

Volume 4

ARLIS
Alaska Resources
Library & Information Services
Anchorage, Alaska

1962-1963

SH
11
.A73
A4
v. 4

STATE OF ALASKA

William A. Egan, Governor



ANNUAL REPORT OF PROGRESS, 1962 - 1963

FEDERAL AID IN FISH RESTORATION PROJECT F-5-R-4

SPORT FISH INVESTIGATIONS OF ALASKA

Alaska Department of Fish and Game

Walter Kirkness, Commissioner

E. S. Marvich, Deputy Commissioner

Alex H. McRea, Director

Sport Fish Division

Richard Haley, Coordinator

INTRODUCTION

This report of progress consists of Job Segment Reports from the State of Alaska Federal Aid in Fish Restoration Project F-5-R-4, "Sport Fish Investigations of Alaska".

The project is composed of 25 separate studies designed to evaluate the various aspects of the State's recreational fishery resources. While some studies are of a more general nature and deal with gross investigational projects, others have been developed to evaluate specific problem areas. These include studies of king salmon, silver salmon, grayling and State Access requirements. The information gathered will provide the necessary background data for a better understanding of local management problems and development of future investigational studies.

The assembled progress reports may be considered fragmentary in many respects due to the continuing nature of the respective studies. The interpretations contained therein, therefore, are subject to re-evaluation as work progresses and additional information is acquired.

JOB COMPLETION REPORT

RESEARCH PROJECT SEGMENT

State: Alaska Name: Sport Fish Investigations
of Alaska.

Project No: F-5-R-4 Title: Investigations of The
Tanana River Grayling
Fisheries: Migration

Job No: 14-B Study.

Period Covered: July 1, 1962 to December 31, 1962.

Abstract:

A tag and recovery program on the Arctic grayling was carried out on the Chatanika River and three tributaries of the upper Tanana River; the Goodpaster River, Delta-Clearwater River and the Richardson-Clearwater River.

Intensive sampling from May 28th through September 25th resulted in the tagging of 6,685 grayling from all the drainages under investigation.

Angler returns and tagging crew recoveries during 1962 accounted for 930 tagged grayling being recovered from the Chatanika River and 297 grayling returned from the upper Tanana River sampling areas. Hook and line was the predominant sampling tool used.

Tag and recovery summaries are presented for the years 1960, 1961 and 1962 with graphic presentations to show the recovered tagged fish movements.

A discussion of the problems associated with the investigation is included with recommendations for continuing the investigation and pertinent phases needing further definition.

Objectives:

To determine the migratory trends of Arctic grayling in the Tanana River drainage, specifically to study the interrelationship between the Goodpaster River and the Delta-Clearwater; movements of grayling in the Delta-Clearwater and Chatanika River with emphasis on mortality cause by diversion of waters into the Davidson Ditch and finally to examine closely the grayling population utilizing the Delta-Clearwater Lake.

Techniques:

Hook and line, bag seine and fyke nets were used to take fish for tagging. The method of hook and line was the most successful technique in taking fish under most stream conditions.

Fyke nets did not work at all in the spring-fed tributaries to the Tanana River. Large amounts of algae and other debris clog the fyke nets and tear out the installation.

Seines were only moderately effective. In the Chatanika River, seining in the tailrace was extremely effective, while seining in the clear tributaries of the upper Tanana was ineffective.

High water levels during the season eliminated normal beaching areas in Clearwater Lake, making seining unpredictable.

The technique employed in the upper Tanana River tributaries was to hunt for feeding fish by river boat. When fish were sighted, sampling proceeded with hook and line. Dry and wet flies were most often used with

Mepps spinners (sizes 0 & 1) used occasionally. Mepps spinners, while effective, were very hard on the fish caught as the treble hook was usually fully engaged in the fish's mouth. For this reason their use was held to a minimum and confined to deep holes where flies did not work effectively.

Subcutaneous plastic tags were inserted beneath the ventral, epidermal layer of skin between the pectoral and ventral fins.

The anesthetic M.S.-222-SANDOZ was used to immobilize the fish prior to tagging.

Findings:

Chatanika River

Tagging activities commenced shortly after breakup on May 28th, 1962. A total of 3,731 grayling were tagged in the interim with 1,255 tagged fish recovered. Table 1, presents a summary of recoveries from 1960 through 1962. Since 1960, an average of 19.6% of all tagged fish have been recaptured.

TABLE 1. SUMMARY OF TAGGED GRAYLING RECOVERIES
Chatanika River, 1960-62
(Incomplete)

Tagging Number		Year and Number				
Year	Tagged	1960	1961	1962	Total	Percent
1960	4,457	496	235	73	804	18.0
1961	5,707		734	252	986	17.3
1962	3,731			930	930	24.9
Total:	13,895	496	969	1,255	2,720	

Overall Percent of Tag Returns = 19.6

Most significant are the numbers recovered in successive years, for the tagging years 1960 and 1961, indicating an annual homing behavior. Grayling are thought to migrate into the Tanana River at some period in the winter remaining until they descend into the river system in the spring.

It has been pointed out from prior studies, (Reed, McKirdy, and Lentfer), that the Chatanika in all probability has characteristics concerning grayling movements that warrant a separate discussion from the tributaries of the Upper Tanana River.

Grayling tagged in the Chatanika River have never been recovered in any other drainage during the study period. Empirical data for recovered, tagged grayling, strongly suggests an absence of inter-stream movement; rather, grayling of the Chatanika River exhibit positive homing behavior. Quite a few fish tagged and recovered in successive years were taken in almost identical locations.

Tagging has been successful in demonstrating six important points in the Chatanika River system: (1) The seasonal tributary utilization by grayling between June and September; (2) Downstream seasonal movements of sub-adults and adults; (3) The diversion dam at Mile 68.7 Steese Highway, is a complete block to grayling stocks below the dam; (4) The mortality to taggable sized fish entering the Davidson Ditch in years of high water flow is negligible; (5) Two separate stocks of grayling exist in the Chatanika River, a resident population above the Diversion Dam and a population below the dam; and (6) Grayling in the Chatanika River exhibit a positive homing behavior for that system.

Still to be resolved are the questions of mortality to young-of-the-year or zero age class grayling entering the Davidson Ditch, either at the dam intake or Sourdough Lateral intake (Figure 1, 2, & 3)



Figure 1. Sourdough Lateral Intake.

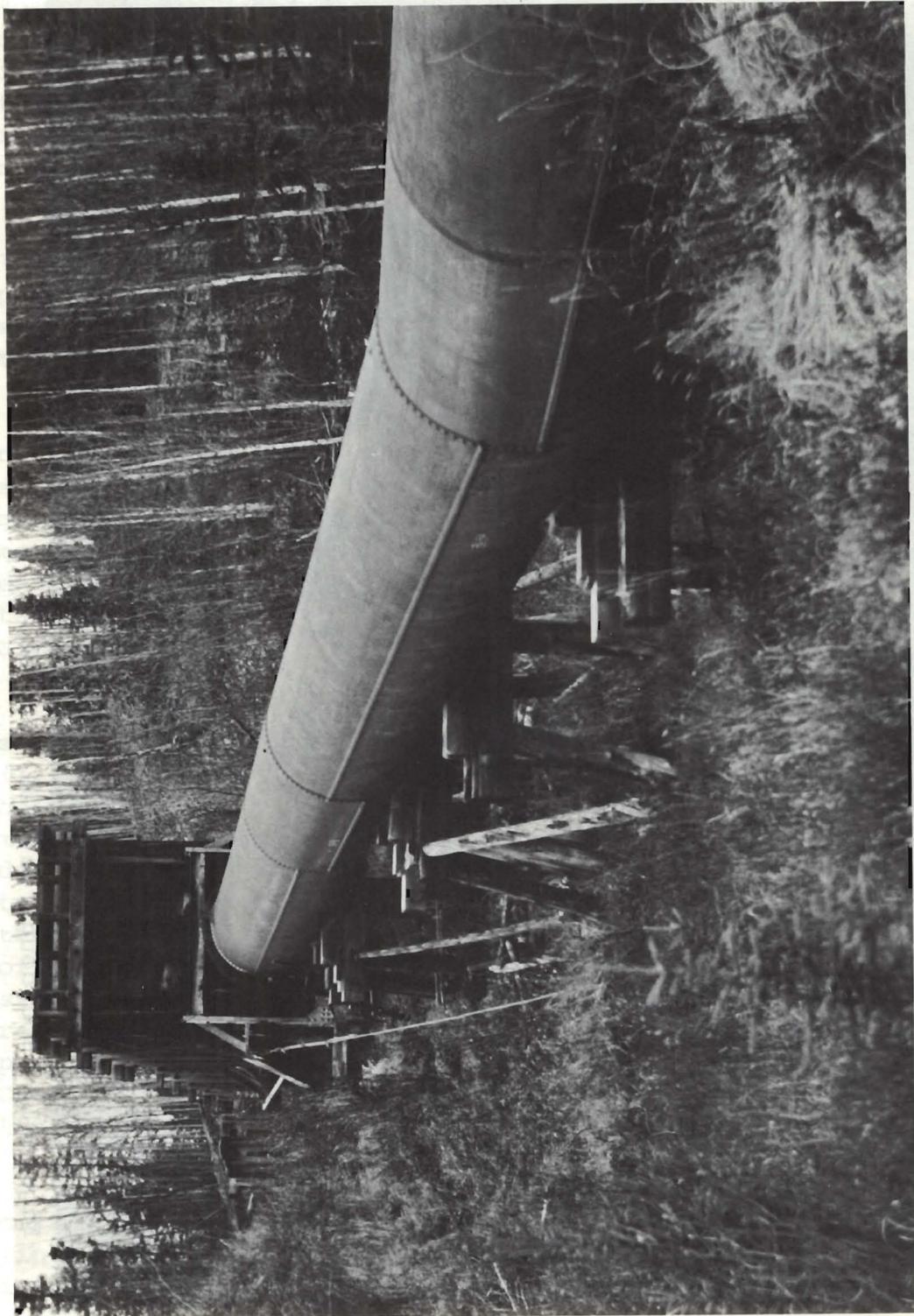


Figure 2. Sourdough Lateral Siphon, Mile 66, Steese Highway.



Figure 3. Sourdough Lateral Siphon Drain, Mile 66,
Steese Highway.



Figure 1. Sourdough Lateral Intake.



Figure 2. Sourdough Lateral Siphon, Mile 66, Steese Highway.

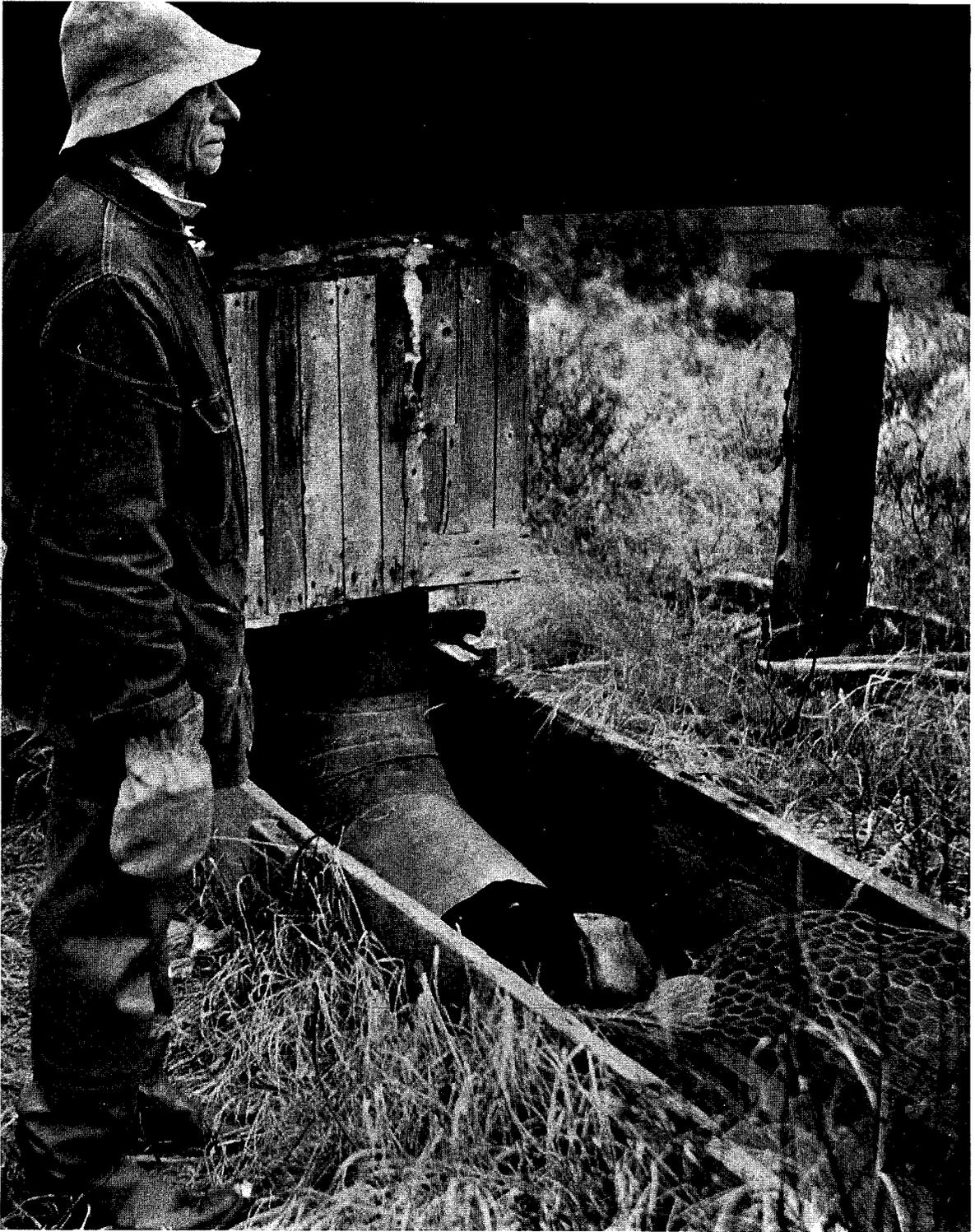


Figure 3. Sourdough Lateral Siphon Drain, Mile 66,
Steese Highway.

and to taggable sized fish forced to enter the ditch at the diversion dam in years of extreme low water flows. It is known from past water records that the entire flow above the diversion dam is taken into the ditch during periods of low water flow. This occurrence has in the past coincided with the estimated time when young-of-the-year grayling are migrating downstream, Figure 4. The total actual loss of young-of-the-year into the Davidson Ditch and to the fishery is not presently known.

Recommendations:

Chatanika River

1. The tagging phase of this project should be discontinued.
2. Determine seasonal downstream migration timing of young-of-year, (0 age class) grayling past the diversion dam and/or into the Davidson Ditch.
3. Determine size and age of spawning grayling.
4. Survey spawning areas above and below the diversion dam to determine areas available, areas utilized, areas blocked and quantitative qualitative analysis of spawning gravels.
5. Make incidental tag recoveries and collect scale samples from same.

Upper Tanana River Tributaries:

Findings:

The 1962 field season activity commenced on May 28th with field personnel reporting for duties and establishing a field operational camp. Boats, sampling gear and other items of equipment were made ready for the work season. Incorporated into the field program

FIGURE 4,

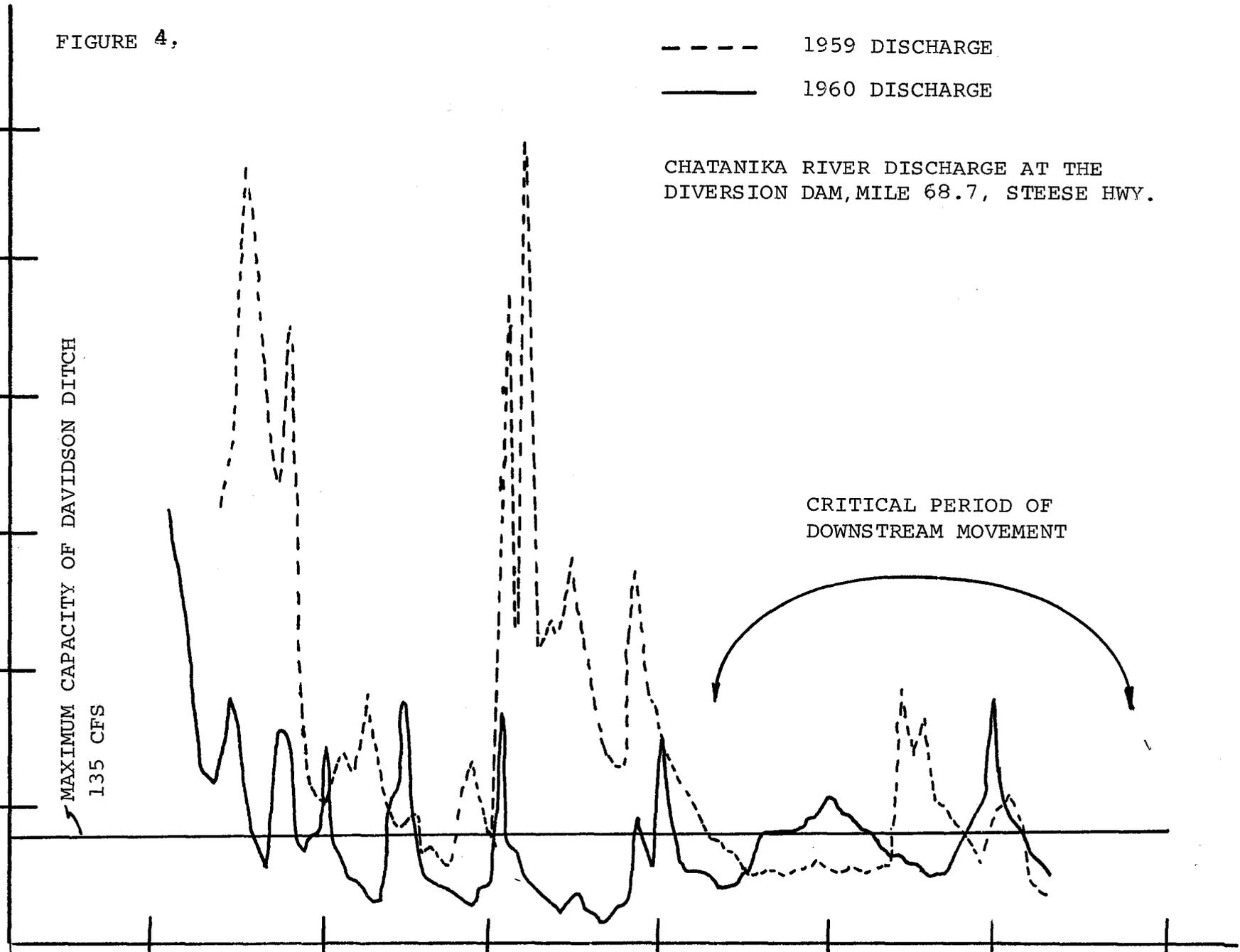
--- 1959 DISCHARGE
 — 1960 DISCHARGE

CHATANIKA RIVER DISCHARGE AT THE
 DIVERSION DAM, MILE 68.7, STEESE HWY.

DISCHARGE CFS
 1200
 1000
 800
 600
 400
 200
 0
 MAXIMUM CAPACITY OF DAVIDSON DITCH
 135 CFS

CRITICAL PERIOD OF
 DOWNSTREAM MOVEMENT

MAY JUNE JULY AUGUST SEPTEMBER OCTOBER



in 1962 were newly devised field forms to record the capture tagging data and recovery of tagged fish. This innovation worked to advantage in the final recording of data to prevent confusion and recording errors.

Arctic grayling were tagged from the Delta-Clearwater, Goodpaster River and Richardson-Clearwater drainages. Shaw Creek, formerly included in the grayling study was omitted during the 1962 season because of un-fishable water conditions and lack of personnel.

Summaries of fish tagged and recovered are presented in Tables 2 through 7. Table 2, is a complete summary for all drainages sampled. Graphic presentations of the recovery data for each of the four upper Tanana River tributaries sampled from 1960 through 1962 are illustrated in Figures 5 through 8.

It must be explained to the reader here, that a large number of the tagged fish recovered were not killed. Rather, they were duly recorded and released again in the same area where taken. Data collected from tagged-recovered-released grayling will probably prove to be the most significant factor in eventually explaining the complex migratory behavior exhibited by upper Tanana tributary grayling.

Discussion of the problem:

Primary to the management of the stocks of Arctic grayling in the upper Tanana River drainages is a knowledge of the seasonal intra-stream and inter-stream migratory behavior movements. It is not known whether grayling caught in a particular tributary were spawned and reared in the same system. Particular attention has to be paid to those times and locations where grayling may be particularly vulnerable to undue exploitation and natural hazards.

It has been established from tag returns that an inter-stream relationship does exist. The disturbing

Table 2. Number of Grayling Tagged 1960 Through 1962,
Tanana River Drainage.

<u>Area</u>	<u>1960</u>	<u>1961</u>	<u>1962</u>	<u>Total</u>
Chatanika River	4,457	5,707	3,731	13,895
Delta-Clearwater	2,160	440	1,506	4,106
Goodpaster River	2,000	71	945	3,016
Richardson-Clearwater	518	623	503	1,644
Shaw Creek *	200	13	0	213
Totals:	9,335	6,854	6,685	22,874

*Discontinued tagging in 1962 due to personnel limitations and water conditions.

Table 3. Summary of Tag Recoveries, Upper Tanana River
Tributaries, 1960, 1961 and 1962 (Incomplete).

<u>Area</u>	<u>1960</u>	<u>1961</u>	<u>1962</u>	<u>Total</u>
Delta-Clearwater	300	30	110	440
Goodpaster River	72	4	95	171
Richardson-Clearwater	71	95	92	258
Shaw Creek	15	0	0	15
Totals:	458	129	297	884

Table 4. Tagged Grayling Recovery Summaries for the
Delta-Clearwater River, 1960 - 1962 (Incomplete).

I Tagging Year - 1960				
Number of Fish Tagged - 2,160				
Recovery Area	Year and Number			Total
	1960	1961	1962	
Delta-Clearwater	184	95	13	292
Goodpaster River		1		1
Richardson-Clearwater			1	1
Tanana River	5	1		6
Totals:	189	97	14	300

II Tagging Year - 1961				
Number of Fish Tagged - 440				
Recovery Area	Year and Number			Total
	1960	1961	1962	
Delta-Clearwater		30	0	30
Totals:		30	0	30

III Tagging Year - 1962				
Number of Fish Tagged - 440				
Recovery Area	Year and Number			Total
	1962			
Delta-Clearwater	110			110
Totals:	110			110

Table 5. Tagged Grayling Recovery Summaries for the Goodpaster River, 1960 - 1962 (Incomplete).

I Tagging Year - 1960				
Number of Fish Tagged - 2,000				
Recovery Area	Year and Number			Total
	1960	1961	1962	
Delta-Clearwater		15	5	20
Goodpaster	4	8	4	16
Richardson-Clearwater		3	32	35
Other: (Donnelly Creek)		1		1
Totals:	4	27	41	72

II Tagging Year - 1961				
Number of Fish Tagged - 71				
Recovery Area	Year and Number			Total
	1961	1962		
Delta-Clearwater		1		1
Goodpaster River			3	3
Totals:			4	4

III Tagging Year - 1962				
Number of Fish Tagged - 945				
Recovery Year	Year and Number			Total
	1962			
Goodpaster			95	95
Totals:			95	95

Table 6. Tagged Grayling Recovery Summaries for the Richardson-Clearwater River, 1960 - 1962 (Incomplete).

I Tagging Year - 1960				
Number of Fish Tagged - 518				
Recovery Area	Number and Year			Total
	1960	1961	1962	
Richardson-Clearwater	2	31	26	59
Shaw Creek		11		11
Other (French Creek)		1		1
Totals:	2	43	26	71

II Tagging Year - 1961				
Number of Fish Tagged - 623				
Recovery Area	Number and Year			Total
		1961	1962	
Delta-Clearwater		2		2
Goodpaster			1	1
Richardson-Clearwater		62	30	92
Totals:		64	31	95

III Tagging Year - 1962				
Number of Fish Tagged - 503				
Recovery Area	Number and Year			Total
			1962	
Richardson-Clearwater			92	92
Totals:			92	92

Table 7. Tagged Grayling Recovery Summaries for Shaw Creek,
1960 - 1962 * (Incomplete).

Recovery Area	Tagging Year - 1960			Total
	Number of Fish Tagged - 200			
	1960	1961	1962	
Delta-Clearwater		1	1	2
Goodpaster River			1	1
Richardson-Clearwater		7	2	9
Shaw Creek	1			1
Totals:	1	8	4	13

* No recoveries during 1961, 1962.

problem is that it is not known whether this effects a significant proportion of the total grayling population or what size or age groups are involved. This raises the questions; is there any one particular tributary contributing extensively to the population of other tributaries, and is the factor of age-size pertinent to migratory behavior.

The concept of any single stream acting as a sole contributor, e.g., a nursery stream, remains a possibility, but cannot be proven at this time. The same must be said for the factor of age-size. Reed, (1960), pointed out that movement of grayling from the Goodpaster to the Delta-Clearwater bore a positive correlation with age and size based on 1959 and 1960 tag returns. Fish recovered from the Goodpaster in successive years in the Delta-Clearwater were predominant five year age class fish. Field data exists to strengthen or reject the above theories, but has not yet been analyzed. During the 1962 season, scale samples and fork length measurements were recorded from all fish tagged and recovered. The age and size analysis of previously tagged fish will provide evidence in establishing the age-size concept in migratory behavior.

Present data does not establish inter-stream movement of grayling in the tributaries investigated as having any definite pattern. It cannot be entirely correct to say that the movement is migratory, a term which implies a periodic passing from one region to another. At this point of analysis, the term, "randomly nomadic" is more appropriate in describing the movement of upper Tanana tributary grayling. A "periodic" movement as such has yet to be firmly established as existing between the various tributaries.

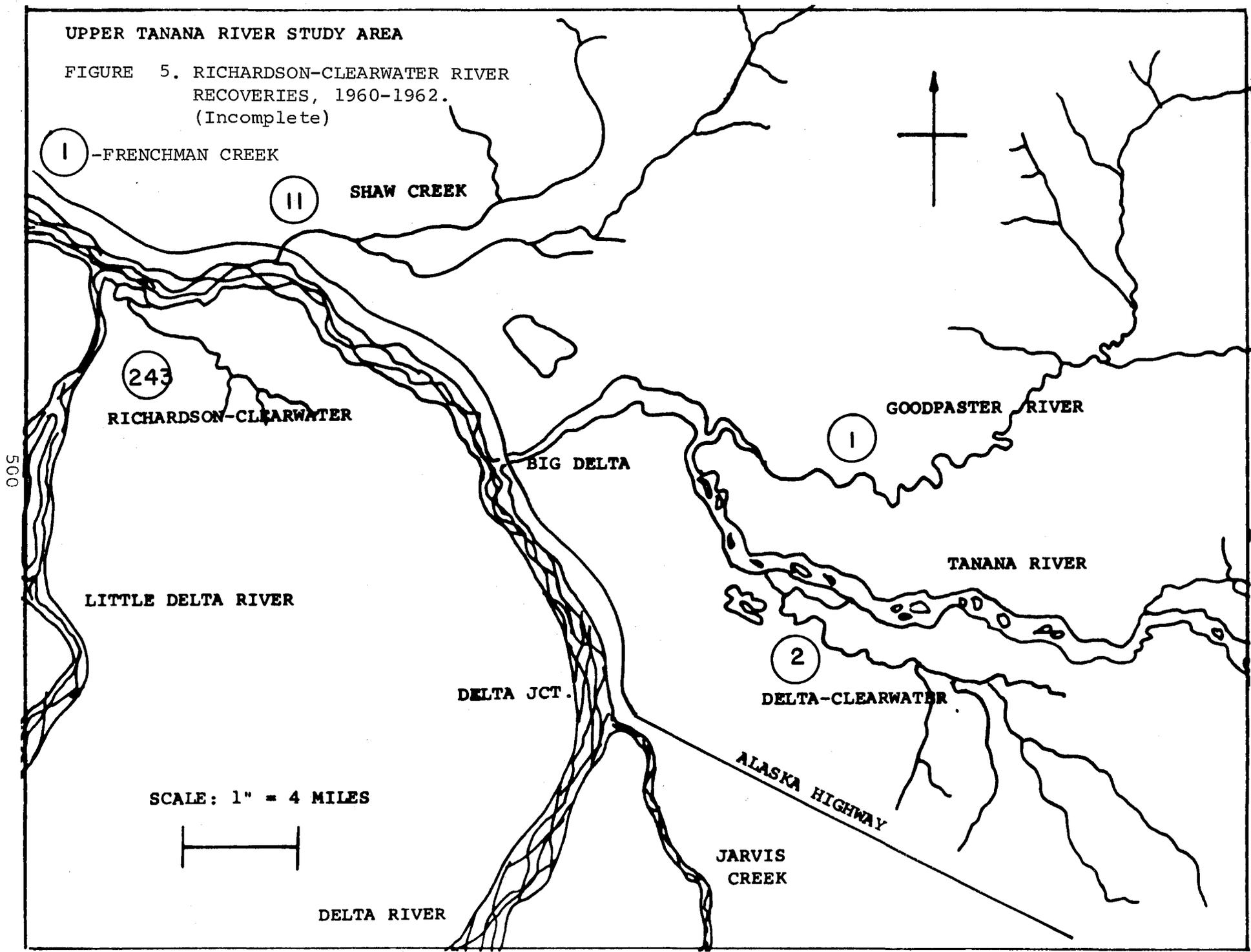
The hypothesis can be put forth that after a period of rearing time in the natal stream, e.g., upon reaching a suitable age and size, a transposition of stream environment may or may not take place. The

motivation may bear a result of various environmental factors such as water flows, temperatures, parasites, food availability or abundance.

Interpreting the tag recovery summaries in Tables 4, 5, 6 & 7, it is observed that inter-stream movement within the same tagging year is minor. It is acknowledged that inadequate and biased sampling methods may account for the small number. However, in successive years tag returns are quite impressive in establishing a basis for a homing tendency, at least for a significant proportion of the grayling tagged and recovered. The question may be asked if this represents true homing instinct. Homing instinct as defined is that the fish leave the natal streams for some portion of time and are compelled to return. In view of this definition, the question cannot presently be answered completely because it cannot be ascertained that tagged fish recovered in successive years in the same stream where tagged, ever really left that stream. Due to the absence of a controlled winter sampling program it cannot be definitely stated that all grayling migrate downstream and out of a system for the winter to reascend in the spring. There is considerable logic to the argument that some portion of a particular population does not leave the system, but rather overwinters in those deep pools that provide a sanctuary. There is also the supposition that some intra-stream winter movement may take place between pools beneath the ice cover. The number of favorable winter pools is necessarily restricted and would be a limiting factor in the numbers remaining. This would especially apply to streams that annually receive an ice cover. In those spring-fed tributaries that do not receive ice covers, grayling might be present anywhere in the system. The winter phase of the life history of Arctic grayling warrants immediate and intensive investigation in order to resolve fully the problem of migratory behavior.

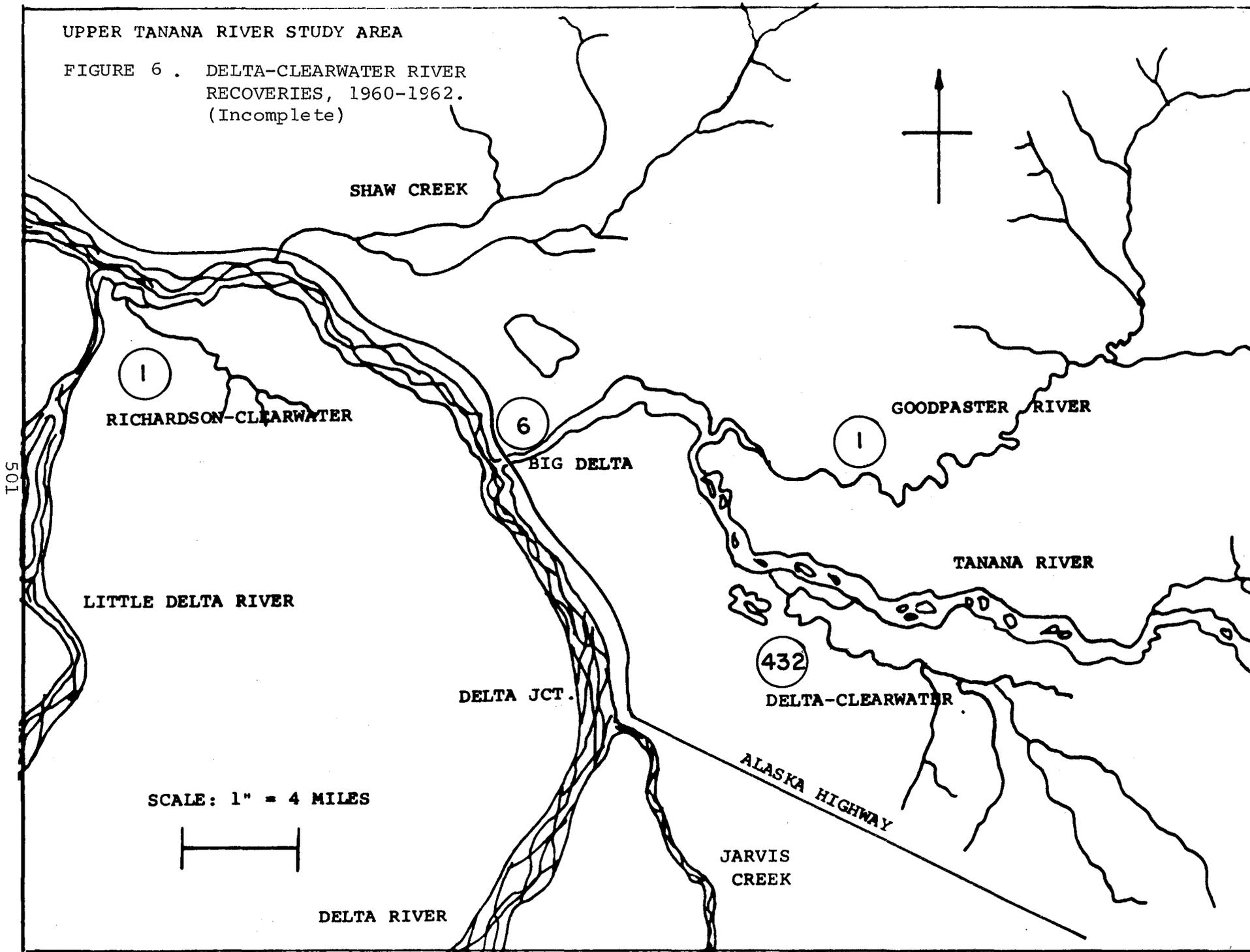
UPPER TANANA RIVER STUDY AREA

FIGURE 5. RICHARDSON-CLEARWATER RIVER RECOVERIES, 1960-1962.
(Incomplete)



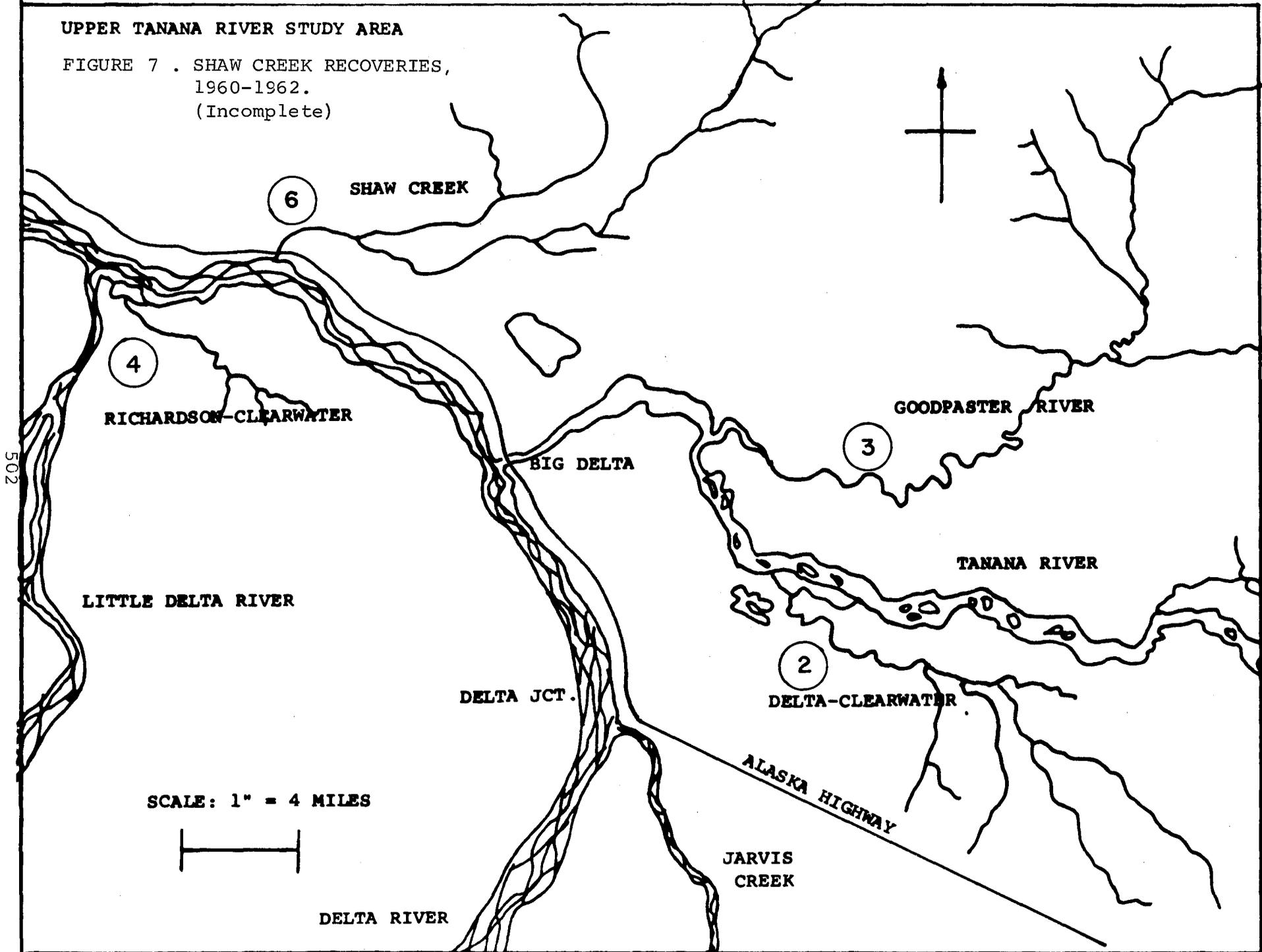
UPPER TANANA RIVER STUDY AREA

FIGURE 6 . DELTA-CLEARWATER RIVER
RECOVERIES, 1960-1962.
(Incomplete)



UPPER TANANA RIVER STUDY AREA

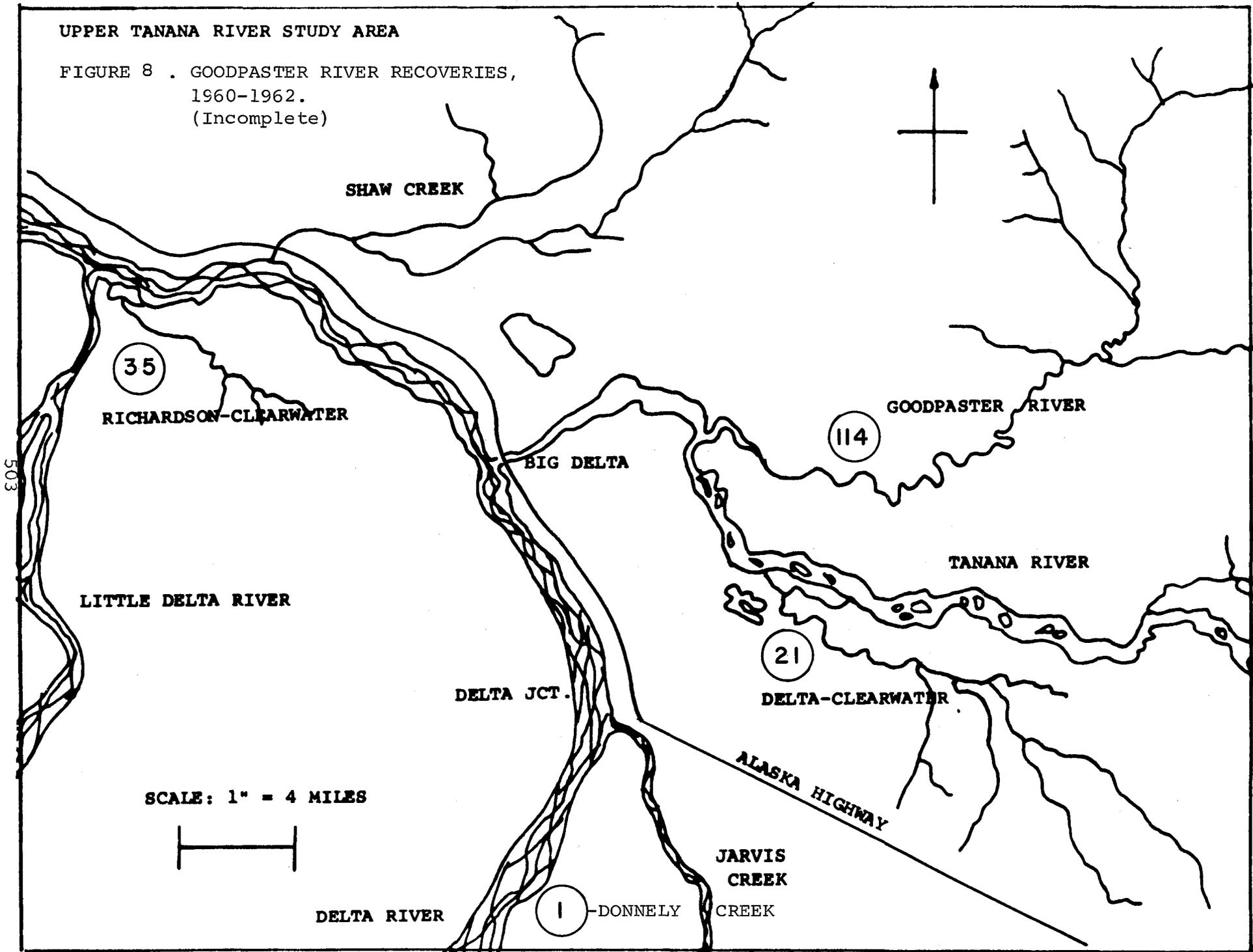
FIGURE 7 . SHAW CREEK RECOVERIES,
1960-1962.
(Incomplete)



502

UPPER TANANA RIVER STUDY AREA

FIGURE 8 . GOODPASTER RIVER RECOVERIES,
1960-1962.
(Incomplete)



Recommendations:

Upper Tanana River tributaries

1. Analyze fully the past three years of tag and recovery data.
2. Continue tagging and recovery of tagged fish in the 1963 field season.
3. Analyze scale samples previously obtained for age composition and growth rates, with emphasis on age-size analysis of recovered, tagged fish.
4. Extend the recovery of tagged grayling by exploratory fishing trips up the Tanana River to other clearwater tributaries in order to further define the migratory behavior range.
5. Continue the investigation of intra-stream movement by instigating a winter sampling program in the Delta-Clearwater.
6. Instigate a winter sampling program in the Tanana River.
7. Management in any one system does not appear to be a substantive factor, management of grayling should be on a species basis.

Literature Cited

- 1962 Lentfer, Jack
 A Progress Report on Fish and Wildlife
 resources relating to Federal Power
 Commission Project, No. 2264, Branch of
 River Basin Studies, U. S. Department of
 Interior, Fish and Wildlife Service.
- 1961 McKirdy, Henry
 Annual Report of Progress, 1961-1962,
 Federal Aid in Fish Restoration, Project
 F-5-R-3, Sport Fish Investigations of
 Alaska, Volume 3.
- 1960 Reed, Roger J.
 Annual Report of Progress, 1960-1961,
 Federal Aid in Fish Restoration Project
 F-5-R-2, Sport Fish Investigations of
 Alaska, Volume 2.

Prepared by:

Approved by:

Thomas Nagata
Fishery Biologist

Richard Haley
D-J Coordinator

Job Leader:

George VanWyhe
Fishery Biologist

Date: March 3, 1963

Alex H. McRea, Director
Sport Fish Division