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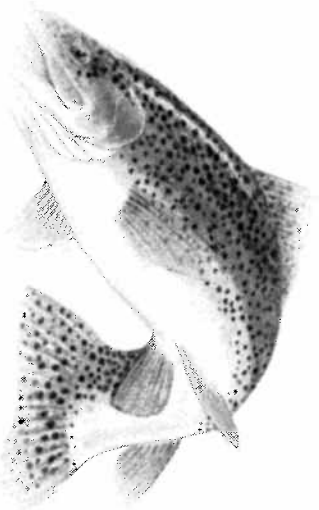

Aquaculture in Michigan
Roadmap through Regulation

Taking Aquaculture in Michigan (AIM) to the future: *a "Roadmap" for the aquaculture sector to understand the underlying regulatory framework for operation expansion and new farm enterprise development.*

Prepared for the Aquaculture Industry Committee
(Administered by the Michigan Department of Agriculture and Rural Development)
By: Originz, LLC
Project Principals: Joe Colyn & Gary Boersen
Summer 2012

...a wise and frugal Government, which shall restrain men from injuring one another, shall leave them otherwise free to regulate their own pursuits of industry and improvement, and shall not take from the mouth of labor the bread it has earned. This is the sum of good government...

Thomas Jefferson, 1st Inaugural Address, 1801

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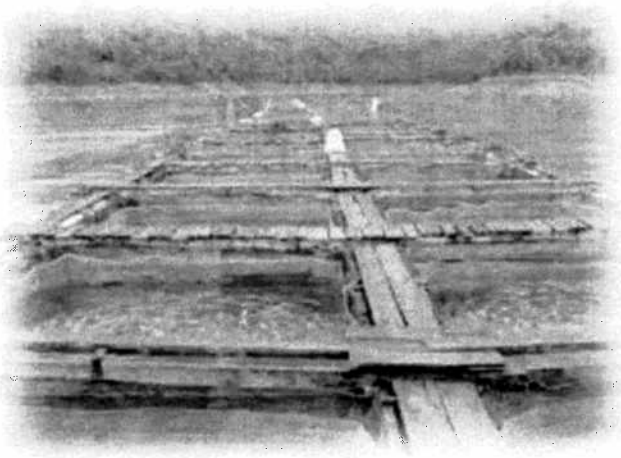

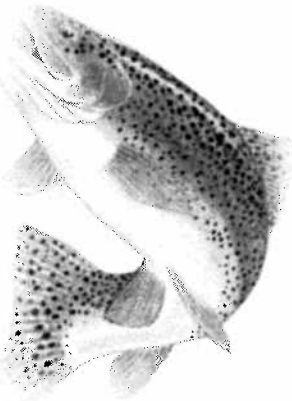

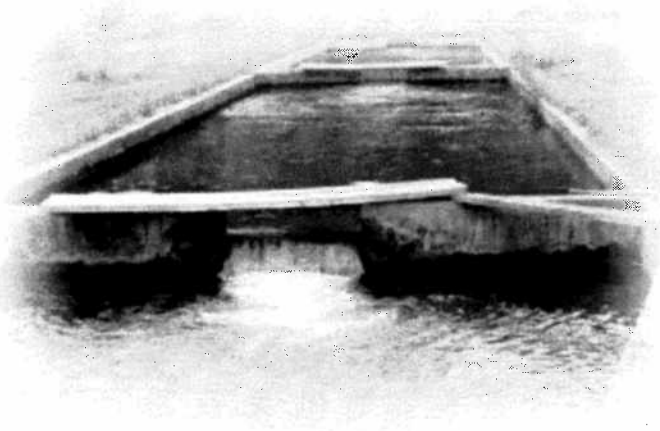

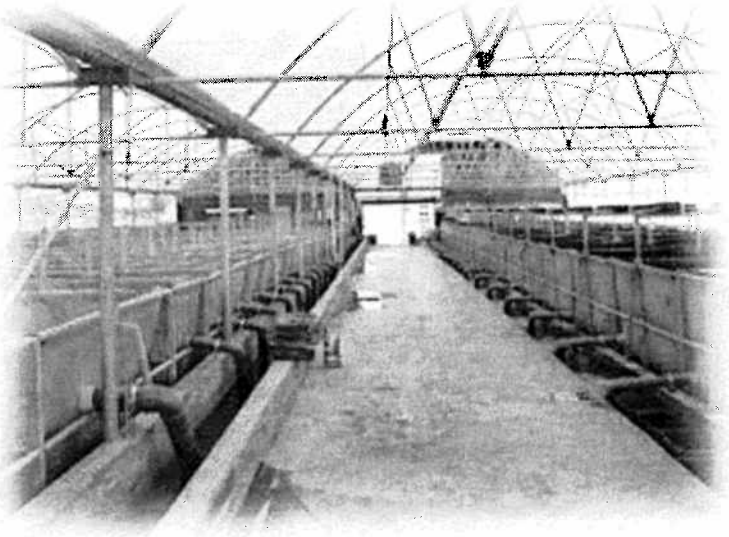

I – A Roadmap Through Regulations for New and Expanding Aquaculture Enterprises

Introduction & Overview

The State of Michigan enjoys abundant water resources and a diverse agricultural base, including an aquaculture sector poised for expansion in response to the opportunities from the domestic seafood market. While in the past Michigan aquaculture has focused on bait, pond stocking, and fee fishing, there is now opportunity for growth in producing fish for human consumption.

By the year 2050, the world will need twice as much food – and four times as much protein. The USA currently imports approximately $11 billion worth of seafood, much of which comes from Southeast Asia. That quadrant of the world has over half of the world's population and, as more of these people enter the middle class, their local demand for protein will place increasing pressure on the supply coming to America. Furthermore, the American people have an increasing desire to know the source of their food, for reasons including food safety, local-sourcing preferences, and freshness – perceived or real. Consequently, Michigan, along with the broader Great Lakes region, has both an opportunity and a responsibility to leverage its water, land, skills, and stewardship resources (including proper regulation) to promote a thriving aquaculture economy that maintains a healthy ecosystem and provides the benefits of jobs and good nutrition.

For those seeking to build new facilities or expand existing infrastructure in Michigan, the Aquaculture Industry Committee (an *ad hoc* industry group comprised of producer, regulator, trade association, university, and extension personnel) Request for Proposal identified the need for a "How-to-Guide" as a "Roadmap" to navigate through the various regulations pertaining to aquaculture. This Roadmap will serve as a valuable resource to the private, public, and tribal facilities that hope to understand the regulatory situation in Michigan.

The Michigan Aquaculture Association's (MAA) current strategic plan proposes that Michigan's aquaculture sector can grow from $5 million annually with 100 direct jobs to over $100 million with 1,500 direct jobs.[1] In its 150-year history, the Michigan aquaculture sector has a track record of sound management in environmental practices and safety, with no invasive species released.[2] In this context, there is clearly great opportunity to realize this $100 million opportunity.

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[1] MAA Strategic Plan 2, source: http://michiganaquaculture.org/strategic-plan/plan-document/

[2] Michigan Sea-Grant Aquaculture in Michigan, source: www.miseagrant.umich.edu/fisheries.aquaculture.html

The Roadmap: This guide provides the Roadmap. It is formatted as a set of seven Decision Trees for aquaculture, each with an introductory page to set the context. Each Decision Tree addresses a key component for starting or expanding an aquaculture enterprise. Used collectively, they map to and through pertinent current regulations. Like any planning process, working through the seven Decision Trees needs to be iterative.

Recommendations and Next Steps for the Development of Aquaculture: In the process of developing this guide, a number of opportunities to improve how the sector can operate in the context of the regulations were revealed. We present to the Aquaculture Industry Committee and its various industry and government partners these opportunities as a set of recommendations for consideration. In some cases, regulatory changes that better quantify the expectations of aquaculturalists by defining formal performance standards would provide improved clarity, freedom to operate, and a better framework for compliance by facility operators. In other cases, the adoption of a set of defined best management practices – for example, in the context of GAAMPs (Generally Accepted Agriculture Management Practices) and the MAEAP (Michigan Agriculture Environmental Assurance Program) – could strengthen operator ability to comply with regulations and performance standards. Taken together, these changes could advance a viable, thriving, and sustainable aquaculture sector.

Liberty: the assurance that every man shall be protected in doing what he believes is his duty against influence of authority and majorities, custom and opinion

Lord Acton

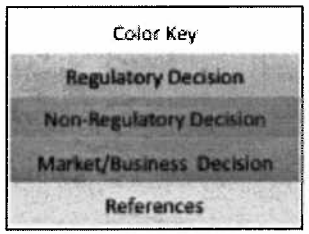
The challenges to growing aquaculture in Michigan are not unique to this sector or to the state of Michigan. Confounding regulations have hampered the development of aquaculture nationwide, as the supply chain for fish moved to foreign sources that are often unverified – and largely unverifiable. Sector development regarding other "specialty crops" (real food crops) has also been competitively disadvantaged in the marketplace, due to various USDA farm bill programs and related commodity and energy policies and regulations. To achieve a thriving sector, a structure is required that includes regulatory framework clarity (found in this Roadmap and beyond, as the recommendations are acted upon), defined performance standards to articulate regulatory constraints, and operator compliance to those regulations through best management practices. Then, the aquaculturalist can go about the business of farming "inside the fence" of his farm. Furthermore, there can be a realization of good food, economic gain, and environmental stewardship. Short of this clarity, aquaculture in Michigan will continue to languish under untenable bureaucratic burdens.

II – Roadmaps –The Decision Trees: A seven-part tool to guide through regulation and commercialization

The following pages include a set of seven Decision Trees, which function as aids for mapping through commercialization and the relevant regulations. These are intended to provide existing aquaculture operations that are considering expansion or construction of new facilities with visuals of the processes to follow, including the applicable regulations and the permits required for aquaculture facilities. When working through a given Decision Tree, be mindful of parallel considerations in the other Decision Trees. Decisions made in a certain Decision Tree may require the revisiting of a previous Decision Tree, in an iterative feedback and feed-forward process that is typical of any sound planning process.

The seven Decision Trees are listed in an order that is intentional and sequential to start the decision process, as follows:

- Basic Planning Requirements
- Water Sourcing & Quantity
- Water Quality
- Siting – Where to Locate
- Water Discharge
- Disease and Pest Monitoring & Reporting
- Permits



Each Decision Tree is introduced with a brief description of its purpose and context. The boxes in the Decision Trees are color-coded to show the type of decision required *(see Color Key, right)*. An Appendix specific to each Decision Tree provides further information and links to supporting documents.

These Decisions Trees go beyond guiding through the regulations. They also provide aid and direction for consideration in the design and operations of an aquaculture facility. Furthermore, they apply equally to food-fish production and the rearing of bait-fish and game-fish species for stocking in Michigan.

Note: In this document we refer to aquaculture as a sector, the classification term commonly used in agriculture (in contrast to the term cluster or industry that are commonly used in economic development agencies). Be advised.

The basic decision process that an aquaculturalist should consider is illustrated below:

Decision Tree #1 – Basic Planning Requirements

Markets: Any business venture needs to give sufficient consideration to the market opportunity. The Decision Tree #1 simply maps a few key considerations to factor in, apart from the operational and regulatory compliance decisions.

Note that, in the follow-up to the AIM project that produced this Roadmap, there is a Michigan SeaGrant www.miseagrant.umich.edu funded Integrated Assessment Project in place to develop a Strategic Plan for the Michigan aquaculture sector in 2012–13. This could serve as an additional resource in scoping the markets that a venture could pursue. Check back with the Michigan Aquaculture Association for updates on the Strategic Plan at: www.michiganaquaculture.org

Regulations: Key regulations pertinent to aquaculture in Michigan are the ***Michigan Aquaculture Development Act*** of 1996 (MADA). For a copy of this act: www.legislature.mi.gov/%28S%28sfv0qi55a40afpvitowiygre%29%29/mileg.aspx?page=print&objectname=mcl-act-199-of-1996. The act includes list of approved species, and lays out a process to add new species. The MADA requires an Aquaculture Facility Registration with MDARD (*Michigan Department of Agriculture and Rural Development*). The registration information is at: http://www.michigan.gov/statelicensesearch/0,4671,7-180-24786_24787-242765--,00.html. The ***Michigan Right to Farm Act*** (RTF) provides additional context for aquaculture, specifically in Policy 8.2. The act at the link: http://www.michigan.gov/mdard/0,4610,7-125-1567_1599_1605---,00.html. Aquaculturalists should be acquainted with both of these acts before working through Decision Trees.

The first step in Decision Tree #1 is the selection of a Michigan Aquaculture Development Act (MADA) approved species. For any species to be legally raised in the state, it must appear on the list of Approved Species contained in the MADA. If it does not appear as an Approved Species, the MADA-defined process (*see section 286.878 of the act*) must be followed to obtain approval to obtain and maintain these species for commercial production purposes.

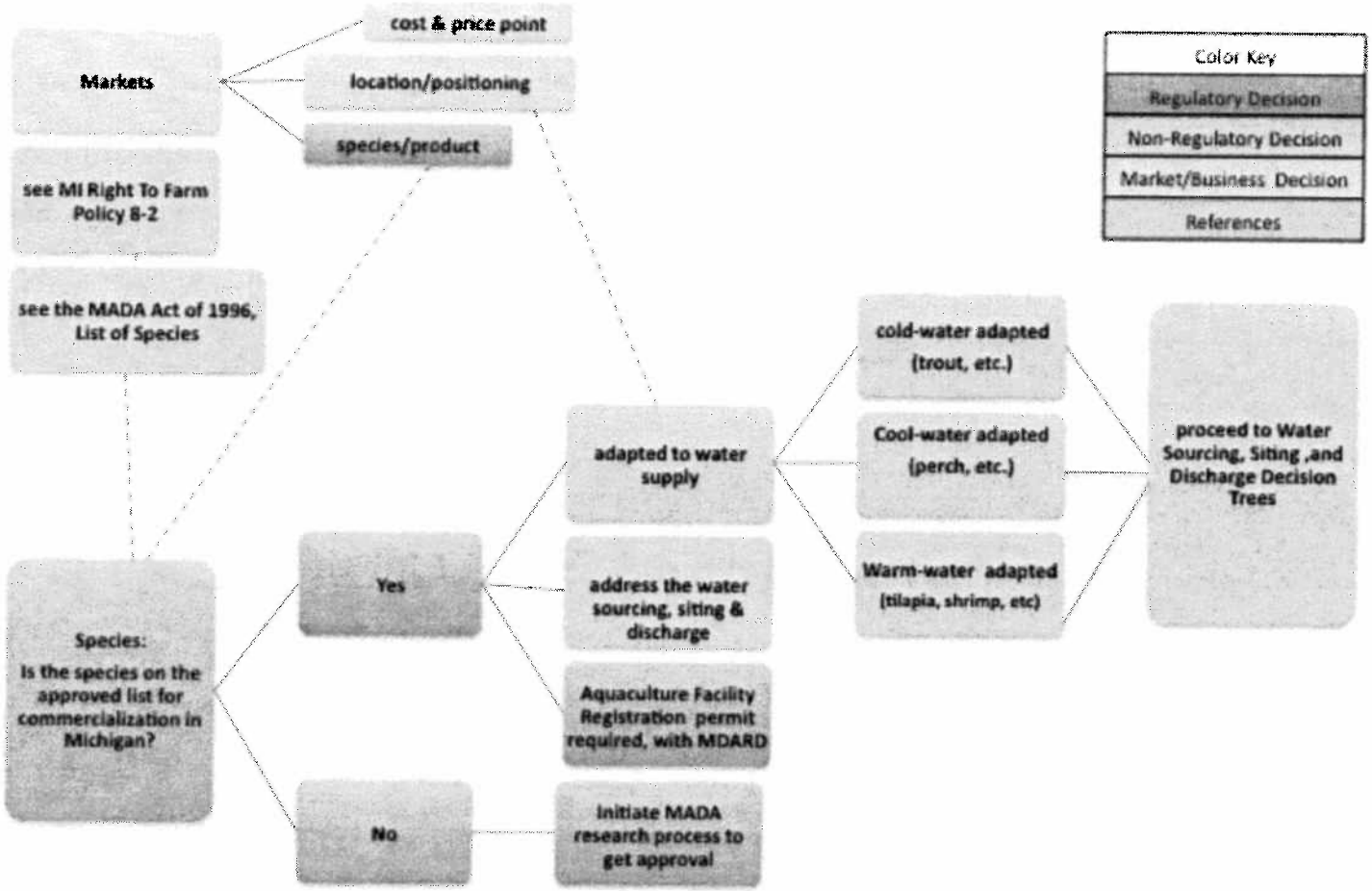
Once the species to be produced is known, a suitable water source must be identified. For example, trout need cold water to survive. However, Michigan's naturally occurring cold water temperatures from groundwater or surface water (for a majority of the year) will not allow the culturing of tilapia without supplemental heating of the water – likely at significant cost.

The basic decisions made in Decision Tree #1 will have ramifications for the rest of the Roadmap decisions including Water Source & Quantity, Water Quality, and Water Discharge.

Further information regarding this Decision Tree is included in Appendix V–B–1 of this Report.

Basic Planning Requirements

Decision Tree #1



Decision Tree #2 – Water Source & Quantity

The basic requirement for any aquaculture operation is water, typically in significant quantity, as necessitated by the scale and type of operation. Whether the system is a Recirculating Aquaculture System (RAS) or if it is set up for once-through water use, calculation of the expected volume is critical.

Some sources (such as groundwater) have a constant temperature. Others, while they may be more abundant (Great Lakes, rivers, inland lakes), have significant temperature variations depending on the time of year. These water temperature factors must be matched against the species to be raised at the facility.

Most water sources in the state will require some regulatory approval and permission before an aquaculturalist is authorized to withdraw and use those waters. Natural springs are water sources that are free-flowing and rise to the surface for collection and use, and permits are not required for withdrawal. On the other hand, wells, both pumped and flowing (artesian), require groundwater withdrawal permission, because they involve a construction (drilling) activity to source.

In Michigan, several different sources of water are available. Some sources are present in specific areas (Great Lakes, inland lakes, streams). In the case of groundwater, its availability and quality will vary, and it is much more abundant in some areas of the state. From a regulatory standpoint, groundwater is generally the easiest water source to secure. Withdrawal of water from the Great Lakes is the most difficult. All sources will require some type of application, design review, and possibly a request for public comment by neighbors and other users of water from the source. While municipal water supplies have traditionally not been used for commercial aquaculture, many Michigan cities and towns have excess capacity that could be used for raising fish.

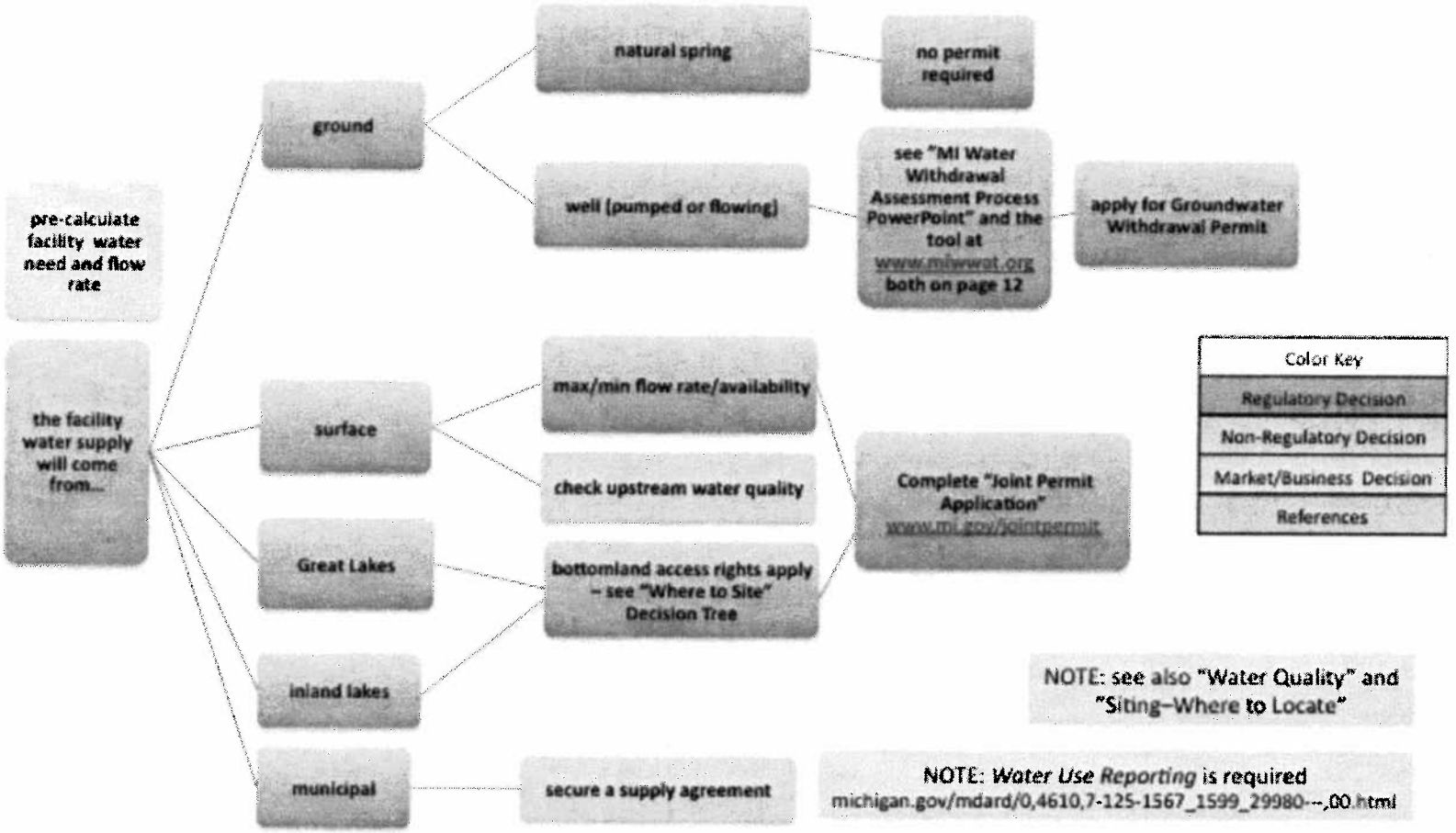
Standard water source permits in Michigan (i.e., those for groundwater withdrawal) may require up to 6 months to issue, and Great Lakes bottomlands permits may take much more time. Be sure to refer to the Decision Trees on Water Quality, Siting, and Permits as well when considering water source.

To assist in evaluation of groundwater sources, Michigan has a Groundwater Assessment Tool. The tool and related educational material and other resources are available at: http://www.miwwat.org This link is to a helpful PowerPoint resource about the tool: http://www.google.com/url?sa=t&rct=j&q=&esrc=s&source=web&cd=10&ved=0CG0QFjAJ&url=http%3A%2F%2Fwww.swmpc.org%2Fdownloads%2Fwwat_process_2011.pdf&ei=RWjbT6zeKsWe2AWYyqXECA&usg=AFQjCNE9FwO2OBKSJhXSfBGYpwECXco0YA

Further information regarding this Decision Tree is included in Appendix V–B–2 of this Report.

Water Source & Quantity

Decision Tree #2



Decision Tree #3 – Water Quality.

As water is so critical to aquaculture, the Water Quality Decision Tree is provided as a guide when considering water sourcing. There are no specific Michigan regulatory or permit requirements regarding water quality for aquaculture.

Water quality must be reviewed as an overall element of any proposed aquaculture plan, because of its impact on the species to be raised and the site selection. In fact, water of a certain acceptable quality must be available at the aquaculture facility site, so quality is closely linked to site selection. At the same time, three key water quality attributes listed on Decision Tree #3 can all be modified with technology, if necessary. However, sourcing a quality water supply already suited to the chosen species can go a long way toward containing costs – and increasing a fish farm's margins and profit.

The table (right) is an example of a chart of the primary water quality requirements that an operator might want to create for the facility's species. Other water attributes (mineralization, contaminants, etc) should also be tested to ensure acceptable quality. Check with fish culture experts for more information. The various aspects of water chemistry to consider in evaluating its quality include ammonia, metals (specifically iron and heavy metal toxins), dissolved salts, chlorine (particularly if the water is from a municipal supply) and possible contaminants from other upstream water uses.

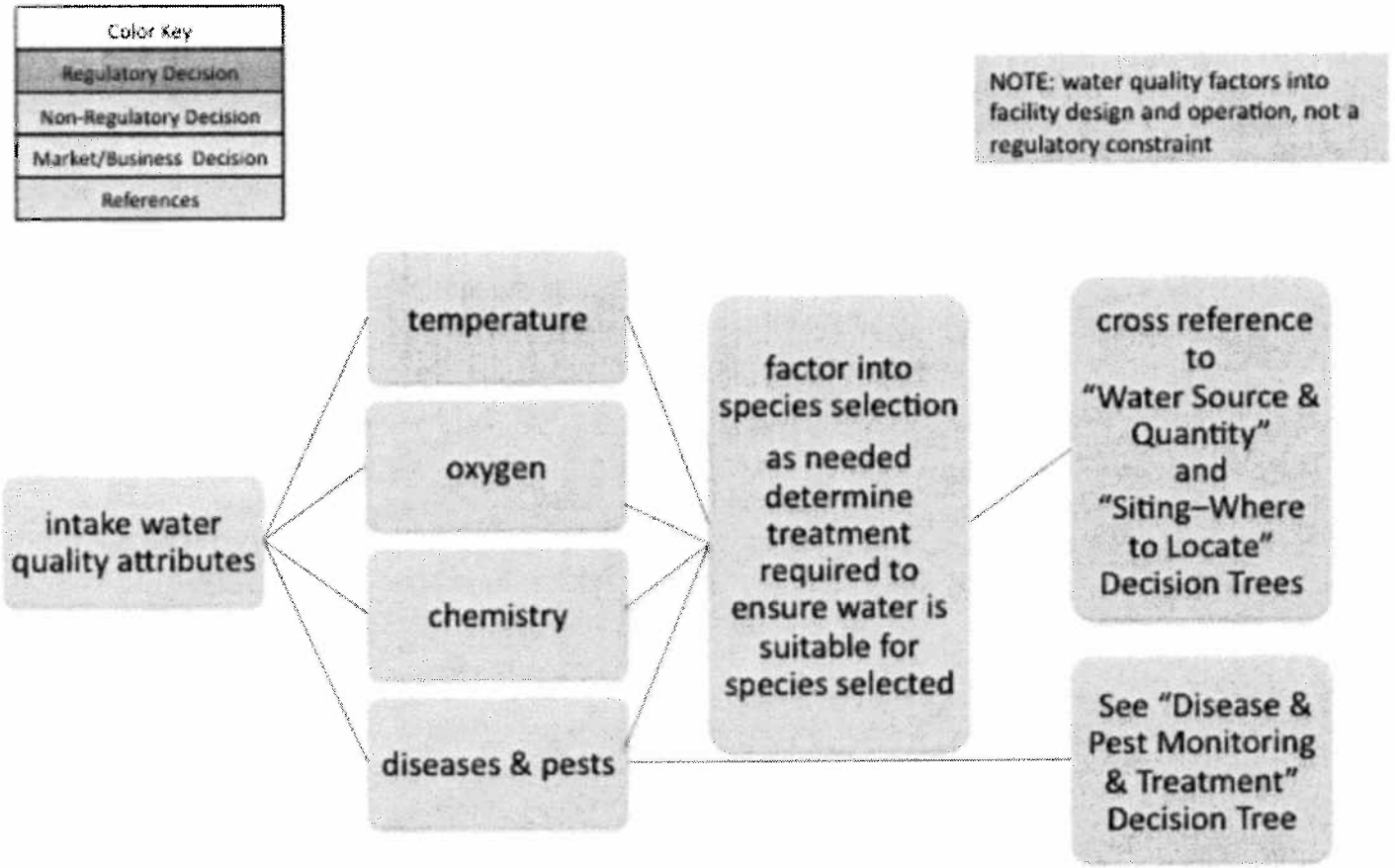
WATER QUALITY REQUIREMENTS FOR FISH (example table)			
Species	Minimun Dissolved Oxygen (mg/l)	Optimum Temperature (F)	Maximum Ammonia (mg/l)
Warm Water Species			
Bait			
Tilapia			
Cool Water Species			
Bluegill			
Yellow Perch			
Cold Water Species			
Salmon			
Rainbow Trout			

Water quality requirements vary with regard to the major species that may be cultured under the MADA. Generally, water requirements for all species include 6.0 mg/l, or more, of dissolved oxygen and less than 0.1 mg/l of ammonia nitrogen. These requirements can vary depending on the species and management of the production system. Temperature is a more species-specific requirement for optimum growth. For a cool-water species like yellow perch, the optimum growing temperature is 70°F, while for a cold-water fish like trout, it is about 60°F. Both fish can survive at lower and higher temperatures, but growth will not be optimum. Tilapia, a warm-water species, will die at temperatures below 55°F, and, in fact, the optimum temperature for tilapia is above those of typical water sources in Michigan. The same would be true for shrimp, meaning that it may be necessary to heat water to grow these warm-water species.

Further information regarding this Decision Tree is included in Appendix V–B–3 of this Report.

Water Quality

Decision Tree #3



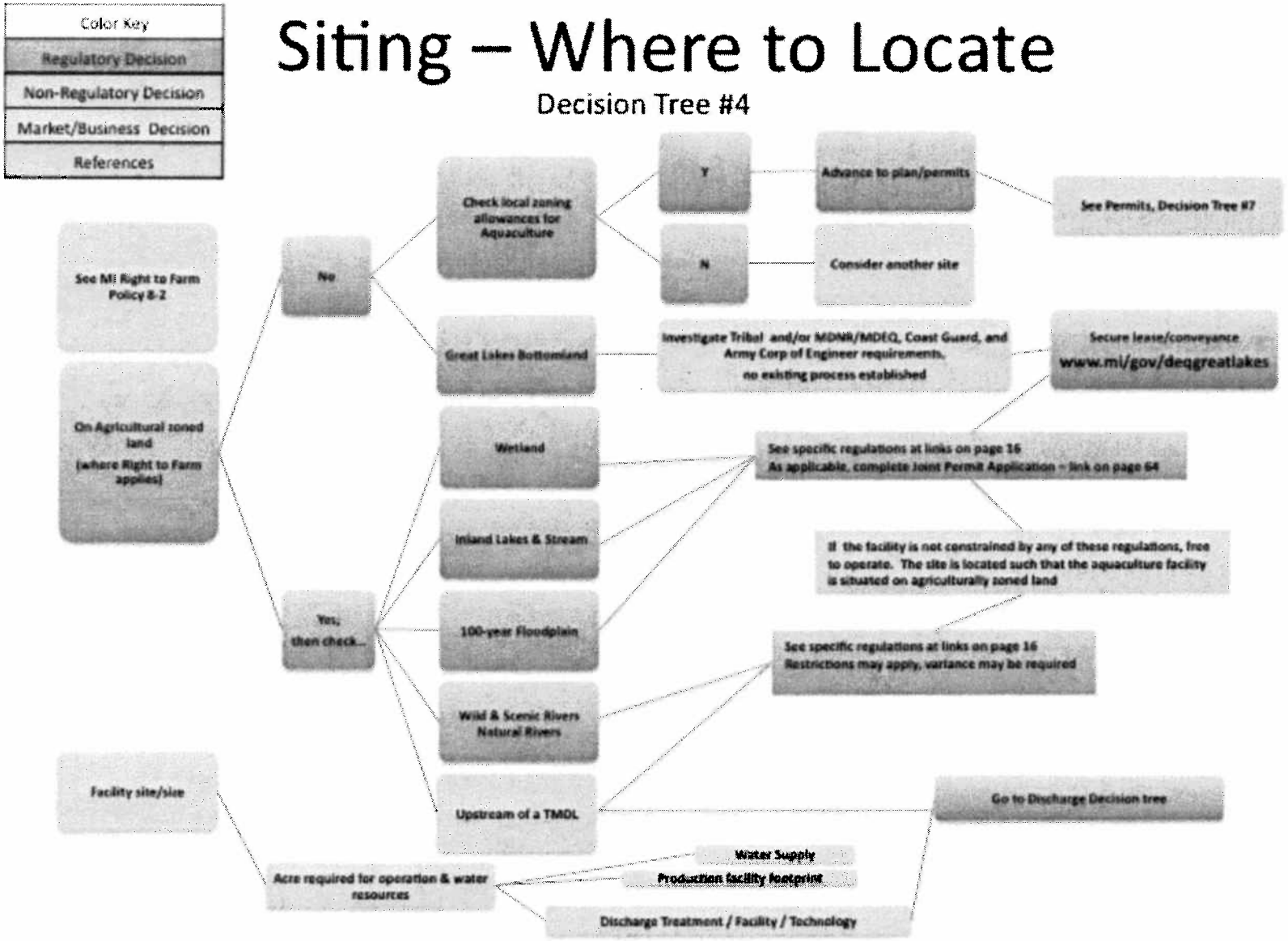
Decision Tree #4 – Siting – Where to Locate

Attention is initially focused on land-use zoning, because if the site is zoned for agriculture, then the Right to Farm Act applies. In that case, the operator is free to operate in the context of this legislation, which is distinct from other commercial/industrial legislation. If the land is not zoned for agriculture, certain additional investigation is required prior to proceeding to the planning and permit stages. For example, city, county, state, or federal/tribal jurisdictions may need to be engaged if the selected site is not on agricultural zoned land. As tribal treaties give the Native Americans priority to a significant portion of the Great Lake waters, accessing the bottomlands above those waters will require engaging tribal governments and federal authorities.

If a site is zoned for agriculture, the Decision Tree #4 outlines a progression through a number of other land-use constraints that need to be factored into siting. This process should occur prior to permit application. To a great extent, it can be a desktop review with a goal to eliminate sites that may preclude commercially viable development, or at least identify those with significant issues. If the site can be located away from the various public waters, wetlands, floodplains, etc, deemed by law to require protection, an aquaculturalist will have maximum freedom to operate. The upshot of Decision Tree #4 is that locating a facility on land with a quality groundwater source and suitable discharge would typically least encumber the facility.

For Bottomland regulations reference the link at: www.mi.gov/deqgreatlakes
For State and Federal Wetlands regulations reference the link at: http://www.michigan.gov/deq/0,4561,7-135-3313_3687-10801--,00.html
For Inland Lakes and Streams regulations reference the link at: http://www.michigan.gov/deq/0,4561,7-135-3313_3681---,00.html
For consideration of 100-year Floodplain regulations reference the link at: http://www.michigan.gov/deq/0,1607,7-135-3313_3684_3725---,00.html
For consideration of TMDL (Total Maximum Daily Load) regulations reference the link at: http://www.michigan.gov/deq/0,1607,7-135-3313_3686_3728-12464--,00.html
For consideration of State Natural Rivers regulations reference the link at: http://www.michigan.gov/dnr/0,1607,7-153-30301_31431_31442---,00.html
For consideration of Federal Scenic &Wild River regulations, refer to the link at: http://www.rivers.gov, or talk to the State Department of Environmental Quality (DEQ) expert on Natural Rivers listed at the link: http://www.michigan.gov/dnr/0,1607,7-153-30301_31431_31442---,00.html

Further information regarding this Decision Tree is included in Appendix V–B–4 of this Report.


Color Key
Regulatory Decision
Non-Regulatory Decision
Market/Business Decision
References
Siting – Where to Locate
Decision Tree #4
See MI Right to Farm Policy 8-2
On Agricultural zoned land
(where Right to Farm applies)
No
Yes, then check...
Check local zoning allowances for Aquaculture
Y
N
Advance to plan/permits
Consider another site
See Permits, Decision Tree #7
Great Lakes Bottomland
Investigate Tribal and/or MDNR/MDEQ, Coast Guard, and Army Corp of Engineer requirements,
no existing process established
Secure lease/conveyance
www.mi/gov/deqgreatlakes
Wetland
Inland Lakes & Stream
100-year Floodplain
Wild & Scenic Rivers
Natural Rivers
Upstream of a TMDL
See specific regulations at links on page 16
As applicable, complete Joint Permit Application - link on page 64
If the facility is not constrained by any of these regulations, free to operate. The site is located such that the aquaculture facility is situated on agriculturally zoned land
See specific regulations at links on page 16
Restrictions may apply, variance may be required
Go to Discharge Decision tree
Facility site/size
Acre required for operation & water resources
Water Supply
Production facility footprint
Discharge Treatment / Facility / Technology

Decision Tree #5 – Water Discharge

Aquaculture facilities will have some type of discharge. In fact, one of the primary challenges for an aquaculture facility is typically water discharge compliance. If there is no discharge going to surface water or groundwater, no permit is required from a state agency. Similarly, if the discharge is to a municipal wastewater treatment system, no state permit is required. In such cases, the operator simply structures some type of agreement with the facility owner. However, when there is a discharge to surface water or groundwater, a state permit is required.

The most significant challenge is presented by the need to comply with the National Pollutant Discharge Elimination System (NPDES). Currently, the process involves a complex set of calculations that are site-specific, and there is no "tool" available to commercial operators. Those seeking a permit are required to provide the Department of Environmental Quality (DEQ) with their best estimates of discharge quality and loads, which are then entered into the calculations by the DEQ. The actual figures (including public notice, etc) will be provided within 6 months. Facilities are required to obtain permits if their output exceeds the limits. It is understood that NPDES permits are required for facilities producing 20,000 pounds or more of cold-water fish in a calendar year. For warm-water fish, permits are required if they produce 100,000 pounds or more. Smaller, existing non-permitted facilities that elect to expand to production levels greater that the above levels must apply for a new-use NPDES permit. For facilities producing less than 20,000 pounds of cold-water fish (100,000 pounds warm-water fish), the historical understanding was that they did not require NPDES permits since they do not meet the federal Clean Water Act definition of a concentrated aquatic animal facility (http://www.epa.gov/oecaagct/lcwa.html). However, while developing this Roadmap it was learned that, by state statute these smaller facilities are subject to NPDES regulation and permitting, and the DEQ is required to issue a permit if a facility applies.

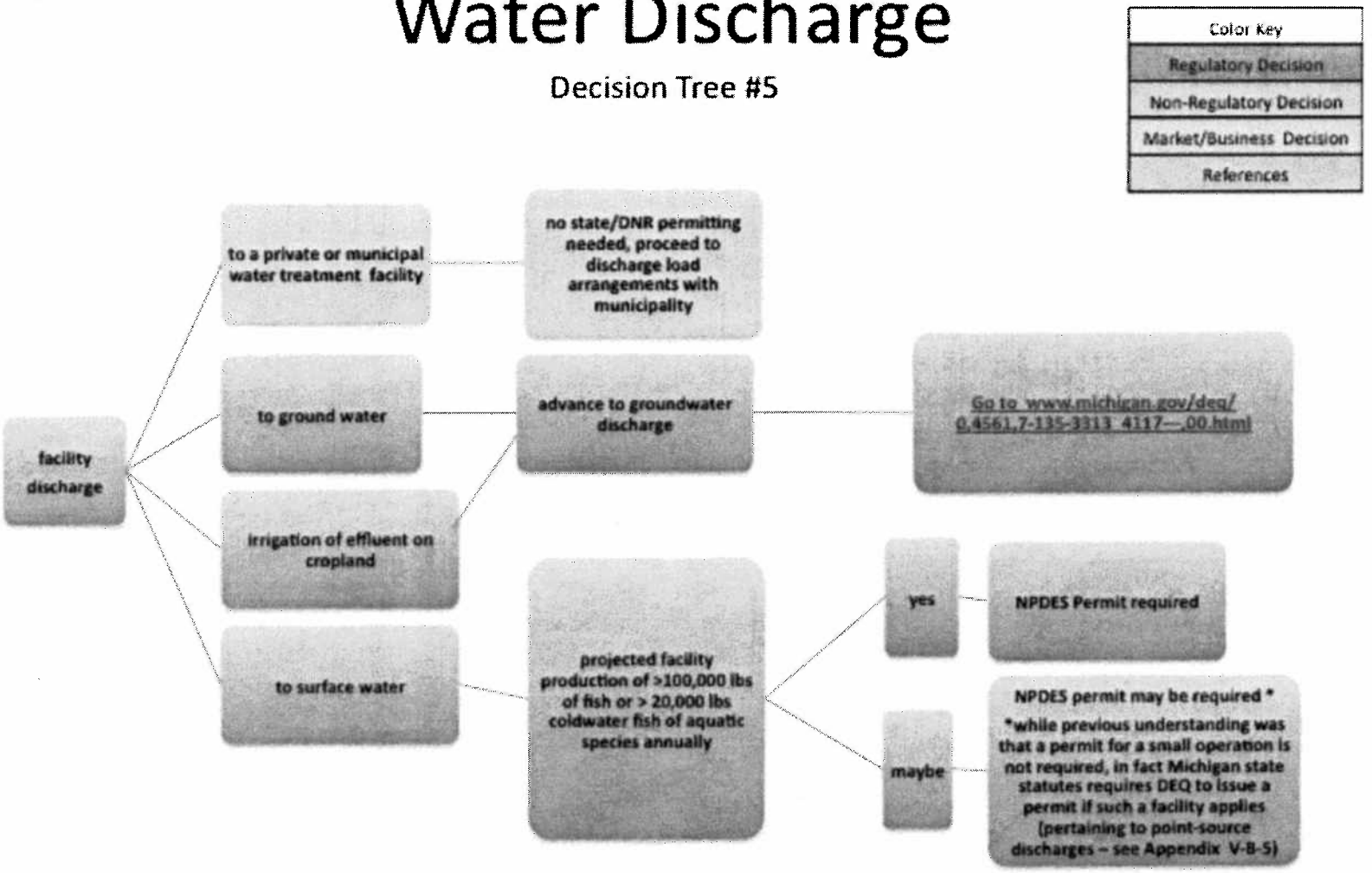
See Appendix V–B–5 for more detail on how to complete an NPDES Application. For more about the NPDES Permit visit: http://www.michigan.gov/deq/0,1607,7-135-3313_3682_3713---,00.html The following link is a helpful online guide to the NPDES permitting process: http://www.michigan.gov/deq/0,4561,7-135-3313_3682-10440--,00.html.

Groundwater discharge, including irrigation-to-surface, requires compliance with the Michigan Groundwater Discharge Program. See link at: www.michigan.gov/deq/0,4561,7-135-3313_4117---,00.html. Permits for surface water or groundwater discharge will require approximately 6 months to be issued.

Further information regarding this Decision Tree is included in Appendix V–B–5 of this Report.

Water Discharge

Decision Tree #5



Decision Tree #6 – Disease and Pest Monitoring & Treatment

Diseases are of major concern to an aquaculture facility, for two important reasons. First, they may have a profound impact on fish health, reducing fish growth and perhaps even resulting in mortality. Second, they may limit or even eliminate the use of the fish for stocking purposes.

For fish being stocked into Department of Natural Resources (DNR) waters of the state, fish health testing is required prior to any stocking (See Table in Appendix V–B–7). Positive results must be reported to the state and may preclude any planting and stocking in DNR waters. A similar situation exists for baitfish. In both cases, a DNR Private Stocking/Public Waters Permit is required. See:
http://www.google.com/url?sa=t&rct=j&q=&esrc=s&source=web&cd=1&ved=0CFMQFjAA&url=http%3A%2F%2Fwww.michigan.gov%2Fdocuments%2FPrivateFishStockingPermitProcess_49511_7.pdf&ei=DX_bT-jeM-OM2gWQt8zRCA&usg=AFQjCNGpbM7j1qV4pcRSxti08H8SItZxxg

Additional reportable diseases, as specified by MDARD and DNR, are listed in the second table in Appendix V–B – 7 of this report.

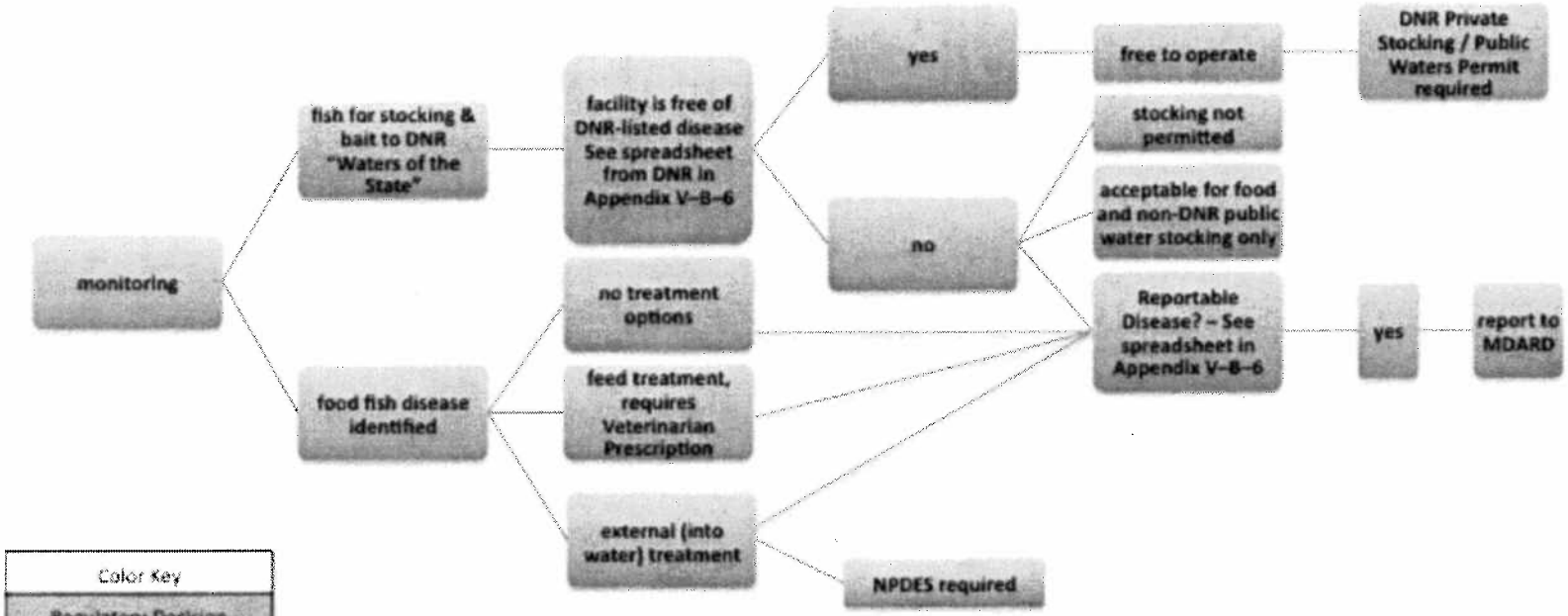
Any internal treatment (medicated feed) must have a prescription from a veterinarian before use. As these treatment chemicals are not considered water additives, their use does not need to be reported to the DEQ NPDES, nor is DEQ NPDES permission required.

For most fish diseases, there are no approved treatments. In Michigan, the key external fish disease treatments allowed are Formalin™ for control of bacterial growth on incubating egg and Chloramine-T™ for external parasites. Use of these chemical treatments will require authorization under the facility's NPDES permit (for facilities that require a permit, small operators are exempt – see Decision Tree #5 – Water Discharge, introduction, p.15). External fish or water treatments (added to the water) do not require a veterinarian's prescription, but these are considered as a water additive. Therefore, their use may require prior approval and an NPDES permit from the DEQ, depending on the chemical/active ingredient.

Further information regarding this Decision Tree is included in Appendix V–B–6 of this Report.

Disease & Pest Monitoring & Treatment

Decision Tree #6



Decision Tree #7 – Permits

A 2012 Memorandum of Understanding (MoU) between MDARD, MDEQ, and MDNR designates MDARD as the advocate for the aquaculture sector within the state government, serving as the primary point of contact for aquaculturalists. (The MDARD advocate can be reached at 1-800-292-3939). This Decision Tree is a summary of the permits required to start or operate an aquaculture facility. Not all these permits are required for all facilities. The required permits will have been identified through the other various Decision Trees. Some are annual, others one-time, and others multi-year. Below are links to the various program regulations and permit applications:

MDARD Permits

- Aquaculture Facility Registration: http://www.michigan.gov/statelicensesearch/0,4671,7-180-24786_24787-242765--,00.html
- Aquaculture Research Permit: http://www.michigan.gov/mdard/0,4610,7-125-1569_16979_21263-47485--,00.html
- Prior Entry Permit: http://www.michigan.gov/mdard/0,4610,7-125-48096_48099-14219--,00.html

DNR Permits

- Private Stocking /Public Waters: http://www.google.com/url?sa=t&rct=j&q=&esrc=s&source=web&cd=1&ved=0CFMQFjAA&url=http%3A%2F%2Fwww.michigan.gov%2Fdocuments%2FPrivateFishStockingPermitProcess_49511_7.pdf&ei=slPbT9j8FKfg2QW8yrTSCA&usg=AFQjCNGpbM7j1qV4pcRSxti08H8SItZxxg
- Salmonid Importation: (check with DNR office) http://www.michigan.gov/dnr
- Wholesale Minnow Dealer License: http://www.michigan.gov/dnr/0,4570,7-153-10363-135675--,00.html

DEQ Permits

- NPDES Discharge: *http://www.michigan.gov/deq/0,1607,7-135-3313_3682_3713---,00.html*
- Groundwater Discharge: *www.michigan.gov/deq/0,4561,7-135-3313_4117---,00.html*
- Water Withdrawal: Groundwater: *http://www.miwwat.org* **Surface Water:** *www.mi.gov/jointpermit*
- Wetland, Inland Lakes & Streams: *www.mi.gov/jointpermit*
- Non-Community Water Supply: *http://www.michigan.gov/deq/0,1607,7-135-3313_3675_3692---,00.html*
- Potable, Well Construction: *http://www.michigan.gov/statelicensesearch/0,4671,7-180-24786_24822-245157--,00.html*
- NPDES – Construction: *http://www.michigan.gov/deq/0,1607,7-135-3313_3682_3713---,00.html*
- Bottomland: www.mi.gov/deqgreatlakes

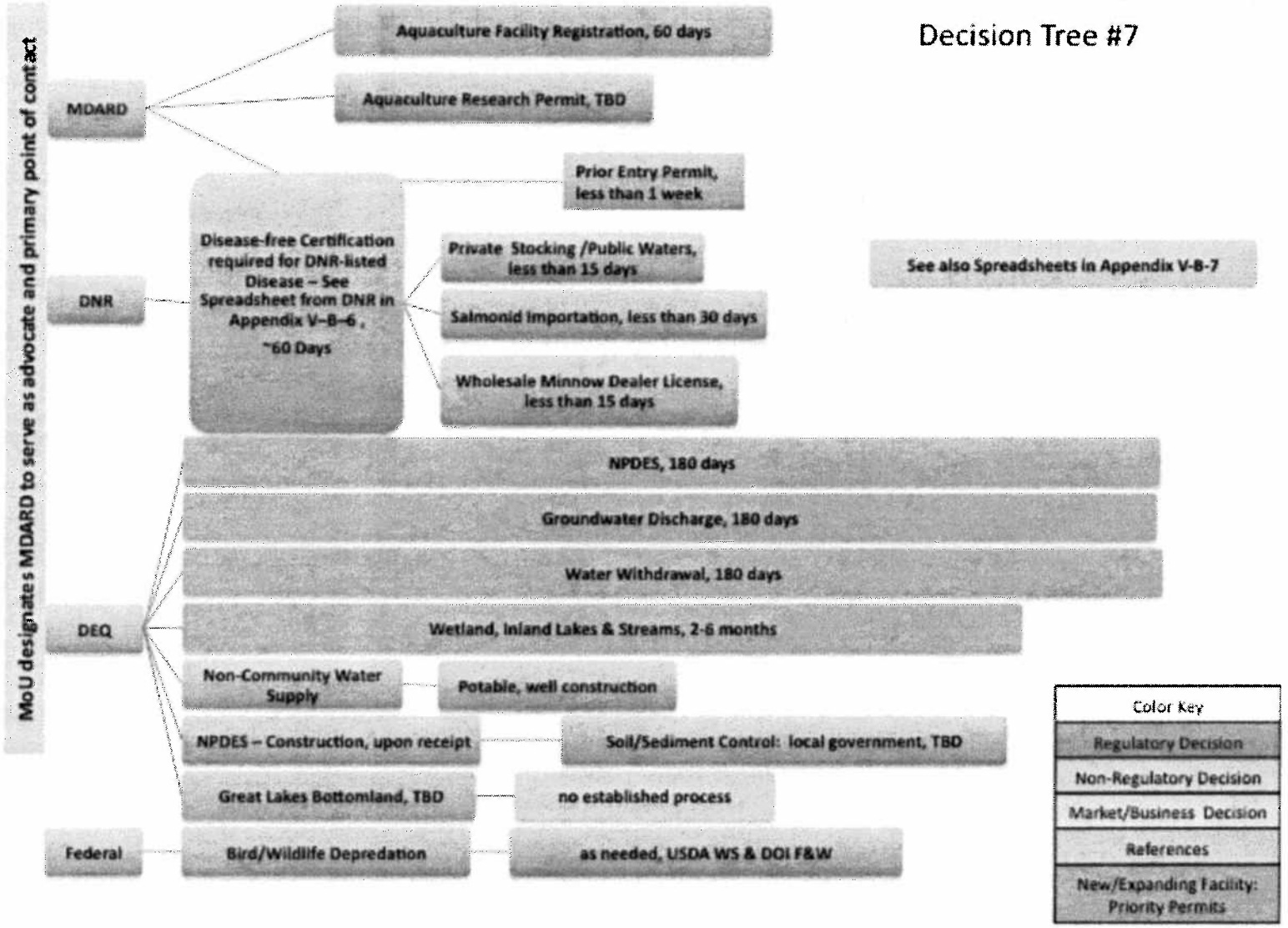
Federal Permits

- Bird/Wildlife Depredation: http://www.google.com/url?sa=t&rct=j&q=&esrc=s&source=web&cd=1&ved=0CE8QFjAA&url=http%3A%2F%2Fwww.fws.gov%2Fforms%2F3-200-13.pdf&ei=o4jbT4XVG-W_2QWko_jUCA&usg=AFQjCNEZ6qwJ-xdXhn8gwFvSEkfJYgvidw

Further information regarding this Decision Tree is included in Appendix V–B–7 of this Report.

Permits

Decision Tree #7



III – Recommendations and Next Steps for the Development of Aquaculture

The scope of this AIM project is limited to presenting a roadmap through the current regulation. In the process of developing this guide, a number of opportunities to improve how the sector can operate in the context of the regulations were revealed. We present to the Aquaculture Industry Committee and its various industry and government partners these opportunities as a set of recommendations for consideration. The recommendations are grouped into two categories, first those pertaining specifically to regulation and the opportunity to adopt best practices, and secondly those pertaining to business strategy and development to realize the market opportunity.

A – Regulatory Recommendations

1 – Memorandum of Understanding

The State's Quality of Life (QOL) departments (MDARD, DNR, and DEQ) are finalizing a working Memorandum of Understanding (MoU) to allow working together to foster a thriving aquaculture sector in Michigan and its surrounding waters. The MoU designates MDARD as the advocate for the industry within state government, and therefore commercial operators should use MDARD as the primary point of contact on aquaculture. The QOL departments should meet regularly with the AIC in the near future to follow up on aquaculture regulatory issues including the recommendations of the Roadmap.

2 – NPDES Permits

The DEQ should pursue a Rule 21 change and adopt the 40 CFR 122.24 Federal Clean Water Act NPDES exemption for small operators (non-Concentrated Aquatic Feeding Operations) to ensure that small farms have the freedom to operate with respect to discharges to surface water when producing less than 20,000 pounds/year of cold-water species and/or less than 100,000 pounds/year of warm-water species.

We recommend a simplified NPDES process for both new permits and renewals. The existing process is complex and uncertain – constraining aquaculturalist's ability to both operate existing facilities and expand to grow their businesses. Removing the uncertainty and reducing the complexity is required – ideally to a process that can be completed within days and weeks rather than the current six months or more. A simplified NPDES process should be a high priority – and be established by the fall of 2012. See also recommendation #4 regarding broader simplification of all permitting.

3 – Best Management Practices

There is opportunity to adopt the use of a set of regulatory performance standards and complimentary operational best management practices (BMP) as the preferred framework for regulatory compliance and environmental protection. In fact the federal Clean Water Act recommends a best management practices approach to compliance and the preferred approach to water resource stewardship. When regulators set performance standards and operators have the freedom to establish BMPs to comply a thriving aquaculture sector can develop.

Michigan's Right to Farm **GAAMP (**Generally Accepted Agricultural Management Practices) and **MAEAP (**Michigan Agricultural Environmental Assurance Program**)** programs can provide an excellent framework for addressing this BMP approach.

The recommended first step is development of an "Aqua-Assist" tool – to guide the aquaculture sector. This could lead to fully incorporating aquaculture into the GAAMPs and MAEAP programs for, as they provide a simplified framework for compliance to DEQ environmental standards. This approach can providing a simple, practical, and elegant solution that is also business-, environment-, and citizen-friendly.

4 – Simplified Reporting, Permitting & Fee Structures

The industry and state government should work toward a simplified, single permit and reporting procedure. Ideally, a standardized reporting process that is in sync with an annual or less-frequent license and permit renewal cycle would simplify the process for the operator and benefit the state government by having a centralized file for each facility/company.
Fee structures should alos be revisited with the understanding that aquaculture is agriculture. For example, while aquaculture uses a lot of water, it is – in terms of federal SIC code – agriculture, and therefore fees should be charged accordingly, and not as an industrial user.

One example of simplified reporting is water use – requirements of the DEQ are handled through a report to MDARD. Beyond that, the reality is that current permitting and reporting processes are unduly complex. For example the application for a permit to construct a pond on an upland site requires completion of all or part of 12 of 20 sections of the application form and a series of additional maps and site-specific documents. Two separate fees are associated with this application - $50 for a Part 301, and $100 for a Part 31. Additional sections must be completed if constructing in a wetland – and the fee structure is different, $500 - simply to permit the construction of a pond.

Two Michigan agencies that can assist in this simplification process are the Rural Development **Interagency Collaboration Council** (ICC) and the Department of **Licensing and Regulatory Affairs** (LARA).

- The **ICC** (http://www.michiganadvantage.org/Michigans-Economic-Development-Partners-ICC/) serves within the state government to bring departments together to resolve issues and situations such as permit streamlining and conflicts in government practices for the benefit of the public and industry when resolution can be achieved without policy or legislative change. The streamlining of aquaculture permitting and reporting could best be addressed at the ICC level. Should simple practice changes not be allowed, the ICC can also recommend policy and law change. The ICC could also address some of the recommendations regarding Definitions and Terminology (see Recommendation 6, below), as well as those regarding Simplified Reporting, Permitting, & Fees (see Recommendation 4).
- **LARA** (http://www.michigan.gov/lara/) has a mission to support business growth and safeguard Michigan's citizens through a simple, fair, efficient, and transparent regulatory structure. This is an additional resource that, failing progress at the ICC, should be leveraged for the benefit of the aquaculture sector.

5 – Wetland- and Floodplain-Sited Facilities

With respect to the existing open-water aquaculture facilities in Michigan, the constraints and requirements of wetland statutes create uncertainty and do significantly limit opportunity for production expansion within the existing footprint of facilities. There is a need for more clarity and flexibility in regulatory policy and programs to allow operators to modify and upgrade these facilities to achieve economic viability. The recommendation is to simplify the permitting process (see recommendation #4, above) to achieve clarity.

For example, regulatory constraints pertaining to wetlands and floodplains include restrictions on the handling and disposal of sand and other materials dredged from ponds and raceways. With regard to this matter, we recommend that the DEQ define a general performance standard to be met by operators (i.e., temporary placement of dredged material for dewatering, etc) and that operators then develop BMPs to comply. In that context, the operators can then have freedom to operate and move these harmless materials within the facility.

To compliment this, the recommendation is that, when considering a new facility to build it on agricultural land outside of designated wetlands, floodplains and other constraining sites, thus avoiding several permitting and reporting requirements.

6 – Definitions and Terminology

Occasionally, various regulations define terms, words, or phrases differently, causing confusion. For example, there are several definitions of the word "pond." Likewise, the DEQ definition of the phrase "waters of the state" differs from the DNR's definition. In the context of the MoU and the primary point of contact through MDARD, clarification should be pursued, in communication or through agreement.

7 – Cage Culture Production

The aquaculture sector – commercial operators, Native American Tribes, trade associations, regulators, etc – should assess the commercial siting, business, and regulatory opportunities and constraints of engaging in cage culture fish production in Michigan water as part of the SeaGrant 2012–14 Integrated Assessment Project.

8 – Natural Rivers

The current Natural River designations exclude the siting of aquacultural operations in and above natural river-designated areas, while the rest of agriculture is free to operate there. Categorizing aquaculture thus with industrial water users in the context of natural river protection does not comply with the Michigan Right to Farm Act. Since aquaculture is classified under the Right to Farm Act as agriculture, fish farming operations should be allowed to operate in natural river-designated areas. It is recommended that the development and adoption of a set of aquacultural GAAMPs (or adapting current GAAMPs to cover aquaculture) can provide the required bio-security and fish disease risk mitigation practices required to protect Michigan's natural resources and citizens and satisfy regulatory compliance.

B – Strategic and Business Recommendations

9 – Aquaculture Industry Committee (AIC) Continuance and AIM Roadmap Maintenance

The AIC, originally organized in 2011 to guide the AIM Roadmap project, should determine who will assume responsibility for the maintenance and upkeep of this Roadmap as the regulatory process is updated and roadblocks to the sector development are removed. In that way, prospective aquaculture entrepreneurs and established operators will always have a current and reliable resource.

Furthermore, the AIC should continue to function as a forum to provide guidance for ongoing aquaculture sector initiatives in Michigan. The AIC might best be structured as a standing committee within the MAA – the sector's trade association. In the

absence of a staff to do this work, the AIC/MAA should appoint a chairman to lead the committee – ideally the Michigan Farm Bureau Livestock Specialist, or consider contracting a professional services firm to coordinate this effort.

10 – Demonstrate Quick Success at Growing the Sector – Recommission Idle Facilities

Within the next few years there is a desire to double or quadruple the output of trout to meet current market demand. Due to several factors, including regulatory constraints, there are currently several underutilized facilities with installed capacity for food-fish production, There is an opportunity to grow the Michigan aquaculture sector in a sustainable manner by leveraging this capacity for food-fish.

The recommendation is to recommission one site as a model to demonstrate what is doable. For example, a current initiative to restart a facility for food-fish production could be a model for increasing open water trout production. The way forward will require regulatory flexibility and adaptation by the QOL departments and operators as the model is tested. – anticipating it to uphold environmental sustainability without negatively impacting natural resources, while being economically viable. This is a logical first step to sector food-fish production expansion, it is relatively low risk, low capital and can be accomplished in a short timeframe.

The successful expansion of an open water trout production capacity will demonstrate that there is indeed growth opportunity – and likely a financially viable model on which the sector can advance. Concurrently, aquaculturalists can explore other production systems and species and develop business plans as a foundation for a diverse and thriving aquaculture.

11 – Business Planning & Access to Financing and Capital

Aquaculturalists need to develop solid business plans that articulate the opportunities and associated risks of new or expanded aquaculture enterprises. The broader economic downturn and uncertainty of the early 2010s present an additional challenge, particularly when high demand for agricultural commodities makes other sectors more attractive and relatively less risky than aquaculture. Developing the needed business plans will need to be an iterative process lead by the aspiring or growth-minded aquaculturalist, in dialog with public agencies, including MDARD, MEDC, and local economic development authorities as well as with private entities including banker and professional service providers familiar with aquacluture.

Economic Development: MDARD & MEDC Support: The aquaculture sector could benefit significantly from a primary point of contact within the state government in support of business development for the sector. Since aquaculture is agriculture, MDARD's Office of Agriculture Development (OAD) should be the lead in economic development, coordinating with the MEDC and local economic development authority as needed.

12 – Vision & Strategic Plan

The state and the industry should advance a Strategic Plan for the industry. The Sea-Grant-funded Integrated Assessment project is an opportunity to develop that Strategic Plan over the next 1–2 years. Before advancing to the Strategic Plan, the aquaculture sector needs to envision the future, answering the question, "What might the sector look like in the year 2025?" before asking, "What might we need to do?" We recommend that the sector engage in a formal Scenario Planning Process in 2012, to develop scenarios that can serve as frameworks for decision-making into the future. An example of the scenario planning process facilitated by Originz, LLC, in 2011 is at: http://www.joe.org/joe/2012june/tt8.php. For more details on how scenarios can benefit from strategic plan developments, contact Originz, LLC. www.originz.com

13 – Research, Extension & Education

Since aquaculture is agriculture, the better fit for the state's public investment in research, extension, and education might be better served if MSU, as the land grant university, considers incorporating aquaculture into the traditional agriculture programs (Ag & Food or Animal Science) rather than within the Department of Fisheries and Wildlife, with its focus on natural resources.

Education: Personnel – Training & Skills: For both management and operation of aquaculture facilities, investment in people development is required. The opportunity exists for a coordinated Great Lakes or Upper Midwest program to ensure that critical mass is achieved cost effectively through a curriculum developed by community colleges, universities, and/or industry. Established training programs for operators at Bell Aquaculture http://www.bellaquaculture.com/) and Ontario's Ministry of Agriculture, Food & Rural Affairs (OMAFRA – http://www.aps.uoguelph.ca/~aquacentre/ are resources for Michigan aquaculture.

14 – Regional Strategy

To grow the billion dollar regional sector that will be needed to meet some of the expected demand of the next decade, a thriving Michigan aquaculture sector will be best realized in the context of a ***Great Lakes Region Aquaculture Strategy***. A regional approach should address the following subjects:

- Standardization of regulations and BMPs
- Processing capacity
- Species selection to meet and create market demands
- Supply/value chain needs for water, discharge, disease management, feed supply, infrastructure, etc.

The pending Michigan SeaGrant Integrated Assessment-developed Strategic Plan should consider a regional strategy.

IV– Assumptions

Market Opportunity: The desire is to grow a thriving and sustainable aquaculture sector in Michigan. The global need for meat protein food in the coming decades and specifically the opportunity it displaces will have an impact on current or future imports. The current US annual imports of ~$11 billion worth of seafood allow for the growth of a $1 billion production base in the country, meaning that the goal of the Michigan Aquaculture Association – to capture 10% of that market and develop a $100 million business within the next decade – is realistic.

Regulatory Context: This Roadmap can guide us through the current regulations, as of 2012. The preferred operating environment for a thriving aquaculture sector may require some change in both regulation and permitting.

Sustainability: There is a desire to cultivate a climate for sustainable (triple bottom line) growth of aquaculture, balancing the benefits for people, the planet and profit. The State of Michigan "Quality of Life" initiatives, which are coordinated across the Department of Environmental Quality, the Department of Natural Resources, and the Department of Agriculture and Rural Affairs, show that there is government leadership in support of a thriving triple bottom line agriculture.

Ongoing Dialog: Dialog will be required by the industry and regulators to define a framework that encourages commercial opportunities that respect both the ecology and societal needs.

Production Aquaculture Focus: The focus of the AIM project is on regulations as they pertain to the production of live fish. The scope does not extend to the processing of fish for food and other seafood. The understanding is that the processing industry will comply with food regulation, including Hazard Analysis Critical Control Point (HACCP) and the management of offal. Fish mortalities on the farm can be handled as outlined in the Michigan Right to Farm Act.

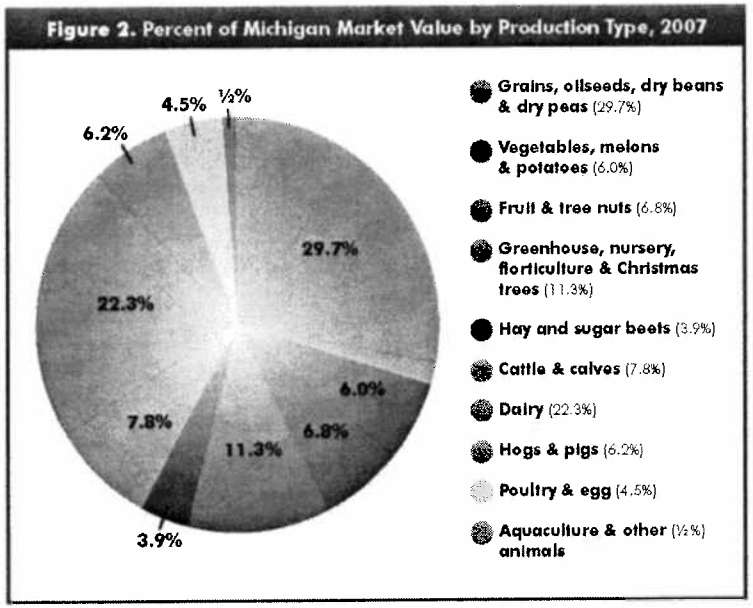
V – Appendices and Supporting Information

V–A: Project Overview, History and Market Considerations

V–A–1: Project Overview *(from the Originz, LLC, November 2011 Proposal, based on RFP, modified)*

The MAA strategic plan indicates that USA seafood imports provide just over 80% of the seafood requirements, representing a trade deficit of over $9 billion.[3] Therefore, there is clearly an opportunity for aquaculture expansion in Michigan. This can be accomplished by leveraging the state's solid track record in environmental and safety practices, while capturing some of the market opportunity both within the state and across the upper Midwest and Great Lakes region. While in the past Michigan aquaculture has focused on bait, pond stocking and fee fishing, the growth opportunity is in producing fish for human consumption. This can be achieved while retaining a strong bait, stocking, and recreational element.

Furthermore, there exists an expanding market for fish-meal and processing offal in the fish-feed and value-added fertilizer markets. In particular, the byproducts of processed aquatic species are desirable as specialty fertilizer amendments for potting soils and other composted natural fertilizers.[4] These value-added fertilizer products present a complimentary opportunity to the production of food-fish. Leveraging these byproduct opportunities will be important in maximizing the aquaculture sector's profitability.



The Aquaculture Industry Committee (AIC) Request for Proposal (RFP) identified the need for a "How-to-Guide" as a "Roadmap" and resource for those looking to build new facilities or expand existing infrastructure in Michigan. Ideally, this guide would be

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[3] MAA Strategic Plan 2, source: http://michiganaquaculture.org/strategic-plan/plan-document/

[4] Personal communications, Brad Morgan, Morgan Composting, Inc. Sears, MI December 6, 2011

developed in the context of the desired commercial outcome – what we propose can be a thriving industry built on best practices. The focus of this proposal is therefore to review the rules and regulations and develop the Guide as a roadmap to commercial success targeting human food markets. Additionally, we will review the regulations in the surrounding states, and consider how their regulatory framework impacts commerce.

An assessment of future impacts on the industry will be conducted, including the new Water Withdrawal Legislation and Good Agricultural Practices (GAP) regarding food safety. We propose a review of current production and processing facilities and marketing practices within Michigan. Assessing the regulatory and commercial framework together will result in the Originz team delivering a robust "How-to-Guide" that builds on the sector's history and will map a new way to the future. We acknowledge that the preferred way forward may require some change in either regulation, interpretation, enforcement and/or practice in the sector, but we believe that can be best accomplished in dialog with regulators and industry stakeholders in the development of the "How-to-Guide." This approach will best position the guide as a tool truly owned by the Michigan aquaculture industry, one that can be used immediately upon completion in 2012 to spur growth in the aquaculture industry. The "Roadmap" also indentifies regulatory conflicts and overlaps, and proposes "Performance Standards" and BMPs in the context of Michigan's MAEAP and GAAMP, as the way forward to provide clarity for operators.

V–A–2: Aquaculture in Michigan – A Brief History

The aquaculture sector is a small segment of Michigan's agriculture, representing less than half a percent of the total production. Over the past 40+ years, the sector has not grown significantly; in fact some capacity has been taken out of production, while other operations are running at less than capacity. Most of the infrastructure dates back 20–50 years, and facility upgrades and expansion have been limited, in many cases due at least in part to regulatory constraints and/or frustration on the part of operators in navigating through the regulations and permit processes.

The sector is not thriving. In fact, the aging infrastructure (including farms and operators) presents a credible threat to the future of the sector. As a result, many of the existing farms are at risk, as they have neither succession plans nor credible paths to long-term viability.

In fact, the state has done a good job of protecting the recreational fishing sector, in no small part due to its strong natural resources and regulations protecting the environmental quality. As part of this recreational fishery investment, the state has invested significantly in government owned Department of Natural Resources (DNR) hatcheries to raise fish to stock public waters. However, regulations to protect these public waters have also constrained expansion of the private aquaculture sector –

specifically for operations adjacent to or on waters-of-the-state, where most of the facilities are located. The DEQ enforces protection of waters-of-the-state from both DNR and private facility discharges. While DNR facilities have public funds to comply with discharge regulations, the compliance costs for private operators considering expansion are often prohibitive, and have constrained the commercial aquaculture sector's growth for much of the past few decades.

The sector's growth has also been constrained by regulatory thresholds. For example, NPDES permit thresholds have resulted in a significant number of operations remaining under the no-permit-required limit of 20,000 pounds/year of production – as the cost and permitting process is considered to be too burdensome by the small-farm operators desiring to grow above that threshold. It is reasonable to assume that the permitting process and permit fees would be less of a hindrance for large commercial operators. However, to date, the state has not attracted entrepreneurs interested in locating large facilities in Michigan.

Additionally, there are ongoing issues with some disease regulations, specifically Viral Hemorrhagic Septicemia (VHS), where testing is required on both food and stocking fish. However, there is no evidence that testing can control disease spread or that it impacts food quality or safety, since this disease is already present in waters. Real or perceived, this regulatory climate has resulted in widespread frustration across the sector.

Because many of the small-farm aquaculture operations are engaged in multiple-market segments (stocking, fee fishing, food-fish), they are required to comply to a wide range of regulations of the DNR, the DEQ and the MDARD, as well as those of several federal agencies. A single-market focus could simplify the regulatory environment for these small farms. To date the operators have not been able to achieve the needed regulatory clarity. This lack of clarity has limited operators access to the capital financing required to expand production.

Market factors also have hindered sector growth. Relatively inexpensive seafood imports (due to lower cost labor, different regulatory environments, or larger scale of operation) have also exerted price-point pressure on the entire USA industry, including the Michigan sector, limiting margins, depressing profits, and constraining reinvestment opportunities. In fact, a number of operators in the state continue to hold USDA FSA loans for 20+ years – partly the result of these market and regulatory challenges.

In 1996, the Michigan Aquaculture Development Act (MADA) was passed; clarifying that aquaculture is an agricultural activity and providing a framework for the growth of the sector. However since then, the sector has continued to be constrained by

regulation enforced by the DNR and the DEQ – particularly the tightening standards that present uncertainty and risk, and preclude expansion.

Current Michigan aquaculture activities focus on raising fish for use as bait, stocking, fee fishing, and food. Whereas the major focus used to be on producing sport fish for stocking and angling pursuits, the changing population demographics and greater consumer interest in healthy diets point to future growth in producing fish for human consumption.

The Michigan aquaculture sector's history is not unique. Across the nation, aquaculture has been a struggling sector for 40 years, characterized by boom and bust cycles and competition with low-priced imports. In addition, changing regulations, particularly regarding water quality, contribute to uncertainty and increase the risk associated with the sector, resulting in limited access to capital and constraining growth.

In fact, commercial aquaculture is a relatively young sector. Millennia ago, mankind domesticated poultry, swine, cattle and numerous small ruminants and practiced their husbandry ever since. As for fish farming, however, we are still in the early days. This presents both risk and opportunity. Without proper management, the quality of public water could be compromised. At the same time, Michigan's water bodies provide a key resource for a thriving aquaculture – an opportunity for economic growth.

The concentration of food retailing and food service over the past 30 years has also presented challenges on the market side for the aquaculture sector. Meijer, Kroger, and Spartan have higher volume requirements that cannot be met by the small operators. To compete in the future, there will need to be some large-scale facilities – or cooperation in the industry to supply larger customers.

V–A–3: Markets

The key drivers for the development of aquaculture in Michigan include:

- Michigan has among the most abundant fresh water resources globally – both inland and in the Great Lakes.
- There is increasing opportunity to address the food security needs of the Upper Midwest and Great Lakes regions by producing locally and reducing reliance on imports and the associated transportation cost and sourcing risks.
- Consumers are increasingly health conscious, and aware of the benefits of protein and other nutrition from fish produced in well-managed sources that practice environmental stewardship.
- Michigan is close to major markets, with Chicago, Cincinnati, Indianapolis, Detroit, and Toronto all within a 500-mile radius
- There is existing underutilized infrastructure for processing (whitefish, etc) and distribution

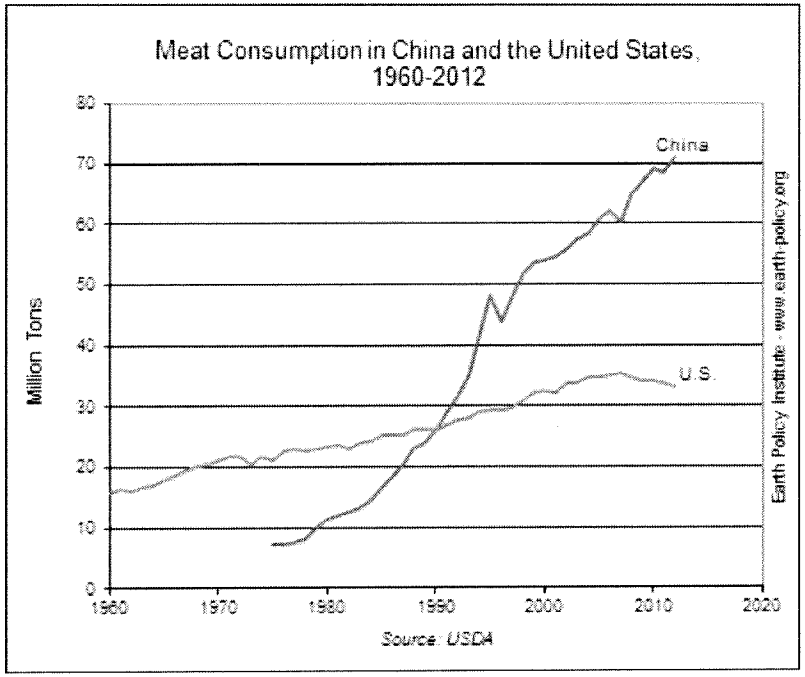

Figure 3 - Its All About Protein, and How Much More We'll Need Globally

V–A–4: Commercial Roadmap: The Markets Await Michigan Seafood

A top-line review of US aquaculture trade based on USDA ERS data as of 3/13/2012[5] points to several primary opportunities that could fit the Michigan aquaculture opportunity. The largest category of imports is shrimp, at ~$5 billion, the bulk of which comes from China and other sources in Southeast Asia. However, the Monterey Bay Aquarium Seafood Watch®[6] program recommends avoiding imported shrimp from this region, due to concerns about production practices. Replacing even a small part of these $5 billion imports presents significant opportunity. Shrimp imports have been a success, in part due to their low retail price-point and the low-cost labor for their harvesting and processing. However, known technologies and growing interest in domestically produced shrimp afford opportunity to create a production base well beyond $100 million. Additionally, as the demand in Asia for meat protein increases over the next few decades, the current supply base will shift to satisfying that regional market.

Salmonid species imports are ~$2 billion annually. Most of this is salmon from Canada and Norway, from trusted suppliers with generally sound production practices and food safety regulations.

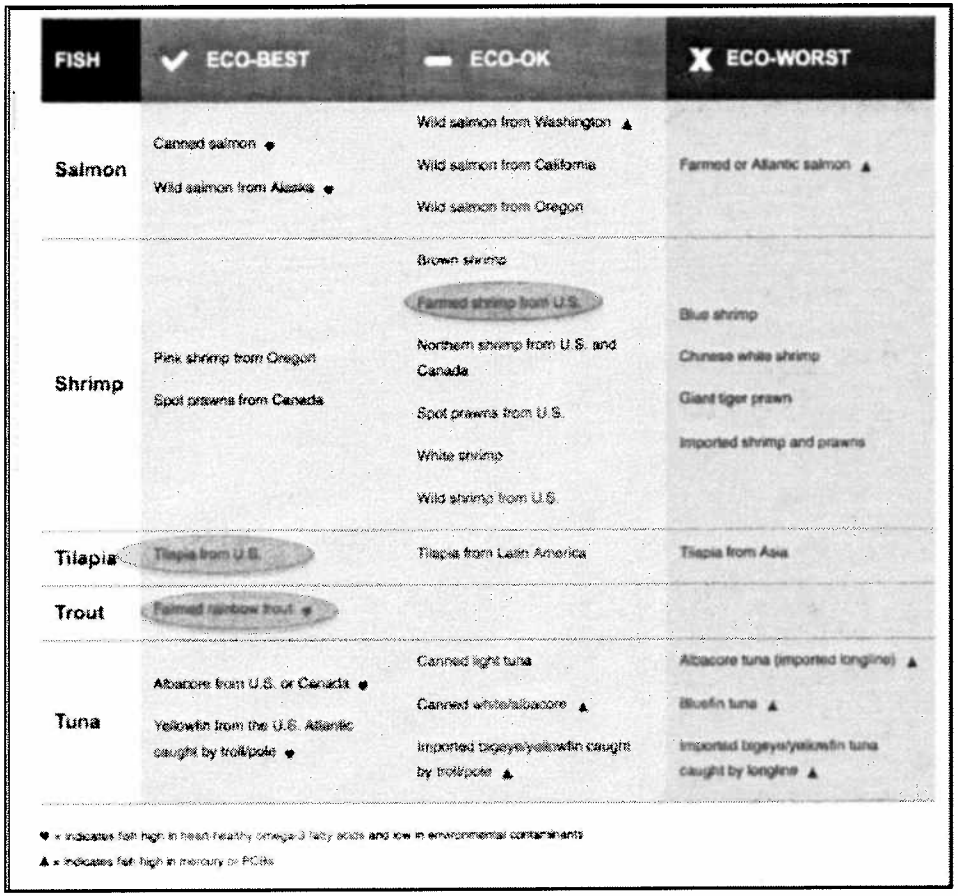

Figure 4 - Ecological Consideration in Species Selection: One Example, Source - Environmental Defense Fund

[5] http://www.ers.usda.gov/Data/Aquaculture/

[6] http://www.montereybayaquarium.org/cr/cr_seafoodwatch/download.aspx -Central US Guide

Trout is a small subset of this salmonid import that is well suited to increased production in Michigan's cold-water resources. There is a known market demand for more local trout within the state and region. With some improved economy of scale, local production could replace Chilean imports and/or product from Idaho. The Idaho production system is constrained from further expansion by limited access to new water sources and related environmental concerns – new supply will need to come from other regions, including the Great Lakes region.

Tilapia is a third example of a major species (approaching imports of $1 billion/year) that has become a restaurant and broad foodservice favorite, because it is easy to prepare and has broad consumer appeal due to its low flavor profile. Because tilapia are omnivores that are more forgiving regarding water quality, the cost of production is lower. Tilapia rations can also include higher inclusion of lower-cost plant protein to replace expensive fish-meal.

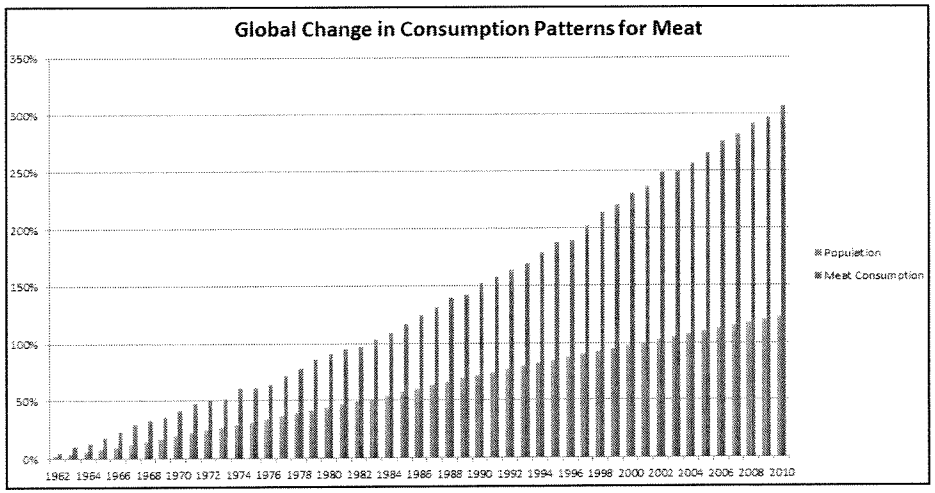

Figure 5 – Demand for Fish and Seafood is projected to grow at double the rate of that for land-based meat. **Source UN FAO Population Estimates, 2011**

V–A–5: Risk Mitigation – Insurance and Access to Capital

Individual aquaculture facility operators, and the sector as a whole, need some form of crop insurance or other risk mitigation that will allow access to capital for construction, expansion, and operations. As for any business, the best way to secure a money source is with the collateral of the enterprise. Unfortunately, the Michigan aquaculture sector has very few thriving enterprises, and the regulatory climate of constraint and uncertainly has contributed to limiting the success of the operators. While the AIM Roadmap and the accompanying recommendations may reduce some uncertainty, there are other steps that aquaculturalists can take to mitigate financial risk.

Developing sound, written business plans can benefit operators by providing an enterprise-specific framework to assess the use of either their own money or borrowed capital. One identified constraint of access to borrowing is the long product cycle of fish, specifically trout, in Michigan – a 2-year-to-a-crop cycle that makes lenders nervous. Operators and the industry could benefit

from defining specific business units around hatchery operations (eg. the first year from egg to fingerlings) and grow-out operations (eg. the second year 'finishing' to market weight). This type of specialization within business units, whether on one farm or as specialized and distinct businesses, can reduce the cycle time for enterprise cash flow. A third operational segment of the production value chain for fish culture could be the specialization in broodstock rearing for egg production. If cash flow for the specific business unit operations is clear, the operator's conversation with prospective lenders should be more productive in pursuit of securing needed financing.

While the sector does not qualify for traditional subsidization of federal crop insurance premiums, the real risk is in the market and the required assurance of supply, particularly for food-fish. Spreading the risk (water, disease, etc) across more farms and more farm sites as the sector grows will be important. This may require formal or informal cooperative marketing and production. The simple fact is that, like any other new enterprise, bankers need assurance of both owner equity and the articulation of the risk factors before lending. This applies not only within the aquaculture sector, but also as it competes with other sectors of agriculture and the broad economy for the available money supply. The reality is that there are many unknowns and risks in fish production, as it is a relatively new form of agriculture (when compared to corn, soybeans, or pork), and an ongoing conversation with lenders is required so that they can understand the business and structure lending (or provide guidance on further risk mitigation) appropriate to the enterprise or sector. Remember, the banker can be your venture's best friend, in the decision to lend and the decision not to lend. In either case the banker is, when fully informed, protecting the interests of both the business venture as well as the bank.

V–A–6: Framework

Moving beyond the past, what is now needed is achieving regulatory clarity and freedom to operate in the context of the MADA, Right to Farm, and the new Quality of Life streamlined approach within the state government that brings the Department of Environmental Quality, Department of Natural Resources and the Department of Agriculture and Rural Development under one executive leadership *"...focused on implementing customer service-orientated government."*[7] The 2012 Memorandum of Understanding for aquaculture between these three Departments can provide a framework of clarity going forward that will complement the Roadmap coordinating the right people and processes to work through regulations and permitting for the sector.

Aquaculture is agriculture, and in Michigan it operates in the context of both the Michigan Aquaculture Development Act of 1996 (www.legislature.mi.gov/%28S%28tuxsqcqwpexklevsefkngh45%29%29/mileg.aspx?page=print&objectname=mcl-act-199-of-1996) and the Right to Farm Act of 1981 (www.michigan.gov/mdard/0,4610,7-125-1567_1599_1605---,00.html).

[7] Dan Wyant, in http://farmprogress.com/story-dan-wyant-group-executive-of-deq-dnr-and-agriculture-rural-development-0-44349

While stocking, bait, and sport fishing will continue to be a part of aquaculture in Michigan, the growth opportunity for the sector is in the supply of commercial food-fish for processing and sale through wholesale and retail channels. Key species to consider are salmonids (rainbow trout and others), tilapia, and shrimp, based on the various ecological impact assessments (see Figure 4, p.36), the market demands for these species in the upper Midwest, and the current species expertise within Michigan and the nation. Aquaculturalists are encouraged to also pursue production of other species that could serve lucrative niches within the local economy, and possible as exports.

This Roadmap, the State's Quality of Life MoU, and the improved business development climate in Michigan all bode well for aquaculture expansion. One caveat to remember is that *"Regulatory agencies always try to strike the appropriate balance between adding value (by making food safer) and detracting from value (by interfering unnecessarily in corporate value creation). When regulations and associated administrative processes impede these innovation processes, they interfere with company value creation."*[8] Regulation can play either an enabling or a disabling role in company and sector performance.

The changing regulatory climate in Michigan is becoming more favorable to growth, creating opportunity for aquaculturalists. A recent example of business-friendly and property-owners-rights legislation is Michigan Senate Bill 1130 of 2012 – currently under consideration – addressing regulation of critical sand dune areas in the state. The bill proposes making dozens of amendments to sections of the 1994 Michigan Natural Resources and Environmental Protection Act, including changing the intent of the previous critical dune legislation from "protection of the environment and the ecology of the critical dune areas for the benefit of the present and future generations" to "balance the benefits of protecting ... the state's critical dunes with the benefits of economic development and multiple human uses of the critical dunes."[9] The bill, currently making its way through the state legislature, would put economic benefits on the same plane as environmental protection when evaluating developments. The opportunity is to pursue similar freedom-to-operate legislative change for the benefit of aquaculture. Sustainability requires a proper balance of economic, environmental, and social need – and aquaculture development will depend on achieving such a balanced framework, where operators can demonstrate that good fish husbandry is sustainable.

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8 Source Conference Board of Canada - CFIC 12-170 All Together Now Report, p.10

9 Overview of pending legislation provided by C. Pistis, MSU Extension, July 19, 2012

V–B: Roadmap Decision Tree Supporting Information

V–B–1 – Basic Planning Requirements Appendix: *(Supporting Information to Decision Tree #1, pages 7–8)*

Commercial Considerations for Species Selection and Planning

The Michigan Aquaculture Association's (MAA) current strategic plan proposes that aquaculture in Michigan can grow from a $5 million sector with 100 direct jobs to one of over $100 million and 1,500 jobs.[10] The Michigan aquaculture sector has a track record of sound management in environmental practices and safety, with no invasive species released in its 150-year history.[11] In this context, there is clearly opportunity to realize the $100 million opportunity. But while this Roadmap can provide some of that clarity for operators, there is also a need to change some of the regulatory framework. Specifically, a regulatory framework that defines performance standards and an opportunity for operators to work in the context of BMPs to comply to those standards can best facilitate a thriving industry.

Species Selection

For species selection, commercial operators should first reference the MADA list (see www.legislature.mi.gov/%28S%28sfv0qi55a40afpvitowiygre%29%29/mileg.aspx?page=print&objectname=mcl-act-199-of-1996) of approved species for production in Michigan, and the MADA-defined process for researching other species that may be considered for addition to this list. The waters of Michigan range from cold water to warm water, and a wide range of species can be selected.

Aquaculture Production Systems

Another key consideration is the choice of the aquaculture production system to be used by the facility for the production of the desired species, be it food-fish, bait, or stocking. The following section lists some of the basic systems and provides links to resources for the various production systems.

i – Recirculating Aquaculture Systems **(RAS)** for fin-fish and shrimp:

Michigan has a known expert in RAS systems for shrimp production, Russ Allen of Seafood Systems, Okemos, MI. He has a proprietary scalable closed-loop system for shrimp production. Learn more at: http://www.farmers-exchange.net/detailPage.aspx?articleID=9818.

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[10] MAA Strategic Plan 2, source: http://michiganaquaculture.org/strategic-plan/plan-document/

[11] Michigan Sea-Grant Aquaculture in Michigan, source: www.miseagrant.umich.edu/fisheries.aquaculture.html

There are a number of resources for a fin-fish RAS production system. The Freshwater Institute based in Shepherdstown, WV (see: http://www.freshwaterinstitute.org), is a Conservation Fund initiative that does public research, allied science, private consultation, training, and system design. The Aquaculture Research Corporation, Tecumseh, MI, (http://aquaresearchcorp.com/about) is another non-profit organization focused on creation of a sustainable and affordable seafood industry in the Great Lakes region.

ii – Cage culture for salmonid production in Great Lake waters

Freshwater cage culture is unique and distinct from that practiced in oceans and fjords, in that the Great Lakes production must be managed near shore and away from major shipping routes and with due consideration for both the social and aesthetic considerations of residents and tourists. Another concern is the management of the ecosystem, which is smaller than that of an ocean. There are great examples of success nearby.

Specifically, in the Great Lakes, the best expertise resides with the trout farmers of Ontario, Canada, who have been operating for 20+ years in the cold waters of Lake Huron and have created a $30+ million industry. The Northern Ontario Aquaculture Association (http://www.ontarioaquaculture.com) is an expert resource and contains links to other resources for those considering the freshwater cage culture production method. Be advised that Michigan does not currently have an established protocol for this type of fish farming in waters above the Great Lakes bottomlands. Locating above these bottomlands may also require collaboration with the Native American Tribes, as they have domain in many of the preferred locations. See also Decision Tree #4 and the supporting siting information and Appendix V–B–4, Bottomland Access – Open Water Cage Culture.

iii – Private commercial hatchery production of food, stocking, and bait-fish fingerlings to meet state needs in private and public waters

Just as in many other sectors of meat production in agriculture, there appears to be opportunity for standalone business ventures focused on brooding and young stock production. Analogous to the beef cow-calf ranch or a hog-farrowing operation, hatchery-fingerling operations in Michigan can be part of a thriving aquaculture supplying to fish-finishing operators of RAS, cage culture, and open-water systems. There could be additional opportunity for sales to the Michigan DNR for stocking needs – on the premise that private operators could be cost-effective producers of stocking fingerlings. In Ontario, Canada the trout industry has operated successfully for the past decade or more with hatcheries supplying grow-out operations – a nearby model for what could contribute to a thriving Michigan sector. One such hatchery operating in Ontario is Lyndon Fish Hatchery. Learn more at: http://www.lyndonfishhatcheries.com/page/page/7583020.htm.

An additional benefit of developing the distinct hatchery and grow-out businesses is that the crop cycle time for each business unit operation would be shorter. With a cycle time of less than a year and resulting improved cash flow, operators would have

better access to working capital financing. A more focused operation should also lead to better risk management – making both the operator and the banker more comfortable with the investment and supporting lending.

iv – Revitalizing the open-water stream and spring-fed capacity of the state's existing, aging infrastructure for commercial fish production

Michigan's trout production capacity has been in decline for over 30 years. With regulatory clarity, including defined performance standards that are clear and known, it is believed that some of this infrastructure can, be returned to production for food-fish and other value-added recreational fishing. It is necessary to set clear standards and then require operators to define best management practices (BMPs, GAAMPs, and/or MAEAP) to comply .

Leveraging the full original design capacity of these facilities will require permitting (NPDES, etc), as capacity will exceed the 20,000 pounds/year of output. The primary challenge for many of these facilities is that they were typically designed for less than 200,000 pounds/year of commercial food trout production. In the current economic climate, these facilities may be too small to provide, as a single revenue source, the desired full-time income for a farm operator to survive and thrive. An option may be for one operator to run several of these facilities to achieve the economy of scale required to thrive. As is their legacy, many of these operations could continue to operate stocking and recreational fishing enterprises that could serve to both generate additional income and fill a "public ambassador" role for the aquaculture sector.

Ongoing risks for these facilities include the bio-security risk of operating in an open-water environment (predation, disease, trespassing) and ensuring that the public good is served on the waters and lands.

Other Resources for Consideration in Commercialization

People/Talent: Furthermore, public investment in both education and research in support of aquaculture has declined in Michigan over the past 30 years, as evidenced by the recent move of NCRAC from Michigan to Iowa and the reduced investment of Michigan State University (MSU) in aquaculture over time. A few bright spots include the work at Lake Superior State's Biology Department, which engages students in the Aquatic Research Laboratory and hatchery work (http://www.lssu.edu/arl/about.php), and which has generated great interest in aquaculture as a career or commercial opportunity. And while MSU continues to operate an aquaculture research program (http://research.msu.edu/tags/aquaculture), the investment in support of food-fish production is limited and declining. (Note: The MSU aquaculture program currently resides within the Department of Fisheries and Wildlife of the College of Agriculture and Natural Resources – on the Natural Resources side of the College. As aquaculture is agriculture,

consideration might be given to housing it on the Agriculture side of the College, possibly in Animal Science, where it could benefit by being grouped with other production-oriented disciplines.)

Bait Production

The AIM process and Roadmap can be applied equally to bait production as to any other type of fish production. In 2012, the majority of bait-fish used in Michigan is either imported from other states, primarily Arkansas, or harvested from public waters for distribution. Inherent with importation is the risk of introducing disease and invasive species, specifically Asian carp, which has been a recent challenge in Mississippi watershed regions. Keeping the Great Lakes basin free of these carp is a priority. This points to an in-state production opportunity to mitigate that risk. The enterprise model and economic viability are yet to be determined and should be considered in the context of a robust strategic plan for the aquaculture sector in Michigan and the Great Lakes region. The plan should consider both the ecological impact (pros and cons) and may require some specific industry leadership to structure a viable sustainable bait production business.

The same logic could be applied to warm-water fish (bass, bluegill, etc) that are imported for rearing and stocking. Broodstock and hatchery opportunities may exist as part of a state and industry strategy to mitigate the concerns regarding invasive species.

V–B–2 – Water Source & Quantity Appendix: *(Supporting Information to Decision Tree #2, pages 9–10)*

Aquaculturalists should begin by calculating their anticipated needs concerning both startup and ongoing water withdrawal. If the expansion of an existing facility is being considered, a determination of any additional water needs should be completed. With that information in hand, water source options appropriate to the facility location can be explored.

Groundwater

If a new well (pumped or artesian) is drilled and a use rate of more than 70 gallons per minutes (GPM) is expected, a Water Withdrawal Assessment Tool (see: www.miwwat.org) registration with the DEQ is required. If, following completion of this assessment tool, the calculation determines that the operation will pull more than 1,400 GPM, a Groundwater Withdrawal Permit is also required from the DEQ. Access to water withdrawal permit and supporting information can be found at: http://www.michigan.gov/deq/0,1607,7-135-3313_3684_45331---,00.html.

Surface and Lake Water

For surface water from rivers, as well as inland lakes and streams and the Great Lakes, aquaculture operators are required to complete the DEQ Joint Permit Application (see: www.mi.gov/jointpermit).

Additionally, water sourced from both inland lakes and the Great Lakes will likely require bottomland access rights. The Great Lakes present specific challenges, as federal and tribal rights to the waters above some bottomlands may limit what can be withdrawn. Please refer to the Decision Tree #4 – Siting – Where to Locate, as well as the associated map and supporting pages. The operator should consider initiating a dialog with the recognized Indian Tribes leadership. The MEDC (Michigan Economic Development Corporation) Michigan Tribal Business Development resource is a good place to start before initiating the discussion. See: http://www.michiganadvantage.org/Business-Development-Tribal/ and the various links at this site.

Water Use Reporting

All parties that draw water from wells, streams, rivers, or lakes are required to report to the State via MDARD, using the tool available at: http://michigan.gov/mdard/0,4610,7-125-1567_1599_29980---,00.html. There is no fee for reporting to MDARD, and as MDARD shares this information with the Michigan DEQ, the reporting is simplified.

Municipal Water

Michigan is one of the states that has seen its population decline over the past few decades. As a result, a number of Michigan municipalities have excess water supply and sewage/waste-water treatment capacity. Additionally, some municipalities have overbuilt in that same timeframe to be ready for new industry that has, in many cases, not materialized. Some of those municipalities are looking for creative ways to leverage these resources and attract jobs to their communities. The aquacultural entrepreneur will need to investigate these municipal water sources on a case-by-case basis with municipal authorities and business development offices in the communities where locating a facility might be an option.

One factor that is unique to municipal water sources is chlorination. Consequently, operators will typically need to factor in dechlorination as part of a water pretreatment plan. On the flip side, there may be offsetting advantages on the discharge water side of a municipal siting, specifically, a relatively low load of primarily organic fish waste, which is relatively inexpensive and low-risk and can be handled in sewage treatments plants.

Some municipalities may also have available buildings that may be suited for re-fitting for aquaculture. Others may offer creative solutions that include siting on adjacent agricultural land (to fit with the Right to Farm Act and farm operations), while providing access to water and/or sewage discharge. The access to these waters, treatments, and sites must be negotiated with the respective municipality.

Municipal water use offers the advantage that no separate state or federal permits and registrations are required; the sourcing simply becomes a contractual agreement between the operator and the municipality. The municipality assumes use and reporting responsibility to the state as part of its usual practice.

V–B–3 – Water Quality Appendix: *(Supporting Information to Decision Tree #3, pages 11–12)*
The Water Quality Decision Tree does not have any direct regulatory implications for aquaculture. It is included to alert the operator of the necessity to test potential water sources completely to ensure suitability for the species intended for the facility. Water quality can have a significant impact on the viability and productivity of an aquaculture operation.

Beyond assessing the quality of the water supply, operators must factor in any required treatments (heating/cooling, oxygenation, chemical removal, disease mitigation) and the associated cost that may be incurred if water quality is not ideally suited to the species to be produced. These are important considerations when planning a facility and making a siting decision.

A good place to start when assessing water quality is with active fish farmers and others that use drinking water for livestock or human consumption. The trade association for aquaculture, the MAA (www.michiganaquaculture.org/) and aquaculture producers/members may provide information on water quality and guidance on site selection.

V–B–4 – Siting – Where to Locate Appendix: *(Supporting Information to Decision Tree #4, pages 13–14)*
A – Siting Criteria:

General

General siting criteria when considering potential locations or existing site expansion should initially be reviewed as a "desk top" review conducted with resources available on the web. As aquaculture is agriculture, a key consideration should be the zoning of the land. Agricultural zoning is preferred, to allow the facility the latitude of operating in the context of the Right to Farm Act. There are various legal considerations pertaining to wetlands, 100-year floodplains, natural rivers, wild and scenic rivers, and TMDLs (see links in the Decision Tree #4 introduction on page 12).

Water Supply

An important consideration is water supply. If well water is the water source, a determination can be made from the DEQ website to check if groundwater supply may be available. If surface water is the water source, the criteria can be reviewed at the DNR/DEQ website. See Appendix **V–B–2** for more on Water Sourcing).

Water Quality

Another consideration is an understanding of the water quality required for the operation. See Appendix V–B–5 for more on Water Quality considerations as they pertain to siting.

Discharge

Assuming the above criteria have been considered and no unsolvable problems exist, obtaining a National Pollutant Discharge Elimination System (NPDES) permit must be considered. An understanding of how the facility will be operated (flow-through, RAS, other) and the initial size of the facility (or its possible future size) will factor into siting and discharge. See also the Water Discharge Decision Tree and Appendix V–B–5.

B – Key Site-Specific Initial Screening Considerations

Assuming the property is being reviewed from some type of real estate listing, the type of zoning must be recognized. Land not zoned as agricultural may have to be rezoned. Another option might be working with the local municipality regarding the acceptability of establishing aquacultural operations on the site. Agricultural zoning classification offers some advantage and latitude as defined in the Right to Farm Act. Some advantages can be realized in construction and operation expenses, advantages that may not be available on other industrial and commercial zoned lands.

As all facilities will use water and will regularly, or at least from time to time, have discharges, watershed-specific limitations and characteristics must be considered. Decision Tree #4 – Siting – Where to Locate lists the following as factors to consider when siting: natural rivers, wild and scenic rivers, inland lakes and streams, wetlands, 100-year floodplains, TMDLs, and bottomland access.

Natural Rivers (State) and Wild and Scenic Rivers (Federal)

Michigan's Natural Rivers Act of 1970 creates a process for communities along a river to develop common zoning rules to maintain the health of the ecosystem and keep riverfront property owners happy. The whole process — from enabling the act to local implementation — is called the Natural River Program. The program is the primary reasons fourteen of Michigan's most prized waterways (see table, right) are still clean, quiet, and rich with fish and wildlife. The Natural Rivers Program is part of the Habitat Management Unit within the Fisheries Division of the Department of Natural Resources. Learn more at: http://www.michigan.gov/dnr/0,1607,7-153-30301_31431_31442---,00.html

State Natural Rivers

- Au Sable River
- Betsie River
- Boardman River
- Flat River
- Fox River
- Huron River
- Jordan River
- Lower Kalamazoo
- Pere Marquette
- Pigeon River
- Pine River
- Rifle River
- Rogue River
- Two Hearted River
- Upper Manistee River
- White River

Some reaches of rivers have special recognition under federal and state laws. The federal Wild and Scenic Rivers Act and state Natural Rivers Act provide special protections to specific reaches (see State Natural Rivers Table, right). Expansion of established facilities or construction of new facilities above these reaches would be subject to additional reviews. All these rivers are in the Upper Peninsula or the northern third of the Lower Peninsula. There is a public process for establishing Natural River status. Aquaculture facility operators should be prepared to participate in this locally driven process to ensure their commercial interests are understood and protected. Moreover, there is a list of 20+ other rivers being proposed for Natural River status. Three variants of Natural Rivers (all related to state and private land 400 ft)

  - Wilderness
  - Country Scenic
  - Wild Scenic

  Refer to the websites (click on the specific river name in the table) for more details.
- Natural River designations are location-specific, and may involve township/county government. Some may not allow aquaculture without a variance, a process that will be specific to the municipality. Be prepared to talk to local government authorities.

Michigan's Federal Wild & Scenic Rivers

Au Sable River
Bear Creek
Black River
Carp River
Indian River
Manistee River – only 26 miles of the Manistee are protected, downstream of the Tippy Dam.
Ontonagon River
Paint River
Pere Marquette River
Pine River
Presque Isle River
Sturgeon River (Hiawatha National Forest)
Sturgeon River (Ottawa National Forest)
Tahquamenon River (East Branch)
Whitefish River
Yellow Dog River

The Federal Wild & Scenic (W&S) Rivers Act protects river corridor and valley venues, limiting building and other changes that might affect the aesthetics. (See table right, above, listing the Michigan Wild & Scenic Rivers.)

Refer to the Federal Wild and Scenic and DEQ Natural Rivers links listed on the Siting – Where to Locate Introductory page (p 13) for more details.

Discharges to Inland Lakes and Streams

Another special criteria when siting a facility with a discharge is determining if the discharge will occur above an inland lake. Limitations for phosphorus, in particular – and possibly other chemical and organic materials contributing to biological oxygen demand [BOD] – may be required to protect the downstream inland lakes and streams. Extensive treatment of the discharge may be required, and/or the size of the facility may be limited by these discharge constraints. The Michigan DEQ resources and regulations for the protection of inland lakes and streams can be found at: http://www.michigan.gov/deq/0,4561,7-135-3313_3681---,00.html

Wetlands

A determination needs to be made if the selected site will impact any federally designated wetlands. The DEQ has a mapping system on the web to perform a preliminary review. The web review is, however, not 100% certain, and consultation with the DEQ is advised. Only federally designated wetlands are on the maps. For state and federal wetland regulations, refer to: http://www.michigan.gov/deq/0,4561,7-135-3313_3687-10801--,00.html. For a definitive answer, a wetland review will be required, which in turn may require the hiring of a qualified independent consultant. See the DEQ website for a list of these consultants.

One specific concern in open-water systems is the introduction of sand and silt into the production facility via the water source. Sand traps may be used to capture that sand, or sand may accumulate in the facility's raceways and ponds, resulting in the need for occasional dredging. A current constraint is that the dredged materials, under current law, cannot be disposed of within a wetland or 100-year floodplain. Nor, as regulations are currently enforced, can the dredged material be placed on the wetland or 100-year floodplain surface temporarily for de-watering. Permits are also required to conduct the dredging. This significantly constrains the operator's ability to economically and sustainably keep the raceways/ponds operational. A better approach to consider to ensure protection of the wetland and floodplains is asking the DEQ to define performance standards specifying that the dredged materials must be removed from the wetland or floodplain in a specified timeframe. Then operators – collectively for the sector or individually specific to their location – could establish a set of BMPs (possibly in the context of GAAMPs and the MAEAPs Program), defining their responsibilities to achieve compliance and give them the freedom to operate "within the fences" of the aquaculture operation.

100-Year Floodplains

Construction that causes an obstruction to water flow cannot generally occur below the high-water mark on any 100-year floodplain. Maps are available through the DEQ website to identity those areas. For consideration of 100-year floodplain regulations, refer to: *http://www.michigan.gov/deq/0,1607,7-135-3313_3684_3725---,00.html*. Not all areas have been mapped, and local

sources (township or county) may need to be contacted to identify all those floodplain areas that may be impacted by a proposed facility.

If the drainage area upstream from the facility is less than 2 square miles, then the operation is exempt from any floodplain requirements.

The best guidance available is outlined below in the box, which includes information provided by Michigan DEQ. *(Source G. Fulcher, March 20, 2012 – via e-mail to G Boersen)*

DEQ 100-Year Floodplain Siting Guidance

Under the States Floodplain Regulatory Authority found in Part 31, Water Resources Protection, a permit is required for construction, filling or grading within the 100-year floodplain of a stream or drain with a drainage area of 2 square miles or more. (This is regardless of whether there is an official floodplain map, as all rivers and drains have a floodplain area). Residential buildings and additions must be elevated to or above the 100-year floodplain elevation, although the state building code requires them to be elevated to 1 foot above the 100-year elevation. Non-residential buildings may be elevated or dry flood proofed. Some types of sheds/storage buildings may be built below the 100-year elevation with proper vent openings, but the electrical and mechanical components within them must be elevated or flood proofed. If you dig a pond and place the spoils outside of the floodplain, then a Part 31 permit is not required. A permit would be required under Part 303 if wetlands were involved, or under Part 301 if the pond were within 500 feet of an inland lake or stream.

Your next question on how you determine if a piece of property is in the floodplain is a little more difficult. The following is a draft outline that I happened to be working on that you could use as a starting point. Keep in mind that it is a draft.

1) Is the project within a mapped floodplain according to currently published FEMA Flood Insurance Rate Maps, which are available at: http://msc.fema.gov?

2) Is the project adjacent to a stream/drain that has a contributing drainage area of 2 square miles or more? (Look at both the smaller stream and the larger receiving stream)

a. *No – No Part 31 Authority.*
b. *Yes – Proceed with Part 31 review in Step 3.*

3) Determine the 100-year floodplain elevation.

a. *If the 1% (100-year) flood frequency discharge is unknown, then submit a request to the DEQ's Hydrologic Studies/Dam Safety Unit. (Response time is approximately 30 days). Website address is www.michigan.gov/deq/hydrology.*
b. *Have the agency's engineer or engineering consultant determine the 100-year floodplain elevation (depth of flow) with one of the following meth*
    i. *Use existing Flood Insurance Study map for numbered A-Zones if one is available. (See report on determining floodplain elevations in unnumbered A-Zones (http://www.fema.gov/plan/prevent/fhm/dl_zonea.shtm)*
    ii. *Use HECRAS Model using more than one stream/floodplain cross-section*
    iii. *Use Manning's equation based on a single cross-section of the stream/floodplain.*
    iv. *Use Nomographs based on stream slope and discharge (available up to 100 square miles).*
    v. *If the engineer does not have a consultant, then request a floodplain elevation determination from the DEQ District Floodplain engineer (response time is 60–150 days). The above listed site elevation data/cross-section data must be provided.*

4) Based on the information determined in Step 3, is the proposed project within the floodplain?
a. *No – No Part 31 Authority*
b. *Yes – Proceed to Step 5*

5) Collect site elevation data where the work is proposed.

6) Estimate the floodway of the stream/drain using one of the following methods:
a. *Use existing Flood Insurance Study floodway map if available*
b. *Use HECRAS model*
c. *Look at contraction ratio (1:1) into a nearby culvert/bridge structure or expansion ratio (1:2) out of the structure.*
d. *Estimate based on depths of flow being less than 1 foot along the outer edges of the floodplain.*

7) Is the project located in the floodway?
a. *No – Proceed to Step 8*
b. *Yes –*
    i. *No filling/berms above existing grade should be proposed within the floodway. This includes any pushout material. The pushout material shall be moved to either outside of the floodway or outside the floodplain.*
    ii. *Filling would be allowed in drainage ditches up to the existing ground elevations. No compensating cut would be required for this fill.*
c. *Modeling would not be required if 1% or less of the conveyance area is blocked. Example – If a cross-sectional area of the floodplain at the 100-year elevation is 500 square feet, then you can block up to 1% (5 square feet).*

d. Filling in the floodway that exceeds the 1% threshold would require the applicant to submit a hydraulic analysis using HEC RAS to demonstrate that the project does not cause any harmful interference. Any proposed increase would require certification from a registered professional engineer licensed in Michigan stating that the project does not cause any harmful interference. In addition, all upstream property owners that are impacted by the proposed increase would need to be notified and given the opportunity to comment on the project. DEQ staff would evaluate all this information in making its determination as to whether the project causes a harmful interference as defined in Part 31.

8) Is fill/pushout material/berms proposed to be placed in the floodplain?

a. No – DEQ will finalize its Part 31 review.

b. Yes – Provide the following

i. A plan view showing areas of fill/pushout material/berms placed and the distance from the stream/drain and from property boundaries and other site features.

ii. A cross-section through the fill/pushout area/berm.

iii. The area behind a berm that permanently impounds water above the existing ground elevation shall be counted as a loss of floodplain storage and should be accounted for in cut-and-fill calculations.

iv. A table indicating the amount of fill/pushout material. Provide the supporting calculations used to determine the amount of cut/fill.

9) Is the fill (including pushout material and any loss of storage due to permanently impounded water above existing ground elevations) proposed in the floodplain more than 300 cubic yards?

a. No – DEQ will finalize its Part 31 review.

b. Yes – Compensating cut for fills amount over 300 cubic yards should be provided, taking into account the following:

i. If the excavated/fill material is removed from the floodplain, then no compensating cut is required for this material.

ii. How much of the floodplain area that can be filled is dependent on the depth of fill? Example – If the proposed fill area is 1 foot deep, then up to 8,100 square feet could be filled before a compensating cut would be required. This could be an area 90 feet by 90 feet or 81 areas that were 10 feet by 10 feet.

iii. Only the amount of excavated/fill material that is below the 100-year floodplain elevation is required to be compensated for. Example – If 4 feet of excavated/fill material is placed on ground that is 2 feet below the 100-year floodplain elevation, then only the first 2 feet of fill will need to be compensated for.

iv. The loss of storage due to permanently impounded water above existing ground levels shall count as loss of storage.

v. Only the portion of the excavated hole that is above the expected water table can be counted as a cut. Example – If the water table is expected to be at the normal ground elevation, then no credit is given for the cut, because the hole would always be full of water.

vi. The amount of compensating cut required could be reduced or eliminated if the applicant can demonstrate that there is a reduction in the curve number due to an expected change in land use. The applicant would need to provide these computations and include the expected decrease in run-off volume. Any decrease in run-off volume could be used to offset the amount of compensating cut required.

10) Has the compensating cut issue been adequately addressed?

a. Yes – DEQ will finalize its Part 31 review.

b. No – DEQ cannot provide Part 31 approval

Total Maximum Daily Load (TMDL)

The state has also designated special reaches of streams with water quality concerns as Total Maximum Daily Limitations (TMDL) areas. These areas have numerous reasons for designation. TMDL areas designated because of phosphorus loadings need to be carefully considered. Most of these sites are in the Lower Peninsula, with the majority in the peninsula's lower half. The areas designated can be found at the DEQ website.

- The complete list of approved TMDL in Michigan are at: http://www.michigan.gov/deq/0,1607,7-135-3313_3686_3728-12464--,00.html

Most relevant for consideration by aquaculturalists are TMDLs that are approved with phosphorus limits. (See table, right)

There are also "incomplete" TMDLs (still a work in process – rivers that may yet be designated sometime in the future). This remains a "gray" area, specifically for new operators working on site selection. This incompleteness could throw a curve at an applicant. Be sure to engage with the DEQ as part of your site selection with regard to TMDLs.

See more about TMDLs in Appendix V–B–5 Water Discharge.

Michigan Approved TMDL's for Phosphorus as of 2012

Bear Lake- Muskegon

Belleville Lake-Nutrients

Brighton Lake

Ford Lake

Goose Lake-Marquette

Great Bear Lake Proper-Van Buren

Kent Lake

Lake Allegan (Kalamazoo River Impoundment)

Lake Macatawa Watershed

Lapoint Drain

Maple River (Upper), Peet Creek, Lost Creek

Morrison Lake

Ore Lake

Pine Creek-Gratiot Co.

Strawberry Lake

Note: this list is derived from the complete Michigan's TMDL list available at [illegible]

This simplified list is for the benefit of those seeking information most pertinent to aquaculture; phosphorus being the primary constraint.

Bottomland Access – Open Water Cage Culture

Michigan currently does not have commercial cage culture fish production. In Ontario waters, however, cage culture production of trout in Lake Huron has been practiced successfully for several decades.

The siting criteria used in Ontario indicates that possible good sites to consider for cage culture in Michigan are waters off of the Garden Peninsula, Drummond Island and the shore north of Alpena. However, as each these sites is located along 1836 and 1842 Native American Treaty Boundaries, access to these bottomlands may require engaging the tribes and the DNR.

There is no definite process in Michigan for establishing an aquaculture facility above the Great Lakes bottomlands. Therefore, the siting process may take some time. This might best be done by leveraging the available Ontario expertise, including the trade association for trout producers, the Northern Ontario Aquaculture Association (NOAA, at: www.ontarioaquaculture.com), or the various provincial government departments involved in regulating the sector, namely the Ontario Ministry of Natural resources (OMNR), the Ontario Ministry of Environment (OMOE), and the Ontario Ministry of Agriculture, Food, and Rural Affairs (OMAFRA). Additionally, there are specific commercial operators who can offer expertise in site selection and guidance through the development of regulation. Contact the NOAA for access to these resources.

Ontario has an extensive background in researching cage culture in the Great Lakes, including long-term studies on the environmental impact using "experimental lakes" in Northern Ontario. The Ontario industry is very willing to share this learning for the benefit of the entire Great Lakes region and for the scaling up of a sustainable fish production industry using cage culture technology. The University of Guelph and OMAFRA are in the process of finalizing the publication of the ***Coordinated Application Review and Decision Guidelines for Cage Aquaculture in Ontario.*** This document can be accessed through NOAA or the editor, Dr. Stephen Naylor (steve.naylor@ontario.ca). While specific to Ontario regulation, it can be an invaluable resource for those interested in cage aquaculture.

C – Other Site Criteria

- *Size* – The ultimate size (acres) of the possible facility must be understood. Is the site large enough to meet the ultimate expectations for the operation?
- *Soils* – The soils at the site should be reviewed to insure that the type of facility being envisioned could be developed at the site. All counties have soil maps available on the web.
- *Brownfield Considerations* – Past uses of the site may limit suitability for aquaculture production, due to contamination or obstructions. Know the history of the property.

- *Public Involvement* – At some point, the level of public input – desired, required or unavoidable – must be considered. Many government requests, such as those for rezoning or obtaining permits – require public review, so the project will become public knowledge. Sufficient knowledge and understanding of the project must be understood, so that questions can be answered and confidence in the project instilled.
- *Municipal Siting* – There may be opportunity in Michigan to leverage the underutilized water supply and sewage treatment capacity of a number of municipalities by locating in or adjacent to these municipalities. As each situation will be unique to that community, the siting and service agreements will need to be tailored to the specific situation.

V–B–5 – Water Discharge Appendix: *(Supporting Information to Decision Tree #5, pages 15-16)*
From an operational perspective, the simplest path through regulation is to eliminate water discharges to ground and surface water bodies. Collection of wastewater for later irrigation at agronomic rates, by piping it to a municipal wastewater treatment facility, can eliminate the need for state permitting. In the latter case, the facility operator simply needs to negotiate a suitable agreement with the municipality accepting the wastewater stream.

Whenever there is a discharge to surface water or groundwater, state permitting is required.
With settling tanks, raceways, and ponds, or by mechanical means, facility design can be optimized to reduce waste and chemical loading of the discharge waters.

Groundwater discharge, including irrigation at higher than agronomic rates to groundwater places, requires compliance to the Michigan Groundwater Discharge Program. See link at: *www.michigan.gov/deq/0,4561,7-135-3313_4117---,00.html*

When discharging to surface waters, compliance with and permission from the National Pollutant Discharge Elimination System (NPDES) is required. Currently, the process involves a complex set of calculations that are site-specific, and there is no "tool" available to commercial operators. Those seeking a permit are required to provide the DEQ with their best estimates of discharge quality and loads, which are then entered into the calculations by DEQ. Subsequently, the results (public notice, etc) are provided on a 6-month turnaround. Facilities are required to obtain permits if their production exceeds the effluent guidelines. For a step-by-step process through NPDES permitting, see the V–B–7 Permit Appendix of this report.

Furthermore, for facilities producing 20,000 pounds or more of cold-water fish in a calendar year, NPDES permits are required. For warm-water fish, permits are required for facilities that produce 100,000 pounds or more in a calendar year. For existing non-

permitted facilities that elect to expand to production levels greater than these EPA effluent guidelines, the application will be handled as a new-use permit.

Facilities producing less than 20,000 pounds of cold-water fish (100,000 pounds warm-water fish) do not meet the federal Clean Water Act definition of a concentrated aquatic animal facility (http://www.epa.gov/oecaagct/lcwa.html), and have in the past been understood to be exempt from NPDES permitting. However, these small facilities are in fact not exempt and by state statute also subject to NPDES regulation and permitting, and the DEQ is required to issue a permit if a facility applies. This is a recent clarification from the DEQ, as of July 17, 2012. It is outlined in the two communications below:

> **1** – I would like to provide the following clarification from the DEQ regarding its position on aquaculture facilities. Subsequent to my 6-27-12 e-mail below, the Permits Section was informed that the Part 21 Rules did not specifically adopt 40 CFR 122.24. This means the DEQ is unable to say that an NPDES permit is not required for aquaculture facilities in Michigan. While the DEQ recognizes the exemption in 40 CFR 122.24, Michigan operates the NPDES program under state law. Because the Part 21 Rules did not specifically adopt that portion of the federal regulations, Part 31 requires that the DEQ issue an NPDES permit if a facility applies. (*per e-mail communication from C Alexander, DEQ July 17, 2012*)
>
> **2** – The DEQ has re-evaluated our position and determined that, under the Clean Water Act, only concentrated aquatic animal facilities that meet the definition under 40 CFR 122.24(b) would be required to apply for a National Pollutant Discharge Elimination System Permit (NPDES). The small facilities we discussed Monday would likely not meet the definition of a point source, and therefore would not be subject to NPDES regulations. Keep in mind the DEQ may make a case-by-case designation of a concentrated aquatic animal production facility under 40 CFR 122.24(c). (*per e-mail communication from C Alexander, DEQ June 27, 2012*)

For more about the NPDES Permit and process see: http://www.michigan.gov/deq/0,1607,7-135-3313_3682_3713---,00.html

The NPDES permitting process may take up to six months. A permit renewal can take the same length of time.

The adoption of discharge performance standards, GAAMPS, and a supporting Aqua-Assist tool could facilitate a better path to compliance, ensure protection of the state's water resources, and give aquaculturalists clarity regarding the expectations and freedom to operate.

Total Maximum Daily Load (TMDL): When a receiving lake or stream does not meet Water Quality Standards (WQS), a study must be completed to determine the amount of a pollutant that can be put into the water body from point sources and nonpoint sources and still meet WQS, including a margin of safety. The TMDL calculation is used to determine the pollutant load that can be assimilated by a lake or stream. The TMDL determinations provide a path to compliance with the Federal Clean Water Act. TMDLs are specific to certain stretches of rivers or other bodies of water. For more specifics on TMDLs see:
http://www.michigan.gov/deq/0,1607,7-135-3313_3686_3728-12464--,00.html
TMDLs include:

- Point sources such as wastewater treatment plants, industrial facilities, and fish farms.
- Non-point-sources such as the broader run-off from residential agricultural lands.

See more about TMDLs, including a list of Michigan TMDLs in Appendix V–B–4 – Siting – Where to Locate.

V–B–6 – Disease and Pest Monitoring & Treatment Appendix: *(Supporting Information to Decision Tree #6, pages 17–18)*

Reportable Fish Diseases, Monitoring and Treatments
The monitoring and control of fish diseases originated at the international level. The World Organization for Animal Health (OIE) is an international organization that identifies diseases of concern and those that must be tracked and controlled by member countries. Failure to follow these protocols can lead to sanctions by other member countries. These can include sanctions in areas not related to aquaculture products. In the U.S., these protocols are under the U.S. Department of Agriculture, Animal and Plant Health Inspection Service (AHPIS). In the Great Lakes area, the procedures to meet AHPIS requirements are handled through the Great Lakes Fish Health Committee. In Michigan, enforcement of these requirements is the responsibility of both MDARD and DNR.

State Agencies
MDARD and the DNR share the responsibility for enforcement of regulations regarding fish diseases in Michigan. MDARD is the lead agency in the state for any reportable disease, regardless of whether on the MDARD list or DNR. The Michigan Aquaculture: Reportable Diseases table (above) lists the MDARD and the DNR reportable diseases. The list is revised and published on an annual basis. The DNR is the agency with responsibility for determining disease monitoring requirements for stocking-fish and for bait-fish going into DNR-defined waters-of-the-state. (See table right) The DNR generally utilizes the recommendations of the Great Lakes Fish Disease Committee for disease monitoring.

The DEQ has oversight of fish disease treatment chemicals that may be discharged to DEQ-defined waters-of-the-state.

(Note – There are differing definitions of waters-of-the-state at the DNR and the DEQ. Be sure to use the proper definition when dealing with the respective departments. This AIM project has recommended that the definition be standardized to avoid confusion – action that is still required at this writing.)

Michigan Aquaculture: REPORTABLE DISEASES

DEPARTMENT			
MDARD	MDNR	REPORTABLE DISEASE(1)	COMMON NAME
X	X	Certomyxosis	Certomyxosis
X	X	Epizootic hematopoietic necrosis	EHN
X		Epizootic ulcerative syndrome	
X		Gyrodactylosos (Gyrodactylus salaris)	
X	X	Infectious hematopoietic necrosis	IHN
X		Infectious salmon anemia	
X		Koi herpesvirus disease	
X		Proliferative kidney disease	
X		Red seam bream iridovviral disease	
X	X	Spring viremia of carp	
X	X	Viral hemorrhagic septicemia	VHS
	X	Aeromonas salmonicida	Furunculosis
	X	Epizootic hematapoietic disease	EED Virus
	X	Infectious Pancreatic Necrosis Virus	IPN Virus
	X	Myxobolus cerebralis	Whirling Disease
	X	Onchorhychus masou Virus	O. masou disease
	X	Renibacterium salmoninarum	Bacteria Kidney Disease
	X	Yersinia ruckeri	Enteric Redmouth
(1) Compiled from MDARD Reportable Disease List of 2011 and MDNR List of 2008.			
All reportable diseases reported to MDARD.			

Disease Monitoring

Disease monitoring is required for only those fish that will be planted or utilized in DNR waters-of-the-state. The aquaculture facility determines which laboratory will conduct the testing. A list of currently approved labs is available from the DNR. It is the responsibility of the aquaculture facility to verify that the laboratory conducting the analysis is certified. This can be checked with the MDARD aquaculture coordinator.

Monitoring procedures for fish sample collection (numbers, tissue collection techniques, and handling) are established by the Great Lakes Fish Disease Committee. MDARD oversees all these activities. Samples must be collected and submitted by a state-licensed veterinarian knowledgeable in the proper collection of fish samples. A list of aquaculture-knowledgeable veterinarians can be obtained from the MDARD aquaculture coordinator. Anyone requesting these services must inform the veterinarian regarding the samples that are to be collected. The Michigan State University Fish Disease and Pathology Lab can conduct analyses for all disease-monitoring requirements and perform the tests for all reportable diseases. Not all reportable

diseases need to be tested for, and if a disease is not found, no reporting is required. If testing is conducted, it needs to be reported only if a certified disease lab has verified the presence of the disease.

Fish may also be tested for other diseases (frunculosis – or cold-water disease, and gill parasites). Positive testing for these diseases does not need to be reported.

Virus testing will require 6–8 weeks for initial results, and bacteria disease testing can be completed in about 1 week.

Disease Reporting

All reportable disease-testing results should be reported to the aquaculture facility operator. The incidence of reportable diseases will be reported verbally to the aquaculture facility (phone call) and within 2 days reported to the MDARD. If the disease is also a DNR-reportable disease, the MDARD will inform the DNR immediately. Paper confirmations will be submitted to both the aquaculture facility and MDARD. If a sufficient sample remains, a confirmation test will be conducted. The results of a retest will be submitted to the aquaculture facility operator and MDARD – with written documentation to follow.

Food-Fish (and other fish) Disease Treatments

The FDA establishes food-fish disease treatments. The number of treatment chemicals is somewhat limited – for food safety reasons. In Michigan, the lead agency is MDARD, under the Food Safety Act. Some treatments may be limited or excluded because of bioaccumulation

DNR Summary of Fish Species and Required Pathogen Testing for Importation into Michigan as Bait or for Stocking into Public Waters in Michigan

Species	Species Code	Pathogen						
		VHSv	IHNv, IPNv, and *Mc*	HSP	LMBv	CCV	WSIv and WSHv	SVCv and KHV
Baitfish								
BLUNTNOSE MINNOW	BNM	X						
COMMON SHINER	CSH	X						
COMMON WHITE SUCKER	CWS	X		X				
CREEK CHUB	CRC	X						
EMERALD SHINER	EMS	X						
FATHEAD MINNOW	FHM	X		X				
GOLDEN SHINER	GOS	X						
SAND SHINER	SAS	X						
SPOTFIN SHINER	SFS	X						
SPOTTAIL SHINER	STS	X						
Gamefish								
ATLANTIC SALMON	ATS	X	X					
BLACK CRAPPIE	BCR	X			X			
BLUEGILL	BLG	X			X			
BROOK TROUT	BKT	X	X					
BROWN TROUT	BNT	X	X					
CHANNEL CATFISH	CCF	X				X		
CHINOOK SALMON	CHS	X	X					
COHO SALMON	COS	X	X					
COMMON CARP and KOI	CAR	X						X
FLATHEAD CATFISH	FCF	X				X		
GREEN SUNFISH	GSF	X			X			
HYBRID SUNFISH	HSF	X			X			
LAKE HERRING	LHR	X	X					
LAKE STURGEON	STN	X					X	
LAKE TROUT	LKT	X	X					
LAKE WHITEFISH	LWF	X	X					
LARGEMOUTH BASS	LMB	X			X			
MUSKELLUNGE	MUS	X						
NORTHERN PIKE	NOP	X						
PUMPKINSEED	PSF	X			X			
RAINBOW TROUT and STEELHEAD	RBT	X	X					
REDEAR SUNFISH	RSF	X			X			
ROCK BASS	RKB	X			X			
SMALLMOUTH BASS	SMB	X			X			
SPLAKE	SPL	X	X					
TIGER MUSKY	TMU	X						
WALLEYE	WAE	X		X				
WHITE BASS	WHB	X						
WHITE CRAPPIE	WCR	X			X			
WHITE PERCH	WHP	X						
YELLOW PERCH	YEP	X		X				

Pathogen Key
VHSv - Viral Hemorrhagic Septicemia
IHNv - Infectious Hematopoietic Necrosis
IPNv - Infectious Pancreatic Necrosis
Mc - Whirling Disease
HSP - *Heterosporis sp*
LMBv - Largemouth Bass Virus
CCV - Channel Catfish Virus
WSIv - White Sturgeon Iridovirus
WSHv - White Sturgeon Herpes Virus
SVC - Spring Viremia of Carp Virus
KHV - Koi Herpes Virus

Source: MDNR GW May 14/12

concerns or by the timing of treatments prior to consumption. The FDA must approve all treatments for food-fish. This includes fish that are utilized for planting stock, because it is assumed that these fish are also food-fish and will also be consumed. Penalties for improper use of treatments may be enforced by both the federal and state agencies. A guide to using drugs, biologics and other chemicals in aquaculture which includes a list of approved chemicals can be found at (http://www.fws.gov/fisheries/aadap/home.htm) The fact that they are approved does not mean they can be discharged at the concentrations required for use under an NPDES permit. Check with the DEQ regarding permissible discharges.
From time to time aquaculturalists may need to use these disease treatments for fish other than food-fish.

Treatment Chemical Handling and Storage

Fish disease treatments are not considered pesticides under MDARD regulations. Therefore the application of chemicals does not require pesticide applicator certification.

Common fishery chemicals, such as chloramine-T and formalin, are regulated under the Part 5 Rules of the DEQ. The threshold management amounts for these chemicals, as regulated under the Part 5 rules, are 440 pounds if storage is outdoors and 2200 pounds if storage is indoors. The rules also specify the need for a secondary containment plan including design, construction, maintenance and operation requirements to prevent the release of polluting materials. Two web links are included to assist in understanding and developing a secondary containment plan. These links are: www.michigan.gov/.../deq-ead-tas-pipp5summary_267022_7.pdf *and* www.michigan.gov/.../deq/deq-whm-hwp-secdryshrt_248281_7.pdf

Record-Keeping

Record keeping is a requirement of all permits. It is the responsibility of the fish farmer to show compliance with applicable regulatory requirements. Failure to maintain proper records will indicate noncompliance to the permitting agency. The permits specify the length of time that records must be retained. Record keeping may also be required for non-permitted activities such as fish disease treatments for fish produced for food-fish markets.
Operators should establish a record-keeping protocol as part of their operational BMPs.

V–B–7 – Permits Appendix: *(Supporting Information to Decision Tree #7, pages 19–20)*

A – MDARD Regulation

The following table lists MDARD Permits and Fees. Website links specific to the various permits are listed on page 22.

MDARD Permits				
Permit Name	**Fee**	**Process Time**	**Description**	**Contact information**
Aquaculture Facility Registratic	$100 new / $75 renew	60 days from receipt of application/Annual	commercially culturing, producing, growing, using, propagating, harvesting, transporting, importing, exporting, or marketing approved aquaculture species under the Michigan Aquaculture	MDARD at 800-292-3939
Aquaculture Research Permit	$250 new / $100 renev	receipt of application/Annual Renewal	transport, import, export, or market species of fish NOT approved under the Michigan Aquaculture Development Act.	MDARD at 800-292-3939
Prior Entry Permit	$0	as soon as possible after request	Required before importation of aquaculture into Michigan	Aquaculture Program Desk at 517-241-4904. If no answer, MDARD at 800-292-3939
Food Establishment License	$70/yr < $25k/yr gross > $175/yr	Typically within 30 days of application. Suggest that you contact MDARD prior to application to discuss plan review options prior to construction of facility.	Fish and fish egg for human consumption processor (food processor) through MDARD Food and Diary Division. Processor wil confirm through contract specifications that grower has, and will follow a HACCP plan.	MDARD at 800-292-3939

i – Prior Entry Permits (Importing Live Fish into Michigan)

To import fish into Michigan, send a copy of the Fish Health Certificate (see certificate program details at: http://www.ncrac.org/node/329) from the importing facility to MDARD by mail or fax (517-373-6015), or electronically to Tina Moreno (morenot@michigan.gov). She will issue you a permit number for the importation. If she is out of the office, there are several back-up people to get the permit number to you, so just call the main number and let them know you need a permit to import fish. If the facility has imported fish into Michigan recently and MDARD has a valid Fish Health Certificate, MDARD will have it on file and can issue the permit based on that. *(Source: N.Barr, e-mail, April 18, 2012, 2.23 PM)* This applies to food-fish, stocking-fish and bait-fish permitting.

Of note and worthy of consideration is the development opportunity for a thriving bait-fish production sector in Michigan, leveraging existing and new production capacity. This could significantly reduce the need for bait imports. Furthermore, the existing and fully unregulated home-aquarium-based production of fish for bait presents a significant threat to our waters-of-the-

state, when these fish are intentionally or inadvertently allowed to enter these waters. A thriving, competitive, local-adapted bait-fish production sector could also serve Michigan well by limiting the risk of aquatic invasive species, thereby enhancing the protection of state water resources.

B – DNR Permits

The following table lists DNR Permits and Fees. Website links specific to the various permits are listed on page 22 of this guide.

Permit Name	Fee	Process Time	Description	Contact information
DNR Permits and Licenses				
Private Stocking of Public Wate	None	Upon receipt and generally <15 days	All stockings by the public of permanent waters require a permit from the DNR. Review examines fish health status and compatibiilty with DNR management objectives for the water.	Contact information for unit staff where stocking will take place is in Table 1 of document at http://www.michigan.gov/documents/PrivateFishStocking
Salmonid Importation	None	Upon receipt and generally <30 days	Trout and salmon including eggs being imported to non-aquaculture facilities and locations require permits from the DNR	Gary Whelan, Fisheries Division whelang@michigan.gov 517-373-6948
Retail Minnow Dealers License	Annual fee $25 for 1 location and 1 vehicle	Upon receipt and generally <15 days	To sell defined baitfish, crayfish and wigglers to retail customers, a retail minnow dealers license is required.	Cecilia Gilson. License Control gilsonc@michigan.gov 517-335-3274
Wholesale Minnow Dealers Lic	Annual fee $100 for 1 location and 3 vehicles	Upon receipt and generally <15 days	To sell defined baitfish, crayfish and wigglers to retail bait dealers, a wholesale bait dealers license is required.	Cecilia Gilson. License Control gilsonc@michigan.gov 517-335-3274
Bait Catchers License	Annual fee $50 and must have either a retail or wholesale minnow dealer license	Upon receipt and generally <15 days	To collect defined baitfish, crayfish and wigglers from the wild for sale to either retail or wholesale minnow dealers, a catchers license is required. Monthly reporting of harvest is required.	Cecilia Gilson. License Control gilsonc@michigan.gov 517-335-3274
Scientific Collectors	None	Upon receipt and generally <30 days	To collect wild fish from Michigan water for scientific purposes or to possess fish above possession limits or unsized fish for educational display purposes, a scientific collectors permit is required. Annual reporting of all fish collected or possessed is required.	Thomas Goniea, Fisheries Division gonieat@michigan.gov 517-373-7341
Natural Rivers Permit	None if DNR Administers or Variable from Local Zoning Administrator	Upon receipt and generally <60 days	Development within 400 feet of a Designed Natural River require a permit and compliance with the Natural Rivers Plan for that water. This is often handled by local zoning administrators or where not, DNR-Fisheries Division administers.	Steven Sutton, Fisheries Division suttons@michigan.gov 517-241-9049
Restricted Fishing License	Variable depending on time desired and status- $1-15 for residents and $7-$34 for non-residents	Upon receipt	To collect, harvest or possess all species of fish except for trout, salmon, lake sturgeon, lake herring, amphibians, reptiles or crustaceans permissible by the Fisheries Orders and stated in the fishing guide	License and Regulation Questions - Christian Lesage, Fisheries Division lesagec@michigan.gov 517-241-3624 Licenses can be purchased online (http://www.mdnr-elicense.com/Welcome/Default.aspx) or from any license agent (i.e. bait shops, Meijers, Walmart)
All Species Fishing License	Variable depending on time desired and status- $1-28 for residents and $7-$42 for non-residents	Upon receipt	To collect, harvest or possess all species of fish permissible by the Fisheries Orders and stated in the fishing guide. If private aquaculturist wishes to collect and transport fish live under there fishing license - a special permit is required from DNR under fisheries order 245.	License and Regulation Questions - Christian Lesage, Fisheries Division lesagec@michigan.gov 517-241-3624 Licenses can be purchased online (http://www.mdnr-elicense.com/Welcome/Default.aspx) or from any license agent (i.e. bait shops, Meijers, Walmart)

C – DEQ Permits

The following table lists DEQ Permits and Fees. Website links specific to the various permits are listed on page 22 of this guide.

Permit Name	Fee	Process Time	Description	Contact information
DEQ Permits				
Water Withdrawal	$2,000	~180 days	Withdrawing quantities of water greater than 1,400 gpm (200,000 gpd)	Andrew LeBaron Lebarona@michigan.gov 517-241-1435
Groundwater Discharge	No application fee, annual fees	180 days	Discharging of wastewater into the groundwater or on the ground surface	www.michigan.gov/deqwater. Click on "Groundwater Discharge" 517-373-8148
Wetlands/Inland Lakes & Streams	Varies	2-6 months	Construction in a wetland or construction near a surface water source	www.michigan.gov/jointpermit. 517-373-9244
Non-Community Water Supply	Varies based on LHD	Generally <30 days	Construction of a drinking water well to supply potable water	Local health department
NPDES (non storm water)	$75-$750, based on facility	180 days	Discharging of wastewater into a surface water source	www.michigan.gov/deqwater. Click on "Surface Water" then "NPDES (Surface Water) Discharge Staff Map"
NPDES Storm water/Construction Site	$400	Upon receipt of application	Discharging of storm water during construction activities (sites > 5 acres)	www.michigan.gov/deqstormwater. Click on "Construction Site Program"
Soil Erosion and Sedimientation Control	Per local agency	Per local agency	Similar to above	www.michigan.gov/deqstormwater. Under "Related Programs" click on SESC Program
Water Use Program Registration	DEQ, $0 to report to MDARD	Annual requirement	Reporting on groundwater or surface water withdrawals	Andrew LeBaron Lebarona@michigan.gov 517-241-1435
Great Lakes Bottomlands				Tom Graf graft@michigan.gov 517-335-3471

If a facility produces 20,000 pounds or more of cold-water species (100,000 pounds of warm/cool water species) fish in a calendar year it is required to obtain an NPDES permit. This permit is required before the 20,000-pound threshold is reached. Generally, it takes at least 6 months for an NPDES permit to be issued. The permit is also required if disease treatment of fish is anticipated.

NPDES Permits: NPDES Application Guidance for Aquaculture Facilities

1. Application Fee of $400 must be submitted with the application.
2. Only Sections I and III of the application need to be completed.
3. Section 1, Item 5 – Check box that says "EXISTING DISCHARGE that is currently unpermitted" *(For existing establishments that do not hold an NPDES permit and are now increasing production beyond the 20,000 pounds cold water, 100,000 pounds warm water, or will use water-based fish treatments, current guidance is that they check this box.)*
4. Section 1, Item 6 – ANTIDEGRADATION REQUIREMENTS, a statement of antidegradation must be submitted for any new use or increased use.

   "In general, this is a statement that acknowledges that there will be a decrease in water quality as a result of discharge, but the benefits obtained from this impact are justified because of the benefits that occur from what is

produced from the discharge. For some facilities, this would be for planting stock for recreational benefits, for others the production of food-fish, and for some facilities both."

5. Section 1, Item 8 – A certified operator is required.
6. Section III, Facility Information, Item 1 – The SIC code for an aquaculture facility is 0273.
7. Section III, Facility Information, Item 2.B – For type of discharge use "Other," and indicate "Fish Rearing Water"
8. Section III, Outfall Information, Item 1.E – Check "Other" and indicate, "Fish Rearing Water." If the system is a flow-through surface system, indicate, "All water from the intake is also discharged." If multiple intakes and discharges occur over a limited length of stream, indicate, "Have only one discharge."
9. Page 21 Effluent Characteristics – Report the levels of ammonia nitrogen, suspended solids and phosphorus. Other sampling is not required.
10. Page 22 – Does not apply
11. Page 24, item 9 – External fish treatments are considered additives and must be included in the discharge application. Most disease treatments have been previously reviewed by the DEQ (see attached list) and the items 1, 6, 7, and 8 do not need to be submitted. Items 2–5 need to be completed.

No structures can be constructed in the 100-year floodplain without consulting the DEQ's Inland Lakes and Streams group. To construct in a wetland, there is likely a need for a variance permit. An additional commercial consideration is that securing insurance for facilities constructed in floodplains may be difficult, posing added risk for the venture. Note that this does not apply to raceways, because they are at or below the stream level, and thus do not cause any obstruction in the floodplain. However, there may still be wetland restrictions if the raceway site is in a wetland.

Any maintenance or modification of structures (raceways, intakes, etc) along the stream will require Inland Lakes and Stream permitting from the DEQ. Authorization for these activities is covered under a general permit, and the DEQ must be notified. (Note: Facilities constructed before 1966 may be improved, as they are 'grandfathered' under the law. Specifically, if water withdrawal is not changed, and if discharge load is not increased, the operator should have freedom to operate and improve using BMPs.)

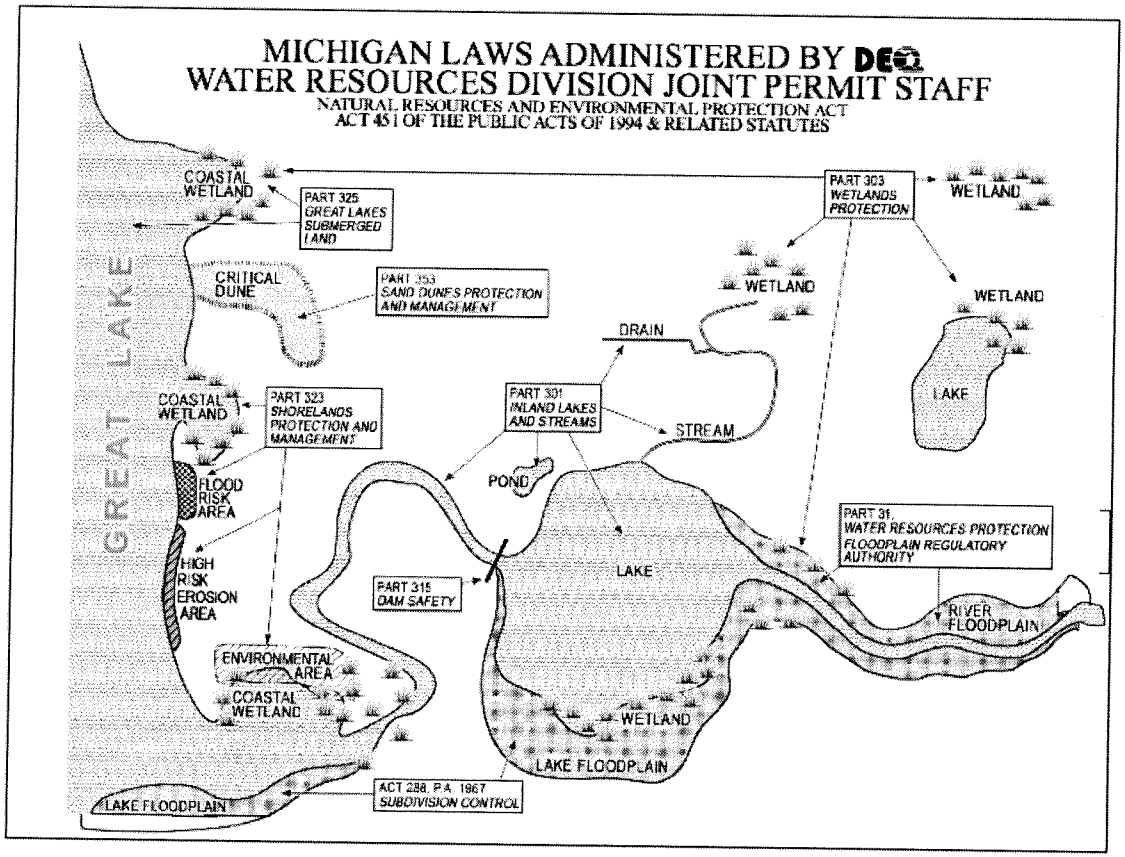
An expansion of an intake structure along a stream will require a DEQ review and a permit. One element of this review assesses whether a greater amount of water will be withdrawn from the stream.

MDEQ/USACE (US Army Core of Engineers) Joint Permit Application: The MDEQ Joint Permit Application (JPA) (see http://www.michigan.gov/deq/0,1607,7-135-3307_29692_24403---,00.html) package covers permit requirements pursuant to state and federal rules and regulations, for construction activities where land meets water, and including wetlands, often referred to as the land/water interface. It is intended to prevent duplication of state and federal regulations.

The application covers activities on:

- Wetlands
- Floodplains
- Inland lakes and streams
- Marinas
- Dams
- Great Lakes bottomlands
- Critical dunes
- High-risk erosion areas

Consideration should be given to all of these when a facility siting and construction is planned. The map shown on the right illustrates pertinent regulation for the land water interfaces.



D – Federal Migratory Bird Depredation and DNR Wildlife Damage & Nuisance Control

Migratory Bird Depredation is only relevant for open-water facilities and does not apply to indoor operations.

From time to time, facilities operating in open waters (uncovered raceways, ponds, cages, etc) can be at risk of losing fish to birds or of having disease introduced by birds. Control or elimination of these birds may be required.

Assistance for control of birds that damage aquaculture is available through the USDA-Wildlife Services Office. They can describe the regulations that apply and provide guidance in protecting fish. In many cases, protecting the fish will involve obtaining a Migratory Bird Depredation Permit from the U.S. Department of Interior, Fish and Wildlife Service (US-FWS). The permit application is at: http://www.fws.gov/forms/display.cfm?number1=200. Securing this permit typically takes less than one week.

US-FWS requires that the USDA Wildlife Services Office be contacted prior to completion and submittal of the application. They can clarify the process and avoid mistakes in the application. Send applications to the USDA Wildlife Services, 2803 Jolly Rd., Suite 100, Okemos, MI, 48864. The telephone number is 517-336-1928.

The permits are good for one year and permits can be renewed on an annual basis. The cost of the initial permit and each renewal is $100.00. Turnaround time for these permits for a completed application is about two weeks.

Although Canada Geese are migratory birds, control of these birds is handled through the DNR._Wildlife Damage and Nuisance Control Permits are issued by the DNR for control of animals such as otter and beaver. These are issued by DNR Law Division Conservation Officer or a DNR Wildlife Division Biologist. They make the determination if the damage or nuisance is bad enough for a permit. An inspection may or may not occur. There is no fee for this permit and the time frame of issuance varies. The DNR contact for these permits can be reached at 517-373-9329.

V–C Supporting Information

V–C–1 People and Other Resources

The primary point of contact for aquaculturalists with regulatory questions for the State of Michigan is MDARD at 800-292-3939 or electronically at: http://www.michigan. gov/mdard/0,4610,7-125-3099---C,00.html. Ask for the aquaculture contact. While MDARD is the primary point of contact, the aquaculturalist may contact other departments on specific matters.

Internet hyperlinks to various resources are provided throughout this Roadmap, and are the best route to current information. For business development inquiries, aquaculturalists should also contact MDARD at 800-292-3939 or http://www.michigan. gov/mdard/0,4610,7-125-3099---C,00.html. and ask for the Office of Agricultural Development. Staff in that office serve as the primary point of contact and have established liaisons to other departments, including the Michigan Economic Development Corporation (MEDC).

The North Central Region Aquaculture Center (NCRAC) is also an invaluable resource for information pertaining to aquaculture both in Michigan and the wider region of surrounding states. See: www.ncrac.org

V–C–2 Acknowledgements

The team at Originz, LLC, wishes to acknowledge all who contributed to this AIM Roadmap. Apologies are offered to any contributors who may have been inadvertently not listed. The growing interest in aquaculture has resulted in a stakeholder community that is expanding even as we complete this resource for the sector. Thank you, everyone.
Joe Colyn & Gary Boersen – July 2012

Production Facilities
Randy Johnson, Glacier Springs Trout Farm
Jerry Kahn, Cedar Brook Trout Farm
Dan Volger, Harrietta Hills Trout Farm
Bob Baldwin, Aqua Springs
Tom Richmond, Indian Brook Farms
Kent Herrick, Aquaculture
John Zubek, Zubek Fish Farm
Russ Allen, Seafood Systems. Inc.
Dave LaBomascus, Stoney Creek Fish Farm
Steve Halpoundserg, Green River Trout Farm
Owen Ballow, Sharon Hills Farm & Aquaculture

Bait
Rick Weidenhamer, Michigan Wholesale Bait
Dan Laggis, Laggis Fish Farm

Ontario Cage Culture
Karen Tracy, Northern Ontario Aquaculture Association
Mike Meeker, Meeker Aquaculture
Dan Glofcheskie, North Wind Fisheries
Steve Naylor, Ontario Ministry of Agriculture

Fish Processing
Jill Bentgen, Mackinac Straits Fish Company
Cam McMurry, Big Stone Bay Fish

Fish Marketing
Evan Smith, Lee Michaels, Cherry Capital Foods
Dan Carmody, Detroit Eastern Market

Academia
Dr. Chris Weeks, NCRAC
Ron Kinnunen, Michigan Sea Grant
Michelle Gunn, Michigan State University
Dr. Barbara Evans, Roger Greil, Lake Superior State University
Ted Batterson, Past Director NCRAC

Economic Development
John Egelhaff, Southwest Michigan Planning Commission, Tri-County Regional Planning
Dan Fette, Berrien County Community Development
Gil Pezza, Bob Metzger, Martin Ruiz, & Eric Shreffler, MEDC

Governmental Agencies
State Government
- Michigan Department of Agriculture and Rural Development
- Michigan Department of Environmental Quality
- Michigan Department of Natural Resources

Federal Government
- United States Department of Agriculture
- United States Department of the Interior

The AIM Project Steering Committee Members & Participants in the Update Meetings: Christine Alexander, Nancy Barr, Bob Baldwin, Chuck Pistis, Michelle Crook, Dan Vogler, Dave LaBomascus, Michael DiBernardo, Nancy Frank, Gary Boersen, Gil Pezza, Steven Halstead, Ernie Birchmeier, James Dexter, Joe Colyn, Kent Herrick, Martin Ruiz, Michael Caston, Peter Butchko , Russ Allen, Chris Weeks, Gary Whelan