Boardman River 2017-2019 Fisheries Surveys
Ranch Rudolf Index Station
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Introduction:
The Boardman River is a 26-mile-long river that flows through Kalkaska and Grand Traverse Counties in the northwestern lower peninsula of Michigan. The Boardman River and its tributaries encompass a drainage area of approximately 186,000 acres, or 287 square miles (Kalish et al., 2018). It originates from tributaries in the Mahan swamp near Kalkaska in central Kalkaska County. The Boardman River then flows generally west and then north until it empties into West Grand Traverse Bay of Lake Michigan in downtown Traverse City. Over the course of the last decade the Boardman River has seen several major dams removed. The Brown Bridge Dam was removed in 2012, the Boardman Dam was removed in 2017, and the Sabin Dam was removed in 2018, leaving the Union Street Dam as the only dam still in place on the Boardman River. Migratory fish from Lake Michigan have access to only approximately 1.5 miles of river in the lower watershed, up to Union Street Dam where fish passage has been blocked until the completion of the FishPass facility designed to replace the Union Street Dam. The combined removal and modification of these dams will reconnect over 160 miles of free-flowing, cold-water stream and restore hundreds of acres of wetlands and upland habitat. It is one of the most comprehensive dam removal and restoration projects in Michigan's history.

The Ranch Rudolf index station on the Boardman River is located upstream of all three of the former dam locations, and historically has not had migratory fish from Lake Michigan present. The station length is 1,100-feet located at Ranch Rudolf, which is a privately-run resort located roughly four miles upstream of the former Brown Bridge Dam. This station has the longest-term data set of any index station on the Boardman River. The trout populations in this stretch are entirely supported by natural reproduction, as the upper Boardman River has not been stocked with any fish by the State since the 1960s. This stretch of river provides fishing opportunities for resident Brown Trout and Brook Trout. The station averages 41.76 feet in width and 1.56 feet in depth. In August of 2017, discharge was measured at 124.3 cubic feet per second.

The Boardman River in this section is managed as a Type 1 Trout Stream open to fishing from the last Saturday in April through September 30th. The minimum size limit for Brook Trout is 7 inches, for Brown Trout 8 inches, and 10 inches for Rainbow Trout. The daily bag limit is five fish, with no more than three fish 15 inches or larger. The Boardman River is also a State-designated Natural River.

Materials and Methods:
Beginning in 2002, the station was adopted as a Fixed Site in the Status and Trends Program. Per the protocol of the program (Wills et al. 2008), the station is sampled for three consecutive years, and then not sampled for three consecutive years (unless it is sampled at the discretion of the Biologist). In one of the three sample years, habitat data is also collected. Temperature data is also recorded in each of the sample years with the use of a continuous recording thermometer.

Population estimates were conducted at this station in 1960-61, 1976, 1985-87, 1994, 2002-2004 and from 2008-2010 (Table 1), and was scheduled to be sampled 2014-2016. Due to staffing and time limitations the Ranch Rudolph station was surveyed in 2014, however not sampled in 2015 and 2016. This Fixed Site survey rotation resumed in 2017, 2018, and 2019, and the next rotation will be in 2023-2025. Temperature data for the station was recorded for the summers of 2002, 2004, 2009- 2010, and 2017-2019 (Table 2). Habitat data was collected in August 2017.

Results:
See Table 3 for the combined results of all three years of electrofishing. Note that in 2017 and 2019 only salmonid species were collected during the survey effort, while in 2018 all species were collected as defined in the Status and Trends program. See Table 4 for average length at age of salmonids.

Discussion:
In these surveys scale samples were used to determine age and growth of Brook Trout and Brown Trout. Brook trout collected were found to be from Age-0 to Age-III (Table 4). Brook Trout growth was positive across all three years, ranging from 0.2 to 0.5 inches above the State average length at age. Brown Trout collected were found to be from Age-0 to Age- V. Brown Trout growth was positive across all three years, ranging from 0.7 to 1.1 inches above the State average length at age. The variability in growth is within acceptable limits for both species of trout.

Due to its modest size, natural landscape, and relatively low angling pressure, the Boardman River is a popular and well-known Brown Trout and Brook Trout stream in Michigan. While trout numbers have varied over the years, in the last several years Brook Trout densities have increased. Overall the densities of both Brook Trout and Brown Trout remains good in the sample reach. Improved age and growth has been noted in both Brown Trout and Brook Trout during this sampling effort, however Brook Trout larger than 8 inches, and beyond Age 1 continue to be rare. The Rainbow Trout (juvenile Steelhead) captured in the 2019 survey were likely the result of natural reproduction occurring after the removal of the Sabin Dam. Resident Rainbow Trout from Boardman Lake, and migratory steelhead from Lake Michigan, were able to make their way upstream and spawn in the winter/spring of 2018. The fish ladder at Union Street Dam is now blocked and migratory fish from Lake Michigan will no longer have access to this section of river, however resident fish of Boardman Lake will have access to the upper reaches of the Boardman River to spawn. Other coolwater species captured occasionally in this reach are likely migrants from the ponds located on the Ranch Rudolf property. These ponds are occasionally stocked privately with Rainbow Trout and support other species such as Largemouth Bass, Green Sunfish, and Pumpkinseed.

Recommendations:
1. The Boardman River supports self-sustaining Brook Trout and Brown Trout populations and should be protected from uncontrolled development and land-use practices. This can be accomplished by working with the Department of Environment, Great Lakes and Energy and other resource agencies to review permit applications and determine best management

practices (BMP's) within the watershed. The MDNR Natural Rivers designation also provides additional protections for the Boardman River.

2. In general, the aquatic habitat in the Boardman River is very good and continues to improve post dam removal and restoration. Adding additional woody material to the river, in the forms of artificial log jams, sweepers, and platform structures could increase the number of larger trout. One of the objectives of this habitat work should be to narrow and deepen the stream, in addition to providing overhead cover for larger trout.

3. Passing migratory species above the Union Street Dam should be considered when the FishPass project begins the optimization phase. Many Lake Michigan species have been denied access to the upper Boardman River for decades and should be allowed to fulfill their life cycle, as well as, provide additional nutrients, diversity and angling opportunities to the watershed.

References:

Kalish, T. G., M. A. Tonello, and H. L. Hettinger. 2018. Boardman River Assessment. Michigan Department of Natural Resources Fisheries Report 31, Lansing.

Wills, T. C., T. G. Zorn, A. J. Nuhfer, and D. M. Infante. 2008 Draft. Stream Status and Trends Program sampling protocols. Chapter 26 in Manual of fisheries survey methods. Michigan Department of Natural Resources, Fisheries internal document, Ann Arbor.

Table 1. MDNR salmonid population estimates for the Boardman River at Ranch Rudolf, 1960-2019.

	BNT		BKT		RBT		Acreage
Year	#/acre	lbs/acre	#/acre	lbs/acre	#/acre	lbs/acre	
1960	271	36.23	243	11.9			0.96
1961	514	52.32	401	20.36			0.96
1976	414	73.26	21	0.86			0.96
1985	540	71.23	47	1.81			0.95
1986	360	61.18	21	0.91	1	0.56	0.95
1987	355	73.24	44	1.24			0.95
1994	266	42.71	501	11.85			0.95
2002	205	38.21	463	11.45	2	0.4	1.06
2003	200	33.68	496	13.73	1	0.5	1.06
2004	201	43.15	346	12.37	1	0.38	1.06
2008	177	19.85	213	5.93	6	2.32	1.03
2009	206	24.88	249	8.52			1.03
2010	148	24.06	285	7.66	2	1.67	1.03
2014	930	22.66	361	9.66			1.05
2017	179	35.02	432	10.96			1.13
2018	257	27.8	322	8.53			1.05
2019	328	29.63	419	9.74	87	0.3	1.05

Table 2. Boardman River temperature data from Ranch Rudolf.

	2002 upstream	2002 downstream	2003 upstream	2004	2009	2010	2017	2018	2019
January Average			34.9			36.4		36.56	35.13
January Maximum			40.6			41		42.43	40.44
January Minimum			32.3			32.7		32.59	32.29
February Average			34.6					36.85	35.71
February Maximum			41.9					42.8	40.81
February Minimum			32.2					32.9	32.24
June Average					57.4		58.26	58.59	57.96
June Maximum					68.2		65.18	70.5	66.64
June Minimum					48.4		48.72	50.53	49.7
July Average	62.4	62.1		57.5	57.1		60.44	61.34	61.09
July Maximum	71.1	69.9		64	64.1		66.81	70.37	68.14
July Minimum	55.3	56.2		51.5	50.3		54.34	54.17	53.86
August Average	59.6	59.6		55.8	57.4		58.57	59.66	57.94
August Maximum	65.9	65		62.5	64.2		65.3	66.47	64.93
August Minimum	52.6	53.3		49	48.9		50.04	53.3	50.93
December Average	37.6				37.1		36.82	38.49	
December Maximum	43.4				42		44.9	42.16	
December Minimum	32.6				32.9		32.54	35.6	

Table 3. Species and number of individuals observed during the Boardman River Status and Trends survey series.

Species	No./Year	2017	2018	2019
Brown Trout		181	270	354
Brook Trout		442	408	510
American Brook Lamprey			50	
Black Bullhead			2	
Bluntnose Minnow			7	
Creek Chub			1	
White Sucker			17	
Green Sunfish			3	
Largemouth Bass			2	
Longnose Dace			2	
Mottle Sculpin			58	
Rainbow Trout (Steelhead)				49
Pumpkinseed			1	
Slimy Sculpin			137	

* All species are collected only one year during the three-year rotation; remaining two years only salmonids are collected.

Table 4. Average total weighted length (inches) at age and growth relative to the State average for fish sampled at the Ranch Rudolph Fixed Site in 2017, 2018, and 2019.

		Age						Mean Growth
Year/Species		0	I	II	III	IV	V	Growth
2017								
	Brook trout	3.41	6.04	8.53	…	…	…	+0.4
		(30)*	(29)	(3)			…	
	Brown trout	3.09	6.99	9.77	13.56	17.1		+0.7
		(21)	(19)	(35)	(14)	(2)		
2018								
	Brook trout	3.41	6.2	…	…	…	…	+0.5
		(29)	(41)					
	Brown trout	3.27	6.65	9.57	13.95	15.77	…	+0.7
		(21)	(52)	(21)	(7)	(2)		
2019								
	Brook trout	3.2	5.79	7.99	…	…	…	+0.2
		(25)	(37)	(3)				
	Brown trout	3.02	6.41	8.71	13.1	15.78	19.7	1.1
		(22)	(25)	(27)	(1)	(4)	(1)	

* Number of fish sampled per age is in parenthesis for each species.