Michigan Trout Unlimited's Comments on Great Lakes Net Penning and State of Michigan Reports on Net Penning

December 4, 2015

Outline:

Introduction

Michigan Trout Unlimited (MITU) is opposed to allowing Great Lakes fish net penning, also referred to as cage aquaculture. MITU has an aquaculture policy adopted, which addresses all forms of aquaculture systems (http://www.michigantu.org/index.php/michigan-tu-contacts-2/michigan-tu-contacts-4/wild-fisheries-conservation/aquaculture-policy), and sets forth our opposition to any form of aquaculture or individual private aquaculture operation that does not or cannot prevent impacts and risks of their operation on our coldwater fisheries. We have extensively reviewed information from around the world for both freshwater and marine net penning operations, and conclude that this form of aquaculture is unable to prevent impacts or eliminate risks from their operation, and thus oppose any allowance of these operations in Michigan or the Great Lakes.

Net penning poses numerous vectors of degradation to public waters, public fisheries, and public uses of those. Among those vectors of damage are nutrient pollution, diseases, escapement and genetic dilution of wild fish stocks, chemical pollution, and interference with existing public trust uses. Net penning, by the implicit virtue of their mode of operation is unable to contain their nutrients, diseases, or domesticated fish livestock, and therefore is unable to prevent the impacts and risks they pose. Research from around the world confirms this fact. Net pens at best, can only seek to manage or minimize these impacts and risks, but are unable to prevent them. When global experience with net penning is combined with the unique physical, chemical and biological characteristics of the Great Lakes, we conclude that localized degradation is certain and far-reaching degradation of our fisheries is highly likely.

The Great Lakes ecosystem is one of tremendous current value. Its ecosystem goods and services are profound to Michigan's economy, livelihood, quality of life, and long-term viability and

vibrancy. We know that Michigan's high quality aquatic landscape is our key to attracting and retaining people and businesses; and conversely degradation to the quality of those waters will lead to lower desirability of people to live by them, businesses to locate by them to competitively attract skilled workers, and loss of tourism economies dependent on the quality of those waters. We also know that our Great Lakes are foundational to myriad forms of economic activity today, especially tourism related activities which are dependent on the high-quality of the Great Lakes and it natural resources (for affirmation of this, see Public Act 106 of 1945, the "Michigan Tourism Policy Act", section 2.101., and Michigan Tourism Council Strategic Plan http://www.michigan.org/lib/files/Industry/Tourism_Strategic_Plan/Tourism_Strategic_Plan.pdf and its list of top identified threats to health of the tourism sector http://msue.anr.msu.edu/news/what_are_the_greatest_threats_to_michigans_tourism_industry). The degradation of these existing economic activities posed by Great Lakes net penning is severe and unacceptable. MITU is especially concerned with the health of the recreational fishing economy that could be jeopardized. Michigan's recreational fishing economy is profound; supporting 1.7 million anglers, $2.4 billion in direct expenditures with $4.2 billion in economic impact (#3 nationally); supporting 38,000 jobs and $287 million in state and local tax revenue; and hosts 347,000 out-of-state anglers annually (#2 nationally). Allowing net penning puts that tremendous economic benefit at severe risk, is a bad business proposition (more to lose than can possibly be gained) and is unacceptable.

Some forms of aquaculture, principally recirculating aquaculture systems, offer a manner for commercial fish production to be done in a contained, controlled, and ecologically responsible manner. This form of aquaculture has traditionally been at economic disadvantage due to higher initial capital investment costs needed for the equipment which inherently makes them more ecological sustainable than other forms like net penning. These recirculating system operations have continued to develop despite this, due in some part to growing consumer awareness of net penning impacts, and demand for responsible fish products. Michigan is well positioned to support developing recirculating system aquaculture, however, allowance of net penning will create a further economic disincentive for it to proliferate (it also creates a competitiveness gap with other protein production such as beef, pork and chicken, which must pay to manage their wastes as well). Net penning inherently asks the public to subsidize its economic profitably by eliminating their requirement to manage their wastes, freeing them of the cost, which is shouldered by the public in the form of aquatic degradation and losses to well-developed public trust uses and economies. Michigan should not be subsidizing net pens in this way, nor should it be disadvantaging the competitiveness of the recirculating aquaculture system sector.

We found the panel report on ecological impacts of net penning, and the other accompanying reports to be useful in many regards, yet in no way effectively comprehensive in their search of useful information to frame this issue. We will discuss specific issues with the reports in a following section of this letter. However, one key overarching issue is important to highlight here. The panel proposed an Adaptive Management framework as a possible means to overcome the uncertainty surrounding Great Lakes net penning. First, we believe that there is sufficient certainty about the risks and impacts net penning is likely to cause in the Great Lakes (both brought forward in the panel report, and also provided in numerous other white papers and literature reviews on this subject which were more

comprehensive) that an experiment with the Great Lakes in the form of the so-called "adaptive management" is inappropriate, because it has no probability of success in testing a hypothesis that net penning will have no impacts. Second, the "adaptive management" framework proposed is not true adaptive management at all. Adaptive management is experimental manipulation of a system under management, to learn something new and useful about its behavior, such that it can possibly be managed in the future to provide greater benefit than possible without that information on its behavior. What the panel actually proposed was allowing a new activity with high certainty of numerous impacts and risks to be monitored extensively (at partial public expense), so those suspected impacts could possibly be documented; presumably with the intent to then ask the operators of the net pens to fix something about their operation which we know in most ways, they are unable to effectively fix. This proposed framework of the panel is not adaptive management, not responsible, not equitable, and is not acceptable.

Michigan Trout Unlimited's Policy on Aquaculture

MITU's board of directors adopted a policy on aquaculture in 2015. This policy can be accessed at (http://www.michigantu.org/index.php/michigan-tu-contacts-2/michigan-tu-contacts-4/wild-fisheries-conservation/aquaculture-policy). It addresses aquaculture as a whole, in all of its types. Please refer to this document in considering our comments on net penning. It covers all of the issues of concern we currently see with aquaculture and puts forth conditions for each in which we would need to see with an operation before we could support it. Our position, is that we oppose and expansion of aquaculture in Michigan unless it can be done so as to prevent any impacts, and eliminate risks of impacts. We recognize a spectrum of impacts and risks posed by different forms of aquaculture, with net penning being on the side of that spectrum where its impacts and risks cannot be prevented currently. As such, we are opposed to Great Lakes net penning. This policy can be found in Appendix A of this comment letter.

Comments on State of Michigan Reports on Net Penning

Panel Report on Ecological Factors

- Panel Members. Some panel members were selected who work for organizations, such as NOAA and Sea Grant, who have organizational directives to support aquaculture development. This is a possible form of bias which could have influenced the paradigms in which these members approached this report.
- Appendix A of the report provides the specific questions posed to the Panel by the Quality of Life Bureau (QOLB). The panel report extensively failed to address a majority of those specific questions. Those questions were presumably identified as critical information needed by QOLB to properly consider net penning and understand how to regulate it, if it were to become legalized. As such, the panel report failed to provide a majority of the necessary information, leaving citizens and QOLB without critical information.
- Adaptive Management, BACI approach. As discussed in our introduction, the adaptive management approach proposed in this report, is not actually true adaptive management,

and as proposed is inappropriate (reasons provided earlier). Despite proposing a BACI approach to monitoring, this approach was not elaborated upon in sufficient detail to determine monitoring details, and whether or not the monitoring would have an ability to document many of the impacts we anticipate from net penning. Further, the Panel suggests that much of the cost of this monitoring would likely need to be provided by the State of Michigan. As taxpayers and fishing license purchasers, we find spending preciously limited public funds of the DEQ and DNR for the economic benefit of a private business enterprise with certain impact to our natural resources deplorable.

- The coverage of "the Ontario Experience" was not only significantly incomplete, but lopsided and biased. For example, the Panel failed to discuss:
    - How they had a closure in the La Cloche channel, why, and how long it took to recover.
    - Ontario Ministry of the Environment reports of field sampling conducted by various net pen operations which showed consistent violation of "severe effluent limits" in "far field" areas, outside the permitted boundaries of the operations (Thornburn 2007, Errata from the Canadian Freshwater Symposium, AAC Spec. Publ. No. 12 (2007).
    - The 2009 Ontario regulatory framework for new net pen operations, and the white paper series that went along with its development (all easily accessible). This regulatory framework, along with the past surveillance, resulted in siting rules, that do not allow consideration of any new permit anywhere other than in full exposure open lake deep sites (not the type of sites the existing operations are located in currently).
    - How all existing net pens there began operation prior to the requirement for an environmental assessment, and have not been required to undergo them during permit renewals.
    - Which types of relevant information have and have not been collected by Ontario.
    - Ongoing public debate and federal policy formation to address problems Ontario continues to have with these operations. CAN Senate Committee on Fisheries and Oceans has been investigating regulatory reform on this topic since 2014.
- The Panel failed to address the impacts from expansion of "flow-through" hatcheries commensurate with net-penning to provide the juvenile fish annually raised in the net pens. The MAA strategic plan for example, has an enterprise budget scenario for net penning of rainbow trout in Michigan showing approximately half the cost of the initial start-up of net penning operations will go toward their associated land-based rearing facility, where they take purchased eggs and raise them till time of release into pens. Despite this, no real discussion of the extent or plans involved in the land-based support systems for net penning were provided.
- The Panel failed to identify, synthesize and reference certain key "white papers" on the subject of cage aquaculture. James Morris, panel member, was co-author on a NOAA technical memo synthesizing many aspects of cage aquaculture (excluding coverage of diseases and escapement), but while referenced, the summaries in it were not prominent in

the report. Also, to name a few key other papers that were excluded, Hutchings, et.al. (Environ. Rev. 20: 220–311 (2012), NRC Research Press)), did a review of the subject for the Canadian government, and published the results in peer reviewed literature. Hutchings has also been a key researcher in this field who has provided numerous key papers on the subject, none of which were identified. Additionally, Ontario produced a series of white papers on this subject, which helped inform their new regulatory process of aquaculture, and these papers were not identified in the report. Nova Scotia also undertook an extensive process of net pen review leading to their ongoing development of a new regulatory process for net penning. They also collected and summarized much pertinent information on this subject, and those are readily available as well.

- In the findings report of a Nova Scotia panel sanctioned to report on problems with current regulation of net penning and make recommendations for necessary improvements, the following key finding was provided: "*For fin-fish and other kinds of aquaculture, the regulation of aquaculture will change in fundamental ways under the proposed framework. For example: a. The regulation of aquaculture will be functionally separated from the promotion of the aquaculture industry."* We note this here, because the QOL Bureau in Michigan has been working "in unison" to evaluate the prospect and concerns with allowing net penning to occur, including regular meetings of the DRARD, DEQ and DNR with the industry. While this may appear to be a positive manner to approach this subject, we have concerns over whether this approach serves to mute some of the unique responsibilities, missions, and mandates of the individual departments. In Nova Scotia, where governmental promotion of agriculture interests has intermingled with or influenced governmental responsibilities for environmental protection and natural resource management, it has led to widespread public mistrust of the entire government's ability to responsibly consider net penning in light of the public trust.
- The Panel routinely uses biased phrases to move through discussions of various topics of impacts created by net penning. For example, "to assure that impacts are localized", "to limit these impacts", "while minimizing escapes", "Only 3-4 catastrophic failures have occurred…". These language choices are pervasive throughout document, and illustrate the personal biases of the members. The writing was not consistently unbiased and scientific in its fact finding, but injects value-based judgments on what level of impacts should be acceptable to Michigan citizens. The Panel was not asked to give its opinion on whether impacts are okay if only localized, if "limiting" impacts is okay compared to preventing them, if minimizing escaped fish rather than preventing them is ok, or if 3-4 catastrophic events is a low number, or shockingly high since they can't be prevented from occurring. These language biases jeopardize the perceived credibility of the report, and subtly bias readers. A "short summary of the science" should be that – not an opinion based interpretation of some of the science.
- The Panel appropriately identifies escapement of fish as a serious risk to wild fisheries, such as our steelhead fishery. Yet, they only encourage the use of triploid fish (while noting that process as imperfect), and recommend the operator only use the "most reasonable" method for "reducing" the reproductive capacity of the fish. Escapement is not preventable

with these operations, it occurs ongoing and in large episodic events, and the number of escaped rainbow trout we could expect annually could outnumber the spawning steelhead rainbow trout sustaining the Little Manistee River and our entire hatchery production annually. It is unacceptable to introduce this risk into our recreational fishing economy.

- Diseases. The report goes to great length to provide information about available protocols for fish livestock health testing and management. However, while those procedures can help manage disease in the livestock fish, and help reduce risk of disease epidemic spread to wild fish, none of them prevent epidemics from occurring in wild fisheries, nor do they offer viable response plans for dealing with those outbreaks in wild fish shall they occur. While an MDARD vet may check the health of the captive fish, and prescribe anti-biotics, that does not provide any sufficient means to track health of wild fish, prevent epidemics, or even control the wild fish disease epidemics once they occur. Can we look forward to our wild fish passing normally harmless diseases to the livestock fish, those diseases being amplified and made more virulent or anti-biotic resistant, becoming epidemics, crashing wild fisheries, and then the public being asked to pay for more nets to help keep our remaining wild fish from contaminating the livestock fish? Our salmon fishery is facing collapse, are we trying now to collapse the steelhead fishery too? How about the remaining lake sturgeon? The Panel Report states, with wild fish epidemics, "their impact on ecosystem structure and function is difficult to fully determine". They provide no plans in their BACI approach to overcome this.
- Siting. The Panel suggests that siting will be very critical to determine and regulate, and we agree. Unfortunately they did not develop the thinking behind necessary criteria further, at least biological, chemical and physical. For instance, if uncontrolled phosphorus pollution and loading were to be allowed, they mention needing certain water depths and flushing rates to spread it. Ontario's experience and regulations have addressed that, and now only consider sites with full exposure in open lake settings. However, those sites are not suitable because of ice damage, accessibility, and inability to secure the nets given Great Lakes storms. Those two considerations alone eliminate feasible siting. Numerous other biological, physical, chemical as well as social considerations (public trust existing uses), will preclude any viable siting.
- Decommissioning. We agree with the panel about decommissioning needs prior to permitting, but the Panel again conditions this requirement on returning sites' structure and function back to original conditions "as close as possible". As close as possible is not adequate. The owner/operator of the business should be responsible for returning the site to original conditions or better, and for paying for all necessary monitoring it takes to accomplish that.
- Fouling Agents. No discussion was provided concerning anti-fouling chemicals commonly used by the net pen industry. These chemicals have posed severe problems when used by net pens in other parts of the world.
- The discussion of Integrated multi-trophic aquaculture as a means of potentially reducing impacts is unnecessary. The Panel discusses it, as to put forth a potential encouraging

means of minimizing impacts, but then later recognizes it's not feasible for Great Lakes waters.

- Summary recommendations provided would not suffice to regulate net pens to prevent impacts and risks.
- Regulatory Authority. Discussion of the adequacy of NPDES permits to protect the environment failed to consider the loophole that the "anti-degradation clause" permits.
- Invasive Species. The Panel mentions "we recommend that policies continue to limit aquaculture to only native and naturalized species to avoid risk of future introductions". Existing policies however, allow non-native and non-naturalized species to be raised, via the "experimental" condition in the aquaculture license. The State of Michigan currently is allowing barramundi to be raised in Michigan as an example. So their premise that current policies are restricting these species from being raised is a faulty premise.
- Nuisance and harmful algal blooms. This topic is given some coverage, and the Panel accepts that net penning has the means to cause these. More scientific exploration of this would have been desirable, as their proliferation not only poses a possibly severe impacts to aquatic life, but also tourism on our beaches, private property rights, and human health with the basic right of drinking water.
- As recreational anglers, we reject the premise presented that the main interaction with recreational fishing and net pens is generally positive, with anglers going to acts of vandalism to release livestock fish. This reference came from an Ontario official from the equivalent of the Agriculture department, not a fisheries manager. A casual comment such as this has no place in a document entitled "a short summary of the science". In Michigan, anglers depend on the long-term health and resiliency of healthy fish stocks. That included tremendous efforts to support wild fisheries, and periodically replacing hatchery stocks as there domestication level leads to poor performance in the wild. The main interaction between net pens and our recreational anglers will not be generally positive. This was a poor section of the report, poorly covered, not science, and with bias.
- The cover photo for the report shows a rainbow trout, caught by angling (fishing line attached to mouth). The commercial or wild origin of the fish is unknown, but it does depict a healthy looking rainbow trout with no fin decay or physical abnormalities typical of domesticated rainbow raised in high densities. Perhaps a better photo for the report cover would be something like found below – a transgenic rainbow trout developed for better commercial production and profit. Photo at http://www.sciencedaily.com/releases/2010/03/100310113540.htm, courtesy of the University of Rhode Island. Perhaps this photo might better reflect the dichotomy of goals between wild fishery management and commercial fish production, and the inherent threat of escapement?

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Economics Papers

-The most glaring concern with the two economics papers relates to Dr. Lupi's identification of the Miller, Mann, Knudson paper's use of a price per pound of rainbow trout estimate that was roughly twice the national average. Despite, this, Miller et al were apparently not required to address this point in a revision of their report. Using an estimate that is nearly twice the national average, without providing robust justification to warrant its use, equates to allowing the economic projections of the net pens to be suspiciously doubled – creating perceived bias in the findings. Despite this issue being raised in report form, QOLB did not require the issue to be reconciled prior to release of the reports. This unreconciled estimate of the economic benefits of the net pen operations is now in use, including in presentations used by the QOLB at the public meeting, and in the media. This problem should be addressed, with required revision of the Miller et al report. Care should be given to carefully reviewing what the justification or rationale is for the valuation used. The Miller et al. report only states that they used the $2.75/lb. price as it was used by Weeks and Knudson 2014. That reference is the MAA strategic plan. When that plan was reviewed, the only mention of the $2.75/lb. estimate was found in the "enterprise budgets" section of the report. In that section, where the rainbow trout net pen scenario is provided, they only say "The sale price is $2.75 per pound." The references for that section site only a study of Nowegian salmon farms, and a shrimp aquaculture study. This hence, leaves a reader to assume that there is no justification for 2.75/lb., but its use was forwarded along by authors not pursuing the validity of their assumptions. Lupi provides comments on the details of rainbow trout pricing in Michigan, referencing prices from national statistics and price dynamics applicable to MI net pen expansion (NASS 2015, and Gvillo et al 2013), which suggest the national average of $1.63/lb. in 2013 should have been used. If the public must attempt to consider balancing the potential economic gains with the potential economic losses than the public must be informed in this regard with accurate information. Please consider having this net pen economic analysis redone and reposted with appropriate product pricing.

Regulatory & Legal

- NPDES. MITU has concerns over the adequacy of this permitting structure to ensure water quality and designated uses of waters when applied to net pen operations. First, the report highlights that net pens will qualify for technology based standards, which require use of best management practices to control discharge of pollutants from the facilities. We are both unaware of any best management practices specifically for this net penning; and also are confident that any such best management practices that were created would be insufficient to prevent its pollutants. The Panel report states that there is no way currently available to collect the wastes associated with net pens. So the only BMP's we are likely to get will be focused on feed content and feeding dynamics. Both will be insufficient to prevent nutrient pollution. Escaped fish and diseases can also be governed by this NPDES, and similarly, any BMP's created will at best, minimize those pollutants but are not able to prevent them. On this point, perhaps the greatest weakness of the NPDES permit in practice, is the use of discretion in applying the anti-degradation clause. In practice, it can be used as a loophole for unacceptable levels of pollution, by simply stating that the pollution levels are necessary in order to achieve the social or economic gains of the operation. This clause should be used to test whether the gains of the operation are greater than the possible social or economic losses from the operation – but it's commonly not. The result is a loophole which makes NPDES permitting less than a confident tool for ensuring environmental protection. Given its use recently, as applied to the Grayling fish farm, we no longer can view NPDES permitting as an existing adequate regulatory safeguard to protect citizens of Michigan from net penning.
- Aquaculture Facility Registration. This section states "Because of the potential long-term impact of escaped fish on the Great Lakes fish populations, the Model Program will need to be strictly followed." This section does not explain what the "Model Program" is, or how it's suitable as a safeguard against escapement issues. Also, in choosing wording, its pointed out that this act currently prohibits net penning in the Great Lakes – so the wording in the previously quoted sentence should be " … the Model Program *would* need to…". Use of "will" signals a judgement from the authors that the law will be overturned.
- Aquaculture Facility Registration. As noted previously, this act has been allowing the use of non-native, non-naturalized fish species through "experimental" license status. This issue needs to be addressed.
- Public Trust Doctrine. This legal concept received no coverage in the report. It is a highly relevant legal concept that will come into play on this issue. It's a basic and foundational legal concept and mandate, the report could use some mention of it in regards to net penning.
- Ontario's "Experience". Ontario has a relatively new regulatory process for net penning. This section of this report does not reflect enough of the details of that process. For example, they have established siting rules, which would have been useful to bring forward here. Also, while they have 6 permitted operations, there was no discussion of them all having been given prior to requirements for environmental assessments. Since new

requirements have been in place, they have not issued a new permit for net penning to our knowledge. These facts paint a different picture of "Ontario's Experience". It would have also been useful to dig deeper into actual compliance reporting results, how often violations have been recorded, and how effective the current operators actually have been in addressing them. It's been hard for the public to get a true picture of how Ontario net pens have performed. Some have used the scarcity of information to falsely project a "clean record" for those net pens. This section would have been well-served to take a deeper investigative approach to bring forth a clearer picture of their true experience.

Conclusion

With growing populations, the world may indeed demand more fish protein. We understand that assumption, and the need to develop systems to accommodate it. However, there are both shortcuts to that, and proper responsible sustainable paths to it. Net penning is a shortcut, attractive to the owners of those operations who will profit from their competitive advantages. The cost of those competitive advantages will be paid by the public in terms of health risks, water quality degradation, and loss of existing high value sustainable economic uses of our waters and shoreline. The subsidies for net pens paid for by the public will put the long-term sustainable forms of fish production at great disadvantage and will set us and the world back from true solutions to our fish demand indefinitely. Allowing net pens in the Great Lakes would be bad public policy.

In Michigan, there exist so many compelling and intelligent reasons why net penning will cause damage; biological, ecological, physical, chemical, economic, social, and health. Any one of these should be enough to confirm that net penning has no place here. Taken cumulatively though, it must be apparent that there is no way through this proposition without unacceptable losses. Some grand BACI experiment with our resources, as proposed, will at best simply partially document the problems to be created and partially tell a picture of the losses we will suffer long-term. Net pens are unable to prevent or mitigate all of their damage. All over the world, where these have been allowed, there have been problems. Some states/countries simply accept the damage in trade for the gains (perhaps they did have much to lose to start); some places have struggled with existing operations, learned, and have crafted new regulatory safeguards that functionally prevent any new net pens (while wishing they could now get rid of the ones they have); other places have learned from the experience and mistakes of others and prevented net penning from starting there. Alaska for example, with their proud heritage of natural resource use, still recognized they had far too much of value to lose by allowing net pens, and banned it. Michigan receives more out-of-state anglers annually than Alaska. Michigan has not allowed net pens, and should be wise enough to learn from others' while protecting the wealth of what our waters provide for us currently.

From a fisheries perspective, net pens will create numerous types of damage to our fisheries, and pose risks to them that we are economically not equipped to absorb. If we create the vector for wild fish disease epidemics, with far reaching impacts to species like salmon or steelhead, walleye or perch we will have created an economic loss to the state which will far outstrip all economic gains from net penning. And there will be no quick fix or solution. We know with certainty and experience that

genetic introgression of heavily domesticated fish with wild fish, will decrease their fitness in the wild. How long will it take for annual escapes of domestic rainbow trout, with periodic large-scale losses, to cause our steelhead fishery to decay? Will we recognize its happening when it does? Can we afford the loss of our vibrant steelhead fishery, which is now helping to sustain Great Lakes fishing and supports year-round destination fishing in our rivers – No. Are the potential losses greater than all the cumulative gains from net penning – Yes. Can we afford the closure of marinas, restaurants, lodging and retail in "waterfront" communities all over Michigan – No. Can we afford the loss of local tax revenues when riverfront properties around Michigan decrease in value when our tremendous fisheries diminish – No.

There is no perfect analogy to this Great Lakes net penning proposition that can fully show it for what it truly represents. But, it is not much different from a proposal to allow a commercial farm to raise hundreds of thousands of domestic turkeys or deer in a netted facility, on a southern Michigan State Park land; where the animal waste would be allowed to be spread on the adjacent State Park lands (to be "assimilated"); where the smell of the waste would be viewed as only a potential nuisance (like nuisance algal blooms on beaches); where disease transmission would occur freely through the fence (flowing water is a far better transmittance factor than air, or direct contact); and where you would knowingly approve of ~9,000 animals escaping annually (3% of 300,000 animals – taken from Panel Report), with even larger occasional catastrophic escape events. This kind of a proposal would be viewed as preposterous, and consideration of it ended quickly. We encourage a similar view of net penning in the Great Lakes.

Thank you for consideration of our comments.

Respectfully & Resolutely,

Michigan Trout Unlimited

Correspondence to be directed to:

Dr. Bryan Burroughs
Executive Director
517-599-5238
bryanburroughs@michigantu.org

Appendix A. Michigan Trout Unlimited's Aquaculture Policy.

MICHIGAN TROUT UNLIMITED AQUACULTURE POLICY POSITION

PURPOSE**:**
The purpose of this document is to state Michigan Trout Unlimited' s ("MITU") policy in regards to the growing aquaculture movement both within the waters of the State of Michigan and the Great Lakes. MITU is concerned about impacts aquaculture may have on Michigan's coldwater fisheries and their watersheds. Aquaculture occurs in three basic forms: closed pond systems, stream flow through systems, and open water net pen systems. Each comes with its own concerns and each will be discussed in sections of this policy.

MITU General Policy Concerning Aquaculture:
MITU is not opposed to aquaculture in Michigan or the Great Lakes so long as it is strictly regulated in a way that absolutely ensures no harm to Michigan's coldwater fisheries and their watersheds. This means that regulations for aquaculture must ensure that no impacts can occur from this activity, and that all risks posed are eliminated. Private operations must not be subsidized by the public by allowing negative impacts or diminishment of our natural resources or the existing uses and benefits provided by our natural resources; nor shall the risks posed by aquaculture operations put our natural resources and their uses in any jeopardy.

Requirements to Ensure No Harm:
The following will list potential harms from aquaculture and MITU's current position on standards to prevent such harm.

1. Water Temperature and Dissolved Oxygen:
High water temperature and low dissolved oxygen impacts will mainly occur from stream flow through systems where diversions of flow from coldwater streams are shunted through raceways or ponds and discharged back into the same stream. This diversion can significantly increase temperature and reduce dissolved oxygen in the water that is discharged back into the stream which will directly impact coldwater fisheries and lower their abundances or extirpate them from miles of streams. With Great Lakes net penning, waste effluent and nutrients can create biological oxygen demand in surrounding waters leading to dissolved oxygen depletion and/or anoxic conditions.
a. Regulatory Standards to Prevent Increased Water Temperature:
i. Water chillers must be made part of all flow through systems to ensure discharge water is at the same or lower temperature than intake water.

ii. Constant temperature monitors must be utilized to ensure the appropriate discharge temperature and close the system if temperatures increase above the intake temperature.

b. Regulatory Standards to Prevent decreased Dissolved Oxygen.

i. Oxygen diffusers must be made part of all flow through systems to ensure discharge water is at the same or higher dissolved oxygen levels than intake water.

ii. Constant dissolved oxygen monitors must be utilized to ensure the appropriate discharge dissolved oxygen levels and closes the system if the dissolved oxygen decreases below the intake level.

iii. Waste effluent and nutrient pollution management requirements at both flow-through and net penning operations must ensure that dissolved oxygen depletion does not occur in waters outside of the aquaculture operations.

2. Nutrient Pollution:

Nutrient pollution can be introduced into the water bodies receiving the discharges of wastewaters from flow through systems or from open water net pen systems. Phosphorus is often the limiting nutrient in aquatic systems, and very small changes in the level of it can lead to significant changes to aquatic ecosystems. Nutrients from uneaten fish food and fish excrement will be the most significant source. In flow through systems discharges with excessive nutrients can lead to increases and shifts in algal communities, algae blooms, filamentous algae, less of some pollution intolerant aquatic invertebrates (like stoneflies, mayflies and caddisflies) and even less of certain stream fish populations (some research has documented brook trout density decreases with minor nutrient pollution). In open water net pen systems nutrients and waste would accumulate on the bottom, smothering benthic life, creating anoxic areas, or helping to stimulate dangerous Microcystis algae blooms that can render water unsafe for public use (similar to the problems occurring in Lake Erie due to nutrient pollution).

a. Regulatory Standards for Nutrient Pollution:

i. Aquaculture operations must be required to take full responsibility for handling all nutrients created by their operations. Effluent nutrient levels should not exceed ambient intake levels.

ii. Aquaculture operations must collect solid waste and prevent solid waste from reaching Michigan inland lakes and streams or becoming free in the Great Lakes from open water net pens.

iii. Aquaculture operations must treat and remove all dissolved nutrients so that no nutrients are added to either Michigan inland lakes and streams or the Great Lakes.

iv. Flow- through systems must be required to take regular samples for solid waste and dissolved nutrients to ensure that neither type are discharged into Michigan’s inland lakes and streams. Rigorous and robust sampling means and regimes must be prescribed by the state and conducted at the expense of the private operator.

v. Open water net pen systems must have all appropriate safeguards to ensure that no solid waste or dissolved nutrients are added to the Great Lakes from the systems, and

include monitoring systems sufficient to document such, and conducted at the expense of the private operator.

3. **Antibiotics & Growth Hormones**:
Addition of antibiotics and growth hormones to the fish food similar to other large-scale meat productions operations may be a desired practice for aquaculture operations. However, because aquaculture in pass through systems or open water net pen systems uses public waters those antibiotics and growth hormones will be released into public waters where they can affect natural bacterial communities dynamics and resistance (influencing frequency and severity of disease outbreaks), wild fish stocks health and public drinking water supplies.
a. Regulatory Standards for Antibiotics and Growth Hormones:
i. Open water net pen systems must not be allowed to release any antibiotics or growth hormones into the Great Lakes and to take all appropriate safeguards to ensure that none are released.

ii. Pass through systems must not be allowed to release any antibiotics or growth hormones into Michigan's inland lakes or streams.

iii. Requirements for regular monitoring for antibiotics and growth hormones to ensure that neither is discharged into Michigan's inland lakes and streams or Great Lakes must be in place.

iv. Examples of implementing these standards could include prohibiting any such chemicals from delivery via fish feed or water inoculation (leaving direct inoculation via injections to individual fish as a possible viable means).

4. Diseases:
Aquaculture poses two main direct vectors for disease introduction to wild fisheries. First, fish raised in a facility are often acquired from other places (spawned from brood stock kept specifically for that purpose) and may bring diseases with them (all net pen operations source fish from other facilities). Second, large and dense fish concentrations increase the probability of disease and the severity of disease outbreaks. Disease prevention regulations need to be commensurately tough compared with the cost of a collapse of the multi-billion dollar Michigan sport fishery.
a. Regulatory Standards Concerning Disease:

i. Regular and rigorous disease testing must occur for all brood stock, and of all juvenile fish sourced for the operations.

ii. Regular and rigorous disease testing must occur for all types of aquaculture operations.

iii. For all cases of disease outbreaks in any type of aquaculture operation, all fish must be immediately quarantined and destroyed, including immediate quarantine or isolation of all water leaving the aquaculture operation (flow-through or open water).

This could include shutting off water inlet and outlets at flow-through operations, or deployment of disease impermeable booms for Great Lakes operations.

iv. All aquaculture operations must be required to provide bonds to the State of Michigan sufficient to cover all costs of natural resource damages and harms to Michigan's sport fishery (including loss of use, effective response, and cost of long-term irreparable loss).

5. Escapement:

Fish escape from aquaculture facilities. Aquaculture escapement provides two categories of impacts. First, escapement can introduce new invasive and foreign species which can result in complete ecological imbalances (See Asian carp – a result of an insufficiently regulated aquaculture operation). Second, and more often under-assessed, is the introduction of domesticated gene pools from fish species that are found in nearby waters. The aquaculture industry utilizes fish purposeful genetic selection (or modification) for mass production as compared to our wild fisheries that have been honed for survival in the wild. Domesticated rainbow trout, for example, are common aquaculture species that perform well in dense populations and feed heavily in response to humans feeding them. Their genetic makeup varies widely from the wild steelhead strains in most of our coldwater tributaries. The traits selected for in domesticated rainbow trout versus wild rainbow trout or steelhead are largely mutually exclusive. Escapement dilutes wild gene pools and disrupts wild fish stocks from thriving. This fact is well studied and used in modern governmental aquaculture operations with goals of restoring wild fish stocks; as well as underpinning the MI DNR's own current procedures for steelhead production. There is scientific literature available on the impacts of marine net pen escaped Atlantic salmon on wild Atlantic salmon stocks available as well.

a. Regulatory Standards Concerning Escapement:

i. All species not currently found in the Great Lakes region must be prohibited from use in flow-through and net penning operations in Michigan. Closed system aquaculture operations must be required to maintain safeguards to escapement of such species adequate to ensure all risk of them being introduced into the wild is eliminated. We have Asian carp because of this, and other popular aquaculture species such as tilapia pose equal risk for introduction and complete ecological imbalances.

ii. All aquaculture operations with species currently found in the Great Lakes region must actively prevent escapement such that no aquaculture raised fish are allowed to escape from operations. Limited escape is not acceptable. Risk of escapement must be eliminated through regulation.

6. Interruption of Existing Uses:

Aquaculture operations may cause significant disruptions to recreational uses of our public waters. Open water net pen systems may result in interference with recreational boating and yachting, sportfishing, swimming and beach enjoyment, lakefront views, tribal fishers and state-

licensed commercial fishers, and Great Lakes shipping channels. Flow- through systems may result in interference with canoers and kayakers, sportfishing, riverfront views, and tribal fishers. Michigan's waters have myriad existing uses, including rights to those uses afforded by property rights, public trust doctrine, Treaty rights, and numerous other basic legal structures. Additionally, our waters currently provide for Michigan's tourism economy, a 4 billion dollar plus annual sport fishery economy, and an incredible portion of local and state tax base through waterfront property owners. Diminishing or jeopardizing any of those uses and benefits of our waters would be short-sighted, irresponsible, and many cases illegal.

a. Regulatory Standards to Preserve Existing Uses:

i. Aquaculture operations must not be allowed to interfere with, diminish, jeopardize or otherwise affect any other uses of Michigan's inland lakes and streams or the Great Lakes.

7. Regulatory Standards as a Whole:

MITU believes that the impacts and risks associated with aquaculture development in Michigan increase from closed-systems to flow-through systems, and again to net penning. Closed-systems, not without risks, offer the most viable and responsible means to aquaculture development in Michigan. Closed-systems may not be pursued, due to the capital investments in infrastructure involved, which implicitly make them less risky or damaging than flow-through or net penning operations. Those capital investments represent the business owner taking financial responsibility, at least in part, for the risks and impacts to public waters its business poses. The general regulatory standards MITU proposed should be uniformly applied to all aquaculture operations to ensure:

a. The prevention of impact or risks to natural resources and their associated uses and benefits;

b. The citizens of Michigan are not forced to subsidize the cost of certain kinds of aquaculture ventures by absorbing the impacts and risks they pose;

c. All three kinds of aquaculture are held to the same consistent standards, thus preventing the public subsidizing an incentive to do net penning or flow-through systems (by absorbing the avoidance of preventing impacts and risks) while simultaneously creating an economic disincentive for closed-system operations.

The above regulatory standards must be established prior to any additional aquaculture operations beginning in Michigan's inland lakes and streams or the Great Lakes. The risks posed are significant and the potential harms are devastating.

The Executive Branch of the State of Michigan and its agencies must approach aquaculture with caution and come together to ensure that Michigan's recreational traditions, incredible water resources, and the benefits they provide to this State are protected. MITU believes that if the above protections are implemented then aquaculture may be able to co-exist with Michigan's well established and valuable water uses.