Skagit River Bald Eagle Natural Area

Final Report and Management Recommendations

1976 - 1977

The Nature Conservancy

Northwest Office
1234 NW 25th Avenue, Portland, Oregon 97210
(503) 228-9561

March 10, 1977

Mr. Bob Reinecke
Seattle City Light
City Light Building
1015 Third Avenue
Seattle, Washington 98104

Dear Bob:

Attached please find a copy of Ken Wiley's final report on the Skagit Eagle Area. You will find, on Page 27 and the accompanying chart, a graphic description of the results of Seattle City Light's water release on January 5. Graph numbers 13 and 14 illustrate the decline in eagle numbers resulting, presumably, from the decline in food or carcass availability thereafter.

You should be able to use this information to develop an internal memo to circulate at Seattle City Light to help your people understand the relationship between water flow and eagles on the Skagit.

Many thanks for coming to the management meeting and for Seattle City Light's cooperation. I look forward to hearing from Gordon Vickery as per our discussion.

Sincerely,

Spencer B. Beebe
Northwest Director

sd

enclosure

COPY

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425 Bush Street, San Francisco, California 94108

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1800 North Kent Street, Arlington, Virginia 22209

S K A G I T R I V E R B A L D E A G L E

N A T U R A L A R E A

F I N A L R E P O R T

A N D

M A N A G E M E N T R E C O M M E N D A T I O N S

1976-77

INTRODUCTION

The 1976-77 wintering period marked the first year of the official existence of the Skagit River Bald Eagle Natural Area. A resident manager was present from October 15, 1976 until February 28, 1977. Management priorities for the season included general research pertaining to the Skagit River fishery and its role as the eagle's winter food source; activities related to preserve maintenance, e.g. the designing of a signing system, gates and appropriate access closures, and litter removal; the monitoring of public use and its effect on eagle behavior patterns; the censusing of eagle numbers; and an inventory of the soils, vegetation, and wildlife found within the preserve.

Research into many aspects of the fisheries situation was conducted with the helpful cooperation of the Washington Department of Fisheries and the Upper Skagit Indian Tribe. Valuable information was obtained from their cooperative chum salmon tagging program carried out over the winter.

The Washington Department of Game was helpful in various aspects of preserve maintenance including assistance in the development of a signing program for the preserve and with the gating of an important access road. They remain involved with several ongoing programs bearing on the joint management of the preserve and are involved in a trapping/banding program on the Skagit.

Public interest in and use of the preserve was higher than anticipated

this year. When it became apparent that potential use problems might arise an effort was made to define them and seek appropriate solutions.

Eagle censusing was done once a week except during the period of peak use from late December through early February when counts were carried out twice weekly.

F I S H E R I E S

I N F O R M A T I O N

CHUM SALMON

Historical information indicates the peak of chum spawning in the preserve area generally occurs during late November and early December. By mid-December carcasses will begin to outnumber live fish. As a rule, few live fish can be found by the first week in January (Graph 1).

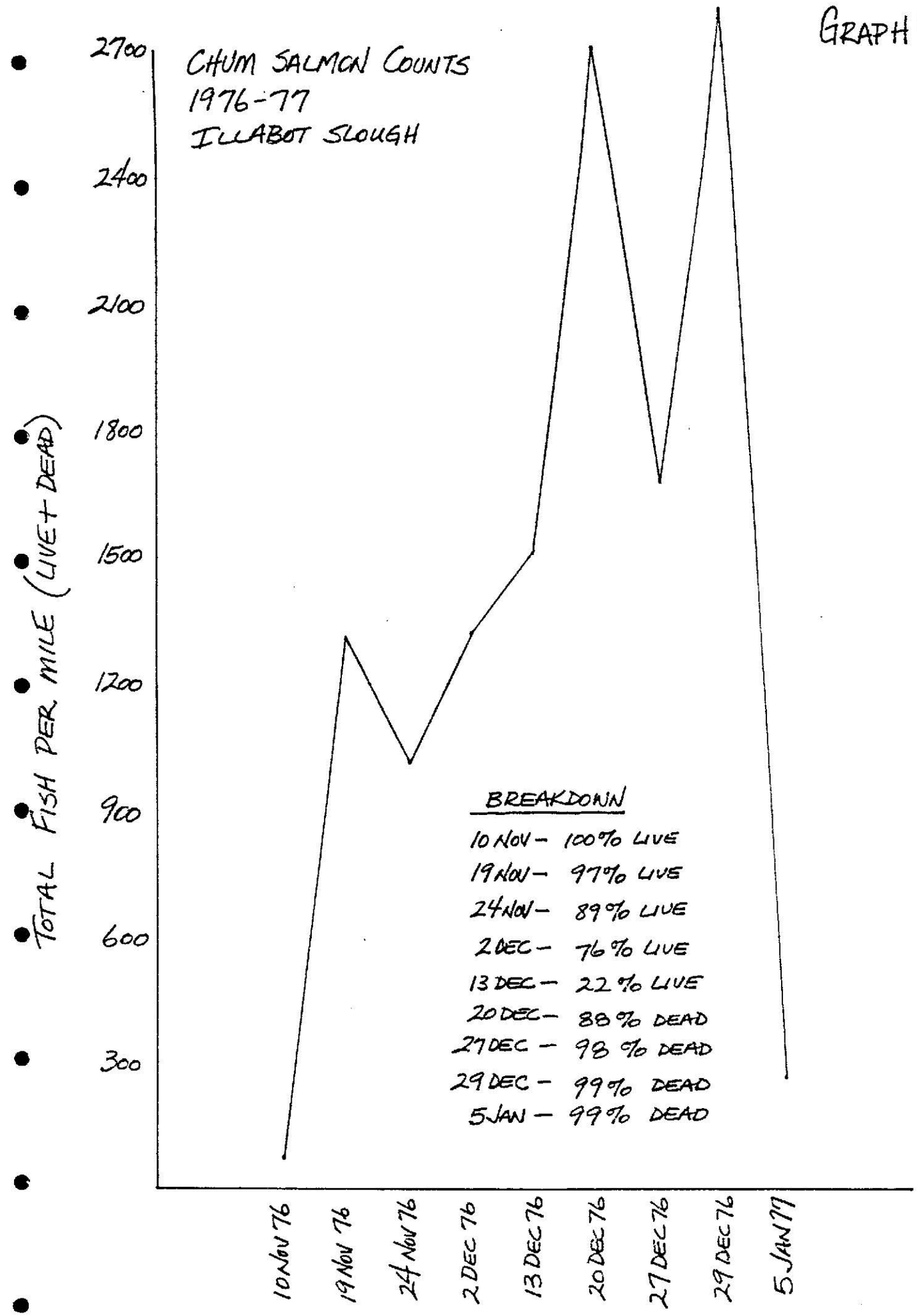
Chum spawn in the lower reaches of side channels and sloughs and utilize slower shallower water in the main river. They are often found spawning adjacent to large gravel bars and islands in the main river (See chum spawning and carcass recovery maps).

Chum salmon are, by and large, on a four-year cycle, that is, eggs laid in the winter of 1968 will hatch and migrate to salt water in the spring of 1969 and return to spawn in the winter of 1972. Escapement figures (Graph 2) clearly show a relationship between numbers of spawners every four years. High escapement numbers are a definite influence, then, on optimum returns four years later.

Chum salmon, however, are also very subject to environmental conditions. For example, the 1971 escapement was estimated at something just over 24,000 fish. While hardly optimum, the figure also does not represent a truly disasterous condition. The 1975 return from this 1971 parent year, however, was disasterous and the reasons for this are attributed to poor egg and fry survival due to adverse environmental conditions.

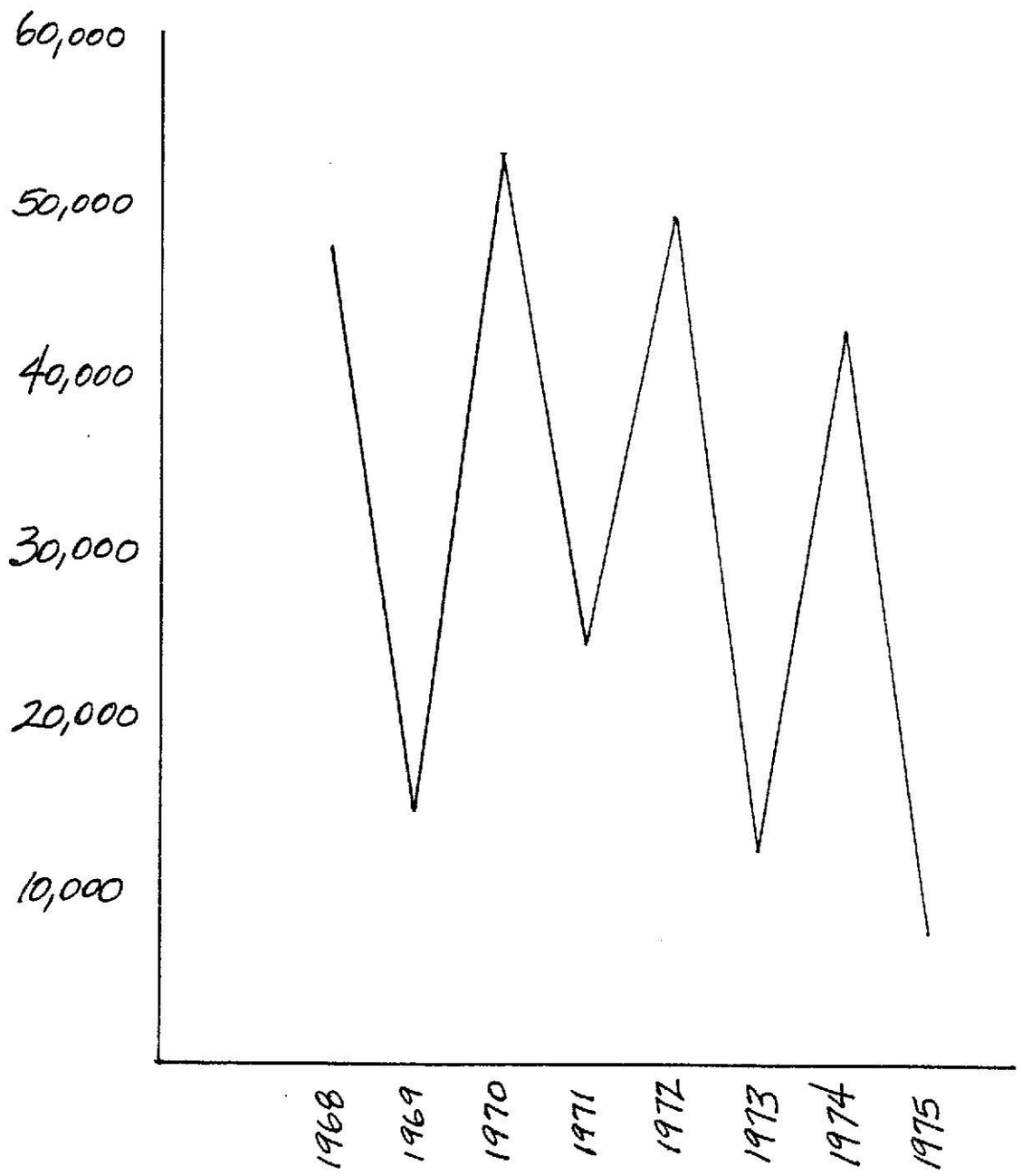
Factors such as a bad winter or high estuarine temperatures when the sensitive emergent fry enter salt water in the spring can have an extremely adverse effect on survival.

GRAPH #1


CHUM SALMON COUNTS
1976-77
ILLABOT SLOUGH
TOTAL FISH PER MILE (LIVE + DEAD)
2700
2400
2100
1800
1500
1200
900
600
300
10 NOV 76
19 NOV 76
24 NOV 76
2 DEC 76
13 DEC 76
20 DEC 76
27 DEC 76
29 DEC 76
5 JAN 77
BREAKDOWN
10 NOV – 100% LIVE
19 NOV – 97% LIVE
24 NOV – 89% LIVE
2 DEC – 76% LIVE
13 DEC – 22% LIVE
20 DEC – 88% DEAD
27 DEC – 98% DEAD
29 DEC – 99% DEAD
5 JAN – 99% DEAD

GRAPH #2

CHUM SALMON ESCAPEMENT: 1968-1975
SKAGIT RIVER



A combination of influences, then, are responsible for the fluctuations in chum salmon escapement numbers.

Importance to Wintering Eagles

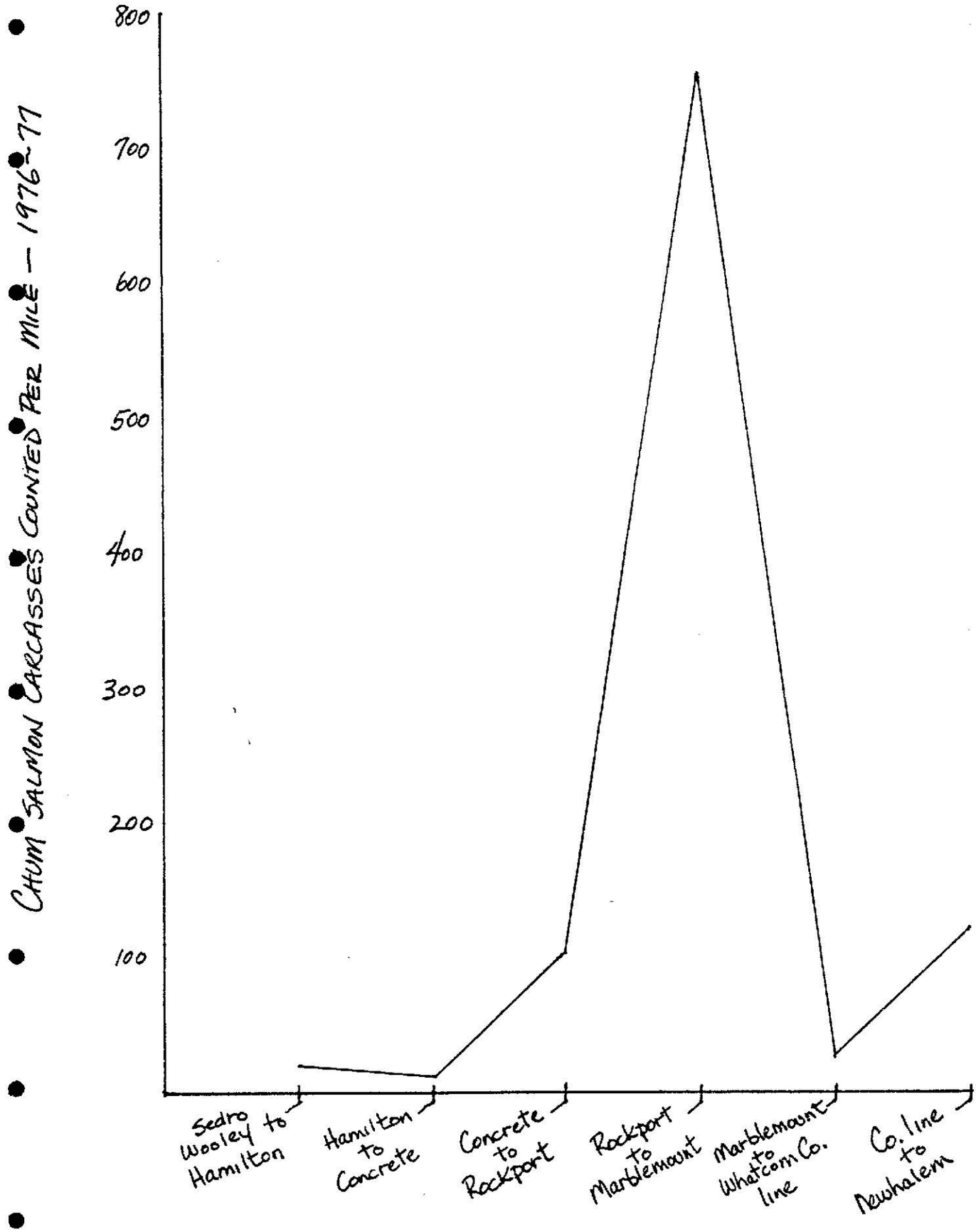
Chum carcasses make up the bulk of the wintering eagle's food supply. Both the timing and location of their spawning offer explanations for the large number of carcasses found on the gravel bars and islands during the winter months.

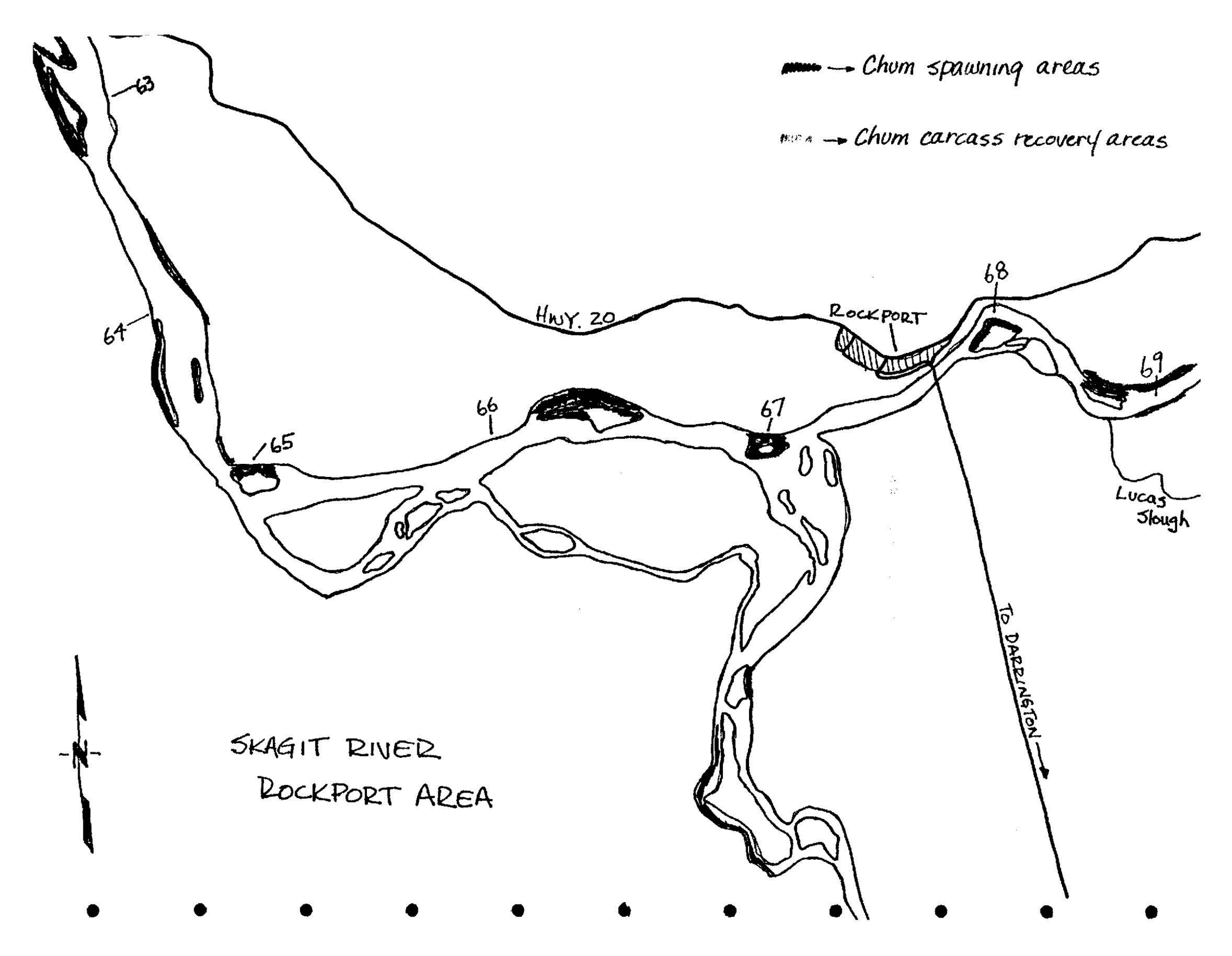
The Illabot Slough area supports possibly the heaviest concentration of chum spawning on the river. Nearly 44% of the chum carcasses counted in the 9.2 river miles between Rockport and Marblemount by Department of Fisheries personnel in 1976-77 were found in the 0.3 miles of Illabot Slough.

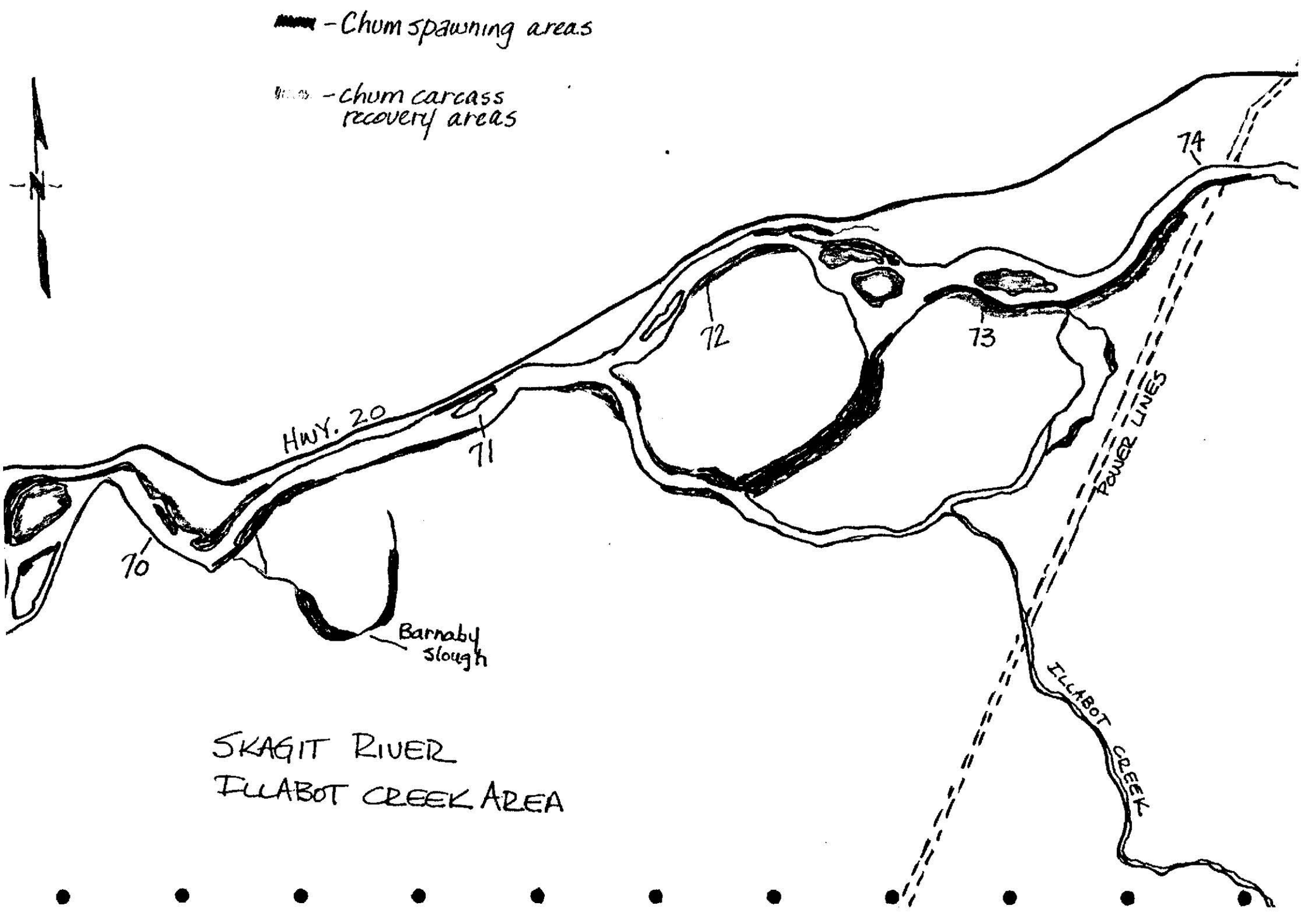
Furthermore, the importance of the entire preserve area to spawning chum is illustrated dramatically by chum carcass counts made along the length of the Skagit during the winter of 1976-77 (Graph 3).

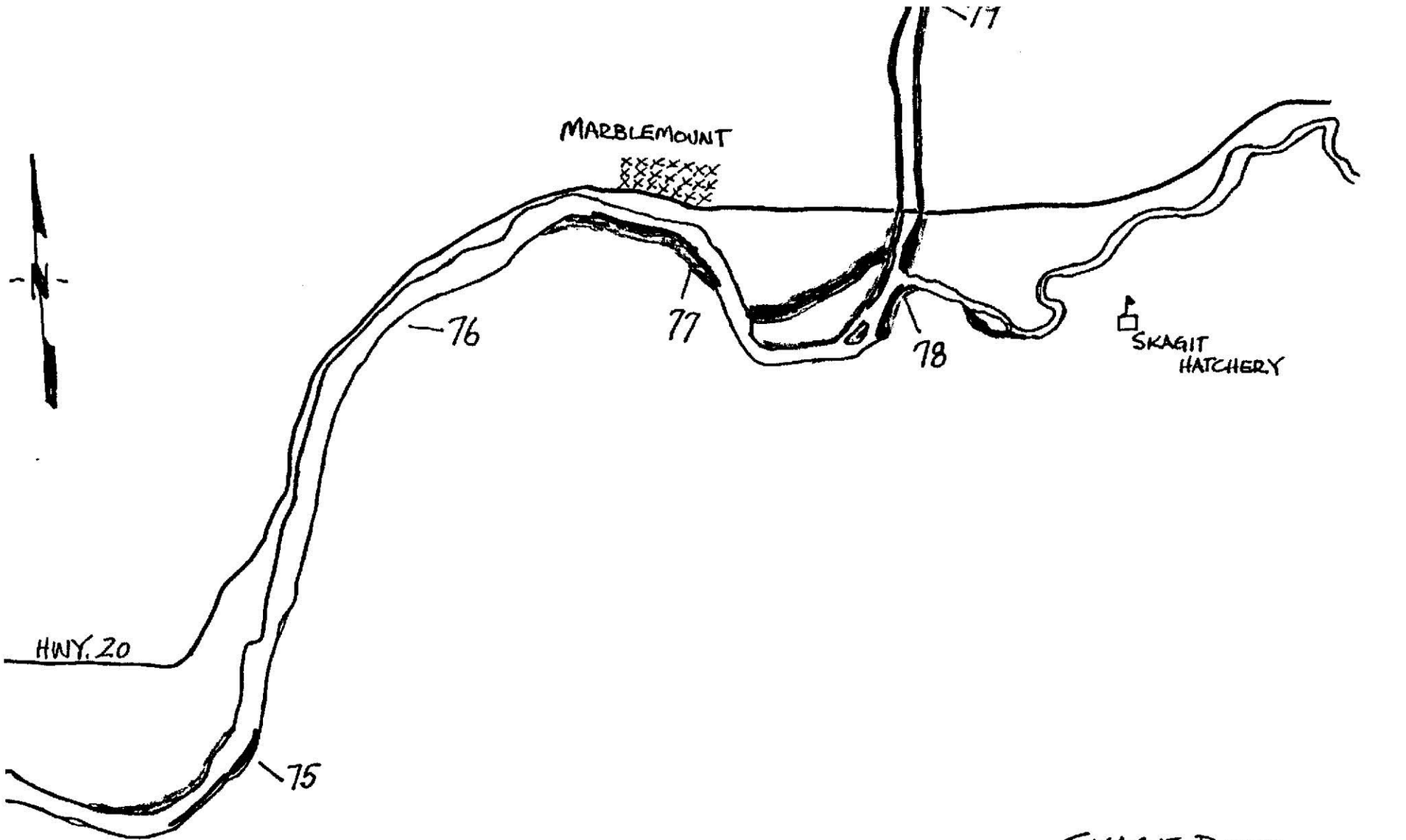
GRAPH 5

CHUM CARCASS COUNTS PER MILE - SEDRO WOOLLEY TO NEWHALEM




Chum spawning areas
Chum carcass recovery areas
63
64
65
66
67
68
69
HWY. 20
ROCKPORT
Lucas Slough
TO DARRINGTON
N
SKAGIT RIVER
ROCKPORT AREA


- Chum spawning areas
- chum carcass recovery areas
N
74
72
73
HWY. 20
71
70
Barnaby slough
POWER LINES
ILLABOT CREEK
SKAGIT RIVER
ILLABOT CREEK AREA



SKAGIT RIVER
MARBLEMOUNT AREA

Notes on Chum Spawning and Carcass Recovery Maps

River Mile 63
Spawning: Moderate
Carcass Recovery: Heavy

R.M. 64-65.5
Spawning: Light
Carcass Recovery: Heavy; especially on bar, north side of river.

R.M. 66.5
Spawning: Moderate
Recovery: Heavy

R.M. 67
Spawning: Light
Recovery: Moderate

R.M. 68
Spawning: Unknown
Recovery: Heavy

R.M. 69
Spawning: Moderate on backside of bar just west of R.M. 69
Recovery: Moderate to heavy throughout this area.

R.M. 69.5
Spawning: Moderate
Recovery: Heavy

R.M. 70
Spawning: Moderate
Recovery: Heavy

R.M. 70.5-71
Spawning: Moderate
Recovery: Heavy on small island just off mouth of Barnaby Slough

R.M. 71.5-72.5
Illabot Slough: Very heavy spawning
Extremely heavy carcass recovery
Bar at mouth of Illabot Creek: Heavy carcass recovery
North side of river, mile 72.5: Moderate to heavy spawning
Heavy carcass recovery

R.M. 73-74
Spawning: Heavy along south bank
Recovery: Heavy

R.M. 75
Spawning: Moderate
Recovery: Moderate

R.M. 77
Spawning: Moderate to heavy
Recovery: Heavy

R.M. 77.5 (Large island north side of river)
Spawning: Heavy
Recovery: Heavy

R.M. 78-79
Spawning: Moderate to heavy
Recovery: Heavy near mouth of Cascade River
Moderate on bar north side of river, mile 78
Moderate on east side of river below Marblemount Bridge

Marblemount to Bacon Creek
Light spawning in many locations
Carcass recovery generally poor due to lack of gravel bars, islands

SUMMER-FALL CHINOOK SALMON

Summer-fall chinook generally reach their peak spawning activity between the first week of September and the middle of October. By and large they are main-stem spawners. Within the preserve area chinook also spawn in small numbers in Illabot Creek and Illabot Slough.

Chinook redd index counts in the main-stem Skagit have shown a relative stability over the past fifteen years (Graph 4) as have past escapement figures (Graph 5). Localized runs, however, in some specific tributaries have not kept pace with and reflected the general well-being of production in the main river (Graph 6).

Importance to Wintering Eagles

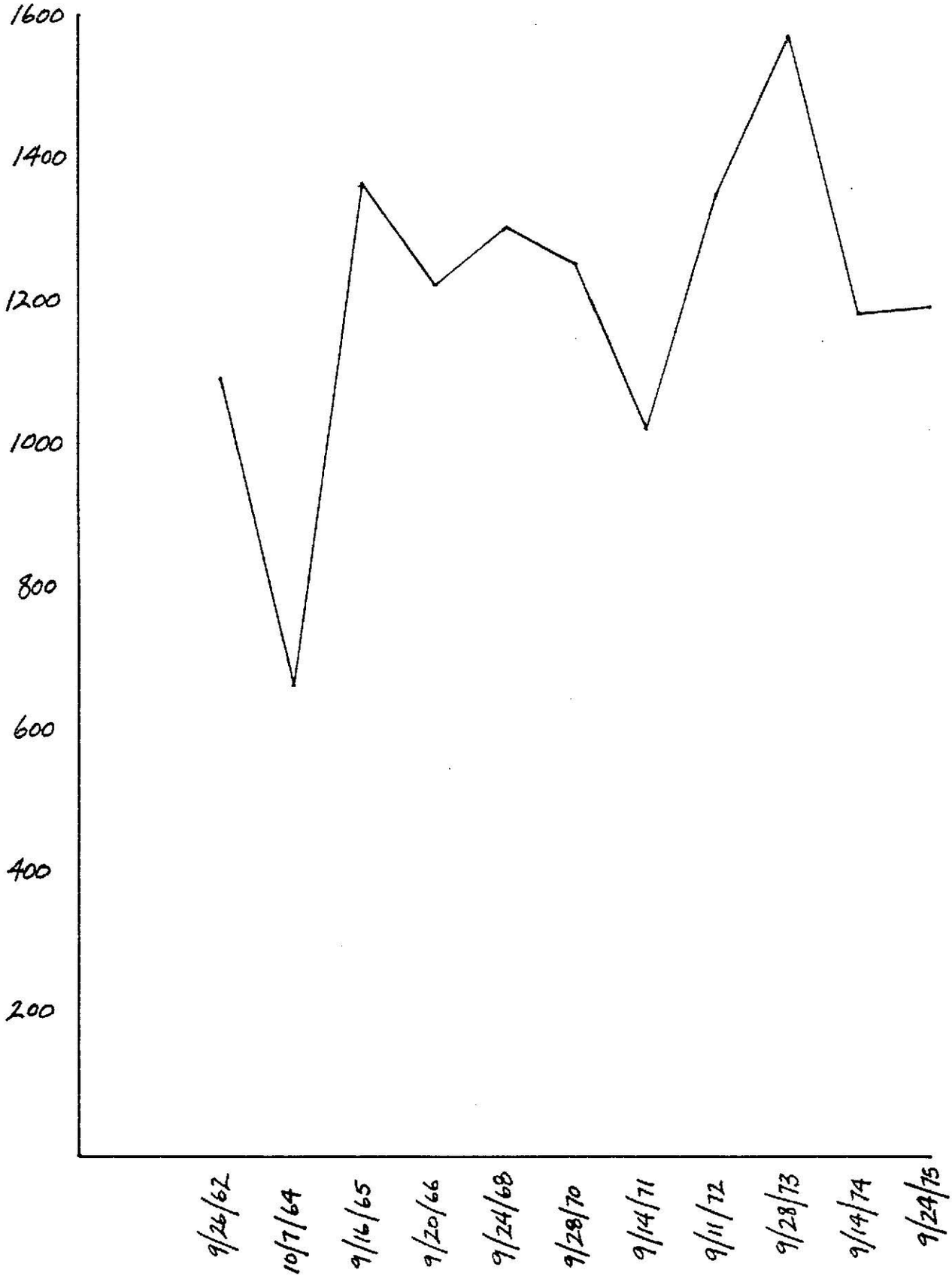
Chinook are probably primarily valuable for whatever buffering effect their carcasses can provide between the arrival dates of the first eagles and the appearance of the first of the chum carcasses, especially so during the even-numbered years when pink salmon are absent from the spawning grounds.

Like the pink salmon, chinook spawn and die at a time when very few eagles are present on the river. Dependent, of course, on the various factors that affect the rise and fall of the river, what carcasses wash ashore could remain available to the birds for a substantial period. The preference of chinook for spawning in the deeper waters of the main-stem river, however, partially inhibits any tendency for their carcasses to reach the river banks.

The highest carcass count in the last fifteen years in the preserve

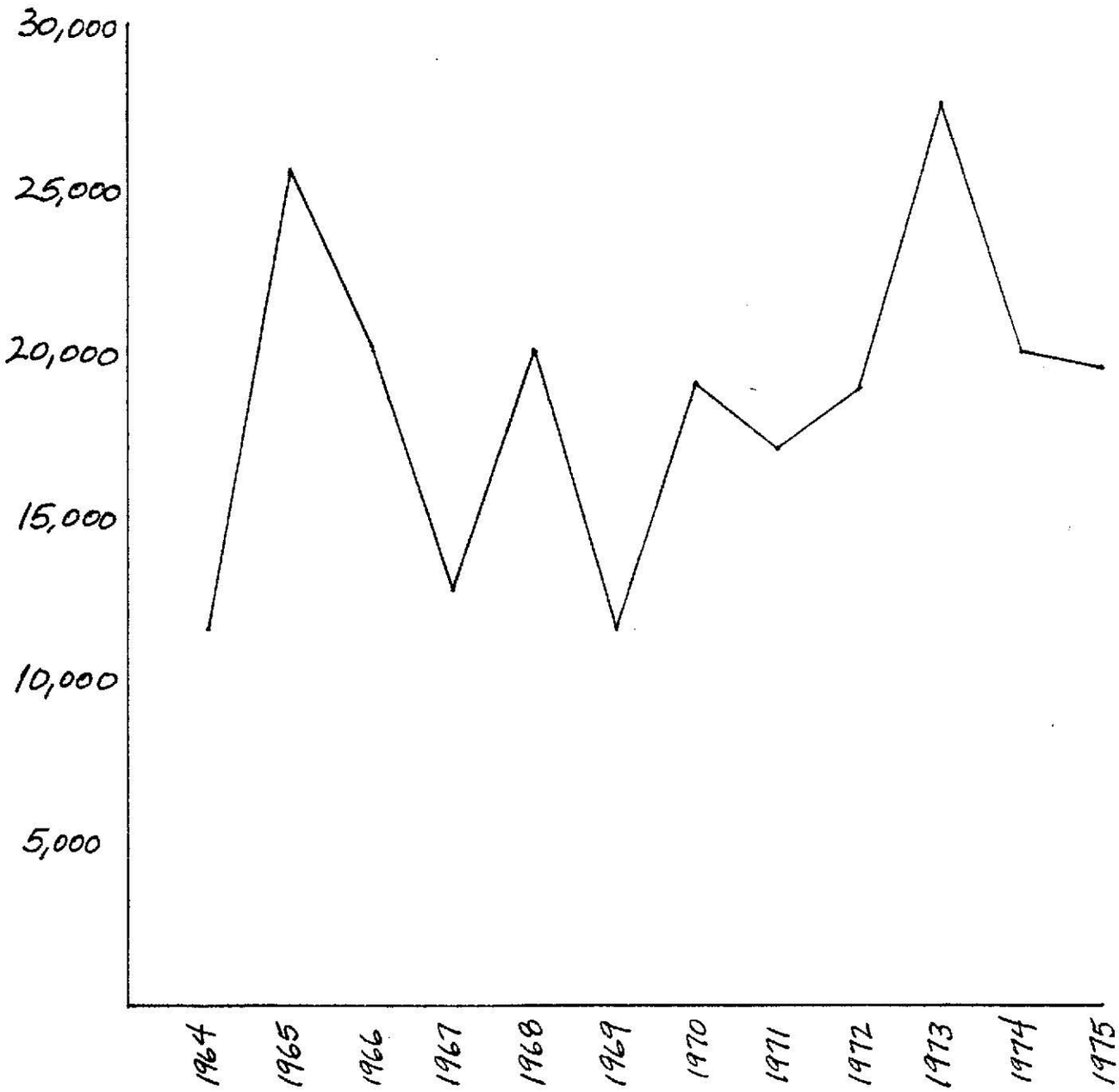
GRAPH #4

CHINOOK SALMON REDD COUNTS – ROCKPORT TO NEHALEM



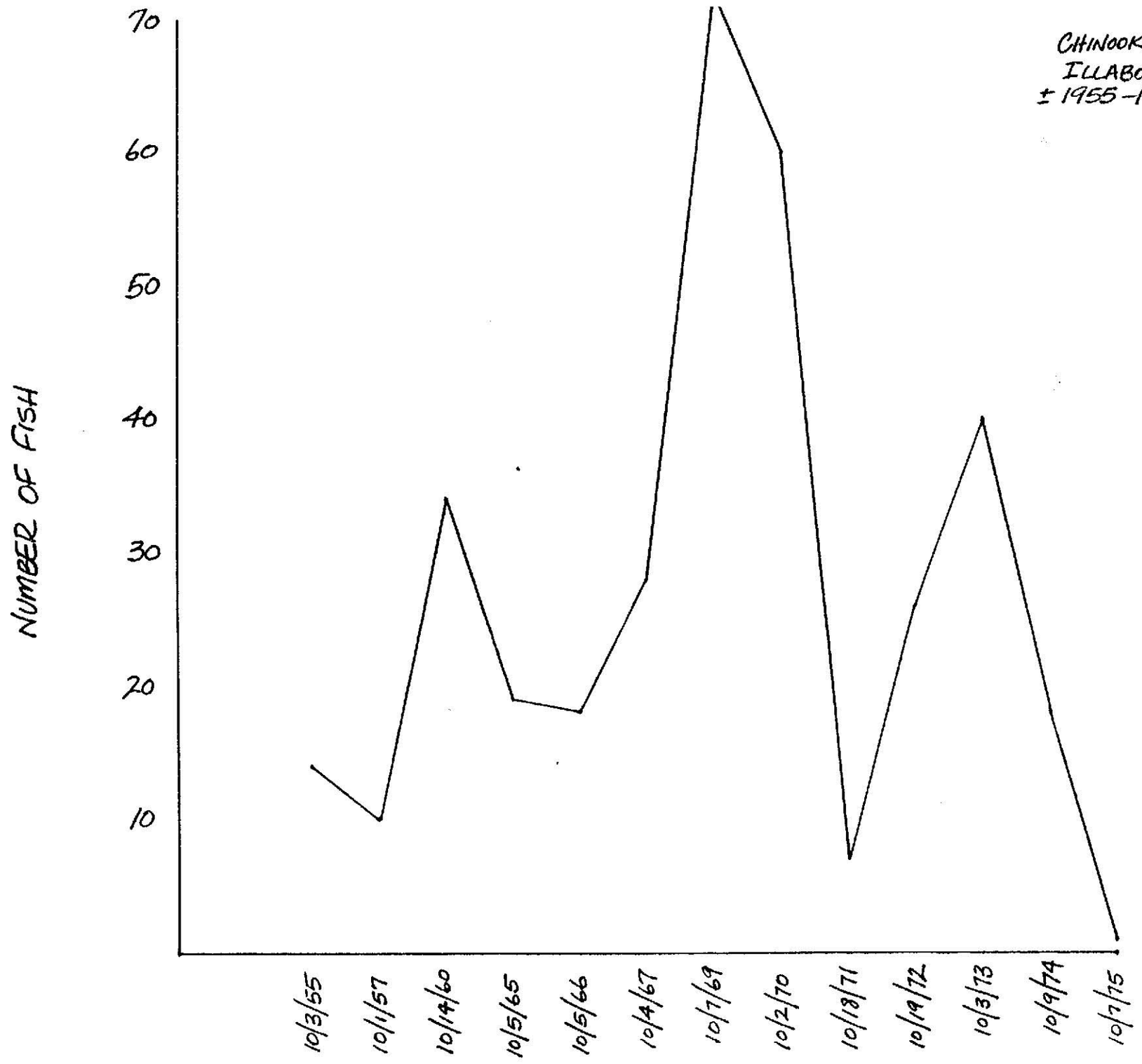
GRAPH "D

SUMMER-FALL CHINOOK SALMON ESCAPEMENT: 1964-1975
SKAGIT RIVER



CHINOOK SALMON COUNT
ILLABOT CREEK (1.8 MILES)
± 1955-1975

GRAPH #6



area between Rockport and Marblemount was 207 carcasses on October 1, 1965, a year when escapement was excellent and over 25,000 fish made it to the spawning grounds. A mid-October count of carcasses made during 1973, the year of the highest escapement on recent record, turned up only 19 carcasses between Concrete and Marblemount, a distance of fifteen river miles.

Carcasses in the preserve area during 1976 were very rare. A tentative escapement estimate by the Washington Department of Fisheries makes this year's run the lowest since 1969.

Further research is recommended in order to more accurately qualify the contribution of chinook carcasses to the Skagit eagles.

PINK SALMON

Pink salmon spawn in odd-numbered years in the Skagit River. Spawning in the main river can peak from mid-september through October with large die-offs occurring after, usually by the end of October and early November. The main river seems to be sporadically utilized within the preserve area.

Illabot Creek has historically been the most important tributary in the preserve area for pink salmon and remains so despite recent declines (Graph 7). Spawning in Illabot Creek also usually peaks somewhere between the second week in September to the middle of October. Both Illabot Slough and Hooper Slough are utilized by pink salmon for spawning within the preserve.

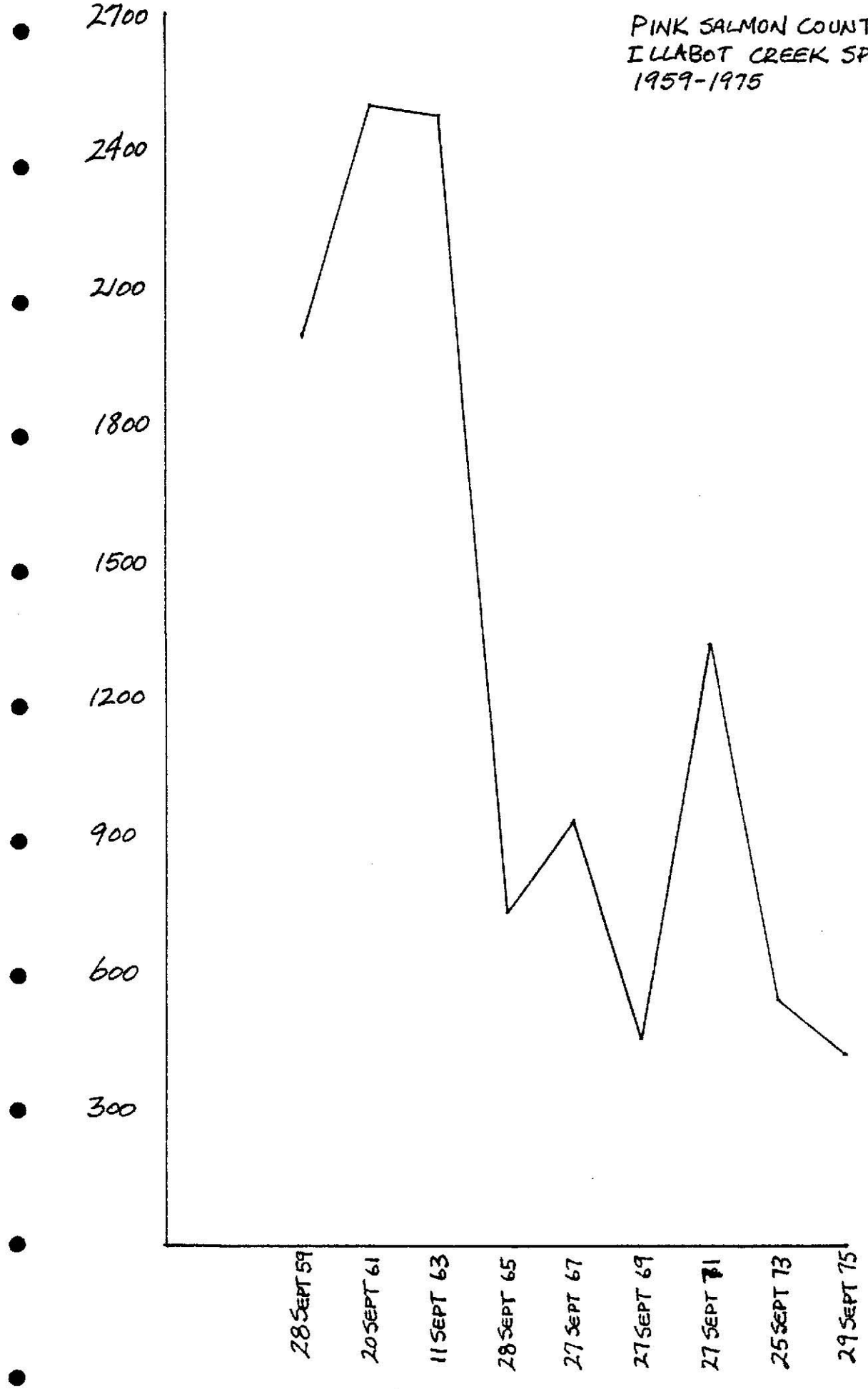
Historical changes in pink salmon numbers throughout the river system and within the preserve area are reflected in escapement figures (Graph 8) and by counts made during late September in Illabot Creek since 1959 (Graph 7).

Like chum salmon, pink salmon are very sensitive to environmental influences. Flooding and scouring of the spawning areas, abnormally high or low temperatures, especially in the estuary, can greatly influence fry survival. The low returns after the huge escapement in 1963 are, in all probability, due more to the effects of the environment than any other reason.

Mainly because of their sensitivity to environmental influences, it is not unusual for the prolific pink salmon to undergo radical

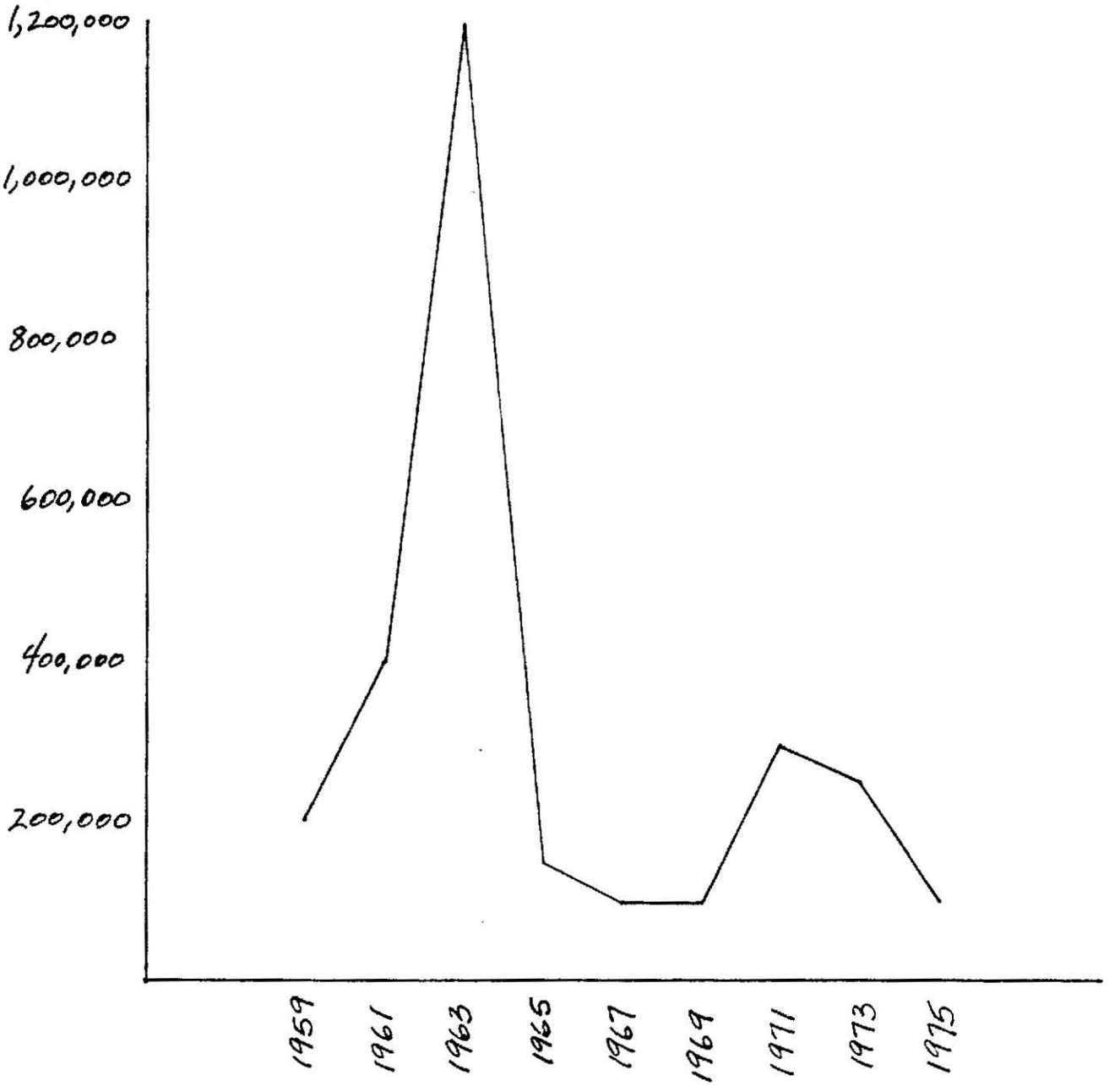
PINK SALMON COUNT
ILLABOT CREEK SPAWNING AREA
1959-1975

GRAPH #7



PINK SALMON ESCAPEMENT: 1959-1975
SKAGIT RIVER

GRAPH #8



fluctuations in their populations. In spite of this, however, the Skagit population seems to be on a general downward trend. Optimum escapement figures for the Skagit pink salmon is generally agreed to be somewhere in the neighborhood of 400,000 fish.

Importance to Wintering Eagles

A definite statement on the relative importance of pink salmon to the wintering eagles is difficult to make at the present time. They were not present in the river during the 1976-77 winter.

Their importance to the early arriving eagles during October and November and possibly early December is probably quite substantial. Pink escapement, even during poor years, still amounts to around 100,000 fish while the late summer-fall chinook run, which occurs at roughly the same time, amounts to an average of only 18,500 fish.

Historically, the eagle population has peaked from roughly late December through early or mid-February; too late, it appears, for either the pink or chinook carcasses to have a sustaining effect of any importance on them.

The contribution of pink salmon to the eagle's food supply during the months of October, November and early December, however, is in all probability, very important and further research is recommended on this relationship.

It also may be noted, on the respective graphs for chum and pink escapement (Graphs 2 and 8), that during the odd-numbered years when pink salmon spawn, the chum salmon escapement has been very poor.

The presence of pink carcasses on the bars during these years may help offset reduced chum numbers.

It is generally felt that adverse environmental conditions, coincidentally occurring during the past few odd-numbered years, have been largely responsible for the poor concurrent showings of these two species.

COHO SALMON

Coho salmon can be found spawning throughout the preserve area and, indeed, throughout the entire Skagit system. In and around the preserve area, coho are found spawning in the main river, Illabot Creek, Illabot Slough, Illabot ponds, Hooper Slough, Barnaby Slough, Corkindale Creek, Marblemount Slough and various small, often unnamed tributaries. The main thrust of their spawning occurs from roughly mid-November through mid-December. Coho are also one of the primary fish produced at the Skagit hatchery.

Importance to Wintering Eagles

Despite large off-station plants of hatchery-reared coho over the years (e.g. 124,750 coho fry were planted in Illabot Creek in April 1974), and despite the correlation between the timing of the major thrust of their spawning and the presence of the eagles, coho are of secondary importance, it appears, as a food source for the Skagit eagles. The reasons for this lie in their life cycle and its behavior patterns.

Coho spend roughly half their life in fresh water. Because of this fact, and so as to most efficiently utilize the available environment, spawning is widely dispersed throughout the river system. This distribution in spawning has a number of effects. One, it ensures that competition between the emergent fry during the rearing period will be minimized. Two, it makes censusing the spawning coho and getting an accurate estimate of escapement very difficult. And three, it means that coho

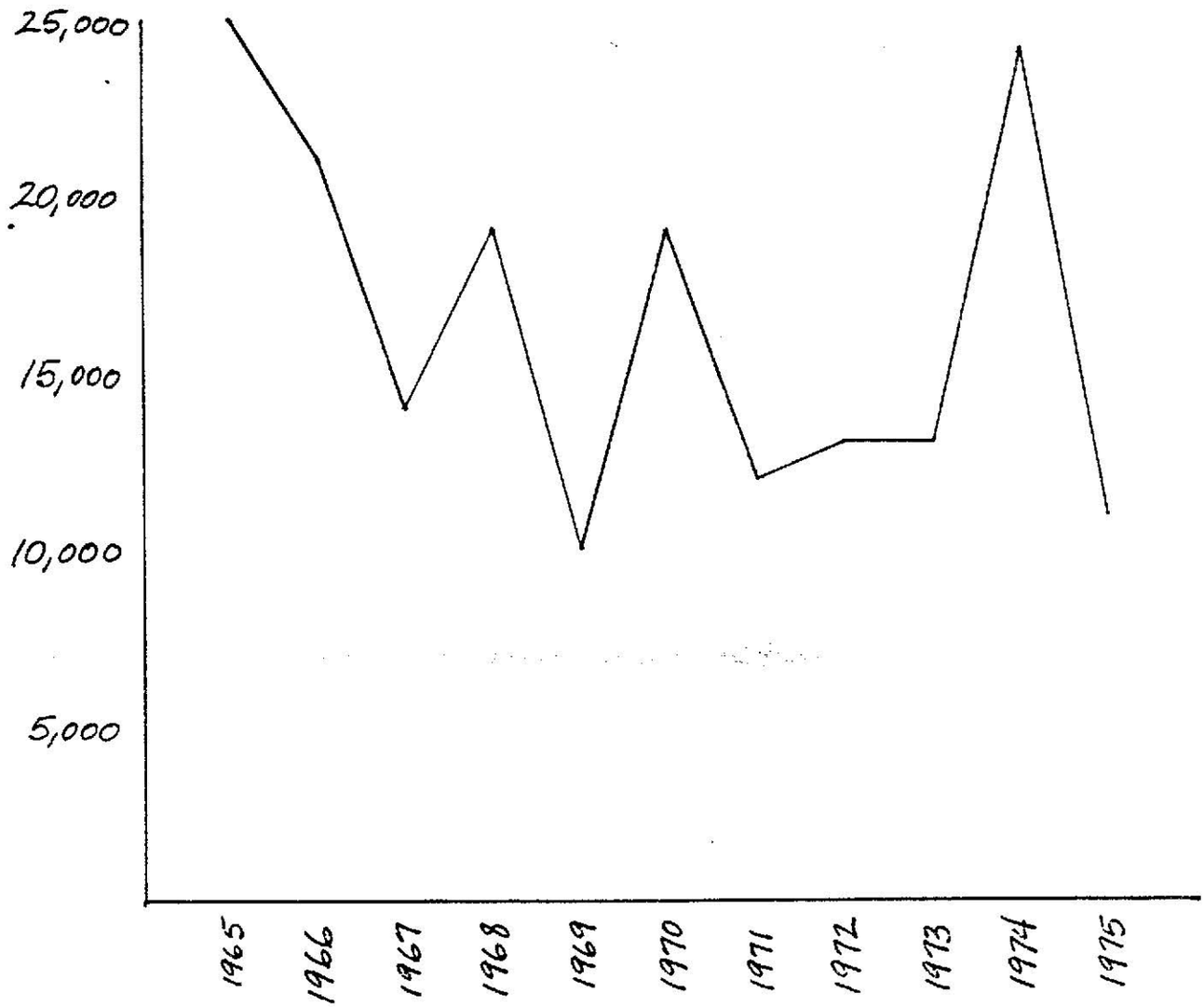
carcasses end up very widely scattered throughout the system.

In addition, while the main thrust of their spawning may occur from mid-November to mid-December, coho may be found spawning in the Skagit at almost anytime between August and the middle of February.

This distribution in both space and time is obviously an advantageous system for the fish. Unfortunately, it is not very beneficial to the eagles. Coho escapement numbers have averaged approximately 16,500 since 1965 (Graph 9). This many fish distributed in uncounted tributaries, over a nearly seven-month period, simply end up spread too thin to be of major importance as a food source to the wintering eagles.

COHO SALMON ESCAPEMENT: 1965-1975
SKAGIT RIVER

GRAPH #9



P U B L I C U S E

1976-77

There was a large increase in both public knowledge and public use of the preserve during the winter of 1976-77. A variety of factors were responsible. Among them; publicity surrounding the acquisition and dedication of the preserve, widespread media support of floating through the natural area to observe eagles, and extremely agreeable winter weather conditions.

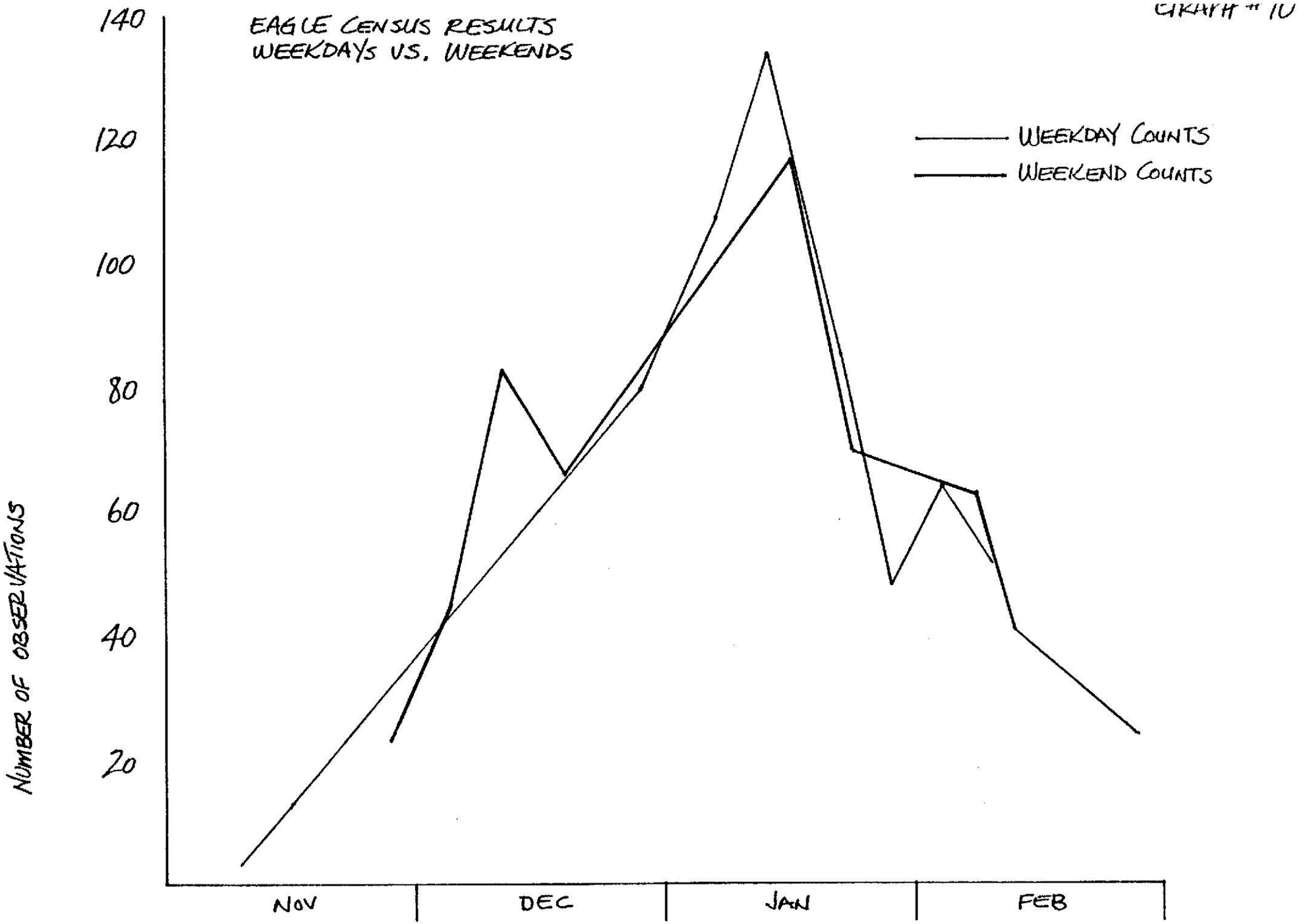
During the early part of the wintering period, viewing from Highway 20 increased to a point where 50-60 people per weekend day were commonly seen on the road. By the middle of January, however, public viewing from the road had increased up to six times its early seasonal level and traffic on the river itself had grown to a point that merited consideration as a serious management problem.

During the early part of the wintering period eagle census counts were made once a week, for the sole purpose of enumerating numbers and adult-subadult ratios. When public use began to intensify, however, census counts were made twice weekly, once on a weekday and once on a weekend day, in an attempt to ascertain the effect on the birds of this heavy weekend use. The results of this are shown in Graph 10 but, unfortunately, are not at all illustrative of the situation. It was found that the birds do not leave the river but, rather, congregate off the main river in areas where human intrusion has minimal impact. Hence, total numbers remained relatively unchanged. Numbers of birds on the main river channel, however, decreased substantially.

There are two sets of data which support this observation.

1) On Tuesday, January 11, the Washington Department of Game

GRAPH # 10


EAGLE CENSUS RESULTS
WEEKDAYS VS. WEEKENDS
WEEKDAY COUNTS
WEEKEND COUNTS
NUMBER OF OBSERVATIONS
140
120
100
80
60
40
20
NOV
DEC
JAN
FEB

conducted their annual Skagit River Wildlife Inventory. During this census, conducted by boat, 244 eagles were counted on the main river between Mount Vernon and Marblemount. Four days later, on Saturday, January 15, a weekend count was conducted in a similar manner. The number of eagles seen on this count totaled only 144, a decrease of 41%. Counts made between Rockport and Marblemount the same two days, but done by car and foot and <u>including areas off of the main river</u>, showed a difference of only 12% in eagle numbers.

2) On Thursday, January 6, a census count in the preserve area by road and foot totaled 107 eagles, 101 of which were on the main river. Two days later, Saturday, January 8, a river float through the preserve was made. Only 25 eagles were seen. A casual count of boats on the river made during the float totaled seven kayaks, four large commercially guided rafts, and five small rafts. Creel census figures from the Department of Game showed 43 anglers on the upper Skagit that day (Table 1).

Three days later on Tuesday, January 11, another census count by road and foot was made. 133 eagles were seen, the highest count of the year. 121 were on the main river channel.

This pattern has been observed in other wintering populations: "Bald eagles will, therefore, distribute themselves in the less disturbing sites given a choice within a specific area. This pattern is highly distinct during periods of abnormally high human pressure." (Stalmaster, 1976)

What constitutes abnormally high human pressure, of course, is somewhat subjective, but any level of activity disruptive to normal

behavior patterns must be considered as a management problem.

The weekend of January 22-23 is indicative of what can easily be considered abnormally high human pressure. On Saturday, the 22nd, just over 300 people were seen on Highway 20 within a four and a half mile stretch of the river, engaged in viewing eagles. Forty-one cars were counted at one time at Steelhead Park in Rockport. Over 90 people were seen floating the river and Game Department data shows 59 anglers on the river between Concrete and Marblemount.

On Sunday the 23rd, in the preserve area, eighteen power boats, four commercially-guided rafts carrying approximately 35 people, six private rafts, and eight kayaks were seen on the main river. In addition, one raft and eight canoes were observed to detour off the main river at river mile 72.5 and follow the river channel behind the large Department of Game-Nature Conservancy owned island, float through Illabot Slough and merge back into the main river at river mile 71.5, at the mouth of Illabot Creek. Nearly 200 people were also counted along the road.

The indication that the Illabot Slough area is beginning to experience public use during the winter months is very important. The prohibition of the practice of floating this stretch deserves the highest management priority.

This stretch of water, consistently and for its size, is the highest producer of fish on the entire river. This area is utilized by the eagles as a roost site, for perching, and as a major feeding area. Perhaps its greatest asset to the preserve, however, is the fact that its isolation renders it attractive to birds as a "retreat" when

human use of the river is at a peak. Consistently high numbers of eagles are found in this area, perched in the maples and alders, during the middle parts of the day, especially on the weekends.

I feel that this general area of the preserve, commonly known as Illabot Slough, is the one most important area on the river to hold inviolate and that floating down its back channels is contrary in the extreme to the preserve purpose.

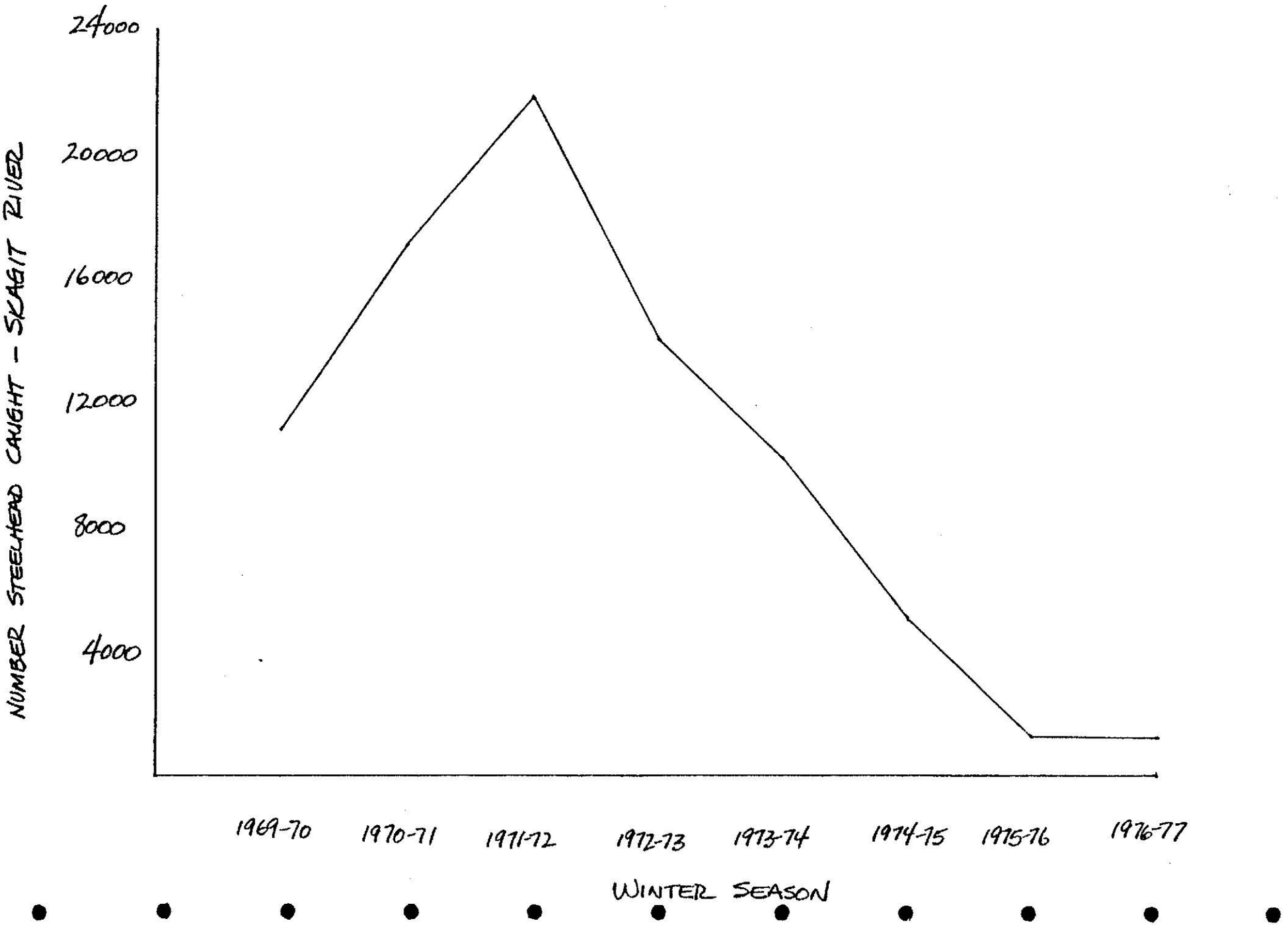
After studying the Skagit eagles during the 1973-74 and 1974-75 wintering periods, Chris Servheen stated that "the current level of steelhead sport fishing from boats appears to be compatible with the goals of the natural area." Since his study, use of the Skagit by steelhead fishermen has declined appreciably because of drastic decreases in fishing success. (Graph 11).

At the same time, it appears, the overall public use of the river during the winter months has increased to a point where a compatibility is no longer evident.

While the power boats of steelhead fishermen have been labeled by several sources as a serious problem in the natural area and while it appears that the integrity of the preserve is threatened by the heavy concentrations of people on the river, it is difficult to place the blame on any one user group as the effect is cumulative and evidence exists that the type of boat involved is of little consequence. In a detailed study of the effects of human disturbance on bald eagles, one researcher says:

GRAPH # 11

STEELHEAD SPORT CATCH - SKAGIT RIVER
1969-1977



> Visual disturbances in conjunction with auditory disturbances were not appreciably more disturbing than visual disturbances alone. The evidence indicates that low-level auditory disturbances are not appreciably disruptive to eagle behavioral patterns. The presence of a visual disturbance within the flight distance range is sufficiently disruptive to displace eagles without auditory effects added. (Stalmaster, 1976)

Unquestionably both louder and aesthetically more objectionable, the much smaller numbers of power boats on the river (especially in the preserve area proper), and their historical use of the Skagit serve to relieve them of much of the guilt many have prescribed to them this winter. The problem appears to be boats in general and since the major users of the river channel this winter were eagle watchers, the thrust of managment should be in their direction.

The whole question of directly regulating float trips on the Skagit is a difficult one. The status of the river as a public corridor makes it very difficult to prohibit activity of this sort. Arriving at a figure of how many boats are compatible and then monitoring and enforcing partial restrictions is unrealistic and, possibly, of questionable legality. The most direct "indirect" approach, and one that has the potential of solving a good portion of the problem, is relatively simple. Restricting access to the river would serve the same purpose as restricting traffic on the river. By closing, during the critical months, the two boat launch ramps upriver from Rockport, the unpowered canoes, rafts and kayaks would have to put in at either Bacon Creek, nearly ten river miles upstream from the preserve proper, or at Steelhead Park in Rockport, below the main eagle areas. It is not felt that this

would attract more power boats into the preserve but that it would serve to severely inhibit the growing numbers of commercial and private float trips and keep boats out of the important Illabot Slough area.

Table 1

NUMBERS OF STEELHEAD FISHERMEN....UPPER SKAGIT RIVER

November 16, 1976 to February 4, 1977

November	Anglers
16	5
17	7
18	5
21	15
22	2
27	35
29	5
Total =	74

December	Anglers
6	2
8	15
10	19
11	41
12	30
13	18
14	24
15	21
17	25
19	29
21	33
22	27
23	39
27	37
28	44
29	57
30	32
31	38
Total =	531

January	Anglers
2	31
3	9
6	17
7	30
8	43
10	22
11	16
12	15
14	28
15	57
16	30
17	11
20	22
22	59
25	13
26	19
27	19
28	19
29	47
30	35
31	16
Total =	558

February	Anglers
2	15
3	18
4	17
Total =	40

*Source: Washington Department of Game Creel Census Figures

C O M M E N T S

P E R T A I N I N G

T O

M A N A G E M E N T

R E C O M M E N D A T I O N S

NATURAL RUN SALMON

From the standpoint of eagle management, chum salmon are the most important species of anadromous fish in the river. They are experiencing large and relatively constant annual fluctuations in their escapement numbers. The reason for this is somewhat obscure but it seems to be at least partially caused by poor environmental conditions contributing to a cyclical pattern in their four-year cycle.

This speculation is supported by the generally poor showing in pink salmon escapement numbers, which parallel the lows in the chum cycle. The pink salmon contribution to the support of the wintering eagles is, for the most part, unknown but is thought to be substantial during the months of October, November and early December.

Chinook escapement numbers, with some periodic highs and lows, have remained relatively constant for the past ten years at just under 20,000. Although chinook redd index counts indicate the majority of the spawning occurs in the upper Skagit, it seems likely that chinook carcasses, at the present time, play only a minor role in the eagle's diet.

Coho salmon are distributed throughout the Skagit system in both space and time and consequently offer few concentrated food sources for the eagles.

A complete eagle census of the Skagit River on January 11, 1977 accounted for 260 birds in the eighty-seven river miles from Mount Vernon to Newhalem. Of these 260, 173 were counted in the ten miles

between the Sauk and the Cascade Rivers. In other words, 66.5% of the wintering eagles were concentrated along 11% of the river.

A thorough census of chum salmon carcasses was made during the 1976-77 winter from Sedro Woolley to Newhalem. 73% of the carcasses counted were found between Rockport and Marblemount, a section accounting for only 13% of the study area.

The relationship between the preserve area, the chum salmon, and the bald eagles is obvious. Attracted by Illabot Slough and by the numerous gravel bars and islands in this section of the river, which are important in chum spawning behavior, the fish, in turn, attract the eagles. Because of the interrelation of these elements, managment of this situation by individual agencies with individual goals, but overlapping responsibilities, is not conducive to a successful outcome.

While The Nature Conservancy and the Non-Game Division of the Washington Department of Game share the responsibility for the well-being of the Skagit eagles, it is, in reality, the Washington Department of Fisheries, along with the tribes who fish the river, that hold the key to their survival. It is not the eagles, as a seperate entity, who need management but, rather, the relation between the eagles and the salmon. This relatively simple ecological juxtaposition can be easily confused by jurisdictional disputes and it is essential that a spirit of cooperation continue to exist between the participating government agencies so as to responsibly allocate conflicting uses of the key resource.

That this is an ecological situation, and not merely a matter of eagles, cannot be stressed enough. The continuation of a large,

naturally produced, and healthy population of (especially chum) salmon on the Skagit River is mandatory if the eagles are going to prosper and return each winter in their present numbers.

This may require that the Department of Fisheries include the goal of maintaining an eagle population within the framework of their chum salmon management objectives. This is not merely desirable from the aesthetic point of view but is absolutely essential, as an alternative wintering area for these 100-200 eagles, in all probability, simply does not exist.

EGG TAKES

During the major chum spawning period, the Upper Skagit Indian Tribe, with the permission of the Washington Department of Fisheries, took somewhere between a quarter to a half a million chum eggs from near or within the preserve area. Illabot Slough was a major source of these eggs.

The taking of eggs is an accepted fisheries practice of long standing, especially in areas where excessive escapement is beleived to have occurred. The use of these eggs will, in all probability, benefit the overall fishery and contribute to important enhancement projects elsewhere. Due, however, to the vast importance of the Illabot Slough area to the Skagit eagles, it may be preferable whenever possible, to avoid this area when egg takes are scheduled and locate an alternative source.

PESTICIDES MONITORING

The accumulation of pesticides in the tissues of predators near the

peak of the food pyramid is well-documented, as are their effects on the reproductive success of many endangered birds of prey.

The agricultural activities surrounding both the Skagit River and the feeding areas of Puget Sound are of a sufficiently intensive nature to suggest a periodic monitoring of the build-up of pesticide residues in the tissues of anadromous fish. The potential effects of such an accumulation in the Skagit salmon needs no elaboration.

ARTIFICIAL FEEDING

When and if artificial feeding of the Skagit eagles needs to be undertaken, it is essential that those involved minimize the intervention aspect as much as possible. Toward this end, a carcass release experiment was conducted during the month of January. A total of approximately 3,000 pounds of spawned-out hatchery coho salmon were released into the Skagit River. Downstream bars were then searched for evidence of these fish in an effort to evaluate the feasibility of this approach toward artificial feeding. It was hoped that fish released in this manner would come to rest on the gravel bars in a more natural way than in the previously utilized method of artificial feeding. (The method hitherto subscribed to consisted of placing fish directly onto the gravel bars from boats).

The results of this experiment were not encouraging:

25 Jan 77: 11 A.M.; ninety one frozen carcasses released from Department of Game access road (near river mile 70.5), 1/4 to 3/4 miles above major downstream feeding bars. 4 P.M.; Downstream bars checked by foot and raft. No carcasses found.

31 Jan 77: 11 A.M.; 116 thawed carcasses released from Department

of Game access road, river mile 70.5.
1230 P.M.; 109 thawed carcasses and 117 frozen carcasses released from beneath power lines near Rocky Creek, near river mile 74.0, approximately one to one and a half miles above major feeding areas.

1 Feb 77: 1 P.M.; all bars checked by raft and foot for recovery of released fish. Total recovered = 0.

The conclusions in this case are easily arrived at. The frozen fish were observed to float easily in the river and were, perhaps, carried through the preserve area and deposited on banks far below. The thawed fish were observed to sink immediately from sight, increasing the odds against recovery substantially.

At the present time, if feeding the eagles is deemed necessary, the placement of salmon directly on the gravel bars seems to be the only available method.

One more point, and easily the most important, remains to be made concerning artificial feeding. The decision agreed to by both the Nature Conservancy and the Washington Department of Game, to curtail feeding except in the rarest and direst of circumstances, carries with it an important responsibility. The decision implies the desire to remove man, as much as possible, as an influence on the wintering behavior of the birds. While idealistic in tone, the implication is not necessarily to leave the birds to their own devices, to ignore them. Rather, the decision implies the desire to have a system that is self-governing and self-regulating while maintaining its high degree of integrity. The decision to curtail artificial feeding also involves a committment to perpetuate the naturally-spawning salmon upon which the eagles depend.

THE IMPACT OF UPRIVER DAMS ON THE FOOD SUPPLY

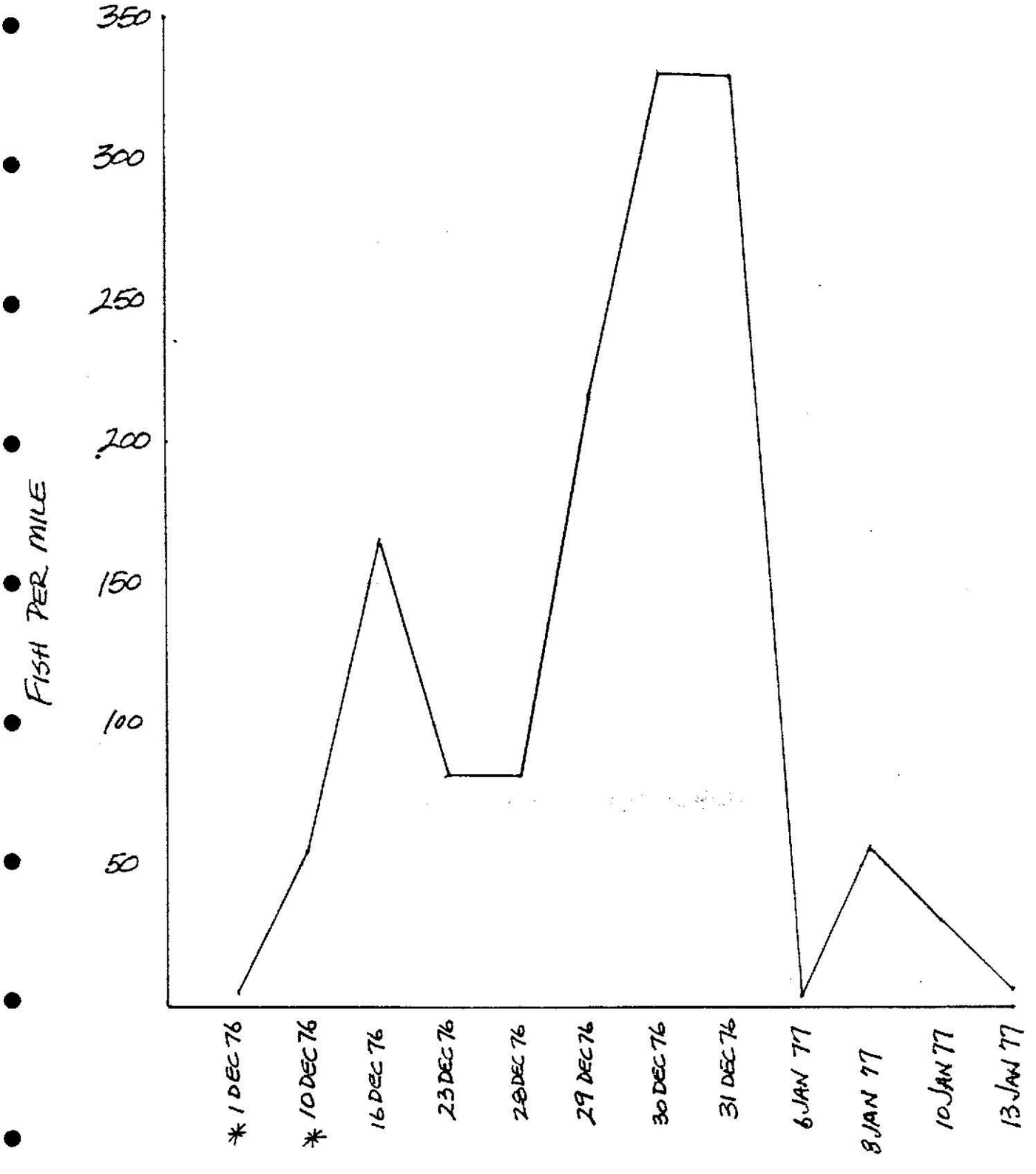
Chum carcass counts on the main river made at intervals between December 1, 1976 and January 13, 1977 by Washington Department of Fisheries personnel indicate a massive decrease in available carcasses at some time between December 31 and January 6 (Graph 12).

A rapid rise in the river during this period was responsible for washing them off the feeding bars. There was no measurable precipitation during this period and temperatures well below normal precluded the possibility of any important contribution from snowmelt.

A large release of water from upstream dams during this period has been ascertained as the main cause of this decrease in carcass availability.

CHUM SALMON CARCASS COUNTS WITHIN PRESERVE AREA
DECEMBER 1, 1976 TO JANUARY 13, 1977

GRAPH # 1



* [illegible] FISH

M A N A G E M E N T

R E C O M M E N D A T I O N S

MANAGEMENT RECOMMENDATIONS

SKAGIT RIVER BALD EAGLE NATURAL AREA

There are two issues of paramount importance bearing on the future well-being of the Skagit eagles; public use of the natural area during the winter months, and their food supply.

The 1976-77 wintering period served to illuminate the potential for human disruption on the natural area. Due to media publicity and, possibly, to agreeable winter weather conditions, use of the preserve by people interested in viewing eagles increased to surprising proportions.

While its status as a management problem is not, for the most part, critical, the matter of the eagle's winter food source also is of such massive and undeniable importance that it deserves more than casual mention here.

With this in mind the following management recommendations are offered:

1) The naturally spawning population of late fall and winter chum salmon must be maintained, at least, at its present level. It is difficult, if not impossible, to arrive at a statistically viable fish-to-eagle ratio when myriad uncontrollable factors affect the equation. Nonetheless, it is very strongly felt that no single action on the part of those involved with the Skagit eagles will benefit the birds as much as an increased and consistent annual run of chum salmon. Until further data is available, any assumptions as to the requirements of the wintering birds should be made in their favor.

Escapement numbers since 1968 on even-numbered years have averaged over 48,000 fish and have proven sufficient. Escapement numbers on odd-numbered years, however, have averaged less than 15,000 fish. It would be extremely beneficial to the eagle's welfare if these low odd-numbered year escapement figures could be increased.

Considering the wintering eagle's total dependence on the late fall and winter salmon runs, mandatory consideration must be given toward including the eagle's needs when escapement figures are allocated.

2) The taking of eggs from spawning chum salmon in the Illabot Slough area is a practice which should be discontinued. The eagles are easily disturbed during the process, the natural distribution of both salmon carcasses and eagles is affected, and there are other places, preferably downstream from the natural area, where eggs might be gathered.

If the process is to continue, a program of mitigation should be undertaken by those involved, such as planting fry hatched from the eggs back into the area.

3) Although the contribution chinook salmon make to the eagle's sustenance is not fully understood, a resumption of the Washington Department of Fisheries program involving the planting of fall chinook in Illabot Creek and other applicable areas within the management boundaries would enhance this run (Graph 12) and provide increased carcass numbers during the interim between the arrival of the first eagles and the appearence on the gravle bars of the first of the chum carcasses.

4) A program of monitoring the bald eagle-pesticides relationship should be inaugurated. Samples of salmon from the Skagit River could be

analyzed on an annual basis to detect any increase toward potentially dangerous levels.

5) Artificial feeding of the birds should be discontinued except in the rarest of circumstances. These circumstances would be those caused by human intervention and at this point are limited to: a) Serious miscalculations of escapement numbers caused by an overharvest of the fishery; and b) Very severe dam-related downstream flooding near the end of the major chum die-off which would remove all available and future feed from the gravle bars.

Artificial feeding programs, carried out over the years, may partially undermine historical knowledge of alternative winter feeding sites and cause an unnecessary and unwanted reliance on human intervention.

6) The superb spawning areas generally available above the old Faber Ferry site, approximately six river miles east of the town of Concrete, should remain closed to commercial fishing. The previous voluntary inclusion of the closure of this area within the fishing regulations of the Upper Skagit Tribe will be beneficial to the eagles as well as the fish and should be applauded.

7) Cooperative arrangements should be made with Seattle City Light Company to minimize, as much as possible, drastic fluctuations in the river level caused by the release of water from upriver dams during the critical months of December, January, and early February. This has had massive impact on carcass removal in the past.

8) Access to the boat launching sites at the Marblemount Bridge, and adjacent to the roadside park, approximately $3\frac{1}{2}$ miles east of

Rockport, should be closed during the critical months of December, January and February. Public access, for those wanting to float the river, would remain available at Bacon Creek, approximately five river miles above Marblemount, and at Steelhead Park, well below the major sanctuary area. Since the vast majority of steelhead fishermen launch their boats at Steelhead Park in Rockport a closure of these sites would not interfere in an unreasonable way with this traditional winter use of the Skagit. It would, at the same time, present an obstacle to the rapid increase in river traffic bent in viewing eagles.

The media could also be utilized to inform the public of the harmful effects of floating the river, and to offer less consumptive alternative uses of the preserve.

9) It should be a priority during the 1977-78 winter season for the preserve manager to gather data on the impact of power boats on eagle behavior. This should be done in close cooperation with the Washington Department of Game as they are the regulatory agency in this situation.

10) Contact should be maintained with the Department of Highways throughout the spring and summer of 1977 so as to ascertain the status of the two proposed viewing sites overlooking river mile 72-73 and river mile 69.5-70.5. They will be important during the 1977-78 winter in changing the focus of public use on the river.

Toward this end, The Nature Conservancy and the Washington Department of Game should work with the Washington Parks and Recreation

Commission in furthering the use of the already existing overlook trails in Rockport State Park. They offer relatively close and unobstructed views of feeding bars at river mile 65 and the mouth of the Sauk River. The minor amount of effort and money involved in the construction of several more viewpoints and the addition of interpretive signs would transform this largely ignored area into a valuable addition to the preserve. It would serve the practical purpose at the same time of taking some of the pressure off of the heavily visited upper portion.

11) There should be no further media publicity related to the natural area except that slanted toward minimizing public use. Unfortunately, for the time being, this should include information geared toward all user groups, including schools, conservation organizations, and the general public.

12) Effort should be increased toward acquiring title or easement considerations to the gravel bar area near river mile 70 now in private ownership. This is one of the two prime feeding areas in the preserve and too high an emphasis cannot be placed on its importance.

13) The opportunity to acquire an island near the town of Marblemount for inclusion in the natural area has arisen. This island includes oft-utilized perch sites, proximity to a large gravel bar, and a spawning area for chum salmon. It is an isolated spot on the river (river mile 77.5) and would be a valuable addition to the preserve.

LITERATURE CITED

Stalmaster, Mark Victor. 1976. Winter Ecology and Effects of Human Activity on Bald Eagles in the Nooksack River Valley, Washington. Unpublished M.S. Thesis, Western Washington State College. Bellingham, Washington.

E A G L E

C E N S U S

D A T A

EAGLE CENSUS INFORMATION

The first bald eagle was seen on the upper Skagit River this winter on November 2, 1976. The high count for the winter was 133 birds on January 11, 1977. By the end of February approximately 25 birds remained in the area.

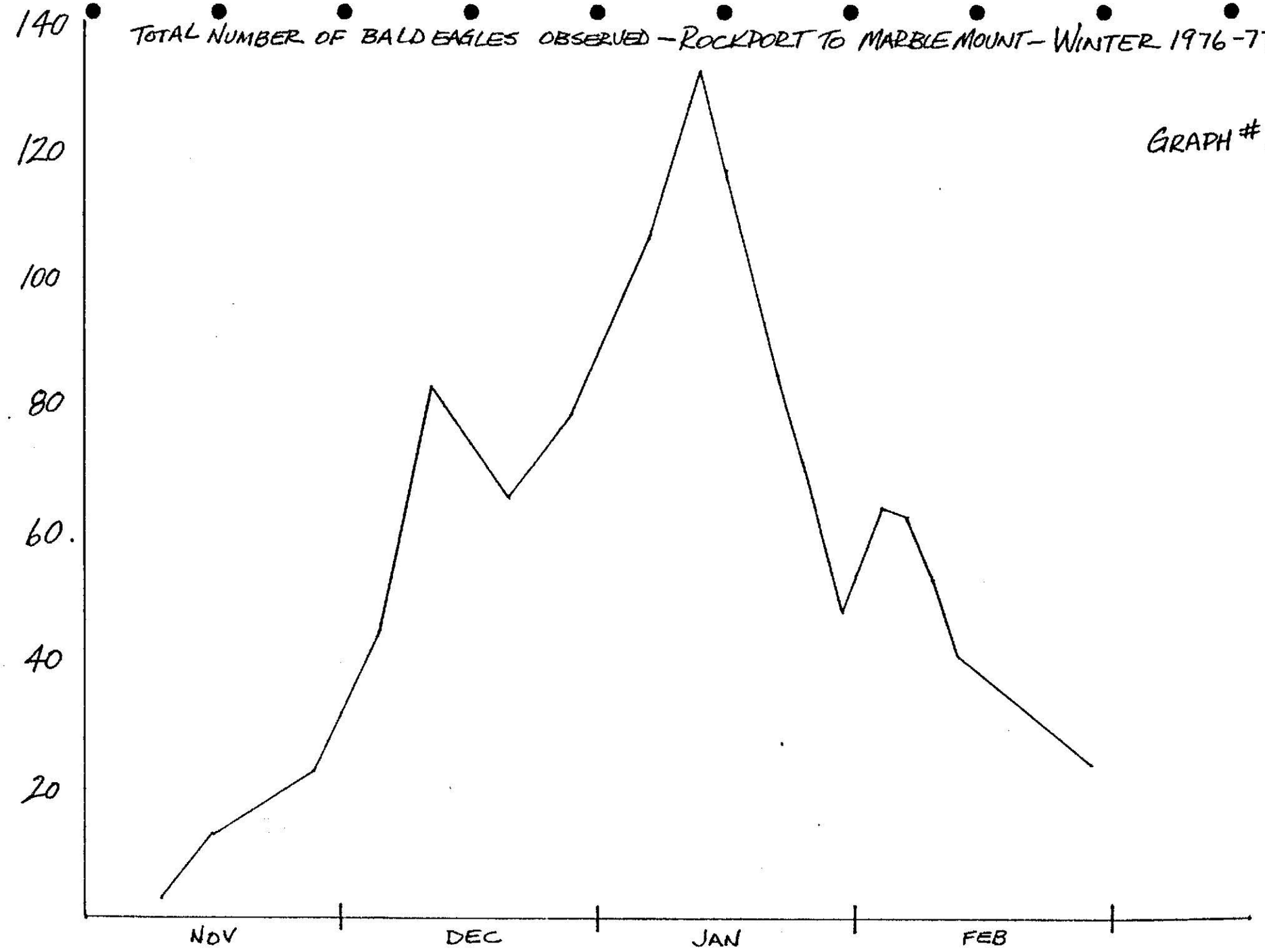
The beneficial effects of a large number of chum salmon carcasses on the gravel bars in and surrounding the natural area were largely negated by the effects of two seperate incidents of high water on the river. The first, related to the release of water from upriver dams, occurred in early January. The second and much higher water, the result of heavy rains, occurred on January 17 and 18. These two incidents were responsible for washing the gravel bars free of carcasses at a time when carcass numbers were at their peak. The decline in the eagle population in the two-week period following January 11 appears to be directly related to this carcass removal

The 1976-77 population curve (Graphs 13, 14) is similar to 1973-74 when numbers peaked in early January and the chum escapement was poor. In 1974-75 the chum escapement was high, there were no floods, and the eagle population peaked in early February. The 1976-77 chum escapement figures are, as yet, unknown but will probably be relatively high. It is probable that, without the effects of flooding, the Skagit eagle population would have remained more stable through the period from mid-January to mid-February.

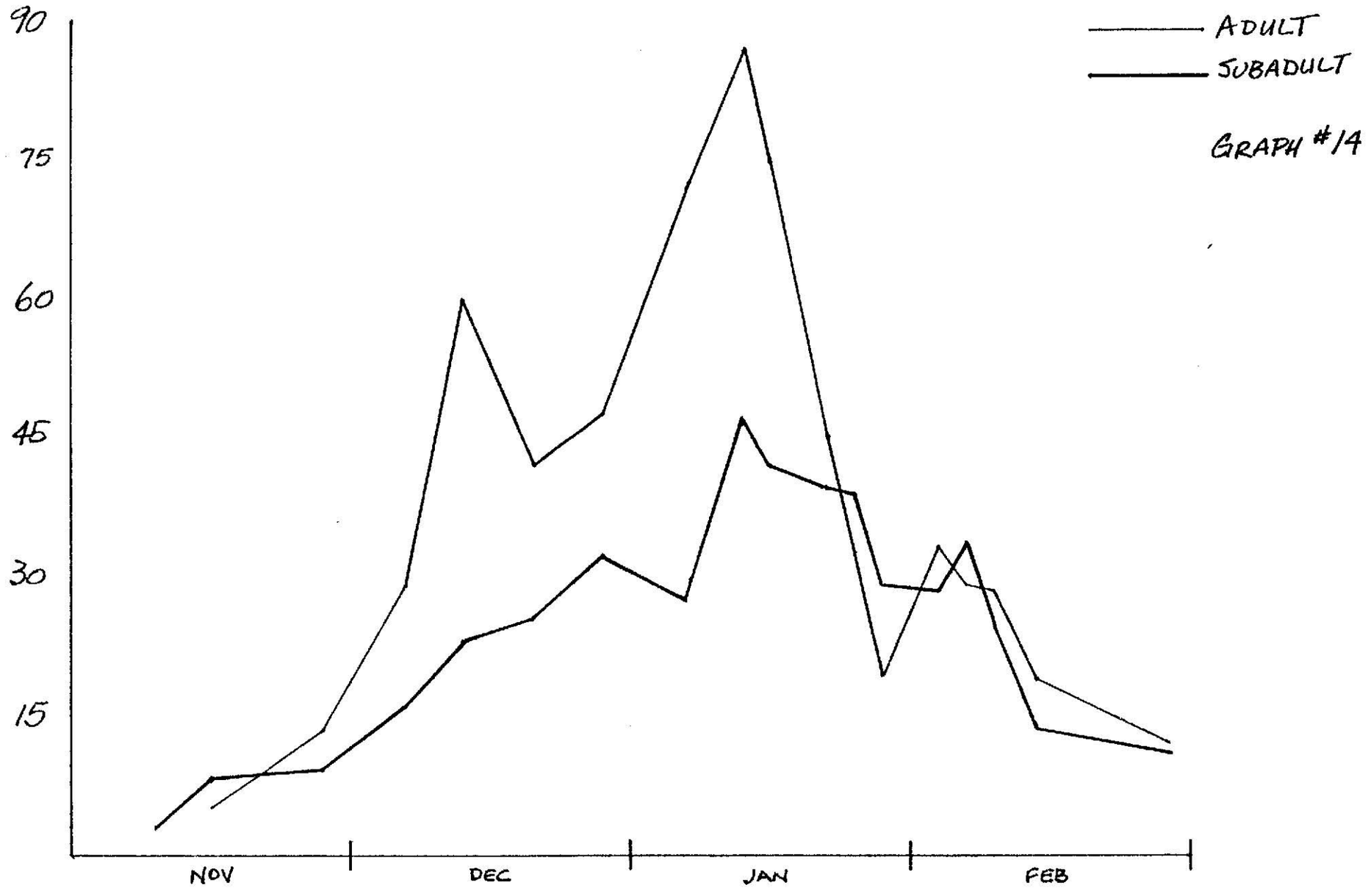
Bald eagle distribution, from the mouth of the Sauk River just below Rockport to the mouth of the Cascade River just above Marblemount, during the period from November 1976 to March 1977 is shown in Graphs 15-18.

TOTAL NUMBER OF BALD EAGLES OBSERVED – ROCKPORT TO MARBLEMOUNT – WINTER 1976-77

GRAPH # 13



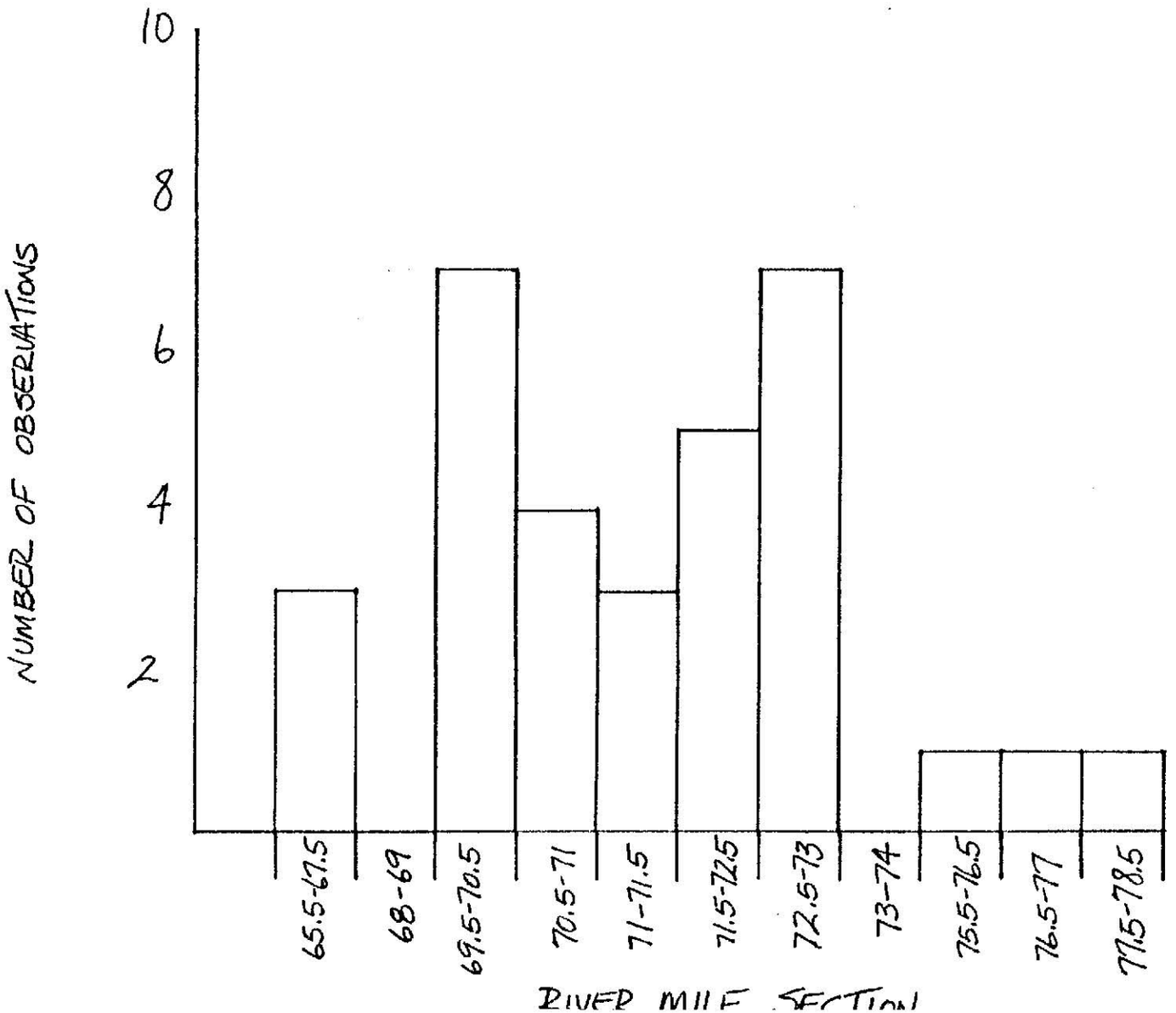
ADULT AND SUBADULT BALD EAGLES - ROCKPORT TO MARBLEMOUNT - WINTER 1976-77

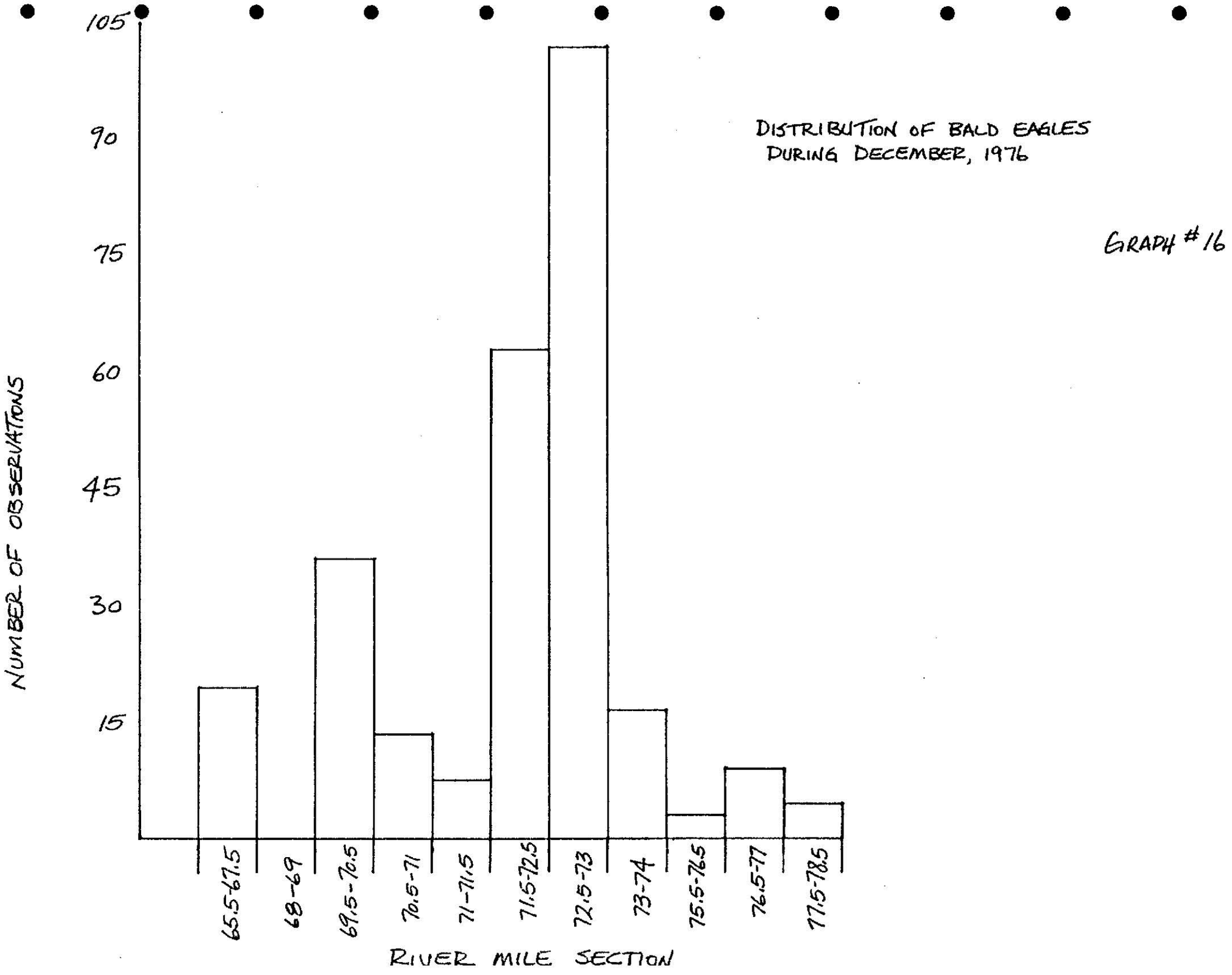


GRAPH #14

DISTRIBUTION OF BALD EAGLES DURING NOVEMBER, 1976

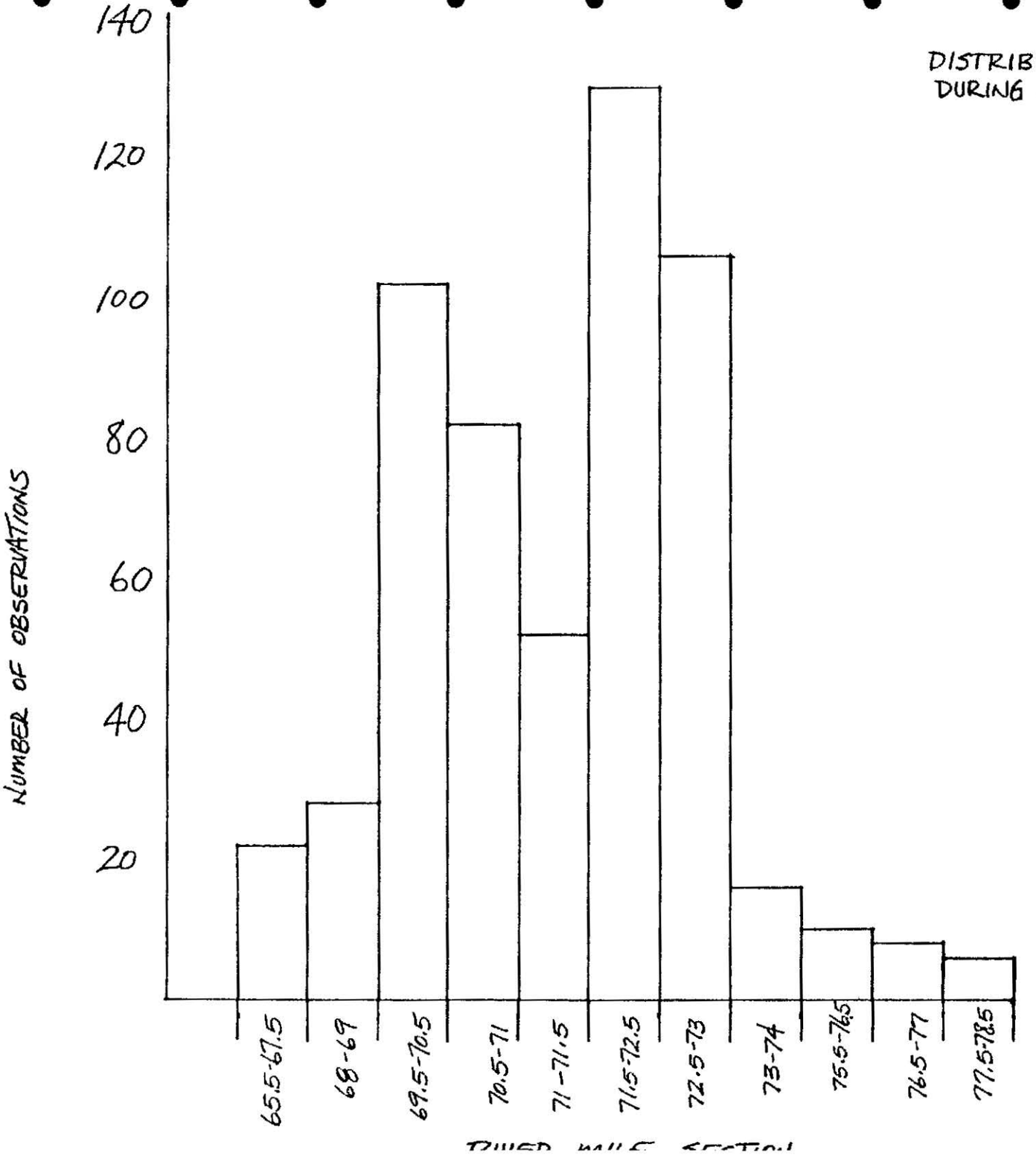
GRAPH # 15




DISTRIBUTION OF BALD EAGLES
DURING DECEMBER, 1976
GRAPH #16
NUMBER OF OBSERVATIONS
105
90
75
60
45
30
15
65.5-67.5
68-69
69.5-70.5
70.5-71
71-71.5
71.5-72.5
72.5-73
73-74
75.5-76.5
76.5-77
77.5-78.5
RIVER MILE SECTION

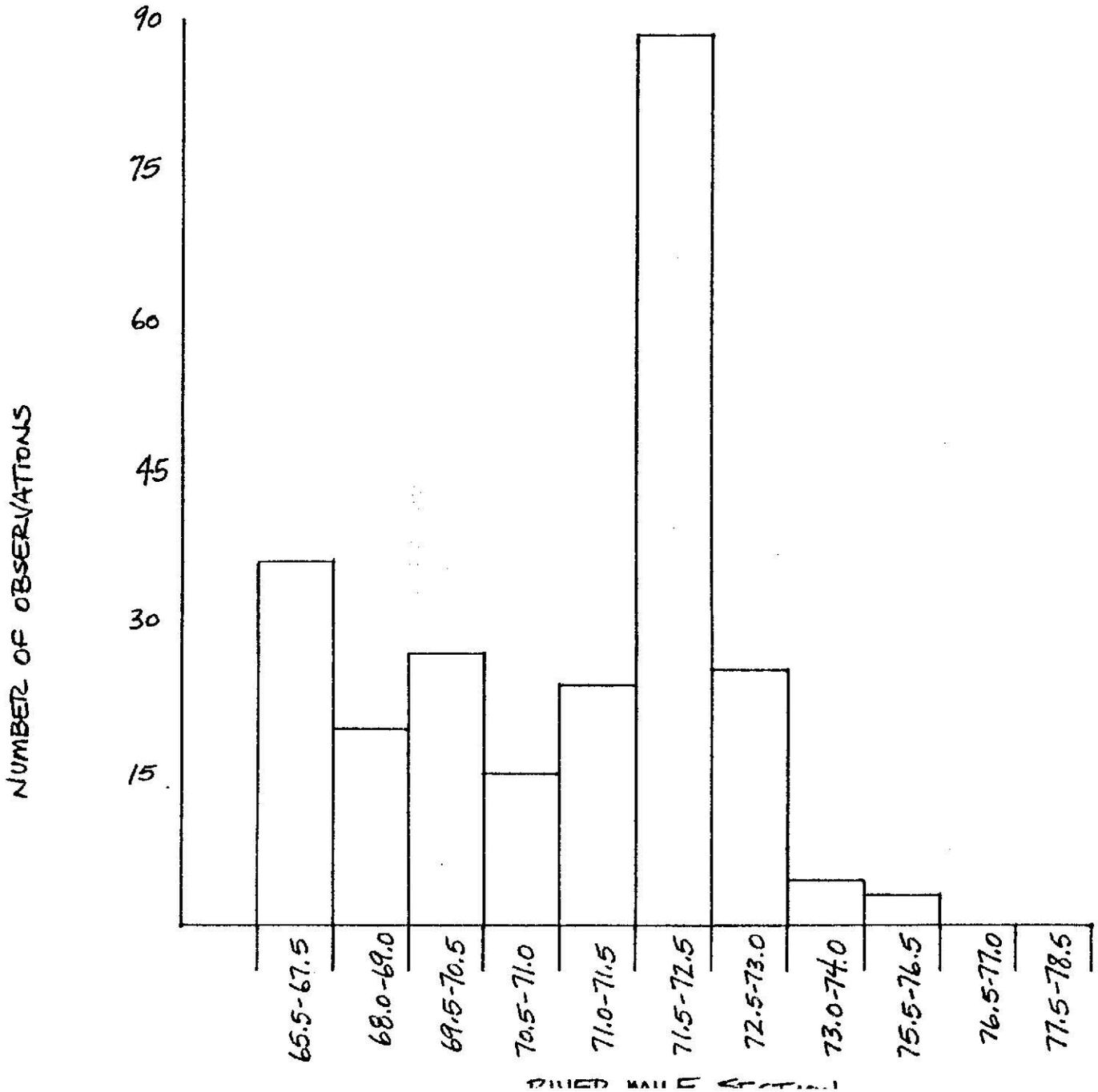
DISTRIBUTION OF BALD EAGLES
DURING JANUARY 1977

GRAPH #17

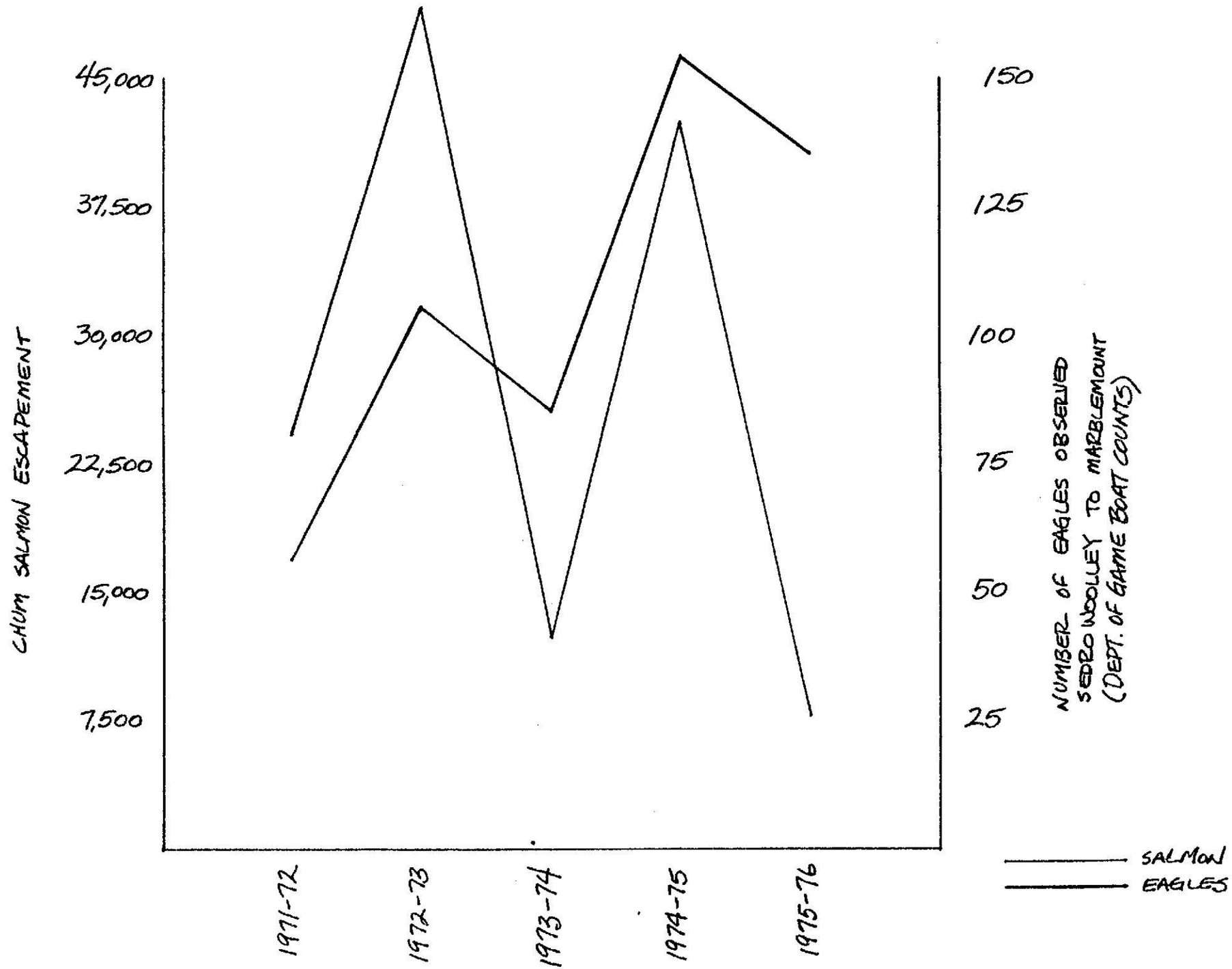


DISTRIBUTION OF BALD EAGLES
DURING FEBRUARY 1977

GRAPH #18



BALD EAGLE NUMBERS VS. CHUM SALMON ESCAPEMENT + 1971-1975



B I R D S

M A M M A L S

P L A N T S

S O I L S

O F

T H E S K A G I T R I V E R

B A L D E A G L E

N A T U R A L A R E A

1976-77 Winter Birds---Skagit River Bald Eagle Natural Area

Winter Wren	Troglodytes troglodytes
Belted Kingfisher	Megaceryle alcyon
Varied Thrush	Ixoreus naevius
Robin	Turdus migratorius
Common Crow	Corvus brachyrynchos
Common Raven	Corvus corax
Red-tailed Hawk	Buteo jamaicensis
Bald Eagle	Haliaeetus leucocephalus
Golden Eagle	Aquila chrysaetos
Great Blue Heron	Ardea herodias
Hairy Woodpecker	Dendrocopos villosus
Downy Woodpecker	Dendrocopos pubescens
Pileated Woodpecker	Dryocopus pileatus
Red-shafted Flicker	Colaptes cafer
Yellow-bellied Sapsucker	Sphyrapicus varius
Song Sparrow	Melospiza melodia
American Goldfinch	Spinus tristis
Evening Grosbeak	Hesperiphona vespertina
Oregon Junco	Junco oreganus
Ruffed Grouse	Bonasa umbellus
Fox Sparrow	Passerella iliaca
Dipper	Cinclus mexicanus
Common Merganser	Mergas merganser
Bufflehead	Bucephala albiola
Stellar's Jay	Cyanocitta stelleri
Golden-crowned Kinglet	Regulus satrapa
Ruby-crowned Kinglet	Regulus calandula
Chestnut-backed Chickadee	Parus rufescens
Black-capped Chickadee	Parus atricapillus
Mallard	Anas platyrhynchos
Killdeer	Charadrius vociferus
Sparrow Hawk	Falco sparverius
Northern Shrike	Lanius excubitor
Rufous-sided Towhee	Pipilo erythrophthalmus
Great Horned Owl	Bubo virginianus
Black-billed Magpie	Pica pica
Brown Creeper	Certhia familiaris
Common Goldeneye	Bucephala clangula
Bushtit	Psaltriparus minimus
Pygmy Owl	Glaucidium gnoma
Canada Goose	Branta canadensis
Glaucous-winged Gull	Larus glaucescens
Ring-billed Gull	Larus delawarensis

*All birds seen in preserve area, October 1976 - March 1977

Mammals....1976-77 Winter....Skagit River Bald Eagle Natural Area

Mole	Scapanus sp.
Snowshoe Hare	Lepus americanus
Douglas Squirrel	Tamiasciurus douglasii
Gopher	Thomomys sp.
Deer Mouse	Peromyscus sp.
Muskrat	Ondatra zibethica
Beaver	Castor canadensis
Coyote	Canis latrans
Black Bear	Euarctos americanus
Raccoon	Procyon lotor
Long-tailed Weasel	Mustela frenata
River Otter	Lutra canadensis
Black-tailed Mule Deer	Odocoileus hemionus columbianus

*Mammals listed identified by either direct sighting or by sign, track or scat.

Partial botanical inventory - Nature Conservancy Preserve

Skagit River Bald Eagle Natural Area

Coniferous Trees

Western Hemlock	Tsuga heterophylla
Douglas Fir	Pseudotsuga menziesii
Western Red Cedar	Thuja plicata
Sitka Spruce	Picea sitchensis

Deciduous Trees

Red Alder	Alnus oregona
Red Willow	Salix lasiandra
Black Cottonwood	Populus trichocarpa
Big Leaf Maple	Acer macrophyllum
Vine Maple	Acer circinatum

Shrubs

Oregon Grape	Berberis nervosa
Snowberry	Symphoricarpos rivularis
Red Huckleberry	Vaccinium parvifolium
Thimbleberry	Rubus parviflorus
Cut-leaf Blackberry	Rubus laciniatus
Salmonberry	Rubus spectabilis
Huckleberry	Vaccinium sp.
Pacific Blackberry	Rubus vitifolius
Salal	Gaultheria shallon
Pacific Red Elderberry	Sambucus callicarpa
Wood Rose	Rosa gymnocarpa
Red Osier Dogwood	Cornus stolonifera

Herbs

Dandelion	Taraxacum officinale
Pearly Everlasting Flower	Anaphalis margaritacea
Purple Foxglove	Digatalis purpurea
Twisted Stalk	Streptopus amplexifolius
Indian Warrior	Pedicularis desiflora
Nettle-leaved Horsemint	Agastache urticcifolia
Common Monkey Flower	Mimulus guttatus
Yarrow	Achillea millefolium
Red Clover	Trifolium pratense
Russian Thistle	Salsola kali

Plant Inventory (continued)

Herbs

Tansy	Tanacetum vulgare
False Solomon's Seal	Smilacina racemosa
Yellow Wood Violet	Viola lobata
Wild Ginger	Asarum caudatum
Sedge	Carex sp.
Horsetail	Equisetum sp.
Sword Fern	Polystichum minitum
Bracken Fern	Pteridium aquilinum

DESCRIPTIONS OF SOILS (See soils map)

Cu--Cathcart stony loam, 15-30% slopes; of minor influence within the preserve area, this soil is composed of glacial materials overlying arkose sand. It has good natural drainage with moderate runoff. The root zone depth is from 0-36 inches and it is generally felt to be suitable only for forestry.

Kr--Kline gravelly loam, 3-8% slopes; this soil is developed from materials deposited by swift-flowing streams. The amount of gravel varies considerably. Included are areas in which stones and cobblestones are scattered on the surface and through the profile. These areas are generally adjacent to present streams or abandoned stream beds. Unsuitable for agriculture and not widespread within the management area.

Pa--Pilchuck fine sand, 0-3% slopes; this soil occupies alluvial bottom lands that are hummocky in places. It is found adjacent to or very near the river itself and is only a few feet above the normal level of the water. This soil is developing from sandy sediments that were deposited very recently by rivers and streams and the materials are of mixed origin. They contain less glacial flour than the parent materials of associated alluvial soils. Its close proximity to the river results in the soil being flooded frequently. Runoff is very slow and internal drainage is very rapid. Associated vegetation consists of alder, maple, willow, cottonwood, some cedar, and shrubs, vines and scattered grasses. Seldom used for agricultural purposes.

Pc—Pilchuck loamy sand, 0-3% slopes; this soil is closely associated with Pilchuck fine sand. It is very similar to Pa except for the difference in the texture of the surface soil. Most of it has been left in its native state and is not utilized for agriculture.

Pb—Pilchuck gravelly sand, 0-3% slopes; most of this soil is in abandoned channels once occupied by swiftly flowing streams. It is closely associated with other Pilchuck soils and with Riverwash (Rc, 0-3% slopes). Except for having a considerable amount of gravle in the profile, it resembles Pilchuck fine sand (Pa). Although not as densely wooded as some of the other Pilchuck soils, it usually supports a fair stand of young alder and willow. This soil is occasionally used as a source of material for roads and other construction.

Pk—Puyallup fine sandy loam, 0-3% slopes; this soil is extensive throughout the management area and covers a very large portion of the Conservancy-owned land. It is found on alluvial bottom lands and is often associated with hummocky or gently undulating areas. It has developed from recently deposited alluvium derived from many different kinds of rocks. The alluvium was deposited by streams that rise in active glaciers of the Cascade Mountains. The original vegetation was western red cedar, western hemlock, and associated trees, brush, vines, and ferns. This soil occupies slightly higher positions than the Pilchuck soils. It is well drained. Water generally runs off the surface rapidly enough, and internal drainage is rapid through the sandy substratum. The lower lying

areas adjacent to the river are occasionally flooded during the rainy season and during periods when the water is high. During winter and spring when the water table rises, only the lower areas generally become waterlogged.

The soil is inherently fertile, contains medium amounts of organic matter and is well supplied with moisture. Most of it is under cultivation and in use as pasture. The uncleared areas are located, by and large, on the very low bottom lands within the braided pattern of the Skagit River. These areas (e.g. much of the Nature Conservancy property) are mostly in deciduous trees, are periodically flooded, and are difficult to reach because they are surrounded by streams.

Profile description:

Surface soil-----
Brown to dark brown or grayish-brown fine sandy loam; very friable; pale brown to light brownish gray when dry; slightly acid to medium acid; 6-12" thick.

Subsoil-----
Grayish brown to olive gray stratified loamy fine sand and fine sand; a few fine, faint brown and yellow mottles, very friable; slightly to medium acid; extends to depths of 18-30".

Substratum-----
Olive gray stratified, loose, fine, and medium sand; also considerable amounts of dark and light-gray sand; slightly acid to nearly neutral.

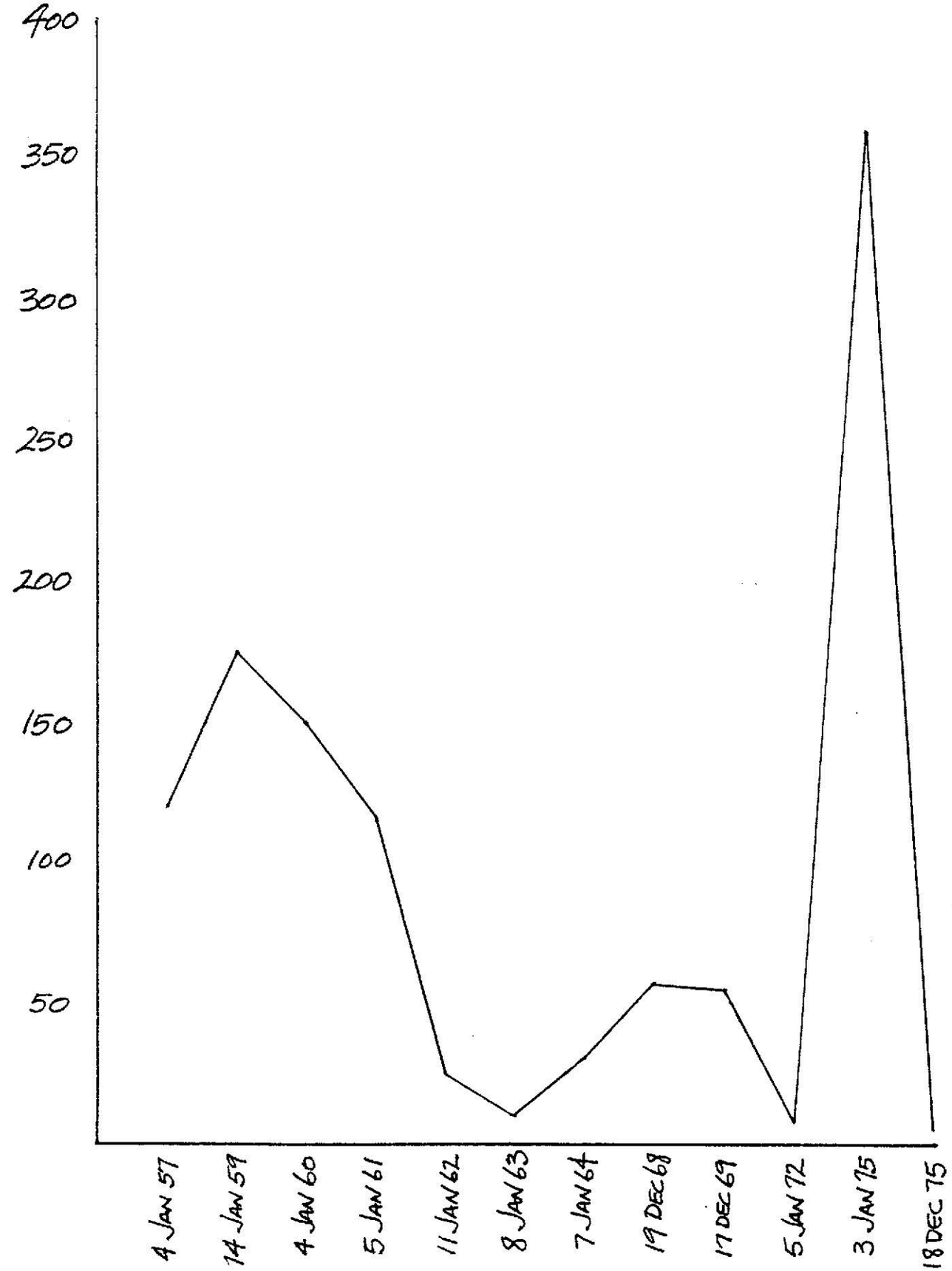
Pm—Puyallup loam, 0-3% slopes; relatively uncommon with the management area, this soil is closely associated with other Puyallup soils. Most of it is found on natural levees along the river. Except for the finer textures of the surface soil, this soil resembles Puyallup fine sandy

loam (Pk), and is nearly all under cultivation.

Po—Puyallup silt loam, 0-3% slopes; although this soil is widely distributed along the bottom lands of the Skagit River it is rare within the managment area. It is associated with other Puyallup soils but is generally found a little farther from the stream channels and, consequently, has less rapid internal drainage. Most of this soil has been cleared and farmed.

Rc—Riverwash, 0-3% slopes; this is a miscellaneous land type consisting of gravel, boulders, and reworked sand. It occupies abandoned river channels and, mainly, areas next to the river itself. It is common in the slough areas adjacent to braided channels around the Illabot Creek-Skagit River junction. Frequent floods result in erosion and deposition and, in times of high water, a change in boundaries. These areas have no agricultural value. They are barren for the most part but in places support some young willow and alder trees, brush, shrubs, and grasses. This type is extensively utilized as a source of material for road building and other construction.

CHUM SALMON COUNTS PER MILE/MAIN RIVER
(RIVER MILES 67.0-77.0)



CHUM SALMON COUNTS – ILLABOT SLOUGH (0.3 MILES)