POPLAR RIVER FISHERIES STUDY
PROGRESS REPORT

Prepared by:

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Research conducted by:

Ecological Services Division
Montana Department of Fish, Wildlife and Parks

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BACKGROUND

A description of the Poplar River, the problems related to development in the drainage and aquatic work undertaken have been described in a previous report (Stewart 1978). Additional information is shown in two other reports (Stewart 1979 and Stewart 1980).

The purpose of Poplar River work in 1980 was measurement of the effects of the Canadian power development on game fish populations and generation of additional data to determine streamflow - reproductive success relationships for walleye and northern pike.

Poplar River work in 1979 and 1980 has been largely confined to the East and Middle Forks (map, Figure 1). Effects of the Canadian power development will be greatest in the East Fork. The Middle Fork is an unaffected control.

Events of significance in 1980 included below average streamflows in April and May and a localized but significant die-off, due to unknown causes, of northern pike and walleye in the East Fork.

The International Joint Commission did not report in 1980 to the Canadian and U. S. governments concerning streamflows and water quality in the East fork and water releases from Cookson Reservoir. This report is expected in 1981.

OBJECTIVES

Specific 1980 objectives were the following:

A. Collect a second sample of walleye and northern pike from the East Fork, Middle Fork and lower Poplar River because of findings of elevated mercury in walleye from Cookson Reservoir (Waite, Dunn and Stedwill 1980) on the East Fork in Canada;

B. Determine reproductive success of walleye and northern pike by measuring the population size of young-of-the-year (YOY) in the fall;

C. Measure population size of walleye and northern pike age I+ and older;

D. Obtain and organize USGS streamflow data related to Poplar River fish populations;

E. Use 1980 data and data from previous years to show relationships between streamflow and reproductive success.

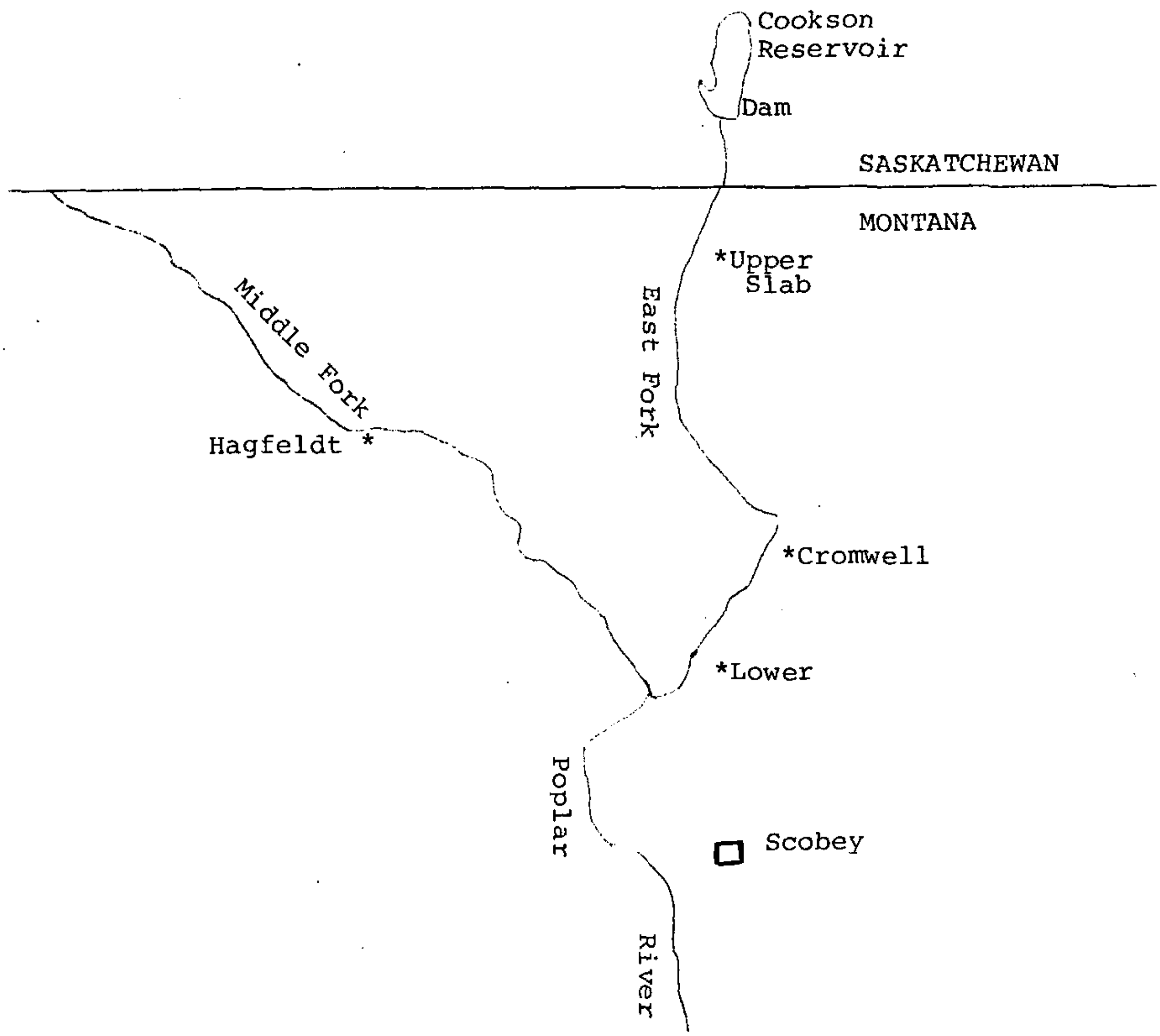

Figure 1. Approximate map of project area showing locations used for fish population estimates.

PROCEDURES

Methods and procedures used in 1980 are described in a previous report (Stewart 1978).

FINDINGS

Results of Population Estimates

Mean and minimum streamflows for April and May 1980 in the East and Middle Forks are shown in Table 1. The same figures are given for 1977, 1978 and 1979 for comparison. Streamflow in April and May 1980 was considerably below averages of 93 cfs (April) and 18 cfs (May) on the Middle Fork. Small releases from Cookson Reservoir in April and May fell far short of mean streamflow values of 79 (April) and 14 (May) on the East Fork Poplar River.

Table 1. Mean and minimum streamflows (cfs) for the months of April and May 1977-1980 in the East and Middle Forks of the Poplar River.[a]

	Mean				Minimum			
	1977	1978	1979	1980	1977	1978	1979	1980
	East Fork Poplar River Near International Boundary							
April	2.4	2.9	143.0	7.1	2.0	2.3	42.0	3.3
May	17.1[b]	3.0	43.9	11.4	1.8	2.6	16.0	3.5
	East Fork Poplar River Near Town of Scobey							
April	6.6	38.0	284	-	3.2	10.0	110	-
May	17.9[c]	8.0	56	-	2.4	3.0	28	-
	Middle Fork Poplar River Near International Boundary							
April	11.1	75.4	325.3	47.8	9.1	20.0	13.0	7.5
May	12.4	25.6	59.7	5.3	4.3	12.0	24.0	2.0

a/ Data from USGS (1977), USGS (1978), USGS (1979) and USGS (1980) (in press).
b/ 2.2 cfs if only the first 12 days of May 1977 are considered.
c/ 3.6 cfs if only the first 12 days of May 1977 are considered.

Table 2 shows walleye and northern pike population numbers by age classes. Previous years are shown along with 1980 data. Complete 1980 population data are shown in Appendix A. No population estimates were made in 1980 for the Cromwell section on the East Fork because numbers of fish present in the section were too low. Only one walleye and one northern pike were captured in this section in one full day of electrofishing, whereas in previous years 75-100 walleye and northern pike were sampled in a single day of electrofishing.

Table 2. Number per mile of walleye and northern pike in Poplar River stream sections in fall 1977-1980.[a]

Age Class	Walleye 1977	Walleye 1978	Walleye 1979	Walleye 1980	Northern Pike 1977	Northern Pike 1978	Northern Pike 1979	Northern Pike 1980
East Fork Poplar River - Upper Slab Section - 6015 feet								
0+	11	0	0	0	0	415	533	6
I+	10	0	29[b]	0	0	0	24	459
II+	3	0	4[b]	8	0	0	0	0
III+ and older	0	0	6[b]	14	1	1	0	0
Middle Fork Poplar River - Hagfeldt Section - 8240 feet								
0+	186	215	397	69	6[b]	101	115	184
I+	22	26	8	26	18[b],[c]	18[b],[c]	66[b],[c]	181
II+	53	26	3	4				18[d]
III+ and older	15	28	12	14				

a/ Complete population data for 1980 are in Appendix A.
b/ Statistical criteria not met; number is approximate.
c/ Age I+ and older.
d/ Age II+ and older.

A die-off of walleye and northern pike in July 1980 was the cause of low numbers of these species found in the Cromwell section of the East Fork in September. The cause of this die-off is unknown. No other species were affected and the die-off did not extend more than a few miles upstream or downstream.

The die-off complicated the problem of assessing reproductive success of walleye and northern pike in the East Fork Poplar River. Reproduction of both species failed in the Upper Slab section (Table 2), but it was impossible to determine reproductive success in the Cromwell section because of the die-off. Survey electrofishing in the lower section of the East Fork revealed that YOY walleye were absent, but that small numbers of YOY northern pike were present. Considering the survey electrofishing in the lower section and the East Fork data in Table 2, it can be concluded that walleye reproduction in the East Fork Poplar River failed in 1980. There was some northern pike reproduction in the lower section but for the East Fork as a whole, numbers produced were too low to sustain a northern pike population.

Insufficient streamflows especially in April but also in May probably caused the poor reproductive success of walleye and northern pike in the East Fork Poplar River. Minimum instream flows formulated for the East Fork are 15 cfs in April and 10 cfs in May (Montana Department of Fish and Game 1979). The April average in 1980 was 7.1 cfs (Table 1) on the East Fork, less than half the recommended amount. The average in May 1980 was 11.4 cfs, but this was to no avail because what spawning occurred was probably completed by the end of April.

In the Middle Fork April 1980 streamflows were larger (Table 1) and YOY population sizes formed were consistent with maintenance of existing numbers of older fish (Table 2). The April 1980 average streamflow was 47.8 cfs; the corresponding figure for May was 5.3 (Table 1). Minimum instream flows recommended for the Middle Fork are 30 cfs for April and 20 cfs for May (Montana Department of Fish and Game 1979). The May 1980 streamflow was less than the recommended amount, but spawning was probably early enough that the egg incubation period was largely over by early May.

Age I+ and older walleye in the Middle Fork reversed the trend of previous years (Table 2). Numbers in 1980 were approximately twice 1979. Age I+ and older northern pike were more abundant then any previous year measured, due largely to high survival of the 1979 year class.

The trend in numbers of age I+ and older walleye and northern pike in the East Fork is more difficult to determine because of the die-off in the Cromwell section and due to having a 1980 estimate only in the Upper Slab section (Table 2), where walleye are not abundant. In the Upper Slab section in 1980 there was good survival of northern pike from YOY to age I+ for the first year since population estimates began. Survey shocking in the lower section of the East Fork indicated that significant numbers of age I+ and older walleye and northern pike were present. Population estimates should be made in this section in 1981 if walleye and northern pike in the Cromwell section fail to recover.

High survival of older fish in 1980 may be related to relatively mild weather in winter 1979-1980.

Streamflow vs. Reproductive Success Regressions

Data concerning spawning and egg incubation periods along with annual estimates of numbers per mile of walleye and northern pike YOY in stream sections on the East and Middle Forks were used to calculate regressions and correlations shown in Figures 2 and 3. Mean streamflows were calculated for each spawning and egg incubation period.

The results for walleye (Figure 2) indicate that spawning and incubation period streamflows are the principal factor determining walleye reproductive success. Mean streamflow during spawning and egg incubation periods accounted for 88 percent of the variability from year to year in size of YOY populations formed. A statistical test was performed to measure the probability that the value for the slope of the regression line is greater than zero. The calculated F equals 52.8 with one and seven degrees of freedom, and is significant at the 0.005 level of probability.

The corresponding relationship for northern pike is not as strong (Figure 3). The data points diverge considerably from the calculated regression line and the relationship accounts for only 14 percent of the variability from year to year in size of YOY populations formed. The calculated F equals 1.77 with one and eleven degrees of freedom and is not significant at the 0.05 level. Streamflows may be more important to northern pike reproduction in the Poplar River than indicated by the calculated regression and correlation. Factors other than streamflow may reduce or enhance YOY survival after hatching.

Mercury Analysis of Fish Tissue

Although Poplar River fish were collected for mercury analysis in June 1978, additional fish were collected in June 1980 because of reports of high mercury in fish collected from Cookson Reservoir in 1979. Waite, Dunn and Stedwill (1980) reported an average mercury concentration in muscle tissue from 14 Cookson Reservoir walleye of 1.04 ppm with a range of 0.74 to 1.71 ppm.

The Cookson Reservoir values are considerably in excess of mercury concentrations in Poplar River fish in the U. S. (Table 3). East Fork Poplar River walleye averaged 0.45 ppm mercury in 1978 and 0.22 in 1980. The corresponding figures for the Middle Fork are 0.56 and 0.35. The smaller numbers of northern pike analyzed for mercury had concentrations somewhat less than the walleye (Table 3). Maximum values approximate 0.9 ppm, approximately half the maximum value measured in walleye from Cookson Reservoir. Considering that the U.S. Food and Drug Administration standard for mercury in fish flesh

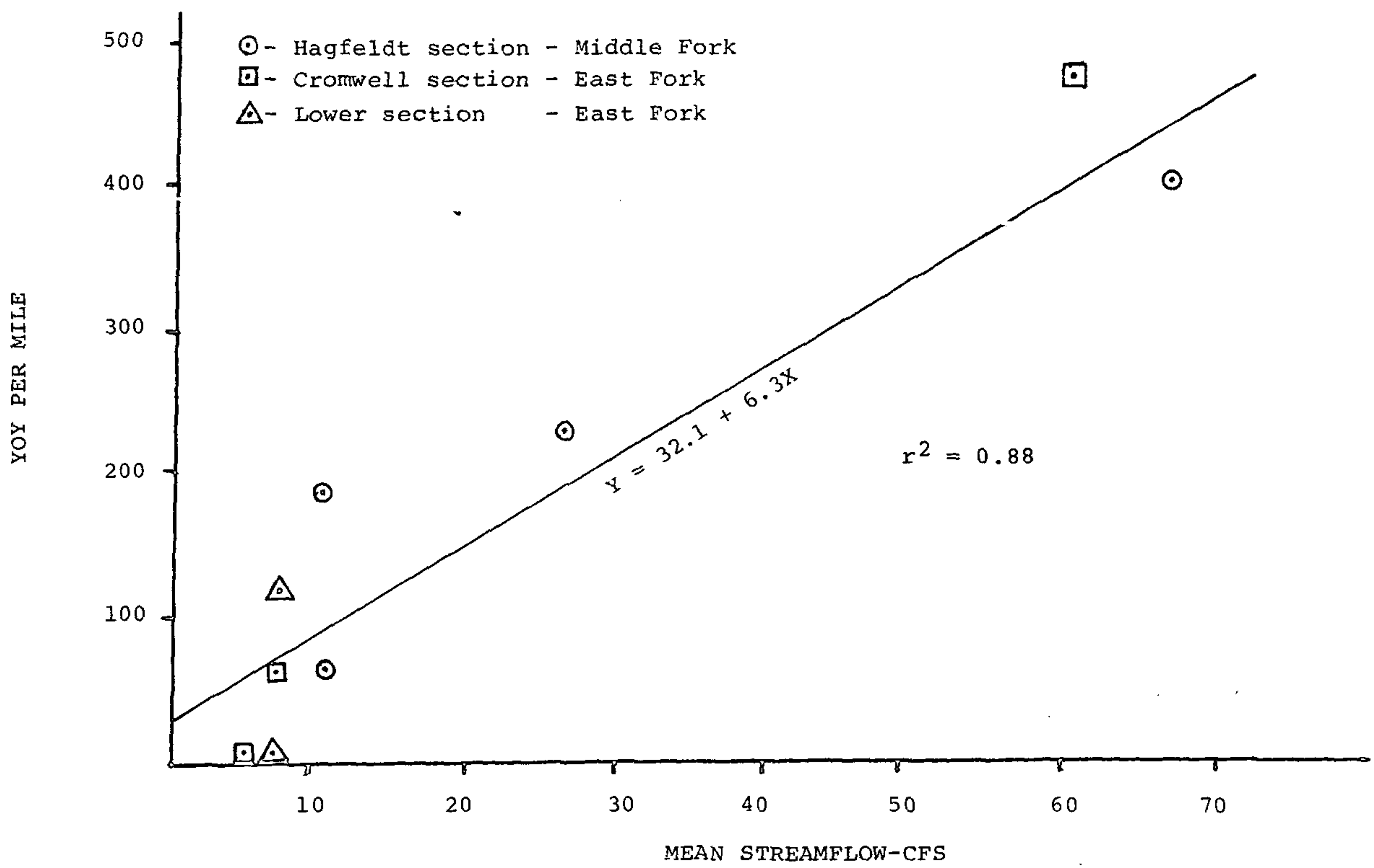

Figure 2. Relationship of mean streamflow during the walleye spawning and incubation period and number of YOY walleye in fall.

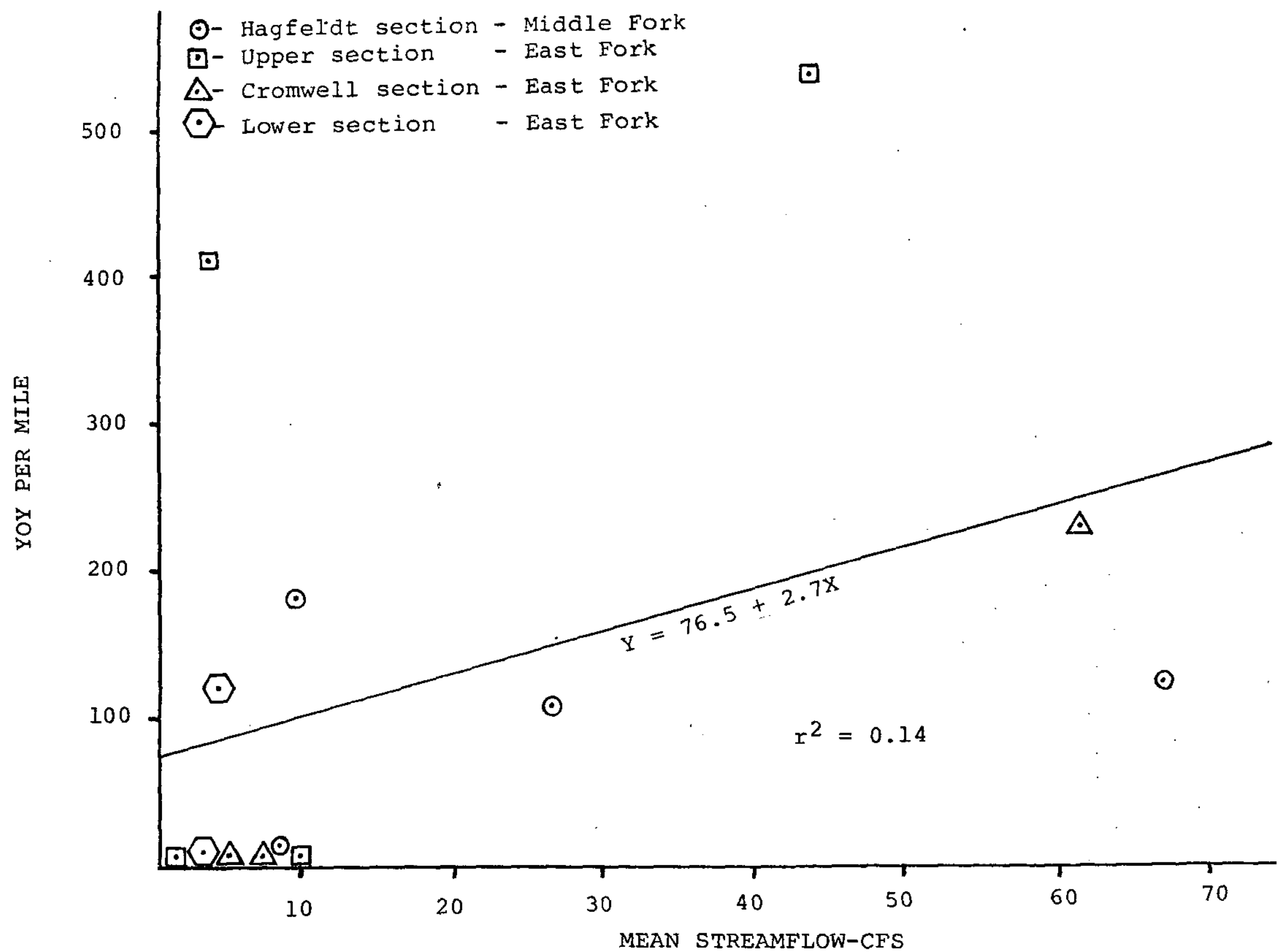

Figure 3. Relationship of mean streamflow during the northern pike spawning and incubation period and number of YOY northern pike in fall.

is 1.0 ppm, mercury in Poplar River fish is not a problem.

Table 3. Mercury content of muscle tissue (parts-per-million) for Poplar River fish collected in June 1978[a] and June 1980[b].

Year	Species	Number of fish	Average length (inches)	Average weight (pounds)	Average mercury content	Mercury - range of values
			East Fork Poplar River			
1978	Walleye	9	10.4	0.38	0.45	0.32-0.80
1980	Walleye	7	11.5	0.51	0.22	0.07-0.89
1978	Northern	1	15.0	0.88	0.12	-
1980	Pike	4	17.1	1.20	0.12	0.10-0.16
			Middle Fork Poplar River			
1978	Walleye	10	13.4	0.78	0.56	0.17-0.86
1980	Walleye	9	13.0	0.86	0.35	0.06-0.76
1978	Northern	1	23.3	3.30	0.42	-
1980	Pike	3	17.3	1.10	0.26	0.14-0.38

a/ 1978 analysis done at EPA lab, Denver, Colorado.
b/ 1980 analysis done at Montana State University chemistry department.

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Appendix A. Walleye and northern pike population data for stream sections in the Poplar River, September and October 1980.

Age class	Mean length (inches)	Mean weight (pounds)	Estimated number	Estimated weight (pounds)	Fish marked	Fish in recapture sample	Marked fish in recapture sample
	East Fork Poplar River - Upper Slab Sections - 6015 feet						
				Walleye			
0+	-	-	0	-	0	0	0
I+	-	-	0	-	0	0	0
II+	13.5	0.76	9	7.0			
III+ and older	16.3	1.40	16	22.9			
TOTALS			25(±5)[a]	29.9(±6)	19	17	13
				Northern Pike			
0+	11.3	0.34	7	2.4			
I+	17.6	1.32	523	692.0			
TOTALS			530(±94)	694.4	139	141	36
	Middle Fork Poplar River - Hagfeldt Section - 8240 feet						
				Walleye			
0+	4.9	0.03	107	3.6			
I+	9.3	0.26	40	10.6			
II+	11.9	0.54	6	3.3			
III+ and older	15.6	1.32	22	29.0			
TOTALS			175(±25)	46.5(±8)	85	111	58
				Northern Pike			
0	8.7	0.15	288	42.6			
I+	13.5	0.55	283	156.2			
II+ and older	18.9	1.49	28	42.4			
TOTALS			599(±97)	241.2(±34)	191	177	62

a/ 80% confidence interval.