A SURVEY OF RILEY COUNTY FARM PONDS

by

PRESSLEY M. PINER

B. S., Sterling College, Sterling, Kansas, 1948

A THESIS

submitted in partial fulfillment of the

requirements for the degree

MASTER OF SCIENCE

DEPARTMENT OF ZOOLOGY

KANSAS STATE COLLEGE
OF AGRICULTURE AND APPLIED SCIENCE

1952

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INTRODUCTION

The purpose of this survey was to correlate a certain phase of wildlife conservation with good land management in Riley County Kansas. Farmers are interested in getting the most from their land with the least possible investment. It was felt that wildlife crops present an opportunity for the farmer to realize a profit from his land that costs him virtually nothing. Wildlife must, however, be cultivated by the farmer as he would cultivate and nurture other farm crops. The cultivation required to promote wildlife would require that the farmer not use fence corners, odd lots or other portions of his farm that are not tillable. A farmer, of course, might not set aside any definite time in the work schedule to aid wildlife; therefore a farm practice that would benefit wildlife with a minimum amount of time and labor by the farmer was of primary importance to wildlife production and protection.

The farm pond development was considered a good land management practice. According to Wing (1951) it is a sound engineering principle of keeping and holding the water where it fell and using it to the fullest advantage. In that way it is available to stock, it helps to maintain ground-water levels, and provides stored water to be used during dry periods. Another consideration should be fish production in the farm ponds. Besides fish production other wildlife may be benefited by an available water supply.

The use of all the available land for the production of

harvestable crops appears to be the national attitude. There are perhaps valid reasons why such an attitude is prevalent. First; there is a shortage of food, and second; commodity markets are paying more for agricultural crops than ever before in our history. The nation is not excused, however, in seeing that the natural resources of the United States are conserved. Wing (1951) states that if the nation's farmers need an incentive to practice these wise land management features then the charm and usefulness of the many wild creatures attracted to the farm pond would be of immeasurable value. The farm pond, as a farm fish pond, has a value in fish production that is far in excess of what the soil of the pond site would produce when used in agricultural pursuits.

Wildlife does not do well on infertile soils that are otherwise not acceptable for agricultural pursuits. The goal of farmers and conservationists should be to prolong the usefulness of the soil by good conservation practices, thereby insuring continued success of agriculture and wildlife.

METHODS

An outline was made covering the intended research and a questionnaire was made to record the data collected from each farmer who owned a pond. The questionnaire used in the survey will be found as Appendix A. The ponds surveyed were those that were one-half surface acre or larger.

The location of each pond was plotted on a map of Riley County, Kansas. The map was necessary to locate the ponds

geographically so that a minimum amount of time would be spent searching for them. The type of map used in the survey will be found, with the co-ordinates of each pond plotted, as Appendix B.

The actual survey of 66 farm ponds was conducted during August, September, October and November, 1951. The farmers were contacted and asked about the ponds. The ponds were visited and pictures taken of the earthen fill. Several of the pictures appear throughout the discussion.

LITERATURE REVIEW

According to Graham (1947) the development of farm ponds in the United States was a continuation of Old World practices which were attempts to correlate prevailing agriculture with the use of the farm pond. However, there was one significant difference. In the Old World there was a rotation between crops and fish production, but in the United States a balance ratio of fish production was attempted with sustained yield the goal in fish ponds.

Two farm fish pond practices were recorded in history, one in China and another in Europe. There were significant differences between the two procedures but the end results, of fish production, was the same. Graham (1947) stated that for 2,000 years the Chinese farmer has been buying fry fish from vendors, who came up the rivers with boatloads of fish, and placed the fish in ponds on their land. The ponds were then intensively fertilized with night soil, human feces, and at the end of the season the fish were seined out for food, and the next year the same procedure

was followed.

The significant difference between the Chinese and European practice was the fish-grain rotation employed by the Europeans. According to Graham (1947) the European farmer would flood a part of his land for a year or two introducing carp into the pond which lived off the stubble, fertilizers or other organic materials in the pond. The pond was drained and all the fish were harvested or left on the land as fertilizer. The next season grains were planted instead of flooding the land.

Hamilton (1940) says that farm ponds have long been a part of the American farm scene. The ponds were first used for fish production. With the rise of the beef cattle industry in the west, water became an important problem. Numerous range wars were a result of disputes over water rights. Barbed wire fences probably played an important role in the development of water storage facilities. With the passing of unlimited ranging and the fencing of natural water supplies the rancher had to develop means to water his stock if he were to be a successful producer of stock. Early in the development of water storage natural catch basins were sought and diversion ditches were used to concentrate the greatest amount of water possible in the basin.

The earthen fill across a dry water course was also used and that practice was the type most often found in Kansas. The drouth, according to Tiemeier (1951), of the early 1930's has emphasized the need for water storage. Anyone who had to haul water during that period knows the importance of a readily available water supply.

Of special significance to soil and moisture conservation was the establishing of the Soil Conservation Service by Congress. According to Graham (1947) official recognition was given to the need for water storage with the formation of the Soil Erosion Service in 1933. In 1935 the Soil Erosion Service became the Soil Conservation Service with the passage of the Conservation Act. The Soil Conservation Service has been a leading force in the conservation of soil and moisture resources and has also included the conservation of agricultural wildlife in their program.

Of special scientific significance in the production of fish in farm ponds was the work of Swingle and Smith in Alabama. The techniques of Swingle and Smith, according to Graham (1947), were originally believed to be adapted to the South only, but it is now thought that their findings may be effective elsewhere. Swingle and Smith (1950) have set up a balancing ratio procedure for stocking farm ponds. They were of the opinion that intensive fertilization was necessary to insure success in maintaining the balance of fish populations and the production of pan size fish. Their findings were undoubtedly true for the leached soil of Alabama, but in Kansas, according to Tiemeier (1951), the natural fertility of the soils is sufficient to insure adequate fertility of the pond when only a few pounds of fish are taken per year from the pond. To fertilize the pond would have only increased the cost per pound of fish caught and would not have insured an adequate catch.

The apparent necessity for farm ponds in Kansas was demonstrated

by a recent press release from the Soil Conservation Service which stated that the Soil Conservation Service had given aid on 40,000 ponds in Kansas. During 1940 to 1951 the Production and Marketing Administration has given financial aid on more than 24,000 ponds, according to Tiemeier (1951). The Soil Conservation Service was of course involved in giving procedural aid on the ponds for which the Production and Marketing Administration had given financial aid. There were, in 1951, at least 40,000 ponds of all sizes in Kansas according to the Forestry, Fish and Game Commission.

CONSTRUCTION, PAYMENTS AND VALUE OF THE POND

Official Aid in Construction

Fifty-five of the 66 owners had been given financial aid from the Production and Marketing Administration and two owners have approval for payment at the time of the survey. Nine owners of the 66 owners had not received payments nor would they receive payments in the future. Eight of these owner's ponds had not measured up to the specifications of the Production and Marketing Administration and the fault had not been corrected; therefore, payments were withheld. One owner's pond was constructed in 1934 by the owner himself and was not built under any official recognition. Production and Marketing Administration payments ranged from $40 to $400, with the average $146.25.

The Soil Conservation Service was, of course, active in

locating the pond, the determination of soil types, and the staking out of the fill, water level and the spillway.

If the pond was built with the approval and co-operation of the Production and Marketing Administration, payments would be approximately 50 to 70 per cent of the entire cost of construction. Following is the rate of assistance taken from the Production and Marketing Administration's set of instructions for constructing an earthen fill:

(a) $0.12 per cubic yard of material moved.
(b) $10.00 per cubic yard of concrete used.
(c) $6.00 per cubic yard of rubble masonry used.
(d) 50 per cent of the average cost of fencing materials, pipe, and seeding or sodding the dam and filter strips.

Only one owner out of the 66 was found who had received any benefit from the Kansas Water Storage Law. That law provides for reduction in the assessed valuation of farm land on which an approved water reservoir has been constructed. A portion of the law reads as follows:

> Any landowner owning land in the state of Kansas, not within the corporate limits in any city in this state, who shall lawfully by the construction of a dam across a dry watercourse or any stream or watercourse draining an area not exceeding ten square miles, form upon his own land one or more reservoirs, having along the axis of the dam at the lowest point in the natural bed of a stream or watercourse a depth of not less than ten feet and a storage capacity at spillway level of not less than five acre-feet, for the collection and storage of surface water, and who shall maintain such a dam or dams in a condition satisfactory to the chief engineer of the water resources in the state board of agriculture, shall be entitled to receive a reduction in the assessed valuation of the contiguous acreage owned by the landowner upon which such reservoir is located for ten years of an amount determined according to the following schedule:
>
> First ten acre-feet of storage capacity-$200.00 per acre-foot

Next five acre-feet of storage capacity - $150.00 per acre-foot
Next five acre-feet of storage capacity - 100.00 per acre-foot
Next five acre-feet of storage capacity - 50.00 per acre-foot

Provided, that the total amount of any such reduction shall not exceed three thousand five hundred dollars and that in any instance it shall not be more than forty per cent of the assessed valuation of the entire contiguous acreage owned by the landowner upon which such reservoir or reservoirs are located.

Cost of Construction

The column labeled cost in Table 1 gives the entire cost of construction. The cost per cubic yard shown in Table 1 was found to vary from 11 to 45 cents, and the average, 22 cents. The cubic yards in the fill varied from 249.6 yards to 5,612.3 yards, with the average being 1,459.2 yards. According to Tiemeier (1951) when considering the cost of a pond the greatest item of expense was the fill. The cost, he further specified, of the fill depends upon the distance earth had to be moved, the availability of proper soils, the size of the fill and the terrain in which the pond was built. Tiemeier (1951) estimated that the cost should range from 12 to 25 cents per cubic yard of earth moved. In attempting to explain why the cost per cubic yard of earth moved exceeded 25 cents it must be taken into consideration that the owner had given the total cost of constructing his pond. The total cost would include other features of pond construction, such as fencing, pipes, tanks and cement, in addition to the earth moved into the fill. As shown in Table 1, the cost per surface acre ranged from $39 to $1,200 per surface acre. Five of the 66

Table 1. Data on cost, size and depth.

Name	Total cost	Surface area (acres)	Cost/ surface acre	Cubic yards in fill	Cost/ yard	P.M.A. payments	Drainage/ surface acre	Drainage acres	Maximum depth
Rubart	$200	2.0	$100	1,253.8	.16	$100	42.5	85	6.4
Leidig	200	5.4	39	1,004.5	.20	None	11.1	60	9.0
Thierer	150	0.9	165	761.0	.20	85	33.3	30	12.0
Roth	300	0.5	600	2,000.0	.15	180	80.0	40	7.2
Schurle	860	0.7	1,118	2,000.0	.43	300	114.2	80	26.0
Dobert	75	0.5	150	269.4	.27	40	60.0	30	8.0
Walter	500	0.5	1,000	1,190.6	.42	None	100.0	50	9.0
Walter	200	0.5	400	1,330.0	.15	None	60.0	30	15.0
Schwab	150	1.0	150	682.0	.22	None	30.0	30	8.0
Beichter	350	1.0	350	1,312.3	.26	210	40.0	40	8.0
Englund	130	0.5	260	396.4	.35	78	80.0	40	8.1
Rudolph	400	0.5	800	691.9	.57	200	60.0	30	10.0
Stienbock	250	0.5	500	1,000.0	.25	125	60.0	30	10.0
Stienbock	800	1.0	800	1,350.0	.58	400	50.0	50	6.4
Thierer	175	0.7	227	899.7	.17	90	71.4	50	11.0
Brandenburg	400	0.7	520	1,074.9	.37	200	135.7	95	9.0
Brandenburg	250	0.5	500	854.0	.29	125	100.0	50	10.0
Brandenburg	250	0.5	500	760.0	.33	125	80.0	40	9.0
Hoerner	150	0.5	300	990.1	.15	75	40.0	20	8.0
Dodge	200	0.7	260	1,082.6	.18	110	21.4	15	8.5
Bearman	300	0.5	600	1,462.4	.20	150	30.0	15	12.3
Kunze	300	1.0	300	1,514.8	.19	150	20.0	20	8.0
Henry	500	3.0	167	3,163.6	.15	None	16.6	50	8.0
Fredrick	200	0.5	400	839.5	.23	None	80.0	40	9.0
Lumb	240	0.5	480	795.0	.30	120	40.0	20	8.4
McNeil	200	2.0	100	1,500.0	.14	125	12.5	25	10.0
McNeil	200	1.0	200	1,490.0	.14	None	40.0	40	10.0
Fosha	165	1.0	165	621.1	.26	100	25.0	25	7.5
Morris	180	0.5	360	766.7	.24	App	20.0	10	8.0
Barr	180	0.5	360	752.4	.23	90	30.0	15	7.4
Fosha	350	0.5	700	1,024.3	.34	175	50.0	25	7.5
Stafford	200	0.5	400	1,034.3	.18	None	60.0	30	10.0
Bohnanblush	150	0.5	300	891.4	.16	75	50.0	25	9.0
Morris	400	1.5	267	2,525.1	.16	200	16.6	25	17.0
Huston	175	0.5	350	1,427.8	.12	90	30.0	15	9.0
Schauer	200	1.0	200	1,434.6	.14	100	40.0	40	14.0
Schauer	350	0.5	700	755.5	.45	175	40.0	20	9.0
Klocke	200	0.5	400	693.1	.28	100	50.0	25	12.0
Peterson	225	0.5	450	1,985.4	.11	120	60.0	30	15.0
Randal	130	0.5	260	680.6	.19	90	40.0	20	13.0
Harrison	158	0.5	310	905.1	.17	90	30.0	15	10.0
Still	225	0.5	450	1,495.5	.15	110	40.0	20	14.0
Bruenger	400	0.6	560	3,374.6	.11	200	50.0	30	17.5
Rundquist	250	0.5	500	1,515.7	.16	App	30.0	15	12.0
Frohn	150	0.5	300	919.8	.16	75	60.0	30	10.0
Swenson	200	0.5	400	955.5	.20	100	60.0	30	10.4
Oman	800	0.7	1,040	5,612.3	.14	400	135.7	95	17.0
Sylvester	300	0.5	600	2,351.2	.13	150	40.0	20	13.0
Wilson	300	0.5	600	2,157.1	.14	150	50.0	25	12.0
Stadel	187	0.5	374	721.8	.26	90	50.0	25	9.0
Welton	250	0.5	500	1,567.8	.16	125	30.0	15	7.4
Robert	459	0.5	918	1,908.2	.24	225	60.0	30	15.2
Rudolph	350	0.5	700	2,214.8	.16	175	40.0	20	15.0
Bergeson	350	0.5	700	1,183.7	.29	175	80.0	40	14.0
Anderson	473	0.5	946	2,366.0	.20	None	70.0	35	16.0
Bender	400	0.6	560	1,971.4	.20	200	83.3	50	13.1
Hageman	270	0.5	540	1,312.9	.20	135	40.0	20	12.4
O'Neal	300	0.5	600	1,561.1	.19	150	44.0	22	11.5
Lippert	380	0.5	760	1,989.6	.19	165	44.0	22	15.1
Bergsten	230	0.5	460	1,183.7	.19	115	60.0	30	12.8
Pishney	380	0.5	760	1,949.1	.19	165	100.0	50	11.0
Hagermaier	261	0.5	523	1,453.3	.18	131	160.0	80	14.8
Rundquist	530	0.5	1,060	2,313.6	.22	265	70.0	35	16.6
Wood	320	0.5	640	1,648.4	.19	160	50.0	25	11.5
Anderson	180	0.5	360	1,461.8	.12	90	60.0	30	10.2
Avery	600	0.5	1,200	3,953.6	.17	300	160.0	80	15.4
Total			32,159	96,295.7	14.62	8,044	3,717.3	2,299	
Average			487	1,459.2	.22	146.25	56.3	34	

owners would have had to pay more than $1,000 for one surface acre of water, while one paid less than $50 per acre, the average being $487 per surface acre.

Preconstruction Activities

Ponds that leak are a waste of space and money. Two ponds lost all but a few inches of water in a short time. Thirty of the 66 ponds showed that they leaked since the area below the fill was wet and muddy. One pond observed had a rock shelf in one side that was about 30 feet long; this rock shelf would drain off part of the water the pond was capable of holding. During wet weather and for about four or five days after the rains the pond would be filled to about four feet over this rock layer. By the end of a week the water in the pond would be down to this layer of rock and would hold close to that level for several weeks, as is shown in Plate I, Fig. 1.

Tree trunks, rocks and other debris from the reservoir area were probably incorporated in the fill and those particles could cause a pond to leak. Some of the cause for leaking could probably be traced to gravel layers.

One of the very first things that was done after the decision to build a pond, was to select the best possible site according to the nature of the soil. Tiemeier (1951) states that soil borings should be made at the possible site of the fill to determine the soil composition. The Production and Marketing Administration specifies that at least seven test borings three feet deep should

be taken - one in the spillway area, one at each end and center of the dam location, and three in the reservoir area. Ponds built over rock layers, sand or gravel layers will leak, and the effectiveness of the pond lost.

The staking out of the dam, spillway, waterlevel, drainage pipes and trickle tubes were considered preconstruction activities. The Soil Conservation Service representatives were considered the experts in that field and the pond location and staking were left to that organization. The Production and Marketing Administration has done the staking on occasions when a Soil Conservation Service representative was not available.

Equipment Used Making the Pond

Two pieces of equipment, the bulldozer and scraper, were used in constructing the pond. When asked the question about the type of equipment used the farmer would promptly answer that the bulldozer had been used, but upon further questioning he would admit that the scraper had been used. Four earthmoving companies were contacted and asked the type of equipment they used in farm pond construction. They all used bulldozers and scrapers on the ponds that they had constructed. These four companies were the companies that constructed the ponds visited during this survey.

The scraper could be used to lay a more uniform layer of earth and the moving back and forth across the fill would do much to improve the packing of the fill. The bulldozer, on the other hand, would tend to move the earth farther and higher than was

necessary because it would push the earth to the top of the fill each time and allow it to fall on either side. The packing of the fill would be sufficient on the upstream side, but with only a minimum amount of packing on the downstream side. Packing down through the fill, as a result of using the bulldozer, would be insufficient to insure a tight bond.

Size of the Pond

The only size ponds considered in the survey were those that were one-half surface acre or larger as shown by Table 1. Tiemeier (1951) states ponds that were less than one-half surface acre were not considered suitable for stocking with fish, and he further recommends that they be one to three surface acres in size.

Clay Core

Fortunately in Riley County Kansas the type of soil found does not make the construction of a clay core of paramount importance. Nevertheless the responsibility rests with the contractor to see that the compacted corewall was made if necessary. In other regions of the state, however, it would be of the utmost importance to be sure that the core was of clay. The fills observed on the survey, without exception, were made entirely of clay.

Laying the Earthen Fill

The owners were not certain that the fill had been made in layers. They thought that the bulldozer had rammed the earth from the reservoir into the fill area. As the dam grew in height the bulldozer would ram more earth from the reservoir up the upstream side to the top of the dam and allowed it to roll down on either side. Some thought that the earth had been moved into the fill area by the scraper and dumped in a pile. The bulldozer would ram down these piles and level them out packing the fill layer by layer. Clark (1950) states that a fill should be laid in a layer at a time, about six inches deep, and then should be thoroughly packed before the next layer is put in the fill. The side slope should be insured as the fill is increased in height.

Slope Ratio

The usual ratio employed in building a fill was a 3-1 upstream ratio and a 2-1 downstream ratio. In only one pond was the ratio different than 3-1 on the upstream side and in that pond it was 1½-1. That particular fill had been laid between two rows of trees and the trees were used to retain the walls of the fill. Production and Marketing Administration payments were not made on that pond.

Top of Dam Width

There was considerable variation in the top of the dam width varying from six to twenty feet in the 66 fills observed. All of the fills were fenced and none of them was used for roadways so there was no apparent reason for the extra wide tops of dams. According to Tiemeier (1951) the width of the dam at the top should be at least eight feet. If the top of the dam was to be used for a road it should be even greater.

CHARACTERISTICS OF THE POND AND DAM

Use of the Pond

The farm pond has many uses, primarily livestock watering, but it may also be used for fire control, irrigation, various types of recreation, fish production, habitat for farm game and to aid in flood and erosion control. According to Tiemeier (1951) the pond undoubtedly has more uses than any other farm development.

Eleven of the 66 owners and their families and friends used the ponds for recreational purposes. The type of recreation participated in may be found in Table 2. Swimming was the most popular recreation, but a great deal of fishing was done. Two ponds had duck blinds and boats for hunting ducks; however, other game hunting was at a minimum because of the hunting restrictions imposed by the state on the hunting of upland game birds. All the farmers expressed a great deal of enthusiasm for rabbit hunt-

ing right after the first snow of the winter.

The fact that all but two of the 66 ponds were left open to livestock made them unattractive as recreational points of interest because, due to the cattle, the water became muddy and contaminated with the deposition of urine and feces in them. The cattle also caused the edges of the pond to be bare as a result of overgrazing. More attention should be given to fencing if the pond is to be used for recreation. Plate I, Fig. 2 shows the fencing required by the Production and Marketing Administration.

Condition of the Water

A home made Secchi disc was used to determine the depth of clearness. The disc was made from a coffee can lid filled with plaster of paris and a piano wire ruled in inches and then embedded in the plaster of paris. The depth in inches that the Secchi disc could be seen ranged from six to 50 inches and the average depth was 11½ inches. The findings of the turbidity readings are given in Table 2.

The clearness and condition of the water were taken to obtain some idea as to the fertility of the water. Findings from this survey indicate that ponds in Riley County Kansas were fertile enough to support the relatively few pounds of fish actually taken from the ponds stocked.

EXPLANATION OF PLATE I

Fig. 1. Rock ledge shown in side of pond by arrow.

Fig. 2. Fencing and vegetation of an earthen fill.

Table 2. Types of recreation, turbidity and types of protective vegetation.

Name	Type of recreation	Turbidity reading (inches)	Spillway protection	Dam vegetation
Rubart	None	8	Grassway	Native grass
Leidig	None	8	Grassway	Native grass
Thierer	None	12	Grassway	Native grass
Roth	None	11	Sod	Sod
Schurle	Swimming	20	Rock	Native grass
Dobert	None	10	Grassway	Brome
Walter	None	50	Grassway	Weeds
Walter	None	11	Rock	Native grass
Schwab	None	10	Grassway	Native grass
Beichter	None	10	Grassway	Native grass
Englund	None	9	Grassway	Native grass
Rudolph	None	10	Grassway	Native grass
Stienbock	None	6	Grassway	Weeds
Stienbock	None	15	Rock	Trees-grass
Thierer	None	12	Grassway	Native grass
Brandenburg	None	10	Grassway	Weeds
Brandenburg	None	10	Grassway	Weeds
Brandenburg	None	10	Grassway	Weeds
Hoerner	None	9	Grassway	Weeds
Dodge	None	7	Grassway	Native grass
Bearman	None	10	Grassway	Native grass
Kunze	None	12	Grassway	Native grass
Henry	None	12	Grassway	Native grass
Fredrick	None	10	Grassway	Native grass
Lumb	None	10	Grassway	Native grass
McNeil	Swimming	10	Grassway	Native grass
McNeil	Hunting	11	Grassway	Native grass
Fosha	None	13	Grassway	Native grass
Morris	Swimming	10	Grassway	Weeds
Barr	None	4	Grassway	Weeds
Fosha	None	10	Grassway	Native grass
Stafford	None	11	Grassway	Native grass
Bohnanblush	None	10	Grassway	Native grass
Morris	Swimming	12	Grassway	Native grass
Huston	None	11	Grassway	Native grass
Schauer	Swimming	12	Grassway	Native grass
Schauer	Boating	12	Grassway	Native grass
Klocke	None	11	Grassway	Native grass
Peterson	Skating	11	Grassway	Native grass
Randal	None	13	Grassway	Weeds
Harrison	None	no test	Grassway	Meadow
Still	None	12	Grassway	Native grass
Bruenger	None	11	Grassway	Brome
Rundquist	None	12	Grassway	Brome
Frohn	None	11	Grassway	Native grass
Swenson	None	14	Stone	Native grass
Oman	None	13	Grassway	Weeds
Sylvester	None	12	Grassway	Native grass
Wilson	Swimming	12	Weeds	Weeds
Stadel	Swimming	12	Grassway	Weeds
Welton	None	12	Grassway	Native grass
Robert	None	12	Rock	Native grass
Rudolph	None	11	Grassway	Native grass
Bergeson	None	13	Grassway	Native grass
Anderson	Swimming	7	Grassway	Native grass
Bender	None	11	Grassway	Native grass
Hageman	None	12	Grassway	Native grass
O'Neal	None	12	Grassway	Native grass
Lippert	None	12	Grassway	Native grass
Bergsten	None	12	Grassway	Weeds
Pishney	None	12	Grassway	Native grass
Hagermaier	None	12	Grassway	Native grass
Rundquist	None	12	Grassway	Native grass
Wood	None	12	Grassway	Native grass
Anderson	None	14	Grassway	Weeds
Avery	None	12	Grassway	Native grass
Total		759		
Average		11.5		

Depth of the Water

There was no attempt to actually measure the depth of water during this survey, but the owner's estimate as to the depth of the water in his pond was used. Table 1 shows the Production and Marketing Administration record of maximum depth. The depth of a pond should insure sufficient water storage during dry years. In January, 1952, 15 of the 66 ponds were visited to observe the water level and to see if any types of wildlife had been found about the pond. These 15 ponds which had been full in late October and early November contained less than a foot of water in January. Each farmer admitted that he had too many cattle using the pond during the period from mid-November to mid-January and they are planning new ponds on their lands to be built this spring. They may be able to get a better distribution of grazing about the ponds, as the immediate area around the ponds was heavily grazed. Three of the 15 owners had lost fish by winterkill and too little water. The owners wanted to relieve that situation next year by insuring fish a sufficient depth of water as well as enough water for their livestock. According to Tiemeier (1951), if the pond is to be used in fish production it should be deep enough to supply adequate water during dry years and during the winter should be at least five feet deep to prevent winterkill.

Weed Control

According to the findings of the survey none of the ponds

was troubled with weeds. The fact that 64 of the 66 ponds surveyed were not fenced probably influenced the absence of weeds in the pond. Cattle were allowed to graze down to the water's edge and to go into the water. Undoubtedly weeds that were growing on the edge of the pond would be grazed with the grasses growing at the edge. Cattle wading into the pond to drink would also stir up the mud from the bottom of the pond. The green submerged vegetation might have been controlled by the sunlight needed for photosynthesis being reflected and not penetrating the water to the depth to which the vegetation grows because of the suspended mud particles. Swingle and Smith (1950) stated that they would expect weeds in new ponds by the end of the first year. Such ponds would eventually become choked with weeds and upset the balance sought in fish production.

Trickle Tube

Only five of the 66 ponds surveyed were equipped with a trickle tube. Some spillway failure could be eliminated by the use of this structure as the trickle tube carries off small amounts of water, which would otherwise be carried off by the spillway causing it to erode. Spillways are designed to take off great volumes of water immediately after the moisture has fallen and are not designed to take a continuous trickle. The period of time covered by the greater volumes of water would be short and damage to the spillway would be negligible if the trickle tube were constructed. Tiemeier (1951) states that if the

spillway has to carry a continuous trickle of water for a longer period of time serious erosion would take place. See Fig. 1, Plate II for the cement collar of a trickle tube located about one foot below a poorly vegetated spillway.

Draining

Three ponds of the 66 surveyed could be drained. Draining of the pond and installation of trickle tubes appeared to be two important features that were consistently neglected. According to Tiemeier (1951) farm ponds that are to be used for fish production will get out of balance with respect to certain of the fish within three to five years. A method of draining the pond could be provided, the fish collected and the fish program started anew. Tiemeier (1951) further states that a means of draining and a method of stock watering below the fill may be incorporated in the same pipe. Davison (1947) says that the quickest and surest cure for a mistake in stocking is to drain the pond and restock it correctly. Fish have been known to die from unexplained causes and undesirable fish may gain entrance to the pond; if these faults are found in a pond they may be quickly remedied by draining the pond.

Rod and line fishing will catch a number of pounds of fish per year, but if the desire is for a big harvest then the pond would have to be drained before all the fish could be taken.

The draining of a pond is important if repair or added work is needed, and it keeps the pond from filling before construction

is completed.

Spillways

Apparently spillway construction was adequate in Riley County Kansas as only one of the 66 surveyed had a spillway that was seriously eroded, Plate II, Fig. 2. The spillways should have carried considerable amounts of water during the summer of 1951. The annual precipitation for this region is 30 inches per year, but in 1951 there were 60 inches of rain. The area suffered heavy losses from severe floods; therefore, the amount of water passing through the ponds should have been great. The spillways would have been called upon to carry large volumes of water during the summer and, as the survey was conducted after the flood period, the fact that the spillways were not eroded speaks well for their carrying capacity. No overtopping of the fill was found which would also tend to indicate that the spillways were adequate to carry off the water from the pond during periods of heavy rainfall.

The spillways were usually well vegetated. However, some instead of having vegetation were solid rock. A large rock ledge was the only thing that saved the pond shown in Plate II, Fig. 2 when the spillway became eroded. A complete list of the vegetation with which the spillways were covered is given in Table 2.

According to Hamilton (1940) the success of a pond depends upon the success of the spillway. One of the most frequent causes for pond failure is that spillways are not large enough. He

EXPLANATION OF PLATE II

Fig. 1. The cement collar of a trickle tube.

Fig. 2. Erosion of the spillway and showing rip rap of the fill.

PLATE II

Fig. 1.

Fig. 2.

further states that natural sod should remain undisturbed in the spillway, for if disturbed it would only lead to the need for revegetation. In a constructed spillway, if deemed necessary, fertilization and seeding should take place immediately to supplement natural sod as spillway cover.

Dam Vegetation

A list was compiled during the survey of the various types of vegetation found on the fills, and is entered in Table 2. None of the fills that was observed in the survey was without some type of vegetation. Native grasses and sod were the most frequent types of vegetation found. One fill had trees planted on it and both the dam and the trees were a year old with no appreciable damage noticeable. One fill was established between two rows of trees that were about 12 feet apart. It was thought by the owner that the double lines of trees formed an anchor for the fill and decreased wave action on it. Wave action was not an important problem in Riley County Kansas, nor was it considered necessary to anchor the fill; therefore, the owner's reasons were not valid. The selection of the site was a poor one and was not approved by the Production and Marketing Administration nor the Soil Conservation Service. The pond was successful, however, even though it violated the principle of not planting deep rooting vegetation on the fill.

Livestock Control

Two of the 66 ponds surveyed were fenced. In one of the two ponds the entire purpose of the pond was destroyed by no facilities being provided for watering the stock. While a wildlife conservationist would like to see ponds used for fishing and the encouragement of wildlife, he does not contend that they be specifically set aside for recreation, but should be used as they were originally intended, to supply water for the production of marketable cattle.

Livestock should be kept off the fill, at least. Their continued trampling and grazing would bare the fill and open it to serious erosion. According to Hamilton (1940) complete fencing in the central states was recommended to protect vegetation, relieve pollution of the reservoir and establish an environment beneficial to wildlife. Plate III, Fig. 1, shows a well vegetated fill with stock watering facilities provided below the fill.

CHARACTER OF THE DRAINAGE AREA

Surrounding Area

Pasture land was the predominant agriculture of the surrounding area. The principal vegetation of the drainage area was an average stand of bluestem (Andropogon scoparius) as shown in Table 3. A pond is usually considered no better than the drainage area because the fertility and the length of effective usefulness are

Table 3. Nature of the drainage area.

Name	Principle vegetation of the drainage area	Special erosion control	Cultivated land in the drainage area
Rubart	Bluestem	None	None
Leidig	Bluestem	None	None
Thierer	Bluestem	None	None
Roth	Bluestem	Sod	None
Schurle	Bluestem	None	None
Dobert	Bluestem	None	None
Walter	Native grass	None	None
Walter	Bluestem	None	None
Schwab	Bluestem	Small trees	None
Beichter	Bluestem	Trees	None
Englund	Bluestem	None	None
Rudolph	Native grass	None	None
Stienbock	Native grass	None	36%
Stienbock	Native grass	None	40%
Thierer	Bluestem	None	None
Brandenburg	Bluestem	Terraced	None
Brandenburg	Bluestem	None	None
Brandenburg	Bluestem	Terraced	25%
Hoerner	Bluestem	None	None
Dodge	Bluestem	None	33%
Bearman	Bluestem	None	None
Kunze	Bluestem	None	None
Henry	Bluestem	None	None
Fredrick	Bluestem	None	None
Lumb	Bluestem	None	None
McNeil	Bluestem	None	None
McNeil	Bluestem	None	None
Fosha	Bluestem	Terraced	40%
Morris	Bluestem	Terraced	None
Barr	Bluestem	None	None
Stafford	Bluestem	None	None
Fosha	Bluestem	None	40%
Bohnanblush	Grain	Terraced	80%
Morris	Bluestem	None	None
Huston	Bluestem	None	None
Schauer	Bluestem	None	None
Schauer	Bluestem	None	75%
Klocke	Bluestem	None	None
Peterson	Bluestem	None	None
Randal	Bluestem	None	50%
Harrison	Native grass	None	None
Still	Bluestem	None	None
Bruenger	Bluestem	None	None
Rundquist	Bluestem	None	None
Frohn	Bluestem	None	None
Swenson	Native grass	None	33%
Oman	Bluestem	None	None
Sylvester	Bluestem	None	None
Wilson	Native grass	None	None
Stadel	Bluestem	Terraced	60%
Welton	Bluestem	None	None
Robert	Bluestem	None	13%
Rudolph	Bluestem	None	None
Bergeson	Bluestem	None	None
Anderson	Bluestem	Terraced	None
Bender	Bluestem	None	None
Hageman	Bluestem	None	None
O'Neal	Bluestem	None	None
Lippert	Bluestem	None	None
Bergsten	Bluestem	None	None
Pishney	Bluestem	None	None
Hagermaier	Bluestem	None	None
Rundquist	Bluestem	None	14%
Wood	Bluestem	None	None
Anderson	Bluestem	None	33%
Avery	Bluestem	None	None

dependent upon the drainage area. The drainage acreage of the ponds surveyed varied from 10 to 95 acres, the average being 34 acres. Drainage per surface acre ranges from 11.1 to 160 acres, the average being 56.3 acres. The drainage area appears to be excessive for most of these ponds. It would be virtually impossible to fertilize the ponds as heavy rains would dilute the fertilizer. The larger drainage areas would deposit more silt in the ponds. Data for drainage acres and for drainage per surface acre will be found in Table 4.

The life of a pond depends upon grasslands cutting down on the silt deposition in the pond. The natural fertility of the land determines the mineral content that goes into the pond. If the mineral content is high the pond will be fertile and fish feeding upon plant materials will have plenty of food. The Production and Marketing Administration requires that before payments will be made any cultivated land appearing in drainage areas must be adequately controlled to prevent silting of the pond.

Special Erosion Control

As shown by Table 3 there has been little done to control erosion in gullies. One pond had three silt basins that aided in controlling erosion in the drainage area of that pond. Gullies were allowed to continue their cutting back into pastures and fields. Planting those areas to soil binding and wildlife cover materials would have aided the pond considerably, as well as the wildlife. In the ponds special erosion controls would cut down

silt deposition. The planting of gullies to some type of vegetation would offer cover for wildlife in winter and would provide them with food.

Cultivated Land

The cultivated land in the drainage areas had been well managed. In all the cases where cultivated land appeared, erosion control practices were being carried out. The percentage of cultivated land appearing in the drainage area will be found in Table 3. The terraces observed had not been put in vegetative cover and were somewhat eroded. Plate III, Fig. 1, shows the results of poor control of cultivated land in the drainage area.

Condition of Silt Basins

The five ponds that had silt basins definitely showed the benefit of the basins in clearer and deeper water at the inlet. A silt basin is a small pond upstream from the main pond which collects the water from the drainage area before it goes into the main pond. The water is held long enough for the suspended soil particles to settle out; then the water flows over a spillway into the main pond. In these five ponds there was no place at the inlet where a silt island had developed that would provide footing for weeds to get a start in the pond.

A silt dam across the inlet to a pond would aid materially in freeing the pond of silt. The structure would cost very little

and could probably be built in one or two hours. No special type fill structure is necessary, only a bank to slow down the water and a depression to hold it for a time so that silt might settle out before going to the pond. This depression could be cleaned and dredged in a short time during dry periods. Plate III, Fig. 2, shows silting in an inlet of a pond with weeds getting a start.

STOCKING THE POND

Species of Fish Stocked

Forty-two of the 66 owners had fish in their ponds, as stated in Table 4, which shows that 17 of these had had their ponds stocked by the Forestry, Fish and Game Commission, and one owner had his pond stocked by the United States Fish and Wildlife Service. Table 4 also shows that these ponds had been stocked with bass (Micropterus dolomieu), bluegill (Lepomis macrochirus). crappie (Pomixix nigro-maculatus), and channel catfish (Ictalurus lacustris) according to the best ration for the combination desired. The other 24 owners had stocked the ponds themselves with channel catfish and bullheads (Ameiurus nebulosus). One owner of the 24 had stocked with bullheads and green sunfish (Lepomis cyanellus). These owners had not followed any ratio in stocking. They had placed fish in their ponds after catching them out of the streams and rivers. Nineteen of the 24 owners had stocked their ponds with catfish, three with bullheads, one with catfish and bullheads, and one with green sunfish and bullheads.

EXPLANATION OF PLATE III

Fig. 1. Stockwatering facilities below the fill.

Fig. 2. Silt forming in the inlet and trees on the fill.

PLATE III

Fig. 1.

Fig. 2.

Table 4. Wildlife utilization.

Name	Fish stocked	Combination/acre	When year	Who stocked	Pounds taken/year	Waterfowl seen
Rubart	None					None
Leidig	None					None
Thierer	Catfish	None	1946	Self	25	Few
Roth	Bullheads	None	1946	Self	None	Few
Schurle	Ba-bl-cr*	1-3-1	1949	FF & GC**	None	Few
Dobert	None					None
Walter	Bl-bu	None	1950	Self	50	Few
Walter	Catfish	None	1947	Self	75	None
Schwab	None					None
Beichter	Ba-ca-cr	1-1-1	1945	FF & GC	50	Few
Englund	None					None
Rudolph	None					None
Stienbock	None					None
Stienbock	Ba-bl	3-1	1949	FF & GC	50	None
Thierer	Catfish	None	1947	Self	None	None
Brandenburg	Ba-bl-ca	1-3-1	1950	FF & GC	None	Few
Brandenburg	Ba-cr-ca	1-1-1	1950	FF & GC	None	Few
Brandenburg	Ba-cr-ca	1-1-1	1950	FF & GC	None	Few
Hoerner	Ba-bl	3-1	1948	FF & GC	None	Few
Dodge	None					None
Bearman	Catfish	None	1948	Self	None	None
Kunze	Catfish	None	1948	Self	None	None
Henry	Ba-bl	3-1	1948	FF & GC	Unknown	Few
Fredrick	Ca-bu	None	?	Self	None	None
Lumb	None					None
McNeil	Ba-bl-cr	1-3-1	1948	FF & GC	50	Few
McNeil	Ba-bl-cr	1-3-1	1950	FF & GC	None	Few
Fosha	Catfish	None	1950	Self	None	None
Morris	Catfish	None	1950	Self	None	Few
Barr	None					None
Fosha	Ba-cr-ca	1-1-1	1950	FF & GC	None	None
Stafford	Catfish	None	1948	Self	15	None
Bohnanblush	None					None
Morris	Ba-bl	3-1	1949	FF & GC	50	None
Huston	Catfish	None	1949	Self	None	None
Schauer	Catfish	None	1951	Self	None	Few
Schauer	Ba-bl-cr	1-3-1	1950	FF & GC	None	Few
Klocke	None					None
Peterson	Ba-bl	3-1	1950	FF & GC	25	None
Randal	Bullhead	None	?	Neighbors	?	None
Harrison	None					None
Still	Catfish	None	1948	Self	20	None
Bruenger	Catfish	None	1948	Self	None	None
Rundquist	Ba-bl	3-1	1951	F&W Service#	None	None
Frohn	Catfish	None	1951	Self	None	None
Swenson	None					None
Oman	Ba-bl	3-1	1951	FF & GC	None	None
Sylvester	None					None
Wilson	None					None
Stadel	Catfish	None	1950	Self	None	Few
Welton	Ba-bl	3-1	1951	FF & GC	None	None
Robert	None					Few
Rudolph	Catfish	None	1951	Self	None	None
Bergeson	None					None
Anderson	Catfish	None	1935	Self	50	Few
Bender	None					None
Hageman	None					None
O'Neal	None					None
Lippert	Catfish	None	1951	Self	None	None
Bergsten	None					None
Pishney	Catfish	None	1951	Self	None	None
Hagermaier	None					None
Rundquist	None					None
Wood	Catfish	None	1951	Self	None	None
Anderson	Ba-bl	3-1	1951	F&W Service	None	None
Avery	Ba-bl	3-1	1951	FF & GC	None	None

* ba-bass, bl-bluegill, cr-crappie, ca-catfish, and bu-bullhead
** FF & GC -- Kansas Forestry, Fish and Game Commission
# F&W Service -- United States Fish and Wildlife Service

Combination in Stocking

When the bass-bluegill combination was followed the 3-1 ratio was used, which was 75 per cent bluegill and 25 per cent bass, or 300 bluegills-100 bass per acre of water. The bass-bluegill-crappie in a 1-3-1 ratio was followed - 20 per cent bass, 60 per cent bluegill and 20 per cent crappie, or 100 bass, 300 bluegill and 100 crappie. The bass-crappie-catfish was a 1-1-1 ratio, 33 and 1/3 per cent of each species, or 100 bass, 100 crappie, and 100 catfish per acre of water. The bass-bluegill-bullhead was a ratio of 1-3-1, 20 per cent bass, 60 per cent bluegill and 20 per cent bullhead, or 100 bass, 300 bluegills, and 100 bullheads. No combination was followed when the owners themselves stocked the pond and the number placed in the pond was not known. The ponds were stocked approximately a year after the completion of the pond. The year of stocking is shown in Table 4. Fifty per cent of the 42 ponds were stocked in 1950 and 1951. The earliest stocking was done by the owner in 1935.

Pounds of Fish Taken

Of the 42 owners, only 11 had any idea of the pounds of fish taken from their ponds, as indicated in Table 4. The highest estimate was 75 pounds and the smallest was 15 pounds. The average number of pounds taken was 41 pounds. Tiemeier (1951) states that ponds in Kansas are capable of producing from 150 to 200 pounds of fish per acre per year.

Apparently the owners are not fishing or allowing their ponds to be fished heavily enough. To take 50 pounds of fish from an acre when it is capable of yielding 150 to 200 pounds is a waste of a valuable food supply.

DISCUSSION

In order for a pond to be successful as a means of watering livestock and as a possible habitat for wildlife the farmer must have incorporated certain items when the pond was constructed and must keep up the area around the pond after construction.

If a farmer is interested in providing a recreational ground for his family and is using his pond for fish production he should fence the area around the pond. Fencing is the most essential item in a successful farm pond. The Production and Marketing Administration requires that the fill only be fenced to protect it from the cattle, but also advocates and encourages the fencing of the whole pond area. Apparently farmers are not aware of the value of fencing the entire pond area. A pond that is not fenced will become only a wallow and its value as a recreational point or for fish production and stock-watering will be lost. The Production and Marketing Administration will pay up to 50 per cent of the cost of fencing so the cost to the farmer is not high and will increase the value of his pond immeasurably. Some farmers thought that fencing would require too much time keeping it in repair. The size of the average farm in Riley County Kansas is not so large that the time spent in inspection of the pond fencing would be

prohibitive. It is felt that the Production and Marketing Administration specifications concerning fencing should be changed to include the complete fencing of the pond.

Multiflora rose could be used as a living fence and when full growth is attained the farmer would be relieved of the inspection of the fence. Not only does multiflora rose make an excellent fence but it is a thing of beauty during the flowering period and would be very attractive for the recreation area. In addition the small red berries make excellent winter food for game and song birds which add to the charm and usefulness of the pond. Multiflora rose was not found on any of the 66 pond sites visited in this survey.

The area around the ponds was very heavily grazed almost to the point of being barren. Cow manure was evident everywhere and the edge of the ponds was chopped up by the cattle hoofs cutting into the soft bank. The cattle, as they waded in the pond, stirred up the bottom mud, causing the pond to be a murky yellow color. In addition to stirring the mud from the bottom, urine and feces were deposited in the pond. This condition would not make the pond conducive to recreational purposes and fish production. Fencing would eliminate this condition and add to the value of the pond.

Much more attention should be given to providing the ponds with draining facilities. The farmer probably never gave this structure much thought, but the Production and Marketing Administration and the Soil Conservation Service should assure the farmer that it is a worthwhile structure. If, however, the pond

is not fenced there is no reason to waste the extra money it would cost to install a means of draining. The pond is no good for fish production when cattle are allowed in it and it is of very little value to the cattle when they are allowed to contaminate it. Cattle in the pond do more harm than can ever be remedied by draining the pond and allowing it to refill.

In the matter of fish production in the farm pond, much can be said for an adequate means of draining the pond. Three of the 66 ponds visited during this survey could not be drained at all. If something should happen to the fish balance in a pond the only effective way to remedy this would be to drain the pond, allow it to refill, and then introduce a new culture of fish.

The production of fish is not the only reason a pond might need to be drained. If repairs are needed or the pond should leak, the only procedure is to drain the pond, and make the necessary repairs. A pond in need of repairs or leaking is virtually a useless structure.

Again, in fish production the owner may want to harvest all of his fish at one time and a means of draining the pond would be of immeasurable value. Seining would collect less than 50 per cent of the fish while draining would assure the owner that all the fish would be taken.

Assuring a long life for a farm pond has several ramifications. The pond should be built to give the longest possible use. Fencing, as mentioned before, is of the utmost importance if the usefulness of the pond is to be prolonged. Aside from fencing the first consideration is that the pond should have adequate

depth to insure plenty of water for stock and fish production. Fifteen ponds visited in January, 1952 were within a few inches of being dry; therefore, these ponds did not insure plenty of water for stock or for fish production. Second, the fill should be so constructed that it will retain water for a sufficiently long time between rains. If a fill should leak the usefulness of the pond is lost. Third, an adequate spillway is necessary to carry away excess water immediately after a rain storm. The spillways were apparently adequate as this survey was conducted after the floods of 1951 and none was seriously eroded. In only one case was the pond in any danger of being lost by spillway failure. The spillway should be wide enough to carry any amount of water so the fill will not be overtopped during heavy rainfall. It should be vegetated so it will not erode when water passes through it. If the spillway does erode with the passage of water, it will soon wear down and the pond will not hold water. Fourth, is the question of trickle tubes. The Production and Marketing Administration decides whether or not the trickle tube is absolutely necessary. Apparently they felt that in this area the trickle tube was not of paramount importance as only five ponds were equipped with a trickle tube. It is true that only one of the spillways observed was in any way eroded, but it is felt that the trickle tube should be more extensively used as a safety factor in the protection of the pond. One prolonged rainy season would cause the spillway to be seriously eroded by carrying a small trickle of water over it. All of these structures have been in the immediate area of the pond and fill, but there are other areas

that would affect the length of time that a pond is useful.

The drainage area should be in grassland to protect the pond from silting. Fourteen ponds of the 66 surveyed had cultivated land in their drainage area. If cultivated lands are not controlled by terracing and contour plowing the pond may collect large amounts of silt in a short time and thus become useless. All of the cultivated land draining into the ponds surveyed was adequately controlled. Another feature which would control silt deposition in the pond is the silt basin. It was only used in a few ponds and farmers were not aware of the value of cutting down silt deposition. They expect someday to let the pond go dry or pump the water out and then dredge the pond. Dredging is an expensive operation and probably cannot be done profitably. It is much better to prolong the life of the pond by controlling silt. If fish production is to be one of the main features of the pond, the problem of silt then becomes very important. Many game fish must see what they eat and if the water is carrying silt the food is hidden from them. Other fishes live on plant materials in the water and silt will kill out green plant materials by cutting out the sun's rays. In any event the pond is not attractive as a point of recreational value when the water is discolored by silt.

One more point observed about fish production is that apparently little attention was given to the condition of the water when selecting the fish combination for stocking. Game fish are the most desired, especially bass and bluegill, but the water needs to be clear for these species and the condition of the water might warrant another combination that would give a higher yield

per acre in less clear water.

The purpose of this survey was to correlate a certain phase of wildlife conservation with good land management in Riley County, Kansas. Wildlife is a product of the land and the way a farmer uses his land has a profound effect upon the wildlife inhabiting the area. If the farmer practices clean farming, doing away with field borders, then wildlife is robbed of a valuable habitat. Odd areas in a farm are often cleared and planted to some harvestable crop when they could be placed to better use as wildlife cover.

The farm pond presented an excellent opportunity to study a wise land management practice and to observe the effects that it might have upon wildlife. In addition to being a potential wildlife habitat the farm pond has a high recreational value for the farm family.

CONCLUSIONS

1. Odd areas in the drainage area and in the immediate vicinity of the pond were not being utilized as possible wildlife habitats.

2. Planting of trees and multiflora rose was not used around the ponds to enhance the beauty of the pond and provide a fence and wildlife cover.

3. Emphasis in most cases was not placed on the desirability of draining the pond.

4. The desirability of a trickle tube being built in the fill was not emphasized sufficiently.

5. The desirability of the pond being fenced was grossly neglected.

6. Farmers were not aware of the Kansas Water Storage Law which would save them substantial sums in taxes.

7. Farm ponds were not being utilized as much as they might be for recreational purposes.

8. More attention should be given to the control of silting in the pond.

9. Spillways and dams were well vegetated and apparently well cared for indicating the owner's concern for success of these structures.

10. Livestock needs to be controlled about the pond as their unrestricted access to the pond makes it undesirable for recreational purposes and adversely influences the production of fish.

11. Ponds were well located in relation to drainage area and to types of vegetation dominating the drainage area.

12. Erosion control was adequate in pond areas where there was cultivated land.

13. Farm ponds that were stocked, were not adequately fished.

ACKNOWLEDGMENT

The author wishes to thank Doctor Otto W. Tiemeier for the many excellent suggestions he offered during this survey and for his critical reading of this manuscript.

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APPENDIX

Appendix A: The questionnaire used in conducting this survey.

I. Construction, payments, methods of construction and value of the pond.

1. When was the pond constructed?
2. Who constructed the pond?
3. Did the Soil Conservation Service or the Production and Marketing Administration aid in the construction?
4. What was the cost of construction?
5. What were the preconstruction activities on the pond site?
6. Were Production and Marketing Administration payments made, or not?
7. What type of equipment was used in making the pond?
8. What is the size of the pond?
9. Is the dam core of clay? If not, what was used?
10. Was the dam made in layers or was it piled in and leveled by a bulldozer?
11. What is the ratio of slope in the fill?
12. How wide is the dam across the top?
13. Is there a decrease in the assessed valuation?

II. Characteristics of the pond and dam.

1. What is the pond used for? Is the pond used at all for recreation? What types?
2. What is the clearness of water?
3. What is the condition of the water?
4. What is the depth of water? Are there any deep holes?
5. Are weeds controlled in the pond? If so, how?

6. Does the pond have a trickle tube?
7. Can the pond be drained? What is provided for draining?
8. What is the size of the spillway? How is it kept from eroding?
9. How is the dam vegetated?
10. How are livestock controlled around the pond? Is the pond fenced off from the stock?
11. What are the facilities for watering stock?
12. List of aquatic plants:

III. Character of the drainage area.

1. What is the nature of the surrounding ground?
2. What is the principal vegetation of the drainage area?
3. What erosion control of the watershed is practiced?
4. Are gullies in the drainage area kept from eroding? How?
5. Is there any cultivated land in the drainage area?
6. What is the condition of the silt basin, if there are any?
7. What is the area below the dam like?
8. Are the enemies of wildlife controlled?
9. Is the area trapped? If so, what is caught? Is it of any value as fur?

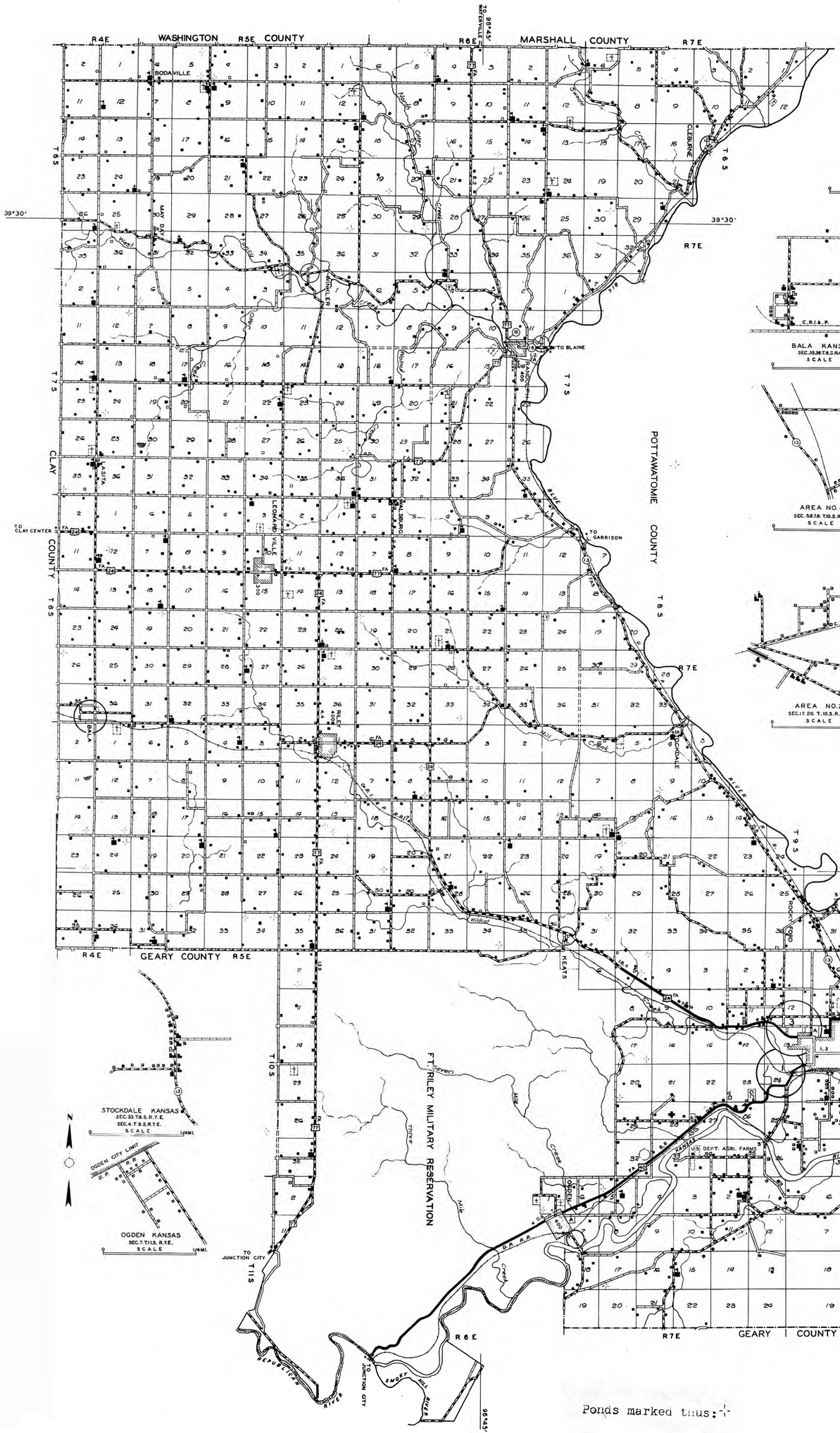
IV. Stocking the pond.

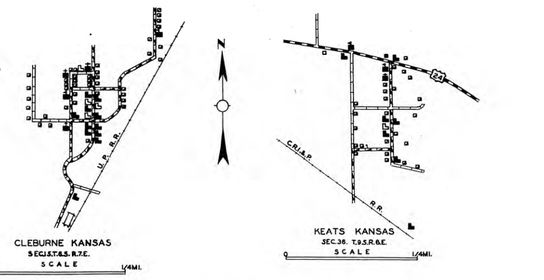
1. With what kind of fish is the pond stocked?
2. What combination was followed in stocking?
3. When was the pond stocked?
4. Who stocked the pond?
5. About how many pounds of fish are taken from the pond?
6. If rough fish are present how are they controlled?

How many ducks and geese are attracted to the pond?

V. Personal evaluation of this pond.

APPENDIX B





LEGEND

ROADS AND ROADWAY FEATURES

- PRIMITIVE ROAD
- UNIMPROVED EARTH
- IMPROVED EARTH
- METAL SURFACED (GRAVEL & STONE, CHATS, ETC.)
- BITUMINOUS SURFACED (B.S.T., BIT. MIX)
- PAVED SURFACE (CONCRETE, BRICK, BIT. MAC)
- FEDERAL AID HIGHWAY SYSTEM
- FEDERAL AID SECONDARY HIGHWAY SYSTEM
- STATE AID ROAD
- CLOVER LEAF
- UNITED STATES HIGHWAY SYSTEM
- STATE HIGHWAY SYSTEM

RAILROADS

- RAILROAD (ANY NUMBER OF TRACKS) USED BY SINGLE OPERATING COMPANY
- RAILROAD (ANY NUMBER OF TRACKS) USED BY MORE THAN ONE OPERATING COMPANY ON SAME OR ADJACENT RIGHTS OF WAY (NOT TRACKAGE RIGHTS)
- ELECTRIC INTERURBAN OR SUBURBAN RAILROAD
- RAILROAD STATION
- GRADE CROSSING
- RAILROAD ABOVE
- RAILROAD BELOW

AIRWAYS

- AIR ROUTE
- ARMY, NAVY OR MARINE CORPS FIELD
- CIVIL AERONAUTICS AUTHORITY INTERMEDIATE FIELD
- COMMERCIAL OR MUNICIPAL FIELD
- MARKED AUXILIARY FIELD
- AIRPLANE LANDING FIELD - MARKED OR EMERGENCY
- AIRWAY BEACON LIGHT
- AIRPORT HOUSING FACILITIES

NAVIGATION

- NAVIGABLE STREAM
- NAVIGABLE STREAM (INTERMITTENT NAVIGN.)

DRAINAGE

- INTERMITTENT STREAM (NARROW)
- INTERMITTENT STREAM (WIDE)
- NARROW STREAM
- WIDE STREAM
- MARSH OR SWAMP LAND
- DRAINAGE DITCH (MAIN) (ARROWS POINT IN DIRECTION OF FLOW)
- IRRIGATION DITCH (ARROWS POINT IN DIRECTION OF FLOW)
- RESERVOIR, POND OR LAKE
- RESERVOIR WITH DAM
- DAM

STRUCTURES

- HIGHWAY BRIDGE (ANY TYPE)
- LEVEE OR DIKE
- LEVEE OR DIKE (WITH ROAD)
- MINOR STRUCTURES CONCRETE FORD OR DIP
- FORD - ROAD ESTABLISHED

PARKS & OTHER RESERVATIONS

- C.C.C. CAMP
- BIRD SANCTUARY
- GAME FARM
- GAME PRESERVE
- MONUMENT - SMALL
- INDIAN BURIAL GROUND
- GC GOLF OR COUNTRY CLUB
- A ATHLETIC FIELD OR AMUSEMENT PARK
- S.P. SMALL PARK (S.P. STATE, C.P. COUNTY, M.P. MUNICIPAL)
- FAIRGROUND, RACE COURSE, SPEEDWAY
- CAMP OR LODGE
- END OF K NUMBERED ROUTE
- END OF US NUMBERED ROUTE

BOUNDARIES

- STATE LINE
- COUNTY LINE
- CORPORATE LINE
- SECTION LINE
- BOUNDARY TO MARK ENLARGEMENT INSET

CITY & VILLAGE CENTERS

- STATE CAPITAL
- COUNTY SEAT
- OTHER CITIES AND VILLAGES

OTHER CULTURAL FEATURES

VACANT / IN USE

- FARM UNIT
- DWELLING (OTHER THAN FARM)
- ROW OR GROUP OF DWELLINGS (FIGURE DENOTES NUMBER OF DWELLINGS)
- COMBINED DWELLING AND STORE OR SMALL BUSINESS
- TENANT HOUSE
- SEASONAL DWELLINGS CLOSELY SPACED (FIGURE DENOTES NUMBER OF DWELLINGS)
- CHURCH - OTHER RELIGIOUS INSTITUTIONS
- COUNTY FARM
- HOSPITAL
- CEMETERY
- WELL
- WINDMILL
- CHURCH WITH CEMETERY ADJACENT
- GROUP OF MIXED CULTURAL FEATURES (FIGURE DENOTES NUMBER OF FEATURES)
- STORE OR SMALL BUSINESS ESTABLISHMENT (FIGURE DENOTES NUMBER OF ESTABLISHMENT)
- FACTORY OR INDUSTRIAL PLANT
- MINE, SHAFT OR DRIFT (ANY KIND)
- OIL OR GAS WELL
- OIL OR GAS FIELD
- OIL TANK
- GAS TANK
- GROUP OF GAS OR OIL TANKS
- PUMPING STATION OIL OR GAS
- GAUGING OR PUMPING STATION (GENERAL)
- MINE OPENING (SHAFT OR DRIFT)
- SEASONAL INDUSTRY (CANNERY OR SMALL GRAIN MILL)
- BEET DUMP
- STOCK YARDS - LOADING PEN
- GRAVEL PIT
- QUARRY
- POST OFFICE
- TOURIST CAMP
- NURSERY
- SCHOOL HOUSE
- CONSOLIDATED OR LARGE SCHOOL
- OTHER EDUCATIONAL INSTITUTIONS
- TWP. TOWNSHIP, GRANGE OR COMMUNITY HALL LETTERS DESIGNATE KIND
- CORRECTIONAL INSTITUTION
- WATER SUPPLY STAND PIPE
- TRANSMISSION LINE
- POWER PLANT
- POWER SUBSTATION
- TRANSFORMER STATION
- RADIO STATION
- WIBW RADIO STATION (WITH CALL LETTERS)
- K.N.C. SHOPS
- PORT OF ENTRY
- GARBAGE OR RUBBISH DUMP
- SEWAGE DISPOSAL PLANT
- FORT, ARMY CAMP, BARRACKS OR MILITARY POST
- 180 POINTS BETWEEN WHICH DISTANCES ARE MEASURED INDICATED THUS
- TRIANGULATION STATION
- FA END OF FA ROUTE
- FAS END OF FAS ROUTE
- SA END OF SA ROUTE (NON FA OR FAS)

N

HIGHWAY & TRANSPORTATION MAP
RILEY COUNTY
KANSAS

PREPARED BY THE
KANSAS STATE HIGHWAY DEPARTMENT
IN COOPERATION WITH THE
FEDERAL WORKS AGENCY
PUBLIC ROADS ADMINISTRATION
DATA OBTAINED FROM
STATE-WIDE HIGHWAY PLANNING SURVEY

SCALE
0 1 2 3 4 MILES

1941

A SURVEY OF RILEY COUNTY FARM PONDS

by

PRESSLEY M. PINER

B. S., Sterling College, Sterling, Kansas, 1948

ABSTRACT OF A MASTER'S THESIS

submitted in partial fulfillment of the

requirements for the degree

MASTER OF SCIENCE

DEPARTMENT OF ZOOLOGY

KANSAS STATE COLLEGE
OF AGRICULTURE AND APPLIED SCIENCE

1952

ABSTRACT

The purpose of this survey was to correlate crop production of wildlife conservation with good land management in Riley County, Kansas. Farmers are interested in getting the most from their land with the least possible investment. It was felt that wildlife crops present an opportunity for the farmer to realize a profit from his land that costs him virtually nothing. Wildlife must, however, be cultivated by the farmer as he would cultivate and nurture other farm crops. The cultivation required to promote wildlife would require that the farmer not use fence corners, odd lots or other portions of his farm that are not tillable. A farmer, of course, might not set aside any definite time in the work schedule to aid wildlife; therefore, a farm practice that would benefit wildlife with a minimum amount of time and labor by the farmer was of primary importance to wildlife production and protection. The farm pond development was considered a good land management practice.

Data for this survey were collected by visiting the pond and by talking with the farmer. Some data were gathered from the Production and Marketing Administration.

Data were collected as to what preconstruction activities went on at the farm pond site. It was found that the fill area had been staked, as well as the water level in the reservoir area by the Soil Conservation Service. Soil borings were taken in the fill area, spillway area and reservoir area by the Soil Conservation Service or by the contractor. All pond areas had been

cleared of debris before the fill was constructed.

The ponds were built to be used primarily for watering livestock, but they were also used to some extent for recreation. The ponds were not at all conducive to recreational pursuits as only two of the 66 ponds were fenced. The lack of fencing of the pond area allowed cattle to graze to the water's edge, and to go into the pond and stir up the mud and to contaminate the pond with their urine and feces.

The clearness of the water was determined by using a Secchi disc and it was found to be clear enough for fish production when the pounds of fish taken per year average 41 pounds.

Depth of water in the pond was taken from the farmer's estimate. A more accurate account of depth was taken from the maximum depth from Production and Marketing Administration records. The maximum depth was recorded.

Weeds were not a serious problem in the ponds surveyed. Cattle were allowed to graze to the water's edge and wade into the water; therefore, aquatic plants had not been given a chance to get a start. That a pond be free of weeds is important to fish production, but the advantage is negative when weeds are controlled by cattle grazing them to the water's edge. Cattle grazing the area heavily would cause it to become barren and thereby open the pond banks to erosion.

The ponds selected to survey were those that were one half surface acre or larger. This size pond contains a sufficient depth and amount of water for fish production.

In order to make an intelligent appraisal of the farm pond's

usefulness to wildlife it was deemed necessary to know something about the construction and cost of the pond.

The cost of the pond was the first consideration and the total cost, cost per surface acre, and cost per cubic yard were obtained and are recorded. The total cost ranged from $75 to $860. The cost per surface acre averaged $487 and the cost per cubic yard averaged $0.22. Included with the costs were whether Production and Marketing Administration payments were made or not and how much the payments were. Only one owner out of the 66 had received any benefit from the Kansas Water Storage Law. This law provides for reduction in the assessed valuation of farm land on which an approved water reservoir has been constructed. The first ten acre-feet of storage capacity is worth $200 per acre foot.

Ponds were constructed by commercial earthmoving companies using bulldozers and scrapers.

The farmers were asked if the earthen fill had been constructed in layers and it was found that they had been. The earthen fills were constructed entirely of clay. The spillway construction was adequate as only one spillway showed any sign of eroding.

Draining of ponds and trickle tubes were generally neglected, and most ponds observed should have at least been provided with a means of draining.

Dam and spillway vegetation was observed and both were found well vegetated. Some spillways were protected by large rock slabs.

The area surrounding the ponds was pasture land. There were small amounts of cultivated land that were terraced or otherwise

kept from eroding.

No apparent attempt had been made to control gullies in the drainage area by any types of special erosion control.

Silt basins, to catch and hold the water before it goes into the main reservoir to settle out silt particles, were used on five ponds. These ponds with silt basins had clearer water.

The Forestry, Fish and Game Commission had stocked 17 ponds and the United States Fish and Wildlife Service, one pond. Twenty-four ponds had been stocked by the farmers themselves. The combination followed by the Forestry, Fish and Game Commission and the United States Fish and Wildlife Service were the same: bass-bluegill-crappie in a 1-3-1 ratio; bass-bluegill in a 3-1 ratio; bass-crappie-catfish in a 1-1-1 ratio and bass-bluegill-bullheads in a 1-3-1 ratio.

Very little fishing had been done because the cattle not being fenced from the pond deposited feces around and in the pond. The highest estimate of the pounds of fish taken per year was 75 pounds. Eleven farmers had an idea of how many pounds of fish had been taken per year from their ponds, which ranged from 75 to 15 pounds, with the average being 41 pounds per year. These ponds were not fished often or heavily enough and many pounds of high protein food were being wasted.

The fact that ponds were not fenced ruined the usefulness of the ponds. When cattle are allowed immediate access to the pond, the pond is obviously of no value for recreation. Fish do not do well in muddy water, but rather need relatively clear water. The water is of little value even to the cattle after they have caused it to be muddy and contaminated.