

SPECIFICATION GUIDE

AQUACULTURE PONDS
(Formerly Commercial Fishponds)

(Acre)

Code 397

The owner/operator 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 aquaculture resource assessment must be made to determine the feasibility of the project. The planning is complete when all practice components essential to reaching the cooperators' management objectives have been identified.

To ensure success with aquaculture ponds it is essential that an adequate quantity of water be available throughout the year. The water source must have sufficient quality and temperature to support the desired fish or other aquatic organisms.

Start with an evaluation of the amount of water available, a chemical analysis of the water source, and monitoring the water temperature throughout a year. At a minimum, measuring water quality and temperature during the coldest part of winter and the warmest time of summer should be done. This will provide information on the highest and lowest water temperatures and important water quality parameters like dissolved oxygen content ranges. These factors will determine the kinds and amounts of fish that can be expected to do well in the specific site.

Refer to Wyoming NRCS Biology Technical Notes 30 (Bottom Water Overflow for Fish Ponds), 32 (Fish Facts), 33 (Aquatic Resources Assessment Guide), and 300 to 311 (Individual notes for different fish species) for additional information.

Consideration should be given to the installation of a drawdown tube for complete pond drainage to facilitate management.

Consult with local representatives of the Wyoming Game and Fish Department, NRCS Biologists, the Extension Service, consultants, or

others with knowledge of aquaculture ponds before beginning.

The following information summarizes the ways in which fish can be legally raised in Wyoming for commercial purposes:

1. A commercial hatchery license is required when fish are being purchased or raised for resale. A license fee is charged and a surety bond is required. Monthly reports must be submitted covering sales or exchange of fish. In addition, the licensee may operate one catch-out pond in connection with the hatchery.
2. A fishing preserve license may be obtained on private manmade bodies of water not exceeding 100 acres in size. A license fee is charged. Approval must be obtained from the Wyoming Game & Fish Department prior to each importation of fish to the preserve. Such requirements are designed to protect private and public fishing from infectious fish diseases. The licensee may charge a fee or dues for fishing. A fishing license is not required, but a receipt must accompany all fish leaving the premises.

Contact must be made with the Wyoming Department of Environmental Quality (DEQ) regarding the insert handling and discharge of effluent.

Embankment ponds. Earthfill 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
Max. fetch * length	Wave height
(ft)	(ft)
<250	0.5
>250 & <500	1.0
>500 & <750	1.5
>750	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 14 ft and 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 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 8 inch in diameter, whichever is larger.

The pond bottom should be sloped to the outlet at a gradient of at least 0.2 ft per 100 ft.

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

10 acres or less-long axis in the direction of prevailing wind. More than 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 15 to 25 gal/min/acre. However, evaporation rates, fish-loading 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 winterkill.

TABLE 2.
WATER DEPTH FOR VARIOUS SPECIES

Species	most desirable (ft)	Min. (ft)
Channel catfish	4 to 6	2.5
Crawfish	1.5 to 2	1
Minnows, other baitfish	4 to 6	3
Trout	3 to 5	3

Ponds used for cage culture shall have a minimum depth of 5 ft where cages are located. (Minimum clearance below the cage is 1 ft but as much as 3 ft is preferred.) Ponds are supplied by a constant flow of water. If pond is filled only during rainy seasons, a depth of to 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.

Trout ponds. Trout can be reared commercially in ponds or reservoirs in the cooler parts of Wyoming where sufficient water is available. However, most commercially produced trout are reared in raceways or modified raceway ponds where large volumes of cold water can be used to maintain water quality, keep the oxygen level high and the temperature low.

A. Site Selection

1. Near level topography is desirable, with a slope of less than 5 percent.
2. Ponds will not be located in high hazard flood zones.
3. Suitable soils are those that are fairly impervious, on which water can be impounded.
4. The pond area will be conveniently accessible to trucks and tractors for management and harvesting activities.
5. Drainage from soils containing pesticide residues will be diverted around ponds to prevent pesticide kills and residue retention in the flesh of fish.

B. Water Supply

A dependable water supply that is free of unwanted fishes, diseases or parasitic organisms, silt and noxious gases, and excessive amounts of organic matter and pollutants is necessary. The water source must be carefully evaluated for proper quantity and quality PRIOR to construction.

1. Wells and springs-as a minimum requirement, a flow sufficient to fill pond, replace evaporation loss, and to provide an emergency flow for use in the event of an oxygen deficiency.
2. Water from streams, canals, or ditches will be filtered to remove unwanted fishes, fish eggs, and debris.
3. Wherever feasible, commercial fish ponds will be designed with inlet and outlet structures independent of other ponds to insure maintenance of good water quality.

C. Pond Construction

Pond will be formed by dams, dikes, or by excavation. In the latter, drainage must be provided by pumping.

1. Depth- trout ponds will be 5 to 8 feet deep over at least one-third of the pond. Where flow-through water is available throughout the freeze-over period and the pond is to be equipped with a water control device, the shallower depths are satisfactory.
2. The trout pond will be one-fourth acre to five acres in size. Smaller ponds of one-tenth acre to one-fourth acre are satisfactory for grading fish, disease treatment, and for growing fry and fingerling trout.
3. Shape- rectangularly shaped ponds are preferable since fish can be seined, handled, and processed more readily than in oval or irregularly shaped ponds.
4. Bottom- the entire bottom will be graded and sloped 0.3 percent toward a harvest basin or outlet to prevent fish from becoming stranded in pools while the pond is being drained. It will be smooth

and free of stumps, roots, rocks, and other debris that would snag a fish seine.

5. Harvest basin (optional)- this is a sump into which fish are concentrated for harvesting or grading by draining or seining the pond. The basin will be 18 inches deeper than the pond bottom, with smooth sloping sides and bottom. It can be installed in front of the outlet where fish can be collected; or it can be installed below the outlet. In the latter case, it will consist of a concrete weir with flashboards and screen. The area required for a harvest basin will vary with pond size.
6. A suitable water control device—i.e., bottom-water overflow, turndown standpipe, shear-gate valve, or regular gate valve—is necessary for each pond and will be designed to allow for bottom-water release and be equipped with removable screens. Water control devices will be:
 - a. Capable of draining pond in 48 hours or less.
 - b. Designed so that the water level can be readily adjusted.
7. Dikes (under 10 feet)
 - a. Top width- 10 to 12 feet, sufficient for vehicular travel.
 - b. Slope- water side, ponds under 2 acres, 2:1 if soils permit 3:1 otherwise; ponds more than 2 acres, 3:1.
 - c. Freeboard- 1 foot on ponds under 1 acre; 2 feet on ponds above 1 acre.
 - d. Erosion control- seed or plant slopes to adapted grasses.
8. Dams- a bottom-water overflow will be included in the outlet structure and the pond bottom smoothly graded and sloped as in item C 4.

D. Water Quality and Environmental Criteria

1. Dissolved oxygen content- trout waters must have a minimum of at least 5 ppm of oxygen—7 ppm or higher is preferable.
 2. Trout waters will have a pH valve within the range of 6.5 and 9.0 (acidity-alkalinity range) for good production.
 3. Hardness- at least 50 ppm hardness is necessary. Hard water (50 to 250 ppm-dissolved solids) produces trout more economically than soft water and management problems are fewer.
 4. Maintenance- there will be sufficient inflow to fill ponds, replace evaporation and percolation loss and insure sufficient dissolved oxygen levels. An inflow of at least 25 gallons per minute surface acre of water is required to maintain proper water quality.
 5. Water temperature- trout require a water temperature within the range of 55 degrees Fahrenheit to 68 degrees Fahrenheit for optimum growth. Trout are not seriously harmed in temperatures up to 75 degrees Fahrenheit for a few hours. If raised in water colder than 50 degrees Fahrenheit, trout take 2 years or more to reach market size; in water warmer than 70 degrees Fahrenheit, they grow slowly and are more subject to diseases and oxygen shortages.
- Minnow Ponds.** All specifications for trout ponds apply for minnow ponds except as follows:
- A. Water sources may or may not supply a continuous flow-through.
 - B. The pH of the water will be within the range of 6.5 to 8.5.
 - C. Water temperature will be in the range of 65 degrees Fahrenheit to 85 degrees Fahrenheit.
 - D. Depth will be 3 to 5 feet.
 - E. Size should be one-quarter to one acre, but can be larger.