IOWA CONSERVATION COMMISSION
FISHERIES SECTION

FEDERAL AID TO FISH RESTORATION

ANNUAL PERFORMANCE REPORT

STREAM FISHERIES INVESTIGATION

PROJECT NO. F-89-R-4

Study No. 604.1 - Physical Inventory of Trout Streams and Survey of Trout Angler Attitudes

Job No. 1: Inventory of all Iowa trout waters to determine status and potential for various management schemes

Job No. 2: Trout angler attitudes, preferences and success

PERIOD COVERED 1 JULY, 80 - 30 JUNE, 81

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ANNUAL PERFORMANCE REPORT

RESEARCH PROJECT SEGMENT

STATE: Iowa

PROJECT NO.: F-88-R-4

STUDY NO.: 604.1

JOB NO.: 1

NAME: Physical Inventory of Trout Streams and Survey of Trout Angler Attitudes

TITLE: Inventory of all Iowa trout waters to determine status and potential for various management schemes

Period Covered: 1 July, 1980 through 30 June, 1981

ABSTRACT: A physical inventory of 50 coldwater streams containing a total of 148 miles of water was completed during 1980. Streams ranged in length from .4 mi, Ram Hollow, to 9.1 mi, Otter Creek while watersheds ranged from < 1 sq mi to 50.7 sq mi, for Ram Hollow and Trout Run, respectively. Gradients ranged from 1.4 to 42 ft/1,000 ft for Joy Springs (Upper Maquoketa River) and Ensign Hollow, respectively. Bank stability varied considerably from stream to stream and even within streams. However, streams within at least some state ownership provided the highest degree of stable banks. Typically watersheds of trout streams in northeast Iowa are moderately to highly erodable. Five categories of cover were identified in trout streams. Log jams were the most prominent form of cover, boulders were second followed in order by bank cover, aquatic vegetation and man-made. Gravel and cobble was the predominant substrate while silt and sand was second followed by clay and bedrock. Pools were segregated into three depth categories < 1 ft, ≥ 1 ft < 2 ft, and ≥ 2 ft. The Maquoketa River had the highest proportion of pools ≥ 1 ft, 97%, followed by Otter and Trout Run each providing 94% ≥ 1 ft. Approximately 80% of the lineal miles surveyed were in private ownership. Springs and subsurface seepage were primary sources of water for cold water streams. Analysis of findings provided several generalizations; land use within stream corridors has a profound impact on bank stability, gradient and stream flows were an important factor influencing silt deposition, accessibility of streams varied considerably and habitat varied considerably from stream to stream. Trout program development could take several routes including increased access, intensified habitat enhancement, expansion of trout waters or variations in stocking program. The investigation will continue for one more season until the completion of inventories of about 50 more coldwater streams.

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Date Prepared: 30 June, 1981

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STUDY OBJECTIVE

Identify and quantify trout angler needs, conduct a physical inventory of trout waters in Iowa and determine potential for access development, habitat enhancement and stream acquisition; and development of a long range management program including future hatchery production needs.

JOB 1 OBJECTIVE

To conduct a physical inventory of coldwater streams including all known and potential trout water. The inventory will include habitat quality, ownership, public access and presence of trout to identify specific management needs or the potential for inclusion into a long range trout program.

STUDY BACKGROUND

Trout are a unique and important fishery resource in northeast Iowa. Nearly 43,000 Iowa trout anglers expended annually approximately 500,000 fishing activity days on 99 coldwater streams that totals 350 miles in length. Statewide, 7% of the fishermen prefer trout to all other kinds of fish while they are preferred by 11% of the anglers in northeast Iowa (Anonymous, 1976).

Iowa's trout program was initiated in 1873 (Schacht, 1966). The first state fish hatchery was built at Anamosa. Other hatcheries responsible for trout propagation followed. Prior to 1933 trout stockings were restricted to fry and fingerlings but more recent trout stocking emphasized use of put and take fisheries utilizing trout 7 inches and greater.

Reduction in quality of habitat for reproduction, nursery and carry-over of trout (Harlan and Speaker, 1969) has necessitated the use of the put and take trout stocking program. Nearly 320,000 trout are stocked annually in Iowa under the present program. Approximately 290,000 trout are released as catchable fish while 30,000 fingerlings are stocked. Catchable trout are about two to the pound at stocking.

Recent management has been directed at establishing a more diversified trout program. Projects have included land acquisition, trout stream enhancement, minimum length limits on brown trout, artificial lure only areas, and reestablishment of brook trout.

Licensed trout anglers increased at an average rate of 7% from 1972 to 1975. The total number of trout anglers will exceed 56,000 within four years or over 900,000 activity days of trout fishing. The increased demand on the limited trout streams and limited hatchery production may reduce fishing quality. Reduced catch rates, increased encounters with other fishermen and a less aesthetic stream resource are several factors that must be considered. Another factor, even more severe, is the degradation of trout streams due to agricultural uses of the riparian zone. Finally, we do not know those factors that most satisfies the trout angler; consequently, long range planning for the coldwater stream resource and hatchery propagation is difficult.

METHODS AND PROCEDURES

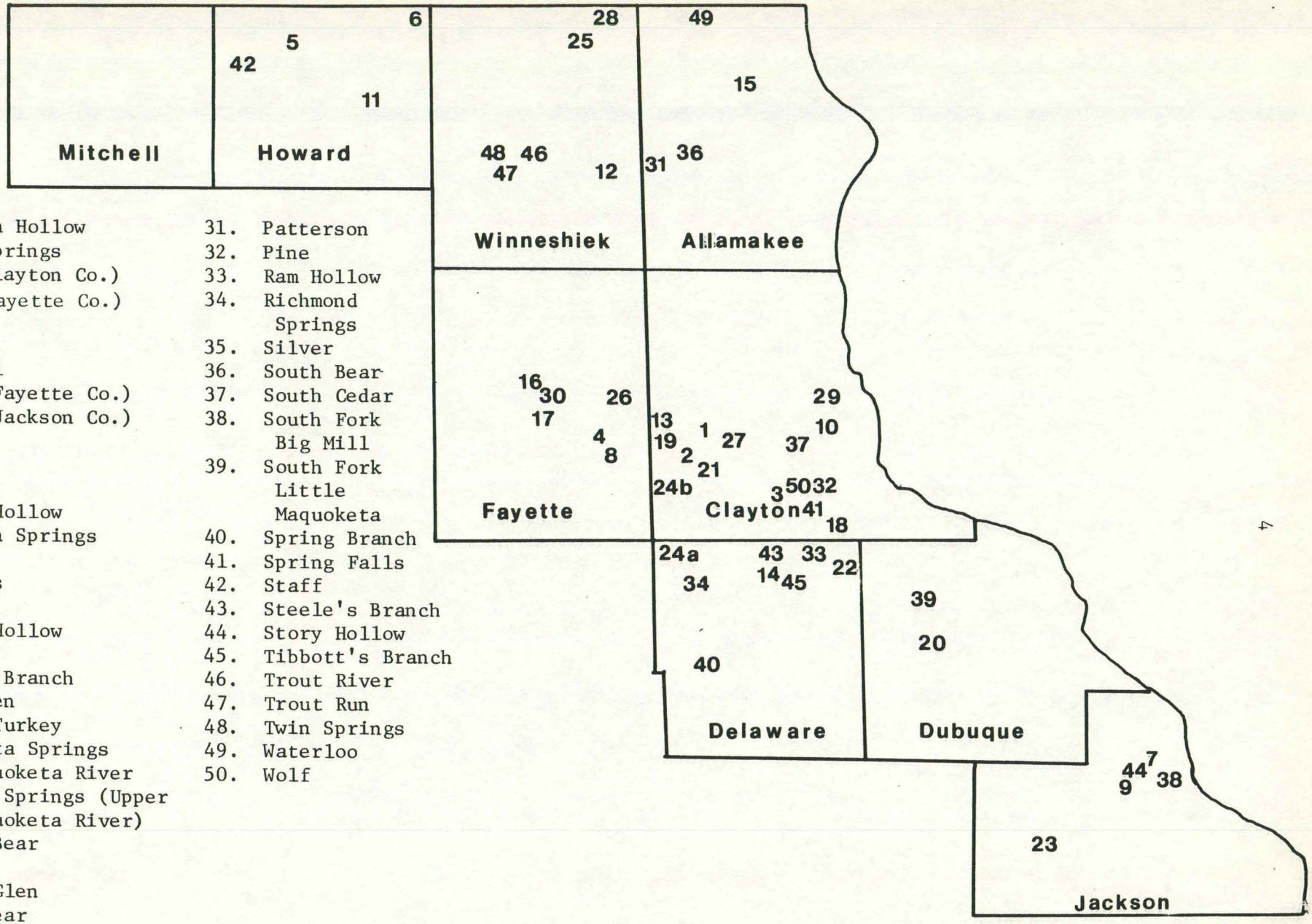
A systematic physical inventory of 50 coldwater streams was conducted during the 1980 season (Figure 1). Selected streams were first located on aerial photos, U.S.G.S. topographic maps, and the Trout Fishing Guide to determine access points. County plat books were used for landowner identification.

Streams were walked and physical information was tabulated by stream (Appendix A). Information was collected from the initial point of designated trout water (in Water Quality Standards) to about ½ mile beyond the end of designated water or to the confluence with a larger stream.

Access was identified as good, adequate or poor before streams were inventoried. Access was considered good when the road approached or paralleled the stream, streams were considered to have adequate access if a road was 100 yds to ¼ mi from the stream, while more remote streams were considered to have poor access. Stream order was assigned (Horton, 1945) and pools were enumerated and placed into three depth categories: < 1 ft, ≥ 1 ft < 2 ft, and ≥ 2 ft. Depth was also a measure of cover. Predominating substrate comprising greater than 50% of pool area was objectively identified from one of four categories: silt and sand, bedrock, gravel and cobble, or clay. Five types of bank or overhead cover were identified and enumerated in pools ≥ 1 ft. Sufficient cover provided a minimum of 6 inches of overhead concealment in association with a minimum of 1 ft of water depth (Hunt, 1966).

Stability of stream bank in terms of percent of length was objectively specified and placed into several categories: stable, deteriorating, and instable. A stable bank was firmly controlled by rooted riparian vegetation; a deteriorating bank had segments of exposed and unprotected soil; while an unstable bank was completely exposed to erosive conditions.

Stream corridor cover type was a measure of land use and was expressed as a percent of the whole. Cover was determined by observation and described as pasture, pastured forest, forest, cultivated, and prairie. Aerial photos were not used in determining cover type because of recent changes in land use. A soil erosion index map of Iowa was obtained from the Iowa Department of Soil Conservation. The map contains soil erosion index values for all watersheds in the state. The soil erosion index was based on the Universal Soil Loss equation which is dependent on rainfall, soil erodibility, land management, slope steepness, and slope length. Estimates of stream gradients and lengths were taken from U.S.G.S. topographic maps.



1. Alderson Hollow
2. Baron Springs
3. Bear (Clayton Co.)
4. Bear (Fayette Co.)
5. Beaver
6. Bigalk
7. Big Mill
8. Brush (Fayette Co.)
9. Brush (Jackson Co.)
10. Buck
11. Chialk
12. Coon
13. Ensign Hollow
14. Fountain Springs
15. French
16. Glover's
17. Grannis
18. Grimes Hollow
19. Hewitt
20. Hogan's Branch
21. Klienlien
22. Little Turkey
23. Maquoketa Springs
24. a. Maquoketa River
    b. Joy Springs (Upper Maquoketa River)
25. Middle Bear
26. Mink
27. Mossey Glen
28. North Bear
29. North Cedar
30. Otter
31. Patterson
32. Pine
33. Ram Hollow
34. Richmond Springs
35. Silver
36. South Bear
37. South Cedar
38. South Fork Big Mill
39. South Fork Little Maquoketa
40. Spring Branch
41. Spring Falls
42. Staff
43. Steele's Branch
44. Story Hollow
45. Tibbott's Branch
46. Trout River
47. Trout Run
48. Twin Springs
49. Waterloo
50. Wolf

Figure 1. Location of 50 inventoried trout streams.

FINDINGS

LENGTHS AND ORDER

Fifty coldwater streams containing a total of 148 miles of water were inventoried for physical features (Table 1). Streams ranged in length from .4 mi, Ram Hollow, to 9.1 mi, Otter Creek, and averaged 2.9 mi. Most streams under "fingerling release and grow" management were order 1 streams while streams under put and take management were generally order 2 or 3 streams or both.

WATERSHED AREA

Watersheds of inventoried trout streams varied from < 1 sq mi, Ram Hollow to as large as 46.9 sq mi, Otter Creek (Table 1). Watersheds averaged 12.2 sq mi.

ACCESS

Most streams were easily accessible; Silver, Otter, Fountain Springs, Buck, Trout Run, Spring Branch, Joy, Twin Spring and Bear are some examples. Only a few streams had undefined access; Ensign Hollow, Baron Springs and Ram Hollow, none of which was under put and take management. On the other hand several trout waters had portions that were readily accessible but were of sufficient length to provide segments that were not within short walking distances; examples are Bear (Clayton County), French, Patterson, Silver, North Cedar, Glover's, and Hewitt.

GRADIENT

Gradient of inventoried streams ranged from 1.4 ft/1,000 ft at Joy Springs (Upper Maquoketa River), to 42 ft/1,000 ft at Ensign Hollow (Table 1). Average gradient was 12.5 ft/1,000 ft.

BANK STABILITY AND LAND USE

Bank stability varied considerably from stream to stream and even within streams (Appendix B). Stability of riparian zones were associated with land use of the stream corridor and erodibility of the soil. In general, streams within at least some state ownership provided the highest degree of stable banks e.g. Bear (75%), Mossey Glen (72%), Twin Spring (65%), Ram Hollow (55%), North Cedar (54%), Grannis (52%) and Trout River (47%). Some exceptions of streams in private ownership with a high proportion of stable banks include Pine (68%), Ensign Hollow (63%), and Otter (54%). The former two streams have watersheds < 1 sq mi (Table 1).

Pasture and ungrazed forest provided the greatest proportion of land use within the corridors of most trout streams (Appendix B). Pastured forest, cultivated land, and prairie formed a smaller proportion of land use. Bigalk was pastured exclusively while Ram Hollow and Richmond Springs were completely within a forested corridor; the latter stream is within a state park and is also subjected to park type development.

Table 1. Physical characteristics including present management (put and take - PT, fingerling release and grow - FRG, no management - NM, marginal streams - M), access, length, stream order, gradient and watershed area of 50 coldwater streams in Iowa.

Stream	Present management	Access	Length (mi)	Stream order	Gradient /1,000 (ft)	Watershed area (sq mi)
Alderson Hollow	FRG	Poor	2.8	1-2	8.1	3.9
Baron Springs	FRG	Poor	1.9	1-2	9.9	2.4
Bear (Clayton Co.)	PT-M	Good	1.1	2	6.8	7.8
Bear (Fayette Co.)	FRG	Adequate	3.6	2	5.1	12.3
Beaver	NM	Adequate	4.5	2	1.3	29.1
Bigalk	PT	Good	1.2	1	1.3	1.9
Big Mill	PT-M	Good	4.2	1-3	6.3	18.3
Brush (Fayette Co.)	FRG	Adequate	2.9	2	11.3	29.0
Brush (Jackson Co.)	PT-M	Good	3.8	1-3	3.1	18.8
Buck	PT-M	Adequate	5.8	2-3	8.4	19.5
Chialk	FRG	Good	1.1	1	6.8	1.0
Coon	PT-M	Adequate	1.8	2	--[a]	11.7
Ensign Hollow	NM	Poor	.9	1-2	42.0	.4
Fountain Springs	PT	Good	2.4	1-3	12.6	4.3
French	PT	Good	5.0	2	5.3	24.0
Glover's	PT	Adequate	2.0	2	15.0	6.9
Grannis	PT	Adequate	1.5	2	8.4	5.9
Grimes Hollow	FRG	Adequate	2.2	1-2	15.4	3.4
Hewitt	PT-FRG	Good	2.3	1-3	7.4	9.3
Hogan's Branch	FRG	Adequate	3.4	2-3	6.7	8.9
Joy Springs[b] (Upper Maquoketa River)	PT	Good	1.4	3	1.3	42.6
Klienlien	NM	Adequate	1.8	1-2	10.5	2.9
Little Turkey	PT-FRG	Adequate	3.0	1-2	8.8	8.2
Maquoketa River[b]	PT-M	Adequate	4.6	3	1.6	43.6
Maquoketa Springs	FRG	Good	2.0	1	--[a]	--[a]
Middle Bear	FRG	Adequate	2.1	1-2	--[a]	--[a]
Mink	PT-M	Adequate	2.2	2	4.9	15.5
Mossey Glen	NM	Adequate	1.4	1-2	21.6	3.1

Table 1. Continued.

Stream	Present management	Access	Length (mi)	Stream order	Gradient /1,000 (ft)	Watershed area (sq mi)
North Bear	PT	Adequate	4.2	2-3	--[a]	--[a]
North Cedar	PT	Adequate	3.2	2	11.8	5.5
Otter	PT-M	Adequate	9.1	2-3	6.3	46.9
Patterson	PT-M	Good	5.8	2	6.5	8.7
Pine	NM	Good	1.8	1-2	17.8	< 1
Ram Hollow	NM	Poor	.4	1	23.6	< 1
Richmond Springs	PT	Good	1.0	1-2	11.3	1
Silver	PT-M	Adequate	7.6	2	5.4	22.4
South Bear	PT	Good	4.4	1-2	--[a]	19.7
South Cedar	PT-M	Adequate	3.8	2	6.9	14.4
South Fork Big Mill	NM	Adequate	.8	2	14	1.8
South Fork Little Maquoketa	FRG	Adequate	2.8	2	10.1	6.3
Spring Branch	NM	Good	2.9	2	3.9	18.8
Spring Falls	FRG	Adequate	.3	1-2	37.8	1.0
Staff	NM	Poor	3.2	2	--[a]	20.2
Steele's Branch	FRG	Poor	7.6	2	8.4	9.3
Story Hollow	NM	Good	1.2	1-2	12.6	2.1
Tibbott's Branch	FRG	Poor	.3	1	50	.5
Trout River	PT	Adequate	2.6	1-2	--[a]	20.2
Trout Run	PT	Good	1.2	1-2	--[a]	50.7
Twin Springs	PT	Good	1	1	--[a]	10.6
Waterloo	PT	Adequate	6.2	2-3	61	45
Wolf	FRG	Poor	1.9	1-2	7.9	3.0

[a]Data unavailable pending completion of USGS topographic maps.

[b]The Maquoketa River was treated as two areas.

WATERSHED ERODIBILITY

Typically watersheds of trout streams in northeast Iowa are moderately to highly erodible (Appendix B). On an erosion index scale of one (least erosion) to ten (most erosion) watershed ranged from three to nine. The majority of trout streams flowed through watersheds with erosion indexes of four (17%), seven (23%), and eight (25%). Conditions favoring erosion in northeast Iowa are related to the highly erodible (sand and clay) soils and the steepness of valley slopes.

INSTREAM COVER

Five categories of cover were identified in trout streams; bank, log jams, boulders, aquatic vegetation, and man-made (Appendix C). Log jams were the most prominent form of cover providing an average of 19% of the trout stream pools with cover. Boulders provided the second most numerous form of cover. Log jams were most prevalent in the Maquoketa River providing cover in 63% of the pools, French and Grimes Hollow contrasted with only 6% each containing log jam cover. Bear (Fayette County) embodied the greatest proportion of pools containing boulder cover, 35%, while they were absent in Ram Hollow, Baron Springs, Grimes Hollow, Joy Springs, and Twin Springs. Trout Run embodied the highest proportion of pools with bank cover, 19%, while Pine provided 18% and Grannis 17%. Aquatic vegetation cover was found in 44% of the pools in Trout Run and 38% of the pools in South Bear. Habitat enhancement work (man-made cover) was most prevalent in pools of French, 12%, Coon and Twin Springs, 11%, Trout River, 10%, Richmond Springs and Pine at 9% each.

Some pools contained multiple cover for trout; thus, when percentages of pools with various cover types were added they will not provide the exact proportion of pools with cover. The percentages can, however, be totaled to provide an overall cover index value (Appendix C). Richmond Springs had the highest cover index value, 100, followed by Trout Run, 95, Glover's, 85, and Joy Springs, 69. Grimes Hollow contained the least cover with an index value of 6.

POOL SUBSTRATE

Gravel and cobble was the predominant substrate found in most pools while silt and sand was second (Appendix C). Clay or bedrock was seldom an important substrate and was found in less than 10% of the pools. Gravel and cobble comprised the major portion of the substrate in 98% of the pools in Bear (Clayton County) while it was important in only 20% of the pools in Staff. Pools in Staff were comprised primarily of silt and sand (76%), while these materials were never abundant in Bear (Clayton County). Spring Falls contained the greatest proportion of pools with clay bottoms, 16% of the pools, while it comprised the major portion of the substrate in 12% of the pools in Klienlien and 8% each in Big Mill and Little Turkey. Bedrock was the most important bottom type in 14% of the pools of North Cedar, 9% in Grimes Hollow and Ensign Hollow and 8% of the pools in Little Turkey.

POOL FREQUENCY AND DEPTH

Buck provided the greatest number of pools, 340, while Bigalk contained only 39 (Appendix D).

Pools were segregated into three depth categories to better describe habitat quality comparisons (Appendix D). Of most importance is the proportion of pools $\geq$ 1 ft. Coldwater streams averaged 38 pools $\geq$ 1 ft/mile of stream. The Maquoketa River had the highest proportion of pools $\geq$ 1 ft, 97%, followed by Otter and Trout Run each providing 94% $\geq$ 1 ft (Appendix D). Only 21% of the pools of Ram Hollow were $\geq$ 1 ft, the lowest proportion recorded.

LAND OWNERSHIP

Most cold water streams in northeast Iowa are in private ownership (Appendix E). Approximately 80% of the lineal miles surveyed were in private control while only three of 50 streams were completely in public ownership. Publicly owned streams were: Ram Hollow, Richmond Springs and South Fork Big Mill. Many streams were entirely within private control. Some streams had only 1 land owner while Brush Creek (Jackson County) had ten and Otter Creek had 12.

With the exception of one land owner, all were cooperative in allowing trespass and providing information. In some cases land owners were unfamiliar with their property lines. Few complaints or suggestions were received concerning the trout program. Names of four property holders interested in further information were given to Fisheries Management personnel.

WATER SOURCES

Springs and subsurface seepage were primary sources of water for cold water streams in northeast Iowa (Table 2). Tile drainage provides a secondary source of water. Streams originating as a spring were Fountain Spring, Baron Spring, Pine, Ram Hollow, Ensign Hollow, Grimes Hollow, Spring Falls, Mossey Glen, South Fork Big Mill, Middle Bear, Richmond Spring, Twin Springs, Trout Run and Grannis.

Table 2. Major sources of water (S - springs, SS - subsurface seepage and T - tile drainage) for 50 coldwater streams in Iowa.

Stream	Water Source	Stream	Water Source
Alderson Hollow	SS	Patterson	SS
Baron Springs	S	Pine	S
Bear (Clayton)	SS	Ram Hollow	S
Bear (Fayette)	SS	Richmond Springs	S
Beaver	SS-T	Silver	SS
Bigalk	S	South Bear	S
Big Mill	S-SS-T	South Cedar	SS
Brush (Fayette)	S	South Fork Big Mill	S
Brush (Jackson)	SS	South Fork Little Maquoketa	S-SS
Buck	SS	Spring Branch	S-SS
Chialk	S	Spring Falls	S-SS
Coon	SS	Staff	SS-T
Ensign Hollow	S	Steele's Branch	S-SS
Fountain Springs	S	Story Hollow	S-SS
French	S	Tibbott's Branch	S
Glover's	SS	Trout River	S
Grannis	SS	Trout Run	S
Grimes Hollow	S	Twin Spring	S
Hewitt	S-SS	Waterloo	S-SS
Hogan's Branch	SS	Wolf	S
Joy Springs (Upper Maquoketa River)	S-SS-T		
Klienlien	S		
Little Turkey	S-SS		
Maquoketa River	SS		
Maquoketa Springs	S		
Middle Bear	S		
Mink	SS		
Mossey Glen	S		
North Bear	S-SS		
North Cedar	S-SS		
Otter	SS-T		

DISCUSSION OF FINDINGS

Cold water streams are unique to northeast Iowa and are not found in other regions of the state. The overall suitability of these streams as trout habitat is governed by one or more factors including land use, gradient, flow rate, watershed area, water source, and soil type. For these reasons streams vary considerably. Thus, generalized statements can be made of each of these factors, none of which are unexpected and several are interrrelated.

Land use within stream corridors has a profound impact on bank stability. Streams traversing through pastured or cultivated land had a high degree of deteriorating or unstable banks. On the other hand, streams under state or county ownership were characterized as stable. In-depth study of soil types in relation to land use was not an objective of this investigation; however, as soil erodibility increased the results of poor land use intensify.

Gradient and stream flow were an important factor influencing silt deposition. Higher proportions of silt and sand were associated with streams of low gradient, < 8 ft/1,000 ft, or low flow. In contrast, streams of higher gradient and adequate or dependable flow not only provided silt free riffle areas, but some streams contained suitable spawning habitat.

Stream temperatures were not measured systematically to allow comparison but it was evident that streams with springs for water sources had cooler water temperatures. Present put and take management of streams that have an insufficient source of spring water are stocked in spring and autumn only; these waters often exceed 70° F during summer months.

Streams with large watersheds (> 6 sq mi) and a limited source of spring water tended to provide only periodic or limited reaches of suitable trout habitat. As watershed size increased deficiencies such as warming of water (> 70° F) and degradation of habitat accelerated. Cold water streams that did not follow this pattern, because of good sources of spring water, include Trout River, Twin Spring, Waterloo, South Bear, Spring Branch, and Little Turkey.

Accessibility of cold water streams varied considerably and was associated with state and county recreation areas, private residences, pastures, farm roads, and state and county roads. Inaccessible reaches were associated with large timbered tracts of state or private land or extensive segments of cultivated or pastured land. Most of the streams inventoried, with land owner permission, were easily accessible to fishermen.

Quality and quantity of instream cover for trout varied considerably from one watercourse to the next. However, there were profound differences between streams of primarily public ownership with a cover index average 83, and those of private ownership with a cover index average 54. The differences were due to land management and extensive habitat enhancement work completed on public streams. Habitat enhancement work was initiated in 1932 (Anonymous, no date), with the services of Tarzwell. The intensity of this work has varied considerably since that time. Presently, habitat enhancement of cold water streams in Iowa is an important management program. The majority of this work has been done on public waters.

Trout program development could take several routes depending upon the quantity and quality of recreational trout fishing desired. Physical development could follow with increased access, intensified habitat enhancement, expansion of trout waters being stocked or variations in stocking program.

Increased access does not appear to be the most important problem at this time. Many anglers prefer to walk at least a quarter of a mile (Job 2) to reach trout water, although easy access streams were the most popular, and many streams in the put and take program fall into this category. On the other hand, several streams could be candidates for improved access not only for anglers but also stocking trucks. The upper reach of Brush Creek (Fayette County), Otter Creek and Buck Creek are all streams in the put and take program that could provide more recreational benefits if they were more accessible to hatchery trucks and anglers.

Availability of streams for trout stocking does not appear to be a limiting factor for a future trout program. The quality of habitat in which trout are released can be improved. Over 80% of the stream miles presently stocked with trout are under private ownership. Thus, the state has little control of the land use and therefore the quality of habitat. As previously mentioned Fisheries Management is actively participating in a stream improvement program on public waters. Attempts to expand these efforts to private waters has met very limited success. Present management agreements offer little incentive to land owners yet tie up economically important land. Purchases of land by the Conservation Commission have provided numerous cold water streams for the trout program, but the acquisition procedure is slow. Future development of the trout program will partially depend on a more active role in management of private water courses.

Easements are an alternative method of obtaining control of the corridors of streams. Contracts of this nature can be written with a variety of terms e.g. short duration to perpetuity, fishing access only, stream development, or inclusion of fencing rights. Easements offer restraints as well as positive points, for example they can be costly but they do not take land off the tax roll, a popular but unwarranted public concern. Other possible aids to improve habitat conditions of trout streams could include a tax incentive similar to the Forest Preserve Program or the Wildlife Set Aside reduced tax assessment of Indiana.

Numerous streams in northeast Iowa could be included in the trout program on a marginal basis. Stocking of these streams that have negligible sport fish populations already could disperse early and late season fishing pressure or attract more anglers to fish trout since some streams are close to urban areas. Additional marginal streams could also supplement the put and take program, if naturally reproduced populations of brook, brown or rainbow trout were established in the prime cold water streams, presently in the put and take program or were stocked annually with fingerling fish.

Results of this phase of investigation have provided some insight into the importance of instream cover to survival of fingerling brown trout. Degan (1981) compared survival of released fingerling brown trout in Bear (Clayton County), Spring Falls and Grimes Hollow to the habitat index of each stream. He found a positive relationship between survival and increased cover. Although

the comparison was limited to only three streams, it provided for some thought into further investigations of benefits of habitat enhancement work to survival of fingerling trout.

RECOMMENDATIONS

This investigation should continue as outlined in the Project Agreement. In addition, trout programs of neighboring states will be reviewed to determine applicability in Iowa. A priority ranking system will be developed to identify the most important trout streams after all cold water streams are inventoried.

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ANNUAL PERFORMANCE REPORT

RESEARCH PROJECT SEGMENT

STATE: Iowa

PROJECT NO.: F-88-R-4

STUDY NO.: 604.1

JOB NO.: 2

NAME: Physical Inventory of Trout Streams and Survey of Trout Angler Attitudes

TITLE: Trout angler attitudes, preferences and success

Period Covered: 1 July, 1980 through 30 June, 1981

ABSTRACT: A total of 944 trout anglers were interviewed by telephone, mail and on trout streams. Telephone and mail interviews accounted for 1.8% of the 26,590 licensed trout anglers in 1980. The proportion of completed interviews to the total number of anglers was used to compute various fishing activities and catch success. The estimate of non-licensed anglers (juveniles) was 10,625. Adult anglers spent 292,045 activity days in pursuit of trout, 99% of the time was spent on put and take managed waters. Total pressure exerted by adults was 386,054 trips to 51 streams. Richmond Springs and Swiss Valley ranked as the most popular streams, 8% of the trips each, Fountain Springs and Trout Run accounted for 5% each and ranked second. Licensed trout anglers caught an estimated 585,814 trout (an overestimate), or 11 trout/season for each angler, while 81% of the anglers were successful in catching at least one trout during 1980. Streams under fingerling release management were fished by 3% of the licensed anglers while 16% utilized streams with "special fisheries". Of the anglers interviewed 85% were satisfied with the trout program. Field interviews mirrored those of the telephone and mail. Thirty-four percent of the anglers interviewed telephoned at least one hatchery on the interview day to determine which streams were stocked. Interview information was compared to a similar interview of trout anglers fishing during 1975 and analysis drawn from changes in the trout program. Licensed trout anglers increased 21% from 1975 to 1980, fishing activity decreased 19%, and trips to individual streams increased 6%. Changes in stocking policies due to public interest, acquisition, changes in habitat, access development, and "special trout fisheries", all played a role in the redistribution of fishing activity. Catching trout was the most important desire of trout anglers, most of which are nonpurists. The investigation identified important factors responsible for variations in fishing activities as well as a general description of the trout angler. A major element not identified yet is the saturation point of angler activity. A future program will concentrate on the put and take fisheries and must maintain the success rate of Iowa trout anglers. The program will also focus on habitat enhancement, hatchery production capabilities, access development, distribution of fishing pressure and land acquisition.

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Date Prepared: 30 June, 1981

JOB 2 OBJECTIVE

To conduct a telephone survey of a statistically significant number of licensed trout anglers in Iowa to determine fishing preferences, success, and attitudes. Also, to conduct interviews of trout fishermen on streams to determine specific success and use of various streams, fishing preferences, and attitudes. This information will be used to forecast future needs and goals of the trout program.

INTRODUCTION

There are nearly 43,000 anglers that fish trout in Iowa, as previously mentioned, and the number has increased at an average annual rate of 7%. The increased interest in trout fishing has paralleled the diminution of the overall quality of trout waters in Iowa. Therefore, a long range trout program must not only determine the quantity and quality of trout waters, but also, the present and future desires of trout fishermen. The principle aim of this segment of study is designed to provide this information.

A survey of trout anglers was conducted by telephone (Moeller, 1976) to determine preferences, catch, angling pressure, and to obtain opinions of anglers relative to the trout program during 1975. A similar study was conducted for the 1980 fishing season and comparisons made to the earlier report. Information was also obtained on trout fishermen through two additional types of surveys.

METHODS AND PROCEDURES

Respondents for the trout angler survey were selected through three different methods. Names of adult trout fishermen (16 years and older) to be surveyed by telephone were obtained from postal reply cards attached to each Trout Stamp Booklet. One card was placed in each booklet. Directions to licensed vendors specified the first person to purchase a trout stamp from each booklet was to fill out and return the card. The maximum sample size that could be attained was 10% of the licensed trout anglers. The survey was similar to that of Moeller (1976). Anglers were interviewed to determine man days spent fishing trout, species preferences, types of streams fished, preference to stream access, annual catch of trout, and recommendations. Anglers not contacted by telephone were mailed an interview form with a cover letter explaining the survey and requesting the angler to complete the form and return it.

A creel survey on streams was conducted in conjunction with stocking trips out of each of Iowa's three trout hatcheries to provide the second method. The survey was conducted once a week from 1 April through 15 November. Anglers were interviewed to determine catch, angler satisfaction, species preference, opinions of present trout program, fishing gear used, bait used, and whether or not they used a telephone to obtain a stocking report. In addition, the total number of anglers fishing the stream was recorded.

Several anglers were specifically requested to maintain diaries of their fishing success at fingerling release and grow streams, the third survey method. Information recorded in the diaries included date of the trip, stream fished, hours fished, species caught, and length of fish caught. The anglers were also requested to count other fishermen they encountered on each fishing trip and record this figure.

FINDINGS

TELEPHONE AND MAIL INTERVIEWS

Telephone and mail interviews accounted for 478 survey responses which was 1.8% of the 26,590 licensed trout anglers in 1980. Trout anglers represent 5.5% of the licensed fishing public. The proportion of completed interviews to the total number anglers with trout stamps was used to compute estimated fishing days, trips, catch statistics, and other information.

Males dominated the survey comprising 92% of the sample. A minimum estimate of 10,625 non-licensed anglers (anglers under 16 years old) fished for trout during 1980. The estimate of young anglers is a minimum figure since it represents only those younger anglers that had at least one parent that purchased a trout stamp in 1980. Young trout anglers whose parents did not purchase a trout stamp could not be estimated. Average age of licensed anglers was 40, over 36% of the licensed anglers were 16-29 years of age, 34% were 30-49 years old, 19% were 50-64 years old while nearly 11% were 65 and older.

Non-resident trout fishermen comprised 4% of all licensed trout anglers. The majority of these non-residents, 78%, resided in Illinois, Minnesota and Wisconsin.

Adult anglers spent 292,045 activity days in pursuit of trout in Iowa during 1980. The majority of this time, 99%, was spent on put and take streams while the remainder was on fingerling stocked waters. Ninty-five percent of the trout stamp purchasers fished trout during 1980, 44% fished 1-5 days during the season, 33% fished 6-15 days, 12% fished 16-30 days, 4% fished 31-60 days while 4% fished 60 or more days.

Trout anglers often journeyed to more than one stream on a fishing day. The total pressure exerted by licensed adults on trout in Iowa was 386,054 trips (Table 3). Richmond Springs and Swiss Valley ranked as the most popular put and take streams and each accomodated 8% of the total trips taken in 1980 (Table 3). Fountain Springs and Trout Run accounted for 5% each, Bloody Run, Little Paint, North Bear and Spring Branch contributed 4% each. Trout anglers also fished the Upper Iowa River, a stream no longer stocked.

Licensed trout anglers caught an estimated 585,814 trout during 1980, 2 fish/day or about 11 trout/season. Over 81% of the fishermen interviewed were successful in catching at least one trout during 1980. Slightly over 37% of the anglers caught 1-10 trout, 22% creeled 11-25 trout, 13% creeled 26-50 trout, 5% creeled 51-100 trout, and over 4% creeled 100 or more trout. Younger anglers, under 16 years old, caught an additional minimum of 36,714 trout.

Table 3. Estimated fishing trips, percent of total trips and rank of put and take trout waters during 1980.

	Estimated fishing trips	Rank
Bankston Creek	7,732	18
Bear Creek	9,123	12
Big Mill Creek	7,677	19
Bigalk Creek	4,895	30
Bloody Run	14,185	8
Bohemian Creek	5,507	28
Brush Creek (Fayette Co.)	4,450	33
Brush Creek (Jackson Co.)	8,122	16
Buck Creek	3,894	35
Clear Creek	556	42
Coldwater Creek	7,788	17
Coon Creek	2,003	39
Dalton Lake	2,781	37
Fountain Springs	19,748	3
Ensign Creek	5,340	29
French Creek	6,119	24
Glover's Creek	6,286	23
Grannis Creek	6,953	21
Hickory Creek	6,119	24
Joy Springs (Upper Maquoketa River)	7,454	20
Little Mill Creek	6,008	25
Little Paint Creek	14,408	7
Livingood Springs	3,449	36
Maquoketa River	4,506	32
Mink Creek	2,614	38
North Bear Creek	14,630	6
North Cedar Creek	1,724	40
Otter Creek	5,730	27
Paint Creek	8,734	14
Patterson Creek	3,449	36
Richmond Springs	31,485	2
Silver Creek	3,894	35

Table 3. Continued.

	Estimated Fishing Trips	Rank
Sny Magill	11,960	9
South Bear	10,625	10
South Cedar Creek	1,724	40
Spring Branch (Bailey's Ford)	15,075	5
Spring Creek	9,735	11
Swiss Valley	32,208	1
Trout River	9,012	13
Trout Run	17,078	4
Little Turkey Creek	5,841	26
Turkey River	8,511	15
Turtle Creek	4,283	34
Twin Springs	6,675	22
Upper Iowa River	556	42
Village Creek	1,113	41
Wapsi River	1,724	40
Waterloo Creek	6,008	25
West Canoe Creek	1,724	40
Wexford Creek	4,839	31
TOTAL	386,054	

Most anglers, 44%, preferred access where it was necessary to walk 100 yds to ¼ mile to get to a trout stream. About 25% of the trout anglers preferred to fish streams where walking of well over ¼ mile was required, 18% preferred immediate access from a raod while 13% had no preference to access.

Rainbow trout was preferred by 40% of the trout anglers. Brown trout were popular with nearly 30% of the anglers, 5% of the trout fishermen preferred brook trout, 26% had no preference while only one person interviewed prized albino rainbow trout, < 1%.

Streams under fingerling release and grow management were visited 2,781 times by 3% of the licensed anglers during 1980. Anglers fishing these streams caught 10,625 trout or nearly 4 trout/trip. Telephone and mail responses, with licensed trout fishermen, provided names and trips to only 14 of 50 streams under fingerling release and grow management (Table 4). Among the more popular streams fished by these anglers was Peck Branch followed by Miners, Middle Bear, Pine Creek, and Hogan's Branch. A reliable assessment of fishing pressure could not be portrayed on these less frequently fished streams due to the small sample size.

Table 4. Estimated fishing trips to 14 of the more popular streams under fingerling release management.

Stream	Estimated number of fishing trips
Steele's Branch	111
Peck Branch	556
Miners Branch	334
Ozark Spring	56
Middle Bear	334
Bloody Run (Dubuque Co.)	56
Pine Creek (Winneshiek Co.)	334
Hogan's Branch	334
Catfish Creek	111
Schechtman's Branch	56
White Pine Hollow	111
Springbrook	167
Spring Falls	56
Maquoketa Spring	111

May and June were the most popular fishing months each accounting for 16% of the fishing pressure. July and September contributed 13% each, April 12%, August and October about 11% each, November 4%, March 3%, while January, February and December each contributed about 1%.

Trout streams with special regulations were fished by 16% of the interviewed trout anglers. Some of the remaining anglers were unaware of the special regulations e.g. no kill on brook trout, artificial lures only, and 14 inch minimum length limit on brown trout.

A large majority, 85%, of the anglers interviewed were completely satisified with the trout program. About 11% of the anglers were dissatisfied while 4% had no opinion. Suggested avenues to improve the program included continued habitat enhancement work, more enforcement effort, purchases of more trout streams by the state, and stronger land use regulations. Other recommendations included the stocking of more fish and bigger fish on a more frequent basis.

FIELD INTERVIEWS OF TROUT ANGLERS

Interviews were conducted at 35 of 46 put and take trout streams during 1980 (Appendix F). Instantaneous counts included 681 anglers of which 466 were interviewed. To avoid duplication anglers were interviewed only once during the season, although they were included in instantaneous counts.

Fishing pressure varied considerably between streams (Appendix F). Instantaneous angler counts averaged 32 at Richmond Springs, 22 at Swiss Valley and Spring Branch, 15 at Twin Springs, 14 at Fountain Springs, 13 at Trout River and 12 at Joy Springs. Anglers were not present on interview days at several streams.

Thirty-four percent of the interviewed anglers telephoned at least one of the hatcheries on the interview day to determine which streams were stocked. Spinning gear was the most popular tackle, used by 77%, followed by fly fishing gear at 20%, the remainder was comprised of an assortment of other types. Nearly half, 48%, of the anglers preferred to use prepared baits (cheese, marshmallows, corn or salmon eggs); live bait (minnows and worms) was preferred by 32% of the anglers; while artificial lures was the preferred bait of 19% of the anglers. Brown trout were sought after by 58% of the anglers while 30% preferred to catch rainbow trout, the remainder were equally divided between brook and albino rainbow trout. Sixteen percent of the fishermen interviewed on the put and take streams also fished streams with special regulations.

Anglers interviewed at stream sites also provided recommendations. Stock more and larger trout was a common suggestion. Other common recommendations, included increase habitat enhancement work, aquire more trout water, more land management or land use regulations, and more enforcement.

FISHING DIARIES

Seven of eight specifically selected trout anglers reported fishing success at streams under fingerling release and grow management. Cooperating anglers fished 107.5 hours during 32 trips to 14 streams (Table 5). Angler C/E ranged from 0 to 4.3 trout/hour with an average C/E of 1. Total catch of trout $<$ 10 inches was 69 while 40 trout were $\geq$ 10 inches of which seven were creeled.

Cooperating trout fishermen interviewed 25 other trout anglers. Interviewed fishermen caught 12 trout or .5 trout each.

Table 5. Number of trips, hours fished, catch and catch success of cooperating anglers to streams under fingerling management.

Stream	Number of trips	Total catch	Total hours fished	Catch per hour
Bear (Clayton Co.)	2	1	3	.3
Maquoketa Springs	2	5	4	1.3
Mossey Glen	1	4	4	1.0
North Canoe	1	1	2.5	.4
Ozark Springs	1	1	1	1
Pine	1	7	4	1.8
South Fork Big Mill	3	13	14	.9
Spring Branch	7	39	37.5	1.0
Springbrook	2	15	3.5	4.3
Steele's Branch	2	7	9	.8
Spring Falls	4	10	11	.9
Suttle	3	6	9	.7
Tibbott's Branch	2	0	3	0
White Pine Hollow	1	0	2	0
Totals	32	109	107.5	
Average	2.3			1

DISCUSSION OF FINDINGS

Trout anglers in Iowa were characterized after the completion of 944 telephone, mail and on stream field interviews. Interview information also provided angler preferences and fishing pressure by area. These data were compared to an earlier study of trout anglers in Iowa (Moeller, 1976). Changes in the fishing activities of anglers from 1975 to 1980 demonstrated the anglers influence on the Trout Program and the program's impact on the angler while some changes were difficult to interpret.

Licensed trout anglers increased numerically from 1975 to 1980 while total fishing license sales for the same period decreased (Appendix G). Trout anglers increased 21% or from 22,354 in 1975 to 26,590 in 1980. Total license sales for the same period decreased from 520,186 to 482,352, a decline of 7%.

Trout fishing activity days decreased 19% from 1975 to 1980, or from 300,985 to 292,045 activity days, despite the increase in numbers of trout anglers. The decline in activity could be explained by the economic experience of increased transportation costs. For example, approximate cost for an average driver driving 10,000 miles/year was 18¢/mile in 1975 while the same driver had to pay 28¢/mile in 1980 (personal communication, Dick Schuck, Iowa AAA). Other unknown causes could be involved.

Fishing trips to individual streams per day increased from 1975 to 1980, followed by changes in the distribution of fishing pressure. Trout anglers made 363,145 trips to 50 put and take streams in 1975 while they made 386,054 in 1980. Little Paint ranked as the most popular stream in 1975, but dropped to 7th in 1980. Richmond Springs remained second in importance both years while Fountain Springs ranked third in 1980 as compared to 28th in 1975. Trout Run increased from ninth in importance during 1975 to fourth in 1980.

Changes in the trout stocking program excellerated the popularity of some streams. Five streams were stocked on a bi-weekly basis with catchable trout during 1975; Richmond Springs, Trout Run, Little Paint, Bloody Run, Twin Springs and Turkey River. All remaining streams were stocked once per week. With the exception of Twin Springs all of the afore mentioned streams ranked among the nine most popular streams during 1975. From 1975 to 1980 several streams were added to the list of more frequently stocked waters; Swiss Valley, Fountain Springs, Joy Springs, Spring Branch (at Bailey's Ford) and Sny Magill. With the exception of Joy Springs fishing pressure at all of the additional streams increased dramatically (Appendix H). Changes in stocking policies for these streams were due to several factors. For example, increased public interest (telephone calls to the hatcheries) were responsible for increased stocking trips to Swiss Valley, Spring Branch and Fountain Springs. Habitat enhancement work at Swiss Valley and Spring Branch further justified additional stocking trips to these streams. Trout stockings at Sny Magill was increased because of land aquisition, access development, and habitat improvement. Also of notable importance was the fact trout waters closest to the metropolitan areas of Waterloo, Cedar Rapids, and Dubuque experienced increased fishing pressure. The more distant streams decreased in popularity e.g. Little Paint, Bloody Run, Twin Springs and Turkey River.

Termination and reductions in stocking quotas reduced or eliminated fishing pressure at some waters. Habitat degradation resulted in the conclusion of trout releases into Klienlien during 1977, it ranked 20th in 1975 while none of the survey respondents fished it during 1980. Stocking quotas were reduced at Dalton Lake and Brush from 1975 to 1980. Dalton Lake ranked 19th in popularity during 1975 and 37th in 1980, while Brush ranked 8th and 33rd for the same years. Although quotas at Big Mill were reduced from 1975 to 1980 popularity of the stream increased slightly, it ranked 23rd in 1975 and was 19th in 1980. The contrasting difference between Big Mill and the other waters was due to the fact Big Mill was once in private ownership and closed to fishing. A segment of Big Mill was purchased by the State in 1973 and access development soon followed enhancing its popularity from 1975 to 1980.

Diversification of the Trout Program from 1975 to 1980 added to the variety of trout fishing, but in general did not increase fishing activity. The variations termed "Special Trout Fisheries" included; stockings of brook trout into North Cedar, South Fork Big Mill, and a segment of Spring Branch; artificial lure only on South Fork Big Mill, North Cedar and a segment of Bloody Run; once a month stockings of catchable brown trout on Little Turkey; and a 14 inch minimum length limit on brown trout on segments of Bloody Run and Spring Branch. Removing some of these streams from the put and take program provided trade-offs to those anglers that regularly fished them. The changes allowed stocking quotas to be increased on other streams and segments of put and take streams with the special regulations. The response in the activity of trout anglers at the former put and take streams was as follows; fishing activity at the put and take segment of Spring Branch (Bailey's Ford) increased, as was previously mentioned, while fishing activity at the "Special Trout Fishery" segment was reduced (District Office Records); angler use of Bloody Run decreased; popularity of North Cedar remained about the same from 1975 to 1980, 49th in 1975 and tied with four other streams in 1980 as one of the least popular; while Little Turkey increased in popularity from 50th in 1975 to 26th in 1980. Special regulations restricting the angler did not increase fishing activity. However, the monthly stocking policy of catchable brown trout at Little Turkey, without special regulations, increased recreational fishing. Despite the lack of increased fishing at many of these streams, 16% of the respondents occasionally fished them during 1980. Presently "Special Trout Fisheries" comprise 2% of the total length of trout water. The addition of more streams within special regulations deems further consideration, since they are utilized in far greater proportion than availability. However, inclusion of an entire put and take stream with no trade off would not be popular with a majority of anglers regularly fishing them because most trout fishermen do not like prohibiting regulations.

Anglers overestimated their fishing success in three recent surveys. Anglers responding to a statewide survey of anglers (Anonymous, 1976) for the 1975 fishing season estimated their total catch of trout to be 1,029,602 fish. Trout fishermen interviewed by Moeller (1976) estimated their total catch in 1975 to be 633,956 trout from put and take managed streams, while stocking records indicated 253,631 catchable trout were released. Anglers interviewed in 1980 provided an estimated catch of 585,814 trout, while only about 320,000 were stocked that year. Fisheries management creel surveys (District Office Records) indicate about 60-80% of the trout released in the put and take program are caught after release; consequently, actual total annual catch is about 230,000 trout.

Catch success and the distribution of the catch has remained unchanged. Trout anglers caught 2 trout/day in 1975 and 1980 while about 25% of the anglers continued to claim 75% of the catch. In general, the anglers that fished more frequently caught more trout.

The minimum estimate of non-licensed trout anglers (less than 16 years of age) remained about the same as did their catch from 1975 to 1980. Younger trout anglers numbered about 10,806 in 1975 compared to 10,625 in 1980, their annual catch was 3.6 trout/angler in 1975 compared to 3.5 in 1980. On a statewide basis there was an 18% decrease in potential anglers less than 16 years old from 1975 to 1980.

Catching trout is the single most important goal of trout fishermen in Iowa, as would be expected. Activity of trout anglers is greatest during the months of highest stocking intensity, May and June, although some anglers do not fish July or August because of heat tolerance. Streams with the most frequent stockings are also the most popular, as demonstrated earlier, the most frequent category of advice in the 1975 and 1980 surveys was "stock more trout" and many trout anglers telephone hatcheries for stocking agendas to insure their success. Additional desires of trout anglers were expressed in the form of recommendations for the trout program. As previously mentioned "stock more and larger trout" was a common suggestion. Also of importance to anglers was the aquisition of more public trout waters, land use regulations, and habitat enhancement. Physical features of habitat enhancement work that most impressed trout anglers was the creation of pools and bank stabilization. another common suggestion was "more law enforcement" on trout streams.

Access is an important physical virtue of trout streams in Iowa. Streams that had fishing readily available from a road, within 100 yds, provided the most important fisheries; Richmond Springs, Swiss Valley, Fountain Springs, Spring Branch (Bailey's Ford), and Trout Run. However, 40% of the anglers interviewed in 1975 and 44% in 1980 indicated they preferred access 100 yds to ¼ mile from the stream. Although anglers reported they liked to fish areas with some walking distance, 100 to ¼ mile, they did not necessarily do it. As in the case of Big Mill and Sny Magill, fishing activity increased after access development.

Streams under fingerling release management maintained recreation for a small but increasing number of anglers. About 1.5% of the licensed trout anglers fished trout in the smaller streams during 1975 while 3% utilized them in 1980. These anglers were primarily in pursuit of brown trout. Catch per trip improved from 1.4/trip in 1975 to 4/trip in 1980.

Angler statistics determined by the telephone and mail survey were mirrored by field interviews. Swiss Valley, Richmond Springs, Fountain Springs and Spring Branch (Bailey's Ford) were all important fishing sites in the field survey and the telephone and mail interviews. Similar results were found for species preference, special regulation preferences and angler recommendations.

The habit of contacting a fish hatchery prior to a fishing trip was an important factor identified in the field survey. Thrity-four percent of the trout fishermen contacted in the field called a hatchery before leaving their homes, many of these individuals had one or more fishing companions. Thus, an important segment of the daily fishing pressure on any given stream is governed by whether or not the stream was stocked that day rather than chance, day of the week or weather conditions.

Findings of this phase of investigation have demonstrated elements responsible for trout angler activities as well as providing a general description of the trout angler and his desires. Fishing activity on individual trout streams is dependent on stocking rate, location of the stream, fishing accessibility, transportation costs, and the capability of determining daily stocking agendas. Some of these features were interrelated creating cause and effect situations. Most trout anglers in Iowa are non-purists simply

wanting to catch fish, his concept of a trout stream is basic, although there is an increased awareness of habitat and land use. Put and take managed streams are prefered by the majority of trout anglers, spinning gear is commonly used with a variety of baits, and 85% of the anglers are satisfied with the present program.

A significant constituent of the trout fisheries not identified, as yet, is the satuartion point of angler activity on trout streams. One possible indicator that fishing activity is approaching saturation is the fact trout stamp sales did not reach the expected extreme. Trout stamps sales increased from 18,888 in 1972 to 23,608 in 1977. Projected forcasts indicated about 31,000 stamps would be sold in 1980, actual sales were 26,590. In addition angler activity days from 1975 to 1980 decreased while anglers also made more trips/day to individual streams. The latter event may be due to dispersion of anglers to streams with less fishing pressure or the need to fish more water to achieve a daily limit. Also the proportion of successful anglers (those catching at least one trout/year) declined slightly from 86% in 1975 to 81% in 1980 and many expressed the desire to have more public trout fishery waters. However, the proportion of anglers satisfied with the trout program improved from 74% in 1975 to 85% in 1980. Activity saturation point is dependent on hatchery production capabilities of catchable sized trout and daily or weekly stocking capabilities. Not necessarily the numbers of available streams.

A trout management program designed to meet the needs of anglers in the future will encompass all of the factors related to earlier. However, of paramount importance will be the maintenance of the catch success of trout anglers and prevention of activity saturation. A vast majority of trout anglers are satisfied with the program because they can catch trout. Trout streams most suited to the put and take program should receive the greatest attention with respect to habitat enhancement (to improve the physical quality of the stream and trout carry over), aquisition, access development and distribution of fishing pressure as well as those points described in Job 1. Although most anglers will always prefer the put and take program, over the fingerling stocked waters or the "Special Trout Fisheries", a future program must be proportioned to the needs of all factions. Accomplishment of a successful management program should also be accompanied by a public relations program explaining objectives and changes.

RECOMMENDATIONS

A major segment of this job was achieved. Only instantaneous angler counts at put and take streams and the angler diaries will be continued.

The 2% sample size of trout stamp holders was acceptable. An increase in sample size could be realized if five to ten postal cards were placed in each stamp booklet, thus cooperating vendors would return more reply cards.

Information collected in this job will be further scrutinized with additional data tabulated during 1981-82. The culminating objective will be to synthesize all of the information into a long range trout management program.

Stocking quotas for 1982 releases of catchable trout should be adjusted to trip frequencies to each stream to distribute trout in accordance to fishing pressure.

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APPENDIX

Appendix A. Physical inventory field work sheet.

Stream _____ County _____

Date Inventoried _____ Water Temperature _____

Location: Twn. _____ R. _____ Sec. _____

Length of trout water _____

Start of trout water _____

End of trout water _____

Length of marginal trout water _____ Temperature _____

End of marginal trout water _____

Temperature of tributary or next stream order _____

Segment _____ Length _____ Stream order _____

Access: Good _____ Adequate _____ Poor _____

Pool Depths: < 1 ft _____ ≥ 1 ft < 2 ft _____ ≥ 2 ft _____

Pool Substrate (50%): Silt and sand _____ Bedrock _____

Gravel and Cobble _____ Clay _____

Bank or overhead cover in pools (%) "6 + 12"

Permanent _____ Log jams _____ Boulders _____ Vegetation _____ Man-made _____

Bank Stability: Stable _____ Deteriorating _____ Instable _____

Watershed Use: Pasture _____ Forest _____ Cultivated _____

Prairie _____ Pasture-Forest _____

Appendix B. Physical inventory data including bank stability, stream corridor land use and soil erosion index for trout waters in Iowa, 1980.

Stream	Bank Stability (percent of length)			Stream corridor land use (percent)					
	Stable	Deteriorating	Unstable	Pasture	Forest	Cultivated	Prairie	Pasture forest	Soil Erosion Index
Alderson Hollow	13	60	27	20	80	0	0	0	4
Baron Springs	35	50	15	15	35	0	10	40	4
Bear (Clayton Co.)	75	15	10	15	35	0	35	20	5
Bear (Fayette Co.)	30	50	20	50	30	0	0	20	5
Beaver	15	45	40	45	6	6	24	19	3
Bigalk	10	40	50	100	0	0	0	0	6
Big Mill	20	53	27	75	12	0	13	0	6
Brush (Fayette Co.)	34	51	15	65	25	0	0	10	5
Brush (Jackson Co.)	11	58	31	74	0	10	0	16	5
Buck	24	53	23	64	23	4	0	8	8
Chialk	34	55	11	50	38	12	0	0	4
Coon	42	34	14	0	28	15	46	10	9
Ensign Hollow	63	33	3	63	0	16	0	20	3
Fountain Springs	66	17	17	5	29	0	0	66	8
French	6	53	41	66	0	6	25	3	7
Glover's	58	33	8	30	50	17	0	3	7
Grannis	52	33	15	25	56	0	19	0	5
Grimes Hollow	25	40	35	25	0	0	0	75	8
Hewitt	24	44	33	33	29	4	0	33	3
Hogan's Branch	56	10	34	72	16	12	0	0	7
Joy Springs (Upper Maquoketa River)	20	70	10	38	38	0	12	12	3

Appendix B. Continued.

Stream	Bank stability (percent of length)			Stream corridor land use (percent)					
	Stable	Deteriorating	Unstable	Pasture	Forest	Cultivated	Prairie	Pasture forest	Soil erosion index
Klienlien	48	6	46	50	0	0	50	0	4
Little Maquoketa (South Fork)	23	27	50	83	0	< 1	0	17	7
Maquoketa Springs	50	25	25	0	67	0	0	33	6
Little Turkey	38	46	16	31	13	0	0	56	8
Maquoketa River	33	53	14	15	39	2	42	25	4
Middle Bear	7	69	24	86	0	0	14	0	7
Mink	2	30	68	40	50	0	0	10	5
Mossey Glen	72	23	5	63	33	0	3	0	4
North Bear	17	50	33	91	8	0	1	0	7
North Cedar	54	34	12	0	71	11	0	18	8
Otter	54	32	14	24	23	12	27	13	7
Patterson	6	72	22	50	20	8	20	0	8
Pine	68	32	0	0	65	0	35	0	8
Ram Hollow	55	45	0	0	100	0	0	0	8
Richmond Springs	50	45	5	0	100	0	0	0	4
Silver	15	56	29	66	8	13	0	13	8
South Bear	13	54	33	42	6	0	48	4	7
South Cedar	10	56	34	44	33	0	0	23	8
South Fork Big Mill	30	5	65	0	0	0	100	0	6
Spring Branch	19	16	65	74	13	0	13	0	4
Spring Falls	35	50	15	50	0	0	0	50	8
Staff	18	37	25	10	0	0	60	30	3

Appendix B. Continued.

Stream	Bank stability (percent of length)			Stream corridor land use (percent)					
	Stable	Deteriorating	Unstable	Pasture	Forest	Cultivated	Prairie	Pasture forest	Soil erosion index
Steele's Branch	48	28	24	39	9	4	6	42	8
Story Hollow	32	28	40	50	0	0	0	50	6
Tibbott's Branch	0	40	60	100	0	0	0	0	8
Trout River	45	31	24	63	16	12	0	9	9
Trout Run	47	37	16	80	0	0	0	29	7
Twin Spring	65	35	0	0	93	0	7	0	7
Waterloo	17	67	16	44	16	6	14	19	7
Wolf	47	30	23	13	67	0	0	20	8

Appendix C. Physical inventory data including cover types, cover index and proportions of dominant pool substrates for trout waters in Iowa, 1980.

Stream	Percentage of pools providing various types of bank or overhead cover					Cover index	Dominant pool substrate (> 50%)			
	Bank	Log jams	Boulders	Aquatic vegetation	Man-made		Clay	Silt and sand	Gravel and cobble	Bedrock
Alderson Hollow	2	26	7	0	0	35	3	39	58	0
Baron Springs	12	36	0	20	0	68	3	42	55	0
Bear (Clayton Co.)	3	4	23	6	0	36	2	0	98	0
Bear (Fayette Co.)	3	12	35	0	0	50	0	35	66	0
Beaver	8	20	3	8	2	41	0	69	31	0
Bigalk	8	23	8	23	0	62	0	30	70	0
Big Mill	14	10	5	14	0	43	8	28	64	0
Brush (Fayette Co.)	5	11	25	0	0	42	1	39	58	1
Brush (Jackson Co.)	3	10	20	0	0	33	< 1	48	45	6
Buck	6	12	10	2	0	30	1	32	63	5
Chialk	6	35	4	28	0	73		67	33	0
Coon	4	5	2	1	11	23	0	77	33	0
Ensign Hollow	15	13	1	1	0	30	4	46	41	9
Fountain Springs	3	12	12	19	27	73	0	24	58	18
French	3	6	3	31	12	55	< 1	39	61	0
Glover's	13	22	28	22	0	85	0	19	78	3
Grannis	17	27	2	0	0	46	1	41	56	2
Grimes Hollow	0	6	0	0	0	6	5	30	57	9
Hewitt	7	24	2	< 1	0	33	0	43	57	0
Hogan's Branch	4	20	< 1	< 1	0	24	< 1	69	30	< 1
Joy Springs (Upper Maquoketa River)	4	39	0	20	6	69	0	69	31	0

Appendix C. Continued.

Stream	Percentage of pools providing various types of bank or overhead cover					Cover index	Dominant pool substrate (> 50%)			
	Bank	Log jams	Boulders	Aquatic vegetation	Man-made		Clay	Silt and sand	Gravel and cobble	Bedrock
Klienlien	8	22	7	16	0	53	12	45	42	1
Little Maquoketa	5	9	11	3	0	28	0	37	61	2
Maquoketa Springs	2	6	15	0	0	23	0	34	12	0
Little Turkey	6	29	10	0	0	45	8	26	58	8
Maquoketa River	13	63	< 1	5	0	81	0	78	22	0
Middle Bear	10	17	3	25	0	55	0	31	66	3
Mink	11	12	12	4	0	39	0	55	45	0
Mossey Glen	9	15	13	13	0	50	2	23	75	0
North Bear	5	12	7	33	6	63	0	28	70	2
North Cedar	7	23	8	1	1	40	1	28	57	14
Otter	8	22	17	2	< 1	49	0	28	68	3
Patterson	4	12	8	4	0	28	< 1	47	52	1
Pine	18	11	9	4	9	51	0	18	78	4
Ram Hollow	5	50	0	23	0	78	0	38	62	0
Richmond Springs	3	38	28	22	9	100	0	44	56	0
Silver	4	13	10	7	0	34	< 1	38	59	2
South Bear	5	13	11	38	7	74	0	25	68	7
South Cedar	1	11	12	< 1	0	24	2	48	48	2
South Fork Big Mill	5	8	5	0	29	47	0	32	68	0
Spring Branch	< 1	17	1	40	29	87	0	46	49	5
Spring Falls	12	7	14	22	0	55	16	12	71	1
Staff	6	26	2	0	0	34	0	76	20	4

Appendix C. Continued.

Stream	Percentage of pools providing various types of bank or overhead cover					Cover index	Dominant pool substrate (> 50%)			
	Bank	Log jams	Boulders	Aquatic vegetation	Man-made		Clay	Silt and sand	Gravel and cobble	Bedrock
Steele's Branch	7	13	16	0	0	36	< 1	50	48	2
Story Hollow	8	9	5	5	0	27	1	20	79	0
Tibbott's Branch	0	16	5	26	0	47	0	90	10	0
Trout River	6	17	2	20	10	55	0	13	80	6
Trout Run	19	24	4	44	4	95	0	24	74	2
Twin Spring	7	11	0	20	11	49	0	9	91	0
Waterloo	7	18	17	2	0	44	1	34	62	3
Wolf	7	15	1	0	0	0	1	50	49	0

Appendix D. Total number of pools, pools/mile ≥ 1 ft and < 1 ft, and percent of pools within three depth categories for 50 coldwater streams in Iowa.

Stream	Total number of pools	Pools/mile		Pool depth (percent)	
		≥ 1 ft	< 1 ft	≥ 1 ft < 2 ft	≥ 2 ft
Alderson Hollow	136	67	50	37	13
Baron Springs	137	43	41	41	18
Bear (Clayton Co.)	68	43	31	48	21
Bear (Fayette Co.)	99	26	14	40	46
Beaver	120	17	38	33	29
Bigalk	39	47	15	39	46
Big Mill	88	15	35	34	31
Grimes Hollow	95	32	26	65	8
Brush (Fayette Co.)	154	35	35	30	35
Brush (Jackson Co.)	188	39	21	37	42
Buck Creek	340	42	29	34	37
Chialk	85	47	39	33	28
Coon	131	52	29	38	33
Ensign Hollow	82	60	34	56	10
Fountain Springs	154	43	20	49	19
French	151	23	24	46	30
Glover's	68	24	29	40	31
Grannis	138	63	31	44	25
Hewitt	126	47	14	49	37
Hogan's Branch	205	19	42	44	14
Joy Springs (Upper Maquoketa River)	51	31	14	49	37
Klienlien	128	45	37	51	12
Little Turkey	145	35	28	37	35
Maquoketa River	135	28	3	49	48
Maquoketa Springs	46	17	28	41	30
Middle Bear	107	36	30	43	27
Mink	113	48	16	48	36
Mossey Glen	60	20	53	30	17
North Bear	137	23	28	42	30

Appendix D. Continued.

Stream	Total number of pools	Pools/mile		Pool depth (percent)	
		≥ 1 ft	< 1 ft	≥1 ft <2 ft	≥ 2 ft
North Cedar	300	60	35	38	26
Otter	236	24	6	45	48
Patterson	219	61	37	36	27
Pine	45	18	29	53	18
Ram Hollow	56	30	79	19	2
Richmond Springs	55	47	15	29	56
Silver	204	19	30	37	33
South Bear	152	30	14	43	43
South Cedar	162	32	24	53	23
South Fork Big Mill	62	50	34	33	33
South Fork (Little Maquoketa)	164	82	50	35	15
Spring Branch	125	72	42	41	17
Spring Falls	68	50	41	52	7
Staff	100	28	10	48	42
Steele's Branch	367	33	31	46	23
Story Hollow	66	40	39	39	21
Tibbott's Branch	19	7	90	10	0
Trout River	190	59	19	44	37
Trout Run	54	43	6	48	46
Twin Springs	44	38	14	61	25
Waterloo	220	31	13	38	49
Wolf	130	36	48	36	16

Appendix E. Ownership of trout streams in Iowa.

Stream	Number of private owners	Ownership (percent of length)		
		State	County	Private
Alderson Hollow	1	0	0	100
Baron Springs	3	0	0	100
Bear (Clayton Co.)	2	40	0	60
Bear (Fayette Co.)	3	0	0	100
Beaver	8	0	0	100
Bigalk	3	0	0	100
Big Mill	7	19	0	81
Brush (Fayette Co.)	3	34	0	66
Brush (Jackson Co.)	10	0	0	100
Buck	5	0	5	95
Chialk	2	0	13	87
Coon	1	66	0	34
Ensign Hollow	2	0	0	100
Fountain Springs	4	0	54	46
French	4	38	0	62
Glover's	2	21	0	79
Grannis	4	22	0	78
Grimes Hollow	4	0	0	100
Hewitt	5	0	0	100
Hogan's Branch	5	0	0	100
Joy Springs (Upper Maquoketa River)	2	0	17	83
Klienlien	2	0	0	100
Little Turkey	5	0	0	100
Maquoketa River	5	20	0	80
Maquoketa Springs	2	15	0	85
Middle Bear	8	0	0	100
Mink	4	0	0	100
Mossey Glen	1	40	0	60
North Bear	7	40	0	60
North Cedar	0	0	0	100
Otter	12	3	0	97

Appendix E. Continued.

Stream	Number of private owners	Ownership (percent of length)		
		State	County	Private
Patterson	8	0	0	100
Pine	1	0	0	1[a]
Ram Hollow	0	100	0	0
Richmond Springs	0	100	0	0
Silver	9	0	0	100
South Bear	5	52	0	48
South Cedar	8	0	0	100
South Fork Big Mill	0	100	0	0
South Fork (Little Maquoketa)	6	0	0	100
Spring Branch	6	17	14	73
Spring Falls	2	0	0	100
Staff	6	0	0	100
Steele's Branch	10	0	0	100
Story Hollow	2	0	0	100
Tibbott's Branch	1	0	0	100
Trout River	7	25	0	75
Trout Run	3	38	0	62
Twin Springs	0	0	100[b]	0
Waterloo	9	0	0	100
Wolf	3	0	0	100

[a]Owned by Boy Scouts of America.

[b]Owned by City of Decorah.

Appendix F. Angler interview, instantaneous counts and number of interview days for put and take trout water.

	Number of days surveyed	Number of anglers interviewed	Instantaneous angler counts		
			Total	Range	Mean
Bankston Creek	2	7	9	4-5	5
Bear Creek (Fayette Co.)	0		0		
Big Mill Creek	3	12	18	0-15	6
Bigalk Creek	1	1	1		1
Bloody Run	3	8	12	1-5	4
Bohemian Creek	1	2	2		2
Brush Creek (Fayette Co.)	0				
Brush Creek (Jackson Co.)	1	3	3		3
Buck Creek	1	2	3		3
Clear Creek	2	0	0		
Coldwater Creek	1	5	5		5
Coon Creek	1	0	0		
Dalton Lake	1	8	8		8
Elk Creek (Fountain Springs)	9	90	126	4-32	14
Ensign Hollow (Hewitt)	3	27	38	6-14	13
French Creek	3	7	7	0-7	2
Glover's Creek	3	4	8	1-5	3
Grannis Creek	2	2	2	0-2	1
Hickory Creek	3	0	3	0-3	1
Livingood Springs	0		0		
Maquoketa River (Joy Springs)	5	51	70	5-19	12
Mink Creek	0	4	0		
Little Mill Creek	3	4	14	2-6	5
Little Paint Creek	4	4	9	0-5	2
North Bear Creek	0				
North Cedar Creek	1	1	1		1

Appendix F. Continued.

	Number of days surveyed	Number of anglers interviewed	Instantaneous angler counts		
			Total	Range	Mean
Otter Creek	1	1	4		4
Paint Creek	1	0	2		2
Patterson Creek	1	1	6		6
Richmond Springs	2	28	64	29-35	32
Silver Creek	1	1	5		5
Sny Magill	3	2	9	2-7	5
South Bear Creek	1	8	10		10
South Cedar Creek	0	0	0		
Spring Branch (Bailey's Ford)	7	66	88	2-32	22
Spring Creek	0				
Swiss Valley	4	63	88	7-40	22
Trout River	2	32	26	6-20	13
Trout Run	0				
Little Turkey Creek	0				
Turkey River	2	11	13	6-7	7
Turtle Creek	0				
Twin Springs	1	12	15		15
Village Creek	0	0	0		
Wapsi River	0				
Waterloo Creek	1	1	10		10
West Canoe Creek	0	0	0		
Wexford Creek	3	2	2	0-2	1

Appendix G. License and trout stamp sales from 1975 through 1980 and percent change.

Year	Total number of licenses sold	Percent change from previous year	Number of trout stamps sold	Percent change from previous year
1975	520,186		21,973	
		+ 7		+ 7
1976	558,708		23,608	
		-13		+ 2
1977	485,722		24,138	
		+17		- 3
1978	568,307		23,559	
		-20		+ 4
1979	456,394		24,604	
		+ 6		+ 8
1980	482,352		26,590	
Average Percent Change		-.6		+ 3.6
Six Year Change (1975-1980)		- 7%		+21

Appendix H. Rank in popularity and weekly stocking rate, during 1975 and 1980, of 12 trout streams in Iowa.

	Rank		Trout stocking/week	
	1975	1980	1975	1980
Swiss Valley	25	1	1	2
Richmond Springs	2	2	2	3
Fountain Springs	28	3	1	2
Trout Run	9	4	2	2
Spring Branch (Bailey's Ford)	39	5	1	3
North Bear	5	6	1	1
Little Paint	1	7	2	2
Bloody Run	7	8	2	2
Sny Magill	24	9	1	2
Turkey River	6	15	2	3
Joy Springs (Upper Maquoketa River)	16	20	1	2
Twin Springs	18	22	2	2