



Michigan Trout Unlimited's

Opposition to 10 brook trout daily bag limit regulations for Michigan's U.P. streams

**Public Comment submitted to the Michigan Department of Natural Resources
Natural Resource Commission**

October 11, 2018



Statement of Opposition

Michigan Trout Unlimited (MITU) is a Michigan non-profit, comprised of 20 local chapters around the State of Michigan, and 8,000 members. Our mission is the conservation, protection and enhancement of Michigan's coldwater fisheries and the watersheds that support them. Our vision is that our grandchildren will still have robust healthy coldwater fish populations to enjoy. While our membership is primarily anglers, we are a conservation organization by mission and practice. Our motto has always been, "take care of the fish and the fishing will take care of itself". We subscribe to the philosophy that what is good for the fish is good for the fisherman. As such, we have direct interest and stake in the productivity, value, resiliency and sustainability of brook trout populations in Michigan, and in fishing for them. Accordingly, we are communicating with you herein, to express our concerns and opposition for proposed changes in the management of brook trout populations in the Upper Peninsula of Michigan. We do so in representation of the interests in this issue posed by our organization's mission, for the interests of our Upper Peninsula based local chapters of our organization, in representation of the interests of all our members from across the state who fish for brook trout in the Upper Peninsula, and in representation of our members who may not fish for brook trout directly but have a public trust interest in the health of brook trout and the public benefits derived from them.

MITU understands that you, the Michigan Natural Resource Commission (NRC), is contemplating voting on a proposal to add more streams to the 10 brook trout bag limit regulation. The streams proposed include;

- Montreal River (Gogebic County), upstream of U.S. 2
- Presque Isle River (Gogebic County), upstream of U.S. 2
- Iron River (Iron County), upstream of the mouth (*originally proposed*)
- W. Branch Sturgeon River, Dickinson County), upstream of Calumet Mine Road
- Upper Dead River (Marquette County), upstream of Silver Lake Basin
- Days River (Delta County), mouth upstream to M-35
- N. Branch Stutts Creek (Schoolcraft and Alger counties), M-94 upstream
- McAlpine Creek (Mackinac County), Millecoquins Lake upstream.

MITU opposed the NRC decision to list many streams under this regulation when it did so in November 2017 (MDNR NRC November 2017), and now opposes the addition of these streams to this regulation. MITU has communicated with the NRC on this issue since 2012, and has highlighted and explained numerous concerns with its analysis and decision-making on this issue; we have never received any written responses to these communications from the NRC, nor any public documents justifying your rationales for decisions made in these regards. We believe these concerns, along with NRC decisions, represent failure to adhere to principles of the scientific fish and wildlife management (NREPA Act 451 of 1994, 324.40113a (Appendix A)), and your Michigan constitutional responsibilities to protect natural resources from impairment (MI Constitution 1963, Article IV, Section 52 (Appendix B)). The remainder of this public comment document explains our concerns in detail, and it is our hope it will help you better achieve a decision process following NRC Policy 1003. We request that you review it thoroughly and vote no on this current proposal; and to remove the streams included in this regulation in November 2017 and return them to a 5 fish daily bag limit.

Table of Contents

Page 1.	Statement of Opposition
Page 2.	Table of Contents
Page 3.	Executive Summary
Page 4.	A brief history of actions on this issue
Page 5.	Biological science considerations
Page 8.	Biological – Social Science interface
Page 11.	Social science considerations
Page 20.	DNR experimental study of 10 brook trout bag limits
Page 22.	Selection of specific streams for 10 brook trout bag limits
Page 25.	Michigan DNR inland trout management plan conflicts
Page 27.	Natural Resource Commission decision making and policies
Page 29.	Summary
Page 30.	References
Page 34.	Appendices

Executive Summary

Since 2012, specific individual Natural Resource Commissioners have championed the benefits of doubling the bag limit of brook trout in UP streams. In 2012, at their urging, Michigan Department of Natural Resources (MDNR) Fish Division undertook an evaluation of the regulation issue. It conducted a survey of Michigan citizens specifically addressing brook trout bag limit preferences and attitudes. That study found that a majority of citizens opposed the 10 brook trout bag limit, and preferred the current 5 fish brook trout bag limit. It also documented that support of 10 brook trout bag limits only predominated in anglers who had fished for >60 years. The MDNR Fish Division also evaluated the potential impact of the regulation on brook trout populations and concluded it expected minimal impact. MITU communicated with the MDNR at that time, providing detailed scientific rationale as to flaws in its biological assessment. The MDNR Fish Division announced it was not recommending changing any streams to a 10 brook trout bag limit. Later in 2012, MDNR Director Keith Creagh, then with the authority over regulating fisheries, implemented an experimental study of the 10 brook trout bag limit, on 8 UP streams, with a 5 year study of it to follow.

In 2017, during the 4th year of a 5 year study, the MDNR Fish Division presented results from the experimental study, and concluded that two *a priori* hypotheses about the 10 brook trout bag limit were rejected due to the evidence from the study. **First, it found that brook trout populations can be negatively impacted from the regulation; its treatment streams (10 bag limit) had 58% reductions in brook trout densities while the control streams showed a 47% increase in brook trout densities during the same period. Second, supportive NRC members had hypothesized that the regulation would result in an increase in fishing use of the streams it was applied to. MDNR Fish Division rejected this hypothesis as it saw no increase in fishing pressure, and saw evidence that fishing pressure may have declined.**

Specific NRC members nonetheless urged the MDNR Fish Division to present the NRC with a proposal to expand the 10 brook trout bag limit to a significant portion of UP streams, despite the study findings. Fish Division created a set of criteria for evaluating streams for inclusion in this regulation, which if cumulatively met, might reduce the risk of negative impacts from the regulation. Under continuous pressure from specific NRC members to find streams to include in the higher bag limit the evaluation criteria were eroded and diminished substantively, as was the manner in which the criteria were communicated to the public. In November of 2017, the NRC (5-1) voted to add 33 streams to a 10 brook trout bag limit regulation, despite not having basic information to validate how the streams fit the criteria (5-1 vote on the order included an opposition statement to the brook trout bag limit component by Commissioner Chris Tracy, and Commissioner Schlaybaugh was absent from the meeting). MITU opposed this NRC action, and communicated to it on our justifications. Somewhere along the way, a charge was given to the Fish Division to evaluate and determine whether more streams could be added to the brook trout bag limit regulation, and to report to the NRC its findings at a meeting in 2018. A public record of that NRC motion is not readily discernable from posted NRC Meeting minutes available electronically on its website.

In 2018, Fish Division undertook the process of evaluating more streams for possible inclusion in a 10 brook trout bag limit. Fish Division staff were asked by MITU if they undertook the review without forgone conclusions, and staff answered that they had been directed to find the best streams to add (September 2018 meeting of the DNR Coldwater Resources Steering Committee). Before the NRC now, is a list of proposed streams for which the Fish Division again has little to no scientific information to assess the appropriateness of this regulation. For example, the DNR has not provided, and indicated it does not have, viable fish population surveys, angler creel surveys, or critical habitat assessments for the

streams currently proposed. When you review the table of “criteria fit” for the streams, know that actual data to justify those assessments has not been provided, and was reported by Fish Division to not be available (September 2018 meeting of the DNR Coldwater Resources Steering Committee). MITU once again opposes the NRC adding more streams to this 10 brook trout bag limit, as it opposed the NRC adding the 33 streams to it in 2017.

The NRC has been delegated authority for regulating fisheries, and was charged to do so following scientific fish and wildlife management principles and to use the best available science in its decision-making. On this issue of 10 brook trout bag limits, the NRC has continued to disregard these principles, and allowed personal agendas of individual members to dictate non-scientific decision-making. Trout Unlimited was formed in 1959, in Michigan, for the express purpose of compelling the Michigan DNR to make progressive science-based decision on fisheries management. Today, as then, we stand steadfast in our opposition to the current proposal to add streams to the 10 brook trout bag limit regulation, and seek scientific fish management from the NRC. The following discussion is a detailed review of this matter, with supporting scientific evidence to help you arrive at the appropriate conclusion. If we can assist any current NRC member in reviewing, interpreting and considering evidence on this matter, we are at your service. Thank you for your careful consideration of this public comment.

A Brief History of Actions on this Issue

In the spring of 2012, the DNR Fish Division announced publically, that it was considering a proposal to increase the bag limit for brook trout from 5 to 10 on Type 1 streams in the Upper Peninsula. On May 30, 2012 MITU provided Jim Dexter, Fish Division Chief, (and then DNR Director Rodney Stokes) written comments in opposition to the proposal, with detailed explanations for our rationale (MITU 2012a). On June 9, 2012, the Fish Division released a report of its findings from a public survey it conducted from March through May 2012, targeted at documenting the attitudes of Michigan anglers in regards to brook trout fishing (MDNR FD 2012). The results of that survey will be discussed in detail in a subsequent section of this document entitled “Social Science”. The Fish Division then consulted with its Coldwater Resources Steering Committee which did not approve of changing the bag limit on streams in the UP as proposed (DNR CRSC September 2012). The Fish Division then publically announced its position was to maintain the current regulations, without change to them. MITU provided testimony in support of those recommendations to the NRC (September 2012 NRC Meeting Minutes).

By October 2012, the new DNR Director Keith Creagh expressed desire to list streams under a 10 brook trout bag limit. MITU communicated with Director Creagh in writing about this on November 3, 2012 (MITU 2012b), again detailing the reasons why we opposed this and felt it did not represent sound scientific management (no response to our scientific arguments was provided). Director Creagh then decided to implement the 10 brook trout bag limit on a set of streams in the UP and committed resources to the study and evaluation of the regulation. Commissioners Madigan, Richardson and Matonich provided support for the Director’s decision, stating that the goal of this was to increase fishing participation, which they believed the 5 brook trout bag limit had reduced (September & November 2012 NRC Meeting Minutes). The evaluation study was planned for a 5 year period.

In 2016, after 4 years of evaluation, the study was ended and Fish Division personnel gave presentations of results to the NRC (September and November 2017 NRC Meeting Minutes) and the Coldwater Resources Steering Committee (MDNR CRSC September 2017 Meeting Minutes), but never produced a written and reviewed report of the study findings. The details of the study will be explained in detail in a subsequent section of this document (DNR Experimental Study Results). However, the

study had two important general conclusions, as reported by Fish Division presentations; the regulation did not result in increased fishing, and it did provide clear evidence that brook trout populations can decrease significantly due to it. These were summarized by the following meeting minutes from Fish Division's presentation of the study results to its Coldwater Resources Steering Committee: *"Contrary to predictions going into the study, it was found that the ten-brook trout bag regulation had potential to negatively affect abundance and size structure of local brook trout populations and the opportunity for higher harvests did not result in increased angler activity."* (MDNR CRSC September 2017 Meeting Minutes).

In the summer of 2017, MITU was notified that Commissioners Richardson and Matonich wanted to see a large expansion of streams added to the list of 10 brook trout bag limit regulations, despite the study's results. MITU participated in meetings with specific commissioners (Matonich, Richardson, Schlaybaugh) and Fisheries Division Chief Jim Dexter, concerning this. MITU stated that it was not ideologically opposed to the possibility of higher bag limits on some streams, but that scientific diligence was required in order to ensure that only streams and fisheries known to have certain characteristics (which collectively would help reduce risk of adverse resource impairment) were selected, and monitoring to detect change should be implemented and reviewed. MITU then provided Fish Division with a list of proposed stream selection criteria, and Fish Division then modified it (weakening the protections proposed) and adopted it for use in considering streams for this regulation (MDNR Fish Division 2017). Through discussions with numerous Fish Division staff, MITU was told that Commissioner Richardson had communicated his expectations for the number of streams and stream mileage he wanted to see listed under this regulation, and that MDNR had been charged to bring that forward to the NRC, regardless of how well candidate streams may or may not fit the selection criteria. Fish Division coordinated review opportunities with MITU for the streams they were considering. MITU communicated with Fish Division regarding concerns with lack of critical scientific information about all of the streams (e.g., lack of fish population estimates, lack of knowledge of angling pressure, lack of information regarding critical habitat issues, and discrepancies with estimates of stream order, mileage estimates, and issues with other criteria fit). MITU also communicated with Fish Division concerning the relative risk of each candidate stream relative to others, where insufficient data was present on all of them; in order to help Fish Division best mitigate risk given the Commissioners' directive to propose streams regardless of criteria fit. MITU opposed the addition of all streams proposed by the Fish Division, and acted upon by the NRC. MITU sent written comment on this matter to the NRC on October 20, 2017 (MITU 2017), and provided testimony at NRC meetings leading up to the November 2017 vote. At this meeting the NRC approved the addition of approximately 1,200 miles of streams to a 10 brook trout bag limit designation, by 5-1 vote (Commissioner Schlaybaugh absent, Commissioner Tracy objected to the brook trout bag limit portion of the fisheries order) (MDNR NRC November 2017 Meeting Minutes).

For information at the October 2018 NRC meeting, additional streams are being proposed for inclusion in this regulation category. MITU is once again opposing this, and communicating to the NRC to ensure it understands the basis of our opposition.

Biological Science Considerations

In 2012, MITU provided the MDNR written communications about our scientific concerns over increasing the bag limit of brook trout on UP streams (MITU 2012a; MITU 2012b). This was done prior

to the MDNR experimental study of this regulation. The referenced public comment documents provide the rationale in full detail, but they will be summarized by the following.

- There was no evaluation of the effects of changing bag limits on brook trout when they occurred in 2000. The DNR changed the bag limits at that time, presumably for specific management objectives. However, there was no evaluation of the effects from changing them, nor monitoring of whether populations were altered due to the change. Professional fisheries management follows a process of management whereby management changes are based on explicit objectives, and evaluation occurs after management actions to determine whether the changes resulted in achievement of the objectives (FAO 2002). With a lack of explicit objectives and evaluation of management actions, current management actions are arbitrary. This process of changing regulations without measuring the realized effects, does not constitute robust fisheries management.

- Many biological and environmental parameters of brook trout fisheries and their streams are critical in determining whether or not they could sustain higher angling mortality. First, the focus of this regulation change applied to Upper Peninsula streams is not based in biological science. For example, mean Summer (July or August) water temperatures have been documented to explain a significant amount of variability in brook trout densities (Downstream Strategies 2012, Zorn et al. 2002, 2008, 2009 and 2012). These mean summer water temperatures are not determined for a stream by their location in Michigan (i.e., UP streams are not intrinsically different from other trout streams in Michigan, in regards to determining important biological or environmental variables that dictate their appropriateness for higher harvest levels). This renders the focus of this regulation on UP streams, as arbitrary from a “biological” sciences perspective.

Second, certain biological parameters of a brook trout population in a given stream are critical for evaluating their ability to sustain higher harvest and angling mortality. These include recruitment levels, population densities, and age-specific densities, growth rates, and survival rates and the variability of each of these. Influencing these, are environmental factors and habitat characteristics of the streams to be evaluated (e.g., groundwater contribution, peak spring flow levels, abundance and distribution of critical habitat elements for reproduction, survival and growth of different life stages for brook trout). UP streams as a whole vary widely in these variables, and there is no scientific justification for including all of them into this increased bag limit regulation. Within the streams that have been listed for this 10 brook trout bag limit in 2017, and currently proposed, the DNR does not possess, nor has it provided information on such variables for all streams proposed, and thus has not presented that it has scientifically determined each brook trout fishery’s biological capacity to sustain higher rates of angling mortality that this regulation poses. The DNR Fish Division may state that they do not have the information for each proposed stream to confidently identify risk of detriment, but they lack the information on any stream proposed to confidently and scientifically state the actual risk of detriment.

- There has been no actual evaluation of brook trout populations in comparison to carrying capacities, in streams included in 2017 under this regulation or those currently proposed. Each stream has a biological population carrying capacity that differs based on the biological and environmental variables present. Streams considered for this regulation change may currently have low population levels either because they have a low carrying capacity, or because angling mortality is currently suppressing them significantly. In evaluation of a brook trout fishery’s appropriateness for higher angling mortality levels, there should be consideration of the degree of population suppression that may already be present.

- Increasing the bag limit of brook trout from 5 to 10, can increase the angling mortality on the population through both increased angling harvest mortality and through increased angling hooking mortality (the percent of fish that die after being caught and released, by anglers continuing to fish in pursuit of the 6th through 10th fish harvested). The effect of this bag limit change and the increase in total angling mortality in light of temporal variability has not been addressed to date yet is critical to

understanding the long-term impairment of brook trout populations given this increased bag limit regulation (Strange et al 1992). Stream trout populations in Michigan are believed to be heavily impacted by random annual differences in environmental conditions (Zorn and Nuhfer 2007). This means that large annual differences in year class strength occur, and often shape the densities of brook trout present in streams. Following good years, a higher density of brook trout might be able to support higher bag limits, while poor years will result in lower densities. Under the latter conditions, higher angling mortality exerts a proportionally higher impact on mortality rate in the population (Hunt et al 1962) and can diminish the recovery and rebound of brook trout populations, slowing the rate of rebound to higher densities.

- It is often argued that because brook trout exhibit relatively high rates of annual mortality inherently, adding angling mortality will have little effect on their populations. This argument is short-sighted, because we do not know to what extent natural and fishing mortalities are compensatory versus additive. If we knew that they were 100% compensatory, then higher bag limits might be more acceptable as natural mortality would be reduced by increased angling mortality. But this is not known. If mortalities were 100% additive, then the populations may not withstand significant added fishing mortality without detriment. In all likelihood, the mechanisms of natural and fishing mortality factors are highly probabilistic from individual to individual, and will be difficult to document. Thus it might be safest to assume fishing mortality is partially compensatory and partially additive for most streams. Hunt et al 1962, in a study of brook trout angling effects on a wild population of brook trout noted that natural mortality appeared to remain constant under differing regulations, and provided evidence that angling mortality is largely additive. Varying rates of this could be modeled to better understand the range of impacts possible from expansion of fishing mortality through increased bag limits, but have not been.

- As brook trout increase in length and age, they produce increasingly more eggs, and have been documented to also have a higher rate of success with age and spawning experience. For example; 6" brook trout produce 189 eggs, 8" 358 eggs, 10" 586 eggs, 12" 876 eggs, and 14" 1231 eggs (Halfyard et al 2008). Given the average size structure of brook trout populations (from MDNR Status and Trends data), this would mean that while 4" -6" brook trout are typically 75% of the fish present, (>7" is ~25%); 4"-6" brook trout contribute only about 45% percent of the eggs produced, compared with 55% for 7"-14" fish. Without factoring in any expected increase in spawning success by older age classes of spawners, this simple illustration can show that >7" brook trout are incredibly important in their spawning contributions and effect on brook trout populations and densities. This type of fecundity information was not included in the 2012 MDNR analysis of the potential impact from doubling the bag limit of brook trout in the U.P. MDNR modeling efforts on this issue were presented to have held recruitment constant, and did not evaluate fecundity at age differences, let alone how density changes would affect recruitment levels. This is akin to a deer harvest model keeping the number of yearling deer constant, even if doe harvest increases and number of does decreases. A modeling effort such as this, where recruitment is not tied to spawning stock, and remains constant despite declines in spawning adults, is woefully insufficient to evaluate the effects of an increase in angling mortality. This highlights a lack of appropriate scientific evaluation of another component of this regulation change.

To date, there has been a lack of monitoring of changes to brook trout populations since 2000. Evidence suggests that since this time, when bag limits of brook trout were reduced from 10 to 5 per day, stocking of brook trout by the MDNR has decreased (Zorn et al 2018), popularity of brook trout among UP resident anglers has significantly increased (Carlson and Zorn 2018) and satisfaction with MDNR management of trout fisheries has increased (Carlson and Zorn 2018). Yet no formal analysis of the fishery changes due to this regulation change have been reported. In 2012, the MDNR concluded a flawed analysis hypothesizing that the 10 brook trout bag limit would have no or negligible impact on brook trout populations. MITU commented in detail on the omissions of that evaluation and the likely

impacts that could occur. In 2017, MDNR reported the results of an experimental study of the 10 brook trout bag limit, and concluded that biological risk of impairment to brook trout populations was likely. However, the NRC has continued to add or consider adding more streams to a 10 brook trout daily bag limit regulation, in the face of scientific information indicating biological effect of impairment. It has, in 2017, included streams in this regulation category that it in fact, have limited to no biological or ecological data to assess.

From the considerations mentioned above, we feel the biological science information that has been used in evaluating or justifying these regulations changes has been incomplete, insufficient, and does not represent the use of best available science in the consideration of the 10 brook trout bag limit and its application in general or to specific streams. The regulation changes do not represent accepted processes and standards for modern fisheries management (FAO 2002). Further, the MDNR Fish Division has historically adopted a priority for Ecosystem-based management of fisheries (FAO 2005, NMFS 2009), which has tenants for fisheries management that go beyond traditionally focused fisheries management objectives, which are also not being met by the politically-driven decision-making process on this 10 brook trout daily bag limit issue.

Biological – Social Science Interface: Angler Use, Pressure, Creel, Angling Mortality

At the interface between biological and social sciences lies information on angling mortality to a brook trout population. By this, we mean considerations of information that pertain to the effects that anglers can have, through their angling activities and behaviors, on the populations of brook trout. This collection of information is often referred to as “creel surveys” or angler behavior studies. Anglers influence brook trout populations through angling in two main ways. First, all anglers can effectuate a certain level of mortality on fish in the population, through “hooking mortality”. This occurs through lethal damage to a fish captured, through the process of hooking it, landing and handling it, unhooking it, and releasing it. Sometimes this is apparent to the angler, and often is not as the fish swims away but subsequently dies. Many factors influence the level of hooking mortality that occurs on a given stream. One variable that has been found to influence it, which has been studied, is the type of terminal gear used (i.e., natural bait, artificial lures, or flies) (reviews of these studies in MDNR Inland Trout Management Plan Zorn et al 2018, Wydoski 1977, and Bachman 2001). In addition to hooking mortality, harvest mortality is the component of angling mortality that occurs due to fish being kept or “harvested”. Together, with the amount of angling pressure exerted on a fishery, and the effectiveness and dynamics of such pressure, angling mortality can be estimated. Understanding angling mortality is critical to understanding the effect of a regulation on a fish population.

A primary concern of MITU in regard to NRC decisions on the bag limit of brook trout in the UP, is that very little information about this variable has been presented and documented to have played a role in evaluating the effect of this regulation. In consideration of the streams that were included in the 10 brook trout bag limit in 2017, or currently proposed, we have not seen presentation of angler pressure data for these streams, despite its fundamental importance. Such information was collected for select streams part of the 2013-2016 experimental study, and we will review that in a following section of this document. But, we have not seen this information provided for streams listed in 2017 nor for those currently proposed (this will be discussed further in this report in the section titled “Stream Selection Criteria”).

To illustrate and document the importance of this information, we highlight important study findings from a Wisconsin historic study. Hunt et al (1962) conducted a study on Lawrence Creek, from

1955-1965, which examined how bag limits and angling mortality effected brook trout populations there. This study is quite old now, and came from a neighboring state where the trout populations, and behaviors of anglers there and then may differ in important ways from our present situation on the UP brook trout streams being considered for 10 brook trout bag limit now. We are including this study here, to provide an example of a study which invested significant resources in quantifying the trout population and the angler demographics influencing it. The following are important excerpts from that study's findings. They are offered for your consideration here, as they document angling pressure can indeed have significant influence on brook trout populations. It also clearly illustrates that knowing the angling pressure exerted on a fishery is critical to determining whether a harvest regulation will be detrimental or not.

- *“The intensive investigations conducted at Lawrence Creek substantiate this premise that man is an effective predator upon brook trout. Anglers creeded 59 per cent of the brook trout population in 1956 and 65 per cent of the brook trout population in 1957. Age Group II brook trout seemed especially vulnerable 72-100 per cent of the brook trout in this age group were caught (Table 12); thus, few Age Group II brook trout survive to spawn for a second time. Regulation of the harvest of wild brook trout from Wisconsin streams, therefore, is both biologically sound and necessary to insure perpetuation of this fishery wherever sufficient angling activity exists.”*

- *“Regardless of the bag limit or size limit in effect, the amount of angling mortality which occurred during the 1955-60 seasons was found to be a function of the relationship existing between angling intensity and density of trout. Angling mortality is an inverse density-dependent factor. If angling pressure remains constant, the rate of exploitation increases as the density of trout decreases. Or, any increase in angling pressure brings about a proportionately greater depletion of sparse trout populations than of dense trout populations.”* (MIDNR data for brook trout streams in the Upper Peninsula, where this bag limit change has been employed, are generally thought to be of low density. With the exception of one MI experimental control study stream, the densities of brook trout study streams were all far below the lowest densities recorded in this WI Lawrence Creek study.)

- *“Two-year-old brook trout predominated in catches taken during the first week of the season after which their importance declined rapidly. The catch of yearling brook trout increased inversely to that of the two-year-old brook trout as the season progressed (Fig. 3). Rapid exploitation of the larger brook trout caused marked changes in size distribution in the yield even during the first week of angling (Fig. 4). The supply of trout larger than 8.4 inches was rapidly depleted, and angling pressure was sufficient to prevent recovery of this group during the open season. This size group roughly corresponds to Age Groups II, III, and IV.”* (This WI study illustrates that angling pressure can be sufficient enough as to deplete legal sized brook trout quickly, leaving subsequent anglers fishing the rest of the season with greatly diminished supplies of legal sized trout to catch.)

- *“The preseason standing crop of brook trout in the entire stream weighed 703 pounds, or about 75 pounds per acre. The yield of 537 pounds (57 pounds per acre) represented 76 per cent of the weight of brook trout present at the beginning of the season. Weight of the postseason residual standing crop (excluding Age Group 0) was 392 pounds.”*

- *“Angling proved effective enough to remove 32 per cent of the number of adult (Age Group I and older) brook trout present when the season began, including 24 per cent of the yearling brook trout, 72 per cent of the two-year-old brook trout and 42 per cent of the brook trout three or more years old (Fig. 6).”*

- *“A large share of the catch was accounted for by a small proportion of the angling trips. Nearly one-third of the total catch was realized from only 6 per cent of all the trips, and half of the total catch was taken during 11 per cent of the trips (Fig. 7).”* This observation of catch and harvest distribution among anglers is consistent with a MI study of brook trout from the late 1980’s and early 1990’s (Wagner et al 1994). It’s important in noting that a small number of anglers, can indeed have a very significant effect on standing crops of brook trout. The recent MIDNR evaluation study of 10 brook trout bag limit indicates the same, while relatively small amounts of fishing pressure might be documented, it can still have significant effects of brook trout population levels.

- *“A summary of the composite data for the 1958-60 (more restrictive regulations, 9”MSL and 5 fish bag limit) seasons revealed that anglers reduced the number of adult brook trout by less than 4 per cent. During this period, less than 1 per cent of the yearlings, 14 per cent of the two-year-olds, and 32 per cent of the brook trout three or more years old were harvested. The weight of brook trout removed in relation to the weight of the preseason standing crop was 15 per cent in 1958, 24 per cent in 1959, and 7 per cent in 1960. None of these yields approached that attained during 1955 under a 6-inch size limit and bag limit of 10. That year anglers removed 32 per cent of the adult brook trout including 24 per cent of the yearlings, 72 per cent of the two-year-olds, and 42 per cent of the older brook trout. The weight of the total catch was equal to 76 per cent of the preseason standing crop.”*

- *“During the 1958 and 1959 fishing seasons, natural mortality of yearlings was approximately of the same magnitude as during the 1955 and 1956 fishing seasons. However, anglers removed an additional 25 per cent and 46 per cent of the yearlings during the respective 1955 and 1956 fishing seasons. While some of the yearlings caught by anglers would have died naturally, mortality due to angling and natural causes combined was approximately twice as great during the summers of 1955-57 as it was during the summers of 1958-60. (Again, this study did show the significant angler mortality that can occur from different regulations.)*

In reviewing this Michigan brook trout bag limit increase in 2012, the MDNR stated it relied upon a study conducted from 1988-1992 on 4 western U.P. trout streams (Wagner et al 1994). This study while, over 25 years old and uncertain in how it reflects current angling dynamics, did document that of all anglers surveyed in the study (which was done during a 10 fish bag limit), about 75% were unsuccessful in catching any brook trout, while only 2.5% caught more than the 5 fish bag limit. This would initially appear to support the increase in bag limit, as few people attained over 5 fish. But, the 2.5% of the anglers harvested 30% of the brook trout harvested over 7” (comparable to Hunt et al 1962 that found 6% of angling trips resulted in a third of the harvest of fish). It is therefore plausible that the higher bag limit could exacerbate localized depletion >7” brook trout from commonly fished areas, decreasing the success rate of a majority of anglers hoping to at least successfully catch some fish (the priority of anglers for a high catch of brook trout will be documented and referenced in the proceeding section on “Social Science Considerations”). For the majority of anglers who prioritize “number of brook trout caught”, expanding the bag limit is counter-productive (documented and discuss in the section on the DNR Experimental Study). The 1994 study also showed that the majority of fishing pressure was exerted from the opener (end of April) to the end of May. Together, this indicates the possibility of increased bag limits leading to quicker depletion of available >7” brook trout in localized areas of easy access, potentially negatively impacting success and satisfaction levels of other anglers. MITU commented in the past to the DNR

about this concern, and evidence for this occurring was documented in the DNR's Experimental Study.

MDNR available studies evaluating the impact of Type 2 regulations (with a 10" minimum size for brook trout) showed that for some U.P. streams (e.g., Iron River) the decreased harvest of 7" – 10" brook trout resulted in twice as many brook trout 7-10" (DNR Fish Division internal report on Type 2 stream evaluation). This situation may or may not apply for all U.P. streams, but does illustrate how the increase in fishing mortality currently proposed can negatively impact some U.P. brook trout populations that receive heavier fishing pressure. Of note, the Iron River was included in the list of streams currently proposed for a 10 brook trout bag limit. While no information about angling pressure on this stream has been presented as part of this current regulation review, from available DNR past studies, there is evidence that more restrictive regulations increased brook trout abundance, and hence evidence that increasing angling mortality is likely to result in brook trout abundance declines there if this regulation is adopted.

As bag limits are increased, anglers will fish longer periods of time after attaining 5 fish bag limits. As <7" brook trout outnumber >7" 3:1 in the average Michigan stream (DNR Status and Trends data, provide by T. Wills in 2012), these sublegal fish will be caught more often, and will be exposed to the increased rates of hooking mortality. For example, use of natural bait is often cited as having ~25% hooking mortality, sometimes as high as 45% (Zorn et al 2018, Bachman 2001, Shetter & Allison 1955 and 1958). Therefore, the impact of this doubling of bag limit does not extend only to harvest mortality increasing, but also to increases in hooking mortality on all size classes. For illustration, if an angler was to fish gear that was not size-selective, the angler might be conservatively expected to catch an additional 15 sublegal sized brook trout (<7") in attaining a 10 brook trout bag limit versus a 5 fish limit, with a hooking mortality of 20%, that could result in an additional 3 sublegal sized brook trout dying. To our knowledge, this mortality consideration was not assessed in DNR evaluation of this regulation change.

Additional relevant information on this subject was collected as part of the DNR Experimental Study of the 10 brook trout bag limit. For brevity, it will not be summarized here, but is included a proceeding section specifically addressing the results of that study. It found that while measured fishing pressure was considered relatively light, harvest can increase, and observable declines in brook trout were measured.

What should be clear from this information, is that anglers can and have had an impact on brook trout populations. A relatively small number of anglers can have impact on brook trout populations, as well as the success of a majority of the other anglers fishing a section of stream. It may be tempting to conjecture that so few people fish a stream, therefore the expanded bag limit cannot lead to impairment of brook trout. But, studies in Michigan and nearby states have documented that it can and has. Brook trout abundance can be lowered, population levels suppressed, and older, larger and more fecund fish can be removed from a population by a few anglers.

Social Science Considerations

Management of fisheries, a public trust resource, implicitly involves considering the public and users of the resource. Managing public trust resources inherently includes goals of ensuring that the resources are sustainable and not compromised for future generations to enjoy; and within that constraint maximizing the value of the resource to the public. Therefore, knowing what the public desires for use

and interaction with a resource, such as any brook trout fishery, and what form of use is sustainable and maximizes the value of it to the public is critical.

From March 26 to May 28, 2012, the DNR Fish Division conducted a public survey of angler opinions on brook trout fishing (MDNR Fish Division 2012). The DNR reported approximately 1,400 responses to the survey. For comparison, similar DNR surveys that had been done on issues of salmon bag limits and number of lines allowed per angler each garnered approximately 300 responses each, indicating a high level of public input received to this survey, and a high level of interest in brook trout management issues. The following are important conclusions of the survey as published by the MDNR Fish Division (MDNR Fish Division 2012).

- “nearly twice as many anglers opposed the possession limit increase compared to those who supported the change.”
- “Survey respondents were asked to rate their level of support for the existing 5 brook trout daily possession limit and the proposed 10 fish daily possession limit. Overall, 55% of respondents indicated that they support the existing 5 fish limit, compared to 17% which opposed the 5 fish limit (Figure 7). By comparison, 28% of anglers supported and 53% opposed the 10 fish daily possession limit. This general pattern of greater support for the existing 5 fish limit and greater opposition to the 10 fish limit held true regardless of how often the respondents fished for brook trout in Upper Peninsula streams (Figure 8).”

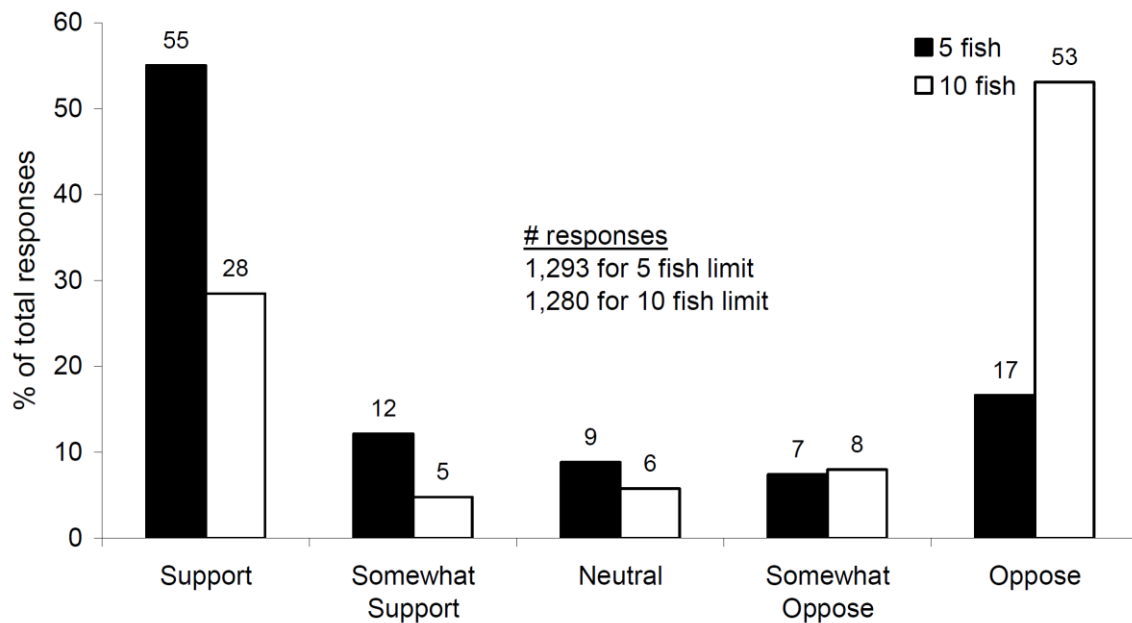


Figure 7.—Percentages of respondents who supported or opposed the existing 5 brook trout daily possession limit and the proposed 10 brook trout daily possession limit.

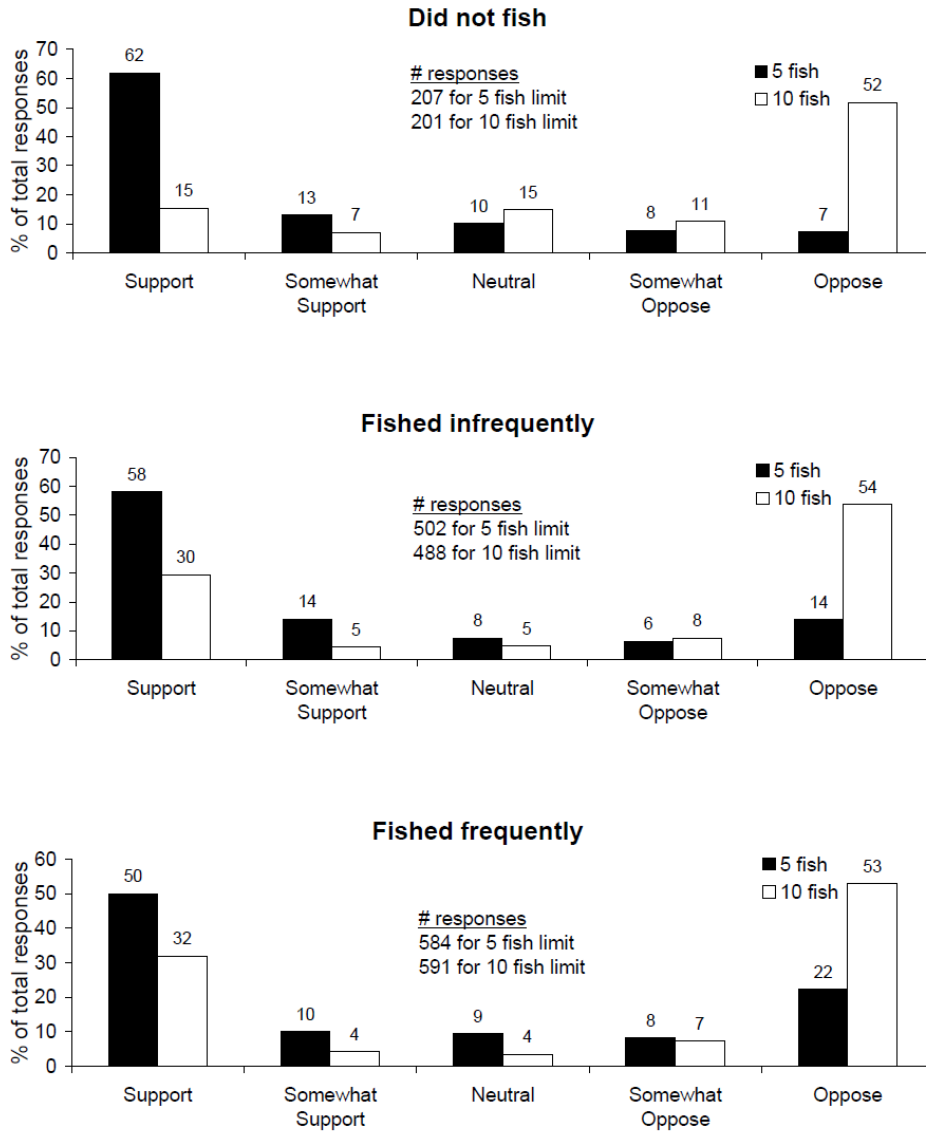


Figure 8.—Percentages of respondents who supported or opposed the existing 5 brook trout daily possession limit and the proposed 10 brook trout daily possession limit. Respondents are grouped based on how frequently they fished for brook trout in Upper Peninsula streams during the last three years. Respondents who fished more than 10 times in the last three years were placed in the “fished frequently” category, whereas those who fished 1-9 times were placed in the “fished infrequently” category.

- “Lower Peninsula residents and nonresident anglers clearly favored the existing 5 fish limit over the 10 fish limit (Figure 11).”
- “Of the respondents from the Upper Peninsula, 45% supported the 5 fish limit and 39% supported the 10 fish limit. Conversely, 27% of Upper Peninsula residents opposed the 5 fish limit and 46% opposed the 10 fish limit.”

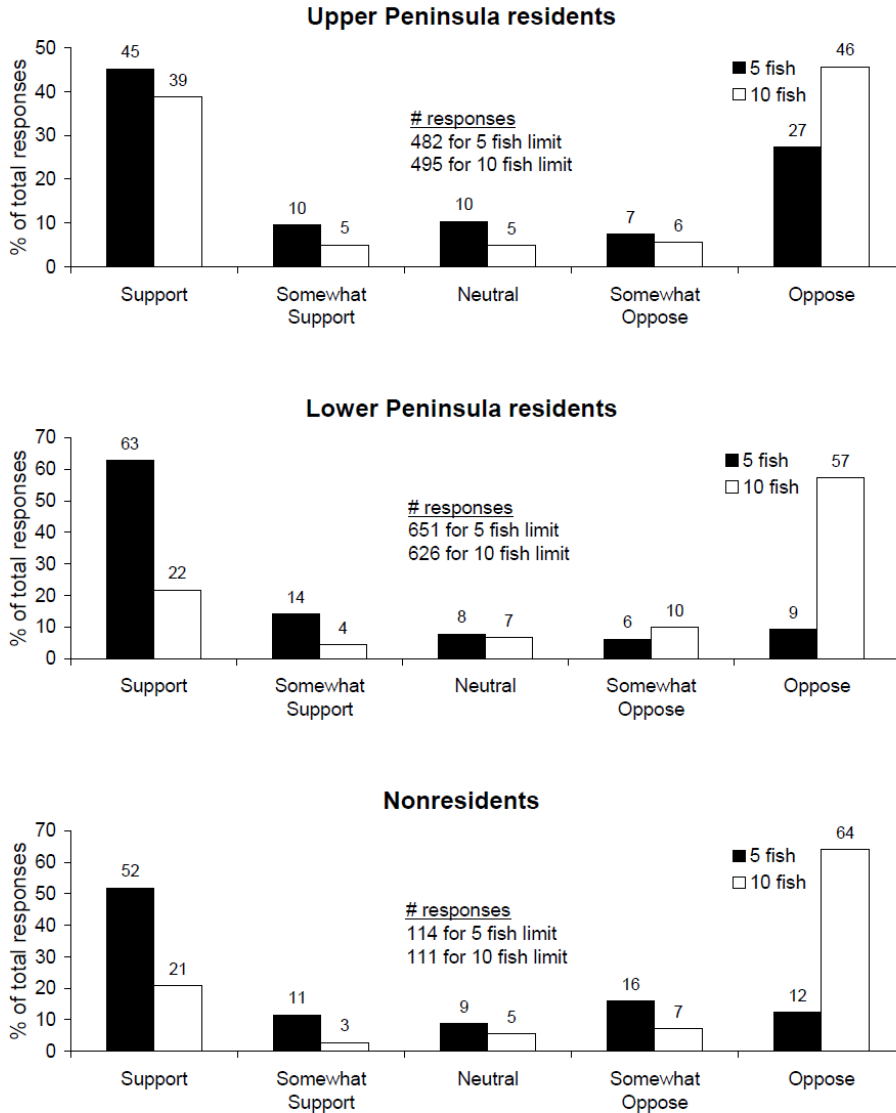


Figure 11.—Percentages of respondents who supported or opposed the existing 5 brook trout daily possession limit and the proposed 10 brook trout daily possession limit. Zip codes of primary residences were used to classify respondents as Upper Peninsula residents, Lower Peninsula residents, or nonresidents.

- “By contrast, anglers who had fished in Michigan for < 60 years were much more likely to support the existing 5 fish limit (Figure 13).”
- This important finding, depicted in Figure 13 of the report illustrates that the only group of respondent anglers that predominantly supported a 10 fish bag limit, were those who had fished for 60 years or more. When considering how implementing a 10 brook trout bag limit might affect fishing participation and recruitment and retention of new anglers into the sport, one can see that the opposition to 10 brook bag limits increases with “newness” to the sport. This is likely a result of two factors. First, newer anglers can be expected to place a priority on successfully catching brook trout, above goals to harvest large numbers of them, and a realization that higher bag limits on a stream can decrease brook trout abundance and therefore catch rates. Secondly, it is also likely a factor of the generational differences in motivations of younger trout anglers versus older ones, where younger anglers place greater emphasis on catch rates or size of fish caught as compared to harvest levels. A 10 brook trout bag limit will not benefit recruitment of new anglers, or motivate them to fish where it is applied.

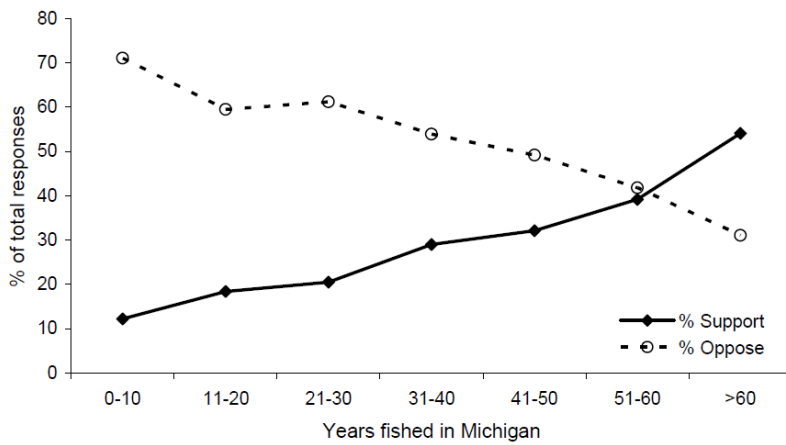


Figure 12.—Percentages of survey respondents who supported or opposed the proposed 10 brook trout daily possession limit. Respondents are grouped by number of years fished in Michigan.

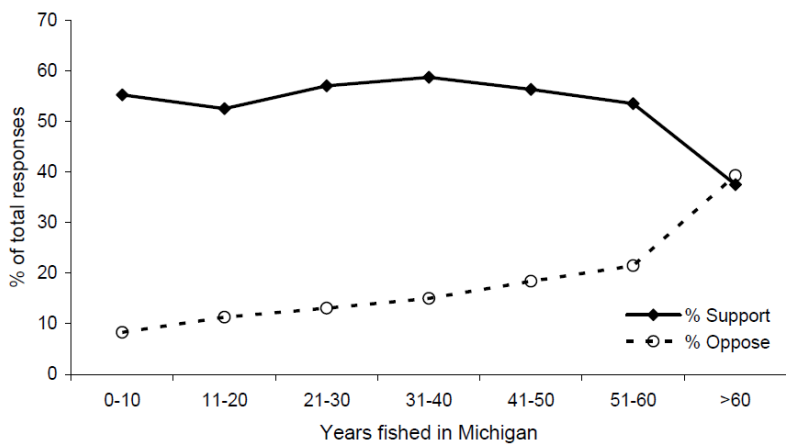


Figure 13.—Percentages of survey respondents who supported or opposed the existing 5 brook trout daily possession limit. Respondents are grouped by number of years fished in Michigan.

- *“Anglers were asked to rate the importance of various factors in determining the quality of their brook trout fishing experiences in Upper Peninsula streams. Approximately 73% of respondents indicated that aesthetics and scenery were important (Figure 5). Only 29% of respondents rated catching fish to eat as important, and 32% indicated that catching fish to eat was not important. Catching large fish and the number of fish caught and released were at least somewhat important to most respondents.”*
- *“There does not appear to be widespread support for raising the daily possession limit for brook trout. In general, catch rates and the opportunity to catch larger fish were more important to anglers than catching fish to eat.”*

This MDNR Fish Division survey effort was conducted in 2012, prior to the regulation experimental study. It provided clear information at the time, to assess the attitudes and preferences of the resource users in regards to the 10 brook trout bag limit regulation. Since then, it has been reinforced and added to by other social science efforts to understand brook trout anglers in Michigan (Melstrom et al 2014, Carlson and Zorn 2018). It was also concluded by MDNR Fish Division that a 10 brook trout bag limit can indeed lower the abundance of brook trout present in streams for anglers to catch. We also note that given NRC precedent for considering a deer antler point restriction (conservative harvest scenario), the NRC requires a majority public support for it prior to considering the proposal. However, in the case of 10 brook trout bag limits (a liberalized harvest scenario with resource risk) the NRC had and has the social science data to illustrate that this regulation does not have a majority public support, but nonetheless added 33 streams to this regulation in 2017, and is now considering another proposal to add more streams to this category in 2018, in apparent contradiction to practices it has used for interpreting social science information in other important contexts.

The 2013 – 2016 MDNR experimental study of the 10 brook trout bag limit surveyed just under 400 anglers fishing in the area of the research streams, via creel, postcard and online surveys (MDNR CRSC 2017). This survey, while smaller in sample size and more restricted in the angler sample pool than the 2012 DNR effort, did provide further social science for consideration in evaluating the 10 brook trout bag limit preferences among anglers. These results were taken from the MDNR 2017 presentations of the experimental results, as presented by Jim Dexter at the November 2017 NRC meeting (MDNR NRC November 2017 Meeting Minutes). The anglers surveyed included anglers from out-of-state, residents of the lower peninsula, and residents of the upper peninsula, but was weighted heaviest to UP residents (50 – 66% of respondents for the various survey techniques used). Despite this, it found that a majority (57%) preferred the 5 brook trout bag limit. This is in spite of 65% of respondents indicating that they “usually” keep legal-sized brook trout (35% usually release them). This illustrates that even out of a sample pool weighted heavily to anglers preferring to harvest brook trout, a majority of them still favored the 5 fish limit. When asked how the 10 brook trout bag limit would affect how often they fished these streams, 66% reported it would have no effect, 10% said they would fish less, and 24% reported they would fish more often (but no reported increases in fishing pressure were documented in the study (see the following section on “DNR experimental study on 10 brook trout bag limits”). This indicates that 2/3rds of the anglers fishing these streams were not motivated in any way by the increased bag limit (this sample pool excluded anglers who chose not to fish these streams because of the regulation imposed). When asked their opinion on whether the 10 brook trout bag limit would have an effect on brook trout populations, 49% reported it would have a negative effect, 41% indicated it would have no effect, and 10% indicated it would have a positive effect. Thus, nearly half the respondents perceived that the regulation will have a detrimental effect on brook trout populations (this survey did not capture those anglers who stopped fishing these streams because of this perceived effect, an important consideration given the next study presented by Melstrom et al 2014).

Melstrom et al. (2014) published a study intended to aid fishery managers in understanding the value anglers place on certain attributes of their angling activities. The researchers used datasets on

stream fish biomass (abundance) in Michigan streams (from MDNR fish population surveys in the Michigan Rivers Inventory (MRI)), along with data from angler trip choices from Michigan anglers (from MDNR Michigan Recreational Angler Survey (MRAS)), to develop economic models that quantify the significance of fish abundance on site choice by anglers. This study documented that the abundance of certain fish species is of significant importance to anglers selecting places for their fishing trips, and they documented increased willingness to pay to fish in places with higher abundance of certain fish species. *“These estimates show that Michigan stream anglers respond to differences in fish biomass between sites and, specifically, that the probability of visiting a site increases with targeted biomass.”* The researchers found that the significance level of this relationship was not the same among anglers fishing for all the different species of fish, and that this relationship was most significant for Michigan stream anglers fishing for brook trout. *“Of the biomass parameters, the point estimates are greatest for brook trout and walleye, implying that anglers’ site preferences are particularly sensitive to the biomass of these two species.”* *“Overall, these estimates imply that increasing brook trout and walleye abundance would return the most value to Michigan’s stream fisheries. These two game fish species also have the least in situ biomass of the species considered in the model”.* *“In particular we found that brook trout, followed by walleye had the most valuable biomasses for stream fishes in Michigan.”* This study is directly applicable to the consideration of a 10 brook trout bag limit for many reasons, but one of note is that the researchers modeled a 50% increase in brook trout biomass. The DNR experimental study of this regulation cited a 58% decrease in >7 ” brook trout in 10 brook trout bag limit treatment streams compared to a 47% increase in the same variable for nearby 5 brook trout bag limit control streams during the study period, thus indicating a biomass loss from a 10 brook trout bag limit greater than the modeled effect in the study.

This study corroborates other studies’ findings that the abundance of brook trout present in a stream, is of high importance to anglers in determining where to fish. It is important to note that this published study (Melstom et al 2014) documented that managing for high brook trout abundance is of proven, documented and quantifiable importance to anglers. What abundances of brook trout are present in streams can effect whether people decide to fish there, and to what level local economies around these fisheries enjoy economic benefits from the angling conducted there. A 10 brook trout bag limit, as opposed to 5, can lower the abundance of brook trout present in a stream (MDNR CRSC 2017). This means that in a very real manner, this regulation can have not just biological impacts on a trout population, but can have real consequences for angler satisfaction and use of a fishery chosen to be designated with an increase bag limit. In addition to the real consequences of lowered brook trout abundance on angler use, fishery managers must also consider the consequences that will result from perceived lower abundances of brook trout in these streams. MDNR surveys, both the 2012 public survey (MDNR Fish Division 2012), and angler surveys conducted as part of the experimental study (MDNR CRSC 2017), both documented that many anglers perceive that the 10 brook trout bag limit will lower the abundance of brook trout present, and as a result many anglers will or did avoid fishing those streams, thus making trip related fishing choices perhaps to avoid the anticipated lower brook trout abundances before ever fishing there and experiencing them firsthand. In applying a 10 brook trout bag limit to a stream, you are therefore disserving two factions of the public. First, anglers who preferred to fish a designated stream prior to the 10 brook trout bag limit, who prefer to fish there but will go elsewhere where they deem important factors in their satisfaction will be better achieved. Second, you disservice those non-anglers in the public, who derive secondary benefits from local fisheries via economic

expenditures by anglers, which will be diminished by the new regulation. These non-angler public beneficiaries are also a consideration in managing a public trust resource for maximum benefit to the public. *“Managing aquatic ecosystem services requires knowledge about the benefits users gain from the resource. This paper provided benefit estimates that can be easily used in cost-benefit analysis”* (Melstrom et al 2014). MITU hopes that it will indeed be easy for the NRC to use this social science data in its cost-benefit analysis of implementing 10 brook trout bag limit regulations.

In February 2018, Fisheries Research Report 29, Carlson and Zorn (a Michigan State University graduate student and a MDNR Fish Division research staff), conducted a public survey of trout anglers (Carlson and Zorn 2018). The study was entitled “Values, Opinions and Behavior of Michigan Inland Trout Anglers”. This study documented several important results related to considering brook trout management and the issue of UP brook trout bag limit regulations. These findings provide evidence that the 10 brook trout bag limit is flawed in concept.

- The authors found that in 2015 brook trout were most popular among UP-resident respondents with nearly half of UP-resident respondents (50%, n = 109) targeting Brook Trout. In contrast, Brook Trout were least popular (of the stream trout species) among UP-resident respondents in 1981 (Fenske 1983). *“This trend suggests that proportionally more UP residents targeted Brook Trout in 2015 than 1981, when the proportion of SLP-resident respondents who traveled to the UP to pursue Brook Trout was greater than the proportion of UP-resident respondents who fished for this species.”* This indicates that the popularity of brook trout among UP resident anglers has grown significantly since 1981 (a period when most streams in the UP had a 10 brook trout bag limit). Some NRC members have suggested that there is diminished interest in fishing for brook trout in the UP since enactment of 5 brook trout bag limits. However, this study finding indicates that popularity of fishing for brook trout by UP residents is higher now. A reason for a perceived decline in people fishing for brook trout in the UP, is likely due to a decline in southern lower peninsula residents making less frequent trips to the UP to fish.
- *“Moreover, 2015 email survey respondents were more satisfied with trout management than Michigan trout anglers were in 1981 (Fenske 1983).”*
- *“In streams, more Michigan trout anglers targeted Brook Trout (77% of Michigan trout anglers) and/or Brown Trout (75%) than Rainbow Trout (55%).”*
- 73% of angler respondents believed the opportunity to catch brook trout was important or very important in their decision to fish a particular stream.
- *“Michigan trout anglers did not have a strong preference to harvest or not to harvest legal-sized Brook Trout when they caught them in streams.”* 46% of Michigan trout anglers rarely or never kept legal-sized Brook Trout; while 26% of Michigan trout anglers often or always kept Brook Trout.
- *“These results suggest that Brook Trout fishing continues to be important for Michigan trout anglers and thus fisheries professionals should sustain healthy, fishable Brook Trout populations via harvest regulations, habitat protection and restoration, and other management strategies.”*
- *“Both the 1981 survey and the ITAS indicate that fisheries professionals should not concentrate their management efforts on just a few streams, but rather employ a regional approach that sustains the quality of trout fisheries in multiple systems. Fisheries managers should consider such findings as they develop management plans for inland trout waters.”*

- *“Fisheries managers can use results from the ITAS to support management decisions, particularly with respect to fishing regulations...”*.

In 2013, another Michigan coldwater fish angler study was conducted by Michigan State University, in coordination with MITU and the MDNR. A random subset of Michigan “unrestricted” fishing license holders were sampled, and a 45% response rate was achieved. The survey was aimed at asking Michigan resident coldwater fish anglers questions concerning their preferences and attitudes about various components of their fishing, and about their economic trip related expenditures. In relation to the issue of brook trout fishing, the following study results were documented (Lupi, personal communications).

- Respondents were asked to rank a series of 8 variables that affect their satisfaction with their trout angling experience (these were repeated from Fenske 1983). The most important variable was “Natural Beauty of the Area”, followed by “Crowding from other anglers”, and then by “Number of Fish Caught”. This provides additional support for other studies (Hunt et al 2005, Knoche 2014, Zorn and Carlson 2018) that have shown that a majority of anglers are well-served by regulations that maintain higher abundances of fish to be caught (as opposed to lower abundances to serve high harvest goals). This variable was more important in 2013 than in 1981.
- As part of the study, Knoche (2014) and Knoche & Lupi (2016), performed a discrete choice method survey technique to assess the relative importance of different aspects of trout fishing experiences for Michigan trout anglers. They found, *“As expected, anglers prefer to fish at locations where catch rates are higher - this result is statistically significant ($P < 0.01$) for both brown and brook trout catch rates.”*

These important social science contributions highlight that Michigan trout anglers put priority on brook trout, and place a high and quantifiable priority on the number of brook trout they can catch on a trip and keeping brook trout abundance high, and together illustrate how a 10 brook trout bag limit can negatively impact a majority of anglers fishing in Michigan. Despite this social science, NRC members Richardson (present), Matonich (past) and Madigan (past) noted that their support for expansion of a 10 brook trout bag limit was predicated on an objective of increasing angling participation and activity. They offered their anecdotal conjecture that angling effort on UP trout streams was lower than historic levels when the brook trout bag limit was 10, and that raising the limit again would increase angling. This hypothesis, while not supported by social science on the reasons for decreased angling in the US (family and work obligations were the most significant reasons for loss of recreational time, and “relaxing/watching TV” were the most common recreational activities of lapsed and former anglers)(ASA 2012) and not being supported by social science surveys of the attitudes and preferences of Michigan trout anglers, was indulged with Fish Division financial resources being allocated to an experimental study of this regulation (at the direction of MDNR Director Keith Creagh in 2012). That study documented no increase in angling activity in the streams where 10 brook trout were applied, and documented some decreases in fishing activity following the regulation change. The stated objective of this regulation was not achieved, and the hypothesis behind the study was rejected. Despite this and ever increasing social science on what anglers prioritize, the NRC listed over 1,200 miles of streams as regulated under a 10 brook trout bag limit in 2017. If the NRC wanted to demonstrate that it was managing these resources scientifically, its management experiment with social science should have been discontinued in 2016, when their hypotheses were rejected, yet they expanded it in 2017 and seek to expand it again in 2018.

DNR Experimental Study of 10 brook trout bag limit

In the fall of 2012, the MDNR Director (then with the authority over fishing regulations prior to the Scientific Fish & Wildlife Management Act), decided that a 10 brook trout bag limit would commence on a limited number of streams under an experimental basis, with MDNR Fish Division to conduct an experimental study of it. At the September 2017 meeting of the MDNR Fish Division's Coldwater Resources Steering Committee, results of the study were presented to citizen advisors, via a PowerPoint presentation (MDNR CRSC 2017). A slightly modified version of this presentation was also given at the November 2017 NRC meeting (MDNR NRC 2017). To our knowledge MDNR Fish Division has never written up the study results into a Fish Division Research Publication, or written up the study formally in any written form. MITU asked the MDNR Fish Division for the study results, and given that no report was prepared, MITU received from the MDNR Fish Division electronic files containing data collected as part of the study.

As reported by the MDNR Fish Division, the study was intended to run for 5 years, 2013 – 2017, but in fact ran for 4 years, from 2013 – 2016. The reason for the shortened duration of study was not documented, but from verbal explanations from the MDNR Fish Division, it appears it was shortened to 4 years for two reasons; 1.) to avoid financial expenditures from the fifth year of the study and 2.) the results of the study were deemed sufficiently clear that it did not warrant the expense of the fifth year of study.

In 2013, sections of 5 streams were designated to 10 brook trout bag limits, these included the East Branch Ontonagon River, East Branch Huron River, Dead River, Driggs River, and the East Branch Tahquamenon River. At this time, 3 control streams were identified for the study, where brook trout bag limits stayed at 5 fish per day; these included Two Mile Creek (close to and paired with Bryan Creek), the Upper Tahquamenon River (close to and paired with the East Branch Tahquamenon River), and the Yellow Dog River (close to and paired with the Dead River). In 2015, 3 additional streams were designated as 10 brook trout experimental streams; these included the Lower Rock River, Bryan Creek, and the Presque Isle River. *A priori*, the DNR Fish Division predicted that the 10 brook trout bag limit regulations would have minimal effect on populations based on their own assessments of the “biology, field and angler surveys, computer simulations”, and that “opportunities to harvest more fish were predicted to increase angler interest/participation/effort” (a stated goal and justification for it forwarded previously by NRC members). MITU had previously provided rationale in writing to the NRC and DNR Fish Division on the reasons it believed their assessments of biological impact were flawed, and social science justifications for why it believed the goal of increased angler use of the streams were flawed. The DNR Fish Division then collected electrofishing fish population surveys on some of the streams, but not all of them, and collected creel, postcard and online surveys of anglers fishing on some of the streams, but not all.

At the conclusion of the study, the MDNR Fish Division reported to the Coldwater Resources Steering Committee at their September 2017 meeting (MDNR CRSC 2017), that “*Contrary to predictions going into the study, it was found that the ten-brook trout bag regulation had potential to negatively affect abundance and size structure of local brook trout populations and the opportunity for higher harvests did not result in increased angler activity.*” In their summary results presented, they cited that from electrofishing surveys of fish populations, the numbers of legal-sized fish (7”+ brook trout) decreased by 58% in treatment streams while increasing in control streams by 47%. From creel survey estimates done on 4 streams serving as control and treatments, they posed a less certain conclusion regarding evidence that decreased angling effort under the 10 brook trout bag limit might have occurred (but was clear that no increase of fishing use occurred). In the angler survey responses they received (N=383), “quality of

fishing” ranked as the most important factor that helped an angler chose where to fish, while “brook trout bag limit” ranked the least important. When asked “In your opinion, how does/would having a 10-brook trout bag limit affect a river’s brook trout population?” 10% indicated “positive”, 41% indicated “No effect”, and 49% indicated “negative”. Remember from our “Social Science Considerations” section of this document, that brook trout abundance is a key factor in anglers selecting where to fish for brook trout, and brook trout anglers had the highest willingness to pay to fish waters with a higher abundance of brook trout (Melstrom et al 2014). *The DNR Fish Division study results went on to conclude that “preliminary indications” from the study include; “UP Brook trout populations highly variable” “10-fish bag limit has potential to deplete local pops”, “bag limit relatively unimportant to most anglers” “decreased effort due to 10-fish bag ?” and “majority of anglers prefer 5-fish bag” (MDNR CRSC 2017) (Appendix C).*

Within the study, Bryan Creek, Two-Mile Creek, E.Br. Tahquamenon and Upper Tahquamenon were the only paired control and treatment streams which received both electrofishing surveys each year of the study (2013, 2014, 2015 and 2016), and also had creel surveys conducted during most but not all years. Electrofishing surveys conducted on the Yellow Dog River control stream were deemed unreliable, as the sampling site location was reported to have been changed during the study period. Creel surveys were not conducted on the other streams where 10 fish bag limits had been employed and where electrofishing data was collected. Thus, without estimates of angler use and harvest at those locations, changes in fish populations there are impossible to interpret in regard to the regulation effect. Thus, two pairs of treatment-control streams provided the primary basis of scientific inference for the study.

Bryan Creek provided the only stream in the study where both a control-treatment effect could be determined, as well as a “Before-After” treatment effect (as it stayed 5 fish bag limit in 2013-2014, and then a 10 fish bag limit in 2015 -2016). The creel survey results from Bryan Creek are thus informative to understanding direct effect of the regulation change on angler use and harvest due to the regulation change. For Bryan Creek, the DNR reported that creel survey data there showed that in 2013-2014 (5 fish bag limit), of 53 anglers surveyed, 32% of anglers caught their limit of 5 fish, while 11% kept their 5 fish bag limit, the average number of brook trout caught by anglers was 5.3, and the average number kept by anglers was 1.9. In 2015 (creel survey not conducted for Bryan Creek in 2016) (under a 10 fish bag limit), of the 21 anglers surveyed, 10% caught their 10 fish limit, while 10% kept their limit of 10 brook trout, and the average number of fish caught by anglers declined to 2.4 brook trout, while the average number kept by anglers increased to 2.4. Thus, the average number of fish kept increased, while the average number caught declined. The DNR Fish Division documented that abundance of all size classes of brook trout in Bryan Creek declined substantially in 2015-2016, as compared to 2013-2014 (whereas the paired control stream Two-Mile Creek, saw increases in brook trout abundance for >7” and <4” brook trout) (Appendix C.). These study results show that while brook trout harvest may have increased for a subset of anglers, the average number of brook trout caught by anglers declined by over 50%.

In the other paired treatment and control streams which had both electrofishing surveys and creel surveys conducted, the E.Br. Tahquamenon River (treatment – 10 fish bag) and the Upper Tahquamenon River (control, 5 fish bag), it was found that brook trout abundance increased in the control and decreased in the treatment (2013-2014 compared with 2015-2016) (Appendix C.). Further, the results of the creel surveys conducted on those two streams showed interesting and important trends within the angling season. In the control, where the bag limit was lower and voluntary catch and release was higher, the number of fish caught by anglers remained high throughout the duration of the season. In the treatment 10-fish bag limit stream, catch and harvest was highest at the beginning of the season, with abrupt

declines in number of brook trout caught per angler thereafter for the remainder of the season (Appendix C.). This indicates that quick localized depletion of brook trout can occur due to a 10 fish bag limit, thus leaving anglers with lower brook trout catches (lower success and lower satisfaction) the remainder of the angling season. These findings are in line with the earlier creel surveys of brook trout anglers in the UP, under a 10 fish bag limit (Wagner et al 1994) and consistent with the findings of Hunt et al (1962) in WI. Thus this 10 fish bag limit poses an angler conflict whereby those seeking higher creel limits may achieve their satisfaction at the exclusion of a majority of anglers who prioritize successfully catching more brook trout.

The experimental study performed by the MDNR to evaluate this regulation change was informative. Given the short duration of the study, and the incompleteness of the data collection and the experimental design limitations, it was surprisingly informative regarding the regulation experiment. MITU communicated with the NRC and MDNR Director in 2012, and provided scientific justifications for problems we saw with its assessment of “no biological impact likely” finding. We also provided specific rationale for how this regulation would pose angler creel based issues. Despite no response to those concerns, this 2013 – 2016 MDNR study provided evidence of all of those concerns coming to fruition. Regrettably, these comments were not treated more seriously prior to the MDNR spending considerable financial resources on this experimental study. Nonetheless, it documented brook trout population declines in treatment streams compared with control streams, and it provides evidence indicating that the goal of increasing angler participation was not met, and may have resulted in decreased angler use of the streams it was imposed on. It provided evidence that quick localized depletion of brook trout can result in lowered catch rates for anglers throughout the season, and thus lower satisfaction of anglers fishing there. Further, when the angler survey results from the study are considered along with other social science studies of trout anglers in Michigan, it’s clear that a majority of anglers do not prefer a 10 brook trout bag limit, many perceive that it will lower brook trout abundance, and brook trout abundance and the quality of brook trout fishing one expects from a stream is among the most important factors an angler chooses where to pursue brook trout. Given all of these considerations and biological and social science the MDNR has invested in acquiring, catering to high harvest oriented anglers with a 10 fish bag limit can decrease the abundance of brook trout in a stream, lowering the populations’ resilience and longterm health and viability (at a time when these populations face considerable stressors (Carlson et al 2017, Downstream Strategies 2012, Appendix D., and Williams et al. 2007)), while simultaneously leading to lower use and satisfaction among a majority of anglers, and lowering the visitation of the stream by anglers and thus the economic benefits to local citizens through decreased angler related expenditure contributions to their communities near these streams. The risks and consequences of this regulation outweigh the benefits to be derived.

Upon completion of this study, and presentation of the results, MITU assumed that at a minimum, the results would be used towards scientific fish and wildlife management, and the NRC would abandon pursuing this 10 brook trout bag limit. Unfortunately, we were wrong, and again, in 2017, the NRC took action to add more streams in the UP to this regulation category and is again considering adding more in 2018.

Selection of specific streams for 10 brook trout bag limit

In 2017, following presentations of the DNR experimental study of 10 brook trout bag limits, we were notified that Natural Resource Commissioners Richardson and Matonich were seeking expansion of streams to be included in the 10 brook trout bag limit regulation, which would become a permanent regulation category instead of an experimental study. MITU met with Commissioners Matonich and Schlaybaugh and Fish Division Chief Dexter to discuss the topic. MITU’s Executive Director Bryan

Burroughs communicated that MITU was not ideologically opposed to a 10 brook trout bag limit, but that we have had scientific concerns with it which were reinforced by the DNR experimental study; and that given those the regulation should be viewed as likely to be detrimental and could only be justified to be applied to streams with certain known characteristics that would cumulatively lower the risk of detriments of the regulation, and along with monitoring of those streams might serve as risk reduction measures. Risk reduction characteristics discussed included but were not limited to;

- High abundance brook trout populations where increased angling mortality would have a proportionally lower effect on total annual mortality rates.
- Low fishing pressure or use streams, remote places with less available access, so the added angling mortality would be lessened through less angling effort.
- Streams that did not serve as critical habitat to the brook trout populations. It would be especially detrimental to increase brook trout angling mortality on sections of streams that serve as thermal refuges in summer, or serve as critical spawning and nursery habitat for example, or offer unique or critical habitat for certain life stages of brook trout. These types of habitat can congregate large numbers of brook trout from significant portions of larger watersheds and serve critically important roles in the viability of brook trout populations in entire watersheds (Hayes et al 1998 (from a study of Michigan U.P. brook trout)).
- Application of the regulation to only one tributary of a larger watershed, so that any realized impacts from the regulation would not jeopardize the brook trout population in an entire watershed.
- Avoid applying the regulation in popular fishing streams, where quick localized depletion of legal sized brook trout would result in lower catch rates and satisfaction to many anglers.
- Avoid placing the regulation on any stream system known to or have been known to produce coaster brook trout (a unique migratory form of brook trout).

Implicit and explicit in discussing these characteristics, was the fact that a 10 brook trout bag limit regulation poses clear detriments, but if a stream was known to meet all of these criteria, they cumulatively *might* serve to reduce the risk of applying the regulation; and along with dedicated monitoring of the streams after the regulation was enacted, might serve to minimize and avoid impairments to the fisheries.

From these meetings, DNR Fish Division created its own list of criteria to guide evaluating streams for inclusion into a 10 brook trout bag limit regulation. In MITU's opinion, the resulting list of criteria were weakened significantly from discussions. They are as follows, directly from Fish Division (MDNR Fish Division 2017):

"UP Brook Trout Bag Limit

Expanding harvest opportunity using a 10 brook trout daily bag limit

Criteria for site selection

1. *Streams selected should be 1st or 2nd order. A section of 3rd order stream can be considered for inclusion if helpful in enforcement or description of boundaries. This should be an exception to the rule, and likely supportable by the public at large.*
2. *Typically this regulation should be proposed for not more than one "sub-watershed" per watershed. Exceptions should be well founded and based on watershed size.*
3. *A goal should be to provide this opportunity so that anglers have this choice within relatively short driving distances. Anglers shouldn't have to drive 2 counties over to find one.*

4. *Proposed streams should not be known as or predicted to be key critical habitat for brook trout in the larger watershed system*
 - a. *It is not a critical spawning or nursery habitat significant to larger watershed system*
 - b. *It is not a critical thermal refuge for fish in the larger watershed system*
5. *Proposed streams will not include those with coaster regulations for the current experiment.*
6. *Proposed streams will not be known to harbor remnant coaster populations or have produced notable observations of them.*
7. *Proposed streams will not include those identified to date by staff (and public) as waters that should remain at 5 fish daily bag limit.*
8. *Proposed streams will not be known as high or moderate angling use streams, relative to UP angling effort levels.*
9. *Proposed streams will likely have reasonable support for its inclusion by those who support the enhanced opportunity and those that are opposed to it.”*

During the summer of 2017, Fish Division personnel communicated to MITU that Commissioners Matonich and Richardson had directed them to identify and propose a significant portion of all Type 1 streams in the UP for inclusion. At this time, and due to this directive, Fish Division staff began referring to the stream selection criteria as loose “guidelines to be applied to the extent possible”, rather than scientific-based risk reduction criteria that should be adhered to and were cumulatively necessary to justify a stream for a known detrimental regulation type. During the late summer to early fall of 2017, Fish Division personnel communicated with MITU about the streams they were evaluating and would be proposing for inclusion in the 10 brook trout bag limit. MITU communicated that data were not presented or identified on any proposed stream section to confidently assess how they fit all criteria, and that most of them were knowingly not complying with one or more criteria. Fish Division staff once again communicated that they had received a directive from certain NRC commissioners for Fish Division to propose a significant amount of streams for inclusion, and were called upon to apply the stream selection criteria as loosely as needed to meet that directive. Fish Division asked MITU to provide any input possible to assist it in assessing the proposed streams appropriateness for the regulation, at least relatively among the ones it identified and given the lack of scientific information it had on any of them. MITU provided input to MDNR Fish Division in this regard, but when Fish Division finally publically announced the list of streams it was proposing to the NRC for consideration, MITU provided written and verbal public comment to the NRC in opposition to all streams proposed (MITU 2017).

At the September 2018 meeting of the Fish Division’s Coldwater Resources Steering Committee, Phil Schneeberger, MDNR Fish Division Lake Superior Basin Coordinator, presented its current 10 brook trout bag limit review process. He provided an NRC motion from 2017 that initiated the process, which dictated that Fish Division was to review, evaluate and determine if more streams are warranted for inclusion in the 10 brook trout bag limit regulation, and report the results of the review to the NRC in 2018. They proposed the following for inclusion:

- Montreal River (Gogebic County), upstream of U.S. 2
- Presque Isle River (Gogebic County), upstream of U.S. 2
- Iron River (Iron County), upstream of the mouth
- W. Branch Sturgeon River, Dickinson County), upstream of Calumet Mine Road
- Upper Dead River (Marquette County), upstream of Silver Lake Basin
- Days River (Delta County), mouth upstream to M-35
- N. Branch Stutts Creek (Schoolcraft and Alger counties), M-94 upstream

- McAlpine Creek (Mackinac County), Millecoquins Lake upstream.

MDNR staff then presented a table that indicated which of the stream selection criteria each of the proposed streams met, and indicated that none of these streams met all the criteria, but all met some or most of the criteria. MDNR staff were then asked by MITU if the MDNR planned to provide detailed data or supporting information used to determine how any specific stream met each criteria (e.g., did fish population estimates exist for the streams and what were the results of each, did angler creel surveys exist for each of the streams to assess fishing pressure levels, did habitat assessments exist to assess critical habitat elements, etc.). MDNR staff answered by stating that MITU knew that the MDNR did not have any of that, and that they (MDNR) were having to guess and try to rely on anecdotal based observations. MITU then asked MDNR staff if the MDNR Fish Division conducted their review and evaluation of streams for inclusion autonomously with no anticipated results in mind, or if they had been directed to find streams to add to this regulation. MDNR staff answered by stating “We were told to find the best streams to add”. MDNR also stated at the meeting that there was no planned effort to study or monitor the effects of these regulations on the streams where they are applied.

MITU has not received, and is not aware of any detailed supporting evidence to scientifically evaluate how any of the currently proposed streams actually fit or do not fit the stream selection criteria. At this point, all that appears available from the DNR to evaluate these streams for inclusion into a 10 brook trout bag limit, seems to be a table that in some form summarizes the best guesses resulting from unknown amounts of anecdotal perceptions by Fish Division staff. We find it appalling that the state of fisheries management in Michigan has been reduced to such a poor level. We anglers paid the costs of an experimental study of this regulation that was based on flawed hypotheses, and the results concluded brook trout populations were reduced significantly, and fishing pressure did not increase, and may have declined. Criteria were still structured so as to identify conditions where if met, this regulation might cautiously be considered and monitored. In 2017, and now, personal directives from individual commissioners have dictated the results of Fish Division evaluations, and that pressure has resulted in paid state fish biologists apparently becoming comfortable making risky public trust resource decisions based anecdotal guesses rather than scientific evidence or consistent application of scientific principles. They also appear to be ready to make those evaluations with no plans to monitor the effects of these decisions. This current state of managing fisheries in no way represents professional scientific fish management. Departure from the standards of scientific fish and wildlife has occurred, and personal agendas of some NRC members have been allowed to dictate the nature and quality of reviews and proposals coming from the MDNR Fish Division. Decisions to add streams to this 10 brook trout regulation in 2017, and more proposed now in 2018 are without adequate scientific justification. As current NRC members now review the characteristics of the streams proposed, we ask that they critically review the actual information supporting whether criteria are met, and as each does not meet many criteria, critically evaluate whether these departures affect the risk you are posing to these fisheries. We also ask the current NRC members carefully review this for streams added in 2017 and reconsider removing them from this regulation category.

Michigan DNR Inland Trout Management Plan Conflicts

In 2018, the MDNR finalized its first formal Inland Trout Management Plan (Zorn et al 2018). The document summarizes the status, history of management, and threats and issues facing the state’s inland trout fisheries. As the management plan for these fish, including brook trout, the document serves as the guideposts for decisions affecting these fisheries. The following are important excerpts from that plan that directly relate to the matter of 10 brook trout bag limits.

- *“Special regulations may be applied to certain stream reaches to facilitate specific fishery management goals, even though they may be speculative or not well-supported by scientific evidence. For example, the Brook Trout bag limit was raised from five to ten on a select number of UP streams with the intention of increasing angler use on these rivers. However, a recent Michigan study (Melstrom et al. 2015) suggested that anglers are more likely to fish waters where they think Brook Trout density is high. So, a higher bag limit may give the perception that Brook Trout in these waters have been more heavily exploited, making them less attractive to prospective anglers. Conversely, the regulation may give anglers the unintended impression that these rivers hold larger Brook Trout populations than other UP rivers and can safely withstand greater levels of harvest. Decision-support models with information specific to UP streams on Brook Trout populations, angling pressure, and angler harvest practices (e.g., percentage of legal-sized fish released) are needed to better predict the effects of changing bag limits on fish populations and angler use or satisfaction.”*
- *“Trout populations in small streams may be vulnerable to overexploitation during the spawning season and when these streams are key thermal refugia for trout populations in larger systems. The majority of Michigan’s inland trout populations are maintained through natural reproduction, so adequate protection is critical.”*
- *“Management of trout populations in Michigan streams is complicated by the scarcity of data on fishing effort and harvest for nearly all of our streams, especially our smaller ones. It is exceptionally difficult and expensive to estimate fishing effort and harvest on trout streams due to many factors, including the sheer number of trout streams in Michigan, multiple access points along rivers, and agency staff limitations. Furthermore, changes in angler behavior (e.g., percent of legal-sized trout that were released) over time limit usefulness of older harvest estimates in predicting effects of proposed regulation changes on stream trout populations.”*
- *“Melstrom et al. (2015) compared fish biomass estimates with fishing trip information from a 2008-2010 survey of Michigan anglers, and found that Brook Trout abundance was an especially important determinant in fishing site selection.”*

In these relevant excerpts, from the Michigan Inland Trout Management Plan, the document serving to guide management of these fisheries, one can easily see that MDNR Fish Division staff involved with the Inland Trout Management Plan articulate known risks to trout populations from regulations such as these, in the form of biological risks, known social science rationale and disserving a majority of anglers of brook trout, and grapple with a paucity of data to justify it. “Speculative” and “not well supported by scientific evidence” were phrases used specifically to highlight this 10 brook trout bag limit regulation. How is there all of this evidence to highlight the problems with this regulation, yet MDNR Fish Division has still “proposed” streams for inclusion in this regulation to the NRC in 2017 and again now in 2018? Personal directives from individual commissioners appear to have had undue influence on and dictate what Fish Division staff “propose” or bring forward to the NRC as a whole to consider, and how they present them. We hope current NRC members can recognize this and take corrective actions on this issue now.

Natural Resource Commission Decision Making and Policies

Since 2012, through the current proposal in 2018, it's been clear that the Natural Resource Commission struggles to conduct itself based on clear and consistent policies, including both on how it interprets information and in how it governs itself. In 2016, the NRC was statutorily given authority over fisheries regulation decisions via the Scientific Fish & Wildlife Management Act (Appendix A).

The Precautionary Principle or approach (United Nations 1992) has not been consistently or wisely applied by the NRC. The Public Trust Doctrine dictates that public trust resources, including fisheries, are held in trust by a State, for the use and enjoyment of present and future generations of citizens of the State. In natural resource decision-making, where uncertainty exists and risk to the sustainability of public trust resources exist, decisions should be made with precaution to the negative impacts that could occur to a resource that would jeopardize its long-term sustainability, and thus rights of future citizens to use and benefit from it. Throughout actions on this issue, the NRC has failed to apply and act according to the precautionary approach. It has and is again considering knowingly putting fish populations at risk. In a similar recent issue involving increased fishing for bass during spawning seasons, the DNR Fish Division concluded that while uncertainty exists in whether bass populations might be negatively impacted by expanding fishing during that time of year, that there were scientific principles present that pose risk to the bass populations, and thus it and the NRC decided to apply the precautionary principle and not expand the fishing season for bass. However, in this issue of brook trout bag limits, scientific principles presented risk to brook trout populations, and an actual experimental study of the regulation provided evidence of it occurring, yet the Fish Division and NRC has expanded this 10 brook trout bag limit regulation, and seeks to do so further in 2018.

In interpreting how to apply public opinion social science information, the NRC has appeared very inconsistent. It has had a practice for deer antler point restriction proposals (a regulation that is actually less liberal on harvest and more protective of deer) that proposals will not be considered unless there is majority of public support for it as documented by social surveys. On this issue of brook trout bag limits, a majority of the public, as documented by DNR Fish Division surveys, prefers the 5 fish bag limit, and a minority preferred the 10 fish bag limit. Yet despite this social science, the regulation's ability to negatively affect the brook trout populations and a majority of anglers, the NRC approved adding streams to 10 fish bag limits in 2017 and is considered adding more in 2018. This conflict of practice on using social science leads, to an appearance that the NRC is inconsistent in its justifications.

Since 2012, the NRC, MDNR Director and the Fish Division has repeatedly failed to ever respond in writing to scientific based concerns provided to it on this subject by MITU. Further, the NRC has not produced any documents or opinions on this subject that publically explain or justify its decision-making. Presumably, if the NRC were abiding by the scientific standards of decision making its required to, it would not struggle to communicate the basis of its decision-making to the citizens it is accountable to.

The NRC has also failed to illustrate a clear governance operation for the development of proposals it considers. In this matter of brook trout bag limits, we have seen over and over again, that personal agendas of individual commissioners have been allowed to dictate to the MDNR Fish Division how it does its job, what it proposes, and the level of scientific rigor its allowed to employ. Without rehashing how this was done on previous brook trout bag limits actions in 2012 or 2017, it is clear the same pattern has emerged yet again in 2018. The Fish Division was charged with evaluating and determining whether any new streams should be added to this 10 brook trout bag limit. Yet, it is clear to us from questioning Fish Division staff that they had been directed to bring forward streams for inclusion,

and a predetermined conclusion was dictated to them. Was the entire NRC involved in that directive, was that a directive of the NRC Fisheries & Wildlife Subcommittee, or were individual commissioners allowed to manipulate and exert undue non-scientific influence over the Fish Division?

The NRC is bound in their decision-making, by at least two important laws. First, the Scientific Fish and Wildlife Management Act (Appendix A), states, “*The commission shall, to the greatest extent practicable, utilize principles of sound scientific management in making decisions regarding the taking of game. The commission may take testimony from department personnel, independent experts, and others, and review scientific literature and data, among other sources, in support of its duty to use principles of sound scientific management.*” The NRC has not transparently demonstrated that it has reviewed and considered all scientific evidence provided to it on this matter, and upon conclusion of the experimental study of it, where its hypotheses for rationale behind implementing 10 brook trout bag limits were rejected, it proceeded to expand the scope of the regulation. Second, the Michigan Constitution (Appendix B), states “*The legislature shall provide for the protection of the air, water and other natural resources of the state from pollution, impairment and destruction*”. The legislature has delegated this responsibility to the MDNR NRC for fisheries. Thus the NRC shall provide for the protection of natural resources (fisheries) of the state from impairment. Brook trout populations in Michigan are facing numerous threats to their long-term viability. The regulation experiment conducted on 10 brook trout bag limits showed that it poses a real threat for decreasing populations of brook trout, and thus impairing them. Perhaps if the hypotheses of the 10 brook trout bag limit study (no or minimal biological impact, and an increase in fishing use) were to have been supported by evidence, then the NRC could have had an arguable basis for implementing this regulation; but those two hypotheses were rejected by the study. It now has evidence that impairment is likely, yet has and continues to consider applying this regulation to streams it has substantially no scientific information at hand to justify impairment will not occur.

Summary

For over six years now, this issue of 10 brook trout bag limits in the UP has been considered in several forms, and has been allowed to have an unwarranted priority among fishery management activities and priorities of this state. In 2012, we believed that this regulation was not supported by social science, and abundant biological evidence was present to highlight the plausible mechanisms for impairment to brook trout fisheries from it. Despite providing these to the MDNR, more of the limited Fish Division resources were allocated towards studying it. Those efforts rejected the hypotheses supporting the pursuit of this regulation change. In that time, several other studies and forms of evidence have also grown to inform our decisions regarding it. Despite this, Fish Division resources were once again allocated to reviewing and proposing streams for inclusion in it, and collecting public comment concerning them. The NRC still voted to expand the use of this regulation in 2017, despite the scientific evidence against it. Yet again in 2018, the NRC once again allocated more Fish Division resources to another review of more streams to be added, and more public comment solicitation. Scientific evidence is now stacked up against this regulation in general. The only area with insufficient scientific evidence still, is in our lack of basic understanding of the specific streams this regulation has been applied to or are proposed for. The time has come to discontinue this regulation and to stop diverting precious fisheries management resources to this singular issue. We have much work in front of all of us to ensure healthy, resilient, productive and desirable fisheries in the State of Michigan, and cannot afford to be distracted from work to that end. Trout Unlimited has from its inception, and will continue to be partners with the Michigan Department of Natural Resources in achieving those goals for the common good. We respectfully ask that NRC members: review all of the information we have presented on this issue; agree that it's time to change course and abandon this regulation; and get back to focusing on the work that we as partners must do to ensure the future of our trout fisheries.

Sincerely,



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References

- American SportFishing Association 2012. On the fence about fishing: a study of why anglers do and don't fish what will get them on the water. Available at: https://asafishing.org/wp-content/uploads/Why_Anglers_Lapse_Fishings_Competition_-_2012_ASA.pdf.
- Bachman, R. A. 2001. Integrating the ecological and human dimensions of trout management. Pages 87–92 in R. DuBois, K. Kayle, M. Ebbers, and S. Turner, editors. Trout and the trout angler II. American Fisheries Society, North Central Division, Salmonid Technical Committee, St. Paul, Minnesota.
- Carlson, A. K., W. W. Taylor, K. M. Schlee, T. G. Zorn, and D. M. Infante. 2017. Projected impacts of climate change on stream salmonids with implications for resilience-based management. *Ecology of Freshwater Fish* 26:190-204.
- Carlson, A. K., and T. G. Zorn. 2018. Values, opinions, and behavior of inland trout anglers in Michigan. Michigan Department of Natural Resources, Fisheries Report 29, Lansing.
- Downstream Strategies. 2012. Midwest Fish Habitat Partnership Fish Habitat Modeling Results. US Fish and Wildlife Service.
- FAO 2002. Cochrane, K.L.. Food and Agriculture Organization. A fishery manager's guidebook. Available at www.fao.org/docrep/005/y3427e/y3427e03.htm.
- FAO 2005. Food and Agriculture Organization. Fisheries governance: The ecosystem approach to fisheries management. Rome. Updated 27 May 2005.
- Fenske, J. L. 1983. Attitudes and attributes of anglers who fish for trout in Michigan. Michigan Department of Natural Resources, Fisheries Research Report 1916, Ann Arbor.
- Halfyard, E.A., J.L. MacMillan. And R.J. Madden. 2008. Fecundity and sexual maturity in select Nova Scotia trout populations. Unpublished Report, January 2008, Inland Fisheries Division, Nova Scotia Department of Fisheries and Aquaculture. Picton, Nova Scotia.
- Hayes, D. B., W. W. Taylor, M. T. Drake, S. M. Marod, and G. E. Whelan. 1998. The value of headwaters to Brook Trout (*Salvelinus fontinalis*) in the Ford River, Michigan, USA. Pages 175–185 in M. J. Haigh, J. Krecek, G. S. Rajwar, and M. P. Kilmartin, editors. Headwaters: water resources and soil conservation. Oxford and IBH Publishing Co., New Delhi.
- Hunt, L.M. 2005. Recreational Fishing Site Choice Models: Insights and Future Opportunities. *Human Dimensions of Wildlife* 10: 153-172.
- Hunt, R.L., O.M. Brynildson, and J.T. McFadden. 1962. Effects of Angling Regulations on a wild brook trout fishery. Wisconsin Conservation Department Publication 1962. Technical Bulletin #26.
- Knoche, S. 2014. Discrete choice models of hunting and fishing in Michigan. Doctoral dissertation. Michigan State University, East Lansing.
- Knoche, S., and F. Lupi. 2016. Demand for fishery regulations: Effects of angler heterogeneity and catch improvements on preferences for gear and harvest restrictions. *Fisheries Research* 181:163-171.
- Lupi, F. 2018. Personal Communications. Michigan Trout and Salmon Angler Survey. Discussion of unpublished results from the study, in preparation.

MDNR CRSC 2012. September 2012 meeting minutes of the DNR Fish Division's Coldwater Resources Steering Committee. Available in DNR records, formerly posted on DNR website for the committee.

MDNR CRSC 2017. Presentation of 10 brook trout bag limit experimental study results. Given to the DNR Coldwater Resources Steering Committee. September 2017. Available in DNR Records or at [http://www.michigantu.org/images/pdffiles/upbrooktroutbaglimitsfiles/10-Brook%20Trout%20Bag%20Summary%20CRSC%20Sep%2016%20\(002\).pdf](http://www.michigantu.org/images/pdffiles/upbrooktroutbaglimitsfiles/10-Brook%20Trout%20Bag%20Summary%20CRSC%20Sep%2016%20(002).pdf)

MDNR Fish Division 2012. Fish Division report on analysis and recommendations concerning UP 10 brook trout bag limit, with summary of public comment survey. Available in DNR records and available at <http://www.michigantu.org/images/pdffiles/upbrooktroutbaglimitsfiles/Brook%20Trout%20Daily%20Possession%20Limit%20Review%20final%207-9-12.pdf> .

MDNR Fish Division 2017. Document outlining stream selection criteria for consideration of 10 brook trout bag limits streams. From electronic communications from Jim Dexter, Fish Division Chief. Available online at ____.

MDNR NRC September 2012. Meeting Minutes of the September 2012 Natural Resources Commission. <http://cdm15867.contentdm.oclc.org/cdm/singleitem/collection/p15867coll4/id/503/rec/1242> .

MDNR NRC November 2012. Meeting Minutes of the November 2012 Natural Resources Commission. <http://cdm15867.contentdm.oclc.org/cdm/singleitem/collection/p15867coll4/id/505/rec/1244> .

MDNR NRC September 2017. Meeting Minutes of the September 2017 Natural Resources Commission. https://www.michigan.gov/documents/dnr/September_Signed_603721_7.pdf .

MDNR NRC November 2017. Meeting Minutes of the November 2017 Natural Resources Commission. https://www.michigan.gov/documents/dnr/Signed_November_Minutes_609160_7.pdf.

Melstrom, R. T., F. Lupi, P. C. Esselman, and R. J. Stevenson. 2015. Valuing recreational fishing quality at rivers and streams. *Water Resources Research* 51:1-11.

MITU 2012a. Public Comment letter to Michigan Department of Natural Resources from Michigan Trout Unlimited concerning 10 brook trout bag limit proposals. May 30, 2012. Available in DNR Records, or available online at <http://www.michigantu.org/images/pdffiles/upbrooktroutbaglimitsfiles/MITU%20Comment%20on%20UP%20brook%20trout%20bag%20limit%20proposal.pdf> .

MITU 2012b. Public Comment letter to Michigan Department of Natural Resources from Michigan Trout Unlimited concerning 10 brook trout bag limit proposals. November 3, 2012. Available in DNR Records, or available online at <http://www.michigantu.org/images/pdffiles/upbrooktroutbaglimitsfiles/TU%20UP%20Brook%20Trout%20Regulation%20Policy.pdf> .

MITU 2017. Public Comment letter to Michigan Department of Natural Resources from Michigan Trout Unlimited concerning 10 brook trout bag limit proposals. October 2017. Available in DNR NRC Records, or available online at <http://www.michigantu.org/images/pdffiles/Michigan-TU-to-NRC-UP-Bkt-BL-10202017.pdf> .

- NMFS 2009. Report to Congress: The state of science to support an ecosystem approach to regional fishery management. National Marine Fisheries Service, NOAA Technical Memorandum NMFS-F/SPO-96.
- Shetter, D. S., and L. N. Allison. 1955. Comparative mortality between fly-hooked and worm-hooked Brook Trout. Michigan Department of Conservation, Fisheries Research Report 1366, Ann Arbor.
- Shetter, D. S., and L. N. Allison. 1958. Mortality of trout caused by hooking with artificial lures in Michigan waters, 1956–1957. Michigan Department of Conservation, Fisheries Research Report 1539, Ann Arbor.
- Strange, E. M., P. B. Moyle, and T. C. Foin. 1992. Interactions between stochastic and deterministic processes in stream fish community assembly. *Environmental Biology of Fishes* 36:1-15.
- United Nations 1992. Rio Declaration on Environment + Development. Application of Precautionary Approach.
- Wagner, W. C., R. G. Schorfhaar, and R. N. Lockwood. 1994. Evaluation of hatchery-reared Brook Trout stocked in the Upper Peninsula of Michigan. Michigan Department of Natural Resources, Fisheries Research Report 2008, Ann Arbor.
- Williams, J.E., Haak, A.L., Gillespie, N.G., Neville, H.M., and Colyer, W.T. 2007. Healing troubled waters: preparing trout and salmon habitat for a changing climate. A report by Trout Unlimited, Arlington, VA October 2007. Available at: <https://www.tu.org/sites/default/files/science/pdfs/Healing-Troubled-Waters-Preparing-Trout-and-Salmon-Habitat-for-a-Changing-Climate.pdf> .
- Wydoski, R. S. 1977. Relation of hooking mortality and sub lethal hooking stress to quality fishery management. Pages 43–87 in R. A. Barnhart and T.D. Roelofs, editors. *Catch-and-release fishing as a management tool*. Humboldt University, Arcata, California.
- Zorn, T. G., 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.
- Zorn, T. G., P. W. Seelbach, and E. S. Rutherford. 2012. A regional-scale habitat suitability model to assess the effects of flow reduction on fish assemblages in Michigan streams. *Journal of the American Water Resources Association* 48:871-895.
- Zorn, T. G., P. W. Seelbach, E. S. Rutherford, T. C. Wills, S. Cheng, and M. J. Wiley. 2008. A landscape-scale habitat suitability model to evaluate effects of flow reduction on fish assemblages in Michigan streams. Michigan Department of Natural Resources, Fisheries Research Report 2089, Ann Arbor.
- Zorn, T. G., P. W. Seelbach, and M. J. Wiley. 2002. Distributions of stream fishes and their relationship to stream size and hydrology in Michigan's Lower Peninsula. *Transactions of the American Fisheries Society* 131:70-85. Zorn, T. G., P. W. Seelbach, and M. J. Wiley. 2004. Utility of species-specific, multiple linear regression models for prediction of fish assemblages in rivers of Michigan's Lower Peninsula. Michigan Department of Natural Resources, Fisheries Research Report 2072, Ann Arbor.
- Zorn, T. G., P. W. Seelbach, and M. J. Wiley. 2009. Relationships between habitat and fish density in Michigan streams. Michigan Department of Natural Resources, Fisheries Research Report 2091, Ann Arbor.

Zorn, T. G., T. A. Cwalinski, N. A. Godby, Jr., B. J. Gunderman, and M. A. Tonello. 2018. Management plan for inland trout in Michigan. Michigan Department of Natural Resources, Fisheries Report 30, Lansing.

Appendices

Appendix A. Michigan's Scientific Fish and Wildlife Management Act.

NATURAL RESOURCES AND ENVIRONMENTAL PROTECTION ACT (EXCERPT) Act 451 of 1994
324.40113a Legislative findings and declarations; taking of game; issuance of orders; right to hunt, fish, and take game. Sec. 40113a. (1) The legislature finds and declares that: (a) The fish and wildlife populations of the state and their habitat are of paramount importance to the citizens of this state. (b) The conservation of fish and wildlife populations of the state depend upon the wise use and sound scientific management of the state's natural resources. (c) The sound scientific management of the fish and wildlife populations of the state, including hunting of bear, is declared to be in the public interest. (d) The sound scientific management of bear populations in this state is necessary to minimize human/bear encounters and to prevent bears from threatening or harming humans, livestock, and pets. (2) The commission has the exclusive authority to regulate the taking of game as defined in section 40103 in this state. The commission shall, to the greatest extent practicable, utilize principles of sound scientific management in making decisions regarding the taking of game. The commission may take testimony from department personnel, independent experts, and others, and review scientific literature and data, among other sources, in support of its duty to use principles of sound scientific management. The commission shall issue orders regarding the taking of game following a public meeting and an opportunity for public input. Not less than 30 days before issuing an order, the commission shall provide a copy of the order to each of the following: (a) Each member of each standing committee of the senate or house of representatives that considers legislation pertaining to conservation, the environment, natural resources, recreation, tourism, or agriculture. (b) The chairperson of the senate appropriations committee and the chairperson of the house of representatives appropriations committee. (c) The members of the subcommittee of the senate appropriations committee and the subcommittee of the house of representatives appropriations committee that consider the budget of the department of natural resources. (3) The legislature declares that hunting, fishing, and the taking of game are a valued part of the cultural heritage of this state and should be forever preserved. The legislature further declares that these activities play an important part in the state's economy and in the conservation, preservation, and management of the state's natural resources. Therefore, the legislature declares that the citizens of this state have a right to hunt, fish, and take game, subject to the regulations and restrictions prescribed by subsection (2) and law. History: Add. 1996, Act 377, Eff. Dec. 5, 1996;□ Am. 1997, Act 19, Imd. Eff. June 12, 1997;□ Am. 2013, Act 21, Imd. Eff. May 8, 2013;□ Am. 2013, Act 22, Imd. Eff. May 8, 2013;□ Am. 2014, Act 281, Eff. Mar. 31, 2015;□ Am. 2016, Act 382, Imd. Eff. Dec. 22, 2016.

Appendix B. Michigan Constitution, 1963, Article IV, Section 52.

STATE CONSTITUTION (EXCERPT)
CONSTITUTION OF MICHIGAN OF 1963

§ 52 Natural resources; conservation, pollution, impairment, destruction.

Sec. 52.

The conservation and development of the natural resources of the state are hereby declared to be of paramount public concern in the interest of the health, safety and general welfare of the people. The legislature shall provide for the protection of the air, water and other natural resources of the state from pollution, impairment and destruction.

History: Const. 1963, Art. IV, § 52, Eff. Jan. 1, 1964

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Appendix C. Selected figures and results from the MDNR experimental study of 10 brook trout bag limits, as presented at the September 2017 MDNR Coldwater Resources Steering Committee Meeting, MDNR CRSC 2017. Figure with creel seasonality data from the Tahquamenon paired streams is from DNR data, but was not presented as part of the September 2017 CRSC meeting.

Electrofishing

Numbers of legal-sized fish

- Treatment ↓ (-58%)
- Control ↑ (+47%)

Creel survey estimates

Data from 4 streams (Treatment & Control)

- Local pop. depletion under 10 bag?
- Decreased effort under 10 bag?



Preliminary indications

Minimal effect on populations?

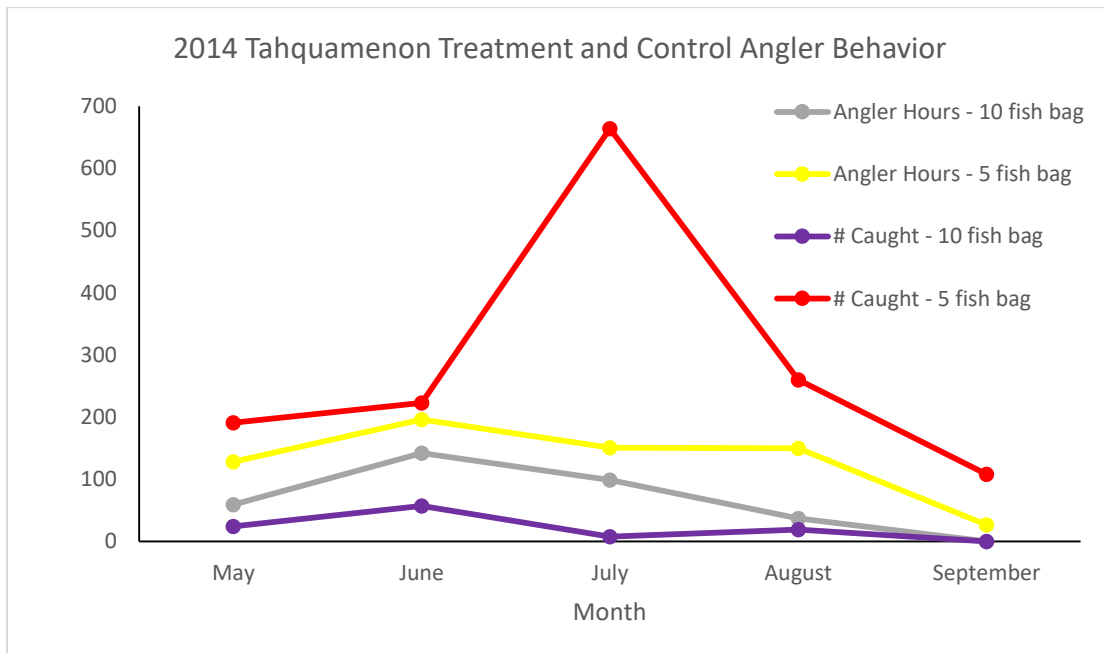
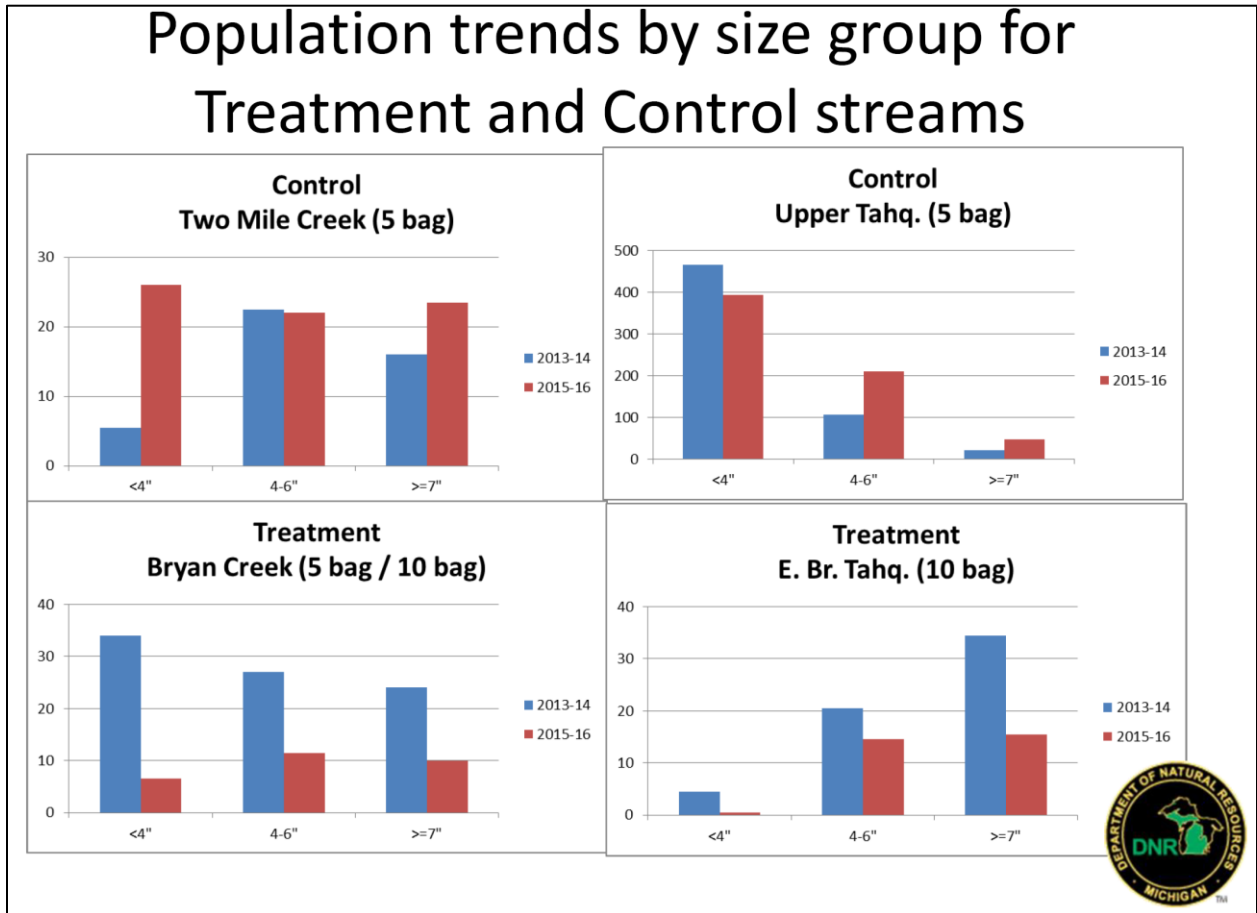
- UP brook trout populations highly variable
- 10-fish bag has potential to deplete local pops

Increase angler effort?

- Bag limit relatively unimportant to most anglers
- Decreased effort due to 10-fish bag ?
- Majority of anglers prefer 5-fish bag



Appendix C. Continued.



Appendix D. Protection priority streams for brook trout populations, from Downstream Strategies 2012, for the Midwest Fish Habitat Partnership, USFWS. These priority areas are the result of information on the status and quality of existing brook trout populations along with information on the stressors to these populations. It can illustrate that managing Midwest brook trout populations for long-term population health and resiliency is a priority of many stakeholders, and that the areas where doubled brook trout bag limits are being applied include areas of regional importance to protect these populations.

Figure 18: Restoration and protection priorities for brook trout

