

69. SOMASS RIVER.

SALMON SPAWNING GROUND SURVEY
ON THE SOMASS RIVER SYSTEM

1956

DEPARTMENT OF FISHERIES, CANADA
VANCOUVER, B.C.

JUNE 28, 1957

SALMON SPAWNING GROUND SURVEY
ON THE SOMASS RIVER SYSTEM
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Department of Fisheries, Canada
Vancouver, B. C.
June 28, 1957.

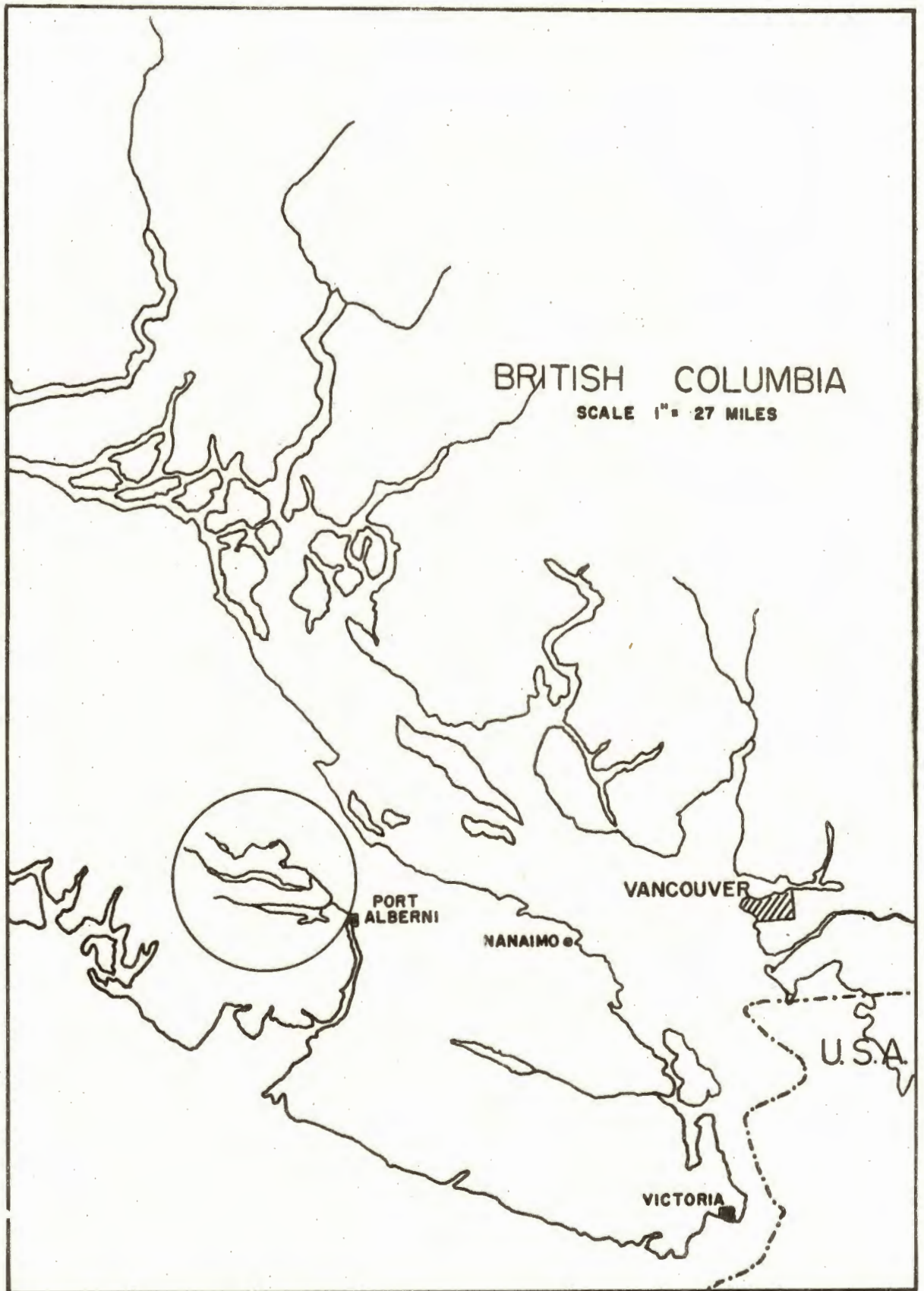


Figure 1. Site map.

SALMON SPAWNING GROUND SURVEY

ON THE SOMASS RIVER SYSTEM

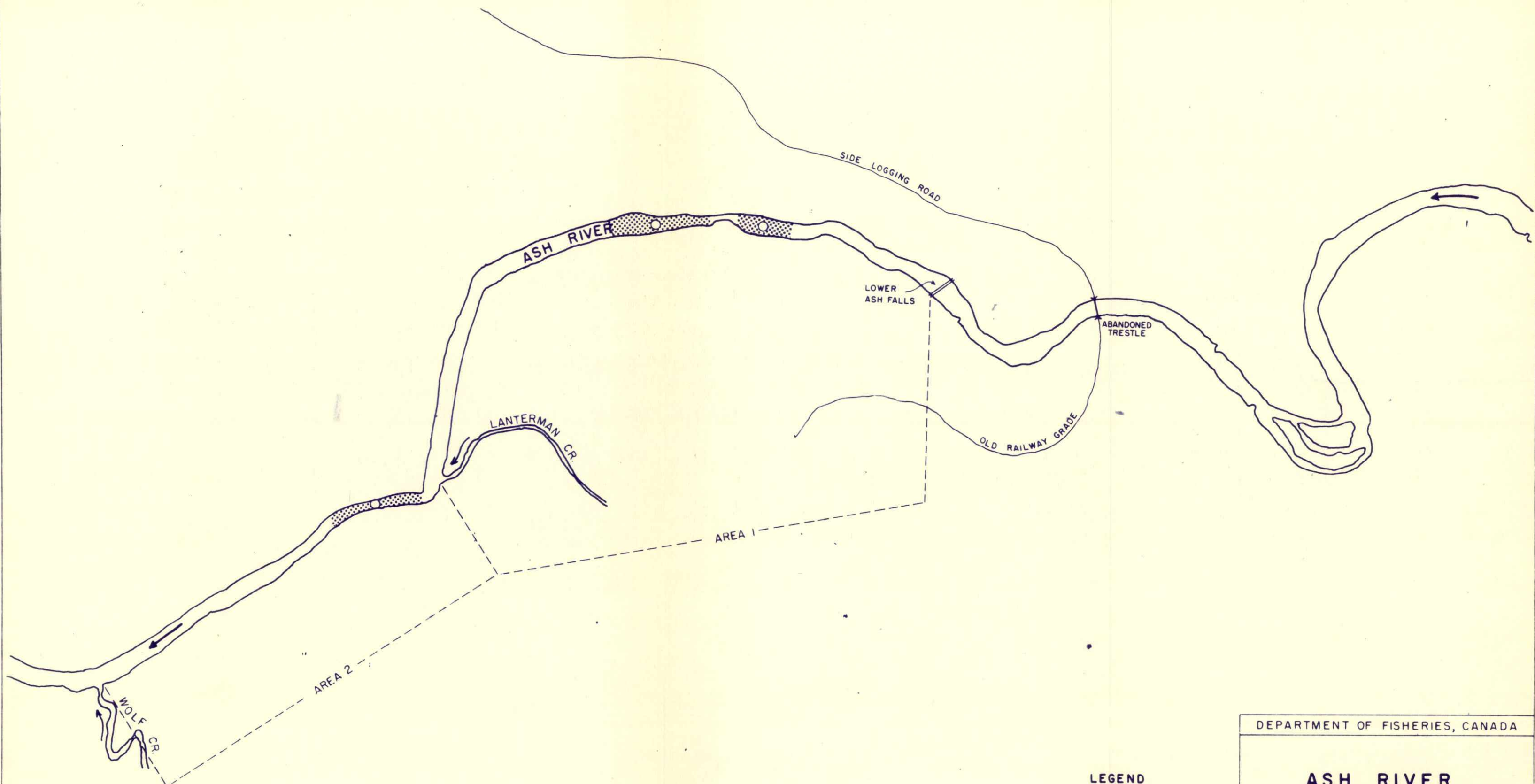
1956

A spawning ground survey of the Somass River system was conducted in 1956, site map (Figure 1). The main purposes of this investigation were to locate and assess the spawning grounds, to obtain population estimates, and to determine the time of migration for each of the various species indigenous to the system.

1 ASH RIVER SURVEY

The Lower Ash River falls, located approximately $3\frac{1}{2}$ miles above the confluence of the Ash and Stamp Rivers, block passage of coho salmon to the river above. Steelhead trout are able to pass these falls and they continue their migration upstream a further 3 miles to Dickson Falls. The observations on the salmon and trout spawning grounds from the lower Ash River falls to the confluence of the Ash and Stamp rivers were conducted mainly by the field personnel who regularly floated the stream in a rubber boat. The coho spawning areas in Wolf and Lanterman creeks, tributaries of the Ash River, were examined regularly by the personnel on foot. In this connection men were employed to cut trails along the stream banks, following which the observers patrolled each creek once a week.

For the purpose of calculating the average life period of coho salmon entering, spawning and dying in a



LEGEND

	LT.	MED.	HV.
COHO	○	◐	●
CHUMS	□	◑	■
SPRINGS	▽	◓	▼
SPAWNING AREA	[Stippled Pattern]		

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**ASH RIVER
SPAWNING GROUNDS**

SOMASS RIVER REPORT

stream a number of this species were tagged. The stream chosen was Ward Creek, a tributary to Sproat Lake, also a component of the Somass River system. Its central location enabled frequent checking of the tagged fish to be conducted. This data was used in connection with the estimation of population size.

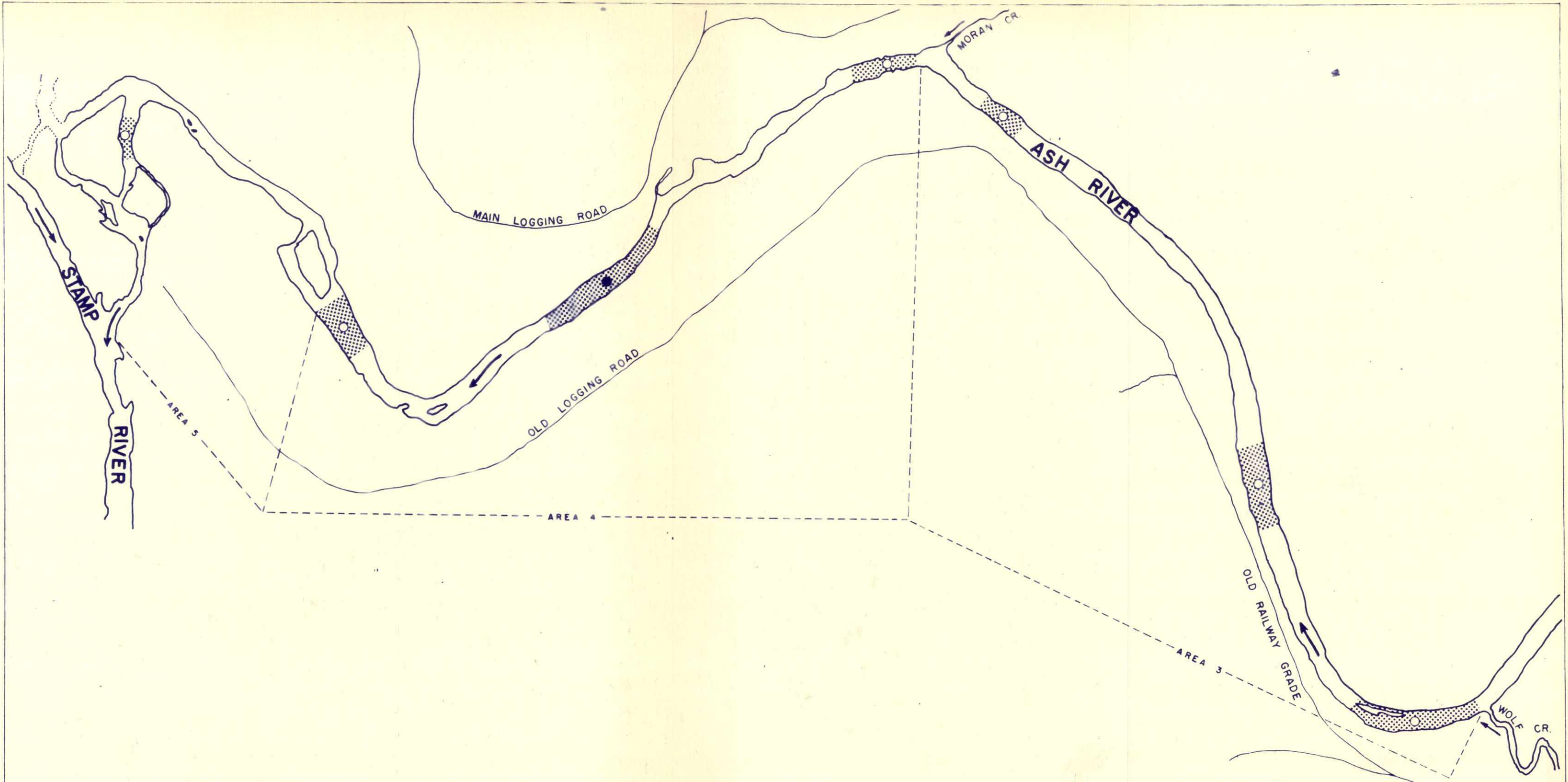
Previous to the spawning ground surveys aerial photographs of the various streams and lakes of the Somass River system were secured. From these photographs mosaic maps were produced which were used for plotting the spawning grounds.

Description of spawning grounds

The coho spawning areas in the Ash River and its tributaries are shown in Figures 2A and 2B. The river was arbitrarily divided into five counting areas and the fish spawning or "holding" were counted in each area. The physical characteristics of the stream and a general description of the salmon and trout spawning in each area are summarized below:

Area 1

This area is 0.7 miles in length, extending from the lower Ash River falls to Lanterman creek (Figure 2A). The gradient is steep with attendant high velocities and the bottom composition is coarse to rocky. A very light coho spawning took place in this section. Anglers fishing for steelhead trout were seen on several occasions from the lower Ash River falls to a point downstream approximately 500 yards.



LEGEND

SPAWNING AREAS	AREAS		
	LT.	MED.	HW.
COHO	○	◐	●
CHUMS	□	◑	■
SPRINGS	▽	◓	▼

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Area 2

This section extends from Lanterman Creek downstream to Wolf Creek, a distance of 0.4 miles (Figure 2A). In this area the gradient and resultant velocities are reduced in comparison with Area 1. There was a small marginal section of gravel suitable for coho spawning in this area, but the river bed for the most part was composed of coarse gravel and large rocks. A small number of coho spawned in this area. There is a long deep pool in the river immediately below Lanterman Creek where coho salmon were observed "holding" awaiting suitable conditions before migrating into the creek. Fishermen were frequently seen angling for steelhead trout in this pool.

Area 3

This area extends from Wolf Creek downstream one mile to a point below the mouth of Moran Creek (Figure 2B). Most of the gravel in this section is coarse and stream velocities are unfavorably high. There were three places within this area in which light coho spawning took place. Important steelhead fishing pools are located below the mouths of Wolf and Moran Creeks.

Area 4

This section of the river extends from Moran Creek to a large island located 0.9 miles downstream (Figure 2B). In most of this section water velocities are high and the gravel is quite coarse. One major coho spawning area and two areas of low intensity spawning were found below Moran Creek. Immediately below Moran Creek there was a deep

pool in which a large number of coho were observed "holding", and anglers were often seen fishing for steelhead.

Area 5

This section extends 0.6 miles from the upstream tip of the large island to the confluence of the Ash and Stamp Rivers (Figure 2B). Throughout most of this section of the river there were good gravel areas and moderate water velocities. A light spawning of coho was recorded in this area. One deep quiet pool serves as a "holding" area for coho and steelhead.

The results of surveys conducted on the Ash River tributaries were as follows:

Wolf Creek - The main channel of this creek has a steep gradient and high velocities. In this area it is estimated that less than 10 percent of the stream bottom is suitable for spawning, since the bottom composition is coarse and rocky. Small numbers of coho were found spawning in isolated areas from the mouth of the creek to a point approximately one mile upstream. In addition during the latter part of the survey spawning was found to have occurred in a small branch of Wolf Creek. The area was about $\frac{1}{2}$ a mile long and the gravel and stream velocities were considered to be favorable for spawning.

Lanterman Creek - The same high velocities and poor gravel conditions were found in this creek as in the main branch of Wolf Creek. The bottom was composed of large rocks, coarse gravel and depressions eroded into sandstone.

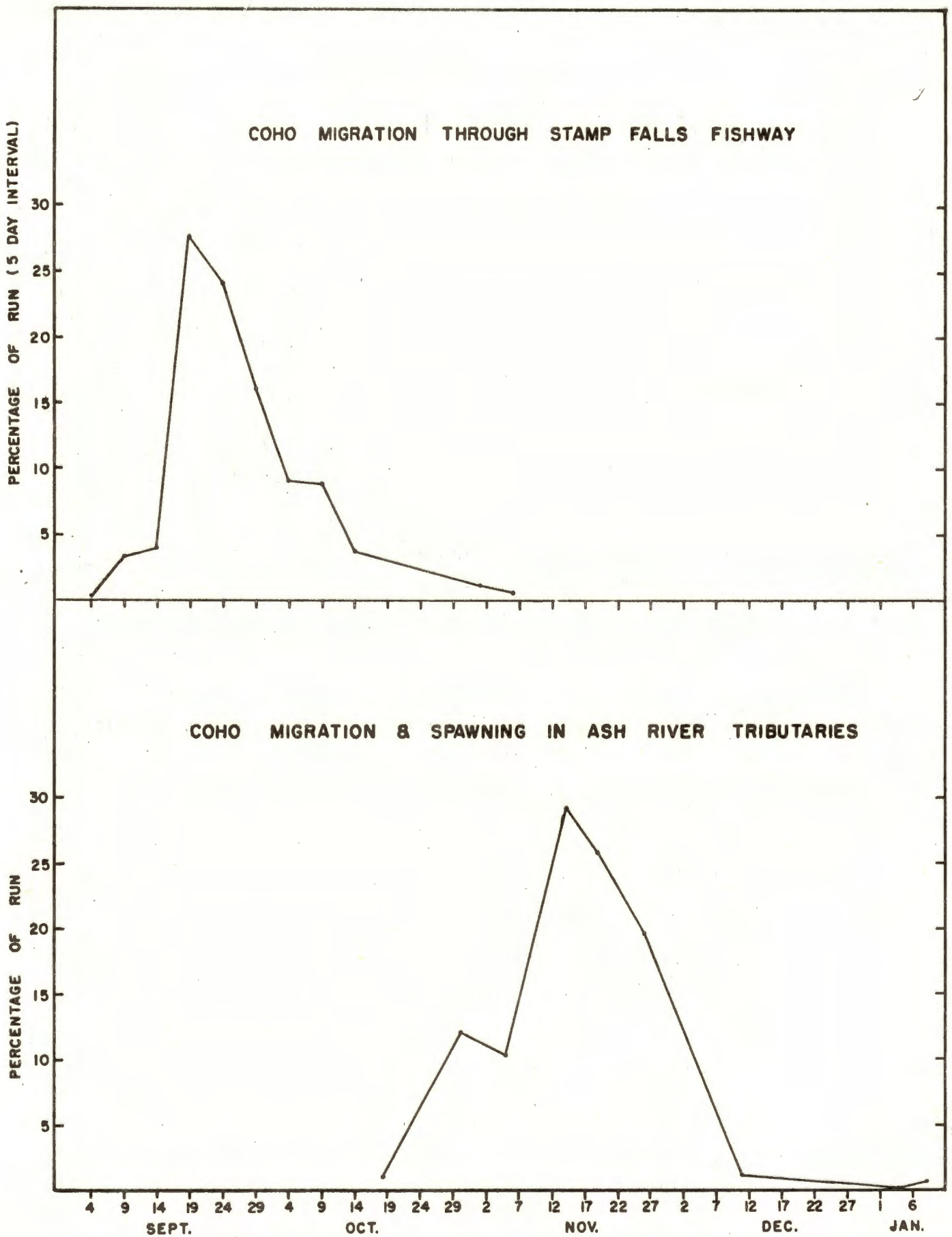


Figure 3. The timing of the coho salmon spawning migration to Ash River system.

Small numbers of coho were found spawning in isolated areas from the mouth of the creek to a point approximately $1\frac{1}{4}$ miles upstream.

Timing of adult salmon migration

The adult coho migration usually commences by mid-September and ends by mid-January. Steelhead trout enter the Somass system in all months of the year with peaks of abundance in November and March. Figure 3 shows the 1956 migration pattern for coho into the Ash River and its tributaries. The upper graph shows that the coho migration to the Ash River had begun by September 4 and had virtually ended by November 7. The peak of migration occurred on September 19. Approximately 88 percent of the migration took place in the thirty day interval between September 14 and October 14. The lower graph shows that coho were present in the Ash River tributaries by October 18 and that the run was virtually finished by December 11, although a very small number of fish were still alive in the creek by January 8. The peak of migration took place about November 14.

Population estimates

The 1956 population estimates for the coho salmon utilizing the Ash River, Lanterman Creek and Wolf Creek as spawning grounds are shown in Tables I, II and III. Data obtained from the tagging experiment at Ward Creek indicated that the average life period for coho salmon on the spawning grounds was 13 days. The time between successive counts made on the Ash River and its tributaries was often less than the

TABLE 1. Estimate of the population of coho spawning in Lanterman Creek.

Date	Count		Correction for 13-day period	Visibility	Increment
	Live	Dead			
Oct. 30	9			Fair	9
Nov. 5	24		$24 - \frac{7}{13} (9)$	Good	19
Nov. 14	23	3	$23 - \frac{4}{13} (24)$	Poor	19
Nov. 19	19		$19 - \frac{8}{13} (23)$	Good	5
Nov. 26	27	3	$27 - \frac{6}{13} (19)$	Poor	26
Dec. 11	1			Poor	1
Jan. 4	0			Good	
Jan. 8	2			Fair	2
Total					81

TABLE 11. Estimate of the population of coho spawning in Wolf Creek.

Date	Count		Correction for 13-day period	Visibility	Increment
	Live	Dead			
Oct. 18	3			Poor	3
Oct. 30	32		$32 - \frac{1}{13} (3)$	Fair	32
Nov. 5	11	1	$11 - \frac{7}{13} (32)$	Good	1
Nov. 14	73	1	$73 - \frac{4}{13} (11)$	Poor	71
Nov. 19	68	1	$68 - \frac{8}{13} (73)$	Good	24
Nov. 26	35	2	$35 - \frac{6}{13} (68) - \frac{1}{13} (73)$	Poor	2
Dec. 11	2			Poor	2
Jan. 4	0			Good	
Jan. 8	2	16 45		Fair	18 45
Total					198

average life period, and accordingly it is considered that surviving fish were counted more than once. To compensate for this "overlapping", the average life period and the time between counts were considered in calculating increments of recruitment. A summation of increments yielded the population estimate for each stream. The results of this analysis yielded an estimated population of 81 for Lanterman Creek (Table 1), and 198 for Wolf Creek (Table 11).

Table 111 shows that fish were observed in the Ash River before November 2. Since no spawning was reported before this date, the fish arriving on the Ash River spawning grounds were considered to be accumulating and maturing. The November 2 count of 352 coho was considered to represent the number of fish present in the river before spawning took place. Following this date, when spawning began, the 13-day life period was considered in calculating increments of recruitment. A summation of the November 2 count and increments of recruitment yielded a population estimate of 493 coho.

During freshets the Ash River and its tributaries become quite muddy and the resulting turbidity made counting very difficult and often impossible. Since many of the low counts reported were made under such conditions, it was concluded that the estimate of population of the Ash River and its tributaries was low. In this connection it is commonly accepted that multiplication by a factor of 1.5 to 2.0 tends to produce a number more nearly approximating the real number of fish. Therefore the total population of coho salmon spawning in the

TABLE 111. Estimate of the population of coho spawning in the Ash River.

Date	Live Count	Correction for 13-day period	Visibility	Increment
Oct. 9	276	No correction	Good	
Oct. 24	6	No correction	Very poor	
Nov. 2	352	No correction	Very good	352
Nov. 8	108	$108 - \frac{7}{13} (352)$	Poor	
Nov. 14	43	$43 - \frac{7}{13} (108) - \frac{1}{13} (352)$	Poor	
Nov. 20	101	$101 - \frac{7}{13} (43) - \frac{1}{13} (108)$	Good	70
Nov. 27	114	$114 - \frac{6}{13} (101)$	Poor	67
Dec. 4	31	$31 - \frac{6}{13} (114)$	Very poor	
Jan. 2	4		Good	4
Total				493

system was estimated to be 1500 coho. The population of the Ash River would be about 1000 coho and the combined population of Wolf and Lanterman creeks would be about 500 coho.

There was insufficient data obtained to indicate the size of the steelhead population in the Ash River system.

11 STAMP RIVER AND GREAT CENTRAL LAKE

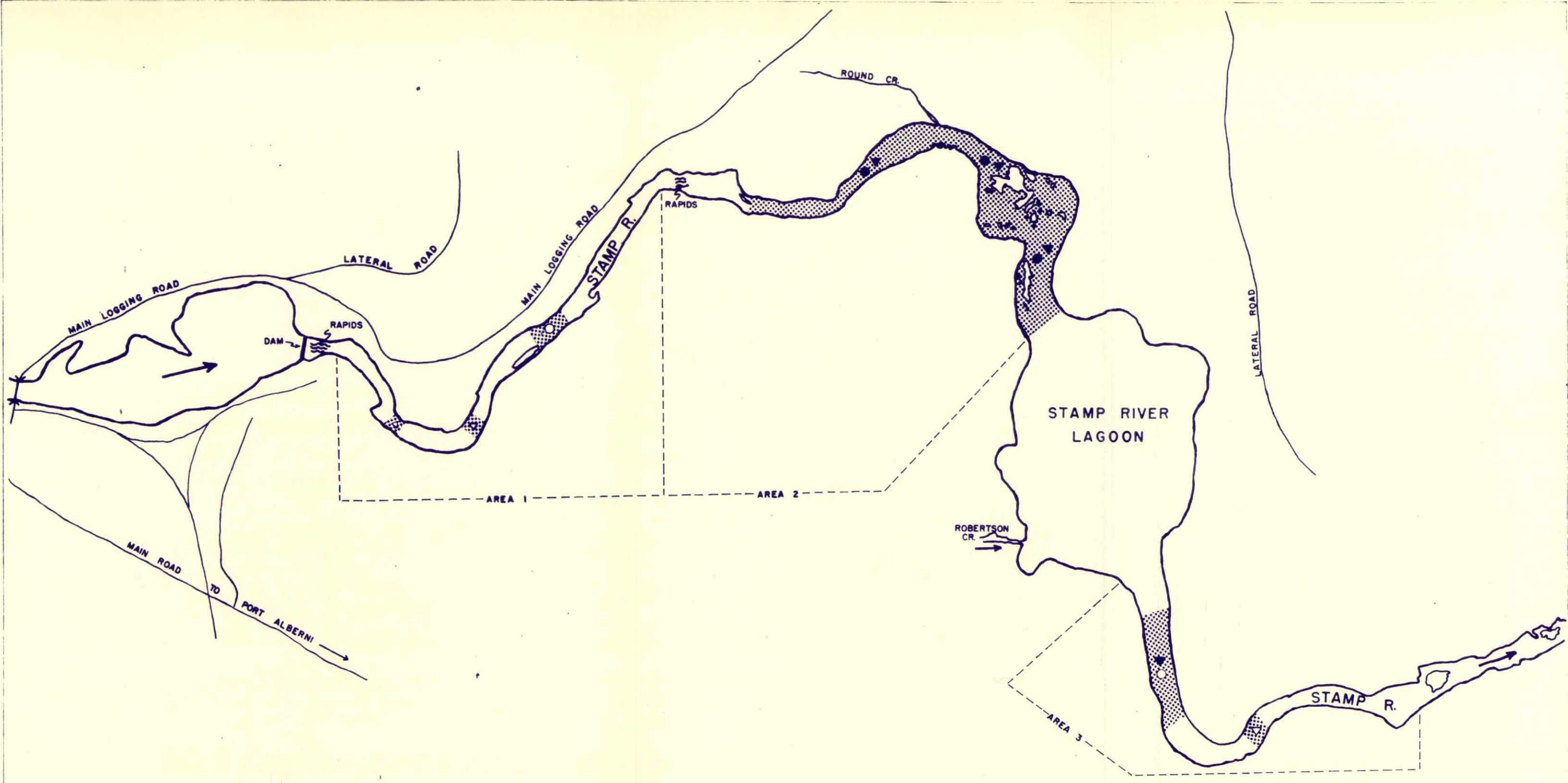
Sockeye, coho, spring salmon and steelhead trout entering the Somass system migrate into the Stamp River and spawn in Great Central Lake, streams tributary to Great Central Lake, streams tributary to the Stamp River, and in the Stamp River proper.

Counts of coho salmon spawning in the Stamp River tributaries and small streams discharging into Great Central Lake were

made on foot. Coho and spring salmon, spawning in the Stamp River between Great Central Lake and the confluence of the Sproat and Stamp rivers, were counted by personnel floating downstream in a rubber boat. Counts of coho salmon spawning in McBride and Drinkwater creeks, the two largest Great Central Lake tributaries, were made by rubber boat. A counting fence was built across Robertson Creek, a secondary outlet of Great Central Lake which flows through Boot Lagoon. Fish leaving the Stamp River and entering Robertson Creek were counted as they passed through the fence. In addition daily counts of salmon passing the MacMillan & Bloedel storage dam on the Stamp River below the outlet of the lake were made. Throughout the migration periods, observers counted the number of each species passing through the Stamp Falls fishway for at least four hours every day.

From September to mid-October the shore of Great Central Lake was patrolled by power boat in an attempt to find sockeye spawning, but attempts to find fish by this method were not successful. The lakeshore was patrolled twice by helicopter in October and successfully resulted in the sites of sockeye spawning grounds being located. The areas were then re-examined by boat. The limits of each site were determined as accurately as possible by counting paired sockeye, and noting areas in which the gravel had been disturbed in redd making.

Numbers of steelhead trout were observed while making counts of other species spawning or migrating into the Stamp River. The number of steelhead seen was noted, and further counts were obtained by floating after coho spawning had ended.



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LEGEND

SPAWNING AREAS	
COHO	LT MED HV
CHUMS	LT MED HV
SPRINGS	LT MED HV

**STAMP RIVER
SPAWNING GROUNDS**

Description of spawning grounds

During the 1955-56 Somass River survey, spring, coho and sockeye salmon were found spawning in the Stamp River and its tributaries, and in Great Central Lake and the streams discharging into the lake. The location, extent and intensity of coho and spring salmon spawning in the Stamp River are shown in Figures 4A, 4B, and 4C. The location and extent of coho and sockeye salmon spawning in Great Central Lake, and in two of its tributaries, McBride and Drinkwater Creeks, are shown in Figure 6. A description of the physical characteristics of each spawning area is given below.

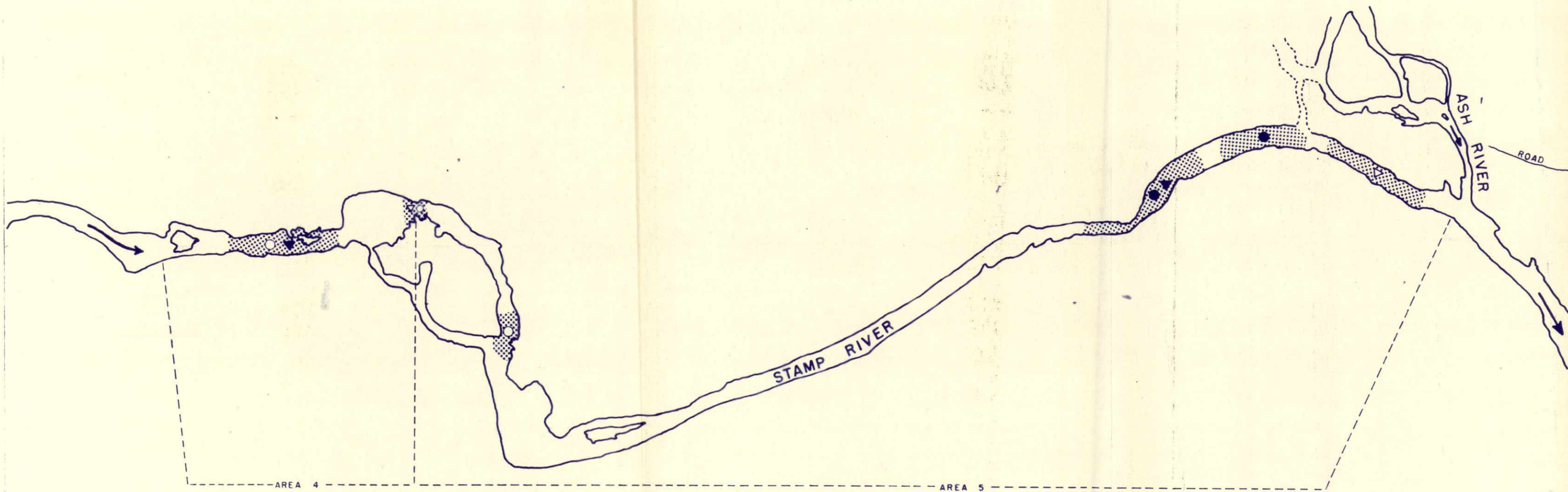
Stamp River

Area 1

This area extends from the MacMillan & Bloedel storage dam to a rapid located approximately 0.4 miles downstream (Figure 4A). The river is quite deep and the velocities are moderate in this area. The gravel is fairly coarse and quite suitable for spring salmon spawning. A light coho and medium spring salmon spawning were recorded in this area. Coho were observed "holding" in this area.











Area 2

This area extends from the rapids downstream a distance of 0.6 miles to the upstream end of Stamp River Lagoon (Figure 4A). Submerged gravel bars in this area produce varying depths which result in small localized velocity differentials. The velocities combined with suitable gravel make conditions extremely suitable for spawning. There were very heavy coho and



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LEGEND

SPAWNING AREAS	
	L ^T MED HV
COHO	  
CHUMS	  
SPRINGS	  

**STAMP RIVER
SPAWNING
GROUNDS**

medium spring spawning recorded throughout the whole area. Coho salmon were observed "holding" in several pools in this area.

Area 3

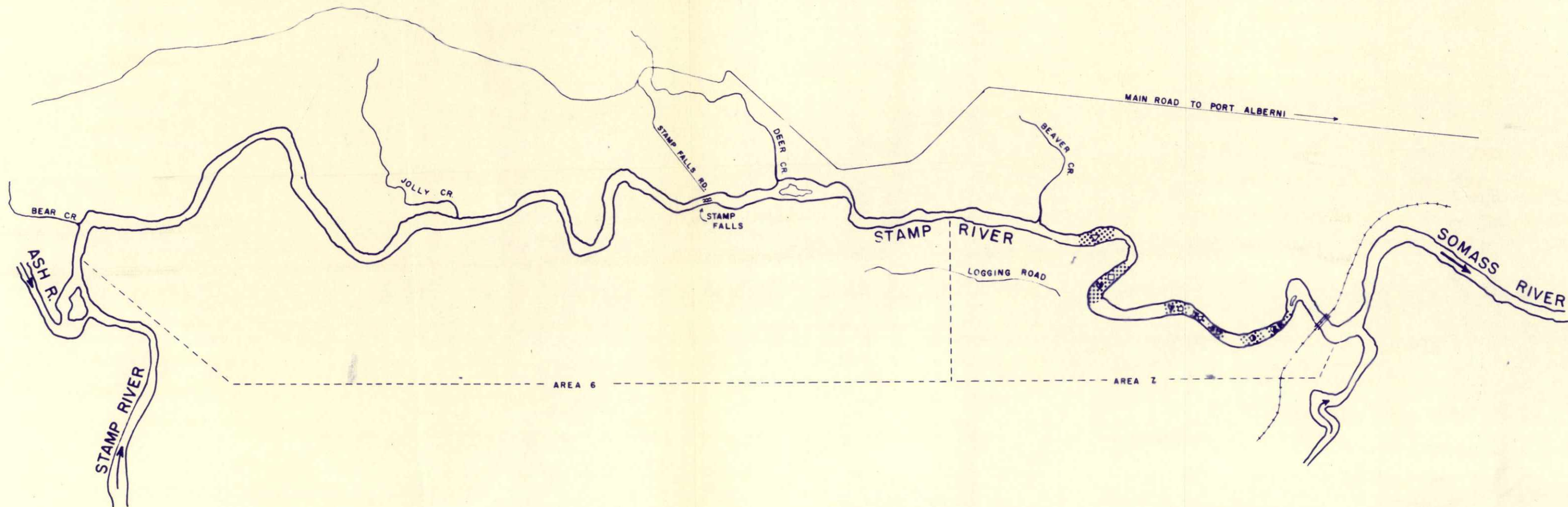
This area extends from the upstream end of Stamp River Lagoon to an island located about 0.5 miles below the lagoon (Figure 4A). The lagoon is deep and velocities are very low with the main flow of water confined to the side of the lagoon adjacent to Robertson Creek. In the river below the lagoon, velocities, depths and gravel sizes are excellent for spawning. Heavy spring and very heavy coho seedings took place in this section. Fish which were "holding" or migrating were observed in Stamp River Lagoon on the side adjacent to Robertson Creek. In addition there were areas in the Stamp River below the lagoon in which fish were observed "holding".

Area 4

This area extends from the small island to a second larger island located 0.3 miles downstream (Figure 4B). Moderate water velocities and depths combined to make conditions suitable for spawning. This area, containing fairly coarse gravel was utilized for spawning by a large number of spring salmon and a smaller number of coho. Coho were observed "holding" in a deep pool situated above the large island.

Area 5

This area extends downstream a distance of 1.3 miles from the large island to the confluence of the Ash and Stamp Rivers (Figure 4B). The river becomes deep and the velocities are greatly reduced in the section bounded by the large

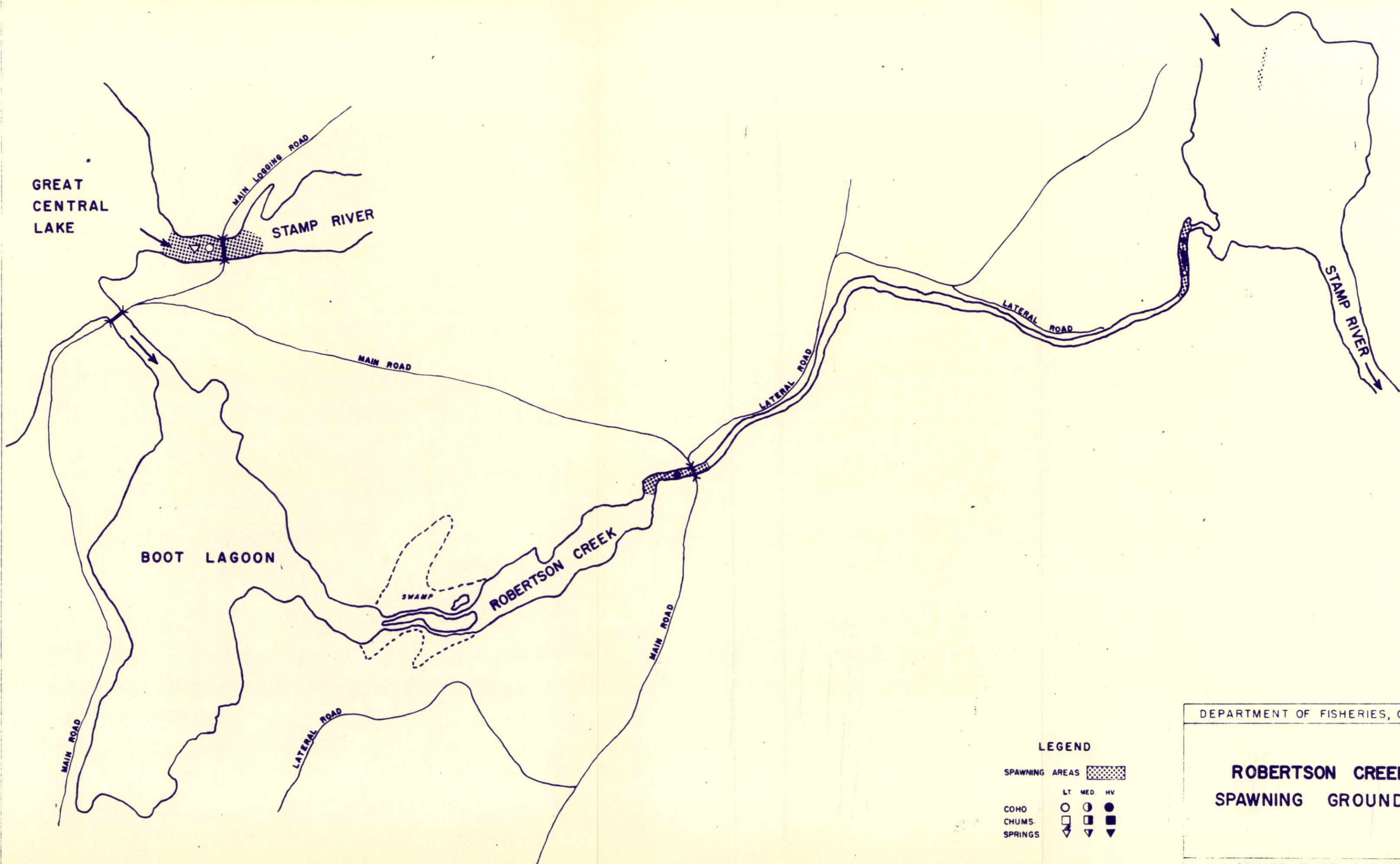


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STAMP RIVER SPAWNING GROUNDS

LEGEND

SPAWNING AREAS	
	T MED HV
COHO	
CHUMS	
SPRINGS	



LEGEND

SPAWNING AREAS	[Cross-hatched box]		
COHO	○	◐	●
CHUMS	◻	◑	◔
SPRINGS	↙	↘	↗

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**ROBERTSON CREEK
SPAWNING GROUNDS**

SOMASS RIVER REPORT

island and a constriction in the river 0.8 miles downstream. No spawning was observed, but coho were observed "holding" in this section of the stream. The section extending from the constriction to the confluence of the Ash and Stamp Rivers was heavily seeded by springs and there was a medium seeding of coho.

Area 6

This area extends from the confluence of the Stamp and Ash rivers to a point 2.5 miles above the confluence of the Stamp and Sproat rivers (Figure 4C). The many rapids in this part of the river make floating quite hazardous at the high water levels which generally prevail during the months of October, November and December. Therefore it was possible to obtain only one count during the spring and coho spawning period. A light coho and spring salmon spawning was recorded.

Area 7

This area extends from the confluence of the Stamp and Sproat rivers to a point 2.5 miles upstream (Figure 4C). The river is wide and fairly deep in this area. There are many sections where the velocities and gravel dimensions are considered to be suitable for spawning. The lower half of this area was most heavily seeded. A very heavy spring spawning and a light coho spawning took place.

Stamp River tributaries

Robertson Creek and Boot Lagoon

This stream is about one mile long and joins Boot and Stamp River lagoons (Figure 5). There are a number of small rapids, but in general velocities are moderate throughout

the stream. There are no points of difficult passage in the stream which would tend to delay or prevent the movement of migrating fish. The gravel which ranges from coarse sand to stones about six inches in diameter was considered to be ideally suitable for spawning. A spring salmon spawning of medium intensity and a heavy coho seeding took place in the area between the mouth of the creek and a point about 100 yards upstream. Another heavy coho seeding took place in the vicinity of the Great Central Lake highway bridge.

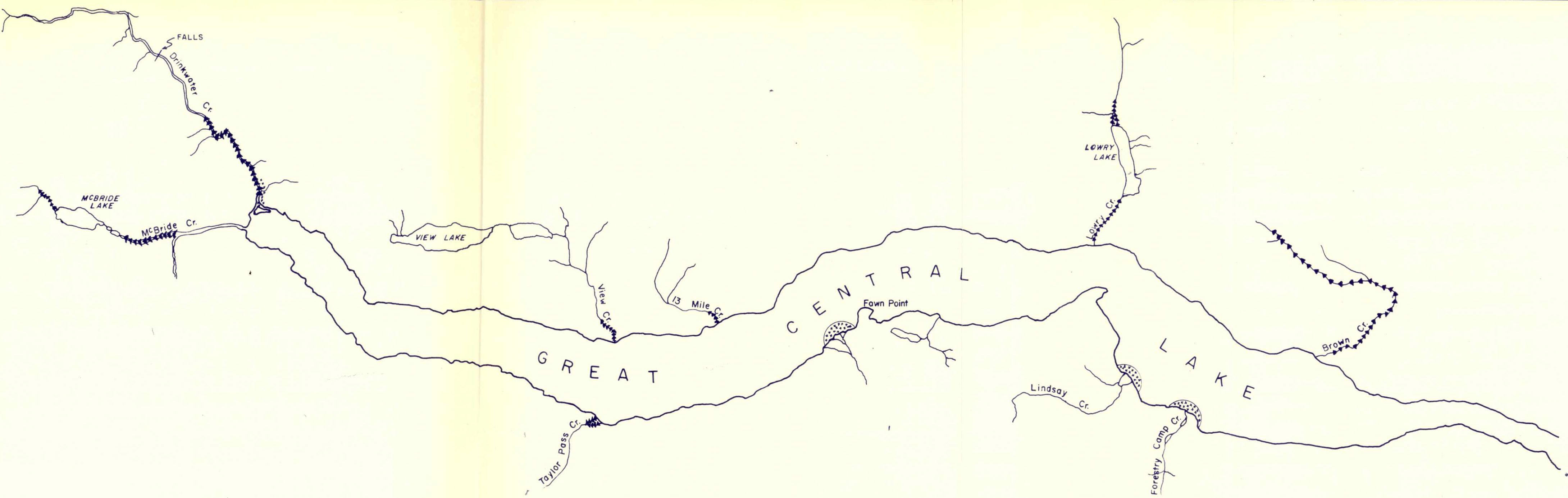
Boot Lagoon was checked by boat three times during the survey. Fish were seen below the railway trestle but no spawning took place since the water velocities are very low and the water is quite deep. There was evidence that both coho and steelhead migrated into Great Central Lake via Robertson Creek and Boot Lagoon.

Round Creek

This is a small stream which enters the Stamp River about three-quarters of a mile below the MacMillan & Bloedel storage dam (Figure 4A). An area from the mouth to a point three-quarters of a mile upstream was lightly seeded by coho salmon.

Bear Creek

This stream discharges into the Stamp River at a point about 200 yards below the confluence of the Ash and Stamp Rivers (Figure 4C). It is about 5 miles long, with the average width about twenty feet and the mean depth about four feet. The velocities are moderate and the stream bottom is characterized by coarse sand and small pebbles. A heavy coho spawning took place



LEGEND
 Sockeye 
 Coho 

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**GREAT CENTRAL LAKE
 SPAWNING GROUNDS**

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Figure 6

in this stream.

Jolly Creek

This is a small creek, 8 to 10 feet wide and 1 to 1½ miles long (Figure 4C). The velocities are moderate and the gravel is suitable for spawning. A coho seeding of medium intensity took place in this stream.

Deer Creek

This stream is approximately five miles long and it discharges into the Stamp River below Stamp Falls canyon (Figure 4C). The gradients, velocities and characteristics of the bottom vary greatly throughout the creek. The gradients in the lower section of the stream are steep and the velocities are accordingly high. In the middle section, the stream flows through swamp and fields where velocities are low and the bottom is fouled with mud. Most of the coho spawning took place in the upper section of the stream where velocities and the characteristics of the gravel are more suitable for spawning. The spawning was estimated to be of medium intensity.

Beaver Creek

Very few adult coho salmon were seen in this stream during 1956, and the stream does not appear to possess physical characteristics suitable for spawning (Figure 4C). Much of the stream runs through a swamp where the velocities are low and the bottom is muddy.

Great Central Lake and tributaries

The below-described creeks flowing into Great Central Lake were investigated during the 1956 survey (Figure 6).

To differentiate between spawning areas which will be inundated and those which will not be affected if the lake level is raised, the percentage of fish spawning above and below the proposed flood mark was estimated for each stream.

McBride Creek

Area 1

This section of the creek extends from the mouth approximately one mile upstream to flood mark. The gravel is coarse and velocities in this area are generally not suitable for spawning. Seven percent of the coho counted in McBride Creek were found in this area.

Area 2

This section of the creek extends from flood mark to a point approximately $1\frac{1}{4}$ miles upstream. The velocities in this area vary considerably, but in general they are moderate, and within the range suitable for spawning. The bottom consists of sand, pebbles and rocks. Ninety-three percent of the total coho count was obtained in this area.

An excellent spawning ground, heavily seeded by coho salmon, was found one-half mile above McBride Lake. Concentrations of coho were seen in McBride Lake, but the section of McBride Creek from McBride Lake to the upper boundary of Area 2 was not considered to be a good spawning area. In this section two points of difficult passage were discovered.

Drinkwater Creek

Area 1

This section of Drinkwater Creek extends

from Great Central Lake about a mile upstream to the proposed reservoir level. The velocities in this area are moderate, and the bottom consists mainly of sand and pebbles. Forty-one percent of the total count of coho was obtained in this area. Sockeye salmon spawned in the lower half mile of this stream.

Area 2

This section extends about $1\frac{1}{2}$ miles upstream from the proposed reservoir level to the foot of a waterfall which is impassable to fish. The velocities in this region are generally suitable for spawning. The bottom, composed of clean sand, pebbles and small stones, is suitable for spawning. The coho counted in this area represented 51 percent of the total number seen in the stream. The coho seeding was very heavy, but no sockeye salmon were observed spawning in this section.

Brown Creek

Area 1

This section extends from the mouth of Brown Creek to a point one-quarter of a mile upstream. The gradients are steep, the velocities high and the gravel is unsuitable for spawning in this area. Less than one percent of the total number of coho counted in Brown Creek were seen here.

Area 2

This section extends from the reservoir level for about two miles upstream. Velocities and gravel characteristics vary considerably, but there are many localities in which conditions are suitable for spawning. A heavy coho spawning took place in this section of Brown Creek.

Lowry Creek

Area 1

This section extends from the mouth of the creek to a point about 300 yards upstream. The velocities in this area are moderate, but the bottom is comprised of large rocks unsuitable for spawning. Twice, at low water levels, a large number of coho were seen here. Their upstream migration was blocked by a small waterfall, which must have been passable at higher water levels, since at subsequent visits no large concentrations of fish were seen. Eight percent of the total number of coho counted were seen in this area, but it is considered that most of these fish were migrating further upstream to spawn.

Area 2

This section extends from reservoir level to Lowry Lake, a distance of about a mile, and from Lowry Lake to a point about one-half mile above Lowry Lake. Spawning intensity was fairly light between reservoir level and Lowry Lake. The velocities are fairly high and most of the stream bottom is composed of large rocks which make the area unsuitable for spawning. The section which extends from Lowry Lake to a point one-half mile upstream appeared to be a very good coho spawning area. The velocities were moderate, and the gravel was suitable for spawning. If the section above reservoir level is considered as a whole, it accounts for 92 percent of the coho salmon found in Lowry Creek. The heaviest coho seeding took place in this stream above Lowry Lake.

Lindsay Creek

Area 1

This section extends from the mouth of the creek to a point about 300 yards upstream. Stream velocities in this area are moderate, and appear to be suitable for spawning. The stream bottom is composed of sand, pebbles and small rocks. Approximately 75 percent of the coho salmon counted in the stream were found in this section. The intensity of spawning was light.

Area 2

This section extends from reservoir level upstream for about two miles. While the bottom tends to be rocky, the velocities are generally moderate and the stream is not too deep for spawning, yet the coho seeding was very light. Only 25 percent of the total count of coho was obtained in this section of Lindsay Creek.

13 Mile Creek, View Creek, Taylor Pass Creek

These creeks were checked weekly, but none of them appeared to be important spawning grounds. The coho seedings were of very light intensity. Of the few fish located in these creeks, between 80 and 100 percent spawned below the proposed reservoir level on Great Central Lake.

During the 1955-56 Somass River survey, an attempt was made to locate and assess the sockeye spawning areas in Great Central Lake and its tributaries. There is sufficient evidence to show that sockeye spawning took place in Drinkwater Creek and on the beaches near Fawn Point, Lindsay Creek and Forestry Camp Creek, as described below. A section of the alluvial shelf

beginning at a point one-half mile east of Lowry Creek and extending eastward another $2\frac{1}{2}$ miles might have been a spawning area. However, there is insufficient data to definitely establish this area as a sockeye spawning ground.

Fawn Point

On October 28, in the course of a survey by helicopter, 5 sockeye carcasses were observed floating near the mouth of Fawn Point Creek. During a subsequent visit by boat on October 31, 13 living sockeye and 1 dead sockeye were seen at the mouth of the creek. On November 1, 200 sockeye were observed distributed on the alluvial shelf 200 to 300 yards on each side of the mouth of Fawn Point Creek. On November 2, 300 to 400 sockeye redds were noted in this area. In early January, this area was thoroughly examined and the results revealed that the beach had been well "dug" by the salmon for a distance of about one-half mile. The width of the alluvial fan averaged about 80 to 100 feet. Most of the redds were found in depths of water ranging between 2 and 12 feet.

Lindsay Creek

During the October 28 helicopter survey, 15 sockeye carcasses were seen lying on the bottom of the lake near the mouth of Lindsay Creek. On October 31, a small number of live and dead sockeye were observed near the mouth of the creek. A more thorough check was made on November 2, and a total of 36 sockeye were found in the area extending from a point 100 yards east of the creek mouth to a point approximately 500 yards west of the creek mouth. At the time of this visit the surface of the

lake was broken by rain and wind and the visibility was poor. Therefore it is likely that more sockeye were present on the beach than the count indicated. A further check of the area on January 3 revealed that it had been well seeded. In an area of about one-half mile, the lake bottom on each side of the creek mouth contained a large number of redds. The seeded section of the beach was between 70 and 90 feet wide and most redds were found in water from 1 to 12 feet deep.

Drinkwater Creek

An estimated 100 sockeye salmon were observed on the Drinkwater Creek spawning grounds on September 12. By the middle of October spawning was completed and no live fish remained in the stream. All spawning took place below the proposed reservoir level of Great Central Lake. The fish were located principally in the main channel of the stream from the creek mouth to a point approximately one-half mile upstream.

Forestry Camp Creek

On October 28, 30 dead sockeye carcasses were seen from the helicopter in the vicinity of the Forestry Camp. When the area was checked on November 2, 33 dead fish and 300 redds were located on the beach from a point about 50 yards above the mouth of the creek to a point about 750 yards below the mouth of the creek. It was noted that the carcasses were more decomposed than those observed on the Fawn Point and Lindsay Creek spawning grounds, indicating that an earlier spawning had taken place in this area. On January 3, the bottom of the lake 600 to 800 yards west of the Forestry camp was examined and the results

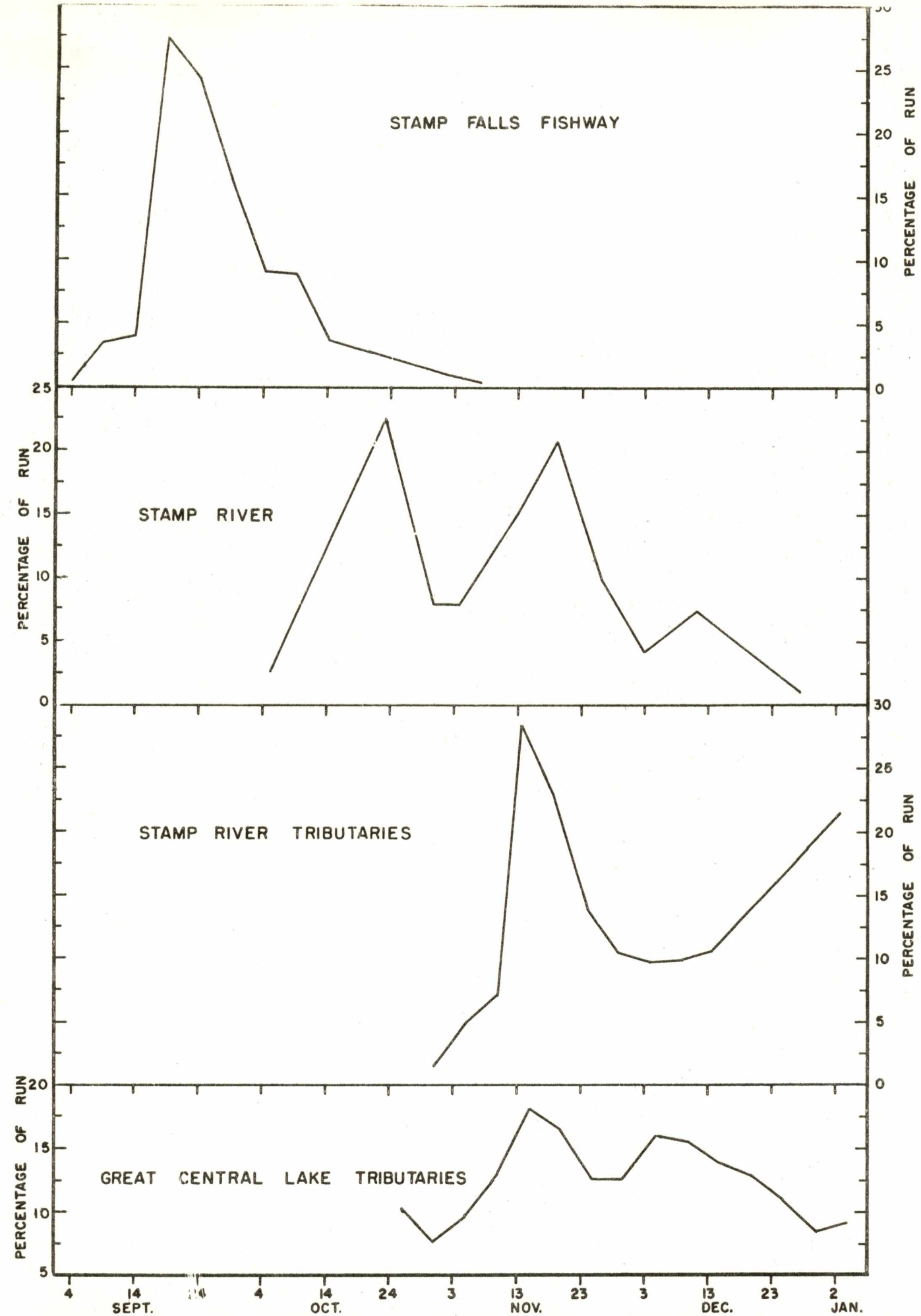


Figure 7. Timing of coho salmon spawning migration to Stamp River and Great Central Lake.

showed that there was a large number of redds. The major proportion of redds were found in shallow water between 1 and 12 feet deep.

Beach one-half mile east of Lowry Creek

During the helicopter survey of October 28, 9 dead sockeye were seen in this area. They were found at various places on the shore area for a distance of about $2\frac{1}{2}$ miles. A second visit in early November produced no further evidence of spawning.

Timing of adult salmon migration

The adult coho migration in the Somass River system began in early September and had virtually ended by early January. The graphs shown in Figure 7 were obtained by plotting the percentage of the total number of coho which passed through Stamp Falls fishway and the fish counted in the streams every five days. These results indicated that the coho migration began in early September and had virtually ended by early January. Coho first appeared on the Stamp River spawning grounds on October 5 and on October 8 observers noted the fish exhibiting spawning behavior. By December 27 very few coho salmon remained alive in the Stamp River and it was concluded that spawning had ended in this area. Ninety-one percent of the fish arrived on these spawning grounds and completed spawning during the interval October 5 to December 3. There appeared to have been two distinct peaks of migration. These were recorded on October 23 and November 19.

The arrival of migrants and the duration of spawning on the spawning grounds of the Stamp River tributaries, viz. Bear,

Deer, Jolly, Beaver and Round creeks is shown in Figure 7. Coho were not observed on the spawning grounds until October 31 and by January 3 most of the population had spawned. Approximately 88 percent of the spawning took place in the interval October 31 to January 3. Again, a bimodal pattern of migration is evident. Maxima are noted on approximately November 14 and January 3.

The pattern of the arrival of coho migrants to the spawning grounds of creeks which discharge into Great Central Lake is also shown in Figure 7. It is estimated that by October 21, 10 percent of the fish had arrived on the spawning grounds and by January 4 spawning had practically ended. The peak of the run appeared between October 31 and December 27. "Peaking" of the run was not so pronounced in this area as it was in the case of the Stamp River and its tributaries, but two fairly distinct maxima occurred on November 15 and January 2.

Since all graphs but that shown for the fish passing Stamp Falls fishway are bimodal, it is probable that two "waves" of migration occurred on the Stamp River. In this connection the Fishery Officers have noted late runs of coho to Bear and Deer creeks, tributaries of the Stamp River. A second "wave" of migration through Stamp Falls may have occurred between October 15 and November 3. During this interval the river was in flood and it was impossible to see or count any fish which might have been passing through the fishway. However, fish were seen attempting to ascend Stamp Falls directly. It is unlikely that any of them managed to negotiate this barrier at very high water levels, but during temporary decreases in level it is possible

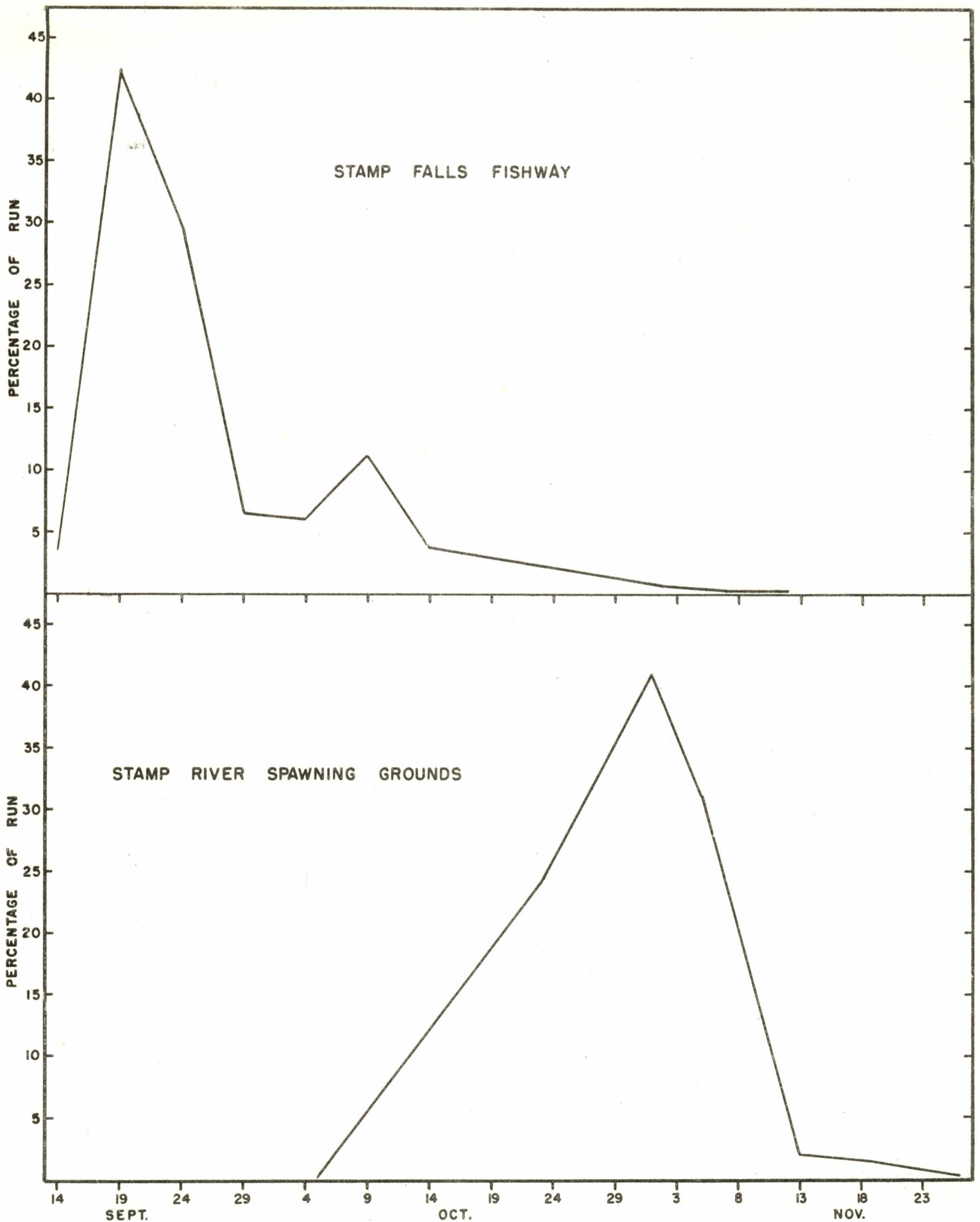


Figure 8. Timing of spring salmon spawning migration to Stamp River.

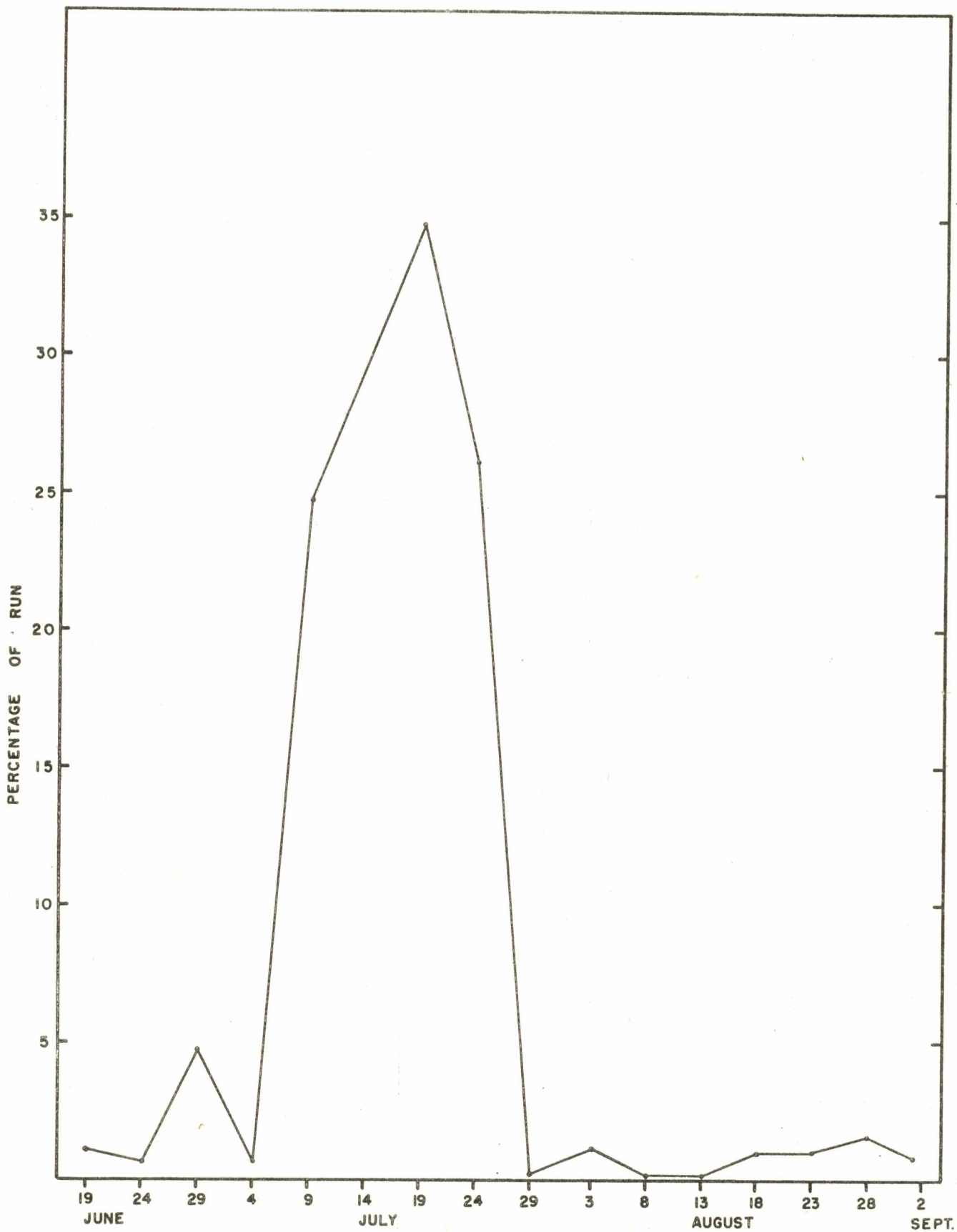


Figure 9. Timing of the sockeye salmon spawning migration through Stamp Falls fishway.

that many of them managed to move upstream by this route. It is quite possible therefore that a bimodal pattern of migration through Stamp Falls probably took place.

Figure 8 shows the percentage of the spring salmon run passing through Stamp Falls fishway at five day intervals, and illustrates the timing of migration to the Stamp River spawning grounds. This migration had begun by mid-September, had reached a maximum by September 19, and had virtually ended by late October. The lower graph shows that no spring salmon had appeared on the Stamp River spawning grounds by October 5. On October 23 they were first observed spawning, and by November 1 the peak of spawning was recorded. Ninety-eight percent of the Stamp River spring spawning took place between October 5 and November 13.

Figure 9 shows that sockeye salmon migrating to the spawning grounds of Great Central Lake did not start to pass through Stamp Falls fishway in large numbers until July 4. In the interval July 4 to July 29, 96 percent of the sockeye passed through the fishway. Small numbers continued to move upstream during August and the migration ended in early September.

There was insufficient data pertaining to the spawning of sockeye in Great Central Lake to accurately describe the timing of their arrival on the spawning grounds, and to precisely define the time interval in which spawning took place. However, the available data indicates that the majority of the sockeye spawning took place in October and had ended by the middle of November.

Population estimates

The 1956-57 coho population estimates for the Stamp

River, its tributaries, and streams flowing into Great Central Lake, are shown in Tables IV, V and VI. As mentioned previously data obtained from the tagging experiment at Ward Creek indicated that the average life period of coho salmon on the spawning grounds was 13 days. The average life period and the time between successive counts was considered in calculating increments of recruitment. For each creek (or river), a summation of increments yielded the total population.

TABLE IV. Estimates of the populations of coho salmon spawning in tributaries of the Stamp River.

Creek	Date	Coho Dead	Coho Alive	Percentage of Total Coho Alive	Days Elapsed	Increment
Bear	Oct. 30	0	2	0.4		2
	Nov. 13	5	102	20.7	13	107
	Nov. 19	3	98	19.9	6	46
	Nov. 26	8	69	14.0	7	32
	Dec. 6	4	46	9.3	10	34
	Jan. 7	291	176	35.7	30	467
Total						688
Deer	Oct. 29	0	0	0		0
	Nov. 6	0	7	1.4	7	7
	Nov. 14	4	166	32.4	8	167
	Nov. 20	5	90	17.6	6	6
	Nov. 27	12	47	9.2	7	18
	Dec. 6	5	44	8.6	9	35
	Dec. 13	4	26	5.1	7	10
	Jan. 5	56	132	25.9	22	188
Total						431

TABLE IV. (Continued)

Creek	Date	Coho Dead	Coho Alive	Percentage of Total Coho Alive	Days Elapsed	Increment
Robertson	Previous to Nov. 18	72	0			72
	Nov. 18	0	175	27.5	13	175
	Nov. 26	8	144	22.6	8	77
	Dec. 1	5	151	23.7	5	62
	Dec. 28	27	166	26.1	27	166
Total						552
Jolly	Nov. 9	0	4	2.6	0	4
	Nov. 14	1	29	18.2	5	27
	Nov. 16	1	38	24.5	2	3
	Nov. 20	0	46	29.6	4	20
	Nov. 26	14	14	8.8	6	4
	Dec. 6	8	17	10.7	11	23
	Jan. 7	15	11	6.9	30	26
Total						107
Beaver	Oct. 23	0	0		0	0
	Oct. 30	0	0		7	0
	Nov. 5	0	0		6	0
	Nov. 6	0	0		1	0
	Nov. 9	0	1		3	1
	Nov. 14	0	2		5	2
	Nov. 20	0	4		6	3
	Nov. 27	0	1		7	0
Total						6

TABLE IV. (Continued)

Creek	Date	Coho Dead	Coho Alive	Days Elapsed	Increment
Round	Jan. 8	82	25	0	107
Total					107

TABLE V. Estimates of the populations of coho salmon spawning in streams tributary to Great Central Lake.

Date	Coho Dead	Coho alive		Total Alive	Percentage of total coho alive	Days Elapsed	Increment
		Above proposed reservoir level	Below proposed reservoir level				
<u>McBride Creek</u>							
Oct. 11		0		0			
Oct. 17		248		248	3.7		
Oct. 25		73		73	1.1		
Oct. 31		93		93	1.4		
Nov. 7		333	30	363	5.5		363
Nov. 16		1421	166	1587	23.8	9	1475
Nov. 21		1465	151	1616	24.2	4	517
Nov. 29	17	1008	87	1112	16.7	8	508
Dec. 6		963	19	982	14.7	7	469
Jan. 3	245	353		598	8.9	28	843
Total							4175
<u>Drinkwater Creek</u>							
Oct. 2	0	0	0	0			
Oct. 26		40	0	40	2.1		40
Nov. 15	12	333	236	569	29.6	20	581
Nov. 22		266	96	362	18.8	7	100
Nov. 28		257	176	433	22.5	6	238

TABLE V. (Continued)

Date	Coho Dead	Coho alive		Total Percentage Alive of total coho alive		Days Elapsed	Increment
		Above proposed reservoir level	Below proposed reservoir level				
<u>Drinkwater Creek (Continued)</u>							
Dec. 5		145	257	402	20.9	7	202
Jan. 4	1	93	23	116	6.0	29	117
Total							1278
<u>Brown Creek</u>							
Oct. 22	0	0	0	0			
Oct. 29		74	15	89	7.8		89
Nov. 6		60	0	60	5.3	8	26
Nov. 18	8	136	0	136	12.0	11	135
Nov. 21	10	191	0	191	16.8	3	96
Nov. 27	9	67	0	67	5.9	6	9
Dec. 3	9	186	51	237	20.9	6	210
Dec. 11		152	14	166	14.6	8	75
Dec. 18	24	189	0	189	16.6	7	136
Jan. 2	19	1	0	1	0.1	13	20
Total							796
<u>Lowry Creek</u>							
Oct. 11	0	0	0	0			
Oct. 17	0	300	3	303	23.2	6	303
Oct. 25	2	250	0	250	19.1	8	136
Oct. 31	0	200	35	235	18.0	6	100
Nov. 7	1	93	16	109	8.3	7	2
Nov. 16	10	179	14	193	14.8	9	170
Nov. 21	1	124	24	148	11.3	5	30

TABLE V. (Continued)

Date	Coho Dead	Coho alive		Total Alive	Percentage of total coho alive	Days Elapsed	Increment
		Above proposed reservoir level	Below proposed reservoir level				
<u>Lowry Creek (Continued)</u>							
Nov. 28	5	30	12	42	3.2	7	5
Dec. 6	5	22	5	27	2.1	8	17
Dec. 13	1	0	0	0		7	1
Total							764
<u>Lindsay Creek</u>							
Oct. 16	0	0	6	6	3.9		
Oct. 25	0	0	16	16	10.4		16
Oct. 31	1	2	4	6	3.9	6	1
Nov. 7	8	1	18	19	12.3	7	24
Nov. 15	0	12	10	22	14.3	8	15
Nov. 21	0	13	1	14	9.1	6	2
Nov. 28	4	0	2	2	1.3	7	4
Dec. 5	0	9	24	33	21.4	7	33
Dec. 13	0	0	17	17	11.0	8	4
Jan. 3	16	0	19	19	12.3	21	35
Total							134
<u>13-mile Creek</u>							
Oct. 25	0	0	5	5	8.3		5
Nov. 1	0	0	0	0			
Nov. 7	0	9	2	11	18.3		11
Nov. 15	0	0	11	11	18.3	8	7
Nov. 21	8	4	11	15	25.0	6	17

TABLE V. (Continued)

Date	Coho Dead	Coho alive		Total Alive	Percentage of total coho alive	Days Elapsed	Increment
		Above proposed reservoir level	Below proposed reservoir level				
<u>13-mile Creek (Continued)</u>							
Nov. 28	0	0	2	2	3.3	7	0
Dec. 5	0	0	11	11	18.3	7	10
Dec. 12	7	0	5	5	8.3	7	7
Total							57
<u>View Creek</u>							
Oct. 25	0	0	0				
Nov. 1	0	0	13				13
Nov. 15	0	0	14			14	14
Nov. 21	1	0	2			6	1
Nov. 28	0	0	6			7	5
Dec. 5	0	0	17			7	14
Dec. 12	0	0	12			7	4
Total							51
<u>Taylor Pass Creek</u>							
Oct. 26	0	6					6
Nov. 1	0		11				11
Nov. 7	0		20			6	14
Nov. 28	0		7			21	7
Dec. 5	0		8			7	5
Dec. 12	0		0			7	0
Total							43

TABLE VI. Estimates of the populations of coho salmon spawning in the Stamp River.

Date	Coho Dead	Coho Alive	Percentage of Total Coho Alive	Days Elapsed	Increment
Oct. 5		132	2.6		
Oct. 23		1163	22.6		
Nov. 1		406	7.9		
Nov. 5		401	7.8		1163
Nov. 13		775	15.1	8	621
Nov. 19		1071	20.8	6	654
Nov. 26		514	10.0	7	20
Dec. 3		219	4.3	7	159
Dec. 11		398	7.7	8	314
Dec. 27		59	1.2	16	59
Total					2990

The total population of coho salmon which spawned in creeks tributary to the Stamp River was calculated to be 1998 fish (Table IV). Round Creek, when examined early in the survey, was not deemed likely to be a productive stream. However, during a visit in early January it was discovered that the stream had been well seeded. A large number of salmon carcasses were found showing that spawning had taken place two to three weeks before the creek was visited. Because of the large proportion of carcasses found, and because other creeks tributary to the Stamp River generally had early as well as late runs, it was considered that more fish than the count indicated had spawned in Round Creek. The January count of 107 was therefore doubled to yield a population estimate of 214 coho.

Many fish migrate via the Stamp River into creeks which discharge into Great Central Lake. Counts of fish seen in these creeks indicated that the total population was 7298 coho (Table V). McBride and Drinkwater creeks contributed most heavily with populations of 4175 and 1278 coho respectively.

A heavy coho seeding took place in the Stamp River proper, principally above Stamp Falls fishway. Counts obtained while floating, indicated that a total of 2990 coho spawned in Stamp River (Table VI).

Daily counts were made of coho salmon migrating through Stamp Falls fishway. It had been previously established that 96 percent of the fish migrating through Stamp Falls fishway do so in daylight, in an approximate 12 hour period from 8:00 A.M. to 8:00 P.M.¹ Since the counts at Stamp Falls were carried out for less than 12 hours per day, the number of fish which would have passed each day, in a 12 hour period, was calculated. A summation of these corrected daily counts indicated that 15,741 coho had passed through the fishway during the interval September 2 to November 11.

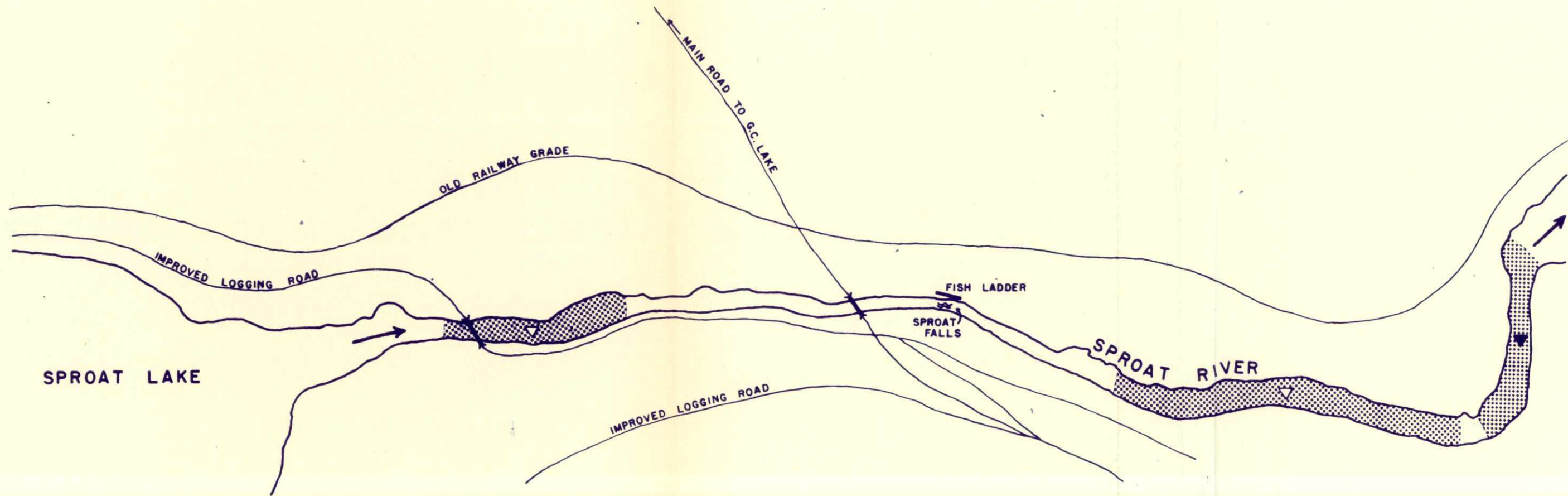
All fish spawning in the Great Central Lake tributaries must pass through Stamp Falls fishway. The combined coho population of these areas amounted to 12,179, which is 16 percent lower than the 15,741 counted at Stamp Falls fishway. The fishway count probably most accurately represents the total coho population of the Stamp River - Great Central Lake system. The results obtained by floating rivers and walking creeks are affected by many factors such as adverse weather, cover reactions by the fish

¹MacKinnon, D., and J.R. Brett, 1953. Fluctuations in the hourly rate of migration of adult coho and spring salmon up the Stamp Falls fish ladder. Fish. Res. Bd. Canada, Pacific Prog. Rep. No. 95.

and water surface glare, which combine to reduce the number of fish which are visible. Counts made while floating or walking were very valuable however, since they provided a measure of the relative abundance of the fish spawning in each stream.

It was not possible to experimentally determine the average life period of spring salmon on the Stamp River spawning grounds. From direct observation, from the relatively short duration of the migration and spawning period, and from the rapid increase in the ratio of dead to living fish (Table VII), it is apparent that the life period of spring salmon on the spawning grounds is much shorter than that of coho salmon. A summation of the counts of live fish obtained on the Stamp River yielded a total of 1377 springs (Table VII). In addition there were spring spawnings in Robertson and Deer Creeks, near their mouths, involving 100 and 30 fish respectively. Therefore the total population of spring salmon spawning in the Stamp River was estimated to be 1500 fish. As mentioned previously many factors prevent observers from obtaining a complete count while floating, and therefore multiplication by a factor of 1.5 to 2 tends to produce a number more nearly approximating the real number of fish in a river. Thus the Stamp River would appear to have supported a population of about 3000 spring salmon.

During the survey it was impossible to quantitatively assess the distribution of sockeye spawning in Great Central Lake. These fish were very difficult to locate and the counts obtained were too low to permit an estimate of population.

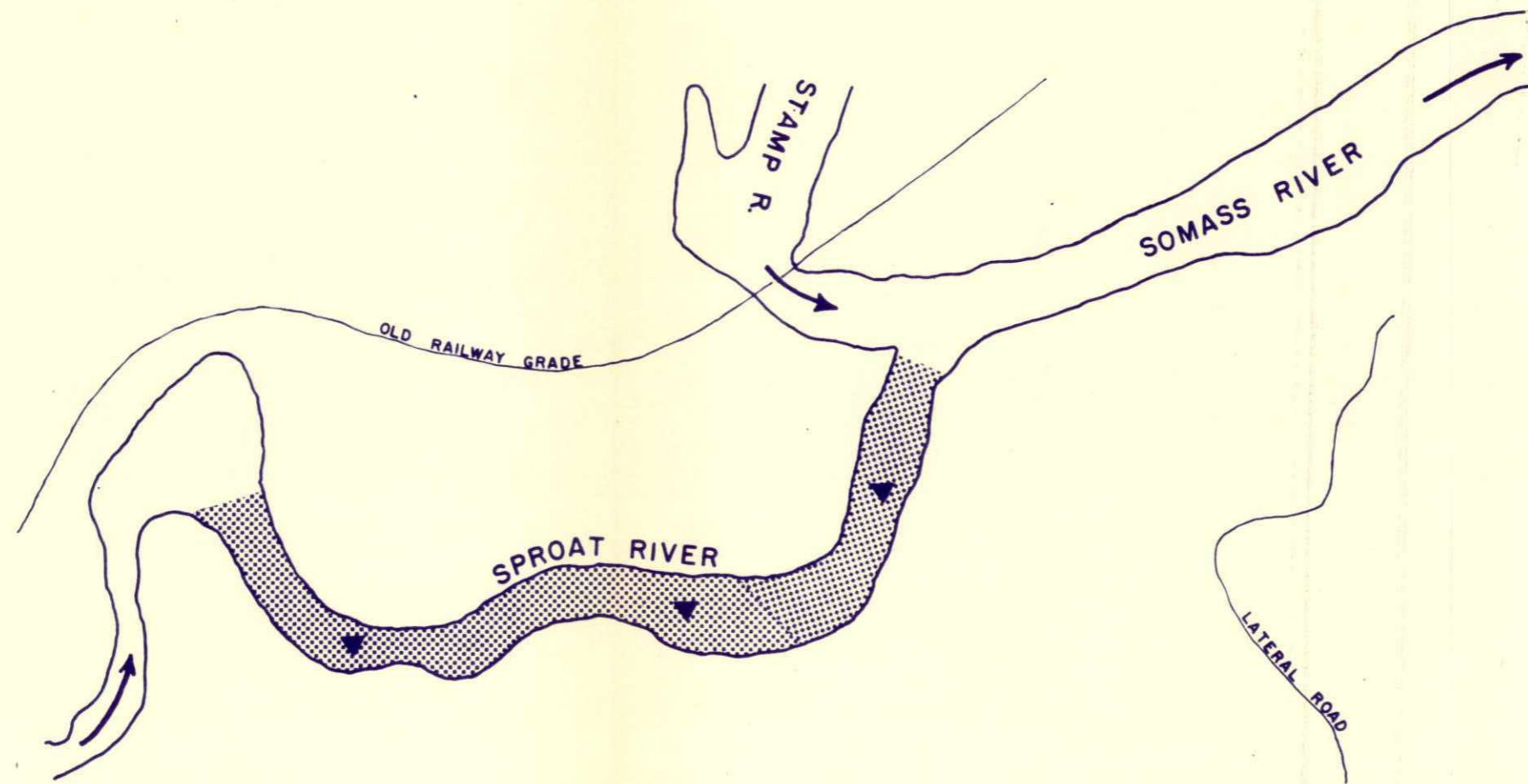


DEPARTMENT OF FISHERIES, CANADA

LEGEND

SPAWNING AREAS	
	LT MED HV
COHO	
CHUMS	
SPRINGS	

**SPROAT RIVER
SPAWNING GROUNDS**



DEPARTMENT OF FISHERIES, CANADA

**SPROAT RIVER
SPAWNING GROUNDS**

LEGEND

SPAWNING AREAS	
COHO	○ ○ ●
CHUMS	□ □ ■
SPRINGS	▽ ▽ ▼

TABLE VII. Counts of spring salmon spawning in the Stamp River.

Date	Spring Alive	Spring Dead	Percentage of Total Spring Alive
Oct. 5	0	0	0
Oct. 23	334	0	24.2
Nov. 1	564	252	41.0
Nov. 5	432	236	31.4
Nov. 13	22	153	1.6
Nov. 19	21	147	1.5
Nov. 26	4	16	0.3
Dec. 3	0	0	
Dec. 11	0	0	
Total Count - Live 1377			
- Dead 804			

111 SPROAT RIVER AND SPROAT LAKE

Floating of the Sproat River was carried out from the beginning of the 1956 Somass River survey, but Sproat Lake was not investigated until November 30. As a result there was more data obtained on the spring salmon spawning than the other species of salmon.

Sproat River

A map showing the location of spring salmon spawning areas in the Sproat River is shown in Figures 10A and 10B. A light seeding took place in an area about 400 yards long located above the Great Central Lake highway bridge. The area extending from the fishway to the first bend in the river located approximately 700 yards below the fishway was lightly seeded. The

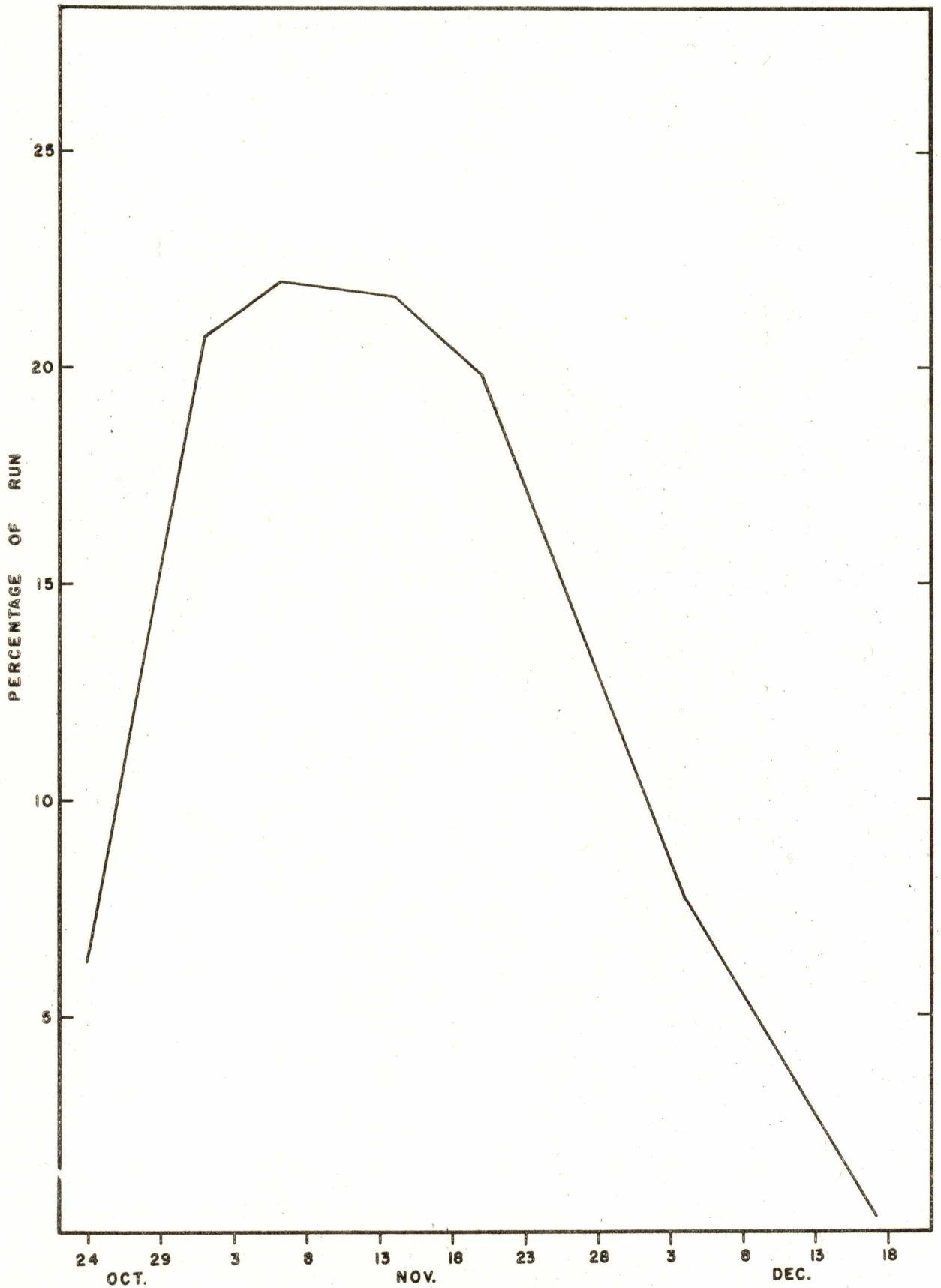
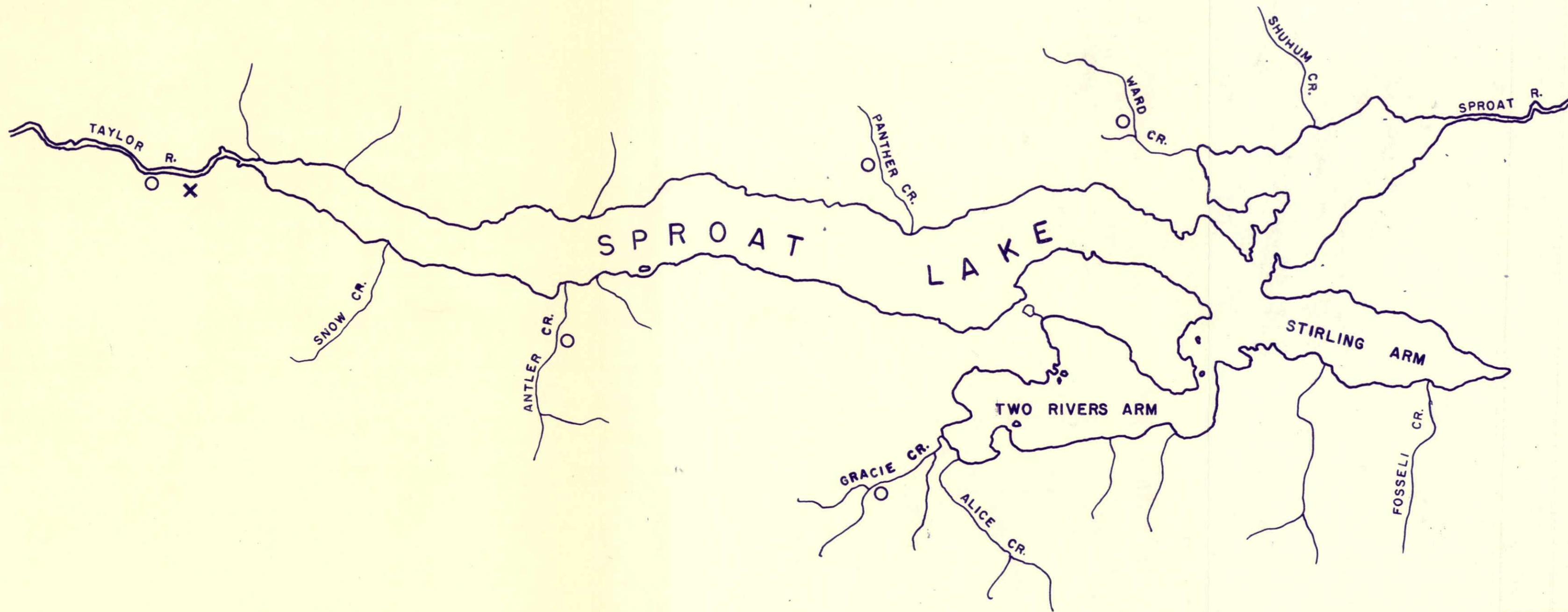


Figure 11. Timing of the spring salmon spawning migration to Sproat River.

remainder of the river from the first bend to the confluence of the Sproat and Somass rivers was very heavily seeded by spring salmon. Velocities in Sproat River are generally moderate, and the gravel is fairly coarse but very suitable for spring spawning.

The timing of the 1956 spring salmon migration to the Sproat River spawning grounds is shown graphically in Figure 11. Spawning had begun by October 24, reached a maximum by approximately November 6, and had ended by December 18.

The life period of spring salmon on the spawning grounds is short. It was not considered necessary to calculate increments of recruitment to compensate for "overlapping" of successive counts in estimating the size of the population. The numbers of living spring salmon observed while floating were summed to yield a population estimate of 6940 fish. Since the Sproat River is wider than the Ash or Stamp rivers it was impossible to note all of the fish in a cross-section of the river. As a result field personnel found it necessary to "favor" one bank of the river when counting. Thus many fish must have remained uncounted and the above estimate of population is considered low. Since the counters would alternate their position between the river banks, basing their selection of location on the number of fish, depths and apparent favorable velocities, it is likely that they were able to account for about two-thirds of the fish in the river. If the population estimate obtained by summing counts is multiplied by a factor of 1.5, an estimate of 10,000 spring salmon is derived. The latter is considered more representative of the number of spring salmon which spawned in the Sproat River during the 1956 spawning season.



LEGEND

- COHO SPAWNING STREAMS ○
- SOCKEYE SPAWNING STREAMS ✕

DEPARTMENT OF FISHERIES, CANADA

**SPROAT LAKE
SPAWNING GROUNDS**

SOMASS RIVER REPORT

Counts of coho salmon were obtained in the Sproat River, but none were observed spawning. The total count was small, amounting to 412 fish. Migration of coho through Stamp Falls fishway began on September 4 and was beginning to decrease by late October. Fish must travel further to reach Stamp Falls than the Sproat River. Since the first float of the Sproat River took place on October 24 it is quite likely that the majority of the coho run was not observed.

A small number of chum salmon were observed in the Sproat River during the 1956 survey. A total count of 470 fish was obtained. These fish spawned in the lower section of the Sproat River close to its confluence with the Somass River.

Sproat Lake and tributaries

The Sproat Lake tributaries investigated during the 1956 survey are shown in Figure 12. These streams were visited at least once by the field personnel during November and December. The maximum daily live counts obtained in each of the creeks are listed as follows:

Taylor River	981 coho
Ward Creek	69 coho
Weiner Creek	30 coho
Antler Creek	28 coho
Gracie Creek	4 coho
Panther Creek	3 coho

On November 30 Ward Creek was visited and only one living coho was seen. However, there was evidence that a fairly large number of coho had spawned earlier. Carcasses, pieces of

bone, and skins were found on the banks for a distance of a mile from the mouth of this stream. On December 11 another 60 to 70 coho entered the stream. This was the only Sproat Lake tributary in which a late run of coho was found. Ward Creek possesses the attributes of a good coho spawning stream, i.e. moderate velocities and a clean bottom comprised of sand and pebbles. Signs of an earlier coho spawning were noted at Weiner, Antler and Gracie Creeks. Living fish, generally spent, and numerous carcasses were noted. Panther and Shuhum Creeks did not appear to possess the characteristics of good spawning streams. The gradients on Panther Creek are steep, the gravel is coarse, and a waterfall located about one-quarter of a mile from the mouth of the creek would prevent further upstream migration.

Sockeye were observed spawning in the lower reaches of Taylor River and a small number of spent sockeye were seen in "side" channels near the mouth. There is considerable evidence that large numbers of sockeye utilize the lake itself for spawning but the late scheduling of the survey precluded a complete examination of this species.