CHAKACHAMNA HYDROELECTRIC PROJECT
INTERIM FEASIBILITY ASSESSMENT REPORT

VOLUME IV
ADDENDUM

BECHTEL CIVIL & MINERALS INC.

ENGINEERS–CONSTRUCTORS

OCTOBER 1983

ALASKA POWER AUTHORITY

CHAKACHAMNA HYDROELECTRIC PROJECT
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CHAKACHAMNA HYDROELECTRIC PROJECT

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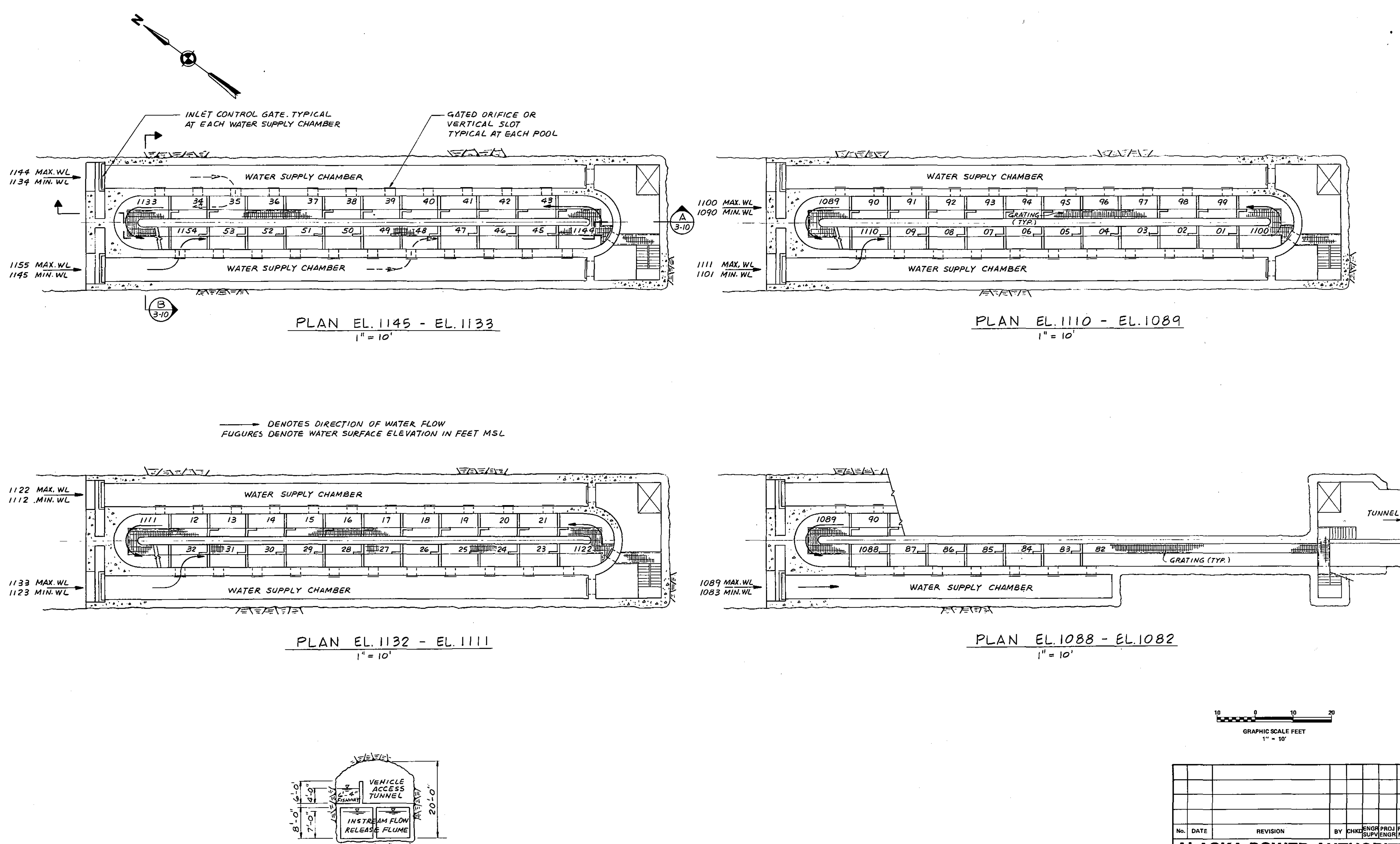
3.0 PROJECT DEVELOPMENT STUDIES

3.5.3 Upstream Migrants Facility

The upstream migrants facility has been revised in response to comments received from the fishery agencies. Figures 3-9 Rev. 1 and 3-10 Rev. 1 included herewith in this Addendum supersede the original Figures 3-9 and 3-10 appearing in Volume 1, Section 3.0, after page 3-32.

The written responses to the agency comments appear in Section 10.3.3.2 of this Addendum.



ACCESS TUNNEL SECTION
(TYPICAL DOWNSTREAM FROM INTERSECTION WITH INSTREAM FLOW RELEASE FLUME)
1" = 10'

No.	DATE	REVISION	BY	CHKD	ENGR SUPV	PROJ ENGR	PROJ MGR

ALASKA POWER AUTHORITY
ANCHORAGE, ALASKA

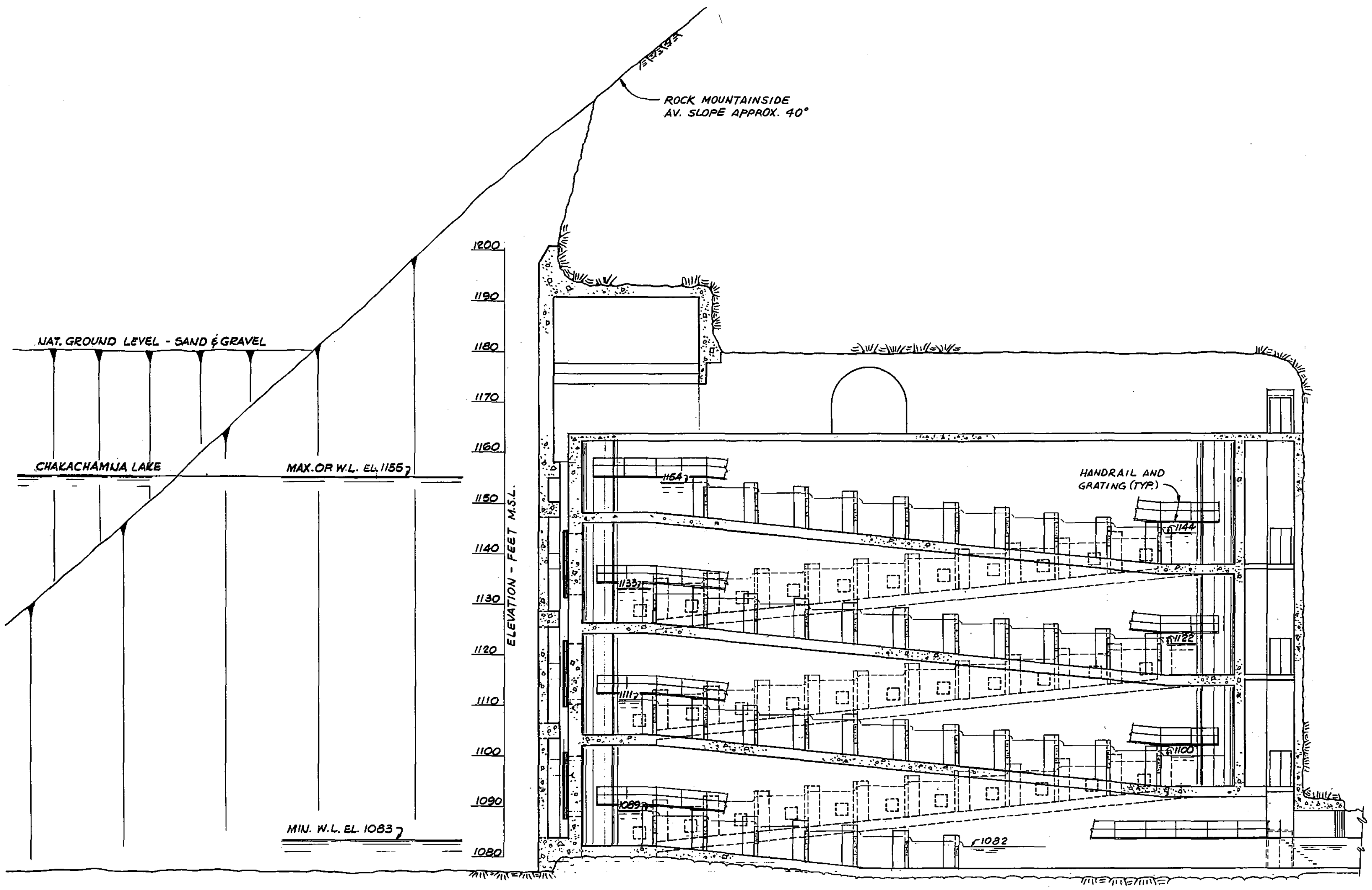
CHAKACHAMNA HYDROELECTRIC PROJECT

UPSTREAM FISH PASSAGE FACILITIES
PLANS AND SECTION

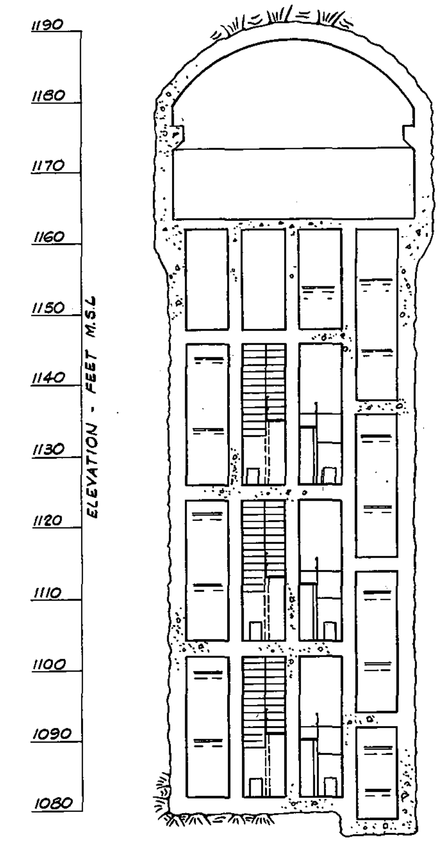
BECHTEL CIVIL & MINERALS, INC.
SAN FRANCISCO

DESIGNED	DRAWN	CHECKED
ENGR SUPV	PROJ ENGR	APP'D

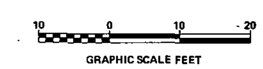
JOB No.	DRAWING No.	REV.
14879	FIGURE 3-9	1



SECTION (A / 3-9)
1" = 10'



SECTION (B / 3-9)



No.	DATE	REVISION	BY	CHKD	ENGR SUPV	PROJ ENGR	PROJ MGR

ALASKA POWER AUTHORITY
ANCHORAGE, ALASKA

CHAKACHAMNA HYDROELECTRIC PROJECT

UPSTREAM FISH PASSAGE FACILITIES
SECTIONS

BECHTEL CIVIL & MINERALS, INC.
SAN FRANCISCO

DESIGNED	DRAWN	CHECKED
ENGR SUPV	PROJ ENGR	APP'D

JOB No.	DRAWING No.	REV.
14879	FIGURE 3-10	1

4.0 HYDROLOGICAL AND POWER STUDIES

4.6 Results

Page 4-22, Volume I, Errata. The first three lines of the last paragraph should read as follows:

> "Alternatives A through D can firmly support the capacities determined from the 11 years of inflow during the 1981 studies. The recommended"

10.0 COORDINATION

10.3 Biological Studies

10.3.3 Meeting - December 9, 1982

10.3.3.1 Response

See Volume I page 10-48.

10.3.3.2 Further Response - September 1983.

Following receipt of the NMFS February 1, 1983 letter and the U.S. Fish and Wildlife Service March 9, 1983 letter, the conceptual designs for the proposed fish passage facilities near the present outlet of Chakachamna Lake have been reviewed and certain revisions have been made at this time. In particular, the layout of the upstream migrant facility has been revised to increase the length of the turn pools at all ladder turns to at least 10 feet in compliance with the comments of both agencies. All ladders and channels will be lighted, this having been the original intent, but details are not shown on the drawings. The objective is to illustrate a concept for the movement of water and fish through the system. Full details of mechanical and electrical equipment will be developed in final design.

Flow of water through the upstream passage facility could be controlled by throttling gates (not shown) installed a short distance downstream from the inlet bulkhead gates presently shown. Closure of the inlet bulkhead gates would enable dewatering to be performed for maintenance or repair of the throttling gates.

Access to the various levels of the upstream passage facility would be provided via the elevator and stairwell. Grating type walkways would be provided over all weirs and pools to give access by foot.

The ladder exits to the lake, as presently shown are 60 feet minimum from the lakeside entry to the downstream passage facility. This distance could be increased if considered necessary, at the cost of increasing the volume of open cut excavation in the vicinity of the portals to the fish passage facilities.

It is evident from the comments on the proposed schemes for the downstream passage of juveniles, that additional conceptual evaluation will be required and present funding limitations do not permit that to be done at the present time. The provision of conventional spillway crests downstream from the gates was purposely avoided in the proposed layouts because of reported heavy losses of fingerlings. For example, in a paper entitled "Fish Handling Facilities for Baker River Project" published in the November 1961 Journal of the Power Division of the American Society of Civil Engineers, it was reported that 64% of the sockeye fingerlings passing over the Lower Baker spillway were killed. In a subsequent test, it was found that 85% survival rate was achieved under conditions approximating free fall between the reservoir and tailwater, a drop of about 160 feet. Our consultants leaned toward the view that provided a sufficient depth of plunge pool were provided, some fish might be temporarily stunned when passing through the 80 foot free fall but that adequate time would be available for their recovery while passing through the 1-1/2 mile long flume in the tunnel to the downstream portal where they would return to the river. Because of the divergences, it is considered advisable to defer resolution of this issue until such time as the project studies are resumed.

For the time being, the breakwater in the lake has been deleted. It is to be noted, however, that waves of 5 feet to 6 feet in height have been observed on the lake during times of strong wind and for this reason, some form of wave protection may be necessary to prevent damage to the approach channel.

With the parameters established for project studies, the maximum flow of water diverted for power generation would be approximately double the average annual inflow to the lake or 7200 cfs. The intake opening for power diversions is at depth to avoid, within practical limits, the attraction of fish into the power tunnel.

New studies of ablation and ice movement in the Barrier Glacier near the lake outlet are planned to be performed when project studies are resumed.

Flows in the vicinity of the rockfill fish barrier should be determined in the final design stage.

The recommended fishway baffle design parameters have been noted for further consideration during the final design stage.

Gates and their operating mechanisms would be simple and robust in order to give best assurance of trouble free operation.

The proposed fish ladder concept is based on a peak daily run of 4,000 fish, and a maximum hourly run of 1,000 fish and a rate of ascent of 5 minutes per pool. With 72 pools between maximum reservoir operating level, elevation 1155, and the bottom of the ladder, elevation 1183, the average number of fish per pool is 69, say 70. If 4 cubic feet of water is provided for each fish, the required pool volume is 280 cubic feet, and if the depth of the water in the pool is 6 feet, the required surface area is 47 sq. feet. For conservatism 60 sq. feet is provided in the layouts.

The passage of ice through the system or its prevention are problems that may require special considerations in addition to those already given. The suggestion for an angled vertical rack in place of the horizontal grating shown is noted and will be considered in future studies.

10.3.4 Meeting - June 8, 1983

Representatives of interested agencies were invited to attend a meeting in Anchorage, Alaska on June 8, 1983 to discuss the proposed study plan for the Chakachamna Hydroelectric Project. At this meeting, representatives of Alaska Power Authority, Bechtel Civil & Minerals, Inc. and Woodward-Clyde Consultants summarized the results of Volumes I, II, and III of the March 1983 Chakachamna Hydroelectric Project Interim Feasibility Assessment Report and described a proposed scope of continuing studies designed to meet the requirements of filing a Federal Energy Regulatory Commission Application for a license to construct the project.

A copy of the invitation letter follows. The agencies invited are listed on the attachment to that letter which is then followed by a copy of the notes of record covering the meeting.

ALASKA POWER AUTHORITY

334 WEST 5th AVENUE - ANCHORAGE, ALASKA 99501

Phone: (907) 277-7641
(907) 276-0001

May 25, 1983

The Honorable Esther Wunnicke
Commissioner
Department of Natural Resources
Pouch M
Juneau, Alaska 99811

Dear Ms. Wunnicke:

Please reference my February 9, 1983, letter which transmitted a summary of our meeting with your staff on December 9, 1982. During the meeting, it was agreed that the Power Authority through its contractors, Bechtel Civil & Minerals and Woodward-Clyde, would develop a study plan which would encompass the necessary data collection and analysis on the Chakachamna hydroelectric project in order to meet the requirements of filing a Federal Energy Regulatory Commission (FERC) Application.

I have attached a draft copy of the proposed study plan for the Chakachamna hydroelectric project for your review. The budget and scope of work are included in this plan. This is the first draft and will be modified as necessary. I must stress that total funding for this plan in the upcoming year is unlikely and that a prioritization of the items will be required in order to make the best use of available funding.

I would like to invite you and your staff to a meeting on Wednesday, June 8, 1983, to discuss this study plan. The meeting will be held at the Alaska Power Authority in the downstairs conference room at 1:30 p.m.

If you have any questions prior to the meeting, please feel free to contact me or Mr. Eric Marchegiani of my staff.

Sincerely,

Eric P. Yould
Executive Director

Attachment as stated.

cc: Mr. Robert Loder, Bechtel, San Francisco
Mr. Wayne Lifton, Woodward-Clyde, Anchorage
Mr. Roland Shanks, DNR, Anchorage
Mr. Ty Dilliplane, Division of Parks, Anchorage
Ms. Kay Brown, Division of Minerals and Energy Management, Anchorage

8873

DISTRIBUTION LIST FOR THE CHAKACHAMNA STUDY PLAN

The Honorable Esther Wunnicke
Commissioner
Department of Natural Resources
Pouch M
Juneau, Alaska 99811

cc: Mr. Roland Shanks, DNR, Anchorage
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Pouch 7-005
Anchorage, Alaska 99510

Mr. Ty Dilliplane, Division of Parks, Anchorage
State Historic Preservation Officer
619 Warehouse Drive, Suite 210
Anchorage, Alaska 99510

Ms. Kay Brown, Director
Division of Minerals and Energy Management
Pouch 7-034
Anchorage, Alaska 99510
ATT: Ms. Karen Oakley

Mr. Keith Schreiner
U.S. Fish & Wildlife Service
1011 E. Tudor Road
Anchorage, Alaska 99501

cc: Mr. Gary Stackhouse, USF&WS, Anchorage
1011 East Tudor Road
Anchorage, Alaska 99507

Mr. Lenny Corin, USF&WS, Anchorage
605 West Fourth Avenue, Suite G-81
Anchorage, Alaska 99507

Mr. Roger J. Contor
Regional Director
National Park Service
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Anchorage, Alaska 99501

cc: Mr. Larry Wright, National Park Service, Anchorage
540 West Fifth Avenue
Anchorage, Alaska 99501

Mr. Paul Haertel
Superintendent
Lake Clark National Park
701 "C" Street, Box 61
Anchorage, Alaska 99513

The Honorable Richard Neve
Commissioner
Department of Environmental Conservation
Pouch O
Juneau, Alaska 99811

cc: Mr. Robert Martin, Dept. of Environmental Conservation, Anchorage
Regional Supervisor
437 E Street
Anchorage, Alaska 99501

Honorable Mark Lewis
Commissioner
Department of Community &
Regional Affairs
Pouch B
Juneau, Alaska 99811

cc: Mr. Mark Stephens, DC&RA, Anchorage
225 Cordova, Bldg. B
Anchorage, Alaska 99501

The Honorable Richard A. Lyon
Commissioner
Department of Commerce &
Economic Development
Pouch D
Juneau, Alaska 99811

cc: Mr. Edward Eboch, DEPD, Juneau
Director
Pouch D
Juneau, Alaska 99811

Mr. Robert McVey, Director
Alaska Region
National Marine Fisheries Service
P.O. Box 1668
Juneau, Alaska 99802

cc: Mr. Ronald Morris, National Marine Fisheries Service, Anchorage
701 C Street
Anchorage, Alaska 99513

Mr. Brad Smith, National Marine Fisheries Service, Anchorage
701 C Street
Anchorage, Alaska 99513

The Honorable Donald W. Collingsworth
Commissioner
Alaska Department of Fish & Game
P.O. Box 3-2000
Juneau, Alaska 99811

cc: Mr. Carl Yanagawa, ADF&G, Anchorage
Regional Supervisor
333 Raspberry Road
Anchorage, Alaska 99503

Mr. Don McKay, ADF&G, Anchorage
Habitat Division
333 Raspberry Road
Anchorage, Alaska 99503

Mr. Phil Brna
Habitat Division
333 Raspberry Road
Anchorage, Alaska 99503

Mr. Ken Tarbox
Alaska Department of Fish & Game
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Soldotna, Alaska 99669

Mr. Keven Delaney
Sport Fish
ADF&G
333 Raspberry Road
Anchorage, Alaska 99502

Mr. Curtis McVey
U.S. Department of the Interior
U.S. Bureau of Land Management
701 C Street, P.O. Box 13
Anchorage, Alaska 99513

cc: Mr. John Benson, U.S. Dept. of the Interior, Anchorage
U.S. Bureau of Land Management
701 C Street, P.O. Box 13
Anchorage, Alaska 99513

Mr. Don Hendrickson
Pennisula Resource Area
U.S. Department of the Interior
Bureau of Land Management
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Anchorage, Alaska 99507

Mr. Wayne Bowden
Bureau of Land Management
Anchorage District Office Manager
4700 East 72nd Street
Anchorage, Alaska 99507

Mr. Fred Lohse
Bureau of Land Management
4700 East 72nd Street
Anchorage, Alaska 99507

Director of Indian Affairs, Dept. of Interior, Juneau
P.O. Box 3-8000
Juneau, Alaska 99802

CHAKACHAMNA HYDROELECTRIC PROJECT

MEETING NOTES

DATE: June 8, 1983

LOCATION: Alaska Power Authority Office
Anchorage, Alaska

SUBJECT: Chakachamna Project Review and Scoping Meeting

PARTICIPANTS:

Alaska Power Authority

Eric Marchegiani

National Park Service

Floyd Sharrock
Larry Wright

Alaska Dept. of Fish and Game

Bruce King
Mike Kasterin
Kevin Delaney

Bureau of Land Management

Don McKay

Alaska Dept. of Natural Resources

Sam Murray

Bureau of Indian Affairs

Don Barrett

U.S. Fish and Wildlife Service

Gary Stackhouse

Bechtel

Bob Loder
Jock Langbein
Dudley Reiser

National Marine Fisheries Service

Brad Smith

Woodward - Clyde Consultants

Wayne Lifton
Larry Rundquist
Mike Joyce
Paul Hampton
Jon Issacs

Representatives from the Alaska Power Authority, Bechtel Civil and Minerals, and Woodward-Clyde Consultants (WCC) met with representatives of various state and federal agencies to review and discuss the proposed environmental program for FY 1984 and the results of the 1983 Interim Feasibility Report. The purpose of the meeting was to present the individual components of the proposed program and to solicit and receive agency comments concerning the proposed studies. Eric Marchegiani of the

Alaska Power Authority (APA) initiated the meeting with introductions of those present. Eric reviewed the funding prospects for FY 1984 and indicated that total funding was unlikely. Therefore, he wanted to use the meeting as a workshop in an effort to prioritize the various program elements. Eric noted that this would not be the only meeting for this purpose.

- Gary Stackhouse (USFWS) asked about the present schedule for completing the FERC license application.

  - Eric Marchegiani (APA) responded by noting that if funding becomes available it would be about 1-2 years before the application would be filed.

- Gary Stackhouse (USFWS) inquired as to how long it would be before filing an application if sufficient funding is not obtained.

  - Eric Marchegiani (APA) noted that an additional 1-1/2 years would probably be required.

Wayne Lifton (WCC) then presented the aquatic biological studies proposed for FY-84 as contained in the Scope of Services document. This document had been distributed to the various agencies about two weeks prior to the meeting. Wayne briefly reviewed the major components of the program: Adult Anadromous studies would include the installation and operation of four fishwheels (3 on the McArthur River and one on the Chakachatna River), tag recovery operations, aerial surveys, mainstream electrofishing operations, and studies of Chakachamna Lake spawning; Outmigrant studies would include the use of two inclined plane smolt traps (one on the McArthur River and one on the Middle River) Resident and Juvenile Anadromous studies would include minnow trapping, electrofishing, Fyke nettings, and for Chakachamna Lake, electrofishing, gill netting, twawling and hydroacoustic surveys; Habitat studies would include the characterization of juvenile, spawning and egg incubation habitat.

- Bruce King (ADF&G) requested the locations of the fish wheels.

  - Wayne Lifton (WCC) noted that fish wheels would be located at Station 1D (3 wheels) and Station 6 (1 wheel); fyke nets would also be set in these areas.

- Brad Smith (NMFS) asked if the program described was for license application (i.e. no priorization of study components).

  - Wayne Lifton (WCC) acknowledged that the entire scope of work was being presented and that studies had not been prioritized.

- Bruce King (ADF&G) asked if the level of hydroacoustic surveys proposed for the winter were the same as for the summer.

  - Wayne Lifton (WCC) noted that the winter studies would be at a lower level of effort. Lifton replied that the winter studies were designed to statistically describe the distribution of fish under the ice and near the proposed intake, however, it would not be possible to tow the transducers around on the ice.

Larry Rundquist (WCC) then presented the hydrology and instream flow studies program and the proposed sampling schedule. Rundquist noted that two continuous recording gages would be operated, one at the location of the former U.S. Geological Survey gage on the Chakachatna River, and one on the upper McArthur River below the power house location. Staff gages would also be installed in various drainages to provide additional streamflow information.

Rundquist described the proposed instream flow studies and indicated a preference for conducting the studies in the spring on an ascending limb of the hydrograph. He noted that the U.S.F.W.S. Instream Flow Incremental Methodology (IFIM) was being proposed for the instream flow studies. Rundquist stated that presently 10 representative reaches and 5 critical reaches (for passage) had been selected for study based on various channel configurations. Rundquist also briefly described the ground water program which was proposed between the Chakachatna and McArthur River.

- Gary Stackhouse (USFWS) asked where tidal influence occurs in the system and whether it might affect spawning.

  - Larry Rundquist (WCC) noted that tidal influence does not extend very far upstream on the Middle River and that the subtrate in the lower reaches of the system was poor for spawning. Rundquist indicated that the reaches for instream flow studies would be above tidal influence.

  - Wayne Lifton (WCC) added that to date the only species of fish using the lower reach of the system for rearing was stickleback.

Mike Joyce (WCC) followed this discussion with a presentation of the wildlife program. Joyce reviewed the major wildlife issues which need to be addressed, including the effects of altered flows on moose and swan habitat, and the impacts of altered fish escapement and distribution on eagle and bear populations. Joyce then introduced and described the proposed use of the Habitat Evaluation Procedure (HEP) for the wildlife studies. He stated that the existing models for the HEP model would be reviewed and appropriately modified to more accurately depict the wildlife species present in the Chakachamna Project area. Joyce noted that for this HEP study, no attempt would be made to evaluate the cumulative impacts of other projects in conjunction with the Chakachamna Project; impact analysis would be limited to only the Chakachamna Project. Indicator species proposed for HEP analysis included: moose, trumpeter swan, bald eagle, brown bear, beaver and wolf. Joyce then reviewed other programs proposed for study including vegetarian mapping, bird studies (waterfowl nesting, and migration and staging activities) and mammal studies (bear denning and feeding; moose winter range and seasonal studies).

Jon Issacs (WCC) then presented the proposed Human Resources program. He noted that the major components of the program as listed in the FERC requirements included evaluations of the project areas historic and archeological value, land use, socioeconomic structure, aesthetics and recreational use. Major project related issues identified by Issacs included regulatory compliance, construction and access impacts, effects of the project on Lake Clark National Park, project effects on the commercial and subsistence fishing, and project effects on viewer access and aesthetics.

Issacs stated that, at the request of Eric Marchegiani (APA), the proposed study also included a public participation program which would involve 1-2 sets of meetings to occur in Tyonek, Soldotna and Anchorage.

- Don Barrett (BIA) asked whether a specific time had been set for the meetings in Tyonek.
  - Jon Issacs (WCC) stated that the meetings would be scheduled when subsistence activities slow down, probably in the fall when villagers are present.
- Don Barrett (BIA) questioned whether ADF&G had done previous subsistence studies in the area.
  - Jon Issacs (WCC) noted that the Subsistence Division of ADF&G had been conducting studies in the area, as had Darbyshire and Associates for a coal development study.

Eric Marchegiani (APA) commented that the question had been raised as to whether a fly-over of the area could be arranged. He noted that this had been done before, with the agency personnel providing their own transportation to Shirleyville and APA providing helicopter transport from there. He added that a site visit would be contingent upon receiving funding for the project.

Eric Marchegiani (APA) then opened the meeting for discussion and asked about the suitability of the programs. He stated that four areas of study had been identified including aquatic biology, hydrology, terrestrial wildlife and human resources. He requested that any comments concerning the programs be brought out now for discussion, and that formal written comments could be submitted later.

- Kevin Delaney (ADF&G) asked what type of studies were being proposed for pink and chum salmon?

  - Wayne Lifton (WCC) replied that outmigrant traps would be used to determine the timing and numbers of outmigrants.

- Kevin Delaney (ADF&G) stated that for the Susitna Project, Fyke nets had been successfully used to monitor downstream migrants, and therefore suggested they be used for the project. He cited the work of Dana Schmidt (ADF&G) which indicated that Fyke nets were more effective than minnow traps and electrofishing.

  - Wayne Lifton (WCC) indicated that use of this method would be investigated if funding becomes available. Kevin Delaney (ADF&G) also noted that from a priority standpoint, more years of aquatic information would be needed than for terrestrial studies. He stated that the objectives of the juvenile studies were right on line, including the studies of distribution, abundance, timing, smolting and habitat.

- Bruce King (ADF&G) concurred with the objectives of the program. In terms of priorities, King felt that primary emphasis should be on adult enumeration and spawning distribution studies (last to be cut from the program). He believed that the smolt outmigration studies could be puton hold since outmigration is already ocurring. He recommended that outmigrant studies be postponed until next spring when the entire smolt outmigration could be monitored. As an alternative, he suggested looking at Chakachamna Lake fry.

- Kevin Delaney (ADF&G) agreed with these priorities and noted that the objectives of the resident and juvenile anadromous fish studies would be to define the extent of their distribution throughout the season.

- Brad Smith (NMFS) asked whether one winter trip would be sufficient for the studies.

- Kevin Delaney (ADF&G) indicated that if money is to be spent, it would be better to use it during the summer, at or prior to breakup, rather than on exploratory winter studies. He felt that during the winter, sample sizes are too small and therefore no conclusions can be made. Delaney felt that winter studies were best reserved for looking at habitat.

- Brad Smith (NMFS) noted that nothing specific was shown related to fish passage in the study plan and asked whether studies were planned.

  - Bob Loder (Bechtel) stated that the best way to address the problems of fish passage would be to meet with the appropriate agencies. He stated that the passage criteria would be based on the peak run with the facilities designed to meet the criteria. Loder noted that comments had been received concerning the proposed facility but that recommended changes had not yet been incorporated into the design. He stated that the changes would be addressed in the next few weeks and will be included in an addendum report.

  - Eric Marchegiani (APA) agreed that the best way to establish criteria is to sit down with the agencies. He then requested comments specific to the Hydrology and/or the Terrestrial programs.

- Don McKay (ADF&G) recommended that the terrestrial wildlife program proceed using a planned approach. He stated that their (ADF&G) comments would probably increase the scope of work, and recommended a scoping session to pinpoint details. McKay felt that the intent of the study for FERC is to complete all required components. He thus felt somewhat uneasy about prioritizing the studies since the entire results would be needed at some time.

  - Eric Marchegiani (APA) explained the potential funding limitation for the Chakachamna Project, and stated that APA had been criticized in the past for wasting money on studies which had not been prioritized properly. He then asked if the National Park Service had any comments?

- Floyd Sharrock (NPS) stated he detected, in the presentation on human resources, some uncertainty as to whether FERC dictates requirements for inventory and analysis, or whether the Advisory Council on Historic Preservation has a say in the FERC requirements. Sharrock recommended that the Advisory Council be approached first and ask them for what they will require. He noted that the Advisory Council will comment at any time and that they should have already been contacted. Sharrock felt that a statement of intent may be adequate and that it can make this whole process more simple and straightforward with less money being spent. He stated that the Compliance Officer for the western states is located in Denver and that he should be contacted. Sharrock asked Jon Issacs (WCC) how the Anchorage (WCC) office related to the San Francisco office, specifically to Ruth Ann Knudson?

- Jon Issacs (WCC) noted that Ruth Ann Knudson is the cultural resource specialist on the project and the project and that she wrote the human resources section. Issacs stated that Knudson would oversee the program.

° Don Barrett (BIA) asked several specific questions concerning the elevation of the lake, nature of the terrain downstream of the lake, and land ownership.

  - Larry Rundquist (WCC) indicated the lake elevation to be 1142 ft; terrain downstream of the lake is relatively flat although the rivers are very steep in the Canyon.

  - Jon Issacs (WCC) added that the area around the lake and 1/4 mile from the river floodplain is a federal power withdrawl area. Issacs noted that the remaining area belongs to a mixture of landowners.

Eric Marchegiani (APA) reiterated the importance of providing comments which will be used in prioritizing the program. He stated that before going too far in defining and finalizing the program, another meeting would be held to better define priorities. He stressed however, that the availability of funds would largely dictate whether or not specific comments could be addressed. The meeting was adjourned at 3:30 p.m.

10.6 Distribution of Report - Comments and Responses

The distribution for this Addendum, Volume IV, will be similar to that for Volumes I, II and III of the Chakachamna Hydroelectric Project Interim Feasibility Assessment Report.

Comments on Volumes I, II and III were received from the following agencies by letters dated as indicated.

National Park Service, 20 May 1983;
Department of the Army, 23 May 1983;
Department of Environmental Conservation, 25 May 1983;
Department of Fish and Game, 26 May 1983;
Community & Regional Affairs, 31 May 1983;
Department of Natural Resources, 9 June 1983;
Department of Natural Resources, 14 June 1983.

Copies of the above letters are reproduced on the pages following together with copies of the Power Authority's responses to the Agencies' comments.

United States Department of the Interior

NATIONAL PARK SERVICE
Alaska Regional Office
540 West Fifth Avenue
Anchorage, Alaska 99501

IN REPLY REFER TO:

L3031 (ARO-P)

20 MAY 1983

Mr. Eric P. Yould
Executive Director
Alaska Power Authority
334 West 5th Avenue
Anchorage, Alaska 99501

Dear Mr. Yould:

Staff of this office and the Lake Clark National Park and Preserve have reviewed the Chakachamna Hydroelectric Project Interim Feasibility Assessment Report. We have the following comments.

The cultural resources section is composed of a brief overview of the prehistory and history of the project area, an evaluation that few factual data were (are) available for reconstructions or for estimating impacts, and a recognition of the need for field investigation prior to project activity. It would be desirable and beneficial for analytical purposes to also include a statement outlining the process that will be followed to inventory and evaluate cultural resources, including coordination with the appropriate state and federal agencies (the State Historic Preservation Officer and the Advisory Council on Historic Preservation) should the project proceed.

We are pleased to note the attention being given to coordination with the staff of the Lake Clark National Park and Preserve and to the analysis of existing recreational use within the project area. While the study report does recognize the close proximity of the project to the park, it does not attempt to identify the potential primary and secondary impacts to park (wilderness) resources. Perhaps the most obvious questions that should be addressed are: What effects, if any, will occur as a result of the project construction and operation to the fish and wildlife resources that normally gain access to the park from the project area? And what effect(s), if any, will result from an increased level of public use within the park as a result of improved road access via the project roads which might later be linked to the Matanuska Valley and Anchorage via a road from the lower Susitna River Valley to Tyonek? Future study reports should attempt to quantify the potential project impacts to park resources.

Thank you for the opportunity to comment.

Sincerely,

Acting Hugh L. Watson

Associate Regional Director
Planning, Recreation and Cultural Resources

cc:
Superintendent, Lake Clark

ALASKA POWER AUTHORITY

334 WEST 5th AVENUE - ANCHORAGE, ALASKA 99501

Phone: (907) 277-7641
(907) 276-0001

September 7, 1983

Mr. Hugh L. Watson
Associate Regional Director
U.S. Department of the Interior
National Park Service
540 West Fifth Avenue
Anchorage, Alaska 99501

Subject: Chakachamna Hydroelectric Project

Dear Mr. Watson:

Receipt is acknowledged of your May 20, 1983, letter conveying comments of your staff and that the Lake Clark National Park and Presence on the March 1983, Interim Feasibility Assessment Report of the above-referenced project.

When funding permits, a study plan for the cultural resources studies to be performed in future project studies will be finalized. A first draft of the proposed study plan was transmitted to you with our letter dated May 25, 1983, and discussed at the meeting in our offices on June 8, 1983. We are pleased to note that you were represented and participated in those discussions.

The final study plan will include revisions to reflect your comments regarding the processes to be followed to inventory and evaluate cultural resources and to coordinate with the State Historic Preservation Officer and Advisory Council on Historic Preservation.

Potential primary and secondary impacts on park resources will be addressed, particularly those on fish and wildlife arising from construction and operation of the project, and the effects resulting from increased public use created by improved overland access.

We appreciate having received your comments on the March 1983, report and look forward to working closely with your staff when funding permits some of these studies to proceed.

Sincerely,

Eric P. Yould
Executive Director

cc: **Mr. Robert Loder**, Bechtel, San Francisco
Mr. Wayne Lifton, Woodward-Clyde, Anchorage

9782/057

DEPARTMENT OF THE ARMY
ALASKA DISTRICT, CORPS OF ENGINEERS
POUCH 898
ANCHORAGE, ALASKA 99506

May 23, 1983

REPLY TO
ATTENTION OF:
Hydropower and Comprehensive
Planning Section

RECEIVED
[illegible] 24 1983
ALASKA POWER AUTHORITY

Mr. Eric P. Yould
Executive Director
Alaska Power Authority
334 West 5th Avenue
Anchorage, Alaska 99501

Dear Mr. Yould:

I appreciate the opportunity to review the Chakachamna Hydroelectric Project Interim Feasibility Assessment Report furnished to this office on 12 April 1983.

Much time and effort has obviously gone into the preparation of this interim assessment report. I agree with you and other interested parties that there are some problem areas where more information and study are needed to permit a determination of project economic feasibility. Such studies would include the considered outlet dike proposal, which would be very sensitive to possible dike failure, and the most effective movement of fishery resources through the outlet barrier. Also, I presume a rock trap would be provided to prevent blasted rock from being washed into the power tunnel. Figure 3-4 of Volume I is unclear on this feature.

If further assistance is required, please do not hesitate to contact Mr. Carl Borash of Planning Branch at 552-3461.

Sincerely,

Neil E. Saling
Colonel, Corps of Engineers
District Engineer

ALASKA POWER AUTHORITY

334 WEST 5th AVENUE - ANCHORAGE, ALASKA 99501

Phone: (907) 277-7641
(907) 276-0001

September 7, 1983

Mr. Neil E. Saling, Colonel
Alaska District Corps of Engineers
Department of the Army
Pouch 898
Anchorage, Alaska 99506

Subject: Chakachamna Hydroelectric Project

Dear Colonel Saling:

Receipt of your May 23, 1983, letter is acknowledged. Your comments on the Feasibility Assessment Report for the project are very much appreciated.

You cited the proposed outlet dike as an area where more information and study are needed. We and our consulting engineers fully agree in this regard and plans for future studies of the project provide for additional surface and subsurface explorations to be performed in this area. We are thinking in terms of designing this dike as an "overflow" or "flow through" type rockfill dike in order to reduce its sensitivity to the possibility of a dike failure. The provision of a spillway will limit the depth of overflow that can occur and thus prevent the onset of conditions that could lead to that type of failure.

In the natural process presently working at the lake outlet, melting of the ice at the toe of Barrier Glacier causes the sand, gravel and boulders being carried along in the ice flow to be deposited in the outlet channel. A bar of gravel and boulders builds up until the lake water level reaches Elev. 1,155 feet, or thereabouts, after which a condition arrives where the gravel bar is overtopped to a sufficient degree to cause a significant part of it to be swept away and a lake outbreak flood such as the August 12, 1971, event occurs. The process then repeats itself.

A barrier formed, as described above, would be composed of a random assortment of particle sizes, and being deposited without control, would be more sensitive to failure than an artificial barrier constructed of selected materials under controlled conditions. Subsurface explorations would be oriented to provide information that would enable the design to guard against a piping or blowout-type of failure. It should be borne in mind that dike failure would cause a downstream flood no greater than has occurred naturally with the breakout type of flood such as occurred in 1971.

9782/057

No attempt has been made to finalize details of the rock traps for the lake tapping. Traditionally, the geometry selected would have been based on a trap below the tunnel, but it was noted that this arrangement may possess a number of disadvantages. When details are carried further forward, it was planned to engage Christian Groner as a special consultant in this field. He has been involved in a significant number of lake taps.

It is intended to further study the provisions of fish passage facilities past the outlet barrier in response to a number of comments received from the State and Federal fishery agencies. These will be covered in an addendum to the report schedule to be issued in the near future.

Sincerely,

Eric P. Yould
Executive Director

cc: Mr. Robert Loder, Bechtel, San Francisco
Mr. Wayne Lifton, Woodward-Clyde, Anchorage

DEPARTMENT OF ENVIRONMENTAL CONSERVATION

MEMORANDUM

State of Alaska

437 E Street/Suite 200 Anchorage, Alaska 99501

TO: Mr. Eric Yould, Director
Alaska Power Authority

DATE: May 25, 1983

FILE NO: Chakachamna

TELEPHONE NO: 274-2533

FROM: Bob Martin, P.E.
Deputy Director, EQO

SUBJECT: Chakachamna Iterim Feasibility Report March 1983

In reviewing the Chakachmna Iterim Feasibility Report, March, 1983, the study provides an interesting overview of potential project scenarios. However, in terms of detailed analysis, the report poses more questions than answers. The environmental field studies are extremely limited, providing a preliminary "reconnaisance level only" review of possible project impacts. Considering that the Department of Environmental Conservation was not invited to participate in any "environmental field study scoping process," it would appear that what has been done to date was not intended to provide a detailed project assessment.

Potential problems noted which would require a mitigation strategy are as follows:

- Exposure of the entire McArthur River stream delta during maximum drawdown (45'below pre-project minimum flow);
- Inundation of lower stream reaches currently unaffected;
- Increased turbidity during winter months in the McArthur River;
- Possible gas saturation in excess of 100% at powerhouse location;
- Increase in water temperature by .9° C at powerhouse, above ambient temperature in McArthur River;
- Possible turbidity increase due to increased glacial meltwater;
- Increased bed scour and bank erosion due to increased flooding of the McArthur River.

In contrast to the excellent coordination and environmental field effort for the Silver Lake Hydroelectric project, the Chakachamna project effort has been minimal at best. At such time as the Alaska Power Authority decides to give serious consideration to the Chakachamna project, the Department would be happy to work with you in scoping out an effective environmental studies program.

DW/BM/jfr

ALASKA POWER AUTHORITY

334 WEST 5th AVENUE - ANCHORAGE, ALASKA 99501

Phone: (907) 277-7641
(907) 276-0001

September 7, 1983

Mr. Robert Martin, P.E.
Deputy Director, EQO
State of Alaska
Dept. of Environmental Conservation
437 E. Street - Suite 200
Anchorage, Alaska 99501

Subject: Chakachamna Hydroelectric Project

Dear Mr. Martin:

Receipt is acknowledged of your May 25, 1983, letter conveying comments on the March 1983, Interim Feasibility Assessment Report for the subject project.

You are entirely correct in noting that the project studies have thus far been quite limited in scope and consequently the report gives only a review of possible project impacts rather than a detailed impact assessment.

The draft copy of the proposed study plan for the project transmitted with my May 25, 1983, letter contains study elements that will address the problems you noted requiring mitigation strategy. We regret that you were unable to be represented at the June 8, 1983, meeting when these plans for future studies were discussed in an open workshop.

We shall be sure to notify you when further activities are contemplated and shall look forward to your participation when funding permits further studies of the project to go forward.

Sincerely,

Eric P. Yould
Executive Director

cc: Mr. Robert Loder, Bechtel, San Francisco
Mr. Wayne Lifton, Woodward-Clyde, Anchorage

9782/057

BILL SHEFFIELD, GOVERNOR

DEPARTMENT OF FISH AND GAME

P.O. BOX 3-2000
JUNEAU, ALASKA 99802
PHONE: (907) 465-4100

OFFICE OF THE COMMISSIONER

May 26, 1983

Alaska Power Authority
334 West 5th Avenue
Anchorage, Alaska 99501

Attention: Mr. Eric P. Yould, Executive Director

Gentlemen:

Re: Chakachamna Hydroelectric Project Interim Feasibility Assessment Report

The Alaska Department of Fish and Game (ADF&G) has reviewed the Chakachamna Hydroelectric Project Interim Feasibility Assessment Report dated March 1983 and offers the following comments for your consideration:

A. General

Overall, the paucity of quantitative data and general conclusions presented in this Interim Feasibility Report confirm the need for a far more encompassing and detailed level of study effort designed to document fully fish and wildlife species and their use of habitats within the study area. The minimal field studies accomplished to date evidence the need for more detailed, site-specific and longer term inventory data before a thorough understanding of the pre-project and post-project conditions can be attained.

Additional study elements which are needed include the collection of sufficient physical and biological environmental information to accomplish an instream flow analysis. This analysis would quantify the optimum flows required to maintain spawning, rearing, migration and incubation habitat for resident and anadromous fish species present within the Chakachamna and McArthur Rivers.

In addition to the instream flow analysis, information sufficient to quantify potential impacts to fish and wildlife resources and public use attributable to the proposed project should be presented. This information should be developed in enough detail to provide for the development of an effective mitigation plan.

We understand that a study plan for the 1983/84 field study program has been drafted and will soon be available for agency review and comment. We look forward to the opportunity to review and provide comments/recommendations on this study plan.

B. Aquatic Biology

1. It does not appear that the study objectives outlined on page 6-28 have been accomplished. Specifically the text does not:

   a. evaluate those species and habitats potentially vulnerable to impacts that might occur during the construction and operation of one of the proposed alternatives;

   b. provide an evaluation of the nature and extent of studies that would be necessary to assess the minimum amount of water necessary to maintain a viable salmon fishery,

   c. identify critical habitats and life functions occurring within the system in sufficient detail for use in evaluating potential impacts to such areas or life functions,

   d. address in adequate detail the morphologic, hydraulic and biological studies required to initiate the proposed Instream Flow Analysis using the IFG Incremental Methodology.

C. Juvenile Salmon Studies

1. The winter-spring sampling program was very sporadic. The information presented does not appear to be based upon a field program designed to sample systematically those stations in stream reaches which are believed to be important overwintering areas.

2. Presentation of the field data lacks pertinent analysis parameters including the omission of sample size data and the electrofishing and seining data are not addressed in terms of catch per unit effort (CPUE). The text discusses data without reference to tables or by referencing the wrong tables; and the report contains no summarization of juvenile catch data comparing seasonal variation by sampling station.

3. Conclusions drawn about habitat utilization by juveniles during the winter and spring period are based on limited and inadequate sample sizes. It appears that no effort has been made to analyze the raw data to determine if hypothesized changes are statistically significant or simply a function of sample variability.

4. Techniques used to survey and evaluate smolt outmigration (use of plankton nets) are inappropriate. More effective and standard methods include the use of fyke nets, inclined plane traps, and rigid smolt traps.

5. Hydroacoustic sampling on Chakachamna Lake was very superficial and inadequate due to:

   a. Use of only one sampling period for the study duration;

   b. Inadequate number of transects;

   c. Species composition was not verified by other sampling means (tow-netting, etc.);

   d. Evaluation of juvenile presence and near surface water column fisheries use was not performed. An upward looking transducer would provide this information.

D. <u>Adult Salmon Studies</u>

1. For the most part, fyke nets are not suitable for obtaining a representative sample of adult salmon migrating past sampling stations. Nets can only be placed in areas of minimal current and as such do not capture species which do not exhibit shore oriented behavior.

2. Some of the techniques used (overflights and netting) do not seem suitable for identification of potential mainstem spawning in glacially occluded areas (and subsequent enumeration of spawners). As a result, very little effort has been made to evaluate the extent of spawning in the mainstem Chakachamna and McArthur rivers. Further, the discussion assumes all spawning occurred in clearwater areas and, therefore, habitat requirements for spawning are limited to those areas. The ADF&G, through the Susitna Hydro Study, has developed highly successful and efficient electroshocking sampling techniques which would have application for the McArthur and Chakchamna River inventories.

3. Potential lake spawning was addressed only superficially and in no way represents an adequate evaluation of that possibility.

4. No data are presented concerning the "correcting" of aerial counts by ground truthing (how much of each spawning area worked, how often repeated, how did counts compare, etc.).

5. No streamlife data are presented in this report (number tagged fish observed, frequency of observation, etc.). This information directly affects escapement estimates and should be well documented.

E. <u>Terrestrial Vegetation and Wildlife - Mammals</u>

The information presented in this report pertaining to wildlife and human use of wildlife does not meet the study objective on page 6-59 which states: "...to identify important wildlife resources in the study area, their use of the area, and the importance of identified vegetative and aquatic communities to these resources." The data and conclusions presented will not enable a meaningful assessment of the potential project impacts on the wildlife resources, their habitats or the secondary effects of public use of these resources. The ADF&G believes that the level of effort used to define existing wildlife use was not adequate to evaluate fully wildlife use of the area. A two-week field program does not allow enough time to quantify terrestrial mammal use of such a large area displaying such a wide range of habitat types. The species list compiled lacks several species known to occur in this area including fox, hare, martin and weasel. Table 6.2, page 6-7 should be amended to include these species. Gray wolves are occasional users of this area and should not be considered common users as indicated in table 6.2. Moose, bear and furbearer harvest statistics for the study area should be included or summarized in this report.

The limited aerial survey data are suspect due to seasonal and nocturnal variations. Methodologies used to identify moose calving and wintering areas are also questionable. The presence of juvenile skeletal remains should not be construed to confirm a calving area nor should shed antlers be relied upon to denote a moose wintering area.

In summary, while there are a significant amount of new data in this report, they are not properly presented, and in some cases the conclusions based on the data are questionable. In addition, given the unplanned and sporadic nature of the data collection, conclusions drawn based on this information may be of little value in determining the potential effects of the proposed project on the anadromous fish resources of the two drainages studied. We suggest that the report data be used as background for preparing a more detailed study plan which will meet the objectives necessary to evaluate the project. We look forward to working with the APA and its contractors to develop a study plan to collect the information necessary to quantify impacts attributable to the project and to develop an acceptable mitigation plan.

Should you have questions or require clarification regarding our comments, please contact Habitat Division Staff in Anchorage.

Sincerely,

for Don W. Collinsworth
Commissioner

ALASKA POWER AUTHORITY

334 WEST 5th AVENUE - ANCHORAGE, ALASKA 99501

Phone: (907) 277-7641
(907) 276-0001

September 12, 1983

The Honorable Don W. Collinsworth
Commissioner
State of Alaska
Dept. of Fish and Game
P.O. Box 3-2000
Juneau, Alaska 99802

Subject: Chakachamna Hydroelectric Project

Dear Commissioner Collinsworth:

Receipt is acknowledged of your May 26, 1983, letter conveying the comments of your Department on the Interim Feasibility Assessment Report for the subject project.

During our December 9, 1983, meeting in Anchorage, it was agreed that the Alaska Power Authority would develop a study plan as considered necessary to meet Federal Energy Regulatory Commission (FERC) license application filing requirements. Our consulting engineers and environmental advisors developed such a study plan and it was transmitted to the various resource agencies by letter dated May 25, 1983.

Subsequently, a meeting was called in our Anchorage office on June 8, 1983. At this meeting a brief presentation covering the study plan was made and representatives of the resource agencies were then invited to participate in a workshop during which much useful dialogue ensued. The study plan specifically addressed collection of data that will provide the level of information needed for detailed impact assessment and mitigation planning. Commencement of the study plan is, however, dependent upon the allocation of funds for its implementation.

We were pleased to receive your comments on the March 1983, Interim Feasibility Assessment Report and offer the responses discussed below by heading:

(B) Aquatic Biology - The initial studies conducted in 1981 and winter/spring 1982, were designed to address and to meet the objectives mentioned insofar as the timing, budgets, and authorization of the studies allowed. It is recognized that such reconnaissance studies are not sufficient by themselves to meet all of the study objectives. The proposed studies for 1983-84 are an expansion of those conducted in the summer/fall

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of 1982, and are described in the recently prepared study plan which was presented to representatives of your agency on June 8, 1983. Instream flow studies have been identified as important to meeting the project objectives, and baseline data have been collected on the morphology, hydraulics, and aquatic biology of the Chakachatna and McArthur River systems. This has led to a selection of river segments within which instream flow study reaches will be selected. As stated in the study plan, it is proposed to collect data in these study reaches for analysis using the IFG Incremental methodology.

(C) Juvenile Salmon Studies -

1. The winter/spring 1982 sampling was conducted at a reconnaissance level and on an ad hoc basis as funds became available during the spring of 1982. These studies were primarily exploratory in nature, with most field programs of limited duration. The primary purpose of the winter studies was to discover areas of potential fisheries over-wintering habitat.

2. Since the data collected in winter/spring 1982 were basically exploratory in nature, seasonal comparisons with more detailed data collections were not warranted. Equal sampling efforts for seining and electrofishing were used at each station; catch per unit effort data for these techniques were presented in Volume III, Appendix A5 of the March 1983 report. An errata sheet for incorrect table references will be prepared and issued with the Addendum to the report in the near future.

3. Because the study was largely exploratory in nature, no detailed prior statistical comparisons were planned and we do not believe they were warranted at that time. The data were purposely presented as observations related to species presence and timing so that the reader would not confuse the results with those of more detailed studies to be conducted later.

4. Outmigrant sampling, as stated in the text, was conducted briefly in different areas of the river systems and by helicopter to aid in evaluating timing of outmigration during a one-day investigation. We concur that an inclined plane trap is a superior method for conducting full-scale programs; an inclined plan trap was utilized in the spring 1983 work, and provision for this methodology is included in our 1983-84 study plan.

5. Weather and safety conditions during September 1983, limited the type and extent of hydroacoustic studies that

could be done. The studies were originally planned to be far more detailed. The hydroacoustic surveys proposed for 1983-84 and presented in the study plan, address all stated concerns.

D. Adult Salmon Studies -

1. During 1982, fyke nets were the only gear available to the project. The nets provided useful data and, in some instances, fished 50 to 100 percent of the stream. As stated in the 1983 study plan, a combination of fish wheels and fyke nets will be used for more detailed studies.

2. Relatively low levels of effort were expended to sample for mainstem spawning in areas where there was no suitable substrate. Many areas of both rivers are also unsuitable due to velocity or depth. Such areas include the vast majority of both the McArthur and Chakachatna River mainstem areas. We concur that electrofishing is an efficient sampling technique in mainstem areas, and we have used it for that purpose in both rivers. An expanded electrofishing program is included in the 1983-84 study plan.

3. Lake spawning was only investigated in areas with substrate suitable for sockeye salmon spawning. The 1983-84 study plan calls for more intensive studies in the future.

4 & 5. These data will be supplied in a future report.

E. Terrestrial Vegetation and Wildlife - During September 1981, a two-week reconnaissance level survey was conducted on the vegetation and wildlife at Chakachatna area. The intent of this survey was to gain a basic understanding of species presence and distribution, or absence. The results of the survey were to be used for planning the scope and level of effort for future studies. To date, funding for additional terrestrial studies has not been available.

A description of future studies was prepared and was discussed with ADF&G representative at our June 8, 1983, meeting. These studies included:

- The preparation of vegetation maps;
- Aerial and ground transects to quantitatively describe the wildlife resources; and

- The use of a modified Habitat Evaluation Procedures analysis to quantitatively describe anticipated project impacts.

This program will be conducted during the course of a year to identify seasonal changes in habitat availability and use when funds become available.

Again, thank you for your comments on the March 1983, report. We look forward to the continuing cooperation of your staff in the implementation of our future studies for this project.

If you have any further questions, please feel free to contact me or Mr. Eric Marchegiani.

Sincerely,

Eric P. Yould
Executive Director

cc: Mr. Robert Loder, Bechtel, San Francisco
Mr. Wayne Lifton, Woodward-Clyde, Anchorage
Mr. Don McKay, ADF&G, Anchorage

9782/057

MEMORANDUM

State of Alaska

Community and Regional Affairs

TO: Eric P. Yould, Executive Director
Alaska Power Authority
Department of Commerce and Economic
Development

DATE: 31 May 1983

FILE NO:

TELEPHONE NO:

FROM: Mark Lewis, Commissioner
Community and Regional
Affairs

SUBJECT: Chakachamna Interim Feasibility Study

RECEIVED
JUN 09 1983
ALASKA POWER AUTHORITY

Thank you for the opportunity to review the Chakachamna Interim Feasibility Study. With regard to the study, and the major hydroelectric project which it presents, this Department submits the following comments for your consideration.

The report's introduction (p. 1-1) presents a study objective: "...to provide a preliminary assessment of the effects that the project would have on the environment". Further in the report, the study environment is defined to include a component of "Human Resources", as well as hydrology and biology. In reading the study, we therefore anticipated the presentation of a preliminary assessment of the effects of the development on the human environment. In this case, the potentially affected human environment is represented at four different levels; by the village of Tyonek; by the Kenai Borough; by the Matanuska-Susitna Borough; and by the Municipality of Anchorage.

However, while this feasibility study did include reasonably thorough baseline portraits of these four human habitats, it stopped short of any actual assessment of the potential effects of project development, either beneficial or detrimental, on the human resource.

A final feasibility study for this proposed project should include specific assessments of the effects of the development on the human resource. Such assessments should be undertaken and presented in such detail and manner so as to permit the potentially affected populations and their representatives to clearly understand the implications of the development relevant to their community(ies).

An example of the kind of further assessment that should be undertaken is a comparison of the existing and potential relationship between the wildlife resource and the use of that resource for subsistance and commercial purposes. The Interim feasibility study presents a detailed account of the area's wildlife, particularly its fisheries resources. The study also indicates that the residents of Tyonek have a strong subsistance relationship to that resource. However, a next step should be taken which specifically relates the acquired data on fisheries to the data on human use of that resource. That is, who fishes for what kind of fish, when and where, and how is the fish used? Knowing this, a further step should be taken which would superimpose the various development scenerios onto the existing framework; assessing the possible range of effects that the development could produce.

The final feasibility study should carry the human resource assessments at least to this point. However, a further useful step in the feasibility process would be the formulation and assessment of possible strategies that affected populations could employ to obtain the maximum benefit (and minimum detriment) from the development, should it actually occur.

Most importantly, the above described assessment and strategy formulation process should include effective participation opportunities for potentially affected populations.

Three areas of concern for which the above process should be employed are: 1) Tyonek village subsistance activity; 2) the economics of commercial fisheries interests in Upper Cook Inlet; and 3) increased service demands on the Kenai Peninsula Borough resulting from construction and operations phases of the project. We feel that it is appropriate and necessary that the final feasibility study reflect a fundamental understanding of the potential futures of these areas of concern relative to the proposed hydroelectric project.

Again, thank you for the opportunity to comment on the study.

ALASKA POWER AUTHORITY

334 WEST 5th AVENUE - ANCHORAGE, ALASKA 99501

Phone: (907) 277-7641
(907) 276-0001

September 7, 1983

The Honorable Mark Lewis
Commissioner
State of Alaska
Community & Regional Affairs
Pouch B
Juneau, Alaska 99811

Subject: Chakachamna Hydroelectric Project

Dear Commissioner Lewis:

Receipt is acknowledged of your memorandum dated May 31, 1983. We were pleased to receive your comments on the March 1983, Interim Feasibility Assessment Report for the subject project and have carefully reviewed them. The Report had a limited set of objectives which included:

- Identify issues and conflicts to be addressed by project studies;
- Summarize available environmental data with additional data gathered dependent on funding priorities;
- Identify potential impacts without detailed analysis;
- Compare project alternatives from engineering, economic and environmental perspectives.

When sufficient funds can be allocated to this project, it is intended to prepare baseline data for a Federal Energy Regulatory Commission License application. At that time, impacts and mitigation measures, including those cited in your memorandum, will be examined. Your concerns such as impacts on Tyonek, the Kenai Peninsula and Mat-Su Boroughs and the Municipality of Anchorage will be addressed as will the impacts on commercial fishing and Tyonek subsistence activities. The preparation of development scenarios, mitigation measures and public participation programs and the definition of project benefits, would also take place at that time. The draft of a proposed study plan for that work was transmitted to you with our letter dated May 25, 1983. It is regretted that you were unable to be represented at the June 8, 1983, meeting when that study plan was discussed.

9782/057

We shall look forward to your participation and cooperation when funding considerations permit some of these studies to proceed.

Sincerely,

Eric P. Yould
Executive Director

cc: **Mr. Robert Loder**, Bechtel, San Francisco
Mr. Wayne Lifton, Woodward-Clyde, Anchorage

9782/057

MEMORANDUM

State of Alaska

DEPARTMENT OF NATURAL RESOURCES

DIVISION OF RESEARCH AND DEVELOPMENT

TO: Eric Yould
Executive Director
Alaska Power Authority

DATE: June 9, 1983

FILE NO:

TELEPHONE NO: 276-2653

FROM: Roland Shanks
Director

SUBJECT: Chakachamna Hydro

RECEIVED
JUN 15 1983
ALASKA POWER AUTHORITY

The Department of Natural Resources has reviewed the Chackachamna Hydroelectric Project Interim Feasibility Assessment Report. The department's clearinghouse, which is located in this division, has received the following information.

The geologic hazards associated with this project are immense and difficult to predict. Effects of an eruption of Mt. Spurr on the Barrior Glacier and Chakachamna Lake could be devastating to attempts to produce hydropower. The project's proximity to the Castle Mountain Fault also needs to be considered.

I hope that the tardiness of these comments does not affect their usefulness. The delay was due to problems with the postal service and was beyond our control.

cc: Gary Prokosch, SCDO
Gail March, DGGS

LW:rh

ALASKA POWER AUTHORITY

334 WEST 5th AVENUE - ANCHORAGE, ALASKA 99501

Phone: (907) 277-7641
(907) 276-0001

September 7, 1983

Mr. Roland Shanks
Director
Department of Natural Resources
Division of Research & Development
555 Cordova
Pouch 7-0005
Anchorage, Alaska 99501

Subject: Chakachamna Hydroelectric Project

Dear Mr. Shanks:

Thank you for your June 9, 1983, memorandum conveying your comments on the Interim Feasibility Assessment Report for the above referenced project.

Please rest assured that the Alaska Power Authority staff, and our consulting engineers studying the project, are well apprized of the hazards associated with an eruption of Mt. Spurr, and with the seismic risk posed by the proximity of the Castle Mountain Fault. The underground arrangement presently proposed for the project should be less vulnerable than surface structures to seismic damage. For example, a surface powerhouse in the McArthur Valley would be subject to rock falls from the high valley walls above the powerhouse during a seismic event.

Your comments are well taken and further investigations of these phenomena are planned when funding permits that to be done.

Sincerely,

Eric P. Yould
Executive Director

cc: Mr. Robert Loder, Bechtel, San Francisco
Mr. Wayne Lifton, Woodward-Clyde, Anchorage

9782/057

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MEMORANDUM

State of Alaska

DEPARTMENT OF NATURAL RESOURCES DIVISION OF RESEARCH AND DEVELOPMENT

TO: ERIC MARCHEGIANI
Alaska Power Authority

DATE: June 14, 1983

FILE NO: DNR 83053102

TELEPHONE NO: 276-2653

RECEIVED
JUN 20 1983
ALASKA POWER AUTHORITY

FROM: ROLAND SHANKS
Director

SUBJECT: Chakachamna Hydro Project

The Department of Natural Resources has received the draft study plan of the proposed hydroelectric project. Reviewers have two concerns:

Page B-8 What is the purpose of building a dike at the end of the lake? If the dike is intended to raise the water level, this may create problems by making Barrier Glacier unstable.

Page 13 We recommend that the study plan include an evaluation of whether the glacier is thickening or thinning. Barrier Glacier holds back the lake. If the glacier moves, then the lake moves also.

Please contact Gail March at the Division of Geological and Geophysical Survey, 474-7147, if you have any questions.

RS/LW/dpj

02-001A (Rev. 10/79)

ALASKA POWER AUTHORITY

334 WEST 5th AVENUE - ANCHORAGE, ALASKA 99501

Phone: (907) 277-7641
(907) 276-0001

September 7, 1983

Mr. Roland Shanks, Director
Department of Natural Resources
Division of Research & Development
555 Cordova
Pouch 7-0005
Anchorage, Alaska 99501

RECEIVED
SEP 1 9 1983
R. T. LODER

Subject: Chakachamna Hydroelectric Project

Dear Mr. Shanks:

Receipt is acknowledged of your memorandum dated June 14, 1983, conveying two comments on the Interim Feasibility Assessment Report. Our response is as follows:

(1) Page B-8. Building a dike at the end of the lake, near its present outlet, is proposed for several reasons, principal among which is the need to develop regulatory storage that will enable surplus water to be stored during the high runoff months and then be diverted for power generation during the low runoff months. The dike would not cause the water level in the lake to rise above the maximum level to which it has risen in the past under natural conditions. Thus, the Barrier Glacier would not be exposed to lake water levels any higher than it has in the past. As may be seen by reference to the Appendix to Section 4.0, Power Studies, in Volume I of the report, Alternative E, Page 1, the mean lake level during operation of the power plant in the 30-year period study would have been Elev. 1,130 feet. According to the U.S. Geological Survey (USGS) records, the mean water level at the lake outlet gauge was 1,139 feet so that operation of the lake for power generation would have caused a net lowering of about 9 feet in the mean water level during that period.

(2) Page 13. Plans for future studies of the project provide for measurements of ablation, advance or retreat of the glacial ice in the vicinity of the lake outlet. Ice thicknesses were measured by the USGS in 1981, but the results have not yet been released.

Sincerely,

Eric P. Yould
Executive Director

cc: Mr. Robert Loder, Bechtel, San Francisco
Mr. Wayne Lifton, Woodward-Clyde, Anchorage

9782/057

ADDENDUM TO VOLUME II

6.0 ENVIRONMENTAL STUDIES

Volume II, Errata

6.8.3.1.4 Spring Studies June 8-11, 1982

Page 6-170, Chilligan River, third line "Table 19" should read "Table 20."

Page 6-171, Chakachatna River, second paragraph, third line, "Table 22" should read "Table 23."

Page 6-173, McArthur River Drainage, second paragraph, first line, "Table 33" should read "Tables 32 and 33."

Supplementary Table References

Page No.	Location	Volume III Table Reference
6-167	Straight Creek	Appendix A3 - Table 13
6-170	Another River	Appendix A3 - Table 18
6-172	Lower Chakachatna River	Appendix A3 - Table 26
6-173	Straight Creek	Appendix A3 - Table 31
6-174	McArthur R. Sta. 11.5	Appendix A3 - Table 36
6-174	McArthur R. Sta. 11	Appendix A3 - Table 37
6-175	Chakachatna R. Sta. 17	Appendix A3 - Table 39
6-175	Middle River	Appendix A3 - Tables 40 & 41
6-175	Straight Creek Clear-water Tributary	Appendix A3 - Table 42
6-176	McArthur River	Appendix A3 - Tables 43, 44, & 45

6.10 ENVIRONMENTAL HYDROLOGY - 1983

6.10.1 Introduction

The purpose of this section is to describe the hydrologic studies conducted in the late fall, winter, and spring of 1982-83 (FY83) in support of the environmental program leading toward the feasibility assessment of the Chakachamna Lake Hydroelectric Project. The overall objective of the environmental hydrology studies was to collect baseline data to assist in future evaluation of the physical processes of the Chakachatna and McArthur River systems, correlation of these processes with fish and wildlife habitats, and to aid in the design of future studies. Previous environmental hydrology studies are summarized in Volume II, Sections 6.2 and 6.7 of the 1983 Interim Feasibility Assessment (1983 IFAR) Report.

The study area is described in Volume II, Sections 6.1 and 6.2 (1983 IFAR). The FY83 winter/spring hydrologic studies were conducted on the Chakachatna River at the Chakachamna Lake outlet and on the McArthur River downstream of the powerhouse location. The studies at these sites concentrated on baseline data collection of stream flow and water temperature. Two recording gages (Datapod Model DP211SG dual channel recorders) were used to record water stage and temperature at the two study sites. The installation and initial data collection of these recorders is discussed in Volume II, Section 6.7.2 of the 1983 IFAR.

6.10.2 Stream Flow Characteristics

Collection of streamflow data was initiated in 1982 with the installation of two recording gages and numerous staff gages distributed through the Chakachatna and McArthur River systems. A single discharge measurement was taken in October at a number of the sites to form the basis of preliminary rating curves. These discharges, along with comparable discharges measured in September 1981, were presented in Section 6.7 of the report. Additional discharge measurements were made in Spring of 1983 at five sites in the project area (Table 6.85). Two of these measurements were conducted at the two recording gage sites; these were used to improve the reliability of the rating curves at these sites.

Chakachatna River. The preliminary rating curve used to calculate the Chakachatna River discharges reported in Section 6.7 (1983 IFAR) was revised based on the additional discharge measurement conducted in spring of 1983 and on a review of U.S.G.S. rating curves. The stages corresponding to the two discharges were adjusted to approximately the same reference elevation as the U.S.G.S. gage reference elevation by adding 7 ft. to the datapod readings. The zero datapod reading does not correspond to a zero discharge because the datapod was installed in the existing U.S.G.S. gage stilling well, which did not extend all the way to the bottom of the channel. The adjustment shifts the stage corresponding to a zero discharge on the datapod to 7 ft. below the datapod, close to the actual stage for zero flow. The two measured discharges and corresponding adjusted stages were found to fit closely to the rating curve developed for the period June 1959 to May 1960 by the U.S.G.S. This curve was based on six discharge measurements and was considered by the U.S.G.S. to be fairly well defined between 800 cfs and 14,000 cfs. Although the U.S.G.S. rating curves shifted from one year to the next, they tended to have similar shapes. It was assumed that using the U.S.G.S. rating curve for the 1959-60 period would be preferable to using a rating curve based on only two measurements in 1982-83. The resulting rating equations are:

$$Q = 1.09\ (S_d + 7)^{3.28}$$

for 0 _ S_d _ 6.2 and

$$Q = 12.26\ (S_d + 7)^{2.34}$$

for 6.2 S_d 15

where

Q = computed discharge, in cfs and

S_d = stage recorded on the datapod, in ft.

The rating curve equations were applied to the stage values recorded by the datapod from its installation on 11 August 1982 through 17 May 1983. The resulting mean daily discharges are presented in Table 6.86, which supersedes the Chakachatna River values presented in Table 6.26 (1983 IFAR) based on the preliminary rating curve. The discharge hydrograph for this period is shown in Figure 6.144. Discharge records for the period August through September are considered poor due to the lack of discharge measurements to verify the rating curve. Discharge records after November are considered very poor due to lack of discharge measurements and insufficient depth of water over the gage.

The stilling well housing of the Chakachatna River gage was destroyed by ice and/or rock falls on or about 17 May 1983. The lower sections of the stilling well were severed from the upper sections at a level roughly 10 to 12 ft. above the level of the gage. The transducer and connector cable for the datapod unit were damaged in the process. The unit was retrieved on 26 May 1983 for repair. The repaired unit was reinstalled on 18 June 1983 on the opposite bank with the pressure transducer at a lower level. The damaged unit precluded the opportunity to check the unit for drift of the transducer readings.

McArthur River. The preliminary rating curve used to calculate the McArthur River discharges presented in Volume II, Section 6.7 (1983 IFAR) does not need to be revised based on the discharge measured in April of 1983. The measured discharge fit the straight line log-log relationship defined by a single field measurement, which was supplemented by a number of values computed using the Manning equation. The equation for this rating curve, which is applicable to the condition of having sand dunes in the channel (see Volume II, Section 6.7.3 1983 IFAR) for a discussion of these dunes), is as follows:

$$Q = 6.59\, S_d^{\;3.85}$$

where

Q = computed discharge, in cfs, and

S_d = stage recorded on the datapod, in ft.

A rating curve was also developed for the period prior to the mid-September 1982 flood when there were no sand dunes in the cross section at the gage. This curve was based only on discharge values calculated from the Manning equation. There were no measured discharges at this cross section prior to the mid-September flood. The resulting rating curve can be written:

$$Q = 141.1\ S_d^{\ 1.81}$$

where Q and S_d are as defined above. It is assumed for both curves that the discharge is zero when the gage is zero (no offset constant); this assumption appears reasonable based on observations at the site. Surveyed water surface elevations were compared with datapod readings to check for drift on the datapod's pressure transducer; a drift of almost 1.5 ft. was calculated from June 1983 measurements. Adjustments to the datapod readings were made assuming linear drift at a rate equal to that during the period from 6 April to 19 June 1983. Based on these assumptions, the datapod readings were adjusted by a constant amount each day beginning on 24 September 1982.

The Adjusted stage values were input to the applicable rating curve equation to compute the corresponding mean daily discharges (Table 6.87). This table supersedes the McArthur River values presented in Table 6.26 (Volume II, 1983 IFAR). The discharge hydrograph for this period is shown in Figure 6.145. Discharge records are considered poor due to the lack of discharge measurements defining the rating curves and the shifting bed.

The datapod gage was replaced on 29 June 1983 to allow for servicing of the drift in the old transducer. The new datapod unit was installed a short distance upstream of the previous gage. Selection of the new gage site was based on (1) the desire to install the gage in a way that it could more easily be removed for servicing and (2) finding a cross section with a lower potential for sediment deposition.

6.10.3 Water Temperature

Water temperatures were measured on a continuous basis at the recording gage locations on the Chakachatna and McArthur Rivers. The daily fluctuations during the late summer and fall are presented in Section 6.7.4, Volume II, 1983 IFAR. Water temperature data for the late fall and winter period at the Chakachatna and McArthur River gage locations are presented in Tables 6.88 and 6.89, respectively of this addendum.

Water temperature in the Chakachatna River decreased to near 0°C by early December. Insufficient depth of water over the transducer limits the usefulness of the temperature data after that time. Water temperatures in the McArthur River decreased to 0°C by early November, began to increase in early April and exceeded 4.0°C by mid-May.

6.11 AQUATIC BIOLOGY - 1983

6.11.1 Introduction and Objectives

Two aquatic biology studies were conducted during 1983; one during winter 1983, and the other during spring 1983.

6.11.1.1 Winter Study

During April 1983 a brief winter field study was carried out with a limited scope of work. This study was carried out in conjunction with environmental hydrology studies and was designed to supplement work carried out during the fall of 1982 (Volume II, 1983 IFAR). The objectives of this study were:

¶ Extend the data base on habitat use and seasonal distribution of fish;

¶ Examine the success of spawning and incubation at selected sites;

¶ Extend the data base on habitat characteristics and water quality including water temperatures in salmon incubation areas.

6.11.1.2 Spring 1983 Study

This study was carried out in the period of mid-June to early July, with the start date based upon permit authorization. Studies were carried out under FY83 funds and were terminated when the authorized scope-of-work had been met. These studies were conducted to the extent feasible, (and authorized) at the level of effort described in the 1983 study plan (Alaska Power Authority, 1983).

This level of effort included more stations than sampled during 1982 and more sample replicates. The study program objectives are described below by program task.

6.11.1.2.1 Adult Anadromous Fish

Although this program was not included in the original scope of work, the presence of adult anadromous fish within the river systems allowed opportunistic data collection to increase the information available about the early migration of salmon into the Chakachatna and McArthur River Systems. The objectives of the program were:

¶ Determine the timing of upstream migrations by adult anadromous fish;

¶ Determine migratory pathways within the Chakachatna and McArthur River Systems as efforts permitted; and

¶ Estimate the escapement to spawning areas in sloughs, tributaries, and mainstream areas as time permitted.

6.11.1.2.2 Resident and Juvenile Anadromous Fish

This program was carried out at a greater level of effort than in previous studies (see Section 6.11.2).

Since the program consisted of only one time period it was designed to contribute to meeting the following objectives:

- ¶ Determine the relative seasonal distribution and abundance of R&JA fish;
- ¶ Identify important rearing areas of R&JA fish; and
- ¶ Identify movement patterns of R&JA fish.

Outmigrants were also studied. Due to the timing and duration of the study, a limited amount of data was collected to meet the overall objectives of:

- ¶ Determine the timing of outmigration of salmon juveniles; and
- ¶ Quantify the number of juveniles migrating to sea.

6.11.1.2.3 Habitat Data Collection

This program was directed at measuring the physical characteristics of habitats at each sampling station. The overall objective was to Determine the use and characteristics of important habitats and characterize these in terms of stream-flow variables.

6.11.2 Methodology

Methodologies used during the winter and spring 1983 studies were basically similar to those used during the 1982 summer-fall fisheries program. Where methods used were the same these have been referenced to Volume II, 1983 IFAR. Where methods or intensity differed, the differences are discussed below. The study periods during which each gear was operated are noted in Tables 6.90 and 6.91. The sampling stations used in this study are shown in Figure 6.146 with details of the McArthur tributaries shown in Figures 6.147 and 6.148.

6.11.2.1 Salmon Spawning Escapement. Although estimation of salmon spawning escapement during the spring (June-July) 1983 studies was not included in the scope of work, observations and counts were made on an opportunistic basis. Methodology generally followed that used during 1982 (see Volume II, Section 6.8.2.1, 1983 IFAR). Ground-truthing was performed for species identification at each site, but counts were not ground-truthed during these surveys.

6.11.2.2 Fyke Nets

During the spring 1983 study, fyke nets were set as a supplement to electrofishing and minnow trap sampling. Nets were initially set at stations 1D, 4, and 6 for dates shown in Table 6.91. The methodology used to fish and sample these nets was the same as that used during the summer-fall 1982 program (Volume II, Section 6.8.2.2 1983 IFAR). Difficulties with heavy debris loads associated with increasing flows occurred at all three stations, and moving sand dunes in the McArthur River were a problem at station 1D. These problems resulted in early removal of the nets.

6.11.2.3 Minnow Traps

Minnow trap methodology for the winter 1983 study was the same as that employed during the 1982 studies (Volume II, Section 6.8.2.3, 1983 IFAR). Four replicate traps were set at each station listed in Table 6.90.

For the spring 1983 study, the methodology was altered in accordance with the draft Chakachamna Hydroelectric Project Feasibility Study Environmental Study Plan (APA, 1983). As stated in that plan, the number of sampling stations below Chakachamna Lake was increased from 26 to 40 (Figure 6.147). Ten baited minnow traps were set at each station (Table 6.91). The minnow traps used were 43.2 x 22.9 cm (17 x 9 in), with 1.6 mm (0.063) in mesh. These traps were set overnight (24 hours) and each set was considered a unit of effort.

6.11.2.4 Electrofishing

Electrofishing during the April and spring studies generally followed the same methodology used during 1982 (Volume II, Section 6.8.2.6, 1983 IFAR). During the April study, electrofishing was used to supplement minnow trap collections, particularly in those areas where turbidity, cover objects, or depth did not allow an adequate determination of fish abundance by observation.

During the spring 1983 study, electrofishing was used at all stations sampled (Table 6.91). Three replicate collections were made at each of the resident and juvenile anadromous fish sampling stations below Chakachmna Lake. Electrofishing was generally used by means of localized intermittent application of electrodes to avoid the effect of "driving" the fish. Electrofishing collections were standarized to a catch-per-effort of number of fish/100 shocking-seconds/replicate (100/s-S).

6.11.2.5 Gill Nets

Vertical experimental gill nets were used for sampling fish in Chakachamna Lake during the winter 1983 study. The nets consisted of vertically oriented panels of nylon monofilament netting of varying mesh sizes. The mesh sizes on each net were ordered on the basis of a randomized block design with each mesh size appearing twice on each net. The nets were 3.0 m wide by 51.2 m long (10 by 168 ft). Meshes used were 1.3 cm (0.5 in), 2.5 cm (1 in), 3.8 cm (1 1/2 in), 5.1 cm (2 in), 6.4 cm (2 1/2 in), 7.6 cm (3 in), and 8.9 cm (3.5 in). Each net was made to be deployed using a weighted pipe at the bottom with rigid horizontal spreaders set perpendicular to the vertical axis along the length of the net. The top of the net was floated and anchored to the ice cover with ice screws. Net effort consisted of a 24 hour set. No fish were caught by this technique during the April study.

6.11.2.6 Inclined Plane Trap Outmigrant Sampling

An inclined plane trap was utilized to sample for outmigrants during the spring 1983 study. The trap was deployed at station 1D and operated from mid-June through early July (Table 6.91). The inclined plane smolt trap is similar in design to that used by ADF&G Commercial Fisheries Division at Crescent Creek. Similar designs have been shown to be effective for sampling the downstream migration of salmon smolt in turbid glacial rivers in Alaska (Meehan, 1964).

The trap (Figure 6.149) is suspended in the water column on each side by floats (pontoons) made of styrofoam and plywood 2.2 m (86 in) long. A frame located slightly in front of the trap center supports a winch system to raise and lower the front of the trap. The trap consists of a perforated aluminum plate floor (0.8 cm, 0.3 in dia. holes) 2.4 m (9.6 in) long and 1.2 m (4 ft) wide at the mouth tapering to the rear where it attaches to the live box. This floor is inside an aluminum frame to which 1.3 cm (0.5 in) mesh wire netting is attached forming the trap sides. The live box is suspended in the water by adjustable styrofoam and plywood floats. The 1.2 m (4.0 ft) long, 0.9 m (3 ft) wide, and 0.6 m (2 ft) deep box has a plywood bottom and perforated aluminum plate sides (0.3 cm, 0.125 in diameter holes). A 10.3 cm (4.1 in) mesh net held in place by a frame is placed inside the box. This net is removable for fish collection. The entire assembly is anchored in place.

Fish were removed daily from the live box and processed, water depth and velocity were also measured to estimate flow through the trap. The trap was cleaned daily and moved if the water depth had changed due to rising water or bed load movement. Such changes were not unusual due to the increasing flow and shifting sand in that portion of the river.

6.11.2.7 Habitat Data Collection

Habitat data were collected in the same manner as described in Volume II, Section 6.8.3, 1983 IFAR. In addition to those data previously collected, measurements of incubation habitat were made during the winter 1983 field trip. Incubation data were collected by means of 2.5 cm (1.0 in) inner diameter, 1.0-2.0 m (3.3-6.6 ft.) long standpipes installed in previously identified spawning areas. These standpipes were installed with their openings as deep as 0.4-1.0 m (1.5-3 ft) below the surface of the substrate. The standpipes were "bailed-out" by means of a hand pump and intergravel water temperature was measured within the standpipe.

6.11.2.8 Data Management and Analysis

Data management and analysis for the winter and spring 1983 studies had the same objectives and were generally similar to these reported in Volume II, Section 6.8.2.11, 1983 IFAR. Data management was conducted using the INFO database management system on the Prime computer. Statistical analyses were carried out using the Statpro and BMDP statistical packages. The basic analysis used was Analysis of Variance (ANOVA) with individual comparisons made by group variance-adjusted (Bonneferoni) probabilities.

Habitat utilization data were summarized by Woodward-Clyde Consultant's computer programs following methodologies described by Baldridge (1981) and Bovee and Cochnauer (1977).

6.11.3 Results

The two studies conducted in 1983, were carried out at different levels of effort using a somewhat different set of stations and are therefore presented separately below.

6.11.3.1 Winter 1983 Study

Winter studies were carried out during April 5-11, 1983 primarily to provide supplementary information on the seasonal distribution and habitat use of fish in the study area. Site specific data collection on incubation and overwintering habitats were emphasized. Sampling was generally conducted where site access was available and at a reduced level of effort as compared to that used during the summer-fall 1982 studies. Data collections were made on an opportunistic basis and emphasized those areas where spawning was observed or where potential overwintering sites had been located based on previous data (see Volume II, Section 6.8.3.2., 1983 IFAR).

6.11.3.1.1 Resident and Juvenile Anadromous Fish

Studies of seasonal fish distribution and examinations for successful incubation were conducted using a variety of methods including minnow traps, electrofishing, observation, dip netting and vertical gill netting. Stations were selected for sampling on the basis of accessibility, time, and budget constraints. Results of collections made by these methods are presented in Appendix B2, catch per effort (c/f) data for these results are presented in

Appendix B3. Vertical gill net results are not presented because no fish was caught using this method. Dates of gear deployment for this study are presented in Table 6.90.

Results of the studies are discussed by species below.

Dolly Varden. During April, age 0^+ Dolly Varden had generally reached the stage of complete yolk-sac resorption. In some sloughs and tributaries, the age 0^+ fish were found to be free-swimming in the water column, while in other areas they appeared to remain within the interstices of the substrate and could only be observed or collected by the use of electrofishing. Incubation was apparently complete at that time.

Other Dolly Varden collected were limited to those fish no older than age II^+. Older Dolly Varden had apparently moved to areas of the river systems that were still ice covered, or they moved into marine waters. There was mark-recapture evidence that at least one adult fish had moved through marine waters.

Dolly Varden were widely dispersed throughout the river systems. Largest numbers of Dolly Varden collected by minnow traps were found in the upper Chakachatna River, Noaukta Slough, and the upper McArthur River. This distribution was similar to that found during the October 1982 sampling (Volume II, Section 6.8.3.2.2, 1983 IFAR). At that time, the largest catches of Dolly Varden were made in the Upper McArthur River, Noaukta Slough and mid-Chakachatna River reaches (Table 6.63, Volume II, IFAR).

Dolly Varden were sampled at accessible sampling stations by means of observation, minnow traps, and electrofishing (Appendices B2 and B3). Minnow trap sampling indicated that Dolly Varden collections (Table 6.92) were not significantly different in c/f (p|0.90). Examination of the distribution of Dolly Varden caught by minnow traps among reaches (Table 6.93) indicated that the differences in c/f by reach were of marginal significance (p_0.09). However, the largest c/f for Dolly Varden, 2.25 fish/trap/day occurred in the upper Chakachatna River reach. The c/f was approximately twice as great as at any other station and was significantly greater than most stations (p_0.07 to 0.01). The exceptions were the Noaukta Slough (p_0.14) and the Upper McArthur River (p_0.18) reaches. The catches at those stations were 1.08 and 1.13 fish/trap/day, respectively.

Electrofishing (Table B3-1, Appendix B3) conducted at the same time indicated the general absence of large Dolly Varden as were observed during the October 1982 field program. It is likely that the larger anadromous Dolly Varden had moved downstream to deeper, ice-covered waters, or had left fresh water by that time. The reduced turbidity present during the study period allowed aerial observations to be conducted to confirm the absence of these larger fish in the upper McArthur River. The recapture of an adult Dolly Varden tagged during August 1982 outside of the McArthur and Chakachatna River drainages during this period suggested movement of adult Dolly Varden into marine and other fresh waters.

Electrofishing operations resulted in the collection of age 0^+ Dolly Varden that were apparently not vulnerable to minnow trap collections. The collection of small age 0^+ Dolly Varden from the substrate interstices was evidence of successful spawning and incubation in those areas. Collections of such Dolly Varden were made at stations 15, 17 (by dip net alone, Table B2-3, Appendix B2), 40A and 42.

The distribution of Dolly Varden as collected by all sampling methods is shown in Table 6.94. The percentage occurrence of Dolly Varden at stations sampled during April was 66.7 percent (Table 6.95), which was only matched by coho salmon.

Examination of Dolly Varden occurrence on a reach basis (Table 6.96) indicated that they occurred in all reaches sampled during this study.

Coho Salmon. Coho salmon were widely dispersed in lower portions of both river systems. The greatest numbers of older fish (age II^+) were collected in the Noaukta Slough and Middle River. Fry were found at varying stages of development in the spawning areas examined. These were found ranging from fry with prominent yolk-sacs to free-swimming juveniles with fully resorbed yolk-sacs.

Coho salmon were widely dispersed during the winter. They were found at 66.7 percent of all sampling stations (Table 6.95) but were not found in all reaches (Table 6.96). Coho salmon have not been found in the Chakachatna River Canyon during any study, nor have they been observed to spawn above this area.

Analysis of collections of coho salmon juveniles made by means of minnow traps indicated that there were statistically significant differences between stations (p 0.0001). Significantly greater (p 0.001) numbers of juvenile coho salmon were found in station 4 in the Middle River (c/f of 4.50 fish/trap/day) than at any other station. Collections of coho salmon from stations 8 and 16A in the Noaukta Slough were significantly (p 0.01) larger than those found at the remaining stations with c/f's of 1.75, and 1.25 fish/trap/day, respectively.

Coho salmon collected at station 4 (Middle River) consisted primarily of a mix of age I^+ and II^+ fish. Coho collected from stations 8 and 16A were primarily age II^+ fish. Coho collected from other locations were primarily age I^+ fish.

Examination of coho salmon captures by reach (Table 6.93) did not show a significant difference between reaches (p|0.66). This is likely attributable to the high variability in captures among stations within reaches.

Comparison of the distribution of coho juveniles collected by minnow traps by reach between April 1983 and October 1982 (Volume II, Table 6.63, 1983 1FAR) shows some differences in c/f among reaches. The absence of significant differences between reaches precludes any meaningful interpretation of the numerical differences.

Electrofishing was successful in collecting age 0^+ and I^+ coho from most other stations (Appendix B2) sampled. The presence of age 0^+ coho fry and parr at station 15, 17, and 42 suggested that successful spawning and incubation had occurred in these areas. At the time of collection, many coho had not completed yolk-sac resorption, while others had and were free-swimming in the water column.

Chinook Salmon. Chinook salmon were caught at only two sampling stations; station 15 in the McArthur River Canyon (one age 0^+ fry) and station 19 (one age I^+ parr) in the clearwater tributary to Straight Creek (Figure 6.146).

Some juvenile chinook salmon have been collected from station 15 previously (Volume II, 1983 IFAR), suggesting the probable presence of some limited spawning there. Extensive electrofishing at station 19 failed to detect any other chinook juveniles. Electrofishing in station 19 was conducted in an area where many chinook salmon had been observed spawning. Since this area was subject to a major channel alteration during September 1982 flooding (Volume II, 1983 IFAR), it is likely that a significant loss of juvenile production may have occurred as a result of that flood (extensive sampling was also conducted through this area during spring 1983, see Section 6.11.3.2.2).

Sockeye Salmon. As in previous studies (Volume II, 1983 IFAR), sockeye salmon juveniles were not vulnerable to capture by minnow traps. Sampling by means of electrofishing and dip nets (Appendix B2) resulted in collection of age 0^+ sockeye at stations 15 (upper McArthur River), 17 (sloughs near

DNR bridge site, Chakachatna River) and 42 (Stream 12.1, tributary to the McArthur River, Figure 6.146). The sockeye collected, consisted of fish in varying stages of yolk-sac resorption, ranging from those with prominent yolk-sacs to those with yolk-sacs fully resorbed (button-up stage). At each location sampled, full development of sockeye fry was still incomplete.

Chum Salmon. Juvenile chum salmon were collected at station 17 (Figure 6.146) in sloughs of the Chakachatna River. Chum salmon were collected by dip net and electrofishing. The age 0^+ chum salmon were found in varying stages of yolk-sac resorption, although many of the chum salmon had fully resorbed their yolk-sacs. Chum juveniles, in general, were more fully developed than other salmon species. The mean length of chum salmon collected ranged between 3.90 and 4.05 cm (Appendix B2).

Rainbow Trout. One rainbow trout juvenile was collected during the April study. This was an age I^+ juvenile found in station 40A (Stream 13u, Figure 6.147).

Pygmy Whitefish. Pygmy whitefish have generally been abundant and widely dispersed in collections made in these river systems. However, during the April study only one juvenile pygmy whitefish was collected at station 22 (Table 6.94). The reason for the paucity of pygmy whitefish in collections is unclear.

6.11.3.1.2 Habitat Data Collection

Detailed habitat observations and measurements were routinely made in conjunction with electrofishing and minnow trap collections to aid in establishing a data base for characterizing fish habitat relationships.

Habitat data collected included water temperature, dissolved oxygen, conductivity, turbidity, water depth, water velocity, river stage (staff gage reading), substrate, cover and the presence/absence of upwelling or slough flow. Measurements were taken at the same locations at which fish sampling was conducted. The methodology employed in collecting habitat data was discussed in Section 6.8.2 (Volume II, 1983 IFAR).

Water Quality. This section summarizes water quality for the April field trip at collecting stations (including Chakachamna Lake) during the time of sampling. As stated in Section 6.8.2 (Volume II, 1983 IFAR), water quality data were collected at each station at the time fish were sampled.

A water quality profile was also taken in Chakachamna Lake near mid-lake (Table 6.97). At the time of sampling, there was a 0.6m (2.0 ft) ice cover present. Data collected from Chakachamna Lake indicated considerable variability among certain parameters. The water temperature profile indicated that the highest water temperature occurred close to the bottom, this was also observed during the March 1982 study (Table 6.34, Volume II, 1983 IFAR). Near-surface water temperature as measured may have been anomalously higher than temperatures at similar depths under the ice during the April survey due to high air temperatures and the large size of the sampling hole. Dissolved oxygen values were well below saturation near the surface (Hutchinson, 1957) and well below gas saturation at greater depths.

Water quality is presented for each river/stream station sampled in Table 6.98. Water temperatures varied extensively between stations and appeared to be greatly affected by the presence of local ice and other sources of inflow.

The intergravel water temperatures present in salmon egg incubation areas were also studied (Table 6.99). Eleven salmon spawning areas were investigated including sloughs, side channels, tributaries to the McArthur River, and tributaries to the Chakachatna River. Water temperatures in all areas were well above freezing, even those areas with negligible water depths. Differences between intergravel waters and surface waters varied with location. With the exception of one area (station 42A), intergravel water temperatures were similar to or lower than surface water temperatures. The lowest intergravel temperatures were measured in the Chilligan River and in the clearwater tributary to Straight Creek (station 19). Both of these areas had extensive ice and snow present.

6.11.3.2 Spring 1983 Studies

6.11.3.2.1 Adult Anadromous Fish

During the spring of 1983, the collection and observation of adult anadromous fish were conducted on an opportunistic basis (see Section 6.11.1.2.1).

Chinook Salmon. Chinook salmon were observed in fresh water at the start of the spring study. Milling chinook were observed in areas near the mouth of Streams 13x and 12.1 (Figure 6.150, Area A) on June 17. A total of 22 chinook salmon were observed in the Noaukta Slough/stream mouth area (Area B, Figure 6.150). No salmon was observed in spawning areas of Stream 13x at that time (Appendix B1). By June 22, 180 chinook salmon were observed in the milling area near the mouths of Streams 13x and 12.1 (Area A, Figure 6.150) and 89 chinook salmon were observed further into the slough near the mouths of Streams 12.2 to 12.4 (Area B, Figure 6.150). No chinook salmon was observed upstream in any of the McArthur River tributaries during this period. An overflight made on July 20 resulted in the observation of chinook salmon in upstream areas of Stream 13x. Approximately one third of the stream was overflown and 72 chinook salmon observed (Appendix B1). During that same overflight, about 100 milling chinook salmon were observed at the mouth of Stream 13u (Figure 6.151).

Tributaries of the Chakachatna River were examined for the presence of salmon. On June 22, only one chinook salmon was observed near the mouth of the clearwater tributary to Straight Creek. One chinook salmon was collected moving upstream in the Chakachatna River (station 6) on the same date (Figure 6.146). On July 20, 335 chinook salmon were observed well upstream in the clearwater tributary to Straight Creek (station 19). No chinook was observed at any other location in the Chakachatna River.

Sockeye Salmon. Aerial reconnaissance conducted on June 17, 1983 resulted in the observation of two groups of sockeye milling in the mouth area of Streams 13x and 12.1 (Area A, Figure 6.150). Approximately 750 sockeye salmon were estimated further to the northeast (Area B, Figure 6.150) near the mouths of Streams 12.2, 12.3, and to 12.4, another 93 sockeye were observed at area C (Figure 6.150). The milling sockeye were generally "fresh" showing little or no spawning coloration. No sockeye was present near the mouth of Stream 13u (Figure 6.147) at that time. No sockeye salmon was observed in upstream areas of any of the McArthur tributaries during that period.

On June 22, 650 sockeye were observed milling in the mouth area of Streams 13x and 12.1 (Figure 6.150, Area A) and 950 sockeye were noted in the mouth area of Streams 12.2, 12.3, and 12.4 (Figure 6.150, near B and C). By June 24, approximately 900 sockeye were also milling near Area A (Figure 6.150).

By July 20, sockeye had begun to ascend the McArthur River tributaries and 70 sockeye were observed in Stream 13x. Over 1,000 sockeye were observed in milling areas A and B at the same time. Many of the fish showed spawning coloration. While other relatively "fresh" fish were also present, at that time, 16 sockeye were observed in upstream areas of Stream 13u, and approximately 300 were observed milling in the mouth area (Figure 6.151).

Fyke net sampling (Table B2-8, Appendix B2) resulted in the collection of sockeye salmon at station 1D at the mouth of the McArthur River (Figure 6.146). Sockeye were collected starting on June 18, these fish were "fresh" and copepods were sometimes attached indicating recent entry to fresh water. The sockeye were tagged and some were later observed in milling areas A, B, and C, shown on Figure 6.150.

None of the overflights of the sloughs or tributaries of the Chakachatna River resulted in the observation of any sockeye. Only one sockeye salmon was collected by a fyke net set at station 4 in the Middle River on June 22.

6.11.3.2.2 Resident and Juvenile Anadromous Fish

As stated in Section 6.11.2, the intensity of sampling used in the spring 1983 study was greater than in previous studies. This greater intensity increased the sensitivity of statistical testing as well as increasing areal coverage. Results reported here consist primarily of minnow trap and electrofishing collections as supplemented by fyke nets.

Dolly Varden. Dolly Varden were abundant and widely dispersed in the study area during the spring study. Dolly Varden juveniles were collected throughout both river systems and younger age classes (0^+ and I^+) were found at high catch per effort (c/f) in areas where Dolly Varden spawning had occurred during 1982. This included the upper McArthur and middle Chakachatna Rivers. The Noaukta Slough also contained abundant younger Dolly Varden. Older juvenile Dolly Varden (age II^+ and older) were found at higher c/f's in the upper Chakachatna River, the Noaukta Slough, and lower portions of the Chakachatna and McArthur Rivers. Adult Dolly Varden were only collected at stations 1D and 4 by fyke nets.

Dolly Varden were abundant and widely dispersed during the spring study being collected at 95.1 percent of all sampling stations below Chakachamna Lake (Table 6.100 and 6.101). The majority of Dolly Varden collected were juveniles. Adults were collected by fyke nets at stations 1D, and 4. No movement of marked fish was detected between stations based on recaptures. By July, adult Dolly Varden were observed in the vicinity of salmon milling and spawning areas at Streams 13x, 13u, and the clearwater tributary to Straight Creek (station 19).

Collections of juvenile (parr or smolting juvenile) Dolly Varden from minnow traps (Table B2-4, Appendix B2) were tested by analysis of variance (ANOVA) and found to be significantly different (p 0.001) among stations sampled. The c/f at station 13 (upper McArthur River), 5.33 fish/trap day, was significantly greater (p 0.003, maximum among stations) than all other stations except station 10 (Noaukta Slough), c/f of 3.80 fish/trap/day, (p_0.09, marginally significant). The c/f at station 10 was greater than most other remaining stations (p 0.05, maximum) except station 12 (lower McArthur River near the Noaukta Slough), c/f of 2.40 fish/trap/day and station 40 (Stream 13u, downstream area), with a c/f of 2.60 fish/trap/day. Dolly Varden minnow trap c/f's tested by ANOVA among reaches were also significantly different (p_0.008). Data in Table 6.102 indicated that the largest c/f for a reach (2.18 fish/trap/day) occurred in the upper McArthur River. The c/f was significantly greater (p 0.009) than all other reaches except the Noaukta Slough (p = 0.29). The c/f in the Noaukta Slough,1.64 fish/trap/day, was significantly greater (p_0.06) than the remaining reaches except the lower Chakachatna River (p_0.49), c/f of 1.37 fish/trap/day, and the lower McArthur River (p_0.65), c/f of 1.42 fish/trap/day.

The Dolly Varden collected by minnow traps in the upper McArthur River were primarily age 0^+ and age I^+, with age II^+ fish found primarily in the lower part of the reach. The Dolly Varden at station 12, just below that reach, were also mostly age II^+ and I^+. The Dolly Varden collected in the Noaukta Slough were primarily age II^+ with some age I^+ and few age 0^+ fish.

Dolly Varden c/f's collected by electrofishing varied significantly (p_0.0004) among the sampling stations. The largest c/f's were at stations 16A (Noaukta Slough), 17D (middle Chakachatna River), and 13 (upper McArthur River), c/f's of 5.48, 4.84, and 3.66 fish/100 shocking-seconds (s-s), respectively. Catch per effort at station 16A was significantly greater p 0.03, maximum) than all other stations except station 17D (p|0.54). C/f at station 17D was significantly greater than most of the remaining stations (p_0.04) with the exception of stations 13, 10 and 21 (p|0.20), c/f's of 3.66, 3.41 and 2.21 fish/100 s-s, respectively.

Electrofishing c/f's were significantly different (p 0.0001) among reaches (Table 6.103). The largest c/f's were found in the middle Chakachatna River (stations 17, 17D, 20 and 21), the Noaukta Slough (stations 8, 9, 10, 16, and 16A), and the upper McArthur River (stations 13, 14, and 15), 2.56, 2.56, and 2.25 fish/100 s-s, respectively. The c/f for the middle Chakachatna River (2.56 fish/100 s-s) was significantly greater (p 0.003, maximum) than the lower Chakachatna, lower McArthur, and tributary reaches but not significantly greater than the upper Chakachatna River reach. The Noaukta Slough reach c/f was the same as that for the mid-Chakachatna Reach. It was not significantly different from the upper McArthur reach (p_0.37) or the upper Chakachatna reach (p_0.26), but was significantly larger than the remaining reaches (p_0.002). The upper McArthur reach had a c/f of 2.25 fish/100 s-s, which was not significantly different from the above reaches or the upper Chakachatna reach (p_0.83), but was significantly larger (p_0.05) than the other reaches (Table 6.103).

Dolly Varden collected by electrofishing included age 0^+ through III^+ fish, with age I^+ and II^+ making up the majority, overall. Fish collected from the middle Chakachatna River reach were generally dominated by age I^+ with both age 0^+ and II^+ fish present. In the Noaukta Slough, age 0^+ and I^+ made up the majority of the collection although fish to age III^+ were present. Collections from the upper McArthur reach consisted entirely of age 0^+ and I^+ fish. Dolly Varden collected from the upper Chakachatna River reach consisted of approximately 2/3 age I^+ fish and 1/3 age II^+ or older.

Coho Salmon. Coho salmon juveniles (parr and smolting juveniles) were widely distributed in the Chakachatna and McArthur River systems during the spring study. Large numbers of coho were collected from the upper McArthur River, Noaukta Slough, while fewer were captured in the lower river systems. Coho found in upstream areas were generally age 0^+ fish, with older fish found in downstream locations. Age 0^+ and I^+ coho were found in the Noaukta Slough, and age II^+ were more common in downstream areas. Outmigrants, as determined from inclined plane trap sampling, included age 0^+ to II^+ fish.

Coho salmon juveniles were widely dispersed during the spring study and were found at most collection stations (Table 6.100). The percentage incidence of coho juveniles collected by all sampling methods was 68.3 percent (Table 6.101).

Analysis of minnow trap collections of coho juveniles (Appendix B2) by ANOVA indicated that there were significant (p_0.0001) differences between stations. The largest minnow trap c/f (6.3 fish/trap/day) occurred at station 16A in the Noaukta Slough. This was significantly larger (p_0.0002) than c/f at any other station. The second largest c/f, 3.11 fish/trap/day, occurred at station 14 in the upper McArthur River. This c/f was significantly greater (p_0.01) than stations other than 16A, 13(p_0.10), or 12 (p_0.10). Stations 13 and 12 are sequentially downstream of station 14 in the McArthur River. The c/f's at stations 13 and 12 were 1.67 and 1.40 fish/trap/day, respectively.

Examination of the minnow trap c/f's on a reach basis indicated that c/f's were significantly different among reaches (p_0.002). The largest c/f (1.54 fish/trap/day) was found for the upper McArthur River which was significantly (p 0.05) greater than all other reaches except the Noaukta Slough. The Noaukta Slough had a c/f of 1.36 fish/trap/day, which was significantly greater than all but one of the remaining reaches (p_0.01, maximum) (lower McArthur River p_0.06, marginally significant).

The juvenile coho salmon collected by minnow traps in the upper McArthur River were primarily age 0^+ fish. These fish may have been produced in spawning areas in the McArthur River Canyon. Coho salmon collected in the Noaukta Slough were primarily age 0^+ and I^+. Age I^+ and II^+ fish were more common in collections from lower portions of both the Chakachatna and McArthur rivers.

Examination of electrofishing c/f's indicated results similar to those obtained from minnow trap collections. Electrofishing captures were significantly different (p_0.0001) between stations.

The largest c/f for coho salmon was found at station 14 with a c/f of 14.91 fish/100 shocking-seconds (s-s). This was significantly greater (p_0.0001) than any other station. The c/f for station 16A in the Noaukta Slough, 5.03 fish/100 s-s, was the second largest. It was significantly larger (p_0.05, maximum) than c/f's at all remaining stations except 20(p_0.08 marginally significant, c/f = 1.79), 4(p_0.11, marginally significant, c/f = 1.82) and 5(p_0.51, c/f = 3.93).

Examination of electrofishing c/f by reach (Table 6.103) showed that there were statistically significant (p_0.0008) differences between reaches. The largest c/f was for the upper McArthur River, 4.97 fish/100 s-s. This was significantly greater (p 0.006) than c/f's for other reaches. The second largest c/f was for the lower Chakachatna reach with a c/f of 1.23 fish/100 s-s, and the third for the Noaukta Slough with a c/f of 1.18 fish/100 s-s. However, these were not significantly greater than the c/f's for the other reaches (p|0.15).

Coho salmon collected by electrofishing in the upper McArthur River were all age 0^+ fish caught at station 14 (lower McArthur River Canyon, Figure 6.146). Coho collected in the lower Chakachatna River consisted of a mix of age I^+ and 0^+ fish. Coho collected in the Noaukta Slough were primarily age 0^+ with few age I^+ fish present. Larger, older coho were generally poorly represented in electrofishing collections.

Collections from inclined plane trap outmigrant sampling at station 1D (Appendix B2, Table B2-7) indicated that some older (age I^+ and II^+) coho may have been migrating to sea. Age 0^+ coho were also represented in these collections. Sampling did not extend for a sufficiently long duration to determine if the peak outmigration occurs in spring or in the fall.

Chinook Salmon. Chinook salmon juveniles were found in a limited number of locations during the spring study. Most chinook were age 0^+ and were found in the tributaries to the McArthur River. Since all of the lower tributaries (13x, 12.1 through 12.5) share a common confluence area it is unclear what movements of chinook juveniles may have occurred subsequent to emergence. Only one age I^+ chinook was collected, this was found in the lower river system. One age 0^+ chinook was collected in the outmigrant trap. No chinook was collected from the clearwater tributary to Straight Creek, despite observation of extensive spawning in that location. This may have been a result of the flooding and channel changes caused by the September 1982 storm.

During the spring study, although chinook salmon juveniles were found at relatively few stations, these were many more stations than were found during previous studies (Table 6.100), 26.9 percent of the stations sampled (Table 6.101). However, this was the first study in which the McArthur River tributaries were intensively sampled.

Examination of minnow trap collections of chinook salmon indicated that there were significant differences (p_0.05) between collections made at the sampling stations. The largest c/f (14.60 fish/trap/day) occurred at station 43A (upstream area of Stream 12.2, see Figures 6.146 and 6.148). This was significantly larger (p_0.025) than other stations. The next largest c/f, 7.60 fish/trap/day, occurred at station 42 (Stream 12.1, downstream area) this was significantly larger (p_0.01) than at stations other than 42A (Stream 12.1, upstream area), 44A (Stream 12.3, upstream area), and 44 (Stream 12.3, downstream area), c/f's of 4.00, 5.88, and 3.40 fish/trap/day, respectively.

When examined on a per reach basis (Table 6.102), the c/f (3.26 fish/trap/day) for the McArthur tributaries was significantly (p_0.05) larger than any other reach. Only a few chinook salmon (c/f = 0.03) were collected in the lower Chakachatna system.

All of the chinook salmon collected by minnow traps in the McArthur River tributaries were age 0^+ fish. One age I^+ chinook was collected at station 1 in the lower Chakachatna River.

Electrofishing results for chinook salmon juveniles did not indicate a significant difference (p_0.31) by ANOVA between stations. The larger electrofishing c/f's were found at station 44A (Stream 12.3, upstream area; 9.65 fish/100 s-s), 43A (Stream 12.2, upstream area; 5.83 fish/100 s-s), and 42A (Stream 12.1, upstream area; 3.09 fish/100 s-s).

Electrofishing c/f examined by reach showed a marginally significant (p_0.12) difference. The c/f, 1.89 fish/100 s-s, of the McArthur tributaries was significantly (p_0.05) larger than the other reaches.

Electrofishing resulted in the collection of exclusively age 0^+ fish at each station. One age 0^+ chinook salmon was collected during outmigrant sampling at station 1D on June 23, 1983. This was an insufficient sample from which to draw any conclusions concerning Chinook outmigrant patterns.

Sockeye Salmon. Sockeye salmon were found in several areas of the river systems. The largest numbers were collected from Chakachamna Lake, which was also the location where age I^+ and age II^+ fish made up the largest percentage of the collection. Downstream of the lake at station 22 (the downstream end of the Chakachatna River Canyon), age I^+ fish made up the majority of sockeye salmon collected. In other locations, age 0^+ dominated the collections. Age 0^+ sockeye were caught consistantly in areas near the confluence of the Chakachatna with the McArthur River, stations 1, 1D, and 2. These stations are located in the vicinity of the outmigrant sampling station (near 1D) which caught age 0^+ and I^+ sockeye juveniles. Based upon the outmigrant collections, it appeared that the number of sockeye outmigrants was decreasing during the course of sampling. This indicated that the peak outmigation may have occurred prior to the sampling period. The apparent low numbers of younger age classes in the lower river system also suggests an earlier outmigration. The apparent movement of older fish from Chakachamna Lake to station 22 (Figure 6.146), may be an indication that further outmigrations of sockeye may occur later in the year.

Sockeye salmon juveniles were collected at 29.3 percent of the samples (Table 6.101) during the spring study.

As in previous studies, minnow traps were a relatively inefficient method of collecting sockeye salmon (Table B2-4, Appendix B2). There were significant differences (p 0.001, by ANOVA) between c/f's at the sampling stations. The largest c/f (1.10 fish/trap/day) was found at station 20 in the middle Chakachatna reach; the c/f was not significantly different from the other stations (p_0.15).

Examination of sockeye minnow trap c/f by reach (Table 6.102) indicated that the largest c/f (0.28 fish/trap/day) occurred in the mid-Chakachatna River reach. The only other reach where sockeye were collected by minnow traps (all age 0+ fish) was the lower McArthur River reach with a c/f of 0.09 fish/trap/day.

Electrofishing resulted in the collection of sockeye salmon in more stations than minnow traps, a total of 12 as compared to four. There was not a significant difference (p_0.45) between c/f at the stations. The largest c/f (7.56 fish/100 s-s) was obtained from station 26 near the Nagishlamina River delta in Chakachamna Lake (Figure 6.146). The second largest c/f (3.03 fish/100 s-s) was collected at station 1

(Figure 6.146), c/f's of 1.43 and 1.41 fish/100 s-s occurred at stations 22 and 20, respectively.

Analysis of c/f by reach including Chakachamna Lake indicated that there was not a significant difference among reaches (p_0.19). The largest c/f was 1.89 fish/100 s-s in Chakachamna Lake, followed by the upper, lower, and mid-Chakachatna River reaches with c/f's of 0.59, 0.53, and 0.43 fish/100 s-s, respectively.

The sockeye collected from Chakachamna Lake were primarily age I^+ and II^+. Sockeye found downstream of the lake at station 22 were age I^+. Sockeye juveniles collected at station 1 were age 0^+, as were the sockeye at station 20.

Outmigrant sampling at station 1D resulted in the collection of numerous sockeye. The largest number (16 fish) were collected on June 19 (Table B2-7, Appendix B), these were age 0^+ and I^+ fish. The numbers of sockeye collected after that dropped off. All sockeye collected were age 0^+ and I^+.

In general, the age 0^+ sockeye appeared to have grown 5 to 10 mm since the winter study. However, since there were length differences between juveniles originating in different areas of the system it is difficult to ascertain the change after these groups have "mixed".

<u>Chum Salmon</u>. Chum salmon were collected in numerous locations in the lower portions of the Chakachatna, Middle and McArthur rivers. Although some chum

juveniles were found in upstream areas, the majority were downstream. The mean lengths of the chum juveniles varied considerably, but were generally larger than fish collected during the winter study. Chum outmigration took place during the study but it is likely that the peak outmigration occurred prior to the sampling period.

Chum salmon were caught in a limited number of stations (Table 6.100) during the spring study, occurring at 29.3 percent of the stations below Chakachamna Lake (Table 6.101).

Minnow traps were relatively ineffective for collecting chum salmon juveniles (Table B2-4, Appendix B). Chum salmon were collected at stations 1D (lower McArthur River), 8 (Noaukta Slough), and 13 (upper McArthur River) with c/f's of 0.22, 0.20, and 0.11 fish/trap/day, respectively. All three areas are located downstream of areas where chum salmon were observed to spawn in 1982 (Volume II, Section 6.8.3, 1983 IFAR).

Electrofishing resulted in the collection of chum juveniles in many more locations. Comparison of c/f's among stations did not indicate a significant difference (p_0.14) among the group of stations. Pair-wise t-testing did indicate that stations 4 and 5 (Middle River, lower Chakachatna River reach, Figure 6.146) had significantly (p_0.04) larger c/f's (2.45 and 2.31 fish/100 s-s, respectively) than all other stations except stations 2 (p_0.09) and 21 (p_0.18) (with c/f's of 1.23 and 1.64 fish/100 s-s, respectively).

Examination of c/f by reach (Table 6.103), indicated that there were significant (p_0.005) differences between the reaches. The largest c/f was in the lower Chakachatna River reach (0.99 fish/100 s-s) which was significantly larger (p 0.04, maximum) than all other reaches. The middle Chakachatna River reach had the next largest c/f (0.41 fish/100 s-s) but this was not significantly different (p_0.36) than the other reaches. The only other reach chum salmon were collected from was the Noaukta Slough (c/f of 0.17 fish/100 s-s).

Inclined plane trap sampling for outmigrants at station 1D (Table B2-7) resulted in the collection of numerous chum outmigrants. The number of outmigrants decreased during the period of sampling from a high of 10 fish/day to 0 fish/day. The mean length of the outmigrants varied from 3.97 cm to 4.74 cm in length.

Pink Salmon. Pink salmon juveniles were collected at station 40 (Stream 13u, downstream area; Figure 6.147) by electrofishing (Table B2-5) and by means of the outmigrant trap at station 1D. Pink salmon outmigrants were collected during the first week of sampling with the numbers caught declining during that period. This indicates that the peak outmigration of pink salmon juveniles had occurred prior to mid-June. The pink salmon outmigrants were under 4.0 cm in length.

Rainbow Trout. Rainbow trout were only collected by means of fyke nets (Table B2-8) at stations 1D, 4, and 6 during the study. During this period, adult fish dominated the catch.

Marked rainbow trout were recaptured in other area of Trading Bay during the study. Three rainbow trout tagged at station 4 (Middle River) during 1982 were recovered in the Chuitna River during 1983. One adult tagged at station 6 (Chakachatna River) on June 20, 1983 was recovered in Chuit Creek on June 30, 1983. Another rainbow trout adult was recaptured having moved from station 6 to station 4, downstream. Such data suggest considerable coastal movement of rainbow trout between streams entering Cook Inlet.

Pygmy Whitefish. Very few pygmy whitefish were collected during the spring study. None was collected by minnow traps and only two, one each at stations 6A and 12, were collected by electrofishing. One pygmy whitefish was collected by a fyke net at station 4 and three very small (less than 3.30 cm total length) pygmy whitefish parr were also collected by the inclined plane trap. As in the winter study, the reason for the small c/f of pygmy whitefish is unknown.

6.11.3.2.3 Habitat Data Collection

Habitat data were collected in conjunction with fish sampling at most sites. Detailed habitat observations and measurements were routinely made with electrofishing and minnow trap collects to add to the data base characterizing fish habitat relationships.

Water Quality. Water quality data were collected at 41 stations in the spring study (Table 6.104). There was considerable variation in water quality among the stations. This is understandable as different stations are subject to differing flows, riparian growth, and stream gradient conditions. Areas influenced by meltwater such as stations 15, 13, and 18A (Figure 6.146) had lower water temperatures. Sloughs and tributary streams generally had low turbidity, since they were not influenced by mainstem conditions.

A water quality profile was obtained of selected parameters in Chakachamna Lake. These data are presented in Table 6.105. There was evidence of surface heating of the lake's surface with apparent mixing in deeper water. The turbidity data indicated the presence of extremely low turbidity water near the bottom (83.8 meters, 275.0 ft).

Water temperatures were also measured for incubation areas at station 17 (see Section 6.11.3.1.2). Intergravel water temperatures (Table 6.106) in the leftmost (LB+0) slough were 0.7-0.8°C lower than surface water temperatures. In the Chakachatna River side channel (LB+2) downstream of a slough area, intergravel water temperatures were similar to the surface water temperature.

6.11.3.3 Habitat Utilization

One of the objectives of the habitat data collection is to obtain information about the relationship of fish distribution to stream-flow related variables such as depth and velocity. These data would eventually be incorporated into the preparation of habitat utilization curves (Bovee and Cochnauer, 1981) for analyzing project effects (APA, 1983).

The present analysis is a summarization of habitat utilization for those species and life-stages for which sufficient data have been collected. These are Dolly Varden juveniles, Coho salmon juveniles, Chinook salmon juveniles, and sockeye salmon juveniles. For ease of discussion, English units will be listed first. Observation (and collections) of these groups at various depths and velocities have been compiled and tabulated in intervals of 0.2 ft/s (0.5 cm/s) velocity and 0.3 ft (0.8 cm) depth. A statistically significant correlation of r = 0.09 (p_.006) exists between velocity and depth in the data base used to analyze habitat utilization. This is a result of lower velocities being found at the shallow edges of the streams studied, and higher velocities being found in the deeper mid-channel areas (relatively few, low velocity deep pools were present). The correlation between velocity and depth somewhat confounds the combined analysis of both.

6.11.3.3.1 Dolly Varden

Table 6.107 presents the distribution of observations of Dolly Varden among velocity intervals. The majority of Dolly Varden observed utilized velocities of 0.6 ft/s (18.3 cm/s) or less with 32.2 percent found in velocities of less than 0.2 ft/s (6.1 cm/s) and a total of 50.2 percent observed at velocities less than 0.5 ft/s (15.2 cm/s). The maximum water velocity used by juvenile Dolly Varden was in the interval 3.2-3.4 ft/s (97.5-103.6 cm/s). A plot of the number of observations versus velocity is shown in Figure 6.152. The shape of the plot clearly indicates that although juvenile Dolly Varden were observed at velocities up to 3.4 ft/s (103.6 cm/s). Relatively high velocity waters were readily available as observed in the field, however, lower velocity waters were apparently used preferentially.

The distribution of juvenile Dolly Varden at velocity intervals was also examined to determine the effect of object cover on velocity utilization (Bovee, 1982). Data were sorted by the presence or absence of cover. Rank order tests were used and it was found that higher velocities were used to a significantly greater extent when object cover was present (0.1_p_0.05).

Observations of depth utilization by Dolly Varden (Table 6.108) indicated that 72.1 percent of the fish utilized depths between 0.3 and 1.2 ft (9.1 cm and 36.6 cm). Juvenile Dolly Varden, however, were found in each depth interval examined.

Kruger's (1981) review of the available literature concerning velocity and depth utilization by juvenile Dolly Varden indicated a general preference for shallow areas and low velocity currents. Work performed at Terror Lake by Baldrige (1981) resulted in the development of habitat suitability criteria for juvenile Dolly Varden. The criteria derived were based upon frequency analysis of data resulting from a total of 344 observations (as compared with 1042 in this study). In the Terror Lake study, juvenile Dolly Varden were observed to primarily utilize lower velocities of 1.0 ft/s (30.5 cm/s) or less. The suitability curves in that case represented the frequency analysis corrected by the amount of each habitat actually available to the fish. Apparent depth use in the Terror Lake study was greatest for depths of approximately 0.2 to 2.0 ft (6.1 to 61.0 cm). The data from this (Chakachamna) study indicated that utilization dropped off at depths greater than 1.2 ft (36.6 cm), and few juvenile Dolly Varden were found in depths in excess of 2.1 ft (64.0 cm).

6.11.3.3.2 Coho Salmon. Coho salmon juveniles were observed to utilize the lower velocities found. 77.5 percent utilized velocities of 0.6 ft/s (18.3 cm/s) or less and 90.8 percent utilized velocities of less than 1.0 ft/s (30.5 cm/s, Table 6.109). Of the 422 fish observed, only one fish was found at velocities in excess of 2.0 ft/s (61.0 cm/s). A plot of the distribution of these observations is shown in Figure 6.154.

The effect of the presence of object cover on velocity utilization by coho salmon was examined. No significant (p|0.1) difference was found in velocity utilization with or without the presence of object cover.

Observations of depth utilization by coho salmon juveniles are tabulated in Table 6.110. The majority of fish (77.4 percent) were observed in the depth interval 0.3 to 1.2 ft (9.1 to 36.6 cm), 96.6 percent of the coho occurred in depth of less than 2.1 ft (64.0 cm) (Figure 6.155).

Juvenile coho salmon habitat suitability curves from the Terror Lake study (Baldridge, 1981) indicated apparent preferred utilization of velocities of approximately 0.0 to 0.5 ft/s (15.2 cm/s) based upon 199 observations. Results from this study were similar, however, maximum utilization occurred in the 0.0 to 0.3 ft/s (9.1 cm/s) range, with considerably lower utilization of velocities in excess of 0.5 ft/s (15.2 cm/s). Water depth utilization from Baldridge (1981) for the Terror Lake study indicated preferred depths of up to 2.0 ft (61.0 cm). Peak utilization for this study occurred in a smaller interval, as discussed above.

6.11.3.3.3 Chinook Salmon. Observations of velocities utilized by juvenile chinook salmon are presented in Table 6.111. There is preferential utilization of lower velocities, with 69.0 percent of the chinook juveniles observed, using velocities of less than 0.2 ft/s (6.1 cm/s) and 90.7 percent using velocities of less than 0.6 ft/s (18.3 cm/s). The utilization of velocities is depicted in Figure 6.156.

Velocity utilization in the presence of object cover was also examined for chinook salmon juveniles. There was no significant difference (p||0.1) in velocity utilization in the presence or absence of object cover.

Depth utilization by juvenile chinook salmon is presented in table 6.112. Peak utilization of water depth occurred in the interval 0.6 to 1.5 ft (18.3 to 45.7 cm), in which 69.2 percent of the chinook salmon were observed. Another 26.1 percent of the chinook were observed in depths in excess of 1.5 ft (45.7 cm). A plot of depth utilization is shown in Figure 6.157.

Generalized probability of use criteria derived by Bovee (1978) for juvenile chinook salmon indicated a high probability of use of velocities around 0.5 ft/s (15.2 cm/s). This is somewhat higher than indicated by the present study. Bovee's (1978) curves also indicated a high probability of use of depths in excess of 1.2 ft (36.6 cm), while the present study indicates preferential utilization of depths of 0.9 to 1.8 ft (27.4 to 54.9 cm). It is probable that Bovee's (1978) generalized curves are not applicable to the present study, based upon the 399 observations tabulated here.

6.11.3.3.4 <u>Sockeye Salmon</u>. Observations of juvenile sockeye salmon velocity utilization are listed in Table 6.113. There appeared to be a preferred utilization of lower velocities, 64.8 percent of the sockeye juveniles observed used velocities of 0.4 ft/s (12.2 cm/s) or less. Over 80 percent of the sockeye observed occurred at velocities less than 1.2 ft/s (36.6 cm/s). No sockeye was observed at a velocity in excess of 1.8 ft/s (54.9 cm/s).

Examination of the effect of object cover on utilization of velocities resulted in no statistically significant (p||0.1) difference in velocity utilization in the presence or absence of object cover.

Utilization of water depth by sockeye salmon juveniles is presented for observations not including Chakachamna Lake. Hydroacoustic observations (Volume II, 1983 IFAR) indicated that juvenile sockeye probably occur to depths of more than 100 ft (30.5 m) at times and such data would not be applicable in analysis of sockeye behavior in a riverine situation. Table 6.114 presents the water depth utilization data for sockeye juveniles as determined by observations in rivers and streams. A plot of this data is shown in Figure 6.159, and it clearly appears to be bimodal. However, this may be an artifact due to an insufficient number (138) of observations (Table 6.114). If more observations are added through additional studies, the distribution may change.

Sockeye utilization of depths of 0.3 to 1.2 ft (9.1 to 36.6 cm) represented 63.0 percent of the total and utilization of depths of 1.8 to 2.1 ft (54.9 to 64.0 cm) represented 23.9 percent. Sockeye juveniles did not appear to utilize depths of less than 0.3 ft (9.1 cm) or over 2.1 ft (64.0 cm) to any great extent in riverine waters.

6.11.4 Discussion

The 1983 winter and spring studies provided additional information concerning the fish distribution and abundance in the Chakachatna and McArthur River systems. For various species, the data provide clarification of habitat use and timing of life history events. The following section provides a discussion of the new information.

6.11.4.1 Sockeye Salmon

During 1983 adult sockeye salmon entered the McArthur River prior to June 18. Sockeye continued to enter the McArthur River through early July and gathered at the mouths of tributaries to the McArthur River in milling areas identified during 1982 and 1983 (Volume II, Sections 6.8.3.2.1, 1983 IFAR; 6.11.3.2.1). Fish continued to enter these areas to mill and mature through July 20 (the last date of sampling). During the period July 9-20, 1983, sockeye salmon ascended Streams 13x and 13u which are tributaries to the McArthur River (Figures 6.146, 6,147, and 6.148). Other sockeye salmon were observed milling in the mouth areas of those streams at the same time. The fish observed milling varied from those newly arrived from salt water to those of stage IV maturity (Nikolsky, 1963). Although the timing of the entry of sockeye into fresh water in the McArthur River appeared to occur earlier than during 1982, their ascent of Streams 13x and 13u was probably no more than seven days earlier than the comparable event the year before (Volume III, Tables A2-7, A2-8, 1983 IFR).

During that same period, sockeye salmon were not observed in any of the known milling or spawning areas in the Chakachatna River drainage. This appears to be in agreement with data gathered during 1982 (Volume III, Appendix A, 1983 IFR). During 1982, sockeye adults were not observed in streams of the Chakachatna River drainage prior to July 31. The collection of only one sockeye adult in the Middle River during the sampling period, by a net blocking the entire stream, suggests that sockeye adults entering the Chakachatna River may ascend the Middle River subsequent to the period sampled. The majority of adult sockeye may also enter through the McArthur River where sockeye adults were caught regularly by a net blocking less than 5 percent of the river width.

Information on the timing of emergence and outmigration of sockeye was also gathered during the studies. Sockeye fry were in the process of emergence during early April 1983. In the incubation areas examined, both yolk-sac fry and fully emergent "button-up" fry were present.

By mid-June the emergent sockeye fry had left their incubation areas below Chakachamna Lake and were found in mainstream areas of the middle Chakachatna and lower Chakachatna and McArthur River reaches. Outmigration of juvenile sockeye salmon occurred during mid- to late June; most likely prior to that period. Age O^+ and I^+ outmigrants were observed. Older juveniles including age I^+ and II^+ sockeye were observed in and below Chakachamna Lake which suggests that at least some of these juveniles migrate to sea later in the year. Data compiled on habitat utilization suggest that juvenile sockeye prefer slow velocity, shallow water habitats.

6.11.4.2 Chinook Salmon

Chinook salmon adults had entered the McArthur River prior to June 17, 1983 when they were observed milling near the mouth area of Stream 13x (Figure 6.150, Area A). Numbers of milling chinook in that area increased through late June, but adults were not observed to have ascended the streams (specifically 13x) prior to early July. By July 20 chinook salmon adults were present in Stream 13x. This represents migration times comparable to 1982 (Volume III, Table A2-7, 1983 IFR). Chinook adults were not observed milling at Stream 13u until July 20. At that time, no chinook had ascended the stream. This represents a delay in timing over 1982, when spawning chinook adults were observed in the stream on July 17.

One chinook salmon was collected migrating up the Chakachatna River on June 22. This fish apparently entered fresh water in the McArthur River, since the Middle River was blocked by a fyke net and no chinook salmon had been caught. In the Chakachatna River drainage, one chinook salmon adult was observed in a spawning area in the clearwater tributary to Straight Creek on June 22, 1983. No other chinook salmon was observed either in the stream or in the milling area at the stream confluence with Straight Creek until July 20. At that time 335 chinook salmon were observed spawning. This timing was similar to that observed during 1982 when chinook salmon were first observed in this stream on July 22.

Successful incubation of chinook salmon occurred in the McArthur River tributaries and to at least a limited extent in the McArthur River Canyon. No evidence of successful chinook incubation or fry production was found in the clearwater tributary to Straight Creek. It is likely that the stream channel changes which occurred during September 1982 may have seriously decreased chinook juvenile production from that stream. It is unclear if there was successful chinook fry production from Stream 13u, since no fry or juveniles was collected from there during 1983.

The age 0^+ chinook juveniles appeared to be rearing in many areas in the downstream areas of the McArthur tributary streams. Since these streams interconnect at their mouths, it suggests that there may be considerable interstream movement. Age I^+ fish apparently leave these streams at some point and either migrate to sea or rear in portions of the lower Chakachatna and McArthur Rivers. The age I^+ chinook found in the lower river systems may however be outmigrants rather than rearing juveniles. However, the only chinook collected by means of the outmigrant trap was an age 0^+ fish. Only one age I^+ chinook was collected from the clearwater tributary to Straight Creek during April, and no chinook was collected during the spring study, indicating both a paucity of juveniles and possible downstream movement of those present.

Data compiled on habitat utilization suggest that juvenile chinook preferentially use relatively low velocities and relatively shallow water depths.

6.11.4.3 Pink Salmon

Pink salmon adults were not observed during the 1983 sampling programs. The first milling pinks observed during 1982 were found on the July 22 weekly survey. This may indicate a somewhat later entry into fresh water for the 1983 run in these rivers.

Pink salmon fry were not collected during the April study in areas where pink salmon spawning had been observed (stations 13, 18, 19, 40A, and 42). However, during the spring study, pink juveniles were found in station 40 (Stream 13u) downstream of the April sampling area; and pink juveniles were collected by the outmigrant trap. Data from outmigrant trap sampling suggested that the peak outmigration of pink salmon juveniles probably occurred prior to mid-June.

6.11.4.4 Chum Salmon

Chum salmon fry were found at varying stages of development during early April 1983. Many of the fry collected had fully resorbed their yolk-sacs and were free-swimming in the water column while others had prominent yolk-sacs present. By June, the chum salmon juveniles had migrated from their incubation areas and were found in the downstream areas of the system including the Middle River, lower Chakachatna River, and lower McArthur River. Outmigrant sampling results suggested that the peak chum outmigration probably occurred prior to mid-June.

Analysis of lengths of juvenile chum collected during April and June suggested that growth of emergent fry occurs in fresh water. This supports similar observations made during 1982.

6.11.4.5 Coho Salmon

Development of coho salmon fry was still taking place during early April 1983. Many fry had fully resorbed their yolk-sacs while others had not. Age 0^+ fish generally appeared to remain in the vicinity of their incubation areas at that time. Older juveniles were prevalent in the Noaukta Slough and Middle River. By June, coho juveniles were abundant and well dispersed, with age 0^+ and I^+ fish found in upstream areas of the McArthur River and the Noaukta Slough. Age I^+ and II^+ fish were most abundant in the

McArthur River tributaries and downstream areas of the Chakachatna, McArthur and Middle Rivers. Juveniles appeared to preferentially utilize very low velocities and relatively shallow depths.

Outmigrant trap sampling indicated that age 0^+, I^+, and II^+ fish were migrating to salt water. Data were not sufficient to determine timing.

6.11.4.6 Dolly Varden

Dolly Varden continued to be the most widely distributed and abundant species collected. Development of Dolly Varden fry was completed earlier than the other species studied, and during early April all Dolly Varden collected had fully resorbed their yolk-sacs. During late winter, Dolly Varden juveniles (age 0^+-II^+) were generally more abundant in upstream areas of the McArthur and Chakachatna Rivers and the Noaukta Slough. Most III^+ and older fish apparently move to downstream areas of the river or enter salt water some time between October and April.

By June, Dolly Varden have become more widely dispersed, particularly age 0^+ and I^+ fish. Older juveniles (age II^+) were found in the same reaches as in April but had also dispersed further downstream. Adult Dolly Varden were also collected in the Middle River and lower McArthur Rivers, and in July were found in the vicinity of salmon spawning and milling areas in both the Chakachatna and McArthur River systems. Juvenile Dolly Varden appeared to preferentially utilize relatively low velocities, but may utilize higher velocities when cover is present. The juvenile Dolly Varden also appeared to utilize relatively shallow water.

6.11.4.7 Pygmy Whitefish

Few pygmy whitefish were collected during 1983. The reason for the paucity of this species compared to 1981 or 1982 collections remains unknown.

Collections made by the outmigrant trap indicated that age 0^+ juveniles were present in the lower McArthur River by mid-June. This supports preliminary observations made during 1982 about the timing of the completion of pygmy whitefish fry development (Volume II, Section 6.8.4.7, 1983 IFAR).

6.11.4.8 Rainbow Trout

As in 1982, few young rainbow trout juveniles were collected in areas of either the McArthur or Chakachatna River drainages.

Mark-recapture information on adult rainbow trout suggested that there is considerable interdrainage movement between rainbow trout found in the Chakachatna and McArthur Rivers and the Chuitna River and its tributaries.

6.11.5 Summary and Conclusions

The 1983 studies provided additional information on the fisheries of the Chakachatna and McArthur River systems. These studies have also provided an improvement in our understanding of the system. The findings of these studies include:

- The movement of adult sockeye and chinook salmon into freshwater apparently occurred earlier in the season in 1983 than in 1982.

- The timing of adult sockeye and chinook salmon ascents of spawning streams was similar to that of 1982, and in some cases slightly earlier in the season.

- Spring rearing and distribution areas of resident and juvenile anadromous fish were identified.

- Chinook salmon juvenile rearing areas were identified in the McArthur River tributaries.

- Outmigrations of sockeye, chum, pink, and coho salmon were identified as taking place. The peak outmigration apparently took place prior to mid-June.

Other findings summarized in the text include:

- Habitats utilized by juvenile Dolly Varden and coho, sockeye, and chinook salmon were characterized.

- Interdrainage movements of rainbow trout were identified.

- Fish habitats were characterized including incubation areas.

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TABLES

Table 6.85. Measured discharges in spring 1983.

Site[a]	Description	Date 1983	Discharge cfs
6	Lower Chakachatna above Middle	6 April	71
13.5	Upper McArthur at Rapids	6 April	45
17	Spawning Channel at Source	26 May	0.79
	Spawning Channel	26 May	2.3
	Side Channel	26 May	2.3
22	Chakachatna below Canyon	6 April	440
C	Chakachatna at Lake Outlet	26 May	1610

[a]For location of sites refer to Figure 6.30.

Table 6.86 Mean daily discharges in cfs of the Chakachatna River at the Chakachamna Lake outlet for the period August 1982 through May 1983.[a]

Day	Aug	Sept	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May
1		7760	6180	1280	770	700	680	710	670	740
2		7570	5820	1280	710	700	750	920	710	770
3		7340	5570	1240	700	660	770	1020	700	840
4		7010	5300	1220	700	660	840	1030	780	660
5		6800	5070	1180	680	670	970	970	660	640[b]
6		7110	4660	1140	670	980	870	930	660	740
7		7290	4270	1090	680	900	700	970	700	680
8		7290	4000	1070	700	750	720	900	750	700
9		7070	3820	1090	700	930	870	710	700	660
10		6880	3520	1020	700	950	920	740	740	640[b]
11	8870	6660	3320	1020	660	670	870	720	700	640[b]
12	9710	6280	3210	1000	680	770	750	660	710	640[b]
13	9830	6010	2980	1030	700	900	1030	640[b]	640[b]	660
14	9710	5780	2810	1070	700	890	1360	670	670	720
15	9940	5850	2630	1000	700	820	1340	810	680	790
16	10160	7630	2500	1000	700	740	1160	890	780	900
17	9940	8920	2440	950	700	680	950	890	740	1000
18	9610	9830	2280	930	680	810	850	890	900	
19	9390	10380	2200	920	640[b]	700	710	840	890	
20	9130	10380	2170	870	640[b]	700	640[b]	770	860	
21	8970	10450	2020	870	640[b]	660	680	670	700	
22	8870	10500	1940	870	640[b]	720	660	710	640	
23	8760	9990	1840	870	640[b]	810	810	710	680	
24	8660	9390	1760	870	680	710	750	670	700	
25	8610	8820	1650	870	640[b]	710	670	640[b]	680	
26	8450	8260	1590	870	640[b]	920	670	680	670	
27	8260	7810	1450	840	640[b]	890	660	770	750	
28	8140	7290	1410	810	640[b]	700	670	770	700	
29	8060	6930	1380	810	680	680	–	790	640[b]	
30	8060	6580	1300	810	700	660	–	710	640[b]	
31	7960	–	1280	–	700	640[b]	–	640[b]	–	

[a] Records are poor during August and September and very poor after November.

[b] Corresponds to 0.0 data pad reading.

Table 6.87 Mean daily discharges in cfs of the McArthur River at the rapids for the period August 1982 through June 1983.[a]

Day	Aug	Sept	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	June
1		743	319	738	341	720	364	61	40	123	859
2		791	301	783	452	481	273	57	51	129	716
3		839	278	743	504	291	192	89	43	126	691
4		887	257	609	516	217	148	117	51	131	559
5		935	265	499	497	327	118	74	52	137	596
6		983	236	528	377	920	98	53	50	136	640
7		1031	219	535	387	147	93	55	47	143	649
8		1079	207	588	239	437	123	89	49	145	651
9		1127	203	481	168	389	258	145	55	155	610
10		1175	189	420	207	330	469	178	54	155	565
11		1223	189	373	168	320	590	101	51	150	550
12		1271	197	428	159	265	610	63	53	159	552
13		1319	180	458	167	232	588	44	55	186	577
14		1367	173	326	245	239	539	44	56	187	633
15		1415	167	291	201	262	463	42	55	193	641
16		1463	157	348	167	273	307	40	55	235	625
17	23	1511	147	387	142	150	210	44	52	231	697
18	71	1543	156	388	111	166	173	45	54	212	1
19	119		144	416	101	139	209	49	51	210	
20	167		160	418	91	120	174	45	52	243	
21	215		222	328	84	117	134	37	57	238	
22	263		404	225	230	113	114	48	65	242	
23	311		697	254	519	113	108	39	67	268	
24	359	545	954	228	662	114	112	29	78	263	
25	407	472	907	223	615	108	96	31	90	242	
26	455	533	759	174	525	107	98	32	98	259	
27	503	427	827	122	631	119	93	32	107	273	
28	551	407	837	134	759	105	69	35	105	291	
29	599	397	766	177	1665	100		40	115	531	
30	647	368	727	203	1186	118		48	126	778	
31	695		729		856	150		56		928	

[a] Records for the entire period are poor.

Table 6.88 Mean daily water temperatures in °C of the Chakachatna River at the Chakachamna Lake outlet for the period August 1982 through November 1982.

Day	Aug	Sept	Oct	Nov	Dec[a]	Jan[a]	Feb[a]	Mar[a]	Apr[a]	May[a]
1		8.4	7.0	4.0	0.8	-0.6	-2.5	-4.8	-4.6	-0.1
2		7.9	6.9	4.0	-0.3	-0.5	-1.6	-10.3	-5.3	0.1
3		8.1	6.8	4.0	-1.1	-0.8	-1.4	-12.1	-4.0	0.1
4		8.0	6.5	4.0	-1.5	-26.0	-1.0	-10.3	-2.5	-37.5
5		6.4	6.5	3.8	-0.8	-38.9	-1.1	-7.1	-26.0	-24.9
6		5.6	6.0	3.4	-12.5	-8.3	-4.6	-6.9	-13.6	-0.1
7		8.4	6.0	3.5	0.5	-12.6	-5.9	-9.3	-1.3	-0.1
8		8.5	6.1	3.4	1.3	-14.5	-19.6	-11.1	-1.5	0.3
9		7.9	6.0	3.0	-0.1	-12.4	-12.5	-11.4	-2.0	0.6
10		7.0	6.0	3.5	-1.0	-12.1	-14.3	-11.5	-3.1	-24.5
11	6.5	7.6	6.0	3.5	-0.5	-20.0	-15.1	-9.0	-14.8	-50.0
12	8.1	8.0	5.9	3.5	0.0	-11.9	-13.1	-28.8	-2.4	-37.0
13	8.1	3.1	5.5	3.5	0.8	-12.6	-15.6	-50.0	-38.1	-23.1
14	8.0	5.8	5.5	3.4	0.9	-12.8	-17.0	-16.6	-15.3	2.0
15	8.5	6.5	5.5	3.3	0.5	-9.6	-17.4	-5.0	-13.5	1.4
16	8.4	6.5	5.5	2.5	0.0	-5.5	-16.4	-4.9	-1.1	1.3
17	8.5	6.5	5.5	2.0	-0.1	-7.0	-15.6	-6.0	-2.0	1.3
18	8.4	6.5	5.5	1.5	-0.5	-7.1	-14.0	-6.0	-1.3	
19	8.1	6.5	5.5	1.1	-12.8	-16.0	-10.0	-5.9	-0.8	
20	8.3	6.9	5.0	1.9	-12.3	-3.0	-19.1	-4.6	-1.1	
21	8.0	6.6	5.0	1.5	-25.1	-14.3	-7.3	-4.6	-0.9	
22	7.6	6.6	5.0	2.3	-50.0	-4.5	-17.5	-5.9	-37.5	
23	7.1	7.0	4.8	3.4	-38.8	-9.6	-5.5	-6.0	0.0	
24	6.8	6.9	4.5	3.0	-15.9	-9.9	-5.0	-16.3	0.0	
25	7.5	7.0	4.5	3.0	-38.5	-17.5	-6.3	-26.8	0.0	
26	8.5	7.0	4.0	3.0	-37.6	-5.0	-6.1	-3.1	-25.1	
27	8.9	7.0	4.3	2.8	-37.6	-3.4	-27.4	-3.0	0.0	
28	7.9	7.0	4.3	2.1	-50.0	-3.1	-15.5	-2.5	0.0	
29	6.1	7.0	4.0	1.9	1.3	-5.6		-3.1	-37.5	
30	7.6	7.0	4.0	1.0	0.6	-39.5		-5.3	-25.0	
31	8.5		4.0		-0.8	-50.0		-5.6		

[a] Insufficient water depth over transducer.

Table 6.89 Mean daily water temperatures in °C of the McArthur River at the rapids for the period August 1982 through June 1983.

Day	Aug	Sept	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	June
1		5.2	3.8	0.5	0.0	0.0	0.0	0.0	1.3	3.9	3.3
2		4.5	3.8	0.6	0.0	0.0	0.0	0.0	1.4	3.6	4.0
3		4.9	3.6	1.0	0.0	0.0	0.0	0.0	1.5	3.8	3.1
4		4.3	3.3	0.9	0.0	0.0	0.0	0.0	1.1	3.9	3.1
5		4.5	3.0	0.5	0.0	0.0	0.0	0.0	0.4	3.8	4.0
6		4.1	1.6	0.0	0.0	0.0	0.0	0.0	0.0	3.8	5.4
7		4.0	2.5	0.0	0.0	0.0	0.0	0.0	0.0	4.1	4.3
8		4.0	2.5	0.0	0.0	0.0	0.0	0.0	0.0	4.1	4.1
9		3.9	2.5	0.0	0.0	0.0	0.0	0.0	0.4	4.3	4.4
10		4.0	2.5	0.0	0.0	0.0	0.0	0.0	1.0	4.0	4.1
11		4.7	2.2	0.0	0.0	0.0	0.0	0.0	1.0	4.0	5.1
12		3.0	2.1	0.0	0.0	0.0	0.0	0.0	1.0	4.0	4.5
13		4.2	2.1	0.0	0.0	0.0	0.0	0.0	1.5	4.0	4.5
14		4.4	2.0	0.0	0.0	0.0	0.0	0.0	1.5	4.0	4.6
15		5.4	1.7	0.0	0.0	0.0	0.0	0.0	1.5	4.0	4.0
16		4.8	1.9	0.0	0.0	0.0	0.0	0.0	1.5	4.0	3.9
17	5.9	6.3	2.0	0.0	0.0	0.0	0.0	0.0	1.6	4.3	5.1
18	5.8	6.6	1.0	0.0	0.0	0.0	0.0	0.0	1.8	4.4	5.0
19	5.7		1.5	0.0	0.0	0.0	0.0	0.0	1.9	4.5	4.5
20	5.8		1.1	0.0	0.0	0.0	0.0	0.0	1.3	4.8	
21	5.6		0.8	0.0	0.1	0.0	0.0	0.0	1.6	4.6	
22	4.9		0.9	0.0	0.0	0.0	0.0	0.0	2.4	4.5	
23	5.3		0.3	0.0	0.0	0.0	0.0	0.0	2.5	4.4	
24	4.6	4.0	0.8	0.0	0.0	0.0	0.0	0.0	3.0	4.5	
25	4.8	3.1	1.0	0.0	0.0	0.0	0.0	0.1	3.5	4.5	
26	5.2	3.9	1.0	0.0	0.0	0.0	0.0	0.3	3.5	4.5	
27	5.4	3.7	1.0	0.0	0.0	0.0	0.0	0.0	3.8	4.4	
28	4.3	3.6	0.9	0.0	0.0	0.0	0.0	0.1	3.5	4.4	
29	5.0	3.6	0.9	0.0	0.0	0.0		0.6	3.5	4.1	
30	4.2	4.0	0.5	0.0	0.0	0.0		0.8	3.5	3.4	
31	4.9		0.5		0.0	0.0		0.8		3.0	

Table 6.90. Stations sampled by gear type and date for April 1983 field program

Station	Minnow Trap	Electro-Shock	Dip Net	Gill Net
1	4-10-83			
2	4-10-83			
3	4-9-83			
4	4-9-83			
5	4-9-83			
6	4-9-83			
8	4-9-83			
11	4-10-83			
12.1		4-5-83		
13		4-5-83		
13u		4-8-83		
14	4-10-83			
15	4-10-83	4-5-83		
16	4-10-83			
16A	4-10-83			
17	4-10-83	4-10-83	4-10-83	
22	4-10-83	4-05-83		
25 Mid Lake				4-09-83 - 4-10-83

Table 6.91. Stations sampled by gear type and date for June/July 1983 field program

Station	Minnow Trap	Electro-Shock	Fyke Net	Dip Net	Inclined Plane Trap
1	6-23-83	6-29-83			
1D	6-19-83	6-23-83	6-18-83 -6-28-83		
2	6-24-83	6-30-83			
3	6-26-83	6-30-83			
4	6-20-83	7-3-83	6-19-83 -6-28-83	6-20-83	6-19-83 -7-5-83
5	6-20-83	7-4-83			
6	6-20-83	7-30-83	6-19-83 -6-28-83		
6A	6-29-83	7-4-83			
8	6-22-83	7-4-83			
9	6-28-83	7-4-83			
10	6-22-83	6-29-83			
11	6-23-83	6-29-83			
11.5	6-28-83				
12	6-27-83	6-29-83			
13	6-25-83	7-4-83			
14	6-26-83	6-23-83			
15	6-27-83	6-23-83			
16	6-22-83	7-4-83			
16A	6-22-83	7-4-83			
17D	6-29-83	7-2-83			
18	6-30-83	6-30-83			
18A	7-1-83	7-1-83			

Table 6.91. Stations sampled by gear type and date for June/July 1983 field program (concluded)

Station	Minnow Trap	Electro-Shock	Fyke Net	Dip Net	Inclined Plane Trap
19	6-30-83	6-30-83			
19A	7-01-83	7-01-83			
20	6-30-83	6-30-83			
21	6-30-83	7-04-83			
22	7-01-83	7-02-83			
23	7-01-83	7-01-83			
24	7-02-83	7-02-83			
25		7-02-83			
26		7-02-83			
27		7-02-83			
28		7-02-83			
40	6-26-83	7-03-83			
40A	6-26-83	7-03-83			
41	6-23-83	7-03-83			
41A	6-24-83	7-03-83			
42	6-25-83	7-03-83			
43	6-27-83	7-03-83			
43A	6-27-83	7-03-83			
44	6-28-83	7-04-83			
44A	6-28-83	7-04-83			
45	6-29-83	6-29-83			

Table 6.92. Catch/effort by station for minnow traps - April 1983

Station	Dolly Varden	Coho Salmon	Pygmy Whitefish
1	0.00	0.00	0.00
2	0.00	0.00	0.00
3	0.00	0.50	0.00
4	1.00	4.50	0.00
5	0.00	0.25	0.00
6	0.00	0.00	0.00
8	1.00	1.75	0.00
11	0.00	0.50	0.00
14	1.50	0.00	0.00
15	0.75	0.00	0.00
16	1.00	0.00	0.00
16A	1.25	1.25	0.00
17	0.50	0.75	0.00
19	0.00	0.00	0.00
22	2.25	0.00	0.25

Table 6.93. Mean minnow trap c/f for each reach for juvenile Dolly Varden and coho salmon - April 1983

	Dolly Varden (parr & juveniles)	Coho Salmon (parr)
Upper Chakachatna River (Canyon)	2.25	0.00
Mid-Chakachatna River	0.50	1.25
Noaukta Slough	1.08	1.08
Lower Chakachatna River	0.17	0.91
Upper McArthur River	1.13	0.00
Lower McArthur River	0.00	0.29
Chakachatna Tributaries	0.00	0.00

Upper Chakachatna River (Canyon)	Stations 22, 23, 24
Mid-Chakachatna River	Stations 17, 17D, 20, 21
Noaukta Slough	Stations 8, 9, 10, 16, 16A
Lower Chakachatna River	Stations 1, 2, 3, 4, 5, 6, 6A
Upper McArthur River	Stations 13, 14, 15
Lower McArthur River	Stations 1D(1), 11, 12
Chakachatna Tributaries	Stations 18, 19

Table 6.94. Incidence of fish at sampling stations - April 1983 all collection methods

Station Number	Dolly Varden	Coho Salmon	Chinook Salmon	Sockeye Salmon	Chum Salmon	Rainbow Trout	Pygmy Whitefish
1							
2							
3		+					
4	+	+					
5		+					
6							
8	+	+					
11		+					
13	+	+					
14	+						
15	+	+	+	+			
16	+						
16A	+	+					
17	+	+		+	+		
19	+	+	+				
22	+						+
40A	+	+				+	
42	+	+		+			

Table 6.95. Percentage incidence of fish species at sampling stations - April 1983

Species	Percentage
Dolly Varden	66.7
Coho Salmon	66.7
Chinook Salmon	11.1
Sockeye Salmon	16.7
Chum Salmon	5.6
Rainbow Trout	5.6
Pygmy Whitefish	5.6

Table 6.96. Collection by reach for juvenile salmonids by all methods - April 1983

	Dolly Varden	Coho Salmon	Chinook Salmon	Sockeye Salmon	Chum Salmon	Rainbow Trout	Pygmy Whitefish
Upper Chakachatna River (Canyon)	+						+
Mid-Chakachatna River	+	+		+	+		
Noaukta Slough	+	+					
Lower Chakachatna River	+	+					
Upper McArthur River	+	+		+			
Lower McArthur River		+					
Chakachatna Tributaries	+	+	+				
McArthur Tributaries	+	+		+		+	

Upper Chakachatna River (Canyon)	Stations 22, 23, 24
Mid-Chakachatna River	Stations 17, 17D, 20, 21
Noaukta Slough	Stations 8, 9, 10, 16, 16A
Lower Chakachatna River	Stations 1, 2, 3, 4, 5, 6, 6A
Upper McArthur River	Stations 13, 14, 15
Lower McArthur River	Stations 1D(1), 11, 12
Chakachatna Tributaries	Stations 18, 19
McArthur Tributaries	Stations 40, 40A, 41, 41A, 42, 42A, 43, 43A, 44, 44A, 45

Table 6.97. Water quality profile of Chakachamna Lake - April 1983

Depth[1] (meters)	Depth[1] (feet)	Temperature (°C)	Dissolved Oxygen (mg/l)	Turbidity (ppm)(mg/l)	Specific Conductivity (umhos/cm)	pH[4]
0[2]	0[2]	0.8	10.8	57	42	4.9[4]
0.3[2]	1[2]	0.8	11.5	55	35	4.6[4]
0.6[2]	2[2]	0.7	11.9	56	31	4.0[4]
0.9	3	0.7	12.3	58	28	4.1[4]
1.2	4	0.7	12.4	63	27	3.9[4]
1.5	5	0.6	12.6	63	22	3.7[4]
3.0	10	0.6	12.4	64	27	3.9[4]
4.5	15	0.6	12.5	66	22	3.9[4]
6.1	20	0.6	12.5	69	21	3.9[4]
7.6	25	0.6	12.4	73	20	4.0[4]
9.1	30	0.6	15.0	67	20	7.0
15.2	50	0.6	15.2	69	19	7.0
22.9	75	0.7	16.1	67	23	7.0
30.5	100	0.7	20.5	65	21	7.0
45.7	150	1.3	20.9	64	20	7.0
61.0	200	1.5	14.3	65	21	7.1
76.2	250	1.7	14.2	62	20	7.2
85.3	280	1.8	22.1	74	20	7.2
86.9[3]	285[3]					

[1] 1 ft of snow on top of ice

[2] ice greater than 2 ft in depth

[3] bottom

[4] possible instrument malfunction

Table 6.98. Water quality data by station - April 1983

Station	Water Temperature Mean (°C)	Water Temperature SD	Dissolved Oxygen Mean (mg/l)	Dissolved Oxygen SD	Conductivity Mean (umhos/cm)	Conductivity SD	Turbidity Mean (mg/l)	Turbidity SD
1	2.7	1.57	10.9	1.59	166.8	11.65	205.8	48.98
2	4.6	.12	12.6	.31	107.3	.83	104.3	4.92
3	3.9	.12	13.0	.11	103.0	1.23	61.5	6.10
4	4.5	.08	10.3	.96	93.0	1.0	75.5	11.86
5	.4	--	12.7	.80	41.0	18.0	73.5	25.5
6	3.6	.45	12.0	.75	104.3	.47	61.3	5.71
8	1.68	.11	12.9	.14	15.0	--	15.0	2.00
11	.77	.09	13.8	--	99.0	--	71.7	15.09
13	3.3	.85	11.05	1.55	39.0	19.0	56.0	2.00
13U	1.8	--	12.5	--	13.0	--	2.0	--
14	3.5	.36	12.2	.51	15.8	.44	24.8	6.83
15	2.8	.52	12.3	.51	16.6	3.32	9.4	12.40
16	3.68	.18	12.4	.39	101.8	.74	43.8	3.42
16A	2.4	.43	12.5	.42	15.0	7.18	24.3	7.50
17	4.1	.09	12.7	.15	73.8	1.17	7.08	3.42
19	0.15	.09	13.9	.38	20.3	1.79	25.5	6.80
22	1.4	.55	14.0	.68	117.6	7.78	34.9	14.22
24.1[1]	16.4	--	8.3	--	27.0	--	83.0	--
24.2[2]	14.2	--	7.9	--	855.0	--	84.0	--

1 Feeder stream from Mt. Spurr into Chakachatna River near Station 24.

2 Another feeder stream from Mt. Spurr into Chakachatna River near Station 24.

Table 6.99. Standpipe readings for selected incubation locations - April 1983

Station[1]	Description: Side of Bank (Facing Up Stream)	Distance From Bank (m)	(ft)	Temperature °C Surface Water	Stand Pipe	Depth Surface Water (m)	(ft)	Velocity @ 0.6 Total Depth Surface Water (cm/s)	(ft/s)
42A		0.9	3	3.5	4.7	0.5	5	39.6	1.3
42	[2]MC			4.7	4.4	0.3	1.1	42.7	1.4
43	MC			6.1	4.3	0.2	0.8	27.4	0.9
44	[3]RB	0.9	3	5.0	3.7	0.1	0.4	35.1	1.15
45	[4]LB	1.5	5	4.2	3.9	0.2	0.5	12.2	0.4
15	MC			3.9	3.7	0.1	0.3	24.4	0.8
15A	[4]LB	1.5	5	3.9	3.9	0.1	0.4	21.3	0.7
17A (LB+0) North End Left Most Channel	LB	0.2	0.5	4.2	4.1	0.1	0.4	6.1	0.2
17 (LB+0) North End Left Most Channel	LB	0.2	5	4.0	3.1	0.2	0.5	6.1	0.2
17 (LB+0) to South End of Left Most Channel	[5]RB	<0.03	<0.1	6.9	3.1	-	-	-	-
17 (LB+0) South End of Left Most Channel	RB	0.9	3	6.8	4.2	0.1	0.3	<3.0	<0.1
17 (LB+2) Adjacent Channel Opposite 17A	[5]LB	<0.03	<.01	4.7	3.7	-	-	-	-
17 (LB+2) Adjacent Channel Opposite 17A	LB	0.8	2.5	4.4	3.7	0.2	0.8	<3.0	<0.1

Table 6.99. Standpipe readings for selected incubation locations - April 1983 (concluded)

Station[1]	Description: Side of Bank (Facing Up Stream)	Description: Distance From Bank (m)	Description: Distance From Bank (ft)	Temperature °C: Surface Water	Temperature °C: Stand Pipe	Depth Surface Water (m)	Depth Surface Water (ft)	Velocity @ 0.6 Total Depth Surface Water (cm/s)	Velocity @ 0.6 Total Depth Surface Water (ft/s)
19	LB	0.6	2	1.6	1.4	0.1	0.4	21.7	0.7
19A 2 miles North of 19	LB	1.2	4	1.8	1.7	0.1	0.3	30.5	1.0
Chilligan River Slough - Upstream Portion	MC			3.2	3.1	0.1	0.3	18.3	0.6
Chilligan River Slough - Downstream Portion	LB	0.9	3	1.4	0.9	0.1	0.2	9.1	0.3

[1]See Figure 6

[2]MC = Mid-channel

[3]RR = Right Bank

[4]LB = Left Bank

[5]WE = Waters Edge

Table 6.100. Incidence of fish at sampling stations: all collection methods Spring 1983

Station	Dolly Varden	Coho Salmon	Chinook Salmon	Sockeye Salmon	Chum Salmon	Rainbow Trout	Pygmy Whitefish	Pink Salmon
1	+	+	+	+	+	+	+	+
1D	+	+	+	+	+			
2	+	+		+	+			
3	+	+			+			
4	+	+	A	A	+	+	+	
5	+	+	+		+			
6	+	+				+		
6A	+	+		+			+	
8	+	+			+			
9	+	+						
10	+	+						
11	+	+						
11.5	+							
12	+	+		+			+	
13	+	+						
14	+	+						
15	+			+				
16	+	+		+				
16A	+	+			+			
17	+	+		+				
17D	+		+					
18	+	+						
18A	+							
19	+							
19A	+							
20	+	+		+				
21	+	+			+			
22	+			+				
23	+							
24	+			+				
40	+							+
40A	+	+	+					
41	+	+						
41A	+							
42	+	+	+					
42A	+	+	+					
43	+	+	+					
43A		+	+					
44	+	+	+					
44A	+	+	+					
45								
25								
26	+			+				
27								
28	+							

A = Adults only
+ = Juveniles with or without adults

Table 6.101. Percentage incidence of fish species at sampling station below Chakachamna Lake - June/July 1983

Species	Percentage
Dolly Varden	95.1
Coho Salmon	68.3
Chinook Salmon	29.3 (26.9)[1]
Sockeye Salmon	31.7 (29.3)[1]
Chum Salmon	29.3
Pink Salmon	4.9
Rainbow Trout	7.3
Pygmy Whitefish	9.8

[1] Juveniles only

Table 6.102. Mean minnow trap c/f for each reach for juvenile salmonids - Spring 1983

	Dolly Varden (parr & juveniles)	Coho Salmon (parr)	Chinook (parr)	Sockeye (parr)
Upper Chakachatna River (Canyon)	0.34	0.00	0.00	0.00
Mid-Chakachatna River	0.81	0.28	0.00	0.28
Noaukta Slough	1.64	1.36	0.00	0.00
Lower Chakachatna River	1.37	0.37	0.03	0.00
Upper McArthur River	2.18	1.54	0.00	0.00
Lower McArthur River	1.42	0.51	0.00	0.09
Chakachatna Tributaries	0.63	0.00	0.00	0.00
McArthur Tributaries	0.88	0.22	3.26	0.00

Upper Chakachatna River (Canyon)	Stations 22, 23, 24
Mid-Chakachatna River	Stations 17, 17D, 20, 21
Noaukta Slough	Stations 8, 9, 10, 16, 16A
Lower Chakachatna River	Stations 1, 2, 3, 4, 5, 6, 6A
Upper McArthur River	Stations 13, 14, 15
Lower McArthur River	Stations 1D(1), 11, 11.5, 12
Chakachatna Tributaries	Stations 18, 19, 18A, 19A
McArthur Tributaries	Stations 40, 40A, 41, 41A, 42, 42A, 43, 43A, 44, 44A, 45

Table 6.103. Mean electrofishing c/f for each reach for juvenile salmonids - Spring 1983

	Dolly Varden	Coho Salmon	Chinook Salmon	Sockeye Salmon	Chum Salmon	Pygmy White-fish	Round White-fish
Upper Chakachatna River (Canyon)	1.45	0.00	0.00	0.59	0.00	0.00	0.00
Mid-Chakachatna River	2.56	0.52	0.11	0.43	0.41	0.00	0.00
Noaukta Slough	2.56	1.18	0.00	0.05	0.17	0.00	0.00
Lower Chakachatna River	0.55	1.23	0.04	0.53	0.99	0.03	0.37
Upper McArthur River	2.25	4.97	0.00	0.08	0.00	0.00	0.00
Lower McArthur River	0.66	0.68	0.00	0.22	0.00	0.06	0.06
Chakachatna Tributaries	0.54	0.12	0.00	0.00	0.00	0.00	0.00
McArthur Tributaries	0.30	0.03	1.89	0.00	0.00	0.00	0.00

Upper Chakachatna River (Canyon)	Stations 22, 23, 24
Mid-Chakachatna River	Stations 17, 17D, 20, 21
Noaukta Slough	Stations 8, 9, 10, 16, 16A
Lower Chakachatna River	Stations 1, 2, 3, 4, 5, 6, 6A
Upper McArthur River	Stations 13, 14, 15
Lower McArthur River	Stations 1D(1), 11, 11.5, 12
Chakachatna Tributaries	Stations 18, 19, 18A, 19A
McArthur Tributaries	Stations 40, 40A, 41, 41A, 42, 42A, 43, 43A, 44, 44A, 45

Table 6.104. Water quality data by station - Spring 1983

Station	Water Temperature Mean (°C)	Water Temperature SD (°C)	Dissolved Oxygen Mean (mg/l)	Dissolved Oxygen SD (mg/l)	Conductivity Mean (umhos/cm)	Conductivity SD (umhos/cm)	Turbidity Mean (mg/l)	Turbidity SD (mg/l)
1	9.8	--	10.8	--	41	--	83	--
1D	9.0	--	12.5	--	29	--	155	--
2	5.4	--	12.8	--	30	--	133	--
3	5.4	--	12.3	--	33	--	82	--
4	8.2	--	12.6	--	47	--	95	--
5	9.7	2.22	10.5	1.98	54.7	24.99	85.7	49.98
6	7.4	--	12.8	--	39	--	92	--
6A	6.5	--	12.2	--	32	--	93	--
8	7.2	--	13.0	--	35	--	74	--
9	6.8	--	12.0	--	33	--	90	--
10	9.0	--	11.2	--	38	--	84	--
11	6.7	0.21	11.35	.15	34.4	1.2	93.9	6.3
11.5	7.0	--	12.5	--	33	--	125	--
12	4.9	--	12.8	--	9	--	220	--
13	4.2	--	11.1	--	12	--	160	--
14	9.6	--	9.4	--	16	--	19	--
15	3.5	--	12.7	--	12	--	194	--
16	5.3	--	13.2	--	31	--	86	--
16A	11.7	3.06	10.3	1.96	70.3	24.42	54.1	18.32
17	5.9	--	10.5	--	31	--	74	30.00
17D	5.7	--	12.3	--	31	--	112	--
18	6.7	--	10.7	--	42	--	51	--
18A	3.2	--	12.9	--	33	--	180	--
19	9.4	--	10.8	--	12	--	8	--
19A	5.8	--	12.3	--	8	--	11	--
20	11.3	--	11.7	--	65	--	3	--
21	6.1	--	12.9	--	39	--	59	--
22	5.1	--	12.6	--	27	--	63	--
23	4.7	--	12.7	--	26	--	56	--
24	5.1	--	15.5	--	28	--	21	--
40	5.5	--	12.2	--	1	--	1	--
40A	5.2	--	12.4	--	1	--	4	--
41	6.7	--	12.6	--	1	--	16	--
41A	5.2	--	12.5	--	6	--	34	--
42	10.7	--	10.7	--	74	--	7	--
42A	7.2	--	12.1	--	64	--	12	--
43	9.3	--	13.3	--	76	--	1	--
43A	7.6	--	10.6	--	75	--	5	--
44	7.9	--	11.2	--	102	--	6	--
44A	7.0	--	12.5	--	102	--	12	--
45	9.2	--	7.0	--	46	--	18	--

Table 6.105. Water quality profiles of Chakachamna Lake, July 1983

Depth (meters)	Depth (feet)	Temperature (°C)	Dissolved Oxygen (mg/l)	Conductivity (umhos/cm)	Turbidity (mg/l)
0.0	0.0	11.1	10.8	35	36
0.3	1.0	9.5	11.3	35	40
0.6	2.0	9.1	11.2	35	39
0.9	3.0	8.9	11.1	33	40
1.2	4.0	8.9	11.1	33	40
1.5	5.0	8.9	11.1	31	35
3.0	10.0	8.2	11.3	29	35
4.6	15.0	7.8	11.3	27	38
6.1	20.0	7.7	11.4	26	36
9.1	30.0	7.1	11.3	25	31
15.2	50.0	7.0	11.6	25	14
30.5	100.0	6.9	11.1	32	17
83.8	27.0	6.5	12.3	28	3

Table 6.106. Standpipe readings for station 17 July 1983

SIDE CHANNEL (LB+2)	
Upstream Standpipe	5.4°C
Downstream Standpipe	5.9°C
Surface Water Temperature	5.7°C
LEFT- SIDE CHANNEL - (LB+0)	
Left Standpipe	4.6°C
Right Standpipe (closes to bank)	4.7°C
Surface Water Temperature	5.4°C

TABLE 6.107. DISTRIBUTION OF OBSERVATIONS OF DOLLY VARDEN BY VELOCITY INTERVAL (IN 0.2 FT/S INTERVALS)

VELOCITY INTERVAL (FTS/S)	NUMBER OF OBSERVATIONS	PERCENTAGE OF TOTAL
0.0 - 0.2	335	32.15
0.2 - 0.4	131	12.57
0.4 - 0.6	119	11.42
0.6 - 0.8	120	11.52
0.8 - 1.0	78	7.49
1.0 - 1.2	60	5.76
1.2 - 1.4	45	4.32
1.4 - 1.6	62	5.95
1.6 - 1.8	55	5.28
1.8 - 2.0	9	0.86
2.0 - 2.2	4	0.38
2.2 - 2.4	5	0.48
2.4 - 2.6	3	0.29
2.6 - 2.8	8	0.77
2.8 - 3.0	4	0.38
3.0 - 3.2	3	0.29
3.2 - 3.4	1	0.10
3.4 - 3.6	0	0.00
3.6 - 3.8	0	0.00
3.8 - 4.0	0	0.00

TOTAL = 1042 TOT PER = 100.01

TABLE 6.108. DISTRIBUTION OF OBSERVATIONS OF DOLLY VARDEN BY DEPTH INTERVAL (IN 0.3 FT INTERVALS)

DEPTH INTERVAL (FT)			NUMBER OF OBSERVATIONS	PERCENTAGE OF TOTAL
0.0	-	0.3	14	1.26
0.3	-	0.6	236	21.26
0.6	-	0.9	284	25.59
0.9	-	1.2	280	25.23
1.2	-	1.5	97	8.74
1.5	-	1.8	93	8.38
1.8	-	2.1	59	5.32
2.1	-	2.4	4	0.36
2.4	-	2.7	15	1.35
2.7	-	3.0	14	1.26
3.0	-	3.3	9	0.81
3.3	-	3.6	2	0.18
3.6	-	3.9	3	0.27

TOTAL = 1110 TOT PER = 100.01

TABLE 6.109. DISTRIBUTION OF OBSERVATIONS OF COHO SALMON BY VELOCITY INTERVAL (IN 0.2 FT/S INTERVALS)

VELOCITY INTERVAL (FTS/S)			NUMBER OF OBSERVATIONS	PERCENTAGE OF TOTAL
0.0	-	0.2	206	48.82
0.2	-	0.4	78	18.48
0.4	-	0.6	43	10.19
0.6	-	0.8	32	7.58
0.8	-	1.0	24	5.69
1.0	-	1.2	21	4.98
1.2	-	1.4	7	1.66
1.4	-	1.6	5	1.18
1.6	-	1.8	0	0.00
1.8	-	2.0	5	1.18
2.0	-	2.2	0	0.00
2.2	-	2.4	1	0.24
2.4	-	2.6	0	0.00
2.6	-	2.8	0	0.00
2.8	-	3.0	0	0.00
3.0	-	3.2	0	0.00
3.2	-	3.4	0	0.00
3.4	-	3.6	0	0.00
3.6	-	3.8	0	0.00
3.8	-	4.0	0	0.00

TOTAL = 422 TOT PER = 100.00

TABLE 6.110. DISTRIBUTION OF OBSERVATIONS OF COHO SALMON BY DEPTH INTERVAL (IN 0.3 FT INTERVALS)

DEPTH INTERVAL (FT)			NUMBER OF OBSERVATIONS	PERCENTAGE OF TOTAL
0.0	-	0.3	2	0.45
0.3	-	0.6	86	19.24
0.6	-	0.9	153	34.23
0.9	-	1.2	107	23.94
1.2	-	1.5	26	5.82
1.5	-	1.8	41	9.17
1.8	-	2.1	17	3.80
2.1	-	2.4	1	0.22
2.4	-	2.7	10	2.24
2.7	-	3.0	3	0.67
3.0	-	3.3	1	0.22
3.3	-	3.6	0	0.00
3.6	-	3.9	0	0.00

TOTAL = 447 TOT PER = 100.00

TABLE 6.111. DISTRIBUTION OF OBSERVATIONS OF CHINOOK SALMON BY VELOCITY INTERVAL (IN 0.2 FT/S INTERVALS)

VELOCITY INTERVAL (FTS/S)			NUMBER OF OBSERVATIONS	PERCENTAGE OF TOTAL
0.0	-	0.2	260	68.97
0.2	-	0.4	21	5.57
0.4	-	0.6	61	16.18
0.6	-	0.8	8	2.12
0.8	-	1.0	5	1.33
1.0	-	1.2	17	4.51
1.2	-	1.4	3	0.80
1.4	-	1.6	0	0.00
1.6	-	1.8	1	0.27
1.8	-	2.0	1	0.27
2.0	-	2.2	0	0.00
2.2	-	2.4	0	0.00
2.4	-	2.6	0	0.00
2.6	-	2.8	0	0.00
2.8	-	3.0	0	0.00
3.0	-	3.2	0	0.00
3.2	-	3.4	0	0.00
3.4	-	3.6	0	0.00
3.6	-	3.8	0	0.00
3.8	-	4.0	0	0.00

TOTAL = 377 TOT PER = 100.02

TABLE 6.112. DISTRIBUTION OF OBSERVATIONS OF CHINOOK SALMON BY DEPTH INTERVAL (IN 0.3 FT INTERVALS)

DEPTH INTERVAL (FT)			NUMBER OF OBSERVATIONS	PERCENTAGE OF TOTAL
0.0	-	0.3	1	0.25
0.3	-	0.6	18	4.51
0.6	-	0.9	95	23.81
0.9	-	1.2	65	16.29
1.2	-	1.5	116	29.07
1.5	-	1.8	21	5.26
1.8	-	2.1	42	10.53
2.1	-	2.4	10	2.51
2.4	-	2.7	3	0.75
2.7	-	3.0	7	1.75
3.0	-	3.3	0	0.00
3.3	-	3.6	21	5.26
3.6	-	3.9	0	0.00

TOTAL = 399 TOT PER = 99.99

TABLE 6.113. DISTRIBUTION OF OBSERVATIONS OF SOCKEYE SALMON BY VELOCITY INTERVAL (IN 0.2 FT/S INTERVALS)

VELOCITY INTERVAL (FTS/S)			NUMBER OF OBSERVATIONS	PERCENTAGE OF TOTAL
0.0	-	0.2	76	54.68
0.2	-	0.4	14	10.07
0.4	-	0.6	12	8.63
0.6	-	0.8	1	0.72
0.8	-	1.0	11	7.91
1.0	-	1.2	9	6.47
1.2	-	1.4	1	0.72
1.4	-	1.6	7	5.04
1.6	-	1.8	8	5.76
1.8	-	2.0	0	0.00
2.0	-	2.2	0	0.00
2.2	-	2.4	0	0.00
2.4	-	2.6	0	0.00
2.6	-	2.8	0	0.00
2.8	-	3.0	0	0.00
3.0	-	3.2	0	0.00
3.2	-	3.4	0	0.00
3.4	-	3.6	0	0.00
3.6	-	3.8	0	0.00
3.8	-	4.0	0	0.00

TOTAL = 139 TOT PER = 100.00

TABLE 6.114. DISTRIBUTION OF OBSERVATIONS OF SOCKEYE SALMON BY DEPTH INTERVAL (IN 0.3 FT INTERVALS)

DEPTH INTERVAL (FT)			NUMBER OF OBSERVATIONS	PERCENTAGE OF TOTAL
0.0	-	0.3	2	1.45
0.3	-	0.6	29	21.01
0.6	-	0.9	23	16.67
0.9	-	1.2	35	25.36
1.2	-	1.5	5	3.62
1.5	-	1.8	9	6.52
1.8	-	2.1	33	23.91
2.1	-	2.4	0	0.00
2.4	-	2.7	1	0.72
2.7	-	3.0	1	0.72
3.0	-	3.3	0	0.00
3.3	-	3.6	0	0.00
3.6	-	3.9	0	0.00

TOTAL = 138 TOT PER = 99.98

FIGURES

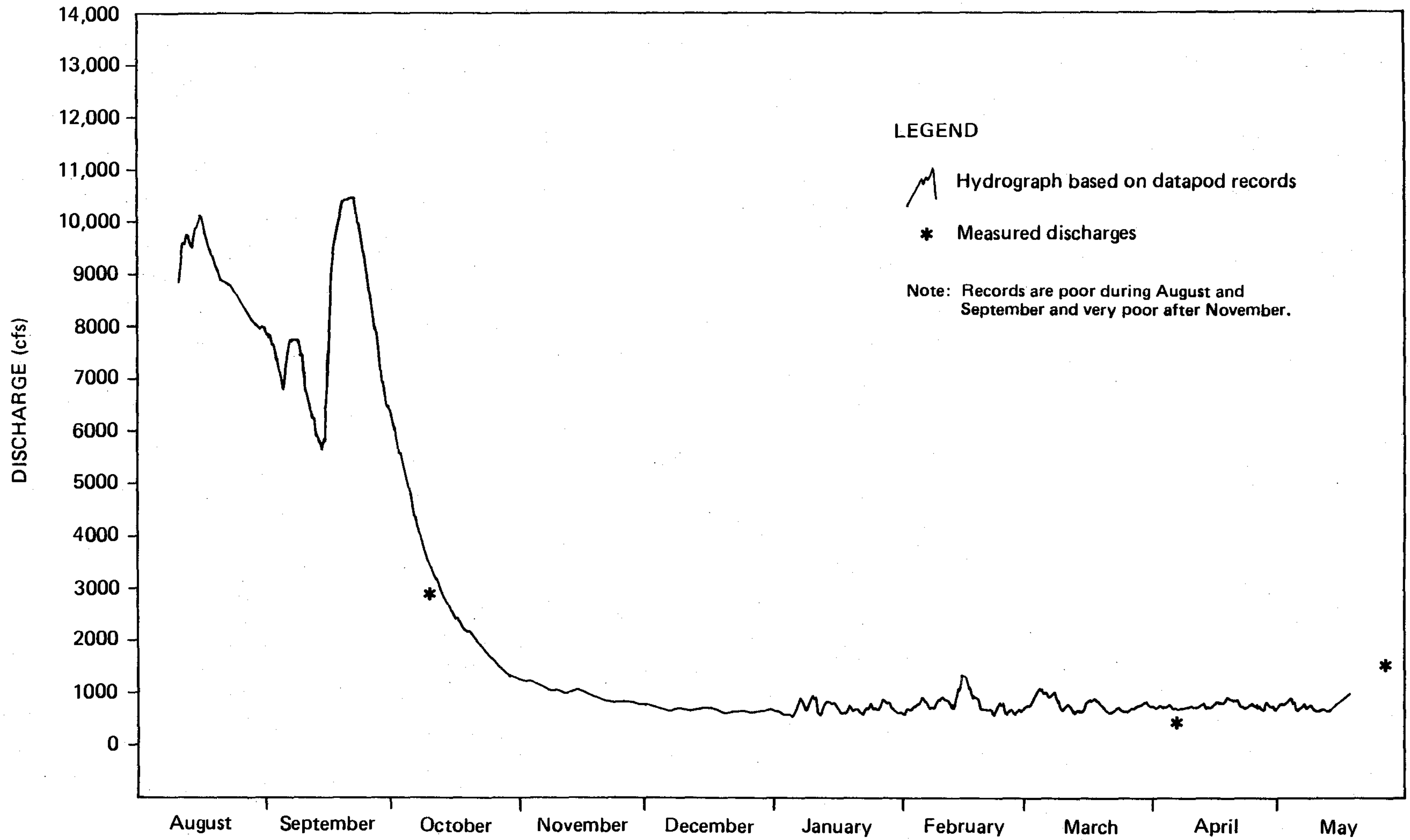


FIGURE 6.144

Discharge Hydrograph of the Chakachatna River at the Chakachamna Lake Outlet for the Period August 1982 through May 1983

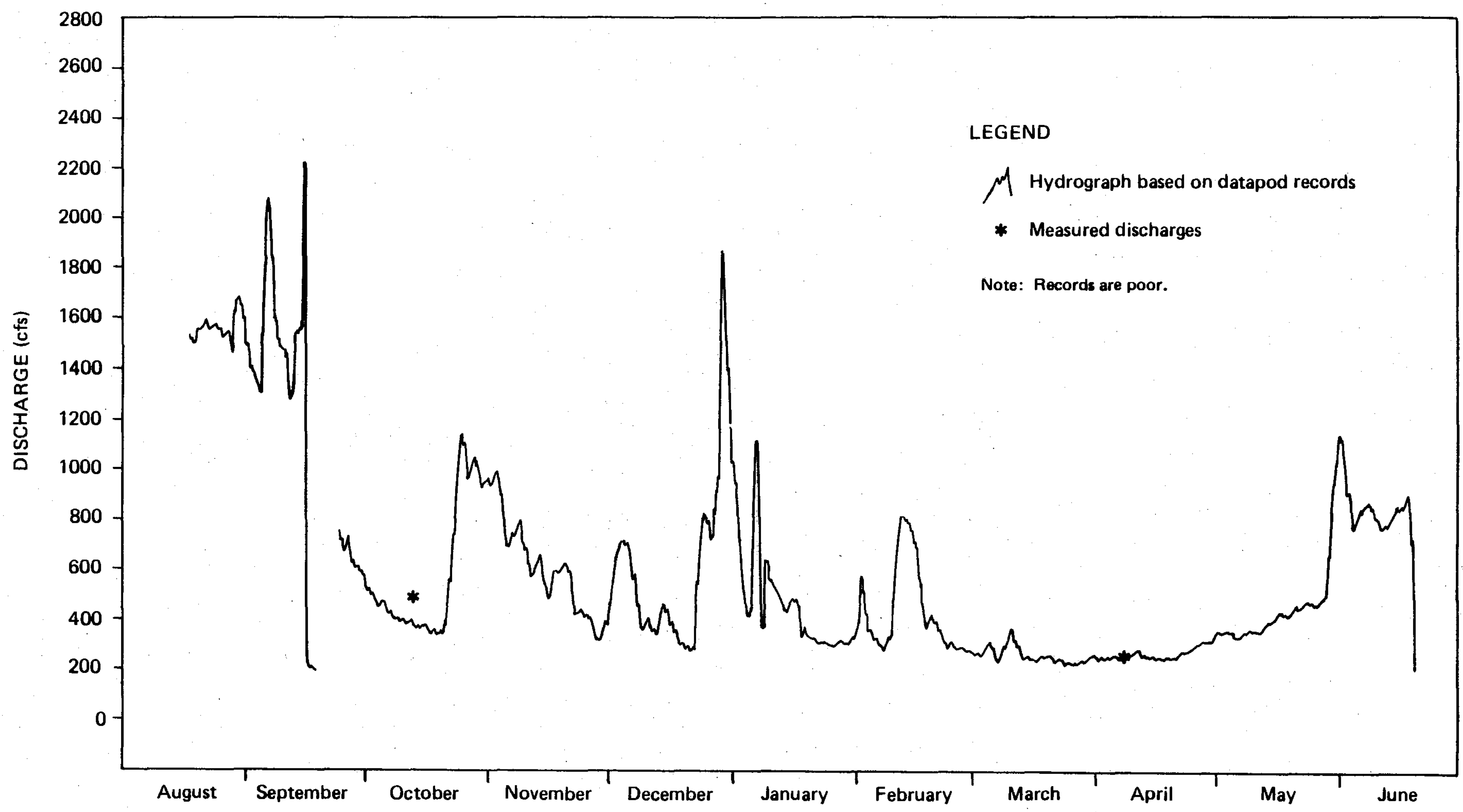


FIGURE 6.145

Discharge Hydrograph of the McArthur River at the Rapids for the Period August 1982 through June 1983

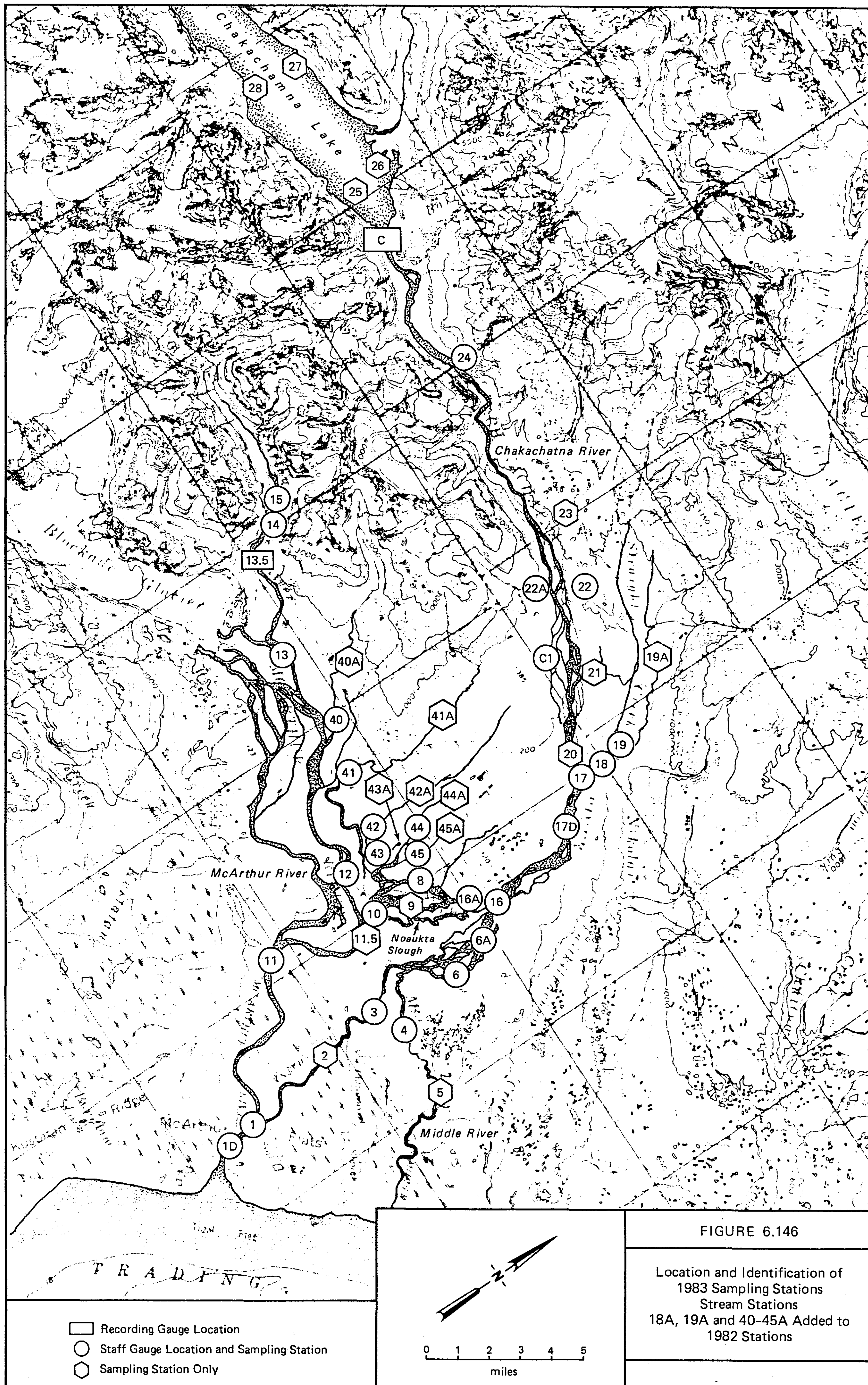


FIGURE 6.146

Location and Identification of 1983 Sampling Stations Stream Stations 18A, 19A and 40-45A Added to 1982 Stations

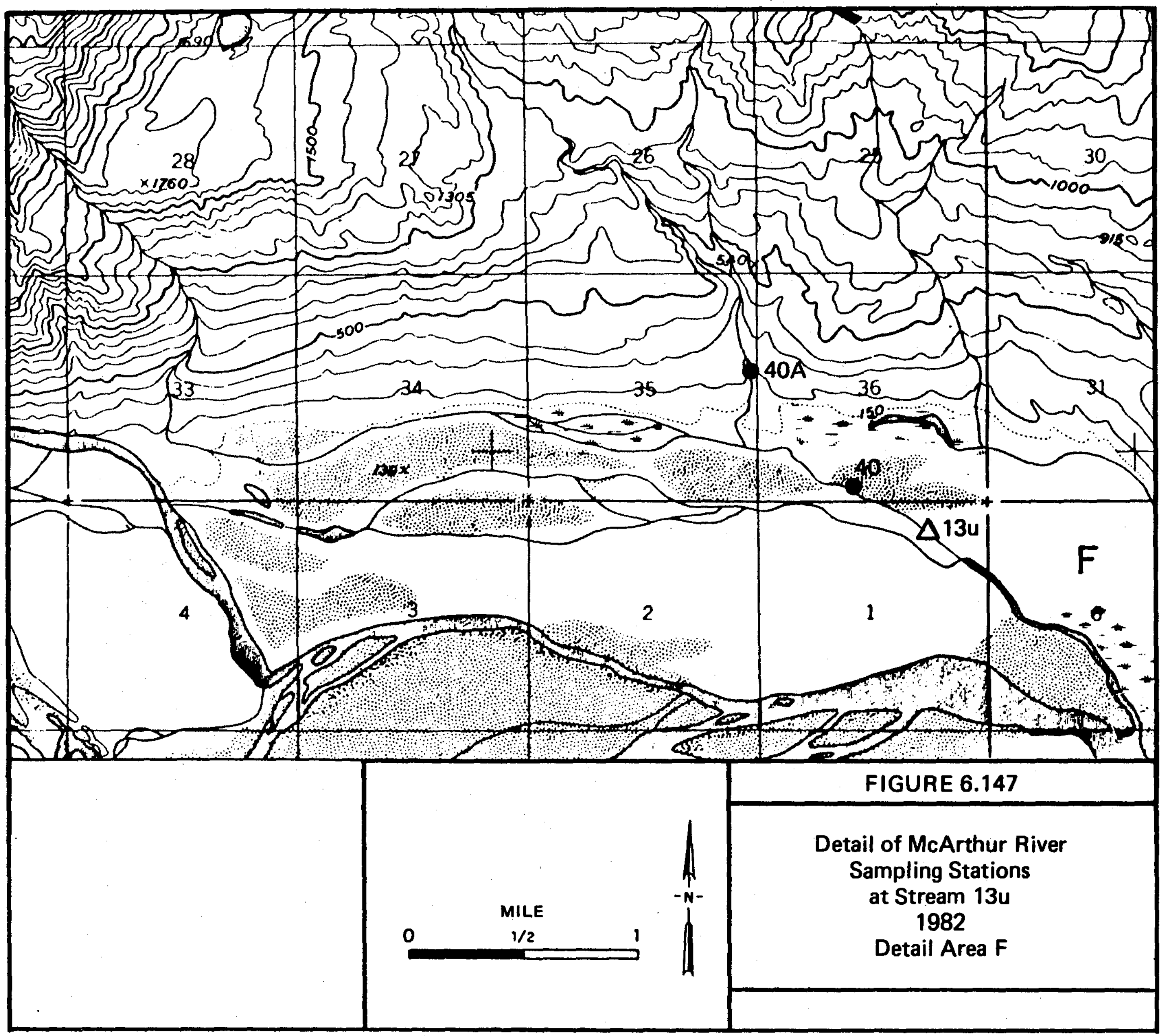


FIGURE 6.147

Detail of McArthur River
Sampling Stations
at Stream 13u
1982
Detail Area F

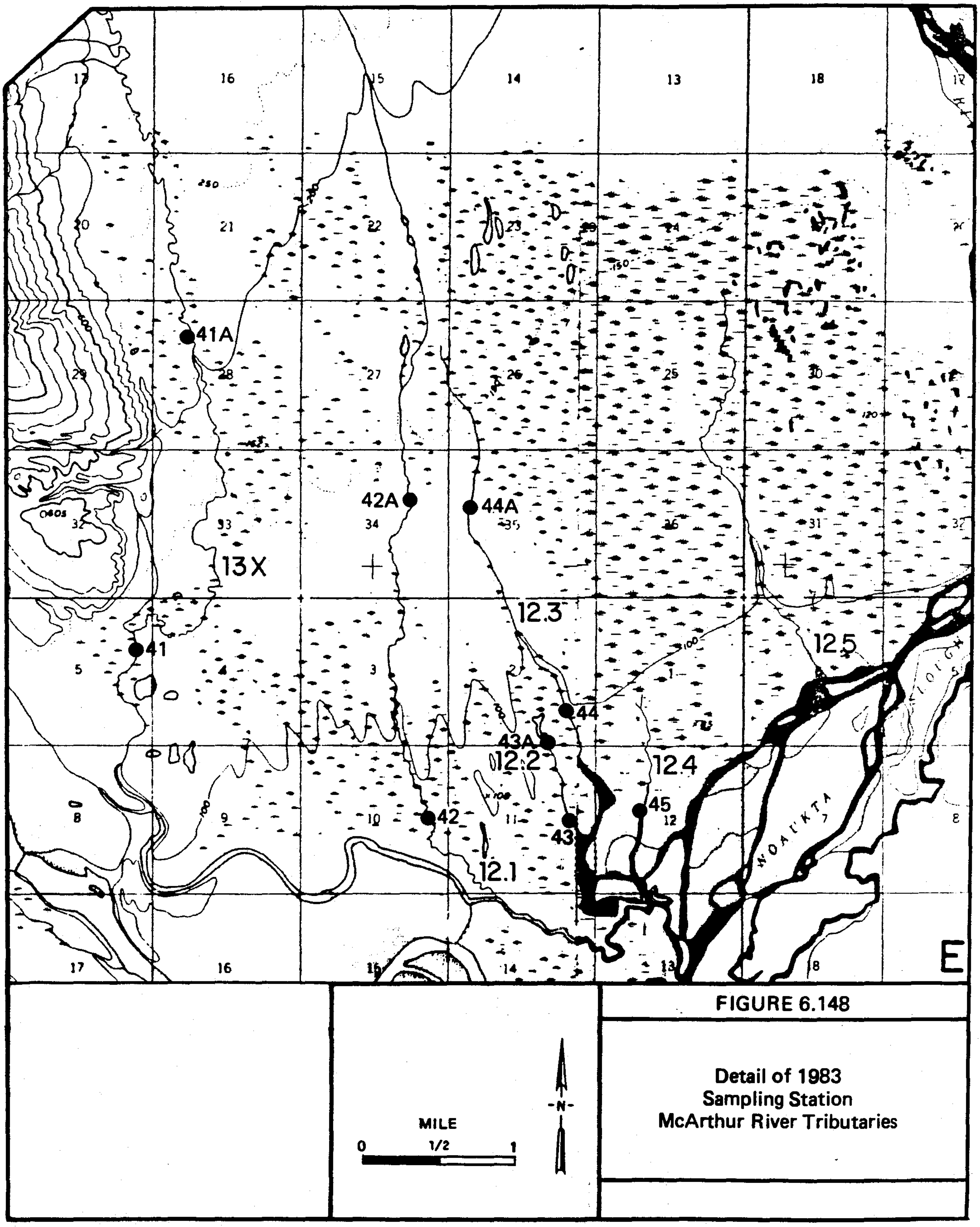


FIGURE 6.148

Detail of 1983 Sampling Station McArthur River Tributaries

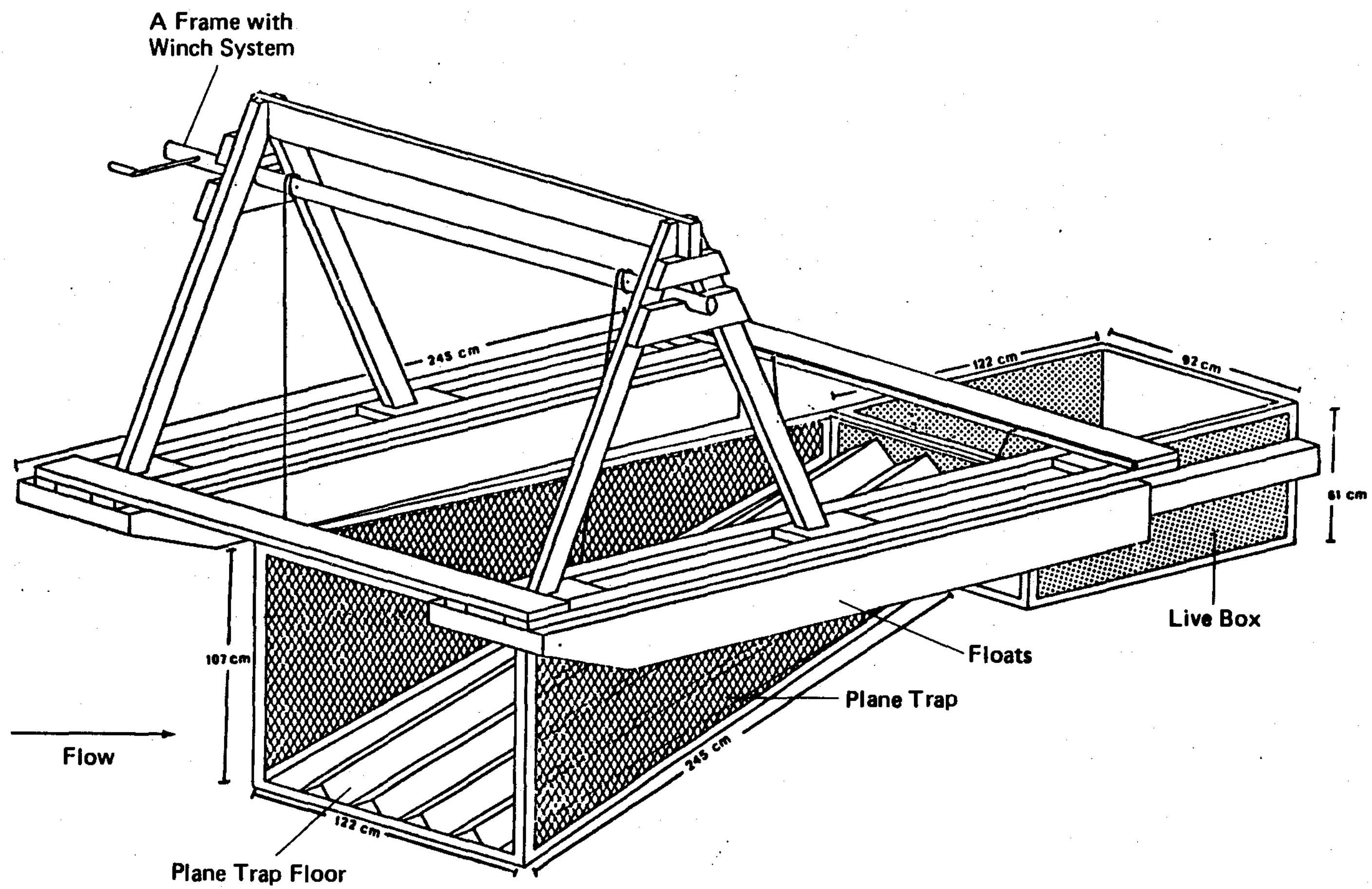
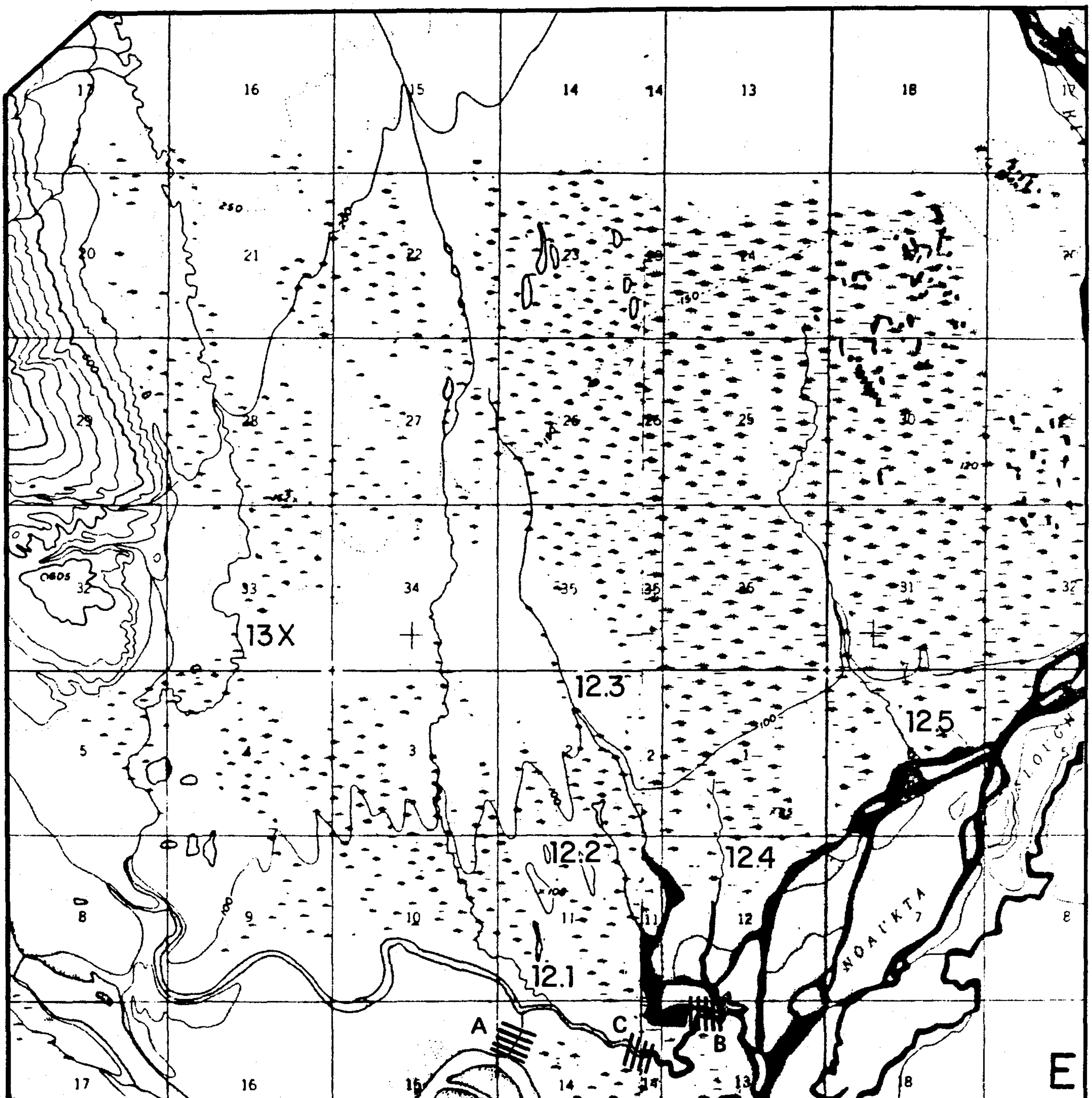


FIGURE 6.149

Inclined Plane Outmigrant Trap



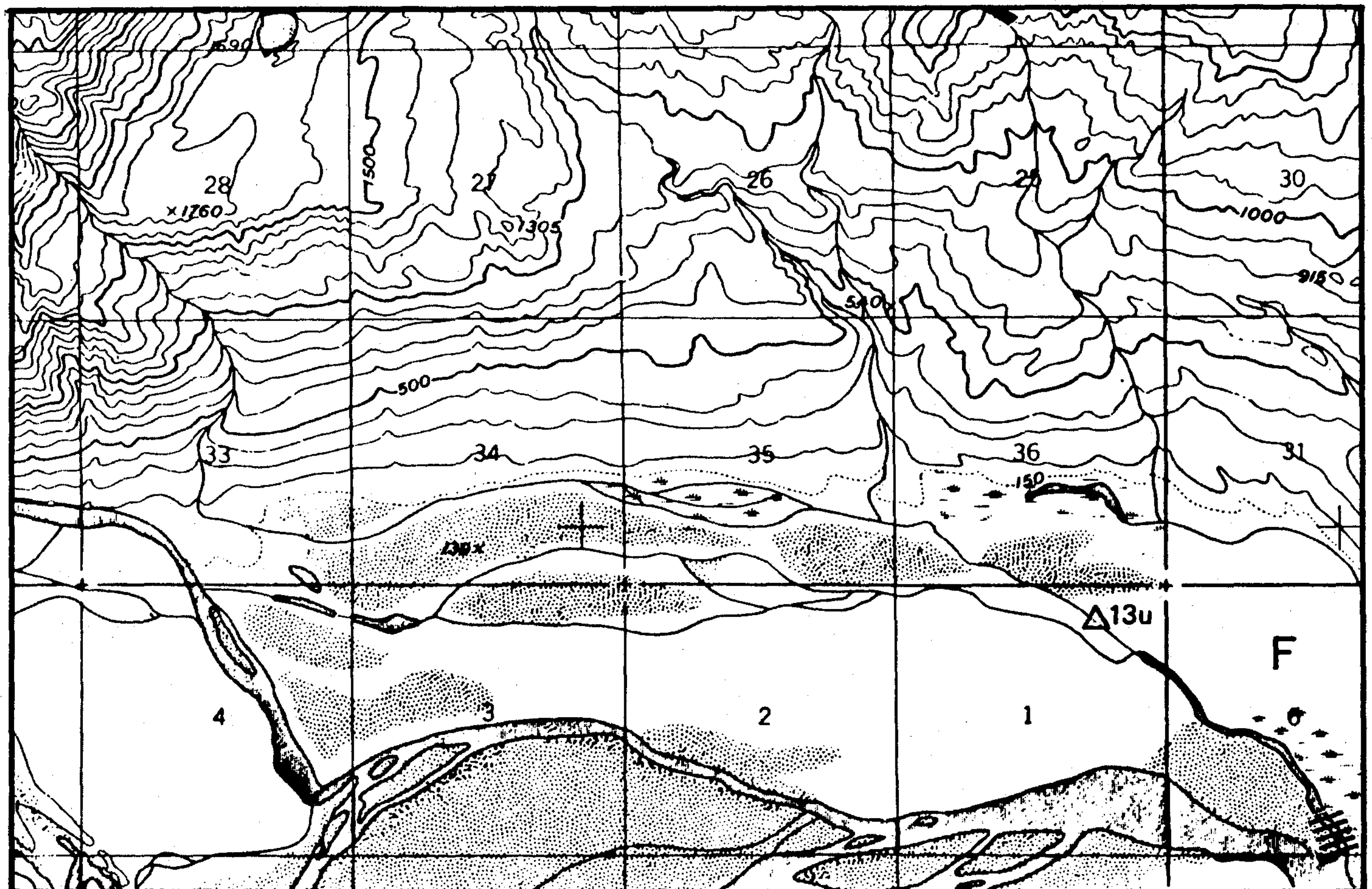
Milling Areas

MILE
0 1/2 1

-N-

FIGURE 6.150

Chinook and Sockeye Milling Areas
Streams 13X, 12.1,
12.2, 12.3
1983
Detail Area E



Milling Areas

MILE

0 1/2 1

N

FIGURE 6.151

Chinook and Sockeye Milling Area
at Stream 13u
1983
Detail Area F

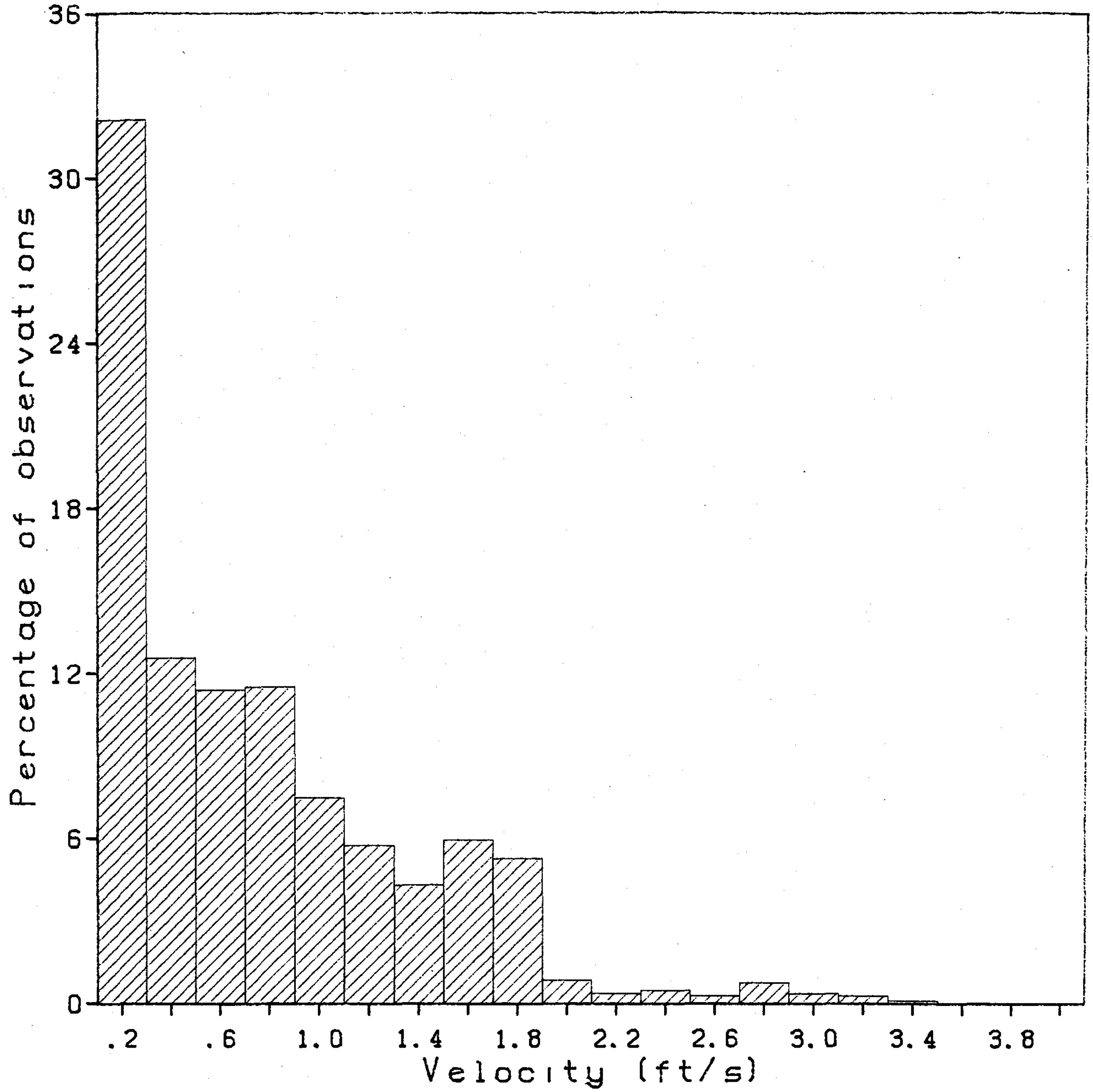


Figure 6.152
Percentage of Observations of
Dolly Varden Juveniles
by velocity intervals
1982 and 1983 data

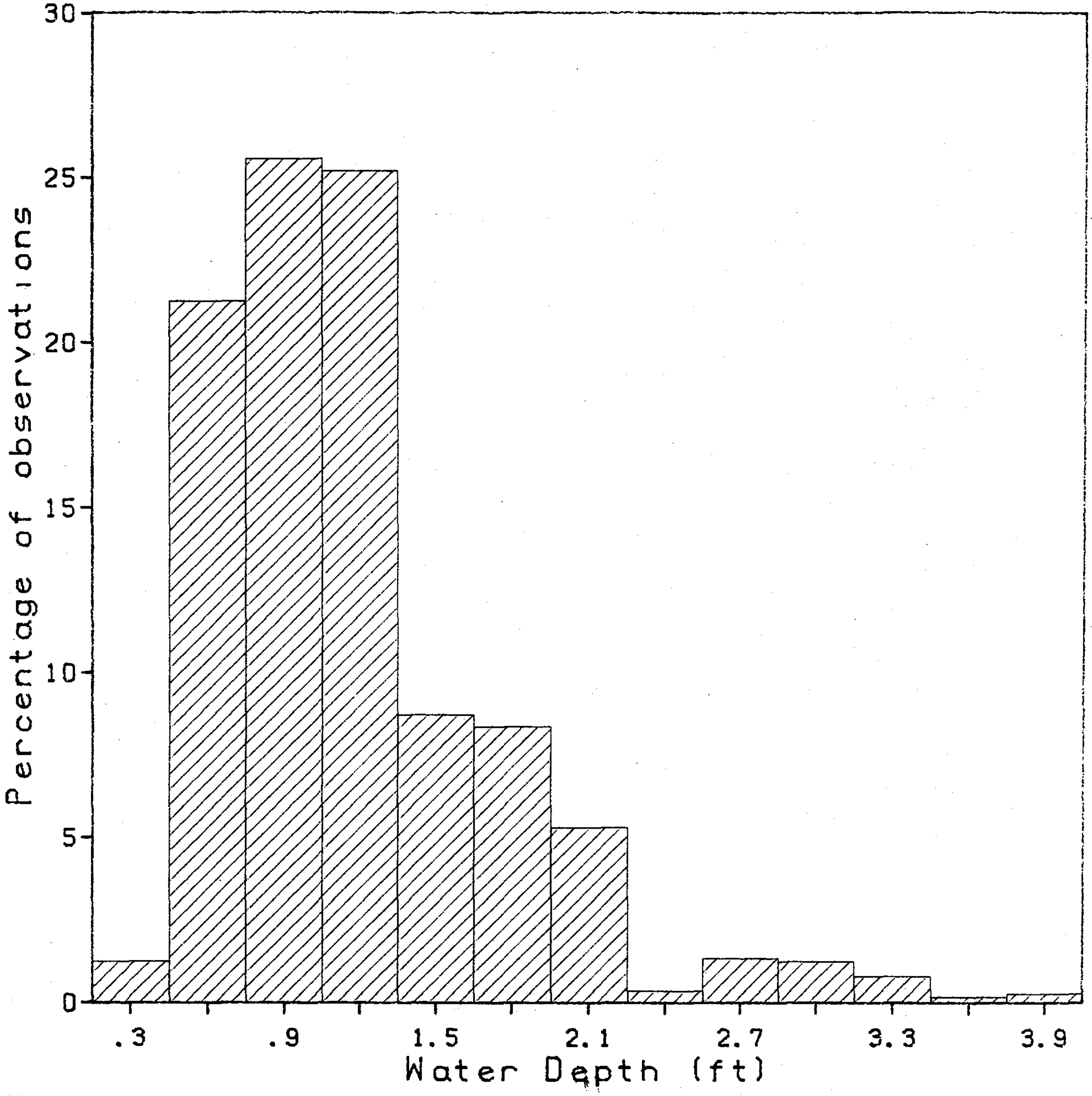


Figure 6.153
Percentage of Observations of Dolly Varden Juveniles by depth intervals 1982 and 1983 data

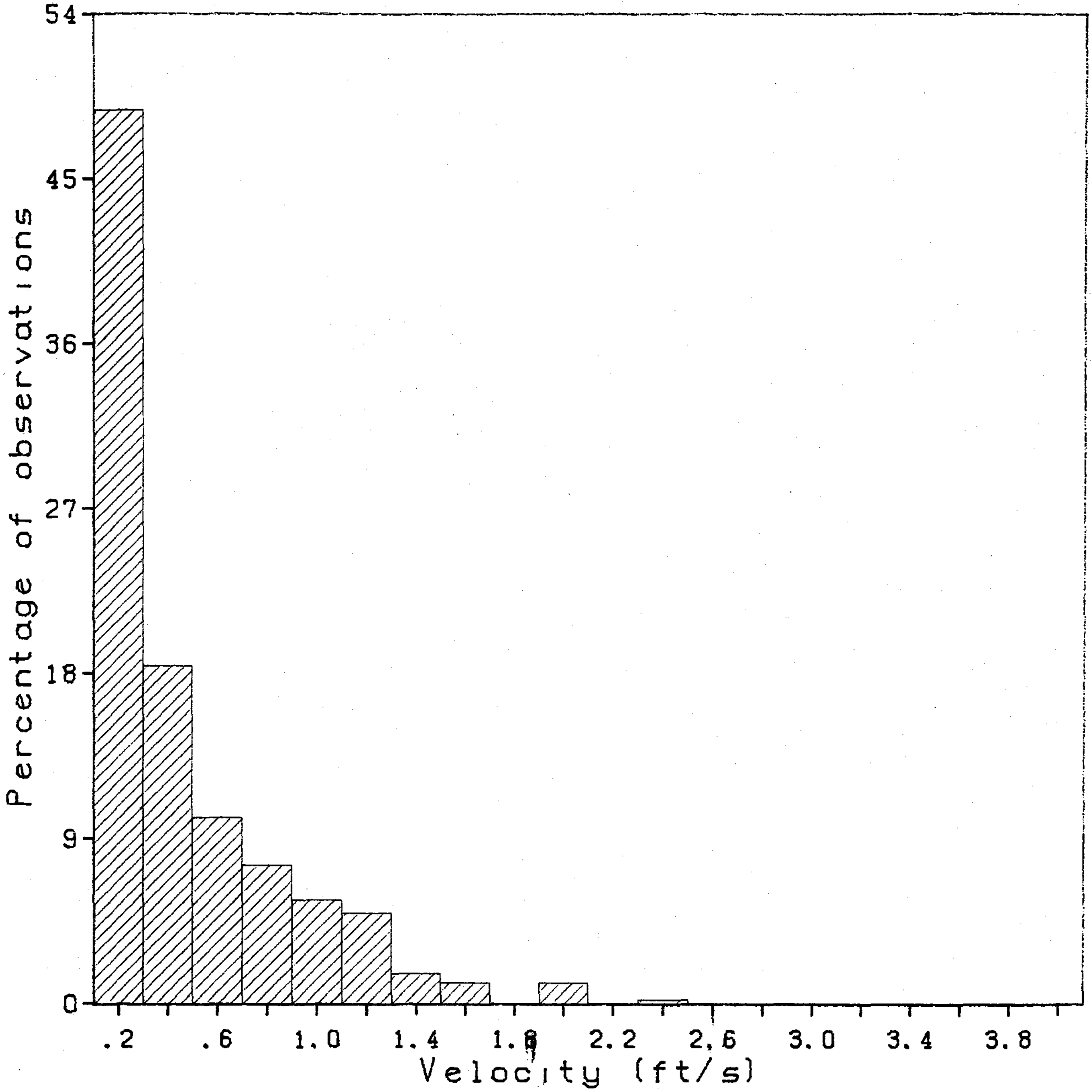


Figure 6.154
Percentage of Observations of
Coho Salmon Juveniles
by velocity intervals
1982 and 1983 data

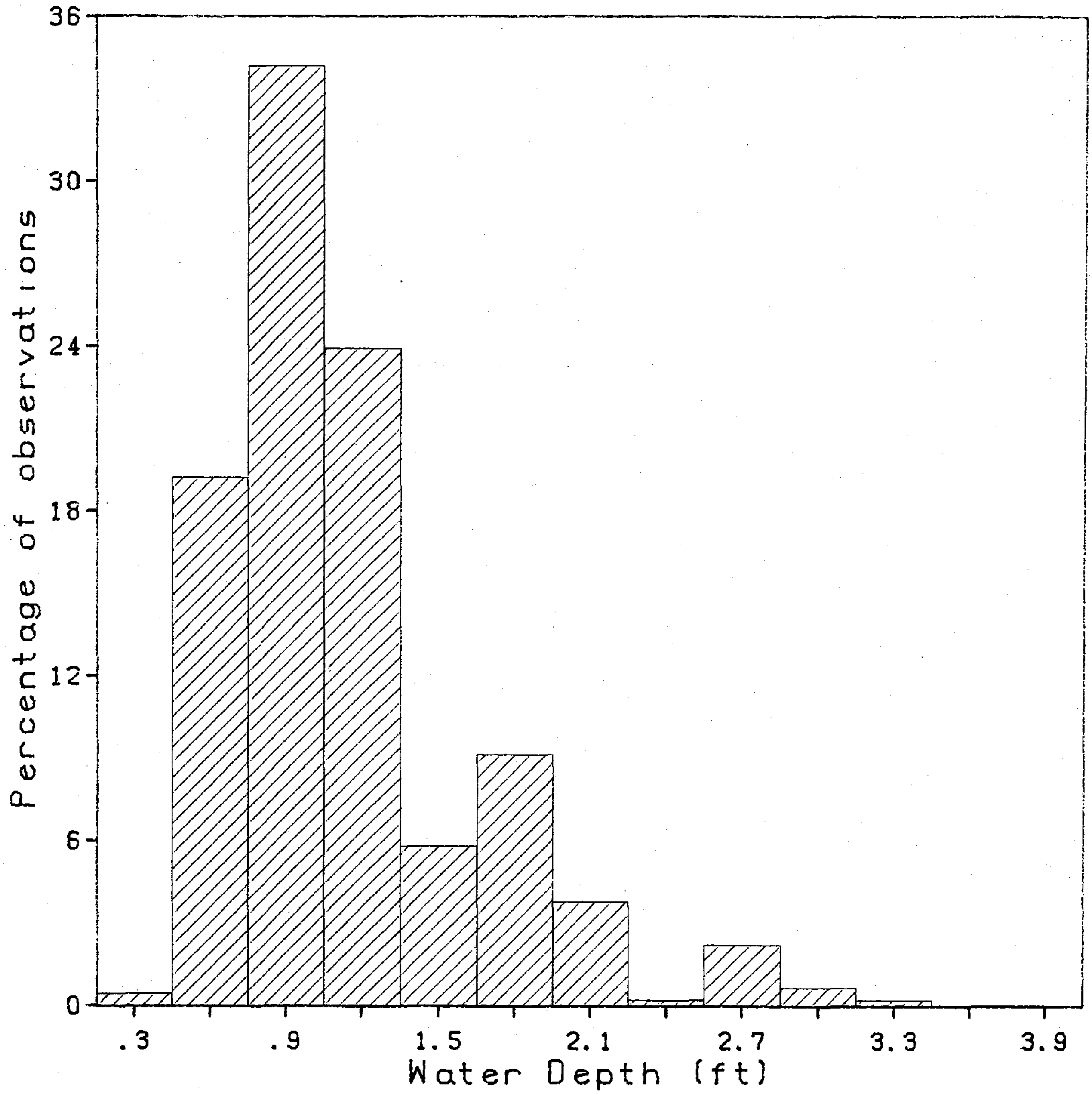


Figure 6.155
Percentage of Observations of
Coho Salmon Juveniles
by depth intervals
1982 and 1983 data

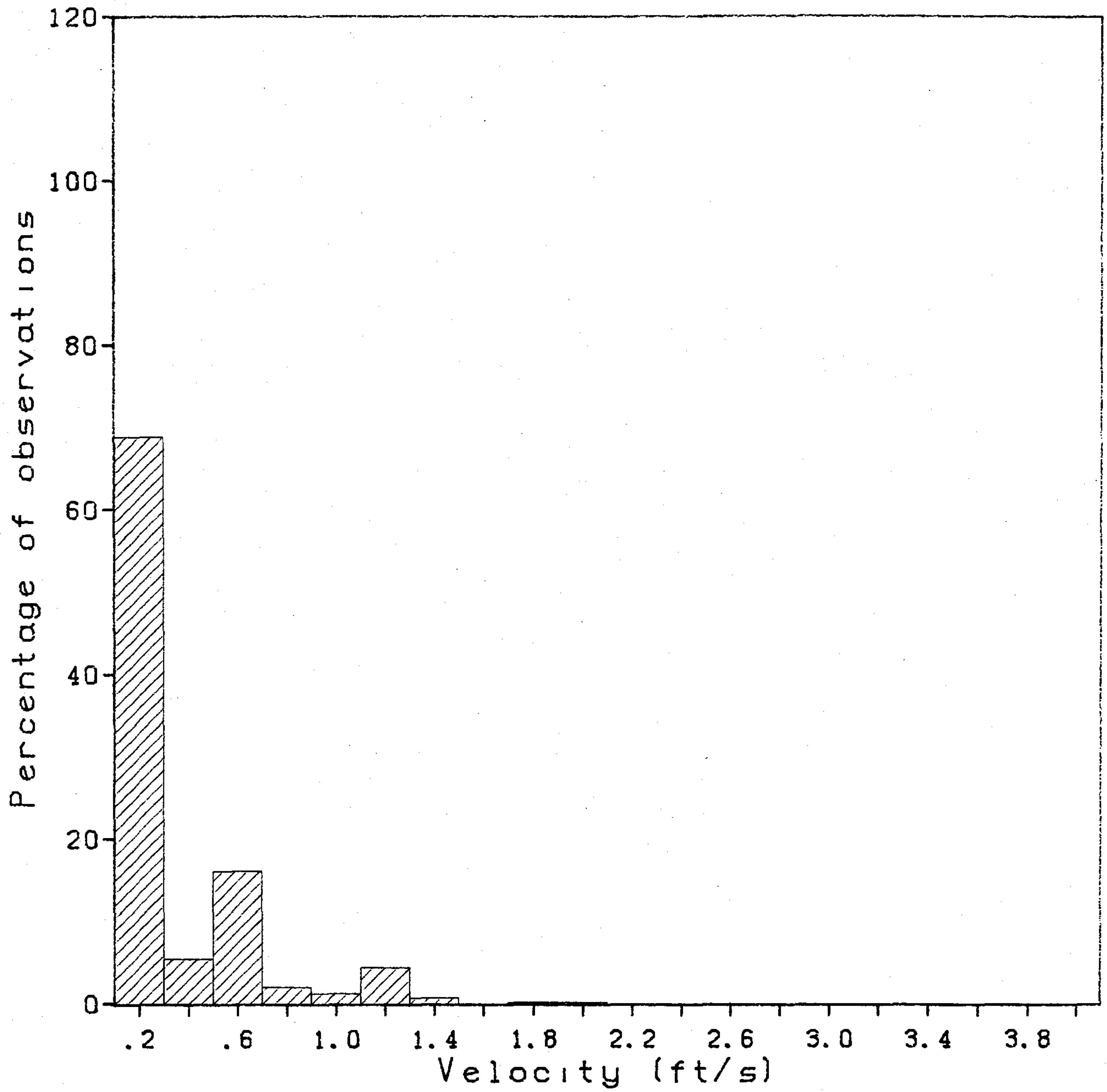


Figure 6.156
Percentage of Observations of
Chinook Salmon Juveniles
by velocity intervals
1982 and 1983 data

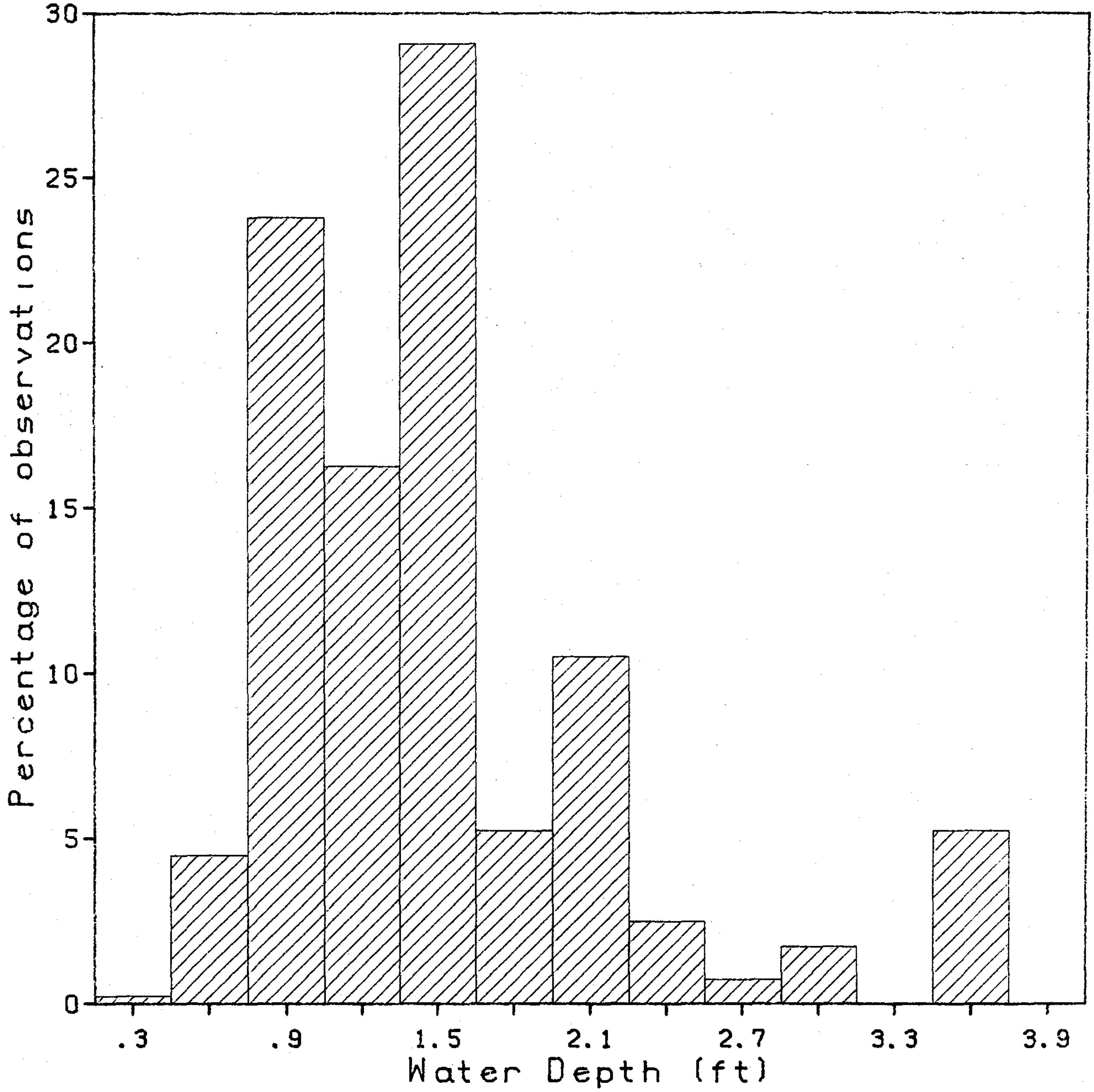


Figure 6.157
Percentage of Observations of
Chinook Salmon Juveniles
by depth intervals
1982 and 1983 data

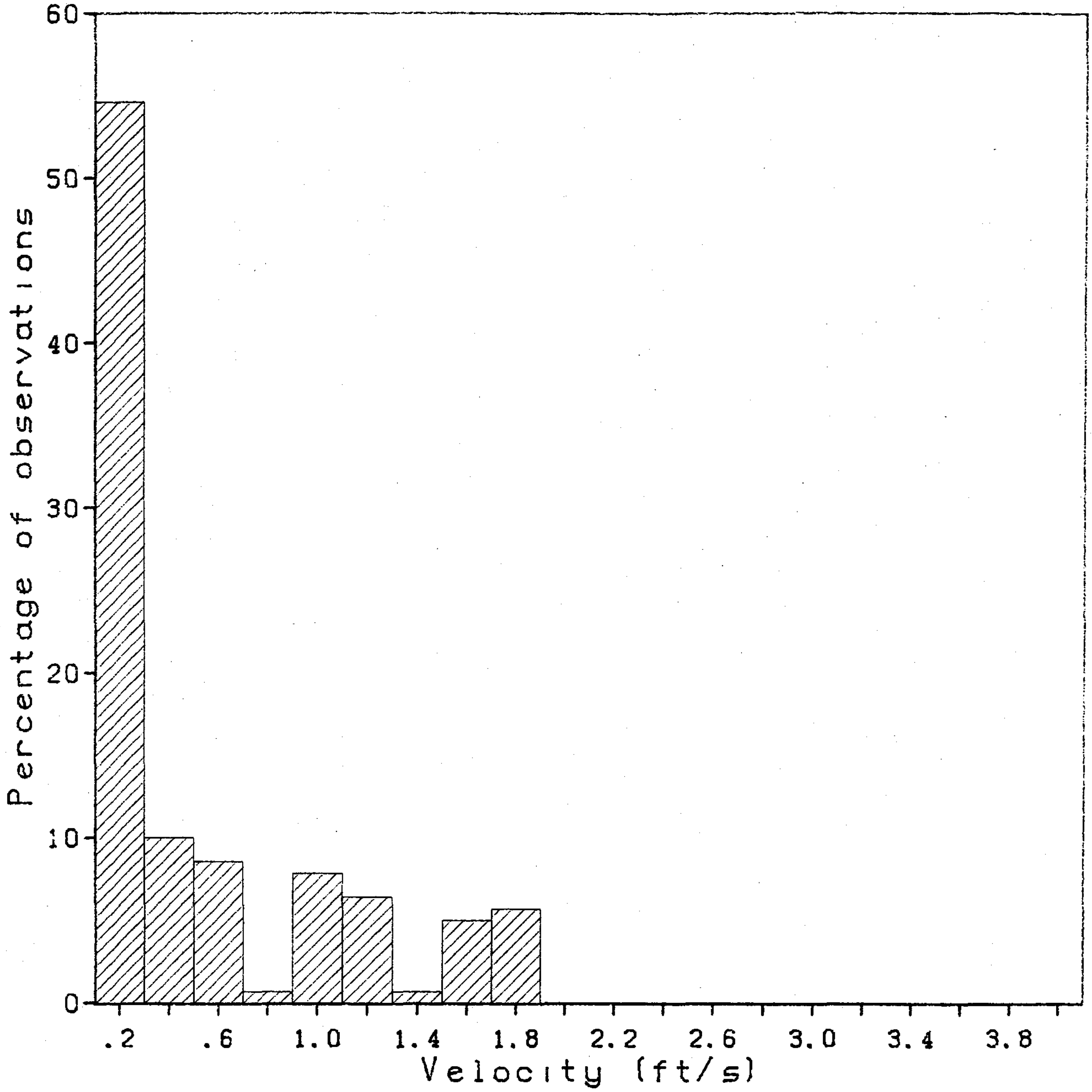


Figure 6.158
Percentage of Observations of
Sockeye Salmon Juveniles
by velocity intervals
1982 and 1983 data

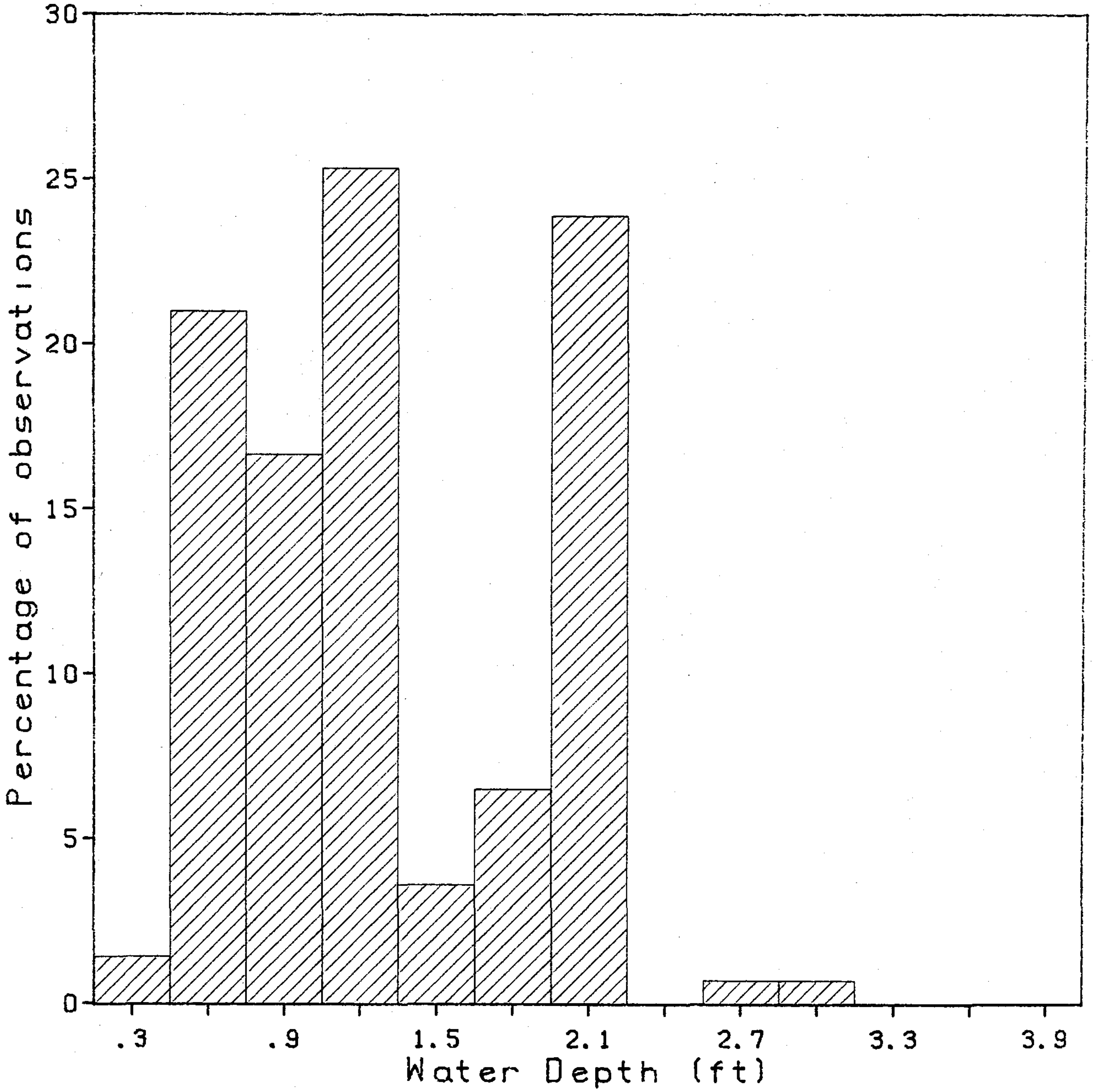


Figure 6,159
Percentage of Observations of
Sockeye Salmon Juveniles
by depth intervals
1982 and 1983 data

APPENDIXES

APPENDIX B

B1. ESCAPEMENT COUNTS BY STREAM

TABLE B1-1. Chakachatna Bridge Area Sloughs (Station 17) Escapement Surveys

Date	Chinook		Sockeye		Water Clarity	Percent Surveyed
	live	carcass	live	carcass		
June 18	0	0	0	0	Excellent	100
22	0	0	0	0	Excellent	100
July 20	0	0	0	0	Excellent	100

TABLE B1-2. Chakachatna Canyon Sloughs Escapement Surveys

Date	Chinook		Sockeye		Water Clarity	Percent Surveyed
	live	carcass	live	carcass		
June 22	0	0	0	0	Good	100
July 20	0	0	0	0	Good-Excellent	100

TABLE B1-3. Straight Creek Mouth and Sloughs Escapement Surveys

Date	Chinook live	Chinook carcass	Water Clarity	Percent Surveyed
June 18	0	0	Fair	100
22	0	0	Good	100
July 20	0	0	Good	100

TABLE B1-4. Chakachatna Tributary C1, Escapement Surveys

Date	Chinook		Sockeye		Water Clarity	Percent Surveyed
	live	carcass	live	carcass		
June 18	0	0	0	0	Excellent	100
22	0	0	0	0	Excellent	100
July 20	0	0	0	0	Excellent	100

TABLE B1-5. McArthur Tributary 13x Escapement Surveys

Date	Chinook		Sockeye		Water Clarity	Percent Surveyed
	live	carcass	live	carcass		
June 22	0	0	0	0	Good	100
July 20	72	0	70	0	Excellent	33

TABLE B1-6. McArthur Tributary 13u Escapement Survey

Date	Chinook		Sockeye		Water Clarity	Percent Surveyed
	live	carcass	live	carcass		
June 17	0	0	0	0	Excellent	100
24	0	0	0	0	Excellent	100
July 20	0	0	16	0	Excellent	100

TABLE B1-7. McArthur Tributary 12.1-12.5 Escapement Surveys

Date	Chinook		Sockeye		Water Clarity	Percent Surveyed
	live	carcass	live	carcass		
June 17	0	0	0	0	Excellent	100
24	0	0	0	0	Excellent	100

TABLE B1-8. Clearwater Tributary to Straight Creek (19)

Date	Chinook		Sockeye		Water Clarity	Percent Surveyed
	live	carcass	live	carcass		
June 22	1	0	0	0	Good	100
July 20	335	0	0	0	Excellent	100

APPENDIX B

B2. CATCH SUMMARIES

TABLE B2-1. SUMMARY OF RESULTS: MINNOW TRAP SAMPLES
APRIL, 1983

STATION	DATE	REPLICATE	SPECIES	LIFE STAGE	NUMBER	LENGTH (CM) MEAN	S.D.	N
1	100483	01	NINE-SPINE STICKLEBACK	JUVENILE	1			0
		02	NINE-SPINE STICKLEBACK	JUVENILE	5	5.20	0.64	5
		03	NINE-SPINE STICKLEBACK	JUVENILE	6	5.48	0.30	6
		03	NINE-SPINE STICKLEBACK	ADULT	2	6.60	0.42	2
		04	NINE-SPINE STICKLEBACK	JUVENILE	9	5.36	0.20	9
		04	NINE-SPINE STICKLEBACK	ADULT	1	7.30	0.00	1
2	100483	01	NO FISH		1			0
		02	NO FISH		1			0
		03	NO FISH		1			0
		04	NO FISH		1			0
3	090483	01	COHO SALMON	PARR	1	7.60	0.00	1
		02	SLIMY SCULPIN	ADULT	1	9.30	0.00	1
		03	COHO SALMON	PARR	1	12.30	0.00	1
		03	SLIMY SCULPIN	JUVENILE	1	6.00	0.00	1
		04	NO FISH		1			0
4	090483	01	COHO SALMON	PARR	2	10.35	0.10	2
		02	COHO SALMON	PARR	8	7.81	2.41	8
		03	DOLLY VARDEN	PARR	3	10.30	1.64	3
		03	COHO SALMON	PARR	5	8.38	2.42	5
		04	DOLLY VARDEN	PARR	1	9.10	0.00	1
		04	COHO SALMON	PARR	3	7.00	1.51	3
		04	SLIMY SCULPIN	ADULT	1	9.70	0.00	1
5	090483	01	TRAP OUT OF WATER		0			
		02	NO FISH		1			0
		03	NO FISH		1			0
		04	COHO SALMON	PARR	1	5.20	0.00	1
5	100483	01	NO FISH		1			0
		02	NO FISH		1			0
6	090483	01	NO FISH		1			0
		02	TRAP MISSING		0			
		03	NO FISH		1			0
		04	NINE-SPINE STICKLEBACK	ADULT	1	6.60	0.00	1
8	100483	01	DOLLY VARDEN	PARR	2	8.00	2.55	2
		01	COHO SALMON	PARR	1	11.80	0.00	1
		01	COHO SALMON	JUVENILE	1	12.80	0.00	1
		01	SLIMY SCULPIN	JUVENILE	1	6.00	0.00	1
		01	NINE-SPINE STICKLEBACK	JUVENILE	3	6.00	0.80	3
		01	NINE-SPINE STICKLEBACK	ADULT	1	7.10	0.00	1
		02	DOLLY VARDEN	JUVENILE	1	13.70	0.00	1
		02	COHO SALMON	PARR	3	7.80	3.04	3
		02	NINE-SPINE STICKLEBACK	ADULT	2	7.10	0.14	2
		03	COHO SALMON	PARR	1	7.30	0.00	1
		03	SLIMY SCULPIN	ADULT	1	9.40	0.00	1

TABLE B2-1. SUMMARY OF RESULTS: MINNOW TRAP SAMPLES
APRIL, 1983

STATION	DATE	REPLICATE	SPECIES	LIFE STAGE	NUMBER	LENGTH (CM) MEAN	S.D.	N
8	100483	03	NINE-SPINE STICKLEBACK	ADULT	2	7.80	0.14	2
		04	DOLLY VARDEN	PARR	1	12.70	0.00	1
		04	COHO SALMON	PARR	1	5.30	0.00	1
		04	NINE-SPINE STICKLEBACK	JUVENILE	4	6.07	0.81	4
		04	NINE-SPINE STICKLEBACK	ADULT	1	6.90	0.00	1
11	100483	01	NINE-SPINE STICKLEBACK	JUVENILE	1	5.40	0.00	1
		02	COHO SALMON	PARR	2	5.60	0.42	2
		03	NO FISH		1			0
14	100483	01	DOLLY VARDEN	PARR	4	10.05	3.33	4
		02	NO FISH		1			0
		02	DOLLY VARDEN	PARR	2	9.40	3.82	2
		03	NO FISH		1			0
		04	DOLLY VARDEN	PARR	2	9.65	2.19	2
		04	SLIMY SCULPIN	JUVENILE	1	7.70	0.00	1
15	100483	01	DOLLY VARDEN	PARR	2	6.95	0.64	2
		01	SLIMY SCULPIN	JUVENILE	1	6.40	0.00	1
		02	DOLLY VARDEN	PARR	1	6.00	0.00	1
		03	NO FISH		1			0
		04	NO FISH		1			0
16	100483	01	NO FISH		1			0
		02	DOLLY VARDEN	PARR	4	9.52	0.66	4
		03	NO FISH		1			0
		04	NO FISH		1			0
17	100483	01	DOLLY VARDEN	PARR	1	9.20	0.00	1
		01	COHO SALMON	PARR	3	3.93	0.62	3
		02	DOLLY VARDEN	PARR	1			0
		03	NO FISH		1			0
		04	NO FISH		1			0
19	100483	01	TRAP FROZEN		0			
		02	TRAP FROZEN		0			
		03	SLIMY SCULPIN	JUVENILE	1	8.60	0.00	1
		04	NO FISH		1			0
22	100483	01	DOLLY VARDEN	PARR	1	11.40	0.00	1
		02	DOLLY VARDEN	PARR	1	11.30	0.00	1
		03	NO FISH		1			0
		04	DOLLY VARDEN	PARR	6	10.27	1.62	6
		04	DOLLY VARDEN	JUVENILE	1	15.30	0.00	1
		04	PYGMY WHITE FISH	JUVENILE	1	11.10	0.00	1
16A	100483	01	NO FISH		1			0
		02	COHO SALMON	PARR	2	8.65	2.76	2
		03	DOLLY VARDEN	PARR	4	10.35	3.03	4
		03	DOLLY VARDEN	JUVENILE	1	9.70	0.00	1

TABLE 32-1. SUMMARY OF RESULTS: MINNOW TRAP SAMPLES
APRIL, 1983

STATION	DATE	REPLICATE	SPECIES	LIFE STAGE	NUMBER	LENGTH (CM) MEAN	S.D.	N
16A	100483	03	COHO SALMON	PARR	3	10.10	0.98	3
		03	NINE-SPINE STICKLEBACK	JUVENILE	5	5.52	1.00	5
		03	NINE-SPINE STICKLEBACK	ADULT	3	6.30	0.17	3
		04	NINE-SPINE STICKLEBACK	ADULT	2	7.55	0.50	2

TABLE B2-2. SUMMARY OF RESULTS: ELECTROFISHING SAMPLES
APRIL, 1983

STATION	DATE	REPLICATE	SPECIES	LIFE STAGE	NUMBER	LENGTH (CM) MEAN	S.D.	N
13	050483	01	DOLLY VARDEN	PARR	17	5.82	0.96	17
		01	SLIMY SCULPIN	JUVENILE	1	6.00	0.00	1
		02	DOLLY VARDEN	PARR	7	5.72	1.06	6
		02	COHO SALMON	PARR	1			0
15	050483	01	DOLLY VARDEN	PARR	3	3.93	1.21	3
		01	COHO SALMON	PARR	8	3.20	0.22	8
		01	SOCKEYE SALMON	FRY	1	3.30	0.00	1
		01	SOCKEYE SALMON	PARR	2	3.15	0.10	2
		01	CHINOOK SALMON	PARR	1	3.80	0.00	1
17	100483	01	COHO SALMON	FRY	2	3.00	0.28	2
		01	COHO SALMON	PARR	9	3.66	0.66	9
		01	SLIMY SCULPIN	JUVENILE	5	4.42	1.96	5
		01	CHUM SALMON	PARR	2	4.05	0.36	2
19	100483	01	DOLLY VARDEN	PARR	9	8.00	2.73	9
		01	COHO SALMON	PARR	1	7.30	0.00	1
		01	CHINOOK SALMON	PARR	1	7.20	0.00	1
		01	SLIMY SCULPIN	JUVENILE	1	6.40	0.00	1
		01	SLIMY SCULPIN	ADULT	1	8.30	0.00	1
22	050483	01	DOLLY VARDEN	PARR	3	8.10	3.38	3
		02	DOLLY VARDEN	PARR	5	11.42	2.13	5
		03	DOLLY VARDEN	PARR	2	10.85	0.10	2
		03	DOLLY VARDEN	JUVENILE	4	12.45	1.77	4
42	050483	01	DOLLY VARDEN	PARR	7	5.29	0.52	7
		01	COHO SALMON	FRY	1	3.10	0.00	1
		01	COHO SALMON	PARR	1	3.20	0.00	1
		01	SOCKEYE SALMON	FRY	1	3.10	0.00	1
40A	030483	01	DOLLY VARDEN	PARR	6	5.23	1.10	6
		01	COHO SALMON	PARR	3	6.20	1.82	3
		01	RAINBOW TROUT	PARR	1	5.30	0.00	1
		01	SLIMY SCULPIN	JUVENILE	3	5.63	2.58	3
		01	SLIMY SCULPIN	ADULT	1			0
		01	NINE-SPINE STICKLEBACK	JUVENILE	3	4.47	0.81	3

TABLE B2-3. SUMMARY OF RESULTS: DIP NET SAMPLES
APRIL, 1983

STATION	DATE	REPLICATE	SPECIES	LIFE STAGE	NUMBER	LENGTH (CM) MEAN	S.D.	N
17	100483	01	DOLLY VARDEN	PARR	1	4.10	0.00	1
		01	COHO SALMON	PARR	20	3.72	0.42	9
		01	SOCKEYE SALMON	FRY	1			0
		01	SOCKEYE SALMON	PARR	12	4.01	0.20	8
		01	CHUM SALMON	FRY	4	3.92	0.30	4
		01	CHUM SALMON	PARR	68	3.90	0.22	22

TABLE B2-4. SUMMARY OF RESULTS: MINNOW TRAP SAMPLES
JUNE, 1983

STATION	DATE	REPLICATE	SPECIES	LIFE STAGE	NUMBER	LENGTH (CM) MEAN	S.D.	N
1	230683	01	THREE-SPINE STICKLEBACK	ADULT	8	8.00	1.11	8
		02	THREE-SPINE STICKLEBACK	ADULT	2	8.35	0.36	2
		03	COHO SALMON	PARR	1	9.70	0.00	1
		03	DOLLY VARDEN	PARR	1	12.20	0.00	1
		04	DOLLY VARDEN	PARR	2	13.50	0.14	2
		04	DOLLY VARDEN	JUVENILE	2	13.10	1.98	2
		04	THREE-SPINE STICKLEBACK	ADULT	4	8.25	0.42	4
		05	DOLLY VARDEN	PARR	2	11.80	0.71	2
		05	COHO SALMON	PARR	2	9.80	1.70	2
		05	DOLLY VARDEN	JUVENILE	2	14.70	1.98	2
		05	THREE-SPINE STICKLEBACK	ADULT	12	8.15	0.42	12
		06	DOLLY VARDEN	PARR	2	11.35	1.06	2
		06	DOLLY VARDEN	JUVENILE	2	14.10	1.13	2
		06	THREE-SPINE STICKLEBACK	ADULT	10	8.53	0.39	10
		07	DOLLY VARDEN	JUVENILE	2	15.15	1.49	2
		07	THREE-SPINE STICKLEBACK	ADULT	10	8.37	0.24	10
		08	NINE-SPINE STICKLEBACK	JUVENILE	1	4.70	0.00	1
		08	DOLLY VARDEN	JUVENILE	1	13.10	0.00	1
		08	THREE-SPINE STICKLEBACK	ADULT	5	8.22	0.58	5
		08	SLIMY SCULPIN	ADULT	3	8.87	0.41	3
		09	SLIMY SCULPIN	JUVENILE	2	5.80	0.71	2
		09	THREE-SPINE STICKLEBACK	ADULT	1	7.60	0.00	1
		10	CHINOOK SALMON	PARR	1	9.10	0.00	1
		10	DOLLY VARDEN	JUVENILE	2	14.10	0.00	2
		10	THREE-SPINE STICKLEBACK	ADULT	11	8.41	0.37	11
2	230683	02	DOLLY VARDEN	PARR	1	7.50	0.00	1
		02	COHO SALMON	PARR	1	10.00	0.00	1
		02	DOLLY VARDEN	JUVENILE	3	11.23	1.52	3
2	240683	01	NO FISH		1			0
		02	DOLLY VARDEN	PARR	3	40.80	51.27	3
		02	DOLLY VARDEN	JUVENILE	5	12.44	1.44	5
		03	DOLLY VARDEN	PARR	2	9.35	0.78	2
		03	DOLLY VARDEN	JUVENILE	1	13.50	0.00	1
		03	SLIMY SCULPIN	JUVENILE	1	6.10	0.00	1
		03	SLIMY SCULPIN	ADULT	1	8.30	0.00	1
		04	DOLLY VARDEN	JUVENILE	1	11.30	0.00	1
		04	SLIMY SCULPIN	JUVENILE	1	6.70	0.00	1
		05	SLIMY SCULPIN	ADULT	1	7.90	0.00	1
		06	NO FISH		1			0
		07	DOLLY VARDEN	JUVENILE	1	10.10	0.00	1
		08	THREE-SPINE STICKLEBACK	JUVENILE	1	8.20	0.00	1
		08	SLIMY SCULPIN	ADULT	2	8.30	0.28	2
		09	NO FISH		1			0
		10	COHO SALMON	PARR	1	3.30	0.00	1
		10	DOLLY VARDEN	JUVENILE	2	13.15	0.10	2
		10	SLIMY SCULPIN	JUVENILE	1	4.30	0.00	1
		10	THREE-SPINE STICKLEBACK	ADULT	1	8.10	0.00	1

TABLE B2-4. SUMMARY OF RESULTS: MINNOW TRAP SAMPLES
JUNE, 1983

STATION	DATE	REPLICATE	SPECIES	LIFE STAGE	NUMBER	LENGTH (CM) MEAN	S.D.	N
3	250683	01	DOLLY VARDEN	PARR	2	9.45	0.10	2
		02	DOLLY VARDEN	PARR	2	11.55	0.10	2
		02	DOLLY VARDEN	JUVENILE	2	12.25	2.33	2
		03	NO FISH		1			0
		04	NO FISH		1			0
		05	DOLLY VARDEN	PARR	1	9.80	0.00	1
		05	SLIMY SCULPIN	ADULT	1	7.10	0.00	1
		06	TRAP BURIED		0			
		07	DOLLY VARDEN	JUVENILE	2	11.45	1.63	2
		07	THREE-SPINE STICKLEBACK	ADULT	1	8.00	0.00	1
		08	NO FISH		1			0
		09	DOLLY VARDEN	PARR	1	9.50	0.00	1
		09	SLIMY SCULPIN	ADULT	1	10.60	0.00	1
		10	NO FISH		1			0
4	200683	01	DOLLY VARDEN	PARR	2	9.45	1.91	2
		01	THREE-SPINE STICKLEBACK	ADULT	1	8.00	0.00	1
		02	DOLLY VARDEN	PARR	3	8.13	0.75	3
		03	DOLLY VARDEN	PARR	4	11.45	2.37	4
		03	SLIMY SCULPIN	JUVENILE	1	8.10	0.00	1
		04	NO FISH		1			0
		05	NO FISH		1			0
		06	DOLLY VARDEN	PARR	1	11.10	0.00	1
		06	SLIMY SCULPIN	ADULT	1	10.40	0.00	1
		07	DOLLY VARDEN	PARR	1	10.60	0.00	1
		07	COHO SALMON	PARR	1	8.70	0.00	1
		07	DOLLY VARDEN	PARR	1	13.20	0.00	1
		07	COHO SALMON	PARR	1	7.50	0.00	1
		07	SLIMY SCULPIN	ADULT	1	10.00	0.00	1
		08	DOLLY VARDEN	PARR	1	13.30	0.00	1
		08	SLIMY SCULPIN	ADULT	1	8.50	0.00	1
		09	NO FISH		1			0
		10	COHO SALMON	PARR	6	5.12	0.92	6
		10	SLIMY SCULPIN	ADULT	1	9.30	0.00	1
5	200683	01	COHO SALMON	PARR	2	11.00	4.38	2
		01	THREE-SPINE STICKLEBACK	ADULT	3	8.53	0.65	3
		02	COHO SALMON	PARR	5	12.04	1.46	5
		02	THREE-SPINE STICKLEBACK	ADULT	35	8.45	0.65	35
		03	SOCKEYE SALMON	PARR	1	5.60	0.00	1
		03	SLIMY SCULPIN	JUVENILE	1	3.50	0.00	1
		03	THREE-SPINE STICKLEBACK	ADULT	2	8.65	0.10	2
		04	THREE-SPINE STICKLEBACK	ADULT	1	8.40	0.00	1
		05	THREE-SPINE STICKLEBACK	ADULT	2	8.35	0.50	2
		05	SLIMY SCULPIN	ADULT	1	9.70	0.00	1
		05	THREE-SPINE STICKLEBACK	ADULT	1	8.20	0.00	1
		06	COHO SALMON	PARR	1	8.10	0.00	1
		06	THREE-SPINE STICKLEBACK	ADULT	4	7.07	1.72	4
		07	THREE-SPINE STICKLEBACK	ADULT	1	8.30	0.00	1
		08	DOLLY VARDEN	PARR	2	10.85	2.48	2

TABLE B2-4. SUMMARY OF RESULTS: MINNOW TRAP SAMPLES
JUNE, 1983

STATION	DATE	REPLICATE	SPECIES	LIFE STAGE	NUMBER	LENGTH (CM) MEAN	S.D.	N
5	200683	08	SLIMY SCULPIN	JUVENILE	1	4.60	0.00	1
		08	THREE-SPINE STICKLEBACK	ADULT	1	8.30	0.00	1
		09	THREE-SPINE STICKLEBACK	ADULT	4	8.05	0.20	4
		10	TRAP MANGLED BY BEAR		0			
6	200683	01	DOLLY VARDEN	PARR	2	10.90	1.98	2
		01	SLIMY SCULPIN	ADULT	1	10.80	0.00	1
		02	DOLLY VARDEN	PARR	1	12.00	0.00	1
		03	DOLLY VARDEN	PARR	5	11.30	2.26	5
		04	SLIMY SCULPIN	JUVENILE	2	5.40	0.14	2
		04	THREE-SPINE STICKLEBACK	ADULT	1	8.70	0.00	1
		05	NO FISH		1			0
		06	DOLLY VARDEN	PARR	1	12.90	0.00	1
		06	COHO SALMON	PARR	1	9.40	0.00	1
		06	SLIMY SCULPIN	JUVENILE	1	5.60	0.00	1
		07	DOLLY VARDEN	PARR	1	10.20	0.00	1
		07	COHO SALMON	PARR	2	5.75	3.18	2
		07	SLIMY SCULPIN	ADULT	1	8.60	0.00	1
		08	DOLLY VARDEN	PARR	4	11.35	3.65	4
		08	SLIMY SCULPIN	JUVENILE	1	5.00	0.00	1
		09	DOLLY VARDEN	PARR	1	9.00	0.00	1
		09	THREE-SPINE STICKLEBACK	ADULT	2	8.25	0.10	2
		09	SLIMY SCULPIN	ADULT	1	8.50	0.00	1
		10	NO FISH		1			0
8	220683	01	CHUM SALMON	PARR	1	3.30	0.00	1
		01	SLIMY SCULPIN	JUVENILE	1	6.50	0.00	1
		02	COHO SALMON	PARR	1	4.10	0.00	1
		03	THREE-SPINE STICKLEBACK	ADULT	1	8.20	0.00	1
		04	NO FISH		1			0
		05	THREE-SPINE STICKLEBACK	ADULT	1	6.10	0.00	1
		06	DOLLY VARDEN	PARR	1	11.20	0.00	1
		07	NO FISH		1			0
		08	CHUM SALMON	PARR	1	4.60	0.00	1
		09	NO FISH		1			0
		10	COHO SALMON	PARR	4	4.95	0.69	4
		10	SLIMY SCULPIN	ADULT	1	8.40	0.00	1
9	230683	01	DOLLY VARDEN	PARR	4	5.27	1.37	4
		02	DOLLY VARDEN	PARR	2	9.75	3.04	2
		03	NO FISH		1			0
		04	DOLLY VARDEN	PARR	4	9.35	1.36	4
		04	SLIMY SCULPIN	JUVENILE	1	5.70	0.00	1
		05	DOLLY VARDEN	PARR	1	11.00	0.00	1
		06	NO FISH		1			0
		07	SLIMY SCULPIN	JUVENILE	1	5.30	0.00	1
		08	NO FISH		1			0
		09	SLIMY SCULPIN	JUVENILE	1	4.90	0.00	1
		09	SLIMY SCULPIN	ADULT	1	11.30	0.00	1
		10	NO FISH		1			0

TABLE B2-4. SUMMARY OF RESULTS: MINNOW TRAP SAMPLES
JUNE, 1983

STATION	DATE	REPLICATE	SPECIES	LIFE STAGE	NUMBER	LENGTH (CM) MEAN	S.D.	N
10	220683	01	DOLLY VARDEN	PARR	2	10.30	4.38	2
		02	DOLLY VARDEN	PARR	4	13.30	1.41	4
		03	DOLLY VARDEN	PARR	3	9.50	2.00	3
		04	NO FISH		1			0
		05	DOLLY VARDEN	PARR	7	10.57	2.28	7
		06	DOLLY VARDEN	PARR	8	9.81	1.60	8
		06	THREE-SPINE STICKLEBACK	ADULT	2	8.40	0.14	2
		07	DOLLY VARDEN	PARR	4	11.42	0.67	4
		08	DOLLY VARDEN	PARR	1	11.60	0.00	1
		09	DOLLY VARDEN	PARR	2	8.90	1.98	2
		10	DOLLY VARDEN	PARR	7	9.64	1.26	7
		10	THREE-SPINE STICKLEBACK	ADULT	2	8.75	0.22	2
11	230683	01	NO FISH		1			0
		02	THREE-SPINE STICKLEBACK	ADULT	1	8.30	0.00	1
		03	COHO SALMON	PARR	5	9.00	1.01	5
		03	DOLLY VARDEN	PARR	1	10.80	0.00	1
		03	COHO SALMON	PARR	1	9.60	0.00	1
		03	DOLLY VARDEN	PARR	1	10.90	0.00	1
		03	THREE-SPINE STICKLEBACK	PARR	1	8.50	0.00	1
		03	COHO SALMON	PARR	1	6.20	0.00	1
		03	SLIMY SCULPIN	PARR	1	2.60	0.00	1
		03	NINE-SPINE STICKLEBACK	JUVENILE	1	5.30	0.00	1
		03	THREE-SPINE STICKLEBACK	ADULT	3	8.33	0.32	3
		04	DOLLY VARDEN	ADULT	1	9.40	0.00	1
		05	NO FISH		1			0
		06	NO FISH		1			0
		07	DOLLY VARDEN	PARR	1	13.90	0.00	1
		07	DOLLY VARDEN	JUVENILE	1	14.00	0.00	1
		08	NO FISH		1			0
		09	THREE-SPINE STICKLEBACK	ADULT	1	8.50	0.00	1
		10	TRAP MISSING		0			
12	270683	01	TRAP BURIED		0			
		02	DOLLY VARDEN	PARR	1	7.70	0.00	1
		02	DOLLY VARDEN	JUVENILE	2	11.90	1.27	2
		03	TRAP BURIED		0			
		04	COHO SALMON	PARR	3	6.73	1.47	3
		04	DOLLY VARDEN	PARR	1	10.20	0.00	1
		04	COHO SALMON	PARR	1	7.70	0.00	1
		04	DOLLY VARDEN	PARR	1	10.10	0.00	1
		04	COHO SALMON	PARR	3	5.00	0.96	3
		04	DOLLY VARDEN	JUVENILE	4	12.75	1.16	4
		04	THREE-SPINE STICKLEBACK	ADULT	1	8.60	0.00	1
		05	DOLLY VARDEN	PARR	1	10.30	0.00	1
		05	THREE-SPINE STICKLEBACK	ADULT	1	8.50	0.00	1
		05	SLIMY SCULPIN	ADULT	1	6.20	0.00	1
		06	DOLLY VARDEN	PARR	1	10.80	0.00	1
		06	DOLLY VARDEN	JUVENILE	1	12.40	0.00	1

TABLE B2-4. SUMMARY OF RESULTS: MINNOW TRAP SAMPLES
JUNE, 1983

STATION	DATE	REPLICATE	SPECIES	LIFE STAGE	NUMBER	LENGTH (CM) MEAN	S.D.	N
12	270683	06	SLIMY SCULPIN	ADULT	1	9.20	0.00	1
		07	SOCKEYE SALMON	PARR	1	3.50	0.00	1
		08	TRAP BURIED		0			
		09	TRAP MISSING		0			
		10	TRAP MISSING		0			
13	250683	01	DOLLY VARDEN	PARR	4	6.50	2.13	4
		02	CHUM SALMON	PARR	1	3.50	0.00	1
		02	DOLLY VARDEN	PARR	1	6.70	0.00	1
		03	DOLLY VARDEN	PARR	1	6.40	0.00	1
		04	DOLLY VARDEN	PARR	2	5.35	1.63	2
		05	NO FISH		1			0
		06	NO FISH		1			0
		07	TRAP OUT OF WATER		0			
		08	COHO SALMON	PARR	1	6.30	0.00	1
		08	DOLLY VARDEN	PARR	10	5.88	1.04	10
		08	COHO SALMON	PARR	2	4.30	0.00	2
		08	DOLLY VARDEN	PARR	1	6.30	0.00	1
		08	COHO SALMON	PARR	1	3.90	0.00	1
		08	DOLLY VARDEN	PARR	4	5.82	1.14	4
		08	COHO SALMON	PARR	4	4.35	0.26	4
		08	DOLLY VARDEN	PARR	1	5.30	0.00	1
		08	COHO SALMON	PARR	7	4.39	0.35	7
		08	DOLLY VARDEN	JUVENILE	1	11.20	0.00	1
		09	DOLLY VARDEN	PARR	14	8.25	1.03	14
		09	DOLLY VARDEN	JUVENILE	8	11.25	0.97	8
		09	SLIMY SCULPIN	ADULT	1	9.40	0.00	1
		10	DOLLY VARDEN	PARR	1	10.20	0.00	1
14	250683	01	COHO SALMON	PARR	7	5.59	3.35	7
		01	DOLLY VARDEN	PARR	3	4.47	0.14	3
		01	COHO SALMON	PARR	1	3.70	0.00	1
		01	DOLLY VARDEN	PARR	1	4.30	0.00	1
		02	DOLLY VARDEN	PARR	1	7.30	0.00	1
		03	NO FISH		1			0
		04	DOLLY VARDEN	JUVENILE	1	12.40	0.00	1
		05	COHO SALMON	PARR	1	6.90	0.00	1
		05	DOLLY VARDEN	PARR	1	6.30	0.00	1
		05	DOLLY VARDEN	JUVENILE	2	11.35	0.10	2
		06	COHO SALMON	PARR	1	3.30	0.00	1
		07	NO FISH		1			0
		08	COHO SALMON	PARR	17	4.49	0.30	17
		08	DOLLY VARDEN	PARR	1	2.50	0.00	1
		08	COHO SALMON	PARR	1	4.10	0.00	1
		09	NO FISH		1			0
		10	TRAP MISSING		0			
15	270683	01	DOLLY VARDEN	JUVENILE	1	7.00	0.00	1
		02	NO FISH		1			0
		03	NO FISH		1			0

TABLE B2-4. SUMMARY OF RESULTS: MINNOW TRAP SAMPLES
JUNE, 1983

STATION	DATE	REPLICATE	SPECIES	LIFE STAGE	NUMBER	LENGTH (CM) MEAN	S.D.	N
15	270683	04	NO FISH		1			0
		05	NO FISH		1			0
		06	NO FISH		1			0
		07	NO FISH		1			0
		08	NO FISH		1			0
		09	DOLLY VARDEN	PARR	1	4.10	0.00	1
		10	NO FISH		1			0
16	220683	01	NO FISH		1			0
		02	DOLLY VARDEN	PARR	1	8.20	0.00	1
		03	NO FISH		1			0
		04	DOLLY VARDEN	PARR	1	9.10	0.00	1
		05	NO FISH		1			0
		06	SLIMY SCULPIN	ADULT	1	12.00	0.00	1
		07	DOLLY VARDEN	JUVENILE	1	13.80	0.00	1
		08	DOLLY VARDEN	PARR	4	10.85	1.44	4
		09	DOLLY VARDEN	PARR	2	10.45	0.92	2
		10	DOLLY VARDEN	PARR	3	9.40	1.15	3
		10	DOLLY VARDEN	JUVENILE	1	13.80	0.00	1
17	290683	01	DOLLY VARDEN	PARR	1	9.90	0.00	1
		01	DOLLY VARDEN	JUVENILE	1	10.20	0.00	1
		02	DOLLY VARDEN	PARR	1	9.60	0.00	1
		03	NO FISH		1			0
		04	COHO SALMON	PARR	1	4.70	0.00	1
		05	NO FISH		1			0
		05	DOLLY VARDEN	PARR	1	9.30	0.00	1
		06	DOLLY VARDEN	JUVENILE	1	11.50	0.00	1
		07	DOLLY VARDEN	JUVENILE	1	11.00	0.00	1
		08	DOLLY VARDEN	PARR	1	9.80	0.00	1
		08	DOLLY VARDEN	JUVENILE	1	14.30	0.00	1
		09	DOLLY VARDEN	JUVENILE	2	11.15	1.20	2
		09	SLIMY SCULPIN	ADULT	1	5.90	0.00	1
		10	NO FISH		1			0
18	300683	01	NO FISH		1			0
		02	NO FISH		1			0
		03	NO FISH		1			0
		04	DOLLY VARDEN	PARR	1	5.10	0.00	1
		05	SLIMY SCULPIN	ADULT	1	7.70	0.00	1
		06	NO FISH		1			0
		07	DOLLY VARDEN	JUVENILE	1	12.20	0.00	1
		08	DOLLY VARDEN	PARR	1	9.90	0.00	1
		09	NO FISH		1			0
		10	NO FISH		1			0
19	300683	01	TRAP MANGLED BY BEAR		0			
		02	NO FISH		1			0
		03	NO FISH		1			0
		04	NO FISH		1			0

TABLE 32-4. SUMMARY OF RESULTS: MINNOW TRAP SAMPLES
JUNE, 1983

STATION	DATE	REPLICATE	SPECIES	LIFE STAGE	NUMBER	LENGTH (CM) MEAN	S.D.	N
19	300683	05	DOLLY VARDEN	JUVENILE	1	11.20	0.00	1
		06	NO FISH		1			0
		07	NO FISH		1			0
		08	DOLLY VARDEN	JUVENILE	1	12.60	0.00	1
		09	NO FISH		1			0
		10	NO FISH		1			0
1D	190683	01	TRAP BURIED		0			
		02	DOLLY VARDEN	PARR	1	9.10	0.00	1
		02	SOCKEYE SALMON	PARR	1	4.40	0.00	1
		02	THREE-SPINE STICKLEBACK	ADULT	4	8.02	0.49	4
		03	THREE-SPINE STICKLEBACK	ADULT	2	8.50	0.00	2
		04	THREE-SPINE STICKLEBACK	ADULT	20	7.99	0.39	20
		05	CHUM SALMON	PARR	1			0
		05	NINE-SPINE STICKLEBACK	JUVENILE	1	3.90	0.00	1
		05	THREE-SPINE STICKLEBACK	ADULT	3	8.13	0.55	3
		06	DOLLY VARDEN	PARR	4	11.12	2.32	4
		06	COHO SALMON	PARR	1	3.90	0.00	1
		06	THREE-SPINE STICKLEBACK	ADULT	5	7.82	0.50	5
		07	DOLLY VARDEN	PARR	3	9.87	0.99	3
		07	COHO SALMON	PARR	1	4.10	0.00	1
		07	THREE-SPINE STICKLEBACK	ADULT	9	8.14	0.40	9
		07	SLIMY SCULPIN	ADULT	1	7.00	0.00	1
		07	THREE-SPINE STICKLEBACK	ADULT	2	8.35	0.92	2
		08	DOLLY VARDEN	PARR	1	10.60	0.00	1
		08	THREE-SPINE STICKLEBACK	PARR	1	9.50	0.00	1
		08	COHO SALMON	PARR	1	8.10	0.00	1
		08	DOLLY VARDEN	PARR	1	8.00	0.00	1
		08	CHUM SALMON	PARR	1	4.90	0.00	1
		08	THREE-SPINE STICKLEBACK	ADULT	6	8.08	0.32	6
		09	DOLLY VARDEN	PARR	2	10.35	1.06	2
		09	DOLLY VARDEN	JUVENILE	1	13.00	0.00	1
		09	THREE-SPINE STICKLEBACK	ADULT	1	8.50	0.00	1
		10	DOLLY VARDEN	PARR	5	11.00	1.48	5
		10	SLIMY SCULPIN	JUVENILE	1	2.50	0.00	1
20	300683	01	SLIMY SCULPIN	ADULT	1	8.80	0.00	1
		02	COHO SALMON	PARR	3	4.80	0.72	3
		02	SOCKEYE SALMON	PARR	1	4.20	0.00	1
		03	DOLLY VARDEN	PARR	1	9.90	0.00	1
		03	SOCKEYE SALMON	PARR	7	4.23	0.77	7
		04	DOLLY VARDEN	PARR	1	8.60	0.00	1
		04	SOCKEYE SALMON	PARR	2	4.30	0.00	2
		04	COHO SALMON	PARR	1	3.90	0.00	1
		04	SLIMY SCULPIN	ADULT	1	7.90	0.00	1
		05	SLIMY SCULPIN	ADULT	1	6.60	0.00	1
		06	NO FISH		1			0
		07	NO FISH		1			0
		08	SOCKEYE SALMON	PARR	1	4.20	0.00	1
		08	COHO SALMON	PARR	1	3.60	0.00	1

TABLE B2-4. SUMMARY OF RESULTS: MINNOW TRAP SAMPLES
JUNE, 1983

STATION	DATE	REPLICATE	SPECIES	LIFE STAGE	NUMBER	LENGTH (CM) MEAN	S.D.	N
20	300683	08	SLIMY SCULPIN	ADULT	1	8.20	0.00	1
		09	NO FISH		1			0
		10	NO FISH		1			0
21	300683	01	NO FISH		1			0
		02	NO FISH		1			0
		03	NO FISH		1			0
		04	NO FISH		1			0
		05	COHO SALMON	PARR	5	3.66	0.14	5
		06	NO FISH		1			0
		07	NO FISH		1			0
		08	DOLLY VARDEN	JUVENILE	2	12.90	2.26	2
		09	DOLLY VARDEN	JUVENILE	3	13.40	2.14	3
		10	DOLLY VARDEN	PARR	1	9.90	0.00	1
22	010783	01	NO FISH		1			0
		02	NO FISH		1			0
		03	DOLLY VARDEN	PARR	1	4.00	0.00	1
		04	DOLLY VARDEN	PARR	1	3.80	0.00	1
		05	NO FISH		1			0
		06	TRAP OUT OF WATER		0			
		07	NO FISH		1			0
		08	NO FISH		1			0
		09	NO FISH		1			0
		10	NO FISH		1			0
23	010783	01	NO FISH		1			0
		02	DOLLY VARDEN	PARR	1	11.90	0.00	1
		02	DOLLY VARDEN	JUVENILE	1	13.50	0.00	1
		03	NO FISH		1			0
		04	DOLLY VARDEN	PARR	1	7.80	0.00	1
		05	DOLLY VARDEN	PARR	2	3.45	0.22	2
		06	NO FISH		1			0
		07	NO FISH		1			0
		08	NO FISH		1			0
		09	DOLLY VARDEN	JUVENILE	1	13.20	0.00	1
		10	DOLLY VARDEN	PARR	1	9.50	0.00	1
24	020783	01	NO FISH		1			0
		02	NO FISH		1			0
		03	NO FISH		1			0
		04	NO FISH		1			0
		05	NO FISH		1			0
		06	NO FISH		1			0
		07	NO FISH		1			0
		08	DOLLY VARDEN	JUVENILE	1	10.80	0.00	1
		09	NO FISH		1			0
		10	NO FISH		1			0
40	250683	01	DOLLY VARDEN	PARR	1	6.10	0.00	1

TABLE B2-4. SUMMARY OF RESULTS: MINNOW TRAP SAMPLES
JUNE, 1983

STATION	DATE	REPLICATE	SPECIES	LIFE STAGE	NUMBER	LENGTH (CM) MEAN	S.D.	N
40	230683	01	THREE-SPINE STICKLEBACK	ADULT	4	8.45	0.10	4
		02	NO FISH		1			0
		03	DOLLY VARDEN	PARR	1	11.30	0.00	1
		03	DOLLY VARDEN	JUVENILE	1	12.20	0.00	1
		04	DOLLY VARDEN	JUVENILE	4	12.67	0.80	4
		04	THREE-SPINE STICKLEBACK	ADULT	1	8.70	0.00	1
		05	DOLLY VARDEN	PARR	3	7.83	1.77	3
		05	DOLLY VARDEN	JUVENILE	7	12.69	1.90	7
		05	THREE-SPINE STICKLEBACK	JUVENILE	1	9.00	0.00	1
		05	THREE-SPINE STICKLEBACK	ADULT	11	8.32	0.17	11
		05	NINE-SPINE STICKLEBACK	ADULT	1	6.20	0.00	1
		05	THREE-SPINE STICKLEBACK	ADULT	1	8.70	0.00	1
		06	DOLLY VARDEN	PARR	2	9.20	0.14	2
		06	DOLLY VARDEN	JUVENILE	2	13.90	1.70	2
		07	DOLLY VARDEN	PARR	2	7.50	1.13	2
		08	NO FISH		1			0
		09	DOLLY VARDEN	PARR	1	5.10	0.00	1
		09	DOLLY VARDEN	JUVENILE	1	13.10	0.00	1
		09	SLIMY SCULPIN	ADULT	1	7.90	0.00	1
		09	THREE-SPINE STICKLEBACK	ADULT	1	7.80	0.00	1
		10	DOLLY VARDEN	PARR	1	7.60	0.00	1
41	230683	01	NO FISH		1			0
		02	NO FISH		1			0
		03	DOLLY VARDEN	PARR	1	7.40	0.00	1
		03	DOLLY VARDEN	JUVENILE	2	13.40	0.14	2
		04	SLIMY SCULPIN	JUVENILE	1	6.70	0.00	1
		05	DOLLY VARDEN	PARR	1	7.70	0.00	1
		05	SLIMY SCULPIN	ADULT	2	8.70	1.27	2
		06	COHO SALMON	PARR	2	4.50	0.42	2
		06	DOLLY VARDEN	PARR	2	8.05	1.77	2
		06	COHO SALMON	PARR	3	5.80	1.61	3
		07	DOLLY VARDEN	JUVENILE	1	14.10	0.00	1
		08	COHO SALMON	PARR	1	3.70	0.00	1
		09	DOLLY VARDEN	PARR	2	9.10	1.56	2
		09	DOLLY VARDEN	JUVENILE	2	12.05	0.22	2
		10	NO FISH		1			0
42	230683	01	CHINOOK SALMON	PARR	4	5.05	1.26	4
		01	COHO SALMON	PARR	1	7.70	0.00	1
		01	CHINOOK SALMON	PARR	3	4.40	0.40	3
		01	THREE-SPINE STICKLEBACK	ADULT	1	9.10	0.00	1
		01	NINE-SPINE STICKLEBACK	ADULT	1	4.70	0.00	1
		02	CHINOOK SALMON	PARR	1	4.70	0.00	1
		02	SLIMY SCULPIN	ADULT	1	5.50	0.00	1
		03	COHO SALMON	PARR	1	6.70	0.00	1
		03	DOLLY VARDEN	PARR	1	7.90	0.00	1
		03	CHINOOK SALMON	PARR	1	4.40	0.00	1
		03	COHO SALMON	PARR	2	6.95	0.50	2
		03	CHINOOK SALMON	PARR	10	4.39	0.44	10

TABLE B2-4. SUMMARY OF RESULTS: MINNOW TRAP SAMPLES
JUNE, 1983

STATION	DATE	REPLICATE	SPECIES	LIFE STAGE	NUMBER	LENGTH (CM) MEAN	S.D.	N
42	250683	04	CHINOOK SALMON	PARR	3	4.03	0.28	3
		04	SLIMY SCULPIN	JUVENILE	3	5.63	0.59	3
		05	CHINOOK SALMON	PARR	10	8.15	2.46	10
		05	NINE-SPINE STICKLEBACK	JUVENILE	2	4.20	0.71	2
		05	NINE-SPINE STICKLEBACK	ADULT	4	5.47	1.02	4
		06	CHINOOK SALMON	PARR	21	4.46	0.71	21
		06	NINE-SPINE STICKLEBACK	ADULT	6	5.25	1.32	6
		07	NO FISH		1			0
		08	CHINOOK SALMON	PARR	12	4.42	1.08	12
		08	NINE-SPINE STICKLEBACK	ADULT	1	7.50	0.00	1
		09	COHO SALMON	PARR	1	9.50	0.00	1
		09	CHINOOK SALMON	PARR	5	4.02	0.37	5
		10	CHINOOK SALMON	PARR	5	6.56	3.10	5
		10	DOLLY VARDEN	PARR	1	4.20	0.00	1
		10	CHINOOK SALMON	PARR	1	4.20	0.00	1
		10	DOLLY VARDEN	JUVENILE	4	11.65	2.42	4
43	270683	01	COHO SALMON	PARR	1	9.30	0.00	1
		01	CHINOOK SALMON	PARR	1	4.20	0.00	1
		01	DOLLY VARDEN	JUVENILE	1	13.70	0.00	1
		02	DOLLY VARDEN	PARR	1	9.70	0.00	1
		02	DOLLY VARDEN	JUVENILE	2	12.90	0.28	2
		03	CHINOOK SALMON	PARR	4	4.52	0.35	4
		03	SLIMY SCULPIN	JUVENILE	2	3.05	0.10	2
		04	SLIMY SCULPIN	JUVENILE	1	6.60	0.00	1
		05	DOLLY VARDEN	PARR	3	9.80	2.77	3
		06	DOLLY VARDEN	PARR	2	8.35	0.10	2
		07	DOLLY VARDEN	PARR	1	10.60	0.00	1
		07	DOLLY VARDEN	JUVENILE	1	14.10	0.00	1
		08	DOLLY VARDEN	PARR	2	8.90	0.35	2
		09	NO FISH		1			0
		10	NO FISH		1			0
44	230683	01	CHINOOK SALMON	PARR	5	4.08	0.40	5
		02	CHINOOK SALMON	PARR	5	3.70	0.56	5
		02	NINE-SPINE STICKLEBACK	ADULT	3	5.87	0.24	3
		03	CHINOOK SALMON	PARR	5	3.84	0.33	5
		04	CHINOOK SALMON	PARR	2	4.15	0.64	2
		05	COHO SALMON	PARR	1	10.50	0.00	1
		05	CHINOOK SALMON	PARR	12	4.00	0.49	12
		05	SLIMY SCULPIN	ADULT	1	6.90	0.00	1
		06	COHO SALMON	PARR	1	7.10	0.00	1
		06	CHINOOK SALMON	PARR	2	4.05	0.22	2
		07	NO FISH		1			0
		08	CHINOOK SALMON	PARR	3	3.87	0.60	3
		09	NO FISH		1			0
		10	DOLLY VARDEN	JUVENILE	1	10.80	0.00	1
45	230683	01	NINE-SPINE STICKLEBACK	JUVENILE	4	2.65	0.14	4
		01	NINE-SPINE STICKLEBACK	ADULT	3	4.73	0.95	3

TABLE B2-4. SUMMARY OF RESULTS: MINNOW TRAP SAMPLES
JUNE, 1983

STATION	DATE	REPLICATE	SPECIES	LIFE STAGE	NUMBER	LENGTH (CM) MEAN	S.D.	N
45	230683	02	NINE-SPINE STICKLEBACK	ADULT	3	5.80	1.21	3
		03	NINE-SPINE STICKLEBACK	ADULT	12	4.90	0.30	12
		04	NINE-SPINE STICKLEBACK	ADULT	12	5.21	0.47	12
		05	NO FISH		1			0
		06	NO FISH		1			0
		07	NO FISH		1			0
		08	THREE-SPINE STICKLEBACK	ADULT	1	5.80	0.00	1
		08	NINE-SPINE STICKLEBACK	ADULT	40	5.58	0.88	40
		09	NO FISH		1			0
		10	COHO SALMON	PARR	4	8.85	0.72	4
6A	250683	09	NO FISH		1			0
6A	230683	01	NO FISH		1			0
		02	DOLLY VARDEN	PARR	1	10.00	0.00	1
		02	DOLLY VARDEN	JUVENILE	1	11.90	0.00	1
		03	NO FISH		1			0
		04	DOLLY VARDEN	PARR	1	9.70	0.00	1
		04	DOLLY VARDEN	JUVENILE	5	12.56	0.83	5
		05	DOLLY VARDEN	PARR	2	9.10	1.70	2
		06	DOLLY VARDEN	PARR	2	8.95	1.35	2
		07	DOLLY VARDEN	PARR	1	9.70	0.00	1
		08	DOLLY VARDEN	JUVENILE	3	8.37	0.71	3
		08	SLIMY SCULPIN	ADULT	1	9.70	0.00	1
		10	NO FISH		1			0
16A	220683	01	COHO SALMON	PARR	1	3.60	0.00	1
		02	SLIMY SCULPIN	ADULT	1	8.20	0.00	1
		03	SLIMY SCULPIN	JUVENILE	2	5.90	0.42	2
		03	SLIMY SCULPIN	ADULT	1	7.70	0.00	1
		04	DOLLY VARDEN	PARR	1	7.70	0.00	1
		04	DOLLY VARDEN	JUVENILE	1	10.70	0.00	1
		04	SLIMY SCULPIN	ADULT	4	9.00	0.54	4
		05	DOLLY VARDEN	PARR	4	9.22	2.21	4
		05	COHO SALMON	PARR	6	5.45	1.19	6
		05	THREE-SPINE STICKLEBACK	ADULT	1	8.80	0.00	1
		06	COHO SALMON	PARR	3	8.37	0.57	3
		06	DOLLY VARDEN	PARR	1	9.00	0.00	1
		06	COHO SALMON	PARR	11	4.59	0.51	11
		06	THREE-SPINE STICKLEBACK	ADULT	1	8.30	0.00	1
		07	DOLLY VARDEN	PARR	1	9.10	0.00	1
		07	COHO SALMON	PARR	8	5.05	1.10	8
		07	THREE-SPINE STICKLEBACK	ADULT	1	7.60	0.00	1
		07	SLIMY SCULPIN	ADULT	1	8.20	0.00	1
		08	COHO SALMON	PARR	4	4.32	0.45	4
		08	DOLLY VARDEN	PARR	2	5.55	2.19	2
		08	COHO SALMON	PARR	8	4.35	0.47	8
		08	DOLLY VARDEN	PARR	1	3.80	0.00	1
		08	COHO SALMON	PARR	2	3.95	0.92	2
		08	DOLLY VARDEN	PARR	1	4.10	0.00	1

TABLE B2-4. SUMMARY OF RESULTS: MINNOW TRAP SAMPLES
JUNE, 1983

STATION	DATE	REPLICATE	SPECIES	LIFE STAGE	NUMBER	LENGTH (CM) MEAN	S.D.	N
16A	220683	08	COHO SALMON	PARR	6	3.83	0.49	6
		08	NINE-SPINE STICKLEBACK	PARR	1	4.50	0.00	1
		08	COHO SALMON	PARR	1	4.30	0.00	1
		08	THREE-SPINE STICKLEBACK	ADULT	1	8.30	0.00	1
		09	SLIMY SCULPIN	ADULT	5	8.68	1.18	5
		09	THREE-SPINE STICKLEBACK	ADULT	2	8.40	0.14	2
		09	COHO SALMON	PARR	3	5.23	0.40	3
		09	SLIMY SCULPIN	JUVENILE	2	7.45	0.22	2
		10	COHO SALMON	PARR	10	4.72	0.51	10
		10	SLIMY SCULPIN	ADULT	1	7.10	0.00	1
17D	290683	01	TRAP OUT OF WATER		0			
		02	NO FISH		1			0
		03	SLIMY SCULPIN	ADULT	1	9.30	0.00	1
		04	NO FISH		1			0
		05	DOLLY VARDEN	PARR	1	8.40	0.00	1
		05	DOLLY VARDEN	JUVENILE	3	11.40	2.10	3
		06	DOLLY VARDEN	JUVENILE	1	10.50	0.00	1
		07	DOLLY VARDEN	PARR	1	9.70	0.00	1
		07	DOLLY VARDEN	JUVENILE	2	13.70	2.40	2
		08	NO FISH		1			0
		09	DOLLY VARDEN	PARR	2	10.80	0.57	2
		09	DOLLY VARDEN	JUVENILE	3	12.63	1.66	3
		10	NO FISH		1			0
18A	010783	01	TRAP OUT OF WATER		0			
		02	DOLLY VARDEN	PARR	2	8.80	1.84	2
		03	NO FISH		1			0
		04	DOLLY VARDEN	PARR	1	7.20	0.00	1
		04	DOLLY VARDEN	JUVENILE	3	11.10	0.79	3
		05	DOLLY VARDEN	PARR	1	10.30	0.00	1
		06	DOLLY VARDEN	PARR	1	10.90	0.00	1
		07	DOLLY VARDEN	PARR	2	10.95	0.10	2
		09	TRAP OUT OF WATER		0			
		10	NO FISH		1			0
19A	010783	01	DOLLY VARDEN	PARR	2	6.50	0.28	2
		02	SLIMY SCULPIN	ADULT	1	8.10	0.00	1
		03	TRAP OUT OF WATER		0			
		04	NO FISH		1			0
		05	NO FISH		1			0
		06	NO FISH		1			0
		07	DOLLY VARDEN	PARR	5	8.32	1.85	5
		08	NO FISH		1			0
		09	NO FISH		1			0
		10	NO FISH		1			0
40A	250683	01	DOLLY VARDEN	JUVENILE	2	14.55	0.64	2
		02	DOLLY VARDEN	PARR	2	9.55	0.22	2
		02	DOLLY VARDEN	JUVENILE	5	12.06	1.31	5

TABLE B2-4. SUMMARY OF RESULTS: MINNOW TRAP SAMPLES
JUNE, 1983

STATION	DATE	REPLICATE	SPECIES	LIFE STAGE	NUMBER	LENGTH (CM) MEAN	S.D.	N
40A	250683	03	COHO SALMON	PARR	2	3.30	0.28	2
		03	DOLLY VARDEN	PARR	1	3.30	0.00	1
		04	NO FISH		1			0
		05	DOLLY VARDEN	PARR	2	8.35	2.05	2
		05	DOLLY VARDEN	JUVENILE	1	12.00	0.00	1
		06	NO FISH		1			0
		07	DOLLY VARDEN	JUVENILE	1	13.80	0.00	1
		08	DOLLY VARDEN	PARR	2	8.85	0.92	2
		08	DOLLY VARDEN	JUVENILE	2	11.20	1.27	2
		08	SLIMY SCULPIN	ADULT	1	8.50	0.00	1
		09	DOLLY VARDEN	PARR	3	6.43	0.30	3
		09	CHINOOK SALMON	PARR	1	3.90	0.00	1
		10	NO FISH		1			0
41A	240683	01	NO FISH		1			0
		02	NO FISH		1			0
		03	NO FISH		1			0
		04	NO FISH		1			0
		05	NO FISH		1			0
		06	TRAP OUT OF WATER		0			
		07	NO FISH		1			0
		08	NO FISH		1			0
		09	DOLLY VARDEN	PARR	2	6.15	0.64	2
		10	NO FISH		1			0
42A	240683	01	NO FISH		1			0
		02	DOLLY VARDEN	PARR	1	7.10	0.00	1
		03	NO FISH		1			0
		04	CHINOOK SALMON	PARR	1	3.50	0.00	1
		04	DOLLY VARDEN	PARR	1	4.00	0.00	1
		05	DOLLY VARDEN	PARR	2	7.45	0.92	2
		06	COHO SALMON	PARR	1	9.90	0.00	1
		06	DOLLY VARDEN	JUVENILE	1	11.70	0.00	1
		07	DOLLY VARDEN	PARR	1	7.90	0.00	1
		07	CHINOOK SALMON	PARR	1	3.90	0.00	1
		08	TRAP OUT OF WATER		0			
		09	CHINOOK SALMON	PARR	1	3.80	0.00	1
		10	CHINOOK SALMON	PARR	6	5.00	1.66	6
		10	DOLLY VARDEN	PARR	1	4.30	0.00	1
		10	CHINOOK SALMON	PARR	4	4.47	1.29	4
		10	DOLLY VARDEN	PARR	2	3.95	0.78	2
		10	CHINOOK SALMON	PARR	5	3.88	0.26	5
		10	DOLLY VARDEN	PARR	1	3.90	0.00	1
		10	CHINOOK SALMON	PARR	8	3.85	0.46	8
		10	DOLLY VARDEN	PARR	1	3.90	0.00	1
		10	CHINOOK SALMON	PARR	3	3.73	0.45	3
		10	DOLLY VARDEN	PARR	2	4.15	0.22	2
		10	CHINOOK SALMON	PARR	7	3.61	0.39	7
43A	270683	01	CHINOOK SALMON	PARR	37	4.38	0.57	37

TABLE B2-4. SUMMARY OF RESULTS: MINNOW TRAP SAMPLES
JUNE, 1983

STATION	DATE	REPLICATE	SPECIES	LIFE STAGE	NUMBER	LENGTH (CM) MEAN	S.D.	N
43A	270683	02	CHINOOK SALMON	PARR	99	4.50	0.48	99
		02	NINE-SPINE STICKLEBACK	ADULT	1	7.00	0.00	1
		03	COHO SALMON	PARR	1	11.20	0.00	1
		04	CHINOOK SALMON	PARR	3	3.67	0.45	3
		05	NO FISH		1			0
		06	COHO SALMON	PARR	2	9.80	0.99	2
		07	NO FISH		1			0
		08	SLIMY SCULPIN	ADULT	1	9.00	0.00	1
		09	SLIMY SCULPIN	ADULT	1	10.30	0.00	1
		10	CHINOOK SALMON	PARR	7	3.67	0.60	7
44A	230683	01	NO FISH		1			0
		02	CHINOOK SALMON	PARR	13	3.88	0.69	13
		02	SLIMY SCULPIN	ADULT	1	8.60	0.00	1
		03	NO FISH		1			0
		04	CHINOOK SALMON	PARR	3	4.47	0.42	3
		04	SLIMY SCULPIN	ADULT	1	8.30	0.00	1
		05	CHINOOK SALMON	PARR	1	4.70	0.00	1
		05	DOLLY VARDEN	JUVENILE	1	14.00	0.00	1
		06	NO FISH		1			0
		07	CHINOOK SALMON	PARR	3	4.53	0.84	3
		07	SLIMY SCULPIN	ADULT	1	9.50	0.00	1
		08	CHINOOK SALMON	PARR	16	3.72	0.47	16
		08	NINE-SPINE STICKLEBACK	PARR	1	4.50	0.00	1
		08	CHINOOK SALMON	PARR	17	3.40	0.26	17
		08	NINE-SPINE STICKLEBACK	ADULT	1	6.30	0.00	1
		09	SLIMY SCULPIN	ADULT	1	7.70	0.00	1
		10	TRAP MISSING		0			
11.5	230683	01	DOLLY VARDEN	PARR	3	9.50	2.62	3
		02	DOLLY VARDEN	PARR	2	9.65	0.22	2
		03	NO FISH		1			0
		04	SLIMY SCULPIN	ADULT	1	6.30	0.00	1
		05	DOLLY VARDEN	PARR	3	7.23	0.49	3
		06	DOLLY VARDEN	PARR	2	8.15	0.10	2
		07	DOLLY VARDEN	PARR	1	6.90	0.00	1
		08	SLIMY SCULPIN	JUVENILE	2	5.50	0.28	2
		09	DOLLY VARDEN	PARR	1	8.40	0.00	1
		10	SLIMY SCULPIN	JUVENILE	1	6.80	0.00	1

TABLE B2-5. SUMMARY OF RESULTS: ELECTROFISHING SAMPLES
JUNE, 1983

STATION	DATE	REPLICATE	SPECIES	LIFE STAGE	NUMBER	LENGTH (CM) MEAN	S.D.	N
1	290683	01	SOCKEYE SALMON	PARR	1	4.90	0.00	1
		01	CHUM SALMON	PARR	1	5.00	0.00	1
		01	COHO SALMON	PARR	1	4.60	0.00	1
		01	SOCKEYE SALMON	PARR	6	4.55	0.55	6
		01	DOLLY VARDEN	JUVENILE	1	14.20	0.00	1
		02	SOCKEYE SALMON	PARR	2	4.90	0.00	2
		02	COHO SALMON	PARR	1	4.80	0.00	1
		02	SOCKEYE SALMON	PARR	1	5.00	0.00	1
		02	COHO SALMON	PARR	1	4.80	0.00	1
		02	SOCKEYE SALMON	PARR	2	4.30	0.71	2
		02	COHO SALMON	PARR	1	4.20	0.00	1
		03	NO FISH		1			0
2	300683	01	ROUND WHITE FISH	PARR	1	7.60	0.00	1
		01	CHUM SALMON	PARR	3	5.33	0.22	3
		01	COHO SALMON	PARR	1	4.30	0.00	1
		01	SOCKEYE SALMON	PARR	2	4.45	0.22	2
		01	ROUND WHITE FISH	JUVENILE	1	11.20	0.00	1
		01	DOLLY VARDEN	JUVENILE	1	11.50	0.00	1
		01	ROUND WHITE FISH	JUVENILE	1	11.70	0.00	1
		01	SLIMY SCULPIN	ADULT	1	7.20	0.00	1
		02	DOLLY VARDEN	PARR	2	8.70	0.99	2
		02	CHUM SALMON	PARR	1	4.30	0.00	1
		02	CHINOOK SALMON	PARR	1	4.80	0.00	1
		02	CHUM SALMON	PARR	1	5.10	0.00	1
		02	ROUND WHITE FISH	JUVENILE	2	12.55	0.78	2
		02	DOLLY VARDEN	JUVENILE	1	12.60	0.00	1
		02	ROUND WHITE FISH	JUVENILE	1	8.70	0.00	1
		02	SLIMY SCULPIN	JUVENILE	1	5.00	0.00	1
		02	SLIMY SCULPIN	ADULT	2	6.85	0.22	2
		03	NO FISH		1			0
3	300683	01	DOLLY VARDEN	PARR	1	12.20	0.00	1
		01	COHO SALMON	PARR	1	7.10	0.00	1
		01	CHUM SALMON	PARR	1	3.80	0.00	1
		01	DOLLY VARDEN	JUVENILE	1	12.80	0.00	1
		01	ROUND WHITE FISH	JUVENILE	2	9.30	2.83	2
		01	SLIMY SCULPIN	JUVENILE	3	5.20	0.36	3
		01	SLIMY SCULPIN	ADULT	1	7.60	0.00	1
		02	NO FISH		1			0
		03	DOLLY VARDEN	PARR	1	8.30	0.00	1
		03	CHUM SALMON	PARR	3	3.87	0.14	3
		03	DOLLY VARDEN	JUVENILE	1	11.50	0.00	1
		03	SLIMY SCULPIN	ADULT	2	8.25	0.10	2
4	030783	01	COHO SALMON	PARR	1	4.60	0.00	1
		01	CHUM SALMON	PARR	4	4.50	0.62	4
		01	ROUND WHITE FISH	PARR	1	8.00	0.00	1
		01	CHUM SALMON	PARR	1	4.60	0.00	1
		01	DOLLY VARDEN	PARR	2	4.10	0.00	2

TABLE B2-5. SUMMARY OF RESULTS: ELECTROFISHING SAMPLES
JUNE, 1983

STATION	DATE	REPLICATE	SPECIES	LIFE STAGE	NUMBER	LENGTH (CM) MEAN	S.D.	N
4	030783	01	COHO SALMON	PARR	1	4.40	0.00	1
		01	CHUM SALMON	PARR	4	5.00	0.10	4
		01	ROUND WHITE FISH	JUVENILE	2	7.60	0.71	2
		01	SLIMY SCULPIN	ADULT	1	11.50	0.00	1
		02	COHO SALMON	PARR	3	8.73	2.88	3
		02	DOLLY VARDEN	PARR	1	9.60	0.00	1
		02	CHUM SALMON	PARR	1	5.10	0.00	1
		02	COHO SALMON	PARR	1	8.30	0.00	1
		03	COHO SALMON	PARR	1	4.20	0.00	1
		03	SLIMY SCULPIN	JUVENILE	1	4.10	0.00	1
5	040783	01	COHO SALMON	PARR	1	4.80	0.00	1
		01	SLIMY SCULPIN	PARR	1	4.60	0.00	1
		01	COHO SALMON	PARR	4	4.45	0.33	4
		02	COHO SALMON	PARR	3	4.60	0.26	3
		02	CHUM SALMON	PARR	1	4.30	0.00	1
		02	COHO SALMON	PARR	1	4.40	0.00	1
		02	CHUM SALMON	PARR	1	4.90	0.00	1
		02	COHO SALMON	PARR	4	5.10	0.74	4
		03	CHUM SALMON	PARR	1	4.30	0.00	1
		03	COHO SALMON	PARR	1	3.70	0.00	1
		03	CHUM SALMON	PARR	7	4.14	0.42	7
6	030783	01	COHO SALMON	PARR	1	3.40	0.00	1
		02	COHO SALMON	PARR	1	4.30	0.00	1
		02	DOLLY VARDEN	PARR	1	8.50	0.00	1
		03	COHO SALMON	PARR	2	4.05	0.36	2
8	040783	01	DOLLY VARDEN	PARR	3	11.03	0.39	3
		01	DOLLY VARDEN	JUVENILE	1	14.80	0.00	1
		01	SLIMY SCULPIN	JUVENILE	2	5.65	0.10	2
		02	CHUM SALMON	PARR	1	4.20	0.00	1
		03	NO FISH		1			0
9	040783	01	DOLLY VARDEN	PARR	1	9.20	0.00	1
		01	COHO SALMON	PARR	1	4.70	0.00	1
		01	SLIMY SCULPIN	JUVENILE	1	5.60	0.00	1
		02	DOLLY VARDEN	PARR	3	6.07	1.44	3
		03	DOLLY VARDEN	PARR	4	7.35	0.87	4
		03	SLIMY SCULPIN	JUVENILE	1	5.00	0.00	1
10	290683	01	DOLLY VARDEN	PARR	5	7.60	1.98	5
		01	SLIMY SCULPIN	JUVENILE	1	4.40	0.00	1
		01	SLIMY SCULPIN	ADULT	1	7.40	0.00	1
		02	NO FISH		1			0
		03	DOLLY VARDEN	PARR	2	8.65	0.64	2
		03	COHO SALMON	PARR	1	6.90	0.00	1
		03	DOLLY VARDEN	PARR	5	5.96	1.73	5
		03	SLIMY SCULPIN	JUVENILE	2	5.05	0.10	2

TABLE B2-5. SUMMARY OF RESULTS: ELECTROFISHING SAMPLES
JUNE, 1983

STATION	DATE	REPLICATE	SPECIES	LIFE STAGE	NUMBER	LENGTH (CM) MEAN	S.D.	N
11	230683	01	DOLLY VARDEN	PARR	1	7.30	0.00	1
		01	COHO SALMON	PARR	1	4.40	0.00	1
		02	DOLLY VARDEN	PARR	1	7.30	0.00	1
		02	COHO SALMON	PARR	1	4.40	0.00	1
		03	DOLLY VARDEN	PARR	2	5.55	2.48	2
		03	DOLLY VARDEN	JUVENILE	1	10.50	0.00	1
12	230683	01	NO FISH		1			0
		02	COHO SALMON	PARR	1	5.80	0.00	1
		02	DOLLY VARDEN	PARR	2	8.70	3.54	2
		02	THREE-SPINE STICKLEBACK	ADULT	3	8.07	0.26	3
		03	SOCKEYE SALMON	PARR	1	4.50	0.00	1
		03	COHO SALMON	PARR	1	7.60	0.00	1
		03	SOCKEYE SALMON	PARR	1	4.20	0.00	1
		03	COHO SALMON	PARR	4	4.92	1.34	4
		03	SLIMY SCULPIN	PARR	1	2.60	0.00	1
		03	ROUND WHITE FISH	JUVENILE	1	11.20	0.00	1
		03	SLIMY SCULPIN	JUVENILE	4	3.40	0.61	4
		03	PYGMY WHITE FISH	ADULT	1	5.20	0.00	1
13	040783	01	DOLLY VARDEN	PARR	3	8.33	0.75	3
		02	DOLLY VARDEN	PARR	4	8.07	1.71	4
		03	DOLLY VARDEN	PARR	6	5.87	0.35	6
14	230683	01	COHO SALMON	PARR	2	3.75	0.10	2
		02	COHO SALMON	PARR	38	3.79	0.36	37
		03	COHO SALMON	PARR	6	3.98	0.47	6
		03	DOLLY VARDEN	PARR	2	10.05	3.18	2
		03	COHO SALMON	PARR	5	3.94	0.20	5
		03	DOLLY VARDEN	PARR	1	5.30	0.00	1
		03	COHO SALMON	PARR	3	4.57	0.72	3
15	230683	01	DOLLY VARDEN	PARR	3	7.93	2.46	3
		02	DOLLY VARDEN	PARR	3	7.10	1.71	3
		03	DOLLY VARDEN	PARR	1	3.60	0.00	1
		03	SLIMY SCULPIN	JUVENILE	1	3.90	0.00	1
		04	DOLLY VARDEN	PARR	1			0
		04	SOCKEYE SALMON	PARR	1			0
16	040783	01	COHO SALMON	PARR	1	3.40	0.00	1
		02	DOLLY VARDEN	PARR	2	7.20	0.28	2
		03	DOLLY VARDEN	PARR	1	8.10	0.00	1
		03	SOCKEYE SALMON	PARR	1	7.10	0.00	1
17	020783	01	NO FISH		1			0
		02	COHO SALMON	PARR	1	5.50	0.00	1
		02	DOLLY VARDEN	PARR	3	6.07	2.81	3
		02	DOLLY VARDEN	JUVENILE	5	11.72	1.89	5
		03	DOLLY VARDEN	PARR	2	8.30	0.14	2
		03	SOCKEYE SALMON	PARR	1	5.20	0.00	1

TABLE B2-5. SUMMARY OF RESULTS: ELECTROFISHING SAMPLES
JUNE, 1983

STATION	DATE	REPLICATE	SPECIES	LIFE STAGE	NUMBER	LENGTH (CM) MEAN	S.D.	N
17	020783	03	DOLLY VARDEN	PARR	1	3.60	0.00	1
		03	DOLLY VARDEN	JUVENILE	1	13.10	0.00	1
18	300683	01	COHO SALMON	PARR	1	4.40	0.00	1
		02	NO FISH		1			0
		03	COHO SALMON	PARR	1	6.70	0.00	1
		03	DOLLY VARDEN	PARR	1	6.40	0.00	1
19	300683	01	NO FISH		1			0
		02	NO FISH		1			0
		03	NO FISH		1			0
1D	230683	01	DOLLY VARDEN	PARR	1			0
		01	SOCKEYE SALMON	PARR	1	3.60	0.00	1
		02	DOLLY VARDEN	PARR	1			0
		02	COHO SALMON	PARR	1			0
		03	NO FISH		1			0
20	300683	01	NO FISH		1			0
		02	SOCKEYE SALMON	PARR	3	3.07	0.14	3
		02	COHO SALMON	PARR	1	5.40	0.00	1
		02	SOCKEYE SALMON	PARR	1	3.50	0.00	1
		02	SLIMY SCULPIN	JUVENILE	1	4.90	0.00	1
		03	COHO SALMON	PARR	4	5.55	0.37	4
		03	SOCKEYE SALMON	PARR	1	3.10	0.00	1
		03	COHO SALMON	PARR	1	4.80	0.00	1
		03	DOLLY VARDEN	JUVENILE	1	13.10	0.00	1
		03	SLIMY SCULPIN	ADULT	3	8.70	0.30	3
21	040783	01	DOLLY VARDEN	PARR	8	7.97	0.54	8
		01	DOLLY VARDEN	JUVENILE	3	14.43	0.64	3
		02	CHUM SALMON	PARR	6	4.27	0.63	6
		03	DOLLY VARDEN	PARR	1	7.60	0.00	1
22	020783	01	SOCKEYE SALMON	PARR	3	6.93	1.93	3
		02	SOCKEYE SALMON	PARR	2	7.35	0.22	2
		03	DOLLY VARDEN	JUVENILE	4	12.20	0.41	4
		03	SLIMY SCULPIN	ADULT	2	8.85	0.22	2
23	010783	01	SLIMY SCULPIN	JUVENILE	1	4.60	0.00	1
		01	SLIMY SCULPIN	ADULT	1	6.60	0.00	1
		02	DOLLY VARDEN	PARR	3	6.50	1.14	3
		02	DOLLY VARDEN	JUVENILE	1	13.00	0.00	1
		02	SLIMY SCULPIN	ADULT	1	10.10	0.00	1
		03	DOLLY VARDEN	PARR	4	9.40	0.89	4
24	020783	01	NO FISH		1			0
		02	SOCKEYE SALMON	PARR	2	5.45	0.10	2
		02	DOLLY VARDEN	JUVENILE	1	12.20	0.00	1
		03	DOLLY VARDEN	PARR	7	8.30	1.60	7

TABLE B2-5. SUMMARY OF RESULTS: ELECTROFISHING SAMPLES
JUNE, 1983

STATION	DATE	REPLICATE	SPECIES	LIFE STAGE	NUMBER	LENGTH (CM) MEAN	S.D.	N
24	020783	03	SLIMY SCULPIN	JUVENILE	2	6.30	0.28	2
		03	DOLLY VARDEN	JUVENILE	1	11.30	0.00	1
		03	SLIMY SCULPIN	ADULT	4	9.00	0.48	4
25	020783	01	NO FISH		1			0
		02	NO FISH		1			0
26	020783	01	SOCKEYE SALMON	PARR	6	3.93	0.66	6
		01	SLIMY SCULPIN	PARR	1	3.40	0.00	1
		01	SOCKEYE SALMON	PARR	19	4.25	0.78	19
		01	SLIMY SCULPIN	PARR	1	2.80	0.00	1
		01	SOCKEYE SALMON	PARR	2	4.40	0.14	2
		01	SLIMY SCULPIN	JUVENILE	3	3.87	0.85	3
		02	LAKE TROUT		1	30.00	0.00	1
		03	DOLLY VARDEN	PARR	3	6.40	1.59	3
		03	SLIMY SCULPIN	PARR	1	5.30	0.00	1
		03	SLIMY SCULPIN	ADULT	2	4.90	0.28	2
		03	LAKE TROUT	ADULT	1	37.70	0.00	1
27	020783	01	NO FISH		1			0
		02	NO FISH		1			0
28	020783	01	NO FISH		1			0
		02	DOLLY VARDEN	PARR	1	9.30	0.00	1
40	030783	01	DOLLY VARDEN	PARR	4	7.22	2.01	4
		01	PINK SALMON	PARR	1	4.50	0.00	1
		01	DOLLY VARDEN	JUVENILE	1	15.10	0.00	1
		01	SLIMY SCULPIN	ADULT	1	10.80	0.00	1
		02	NO FISH		1			0
		03	SLIMY SCULPIN	JUVENILE	1	6.60	0.00	1
		03	SLIMY SCULPIN	ADULT	1	7.10	0.00	1
		03	NINE-SPINE STICKLEBACK	ADULT	1	4.70	0.00	1
41	030783	01	NO FISH		1			0
		02	COHO SALMON	PARR	1	5.40	0.00	1
		02	SLIMY SCULPIN	ADULT	1	7.20	0.00	1
		03	NO FISH		1			0
42	030783	01	NO FISH		1			0
		02	NO FISH		1			0
		03	SLIMY SCULPIN	JUVENILE	1	5.10	0.00	1
43	030783	01	CHINOOK SALMON	PARR	4	4.82	0.33	4
		01	SLIMY SCULPIN	ADULT	3	7.83	0.97	3
		02	NO FISH		1			0
		03	CHINOOK SALMON	PARR	1	4.50	0.00	1
		03	SLIMY SCULPIN	JUVENILE	2	6.00	0.14	2
		03	SLIMY SCULPIN	ADULT	1	11.10	0.00	1

TABLE B2-5. SUMMARY OF RESULTS: ELECTROFISHING SAMPLES
JUNE, 1983

STATION	DATE	REPLICATE	SPECIES	LIFE STAGE	NUMBER	LENGTH (CM) MEAN	S.D.	N
44	040783	01	CHINOOK SALMON	PARR	2	3.95	0.64	2
		01	DOLLY VARDEN	PARR	2	5.75	2.05	2
		01	CHINOOK SALMON	PARR	2	4.20	0.14	2
		01	SLIMY SCULPIN	JUVENILE	2	6.55	2.48	2
		02	CHINOOK SALMON	PARR	2	3.70	0.28	2
		03	NO FISH		1			0
45	290683	01	NO FISH		1			0
6A	040783	01	DOLLY VARDEN	PARR	2	3.45	0.10	2
		01	SLIMY SCULPIN	JUVENILE	1	3.20	0.00	1
		01	SLIMY SCULPIN	ADULT	1	7.80	0.00	1
		02	COHO SALMON	PARR	1	4.10	0.00	1
		02	SLIMY SCULPIN	JUVENILE	1	4.50	0.00	1
		02	SLIMY SCULPIN	ADULT	3	9.80	1.61	3
		03	DOLLY VARDEN	PARR	1	3.90	0.00	1
		03	SOCKEYE SALMON	PARR	1	4.30	0.00	1
		03	SLIMY SCULPIN	JUVENILE	3	4.53	1.51	3
		03	PYGMY WHITE FISH	ADULT	1	8.70	0.00	1
		03	SLIMY SCULPIN	ADULT	2	8.65	0.36	2
16A	040783	01	DOLLY VARDEN	PARR	3	4.20	0.10	3
		01	COHO SALMON	PARR	1	5.50	0.00	1
		01	DOLLY VARDEN	PARR	3	4.97	1.03	3
		01	COHO SALMON	PARR	1	3.80	0.00	1
		01	DOLLY VARDEN	PARR	1	5.00	0.00	1
		01	COHO SALMON	PARR	3	5.17	0.20	3
		01	DOLLY VARDEN	PARR	4	5.65	2.32	4
		01	COHO SALMON	PARR	1	4.80	0.00	1
		01	SLIMY SCULPIN	JUVENILE	1	3.40	0.00	1
		02	DOLLY VARDEN	PARR	5	9.14	1.93	5
		02	COHO SALMON	PARR	11	5.06	0.47	11
		02	SLIMY SCULPIN	ADULT	1	8.30	0.00	1
		03	DOLLY VARDEN	PARR	1	3.50	0.00	1
		03	CHUM SALMON	PARR	1	4.00	0.00	1
		03	DOLLY VARDEN	PARR	5	3.72	0.33	5
		03	COHO SALMON	PARR	1	4.10	0.00	1
		03	CHUM SALMON	PARR	1	4.40	0.00	1
		03	DOLLY VARDEN	PARR	1	4.10	0.00	1
		03	COHO SALMON	PARR	1	3.30	0.00	1
		03	DOLLY VARDEN	PARR	1	4.50	0.00	1
17D	020783	01	DOLLY VARDEN	PARR	7	8.27	1.32	7
		01	DOLLY VARDEN	JUVENILE	3	12.73	1.29	3
		01	SLIMY SCULPIN	ADULT	2	7.80	0.71	2
		02	DOLLY VARDEN	PARR	7	9.63	3.67	7
		02	DOLLY VARDEN	JUVENILE	2	10.10	5.52	2
		02	SLIMY SCULPIN	ADULT	1	8.30	0.00	1
		03	CHINOOK SALMON	PARR	2	5.40	0.28	2
		03	DOLLY VARDEN	PARR	2	8.95	0.92	2

TABLE B2-5. SUMMARY OF RESULTS: ELECTROFISHING SAMPLES
JUNE, 1983

STATION	DATE	REPLICATE	SPECIES	LIFE STAGE	NUMBER	LENGTH (CM) MEAN	S.D.	N
17D	020783	03	ROUND WHITE FISH	JUVENILE	1	18.50	0.00	1
		03	SLIMY SCULPIN	JUVENILE	1	5.50	0.00	1
		03	SLIMY SCULPIN	ADULT	5	8.36	0.93	5
18A	010783	01	NO FISH		1			0
		02	DOLLY VARDEN	JUVENILE	1	10.30	0.00	1
		03	NO FISH		1			0
19A	010783	01	DOLLY VARDEN	PARR	4	7.52	1.59	4
		01	SLIMY SCULPIN	JUVENILE	1	8.70	0.00	1
		01	SLIMY SCULPIN	ADULT	1	9.10	0.00	1
		02	NO FISH		1			0
		03	DOLLY VARDEN	PARR	2	5.70	0.71	2
40A	030783	01	NO FISH		1			0
		02	NO FISH		1			0
		03	DOLLY VARDEN	JUVENILE	1	4.00	0.00	1
41A	030783	01	DOLLY VARDEN	PARR	1	7.70	0.00	1
		02	DOLLY VARDEN	PARR	2	6.75	2.05	2
		02	SLIMY SCULPIN	ADULT	1	5.70	0.00	1
		03	NO FISH		1			0
42A	030783	01	SLIMY SCULPIN	JUVENILE	1	5.10	0.00	1
		02	DOLLY VARDEN	PARR	2	5.00	0.42	2
		02	SLIMY SCULPIN	ADULT	1	5.40	0.00	1
		03	CHINOOK SALMON	PARR	21	4.01	0.45	21
43A	030783	01	CHINOOK SALMON	PARR	2	4.80	0.57	2
		02	CHINOOK SALMON	PARR	11	4.35	0.28	11
		02	NINE-SPINE STICKLEBACK	ADULT	1	6.80	0.00	1
		03	CHINOOK SALMON	PARR	9	4.12	0.50	9
44A	040783	01	CHINOOK SALMON	PARR	36	3.90	0.56	36
		01	SLIMY SCULPIN	JUVENILE	3	3.80	1.74	3
		02	NO FISH		1			0
		03	CHINOOK SALMON	PARR	1	4.30	0.00	1

TABLE B2-6. SUMMARY OF RESULTS: DIP NET SAMPLES
JUNE, 1983

STATION	DATE	REPLICATE	SPECIES	LIFE STAGE	NUMBER	LENGTH (CM) MEAN	S.D.	N
4	200683	01	COHO SALMON	PARR	7	3.89	0.39	7
		01	CHUM SALMON	PARR	1	4.20	0.00	1

TABLE B2-7. SUMMARY OF RESULTS: INCLINE PLANE TRAP SAMPLES
JUNE, 1983

STATION	DATE	REPLICATE	SPECIES	LIFE STAGE	NUMBER	LENGTH (CM) MEAN	S.D.	N
1D	020733	01	NO FISH		1			0
1D	030733	01	SOCKEYE SALMON	PARR	1	4.00	0.00	1
1D	040733	01	COHO SALMON	PARR	1	4.20	0.00	1
1D	050733	01	COHO SALMON	PARR	1	6.90	0.00	1
		01	THREE-SPINE STICKLEBACK	ADULT	1	7.30	0.00	1
1D	130633	01	SOCKEYE SALMON	JUVENILE	8	7.07	0.77	8
		01	CHUM SALMON	JUVENILE	5	4.10	0.63	5
		01	EULACHON	JUVENILE	1	3.40	0.00	1
		01	CHUM SALMON	JUVENILE	1	4.50	0.00	1
		01	SOCKEYE SALMON	JUVENILE	1	6.70	0.00	1
		01	CHUM SALMON	JUVENILE	2	4.80	0.71	2
		01	SOCKEYE SALMON	JUVENILE	2	3.95	0.50	2
		01	CHUM SALMON	JUVENILE	1	3.70	0.00	1
		01	PINK SALMON	JUVENILE	2	3.05	0.10	2
		01	SOCKEYE SALMON	JUVENILE	2	4.30	0.71	2
		01	CHUM SALMON	JUVENILE	1	4.00	0.00	1
		01	SOCKEYE SALMON	JUVENILE	2	3.60	0.42	2
		01	PINK SALMON	JUVENILE	1	3.10	0.00	1
		01	SOCKEYE SALMON	JUVENILE	1	3.60	0.00	1
		01	PINK SALMON	JUVENILE	2	3.40	0.00	2
		01	THREE-SPINE STICKLEBACK	ADULT	16	8.07	0.42	16
		01	NINE-SPINE STICKLEBACK	ADULT	1	4.30	0.00	1
1D	200633	01	COHO SALMON	PARR	1	3.90	0.00	1
		01	COHO SALMON	JUVENILE	1	11.30	0.00	1
		01	THREE-SPINE STICKLEBACK	JUVENILE	1	7.60	0.00	1
		01	SOCKEYE SALMON	JUVENILE	3	4.90	0.60	3
		01	CHUM SALMON	JUVENILE	5	4.66	0.56	5
		01	SOCKEYE SALMON	JUVENILE	1	6.90	0.00	1
		01	PINK SALMON	JUVENILE	1	3.70	0.00	1
		01	CHUM SALMON	JUVENILE	1	4.10	0.00	1
		01	SOCKEYE SALMON	JUVENILE	2	4.15	0.50	2
		01	PINK SALMON	JUVENILE	5	3.68	0.22	5
		01	EULACHON	ADULT	1	21.40	0.00	1
1D	210683	01	CHUM SALMON	JUVENILE	2	5.45	0.22	2
		01	SOCKEYE SALMON	JUVENILE	1	7.70	0.00	1
		01	PINK SALMON	JUVENILE	1	3.80	0.00	1
		01	SOCKEYE SALMON	JUVENILE	1	6.80	0.00	1
		01	CHUM SALMON	JUVENILE	2	4.35	0.50	2
		01	SOCKEYE SALMON	JUVENILE	1	6.90	0.00	1
		01	CHUM SALMON	JUVENILE	1	4.80	0.00	1
		01	SOCKEYE SALMON	JUVENILE	2	7.05	0.10	2
		01	CHUM SALMON	JUVENILE	3	4.50	0.35	3
		01	SOCKEYE SALMON	JUVENILE	1	7.70	0.00	1
		01	THREE-SPINE STICKLEBACK	ADULT	5	6.04	0.47	5

TABLE B2-7. SUMMARY OF RESULTS: INCLINE PLANE TRAP SAMPLES
JUNE, 1983

STATION	DATE	REPLICATE	SPECIES	LIFE STAGE	NUMBER	LENGTH (CM) MEAN	S.D.	N
1D	220683	01	CHUM SALMON	JUVENILE	1	3.20	0.00	1
		01	THREE-SPINE STICKLEBACK	ADULT	3	7.63	0.36	3
1D	230683	01	SOCKEYE SALMON	PARR	1	4.20	0.00	1
		01	PINK SALMON	PARR	1	3.90	0.00	1
		01	SOCKEYE SALMON	PARR	1	3.90	0.00	1
		01	CHUM SALMON	PARR	3	3.97	0.10	3
		01	CHINOOK SALMON	PARR	1	3.60	0.00	1
		01	PYGMY WHITE FISH	PARR	2	2.65	0.10	2
		01	THREE-SPINE STICKLEBACK	ADULT	4	7.80	0.36	4
1D	240683	01	COHO SALMON	PARR	1	3.70	0.00	1
		01	PYGMY WHITE FISH	PARR	1	3.30	0.00	1
		01	THREE-SPINE STICKLEBACK	ADULT	1	8.10	0.00	1
1D	250683	01	NO FISH		1			0
1D	270683	01	THREE-SPINE STICKLEBACK	ADULT	1	8.50	0.00	1
1D	280683	00	THREE-SPINE STICKLEBACK	ADULT	1	5.30	0.00	1
		00	NINE-SPINE STICKLEBACK	ADULT	1	4.30	0.00	1
1D	290683	01	NO FISH		1			0
1D	300683	01	COHO SALMON	PARR	1	10.80	0.00	1

TABLE B2-8. SUMMARY OF RESULTS: FYKE NET SAMPLES
JUNE, 1983

STATION	DATE	REPLICATE	SPECIES	LIFE STAGE	NUMBER	LENGTH (CM) MEAN	S.D.	N
4	190683	01	RAINBOW TROUT	JUVENILE	1	20.10	0.00	1
		01	RAINBOW TROUT	ADULT	1	27.50	0.00	1
		01	PYGMY WHITE FISH	ADULT	1			0
		01	ROUND WHITE FISH	ADULT	1	36.70	0.00	1
		01	RAINBOW TROUT	ADULT	1	43.20	0.00	1
4	200683	01	RAINBOW TROUT	ADULT	1	44.70	0.00	1
		01	DOLLY VARDEN	ADULT	1	37.60	0.00	1
		01	RAINBOW TROUT	ADULT	1	41.20	0.00	1
4	220683	01	ROUND WHITE FISH	JUVENILE	2	14.75	1.06	2
		01	RAINBOW TROUT	ADULT	1	27.00	0.00	1
		01	SOCKEYE SALMON	ADULT	1	63.70	0.00	1
		01	SLIMY SCULPIN	ADULT	1	11.00	0.00	1
4	240683	01	RAINBOW TROUT	JUVENILE	1	26.50	0.00	1
		01	ROUND WHITE FISH	ADULT	1	32.50	0.00	1
		01	RAINBOW TROUT	ADULT	4	32.62	9.08	4
4	260683	01	TRAP BURIED		0			
4	280683	01	TRAP BURIED		0			
6	190683	01	ROUND WHITE FISH	JUVENILE	1	24.70	0.00	1
		01	ROUND WHITE FISH	ADULT	2	32.10	1.13	2
		01	RAINBOW TROUT	ADULT	5	38.38	3.15	5
		01	ROUND WHITE FISH	ADULT	2	35.50	4.24	2
6	200683	01	ROUND WHITE FISH	ADULT	1	35.30	0.00	1
		01	RAINBOW TROUT	ADULT	2	43.45	6.29	2
6	220683	01	ROUND WHITE FISH	JUVENILE	1	13.60	0.00	1
		01	ROUND WHITE FISH	ADULT	5	28.10	3.36	5
		01	RAINBOW TROUT	ADULT	1	44.40	0.00	1
		01	CHINOOK SALMON	ADULT	1	59.00	0.00	1
6	240683	01	ROUND WHITE FISH	ADULT	7	23.57	11.55	7
6	260683	01	TRAP BURIED		0			
6	280683	01	ROUND WHITE FISH	JUVENILE	2	16.15	0.22	2
		01	ROUND WHITE FISH	ADULT	1	25.20	0.00	1
		01	RAINBOW TROUT	ADULT	3	41.47	2.59	3
10	180683	01	DOLLY VARDEN	JUVENILE	1			0
		01	SOCKEYE SALMON	ADULT	3	50.73	5.23	3
		01	DOLLY VARDEN	ADULT	1	47.60	0.00	1
		01	EULACHON	ADULT	1	20.00	0.00	1
10	190683	01	SOCKEYE SALMON	ADULT	4	63.30	2.78	4

TABLE B2-8. SUMMARY OF RESULTS: FYKE NET SAMPLES
JUNE, 1983

STATION	DATE	REPLICATE	SPECIES	LIFE STAGE	NUMBER	LENGTH (CM) MEAN	S.D.	N
1D	200683	01	SOCKEYE SALMON	ADULT	3	57.57	6.84	3
		01	EULACHON	ADULT	2	15.65	8.56	2
1D	220683	01	RAINBOW TROUT	ADULT	2	45.20	14.85	2
		01	DOLLY VARDEN	ADULT	3	42.27	5.32	3
		01	SOCKEYE SALMON	ADULT	2	59.65	8.27	2
		01	EULACHON	ADULT	1	21.00	0.00	1
1D	230683	01	DOLLY VARDEN	ADULT	2	31.50	2.83	2
		01	SOCKEYE SALMON	ADULT	3	59.83	2.67	3
		01	EULACHON	ADULT	3	19.90	0.69	3
1D	250683	01	EULACHON	ADULT	14	21.16	0.69	14
		01	RAINBOW TROUT	ADULT	2	25.10	2.69	2
		01	DOLLY VARDEN	ADULT	1	42.50	0.00	1
1D	270683	01	TRAP BURIED		0			

APPENDIX B

B3. CATCH PER EFFORT SUMMARIES

TABLE B3-1. CATCH PER EFFORT: ELECTROSHOCKING SAMPLES
APRIL 1983

STATION	SPECIES	LIFE STAGE	CATCH/ EFFORT	LENGTH MEAN	LENGTH S.D.	LENGTH N
13	DOLLY VARDEN	PARR	2.49	5.80	0.95	23
	COHO SALMON	PARR	0.10			0
	SLIMY SCULPIN	JUVENILE	0.11	6.00	0.00	1
15	DOLLY VARDEN	PARR	0.38	3.93	1.19	3
	COHO SALMON	PARR	1.02	3.20	0.21	8
	SOCKEYE SALMON	FRY	0.13	3.30	0.00	1
	SOCKEYE SALMON	PARR	0.25	3.15	0.07	2
	CHINOOK SALMON	PARR	0.13	3.80	0.00	1
17	COHO SALMON	FRY	0.50	3.00	0.28	2
	COHO SALMON	PARR	2.26	3.66	0.70	9
	SLIMY SCULPIN	JUVENILE	1.25	4.42	1.96	5
	CHUM SALMON	PARR	0.50	4.05	0.35	2
19	DOLLY VARDEN	PARR	1.48	8.00	2.73	9
	COHO SALMON	PARR	0.16	7.30	0.00	1
	CHINOOK SALMON	PARR	0.16	7.20	0.00	1
	SLIMY SCULPIN	JUVENILE	0.16	6.40	0.00	1
	SLIMY SCULPIN	ADULT	0.16	8.30	0.00	1
22	DOLLY VARDEN	PARR	3.66	10.31	2.63	10
	DOLLY VARDEN	JUVENILE	1.01	12.45	1.77	4
42	DOLLY VARDEN	PARR	4.73	5.29	0.56	7
	COHO SALMON	FRY	0.68	3.10	0.00	1
	COHO SALMON	PARR	0.68	3.20	0.00	1
	SOCKEYE SALMON	FRY	0.68	3.10	0.00	1
40A	DOLLY VARDEN	PARR	0.25	5.23	1.08	6
	COHO SALMON	PARR	0.12	6.20	1.82	3
	RAINBOW TROUT	PARR	0.04	5.30	0.00	1
	SLIMY SCULPIN	JUVENILE	0.12	5.63	2.57	3
	SLIMY SCULPIN	ADULT	0.04			0
	NINE-SPINE STICKLEBACK	JUVENILE	0.12	4.47	0.83	3

TABLE B3-2. CATCH PER EFFORT: MINNOW TRAP SAMPLES
APRIL 1983

STATION	SPECIES	LIFE STAGE	CATCH/ EFFORT	LENGTH MEAN	LENGTH S.D.	N
1	NINE-SPINE STICKLEBACK	JUVENILE	5.250	5.35	0.46	20
	NINE-SPINE STICKLEBACK	ADULT	0.750	6.83	0.50	3
3	COHO SALMON	PARR	0.500	9.95	3.32	2
	SLIMY SCULPIN	JUVENILE	0.250	6.00	0.00	1
	SLIMY SCULPIN	ADULT	0.250	9.30	0.00	1
4	DOLLY VARDEN	PARR	1.000	10.00	1.61	4
	COHO SALMON	PARR	4.500	8.12	2.21	18
	SLIMY SCULPIN	ADULT	0.250	9.70	0.00	1
5	COHO SALMON	PARR	0.250	5.20	0.00	1
6	NINE-SPINE STICKLEBACK	ADULT	0.333	6.60	0.00	1
8	DOLLY VARDEN	PARR	0.750	9.57	3.26	3
	DOLLY VARDEN	JUVENILE	0.250	13.70	0.00	1
	COHO SALMON	PARR	1.500	7.97	2.86	6
	COHO SALMON	JUVENILE	0.250	12.80	0.00	1
	SLIMY SCULPIN	JUVENILE	0.250	6.30	0.00	1
	SLIMY SCULPIN	ADULT	0.250	9.40	0.00	1
	NINE-SPINE STICKLEBACK	JUVENILE	1.750	6.04	0.71	7
	NINE-SPINE STICKLEBACK	ADULT	1.500	7.30	0.40	6
11	COHO SALMON	PARR	0.666	5.60	0.42	2
	NINE-SPINE STICKLEBACK	JUVENILE	0.333	5.40	0.00	1
14	DOLLY VARDEN	PARR	2.000	9.79	2.76	8
	SLIMY SCULPIN	JUVENILE	0.250	7.70	0.00	1
15	DOLLY VARDEN	PARR	0.750	6.63	0.71	3
	SLIMY SCULPIN	JUVENILE	0.250	6.40	0.00	1
16	DOLLY VARDEN	PARR	1.000	9.52	0.56	4
17	DOLLY VARDEN	PARR	0.500	9.20	0.00	1
	COHO SALMON	PARR	0.750	3.93	0.58	3
19	SLIMY SCULPIN	JUVENILE	0.500	8.60	0.00	1
22	DOLLY VARDEN	PARR	2.000	10.54	1.48	8
	DOLLY VARDEN	JUVENILE	0.250	15.30	0.00	1
	PYGMY WHITE FISH	JUVENILE	0.250	11.10	0.00	1
16A	DOLLY VARDEN	PARR	1.000	10.35	3.03	4
	DOLLY VARDEN	JUVENILE	0.250	9.70	0.00	1
	COHO SALMON	PARR	1.250	9.52	1.74	5
	NINE-SPINE STICKLEBACK	JUVENILE	1.250	5.52	1.01	5
	NINE-SPINE STICKLEBACK	ADULT	1.250	6.90	0.74	5

TABLE B3-3. CATCH PER EFFORT: ELECTROSHOCKING SAMPLES
JUNE 1983

STATION	SPECIES	LIFE STAGE	CATCH/ EFFORT	LENGTH MEAN	S.D.	N
1	DOLLY VARDEN	JUVENILE	0.23	14.20	0.00	1
	COHO SALMON	PARR	1.07	4.75	0.10	4
	SOCKEYE SALMON	PARR	3.03	4.63	0.49	12
	CHUM SALMON	PARR	0.23	5.00	0.00	1
2	DOLLY VARDEN	PARR	0.53	8.70	0.99	2
	DOLLY VARDEN	JUVENILE	0.50	12.05	0.78	2
	COHO SALMON	PARR	0.23	4.30	0.00	1
	SOCKEYE SALMON	PARR	0.46	4.45	0.21	2
	CHINOOK SALMON	PARR	0.27	4.80	0.00	1
	ROUND WHITE FISH	PARR	0.23	7.60	0.00	1
	ROUND WHITE FISH	JUVENILE	1.26	11.34	1.63	5
	SLIMY SCULPIN	JUVENILE	0.27	5.00	0.00	1
	SLIMY SCULPIN	ADULT	0.76	6.97	0.25	3
	CHUM SALMON	PARR	1.23	5.08	0.45	5
3	DOLLY VARDEN	PARR	0.37	10.25	2.76	2
	DOLLY VARDEN	JUVENILE	0.37	12.15	0.92	2
	COHO SALMON	PARR	0.20	7.10	0.00	1
	ROUND WHITE FISH	JUVENILE	0.40	9.30	2.83	2
	SLIMY SCULPIN	JUVENILE	0.59	5.20	0.36	3
	SLIMY SCULPIN	ADULT	0.55	8.03	0.38	3
	CHUM SALMON	PARR	0.72	3.85	0.21	4
4	DOLLY VARDEN	PARR	0.77	5.93	3.18	3
	COHO SALMON	PARR	1.82	6.81	2.81	7
	ROUND WHITE FISH	PARR	0.24	8.00	0.00	1
	ROUND WHITE FISH	JUVENILE	0.48	7.60	0.71	2
	SLIMY SCULPIN	JUVENILE	0.18	4.10	0.00	1
	SLIMY SCULPIN	ADULT	0.24	11.50	0.00	1
	CHUM SALMON	PARR	2.45	4.77	0.45	10
5	COHO SALMON	PARR	3.93	4.64	0.56	14
	SLIMY SCULPIN	PARR	0.31	4.60	0.00	1
	CHUM SALMON	PARR	2.31	4.25	0.40	10
6	DOLLY VARDEN	PARR	0.36	8.50	0.00	1
	COHO SALMON	PARR	1.10	3.95	0.44	4
8	DOLLY VARDEN	PARR	0.74	11.03	0.21	3
	DOLLY VARDEN	JUVENILE	0.25	14.80	0.00	1
	SLIMY SCULPIN	JUVENILE	0.49	5.65	0.07	2
	CHUM SALMON	PARR	0.32	4.20	0.00	1
9	DOLLY VARDEN	PARR	2.24	7.10	1.43	8
	COHO SALMON	PARR	0.31	4.70	0.00	1
	SLIMY SCULPIN	JUVENILE	0.57	5.30	0.42	2
10	DOLLY VARDEN	PARR	3.41	7.09	1.92	12

TABLE 33-3. CATCH PER EFFORT: ELECTROSHOCKING SAMPLES
JUNE 1983

STATION	SPECIES	LIFE STAGE	CATCH/ EFFORT	LENGTH MEAN	LENGTH S.D.	N
10	COHO SALMON	PARR	0.32	6.90	0.00	1
	SLIMY SCULPIN	JUVENILE	0.87	4.83	0.38	3
	SLIMY SCULPIN	ADULT	0.24	7.40	0.00	1
11	DOLLY VARDEN	PARR	1.09	6.42	1.75	4
	DOLLY VARDEN	JUVENILE	0.23	10.50	0.00	1
	COHO SALMON	PARR	0.63	4.40	0.00	2
12	DOLLY VARDEN	PARR	0.42	8.70	3.54	2
	COHO SALMON	PARR	1.08	5.52	1.49	6
	PYGMY WHITE FISH	ADULT	0.17	5.20	0.00	1
	SOCKEYE SALMON	PARR	0.35	4.35	0.21	2
	ROUND WHITE FISH	JUVENILE	0.17	11.20	0.00	1
	SLIMY SCULPIN	PARR	0.17	2.60	0.00	1
	SLIMY SCULPIN	JUVENILE	0.69	3.40	0.61	4
	THREE-SPINE STICKLEBACK	ADULT	0.64	8.07	0.05	3
13	DOLLY VARDEN	PARR	3.66	7.12	1.52	13
14	DOLLY VARDEN	PARR	0.94	8.47	3.55	3
	COHO SALMON	PARR	14.91	3.87	0.39	53
15	DOLLY VARDEN	PARR	2.14	6.96	2.31	7
	SOCKEYE SALMON	PARR	0.25			0
	SLIMY SCULPIN	JUVENILE	0.22	3.90	0.00	1
16	DOLLY VARDEN	PARR	0.68	7.50	0.56	3
	COHO SALMON	PARR	0.22	3.40	0.00	1
	SOCKEYE SALMON	PARR	0.23	7.10	0.00	1
17	DOLLY VARDEN	PARR	1.67	6.40	2.50	6
	DOLLY VARDEN	JUVENILE	1.62	11.95	1.79	6
	COHO SALMON	PARR	0.27	5.50	0.00	1
	SOCKEYE SALMON	PARR	0.29	5.20	0.00	1
18	DOLLY VARDEN	PARR	0.22	6.40	0.00	1
	COHO SALMON	PARR	0.50	5.55	1.63	2
1D	DOLLY VARDEN	PARR	0.65			0
	COHO SALMON	PARR	0.34			0
	SOCKEYE SALMON	PARR	0.31	3.60	0.00	1
20	DOLLY VARDEN	JUVENILE	0.30	13.10	0.00	1
	COHO SALMON	PARR	1.79	5.40	0.41	6
	SOCKEYE SALMON	PARR	1.41	3.16	0.24	5
	SLIMY SCULPIN	JUVENILE	0.28	4.90	0.00	1
	SLIMY SCULPIN	ADULT	0.91	8.70	0.30	3
21	DOLLY VARDEN	PARR	1.70	7.93	0.43	9

TABLE 33-3. CATCH PER EFFORT: ELECTROSHOCKING SAMPLES
JUNE 1983

STATION	SPECIES	LIFE STAGE	CATCH/ EFFORT	LENGTH MEAN	S.D.	N
21	DOLLY VARDEN	JUVENILE	0.51	14.43	0.51	3
	CHUM SALMON	PARR	1.64	4.27	0.65	6
22	DOLLY VARDEN	JUVENILE	0.86	12.20	0.41	4
	SOCKEYE SALMON	PARR	1.43	7.10	1.38	5
	SLIMY SCULPIN	ADULT	0.43	8.95	0.21	2
23	DOLLY VARDEN	PARR	1.78	8.16	1.80	7
	DOLLY VARDEN	JUVENILE	0.24	13.00	0.00	1
	SLIMY SCULPIN	JUVENILE	0.29	4.60	0.00	1
	SLIMY SCULPIN	ADULT	0.53	8.35	2.47	2
24	DOLLY VARDEN	PARR	1.14	8.30	1.60	7
	DOLLY VARDEN	JUVENILE	0.33	11.75	0.64	2
	SOCKEYE SALMON	PARR	0.33	5.45	0.07	2
	SLIMY SCULPIN	JUVENILE	0.33	6.30	0.28	2
	SLIMY SCULPIN	ADULT	0.65	9.00	0.48	4
25	NO FISH		0.00			0
26	DOLLY VARDEN	PARR	0.62	6.40	1.59	3
	SOCKEYE SALMON	PARR	7.56	4.19	0.71	27
	SLIMY SCULPIN	PARR	0.77	3.83	1.30	3
	SLIMY SCULPIN	JUVENILE	0.84	3.97	0.87	3
	SLIMY SCULPIN	ADULT	0.41	4.90	0.28	2
	LAKE TROUT	ADULT	0.21	37.70	0.00	1
	LAKE TROUT		0.28	30.00	0.00	1
27	NO FISH		0.00			0
28	DOLLY VARDEN	PARR	0.38	9.30	0.00	1
40	DOLLY VARDEN	PARR	1.03	7.22	1.99	4
	DOLLY VARDEN	JUVENILE	0.26	15.10	0.00	1
	SLIMY SCULPIN	JUVENILE	0.24	6.60	0.00	1
	SLIMY SCULPIN	ADULT	0.50	8.95	2.62	2
	NINE-SPINE STICKLEBACK	ADULT	0.24	4.70	0.00	1
	PINK SALMON	PARR	0.26	4.50	0.00	1
41	COHO SALMON	PARR	0.27	5.40	0.00	1
	SLIMY SCULPIN	ADULT	0.27	7.20	0.00	1
42	SLIMY SCULPIN	JUVENILE	0.23	5.10	0.00	1
43	CHINOOK SALMON	PARR	1.09	4.76	0.23	5
	SLIMY SCULPIN	JUVENILE	0.47	6.00	0.14	2
	SLIMY SCULPIN	ADULT	0.87	8.65	1.80	4
44	DOLLY VARDEN	PARR	0.58	5.75	2.05	2

TABLE B3-3. CATCH PER EFFORT: ELECTROSHOCKING SAMPLES
JUNE 1983

STATION	SPECIES	LIFE STAGE	CATCH/ EFFORT	LENGTH MEAN	LENGTH S.D.	N
44	CHINOOK SALMON	PARR	1.77	3.95	0.39	6
	SLIMY SCULPIN	JUVENILE	0.58	6.55	2.47	2
45	NO FISH		0.00			0
6A	DOLLY VARDEN	PARR	0.69	3.60	0.26	3
	COHO SALMON	PARR	0.25	4.10	0.00	1
	PYGMY WHITE FISH	ADULT	0.21	8.70	0.00	1
	SOCKEYE SALMON	PARR	0.21	4.30	0.00	1
	SLIMY SCULPIN	JUVENILE	1.12	4.26	1.21	5
	SLIMY SCULPIN	ADULT	1.42	9.08	1.33	6
16A	DOLLY VARDEN	PARR	5.48	5.48	2.37	24
	COHO SALMON	PARR	5.03	4.88	0.63	19
	SLIMY SCULPIN	JUVENILE	0.15	3.40	0.00	1
	SLIMY SCULPIN	ADULT	0.32	8.30	0.00	1
	CHUM SALMON	PARR	0.54	4.20	0.28	2
17D	DOLLY VARDEN	PARR	3.70	8.95	2.57	16
	DOLLY VARDEN	JUVENILE	1.14	11.68	3.23	5
	CHINOOK SALMON	PARR	0.46	5.40	0.28	2
	ROUND WHITE FISH	JUVENILE	0.23	18.50	0.00	1
	SLIMY SCULPIN	JUVENILE	0.23	5.50	0.00	1
	SLIMY SCULPIN	ADULT	1.81	8.21	0.79	8
18A	DOLLY VARDEN	JUVENILE	0.20	10.30	0.00	1
19A	DOLLY VARDEN	PARR	1.75	6.92	1.82	6
	SLIMY SCULPIN	JUVENILE	0.33	8.70	0.00	1
	SLIMY SCULPIN	ADULT	0.33	9.10	0.00	1
40A	DOLLY VARDEN	JUVENILE	0.30	4.00	0.00	1
41A	DOLLY VARDEN	PARR	0.64	7.07	1.55	3
	SLIMY SCULPIN	ADULT	0.21	5.70	0.00	1
42A	DOLLY VARDEN	PARR	0.45	5.00	0.42	2
	CHINOOK SALMON	PARR	3.09	4.01	0.40	21
	SLIMY SCULPIN	JUVENILE	0.28	5.10	0.00	1
	SLIMY SCULPIN	ADULT	0.22	5.40	0.00	1
43A	CHINOOK SALMON	PARR	5.83	4.30	0.44	22
	NINE-SPINE STICKLEBACK	ADULT	0.24	6.80	0.00	1
44A	CHINOOK SALMON	PARR	9.65	3.91	0.58	37
	SLIMY SCULPIN	JUVENILE	0.78	3.80	1.74	3

TABLE B3-4. CATCH PER EFFORT: MINNOW TRAP SAMPLES
JUNE 1983

STATION	SPECIES	LIFE STAGE	CATCH/ EFFORT	LENGTH MEAN	S.D.	N
1	DOLLY VARDEN	PARR	0.70	12.21	1.06	7
	DOLLY VARDEN	JUVENILE	1.10	14.13	1.31	11
	COHO SALMON	PARR	0.30	9.77	1.20	3
	CHINOOK SALMON	PARR	0.10	9.10	0.00	1
	SLIMY SCULPIN	JUVENILE	0.20	5.80	0.71	2
	SLIMY SCULPIN	ADULT	0.30	8.87	0.51	3
	NINE-SPINE STICKLEBACK	JUVENILE	0.10	4.70	0.00	1
	THREE-SPINE STICKLEBACK	ADULT	6.30	8.28	0.54	63
2	DOLLY VARDEN	PARR	0.60	24.77	36.88	6
	DOLLY VARDEN	JUVENILE	1.30	12.08	1.42	13
	COHO SALMON	PARR	0.20	6.65	4.74	2
	SLIMY SCULPIN	JUVENILE	0.30	5.70	1.25	3
	SLIMY SCULPIN	ADULT	0.40	8.20	0.26	4
	THREE-SPINE STICKLEBACK	JUVENILE	0.10	8.20	0.00	1
	THREE-SPINE STICKLEBACK	ADULT	0.10	8.10	0.00	1
3	DOLLY VARDEN	PARR	0.67	10.22	1.04	6
	DOLLY VARDEN	JUVENILE	0.44	11.85	1.71	4
	SLIMY SCULPIN	ADULT	0.22	8.85	2.47	2
	THREE-SPINE STICKLEBACK	ADULT	0.11	8.00	0.00	1
4	DOLLY VARDEN	PARR	1.30	10.56	2.23	13
	COHO SALMON	PARR	0.80	5.86	1.63	8
	SLIMY SCULPIN	JUVENILE	0.10	8.10	0.00	1
	SLIMY SCULPIN	ADULT	0.40	9.55	0.83	4
	THREE-SPINE STICKLEBACK	ADULT	0.10	8.00	0.00	1
5	DOLLY VARDEN	PARR	0.22	10.85	2.47	2
	COHO SALMON	PARR	0.89	11.29	2.42	8
	SOCKEYE SALMON	PARR	0.11	5.60	0.00	1
	SLIMY SCULPIN	JUVENILE	0.22	4.05	0.78	2
	SLIMY SCULPIN	ADULT	0.11	9.70	0.00	1
	THREE-SPINE STICKLEBACK	ADULT	5.99	8.32	0.74	54
6	DOLLY VARDEN	PARR	1.50	11.19	2.30	15
	COHO SALMON	PARR	0.30	6.97	3.08	3
	SLIMY SCULPIN	JUVENILE	0.40	5.35	0.26	4
	SLIMY SCULPIN	ADULT	0.30	9.30	1.30	3
	THREE-SPINE STICKLEBACK	ADULT	0.30	8.40	0.26	3
8	DOLLY VARDEN	PARR	0.10	11.20	0.00	1
	COHO SALMON	PARR	0.50	4.78	0.70	5
	SLIMY SCULPIN	JUVENILE	0.10	6.50	0.00	1
	SLIMY SCULPIN	ADULT	0.10	8.40	0.00	1
	THREE-SPINE STICKLEBACK	ADULT	0.20	7.15	1.48	2
	CHUM SALMON	PARR	0.20	3.95	0.92	2
9	DOLLY VARDEN	PARR	1.10	8.09	2.69	11

TABLE B3-4. CATCH PER EFFORT: MINNOW TRAP SAMPLES
JUNE 1983

STATION	SPECIES	LIFE STAGE	CATCH/ EFFORT	LENGTH MEAN	LENGTH S.D.	LENGTH N
9	SLIMY SCULPIN	JUVENILE	0.30	5.30	0.40	3
	SLIMY SCULPIN	ADULT	0.10	11.30	0.00	1
10	DOLLY VARDEN	PARR	3.80	10.46	2.00	38
	THREE-SPINE STICKLEBACK	ADULT	0.40	8.57	0.25	4
11	DOLLY VARDEN	PARR	0.33	11.87	1.76	3
	DOLLY VARDEN	JUVENILE	0.11	14.00	0.00	1
	DOLLY VARDEN	ADULT	0.11	9.40	0.00	1
	COHO SALMON	PARR	0.78	8.69	1.39	7
	SLIMY SCULPIN	PARR	0.11	2.60	0.00	1
	NINE-SPINE STICKLEBACK	JUVENILE	0.11	5.30	0.00	1
	THREE-SPINE STICKLEBACK	PARR	0.11	8.50	0.00	1
	THREE-SPINE STICKLEBACK	ADULT	0.55	8.36	0.13	5
12	DOLLY VARDEN	PARR	1.00	9.82	1.22	5
	DOLLY VARDEN	JUVENILE	1.40	12.46	1.05	7
	COHO SALMON	PARR	1.40	6.13	1.50	7
	SOCKEYE SALMON	PARR	0.20	3.50	0.00	1
	SLIMY SCULPIN	ADULT	0.40	7.70	2.12	2
	THREE-SPINE STICKLEBACK	ADULT	0.40	8.55	0.07	2
13	DOLLY VARDEN	PARR	4.33	6.90	1.65	39
	DOLLY VARDEN	JUVENILE	1.00	11.24	0.91	9
	COHO SALMON	PARR	1.66	4.46	0.60	15
	SLIMY SCULPIN	ADULT	0.11	9.40	0.00	1
	CHUM SALMON	PARR	0.11	3.50	0.00	1
14	DOLLY VARDEN	PARR	0.78	4.83	1.55	7
	DOLLY VARDEN	JUVENILE	0.33	11.70	0.61	3
	COHO SALMON	PARR	3.11	4.76	1.76	28
15	DOLLY VARDEN	PARR	0.10	4.10	0.00	1
	DOLLY VARDEN	JUVENILE	0.10	7.00	0.00	1
16	DOLLY VARDEN	PARR	1.10	9.98	1.35	11
	DOLLY VARDEN	JUVENILE	0.20	13.80	0.00	2
	SLIMY SCULPIN	ADULT	0.10	12.00	0.00	1
17	DOLLY VARDEN	PARR	0.40	9.65	0.26	4
	DOLLY VARDEN	JUVENILE	0.60	11.55	1.51	6
	COHO SALMON	PARR	0.10	4.70	0.00	1
	SLIMY SCULPIN	ADULT	0.10	5.90	0.00	1
18	DOLLY VARDEN	PARR	0.20	7.50	3.39	2
	DOLLY VARDEN	JUVENILE	0.10	12.20	0.00	1
	SLIMY SCULPIN	ADULT	0.10	7.70	0.00	1
19	DOLLY VARDEN	JUVENILE	0.22	11.90	0.99	2

TABLE B3-4. CATCH PER EFFORT: MINNOW TRAP SAMPLES
JUNE 1983

STATION	SPECIES	LIFE STAGE	CATCH/ EFFORT	LENGTH MEAN	LENGTH S.D.	LENGTH N
10	DOLLY VARDEN	PARR	1.89	10.44	1.58	17
	DOLLY VARDEN	JUVENILE	0.11	13.00	0.00	1
	COHO SALMON	PARR	0.33	5.37	2.37	3
	SOCKEYE SALMON	PARR	0.11	4.40	0.00	1
	SLIMY SCULPIN	JUVENILE	0.11	2.50	0.00	1
	SLIMY SCULPIN	ADULT	0.11	7.00	0.00	1
	NINE-SPINE STICKLEBACK	JUVENILE	0.11	3.90	0.00	1
	THREE-SPINE STICKLEBACK	PARR	0.11	9.50	0.00	1
	THREE-SPINE STICKLEBACK	ADULT	5.77	8.07	0.38	52
	CHUM SALMON	PARR	0.22	4.90	0.00	1
20	DOLLY VARDEN	PARR	0.20	9.25	0.92	2
	COHO SALMON	PARR	0.50	4.38	0.78	5
	SOCKEYE SALMON	PARR	1.10	4.24	0.61	11
	SLIMY SCULPIN	ADULT	0.40	7.87	0.93	4
21	DOLLY VARDEN	PARR	0.10	9.90	0.00	1
	DOLLY VARDEN	JUVENILE	0.50	13.20	1.91	5
	COHO SALMON	PARR	0.50	3.66	0.17	5
22	DOLLY VARDEN	PARR	0.22	3.90	0.14	2
23	DOLLY VARDEN	PARR	0.50	7.22	3.74	5
	DOLLY VARDEN	JUVENILE	0.20	13.35	0.21	2
24	DOLLY VARDEN	JUVENILE	0.10	10.80	0.00	1
40	DOLLY VARDEN	PARR	1.10	7.91	1.84	11
	DOLLY VARDEN	JUVENILE	1.50	12.84	1.46	15
	SLIMY SCULPIN	ADULT	0.10	7.90	0.00	1
	NINE-SPINE STICKLEBACK	ADULT	0.10	6.20	0.00	1
	THREE-SPINE STICKLEBACK	JUVENILE	0.10	9.00	0.00	1
	THREE-SPINE STICKLEBACK	ADULT	1.80	8.36	0.27	18
41	DOLLY VARDEN	PARR	0.60	8.23	1.27	6
	DOLLY VARDEN	JUVENILE	0.50	13.00	0.92	5
	COHO SALMON	PARR	0.60	5.02	1.38	6
	SLIMY SCULPIN	JUVENILE	0.10	6.70	0.00	1
	SLIMY SCULPIN	ADULT	0.20	8.70	1.27	2
42	DOLLY VARDEN	PARR	0.20	6.05	2.62	2
	DOLLY VARDEN	JUVENILE	0.40	11.65	2.42	4
	COHO SALMON	PARR	0.50	7.56	1.17	5
	CHINOOK SALMON	PARR	7.60	5.05	1.86	76
	SLIMY SCULPIN	JUVENILE	0.30	5.63	0.55	3
	SLIMY SCULPIN	ADULT	0.10	5.50	0.00	1
	NINE-SPINE STICKLEBACK	JUVENILE	0.20	4.20	0.71	2
	NINE-SPINE STICKLEBACK	ADULT	1.20	5.47	1.23	12
	THREE-SPINE STICKLEBACK	ADULT	0.10	9.10	0.00	1

TABLE B3-4. CATCH PER EFFORT: MINNOW TRAP SAMPLES
JUNE 1983

STATION	SPECIES	LIFE STAGE	CATCH/ EFFORT	LENGTH MEAN	S.D.	N
43	DOLLY VARDEN	PARR	0.90	9.36	1.61	9
	DOLLY VARDEN	JUVENILE	0.40	13.40	0.62	4
	COHO SALMON	PARR	0.10	9.30	0.00	1
	CHINOOK SALMON	PARR	0.50	4.46	0.26	5
	SLIMY SCULPIN	JUVENILE	0.30	4.23	2.05	3
44	DOLLY VARDEN	JUVENILE	0.10	10.80	0.00	1
	COHO SALMON	PARR	0.20	8.80	2.40	2
	CHINOOK SALMON	PARR	3.40	3.94	0.46	34
	SLIMY SCULPIN	ADULT	0.10	6.90	0.00	1
	NINE-SPINE STICKLEBACK	ADULT	0.30	5.87	0.35	3
45	COHO SALMON	PARR	0.40	8.85	0.72	4
	NINE-SPINE STICKLEBACK	JUVENILE	0.40	2.65	0.13	4
	NINE-SPINE STICKLEBACK	ADULT	7.00	5.38	0.79	70
	THREE-SPINE STICKLEBACK	ADULT	0.10	5.80	0.00	1
6A	DOLLY VARDEN	PARR	0.70	9.36	0.98	7
	DOLLY VARDEN	JUVENILE	0.90	11.09	2.17	9
	SLIMY SCULPIN	ADULT	0.10	9.70	0.00	1
16A	DOLLY VARDEN	PARR	1.10	7.43	2.62	11
	DOLLY VARDEN	JUVENILE	0.10	10.70	0.00	1
	COHO SALMON	PARR	6.30	4.80	1.13	63
	SLIMY SCULPIN	JUVENILE	0.40	6.67	0.94	4
	SLIMY SCULPIN	ADULT	1.30	8.51	0.93	13
	NINE-SPINE STICKLEBACK	PARR	0.10	4.50	0.00	1
	THREE-SPINE STICKLEBACK	ADULT	0.60	8.30	0.39	6
17D	DOLLY VARDEN	PARR	0.44	9.92	1.19	4
	DOLLY VARDEN	JUVENILE	1.00	12.22	1.93	9
	SLIMY SCULPIN	ADULT	0.11	9.30	0.00	1
18A	DOLLY VARDEN	PARR	1.00	9.70	1.64	7
	DOLLY VARDEN	JUVENILE	0.43	11.10	0.79	3
19A	DOLLY VARDEN	PARR	0.78	7.80	1.75	7
	SLIMY SCULPIN	ADULT	0.11	8.10	0.00	1
40A	DOLLY VARDEN	PARR	1.00	7.61	2.10	10
	DOLLY VARDEN	JUVENILE	1.10	12.51	1.54	11
	COHO SALMON	PARR	0.20	3.30	0.28	2
	CHINOOK SALMON	PARR	0.10	3.90	0.00	1
	SLIMY SCULPIN	ADULT	0.10	8.50	0.00	1
41A	DOLLY VARDEN	PARR	0.22	6.15	0.64	2
42A	DOLLY VARDEN	PARR	1.33	5.18	1.74	12
	DOLLY VARDEN	JUVENILE	0.11	11.70	0.00	1

TABLE B3-4. CATCH PER EFFORT: MINNOW TRAP SAMPLES
JUNE 1983

STATION	SPECIES	LIFE STAGE	CATCH/ EFFORT	LENGTH MEAN	LENGTH S.D.	N
42A	COHO SALMON	PARR	0.11	9.90	0.00	1
	CHINOOK SALMON	PARR	4.00	4.05	0.92	36
43A	COHO SALMON	PARR	0.30	10.27	1.07	3
	CHINOOK SALMON	PARR	14.60	4.41	0.56	146
	SLIMY SCULPIN	ADULT	0.20	9.65	0.92	2
	NINE-SPINE STICKLEBACK	ADULT	0.10	7.00	0.00	1
44A	DOLLY VARDEN	JUVENILE	0.11	14.00	0.00	1
	CHINOOK SALMON	PARR	5.88	3.76	0.59	53
	SLIMY SCULPIN	ADULT	0.44	8.52	0.75	4
	NINE-SPINE STICKLEBACK	PARR	0.11	4.50	0.00	1
	NINE-SPINE STICKLEBACK	ADULT	0.11	6.30	0.00	1
11.5	DOLLY VARDEN	PARR	1.20	8.42	1.64	12
	SLIMY SCULPIN	JUVENILE	0.30	5.93	0.78	3
	SLIMY SCULPIN	ADULT	0.10	6.30	0.00	1

TABLE B3-5. CATCH PER EFFORT: FYKE NET SAMPLES
JUNE 1983

STATION	SPECIES	LIFE STAGE	CATCH/ EFFORT	LENGTH MEAN	S.D.	N
4	DOLLY VARDEN	ADULT	0.14	37.60	0.00	1
	PYGMY WHITE FISH	ADULT	0.14			0
	SOCKEYE SALMON	ADULT	0.14	63.70	0.00	1
	RAINBOW TROUT	JUVENILE	0.28	23.30	4.53	2
	RAINBOW TROUT	ADULT	1.28	34.90	8.58	9
	ROUND WHITE FISH	JUVENILE	0.28	14.75	1.06	2
	ROUND WHITE FISH	ADULT	0.28	34.60	2.97	2
	SLIMY SCULPIN	ADULT	0.14	11.00	0.00	1
6	CHINOOK SALMON	ADULT	0.11	59.00	0.00	1
	RAINBOW TROUT	ADULT	1.21	40.69	3.89	11
	ROUND WHITE FISH	JUVENILE	0.44	17.65	4.85	4
	ROUND WHITE FISH	ADULT	1.98	27.84	8.43	18
10	DOLLY VARDEN	JUVENILE	0.11			0
	DOLLY VARDEN	ADULT	0.78	39.99	6.94	7
	SOCKEYE SALMON	ADULT	1.67	58.46	6.19	15
	RAINBOW TROUT	ADULT	0.44	35.15	14.51	4
	EULACHON	ADULT	2.34	20.39	2.61	21

TABLE B3-5. CATCH PER EFFORT: FYKE NET SAMPLES
JUNE 1983

STATION	SPECIES	LIFE STAGE	CATCH/ EFFORT	LENGTH MEAN	S.D.	N
4	DOLLY VARDEN	ADULT	0.14	37.60	0.00	1
	PYGMY WHITE FISH	ADULT	0.14			0
	SOCKEYE SALMON	ADULT	0.14	63.70	0.00	1
	RAINBOW TROUT	JUVENILE	0.28	23.30	4.53	2
	RAINBOW TROUT	ADULT	1.28	34.90	8.58	9
	ROUND WHITE FISH	JUVENILE	0.28	14.75	1.06	2
	ROUND WHITE FISH	ADULT	0.28	34.60	2.97	2
	SLIMY SCULPIN	ADULT	0.14	11.00	0.00	1
6	CHINOOK SALMON	ADULT	0.11	59.00	0.00	1
	RAINBOW TROUT	ADULT	1.21	40.69	3.89	11
	ROUND WHITE FISH	JUVENILE	0.44	17.65	4.85	4
	ROUND WHITE FISH	ADULT	1.98	27.84	8.43	18
10	DOLLY VARDEN	JUVENILE	0.11			0
	DOLLY VARDEN	ADULT	0.78	39.99	6.94	7
	SOCKEYE SALMON	ADULT	1.67	58.46	6.19	15
	RAINBOW TROUT	ADULT	0.44	35.15	14.51	4
	EULACHON	ADULT	2.34	20.39	2.61	21