NATURAL RESOURCES CONSERVATION SERVICE

CONSERVATION PRACTICE STANDARD

AQUACULTURE PONDS

(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.
- Embankment impoundments that do not exceed the requirements for Class (a) dams having a product of storage times effective height of dam less than 3,000 acre-ft^2 and effective height of dam less than 35 feet, as defined in conservation practice standard 378, Pond.

CRITERIA

General Criteria

This conservation practice is exempt from receiving coverage under TDEC's (Tennessee Department of Environment and Conservation) ARAP permits as long as NRCS provides technical or financial assistance for this conservation practice. This exemption allows this conservation practice to be installed adjacent to streams and/or wetlands, and for the outlet of the structure to be placed down through the stream channel bank and into the closest edge of the stream channel. The TDEC ARAP exemption does not change the permitting requirements for the U. S. Army Corps of Engineers permits (404), the Tennessee Valley Authority permits (26a – if located within the Tennessee River drainage area.), or any permits that may be required by local units of government.

The exception to the TDEC ARAP exemption described in the previous paragraph is where the conservation practice is planned to impound the stream, place fill material in a wetland, provide drainage for a wetland, or directly impact a stream channel and/or a wetland. If this conservation practice is planned on a stream or in a wetland, then it is no longer exempt from the ARAP process. If planned on a stream or in a wetland, these conservation practices are required to apply for and receive U. S. Army Corps of Engineers permits (404), Tennessee Department of Environment and Conservation permits (ARAP), Tennessee Valley Authority permits (26a – if located within the Tennessee River drainage area.), and any permits that may be required by local units of government. All conditions listed within the permits shall be followed during the installation of the practice.

A thorough aquaculture resource assessment shall be made to determine the feasibility of the project prior to design. The resource assessment will be based on the species to be cultured and include the ecological needs of the species, physical site conditions, available water quality and quantity, and planned harvesting methods to be employed.

Aquaculture ponds may be: (1) embankment ponds that intercept and store surface runoff water, or (2) off-channel impoundments or excavated (levee)

ponds that are filled by pumping ground water, or diverting spring or stream flows.

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, or any known history of past use of these chemicals. If row crops were grown on or adjacent to the site, the top 2 to 4 inches of soil must be checked for long lasting residual concentrations of chlorinated hydrocarbon insecticides such as toxaphene and DDT.

Acid soils shall be limed to achieve a neutral condition or the desired pH range to optimize production.

When multiple ponds are installed, each pond shall be arranged so that it can be managed independently (independent inflows and outflows) 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.

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. Water pumped from streams or rivers require an 'Aquatic Resources Alteration Permit' obtained from the Tennessee Department of Environment and Conservation.

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

In general, the water supply shall be adequate to fill the pond completely within 10 days. Additional available water capacity of at least 25 gallons per minute per acre of pond surface is required in order to meet potential flushing and maintenance needs.

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

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

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

Provisions shall be made for any needed treatment of water released downstream to ensure that the State's designated use of the receiving waters is not degraded from the aquaculture impoundment structure. This may include providing for the collection, harvest, and utilization of wastes from the cultured organisms.

All federal, State and local regulations will be followed and necessary permits will be obtained prior to construction and stocking. Permits include the Resident Fish Dealer License (TCA 70-1-206 and 70-2-221) obtained from the Tennessee Wildlife Resources Agency and the National Pollutant Discharge Elimination System (NPDES) Permit obtained from the Tennessee Department of Environment and Conservation (TDEC). The NPDES permit is required to allow a fish farmer to discharge water used back into a receiving stream or waterbody. All construction activities impacting one acre or more will also require a Stormwater Discharge Pollution Prevention Permit (SWPPP) obtained from TDEC.

Design Criteria – Embankment Ponds. Earthfilled 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 16 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. A minimum 8-inch diameter pipe shall be used.

The minimum top width of interior levees shall be 16 feet. The minimum top width of outside main access levees shall be 20 feet to accommodate equipment and haul trucks.

Levee construction shall add 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.

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 fish 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 near shore for weed control.

The pond bottom shall be sloped to the outlet at a gradient of at least 0.33 foot per 100 feet.

For shrimp (freshwater prawns), if an “in-pond” catch basin is planned it shall be excavated six inches deeper than the maximum pond depth and 20 foot square around the drain pipe to concentrate the prawns for harvest.

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

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.

CONSIDERATIONS

This practice and/or associated practices may include placement of fill material, the clearing of trees, and/or the construction of ditches or subsurface drainage pipes in low lying and floodplain type situations. The placement of fill material, the clearing of trees, and/or the installation of new ditches or drainage tiles in areas that are potentially wetlands may be a violation of the Swampbuster portion of the Food Security Act, the Clean Water Act, and the Tennessee State Water Quality Control Act. All of these areas should be evaluated for wetland potential thoroughly prior to implementation of this practice and/or other associated practices.

The Tennessee Wildlife Resources 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 or other animals should be included in the design.
- A tailwater recovery system may be considered to allow the recirculation and retention of water on site.
- A storage reservoir may be necessary to provide surplus water needed to compensate dry periods.

Buffers or large setbacks to nearby crop fields may be needed to avoid chemical drift. Pond sites immediately adjacent to row crop production should be avoided.

For most aquaculture species, grow out ponds should be rectangular in shape to facilitate even distribution of feeds and harvesting.

For drain harvesting shrimp ponds, consider at least two drain pipes in a pond for a backup in the event one pipe becomes obstructed. Drain pipes (typically 8 inch to 16 inch diameter) should be large enough to drain the pond within 24-48 hours.

Main access levees used for feeding, harvesting and hauling equipment should be treated or surfaced (e.g. gravel surface) in accordance with Access Road (560) to provide all weather access.

Desired pH ranges for the proper management of commercially grown species in Tennessee are listed in Table 1.

Table 1. Desired pH ranges for various aquaculture species.

Species	pH Range
Catfish, channel	6.5 to 9.0
Baitfish, minnows	6.5 to 9.0
Tilapia*	6.0 to 9.0
Trout, rainbow	6.5 to 8.0
Shrimp, freshwater	7.0 to 8.5

* Tilapia aureus is one of the coldest tolerant species.

Table 2 lists optimal sizes and depths for excavated levee ponds to facilitate management.

Table 2. Recommended size and depth of grow out levee ponds for various species.

Species	Optimum Size (ac.)	Depth Range (ft.)
Catfish, channel	5 - 10	3 – 6
Baitfish, minnows	0.5 - 3	3 – 6
Tilapia*	1 – 10	3 – 6
Trout, rainbow	0.5 – 5	3 – 10
Shrimp, freshwater	0.5 – 3	2.2 – 4

*Blue tilapia (Oreochromis aureus) is one of the coldest tolerant species.

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 soil 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. This O&M plan shall provide for inspection, operation, and maintenance of vegetation, pipes, valves, spillways, roads, and other parts of the system.

REFERENCES

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