



Supplement of

Citizen science as a long-term environmental baseline: assessing impacts of a small dam removal in Montana, USA

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Figure S1. Photos of the Watershed Education Network Stream Team monitoring. Methods include measuring cross-sectional profiles (a), conducting aquatic macroinvertebrate counts (b, c), and conducting pebble counts (d). Photos courtesy of Stephie Novak (WEN; a-c) and Bethany Blakey (d).

Table S1. Stream Team site names and distances from the dam and confluence with the Clark Fork river

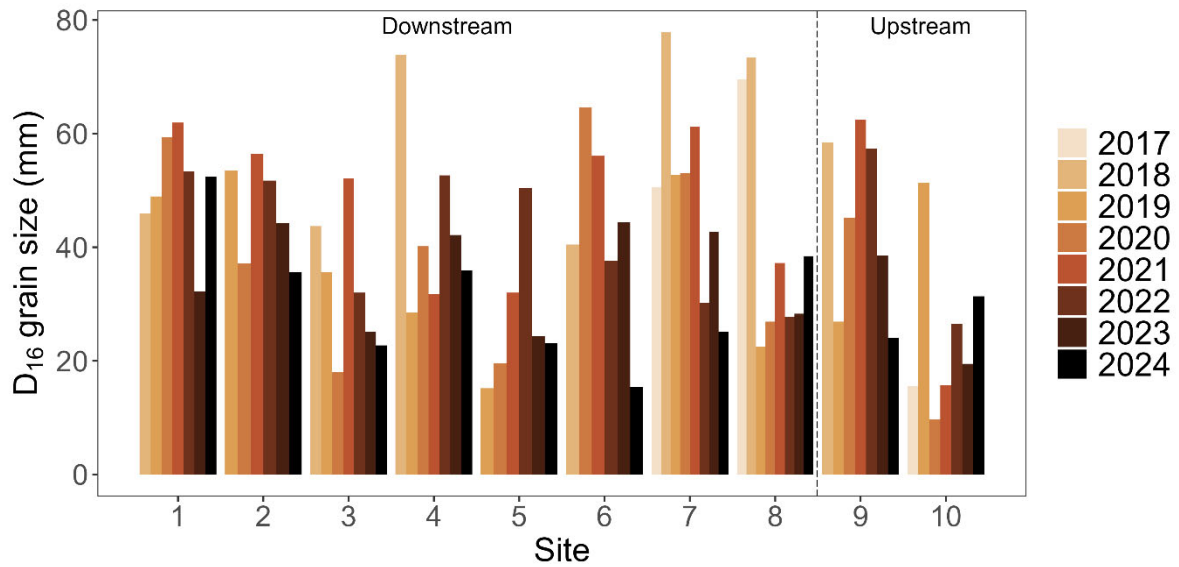
Site	Name	Distance below the dam (km)	Distance above the dam (km)	Distance from confluence (km)
1	Confluence w/ Clark Fork	8.73	n/a	0.07
2	Lower Greenough Park	7.5	n/a	1.3
3	Upper Greenough Park	6.5	n/a	2.3
4	Pine View Park	4.3	n/a	4.5
5	Creek Crossing Road	2.7	n/a	6.1
6	Foxfarm	1.2	n/a	7.6
7	Duncan Drive	0.9	n/a	7.9
8	Below the Dam	0.1	n/a	8.7
9	Above the dam	n/a	0.6	9.4
10	Horse Bridge	n/a	2.9	11.7

Watershed Education Network- Data Entry Template www.MontanaWatershed.org			
Organization/Group:			Data Entered By:
Project ID Code:			Date:
Date:			
Time (24 hour time):			Reviewed By:
Stream/River			Date:
GPS Corridinates	N	W	
Site Description:			
Surveyors			
Weather:			
Cloud Cover:			
Precipitation			
Past Precip. (last 24 Hours)			
Air temp (°C)			
Stream Channel and Riparian Vegetaiton Summary			
Presence of Stream Side Shrubs/Trees:			
Browsing/Grazing on Riparian Shrubs:			
Stream Channel Morphology:			
Floodplain Use:			
Present Flow Characteristics:			
Comments:			

Summary- AutoFills From Above	
Organizati	0
Project ID:	0
Date:	1/0/1900
Site Time (	0:00
Stream/Riv	0
Site Latitud	0
Site Longitu	0
Site Descrip	0
All Surveyd	0
Cloud cove	0
Precipitiati	0
Past Precip	0
Site Air Ter	0
Presence o	0
Browsing/G	0
Stream Cha	0
Floodplain	0
Present Flo	0
Site Comm	0
Data Enter	0
Data Entry	1/0/1900
Date Verifi	0
Data Verifi	1/0/1900

Figure S2. Example page from the Watershed Education Network Excel workbooks used to digitize field data. For inquiries on the complete Excel workbook, please contact water@montanawatershed.org.

(a)



(b)

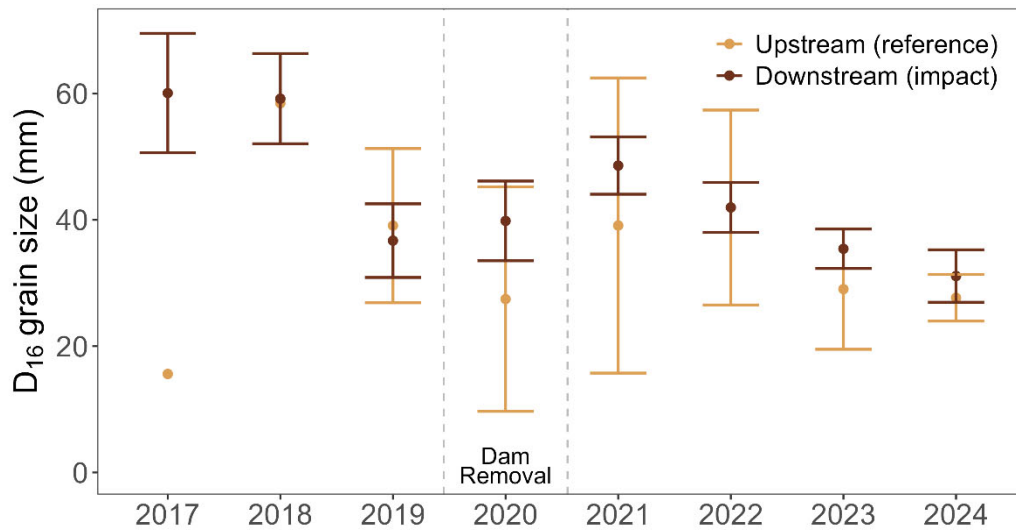
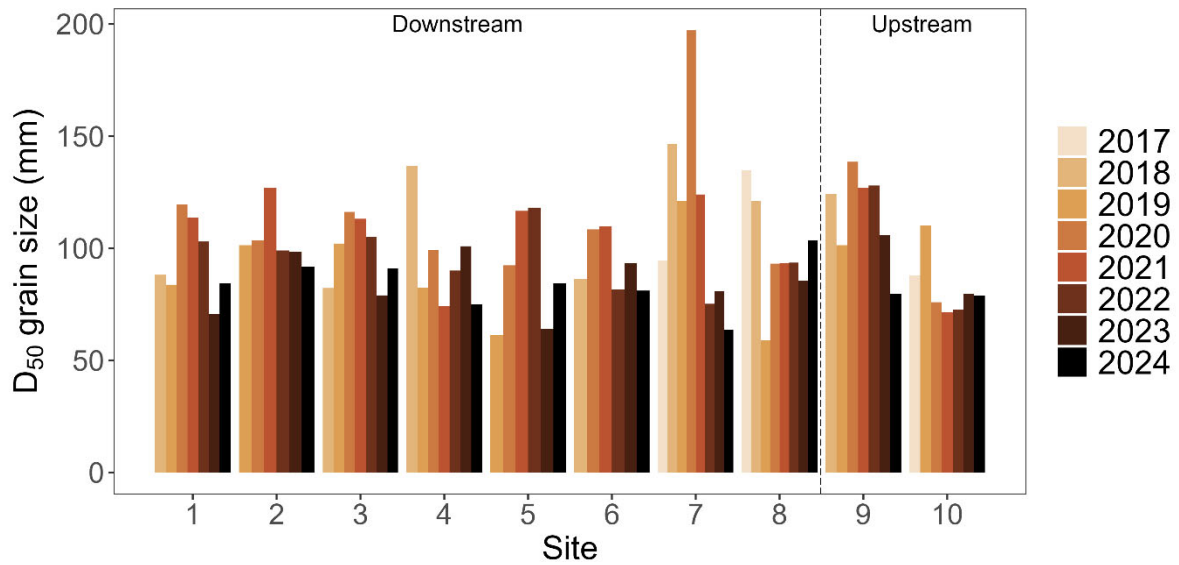


Figure S3. Sixteenth percentile (D_{16}) grain size distribution data. Top chart (a) shows D_{16} distribution by site for all monitoring years. The location of the dam, between sites 8 and 9, is depicted with a dashed line. Bottom chart (b) shows the mean D_{16} distribution from before to after dam removal (2020; grey bar) for impact and reference sites. Error bars represent the standard error of the mean, and data points without error bars are those with only one measurement documented.

(a)



(b)

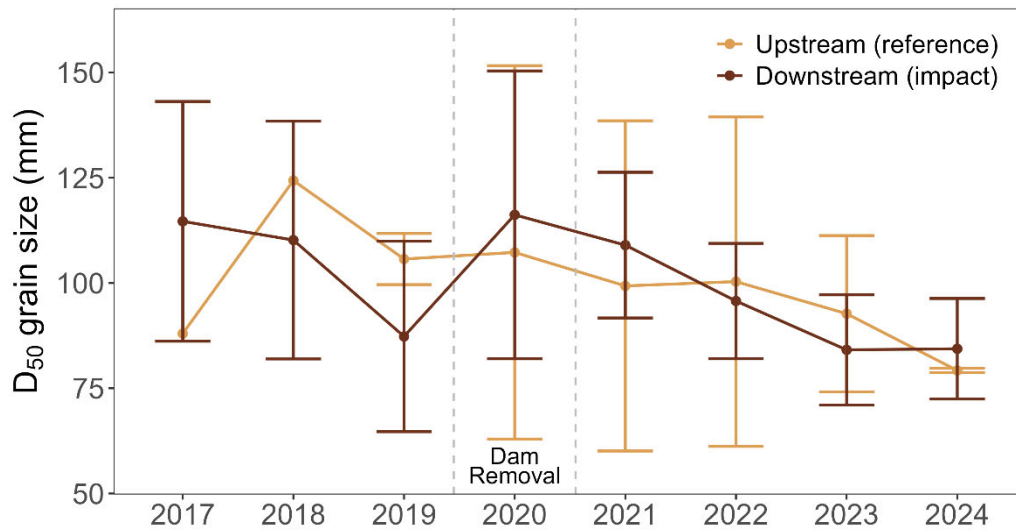
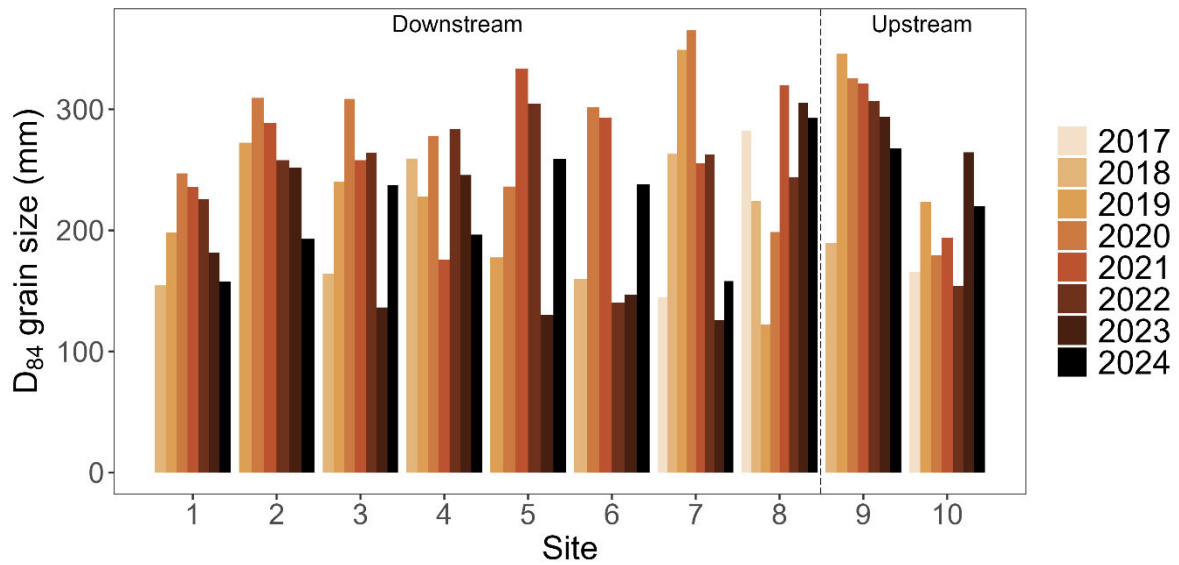


Figure S4. Median (D_{50}) grain size distribution data. Top (a) shows D_{50} distribution by site for all monitoring years. The location of the dam, between sites 8 and 9, is depicted with a vertical dashed line. Bottom (b) shows the mean D_{50} distribution from before to after dam removal (2020; grey bar) for impact and reference sites. Error bars represent the standard error of the mean, and data points without error bars are those with only one measurement documented.

(a)



(b)

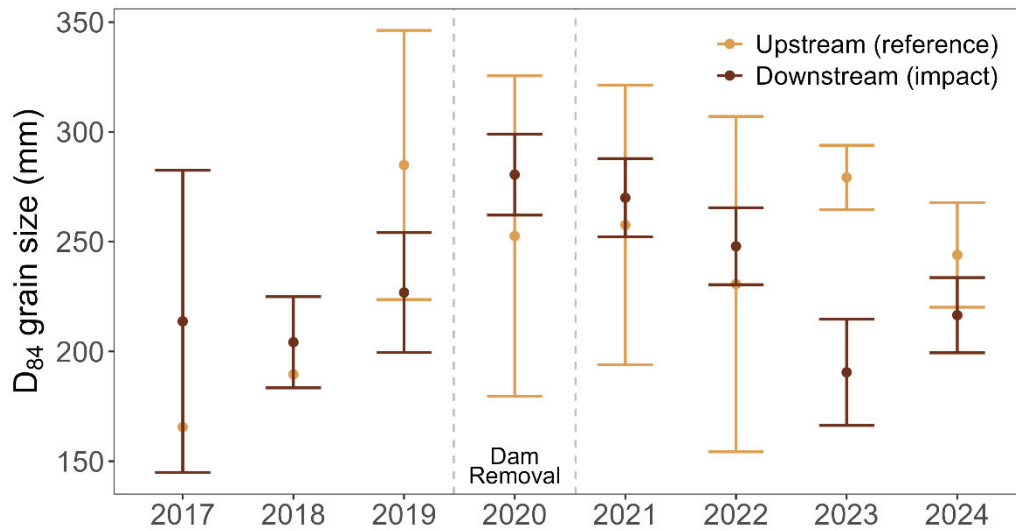


Figure S5. Eighty fourth percentile (D_{84}) grain size distribution data. Top (a) shows D_{84} distribution by site for all monitoring years. The location of the dam, between sites 8 and 9, is depicted with a vertical dashed line. Bottom (b) shows the mean D_{84} distribution from before to after dam removal (2020; grey bar) for impact and reference sites. Error bars represent the standard error of the mean, and data points without error bars are those with only one measurement documented.

Table S2. Mean differences and BACI values for grain size percentiles and the WAV Biotic Index from the BACI calculations using Eq. (1) and their standard error. All standard error values are greater than the BACI values, indicating no significant change in grain size percentiles or the biotic index following dam removal

	Before mean difference	After mean difference	BACI value
	$\bar{x}_{\text{downstream}} - \bar{x}_{\text{upstream}}$	$\bar{x}_{\text{downstream}} - \bar{x}_{\text{upstream}}$	$\bar{x}_{\text{after}} - \bar{x}_{\text{before}}$
D₁₆ (mm)	10.8 ± 11.2	4.8 ± 6.5	-5.9 ± 13.0
D₅₀ (mm)	-5.8 ± 10.3	0.4 ± 8.9	6.2 ± 13.6
D₈₄ (mm)	-15.2 ± 43.3	-21.6 ± 23.3	-6.4 ± 49.2
WAV Biotic Index	0.10 ± 0.14	-0.04 ± 0.05	-0.13 ± 0.15

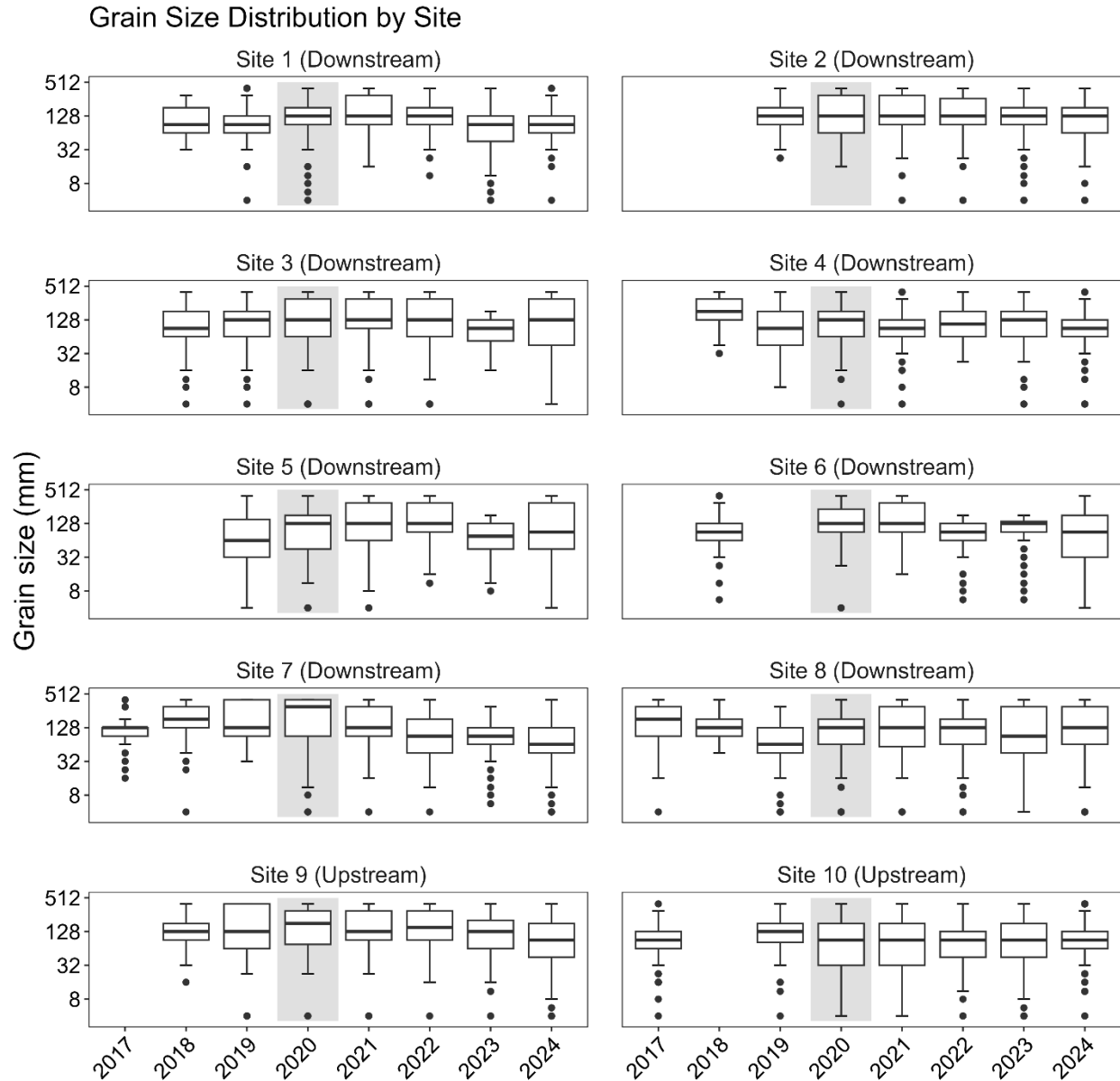


Figure S6. Grain size variations from 2017 to 2024 at each Stream Team site. Sites 1–8 are located downstream of the dam, where site 1 is the downstream-most reach at the confluence with the Clark Fork River, and site 8 is 100 m downstream of the dam site. Sites 9 and 10 are located upstream of the dam. The gray rectangle represents when the dam was removed in 2020, and sites were surveyed in 2020 throughout the dam removal process. The thick horizontal line through the box shows the median, the height of the box shows the interquartile range, the vertical lines represent 1.5 times the interquartile range, and the circles represent data points outside of 1.5 times the interquartile range. Overall, there are not discernible changes in grain size following dam removal.

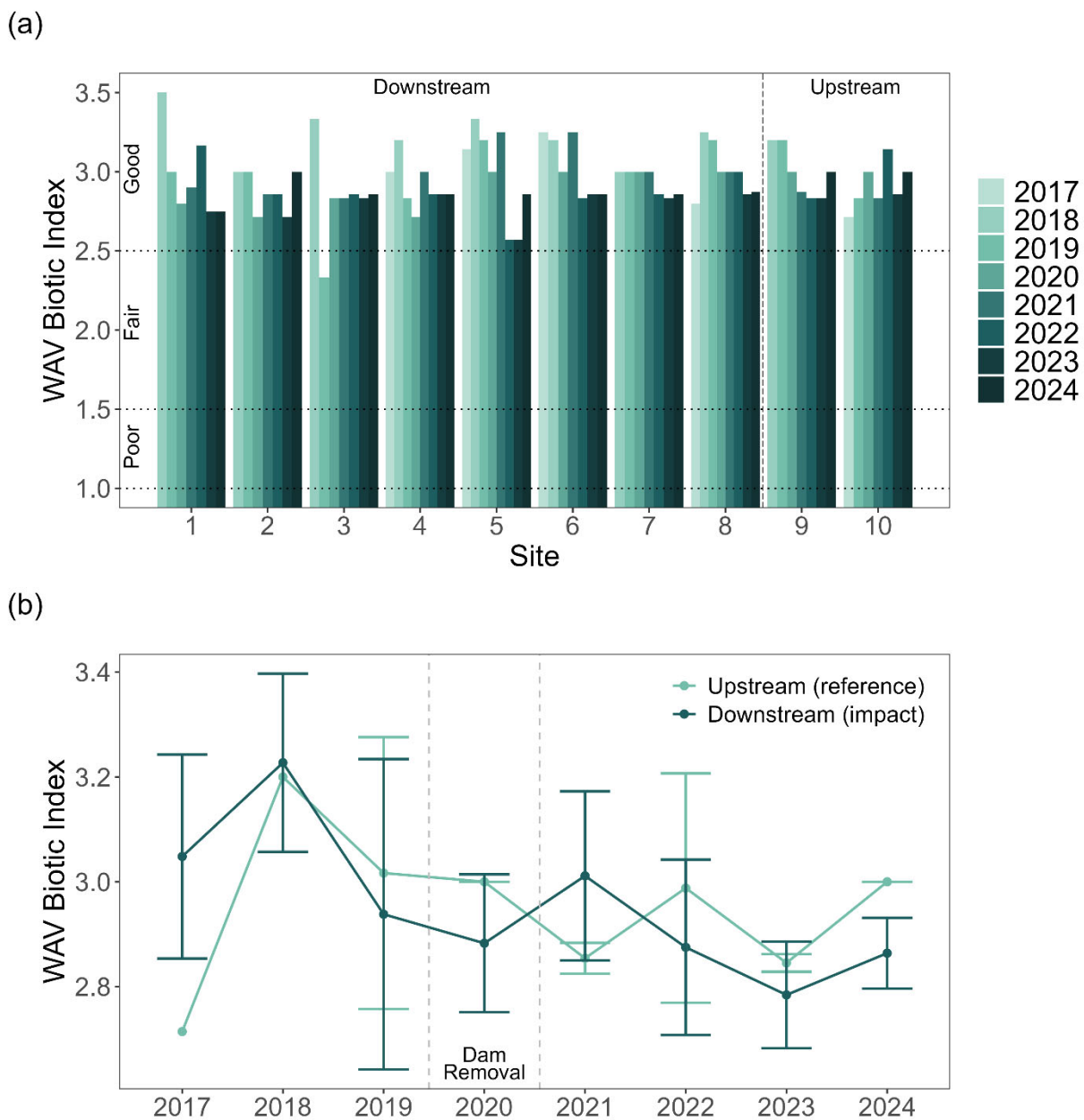


Figure S7. WAV Biotic Index distribution data from macroinvertebrate counts. Top (a) shows WAV Biotic Index distribution by site for all monitoring years (stream health categories are labeled between corresponding y-axis values). The location of the dam, between sites 8 and 9, is depicted with a vertical dashed line. Bottom (b) shows the average WAV Biotic Index distribution from before to after dam removal (2020; grey bar) for impact and reference sites (data points without error bars are those with only one measurement documented).

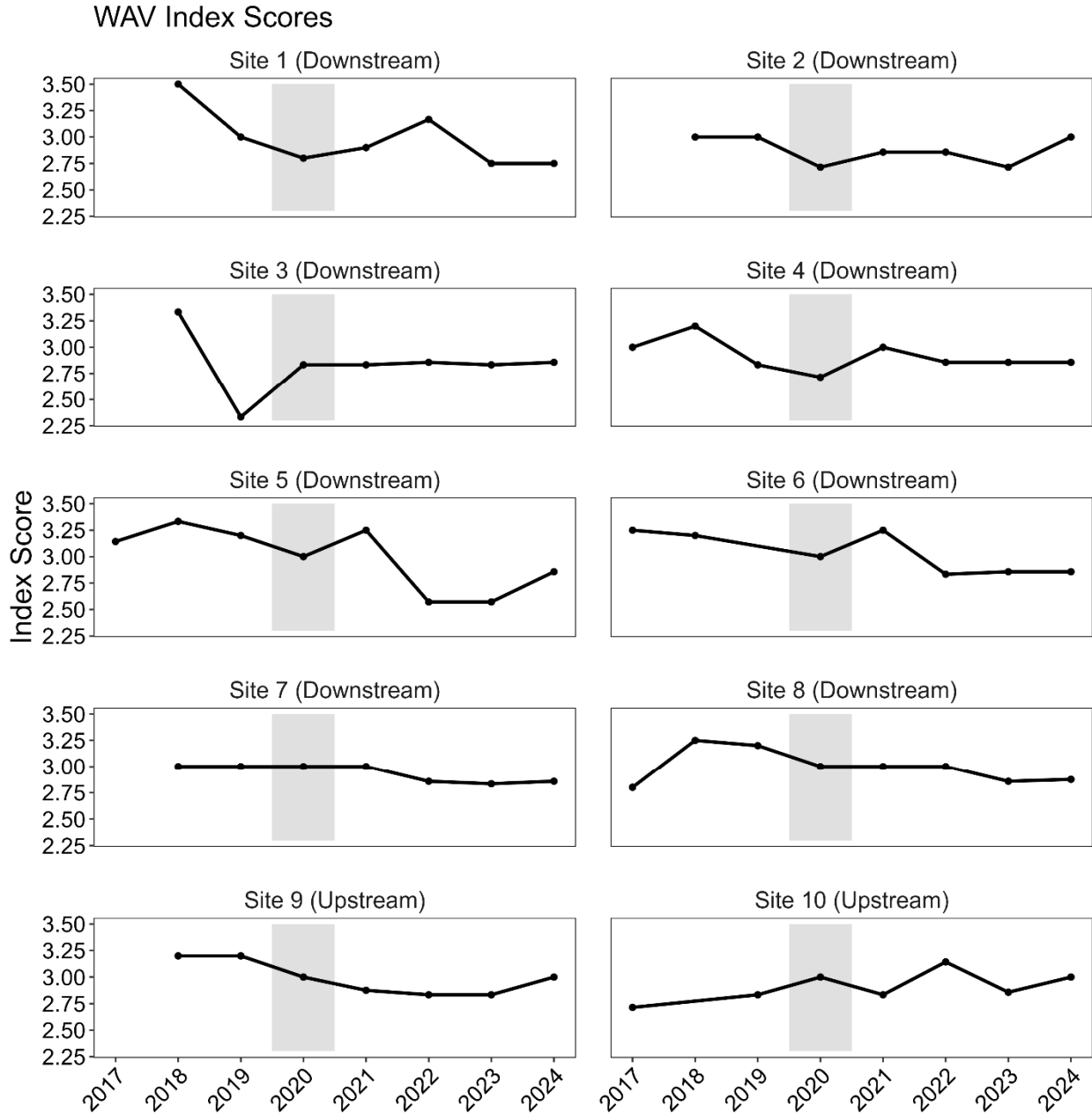


Figure S8. WAV biotic index data from macroinvertebrate counts from 2017 to 2024 at each Stream Team site. Sites 1–8 are located downstream of the dam, where site 1 is the downstream-most reach at the confluence with the Clark Fork River, and site 8 is 100 m downstream of the dam site. Sites 9 and 10 are located upstream of the dam. The gray rectangle represents when the dam was removed in 2020, and sites were surveyed in 2020 throughout the dam removal process. Overall, there are no discernible changes in the biotic index following dam removal. Note: all values fall in the “Good” range except for site 3 in 2019.