Wisconsin Conservation Department
Madison, Wisconsin 53701

Fish Management Division
Management Report No. 9

FARM PONDS IN WISCONSIN

by

Charles N. Lloyd
C. W. Threinen

December 1966

FARM PONDS IN WISCONSIN

In Wisconsin, best estimates place the number of farm ponds at 6,302. In developing this estimate, the following definition for a farm pond was used: A farm pond is a body of water which was constructed by an individual and which lies on private land. The number is not accurately known because anyone can build a farm pond and public agencies may or may not hear about it. The Soil Conservation Service places the number of farm ponds at 5,185. Their records come from Agricultural Stabilization Committee applications forwarded to take advantage of cost sharing at the 50 percent level.

Facts on the characteristics and management of farm ponds were obtained in a questionnaire answered by district fish managers. Ponds are generally small, the most common size being about one-quarter to one-half acre. Size ranges from 0.1 to 60 acres but few exceed an acre. Basically, Wisconsin's district fish managers are dealing primarily with small one-quarter to one-half acre ponds.

The manner of construction and water supply have significance for management. Fifty percent of the ponds have simply been dug out to intercept high groundwater levels. Since there is generally some movement of groundwater downslope, these types of ponds generally have small outflows and may have a spring in them. Normal maximum depths are six to eight feet. Another 25 percent of the ponds are springs either dammed up or dug out. Then there is the dammed-up draw with a relatively small watershed and the dammed-up draw with quite a large watershed--the classical farm pond situations. Neither of these situations ordinarily provide much deep water. The pond having a large watershed will ordinarily have a continuous inflow from groundwater supplies or at least have frequent inputs of runoff. Estimates place the maximum depths of the majority of ponds at six to eight feet. Ponds dependent upon runoff have fluctuating water levels.

Water supply and geography are a substantial governor on pond characteristics. An approximation of fertility levels expected in various circumstances was prepared (Table 1). The data included in this table are based on data obtained from lakes and streams which provide similar circumstances to farm ponds. In Wisconsin, we have acid drift, loessal or alkaline drift soils, which are the source materials for water supply. The sandy acid soils ordinarily have lower quantities of dissolved minerals. Fertility levels are a product of the quantity of water in the system, length of exposure of the water supply to soluble minerals in the ground and the solubility of mineral supplies. Limestone in the alkaline drift is highly soluble. Groundwaters have almost without exception had lengthy exposure to soluble minerals and, therefore, carry greater quantities than surface waters though they may lack phospherous. Phospherous, on the other hand, is derived from surface weathering and will, therefore, be in greater supply in situations having the larger watersheds. These comments make no inferences about artificial locally derived sources of nutrients such as cow yards, artificial feeding or other circumstances. Soil characteristics dictate that ponds in the northern and central parts of the state will be less fertile than those in the south, east and west parts.

Table 1. Relative fertility of farm ponds of various types.

	Probable fertility level as indicated by total alkalinity*	Verbal description of fertility
Sandy Soils		
Dug pond (little water exchange)	<50	Low
Dug out spring (significant water exchange)	50 - 100+	Moderate
Dammed-up draw (small watershed <10 x size of pond - modest water exchange)	50 - 100	Moderate
Dammed-up draw (large watershed >10 x size of pond - substantial water exchange)	50 - 100	Moderate
Medium Textured Soils		
Dug pond (little water exchange)	100 - 150	Moderate
Dug out spring (significant water exchange)	150+	Moderate
Dammed-up draw (small watershed <10 x size of pond - modest water exchange)	150+	High
Dammed-up draw (large watershed >10 x size of pond - substantial water exchange)	150+	High

* Total alkalinity has been a reasonably reliable indicator of the fertility of water in Wisconsin. It is measured by the methyl purple or methyl orange alkalinity test. Data adapted from Poff (1941) and Weidman and Schultz (1915).

Production

Farm pond production has never been assessed per se, but there have been assessments on small lakes on one extreme and fish hatcheries on the other. These data, as summarized in Table 2, while not always specifically applicable, give some meaningful dimensions to the productivity of farm ponds.

The flowing water situation--more a raceway than a pond--seems to be capable of supporting 15 pounds of fish per gallon per minute of water.[1] This production is based entirely on artificial feeding and is a function of water volume rather than area. Those farm ponds having a cold-water source will, therefore, grade down from this level depending on the amount of flowing water and the amount of feeding. The pond having a spring source and cold enough for trout with supplemental feeding has produced 5,000 pounds per acre.[2] The creel harvest from an infertile seepage lake in sandy soils in northern Wisconsin was as high as 12.3 pounds per acre (Burdick and Cooper, 1956), a portion of either standing crop or production.

Johnson and Hasler (1954) report rainbow trout standing crops of 37 to 90 pounds per acre for small dystrophic seepage lakes also located in northern Wisconsin in sandy soils. They suggested that the carrying capacity appeared to be 50 pounds per acre based on conditions of fish at various densities. Certainly, potential harvest will probably lie between the two figures--probably about 25 pounds per acre per year. Harvests of this magnitude are common in streams.

Natural production of warmwater fish is much higher apparently because of greater diversity of species and perhaps more efficiency of production. Standing crops of 500 pounds per acre have been recorded for several lakes which have been rehabilitated. Production of 200 to 300 pounds peracre for carp alone has been noted in fertile hatchery ponds in southern Wisconsin (Mraz and Cooper, 1957). These would be the equivalent of drainage lakes. Seining carp in shallow lakes has resulted in harvests approximating 100 pounds per acre (Threinen, 1952). Angling harvests of four pounds per acre of largemouth bass alone were noted in a seepage-type lake in southeastern Wisconsin supporting primarily bass and bluegills (Mraz and Threinen, 1957). Such production of bass would be the equivalent of that from dug ponds with a mixture of bass and bluegills. However, a much better record was noted for a farm pond used to rear largemouth bass in southern Wisconsin. One hundred pounds of largemouth bass were cropped from a one-acre pond for two successive years (Mraz, 1964).

On the other extreme, standing crops of 92, 135 and 186 have been reported for three small northern Wisconsin seepage lakes (O'Donnell, 1942). Seepage lakes in Oneida and Vilas Counties which have been creel censused or netted have produced angling yields of 5 to 20 pounds per acre per year. Drainage lakes in northern Wisconsin do better--records from an impoundment showing creel harvests of 50± pounds per acre per year of all species.

Production data on waterfowl should not be ignored either because it appears that every farm pond is potentially capable of producing at least one brood of ducks, and two broods have been reported.

---

[1] Commonly recorded figures for Wisconsin trout hatcheries.

[2] Production recorded from dirt ponds at trout hatcheries.

Table 2. Fish production data for farm pond type situations in Wisconsin.

	Standing Crop Quantity (lbs./acre)	Production Quantity (lbs./acre/yr.) Characteristics
Small impoundment in alkaline drift (Stewart Lake, Dane County)	400	--
Impoundment in acid drift (Murphy Flowage, Rusk County)	--	50±
Fertile shallow drainage ponds (Lake Mills Fish Hatchery)	--	100 lbs. largemouth bass 200 - 300 lbs. carp
Fertile shallow seepage lake (Spauldings Pond, Rock County)	716	--
Seepage lake in alkaline drift (Potters Lake & Browns Lake, Racine County)	250	6
Seepage lakes in acid drift (Bayfield County lakes)	92, 135 & 186	--
Seepage lakes in acid drift (Weber Lake & others, Vilas County)	50	12.3 maximum harvest to angling
Fish hatchery on spring water (Nevin Fish Hatchery, Dane County)	15 lbs./gal./min.	--
Trout rearing pond in alkaline drift (Nevin Fish Hatchery, Dane County)	10,000*	5,000

* Pond has a substantial spring flow entering it.

Production will obviously depend upon the types of fish being produced, i.e., their position in the food web plus the amount of supplemental feeding and the fertility of the water supply. When the entire food supply is man-made, fertility is of no consequence except for the nuisances it causes.

Fishery Management Problems

An interpretation of management problems is dependent upon the purpose for which a pond is managed. Many farm ponds are constructed solely for swimming purposes or for wildlife purposes. In the tally of Wisconsin farm pond owners, management purposes are indicated and summarized for the state as a whole. These results are reported in Table 3 for the various regions of the state. Although there are over 6,000 farm ponds in the state, only 39 percent have fish production as their primary management purpose.

Most farm pond owners want fishing but although most want fishing, our district personnel report that the level of management is very low. No more than 10 percent are actively managed.

Among the problems facing pond owners in this northern climate, winterkill is ever present. Mitigation comes from either having a source of fresh water, such as a spring, taking steps to assure photosynthesis, such as keeping the lake free of snow cover, or having sufficient deep water to have enough of a reserve of fresh water to furnish needed oxygen through the winter. Since none of the farm ponds in the state are this deep nor are they likely to be constructed to this depth (20 feet or more), the latter possibility is not practical. Keeping ponds free of snow is seldomly pursued, although it is known to be successful on shallow natural lakes.

Ponds which have a permanent groundwater inflow offer the greatest insurance against winterkill. Groundwaters almost always have sufficient oxygen to satisfy the needs to fish. A pond of this type is, therefore, preferable. Unfortunately, in taking pond sites with spring sources, farm pond builders are in direct competition with a natural trout fishery in many instances. Without sources of fresh water or measures to counteract winterkill, pond owners are reduced to dealing with fish species which are tolerant of winterkill, such as bullheads and certain species of minnows such as the fathead or golden shiner.

Two management courses are open to pond owners, rearing trout or warmwater fish. The most frequent difficulty reported in the management of warmwater fish themselves was stunted panfish. This difficulty probably has several different causes ranging from inadequate predators to excessive aquatic plant growths which prohibit effective natural controls. Smallness of the average small pond contributes to the tendancy for unbalanced conditions to develop. A small pond has such a small number of predators that to lose but a few of them could mean dislocation of the entire population. Fish managers in Wisconsin much prefer to have larger ponds as management units. The rearing of trout was more commonly reported as "successful" in large part because populations could be controlled and supplemental feeding is possible.

Probably the greatest interference in farm pond management is the growth of the dense beds of rooted submergent plants, filamentous algae and encroaching marsh vegetation in some cases. Ponds begin to look "scummy" after the first year of operation unless aggressive and continuous vegetation control measures are taken. Since vegetation control is necessary and "scummy" conditions

Table 3. A regional summary of the purposes for which farm ponds are operated.

Area	Sport Fishing	Minnows	Wildlife	Stock Watering	Others
Northwest	122	42	147	125	56
Northeast	239	19	298	664	332
West Central	284	55	226	6	286
East Central	645	82	475	76	131
Southern	1,046	40	93	520	17
TOTAL	2,336	238	1,239	1,391	822
Percent	38.7	3.9	20.6	23.2	13.6

commonly prevail, pond owners will often despair at the work required and conditions created. In the educational process associated with farm pond management, it is essential to adequately inform pond owners of the vegetation control needs for effective management. Also, it is essential to direct them to the use of chemicals which will not impair fishery values by depressing invertebrates. This direction calls for avoidance of copper products and arsenicals.

Concluding Advice for Farm Pond Management

Trout are easiest to manage provided a cold groundwater source is available. There are numerous established private fish hatcheries which are available which can supply fish stocking needs, and populations can be conveniently regulated. Regardless of what kind of fish management is pursued, vegetation control will be necessary in the shallow ponds. Farm pond owners, therefore, have to be brought into contact with vegetation control information and the information has to provide advice on measures that won't be harmful to the fishery.

If warmwater fish management is pursued, the consistent prevalence of stunted panfish suggests that management should be dedicated to rearing largemouth bass in combination with a minnow species or that pond owners should be prepared to undertake regular panfish control measures. Experimental drawdowns combined with adequate vegetation control programs need increased employment. Catfish have yet to be effectively tried in this state.

Increasing fertility by application of fertilizers, so commonly recommended elsewhere in the country, is not a sound measure. It heightens the risk of winterkill in ponds without much water exchange and if groundwater supplies are available, nutrients are flushed out. Most farm pond waters are adequately fertile in their natural condition.

Where environmental circumstances cause frequent winterkills, a farm pond owner must be content to raise bullheads, minnows and frogs or wildlife.

Since the number of farm ponds has increased immensely in Wisconsin and they are potentially the equivalent of a large lake, we feel an increasing obligation to bring them to a higher level of management. Substantial fish production from farm ponds is now largely latent and unrealized and awaits the key of management and education to unlock it.

12-6-66
bw

REFERENCES

Burdick, Milton E. and Edwin L. Cooper
1956. Growth rate survival and harvest of fingerling rainbow trout planted in Weber Lake, Wisconsin. Jour. of Wildlife Mgt. 20(3):233-39

Johnson, Waldo E. and Arthur D. Hasler
1954. Rainbow trout production in dystrophic lakes. Jour. of Wildlife Mgt. 18(1):113-34

Mraz, Donald
1964. Observations on large and smallmouth bass nesting. Wisconsin Conservation Dept. Research Rep. No. 11, 13 pp. (mimeo.)

Mraz, Donald and Edwin L. Copper
1957. Natural reproduction and survival of carp in small ponds. Jour. of Wildlife Mgt. 21(1):66-69

Mraz, Donald and C. W. Threinen
1957. Angler harvest, growth rate and population estimate of the largemouth bass of Browns Lake, Wisconsin. Trans. Am. Fish. Soc. 85 (1955):241-56

O'Donnell, D. John
1942. The fish populations of three small lakes in northern Wisconsin. Trans. Am. Fish. Soc. 72:187-96

Poff, Ronald
1961. Ionic composition of Wisconsin lake waters. Wisconsin Conservation Dept. Fish Mgt. Misc. Rep. No. 4, 20 pp. (mimeo.)

Threinen, C. W.
1952. History, harvest and management of the Lake Koshkonong fishery. Wisconsin Conservation Dept. Fish. Biol. Invest. Rep. No. 668

Weidman, Samuel and Alfred R. Schultz
1915. The underground and surface water supplies of Wisconsin. Wis. Geol. and Nat. Hist. Sur. Bull. XXXV, 664 pp.