NATURAL RESOURCES CONSERVATION SERVICE

CONSERVATION PRACTICE STANDARD

AQUACULTURE PONDS

(Ac.)

CODE 397

DEFINITION

A water impoundment constructed and managed for commercial aquaculture production.

PURPOSE

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

CONDITIONS WHERE PRACTICE APPLIES

This practice applies to:

- All impoundments that store water and are managed for commercial 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

A thorough aquaculture resource assessment shall be made to determine the feasibility of the project prior to design.

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.

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 harmful fishery species to downstream waters.

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.

Evaporation rates, fish-stocking densities, and 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.

Water temperature and water chemistry shall be suitable for use for fish-stocking density and species requirements in the planned aquaculture production.

Incoming water shall be added as far away from 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 from the aquaculture impoundment structure.

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 specified for Pond (378).

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. A minimum 8-inch diameter pipe shall be used.

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, or other devices for water level control and pond management are to be included in the construction of the drawdown facility as appropriate. Conduit design and seepage control shall meet or exceed the requirements specified for Pond (378).

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 should 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. The access ramps, if provided, shall have a grade for equipment access 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

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 or other animals should be included in the design.

Water. A dependable supply of good quality water is of primary importance and should be the first consideration in selecting sites for aquaculture ponds. Water from wells, springs, streams, or surface runoff is suitable if necessary precautions are taken.

The best quality water can be obtained from a well. Using well water reduces problems of disease, unwanted fish, flood hazard, pesticides, and turbidity. Well water will generally need to be aerated before use in order to oxygenate the water and disperse harmful gasses if present. This may be done by splashing the flow over baffles or by spraying into the air. An adequate quantity of water is often difficult to obtain from this source in most areas of North Carolina.

Springs are also a good source of water but may contain undesirable fish. Spring water should be filtered. Checks must be made to be certain that flow is adequate year-round.

Streams and other surface water supplies may be used, but problems are often involved, i.e., undesirable fish, turbidity, and pollutants. Undesirable fish may be excluded by filtering the water with Saran or fiberglass screen filters, but the possibility of problems from parasites, diseases, pesticides, silt, etc., must be carefully considered. Watershed conditions must be thoroughly evaluated prior to initiation of facility development.

Soils and Topography. A soils investigation should be made to determine if the pond will hold water without excessive seepage. When possible, ponds should be located where topography is flat or nearly flat. On flat land, rectangular ponds are most practical. On sloping lands, ponds should be designed to fit the contour of the land. A determination must be made that the pond can be satisfactorily drained and that an adequate outlet is available for disposal of the water. Ponds should be located out of the flood plain or necessary precautions must be taken to eliminate flood hazard. Suitability of the soils for road construction must also be considered.

Type of Pond. Ponds of the levee or impoundment types are generally most practical. Whenever possible, the long axis of the pond should be at right angles to prevailing winds to reduce erosion caused by wave action.

Harvest Basin. The harvest (catch) basin is located at the drain pipe and is an area into which the fish will collect as the pond is drained. It should cover about 10 percent of the pond area and should be 2 to 2-1/2 feet below the surrounding areas.

Water Depth. The pond should have an average depth of 5 feet with the edges no less than 3 feet. Aquatic weeds are usually controlled at 2 feet and depths over 5 feet contribute little to fish production.

Freeboard. The top of the dam should be a minimum of 2 feet above normal pool elevation but in some circumstances, more freeboard will be required. (See Pond – PC378)

Inflow. The inflow into production ponds should be totally controlled to eliminate or reduce problems with muddy or polluted water, flooding, and undesirable fish. This can only be done by diverting surface water around the pond and controlling inflow into the pond through a properly designed pipe or other structure.

Water Control Structures. Ponds should be able to be drained within 48 hours. This will help prevent crowded fish from dying from oxygen depletion during a prolonged period of shallow water and will facilitate harvest planning. Drain pipes are necessary, but

pumps may be used to speed up the drainage. The outlet pipe must be low enough to completely drain the pond and should be screened to prevent the loss of fish.

The control structure should be capable of removing water from both the top and bottom of the pond. There are several types of control structures, but the most preferable is probably the three-ring turn-down pipe. This device acts as an overflow and drain pie and permits desired ware levels to be established by turning the pipe. A sleeve device fitted over the riser removes water from the bottom of the pond and helps prevent the build up of toxic materials. Flashboard risers can also be used for water control.

Size. Ponds can vary in size depending on factors such as topography, species to be produced, available water, etc. Larger ponds often cost less, but ponds in the two to five acre size are usually the most manageable. Bait fish ponds are usually one to two acres in size, although larger ponds have proven successful.

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.

OPERATION AND MAINTENANCE

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