

**NATURAL RESOURCES CONSERVATION SERVICE
CONSERVATION PRACTICE STANDARD**

AQUACULTURE POND

(Ac.)

CODE 397

DEFINITION

A water impoundment constructed and managed for farming of freshwater and saltwater organisms including fish, mollusks, crustaceans and aquatic plants.

PURPOSE

Provide a favorable aquatic environment for producing, growing, and harvesting aquaculture crops.

CONDITIONS WHERE PRACTICE APPLIES

This practice applies to all impoundments that store water and are managed for aquaculture purposes.

On land where soil conditions, water resources, and topography are suitable for constructing a pond or reservoir.

CRITERIA

General Criteria

Planners are encouraged to work with the appropriate state staff specialists and aquaculture specialists from Kentucky State University Aquaculture and fisheries biologist from the Kentucky Department of Fish and Wildlife (KDFWR). Contact at: <http://www.ksuaquaculture.org> for more information on production aquaculture when utilizing this standard.

Ponds will be constructed as specified in the conservation practice standard Pond (378). In addition, the following criteria will be incorporated into the design for the intended use. Aquaculture ponds may be: (1) embankment ponds that intercept and store surface runoff water, or (2) off-channel impoundments or excavated ponds that are

filled by pumping ground water, or diverting spring or stream flows; and on land where soil conditions, water resources, and topography are suitable for constructing a pond or reservoir. Note: excavated ponds are often difficult to drain and may require the use of a pump.

The site must be protected from flooding, sedimentation, and non-sediment contamination.

The soils within the pond area, as well as those in the contributing drainage area, must be checked for residues of pesticides and other harmful chemicals if there is any possibility of contamination.

Acid soils shall be limed to achieve a neutral condition or the desired pH level for best production.

When multiple ponds are installed, each pond shall be arranged so that it can be managed independently of the others to facilitate harvesting and the control of parasites and disease.

All ponds shall be designed to minimize the escape of non-native or otherwise harmful species to adjacent surface water bodies especially downstream and upstream of streams and rivers.

A protective cover of vegetation shall be established on all exposed soil surfaces that have been disturbed. If soil or climatic conditions preclude the use of vegetation, other protection methods shall be used.

The standards and specifications for Dike (356), Dam, Diversion (348), Diversion (362), Grade Stabilization Structure (410), Grassed Waterway (412), Lined Waterway or Outlet (468), Pond Sealing or Lining (521), Pumping Plant for Water Control (533), Water

Harvesting Catchment (636), and Structure for Water Control (587) may also be used as appropriate. Refer to the NEH part 650 Engineering Field Handbook for additional design information.

In addition refer to (399) Fishpond Management and the KDFWR publication entitled *A Management Guide for Ponds and Small Lakes in Kentucky* for additional management information.

Water supply. Any available water source may be used if the quality and quantity are adequate. If water is pumped from rivers and streams or other sources where undesirable fish, pesticide residue, fish disease, and parasites may be introduced, filters must be installed in the pumping system.

Evaporation rates, stocking densities, and cultured species requirements shall be used in establishing specific incoming flow rates.

Water Quality. Water entering the pond shall be aerated to increase dissolved oxygen and dissipate harmful gases, if needed. The minimum dissolved oxygen level in ponds is 3 to 5 parts per million. Supplemental aeration within the aquaculture pond shall be included, as necessary to maintain desired dissolved oxygen.

Water temperature and water chemistry shall be suitable to meet the species requirements and the planned production level.

Incoming water shall be introduced as far away from outlet drain as practicable to prevent the rapid removal of fresh water from the pond.

Provide for the collection, harvest and utilization of wastes from the cultured organisms.

Provisions shall be made for any needed treatment of water released downstream to ensure that the State designated use of the receiving waters is not degraded from the aquaculture impoundment structure.

All federal, State and local regulations will be followed and necessary permits will be obtained prior to construction and stocking.

Design Criteria – Embankment Ponds. Earthfill dams and embankments around excavated ponds shall meet or exceed the

requirements for embankments as specified in conservation practice standard 378, Pond.

The minimum top width of the embankment shall be 14 feet, where it is to be used as a road for harvesting, feeding, and management purposes and is nonpublic.

Design Criteria – Excavated Ponds. Ponds established by excavating and constructing an embankment around their outer perimeter that excludes outside runoff shall have either an auxiliary spillway or a principal spillway pipe installed with sufficient capacity to remove a 10-year/24-hour direct rainfall amount in 48 hours or less. A minimum 8-inch diameter pipe shall be used.

Levee construction shall include the required embankment settlement to the minimum freeboard requirements. A minimum berm width of 10 feet shall be provided between the outside toe of levee and top of bank of outlet drainage ditch.

Pipes and conduits. Pump discharge through levees shall be installed above expected high water level, and provisions shall be made to prevent pump and motor vibrations from being transmitted to discharge conduits.

Interior embankments constructed for division of water or to direct water flow for circulation shall have adequate cross section to ensure stability and function for its intended purpose.

Adequate provisions must be made to protect earth surfaces from turbulent water at pipe inlets and outlets.

Pond size and depth. The pond shall be constructed to the recommended size and depth for the species to be grown. ***Refer to the specific depth criteria in this standard as described for bait fish, catfish ponds.***

Drains. All ponds shall have facilities for complete as well as partial drawdown. Turn-down pipes, quick-release valves, bottom-water release sleeves, pumps or other devices for water level control and pond management are to be included in the design and construction of the impoundment. Conduit design and seepage control shall meet or exceed the requirements specified in conservation practice standard 378, Pond.

Pond bottom. Where organisms are harvested by seining, the pond bottom shall be smooth and free of all stumps, trees, roots, and other debris. Existing channels and depressions in the pond area shall be filled and smoothed. The edges of the pond shall be deepened to provide at least 3 feet of water.

Where crawfish are harvested by trapping, complete clearing and removal of trees, stumps, and other vegetation is not required.

The pond bottom shall be sloped to the outlet at a gradient of at least 0.2 foot per 100 feet.

Access and safety. Provisions shall be made for access to the site as well as access for operation and maintenance. Ramps for equipment access shall have a grade of 4 horizontal to 1 vertical or flatter.

Appropriate safety features shall be made available nearby to aid people who may fall into the pond and devices installed to prevent such accidents.

Fences shall be installed as necessary to exclude livestock and unwanted traffic. Refer to conservation practice standard (472) Access Control.

Additional Criteria for Bait Fish Ponds

Ideal locations for bait ponds are relatively flat or gently sloping areas 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 ensure filling by gravity flow from the water source.

Ponds from 1/4 to 1/2 acres in size are most desirable; however, slightly larger or smaller ones may be designed where needed. Ponds exceeding 1 acre are impracticable due to difficulty in handling large numbers of bait fish when draining to harvest.

The maximum depth should not be greater than 4 to 5 feet. The edges should slope rapidly to a depth of 3 feet (i.e. not exceed 2:1).

Catch basins shall be designed at the drain pipe in the deepest part of the pond and be a

minimum of 15 square feet in size. The basin should be a minimum of 12 inches deep. Pond bottoms shall be graded so that the last of the fish and water will be in the catch basin during harvest. The walls of the basin shall be constructed of concrete or concrete blocks. The floor shall be at least 4 inches of concrete.

The water source shall be free of silt and sediment and of sufficient quantity at all seasons of the year to meet the desired levels of production. For economy, the water source should be situated so that all ponds may be filled by gravity flow. Consult the appropriate technical specialists for assistance to determine capacities of needed storage facilities.

Water should be periodically tested for chemical and organic pollutants. If the pond is filled by runoff it may be necessary to divert water originating at pollution sources.

Production of bait minnows requires that the ponds be kept free of other species of fish. Devices such as gravel filters may be required to exclude newly-hatched fry or other species of bait fish. A screen filter must also be placed over the drain inlet to prevent loss of fish into adjoining waters. (Consultation with the state engineering staff, KDFWR and/or Aquaculture Extension Specialist for proper design of filter and supply system is required.)

Table 1 below lists recommended species and stocking rates for bait fish ponds. Refer to the state staff biologist, Kentucky State University aquaculture specialist or the KDFWR fisheries biologist for stocking rates of other species of bait fish.

SPECIES	STOCKING RATE PER SURFACE ACRE
Golden Shiners	4,000 adults
Fathead Minnows	500 to 600 (1 pound) adult fish

Table 1. Stocking rates for Fathead minnows and Golden shiners for bait fish ponds.

If aquatic vegetation is desired for spawning habitat, water level should be dropped in the spring (March) to permit the growth of grasses and other vegetation. Artificial spawning devices may be provided as follows:

- Golden Shiners - Place square bales of straw or hay in the pond with water covering them to a depth of one foot. Use 4 to 5 bales per ¼ surface acre. Anchor bales with stakes or weights to prevent drifting and remove them after spawning.
- Fathead Minnows - Place 2 to 4 untreated spawning boards (1" x 4", 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.

CONSIDERATIONS

The State fishery agency or appropriate State University or research institution should be contacted for recommendation on pond size, water depths, and adapted commercial aquatic species.

Consider any adverse impact to cultural resources when planning for aquaculture ponds.

Other planning considerations include the following:

- The visual design of ponds should be carefully considered in areas of high public visibility and those associated with recreational fishing.
- Consider the effects on the volume of downstream flow or aquifers that might cause undesirable environmental, social, or economic effects and contribute to water table decline from heavy pumping.
- Measures to avoid depredation by birds and/or other animals should be included in the design.

PLANS AND SPECIFICATIONS

Plans and specifications for constructing aquaculture ponds shall be in keeping with this

standard and shall describe the site-specific requirements for applying the practice to achieve its intended purpose.

As a minimum the plans shall include:

- A site location map with topographic information.
- Typical cross sections of the pond(s) showing the elevations and dimensions.
- Structure size, location, material type, and elevations.
- Disposal of any excess excavated material.
- Location and type of fence, if required.
- Areas to be vegetated and vegetative specification.

OPERATION AND MAINTENANCE

A written site specific operation and maintenance plan shall be prepared and provided for use by those responsible for the system. The O&M plan shall provide for inspection, operation, and maintenance of vegetation, pipes, valves, spillways, roads, and other parts of the system

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, 11. 263 pp.

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