AQUACULTURE SITE SELECTION

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Choosing the right site ranks second after identifying markets for your product. Locating land that meets your needs is usually less costly than trying to make a readily available site fit the requirements later. The three most critical criteria are adequate water (supply and quality), suitable soil type and the appropriate topography.

Water

Aquaculture requires large volumes of good quality water. While you may be able to fill a pond with your garden hose, it may take six months to do so. Normally, a well or surface water source (river, stream or spring) is required. Surface sources may be polluted, intermittently available (affected by weather, e.g. drought) or contain wild fish populations which might be introduced into your pond. Wild fish can be a source of disease and will often compete with cultured fish for feed. Many of the most successful aquaculture operations in the U.S. depend on large aquifers (underground water supplies) for water needs. Typically, commercial aquaculture requires a water flow rate of 25-40 gallons/minute, on demand, for every surface acre (4 acre-feet) of pond water.

Water must be of high quality and free of pollutants, sewage and toxic contaminants. Generally, water that is safe for livestock and domestic use or that supports wild fish populations is safe for aquaculture. However, livestock and aquaculture do not mix. Manure from just a few farm animals can pollute a pond.

There are several chemical characteristics of water that are desirable for good fish growth. Water should have a pH of 6.5-9.0, total alkalinity of 75-250 mg/l and total hardness of 75-250 mg/l. Total hardness and alkalinity should not be less than 20 mg/l. Low alkalinity and acid water are usually related to acid soils. Agricultural limestone can be used to raise pH, alkalinity and hardness to the minimum required levels in soft, acid water. If striped bass or red drum are being considered, calcium hardness and total alkalinity between 100-250 mg/l are preferable; a calcium hardness value of 250 mg/l is ideal. Often, well water contains no oxygen and high levels of carbon dioxide and nitrogen, necessitating aeration before use or pH testing.

Soils

Second, the site must have soils that hold water and can be compacted. If pond levees are constructed with soil that has high water permeability (leakage), the cost of pumping water could become prohibitive. Soils should contain no less than 20% clay. Soils with high sand and silt compositions may erode easily and present a piping hazard -- soil-water flow along pipes -- which could wash out a levee. Anti-seep collars can help minimize that problem. The following list can be used as a general guide to the clay content of various soil textures:

Texture	Clay (%)
Clay	>40
Silty clay	40-60
Sandy clay	35-55
Silty clay loam	27-40
Clay loam	27-40
Sandy clay loam	20-35
Heavy silt loam	>20 to 27
Silt loam	12-27
Loam	7-27
Sandy loam	<20
Loamy sand	<15
Silt	<12
Sand	<10

One can see that soils classified between sandy loam and sand do not contain enough clay for pond construction. Silt loams and loams may or may not have adequate clay. Texture classifications are based on per cent compositions of clay, silt and sand. It is particle size that determines how soil is classified:

Soil	Particle Size (millimeters)
Very fine sand	0.05-0.1
Silt	0.002-0.05
Clay	<0.002

If you think your soil may be acceptable for building ponds, it is important that you check with your County Agricultural Extension Agent and the Natural Resource Conservation Service to be certain. Clay content is not the only factor. Soil distribution, particle form and composition, uniformity, and layer thickness are equally important. Suitable soils should be close to the surface and extend deep enough that construction, harvest activity or routine pond maintenance will not cut into a water permeable layer, causing a leak. Soil analysis and the services of an engineer may be necessary. The following are examples of soils that can be found in west Kentucky:

Soil Series	Depth (inches) from Surface	Texture
Alligator	0-8	Silty clay
	8-60	Clay
Sharkey	0-65	Silty clay
Dubbs	0-13	Silty clay loam
	13-38	Silty clay
Dundee	0-25	Silty clay loam
	25-52	Silty clay
Lindside	0-60	Silty clay loam
Newark	0-60	Silty clay loam
Nolin	0-108	Silty clay loam
Arkabutla	0-36	Heavy silt loam
	36-60	Silty clay loam
Rosebloom	0-52	Heavy silt loam
	52-72	Heavy silty clay loam
Cascilla	0-65	Heavy silt loam
Memphis	0-12	Silt loam
	12-24	Silty clay loam
	24-60	Heavy silt loam
Colp	0-12	Silt loam
	12-18	Heavy silt loam
	18-65	Silty clay
Okaw	0-13	Silt loam
	13-18	Heavy silt loam
	18-62	Silty clay to clay
Loring	0-12	Silt loam
	12-34	Heavy silt loam
	34-46	Silt loam fragipan
Grenada	0-7	Silt loam
	7-25	Heavy silt loam
	25-50	Silt loam fragipan
Calloway	0-26	Silt loam
	26-50	Silty clay loam fragipan
	50-70	Silt loam
*Brandon	0-12	Silt loam
	12-32	Silty clay loam
	32-75	Very gravelly sandy loam

* The Brandon series is a good example of a thin layer of suitable soil overlying a thick layer of soil with high water permeability. It would be easy to break through a weak section of the silty clay loam during construction, discing or seining. Building ponds on soils like the Brandon series would not be advisable.

Topography

Large commercial fish farms are typically built on flat land. Pond bottoms drop approximately 0.2 foot for every 100 feet of length, a slope of 0.2%. Topography with slopes of 0-2% is better for pond construction. Extensive earth moving may be required on land with slopes greater than these; increasing construction costs. Some innovative farmers use terracing -- stair-stepping -- for pond layouts in hollows or on land with slopes greater than 2%. However, the economics of that method should be carefully examined. It is important that ponds have an adequate drainage area for harvest. The site should be above the 25-year flood plain. If the pond site is situated within the 100-year flood plain, a permit will be required before construction from the Division of Water, Water Resources Branch -- Flood Plain Management, in Frankfort, Kentucky.

Considerations

Other considerations include former land use, agricultural activities in surrounding areas, accessibility and migratory birds. New ground may contain roots and stumps which make operation of earth moving equipment difficult. The presence of roots or stumps in pond levees is likely to create leaks. If the site was previously used for crops that required heavy pesticide or herbicide applications, there may be too much toxic residue in the soil for fish production. Likewise, wind drift from extensive aerial applications of pesticides or herbicides on neighboring farms could result in the loss of a fish crop. Land for commercial aquaculture should have access to all weather roads and 230 volt or preferably, three phase electricity. Finally, fish farms should not be sited where fish-eating birds are likely to be a problem (e.g. near migratory bird refuges and wintering grounds).