January 1985
Alaska Power Authority
Susitna Hydroelectric Project

Resident and Juvenile Anadromous Studies Procedures Manual Draft

(May 1984 - April 1985)

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1.0 INTRODUCTION

The Resident and Juvenile Anadromous Fish Studies (RJ) were established to accomplish the general objectives described in 1979 by the Alaska Department of Fish and Game (ADF&G) for the Susitna Hydroelectric Project (ADF&G 1979). These objectives are stated below:

A. Define the seasonal distribution and relative abundance of resident and juvenile anadromous fish in the Susitna River between Cook Inlet and Devil Canyon.

B. Characterize the seasonal habitat requirements of selected anadromous and resident species within the study area.

The Resident and Juvenile Anadromous Fisheries Studies began in November of 1980 and will continue through the Federal Energy Regulatory Commission (FERC) licensing process. Initial studies were general surveys of the Susitna River mainstem and associated habitats below Devil Canyon, and the portions of the upper Susitna River basin to be inundated by the proposed impoundments (ADF&G 1981). During the winter of 1981, and the spring and summer of 1982, the studies were concentrated on areas that may be most severely affected by the development of the Susitna Hydroelectric Project (ADF&G 1983a).

The primary purpose of the RJ studies was to address the distribution and abundance of resident and juvenile anadromous fish (Objective A). During the 1982 summer investigations, the studies concentrated on developing more information on habitat relationships of rearing resident and juvenile anadromous species that may be affected by the Susitna Hydroelectric Project (Objective B).

Studies conducted during the 1983-84 season addressed geographical areas where data had not previously been collected and provided a more direct and focused effort on habitat and rearing relationships of the juvenile anadromous species and selected resident species in the middle reach of the Susitna River between the Chulitna River confluence and Devil Canyon (Schmidt et al. 1984).

Studies to be conducted during the 1984 open-water and the 1984-85 ice-covered season are a continuation of the activities already described. Emphasis will be placed on characterizing the seasonal habitat requirements of selected juvenile anadromous and resident fish in the lower Susitna River (below the Chulitna River confluence) and further defining population parameters and the importance of selected macrohabitat types in the middle Susitna River (Chulitna River confluence to Devil Canyon). We will also initiate studies defining population parameters in the lower river.

Winter studies will attempt to define relative importance of habitat by examination of distribution of juvenile anadromous fish in both micro and macrohabitats.

2.0 TECHNICAL PROCEDURES

2.1 Study Description and Rationale

2.1.1 Resident and Juvenile Anadromous Fish Studies

2.1.1.1 Sub-objectives

A. Determine the distribution and abundance of rearing salmon juveniles and selected resident species in the Susitna River between Cook Inlet and the Chulitna River confluence.

B. Estimate the response of habitat for the rearing salmon juveniles and resident species as appropriate, as a function of changes in mainstem discharge.

2.1.1.2 Rationale

Approximately 40% of the annual discharge of the Susitna River below the Park's Highway bridge originates from the mainstem Susitna River above the Talkeetna River confluence. The operation of the proposed hydro-electric project will alter the natural flow regime of this reach during the open-water season. The amount of water flowing through this reach of river in the winter under postproject conditions is proposed to be several times the preproject conditions.

To assess the effects of these changes in the natural flow regime on the habitat of resident and juvenile anadromous fish, it is necessary to:

A. Determine the distribution of the species over the different seasons and;

B. Develop the predictive capability to estimate changes in available habitat for rearing of these species as a function of mainstem discharge. Since the presence of ice in winter compounds a quantitative assessment of the rearing habitat, this study will address only the open-water season.

2.1.1.3 Field Study Design

Definition of the Problem

Previous studies conducted by the Alaska Department of Fish and Game in this reach of river have provided limited insight into the distribution of the fish species and a preliminary analysis of the response of habitat in the backwater zones near slough and tributary mouths, to mainstem stage changes. The distribution information has provided some insight into the year-round distribution of juvenile coho and chinook salmon but has provided less information on pink, chum, and sockeye salmon juveniles. This was predominantly caused by emphasis on the use of baited minnow traps as the primary mode of juvenile salmon collection which limited catch to chinook and coho.

The analysis of the response of habitat to the discharge of the mainstem Susitna River by the examination of the distribution of juvenile anadromous fish in backwater zones and the incremental watering and dewatering of these areas provided a general insight as to how the different species present would respond to changing stages of the mainstem Susitna. However, during this analysis, we observed that the cover value of the habitat in these backwater areas and in free-flowing areas often changed disproportionately to the changes in surface area measured. This observation suggested that monitoring cover response to mainstem discharge would be of importance. Studies conducted in the Susitna River between the Chulitna River confluence and Devil Canyon (middle river) used habitat models based on cover in addition to hydraulic analysis of areas of use. These studies suggested cover did not change rapidly with discharge. Turbidity was apparently used as cover by chinook salmon and was clearly influenced by mainstem discharge. Other species tended to occupy areas that were influenced less by mainstem flow.

In the Susitna River below the Chulitna River confluence (lower river), the lesser gradient of tributary streams and the braided nature of the river provides very different habitat components than the reach above the Chulitna River confluence. Initial observations of chum salmon in this area during reconnaissance surveys conducted in the spring of 1983 suggested this species frequently occupied turbid backwater areas near the mouths of sloughs, side channels, and tributaries. The sockeye juveniles appear to prefer the deeper clear-water habitats such as the mouth areas near Birch Creek or upland sloughs such as Slough 6A in the middle river.

Resident species occurred in turbid water environments as well as in clear-water areas where adequate depth and cover were available. Our observations of radio tagged fish behavior in the middle river suggests virtually all of the rainbow trout overwinter in the mainstem Susitna and also spend a significant portion of their open-water life cycle in the turbid areas of the mainstem Susitna. We have much less information on rainbow trout and other species in the lower river but we are aware that the populations of fish are much larger in the lower river and significant sport fisheries occur, often near the mouths of clear-water tributaries.

With this information we have formulated a study plan that will examine the habitat availability of different reaches and morphological components of the Susitna River for juvenile salmon as well as selected resident species. This habitat availability study will be centered around the discharge measurements from the United States Geological Survey (USGS) gaging station at the Park's Highway bridge and will be designed to provide incremental assessment of habitat availability as a function of discharge at this site.

2.1.2 Juvenile Outmigrant Studies

2.1.2.1 Juvenile Outmigrant Studies of the Middle Susitna River (Chulitna River Confluence to Devil Canyon)

2.1.2.1.1 Sub-objectives

A. Estimate the timing, relative abundance and size of outmigrating juvenile salmon from the Susitna River.

B. Estimate the population of emergent chum and sockeye salmon fry and their survival from egg to outmigrant fry from this reach of the river.

C. Estimate the relative size of outmigrants seasonally from the mainstem Susitna River.

D. Estimate the timing and size of outmigrant chum salmon from the Talkeetna River.

E. Estimate the effect of changes in mainstem Susitna discharge and other environmental variables on outmigration rates of the salmon species.

F. Estimate the timing and rate of movement of juvenile chinook and coho out of Indian River and residence time at selected macrohabitats associated with the mainstem Susitna.

2.1.2.1.2 Rationale

In assessing the potential impact of the hydroelectric project on the downstream fisheries, a measurement of the current production of juvenile salmon is desirable. This measurement can be used to estimate the relative importance of the fishery in a particular reach or basin or to ultimately assess the current importance of habitat in the area. These data can also be used as a benchmark to measure future project effects against and can be used as the basis for determining the extent of mitigation required to produce no net loss to the fisheries of an area.

2.1.2.1.3 Field Study Design

Description of the Problem

Studies of outmigrants from the Chulitna River confluence to Devil Canyon reach of the Susitna River were begun in 1982 and were expanded in 1983. This data set has provided very valuable information on the success of the previous summer's spawning runs, the effects of discharge on redistribution of young-of-the-year rearing juveniles, and provided population estimates and survival estimates (when coupled with adult escapement data).

Initially, one trap was installed on the east bank of the Susitna River at river mile (RM) 103.0 on June 18th, 1982 and was operated to near freeze-up. Two traps were established at the same site on opposite banks of the Susitna in 1983, and began operation within three days of ice-out. Coupled with the operation of these traps, approximately 40,000 chum and sockeye emergent fry were tagged with coded wires near emergence sites. A sample of these coded wire tagged salmon fry were subsequently recovered at the Talkeetna Station outmigrant traps.

During the tagging operation at selected natal areas we attempted to estimate outmigrants by direct count at a collection weir net. In addition, a mark-recapture method was employed at one of these sites using different marks on different days. This study suggested weir counts were unreliable because of unpredictable flow changes that were impossible to weir successfully.

However, the multiple mark demonstrated some success and provided an emergence and an outmigrant rate estimate for one site. Extrapolation of this data set over a longer period of time and at several key sites would provide a comparative index of the production of individual sloughs.

Analysis of data from this operation provided information on growth rates, effects of discharge on turbidity and discharge on movements, comparisons of species and habitat effects on survival, relative importance of rearing in habitats as a function of time of year and associated flow regime in addition to many other insights.

Because of the success of the study, we will continue it with minor modifications. We have added an intermittent monitoring of outmigrant chum and other species from the Talkeetna River as an additional task. This information will be used to support analysis of the relative importance of the Susitna River reach below the Chulitna River confluence.

Investigations by ADF&G Su Hydro conducted during 1982 and 1983 have suggested substantial numbers of chinook outmigrate into the mainstem Susitna during early summer, with apparently much of their freshwater rearing occurring in the habitats associated with the Susitna River (ADF&G 1983b; Schmidt et al. 1984). The relative importance of the outmigrants observed, with respect to the total population could not be established, although data on habitats associated with the Susitna, suggested substantial numbers used the turbid water for apparent rearing. This information has suggested the need for additional studies.

To establish what percentage of the rearing of juvenile chinook occurs in mainstem associated areas, we require data on the timing and rate of movement out of the primary producing chinook tributaries of the Susitna River between the Chulitna River confluence and Devil Canyon.

The coded wire tagging study and recapture of the outmigrants of all salmon species at Talkeetna Station will duplicate the 1983 study with an increase in tag rate of chum salmon.

Analytical Approach

Analysis of the data will be similar to the 1983 open-water report but will include evaluation of the information from outmigrant studies on upstream tributaries, and on the results of downstream outmigrant studies when pertinent to evaluation of this reach of river.

2.1.2.2 Juvenile Outmigrant Studies of the Lower Susitna River (Cook Inlet to the Chulitna River Confluence)

2.1.2.2.1 Sub-objectives

A. Estimate the timing and rate of outmigration of rearing chinook juveniles from the Deshka River into the mainstem Susitna.

B. Estimate the timing and rate of outmigration of juvenile salmon from the Susitna River into Cook Inlet and the effect of environmental parameters on this outmigration.

C. Estimate the rate of growth of juvenile chum and chinook salmon from the time they enter the lower river until they enter the estuarine environment.

2.1.2.2.2 Rationale

The importance of rearing habitat associated with the mainstem Susitna between Cook Inlet and the Chulitna River confluence needs to be established. Changes to habitat that supports large numbers of fish need not be large to affect the production of substantial numbers of rearing salmon. By examining migration patterns and related data on macrohabitat distribution, we can infer the proportion of the population using mainstem affected habitats at any given time.

Studies of chum salmon rearing by Parker (1971) and Healy (1982) in the Pacific Northwest have suggested that survival in the marine environment can be significantly affected by the timing and size of the juveniles entering these areas for subsequent rearing and growth. In Southeastern Alaska and the Puget Sound area, rearing of newly emergent chum salmon often occurs in the estuarine areas. In Cook Inlet, the estuarine environment of the Susitna River is unstable with many miles of mud flats exposed by the very large tides. Consequently, the marine areas, normally ascribed to providing this early important growth phase are probably not present. This suggests that this growth must occur either in the Susitna River or in the open portion of Cook Inlet. If rearing is occurring in the Susitna River habitats, fish of this size would be expected to be found in the habitats associated with the mainstem below their natal areas.

During the first two weeks in June, 1983, fish were collected at specific habitats in the lower and middle river over several days to determine the extent of distribution of chum salmon fry. Most of the small turbid backwater areas near tributary, slough, and side channel mouths throughout the lower river had chum juveniles. Although we cannot directly interpret these observations as supporting the hypotheses of extended freshwater rearing of chum juveniles, this does suggest further study would be desirable.

Sockeye salmon rearing in the Susitna Basin is predominantly associated with clear-water lakes but the outmigration patterns of juvenile slough-spawned sockeye, suggests much of their rearing may also occur in this reach of river.

Studies conducted by ADF&G on chinook salmon indicate substantial movement into the lower river during the summer, as measured by the Talkeetna Station outmigrant trap. Further, studies conducted by the Sport Fish biologists of ADF&G Region 2 have indicated early movement of chinook out of the Deshka River into the mainstem Susitna. We need to establish if these observations support the contention that chinook are obtaining significant amounts of their freshwater growth in habitats associated with the mainstem Susitna River.

Coho salmon have been observed to rear primarily in small clear-water tributaries and beaver pond environments. Although data on intra-basin movements of coho will be recorded, it is doubtful that further information on their rearing will be obtained from the migrational data obtained by the proposed studies.

The movement of chum, sockeye, and chinook into the lower river will be evaluated by use of the data obtained from the Talkeetna Station traps and intermittent sampling of the Talkeetna River.

2.1.2.2.3 Field Study Design

The monitoring of outmigrants and their condition is proposed at a site on the Susitna River below the Yentna River confluence. This outmigrant trap will provide an estimate of the timing, size, and relative numbers of juvenile salmon that are leaving the freshwater system.

Chinook movement into the mainstem environments will be estimated by monitoring outmigrants at a temporary outmigrant trap established and operated intermittently on the Deshka River. This trap will be operated by the resident and juvenile anadromous habitat study team operating out of this site.

2.1.3 Winter Studies of Resident and Juvenile Anadromous Fish

2.1.3.1 Sub-objectives

A. Describe the distribution of rearing chinook and coho salmon juveniles by macrohabitat types in the habitats associated with the mainstem Susitna River between Cook Inlet and Devil Canyon.

B. Describe the distribution and habitat associated with overwintering rainbow trout in the mainstem Susitna River below the Chulitna River confluence.

C. Estimate the response of rainbow trout and chinook salmon overwintering habitat at selected sites to hydraulic changes during the winter period (assuming habitat response parallels open channel hydraulics).

2.1.3.2 Rationale

The winter discharge of the Susitna River after the proposed hydroelectric project comes on line will be substantially above the flow experienced in preproject conditions. This will occur in all reaches of the Susitna, both above, and below the Chulitna River confluence. To assess the impact of these changes on the river system, we have proposed a series of field studies that will help further explain the relationship of mainstem discharge of the Susitna River to overwintering habitat of important resident and rearing salmon species.

2.1.3.3 Field Study Design

Definition of the Problem

Data on the distribution of overwintering juvenile salmon and resident species is minimal when compared to the data available for the open-water season. Much of the problems in understanding overwintering habitat is caused by very difficult sampling conditions that prevail during the winter months. Because of the ice cover and the prevalence of slush ice under the ice cover, sampling techniques are often limited to baited gear. The lower fish activity rates associated with the colder temperatures, often lower the effectiveness of this type of sampling equipment. Although catch data over a wide variety of habitats have been accumulated during previous winter periods, the lack of trends and small number of fish collected, do limit our understanding of the importance of the different types of habitat that occur in the mainstem

Susitna River. Low catch rates of juvenile chinook and coho salmon have been measured at many sites associated with the mainstem that have some thermal influence from ground water sources. The distribution from this data appears to be rather broad, but not associated with the mainstem winter flows. This suggests that the near zero degree water does not provide suitable conditions for overwintering, probably because of continual formation of anchor ice and unstable flows as ice processes continue to develop throughout the winter. Ground water sources in the side sloughs and tributary mouth areas appear to be of major importance although there are very limited data that support this hypothesis.

Radio telemetry data from rainbow trout and burbot tagged in the middle river indicate that these species are often found in areas of higher conductivity and warmer temperatures, which suggest that they may seek ground water sources in the winter as well. These areas are usually in deeper and faster water than the areas where chinook and coho juveniles are hypothesized to overwinter. Movements of radio tagged rainbow trout and Arctic grayling suggest that significant numbers of these species rear in clear-water tributaries during the summer months and then enter the mainstem Susitna in the fall to overwinter. Currently, we have a very small number of data points to support these conclusions.

Winter observations indicate that ice formation processes can create major changes in stage and discharge through sloughs and side channels. Although we have no direct evidence as to the effect of these changes on fish habitat, the observations of increased downstream movement after unstable flow periods suggests these changes may displace fish from suitable overwintering habitat and thus may decrease subsequent survival. However, the movement of the fish into the mainstem Susitna during the fall, and the small amount of discharge occurring in the clear-water tributaries in midwinter, suggests that low winter flows are of major importance in limiting the available overwintering habitat. There are many studies in the literature that also support these conclusions; namely that increased winter flows, that remain stable, are beneficial to the rearing species using this type of habitat. Thus flow augmentation during the winter, if stable, could provide enhanced survival for the rearing species.

To evaluate the effects of postproject discharges on overwintering habitat, further studies on the distribution of the rearing salmon species and resident species will be desirable. We will attempt to obtain more information on slough utilization by rearing species through collection of rearing individuals during the spring of 1984 with temporary beach seine weirs across the mouths of sloughs that do not have mainstem water breaching their upper heads. This data collection effort will be associated with the coded wire tagging program planned for this coming spring and in the following spring of 1985.

Outmigrant trapping on Indian River will provide the needed information to assess the outmigration of juvenile chinook and coho salmon into the mainstem Susitna. From this information and the outmigration observed from the sloughs, the overwintering habitat importance will be inferred.

The microhabitat utilized within the sloughs and the response of juveniles to habitat discharge changes will be estimated by intensive winter studies on one or more slough/side channel areas. The ice conditions that occur at slough and side channel sites increase the prospect of failure for this type of study.

From this data set we will attempt to describe the response of juvenile salmon to discharge changes within the slough and the utilization of microhabitat within the slough complex. The effects of ice processes and flow changes caused by the hydroelectric project will be applied by other investigators to the responses we observed in behavior of the overwintering juveniles. Downstream displacement in response to discharge changes will be considered to represent habitat losses.

Further information will be obtained on rainbow trout overwintering habitat by use of radio telemetry. We will establish by means of relocation of radio tagged fish, and measurement of habitat conditions at the relocation sites, the habitat utilization and winter distribution of this species. Estimates of the effects of the project and ice processes on these types of habitat conditions will be provided by Harza-Ebasco Susitna Joint Venture.

2.2 Field Data Collection Work Plans

2.2.1 Resident and Juvenile Anadromous Fish Studies

2.2.1.1 Resident Fish Studies

A two man crew will take samples of resident fish on the Susitna River between Cook Inlet and Devil Canyon for habitat and relative abundance studies, and a radio telemetry-migrational study. River boats, fixed-wing aircraft, and helicopters will be used for support. Sampling methods to be used in this study are electrofishing, angling, trotlines, gill nets, and hoop nets. During the open-water season the crew will operate out of tent camps located on the Susitna River primarily at Talkeetna Station and Gold Creek.

2.2.1.1.1 Methods

Habitat and Relative Abundance

Resident fish will be collected at mainstem and tributary sites primarily with a boat mounted electrofishing unit.

All resident fish captured will be identified to species. Biological data (age, length, sex, and sexual maturity) will be collected as defined in the 1982 procedures manual (ADF&G 1983a).

The following habitat parameters will be collected at all resident fish spawning sites: water temperatures, water depths, water velocities, conductivity, dissolved oxygen, pH, turbidity, intragravel temperatures, and substrate composition.

The tag recapture program to monitor the seasonal movements of adult resident fish will be continued. In 1981, 1,550 adult resident fish were Floy anchor tagged in the Susitna River between Cook Inlet and Devil Canyon (ADF&G 1981). During 1982 and 1983, 3,118 and 3,037 adult resident fish were tagged in the same reach, respectively (ADF&G 1983b; Schmidt et al. 1984). Tagging crews will attempt to tag an additional 3,000 resident fish during the 1984-85 field season. Tagging in 1984-85 will be conducted above the Chulitna River confluence from May through August and primarily below the Chulitna River confluence after August.

Floy anchor tags will be used to tag seven species of adult resident fish. Species to be tagged are humpback whitefish, round whitefish, burbot, longnose suckers, rainbow trout, Arctic grayling, and Dolly Varden.

With the exception of burbot, all resident fish that appear to be healthy after capture and have a fork length greater than 200 millimeters (mm) will be tagged. Burbot with a total length of 225 mm or greater will be tagged.

Floy anchor tags will be inserted between the lateral line and the posterior ray of the dorsal fin with a Floy tagging gun.

Tags will be recovered by the following means:

- o Resident fishery crew

- o The angling public will be requested to return recovered tags or report the tag number to the nearest office of the Alaska Department of Fish and Game with information regarding the location and date of catch and if the fish was released with the tag intact. The public will be informed of the tagging program by news releases to the media, Su Hydro staff, and posters placed in conspicuous places frequented by anglers.

o Adult Anadromous fishwheel operations.

Radio Telemetry

During 1984-85, the resident fish studies crew will attempt to deploy 95 radio tags. In May and June 1984, approximately 25 internal and 5 external radio tags will be implanted in rainbow trout in the Susitna River between the Chulitna River confluence and Devil Canyon for spawning studies.

In September and October, the resident fish crew will attempt to implant the remaining 65 radio tags in resident fish captured in the Susitna River below Talkeetna. Approximately 30 rainbow trout will be internally radio tagged and 20 Arctic grayling will be externally radio tagged to determine the timing of their outmigration from tributaries into the mainstem and to locate overwintering areas for habitat studies. In addition, this crew will attempt to radio tag 15 burbot for winter habitat studies.

Tagging crews will radio tag healthy adult resident fish collected within the proposed study area.

Tags to be implanted in rainbow trout during the 1984-85 radio telemetry study are Advanced Telemetry Systems, Model 10-35. Advanced Telemetry Systems, Model 625 external tag will be used to radio tag Arctic grayling. Smith Root, Model P40-500L 3V radio transmitters will be used to radio tag burbot.

The same procedures to surgically implant radio tags in resident fish that were described in 1982 procedures manual (ADF&G 1983a) will be used in 1984. The external tag will be attached using the same methods used when attaching Peterson disc tags. Procedures to attach Peterson disc tags are described in the Adult Anadromous section of the 1982 ADF&G procedures manual (ADF&G 1983a).

2.2.1.1.2 Study Locations

Habitat and Relative Abundance Measurements

Twelve habitat and relative abundance sites will be boat electrofished regularly to monitor seasonal trends in relative abundance of resident fish (Table 1). Additional mainstem, side channel, slough, and tributary mouth sites on the Susitna River between Cook Inlet and Devil Canyon will be selected and electrofished at random to augment habitat and relative abundance data on resident fish.

Adult resident fish caught by fishwheels, outmigrant traps, fyke nets, and by the Juvenile Anadromous Habitat Study (JAHS) crews will also be recorded to help evaluate trends in relative abundance and seasonal movements.

In May and early June, 1984, surveys will be conducted on upper Fourth of July Creek, upper Indian River and upper Portage Creek to locate rainbow trout and Arctic grayling spawning areas and document the time of spawning for these species.

Radio Telemetry

Selection of rainbow trout radio tagging sites in May and June in the mainstem Susitna between the Chulitna River confluence and Devil Canyon will be based on resident fish distribution data collected during the 1981, 1982, and 1983 open-water seasons (ADF&G 1981, 1983b, Schmidt et al. 1984). Rainbow trout which may be spawning in the upper reaches of Fourth of July Creek, Indian River, and Portage Creek will also be tagged.

Table 1. Resident fish habitat and relative abundance study sites on the Susitna River between the Chulitna River confluence and Devil Canyon, 1984.

Site	River Mile
Whiskers Creek Slough - Mouth	101.2
Slough 6A	112.3
Lane Creek - Mouth	113.6
Skull Creek - Mouth	124.7
Slough 8A	125.3
Fourth of July Creek - Mouth	131.1
Susitna Mainstem - West Bank	137.2-138.2
Indian River - Mouth	138.6
Slough 20 - Mouth	140.1
Jack Long Creek - Mouth	144.5
Susitna Mainstem	147.0-148.0
Portage Creek - Mouth	148.8

Rainbow trout and Arctic grayling radio tagged in September and October will be captured at sites below the Chulitna River confluence. These fish will be captured in the upper reaches of Little Willow Creek (RM 50.5), Kashwitna River (RM 61.0), Goose Creek (RM 72.0), Montana Creek (RM 77.0), and Rabideaux Creek (RM 83.1). Fish will also be captured and tagged at the mouths of these tributaries, in the mainstem Susitna, and at the mouth of the Deshka River (RM 40.1). In September, burbot will also be collected and radio tagged in the mainstem Susitna River below the Chulitna River confluence.

2.2.1.1.3 Schedule of Activities and Frequency of Sampling

Habitat and Relative Abundance Measurements

The open-water season will be divided into three time periods: ice-out to June 30th, July 1st to August 30th, and September 1st to freeze-up.

From ice-out to June 30th and from September 1st to freeze-up, emphasis will be placed on capturing and tagging as many resident fish as possible, identifying and characterizing resident fish spawning habitat, recording timing of resident fish spawning, and collecting adult resident fish for radio telemetry studies.

Between July 1st and August 30th, field crews will identify and characterize rearing areas for juvenile and adult resident fish.

Radio Telemetry

Two to three days during each sampling trip between May and October 1984 will be allotted to the capture of and implanting of radio tags in resident fish.

From May 1984 to October 1984, radio tracking surveys will be made every 10 to 20 days by boat or fixed-wing aircraft.

During the spring of 1984 and 1985, attempts will be made to locate rainbow trout spawning grounds using radio telemetry. During May and June, aerial surveys will be flown every 7 to 10 days to locate and monitor movements of potential spawners. When a prespawn radio tagged rainbow trout is located in the same area for several weeks during the spawning period, an on-site investigation will be made to map the sites, characterize the spawning habitat, and evaluate the relative spawning maturity of other rainbow trout in the immediate vicinity of the radio tagged fish.

2.2.1.2 Juvenile Anadromous Fish Studies

Three Juvenile Anadromous Habitat Study (JAHS) field crews, of two biologists each, will examine microhabitat parameters of the rearing habitats used by juvenile salmon at selected sloughs, side channels, tributaries, and mainstem sites of the Susitna River between the Yentna River confluence (RM 28.5) and Chulitna River confluence (RM 98.5). JAHS sampling will be conducted from river boats during the open-water season. Helicopter support will be enlisted as needed. The crews will operate from camps located on the Susitna River at the Deshka River (RM 40.6), Sunshine Station (RM 79.0), and Talkeetna (RM 97.5). The crew operating out of Talkeetna will also spend about 50% of the time conducting resident fish studies (see Section 2.2.1.1). Duties of the crew stationed at the Deshka River will also include the operation of a fyke net on the Deshka River (see Section 2.2.2.2).

The JAHS field crews will sample sites which have been divided into three different categories. Most of the sampling will occur at Resident Juvenile Habitat (RJHAB) model sites where the response of the site to changes in mainstem discharge will be evaluated. Crews will also sample Instream Flow Incremental Methodology (IFIM) model sites at which other habitat models are being developed. The third category of sites to be sampled are known as "opportunistic" sites where further data on fish distribution will be gathered.

2.2.1.2.1 Methods

Sampling equipment that will be used to collect fisheries data at all JAHS sites are backpack electrofishing units (Coffelt, Model BP1C and Smith Root, Model XVBPG) and 1/8" mesh beach seines. Procedures used for sampling with this equipment are described in the 1982 procedures manual (ADF&G 1983a).

Physical habitat data at all JAHS sites will be taken with a variety of gear. Depths will be measured to the nearest one tenth of one foot with a topsetting wading rod. Velocities will be measured with a Price, Model AA or Marsh-McBirney, Model 201 velocity meter. Turbidity measurements will be taken with an HF Instruments, Model DRT-15 turbidimeter. Water quality measurements will be taken with a Hydrolab, Model 4001 multi parameter meter. The meters will be recalibrated prior to each field sampling. A Leitz-Eslon fiberglass surveyors tape will be used to make distance measurements and bearings will be measured with a Silva (Ranger Model) magnetic compass.

Resident Juvenile Habitat (RJHAB) Model Sites

About 15 locations will be designated as Resident Juvenile Habitat (RJHAB) model sites.

Two types of data will be collected at the RJHAB model sites. Habitat data will be collected for the purpose of modelling the response of the site to changes in mainstem discharge. Fish sampling data will be used to verify the habitat model data, document abundance and distribution, and modify suitability criteria, if necessary. Techniques for the collection of habitat modelling data at RJHAB sites will first be discussed and then the collection of fish sampling data at RJHAB sites will be discussed.

Each of the RJHAB sites will be sampled within one or two grids. Grids will be located so that water quality within them will be as uniform as possible and so that they will encompass a variety of habitat types. Each grid will consist of a series of transects which intersect the channel of the study site at right angles (Figure 1). Survey stakes and orange flagging will be used to mark each transect within a grid. Initial measurements within each grid will include distances and angles between transect bench marks. Transects will be spaced at least 50 feet apart and normally will be 100 to 300 feet apart. Placement of the transects will be made to represent the variety of habitat types within the grid.

There will be one to four cells extending upstream from every transect within the grid (Figure 1). Attempts will be made to confine uniform habitat within each cell. Each of the cells will measure 50 feet in length and six feet in width. If the width of the wetted channel is greater than 42 ft, two of the four cells will parallel both edges of the channel and the third and fourth cells will be located parallel to the bank cells so as to split the channel into thirds. If the channel measures 30 to 41 feet in width at the transect, there will be a cell on each edge of the channel and one cell located approximately mid-channel. If the slough is 18 to 29 feet in width, there will be one cell on each side of the channel parallel with the bank. If the channel is less than 18 feet in width, there will only be one cell.

Transects will be numbered consecutively beginning with the transect furthest downstream within the site. Cells will also be numbered consecutively from right to left looking upriver. If there are less than four cells within a transect, cells will be numbered as if the missing cells were present.

One or more staff gages will be installed by the Aquatic Habitat and Instream Flow Project (AH) personnel at each site to document changes in the stage at each site with changes in mainstem discharge. These gages will provide an index to the changes in habitat and hydraulic conditions at the site between sampling occasions. AH staff will also develop site stage and flow relationships and map the thalweg at selected sites.

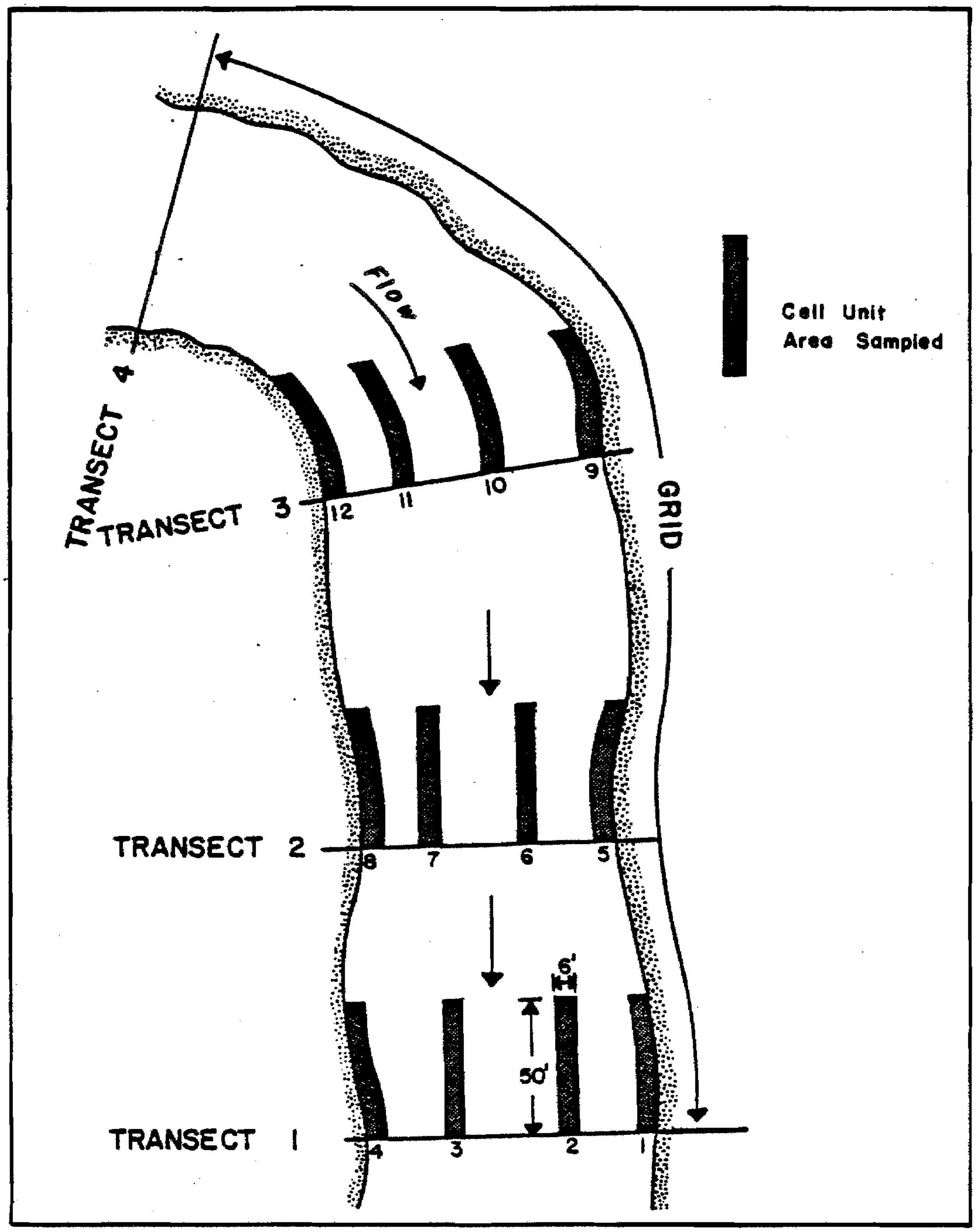


Figure 1. Arrangement of transects and sampling cells within a grid at a hypothetical RJHAB modelling site.

Habitat modelling data will be collected over a broad range of mainstem discharges. An emphasis will be placed, however, on data collection at mainstem discharges of 30,000 to 60,000 cfs as measured at the Sunshine gaging station. If staff gage readings and observation indicate that the habitat at the site has not changed from a previous sampling occasion, no habitat data need be taken.

Habitat data to be taken at each grid for modelling will include the following. At each transect, the distance between the left and right edge of water and the left bank transect marker will be measured. If the water quality within the grid or grids appears uniform, one measurement of water pH, temperature, conductivity, and dissolved oxygen will be taken. A turbidity sample will be collected in a 250 ml plastic bottle and stored in a cool dark location prior to analysis. If the water quality within the grid appears to vary because of mixed water sources, additional water quality and turbidity measurements will be taken as necessary to describe these within grid variations.

Each cell within the grid will be further characterized by several physical measurements. A representative depth and velocity will be measured by taking one or more point measurements along the midline of each cell. The entire cell will be walked so measurements taken are representative. The velocity measurement will be taken at 0.6 of the distance from the top of the water column. Also, the area of the cell sampled will be recorded so that catches in cells with areas different than 300 ft^2 can be adjusted to this standard cell size.

Additionally, cover type and amount will be estimated in each cell. Initially, the total amount of cover of all types will be estimated for the entire cell. Next, the primary and secondary cover type will be recorded along with a percentage of the total for each. Cover is defined as hiding or escape cover for fish that range in length to approximately 100 mm. Further details about recording cover type and amount are given in Appendix 2.

Once during the sampling season, the cover on all the transects within a site will be systematically recorded. The coding will take place during low water and all the sites will be measured during a short period of time. A limited number of personnel will do the recording so that observer bias is minimized. The cover will be recorded by distance from either the right or left bank transect marker along the transect line.

Fisheries data will normally be collected from a minimum of seven cells within each RJHAB site during each sampling occasion. Cells will be selected randomly by using a random numbers table. Each cell selected will then be sampled for fish with a backpack electroshocker or beach seine in one pass through the area. If a cell is missing or cannot be sampled, an additional cell will be randomly chosen for sampling from the site.

Limited habitat measurements will be taken when fish sampling is conducted. Water chemistry data and a turbidity sample will be measured using the same equipment and techniques used at habitat modelling sites. Each cell will also be characterized by a representative velocity, depth, and estimate of cover type and abundance.

Additional "selected cells" can be fished at the site if sampling of the random cells has failed to capture many fish. In this case, the sampling crew will fish areas believed to harbor fish. Cells fished can either be existing cells on the transects or any areas within the site. If the cells sampled are not numbered cells on the grid, numbering will begin at 50.

After each cell is sampled, most juvenile salmon captured will be identified to species and then released. Those specimens that cannot be identified will be preserved in 10 percent formalin for later identification. The total length of each of the first 50 fish of each species in each size class will be measured in millimeters.

Instream Flow Incremental Methodology (IFIM) Sites

In addition to the RJHAB model sites, there will also be six sites modeled for juvenile fish using the "instream flow incremental methodology" (IFIM) (Bovee 1982). These sites will also be located below the Chulitna River confluence. All habitat data used in these models will be collected and analyzed by Aquatic Habitat (AH) personnel (see the AH Section of this procedures manual). Two of the IFIM sites will also be modeled with RJHAB models using the same transects for comparison of output from the two modelling methods. At these two sites, RJ personnel will collect the RJHAB data and AH personnel will collect the IFIM data, so the two models will be independent.

Sampling effort by RJ personnel at the four remaining IFIM sites will be secondary in importance to the sampling of the RJHAB sites. Cells will be sampled for fish using the transects placed for the IFIM models. Cells will be randomly selected and then sampled with the same procedures used at RJHAB sites. Cell numbering is the same as that used in the RJHAB studies. The distance from the transect end markers to the cell edge will be measured, however, so that the location of the cell on the transect can be specified. Other data collected at each cell fished will include amount and type of cover, water depth, and water velocity. Water chemistry and a turbidity sample will also be taken at a selected location of the site.

Opportunistic Sites

In addition to the RJHAB and IFIM sites, other sites will be sampled for fish opportunistically as time permits. The purpose of this sampling will be to gather juvenile abundance and distribution information at a wider variety of sites and to gather data for further analysis of juvenile suitability criteria. No permanent grids of transects will be marked at these sites but selected 6 ft x 50 ft cells will be sampled for juvenile salmon as time permits. Water chemistry will also be measured at mid-site. Each cell sampled for fish will be characterized as to amount and type of cover, water depth, and water velocity as for cells sampled at RJHAB and IFIM sites.

2.2.1.2.2 Study Locations

The RJHAB modeling sites were chosen from upland sloughs, side sloughs, tributary mouths, and side channels which met the following basic criteria:

A. The effects of mainstem discharge (stage and flow) on the sites are measurable.

B. The sites are documented or thought to contain habitat for rearing juvenile salmon.

C. The sites are accessible by boat at normal mainstem discharges during the open-water season.

The preliminary selection of sites to be modelled with RJHAB models and IFIM models are listed in Table 2. Thirteen of the sites are to be modelled only with the RJHAB model, four with only IFIM models, and two with both RJHAB and IFIM models. Seven of the sites are located within side channel complexes which were picked by R&M Consultants and E.W. Trihey and Associates as representative of lower Susitna River side channel complexes. Four of the sites are normally clear water sloughs or tributary mouths while the other sites are side channels at normal summer flows. Side channels selected range greatly in size, shape, and overtopping discharge. The majority of the habitat model sites are side channels because the majority of the potential available habitat for juvenile fish in the lower Susitna River is composed of side channels.

The selection of opportunistic sites to be sampled will be dependent upon logistics, and upon needs perceived by sampling crews to gather additional fish distribution and abundance data. Sites to be sampled will be even more diverse than the RJHAB sites currently under

Table 2. Juvenile Anadromous Habitat Study (JAHS) modelling sites on the Susitna River between the Yentna River and Talkeetna River confluences, 1984.

Site	River Mile	Model Type
* Hooligan Side Channel	35.2	RJHAB
* Eagles Nest Side Channel	36.2	RJHAB
Kroto Slough Head	36.3	RJHAB
Rolly Creek Mouth	39.0	RJHAB
Bear Bait Side Channel	42.9	RJHAB
Last Chance Side Channel	44.4	RJHAB
Rustic Wilderness Side Channel	59.5	RJHAB
Caswell Creek Mouth	63.0	RJHAB
Island Side Channel	63.2	RJHAB, IFIM
Mainstem West Bank	74.4	IFIM
Goose 2 Side Channel	74.8	RJHAB
Circular Side Channel	75.3	IFIM
Sauna Side Channel	79.8	IFIM
* Sucker Side Channel	84.5	RJHAB
* Beaver Dam Slough	86.3	RJHAB
* Sunset Side Channel	86.9	IFIM
* Sunrise Side Channel	87.0	RJHAB
* Birch Creek Slough	88.4	RJHAB
Trapper Creek Side Channel	91.6	RJHAB, IFIM

* Located within side channel complexes picked by R&M and E. W. Trihey and Associates as representative of lower Susitna River side channel complexes.

consideration and may include areas of mainstem gravel bars. Sites will also be picked on the basis of mainstem discharge.

2.2.1.2.3 Schedule of Activities and Frequency of Sampling

Field sampling trips, lasting approximately 7-10 days, will be conducted bimonthly from May through September by the three JAHS crews. Each RJHAB site will be sampled for fish on each sampling occasion. Habitat data will be collected on at least three occasions when staff gage readings or observations suggest a change in the habitat within a site. The collection of habitat data is therefore very dependent upon mainstem discharge.

The IFIM sites will be sampled at least once a month during the open-water season. Opportunistic sites will be sampled as time permits and some will only be sampled once.

2.2.2 Juvenile Outmigration Studies

2.2.2.1 Juvenile Outmigration Studies of the Middle River

2.2.2.1.1 Methods

Coded Wire Tagging

A five man crew will conduct the coded wire tagging operation at selected sites in the Susitna River above the Chulitna River confluence. The crew will be based at the Gold Creek field station (RM 136.8) and use a 20 foot riverboat as the primary means of transportation.

Binary coded one-half length wire tags will be used in conjunction with adipose fin clips to field mark post-emergent sockeye and chum salmon fry.

Coded wire tagging operations will be conducted at Slough 11 (RM 135.3) with equipment and personnel staged in a portable wall tent. Fish to be tagged will be transported in an aerated holding tub from the various collection areas to the tagging site at Slough 11. The tagged fish will be returned to the areas of collection, held overnight, and then released the following day.

The primary fisheries collection techniques will be beach seines and weirs. One or more seines will be set as weirs at fixed locations across the lower end of the sampling location and fished as necessary during the tagging period. The seines will be made from 3/16 inch or 1/4 inch square mesh, four feet deep and 25 to 40 feet in length. The weirs will be checked periodically to collect fish and remove debris. All captured fish will be removed by dipnet and placed in live boxes for holding until the tagging operation. Active beach seining will supplement the weirs at sites where weiring does not provide enough fish for the tagging operation, or at those sites at which weirs are not deployable.

The coded wire tagging equipment will be leased from Northwest Marine Technology, Inc. (Shaw Island, Washington) and operated in accordance with the manufacturer's instruction and operation manual. The equipment to be used will be the NMT, Model MK2A tagging unit and include the following:

- o Coded wire tag injector with 1/2 length tag capability
- o Quality Control Device (QCD)
- o Water pump
- o Portable power supply

The one-half length tag capability is necessary due to the small size of the fish to be tagged. Susitna River chum salmon emerge at a mean total length of 40 millimeters (mm) and averaging 1,500 fish per pound, while sockeye salmon were observed emerging at a mean total length of 32 mm and averaging approximately 3,000 fish per pound. The small area of cartilage in the snout of fish at this size for tag implantation does not allow the use of full length tags.

The coded wire tags for the program were made from biologically inert stainless steel wire which are capable of magnetic detection, and have a continually repeating binary code etched into the wire which allows code reading of recovered tags. Half-length tags measure .02 inches (.533 mm) in length and .01 inches (.254 mm) in diameter.

A total of 60,000 one-half length coded wire tags consisting of 21 separate binary code groups will be ordered for the program, including six code groups of 5,000 tags each and 15 code groups of 2,000 tags each. As many tag code groups as possible will be implanted, however only one tag code will be used for each species at any given site during each collection and tagging period. A tagging period will consist of one to six days of tagging per site, depending on the availability of fish. At the completion of each tagging period, a new tag code group will be used for the next site or species to be sampled. Up to four different tag code groups will be implanted at any one site for a given species during the entire program.

The coded wire tag implantation procedures will be similar to those outlined by Moberly et al. (1977). Adjustments to these procedures will be implemented as necessary by our particular field program.

At the end of the tagging day, a random sample of 100 tagged fish will be collected from the holding tank and run through the QCD to determine the percent tag retention. Tag mortality will be recorded the following day. All tagged fish will be released at the capture site at the end of each tagging period.

The necessary numbers of each juvenile salmon species to be tagged to provide accurate population estimates will be calculated using the estimator provided by Robson and Regier (1964). This will provide a Petersen estimate of population varying not more than 25% from the true population in 95% of the trials. To establish the numbers of marked fish necessary for accurate estimates, the following variables must be predetermined: adult escapement, male to female ratio of adults, average fecundity, estimated survival from egg to fry, and the estimated number of fish which will be recovered and examined for marks. Adult salmon escapement and male to female ratio data from the Curry Station fishwheels in 1983 will be used in the calculations.

Chum and sockeye fecundity will be determined from studies of Susitna River salmon (Barrett et al. 1984). Egg to fry survival is dependent on the interplay of many environmental factors including temperature and dissolved oxygen, and survival varies widely under changing habitat conditions (Bjornn et al. 1968; Hunter 1959; Mathisen et al. 1962). Expected numbers of fish to be recovered and examined for marks will be expanded from the results of the 1983 operation of the stationary outmigrant traps.

Talkeetna Stationary Outmigrant Traps

A three man crew will recover coded wire tagged chum and sockeye salmon juveniles with two stationary outmigrant traps located at the Talkeetna

Camp on the mainstem Susitna River (RM 103.0). Freeze-branded chinook and coho juveniles will also be recovered at the traps following the implementation of this mark-release program.

The stationary outmigrant traps have two polyethylene plastic modular pontoons to float a welded steel lattice frame in which is mounted the inclined plane and livebox. The steel infrastructure is covered by a two foot wide plywood deck surrounding a five-by-ten-foot center opening for suspension of the inclined plane and livebox. A three foot high safety railing is attached to the rear of the trap. The entire trap structure measures 10-by-17-feet.

The inclined plane is eight foot long with an entrance opening measuring 4.5 feet square and is covered by one-quarter inch galvanized hardware cloth on the sides and bottom. Hand crank winches are used to adjust the fishing depth and to raise the inclined plane for cleaning. The livebox is covered by one-eighth inch hardware cloth on the sides and bottom, and is removable from the trap structure so that captured fish can be retrieved and the trap can be cleaned.

The stationary outmigrant traps require a river velocity of at least 1.0 feet per second for successful operation. The mesh of the inclined plane allows the major portion of the sampled water column to pass through the screen while retaining the fish and the remaining water which pass over a baffle and into the livebox. The traps will be secured with a cable and rope attached to large trees upstream of the trap and held off the bank by a boom log attached to the trap and shore.

Sampling of the trap catch will be done by lifting the livebox from its fishing position and placing it to the rear of the deck. The incline is then raised for cleaning using the hand crank winches. The livebox is picked clean by hand and the above procedure is reversed to return the trap to fishing mode.

Fishing depth and trap distance from shore will be adjusted to maximize catches and minimize mortalities. Distance from shore is adjusted by moving the attached boom log up or down the beach.

Additions and alternatives to the stationary outmigrant traps may be implemented depending on their success in capturing coded wire tagged fish. Weirs from shore to the traps may be added to divert more fish into the traps and the traps may be held in mid-channel for short intervals using riverboats.

Untagged fish species expected to be caught in the stationary outmigrant traps include juvenile chinook, coho, and pink salmon, round whitefish, humpback whitefish, Arctic grayling, Dolly Varden, rainbow trout, slimy sculpin, longnose sucker, three-spine stickleback, Arctic lamprey, and burbot. All fish captured will be anesthetized using Tricane methane-sulfonate (MS-222). Chum and sockeye salmon juveniles will be visually checked for an adipose fin-clip which would indicate the presence of a coded wire tag. Fin-clipped fish will be passed through a Northwest Marine Technologies FSD-1 field sampling detector to audibly denote the presence of a tag and then preserved for later tag analysis. Juvenile chinook and coho salmon will be checked for cold brand marks. All other fish will be retained until anesthetic recovery is complete and then released downstream of the traps to minimize the chance of recapture.

Three pieces of equipment will be used in the collection of the habitat data at the stationary outmigrant traps. Turbidity samples will be analyzed using an HF Instruments, Model DRT 15 turbidimeter. A hand-held thermometer will be used to collect air and water temperature. Water velocity at each trap will be measured daily using a Marsh McBirney, Model 201 velocity meter.

Secondary recovery operations will be conducted at the tagging sites during periods of fish collection for tagging. Recoveries may also occur during the sampling conducted by the Juvenile Anadromous Habitat Studies (JAHS) crews at the survey sites.

Dependent on the future of the Susitna Hydro Aquatic Studies, returning adults may be observed for tags at the fishwheels and the specific spawning sites.

Cold Branding

A two man crew will conduct mark-recapture studies of juvenile chinook and juvenile coho salmon at Indian River and selected sloughs and side channels of the Susitna River in the Gold Creek area using cold branding to evaluate tributary outmigration and slough rearing in this reach. The crew will be based at the Gold Creek camp (RM 136.8) and use the Whitewater riverboat and helicopters as the primary means of transportation.

Cold branding operations will be conducted at the Gold Creek camp (RM 136.3). The fish will be transported in buckets from the collection site to the Gold Creek camp and will then be returned to the release site after branding. Fish will be held a minimum of 24 hours after branding to determine mortality.

The primary fisheries collection techniques will include beach seines, dip nets, and minnow traps.

In upper Indian River, fish will be collected by all of the above methods, branded and released at one, as yet to be selected release point, somewhere between TRM 5.0 and TRM 10.0.

At the mouth of Indian River, 25-30 minnow traps will be set and checked daily to provide information on CPUE and recaptures. These fish will also be branded and released at the site between TRM 5.0 and TRM 10.0.

Using the same gear types, outmigration and population estimate data will be collected at selected slough and side channel sites. Sampling will be conducted for five consecutive days at the site and fish will either be branded and released the same day or held until the end of the five days.

The cold branding equipment will include:

- o Cyrogenics nitrogen container (60 liter)
- o Cold branding box
- o Brands

This equipment is all field portable. The nitrogen container is a double-walled insulated canister which will last for 10,000 juvenile fish brands or 15 days. The cold branding box was constructed from a polyvinyl chloride (PVC) pipe coupling, a 4 inch-brass-cap, threaded brass pipes, and spray urethane insulation. The design is similar to that used by Mighell (1969), Raleigh et al. (1973) and Laird et al. (1975). The brands will consist of letters and symbols approximately 3 mm in height soldered on threaded brass caps by a local jeweler.

Juvenile chinook and coho salmon will be branded with a different distinctive brand depending on the location and time of their capture. Each fish will be branded on its left or its right side at one of three target branding areas which are anterior, beneath, or posterior to the dorsal fin (Figure 2).

Actual branding procedures are outlined in Raleigh et al. (1973), and a branding time of 2 seconds will be used.

2.2.2.1.2 <u>Study Locations</u>

<u>Coded Wire Tagging</u>

Sites of the coded wire tagging program will be selected from locations where high density spawning has been documented (Barrett et al. 1984), and from surveys of the availability of sufficient numbers of juvenile chum and sockeye salmon for collection and tagging (Figure 3). Locations which will be surveyed as possible collection sites for coded wire tagging are:

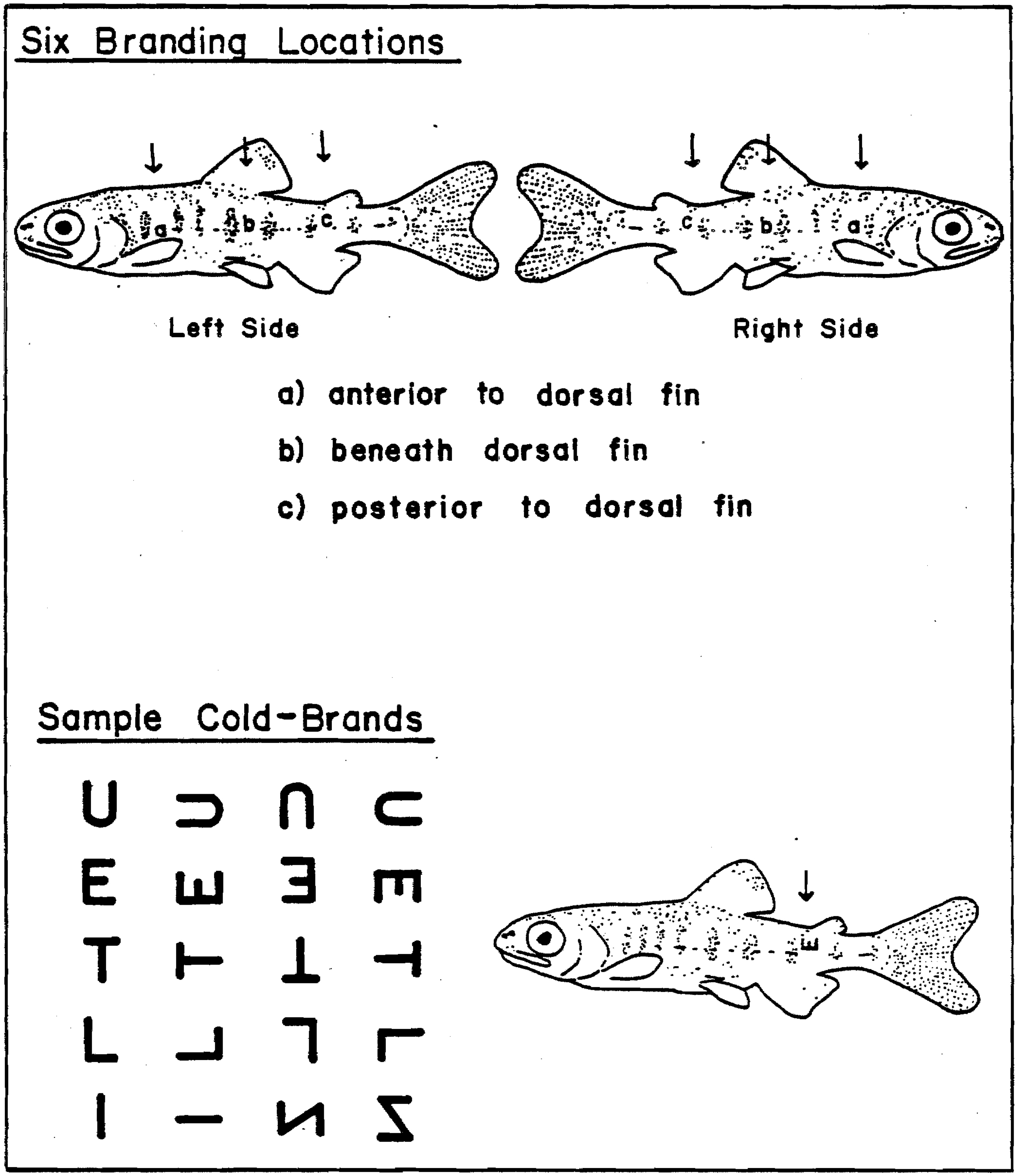


Figure 2. Branding locations and sample brands used for cold branding chinook and coho salmon juveniles.

Site	River Mile
Slough 8B	122.4
Moose Slough	123.1
Slough 8A	125.3
Slough 9	129.2
Fourth of July Creek	131.1
Slough 10	133.8
Slough 11	135.3
Slough 12	135.4
Slough 13	135.7
Slough 15	137.3
Slough 16	137.7
Indian River	138.6
Slough 17	138.9
Slough 18	139.1
Slough 19	140.0
Slough 20	140.1
Slough 21	142.0
Slough 22	144.3

Talkeetna Stationary Outmigrant Trap

Two stationary outmigrant traps will be deployed on the Susitna River at the Talkeetna base camp (RM 103.0) above the confluence of the Chulitna River (Figure 3). One trap will be set off the east bank and the other off the west bank of the river. The east bank site is deep and the bottom drops off quickly from shore. The west bank site is relatively shallow and has a gradual gradient (Figure 4).

Cold Branding

Outmigrant studies will be conducted on Indian River. Actual sampling sites will include the mouth and any side channels and side sloughs upriver which contain catchable numbers of fish.

Outmigrant and population estimate studies will be conducted on sloughs and side channels of the mainstem Susitna River between Curry and Portage Creek that have sufficient numbers of juvenile fish present. These sites will probably include Slough 8A, Slough 10, Slough 11, Slough 20, Slough 21, and Slough 22 (Figure 5).

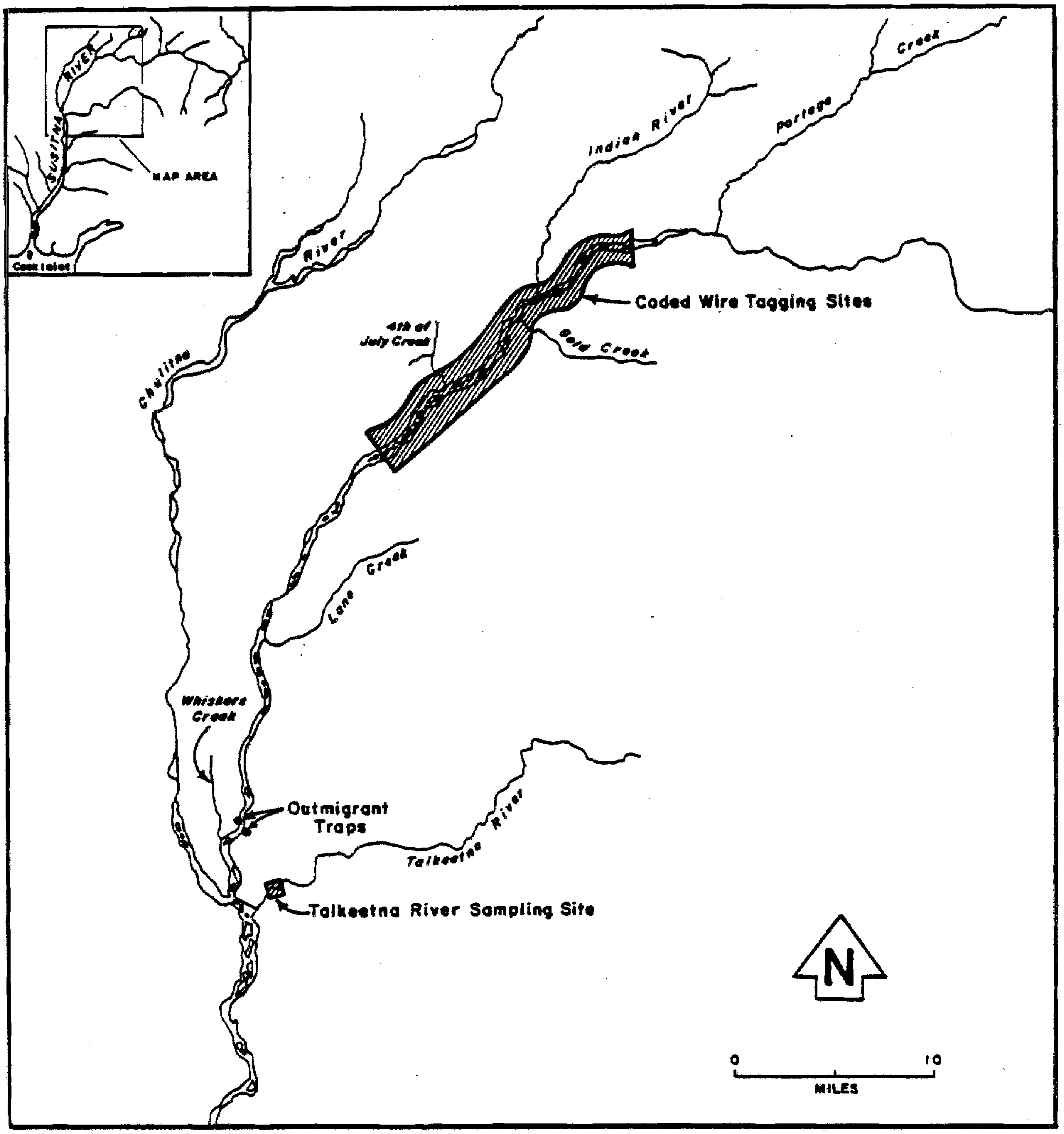


Figure 3. Map showing the area of the juvenile salmon coded wire tagging sites (RM 122.2 to 144.8) and the locations of the Talkeetna stationary outmigrant traps (RM 103.0) and Talkeetna River sampling (TRM 2.0), 1984.

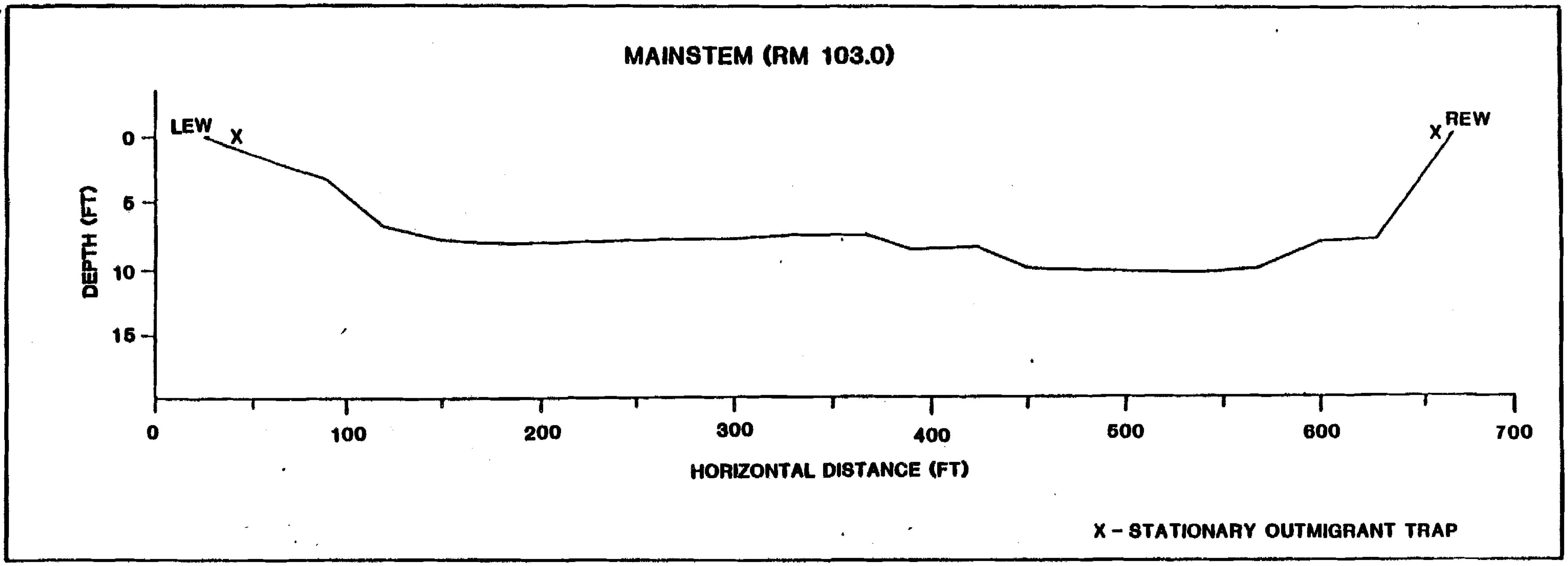


Figure 4. Bottom profile of the Susitna River (RM 103.0) at the Talkeetna stationary outmigrant trap sites. USGS preliminary data - 37,348 cfs discharge at Gold Creek on June 22, 1982.

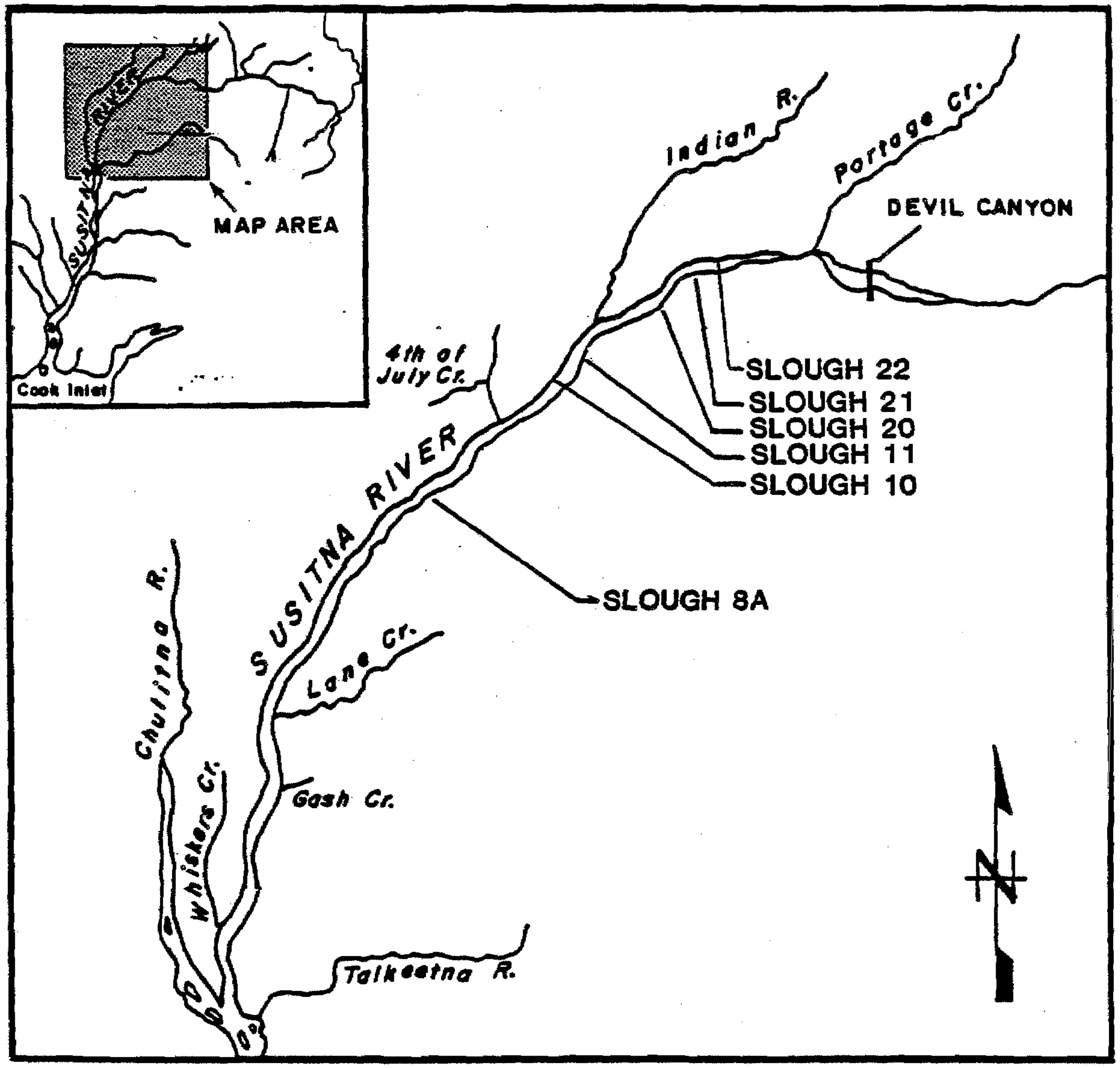


Figure 5. Map showing the locations of possible juvenile salmon cold branding sites on the Susitna River between the Chulitna River confluence and Devil Canyon, 1984.

2.2.2.1.3 Schedule of Activities and Frequency of Sampling

Coded Wire Tagging

Coded wire tags will be deployed on a continual basis from May 16 through June 20, 1983.

Talkeetna Stationary Outmigrant Traps

The stationary outmigrant traps will be deployed on May 14. They will be operated periodically as river conditions permit until outgoing ice clears sufficiently to allow safe operation on a full-time basis. The traps will be operated continuously thereafter until freeze-up.

The traps will be monitored according to river conditions. Periods of high discharge will require more frequent checks due to the associated debris. Checks will be conducted at least twice daily in order to collect captured fish and to clean the screens.

Cold Branding

Two 10-day sampling trips will be conducted each month throughout the open-water season.

2.2.2.2 Juvenile Outmigration Studies of the Lower River

2.2.2.2.1 Methods

Flathorn Stationary Outmigrant Trap

A three man crew will operate one stationary outmigrant trap on the mainstem Susitna River at Flathorn Camp (RM 22.4). The stationary outmigrant trap at Flathorn is similar to the outmigrant traps used at Talkeetna Camp, however the design, dimensions, and flotation differ.

The Flathorn trap requires a higher velocity (1.5 fps) than the Talkeetna trap to operate efficiently.

The 10-by-11-foot stationary outmigrant trap consists of two separate but attached floating structures. Each floating structure has two pontoons constructed of polystyrene plastic (Styrofoam). These eight foot pontoons provide the flotation for the welded aluminum frame of the stationary trap. The pontoons are covered with a two foot wide plywood deck striped with non-skid material. The deck provides a walking surface from which the inclined plane is cleaned and serviced. The inclined plane is suspended in a six foot opening between the pontoons from the aluminum frame work. A hand winch is used to raise and lower the inclined plane. A second set of smaller pontoons provides flotation for the live box structure which is attached to the downstream end of the inclined plane. The removal of the live box for cleaning or retrieval of fish requires the use of an eighteen foot boat to aid in accessing the live box. The floating live box frame measures 45 inches in length by 60 inches in width. The removable live box consists of a wood frame (2 x 2 inch material) covered by one-eighth inch hardware cloth on the sides and bottom. A system of bolts and holes on the live box allows for adjustments of the trap, so that a high trap efficiency can be maintained as river conditions change.

The outmigrant trap will be secured to a fixed point along the shoreline by means of a primary and secondary rope-cable system and a boom plank. The primary rope-cable system will consist of a 5/8 inch diameter nylon rope attached to a 1/4 inch inch wire rope bridle. This wire rope bridle will be attached to the frame of the trap. The other end of the nylon rope will be attached to the base of a large tree located upstream of the trap. The secondary system will consist of a 1/2 inch polypropylene rope attached to the trap frame, and will serve as the safety line in the event the primary rope-cable system should fail.

The distance of the trap from the shore will be adjusted by means of a 20 foot boom plank. This boom plank will be attached to shore via fence posts and to the stationary trap by eye bolts and rope. The distance will be adjusted by moving the shore anchor point of the boom up or down on the bank as needed to compensate for any changes in flow and debris levels.

Five species of juvenile salmon (pink, coho, sockeye, chum, and chinook) are expected to be captured at Flathorn Station with the outmigrant trap. All fish captured will be anesthetized, identified, and measured (total length) to the nearest mm in accordance with procedures used at the Talkeetna outmigrant traps. Chum and sockeye salmon juveniles will be visually examined for an adipose fin clip which indicates the presence of a half length coded wire tag. Chinook and coho juvenile salmon will be visually examined on both sides of their bodies for cold brand marks. A subsample of coho, chinook, and sockeye juvenile salmon will have a scale sample taken to be used for age analysis of the fish. The scales will be read immediately by the crew members using a dissecting microscope.

Cold branded, and fin-clipped fish will be preserved with ten percent formaldehyde for later examination and tag analysis respectively. All other fish will be retained in fresh water after examination until anesthetic recovery is complete, and then released downstream of the trap.

Daily water velocity measurements will be taken at the entrance of the inclined plane, using a Price, Model AA velocity meter.

Flathorn Mobile Outmigrant Trap

A three man crew will operate a mobile outmigrant trap at 10 transect points on the mainstem Susitna River at Flathorn Station. Two crew members will operate the mobile trap while the third person will operate a 18 foot safety boat and/or monitor a citizen band radio to maintain communication between the field camp and crew of the mobile trap.

The mobile outmigrant trap will consist of a modified 20 foot boat equipped with three conical-shaped mesh net traps. Two nets will comprise the twin net surface sampler system (surface trap) and the third net will constitute the vertical trap. The surface trap will be used to sample the water column from the surface to a depth of 2.5 feet. The vertical trap will be used to sample the water column between 2.5 feet and 10.0 foot, in 2.5 feet increments. One surface net is attached on each side of the boat by six foot booms that are used to set and retrieve the nets (Figure 6). The vertical trap is welded to an aluminum "mast" that is raised and lowered to the desired sampling depth through an access opening in the bottom of the boat (Figure 7 and Appendix 1).

The surface trap and support boom assembly is controlled with a system of hand winches and wire cables that provides both vertical and horizontal control of the surface trap. The vertical trap assembly is supported by an aluminum framework and raised and lowered with a separate hand winch/cable system. A system of quick release devices serves as a safety feature for the surface trap and allows each surface net to be independently released in case of an emergency.

The following preventive maintenance procedures will be conducted daily prior to the operation of the mobile trap.

- o All electric and hand winches, wire cables and fittings, anchors and anchor lines, and quick release mechanisms will be thoroughly inspected, cleaned, lubricated, and replaced if necessary.

- o All nuts, bolts, and screws associated with the vertical trap and the surface trap will be inspected for tightness.

- o Electrical components such as switches, battery cables, battery fluid, and battery terminals will be inspected, repaired, and replaced as needed.

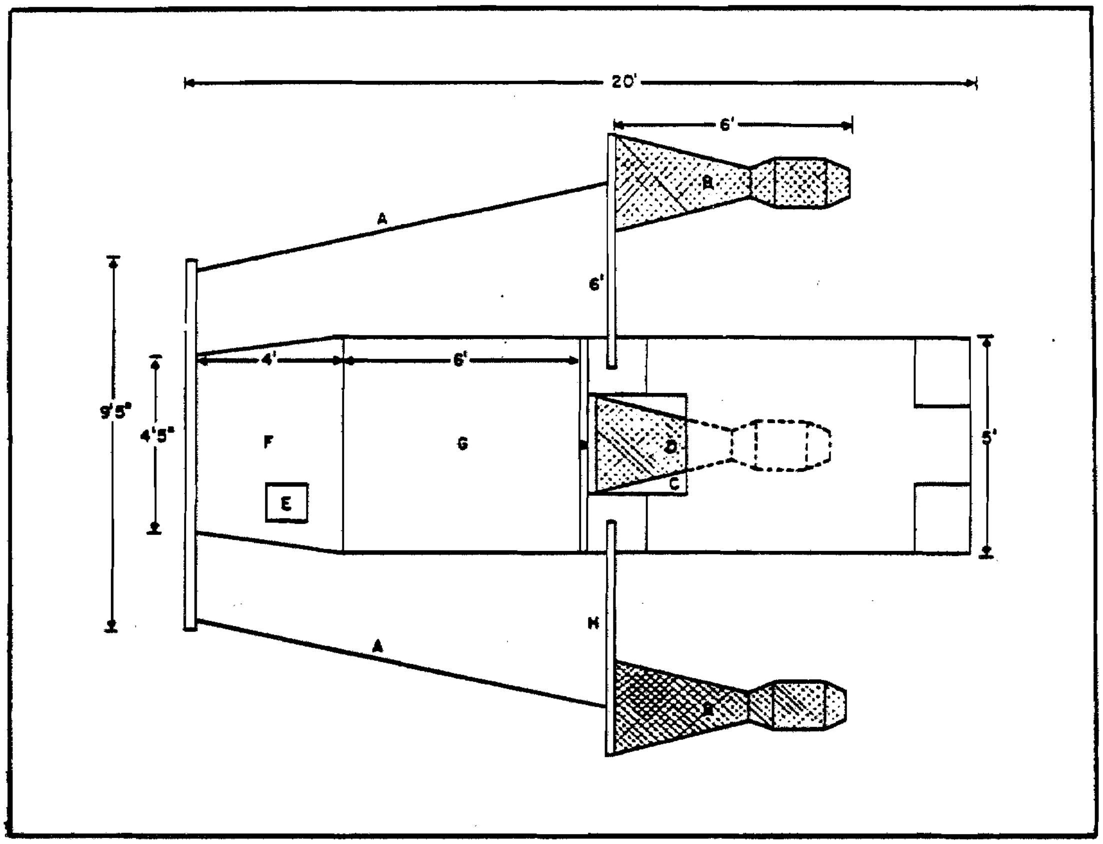


Figure 6. Top view of the Flathorn mobile outmigrant trap in the fishing mode. (A) Front guide cables, (B) Surface nets, (C) Access well for vertical nets, (D) Vertical net, (E) Electric winch, (F) Forward work platform, (G) Main work area, and (H) Booms.

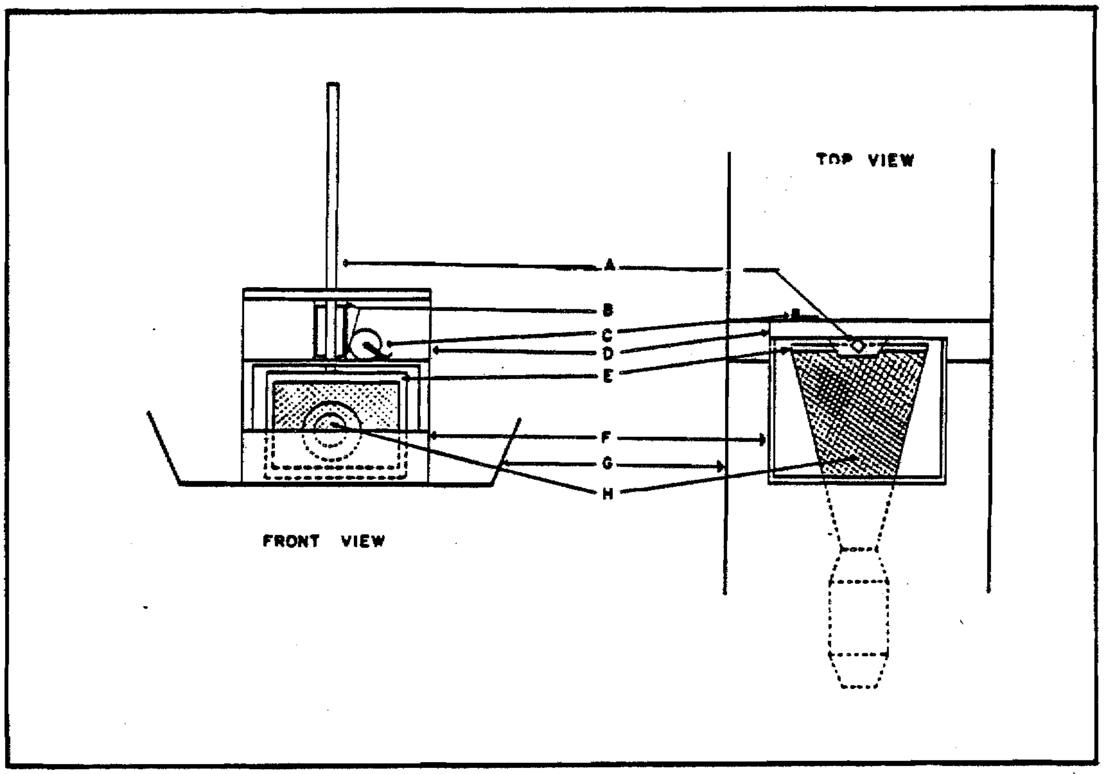


Figure 7. Front and top view of vertical net and support framework for the Flathorn mobile outmigrant trap. (A) Aluminum mast (12 ft), (B) Guide collar, (C) Hand winch, (D) Aluminum support frame, (E) Aluminum net frame (2.5 ft X 2.5 ft), (F) Rim of access well, (G) Side of boat, and (H) Vertical net.

- o Surface and vertical nets will be inspected and any damage will be repaired. Each net will be cleaned prior to each set.

Personnel will be required to wear personal flotation devices and to maintain radio contact with the Flathorn base camp while operating the mobile trap. Personnel should contact the base station or the safety boat, at the beginning of each transect point set and halfway through each 20 minute set.

The following procedures will be used in the operation of the mobile outmigrant trap.

The mobile traps distance from shore is determined with a Ranging, Model 100 range finder and transect markers located on the river bank. Begin to set the vertical trap by first motoring 100 feet above the desired point on the transect line. Place motor in neutral and allow boat to drift downriver. While drifting, lower the vertical trap to the desired fishing depth (normally five feet). This is accomplished by releasing the vertical winch and manually forcing the aluminum boom and attached trap down into the water. Once the vertical trap is in place lock the hand winch and, depending upon water velocities, throw one or two anchors. Allow the anchor or anchors to catch and hold. The boat should now be located along the transect line and at the desired distance from shore. This distance should be checked and recorded along with the vertical trap set time.

Set twin surface nets by releasing the vertical hand winch, and by lowering the trap booms into the water so that the nets and live boxes are submerged. Allow the current to pivot the nets perpendicular to the flow of the river and to the boat. Depending upon the velocity it may be necessary to engage the engine in forward and use the motor to hold the boat on the transect line position. Optional use of the engine to hold trap position may be used in the event of high debris or a substrate which prohibits the use of the anchor system. Record the set time for the twin surface nets.

Inspect emergency anchor release system and insure proper alignment for safe release.

During the 20 minute period that the nets are fishing, measure and record the water velocity and water depth. The water velocity will be taken at the front of the boat (2.5 foot depth) using a Price, Model AA or a Marsh-McBirney, Model 201 velocity meter. The water column depth will be measured using a Lowrance depth finder or with a staff rod. Upon the completion of each 20 minute set for both the vertical and twin surface nets, retrieve the traps, remove all fish and place them in small tub of water for later processing. After the vertical trap and twin surface traps have been retrieved, recover the anchors, clean the nets, and notify the Flathorn base station of set completion.

Then move to one of the other 10 designated transect points to be sampled. In order to avoid sampling each transect point during the same time each day, these sites will be sampled on a rotating schedule as shown in Table 3.

Repeat the sequence of steps as outlined for the previous 20-minute set. During the next set, any fish captured during the previous set should be anesthetized, identified, and measured.

The catch per unit effort (CPUE) of the mobile outmigrant trap will be compared to the stationary outmigrant trap throughout the season. This will be accomplished by anchoring the mobile trap along the side of the stationary trap and comparing the hourly catch rates of the stationary trap to the mobile trap.

Deshka River Fyke Net Weir

A JAHS crew will operate a fyke net on the Deshka River in conjunction with JAHS sampling in the lower Susitna River. A fyke net will be used as a weir to span a side channel of the Deshka River (Figure 8). The fyke net is 15 feet long and contains three baffles. Two 20 foot wings

Table 3. Sampling sequence for the mobile outmigrant trap transect points, Flathorn Station, 1984.

Day	Sampling Sequence for Mobile Trap Transect Points[1]									
1	10	9	8	7	6	5	4	3	2	1
2	7	8	9	10	6	1	2	3	4	5
3	6	5	4	1	2	3	10	9	8	7
4	3	2	1	4	5	6	7	8	9	10
5	10	9	8	7	1	2	3	6	5	4
6	7	8	9	10	3	2	1	4	5	6
7	1	2	3	4	5	6	10	9	8	7
8	4	5	6	1	2	3	7	8	9	10
9	7	8	9	10	4	5	6	1	2	3
10	1	2	3	4	5	6	7	8	9	10

[1] This sampling sequence is repeated every 10 days.

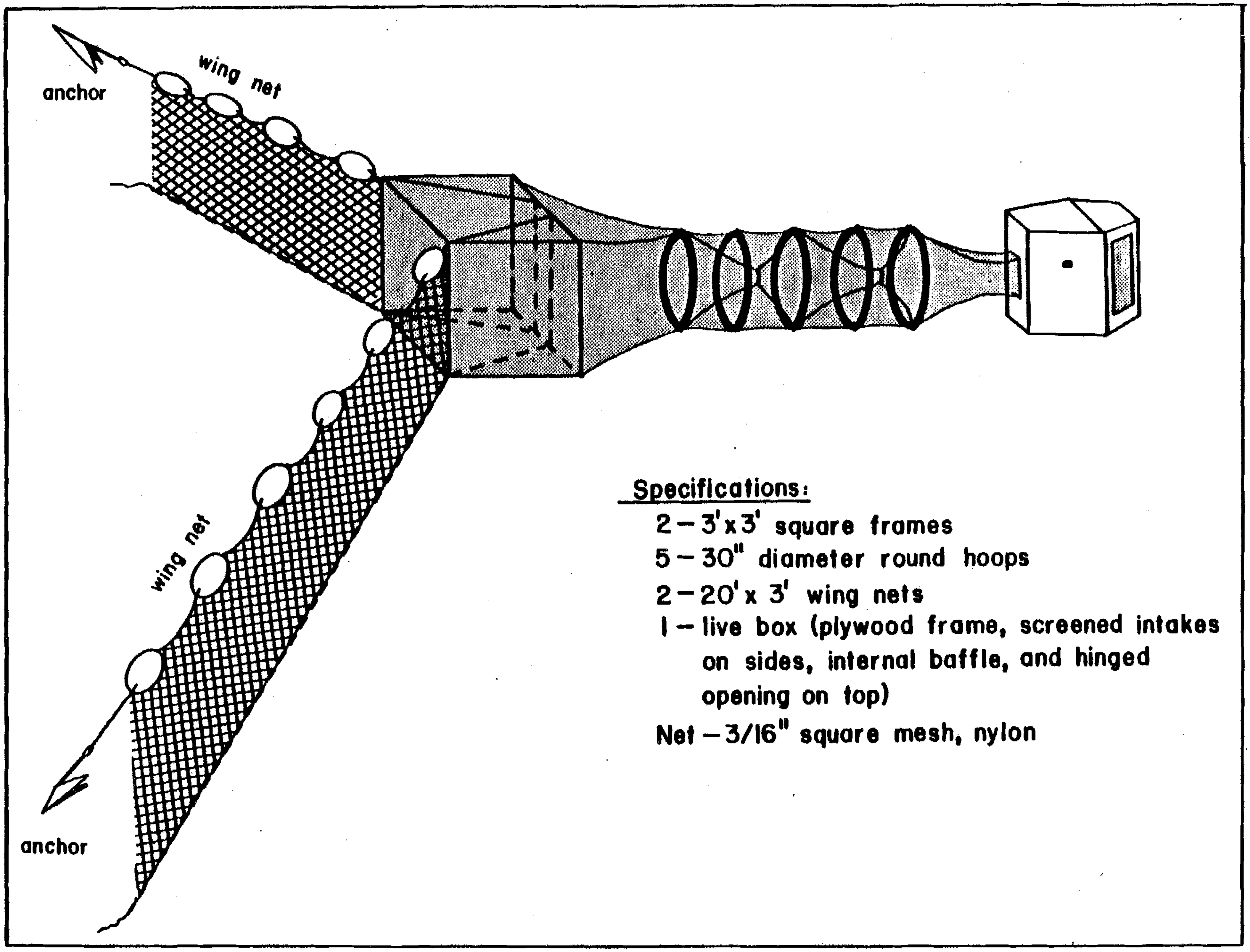


Figure 8. Components of the Deshka River fyke net weir.

extend from the entrance of the trap towards each side. A live box is secured to the posterior end of the fyke net by a collar. The live box is a hexagonal box which is four feet long, three feet high with screens, a baffle and a 10 x 18 inch entrance.

Talkeetna River Beach Seining

The stationary outmigrant trap crew at Talkeetna Camp (RM 103.0) will beach seine juvenile salmon from the lower reach of the Talkeetna River periodically in order to compare the species composition, outmigration timing, and relative size of the Talkeetna River fish with those caught in the Susitna River at the stationary outmigrant traps.

2.2.2.2.2 Study Locations

Flathorn Stationary Outmigrant Trap

The stationary outmigrant trap will be deployed on the west bank of the mainstem Susitna River about 4 miles below the confluence of the Yentna River at Flathorn Station (RM 22.4) (Figure 9). The bottom profile of this sampling site in the west channel is given in Figure 10.

Flathorn Mobile Outmigrant Trap

The mobile downstream outmigrant trap will sample a total of ten points located along a transect line which spans three channels of the mainstem Susitna River at Flathorn Station (Figure 9). Five sampling points will be located in the west channel (RM 22.4), one in the middle channel (RM 22.8), and four in the east channel (RM 23.9). The bottom profile of these channels are presented in Figure 10.

Deshka River Fyke Net Weir

The outmigration fyke net weirs the west channel of the Deshka River at TRM 3.0 (Figure 11). This channel is relatively shallow and has a gradual gradient.

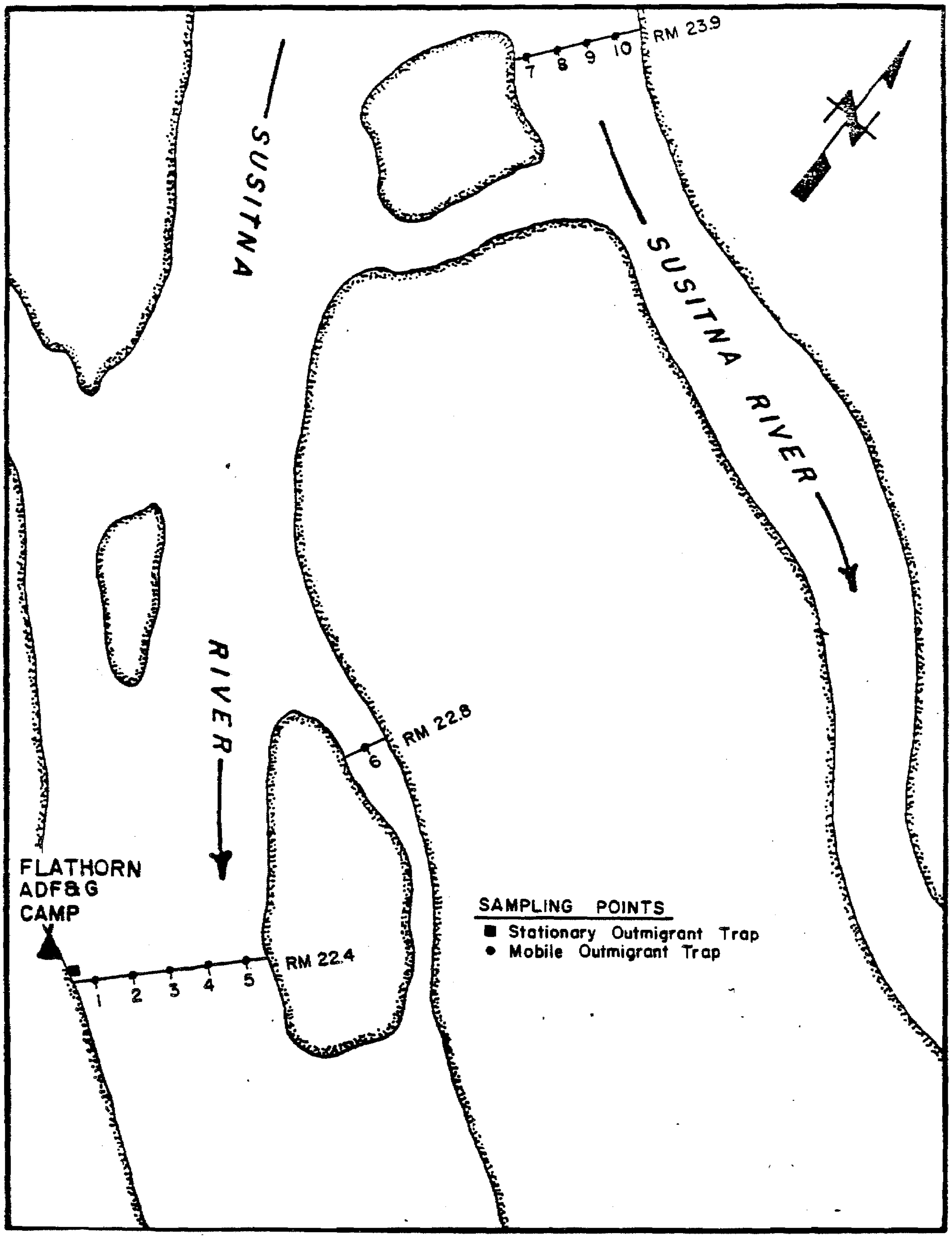


Figure 9. Map showing the locations of the Flathorn stationary outmigrant trap and the mobile outmigrant trap sampling points on the Susitna River.

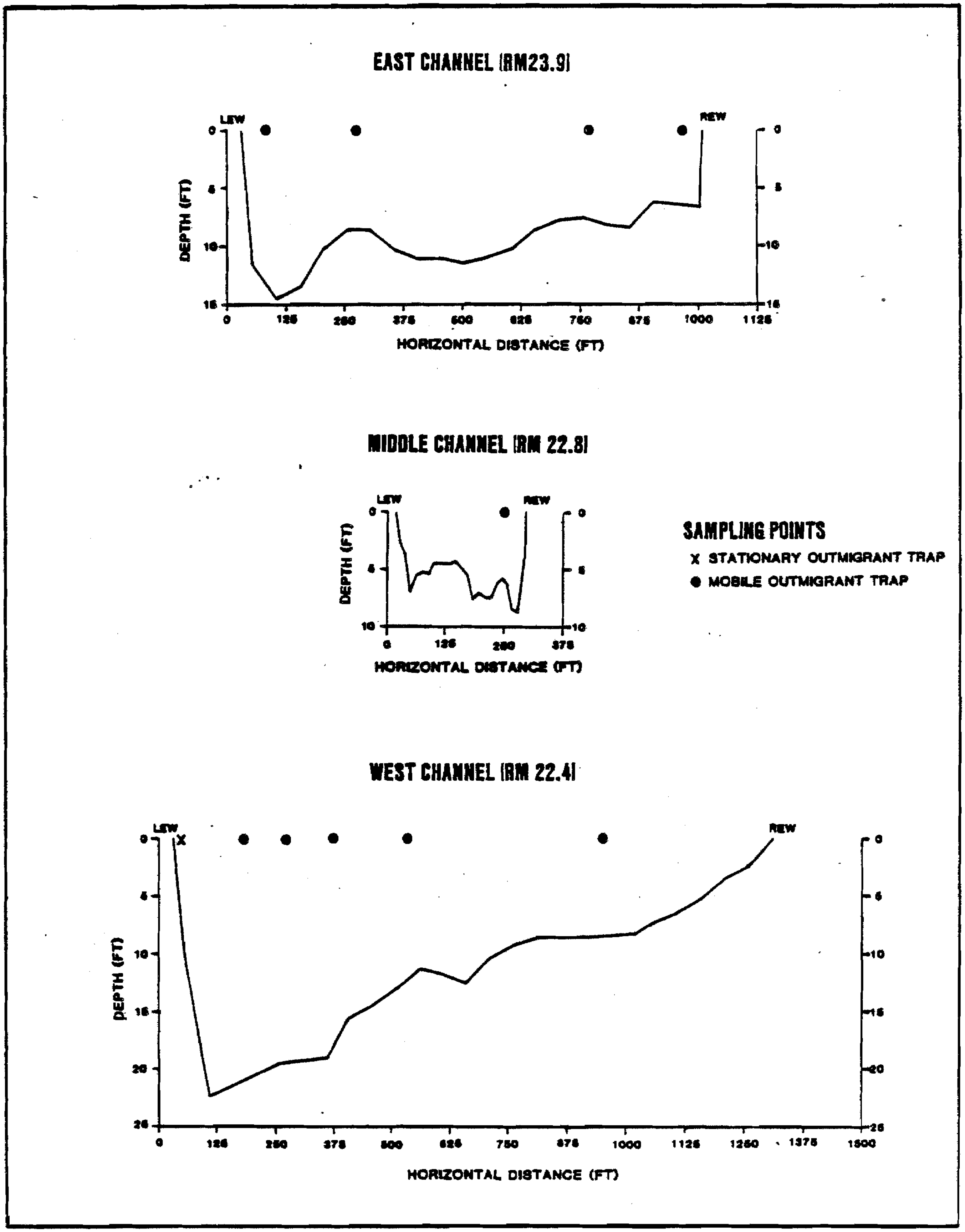


Figure 10. Bottom profile of the Susitna River at the Flathorn stationary outmigrant trap and the mobile outmigrant trap sampling points. USGS preliminary data - 54,600 cfs at Sunshine on August 23, 1984.

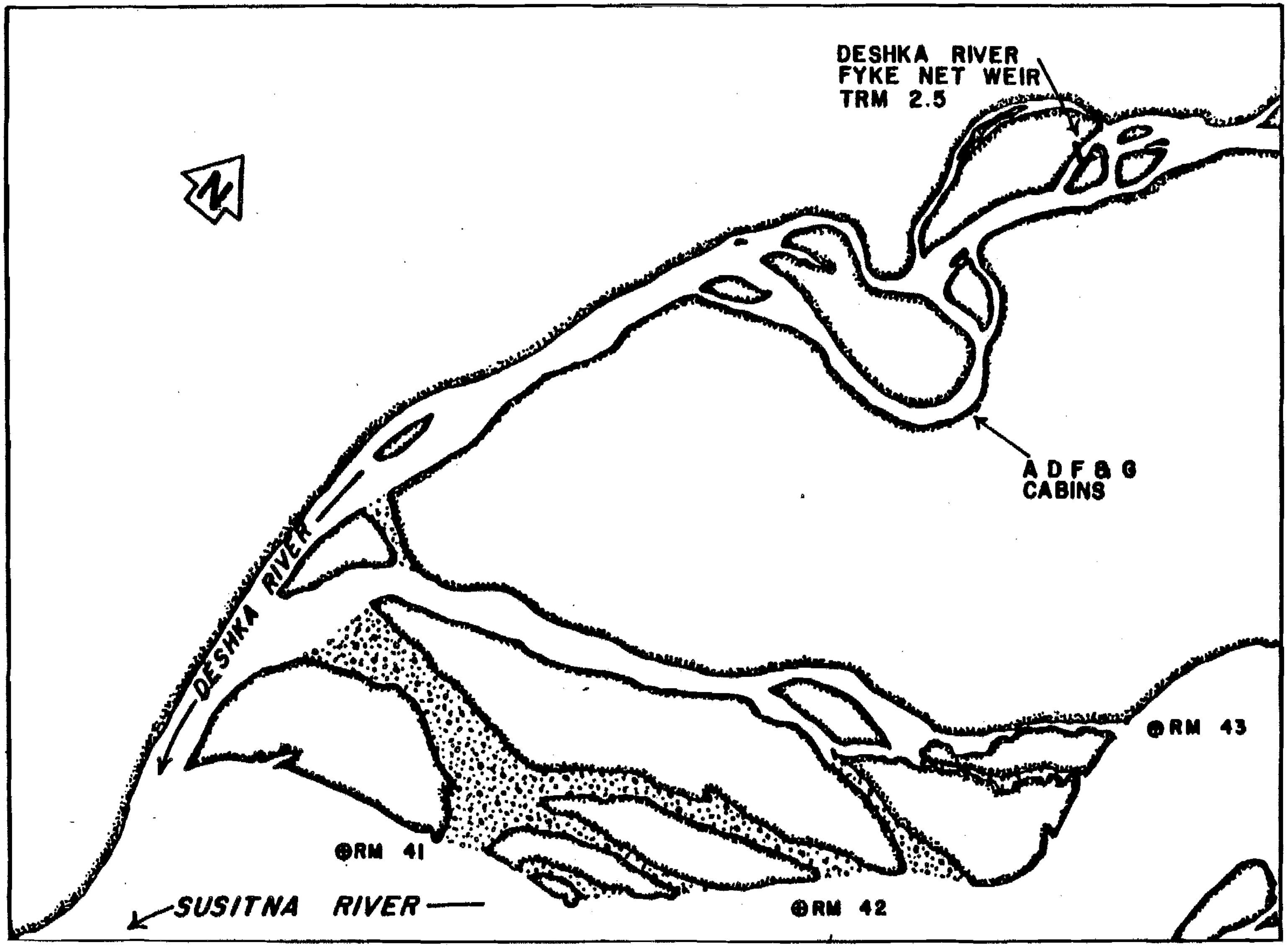


Figure 11. Map showing the location of the fyke net weir on the Deshka River (TRM 2.5), 1984.

Talkeetna River Beach Seining

The Talkeetna River beach seining site will be located in the north channel approximately one mile upstream from the river's mouth (Figure 3).

2.2.2.2.3 Schedule of Activities and Frequency of Sampling

Flathorn Stationary Outmigrant Trap

The stationary outmigrant trap at Flathorn station will be deployed on May 20th or as soon as river conditions (ice and debris) allow for safe operation of the trap and service boat. The trap will be operated continuously until freeze up or October 1st. The trap may be operated on a limited basis after October 1st, provided river conditions permit and significant numbers of fish are captured during late September. However, field operations will be discontinued no later than October 10th.

Staff gage readings will be noted each time the outmigrant trap is checked. The trap will be checked at least three times daily, generally at 0800, 1400 and 2200 hours. Additional checks may be necessary if high catches of juvenile salmon occurs. Furthermore the trap may require more frequent maintenance (cleaning) during periods of moderate to high debris to insure that trap efficiency remains high. During periods of extreme high debris it may be necessary to discontinue the outmigrant trap operation if trap efficiency is unable to be maintained.

Several 24-hour diel experiments will be conducted in late August and early September. The stationary trap will be checked every two to three hours to determine any change in the timing of outmigrating juvenile salmon relative to changes in day length.

Flathorn Mobile Outmigrant Trap

The mobile outmigrant trap will be operational in late June or early July, after completing a series of experiments designed to evaluate its structural integrity and to test its capture efficiency. The capture efficiency of the mobile trap will be determined by comparing juvenile salmon catch rates of the mobile trap with stationary trap catch rates.

The mobile trap will be operated twenty days each month, generally Monday through Friday of each week. In the event that a scheduled sampling day is missed, due to bad weather or mechanical problems, the mobile trap will then be operated on the weekend immediately following the week in which the mobile trap was not fished.

Two or three depth and velocity profiles of each of the three mainstem river channels will be conducted by Aquatic Habitat (AH) personnel. The profiles of the channels will be conducted during stage conditions which represent low, average, and high mainstem flows.

Deshka River Fyke Net Weir

The outmigrant trap will be operated intermittently during the 1984 summer field season. Operation of the weir will coincide with the 1984 JAHS sampling program schedule.

Talkeetna River Beach Seining

The Talkeetna River sampling site will be beach seined one to two times each week throughout the open water period.

2.2.3 Winter Studies of Resident and Juvenile Anadromous Fish

2.2.3.1 Resident Fish Winter Studies

A two man crew will continue to sample selected resident fish on the Susitna River between Cook Inlet and Devil Canyon during the ice-covered season (November-April) in order to describe the mainstem distribution and overwintering habitats of these species and to estimate the response of selected overwintering habitats to hydraulic changes during the winter.

2.2.3.1.1 Methods

Winter studies of resident fish will rely heavily upon radio telemetry techniques (described previously in Section 2.2.1.1.1 of this text and ADF&G (1982)) to monitor winter movements of fish which were radio tagged in late summer or in the fall and to locate specific overwintering areas. Radio tracking will be conducted from fixed-wing aircraft, helicopters, and snowmobiles.

The following habitat parameters will be collected at selected overwintering sites of radio tagged fish: water temperatures, water depths, water velocities, conductivity, dissolved oxygen, pH, turbidity, and substrate composition.

The relative abundance and species composition of resident fish at suspected overwintering sites will be determined by on-site sampling with trotlines and/or under-ice gill nets.

All resident fish captured will be identified to species and their age, length, sex, and sexual maturity will be collected as described in ADF&G (1982).

2.2.3.1.2 Study Locations

Radio tracking flights will be conducted periodically throughout the winter months over the mainstem Susitna River between Cook Inlet and Devil Canyon and selected tributaries.

On-site sampling will be conducted at selected sites on the Susitna River where radio tagged resident fish are overwintering to determine the relative abundance and species composition of fish present and the habitat parameters that prevail at these overwintering sites.

On-site sampling to reaffirm the timing of burbot spawning and to further define habitat parameters at suspected burbot spawning sites will also be conducted near the confluence of the Deshka River (RM 40.1) and in the mainstem Susitna River near the Parks Highway Bridge (RM 83.9).

2.2.3.1.3 Schedule of Activities and Frequency of Sampling

From November 1984 through April 1985, radio tracking for resident fish will be conducted every 15 to 30 days until all of the radio tag batteries have expired.

In January and February 1985, resident fish sampling will be carried out once every two weeks on the Susitna River below the Chulitna River confluence to reaffirm the timing of burbot spawning, further define suspected spawning areas, and to locate and describe overwintering habitats of radio tagged fish and other resident fish species.

2.2.3.2 Juvenile Anadromous Fish Winter Studies

2.2.3.2.1 Methods

A two man crew will conduct the winter studies of juvenile anadromous fish at selected sites on the Susitna River in the Gold Creek area. The crew will be based at the miners cabin at Gold Creek. The primary means of transportation will be helicopter and snowmachine.

The primary collection techniques will include beach seines (both active and passive), minnow traps, and backpack electroshockers. Gear will be deployed at the selected sites in order to maximize catches.

The winter juvenile studies will use the same cold branding procedures that were presented in Section 2.2.2.1.1 of this text. Cold branding operations will take place at the Gold Creek cabin. All juvenile chinook and coho salmon captured at the various study sites will be transported to the cabin in aerated coolers, cold branded with a unique site/trip brand, and then released in the same site and sampling area they were originally caught in.

Habitat parameters to be collected will include surface water and intragravel temperature, water depth, water velocity, substrate composition, percent ice cover, and ice thickness.

Fisheries data to be collected monthly will include - total catch/minnow trap, species/sampling areas, total length measurements of 50 juvenile chinook and 50 juvenile coho salmon at each site, and notes on fish observations.

Each site will be divided into three to five sampling areas (partitions) based on different flow, depth, cover, and substrate characteristics. Sampling areas at each site will be designated in October after winter flows have stabilized.

2.2.3.2.2 Study Locations

Study locations will include Indian River, Slough 10, Slough 22, and possibly two more side channel/side slough sites to be chosen in October.

2.2.3.2.3 Schedule of Activities and Frequency of Sampling

All partitions at each site will be sampled three times per month with five minnow traps for one 24-hour period each from November 1984 through April 1985.

3.0 DATA PROCEDURES

3.1 Resident and Juvenile Anadromous Fish Studies

3.1.1 Resident Fish Studies

3.1.1.1 Field Data

Habitat and Relative Abundance

Biological data recorded at habitat and relative abundance study sites include species, length, sex, scale card number, age, and fate.

Catch data gathered at habitat and relative abundance sites are location, river mile/tributary mile, geographic code, date, collectors, catch by species, tag number, fate, recapture code/number, gear code, date set, date pulled, time set, time pulled, total time fished or catch per unit effort, time shocked, distance shocked, net length, mesh size, bait type, hook size, and hook type.

Habitat data to be collected at spawning sites are water depth, water velocity, pH, dissolved oxygen, specific conductance, turbidity, surface water temperature, intragravel temperature, air temperature, and substrate.

Sampling forms to be utilized at habitat and relative abundance sites are presented in Figures 12 to 16.

Radio Telemetry

Biological data to be collected from radio tagged fish are species, length, sex, and age.

Catch data for radio tagged fish will include capture date, capture location, capture river mile, release date, release site, and release

File No. 03-82-7.10-272

Page ___ of ___

SUSITNA HYDRO BIOLOGICAL DATA RJ 82-02

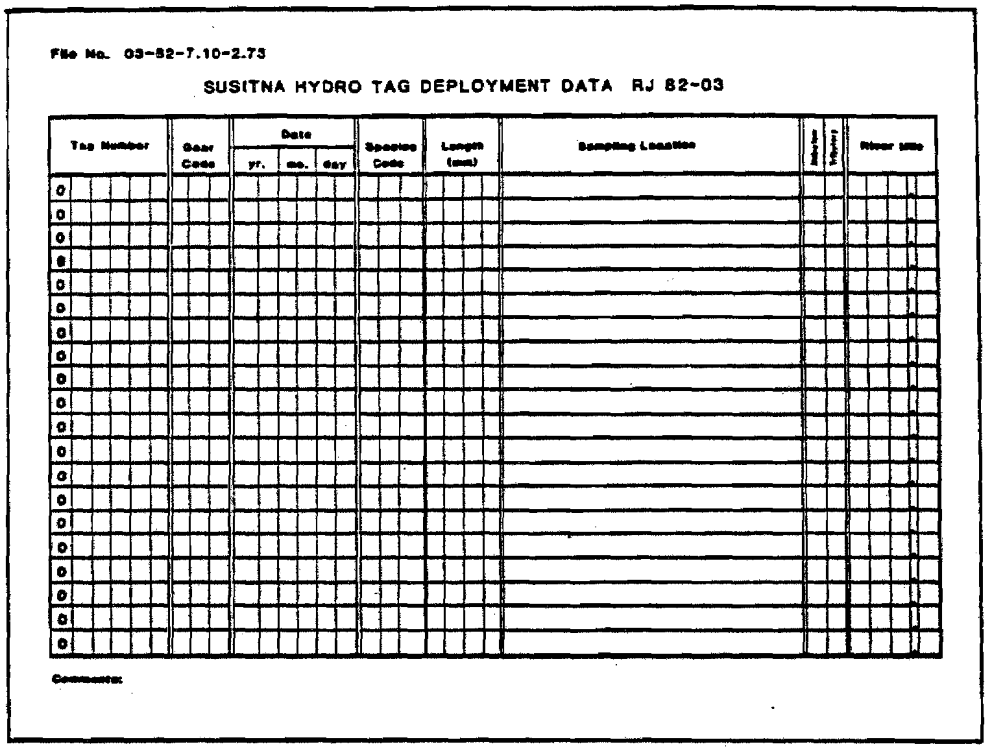
Location ______________ RM/TRM ________ GC __/__/__/__/__

Date collected ___/___/___ (yr. / mo. / day) Collector Initials ______________

	Species Code	Length (mm)	Sex M	Sex F	Age	Scale Card No.	Gear Code		Mesh Size (in.)	Tag Number		Remarks
1									.			
2									.			
3									.			
4									.			
5									.			
6									.			
7									.			
8									.			
9									.			
10									.			
11									.			
12									.			
13									.			
14									.			
15									.			
16									.			
17									.			
18									.			
19									.			
20									.			

Comments:

Figure 12. Susitna Hydro biological data form, RJ 82-02.



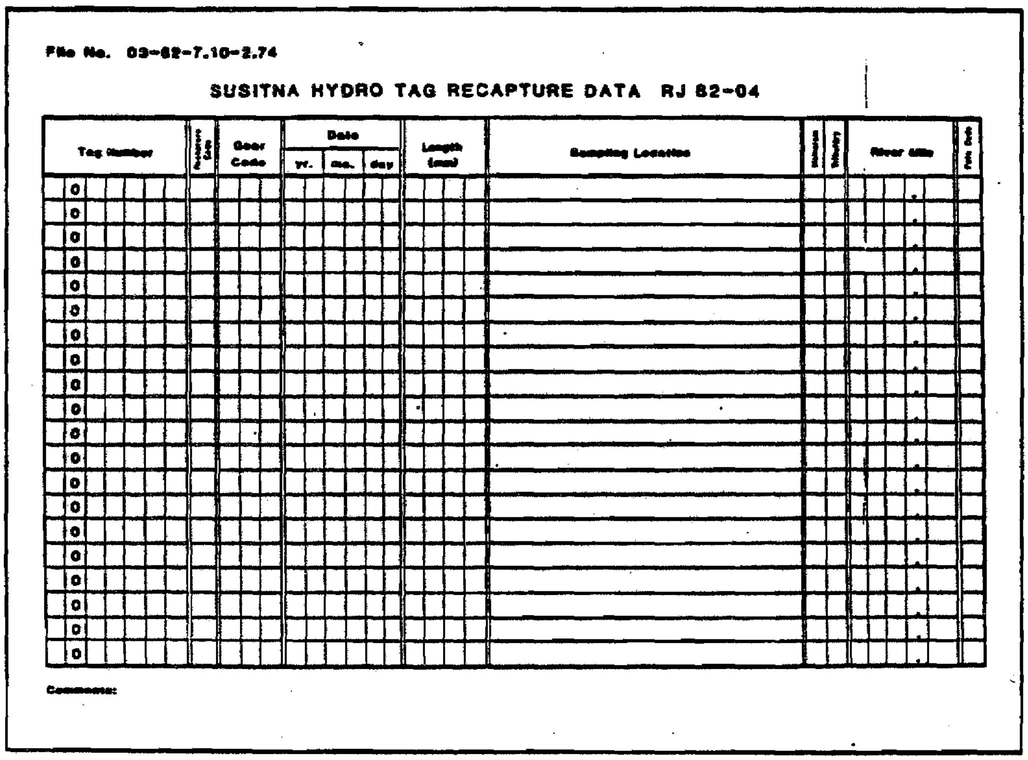
File No. 03-82-7.10-2.73

SUSITNA HYDRO TAG DEPLOYMENT DATA RJ 82-03

Tag Number	Gear Code	Date yr.	mo.	day	Species Code	Length (mm)	Sampling Location	[illegible]	[illegible]	River Mile

Comments:

Figure 13. Susitna Hydro tag deployment data form, RJ 82-03.



File No. 03-82-7.10-2.74

SUSITNA HYDRO TAG RECAPTURE DATA RJ 82-04

Tag Number	[illegible]	Gear Code	Date yr.	mo.	day	Length (mm)	Sampling Location	[illegible]	[illegible]	River Mile	[illegible]

Comments:

Figure 14. Susitna Hydro tag recapture data form, RJ 82-04.

File No. 03-82-7.10-2.75 Page____ of____

SUSITNA HYDRO OPPORTUNISTIC GEAR CATCH DATA RJ 82-05

Location ______________ RM/TRM ________ GC __/___/___/__/___

Date: Gear Set ____/____/____ Gear Pulled ____/____/____ Collector Initials ________

Gear Code	PSN	Net Length	Mesh Size

TIME			Catch - Species Code Number								Remarks
Set	Pulled	Total									

		Conductivity	Volts	Amps

Unit - Make and Model No.

		Bait Type	Hook Size	Hook Type

Comments:

Figure 15. Susitna Hydro opportunistic gear catch data form, RJ 82-05.

SUSITNA HYDRO ELECTROSHOCKING CATCH FORM, RJ 84-03

Crew: ________

Date (YY/MM/DD): __/__/__/

Time (military): ________

Distance Shocked (yards): ____

Location: ____________

River Mile: ____________

Trib. River Mile: ________

Time Shocked (to the nearest 0.5 min): ________

Species		Catch	Remarks
Dolly Varden	(530)		
Rainbow trout	(541)		
Humpback whitefish	(582)		
Round whitefish	(586)		
Arctic grayling	(610)		
Longnose sucker	(640)		
Burbot	(590)		

Comments:

Figure 16. Susitna Hydro electroshocking catch form, RJ 84-03.

river mile. Also recorded, will be the Floy tag number to identify the fish in case it is later recaptured.

The following surgical data will be recorded for each radio tagged fish: time anesthetized, time surgery begun, time surgery completed, and the total time for the operation.

Tag data to be recorded at the time of implantation and during each tracking flight are type of tag (internal or external), frequency and pulse per second or seconds per pulse. The location, date, and river mile (to the nearest 0.1 mile) of each radio tag signal that is received will be recorded during each tracking flight.

Figure 17 and 18 presents the forms which were used to collect data for the radio telemetry studies.

3.1.1.2 Data Transfer

Data forms for resident fish habitat and relative abundance and radio telemetry will be checked for accuracy and completeness following each sampling trip by each field crew and the subproject supervision section. Habitat and relative abundance data is then submitted to the data processing unit for key punching and radio telemetry data are filed for hand compilation at a later date. Printouts of the initial habitat and relative abundance data are returned to the individuals who collected the data so that they can be rechecked for errors before they are incorporated into the computer data base for analysis (Figure 19).

Field trip reports, which summarize the preliminary data finds, will be submitted after each sampling trip.

3.1.1.3 Data Analysis

The final products for the resident fish studies are a description of the distribution and relative abundance for selected resident fish

SUSITNA HYDRO RADIO TAG DEPLOYMENT DATA, RJ 83-06

					RADIO TAG DATA				CAPTURE DATA					TIME OF OPERATION			
Species	Fork lenght/age in mm	Sex	Floy tag #	Scale Card #	Freqeuncy	delta	Pulses per sec	Secs per pulse	DATE		loc.	R.M.	Method of capt.	Aneth. Time	Beg Sur.	End Sur.	Total Time
									capt.	rel.							

Figure 17. Susitna Hydro radio tag deployment data form, RJ 83-06.

SUSITNA HYDRO RESIDENT FISH RADIO TRACKING DATA FORM RJ 83-07

DATE: ___/___/___ TIME: ______ to ______ WEATHER: ______________

Species	Channel	Tag	Release Site	Date	RM	Last Position	Date	RM	New Position	RM
	1	600.5								
		600-1								
		600-2								
		600-3								
	2	610.5								
		610-1								
		610-2								
		610-3								
	3	620.5								
		620-1								
		620-2								
		620-3								
	4	630.5								
		630-1								
		630-2								
		630-3								
	5	640.5								
		640-1								
		640-2								
		640-3								
	6	650.5								
		650-1								
		650-2								
		650-3								
	7	660.5								
		660-1								
		660-2								
		660-3								
	8	670.5								
		670-1								
		670-2								
		670-3								
	9	680.5								
		680-1								
		680-2								
		680-3								
	10	700.5								
	11	710-1								
		710-3								
	12	730-2								

REACH OF RIVER FLOWN: ______________

ESTIMATED ALTITUDE (ft.): ______________

EQUIPMENT USED: ______________

RELATIVE RIVER CONDITION: ______________

NAMES OF PEOPLE FLYING: ______________

FLYING SERVICE: ______________

TRIBUTARY REACHES FLOWN: ______________

Figure 18. Susitna Hydro resident fish radio tracking data form, RJ 83-07.

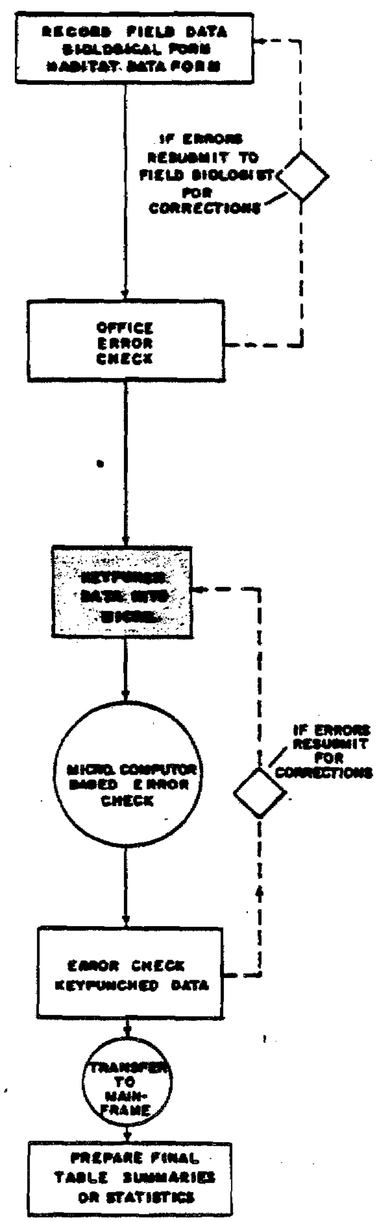


Figure 19. Resident Fish Studies and Juvenile Anadromous Habitat Studies (JAHS) data transfer flow chart.

species, including an analysis of the environmental factors affecting distribution.

3.1.2 Juvenile Anadromous Fish Studies

3.1.2.1 Field Data

Field data collected at all sites sampled for fish will be recorded on JAHS FISH HABITAT AND CATCH DATA form RJ 84-09 (Figure 20). On this form, biological data recorded will include species, number of fish captured and lengths. Habitat data recorded on the form include turbidity, pH, dissolved oxygen, temperature, and conductivity of the grid. For each cell, velocity, area, depth, percent cover, and cover type(s) will also be recorded on the form. The instructions for completing form RJ 84-09 are outlined in Appendix 2.

At RJHAB sites, form RJ 84-10 (Figure 21) and form RJ 84-11 (Figure 22) will be used to record additional habitat data. Data recorded on these forms will include a site map, wetted edge measurements, and initial compass bearings and distance measurements between transect markers. Instructions for completing these forms are also given in Appendix 2.

3.1.2.2 Data Transfer

After each sampling trip, RJ 84-09 data forms will be checked for accuracy and completeness by each field crew and the subproject supervision section before they are submitted to the data processing unit for key punching. Printouts of the initial data will then be returned to the individuals who collected the data so that it can be rechecked for errors before it is incorporated into the computer data base for analysis (Figure 19).

Field trip reports will be completed after each sampling trip and will summarize the initial findings of each sampling trip.

SUSITNA HYDRO JAHS FISH HABITAT AND CATCH DATA FORM RJ 84-09

PAGE ___ OF ___

LOCATION: ______________ HABITAT MODEL ________ COLLECTOR'S INITIALS: ________

DATE: ___ / ___ / ___ (yr. / mo. / day) GRID NO.: ________ HYDROLAB NO.: ________ TIME: ________

TURBIDITY: ________ WATER TEMP.: ________ pH: ________ D.O.: ________ COND.: ________

	HABITAT DATA							CATCH DATA				
	Cell No.	Area (sq/ft)	Vel. ft/sec	Depth (ft)	% Cover	Cover Prim.	Cover Sec.	Gear Code	Species Code	No. of Fish	Length (mm)	Remarks
1												
2												
3												
4												
5												
6												
7												
8												
9												
0												
1												
2												
3												
4												
5												

U : Habitat Conditions unfavorable for fish presence. Low probability of juveniles occupying this random cell.

F : Habitat Conditions favorable for fish presence in this random cell.

COVER

1 NO COVER
2 EMERGENT VEGETATION
3 AQUATIC VEGETATION
4 LARGE GRAVEL 1"-3"
5 RUBBLE 3"-5"
6 COBBLE OR BOULDER > 5"
7 DEBRIS / DEADFALL
8 OVERHANGING RIPARIAN
9 UNDERCUT BANKS

% COVER

1 0-5 %
2 6-25 %
3 26-50 %
4 51-75 %
5 76-95 %
6 96-100%

SPECIES CODE

412- CHINOOK
422- SOCKEYE
433- COHO
440- PINK
450- CHUM
541- RAINBOW TROUT
586- ROUND WHITE
590- BURBOT
610- ARCTIC GRAYLING
640- LONGNOSE SUCKER
660- 3 SPINE STICKLEBACK

Figure 20. Susitna Hydro JAHS fish habitat and catch data form, RJ 84-09.

SUSITNA HYDRO JAHS SITE MAP FORM RJ 84-10

LOCATION ________ RM ________ GC ___/___/___/___/___

DATE ___/___/___ (yr. / mo. / day) GRID NO. ______ COLLECTOR'S INITIALS ______

STAFF GAUGE	
NO.	READING

PAGE ___ OF ___

Figure 21. Susitna Hydro JAHS site map form, RJ 84-10.

SUSITNA HYDRO JAHS SITE TRANSECT DESCRIPTION FORM RJ 84-11

LOCATION ________ RM ________ GC ___/___/___/___/___

DATE ___/___/___ (yr. / mo. / day) GRID NO. ______ COLLECTOR'S INITIALS ______

TRANSECT NUMBER	DISTANCE L-LEW	DISTANCE L-REW	DISTANCE L-R	DISTANCE L-L+1	DISTANCE R-R+1	BEARING L-R	BEARING L-L+1	BEARING R-R+1
1								
2								
3								
4								
5								
6								
7								

Figure 22. Susitna Hydro JAHS transect description form, RJ 84-11.

3.1.2.3 Data Analysis

There are basically four final products of the JAHS data analysis (Figure 23). Catch data will be used to describe distribution and relative abundance for each species, verify RJHAB and IFIM models, and, optionally, to modify suitability criteria developed in 1983. The habitat data will be used in the RJHAB model to produce graphs, by species, of the site response of juvenile salmon habitat to variations in mainstem discharge.

3.2 Juvenile Outmigration Studies

3.2.1 Juvenile Outmigration Studies of the Middle River

3.2.1.1 Field Data

Coded Wire Tagging

Tagging data to be recorded at each tagging site will include species, mean length, number of fish tagged, percent tag retention, and mortality. Site, data, tag code, and time of release will also be recorded.

Talkeetna Stationary Outmigrant Traps

Biological data to be collected at the downstream migrant traps will include fish species, length, and scale sampling. Upon measuring and aging a total of 50 fish of each species in a given day, a tally of those species will be kept for the remainder of that day minus the biological data.

Samples to be collected include scales from predetermined size classes of resident and juvenile anadromous species for age classification. All adipose fin clipped chum and sockeye salmon juveniles will be collected and preserved for future dissection and analysis of the coded wire tags.

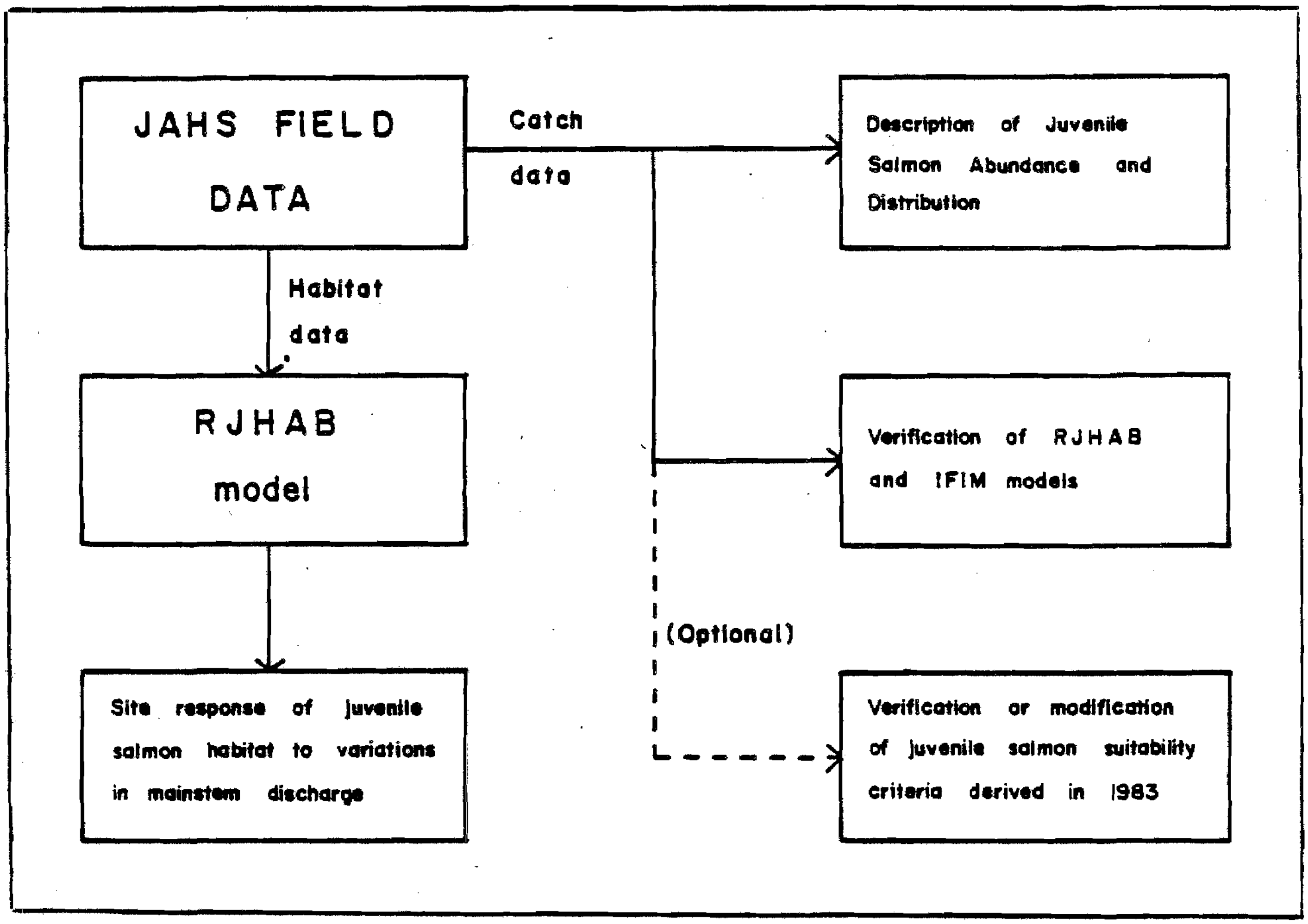


Figure 23. Juvenile Anadromous Habitat Study (JAHS) data analysis flow chart, 1984.

Habitat data collected in association with the biological data at the stationary outmigrant traps will include depth fished (feet), distance from shore (feet), velocity at each trap (fps), river stage (feet), air and water temperature (°C), and turbidity (NTU). Depth fished is read from the water surface to the bottom of the front of the incline. Distance from shore will be measured from water's edge to the center of the inclined plane. Velocity will be read from the center of the bow of each trap directly in front of the incline. If the depth at this point exceeds three feet, velocity readings will be read at 0.2 and 0.8 of the total depth and averaged. If the depth is less than three feet, one reading will be taken at 0.6 of the total depth. River stage will be read from staff gages to be surveyed in by AH staff. Water temperature and turbidity samples will be taken from the deck of the east bank trap and air temperature will be measured in camp.

Depth fished and distance from shore will be recorded for each trap at every check. All other parameters will be measured once daily.

Habitat and biological data will be entered directly into an Epson HX-20 microcomputer. This computer has printing and cassette drive functions. The microcomputer will provide an initial entry printout and a final corrected printout as well as recording the data on two micro-cassette tapes, a primary tape and a backup tape. The program for data entry includes "prompts" for all habitat and biological data (see Appendix 3) and can store up to 100 individual entries per file.

Each trap check will correspond to a file number on the Epson printouts and cassette tapes, and will consist of entries for all relevant water quality and habitat data followed by the biological data and individual species tallies. In the event that the Epson micro-computer fails to provide adequate storage or proves unworkable, data will be recorded by hand.

A sample of chinook, coho, and sockeye salmon fry covering the range of lengths of fish recovered in the traps will be weighed to the nearest grain using a RCBS 10-10 reloading scale. The weights will be converted to grams at the end of the field season to provide a condition factor for juvenile salmon outmigrating from the study reach.

Cold Branding

Data to be recorded from each site will include location, species, number of fish captured, date, hours fished, brand symbol, collectors, recaptures, and lengths from 50 of each species each sampling trip.

Data will be recorded on form RJ 84-04 (Figure 24).

3.2.1.2 Data Transfer

Talkeetna Stationary Outmigrant Traps

Field data will be transferred to the data processing section by micro-cassette tape and paper printout from the Epson microcomputer as it is collected (Figure 25). Trip reports will be submitted monthly to include total catch by species, coded wire tag recoveries, efficiency of the Epson as a data recording system, and river conditions.

Cold Branding

Field data will be used as is for data analysis. Trip reports will be submitted after each trip and will include: sites sampled, total catch and release by species, and general trip comments.

3.2.1.3 Data Analysis

Coded Wire Tagging

Preliminary data analysis will begin following the end of the tagging program in June with the preparation of a table for the Pacific Marine Fisheries Commission (PMFC). This table will outline the tagging sites,

SUSITNA HYDRO COLD BRANDING DATA FORM RJ 84-04

FILE NO.: 03-84-7.10-2.71

DATE: ___ / ___ / ___

SYMBOL: ____________

LOCATION: ____________

PAGE ___ OF ___

SET TIME: ______ CHECK TIME: ______ COLLECTOR'S INITIALS ______

SP.								
1								
2								
3								
4								
5								
6								
7								
8								
9								
10								
11								
12								
13								
14								
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16								
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21								
22								
23								
24								
25								

COMMENTS:

Figure 24. Susitna Hydro cold branding data form, RJ 84-04.

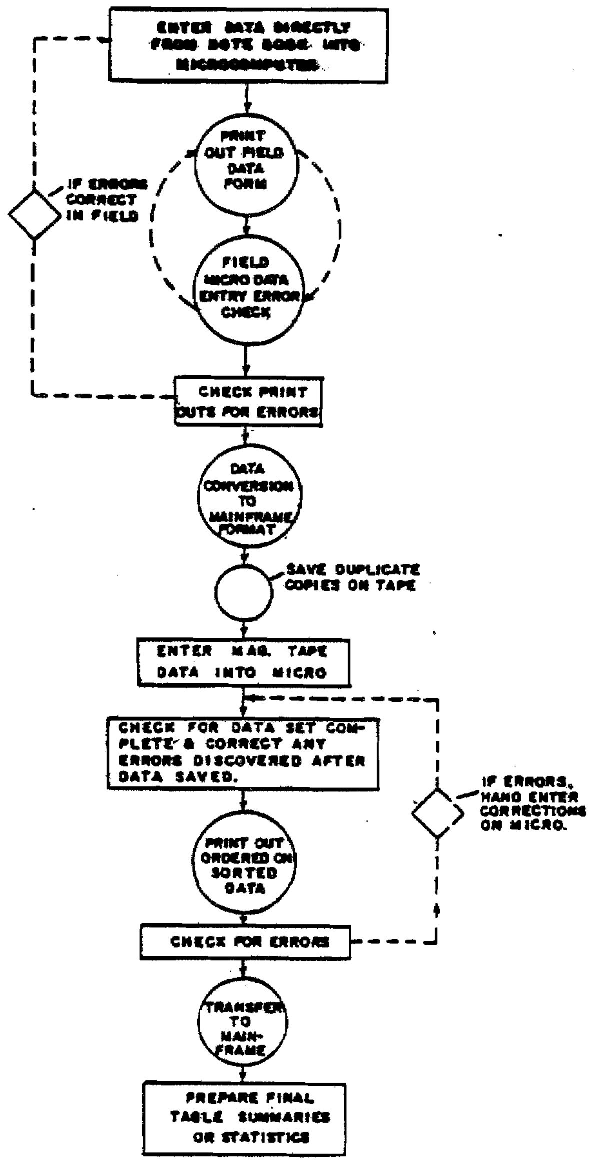

Figure 25. Data transfer flow chart for Talkeetna and Flathorn outmigrant trap data.

dates of release, species and numbers of fish tagged, and mean length of fish tagged. Also provided at this time will be a preliminary inner office report on the outcome of program implementation.

Tags collected from recovered fish will be read at the end of the field season. Population and survival estimates will be calculated following the compilation and preliminary analysis of data collected at the downstream migrant traps. A report on the coded wire tagging program will be included in the 1984 Aquatic Studies Basic Data report. Population estimates from the mark-recovery program will be provided using the Petersen and Schaefer estimators of Ricker (1975). Survival will be extrapolated from using the estimates of total egg deposition and outmigrant populations.

Talkeetna Stationary Outmigrant Traps

All data will be compiled and organized by data processing personnel. Variables to be used in catch data analysis will include Gold Creek discharge, water temperature, diurnal timing, turbidity, seasonal timing, and horizontal and vertical distribution in the water column.

Cold Branding

Data from cold branding will be used in a variety of ways. Juvenile salmon length data will be compared between cold branding sites and other sites on the Susitna River. The branding and recapture data will be used to generate population estimates using the Schaeffer and Jolly-Seber methods (Ricker 1975), the Capture Program (White et al. 1982) and various removal methods.

Data will also be analyzed to determine any factors which may appear to influence outmigration, i.e., length, flows, timing, etc.

3.2.2 Juvenile Outmigrant Studies of the Lower River

3.2.2.1 Field Data

Flathorn Stationary Outmigrant Trap

The length, species, date, set time, and check time will be recorded on form RJ 84-01 (Figure 26). Also denoted on this form should be whether or not the fish was alive or dead (M=mortality), and if the fish was aged via scale analysis (A=Aged). Any general comments on weather, river condition, debris load, etc. should be entered on the bottom of the form.

Biological and habitat data will be collected at Flathorn Station following the same procedure outlined in the RJ section of the 1983-84 procedure manual for Talkeetna Station with the following exceptions:

> For all 24 hour sampling periods, the first 25 fish of each species will be measured for total length to the nearest millimeter (mm) and recorded on form RJ 84-01. If more than 25 fish of any one species are collected the excess fish will be counted and recorded.

Habitat data collected in association with the stationary outmigrant trap will be entered on form RJ 84-00 (Figure 27) and will include the following:

- o Habitat time
- o Staff gage reading and letter
- o Trap depth and distance from shore

River conditions including stage, debris loads will be recorded on a daily basis in the comments sections on data form RJ 84-00. Classification of debris loads in the river and live box will be based on the following descriptive terms:

SUSITNA HYDRO STATIONARY OUTMIGRANT TRAP BIOLOGICAL DATA FORM RJ 84-01

FILE NO.: 03-84-7.10-2.71 LOCATION: ________ PAGE ___ OF ___

DATE: ___/___/___ SET TIME: _____ CHECK TIME: _____ COLLECTOR'S INITIALS _____

TRAP NO.: _____

SP.							
1							
2							
3							
4							
5							
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7							
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9							
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11							
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20							
21							
22							
23							
24							
25							

COMMENTS:

Figure 26. Susitna Hydro stationary outmigrant trap length data form, RJ 84-01.

SUSITNA HYDRO STATIONARY OUTMIGRANT TRAP HABITAT DATA FORM RJ 84-00

FILE NO.: 03-84-7.10-2.70 PAGE ___ OF ___

DATE: ________ COLLECTOR'S INITIALS: _____

Habitat Time _____
Air Temp. _____
Water Temp. _____
Turbidity _____
Staff Gage _____

HYDROLAB:
Water Temp. _____
pH _____
Dissolved O_2 _____
Conductivity _____

TRAP 1
Total Depth _____
Water Velocity (0.8) _____
Water Velocity (0.2) _____
$\bar{v}$ (or 0.6) _____

Set	Check	Distance	Depth

TRAP 2
Total Depth _____
Water Velocity (0.8) _____
Water Velocity (0.2) _____
$\bar{v}$ (or 0.6) _____

Set	Check	Distance	Depth

COMMENTS: (Weather, Stage, Debris, Traps, Epson, etc.)

Figure 27. Susitna Hydro stationary outmigrant trap habitat data form, RJ 84-00.

- o No Debris
- o Low Debris
- o Moderate Debris
- o High Debris
- o Extremely High Debris

Flathorn Mobile Outmigrant Trap

Data collected with the mobile trap will be entered on Susitna Hydro mobile outmigrant trap data form RJ 84-02 (Figure 28) and will include the following information for each transect point: Trap set time, check time, stationary set water velocity (trap velocity at 1.25 ft when anchored), drift set water velocity (trap velocity at 1.25 ft when drifting), water column depth, fish species, total length (mm) or total number enumerated, scale sample number, fate, date sampled, mobile trap position including transect point identification number (1-10) and distance of trap position from white and orange transect markers.

Daily summaries of the mobile outmigrant catch data will be tabulated. These summaries will include: daily juvenile salmon catch by species, catch rate by species, cumulative catch, and total hours fished.

Furthermore length frequency data will be entered daily for the mobile trap.

Deshka River Fyke Net Weir

Biological data to be collected at the outmigration trap will include species, length, fate of captured fish and scale samples of larger 1+ chinooks, 1+ and 2+ coho juveniles. During each trap check, biological data will be recorded for the first 50 fish of each species; any additional catches of the same species will be counted and released. Field data collected will be recorded on form RJ 82-02 and form RJ 82-05 (Figures 12 and 15).

SUSITNA HYDRO MOBILE OUTMIGRANT TRAP DATA FORM RJ 84-02

FILE NO: 03-84-7.10-2.77 LOCATION: ______ PAGE ___ OF ___

DATE: __/__/__ PERIOD SAMPLED: ______ COLLECTOR'S INITIALS: ______

T. P.	Set / Check	Velocity / Depth	SPECIES								
			Water Col. Depth								
T. P.	Set / Check	Velocity / Depth	SPECIES								
			Water Col. Depth								
T. P.	Set / Check	Velocity / Depth	SPECIES								
			Water Col. Depth								
T. P.	Set / Check	Velocity / Depth	SPECIES								
			Water Col. Depth								
T. P.	Set / Check	Velocity / Depth	SPECIES								
			Water Col. Depth								

Figure 28. Susitna Hydro mobile outmigrant trap data form, RJ 84-02.

Talkeetna River Beach Seining

Data recorded for fish collected on the Talkeetna River will be species and total length.

3.2.2.2 Data Transfer

Flathorn Outmigrant Traps

Field data from the stationary outmigrant trap will be transferred to the data processing section as outlined in the RJ 1983-84 Procedures Manual (ADF&G 1984) for the Talkeetna outmigrant traps.

Field data from the stationary and the mobile outmigrant traps at Flathorn will be summarized in trip reports after the completion of each 10 day sampling period.

Mobile trap catch rates for each species of salmon, especially juvenile chinook and chum salmon, will be calculated on a daily basis and presented in 10 day groups for each transect point. The vertical and horizontal distribution of juvenile salmon at each transect point will be organized and presented for each of the five species of salmon.

Deshka River Fyke Net Weir

Field data will be checked by the subproject supervision staff and entered on a Lotus 1-2-3 spread sheet for later analysis with an IBM personal computer.

3.2.2.3 Data Analysis

Flathorn Outmigrant Traps

Data will be compiled and organized by data processing personnel and by biologists who collected the Flathorn data. Variables to be used in catch data analysis will include Susitna Station discharge, diurnal timing, and seasonal timing. The variables will be analyzed using each of the five species of juvenile salmon collected during the 1984 field season. Trap catch per hour and seasonal cumulative catch data will also be compiled for each species.

Mobile trap data will be compiled and analyzed by the biologists who gathered the data at Flathorn. Variables to be included in catch data analysis will include: Susitna Station discharge, seasonal timing of migrating juvenile salmon, vertical and horizontal distribution, horizontal distribution of each age class of juvenile salmon species catch per hour, species catch per hour/per volume of water, comparison of mobile trap data with stationary trap data.

Mobile trap catch data will be organized into ten day groups for purposes of analysis.

Preliminary analysis of mobile trap data will be conducted in the field at the end of each ten day sampling period to insure the reliability of the data collected in relation to catch data collected with the stationary trap.

Deshka River Fyke Net Weir

Data collected in the Deshka River can be compared with the outmigrant data obtained from the Talkeetna and Flathorn Station outmigrant traps. These data can then be used to assess the importance of mainstem chinook and coho rearing in the lower Susitna River.

Talkeetna River Beach Seining

Talkeetna River beach seine catch data will be used to compare the species composition, outmigration timing, and the relative size of the juvenile salmon caught in this tributary with juvenile salmon data from the stationary outmigrant traps on the Susitna River at RM 103.0.

3.3 Winter Studies of Resident and Juvenile Anadromous Fish

3.3.1 Resident Fish Winter Studies

The resident fish winter studies will utilize the same data recording, data transfer, and data analysis procedures that were presented for the open water season studies (Sections 3.1.1.1 - 3.1.1.3). In addition, habitat data which was collected at spawning sites during the open water season will also be collected at sites identified as winter rearing habitats.

3.3.2 Juvenile Anadromous Fish Winter Studies

3.3.2.1 Field Data

Winter cold branding data to be recorded at each site will include location, date, set time, collector's initials, species, lengths, and brand symbol. These data parameters will be recorded on form RJ 84-04 (Figure 24).

Winter habitat and catch data to be collected at each microhabitat site (partition) will be recorded on form RJ 84-05 (Figure 29). These data will include location, date, collector's initials, partition number, water temperature (surface and intragravel), ice data (% cover and thickness), and catch by trap number and species.

In March 1985, the following habitat parameters will be collected once at all partitions in each winter study site: location, date, collector's initials, partition number, area, velocity, depth, % cover, and cover type (primary and secondary). This information will be recorded on the RJ 84-09 data form (Figure 20) using the same procedures described in Appendix 2.

PAGE ___ OF ___

SUSITNA HYDRO JUVENILE SALMON WINTER DATA RJ 84-05

LOCATION ______________________ COLLECTOR'S INITIALS ____________

DATE ___/___/___
yr. mo. day

PARTITION	WATER TEMP.		ICE		TRAP NO.	CATCH						
	SURFACE	INTRA GRAVEL	% COVER	THICKNESS		JUV. SALMON	162	640		410	430	

COMMENTS

Figure 29. Susitna Hydro juvenile salmon winter data form, RJ 84-05.

3.3.2.2 Data Transfer

Field data will be used as is for data analysis. Trip reports will be submitted semi-monthly and will include catch by species, brands recovered, and basic trip highlights.

3.3.2.3 Data Analysis

Cold branding data will be used to generate population estimates and migration patterns. Length data will be used to determine age and outmigration factors.

Habitat data collected will be used in conjunction with the fisheries data to determine overwintering preferences.

4.0 QUALITY CONTROL

The Resident and Juvenile Anadromous Project Leader and his respective Sub-Project Leaders are charged with the responsibility of maintaining standards for collection, recording, and the processing of data. Sub-project Leaders report to the Project Leader after each sampling trip to discuss the progress of their individual studies. The Project Leader and/or his representative also inspect field operations periodically to insure that the sampling programs are conducted consistently and accurately.

Literature on the latest data collection and analysis procedures are continually reviewed to be sure that the best possible methods are being employed.

Field data from each sub-project are recorded and systematically checked for accuracy and completeness by each field crew. The data is then submitted to the Subproject Supervision Section where it is reviewed and routed to the Data Processing Section for key punching. Data processing returns a print-out of the data which is then cross checked with the original data forms by the individuals who initially collected it. When all parties concerned are satisfied with the data, it is routed through the project biometrician for final analysis before being incorporated into the basic data and analysis reports.

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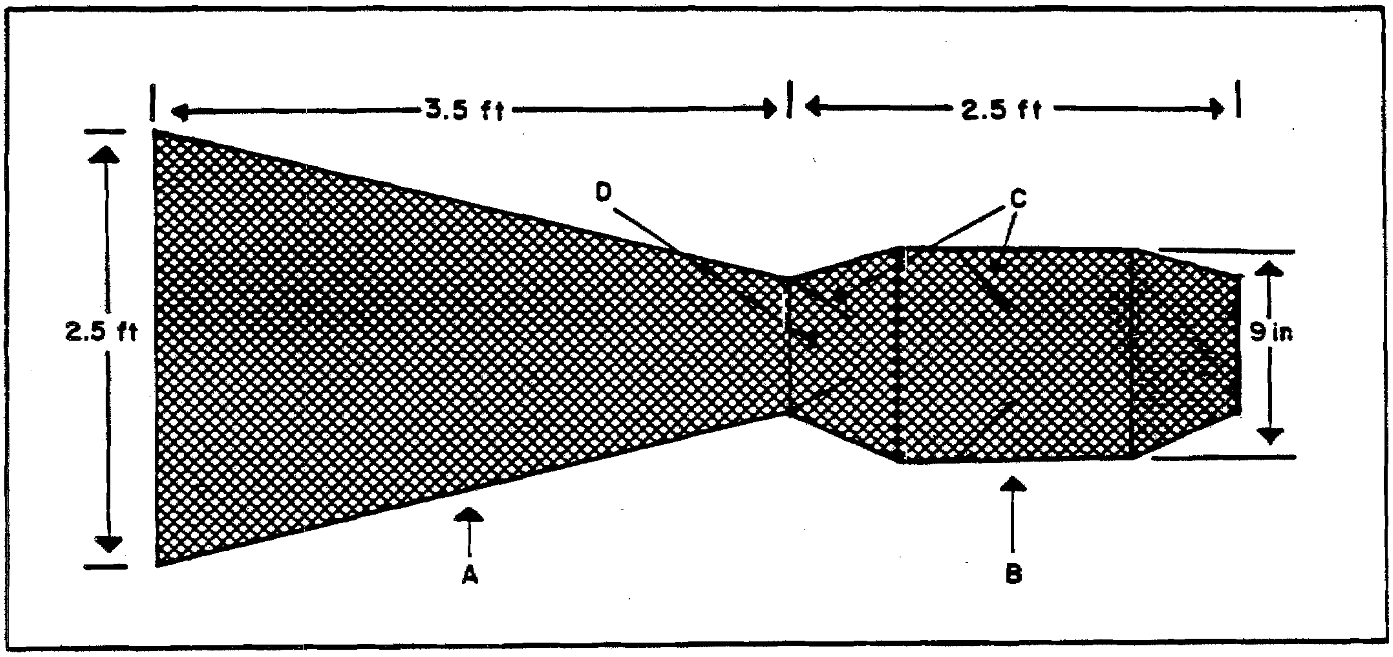
APPENDIX 1

RESIDENT AND JUVENILE ANADROMOUS FISHERIES PROJECT

Additional details of the mobile outmigrant trap.

Each surface trap and vertical trap will consist of a 3.0 foot long conical shaped one-quarter inch mesh net with the opening attached to a 2.5 foot by 2.5 foot aluminum frame (Appendix Figure 1-1). The net cross section is reduced to nine inches in diameter at the point where the net attaches to the entrance of the live box. The live box consists of a modified minnow trap (one-quarter inch mesh) with one end sealed and a 24-inch extension connecting it to the net. The live box measures 31 inches in length by nine inches in diameter. One-eighth inch hardware cloth was inserted into the live box to serve as baffles to reduce escapement of captured fish. The vertical trap's net frame is bolted to the end of a 12-foot post made of two inch channel stock of high tensile aircraft aluminum. The aluminum channel stock is supported in a vertical position by an aluminum frame work that will allow the post to be moved up and down within the support collar through an "access" opening in the bottom of the mobile trap. This opening measures 38 inches by 38 inches and is located in the center of the boat, just forward of the steering console. Surrounding this opening, preventing water from entering the boat, is an eighteen inch high welded aluminum "well rim." Attached to the well rim are two bars which help support the vertical trap framework. The trap is raised and lowered by means of a hand winch and a cable pulley system.

The surface traps and the support boom assembly will also be controlled with a system of hand winches and wire cables. The boom of each surface trap will be connected to one pair of one-quarter inch wire cables. These cables will provide vertical and horizontal control of the surface trap assembly. The vertical wire cable will be connected to both nets and will be controlled by a single vertical hand winch. This system will allow the operator to both adjust the "fishing" depth of the surface nets and to retrieve them. The second wire cable, known as the forward guide cable, will be attached to the end of each net boom and will extend forward to connect to a ten foot long section of aluminum tubing bolted across the bow of the boat. The forward guide cable will be attached to the aluminum tubing via quick release devices. The function of the forward guide cable will be to keep the surface trap perpendicular to the boat and in a "fishing" mode. The quick release devices will serve as a safety feature and will permit each surface net to be independently released from the perpendicular position. In the event of an emergency, such as a large log becoming entangled in the net, activating the release mechanism will allow the surface trap to pivot toward the side of the boat to facilitate removal of entangled debris. Each quick release mechanism will be activated by pulling a "D" ring attached to the unit by means of a one-quarter inch nylon rope. The nylon rope and D ring will extend toward the stern of the boat to be easily accessible to the operators of the mobile trap. A similar quick release system will be utilized for the double anchor system. Each of the two anchor lines will have seperate release mechanisms which will allow the operator to quickly release the anchors should the anchor lines become fouled or if it is necessary to move the boat out of the way of oncoming debris.



Appendix Figure 1-1. Flathorn mobile outmigrant trap vertical and surface net assembly. (A) Conical shaped net, ¼ inch mesh, (B) Live box, modified minnow trap with extension, ¼inch mesh, (C) Wire mesh baffles, and (D) Live box entrance.

APPENDIX 2

RESIDENT AND JUVENILE ANADROMOUS FISHERIES PROJECT

Instructions for completing Juvenile Anadromous Habitat Studies (JAHS) sampling forms and field data notes.

Instructions for Completing Form RJ 84-09:

1. DATE - Year Month Date

2. LOCATION - Enter standard name identifying study site.

3. GRID NUMBER - Enter the established identification number.

4. HABITAT MODEL - Enter Y (Yes) if RJHAB model data are being calculated or N (No) otherwise.

5. COLLECTORS INITIALS - Initials of persons who collect habitat and catch data.

6. PAGE NUMBER - Indicate the page number and total number of pages used.

7. TIME - Military time.

8. HYDROLAB NUMBER - Enter equipment serial number located under the digital display hood.

9. TURBIDITY - Enter the turbidity, expressed in NTU's.

10. WATER CHEMISTRY - Enter the hydrolab readings in the correct heading for pH, temperature (°C), D.O. (dissolved oxygen in ppm), and conductivity.

11. CELL NUMBER - Enter the number that identifies the cell sampled. If the cell is selected and on a grid, enter an asterisk after the number. If the cell sampled is not on the transects or lies within an opportunistic site, begin numbering the cells at 50. Within these cells numbered over 50, enter either a "B" for bank or "M" for middle of channel.

12. AREA - Computed by multiplying cell width (6 ft) with cell length (50 ft). Generally cell area is a constant 300 ft^2, however on some occasions this value could be more than or less than 300 ft^2.

13. DEPTH - Enter the average depth of the cell taken approximately 3 ft from the bank in an area in which the water depth is representative of the entire cell.

14. VELOCITY - Point velocity used to represent the entire cell obtained from the rating table using revolution and time information or the velocity reading from a direct readout meter. The velocity is measured at 0.6 the depth of the water column.

15. PERCENT COVER - Percent cover of each cell will be classified as a single digit code. Enter the percent cover code which represents the total of all available cover within an individual cell.

Percent Cover Code	Percentage
1	0 - 5
2	6 - 25
3	26 - 50
4	51 - 75
5	76 - 95
6	96 - 100

16. COVER CLASSIFICATION - The cover types of each cell will be classified with a one or two digit cover code, which will express the primary and secondary cover types represented within the cell. Enter the secondary numerical cover code only if the secondary cover type exceeds 10% of the total cover.

Cover Code	Description
1	No cover
2	Emergence cover
3	Aquatic vegetation
4	Large gravel (1" - 3")
5	Rubble (3" - 5")
6	Cobble or boulder (greater than 5")
7	Debris deadfall
8	Overhanging riparian
9	Undercut banks

17. GEAR CODE - Enter appropriate gear code; 003 for beach seines, 002 for electrofishing.

18. SPECIES CODE - Enter the code that identifies the species of fish captured. Codes are listed on the bottom of the sheet.

19. NO. OF FISH - Enter the number of fish caught.

20. LENGTH - Enter total length measured from tip of nose to tip of caudal lobe for juvenile salmon.

21. REMARKS - Enter any comments you may have concerning the cell sampled. At IFIM sites, enter distance from left bank or right bank head pin to cell boundary.

Instructions for Completing Form RJ 84-10:

1. DATE - Year, Month, Date

2. LOCATION - Name identifying study site.

3. GRID NUMBER - Enter the established identification number.

4. COLLECTOR'S INITIALS - Initials of person who records site map data.

5. STAFF GAGE NUMBER - Enter established identification number.

6. STAFF GAGE HEIGHT - Record stage height to the nearest 0.01 foot.

7. RM AND GC (Optional) - If river mile and geographic code are known, enter here.

8. SKETCH MAP - Draw map of site with enough detail so that site can be reconstructed in the office. Note any features not detailed by site measurements, including the status of side channel heads (not breached or open) and presence of mainstem backwater.

9. PAGE - Indicate the page number and total number of pages used.

Instructions for Completing Form RJ 84-11:

1. Enter date, location, grid no., and collectors initials as for form RJ 84-10.

2. Distance L→LEW - Enter distance rounded to feet from left transect marker to left edge of water.

3. Distance L→REW - Enter distance rounded to feet from left transect marker to right edge of water. If necessary, measure from right transect marker and note with an R.

4. Distance L→R - Enter distance from left transect marker to right transect marker.

5. Distance L→L+1 - Enter distance from left transect marker to left transect marker of next transect upstream.

6. Distance R→R+1 - Enter distance from right transect marker to right transect marker of next transect upstream.

7. Bearing L→R - Enter bearing (in degrees from 0° to 360° using magnetic north as 0°) from left transect marker to right transect marker.

8. Bearing L→L+1 - Enter bearing (as in 7 above) from left transect marker to left transect marker of next transect upstream.

9. Bearing R→R+1 - Enter bearing (as in 7 above) from right transect marker to right transect marker of next transect upstream.

Note that numbers 4 through 9 need to be recorded only once, when the site is initially laid out.

Field Notes

Daily field notes recorded by biologists conducting JAHS studies may address the following items:

1. Changes in the sites between sampling periods and other phenomena such as changes in channel morphology caused by high water or icing conditions will be recorded.

2. A description of how changes in discharge of the mainstem have affected the availability of microhabitat for juvenile salmon will also be noted in general terms.

3. Problems with the data base recorded or keys to assist in its interpretation will also be noted.

4. Factors such as observed upwelling of ground water, unusual readings or other conditions that depart from the expected and hypotheses as to the cause of the anomalies will be described. Any other unusual habitat conditions that may affect the microhabitat availability and consequently distribution and abundance of the fish in the area will be included.

5. Hypotheses as to the factors that are, in the opinion of the field biologist, influencing the microhabitat utilization and abundance of juvenile salmon within the sampling grid will be described.

6. Any other field notes that will assist in the interpretation of the data should also be recorded. These field notes will provide an additional basis for the preparation of the final reports on the fish at these sites and the response of the fish to changes in the microhabitat that occur during the course of the field season because of varying mainstem Susitna discharges.

APPENDIX 3

RESIDENT AND JUVENILE ANADROMOUS FISHERIES PROJECT

Operational procedures for the Epson HX-20 microcomputer data form programs.

FLATHORN STATIONARY OUTMIGRANT TRAP
DATA ENTRY PROGRAM ON THE EPSON HX-20

Note to operator: You must type underlined material exactly as it appears.

TO OPERATE:

1. Turn on computer; turn printer switch on.

2. A menu (numbered list) should appear on the screen; choose the selection labeled "FORM" by typing the appropriate number.

3. A series of questions will follow. The statement "This is entry # " will appear, with the question "New Count?". If the observation number is correct, just hit the RETURN key. If the observation number appearing is incorrect, type Y. The question "What is the count?" should now appear; type in the new correct observation number followed with the RETURN key.

   The question "New tape?" will follow. If the tape is new or you are changing to the reverse side, type Y. The computer will ask you to enter a new tape at this time. Hit any key one the new tape is inserted. If this is not a new tape, hit the RETURN key in response to the "New tape?" question.

4. If a statement "Warning-tape has only ### units left" appears, you should replace or turn the tape over and type Y to above question unless you have only a very small number of entries.

5. Now the statement "Initializing - Data erased" will appear and, after a few seconds, a new menu. Choose "Enter Data" from the menu by typing 1. "Header data" and habitat questions should now appear on the screen. If the information is correct as displayed, hit RETURN key, otherwise type in the complete correct entry data followed by the RETURN key. If you hear a warning buzzer sound, you should reexamine the data entry by use of the arrow keys going backward or forward. Either the up or down arrows or the left-right arrows will take you back to the previous entry or the next entry, as appropriate. Correct the data entry as needed. If a number is 1.0, enter 1.0, not 1. If the set or check time is midnight, enter 0000 and the date of the coming day.

   After all general header information is entered, the buzzer will sound and two boxes will appear with "###" under the left one and "species" under the right one. The left box will contain a "1". Enter correct species code followed by RETURN or right arrow key. Enter remaining data according to prompts indicated below boxes. If the warning buzzer sounds, use the left arrow key to re-examine last entry. After entering the fate code (or RETURN key if the fate code is correct as listed), fish #2 will appear. Continue entering data as appropriate until all fish are accounted for. You may use the arrow keys to correct any previous entry or to enter only one field, such as length, if all other fields are constant between fishes; there is no need to hit RETURN key after entries as the arrow keys perform the same function. After completing the last entry, enter ! (hold down SHIFT key while pressing the ! key) and then press the RETURN key to end data entering. Maximum number of fish entries allowed is 100.

6. The data form menu will reappear. Choose #2 on the menu (type 2) to print data out on the Epson printer. A sample printout from this program is presented in Appendix Figure 3-1. Review this data to ensure its accuracy. Choose #1 to correct any errors in the habitat and header data, exiting the data entry after the fish # comes up by typing ! followed by the RETURN key. Correct any errors in the fish data entry by choosing #5 on the menu (type 5). To eliminate entries on the end of the list, choose selection #6 from the menu (type 6). The question "Last fish # to save? will appear. Enter the last valid fish number and press the RETURN key. Another method to correct errors in the fish entry data is to edit individual fish entries. To edit individual fish, also choose #6 and then hit RETURN key in response to the first question. The questions "Fish # on print out?, Species Code?, Number of Fish?" etc., will appear. Enter complete information in response to each question. The menu will reappear after entering the fate code.

7. Reprint the data using selection #2 if the changes are extensive. Otherwise, just make pencil corrections on the paper printed out earlier. Note whether or not pencil changes on paper have been made on the Epson.

8. Select "File/Print" from the menu (type 3). After the data is stored, answer Y to the "Hit Y for Backup?" question. You must make a backup copy of the tape. After the backup copy is completed, the computer will ask "Backup OK?" If there were no problems with the backup procedure, such as inserting the wrong tape, etc., type Y to this question, otherwise insert new backup tape and repeat. You must exit this routine with a Y to "Backup O.K.?" in order to ensure that the next entry session will be properly updated.

9. To enter a new data set or the next trap number, choose "KILL" on the menu (type 4) or turn the computer off and repeat the process from item 1 on this list.

ADDITIONAL HELPFUL HINTS:

If you have entered a large amount of data and the program breaks, you can resume operation by typing CONT followed by the RETURN key. If an abort message appears, you must reenter all of the data. If typing CONT does not work, type GOTO 90. This will allow the menu to reappear and you can resave the data to file or edit any errors without updating the observation number. If this occurs before you have exited the "Backup OK?" question properly, the data set will overwrite the data entered earlier using the "Print/File option". Be sure this is what you want to happen before completing this procedure.

```
HEADER DATA
********************
RJSMOLT84   FORM NO
840910   DAY
0830   CHECK TIME
1  TRAP #
FLAT  TRAP LOCATION
DMR,JDG  INVESTIGATORS
2115  STARTING TIME
3.2  VELOCITY
2.5  DEPTH
NM     TURBIDITY
NM     H2O TEMPERATURE
10  DIST. FROM SHORE
NM  AIR TEMP
0830  TIME/HAB.DATA
2.13  STAFF GAGE
0  GAGE #
840910
DATE-HABITAT DATA
DATA LIST
### SP NU LE T# S# AD FA
 1  430
       1  78 0  0  0  1

 2  430
       1  78 0  0  0  1

 3  432
       1  134
             0  0  0  1

 4  660
       1  32 0  0  0  1
```

Appendix Figure 3-1. Sample Epson HX-20 microcomputer printout from the Flathorn stationary outmigrant trap data entry program.

Any errors observed after the data are stored should be noted on both printouts with a large indication of the fact that they are inaccurate and need editing in the office. Any repeated or omitted observation numbers on the printouts should likewise be noted.

IF PROBLEMS OCCUR:

If the program will not run properly, you may have to erase the program and reload it from tape.

To reload the program:

1. Insert program tape.

2. Turn computer on and select "BASIC" from the main menu (type 2).

3. Type LOGIN 2, then hit RETURN key; type TITLE"", then hit RETURN key; type NEW, then hit RETURN key.

4. Type WIND, then hit RETURN; after cursor reappears, type LOAD, then hit RETURN.

5. After the tape stops running (cursor reappears) and no errors occurred, type TITLE "FORM" then hit RETURN. If a 10 ERROR" appears, repeat steps 4 and 5.

6. Type CLEAR 350, 120 then hit RETURN. Now hit the MENU key and select "FORM". The program should now run normally.

If the program still will not run properly or the computer malfunctions, you may have to press the RESET key, the red one on the right side of the box. This erases the program and any data not saved. Then repeat the last six steps to reload the program.

TALKEETNA DOWNSTREAM MIGRANT TRAP DATA ENTRY PROGRAM ON THE EPSON HX-20 Version 1.0

The Talkeetna downstream migrant trap program (TalkForm) on the Epson HX-20 is an interactive program to allow entry of data in the field as it is gathered by the biologists. The data are printed on a paper printout and stored on a microcassette tape in a format readily usable, once transferred from tape to a microcomputer, by various database programs.

General Description

The function of the program is to enable storage of field data on microcassette tape for eventual transfer via microcomputer and telephone line to a file on Boeing computer services EKS1.

The program allows entry and storage of information from two traps at once, with up to 125 separate entries of fish per trap.

Directions For Use

I suggest reading the Epson tutorial supplied with the machine before using this program by yourself. It is not essential but would probably help. If this isn't possible, then a few cautions are necessary. Don't ever pull on the printer paper when the printer is printing. You may pull on the paper when the printer is not printing. Don't ever try to remove the microcassette when the record (REC) light is on. Other than these two precautions, relax. You aren't going to hurt the Epson no matter what you type on the keyboard. At the worst, you'll lose some of the data that you entered, or erase part of the program.

Next, I insist that you read this whole document before actually using it as a guide. At least skim it first. Then you'll know where to look when you have a question.

I'll start the description by assuming that the program has been correctly loaded into the Epson and is on the menu that shows when the Epson is first turned on. If this is not the case, see the section on HELP.

Check that a microcassette is in the tape drive. It should either be blank (brand new) or you should know what is on it. Turn on the Epson with the power switch on the lower right hand side of the machine. Observing the menu on the screen, push the number on the menu corresponding to TalkForm.

DATE IS XX/XX/XX RIGHT? Y/N
The Epson must keep track of date and time. If the correct date is displayed, type "Y". Otherwise, type"N". If you type "N",it will ask WHAT IS DATE? YYMMDD. You should then enter the date in YYMMDD format. If you type in an impossible date, it will ignore it and ask again what the date is.

TIME IS XX:XX:XX RIGHT? Y/N

This is similar to the date question above. If the correct time is displayed, type "Y". Otherwise, type"n". If you type "n",it will ask **WHAT IS TIME? HHMM.** You should then enter the time in military format, hours and minutes. Twelve noon is 1200, 3:55 pm is 1555, etc. If you type in an impossible time, it will ignore it and ask again what the time is.

WANT TO CLEAR OLD DATA? Y/N

Normally, answer "N". If the data from the last session have been recorded and have not been cleared from memory, or you have totally screwed up data entry and want to start with a clean slate, you need to erase old data, and would answer "Y".

When I say "clear" I mean clear from memory. This program NEVER erases a tape. Once you have recorded data on a tape, it is there forever, as far as you're concerned. If you record something that you don't want recorded, keep the paper printout, and mark on it that it is garbage. when we read the tapes in the office, we will see your note and discard the data.

The Epson will automatically clear memory at the end of a session after you have successfully recorded on two tapes (what normally happens) but if somebody accidentally turns the machine off right after recording the second tape, or something, you are stuck with the last session's data in memory. Normally the data will be cleared from memory automatically. I've put in this option for use in catastrophes only. Normally you would answer "N". But assuming you answer "Y", it will ask you:

YOU HAVE RECORDED THE LAST
SESSION, RIGHT? Y/N

If you answer "N", it will ask the first question again (the idea is not to let you erase data without recording them first). Once you're sure you want to erase the data, type "Y", and the screen will look like this:

CLEARING MEMORY
WAIT
TAKES 2 MIN.
DON'T TOUCH ME!

After 2 minutes, you will be back in the Main Menu, ready to enter data.

What if you don't want to erase the data? Just answer the first question with "N", and the Epson will put you into the Main Menu.

MAIN MENU-Talkeetna
1=Enter/Modify Data
2=Prt/Rec

The "main menu" is now on the screen. From here, you can choose 1, entry or modification of data, by typing a 1 on the keyboard. You could choose to print or record data that you have already entered by typing a 2. Let's start with choosing 1.

1=Trap 2=Fish
3=Hab Data
4=Special Edit
5=Main Menu
You are now at the "secondary menu", which is entirely related to data entry, except for 5, which gets you back to the main menu. Try going back to the main menu, then getting back to this secondary menu. To go back to the main menu, type 5. At the main menu, to get back to here, type 1. See how it works?

Now I'll explain what the items on this menu mean.

1=Trap
This is what you choose to enter trap-related variables, that is, water velocity, start date and time (when the trap was put in the water), check date and time (when the trap was taken out of the water), distance from shore, and trap depth. When you choose this option, the screen will display
ENTER TRAP
#(1 OR 2)
If you are working on trap 1, for example, type a 1.
The screen will now display
INITIALS
You should now type in the crews initials. Make sure you use all capital letters (the CAPS LOCK key makes this easy, just like a typewriter). If you type a disallowed character (for example a ",") the Epson will beep and ignore the character). When you have finished typing in in the initials, you go to the next field by hitting the RETURN key or the right arrow key.
The screen will now display
SWVEL #.#
This is an abbreviation for surface water velocity at the trap. I had to abbreviate some things to save space, unfortunately. You should understand what the #.# means. This is the maximum size of the field. That is, for this field you may type in a number with at most two places to the left of the decimal point, and 1 to the right. I use this symbolism lots of places. For example, for this field you don't have to type in "00.1" if you want to enter 1/10, you could just type".1", but you should not enter ".98" or "100" for example. If you enter a value that is invalid, the Epson will beep and ask you again.
Again, once you have entered the surface water velocity, to go to the next field you hit the RETURN or right arrow key (either one works). But say you wanted to go back to INITIALS to check if you did them right, and maybe change them. To do that, hit the left arrow key. The left and right arrows work the same way throughout this program.

Moving on, I will list the rest of the prompts you will get when entering TRAP information.

ST DATE YYMMDD Note: January 2 1984 would be entered 840102
ST TIME HHMM Note: 3:15 pm would be entered 1515
CHK DATE YYMMDD
CHK TIME HHMM
DFSHORE ### Note: this is distance from shore - nearest foot
TRDEPTH #.# Note: this the depth at which the trap is set; it is not the water depth.

After entering trap depth and hitting RETURN or right arrow, you will return to the secondary menu. But say you are in the middle somewhere (say on CHK DATE) and you want to get back to the menu (you are through with data entry for this trap information). You don't have to use the right arrow to step your way out, you can hit the "!" key (which is a shift 1) and you will jump out to the menu. NOTE - you must hit a return or arrow on the last field you are in, or the Epson won't remember it. The "!" key works this way throughout the program, and becomes more important when entering fish information.

2=Fish

You choose this to enter fish information. The screen will display

ENTER TRAP #(1 OR 2)

After you enter either "1" or "2", the trapnumber and "OK" will flash across the screen. The Epson screen will now display two things. On the left of the screen will be the "fish #". This will start at 1 and go up each time you enter fish information. On the right of the screen will be a box, with SP CODE underneath it. This means you should enter the species code. If you enter an invalid species code, the Epson will beep and ask you for it again, just like when you were entering trap information. Below are the fields of fish information.

```
SP CODE  LENGTH  # CAUGHT  AF CLIP  TAG #  BRAND #  SCALE #
-----------------------------------------------------------
  ###     ####     ####       #      ####    ####     ####
```

Below each field I've listed the format of each field. The abbreviations are as follows:SP CODE-species code;# CAUGHT-number of fish caught;AF CLIP-adipose fin clip, blank means none, 1 means there is a clip;TAG #-tag number;BRAND #-brand number;SCALE #-scale card number.

When entering this data, you can use the left and right arrows like before. For example, if you've entered adipose fin clip and you want to go back to # caught of the same fish, a left arrow will get you there. But you have more arrows to contend with now. If, for example, you have just entered the species code, number caught and length of fish #1 (since you have entered the length, the number caught had better be 1). You know that fish #2 is the same species code, and the same number were caught (1) and you want that information carried down. Enter a down screen. You will now be on fish#2, which automatically has the same species code and # caught. To check this out if you want, you can use the left arrow to verify it. The only fields that will be carried down with the down arrow are species code and # caught, but you can use the down screen from any field. The up screen will take you to the previous fish, but will not change any values.

But say you want a field to be blank? Just leave it blank. You don't have to even go over to TAG #, for example, until you really have a tag number. If you accidentally enter something in a field, just blank it out and it will be gone. You blank stuff out or correct it with the space bar and the INS/DEL key (the upper right hand side of the keyboard), respectively.

Remember the "!" key? You really need it now. Say you've entered 25 fish, you're all finished, but the Epson is prompting you for fish#26! Help, how do you get out? Hit the "exit button", the "!", and you get back to the menu. Remember about hitting a return or arrow on the last field you do want recorded.

3=Hab Data

This is how you enter habitat data (measured once a day). This works very much like the trap information. The fields to be entered are

HAB DATE YYMMDD date on which habitat data measured
HAB TIME HHMM time at which habitat data measured
AIRTEMP ##.# air temperature
MERC H20 ##.# water temperature measured with mercury thermometer
TURB #### turbidity
S G NO 103.OF# staff gage number (enter last character)
S G RDG #.## staff gage reading
HY-H20 TEMP##.# hydrolab water temperature
HY-pH ##.# hydrolab ph
HY-D. O. ##.# hydrolab dissolved oxygen
HY-COND. ####.# hydrolab conductivity

4=Special edit

You probably won't need this until after you've learned how to print, but I'll explain it here anyway. SPECIAL EDIT is a "tertiary menu" for editing specific lines of fish or for cutting off data after a certain entry without having to scroll through all lines of fish data. When you are in the Main Menu, hit "4". The screen will look like this:

1=Single fish
2=Cut Off
3=Secondary Menu

Now I'll explain what what these items are.

1=Single fish

After you have printed out the data, you may find that fish #69 of 123 fish is screwed up. You could choose 2=Fish from the menu and use the down arrow 68 times to get to that one fish to correct it, but there is a better way. You guessed it, choose 1=Single fish. It will display on the screen

WHICH LINE?
ENTER LINE # AND <CR>

In this example, you would type in "69" and hit RETURN. Remember that you must hit RETURN, or the Epson will just sit there.
The Epson will then display

ENTER TRAP #(1 OR 2)

Specify the trap you want to work on, and you will now have the requested fish displayed for you to modify.

2=Cut Off

You would use this when you accidentally enter extra fish. Say you entered 100 fish when you only should have entered 98. Choose this option. The Epson will ask for the trap and line number, as before.

5=Main Menu

When you're finished entering data, choose this to get back so you can print out the data and record it if it's correct.

MAIN MENU-Talkeetna
1=Enter/Modify Data
2=Prt/Rec

I have just run through what happens when you choose 1=Enter/Modify Data. Now suppose you have entered some data. You should print it out, check that it is correct, and once it is correct, record it. That is the whole point of all this, after all. But first, how to print it out? You have probably guessed, choose 2=Prt/Rec from the menu. At this point, the program will check that the date habitat data taken is the same as the date the trap was checked. If it does not match for either trap, the Epson will beep and tell you so. It will ask if you want to continue anyway. If you have goofed and forgotten to record habitat data (or something) then type "N", and it will go back to the menu, where you can choose 1=Enter/Modify Data and go back and correct the habitat date or the check date. If the dates are supposed to be different, tell it you want to continue anyway with a "Y". Assuming you got past all this (your dates are hunky dory) the Epson will display
RECORD (R)
OR
PRINT (P)
Right now I'm telling you how to print, so you should of course type in "P". But make sure that the printer switch is "on". (You shouldn't record until you've checked that the data are correct (with a printout as we're about to do). So type the "P". The Epson will first ask if you want to print trap 1 info. In this case, you do. There may be a time when you don't (say you have printed out both traps previously, and trap 1 was okay but trap 2 needed correcting). Anyway, type in a "Y". The printer will start, listing first all the trap info and habitat data, then the individual fish information. If the printer doesn't print, check that the printer switch is on. When it is finished printing trap 1, it will ask if you want to print trap 2. You decide.

A sample of the Epson HX-20 microcomputer printout from the Talkeetna stationary outmigrant trap data entry program is presented in Appendix Figure 3-2.

```
06/26/84  18:23:49
# OF FILES ON TAPE IS  4

TAPCNT IS  2030
* * * TRAP  2 * * *

 OBSID =     281

LOC = TALK
CREW = CB PH SF
WATER VEL. =  2.8
START DATE = 840626
START TIME = 1025
CHECK DATE = 840626
CHECK TIME = 1615
DIST. FROM SHORE =  12
TRAP DEPTH = 2.2
DATE HAB TAKEN = 840626
TIME HAB TAKEN = 0920
AIR TEMP = 14.2
MERC H20 TEMP = 13.0
TURB. =  160
ST. G. # = 103.0F18
ST. G. READING = 0.70

HY. H20 TEMP = 12.3
HY. pH =  7.1
HY. D.O. = 11.3
HY. COND. =  149.0
 #   SP  CATCH
    LEN AF TAG BRND SCA
   --------------------

  1  410    1
     72

  2  410   15

  3  411    5

  4  420   22

  5  430    1
     31

  6  450    1
     41

  7  526    1
     90
```

Appendix Figure 3-2. Sample Epson HX-20 microcomputer printout from the Talkeetna stationary outmigrant trap data entry program.

So now you've printed out the data, and say there's something wrong. If, for example, you goofed and entered the wrong check time, go back to 1=Enter/Modify Data, choose 1=Trap, and step through with RETURNs or right arrows until you get to check date. Enter the correct date right on top of the old one. Remember you have the INS DEL key to back up with. You also have a couple more keys I haven't told you about yet. These are the [and] keys. The [moves the cursor to the left, and the] moves the cursor to the right, WITHIN THE FIELD YOU ARE IN. Note - These two keys do not work when entering fish data. You can accomplish the same thing by typing on top of the old field and backing up with the INS DEL, these are just handy sometimes. Now that you're correcting data, you can probably see the utility of the 1=Single Fish and the 2=Cut Off options in the secondary menu. Once you have corrected all your errors, go back and print out the affected trap(s) again, to make sure everything's cool. Once it is, you're ready to record. Choose 2=Prt/Rec from the main menu again, and choose "R" when it asks PRINT (P) OR RECORD (R). It will ask

NEW TAPE Y/N

If you have NEVER recorded on this SIDE of this tape before, it is a new tape. If you have already recorded some data on this tape, it is not a new tape. The screen will guide you from now on. If the Epson gives a plaintive wail and the screen says

IO Error in 3090

this means you have a bad tape. Don't panic. Sometimes the tape is dirty or has a bad surface. A tape is also "bad" if the write protect tabs have been broken off (these may be covered with scotch tape if you want to reuse the tape). The program is supposed to sense this and guide you through it, but sometimes it fails. The Epson will remember all the data until you have successfully recorded onto two tapes. So what do you do? On the upper left hand side of the keyboard, there are three keys, PAUSE, MENU, and BREAK. You simply press MENU. Note that this does not get you back to what I've been calling the main menu, it gets you to how the machine is when you first turn it on. Choose TalkFORM from the menu, and the program will again check the date and time with you. DO NOT answer Y to the "clear data" question. Once you're back to the main menu, if you're really worried about it, you can print your data out again to convince yourself it's there, but it will be. Now get two new tapes and start over with recording. Tell the Epson that it is a new tape.

When the Epson is done recording on both tapes, it will ask you INSERT FIRST TAPE AND HIT ANY KEY WHEN READY. Don´t worry - it won´t record on the tape again, but only wind it to the correct start position for the next recording.
Now assuming you have successfully recorded on two tapes, DON´T turn off the machine right away. The Epson needs 2 minutes to clear its memory. You have to clear the memory this way before entering the next set of data. Watch the screen, it will tell you what it´s doing. When the program beeps and returns to the main menu, it is finished, and you can turn it off. If you forget, and turn off the machine right away, turn the machine on again, choose TalkFORM again, and in anwser to the question "clear data" answer "Y". Then the machine will be cleaned up for the next guy.

HELP

So far I've described the mechanics of the program, but how does it really work?

You should first understand that all the data you enter is stored in what Epson calls RAM memory. This means that the Epson will remember what you entered, even when you turn it off and turn it on again, and even if the battery runs down (assuming you charge it up soon). So you can enter some data, turn off the Epson, come back after lunch and continue where you left off. However, the Epson can only remember two traps (1 and 2) at a time (with at most 125 fish each). So you must make sure you record each time you check the traps. When the tape gets anywhere near full, turn the tape over and use the second side, or start a new tape.

WHAT DO I DO WHEN TalkFORM ISN'T ON THE MENU?

This also applies when the program acts like it's busted (it doesn't act like the description of it). You have to load the program off of your program tape. There is probably someone in camp who has done this before, but if there isn't, don't panic. First, make sure the Epson is turned on. Put the special tape with the TalkFORM program on it into the cassette drive. If you don't know where this special tape is, you're out of luck. Anyway, now that the tape is in the drive, choose 2 BASIC from the menu that shows up when you turn the machine on. The screen will show EPSON BASIC V1.0

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It will also show P1: and may show a number of bytes. Don't worry about that. First type WIND and hit the RETURN key, then type TITLE "" (type the quotes,too) and hit the RETURN key. Then type LOAD followed by a RETURN key. If the Epson says SYNTAX ERROR, check that you spelled LOAD correctly. The tape should then start moving, and the Epson will display Searching. It will eventually (within 2 minutes) say Found TalkFORM or something similar. Don't touch it until the cursor (the little underline character) comes back. Sometimes the tape will not move for a few seconds. If the tape winds all the way and it never finds anything, try the other side of the tape. If the Epson screams "IO Error" type in LOAD again and it will continue searching to the end of tape. Anyway, say it finished loading (the cursor has come back with no error messages). You're almost done. Type TITLE "TalkFORM" and a carriage return. You have to spell TITLE correctly, and you have to use the two double quotes. This puts the title in the menu. Now hit the MENU key and TalkFORM should be there in the menu.

I´M THROUGH ENTERING FISH AND IT KEEPS ASKING FOR MORE!

Remember the "!" (exclamation mark). That will get you out of data entry and back to the secondary menu.

I´VE BEEN ENTERING DATA AND I DON´T KNOW HOW FAR I GOT OR IF IT´S SCREWED UP! WHAT DO I DO NOW?

Go back to the main menu and choose Prt/Rec. Choose print.
If the printer doesn´t go, are you sure it´s turned on? If it starts printing garbage and looks like it´s going to go until doomsday, don´t panic. Hit the BREAK key. Now hit the MENU key, and you can choose TalkFORM again when you´ve calmed down. In general, you can hit the BREAK or MENU key anywhere in this program, EXCEPT WHEN THE MACHINE IS RECORDING OR ABOUT TO RECORD. If you are in data entry and hit the BREAK or MENU, the program may forget the last fish or item you entered.

WHAT HAPPENS IF WE HAVE TO USE A NEW EPSON?

Say your first Epson broke down, or you will be using two Epsons simultaneously. First of all, you need to load TalkFORM into the new Epson just as you would do when TalkFORM isn't on the menu. Then you will need to start with a new observation id ('obsid'), because data with identical obsids will overwrite each other once we read them in the office. Here's a program that lets you pick new obsids: REBOOT

REBOOT is on a separate tape, the 'reboot tape'. After loading Talkform, follow these steps:
Put the reboot tape into the tape drive. Hit the **MENU** key and select 2 **BASIC**. First type **WIND** and hit the return key, then type **LOGIN 2**. This will get you into user area 2 as opposed to the user area 1 that TalkFORM is in. Next type **TITLE ""** and return, then **LOAD** and return. The machine should display **Searching**. Within a few seconds, **Found REBOOT** should appear on the screen. Wait until the cursor reappears and type **RUN** to execute REBOOT.
The program will display:
Use this program
ONLY when recovering
from a broken Epson.
Hit any key
After you hit some key it will ask
SURE you WANT
to DO THIS? Y/N
If you type "Y" it will ask you for the new obsid which you calculate by taking the last trap 1 obsid used (look at the most recent paper tape listing) and adding 4.
What is NEW
(4 higher than
last & divisible
by 4) OBSID #####
Type the new obsid in (i.e. 4#### or 360##) and it will show
New obs is -- Right? Y/N
If you answer "N", the epson will again ask you for the obsid, If you answer "Y", it will say **New obsid is --** and ask you to hit the menu button and you're ready to proceed as usual.

If you answer the 'SURE YOU WANT TO DO THIS' question with "N", the Epson will beep and ask you to hit the Main Menu. After running, the REBOOT program will invariably self destruct and needs to be loaded from tape if you need to run it again.

THE MACHINE HAS "ERROR" ON THE SCREEN AND THE PROGRAM DOESN'T WORK ANY MORE. WHAT DO I DO?

Congratulations! You have figured out how to break the program. The first thing to do is to write down what is on the screen, so that maybe I can fix the problem. But what do you do to recover? If you have typed way ahead, chances are you have erased part of the program. You have to load the program back in, as explained under what to do if TalkFORM isn't on the menu. If you have fish sitting in buckets, you should probably record the information on paper and type it in later. The Epson will remember everything you entered correctly up until when it died. When you do get around to re-entering the data, print it out first to see if you want to start all over from scratch (clear memory).

WHAT DO I DO IF I'VE GOT A PROBLEM NOT IN THIS DOCUMENT?

Try to make a note of it, so I can document it. As long as you can get a printout of the data, or even write it down, we can eventually use it. This program is to help you, not drive you crazy, believe it or not.

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