Tim Cwalinski, Fisheries Biologist, MDNR Gaylord

Milligan Creek is one of the larger tributaries to the upper Black River in northeast Michigan. The Black River watershed is a popular trout fishing destination for many anglers, and in particular, for brook trout. Milligan Creek enters the Black River below Kleber Dam (a dam on the Black River). Black Lake itself holds a population of brook trout which use various tributaries for spawning in the fall. Many of these tributaries (Stony Ck, Rainy Rv, Mud Ck, Black Rv) are too warm for trout during the summer months and some are even intermittent, yet Milligan Creek has the potential to be colder.

Milligan Creek is a designated Michigan trout stream and is managed as a Type 1 trout stream (bag limit of 5 brook trout, minimum size 8 inches). It was once known among the locals as well as DNR officials as a high quality brook trout stream, with 15-20+ inch fish periodically caught. These larger fish were presumed to have spent some time in Black Lake. However, anglers also mention that smaller brook trout could always be caught. The stream was also known for illegal harvest of brook trout. Other species such as walleye and northern pike have been observed spawning in this creek as well. Anglers in recent years tell of reduced brook trout catches and an increase in a warm water fish community dominated by creek chubs and white suckers. Angling pressure on this creek is very low at the present due to loss of a fishable brook trout population from the stream.

Milligan Creek arises out of Duby Lake in the Pigeon River Country State Forest and flows north through aspen, oak, and pine swamps surrounded by low ridges, crosses under M68 Highway, and continues to the Black River. The headwaters reaches are sand substrate dominated, with high quality gravel and cobble increasing as M68 Highway is approached. The lower reaches (by Brady Road) are dominated by bedrock, boulders, and cobble and even have two small waterfalls.

Beaver dams have been fairly common along the length of Milligan Creek in recent years. This is especially true for sections 13, 12, and 7 (T34N, R1W/E). Past local trappers did their part to float this remote stream corridor, and have trapped considerable numbers of beaver in the past. A four-hour trapping-float in 2005 of this reach found many beaver dams, but in particular, six very large dams in previously mentioned sections. The Upper Black River Watershed Restoration Committee (UBRWRC) members have removed many of the older dams, and will continue to do so into the future to some extent. Some larger dams may need to removed through more aggressive means. Some very high quality spawning grounds exist between these dams, while the dams themselves completely cover many spawning grounds with thick silt. Plans were made to remove dams with the assistance of FMFMD in a careful, downstream to upstream manner. This task was begun in 2006. Three small brush/mud dams were removed along with one larger one directly upstream of the Alexander Hole in 2006 with the use of explosives. These were the first obstructions directly upstream of M68 Highway. The explosives were paid for by Trout Unlimited. One local has continued to monitor (and sometimes remove) the presence of beaver dams in Milligan Creek, particularly downstream of the confluence of Gokee Creek. It was recommended that an aggressive beaver trapping program will need to be attempted beginning in the winter of 2006/07. Attempts were made at this in the winter of 2007-2008, but will need further emphasis in coming years. A nuisance trapping permit was obtained by a local trapper for late-April of 2008 but the number of beaver taken under this permit was not considered to be significant. This program will need to continue.

According to models, and casual observations, groundwater potential is greater near M68 Highway and further downstream. Thus, the stream typically runs warmer in the upper reaches, and gains groundwater as it flows past the highway. However, excessive ponding from upstream beaver dams is probably increasing downstream water temperatures just enough to hamper the brook trout community. The

groundwater downstream may not be enough to buffer increased upstream temperatures. MDNR, Fisheries Division and the UBRWRC began collecting summer temperature information for various reaches of this stream in recent years. The mean summer temperatures for these locations can be found in Table 1. Mean monthly summer temperatures are high for Milligan Creek at various locations and are often out of the suitable range for brook trout. Trout research in Michigan has demonstrated that monthly average stream temperatures above 66ºF often correlate with a declining or absent brook trout population. Maximum water temperature at this creek often can peak above 80ºF (Table 1). The author believes that excessive upstream ponding of this creek has elevated these temperatures.

An action list and schedule was created in 2006 and lists the following management strategies for Milligan Creek for a period of 10-20 years:

A. Use discretionary surveys at various locations to determine present fish communities and spatial dynamics.
B. Continue to monitor summer stream temperatures at various locations.
C. Continue to work with FMFMD (Forest, Mineral, and Fire Division MDNR) in the Milligan Creek watershed to prevent forestry practices which would enhance beaver populations.
D. Work with local trappers to effectively control beaver populations through an aggressive trapping program. Remove dams on state land with the assistance of FMFMD which warm the downstream reaches considerably, and prevent fish passage of resident and Black Lake brook trout. Encourage local riparians and UBRWRC work crews to remove old dams when noted and to locate dams in the lower reaches of the creek and encourage landowners to allow access to trappers.

Benefits from such an action list may include increased angler hours, and restoration of native brook trout habitat, including an adfluvial form. Costs of the project include 10 hours of technician time (survey, fish aging) and 18 total hours (survey, writeup, public calls, watershed group correspondence) annually from lead biologist for a total of $798.00 dollars.

Many of the above items have been acted on in recent years and will continue into future years to various extents. For action list B, Fisheries Division has continued to ask for 300 foot buffers to cutting along the stream. This has been done in assistance with FMFMD and beaver habitat is not encouraged in this watershed. Old beaver dams are monitored and removed where possible, and beaver trapping (during and out-of-season) is highly encouraged among different trappers.

Little fisheries data existed for this stream prior to 2006. Stocking records date back to 1938 for Milligan Creek. Brook trout were stocked from 1938-1943. In 1966, a large brook trout die-off was noted when an estimated 400 fish died in a one-mile reach. It was believed that warm water triggered a bacterial infection. This is the extent of historical fisheries data for Milligan Creek.

Recent Surveys

2006

This was a quick assessment of the current brook trout population in Milligan Creek. Backpack electrofishing unit(s) were used for approximately 6,040 feet of stream at various locations. The site locations and descriptions are listed below and in Table 2:

1. Ross Nave cabin –beginning at the landowner cabin and proceeding upstream to the Alexander Hole (2,841 feet)

2. M68 Highway –beginning downstream of the Bandish Cabin walkbridge about 300 feet and proceeding upstream to 100 feet above the highway (1,463 feet)
3. Kisser Road –beginning upstream of the road at the house stairs and proceeding upstream to beaver dam
4. Brady Road east –beginning below the upper falls and proceeding upstream to the plunge pool

Trout densities were very low or even absent at all four 2006 sampling reaches. (Table 3). No fishery could be provided from such low numbers. Densities for all four locations combined were found to be less than 16 brook trout per mile of stream. Young fish were virtually absent from the survey. It is the belief of this author that the adults seek thermal refuge in specific locations in this stream during the summer months. Despite this, mortality is still believed to be extremely high. Young trout were virtually absent at four sampling locations, despite an ample amount of spawning habitat. Young-of-year (age-0) brook trout may have colder water requirements for development and growth. They also lack the ability to migrate for thermal refuge during critical summer periods. Thus, mortality of these young trout may very well be near 100%. This, in turn, may limit broodstock populations. Fair numbers of age-2 brook trout were surveyed when compared to age-1 fish. The summer of 2004 was cool, thus more young trout (age-0) may have survived to later ages as a result of the cold summer temperatures of that year. Overall growth of brook trout from this sample was good. The growth index was +1.3 inches, meaning that fish of a certain age grew more than an inch faster than the statewide average for this species. This is to be expected as a result of the warmer water which stimulates food production, as well as the limited competition among trout.

Other species observed in the sampling reaches included: blacknose dace, creek chub, central mudminnow, blackside darter, Johnny darter, burbot, white sucker, sculpin species, and common shiner. Also present at Site 4 were yellow perch, rock bass, bullhead species, and smallmouth bass. The creek chub population is dominant, with many large individuals present. It is speculated that the brook trout are highly vulnerable to this burgeoning creek chub population as a result of: competition for space and forage, and predation of chubs on young trout.

2007

Two of the survey sites previously listed (Site 1 and 2) were again surveyed on September 10, 2007. The only difference between the years was that 2 backpack electrofishing units were used at Site 1 in 2007 (compared to 1 unit the previous year). The distance between Site 1 and 2 is very short, thus, the catches and distances were pooled between sites within each year. The pooled catch data is listed in Table 4. Growth of Milligan Creek brook trout was good in 2007 (Table 5), as it was in 2006.

2008

Site 1 and 2 were again surveyed with 2 backpack shockers on September 10, 2008. Catches of brook trout were much higher than in previous years, especially for age-0 fish. Growth rates were still above statewide average (+0.6”) but slightly below the previous years which may be explained by increased numbers (competition). The higher numbers of young trout are encouraging. A handful of beaver dams were again removed in Milligan Creek at the end of summer and trapping efforts (though minimal) continue. Hourly temperature was also gathered again at the Bandish Cabin as in previous years and is summarized in Table 1. Milligan Creek ran slightly colder in 2008 as evidenced by average temperatures by month. The maximum temperatures were also less lethal as compared to previous years. Thus far (based on 3 years), a higher catch of age-0 brook trout in the late-summer is achieved as average temperatures in July and August are lower.

2009

Site 1 and 2 were again surveyed on September 1, 2009. The summer of 2009 was characterized as very cool with ample amount of precipitation. In fact, the Milligan Creek watershed received near record rains weeks prior to this survey, enough rain to even hide the appearance of Brady Falls downstream. This type of recent condition may have been suitable for movement of larger brook trout from downstream, or even Black Lake. Due to the high water conditions, we changed gear from 2 backpack shocking units, to a stream shocker with 2 probes. It is reasonable to stipulate that this gear is more efficient than backpack shockers, however, the fast and high water probably balanced catches out, making years more comparable.

Catches of brook trout were again higher than in previous warmer years, especially for age-0 fish. Growth rates were still above statewide average (+") but slightly below the previous years which may be explained by increased numbers (competition). The continued higher numbers of young trout are encouraging, but it is not completely sure if it is a result of the colder summer weather (probable) or continued beaver dam removal. A handful of beaver dams were again removed (like recent years) in Milligan Creek at the end of summer and trapping efforts (though minimal) continue. Hourly temperature was also gathered again at the Bandish Cabin as in previous years and is summarized in Table 1. Milligan Creek ran considerably colder in 2009 as evidenced by average temperatures by month. Thus far (based on 3 years), a higher catch of age-0 brook trout in the late-summer is achieved as average temperatures in July and August are lower.

2010

Site 1 and 2 were again surveyed on September 13, 2010. The summer of 2010 was characterized as warm with fair amounts of precipitation. Once again though, the water level was normal enough to use two backpack shockers for surveying trout. Catches of brook trout were again fairly high despite the warm summer weather. The catches of age 1 and 2 trout were high most likely due to the increase in age-0 brook trout in the previous two years, with sufficient survival to age-1 for both year classes. It is this authors belief that the production of brook trout in Milligan Creek was very high in 2010, but that summer temperatures reduced survival of young fish to the point shown in Figure 1.

Seven old beaver dams were again removed in Milligan Creek in 2010 upstream of the survey reach. Hourly temperatures were also gathered at the Bandish Cabin site as in previous years and are summarized in Table 1.

2011

Site 1 and 2 were again surveyed, on September 12, 2011. The summer of 2011 was characterized very warm and rainy at times. Stream temperatures were very high this year. Water level during the survey was suitable to use two backpack shockers. The difference was that the upstream end of the survey site was partially surveyable whereas in most years it was too deep to survey. We caught good numbers of large brook trout in this hole this year and probably missed many more. Growth was comparable to other years. Large numbers of age 2 brook trout were collected ranging from 8-13 inches. Again, a large (16 inch) brook trout was collected but not aged. Number of YOY collected this year, despite the warm weather, were high like last year. However, this author feels that production in 2011 was very good since adult brood numbers were higher from the year before. Varying forces of natural mortality for juveniles (warm temperatures) probably culled large number of juveniles prior to this survey. Growth was average for age 0 and 1 brook trout. Growth was excellent (when compared to other Michigan brook trout in streams) for age 2 and older fish.

Table 1. Summer water temperatures from Milligan Creek in various years and locations.

Location	Year	Month	Average	Maximum
Gokee Hill	03	June	63	82
(Section 13)	03	July	67	79
	03	Aug	68	77
Bandish Cabin	04	June	64	78
(Section 6)	04	July	67	77
	04	Aug	64	75
Section 19	04	June	65	80
	04	July	67	78
	04	Aug	63	76
Bandish Cabin/M68	06	June	66	78
(Section 6)	06	July	71	81
	06	Aug	66	80
Section 19	06	June	65	82
	06	July	67	86
	06	Aug	62	81
Bandish Cabin/M68	07	June	68	79
(Section 6)	07	July	68	78
	07	Aug	67	79
Bandish Cabin/M68	08	June	64	76
(Section 6)	08	July	67	76
	08	Aug	65	77
Bandish Cabin/M68	09	June	63	80
(Section 6)	09	July	64	74
	09	Aug	64	74
Bandish Cabin/M68	10	June	62	74
(Section 6)	10	July	68	77
	10	Aug	67	77
Bandish Cabin/M68	11	June	63	76
(Section 6)	11	July	70	81
	11	Aug	66	79

*2004 and 2009 were cool year, while 2005, 2006, 2010 and 2011 were warm years, 2007 and 2008 was in-between

Table 2. Station description and catch data for 2006.

Site	T, R, S	Backpack Shockers Used	Station length (ft)	Date	Water Temp (F)	Substrate	No. Species	No. Brook Trout	Brook trout per mile
1	34N, 1E, 6/7	1	2,841	Aug 29	-	Sand, gravel, cobble	7	5	10.6
2	34N, 1E, 6	2	1,463	Aug 10	-	Gravel, cobble	7	16	58.1
3	34N, 1W, 1	2	740	Aug 29	61	Sand, gravel, cobble	7	1	5.3
4	35N, 1E, 29/32	1	1,000	Aug 29	65	bedrock	11	0	0.0

Table 3. Length and age-frequency of brook trout captured in Sites 1 and 2 (4,304ft) of Milligan Creek in 2011.

Length (in)	Number	Age(s)
1	1	0
2	378	0
3	285	0
4	8	I
5	52	I
6	47	I
7	17	I
8	10	I, II
9	20	II
10	27	II
11	17	II
12	8	II, III
13	1	II
14		
15		
16	1	-

Table 4. Length-frequency catch data pooled for Site 1 and 2 between years.

Length Range	2006	2007	2008	2009	2010	2011
1	1					1
2	3	61	43	133	296	378
3		3	261	187	62	285
4		1	1	9	4	8
5	1	4	32	34	43	52
6	4	7	28	46	59	47
7	2	6	18	20	61	17
8	2	3	5	12	12	10
9	3	2		7	28	20
10	3	4	2	9	13	27
11	2	5	4	5	2	17
12		1	1	1	4	8
13				1	5	1
14						
15				1		
16					1	1
Total trout captured	**21**	**97**	**395**	**465**	**590**	**872**
Average July Temp (F)*	**71**	**68**	**67**	**64**	**68**	**70**
% 7 inches and larger	**57%**	**22%**	**8%**	**12%**	**21%**	**12%**

* temperature average was taken near M68 Highway

Table 5. Growth data for brook trout surveyed from Milligan Creek in 2011.

Age	No. aged	Length range (in)	State avg. length (in)	Weighted mean length (in)	Mean growth index (in)
0	22	1.9 – 3.4	2.9	2.8	+0.8
I	47	4.2 – 8.9	5.7	6.3	
II	38	8.6 – 13.0	8.5	10.6	
III	1	12.5	11.3	12.5	

Table 6. Comparison by year of mean length (in) at age of brook trout in Milligan Creek. Number in parentheses represents the number of fish aged in that age group.

Age Group	2006 August	2007 September	2008 September	2009 September	2010 September	2011 September	Range of growth compared to statewide average
0	2.3 (1)	2.5 (21)	3.1 (20)	3.1 (26)	2.7 (20)	2.8 (22)	+0.6 to +1.3 inches
I	7.0 (9)	6.7 (19)	6.4 (36)	6.6 (47)	6.5 (48)	6.3 (47)	
II	10.5 (9)	9.6 (9)	11.0 (8)	10.5 (19)	9.9 (32)	10.6 (38)	
III	-	11.5 (5)	-	14.8 (2)	12.4 (5)	12.5 (1)	
IV	-	-	-	-	16.0 (1)		

Figure 1. Plot of age-0 brook trout catch for the survey station compared to average July temperature for the same reach by year.