

**NATURAL RESOURCES CONSERVATION SERVICE  
CONSERVATION PRACTICE STANDARD**

**COMMERCIAL FISHPONDS**

(Ha, Acre)

CODE 397

**DEFINITION**

A water impoundment constructed and managed for commercial aqua-culture production.

**SCOPE**

This standard applies to impoundments that store water and are managed for commercial aqua-culture purposes. It applies to all types of ponds installed or modified for commercial production of fish and other animals and plants, including those for fee harvesting on the site. It does not apply to ponds used for noncommercial aqua-culture products grown for home use or recreational purposes. This standard applies to Class (a) dams having a product of storage times effective height of dam of less than  $1.13 \times 10^6 \text{ m}^4$  (3,000 acre ft<sup>2</sup>) and effective height of dam less than 10.7 m (35 ft).

**PURPOSE**

To provide a favorable water environment for producing, growing, harvesting, and marketing commercial aqua-culture crops to supplement natural food supplies, to control water quality, and for effective use of land, water, and related resources.

**CONDITIONS WHERE PRACTICE APPLIES**

On land where soil conditions, climate, water resources, and topography are suitable for constructing a pond or reservoir for commercial aqua-culture production that meets the following criteria and conditions:

1. Water quantity will be adequate considering evaporation, seepage, and need for water exchange.

2. Water quality will be suitable for use in aqua-culture production or can be made satisfactory by suitable treatment.
3. Application of practical pond management techniques will achieve the desired level of production on a predictable basis.
4. Access to the site is available or can be constructed and maintained.
5. Provision will be made for any needed treatment of water released downstream from the pond.
6. Ponds will store the recommended depth and area of water needed for specific aqua-culture products.
7. The location, design, and installation of ponds will comply with flood plain, wetland, and prime farmland regulations.

**PLANNING CONSIDERATIONS**

The owner/operator's objectives will dictate the level of development and management to be planned. The plan must be based on the limitations and potentials of available natural resources. A thorough aqua-culture resource assessment must be made to determine the feasibility of the project. The planning is complete when all practice components essential to reaching the cooperator's management objectives have been identified.

**DESIGN CRITERIA**

The site must be protected from flooding, sedimentation, and 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 a possibility of contamination.

Commercial fishponds may be: (1) embankment ponds that intercept and store surface runoff water, or (2) excavated ponds

that are completely enclosed by an embankment around the outer perimeter and are filled by pumping.

**Embankment ponds.** Earth-fill dams and embankments around excavated ponds shall meet or exceed the requirements specified for Pond - 378 with the following additional requirements:

1. The minimum elevation of the top of the settled embankment shall be increased to allow for wave action. This increased allowance shall be as specified in table 1.

**Table 1. Wave height**

Maximum fetch* length		Wave height	
m	ft	m	ft
≤ 100	≤ 330	0.15	0.5
100-200	330-660	0.31	1.0
200-400	660-1,320	0.46	1.5
400-1,600	1,320-5,280	0.61	2.0

\*Fetch is defined as the longest uninterrupted distance traveled by wind or wave.

2. The minimum top width of the embankment shall be 4.3 m (14 ft) and 6.1 m (20 ft), respectively, where it is to be used as a one-lane or two-lane road for management purposes and is nonpublic.
3. Interior embankments constructed for division of water or to direct water flow for circulation shall have adequate cross section to provide for stability and function for its intended purpose.

**Excavated ponds.** Ponds established by excavating and constructing an embankment around their outer perimeter that excludes outside runoff shall have either an emergency spillway with a bottom width of at least 3.0 m (10 ft) or have an overflow pipe installed with sufficient capacity to remove a 10-yr/24-hr direct rainfall amount or be at least 200 mm (8 in) in diameter, whichever is larger.

The pond bottom should be sloped to the outlet at a gradient of at least 0.06 m per 30 m (02 ft per 100 ft).

**Orientation.** Rectangular ponds shall be positioned as nearly as possible as follows:

4.0 ha (10 acres) or less-long axis in the direction of prevailing wind. More than 4.0

ha (10 acres) long axis perpendicular to the direction of prevailing wind.

**Water supply.** Wells are the most desirable source of water, but any available 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 may be introduced, filters must be installed on the intake.

The minimum incoming water supply for adequate maintenance is considered to be 0.4 to 0.6 L/s/ha (15 to 25 gal/min/acre). However, evaporation rates, fishloading densities, and species requirements will be used in establishing specific rates. Flow shall be measured during periods of lowest flow. The pumping and pipeline facilities shall be located to best serve the pond, taking into account accessibility for maintenance and repair; protection from overflow and flood hazards; connections to power lines or fuel sources; and future expansion. Water entering the pond shall be aerated to increase dissolved oxygen and dissipate harmful gases if needed. This can be accomplished by falling, splashing, spraying, etc. Also, incoming water shall be as far away from outlet drain as possible so that "short circuits" will be avoided.

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

**Depth.** The water depths for various species are as shown in table 2. These values are applicable to warm climates. Additional depth is required in cold climates to prevent or minimize winter kill.

**Table 2. Water depth for various species**

Species	Most desirable m(ft)	Minimum m(ft)
Channel catfish	12 to 1.8 (4 to 6)	<sup>1</sup> 0.76 (2.5)
Crawfish	0.4 to 0.6 (1.5 to 2)	0.3 (1)
Minnows, other bait-fish	1.2 to 1.8 (4 to 6)	0.9 (3)
Trout	<sup>2</sup> 0.9 to 1. (3 to 5)	0.9 (3)

<sup>1</sup>Ponds used for cage culture shall have a minimum depth of 15 m (5 ft) where cages are located. (Minimum clearance below the cage is 0.3 m (1 ft) but as much as 0.9 m (3ft) is preferred.)

<sup>2</sup>Ponds are supplied by a constant flow of water. If pond is filled only during rainy seasons, a depth of 3 to 3.7 m (10 to 12 ft) over one-fourth or more of the pond area is recommended.

**Drains.** The pond must have facilities for complete as well as partial drainage. Turn-down pipes, quick-release valves, bottom-water release sleeves, or other devices for water level control and pond management are to be included in the construction of the drain facility as appropriate. Pond - 378 shall be followed for conduit design and installation of anti-seep collars.

**Pond bottom.** Where fish are harvested by seining, the pond bottom shall be smoothed and free of all stumps, trees, roots, and other debris. Existing channels and depressions in the pond area shall be filled and smoothed.

For ponds where crawfish are harvested by trapping, complete clearing and removal of trees, stumps, and other vegetation are not necessary unless required by state or local ordinances.

**Access and safety.** Provisions shall be made for access to the site as well as access for operation and appropriate safety features and devices shall be installed or made available close by to aid people who fall into the pond and to prevent such accidents.

**Maintenance.** Ramps shall be located as necessary to accommodate aeration and harvesting equipment. The maximum grade for equipment access shall be 20 percent (5:1 slope).

Generally, level areas or restraining barriers shall be provided to protect pumps, motors, fuel tanks, and utility poles from vehicular traffic.

**Protection.** 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 may be used. Adequate provisions must be made to protect earth surfaces from wave erosion and turbulent water at pipe inlets and outlets. Fences shall be installed as necessary to exclude livestock and unwanted traffic. Road surfaces shall be treated if necessary to prevent vehicles from cutting deep ruts or sliding into the pond. Dams and levees shall be crowned to provide positive drainage.

**Operation and Maintenance.** A plan for operation and maintenance shall be prepared for use by those responsible for the roads system. This plan shall provide for inspection, operation, and maintenance of vegetation, pipes, valves, spillways and other parts of the system.

**Plans and Specifications.** Plans and specifications 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.

**NATURAL RESOURCES CONSERVATION SERVICE  
CONSERVATION PRACTICE SPECIFICATIONS**

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**ENGINEERING**

Commercial fishponds shall be constructed according to the specifications for Pond-378.

**BIOLOGY**

The specifications shall identify the species or combinations of species to be produced. The practice shall specify the limits of essential water quality parameters and physical factors such as pond size and depth to meet the biological requirements of each species. The specifications must include each practice component that may be needed, alone or in combination, to achieve planned management objectives. Minimum requirements for application of each practice component shall be specified in terms of acceptable criteria. The following practice

components shall be included as appropriate depending on individual state needs:

Water Quality	Feeding rates and schedules
pH	Waste water control
Dissolved Oxygen	Harvesting dates and methods
Ammonia-nitrogen	Selective harvest
Hydrogen sulfide	Total harvest
Turbidity	Rotation with other crops
Carbon Dioxide	Crops
Iron	Schedules
Temperature	Water supplies
Stocking rates and size to be stocked by species	Amount Types Dependability

**SUPPLEMENT**

**WATER SUPPLY**

When a water-supply pond is used, at least 3 acre-feet of water is needed for each acre-foot of water in the production ponds.

**POND BOTTOM**

The pond bottom should be sloped to a harvest pit or basin. This pit should be approximately 10 percent of the pond area and 1 to 2 feet deeper than the pond bottom. The water control structure should be set so that the pond can be completely drained.

**CATFISH PRODUCTION**

**WATER QUALITY**

Water must be free of harmful gases, minerals, silt, pesticides, and other pollutants. A water

analysis should be made before design and construction unless previous use or experience indicates the quality is satisfactory. Water requirements for catfish are shown in Table 1.

**Table 1 – Water Quality Requirements for Catfish**

Parameter	Desirable	Minimum	Maximum
Dissolved Oxygen	5 ppm or more	3 ppm	--
Water Temperature	75 - 84° F	60° F	90° F
pH	6.5 - 9.0	6.0	9.5
Carbon Dioxide	5 ppm or less	0 ppm	10 ppm

At high stocking rates, be prepared to correct oxygen deficiency problems by adding water or aerating.

## STOCKING RATES

Fish are grown from fingerlings to eating size by daily feeding in production ponds. Fingerlings should be stocked between March 15 and April

1. The following stocking rates are practical under varying levels of management:

1. For home use in ponds that depend solely on runoff water stock 750 to 1,000 fingerlings (4-6 inches) per surface acre.
2. For commercial production under low levels of management in ponds with reliable water supplies, stock 1,500 to 2,000 fingerlings (4-6 inches) per surface acre.
3. For, intensive commercial production, stock from 3,000 to 4,000 fingerlings (4-6 inches) per surface acre. This stocking rate requires high level management skills, adequate water supply, and aeration equipment.

## FEEDING

Commercial catfish production requires the use of good quality food provided on a regular basis. Feeding requirements areas follows:

1. Select a commercial pellet with 32 to 36 percent protein, 6 percent fat, 10 to 20 percent carbohydrates, and 10 to 15 percent fiber. A minimum of 8 percent of the ration should be from fishmeal and contain recommended vitamins.
2. Pellets should be hard enough to remain 90 percent intact for 10 minutes after immersion.
3. Feed floating or sinking pellets based on the preferences of the producer. Sinking pellets are less expensive, but may result in a higher build-up of organic wastes.
4. Feed fish at the same time each day, 6 days per week or install automatic feeders which allow fish to feed upon demand.
5. Feed approximately 3 percent of estimated body weight each day, not to exceed 30 pounds per surface acre per day. In any case, do not feed more than the fish will consume in 30 minutes.
6. If fish do not eat vigorously, discontinue feeding until the cause is identified.

## HARVESTING

Fish stocked in late March or early April should be harvested about September 15 to November 1 (based on a 180 to 210-day growing season). The size of harvested fish will vary according to stocking rates, but should generally average

about 1 pound. Harvesting will usually be accomplished by one of the following methods:

1. Partial Harvest-harvest market sized fish, by using seining that allows smaller fish to pass through the mesh.
2. Complete Harvest - remove entire population by seining pond or by draining pond and concentrating fish in a harvesting basin:

## BAIT FISH PRODUCTION STOCKING

1. Golden shiner
  - A. Brooder ponds- Stock 500 to 1,000, brooder fish per surface acre.
  - B. Rearing ponds- Stock 100,000 to 200,000 fry per surface acre.
2. Fathead minnow
  - A. Brooder ponds
    - (1) Extensive culture - 500 to 2,000 adults per surface acre.
    - (2) Intensive culture - 15,000 to 25,000 adults per surface acre.
  - B. Rearing ponds - 100,000 to 300,000 fry per surface acre.

## FEEDING

1. The following is a suggested feed formula:

<b>Starter Feed</b>	
<b>Ingredients</b>	<b>Pounds</b>
Soybean flour	200
Blood or feather flour	100-200
Oat flour or ground wheat	800-900
Distiller solubles	100-200
Delactose whey or skim milk	200
Gluten meal	100-200
Fish meal	200
Vitamin concentrate	20
Minerals	5
Total	<u>2,000</u>

<b>Grower Feed</b>	
<b>Ingredients</b>	<b>Pounds</b>
Soybean flour	200
Blood flour	100
Skim milk	100
Alfalfa meal or reground pellets	250
Fish meal	200
Poultry by-products meal	150
Ground wheat	950
Vitamin concentrate	20
Minerals	30
Total	<u>2,000</u>

2. Minnows are primarily plankton feeders. Ponds should be properly fertilized with commercial fertilizer to develop a good plankton bloom.
3. Feed must be finely ground for very small fry: Very small pellets may be used for larger fish.
4. Feed 3 to 5 percent of body weight daily. Up to 20 pounds per acre per day may be provided depending on the condition of the plankton bloom.

### **OTHER MANAGEMENT CONSIDERATIONS**

Problems that may occur in commercial fish production include muddy water, waterweeds, disease, parasites, predators, and off-flavor in catfish. Consult an NRCS biologist or get other professional assistance when these problems occur. For additional information, refer to:

1. F.B. 2260 - Catfish Farming
2. Standard and Specification for Fishpond Management in Oklahoma.
3. National Aqua-culture Development Plan, Washington, D .C. 1983.
4. Catfish Cage Culture, Fingerlings to Fool Fish, Kerr Foundation, P.O. Box 588, Poteau, Oklahoma 74953
5. Catfish Farmers of Oklahoma, P.O. Box 1650, McAlester, Oklahoma 74501
6. Manual for Baitfish Culture in the South Arkansas Cooperative Extension Service, P.O. Box 391, Little Rock, Arkansas 72203
7. Small-Scale Caged Fish Culture in Oklahoma Farm Ponds Langston University, Langston, Oklahoma 73050
8. Fish Farming Experimental Station, U.S. Fish and Wildlife Service, P.O. Box 860, Stuttgart, Arkansas 72160