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SALMONID STOCKING NEEDS IN WISCONSIN

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by
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Introduction

This report summarizes the Salmonid stocking needs and compares it with the present stocking program. Increasing angling and the realization of the potential of the Great Lakes for Salmonid management dictate a review of stocking needs and priorities.

This information is essential to the logical planning of propagation programs.

Stocking Objectives

Trout are stocked to furnish trout fishing in selected locations where natural reproduction is lacking or insufficient. Wise stocking also utilizes the growth potential of the waters. Many lakes and streams produce great quantities of food for fish but natural reproduction of desirable species is lacking. Stocked fish utilize this food and as a result large amounts of high quality fish flesh can be produced.

Stocking of Salmonids should meet the public demand for that type of angling and furnish high quality fish flesh for food. The food production aspect is important in this period of protein shortages. Certainly anglers eat most of the fish they catch.

Present Program

Each year stocking varies depending upon past success, need and programming the stocking of the available fish. Because of the more efficient use of the rearing facilities, the pounds of fish produced has gradually increased. Figure 1 shows the pounds stocked in inland waters and each of the Great Lakes.

Each year stocking quotas are prepared for specific waters of the state. The highest priority for stocking of brook, brown and rainbow trout is given to the inland waters. Those trout which are produced in addition to the inland needs are stocked in the Great Lakes. The Great Lakes, however, do receive highest priority for the stocking of lake trout, splake and salmon. Very few of these species are stocked in inland waters.

Figure 2 shows the number of fish stocked in inland waters of the various districts of the state as well as the number stocked in each of the Great Lakes in 1973. In addition to the state stocking program, about 1.3 million fish are stocked each year in Wisconsin waters of the Great Lakes by the federal government.

There are two basic types of Salmonid stocking. "Put-and-take" stocking is the stocking of catchable size fish in waters where the angler is expected to remove them soon after stocking. This type of stocking creates a great deal of recreation but does not utilize the biological production potential of the waters involved. The pounds of fish harvested is seldom as great as that stocked. Put-and-take stocking creates a great deal of angling pressure as soon as the fish are available and generates a great deal of additional angler demand. This is a long established program which is popular with many anglers.

Stocking on a "put-grow-and-take" basis allows for the fish to grow considerably before they are taken by anglers. This type of stocking utilizes the natural production capabilities of the water involved. In these cases the pounds of fish that the anglers catch are considerably greater than the poundage of fish stocked. In Lake Michigan, for example, 7.5 pounds of fish are taken for each pound stocked, and in Lake Superior 4 pounds are taken for each pound stocked.

Resources

Good natural trout populations occur in 2,730 miles of stream scattered throughout the state. There are, however, 8,690 miles of stream where at least some trout are found. This includes 3,320 miles which are stocked. With proper stocking, the remaining 2,640 miles could furnish suitable trout fishing.

Most of the stream stocking is "put-and-take" stocking; however, 1,050 miles are stocked with fingerling in a "put-grow-and-take" program. Natural reproducing trout populations have been known to produce to the angler more than 50 pounds per surface acre annually. (Hune et al. - 1962). Although this magnitude of production can probably not be expected in all waters, a considerable increase in poundage of stocked fish to the angler's creel is possible. A number of investigators report that harvests of trout were 3 to 5 times as large as the poundage stocked. In one case, the harvest was 18 times as great.

Although there is a considerable mileage of trout streams, the actual acreage is relatively small. It is estimated that streams with good natural reproduction cover considerably less than 7,000 surface acres. It is also estimated that all streams containing enough trout to furnish suitable angling, including those which are stocked, cover about 20,000 acres. Figure 3 shows by county the miles of the streams having good natural reproduction.

There are at least 500 inland lakes in the state which could be managed for trout. About 200 of these, covering 20,000 acres, are being stocked at the present time. Although a few lakes have small populations derived from natural reproduction in feeder streams, the lake fishery for trout would be essentially eliminated if none were stocked. Many of the lakes which would be suitable for trout also have suitable populations of warmwater game fish. In many of these waters the warmwater fish populations would have to be eliminated before successful trout management could be initiated. There are, however, some of the larger lakes which are being stocked with insufficient numbers of fish to fully utilize their potential or produce good trout fishing. Figure 4 shows the miles of trout streams and acres of inland lakes which are being managed for trout in each district and the percent of the state total of such waters which is located in each district.

The southeastern part of the state lacks suitable streams for stocking Salmonids but has a number of large lakes which could furnish satisfactory trout angling with additional stocking. Among these are Big Cedar Lake, Washington County, Pine and Little Muskego Lakes in Waukesha County, and the Lauderdale Lakes in Walworth County. Some of these do not currently have sufficient public access to allow management by the state however.

Wisconsin waters of the Great Lakes cover 6.44 million acres. This is a vast area which can produce many tons of fish and furnish a great deal of recreation. These waters once contained good lake trout populations; however sea lamprey and other factors have caused drastic population changes.

In Lake Superior, the number of lake trout declined drastically in the late 1950's and for a number of years no reproduction took place. Heavy stocking resulted in a partial recovery of the population and at the present time, limited natural reproduction of this species is taking place. In tributary streams, natural reproduction of brown and rainbow trout has continued throughout this entire period.

In Lake Michigan, the decline of lake trout began somewhat earlier than in Lake Superior and by the mid 1950's this species was almost totally eliminated there. Populations of lake trout and other species of Salmonids have developed in recent years because of stocking. Evidence of natural reproduction of lake trout has not been found in Lake Michigan and that of other Salmonid species cannot be expected to be significant in Wisconsin because of the lack of suitable tributary streams.

Historically Lake Superior produced more than .5 million pounds of lake trout annually and Lake Michigan, 2.5 million pounds. (Baldwin and Saalfeld, 1962) Even though these harvests were made by commercial gear, they may provide an insight as to potential production levels. Currently, the harvest in Lake Michigan is made almost entirely by sport angling but in Lake Superior sport fishing accounts for only about half of the total catch. In the Wisconsin waters of Lake Superior the annual harvest is about .2 million pounds and in Lake Michigan 1.66 million pounds. Certainly commercial fishing methods are more effective at catching fish than sport fishing methods. There are also other indications that lake trout populations have not reached their historic levels. In March of 1948, 1949 and 1950, an average of 18 lake trout were caught per thousand feet of gill net fished on the Sheboygan Reef. (Eschmeyer 1955) Comparative netting done in1974 caught only one lake trout per thousand feet of net. (Schultz & Baumgart in press) Current growth rates of lake trout on Lake Michigan are considerably greater than they were historically, indicating that the food supplies could support a considerably greater Salmonid population.

Since the Salmonid and forage populations are currently composed of a larger number of species than previously, each having its own ecological preference, production can be expected to be greater than when only one prime predator species was involved. In spite of the oligotrophic characteristics of these lakes, it is reasonable to expect a potential Salmonid production considerably greater than the historic harvest of .46 pounds per acre. Current harvest levels are .29 pounds per acre.

In Lake Superior, there are four pounds of Salmonids harvested for each pound stocked. In Lake Michigan, 7.5 pounds are harvested for each pound stocked. If the historic harvest is used as a goal and the current level of return of stocked fish is used, it is estimated that the stocking of Wisconsin waters of Lake Superior should be 90,000 pounds more than at present and Lake Michigan should receive 110,000 pounds more than the present annual level. Because these figures are based upon the historic harvest, they are thought to be minimal increases.

Public Use

In 1973 there were about 1,744,000 anglers in the state. There were 1,367,000 licensed anglers and the remainder were either too young or too old to require licenses. (Grant 1974) Thirty-six percent of all residents between the ages of 16 and 65 were licensed anglers.

It is estimated that 30% of all anglers fish Salmonids. In the open water season of 1967, only 18% of the anglers caught trout. (Churchill 1968) The following year, however, the number of licensed anglers began to increase rather dramatically and in the next four years increased by 200,000, or 17%. (Dept. Nat. Res 1974) This increase corresponds closely to the redevelopment of the Lake Michigan fishery which began significantly in 1968. Figure 5 shows the number of licensed anglers and compares it with the amount of angling done on Lake Michigan. Between 1968 and 1972 angling on Lake Michigan increased from about 100,000 trips to almost 670,000 trips annually. (Daly et al.- 1974) A significant increase, but of lesser magnitude, occurred on Lake Superior in the mid-1960's.

In 1973 it was estimated that 20% of all Wisconsin anglers fished the Great Lakes. (Bureau of Research - 1974) Eight percent of the total angling that year was done on the Great Lakes and 10% on trout streams. No estimate of angling on inland trout lakes has been made.

Figure 4 indicates the percent of the state population which lives in each district and an estimate of the percent of the trout caught from inland waters in each district. (Bureau of Research - 1974) It is extremely evident that there is a considerable disparity between the geographic distribution of people, the inland trout havest, and the amount of managed trout water. Few streams in the southeastern part of the state have potential for trout management, but because of the concentration of the population there, effort should be made to create more Salmonid fishing in that district. This can be done by utilization of inland lakes for that purpose and also by further development of the Great Lakes fishery. It is estimated that by 1980 there will be about 1.5 million angling trips on the Wisconsin waters of the Great Lakes.

There has been some objection to the management of the Great Lakes with Salmonids because of the relatively large expenditures necessary for purchase of equipment for trolling or for rental of commercial trolling facilities. Table 1 indicates the percentage of the angling which was done by various methods and the percentage of various types of Salmonids which were captured by those methods on Lake Michigan in 1973. Over 60% of the angling hours were by trolling but shore fishing, pier fishing, or fishing tributary streams was also popular and very successful in harvesting Salmonids except for lake trout. (Daly et al - 1974) Practically all of the lake trout were taken by trolling. The other methods of fishing, however, were more successful than trolling for catching stream trout or salmon. It must be pointed out that at present, all of the lake trout stocked in Lake Michigan are from federal hatcheries. However, the availability of federal fish for stocking in Wisconsin waters of the Great Lakes is expected to decrease in the future because of increasing demands for stocking the other Great Lakes. These demands increase as sea lamprey control becomes more effective.

TABLE 1. Percent of angling and harvest of types of Salmonids by various angling methods on Lake Michigan in 1973.

	Angling Hours	Stream Trout	Salmon	Lake Trout	Total Salmonids
Stream	10%	21%	15%	1%	12%
Pier and breakwater	21%	24%	25%	1%	17%
Trolling	62%	33%	57%	99%	64%
Shore	7%	22%	3%	1%	7%

The public need for trout fishing is an extremely difficult demand to assess. It can be done by considering the geographic distribution of the trout fisheries and the human population or the trends in angling license sales or the amount of angling. It is believed, however, that one of the best indications of public need are the expressions of that need to government agencies. Area fish managers scattered throughout the state are in close contact with local sportsmen's groups, local governmental bodies, residents and the angling public. They are in an excellent position to assess public needs.

With minor exceptions it is the opinion of the area fish managers that sufficient stream trout are being stocked in inland waters except for some of the larger waters in the Southeast District. Here approximately 150,000 additional stream trout should be made available for lake stocking. In larger lakes of the Southeast and the North Central Districts, increases of about 150,000 lake trout and splake are desired. Managers agree that additional stocking efforts are necessary in both of the Great Lakes if their potential for fish production is to be reached and future angler demands are to be met.

Reconciliation between present program and needs

Although additional Salmonid stocking is necessary to meet increasing angler demand and to more fully utilize the production potential of suitable waters, economic justification is necessary.

Since most of the stocking increase is for the Great Lakes, especially Lake Michigan, the economics of that fishery is particularly important. The vast majority of the fishing there is for Salmonids, almost all of which are stocked. It is extremely difficult to establish reliable values for sport fishing. Estimates as high as $25 million have been discussed for the Lake Michigan fishery. Although this may seem high, the impact of 98 charter trolling boats alone is estimated to generate almost $3.5 million in business. (Strang & Ditton - 1974) A nationwide study of freshwater fishing made in 1970 indicates that the average angler spends $6.30 for each fishing trip. (Bur. Sport Fisheries & Wildlife - 1972) if this is true, anglers spent $4.23 million in 1973 fishing in Lake Michigan.

Most of the fish taken by anglers are eaten. Therefore, the value of the catch for food must also be considered. At $1.00 per pound, the Lake Michigan catch is valued at $1.66 million.

The effect of the stocking program upon license sales revenue is important because most of the stocking program is funded from this source. Although this information is difficult to evaluate, there is some indication that the increase of angling on Lake Michigan had an impact upon the number of licensed anglers and license revenue between 1969 and 1972. Figure 6 shows that in this period angling license revenue rose $422,000.

Salmonid stocking costs also rose during this period but by only $190,000. Some of these costs have been funded by the Federal Anadromous Fish Act. Revenue from this source has been gradually increasing and in fiscal year 1972-73 $65,000 was used for this program. Indications are that further increases will take place.

Any of the estimates of value for the Lake Michigan fishery would form the basis for an extremely favorable cost-benefit ratio for stocking. Table V lists the estimated values of all or parts of the Lake Michigan fishery, as well as the total cost of stocking. In 1973 about $150,000 in state funds and $250,000 in federal funds were spent in stocking Lake Michigan. If only the value of the fish flesh is used, the cost-benefit ratio is 1:4.15. Using other estimated values would bring this ratio to as high as 1:62.5

TABLE V. Stocking costs and cost-benefit ratios using estimated values of all or parts of the Lake Michigan sport fishery.*

	Estimated Value	Cost-benefit Ratio
Spent by anglers @ $6.30/trip	$ 4,230,000	1:10.57
Business generated by charter trolling industry	3,436,000	1: 8.64
Maximum total value tentative	25,000,000	1:62.5
Value of Salmonid flesh harvested @ $1.00/lb.	1,660,000	1: 4.15

*Based on state and federal stocking costs of $400,000

Although the economic benefits of the Lake Michigan fishery have been very favorable, it is doubtful that the results of the proposed higher stocking rates will be quite as great. There is no doubt, however, that benefits would be well worth the additional expenditures.

Recommendations

1. As funds become available, provision should be made for stocking an additional 100,000 pounds of Salmonids; this is about half the total increase requested. The increase should include all the additional needs for inland stocking.

2. An evaluation should be made of each species stocked in the Great Lakes to determine the most successful species and sizes to stock. Much data has been collected but has not yet been thoroughly evaluated.

3. After sufficient evaluation of the Great Lakes stocking program, new recommendations should be made regarding the best species, sizes and rates for stocking.

4. Emphasis should be placed upon the development of additional inland trout fisheries in the Southeast District because of the concentration of people living in that district.

5. Continuous evaluations should be made of major inland stocking programs so that stocking can be adjusted to favor waters producing the best results.

6. Broad changes in inland stocking should be accomplished gradually with adequate public approval; however, in general put-and-take stocking should be discouraged in favor of put-grow-and-take stocking. The maximum pondage return should be emphasized.

7. Angling regulations should be emphasized which will maximize the poundage of stocked fish harvested.

Summary

1. The objectives of Salmonid stocking are to meet the public demand for that type of angling where sufficient natural populations do not exist and to utilize the growth potential of the waters so that they will produce significant quantities of high quality fish flesh for the public.

2. 2,730 miles of stream contain good trout populations from natural reproduction. In addition 3,320 miles of stream and 20,000 acres of inland lakes are stocked, and 2,640 miles of stream contain substandard trout populations. Salmonid stocking in the Great Lakes also furnishes a great deal of additional angling opportunity.

3. Many inland waters are stocked with catchable size fish to furnish immediate angling. Fish stocked in other waters, including the Great Lakes, are expected to grow significantly before they are caught. In Lake Michigan 7.5 pounds are harvested for each pound stocked.

4. The Great Lakes and some inland waters have the ability to produce many more pounds of Salmonids if stocking is increased.

5. Although the major concentration of people is in the Southeast District, a relatively small amount of inland trout fishing is available there. This is partly due to lack of suitable streams and inadequate public access to lakes.

6. The development of the Lake Michigan fishery has apparently caused a significant increase in the number of licensed anglers and the amount of money obtained from license sales.

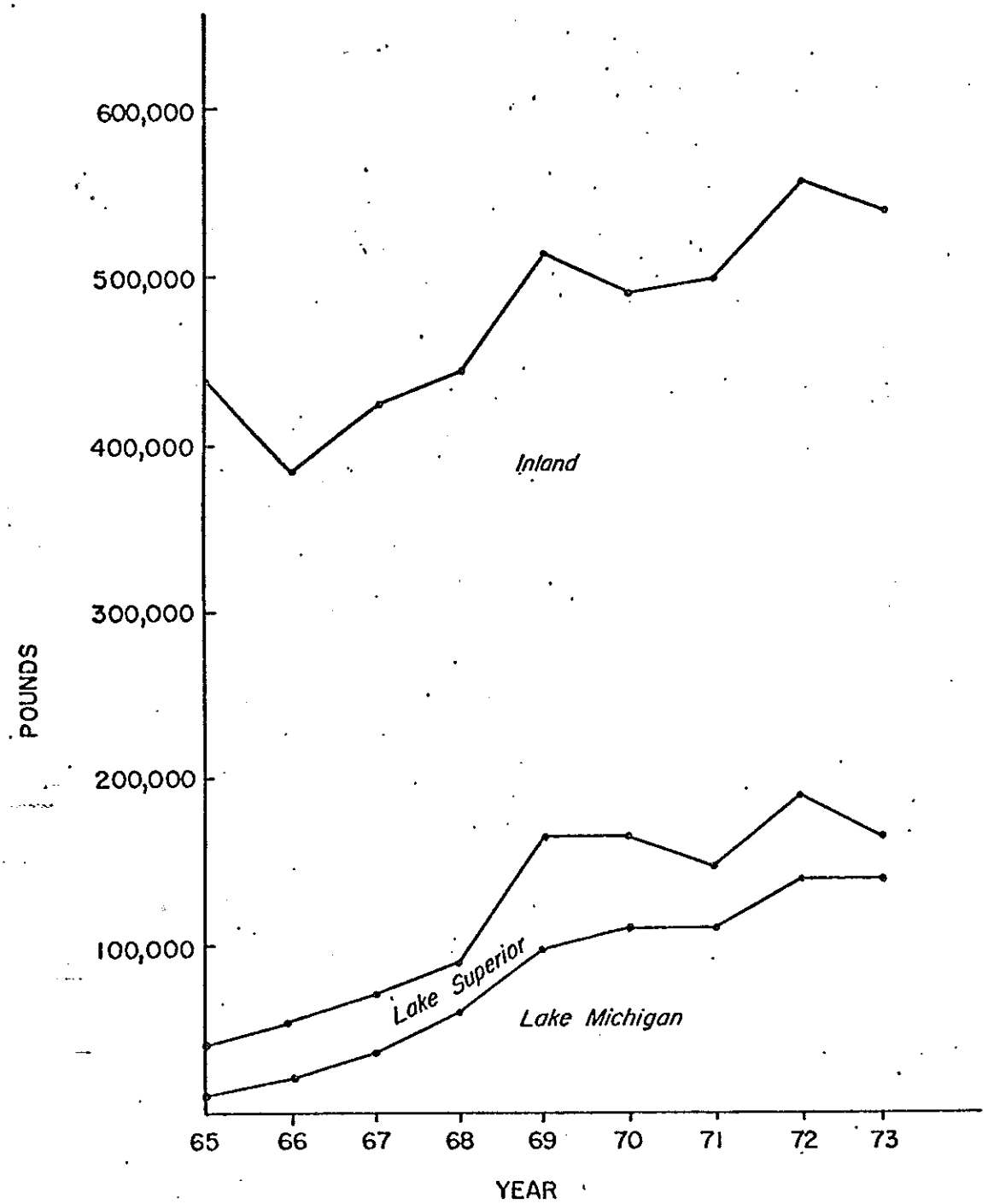
7. Although 60% of the angling in Lake Michigan is trolling, the simple less expensive angling methods are popular and more successful than trolling for catching all types of Salmonids other than lake trout.

8. Area fish managers indicate that except for additional lake trout and splake stocking in a few lakes, generally the number of trout stocked in inland waters is sufficient. The major exception is in the Southeast District where additional stream trout stocking is needed. Sizeable stocking increases are needed for the Great Lakes, particularly Lake Michigan.

9. The number of Salmonids stocked should be increased from about 4.4 million to about 6.4 million. This means an increase from 500,000 pounds to just over 700,000 pounds. Bayfield Hatchery will produce 50,000 pounds of the increased need; however production will still be 150,000 pounds short of stocking needs.

10. Reliable economic results of Salmonid stocking is difficult to obtain and has not been attempted for inland stocking. The Lake Michigan sport fishery which is largely the result of Salmonid stocking has been valued as high as $25 million. The value of Salmonid flesh harvested is four times greater than the cost of stocking. Cost-benefit ratios for Lake Michigan stocking are very favorable, ranging from 1:4.15 to 1:62.5.

FIGURE 1. Pounds of Salmonids Stocked by the State.



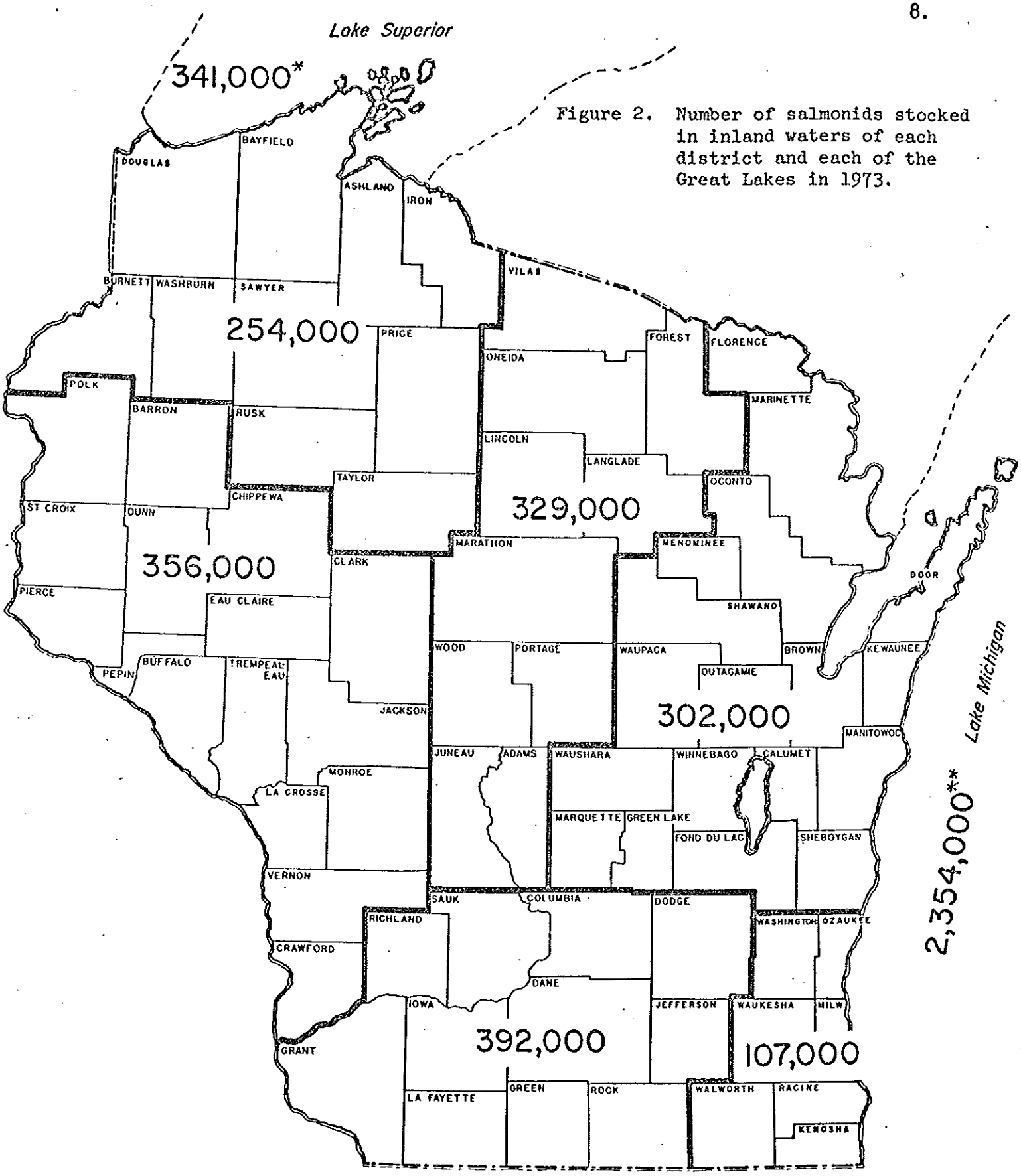


Figure 2. Number of salmonids stocked in inland waters of each district and each of the Great Lakes in 1973.

*Plus 105,000 from other than state sources
**Plus 1,274,000 from other than state sources

Figure 3. Miles of stream with adequate natural trout populations and miles having some trout.

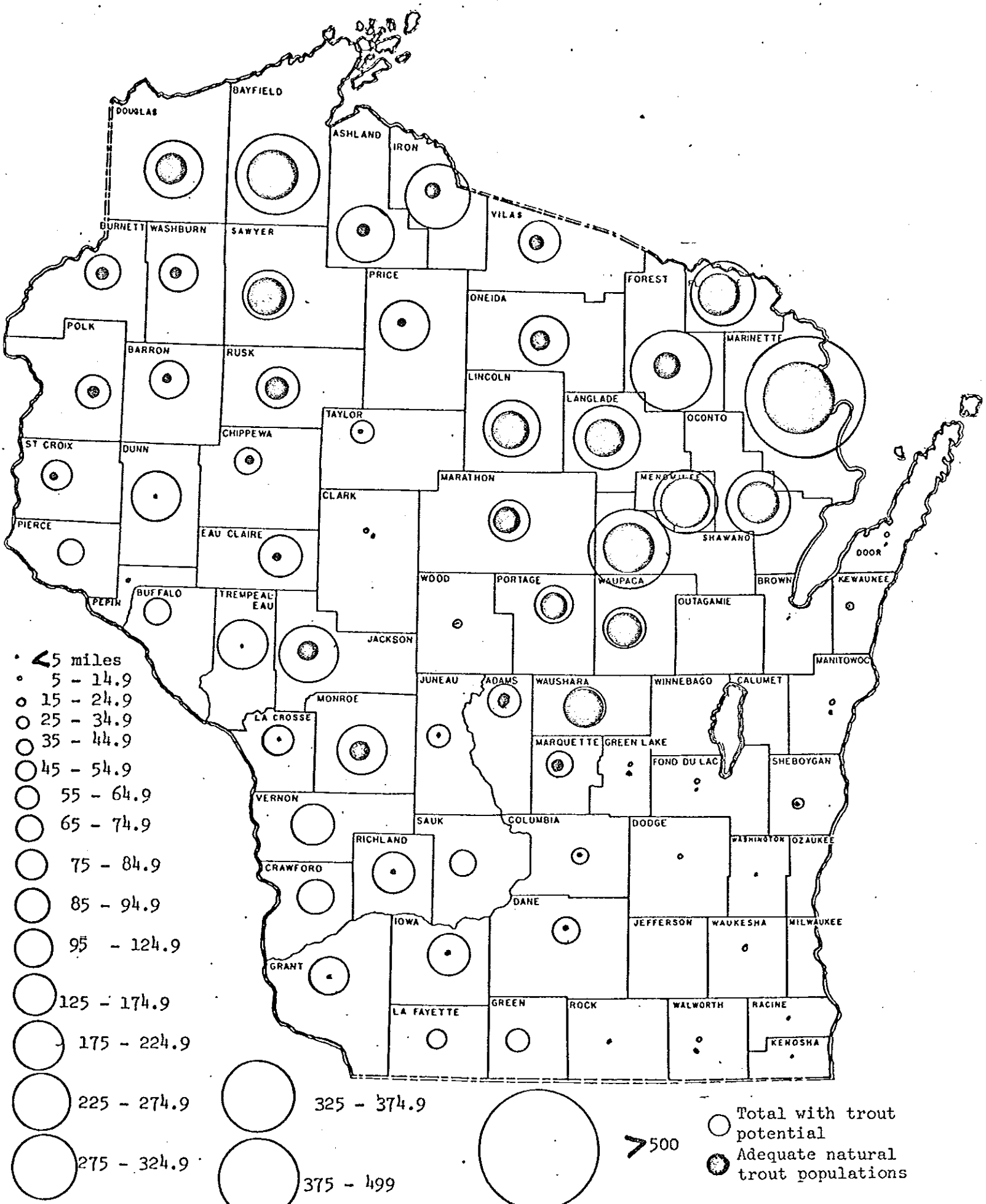


Figure 4.

Managed Trout Waters, Trout Harvest and Human Population of Districts by Percent of State Total.

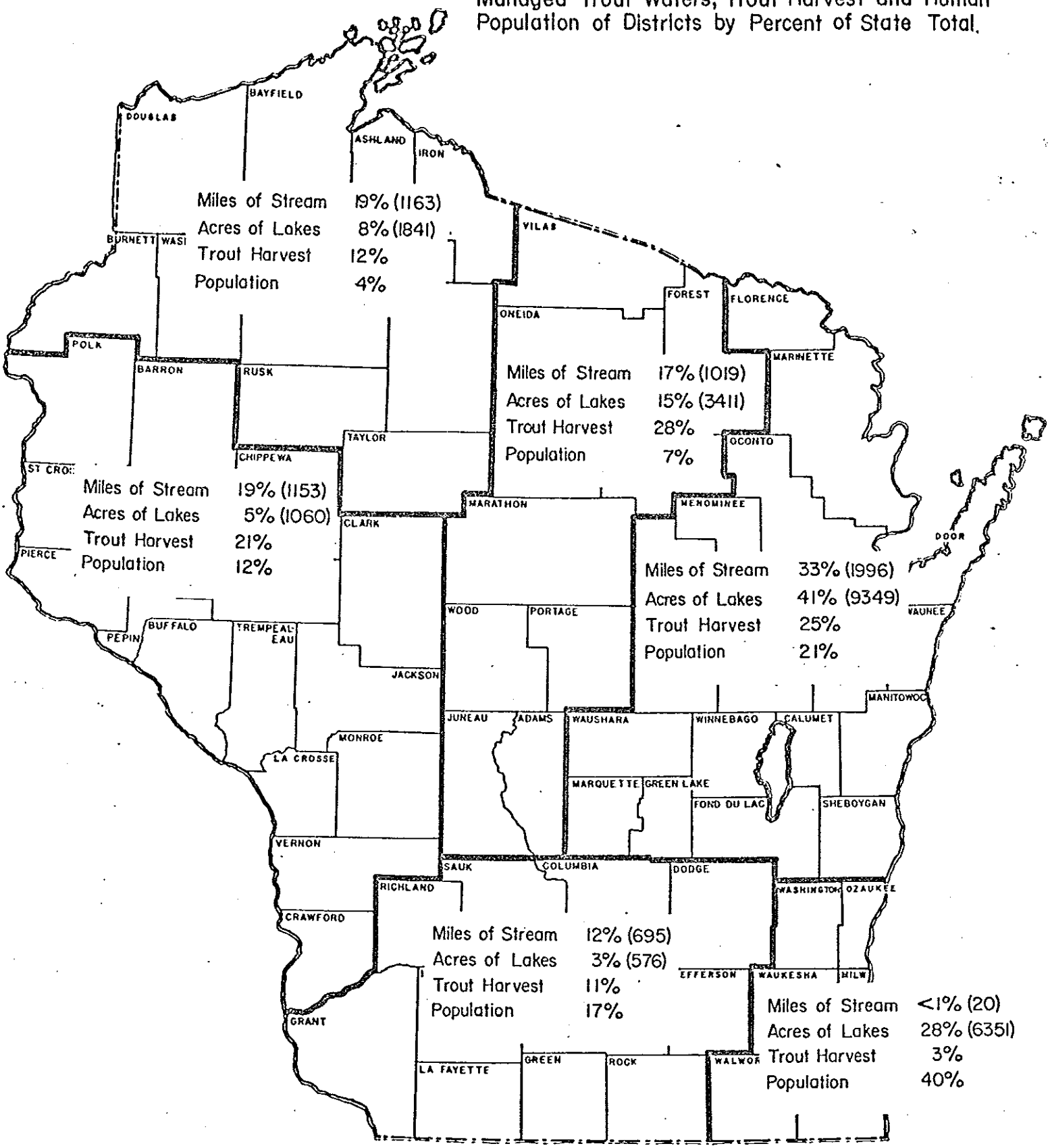


FIGURE 5. Number of Licensed Anglers and Angling Trips on Lake Michigan.

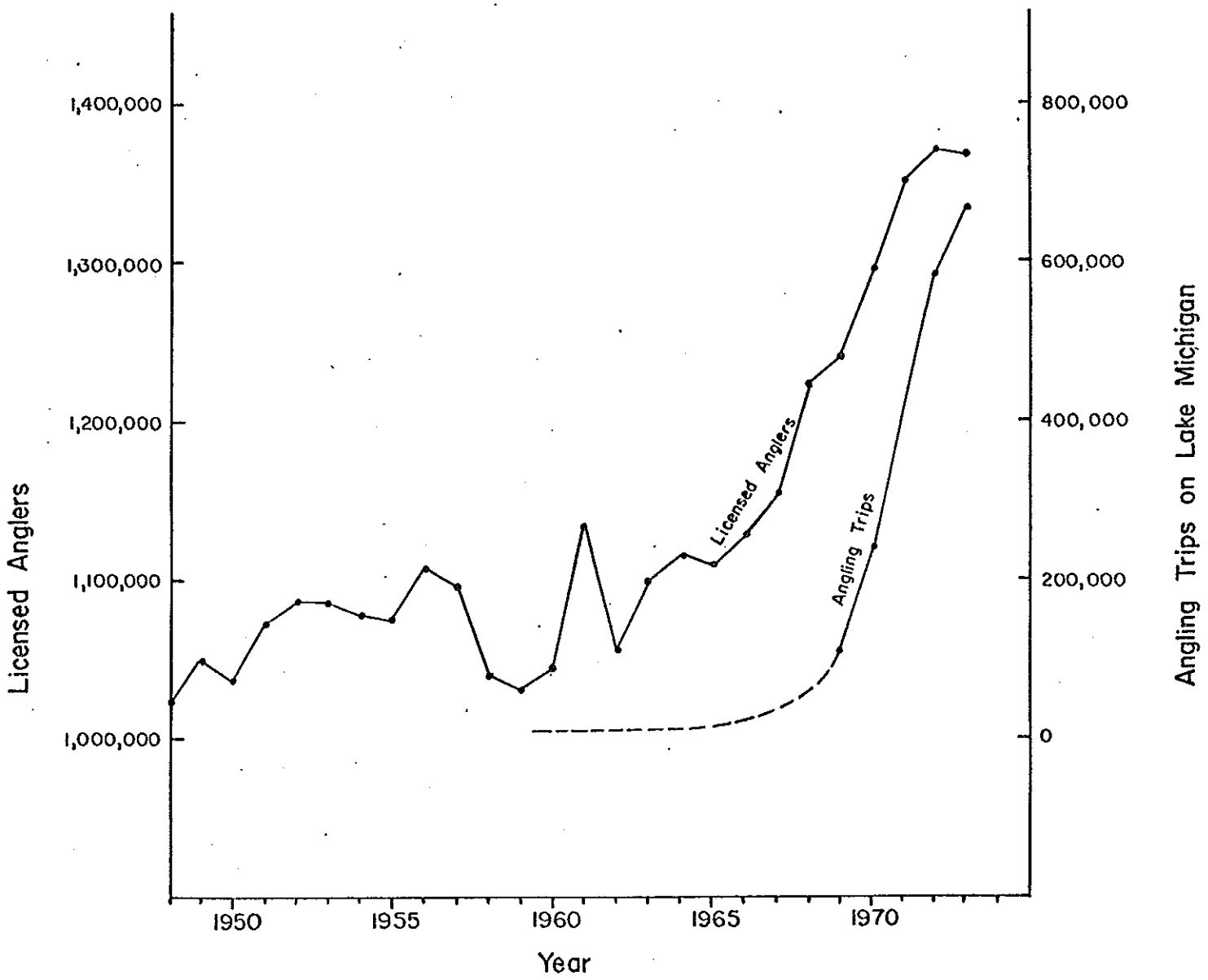


TABLE II

COMPARISON OF 1974 STOCKING WITH ESTIMATED NEEDS

	1974 Stocking			Estimated Need			Difference
	Inland	Great Lakes	Total	Inland	Great Lakes	Total	
Brook - fgl. spring	39,000		39,000	7,000		7,000	-32,000
fall	104,350		104,350	121,500		121,500	17,150
holdover	253,600	76,300	329,900	250,225	200,000	450,225	120,325
Brown - fgl. spring	288,500		288,500	9,500		9,500	-279,000
fall	172,600	210,000	382,600	326,100	250,000	576,100	193,500
holdover	415,925	232,000	647,925	489,875	440,000	929,875	281,950
Rainbow - fgl. spring	25,000		25,000	168,500		168,500	143,500
Fall	42,600	185,500	228,100	30,500	150,000	180,500	- 47,600
holdover	343,850	292,000	635,850	436,650	380,000	816,650	180,800
Lake - holdover	45,000	200,000	245,000	145,000	300,000	445,000	200,000
Coho - holdover	5,000	316,000	321,000	20,000	650,000	670,000	349,000
Chinook - fgl. spring		650,000	650,000	10,000	1,300,000	1,310,000	660,000
Splake - holdover		20,000	20,000	63,000	185,000	248,000	228,000
Tiger - holdover		34,000	34,000		50,000	50,000	16,000
Atlantic Salmon					20,000	20,000	20,000
Totals	1,738,425	2,215,800	3,951,225	2,077,850	3,925,000	6,002,850	2,051,625

TABLE III

COMPARISON OF NEEDS AND 1974 SCHEDULED STOCKING OF GREAT LAKES WITH STATE FISH

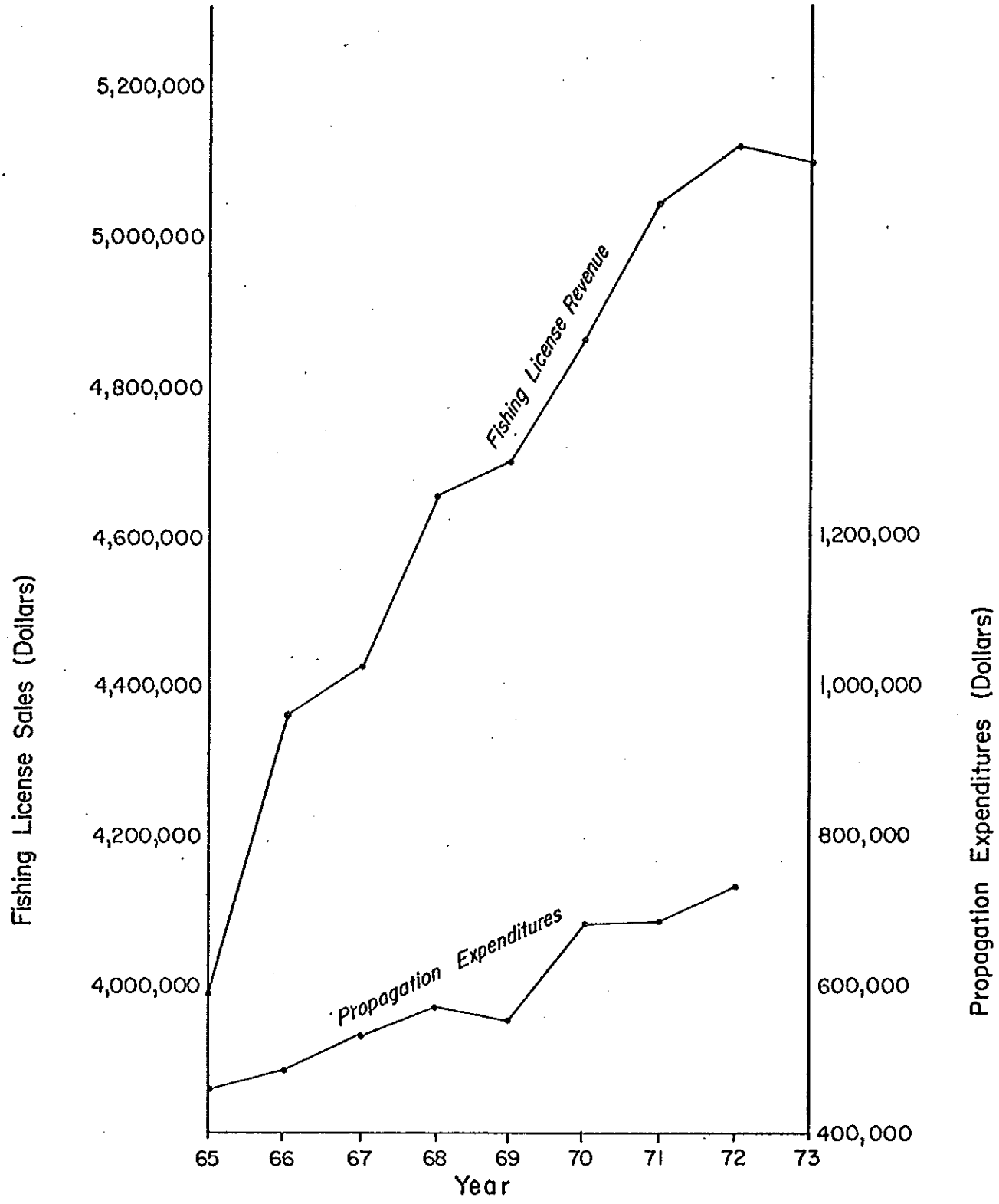
	Lake Superior			Lake Michigan			Total
	1974	Optimum	Adjustments	1974	Optimum	Adjustments	Adjustments
Brook - fgl.							
- yearling	25,000	50,000	25,000	51,300	150,000	98,700	123,700
Brown - fgl.				210,000	250,000	40,000	40,000
- yearling	90,000	110,000	20,000	142,000	330,000	188,000	208,000
Rainbow - fgl.				185,500	150,000	-34,500	-35,500
- yearling	60,000	100,000	40,000	232,000	280,000	48,000	88,000
Lake - fgl.							
- yearling	200,000	300,000	100,000				100,000
Coho - yearling				316,000	650,000	334,000	334,000
Chinook - fgl				650,000	1,300,000	650,000	650,000
Tiger - yearling				34,000	50,000	16,000	16,000
Splake - yearling	20,000	30,000	10,000		155,000	155,000	165,000
Atlantic salmon		20,000	20,000				20,000
Totals	395,000	610,000	215,000	1,820,800	3,315,000	1,494,200	1,709,200

TABLE IV

PRODUCTION ADJUSTMENTS NECESSARY TO MEET MANAGEMENT NEEDS

	Fgl.				Holdover			
	No.		No/lb.	Lb.	No.		No/lb.	Lb.
Brook	+ 17,150	@	14	+ 1,200	+120,325	@	4.3	+ 28,000
Brown	+193,500	@	13	+14,900	+281,950	@	4.5	+ 62,700
Rainbow	- 47,600	@	13	- 3,700	+180,800	@	3.9	+ 46,400
Lake					+200,000	@	20.0	+ 10,000
Coho					+349,000	@	15.0	+ 23,300
Splake					+228,000	@	15.0	+ 15,200
Tiger					+ 16,000	@	4.3	+ 3,700
Atlantic Salmon					+ 20,000	@	10.0	+ 2,000
Chinook - spring	+660,000	@	70	+ 9,400				
				+21,800				+191,300

FIGURE 6. Revenue from Sport Fishing License Sales and Salmonid Propagation Expenditures.* 1965-1973



*Includes Anadromous Fish Foods

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