

# STATE OF ALASKA

## DEPARTMENT OF FISH AND GAME OFFICE OF THE COMMISSIONER

JAY S. HAMMOND, GOVERNOR

SUPPORT BUILDING  
JUNEAU, ALASKA 99801

RECEIVED

SEP 17 1981

September 9, 1981

Mr. Eric P. Yould, Executive Director  
Alaska Power Authority  
333 West 4th Avenue  
Suite 31  
Anchorage, Alaska 99501

Alaska Dept. of Fish & Game  
Sport Fish/Susitna Hydro

Dear Mr. Yould:

Thank you for transmitting the Review of the ADF&G Fisheries Baseline Study by Terrestrial Environmental Specialists (TES) on July 27, 1981, and for your favorable comments in your August 13 letter regarding the Su Hydro Aquatic Studies Field data collection efforts.

We are pleased that TES indicated most of the aquatic study objectives can be achieved. Our comments to the sections in which TES indicated some question of accomplishment are included in Attachment A.

Your letter of August 13 indicated a concern whether we would be able to execute our responsibilities pertaining to the data reduction, analysis, and reporting phase of our work. On August 6, I met with Rupert Andrews, Director of Sport Fish Division and Tom Trent, Su Hydro Aquatic Studies Coordinator. At that time, Tom indicated that data reduction and analysis effort had been receiving attention by himself and his staff since late June. With the employment of a staff biometrician for the aquatic studies program on July 6, the Alaska Department of Fish and Game Su Hydro staff initiated the formal planning and implementation effort for data reduction and reporting. Furthermore, Tom related that he had discussed preparation of a revised reporting schedule and concept of reporting to Kevin Young of Acres America (Acres) during a telephone conversation on July 16, and with Dave Wozniak of your staff at a recent meeting of the Instream Flow Work Group on July 31.

Attachment B is a discussion and an outline of the scheduling and basic format of reports which we believe can ultimately meet the Phase I deadlines mandated to the Alaska Power Authority by the Legislature. The draft and final Phase I report schedules established for the ADF&G by Acres (John Hayden to Tom Trent, September 3, 1980, attached), which was the last formal advisory we had received regarding report scheduling, would be basically targeted under the proposed schedule revision. The primary proposed change is to provide a series of species/subject project reports (shown in Section II, Content Considerations of Attachment B) which would replace the quarterly reports. The initial reports will present a

synthesis of first stage data reduction by aquatic study staff, and each report could stand on its own as a data presentation. The Phase I Final Report would present a synthesis of relationships drawn from our respective individual species/subject reports and the reports of others with information relevant to the assessment of the Su Hydro project impacts on fisheries.

We hope the information in attachments A and B will ameliorate any concerns of the APA, Acres, and TES. The ADF&G recognizes the concern of the APA that all ongoing study projects, including the ADF&G Aquatic Studies program, must provide a thorough reporting of data collected during field studies, and that the time frame resulting from the mandate for the Alaska State Legislature requires a significant showing of study results by April of 1982.

Sincerely,



Ronald O. Skoog  
for Commissioner

cc: R. Andrews  
S. Pennoyer  
J. Hayden - Acres  
J. Barnes - TES

Attachment A. ADF&G Comment to TES Review of ADF&G Fisheries Baseline Study.

The ADF&G Su Hydro Aquatic Studies Team has reviewed the Terrestrial Environmental Services (TES) comments on the ADF&G Procedures Manual. While TES has largely indicated that respective project objectives would be met, some of the comments seem to indicate generalized problems with certain program segments. We are aware that the TES review was made two months ago and that certain concerns they expressed have been alleviated or clarified, but nonetheless the transmission of the TES review at this time may imply to the APA and others that there are unresolved deficiencies within the established program.

Our responses to their statements on items 1, 3, 5, 11 and 14 of their review are as follows:

1. Adult Anadromous Studies - sonar counting

TES stated in the feasibility of meeting planned objectives, that, "Although some gaps will appear in the data, these objectives will be met."

The ADF&G staff were concerned that no specific gaps were described. Subsequently, TES fishery biologist, Dana Schmidt, in a letter to Tom Trent on August 17 had stated that, "The data gaps that we anticipated that will develop are items such as shut downs for floods, equipment malfunction, etc. These do not present any significant problem for our ultimate use of the data" (attachment).

3. Adult Anadromous Studies - tag and recapture

TES stated in their review: "There are significant problems with this study which need immediate attention, most significant of which is that there is no detailed plan as to how population will be estimated (i.e. Petersen, Schnabel Method)."

ADF&G comment: We would desire that TES specifically define the significant problems seen in this aspect of the anadromous adult project. Population estimates can be made with either the Petersen or Schnabel Method. We intend to use the Schnabel Method.

Our basic program objectives, we would point out (Attachment B-3, Task 1.1) is to determine the distribution and relative abundance of adult anadromous fish within the study area and not a full blown population estimate. As it is structured now, a population (escapement) estimate with some degree of confidence, can be obtained for stocks in the Susitna River above the Talkeetna-Susitna-Chulitna River confluence; and with a greater degree of confidence, a population (escapement) estimate for that portion of the Susitna River above

the Talkeetna sonar-fishwheel sites. Because of the study area i.e., working only with restraint, fisheries in close association with the mainstem Susitna River as established by the APA, a population (escapement) estimate of anadromous adult above the Sunshine sonar-fishwheel sites cannot be established with a great deal of confidence. Tag recovery work would be required in the Chulitna-Talkeetna drainages, which are outside the present study area limits, to establish populations (escapements) with a higher degree of confidence above Sunshine.

Also, a true population estimate would be as follows:

Population (total run of adults = Catch (harvest in + escapement  
to the Susitna River) Cook Inlet  
and the  
river)

TES also stated: "It has not been determined whether recaptured tagged fish will be removed from the system, released following capture with or without tags, and how carcasses will be included as part of the population estimate. These efforts need to be addressed."

ADF&G comment: Page 00007, paragraph 4 of the ADF&G Procedures Manual states, "Fish captured at upstream tagging locations will be immediately released following species identification and recording of tag type color and number." Tagged carcasses will not be included in the population estimates. Only live tagged and untagged fish counts will be used to derive population size. Carcass counts will assist in providing peak spawner abundance. Tags will be removed by survey crews from carcasses. Appropriate information will be recorded (tag type, number and color, location, date and species). This data will be used to provide insight on escapement timing by subsystem.

#### 5. Adult Anadromous Studies - mainstem spawning areas

TES states: "It should be possible to indicate whether salmon are remaining in this area for any period of time. However, it is questionable whether spawning areas can be identified. Verifying spawning localities in this area could be better accomplished by surveying the river for redds just prior to freeze up at sites identified previously and by pumping eggs from these redds."

ADF&G comment: Page 000010, paragraph 5 of the ADF&G Procedures Manual states, "Where water depth allows, suspected mainstem spawning areas will be sampled for egg deposition. A standard backpack water pump and two (2) circular standing screen cod nets 18 inches in diameter will be used to sample the river bed. Equipment operating procedures will be demonstrated in the field. Results will be recorded in the appropriate sampling form (III Data Procedures)."

Also, actual observation of spawning fish, if the gillnet methods outlined in the ADF&G Procedures Manual are successful, would be as meaningful as would the outlined redd pumping method.

11. Resident/Juvenile Studies - Winter field studies

TES states: "The first winter's sampling effort has supplied virtually no information on habitat requirements. The levels of information collected on adult resident fishes is negligible and there is no information from the area above the dam sites."

ADF&G comments: The Department during discussions with APA and the consultant group had made it clear that the first few months of winter work for both the Resident and Juvenile Anadromous (RJ) project and the Aquatic Habitat and Instream Flow (AH) projects would be basically a reconnaissance effort, a training period for staff, and a gear acquirement and a developmental period for winter related work. Starting in December, staff began field work using the limited amount of equipment we could borrow from other projects within the Department until equipment better suited to our winter operations could be acquired. The APA and consultant group must understand this is the first time winter work has been done in the Susitna River drainage on more than a casual basis and unlike the summer period we had no experience with the basic characteristics of winter fish habitats or knowledge of the success of various net or trap sampling techniques under the conditions found on the Susitna in winter. Of the projects being conducted by ADF&G, the AH project is most dependent on equipment and proper training of personnel to successfully collect data. It was necessary to determine the types of equipment, for example water quality equipment, which would operate under freezing conditions, and suitable devices did not arrive until just prior to breakup. This limited actual measurement of many physical environmental conditions.

With respect to collection of information on resident species above the dam sites, no program was planned for initiation in the January to May period of 1981. Our June 2, 1980 RSA indicated winter work wouldn't be conducted until calendar year 1982 in the impoundment area. The remoteness of the impoundment area, and weather, logistic support, and communication problems for field personnel working the area in winter makes it imperative that their safety be given paramount consideration before they are permitted to begin work.

14. Aquatic Habitat Studies - general, specific, and fisheries habitat evaluation

TES states: "It appears that the information being collected as part of the general habitat study is virtually identical to that being collected for the specific habitat studies. In addition, it is doubtful that the information can be obtained for the approximately sixty planned study sites."

ADF&G comment: Selected Habitat Data collection includes the collection of the data listed in Table 4 of the ADF&G Procedures Manual (attached). These data are collected jointly by the Selected Habitat crew and USGS personnel along a discharge transect and are depth integrated. General Habitat data collection does not include the collection of these depth integrated water quality parameters. These data are collected by joint AH and RJ crews. USGS does not assist with the collection of data at these sites. Additionally, there is a typographical error on page 00031 in the ADF&G Procedures Manual (attached). Discharges are only measured at the Selected Habitat study sites. All general habitat data are being collected at the combined RJ/AH 82 sites with 44 habitat locations as planned with the exception of intragravel temperatures because the equipment has not arrived.

Attachment B. Proposed Phase I Report Scheduling and Content for ADF&G Su Hydro Aquatic Studies.

The ADF&G Su Hydro Aquatic Studies Team has reviewed the reporting schedule established on September 3, 1981 by Acres American Inc. (Acres), and has evaluated the administrative, staffing and technical constraints which affected the earlier planning and implementation of the aquatic study data reduction and analysis program. The goal of this review was to determine possible ways to insure that reports prepared by the Aquatic Studies Team will provide the best available information to the APA, Acres, and TES so they can conclude essential Phase I tasks within their required final deadlines.

The ADF&G studies team is presently in the active field data collection stage. Only recently have we been able to initiate formal planning for data reduction and analysis, as well as start necessary microcomputer setup and data entry, key punching, and obtain other data processing services that are essential to handling the large volume of raw data being generated by the field studies. As a result, we have several suggestions which we believe will avoid expending unnecessary time and effort in developing incomplete data presentations, and will lead to making the best available data presentation required for the Phase I Final Report.

Basic to our proposed reporting schedule is the elimination of the quarterly report schedule. In substitution, we propose that reports be scheduled around significant biological or physical events. For the Anadromous Adult project (AA), reports would be prepared which present data derived from the start to conclusion of the respective salmon species runs to the Susitna River. For the Resident and Juvenile Anadromous (RJ) project and Aquatic Habitat and Instream Flow (AH) project, breakup and freezeup of the river are the significant beginning and termination points of a reporting period. A synthesis of data obtained and reported for the span between the beginning and end of these events would be combined so reviewers can more effectively evaluate relationships.

The current quarterly report schedule prepared by Acres and TES seems to be aimed more at determining if the Department is collecting data, than whether these data can be effectively consolidated to evaluate fundamental biological and physical relationships which may be impacted by the proposed Susitna Hydro Project. We believe we can deal more effectively with compressed time frames for reporting Phase I information, and will have a better quality and more effective product if our concept of species/subject reports based on the conclusion of biological/physical events is implemented.

The Phase I Final Report, in concept, would draw from the respective species/subject reports ADF&G would prepare, and the Final Report would present an analysis of the biological and physical relationships that can be discerned from the data presented in the species/subject reports.

It is the intent of the ADF&G Su Hydro Aquatic Studies Team to provide more data in monthly reports to satisfy Acres and TES concerns that data is being collected. This concept has already been initiated for monthly reports, and will be expanded in succeeding monthly reports. Data presented in these monthly reports will not be cumulative, but will be summations of what occurred in the report period without any intent to analyze and suggest trends or relationships.

Some reportable subjects would be deferred from immediate submission in species/subject reports but would be included in the Phase I drafts in December. Typically, these subjects would be those that require many hours of tedious analysis. Age data from scale and otolith reading are specific examples of data that would be deferred as addenda to the species/subject reports but completed by the time of the draft Phase I Report.

Although reporting dates would change with our proposal, the objectives of the study would not. The objectives as stated in the ADF&G Aquatic Studies Procedures Manual along with an outline of the probable subject areas that can be reported upon, their data sources, the envisioned statistical presentation of the data and proposed structure and format of the reports follow.

#### PROJECT OBJECTIVES

Adult Anadromous Study: Determine the seasonal distribution and relative abundance of adult anadromous fish populations produced within the study area.\*

- Task 1.1 Enumerate and characterize the runs of the adult anadromous fish.
- Task 1.2 Determine the timing and nature of migration, milling and spawning activities.
- Task 1.3 Identify spawning locations within the study area and estimate their comparative importance.
- Task 1.4 Identify and determine methods, means and the feasibility of estimating the Susitna Rivers contribution to the Cook Inlet commercial fishery.

Resident and Juvenile Anadromous Study: Determine the seasonal distribution and relative abundance of selected resident and juvenile anadromous fish populations within the study area.\*

- Task 2.1 Identify spawning and rearing locations of resident species and the rearing location of juvenile anadromous species to estimate their comparative importance.

\* As defined in the ADF&G Procedures Manual.



Task 2.2 Record descriptive information on captured fish (species, location of capture sites, age class), and discuss seasonal migration patterns of selected adult resident species.

Aquatic Habitat and Instream Flow Study: Characterize the seasonal habitat requirements of selected anadromous and resident species within the study area.\*

Task 3.1 Through direct field observation and measurements identify the physical and chemical conditions which appear to be influencing the suitability of various habitat types for the species and life history stages of interest.

Task 3.2 Through direct field observations and measurements characterize the physical and chemical parameters of the various types found in the study area.

\* As defined in the ADF&G Procedures Manual.

## PROPOSAL OUTLINE

- I. Structure, Format and Schedule of ADF&G Species/Subject Reports for Phase I.
  - A. Structure
    1. Adult Anadromous by species timing
    2. Resident juvenile and Aquatic Habitat by season and river reach.
  - B. Format
    1. Title page
    2. Summary
    3. Table of contents
      - aa. List of figures
      - bb. List of tables
    4. Introduction
    5. Objectives
    6. Methods
    7. Results
    8. Discussion of results
    9. Literature cited
  - C. Report Schedule
    1. Filing date
      - a. 30 to 45 days after conclusion of event (Figures 1 and 2) for example, chinook salmon: The last data collection relative to chinook salmon is expected by August 15, 1981, upon cessation of the run, so the report would have to be postmarked no later than September 15, 1981.
      - b. Chinook salmon: September 15, 1981
      - c. Coho, chum, sockeye and pink salmon: November 15, 1981
      - d. Impoundment RJ/AH studies: November 15, 1981
      - e. Lower reach RJ/AH studies: 45 days after freeze or break up
    2. Proposed amended report schedule
      - a. See Figure 3
- II. Content considerations
  - A. AA by species/subject
    1. Chinook salmon
      - a. Run timing - peak and duration
        - 1.1 Data source
          - aa. Fishwheel counts
          - bb. Discharge
          - cc. Water temperature
        - 2.1 presentation of data
          - aa. Graphic displays

- b. Escapement enumeration
  - 1.1 Data source
    - aa. Aerial surveys
    - bb. Fishwheel counts
    - cc. Sonar counts
  - 2.2 Presentation of data
    - aa. Graphic displays
    - bb. Tabulation
- c. Spawning locations
  - 1.1 Data source
    - aa. Aerial surveys
    - bb. Ground surveys (side sloughs, etc.)
    - cc. Gear results
    - dd. Radio telemetry (mainstem and tributaries)
  - 2.2 Presentation of data
    - aa. Maps
    - bb. Tabulation
- d. Incidental point specific characterization of spawning redds (Talkeetna to Devil Canyon).
  - 1.1 Data source
    - aa. Point specific velocity, depth & substrate measurement
    - bb. Mean column velocity measurements
    - cc. Photographs
  - 2.2 Presentation of data
    - aa. Graphic displays
    - bb. Tabulation
- e. Migratory behavior
  - 1.1 Preferred routes and rates of passage from tagging point
  - 2.2 Milling patterns
  - 3.3 Final destination (spawning location)
  - 4.4 Data source
    - aa. Fishwheel counts
    - bb. Radio telemetry
    - cc. Discharge
    - dd. Water temperature
  - 5.5 Presentation of data
    - aa. Graphic displays
    - bb. Maps
    - cc. Tabulation

- f. Age, sex, length
  - 1.1 Deferred data reduction
  - 2.2 Data source
    - aa. Scale readings
    - bb. On site measurements and observations
  - 3.3 Presentation of data
    - aa. Tabulation
    - bb. Graphic displays
- 2. Coho, sockeye, chum, and pink (discussed separately) salmon.
  - a. Run timing - peak and duration
    - 1.1 Data source
      - aa. Fishwheel counts
      - bb. Sonar counts
      - cc. Discharge
      - dd. Water temperature
    - 2.2 Presentation of data
      - aa. Graphic displays
  - b. Escapement enumeration
    - 1.1 Data source
      - aa. Fishwheel counts
      - bb. Sonar counts
      - cc. Ground surveys
      - dd. Tag/recapture
      - ee. Discharge
      - ff. Water temperature
    - 2.2 Presentation of data
      - aa. Graphic display
      - bb. Tabulation
      - cc. Maps
  - c. Spawning locations
    - 1.1 Data source
      - aa. Ground surveys
      - bb. Gear results
      - cc. Radio telemetry
    - 2.2 Presentation of data
      - aa. Maps
      - bb. Tabulation
  - d. Point specific characterization of spawning redds (Talkeetna to Devil Canyon)
    - 1.1 Data source
      - aa. Point specific velocity, depth and substrate measurements
      - bb. Mean column velocity measurements
      - cc. Photographs
      - dd. Date, species and location

- 2.2 Presentation of data
  - aa. Graphic displays
  - bb. Tabulation
- e. Migratory behavior
  - 1.1 Preferred routes and rates of passage from tagging point
  - 2.2 Milling patterns
  - 3.3 Final destination (spawning location)
  - 4.4 Data source
    - aa. Fishwheel counts
    - bb. Sonar counts
    - cc. Radio telemetry
    - dd. Tag/recapture
    - ee. Water temperature
    - ff. Discharge
  - 5.5 Presentation of data
    - aa. Graphic displays
    - bb. Maps
    - cc. Tabulation
- f. Age, sex, length
  - 1.1 Deferred data reduction
  - 2.2 Data source
    - aa. Scale readings
    - bb. On site measurements
  - 3.3 Presentation of data
    - aa. Tabulation
- 3. Eulachon (deferred)
  - a. Status of Phase II survey presentation
    - 1.1 Data source
      - aa. Literature search
    - 2.2 Presentation of data
      - aa. Bibliography
      - bb. Survey proposal
      - cc. Addition to Procedures Manual addressing subject
- 4. Stock assessment (deferred)
  - a. As outlined in Procedures Manual

- B. RJ-AH by season and reach
  - 1. Impoundment
    - a. General habitat characterization of sampling and post-impoundment evaluation level (P.I.E.L.) areas
      - 1.1 Data source
        - aa. General habitat evaluation parameters, Table 2, page 24 of Procedures Manual
      - 2.2 Presentation of data
        - aa. Graphic display
        - bb. Tabulation
        - cc. Maps
        - dd. Photographs
    - b. Point specific characterization of utilized habitat
      - 1.1 Data source
        - aa. Point specific velocity, depths and substrate measurements
        - bb. Date, species, sex, length, location and gear type
        - cc. Photographs
      - 2.2 Presentation of data
        - aa. Graphic displays
        - bb. Tabulation
    - c. Species composition
      - 1.1 Data source
        - aa. Gear effort
      - 2.2 Presentation of data
        - aa. Tabulation
        - bb. Maps
    - d. Distribution and relative abundance (Arctic grayling)
      - 1.1 Data source
        - aa. Tag/recapture
        - bb. Gear effort
      - 2.2 Presentation of data
        - aa. Graphic displays
        - bb. Tabulations
    - e. Migration behavior
      - 1.1 Inter-intra tributary
      - 2.2 Tributary/mainstem
      - 3.3 Data source
        - aa. Tag/recapture

- 4.4 Presentation of data
  - aa. Graphic displays
  - bb. Tabulation
  - cc. Maps
  
- 2. Lower reaches (ice covered months)
  - a. Fishery habitat evaluation
    - 1.1 General habitat characterization
      - aa. Data source
        - i General habitat evaluation parameters  
Table 2, page 24 of Procedures Manual
      - bb. Presentation of data
        - i Graphic displays
        - ii Tabulation
        - iii Maps
        - iv Photographs
  - b. Distribution and relative abundance of species  
adult and juvenile
    - 1.1 Data source
      - aa. Gear effort at sampling sites
    - 2.2 Presentation of data
      - aa. Graphic displays
      - bb. Maps
      - cc. Tabulation
  - c. Identification of rearing location (winter)
    - 1.1 Data source
      - aa. Gear effort at sampling sites
      - bb. General habitat characterization  
data
    - 2.2 Presentation of data
      - aa. Graphic displays
      - bb. Maps
      - cc. Tabulation
  - d. Migratory behavior (winter)
    - 1.1 Data source
      - aa. Radio telemetry
      - bb. Tag/recapture
    - 2.2 Presentation of data
      - aa. Maps
      - bb. Tabulation
  
- 3. Lower reaches (ice free months)
  - a. Fishery habitat evaluation
    - 1.1 General habitat characterization
      - aa. Data source
        - i General habitat evaluation parameters  
Table 2, page 24 of Procedures Manual

- bb. Presentation of data
  - i Graphic displays
  - ii Tabulation
  - iii Maps
  - iv Photographs
- b. Distribution and relative abundance of species, adult and juvenile
  - 1.1 Data source
    - aa. Gear effort at sampling sites
  - 2.2 Presentation of data
    - aa. Graphic displays
    - bb. Maps
    - cc. Tabulation
- c. Identification of rearing location (summer)
  - 1.1 Data source
    - aa. Gear effort at sampling sites
    - bb. Visual observation
  - 2.2 Presentation of data
    - aa. Graphic displays
    - bb. Maps
    - cc. Tabulation
- d. Identification of spawning locations
  - 1.1 Data source
    - aa. Gear effort at sampling sites
    - bb. Visual observations
    - cc. Conditions of fish at capture
  - 2.2 Presentation of data
    - aa. Maps
    - bb. Tabulation
- e. Migratory behavior
  - 1.1 Data source
    - aa. Radio telemetry
    - bb. Tag/recapture
    - cc. Inference from gear effort
  - 2.2 Presentation of data
    - aa. Maps
    - bb. Tabulation
- f. Timing of smolt outmigration (duration and end poing)
  - 1.1 Data source
    - aa. Gear effort
    - bb. Visual observations
  - 2.2 Presentation of data
    - aa. Graphic displays
    - bb. Tabulation



4. Age, sex, length
  - a. Deferred data reduction
  - b. Data source
    - 1.1 Scale readings
    - 2.2 Otolith readings
    - 3.3 Size frequency
  - c. Presentation of data
    - 1.1 Graphic displays
    - 2.2 Tabulation
5. Selected habitat evaluation
  - a. Talkeetna to Devil Canyon
    - 1.1 Data source
      - aa. Selected habitat evaluation parameters  
Table 3, page 25 of Procedures Manual
      - bb. Water quality data collected jointly  
with USGS, Table 4, page 26 of  
Procedures Manual.
      - cc. R&M and USGS instream flow data
    - 2.2 Presentation of data
      - aa. Graphic displays
      - bb. Tabulation

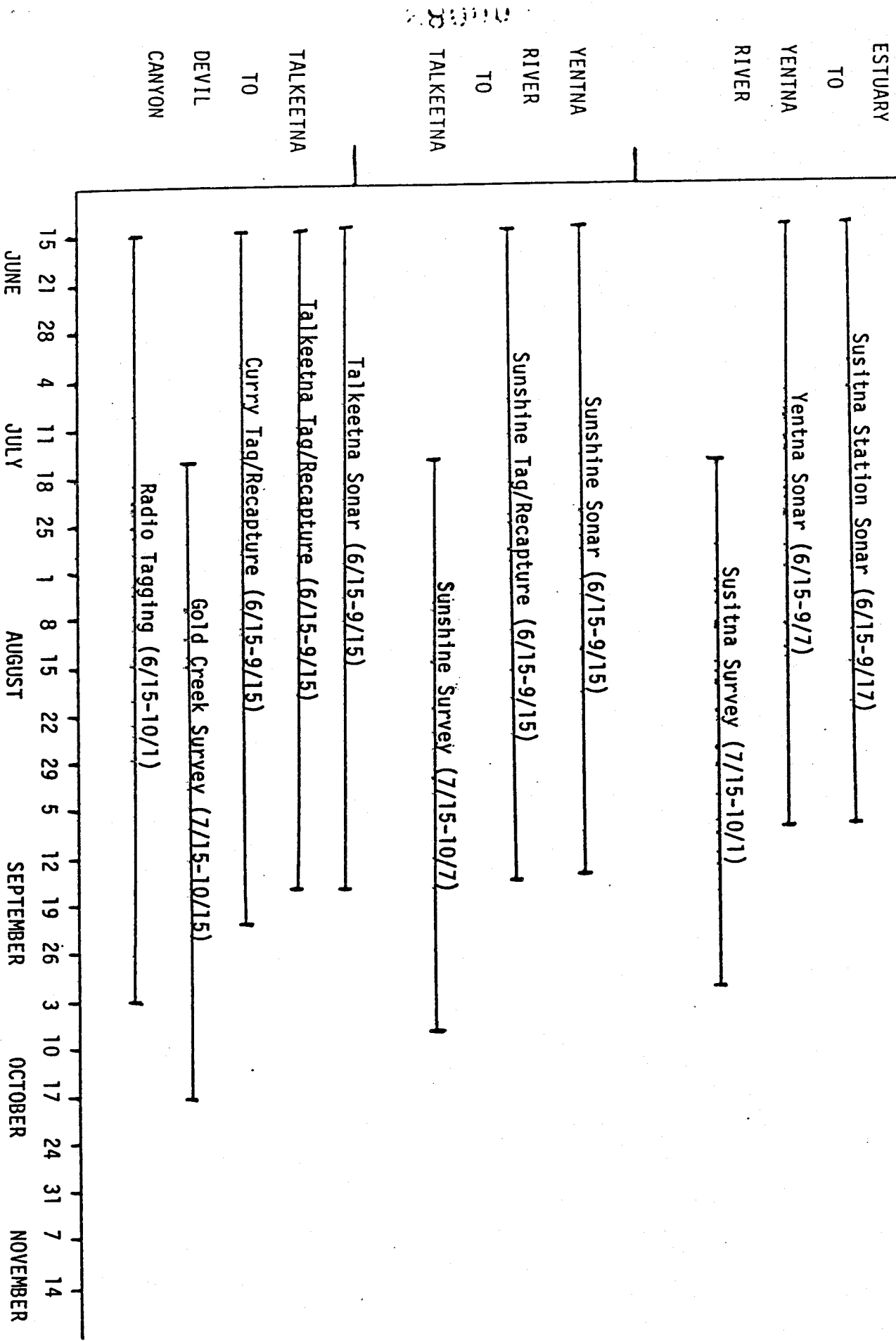


Figure 1. Adult Anadromous Project Schedule, 1981.

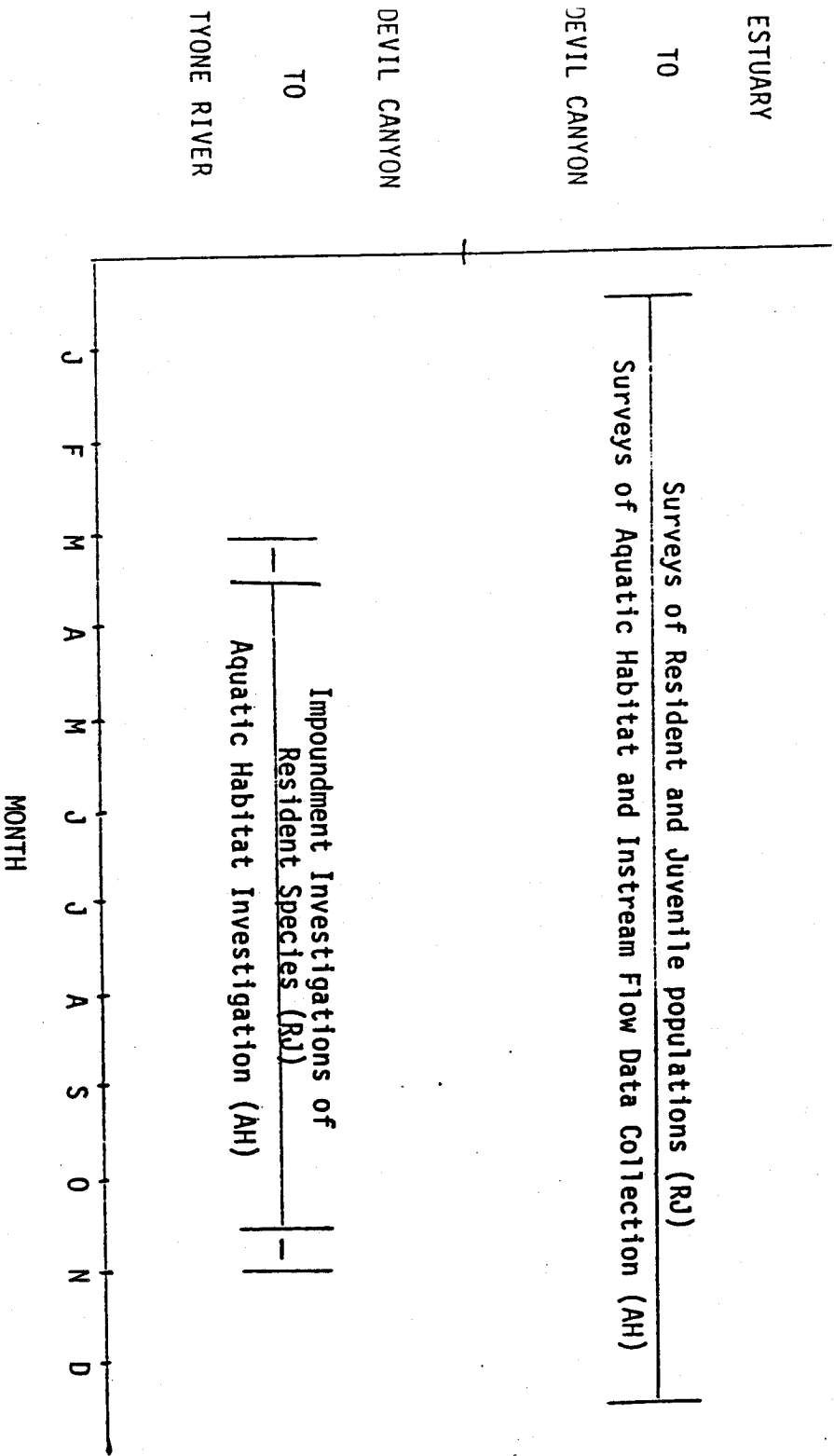


Figure 2. Activity schedule, 1981. Integrated Resident and Juvenile Anadromous Fisheries and Aquatic Habitat and Instream Flow Projects.

January	-	
10	-	Monthly Report
February	-	
10	-	Monthly Report
March	-	
10	-	Monthly Report
April	-	
10	-	Monthly Report
May	-	
10	-	Monthly Report
June	-	
10	-	Monthly Report
July	-	
10	-	Monthly Report
August	-	
10	-	Monthly Report
September	-	
10	-	Monthly Report
October	-	
10	-	Monthly Report
November	-	
10	-	Monthly Report
15	-	<u>Species/Subject Reports Coho, Sockeye, Chum and Pink Salmon</u>
December	-	
1	-	<u>Species/Subject Impoundment Investigations Report</u> <u>RJ/AH Lower Reaches Species/Subject Report Ice</u> <u>Free Months</u>
10	-	Monthly Report
15	-	<u>Anadromous Phase I Draft Report</u>
1982		
February		
1	-	<u>Resident/Juvenile/Habitat Phase I Draft Report</u>

Figure 3. Proposed and amended reporting schedule, 1981.

Table 4. ADF&G/USGS Additional Water Quality Measurements.

Nutrients And Organics

NO <sub>2</sub> + NO <sub>3</sub> dissolved	NH <sub>4</sub> Organic N Total
NH <sub>4</sub> dissolved	Phosphorus Dissolved Total
NH <sub>4</sub> + Organic N dissolved	Phosphorus Total
NO <sub>2</sub> + NO <sub>3</sub> Total	Dissolved Organic Carbon
	Suspended Organic Carbon

Inorganic Constituents

Silica	Chloride
Calcium Magnesium	Fluoride
Sodium	Sulfate
Potassium	Turbidity
	Dissolved Solids (residue at 18°C)

Minor Elements Dissolved and Total

Arsenic	Iron
Barium	Lead
Cadium	Manganese
Chromium	Mercury
Cobalt	Nickel
Copper	Selenium
Zinc	

Field Parameters

Specific conductance, alkalinity, pH, temperature, dissolved oxygen.

Sediment Analysis

Suspended sediment concentration and complete particle size analyzed.

100026

A transect will be surveyed, and the stream bed profile *selected habitat gage* determined in a plane perpendicular to the flow of water at each gage site prior to installing a gage. Staff gage elevations in the study area between Talkeetna and Devil Canyon will be determined from the R&M Consultants datum used to establish streambed elevations. The staff gage will be read before and after collecting the discharge data. This information will be used to develop stage/discharge rating curves and to estimate reach specific streamflows. Where applicable, mainstem discharge information will be obtained from the closest USGS gaging station as a control.

Discharge will be measured at staff gage placement sites during three seasonal flow periods (high, medium, and low). These measurements and the following discussion are based on procedures developed by the USGS (Smoot and Novak, 1977; Buchanan and Somers, 1973), and USFWS Instream Flow Group (Bovee and Milhous, 1978; Trihey and Wegner, 1981).

Discharge will be computed from the mean column velocity and depth information recorded at vertical columns (verticals) collected along the transects surveyed when placing the staff gages. A tagline will be stretched across the water parallel to the transect. One should attempt to subdivide the channel such that no more than 5% of the total flow passes between successive verticals. The spaces between verticals are termed cells. Verticals are to be placed such that they best describe velocity distribution and changes in the cross sectional channel geometry. If the direction of flow is not at right angles to the cross section, find the velocity vector normal to the section. Measure the cosine of the horizontal angle (Figure 8) by holding the discharge measurement note sheet in a horizontal position with the point of origin (0) on the left edge over the tag line, bridge rail, or any other feature parallel to the cross section. With the long side parallel to the direction of flow, the tag line or bridge rail will intersect the value of the cosine of the angle (a) on the top, bottom, or right edge. Multiply the measured velocity by the cosine of the angle to determine the velocity vector component normal to the measuring section.

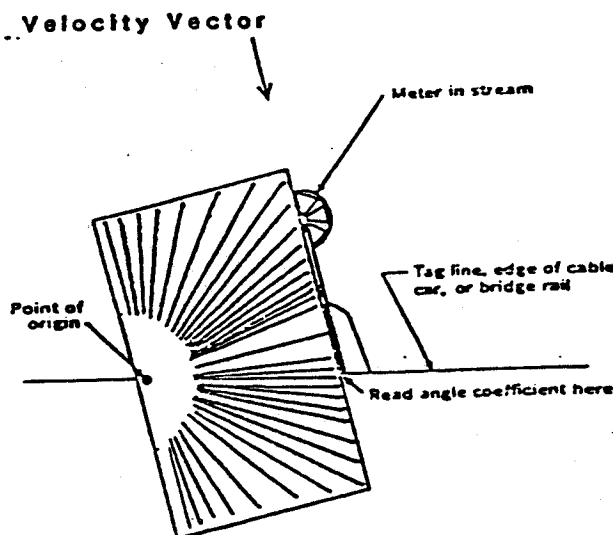


Figure 8. Measurement of Horizontal Angles (from Buchanan and Somers, 1973).