POPLAR RIVER FISHERIES STUDY

PROGRESS REPORT

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FINDINGS

Stream Temperature

Temperatures in 1979 differed very little from previous years with the exception of May, when minimum temperatures lower than previous years were recorded (Table 1). This was caused by air temperatures much below seasonal averages in the first half of May. Summer temperatures are largely in the range favorable for fish growth.

Temperature data on the Middle and West Forks are sufficient for the present. Thermographs will not be operated on these two forks in 1980. The USGS thermograph on the East Fork at the U. S.-Canadian border is expected to be continued in 1980.

Game Fish Movement

Although Poplar River fish were not tagged in 1979 except near the mouth, 11 angler returns were received and 26 tagged walleye and northern pike were recaptured during electrofishing for fish population estimates. These fish were tagged in 1977 and 1978. Table 2 is a summary of movement by these fish.

Most walleye and northern pike appear to be sedentary. Of 11 recaptured walleye, 9 (82 percent) were recaptured at the same location where tagged (Table 2). Of 26 recaptured northern pike, 20 (77 percent) had not moved. Of the six northern pike that had moved, three had moved into the East Fork Cromwell section from a downstream point (approximately 4 miles) on the East Fork. Two others moved into this section, one from the Middle Fork and one from the Poplar River immediately downstream of the East Fork.

Although a somewhat greater percentage of recaptures in 1979 had moved as compared to recaptures in 1978, the conclusion that Poplar River walleye and northern pike are largely sedentary still appears valid.

Larval Fish

Spawning and development of walleye and northern pike eggs to the prolarval stage was much later in 1979 than in 1978. Prolarval walleye were first captured on May 11, 1978 and May 25, 1979. Larval samples were collected on May 25, 29 and June 4, 1979 at the six sampling stations on the East and Middle Forks shown in Figure 1. In the two forks, a total of 48 larval walleye was captured in set nets in 1978 and 8 in 1979. Walleye larval sampling is summarized in Table 3.

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 1978a). Portions of the results of larval fish sampling and game fish population estimates done in 1978 and not shown in the 1979 report to the Environmental Protection Agency (Stewart 1979a), are found in a later report (Stewart 1979b) which is enclosed.

Poplar River aquatic work in 1979 was largely confined to the East and Middle Forks (map, Figure 1). Effects of the Canadian power development will probably be greatest in the East Fork; the Middle Fork is an unaffected control. The purpose of the work was measurement of the effects of the Canadian power development on game fish populations.

Cookson Reservoir on the East Fork in Canada was full early in 1979. Water was released from the reservoir beginning in March 1979 and continued for much of the spring. The resultant flows, consisting also of considerable snowmelt runoff in the lower portions of the East Fork, allowed formation of large year classes of walleye and northern pike.

The International Joint Commission is expected to make recommendations in 1980 to the Canadian and U. S. governments concerning streamflows and water quality in the East Fork and water releases from Cookson Reservoir.

OBJECTIVES

Specific 1979 objectives were the following:

A. Continue to monitor stream temperature in the West and Middle Forks with thermographs, (East Fork temperature measurements by U. S. Geological Survey);

B. Measure reproductive success of walleye and northern pike in spring using nets set in riffles to capture drifting larval fish, and by estimating the size of young-of-the-year (and older fish) populations in the fall of the year;

C. Continue to tabulate tag returns of fish tagged in 1977 and 1978.

PROCEDURES

Methods and procedures used in 1979 are described in Stewart (1978a).

Table 2. Recaptures in 1979 of fish tagged 1977 through 1979.[a]

Number Recaptured		No movement from location tagged				Moved from location tagged			
		Walleye		N. Pike		Walleye		N. Pike	
Walleye	N. Pike	No.	%[b]	No.	%[b]	No.	%[b]	No.	%[b]
		Recaptured in East Fork Poplar River							
1	14	1	100	9	64	0	0	5	36
		Recaptured in Middle Fork Poplar River							
7	7	7	100	7	100	0	0	0	0
		Recaptured in West Fork Poplar River							
1	1	1	100	1	100	0	0	0	0
		Recaptured in Main Poplar River							
2	4	0	0	3	75	2	100	1	25
		Totals							
11	26	9	82	20	77	2	18	6	23

a - Twenty-six recaptures by electrofishing, 11 by anglers.
b - Percent of number recaptured.

Table 1. Monthly extreme water temperatures recorded at two Poplar River stations for 1976-1979 (° F).

Station	Year	April	May	June	July	Aug.	Sept.	Oct.	Nov.
Middle Fork-Ofstedal	1976	58-38	70-47	79-57	80-61	78-55	72-48	59-32	42-32
	1977	66-34	73-48	80-56	83-57	75-57	69-48	52-36	43-34
	1978	59-38	73-52	77-49	83-62	80-58	76-46	57-35	42-32
	1979[a]	-	70-36	80-52	82-63	77-59	70-54	55-39	-
	All years	66-34	73-36	80-49	83-57	80-55	76-46	59-35	43-32
West Fork-Susag	1976	59-37	69-45	77-54	79-60	76-52	71-47	61-32	40-32
	1977	65-40	73-47	78-54	83-58	78-54	74-46	51-33	44-34
	1978	59-37	74-49	81-47	83-62	82-55	73-44	59-36	44-32
	1979	-	73-37	80-50	82-61	79-56	77-49	58-37	-
	All years	65-37	74-37	81-47	83-58	82-52	77-44	61-33	44-32

a - Beaver dam 100 feet upstream of thermograph probably decreased diurnal temperature fluctuation from mid-August on.

Table 3. Comparison of walleye larvae sampling in set nets in 1977, 1978 and 1979.

Stream Fork	Water Volume Sampled (M^3)			Number of Larvae			Number of Larvae/1000 M^3		
	1977	1978	1979	1977	1978	1979	1977	1978	1979
East Fork	34,999	7,607	4,189	0	0	2	0.00	0.00	0.477
Middle Fork	11,044	23,199	5,644	5	48	6	0.45	2.07	1.06

Larval sampling for walleye in the Poplar River is probably useful in making an early determination of the presence or absence of a year class, but number of larvae captured per unit of water volume does not accurately indicate the size of fall young-of-the-year populations formed. For example, the data in Table 3 suggest a larval density twice as large in 1978 in the Middle Fork as in 1979. However, fall young-of-the-year walleye populations in the Middle Fork were larger in 1979. Fall young-of-the-year walleye populations are discussed in the following section.

The same conclusion is probably even more valid for northern pike. In 1979 a total of 4 larval northern pike was captured, all on the Middle Fork. However, fall young-of-the-year northern pike were more abundant in the East Fork in 1979. An additional problem is present in sampling northern pike larvae. Following hatching the larvae attach to vegetation by an adhesive organ (Machniak 1975). For this reason, they are not available to sampling by drift nets for much of the larval period.

Fall population estimates of young-of-the-year will probably be utilized as the sole index of reproductive success for future work on the Poplar River.

Game Fish Population Estimates

Walleye and northern pike numbers per mile in East and Middle Fork stream sections are summarized in Table 4. Complete data for 1979 population estimates are shown in Appendix A.

Walleye and northern pike reproduction was substantial in 1978 and 1979 for all three stream sections shown in Table 4.

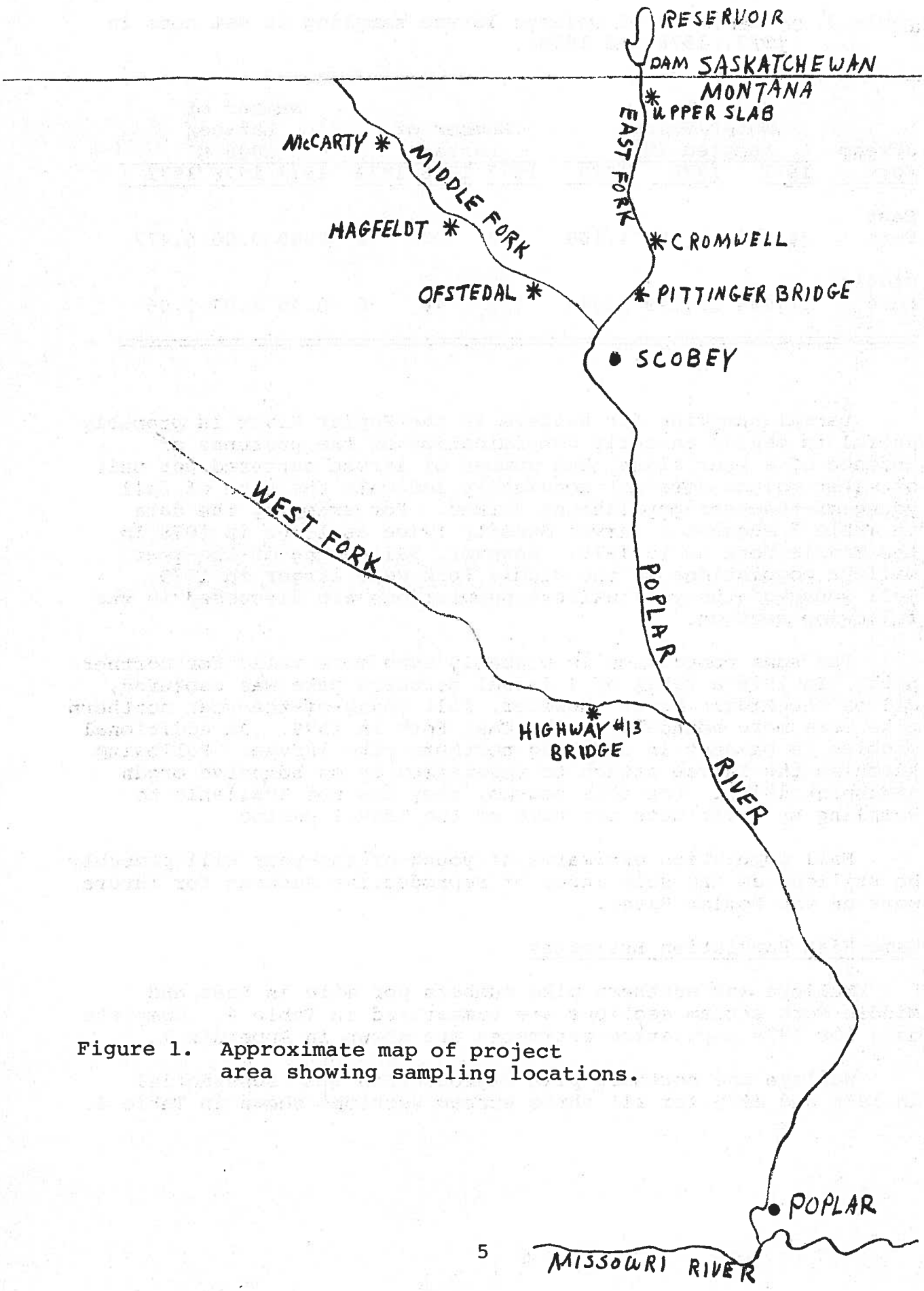

Figure 1. Approximate map of project area showing sampling locations.

Numbers of walleye and northern pike in the Upper Slab section on the East Fork Poplar River have been low, with the exception of young-of-the-year northern pike in 1978 and 1979 (Table 4). This section is near the Canadian border. Habitat for walleye and northern pike is less favorable than at downstream points. However, large numbers of northern pike young-of-the-year can be produced in some years.

Numbers of adult walleye and northern pike have decreased in both the Middle and East Forks from 1977 to 1979 (Table 4). This was caused by severe winters in 1977-78 and 1978-79 resulting in ice thicknesses of about 4 feet by late winter, and low dissolved oxygen (Stewart 1978b). Much of the Poplar River froze to the bottom both winters. Comparing ages I+ and older in the East Fork, Cromwell section, in 1977 and 1979, walleye were less than one-third as abundant in 1979. The corresponding value for northern pike is about one-half. For the Middle Fork, Hagfeldt section, the number of age I+ and older walleye in 1979 was about one-fourth the 1977 number. Numbers of northern pike in the Hagfeldt section are too low, and estimates too unreliable to make a 1977-79 comparison.

Fish population data from 1979 reinforce the previous conclusion (Stewart 1979b) that streamflow during spawning and egg incubation determines the strength of year classes of walleye and northern pike in the Poplar River. Streamflows for April and May 1977-78-79 are shown in Table 5. The only complete failure of both walleye and northern pike young-of-the-year occurred in 1977 in the East Fork when there was a very low snowmelt runoff which was impounded by the dam in Canada, and no water was released from the dam until about May 12. This date was too late to benefit walleye and northern pike, which had spawned almost a month earlier. In contrast, the low runoff that year in the Middle Fork was sufficient to form a moderate-sized year class of walleye, but too small for northern pike year class formation (Table 4). Above average snowmelt runoff in 1978 and 1979, combined with spring water releases from the dam in 1979, formed strong year classes of both species in both forks in those years.

Metals Analysis of Fish Tissue

Fish were collected from the West, Middle and East Forks of the Poplar River for analysis of several metals in muscle tissue. Analysis was done at the U. S. Environmental Protection Agency laboratory in Denver, Colorado. To date, results have been received only for mercury; these are shown in Table 6.

Some walleye from all three locations had more than 0.5 ppm mercury, although none were found to contain as much as 1.0 ppm. The 0.5 ppm level in fish has long been recognized

Table 4. Number per mile of walleye and northern pike in Poplar River stream sections in late 1977, 1978 and 1979.[a]

Age Class	Walleye 1977	Walleye 1978	Walleye 1979	Northern Pike 1977	Northern Pike 1978	Northern Pike 1979
East Fork Poplar River - Upper Slab Section - 6,015 feet						
0+	11	0	0[b]	0	415	533
I+	10	0	29[b]	0	0	24
II+	3	0	4[b]	0	0	0
III+ & older	0	0	6[b]	1	1	0
East Fork Poplar River - Cromwell Section - 7,560 feet						
0+	3[b]	69	490	0	0	211[b]
I+	6	24	39	74	5	74
II+	100	87	9	51	20	13
III+ & older	55	59	12	71	24	26
Middle Fork Poplar River - Hagfeldt Section - 8,240 feet						
0+	186	215	397	6[b]	101[b,c]	115[b,c]
I+	22	26	8	18[b,c]	18[b,c]	66[b,c]
II+	53	26	3			
III+ & older	15	28	12			

a - Complete population data for 1979 are in Appendix A.
b - Statistical criteria not met; number is approximate.
c - Age I+ & older.

Reproductive success in 1977, or at least survival of young-of-the-year to the fall season, was very low except for walleye in the Middle Fork stream section. Larval sampling in 1977 indicated that the low numbers of young-of-the-year present in 1977 were due to poor egg survival because very few larval fish were present (Stewart 1979b). For all three sections in Table 4, the average number per mile of fall young-of-the-year walleye in 1977-78-79 was 67, 95 and 296. The corresponding numbers for northern pike were 2, 172 and 287. The 1977 average for walleye is misleading, because almost none were present in East Fork sections (Table 4), while moderately high numbers were present in the Hagfeldt section on the Middle Fork.

Table 6. Mercury content of muscle tissue (parts per million) for Poplar River fish collected in June 1978.

Species	Length (inches)	Weight (pounds)	Mercury
East Fork Poplar River - Cromwell Section			
Walleye	9.2	0.24	0.38
"	9.6	0.29	0.33
"	10.5	0.39	0.40
"	10.7	0.40	0.36
"	11.8	0.54	0.80
"	12.1	0.56	0.63
"	11.5	0.52	0.32
"	10.8	0.41	0.48
"	7.2	0.12	0.32
Northern pike	15.0	0.88	0.12
Middle Fork Poplar River - Ofstedal Section			
Walleye	11.1	0.45	0.57
"	14.0	0.86	0.59
"	12.9	0.66	0.62
"	14.0	0.82	0.41
"	11.8	0.54	0.37
"	14.7	0.96	0.86
"	16.2	1.24	0.56
"	14.1	0.92	0.49
"	9.7	0.32	0.17
"	15.0	1.06	0.57
Northern pike	23.3	3.30	0.42
West Fork Poplar River - Near Highway #13 Bridge			
Walleye	15.1	0.95	0.55
"	11.8	0.51	0.90
"	12.8	0.68	0.61
"	11.4	0.44	0.61
"	18.5	2.20	0.89
"	9.7	0.30	0.52
"	7.8	0.16	0.31
"	7.5	0.16	0.25
"	7.6	0.16	0.25
"	7.2	0.14	0.33
Northern pike	20.3	1.80	0.49

Table 5. Mean, maximum and minimum streamflows (cfs) for the months of April and May 1977, 1978 and 1979[a] for the East and Middle forks of the Poplar River.

	Mean			Max.			Min.		
	1977	1978	1979	1977	1978	1979	1977	1978	1979
East Fork Poplar River near International Boundary									
April	2.4[b]	2.9	143.0	2.9	3.6	270.0	2.0	2.3	42.0
May	17.1[b]	3.0	43.9	58.0	3.7	139.0	1.8	2.6	16.0
East Fork Poplar River near Town of Scobey									
April	6.6[c]	38.0	-	11.0	125.0	-	3.2	10.0	-
May	17.9[c]	8.0	-	164.0	10.0	-	2.4	3.0	-
Middle Fork Poplar River near International Boundary									
April	11.1	75.4	325.3	15.0	709.0	1620.0	9.1	20.0	13.0
May	12.4	25.6	59.7	82.0	47.0	155.0	4.3	12.0	24.0

a - Data from USGS (1977), USGS (1978) (in press) and USGS (1979) (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.

APPENDIX A. Walleye and northern pike population data for stream sections in the Poplar River, September and October 1979.

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 Section-6,015 feet							
Walleye							
0+	-	-	0	-	0	0	0
I+	11.9	0.56	33[b]	18.5			
II+	14.9	1.14	5[b]	5.4			
III+ and older	19.2	2.72	6[b]	17.1			
Totals			44 (±15)[a]	41.0 (±14)	20	14	6
Northern Pike							
0	11.6	0.41	608	252.0			
I+	19.7	1.86	28	51.8			
Totals			636 (±161)	303.8 (±77)	138	86	18
East Fork Poplar River - Cromwell Section-7,560 feet							
Walleye							
0+	4.8	0.04	701	24.9			
I+	10.0	0.35	56	19.7			
II+	12.8	0.69	14	9.4			
III+ and older	14.7	1.15	17	19.2			
Totals			788 (±246)	73.2 (±13)	118	157	37

as a threshold value, above which consumption of fish may endanger human health. The new FDA standard, however, was raised to 1.0 ppm in late 1979. State Health authorities are aware of this situation, but no public warning has been made. The reasons for the mercury values found in Poplar River fish are not known. More fish will be analyzed in 1980.

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APPENDIX A. (continued)

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 - Crommwell Section-7,560 feet							
Northern Pike							
0+	10.2	0.27	302[b]	81.8			
I+	17.6	1.30	105	136.6			
II+	20.8	2.09	19	38.9			
III+ and older	27.5	4.89	36	178.4			
Totals			462 (±146)	435.7 (±71)	78	184	35
Middle Fork Poplar River - Hagfeldt Section-8,240 feet							
Walleye							
0+	4.8	0.03	620	20.3			
I+	8.7	0.20	13	2.5			
II+	10.9	0.39	4	1.7			
III+ and older	14.7	1.15	18	21.0			
Totals			655 (±115)	45.5 (±5)	223	152	62
Northern Pike							
0+	9.4	0.17	179	31.2			
I+	14.9	0.70	80[b]	55.8			
II+	19.7	1.65	13[b]	21.6			
III+ and older	25.1	3.98	12[b]	46.3			
			284 (±59)	154.9 (±58)	107	73	28

[a] - 80% confidence interval; [b] - Statistical criteria not met, estimate is approximate.