Module 5
Site Selection, Facility design & Systems Selection

**Objective:** The purpose of this consolidated worksheet is to guide you through the most important considerations before you start up your aquaculture business. Besides the technical considerations on site selection, facility design and system selection, it is vital to know what type of permits you need to have to properly operate your business. The following worksheet includes both technical aspects and the aquaculture permits in Ohio.

### A1: Analyze Water Source

<table>
<thead>
<tr>
<th>Water Quality</th>
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<tbody>
<tr>
<td>The most serious threat to profitable fish production is poor water quality and lack of an acceptable quantity of good water, fish production may be costly or impossible.</td>
</tr>
</tbody>
</table>

There are six categories of water sources being used:

1. Springs
2. Wells
3. Rivers, streams or lakes
4. Surface runoff
5. Ground water
6. Municipal

Quality of water should be investigated by taking a number of water samples from the proposed water source for laboratory analyses of physical, chemical, biological and micro-biological properties, including health hazards. For initial testing, portable test kits and meters can identify water quality parameters. However, water test procedures should be in accordance with the relevant Standard Classification of your local area.

**Fact Sheets: A1 Analyze Water Source**

Water Quality Water Sources Used in Aquaculture

Getting Started in Aquaculture Enterprises – Managing Iowa Fisheries: Water

Consideration in the Selection of Sites for Aquaculture: Water Supply and Water Quality

<table>
<thead>
<tr>
<th>Water Analysis Inventory</th>
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</thead>
<tbody>
<tr>
<td>1. Are there large volumes of high-quality water? Yes ___ No ___</td>
</tr>
<tr>
<td>2. What is your water source?</td>
</tr>
<tr>
<td>□ Springs</td>
</tr>
<tr>
<td>□ Well How deep? ________</td>
</tr>
<tr>
<td>□ River, stream, or river</td>
</tr>
<tr>
<td>□ Surface runoff</td>
</tr>
<tr>
<td>□ Ground water</td>
</tr>
<tr>
<td>□ Municipal</td>
</tr>
<tr>
<td>3. What is the volume of flowing water available in gallons per minute? ________</td>
</tr>
<tr>
<td>4. Do you know these water chemistry parameters for your source? Yes ___ No ___</td>
</tr>
</tbody>
</table>

If yes, indicate the values and any known fluctuations:

- **Hardness:**
- **Alkalinity:**
- **pH:**
- **Dissolved oxygen:**
- **Temperature range:**
- **Iron or mineral content:**
- **Turbidity or clarity analysis:**
- **Color (e.g. Green, light brown, dark brown, etc.)**
Salinity: 

A2: Survey land topography
A3: Test Soil Profiles

Soil
A good understanding of soil and its characteristics is one of the most important of the many factors which must be considered for successful freshwater fish culture.

What is soil? Soil is a complex mixture of living organisms, organic matter, minerals, water and air. Soil is made up of:

- Organic particles of decayed plant and animal materials which come from living plant and animal bodies;
- Mineral particles such as sand, clay, stones or gravel which were once parts of larger rocks.

*How well does your soil hold water?*

It is important to know how well your soil holds water. This is called soil permeability. Soil which is permeable does not hold water. Soil which is impermeable holds water. Before you build a fish-pond, you will need to test your soil to see if its permeability is suitable for building a pond. If the loss of water through seepage is too great, you may need to seal the bottom of your pond, you may need to seal the dikes, or you may find that you lose too much water from your supply canals.

*Remember...*
- Choose a site for the construction of your pond with good soil where water losses through seepage will be minimal
- When you are building a pond, good soil ensures strong and impermeable dikes so that the water remains in the ponds. Wet and swampy grounds are usually good for pond construction;
- Avoid building-sites for ponds with holes or cracks, anthills or rock outcroppings or with the roots of large bushes or trees. Here, water losses might be excessive and it could be difficult to seal the pond bottom

### Land and Physical Parameters Inventory

Where do you plan to culture your species? Check one or more)

- Ponds (go to “A” of existing, “B” if ponds must be constructed
- Raceways or Flow-through systems (go to “C”)
- Closed systems:
  - Indoors
  - Outdoors (go to “D”)
- Undecided

A. For existing ponds:

1. How old is the pond? 

2. Is the pond
   - Natural or
   - Constructed?

3. What shape and how large is the pond?
   - Round
   - Oblong
   - Square
   - Rectangular
   - Irregular

Surface acres or dimensions: ______________________

Maximum depth ______________
Average depth ______________

4. Is the pond drainable? 
   Yes ___ No ___

5. Are there any tree stumps in the pond? 
   Yes ___ No ___

6. Are there any deep holes in the pond? 
   Yes ___ No ___
properly;
☑ If you plan to build a small reservoir, select a good site for the dam with suitable soil located nearby for its construction.

*The purpose of the soil survey*

The purpose of making a soil survey is to obtain a representative image of the various types of soils and of the soil horizons present on the site where you plan to build fish-ponds. To save time, effort and money, a soil survey of the site should be done as early as possible. It should be done before the purchase of a site which may prove to have soils unsuitable for pond construction and before designing the fish-farm.

**Fact Sheets: A2 Survey land topography**

Simple Methods for Aquaculture: Soil
Simple Methods for Aquaculture: How to conduct a soil survey


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Yes ___ No ___
7. Do you plan to use
   ☑ Cages or
   ☑ Small net pens?

8. Does the pond freeze during the winter?
   Yes ___ No ___

9. What is the present use of the pond? (Irrigation, recreation, etc.)
   __________________________

10. Does the pond have an outflow?
    Yes ___ No ___
    Into what? _______________

11. Is there any known or suspected runoff into the pond from agricultural fertilizers or pesticides, septic leakage, roads, livestock feedlots, garbage dumps, etc.?
    Yes ___ No ___
    If yes, indicate what
    __________________________

12. Has the pond ever purposely been treated with fertilizers, chemicals, or lime? Yes ___ No ___

13. Does the pond lose much water through evaporation during summer?
    Yes ___ No ___

14. What aquatic species are in the pond now?
    __________________________

15. Is the area subject to flooding? Yes ___ No ___

B. For ponds to be constructed:
   1. Do you own the land?
      Yes ___ No ___
   2. How much land is available?
   3. Topography – flat,
sloped, wooded, etc.

4. Is the proposed culture site an unrestricted area (e.g. not a right-of-way or wetland)?
   Yes ___ No ___

5. Is the site proposed to flooding or in a flood plain? Yes ___ No ___

6. What is the soil type?

7. pH

8. Have pesticides been used in the area?
   Yes ___ No ___

C. For flow-through raceways:
   1. Is the water flow constant year round?
      Yes ___ No ___

   2. What is the yearly water temperature range?
      __________________

D. For closed systems:
   1. Is it your design?
      Yes ___ No ___
      If yes, have you tried it on a small scale? Yes ___ No ___

   2. Is it a purchased system?
      Yes ___ No ___
      If yes, have you seen other systems from this supplier in operation?
      Yes ___ No ___

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A4: Assess site infrastructure (e.g. roads, utilities)
A5: Inspect Existing Structures

<table>
<thead>
<tr>
<th>Assess Site Infrastructure Inventory</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Is electricity available at the site?</td>
</tr>
<tr>
<td>Yes ___ No ___</td>
</tr>
<tr>
<td>Voltage and phase?</td>
</tr>
<tr>
<td>__________________</td>
</tr>
<tr>
<td>2. Are there roads or all weather access to</td>
</tr>
</tbody>
</table>

Infrastructures refers to the background facilities, which are needed for the development of aquaculture in a determine regions.

Operational concerns are important factors in
determining the location of an aquaculture facility

**Fact Sheets: A4: Assess site infrastructure (e.g. roads, utilities)**

Site Selection, Acquisition, and Planning for Aquaculture in Dredged Material Containment Areas


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### A6: Plan for Security

#### Importance of Security

Aquaculture facilities need the implementation of security against damage and poaching.

#### Why Do I Need a Biosecurity Plan?

Aquatic farmers face enormous pressure from native and exotic disease-causing organisms, or pathogens. Infection and disease can invade from multiple sources–water, wild fish or shellfish, newly-introduced farmed fish or shellfish, contaminated equipment, predators, human visitors–and can interfere at all stages of production. Disease resulting from the introduction of new pathogens can have devastating impacts. Potential impacts include: production losses from mortality events; loss of market access if certain pathogens are associated with the facility, aquaculture sector or region; and consequent inability to transport product to other farms or locations. These types of events frequently have crippling economic consequences. Lack of adequate epidemiological information for many aquatic pathogens or lack of access to the area? Yes ___ No ___

3. What is your kilowatt/hour charge for electric in your area?
   Kilowatt/hour: $___________________

4. What existing infrastructures would require relocation?
   - Utilities
   - Pipelines
   - Roads
   - Residences

5. Site accessibility: Identify
   - Paved roads: identify (e.g. US32)___________________________
   - Unpaved roads:___________________________

#### Security Inventory

1. Do you live close enough to the culture site to visit and monitor as needed, and to ensure security?
   Yes ___ No ___

#### Biosecurity Inventory

1. What are the local and regional disease risks for the species that I am growing?

2. How is my operation vulnerable to disease?

3. What factors (e.g. health status of introduced animals, contaminated transport water, contaminated farm water source, etc.) might influence that status?

4. What is the current health status of animals on my farm?
current, valid information about particular diseases compound the problems in the aquaculture sector.

One highly effective, voluntary way to reduce the risk of infection and disease to a farm is the development of a biosecurity plan. By definition: “In aquaculture, biosecurity is a collective term that refers to the concept of applying appropriate measures (e.g. proactive disease risk analysis) to reduce the probability of a biological organism or agent spreading to an individual, population, or ecosystem, and to mitigate the adverse impact that may result.” (Subasinghe and Bondad-Reantaso 2006.)

Fact Sheets: A6: Plan for Security


Biosecurity on the Farm – Guidelines & Resources for Developing a Biosecurity Plan

A7: Analyze Effluent Options

A proper waste management plan is needed to maintain the legality, profitability and environmental soundness of any aquaculture facility. Typical wastes from an aquaculture facility may include feces and nutrients from excretion by aquatic animals, as well as uneaten feeds and chemicals such as therapeutant and cleanser residues.

If there is a significant discharge of waste into lakes, rivers, and estuaries or any other receiving waters it may cause adverse environmental impacts. In order to prevent these adverse impacts from occurring, regulations on discharges into receiving waters have been or are in the process of being established.

### Effluent Analysis Inventory

1. Where would the effluent go? ____________________________________________________________________

2. Do you have an appropriate disposal plan for the uneaten food and fecal material? Yes ___ No ___

3. Can you effectively manage wastes produced by your operation? Yes ___ No ___
In most cases, aquaculture facilities are not given permits unless there is a waste management plan that meets applicable local, state and federal environmental regulations.

For more information, read the fact sheet below.

**Fact Sheets: A7: Analyze Effluent Options**

Aquaculture Effluents: A Guide for Water Quality Regulators and Aquaculturists

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**A8: Conduct Labor Market Analysis**

Technical resources, information and expertise are critical to aquaculturists. Environmental and disease problems can develop quickly and threaten an entire crop. Quick access to professional diagnostic services such as fish disease labs can salvage a threatened batch of fish.

**Fact Sheets: A8: Conduct Labor Market Analysis**

Aquaculture: Realities and Potentials When Getting Started
https://srac.tamu.edu/index.cfm/event/getFactSheet/whichfactsheet/100/

Aquaculture Enterprises: Considerations and Strategies

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**Labor market analysis inventory**

1. Can your personal situation stand the extra stress of starting a new enterprise?  
   Yes ___ No ___

2. Is dependable and knowledgeable labor force available in the area?  
   Yes ___ No ___

3. Do you and/or your employees have the skills needed to make the proposed operation work? Consider management skills as well as mechanical and farming skills needed.  
   Yes ___ No ___

4. Would you hire yourself to do the planning, management and day to day labor required? Be honest with yourself about your strengths and weaknesses.  
   Yes ___ No ___

5. Are you willing to work long hard and
irregular hours (e.g., 16 hours/day, 7 days/week)?
Yes ___ No ___

6. Will you seek help when needed?
Yes ___ No ___

7. Can you afford to hire an experienced technician?
Yes ___ No ___

A9: Investigate Community Perceptions

Identify appropriate or affected public. Based on past activities in the area and knowledge of similar projects could help identity which parties can be expected to express interest or disagreement in the selection of the candidate site.

Fact Sheets: A9: Investigate Community Perceptions

Site Selection, Acquisition, and Planning for Aquaculture in Dredged Material Containment Areas

Community Perceptions Inventory

1. Have you anticipate any problems with neighbors?
Yes ___ No ___

2. Has this project been discussed with the town zoning office? Yes ___ No ___
If yes, what was the response?
_____________________________________________________

3. Do you get along well and communicate effectively with people? (Small producers not only grow fish or shellfish, they must also promote and market themselves and their product.)
Yes ___ No ___

4. Will your neighbors and other user groups (e.g., recreational, commercial fisheries) accept the aquaculture operation (the operation will not interfere or be perceived to interfere with their interests)?
Yes ___ No ___

5. Have you discussed your planned operation with the appropriate state agency (ies) and your local Cooperative or Extension Educator?
Yes ___ No ___

6. Have you identified the permits required to construct and operate an aquaculture operation?
Yes ___ No ___
Regulatory issues in Ohio regarding aquaculture
By: Laura Tiu, Aquaculture Specialist, OSU South Centers

Disclaimer: These rules and regulations can change. Please check with the appropriate agency to get the most updated information.

1) **Aquaculture is a form of agriculture in Ohio.**
   
   Ohio Revised Code 1.61. "Agriculture" defined.
   
   As used in any statute except section 303.01 or 519.01 of the Revised Code, "agriculture" includes farming; ranching; aquaculture; apiculture and related apicultural activities, production of honey, beeswax, honeycomb, and other related products; horticulture; viticulture, winemaking, and related activities; animal husbandry, including, but not limited to, the care and raising of livestock, equine, and fur-bearing animals; poultry husbandry and the production of poultry and poultry products; dairy production; the production of field crops, tobacco, fruits, vegetables, nursery stock, ornamental shrubs, ornamental trees, flowers, sod, or mushrooms; timber; pasturage; any combination of the foregoing; the processing, drying, storage, and marketing of agricultural products when those activities are conducted in conjunction with, but are secondary to, such husbandry or production; and any additions or modifications to the foregoing made by the director of agriculture by rule adopted in accordance with Chapter 119. of the Revised Code.

In a recent survey of State Aquaculture Coordinators, the 17 states that define aquaculture find it has a number of benefits:

- sales and use tax exemptions
- building code exemptions
- right-to-farm laws developed to create a legal buffer between farms and encroaching suburbanites
- allows for sovereign submerged land leases
- protects farmers who follow BMPs from environmental lawsuits
- provides for an ombudsman to resolve issues with regulatory agencies
- disaster assistance from USDA
- access to land, water appropriations, and discharge exemptions provided to agricultural operations
- provides a seat on the state’s Agricultural Commission and representation by Farm Bureau
- makes theft of farmed fish punishable
- allows exemption from wildlife regulations on take method, season, limit, and size
- allows producers to file for agricultural land tax rates
- provides for coordinated fish health monitoring efforts
2) Aquaculture permits in Ohio.
   Fee: $50.00 - $100.00
   Ohio Revised Code 1533.632. Aquaculture permits in Ohio. Permitting for production of aquaculture species is provided by the Ohio Department of Natural Resources (ODNR), Division of Wildlife.
   The Aquaculture Law Digest is accessible on-line as ODNR Publication 61. Permits are annual from January 1 – December 31. Transportation and Baitfish permits information available on the same webpage.

3) Fish Importation into Ohio
   Aquatic fish health is regulated by the Ohio Department of Agriculture
   Find more information on this website:
   http://www.ncrac.org/Info/StateImportRegs/ohio.htm#Importation

4) Storm Water Discharge permits – Ohio EPA
   Fee: $200.00 - $500.00
   As of March 10, 2003, if your construction project disturbs 1 or more acres of ground, you must get a permit to discharge storm water from your site. If your project disturbs less than 1 acre but is part of a larger plan of development or sale, you also need a permit to discharge storm water from the site. This includes excavation of ponds.

   For more information: http://www.epa.ohio.gov/dsw/storm/construction_index.aspx
   NOI costs: http://www.epa.ohio.gov/dsw/permits/gpfees.aspx

5) National Pollutant Discharge Elimination System (NPDES) permits
   Specific language from Federal Register 40 CFR part 451, Vol. 68, No 162 August 24, 2004:
   On June 30, 2001, EPA finalized a new rule establishing regulations for concentrated aquatic animal production (CAAP), or farm raised fish facilities. The regulation will apply to approximately 245 facilities that generate wastewater from their operations and discharge that wastewater directly into waters of the United States. This rule will help reduce discharges of conventional pollutants, primarily total suspended solids. The rule will also help reduce non-conventional pollutants such as nutrients. To a lesser extent, the rule will reduce drugs that are used to manage diseased fish, chemicals used to clean net pens, and toxic pollutants (metals and PCBs). The final rule applies to direct discharges of wastewater from existing and new facilities that produce at least 100,000 pounds of fish a year and discharge at least 30 days a year and facilities that produce at least 100,000 pounds of fish a year in net pens or submerged cages.

   Information: http://water.epa.gov/scitech/wastetech/guide/aquaculture/index.cfm
   Form: http://www.epa.ohio.gov/portals/35/permits/cafo_fedrgstr_form2b.pdf
6) **Water Withdrawal Facilities Registration**

The Water Withdrawal Facilities Registration Program, as established in H.B. 662 by the Ohio General Assembly in 1988, implements one of the objectives of the Great Lakes Charter in Ohio. Section 1521.16 of the Ohio Revised code requires any owner of a facility, or combination of facilities, with the capacity to withdraw water at a quantity greater than 100,000 gallons per day (GPD) to register such facilities with the Ohio Department of Natural Resources (ODNR), Division of Water. The Water Withdrawal Facility Registration (WWFR) Program will provide information of great importance to the citizens of the state. Water, one of our most basic and precious natural resources, needs to be studied more intensely and water resource planners need reliable information to plan for the future. The state's economy depends on water and economic development will continue to place increased demands on this critical resource.

Water withdrawal forms:
http://www.dnr.state.oh.us/Water/wwfr/default/tabid/4265/Default.aspx

7) **Fish Processing**

Your aquaculture permit allows you to sell fish live or whole on ice. If you want to process your fish product, you fall under additional regulations.

On-farm retail: If it is 100% retail from the farm (no wholesaling), it does not fall under the federal or state seafood HACCP regulation, just the local health department.

Every "processor" must conduct a hazard analysis to determine whether they have likely food safety hazards that they must control. This processing falls under Federal HACCP regulations. For more information go to: http://seafood.ucdavis.edu/

For HACCP questions in Ohio:
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