

PRE-CONSTRUCTION ECOLOGICAL STUDIES
FOR THE PEBBLE SPRINGS SITE

SUPPLEMENT
to May 1978 Final Report

Prepared for

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FOREWORD

During the 1976-77 water year the Pacific Northwest experienced its worst drought in over 100 years. In response to this drought various agencies implemented a program which transported 2.8 million juvenile salmonids from the lower Snake River to below Bonneville Dam.

Portland General Electric felt that this action may have influenced the results of the hydroacoustic survey performed during this period at the Pebble Springs site (BEAK 1978).

In addition, the drought significantly affected the vegetative growth at the plant site which may, in turn, have affected the Long-billed Curlew usage.

Therefore, in February 1978 PGE retained BEAK Consultants Incorporated to continue the monitoring program begun in 1977 on salmonid smolts, curlews and raptors. This document reports the results of those studies.

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ACKNOWLEDGMENTS

Beak Consultants Incorporated expresses thanks to the staff of Portland General Electric Company for its assistance on this study. Dr. S. C. Katkansky and Mr. R. Klein provided assistance in the review and preparation of this report.

SUMMARY

The results of the supplemental pre-construction ecological studies at the Pebble Springs site are summarized below.

I. Fisheries

A supplemental fish study was performed with hydroacoustic techniques concurrent with gill net sampling from April, 1978 through July, 1978. The study location was approximately three miles up the Columbia River from Arlington, Oregon.

Data from the hydroacoustic and gill net studies indicate that very low numbers of salmonid smolts were present in the vicinity of the proposed Pebble Springs intake during the interval April 17 through July 25, 1978. These findings are consistent with the data obtained during 1977 (BEAK 1978).

II. Long-billed Curlews

Data from the 1978 studies indicate that curlew populations and the number of territorial pairs were generally lower in 1978. Also, the distribution of observed curlews shifted from the previous studies.

The reduced population levels and number of territorial pairs observed on the Pebble Springs site in 1978 may be a result of the low reproductive success in 1977.

III. Raptors

Common Raven, Ferruginous Hawk, and Swainson's Hawk were the most abundant raptor (or raptor-like) species in the study area during 1978. Four species, the Prairie Falcon, Rough-legged Hawk, Short-eared Owl, and Burrowing Owl, that were observed during 1977 were not recorded in 1978. A reduction in sampling intensity (i.e., one day site visit) during 1978 may have been a factor that contributed to the lower number of species observed.

I. FISHERIES

A. INTRODUCTION

This report presents supplementary data on salmonid smolt densities in the vicinity of the proposed Pebble Springs cooling water intake. A previous study conducted by Beak Consultants Incorporated during the interval April, 1977 through March, 1978 indicated that the intake site was not an area of high fish density (BEAK 1978). However, the data obtained during that study may not have been representative of normal conditions due to extremely low flow conditions in the Columbia River and large reductions in the normal smolt numbers due to the Army Corps of Engineers 1977 smolt transport program. To provide smolt density estimates for more representative conditions, PGE retained BEAK to continue the smolt sampling program for April 17, 1978 through July 25, 1978. Modifications were made in the hydroacoustic sampling technique to allow more precise estimation of relative smolt densities in the near-surface waters. This report contains a description of the sampling modifications (Section C) and results of the sampling program (Sections D, E, and Appendices A and B).

B. LOCATION OF STUDY AREA AND SAMPLING STATIONS

The Pebble Springs aquatic study site is located along the Oregon shore of the Columbia River (River Mile 244 to 248) approximately three miles upriver from Arlington, Oregon (Figure 1). It is approximately 28 miles above John Day Dam and about 48 miles downriver from McNary Dam. The proposed Pebble Springs nuclear power plant site is about four miles inland, to the south-southeast. Sampling stations for set gill nets, hydroacoustic transects, and inverted hydroacoustic transducer studies are depicted in Figure 2.

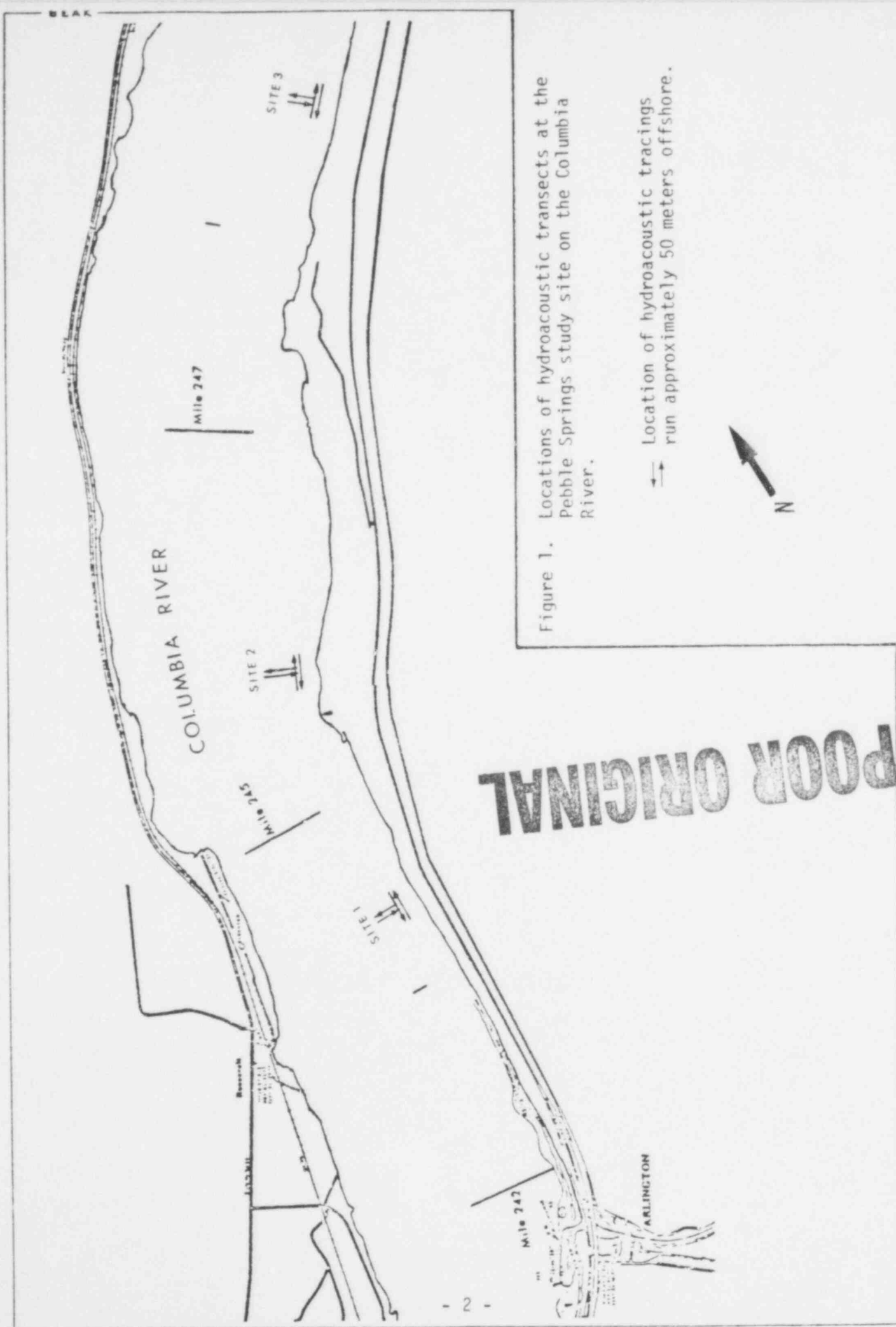
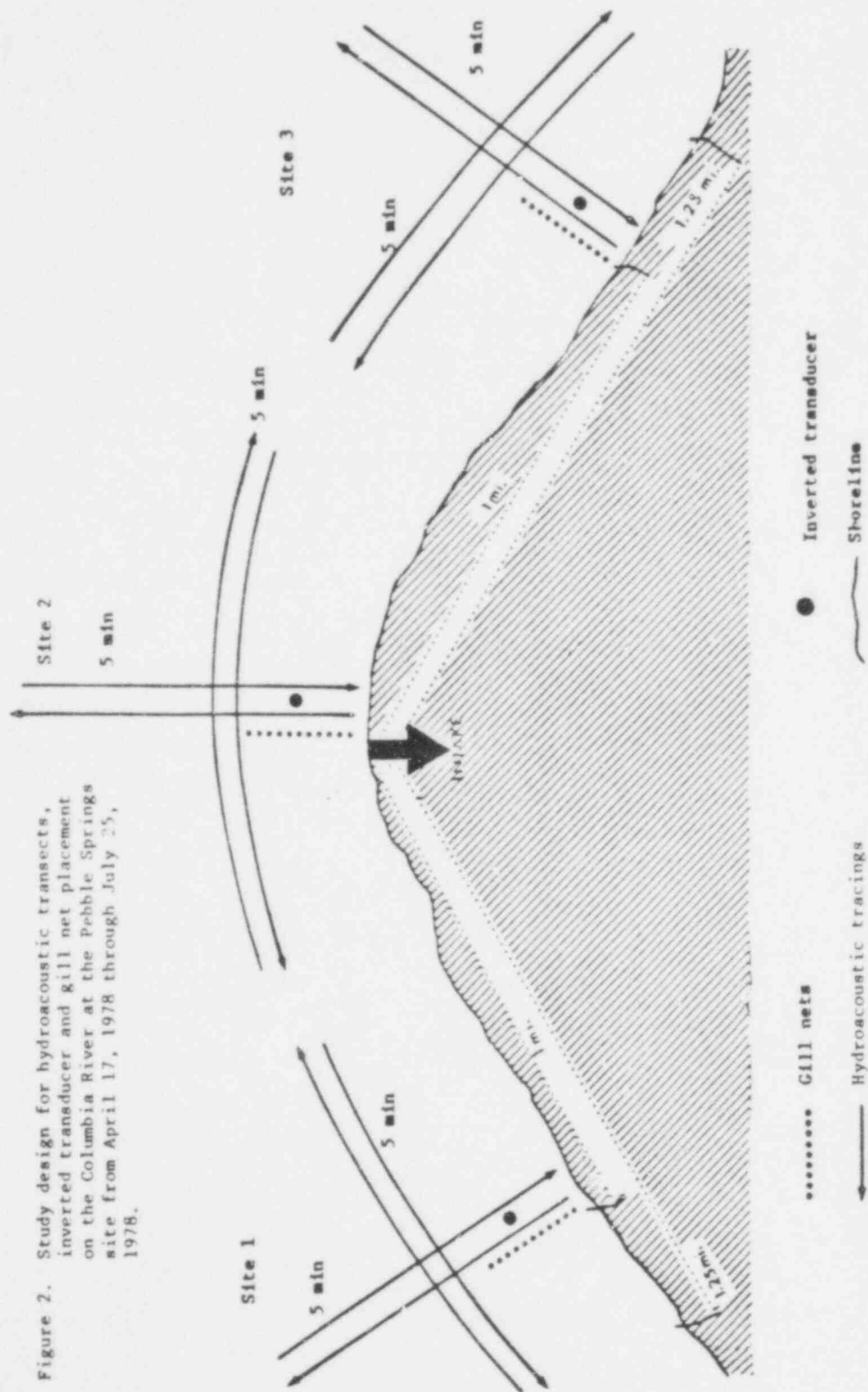


Figure 1. Locations of hydroacoustic transects at the Pebble Springs study site on the Columbia River.



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C. METHODOLOGY

1. Hydroacoustic

a. Equipment and Calibration

The hydroacoustic data acquisition system was basically a recording echo sounder. Target information was stored in two ways, as echograms, and on magnetic tape. Echograms were usable only as a gross indication of fish density or depth. Analysis of the data recorded on magnetic tape yielded quantitative information on fish density, depth, and distribution.

The components of BEAK's hydroacoustic data acquisition system are shown in Figure 3. The system consisted of a Ross 200A Fineline echo sounder with a frequency of 200 kHz and a pulse control switch for 0.1 or 0.16 msec transmitter pulse duration. The transceiver was tuned to 200 kHz and calibrated to the echo sounder with a calibration oscillator switch. The transducer produced a circular beam pattern of approximately 22° full angle at 6 dB down as shown in Figure 4. The echo sounding data were converted from 200 kHz to 5 kHz by chopper and filter circuits in an interface amplifier and recorded by a standard stereophonic tape recorder. The system was described in greater detail by Thorne et al. (1972).

Other components of the hydroacoustic system included a Philips PM 3212 0-25 mHz dual channel oscilloscope. The oscilloscope monitored the transmitted or received signal during a survey and allowed accurate field calibration of the hydroacoustic system. Calibration of the transducer and measurement of the system's various power output, transmit, receiver sensitivity, and source level was performed by the Applied Physics Laboratory, University of Washington. This laboratory calibration was sufficient unless field calibration indicated a trouble source.

The voltage return of an echo from a fish is measured as a decibel level and termed its "target strength." To determine the target strength of chinook and coho smolts, BEAK conducted a series of experiments in April 1978 on contained

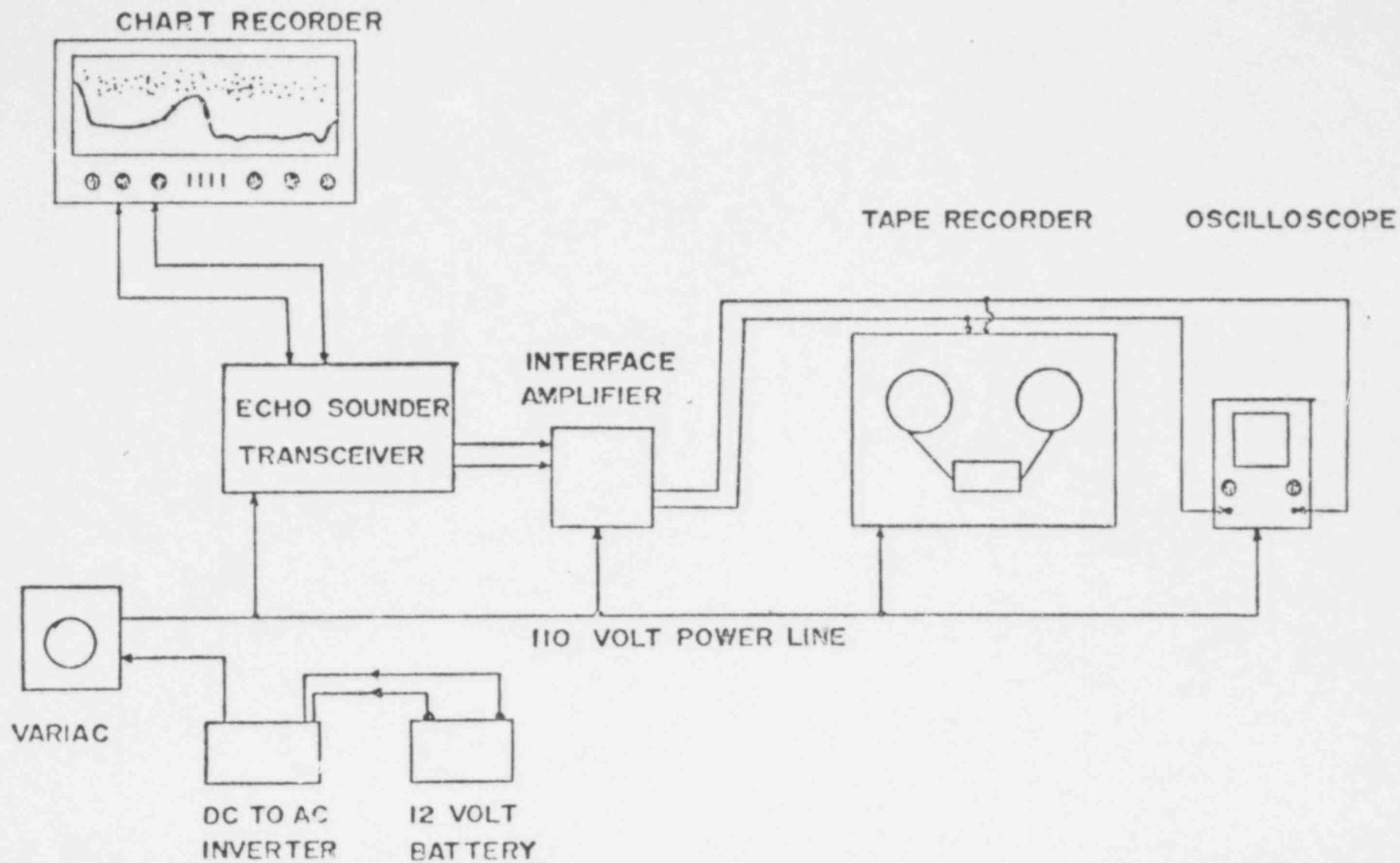


Figure 3. The hydroacoustic data collection system.
(from Nunnallee, 1974).

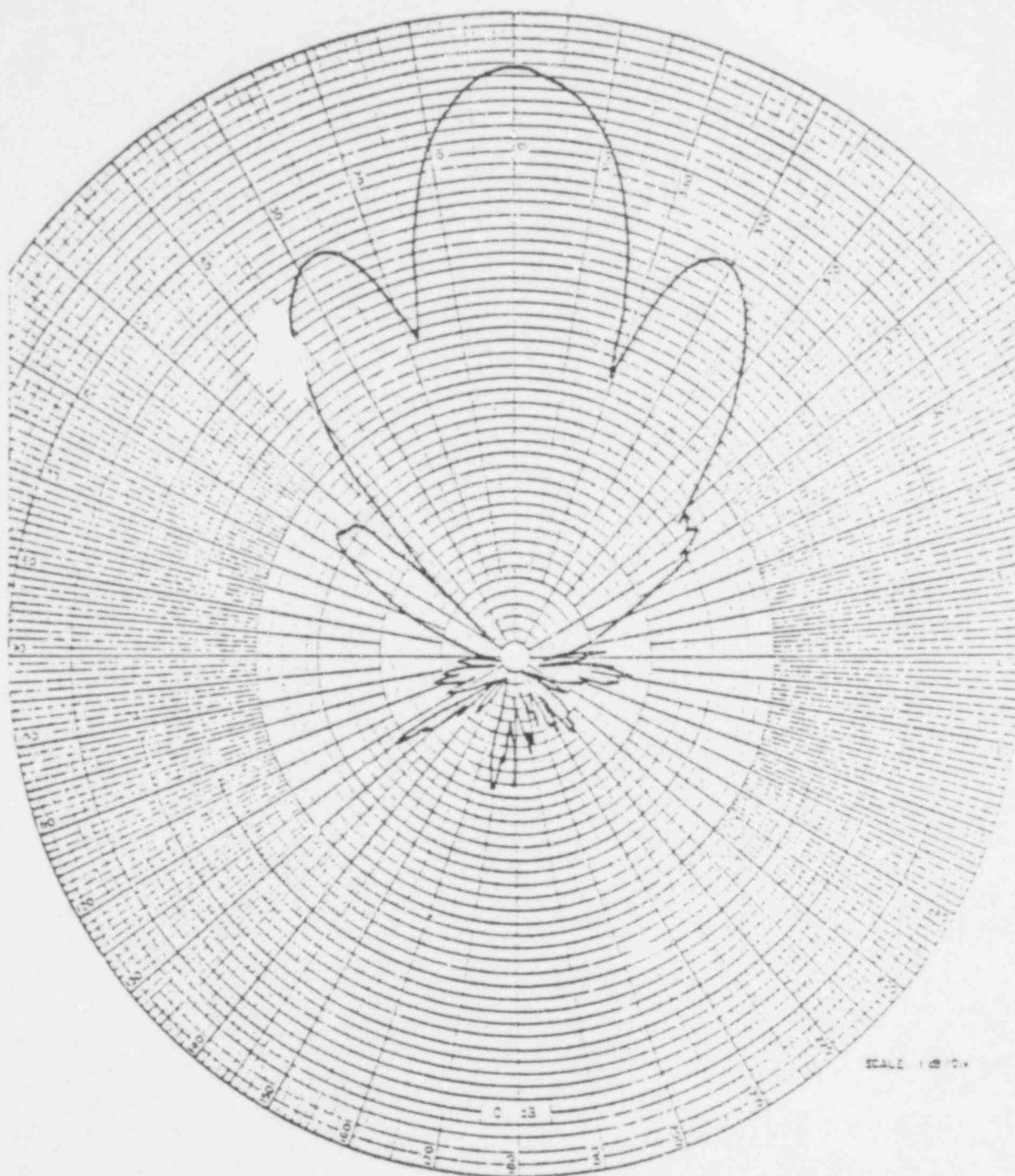


Figure 4. Directivity pattern of 200 kHz, 22° transducer used during the Pebble Springs Study on the Columbia River.

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smolts prior to initiating the study. The target strength of smolts was found to range from about 40 to 46 decibels. Submerged ping pong balls were found to have a target strength of about 41 decibels and were used as a convenient means of calibrating the hydroacoustic gear prior to each survey. This calibration technique allowed discrimination between fish of small sizes (like smolts) and larger fishes. Voltage returns from large fish saturated the magnetic tape and were excluded during tape analysis. It was felt that this method was more selective for smolts and provided reliable overall data even when considering fish aspect (the position of the fish when detected).

b. Sampling

Two acoustical techniques were employed in this study: "downlooking" and "uplooking." The downlooking technique involved the use of a boat-mounted transducer that echoed signals off the river bottom (BEAK 1978). The uplooking technique employed a hydroacoustic transducer that was anchored to the river bottom with sound waves echoed off the surface (Figure 5). The uplooking technique is particularly sensitive to fish located near the water surface. Since downstream migrating smolts tend to swim near the surface, it was felt that the uplooking technique would be more effective.

Downlooking hydroacoustic transects were run at essentially the same locations as those described above. Transects were run at each sample site for 10 minutes parallel to shore (five minutes upstream and five minutes downstream) and 10 minutes perpendicular to shore (five minutes across channel and five minutes back) (Figure 2).

Fixed location sampling with the uplooking technique was conducted at each sample site for one hour in 7 to 12 m of water (Figure 2). Hydroacoustic data were recorded on magnetic tape for five minutes every 15 minutes during the hour. The echogram ran continuously throughout the hour.

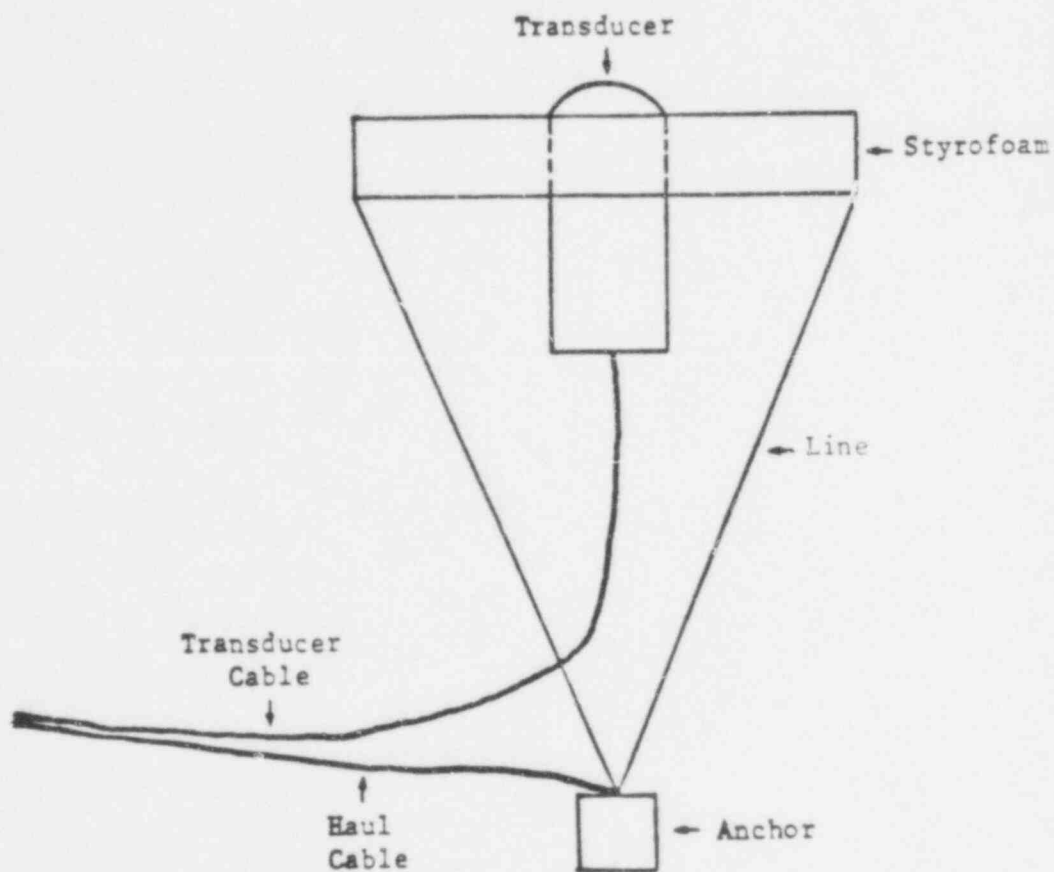


Figure 5. Diagram of inverted transducer for fixed location hydroacoustic data acquisition on the Columbia River at the Pebble Springs site from April 17, 1978 through July 25, 1978.

Both hydroacoustic techniques were used in conjunction with gill net sampling. Gill net samples provided relative abundance data for interpretation of hydroacoustic density estimates as well as an alternate estimate of smolt density. Hydroacoustic surveys were conducted simultaneously with gill net sampling both day and night at the proposed intake site and at the upstream and downstream control sites.

c. Estimates of Fish Density

Two methods have been developed for the estimation of fish densities. The first requires the use of an oscilloscope and a tape player (Nunnallee 1974), and the second includes the use of a Digital Data Analysis Unit (DDAU) computer. Fish density estimates by computer are designed for hydroacoustic data of high fish densities. The oscilloscope method is more applicable to low densities as encountered on this survey and was used throughout the study.

The signal channel output of the player was connected to the oscilloscope vertical input connector and the synchronization pulse output was applied to the external synchronization input connector. In this manner, the echo train from each transmitted pulse could be displayed over the width of the oscilloscope screen.

To separate the echoes or noise inherent in the system, a threshold just above the largest of the small echoes was established. Individual fish exceeding the threshold in each transect were counted. Threshold level decreased in proportion to depth. Compensation for the effect of depth on echo strength was made according to the technique described by Thorne (1972).

Magnetic tape recordings were analyzed 4 to 5 times until agreement was reached on the number of individual fish targets.

The number of fish detected by each pulse was treated as an independent measure of fish density, and by extension, the average density of fish within a

volume was found by dividing the total number of fish detections by the product of the corresponding effective pulse volume and the transect length.

$$\text{fish}/1,000 \text{ m}^3 = \frac{(1,000) (\text{total detections})}{(\text{effective pulse volume}) (\text{length of transect})}$$

The volume of water insonified was determined from the half angle (ϕ) of the transducer beam (see Figure 4) and water depth (Z).

$$V = \frac{(Z \tan \phi) Z(2)}{2} = Z^2 \tan \phi$$

Correcting for the upper 3 meters not insonified

$$V = Z^2 \tan \phi - 3^2 \tan \phi$$

$$V = (Z^2 - 3^2) \tan \phi$$

$$\text{Length of transect} = (\text{boat speed, Kts}) (\text{time, min}) \left(\frac{1,854}{60}\right)$$

The uplooking technique provided estimations of relative fish density at the three sampling stations. During each one-hour sampling interval, the number of targets recorded during four five-minute observations were counted and reduced to the mean number of fish per five-minute observation.

d. Data Analysis

Magnetic tape recordings of hydroacoustic data were analyzed by the echo counting method described by Nunnalee (1974) utilizing a Phillips PM 3212 0-25 MHz dual channel oscilloscope.

2. Gill Nets

Experimental monofilament, variable mesh gill nets 3.66 m by 45.7 m were utilized in the study. The nets incorporated six panels of 1.27, 2.54, and 3.81 cm square-mesh netting. During the course of the downlooking hydroacoustic transects a gill net was placed at each location and left in position for 30 minutes (Figure 2). At the end of the 30 minutes, the net was pulled, fish identified, counted, weighed, and fork lengths determined.

During each fixed location or uplooking hydroacoustic set, a gill net was placed immediately downstream of the inverted transducer (Figure 2) and left in

position for one hour. At the end of the hour the transducer was hauled up and the gill net was pulled. The fish were identified, counted, weighed, and measured.

All nets were tended continuously at the request of the Oregon Department of Fish and Wildlife to reduce salmonid mortalities. Dead adult salmonids were cleaned, iced, and turned over to the Oregon State Police.

D. RESULTS

1. Gillnetting

The total gill net catch during the interval April 17, 1978 through July 25, 1978 was 289 individuals representing 11 species (Appendix A, Table 1). Sockeye and chinook salmon and rainbow trout-steelhead were the only salmonid species captured. Gill net time during the downlooking hydroacoustic studies amounted to 24 hours with 58 fish captured. Gill net time during the uplooking studies amounted to 48 hours and 231 fish (80 percent of the total catch). Smolts made up 4.1 percent of the total catch and were approximately evenly distributed between day and night.

Figures 6-8 illustrate catch/effort values (number/hour) for salmonids and nonsalmonids captured by set gill nets downstream (net 1), at the proposed intake site (net 2), and upstream (net 3). Data from gill net sets conducted with uplooking and downlooking hydroacoustics (Appendix A, Table 2) were combined in these figures. The night catch/effort values were generally greater than day values. The largest catch occurred June 19 at night in net 2 (37 individuals, most of which were chiselmouth).

The largest smolt catch of the study (five chinook salmon/hour) occurred during the day on July 12 at the downstream station (Figure 6). Other salmonid catches at the downstream station occurred on May 25 (one chinook salmon adult), June 19 (one sockeye smolt), July 12 (one steelhead) and July 25 (three sockeye smolts). The nonsalmonid species collected in the downstream net were predominantly northern squawfish and chiselmouth.

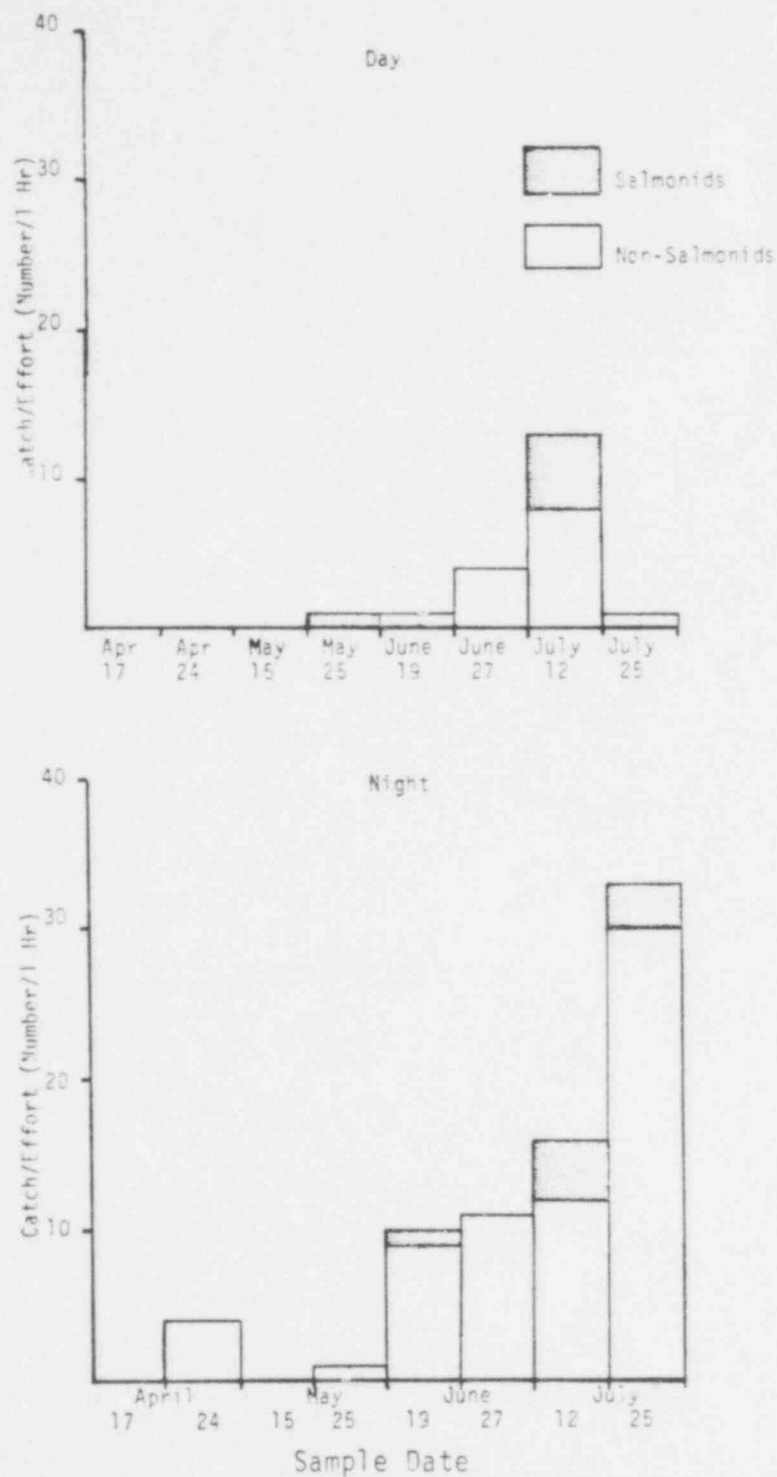


Figure 6. Day and night catch/effort values (number/hr) for salmonids and non-salmonids collected in experimental gill net Number 1 downstream of the proposed intake site at the Pebble Springs site on the Columbia River from April 1978 through July 1978.

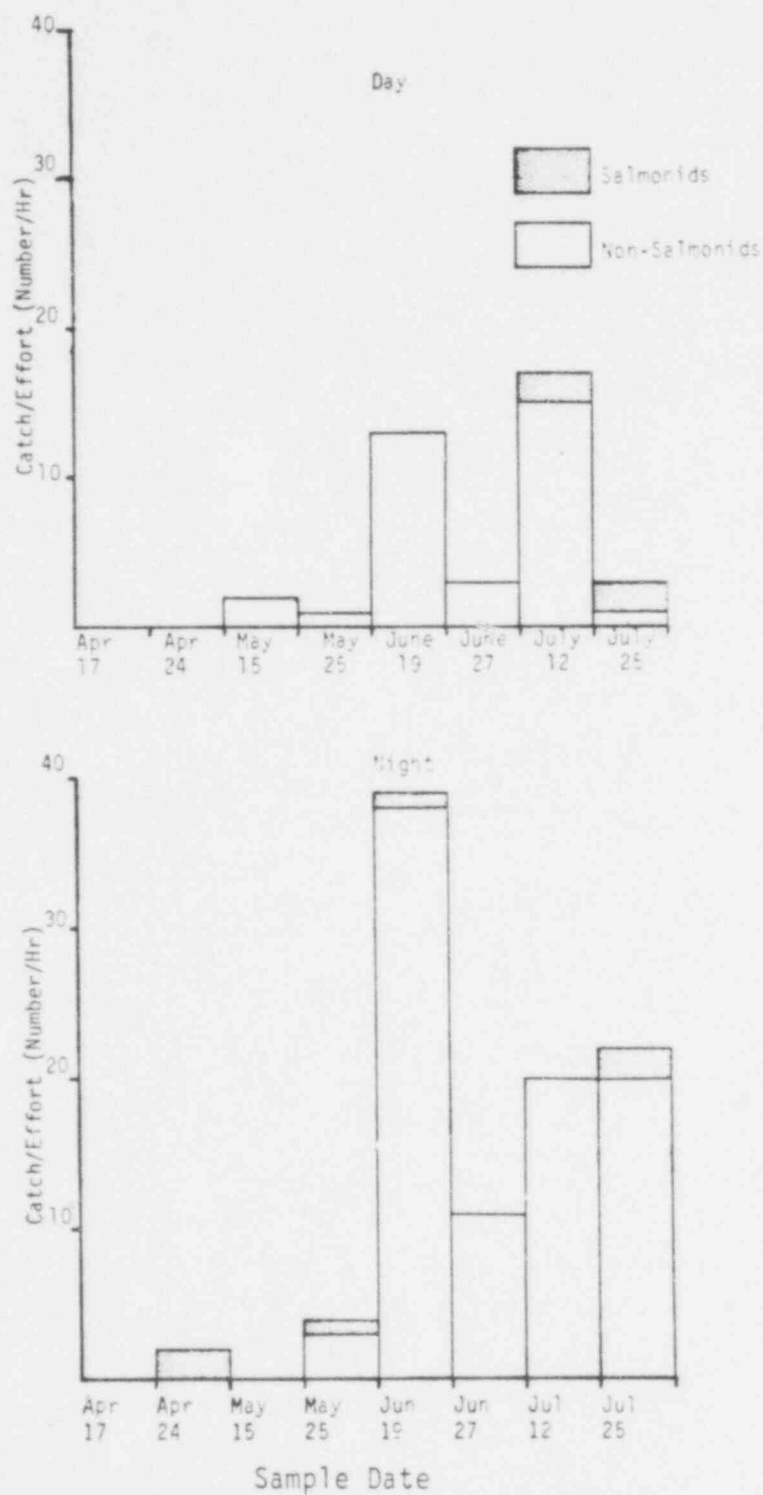


Figure 7. Day and night catch/effort values (number/hr) for salmonids and non-salmonids collected in experimental gill net Number 2 at the proposed intake site at the Pebble Springs site on the Columbia River from April 1978 through July 1978.

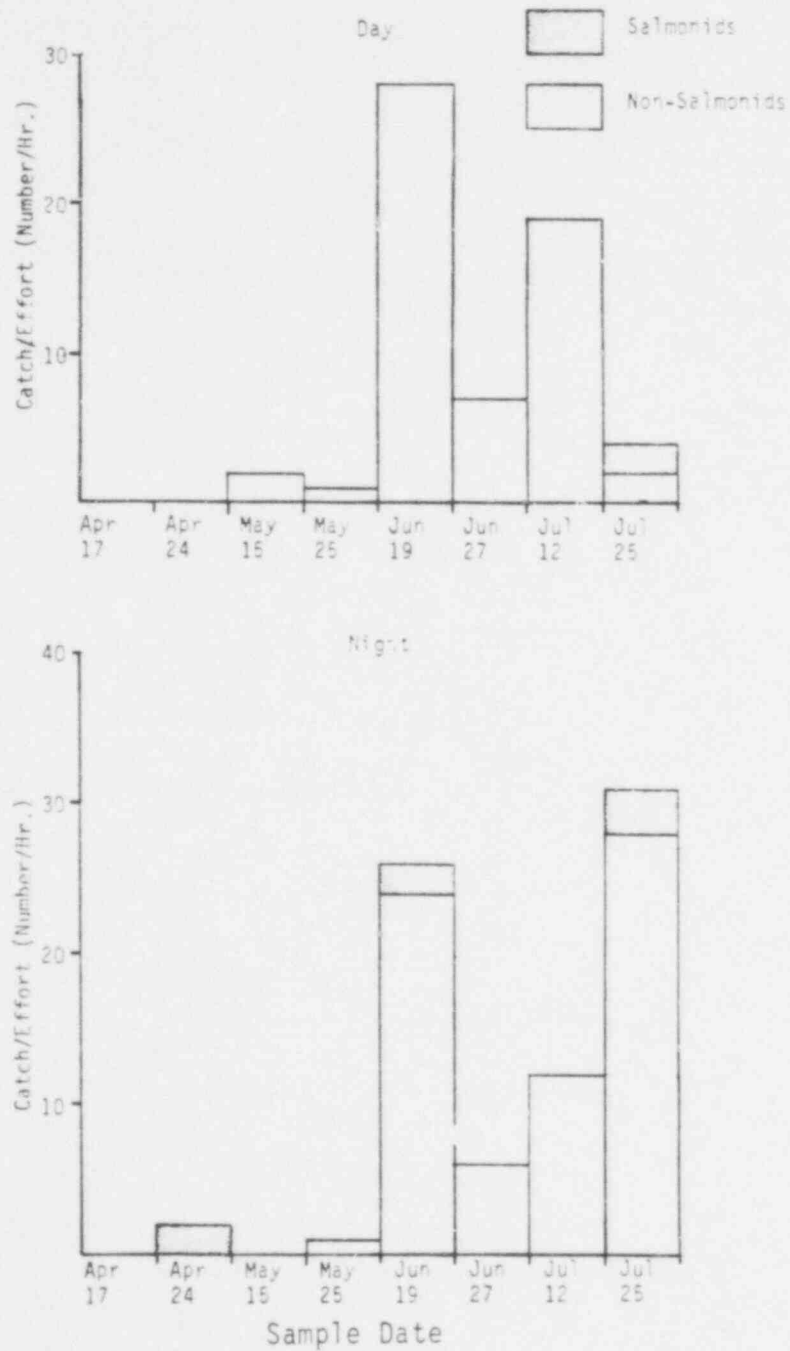


Figure 8. Day and night catch/effort values (number/hr) for salmonids and non-salmonids collected in experimental gill net Number 3 upstream of the proposed intake site at the Pebble Springs site on the Columbia River from April 1978 through July 1978.

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Figure 7 illustrates the catch/effort values for net 2, which was located in the area of the proposed intake. Salmonid catches occurred on April 24 (two chinook smolts), May 25 (one chinook adult), June 19 (one chinook juvenile), and July 25 (four sockeye smolts). Net 2 caught fewer salmonids than the downstream net (net 1) but slightly more than the upstream net (net 3).

Catch/effort values for the upstream net are shown in Figure 8. Salmonid catches occurred on April 24 (two chinook smolts), June 19 (one chinook and one sockeye smolt) and July 25 (four sockeye smolts). The nonsalmonid species collected in the upstream net were predominantly northern squawfish and chiselmouth.

Length-frequency distributions of the fish caught in gill nets at each station were similar (Figures 9-11 and Appendix A, Tables 3 and 5). The majority of fish fell into the 20 to 30 cm size range. Most of these fish were young sucker, northern squawfish and chiselmouth. Most of the salmonid smolts were in the 10 to 20 cm size range. Fish in the 0 to 10 cm size range were primarily redbside shiners. Adult chinook salmon ranged from 70 to 90 cm; the single steelhead captured fell into the 30 to 40 cm size range. No adult sockeye salmon were captured. It should be noted that larger size classes of fish were generally excluded from the samples due to the small mesh opening of gill net. Adult salmon occasionally become entangled in small mesh gill nets even though they are too large to be gilled.

Mean wet weights of the species caught in the gill nets at each site are presented in Appendix A, Table 4. Due to the low numbers of salmonids captured, no attempt was made to calculate biomass per unit effort from the weight data.

Total numbers and percentage composition of fishes caught in gill nets during downlooking studies and uplooking studies are compared in Appendix A, Table 6. Salmonid smolts comprised 11.5 percent of the day catch and 8.7 percent of the night catch during downlooking studies, but only 2.3 percent of the day catch and 2.6 percent of the night catch during uplooking studies.

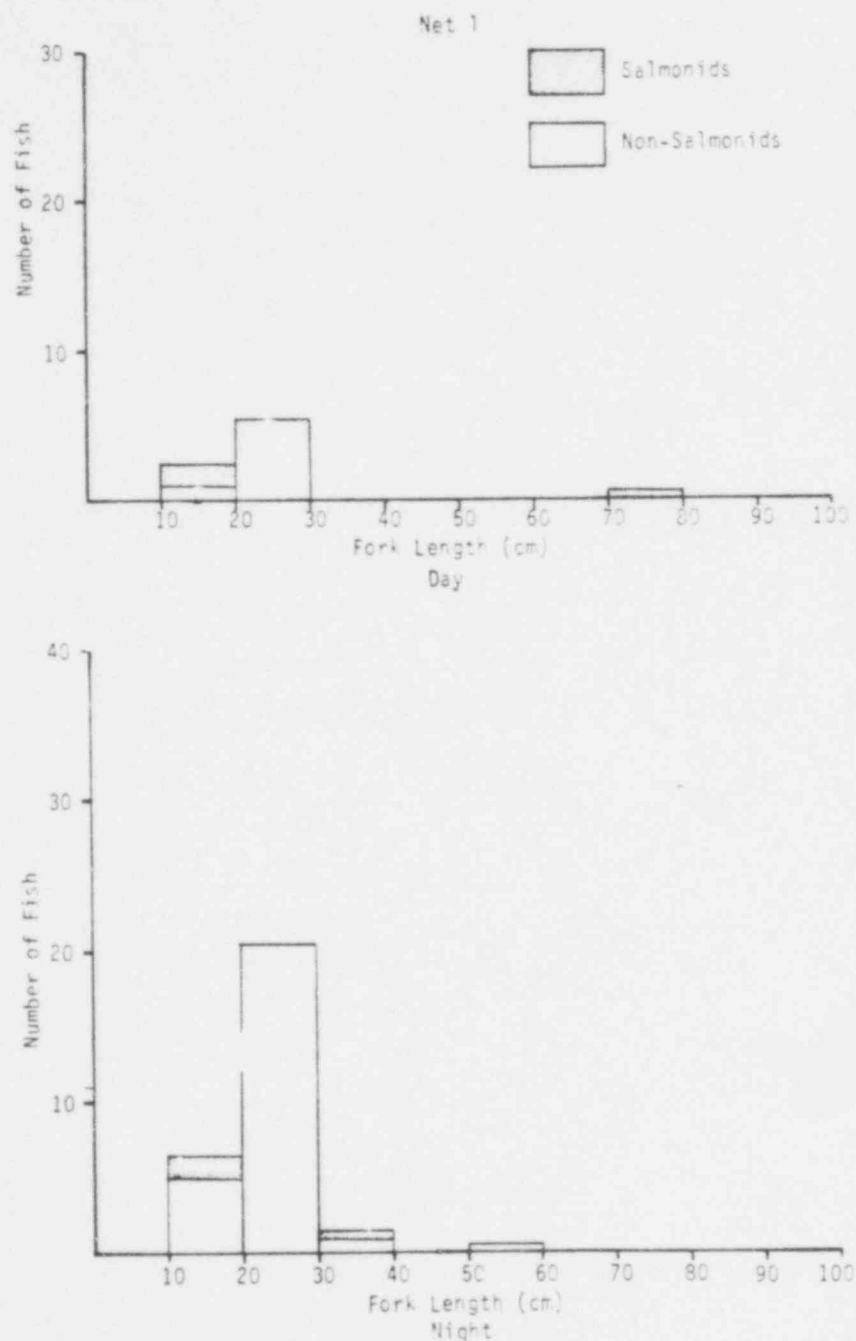


Figure 9. Length-frequency distribution of salmonids and non-salmonids collected in experimental gill nets at Site 1 during day and night sampling downstream of the proposed intake site at the Pebble Springs study site on the Columbia River from April 17, 1978 through July 25, 1978.

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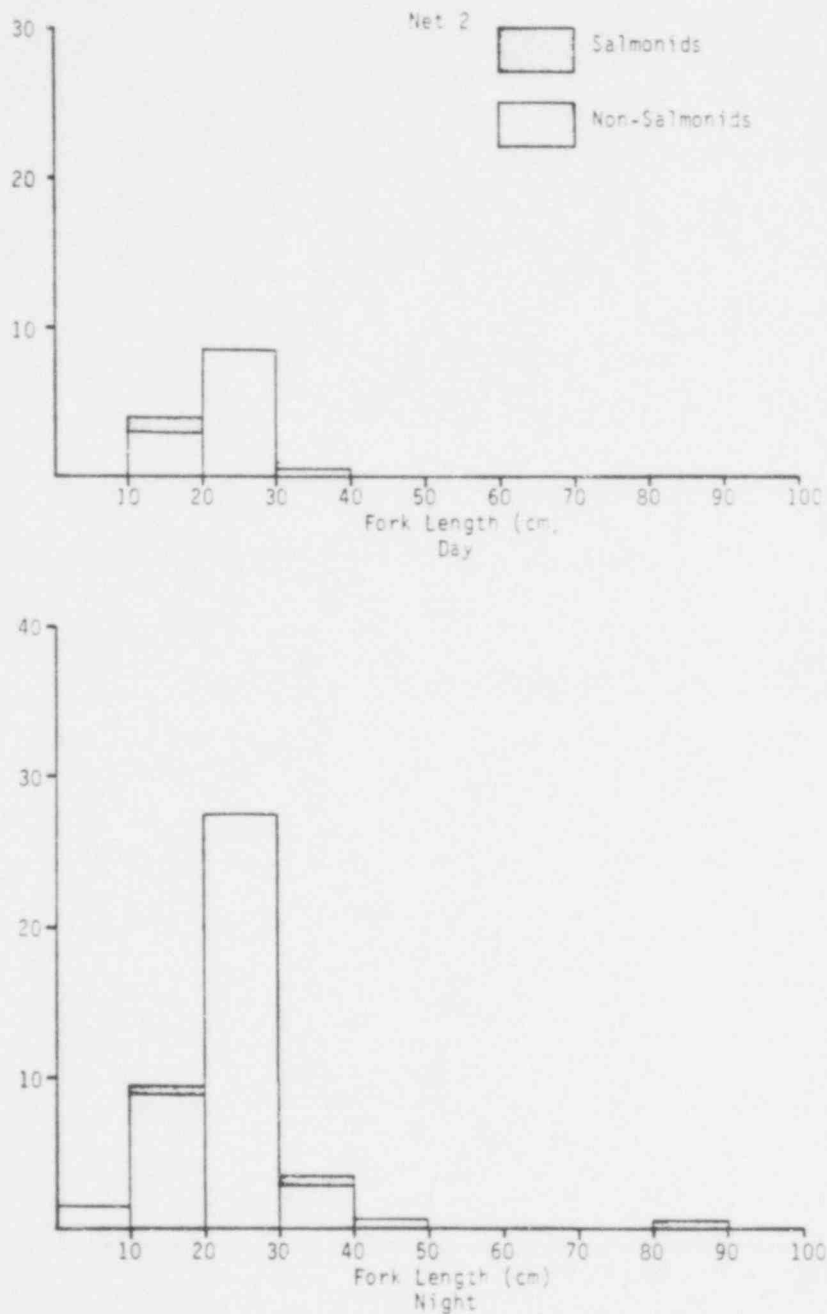


Figure 10. Length-frequency distribution of salmonids and non-salmonids collected in experimental gill nets at Site 2 during day and night sampling at the proposed intake site at the Pebble Springs study site on the Columbia River from April 17, 1978 through July 25, 1978.

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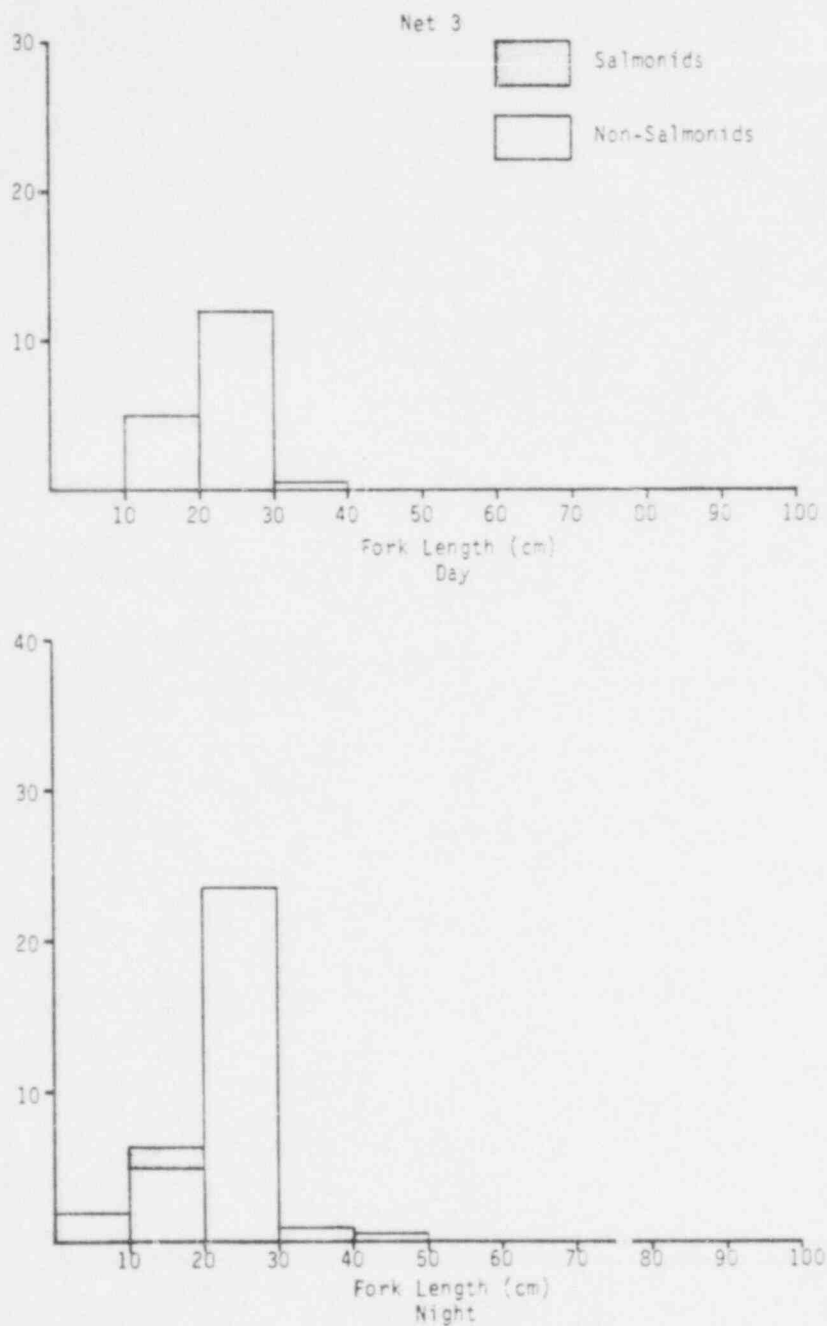


Figure 11. Length-frequency distribution of salmonids and non-salmonids collected in experimental gill nets at Site 3 during day and night sampling upstream of the proposed intake site at the Pebble Springs study site on the Columbia River from April 17, 1978 through July 25, 1978.

2. Hydroacoustic Studies

The result of both the uplooking and downlooking hydroacoustic studies indicates that very few smolt-size fish were present at any of the sampling stations during the time intervals sampling was conducted. Results of the uplooking hydroacoustic samples are presented in Table 7. The largest number of smolt-size targets recorded during a five-minute uplooking observation (four targets) occurred at station 1 on April 17 and on July 25. One target per five-minute observation was the largest number of targets recorded at the proposed intake site (station 2). The downstream station (station 1) had the largest total number of targets during the study. However, no significant station difference in relative fish density were detected.

Results of the downlooking transect surveys are shown in Table 8. Very few targets were recorded during either day or night surveys. No distribution patterns or station differences in fish density could be determined.

E. DISCUSSION

Results of gill net and hydroacoustic studies conducted between April 17 and July 25, 1978 indicate very low numbers of salmonid smolts in the vicinity of the proposed Pebble Springs intake. These results could be due to several factors. First is the impact of the U.S. Army Corps of Engineers (USACE) smolt transport program. Since 1977 the USACE has conducted a smolt trapping and hauling program at Lower Granite and Little Goose dams on the Snake River. In 1978 additional trapping and hauling was initiated at McNary Dam on the Columbia River. The captured smolts were hauled to a release site below Bonneville Dam. In 1978, the USACE hauled 1.6 million chinook and 1.4 million steelhead from the Snake River Dams and 32,000 chinook, 21,000 steelhead, 22,000 coho and 7,000 sockeye from McNary Dam. This program may have resulted in reductions in the number of smolts passing the proposed intake site. The USACE plans to continue the trapping and

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hauling program in 1979. At the present time continuation of the program is determined on a year-to-year basis by state and federal fisheries agencies (see letter from E. M. Mains, Chief, Environmental Resources Branch USACE in Appendix B).

Second, the migratory patterns of smolts in the study area are poorly understood. It is possible that the downstream migratory routes selected by the majority of smolts result in avoidance of the intake site. Although most of the available literature indicates that smolts tend to migrate along the shores of rivers (Mains and Smith 1964) there is relatively little information on their movement through impoundments. The sampling program was not designed to examine densities of fish in the midstream area or on the opposite shore. If this had been done, it is possible that migratory routes would have been identified, thereby, providing an alternate explanation for the low densities in the study area.

Third, it is possible that sampling techniques did not provide a representative estimate of the number of smolts in the area. This is unlikely due to the variety of sampling methods employed. Gill netting and hydroacoustic sampling are techniques known to be effective in the estimation of fish density. Of the two hydroacoustic methods employed, the uplooking technique probably provided the best estimate of smolt-size fish density. The downlooking technique is considered less efficient due to potential problems associated with smolt avoidance of the noise created by the boat and the inefficiency of the gear in recording near-surface fish. The fact that all three sampling techniques indicated low densities of smolts provides strong support for the conclusion that smolt densities were very low at the time of sampling.

Finally, there is a possibility that the sampling frequency of two days per month was not sufficient to detect representative smolt densities. Peak smolt migratory periods in the Upper Columbia River are known to occur during the months that the study was conducted. However, it is also recognized that factors such as

water temperature, flow conditions and turbidity can influence migratory rates (Raymond 1968; USACE 1956). If one or more sampling dates happened to fall on a temporary period of slow migration, the measured densities may not have been representative of average daily densities preceding and following the sampling period.

Statistical analysis of the hydroacoustic data indicated no significant station differences in relative fish density. However, more targets were recorded at the downstream station (station 1) and gill net catches were generally higher at the downstream station. Significantly higher fish densities were found at the downstream station in 1977 (BEAK 1978). Differences in habitat characteristics might explain why more fish would be present at the downstream site. Unlike the intake and upstream stations, the downstream station has back eddies and a shallow ledge that apparently make it a potential habitat for fishes, such as squawfish and chiselmouth. Gill net samples taken concurrently with the hydroacoustic samples in this study indicate that the relatively higher densities of targets that occurred occasionally at downstream sites were probably caused by nonsalmonid fishes.

Fish densities from the downlooking hydroacoustics were considerably lower than those reported in the Pebble Springs Final Report (BEAK 1978). This was probably due to calibration of the gear for smolt-size fish. In the previous study, no attempt was made to discriminate between large and small fish.

CONCLUSION:

Data from the hydroacoustic and gill net studies indicate that very low numbers of salmonid smolts were present in the vicinity of the proposed Pebble Springs intake during the interval April 17 through July 25, 1978. These findings are consistent with the data obtained during 1977 (BEAK 1978). The low number of smolts in this area may be, in part, a reflection of the effectiveness of the USACE smolt transport program. However, it is also possible that smolt migratory routes through the John Day pool avoid the proposed intake area. In either case, the data

indicate that the proposed Pebble Springs intake would not pose a serious threat to downstream migratory salmonids.

II. LONG-BILLED CURLEWS

A. INTRODUCTION

One of the more conspicuous nesting birds in the Pebble Springs area is the Northern Long-billed Curlew (Numenius americanus parvus) (Rogers et al. 1976). This subspecies was formerly listed as "status undetermined" indicating that it "has been suggested as possibly threatened with extinction" (U.S. Department of Interior 1973), and is currently under consideration for endangered or threatened status by federal wildlife agencies. The major reason for this consideration is the extensive loss of curlew breeding habitat to agricultural development (David Marshall pers. comm. Aug. 1977, U.S. Fish and Wildl. Serv.).

The Long-billed Curlew commonly bred throughout the prairie regions of the United States and southern Canada prior to the 1900's (Bent 1929) but the extensive conversion of open prairie and rangelands to cultivated farmland has greatly reduced the present occurrence of breeding curlews to scattered populations in the western U.S. (U.S. Department of Interior 1973). This is especially true of the Gilliam, Morrow, and Umatilla Counties where thousands of acres of potential breeding habitat (shrub-steppe) have been converted to irrigated agricultural circles in the last few years (Melland undated, John Kurtz pers. comm. April 1977, Umatilla Natl. Wildl. Refuge).

Current information on curlew breeding behavior and the status of their population levels is limited. BEAK, therefore, developed a program to provide information on these factors which would assist in determining the effect of construction and operation of the Pebble Springs nuclear power plant and ancillary facilities on curlews. This report reviews information collected during 1978 to supplement data gathered during 1977 and provide additional information on the curlew populations of the Pebble Springs study area.

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B. METHODS

Field studies were conducted during 1978 to collect information on the Long-billed Curlew populations in the Pebble Springs study area. Road surveys were undertaken to determine the distribution, seasonal occurrence, habitat usage, and nesting activities of the curlews in the area. The sampling methods were similar to those used in 1977 (BEAK 1978a) with slight modifications. The data generated each year are comparable within the constraint of these modifications.

Four road survey transects (A, B, C, D) were established to survey Long-billed Curlews in the Pebble Springs study area with an observation corridor of 0.5 km on either side of the route (Figure 12). They vary slightly from those used in 1977 (BEAK 1978a). Road transects were systematically run weekly in April, twice a month in May and June, and monthly in July and August in 1978. In 1977 the same schedule of site visits occurred but surveys were conducted on two consecutive days for each site visit. Therefore, the sampling intensity in 1978 was about one half as great as the 1977 investigations. Lengths of the transects and extent of major habitat type occurring in each transect corridor are presented in Appendix C. The routes were designed to provide a broad and representative inventory of the Pebble Springs study area. During each site visit the road transects were driven by two observers in a 4-wheel drive vehicle. These observers plotted the number and location of all curlews observed within the observation corridor on a field data map. A separate data map was used to record curlew observations for each site visit.

Long-billed Curlew habitat usage information was also collected during the road surveys. Curlews that were using an area (e.g., perched, feeding, or nesting) when first detected were included in the analysis of habitat usage. Birds that were observed over an area but were not actually utilizing the habitat (i.e., flying, "mobbing") were omitted from the analysis.

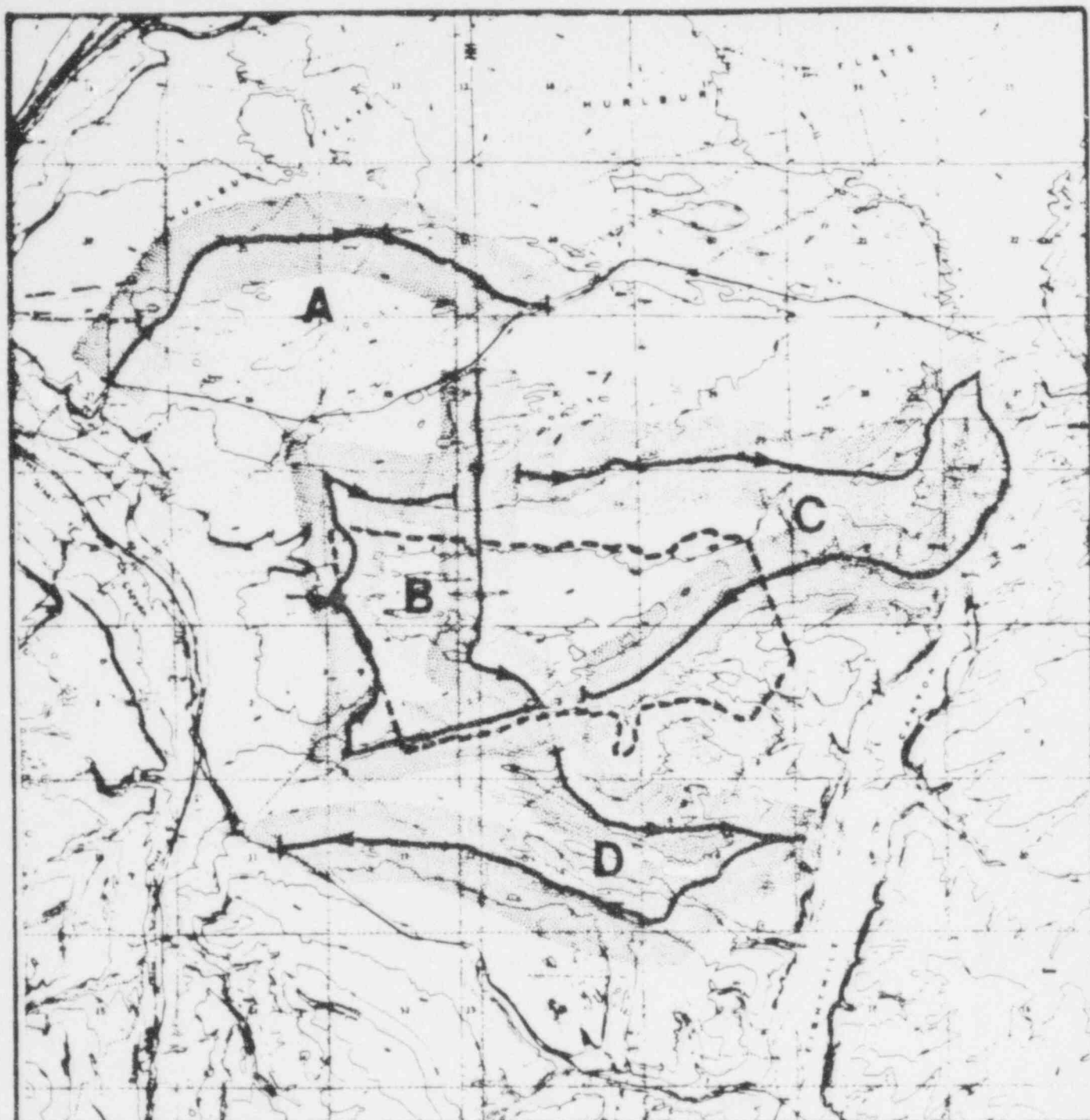
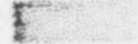


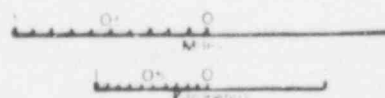


Figure 12. Survey routes and 0.5 km observation corridors on the Pebble Springs study area from 7 April to 8 August 1978.

-  Observation corridor
-  Survey routes
-  Future impoundment boundary



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No systematic nest searches were undertaken but incidental surveys were conducted if behavior of birds indicated a potential nesting location. In addition, a composite map of curlew observation was developed to assist in determining location of territorial pairs. Repeated observations of one or two birds exhibiting feigning or defense behavior in the same area during two or more visits were assumed to designate a territorial pair.

C. RESULTS AND DISCUSSION

Long-billed Curlews were observed from 7 April when studies were initiated to 25 July 1978 (Figure 13, Appendix D). In contrast, 16 June was the latest observation of curlews on the Pebble Springs study area in 1977.

The observations of Long-billed Curlews fluctuated greatly along the individual road transects during the survey period (Figure 13, Appendix D) in 1978. The high number of curlews observed on Transect A in July was probably a late occurring flock of migrants passing through the area or a concentration of local curlews engaged in premigratory staging. A segment of this flock (minimum of 20 birds) were females which typically have left on migration by the first week of July (Mel-land undated, BEAK 1978b). This implies that at least a portion of this flock were northern birds moving through the area. Tremaine (1975) reported that sporadic flocks from farther north passed through her study area after the breeding birds had departed. Transect B values were consistently high during most of the study period and the transect appeared to support the highest number of potentially breeding curlews in the study area. The increase in curlew numbers near the end of the study (June and July) probably reflected a combination of premigratory staging and reproductive recruitment. Transect C supported a high number of curlews in mid-April but the number of observations declined greatly by the end of the month. Values for Transect D were generally low throughout the study period.

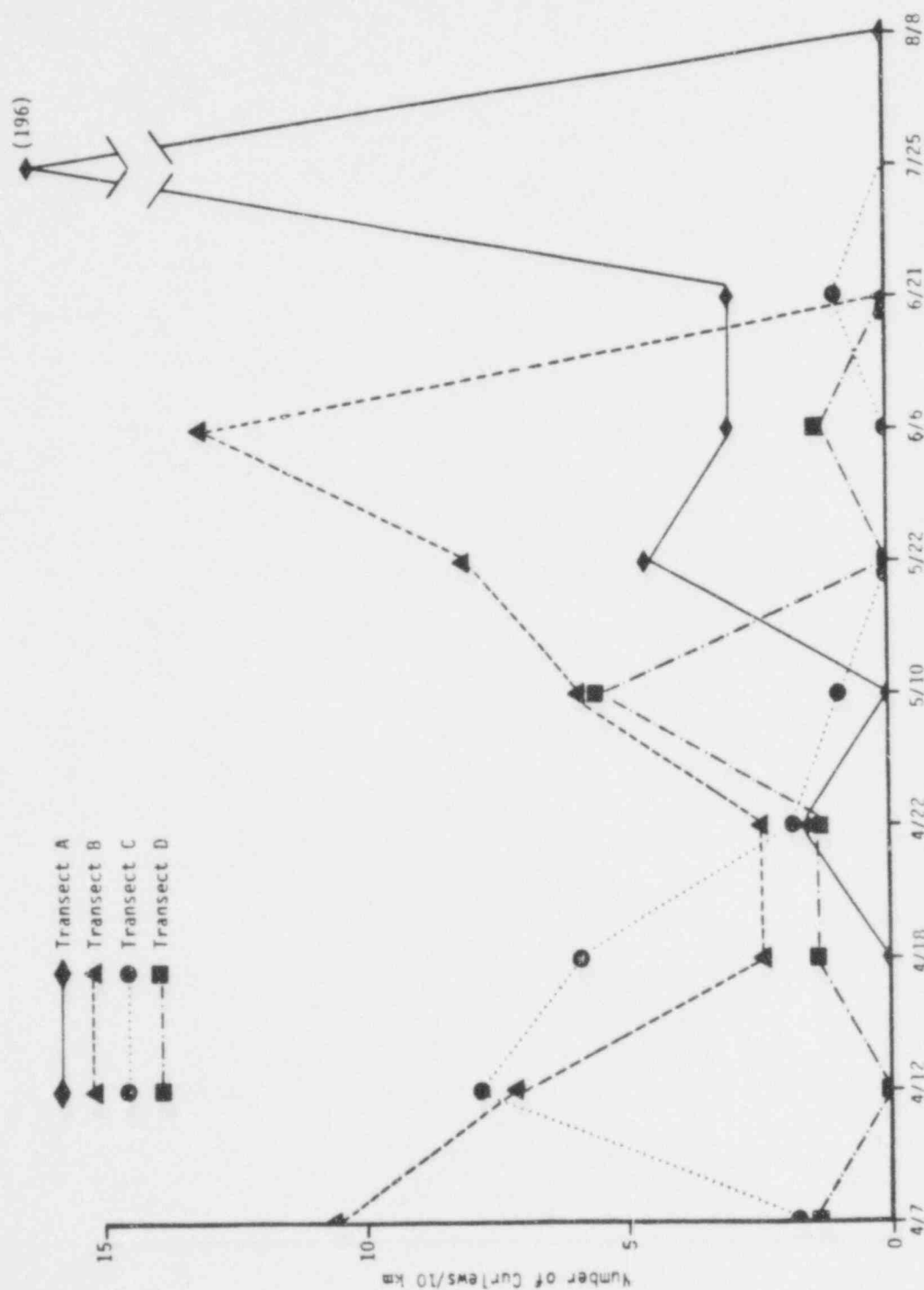


Figure 13. Number of Long-billed Curlews observed per 10 Km of road survey at the Pebble Springs study area in 1978.

The number of curlews observed per site visit was generally lower during 1978 than 1977 (Figure 14). Patterns of abundance were generally similar for the two years. During the early part of the studies (April and May) the variations in observed numbers were of low magnitude and probably reflected a relatively stable breeding population. Only the observation of the large flock of late occurring curlews in 1978 departed from the pattern of abundance for 1977. The occurrence of these migratory flocks is probably sporadic and their observation may have been a chance occurrence due to the limited number of site visits during the fall migratory period.

Curlew observations were distributed throughout the study area but areas of concentration were noted (Figure 15). These concentration areas shifted in 1978 from those observed in 1977 (BEAK 1978a). The most notable difference occurred in the central portion of the reservoir where no large groups were observed as were seen in 1977.

Along the survey routes curlew observations were located exclusively in the rabbitbrush/cheatgrass (Chrysothamnus nauseosus/Bromus tectorum) community (Appendix E). However, the rabbitbrush/cheatgrass community occupied almost the entire survey area with only small amount of other habitats (i.e., sagebrush, bitterbrush, cultivated) available. Therefore, curlew observations appeared to be roughly in proportion to those amounts of habitat available. Although information on habitat preferences was inconclusive the lack of curlew observations in sagebrush or cultivated areas does appear to agree with studies by MacCallum et al. (1977), Grimes et al. (undated), Bent (1929), BEAK (1978b), Melland (undated), and Tremaine (1975). Information from these studies indicate that rabbitbrush/cheatgrass community apparently provides a sparse, short-statured vegetation that curlew prefer during the breeding season for nesting and feeding.

Observer biases due to varying ability to locate birds in the habitat types



Figure 14. Total number of Long-billed Curlews observed per site visit at the Pebble Springs study area in 1977 and 1978. Values for 1977 are based on average number of curlews observed during two-day site visits on comparable dates.

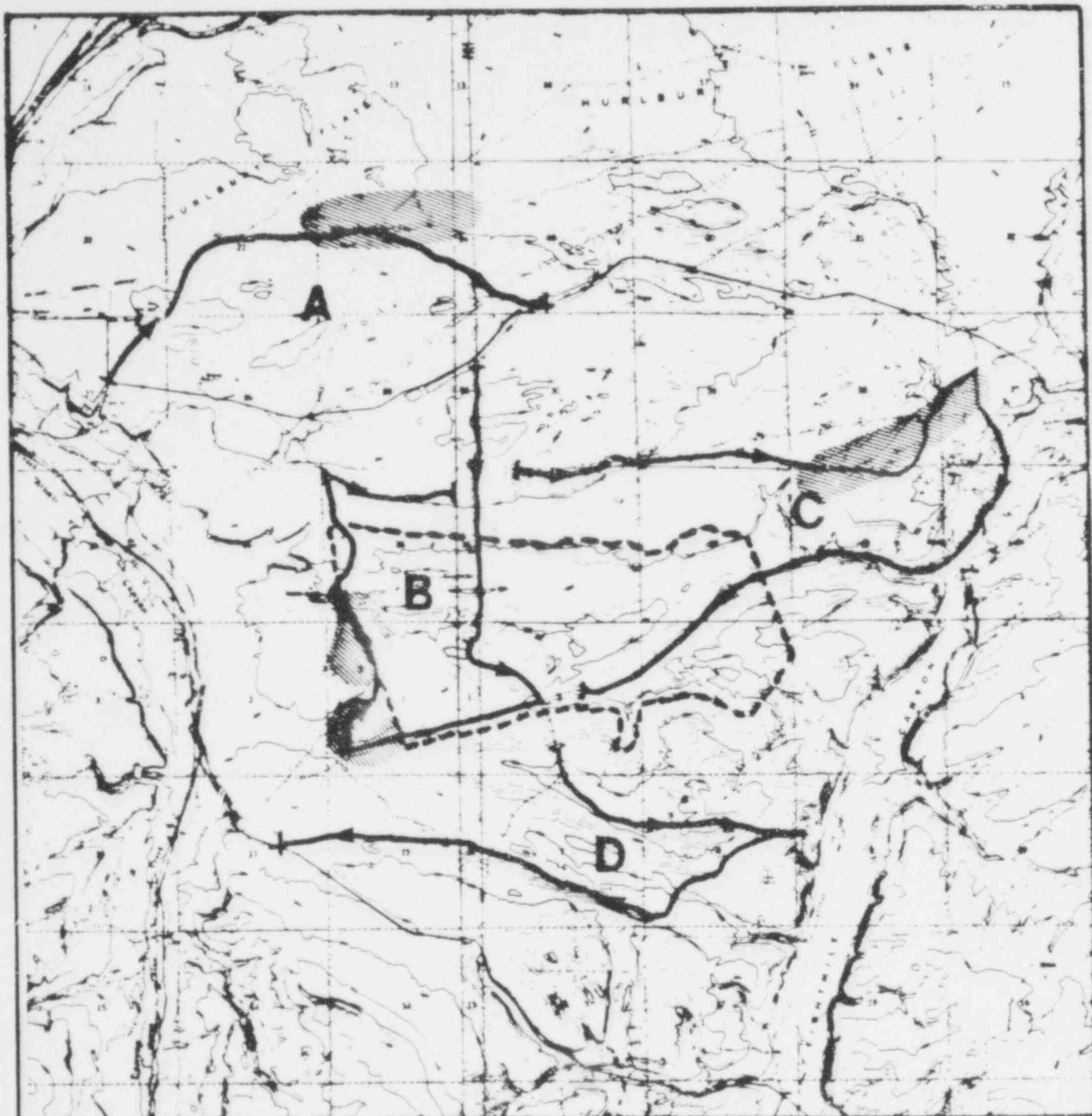



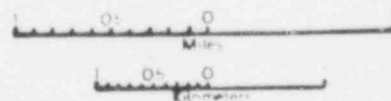


Figure 15. Concentration areas of Long-billed Curlews on Pebble Springs study area from 7 April to 8 August 1978.

-  Areas of concentration
-  Survey routes
-  Future impoundment boundary



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may have influenced the results. Birds in the low, sparse vegetation of the rabbitbrush/cheatgrass habitat may have been easier to locate than birds in the dense, tall stands of sagebrush and bitterbrush. While this may be an important factor, it does not appear to account for the observed difference in usage between habitat types. In addition, breeding activities (i.e., calls, courtship and defensive flights) of the curlews were generally quite conspicuous and would have been easily observed in the sagebrush/bitterbrush habitats. Findings reported by BEAK (1978b) appeared to verify this assumption.

A minimum of four territorial or nesting pairs of Long-billed Curlews were judged to be using the study area based on composite mapping of bird observations (Figure 16) but these estimates are highly speculative due to the limited number of site visits. No nests or juveniles were located during 1978, although, incidental searches were made on several occasions when behavior of the birds indicated a potential nesting site. The number of territorial pairs using the study area in 1978 was lower than in 1977, and only two of the territorial pairs observed in 1978 occurred in locations similar to those reported in 1977 (BEAK 1978a).

Atypical weather conditions (i.e., drought, late frost) reported during 1976 and 1977 were presumed to have disrupted curlew breeding activities. Data collected during 1978 was to be used to determine what might occur during more normal climatic conditions. However, data for 1978 indicate that curlew populations and the number of territorial pairs were generally lower in 1978 (BEAK 1978). In addition, the distribution of the observations of curlews also shifted. Factors that may have contributed to this decline are unknown but Tremaine (1975) indicated that following a year of low reproductive success, 30% of the nesting territories could be vacant the next year. During 1977 no fledged juveniles were observed at Pebble Springs or Boardman (BEAK 1978a,b). Similarly Meiland (undated) indicated that no young curlews were observed in 1977 in Heppner-Hardman area, south of the

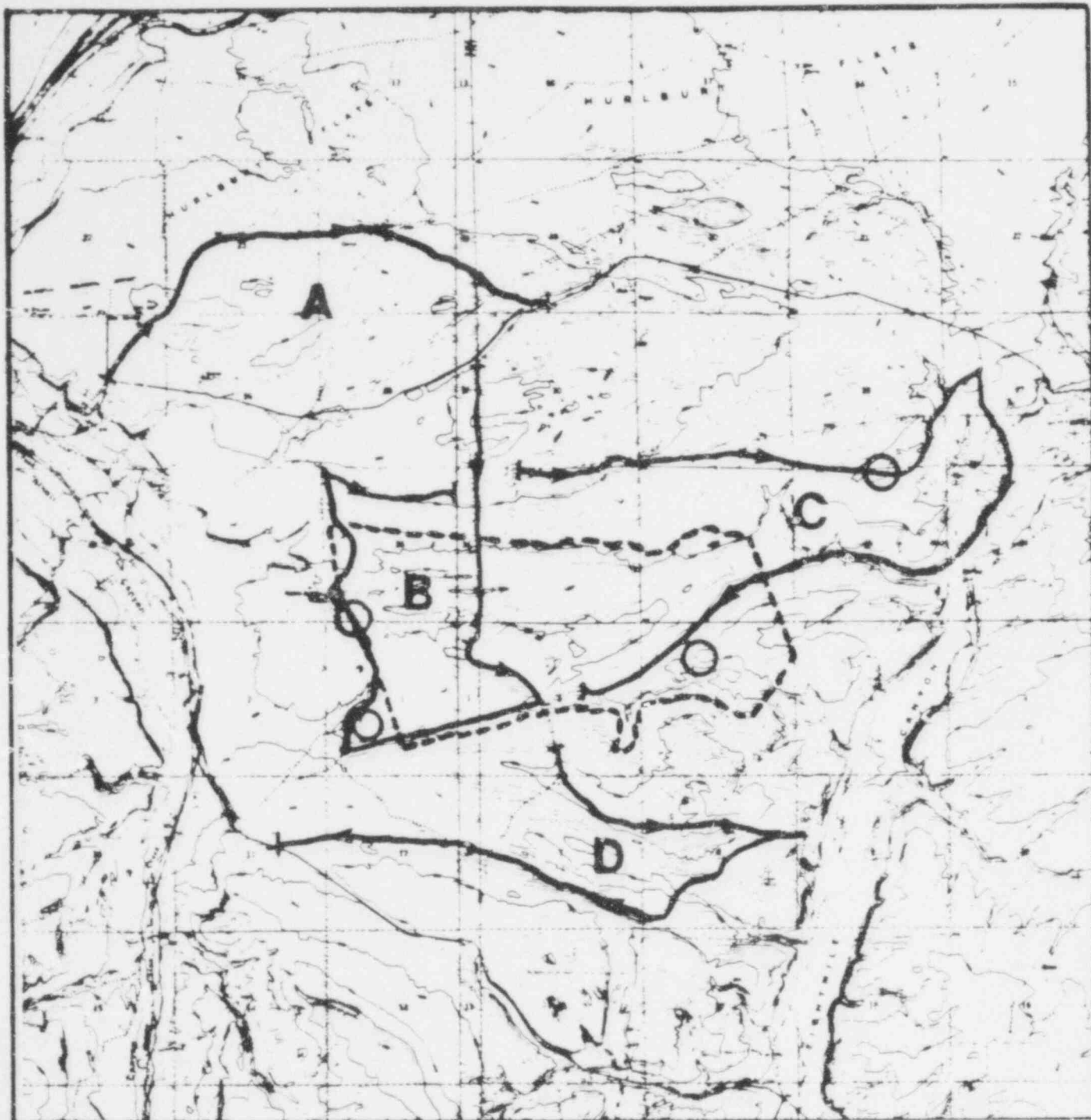
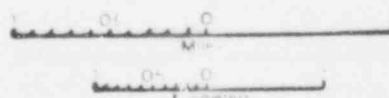


Figure 16. Locations of territorial pairs of Long-billed Curlews on the Pebble Springs study area during 1978.

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- Territorial pair (suspected nest)
- Survey routes
- - - Future impoundment boundary



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study area. Perhaps the reduced population levels and number of territorial pairs observed on the Pebble Springs study area in 1978 were a result of the low reproductive success in 1977.

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III. RAPTORS

A. INTRODUCTION

A substantial raptor (i.e., birds of prey) population has been recorded for Pebble Springs study area (Rogers et al. 1975, 1976). Considerable public interest and concern has developed in recent years due to the aesthetic and emotional appeal of raptors, their relative rarity, and their economic and environmental importance. This increased concern coupled with the drastic decline of raptor populations in North America has resulted in federal and state legislation and regulations to protect many of these species (e.g., Bald Eagle and Golden Eagle Protection Act, Endangered Species Act as amended 1973). In addition, raptors are consumers at the top of the food web and have been shown to exhibit population changes which could be associated with environmental stresses such as chemical variations in prey population and modifications of habitat (e.g., Cooke 1973, Craighead and Craighead 1969, White 1974, Snyder and Snyder 1975, and Verner 1975). Thus changes in the raptor populations may serve as an indirect measure of habitat quality for a wide variety of wildlife species. Therefore, raptors were studied to determine their distribution, abundance, and nesting status on the Pebble Springs study area.

Raptor (i.e., birds of prey) studies on the Pebble Springs study area included hawks, owls, eagles, and falcons; however, two additional kinds of birds, the Common Raven and Loggerhead Shrike, were also included in the program. Although taxonomically and morphologically these species are not viewed as "true" raptor species, they compete with various raptorial species for prey and nesting sites and ecologically function as raptors or birds of prey (Craighead and Craighead 1969).

B. METHODS

Four road survey transects were established to collect information on the distribution and abundance of raptors (i.e., birds of prey) population on the Pebble Springs study area from 7 April to 8 August, 1978. Raptor surveys were conducted

concurrent with Long-billed Curlew surveys and followed similar data collection procedures. A 0.5 kilometer strip on each side of the route (Figure 12) formed the approximate observation corridor for the road survey transects. Lengths of the survey routes are presented in Appendix C.

C. RESULTS AND DISCUSSION

Eight species of raptors were observed on the Pebble Springs study area during 1978 (Appendices F and G). These species are typically associated with the shrub-steppe community of the Pacific Northwest (Rotenberry and Wiens 1978). In 1977, 12 species were recorded during general bird transects and incidental observations (BEAK 1978a). Four species, the Prairie Falcon, Rough-legged Hawk, Short-eared Owl, and Burrowing Owl, that were observed during 1977 were not recorded in 1978. A reduction in sampling intensity (i.e., one day site visit) during 1978 may have been a factor that contributed to the lower number of species observed.

Common Raven, Ferruginous Hawk, and Swainson's Hawk were the most abundant raptor species in the Pebble Springs study area in 1978 (Appendices F and G). The Common Raven was most abundant on Transect A where it was also the only species observed. Ravens along this transect were frequently observed feeding on carrion (i.e., sheep carcasses). The high number of Swainson's Hawks on Transect B and C and Ferruginous Hawks on Transect D were attributed to survey routes adjacent to active nest locations. Likewise, the high number of Common Ravens on Transect B were probably due to the suitable nesting sites (i.e., cliffs) adjacent to the route. The greatest number of raptor species in the Pebble Springs area occurred along Transect C, specifically the Eight Mile Canyon area. Obstruction currents (i.e., updrafts) and riparian habitat of the canyon apparently created suitable conditions for soaring and foraging for a variety of raptors.

The Swainson's and Ferruginous Hawks and Common Ravens were observed repeatedly during 1978 and presumed to be breeding in the study area (Appendix G). Breeding

activities of the Ferruginous and Swainson's Hawks were verified by the location of nests (Figure 17). The frequent observations of Common Ravens along the cliff areas of Transect B indicated the presence of a potential nest location. Observations of the Red-tailed Hawk, Golden Eagle, and Marsh Hawk were limited and sporadic indicating that these species were probably not breeding in the study area. Logger-head Shrike and American Kestrel may have been nesting in the study area but no nest sites or territorial pairs were recorded.

An egg-laying/incubating Ferruginous Hawk was observed on a nest in a juniper on 27 April (Figure 17). Adult birds were recorded repeatedly on subsequent field visits and two downy young were observed on 21 June with both adults in attendance. However, on 25 July the nest was found demolished with one young hanging dead in the tree and an adult bird was nearby. Although the fate of the second nestling is unknown, an immature Ferruginous Hawk was observed in adjacent Eight Mile Canyon on 8 August.

A Swainson's Hawk was observed on a nest in a juniper on 5 May (Figure 17). This same nest was also occupied by a Swainson's Hawk in 1977. Three young nestlings and one egg were observed in the nest on 21 June 1978 with a dark phase Swainson's Hawk soaring nearby. On 25 July one nestling was observed in the nest and the remains of a down-covered juvenile were discovered under the nest. The nest was found deserted on 8 August and the remaining young bird had presumably fledged.

Although no productivity studies were conducted at Pebble Springs, it appears that both nests observed during 1978 were successful (i.e., fledged young). In 1977 the only nest site located was a single Swainson's Hawk and it was also presumed to be successful.

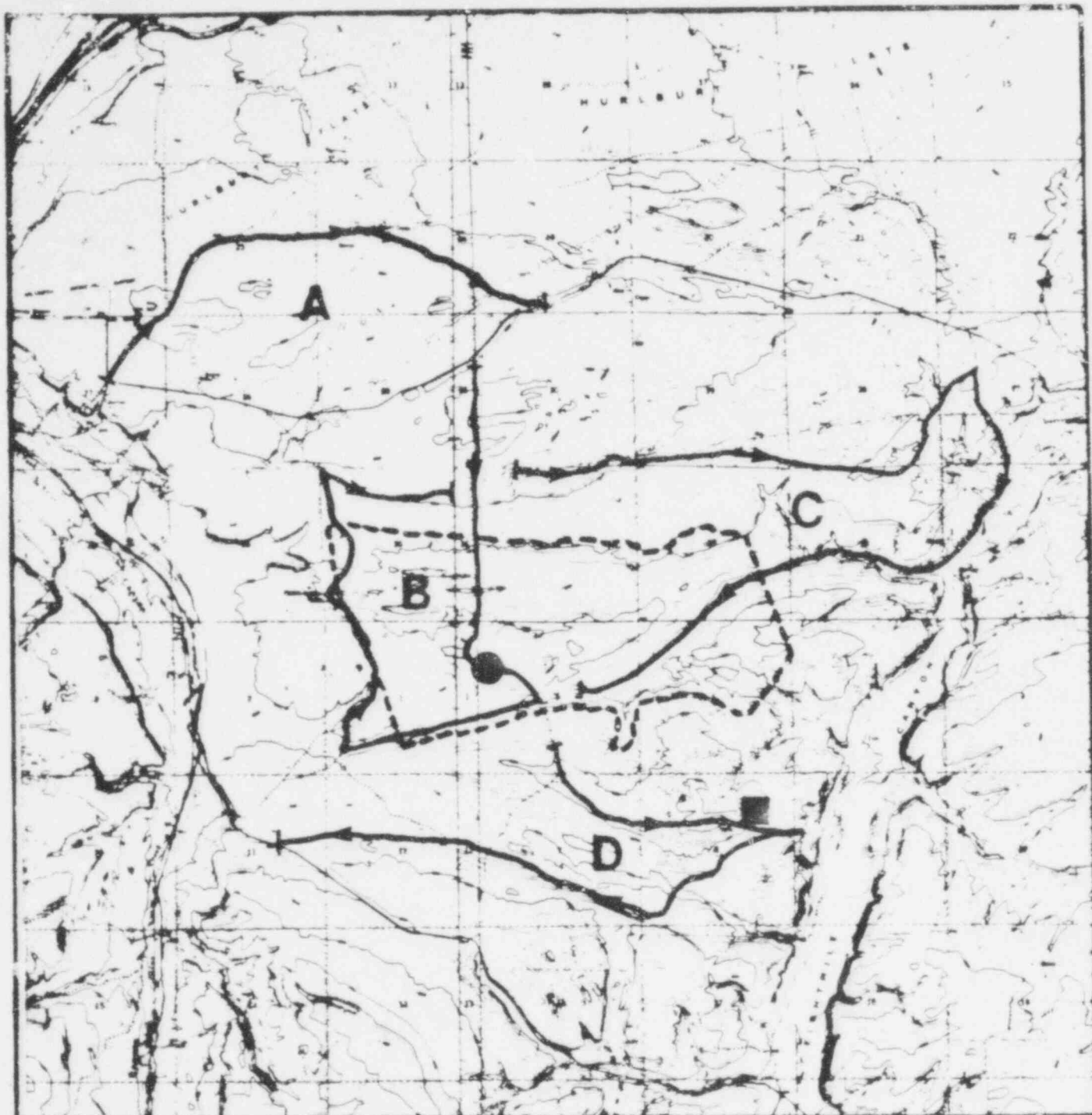
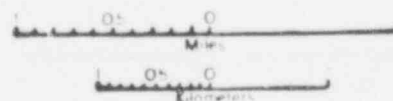


Figure 17. Locations of Swainson's and Ferruginous Hawk nests on the Pebble Springs study area during 1978.

- Swainson's Hawk nest
- Ferruginous Hawk nest
- Survey routes
- - - Future impoundment boundary



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APPENDIX A

Tables 1-8

Table 1. Common and scientific names of fishes collected in the Columbia River at the Pebble Springs study site during the period April 17, 1978 through July 25, 1978.

<u>Common Name</u>	<u>Scientific Name</u>
Salmonidae	
Sockeye salmon	<u>Oncorhynchus nerka</u> (Walbaum)
Chinook salmon	<u>Oncorhynchus tshawytscha</u> (Walbaum)
Rainbow trout (steelhead)	<u>Salmo gairdneri</u> (Richardson)
Catostomidae	
Bridgelip sucker	<u>Catostomus columbianus</u> (Eigenmann and Eigenmann)
Largescale sucker	<u>Catostomus macrocheilus</u> (Girard)
Cyprinidae	
Carp	<u>Cyprinus carpio</u> (Linnaeus)
Peamouth	<u>Mylocheilus caurinus</u> (Richardson)
Northern squawfish	<u>Ptychocheilus oregonensis</u>
Redside shiner	<u>Richardsonius balteatus</u> (Richardson)
Chiselmouth	<u>Achrocheilus alutaceus</u> (Agassiz and Pickering)
Percopsidae	
Sand roller	<u>Columbia transmontana</u> (Eigenmann and Eigenmann)

TABLE 2. CATCH/FEEDBACK VALUES (NUMBER/1 HOUR) AND NUMBER OF FISHES COLLECTED (IN PARENTHESES) IN EXPERIMENTAL GILL NETS AT THE PEOPLE SPRINGS STUDY SITE ON THE COLUMBIA RIVER FROM APRIL, 1978 THROUGH JULY, 1978.

LOOKING APRIL 17 1978		SPECIES		DAY		NIGHT	
NET 1	NET 2	NET 3	NET 1	NET 2	NET 3	NET 1	NET 2
SUCKEYE SALMON (S)	0. (0)	0. (0)	0. (0)	0. (0)	0. (0)	0. (0)	0. (0)
CHINOOK SALMON	0. (0)	0. (0)	0. (0)	0. (0)	0. (0)	0. (0)	0. (0)
CHINOOK SALMON (S)	0. (0)	0. (0)	0. (0)	0. (0)	0. (0)	0. (0)	0. (0)
CHINOOK SALMON (L)	0. (0)	0. (0)	0. (0)	0. (0)	0. (0)	0. (0)	0. (0)
BRIDGELIP SUCKER	0. (0)	0. (0)	0. (0)	0. (0)	0. (0)	0. (0)	0. (0)
LARGESCALE SUCKER	0. (0)	0. (0)	0. (0)	0. (0)	0. (0)	0. (0)	0. (0)
CARP	0. (0)	0. (0)	0. (0)	0. (0)	0. (0)	0. (0)	0. (0)
PEAMOUTH	0. (0)	0. (0)	0. (0)	0. (0)	0. (0)	0. (0)	0. (0)
NORTHERN SQUAWFISH	0. (0)	0. (0)	0. (0)	0. (0)	0. (0)	0. (0)	0. (0)
BENDISH SHINER	0. (0)	0. (0)	0. (0)	0. (0)	0. (0)	0. (0)	0. (0)
CHISELMOUTH	0. (0)	0. (0)	0. (0)	0. (0)	0. (0)	0. (0)	0. (0)
SAND DOLLER	0. (0)	0. (0)	0. (0)	0. (0)	0. (0)	0. (0)	0. (0)
TOTAL CATCH	0. (0)	0. (0)	0. (0)	0. (0)	0. (0)	0. (0)	0. (0)
SALMONID	0. (0)	0. (0)	0. (0)	0. (0)	0. (0)	0. (0)	0. (0)
NON-SALMONID	0. (0)	0. (0)	0. (0)	0. (0)	0. (0)	0. (0)	0. (0)
TOTAL SPECIES	0	0	0	0	0	0	0
HOURS FISHED	1.0	1.0	1.0	1.0	1.0	1.0	1.0

LOOKING APRIL 24 1978		SPECIES		DAY		NIGHT	
NET 1	NET 2	NET 3	NET 1	NET 2	NET 3	NET 1	NET 2
SUCKEYE SALMON (S)	0. (0)	0. (0)	0. (0)	0. (0)	0. (0)	0. (0)	0. (0)
CHINOOK SALMON	0. (0)	0. (0)	0. (0)	0. (0)	0. (0)	0. (0)	0. (0)
CHINOOK SALMON (S)	0. (0)	0. (0)	0. (0)	0. (0)	0. (0)	0. (0)	0. (0)
CHINOOK SALMON (L)	0. (0)	0. (0)	0. (0)	0. (0)	0. (0)	0. (0)	0. (0)
BRIDGELIP SUCKER	0. (0)	0. (0)	0. (0)	0. (0)	0. (0)	0. (0)	0. (0)
LARGESCALE SUCKER	0. (0)	0. (0)	0. (0)	0. (0)	0. (0)	0. (0)	0. (0)
CARP	0. (0)	0. (0)	0. (0)	0. (0)	0. (0)	0. (0)	0. (0)
PEAMOUTH	0. (0)	0. (0)	0. (0)	0. (0)	0. (0)	0. (0)	0. (0)
NORTHERN SQUAWFISH	0. (0)	0. (0)	0. (0)	0. (0)	0. (0)	0. (0)	0. (0)
BENDISH SHINER	0. (0)	0. (0)	0. (0)	0. (0)	0. (0)	0. (0)	0. (0)
CHISELMOUTH	0. (0)	0. (0)	0. (0)	0. (0)	0. (0)	0. (0)	0. (0)
SAND DOLLER	0. (0)	0. (0)	0. (0)	0. (0)	0. (0)	0. (0)	0. (0)
TOTAL CATCH	0. (0)	0. (0)	0. (0)	0. (0)	0. (0)	0. (0)	0. (0)
SALMONID	0. (0)	0. (0)	0. (0)	0. (0)	0. (0)	0. (0)	0. (0)
NON-SALMONID	0. (0)	0. (0)	0. (0)	0. (0)	0. (0)	0. (0)	0. (0)
TOTAL SPECIES	0	0	0	0	0	0	0
HOURS FISHED	1.0	1.0	1.0	1.0	1.0	1.0	1.0

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TABLE 2. CATCH/EFFORT VALUES (NUMBER/1 HOUR) AND NUMBER OF FISHES COLLECTED (IN PARENTHESES) IN EXPERIMENTAL CHL NETS AT THE PENNIE SPRINGS STUDY SITE ON THE COLUMBIA RIVER FROM APRIL, 1978 THROUGH JULY, 1978.

UPLOOKING MAY 15, 1978 SPECIES	DAY			NIGHT		
	NET 1	NET 2	NET 3	NET 1	NET 2	NET 3
SOCKEYE SALMON (S)	0. (0)	0. (0)	0. (0)	0. (0)	0. (0)	0. (0)
CHINOOK SALMON	0. (0)	0. (0)	0. (0)	0. (0)	0. (0)	0. (0)
CHINOOK SALMON (S)	0. (0)	0. (0)	0. (0)	0. (0)	0. (0)	0. (0)
CHINOOK SALMON (J)	0. (0)	0. (0)	0. (0)	0. (0)	0. (0)	0. (0)
WINGFLIP SUCKER	0. (0)	0. (0)	0. (0)	0. (0)	0. (0)	0. (0)
LARGESCALE SUCKER	0. (0)	0. (0)	0. (0)	0. (0)	0. (0)	0. (0)
CARP	0. (0)	0. (0)	0. (0)	0. (0)	0. (0)	0. (0)
PEAMOUTH	0. (0)	0. (0)	0. (0)	0. (0)	0. (0)	0. (0)
NORTHERN SQUAWFISH	0. (0)	0. (0)	0. (0)	0. (0)	0. (0)	0. (0)
WEEDSIDE SHINER	0. (0)	0. (0)	0. (0)	0. (0)	0. (0)	0. (0)
CHISELMOUTH	0. (0)	0. (0)	0. (0)	0. (0)	0. (0)	0. (0)
SAND ROLLER	0. (0)	0. (0)	0. (0)	0. (0)	0. (0)	0. (0)
TOTAL CATCH	0. (0)	0. (0)	0. (0)	0. (0)	0. (0)	0. (0)
SALMONID	0. (0)	0. (0)	0. (0)	0. (0)	0. (0)	0. (0)
NON-SALMONID	0. (0)	0. (0)	0. (0)	0. (0)	0. (0)	0. (0)
TOTAL SPECIES	0	0	0	0	0	0
HOURS FISHED	1.0	1.0	1.0	0.	0.	0.

UPLOOKING MAY 26, 1978 SPECIES	DAY			NIGHT		
	NET 1	NET 2	NET 3	NET 1	NET 2	NET 3
SOCKEYE SALMON (S)	0. (0)	0. (0)	0. (0)	0. (0)	0. (0)	0. (0)
CHINOOK SALMON	1.0 (1)	0. (0)	0. (0)	0. (0)	1.0 (1)	0. (0)
CHINOOK SALMON (S)	0. (0)	0. (0)	0. (0)	0. (0)	0. (0)	0. (0)
CHINOOK SALMON (J)	0. (0)	0. (0)	0. (0)	0. (0)	0. (0)	0. (0)
WINGFLIP SUCKER	0. (0)	0. (0)	0. (0)	0. (0)	1.0 (1)	1.0 (1)
LARGESCALE SUCKER	0. (0)	0. (0)	0. (0)	0. (0)	0. (0)	0. (0)
CARP	0. (0)	0. (0)	0. (0)	0. (0)	0. (0)	0. (0)
PEAMOUTH	0. (0)	1.0 (1)	1.0 (1)	1.0 (1)	0. (0)	0. (0)
NORTHERN SQUAWFISH	0. (0)	0. (0)	0. (0)	0. (0)	2.0 (2)	0. (0)
WEEDSIDE SHINER	0. (0)	0. (0)	0. (0)	0. (0)	0. (0)	0. (0)
CHISELMOUTH	0. (0)	0. (0)	0. (0)	0. (0)	0. (0)	0. (0)
SAND ROLLER	0. (0)	0. (0)	0. (0)	0. (0)	0. (0)	0. (0)
TOTAL CATCH	1.0 (1)	1.0 (1)	1.0 (1)	1.0 (1)	4.0 (4)	1.0 (1)
SALMONID	1.0 (1)	0. (0)	0. (0)	0. (0)	1.0 (1)	0. (0)
NON-SALMONID	0. (0)	1.0 (1)	1.0 (1)	1.0 (1)	3.0 (3)	1.0 (1)
TOTAL SPECIES	1	1	1	1	3	1
HOURS FISHED	1.0	1.0	1.0	1.0	1.0	1.0

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Table 2. CATCH/CEPOT values (NUMBER/1 HOUR) AND NUMBER OF FISHES COLLECTED (IN PARENTHESES) IN EXPERIMENTAL GILL NETS AT THE BEARLE SPRINGS STUDY SITE ON THE COLUMBIA RIVER FROM APRIL* 1978 THROUGH JULY* 1978.

UPLOOKING		JUNE 19 1978		SPECIES		DAY												NIGHT														
						NET 1			NET 2			NET 3			NET 1			NET 2			NET 3			NET 1			NET 2			NET 3		
SUCKEY SALMON (S)	0. (0)	0. (0)	0. (0)	0. (0)	0. (0)	0. (0)	0. (0)	0. (0)	0. (0)	0. (0)	0. (0)	0. (0)	0. (0)	0. (0)	0. (0)	0. (0)	0. (0)	0. (0)	0. (0)	0. (0)	0. (0)	0. (0)	0. (0)	0. (0)	0. (0)	0. (0)	0. (0)	0. (0)	0. (0)			
CHINOOK SALMON	0. (0)	0. (0)	0. (0)	0. (0)	0. (0)	0. (0)	0. (0)	0. (0)	0. (0)	0. (0)	0. (0)	0. (0)	0. (0)	0. (0)	0. (0)	0. (0)	0. (0)	0. (0)	0. (0)	0. (0)	0. (0)	0. (0)	0. (0)	0. (0)	0. (0)	0. (0)	0. (0)	0. (0)	0. (0)			
CHINOOK SALMON (S)	0. (0)	0. (0)	0. (0)	0. (0)	0. (0)	0. (0)	0. (0)	0. (0)	0. (0)	0. (0)	0. (0)	0. (0)	0. (0)	0. (0)	0. (0)	0. (0)	0. (0)	0. (0)	0. (0)	0. (0)	0. (0)	0. (0)	0. (0)	0. (0)	0. (0)	0. (0)	0. (0)	0. (0)	0. (0)			
CHINOOK SALMON (J)	0. (0)	0. (0)	0. (0)	0. (0)	0. (0)	0. (0)	0. (0)	0. (0)	0. (0)	0. (0)	0. (0)	0. (0)	0. (0)	0. (0)	0. (0)	0. (0)	0. (0)	0. (0)	0. (0)	0. (0)	0. (0)	0. (0)	0. (0)	0. (0)	0. (0)	0. (0)	0. (0)	0. (0)	0. (0)			
HAIGBELT SUCKER	0. (0)	0. (0)	0. (0)	0. (0)	0. (0)	0. (0)	0. (0)	0. (0)	0. (0)	0. (0)	0. (0)	0. (0)	0. (0)	0. (0)	0. (0)	0. (0)	0. (0)	0. (0)	0. (0)	0. (0)	0. (0)	0. (0)	0. (0)	0. (0)	0. (0)	0. (0)	0. (0)	0. (0)	0. (0)			
LARGESCALE SUCKER	0. (0)	0. (0)	0. (0)	0. (0)	0. (0)	0. (0)	0. (0)	0. (0)	0. (0)	0. (0)	0. (0)	0. (0)	0. (0)	0. (0)	0. (0)	0. (0)	0. (0)	0. (0)	0. (0)	0. (0)	0. (0)	0. (0)	0. (0)	0. (0)	0. (0)	0. (0)	0. (0)	0. (0)	0. (0)			
CARP	0. (0)	0. (0)	0. (0)	0. (0)	0. (0)	0. (0)	0. (0)	0. (0)	0. (0)	0. (0)	0. (0)	0. (0)	0. (0)	0. (0)	0. (0)	0. (0)	0. (0)	0. (0)	0. (0)	0. (0)	0. (0)	0. (0)	0. (0)	0. (0)	0. (0)	0. (0)	0. (0)	0. (0)	0. (0)			
PEAMOUTH	0. (0)	1.0 (1)	0. (0)	0. (0)	0. (0)	0. (0)	0. (0)	0. (0)	0. (0)	0. (0)	0. (0)	0. (0)	0. (0)	0. (0)	0. (0)	0. (0)	0. (0)	0. (0)	0. (0)	0. (0)	0. (0)	0. (0)	0. (0)	0. (0)	0. (0)	0. (0)	0. (0)	0. (0)	0. (0)			
NORTHERN SQUAWFISH	1.0 (1)	0. (0)	0. (0)	0. (0)	0. (0)	0. (0)	0. (0)	0. (0)	0. (0)	0. (0)	0. (0)	0. (0)	0. (0)	0. (0)	0. (0)	0. (0)	0. (0)	0. (0)	0. (0)	0. (0)	0. (0)	0. (0)	0. (0)	0. (0)	0. (0)	0. (0)	0. (0)	0. (0)	0. (0)			
WEEDSIDE SHIMP	0. (0)	0. (0)	0. (0)	0. (0)	0. (0)	0. (0)	0. (0)	0. (0)	0. (0)	0. (0)	0. (0)	0. (0)	0. (0)	0. (0)	0. (0)	0. (0)	0. (0)	0. (0)	0. (0)	0. (0)	0. (0)	0. (0)	0. (0)	0. (0)	0. (0)	0. (0)	0. (0)	0. (0)	0. (0)			
CHISLMOUTH	0. (0)	0. (0)	0. (0)	0. (0)	0. (0)	0. (0)	0. (0)	0. (0)	0. (0)	0. (0)	0. (0)	0. (0)	0. (0)	0. (0)	0. (0)	0. (0)	0. (0)	0. (0)	0. (0)	0. (0)	0. (0)	0. (0)	0. (0)	0. (0)	0. (0)	0. (0)	0. (0)	0. (0)	0. (0)			
SAND PUFFER	0. (0)	0. (0)	0. (0)	0. (0)	0. (0)	0. (0)	0. (0)	0. (0)	0. (0)	0. (0)	0. (0)	0. (0)	0. (0)	0. (0)	0. (0)	0. (0)	0. (0)	0. (0)	0. (0)	0. (0)	0. (0)	0. (0)	0. (0)	0. (0)	0. (0)	0. (0)	0. (0)	0. (0)	0. (0)			
TOTAL CATCH	1.0 (1)	0. (0)	0. (0)	0. (0)	0. (0)	0. (0)	0. (0)	0. (0)	0. (0)	0. (0)	0. (0)	0. (0)	0. (0)	0. (0)	0. (0)	0. (0)	0. (0)	0. (0)	0. (0)	0. (0)	0. (0)	0. (0)	0. (0)	0. (0)	0. (0)	0. (0)	0. (0)	0. (0)	0. (0)			
SALMONID	0. (0)	0. (0)	0. (0)	0. (0)	0. (0)	0. (0)	0. (0)	0. (0)	0. (0)	0. (0)	0. (0)	0. (0)	0. (0)	0. (0)	0. (0)	0. (0)	0. (0)	0. (0)	0. (0)	0. (0)	0. (0)	0. (0)	0. (0)	0. (0)	0. (0)	0. (0)	0. (0)	0. (0)	0. (0)			
NON-SALMONID	1.0 (1)	0. (0)	0. (0)	0. (0)	0. (0)	0. (0)	0. (0)	0. (0)	0. (0)	0. (0)	0. (0)	0. (0)	0. (0)	0. (0)	0. (0)	0. (0)	0. (0)	0. (0)	0. (0)	0. (0)	0. (0)	0. (0)	0. (0)	0. (0)	0. (0)	0. (0)	0. (0)	0. (0)	0. (0)			
TOTAL SPECIES	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0			
HOURS FISHED	1	2	3	1.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0			

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TABLE 2. CATCH/EFFORT VALUES (NUMBER/1 HOUR) AND NUMBER OF FISHES COLLECTED (IN PARENTHESES) IN EXPERIMENTAL GILL NETS AT THE DEERLE SPRINGS STUDY SITE ON THE COLUMBIA RIVER FROM APRIL 1978 THROUGH JULY 1979.

UPLOOKING JULY 12 1978 SPECIES	DAY			NIGHT			TOTAL SPECIES HOURS FISHED
	NET 1	NET 2	NET 3	NET 1	NET 2	NET 3	
SOCKEYE SALMON (S)	0. (0)	0. (0)	0. (0)	0. (0)	0. (0)	0. (0)	0. (0)
CHINOOK SALMON	0. (0)	0. (0)	0. (0)	0. (0)	0. (0)	0. (0)	0. (0)
CHINOOK SALMON (S)	1.0 (1)	0. (0)	0. (0)	0. (0)	0. (0)	0. (0)	0. (0)
CHINOOK SALMON (J)	0. (0)	0. (0)	0. (0)	0. (0)	0. (0)	0. (0)	0. (0)
WINGEFLIP SUCKER	0. (0)	0. (0)	0. (0)	0. (0)	0. (0)	0. (0)	0. (0)
LARGESCALE SUCKER	0. (0)	0. (0)	0. (0)	0. (0)	0. (0)	1.0 (1)	0. (0)
CARP	0. (0)	0. (0)	0. (0)	0. (0)	0. (0)	0. (0)	0. (0)
DEAMOUTH	0. (0)	2.0 (2)	2.0 (2)	0. (0)	1.0 (1)	0. (0)	0. (0)
NORTHERN SQUAWFISH	0. (0)	0. (0)	1.0 (1)	2.0 (2)	1.0 (1)	3.0 (3)	0. (0)
REDSTINE SPINER	0. (0)	0. (0)	0. (0)	0. (0)	0. (0)	0. (0)	0. (0)
CHISFIMOUTH	0.0 (0)	1.0 (1)	6.0 (6)	3.0 (3)	5.0 (5)	3.0 (3)	0. (0)
SAND ROLLER	0. (0)	0. (0)	0. (0)	1.0 (1)	5.0 (5)	3.0 (3)	0. (0)
TOTAL CATCH	9.0 (9)	3.0 (3)	9.0 (9)	6.0 (6)	12.0 (12)	10.0 (10)	0. (0)
SALMONID	1.0 (1)	0. (0)	0. (0)	0. (0)	0. (0)	0. (0)	0. (0)
NON-SALMONID	8.0 (8)	3.0 (3)	9.0 (9)	6.0 (6)	12.0 (12)	10.0 (10)	0. (0)
TOTAL SPECIES	2	2	3	3	4	4	0
HOURS FISHED	1.0	1.0	1.0	1.0	1.0	1.0	0.

UPLOOKING JULY 25 1978 SPECIES	DAY			NIGHT			TOTAL SPECIES HOURS FISHED
	NET 1	NET 2	NET 3	NET 1	NET 2	NET 3	
SOCKEYE SALMON (S)	0. (0)	0. (0)	0. (0)	1.0 (1)	0. (0)	1.0 (1)	0. (0)
CHINOOK SALMON	0. (0)	0. (0)	0. (0)	0. (0)	0. (0)	0. (0)	0. (0)
CHINOOK SALMON (S)	0. (0)	0. (0)	0. (0)	0. (0)	0. (0)	0. (0)	0. (0)
CHINOOK SALMON (J)	0. (0)	0. (0)	0. (0)	0. (0)	0. (0)	0. (0)	0. (0)
WINGEFLIP SUCKER	0. (0)	0. (0)	0. (0)	0. (0)	0. (0)	0. (0)	0. (0)
LARGESCALE SUCKER	0. (0)	0. (0)	0. (0)	0. (0)	0. (0)	0. (0)	0. (0)
CARP	0. (0)	0. (0)	0. (0)	0. (0)	0. (0)	0. (0)	0. (0)
DEAMOUTH	1.0 (1)	1.0 (1)	2.0 (2)	3.0 (3)	1.0 (1)	0. (0)	0. (0)
NORTHERN SQUAWFISH	0. (0)	0. (0)	0. (0)	2.0 (2)	1.0 (1)	1.0 (1)	0. (0)
REDSTINE SPINER	0. (0)	0. (0)	0. (0)	0. (0)	1.0 (1)	1.0 (1)	0. (0)
CHISFIMOUTH	0. (0)	0. (0)	0. (0)	25.0 (25)	17.0 (17)	24.0 (24)	0. (0)
SAND ROLLER	0. (0)	0. (0)	0. (0)	0. (0)	0. (0)	0. (0)	0. (0)
TOTAL CATCH	1.0 (1)	1.0 (1)	2.0 (2)	31.0 (31)	20.0 (20)	29.0 (29)	0. (0)
SALMONID	0. (0)	0. (0)	0. (0)	1.0 (1)	0. (0)	1.0 (1)	0. (0)
NON-SALMONID	1.0 (1)	1.0 (1)	2.0 (2)	30.0 (30)	20.0 (20)	28.0 (28)	0. (0)
TOTAL SPECIES	1	1	1	4	4	4	0
HOURS FISHED	1.0	1.0	1.0	1.0	1.0	1.0	0.

TABLE 2.
CATCH/REIGHT VALUES (NUMBER/1 HOOK) AND NUMBER OF FISHES COLLECTED IN PARVINESES IN EXPERIMENTAL
GILL NETS AT THE PEOPLE'S FISHERIES STUDY SITE ON THE COLOMBIA RIVER FROM APRIL* 1978 THROUGH JULY* 1978.

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TABLE 2. CATCH/EFFORT VALUES (NUMBER/1 HOUR) AND NUMBER OF FISHES COLLECTED (IN PARENTHESES) IN EXPERIMENTAL GILL NETS AT THE DEBBIE SPRINGS STUDY SITE ON THE COLUMBIA RIVER FROM APRIL, 1978 THROUGH JULY, 1978.

DOWNSTREAMING MAY 15, 1978 SPECIES	DAY			NIGHT		
	NET 1	NET 2	NET 3	NET 1	NET 2	NET 3
SOCKEYE SALMON (S)	0. (0)	0. (0)	0. (0)	0. (0)	0. (0)	0. (0)
CHINOOK SALMON (S)	0. (0)	0. (0)	0. (0)	0. (0)	0. (0)	0. (0)
RAINBOW TROUT	0. (0)	0. (0)	0. (0)	0. (0)	0. (0)	0. (0)
WINGFLIP SICKER	0. (0)	0. (0)	0. (0)	0. (0)	0. (0)	0. (0)
LARGESCALE SICKER	0. (0)	2.0 (1)	2.0 (1)	0. (0)	0. (0)	0. (0)
DEERMOUTH	0. (0)	0. (0)	0. (0)	0. (0)	0. (0)	0. (0)
NORTHERN SNAKEFISH	0. (0)	0. (0)	0. (0)	0. (0)	0. (0)	0. (0)
CHISELMOUTH	0. (0)	0. (0)	0. (0)	0. (0)	0. (0)	0. (0)
TOTAL CATCH	0. (0)	2.0 (1)	2.0 (1)	0. (0)	0. (0)	0. (0)
SALMONID	0. (0)	0. (0)	0. (0)	0. (0)	0. (0)	0. (0)
NON-SALMONID	0. (0)	2.0 (1)	2.0 (1)	0. (0)	0. (0)	0. (0)
TOTAL SPECIES	0. (0)	1. (0)	1. (0)	0. (0)	0. (0)	0. (0)
HOURS FISHED	0. (0)	0.5	0.5	0. (0)	0.5	0.5
DOWNSTREAMING MAY 25, 1978 SPECIES	DAY			NIGHT		
	NET 1	NET 2	NET 3	NET 1	NET 2	NET 3
SOCKEYE SALMON (S)	0. (0)	0. (0)	0. (0)	0. (0)	0. (0)	0. (0)
CHINOOK SALMON (S)	0. (0)	0. (0)	0. (0)	0. (0)	0. (0)	0. (0)
RAINBOW TROUT	0. (0)	0. (0)	0. (0)	0. (0)	0. (0)	0. (0)
WINGFLIP SICKER	0. (0)	0. (0)	0. (0)	0. (0)	0. (0)	0. (0)
LARGESCALE SICKER	0. (0)	0. (0)	0. (0)	0. (0)	0. (0)	0. (0)
DEERMOUTH	0. (0)	0. (0)	0. (0)	0. (0)	0. (0)	0. (0)
NORTHERN SNAKEFISH	0. (0)	0. (0)	0. (0)	0. (0)	0. (0)	0. (0)
CHISELMOUTH	0. (0)	0. (0)	0. (0)	0. (0)	0. (0)	0. (0)
TOTAL CATCH	0. (0)	0. (0)	0. (0)	0. (0)	0. (0)	0. (0)
SALMONID	0. (0)	0. (0)	0. (0)	0. (0)	0. (0)	0. (0)
NON-SALMONID	0. (0)	0. (0)	0. (0)	0. (0)	0. (0)	0. (0)
TOTAL SPECIES	0. (0)	0. (0)	0. (0)	0. (0)	0. (0)	0. (0)
HOURS FISHED	0. (0)	0.5	0.5	0. (0)	0.5	0.5

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TABLE 2. CATCH/EFFORT VALUES (NUMBER/2/1 HOUR) AND NUMBER OF FISHES COLLECTED (IN PARENTHESES) IN EXPERIMENTAL GILL NETS AT THE DEBOLE SPRINGS STUDY SITE ON THE COLUMBIA RIVER FROM APRIL, 1978 THROUGH JULY, 1978.

DOWNDORING JUNE 19 1978 SPECIES	DAY			NIGHT		
	NET 1	NET 2	NET 3	NET 1	NET 2	NET 3
SOCKEYE SALMON (S)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
CHINOOK SALMON (S)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
RAINBOW TROUT	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
WINGFLIP SUCKER	0 (0)	0 (0)	0 (0)	2 (0)	0 (0)	0 (0)
LARGESCALE SUCKER	0 (0)	0 (0)	2 (0)	0 (0)	0 (0)	0 (0)
DEERMOUTH	0 (0)	2 (0)	4 (0)	0 (0)	0 (0)	0 (0)
NORTHERN SOJAWEFISH	0 (0)	2 (0)	6 (0)	2 (0)	0 (0)	0 (0)
CHISEL MOUTH	0 (0)	0 (0)	12 (0)	4 (0)	2 (0)	0 (0)
TOTAL CATCH	0 (0)	4 (0)	24 (0)	6 (0)	2 (0)	0 (0)
SALMONID	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
NON-SALMONID	0 (0)	4 (0)	24 (0)	6 (0)	2 (0)	0 (0)
TOTAL SPECIES	0	2	4	3	1	1
HOURS FISHED	.5	.5	.5	.5	.5	.5

DOWNDORING JUNE 27 1978 SPECIES	DAY			NIGHT		
	NET 1	NET 2	NET 3	NET 1	NET 2	NET 3
SOCKEYE SALMON (S)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
CHINOOK SALMON (S)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
RAINBOW TROUT	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
WINGFLIP SUCKER	0 (0)	0 (0)	2 (0)	0 (0)	0 (0)	0 (0)
LARGESCALE SUCKER	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
DEERMOUTH	0 (0)	0 (0)	2 (0)	2 (0)	2 (0)	0 (0)
NORTHERN SOJAWEFISH	2 (0)	2 (0)	2 (0)	6 (0)	2 (0)	0 (0)
CHISEL MOUTH	0 (0)	0 (0)	0 (0)	0 (0)	2 (0)	0 (0)
TOTAL CATCH	2 (0)	2 (0)	6 (0)	8 (0)	6 (0)	0 (0)
SALMONID	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
NON-SALMONID	2 (0)	2 (0)	6 (0)	8 (0)	6 (0)	0 (0)
TOTAL SPECIES	1	1	3	3	1	0
HOURS FISHED	.5	.5	.5	.5	.5	.5

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TABLE 2. CATCH/NETTOWN VALUES (POUNDS/21 HOURS) AND NUMBER OF FISHES COLLECTED (IN PARENTHESES) IN EXPERIMENTAL GILL NETS AT THE DEERLE SPRINGS STUDY SITE ON THE COLUMBIA RIVER FROM APRIL 1, 1978 THROUGH JULY 1, 1979.

SPECIES	DAY			NIGHT		
	NET 1	NET 2	NET 3	NET 1	NET 2	NET 3
DOWNY DORLING JULY 12 1978						
SOCKEYE SALMON (S)	0. (0)	0. (0)	0. (0)	0. (0)	0. (0)	0. (0)
CHINOOK SALMON (S)	4.0 (2)	2.0 (1)	0. (0)	2.0 (1)	0. (0)	0. (0)
WATNROW TROUT	0. (0)	0. (0)	0. (0)	2.0 (1)	0. (0)	0. (0)
WINGELIP SICKER	0. (0)	0. (0)	0. (0)	0. (0)	0. (0)	0. (0)
LARGESCALE SUCKER	0. (0)	0. (0)	0. (0)	0. (0)	0. (0)	0. (0)
DEAMOUTH	0. (0)	0. (0)	2.0 (1)	0. (0)	0. (0)	0. (0)
NORTHERN SQUAMFISH	0. (0)	0. (0)	0. (0)	0. (0)	0. (0)	0. (0)
CHISELMOUTH	0. (0)	12.0 (6)	0. (0)	6.0 (3)	0. (0)	0. (0)
TOTAL CATCH	4.0 (2)	14.0 (7)	10.0 (5)	10.0 (5)	0. (0)	0. (0)
SALMONID	4.0 (2)	2.0 (1)	0. (0)	4.0 (2)	0. (0)	0. (0)
NON-SALMONID	0. (0)	12.0 (6)	10.0 (5)	6.0 (3)	0. (0)	0. (0)
TOTAL SPECIES HOURS FISHED	1 .5	2 .5	2 .5	3 .5	1 .5	1 .5
DOWNY DORLING JULY 25 1978						
SOCKEYE SALMON (S)	0. (0)	2.0 (1)	2.0 (1)	2.0 (1)	2.0 (1)	2.0 (1)
CHINOOK SALMON (S)	0. (0)	0. (0)	0. (0)	0. (0)	0. (0)	0. (0)
WATNROW TROUT	0. (0)	0. (0)	0. (0)	0. (0)	0. (0)	0. (0)
WINGELIP SICKER	0. (0)	0. (0)	0. (0)	0. (0)	0. (0)	0. (0)
LARGESCALE SUCKER	0. (0)	0. (0)	0. (0)	0. (0)	0. (0)	0. (0)
DEAMOUTH	0. (0)	0. (0)	0. (0)	0. (0)	0. (0)	0. (0)
NORTHERN SQUAMFISH	0. (0)	0. (0)	0. (0)	0. (0)	0. (0)	0. (0)
CHISELMOUTH	0. (0)	0. (0)	0. (0)	0. (0)	0. (0)	0. (0)
TOTAL CATCH	0. (0)	2.0 (1)	2.0 (1)	2.0 (1)	2.0 (1)	2.0 (1)
SALMONID	0. (0)	2.0 (1)	2.0 (1)	2.0 (1)	2.0 (1)	2.0 (1)
NON-SALMONID	0. (0)	0. (0)	0. (0)	0. (0)	0. (0)	0. (0)
TOTAL SPECIES HOURS FISHED	0 .5	1 .5	1 .5	1 .5	1 .5	1 .5

POOR ORIGINAL

TABLE 3. FISH LENGTHS (CM) OF FISHES COLLECTED IN EXPERIMENTAL GILL NETS AT THE PERLIE SPRINGS STUDY SITE ON THE COLUMBIA RIVER FROM APRIL 1979 THROUGH JULY, 1979. (X = MEAN, RANGE, N = SAMPLE SIZE)

UPLOOKING APRIL 17 1979	SPECIES	DAY	NET 1			NET 2			NET 3		
			X	RANGE	N	X	RANGE	N	X	RANGE	N
	SOCKEYE SALMON (S)		0	0 - 0	0	0	0 - 0	0	0	0 - 0	0
	CHINOOK SALMON (S)		0	0 - 0	0	0	0 - 0	0	0	0 - 0	0
	CHINOOK SALMON (S)		0	0 - 0	0	0	0 - 0	0	0	0 - 0	0
	CHINOOK SALMON (J)		0	0 - 0	0	0	0 - 0	0	0	0 - 0	0
	WINGFLIP SUCKER		0	0 - 0	0	0	0 - 0	0	0	0 - 0	0
	LARGESCALE SUCKER		0	0 - 0	0	0	0 - 0	0	0	0 - 0	0
	CARP		0	0 - 0	0	0	0 - 0	0	0	0 - 0	0
	PEAMOUTH		0	0 - 0	0	0	0 - 0	0	0	0 - 0	0
	NORTHERN COHAWFISH		0	0 - 0	0	0	0 - 0	0	0	0 - 0	0
	WEEDS OF SHINER		0	0 - 0	0	0	0 - 0	0	0	0 - 0	0
	CHITSLMOUTH		0	0 - 0	0	0	0 - 0	0	0	0 - 0	0
	SAND ROLLER		0	0 - 0	0	0	0 - 0	0	0	0 - 0	0

UPLOOKING APRIL 17 1979	SPECIES	NIGHT	NET 1			NET 2			NET 3		
			X	RANGE	N	X	RANGE	N	X	RANGE	N
	SOCKEYE SALMON (S)		0	0 - 0	0	0	0 - 0	0	0	0 - 0	0
	CHINOOK SALMON		0	0 - 0	0	0	0 - 0	0	0	0 - 0	0
	CHINOOK SALMON (S)		0	0 - 0	0	0	0 - 0	0	0	0 - 0	0
	CHINOOK SALMON (J)		0	0 - 0	0	0	0 - 0	0	0	0 - 0	0
	WINGFLIP SUCKER		0	0 - 0	0	0	0 - 0	0	0	0 - 0	0
	LARGESCALE SUCKER		0	0 - 0	0	0	0 - 0	0	0	0 - 0	0
	CARP		0	0 - 0	0	0	0 - 0	0	0	0 - 0	0
	PEAMOUTH		0	0 - 0	0	0	0 - 0	0	0	0 - 0	0
	NORTHERN COHAWFISH		0	0 - 0	0	0	0 - 0	0	0	0 - 0	0
	WEEDS OF SHINER		0	0 - 0	0	0	0 - 0	0	0	0 - 0	0
	CHITSLMOUTH		0	0 - 0	0	0	0 - 0	0	0	0 - 0	0
	SAND ROLLER		0	0 - 0	0	0	0 - 0	0	0	0 - 0	0

POOR ORIGINAL

TABLE 3. FISH LENGTHS (CM) OF FISHES COLLECTED IN EXPERIMENTAL GILL NETS AT THE PERRIE SPRINGS STUDY SITE ON THE COLUMBIA RIVER FROM APRIL, 1978 THROUGH JULY, 1978. (X = MEAN, RANGE, N = SAMPLE SIZE)

UPLOOKING APRIL 24 1978	: DAY	X	NFT 1 RANGE	N	X	NFT 2 RANGE	N	X	NFT 3 RANGE	N
SPECIES										
SOCKEYE SALMON (S)		0	0 - 0	0	0	0 - 0	0	0	0 - 0	0
CHINOOK SALMON		0	0 - 0	0	0	0 - 0	0	0	0 - 0	0
CHINOOK SALMON (S)		0	0 - 0	0	0	0 - 0	0	0	0 - 0	0
CHINOOK SALMON (J)		0	0 - 0	0	0	0 - 0	0	0	0 - 0	0
WINGELET SICKER		0	0 - 0	0	0	0 - 0	0	0	0 - 0	0
LARGESCALE SUCKER		0	0 - 0	0	0	0 - 0	0	0	0 - 0	0
CARP		0	0 - 0	0	0	0 - 0	0	0	0 - 0	0
PEAMOUTH		0	0 - 0	0	0	0 - 0	0	0	0 - 0	0
NORTHERN SOLJAWFISH		0	0 - 0	0	0	0 - 0	0	0	0 - 0	0
WEDSIDE SHINER		0	0 - 0	0	0	0 - 0	0	0	0 - 0	0
CHISFLMOUTH		0	0 - 0	0	0	0 - 0	0	0	0 - 0	0
SAND ROLLER		0	0 - 0	0	0	0 - 0	0	0	0 - 0	0

UPLOOKING APRIL 24 1978	: NIGHT	X	NFT 1 RANGE	N	X	NFT 2 RANGE	N	X	NFT 3 RANGE	N
SPECIES										
SOCKEYE SALMON (S)		0	0 - 0	0	0	0 - 0	0	0	0 - 0	0
CHINOOK SALMON		0	0 - 0	0	0	0 - 0	0	0	0 - 0	0
CHINOOK SALMON (S)		0	0 - 0	0	0	0 - 0	0	0	0 - 0	0
CHINOOK SALMON (J)		0	0 - 0	0	0	0 - 0	0	0	0 - 0	0
WINGELET SICKER		0	0 - 0	0	0	0 - 0	0	0	0 - 0	0
LARGESCALE SUCKER		0	0 - 0	0	0	0 - 0	0	0	0 - 0	0
CARP		0	0 - 0	0	0	0 - 0	0	0	0 - 0	0
PEAMOUTH		0	0 - 0	0	0	0 - 0	0	0	0 - 0	0
NORTHERN SOLJAWFISH		0	0 - 0	0	0	0 - 0	0	0	0 - 0	0
WEDSIDE SHINER		0	0 - 0	0	0	0 - 0	0	0	0 - 0	0
CHISFLMOUTH		0	0 - 0	0	0	0 - 0	0	0	0 - 0	0
SAND ROLLER		0	0 - 0	0	0	0 - 0	0	0	0 - 0	0

TABLE 3. FISHES COLLECTED IN EXPERIMENTAL GILL NETS AT THE DEQUE SPRINGS STUDY SITE ON THE PEJOTA RIVER FROM APRIL 1978 THROUGH JULY 1979. (X = MEAN, RANGE * N = SAMPLE SIZE)

BEAK

UPLOOKING MAY 15 1978 SPECIES	DAY	NET 1 X	NET 1 RANGE	N	NET 2 X	NET 2 RANGE	N	NET 3 X	NET 3 RANGE	N
SOCKEYE SALMON (S)		0	0 - 0	0	0	0 - 0	0	0	0 - 0	0
CHINOOK SALMON		0	0 - 0	0	0	0 - 0	0	0	0 - 0	0
CHINOOK SALMON (S)		0	0 - 0	0	0	0 - 0	0	0	0 - 0	0
CHINOOK SALMON (J)		0	0 - 0	0	0	0 - 0	0	0	0 - 0	0
WINGED SUCKER		0	0 - 0	0	0	0 - 0	0	0	0 - 0	0
LARGESCALE SUCKER		0	0 - 0	0	0	0 - 0	0	0	0 - 0	0
CARP		0	0 - 0	0	0	0 - 0	0	0	0 - 0	0
DEAMOUTH		0	0 - 0	0	0	0 - 0	0	0	0 - 0	0
NORTHERN SQUAWFISH		0	0 - 0	0	0	0 - 0	0	0	0 - 0	0
REDSTIE SHINER		0	0 - 0	0	0	0 - 0	0	0	0 - 0	0
CHISELMOUTH		0	0 - 0	0	0	0 - 0	0	0	0 - 0	0
SAND PILLER		0	0 - 0	0	0	0 - 0	0	0	0 - 0	0

UPLOOKING MAY 15 1978 SPECIES	NIGHT	NET 1 X	NET 1 RANGE	N	NET 2 X	NET 2 RANGE	N	NET 3 X	NET 3 RANGE	N

NO SAMPLE TAKEN.

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POOR ORIGINAL

BEAK

POOK ORIGINAL

TABLE 2. FORK LENGTHS (CM) OF FISHES COLLECTED IN EXPERIMENTAL GILL NETS AT THE PERLIFE COASTS STUDY SITE ON THE COLUMBIA RIVER FROM APRIL - 1978 THROUGH JULY - 1979. (X = MEAN, RANGE* N = SAMPLE SIZE)

SPECIES	JUNE 19 1978			JUNE 19 1979		
	MEAN	RANGE	N	MEAN	RANGE	N
UPLOOKING						
SOCKEYE SALMON (S)	0.	0. - 0.	0	0.	0. - 0.	0
CHINOOK SALMON	0.	0. - 0.	0	0.	0. - 0.	0
CHINOOK SALMON (S)	0.	0. - 0.	0	0.	0. - 0.	0
CHINOOK SALMON (J)	0.	0. - 0.	0	0.	0. - 0.	0
HAINGELIP SUCKER	0.	0. - 0.	0	0.	0. - 0.	0
LARGESCALE SUCKER	0.	0. - 0.	0	0.	0. - 0.	0
CARP	0.	0. - 0.	0	0.	0. - 0.	0
PEAMOUTH	0.	0. - 0.	0	0.	0. - 0.	0
NORTHERN SQUAWFISH	22.2	22.2-22.2	1	17.8	17.8-17.8	1
PERCINE SHINER	0.	0. - 0.	0	0.	0. - 0.	0
CHISLMOUTH	0.	0. - 0.	0	0.	0. - 0.	0
SAND DOLLER	0.	0. - 0.	0	0.	0. - 0.	0

SPECIES	JUNE 19 1978			JUNE 19 1979		
	MEAN	RANGE	N	MEAN	RANGE	N
UPLOOKING						
SOCKEYE SALMON (S)	12.1	12.1-12.1	1	11.4	11.4-11.4	1
CHINOOK SALMON	0.	0. - 0.	0	0.	0. - 0.	0
CHINOOK SALMON (S)	0.	0. - 0.	0	0.	0. - 0.	0
CHINOOK SALMON (J)	0.	0. - 0.	0	0.	0. - 0.	0
HAINGELIP SUCKER	0.	0. - 0.	0	0.	0. - 0.	0
LARGESCALE SUCKER	0.	0. - 0.	0	0.	0. - 0.	0
CARP	0.	0. - 0.	0	0.	0. - 0.	0
PEAMOUTH	20.3	20.3-20.3	1	21.6	17.8-25.4	4
NORTHERN SQUAWFISH	0.	0. - 0.	0	20.8	16.5-27.9	4
PERCINE SHINER	0.	0. - 0.	0	15.2	15.2-15.2	1
CHISLMOUTH	0.	0. - 0.	0	19.7	16.5-21.6	12
SAND DOLLER	0.	0. - 0.	0	0.	0. - 0.	0

POOR ORIGINAL

TABLE 3. FORK LENGTHS (CM) OF FISHES COLLECTED IN EXPERIMENTAL GILL NETS AT THE DEERIE SPRINGS STUDY SITE ON THE COLUMBIA RIVER FROM APRIL * 1978 THROUGH JUNE * 1978. (X = MEAN; RANGE * N = SAMPLE SIZE)

[illegible]

POOR ORIGINAL

TABLE 3. FORK LENGTHS (CM) OF FISHES COLLECTED IN EXPERIMENTAL GILL NETS AT THE PEARLE SPRINGS STUDY SITE ON THE COLUMBIA RIVER FROM APRIL - 1979 THROUGH JULY, 1979. (X = MEAN, RANGE * N = SAMPLE SIZE)

SPECIES	JULY 12 1979 : DAY			JULY 12 1979 : NIGHT		
	X	RANGE	N	X	RANGE	N
SUCKEYE SALMON (S)	0*	0* - 0*	0	0*	0* - 0*	0
CHINOOK SALMON	0*	0* - 0*	0	0*	0* - 0*	0
CHINOOK SALMON (S)	11.4	11.4-11.4	1	0*	0* - 0*	0
CHINOOK SALMON (J)	0*	0* - 0*	0	0*	0* - 0*	0
WIDGELIP SUCKER	0*	0* - 0*	0	0*	0* - 0*	0
LARGESCALE SUCKER	0*	0* - 0*	0	0*	0* - 0*	0
CARP	0*	0* - 0*	0	0*	0* - 0*	0
PEAMOUTH	0*	0* - 0*	0	0*	0* - 0*	0
NORTHERN SQUAWFISH	0*	0* - 0*	0	0*	0* - 0*	0
BENDSIDE SHINER	0*	0* - 0*	0	0*	0* - 0*	0
CHISELMOUTH	21.9	17.9-25.4	9	21.0	19.1-22.9	3
SAND ROLLER	0*	0* - 0*	0	9.5	9.5-9.5	1
SUCKEYE SALMON (S)	0*	0* - 0*	0	0*	0* - 0*	0
CHINOOK SALMON	0*	0* - 0*	0	0*	0* - 0*	0
CHINOOK SALMON (S)	0*	0* - 0*	0	0*	0* - 0*	0
CHINOOK SALMON (J)	0*	0* - 0*	0	0*	0* - 0*	0
WIDGELIP SUCKER	0*	0* - 0*	0	0*	0* - 0*	0
LARGESCALE SUCKER	0*	0* - 0*	0	0*	0* - 0*	0
CARP	0*	0* - 0*	0	0*	0* - 0*	0
PEAMOUTH	0*	0* - 0*	0	0*	0* - 0*	0
NORTHERN SQUAWFISH	0*	0* - 0*	0	0*	0* - 0*	0
BENDSIDE SHINER	0*	0* - 0*	0	0*	0* - 0*	0
CHISELMOUTH	21.9	17.9-25.4	9	21.0	19.1-22.9	3
SAND ROLLER	0*	0* - 0*	0	9.5	9.5-9.5	1

SPECIES	JULY 12 1979 : DAY			JULY 12 1979 : NIGHT		
	X	RANGE	N	X	RANGE	N
SUCKEYE SALMON (S)	0*	0* - 0*	0	0*	0* - 0*	0
CHINOOK SALMON	0*	0* - 0*	0	0*	0* - 0*	0
CHINOOK SALMON (S)	0*	0* - 0*	0	0*	0* - 0*	0
CHINOOK SALMON (J)	0*	0* - 0*	0	0*	0* - 0*	0
WIDGELIP SUCKER	0*	0* - 0*	0	0*	0* - 0*	0
LARGESCALE SUCKER	0*	0* - 0*	0	0*	0* - 0*	0
CARP	0*	0* - 0*	0	0*	0* - 0*	0
PEAMOUTH	0*	0* - 0*	0	0*	0* - 0*	0
NORTHERN SQUAWFISH	0*	0* - 0*	0	0*	0* - 0*	0
BENDSIDE SHINER	0*	0* - 0*	0	0*	0* - 0*	0
CHISELMOUTH	21.9	17.9-25.4	9	21.0	19.1-22.9	3
SAND ROLLER	0*	0* - 0*	0	9.5	9.5-9.5	1

SPECIES	JULY 12 1979 : DAY			JULY 12 1979 : NIGHT		
	X	RANGE	N	X	RANGE	N
SUCKEYE SALMON (S)	0*	0* - 0*	0	0*	0* - 0*	0
CHINOOK SALMON	0*	0* - 0*	0	0*	0* - 0*	0
CHINOOK SALMON (S)	0*	0* - 0*	0	0*	0* - 0*	0
CHINOOK SALMON (J)	0*	0* - 0*	0	0*	0* - 0*	0
WIDGELIP SUCKER	0*	0* - 0*	0	0*	0* - 0*	0
LARGESCALE SUCKER	0*	0* - 0*	0	0*	0* - 0*	0
CARP	0*	0* - 0*	0	0*	0* - 0*	0
PEAMOUTH	0*	0* - 0*	0	0*	0* - 0*	0
NORTHERN SQUAWFISH	0*	0* - 0*	0	0*	0* - 0*	0
BENDSIDE SHINER	0*	0* - 0*	0	0*	0* - 0*	0
CHISELMOUTH	21.9	17.9-25.4	9	21.0	19.1-22.9	3
SAND ROLLER	0*	0* - 0*	0	9.5	9.5-9.5	1

POOR ORIGINAL

TABLE 3. FISH LENGTHS (CM) OF FISHES COLLECTED IN EXPERIMENTAL GILL NETS AT THE PEARLE SPRINGS STUDY SITE ON THE COLUMBIA RIVER FROM APRIL, 1978 THROUGH JULY, 1979. (X = MEAN, RANGE, N = SAMPLE SIZE)

UPLOOKING JULY 25 1978	:DAY	NET 1 X	NET 1 RANGE	N	X	NET 2 RANGE	N	X	NET 3 RANGE	N
SOCKEYE SALMON (S)		0.	0. - 0.	0	0.	0. - 0.	0	0.	0. - 0.	0
CHINOOK SALMON		0.	0. - 0.	0	0.	0. - 0.	0	0.	0. - 0.	0
CHINOOK SALMON (S)		0.	0. - 0.	0	0.	0. - 0.	0	0.	0. - 0.	0
CHINOOK SALMON (J)		0.	0. - 0.	0	0.	0. - 0.	0	0.	0. - 0.	0
WINGFLIP SUCKER		0.	0. - 0.	0	0.	0. - 0.	0	0.	0. - 0.	0
LARGESCALE SUCKER		0.	0. - 0.	0	0.	0. - 0.	0	0.	0. - 0.	0
CARP		0.	0. - 0.	0	0.	0. - 0.	0	0.	0. - 0.	0
PEAMOUTH	20.3	20.3-20.3	1	0.	0.	0. - 0.	0	24.3	27.3-29.2	2
NORTHERN SQUAWFISH		0.	0. - 0.	0	0.	0. - 0.	0	0.	0. - 0.	0
WEDDIE SHINER		0.	0. - 0.	0	0.	0. - 0.	0	0.	0. - 0.	0
CHITSELMOUTH		0.	0. - 0.	0	0.	0. - 0.	0	0.	0. - 0.	0
SAND ROLLER		0.	0. - 0.	0	0.	0. - 0.	0	0.	0. - 0.	0

UPLOOKING JULY 25 1978 SPECIES	:NIGHT	X	NET 1 RANGE	N	X	NET 2 RANGE	N	X	NET 3 RANGE	N
SOCKEYE SALMON (S)		10.2	10.2-10.2	1	0*	0* - 0*	0	10.2	10.2-10.2	1
CHINOOK SALMON		0.	0* - 0*	0	0*	0* - 0*	0	0*	0* - 0*	0
CHINOOK SALMON (S)		0.	0* - 0*	0	0*	0* - 0*	0	0*	0* - 0*	0
CHINOOK SALMON (J)		0.	0* - 0*	0	0*	0* - 0*	0	0*	0* - 0*	0
WINGFLIP SUCKER		0.	0* - 0*	0	0*	0* - 0*	0	0*	0* - 0*	0
LARGESCALE SUCKER		0.	0* - 0*	0	0*	0* - 0*	0	0*	0* - 0*	0
CARP		0.	0* - 0*	0	43.2	43.2-43.2	1	0*	0* - 0*	0
PEAMOUTH	21.2	17.8-22.9	3	0*	0*	0* - 0*	0	0*	0* - 0*	0
NORTHERN SQUAWFISH	30.4	27.0-50.8	2	26.7	26.7-26.7	1	25.0	21.6-27.9	3	3
WEDDIE SHINER	0.	0* - 0*	0	11.4	11.4-11.4	1	12.7	12.7-12.7	1	1
CHITSELMOUTH	21.7	15.2-25.4	25	24.5	17.8-27.9	17	24.2	17.8-27.9	24	24
SAND ROLLER	0.	0* - 0*	0	0*	0* - 0*	0	0*	0* - 0*	0	0

POOR ORIGINAL

TABLE 3. FORK LENGTHS (CM) OF FISHES COLLECTED IN EXPERIMENTAL GILL NETS AT THE PEBBLE SPRINGS STUDY SITE ON THE COLUMBIA RIVER FROM APRIL 1978 THROUGH JULY, 1978. (X = MEAN, RANGE* N = SAMPLE SIZE)

DOWNLOOKING		NIGHT		DAY		NIGHT	
APRIL 17 1978		APRIL 17 1978		APRIL 17 1978		APRIL 17 1978	
SPECIES		SPECIES		SPECIES		SPECIES	
X	NET 1	X	NET 1	X	NET 1	X	NET 1
RANGE		RANGE		RANGE		RANGE	
N		N		N		N	
0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0
0	0	0					

POOR ORIGINAL

BEAK

[illegible]

BEAK

[illegible]

TABLE 3. FISH LENGTHS (CM) OF FISHES COLLECTED IN EXPERIMENTAL GILL NETS AT THE DEERIE SPRINGS STUDY SITE ON THE COLUMBIA RIVER FROM APRIL 1978 THROUGH JULY 1978. (X = MEAN, RANGE, N = SAMPLE SIZE)

DOWNY DOKING JUNE 27 1978 SPECIES	DAY	NET 1			NET 2			NET 3		
		X	RANGE	N	X	RANGE	N	X	RANGE	N
SOCKEYE SALMON (S)		0.	0. - 0.	0	0.	0. - 0.	0	0.	0. - 0.	0
CHINOOK SALMON (S)		0.	0. - 0.	0	0.	0. - 0.	0	0.	0. - 0.	0
WATNROW TROUT		0.	0. - 0.	0	0.	0. - 0.	0	0.	0. - 0.	0
WINGELET SICKER		0.	0. - 0.	0	0.	0. - 0.	0	21.6	21.6-21.6	1
LARGESCALE SICKER		0.	0. - 0.	0	0.	0. - 0.	0	0.	0. - 0.	0
DEAMOUTH		0.	0. - 0.	0	0.	0. - 0.	0	19.1	19.1-19.1	1
NORTHERN SQUAWFISH		27.9	27.9-27.9	1	27.9	27.9-27.9	1	13.3	13.3-13.3	1
CHITSELMOUTH		0.	0. - 0.	0	0.	0. - 0.	0	0.	0. - 0.	0

DOWNY DOKING JUNE 27 1978 SPECIES	NIGHT	NET 1			NET 2			NET 3		
		X	RANGE	N	X	RANGE	N	X	RANGE	N
SOCKEYE SALMON (S)		0.	0. - 0.	0	0.	0. - 0.	0	0.	0. - 0.	0
CHINOOK SALMON (S)		0.	0. - 0.	0	0.	0. - 0.	0	0.	0. - 0.	0
WATNROW TROUT		0.	0. - 0.	0	0.	0. - 0.	0	0.	0. - 0.	0
WINGELET SICKER		0.	0. - 0.	0	0.	0. - 0.	0	0.	0. - 0.	0
LARGESCALE SICKER		0.	0. - 0.	0	0.	0. - 0.	0	0.	0. - 0.	0
DEAMOUTH		17.8	17.8-17.8	1	11.4	11.4-11.4	1	0.	0. - 0.	0
NORTHERN SQUAWFISH		25.9	19.1-33.0	3	22.9	22.9-22.9	1	0.	0. - 0.	0
CHITSELMOUTH		0.	0. - 0.	0	19.1	19.1-19.1	1	0.	0. - 0.	0

POOR ORIGINAL

Table 3. Fork lengths (cm) of fishes collected in experimental gill nets at the Pease Springs Study Site on the Columbia River from April, 1978 through July, 1978. (x = mean, range, n = sample size)

DOWN DURING JULY 12 1978 DAY				DOWN DURING JULY 12 1978 NIGHT			
SPECIES	NET 1	x	RANGE	SPECIES	NET 1	x	RANGE
SOCKEYE SALMON (S)	0	0	0 - 0	SOCKEYE SALMON (S)	11.4	11.4	11.4-11.4
CHINOOK SALMON (S)	11.4	11.4	11.4-11.4	CHINOOK SALMON (S)	34.3	34.3	34.3-34.3
RAINBOW TROUT	0	0	0 - 0	RAINBOW TROUT	0	0	0 - 0
WINGED LIP SUCKER	0	0	0 - 0	WINGED LIP SUCKER	0	0	0 - 0
LARGESCALE SUCKER	0	0	0 - 0	LARGESCALE SUCKER	0	0	0 - 0
PEAMOUTH	0	0	0 - 0	PEAMOUTH	0	0	0 - 0
NORTHERN SQUAWFISH	0	0	0 - 0	NORTHERN SQUAWFISH	0	0	0 - 0
CHISELMOUTH	0	0	0 - 0	CHISELMOUTH	21.4	21.4	20.3-22.9
NET 2				NET 3			
SPECIES	NET 2	x	RANGE	SPECIES	NET 3	x	RANGE
SOCKEYE SALMON (S)	0	0	0 - 0	SOCKEYE SALMON (S)	0	0	0 - 0
CHINOOK SALMON (S)	11.4	11.4	11.4-11.4	CHINOOK SALMON (S)	0	0	0 - 0
RAINBOW TROUT	0	0	0 - 0	RAINBOW TROUT	0	0	0 - 0
WINGED LIP SUCKER	0	0	0 - 0	WINGED LIP SUCKER	0	0	0 - 0
LARGESCALE SUCKER	0	0	0 - 0	LARGESCALE SUCKER	0	0	0 - 0
PEAMOUTH	0	0	0 - 0	PEAMOUTH	0	0	0 - 0
NORTHERN SQUAWFISH	0	0	0 - 0	NORTHERN SQUAWFISH	0	0	0 - 0
CHISELMOUTH	0	0	0 - 0	CHISELMOUTH	0	0	0 - 0

POOR ORIGINAL

TABLE 3. FORK LENGTHS (CM) OF FISHES COLLECTED IN EXPERIMENTAL GILL NETS AT THE PEARLE SPRINGS STUDY SITE ON THE COLUMBIA RIVER FROM APRIL, 1979 THROUGH JULY, 1979. (X = MEAN, RANGE, N = SAMPLE SIZE)

DOWN DOKING	JULY 25 1979	SPECIES	NET 1			NET 2			NET 3		
			X	RANGE	N	X	RANGE	N	X	RANGE	N
DOWN DOKING	JULY 25 1979	SUCKEYE SALMON (S)	0*	0* - 0*	0	13.3	13.3-13.3	1	0*	0* - 0*	0
		CHINOOK SALMON (S)	0*	0* - 0*	0	0*	0* - 0*	0	0*	0* - 0*	0
		PALEOM TROUT	0*	0* - 0*	0	0*	0* - 0*	0	0*	0* - 0*	0
		HEADFLIP SUCKER	0*	0* - 0*	0	0*	0* - 0*	0	0*	0* - 0*	0
		LARGESCALE SUCKER	0*	0* - 0*	0	0*	0* - 0*	0	0*	0* - 0*	0
		PEAMOUTH	0*	0* - 0*	0	0*	0* - 0*	0	0*	0* - 0*	0
		NORTHERN SNAKEFISH	0*	0* - 0*	0	0*	0* - 0*	0	0*	0* - 0*	0
DOWN DOKING	JULY 25 1979	CHITSEL MOUTH	0*	0* - 0*	0	0*	0* - 0*	0	0*	0* - 0*	0
		SUCKEYE SALMON (S)	0*	0* - 0*	0	0*	0* - 0*	0	0*	0* - 0*	0
		CHINOOK SALMON (S)	0*	0* - 0*	0	0*	0* - 0*	0	0*	0* - 0*	0
		PALEOM TROUT	0*	0* - 0*	0	0*	0* - 0*	0	0*	0* - 0*	0
		HEADFLIP SUCKER	0*	0* - 0*	0	0*	0* - 0*	0	0*	0* - 0*	0
		LARGESCALE SUCKER	0*	0* - 0*	0	0*	0* - 0*	0	0*	0* - 0*	0
		PEAMOUTH	0*	0* - 0*	0	0*	0* - 0*	0	0*	0* - 0*	0
DOWN DOKING	JULY 25 1979	NORTHERN SNAKEFISH	0*	0* - 0*	0	0*	0* - 0*	0	0*	0* - 0*	0
		CHITSEL MOUTH	0*	0* - 0*	0	0*	0* - 0*	0	0*	0* - 0*	0
		SUCKEYE SALMON (S)	0*	0* - 0*	0	0*	0* - 0*	0	0*	0* - 0*	0
		CHINOOK SALMON (S)	0*	0* - 0*	0	0*	0* - 0*	0	0*	0* - 0*	0
		PALEOM TROUT	0*	0* - 0*	0	0*	0* - 0*	0	0*	0* - 0*	0
		HEADFLIP SUCKER	0*	0* - 0*	0	0*	0* - 0*	0	0*	0* - 0*	0
		LARGESCALE SUCKER	0*	0* - 0*	0	0*	0* - 0*	0	0*	0* - 0*	0
DOWN DOKING	JULY 25 1979	PEAMOUTH	0*	0* - 0*	0	0*	0* - 0*	0	0*	0* - 0*	0
		NORTHERN SNAKEFISH	0*	0* - 0*	0	0*	0* - 0*	0	0*	0* - 0*	0
		CHITSEL MOUTH	0*	0* - 0*	0	0*	0* - 0*	0	0*	0* - 0*	0
		SUCKEYE SALMON (S)	0*	0* - 0*	0	0*	0* - 0*	0	0*	0* - 0*	0
		CHINOOK SALMON (S)	0*	0* - 0*	0	0*	0* - 0*	0	0*	0* - 0*	0
		PALEOM TROUT	0*	0* - 0*	0	0*	0* - 0*	0	0*	0* - 0*	0
		HEADFLIP SUCKER	0*	0* - 0*	0	0*	0* - 0*	0	0*	0* - 0*	0

POOR ORIGINAL

TABLE 4. NET WEIGHTS (G) OF FISHES COLLECTED IN EXPERIMENTAL GILL NETS AT THE DEER SPRINGS STUDY SITE ON THE COLUMBIA RIVER FROM APRIL, 1978 THROUGH JULY, 1978. (X = MEAN, RANGE, N = SAMPLE SIZE)

UPLOOKING	SPECIES	APRIL 17 1978 DAY			APRIL 17 1978 NIGHT		
		X	RANGE	N	X	RANGE	N
UPLOOKING	SUCKEYE SALMON (S)	0.	0. - 0.	0	0.	0. - 0.	0
	CHINOOK SALMON	0.	0. - 0.	0	0.	0. - 0.	0
	CHINOOK SALMON (S)	0.	0. - 0.	0	0.	0. - 0.	0
	CHINOOK SALMON (L)	0.	0. - 0.	0	0.	0. - 0.	0
	SPIDGELIP SUCKER	0.	0. - 0.	0	0.	0. - 0.	0
	LARGESCALE SUCKER	0.	0. - 0.	0	0.	0. - 0.	0
	CARP	0.	0. - 0.	0	0.	0. - 0.	0
	PEAMOUTH	0.	0. - 0.	0	0.	0. - 0.	0
	NORTHERN SQUAWFISH	0.	0. - 0.	0	0.	0. - 0.	0
	REDSIDE SHINER	0.	0. - 0.	0	0.	0. - 0.	0
	CHISEL MOUTH	0.	0. - 0.	0	0.	0. - 0.	0
	SAND ROLLER	0.	0. - 0.	0	0.	0. - 0.	0
	UPLOOKING	0.	0. - 0.	0	0.	0. - 0.	0
UPLOOKING	SUCKEYE SALMON (S)	0.	0. - 0.	0	0.	0. - 0.	0
	CHINOOK SALMON	0.	0. - 0.	0	0.	0. - 0.	0
	CHINOOK SALMON (S)	0.	0. - 0.	0	0.	0. - 0.	0
	CHINOOK SALMON (L)	0.	0. - 0.	0	0.	0. - 0.	0
	SPIDGELIP SUCKER	0.	0. - 0.	0	0.	0. - 0.	0
	LARGESCALE SUCKER	0.	0. - 0.	0	0.	0. - 0.	0
	CARP	0.	0. - 0.	0	0.	0. - 0.	0
	PEAMOUTH	0.	0. - 0.	0	0.	0. - 0.	0
	NORTHERN SQUAWFISH	0.	0. - 0.	0	0.	0. - 0.	0
	REDSIDE SHINER	0.	0. - 0.	0	0.	0. - 0.	0
	CHISEL MOUTH	0.	0. - 0.	0	0.	0. - 0.	0
	SAND ROLLER	0.	0. - 0.	0	0.	0. - 0.	0
	UPLOOKING	0.	0. - 0.	0	0.	0. - 0.	0

POOR ORIGINAL

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TABLE 4. NET WEIGHTS (G) OF FISHES COLLECTED IN EXPERIMENTAL GILL NETS AT THE PERRIE SPRINGS STUDY SITE ON THE COLUMBIA RIVER FROM APRIL 1978 THROUGH 4 JULY 1979. EX = MEAN, RANGE = N = SAMPLE SIZE

UPLOOKING APRIL 24 1978 SPECIES	DAY	NET 1 RANGE	N	EX	NET 2 RANGE	N	EX	NET 3 RANGE	N
SOCKEYE SALMON (S)		0.0 - 0.0	0	0.0	0.0 - 0.0	0	0.0	0.0 - 0.0	0
CHINOOK SALMON		0.0 - 0.0	0	0.0	0.0 - 0.0	0	0.0	0.0 - 0.0	0
CHINOOK SALMON (S)		0.0 - 0.0	0	0.0	0.0 - 0.0	0	0.0	0.0 - 0.0	0
CHINOOK SALMON (L)		0.0 - 0.0	0	0.0	0.0 - 0.0	0	0.0	0.0 - 0.0	0
WINGFLIP SUCKER		0.0 - 0.0	0	0.0	0.0 - 0.0	0	0.0	0.0 - 0.0	0
LARGESCALE SUCKER		0.0 - 0.0	0	0.0	0.0 - 0.0	0	0.0	0.0 - 0.0	0
CARP		0.0 - 0.0	0	0.0	0.0 - 0.0	0	0.0	0.0 - 0.0	0
PEAMOUTH		0.0 - 0.0	0	0.0	0.0 - 0.0	0	0.0	0.0 - 0.0	0
NORTHERN SQUAWFISH		0.0 - 0.0	0	0.0	0.0 - 0.0	0	0.0	0.0 - 0.0	0
REDSTIE SHINER		0.0 - 0.0	0	0.0	0.0 - 0.0	0	0.0	0.0 - 0.0	0
CHISLMOUTH		0.0 - 0.0	0	0.0	0.0 - 0.0	0	0.0	0.0 - 0.0	0
SAND ROLLER		0.0 - 0.0	0	0.0	0.0 - 0.0	0	0.0	0.0 - 0.0	0
UPLOOKING APRIL 24 1978 SPECIES	INTIGHT	NET 1 RANGE	N	EX	NET 2 RANGE	N	EX	NET 3 RANGE	N
SOCKEYE SALMON (S)		0.0 - 0.0	0	0.0	0.0 - 0.0	0	0.0	0.0 - 0.0	0
CHINOOK SALMON		0.0 - 0.0	0	0.0	0.0 - 0.0	0	0.0	0.0 - 0.0	0
CHINOOK SALMON (S)		0.0 - 0.0	0	0.0	0.0 - 0.0	0	0.0	0.0 - 0.0	0
CHINOOK SALMON (L)		0.0 - 0.0	0	0.0	0.0 - 0.0	0	0.0	0.0 - 0.0	0
WINGFLIP SUCKER		0.0 - 0.0	0	0.0	0.0 - 0.0	0	0.0	0.0 - 0.0	0
LARGESCALE SUCKER		0.0 - 0.0	0	0.0	0.0 - 0.0	0	0.0	0.0 - 0.0	0
CARP		0.0 - 0.0	0	0.0	0.0 - 0.0	0	0.0	0.0 - 0.0	0
PEAMOUTH		0.0 - 0.0	0	0.0	0.0 - 0.0	0	0.0	0.0 - 0.0	0
NORTHERN SQUAWFISH		0.0 - 0.0	0	0.0	0.0 - 0.0	0	0.0	0.0 - 0.0	0
PENSTIE SHINER		0.0 - 0.0	0	0.0	0.0 - 0.0	0	0.0	0.0 - 0.0	0
CHISLMOUTH		0.0 - 0.0	0	0.0	0.0 - 0.0	0	0.0	0.0 - 0.0	0
SAND ROLLER		0.0 - 0.0	0	0.0	0.0 - 0.0	0	0.0	0.0 - 0.0	0

POOR ORIGINAL

TABLE 4. NET WEIGHTS (G) OF FISHES COLLECTED IN EXPERIMENTAL GILL NETS AT THE PEARLE SPRINGS STUDY SITE ON THE COLUMBIA RIVER FROM APRIL, 1978 THROUGH JULY, 1978. (X = MEAN, RANGE, N = SAMPLE SIZE)

UPLOOKING									
MAY 15 1978					SPECIES				
:DAY					:NIGHT				
NET 1					NET 1				
RANGE					RANGE				
N					N				
X					X				
NET 2					NET 2				
RANGE					RANGE				
N					N				
X					X				
NET 3					NET 3				
RANGE					RANGE				
N					N				
SUCKEYE SALMON (S)					0.				
CHINOOK SALMON					0.				
CHINOOK SALMON (S)					0.				
CHINOOK SALMON (L)					0.				
WILDCELIC SUCKER					0.				
LARGESCALE SUCKER					0.				
CARP					0.				
PEANUTTH					0.				
NORTHERN SQUAMFISH					0.				
WEBSITE SHIMP					0.				
CHIFF MOUTH					0.				
SAND DOLLER					0.				

NO SAMPLE TAKEN.

POOR ORIGINAL

Table 4. Wet weights (g) of fishes collected in experimental gill nets at the Pebble Springs Study Site on the Columbia River from April, 1979 through July, 1978. (X = mean, RANGE = N = sample size)

Hauling															
JUNE 19 1978															
NIGHT															
SPECIES															
X															
NFI 1															
RANGE															
N															
Sockeye Salmon (S)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Chinook Salmon	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Chinook Salmon (S)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Chinook Salmon (L)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Hardhead Sucker	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Largehead Sucker	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Carp	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Peanut	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Northern Squawfish	100.0	100.0	100.0-100.0	1	0	0	0	0	0	0	0	0	0	0	0
Bendy Shiner	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Chiselmouth	0	0	0	0	0	0	79.5	79.5-79.5	8	100.0	100.0	100.0-100.0	2	0	0
Sand Booby	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Hauling															
JUNE 19 1978															
DAY															
SPECIES															
X															
NFI 1															
RANGE															
N															
Sockeye Salmon (S)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Chinook Salmon	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Chinook Salmon (S)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Chinook Salmon (L)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Hardhead Sucker	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Largehead Sucker	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Carp	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Peanut	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Northern Squawfish	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Bendy Shiner	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Chiselmouth	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Sand Booby	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Hauling															
JUNE 19 1978															
NIGHT															
SPECIES															
X															
NFI 2															
RANGE															
N															
Sockeye Salmon (S)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Chinook Salmon	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Chinook Salmon (S)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Chinook Salmon (L)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Hardhead Sucker	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Largehead Sucker	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Carp	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Peanut	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Northern Squawfish	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Bendy Shiner	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Chiselmouth	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Sand Booby	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Hauling															
JUNE 19 1978															
DAY															
SPECIES															
X															
NFI 2															
RANGE															
N															
Sockeye Salmon (S)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Chinook Salmon	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Chinook Salmon (S)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Chinook Salmon (L)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Hardhead Sucker	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Largehead Sucker	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Carp	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Peanut	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Northern Squawfish	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Bendy Shiner	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Chiselmouth	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Sand Booby	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Hauling															
JUNE 19 1978															
NIGHT															
SPECIES															
X															
NFI 3															
RANGE															
N															
Sockeye Salmon (S)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Chinook Salmon	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Chinook Salmon (S)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Chinook Salmon (L)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Hardhead Sucker	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Largehead Sucker	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Carp	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Peanut	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Northern Squawfish	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Bendy Shiner	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Chiselmouth	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Sand Booby	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Hauling															
JUNE 19 1978															
DAY															
SPECIES															
X															
NFI 3															
RANGE															
N															
Sockeye Salmon (S)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Chinook Salmon	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Chinook Salmon (S)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Chinook Salmon (L)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Hardhead Sucker	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Largehead Sucker	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Carp	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Peanut	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Northern Squawfish	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Bendy Shiner	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Chiselmouth	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Sand Booby	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

POOR ORIGINAL

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BEAK

[illegible]

TABLE 4. NET WEIGHTS (G) OF FISHES COLLECTED IN EXPERIMENTAL GILL NETS AT THE PEARL SPRINGS STUDY SITE ON THE COLUMBIA RIVER FROM APRIL, 1978 THROUGH JULY, 1978. (X = MEAN, RANGE, N = SAMPLE SIZE)

UPLOOKING JULY 12 1978 SPECIES	:DAY	NET 1 RANGE	X	N	X	NET 2 RANGE	N	X	NET 3 RANGE	N
SOCKEYE SALMON (S)		0. - 0.	0.	0	0.	0. - 0.	0	0.	0. - 0.	0
CHINOOK SALMON		0. - 0.	0.	0	0.	0. - 0.	0	0.	0. - 0.	0
CHINOOK SALMON (S)		30.0 - 30.0	30.0	1	0.	0. - 0.	0	0.	0. - 0.	0
CHINOOK SALMON (J)		0. - 0.	0.	0	0.	0. - 0.	0	0.	0. - 0.	0
HEINGELIP SUCKER		0. - 0.	0.	0	0.	0. - 0.	0	0.	0. - 0.	0
LARGESCALE SUCKER		0. - 0.	0.	0	0.	0. - 0.	0	0.	0. - 0.	0
CARP		0. - 0.	0.	0	0.	0. - 0.	0	0.	0. - 0.	0
PEAMOUTH		0. - 0.	0.	0	55.0	50.0 - 60.0	2	40.0	20.0 - 60.0	2
NORTHERN SQUAWFISH		0. - 0.	0.	0	0.	0. - 0.	0	20.0	20.0 - 20.0	1
WESIDE SHINER		0. - 0.	0.	0	0.	0. - 0.	0	0.	0. - 0.	0
CHITSLMOUTH		50.0 - 160.0	103.8	4	150.0	150.0 - 150.0	1	78.3	50.0 - 160.0	6
SAND GOLLER		0. - 0.	0.	0	0.	0. - 0.	0	0.	0. - 0.	0

UPLOOKING JULY 12 1978 SPECIES	:NIGHT	NET 1 RANGE	X	N	X	NET 2 RANGE	N	X	NET 3 RANGE	N
SOCKEYE SALMON (S)		0. - 0.	0.	0	0.	0. - 0.	0	0.	0. - 0.	0
CHINOOK SALMON		0. - 0.	0.	0	0.	0. - 0.	0	0.	0. - 0.	0
CHINOOK SALMON (S)		0. - 0.	0.	0	0.	0. - 0.	0	0.	0. - 0.	0
CHINOOK SALMON (J)		0. - 0.	0.	0	0.	0. - 0.	0	0.	0. - 0.	0
HEINGELIP SUCKER		0. - 0.	0.	0	0.	0. - 0.	0	0.	0. - 0.	0
LARGESCALE SUCKER		0. - 0.	0.	0	0.	0. - 0.	0	500.0	500.0 - 500.0	1
CARP		0. - 0.	0.	0	0.	0. - 0.	0	0.	0. - 0.	0
PEAMOUTH		0. - 0.	0.	0	40.0	40.0 - 40.0	1	0.	0. - 0.	0
NORTHERN SQUAWFISH		100.0 - 230.0	165.0	2	110.0	110.0 - 110.0	1	133.3	70.0 - 250.0	3
WESIDE SHINER		0. - 0.	0.	0	0.	0. - 0.	0	0.	0. - 0.	0
CHITSLMOUTH		40.0 - 160.0	110.0	3	148.0	100.0 - 200.0	5	100.0	50.0 - 150.0	3
SAND GOLLER		20.0 - 20.0	20.0	1	22.0	20.0 - 30.0	5	10.0	10.0 - 10.0	3

POOR ORIGINAL

TABLE 4. NET WEIGHTS (G) OF FISHES COLLECTED IN EXPERIMENTAL GILL NETS AT THE PERRIE SPRINGS STUDY SITE ON THE COLUMBIA RIVER FROM APRIL, 1978 THROUGH JULY, 1978. (X = MEAN, RANGE, N = SAMPLE SIZE)

UPLOOKING JULY 25 1978 SPECIES	DAY	NFT 1 RANGE	N	X	NFT 2 RANGE	N	X	NFT 3 RANGE	N
SOCKEYE SALMON (S)		0. - 0.	0	0.	0. - 0.	0	0.	0. - 0.	0
CHINOOK SALMON		0. - 0.	0	0.	0. - 0.	0	0.	0. - 0.	0
CHINOOK SALMON (S)		0. - 0.	0	0.	0. - 0.	0	0.	0. - 0.	0
CHINOOK SALMON (J)		0. - 0.	0	0.	0. - 0.	0	0.	0. - 0.	0
WINGELIP SUCKER		0. - 0.	0	0.	0. - 0.	0	0.	0. - 0.	0
LARGESCALE SUCKER		0. - 0.	0	0.	0. - 0.	0	0.	0. - 0.	0
CARP		0. - 0.	0	0.	0. - 0.	0	0.	0. - 0.	0
PEAMOUTH		60.0 - 60.0	1	0.	0. - 0.	0	200.0	160.0 - 240.0	2
NORTHERN SQUAMFISH		0. - 0.	0	0.	0. - 0.	0	0.	0. - 0.	0
REDTIDE SHINER		0. - 0.	0	0.	0. - 0.	0	0.	0. - 0.	0
CHISELMOUTH		0. - 0.	0	0.	0. - 0.	0	0.	0. - 0.	0
SAND ROLLER		0. - 0.	0	0.	0. - 0.	0	0.	0. - 0.	0

UPLOOKING JULY 25 1978 SPECIES	NIGHT	NFT 1 RANGE	N	X	NFT 2 RANGE	N	X	NFT 3 RANGE	N
SOCKEYE SALMON (S)		20.0 - 20.0	1	20.0	0. - 0.	0	5.0	5.0 - 5.0	1
CHINOOK SALMON		0. - 0.	0	0.	0. - 0.	0	0.	0. - 0.	0
CHINOOK SALMON (S)		0. - 0.	0	0.	0. - 0.	0	0.	0. - 0.	0
CHINOOK SALMON (J)		0. - 0.	0	0.	0. - 0.	0	0.	0. - 0.	0
WINGELIP SUCKER		0. - 0.	0	0.	0. - 0.	0	0.	0. - 0.	0
LARGESCALE SUCKER		0. - 0.	0	0.	0. - 0.	0	0.	0. - 0.	0
CARP		0. - 0.	0	1905.0	1905.0 - 1905.0	1	0.	0. - 0.	0
PEAMOUTH		60.0 - 120.0	3	96.7	0. - 0.	0	0.	0. - 0.	0
NORTHERN SQUAMFISH		190.0 - 1814.0	2	1002.0	160.0 - 160.0	1	130.0	100.0 - 150.0	3
REDTIDE SHINER		0. - 0.	0	0.	20.0 - 20.0	1	10.0	10.0 - 10.0	1
CHISELMOUTH		50.0 - 190.0	25	122.0	80.0 - 240.0	17	116.7	40.0 - 170.0	24
SAND ROLLER		0. - 0.	0	0.	0. - 0.	0	0.	0. - 0.	0

POOR ORIGINAL

TABLE 4. NET WEIGHTS (G) OF FISHES COLLECTED IN EXPERIMENTAL GILL NETS AT THE PERRIF SPRINGS STUDY SITE ON THE COLUMBIA RIVER FROM APRIL 1978 THROUGH JULY 1978. (X = MEAN, RANGE, N = SAMPLE SIZE)

DOWNLOOKING APRIL 17 1978 SPECIES	DAY	X	NET 1 RANGE	N	X	NET 2 RANGE	N	X	NET 3 RANGE	N
SOCKEYE SALMON (S)		0.	0. - 0.	0	0.	0. - 0.	0	0.	0. - 0.	0
CHINOOK SALMON (S)		0.	0. - 0.	0	0.	0. - 0.	0	0.	0. - 0.	0
RAINBOW TROUT		0.	0. - 0.	0	0.	0. - 0.	0	0.	0. - 0.	0
WINGFLIP SUCKER		0.	0. - 0.	0	0.	0. - 0.	0	0.	0. - 0.	0
LARGESCALE SUCKER		0.	0. - 0.	0	0.	0. - 0.	0	0.	0. - 0.	0
PEAMOUTH		0.	0. - 0.	0	0.	0. - 0.	0	0.	0. - 0.	0
NORTHERN SQUAMFISH		0.	0. - 0.	0	0.	0. - 0.	0	0.	0. - 0.	0
CHISLMOUTH		0.	0. - 0.	0	0.	0. - 0.	0	0.	0. - 0.	0

DOWNLOOKING APRIL 17 1978 SPECIES	NIGHT	X	NET 1 RANGE	N	X	NET 2 RANGE	N	X	NET 3 RANGE	N
SOCKEYE SALMON (S)		0.	0. - 0.	0	0.	0. - 0.	0	0.	0. - 0.	0
CHINOOK SALMON (S)		0.	0. - 0.	0	0.	0. - 0.	0	0.	0. - 0.	0
RAINBOW TROUT		0.	0. - 0.	0	0.	0. - 0.	0	0.	0. - 0.	0
WINGFLIP SUCKER		0.	0. - 0.	0	0.	0. - 0.	0	0.	0. - 0.	0
LARGESCALE SUCKER		0.	0. - 0.	0	0.	0. - 0.	0	0.	0. - 0.	0
PEAMOUTH		0.	0. - 0.	0	0.	0. - 0.	0	0.	0. - 0.	0
NORTHERN SQUAMFISH		0.	0. - 0.	0	0.	0. - 0.	0	0.	0. - 0.	0
CHISLMOUTH		0.	0. - 0.	0	0.	0. - 0.	0	0.	0. - 0.	0

POOR ORIGINAL

TABLE 4. NET WEIGHTS (G) OF FISHES COLLECTED IN EXPERIMENTAL GILL NETS AT THE DEERLE SPRINGS STUDY SITE ON THE COLUMBIA RIVER FROM APRIL, 1978 THROUGH JULY, 1978. (X = MEAN, RANGE, N = SAMPLE SIZE)

DOWNLOOKING APRIL 24 1978 SPECIES	:DAY	NET 1			NET 2			NET 3		
		X	RANGE	N	X	RANGE	N	X	RANGE	N
SOCKEYE SALMON (S)		0.	0. - 0.	0	0.	0. - 0.	0	0.	0. - 0.	0
CHINOOK SALMON (S)		0.	0. - 0.	0	0.	0. - 0.	0	0.	0. - 0.	0
RAINBOW TROUT		0.	0. - 0.	0	0.	0. - 0.	0	0.	0. - 0.	0
WINGFLIP SUCKER		0.	0. - 0.	0	0.	0. - 0.	0	0.	0. - 0.	0
LARGESCALE SUCKER		0.	0. - 0.	0	0.	0. - 0.	0	0.	0. - 0.	0
PEAMOUTH		0.	0. - 0.	0	0.	0. - 0.	0	0.	0. - 0.	0
NORTHERN SQUAMFISH		0.	0. - 0.	0	0.	0. - 0.	0	0.	0. - 0.	0
CHISELMOUTH		0.	0. - 0.	0	0.	0. - 0.	0	0.	0. - 0.	0

DOWNLOOKING APRIL 24 1978 SPECIES	:NIGHT	NET 1			NET 2			NET 3		
		X	RANGE	N	X	RANGE	N	X	RANGE	N
SOCKEYE SALMON (S)		0.	0. - 0.	0	0.	0. - 0.	0	0.	0. - 0.	0
CHINOOK SALMON (S)		0.	0. - 0.	0	15.0	15.0 - 15.0	1	0.	0. - 0.	0
RAINBOW TROUT		0.	0. - 0.	0	0.	0. - 0.	0	0.	0. - 0.	0
WINGFLIP SUCKER		115.0	115.0 - 115.0	1	0.	0. - 0.	0	0.	0. - 0.	0
LARGESCALE SUCKER		0.	0. - 0.	0	0.	0. - 0.	0	0.	0. - 0.	0
PEAMOUTH		135.0	135.0 - 135.0	1	0.	0. - 0.	0	0.	0. - 0.	0
NORTHERN SQUAMFISH		0.	0. - 0.	0	0.	0. - 0.	0	0.	0. - 0.	0
CHISELMOUTH		0.	0. - 0.	0	0.	0. - 0.	0	0.	0. - 0.	0

POOR ORIGINAL

TABLE 4. NET WEIGHTS (G) OF FISHES COLLECTED IN EXPERIMENTAL GILL NETS AT THE PERHLE SPRINGS STUDY SITE ON THE COLUMBIA RIVER FROM APRIL, 1978 THROUGH JULY, 1978. (X = MEAN, RANGE, N = SAMPLE SIZE)

DOWNDORING MAY 15, 1978 SPECIES	DAY	NET 1			NET 2			NET 3		
		X	RANGE	N	X	RANGE	N	X	RANGE	N
SOCKEYE SALMON (S)		0*	0* - 0*	0	0*	0* - 0*	0	0*	0* - 0*	0
CHINOOK SALMON (S)		0*	0* - 0*	0	0*	0* - 0*	0	0*	0* - 0*	0
BAYBROW TROUT		0*	0* - 0*	0	0*	0* - 0*	0	0*	0* - 0*	0
WINGELTP SUCKER		0*	0* - 0*	0	0*	0* - 0*	0	0*	0* - 0*	0
LARGESCALE SUCKER		0*	0* - 0*	0	539.0	539.0 - 539.0	1	0*	0* - 0*	0
PEAMOUTH		0*	0* - 0*	0	0*	0* - 0*	0	0*	0* - 0*	0
NORTHERN SOLIAWFISH		0*	0* - 0*	0	0*	0* - 0*	0	0*	0* - 0*	0
CHISF MOUTH		0*	0* - 0*	0	0*	0* - 0*	0	0*	0* - 0*	0
DOWNDORING MAY 15, 1978 SPECIES	INIGHT	X	RANGE	N	X	RANGE	N	X	RANGE	N

NO SAMPLE TAKEN.

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POOR ORIGINAL

TABLE 4. NET WEIGHTS (G) OF FISHES COLLECTED IN EXPERIMENTAL GILL NETS AT THE PEARLE SPRINGS STUDY SITE ON THE COLUMBIA RIVER FROM APRIL, 1978 THROUGH JULY, 1978. (X = MEAN, RANGE, N = SAMPLE SIZE)

DOWNDROCKING JUNE 19 1978 SPECIES	DAY	NET 1			NET 2			NET 3		
		X	RANGE	N	X	RANGE	N	X	RANGE	N
SOCKEYE SALMON (S)		0.	0. - 0.	0	0.	0. - 0.	0	0.	0. - 0.	0
CHINOOK SALMON (S)		0.	0. - 0.	0	0.	0. - 0.	0	0.	0. - 0.	0
RAINBOW TROUT		0.	0. - 0.	0	0.	0. - 0.	0	0.	0. - 0.	0
BROWN TROUT		0.	0. - 0.	0	0.	0. - 0.	0	0.	0. - 0.	0
WINGFLAP SUCKER		0.	0. - 0.	0	0.	0. - 0.	0	0.	0. - 0.	0
LARGESCALE SUCKER		0.	0. - 0.	0	0.	0. - 0.	0	0.	0. - 0.	0
PEAMOUTH		0.	0. - 0.	0	170.0	170.0 - 170.0	1	70.0	70.0 - 70.0	1
NORTHERN SQUAMFISH		0.	0. - 0.	0	50.0	50.0 - 50.0	1	120.0	90.0 - 150.0	3
CHISELMOUTH		0.	0. - 0.	0	0.	0. - 0.	0	90.0	70.0 - 130.0	6

DOWNDROCKING JUNE 19 1978 SPECIES	NIGHT	NET 1			NET 2			NET 3		
		X	RANGE	N	X	RANGE	N	X	RANGE	N
SOCKEYE SALMON (S)		0.	0. - 0.	0	0.	0. - 0.	0	0.	0. - 0.	0
CHINOOK SALMON (S)		0.	0. - 0.	0	0.	0. - 0.	0	0.	0. - 0.	0
RAINBOW TROUT		0.	0. - 0.	0	0.	0. - 0.	0	0.	0. - 0.	0
BROWN TROUT		0.	0. - 0.	0	0.	0. - 0.	0	0.	0. - 0.	0
WINGFLAP SUCKER		70.0	70.0 - 70.0	1	0.	0. - 0.	0	0.	0. - 0.	0
LARGESCALE SUCKER		0.	0. - 0.	0	0.	0. - 0.	0	0.	0. - 0.	0
PEAMOUTH		0.	0. - 0.	0	0.	0. - 0.	0	0.	0. - 0.	0
NORTHERN SQUAMFISH		60.0	60.0 - 60.0	1	0.	0. - 0.	0	0.	0. - 0.	0
CHISELMOUTH		65.0	60.0 - 70.0	2	0.	0. - 0.	0	0.	0. - 0.	0

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POOR ORIGINAL

TABLE 4. WET WEIGHTS (G) OF FISHES COLLECTED IN EXPERIMENTAL GILL NETS AT THE PERRIE SPRINGS STUDY SITE ON THE COLUMBIA RIVER FROM APRIL, 1978 THROUGH JULY, 1979. (X = MEAN, RANGE, N = SAMPLE SIZE)

DOWNLOOKING JUNE 27 1978 SPECIES	DAY	NET 1 X	NET 1 RANGE	N	X	NET 2 RANGE	N	X	NET 3 RANGE	N
SOCKEYE SALMON (S)		0.	0. - 0.	0	0.	0. - 0.	0	0.	0. - 0.	0
CHINOOK SALMON (S)		0.	0. - 0.	0	0.	0. - 0.	0	0.	0. - 0.	0
RAINBOW TROUT		0.	0. - 0.	0	0.	0. - 0.	0	0.	0. - 0.	0
BROADBELT SICKER		0.	0. - 0.	0	0.	0. - 0.	0	60.0	60.0 - 60.0	1
LARGESCALE SICKER		0.	0. - 0.	0	0.	0. - 0.	0	0.	0. - 0.	0
PEAMOUTH		0.	0. - 0.	0	0.	0. - 0.	0	70.0	70.0 - 70.0	1
NORTHERN SOUTHWEST FISH		210.0	210.0 - 210.0	1	200.0	200.0 - 200.0	1	30.0	30.0 - 30.0	1
CHITSEL MOUTH		0.	0. - 0.	0	0.	0. - 0.	0	0.	0. - 0.	0

DOWNLOOKING JUNE 27 1978 SPECIES	NIGHT	NET 1 X	NET 1 RANGE	N	X	NET 2 RANGE	N	X	NET 3 RANGE	N
SOCKEYE SALMON (S)		0.	0. - 0.	0	0.	0. - 0.	0	0.	0. - 0.	0
CHINOOK SALMON (S)		0.	0. - 0.	0	0.	0. - 0.	0	0.	0. - 0.	0
RAINBOW TROUT		0.	0. - 0.	0	0.	0. - 0.	0	0.	0. - 0.	0
BROADBELT SICKER		0.	0. - 0.	0	0.	0. - 0.	0	0.	0. - 0.	0
LARGESCALE SICKER		0.	0. - 0.	0	0.	0. - 0.	0	0.	0. - 0.	0
PEAMOUTH		50.0	50.0 - 50.0	1	10.0	10.0 - 10.0	1	0.	0. - 0.	0
NORTHERN SOUTHWEST FISH		147.3	70.0 - 230.0	3	100.0	100.0 - 100.0	1	0.	0. - 0.	0
CHITSEL MOUTH		0.	0. - 0.	0	60.0	60.0 - 60.0	1	0.	0. - 0.	0

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POOR ORIGINAL

TABLE 4
WEIGHTS (G) OF FISHES COLLECTED IN EXPERIMENTAL NETS AT THE DEEP-SPRINGS STUDY SITE
ON THE COLUMBIA RIVER FROM APRIL 1978 THROUGH JULY, 1978. (X = MEAN, RANGE = N = SAMPLE SIZE)

SPECIES	JULY 12 1978			JULY 12 1978			JULY 12 1978			JULY 12 1978		
	DAY	NET 1	RANGE	X	NET 2	RANGE	N	X	NET 3	RANGE	N	
DOWNY DOKING												
SUCKEYE SALMON (S)	0	0	0	0	0	0	0	0	0	0	0	
CHINOOK SALMON (S)	29.0	20.0-20.0	2	20.0	20.0-20.0	1	0	0	0	0	0	
RAINBOW TROUT	0	0	0	0	0	0	0	0	0	0	0	
HAIOGELLIP SICKER	0	0	0	0	0	0	0	0	0	0	0	
LAGGSCALF SICKER	0	0	0	0	0	0	0	0	0	0	0	
PEAMOUTH	0	0	0	0	0	0	0	0	0	0	0	
NORTHERN SQUAWFISH	0	0	0	0	0	0	0	0	0	0	0	
CHISLMOUTH	0	0	0	0	0	0	0	0	0	0	0	

SPECIES	JULY 12 1978			JULY 12 1978			JULY 12 1978			JULY 12 1978		
	NIGHT	NET 1	RANGE	X	NET 2	RANGE	N	X	NET 3	RANGE	N	
DOWNY DOKING												
SUCKEYE SALMON (S)	0	0	0	0	0	0	0	0	0	0	0	
CHINOOK SALMON (S)	20.0	20.0-20.0	2	20.0	20.0-20.0	1	0	0	0	0	0	
RAINBOW TROUT	0	0	0	0	0	0	0	0	0	0	0	
HAIOGELLIP SICKER	0	0	0	0	0	0	0	0	0	0	0	
LAGGSCALF SICKER	0	0	0	0	0	0	0	0	0	0	0	
PEAMOUTH	0	0	0	0	0	0	0	0	0	0	0	
NORTHERN SQUAWFISH	0	0	0	0	0	0	0	0	0	0	0	
CHISLMOUTH	0	0	0	0	0	0	0	0	0	0	0	

POOR ORIGINAL

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TABLE 4. NET WEIGHTS (G) OF FISHES COLLECTED IN EXPERIMENTAL GILL NETS AT THE PERRIE SPRINGS STUDY SITE ON THE COLUMBIA RIVER FROM APRIL, 1978 THROUGH JULY, 1978. (X = MEAN, RANGE, N = SAMPLE SIZE)

DOWNLOOKING JULY 25 1978 SPECIES	DAY	NET 1 X	NET 1 RANGE	N	X	NET 2 RANGE	N	X	NET 3 RANGE	N
SOCKEYE SALMON (S)		0*	0* - 0*	0	20*0	20*0 - 20*0	1	0*	0* - 0*	0
CHINOOK SALMON (S)		0*	0* - 0*	0	0*	0* - 0*	0	0*	0* - 0*	0
RAINBOW TROUT		0*	0* - 0*	0	0*	0* - 0*	0	0*	0* - 0*	0
WINGEFLTP SUCKER		0*	0* - 0*	0	0*	0* - 0*	0	0*	0* - 0*	0
LARGESCALE SUCKER		0*	0* - 0*	0	0*	0* - 0*	0	0*	0* - 0*	0
PEAMOUTH		0*	0* - 0*	0	0*	0* - 0*	0	0*	0* - 0*	0
NORTHERN SQUAMFISH		0*	0* - 0*	0	0*	0* - 0*	0	0*	0* - 0*	0
CHITSELMOUTH		0*	0* - 0*	0	0*	0* - 0*	0	0*	0* - 0*	0

DOWNLOOKING JULY 25 1978 SPECIES	NIGHT	NET 1 X	NET 1 RANGE	N	X	NET 2 RANGE	N	X	NET 3 RANGE	N
SOCKEYE SALMON (S)		0*	0* - 0*	0	0*	0* - 0*	0	0*	0* - 0*	0
CHINOOK SALMON (S)		0*	0* - 0*	0	0*	0* - 0*	0	0*	0* - 0*	0
RAINBOW TROUT		0*	0* - 0*	0	0*	0* - 0*	0	0*	0* - 0*	0
WINGEFLTP SUCKER		0*	0* - 0*	0	0*	0* - 0*	0	0*	0* - 0*	0
LARGESCALE SUCKER		0*	0* - 0*	0	0*	0* - 0*	0	0*	0* - 0*	0
PEAMOUTH		0*	0* - 0*	0	0*	0* - 0*	0	0*	0* - 0*	0
NORTHERN SQUAMFISH		0*	0* - 0*	0	0*	0* - 0*	0	0*	0* - 0*	0
CHITSELMOUTH		0*	0* - 0*	0	0*	0* - 0*	0	0*	0* - 0*	0

Table 5. Length-frequency distribution of salmonids and nonsalmonids collected in experimental gill nets during day and night uplooking hydroacoustics at the Pebble Springs study site on the Columbia River from April 17, 1978 through July 25, 1978.

	DAY		NIGHT		FORK LENGTH RANGE
	<u>SAL</u>	<u>N-SAL</u>	<u>SAL</u>	<u>N-SAL</u>	
NET 1	0	0	0	0	0-9
	1	2	2	4	10-19
	0	10	0	35	20-29
	0	0	0	1	30-39
	0	0	0	0	40-49
	0	0	0	1	50-59
	0	0	0	0	60-69
	1	0	0	0	70-
NET 2	0	0	0	3	0-9
	0	5	0	13	10-19
	0	9	0	53	20-29
	0	0	1	6	30-39
	0	0	0	1	40-49
	0	0	0	0	50-59
	0	0	0	0	60-69
	0	0	1	0	70-
NET 3	0	0	0	4	0-9
	0	7	3	10	10-19
	0	7	0	47	20-29
	0	1	0	2	30-39
	0	0	0	1	40-49
	0	0	0	0	50-59
	0	0	0	0	60-69
	0	0	0	0	70-

Table 5. Length-frequency distribution of salmonids and nonsalmonids collected in experimental gill nets during day and night downlooking hydro-acoustics at the Pebble Springs study site on the Columbia River from April 17, 1978 through July 25, 1978.

	DAY		NIGHT		FORK LENGTH RANGE
	SAL	N-SAL	SAL	N-SAL	
NET 1	0	0	0	0	0-9
	2	0	1	6	10-19
	0	1	0	6	20-29
	0	0	1	1	30-39
	0	0	0	0	40-49
	0	0	0	0	50-59
	0	0	0	0	60-69
	0	0	0	0	70-
NET 2	0	0	0	0	0-9
	2	1	1	5	10-19
	0	8	0	2	20-29
	0	1	0	0	30-39
	0	0	0	0	40-49
	0	0	0	0	50-59
	0	0	0	0	60-69
	0	0	0	0	70-
NET 3	0	0	0	0	0-9
	0	3	0	0	10-19
	0	17	0	0	20-29
	0	0	0	0	30-39
	0	0	0	0	40-49
	0	0	0	0	50-59
	0	0	0	0	60-69
	0	0	0	0	70-

Table 5. Length-frequency distribution of salmonids and nonsalmonids collected in experimental gill nets during day and night, uplooking and downlooking hydroacoustics at the Pebble Springs study site on the Columbia River from April 17, 1978 through July 25, 1978.

	DAY		NIGHT		FORK LENGTH RANGE
	SAL	N-SAL	SAL	N-SAL	
NET 1	0	0	0	0	0-9
	3	2	3	10	10-19
	0	11	0	41	20-29
	0	0	1	2	30-39
	0	0	0	0	40-49
	0	0	0	1	50-59
	0	0	0	0	60-69
	1	0	0	0	70-
NET 2	0	0	0	3	0-9
	2	6	1	18	10-19
	0	17	0	55	20-29
	0	1	1	6	30-39
	0	0	0	1	40-49
	0	0	0	0	50-59
	0	0	0	0	60-69
	0	0	0	0	70-79
NET 3	0	0	1	0	80-89
	0	0	0	4	0-9
	0	10	3	10	10-19
	0	24	0	47	20-29
	0	1	0	2	30-39
	0	0	0	1	40-49
	0	0	0	0	50-59
	0	0	0	0	60-69
	0	0	0	0	70-

Table 6. Total number and percentage of fishes captured day and night in experimental gill nets at the Pebbie Springs study site on the Columbia River from April 17, 1978 through July 25, 1978.

DOWNLOOKING PERCENT TABLES	DAY		NIGHT		TOTAL	
Sockeye Salmon (S)	1	2.9%	0	0.0%	1	1.7%
Chinook Salmon	0	0.0%	0	0.0%	0	0.0%
Chinook Salmon (S)	3	8.6%	2	8.7%	5	8.6%
Chinook Salmon (J)	0	0.0%	0	0.0%	0	0.0%
Rainbow Trout	0	0.0%	1	4.3%	1	1.7%
Bridgelip Sucker	1	2.9%	2	8.7%	3	5.2%
Largescale Sucker	2	5.7%	0	0.0%	2	3.4%
Carp	0	0.0%	0	0.0%	0	0.0%
Peamouth	5	14.3%	7	30.4%	12	20.7%
Northern Squawfish	7	20.0%	5	21.7%	12	20.7%
Redside Shiner	0	0.0%	0	0.0%	0	0.0%
Chiselmouth	16	45.7%	6	26.1%	22	37.9%
Sand Roller	0	0.0%	0	0.0%	0	0.0%
UPLOOKING PERCENT TABLES	DAY		NIGHT		TOTAL	
Sockeye Salmon (S)	0	0.0%	4	2.1%	4	1.7%
Chinook Salmon	1	2.3%	1	.5%	2	.9%
Chinook Salmon (S)	1	2.3%	1	.5%	2	.9%
Chinook Salmon (J)	0	0.0%	1	.5%	1	.4%
Rainbow Trout	0	0.0%	0	0.0%	0	0.0%
Bridgelip Sucker	0	0.0%	1	.5%	1	.4%
Largescale Sucker	1	2.3%	1	.5%	2	.9%
Carp	0	0.0%	2	1.1%	2	.9%
Peamouth	8	18.6%	17	9.0%	25	10.8%
Northern Squawfish	5	11.6%	22	11.7%	27	11.7%
Redside Shiner	0	0.0%	3	1.6%	3	1.3%
Chiselmouth	27	62.8%	124	66.0%	151	65.4%
Sand Roller	0	0.0%	11	5.9%	11	4.8%
OVERALL PERCENT TABLES	DAY		NIGHT		TOTAL	
Sockeye Salmon (S)	1	1.3%	4	1.9%	5	1.7%
Chinook Salmon	1	1.3%	1	.5%	2	.7%
Chinook Salmon (S)	4	5.1%	3	1.4%	7	2.4%
Chinook Salmon (J)	0	0.0%	1	.5%	1	.3%
Rainbow Trout	0	0.0%	1	.5%	1	.3%
Bridgelip Sucker	1	1.3%	3	1.4%	4	1.4%
Largescale Sucker	3	3.8%	1	.5%	4	1.4%
Carp	0	0.0%	2	.9%	2	.7%
Peamouth	13	16.7%	24	11.4%	37	12.8%
Northern Squawfish	12	15.4%	27	12.8%	39	13.5%
Redside Shiner	0	0.0%	3	1.4%	3	1.0%
Chiselmouth	43	55.1%	130	61.6%	173	59.9%
Sand Roller	0	0.0%	11	5.2%	11	3.8%

(S) Smolts
(J) Jack

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Table 7. Mean and total number of smolt-size targets observed per 5-minute sampling interval at each station for day and night uplooking hydroacoustic samples April 17 through July 25, 1978.

DATE	TIME DAY/NIGHT	STATION	FISH OBSERVED IN EACH 5 MINUTE INTERVAL	MEAN NUMBER OF FISH PER 5 MINUTE INTERVAL	STANDARD DEVIATION
4-17-78	N	1	0,0,0,0	0	-
"	N	2	0,1,1,0	0.50	0.58
"	N	3	0,0,0,0	0	-
"	D	1	4,0,0,0	1.00	2.00
"	D	2	0,0,0,0	0	-
"	D	3	0,0,0,0	0	-
4-24-78	N	1	0,0,0,0	0	-
"	N	2	0,0,0,0	0	-
"	N	3	0,1,0,0	0.25	0.50
"	D	1	0,0,0,0	0	-
"	D	2	0,0,0,0	0	-
"	D	3	0,0,1,0	0.25	0.50
5-15-78	N	1	No Data*	-	-
"	N	2	No Data*	-	-
"	N	3	No Data*	-	-
"	D	1	0,0,0,0	0	-
"	D	2	0,0,0,0	0	-
"	D	3	0,0,0,0	0	-
5-25-78	N	1	0,0,1,0	0.25	0.50
"	N	2	0,0,0,1	0.25	0.50
"	N	3	No Data**	-	-
"	D	1	3,0,3,0	1.50	1.70
"	D	2	0,0,0,0	0	-
"	D	3	0,0,0,0	0	-
6-19-78	N	1	0,0,0,0	0	-
"	N	2	0,0,0,0	0	-
"	N	3	0,0,0,0	0	-
"	D	1	0,0,0,0	0	-
"	D	2	0,0,0,0	0	-
"	D	3	0,0,0,0	0	-
6-27-78	N	1	0,0,0,0	0	-
"	N	2	0,0,1,0	0.25	0.50
"	N	3	0,1,0,0	0.25	0.50
"	D	1	0,0,0,0	0	-
"	D	2	0,0,0,0	0	-
"	D	3	0,0,0,0	0	-
7-12-78	N	1	No Data**	-	-
"	N	2	No Data**	-	-
"	N	3	No Data**	-	-
"	D	1	0,0,0,0	0	-
"	D	2	0,0,0,0	0	-
"	D	3	1,0,0,0	0.25	0.50
7-25-78	N	1	2,4,0,0	1.50	1.90
"	N	2	1,0,0,0	0.25	0.50
"	N	3	0,0,0,0	0	-
"	D	1	0,1,0,0	0.25	0.50
"	D	2	0,0,0,0	0	-
"	D	3	2,0,0,0	0.50	1.00

* Sampling cancelled due to weather

** Sampling not completed due to equipment failure

Table 8. Density (number of targets/1,000 m³) of smolt-size targets recorded along downlooking hydroacoustic transects at each station for day and night surveys, April 17 through July 25, 1978.

DATE	DAY			NIGHT		
	STATION 1	STATION 2	STATION 3	STATION 1	STATION 2	STATION 3
4/17	0.000	0.000	0.000	0.000	0.000	0.000
4/24	0.000	0.000	0.000	0.000	0.000	0.000
4/15	0.000	0.000	0.000	*	*	*
5/25	0.000	0.000	0.000	0.000	0.000	0.000
6/19	0.000	0.000	0.000	0.000	0.000	0.000
6/27	0.000	0.000	0.000	0.000	0.000	0.000
7/12	0.000	0.000	0.005	**	**	**
7/25	0.035	0.004	0.000	0.000	0.000	0.000

* Sampling cancelled due to weather

** Sampling not completed due to equipment failure



DEPARTMENT OF THE ARMY
NORTH PACIFIC DIVISION, CORPS OF ENGINEERS
P.O. BOX 2870
PORTLAND, OREGON 97208

NPDPL-ER

20 September 1978

Mr. Mark T. Hill
Fishing Biologist
Beak Consultants Inc.
8th Floor, Loyalty Bldg.
317 S.W. Alder St.
Portland, Oregon 97204

Dear Mark:

In response to your 14 September 1978 letter regarding smolt transportation objectives, the following information is provided.

At present our objective is to trap and haul all the smolts we can from Lower Granite, Little Goose, and McNary Dams to a release point below Bonneville Dam. In 1977 and 1978 we hauled everything we could trap and haul from Lower Granite and Little Goose, but we did not have all units at these projects fully screened. In 1979 we will have all six units at each of these projects fully screened and should have the capability of trapping and hauling 70% to 80% of the Snake River migration. The one possible constraint is the fisheries agencies. They have made a determination on a year-to-year basis as to what percent of the fish we should haul. So far we have heard nothing about 1979, but are planning to haul everything we can trap.

Our effort at McNary is still largely experimental with two of fourteen units to be screened by spring, 1979. We do plan to haul most of the fish that are taken at McNary, subject to fisheries agencies concurrence. Some fish will be released at McNary as control fish.

As far as numbers are concerned, N.M.F.S. usually estimates 8 to 10 million salmon and steelhead smolts leaving the Snake River system. We haven't seen any numbers like that. In 1977 we hauled 1.7 million chinook and 1.1 million steelhead from Little Goose and Lower Granite to below Bonneville. In 1978 we hauled 1.6 million chinook and 1.4 million steel-

N2DPL-ER

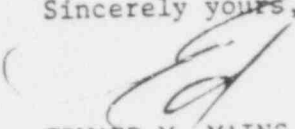
Mr. Mark T. Hill

20 September 1978

head. In 1978, our first year's effort at McNary, 32,097 chinook, 20,799 steelhead, 22,458 coho and 6,857 sockeye were transported.

I hope this information is useful to you. Please let me know if I can be of further assistance.

Sincerely yours,



EDWARD M. MAINS
Chief, Environmental Resource Branch

Appendix C. Area (km^2) of major habitat types along the road survey transects at Pebble Springs Study Area in 1978. Values are based on a 0.5 km strip on either side of the transects.

	TRANSECT			
	A	B	C	D
Length of Transect (km)	2.0	4.1	4.4	3.0
HABITAT TYPES				
Rabbitbrush/Cheatgrass	6.0 (95%)	8.5 (100%)	10.0 (97%)	6.4 (90%)
Sagebrush/Bitterbrush	0.0 (0%)	0.0 (0%)	0.3 (3%)	0.0 (0%)
Disturbed/Agriculture	0.3 (5%)	0.0 (0%)	0.0 (0%)	0.7 (10%)
Total	6.3 (100%)	8.5 (100%)	10.3 (100%)	7.1 (100%)

Appendix D. Number of Long-billed Curlews observed per site visit on road survey transects at the Pebble Springs study area during 1978.

Sample Period	TRANSECT								ALL TRANSECTS		
	A		B		C		D		1978	1977 ¹	
	No./ Survey	No./ 10 km	No./ Survey	No./ 10 km	No./ Survey	No./ 10 km	No./ Survey	No./ 10 km	Total No.	Average No./ 10 km	Total No.
4/7	0.0	0.0	9.0	10.6	2.0	1.9	1.0	1.4	12.0	3.5	15.0
4/12	0.0	0.0	6.0	7.1	8.0	7.8	0.0	0.0	14.0	3.7	20.0
4/18	0.0	0.0	2.0	2.4	6.0	5.8	1.0	1.4	9.0	2.4	16.0
4/27	1.0	1.5	2.0	2.4	2.0	1.9	1.0	1.4	6.0	1.8	20.0
5/10	0.0	0.0	5.0	5.9	1.0	1.0	4.0	5.6	10.0	3.1	17.0
5/22	3.0	4.6	6.0	7.1	0.0	0.0	0.0	0.0	9.0	2.9	19.0
6/6	2.0	3.0	11.0	13.0	0.0	0.0	1.0	1.4	14.0	6.3	43.0
6/21	2.0	3.0	0.0	0.0	1.0	1.0	0.0	0.0	3.0	1.0	3.0
7/25	196.0	297.0	0.0	0.0	0.0	0.0	0.0	0.0	196.0	74.3	0.0
8/8	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total	204.0	309.1	41.0	48.5	20.0	19.4	8.0	11.2	278.0	99.0	153.0

¹ Average number of curlews observed during 2-day site visits on comparable dates in 1977.

Appendix E. Habitat usage of Long-billed Curlews on road survey transects on the Pebble Springs study area in 1978. Number of observations are indicated in parenthesis.

	TRANSECT				Averages
	A	B	C	D	
Rabbitbrush/Cheatgrass	100% (204.0)	100% (33.0)	100% (17.0)	100% (4.0)	100% (258.0)
Sagebrush/Bitterbrush	0% (0.0)	0% (0.0)	0% (0.0)	0% (0.0)	0% (0.0)
Disturbed/Agricultural	0% (0.0)	0% (0.0)	0% (0.0)	0% (0.0)	0% (0.0)
Total	100% (204.0)	100% (33.0)	100% (17.0)	100% (4.0)	100% (258.0)

Appendix F. Average number of raptors observed per 10 km of road survey transects on the Pebble Spring study area from 7 April to 8 August 1978.

	TRANSECTS				<u>Total</u>
	<u>A</u>	<u>B</u>	<u>C</u>	<u>D</u>	
Red-tailed Hawk	0	0.2	0.9	0	1.1
Swainson's Hawk	0	1.2	1.6	1.0	3.8
Ferruginous Hawk	0	0	1.1	3.0	4.1
<u>Buteo</u> spp.	0	0.4	0.4	0	0.8
Golden Eagle	0	0.2	0.2	0	0.4
Marsh Hawk	0	0	0.2	0	0.2
American Kestrel	0	0	0.7	1.0	1.7
Common Raven	20.0	2.2	1.1	1.3	24.6
Loggerhead Shrike	<u>0</u>	<u>0.4</u>	<u>0</u>	<u>0.3</u>	0.7
Total	20.0	4.6	6.2	6.6	

Appendix G. Number of raptors observed per 10 km of road survey transect on the Pebble Spring study area from 7 April to 8 August 1978.

SPECIES	SURVEY PERIODS																			
	April 7				April 12				April 18				April 27				May 10			
	TRANSECTS																			
	A	B	C	D	A	B	C	D	A	B	C	D	A	B	C	D	A	B	C	D
Red-tailed Hawk	0	0	2.3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Swainson's Hawk	0	2.5	0	0	0	0	2.3	0	0	0	4.6	0	0	0	2.3	3.3	0	0	4.6	3.3
Ferruginous Hawk	0	0	2.3	3.3	0	0	0	0	0	0	0	3.3	0	0	0	3.3	0	0	2.3	3.3
Buteo spp.	0	0	0	3.3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Golden Eagle	0	0	0	0	0	0	2.3	0	0	0	0	0	0	0	0	0	0	0	0	0
Marsh Hawk	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
American Kestrel	0	0	0	3.3	0	0	0	0	0	0	0	0	0	0	2.3	6.6	0	0	2.3	0
Common Raven	0	10.0	0	0	0	0	0	9.9	4.9	0	2.3	0	24.5	2.5	0	3.3	4.9	7.5	4.6	0
Loggerhead Shrike	0	0	2.3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	0	12.5	6.9	9.9	0	0	4.6	9.9	4.9	0	6.9	3.3	24.5	2.5	4.6	16.5	4.9	7.5	13.8	6.6

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SPECIES	SURVEY PERIODS																			
	May 22				June 6				June 21				July 25				August 8			
	TRANSECTS																			
	A	B	C	D	A	B	C	D	A	B	C	D	A	B	C	D	A	B	C	D
Red-tailed Hawk	0	0	0	0	0	0	0	0	0	0	4.6	0	0	0	2.3	0	0	2.5	0	0
Swainson's Hawk	0	2.5	0	0	0	2.3	0	0	0	2.5	2.3	3.3	0	2.5	0	0	0	0	0	0
Ferruginous Hawk	0	0	0	3.3	0	0	2.3	3.3	0	0	2.3	3.6	0	0	0	3.3	0	0	2.3	0
Buteo spp.	0	2.5	0	0	0	0	0	0	0	2.5	4.6	0	0	0	0	0	0	0	0	0
Golden Eagle	0	2.5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Marsh Hawk	0	0	2.3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
American Kestrel	0	0	2.3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Common Raven	14.7	0	2.3	0	0	0	2.3	0	0	2.5	2.3	0	0	0	0	0	0	0	0	0
Loggerhead Shrike	0	0	0	0	0	0	0	0	0	0	0	0	0	2.5	0	0	0	0	0	3.3
Total	14.7	7.5	6.9	3.3	0	2.5	6.9	3.3	0	7.5	16.1	9.9	0	5.0	2.3	3.3	0	2.5	2.3	3.3