SERVICE

WEST VIRGINIA

COMMERCIAL FISH PONDS (ACRE)

Definition

A water impoundment constructed and managed for commercial aquaculture production.

Scope

This standard applies to all types of ponds installed or modified for commercial production of fish including those for fee harvesting on the site.

Purpose

To provide water for growing and harvesting a fisheries crop.

Conditions Where Practice Applies

On land where soil conditions, water resources, and topography are suitable for constructing a pond or reservoir. (A useful tool for evaluating potential for aquaculture is the SCS Aquaculture Resource Assessment Guide, 1982.)

Planning Considerations

Commercial fish producers and fee fishing operators are required to obtain licenses and/or permits from the West Virginia Department of Natural Resources. Also, permits may be required to discharge water from commercial ponds into streams.

Cooperators should give careful attention to the former use of a site proposed for impoundment construction. Pesticide residues may have accumulated in the soil at levels which will be toxic to fish. Adjacent land use should also be considered if runoff from such areas is to be permitted to enter the impoundment. Agricultural associated pollutants pose major problems for commercial fish production. Sufficient area should be available for expansion of facilities. Successful operations will likely need such space.

The impoundment site should be made accessible for harvesting equipment. In the case of fee fishing enterprizes, the facilities should be so designed as to facilitate recreational fishing.

Design Criteria

Commerical fish ponds can be either embankment or dug-out ponds. (Note: excavated ponds are often difficult to drain and may require the use of a pump.) Ponds will be constructed as specified in Standard and Specification 378 (Pond), 377 (Earth Embankment), or 350 (Sediment Basin). In addition, the following criteria will be incorporated into the design for the intended use.

A. Bait Fish Ponds

1. Construction - an ideal location for bait ponds is a relatively flat or gently sloping area of bottom land. (Avoid areas subject to overflow from creeks or rivers.) Subsoil should be compact enough to prevent excessive seepage. Ponds should be located as to insure filling by gravity flow from the water source. Follow sound engineering principles for dam construction.

   a. Size of ponds - Ponds from 1/4 to 1/2 acres in size are most desirable; however, slightly larger or smaller ones can be designed where needed. Minnow ponds exceeding 1 acre are impracticable due to difficulty in handling large numbers of minnows when draining to harvest production.

   b. Depth of ponds - Maximum depth should not be greater than 4 to 5 feet. The edges should slope rapidly to a depth of 3 feet.

   c. Catch basin - Design the catch basin at the drain pipe in the deepest part of the pond. It should be about 15 feet square in size. The basin should be about 12 inches deep. Carefully grade the pond bottom so that the last of the fish and water will be in the catch basin. The walls of the basin should be made of concrete or concrete blocks. The floor should be at least 4 inches of concrete.

2. Water supply and quality - The water source should be free of silt most of the time, and of sufficient quantity at all seasons of the year. For economy the source should be situated so that all ponds may be filled by gravity flow. Consult the area engineer for technical asistance to determine capacities of needed storage facilities. Test water for chemical and organic pollutants. If the pond is filled by runoff it may be necessary to divert water originating at pollution sources.

   A prime requisite for production of bait minnows is that the ponds be kept free of other species of fish. Gravel filters are very successful in excluding newly-hatched fry of most fish species. (Consult the engineer for proper design of filter and supply system.) A screen filter must also be placed over the drain inlet to prevent loss of fish.

   The water should be moderately hard, and the pH slightly alkaline. The temperature should get to about 60° F early in the year for early egg production.

3. Species and Stocking Rates:

Species for Stocking	Rate of Stocking Per Surface Acre
Golden Shiners	300-400
Fathead Minnows	600-700

4. Spawning Facilities - If aquatic vegetation is desired for spawning habitat, water level should be dropped in the spring to permit the growth of grasses and other vegetation. Artificial spawning devices can be provided as follows:

   a. Golden Shiners - Place bales of straw or hay in the pond with water covering them to a depth of one foot. Use 4 or 5 bales per 1/4 acre pond. Anchor bales to prevent drifting and remove them after spawning.

   b. Fathead Minnows - Place 2 to 4 untreated spawning boards (1"x4", approximately 6 feet long) along the edge of the pond at a depth of 1 to 2 feet. Attach boards to the top of stakes driven into the bottom so they are approximately six inches from the bottom.

B. Trout (Note: Intensive trout production is not generally feasible in ponds. Cooperators interested in such enterprises should consider development of fish raceways.)

Water Quality - Water temperature must not exceed 70° F. (In summer, the surface water temperature may rise to 75 or 80° F for two or three hours on the few hottest afternoons if it has lowered to 70° F or less by the following morning.)

Alkalinity - Total alkalinity should be in the range of 50-200 p.p.m. $CaCO_3$ equivalent unless supplemental feeding is to be conducted. Lower alkalinity is acceptable where supplemental feeding is conducted.

pH Limits - 6.5 - 9.0

Water Depth - One-third of the surface area shall be at least 6 feet deep with a portion at least 8 feet deep. The 8 foot requirement may be waived when a spring having a flow exceeding 50 g.p.m. per surface acre of water is the source. Pond shorelines must slope 2:1 to a depth of 3 feet.

Pond Size - Runoff or by-pass ponds - a minimum of 1/4 surface acre.
Spring fed ponds - a minimum of 1/10 surface acre.

Water Supply - A dependable supply of water is essential for commercial trout ponds where supplemental feeding is practiced. The following sources are listed in order of preference -- springs, wells, and streams. Water must be free of undesirable fish when it enters the pond. At least 50 gallons per minute per surface acre must be available from the source.

Other - Ponds, where supplemental feeding is practiced, must have complete control of water entering and leaving the pond except for minor watershed runoff.

Drain pipes and trickle tubes must be installed as required by the site.

C. Catfish

Water Quality - Water temperature must be 70° F and above for at least 140 days. (Catfish grow more slowly in water with temperatures between 60 and 70° F and practically stop growing when temperature falls below 50° F.) Bottom water outlets produce warmer summer water temperatures and thereby increase the length of the growing season. Examples of such outlets are found in the Engineering Field Manual for Conservation Practices.

pH Limits 6.5 - 8.5

Water Depth - Depth in ponds must be at least 3 feet at the upper end and sides, sloping to 6 or more feet (1/3 of the surface area) at the drain gate outlet. Pond shorelines must slope 2:1 to a depth of 3 feet.

Pond Size - 1/4 acre or more. Ponds 1-2 acres are more easily managed and harvested.

Water Supply - A dependable water supply is essential for commercial fish ponds where supplemental feeding is practiced. The following sources are listed in order of preference -- wells, springs, streams, and runoff ponds. At least 25 gallons per minute per surface acre of pond should be available from the source. If surface runoff is the only source of water, storage reservoirs above the rearing ponds may be needed. Such reservoirs should have twice the capacity of the rearing ponds.

Other - Ponds, where supplemental feeding is practiced, must have complete control of water entering and leaving the pond except for minor watershed runoff. Aeration ponds may be necessary for treating water prior to release.

Harvesting basins, deepened 18 to 24 inches below the main pond bottom may be desirable for final harvesting. They should be 10 percent of the total bottom area. Special care to assure a smooth bottom surface will aid in harvesting fish.

Drain pipes should be large enough to permit rapid drainage (complete drainage in 24 to 36 hours.) A 4-inch drain will generally handle ponds up to three acres in size.

OPERATION AND MAINTENANCE

Plans for operation and maintenance shall provide for inspection, operation, and maintenance of vegetation, pipes, valves, spillways, roads, and other parts of the system.

SPECIFICATIONS

Plans for constructing commercial fishponds shall be in keeping with this standard and shall describe the requirements for applying the practice to achieve its intended purpose.

Commercial fishponds shall be constructed according to the specifications for Pond-378, Earth Embankment-377 or Sediment Basin-350.

REFERENCES - Gindice, John J., D. Leroy Gray, and J. Mayo Martin. "Manual for Bait Fish Culture in the South." EC550 University of Arkansas: Cooperative Extension Service. 49 pp.

Lee, Jasper S. 1973. Commercial catfish Farming. Interstate Printers & Publishers, Inc., Danville, IL. 263 pp.

Planning considerations for water quantity and quality

Quantity

1. Effects on the water budget, with emphasis on effects on volumes and rates of runoff, infiltration, evaporation, transpiration, deep percolation, and ground water recharge.

2. Effects on the volume of downstream flow or aquifers that might cause undesirable environmental, social, or economic effects.

Quality

1. Effects on erosion and the movement of sediment, organics, and soluble and sediment-attached substances.

2. Effects on the visual quality of water resources.

3. Short-term and construction-related effects on the water resources.

4. Effects on the temperature of water discharged.

5. Effects on the movement of dissolved substances below the root zone and toward ground water.

6. Potential for redistributing toxic materials during earth moving.