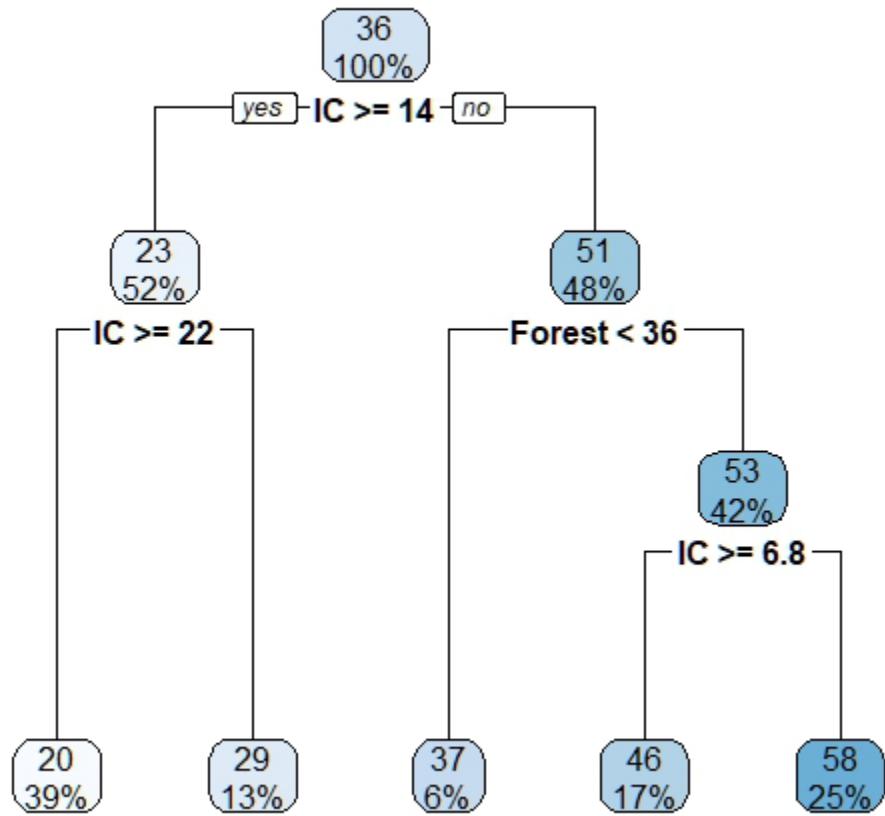


Figure A72. Classification and Regression Tree Analysis with biology, forest, and impervious cover as explanatory factors.