WALLEYE REARING POND

DESIGN AND MANAGEMENT

Conservation Sheet ***378A***

Natural Resources Conservation Service (NRCS) **DEC 2000**

WHAT IS A WALLEYE REARING POND?

A walleye rearing pond is designed and managed for the purpose of raising walleye, *Stitzostedion vitreum*, from a fry (newly hatched) to a fingerling stage. These fingerlings are usually used to stock natural lakes and streams. Research has shown that stocking walleye in natural lakes and streams is more successful with fingerlings 2 to 3 inches in length instead of fry. It is very difficult to continue raising these fingerlings in a pond situation and only a few producers have developed the technique for producing adult fish from ponds. Walleye fry feed on zooplankton until approximately 6-8 weeks olds. At this time their diet changes to aquatic insects and other fish species.

POND CONSTRUCTION

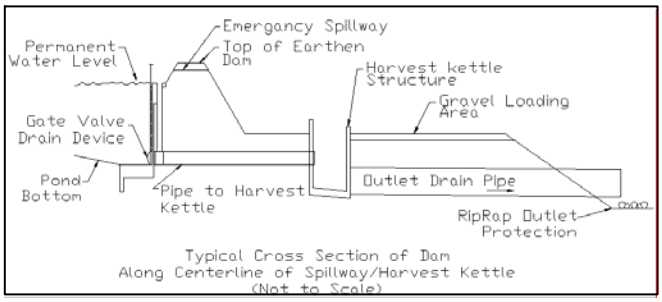
Walleye fingerlings have been raised in outdoor ponds by state agencies and others for many years. However, there is no single pond design that has proven optimal. There are many variables to consider including water source, climate, source of fry, and pond types.

Currently, the most effective rearing ponds are those that are drainable. Therefore, high water table sites may not make the most desirable locations for walleye rearing ponds. Successful rearing ponds are from 1 to 5 acres in size, 4 to 10 feet in depth and sloped to a water control structure.

Permits: Ponds are often located in wet areas, depressions or in small drainage areas. Wetland programs such as the Wetland Provisions of the Farm Bills or the Michigan Wetlands Protection Act or local township regulations may apply to private landowners. In addition, stocking permits may be needed from the MDNR. All necessary permits should be acquired by the landowner before construction begins. Also the impacts of the development on upstream and downstream landowners shall be evaluated.

Excavation or Impoundments: Walleye rearing ponds are usually dug with either a bulldozer, dragline or hydraulic unit. Water pool areas may be formed from excavations, impounding existing drainage ways, or a combination of both. Sideslopes should range from 2:1 to 8:1.

Pool areas should be from 1 to 5 acres in size and range from 4 to 6 feet in depth. The pond bottom should slope toward the water control structure at a slope of 1/2 to 1 percent or 6 to 12 inches per 100 feet of length. To aid in harvesting the fingerlings, a concrete lined collecting pool may be constructed at the outlet structure. Excavated spoil will be spread on upland areas in a manner that fit in with the landscape. Topsoil should be re-spread over excavated areas in the pool to provide a nutrient source for vegetation.



(Details for drawing provided by USDA NRCS in Wisconsin)

Spillway: Impoundments and excavated ponds that have surface water entering them will have an emergency spillway installed to insure that the water is safely controlled in a large storm event. This spillway should be protected to prevent fry from leaving the pond with a large flow event. A mechanical structure such as a drop pipe should be installed to manage water levels to benefit walleye fingerling development.

WALLEYE BIOLOGY

Walleye are native to many lakes and rivers in Michigan. However, in order to maintain high population levels, annual stocking of walleye fingerings is commonly used.

Female walleye spawn in early spring when water temperatures are 40-50 degrees F. One adult female will produce approximately 30,000 eggs per pound of body weight. The eggs generally hatch in 10 days depending on water temperature. The developing fry are up to 1/4 inch long. They don't begin feeding until 3 to 5 days after hatching. During this time, they are absorbing energy from

the egg sac. After absorbing the egg sac, fry feed on very small planktonic animals called zooplankton. Zooplankton are small multi-cellular animals which live in the water column.

As the developing fingerlings grow, larger prey, such as minnows, become important in the diet. Walleye will prey on their siblings when only 1/2 inch in length. After 6-8 weeks old, their diet is mainly fish and aquatic insects.

Walleye growth rates depend on the amount of food available and the temperature of the water. The optimum water temperature for growth of walleye fingerlings is 69-72 degrees F. Fingerlings can be expected to grow to 2 inches in 35-55 days.

POND MANAGEMENT

Ideally, the pond is drained and completely dry for at least 48 hours before filling. This will ensure that no competing fish are present. If the pond is not drained, it is important to ensure that no fish species are present to eat the fry.

Fill the pond at least 14 days before stocking it with fry. This will provide time for the zooplankton population to develop. The method used to fill the pond depends on the water source. If the water is from a surface water source such as a stream or lake, filter the water to eliminate fish and their eggs. Cloth filters are commonly used to filter the water source. Water from surface sources will already have zooplankton present. Water from groundwater sources will need to have additional time for zooplankton populations to develop. This water may be inoculated with zooplankton from nearby surface water sources.

It is extremely important to develop and maintain a high, diverse and stable population of zooplankton for the developing fingerings to feed on. Because these fingerlings are kept at concentrated levels, zooplankton populations must also be high to supply their nutritional requirements. Zooplankton feed upon bacteria, algae, phytplankton and protoza. Several methods can be used to provide food to develop and maintain high zooplankton populations. These methods are divided into providing organic and inorganic food sources.

Organic food sources include the addition of plant or animal food such as alfalfa, bone meal, oat cover crops or animal manure to the pond. A common method in use in drainable ponds is the planting of a cover crop of oats or rye when the basin is dry. The basin is flooded when the cover crop is 3-4 inches in height. Another method is adding alfalfa hay or pellets to the water. Generally, 500-1500 lb. Per surface acre are applied in 3-5 applications over the 4-6 week growing period. Organic sources stimulate populations of algae, bacteria, protozoa, phytoplankton and zooplankton.

Inorganic food sources include the addition of commercial fertilizes such as 10-35-0 to the water. Generally, using inorganic fertilizes reduces the potential for depleted oxygen in the water and algae blooms.

In all cases water quality parameters such as dissolved oxygen levels, PH, water temperature and Total Ammonia Nitrogen should be monitored to maintain an environment suitable for walleye fingerling growth. Walleye fry are susceptible to low oxygen levels, high ammonia levels and extreme PH levels.

In addition, zooplanton populations should be monitored to ensure adequate food for the developing walleye. Zooplankton populations should be sampled weekly. Zooplankton can be sampled by towing a plankton net a known distance through the water column. It is best to sample zooplankton populations at night since most species move to the upper pond layers after dark. Although no minimum density of zooplankton populations have been established, a general guideline is that 800 large-bodied zooplankton per gallon should be adequate.

After the pond is filled and zooplankton populations have been established, it is time to plant the fry. Finding a reliable source of high quality walleye fry is essential. Fry should be disease free and in an excellent condition at release time. Acclimate the fry to the water temperature in the pond and release the fry where they will not be washed ashore. Optimal fry stocking densities depend upon numerous factors including pond configuration, zooplankton populations and water characteristics. Generally, stocking rates vary from 20,000 to 30,000 fry per acre-foot of water. This includes higher rates in the south part of the state and lower rates in the north. An acre-foot of water is the amount of water needed to fill one surface acre to a depth of 1 foot or 43,560 cu. feet. Under ideal conditions, stocking rates of 50,000 fry per acre-foot have been possible. However, too high stocking rates will lead to low growth rates of fingerlings.

Monitor the growth rates of the fingerlings periodically. Fry collected two to three weeks after stocking should indicate considerable growth.

HARVESTING FINGERLINGS

After 4-6weeks of normal growing conditions, walleye fingerlings should average 2 inches in length. Many factors are involved in deciding when to harvest fingerlings including fish condition, food availability and amount of cannibalism. Once the fish reaches 1 1/2 inches, cannibalism amongst the fingerlings may become prevalent.

Drainable ponds with concrete lined pools are ideal for harvesting walleye fingerlings. As the water is lowered, fish are concentrated in the pool area where they can be dip netted out and placed in tanks for transportation. If the pond is not drainable, seines or traps such as fyke nets may be used harvest fingerlings. Many attempts will be needed to harvest a substantial percentage of the populations and is not as efficient as using a drainable pond.

Stress must be kept to a minimum at harvest time. Stress is associated with crowding and handling of fingerlings. All of the efforts are useless if viable fingerlings are not produced.

After collecting fingerlings in holding tanks, it is important to stock them into lakes or streams as soon as possible.

Aquatic Vegetation Control

It is important to control excessive aquatic vegetaton growth. Types of vegetation that may be present in a rearing pond include algae, submergent, emergent and floating vascular plants. At low population level, vegetation is not a problem. However high population levels, especially in nutrient rich waters, can cause low dissolved oxygen levels at sunrise or interfere with harvesting methods. Many methods are available for controlling aquatic vegetation including herbicides. Only a portion of the pond should be treated at a time to reduce the potential of the decaying vegetation lowering the dissolved oxygen levels. For additional information see "Managing Michigan Ponds for Sport Fishing" MSU Extension Bulletin E-1554.

Additional Information

Pond Culture of Walleye Fingerlings by Harding, Clouse, Summerfelt, and Morris; North Central Regional Aquatic Center Fact Sheet 102

Walleye Culture Manual, by Summerfelt et al, North Central Regional Aquatic Center, Culture Series 101

Fish Farmer's Guide to Understanding Water Quality by LaDon Swann, Published by Illinois-Indiana Sea Grant Program

SHALLOW WATER AREAS FOR WILDLIFE DESIGN WORKSHEET

Landowner: Location: Address & phone: Date:

Structural Components Required

Source of water: (Check if required and see approved engineering design for site)

_____ Diversion. _____ Pond/reservoir _____ Well with pump. _____ Pump.	_____ Water control structure on tile line, ditch, or dike. _____ Other source to be developed _____ Surface water (Seasonal flood events and/or surface runoff is usually sufficient) Anticipated surface water size _____

Anticipated engineering required: _____ Survey of Site _____ Hydrology calculations	_____ Soils investigation _____ Design _____ Inspection of Construction _____ Other:

Considerations:
_____ Wetland Permits
_____ Utilities Notified
_____ Impacts on Upstream and Downstream Landowners
_____ Impacts on Threatened and Endangered Species

Excavation required: (see design for site)

Average depth_____ Average length_____ Average width_____ Total cubic yards_____

Dikes required: (see design for site)

Average height _____ Total length _____. Total cubic yards _____.

Mechanical Spillway requirements: (see design for location)

Diameter_____ Total length_____ Materials_____

Earthen Spillway requirements: (see design for location)

Average width_____ Total length_____ Average Depth_____

Vegetative Buffer:
Width_____ Length_____

Seeding Required:

_____ Acres of seeding on dikes. See Job Sheet 327

_____ Acres of seeding for buffer strips. See Job Sheet 327.

Native GrassSeeding Mixture and establishment method:

LOCATION AND LAYOUT SKETCH

TYPICAL PROFILE