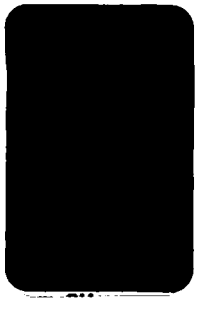
PERFORMANCE REPORT FOR FEDERAL AID GRANT F-48-R, SEGMENT 5

1995

SURVEY AND MANAGEMENT OF FRESHWATER FISHERIES RESOURCES

Maryland Department of Natural Resources
Fisheries Service
Freshwater Fisheries Division
Tawes State Office Building
Annapolis, Maryland 21401

This grant was supported in part by funds from the Federal Aid in Fish Restoration Acts (Dingell-Johnson/Wallop-Breaux)



EXPENDITURES F-48-R-5

STUDY	TOTAL	STATE	FEDERAL
51	$ 14,234.07	$3,558.52	$10,675.55
52	96,335.72	24,083.93	72,251.79
53	146,929.28	36732.32	110,196.96
54	15,096.92	3,774.23	11,322.69
55	120,349.68	30,087.42	90,262.26
56	3,508.55	877.14	2,631.41
58	118,786.83	29,696.71	89,090.12
59	19,036.87	4,759.22	14,277.65
60	23,076.81	5,769.20	17,307.61
62	991.48	247.87	743.61
63	4,502.79	1,125.70	3,377.09
TOTALS	562,849.00	140,712.25	422,136.75

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ANNUAL PERFORMANCE REPORT

Maryland Department of Natural Resources
Fisheries Service
Freshwater Fisheries Division

SURVEY AND MANAGEMENT OF FRESHWATER FISHERIES DIVISION

Biological Surveys of Lakes and Streams

Federal Aid Project: F-48-R-3

Study No.: I

By

Melvin Beaven

1995

ANNUAL PERFORMANCE REPORT

State: Maryland

Project No.: F-48-R-2

Study No.: I

Job No.: 1

Project Title: Survey and Management of Freshwater Fisheries Resources

Study Title: Biological Surveys of Lakes and Streams

Job Title: Biological Surveys of Lakes and Streams

Job Objectives: To measure and evaluate physical and chemical characteristics of Maryland lakes and streams for species suitability and their capability to sustain fish populations. To determine the species composition, conduct population estimates or estimates of relative abundance, food habits, and age and growth of fish species in Maryland lakes and streams. To determine the species composition, distribution, and relative abundances of benthic macroinvertebrates for streams. To prepare fishery management plans for each lake and stream surveyed.

Mattawoman Creek

The investigation of fish species and their relative abundance continued on the non-tidal section of Mattawoman Creek in 1995. Streambed composition, water temperature, pH, dissolved oxygen, and other physical characteristics were recorded for each site.

Three stations were sampled on the upper portion of the watershed (Table 1). Nine fish species representing six Families were documented, with members of the Centrarchidae, Anguillidae, and Cyprinidae Families being most abundant (Table 2).

Streambed composition was typically sand and gravel with little detritus. Watercolor was clear to slightly stained, and flow was considered good. Streambanks were well vegetated but showed signs of some erosion and were characterized by periodic undercut banks. Large gravel bars were typical. Tree cover was considered dense, and development did not occur in the immediate vicinity of the stream. Water quality was good with an average pH of 6.6, and dissolved oxygen ranging from 11.8 at the McDaniel Road site, to 12.5 at Acton Lane.

Because of the construction of a Co-Generation facility on Timothy Branch at the headwaters of Mattawoman Creek, continued documentation of fish species and stream condition is considered an important objective for the upper reaches of the watershed. Also, the Sharperville Bridge site will continue to be monitored for pH levels, and a Ryan TempMentor will be installed to record temperature fluctuations in the stream. Excellent water flow, deep pools, and a variety of submerged and emergent vegetation may make this branch a good candidate for further fisheries enhancement if accessibility to the stream is found to be adequate.

TABLE 1 Sampling Stations, Locations, and Date. Mattawoman Creek, 1995.
Distance Sampled: Approximately 200 yards

Station Number	Date Sampled	Location
1	12/27/95	McDaniel Rd/Piney Branch
2	12/27/95	Acton Lane
3	12/29/95	Sharperville Bridge

TABLE 2 Fish Collected from Mattawoman Cr., 1995. Species Listed in order of relative abundance.

		Station Number		
Scientific Name	Common Name	1	2	3
Lepomis machrochirus	Bluegill	6	1	1
Lepomis gulosis	Warmouth	3	-	-
Anguilla rostrada	American Eel	1	2	-
Lepomis gibbosus	Pumpkinseed	2	-	-
Enneacanthus gloriosus	Bluespotted Sunfish	2	-	-
Esox niger	Chain Pickerel	-	-	1
Erimyzon oblongus	Creekchub Sucker	-	-	3
Semotilus corporalis	Fallfish	1	-	-
Notemigonus crysoleucas	Golden Shiner	-	-	1
Total number of species found at each site		6	2	4

Zekiah Swamp

Eight new stations in Zekiah Swamp were sampled in 1995 to document fish species and relative abundance, and to record data on streambank condition, bottom composition, dissolved oxygen, ph, water temperature, and physical characteristics. All stations were located within the central portion of the swamp (Table 1).

Seventeen fish species, representing nine Families, were documented with members of the Cyprinidae, Umbridae, and Centrarchidae Families being most abundant (Table 2). Overall water quality was good, with average pH (6.6 - 7.1), good dissolved oxygen (+/- 11.6), and clear to slightly tannic water.

Streambed composition consisted mainly of sand and gravel with some overlaying silt in several places. For the most part, the watershed was characterized by relatively dense trees and ground cover, thick humus layers, and mostly undisturbed streambanks. Water currents were slow to moderate, with some riffles or pools in areas of stream constriction.

Baseline data collection of fish species and stream characteristics will continue in 1996, along with periodic checks of pH levels and the deployment of Ryan TempMentors in four of the tributaries. Several sites will be resampled to determine consistency in the presence of fish species between years of normal water flow and drought conditions.

Table 1. Sampling Station, Locations, and Date. Zekiah Swamp, 1995.
Distance Sampled: Approximately 300 yards

Station	Date Sampled	Location	Station	Date Sampled	Location
1	12/12/95	Dr Samuel Mudd Rd.	5	12/18/95	Piney Branch
2	12/12/95	Olivers Shop Rd	6	12/18/95	Kerrick Swamp
3	12/18/95	Bryantown Rd	7	12/22/95	Clarks Run, LaPlata
4	05/10/95	Jordan Swamp	8	12/22/95	James Runs/Cooksey Rd.

Table 2. Fish Collected from Zekiah Swamp, 1995. Species listed in order of relative abundance.

		Station Number							
Scientific Name	Common Name	1	2	3	4	5	6	7	8
Rhinichthys atratulus	Blacknose Dace	-	-	-	300	-	-	-	55
Clinostomus funduloides	Rosyside Dace	2	1	7	50	17	2		28
Umbra pygmaea	Eastern Mudminnow	-	2	2	70	12	-	1	-
Semotilus corporalis	Fallfish	-	3	3	24	-	7	-	-
Anguilla rostrata	American Eel	-	3	1	2	5	5	3	-
Etheostoma olmstedi	Tessellated Darter	-	1	-	15	-	1	-	-
Lepomis gibbosus	Pumpkinseed	-	4	-	1	6	1	1	-
Erimyzon oblongus	Creekchub Sucker	1	2	2	1	-	2	3	-
Lepomis machrochirus	Bluegill Sunfish	-	9	1	-	-	-	-	-
Esox americanus americanus	Redfin Pickerel	2	-	1	-	-	1	1	-
Aphredoderus sayanus	Pirate Perch	2	-	-	-	1	1	-	-
Catostomus commersoni	White Sucker	-	-	1	-	-	1	-	1
Noturus insiginis	Margined Madtom	-	-	-	1	-	-	-	-
Lepomis gulosis	Warmouth	-	-	-	-	-	1	-	-
Micropterus salmoides	Largemouth Bass	-	-	1	-	-	-	-	-
Semotilus atromaculatus	Creekchub	-	-	-	-	-	1	-	-
Lampetra aepyptera	Least Brook Lamprey	-	-	-	1	-	-	-	-
Total number of species found at each site		4	8	9	10	5	11	5	3

JOB PROGRESS REPORT

Maryland Department of Natural Resources
Fisheries Service
Freshwater Fisheries Division

STATEWIDE FISHERIES SURVEY AND MANAGEMENT

Statewide Monitoring Studies

Federal Aid Project: F-48-R-3

Study No.: II

by

Melvin Beaven
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1995

JOB PROGRESS REPORT

State: Maryland

Project No.: F-48-R-3
Study No.: II
Job No.: 1

Project Title: Survey and Management of Freshwater Fisheries Resources

Study Title: Statewide Monitoring Studies

JOB OBJECTIVE

To monitor changes in habitat, fish and macroinvertebrate populations and physical-chemical characteristics in selected lakes and streams. To identify management problems for special study or corrective action and to revise existing fishery management plans as required.

PROCEDURES

Procedures followed are similar to those described in previous reports.

SUMMARY

Monitoring studies were conducted on Allens Pond, Lake Artemesia, Bowie Town Center Pond, Cash Lake, Cosca Lake, Eisenhower Pond, Hughesville Pond, Merkle Ponds, Greenbelt Lake, Milltown Pond, Mt. Harmony Pond, Rocky Gorge Reservoir, Triadelphia Reservoir, U. of MD Science & Tech Pond, Patuxent River, Broadford Leke, Pleasant Valley Lake, Piney Reservoir, New Germany Lake, Deep Creek Lake, Stemmers Run, Smithville Lake, Deer Harbor Pond, Loch Raven Reservoir, Prettyboy Reservoir, Piney Run Reservoir, Liberty Reservoir, Potomac River, and Clopper Lake.

Duration: January 1, 1995 to December 31, 1995

Prepared By: _____
Letha L. Grimes

Date: February 1996

Project Title: Survey and Management of Freshwater Fisheries Resources

Study Title: Statewide Monitoring Studies

JOB OBJECTIVE

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Duration: January 1, 1995 to December 31, 1995

Prepared By: _____ Date: February 1996
Letha L. Grimes

ALLENS POND

An electrofishing and seining survey of Allens Pond on 19 June 95 found poor bass reproduction and no quality sunfish. Only one young-of-year (YOY) largemouth was collected from five seine hauls of 50 feet each. Six adult largemouth were electrofished along with 13 yearlings. The most abundant fish was the brown bullhead catfish with 38 being collected. Also found were a few golden shiners and small redear sunfish. The pH was 7.7 and conductivity 150.

Allens Pond was drained in the fall of 1993 to dredge out accumulated sediment and refilled in the spring of 1994. The pond was re-stocked with the following species:

Species	Number	Size	Date
Golden Shiner	150	3-5"	5/17/94
largemouth bass	500	1"	6/01/94
largemouth bass	103	15-18"	6/15/94
redear sunfish	6	8"	6/15/94
channel catfish	105 lb.	1 lb	6/20/94
channel catfish	300 lb.	1-2 lb	8/31/94
redear sunfish	10,000	1"	9/20/94
cutthroat trout	500	10"	3/29/95
redear sunfish	10,000	1"	9/21/95

Allens Pond will be monitored during the summer of 1996 and more fish stocked as necessary based on survey data. It is expected that numbers and size of fish will improve. Put and Take rainbow trout will also be stocked during the spring of 1996.

LAKE ARTEMESIA

Lake Artemesia is a new pond which was first stocked in 1992. (Table 1.) The lake is approximately 35 acres and was designed for recreational fishing. Special fishing regulations were enacted starting in 1994 to prevent over harvest of bass which has occurred in other nearby areas. These regulations called "Limited Harvest" create a 15 inch maximum size limit on bass. An angler is limited to a creel of 10 fish, only one of which can be a bass.

An electrofishing survey on 27 Sept 95 found excellent numbers and size of largemouth bass (Table 1). Proportional Stock Density (PSD) increased from 42% in 1994 to 82% in 1995. This high value may be due to the harvest of stock bass or that few substock bass were available to grow to stock size in 1995. Stock bass Catch-Per-Unit-Effort (CPUE) dropped from 86 in 1994 to only 15 in 1995. CPUE of quality bass (>12") was 66 which is approximately the same as found in 1992 & 1993. CPUE of sub-stock bass was 244 which should be reflected in higher stock values in 1996.

Table 1. Electrofishing Data for Lake Artemesia
Catch-Per-Unit-Effort/hour

Species	Date	Sub-stock	Stock	Quality	PSD
largemouth	9/27/95	244	15	66	82%
largemouth	6/13/94	---	86	63	42%
largemouth	7/01/93	---	0	63	---
redear	9/27/95		48	6	10%

Very few stock and quality sunfish were collected during this survey. Only 26 stock and three quality redear were collected. No quality redbreast sunfish were collected as had been caught in previous years. In order to boost sunfish populations, 20,000 redear were stocked in both 1994 and 1995. Although there are not many sunfish, there are plenty of golden shiners to provide food for the bass. All sizes of bass were of good body condition. The large amounts of submerged aquatic vegetation make for excellent spawning and survival of golden shiner. Also collected were 8 goldfish, 1 eel, 1 brown bullhead catfish, and 1 yellow bullhead catfish.

It is too early to evaluate the impact of the new Limited Harvest Regulations but so far they seem to be working. It is recommended that black crappie be stocked during 1996 and additional brush shelters or fishing reefs be added. Fish stocked during 1995 are shown in Table 2.

Table 2. Fish Stocking Records for Lake Artemesia, 1995

SPECIES	NUMBER	SIZE	DATE
Rainbow trout	500	12"	01/31/95
Cutthroat trout	500	10"	03/29/95
Rainbow trout	300	12"	04/24/95
Walleye	4,600	1.5"	05/17/95
Redear sunfish	20,000	1"	09/21/95
Rainbow trout	700	12"	10/05/95

BOWIE TOWN CENTER POND

A largemouth bass reproduction survey of Bowie Town Center Pond on 19 June 95 found no YOY largemouth. The water had a high pH of 10.3 and a conductivity of 195. This pond has been plagued with heavy algae blooms resulting in abnormally high pH values. This high pH is believed to be inhibiting bass reproduction and has caused the die off of golden shiners. To make up for the lack of bass reproduction, 500 four inch largemouth were stocked on 25 Oct 95.

Without an improvement in water quality this pond cannot maintain a balanced fish population. The poor water quality in Bowie Town Center pond is a result of extremely eutrophic conditions caused by excessive nutrient inputs. This results in

heavy phytoplankton blooms which lower oxygen and raise pH values. It is evident that considerable nutrient pollution such as fertilizer has entered the pond in recent years. It is recommended that measures be taken to reduce nitrogen and phosphorus levels in the water. Such measures should include: reducing polluted runoff into the pond; adding an aeration system to help digest nutrients; and adding alum to reduce phosphorous levels.

CASH LAKE

Cash Lake is a 47 acre impoundment located on the property of the U.S. Fish and Wildlife Service (USFWS), Patuxent Wildlife Research Center near Laurel Maryland. The Maryland Department of Natural Resources, Freshwater Fisheries has conducted an electrofishing survey of Cash Lake each year since 1991, when it was opened by the USFWS to public fishing for the first time in over 20 years. The population structure and species composition has been monitored for changes due to fishing pressure during the 5 year study period.

Prior to the public opening, fishery surveys in 1989 (USFWS, 1989) and 1991 indicated a very small population of largemouth bass atypical of a lake of this size. However, a good size distribution existed with a PSD of 59 percent (n=32) and a high proportion of quality size bluegill (PSD 63%, n=178). To protect the fish population and allow a reasonable amount of public fishing, the following special regulations were enacted:

- The lake is open from June 15 to October 15.
- Fishermen must apply for a permit and predetermine which dates they plan to fish.
- 25 permits are allotted per day.
- Bass, catch and release only, except keeping one bass greater than 15 inches in length is permitted.
- Pickerel, catch and release only, except keeping one pickerel greater than 15 inches in length is permitted.
- Sunfish and catfish, 15 per day total fish limit.

Overharvest of largemouth bass from previously unfished waters has been well documented (Jennings et al. 1986). Once the numbers of predators are reduced, prey species such as sunfish can quickly overpopulate, resulting in poor fishing. Cash Lake provides an opportunity to study a lake in Maryland which has not been open to public fishing and to evaluate changes in the fish population structure once fishing occurs. In addition, the study will determine if the special regulations for Cash Lake were protecting the fishery sufficiently.

Cash Lake can be characterized as shallow, tannin stained lake, with a heavy growth of water lilies and other submerged aquatic vegetation. The lake was originally designed for

wildlife management and is shallower than most fishing lakes. The water is slightly acidic with a pH of 6.8 and has a low conductance of 50 μmhos. The lake has a drainage of 2.51 mi^2 some of which comes from a landfill. Since the lake was constructed, organic material and sediment has accumulated making it more shallow.

Objectives

1. To compare the population structure and species composition before and after fishing occurs.

2. To monitor the changes that take place after fishing occurs.

3. To assess the whether the regulations promote a quality sustainable fishery over time.

Results

An electrofishing survey of Cash Lake took place on 21 Nov 95 to monitor the present status of the fishery and to compare with previous surveys and the unfished condition in 1991. Nine species of fish have been collected since monitoring began. Table 3 summarizes the species collected and their associated CPUE over the study period. One change was the disappearance of brown bullhead and creek chubsucker from the samples after 1992. This may be explained by the switch to fall sampling. Brown bullhead and creek chubsuckers are benthic fishes and would likely be in the deepest water in the fall and therefore inaccessible. Chain pickerel, golden shiner, warmouth sunfish, and pumkinseed populations have remained about the same throughout the study period. A decline was observed in 1995 in the collection rate of chain pickerel and golden shiner but no trend can be established at this time.

Table 3. Fish Species Collected from Cash Lake

		OVERALL CPUE/hr.				
Common Name	Scientific Name	1991	1992	1993	1994	1995
Largemouth Bass	Micropterus salmoides	26	24	21	36	18
Bluegill Sunfish	Lepomis macrochirus	183	307	152	357	234
Black Crappie	Pomoxis nigromaculatus	15	82	155	57	104
Chain Pickerel	Esox niger	15	20	12	20	7
Golden Shiner	Notemigonus crysoleucas	18	20	38	36	3
Warmouth Sunfish	Chaenobryttus gulosus	15	17	12	12	17
Pumkinseed	Lepomis gibbosus	10	2	0	1	2
Brown Bullhead	Ictalurus nebulosus	3	7	0	0	0
Creek Chubsucker	Semotilus atromaculatus	3	4	0	0	0
Eel	Anguilla rostrata	seen, not collected				

The most notable change in the fish population was a decrease in the number of quality size bass collected and an increase in the number of stock size bluegill as indicated by their associated CPUE values (Table 4). PSD values have decreased for bass, bluegill, and black crappie. Most recently, on 21 Nov 95, the PSD for largemouth bass (11%) as below the

normal range for a predator (30-70%). Fishing mortality of the larger size bass, either by harvest or from handling, would likely account for this change.

The PSD of black crappie has declined steadily from 86% in 1991 to the recent 13% which is below the normal range of 20-50%. The CPUE for black crappie indicates that there has been a significant increase in the number of smaller sizes.

Quality size bluegill remain abundant although the PSD has declined over the study period. Again, this is due to an increase in the number of smaller (stock) sizes. Bluegill growth rates (Table 5) have slowed by comparison to the 1991 age analysis because of the increased number of small bluegill competing for the same food source. This is indicated in the length frequency comparisons of the bluegill population in 1991 compared to 1995 (Figure 1).

Table 4.

		Catch-Per-Unit-Effort/hour				Relative Weight		
Species	Date	Sub-stock	Stock	Quality	PSD	substock	stock	quality
Largemouth	6/5/91	5	9	13	59	115	99	97
Largemouth	4/22/92	0	9	15	62			
Largemouth	11/23/93	8	6	8	56			
Largemouth	11/22/94	16	16	4	21			
Largemouth	11/21/95	3	13	2	11	--	95	82
Bluegill	6/5/91		66	112	63			
Bluegill	4/22/92		26	184	90			
Bluegill	11/23/93		59	92	61			
Bluegill	11/22/94		240	117	31			
Bluegill	11/21/95		129	104	45			
Black Crappie	6/5/91		2	13	86			
Black Crappie	4/22/92		14	73	84			
Black Crappie	11/23/93		123	27	18			
Black Crappie	11/22/94		45	9	16			
Black Crappie	11/21/95		91	13	13			
Chain Pickerel	6/5/91	--	9	1	13			
Chain Pickerel	4/22/92	4	17	0	0			
Chain Pickerel	11/23/93	0	8	5	38			
Chain Pickerel	11/24/94	4	12	4	27			
Chain Pickerel	11/21/95	3	2	2	--			

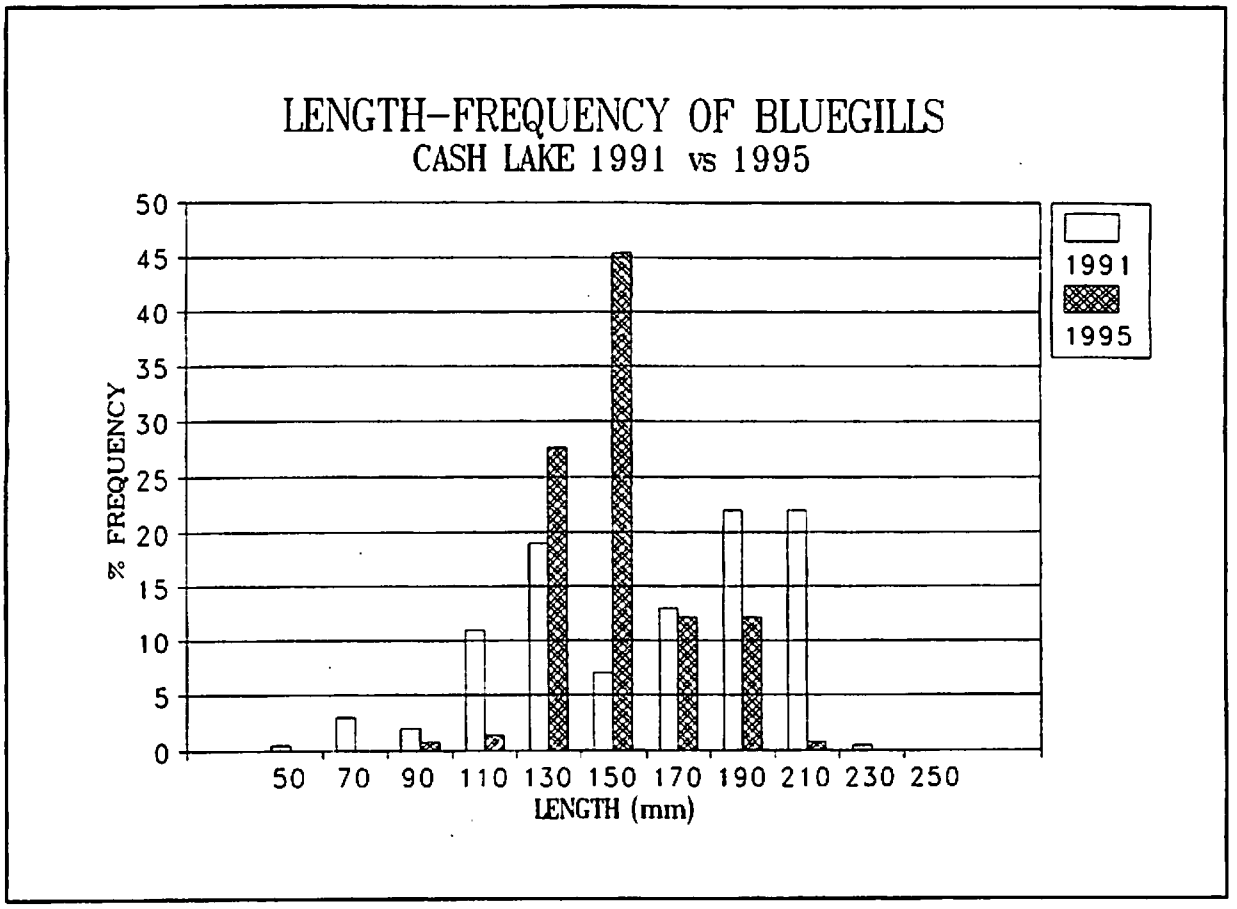


Figure 1

The small sample size of 11 largemouth bass makes it difficult to assess the growth rate for 1995 but according to the calculations, the growth rate for bass in 1995 is slower than in 1991 (Table 5).

Table 5. Calculated Growth Rates of Cash Lake Bass and Bluegill

	Age				
	I	II	III	IV	V
Bass					
Cash 1991	102 mm	201	257	290	333
Cash 1995	96 mm	145	191	236	279
Statewide	119	244	315	381	432
Bluegill					
Cash 1991	61 mm	109	152	175	193
Cash 1995	58 mm	102	136	157	172
Statewide	61	119	163	185	203

In most circumstances a light harvest of fish from an old stable population should stimulate the growth rate of the remaining fish. It is possible that the increased density of stock bluegill and black crappie compete with the smaller bass. Although there has been a slowdown when looking at the annual

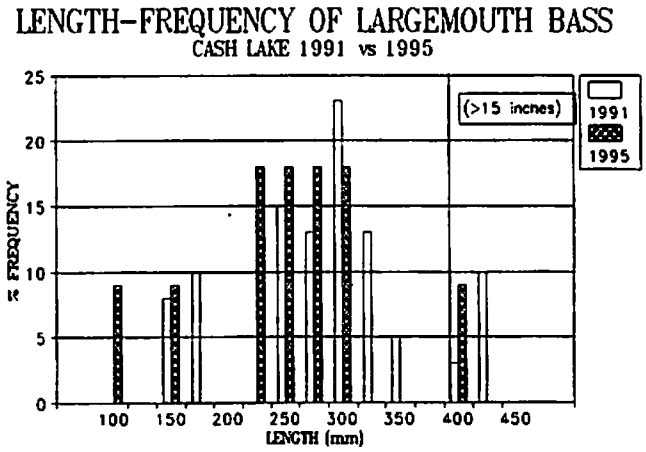
increment of growth for age 0-I, I-II, and II-III, the growth increment for age III-IV and IV-V has increased compared to 1991. The average growth rate is far below the statewide growth rate for bass (Elser, 1962). The CPUE and length frequency for bass (Figure 2, Table 4) show that the highest catch rate was for those between 200-300mm (13/hr). Legal bass (≥15in.) were caught at a rate of 2/hr comprising 9% of the bass collected. The condition of the bass, expressed as percent relative weight (Table 4), has declined slightly over the study period but remains nearly satisfactory. The weighted mean W_R for 1991 was 100% and for 1995 was 94%.

Of four chain pickerel collected, only one was over 15" (legal size in Cash Lake). It does not appear that pickerel will contribute much to sportfish harvest due to their low number.

Discussion

The opening of Cash Lake to fishing has provided a good recreational resource to the public. The USFWS has improved the lake since 1991 by installing a pier accessible to disabled persons. In addition, the USFWS has spot treated the lilies in front of the pier area with chemical controls, and has installed agitators to improve the dissolved oxygen. In 1991 dissolved oxygen measurements indicated that a low oxygen situation (< 5ppm) was occurring in hot weather. This condition is stressful to larger fish which require more oxygen and may

Figure 2



explain the slow growth rate of bass. Two or three agitators were installed in the summer of 1993.

Any effect that these changes have had on the fish population was not apparent except for the improved fishability. Fishing pressure on the lake has altered the population structure

in that there is a decline in the older larger bass. This result would be expected since the regulations allow for keeping one bass over 15". An increase in the number of stock size bluegill was also noted and could be explained by the loss of big bass which tend to control bluegill.

Even with the protective measures in the regulations that were enacted in 1991, the number of larger size bass has declined resulting in a PSD of 11. A change in the regulations to catch-and-release fishing for bass could protect the remaining larger size bass. Additionally, more bass could be stocked to help supplement natural reproduction. An additional small forage fish such as mosquitofish (Gambusia affinis) should also be stocked to enhance the food source for small bass. Continued monitoring of the fish population each year is recommended.

COSCA LAKE

An electrofishing survey on 19 Sept 95 found an improvement in CPUE of stock largemouth bass (219) but a decline in CPUE of quality bass (22) over 1994 values (Table 6). Largemouth PSD also declined from 35 in 1994 to 6 in 1995. The decline in bass PSD is mainly due to the increase in the numbers of stock size bass. Bluegill PSD increased from 26 in 1994 to 53 in 1995.

Cosca Lake has traditionally had a problem with excess sunfish and poor bass reproduction. Starting in 1995, Cosca Lake will go under "Limited Harvest" fishing regulations. These regulations should improve both the number and size of bass and sunfish. This lake will be monitored annually to evaluate the impact of these regulations.

Fish stocked during 1995 include 10,000 one inch redear sunfish fingerlings and 3,200 rainbow trout.

Table 6. Electrofishing Data for Cosca Lake

	Largemouth Bass (CPUE/hr)				Bluegill (CPUE/hr)		
Date	Sub-Stock	Stock	Quality	PSD	Stock	Quality	PSD
09/19/95	154	219	14	6	342	387	53
07/18/94	199	42	22	35	305	109	26
07/27/92	23	75	0	0	238	296	55
10/08/91	104	224	16	7	624	448	42
08/07/90		292	18	6	---	---	--

EISENHOWER POND

An electrofishing survey was conducted on Eisenhower Pond on 28 Sept 95 to evaluate how the new "Limited Harvest" fishing regulations are protecting the fish population since the pond was officially opened to fishing in 1994.

Eisenhower Pond had an excellent population of fish prior to opening the pond to fishing. Surveys in 1991 and 1992 (Table 7)

Table 7. Electrofishing Data for Eisenhower Pond

		Catch-Per-Unit-Effort/hour				
Species	Date	Sub-stock	Stock	Quality	>15"	PSD
Largemouth	9/28/95	131	83	75	16	47
Largemouth	6/16/94	32	89	109	32	55
Largemouth	7/28/92	9	39	168	35	81
Largemouth	12/08/91	27	18	153	45	89
Bluegill	9/28/95	--	40	196		83
Bluegill	6/16/94	--	306	326		52
Bluegill	7/28/92	--	220	263		51
Black Crappie	9/28/95	--	0	56		100
Black Crappie	6/16/94	--	8	64		89
Black Crappie	7/28/92	--	4	73		94
Redear	9/28/95	--	8	43		84
Redear	6/16/94	--	0	56		100

found excellent numbers and size of both bass and sunfish. The CPUE for quality bass (≥12") ranged from 153 to 168 with PSD values in the 80% range. PSD, more simply stated, is the percentage of quality fish in the population, of all fish stock size and greater. Over 80% of the bass in Eisenhower Pond were greater than 12 inches prior to opening the pond to fishing.

Results of an electrofishing survey on 28 Sept 95 show a sharp decline since 1992 in PSD & CPUE values of quality and larger size bass. A corresponding increase was observed in stock and sub-stock bass during the same period. The increase in small bass can probably be attributed to the decline of large bass that prey upon small bass. The decrease in large bass is probably due to fishing mortality. CPUE values of quality sunfish and crappie have declined slightly, but PSD values have increased. A sharp decline in stock bluegill was observed in 1995 which is probably due to the increase of small bass preying upon them. Adult redear sunfish, which were first stocked in November of 1992, are now averaging over 9 inches and are starting to reproduce. Some redear weigh over 3/4 pound.

It is too early to evaluate the success of the "Limited Harvest" regulations. Declines in number of quality bass would be expected even if the pond was totally catch and release due to hooking mortality. It is hoped that the increase in small bass will boost numbers of quality bass in future years. This pond will continue to be monitored annually to evaluate fish population changes. Presently a permit is required to fish Eisenhower Pond and it is only open to fishing in the early morning.

GREENBELT LAKE

An electrofishing survey on 11 Oct 95 found an improvement in CPUE of stock and sub-stock bass but a sharp decline of quality bass (Table 8). It is hoped that the increase in small bass will be reflected in improved numbers of larger bass in future years. Bluegill PSD also declined but it is expected to rise in the future due to the large numbers of small bass preying on them. A large increase in numbers and size of black crappie was observed in 1995. This increase should make the "pan-fishermen" happy.

Put-and-Take trout stocking during 1995 included 1,450 rainbow trout and 500 cutthroat trout.

The new "Limited Harvest" fishing regulations which went into effect in 1994, have not improved the fish population so far. Although these regulations have been in effect for only two years it was expected that they should be starting to help protect larger bass. It is recommended that additional regulation signs be posted at the lake and that enforcement personnel make sure fishermen are obeying the laws. Greenbelt Lake will be closely monitored in future years to evaluate the success of these new regulations.

Table 8. Electrofishing Data for Greenbelt Lake

		Catch-Per-Unit Effort/hour			
Species	Date	Sub-Stock	Stock	Quality	PSD
Largemouth	10/11/95	141	75	0	0
Largemouth	7/15/94	82	39	15	25
Largemouth	8/13/92	112	50	7	12
Bluegill	10/11/95	--	149	22	13
Bluegill	7/15/94	--	68	19	22
Bluegill	8/13/92	--	208	3	2
Redear	10/11/95	--	10	8	44
Redear	7/15/94	--	22	17	44
Redear	8/13/92	--	17	0	0
B. Crappie	10/11/95	--	44	48	52
B. Crappie	7/15/94	--	6	0	--

HUGHESVILLE POND

Hughesville Pond was drained and reclaimed in late 1992 due to an accumulation of silt and sediment since construction in 1954. The pond was re-stocked in 1993 with largemouth bass and redear sunfish. Starting in 1994 Hughesville Pond was placed under the new "Limited Harvest" fishing regulations.

An electrofishing survey on 14 Sept 95 found good growth and survival of largemouth bass and redear sunfish (Table 9). Largemouth bass had good reproduction during 1995 and redear sunfish PSD is already 70% indicating excellent growth rates. Also collected were a number of bluegill and pumpkinseed sunfish which were not stocked. Although the pond was deepened, it is still plagued with excess aquatic vegetation and algae. It may be necessary to use herbicides to control vegetation in future years. Monitoring will continue in order to evaluate the success of the new "Limited Harvest" fishing regulations.

Table 9. Electrofishing Data for Hughesville Pond

		Catch-Per-Unit Effort/hour			
Species	Date	Sub-Stock	Stock	Quality	PSD
Largemouth	9-14-95	317	163	10	-
Largemouth	7-18-94	8	118	0	-
Redear	9-14-95	--	67	154	70
Redear	7-18-94	--	134	24	15
Bluegill	9-14-95	--	134	19	12
Bluegill	7-18-94	--	24	0	0

MERKLE PONDS

An electrofishing survey was conducted only on "Windmill" Pond during 1995. Two other ponds- "Stump" & "Main" pond were not surveyed.

Electrofishing data (Table 10) show little change since 1992 in CPUE and PSD values of both largemouth bass and bluegill. Largemouth bass PSD declined from 89% in 1992 to 67% in 1995. However, CPUE values of quality bass increased slightly. Values for bass over 15 inches stayed exactly the same. Bluegill PSD also declined slightly from 54 in 1992 to 49 in 1995. CPUE values of quality bluegill stayed approximately the same.

A fish kill was reported in this pond during early June of 1995. The present survey data show that it had no significant impact on the bass or bluegill population. Most of the fish that died were probably gizzard shad which tend to overpopulate and have periodic dieoffs.

All ponds located in Merkle Wildlife Sanctuaries were placed under new "Limited Harvest" fishing regulations starting in 1994. It is hoped that these regulations will help protect the bass fishery and prevent over harvest of other species. These ponds will be monitored annually to evaluate the success of these regulations.

Table 10. Electrofishing Data for Merkle Ponds

		Catch-Per-Unit-Effort/Hour				
Species	Date	Sub-Stock	Stock	Quality	>15"	PSD
Largemouth	6/28/95	15	19	38	23	67
Largemouth	4/22/92	36	4	36	23	89
Bluegill	6/28/95	--	136	132		49
Bluegill	4/22/92	--	108	126		54

MILLTOWN POND

An electrofishing survey of Milltown Pond on 18 Sept 95 found excellent numbers of quality sunfish (Table 11). CPUE values for bass, however, declined from 27 in 1992 & 1994 to 16 in 1995. RSD15, which is the percentage of bass 15 inches and larger, stayed approximately the same. Bluegill PSD was 78% which is the highest ever recorded. Number of quality white perch showed a large drop from 230 in 1994 to only 95 in 1995. The reason for this drop is unclear but may be due to increased fishing pressure.

Milltown Pond was placed under Limited Harvest Regulations in 1994. This pond will be monitored annually to evaluate these regulations.

Table 11. Electrofishing Data for Milltown Pond

		Catch-Per-Unit-Effort/Hour				
Species	Date	Sub-Stock	Stock	Quality	PSD	RSD15
Largemouth	9/18/95	106	74	16	18	18
Largemouth	7/20/94	68	74	27	27	20
Largemouth	9/24/92	99	125	27	18	
Bluegill	9/18/95	--	64	222	78	
Bluegill	7/20/94	--	263	290	52	
Bluegill	9/24/92	--	224	188	46	
White Perch	9/18/95	--	21	95	82	
White Perch	7/20/94	--	263	230	47	
White Perch	9/24/92	--	161	0	0	

MT. HARMONY POND

Mt. Harmony Pond was drained in late 1992 in order to make repairs to the dam including the installation of a new drain and riser pipe. The pond was re-stocked in 1993 with 100 largemouth bass and 500 redear sunfish fingerlings and some golden shiners for forage. At a dedication of the pond on 6 June 95, 165 hybrid sunfish and three largemouth bass (4 lbs) were stocked. At this dedication the pond was renamed "Hutchins" Pond. Starting in 1994 Hutchins Pond was placed under new "Limited Harvest" fishing regulations. It is hoped that these regulations will help prevent overharvest of fish and improve numbers of quality bass and sunfish.

An electrofishing survey on 31 May 95 found good growth and survival of largemouth bass. Eleven adult largemouth bass were collected that averaged almost 14 inches after only two years. Large schools of bass reproduction were observed along the shore. Also collected were a number of bluegill and pumpkinseed sunfish which were not stocked. No redear sunfish were collected during this survey.

At this stage Hutchins Pond has a good fish population. It is hoped that the new "Limited Harvest" fishing regulations will protect these fish and maintain good fishing. This pond will be monitored annually to evaluate the impact of these regulations.

ROCKY GORGE RESERVOIR

Fisheries monitoring studies in Rocky Gorge Reservoir during 1995 included: An early spring sampling for spawning walleye; An electrofishing survey for Striped Bass; A late summer survey of walleye and striped bass; and a series of October electrofishing surveys.

Walleye Studies:

A hoop net was set below Brighten Dam on 22 March and fished until 3 April. No walleyes were captured during this fishing period. Two electrofishing surveys were also conducted just below the dam during this period. No walleye were collected during these surveys either. Water levels were low during this period and it appears that no walleye moved up the river as far as the Brighten Dam. On 3 April an electrofishing survey was conducted in the Patuxent River above Browns Bridge Rd. Seven male walleye were captured ranging in size from 15 to 21 inches. It appeared that these walleye had already spawned. Also captured was a northern pike. Five others were observed but not captured. A electrofishing survey on 22 August found six YOY walleye below Scott's Cove toward the dam.

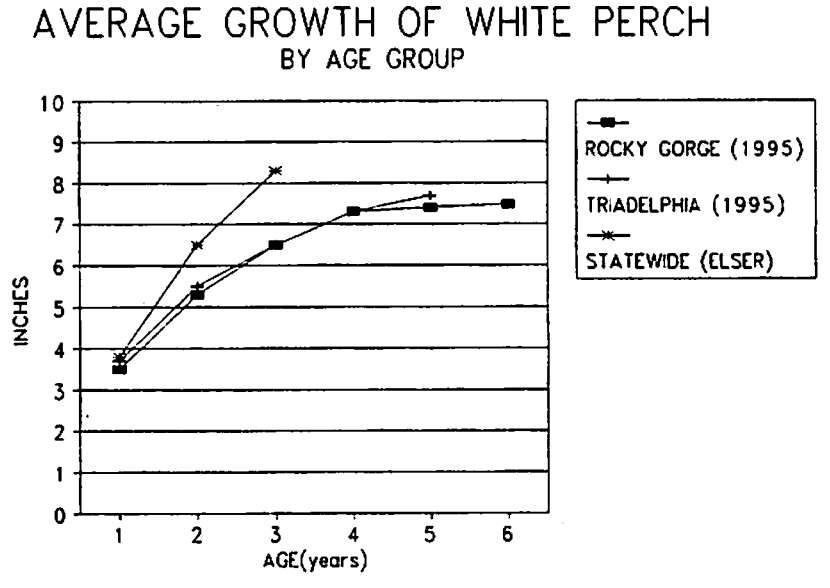
Largemouth Bass Studies:

Electrofishing surveys were conducted October 17 & 19 to access the bass population and other fish species. Results of

these surveys are presented in Table 12. CPUE values for stock and quality largemouth bass decreased significantly over 1994 values. A decrease was also observed in stock and quality bluegill. PSD values for both species stayed approximately the same. The reason for these decreases is probably due to the water level in the reservoir rather than a decrease in abundance. During 1994 the water level was down at least 10 feet during the survey therefore concentrating the fish. Since PSD remained the same there was no change in the ratio of big and little fish. Overall Rocky Gorge has an excellent largemouth bass population.

White perch continue to be abundant and slow growing. PSD was only 8%, meaning that only 8% of perch collected were of quality size (>8"). Growth rates of perch (Figure 3) are similar to those in Triadelphia but much slower than the statewide average (Elser 1962). It takes at least 8 years for white perch in Rocky Gorge to reach 8 inches.

Figure 3.



Two quality and one stock northern pike were collected during October samples. The largest of these was 25" and weighed 3.1 lbs. Two YOY northern pike were also collected on 22 August. This is the first reproduction of northern pike that has been documented during the 1990's. Age analysis from previous years when compared to northern pike stockings has indicated that there may have been some reproduction.

Striped Bass Studies:

An electrofishing survey for striped bass was conducted on 3 May 95 in the upper 1/3 of the reservoir. No striped bass were

found during this survey. A similar survey in Triadelphia Reservoir the week before found eleven large striped bass up to 38 pounds. A YOY survey on 22 Sept 95 found no striped bass even though nearly 2,000 fingerlings were stocked (Table 13).

Table 12. Summary of Electrofishing data for Rocky Gorge Reservoir

		Catch-Per-Unit-Effort/hour			
Species	Date	Sub Stock	Stock	Quality	PSD
Largemouth	10/95	45	46	47	51
Largemouth	11/94	59	104	97	48
"	10/93	46	68	68	50
"	10/92	21	93	42	31
"	10/91	39	67	58	46
Smallmouth	10/95	0	1	0	
Smallmouth	11/94	4	3	4	--
"	10/93	3	2	3	--
"	10/92	0	0	0	--
"	10/91	1	0	0	--
Bluegill	10/95	--	131	46	26
Bluegill	11/94	--	516	144	22
"	10/93	--	522	80	13
"	10/92	--	51	34	40
"	10/91	--	154	57	27
White Perch	10/95	9	52	4	8
White Perch	11/94	25	131	17	12
"	10/93	68	27	5	15
"	10/92	12	56	4	6
"	10/91	0	140	0	0
Walleye	10/95	6	1	0	--
Walleye	11/94	0	5	0	--
"	10/93	2	0	0	--
"	10/92	0	0	0	--
"	10/91	0	1	0	--
Black Crappie	10/95	0	19	5	22
Black Crappie	11/94	46	99	8	7
"	10/93	17	14	11	47
Northern Pike	10/95	0	1	2	--

Table 13. Fish Stocked In Rocky Gorge During 1995:

Species	Number	Size	Date
Striped Bass	1,250,000	7 day old	4/24/95
"	1,955	6"	10/19/95
Walleye	25,000	1.5"	5/16/95
"	50,000	1.5"	5/17/95
"	2,032	3"	5/31/95

TRIADELPHIA RESERVOIR

Fisheries monitoring studies in Triadelphia Reservoir during 1995 included: A spring electrofishing survey for striped bass & walleye; and a fall electrofishing survey for largemouth bass and other species.

Striped Bass Monitoring:

A daytime electrofishing survey on 28 Mar 95 captured 11 large striped bass. Ten of these striped bass exceeded 19 lbs with the largest being 38 lbs (Table 14).

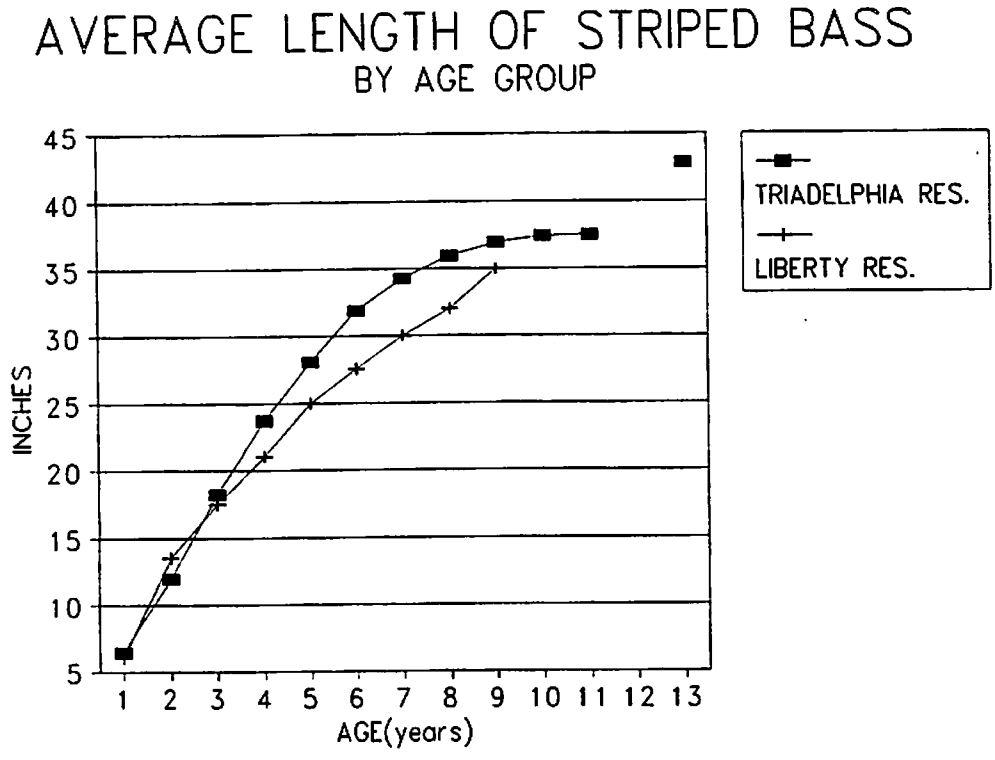
Table 14. Lengths and Weights of Striped Bass Collected on March 28, 1995:

LENGTH (Inches)	WEIGHT (Pounds)	SEX
42.8"	38.0 lb	Female
39.1"	29.5 lb	Female
39.1"	29.0 lb	Female
39.0"	28.5 lb	Female
38.6"	25.5 lb	Female
37.9"	22.2 lb	Female
37.8"	28.2 lb	Female
37.2"	22.2 lb	Female
37.2"	26.0 lb	Female
36.6"	25.0 lb	Female
33.9	19.8 lb	Male

This was the first time that large striped bass have been successfully captured by electrofishing in Triadelphia. In

previous years a few striped bass have been captured by using gill nets. All of the large fish appeared to be at least 11 years old. The first stocking of striped bass occurred in 1980 followed by a stockings in 1982 & 1984. Growth rates of striped bass in Triadelphia are considered good; and are growing slightly faster than striped bass in Liberty Reservoir (Figure 4).

Figure 4



No striped bass YOY were collected during fall electrofishing surveys. One 2 year old striped bass (13") was collected on 16 October. To date, there has not been any striped bass reproduction documented in Triadelphia. Striped bass reproduction has occurred in Piney Run and Liberty reservoirs.

Large and Smallmouth bass Studies:

Only one electrofishing survey could be conducted during the fall of 1995 due to low water levels in the reservoir. This survey on 16 Oct 95 was conducted in the lower reservoir near the dam. Due to the low water level and the short survey time (900sec) this data may not be comparable with previous years.

CPUE values for both largemouth and smallmouth bass continue to improve in Triadelphia (Table 15).

Table 15. Summary of Electrofishing Data for Triadelphia Reservoir, 1992-1995.

Species	Date	Catch-Per-Unit-Effort/Hour Sub-Stock	Stock	Quality	PSD
Largemouth Bass	10/95	20	28	40	59%
Largemouth Bass	11/94	27	60	31	34%
Largemouth Bass	10/93	103	33	20	38%
Largemouth Bass	10/92	80	48	18	27%
Smallmouth Bass	10/95	12	52	20	28%
Smallmouth Bass	11/94	9	14	2	12%
Smallmouth Bass	10/93	21	16	4	20%
Smallmouth Bass	10/92	4	16	0	--
Walleye	10/95	4	12	0	--
Walleye	11/94	4	2	0	--
Walleye	10/93	3	1	1	--
Walleye	10/92	32	0	0	--
Bluegill	10/95	--	428	180	30%
Bluegill	11/94	--	193	87	31%
Bluegill	10/93	--	156	118	43%
Bluegill	10/92	--	233	43	16%
White Perch	10/95	640	1272	32	2%
White Perch	11/94	27	177	6	3%
White Perch	10/93	51	182	13	7%
White Perch	10/92	85	170	2	1%
Black Crappie	10/95	4	84	0	0%

Since 1992 numbers of quality largemouth bass collected per hour have increased from 18 in 1992 to 40 in 1995. Smallmouth CPUE values have increased from near 0 to 20 in 1995. These values are reflected in improved PSD's. Largemouth PSD was 59% and smallmouth PSD was 28% in 1995. Numbers of stock size (<12") smallmouth bass have also improved. This can probably be attributed to the stocking of 2,500 fingerlings in 1993 (Table 16). An additional 11,000 (1") fingerling smallmouth were stocked in 1995.

Excess numbers of small white perch continue to plague Triadelphia Reservoir. The number of sub-stock and stock white perch increased dramatically in 1995. These increases may be due to low water levels which concentrated perch. White Perch PSD continues to be poor reflecting a lack of quality size (>8") fish. Growth rates of perch (Figure 5) are similar to those in Rocky Gorge Reservoir but much slower than the statewide average (Elser 1962). It takes at least 8 years for white perch in Triadelphia to reach 8 inches.

Figure 5

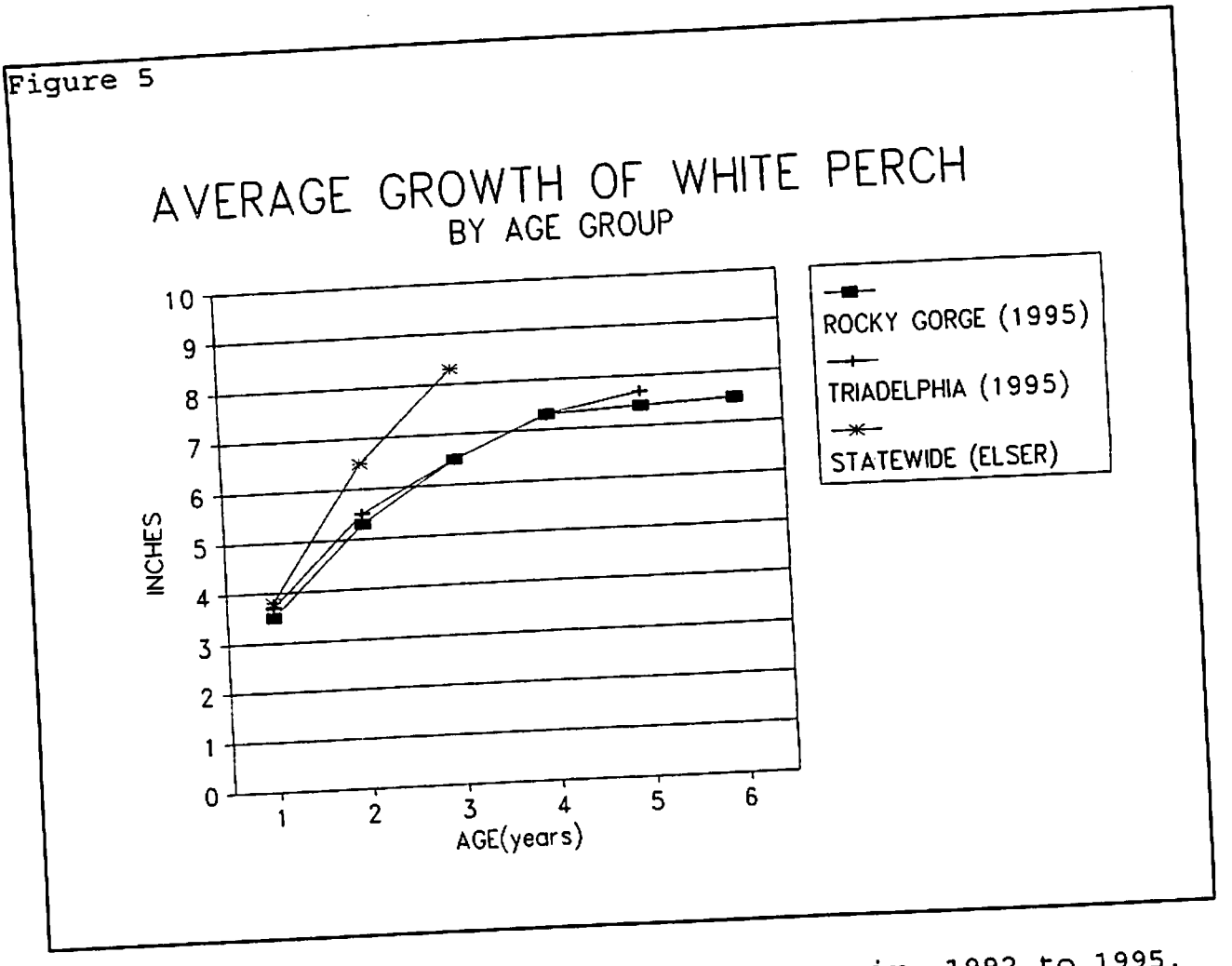


Table 16. Fish stocked in Triadelphia Reservoir, 1992 to 1995.

Species	Number	Size	Date	
Striped Bass	1,620	6"	10/19/95	
"	1,000	6"	10/11/95	from Tri Res growout pond
"	6,000	1"	06/10/94	
"	600	2-4	07/24/93	
"	1,030	4-8"	11/10/92	
"	20,000	1.5"	06/16/92	
Walleye	25,000	1.5"	05/16/95	
"	3,250	4-6"	08/03/94	from Tri Res growout pond
"	23,211	1"	06/07/94	
"	430	2"	06/03/93	
"	5,788	1"	06/03/93	
"	3,000	3-4"	06/ /92	from Tri Res growout pond
Smallmouth Bass	11,000	1"	05/25/95	
"	400	3-5"	11/ /94	from Tri Res growout pond
"	2,500	3-4"	07/ /93	from Tri Res growout pond
Tiger Muskie	3,000	6-8"	10/19/92	from Tri Res growout pond
Largemouth Bass	3,800	3-5"	11/ /94	from Tri Res growout pond
"	825	5-7"	07/ /94	

U. of MD. SCIENCE & TECH. POND

An electrofishing survey on 19 June 95 found a good fish population considering the small size of this pond (1 Acre). Good bass reproduction was observed. Three quality bass were also collected that exceeded 16". Bluegill PSD was 27% and redear PSD was 7%. Heavy growth of duckweed, algae, and SAV was observed along the shore. The conductivity of the water was 405 µmhos. This high conductivity is probably a result of road salt runoff since this pond is a stormwater management pond for Route 50. It is suggested that this pond be placed under "Limited Harvest" regulations to protect big bass and prevent over harvest of other species.

PATUXENT RIVER

Freshwater Fisheries activities on the Patuxent River in 1994 and 1995 included: several largemouth and smallmouth bass stockings; a 7-day electrofishing survey to obtain a population estimate for largemouth bass; electrofishing surveys; and a radio tagging study designed to track largemouth bass movement patterns and preferred spawning habitat.

STOCKING:

Largemouth and smallmouth bass were stocked in the Patuxent River to supplement poor natural reproduction of wild bass (Table 17). A total of 47,165 largemouth and 22,000 smallmouth bass were stocked in the river in 1994. An additional 50,977 largemouth and 30,447 smallmouth bass were stocked in 1995. A total of 973 of the largemouth bass had been removed from Lariat, Wheatley, and St. Marys Lakes, and ranged in size from 3 -10 inches. The removal of these fish was necessary in order to relieve some of the overcrowded conditions present in all three of the impoundments.

Table 17. Fish Stocking Records for Patuxent River and Tributaries, 1994 and 1995

Location	Species	Number	Size	Date
Hall Creek	LMB	80	4-8"	5/05/94
Hall Creek	LMB	35	9-18"	6/03/94
Hall Creek	LMB	15,000	.5-1"	6/03/94
Jacksons Landing	LMB	50	2-3 lbs.	4/15/94
Jacksons Landing	LMB	5,000	2-3"	6/16/94
Western Branch	LMB	6,000	.5-1"	6/03/94
Waysons Corner	LMB	10,000	.5-1"	6/03/94
Governors Bridge	LMB	11,000	.5-1"	6/03/94
4H Center	SMB	7,000	.5-1"	5/24/94
Governors Bridge	SMB	11,000	.5-1"	5/24/94
Western Branch	SMB	3,000	.5-1"	5/24/94
Jacksons Landing	LMB	15,000	1"	6/01/95
Jacksons Landing	LMB	115	3-10"	6/09/95
Jacksons Landing	LMB	450	4-8"	11/13/95
Jacksons Landing	LMB	268	4-8"	11/20/95
Jacksons Landing	LMB	60	4-8"	12/13/95
Waysons Corner	LMB	12,584	2"	6/01/95
Trailer Park	LMB	7,500	2"	6/01/95
Western Branch	LMB	15,000	1-2"	6/01/95
Waysons Corner	SMB	7,886	1"	5/24/95
Governors Bridge	SMB	7,885	1"	5/24/95
Rt. 214 Bridge	SMB	5,102	1"	5/24/95
Davidsonville Rd.	SMB	1,500	1"	5/24/95
Rt. 1	SMB	2,972	1"	5/24/95
Western Branch	SMB	5,102	1"	5/24/95

1994 POPULATION ESTIMATE:

A largemouth bass population estimate was calculated from a 7-day mark and recapture study (Table 18). The study area consisted of 160 surface acres which began at Jacksons Landing in Prince Georges County and extended northward to approximately 1.5 miles beyond the Route 4 bridge at Waysons Corner. The 7 surveys were conducted during daylight hours from 26 Sept to 7 Oct 94. Bass were collected with a Smith-Root electrofishing boat and were internally marked with a Passive Integrated Transponder (PIT tag), and externally marked by removing one half of the left pelvic fin.

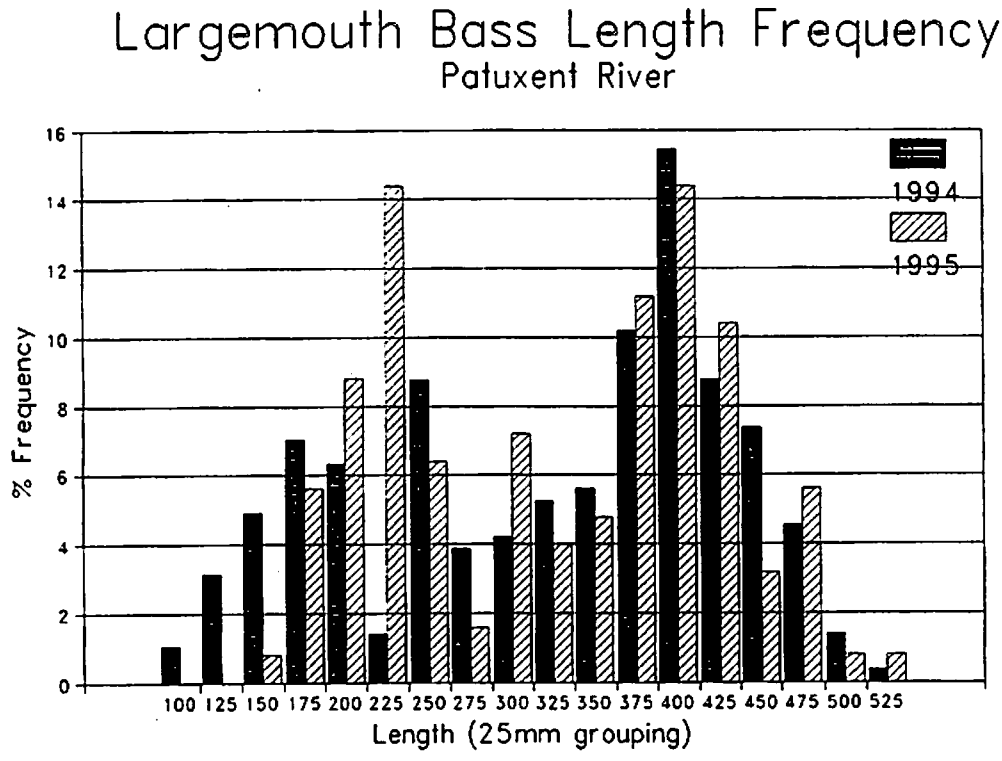
Table 18. 1994 Population Estimate of Patuxent River Largemouth Bass.

	Patuxent River Estimate		95% Confidence Limit	
Size Group	N	N/acre	Low	High
Sub-Stock (<8")	144	.9	109	193
Stock (8-12")	128	.8	98	171
Quality (>12")	428	2.7	326	575
All Fish	70	4.4	533	939

A total of 316 largemouth bass were collected during this survey resulting in a CPUE of 19 fish/hr and a PSD of 82%. The high PSD indicates that there is limited bass reproduction and

low mortality rates for adult bass. Approximately 38% of the fish collected in 1994 were less than 12 inches in length (Figure 6). Over 70,000 microtagged bass have been stocked in the Patuxent River from 1988 to 1993. A total of 104 bass were scanned during the survey to detect the presence of microtags. Five fish were found to contain microtags, indicating that the stocked fish are surviving.

Figure 6.



Interviews with local watermen and anglers indicate the presence of smallmouth bass in the tidal section of the river south of Jacksons Landing during the spring of the year. Freshwater fisheries, however, have documented few smallmouth bass during survey work, and collected only two adults during the mark-and-recapture study.

Back-calculated lengths at each annulus for Patuxent River bass in 1994 and 1995 is shown in Tables 19 and 20, respectively. Western Branch back calculated lengths are illustrated in Table 21. The growth of Patuxent River bass is slightly slower than the state average, but falls within the normal range. Western Branch fish are growing below the state average according to

Elser, 1962. The slow growth may be attributed to competition with the abundant white perch population in this section of the river.

Table 19. Mean Back Calculated Length at Each Annulus from Scale Measurements of Patuxent River Largemouth Bass, 1994. (Correction Factor = 20)

Age Group	Number of Fish	Mean Calculated Length (mm)						
		1	2	3	4	5	6	7
I	5	143						
II	1	157	227					
III	11	135	210	286				
IV	17	134	235	311	354			
V	8	130	216	288	360	396		
VI	2	136	194	293	337	397	427	
VII	1	104	171	240	306	337	397	427
Total 45								
Mean Length		135	220	297	353	391	419	427

Table 20. Mean Back Calculated Length at Each Annulus from Scale Measurements of Patuxent River Largemouth Bass, 1995. (Correction Factor = 20)

Age Group	Number of Fish	Mean Calculated Length (mm)						
		1	2	3	4	5	6	7
I	11	117						
II	34	124	179					
III	24	117	203	268				
IV	27	123	210	285	340			
V	13	146	234	319	403	449		
VI	14	117	191	264	335	380	412	
VII	1	146	207	334	365	400	429	448
Total 124								
Mean Length		101	190	286	354	413	413	448

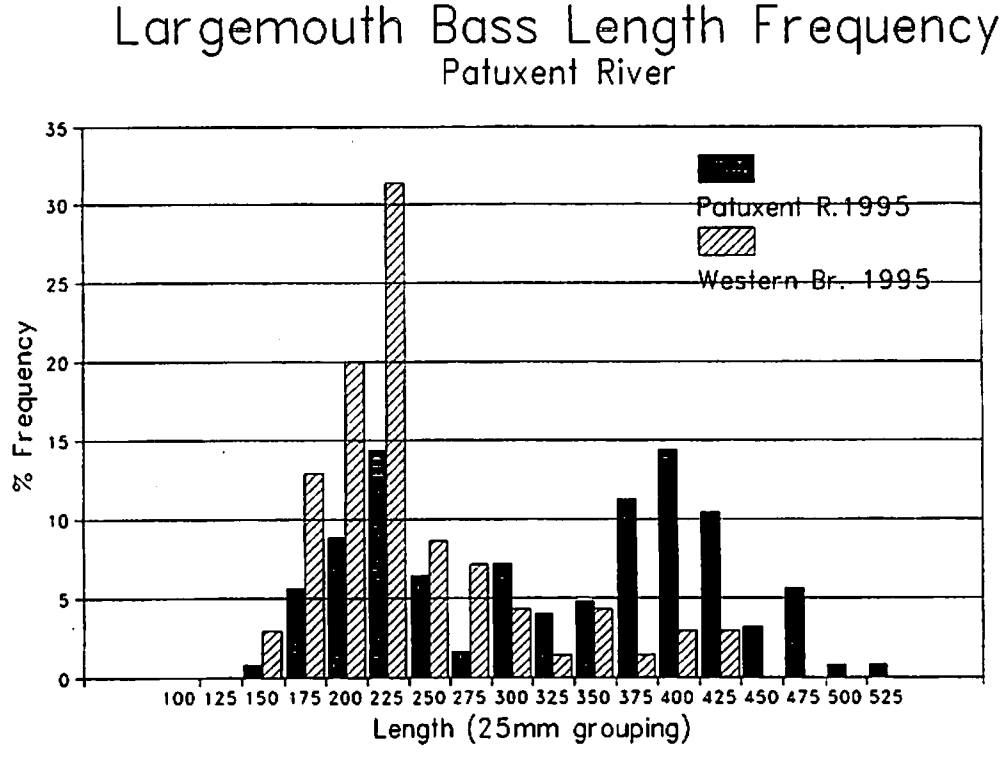
Table 21. Mean Back Calculated Length at Each Annulus from Scale Measurements of Western Branch Largemouth Bass, 1995. (Correction Factor = 20)

Age Group	Number of Fish	Mean Calculated Length (mm)						
		1	2	3	4	5	6	7
I	15	118						
II	38	108	169					
III	10	110	184	242				
IV	5	134	181	270	316			
V	1	165	288	293	362	389		
VI	1	127	212	263	307	364	386	
Total 70								
Mean Length		113	175	260	321	377	386	

1995 MANAGEMENT SURVEY

Electrofishing surveys were conducted on the tidal Patuxent River in the fall of 1995. Seventy-one percent of the bass captured were less than 12 inches long, which would normally indicate good reproduction and a growing population (Figure 6). However, based on past tagging studies, we know that natural reproduction on the Patuxent is poor. The high percentage of young fish is most likely explained by the fact that many were found near stocking sites. Eighty seven percent of the population in Western Branch alone was less than 12 inches in length (Figure 7). This section of the river is one of the most heavily stocked areas on the Patuxent and has good survival of stocked fish.

Figure 7



A PSD of 65% for the entire Patuxent was within the recommended range of 30-70% for predators (Weithman, Reynolds, and Simpson, 1979). Data collected in Western Branch, however, revealed a PSD of 20% (Table 22). Again, the stocking of fingerlings in this section of the river most likely explains the

low PSD. CPUE values also varied widely between the two sections sampled. The main part of the river had a total CPUE of 29 fish/hr., while Western Branch had a total CPUE of 140 fish/hr. Fish are concentrated in Western Branch at a discharge outflow of a water treatment plant and tend to be found in proportionally high numbers, including recently stocked fingerlings.

Table 22. CPUE and PSD Values for Largemouth Bass in the Tidal Patuxent River, 1995.

Area	PSD	CPUE Fish Hour	CPUE # of Fish
Patuxent (main)	65%	29	129
Western Branch	20%	140	77

1994/1995 RADIO TELEMETRY

A radio telemetry study was initiated in December, 1994. Eleven Patuxent River largemouth bass were equipped with radio tags and released back into the river between Jacksons Landing and Western Branch in the fall of 1994, and the spring of 1995. During the fall sampling in 1995, a total of 12 more largemouth bass were collected, radio tagged, and released. Monitoring of these fish will begin in the spring of 1996. The purpose of this study was to determine whether tidal bass in the Patuxent move into the streams to spawn or if they choose to stay in the river. Once the spawning areas are identified, the goal of this project is to attempt to enhance the spawning habitat and improve natural reproduction.

Analysis of initial radio telemetry data shows three possible spawning sites preferred by the largemouth bass (Table 23). All three of the areas are in marshy wetland habitats that are characterized by thick vegetation and winding channels that offer protection from strong currents generated by tidal fluctuations. None of the fish displayed a tendency to migrate up into the streams for spawning, as was previously expected. Several fish, however, were found just inside the mouths of both Mattaponi Creek and Western Branch and remained there for several weeks. Observations made by sport fishermen in the area also coincide with initial findings. Local fishermen report the presence of spawning largemouth bass in the three areas identified in this study.

Table 23. Possible Spawning Sites for Largemouth Bass in the Tidal Patuxent River, 1995.

Site #1 - Mondays Creek/Railroad Creek - North of Jug Bay Wetlands Area.
Site #2 - Jug Bay Wetlands Sanctuary - Across from Western Branch.
Site #3 - Marsh below the Mouth of Mattaponi Creek - Prince Georges County side.

In conclusion, initial investigations into the spawning habits of largemouth bass are promising and have provided some information on possible areas for habitat enhancement. Additional tracking data is needed to verify initial observations, and to provide a better understanding of how to best improve the fishery resource on the Patuxent River.

Monitoring studies for the Southern Region were conducted on fifteen public impoundments, and the tidal Patuxent River during 1995. A summary of largemouth bass and bluegill CPUE and PSD are shown in Table 24.

Table 24. Catch-per-Unit-Effort and PSD Values for Public Impoundments in Region IV.

		Largemouth Bass				Bluegill		
			CPUE/hr				CPUE/hr	
Impoundment	Date	PSD	Sub-stock	Stock	Quality	PSD	Stock	Quality
Artemesia	9/27/95	82	244	15	66	-	-	-
Cash Lake	11/22/94	21	16	16	4	31	240	117
Cosca	9/19/95	6	154	219	14	53	342	387
Eisenhower	9/28/95	47	131	83	75	83	40	196
Greenbelt	10/11/95	0	141	75	0	13	149	22
Hughesville	9/14/95	6	317	163	10	12	134	19
Merkle	6/28/95	67	15	19	38	49	136	132
Milltown	9/18/95	18	106	74	16	78	64	222
Rocky Gorge	10/95	51	45	46	47	26	131	46
Triadelphia	10/95	59	20	28	40	30	428	180

BROADFORD LAKE

Broadford Lake, a 230 acre (101 hectares) impoundment, serves as the domestic water supply for the town of Oakland, Garrett County, MD. Broadford Lake is primarily a warmwater fishery, however, adult rainbow trout stocked by the Freshwater Fisheries Division provide a popular spring fishery. Fish population studies conducted during 1985 indicated that Broadford Lake supported a marginal largemouth bass fishery and large populations of stunted panfish species (Pavol 1985). Additional predatory gamefish species were introduced after that study and black bass regulations were modified in 1990. The purpose of this study was to re-examine the status of gamefish in Broadford Lake with particular emphasis on largemouth bass, and to evaluate the status of bluegill, black crappie, and yellow perch stocks.

Procedures

A Smith-Root boat mounted electroshocker was used to collect fish samples on 26 April 94. Relative abundance was measured as CPUE. Total length (mm) and weight (gram) was recorded for all fish captured. Scale samples were obtained from a representative sample of target species, pressed onto acetate slides and interpreted using a Micron Model 700-A microfiche reader.

A 15.4 m seine was used to collect YOY black bass on 7 July 94. Indices of abundance were reported as the number of YOY per 30.5 m of shoreline.

Results

Fish species composition and relative abundance are contained in Table 25. Fish species composition has not changed since 1985, except for the presence of chain pickerel, apparently the result of an unauthorized introduction. Hybrid striped bass stockings were discontinued in Broadford lake in 1984, and none were collected during this survey.

A total of 53 largemouth bass were collected during the electroshocking survey, ranging in size from 112 mm to 540 mm. The PSD value was 47.7 %, within the suggested range of 45 - 65 % for small warmwater impoundments (Alexander 1976). Growth rates for largemouth bass (Table 26) are considered below average for Maryland largemouth bass populations (Elser 1962), however growth rates have remained stable since 1983 (Pavol 1985). Largemouth bass in Broadford Lake reach legal size (305 mm) by age IV.

Largemouth bass reproduction was considered poor in Broadford Lake in 1994, as evidenced by an abundance index of only 1.8 YOY/ 30.5 meters. Pavol (1985) also reported poor reproductive success of largemouth bass in Broadford Lake during the years 1982 through 1984. Low survival rates of YOY largemouth bass in Broadford Lake may be related to interspecific competition. Hackney (1975) reported that young bass are often unable to compete for invertebrates in fish communities dominated by slow growing sunfish and starvation is common.

Seven smallmouth bass were collected in Broadford Lake, ranging in size from 231 mm to 396 mm. Smallmouth bass were first documented in Broadford Lake in 1984 when one adult was collected (Pavol, 1985). Although smallmouth bass reproductive rates were low in 1994 (0.5 YOY/30.5 meters), they have apparently established a reproducing population. Growth rates for smallmouth bass in Broadford Lake (Table 27) are considered below average for Maryland smallmouth bass populations (Elser 1962). Legal harvestable size (305 mm) is attained by age V.

Bluegills were the most abundant panfish species collected in Broadford Lake (Table 25). Growth rates for bluegills (Table 28) are considered slow for Maryland populations (Elser 1962). Bluegills reach harvestable size (150 mm) in Broadford Lake by age V. PSD was 55 % for bluegills, exceeding the recommended PSD of 20 - 40 % for small impoundments where fishing for both bass and bluegill is important (Novinger and Legler 1978). Pumpkinseed sunfish in Broadford Lake reach harvestable size (150 mm) by age IV+, about average for Maryland populations (Elser, 1962).

Black crappie growth rates have improved since 1985, and are considered normal for Maryland black crappie populations (Elser 1962). A PSD value of 83 % was calculated for Broadford Lake black crappie, exceeding the optimal level of 20 - 40 %. Black crappie reach adequate harvestable size (150 mm) by age III (Table 30) in Broadford lake.

Yellow perch were first documented in Broadford Lake in 1979 (Pavol 1985) and have become one of the most abundant fish species present in the lake (Table 25). Growth rates (Table 31) are considered normal for Maryland yellow perch populations (Elser 1962).

Two adult walleye measuring 510 mm and 530 mm were collected during the electroshocking survey. Juvenile and adult walleye from neighboring Deep Creek Lake were stocked into Broadford Lake during 1984 and 1985 with the objective of establishing a naturally reproducing population and a biological control on yellow perch stocks (Pavol 1985). However, there was no evidence of natural reproduction of walleye in Broadford Lake in 1994.

A tiger muskie measuring 991 mm (39 inches) and weighing an estimated 18 lbs was captured during the survey. In recent years, documented catches of tiger muskie up to 23.5 lbs. have been reported for Broadford Lake. Tiger muskie were first stocked in Broadford Lake in June, 1984 (10,000, mean length 130 mm), and again in July, 1989 (5140, mean length 150 mm) and October, 1989 (1860, mean length 203 mm).

Recommendations

Pavol (1985) reported that the largemouth bass fishery in Broadford Lake was characteristic of an over-exploited population. The age and size structure of Broadford Lake largemouth bass has improved since 1985, due at least in part to the closed season from March 1 through June 15 that was implemented in 1990. Voluntary year-round catch and release fishing is also an important component in maintaining diverse age and size structure in largemouth bass populations. Fewless (1995) reported that 80.6% of fishermen practice voluntary catch and release bass fishing in Maryland's tidal largemouth bass fishery. The black bass population of Broadford Lake should be surveyed bi-annually in order to monitor the status of bass stocks.

PSD values indicate that Broadford Lake could sustain increased harvest of bluegills, pumpkinseed sunfish, black crappies, and yellow perch, in order to bring PSD values into the optimal range and improve growth rates for those species, and to improve conditions for largemouth bass spawning success. Brown bullhead, which are generally under-utilized by anglers, could also sustain greater harvest.

A total of 10,100 walleye fingerlings (mean length = 25 mm) were stocked in May 1995. Previously stocked walleye in Broadford Lake have exhibited good growth, however, there is no evidence that they have established a naturally reproducing population. Periodic fingerling stockings are recommended to support a walleye fishery and to provide a predator on the abundant yellow perch population.

Approximately 1,000 fingerling tiger muskie (mean length = 152 mm) were stocked in Broadford lake on 20 Sept 95. Tiger muskie, stocked previously in Broadford Lake to improve the predator/prey balance, grew quickly to 40 inches in as little as four years, producing a popular fishery with many anglers targeting tiger muskie exclusively. Because tiger muskie are sterile and fingerling availability is limited, sustaining a quality fishery will be problematic. Posting informational signing at Broadford Lake encouraging catch and release fishing for tiger muskie is a potential option to reduce harvest. An increase in the minimum size limit for tiger muskie from 30 to 36 inches is being evaluated by Maryland DNR Freshwater Fisheries Division for possible implementation in 1997.

The stocking of adult hatchery rainbow trout for a recreational springtime put and take fishery should be continued at the present stocking density, about 10 fish/acre.

Table 25. Fish species composition and relative abundance in Broadford Lake, 27 April 1994.

Common Name	Scientific Name	CPUE
Common carp	Cyprinus carpio	*
Golden shiner	Notemigonus crysoleucas	*
White sucker	Catostomus commersoni	*
Brown bullhead	Ameieurus nebulosus	*
Chain pickerel	Esox niger	7.7
Tiger muskellunge	Esox masquinongy X Esox lucius	0.7
Rainbow trout	Oncorhynchus mykiss	*
Pumpkinseed	Lepomis gibbosus	7.7
Bluegill	Lepomis macrochirus	65.1
Smallmouth bass	Micropterus dolomieu	4.9
Largemouth bass	Micropterus salmoides	65.8
Black crappie	Pomoxis nigromaculatus	16.8
Yellow Perch	Perca flavescens	44.8
Walleye	Stizostedion vitreum	1.4

* observed, not counted or collected

Table 26. Mean calculated length at age for largemouth bass, Broadford Lake, 1994.

Age	N	Mean L	Mean calculated length (mm) at annulus I	II	III	IV	V	VI	VII	VIII
I+	1	112	112							
II+	9	185	89	182						
III+	6	238	113	179	233					
IV+	21	304	97	202	265	300				
V+	6	313	95	203	268	392	310			
VI+	4	375	93	214	289	324	352	373		
VII+	1	400	82	202	282	328	352	374	392	
VIII+	2	407	81	216	271	313	345	366	387	407
Mean L =			95	200	268	311	340	371	390	407

Table 27. Mean calculated length at age for smallmouth bass, Broadford Lake, 1994.

Age	N	Mean L	Mean calculated length (mm) at annulus I	II	III	IV	V	VI	VII
III+	2	236	76	158	224				
IV+	1	238	69	161	211	233			
V+	1	280	75	171	205	239	267		
VI+	1	345	71	119	205	274	309	338	
VII+	1	396	67	168	246	302	338	360	392
Mean L =			72	155	218	259	305	349	392

Table 28. Mean calculated length at age for bluegills, Broadford Lake, 1994.

Age	N	Mean L	Mean calculated length (mm) at annulus I	II	III	IV	V	VI
III+	7	118	20	62	109			
IV+	7	141	20	72	126	135		
V+	8	176	25	66	104	140	167	
VI+	5	189	27	61	100	143	167	182
Mean L =			23	65	110	140	167	182

Table 29. Mean calculated length at age for pumpkinseeds, Broadford Lake, 1994.

Age	N	Mean L	Mean calculated length (mm) at annulus I	II	III	IV	V	VI
III+	1	112	13	58	109			
IV+	3	152	25	66	121	147		
V+	4	165	25	67	115	142	159	
VI+	3	198	28	81	133	161	182	193
	Mean L =		23	68	119	150	171	193

Table 30. Mean calculated length at age for black crappie, Broadford Lake, 1994.

Age	N	Mean L	Mean calculated length (mm) at annulus I	II	III	IV	V	VI	VII	VIII
II+	4	128	49	121						
III+	1	151	49	116	144					
IV+	1	241	37	139	204	232				
V+	10	247	44	119	186	220	239			
VI+	4	265	30	91	140	211	232	257		
VII+	2	279	39	106	151	186	224	245	269	
VIII+	2	287	51	108	169	193	229	253	267	277
	Mean L =		43	114	166	208	231	252	268	277

Table 31. Mean calculated length at age for yellow perch, Broadford Lake, 1994.

Age	N	Mean L	Mean calculated length (mm) at annulus I	II	III	IV	V	VI	VII
II+	1	137	71	130					
III+	4	175	51	124	163				
IV+	5	193	64	114	160	184			
V+	5	216	66	130	166	191	203		
VI+	7	246	66	127	171	197	217	236	
VII+	1	295	66	131	197	229	245	262	284
	Mean L =		64	126	171	200	223	249	284

PLEASANT VALLEY LAKE

Pleasant Valley Lake, located within the University of Maryland's 4-H Center property in Garrett County, MD, is a shallow (maximum depth = 6.1 m) 7.3 hectare impoundment on the headwaters of the North Branch Casselman River.

Procedures

A Smith-Root boat mounted electroshocker was used to collect fish species on 20 June 95. Relative abundance was measured as CPUE. Total length, weight, and scale samples were obtained from a representative sample of each fish species. Scale samples were pressed onto acetate slides and interpreted using a Micron Model 700-A microfiche reader.

A 15 m seine was used to collect YOY largemouth bass on 20 July 95. Index of abundance was reported as the number of YOY per 30.5 m of shoreline.

Results

Fish species composition and relative abundance are contained in Table 32.

Thirty-four largemouth bass were collected during the electroshocking survey, ranging in size from 92 mm to 485 mm. The PSD was 29.2 %, below the objective range of 45 - 65 % for small warmwater impoundments (Alexander, 1976).

Growth rates for largemouth bass in Pleasant Valley Lake (Table 33) are considered below average for Maryland populations, particularly during the first year of life (Elser, 1962). Legal harvestable size ($\geq$ 305 mm) is reached by age V.

No YOY largemouth bass were collected during the seining survey in 1995. Juvenile largemouth bass in Pleasant Valley Lake are probably subject to intense interspecific competition. Hackney (1975), reported that young bass are often unable to compete for invertebrate forage in communities dominated by slow-growing sunfish and starvation is common.

PSD values of 66.7 % and 45.8 %, respectively, were measured for bluegill and pumpkinseed sunfish in Pleasant Valley Lake. PSD values of 20 - 60 % are considered desirable management objectives for these species (Novinger and Legler 1978). Growth rates (Tables 34 and 35) are considered below average for Maryland populations (Elser 1962).

Brown bullheads were the most abundant fish species captured in Pleasant Valley Lake (Table 32). The majority collected were of adequate harvestable size, between 200 - 229 mm.

Recommendations

The largemouth bass population in Pleasant Valley Lake is slow growing with few quality size bass present. The lake's shallow depth and clear water contributes to extensive weed growth over a large proportion of the bottom by early summer, reducing the ability of largemouth bass to forage effectively. Attempts by the lake manager to control rooted, emergent aquatic vegetation using herbicides have been largely ineffective. Growth and reproductive success of largemouth bass are not likely to improve in Pleasant Valley Lake in the absence of a long term solution to the chronic weed problem. Freshwater Fisheries Division personnel are currently evaluating various methods for the control of excess aquatic vegetation and may develop protocols that are appropriate for Pleasant Valley Lake.

The harvest of bluegills and pumpkinseeds should be encouraged in Pleasant Valley Lake, to maintain PSD values in or near the optimal range, and to improve growth rates. The harvest of brown bullheads, which are often under utilized by anglers, should also be encouraged to prevent overpopulation and stunting.

The stocking of fingerling tiger muskie should be considered to improve the predator/prey balance in Pleasant Valley Lake. Tiger muskie introductions in other local small impoundments have been successful in improving panfish growth rates, and have provided an exciting trophy fishing opportunity (Pavol and Klotz 1996). The stocking of adult hatchery rainbow trout to provide a put and take fishery should also be explored.

Table 32. Fish species composition and relative abundance, Pleasant Valley Lake, 20 June 1995.

Common Name	Scientific Name	CPUE
Brown bullhead	*Ameiurus nebulosus*	301.6
Pumpkinseed	*Lepomis gibbosus*	72.8
Bluegill	*Lepomis macrochirus*	54.6
Largemouth bass	*Micropterus salmoides*	88.4

Table 33. Mean back-calculated length at age for largemouth bass, Pleasant Valley Lake, 1995.

			Mean calculated length (mm) at annulus					
Age	N	Mean L	I	II	III	IV	V	VI
II+	11	202	83	191				
III+	4	238	107	184	229			
IV+	3	289	86	181	230	277		
V+	2	339	78	184	259	302	328	
VI+	3	345	67	164	232	274	307	330
Mean L =			84	181	238	284	318	330

Table 34. Mean back-calculated length at age for bluegills, Pleasant Valley Lake, 1995.

			Mean calculated length (mm) at annulus						
Age	N	Mean L	I	II	III	IV	V	VI	VII
IV+	1	170	24	84	126	161			
V+	2	178	27	74	119	148	170		
VI+	1	181	24	71	102	142	165	173	
VII+	4	192	30	75	107	132	154	171	184
Mean L =			26	76	114	146	163	172	184

Table 35. Mean back-calculated length at age for pumpkinseeds, Pleasant Valley Lake, 1995.

			Mean calculated length (mm) at annulus						
Age	N	Mean L	I	II	III	IV	V	VI	VII
IV+	1	151	39	103	121	143			
V+	2	158	36	73	100	141	152		
VI+	3	158	27	63	96	127	142	153	
VII+	1	162	29	65	101	130	145	153	
159									
Mean L =			33	76	105	135	146	153	159

PINEY RESERVOIR

Piney Reservoir, located in Garrett County, Maryland, is a 120 acre impoundment with a maximum depth of 10.7 m, and serves as the domestic water supply for the town of Frostburg. The impoundment is primarily a warmwater fishery although adult rainbow trout, stocked by Freshwater Fisheries Division, provide a popular spring fishery.

Procedures

A Smith-Root boat mounted electroshocker was used to collect fish samples on 18 May 94. Relative abundance was measured as CPUE. Total length and weight was recorded for all fish captured. Scale samples were obtained from a representative sample of game and panfish species, pressed onto acetate slides and interpreted using a Micron Model 700-A microfiche reader.

A 15 m seine was used to collect YOY black bass on 20 July 95. Indices of abundance were reported as the number of YOY per 30.5 m of shoreline.

Results

Fish species composition and relative abundance of the twelve fish species collected in Piney Reservoir are contained in Table 36. A total of 46 largemouth bass were collected during the electroshocking survey, ranging in size from 72 mm to 516 mm. The PSD value was 45.8 %, within the suggested range of 45 - 65 % for small warmwater impoundments (Alexander 1976). Growth rates for largemouth bass (Table 37) are considered below average for Maryland largemouth bass populations (Elser 1962). Largemouth bass in Piney Reservoir reach legal size (305 mm) by age V. Largemouth bass reproduction was considered excellent in Piney Reservoir in 1995, as evidenced by an abundance index of 12 YOY/ 30.5 meters.

Growth rates for bluegills (Table 38) are considered average for Maryland populations (Elser 1962). Bluegills reach harvestable size (150 mm) in Piney Reservoir by age IV. PSD was 30 % for bluegills, within the recommended PSD of 20 - 40 % for small impoundments where fishing for both bass and bluegill is important (Novinger and Legler 1978). Pumpkinseeds in Piney Reservoir reach harvestable size (150 mm) by age V (Table 39), which is considered below average for Maryland populations (Elser 1962). Only seven white crappie were collected in Piney Reservoir, all age III individuals from the 1991 year class. Their growth was above average (Table 40) for Maryland populations (Elser 1962).

Yellow perch were the most abundant panfish species present in Piney Reservoir (Table 36). Growth rates (Table 41) are considered normal for Maryland yellow perch populations.

A tiger muskie estimated to be about 965 mm (38 inches) and 18 lbs was observed during the survey but was not captured. Piney Reservoir received an initial stocking of spring fingerling tiger muskie in 1990.

Recommendations

The largemouth bass population in Piney Reservoir is characterized by a diverse age and size structure with older, larger individuals well represented in the population, evidence that the population is not over exploited.

A supplemental stocking of 1,850 fall fingerling bass (source - Oakland grow-out ponds) was conducted in 1990. The 1995 YOY index shows natural reproduction of largemouth bass is adequate to support the population and further fingerling stocking is not warranted at this time.

The harvest of bluegills, pumpkinseeds, white crappies, yellow perch, and brown bullheads should be encouraged to maintain or improve PSD values and growth rates for those species. Under-harvested panfish populations may result in overpopulation, reduced growth rates, and failure of successful bass reproduction (Hackney 1975).

An initial stocking of 7,137 walleye fingerlings was conducted in June 1994. Periodic fingerling stockings are recommended to continue to develop a walleye fishery and to provide a predator on the abundant yellow perch population.

Approximately 500 fingerling tiger muskies (mean length = 152 mm) were stocked in Piney Reservoir on 20 Sept 95. Tiger muskies, stocked previously in Piney Reservoir to improve the predator/prey balance, grew quickly to 40 inches in as little as four years, producing a popular fishery with many anglers targeting tiger muskie exclusively. Because tiger muskie are sterile and fingerling availability is limited, sustaining a quality fishery will be problematic. Posting informational signing at Piney Reservoir encouraging catch and release fishing for tiger muskie is a potential option to reduce harvest. An increase in the minimum size limit for tiger muskie from 30 to 36 inches is being evaluated by Maryland DNR Freshwater Fisheries Division for possible implementation in 1997.

The stocking of adult hatchery rainbow trout for a recreational springtime put and take fishery should be continued at the present stocking rate of 4,500 per year.

Table 36. Fish species composition and relative abundance in Piney Reservoir, 18 May 1994.

Common Name	Scientific Name	CPUE
Golden shiner	Notemigonus crysoleucas	13.2
White sucker	Catostomus commersoni	8.8
Brown bullhead	Ameieurus nebulosus	3.3
Tiger muskellunge	Esox masquinongy X Esox lucius	1.1
Rainbow trout	Oncorhynchus mykiss	19.8
Rock bass	Ambloplites rupestris	1.1
Redbreast sunfish	Lepomis auritus	1.1
Pumpkinseed	Lepomis gibbosus	25.3
Bluegill	Lepomis macrochirus	33.0
Largemouth bass	Micropterus salmoides	50.6
White crappie	Pomoxis annularis	7.7
Yellow Perch	Perca flavescens	44.8

Table 37. Mean calculated length at age for largemouth bass, Piney Reservoir, 1994.

			Mean calculated length (mm) at annulus								
Age	N	Mean L	I	II	III	IV	V	VI	VII	VIII	IX
II+	4	186	91	182							
III+	5	234	70	164	227						
IV+	4	294	85	197	250	287					
V+	3	311	92	161	220	268	302				
VI+	0	-	-	-	-	-	-	-			
VII+	3	375	94	156	208	270	301	335	348		
VIII+	1	399	80	168	234	271	300	345	364	388	
IX+	2	450	99	161	228	274	318	353	352	412	437
	Mean L =		87	170	228	274	305	344	355	400	437

Table 38. Mean calculated length at age for bluegills, Piney Reservoir, 1994.

			Mean calculated length (mm) at annulus					
Age	N	Mean L	I	II	III	IV	V	VI
III+	7	138	48	73	133			
IV+	5	156	52	82	129	151		
V+	1	180	66	80	140	154	175	
	Mean L =		55	78	134	153	175	

Table 39. Mean calculated length at age for pumpkinseeds, Piney Reservoir, 1994.

Age	N	Mean L	Mean calculated length (mm) at annulus I	II	III	IV	V	VI
III+	2	119	37	88	116			
IV+	0	-	-	-	-	-		
V+	2	162	34	80	114	141	158	
	Mean L =		36	84	115	141	158	

Table 40. Mean calculated length at age for white crappie, Piney Reservoir, 1994.

Age	N	Mean L	Mean calculated length (mm) at annulus I	II	III
III+	7	198	111	162	192

Table 41. Mean calculated length at age for yellow perch, Piney Reservoir, 1994.

Age	N	Mean L	Mean calculated length (mm) at annulus I	II	III	IV	V	VI	VII	VIII
III+	4	163	75	128	158					
IV+	2	174	62	124	150	166				
V+	5	196	70	122	153	175	188			
VI+	2	230	81	145	171	192	214	224		
VII+	1	254	81	137	166	184	216	231	248	
VIII+	1	261	75	133	173	192	202	212	232	251
	Mean L =		74	132	162	182	205	222	240	251

NEW GERMANY LAKE

New Germany Lake, located within New Germany State Park, Garrett County, MD, is a shallow (max. depth 3.7 m) ten acre impoundment on the mainstem of Poplar Lick. New Germany Lake is primarily a warmwater fishery, however, stocked adult rainbow trout provide a popular springtime recreational fishery.

Procedures

A Smith-Root boat mounted electroshocker was used to collect fish species on 16 May 94. Relative abundance was measured as CPUE. Total length and weight was measured for each fish captured, and scale samples were obtained from a representative sub-sample. Scale samples were pressed onto acetate slides and

interpreted using a Micron Model 700-A microfiche reader.

A 15 m seine was used to collect YOY largemouth bass on 5 July 94. Index of abundance was reported as the number of YOY per 30.5 m of shoreline.

Results

Fish species composition and relative abundance are contained in Table 42. Fish species composition has not changed since 1983 (Pavol, 1983).

Twelve largemouth bass were collected during the electroshocking survey, ranging in size from 228 mm to 381 mm. The PSD was 25 %, below the desired range of 45 - 65 % for small warmwater impoundments (Alexander, 1976). Growth rates for largemouth bass (Table 43) are considered below average compared to other area populations (Pavol and Klotz, 1994). Largemouth bass reproduction was considered excellent in 1994; an index of 74.7 YOY/30.5 meters was obtained.

The bluegill and pumpkinseed sunfish populations had PSD values of 85 % and 86 %, respectively. These values exceed the 20 - 40 % optimal PSD level for impoundments where fishing for both bass and bluegill is important (Novinger and Legler, 1978). Growth rates for bluegill and pumpkinseed sunfish (Tables 3 - 4) are considered below average (Emig, 1966).

A single adult channel catfish was collected during the electroshocking survey, although several adult channel catfish were observed but escaped capture. No YOY or juvenile channel catfish were collected during the seining surveys. A total of 180 lbs of adult channel catfish was stocked in New Germany Lake on 26 May 94.

Eight rainbow trout were collected, apparently the result of recent put and take stockings. Approximately 3,000 adult rainbow trout were stocked in New Germany Lake during 1994. There was no indication of year-round survival by rainbow trout in New Germany Lake in 1994.

Discussion

The largemouth bass population in New Germany Lake is characteristic of heavily exploited impoundments. There are few older, larger individuals present in the population and growth rates are slow for the limited number of adults sampled to date. New Germany Lake drains a natural bog and is somewhat acidic and sterile. Rainbow trout experienced mortalities associated with low pH in New Germany Lake when a precipitation event coincided with a spring, 1994, trout stocking. It's probable that weak inorganic acids from the watershed combined with acid precipitation and snowmelt to produce a low pH spike sufficient

to cause mortalities among sensitive hatchery rainbow trout. Although mortality among resident fish species in New Germany Lake was not observed during the spring of 1994, it's likely that stresses associated with seasonal low pH spikes impact fish growth rates and overall productivity in the lake

The high largemouth bass YOY index indicates that natural reproduction in New Germany Lake was adequate in 1994.

Recommendations

Habitat assessment conducted during the electrofishing survey indicated that large areas of the lake bottom was devoid of physical structure. As a result, Freshwater Fisheries and New Germany State Park personnel placed 35 christmas tree fish shelters in New Germany Lake during March 1995. These structures not only concentrate adult fish for more productive fishing, but also serve as spawning areas, shelter, and as a food producing substrate when colonized by aquatic invertebrates. As the smaller branches of the christmas trees degrade, the benefits of the shelters are reduced. It is recommended that the shelters be replaced in six to eight years.

The stocking of adult channel catfish for fishing rodeos was curtailed in 1995. In order to maintain the channel catfish population, artificial spawning structures should be placed in the lake. Under natural conditions, channel catfish deposit eggs in submerged hollow logs, muskrat burrows, undercut banks, and other places where the eggs are at least partially hidden (Sigler and Miller 1963). Baker et al. (1993) reports that suitable catfish spawning devices can be made from vitrified clay, PVC, or corrugated polyethylene pipes bundled together in a pyramid shape with a cement plug for ballast.

The harvest of bluegills and pumpkinseeds should be encouraged to bring the PSD value into the optimal range and to improve growth rates. The harvest of brown bullheads, which are typically under utilized by anglers, should be encourages to avoid overpopulation and stunting.

The stocking of adult hatchery rainbow trout for a recreational put and take fishery should be continued at the present stocking density. As of this writing, a closure period on New Germany Lake is proposed to make stocked trout equally available to all anglers. The stocking of adult rainbow trout in late fall to provide late season and icefishing opportunities should also be considered. Spring trout stockings should be delayed until late April or early May to ensure that pH conditions are suitable.

Table 42. Fish species composition and relative abundance, New Germany Lake, 16 May 1994.

Common Name	Scientific Name	CPUE
Golden shiner	*Notemigonus crysoleucas*	9.0
Creek chub	*Semotilus atromaculatus*	*
Rainbow trout	*Oncorhynchus mykiss*	24.0
Brown bullhead	*Ameiurus nebulosus*	3.0
Channel catfish	*Ictalurus punctatus*	3.0
Pumpkinseed	*Lepomis gibbosus*	78.0
Bluegill	*Lepomis macrochirus*	39.0
Largemouth bass	*Micropterus salmoides*	36.0

* collected during YOY bass survey

Table 43. Mean back-calculated length at age for largemouth bass, New Germany Lake, 1994.

		Mean calculated length (mm) at annulus					
Age	N	I	II	III	IV	V	MeanL
III+	6	61	136	206			241
IV+	1	60	109	197	227		255
V+	2	57	118	189	265	321	337
Mean L =		59	121	197	246	321	

Table 44. Mean back-calculated length at age for bluegills, New Germany Lake, 1994.

		Mean calculated length (mm) at annulus						
Age	N	I	II	III	IV	V	VI	Mean L
V+	2	23	52	87	107	134		158
VI+	6	29	53	76	107	127	142	167
Mean L =		26	53	82	107	131	142	

Table 45. Mean back-calculated length at age for pumpkinseeds, New Germany Lake, 1994.

		Mean calculated length (mm) at annulus					
Age	N	I	II	III	IV	V	Mean L
IV+	3	32	62	94	119		125
V+	2	31	52	91	120	150	163
Mean L =		32	57	93	120	150	

DEEP CREEK LAKE

Black Bass

Job Objective

To measure trends in the age and size composition, growth rates, and indices of condition, of Deep Creek Lake black bass; and to determine annual recruitment rates.

Procedures

Age and Growth. Total length (mm), weight (grams), and scale samples were obtained from 131 largemouth bass and 438 smallmouth bass captured during two B.A.S.S. sponsored tournament events. Scale samples were taken from the left side below the lateral line near the tip of the pectoral fin. Scales were impressed on acetate slides and interpreted using a Micron Series 700A microfiche reader. The length - weight relationship described by Lagler (1956) was used as a measure of fish condition.

Recruitment Rates. A 15 meter fry seine was used to collect YOY bass on 12 and 13 July 95. Index of abundance was reported as the number of YOY per 30.5 meters of shoreline.

Findings

Largemouth bass averaged 375 mm (range 305 - 520 mm) and 813 g (range 397 - 2100 g). The average length and weight of tournament captured largemouth bass in 1995 was similar to the mean length and weight of largemouth bass captured in Deep Creek Lake tournaments from the years 1987 to 1994: 380 mm and 865 g respectively. Largemouth bass $\geq$ 15 inches (381 mm) comprised 38.9 % of tournament captured bass. A strong largemouth bass year class produced in 1991 comprised 50 percent of the catch (Table 46). Back calculated lengths at age are presented in Table 46. Largemouth bass in Deep Creek Lake reach legal size (305 mm) by Age III +.

The length-weight relationship for Deep Creek Lake largemouth bass in 1995 was Log W = -5.19101 + 3.13819 Log L. The slope of the regression line is a useful description of relative fatness or condition of bass populations. Carlander (1977) proposed a value of 3.08 as representative of average condition for largemouth bass in the United States (mean of 116 populations). Deep Creek Lake largemouth bass exhibited slightly better than average condition (3.14) in 1995.

Deep Creek Lake smallmouth bass averaged 355 mm (range 305 - 545 mm) and 597 g (range 341 - 1532 g) in 1995, similar to the eight year mean of 351 mm and 570 g. Smallmouth bass $\geq$15 inches (381 mm) comprised 25.6 % of the tournament catch. Mean total length by age class and back-calculated lengths at age are

presented in Table 47. Smallmouth bass in Deep Creek Lake reach legal size (305 mm) by Age IV +. The length - weight relationship, Log W = -4.33936 + 2.783321 Log L (slope of the regression line 2.78) indicates that Deep Creek Lake smallmouth bass condition was slightly below Carlander's (1977) suggested average condition of 3.04.

An index of 4.6 YOY largemouth bass per 30.5 m of shoreline was measured in 1995, below the eight year mean of 7.5/30.5 m. Smallmouth bass YOY abundance was 2.1 per 30.5 meters of shoreline in 1995, similar to the eight year mean of 2.4/30.5 m.

Recommendations

A Catch-and-Release bass season was first implemented in 1987 on Deep Creek Lake in response to declining age and size among black bass attributable to increasing harvest. The regulation currently precludes the harvest of black bass from March 1 through June 15. The objective of the regulation was to increase survival rates among adult black bass, and thereby produce a diverse age and size structure characterized by the presence of older, larger individuals in the bass population. That objective has been achieved. It is recommended that Freshwater Fisheries Division:

1) Continue the March 1 to June 15 closed "catch and immediate release" season for black bass.

2) Continue to monitor black bass age, growth, and reproductive indices.

Table 46. Deep Creek Lake largemouth bass mean length at age and back-calculated lengths (mm), 1995.

AGE	N	L	I	II	III	IV	V	VI	VII	VIII	IX	X
III+	11	326	134	247	310							
IV+	40	349	132	234	309	336						
V+	4	368	134	240	299	330	355					
VI+	8	401	137	241	308	353	378	391				
VII+	7	429	143	234	307	350	385	407	418			
VIII+	6	440	135	254	326	363	385	404	424	433		
IX+	1	400	134	178	264	307	334	351	368	377	386	
X+	3	494	167	290	359	382	407	434	451	462	475	485
	Mean =		140	240	310	346	374	397	415	424	431	485

Table 47. Deep Creek Lake smallmouth bass mean length at age and back-calculated lengths (mm), 1995.

Age	N	L	I	II	III	IV	V	VI	VII	VIII	IX
IV+	27	320	90	176	264	306					
V+	19	336	80	161	234	292	324				
VI+	13	365	79	148	219	280	324	351			
VII+	7	398	72	150	220	271	321	359	382		
VIII+	9	422	87	158	228	289	338	371	396	411	
IX+	5	446	84	189	271	323	367	392	411	426	439
	Mean =		82	164	239	294	335	368	396	419	439

Walleye

Job Objectives

To monitor age and size composition, growth rates, and YOY abundance of the Deep Creek Lake walleye population.

Procedures

A Smith-Root boat mounted electroshocker was used to collect 50 adult walleye on 17 April 95. Total length and weight were measured, and scale samples were obtained from each fish. Scale samples were pressed onto acetate slides and interpreted using a Micron model 700-A microfiche reader. Additional age and growth data was collected from 160 tournament caught walleye ($\leq$ 381 mm).

Walleye YOY abundance was determined using a boat mounted electroshocker at night on 26 Sept 95, and reported as CPUE.

Results

Mean back-calculated lengths at age for Deep Creek walleye are presented in Table 48. Similar growth rates were reported for Deep Creek Lake walleye from 1985 through 1994 (Pavol and Klotz 1995). Growth rates in Deep Creek Lake are about average for walleye populations in lakes and reservoirs (Calhoun 1966). Pavol and Klotz (1995) reported that walleye older than age VII were uncommon (less than two percent of the adult population) in Deep Creek Lake for the years 1991 through 1994. However, 16 % of the adult walleye collected during the 1995 electroshocking survey were age VIII or older.

Average length and weight of legal sized walleye captured by electroshocking was greater than for walleye captured by the same method during 1994. Mean total length and weight was 465 mm (18.3 inches) and 868 g (1.9 lbs) for electroshocked walleye in 1995, while walleye averaged 446 mm (17.6 inches) and 741 g (1.6 lbs) in 1994. However, the size of angler caught walleye was similar in both years, averaging 434 mm (17.1 inches) and 678 g

(1.5 lbs) in 1995, and 433 mm (17.0 inches) and 709 g (1.6 lbs) in 1994.

The 1995 walleye YOY CPUE value of 138/hour was the highest abundance index observed to date in Deep Creek Lake. The average length of the age 0+ walleye in September was 157 mm. Indices of walleye YOY abundance for the years 1985 through 1995 are contained in Table 49.

Recommendations

The Maryland Department of Natural Resources implemented a Closed "Catch-and-Release" season (March 1 through April 15) for walleye in Deep Creek Lake effective January 1, 1995, in order to:

1) increase walleye survival and develop a more balanced and diverse age and size structure including older age classes;

2) improve survival rates of large, sexually mature female walleyes;

3) increase walleye egg deposition and therefore enhance the potential for adequate year class production.

In 1995, the first year of the early season closed regulation, Deep Creek Lake walleye produced the largest year class observed to date while the proportion of adult walleye ≥ age VIII in the population increased. Further monitoring will be necessary to evaluate the response of Deep Creek Lake's walleye population to the closed season.

It is recommended that this study be continued in 1996.

Table 48. Mean calculated length at age for walleye, Deep Creek Lake, 1995.

			Mean calculated length (mm) at annulus								
Age	Avg L	N	I	II	III	IV	V	VI	VII	VIII	IX
III+	371	1	149	232	356						
IV+	424	5	190	315	374	411					
V+	421	2	153	276	344	387	409				
VI+	449	10	174	296	372	408	427	439			
VII+	464	19	173	300	369	407	426	440	455		
VIII+	491	6	180	319	379	419	442	458	471	482	
IX+	511	1	202	354	417	441	453	464	476	488	499
	Mean =		174	299	373	412	431	450	467	485	499

Table 49. Deep Creek Lake YOY walleye abundance indices, 1985 through 1995.

	YEAR										
	85	86	87	88	89	90	91	92	93	94	95
CPUE YOY/hour	28	37	11	131	3	0.3	87	0	38	36	138

STEMMERS RUN

Annual sampling to determine the success of largemouth bass reproduction in Stemmers Run pond was done. Haul seining with a 5m, 20mm stretched mesh seine was done at six sites around the lake on 8 July 95. Ten YOY bass were collected during eight seining efforts (CPUE=1.25 bass/seine), ranging in size from 42mm to 87mm. To supplement this limited bass reproduction 958 largemouth bass (51mm to 127mm) were stocked in Stemmers run on 14 Sept 95.

SMITHVILLE LAKE

Sportfish populations in Smithville Lake were sampled during a 900 second electrofishing boat episode. All largemouth bass and bluegill sunfish collected were measured (mm), weighed (g), and had scales removed for age determination by back calculation (Lagler 1952). The remainder of the fish collected, black crappie, gizzard shad, golden shiner, and creek chubsucker were measured and weighed only.

The largemouth bass CPUE was 22 bass/900 seconds, mean length was 293mm (range 65mm to 510mm) and mean weight was 447g (range 15g to 1871g). Bass condition was average as indicated by condition indices; K(TL)=1.7, slope of the length-weight equation=2.42 (Carlandar 1977), and mean relative weight (W_r)=99 (Wege and Anderson 1978). PSD (47%, P(0.27<0.47<0.68)=0.90) was within the target range of 40% to 60% (Weithman et al. 1979) for sustaining a good quality sport fishery. Back-calculated growth rates (Table 50) were within the normal range for Maryland coastal plain impoundments (Elser 1962).

Bluegill sunfish were the most abundant gamefish species collected (186). Mean length was 126mm (range 70mm to 220mm) and mean weight was 62g (range 5g to 220g). Condition indices, K(TL)=2.9, and slope of the length-weight equation=2.28, indicated that the fish are in average condition. PSD (41%, P(0.38<0.41<0.45)=0.90) was within the 20% to 50% target range for prey species (Weithman et al. 1979).

A balanced largemouth bass-bluegill sportfishery is present in Smithville Lake. Angling opportunity for quality and trophy

size (>457mm) largemouth bass is excellent as illustrated by the high RSD 15 (40%) value and the length-frequency graph (Figure 8). An excellent fishery for large (>165mm) bluegills is also present.

Smithville Lake is designated as a highly eutrophic pond (Maryland Department of Environment 1990) with associated nuisance levels of aquatic vegetation and several minor summer fish kills occurring (mainly large gizzard shad) in the past decade. No reports of fish kills were received in 1995, and aquatic vegetation observed during the survey, duckweed (Lemna spp.), filamentous algae spp., water meal (Wolffia spp.), and water lily (Nymphaea spp.), was abundant but not at a nuisance level.

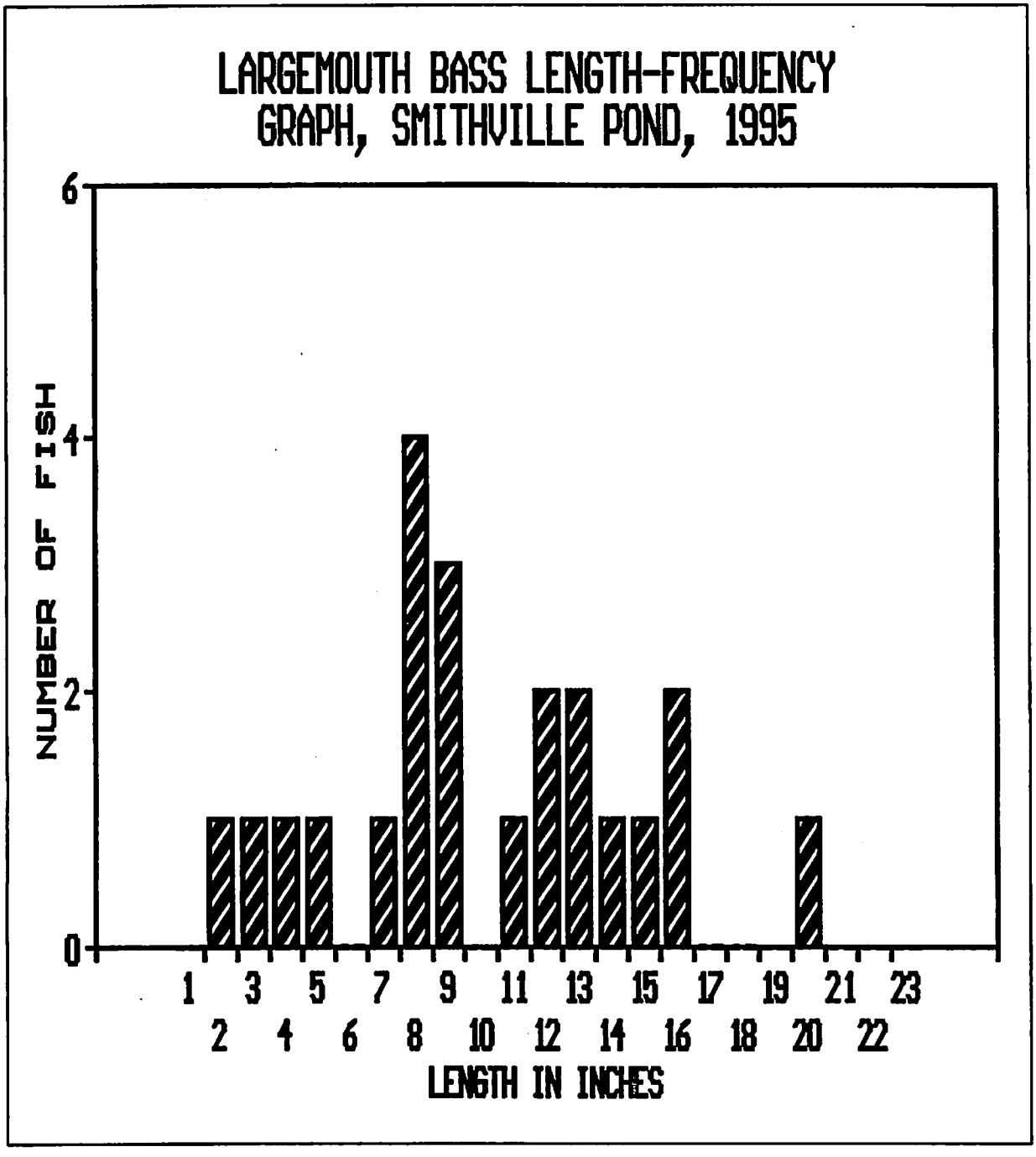
Management Recommendations

- Monitor vegetation and water quality abundance annually.
- Continue annual winter drawdowns.
- Survey the fishery in 1997.

Table 50. Calculated total length (mm) and increment of growth (mm) of Smithville Lake largemouth bass, 1995.

		Back Calculated Length At Each Annulus				
# Fish	Age	An1	An2	An3	An4	An5
4	1	120				
5	2	93	185			
5	3	93	189	266		
1	4	112	196	309	379	
1	5	138	260	337	373	385
Total	16					
Mean Length		104	194	282	376	385

Figure 8. Largemouth bass length-frequency graph, Smithville lake, 1995.



DEER HARBOR POND

Deer Harbor Pond was checked on 8 Aug 95 to evaluate the condition of the fishery. A 15 minute boat electrofishing sample

was conducted along the perimeter of the pond. All fish were collected (Table 51), measured, and weighed, and data recorded for statistical analysis. A 6m, 5mm stretched mesh seine was used to collect YOY largemouth bass.

Largemouth bass CPUE, 12 bass/15 minute, was low compared to other impoundments on the Eastern shore (Table 52). The mean length of bass was 376mm (range 220mm to 490mm) and the mean weight was 911g (range 130g to 1814g). Bass condition was average as indicated by condition indices; K(TL)=1.3, slope of the length-weight equation=3.19 (Carlander 1977), and mean relative weight (W_r)=93 (Wege and Anderson 1978). PSD was 75% (P(0.54<0.75<0.96)=0.90), above the target range of 40% to 60% for sustaining a good quality fishery (Weithman et al. 1978). Reproduction of largemouth bass was poor, only two YOY bass (35mm) were collected during seining.

Sunfish were the most abundant game fish collected (152), with the majority (145) being bluegill sunfish and the remainder (7) pumpkinseed sunfish. Data were combined for both sunfish species for calculating condition indices, PSD, and mean length and weight. Mean length of sunfish was 111mm (range 40mm to 205mm), mean weight was 37g (range 2g to 161g). Condition indices, K(TL)=2.1 and slope of the length-weight equation=3.17 indicated that fish were in average condition (Carlander 1977). PSD was 20% (P(0.18<0.20<0.21)=0.90), at the low end of the recommended range (20% to 50%) for prey species (Weithman et al. 1978).

The predator-prey relationship in Deer Harbor pond is unbalanced. Abundance of adult bass was low and reproduction was poor. Physical condition of the pond, heavy siltation, no submerged aquatic vegetation (SAV), and limited structure are not conducive to bass spawning and survival of YOY bass, as was apparent by the collection of only two YOY largemouth bass from the haul seining effort. Nesting in protected littoral zones on hard substrates is usually preferred for optimal largemouth bass reproduction (Heidinger 1975). Structure and SAV serve as spawning habitat and provide protective cover and food (invertebrates) for YOY bass (Summerfelt 1993).

The lack of bass in the pond has resulted in overabundance of prey species, particularly small sunfish (70% < 140mm) and gizzard shad. Overabundance of sunfish can limit bass reproduction by predation on bass eggs and fry (Bennett 1971). Lack of predation on gizzard shad typically results in a population comprised mainly of shad too large for bass to be preyed upon, as was found for Deer Harbor, tying up prey biomass.

Increasing the number of bass in the pond is necessary to reduce overabundant prey populations and improve the quality of the bass and sunfish sportfisheries. Fisheries management recommendations for accomplishing this are:

- Install a fish barrier over the pipe connecting the pond to the river to prevent gizzard shad from entering the pond.

- Place artificial fish habitat (i.e. christmas tree shelters) in 1m to 1.5m of water along the shorelines to increase spawning habitat for largemouth bass and provide shelter for YOY bass.

- Create additional bass spawning areas by placing largemouth bass nesting boxes in the pond.

Table 51. Fish species collected on 8 Aug 95 from electrofishing sample of Deer Harbor Pond, Wicomico County.

Common name	Scientific name
American eel	Anguilla rostrata
Bluegill sunfish	Lepomis macrochirus
Pumpkinseed sunfish	Lepomis auritus
Brown bullhead	Ictalurus nebulosus
Black crappie	Pomoxis nigromaculatus
Chain pickerel	Esox niger
Gizzard shad	Dorosoma cepedianum
Golden shiner	Notemigonus crysoleucas
Largemouth bass	Micropterus salmoides
White perch	Morone americana

Table 52. Comparison of largemouth bass catch-per-unit-effort between Deer Harbor Pond and other bodies of water on the eastern shore.

Body of Water	Largemouth Bass (CPUE)/900seconds
Johnsons Lake	53
Schumaker Lake	40
Stemmers Run Pond	29
Smithville Lake	24
Deer Harbor Pond	12
Urieville Community Lake	4

LOCH RAVEN RESERVOIR

Fisheries activities conducted on Loch Raven Reservoir during 1995 included an electrofishing survey on 5 May 95 an

shoreline seining on 2 Aug 95 to document natural reproduction of fish species.

A total of 23 hybrid striped bass were collected during the electrofishing survey. They ranged from 70.0 to 86.8 cm in total length. Weights were not recorded. A sample of 83 white perch resulted in an average size of 24.0 cm. Chain pickerel were abundant throughout the reservoir. Nineteen individuals were collected; they ranged from 36.8 to 52.0 cm in total length. A total of 24 largemouth bass were collected while electrofishing, these fish ranged 35.7 to 43.4 cm in total length, the largest (17.1") weighed 1.4 kg (3 lbs,1 oz). One smallmouth bass was collected. Two northern pike were observed. The smaller fish was recovered. It was 59.9 cm (23.6") in total length, and weighed 1.3 kg (2 lbs,14 oz). Other fish species observed or collected were black crappie, yellow perch, bluegill, golden shiner, carp, white sucker, and american eel.

The Loch Raven Reservoir striped bass hybrids (striped bass x white bass) are extremely long-lived. Stocking records indicate that 600, 42,800, and 11,500 fingerlings were stocked into this reservoir in 1980, 1981, and 1984 respectively. The hybrids collected this year were at least in their 12th year of life, possibly older. Scales will be removed from any hybrids collected in the future to verify this extraordinary old age.

A limited seining effort documented what appeared to be an excellent hatch (5.2 seining index) of largemouth bass in 1995. No young smallmouth bass were collected. Other fish species that were documented to be reproducing naturally were bluegill, yellow perch, banded killifish, bluntnose minnow, spotfin shiner, tessellated darter, golden shiner, and gambusia. Swallowtail shiner (Notropis procne) were found during the seining effort and were added to the list of fish species present in Loch Raven Reservoir.

Fisheries activities planned for 1996 include determining the growth rate of white perch; monitoring the hybrid striped bass population for confirmation of age class; and collecting data on the chain pickerel and northern pike populations.

PRETTYBOY RESERVOIR

Fisheries activities conducted on Prettyboy Reservoir during 1995 included an electrofishing survey on 28 April 95, shoreline seining for YOY on 31 July 95, stocking of walleye fingerlings, tiger musky fingerlings, and fall stocking of adult rainbow trout.

A total of 231 white perch were collected by electrofishing and measured during April. The average length was 21.9 cm (8.6"). Scales were removed from 34 fish for age and growth analysis. Prettyboy Reservoir white perch averaged 5.8, 11.2,

16.5, 19.6, 22.2, and 24.5 cm at the end of their 1st through 6th year of life respectively. Their growth rate is considered normal when compared to statewide averages as determined by Elser(1962) and is similar to that recorded for white perch in 1994. To date the growth rate of this fish species has not slowed as they become more established in this reservoir. Two hybrid striped bass were collected in the Graves Run area of the reservoir. They were 71.5 and 77.8 cm in length. As were the hybrids in Loch Raven Reservoir, these fish were in their 12th growing season or older. Approximately 9,100 (striped bass x white bass) hybrids were stocked in 1981, and 7,750 hybrids were stocked in 1984. One of only two walleye ever recovered was found in the Gunpowder River area. This walleye was 57.8 cm in total length and 1.9 kg in weight. A total of 14 largemouth bass were collected ranging from 34.6 to 48.8 cm in length. Other fish species collected were black crappie, yellow perch, and golden shiner.

Shoreline seining indicated a good hatch of largemouth bass and fair hatch of smallmouth bass during 1995. The seining indexes were 3.7 and 2.5 respectively.

A total of 50,400 walleye fingerlings, reared at the Manning Hatchery, were stocked at three locations around the reservoir on 17 May 95. The Pennsylvania Fish Commission provided the Maryland Freshwater Fisheries Division with extra tiger musky fingerlings in 1995. In an effort to expand the range of this fish in Maryland and provide Prettyboy Reservoir anglers with an opportunity to catch another large trophy size fish, approximately 2,130 tiger musky were stocked on 16 Oct 95. A total of 10,000 adult rainbow trout were stocked on Nov 28 and 29. Approximately 6,000 of these trout were distributed throughout the reservoir utilizing two boats equipped with fish tanks.

Management activities for 1996 include a baseline fishery survey of the reservoir with emphasis on length frequency and age of white perch, walleye, and rainbow trout populations; stocking of walleye fingerlings; stocking of approximately 3,000 adult rainbow trout during the spring and additional stockings during the fall dependent upon availability from state hatcheries.

PINEY RUN RESERVOIR

Monitoring studies on Piney Run Reservoir during 1995 included shoreline seining on July 17 to document natural reproduction of warmwater fish species; spring and fall electrofishing to collect striped bass; night electrofishing on 1 Nov 95 to evaluate the largemouth bass and sunfish populations; one fall gill net sampling effort to collect predatory fish that will be tested for mercury content; stocking of channel catfish.

The seining index for YOY largemouth bass was 35 indicating an excellent hatch in 1995. There was relatively good reproduction of yellow perch, fair reproduction of both bluegill and black crappie. Killifish and brown bullhead also reproduced naturally in 1995. The seining effort, as in past years, failed to recover any YOY redear sunfish. No YOY golden shiners were recovered despite a well established adult population in the reservoir.

The fall night electrofishing effort substantiated an excellent largemouth bass fishery characterized by good numbers of quality size (>12") fish. The electrofishing PSD was 63 (65/104). This is at the upper range of 30 to 70 suggested for predator fish species in a balanced population. There are relatively high numbers of quality size bass as compared to smaller size (8-12") bass. The electrofishing CPUE of 106 stock size fish/hr indicates high abundance of largemouth bass in Piney Run Reservoir. The largest bass collected was 52.6 cm (20.7") in total length, bass weights were not recorded. With this predatory fish, not to mention striped bass, black crappie, and yellow perch, the lack of prey in the reservoir has always been a concern. Golden shiners appear to be making a significant contribution to the prey base. The electrofishing PSD for sunfish was 79 (177/224) indicating the population is comprised of relatively large individuals as opposed to small, the latter typically provides good prey opportunities for predator fish. The electrofishing CPUE was 229 stock fish/hr, which suggests low abundance. The high PSD and relatively low CPUE follows a trend that has been recorded in other electrofishing samples 1989 thru 1993.(Grimes 1994). Redear sunfish comprised only 3% of the sunfish collected; the redear were quality size and larger.

There were no YOY striped bass collected or observed during the night electrofishing survey. Only three striped bass were collected during 1995, and fishermen provided scales from three striped bass. One striped bass was 38.1 cm (15") in total length by June and was hatched in 1993. In March two 1990 YC aged stripers measured 61.0 cm (24") and 67.3 cm (26½"). In late fall two aged 1990 YC stripers measured 72.3 cm (28½") and 71.5 cm (28"). The latter striped bass weighed 9½ lbs. A 100.5 cm (39½"), 10.6 kg (23 lbs 9 oz) striped bass was collected near the propagation area. It was aged to probably be in its 11th year of life, being hatched in 1985.

A small number of yellow perch were collected in December and scales were removed for aging. Fish nearing the end of their 3rd year of life were averaging 19.3 cm, fish nearing the end of their 4th year of life were averaging 26.5 cm. This initial data suggests that Piney Run Reservoir yellow perch are exhibiting very good growth rates.

Five adult yellow perch and five adult black crappie were collected in December and sacrificed to obtain tissue samples that will be analyzed for mercury concentrations. The Academy of

Natural Sciences is conducting a research project on the distribution and biogeochemistry of mercury throughout Maryland for MD DNR/Power Plant Topical Research Program.

A total of 3,000 channel catfish were stocked into Piney Run Reservoir in June. These catfish ranged from 23 to 30.5 cm in length and average 228 g in weight. They were purchased from Zetts Fish Hatchery in Inwood, WV. This was a put-and-grow stocking effort to increase numbers of channel catfish in the reservoir.

During late April and early May the reservoir experienced above normal mortalities of golden shiners, bluegill, and black crappie. Necropsy of selected fish showed a severe parasitic burden, mostly by trematodes, the white and yellow grub. The bacteria *Aeromonas hydrophila* was also found. This bacteria has the potential to cause mortalities when fish are experiencing stress due to spawning (the fish species experiencing mortalities normally spawn in April and May), and have parasitic burden. Poor water quality can increase mortalities, but it was not suspected in Piney Run Reservoir during the spring. The most practical measure of control of trematodes is the reduction of the intermediate host in the life cycle, the snail. Introduction of the redear sunfish during the fall of 1987 and subsequent stockings, were made to control the snail population in Piney Run Reservoir.

Future management activities for Piney Run Reservoir include: monitor natural reproduction of fish species with emphasis on the striped bass and redear sunfish; stocking and evaluation of the channel catfish population; monitoring the growth of yellow perch; enhance efforts to increase the number of redear sunfish.

LIBERTY RESERVOIR

Management activities on Liberty Reservoir during 1995 included stocking of yearling smallmouth bass and adult rainbow trout; shoreline seining to document natural reproduction of fish species; electrofishing surveys; tracking of radio tagged striped bass; and limited gill netting. Electrofishing was almost exclusively utilized to sample the striped bass population, collect black crappie for age growth determination, and employed during the evening of 2 Nov 95 to document natural reproduction of striped bass.

Natural reproduction of largemouth bass was good with a seining index of 2.8 which is a slight increase over last year's index of 2.0. The seining index for smallmouth bass was 1.7 indicating a fair hatch this year. This was a increase from the 0.8 index obtained in 1994. Significant numbers of bluegill were collected in the seine hauls indicating a good hatch this year. Other fish species collected in the hauls were: various sunfish,

yellow perch, tessellated darter, banded killifish, bluntnose minnow, mummichug, spotfin shiner, and creek chub.

The fall electrofishing CPUE for stock size largemouth bass was 28.7 fish/hr. This was similar to values recorded in previous years and suggests fair abundance. The PSD for largemouth bass was 41 (18/44)(90% confidence range of 25 to 57), within the desired range for this species. The smallmouth bass CPUE was 20.9 fish/hr and the PSD was 22 (7/32)(90% confidence range for 9 to 35). The smallmouth PSD was below the desired range for this species as there were numerous stock size fish compared to quality size fish in the electrofishing sample.

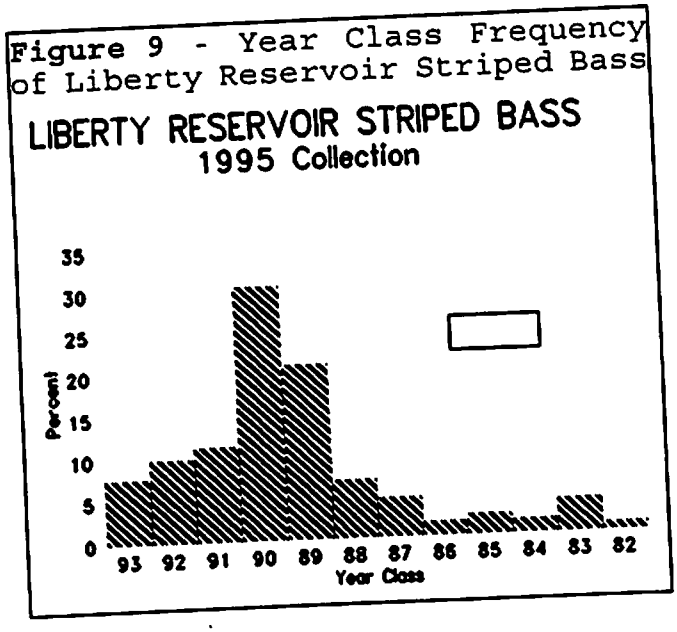
The fall night electrofishing effort documented the strongest naturally reproduced year class of striped bass to date (Table 53). The CPUE was 84.3 fish/hr, the next highest CPUE recorded since reproduction began in 1986 was 17.7 fish/hr recorded in 1987. Young striped bass were widely scattered in the reservoir being collected at all sampling locations. The fish ranged from 11.1 to 23.3 cm in total length and had a mean total length of 17.5 cm. This mean length is larger than that recorded in other years; the range sizes was relatively wide. This may suggest that several year classes of striped bass are now reproducing successfully and have contributed to this 1995 year class of striped bass. No yearling (1994 YC) striped bass were collected in Liberty Reservoir this past year.

The fall night electrofishing survey failed to recover any young walleyes. The last year that no young walleye were collected was 1989. The electrofishing CPUE for young walleye over the past three years ranged from 5.7 to 7.3 fish/hr representing the best catch rates on record. The absence of young walleye in this year's electrofishing sample was disappointing. A good walleye hatch was anticipated but did not occur in the mainstream of the Potomac River this past year. Poor walleye recruitment this year could possibly be weather related. Several yearling walleye were collected in November. They ranged from 33.1 to 37.8 cm in total length, with a mean total length of 35.9 cm or 14.1 inches.

A total of 135 striped bass were aged by scale analysis. Most of these stripers (103) were collected by electrofishing, and 32 were angler catches. Twelve year classes are represented (Figure 9); the largest striper caught was 115.1 cm (45") in total length and weighed 18 kg (39.6 lbs). Growth rates of Liberty Reservoir striped bass are presented in Table 54.

Of the ten striped bass radio tagged during 1994, only eight remained in the reservoir at the beginning of 1995. Tracking efforts began in early April and ended in late November. We average two tracking efforts a month, except for August and September when we tracked once a week. The majority of striped bass exhibited the same movement patterns similar to last year

Figure 9 - Year Class Frequency of Liberty Reservoir Striped Bass



except for a few changes, for example: two striped bass, that had avoided the Patapsco Branch over a two year period were found there in early April; one striped bass never moved into the propagation area during the year; three fish were highly mobile being found at numerous locations throughout the reservoir, moving frequently between Morgan Run and Patapsco Branch; several striped bass were located in the main channel of the reservoir, an area that stripers had not been previously found. An angler caught a tagged striped bass in October, so now only seven tagged striped bass remain.

This past year MD Department of Natural Resources, Recreational Fisheries Division established a new category for state record keeping, the freshwater striped bass. Mr. Jerry Sauter presently holds the state record. On 3 Nov 95 he caught a 111.1 cm (43.75 inches), 16.6 kg (36 lb 4 oz) striped bass in Liberty Reservoir. It is predicted that this record will be broken by a larger striped bass from Liberty Reservoir during 1996.

A total of 102 black crappie were collected by electrofishing during May of 1995. Scales were removed from 97 fish for age and growth analysis (Table 55). The growth rate of black crappie in Liberty Reservoir is normal when compared to statewide and piedmont averages as determined by Elser (1962). The PSD for black crappie collected by electrofishing was 28 (90% confidence level range of 19-37) and the mean length was 18.7cm. The PSD is slightly below the 30-70 range recommended for a predator species in a balanced population (Weithman,1987). Collection of fish >25cm increased as compared with previous surveys conducted by Enamait (1985,1990). The largest black crappie collected was 26.6cm (10.5") and determined to be starting its 8th year of life.

The 1994 year class of Liberty Reservoir smallmouth bass was thought to be relatively weak (seining index was 0.8). Yearling smallmouth bass were available as surplus fish from an impoundment in Washington County so 346 were removed, the left pelvic fin was clipped, and these smallmouth were stocked into Liberty Reservoir. A total of 10,000 adult rainbow trout were stocked on November 28 and 29 as a continuing effort to establish a trout fishery in Liberty Reservoir, a fishery that has the potential to produce trophy size trout.

Future management plan for Liberty Reservoir include monitoring natural reproduction of striped bass, largemouth bass, smallmouth bass, and other warmwater fish species; monitoring the growth, condition, and movement of striped bass; electrofishing to assess the large and smallmouth bass populations; stocking of adult rainbow and possibly brown trout.

Table 53. Summary of Fall Electrofishing Catches of Naturally Reproducted Striped Bass, Liberty Reservoir.

Year of Collection	CPUE (# fish/hr)	# Fish	Length Range (cm)	Mean Length
1986	0.8	13	11.5 - 16.0	12.9
1987	17.7	96	11.3 - 18.3	14.0
1988	0	0	-	-
1989	13.2	76	10.9 - 16.4	13.3
1990	4.8	16	11.4 - 16.5	14.8
1991	4.7	18	14.0 - 18.7	17.0
1992	8.5	23	10.1 - 17.5	14.1
1993	4.8	14	13.0 - 19.8	16.2
1994	0	0	-	-
1995	84.3	129	11.1 - 23.2	17.5

Table 54. Mean Calculated Length at Each Annulus from Scale Measurements of Striped Bass in Liberty Reservoir, 1995

		Mean Calculated Length (cm) at Annulus										
Age	# of Fish	1	2	3	4	5	6	7	8	9	10	Mean Length at Capture
1	7	18.2										36.6
2	13	16.2	37.6									50.2
3	11	16.6	34.1	47.5								59.0
4	21	14.9	34.4	48.3	59.8							68.3
5	48	15.0	33.2	46.6	57.7	66.6						72.5
6	12	14.5	32.5	44.9	54.9	64.4	72.4					77.5
7	9	13.1	29.8	43.0	54.6	64.1	72.1	78.4				83.3
8	0	-	-	-	-	-	-	-	-			-
9	4	12.1	34.5	50.4	65.4	74.5	81.2	86.8	91.8	95.3		98.4
10	2	12.4	32.6	50.9	63.9	71.7	79.4	85.7	91.9	97.1	99.5	103.3
Mean Length at Annulus		15.1	33.7	46.7	58.0	66.5	74.1	81.6	91.9	95.9	99.5	
Total Number of Fish - 127												

Table 55. Mean Calculated Length at Each Annulus from Scale Measurements of Black Crappie taken from Liberty Reservoir, May 1995. (No Correction Factor)

Age	Number of Fish	Mean Calculated Length (mm) at End of Year of Life							Mean Total Length (mm) at Capture
		1	2	3	4	5	6	7	
I	0	-	-	-	-	-	-	-	-
II	63	72	136	-	-	-	-	-	168
III	13	55	105	176	-	-	-	-	202
IV	11	52	105	172	207	-	-	-	224
V	5	46	96	141	191	225	-	-	240
VI	4	52	112	157	188	214	245	-	256
VII	1	54	105	147	167	184	209	252	266
Total Mean Length (mm)		65	125	167	198	216	238	252	-

POTOMAC RIVER

Fishery monitoring activities conducted on the Potomac River during 1995 included: spring electrofishing to assess the numbers of spawning walleye below Dam #4 (March 14, May 1); seining for YOY smallmouth bass (July 24-26); night electrofishing to monitor the channel catfish population (August 21-24); data collection from a sanctioned fishing tournament at White's Ferry; day and night electrofishing survey to obtain a population estimate for smallmouth bass at sites within and out of the trophy bass area; coincidental electrofishing survey of tiger musky and stocking of tiger musky fingerlings; coincidental fall electrofishing survey of walleye.

Natural reproduction of smallmouth bass was considered to be just fair in 1995. The seining index was 1.0, well below the average of 5.4 recorded over the past twenty years and indexes of 8.3 and 12.9 documented in 1993 and 1994 respectively. The average size of young smallmouth in the Potomac during late July

was 4.8 cm (1.9 inches), recorded from seven seining stations from Seneca upriver to McCoy's Ferry. This is relatively large for Potomac River YOY smallmouth during July.

Channel catfish were collected at White's Ferry, Snyder's Landing, Potomac Fish & Game, and McCoy's Ferry on the Potomac River. At White's Ferry the CPUE was 14.4 fish/hr for stock size fish with a PSD of 29. These fish ranged in total length (TL) from 28.2 to 46.5 cm with a mean of 36.0 cm. Catfish weights ranged from 0.5 - 2.0 lbs with a mean of 1.0 lb. The CPUE at Snyder's Landing was 45.3 fish/hr with a PSD of 47. These fish ranged in TL from 17.4 - 59.6 cm with a mean of 39.8 cm. Fish weight range was 0.1 - 6.1 lbs with a mean of 1.5 lbs. The CPUE at Potomac Fish & Game was 31.4 fish/hr with a PSD of 63. These fish ranged in TL from 24.3 - 70.9 cm with a mean of 44.5 cm. Catfish weights ranged from 0.2 - 9.8 lbs with a mean of 2.3 lbs. The CPUE at McCoy's Ferry was 20.5 fish/hr with a PSD of 69. These fish ranged in TL from 16.3 - 61.2 cm with a mean of 41.4 cm. Total weight ranged from 0.1 - 5.6 lbs with a mean of 2.0 lbs. The 1995 electrofishing survey resulted in a CPUE of 27.5 fish/hr, a PSD of 55, a mean TL of 41.1 cm, and a mean total weight of 1.8 lbs for channel catfish in the Potomac River. The CPUE and mean length in the 1995 survey are similar to the CPUE of 28.6 fish/hr and mean length of 42.3 cm recorded for Potomac River channel catfish in 1992.

A five fish per day creel limit was imposed for channel catfish in the Potomac River effective 1993. Comparison of electrofishing data a year before and two years after the regulation shows that channel catfish mean size, PSD's and CPUE's are similar (Table 56). More intensive electrofishing efforts were conducted in the Potomac River targeting smallmouth bass, walleye, and tiger musky. General observations by electrofishing crews during this sampling is that there has been an increase in the abundance of channel catfish since the restrictive creel limit.

A 115 acre section above Williamsport and a 70 acre stretch of river immediately above Taylor's Landing were electrofished during the day and night to obtain population estimates of smallmouth bass. The estimates were obtained by applying Schnabel's (1938) formula. The bass were marked by removing the right pelvic fin, except for very large bass which had their anal fin clipped just enough to straighten the outer margin.

At the Williamsport station a total of 718 stock size and 51 quality size smallmouth were collected resulting in a PSD of 7.1; a CPUE of 72 fish/hr. The RSD (38+cm) was 1.3. The smallmouth bass population was estimated to be 4,445 fish or 39 fish per acre (95% confidence range of 31 to 47 fish per acre).

A total of 822 stock size and 80 quality size smallmouth were collected form the Taylor's Landing area resulting in a PSD of 10; a CPUE of 56 fish/hr. The RSD was 0.7. The smallmouth

bass population was estimated to be 4,953 fish of 71 fish per acre (95% confidence rang of 59 to 84 fish per acre).

Three other station within the trophy bass area (Snyder's Landing, Shepherdstown, and Shinham) were electrofished in late fall (Nov 6, 8 & 9). This sampling was conducted recognizing that typically fewer stock size and more quality size bass are collected as water temperatures cool. The combined PSD for these stations was 24, the CPUE was 63 fish/hr.

Electrofishing was conducted relatively early and late during the normal spawning period for walleye, high water conditions prevented sampling during the expected peak in early April. A total of 23 walleye were collected at the rate of 9.5 quality fish/hr. The walleye recovered ranged from 39.5 to 61.4 cm (15.5-24 inches) in TL.

Fall electrofishing sampling between Dam #3 and Dam #4 failed to recover any YOY walleye. Natural reproduction of walleye in the Potomac River in 1995 was considered to be poor. There was some reproduction as evidenced by collection of two walleye in the C&O Canal after river flooding in January 1996 thought to be YOY. Scales were removed from one fish that was 30.3 cm in length, scale examination confirmed that this walleye was hatched in 1995. A total of 25 adult walleye were collected during the fall. These fish ranged from 42.8 to 59.0 cm in TL and had a mean length of 48.0 cm. Most of these fish were thought to be form the 1990 YC walleye. As members of this year class decreases so is our electrofishing CPUE for stock size walleye, the 1995 rate similar to that obtained in 1990. The CPUE recorded from 1990 thru 1995 was 1.5, 3.8, 8.0, 2.3, and 1.5 fish/hr respectively.

Thirty adults and 30 youths fished the White's Ferry area for 8 hours on 24 Sept 95. A total of 24 smallmouth bass, ranging from 30.0 to 39.0 cm in TL, were checked in by youth anglers. Their angler catch rate of quality size smallmouth bass was 0.8 fish for the tournament day. An additional 54 quality size smallmouth were caught and released by adults; 389 sub-quality size were caught and released by both youth and adult. Of the total of 467 smallmouth caught by all anglers, 17% or 78 fish were quality size fish.

The PA Fish Commission had surplus tiger musky fingerlings at their Huntsdale Hatchery this past year so the Potomac River and some Maryland impoundments benefited by receiving additional fish. A total of 2,300 fingerlings were stocked at access points in Cumberland and Spring Gap; 6,400 fingerlings were distributed along the Potomac (via the towpath) from Hancock to Seneca; the Conococheague Creek received 1,000 fingerlings. During spring electrofishing above Taylor's Landing we collected eight tiger musky that range from 40.0 to 100.0 cm. The latter fish weighed 6.6 Kg (14.5 lbs). Electrofishing surveys during late summer and fall recovered six musky ranging from 56.1 to 69.0 cm. Most were

aged at 2+ after scale examination, however, previous growth data supports Potomac River tiger musky should have been 1+ at this size. Upon capture these fish were though to be from the Minnesota Musky Farm but scale examination could not confirm this. It is speculated that these musky may have laid down a false annuli during the summer of 1995.

Planned management activities in 1996 include late winter removal of flood trapped fish from the C&O Canal to be placed back into the Potomac River; spring electrofishing survey for adult walleye; assess natural reproduction of smallmouth bass by seining, reproduction of walleye by electrofishing; stocking of walleye fry and fingerling; stocking of 2,000 tiger musky fingerlings; fall electrofishing survey in the black bass Catch-and-Return Area; schedule and coordinate a Potomac River fishery informational meeting for the general public for early 1997.

POTOMAC RIVER CHANNEL CATFISH DATA

CPUE

	1995	1992	1989
Whites Ferry	14.4	28.4	18.1
Snyder's Landing	45.3	44.8	17.5
Potomac F & G	31.4	29.2	20.7
McCoy's Ferry	20.5	10.9	---
Overall	27.5	28.6	18.6

PSD

	1995	1992	1989
White's Ferry	29	79	65
Snyder's Landing	47	63	64
Potomac F & G	63	51	62
McCoy's Ferry	69	69	---
Overall	55	65	64

Length-range & mean (cm)

1995	1992	1989
		mean
mean	mean	

White's Ferry	28.2 - 46.5	36. 0	20.2 - 55.6	42. 4	33.5 - 56.5	42. 6
Snyder's Landing	17.4 - 59.6	39. 8	21.2 - 63.7	41. 5	24.6 - 64.1	43. 8
Potomac F & G	24.3 - 70.9	44. 5	19.5 - 67.5	42. 7	31.9 - 56.7	42. 6
McCoy's Ferry	16.3 - 61.2	41. 4	36.3 - 56.6	44. 8	---	---
Overall	16.3 - 70.9	41. 1	19.5 - 67.5	42. 3	24.6 - 64.1	43. 0

CLOPPER LAKE

Activities and studies conducted in 1995 included: a largemouth bass reproduction survey, a daytime electrofishing survey, and the stocking of tiger musky fingerlings.

Reproduction Survey

A shoreline seining survey was conducted on 18 Aug 95 to assess largemouth bass reproductive success. Three sites throughout the lake were sampled using 15 foot seine. Largemouth bass reproduction was determined to be excellent with an average of 11 largemouth bass/100 feet of seined shoreline. A 100 foot section of shoreline that produces more than five YOY is considered excellent in Maryland. Bluegill averaged 133 YOY/30 feet of seined shoreline. Redear sunfish and black crappie were also noted in each seine haul. The aquatic plant, Spiny Naiad (Najas minor), was present throughout the lake.

Electrofishing Survey

A daytime electrofishing survey of Clopper Lake was conducted on 25 Oct 95. The survey consisted of two runs that covered approximately 65 percent of the shoreline. The total electrofishing time elapsed was 21.4 minutes. The following species were collected or observed: bluegill sunfish, redear sunfish, largemouth bass, black crappie, and carp.

The CPUE for bluegill sunfish was 190 stock sized and 14 quality sized bluegill per hour. The PSD of the bluegill sunfish was 7. This falls short of the desired range of 20-50 for the PSD of a prey species.

Thirty-eight redear sunfish were collected during the survey. The PSD for the redear sunfish was 18. The CPUE for redear sunfish was 109 stock sized and 20 quality sized fish per hour.

Black crappie were observed during both survey runs at Clopper Lake. YOY and intermediate size black crappie were common near a beaver lodge. A total of 37 crappie ranging in length from 7.0 cm to 18.7 cm were collected. The PSD for black crappie was 0. This falls short of the desirable range of 30 to 70 for a predatory fish species.

A total of 90 largemouth bass were collected during the survey. The CPUE for largemouth bass was 173 stock sized and 8 quality sized fish per hour. The PSD for largemouth bass was 5. A PSD of 30 to 70 is the desired range for largemouth bass in Maryland. A PSD of 5 indicates that there are few largemouth bass over 30 cm in the population sampled. It is our opinion that the PSD was not accurately represented due to the late timing of the survey, the fact that it was a daylight survey, and by comparing PSD's from the past 3 years.

Stocking

A total of 360 tiger musky fingerlings were stocked into Clopper Lake on 22 Sept 95. This represents the first stocking of this species into the lake. The fingerlings averaged 6 to 9 inches and were obtained from the Pennsylvania Fish Commission at Huntsdale Hatchery. Tiger muskies were stocked with the intention of providing an additional trophy angling opportunity for area fishermen.

Management

Clopper Lake currently has a 10 inch minimum size limit on largemouth bass. This is the only water in the state that has this regulation. Historically, Clopper Lake has had an overabundance of small bass. The intent of the 10 inch minimum size was to remove the overabundant small bass. It is our opinion that this objective could be accomplished by managing Clopper Lake with "Trophy Bass " regulations as are several other impoundments throughout the state. The regulation allows anglers to harvest 5 bass less than 11 inches or 4 bass less than 11 inches and 1 bass $\geq$ 15 inches. Bass between 11 and 15 inches are protected. The objective of the "Trophy Bass" regulation is to promote a high catch rate of bass within and beyond the desired slot (11-15 in.) while providing limited harvest of smaller fish with an opportunity to harvest one trophy bass (> 15 in.) per day.

The survey plans for 1996 include shoreline seining to assess centrarchid reproduction, day and night electrofishing surveys, and an age and growth analysis of the largemouth bass population, and stocking of adult channel catfish if available. Data collected in 1996 will determine if Trophy Bass regulations are desirable or the statewide 12 inch minimum length limit would better suit the management needs of Clopper Lake.

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JOB PROGRESS REPORT

Maryland Department of Natural Resources
Fisheries Service
Freshwater Fisheries Division

SURVEY AND MANAGEMENT OF FRESHWATER FISHERIES RESOURCES

Coldwater Survey and Inventory

Federal Aid Project: F-48-R-5

Study No. III

By:

Howard Stinefelt (Coldwater Specialist)
Kenneth Pavol (Western Region Manager)
Charles Gougeon (Central region Manager)

1995

PERFORMANCE REPORT - 1995

State: Maryland

Project No.: F-48-R-5

Study No.: III

Job No.: 1

Project Title: Survey, Inventory, and Management of Maryland's Freshwater Fisheries Resources

Study Title: Survey and Inventory of the Coldwater Fisheries Resources

Job Title: Coldwater Survey and Inventory

Job Objectives: To determine the distribution and abundance of trout, and to identify physical,chemical and biological parameters affecting densities of trout for those waters of the state which are known to support natural trout populations, may have the potential to support natural trout populations, or may be utilized to provide public recreational trout fishing. To monitor environmental conditions in order to detect changes in environmental quality to prevent or reduce environmental degradation as well as to document any improvement in environmental quality. To provide data for the development of effective management plans.

Duration: January 1, 1995 to December 31, 1995

Prepared By: Howard A. Kimsey Jr. Date: March 1, 1996

Coldwater Fisheries Specialist

Results:

SUMMARY OF TROUT POPULATION STATISTICS - 1995

The following tables are a summary of the results of all trout population studies funded within Federal Aid Profect F-48-R-5 during 1995. Population studies were conducted by Freshwater Fisheries personnel and the results are grouped by Fisheries Management Region.

The Zippin Three Pass Removal Method was used to evaluate trout populations and population analysis were derived for all sampling using MicroFish 2.2 and 3.0. Fish were collected using a variety of electrofishing apparatus.

Results of Electrofishing Surveys in Freshwater Fisheries, Western Region during 1995.
Maryland Department of Natural Resources, Freshwater Fisheries Division.

- Counties: Garrett, Allegany, Washington, Frederick Counties
- Bk = Brook Trout, Bn = Brown Trout, R = Rainbow Trout, Ct = Cutthroat Trout
- n = naturally reproduced, a = stocked as adults, f = stocked as fingerlings

Stream Station	Species-origin	Adult (1+ and older) trout lbs./acre	trout acre	trout mile	95% CI	YOY acre	YOY mile	YOY 95% CI
Savage River, lower								
Above Piedmont D.	Bn-n	70	140	959	±1%	12	79	±67%
	Bk-n	15	59	405	±6.4%	227	1549	±16%
	total	86	199	1364	±1.7%	241	1646	±16%
Below Piedmont D.	Bn-n	44	63	361	±16%	15	88	±19%
	Bk-n	13	74	422	±6%	187	1065	±7%
	total	56	138	783	±7%	204	1162	±7%
Rizer	Bn-n	61	94	598	±6%	12	79	±0%
	Bk-n	11	51	326	±14%	116	739	---
	total	73	145	924	±6%	98	625	±37%
Aaron Run	Bn-n	30	58	378	±11%	16	106	±17%
	Bk-n	9	46	299	±10%	47	308	±9%
	total	39	103	678	±7%	65	422	±9%
Mouth	Bn-n	19	36	211	±7%	4	26	---
	Bk-n	4	19	114	±15%	63	370	±38%
	total	23	55	326	±6%	64	378	±27%
Youghiogany River								
Hoyes Run	Bn-f	29	68	1204	±3%	0	0	
	R -f	5	17	306	±6%	0	0	
	total	34	86	1521	±3%			
Sang Run	Bn-f	12	37	543	±68%	0	0	
	R -f	9	27	401	±39%	0	0	
	total	21	66	961	±40%			
North Branch Potomac River								
just below JRL	Bn-mix	5	8	95	±32%	0	0	
	R -mix	21	15	169	±68%	0	0	
	Ct-mix	5	5	53	---	0	0	
	total	35	33	370	±70%			
1/2 mile below JRL	Bn-mix	8	14	189	±5%	0	0	
	R -mix	16	12	162	±13%	0	0	
	Ct-f	2	2	27	---	0	0	
	total	26	30	391	±6%			
Barnum	Bn,R,Bk,Ct-mix	5	10	116	±12%	Bn,Bk-n 5	63	±16%
Lower C&R area	Bn-n,f	1	2	22	---	0	0	
	Bk-n	2	9	120	---	14	186	±41%
	Ct-f	2	14	186	±64%	0	0	
	total	7	31	416	±111%			
Monroe Run								
lower	Bk-n	17	214	344	±8%	186	298	±43%
Hoyes Run								
lower	Bn-n	16	137	364	±30%	too small to collect		
	Bk-n	1	27	73	---			
	R -n	15	158	419	±13%			
	total	35	356	947	±21%			

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Stream Station	Species-origin	Adult (1+ and older) lbs./acre	trout acre	trout mile	95% CI		YOY acre	YOY mile	YOY 95% CI
Hunting Creek									
Hemlock Bridge	Bn-n	102	930	1399	±1%		653	983	±11%
	Bk-n	9	171	257	±2%		166	250	±11%
	total	110	1101	1657	±1%		824	1241	±9%
Elbow Pool	Bn-n	74	368	773	±1%		184	386	±4%
	Bk-a	91	90	189	±8%		0	0	
	R -a	117	66	138	±4%	n	111	233	±3%
	total	283	524	1100	±1%		295	619	±2%
Bear Branch	Bn-n	44	198	415	±3%		104	219	±2%
	Bk-a	14	17	36	±44%		3	7	---
	R -a	26	17	36	±9%	n	17	36	±25%
	total	84	233	488	±3%		125	262	±3%
Rt. 15 ramp	Bn-n	27	83	243	±29%		61	180	±46%
		(1 stocked brook collected)							
Little Hunting Creek									
Catoctin Hollow	Bn-n	48	96	210	±7%		211	459	±11%
	Bk-n	6	42	92	±30%		187	406	±26%
	total	54	139	301	±4%		404	878	±13%
Manor Area	Bn-n	14	76	221	±7%		190	553	±20%
	Bk-n	8	38	111	±4%		174	506	±11%
	total	22	114	332	±4%		370	1075	±12%
Black Mill Road	Bn-n	25	66	109	±6%		16	27	±107%
Little Antietam Creek - north									
Rt. 491, Ap Trail	Bk-n	41	275	585	±13%		440	935	±6%
Rowe Road	R -n	48	242	496	±5%		443	908	±4%
Gardenhour Road	R -n	45	226	515	±8%		56	129	±9%
"Warner Hollow Run" Little Antietam watershed									
above Reservoir	Bk-n	52	216	211	±12%		1108	1082	±22%
High Run									
Shooting Range	Bk-n	62	617	734	±5%		1533	1826	±43%
Clifford Branch									
Hamburg Road	Bk-n	22	217	275	±17%		1483	1880	±7%
Owens Creek									
Campground ent.	Bn-n	9	44	73	±0%		25	40	---
	Bk-n	33	250	412	±1%		225	371	±3%
	total	41	294	484	±1%		255	420	±9%
Lower Boundry	Bn-n	15	54	94	±13%		25	44	±0%
	Bk-n	5	36	62	±17%		101	175	±103%
	total	21	90	156	±10%		108	187	±34%
Fishing Creek, left fork									
upper	Bk-n	31	528	915	±4%		803	1390	±6%
lower	Bk-n	11	216	411	±1%		204	387	±5%
Fishing Creek, right fork									
middle	Bk-n	30	371	553	±11%		539	805	±21%
lower	Bk-n	45	500	548	±4%		1055	1156	±3%

Results of Electrofishing Surveys in Freshwater Fisheries, Central Region, during 1995.
Maryland Department of Natural Resources, Freshwater Fisheries Division.

- Counties: Montgomery, Howard, Carroll, Baltimore, Harford, Cecil
- Bk = Brook Trout, Bn = Brown Trout, R = Rainbow Trout, Ct = Cutthroat Trout
- n = naturally reproduced, a = stocked as adults, f = stocked as fingerlings

Stream Station	Species-origin	Adult (1+ and older) lbs. acre	Adult (1+ and older) trout acre	Adult (1+ and older) trout mile	Adult (1+ and older) 95% CI	YOY acre	YOY mile	YOY 95% CI
Gunpowder Falls Watershed								
Gunpowder Falls								
Dam/Falls Rd.	Bn-n	121	356	2274	±3%	64	406	±17%
	R -n	6	15	97	±16%	48	309	±5%
	Bk-n	<1	3	16	--	0	0	
	total	127	374	2388	±3%	112	715	±8%
Falls Road	Bn-n	69	197	1260	±3%	90	577	±15%
	R -n	11	20	128	±10%	40	255	±42%
	Bk-n	1	2	11	±244%	0	0	
	total	81	220	1405	±3%	131	838	±15%
Masemore Road	Bn-n	68	161	941	±1%	324	1898	±4%
	R -n	2	4	25	±0%	2	10	±0%
	Bk-n	>1	1	5	--	1	5	--
	total	70	166	972	±1%	327	1913	±4%
Bunker Hill Road	Bn-n	90	238	1101	±4%	251	1163	12%
	R -n	2	2	9	±244%	0	0	
	Bk-n	2	4	18	±0%	0	0	
	total	95	244	1128	±4%	251	1163	±12%
York Road	Bn-n	114	259	1282	±2%	380	1879	±8%
	R -n	1	1	5	--	0	0	
	Bk-n	1	2	10	±0%	3	16	±0%
	total	115	262	1298	±2%	382	1890	±8%
Blue Mount Road	Bn-n	15	37	308	±5%	187	1536	±13%
First Mine Branch								
Vernon Road	Bn-n	2	7	8	±0%	181	210	±33%
	Bk-n	5	21	24	±0%	0	0	
	total	6	28	32	±0%	181	210	±33%
Bacon Road	Bn-n	13	36	67	±15%	247	460	±21%
Piney Run - Parallels Int. 83								
Piney Hill Road	Bn-n	19	108	141	±8%	846	1106	±6%
	Bk-n	1	19	25	±0%	42	55	±7%
	total	20	127	166	±6%	888	1162	±6%
Bunker Hill Trib.								
low	Bn-n	3	28	46	±0%	271	450	±20%
	Bk-n	1	22	37	±0%	72	119	±17%
	total	4	50	83	±0%	348	579	±17%

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Stream Station	Species-origin	Adult (1+ and older) lbs./acre	Adult (1+ and older) trout acre	Adult (1+ and older) trout mile	Adult (1+ and older) 95% CI		YOY acre	YOY mile	YOY 95% CI
Panther Branch									
low	Bn-n	6	75	79	±12%		495	521	±4%
	Bk-n	6	47	49	±29%		991	1042	±10%
	total	12	121	128	±11%		1495	1573	±6%
Bee Tree Run									
middle	Bn-n	23	91	147	±5%		451	733	±16%
Beaverdam Run									
above Int. 83	Bn-n	14	78	189	±28%		127	308	±14%
	Bk-n	1	5	12	--		5	12	±0%
	total	16	83	201	±28%		132	320	±13%
Patapsco River Watershed									
Glen Falls tributary									
Glen Falls Road	Bn-n	17	56	78	±0%		14	19	--
Stillwater Creek									
Monroe Ave.	Bk-n	18	71	63	±0%		262	232	±14%
Roaring Run									
Brown Road	Bn-n	4	11	14	--		169	209	±13%
Morgan Run									
Klee Mill Rd.	Bn-s	11	28	106	±6%	n	2	9	--
	R -s	4	9	35	±49%	?	2	9	--
	total	15	37	141	±7%		5	18	
Washington Metro Watershed									
Paint Branch									
Peach Orchard Rd.	Bn-n	4	6	9	--		6	9	--
Right Fork	Bn-n	16	70	66	±67%		14	13	--
Fairland Road	Bn-n	10	27	54	±3%		31	61	±2%
Good Hope Trib. - Paint Branch									
Hobbs Drive	Bn-n	43	304	304	±7%		393	394	±8%
Lower	Bn-n	13	90	123	--		615	845	±8%
Gum Springs Trib. - Paint Branch									
mouth	Bn-n	2	18	20	±0%		27	31	±0%
Wildcat Branch									
Davis Mill Road	Bn-n	6	18	25	--		71	101	±12%
Little Seneca Creek									
Clopper Rd., above	Bn-f	17	45	107	±10%	n	19	45	±9%
	R -f	12	34	81	±31%		0	0	
	cut-f	1	4	9	--		0	0	
	total	31	87	206	±18%				
Clopper Rd., below	Bn-f	21	42	96	±7%		0	0	
	R -f	6	12	28	±29%		121	276	±14%
	total	27	54	124	±7%				
Hoyes Mill Road	Bn-f	5	14	70	±14%	n	1	6	--
	R -f	1	3	13	--		25	121	±76%
	total	6	17	83	±11%				

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Stream Station	Species-origin	Adult (1+ and older) lbs./acre	Adult (1+ and older) trout acre	Adult (1+ and older) trout mile	Adult (1+ and older) 95% CI	YOY acre	YOY mile	YOY 95% CI
Other Watersheds								
Patuxent River								
Mullinix Mill Rd.	Bn-n	12	44	138	±5%	75	234	±59%
Hipsley Mill Road	Bn-n,a	5	12	31	±67%	n 7	19	--
	R -a	10	16	44	±33%	0	0	
	total	16	30	81	±43%			
Howard Chapel Rd.	Bn-a	14	29	81	±17%	0	0	
	R -a	29	52	146	±13%	0	0	
	Ct-a	3	6	16	±0%	0	0	
	total	48	89	252	±12%			
Cecil County								
Basin Run								
site 2	Bn-n	42	25	42	±0%	0	0	
site 3	Bn-n	3	12	20	---	0	0	
	R -a	23	35	60	±38%	0	0	
	total	26	47	80	---			
site 6	Bn-n	42	77	74	±0%	31	30	---
Mill Creek								
Diamond Jim Rd.	Bn-	63	83	45	±38%	0	0	
Reservoir Road	Bn-	38	190	106	±16%	0	0	
Unnamed trib. to Stone Run								
near Rising Sun Pond	Bn-n	81	300	127	±6%	150	63	---

Fingerling Trout Stocking Records - 1995
Maryland Department of Natural Resources
Freshwater Fisheries Division

County Stream	Species	Number	Source
Garrett Co.			
Youghioghney River	Brown	9,800	Murley Sp.
	Brown	5,000	Laurel Hill
	Rainbow	10,000	Laurel Hill
N. Br. Potomac River	Cutthroat	12,000	A.P.H. - WY
	Rainbow	3,000	Laurel Hill
	Rainbow	3,000	Laurel Hill
Washington County			
Marsh Run, south	Brown	1,000	Murley Sp.
	Cutthroat	500	Genstar-WY
"Kemps Mill" Run	Brown	2,000	Murley Sp.
St. James Run	Brown	3,000	Murley Sp.
Antietam Creek	Brown	2,000	Laurel Hill
	Cutthroat	1,000	Genstar-WY
Licking Creek	Brown	500	Laurel Hill
Beaver Creek	Brown	500	Laurel Hill
Frederick County			
Friends Creek	Brown	500	Laurel Hill
Owens Creek	Brown	500	Laurel Hill
Carroll County			
Joes Branch	Brown	725	Murley Sp.
Bear Branch	Brown	725	Murley Sp.
Howard County			
Patapsco River	Cutthroat	1000	A.P.H. - WY
	Rainbow	450	Laurel Hill
	Brown	2816	Laurel Hill
Patuxent River, Laurel	Cutthroat	1000	A.P.H. - WY
Lt. Patuxent River	Cutthroat	1000	A.P.H. - WY
	Rainbow	450	Laurel Hill
	Brown	883	Laurel Hill
Montgomery County			
Great Seneca Creek	Brown	1200	Laurel Hill
Little Seneca Creek	Rainbow	1100	Laurel Hill
Baltimore County			
Little Gunpowder Falls	Brown	1000	Murley Sp.
Brice Run	Brown	225	Laurel Run
Harford County			
Deer Creek	Brown	1200	Murley Sp.
Little Deer Creek	Brown	1200	Murley Sp.
Island Branch	Brown	300	Murley Sp.
Falling Branch	Brown	850	Murley Sp.
Cecil County			
Stone Run	Brown	500	Green Spring
W. Br. Christina Ck.	Brown	500	Green Spring

INDIVIDUAL STREAM STUDIES

- 1995 -

Western Fisheries Management Region

Garrett, Allegany, and w. Washington Counties
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PERFORMANCE REPORT

State: Maryland Project No.: F-48-R

Study No. : III

Job No. : 2

Project Title: Survey, Inventory, and Management of Maryland's Freshwater Fisheries Resource

Study Title: Survey and Inventory of the Coldwater Fisheries Resource

Job Title: Annual Performance Report - Trout Studies in the Youghiogheny River

Duration: January 1, 1995 to December 31, 1995

OBJECTIVES

To document water temperature regimes within the mainstem Youghiogheny River with particular emphasis on critical midsummer conditions and changes attributable to coldwater discharges from the Deep Creek Lake Power Plant (hereafter DCLPP).

To assess population densities, standing crops, species composition, relative abundance, age and growth indices, and distribution of trout in the mainstem Youghiogheny River.

PROCEDURES

Temperature Regimes

Ryan Digital TempMentors were deployed in the river at eight sites between Swallow Falls and Sang Run from 19 June to 19 September, 1995. The recorders were programmed to record at thirty minute intervals. One TempMentor was deployed near the DCLPP to record ambient air temperatures.

Trout Population Surveys

A 1.5 kw, pulsed DC, barge-mounted electroshocker equipped with two anodes was used to collect trout at the Sang Run and Hoyes Stations on 18 September and 4 October 1995 respectively. The Zippen three pass depletion method was used to estimate the trout population.

RESULTS

Trout Population Surveys

Adult trout densities (trout/mile) of combined species at the Hoyes and Sang Run stations increased 20% and 102 % respectively from June 1994 to October 1995 (Table 1). Adult trout standing crop was 34 lbs/ acre at Hoyes in October 1995, an 89 % increase over 1994 and the highest standing crop measured in the Youghiogheny River since monitoring studies were initiated in 1987. Trout standing crop at Sang Run was 21 lbs/acre, an increase of 200 % from 1994 and the highest observed to date at that site (Table 2).

Mean length, weights, and condition factors of brown and rainbow trout are presented in Table 3. In general, rainbow and brown trout in the Yough River exhibited good growth and condition in 1995 as measured by K factor (coefficient of condition). Mean lengths of brown and rainbow trout increased 8.4 % and 28.3 %, respectively, from 1994. Species composition of trout in the Youghiogheny River (both stations inclusive) was 70 % brown trout and 30 % rainbow trout.

During 1994, 5,000 of a total of 18,000 Kamloops strain rainbow trout, the same strain used for adult trout production in Maryland hatcheries, were fin clipped (adipose) and stocked in the Hoyes and Sang Run areas in order to compare growth and relative survival to warm water strain rainbows secured from a private hatchery. No fin clipped Kamloop strain rainbow trout were collected in the Fall 1995 trout survey. Fingerling trout stocking records for 1995 are contained in Table 4. A total of 24,800 fingerling trout (14,800 brown and 10,000 warmwater rainbow) were float stocked from Hoyes to Sang Run during the fall of 1995.

Temperature Regimes

The Pennsylvania Electric Company (Pennelec), as required by Condition 16, River Water Temperature Enhancement (Deep Creek Project-Permit No. GA92S009-01), is attempting to maintain water temperatures of < 25øC in the Youghiogheny River as measured at Sang Run using generating discharges from the DCLPP. Actual river temperature at Sang Run reached or exceeded 25øC on at least 15 dates between June 11 and August 24, 1995 (Phillips 1995). The results of water temperature monitoring studies conducted by Freshwater Fisheries Division for 1995 were forwarded to Versar, Freshwater Fisheries Division consultants, for analysis. The results of Versar's analysis will be available at a later date.

Pennelec began a Flow Bypass Operation (Permit Condition No. 17) during 1995 in order to augment river flow volume to at least 40 cfs during low flow conditions. Pennelec reported that the bypass was first required on July 25, 1995 and was operated

frequently thereafter (Phillips 1995). Pennelec also reported that a Tailrace Weir Operation (Permit Condition No. 18) was operational in 1995 and significantly increased dissolved oxygen concentrations in the DCLPP discharge (Phillips 1995).

MANAGEMENT DISCUSSION

Adult trout population parameters measured in 1995 were the first to reflect the combined influences of catch and release trout management and operational changes at the DCLPP designed to control river water temperature, maintain a 40 cfs minimum flow in the Youghiogheny downstream of the DCLPP, and enhance dissolved oxygen concentrations in the DCLPP discharge. Despite record heat and low precipitation in July and August 1995, trout standing crops and densities in the Youghiogheny River Catch and Release Trout Management Area in 1995 were the highest measured since monitoring studies began in 1987.

Although the availability of fall fingerling trout is variable, sufficient numbers were stocked in the Youghiogheny River between Hoyes and Sang Run in the fall of 1995 to provide adequate recruitment as age I+ adult fish in 1996. Continued temperature control, dissolved oxygen enhancement, and flow augmentation from the DCLPP in concert with Catch and Release management should have a continued positive influence on adult trout numbers in the Youghiogheny in 1996.

RECOMMENDATIONS

Kamloops strain rainbow trout fingerlings, although readily available, did not survive well after stocking in the Youghiogheny River in 1994. It is recommended that warmwater strain rainbow trout, which are obtained from a commercial hatchery source, be used exclusively for fall fingerling plants in the Youghiogheny.

Further study will be required in order to continue to monitor and evaluate changes in the trout population of the Youghiogheny River in response to catch and release trout management and operational changes at the DCLPP. It is recommended that this study be continued in 1995.

LITERATURE CITED

Phillips, J. C. 1995. Final report on Deep Creek Project - Permit No. GA92S009(01) - Condition 16. Pennsylvania Electric Company, Reading, Pa.

Prepared by: Kenneth W. Pavol
Western Regional Fisheries Manager
Alan W. Klotz
District I Fisheries Biologist

Table 1. Adult trout densities (trout/mile), Youghiogheny River, June 1994 to October 1995.

Station	Date	Brown	Rainbow	Combined	% Change
Hoyes	6/94	708 + 144	528 + 96	1267 + 161	
	10/95	1204 + 34	306 + 19	1521 + 40	+ 20 %
Sang	6/94	134 + 38	334 + 158	476 + 154	
	9/95	543 + 369	401 + 154	961 + 379	+ 102 %

Table 2. Adult trout standing crops (lbs/acre), Youghiogheny River, June 94 to October 95.

Station	Date	Brown	Rainbow	Combined	% Change
Hoyes	6/94	13 + 2	5 + 2	18 + 2	
	10/95	29 + 1	5 + 0	34 + 1	+ 89 %
Sang Run	6/94	3 + 1	3 + 2	7 + 2	
	9/95	12 + 8	9 + 3	21 + 8	+ 200 %

Table 3. Mean length, weight, and condition factors of Youghiogheny River adult trout, 1995.

Brown trout	Rainbow trout
N = 155	N = 67
Avg L = 255.6 mm	Avg L = 245.7 mm
Avg W = 177.1 g	Avg W = 141.9 g
Avg K = 1.07	Avg K = 1.09

Table 4. Fingerling trout stockings, Youghiogheny River, 1995. Sources: Murley Spring Run (MSR) and Laurel Hill Hatchery (LHH).

Date	Species	Number	Source	Area Stocked
9/15	Brown	4,000	MSR	Float stocked Hoyes-Sang Run
9/29	Brown	3,000	MSR	Float stocked Hoyes-Sang Run
10/6	Brown	5,000	LHH	Float stocked Hoyes-Sang Run
10/10	Brown	2,800	MSR	Hoyes and Sang Run

10/23 Rainbow 10,000 LHH Float stocked Hoyes-Sang Run

==========

Totals Brown = 14,800 Rainbow = 10,000 Combined = 24,800

PERFORMANCE REPORT

State: Maryland Project No. F-48-R-1

Study No. III

Job No. 2

Project Title : Survey and Management of Freshwater Fisheries Resources

Study Title: Survey and Inventory of the Coldwater Fisheries Resource

Job Title: Lower Savage River Trout Population Studies

Duration: January 1, 1995 through December 31, 1995

Job Objectives

To monitor changes in wild trout numbers, species composition, growth rates, and reproductive success in response to Trophy Trout Management and regulated flows from the Savage River Dam.

Introduction

The Lower Savage River is regulated under Trophy Trout regulations implemented in January 1991. A Fly-Fishing Only Trophy Trout Management Area is located in the section of the river from the Savage River Reservoir downstream approximately 1.3 miles to the Allegheny Bridge. A Trophy Trout Management Area, restricted to artificial lures or flies, is located from the Allegheny Bridge downstream approximately 2.7 miles to the mouth of the river. Regulations for both Trophy Trout Management Areas include a year round open season, a 12 inch minimum size limit for brook trout, an 18 inch minimum size limit for brown trout, and a two trout daily creel limit. There is no minimum size limit on rainbow trout in either area. The stocking of hatchery trout in the Lower Savage River was discontinued after 1990.

Procedures

Trout populations were measured at five stations from August 14 through 31, 1995, using a 1.5 kw, pulsed direct current, bank mounted electro-shocker equipped with two anodes. Stations 1 and 2 were located in the Flyfishing Only section, while stations 3, 4 and 5 were located in the Artificial Lures/Flies section. The Zippen depletion method was used to estimate trout populations.

Results

Mean adult trout standing crop (brook and brown trout combined) was 55.4 lbs/acre (range 23 - 86) in the Lower Savage River in 1995, an increase of 6.9 % over 1994 levels (Table 1). Mean adult brook trout standing crops increased slightly from 9 lbs/acre in 1994 to 10.4 lbs/acre in 1995 (Table 1). Mean adult brown trout standing crop was 44.8 lbs/acre (range 19 - 70) in 1995, compared to 42.2 lbs/acre (range 21-58) in 1994 (Table 1). Brown trout made up approximately 81 % of trout standing crops in the Lower Savage in 1995 while brook trout comprised the remaining 19 %, about equal to the proportions observed in 1994 (Pavol and Klotz 1995). Overall, trout standing crops increased significantly at three of five Lower Savage River sampling stations in 1995 (Stations 1, 2, and 3). The combined adult trout standing crop measured in Station 1 in 1995 was 86 lbs/acre, the highest observed since studies began on the Lower Savage in 1983. The standing crop declined at only one station (4), and was unchanged at Station 5.

Adult trout per mile increased for both trout species in 1995. The mean number of adult brook and brown trout per mile increased 58.9 % and 14.4 % respectively from 1994. Relatively good survival and recruitment of the 1994 brook trout year class accounted for the sharp increase in adult brook trout per mile in 1995. Adult brown trout comprised 61.6 % of the total number of adult trout (N = 451) collected in the Lower Savage in 1995, while adult brook trout comprised the remaining 38.4 %.

Adult brook trout averaged 208 mm and 94.1 g with a mean K factor of 0.98 (N =173). Average size of brook trout decreased from 1994 (Pavol and Klotz 1995). Quality sized brook trout (> 229 mm) averaged 65 per mile (range 0 - 132), a 46.2 % decrease from 1994 (Table 3). The brook trout population in 1994 was characterized by older, larger fish with few age 1+ brook trout in the population (Pavol and Klotz 1995). Recruitment of the 1994 brook trout year class as age I+ fish, and the loss of older fish through natural mortality, probably reduced the average size of brook trout collected in the Lower Savage River during the 1995 survey.

Adult brown trout (N = 278) averaged 290 mm and 257.9 g with a mean K factor of 0.96. Quality size brown trout (> 305 mm) in the Lower Savage increased significantly from a mean of 151 per mile in 1994 to 255 per mile in 1995 (Table 3).

Brook trout reproductive indices were considered good in 1995, while brown trout reproductive success was fair (Table 4).

Discussion

Wild trout population indices in the Lower Savage River

generally improved in 1995, showing increases in the combined species standing crop, adult trout per mile, and quality sized brown trout per mile. After Trophy Trout regulations were first implemented on a limited basis in 1987, the wild brook trout population of the specially regulated portion of the Lower Savage increased quickly and was initially numerically dominant over the brown trout population. However, brown trout have generally increased their relative proportion of total trout standing crops and trout density in the Lower Savage River since 1987 while brook trout standing crops and densities have declined somewhat.

Since trophy regulations were extended throughout the Lower Savage River in 1991, and the stocking of hatchery trout was eliminated, wild trout standing crops have shown continued improvement (Figure 1). At the same time, brook and brown trout population parameters measured in 1993, 1994, and 1995 suggest an equilibrium may be developing with regard to wild trout species composition and standing crops in the Lower Savage River:

Year	% Adult Trout/mile (Total #)			% Total Stand.Crop		avg.lbs/
	Brown	Brook		Brown	Brook	acre
1993	58%	42%	(901)	80%	20%	45.2
1994	69%	31%	(635)	82%	18%	51.8
1995	62%	38%	(815)	81%	19%	55.4

-- Adult brook trout have consistently made up almost 20 percent of adult trout standing crops in the Lower Savage over the last three years while total wild trout standing crops have increased almost 23 percent for the same period, evidence that brook trout are maintaining a consistent proportion of total standing crops in the presence of an increasing population of wild brown trout. Brook trout comprised an average of 37 percent of all adult trout per mile from 1993 through 1995.

YOY brook trout produced in 1995 were about 50 percent more abundant than the 1994 year class (Table 4). The 1995 brook trout year class will recruit to adult status in 1996, thus allowing brook trout to at least maintain, and possibly increase, their current proportion of wild trout standing crops. Brown trout YOY abundance improved in 1995 after two relatively poor year classes in succession.

The continued presence of a viable wild brook trout component in the Lower Savage River trout fishery is desirable from a management perspective. Brook trout strike flies and lures aggressively and are relatively easier for fisherman to catch than brown trout (Cooper 1952), and thus contribute significantly to angler perception of fishing quality. Personal communications with fisherman on the Lower Savage indicate that the typical angler often catches primarily brook trout and perceives brook trout to be the numerically dominant trout species present.

Recommendations

All project work objectives for 1995 were accomplished. However, further study will be required in order to continue to monitor the response of wild brook and brown trout to trophy trout management in the Lower Savage River.

It is recommended that this study be continued in 1996.

Prepared by: Kenneth Pavol, Western Regional Manager and Alan Klotz, District I Biologist

Literature Cited

Cooper, E. L. 1952. Rate of exploitation of wild eastern brook trout in the Pigeon River, Michigan. Transactions of the American Fisheries Society 81: 224-234.

Pavol, K. W., and A. W. Klotz. 1995. Gear type and the associated hooking mortality on trout populations. Maryland Department of Natural Resources, Annapolis, MD. Project F-48-R, Study VI, Job 2.

Pavol, K. W., and A. W. Klotz. 1995. Lower Savage River trout population studies. Maryland Department of Natural Resources, Annapolis, MD. Project F-48-R, Study III, Job 2.

Figure 1. Wild trout standing crops in the Lower Savage River, 1991 - 1995.

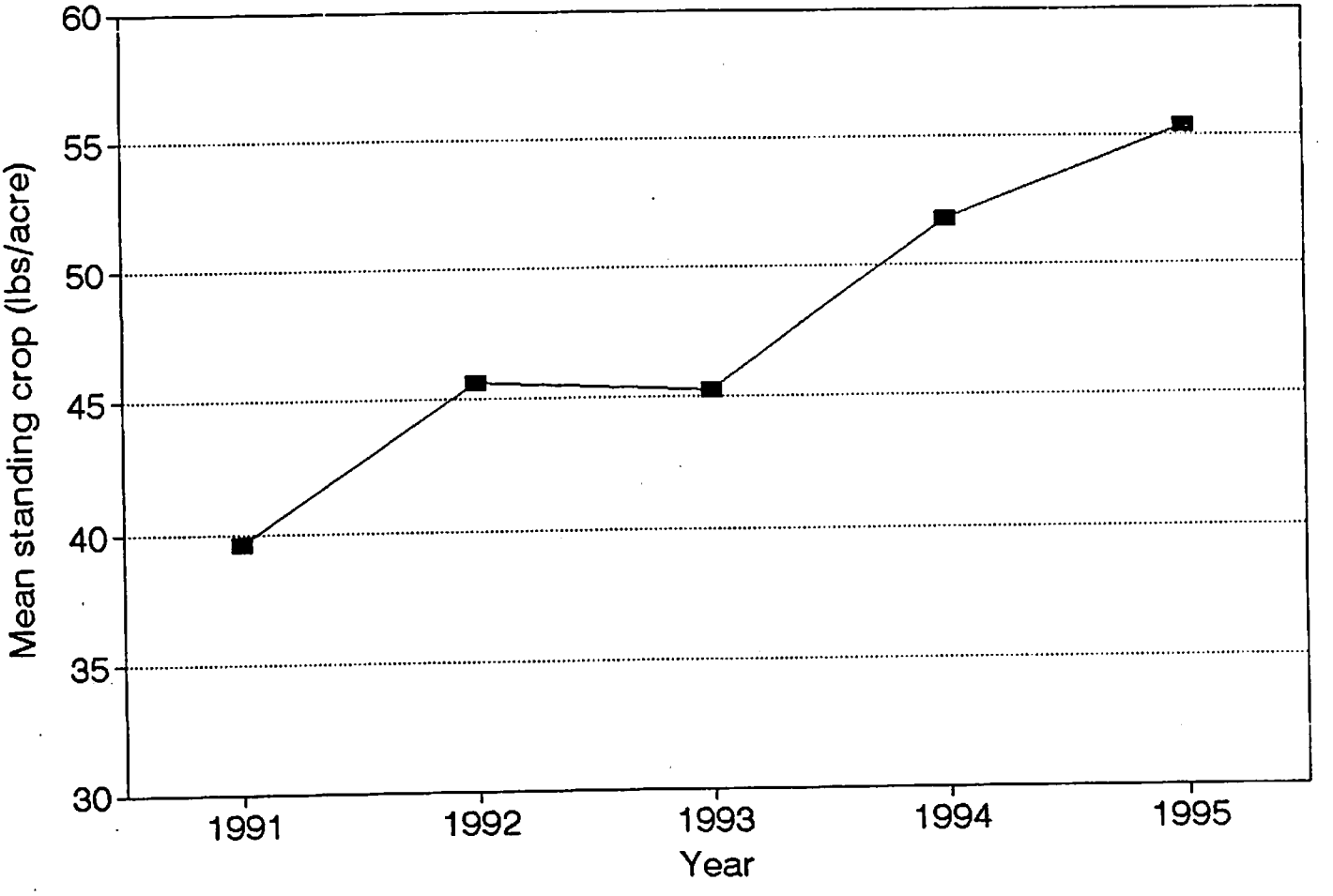


Table 1. Adult brook and brown trout standing crops, Lower Savage River, 1994 - 1995.

Brook Trout Station	Year	Brown Trout lbs/acre	lbs/acre	Combined lbs/acre
1	1994	17 + 3	58 + 2	75 + 4
	1995	15 + 1	70 + 1	86 + 1
2	1994	12 + 2	33 + 2	46 + 3
	1995	13 + 1	44 + 7	56 + 4
3	1994	8 + 1	49 + 2	57 + 2
	1995	11 + 1	61 + 4	73 + 4
4	1994	7 + 2	50 + 8	59 + 10
	1995	9 + 1	30 + 3	39 + 3
5	1994	1	21 + 1	22 + 1
	1995	4 + 1	19 + 1	23 + 2
Mean	1994	9.0	42.2	51.8
	1995	10.4	44.8	55.4

Table 2. Adult brook and brown trout densities, Lower Savage River, 1994 - 1995.

Brook Trout Station	Year	Brown Trout trout/mile	Combined trout\mile	trout\mile
1	1994	422 + 97	730 + 27	1135 + 60
	1995	405 + 26	959 + 13	1364 + 23
2	1994	229 + 52	308 + 15	537 + 40
	1995	422 + 27	361 + 56	783 + 55
3	1994	185 + 13	475 + 26	660 + 28
	1995	326 + 46	598 + 36	924 + 55
4	1994	132 + 43	493 + 78	642 + 103
	1995	299 + 30	378 + 42	678 + 50
5	1994	18	185 + 9	202 + 9
	1995	114 + 17	211 + 14	326 + 20
Mean	1994	197	438	635
	1995	313	501	815

Table 3. Estimated number of quality size trout/mile, Lower Savage River, 1994 - 1995.

Station	Year	Brook trout > 9 in.	Brown trout > 12 in.
1	1994	167	255
	1995	132	370
2	1994	106	106
	1995	53	202
3	1994	106	79
	1995	88	422
4	1994	88	238
	1995	53	185
5	1994	9	79
	1995	0	97
Mean	1994	95	151
	1995	65	255

Table 4. Young-of-the-year densities (trout/mile), Lower Savage River, 1994 -1995.

Station	Year	Combined	Brook	Brown
1	1994	871*	748*	123*
	1995	1646 + 269	1549 + 253	79 + 53
2	1994	854 + 232	801 + 232	44 + 19
	1995	1162 + 81	1065 + 75	88 + 17
3	1994	590 + 119	510 + 143	88 + 12
	1995	625 + 229	739 + 736	79*
4	1994	326*	273*	53 + 15
	1995	422 + 40	308 + 29	106 + 19
5	1994	194*	185*	9*
	1995	326 + 20	114 + 16	211 + 14
Mean	1994	567	503	63
	1995	836	755	113

* YOY trout were collected in an non-descending order. Zippen population estimates were considered non-reliable. The actual number of YOY collected was used to estimate the population.

Hunting Creek - Frederick County
Progress Report 1996

Fishery activities on Hunting Creek in 1995 included electrofishing surveys at four established stations (Hemlock Bridge, Elbow Pool, Bear Branch, and below Frank Bentz Pond) to assess trout populations and monitoring summer water temperatures. The three-pass removal technique described by Zippen was used to obtain population estimates for adult and young-of-year trout on 18, 19, and 20 July. Table 1 summarizes the 1995 Hunting Creek Zippen population data collected by electrofishing.

Hunting Creek supports one of the highest standing crops of naturally reproducing brown trout in Maryland. Since 1990, the standing crop of adult brown trout has averaged 60 lbs/acre within the tailwater. In 1995, the standing crop of adult brown trout was 120, 80, 63, and 27 lbs/acre at Hemlock Bridge, Elbow Pool, Bear Branch, and below Frank Bentz Pond, respectively. Both tailwater sites showed declines in standing crop, 8% at Elbow Pool and 30% at Bear Branch. At Hemlock Bridge, an area managed for wild trout, brown trout standing crop declined 15%. These declines were not unexpected as the 1994 standing crops were the highest ever recorded and the stream is believed to be at its carrying capacity. The only station to show an increase in standing crop was below Frank Bentz Pond (1994 - 20, 1995 - 27 lbs/acre), reflecting a stable population with a greater mean weight.

Natural reproduction of trout species in Hunting Creek was considered excellent in 1995. In line with past data, reproduction was greatest at Hemlock Bridge and decreased with downstream progression. The density of young-of-year brown trout at Hemlock Bridge, Elbow Pool, Bear Branch, and below Frank Bentz Pond was 653, 184, 104, and 61 YOY/acre, respectively. Natural reproduction on rainbow trout within the tailwater was also very good in 1995. Reproduction was greatest at Elbow Pool (111 YOY/acre) and significantly lower at Bear Branch (17 YOY/acre).

Stocked rainbow trout were less abundant in 1995 than in 1994, 59% less at Elbow Pool and 60% less at Bear Branch. However, the average weight in 1995 was 1.72 lbs., up 76% from the average weight of .98 lbs. recorded last year. The stocked brook trout were also larger in 1995; the average weight was .85 lbs in 1994, .97 lbs in 1995.

Two Ryan TempMentors were placed into Hunting Creek on 30 May and recovered on 5 October to assess summer stream temperatures. As in past years, one recorder was placed below the dam at the gauging station and one was placed in the vicinity of Bear Branch. Recorders were programmed to record water temperatures every hour continuously. The maximum daily temperatures recorded at both sites are presented in Figure 1. A maximum temperature of 69°F was recorded at the gauging station during early July, demonstrating that the dam is providing an excellent temperature regime for

trout within the tailwater. Further downstream at Bear Branch, a maximum temperature of 72°F was reached during early August.

Hunting Creek continues to be one of the most popular trout fisheries in Maryland. Very good, consistent natural reproduction has maintained an excellent abundance of brown trout. In addition, stocked brook and rainbow trout, reared by the Potomac Valley Fly Fishermen and the Maryland Fly Anglers as part of the cooperative trout rearing program, provide anglers with an opportunity to catch very large trout.

Recommendations

- continue annual monitoring of adult and young-of-year trout populations at the four established stations.

- continue monitoring summer stream temperatures at the gauging station and Bear Branch.

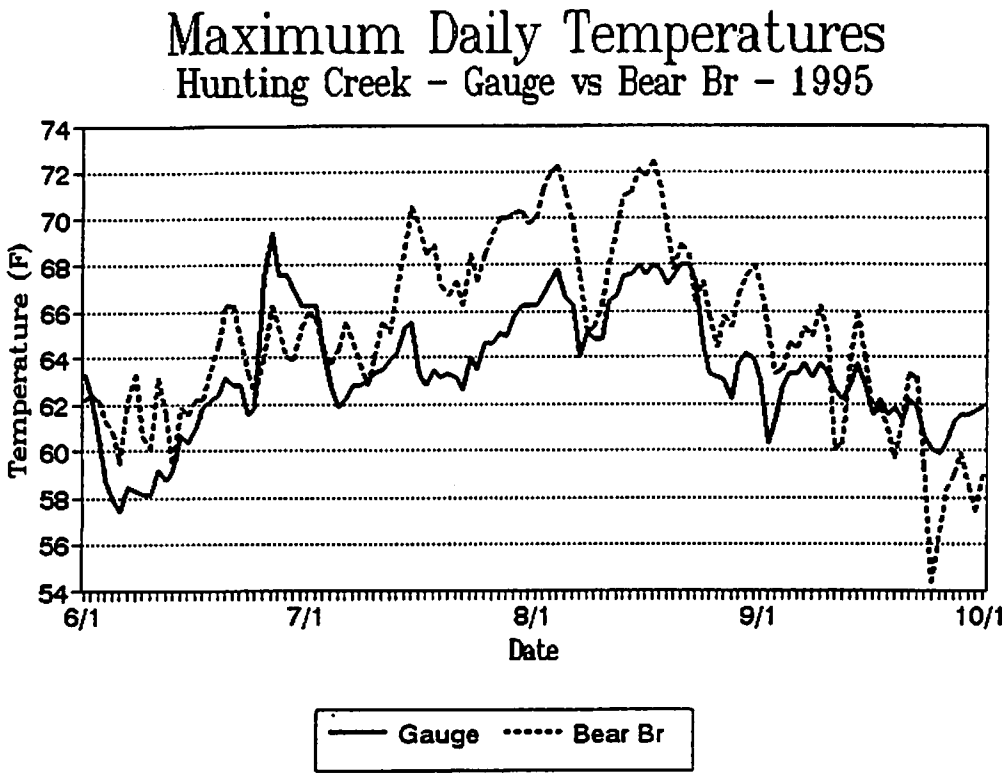
Literature Cited

Zippen, C. 1958. The Removal Method of Population Estimation. Journal of Wildlife Management 22:82-92.

Table 1. Summary of 1995 Hunting Creek Zippen population data for adult and young-of-year trout collected by electrofishing.

	TOTAL	BROOK	BROWN	RAINBOW
Hemlock Bridge				
Standing Crop (lbs/acre)	110	9	102	
Density - (trout/acre)	1101	171	930	
(trout/mile)	1657	257	1399	
(YOY/acre)	824	166	653	
Elbow Pool				
Standing Crop (lbs/acre)	283	91	74	117
Density - (trout/acre)	524	90	368	66
(trout/mile)	1100	189	773	138
(YOY/acre)	295	0	184	111
Bear Branch				
Standing Crop (lbs/acre)	84	14	44	26
Density - (trout/acre)	233	17	198	17
(trout/mile)	488	36	415	36
(YOY/acre)	125	3	104	17
below Frank Bentz				
Standing Crop (lbs/acre)			27	
Density - (trout/acre)			83	
(trout/mile)			243	
(YOY/acre)			61	

Figure 1. Maximum Daily Temperatures, Hunting Creek, 1995



Owens Creek - Frederick County
1995 Progress Report

Fish management activities on Owens Creek in 1995 included: electrofishing surveys to assess the native brook and wild brown trout populations within Catoctin Mountain National Park, assessing the over-summer survival of stocked adult trout within the Put-and-Take/Catch-and-Return Area, and monitoring summer stream temperatures.

On 28 June two established stations within Catoctin Mountain National Park (Campground, Lower Park Boundary) were surveyed using the three-pass depletion method described by Zippen to obtain population estimates for adult and young-of-year (YOY) trout. The population data for adult and YOY trout collected at the Campground station is summarized below:

	TOTAL	BROOK	BROWN
Standing crop (lbs/acre)	41	33	9
Density - trout/acre	294	250	44
trout/mile	484	412	73
YOY/acre	255	225	25

After four consecutive gains in brook trout density following the termination of put-and-take stocking, the 1995 survey documented a 52% decrease (Figure 1). The standing crop (lbs/acre) of adult brook trout, however, decreased by only 8%. This suggests that fewer yearlings were present in 1995 than in 1994, even though a good hatch of brook trout (167 YOY/acre) occurred last year. The excellent hatch in 1995 (225 YOY/acre) is expected to increase brook trout density in 1996. However, the brook trout standing crop appears to be stabilizing, indicating that the population may be approaching the streams carrying capacity (Figure 1). Based on our electrofishing data, we estimate the brook trout carrying capacity at the Campground station to be between 30 and 40 lbs/acre. Adult brown trout density and standing crop values recorded in 1995 were very similar to 1994 values and have remained very stable (Figure 1).

The population data for adult and YOY trout collected from the Lower Park station is summarized below:

	TOTAL	BROOK	BROWN
Standing Crop (lbs/acre)	21	5	15
Density - trout/acre	90	36	54
trout/mile	156	62	94
YOY/acre	108	101	25

Although the abundance of both adult brook and brown trout have shown notable increases after put-and-take stocking was discontinued in 1990, the density of both species has fluctuated from year to year. The brook and brown trout standing crops, however, have been much more stable and also appear to be stabilizing (Figure 2). Natural reproduction of brook trout was good (101 YOY/acre) in 1995; natural reproduction of brown trout was poor (25 YOY/acre).

The two electrofishing stations (High Bridges, Roddy Rd) established within the Put-and-Take/Catch-and-Return Area in 1994 were surveyed again in 1995 to assess the over-summer survival of stocked trout. A total of 300 adult brown trout were stocked within the Put-and-Take/Catch-and-Return Area during early June of 1994 and 1995 to supplement the number of trout surviving from the annual spring stockings. Both stations were surveyed using backpack electrofishing gear on 29 June, 27 July, and 29 August. The three-pass depletion method described by Zippen was used to obtain population density data.

Surprisingly, in 1995 trout abundance did not decrease successively each month as might be expected. The density of trout (all species) at the High Bridges was 342, 457, and 300 trout/acre at the end of June, July, and August, respectively. The density of trout at Roddy Road was 291, 145, 218 trout/acre during the same months. The variation suggests that fish may be moving in and out of our sample area or that the surveys were not uniformly efficient over the three survey dates. A very large brown trout, 22 inches in length and weighing 4.25 pounds, was collected from the Roddy Road station during the June survey. This fish was not captured or seen during the other two surveys. In either case, the population data suggests that a fishable population of hatchery trout should remain available to anglers throughout the summer months during most years.

Ryan TempMentors were placed into Owens Creek at two locations (Route 550 below Lantz, Franklinville Rd.) on 30 May and recovered on 5 October to monitor

summer water temperatures within the Put-and-Take/Catch-and-Return Area. The recorders were programmed to record water temperatures every hour continuously. A maximum temperature of 80°F was recorded during mid-July at Route 550. On the same date, a maximum temperature of 76°F was recorded at Franklinville Road. The mean daily temperatures recorded at both stations are shown in Figure 3. Mean daily temperatures exceeded 68°F a total of 37 days at Route 550 and 38 days at Franklinville Road. Similar to 1994, there is no significant difference in temperature between the two locations. High summer water temperatures combined with low flows are considered to be the primary limiting factors affecting the degree of summer trout survival.

Owens Creek is providing a diversity of trout angling opportunities throughout the year. The native brook and wild brown trout populations in Catoctin Mountain National Park are stabilizing after immediate increases in density and standing crop following wild trout management in 1991. The more catchable brook trout have responded to wild trout management to a greater extent than the brown trout. After monitoring stream temperatures and the survival of stocked adult trout during the summer of 1994 and 1995, it is my judgement that the Put-and-Take/Catch-and-Return regulation has some merit in extending trout fishing recreation in streams that can not support natural trout populations but may support stocked adult brown trout.

Recommendations

- continue monitoring natural trout populations within Catoctin Mountain National Park

- continue stocking 300 to 500 adult brown trout within the Put-and-Take/Catch-and-Return Area during early June to supplement the number of stocked trout surviving from the spring put-and-take stockings.

Literature Cited

Zippen, C. 1958. The removal method of population estimation. Journal of Wildlife Management 22:82-90

Figure 1. Density of yearling and older trout, Owens Creek, Campground 1989 - 1995

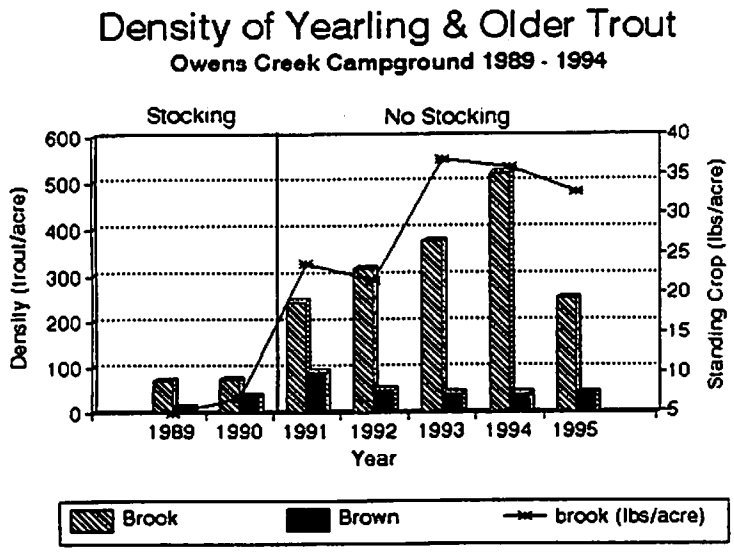
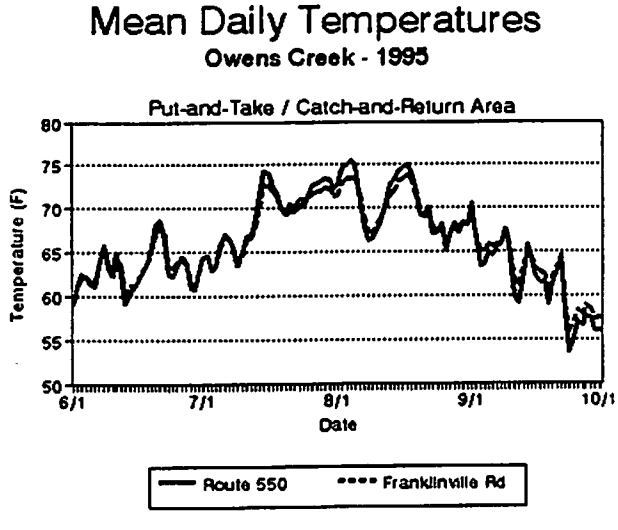


Figure 2. Standing Crop of Adult Trout, Owens Creek, Lower Park 1989 - 1995

Figure 3. Mean Daily Temperatures, Owens Creek Put-and-Take/Catch-and-Return Area 1995.



Fishing Creek - Frederick County
Progress Report - 1995

Fishing Creek and the right fork of Fishing Creek are small freestone headwater streams on the east slope of Catoctin Mountain in Frederick County. Both streams have historically supported native brook trout as well as provided spring put-and-take fishing. Beginning in 1990, no hatchery trout have been stocked into the right fork; the creel limit is two trout per day rather than five trout per day in put-and-take areas. The left fork (Fishing Creek) is still managed as a spring put-and-take area and is stocked with 4000 hatchery rainbow trout annually. The left fork has been used as a control to measure the changes occurring in the right fork as a result of wild trout management.

Electrofishing surveys have been conducted on both forks of Fishing Creek annually since 1988. During 1995, the brook trout populations were surveyed using electrofishing gear at four established stations, two on the left fork (LFL - left fork lower, LFU - left fork upper) and two on the right fork (RFL - right fork lower, RFU - right fork upper). The three pass removal method described by Zippen was used to obtain population data for adult and young-of-year trout on 7 and 8 August.

The standing crop of adult brook trout in both forks of Fishing Creek, 1988 - 1995, is shown in Figure 1. Adult trout standing crop at the RFL station was 45 lbs/acre in 1995. As shown on the graph, brook trout standing crop peaked on the right fork at 55 lbs/acre in 1991, the year after stocking ceased. The standing crop then fell to less than half that value in 1992, but has since increased each year reaching the second highest standing crop (45 lbs/acre) in 1995. The standing crop at the LFL station, an area heavily stocked and fished, has remained relatively constant around 10 lbs/acre (Figure 1).

Adult brook trout in the right fork (no stocking) have a greater mean length (6.0") than brook trout in the put-and-take area on the left fork (5.3"). This difference was found to be significant at the 97.5% confidence level. The largest brook trout collected from the right fork was 11.1 inches in total length compared to 7.9 inches in the left fork.

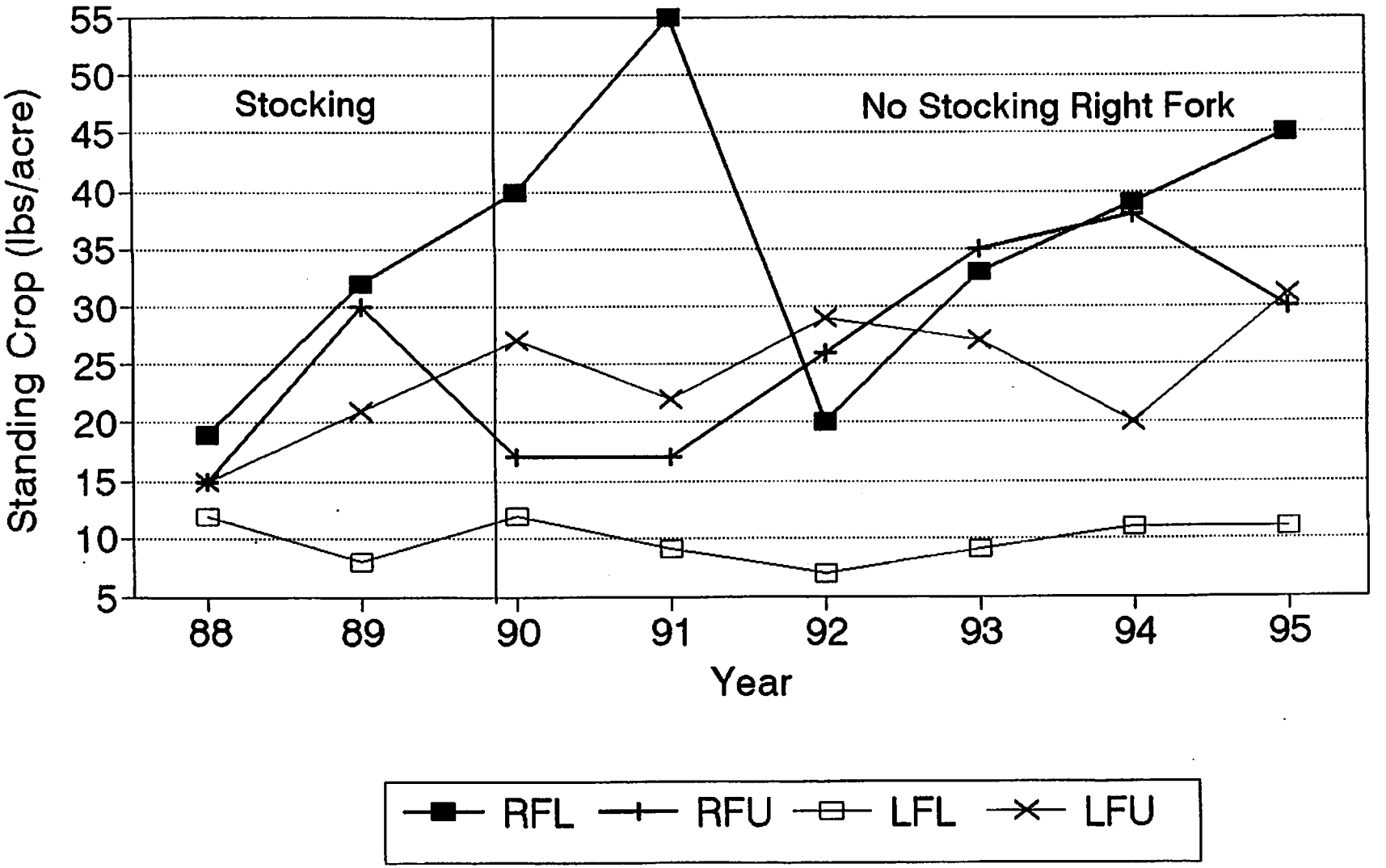
Natural reproduction of brook trout was considered excellent at all survey locations. Young-of-year were most abundant at the RFL station (1055 YOY/acre) and least abundant at the LFL station (204 YOY/acre).

Recommendations

- begin monitoring the Fishing Creek brook trout populations biannually to remain up-to-date on their status.

Fishing Creek 1988 - 1995

Adult Trout Standing Crop



Little Antietam Creek
Progress Report - 1995

Little Antietam Creek supports one of the only self-sustaining wild rainbow trout fisheries in Maryland. This unique resource was surveyed by fisheries personnel on 3 July to obtain population estimates for adult and young-of-year trout. The three-pass removal method described by Zippen was used at two previously established stations, Rowe Road and Gardenhour Road. Summaries, by station, of the rainbow trout population data collected by electrofishing is shown below:

Rowe Road

Standing Crop (lbs/acre)	48
Density - (trout/acre)	242
(trout/mile)	496
YOY/acre	443

Gardenhour Road

Standing Crop (lbs/acre)	45
Density - (trout/acre)	226
(trout/mile)	515
YOY/acre	56

Population data at both stations were very similar in 1995. The standing crop of adult rainbow trout was 48 lbs/acre at Rowe Rd. and 45 lbs/acre at Gardenhour Rd., indicative of a high quality resource. The population size structures were also very similar. The percentage of trout collected less than 9", between 9 and 12", and greater than 12" was (81, 13, 6%) respectively at Rowe Rd and (79, 15, 5%) respectively at Gardenhour Rd. Natural reproduction was excellent in 1995 at Rowe Rd.(443 YOY/acre), but only fair downstream at Gardenhour Rd. (56 YOY/acre).

Management Recommendations

- continue biannual electrofishing surveys of the wild rainbow trout fishery to monitor its status and to keep abreast of changes in the watershed that may impact this valuable resource.

Literature Cited

Zippen, C. 1958. The Removal Method of Population Estimation. Journal of Wildlife Management 22: 82-92.

Little Hunting Creek - Frederick County
Progress Report - 1995

Little Hunting Creek was removed from the list of put-and-take trout fishing areas in 1993 to allow the native brook and wild brown trout populations to expand. Under put-and-take regulations, the Manor Area (Cunningham Falls State Park) was subject to a five trout per day creel limit with no bait restrictions. Beginning with the 1994 fishing season, the Manor Area has been subject to catch-and-return, artificial lure only restrictions. Such restrictions are necessary to protect this highly accessible resource from the heavy fishing pressure generated by the adjacent public picnic area.

Electrofishing surveys were conducted on three established stations (Catoctin Hollow Road - CHR, Manor Area - MA, Hunting Creek Hatchery property - HCH) to document the response of the wild trout populations to the regulation changes. The Catoctin Hollow Road and Manor Area stations have similar physical habitat and flow characteristics. The Hunting Creek Hatchery station has a lower gradient, a greater diversity of fish species, and flows altered by the withdrawal and discharge of water for hatchery operations. Therefore, comparisons between trout populations at the CHR and MA stations would most accurately represent changes occurring within the Manor Area as a result of the regulation change. The three-pass removal technique described by Zippen was used to obtain population estimates for adult and young-of-year trout.

A summary of the population data collected at each of the three stations by electrofishing is shown in Table 1. Adult trout density and standing crop continue to decline at the Hunting Creek Hatchery station. Poor reproduction in 1994 (5 YOY/acre) resulted in few yearlings present in 1995. In addition, the large pool and undercut roots at the beginning of the station contained several very large brown trout during past surveys which were not recovered during the 1995 survey. The absence of these fish has drastically reduced the standing crop. Natural reproduction of brown trout was also poor (16 YOY/acre) in 1995. Excellent reproduction at the two upstream stations, however, may increase trout abundance at the HCH station in 1996.

The summary of adult trout standing crops for the Catoctin Hollow Road and Manor Area stations, 1989 - 1995, are shown in Figure 1. The line graph represents brook, brown, and total trout standing crops at Catoctin Hollow. Due to the very limited fishing access and stable watershed, this station serves as a control for monitoring changes that occur in the trout population at the Manor Area, represented by the bar portion of the graph. For these reasons, changes occurring at Catoctin Hollow are believed to be the result of changes in the physical environment rather than fishing.

The most significant result of wild trout management thus far has been the presence of adult and young-of-year brook trout within the Manor Area (Figure 1). Prior to catch-and-release regulations and no-stocking, few in any brook trout were collected during electrofishing surveys. The brook trout standing crop at the Manor Area in 1994 was 3 lbs/acre and increased to 8 lbs/acre in 1995, higher than the standing crop recorded at Catoctin Hollow (6 lbs/acre) in 1995. The recent contribution of brook trout to the Manor Area has brought the total standing crop to 22 lbs/acre in 1995. Past surveys within the Manor Area have not documented total standing crops above 18 lbs/acre (Figure 1). Total standing crop at the Manor Area is expected to increase in 1996 due to excellent reproduction during 1995.

Natural reproduction of trout species upstream of Route 15 was excellent in 1995 (Figure 2). The electrofishing surveys found 174 brook YOY/acre and 190 brown YOY/acre within the Manor Area. A total of 187 brook YOY/acre and 211 brown YOY/acre were collected from the Catoctin Hollow station. Favorable environmental conditions throughout the winter of 1994 and spring of 1995 are thought responsible for the large yearclass. Natural reproduction of trout species was generally very good to excellent in other Frederick County streams as well. Unfortunately, the winter of 1995 has been more severe than normal. Extremely cold temperatures caused extensive formations of anchor ice. In addition, the "Blizzard of '96" was followed by a warming trend with heavy downpours resulting in widespread flooding of the Potomac drainage during the end of January. Flows may have been high enough to cause scouring of stream bottoms, particularly high gradient streams such as Little Hunting Creek. As a result, trout reproduction is expected to be poor in 1996.

Recommendations

- Continue annual monitoring of wild trout populations to document changes that occur as a result of wild trout management, catch-and-return regulations, and the winter 1995 flood.

Literature Cited

Zippen, C. 1958. The removal method of population estimation. Journal of Wildlife Management 22:82-90

Table 1. Summary of adult and young-of-year trout population data, Little Hunting Creek, 1995.

	TOTAL	BROOK	BROWN
Catoctin Hollow			
Standing Crop (lbs/acre)	54	6	48
Density - trout/acre	139	42	96
trout/mile	301	92	210
YOY/acre	404	187	211
Manor Area			
Standing Crop (lbs/acre)	22	8	14
Density - trout/acre	114	38	76
trout/mile	332	111	221
YOY/acre	370	174	190
Hunting Ck Hatchery			
Standing Crop (lbs/acre)	25		25
Density - trout/acre	66		66
trout/mile	109		109
YOY/acre	33	16	16

Figure 1.

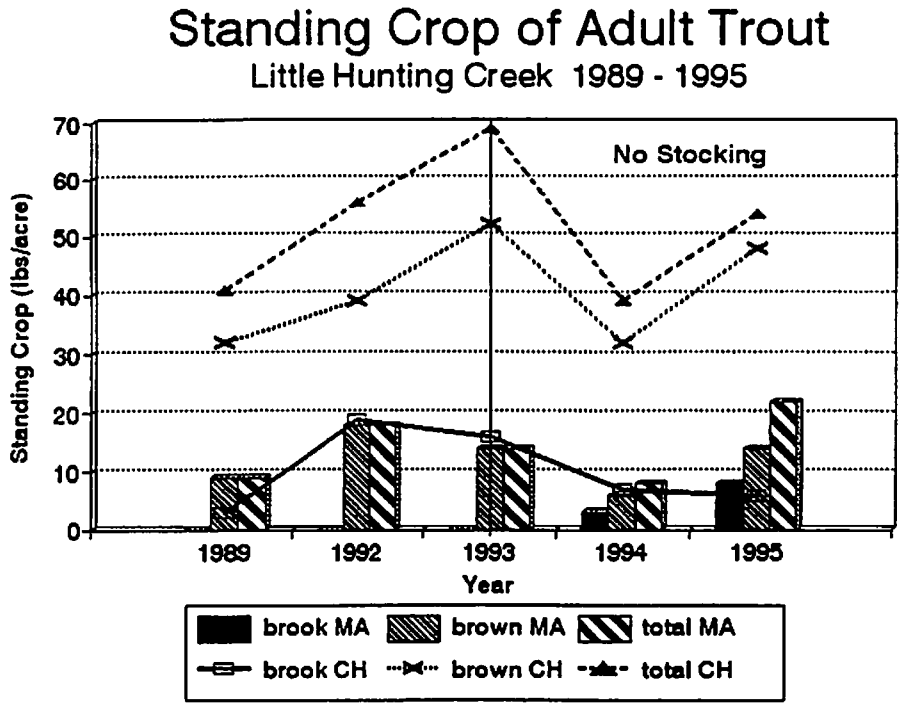
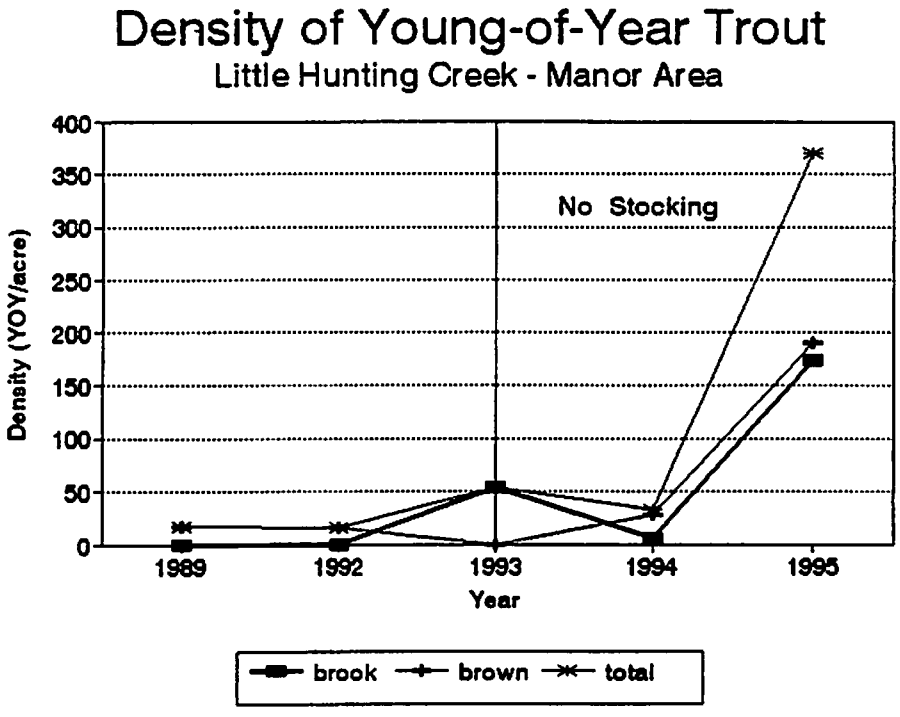


Figure 2.



INDIVIDUAL STREAM STUDIES

- 1995 -

Central Fisheries Management Region

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Gunpowder River Tailwater (Baltimore County)
1995 Status Report

Freshwater fisheries personnel continued trout population studies on the Gunpowder Falls tailwater to monitor changes in the population structure, natural reproduction, and response to changes in fishing regulations. Water temperatures were monitored at hourly intervals at three sites using continuous recording Ryan TempMentors. TempMentors were installed at the Falls Road, York Road, and Blue Mount Road electrofishing stations located approximately 1.2, 4.2, and 7.3 miles respectively below Prettyboy dam.

Water temperatures at each of the three TempMentor stations were monitored between 9 June and 18 October 1995. The maximum water temperatures recorded in degrees Fahrenheit during the monitoring period for the Falls Road and York Road stations were 72.1°F and for the Blue Mount Road site 72.3°F. On average, water temperatures above Falls Road were coldest and demonstrated the smallest daily variations of the three sites monitored (Figures 1, 2, 3). Two thermal spikes resulting in water temperatures above 68° F were observed all three TempMentor stations. Both spikes occurred as a result of spillovers from the reservoir. The spillovers were caused by summer rainstorms that temporarily elevated water temperatures above 68°F for 35 1/2 hours between 7 and 8 July and 12 hours on 11 July (Figure 4). The water temperatures stayed well below the 68°F mark for the remainder of the monitoring period. Overall, the flow regime and water temperatures in the Gunpowder Falls tailwater were excellent for trout.

The warmest tailwater temperatures for the last six year period occurred in 1989 when maximum water temperature reached 73.8°F at the Blue Mount Road station. Little Falls remains the single greatest thermal impact to the Gunpowder Falls tailwater downstream of Blue Mount Road.

Trout populations were evaluated using the Zippin three pass removal method at six tailwater locations[1] ranging in distance from one half to seven miles downstream of the dam. Fish were collected using a barge mounted 1.5 kilowatt electrofisher at all stations except the Dam/Falls station where two battery operated Smith-Root Type XII backpack electrofishers were operated side by side. All trout collected were weighed, measured, and identified to species.

Figures 5 and 6 show combined adult trout species densities (trout/mile) and standing crops (pounds/acre) for the years 1991 to 1995. Combined trout population densities demonstrated slight declines in 1995 in the Masemore Road (7%) and Bunker Hill Road (2%) stations. The Blue Mount Road station experienced the greatest

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[1]The Quarry and Glencoe stations were not sampled in 1995 due to high water levels and time constraints.

decline at 35%. Falls Road and York Road stations showed slight increases of 17% and 14% respectively. Dams/Falls remained unchanged from 1994. Standing crops for the combined trout species decreased slightly in 1995 in four of the five stations. Combined trout standing crop ranged from a low of 15 pounds/acre at the Blue Mount station to a high of 127 pounds/acre at the Dam/Falls station.

In 1995, adult brown trout densities (trout/mile) increased slightly in the Falls Road (14%), Masemore Road (2%), Bunker Hill Road (0.4%) and York Road (15%) stations, remained unchanged in the Dam/Falls station, and decreased at the Blue Mount Road station (35%) (Figure 7). Adult brown trout densities remained very high in 1995, ranging from a low of 308 trout/mile at the Blue Mount station to a high of 2274 trout/mile at the Dam/Falls station.

Adult rainbow trout were found in five of the six sample stations in 1995. Standing crop estimates, however, remain low ranging from 1 to 11 pounds/acre with the highest estimates calculated for the Falls Road station (Figure 8). A few brook trout were found at most stations, but standing crops and densities were not calculated for this species due to their rarity. One stream bred tiger trout (brook X brown) hybrid was also recovered in the 1995 fish survey at the Dam/Falls site.

Natural reproduction of brown trout was again confirmed in 1995, and recruitment was the second best since natural reproduction was first documented in 1989. All six stations surveyed in 1995 showed dramatic density (yoy/mile) increases for brown trout over 1993 and 1994 (Figure 9). Young-of-year densities ranged from a low of 406 yoy/mile in the Dam/Falls station to a high of 1898 yoy/mile in the Masemore station.

Staff confirmed natural reproduction of rainbow trout in the tailwater for the fifth year. While rainbow trout yoy were captured in four upstream stations in 1994, in 1995 rainbow trout yoy were found in only three upstream sampling sites. Density (yoy/mile) of rainbow trout young-of-year decreased at the Dam/Falls and Masemore Road sample sites by 13% and 15% respectively but increased dramatically at the Falls Road site (281%) in 1995 (Figure 10).

Consistent with past surveys, the greatest numbers of young-of-year rainbow trout continued to be found above Falls Road. A combined total of 57 rainbow trout young-of-year were captured in 1995 compared to 38, 13, 51, and 143 in 1994, 1993, 1992 and 1991, respectively. The rainbow trout population in the tailwater does not appear to have a promising future regarding the maintenance of a self-sustaining, fishable population. The lack of spawning habitat upstream of Falls Road and the presence of a growing brown trout population are suspected as being the two most prominent factors limiting the rainbow trout population in the tailwater.

Hooking injuries were recorded for all six stations during the 1995 fish population surveys. Eleven percent (11%) of all adult trout collected (130 of 1143) exhibited hooking injuries. Overall, hooking injuries were highest for rainbow trout at 49% (18 of 37) followed by brook trout at 40% (4 of 10) and then by brown trout at 10% (108 of 1096). The consistently low incidence of hooking injuries for the brown trout has implicated it as having the lowest catchability of the three trout species in the Gunpowder Falls tailwater. Similar results have been found in previous years regarding hooking susceptibility of the three trout species in the tailwater.

Informal stream side interviews of fishermen conducted by Freshwater Fisheries staff in 1995 implicated catch rates were down and the annual caddis hatch was very poor at best. It is our opinion that poor catch rates resulted from a combination of the following two factors. Poor brown trout recruitment in 1993 and 1994 provided fewer easy to catch young trout for anglers in 1995. Secondly, a predominance of older brown trout from the 1992 year class has proven more difficult to fool as they have experienced three plus seasons of intense catch and release fishing. Bank full water releases occurring in September and October in response to drought conditions are suspected to have kept anglers from witnessing the caddis hatch as the high water kept most fly anglers from fishing during this time.

Staff conducted a redd count on foot and by canoe on 22 November 1995. The section surveyed extended from Prettyboy Dam through the Blue Mount station and along upper Glencoe Road. A combined total of 343 redds were counted, and many actively spawning trout were observed during the canoe float. The record high redd count of 1995 is further testimony to the growing, well established tailwater brown trout fishery. No trout stocking has taken place in the catch-and-return portions of the Gunpowder Falls tailwater since 1993 due to increasing natural recruitment. The last trout stocking in the catch-and-return area consisted of fingerling brown trout in the spring of 1992.

It now appears the tailwater has attained our desired objective of self-sustaining wild trout status. Freshwater Fisheries Division staff plans to continue annual monitoring of the trout population and water temperatures into the future. Management proposals for the tailwater downstream of Blue Mount Road are anticipated for 1997.

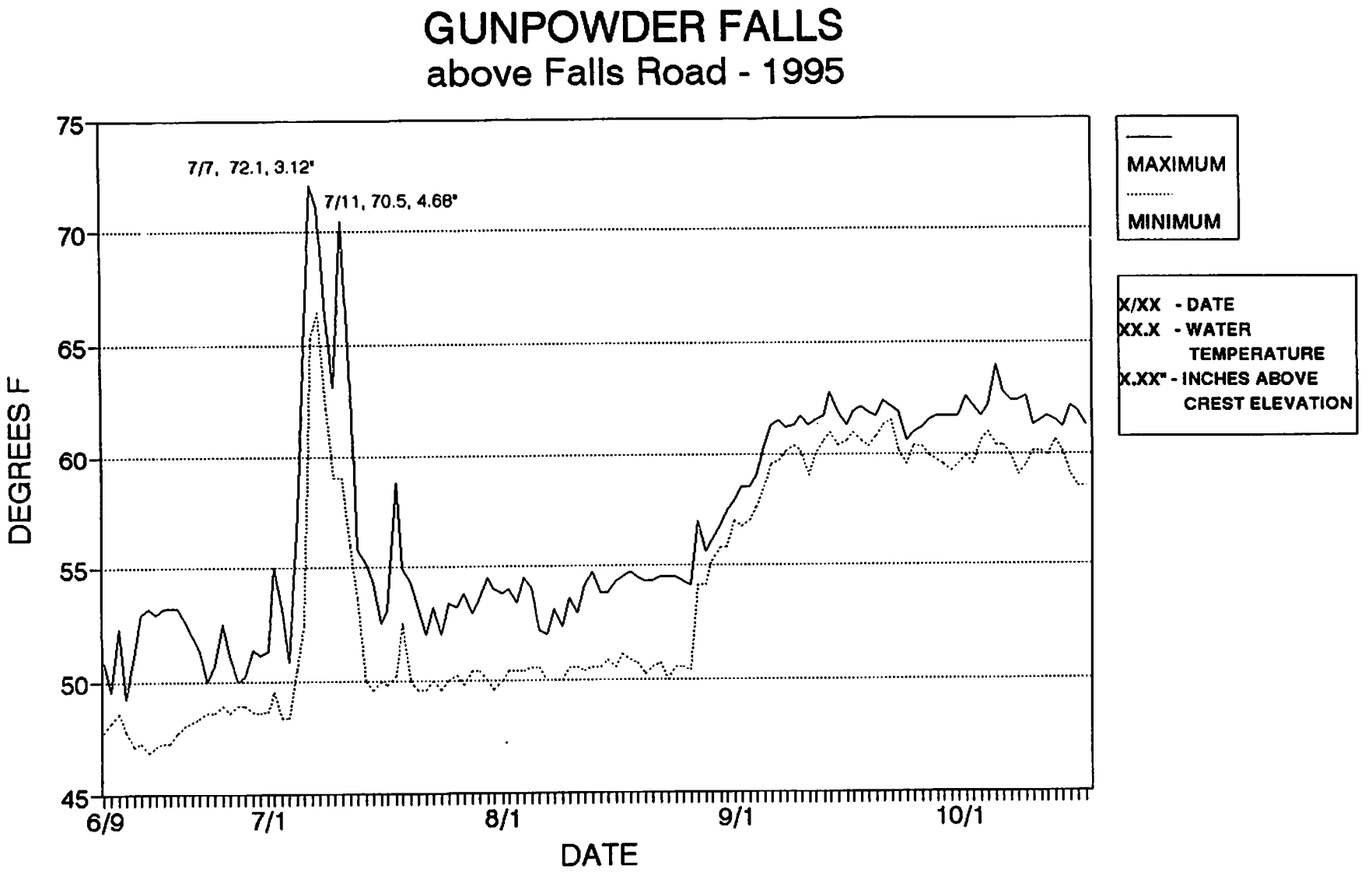

Figure 1. Water temperatures recorded above Falls Road in Gunpowder Falls between June and October 1995 with a contineous recording device.

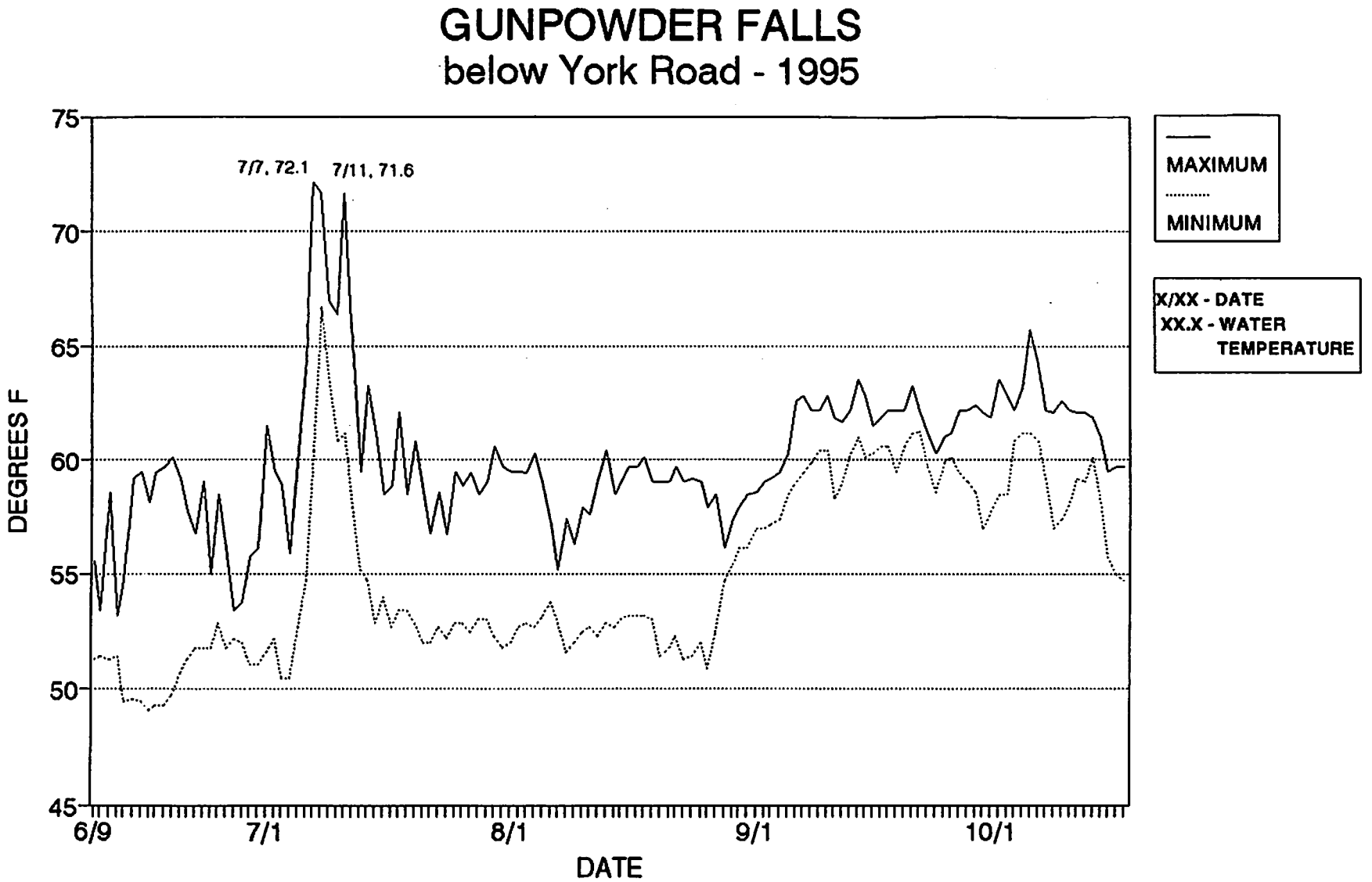

Figure 2. Water temperatures recorded below York Road in Gunpowder Falls between June and October 1995 with a contineous recording device.

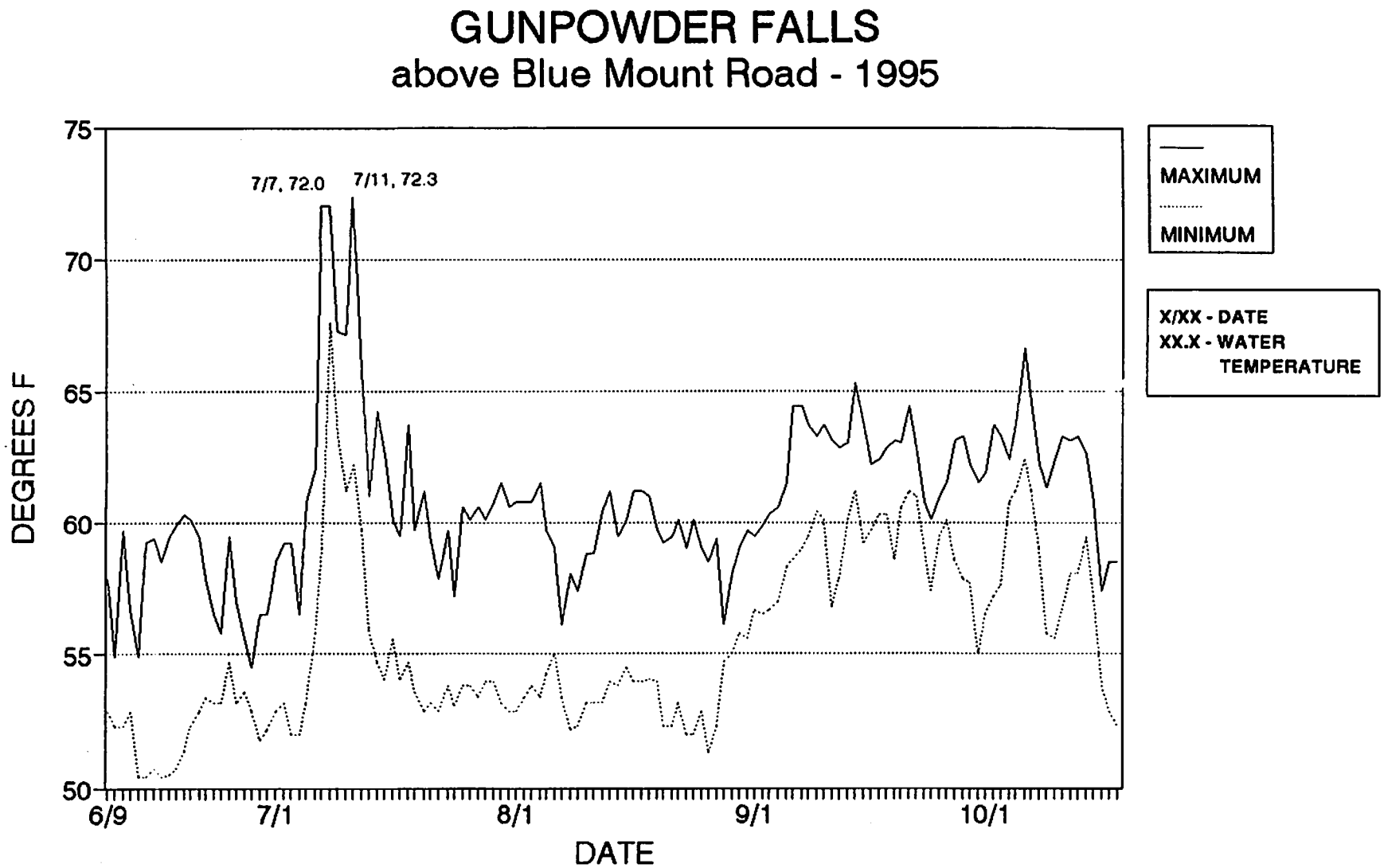

Figure 3. Water temperatures recorded above Blue Mount Road in Gunpowder Falls between June and October 1995 with a contineous recording device.

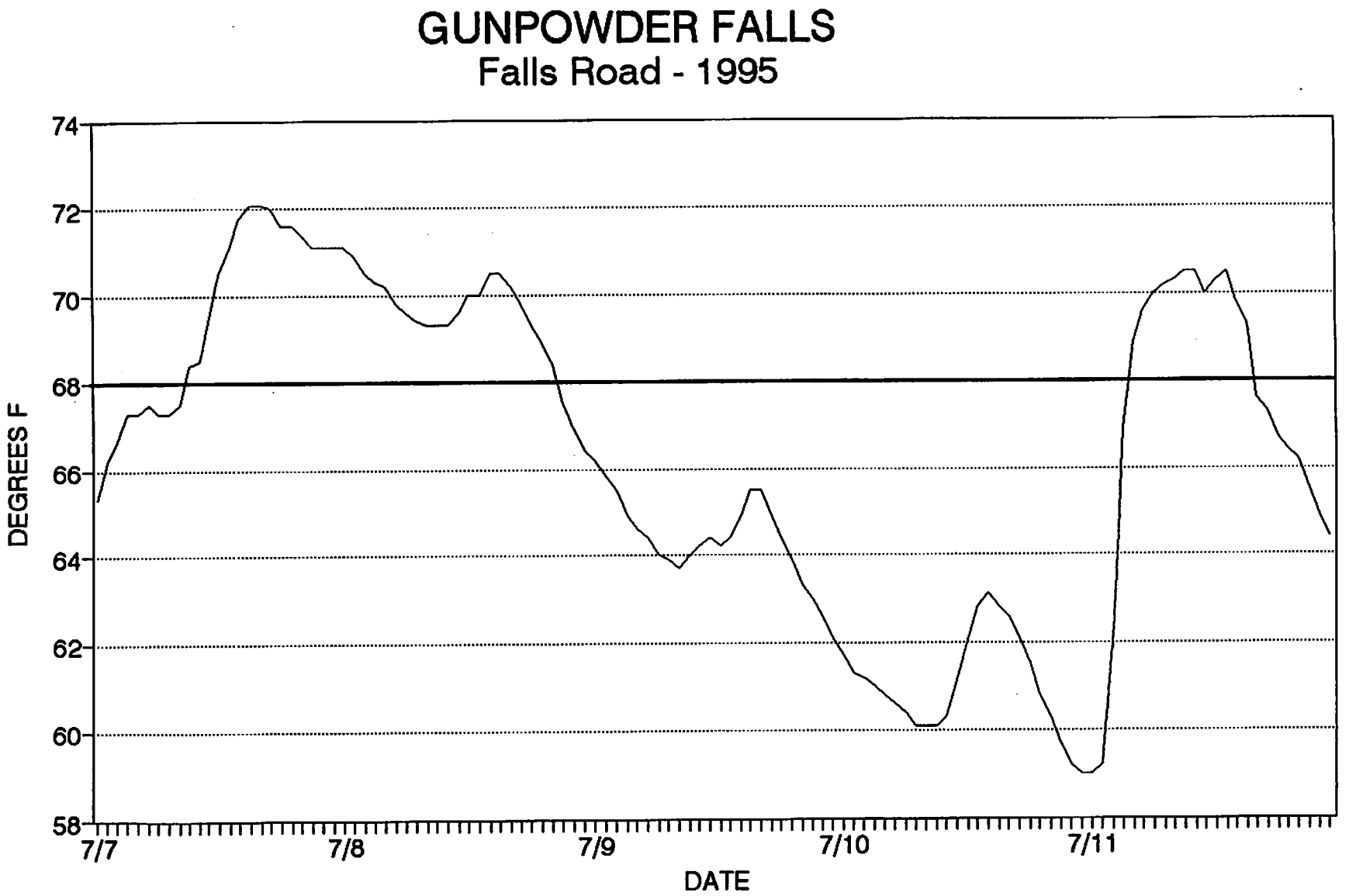

Figure 4 . Water temperatures recorded above Falls Road in Gunpowder Falls between 7 July and 11 July 1995.

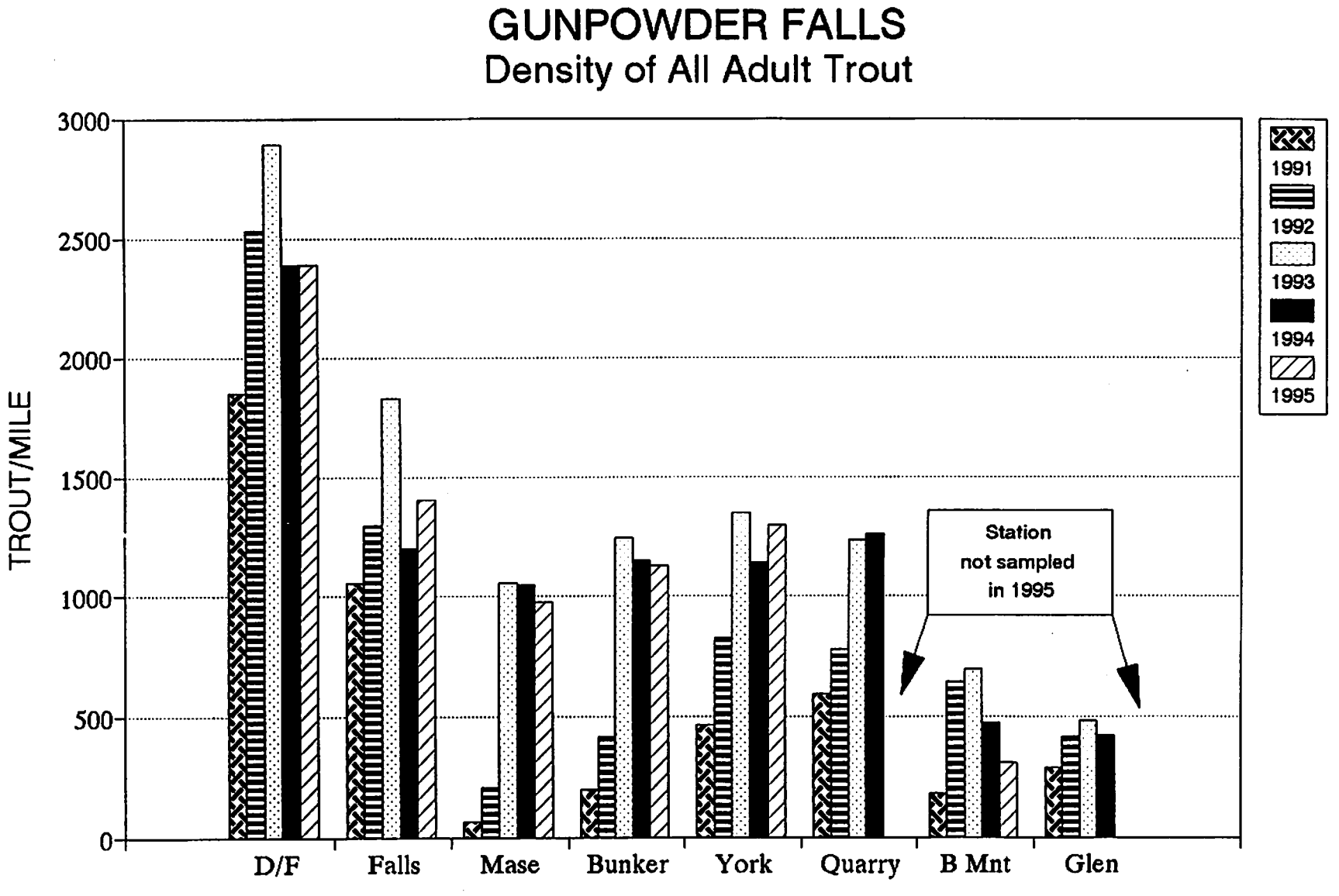

Figure 5. Fall density estimates (trout/mile) for 1+ year old and older trout of all species in Gunpowder Falls tailwater in 1991-1995.

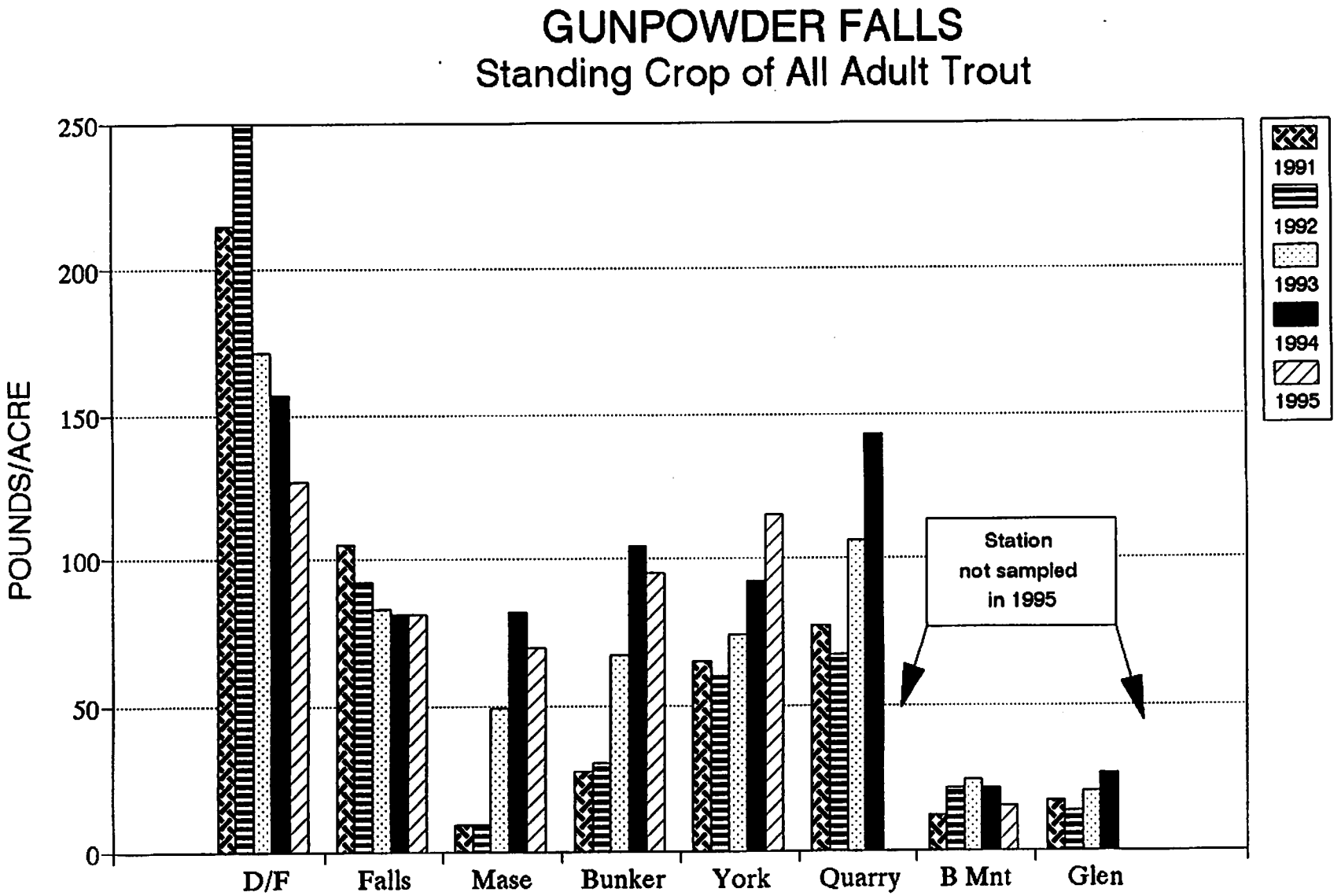

Figure 6. Fall standing crop (lbs/acre) for 1+ year old and older trout of all species in Gunpowder Falls tailwater in 1991-1995.

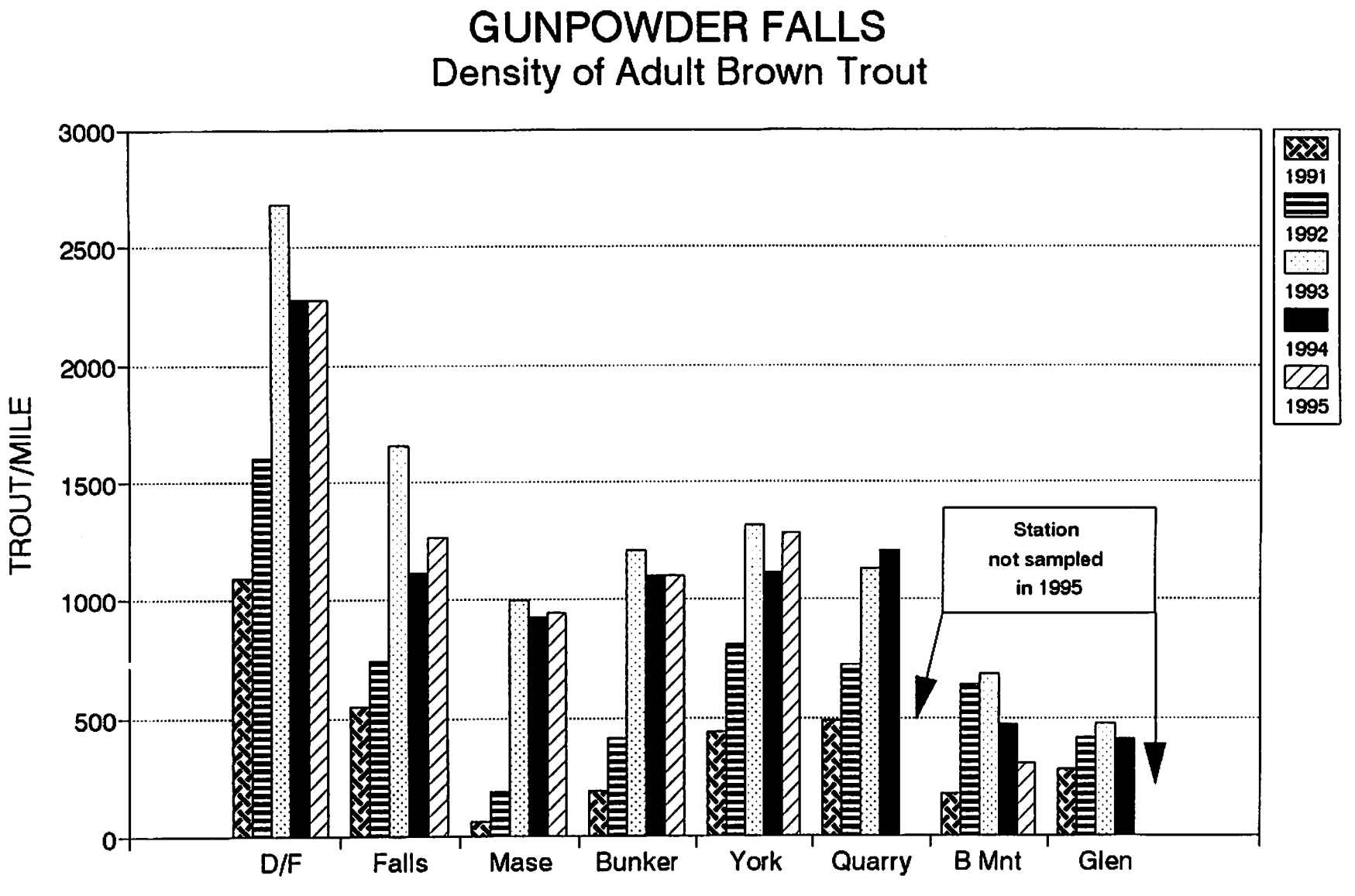

Figure 7. Fall density estimates (trout/mile) for 1+ year old and older brown trout in the Gunpowder Falls tailwater in 1991-1995.

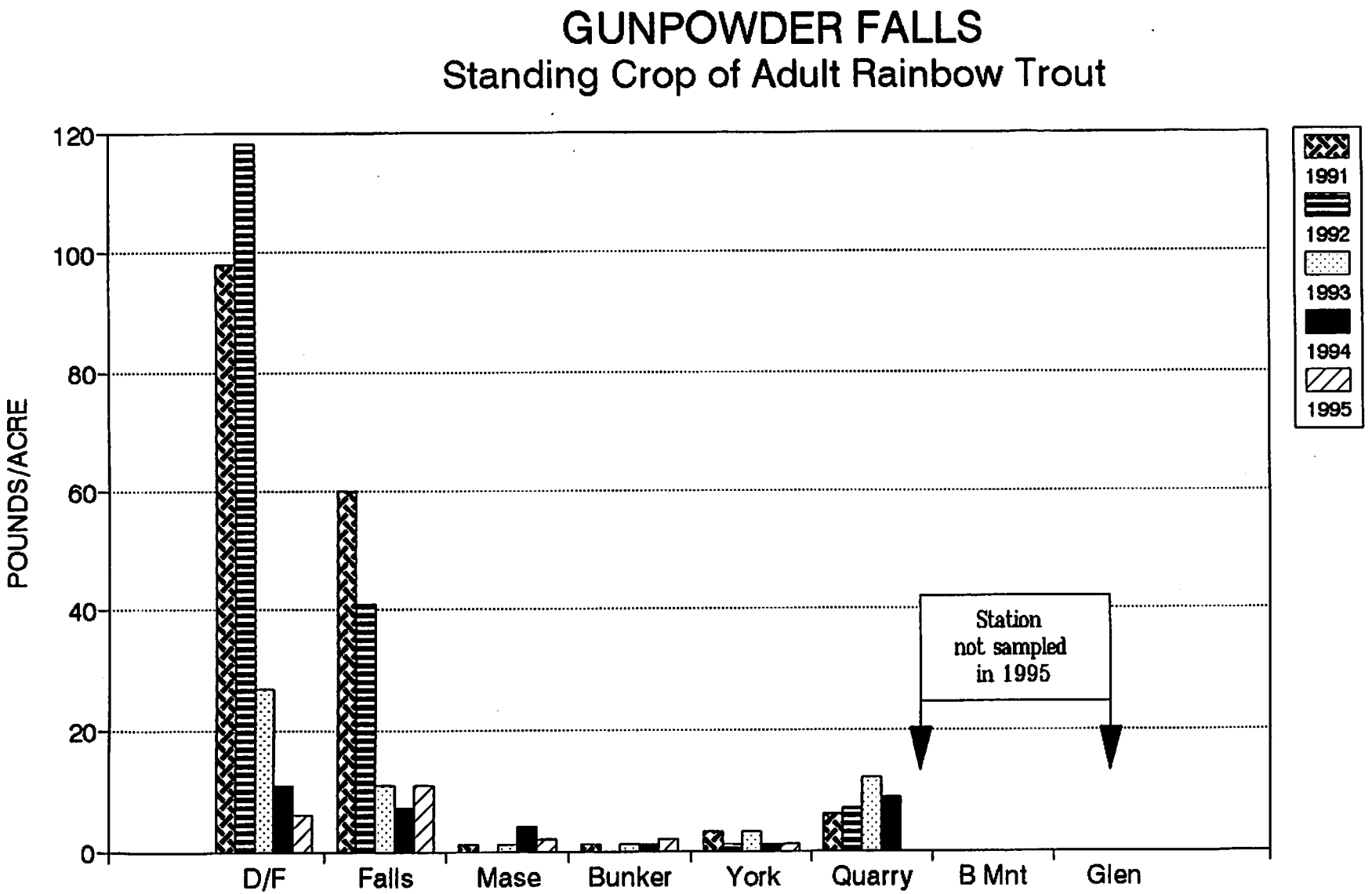

Figure 8. Fall standing crops (lbs/acre) for 1+ year old and older rainbow trout in the Gunpowder Falls tailwater in 1991-1995.

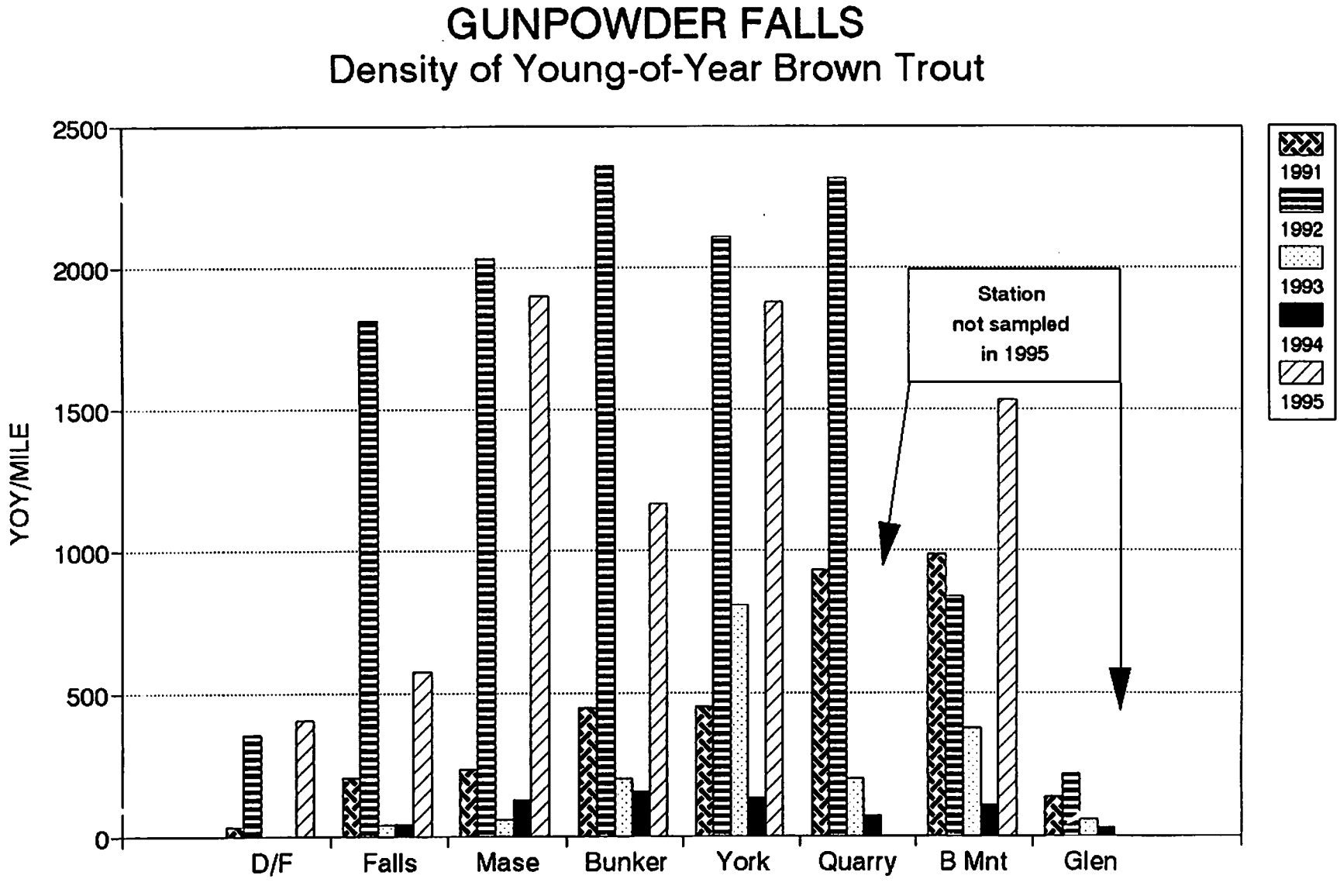

Figure 9. Fall density estimates (yoy/mile) for naturally reproduced brown trout in the Gunpowder Falls tailwater in 1991-1995.

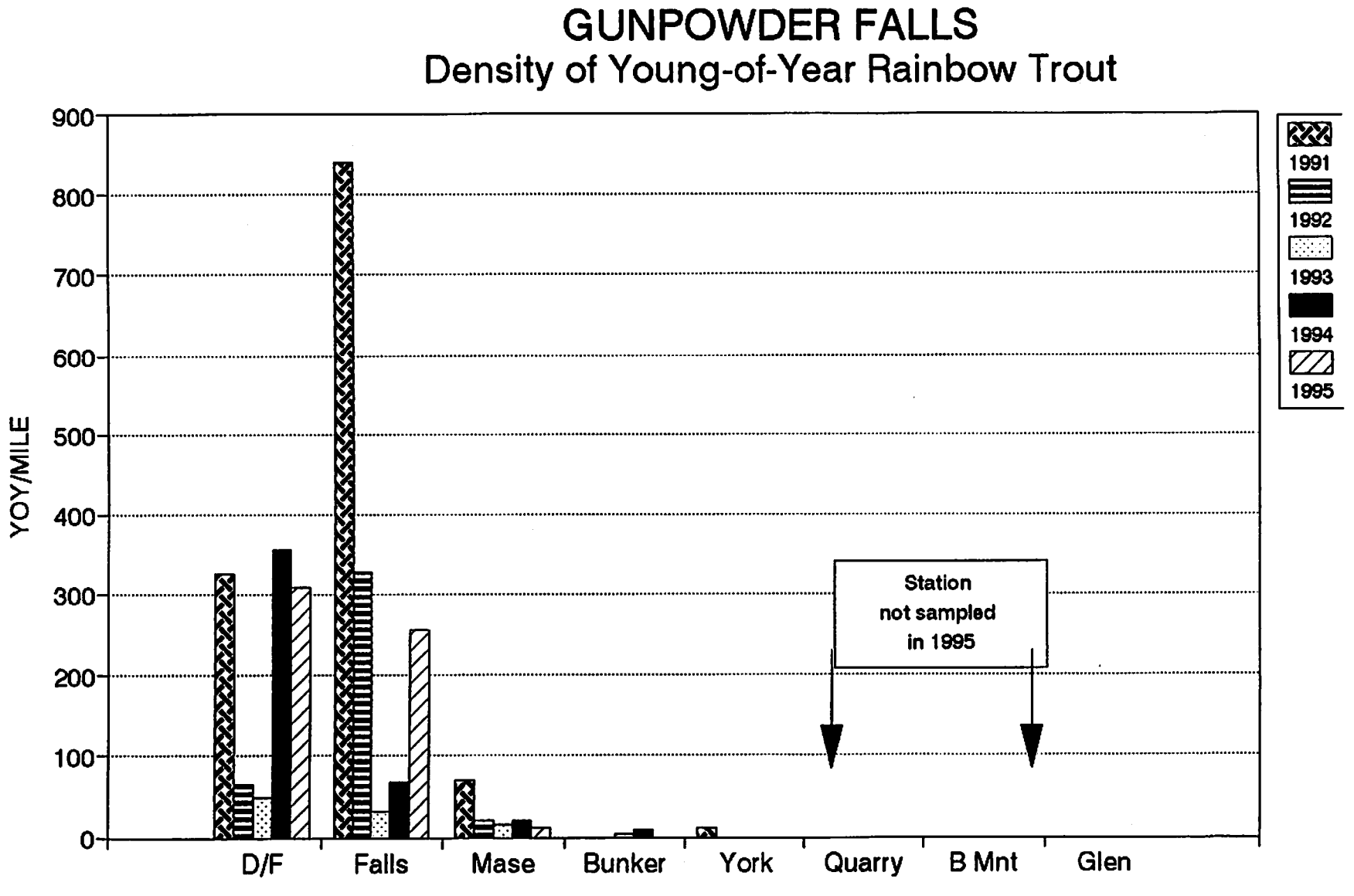

Figure 10. Fall density estimates (yoy/mile) for naturally reproduced rainbow trout in the Gunpowder Falls tailwater in 1991-1995.

Little Seneca Creek Tailwater
(Montgomery County)

1995 Progress Report

Field activities conducted in the Little Seneca Creek tailwater during 1995 included: water temperature monitoring, stocking of fingerling rainbow trout, a redd count, electrofishing three established stations, and a one pass electrofishing spot check.

Water Temperature Monitoring

Water tempratures were monitored in Little Seneca Creek at two previously monitored stations using Ryan continuous recording TempMentors. The stations are located approximately 300 yards below the Little Seneca Lake dam and approximately 300 yards below Hoyles Mill Road. Water temperatures were monitored at both stations for a 153 day period from 31 May 1995 to 31 October 1995. The highest water temperature recorded at the dam site was 63.9° F on 23 October 1995. The highest water temperature recorded at the Hoyles Mill site was 71.4° F on 4 and 6 August 1995.

Stocking

Stocking in the Little Seneca Creek tailwater in 1995 consisted of 1,100 "warmwater" fingerling rainbow trout on 27 October from Laurel Hill trout hatchery, Pa. No brown trout fingerlings were stocked into Little Seneca Creek in 1995 to determine if natural reproduction of brown trout is occurring. The rainbow trout fingerling stocking was made in order to continue the assessment of rainbow trout survival and put and grow management potential.

Redd Count

On 20 November 1995, Freshwater Fisheries personnel conducted a redd count on the Little Seneca Creek tailwater below Clopper Road. Two redds were found below Clopper Road within the established electrofishing station. All redds had been constructed prior to Freshwater Fisheries observations in the fall. No active spawning was observed.

Electrofishing Surveys

Freshwater Fisheries staff conducted three electrofishing surveys in 1995 to assess trout survival and growth (Table 1). One station is located above Clopper Road and was surveyed on 25 July. The station above Clopper Road is annually surveyed and was established in 1989 to document the number of trout surviving the mid-summer months. The remaining stations, located below Clopper Road and above Hoyles Mill Road, were surveyed on 7 December. The Zippin removal method (1958) was employed at all stations. A one pass spot check was also conducted below Schaeffer Road on 7 September. No trout were found during the spot check.

Table 1. Results of the three electrofishing surveys for 1995.

Station	Adults, fingerlings and young-of-the-year Standing Crop (lbs/acre)	Trout/ acre	Trout/ mile
above Clopper Road			
25 July 1995			
Brown trout adults	17	45	107
Rainbow trout adults	12	34	81
Total adults	31	87	206
Brown trout yoy		19	45
above Hoyles Mill Road			
7 December 1995			
Brown trout adults	5	14	70
Rainbow trout adults	1	3	13
Total adults	6	17	83
Brown trout yoy		1	6
Rainbow (fingerlings)		25	121
below Clopper Road			
7 December 1995			
Brown trout Adults	21	42	96
Rainbow trout Adults	6	12	28
Total adults	27	54	124
Rainbow (fingerlings)		121	276

The standing crop (lbs/acre) for adult brown trout decreased by 10% from the 1994 results for the summer survey above Clopper Road. The density (trout/acre) for brown trout adults decreased by 21% from the 1994 results. The adult rainbow trout standing crop remained the same and the density (trout/acre) decreased by 19% from the 1994 results. Five naturally reproduced, stream bred brown trout young-of-the-year (yoy) were collected. This is the first time since surveys began in 1985 that wild yoy were collected in Little Seneca Creek without any uncertainty. No brown trout fingerlings were stocked into Little Seneca Creek in 1995.

No comparisons can be made between the Hoyles Mill station surveys as too few trout were captured on the first pass in 1994 to warrant a multiple pass survey. The capture of 11 brown trout adults and two rainbow trout adults in 1995 was encouraging considering the low number of adult and fingerling brown and rainbow trout captured during the 1994 survey. One wild brown trout yoy was captured in the Hoyles Mill station confirming that successful natural reproduction is possible in the downstream areas of the tailwater.

The 1995 standing crop for adult brown trout below Clopper Road increased 320% over the 1994 results. The density (trout/acre) increased 147%. The standing crop for adult rainbow trout increased

50% over the 1994 results below Clopper Road and the density (trout/acre) increased 20% over the 1994 results. The large increase in adult brown trout in the Clopper Road station, including four over 12 inches and three 0.5 inch under 12 inches, is very encouraging for the brown trout fishery in Little Seneca Creek as more adults are maturing to spawning age. One large redd was found within the electrofishing station near a pool in which the two largest brown trout adults, a male and female, were captured. These fish were most likely the producers of the redd. No wild brown trout yoy were captured during the survey.

Rainbow trout fingerling survival was considered fair at best in 1995. A total of 61 rainbow trout fingerlings were captured in December of 1995 as compared to 39 in 1994. Only 1,100 rainbow trout were stocked into Little Seneca Creek in 1995 as compared to 10,000 rainbow fingerlings stocked in 1994. The 1995 fingerlings were stocked in October whereas the 1994 fingerlings were stocked in May. The fingerlings from 1994 were in the stream for a longer duration of time before the December 1994 surveys and were therefore more susceptible to predation as well as thermal shock from spillover events during summer thunderstorms.

Discussion

Since the completion of Little Seneca Creek dam in late 1984, Freshwater Fisheries staff have worked closely with personnel from the Washington Suburban Sanitary Commission (WSSC) and the Maryland National Capital Parks and Planning Commission (M-NCPPC) to formulate and implement water release guidelines for the dam. Modifications to the water release guidelines have been made continually in order to maximize the cold water fishery potential downstream of the dam by enhancing the quantity and quality of water being released.

Little Seneca Creek dam was constructed so water could be selectively withdrawn from three separate depths (ports) within the reservoir pool. The different ports are operated to maintain suitable water temperatures and water quality in the tailwater for trout throughout the hot summer months. The cold water conditions are directly attributed to the operational strategies employed at the dam by WSSC personnel.

Spillover prevention at the dam and/or immediate mitigation via cold water release will eliminate the single greatest threat to the tailwater trout fishery. It is our opinion that the operational strategy of maintaining the reservoir six inches below the spillway provides inadequate flood storage capacity capable of ensuring sufficient reaction time to make the necessary flow adjustments at the dam to prevent spillover during a storm event. Our assessment is based on the facts that there is no permanently assigned dam operator and spillover events have occurred when the pool has been six inches below spillway. The flashy nature and magnitude of water runoff from the watershed has repeatedly demonstrated that six inches of flood storage gives too little reaction time to WSSC to respond effectively.

Generally, tailwater temperatures in 1995 were considered good to excellent for the growth and survival of trout. No major spikes of warm temperatures occurred in Little Seneca Creek in 1995. Temperature spikes associated with spillover of Little Seneca Lake during storm events is considered a major factor in the survival of trout in Little Seneca Creek. Temperature spikes create excessive stress to trout, particularly young-of-the-year which can promote high mortalities.

It is our opinion that poor survival of adult trout in Little Seneca Creek can be attributed to inadequate base flow throughout most of the year which leaves the trout vulnerable to predation by raccoons, great blue herons, kingfishers and otters. Little Seneca Creek also lacks high quality adult habitat throughout the stream. Many pools are featureless, lacking undercut banks, woody debris and boulders. The depth of the pools provides most of the cover for the adult trout and with the consistently low flows associated with Little Seneca Creek, many pools are mediocre at best.

The future of Little Seneca Creek tailwater as a high quality catch-and-return, self-sustaining trout fishery appears to be very questionable, as standing crops of trout and natural reproduction have been poor at best. Although rainbow trout appear to survive and grow through their first year, survival beyond 1+ is an occasional fish. Brown trout also appear to be experiencing difficulty surviving to the point where they stock pile healthy numbers of spawners. Recently, many housing developments have begun along Little Seneca Creek and several more very large developments have been approved for the next several years. The anticipated impact of the development on Little Seneca Creek tailwater is expected to be considerable. Sediment and thermal inputs expected from development and the stormwater management ponds will further compromise an already unlikely prospect for a viable catch-and-return, self-sustaining trout fishery.

Management Recommendations

The following are management recommendations for the Little Seneca Creek tailwater in 1996.

- Continue water temperature monitoring with continuous recording TempMentors at the Dam and Hoyles Mill stations
- Conduct swim-up fry and young-of-the-year surveys in the spring to assess trout reproduction
- Trout stocking will be rainbow trout fingerlings only. If brown trout fingerlings are to be stocked, the adipose fin will be removed from each fingerling
- Annual electrofishing surveys will be conducted to assess survival and growth of all trout species

Literature Cited

Zippin, C. 1958. The removal method of population estimation. Journal of Wildlife Management. 22(1): 82-90.

Paint Branch
(Montgomery Co.)

1995 Progress Report

Freshwater fisheries studies and activities conducted in the Paint Branch watershed in 1995 included: water temperature monitoring, quarterly macroinvertebrate sampling, a swim-up fry count, electrofishing surveys and redd counts.

Water Temperature Monitoring

Stream temperatures were monitored in the Good Hope tributary above Good Hope Road, at Hobbs Drive and at the lower end of Good Hope tributary within the lower macroinvertebrate sampling station. Temperatures were also monitored in the Left Fork of Paint Branch upstream of Peach Orchard Road and in the Right Fork of Paint Branch at the end of Timberlake Drive. Ryan TempMentors were used to monitor stream temperatures.

Temperatures were monitored in the Good Hope tributary from 13 June to 19 September above Good Hope Road, at Hobbs Drive and at the lower macroinvertebrate station. Temperatures were monitored in the Left and Right Forks of Paint Branch from 20 June to 19 September. The highest temperature recorded for the Good Hope tributary above Good Hope Road and at Hobbs Drive was 74.5° F and 73.4° F respectively on 5 August. The highest temperature recorded at the lower macroinvertebrate station was 72.7° F on 4 August. The highest temperature recorded on the Left and Right Forks was 75.6° F and 72.7° F respectively on 5 August.

Macroinvertebrate Sampling

Aquatic macroinvertebrates were collected at seven established stations within the Paint Branch watershed. Samplings were conducted at quarterly intervals. All samples were sent to the Maryland Freshwater Fisheries Division macroinvertebrate specialist for analysis.

Swim-up Fry Survey

Freshwater Fisheries staff observed swim-up and newly emerged brown trout fry on the Good Hope tributary from the upper macroinvertebrate sampling station through the electrofishing survey station at Hobbs Drive on 3 April 1995. Each riffle where a redd had been identified in the fall of 1994 had at least six brown trout fry. A total count was not taken. Good Hope tributary is surveyed to ascertain annual brown trout reproductive success.

Electrofishing Surveys

Electrofishing surveys were conducted in May, June, July and August at nine sites in the Paint Branch watershed. All

electrofishing was conducted using a Type XII Smith-Root backpack electrofisher. The Zippin removal method (1958) was employed to estimate the population at seven electrofishing stations. Staff conducted one pass spot checks at two sites, the Beltsville Agricultural Center and the Left Fork of Paint Branch above the Peach Orchard Road station. Staff also coordinated with the Montgomery County Department of Environmental Protection (MCDEP) and assisted with electrofishing surveys and fish species identification at two locations on the Paint Branch mainstem as part of the MCDEP biological stream assessment surveys for Montgomery County streams.

Table 1. Brown trout population estimates from Paint Branch watershed in 1995.

Location	Adult lbs/acre	Adult trout/acre	Young-of-year trout/acre
Good Hope tributary at Hobbs Drive	43	304	393
Good Hope tributary at lower macro station	13	90	615
Gum Springs tributary at Bart Drive	0	0	0
Gum Springs tributary at the mouth	2	18	27
Paint Branch - Right Fork at high zone *	16	70	14
Paint Branch - Left Fork at Peach Orchard	4	6	6
Paint Branch at Fairland Road	10	27	31

* New station in 1995

Adult brown trout densities (trout/acre, trout/mile) decreased in both Good Hope and Gum Springs tributary stations and the Paint Branch mainstem at Fairland Road station. The most significant decrease in adult density (trout/acre) occurred in the Gum Springs at Bart Drive station with a 100% decrease from 1994. A sewer drain overflow above the Gum Springs station in March of 1995 eliminated the brown trout population from the station upstream to the spill. The Gum Springs tributary station at the confluence with Paint Branch had an 80% decrease in adult density in comparison to the 1994 survey results indicating the sewer spill negatively impacted the brown trout population throughout the tributary . The Good Hope tributary at Hobbs Drive, at the lower

macroinvertebrate station and the Paint Branch mainstem at Fairland Road decreased in trout/acre by 37%, 30% and 58% respectively.

Adult brown trout standing crops (lbs/acre) decreased in the Good Hope tributary at Hobbs Drive and the lower macroinvertebrate station by 26% and 41% respectively. Standing crop decreased in the Gum Springs tributary at the mouth by 80%. Standing crop increased by 43% in the Paint Branch mainstem at Fairland Road.

In 1995, brown trout young-of-the-year density (yoy/acre) in the Good Hope tributary at Hobbs Drive remained unchanged from 1994. The density of yoy in lower Good Hope tributary station near the mouth increased 37% in 1995 over those in 1994. Young-of-the-year density decreased by 86% at the mouth of Gum Springs. Young-of-the-year density in the Paint Branch mainstem at Fairland Road increased 55% compared to 1994 results. The Good Hope tributary continues to be the most productive section of the Paint Branch for brown trout recruitment.

A one pass electrofishing spot check was conducted on the Paint Branch at the Beltsville Agricultural Center on 24 May. No trout were found. Habitat for adult trout was poor throughout this section of stream. A one pass elctrofishing spot check was conducted on the Left Fork of Paint Branch from the head of the Peach Orchard Road electrofishing station upstream to the pond outfall at Maydale Nature Center on 22 August. Six adult brown trout and 14 yoy brown trout were captured.

Redd Count

The Good Hope tributary is surveyed annually to assess spawning effort. Brown trout begin spawning in the Paint Branch watershed by early November. Redd counts were conducted on the 20th and 27th of November, 1995. A combined total of 16 redds were identified in the Good Hope tributary between the mouth and Hobbs Drive. This represents a 36% decrease from the 25 redds found in 1994. Redd counts have been conducted since 1978 in the stream section between the mouth and Hobbs Drive. The average redd count for the years 1978 to 1994 is 24. The redd count is influenced by several variables which may change year to year. For example, the most accurate counts are totals resulting from multiple observations during years where the count has been uninterrupted by significant storm events. In some years, the count has been very low, in part to single observations and or weather events which have hindered Freshwater Fisheries' ability to make accurate counts.

Notes of Importance

Once more, the Intercounty Connector (ICC) project has risen to importance in its thirty plus years of existence. The ICC is again under study as a possible landmark in the Paint Branch watershed as it is proposed to link Maryland Route 1 in Prince Georges County with Interstate Route 270 in Montgomery County. The

Maryland State Highway Administration (MDSHA) is spear heading the project and has hired numerous consulting firms to assist them in completing a three year study to determine purpose and need, select alternate paths for the ICC and determine extent of environmental, social and economic impacts to the immediate community and environment. As a result, the Paint Branch mainstem and major tributaries upstream of Route 29 have been transformed into an outdoor biology experiment. Beginning in the fall of 1995, Paint Branch and its tributaries were surveyed by Dr. Raymond White, a nationally known trout expert in an attempt to assess the extent and condition of the brown trout population. This study proposes to quantify the brown trout population as a whole and will be repeated in the spring of 1996. Close on the heels of this study are many more studies targeting the Paint Branch watershed water quality, origins, and hydrology. Findings from the myriad of studies will be compiled and used at a future date to determine an ICC alternate and allow assessment and or mitigation which would make the ICC a reality and still preserve the trout population and maintain existing water quality in the Paint Branch and its tributaries.

Freshwater Fisheries share many concerns regarding such an undertaking in view of Paint Branch's stressed and sensitive nature. We are concerned that the brown trout population, which has been self-sustaining since the late 1930's, may be at a perilous juncture as its future will be determined based on a "snap shot" of data and a huge economic denominator. Major concerns center about the trout population enumeration in the midst of a record drought in the summer of 1995 and record snowfall and subsequent flooding in early 1996.

Literature Cited

Zippin, C. 1958. The removal method of population estimation. Journal of Wildlife Management. 22(1): 82-90.

Patuxent River Catch-and-Release Area
(Howard and Montgomery Counties)

1995 Progress Report

Freshwater fisheries activities and studies conducted in 1995 included: stocking adult brown, rainbow and cutthroat trout, electrofishing surveys at four established stations and three electrofishing spot checks.

Stocking

Trout stocking activities in 1995 consisted of stocking 1500 brown trout adults on 22 February from the Laurel Hill Trout Hatchery, Pa., a stocking of 1000 adult rainbow trout on 28 February from the Albert Powell State Trout Hatchery (APH), a 3 March stocking of 60 adult rainbow trout originating from APH and raised from fingerlings by Northern High School, Calvert County, as part of the school's aquaculture science program, and a 9 May stocking of 500 adult warmwater rainbow trout and 250 adult cutthroat trout from the State trout hatchery facility at Genstar in Frederick, MD. The trout were stocked from above Annapolis Rock Road downstream to Howard Chapel Road. Adult trout stockings above Mullinix Mill Road have long been discontinued due to the presence of a wild brown trout population.

Electrofishing Surveys

In 1995, Freshwater Fisheries staff conducted electrofishing surveys at two established stations on 15 June: below Hipsley Mill Road and above Howard Chapel Road. Freshwater Fisheries staff conducted a three pass survey in the established station above Mullinix Mill Road on 23 October and conducted one pass surveys in the established stations above Annapolis Rock Road and below Hipsley Mill Road on 9 November. Too few trout were collected on the first pass in the Annapolis Rock and Hipsley Mill stations to warrant multiple passes. Electrofishing spot checks were also conducted upstream of the Annapolis Rock Road station, downstream of the Hipsley Mill station and from Route 97 upstream 1/4 mile on 9 November. The spot checks were conducted to determine the survivability of the stocked brown and rainbow trout.

Electrofishing surveys were conducted on 15 June and 9 November to determine the number of trout available to anglers after the spring stocking season and the survivability of the trout populations over the summer and early fall. Trout populations were estimated using the removal method described by Zippin (1958). Table 1 is a summary of the trout populations at the established electrofishing stations.

Table 1. Population data for trout in the Patuxent River.

	# captured	Age 1+ and Older lbs/ acre	Trout/ acre	Trout/ mile	Young-of-year YOY/ acre	YOY/ mile
below Hipsley Mill						
15 June 1995						
Brown trout	5	5	12	31	7	19
Rainbow trout	7	10	16	44		
9 November 1995						
Brown trout	1	2	6	11	6	11
Rainbow trout	1	5	6	11		
above Howard Chapel						
15 June 1995						
Brown trout	10	14	29	81		
Rainbow trout	18	29	52	146		
Cutthroat trout	2	3	6	16		
above Mullinix Mill						
23 October 1995						
Brown trout	16	12	44	138	74	234
Rainbow trout	1	1	3	9		
above Annapolis Rock						
9 November 1995						
Brown trout	4	4	16	32	12	24

The 1995 standing crop (lbs/acre) of adult brown trout in the Mullinix Mill Road station increased 200%, trout/acre increased 100%, and yoy/acre decreased 33% from 1994. All brown trout captured were of wild origin. The section above Mullinix Mill Road has consistently provided the greatest brown trout recruitment in the Patuxent River Catch-and-Release Area. Two rainbow trout were also captured within the station which is more than a mile upstream of the nearest stocking point for the spring rainbows.

Brown trout standing crop and density at the Annapolis Rock Road station in 1995 remained the same as in 1994. The yoy/acre remained the same as in 1994 as well. The four captured brown trout adults were of wild origin. No rainbow trout were captured in the station.

The brown trout standing crop in the Hipsley Mill station decreased 60% and the density decreased 50% between the June 1995 and November 1995 surveys. The rainbow trout standing crop decreased 50% and the density decreased 63% between the two surveys as well. The poor results of the November survey were comparable to the results of past fall surveys for this station. The results of the June survey suggest that survival of the stocked trout was poor in the Hipsley

Mill station before the start of summer.

The standing crop for all trout species was 46 lbs/acre in the Howard Chapel station on 15 June. An early May stocking of 500 warm water rainbows and 250 cutthroat adults may have been responsible for a high standing crop at the Howard Chapel station on 15 June. Time constraints prevented a fall survey to determine over-summer trout survival within the Howard Chapel station. The historical high for standing crop in the Howard Chapel station since multiple pass regression surveys have been conducted is 16 lbs/acre on 13 October 1989. Only brown trout were captured during the 1989 survey. The most recent fall survey was conducted on 8 November 1993 in which the standing crop was 2 lbs/acre. Only brown trout were captured during the 1993 survey.

Three one pass spot checks were conducted on 9 November. The first spot check was from the head of the Annapolis Rock Road station to approximately 250 feet above the station. Four wild brown trout adults and one stocked brown trout were captured. One young-of-the-year (yoy) brown trout was also captured. A one pass spot check was conducted from approximately 1000 feet below the Hipsley Mill station upstream to the start of the station. One stocked brown trout adult and one stocked rainbow trout adult were captured. One yoy brown trout was also captured during the spot check. The final spot check was conducted from Route 97 upstream approximately 1500 feet. Four wild brown trout adults were captured.

Discussion

Brown trout recruitment was considered fair at the Mullinix Mill Road station and poor at the Annapolis Rock Road station in 1995. Three yoy brown trout were captured in the Hipsley Mill station in June and one yoy brown trout was captured during the fall survey. As in every year past, few stocked brown or rainbow trout remained in the lower stations despite the stocking of a substantial number of adults in the spring. The post-summer survivors were emaciated and in poor condition.

It is our opinion that wild brown trout are self-sustaining and providing a fishable population without additional stocking above Mullinix Mill Road. Low numbers of wild trout are currently being sustained between Mullinix Mill Road and Annapolis Rock Road but rely on periodic stockings of adult trout to maintain a fishable population. The remaining portion of stream between Annapolis Rock Road and Route 97 has demonstrated insignificant recruitment to provide for a wild trout fishery and very poor ability to hold-over hatchery stocked trout which would result in a quality trout fishing experience.

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Jabez Branch
(Anne Arundel Co.)

1995 Progress Report

The fisheries activities conducted on Jabez Branch in 1995 included a brook trout fry count and collection on the left fork in March and an electrofishing survey on the entire Jabez Branch mainstem and portions of the Right Fork and Hog Farm tributaries in December to determine the number of surviving young-of-the-year (yoy) and adult brook trout.

Swim-up Fry Count

On 1 March, Freshwater Fisheries staff discovered 18 brook trout fry on the Left Fork of Jabez Branch. The fry were mobile and found throughout the Left Fork. On 2 March, staff returned to the Left Fork to meet with the media and collected fry trout for display to Channel 2 and 13 TV news, The Capital and The Sun newspapers. These were the first naturally reproduced brook trout found in Jabez Branch since 21 December 1988 when three yoy brook trout were collected in the Right Fork. In December of 1990, no brook trout adults or yoy were found in Jabez Branch and the population was considered extirpated. A total of 328 wild brook trout adults and yoy have been stocked into Jabez Branch since 1991 (Table 1) in hopes of re-establishing a naturally reproducing wild brook trout fishery.

Table 1. Summary of trout transplanted in Jabez Branch and numbers recaptured by electrofishing.

Station	Number Stocked			Number Captured				
	1991	1992	1994	1991	1992	1993	1994	1995*
Left Fork Jabez Br.	35	51	22	1	10	8	11	44
Right Fork Jabez Br.	35	43	0	0	7	1	2	4
Mainstem - Hog Farm Rd. to Rt. 32	30	25	0	0	5	0	3	4
Mainstem - Mouth to Hog Farm Rd.	10	20	0	2	0	1	2	5
Hog Farm Rd. Tributary	27	30	0	0	2	0	0	0
Total	137	169	22	3	24	10	18	57

* Includes wild brook trout yoy naturally reproduced in Jabez Branch

Electrofishing Survey

On 11 December 1995, the Jabez Branch watershed was electrofished where brook trout were stocked in 1991, 1992, and 1994 (Table 1). To allow the determination of brook trout naturally reproduced in Jabez Branch from [illegible] trout, clipped adipose fins

were removed from the transplanted trout. No stocking was conducted in 1993 so that adult survival and recruitment capability could be determined without confusing stocked trout with surviving adults and stream bred trout. Trout stocking was resumed in 1994 when the 1993 survey demonstrated reproduction had not occurred. No brook trout were stocked in 1995 as a result of the successful hatch in the winter of 1995.

Following the electrofishing survey in December 1994, 18 brook trout were known to be inhabiting Jabez Branch. During the 1995 survey, 57 brook trout ranging in size from 2.9 to 8.9 inches were collected. Of this number, eight of the brook trout were adults, one of which had an adipose fin clip and another which appeared to have a regenerated adipose fin. Due to the use of small trout for transplanting in 1994, (transplanted trout ranged 2 to 6 inches long) it was difficult to completely remove the adipose fin and regeneration was observed in all but four of the 18 recaptured brook trout in 1994.

The recovery rate of adult brook trout in 1995 was 44% (8 of possible 18) which compares favorably to the 56% (18 of possible 32) recovery rate of transplanted adult and yoy brook trout found in the 1994 survey. Forty-nine stream bred yoy brook trout were collected in Jabez Branch in 1995. A total of 38 yoy were collected in the Left Fork and two were seen but not captured. Only 11 yoy were collected outside the Left Fork tributary. No trout were found in the Hog Farm Road tributary. The Left Fork has historically been the most productive section of Jabez Branch, primarily due to the prominent cold water spring influence associated with the area.

Although the lack of recruitment in 1993 and 1994 was disappointing, high trout survival for both years stockpiled adults which led to the successful reproduction in 1995. The sandy, unstable substrate of Jabez Branch makes reproductive success highly dependent on the number and magnitude of storm events during the critical spawning and incubation period which extends from October through March. High stream discharge can easily cause the sand to shift, smothering incubating trout eggs and entrapping developing fry. The fall and winter of 1994-95 was very mild with no major storm events significantly affecting recruitment. To ensure the continued survival of adult and sensitive yoy brook trout, all thermal influences to the watershed during the warm summer months must be identified and controlled.

Management Strategy

The management strategy proposed for 1996 is to conduct swim-up fry observations on the Left Fork in late February to assess successful trout reproduction. Electrofishing surveys to assess adult survival and determine the extent of successful recruitment of wild brook trout will continue in 1996.

Bee Tree Run
(Baltimore County)

1995 Progress Report

Bee Tree Run is a small to medium sized freestone stream located in the northeast corner of Baltimore County. For many years, Bee Tree Run has been known to support a natural reproducing brown trout population. As part of Freshwater Fisheries' ongoing study of the brown trout population in Bee Tree Run, D.N.R. fisheries personnel continued population surveys at one of three established stations on Bee Tree Run.

Three stations have been surveyed annually since 1987. The lower sample station is located below Bee Tree Road in a section that was managed for many years as a put-and-take trout fishery. Stocking and put-and-take management was discontinued on Bee Tree Run in 1989. The upper two stations have never been managed as put-and-take trout areas and are located approximately .3 and 1.5 miles upstream of the lower station. Angler access to the upper most station requires a long walk (about 1 mile) or bike ride along the Northern Central Railroad trail that parallels the stream.

Beginning in 1994, as a result of consistently high standing crops, densities, and recruitment at all three stations since 1990, Freshwater Fisheries staff determined that surveying one station annually would be sufficient to monitor the condition of the brown trout population in Bee Tree Run. During 1995, the brown trout population was estimated at the upper station using the multiple pass removal method described by Zippin (1958).

Table 1. Results of 1995 brown trout population study conducted on Bee Tree Run.

	Age 1+ and Older			Young-of-Year	
Station	Standing Crop (lbs/acre)	Trout/ acre	Trout/ mile	YOY/ acre	YOY/ mile
Upper	23	91	147	451	733
Middle	Not surveyed in 1995				
Lower	Not surveyed in 1995				

The standing crop of adult brown trout decreased 30% in the upper station since the 1993 survey from 33 lbs/acre to 23 lbs/acre in 1995 (Figure 1). Adult brown trout density (trout/acre) decreased 45% in the upper station from 165 in 1993 to 91 in 1995. Brown trout recruitment, however, increased 48% in the upper station from 304 yoy/acre in 1993 to 451 yoy/acre in 1995.

In the past, Bee Tree Run has shown it has potential to grow large (>12") brown trout adults. However, representation of brown trout larger than 12 inches has been very low prior to 1994. As an example, all three stations contained a combined total of four brown trout over 12 inches in 1993. Two brown trout over 12 inches were captured in the upper station in 1995 while none were collected over 12 inches from this station during the 1993 survey. Five brown trout over 12 inches were captured in the middle station alone in 1994 with three other individuals within one half inch of 12 inches.

Although it is too early to determine if there is a trend leading towards higher densities of brown trout over 12 inches in Bee Tree Run, there seems to be some hope for improvement under current management. If however, fishermen are selectively harvesting brown trout greater than 12 inches, or enforcement of the current 2 fish per day per angler is not effective, catch-and-release and/or slot limit regulations would be needed to improve the numbers of trout greater than 12 inches. Natural reproduction of brown trout continues to be consistent and more than adequate throughout its length. We propose to monitor the lower station in 1996.

Literature Cited

Zippin, C. 1958. The removal method of population estimation. Journal of Wildlife Management 22(1): 82-90.

BEE TREE RUN 1986 - 1995

ADULT BROWN TROUT STANDING CROPS

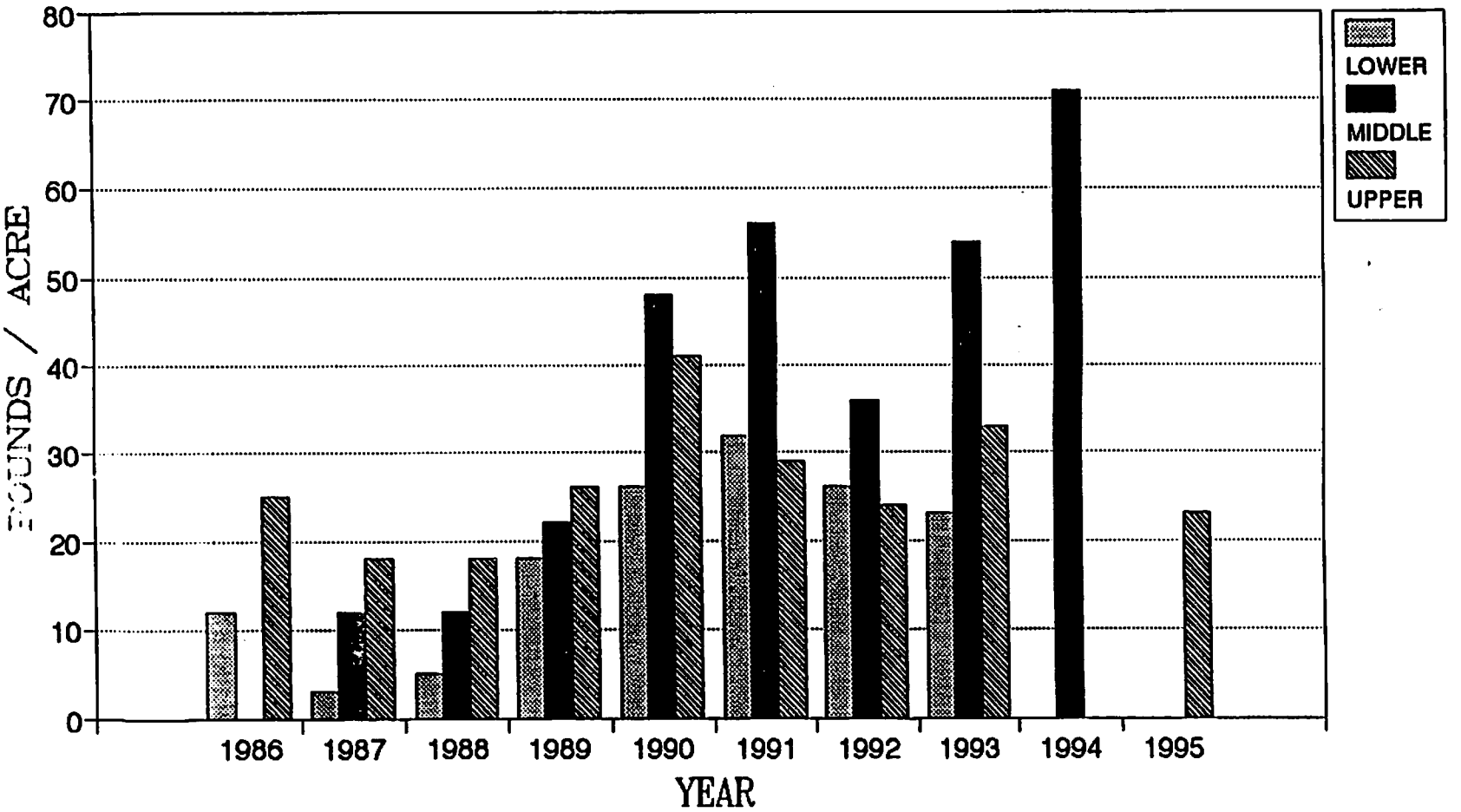

Figure 1. Standing crops for adult brown trout in Bee Tree Run, 1986 - 1995.

Basin Run - Cecil County

Backpack electrofishing (Zippin three-pass method) was done at sample stations 2, 3, and 6 to estimate wild brown trout (Salmo trutta) population size (Zippin 1958) in Basin run. The annual single-pass backpack electrofishing episode in an unnamed tributary to count young-of-year (YOY) brown trout was also done.

Population estimates for adult and YOY brown trout at stations 2, 3, and 6 are listed in Table 1. Standing crop (lbs./acre) for adult brown trout at station 6 (42+/-4) was well above the historic range, at the low end of the range for station 2 (12+/-2), and well below the low end of the range for station 3 (3+/-1) (Table 2). The estimated number of trout per mile at stations 2 (42+/-7), 3 (20+/-1), and 6 (74+/-2) were either below (stations 2 and 3) or at the low end (station 6) of their respective historic ranges (Table 3). Mean size of adult brown trout at station 2 was 297mm, 258mm at station 3, and 284mm at station 6 (Table 4).

No YOY brown trout were collected at stations 2 and 3, and only four YOY's were collected at station 6. The number of YOY trout collected (5) in the unnamed tributary was well below the long term mean (22.3, range 15 to 31) for this tributary since 1992.

While brown trout standing crop increased over the long term range at Station 6 the overall trend in the brown trout population in 1995 is a decrease in both the number (trout per mile) of adult and YOY trout and the standing crop of adult trout. Low survival of the 1994 year class and a poor spawn in 1995 may be the main causal factor for these changes in the Basin run brown trout population. This is illustrated by the increase in mean size of adult trout at Stations 2, 3, and 6 in 1995 over the long term range (Table 4). Factors that could account for poor recruitment and survival of yearling fish include the effects of high water temperatures and low flow during the drought of 1995 and angler induced mortality on yearling trout.

Management recommendations

- Consider removing Basin run from the statewide put-and-take trout stocking list and manage it as a wild trout fishery, particularly in light of the streambank fencing and canopy restoration efforts being done in 1996 on 1.2 miles of upper Basin run. This stretch of stream has been identified as a major cause of high downstream summer water temperatures.

- Electrofish all established sample stations (6) and the unnamed tributary in fall 1996.

- Place continuous water temperature monitoring devices above the restoration area, within the restoration area, and downstream of the restoration area in 1996 and 1997 to measure the impact of restoration efforts on summer and low flow water temperatures.

Table 1. Population estimates (Zippin three-pass method) for Basin Run brown trout, adults and young-of-year (YOY), at sites 2, 3, and 6, fall 1995.

Measure	Age	Station 2	Station 3	Station 6
Standing crop (lbs./acre)	Adult	12+/-2	3+/-1	42+/-1
Trout/acre	Adult	25+/-4	12+/-2	77+/-1
	YOY	0	0	31+/-5
Trout/mile	Adult	42+/-7	20+/-2	74+/-2
	YOY	0	0	30+/-5

Table 2. Estimated (Zippin three-pass method) standing crop (lbs./acre) of adult Brown trout for Basin run, 1990-1993 and 1995.

Year	Standing crop (lbs./acre) Station 2	Station 3	Station 6
1990	14+/-3	13+/-10	NS
1991	12+/-1	14+/-4	21+/-1
1992	19+/-1	26+/-2	28+/-2
1993	27+/-2	21+/-2	18+/-1
1995	12+/-2	3+/-4	42+/-4

Table 3. Estimated number (Zippin three-pass method) of Brown trout per mile, adults and young-of-year (YOY), for Basin run, 1990-1993 and 1995.

		Trout per mile		
		Station		
Year	Age	2	3	6
1990	Adult	60+/-10	110+/-10	NS
	YOY	0	150+/-2000	NS
1991	Adult	47+/-8	120+/-35	131+/-9
	YOY	85+/-65	120+/-8	203+/-17
1992	Adult	106+/-6	179+/-12	131+/-4
	YOY	11+/-10	60+/-50	29+/-17
1993	Adult	148+/-2	100+/-9	74+/-10
	YOY	0	60+/-23	0
1995	Adult	42+/-7	20+/-1	74+/-2
	YOY	0	0	30+/-5

Table 4. Mean length (mm) of Basin run brown trout at Stations 2, 3, and 6, 1990-1993 and 1995.

	Mean length in mm		
	Station		
Year	2	3	6
1990	272	229	-
1991	256	228	212
1992	231	224	230
1993	243	227	218
Range	231-272	224-229	212-230
1995	297	258	285

Mill Creek - Cecil County

From 1992 to 1994 brown trout fingerlings were stocked in Mill creek, a small tributary to Furnace bay in Cecil county, in an attempt to establish a self-sustaining trout population. Annual backpack electrofishing surveys (Zippin three-pass removal method) have been conducted at five sites to monitor the success of this effort. Survival of stocked brown trout fingerlings has been seen each year following stocking, however for the first time since sampling was initiated in 1992 sufficient trout were collected in this years sampling to estimate population size.

Brown trout were collected at the Diamond Jim road and Reservoir road sites, no trout were collected at the Principio, Jackson Station, and Cedar Corner road sites. Standing crop (lbs/acre) estimate for adult (1+) brown trout at the Diamond Jim site was 63+/-23 lbs/acre and 38+/-6 lbs/acre at the Reservoir road site. Table 1 lists the Zippin (1958) population estimates for both sites. No wild young-of-year (YOY) trout were collected at either site. Trout ranged in size from 185mm to 450mm (mean 270mm) and were in good condition.

While stocking of fingerling brown trout has been successful in establishing a trout population in Mill Creek, no natural reproduction has been seen. Physical condition of trout collected in the surveys has been good, adults from the 1992, 1993, and 1994 stockings should be reproductively mature (Hunter 1991) for the 1996 spawning season. To determine if trout reproduction has occurred backpack electrofishing will be done in 1996. If fingerling brown trout are available for stocking in 1996 the adipose fin will be clipped as an identifying mark.

Table 1. Brown trout (adult 1+) population estimates (Zippin three-pass method) for the Diamond Jim and Reservoir roads sample stations, Mill Creek, Cecil county, 1995.

Measure	Station Diamond Jim Rd.	Reservoir Rd.
Standing crop (lbs./acre)	63+/-23	38+/-6
Trout/acre	83+/-31	190+/-31
Trout/mile	45+/-17	106+/-18

Stone Run - Cecil County

A previously undocumented population of wild brown trout was discovered in an unnamed tributary of Stone run in Cecil county. Backpack electrofishing (Zippin three-pass method) was done to estimate population size (Zippin 1958), estimates are listed in Table 1. While the tributary is extremely small and has only limited value as a fishery, the excellent population of wild brown trout it contains has the potential to help repopulate the mainstem of Stone run as water quality improves.

Fingerling brown trout (500) were again stocked in the mainstem of Stone run, upstream of the confluence with Octoraro, in an attempt to reestablish the wild brown trout population. During a single-pass backpack electrofishing episode four stocked brown trout fingerlings (125mm, 127mm, 133mm, 135mm) in good physical condition were collected at the Stone Run road sample station in late fall, confirming survival of the fingerlings through the summer. No adult brown trout from the 1994 fingerling stocking were collected.

Management recommendations

- Continue stocking brown trout fingerlings in the mainstem of Stone Run in 1996.
- Backpack electrofish the mainstem to monitor survival of stocked fingerlings from previous years stockings.

Table 1. Brown trout (adult and YOY) population estimates (Zippin three-pass method) for an unnamed tributary to Stone run, Cecil county, 1995.

Measure	Age	Unnamed tributary
Standing crop (lbs./acre)	Adult	81+/-5
Trout/acre	Adult	300+/-18
	YOY	150+/-150
Trout/mile	Adult	127+/-8
	YOY	63+/-63

Literature cited

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JOB PROGRESS REPORT

Maryland Department of Natural Resources
Fisheries Service
Freshwater Fisheries

SURVEY AND MANAGEMENT OF FRESHWATER FISHERIES RESOURCES

Trophy Largemouth Bass Waters

Federal Aid Project: F-48-R-5

Study No.: IV

By

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1995

JOB PROGRESS REPORT

State: Maryland **Project No.** F-48-R-05

Project Title: Trophy Largemouth Bass Waters

Study Title: Trophy Largemouth Bass Waters

Job No.: 1

Period Covered: 1 January 1995 to 31 December 1995

JOB OBJECTIVE

To determine the quality of the largemouth bass fishery following the implementation of slot-length size limits.

SUMMARY

Fish populations were evaluated in Centennial Lake, Johnson's Pond, Lake Lariat, Little Seneca Lake, St. Mary's Lake, and Wheatley Lake to determine the quality of the largemouth bass fishery following implementation of slot-length size limits.

CENTENNIAL LAKE
(Howard Co.)

1995 PROGRESS REPORT

Fisheries activities and studies conducted on Centennial Lake in 1995 included: stocking adult trout, adult largemouth bass and fingerling tiger muskie, a recruitment survey, and a two night electrofishing survey.

Stocking

Centennial Lake was stocked with a total of 4050 adult brown and rainbow in 1995. The spring stocking received 2250 rainbow and 500 brown trout and the fall stocking consisted of 1800 adult rainbow trout.

A total of 56 adult largemouth bass were stocked into Centennial Lake on 21 June 1995. The bass were excess brood stock from Lewistown State Hatchery and averaged 14 inches in length.

On 22 September 1995, 240 tiger muskie fingerlings were stocked into Centennial Lake. The fingerlings were obtained from the Pennsylvania Fish Commission's Huntsdale hatchery and averaged 6 to 9 inches. If successful, the tiger muskie are expected to provide another trophy fish for anglers at Centennial Lake.

Reproduction Survey

One shoreline seining survey was conducted to assess largemouth bass reproductive success. A survey of four sites on 10 August 1995 revealed good largemouth bass reproduction. In Maryland waters, more than five largemouth bass young-of-year(yoy)/100 feet of shoreline is considered excellent reproduction. Seine hauls along 100 feet of shoreline averaged 4.6 yoy in Centennial Lake. Good hatches of bluegill, redear sunfish, and crappie were noted in the seine hauls.

Electrofishing Survey

Two night electrofishing surveys were conducted on Centennial Lake in 1995. The first survey was conducted on 1 November and was limited to one run due to equipment failure. The total electrofishing time was 340 seconds. The second survey was on 13 November and consisted of 2 runs totalling 1915 seconds.

A combined total of 73 largemouth bass were collected and ranged from 14.3 to 40.5 cm. The proportional stock density (PSD) was 27 which is near the recommended range of 30-70 for a predatory fish species.

This is the highest PSD recorded to date on Centennial Lake. The catch-per-unit-effort (CPUE) for stock size bass(>20 cm) was 129 fish/hour. This value is considered slightly higher than normal(100/hr) for other Maryland waters but similar to CPUE's calculated for Centennial Lake in the past. The average relative weight(Wr) of 95 is considered a good condition for largemouth bass. The size distribution and condition of bass in Centennial Lake improved in 1995.

Bluegill had a PSD of 62, which is above the target range of 20-50 for a prey fish species. A total of 42 were collected. Eleven redear sunfish were collected and had a PSD of 9. This low PSD is indicative that redear are still establishing a population in Centennial Lake. Black crappie had a PSD of 80, slightly above the recommended range of 30-70 for a predatory fish species. Twenty black crappie were collected ranging in length from 14 to 24.5 cm. Panfish continue to be highly sought after by anglers at Centennial Lake.

Ten tiger muskies were collected ranging in length from 22.5-28.0 cm. Initial survival of the tiger muskies appears to be good and the fingerlings had grown during the month since they were stocked. Other species observed were white crappie, pumpkinseed sunfish, and rainbow trout.

Management Activities

Survey plans for 1996 include; shoreline seining to assess centrarchid reproduction, day and night electrofishing surveys, stockings of adult trout and adult channel catfish(if available). Freshwater Fisheries staff have made numerous angler contacts who have reported fishing for and catching good numbers of large

channel catfish since stockings began in 1991. It is our opinion that the channel catfish are surviving well and are being sought after by a considerable number of anglers which warrants future stockings and management of channel catfish in Centennial Lake.

Historically, the aquatic plant Hydrilla has grown to nuisance levels in Centennial Lake. Treatment of the lake with granular Sonar in 1992 virtually eliminated Hydrilla. Some aquatic vegetation in the lake would be beneficial to protect the young sunfish and minnows from bass predation. Certain coves that are not heavily used by anglers could be untreated in the future to provide a nursery area for forage fish.

JOHNSON'S POND
(Wicomico Co.)

INTRODUCTION

Johnson's Pond is a 104 acre warmwater impoundment located in Salisbury, Maryland, that has traditionally been a popular fishing destination for largemouth bass (Micropterus salmoides) anglers. An initial fishery survey conducted in 1988 (Fewlass 1988) found that the largemouth bass population was predominantly comprised of small (<305 mm), slow-growing bass in poor condition, and was not providing anglers with the opportunity to catch quality (>305 mm) and trophy size (>381 mm) bass. To increase the number of quality and trophy bass and also improve growth rates and condition of the bass Johnson's pond was designated a Trophy Largemouth Bass Fishing Area in 1990. This designation places special regulations on the size and number of bass that anglers can harvest during the statewide open black bass season (June 16 through last day of February). Anglers can harvest (possess) five bass less than 279 mm in length per day, or four bass less than 279 mm and one bass longer than 381 mm per day. Bass from 279 mm to 381 mm cannot be harvested.

To evaluate the effects of the Trophy Bass designation on the Johnson's Pond sport fishery, data was collected during sampling episodes in fall of 1992 and 1995 and analyzed in this report.

METHODS

Fish population data was collected by daytime boat electrofishing (Smith-Root, 5.0 GPP), 15 minute duration per sample, at two established sites (Figure 1) in the fall of 1992 and 1995. During electrofishing episodes several fish species were collected, total length (mm) and weight (g) recorded, and scales taken from largemouth bass and sunfish spp. (Lepomis sp.) for age determination. Scales were removed from fish at a point ventral to the lateral line just behind the posterior tip of the left pectoral fin (depressed). A 6 m, 5 mm stretched mesh, seine was used at

five sites along the lake shore in June of 1992 and 1995 for capturing young-of-year (YOY) fingerling largemouth bass.

The length-weight relationship (Carlander 1977), condition factor (KTL) (Carlander 1977), proportional stock density (PSD) (Weithman et al. 1979), and mean weight and length were calculated for largemouth bass and sunfish spp. Relative weight (W_r) per inch group and overall mean W_r was calculated for largemouth bass (Wege and Anderson 1978). Catch-per-unit-effort (CPUE) is reported as number of fish collected per 15 minute electrofishing sample. Largemouth bass population structure assessment followed methods devised by Kruse (1988).

Largemouth bass and sunfish spp. scales were cleaned and then impressed on plastic (acetate) slides. Fish aging and scale measurements were done by examining the slides under low power on a microfiche reader. Back-calculations were performed using the method described by Lagler (1952):

$$L_1=S_1\ (L_2-a)/S_2 + a$$

Where: L_1= fish length at annulus
S_1= scale length at annulus
L_2= fish length at capture
S_2= scale length
a= correction factor

The correction factor (a) was derived from the scale-body equation (Carlander 1977).

RESULTS

Largemouth bass CPUE increased from 31 bass/15 minute in 1992 to 52 bass/15 minute in 1995, CPUE for bass in the protected slot (279-318 mm) increased from 17 bass/15 minute in 1992 to 33 bass/15 minute in 1995 (Table 1). KTL's and the slopes of the length-weight equations for 1992 and 1995 (Table 2) and the mean relative weight values (W_r95 in 1992, W_r99 in 1995) indicated that bass were in good to excellent condition. Bass growth rates were higher in 1992 than the initial rates (Fewlass 1988) found in 1988, and increased again in 1995 (Table 3), falling within the normal range for bass in Maryland coastal plain impoundments (Elser 1962).

The Johnson's Pond largemouth bass population assessment (Kruse 1988) point values for 1992 were: structure 26, abundance 29, recruitment 4, overall 59, and represent an average fishery. The point values increased for 1995 and were: structure 32, abundance 23, recruitment 12, and overall 67, representative of a good fishery. All three population measures increased after implementation of trophy bass management. Maximum point values achievable are: structure 40, abundance 40, recruitment 20, and overall 100. The improvement in the quality of the bass population since 1988 (Table 4) after the initiation of Trophy bass regulations in 1990 is illustrated in the length-frequency distribution of the bass population from 1988 through 1995 (Figure 2).

Reproduction of bass in both 1992 (25 bass/30.5 m shoreline) and 1995 (14.0 bass/30.5 m shoreline) was excellent based on the Maryland largemouth bass reproduction index (Table 5).

Sunfish spp. (predominantly bluegill sunfish, Lepomis macrochirus) CPUE dropped slightly from 1992 (149 fish/15 minute sample) to 1995 (112 fish/15 minute sample). PSD for sunfish increased from 16% ($P(0.14<0.16<0.18)=0.90$) in 1992, below the recommended 20% to 50% range for prey species (Weithman et al. 1978), to 26% ($P(0.23<0.26<0.28)=0.90$) in 1995, within the recommended range. Growth rate of bluegill sunfish was lower in 1995 than in 1988 (Table 6), but still within the normal range for Maryland coastal plain streams (Elser 1962).

Additional fish species collected in 1992 and 1995 are listed in Table 7. For the first time since the initial sampling in 1988 (Fewlass 1988) large schools of small (30 mm to 76 mm) gizzard shad (Dorosoma cepedianum) were observed during the 1995 boat electrofishing sample. During previous electrofishing samples in 1988 (Fewlass 1988), 1990 (Richardson 1990), and 1992 (Heft 1992) adult gizzard shad were abundant but young gizzard shad were uncommon. Fewlass (1988) recommended removal of adult gizzard shad because they were overabundant and too large for the bass to prey on. Overabundance of large adult (2+ years) gizzard shad (low fecundity) in an impoundment can result in reduced or insignificant shad recruitment (USFWS 1985), tying up prey biomass with no return to the system, and inconsistent year classes of shad. The expanding population of larger bass (305 mm +) in the pond since implementation of trophy bass regulations has likely increased predation on adult gizzard shad, shifting the shad spawning population to the more fecund smaller adults. This provides for consistent year class production and a more stable, utilizable food source for the bass.

DISCUSSION

Management of Johnson's Pond since 1990 as a Trophy Largemouth Bass Fishery Area has been successful in reaching the desired goals: increased number of quality (>305 mm) and trophy (>381 mm) size bass available to anglers (Fig. 2), and improved growth rates and condition of bass. The bass population has also expanded as evidenced by the increased CPUE of bass since the initial 1988 survey (24 fish/15 minute in 1988, 52 fish/minute in 1995), attributable to the stabilization of the prey base (shad and sunfish populations) and the effect of trophy bass regulations on angler harvest.

The quality of the fishery as rated with Kruse's (1988) largemouth bass population assessment method has increased from poor (overall value 48, Table 4) in the initial 1988 survey to good (overall value 67) for the 1995 survey. As more bass grow through the protected slot and reach trophy size (>381 mm) the fishery will continue to improve.

Surveys will be conducted on a two year cycle to monitor the status of the bass population. As the number and size of the trophy bass portion of the population increases, night electrofishing will be instituted to insure the collection of large fish. CPUE and bass length-frequency will be analyzed to determine if there are differential catch rates, particularly of larger bass, between day and night electrofishing samples.

Table 1. Johnson's pond catch-per-unit-effort (CPUE) for all largemouth bass and for bass in the protected slot (279 mm to 381 mm). CPUE reported as number of bass collected per 15 minute electrofishing sample for 1988, 1990, 1992, and 1995.

	CPUE (no. bass/15 minute sample)	
Year	All bass	Slot bass
1988	24	7
1990	21	4
1992	31	17
1995	52	33

Table 2. Johnson's pond largemouth bass KTL and slope of the length-weight equation for 1988, 1990, 1992, and 1995.

Year	KTL	Slope
1988	1.4	2.9186
1990	1.5	2.7082
1992	1.4	3.0300
1995	1.4	3.0044

Table 3. Back-calculated growth rates for Johnson's pond largemouth bass, 1988, 1992, and 1995.

	Bass length at annulus (mm)					
Year	I	II	III	IV	V	VI
1988	133	240	259	320	358	389
1992	124	221	289	346	385	427
1995	124	229	304	346	369	

Table 4. Population assessment values (structure, abundance, recruitment, and overall) for Johnson's pond largemouth bass for 1988, 1992, and 1995 and the maximum values for each category (Kruse 1988).

	Category			
Year	Structure	Abundance	Recruitment	Overall
1988	27	17	4	48
1992	26	29	4	59
1995	32	23	12	67
Maximum	40	40	20	100

Table 5. Maryland largemouth bass reproduction index.

Category	Number of young-of-the-year bass collected per 30.5m of shoreline
Poor	0.00 to 0.50
Fair	0.51 to 2.50
Good	2.51 to 5.50
Excellent	5.51 or more

Table 6. Back-calculated growth rates for Johnson's pond bluegill sunfish, 1988, 1992, and 1995.

	Bluegill length at annulus (mm)					
Year	I	II	III	IV	V	VI
1988	80	128	161	182		
1995	62	104	139	166	186	

Table 7. Fish species collected in Johnson's pond during fall 1995 electrofishing survey.

Fish species	Common name
Micropterus salmoides	Largemouth bass
Lepomis macrochirus	Bluegill sunfish
Lepomis gibbosus	Pumpkinseed sunfish
Perca flavescens	Yellow perch
Pomoxis nigromaculatus	Black crappie
Morone americana	White perch
Ictalurus nebulosus	Brown bullhead
Esox niger	Chain pickerel
Dorosoma cepedianum	Gizzard shad
Erimyzon oblongus	Creek chubsucker
Notemigonus crysoleucas	Golden shiner
Anguilla rostrata	American eel
Cyprinus carpio	Common carp

Figure 1. Electrofishing sample sites, Johnson's pond.

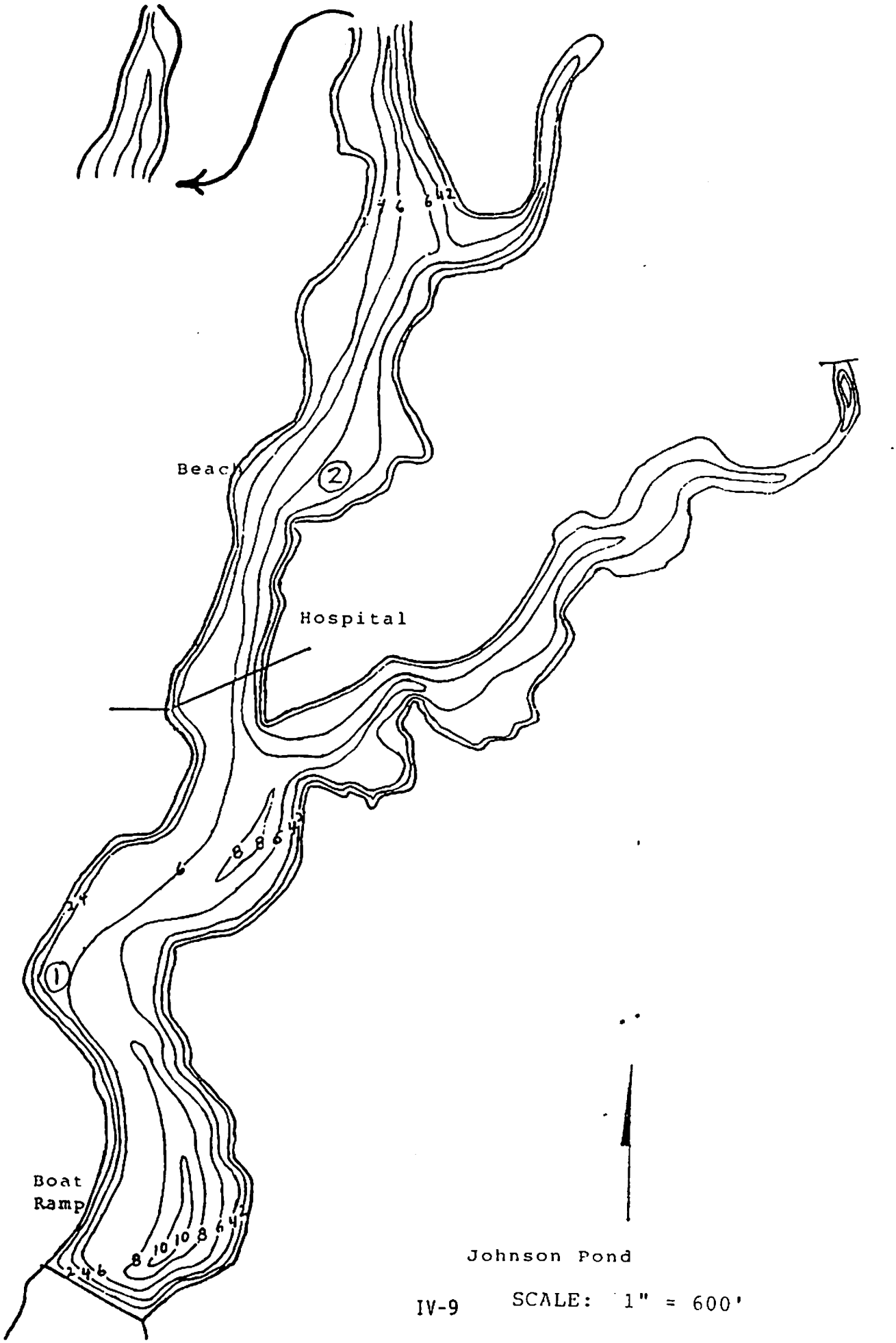
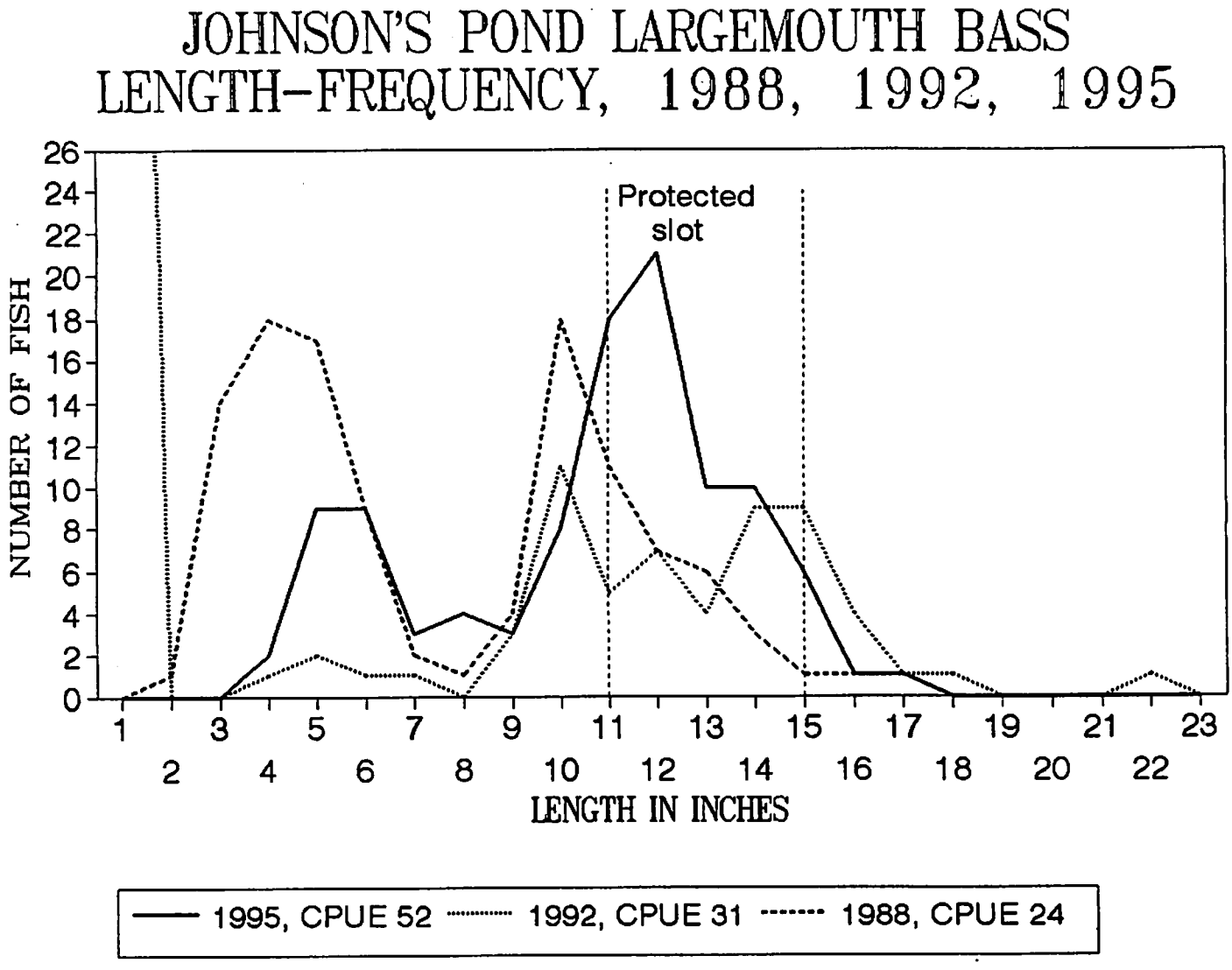


Figure 2. Johnson's pond largemouth bass length-frequency distribution graph for 1988, 1992, and 1995.



Lake Lariat
(Calvert Co.)

Background

A fishery survey of Lake Lariat was conducted on 3 May 1995 as part of a continuing study of Trophy Management Regulations for largemouth bass. The regulations were changed from the standard 12 inch minimum to Trophy Management (slot length limit 11-15") in 1991. Trophy Management Regulations were initiated at Lake Lariat because there were few bass over 12 inches and electrofishing surveys indicated a crowded bass conditior. Electrofishing surveys have been conducted every year since 1989 closely monitoring growth rates, length frequency distribution, and other population trends of largemouth bass and bluegill.

Changes in the population of largemouth bass have been occurring very slowly in Lake Lariat. The Chesapeake Ranch Fishing Club and Freshwater Fisheries have acted together to implement several management strategies in order to make improvements. Management strategies to stimulate improvements to the bass fishing at Lake Lariat included the following:

- regulate Lake Lariat as a Trophy Management Area
- stock black crappie
- stock additional forage (redear and golden shiners)
- remove bass smaller than 9 inches with electrofishing boat
- add many tree reefs and rubble piles

Stocking at Lake Lariat has included black crappie, redear sunfish, and golden shiners (Table 8.). These stockings are intended to improve species diversity and the forage base. Adult black crappie can also feed on small bass.

In 1994 and 1995 an attempt was made to thin out the small bass utilizing an electrofishing boat. These removals are indicated with a minus sign in table 8. The goal of this action was to reduce the competition for food among the remaining bass and improve their growth rates.

Table 8. Lake Lariat stockings or removals of fish.

Species	Number	Size	Date
	STOCKED		
Redear	+30,000	1"	09-20-94
Redear	+3500	1-2"	11-19-93
Redear	+10,000	1-2"	10-29-91
Bl. Crappie	+35	6-8"	05-01-90
Golden Shiners	+50	4-6"	04-24-90
	REMOVED		
Largemouth	-44	3-7"	05-03-95
Largemouth	-82	4-8"	05-03-94
Largemouth	-53	6-11"	04-24-94
Largemouth	-64	4-8"	04-30-92

Results

The electrofishing results from 3 May 1995 indicate that the efforts to improve the bass population at Lake Lariat are working.

The proportional stock density (PSD) for largemouth bass has shown an increase from 6% (n=53) in 1990 to 33% (n=87) in 1995 (Table 9). Another desirable trend is that the catch-per-unit-effort (CPUE) for stock size bass has decreased (123/hr in 1990 to 37/hr in 1995).

Bluegill PSD was 38% (n=448) in 1995. One benefit of the crowded bass population has been an excellent bluegill fishery. The large number of small bass consume the majority of the bluegill reproduction; the few that survive have less competition for food and grow quickly. (The back calculated growth rate for bluegill confirms a good growth rate for bluegill.)

Redear sunfish were first stocked in 1991 and subsequently in 1993 and 1994. As a result of these stockings, the number of redear collected in each years' electrofishing survey has increased. The PSD for redear was 21% in 1995. Four redear over 228mm (9 inches) were collected in the electrofishing sample. Because they were first stocked in the fall of 1991, these large redear would have, at most, three seasons of growth at the time of the spring 1995 survey.

The redear will provide additional forage as they reproduce and will not compete with the bluegill because they take up a different niche in the environment. Survival of the redear has been good and no more will be stocked unless needed.

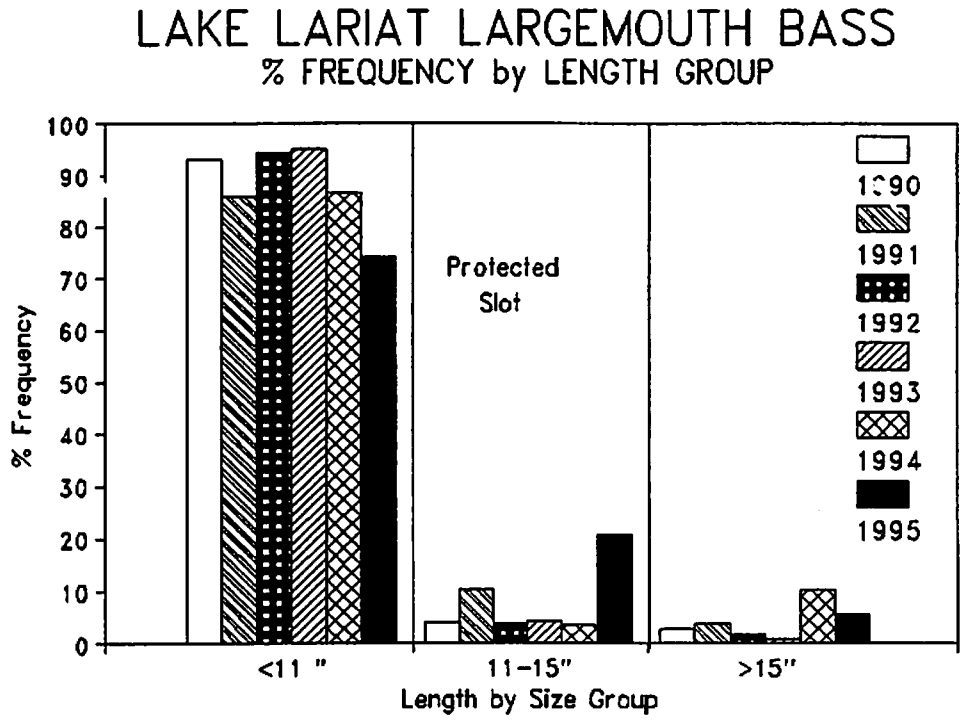
Table 9.

		Catch-Per-Unit-Effort/hour			
Species	Date	Sub-stock	Stock	Quality	PSD
Largemouth	4/24/90	49	123	7	6
Largemouth	4/17/91	84	82	16	16
Largemouth	5/20/92	110	84	18	18
Largemouth	5/4/93	58	51	5	9
Largemouth	5/3/94	77	47	16	25
Largemouth	5/3/95	41	37	19	33
Bluegill	5/10/89		107	135	56
Bluegill	4/24/90		135	699	84
Bluegill	4/17/91		274	266	49
Bluegill	5/20/92		566	411	42
Bluegill	5/4/93		138	131	49
Bluegill	5/3/94		166	166	50
Bluegill	5/3/95		178	114	38
Black Crappie	4/17/91		2	0	0
Black Crappie	5/20/92		7	44	86
Black Crappie	5/4/93		5	17	78
Black Crappie	5/3/94		9	8	45
Black Crappie	5/3/95		3	3	60
Redear	4/23/92	11	0	0	0
Redear	5/4/93		8	2	22
Redear	5/3/94		16	11	40
Redear	5/3/95	1	68	18	21

The length frequency (%) for various length groups of bass was calculated for 1990 through 1995 to compare changes since the initiation of trophy management (Figure 3).

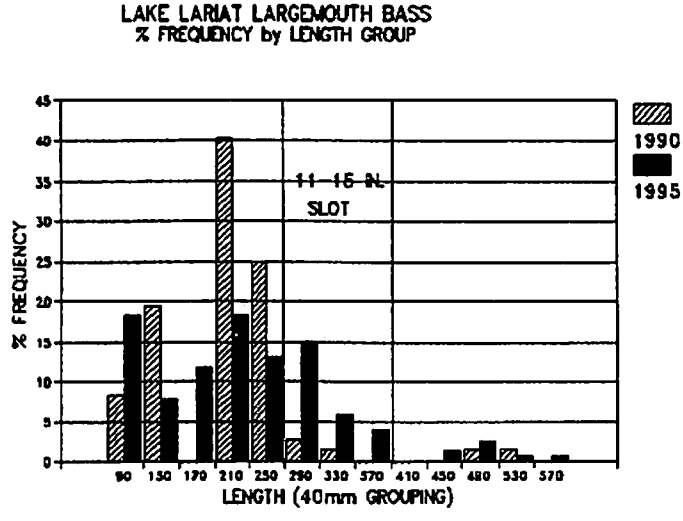
One trend presented in figure 1 is the decline in bass less than 280mm (11 inches). Declines of this size range is beneficial in that it reduces competition for food and should improve growth rates for bass. A further decline in the bass less than 280mm would be desirable and continued removal of small bass with the electrofishing boat will be recommended. A comparison between the

Figure 3



length frequency for 1990 and 1995 is shown in figure 4. Of interest is the increased number of bass in the protected slot. The greater number of bass that are in the 11-15 inch slot will increase the chance that some will grow through it to reach trophy size. Perhaps more will be collected in the slot in the future if we can continue to reduce the number of bass less than 280mm.

Figure 4



Relative Weight (W_r) is an index of condition for bass. Table 10 shows W_r values for largemouth bass in Lake Lariat. The mean W_r for 1995 was 79% which is low. W_r values for smaller sized fish have remained about the same throughout the study period. The W_r values less than 95-100% indicate below average condition for largemouth bass from Lake Lariat.

Table 10. W_r Values for Lake Lariat Largemouth Bass

Year	All Fish	<279mm (<11 in)	279-382mm (11-15 in)	>381mm (>15 in)
1989	81			
1990	85	78	84	108
1991	82	73	86	96
1992				
1993	77	77	81	102
1994	93	86	84	100
1995	79	75	82	86

Summary

Excellent spawning and survival of young has resulted in large year classes of small bass. A lack of food is preventing the growth of these fish. Slow growth rates lengthen the time necessary to reach the protected slot (or larger sizes in general) creating a greater probability for natural mortality while the bass are still small. Based on the ageing data, a 5-year-old fish is approximately 14 inches in Lake Lariat. It appears that there are few bass surviving to 5 years. Improving growth rates is necessary to change the size structure of the largemouth population in the lake. Reducing the population of small bass, which is the concept behind Trophy Management, should make additional food available for the remaining bass and improve growth rates. Evidently there are more small bass than angling pressure can remove. In 1993, a population estimate for bass less than 9 inches was roughly 2000. Intensive removal of small bass (as many as possible) using electrofishing will be required to get faster results.

Management Strategies for 1995:

- continued monitoring of the fish population
- remove small bass (< 10 inches)

LITTLE SENECA LAKE
(Montgomery Co.)

1995 Progress Report

Activities and studies conducted in 1995 included a largemouth bass reproduction survey, stocking, and two electrofishing surveys.

Reproduction Survey

A shoreline seining survey was conducted on 10 August to assess largemouth bass reproductive success. A 15 foot seine was used for the survey. Five seine hauls resulted in an average of 12 largemouth bass young-of-year (yoy)/100 feet of shoreline. The 1995 hatch was considered excellent for largemouth bass. A 100 foot section of shoreline that produces more than five yoy is considered excellent reproduction for largemouth bass in Maryland.

Stocking

On 22 September, 1800 tiger muskie fingerlings, 6-9 inches long, were stocked into Little Seneca Lake. The fingerlings were obtained from the Pennsylvania Fish Commission's Huntsdale hatchery. Tiger muskies were first introduced into the lake in June 1992, followed by an additional fingerling stocking in September 1993. This will provide another year class of tiger muskies in the lake and furnish more recreation for anglers.

On 29 September, 5640 mixed bluegill and redear fingerlings were stocked into the lake. The fingerlings were reared at Cedarville State hatchery and were excess from the farm pond stocking program.

Electrofishing Surveys

Two electrofishing surveys were conducted on Little Seneca Lake in 1995. A 12 May survey was conducted to obtain data on the largemouth bass population and to determine growth rates and survival of the tiger muskies stocked in June of 1992 and September of 1993. A May date was selected to coincide with bass spawning activity and allow observation of some of the larger bass. One run of 915 seconds was conducted during the daytime survey resulting in the capture of 76 largemouth bass. The largest bass was 50.5 cm (19.8 in.) and 68.8 ounces (4 lbs. 3 oz.). The Proportional Stock Density (PSD) was 53 which is within the recommended range of 30 to 70 for a predatory fish species. The catch-per-unit-effort (CPUE) for stock size bass was 287 bass/hour and the CPUE for quality size bass was 153 bass/hour. These values are high for Maryland waters. A stock CPUE of 50 to 100 fish/hour is considered normal in Maryland. Fifty-one percent of the largemouth bass were within the slot limit of 11 inches up to but not including 15 inches.

Three tiger muskies from the September 1993 stocking were captured during the survey. The tiger muskies average length was

54.5 cm and average weight was 30.2 ounces. The tiger muskies were 17.8 to 22.9 cm long when stocked in September of 1993. This finding demonstrated for the third straight year that tiger muskies can successfully over winter in Little Seneca Lake and exhibit good growth rates.

On 11 October, a night electrofishing survey of Little Seneca Lake was conducted. Three runs totalling 3991 seconds of actual electrofishing time were completed throughout the lake.

A total of 115 largemouth bass were collected during the survey. The PSD was 44, within the recommended range of 30-70 for a predatory fish species. The stock size(>20 cm) CPUE was 102 fish /hour and the quality size(>30 cm) CPUE was 45 fish/hour. The average relative weight (Wr) for stock size bass was 99. This value indicates the fish are in excellent condition. Sixty-three percent of the largemouth bass collected were within the protected slot of 11 to 15 inches.

Other species observed during the surveys included: black crappie, creek chubsucker, bluegill, pumpkinseed sunfish, and yellow bullhead.

The slot limit regulations on Little Seneca Lake appear to be meeting the intended objectives of providing large numbers of bass in the 11 to 15 inch protected slot in addition to providing excellent angling for bass over 15 inches.

Tiger muskies are surviving and growing very well. Although we have yet to recover a legal tiger muskie(> 30 in.), we have spoken to anglers who have caught such fish and witnessed photographs. In the fall of 1994, we observed but did not capture what appeared to be a legal tiger muskie while electrofishing.

Management Activities

The following are recommended management activities for 1996.

- continue monitoring the largemouth bass population with spring and fall electrofishing surveys
- monitor bluegill, pumpkinseed and redear sunfish to determine the condition of each population
- continue monitoring the black and white crappie population when crappie are actively spawning
- continue seining surveys to assess reproductive success for largemouth bass, sunfish, and crappie
- continue monitoring the tiger muskellunge population

ST. MARY'S LAKE
(St. Mary's Co.)

Introduction:

St. Mary's Lake is a 250 acre impoundment located near Callaway in St. Mary's County, Md. It was designed mainly for sport fishing. From 1977 to 1984 an overcrowded population of small largemouth bass (*Micropterus salmoides*) made St. Mary's an undesirable lake for bass fishing. Since 1985, St. Mary's Lake has been a "Trophy Bass Management Area". Trophy management regulations were enacted to improve growth rates and to encourage bigger sizes of bass. Other studies such as Summers (1988), have shown that similar regulations increased the density of bass over 15 inches and improved PSD values.

During the first 3 years of trophy management regulations, beginning in 1985, anglers were permitted to take five bass between 9 and 11 inches or four bass between 9 and 11 inches and one bass over 15 inches per day. In 1988 the 9 inch minimum was removed and thereafter simply the slot between 11 and 15 inches became protected.

Since the initiation of trophy management regulations, data has been collected at least twice annually on fish populations in St, Mary's Lake. Fish collections were made using an electrofishing boat equipped with a gas powered 5,000 watt generator using pulsed Direct Current.

Summary of Results:

A summary of electrofishing data for St. Mary's Lake since 1990 is shown in Table 11. Data collected during 1995 show little change in bass PSD or CPUE values from previous years. Largemouth bass PSD in 1995 was only 13% which is well below the recommended range of 30 to 70% (Weithman et al. 1979). Bluegill PSD has been increasing since 1990 and was 60%. This is above the recommended range of 20 to 50% for a prey species. CPUE\hr for quality Black Crappie has been declining and was only 13 in 1995. CPUE\hr of quality redear rose from 53 in 1994 to 90 in 1995.

Growth rates of largemouth bass remain slow for the first 4 years in St. Mary's Lake (Table 12) as compared to the coastal plain average (Elser, 1962). A three year old bass in St. Mary's is only 11.1 inches as compared to 13.0 inches for other coastal plain largemouth. The Relative Weight index (Table 13) indicates that most bass are slightly below average in body condition. Normal Relative Weight values should be 95-100% (Wedge and Anderson, 1978) whereas St. Mary's bass are only 90%.

Discussion:

Trophy Bass management regulations were proposed in 1984 with the main goal of providing more big bass for sport fishermen. It was hoped that these regulations in St. Mary's Lake would: reduce the number of small bass by increasing harvest; increase growth rates and condition of small bass; protect intermediate bass from

harvest; and allow more bass to survive to "trophy size".

Unfortunately "Trophy Management Regulations" have not been successful in St. Mary's Lake. Since 1985 when trophy regulations were first enacted, largemouth bass population structure has seen little change (Figure 5).

Table 11. Electrofishing data for St. Mary's Lake (1990-1995)

			Catch-Per-Unit-Effort/hour			
Species	Date	Sub-stock	Stock	Quality	Trophy	PSD
Largemouth	10-11-95	74	155	23	11	13%
Largemouth	10-19-94	116	132	16	6	11%
Largemouth	10-14-93	76	102	18	8	15%
Largemouth	10-15-92	38	90	36	18	29%
Largemouth	10-10-91	198	124	34	11	22%
Largemouth	10-22-90	75	48	16	6	25%
Bluegill	10-11-95		110	166		60%
Bluegill	10-19-94		95	87		48%
Bluegill	10-14-93		328	261		44%
Bluegill	10-15-92		724	364		33%
Bluegill	10-10-91		296	120		29%
Bluegill	10-22-90		238	90		27%
Black Crappie	10-11-95		5	13		71%
Black Crappie	10-19-94		4	22		85%
Black Crappie	10-14-93		6	37		59%
Black Crappie	10-15-92		36	52		86%
Black Crappie	10-10-91		53	57		52%
Black Crappie	10-22-90		27	36		57%
Redear	10-11-95		38	90		70%
Redear	10-19-94		24	53		68%
Redear	10-14-93		18	33		65%
Redear	10-15-92		8	24		75%
Redear	10-10-91		4	25		86%
Redear	10-22-90	3	0	0		0%

Table 12. Calculated Growth Rates (Inches) of St. Mary's Lake Bass

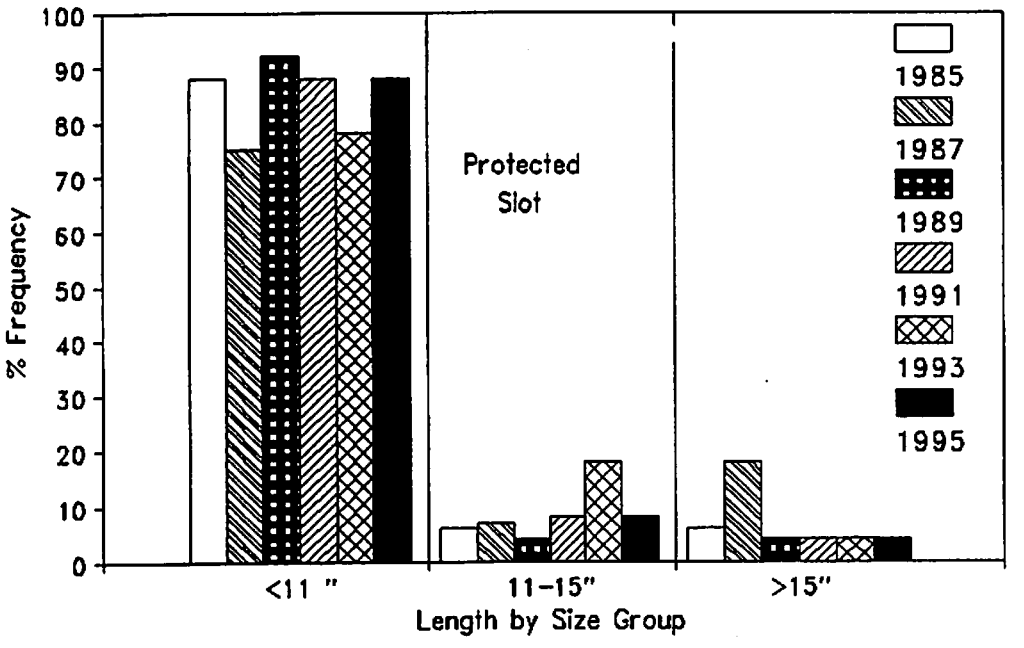
	AGE					
Year	I	II	III	IV	V	VI
1987	5.6	11.3	14.7	17.1	18.6	
1988	5.9	10.8	13.1	17.1	18.7	
1989	5.7	9.2	12.6	15.6	17.7	
1990	5.2	9.7	12.9	15.2	17.0	
1991	5.5	9.1	11.5	13.9	16.5	17.4
1992	5.4	8.6	10.9	13.2	14.8	17.2
1993	4.4	8.4	10.8	12.7	14.6	16.0
1995	4.9	8.6	11.1	13.5	17.3	18.7
*Elser	4.9	9.7	13.0	15.3	16.9	18.7

* Md. Coastal Plain Average (Elser, 1962)

Table 13. Largemouth Bass Weighted Means of Relative Weights

Year	All Fish	<279mm (<11 in.)	279-381mm (11-15 in.)	>381mm (>15 in.)
1985	98	98	103	
1986	96	94	96	114
1987	94	92	88	107
1988	100	98	89	109
1989	92	89	94	108
1990	90	88	91	103
1995	90	91	82	95

Figure 5



Excess numbers of small bass under 11 inches still persist. There has been no improvement in numbers of protected bass (11-15") or numbers of trophy bass (>15"). Growth rates of bass remain slow. The only improvement in the fish population has been an improvement in the PSD of bluegill from 27% in 1990 to 60% in 1995. The high CPUE of quality bluegill and redear sunfish should keep the "pan fisherman" happy.

Excellent spawning, and survival of young has resulted in large year classes of small bass. A lack of food is preventing the growth of these fish. Slow growth rates lengthen the time necessary to reach the protected slot (or larger sizes in general) creating a greater probability for natural mortality while the bass are still small. Improving growth rates is necessary to change the size structure of the largemouth population in the lake. Reducing the population of small bass, which is the concept behind Trophy Management, should make additional food available for the remaining bass and improve growth rates. Evidently there are more small bass than angling pressure can remove. Intensive removal of small bass (as many as possible) using electrofishing will be required to get faster results.

One change at St. Mary's Lake since 1991 has been the addition of structure. The PAX River Bassmasters fishing club has felled a number of trees along the shoreline out into the lake. These added trees will provide habitat and cover that will attract most fish species. Additional cover to protect prey species would benefit St. Mary's Lake. Increasing the survival of prey will provide more food for the bass. Yellow water lilies (nuphar) would be a good choice because it provides good habitat and is restricted to shallow water.

Plans for 1996 include the following:

- continued monitoring of the fish population.
- plant yellow water lilies
- remove small bass collected with electrofishing boat

Wheatley Lake
(Charles County)

Management activities conducted on Wheatley Lake in 1995 included: stocking channel catfish; electrofishing surveys, and largemouth bass removal.

Approximately 100 pounds of channel catfish were stocked into Wheatley Lake on June 7. The catfish were 1 to 2.5 pounds when stocked, and were purchased from a private aquaculture farm. The purpose of stocking catfish is to increase the probability of success for anglers during fishing rodeos. Hatchery reared catfish feed readily on a variety of natural and processed baits which make them easier to catch.

Results from fall electrofishing samples shows the majority of bass ranging from 200 to 280 mm in total length. There has been a noticeable increase in fish within the 200 to 260 mm length group since 1992 (Figure 6). The larger fish in this group were beginning to move into the protected slot range in 1994. The change in slot-length bass was minimal in 1995 with the exception of a few more fish exceeding 300 mm. PSD values increased to 7% in 1995 (Table 15), but still remains well below the recommended range of 30 to 70% for predators. Bluegill and redear sunfish PSD have decreased to 46% and 36%, respectively, which falls into the suggested range of 20% to 50% for prey species (Weithman, Reynolds, and Simpson, 1979).

Figure 6

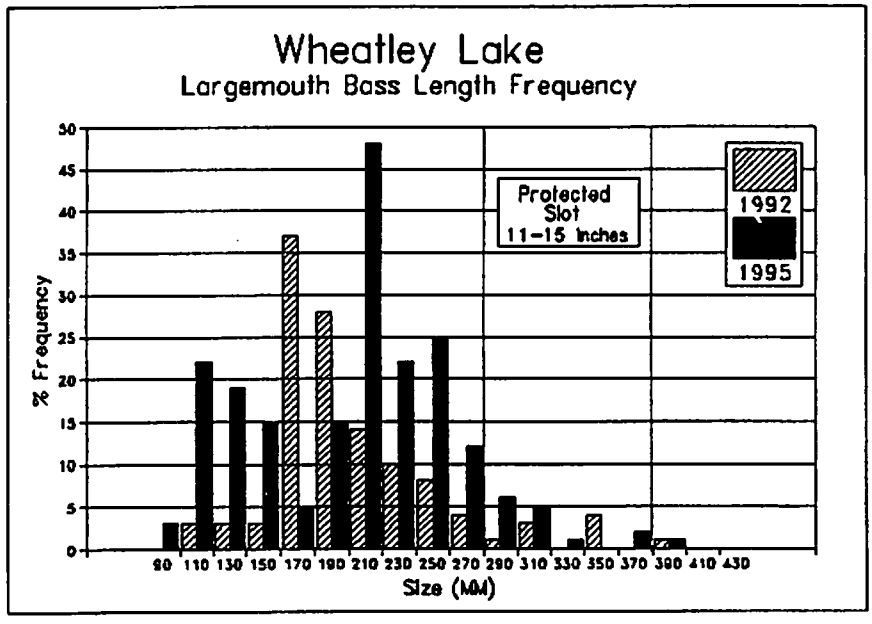


Table 15. Proportional Stock Density of Wheatley Lake Largemouth Bass, Bluegill and Redear Sunfish.

Date	Bass	Bluegill	Redear
11-15-88	4%	-	-
11-03-89	3%	36%	-
10-10-90	10%	39%	-
10-24-91	13%	37%	-
10-22-92	18%	46%	-
10-20-93	6%	41%	-
10-27-94	4%	60%	57%
10-18-95	7%	46%	36%

Catch per unit effort values (Table 16) for bass shows a large decline in the numbers of fish below 9" in length. This decrease of small fish is an improvement to the total bass population, but fish in the 9 - 11" size range are still too abundant. An increase in numbers of bass in the protected slot indicates a slight improvement over the past 7 years. Bass exceeding 15 inches continue to be in short supply.

Table 16. CPUE/hour by Size Group for Wheatley Lake Bass (fall samples).

Year	<9 in.	9-11 in.	11-15 in.	>15
1988	142	46	12	0
1989	135	33	2	0
1990	136	72	23	2
1991	153	22	10	6
1992	255	59	24	3
1993	149	143	19	2
1994	138	84	27	3
1995	23	112	39	2

Relative weight indices (Table 17) indicate that Wheatley Lake bass are below the desired weight for their length. Trophy management regulations have not been effective at increasing the relative weights of bass or maintaining a balanced fish population. The overall relative weight of bass increased to 84, but continues to be well below the standard.

A total of 784 largemouth bass ranging in size from 4 to 10 inches were removed from the lake in November, 1995. This was done as a management procedure in order to reduce the numbers of small bass in the population and to decrease competition for food.

Hydrilla was documented for the first time in Wheatley Lake in 1995. Submerged Aquatic Vegetation provides good habitat and cover for young fish. Gizzard Shad where initially found in the fall of 1994, and again in the spring of 1995. During the fall sampling of this year, however, no gizzard shad were found. The successful reproduction of these fish could have provided a good food base for the bass.

Table 17. Largemouth Bass Weighted Means of Relative Weights.

Year	All Fish	<11 in	>11 in
1988	83	83	80
1989	84	84	81
1990	81	81	85
1991	88	88	84
1992	86	86	82
1993	85	84	89
1994	83	83	85
1995	84	83	85

Wheatley Lake was placed under trophy management regulations in 1989. There have been minimal changes in the bass population since the new management plan went into effect, with the exception of a few more fish in the slot. The bass reaching the slot-size range will be monitored as they enter the protected slot length. The goal of the trophy management regulations is for these smaller

fish to grow into, and beyond, the protected slot range and survive to trophy size. Wheatley Lake will be closely observed through 1996 to determine the effects of trophy management and to decide if further fish removal is necessary.

Fresh Creek
(Calvert County)

Freshwater Fisheries activities on Fresh Creek in 1995 included stocking young largemouth bass and conducting an electrofishing survey on May 3.

Fresh Creek is located along the Chesapeake Bay with only a narrow beach and causeway separating the two bodies of water. Fresh Creek often experiences an inflow of bay water in periods of storm tides or extreme flooding. An anadromous fish passageway was constructed in the 1980's to allow for the unobstructed movement of fish between the Bay and creek. Shifting sand, however, often changes the course of water flow and, in dry periods, water flow ceases completely.

Documentation of fish species found during electrofishing samples is shown in Table 1. Natural reproduction of bluegill sunfish, pumpkinseed sunfish, black crappie, and white perch were considered good and should provide a reliable food base for predator species.

Table 1. List of fish species present in Fresh Creek, 1995

Common Name	Scientific Name
Largemouth Bass	Micropterus salmoides
Bluegill	Lepomis machrochirus
Pumpkinseed	Lepomis gibbosus
Redear sunfish	Lepomis microlophus
Black Crappie	Pomoxis nigromaculatus
Yellow Perch	Perca flavescens
White Perch	Morone americanus
Brown Bullhead	Ictalurus nebulosus
Carp	Cyprinus carpio
Gizzard Shad	Dorosoma cepedianum
Alewife Herring	Alosa pseudoharangus

A total of 17 juvenile and 34 adult largemouth bass were collected during the survey. The CPUE for stock size bass was 17 fish/hr. This is an improvement since the 1989 CPUE of 0 fish/hr. The PSD for bass was 71, which is slightly above the recommended range of 30% to 70% (Table 2).

Table 2. Proportional Stock Density (PSD) of Fresh Creek Largemouth Bass, Bluegill, Black Crappie and White Perch.

Date	Bass	Bluegill	Black Crappie	White Perch
5/10/89	100%	4%	-	13%
4/29/92	67%	4%	67%	6%
5/3/95	71%	4%	56%	0%

Approximately 161 largemouth bass have been stocked since 1992 in order to supplement the poor natural reproduction in Fresh Creek. These fish, which ranged in size from 3 to 11 inches, were transferred from Lake Lariat where an overabundance of small fish occurs.

The bluegill population was made up of mainly small fish having a PSD of 4%. This value has not changed since the lake was initially surveyed in 1989. Black crappie were not documented in 1989, but by 1992 a good population had been established, having a PSD of 67%. In 1995, the black crappie population continued to be in good balance, having a PSD of 56%. White perch had a PSD of 13% in 1989 but declined to 0% in 1995. A white perch population still exists in Fresh Creek, but it is made up of stock and sub-stock fish.

Based on current information, the bass population in Fresh Creek has improved since 1989. This improvement, however, is primarily a result of stocking efforts. Because of the poor largemouth bass reproduction, stocking efforts should continue. Habitat enhancement is also a possibility. The establishment of some vegetation (SAV) should help protect any reproduction that does occur in the pond.

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ANNUAL PERFORMANCE REPORT

Maryland Department of Natural Resources
Fisheries Service
Freshwater Fisheries Division

SURVEY AND MANAGEMENT OF FRESHWATER FISHERIES RESOURCES

Fishing Regulations

Federal Aid Project: F-48-R-5

Study No.: VIII

By

Robert M. Davis

1995

ANNUAL PERFORMANCE REPORT

State: Maryland **Project No.:** F-48-R-5

Study No.: VIII

Job No.: 1

Project Title: Survey and Management of Freshwater Fisheries Resources

Study Title: Fishing Regulations

Job Title: Fishing Regulations

Objective: To adopt fishing regulations on the basis of the best information to ensure the perpetuation of fish species and to provide maximum fishing opportunities and quality.

Results: Five informational meetings involving public participation were held in May 1995, where regulations proposed for implementation in 1996 were presented and questions and comments were received from the audience. Proposed regulations were published in the Maryland Register and a public hearing concerning the adoption of these regulations was held at the Tawes State Office Building in Annapolis on September 21, 1995.

New freshwater fishing regulations going into effect on January 1. These include modifying closure periods for Put-and-Take Trout Fishing Areas; adding waters to the list of Put-and-Take Trout Fishing Areas; changing the closure dates of several Put-and-Take Trout Fishing Areas; adding waters to the list of Limited Harvest Fishing Areas; and deleting from the list of Trout Fishing Areas Limited to Fishing by Persons Under 16 Years of Age, 65 years Old and Older and Blind Persons that portion of Little Tonoloway Creek lying within Weidmeyer Park and adding it to the list of Youth and Blind Put-and-Take Trout Fishing Areas.

Inclusion in the Put-and-Take Trout Fishing Areas means that an angler with a license and trout stamp may keep up to five trout per day, as opposed to the general statewide limit of two trout per day. In addition, it generally means an area will have a stream closure ranging from one to three weeks to allow stocking of trout. Waters being added to the list of Put-and-Take Trout Fishing Areas in 1996 are:

* North Branch Potomac River (Garrett County) from the uppermost boundary of the Potomac State Forest at

Wallman to the bridge at Old Wilson Road, a distance of approximately 8 miles. This is an area that until just recently was so severely impacted by acid mine drainage that it not support fish life.

* Greenbelt Lake (Prince George's County)

The closure dates for the following Put-and-Take Trout Fishing Areas were changed from no closure to a one week closure during stocking to allow for a more equitable distribution of trout to anglers: New Germany Lake, Melwood Pond, Lake Waterford, Tucker Pond, and Cosca Lake.

To prevent overexploitation of largemouth bass and panfish, Farm Museum Pond, Westminster Community Pond, Cosca Lake, Tucker Pond, and Myrtle Pond have been added to the list of Limited Harvest Fishing Areas. Special requirements in effect in these ponds are that a person may possess not more than 10 fish, only one of which can be a largemouth bass and the largemouth bass may not exceed 15 inches in length.

Little Tonoloway Creek, lying within Weidmyer Park, was deleted from the list of Trout Fishing Areas Limited to Fishing by Persons Under 16 Years of Age, 65 Years Old and Older, and Blind Persons and added to the list of Youth and Blind Put-and-Take Trout Fishing Areas. This was done because the 65 and older age group was harvesting nearly all of the trout before youths under 16 had an opportunity to fish. This regulation change was made because their were several waters nearby for the 65 and older age group to fish, but areas expressly set aside for young people.

Duration: January 1, 1995 through December 31, 1995

ANNUAL PERFORMANCE REPORT

Maryland Department of Natural Resources
Fisheries Service
Freshwater Fisheries Division

SURVEY AND MANAGEMENT OF FRESHWATER FISHERIES RESOURCES

North Branch Potomac River Restoration Study

Federal Aid Project: F-48-R-5

Study No.: IX

By

Kenneth Pavol and Alan Klotz

1995

Annual Performance Report

State: Maryland

Project No.: F-48-R-4

Study No.: IX

Job No.: 1

Project Title: Survey, Inventory, and Management of Maryland's Freshwater Fisheries Resource

Study Title: North Branch Potomac River Restoration Study

Job Title: North Branch Potomac River, Jennings Randolph Dam Downstream to Cumberland, MD

Duration : January 1, 1995 to December 31, 1995

JOB OBJECTIVE

As part of an ongoing statewide project to establish baseline data characterizing the freshwater fisheries resources of Maryland, Freshwater Fisheries Division personnel conducted a survey of fish and benthic macroinvertebrates in the North Branch Potomac River from the Jennings Randolph Lake Dam downstream to Cumberland in 1995.

PROCEDURES

Fish and benthic macroinvertebrate were obtained at eight sites in the North Branch Potomac River, and one site in Georges Creek, an important tributary stream. Site locations are described in the 1990 North Branch Potomac River Final Report.

FISH COLLECTIONS

Fish species composition and relative abundance (catch per unit effort) were determined using a 1.5 kw pulsed DC barge mounted electro-shocker at stations 1 through 6. A 5.0 kw pulsed DC boat electro-shocker was used at station 7 and two battery powered backpack units were used at station 8 in Georges Creek. New sample stations were established in the upper Catch and Release Trout Management Area (1a) and the lower Catch and Release Area (2a). The Zippen three pass removal method was used to estimate trout populations in stations 1, 1a, 2, and 2a.

BENTHIC MACROINVERTEBRATE COLLECTIONS

Multiple plate samplers and kicknet samples were used to obtain benthic macroinvertebrate collections at each station, except 1a and 2a, on 21 August, 1995. Results are reported in "Annual Progress Report, 1995, Federal Aid Project F-48-R, Study X, Tailwater Macroinvertebrate Populations".

RESULTS

FISH COLLECTIONS

A list of common and scientific names of 37 fish species collected in the NBPR during 1995 is contained in Table 1. Catch per unit effort for each fish species by station is presented in Table 2.

Trout population estimates at Station 1, located in a designated Natural Trout Propagation Area immediately downstream of the Jennings Randolph Dam, included adult trout of three species (Table 3). Adult trout standing crop at Station 1 was the highest of all stations supporting trout populations. Despite observations of heavy spawning activity by brown trout in this area of the river during the fall of 1994, no wild YOY trout were collected at Station 1.

Station 1a (located approximately 0.6 miles downstream of Station 1) is managed under Catch and Release regulations, however, all access to this area is currently denied by the Army Corps of Engineers. Four species of adult trout (Table 2) as well as wild YOY brook and brown trout were collected at Station 1a. Standing crops were lower than in Station 1, however, adult trout densities were greater (Table 4).

Adult trout standing crops and densities were lowest at Station 2, located in the Put and Take Management Area of the North Branch (Tables 3 - 4). This area receives approximately 12,000 hatchery brown and rainbow trout annually. Rainbow trout were observed spawning in this station during late summer, 1995. Subsequent sampling in late fall produced numerous YOY rainbow trout from swim-up fry stage to 50 mm; possibly the first successful reproduction by rainbow trout in the North Branch Potomac River. Wild YOY brook and brown trout were also collected at Station 2 in 1995, the fifth consecutive year that natural reproduction by those species has been documented there.

Station 2a, located in a catch and release trout management area, contained the highest estimated number of adult trout per mile (Table 4) as well as the greatest abundance of wild brook trout, both adult (Table 2) and YOY (186 $\pm$ 77/mile). No adult hatchery trout are stocked in Station 2a, however, 12,000 cutthroat trout spring fingerlings were stocked in all stations (1,1a,2,2a) in 1995. Cutthroat trout, the result of fingerling plants in 1992, 1993, and 1994, were the most common adult trout species collected in Station 2a (Table 4).

Fish sampling efforts at Station 4, immediately upstream of the Westernport Wastewater Treatment Plant (WWTP) effluent, produced 13 fish species, including rainbow and brown trout, and smallmouth bass (Table 2). The WWTP receives and treats domestic sewage from surrounding communities as well as industrial wastewater from the Westvaco Pulp and Paper Mill at Luke. The

treated effluent from the WWTP, about 2% municipal sewage and 98% Westvaco wastewater, is discharged into the North Branch Potomac at Westernport. Species richness decreased to seven fish species at Station 5, 1.5 miles downstream of the WWTP discharge. Adult brown trout were collected at Station 5 for the third consecutive year.

Species richness improved to 17 species at Station 6, Pinto (Table 2). Efforts to reestablish gamefish species in the North Branch continued in 1995. Approximately 8,400 largemouth and 15,000 smallmouth bass spring fingerlings, as well as 2,007,500 walleye fry, were stocked between Pinto and Cumberland during May and June 1995. Subsequent sampling at Station 6 in July, 1995, produced one YOY and one yearling smallmouth bass. A total of 28 largemouth bass, ranging in size from 42 mm to 311 mm, were collected. No walleyes were collected in electrofishing samples at Pinto.

The highest fish diversity of all study sites was measured at Station 7, Cumberland (Table 2). Gamefish species such as largemouth and smallmouth bass, walleye, chain pickerel, channel catfish, and several panfish species were present at Station 7. Gamefish species are sufficiently abundant in the North Branch at Cumberland to support a popular recreational fishery.

Station 8 (Georges Creek) exhibited a diverse fish assemblage despite the impacts of acid mine drainage and untreated domestic sewage which still persist in the watershed. A total of 12 fish species, including holdover rainbow trout from spring stockings, were collected in Georges Creek.

RECOMMENDATIONS

It is recommended that this study be continued in order to monitor the recovery of the North Branch Potomac River in response to pollution abatement efforts in the watershed, to monitor the developing wild trout fishery, and to assess Freshwater Fisheries Division's efforts to reestablish black bass and walleye.

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Prepared by:

Kenneth W. Pavol, Western Region Fisheries Manager

Alan W. Klotz, District I Fisheries Biologist

Table 1. List of common and scientific names of fish collected in the North Branch of the Potomac River from the Jennings Randolph dam downstream to Cumberland, 1995 (AFS, 1991).

Central stoneroller	-	Campostoma anomalum
Spotfin shiner	-	Cyprinella spiloptera
Carp	-	Cyprinus carpio
Cutlips minnow	-	Exoglossum maxillinga
Common shiner	-	Luxilus cornutus
River chub	-	Nocomis micropogon
Golden shiner	-	Notemigonus crysoleucas
Spottail shiner	-	Notropis hudsonius
Bluntnose minnow	-	Pimephales notatus
Blacknose dace	-	Rhinichthys atratulus
Longnose dace	-	Rhinichthys cataractae
Creek chub	-	Semotilus atromaculatus
Fallfish	-	Semotilus corporalis
White sucker	-	Catostomus commersoni
Creek chubsucker	-	Erimyzon oblongus
Northern hogsucker	-	Hypentelium nigricans
Golden redhorse	-	Moxostoma erythrurum
Brown bullhead	-	Ameiurus nebulosus
Channel catfish	-	Ictalurus punctatus
Chain pickerel	-	Esox niger
Cutthroat trout	-	Oncorhynchus clarki
Rainbow trout	-	Oncorhynchus mykiss
Brown trout	-	Salmo trutta
Brook trout	-	Salvelinus fontinalis
Mottled sculpin	-	Cottus bairdi
Rock bass	-	Ambloplites rupestris
Redbreast sunfish	-	Lepomis auritus
Green sunfish	-	Lepomis cyanellus
Pumpkinseed sunfish	-	Lepomis gibbosus
Bluegill	-	Lepomis macrochirus
Longear sunfish	-	Lepomis megalotis
Smallmouth bass	-	Micropterus dolomieu
Largemouth bass	-	Micropterus salmoides
Greenside darter	-	Etheostoma blennioides
Fantail darter	-	Etheostoma flabellare
Tessellated darter	-	Etheostoma olmstedi
Walleye	-	Stizostedion vitreum

Table 2. Catch per unit effort (individuals/hr) electrofishing at North Branch Potomac River sampling stations, 1995.

Species	Station Number 1	1a	2	2a	4	5	6	7	8
Stoneroller	0	0	0	0	0	0	0	0	1.0
Spotfin shiner	0	0	0	0	0	0	0	3.0	0
Carp	0	0	0	0	0	0	0	30.0	0
Cutlips minnow	0	0	0	0	0.8	0	0	0	0
Common shiner	0	0	0	0	0	0	9.1	1.0	0
River chub	0	0	0	0	0	0	0	2.0	0
Golden shiner	0	0	0	0	0	0	61.1	0	0
Spottail shiner	0	0	0	0	0	0	10.4	18.0	0
Bluntnose minnow	0	0	0	0	0	0	6.5	2.0	0
Blacknose dace	0	2.2	1.5	43.9	53.1	27.2	39.0	0	118.0
Longnose dace	1.0	15.4	9.0	13.8	15.8	9.5	7.8	0	45.0
Creek chub	0	0	0	0	0.8	42.2	41.6	0	4.0
Fallfish	0	0	0	0	0	0	0	6.0	0
White sucker	21.0	22.0	2.3	14.8	181.8	145.5	79.3	7.0	88.0
Creek chubsucker	0	0	0	0	0	0	0	2.0	0
Northern hogsucker	0	0	0	0	0	0	0	2.0	0
Golden redhorse	0	0	0	0	0	0	0	59.0	0
Brown bullhead	0	0	0	0	0	0	0.7	8.0	0
Channel catfish	0	0	0	0	0	0	0	1.0	0
Chain pickerel	0	0	0	0	0	0	0	1.0	0
Cutthroat trout	3.0	2.2	3.0	7.4	0	0	0	0	0
Rainbow trout	13.0	13.2	2.3	0	2.5	0	0	0	3.0
Brown trout	9.0	15.4	2.3	1.1	0.8	2.7	0	0	0
Brook trout	0	1.1	2.3	11.7	0	0	0	0	0

Table 2 (cont.). Catch per unit effort (individuals/hr) electrofishing at North Branch Potomac River sampling stations, 1995.

Species	Station Number 1	1a	2	2a	4	5	6	7	8
Mottled sculpin	1.0	0	0	2.7	10.8	0	0	0	2.0
Rock bass	0	0	0	0	3.3	0	2.6	16.0	2.0
Redbreast sunfish	0	0	0	0	0	0	24.7	25.0	2.0
Green sunfish	0	0	0	0	1.7	0	1.3	0	2.0
Pumpkinseed	0	0	0	0	8.3	0	50.7	17.0	9.0
Bluegill	0	0	0	0	0	0	2.0	14.0	0
Longear sunfish	0	0	0	0	0	0	0	5.0	0
Smallmouth bass	0	0	0	0	4.2	1.4	1.3	4.0	0
Largemouth bass	0	0	0	0	0	0	18.2	19.0	0
Greenside darter	0	0	0	0	0	0	0	1.0	0
Fantail darter	0	0	0.8	8.5	14.1	1.4	0	0	4.0
Tessellated darter	0	0	0	0	0	0	28.6	1.0	0
Walleye	0	0	0	0	0	0	0	1.0	0
Total Species	6	7	8	8	13	7	17	24	12

Table 3. Adult trout standing crops (lbs/acre) in the North Branch Potomac River, 1995.

Station	Total	Brook	Brown	Rainbow	Cutthroat
1	35 ± 24	0	5 ± 1	21 ± 14	5 ± 27
1a	26 ± 2	< 1	8 ± 1	16 ± 2	2 ± 12
2	5 ± 1	1 ± 0	1 ± 0	5 ± 28	1 ± 0
2a	7 ± 8	2 ± 4	1 ± 9	0	2 ± 1

Table 4. Adult trout densities (trout/mile) in the North Branch Potomac River, 1995.

Station	Total	Brook	Brown	Rainbow	Cutthroat
1	370 ± 258	0	95 ± 30	169 ± 115	53 ± 283
1a	391 ± 24	13 ± 0	189 ± 9	162 ± 22	27 ± 178
2	116 ± 14	21 ± 0	21 ± 0	53 ± 283	42 ± 0
2a	416 ± 463	120 ± 259	22 ± 144	0	186 ± 118

Annual Performance Report

State: Maryland

Project No.: F-48-R

Study No. : IX

Job No. : 2

Project Title: Survey, Inventory, and Management of Maryland's Freshwater Fisheries Resource

Study Title: North Branch Potomac River Restoration Study

Job Title: North Branch Potomac River - upstream of Jennings Randolph Lake

Duration: January 1, 1995 to December 31, 1995

JOB OBJECTIVE

As part of an ongoing statewide project to establish baseline data characterizing the freshwater fisheries resource of Maryland, Freshwater Fisheries Division personnel conducted a survey of fish and benthic macroinvertebrates in the North Branch Potomac River upstream of Jennings Randolph Lake at four stations in 1995. Particular emphasis was placed on documenting the recovery of aquatic organisms in response to acid mine drainage abatement measures in the upper North Branch Potomac River Watershed.

PROCEDURES

Fish Collections

Fish species composition and relative abundance (catch per unit effort) were determined using a 12 volt battery backpack electroshocker at four stations. Station 1 was located within the town limits of Kitzmiller, Station 2 was located at Wallman in the Potomac State Forest, Station 3 was located at Steyer, and Station 4 was located near Bayard, WVA (Fig. 1).

Benthic Macroinvertebrate Collections

Benthic macroinvertebrates were collected using a D-frame kick net (6 samples, 30 second duration) and multiple plate samplers (44 day exposure) at four sites in the North Branch Potomac River.

Temperature Regimes

Ryan TempMentors were deployed at two sites in the river to monitor summertime maximum temperatures. Site 1 was located 20

meters upstream from the confluence of Lostland Run, and site 2 was located at Wallman.

RESULTS

Fish Collections

A list of common and scientific names of the ten fish species collected in the North Branch Potomac River upstream of Jennings Randolph Lake in 1995 are presented in Table 1. Catch per unit effort of electroshocking for fish species by station is contained in Table 2.

Four fish species (stoneroller, creek chub, bluegill, and smallmouth bass) were collected in low numbers at Station 1 - Kitzmiller. Fish species richness was greater in this area of the river in 1994, when four additional fish species were collected (Pavol and Klotz 1995). Abrams Creek, a severely mine acid polluted tributary to the North Branch, apparently impacted fish populations in this station based on our observations of fish habitat availability and low fish abundance. Pavol (1987) reported collecting five species of fish in this area of the river during 1985. These species consisted of creek chubs, white suckers, mottled sculpins, pumpkinseed, and green sunfish.

Fish species richness increased to seven species at Station 2, Wallman, approximately 8.5 miles upstream of the confluence of Abrams Creek. White sucker, blacknose dace, and creek chub were abundant. Four adult smallmouth bass (size range = 226 - 320 mm) were collected, probably originating from Mt. Storm Lake in WVA. Pavol (1987) reported that only two creek chubs were collected at this station in 1985.

Station 3 - Steyer, 1.8 miles downstream of the lime doser at Gorman, exhibited the highest fish species diversity of the upper North Branch Potomac River sampling stations. A total of eight fish species were collected, including large numbers of blacknose dace, creek chub, and white sucker, (Table 2). Fantail darters and rock bass were collected at this station for the first time during this study. Pavol (1987) reported that no fish were collected in this area of the river during 1985.

A total of five fish species were collected at Station 4 - Bayard, approximately 2.0 miles upstream of the Gorman doser. Blacknose dace, creek chub, and white sucker were common, while mottled sculpin and bluegill were found in low abundance.

Benthic macroinvertebrates

Benthic macroinvertebrates sampled in this study will be reported under Federal Aid Study F-48, Job X, Statewide Macroinvertebrate Studies.

Temperature Regimes

Maximum river temperature reached 84° F and routinely exceeded 70° F from July through the end of August 1995 at Wallman (Fig. 2). The temperature recorder at the Lostland Run site, approximately 6 miles downstream of Wallman, was not recovered.

Management Discussion

Since lime doser technology was implemented in the North Branch Potomac Watershed in 1993, the aquatic biota in the river has improved dramatically. Fish species richness and abundance have increased through recolonization from tributary streams. To create recreational fishing opportunities in the North Branch Potomac River, the MD DNR Freshwater Fisheries Division stocked several thousand catchable size rainbow trout in the river from Kitzmiller to Wallman beginning 1994 and continuing in 1995. The 6.5 mile stretch of the river bordering the Potomac State Forest was designated as a Delayed Harvest Trout Management Area, while the area of the river immediately downstream to Jennings Randolph Lake was designated as a Put and Take Trout Management Area. To further increase recreational trout fishing in the North Branch Potomac River, an 8.5 mile portion of the river upstream of the Delayed Harvest Area between Steyer and Wilson was designated as a Put and Take Management Area effective January, 1996. During October 1995, an experimental stocking of 3,000 warmwater strain rainbow trout fingerlings was conducted in the Wallman area to evaluate put and grow trout management potential.

Further monitoring will be necessary to document the recovery of the aquatic biota in the upper North Branch Potomac River in response to water quality improvements resulting from acid mine drainage abatement efforts. It is recommended that this study be continued in 1996.

Prepared by:

Kenneth W. Pavol, Western Region Fisheries Manager

Alan W. Klotz, District I Fisheries Biologist

Literature Cited

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Pavol, K. W. and A. W. Klotz. 1995. North Branch Potomac River restoration study. Maryland Department of Natural Resources, Annapolis, MD. Federal Aid Project F-48-R, Study IX, Job II.

Table 1. List of common and scientific names of fish species collected in the North Branch Potomac River upstream of Jennings Randolph Lake, 1995.

Common Name	Scientific Name
Central stoneroller	Campostoma anomalum
Blacknose dace	Rhinichthys atratulus
Creek chub	Semotilus corporalis
White sucker	Catostomus commersoni
Rainbow trout	Oncorhynchus mykiss
Mottled sculpin	Cottus bairdi
Rock bass	Ambloplites rupestris
Bluegill	Lepomis macrochirus
Smallmouth bass	Micropterus dolomieu
Fantail darter	Etheostoma flabellare

Table 2. Catch per unit effort (individuals/hr) by electroshocking in the North Branch Potomac River sample stations, 1995.

	Station			
	1	2	3	4
Species	Kitzmiller	Wallman	Steyer	Bayard
Stoneroller	2.8	0	1.4	0
Blacknose dace	0	86.4	158.2	34.0
Creek chub	8.4	84.8	46.2	30.6
White sucker	0	89.6	89.6	27.2
Rainbow trout	0	1.6	0	0
Mottled sculpin	0	1.6	8.4	1.7
Rock bass	0	0	1.4	0
Bluegill	2.8	4.8	2.8	1.7
Smallmouth bass	5.6	6.4	0	0
Fantail darter	0	0	5.6	0
Total species	4	7	8	5

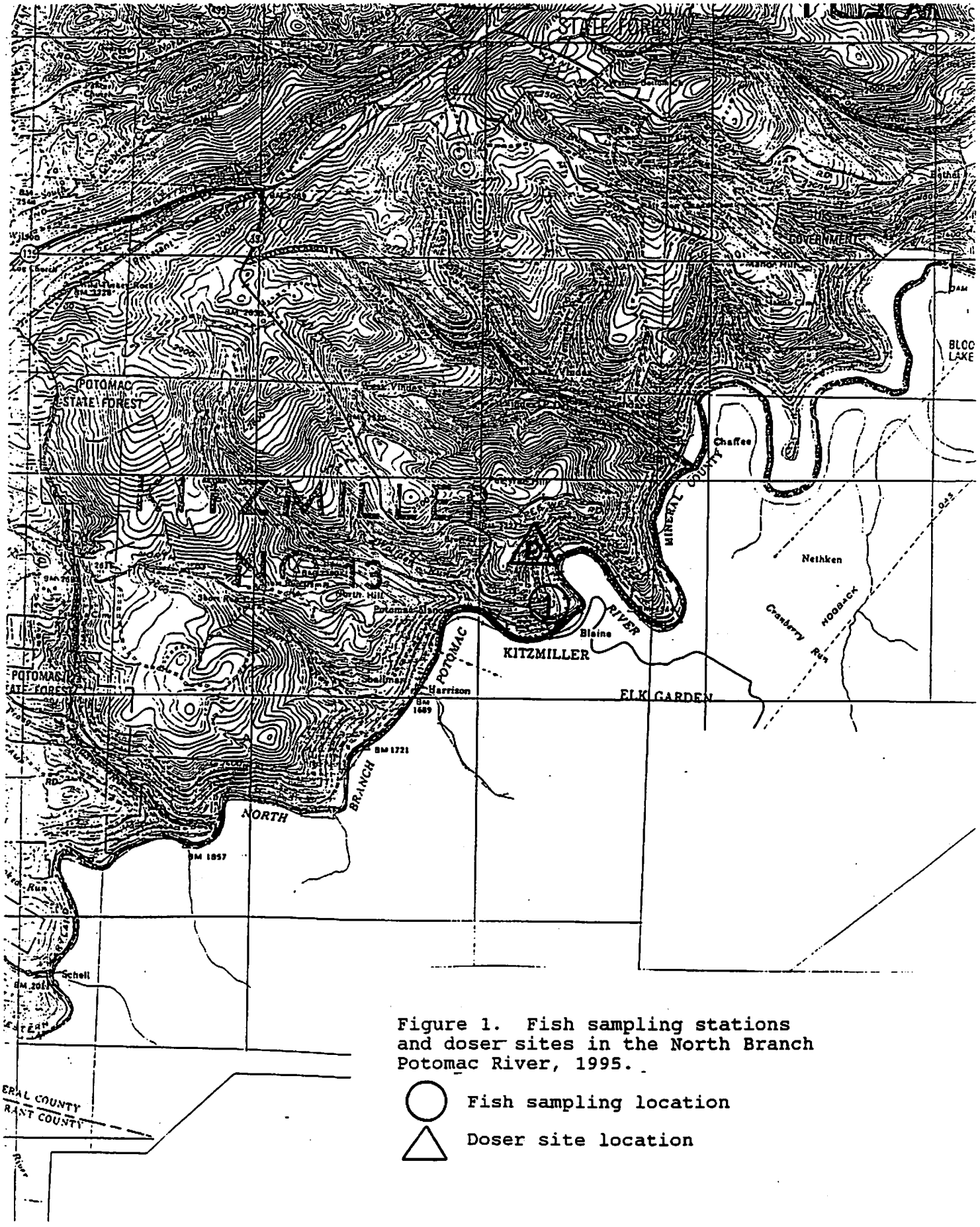

Figure 1. Fish sampling stations and doser sites in the North Branch Potomac River, 1995.

○ Fish sampling location

△ Doser site location

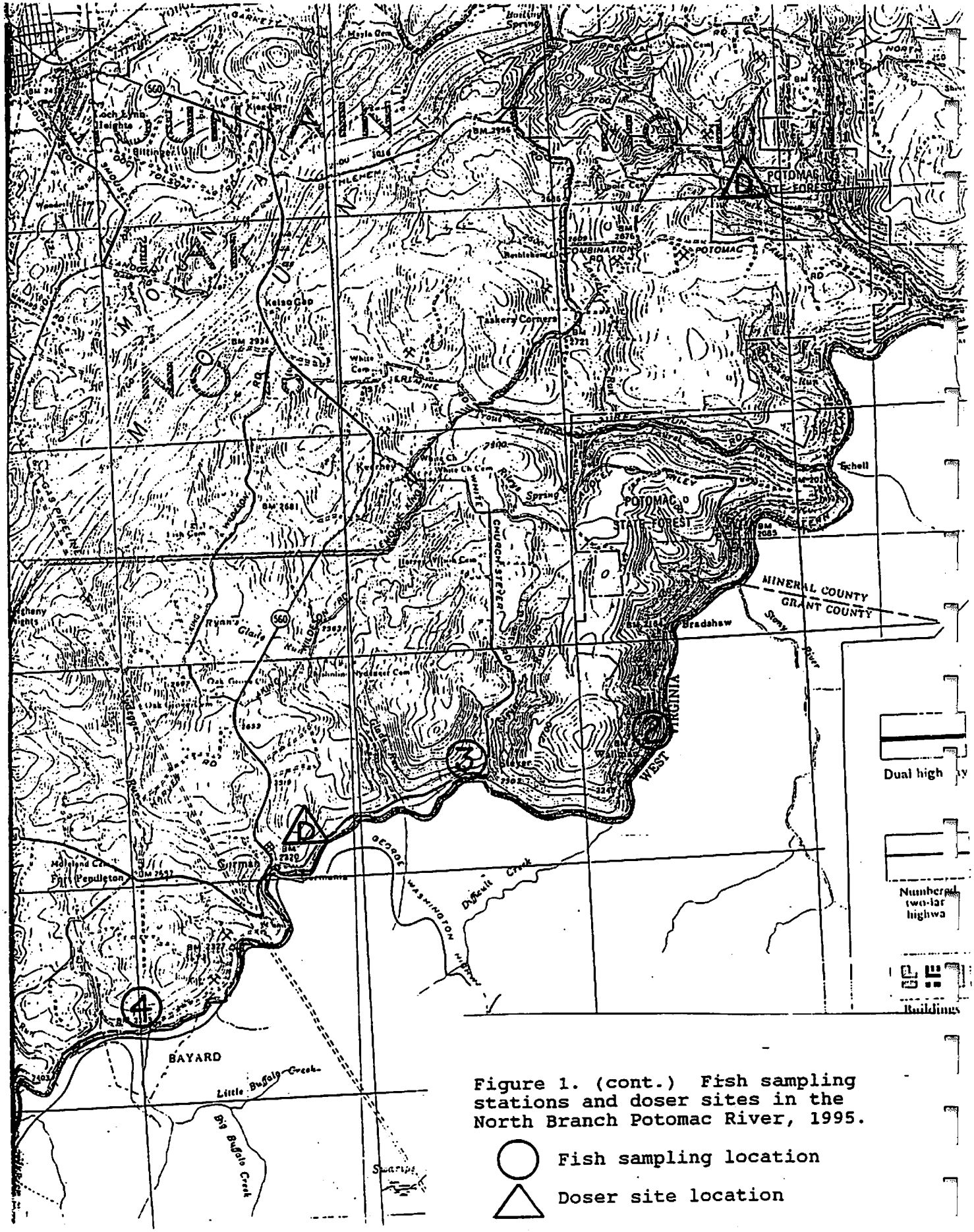

Figure 1. (cont.) Fish sampling stations and doser sites in the North Branch Potomac River, 1995.

Fish sampling location

Doser site location

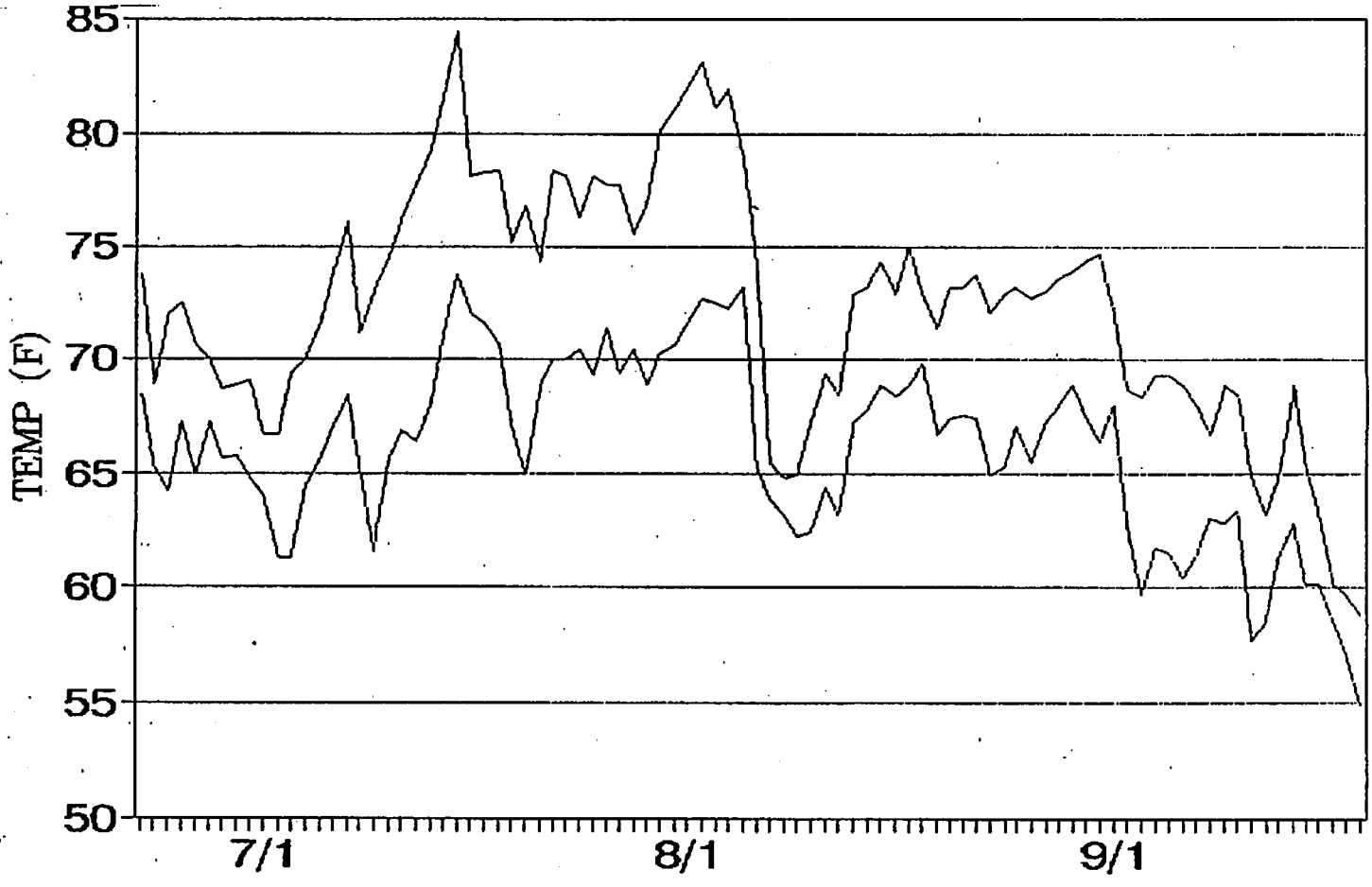

Figure 2. Minimum and maximum river temperatures in the North Branch Potomac River at Wallman, 1995

ANNUAL PERFORMANCE REPORT

Maryland Department of Natural Resources
Fisheries Service
Freshwater Fisheries Division

SURVEY AND MANAGEMENT OF FRESHWATER FISHERIES RESOURCES

Macroinvertebrate Studies

Federal Aid Project: F-48-R-5

Study No.: X

By

Susan Rivers

1995

ANNUAL PERFORMANCE REPORT

State: Maryland **Project No.:** F-48-R-5

Study No.: X

Job No.: 1

Project Title: Survey and Management of Freshwater Fisheries Resources

Study Title: Macroinvertebrate Populations in Tailrace Fishing Areas

Job Title: Macroinvertebrate Tailrace Populations

Objectives: To determine the impact of water temperature and pH on the size structure and population structure of macroinvertebrate populations in tailwater trout streams, and to determine if changes in size and population structure are an indicator of water quality problems.

Results:

Semples Run - Washington County

Macroinvertebrate populations were examined in Semples Run in Washington County, Maryland to justify reclassification of the watershed from Water Contact Recreation usage to Natural Trout Water usage. This followed the stocking and subsequent successful survival of fingerling rainbow trout in the stream. Semples Run was a high quality limestone stream of sufficient flow to provide good trout conditions.

Sampling was conducted in April of 1995, when the macroinvertebrate populations should have been at their peak. Macroinvertebrate habitat was limited to bottom sediments and a marl bottom. Lack of a variety of bottom habitats limited the resident macroinvertebrates to those that can thrive in marl or in sediments. The habitat biotic index rated the stream as only "Fair" due to bottom limitations. There was an abundance of organisms in the stream specially adapted to using the abundant calcium materials in the water and on the bottom. Crustaceans dominated the sample, so diversity and equitability were lower. All data collected reflected the dominance of one species, but this is typically seen in limestone situations.

Semples Run Hopewell Rd Washington Co. April 27, 1995

Ephemeroptera:	Baetis sp	9
	Ephemerella sp	2
Trichoptera:	Hydropsyche sp	17
	Cheumatopsyche sp	5
Diptera:	Chironomidae - Chironominae	20

	Orthocladiinae	5
Tipulidae -	Antocha sp	2
	Tipula sp	2
Simuliidae -	Simulium sp	5
Empididae		1
Decapoda:	Cambarinae	1
Amphipoda:	Gammarus sp	167
Isopoda:	Asellus sp	8
	s=14	
	N=248	

Protocol data
1. Richness = 14
2. HBI = 5.82 fair
3. Scraper filterer ratio = undefined
4. EPT = #33 taxa 4
5. EPT/C = 1.18
6. Dominant family = 67.3% Gammaridae
7. CPOM = 0.0081
8. Diversity = 1.93
9. Equitability = 0.357

Order dominance

Ephemeroptera	4%
Plecoptera	0%
Trichoptera	9%
Diptera	15%
Coleoptera	0%
Other	72%

Paint Branch - Montgomery County

Macroinvertebrates were monitored in Paint Branch as part of an on-going study. Comparisons were made with previous data to detect any trends in the populations.

Good Hope Tributary at Hobbs Drive

The upper Good Hope Tributary station showed very good to excellent Habitat Biotic Index (HBI). Compared to the 1994 data, this station showed an increase in the number of species of Ephemeroptera (mayflies). This led to better HBI and diversity values. The number of individual organisms in the samples were down, but this can be attributed to a dry spring and fall. The number of chironomids in the samples decreased from previous years, while percent family dominance remained low. These two factors indicate a more balanced macroinvertebrate population when compared with previous years.

Lower Good Hope Tributary

These samples also showed more mayflies than 1994, but the HBI values changed from excel to the very good and good range. There were more simulids and hydropsychids in the samples. Both of these

groups are more tolerant of silty stream conditions.

Paint Branch at Peach Orchard Drive

HBI values were higher than in 1994, and sample sizes increased. Chironomids decreased in number, and this improved the Ephemeroptera, Plecoptera, Trichoptera to Chironomid (EPT/C) ratio. The dominant order was Trichoptera (caddisflies).

Paint Branch at Fairland Road

This station showed improvements in size, richness, EPT and HBI values. Chironomids were down, and caddisflies dominated. Some stream disturbance was noted with and following the summer sampling. Diversity decreased and some shifts in dominant species were noted. This indicated that a sediment loading problem occurred and persisted through the fall samples.

Lower Gum Spring Tributary

The 1995 samples showed a drop in richness from the previous year. All other readings remained stable. Mayflies peaked in the spring sample and dropped off for the remainder of the year.

Paint Branch at Timberlake and Seibel

All readings at this station remained constant with the exception of the EPT/C ratio. Chironomids dropped off mid-year and did not return. HBI values were excellent throughout the year, so there were no other impacts on the macro's.

Paint Branch at Rt 29

The Rt 29 station maintained HBI values in the very good range. The dominant species belonged to the Hydropsychid family. Diversities remained a little low, but this was due to poor habitat for the insects and not poor water quality.

ANNUAL PERFORMANCE REPORT

Maryland Department of Natural Resources
Fisheries Service
Freshwater Fisheries Division

SURVEY AND MANAGEMENT OF FRESHWATER FISHERIES RESOURCES

Environmental Impact Investigations

Federal Aid Project: F-48-R-5

Study No.: XIII

By

Robert M. Davis

1995

ANNUAL PERFORMANCE REPORT

State: Maryland **Project No.:** F-48-R-5

Study No.: XIII

Job No.: 1

Project Title: Survey and Management of Freshwater Fisheries Resources

Study Title: Environmental Impact Investigations

Job Title: Environmental Impact Investigations

Objective: To protect freshwater fishes, associated aquatic species, and aquatic environment from municipal and industrial wastes and non-point source wastes.

Results: Legislative actions have mandated environmental reviews at both the federal and state levels. In response to these laws, regulations, and interagency agreements, Freshwater Fisheries personnel conducted field investigations and prepared environmental review statements concerning the effects of waterway construction, wastewater and industrial discharge, mining, and timber harvest projects.

Assessments were made of discharge and waterway construction projects and fish kills as they were received. Environmental reviews were conducted using the following procedures:

* Review project document and determine areas of concern.
* Site specific data and information on species and habitat.
* List and analyze positive and negative impacts.
* Document effects of impacts.
* Assess impact probability.
* Discuss measures to mitigate adverse impact.
* Recommend means of preventing losses of habitat or restoring habitat and fish populations.

Freshwater Fisheries personnel participated in interagency meetings, public hearings, and legal proceedings. Field reports of findings and recommendations were submitted to the Chief of Environmental Review and Habitat Protection for review and routing to appropriate agencies for implementation.

The following environmental review investigations were conducted by Freshwater Fisheries personnel in 1995 and reports submitted to the designated reviewing agency.

Type of Review	Number of Reviews
Waterway Construction	17
Mining Permits	7
Wastewater & Industrial Discharge	5
Timber Sale Review	16
Pond Construction/Repairs/Maintenance	13
Housing/Shopping Center Developments	16
Pond Construction	5

Duration: January 1, 1995 thorough December 31, 1995