MICHIGAN DEPARTMENT OF NATURAL RESOURCES
Fisheries Division

Response to:

"Public Comment on MDNR Fish Division's proposal
to modify Trout Stream Regulations"

June 30, 2009

On June 12, 2009 the Michigan Department of Natural Resources (DNR) received a letter co-signed by six members of Fisheries Division's Coldwater Regulations Committee with comments on the Division's proposed changes for regulations governing trout and salmon fishing in inland streams of the State. Staff in Fisheries Division has prepared this response for each specific comment in the letter received to provide additional information for all Committee members in anticipation of further discussion and clarification at an upcoming meeting of the Committee.

As a general comment, the authors seem to imply that we are either not interested in, or possibly don't understand, the economic benefit of tourism and fishing to the State of Michigan. In fact, we are acutely aware of the economic hardship facing the State and the need to promote tourism. We are especially cognizant of the economic benefits and the quality of life derived from the State's fabulous natural resources in general, and from our aquatic resources specifically.

The authors suggest "*According to the Pure Michigan campaign, supported by public funds, for every dollar we spend promoting Michigan recreation the State receives three dollars back in tax revenue*". Although this may be true and is a positive for the State in general, we wish to point out that those tax dollars do not come to Fisheries Division to help with managing the State's vast aquatic resources. In fact, those who own gas stations, restaurants, hotels, etc., and thus benefit directly from tourism, do not pay anything in return to help with future management of the State's aquatic resources. This has always been the case in Michigan, even though some portion of the benefits these owners receive are generated explicitly because of the management of the State's aquatic resources by personnel in Fisheries Division. Given these realities and the tenuous nature of the budget for Fisheries Division over the past 10 years, we find it difficult to understand why the authors would suggest our conclusions are "*…unsupported speculation…*" simply because we based our conclusions on a sample of representative trout streams rather than a survey of every trout stream under the Type 2 category (or any category for that matter). Although the samples were chosen for good reason, if the latter methodology is the standard to which management will be held in the future, then gridlock will always be the eventual outcome. The paradox is immutable!

Comment I: **Inadequate evaluation of existing trout stream regulation framework provided**

When the trout stream category system was implemented in 2000, the least restrictive regulation was applied to streams classified under the Type 1 category. This single category comprised 84% of all waters designated as trout streams in the State. Regulations under the Types 2, 5, 6, and 7 categories were new, and were most often applied to reaches of inland trout streams isolated from the Great Lakes by barriers that blocked migration of fish upstream. The streams classified under the Type 2 category had higher minimum size limits on all species of trout than found in the Type 1 category, but no new gear restrictions. Presently about 600 miles of streams in Michigan are classified under the Type 2 category, which represents 88% of the total miles of trout streams currently classified under Types 2, 5, 6, and 7 combined. Most streams designated as Types 5 or 7 were already managed under flies-only or no-kill regulations prior to 2000. With the exception of Johnson Creek, streams designated as Type 6 included only the Escanaba River and Duck Creek where artificial lures or flies and higher minimum size limits than found in the Type 1 category were already in effect prior to 2000.

Thus, the DNR focused most evaluation efforts on streams classified under the Type 2 category because this was clearly the most important regulation change that occurred in 2000. In our opinion there was little point in directing additional evaluation effort toward streams classified under the Types 5, 6, or 7 categories because no significant change in regulations occurred on these streams. In addition, no pre-regulation-change data were available for comparison to post-regulation-change data on many of the new streams that were added to the Types 5, 6, or 7 categories in 2000 (e.g., the Manistee River downstream of M-72).

Type 2 regulations were often applied on streams where habitat improvement work had been conducted in hopes that better protection of trout at improved sites would generate even more angling opportunity than stream improvement alone. Trout population data collected prior to 2000 to evaluate effects of stream improvement provided pre-regulation-change data useful for comparison to data collected after the Type 2 regulations went into effect. In the case of the Manistee River, the possible effects of the regulation change were confounded with possible effects of stream improvement and higher levels of natural reproduction. On some other streams both improved and unimproved sites were surveyed on the same streams and on others only unimproved sites were evaluated.

Although effects of the regulations implemented in 2000 on trout in streams classified in categories other than Type 2 were not discussed in DNR's recent proposal to modify Michigan's trout stream regulations, some information on evaluations can be provided for these other stream Types.

For example, streams classified in the Type 1 category were not specifically evaluated for two primary reasons. First, the regulations applied to streams classified under the

Type 1 category were virtually identical to the statewide regulations in effect prior to 2000. The only substantive difference was a lower creel limit. Fisheries researchers and managers have known for over a half century that creel limits have no significant effect on angling mortality, except in cases where a majority of anglers catch their limit. In spite of the rhetoric to the contrary, these conditions do not exist in Michigan's inland trout streams that are subject to a 5-fish creel limit. Second, Fisheries Division's Streams Status and Trends Program was not implemented until 2002, so there was little pre-regulation-change population data available for assessing trends in Type 1 streams. Most survey activities prior to 2002 did not include population estimates.

The best data set we have available for evaluating a trend in abundance of brown trout in a Type 1 stream is a 14-year series of annual population estimates conducted in a 1.4 mile reach of Gilchrist Creek. In this stretch of Gilchrist Creek, there was an upward trend in abundance of age-2-and older brown trout from 1995 to 2008. The increase in abundance of older and larger brown trout in Gilchrist Creek over time parallels a steady increase in reproduction of brown trout between 1998 and 2008. In other words, we observed that greater numbers of young-of-year trout subsequently produced greater numbers of large brown trout over the following years in Gilchrist Creek. This same phenomenon was also observed in the Manistee River at Cameron Bridge after this stretch was classified under the Type 2 category, yet in the case of Gilchrist Creek no regulation change had occurred.

Effects of regulations on streams classified under the Type 3 and Type 4 categories have been evaluated only for the Muskegon River using both electrofishing data and angler census. Although omitting this information from the proposal may have been an oversight, it had been extensively discussed in previous regional public meetings held specifically for reviewing and proposing changes to regulations on the Muskegon River. We do, however, include the major findings below:

- angler use, catch, and catch rates all declined under the more restrictive regulations for the Type 3 category;
- numbers of trout larger than 15 inches did not increase in the population or in the creel under more restrictive regulations for the Type 3 category; and
- high summer water temperatures limited survival of stocked trout such that more restrictive regulations did not result in the production of more large individuals.

In the case of streams newly classified under the Type 5 category in 2000, only a stretch of the Manistee River was changed from statewide regulations to the Type 5 category. In this sole instance, the effect was not evaluated because pre-regulation change data suitable for before-and-after comparisons were not available for this stretch of the Manistee River.

The majority of stream miles (30 of 51 miles) classified under the Type 5 category in 2000 were located on the North and South branches of the Au Sable River. These reaches were previously regulated under flies-only rules with a 10-inch minimum size limit for brown trout and an 8-inch minimum size limit for brook trout. In addition, angler census data indicate that a majority of contemporary anglers fishing these waters

voluntarily release trout that could be legally kept. We believe that any evaluation of populations in these streams after 2000 would not be reflective of what might happen if a stream where more liberal statewide regulations were in effect before 2000 was classified under the Type 5 category. However, long-term data collected on the Au Sable River system can be used to demonstrate the relative importance of regulations and habitat conditions in shaping the size structure of trout populations.

The DNR has made large investments in habitat improvement work on the Au Sable River beginning about 75 years ago. Some of the first artificial cover structures constructed in Michigan were placed into the North Branch of the Au Sable River in the 1930s. A large amount of habitat work was also done on multiple branches of the Au Sable River in past decades, particularly in the 1950s, 1970s, and 1990s. More recently Fisheries Division has invested most of a $2,000,000 commitment to fund $200,000 of habitat rehabilitation work per year for 10 years on the upper Au Sable River watershed. This recent work was undertaken in large part because trout population levels in the upper watershed had declined steadily from the peak levels observed in the 1960s and 1970s, reaching a deep trough in the 1990s. In the North and South branches these declines occurred during a time when angling regulations did not change. On the mainstream of the Au Sable River a variety of regulations were tested, but none of them halted the downward trend.

Fall population estimates for the North Branch of the Au Sable have been made during many years from 1957 to the present time. The section of river containing the DNR's present day population index station at Dam 4 has been subject to flies-only regulations for the entire period for which population data are available. Minimum size limits for both brown trout and brook trout were 9 inches from 1957 through 1967, 10 inches for brown trout and 8 inches for brook trout from 1968 through 1999, and 15 inches for brown trout and 10 inches for brook trout since 2000. Creel limits were 5 or fewer fish throughout the entire period. Fifty years ago, large numbers of trout were harvested from this stretch of the North Branch of the Au Sable compared to more recent times.

Between 1961 and 1967 anglers harvested an average of 8,767 trout per year between the Sheep Ranch and Kellogg Bridge, and in 1976 they harvested 3,030 trout in the same reach (Alexander et al. 1979). Angler harvest was much lower from 1985-90 when total numbers of trout harvested between the Ranch and Kellogg Bridge fell to an average of 1,354 per year (Clark and Alexander 1992). Voluntary release rates of legal-sized fish caught from the North Branch increased steadily from 40% in 1976 to nearly 80% in 1990 (Clark and Alexander 1992). It is certain that this trend toward higher levels of voluntary release continued beyond 1990. Declining levels of angler harvest did not stem the decline in abundance of larger brown trout as is shown in Figure 1.

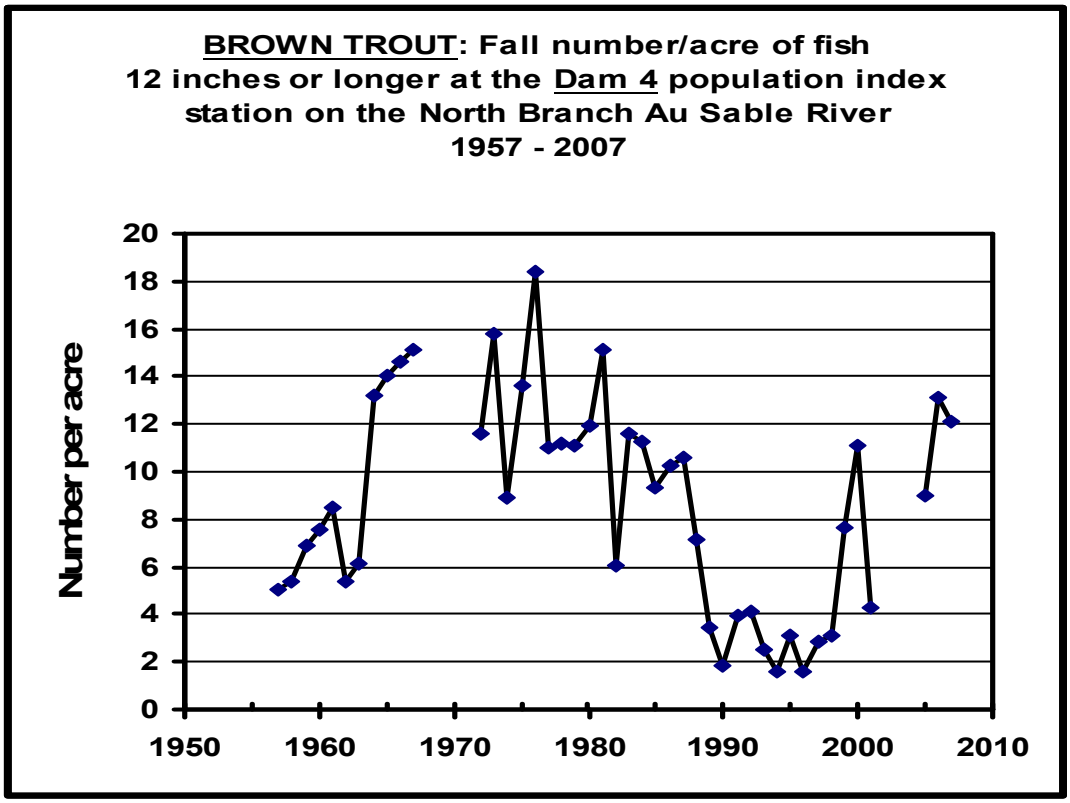

Figure 1 – Abundance of brown trout at the North Branch Au Sable River population index station at Dam 4.

In recent years vast quantities of large woody debris (LWD) in the form of whole trees, as well as constructed cover, have been added to the North Branch. Reproduction levels for brown trout were also higher in the late 1990s and early 2000s. These stronger year classes carried forward to produce more large brown trout, which also presumably took advantage of the better fish cover that was available. These two reasons are the best explanations for recent increases in abundance of larger trout. During 1961-67 when many trout were harvested, anglers cropped only 4% of the annual production of brook trout and 15% of the annual production of brown trout in the waters governed by special regulations (Alexander and Ryckman 1976). Angler harvest had only minor effects on the population in the past and has negligible effect on the population today.

Figure 1 clearly illustrates that highest abundance levels occurred when harvest was most intense and regulations were more liberal. The point to take home here is that natural mortality rates are high in the North Branch and fishing mortality is negligible.

Regulations on streams classified under the Type 6 category were not evaluated due to a lack of data before and after the regulation change was implemented in 2000. Only three streams are presently in this category. Almost no trout stocked into Johnson Creek in Wayne County survive beyond the summer of the year they are stocked, so

there was no point in evaluating regulations for the Type 6 category on this creek since the trout die before growing to 12 inches. In the cases of Duck Creek and the Escanaba River, pre-regulation-change data were not adequate for evaluating the effects of Type 6 regulations.

Regulations for streams classified under the Type 7 category were not evaluated because no streams that had more liberal regulations prior to 2000 were placed into this category after the new regulations were implemented[1]. However, a long-term data set at Stephan Bridge on the mainstream of the Au Sable River can be used to illustrate how a variety of regulations failed to stem declines in populations of brown trout in the face of changing habitat (Figure 2). The mainstream of the Au Sable River has been fished under a flies-only regulation since 1955. From 1955-72 the minimum size limit for brown trout was 10 inches. The minimum size limit was 12 inches from 1973-78. A harvest slot limit was in effect from 1979-88. Slot regulations allowed the harvest of trout 8.0 to 11.9 inches, no kill of trout 12.0 to 15.9 inches, and the harvest of one individual 16.0 inches or longer.

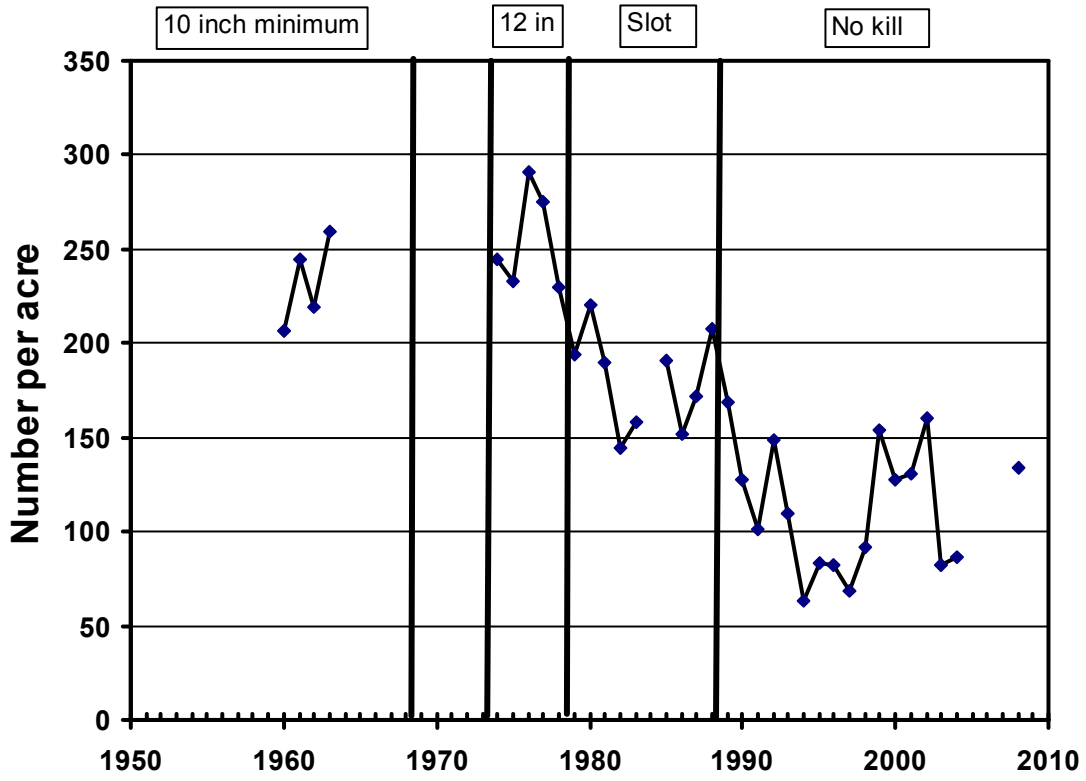

Figure 2 – Number of 8.0- to 11.9-inch brown trout per acre in the mainstream of the Au Sable River at the Stephan Bridge population index station from 1960-2008.

[1]The only new stream added to the Type 7 category after 2000 was a section of the Pere Marquette River from M-37 to Gleason's Landing. The regulations on this stretch prior to its classification under the Type 7 category were: open all year; artificial flies only; minimum size limit of 16 inches for trout and salmon; possession limit was 1 trout or salmon per day; and catch-and-release of brown trout from October 1 to the last Friday in April.

Managers and researchers at the time wanted to test the hypothesis that thinning the population of intermediate-sized trout might improve growth rates so that trout would grow more rapidly beyond 12 inches. During the days of sewage enrichment, trout grew very rapidly in the mainstream of the Au Sable River, but after discharges ceased growth declined such that 3-year-old brown trout that used to average nearly 14 inches in length by fall now fell short of 12 inches in length. Growth rates in the North and South branches were now faster than in the mainstream, instead of slower as in the past. However, the slot limit was ineffective at increasing growth rates, and was in fact less effective than the 12-inch minimum size limit (Clark and Alexander 1985).

The lowest abundance of intermediate-sized brown trout in nearly 50 years was observed during the middle 1990s when the mainstream of the Au Sable River was managed under no-kill regulations. This extensive data set from the mainstream of the Au Sable River clearly illustrates that changes in habitat features, such as nutrient levels, quantity of large woody debris, weather, flow regime, etc., are far more powerful than fishing regulations in shaping the size structure of trout populations. Indeed, data collected for trout populations from around the state have revealed that temporal rises and declines in abundance of trout were synchronous across many streams in Michigan. One such example is the high level of synchrony in abundance of age-2 brown trout in the Pere Marquette River at Zimmy's and the mainstream of the Au Sable River at Thendara Road, as shown in Figure 3 from Zorn and Nuhfer (2007). Influences of spring stream-discharge patterns on reproductive levels of trout appeared to be the primary cause.

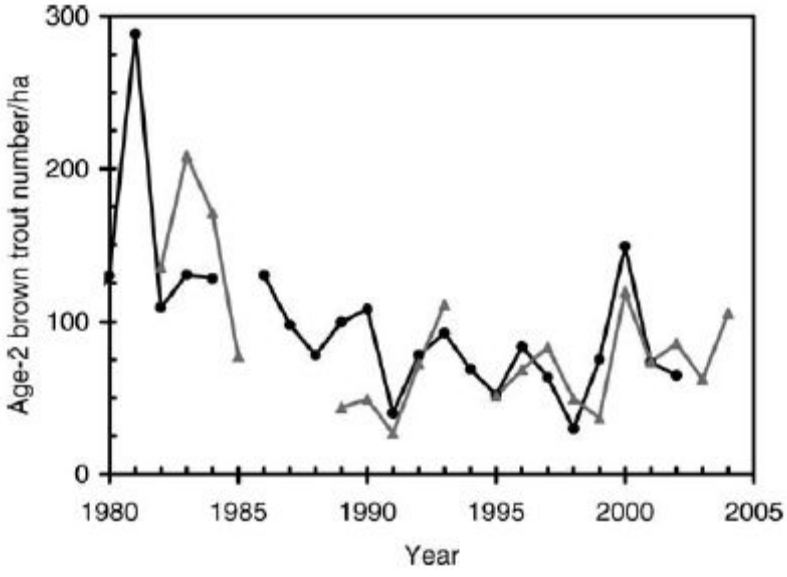

FIGURE 3.—Age-2 brown trout density over time at sites 140 km apart on two Michigan rivers, the main-stem Au Sable (black circles) and Pere Marquette (gray triangles).

Habitat improvement work and probably some help from the weather do appear to have improved contemporary populations of brown trout over 12 inches in the mainstream of the Au Sable River. For example, at Stephan Bridge where no-kill regulations have been in effect since 1989, abundance of trout larger than 12 inches was significantly higher after 2000 than from 1989-1999 as shown in Figure 4. Virtually all of the trout over 12 inches depicted in Figure 4 are brown trout.

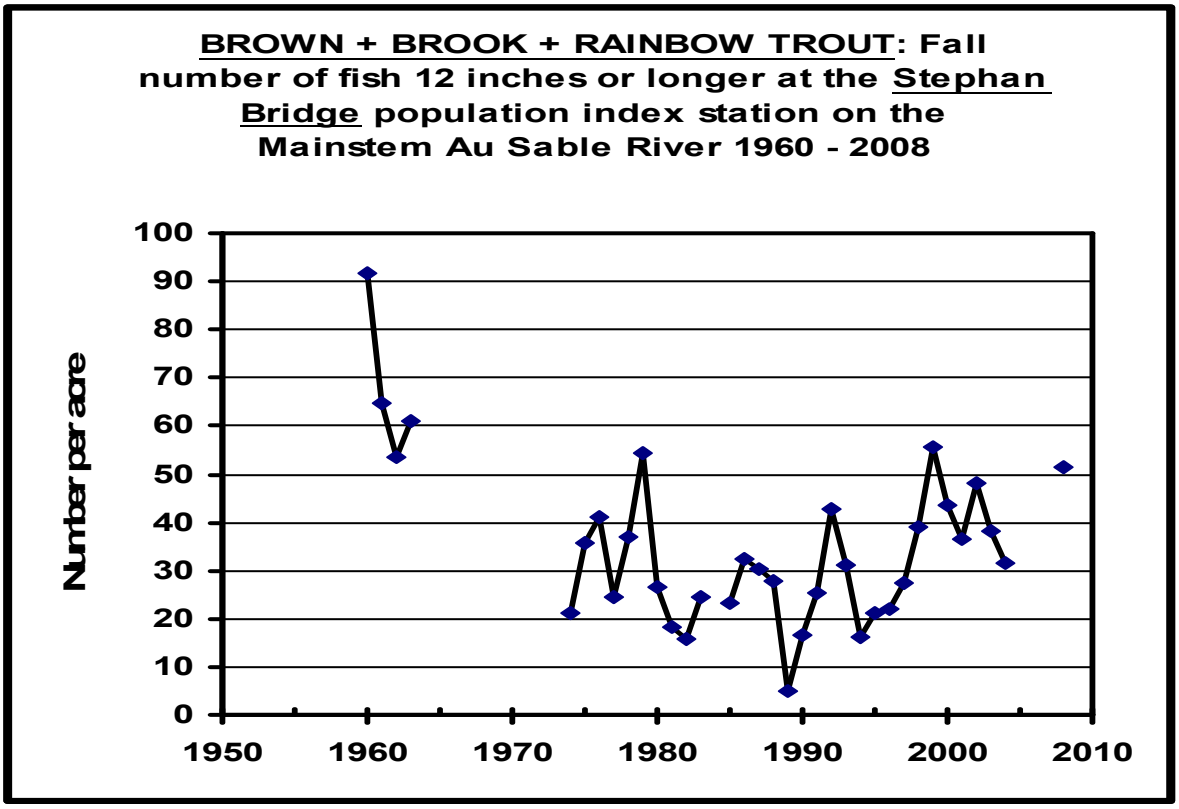

Figure 4 – Abundance of brown, brook, and rainbow trout in the mainstream of the Au Sable River at the Stephan Bridge population index station.

Comment II: **All types of size restrictions considered**

DNR did consider more than just minimum size limits. The proposal, however, did not include maximum size limits or slot size limits because our experience and knowledge indicate that they are less effective than minimum size limits for producing large trout. For example, the harvest slot limit applied to the Holy Waters of the mainstream of the Au Sable River from 1979-1988 yielded fewer brown trout over 12 inches in the population than the minimum size limit of 12 inches that was in effect during 1973-1978 (Clark and Alexander 1985, 1992). Maximum size limits do not protect fish unless they survive long enough to grow to the size limit. Few brown trout in Michigan streams live beyond age 4, yet most do not grow to be 18 inches until they reach 5 years of age. Thus, these regulations would protect from harvest only that small percentage of

individuals that grow to a large size, whereas minimum size limits protect most of the trout smaller than the minimum size for harvest.

Comment III: **Size limits for brook and brown trout in Type 1 streams**

It is true that brown trout mature at older ages and larger sizes than brook trout. Brown trout are much harder to catch than brook trout, however, and hence even if it is permissible to harvest them at 8 inches before they mature, the fact is that plenty of them escape angling mortality at small sizes and grow to maturity.

Figures 5 and 6 show that some of the highest stocks of brown trout in Michigan are currently found in streams managed under an 8-inch minimum size limit, as has been proposed statewide for the Type 1 category. These data were collected under the Division's Stream Status and Trends Program from sites throughout Michigan that were surveyed during late summer after the majority of angling had occurred. In most cases, the abundance levels for trout shown in the graphs are the average of 3 or more population estimates made since 2002. Note that some streams with a very low abundance of brown trout are occupied primarily by brook trout, including Bear Creek, the North Branch of the Manistee River, the Black River, and the West Branch of the Maple River.

These figures also show that some rivers managed under restrictive regulations, including the North and South branches of the Au Sable River have middle-of-the-road standing stocks of brown trout. In the case of the shallow North Branch of the Au Sable River, high rates of natural mortality are the primary hurdle that limits production of more big brown trout. In the South Branch, reproduction levels are a primary factor limiting production of more big browns. If you view the graphics of trends for the Au Sable River on the Hunt Creek Research Station Web Page (http://www.michigan.gov/dnr/0,1607,7-153-10364_52259_10951_11302-114740--,00.html) depicting abundance of brown trout 12 inches and longer, note that the highest abundance levels for all 3 branches occurred during times when minimum size limits were generally 10 inches on the North and South branches and during a period when voluntary release of legal-sized fish was much lower than it is today.

Large investments in habitat work by the DNR and a multitude of private groups appear to have fostered better survival and retention of large brown trout in the upper Au Sable River. Recently, abundance of 12-inch and larger brown trout has been high in all three branches of the Au Sable River. In our opinion this is most likely a result of a combination of habitat improvement work and, in some cases, increases in reproduction. Angling mortality on these branches has been low for many years. While regulations are important and generate much discussion and excitement, keep in mind that habitat conditions are a very critical factor. If this was not true, we would not have so many contemporary brown trout streams managed under an 8-inch minimum size limit with outstanding stocks of brown trout. Harvest of immature brown trout by anglers did not prevent this achievement.

Perhaps the proposed 8-inch minimum size limit is not the "best" for streams classified under the Type 1 category. Other minimum size limits were discussed internally and could certainly be considered for non-biological reasons. Recognize, however, that a 12-inch minimum size limit would severely limit the numbers of harvestable-sized brown trout in small, cold streams classified under the Type 1 category. For example, in Gilchrist Creek the average length of a 3-year old brown trout around the end of August is 10.5 inches. There were an average of 44 brown trout over 12 inches in a 1.4 mile reach of Gilchrist Creek where DNR estimated populations annually from 1995-2008. By contrast, there was an average of 432 brown trout over 8 inches in the same stream section. This is a 10-fold difference in the number of harvestable-sized brown trout.

Even though Gilchrist Creek has been classified under the Type 1 category since 2000 with a minimum size limit of 8 inches for harvest of brown trout, the creek has continued to maintain a standing stock of brown trout second only to the Au Sable River at Stephan Bridge among streams sampled for the Status and Trends Program in the Northern Lake Huron Management Unit (Figure 5). In addition, the average fall density of young-of-year brown trout in a 1.4 mile reach of Gilchrist Creek has averaged over 1,000 per acre since 2000, as compared to 700 per acre at Stephan Bridge on the mainstream of the Au Sable River, and 390 per acre at Dam 4 on the North Branch of the Au Sable River. It is apparent from these data that harvest by anglers under the existing 8-inch minimum size limit has not impaired natural reproduction by brown trout in Gilchrist Creek.

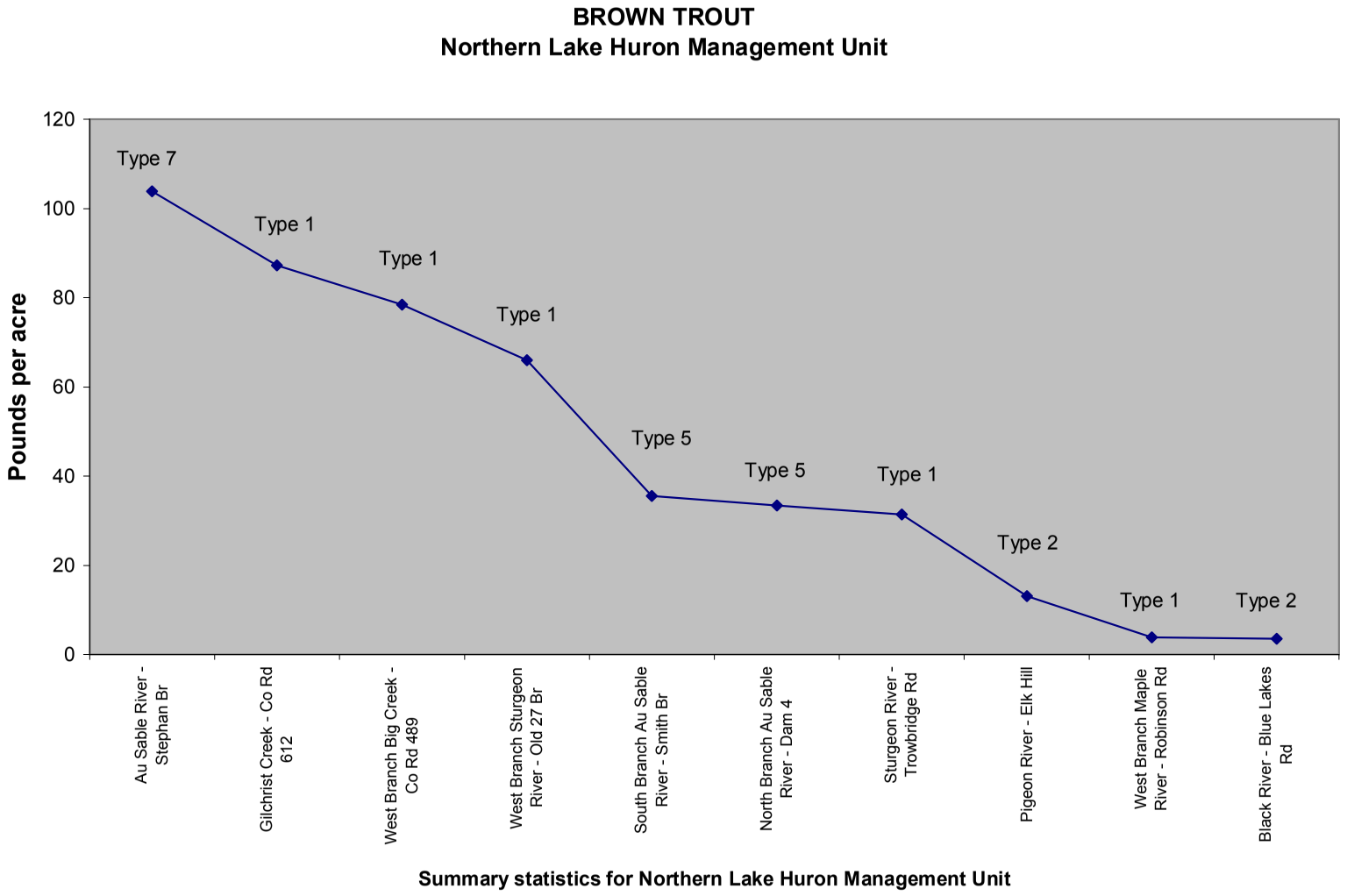

Figure 5 – Pounds per acre of brown trout at population index stations in the Northern Lake Huron Management Unit surveyed under the Division's Streams Status and Trends Program.

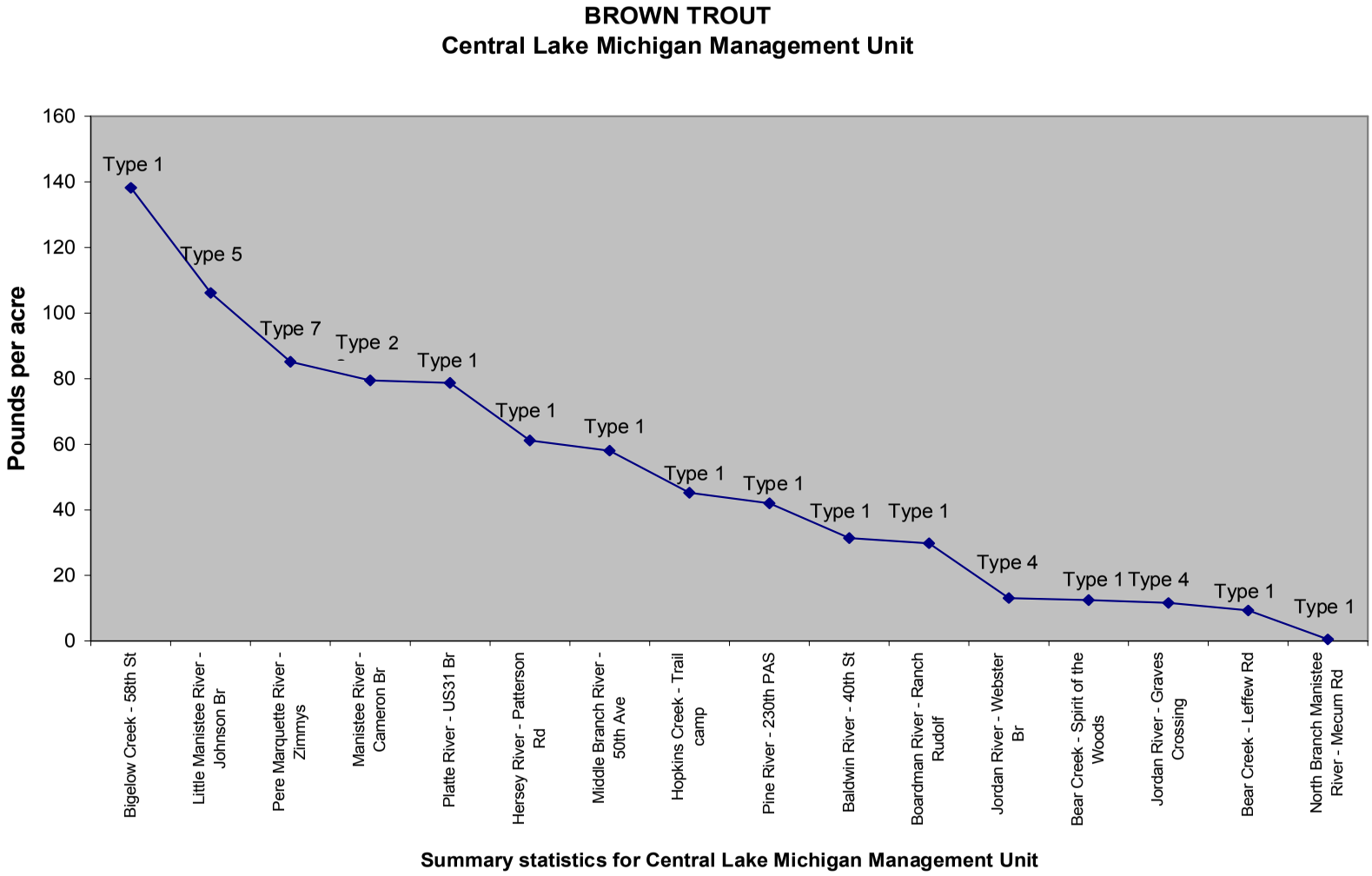

Figure 6 – Pounds per acre of brown trout at population index stations in the Central Lake Michigan Management Unit surveyed under the Division's Streams Status and Trends Program.

Comment IV: **Elimination of Existing Type 2 Regulations**

Ideally, a long-term study spanning a period of about 10 years would have been designed to evaluate the effects of imposing regulations for the Type 2 category on trout streams. Study stream segments would have included sites with and without stream improvement. Data would have been collected for 5 years before and 5 years after the change. Reference streams where regulations were not changed would have been surveyed for 10 years in a row, and angler surveys would have been conducted so that natural and angling mortality rates could be partitioned. This was the research approach the DNR was able to use in the past to evaluate experimental regulations for trout on rivers such as the Au Sable and Pigeon. We must also point out that at those times, however, more resources were available and allocated to evaluate the health of trout populations in inland lakes and streams.

The reality today is that such a long-term study would have cost well over one million dollars and was simply not feasible with the dollars and manpower available to Fisheries Division to manage all of the State's aquatic resources. The only affordable option was to use pre-existing data sets, which were almost all population abundance data collected late in the summer. In most cases, the population data were collected to help evaluate the effectiveness of habitat improvement work. The only angler census data available were from a volunteer angler survey on the Manistee River. These data did show that catch rates for the volunteers were higher in the reach of river classified under a Type 2 category. Yet, because total angling effort was not measured, it is not possible to determine whether more or fewer anglers used the river section after regulations became more restrictive in 2000.

No angler census was conducted on the Iron River where populations of 7.0- to 9.9-inch brook trout doubled under Type 2 regulations. Many anglers complained, however, that they could not catch many legal-sized fish and few expressed satisfaction with the new regulation. As a result of angler dissatisfaction on the Iron River and on other streams, fisheries managers in the Upper Peninsula had already reclassified the Iron River, the Fence River, and the East Branch of the Fox River from the Type 2 category to the Type 1 category before the current proposal was even developed.

The assertion by the authors that DNR is engaging in unwarranted speculation by stating that habitat improvements contributed, at least in part, to increases in the abundance of larger brown trout in Silver Creek and the Manistee River, both of which have stretches that are currently classified under the Type 2 category, is itself unwarranted. The authors have either ignored or discounted data that do not support the notion that more restrictive regulations will result in more large trout. For example, Spring Brook and Brandywine Creek are two creeks in southwest Michigan that are currently classified under the Type 2 category and both are on par with Silver Creek. Yet both Spring Brook (statistical significance of 95%) and Brandywine Creek (statistical significance of 94%),had abundances of trout that were higher when these streams were previously classified under the Type 1 category. That being true, what logic leads one to a conclusion that regulations were responsible for an increase in abundance of

intermediate-sized brown trout in Silver Creek? There is none because no such change occurred in abundance of brown trout at the unimproved site in Silver Creek, while the population of brown trout increased at the improved site. This was observed even though the same regulation governed fishing for brown trout at both sites.

A more careful reading of the analysis for the Manistee River clearly shows that the DNR did not state that regulations had no effect, and did in fact point out that factors well known to influence subsequent abundance of larger trout were involved such as increased levels of natural reproduction.

> *"… the increase in abundance of larger brown trout cannot be fully attributed to the regulation change. Extensive habitat improvement work has been conducted on the Manistee River over the past 3 decades. The naturally reproduced brown trout juveniles that produced more big brown trout after the regulations change in 2000 were nearly twice as abundant as they were during the late 1980s and early to middle 1990s. In other words, higher levels of natural reproduction produced greater numbers of large brown trout over the following years. We believe that improved reproduction achieved by controlling excess sediment and additions of LWD were primarily responsible for increased abundance of large brown trout in the Manistee River, although the more restrictive regulations may have contributed to the increase.*"

Finally, control of excess sediment has been shown to improve habitat for reproduction and, therefore, the success of reproduction. We leave this discussion with a single, rhetorical question: if the authors believe that habitat protection or enhancement efforts are not important for improving trout populations, why then has so much time and money been spent on such efforts?

Comment V: **The newly proposed Type 2 and 3 regulations (existing types 3 & 4)**

Some elements of this comment have already been addressed above. A short description of the evaluation of regulations for the Muskegon River when classified under the existing Types 3 and 4 categories is given in the response to Comment I. Minimum size limits have also been discussed relative to regulations for streams classified under the Type 1 category. The proposed regulations for streams classified under the new Type 3 category are popular and work well for certain tailwater fisheries on rivers that are stocked with trout. Examples include the Muskegon and Manistee rivers where stocked trout grow to exceed the minimum size limit during the year in which they are stocked, but few survive to grow to the larger size limits as suggested by the authors.

Comment VI: **New proposed gear restricted category**

We support moving forward with a review of both the streams that currently exist in the proposed Gear Restricted category, as well as those proposed for future inclusion in

this category. At the same time, we disagree with the assertion that the criteria in Fisheries Order 213 (FO-213) are neither objective nor quantifiable. These statements not only ignore the biological and social parameters and benchmarks contained in the criteria, but also show a lack of historical perspective on the development of the criteria. The criteria established in FO-213 are the result of a collective effort between Fisheries Division and the Coldwater Regulations Committee over the course of several years. While the most recent effort to develop criteria began in earnest in the summer of 2002, the process to establish criteria for "Quality Trout Streams" actually started many years ago. Ideas generated by Committee members during those earlier meetings, and even prior to that during the development of the "Blue Ribbon Trout Streams" list, helped shape the existing Order. The Division accepted these comments and spent considerable time discussing drafts of FO-213 at our October 2002 biologist meeting, during a subcommittee work group meeting in December 2002, and at our March 2003 biologist meeting. The Division then convened the Committee in the summer of 2003 for a final review, discussion, and agreement. The Coldwater Regulations Committee was not only instrumental in the development of the criteria; they also were in support of the final product. Furthermore, Trout Unlimited testified in strong support of FO-213 at the October 2003 NRC meeting.

The criteria contained in FO-213 clearly recognize, first and foremost, the importance of biological factors when considering streams for inclusion in the gear restricted category. Yet, the criteria are also structured to acknowledge the geographical, social, and political factors that can be important considerations before selecting or rejecting a given stream or reach. Overall the criteria provide us with a sound and defensible framework to use when making such decisions, and they offer excellent guidance in how to approach the selection process.

References

Alexander, G. R. and J. R. Ryckman. 1976. Trout production and catch under normal and special angling regulations in the North Branch of the Au Sable River, Michigan. Michigan Department of Natural Resources, Fisheries Research Report 1840, Ann Arbor.

Alexander, G. R., W. J. Buc, and G. T. Schnicke. 1979. Trends in angling and trout populations in the Main Au Sable and North Branch Au Sable Rivers from 1959-1976. Michigan Department of Natural Resources, Fisheries Research Report 1865, Ann Arbor.

Clark, R. D. Jr. and G. R. Alexander. 1984. Effects of a slotted size limit on the brown trout fishery of the Au Sable River, Michigan. Michigan Department of Natural Resources, Fisheries Research Report 1927, Ann Arbor.

Clark, R. D. Jr. and G. R. Alexander. 1985. Effects of a slotted size limit on a multispecies trout fishery. Michigan Department of Natural Resources, Fisheries Research Report 1926, Ann Arbor.

Clark, R. D. Jr. and G. R. Alexander. 1992. Evaluation of catch-and-release trout fishing regulations on the South Branch of the Au Sable River, Michigan. Michigan Department of Natural Resources, Fisheries Research Report 1987, Ann Arbor.

Zorn, T. B.. and A. J. Nuhfer. 2007. Regional synchrony of brown trout and brook trout population dynamics among Michigan Rivers. Transactions of the American Fisheries Society 136:706-717.