

Expenditures
of
Great Lakes
Salmon and Trout
Stamp Revenues
1987-1992

Administration Report No. 36

By
William H. Horns
David A. Zilker
Leah Perkins

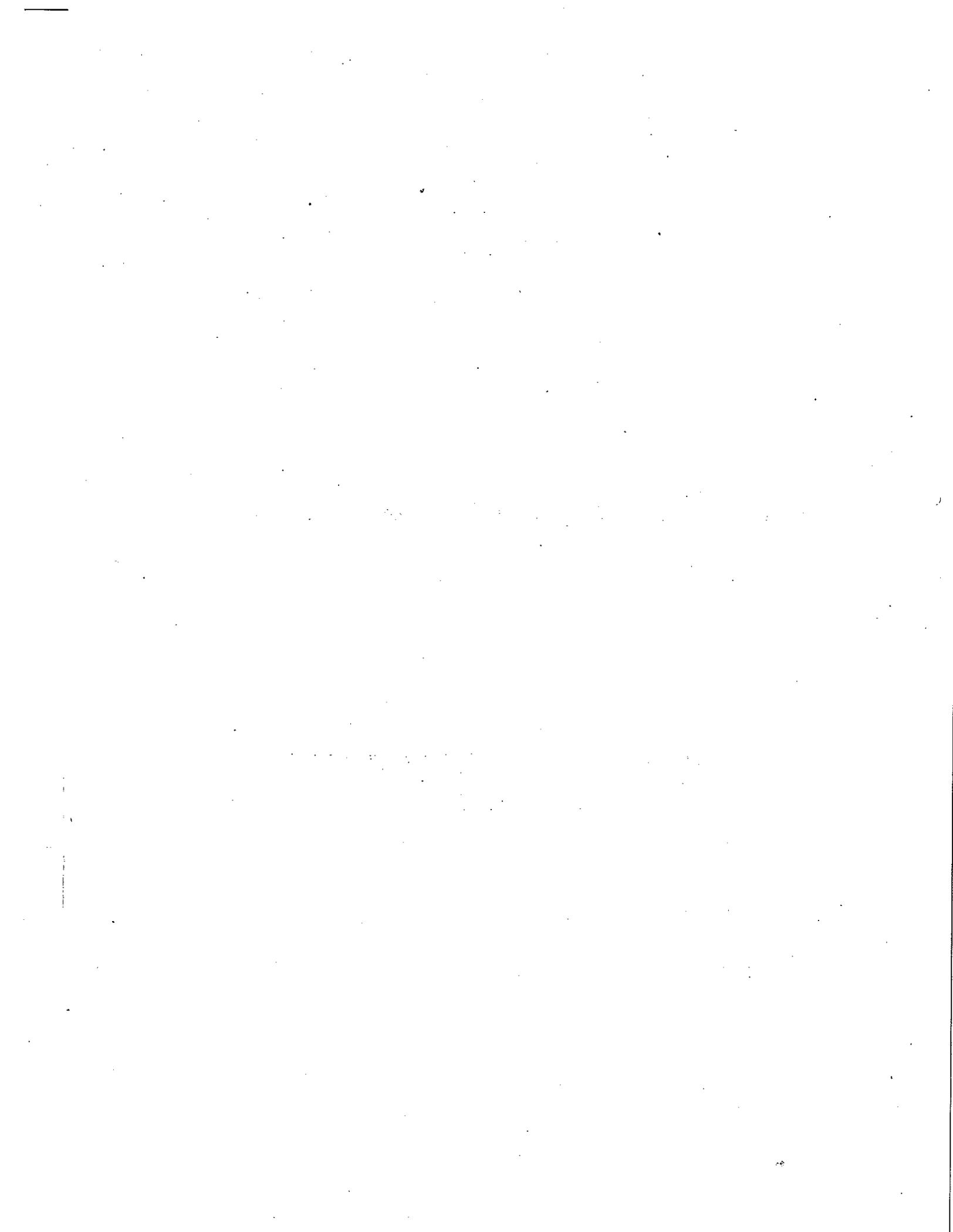
Wisconsin Department of Natural Resources
Bureau of Fisheries Management
Madison, Wisconsin
November 1993



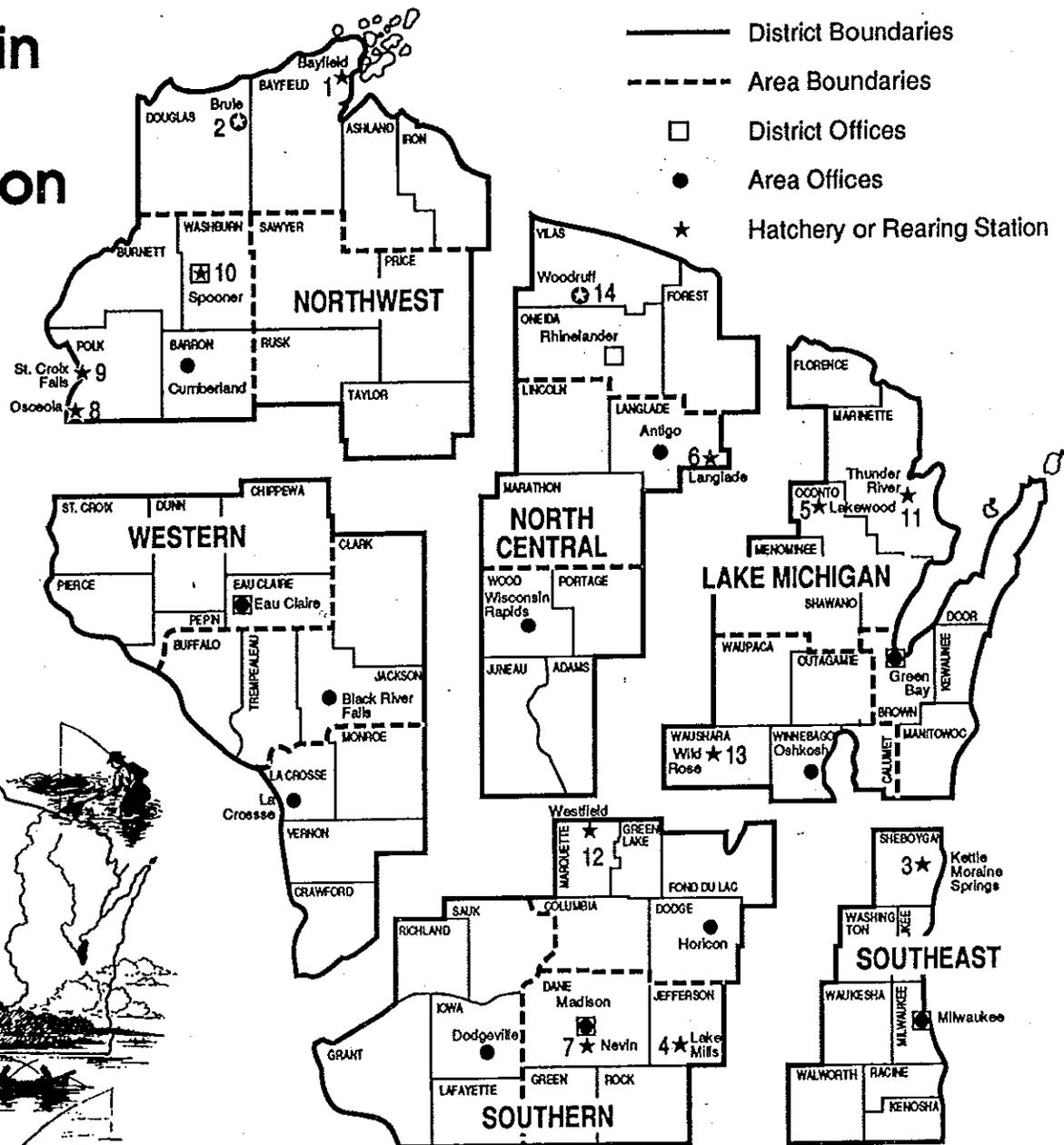
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Wisconsin Fish Production Stations



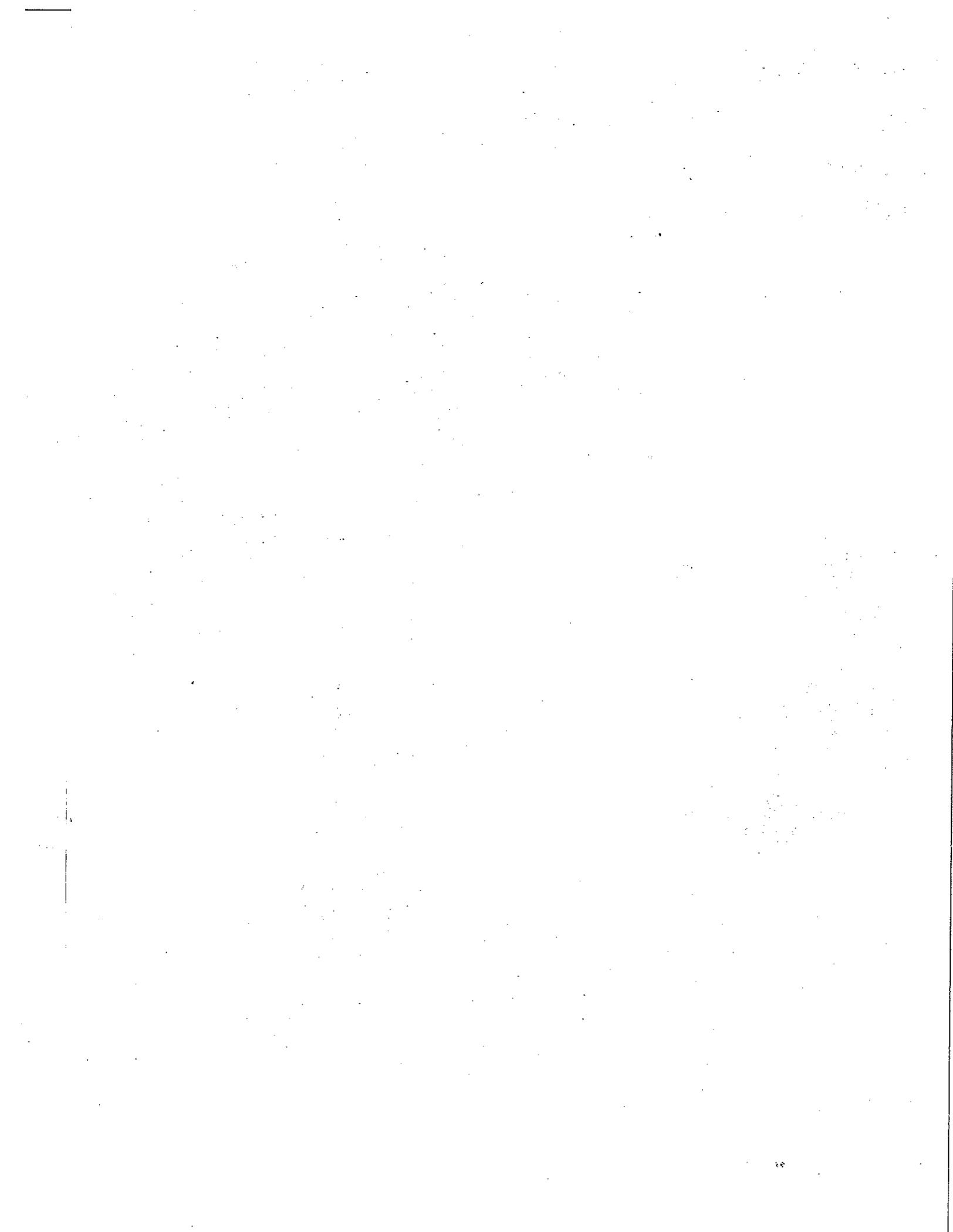
Facility	Telephone Number	Hatches Eggs	Type of Fish	Live Fish Display	Restrooms	Picnic Area	Seasonal Operation*
1 Bayfield	(715) 779-5430	●	C		●		
2 Brule	(715) 372-4820	●	C		●	▲	
3 Kettle Moraine Springs	(414) 528-8825	●	C		●		
4 Lake Mills	(414) 648-8012	●	C/W	●	●	●	
5 Lakewood	(715) 276-6066		C		●		
6 Langlade	(715) 882-8757		C		●		
7 Nevin	(608) 275-3246	●	C		●	●	
8 Osceola	(715) 294-2525	●	C				
9 St. Croix Falls	(715) 483-3535	●	C		▲	▲	
10 Spooner	(715) 635-4147	●	W	●	●		●
11 Thunder River	(715) 757-3541		C		●		●
12 Westfield	(608) 296-2343	●	C				
13 Wild Rose	(414) 622-3527	●	C/W	●	●	●	
14 Woodruff	(715) 356-5211	●	W	●	●		●

Key

- At hatchery
- ▲ Nearby
- No fish on premises during winter

Type of Fish

- C Coldwater
- W Cool/warmwater
- C/W Both



Since 1982 every angler wishing to fish for salmon or trout on Wisconsin waters of the Great Lakes has been required to purchase a Great Lakes Salmon and Trout Stamp (stamp). Wisconsin Statute 29.15(5) directs the Department of Natural Resources (DNR) to "expend the receipts from the sale of Great Lakes Salmon and Trout Stamps to supplement and enhance the existing trout and salmon rearing and stocking program for outlying waters and to administer this section." Receipts from sale of Great Lakes Salmon and Trout Stamps are placed in a salmon stamp account. A six-year plan for use of stamp sale revenues was published in 1983¹. Summaries of expenditures for fiscal year 1983 (FY83) and FY84, FY85 and FY86 stamp sale revenues were published in reports completed in 1984² and 1987³. (Fiscal years run from July 1 of one year through June 30 of the next. For example, FY87 is the period July 1 1986 through June 30 1987.)

In 1984, the Legislature approved a one-day fishing license for the Great Lakes. The intent was to provide an inexpensive license that would allow people to spend one day fishing salmon and trout on the Great Lakes without having to buy an annual Great Lakes Trout and Salmon Stamp. Since this might mean a reduction in the amount of money available to fund the salmon and trout program, the law directed that half of the revenues from the license would be used for salmon and trout projects on the Great Lakes.

In 1988, the daily license was changed by the Legislature to allow people to fish inland or on the Great Lakes. The law required that the revenue be split among Great Lakes salmon projects, inland trout habitat projects and general fisheries work.

In 1992, the Legislature replaced the daily license with a two-day fishing license for the Great Lakes. The two-day license is easier to administer because it is valid only on the Great Lakes and doesn't require us to split the revenue among the Great Lakes and inland fisheries programs. By law, half of the revenue must be used for salmon and trout projects.

This report summarizes the use of all revenue allocated to the salmon stamp account for fiscal years 1987-1992 and includes actual

¹ Krueger, C.C. 1983. Expenditure Plan for Great Lakes Salmon and Trout Stamp Revenues, 1983-1988. Administrative Report No. 18. Bureau of Fisheries Management, Department of Natural Resources, Madison, Wisconsin.

² Hansen, M.J. 1984. Expenditures for Great Lakes Salmon and Trout Stamp Revenues, 1983-84. Administrative Report No. 22. Bureau of Fisheries Management, Department of Natural Resources, Madison, Wisconsin.

³ Welch, D. 1987. Expenditures of Great Lakes Salmon and Trout Stamp Revenues, 1985-86. Administrative Report No. 26. Bureau of Fisheries Management, Department of Natural Resources, Madison, Wisconsin.

costs for each DNR District and their respective projects. All costs associated with travel, special services, supplies, permanent property, and limited term employee salaries are included. Projects are categorized as either program operations (activities) or developments (facilities). Permanent employee salaries and fringe benefits are charged against separate allotments within each district as employees engage in approved projects.

The closing cash balance at the end of FY92 was \$307,379. Expenditures in FY93 will be summarized in a future report. The cash balance at the end of FY93 was \$650,124.

NORTHWEST DISTRICT

Permanent employee salaries paid from the salmon stamp account to the Lake Superior Work Unit were \$30,365 for FY87, \$31,353 for FY88, \$33,113 for FY89, \$35,170 for FY90, \$35,819 for FY91, and \$29,898 for FY92.

Operations (Activities)

1. Monitor trends in relative abundance, total annual mortality, and sea lamprey marking on spring-sampled native and stocked lake trout in the Wisconsin waters of Lake Superior. \$15,248 in FY87.

Lake trout abundance has been gradually increasing in the Apostle Islands area. Native fish accounted for 72% of the catch in 1992, up from 30% in 1981. Sea lamprey mortality still looms as a major obstacle to rehabilitation.

2. Assess native and stocked lake trout spawning. \$9,089 in FY87.

The Gull Island Shoal lake trout spawning population was one of a few Lake Superior lake trout populations that survived the effects of the sea lamprey invasion and continued to reproduce from a small number of mature fish. The population size has steadily increased since 1961, when no mature females were sampled during annual spawning assessments. The population was given protection in 1976 when a permanent year-round fish refuge was created. Native lake trout now account for 91% of all spawners. The population today is healthy and continues to increase in abundance.

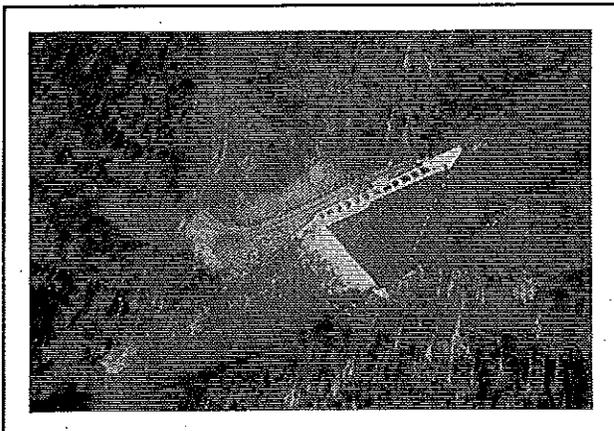


FIG. 1 Brule River Lamprey Barrier Fishway. The Brule River fish passageway is part of this structure.

3. **Monitor population status and estimate harvest of trout and salmon from Lake Superior and tributaries. Monitor anadromous strains at index station.** \$39,583 in FY87, \$39,195 in FY88, \$40,678 in FY89, \$31,382 in FY90, \$21,987 in FY91, and \$25,608 in FY92.

Annual creel surveys were conducted to monitor the catch of salmonids from Lake Superior. Results from creel surveys provide information on the success or failure of stocking programs and the status of species that are self-sustaining. Index stations in Lake Superior and tributary streams are monitored annually to assess the health of salmonid populations. Information collected from creel surveys and index sampling has resulted in new regulations designed to better manage the salmonid populations in Lake Superior.

4. **Develop a long range management plan aimed at a self-sustaining wild trophy fishery for the Bois Brule River.** \$34,415 in FY87, \$25,873 in FY88, \$30,120 in FY89, \$22,398 in FY90, and \$27,037 in FY91.

In the early 1980's, the steelhead fishery on the Bois Brule River collapsed due to over exploitation. A comprehensive investigation studying the dynamics of the population identified problem areas. Restrictive regulations and stocking of wild Brule River strain steelhead have combined successfully to rebuild the Bois Brule population.

5. **Evaluate survival of stocked lake trout.** \$8,530 in FY87.

Survival of stocked lake trout has been decreasing over the past 30 years. As native fish become more abundant, hatchery fish may have been unable to compete; consequently survival has decreased. This trend has been common throughout Lake Superior.

6. **Evaluate hormones for inducing ripening of wild lake trout.** \$1,290 in FY87.

An attempt was made to induce ripening of captured wild mature female lake trout. Spawning additional females would increase the number of eggs available for the astroturf program. Results were inconclusive because we were unable to obtain females early enough for injections.

7. **Monitor ongoing conditions at lamprey barriers for problems. Correct and maintain conditions to allow the natural upstream movement of the anadromous salmonid spawning run.** \$11,703 in FY88, \$9,988 in FY89, \$16,929 in FY90, and \$2,297 in FY91.

The Brule River sea lamprey barrier has played a vital role in the sea lamprey control program. The barrier has trapped over 18,000 lamprey since it began operations in 1986. The barrier is

also an excellent fisheries management tool. Anadromous fishery runs can be quantified while passing through an observation window. Results from information collected at the barrier have led to better fishery management regulations.

8. **Assess lake trout egg seeding.** \$7,807 for FY87.

Stocked lake trout have failed to re-establish self-reproducing populations on numerous offshore reefs typical of the Apostle Islands area. As an alternative stocking strategy, approximately 12 million lake trout eggs have been placed in astroturf bundles on Devils Island shoal since the program started in 1980. Results from spawning assessments have been encouraging. An increase in spawner abundance corresponding with year classes stocked indicates that lake trout are homing back to the reef.

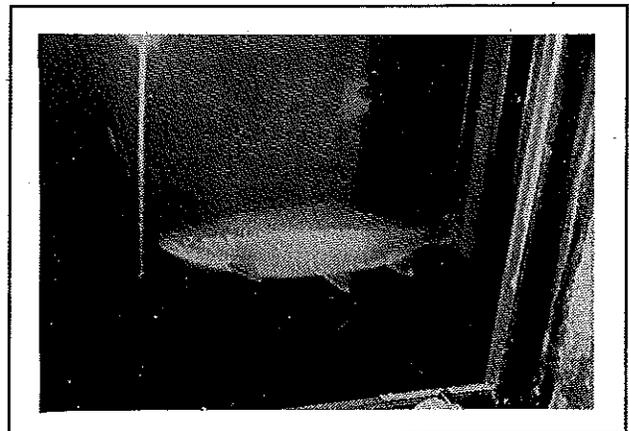
9. **Rehabilitate lake trout population in Lake Superior.** \$663 in FY88, \$951 in FY89, \$1,706 in FY90, \$117 in FY91, \$47 in FY92.

Lake trout rehabilitation is progressing nicely. Controls on exploitation have restricted commercial and sport fishers, and lake trout have responded favorably. Abundance has been gradually increasing in the Apostle Islands area. Native fish accounted for 30% of the catch from the spring assessment in 1981 and increased to 70% by 1992. Sea lamprey mortality still looms as a major obstacle to rehabilitation. Lamprey control and conservative sport and commercial regulations are imperative if lake trout are to continue successful rehabilitation.

10. **Determine desirable annual fishing mortality rates of anadromous species in the Sioux River.** \$10,088 in FY88 and \$8,465 in FY89.

Population dynamics of anadromous brown trout and coho salmon were studied using a fish trap and creel survey. Population and harvest estimates were used to develop regulations for anadromous streams.

FIG. 2 A steelhead traveling up stream in the Brule River fish passageway. Quantitative information is obtained in this state-of-the-art facility.



Developments (Facilities)

1. **Bayfield Hatchery raceway development.** \$4,754 in FY87.

In 1987 two raceways were constructed in order to hold lake trout broodstock at the Bayfield hatchery site. The dimensions of the raceways are one hundred feet long by eight feet wide by four feet deep (100'x 8'x 4').

2. **Bayfield Hatchery broodstock shed.** \$35,827 in FY87.

In order to protect the lake trout broodstock from direct sunlight and predation a poleshed was constructed over the raceways.

3. **Bayfield Hatchery waterline.** \$1,590 in FY88 and \$106,691 in FY89.

During 1988 a waterline was installed to supply well water to the raceways. In 1989 major well development work was undertaken in order to increase the flow rates from two high-capacity wells. An attempt was made to fracture the sandstone substrate using dynamite charges and sediment was removed by bailing sand from the well shafts.

4. **Brule River fish passageway.** \$600 in FY87 and \$9,555 in FY88.

The Brule River fish passageway provides a state-of-the-art facility for fisheries management. Quantitative estimates of anadromous fish runs have enabled fisheries biologists to develop protective regulations. The passageway is part of the Brule River lamprey barrier.

LAKE MICHIGAN DISTRICT

Permanent employees salaries paid from the salmon stamp account to the Lake Michigan Work Unit were \$9,980 in FY87, \$10,000 in FY88, \$9,567 in FY89, \$10,669 in FY90, \$11,395 in FY91, and \$0 in FY92.

Operations (Activities)

1. **Wild Rose Hatchery individual-family hatchery batteries for chinook salmon.** \$477 in FY90

The Wild Rose Hatchery purchased two hundred containers for transporting Chinook Salmon eggs from the spawning sites to Wild Rose. In the past, the eggs from many females were pooled together. The containers makes it possible to keep the eggs separate for the purpose of disease detection and isolation.

2. **Determine if Nipigon strain brook trout is a more desirable strain of trout to stock in Lake Michigan than the present hatchery strain.** \$2,818 in FY87.

1987 was the final year of field work for a study comparing movement, growth, and survival of two strains of brook trout (wild Nipigon versus the domestic Nashua) stocked in Lake Michigan off Door County. Results of this study indicated that the Nipigon brook trout survived longer and grew to trophy size in three years. Consequently Nipigon brook trout are now the preferred strain for stocking when available.

3. **Evaluate chinook stocking by method of release in the Kewaunee and East Twin Rivers. Evaluate the harvest of sterile chinook salmon.** \$21,832 in FY87, \$18,035 in FY88, \$13,675 in FY89, \$5,311 in FY90, and \$3,946 in FY91.

Groups of chinook fingerlings marked with coded wire tags, were released in spring for two consecutive years (1986-1987) to determine if there was a difference in survival between fish stocked by the following three methods:

- 1) reared in a pond, then released into the Kewaunee or East Twin Rivers;
- 2) released directly in the two rivers;
- 3) released directly into Lake Michigan away from the river mouths.

Based on fish caught by sport anglers and in nets in the open lakes, survival was greater for pond stocked fish, followed by river stocked, and lastly lake stocked fish.

Annually groups of sterilized fingerling chinook were released at Marinette, Strawberry Creek, Sheboygan, and Racine from 1986-1988 to create a trophy fishery of non-maturing, continually-growing fish. Returns to date indicate that:

- 1) sterilization was not 100 percent effective,
 - 2) the sterilization process may have slowed growth, and
 - 3) sterilization did delay maturity in some fish but has not yet produced a record sized fish.
4. Determine if splake would significantly contribute to the existing salmonid fishery along the west shore of Green Bay. \$1,917 in FY87, \$1,746 in FY88, and \$329 in FY89.

A splake project was started in Green Bay in October 1982. The goals of the project were to add diversity to the existing salmonid fishery, develop ice fishing opportunities of Green Bay, and evaluate the success of fingerling versus yearling stocking as it relates to the first two goals. The project was designed to stock 20,000 marked fingerlings and yearlings each for four years and evaluate results. Then, based on the degree of success, the program would be continued or terminated. As a result of disease problems at the hatchery where the splake were being held, the fourth class (1986) had to be stocked as fingerlings. The 1983-85 paired fingerling-yearling plants were followed through 1991.

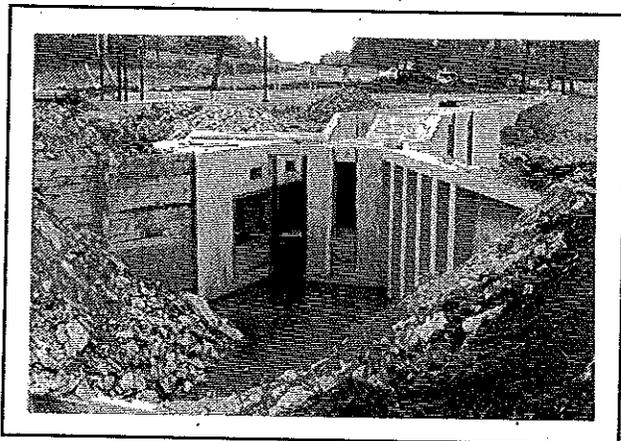


FIG. 3 *Diversion fishway at the C.D. "Buzz" Besadny Anadromous Fisheries Facility [previously known as the Kewaunee River Anadromous Fish Facility] with public viewing windows.*

5. **Maintain chinook fishery through collection of eggs from mature chinook returning annually to Strawberry Creek pond and the annual rearing and release of fingerlings from selected ponds.**

\$16,504 in FY87, \$16,079 in FY88, \$33,449 in FY89, \$55,599 in FY90, \$43,563 in FY91, and \$51,915 in FY92.

Annually in spring fingerling chinook were stocked into ponds in Door, Kewaunee, and Manitowoc counties and fed until smolting size was reached. They were then released into adjacent tributaries for imprinting and eventual movement into Lake Michigan. Annually in fall mature fish were trapped at Strawberry Creek and (recently) at Kewaunee, where eggs were stripped, fertilized, and transported to hatcheries for production of fingerlings to continue the program. Mature fish were also sampled for special studies, health monitoring, and contaminants.

6. **Provide a detailed description of trawl fishery and develop information from the trawl monitoring into useful trend information and provide the necessary framework for tracking any quota which is developed.** \$6,830 in FY87, \$447 in FY88, \$16 in FY89, \$179 in FY90, and \$414 in FY91.

In the 1980's concern developed regarding the impact of the trawl fishery on sport fish and on the prey of salmon and trout. During 1987 through 1991, over 270 onboard monitors of the Lake Michigan and Green Bay trawl fisheries were conducted. Over 2,000 sport fish caught incidental to trawling were tagged by WDNR fisheries personnel and released. Information from those efforts were used to enact regulations on the trawl fishery:

- 1) to prevent the expansion of the trawler industry while the fishery was assessed (1986),
- 2) to prevent the expansion of the Green Bay smelt fishery (1988), and
- 3) to eliminate the targeted harvest of alewife while permitting the harvest of smelt for human consumption (1991).

7. **Re-establish self-sustaining lake trout population.** \$40,134 in FY87, \$54,817 in FY88, \$48,562 in FY89, \$31,178 in FY90, \$14,761 in FY91, and \$7,812 in FY92.

To determine the progress of efforts to reestablish self-sustaining, native lake trout in Lake Michigan, netting surveys using Department, federal, and commercial fishing boats were conducted annually from Door County to Milwaukee. Information collected was used to determine abundance of adult and juvenile fish, suitability of different strains, movement of tagged fish, survival, growth, diets, lamprey wounding, and the presence of eggs and fry on spawning reefs. Special studies were also conducted on location and suitability of spawning reefs, viability of eggs,

effects of contaminants on hatching and survival of fry, and the use of astroturf bundles for incubation of eggs at selected locations in the Lake.

8. **Creel survey for trout and salmon.** \$37,264 in FY87, \$37,773 in FY88, \$39,605 in FY89, \$44,260 in FY90, \$46,949 in FY91, and \$54,555 in FY92.

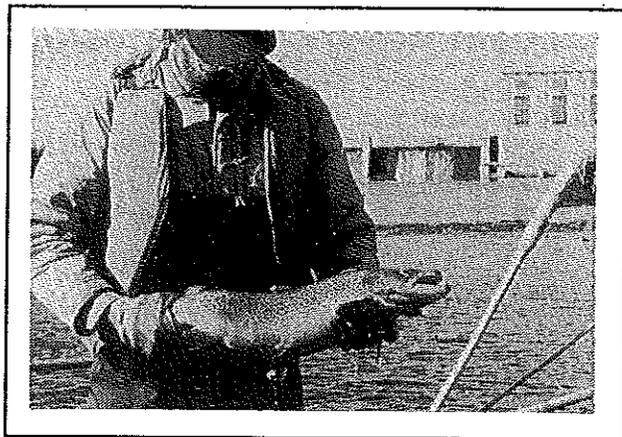
Creel surveys were conducted annually from March through October in Door, Kewaunee, Marinette, and Manitowoc (in 1991 and 1992) counties to determine fishing pressure and harvest of stocked trout and salmon. Creel clerks interviewed fishermen at ramps, on streams, piers, and on shore. Additional information collected included size of fish, fin clips, coded-wire-tagged heads, and stomachs for diet studies. This survey is the best method for determining success of the trout and salmon stocking program and the general status of the sport fishery on Lake Michigan.

9. **Document success of rainbow stocking program in Manitowoc-Branch River system and identify which strains, stocking techniques, and ratios are most successful.** \$5,867 in FY87, \$14,777 in FY88, \$25,377 in FY89, \$23,278 in FY90, \$8,502 in FY91, and \$8,648 in FY92.

During 1987 through 1992 this project was a major component of a lakewide steelhead strain evaluation. This project funded 153 shocker surveys of the Manitowoc-Branch River system and 56 surveys of the Kewaunee River.

Information from these surveys contributed to the development of Wisconsin's Lake Michigan steelhead plan and to a stocking protocol for three strains of steelhead. The study documented the periods of smolt residence and out-migration, the timing and magnitude of adult returns, and the harvest of the three strains.

FIG. 4 *F i s h e r i e s*
Biologist holding a brown
trout for spawn from the
Menominee River.



10. **Assess brown trout harvest, abundance, and movement.** \$947 in FY90, \$580 in FY91, and \$2,599 in FY92.

From 1991 through 1993 three groups of yearling brown trout have been fin clipped and released in four areas to evaluate their performance in Green Bay and Lake Michigan. The three groups include:

- 1) standard domestic Wild Rose strain from hatchery brood stock,
- 2) Wild Rose strain from returning Lake Michigan survivors (feral strain), and
- 3) Seeforellen strain from eggs obtained from New York DNR.

Seeforellen strain had never been stocked in Lake Michigan before. The majority mature at a year or two older than our Wild Rose fish, they also spawn later in the year (December), thus gaining more time to grow to a larger size. Results after one year in the fishery are encouraging. The return rate of Seeforellen strain is similar to our domestic Wild Rose strain. Although Seeforellen are smaller at stocking because adults spawn later, their average length at age 3 was the same as Wild Rose strain. Seeforellen, however, tend to be slimmer than our domestics.

11. **Assess salmonids at release locations and harvest facilities.** \$1,298 in FY90, \$2,849 in FY91, and \$12,706 in FY92.

Data on specially tagged or clipped chinook and coho were collected at release/harvest facilities at Strawberry Creek and Kewaunee. The data were used for studies on growth trends, rate of return to weirs, comparative growth and survival of different strains of chinook and coho, and disease status and prevention.

12. **Determine diet of all salmonid species, with consideration of season, location, and size of fish. Relate changes in diet to abundance of forage fish.** \$2,518 in FY92.

Stomachs from chinook and coho salmon and brown, rainbow, and lake trout caught by sport anglers, and in assessment nets and incidentally in commercial nets from Marinette to Kenosha were examined for food contents. The data are used to compare lakewide diets of these stocked species to the available forage base.

13. **Maintain and operate a hatchery specializing in propagation of wild trout and salmon at Wild Rose Hatchery.** \$14,994 in FY87

In the fiscal year 1987 a trailer was purchased for microtagging salmonids and transporting all the necessary equipment and supplies, in addition to the tanks to make it operational.

Developments (Facilities)

1. **Assess the suitability of the Oconto River for development of a substantial rainbow trout run consisting of several strains.** \$10,201 in FY87, \$14,449 in FY88, \$16,214 in FY89, \$344 in FY90, and \$1,313 in FY91:

During 1987 through 1991 this project was a major component of a lakewide steelhead strain evaluation. This project funded extensive shocker surveys of the Oconto River system. Evaluations were conducted to assess the possible construction of a trap and transfer facility. Construction of the Kewaunee facility eliminated the need for this facility on the Oconto River. Yet, information from these surveys contributed to the development of Wisconsin's Lake Michigan steelhead plan and to a stocking protocol for three strains of steelhead. The study documented the periods of smolt residence and out-migration, the timing and magnitude of adult returns, and the harvest of the three strains.

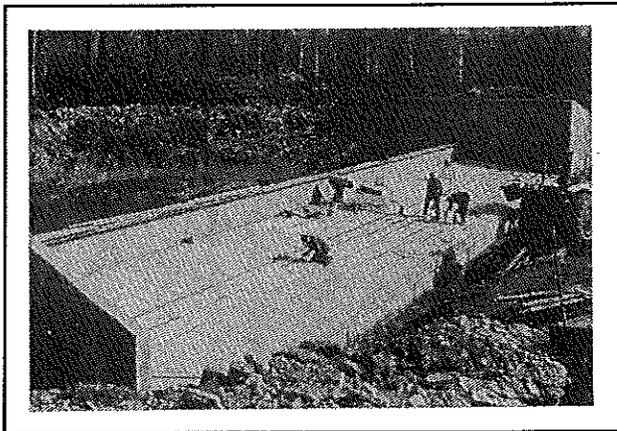


FIG. 5 Construction of a low head barrier dam and spillway on the Kewaunee River part of the C.D. "Buzz" Besadny Anadromous Fisheries Facility.

2. **Kewaunee River Anadromous Fish Facility.** \$3,680 in FY87, \$1,532 in FY88, \$21,808 in FY89, \$193,653 in FY90, \$24,530 in FY91, and \$4,183 in FY92.

The facility was constructed on the lower Kewaunee River to capture Lake Michigan trout and salmon migrating upstream to spawn. A low-head barrier dam directs trout and salmon up a fish ladder and into holding ponds. The fertilized eggs from wild chinook salmon, coho salmon and three strains of rainbow collected at the facility are reared in Department hatcheries to provide fish for stocking into Lake Michigan. The U.S. Fish and Wildlife Service's Anadromous Fish Conservation Act provided for half of the facility's \$535,000 construction cost.

3. **Land acquisition for Kewaunee River Anadromous Fish Facility.** \$10,600 in FY88 and \$1,000 in FY89.

The site chosen to construct the facility was on Department owned land along the Kewaunee River. Since a low-head barrier dam had to be constructed across the river, 14.6 and 5.6 acre land parcels were purchased for total land control on both sides of the river.

4. **Strawberry Creek salmon pond.** \$296 in FY87.
At Strawberry Creek, repairs were made to the crowding screen, which is used in harvesting mature chinook salmon for collection of eggs.

5. **Wild Rose Hatchery bulkhead and raceway.** \$13,086 in FY88

Many of the bulkheads and pond walls had deteriorated to the point of being unsafe. Therefore 450 feet of the worst pond walls were replaced as well as the four worst bulkheads.

SOUTHEAST DISTRICT

Permanent employee salaries paid from the salmon stamp account to the Lake Michigan Work Unit and Kettle Moraine Springs Hatchery were \$26,850 in FY87, \$28,308 in FY88, \$29,177 in FY89, \$26,545 in FY90, \$29,588 in FY91, and \$21,679 in FY92.

Operations (Activities)

1. **Determine PCB levels in steelhead and coho smolts stocked in the Sheboygan River and in returning adult steelhead and coho from these plants.** \$6,755 in FY92.

This project will determine PCB levels in steelhead and coho smolts stocked in the Sheboygan River and control rivers, as well as the returning adult steelhead and coho salmon from these plants. Previous studies indicated high levels of PCB's in fish taken from the Sheboygan River but the information is outdated and incomplete with major inconsistencies present in the study. This project will not only determine if Sheboygan River can be stocked again but will also provide valuable baseline PCB information.

2. **Develop a long term index of chinook and coho populations in SED Lake Michigan.** \$8,628 in FY92.

This project was designed to take advantage of the future presence of the egg taking facility on the Root River to provide an index station for adult coho and chinook salmon returning from Southeast District waters of Lake Michigan. These expenses covered the cost of marking the 166,989 chinook salmon which were stocked into the Root River in 1992.

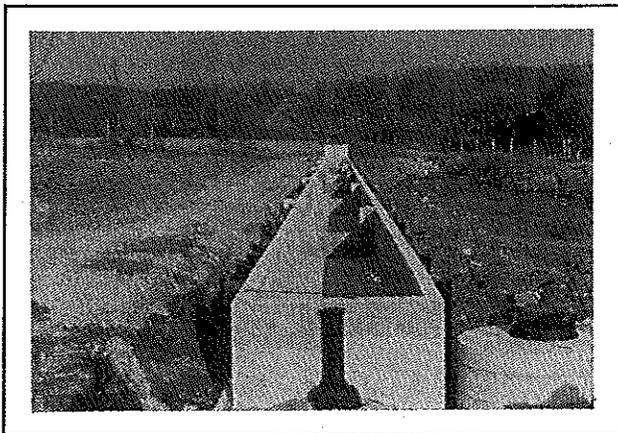


FIG. 6 Construction of a new raceway at the Kettle Moraine Springs Hatchery. Raceways like this are used to house steelhead.

3. **Maintain and operate a hatchery specializing in propagation of wild trout and salmon at Kettle Moraine Springs Hatchery.** \$13,056 in FY87, \$16,176 in FY88, \$16,427 in FY89, and \$11,770 in FY92.

These expenses cover the administrative costs incurred in the operation of the Kettle Moraine Springs Hatchery.

4. **Production at Kettle Moraine Springs Hatchery.** \$77,534 in FY87, \$76,917 in FY88, \$121,643 in FY89, \$72,534 in FY90, \$24,489 in FY91, and \$95,564 in FY92.

These expenses cover the daily operating cost at the Kettle Moraine Springs Hatchery. These include those costs associated with fish rearing, operation and support of the facilities used to rear fish, and equipment maintenance and purchases.

5. **Advance spawning time for coho salmon.** \$2,432 in FY87, \$236 in FY88, and \$881 in FY89.

Eggs were collected from early fall run coho salmon. The purpose of this project was to try to select coho which would spawn earlier in the fall. This was an attempt to increase the numbers of coho returning to the early fall fishery and reduce the numbers returning in the late fall.

6. **Creel survey for trout and salmon.** \$51,600 in FY87, \$50,402 in FY88, \$54,173 in FY89, \$67,061 in FY90, \$59,886 in FY91, and \$53,889 in FY92.

This project determines effort, harvest, catch and harvest rates from anglers using ramp, pier, shore and stream sites. The information is used to guide management decisions.

7. **Re-establish self-sustaining lake trout population.** \$22,497 in FY87, \$44,152 in FY88, \$25,600 in FY89, \$20,993 in FY90, \$16,605 in FY91, and \$27,851 in FY92.

This project is part of Wisconsin's participation in the lakewide lake trout management plan. These expenses cover the costs associated with the annual lake trout population assessments. These assessments include a fall spawning assessment and a summer mortality/growth assessment. The spawning assessment determines the relative abundance of adults in or near potential spawning areas at the appropriate time of year. The summer assessment is used to determine growth rates and to assess the effectiveness of Wisconsin's management practices in keeping lake trout mortality rates below the agreed upon target level of 40%.

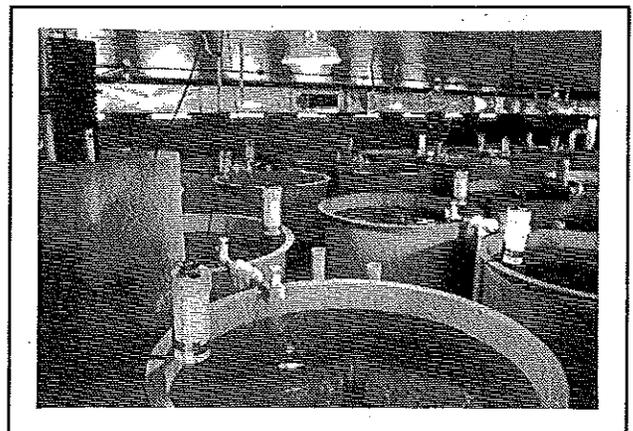
8. **Measure micro-contaminant levels of Lake Michigan fish species.** \$223 in FY87, \$4 in FY88, \$749 in FY89, and \$11 in FY90.

Expenses covered the costs associated with the collection of samples of fish from Lake Michigan and its tributaries for PCB and other contaminant analysis.

9. **Assess movement of chinook salmon through the use of coded wire tags.** \$1,034 in FY87, \$1,318 in FY88, \$1,113 in FY89, and \$261 in FY90.

The purpose of this project was to assess the movements of chinook salmon in Lake Michigan using coded wire tags. Expenditures were for the set-up and support of a system to collect and transport samples of chinook salmon which had been marked using these tags.

FIG. 7 *Six foot diameter rearing tanks up and running in the new Kettle Moraine Springs Hatchery building.*



10. **Determine optimum stocking size and best time of the year to stock brown trout. Describe characteristics of brown trout fishery. Determine which stocking sites produce the best local fishery.** \$12,902 in FY87, \$2,305 in FY88, \$2,564 in FY89, \$2,634 in FY90, and \$1,253 in FY91.

Data on marked fish for this project were collected from the Lake Michigan creel survey and from tributary and harbor electroshocking. Results have shown that optimum returns have been achieved by stocking yearling fish in April as opposed to fall fingerlings. The best returns to anglers in the SED occurs in the spring and fall.

11. Evaluate performance of Skamania, Chamber's Creek, and Ganaraska strains of steelhead in terms of rates of return, harvest, and growth. Develop a long-term index of steelhead abundance in SED Lake Michigan. Track abundance, growth rates, and exploitation rates of three strains of steelhead. \$7,962 in FY87, \$13,583 in FY88, \$15,252 in FY89, and \$46,857 in FY90, \$18,093 in FY91 and \$15,027 in FY92.

This project was designed to use the Root River as an index station for tracking long-term abundance, growth rates and exploitation rates of adult steelhead. It also has evaluated the performance of Skamania, Chambers's Creek, and Ganaraska strains of steelhead in terms of rates of return, harvest, and growth. Field data collection for this project included stream shocker assessments and a special Root River creel survey. Costs associated with fin clipping the different strains were also covered.

12. Develop an anadromous trout and salmon fishery in at least 60% of the Oak Creek watershed; Reestablish intolerant forage fish species in watershed; Improve in-stream aquatic habitat; Document expansion of the fishery. \$842 in FY88, \$3,133 in FY89, \$508 in FY90, and \$17,183 in FY91.

In-stream habitat structures were installed primarily to improve carrying capacity for steelhead. Twenty seven structures were installed at 7 locations. Creel reports have reflected dramatic results. Erosion control has been a significant added benefit. The goal of developing an anadromous fishery in 60% of the watershed was not achieved due to local opposition to removal of a dam 0.6 miles upstream from the mouth of the creek in Lake Michigan. All of the habitat work was done downstream from this dam. This section of river currently supports an excellent anadromous fishery.

13. Diagnose fish diseases. \$56 in FY89 and \$2,367 in FY91.

These expenses were associated with diseased salmonids, primarily with the occurrence of Bacterial Kidney Disease (BKD) in chinook salmon. Expenditures in FY91 were used to help cover costs of fin-clipping erythromycin-treated chinook salmon which were stocked into Lake Michigan.

14. Off-station rearing and broodstock collection. \$1,594 in FY92.

This project covered Kettle Moraine Springs Hatchery expenses associated with monitoring and inspecting the cooperative rearing facilities in Kenosha and collection of Skamania broodstock.

Developments (Facilities)

1. **Evaluate potential steelhead facility on Root River. Increase annual angler harvest of steelhead on Root River. \$1,212 in FY89, \$3,464 in FY90, \$560 in FY91, and \$3,875 in FY92.**

This project was undertaken to evaluate the potential of an egg collection facility on the Root River. Construction of the facility began during July of 1993 and should be completed sometime in early 1994.

2. **Sheboygan River release pond and weir. \$701 in FY87.**

Expenses were incurred in evaluating the potential site of a facility on the Sheboygan River to collect salmonids for spawning.

3. **Kettle Moraine Springs Hatchery building, raceway, and second waterline. Kettle Moraine Springs Hatchery concrete raceway. \$4,825 in FY87, \$7,653 in FY88 and \$15,430 in FY90.**

These development expenses were associated with construction of the third hatchery building, its water supply, and outside raceways. The number-three hatchery building houses a boiler used to increase water heating potential and twenty four (24) six foot diameter rearing tanks. They are used for rearing and stocking steelhead, coho salmon, and Atlantic salmon. The raceways are used to house steelheads.

4. **Kettle Moraine Springs Hatchery roof. \$9,371 in FY88.**

Construction of a roofed enclosure over the outside raceways was conducted in order to provide shading for steelhead. In addition, nets are draped from the roof to the ground, in order to reduce the losses of fingerlings to predators.

5. **Kettle Moraine Springs Hatchery boiler in Building #3. \$13,331 in FY88.**

These funds were used to install a boiler at Kettle Moraine Springs Hatchery. This boiler increases the water temperature in order to accelerate the growth of Ganaraska steelhead and Atlantic salmon.

6. **Kettle Moraine Springs Hatchery groundwater drainage system. \$10,255 in FY88.**

The construction of a bypass drainage system for storm water was conducted at the hatchery. This allows for the separation of surface storm water from the groundwater system which is used for hatching and rearing.

7. **Kettle Moraine Springs Hatchery high capacity well.** \$5,632 in FY88, and \$12,564 in FY89.

These funds were used to operate the hatcheries second system when maximum fish carrying capacities are reached. It allows augmentation water which is high in iron and sulfur to be mixed with spring water.

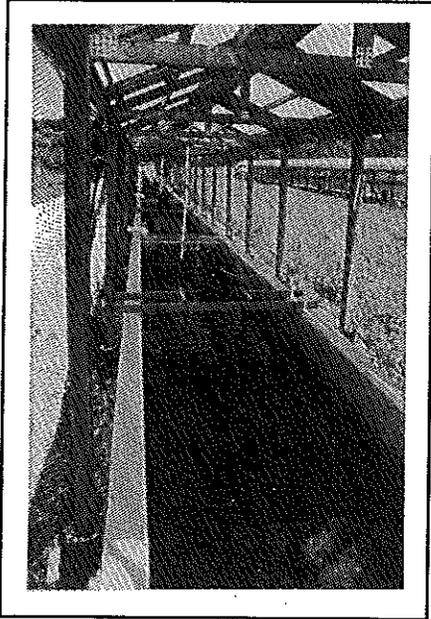


FIG. 8 Construction of a roofed enclosure provide shade for fingerling steelhead. Nets are hang from the roof reduce fingerling predation.

SOUTHERN DISTRICT

Permanent employee salaries paid from the salmon stamp account to the Lake Mills Hatchery totaled \$17,732 in FY87 and \$0 in FY88, FY89, FY90, FY91, and FY92.

Operations (Activities)

1. **Coldwater production at the Lake Mills Hatchery.** \$39,652 in FY87, \$49,982 in FY88, \$52,631 in FY89, \$19,634 in FY90, \$55,073 in FY91, and \$52,152 in FY92.

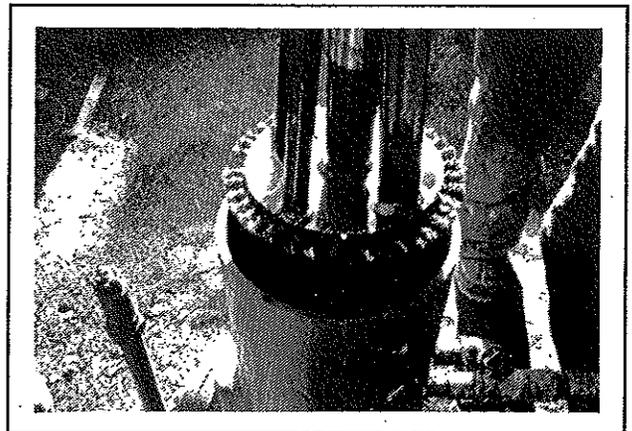
Expenditures covered the purchase of food for coho salmon and equipment and supplies needed to produce coho salmon and operate the facility.

Developments (Facilities)

1. **Lake Mills Hatchery wells (disinfection and installation).** \$55,296 in FY89.

This one time expenditure accomplished the reclamation of the primary water supply used for coho salmon production. The two high-capacity groundwater wells had severe plugging because of an infestation of iron bacteria. The wells were cleaned and disinfected and the pumps and motors were refurbished.

FIG. 9 Part of the well disinfection process at the Lake Mills Hatchery. Wire brush well bores are used to loosen iron bacterial slime growths in order to make chlorine more effective.



NORTH CENTRAL DISTRICT

Permanent employee salaries paid from the salmon stamp account to the North Central Work Unit were \$0 in FY87, FY88, FY89, FY90, FY91, and FY92.

Developments (Facilities)

1. **Security fence at Langlade Rearing Station.** \$175 in FY90.

This project was implemented in fiscal year 1986-1987 to provide security for the St. Croix brown trout brood stock transferred to Langlade. In fiscal year 1990 maintenance of the security fence was conducted and all damaged areas of the fence were repaired.

2. **Lakewood Hatchery development.** \$1,303 in FY89 and \$12,596 in FY91.

The Lakewood Fish Hatchery effluent/settling pond was cleaned out by hydraulic dredging and 2,000 cubic yards of sediments high in nitrogen and phosphorus was landspread for disposal. This improved the quality of the water discharge to Lake John and will enable the Lakewood station to meet or exceed the standards for discharge for the next five to ten years.

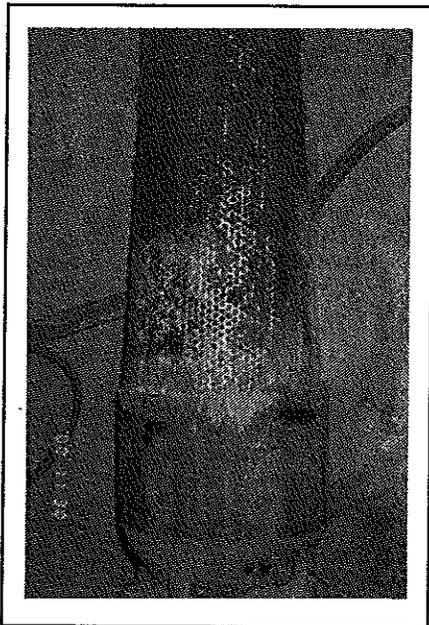


FIG. 10 Lake Mills Hatchery's number 1 well shows plugging of the intake screen due to iron bacteria.

CENTRAL OFFICE

Operations (Activities)

1. **Acoustic assessment.** \$72,810 in FY87, \$1,200 in FY88.

Expenditures in 1987 and 1988 include \$72,810 and \$1,200 respectively for two dual beam processors and other gear used in a lakewide acoustic assessment of forage fish abundance in Lake Michigan.

2. **Bois Brule River research.** \$16,992 in FY87.

A contracted research investigation of genetic stock discreteness of Bois Brule River brown and rainbow trout using starch gel electrophoresis was conducted at a cost of \$16,992 in 1987.

3. **Chinook salmon sterilization project.** \$49,348 in FY87, \$9,716 in FY88 and \$5,302 in FY89.

A cooperative research contract to sterilize chinook salmon for stocking in Lake Michigan cost \$49,348 in 1987, \$9,716 in 1988 and \$5,302 in 1989. It was hoped that the sterile chinook would live beyond their normal life span in the lake and grow beyond the normal size of mature chinook salmon.

4. **Administer salmon and trout stamp program.** \$12,790 in FY87, \$9,927 in FY88, \$11,606 in FY89, \$11,946 in FY90, \$9,150 in FY91, and \$6,133 in FY92.

Administrative costs associated with the salmon and trout stamp program include but are not limited to the following:

* Costs for limited term employees to tabulate creel survey data and write reports, research and gather data for this report were \$3,468 in 1987, \$4,125 in 1988, \$4,747 in 1989, \$3,534 in 1990, \$1,423 in 1991, and \$0 in 1992.

* The Great Lakes Salmon and Trout stamp judging and printing costs were \$5,802 in 1987, \$5,802 in 1988, \$6,553 in 1989, \$5,634 in 1990, \$6,199 in 1991, and \$6,133 in 1992.

Table 1. Expenditures of Great Lakes Salmon and Trout Stamp revenues for facility developments and program operations in Wisconsin 1987-1992.

	FY 1987	FY 1988	FY 1989	FY 1990	FY 1991	FY 1992
Northwest						
Developments	41,181	11,145	106,691	0	0	0
Operations	146,327	118,875	123,315	107,585	87,257	55,553
Total	187,508	130,020	230,006	107,585	87,257	55,553
Lake Michigan						
Developments	14,177	39,667	39,022	193,997	25,843	4,183
Operations	158,457	153,674	170,580	173,196	132,959	140,753
Total	172,634	193,341	209,602	367,193	158,802	144,936
Southeast						
Developments	5,526	46,242	13,776	18,894	560	3,875
Operations	216,090	234,243	270,768	237,404	169,464	242,757
Total	221,616	280,485	284,544	256,298	170,024	246,632
Southern						
Developments	0	0	55,296	0	0	0
Operations	57,384	49,982	52,631	19,634	55,073	52,152
Total	57,384	49,982	107,927	19,634	55,073	52,152
North Central						
Developments	0	0	1,303	175	12,596	0
Operations	0	0	0	0	0	0
Total	0	0	1,303	175	12,596	0
Central Office	151,940	20,843	16,908	11,946	9,150	6,133
Miscellaneous	1,098	1,538	1,102	1,204	874	836
Fringe Benefits	81,238	67,339	77,091	14,886	69,420	56,292
Grand Total	873,418	743,548	928,483	778,921	563,196	562,534

Table 2. Annual Great Lakes Salmon and Trout Stamp balances, 1987-1992.

	FY 1987	FY 1988	FY 1989	FY 1990	FY 1991	FY 1992
Beginning Cash Balance	406,319	356,576	413,106	327,439	71,460	65,209
Revenues	823,675	800,078	842,816	522,942	556,945	804,704
Total Funds Available	1,229,994	1,156,654	1,255,922	850,381	628,405	869,913
Total Expenditures	873,418	743,548	928,483	778,921	563,196	562,534
End of the Year Balance	356,576	413,106	327,439	71,460	65,209	307,379