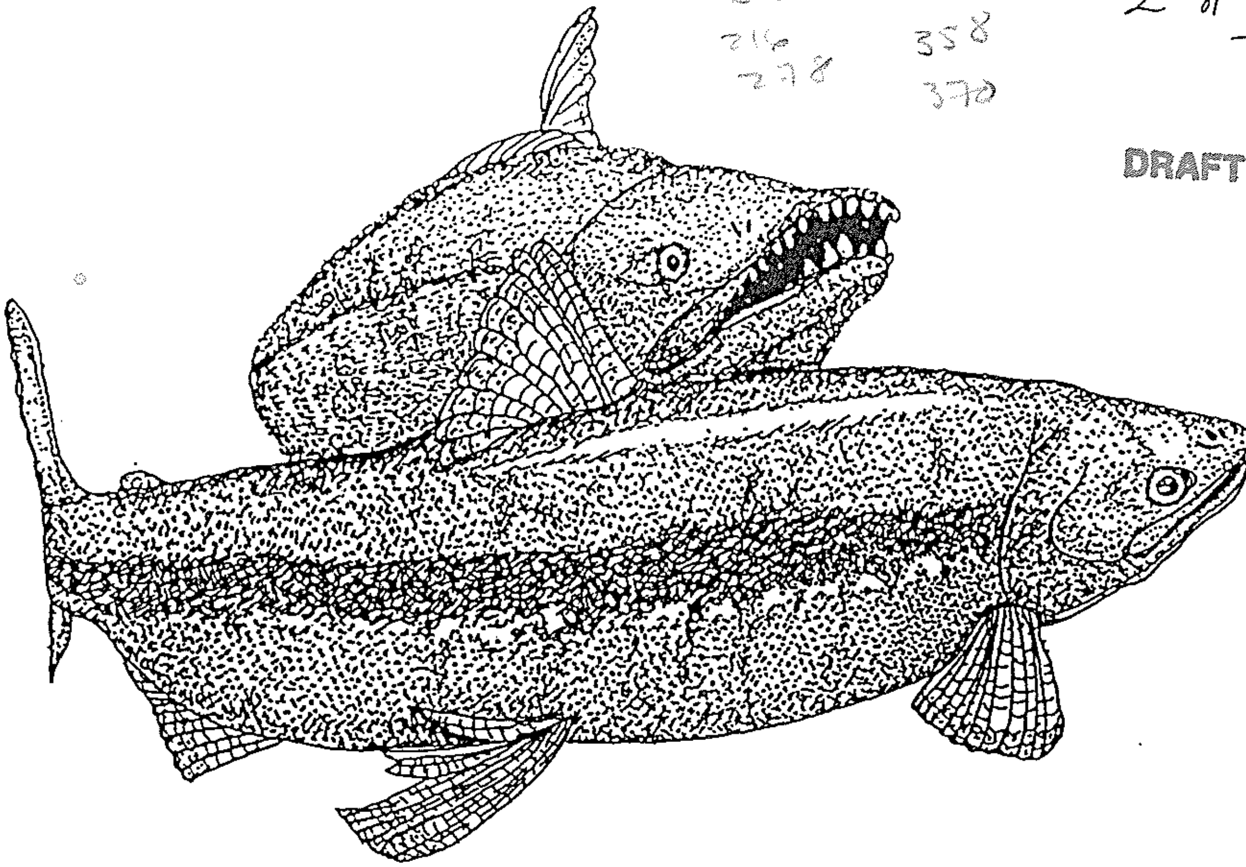
DRAFT



# SUSITNA HYDRO AQUATIC STUDIES
# PHASE II BASIC DATA REPORT

## Volume 4. Aquatic Habitat and Instream Flow Studies, 1982.

Part II & Appendix A

-by-

ALASKA DEPARTMENT OF FISH AND GAME
Susitna Hydro Aquatic Studies
2207 Spenard Road
Anchorage, Alaska 99503
1983

# P A R T  I I

# FISH HABITAT INVESTIGATIONS

# 1. OBJECTIVES

## 1.1 Adult Anadromous Habitat Investigations

Adult anadromous fish habitat studies were designed to meet the following objectives.

a) Identify the presence of spawning, activities and mainstem and slough habitats.

b) Identify the types and ranges of the physical and chemical conditions utilized for spawning and passage.

c) Support the analysis of the availability of spawning habitat within sloughs at a variety of flows of the mainstem Susitna River.

d) Support an evaluation of the accessibility of slough and tributary habitats to adult salmon at a variety of flows of the mainstem Susitna River.

e) Support an evaluation of whether to initiate detailed salmon spawning habitat investigations in the Susitna River between Cook Inlet and Talkeetna in 1983.

### 1.1.1 Salmon Habitat

#### 1.1.1.1 Mainstem

Adult anadromous salmon have been reported to utilize the mainstem Susitna River for spawning (ADF&G 1981a). Tasks conducted from August 1 to September 15, 1982 included the following:

1) Determine the extent, timing and number of chum, pink, sockeye and coho salmon spawning in the mainstem Susitna River and its associated side channels.

2) Evaluate the physical and chemical characteristics of mainstem habitats utilized for spawning.

3) Identify the relationship between changes in mainstem discharge to the extent, timing and number of salmon present in the mainstem.

Results of the first task are summarized in Volume 2 of this draft report. Results of the second objective are summarized in section 3.1.1.1, of this volume.

#### 1.1.1.2 Slough

This portion of the study focused on the evaluation of adult salmon spawning habitat (primarily chum salmon) in selected sloughs. It is integrally related to objectives stated in Volume 2 and Volume 4 Part I but expands them a step further and evaluates the habitat actually available to and used by fish. Tasks were as follow.

1) Identify the types and ranges of hydrological and water quality variables (e.g.. discharge, water velocity and depth, substrate composition, presence of upswelling, surface and intragravel water temperatures) in slough and side channel habitats during the adult salmon spawning period.

2) Identify the types and ranges of the above hydrological and water characteristics which are utilized by adult salmon for spawning in sloughs.

3) Model and quantify the availability of spawning habitat in sloughs at a variety of flows of the mainstem Susitna River.

4) Collect data supporting an evaluation of the accessibility of slough and tributary habitats to adult salmon at a variety of flows of the mainstem Susitna River.

### 1.1.2 Eulachon Habitat

Eulachon (*Thaleichthys pacificus* [Richardson]), an anadromous member of the smelt family, has been previously reported to spawn in the lower

Susitna River (Morrow 1980; Lee et al. 1980) Sampling conducted from May 16 (ice-out) to June 12, 1982 included the following tasks.

1) Determine the extent, timing and numbers of the spawning runs of eulachon in the Susitna River.

2) Evaluate the physical and chemical characteristics of habitats utilized for spawning by eulachon.

3) Identify the relationship between changes in mainstem discharge to the extent, timing and number of eulachon present.

Results of the first task are summarized in Volume 2 of this report. Results of the second and third tasks are summarized in Section 3.1.6 of this volume.

### 1.1.3 Bering Cisco Habitat

Bering cisco (*Coregonus laurettae* Bean), an anadromous member of the whitefish family, were first discovered to utilize the Susitna River basin for spawning in 1981 (ADF&G 1982b). A total of 747 fish were sampled during 1981 using fishwheels, gillnets, and electroshocking gear. Habitat evaluation surveys were also conducted at three major spawning areas located between RM 75 and 80 during 1981.

Tasks during the 1982 open water field season were as follows.

1) Determine the extent, timing and number of the spawning runs of Bering Cisco in the Susitna River.

2) Evaluate the physical and chemical characteristics of habitats utilized for spawning by Bering Cisco.

3) Identify the relationship between changes in mainstem discharge to the extent, timing and number of Bering Cisco present.

The results of the first task are summarized in Volume 2 of this report. Results of the second and third tasks are summarized in Section 3.1.7 of this volume.

## 1.2 Juvenile Anadromous Fish Habitat Investigations

Juvenile anadromous fish studies included measurements of a variety of physical and chemical habitat variables at 17 sites (see Appendix F) between Goose Creek and Portage Creek during the ice-free season of 1982. Details of the program and sampling sites are contained in Section 2.3 of Volume 3. These studies were designed to determine how fluctuations in mainstream discharge affect habitat parameters at sampling sites and how those changing habitat parameters affect fish distribution and relative abundance. Specific objectives are as follow.

1) Define the ranges for various habitat parameters at sampling sites and characterize seasonal habitat requirements of selected species.

2) Determine how spatial and temporal differences in habitat parameters affect fish distribution and relative abundance.

3) Determine the relative importance of the environmental factors which influence fish distribution and relative abundance.

4) Determine if a change in mainstem discharge has an effect on distribution and relative abundance of selected species at the sampling sites.

5) Characterize values of habitat variables within specific hydraulic zones, determine the preference of selected species for particular zones, and estimate the comparative value of habitats utilized by each species.

### 1.3 Resident Fish Habitat Investigations

Objectives listed previously in Section 1.2, Juvenile Anadromous Habitat Investigations apply also to Resident Fish Habitat Investigations. Additional objectives for these species are as follow.

1) Determine characteristics of habitats utilized for spawning by adult resident fish.

2) Determine movement and migrational patterns of adult resident fish.

3) Determine characteristics of overwintering habitats utilized by adult resident fish.

# 2. METHODS

## 2.1 Adult Anadromous Habitat Investigations

### 2.1.1 General Mainstem and Lower River Studies

#### 2.1.1.1 Mainstem Salmon

Boat-mounted (Plate 4II-2-1) and backpack electrofishing gear (for methods and design see ADF&G 1982a) drift nets and foot surveys were utilized to identify spawning sites in the mainstem Susitna River below Devil Canyon (RM 152.0) from August 1 to September 15, 1982. The "mainstem" in this study is defined to include the main channel and its associated side channels. It does not include tributary-mainstem confluence zones or slough habitats (as defined in ADF&G 1982b).

The mainstem Susitna River was sampled for spawning salmon five days each week throughout the survey period. The sampling area extended from the estuary (RM 0.0) to Devil Canyon (RM 151.0) (Figure 4-1) and was sampled by three separate crews as follows:

1) Yentna crew - estuary (RM 0.0) to Kashwitna River (RM 61.0),

2) Sunshine crew - Kashwitna River (RM 61.0) to Talkeetna (RM 97.0), and,

Plate 4II-2-1. Electroshocking on the mainstem Susitna River.

3) Gold Creek crew - Talkeetna (RM 97.0) to Devil Canyon (RM 151.0).

Salmon were not assumed to be spawning at a catch site unless all of the following criteria were met.

1) Fish exhibited spawning maturation colors and morphology.

2) Fish expelled eggs or milt when slight pressure was exerted on the abdomen.

3) Fish were in vigorous condition, with 25% or more of the eggs or milt remaining in the body cavity.

4) Additional sampling efforts produced fish that met criteria one through three above.

When a mainstem spawning site was identified, the habitat of the site was also evaluated. This was a first year attempt at evaluating habitat characteristics of mainstem salmon spawning areas and the study design, procedures and methods of study were modified in the field as necessary. The following procedures were utilized.

1) River mile, geographic code (GC) and time of sampling were determined and recorded.

2) A qualitative description of general habitat characteristics, sampling methods and gear was documented.

3) Substrate composition was determined using methods described in the Procedures Manual (ADF&G 1982b).

4) Representative measurements of the following variables were collected at each site using techniques described in the Procedures Manual (ADF&G 1982b): air temperature, surface and intragravel water temperatures, pH, dissolved oxygen, specific conductance, turbidity and water depth and velocity.

5) A map of the area was drawn indicating salmon spawning sites and areas of data collection.

6) Representative photographs of the site were taken. (A complete set of photographs are on file at the ADF&G Su Hydro Office, 2207 Spenard Road, Anchorage, Alaska 99503).

#### 2.1.1.2 Eulachon

Set and dip nets and boat-mounted electrofishing gear (for methods and design see ADF&G 1981b Procedures Manual) were utilized to define eulachon spawning sites and the upstream limits of their migration. Eulachon sampled by the above gear were not assumed spawning at a catch site unless all of the following criteria were met.

1) Fish freely expelled eggs or milt.

2) Fish were in a vigorous free-swimming condition.

3) Twenty or more fish were caught in the initial or subsequent site sampling efforts which met criteria one or two above.

It was difficult, however, to distinguish between migrational, milling and spawning areas using the above criteria. Eulachon are known to be broadcast spawners and thus do not fan a nest (Morrow 1980), making it difficult to observe the exact location and timing of spawning. Attempts were made to identify deposited eggs in substrate samples by direct observations. This proved largely unsuccessful, because the eggs are quite small and opaque white (Morrow 1980).

When a eulachon spawning site was identified, the habitat at the site was also evaluated. Because this was a first year attempt at evaluating the habitat characteristics of eulachon spawning areas, procedures and methods of study had to be designed and modified in the field. Due to the similarity between eulachon spawning to Bering cisco spawning behavior, adaptation of techniques similar to those used in the Bering cisco study were employed in this study (ADF&G 1982b). The following procedures were utilized.

1) The site was assigned a name and the river mile, geographic code, and time of sampling were determined and recorded.

2) A general narrative of the site and the sampling methods and gear used were recorded.

3) The overall substrate composition of the site was determined and recorded.

4) The following water quality measurements were collected and recorded: water and air temperature, pH, dissolved oxygen, specific conductance and turbidity.

5) A map of the area was drawn and a sampling grid for the collection of depth and water velocity data was developed based on procedures developed by Bovee and Cochnauer (1977).

6) Depth and water velocity data were collected and recorded.

7) Representative photographs of each site were taken.

Water quality and quantity data were collected using standard techniques described in the Procedures Manual (ADF&G 1982b).

Two Peabody-Ryan model J-90 thermographs were placed in the Susitna River to continuously monitor water temperature. These data were used to determine if any correlation existed between timing of eulachon spawning runs and surface water temperatures. Thermographs were placed along the east bank of the Susitna River at RM 5.5 (at the east bank gill net site) and RM 25.5 (at Susitna Station) (refer to Figure

4I-2-1). The thermograph and its recorded data at RM 5.5 was lost during an attempt to recover it. The thermograph at RM 25.5 was recovered and daily mean temperatures were calculated as the mean of four, six-hour point readings.

#### 2.1.1.3 Bering Cisco

Sampling was conducted from September 1 to October 15 (freeze-up), 1982 in the mainstem Susitna River and its associated side channels and sloughs to ascertain the degree of spawning by Bering cisco. In addition, tributary mouths were occasionally sampled. Sampling was conducted utilizing fishwheels and standard boat-mounted electrofishing gear (for design and procedures see ADF&G 1982b).

Bering cisco are believed to be broadcast spawners (Morrow 1980). This makes it difficult to determine the exact timing and location of spawning. Bering cisco captured by the above gear were not considered to be spawning at a catch site unless all of the following criteria were met.

1) Fish freely expelled eggs or milt.

2) Approximately 20 or more fish, with a mixture of both sexes, were captured at a catch site.

3) Ripe or spent fish were present at the same site 24 hours after the initial sampling effort.

When a catch site was determined to be a Bering cisco spawning location, the habitat of the site was also evaluated. To assure consistency of data, procedures similar to those employed during the 1981 study of Bering cisco spawning grounds (ADF&G 1981a) were employed this year. The following procedures were utilized.

1) The site was assigned a name and the river mile, geographic code and time of sampling were determined.

2) A general description of the site and sampling methods used were recorded.

3) Overall substrate composition of the site was determined (ADF&G 1982a) and recorded.

4) The following water quality measurements were collected (ADF&G 1982a) and recorded: air temperature, surface and intragravel water temperatures, pH, dissolved oxygen, specific conductance and turbidity.

5) A map of the area was drawn and a sampling grid for the collection of depth and water velocity data was developed based on procedures developed by Bovee and Cochnauer 1977).

6) Depth and water velocity data were recorded.

7) Representative photographs of each site were taken.

### 2.1.2 General Slough and Tributary Studies

Several of the sloughs located within the Talkeetna to Devil Canyon reach of the Susitna River that were studied during the 1981 field season or that had previously been identified as important to the fishery, were sampled during the 1982 open water field season. The sloughs sampled included: Whiskers Creek Slough, Slough 6A, Lane Creek Slough, sloughs 9A, 10, 16, 19, 20, and 22. Substrate, upwelling and spawning areas were mapped and water quality was measured. Sloughs 8A, 9, 11 and 21 were sampled in the same manner; however, they were also studied in greater detail with respect to spawning areas, upwelling and hydraulic characteristics as discussed in Section 2.1.3.

Each of the sloughs surveyed for the general slough study were visited one time during early October. This was during a low flow period which enabled easy access and visibility of substrates and areas of upwelling. A foot survey was conducted at each slough, visually assessing substrate and upwelling areas and identifying these characteristics on scaled (1"-50') maps obtained by aerial photography. Point water quality measurements (pH, DO, specific conductance and temperature) were also taken. Spawning areas were marked later by the AA stream survey personnel who had monitored these sloughs throughout the spawning season.

### 2.1.3 Specific Slough Studies

The specific slough studies were comprised of two components: hydraulic modeling and fish spawning habitat availability and utilization.

Sloughs 8A, 9, 11 and 21 were selected for study because of their relative importance to the fishery and the comparatively large fishery data base available for them from previous fish and game studies. The hydraulic data required for modeling Slough 11 was not collected due to time and personnel limitations.

There was a significant overlap in data types required to fulfill objectives for the hydraulic modeling and fish spawning habitat availability and utilization components of the study in that both required discharge data collected across several transects at a variety of different flows. Within each slough specific sites and transect locations were selected to represent the range of hydraulic and other habitat conditions in the slough. These transects were numbered from downstream up for identification and used for both components of the study.

#### 2.1.3.1 Modeling

Data collection for the hydraulic portion of the model involved collection of discharge along several transects within a site chosen to be representative of the reach being simulated. These transects were surveyed in order to be tied together in the model with respect to elevation and horizontal distances. The specific field procedures followed are outlined in detail in the 1981 and 1982 Procedures Manual (ADF&G 1981a, 1982a). In addition to the hydraulic portion of the model, a habitat simulation portion will eventually be combined to determine the amount of habitat useable by the appropriate life stage of the species being considered. The field data collection methods used are discussed in the utilization section (Section 2.1.3.2.2). The programming and analysis procedures used are discussed by Milhouse, et al. (1981).

### 2.1.3.2 Habitat Availability and Utilization

This portion of the study was designed to determine the ranges of several physical characteristics (water, depth, velocity and substrate) associated with habitats available to selected fish species and life stages at various mainstem discharges. In addition, this portion of the study was designed to determine the portion of the habitat that was actually utilized by the studied fish species and life stages at various mainstem discharges. The primary species studied was chum salmon, however limited data was also collected for sockeye and pink salmon.

#### 2.1.3.2.1 Availability

The collection of availability data involved the collection of water depth and velocity and streambed substrate types at regular intervals along transects within the study site. The transects used included those used for the modeling portion and additional transects selected where fish activity occurred outside of the modeling site. These additional transects were labeled alphabetically going upstream. Substrate analysis was conducted following procedures outlined in the 1982 Procedures Manual (ADF&G 1982b).

#### 2.1.3.2.2 Utilization

Utilization data were collected in order to describe the specific habitat that was used by the fish for spawning. When it was determined that a fish had established a redd and was determined to be spawning, depth, velocity, substrate and intragravel water temperature data were collected. The criteria used for confirming a spawning fish are described in the 1981 Procedures Manual (ADF&G 1981b) and Estes, et al. (1981). For each set of utilization data collected at redds at a particular stage, a set of discharge data was also collected along the transects. If the stage changed significantly and more utilization data was collected, additional transect data was collected.

Data collected at chum salmon redds were used to represent habitat used by the fish during spawning, a life stage potentially vulnerable to fluctuations in hydraulic conditions. Other species and life stages will be modeled as more data are compiled.

In the habitat availability and utilization study, transect data were used to represent amount of each habitat characteristic available. The data collected at the spawning sites were used to represent the portion of each type of habitat actually utilized. A comparison of the two can show what habitat characteristics are "preferred".

#### 2.1.3.2.3 Water Quality

Water quality data were collected in each slough to determine the differences in water quality within the slough; what possible sources may be; and to document the quality of the water available to and utilized by the fish when present. The majority of this data is discussed in Part I of this volume, however interim analysis of intragravel temperatures collected at salmon redds brought up several questions concerning the source and importance of intragravel water sources. The following studies along transects and at specific locations of interest were developed to address these questions. In each slough, temperature (intragravel, substrate/water interface, and surface) measurements were obtained at study transects.

In addition to data obtained on study transects, intragravel, surface water temperatures and conductivity measurements were obtained at a variety of specified locations (Figures 4II-2-1 to 3) generally selected for specific comparative purposes (e.g., ground water vents vs. no vent areas).

## 2.2 Juvenile Anadromous Fish Habitat Investigations

### Rationale

New methods were developed to sample the distribution and abundance of juveniles with respect to habitat conditions at a particular site during the 1982 field season, as suggested in the 1982 final report (1982b). This was necessitated by the relatively low density of juveniles at most of the habitat sites during earlier field observations (ADF&G 1981d). These observatins indicated that juvenile fish were often transient during their summer rearing period in the upper river. Concentrations

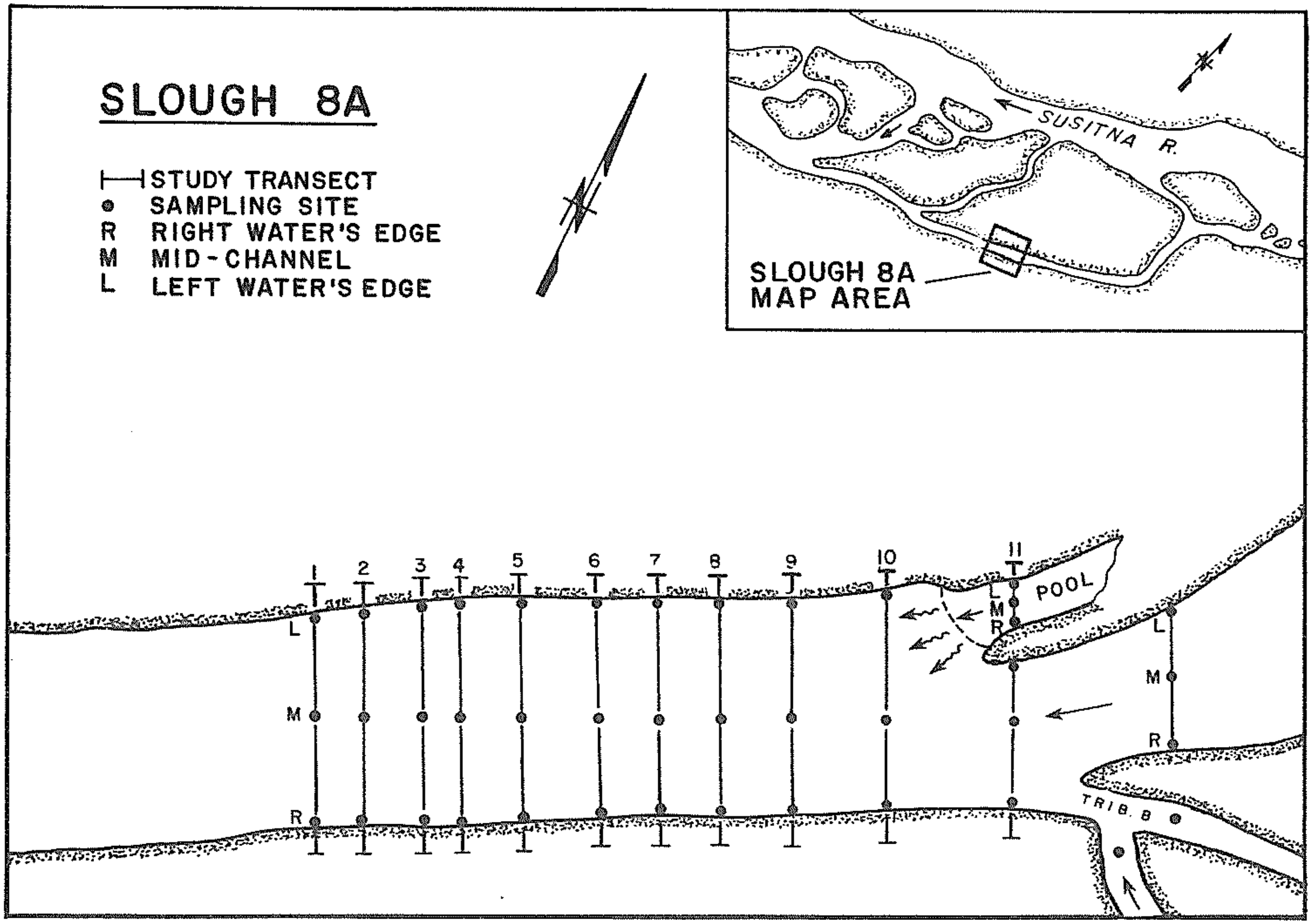



Figure 4II-2-1. Water quality sampling locations in Slough 8A.

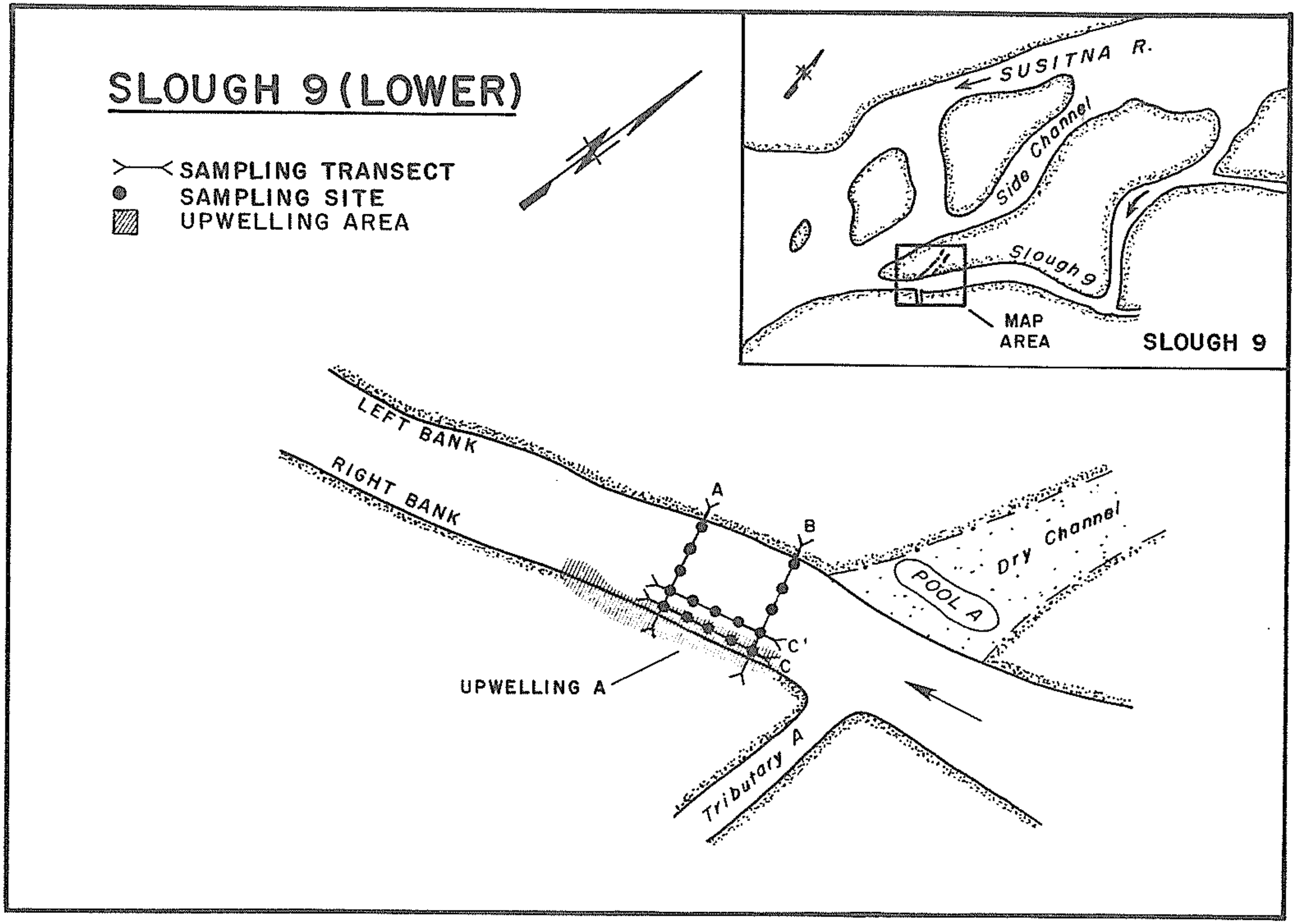



Figure VII-2-2. Water quality sampling locations in lower Slough 9.

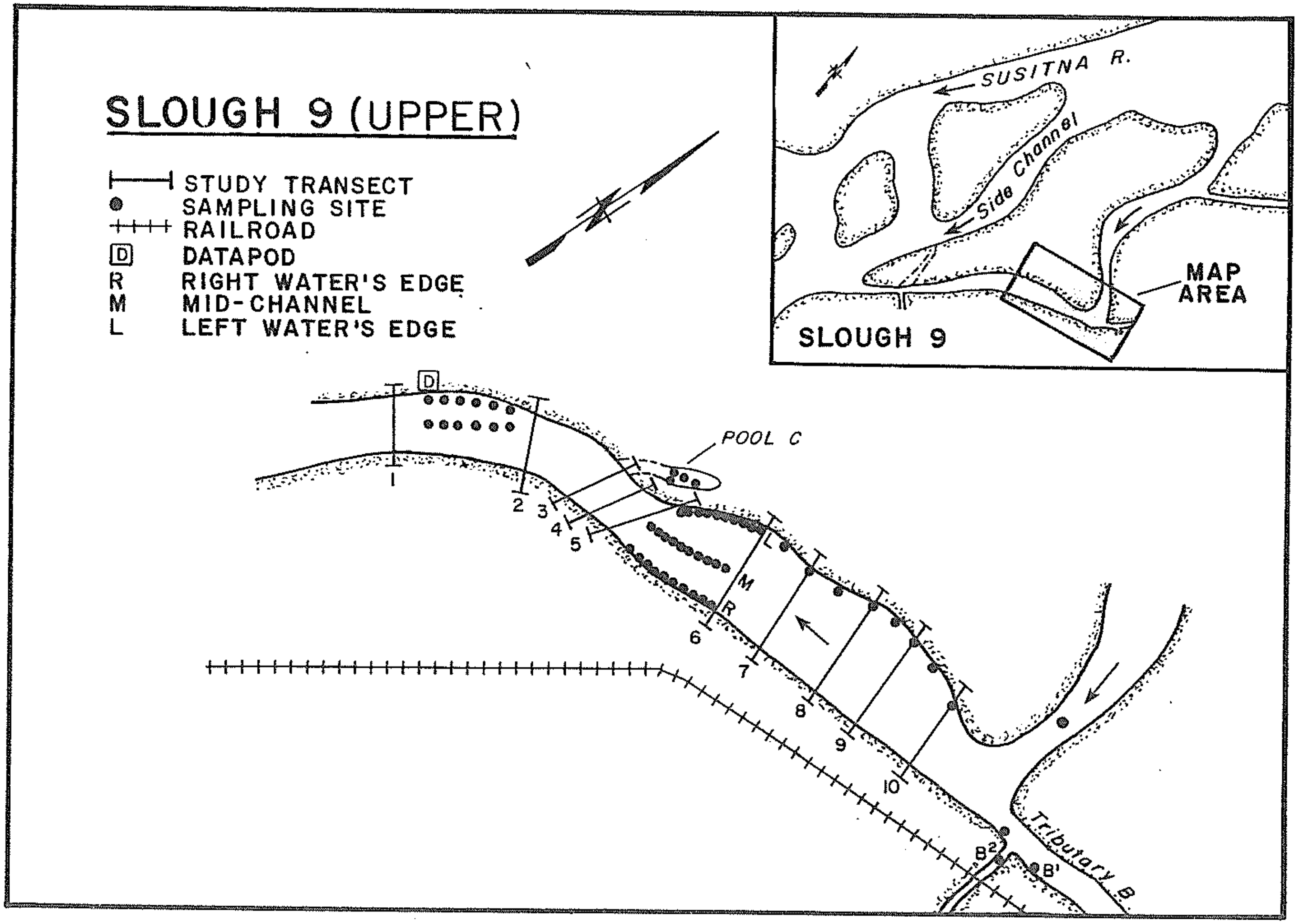



Figure 4II-2-3. Water quality sampling locations in upper Slough 9.

of juveniles often changed markedly between sampling periods. This probably reflects outmigration and behavioral responses to changing habitat conditions. At any given moment fish are able to select between different micro-habitats at a site which provides an indication of the behavioral preference for the variable conditions that existed at the sites.

Based on 1981 data (ADF&G 1981a), the numbers of fish collected were not expected to be sufficient to provide data that would allow a true multi-variate analysis of the myriad of environmental parameters at a given site if point measurements were made at each fish capture location. The wide variation in abundance would preclude collection of sufficient data. Also, a quantitative description of the amount of habitat that would be available for the fish to select from, as is typically done in the development of preference or selectivity curves, would not be possible at many of these sites because of the large number and diversity of unusual hydraulic conditions.

Therefore, stratification of habitat areas to cover a wide range of conditions was implemented. These areas were designated as habitat zones (Table 4II-2-1, Figure 4II-2-4) and reflected the surface water velocity at each location. These zones were further divided to reflect the influence of the origin of the water source on the zone. That is, the velocity areas that were similar were further subdivided into zones that were influenced by tributaries or ground water, versus those that were influenced by mainstem water. The distribution of zones at a hypothetical site at three different levels of mainstem discharge is

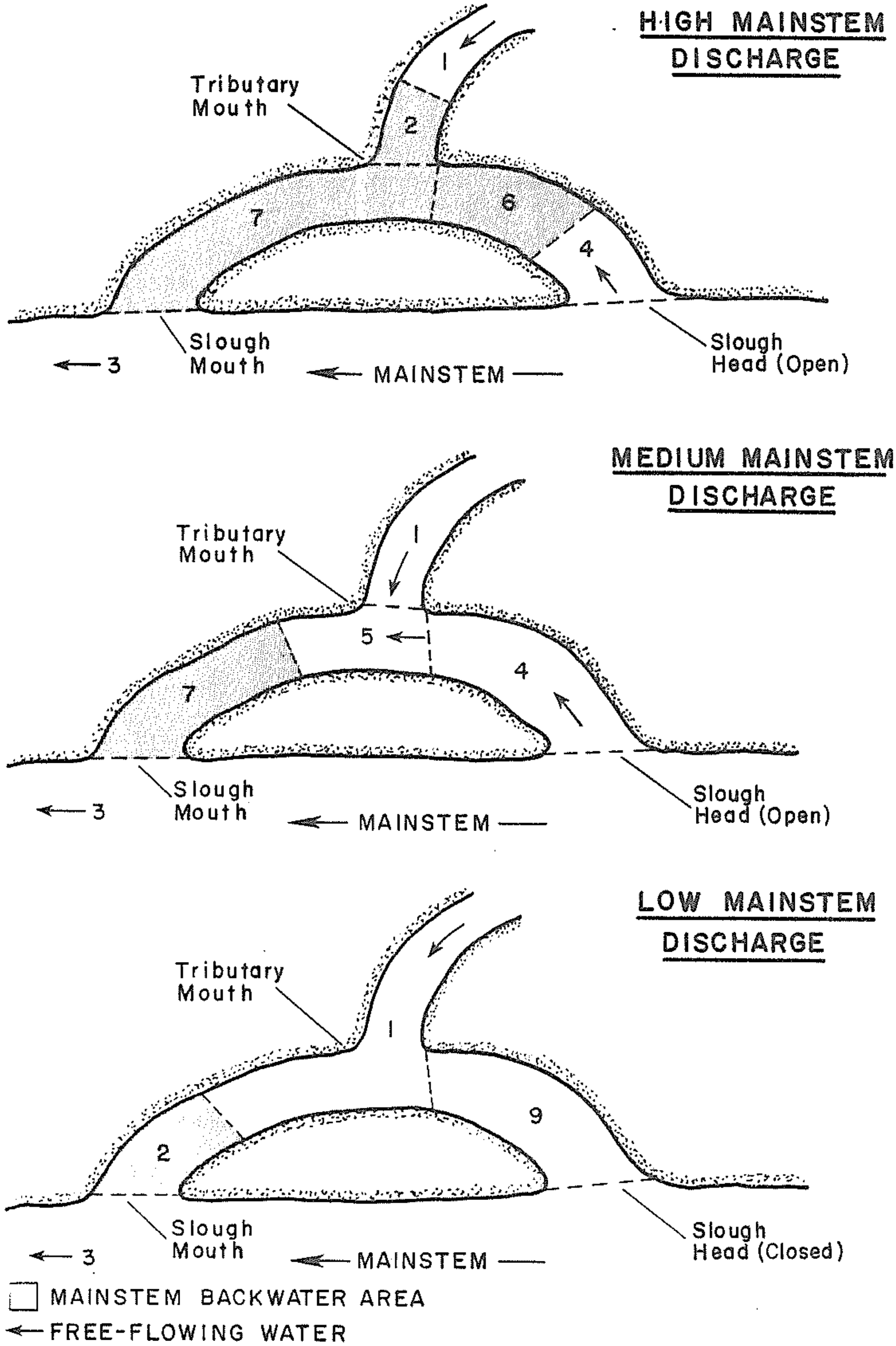



Figure 4/II-2-4. Hypothetical slough with associated tributary showing hydraulic zones present at three different levels of mainstem discharges.

shown in Figure 4II-2-4. The size and occurrence of these habitat zones responded, often dramatically, to changes in mainstem discharge. Fish collection efforts were designed to provide representative catch per unit effort within each day of these designated zones.

The response of the zones to mainstem discharge was characterized primarily by measuring changes in wetted surface area or in the linear extent of each zone at various mainstem discharges. Further analysis, using staff gage data and discharge measurements within the habitats, will evaluate changes in depth and possibly velocity of these zones with mainstem discharge. Ultimately, effects of tributary or ground water inflow on depth, surface area, and velocity, as well as the effects on temperature and turbidity will be examined. Long-term effects on cover and geomorphological changes have not been quantified, but observations by field biologists of the changes associated with flood or icing events on these parameters will be described in narrative form.

Table 4II-2-1. Description of habitat zones sampled at Designated Fish Habitat sites: June through September, 1982.

| Zone Code | Description |
|---|---|
| 1 | Area with a tributary or groundwater source which are not influenced by mainstem stage and which usually have a significant surface water velocity. |
| 2 | Areas with a tribitary or ground water source which have no appreciable surface water velocity as a result of a hydraulic barrier created at the mouth of a tributary or slough by mainstem stage. |
| 3 | Areas of significant surface water velocities, primarily influenced by the mainstem, where tributary or slough water mixes with the mainstem water. |

| | |
|---|---|
| 4 | Areas of significant water surface velocities which are located in a slough or side channel above a tributary confluence (or in a slough where no tributary is present) when the slough head is open. |
| 5 | Areas of significant water surface velocities which are located in a slough or side channel below a tributary confluence when the slough head is open. |
| 6 | Backwater areas with no appreciable surface water velocities which result from a hydraulic barrier created a mainstem stage which occur in a slough or side channel above a tributary confluence (or in a slough or side channel where no tributary is present), when the head of the slough is open. |
| 7 | Backwater areas with no appreciable surface water velocities which result from a hydraulic barrier created by mainstem stage which occur in a slough or side channel below a tributary confluence, when the head of the slough is open. |
| 8 | Backwater areas consisting of mainstem eddies. |
| 9 | A pool with no appreciable surface water surface velocities which is created by a geomorphological feature of a free-flowing zone or from a hydraulic barrier created by a tributary; not created as a result of mainstem stage. |

The relative importance of these different habitat zones for each species will be reflected in their preference for different zones. The proportion of catch per unit effort for each species or age class at a particular time will provide an index to the importance of the zones. It will then be possible to deduce the overall response of juvenile salmon habitat to the variable, mainstem discharge. This requires the assumption that reductions in wetted surface area reflect loss of habitat for a particular species or age class.

## Methods

The sampling design, methods, and sampling sites of the biological data collection effort are described in Volume 3, section 2.1.3. The location of the 17 tributary mouth and slough sampling sites of this study, called Designated Fish Habitat (DFH) sites, are shown in Figure 4II-2-5. A general description and an aerial photo of each site are contained in Appendix F. A description of the techniques used in measuring the surface area of sampling zones backed up by the mainstem is contained in Part I of this volume (Volume 4) in section 2.1.3.1.

All of the sampling sites responded hydraulically to changes in mainstem discharge, some more than others. The prevailing hydraulic conditions at each site were evaluated each sampling trip prior to the deployment of any gear. The site was visually partitioned into habitat zones (Table 4II-2-1) using the following criteria: 1) presence or absence of a backed-up area resulting from a hydraulic barrier created by the mainstem at the mouth of the site; 2) slough head open or closed (for slough sites), and 3) source of water (tributary and/or ground water versus mainstem water). Water velocity and turbidity were used to help determine zone boundaries. In some cases where the gradient was very low, the decrease in surface water velocity at the point where a free-flowing stream or slough started to respond to the effect of a backed-up area was imperceptible to the observer. At those sites, a series of mean column water velocities was taken and a zone boundary drawn where the velocity of the backed up area was at least 0.2 ft/sec less than the velocity of the free-flowing area.

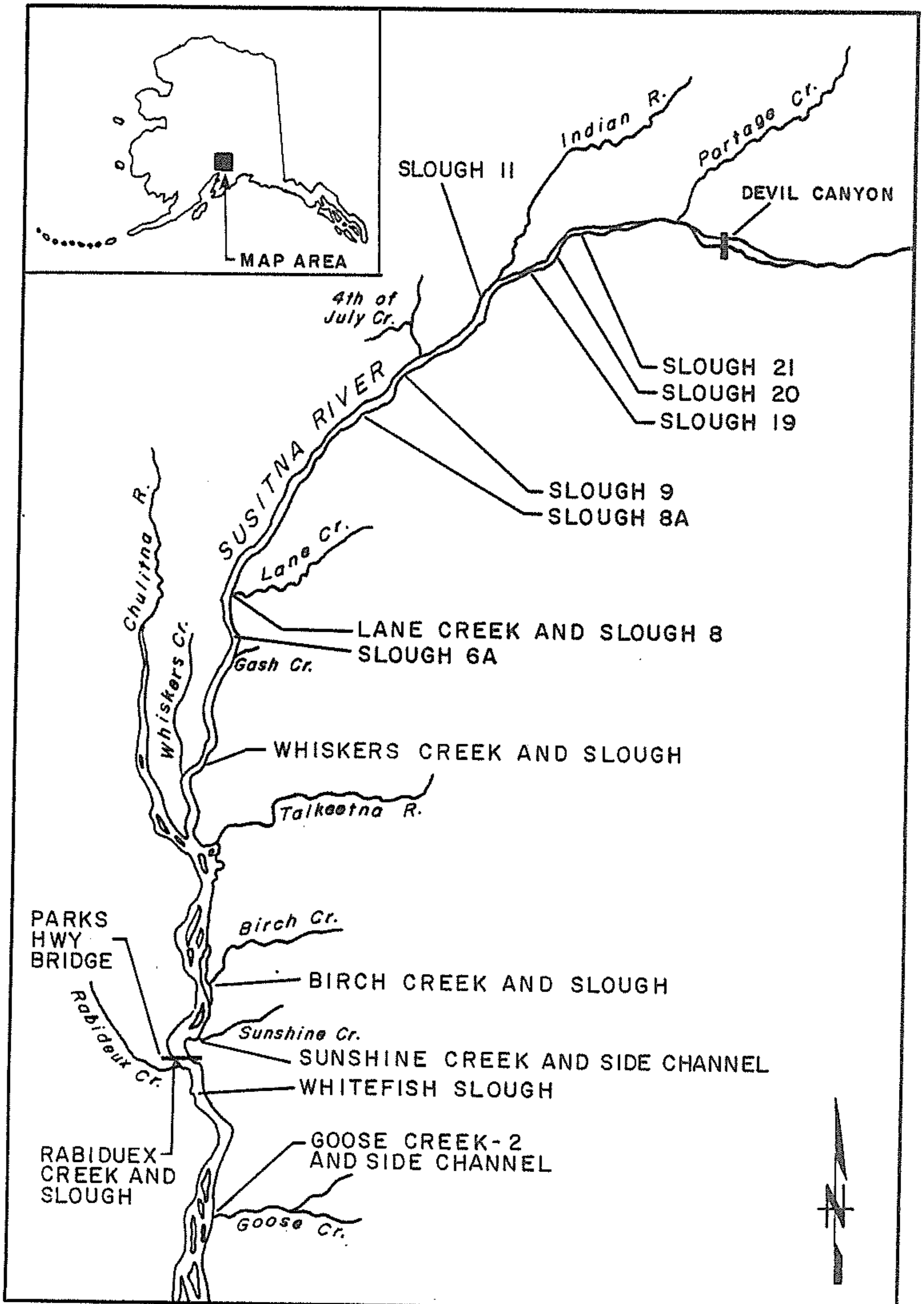



Figure 4II-2-5. Location of Designated Fish Habitat (DFH) sites on the Susitna River, Goose Creek 2 to Portage Creek.

Water temperature, dissolved oxygen, pH, specific conductance, turbidity and water velocity were collected twice a month from each DFH sampling site, for each zone where fish data was collected. One to three measurements of each parameter were made in each zone in that part of the zone which was actually sampled by the fishing gear and the average reading recorded. Fluorescein dye was used initially in minnow traps to determine the location of the scent plume from the minnow trap. Measurements recorded were representative of the part of the zone which was sampled by the fish collection gear; they are not necessarily representative of the entire zone, although in most cases there is little difference.

Additionally, field notes on the dominant substrate type and amount and quality of cover in each zone were recorded. The equipment and techniques used to measure the different habitat parameters are described in Part I of this volume (section 2.2) and in the Procedures Manual (ADF&G 1982b).

Staff gages were installed at most of the DFH sites in such a manner that water surface elevations could be obtained for each zone. The methods are described in Part I of this volume (section 2.1.1). These staff gages were read twice a month concurrently with the collection of biological and habitat data.

The habitat zones discussed earlier were aggregated according to different criteria to aid in analysis of the data. Aggregate zones, using hydraulic condition as a criterion, are as follow.

| Aggregate Zone | Numerical Zones Included | Definition |
|---|---|---|
| H-I | 1, 4, 5, 9 | not backed up by mainstem |
| H-II | 2, 6, 7, 8 | backed up by mainstem |
| H-III | 3 | mainstem |

Zone 9, a pool created by morphological features, can occur within a zone 1, zone 4, or zone 5, so these three zones, which normally have medium to high water below, may include slackwater areas. The criterion is that the slackwater areas in Aggregate Zone H-I are not caused by mainstem backup.

Aggregate zones using water source as the criterion are as follow.

| Aggregate Zone | Numerical Zones Included | Definition |
|---|---|---|
| W-I | 1, 2 | tributary water and/or ground water only |
| W-II | 4, 6, 8, sometimes 3 | mainstem water only |
| W-III | 5, 7, sometimes 3 | mixed water sources |

The zones can also be aggregated using the open/closed status of the slough head as a criterion. The presence of any one of the numerical zones 4, 5, 6, or 7, indicates that the slough head is open. If none of these zones are present, the slough head is closed. In this case, for those sloughs that are associated with a tributary, the zone 1 and zone 2 move into the slough channel.

## 2.3 Resident Fish Habitat Investigations

### 2.3.1 General Mainstem

#### 2.3.1.1 Radio Telemetry Studies

Five burbot and five rainbow trout were surgically implanted with radio transmitters from October 5 through 14, 1981 in the portion of the Susitna River between RM 76.3 and 84.7 to determine.

1) the movement and/or migrational patterns of these species and;

2) the location and characteristics of overwintering habitats utilized by these species.

These fish were tracked using aerial, boat and snowmachine surveys from the dates of implantation until early April, 1982, or until transmitter failure occurred. Preliminary studies of the overwintering habitats of these fish were attempted. Findings by species of these studies are in Sections 3.3.1 and 3.3.3.

#### 2.3.1.2 Miscellaneous Spawning Fish

Preliminary evaluations of spawning habitats were conducted in 1982 for any resident fish observed spawning in the Susitna River basin. These evaluations included measurement of water temperature, pH, specific conductance, dissolved oxygen, substrate and water depth and velocity at observed spawning sites.

### 2.3.2 General Slough and Tributary

Methods of resident fish studies at Designated Fish Habitat sites, except for the fish collection gear, are the same as the methods outlined in section 2.2 of this volume. For the methods of resident fish studies at Selected Fish Habitat sites, refer to section 2.1.1 and 2.1.2 of Volume 3. Selected Fish Habitat sites are areas ranging from Cook Inlet to Devil Canyon which were primarily sampled by boat electrofishing.

# 3. RESULTS

## 3.1 Adult Anadromous Fish Habitat Investigations

### 3.1.1 Chum Salmon

#### 3.1.1.1 Mainstem

During the 1982 mainstem salmon spawning surveys, no mainstem spawning sites were located for any of the salmon species except chum salmon. Mainstem chum salmon spawning sites were not found downstream of Lane Creek (RM 113.6). Eight mainstem chum salmon spawning sites (Figure 4II-3-1) were identified between Lane Creek (RM 113.6) and Devil Canyon (RM 152.0). These include:

| River Mile | Site Number | Geographic Code |
|---|---|---|
| 114.4 | 1 | S28N04W06CAB |
| 128.6 | 6 | S30N03W16BCA |
| 129.8 | 8 | S30N02W09DAB |
| 131.1 | 7 | S30N03W03DAD |
| 136.0 | 2 | S31N02W19AD |
| 137.4 | 5 | S31N02W17DBB |
| 138.9 | 4 | S31N02W09DBD |
| 148.2 | 3 | S32N01W26DCA |

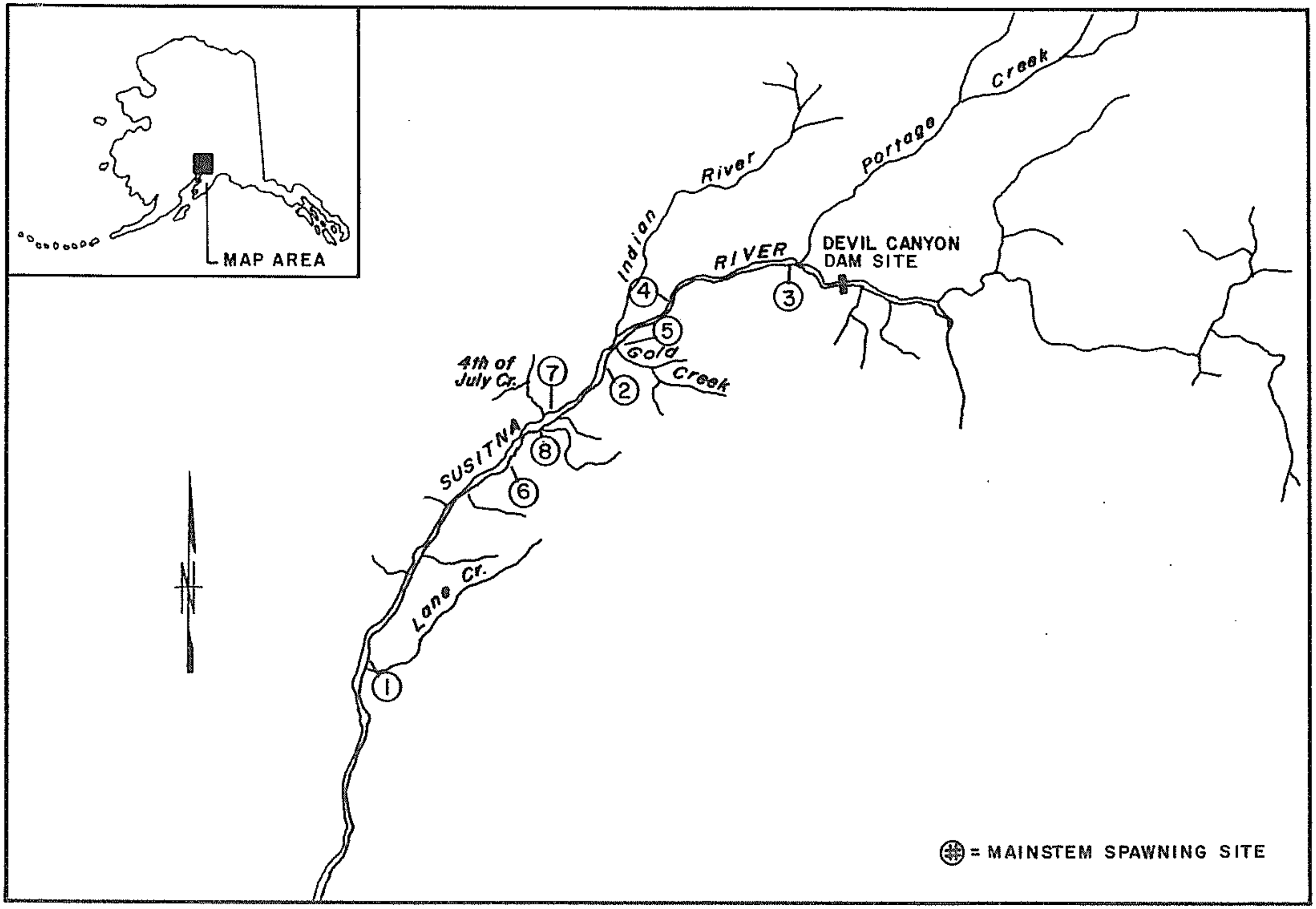



Figure 4/II-3-1. Location of the "mainstem" chum salmon spawning sites on the upper Susitna River: September 4-15, 1982.

Planimetric maps, identifying the spawning areas within each of the identified spawning sites, are presented in Figure 4II-3-2 to Figure 4II-3-9. Representative chum salmon spawning areas are shown in Plates 4II-3-1 and 4II-3-2.

Water quality (Table 4II-3-1), water depths, velocities and substrates (Table 4II-3-2) are summarized for each spawning site.

#### 3.1.1.2 Slough

The analysis of chum salmon spawning in sloughs was approached in several ways, including computer modeling, summarization of important spawning habitat variables (Figures 4II-3-10 to 31), comparisons of water quality from surface and ground water sources, and comparisons of available water depths and velocities versus those utilized for chum salmon redds.

##### 3.1.1.2.1 Modeling

Water depths and velocities and substrates were recorded along transects at various flows at the Chum Channel, Rabideaux Slough, and sloughs 8A, 9 and Slough 21 study locations (Figures 4II-3-10 to 12, 4II-3-17, 4II-3-27). Before the hydraulic and habitat simulations can be combined, the hydraulic model must be calibrated (Milhous, et al. 1981). This task is currently in progress.

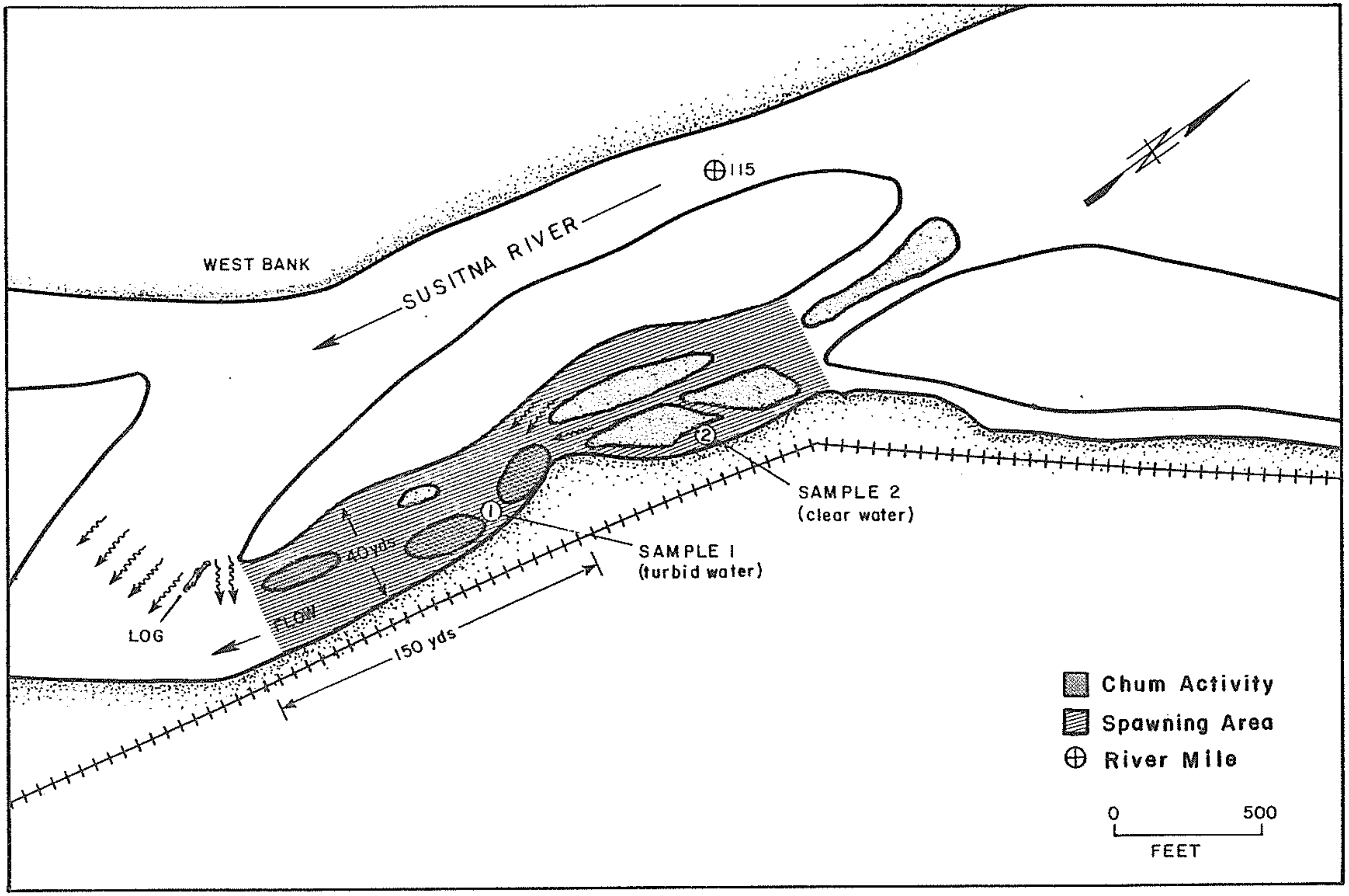



Figure 4II-3-2. Chum salmon spawning area on the Susitna River at RM 114.4, GC S28N04W06CAB: September 9, 1982.

Table 4II-3-1. Water quality at chum salmon spawning sites on the Susitna River, September 4-14, 1982.

| Site Number | River Mile | Sample Number | Temperature (°C) Intra-gravel | Water | Air | Specific Conductance (umhos/cm) | Dissolved Oxygen (mg/l) | pH |
|---|---|---|---|---|---|---|---|---|
| 1 | 114.4 | 1 | 7.6 | 10.6 | 13.4 | 85 | 13.4 | 7.5 |
| | | 2 | 7.6 | 10.5 | 14.0 | 79 | 14.0 | 6.9 |
| 2 | 136.0 | 1 | 5.6 | 5.8 | 12.2 | 79 | 7.1 | 7.3 |
| | | 2 | 5.8 | 6.1 | 12.2 | 80 | 8.0 | 7.6 |
| | | 3 | 3.7 | 7.5 | 12.2 | 108 | 10.6 | 7.8 |
| 3 | 148.2 | 3 | -[a] | 7.5 | 13.0 | 96 | 9.9 | 8.1 |
| 4 | 138.9 | 1 | 3.3 | 5.1 | 12.2 | 58 | 9.0 | 7.1 |
| 5 | 136.9 | 1 | 3.3 | 7.7 | 12.2 | 91 | 10.4 | 7.3 |
| 6 | 128.6 | 1 | 4.5 | 8.8 | 12.0 | 106 | 12.3 | 7.1 |
| | | 2 | 4.7 | 8.8 | 12.0 | 104 | 12.3 | 7.4 |
| | | 3 | 4.7 | 9.1 | 12.0 | 112 | 12.1 | 7.7 |
| | | 4 | 4.7 | 8.8 | 12.0 | 116 | 11.8 | 7.7 |
| 7 | 131.3 | 1 | 5.4 | 10.2 | 13.0 | 74 | 12.8 | 8.7 |
| | | 2 | 5.2 | 10.2 | 13.0 | 74 | 12.8 | 8.7 |
| | | 3 | 4.2 | 9.5 | 11.8 | 92 | 13.9 | 7.0 |
| | | 4 | 3.8 | 8.6 | 11.8 | 124 | 12.9 | 7.9 |
| | | 5 | 4.1 | 8.5 | 11.8 | 132 | 12.5 | 7.9 |
| | | 6 | 7.0 | 9.3 | 11.8 | 33 | 13.1 | 8.0 |
| 8 | 129.8 | 1 | 4.1 | 7.2 | 7.6 | 113 | 6.4 | 7.4 |

[a] Meter malfunction, no reading taken.

Table 4II-3-2. Water depths, velocities and substrates at chum salmon spawning sites on the Susitna River: September 4-14, 1982.

| Site Number | River Mile | Sample Number | Depth (ft) | Velocity (ft/sec) | Substrate | Embededness | Notes |
|---|---|---|---|---|---|---|---|
| 1 | 114.4 | 1 | 0 - 4.0[a] | 0 - 1.0[b] | 30% silty sand<br>30% rubble<br>20% cobble<br>10% gravel | Yes (50%) | Turbid water |
| | | 2 | 1.5 | 0 | (same as sample 1) | | redd |
| 2 | 136.0 | 1 | 1.5 | 0 | 25% cobble<br>20% rubble<br>15% gravel | Yes (80%) | redd<br>clearwater |
| | | 2 | 0.5 | 0 | 25% cobble<br>5% gravel<br>70% silt | Yes (80%) | redd,<br>clearwater |
| | | 3 | 0.5 | 0 | (same as sample 2) | | redd |
| 3 | 148.2 | 1 | 1.5 | 0 | 60% boulder<br>20% silt<br>10% cobble<br>10% rubble | Yes | Turbid water |
| | | 2 | 2.1 | 0.2 | | | |
| | | 3 | 1.3 | 0.1 | | | |
| | | 4 | 1.9 | 0 | | | |
| | | 5 | 2.0 | 0 | | | |
| 4 | 138.9 | 1 | 0 - 2.0[a] | 0 - 0.2[b] | 30% gravel<br>20% cobble<br>20% rubble<br>25% silt<br>5% boulders | Yes | clearwater |
| 5 | 136.9 | 1 | 0 - 2.5[a] | 0 - 0.3[b] | 90% silt<br>10% boulders | Yes | clearwater |
| 6 | 128.6 | 1 | 0.7 | 0 | 30% gravel<br>30% cobble<br>30% rubble<br>10% silt | Yes | redd,<br>clearwater |
| | | 2 | 0.9 | 0 | 30% gravel<br>30% cobble<br>30% rubble<br>10% silt | Yes | redd,<br>clearwater |
| | | 3 | 0.8 | 0 | 50% gravel<br>30% rubble<br>20% silty sand | Yes | redd,<br>clearwater |

[a] Range of depths in spawning area.

[b] Range of velocities in spawning area.

Table 4ll-3-2 (Continued).

| Site Number | River Mile | Sample Number | Depth (ft) | Velocity (ft/sec) | Substrate | Embededness | Notes |
|---|---|---|---|---|---|---|---|
| | | 4 | 0.9 | 0 | 50% gravel<br>20% cobble<br>20% boulder<br>10% silt | Yes | redd, clearwater |
| 7 | 131.3 | 1 | 0.7 | 0.2 | 70% cobble<br>10% gravel<br>20% silt | Yes (30%) | redd, clearwater |
| | | 2 | 0.9 | 0 | 70% cobble<br>10% gravel<br>20% silt | Yes (50%) | redd, clearwater |
| | | 3 | 0.8 | 0.2 | 40% gravel<br>30% rubble<br>20% sand<br>10% sand | Yes (40%) | redd, clearwater |
| | | 4 | 0.9 | 0 | 40% gravel<br>30% cobble<br>15% rubble<br>15% sand | Yes (30%) | redd, clearwater |
| | | 5 | 1.1 | 0 | 40% gravel<br>30% cobble<br>15% rubble<br>15% sand | Yes (30%) | redd, clearwater |
| | | 6 | 1.2 | 0 | 30% gravel<br>30% rubble<br>30% cobble<br>10% sand | Yes (40%) | redd, turbid water |
| 8 | 129.8 | 1 | 1.0 - 2.5[a] | 0 - 0.2[b] | 40% cobble<br>40% rubble<br>20% silt | Yes | redd, clearwater |

[a] Range of depths in spawning area.

[b] Range of velocities in spawning area.

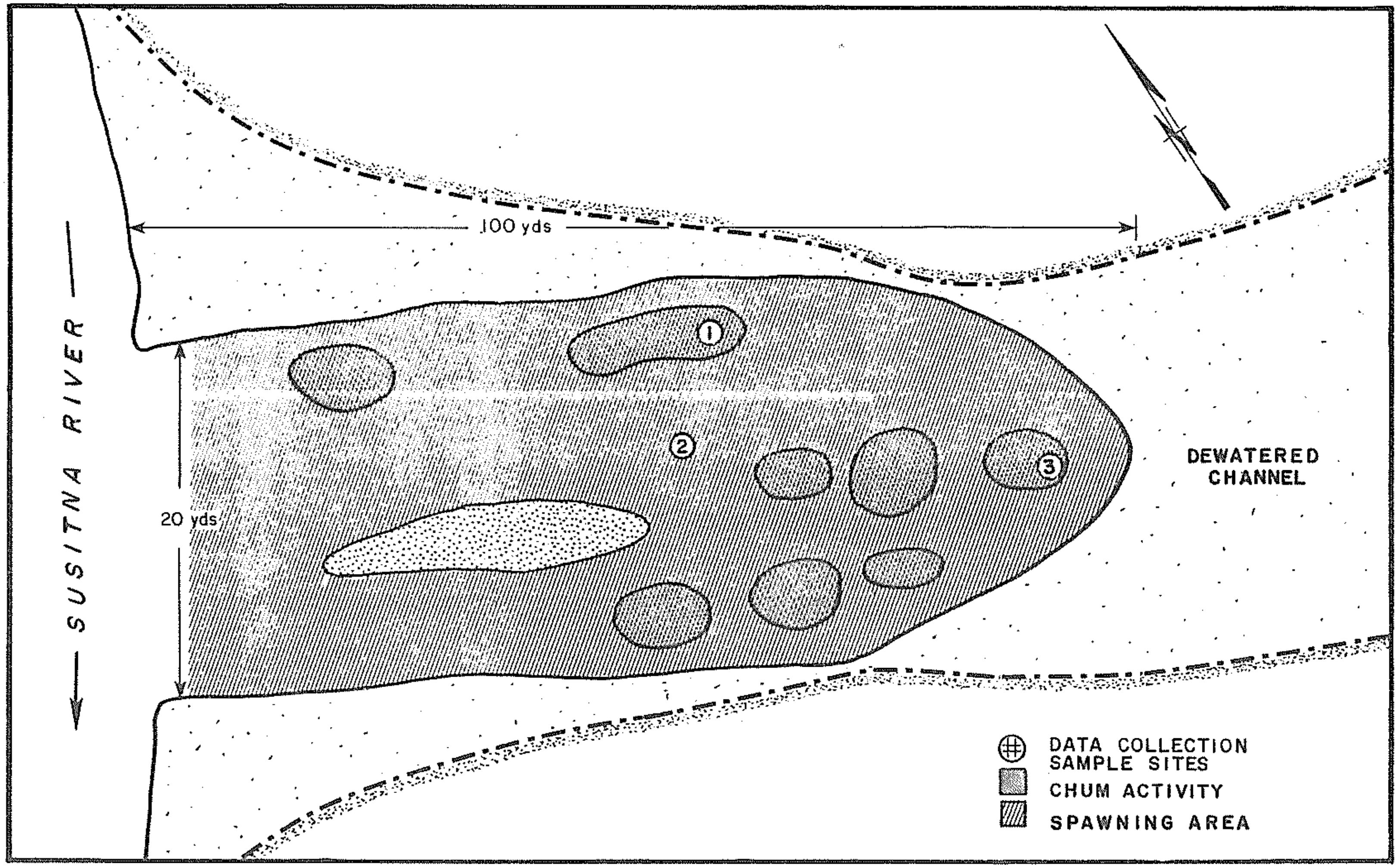



Figure 4II-3-3. Chum salmon spawning area on the Susitna River at RM 136.0, GC S31N02S19AD-: September 4, 1982.

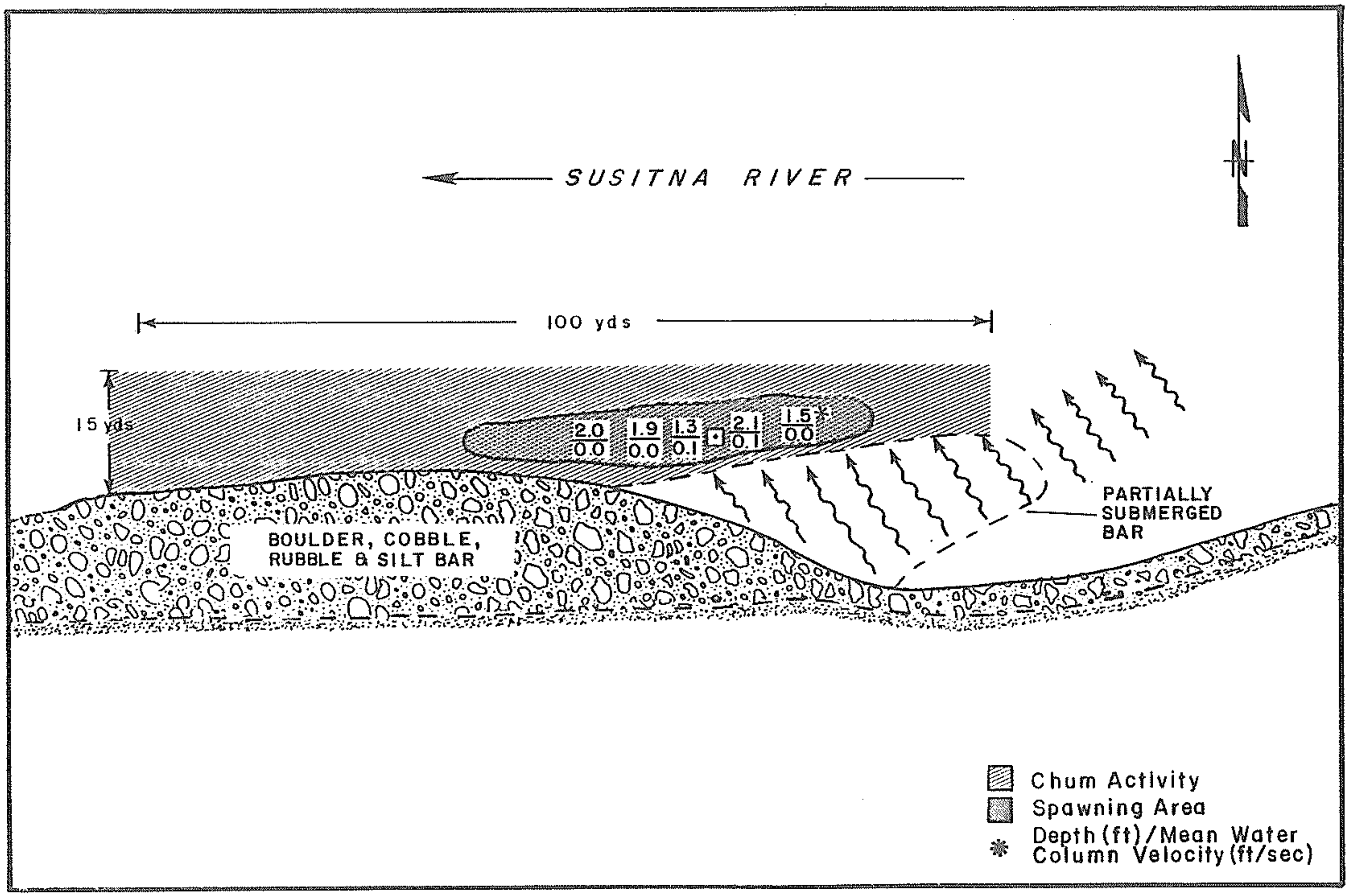



Figure 4II-3-4, Chum salmon spawning area on the Susitna River RM 148.2, GC S32N01W26DCA: September 5, 1982.

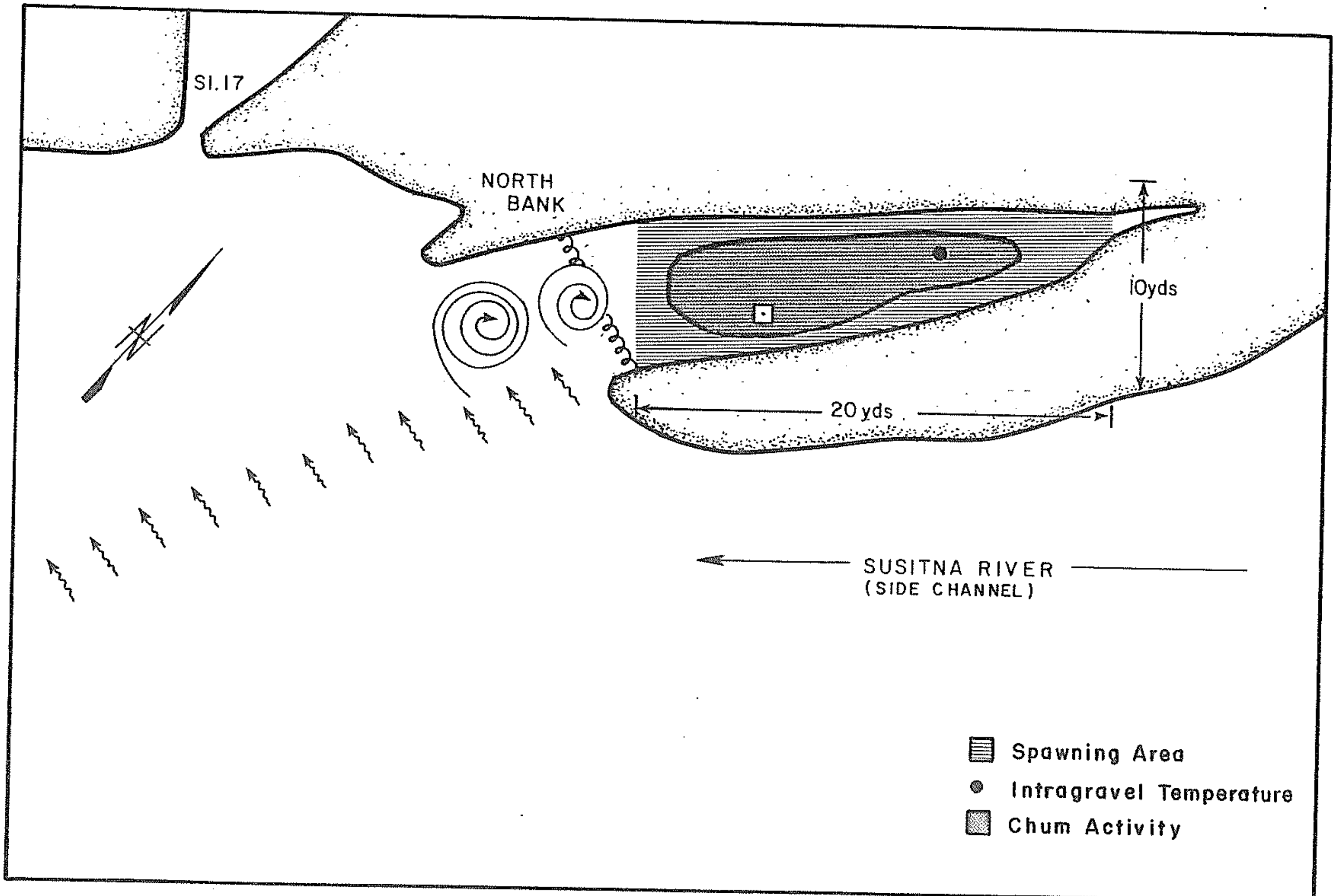



Figure 4II-3-5. Chum salmon spawning area on the Susitna River at R 138.9, GC S31N02W09DBD: September 6, 1982.

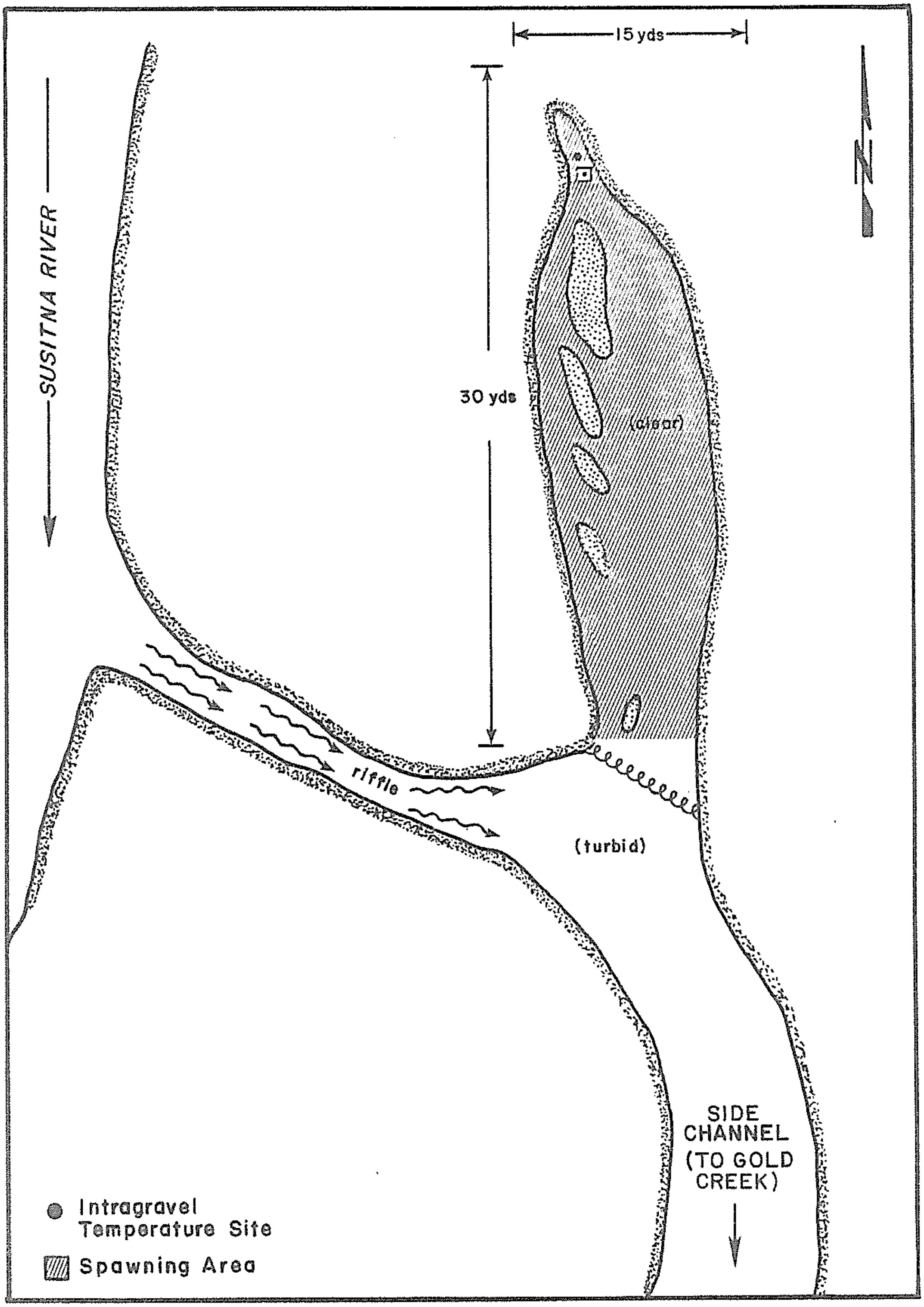



Figure 4II-3-6. Chum salmon spawning area on the Susitna River at RM 137.4, GC S31N02W17DBB: September 6, 1982.

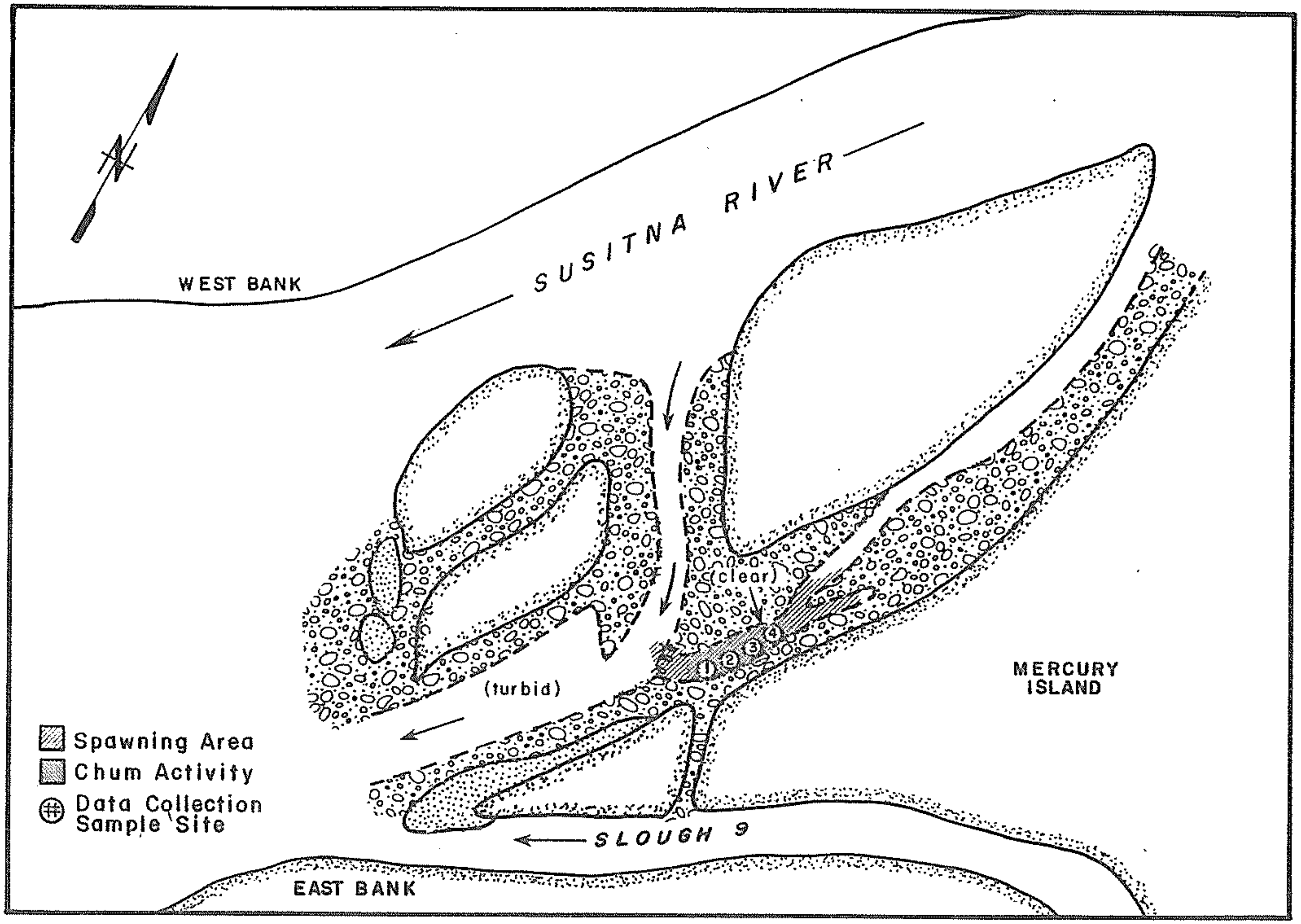



Figure 4II-3-7. Figure Chum salmon spawning area on the Susitna River at RM 128.6 (GC S30N03W16BCA): September 7, 1982.

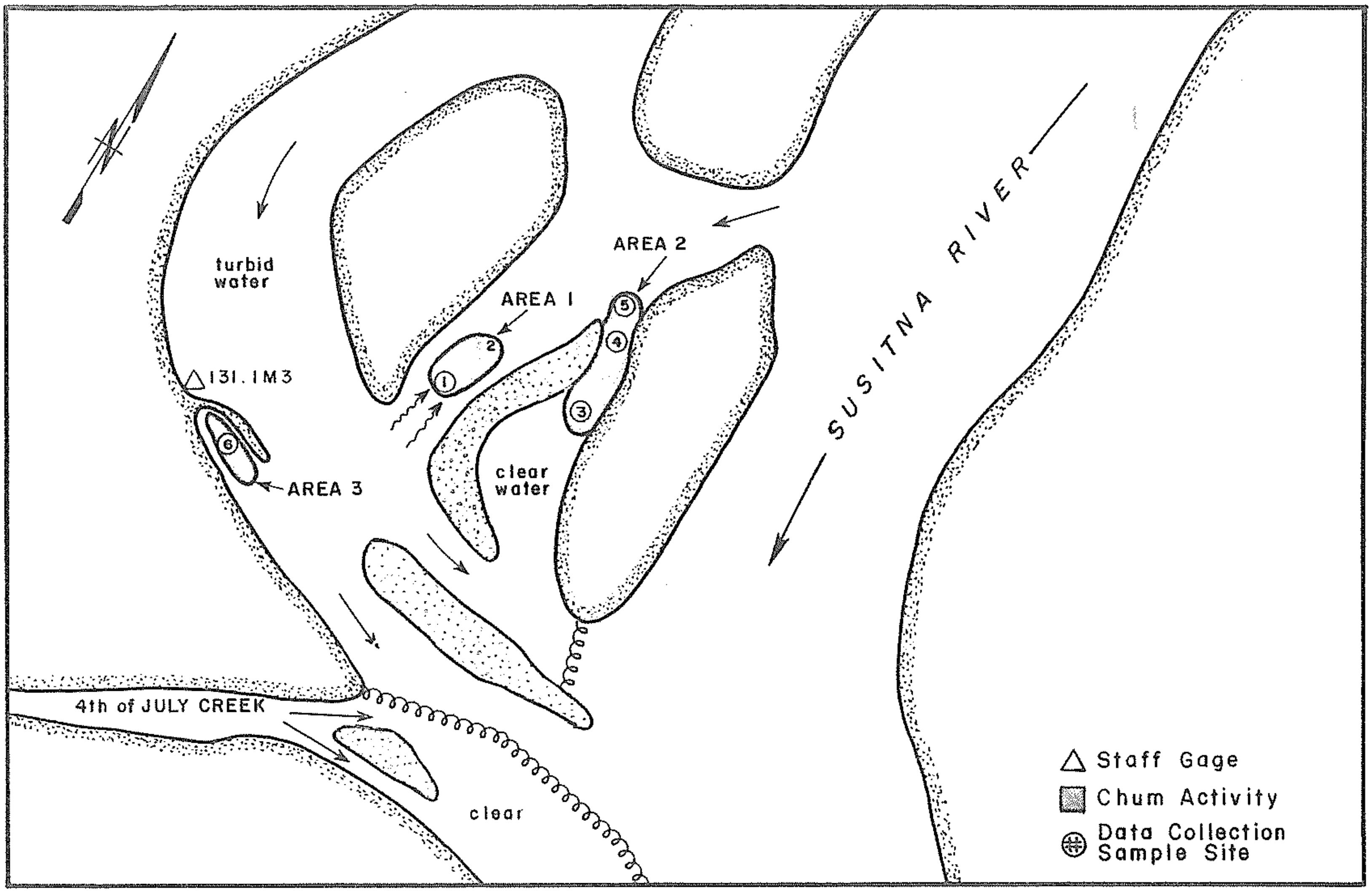



Figure 4II-3-8. Chum salmon spawning area on the Susitna River at RM 131.3, GC S30N03W03DAD: September 4-8, 1982.

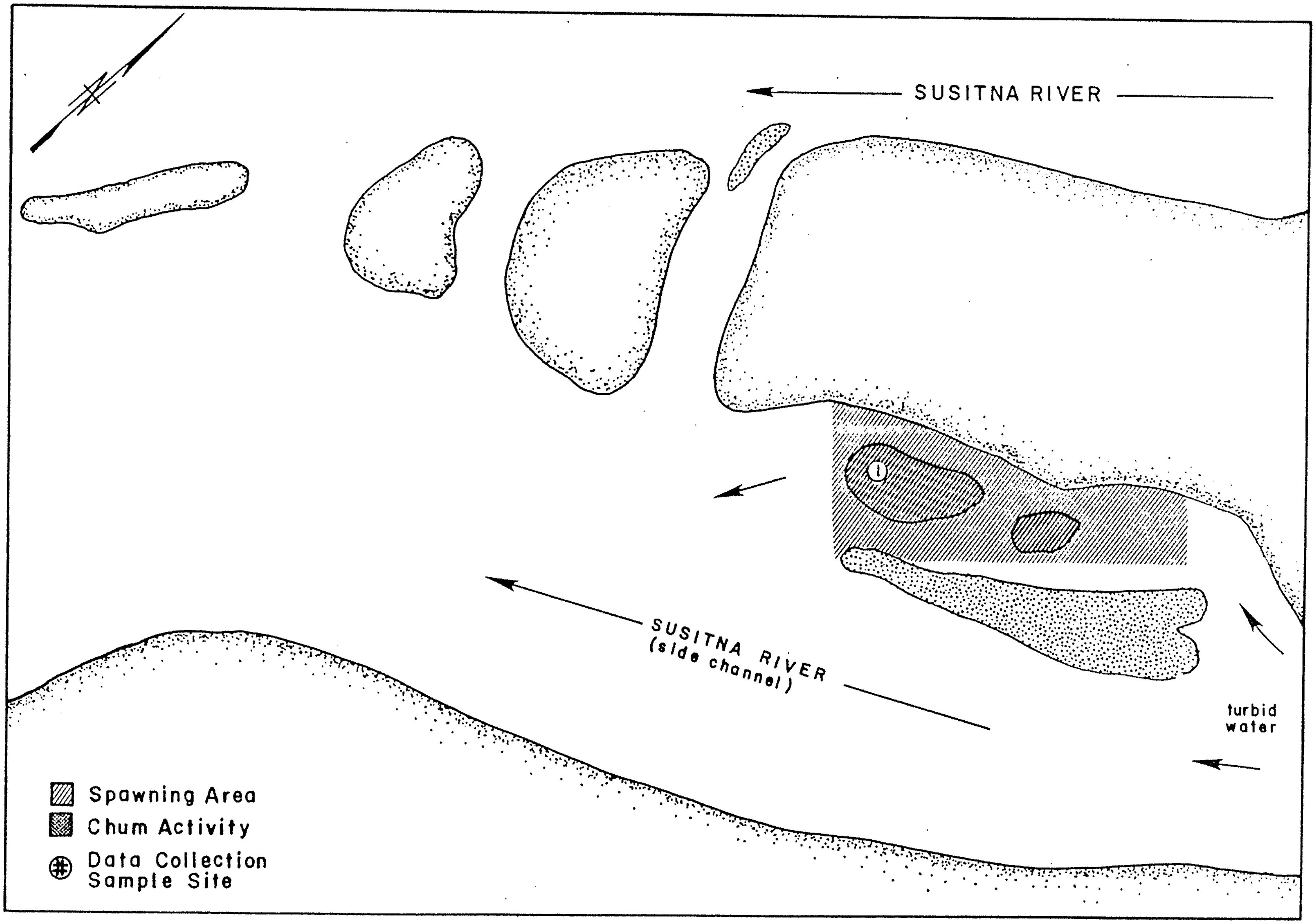



Figure VII-3-9. Chum salmon spawning area on the Susitna River at RM 129.8, GC S30N03W09DAB: September 14, 1982. Chum salmon were also observed spawning on September 13, 1982, when the water was clear at the site.

Plate 4II-3-1. Chum salmon spawning area on the Susitna River at RM 114.4 (GC S28N04W06CAB): September 9, 1982.

Plate 4II-3-2. Chum salmon spawning area on the Susitna River at RM 128.6 (GC S30N03W16BCA): September 7, 1982

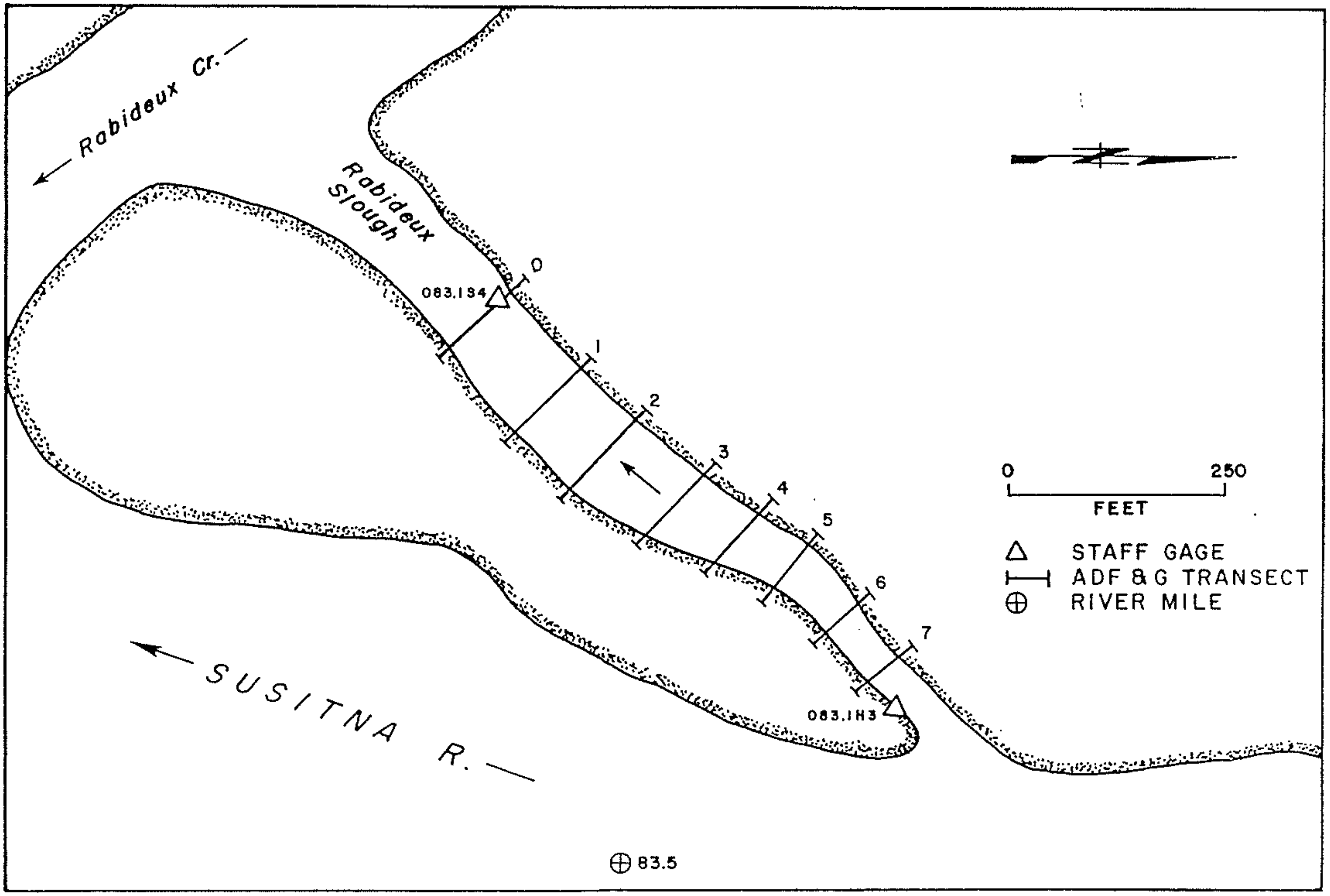



Figure 4II-3-10 Rabideux Slough transects.

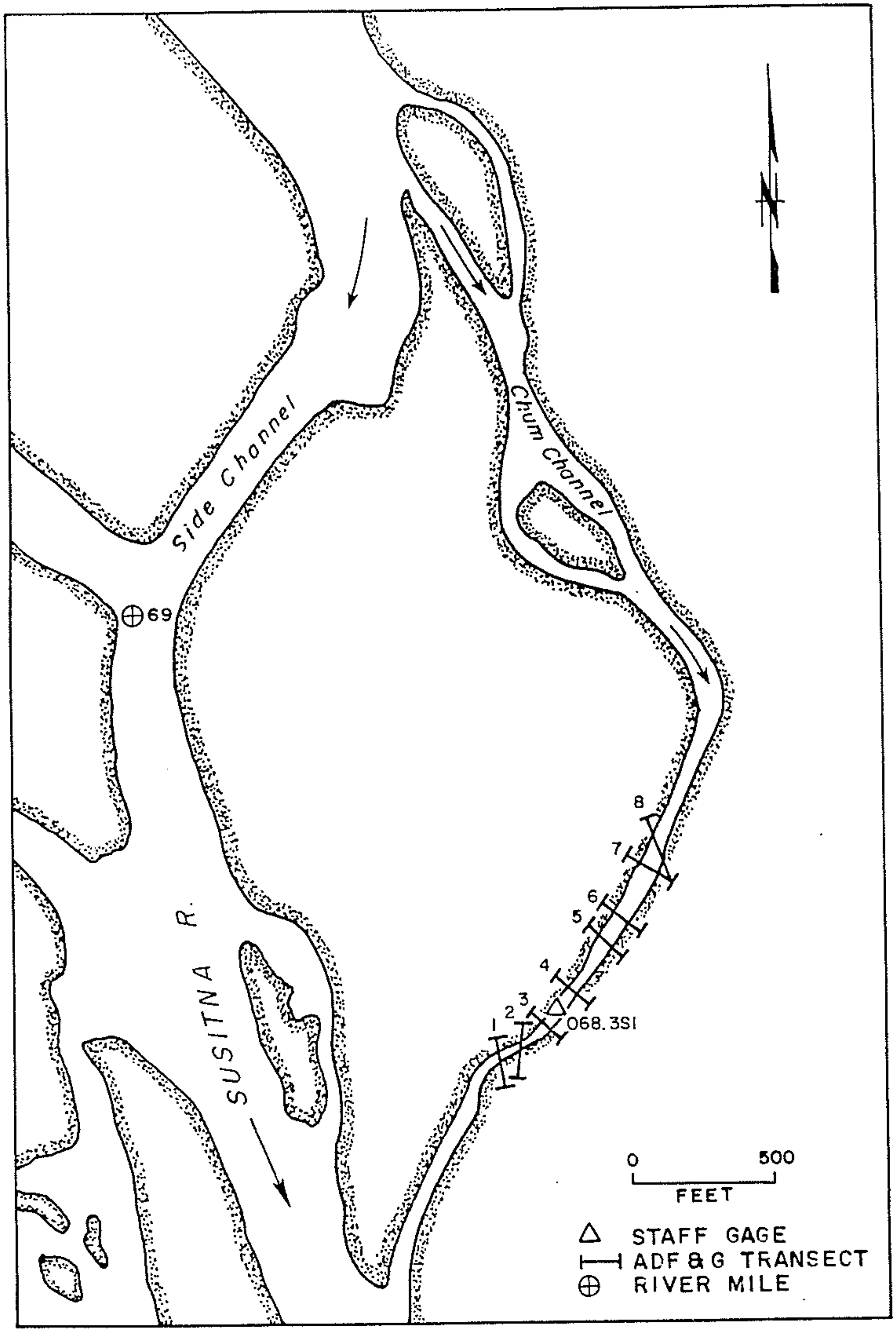



Figure VII-3-11. Chum Channel transects.

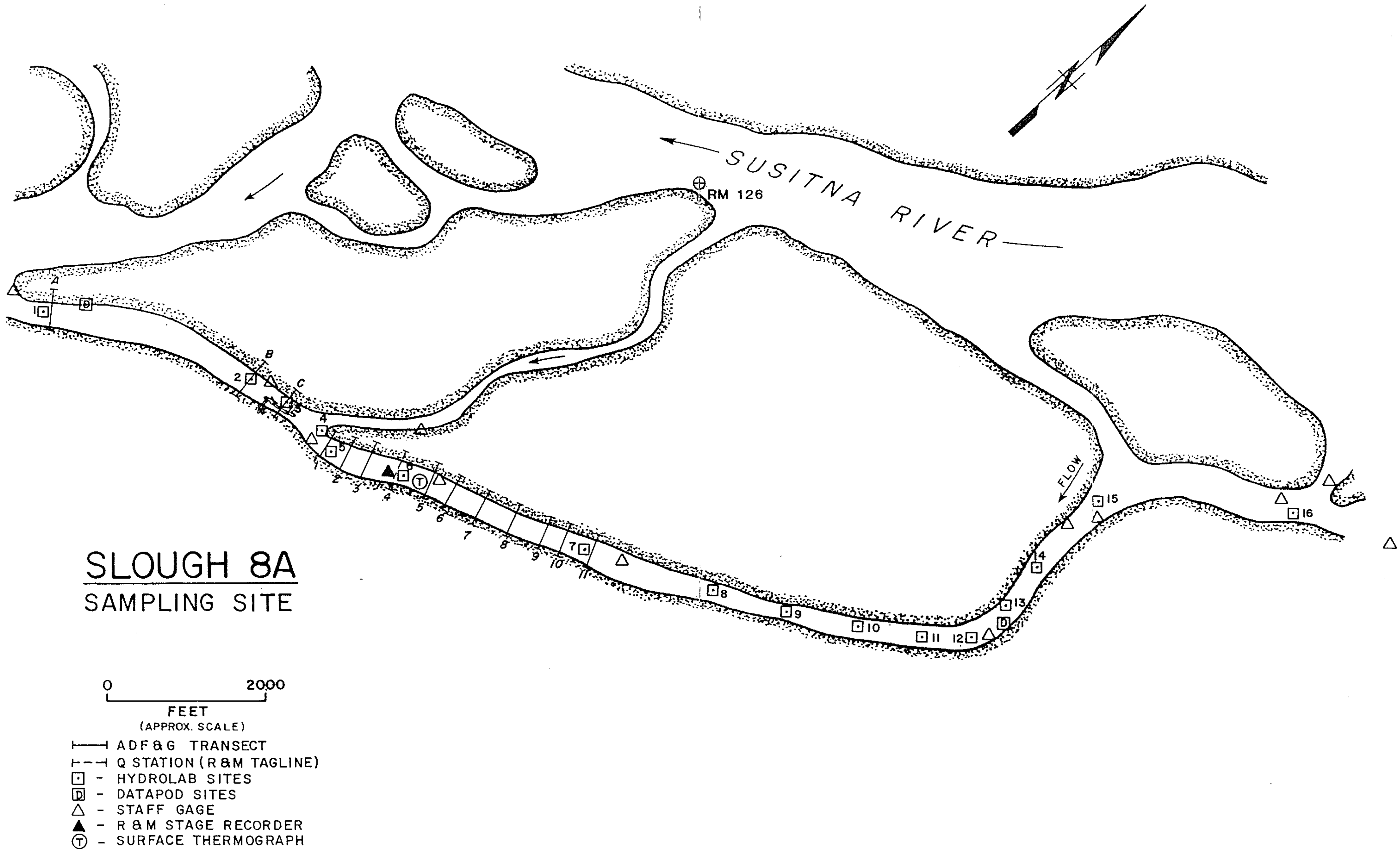



Figure 4II-3-12. Slough 8A sampling sites, 1982.

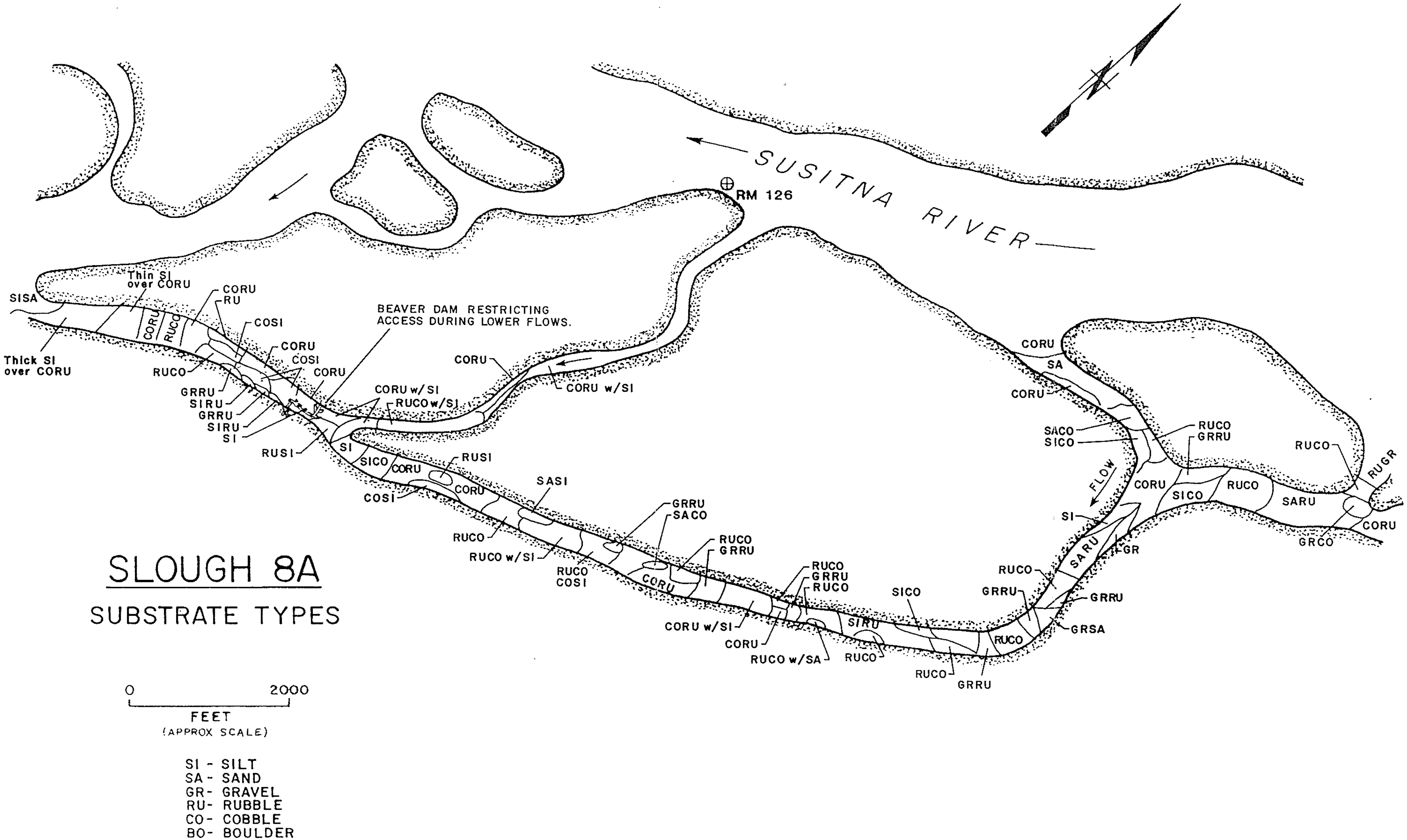



Figure 4II-3-13. Slough 8A substrate, 1982.

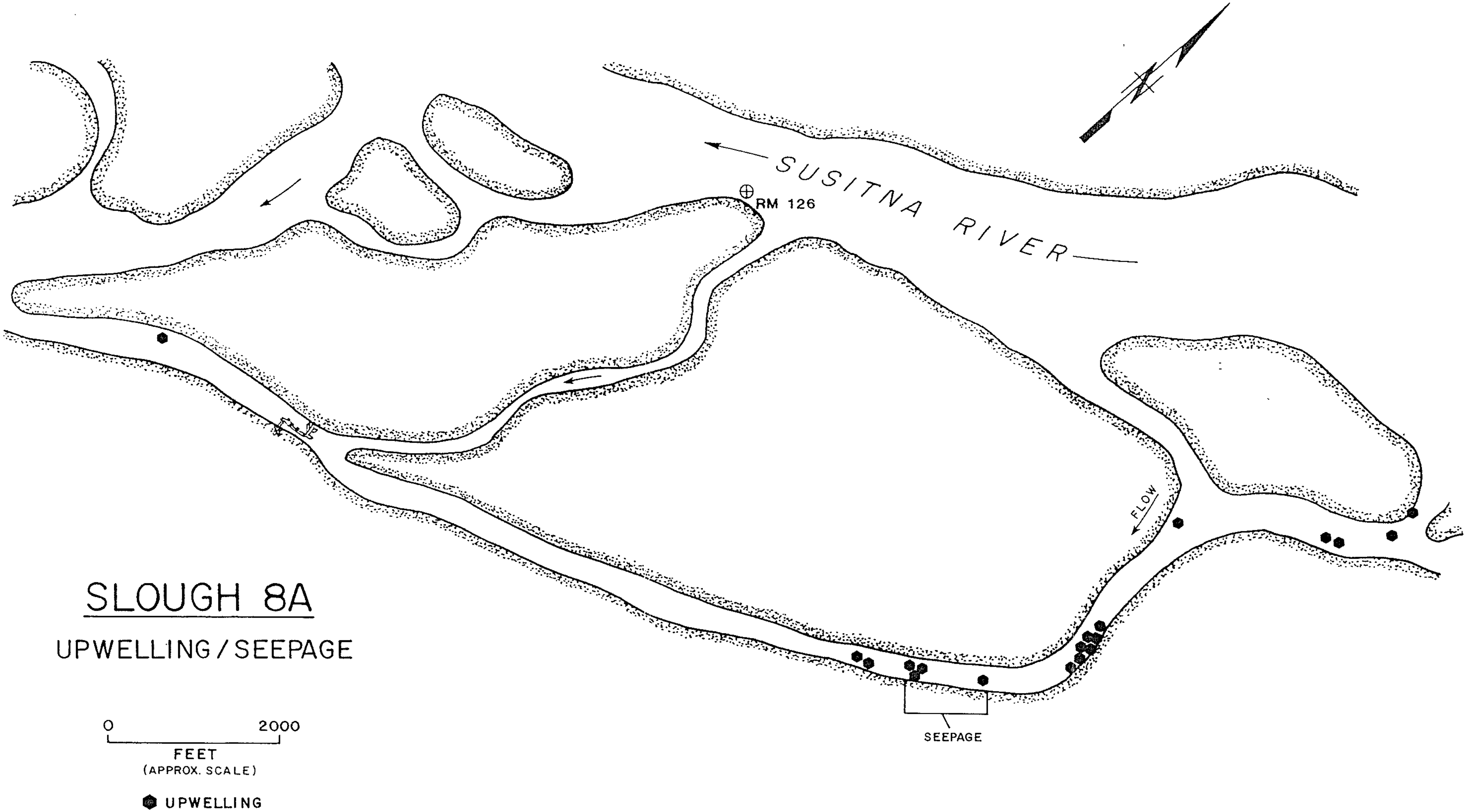



Figure 4II-3-14. Slough 8A upwellings, 1982.

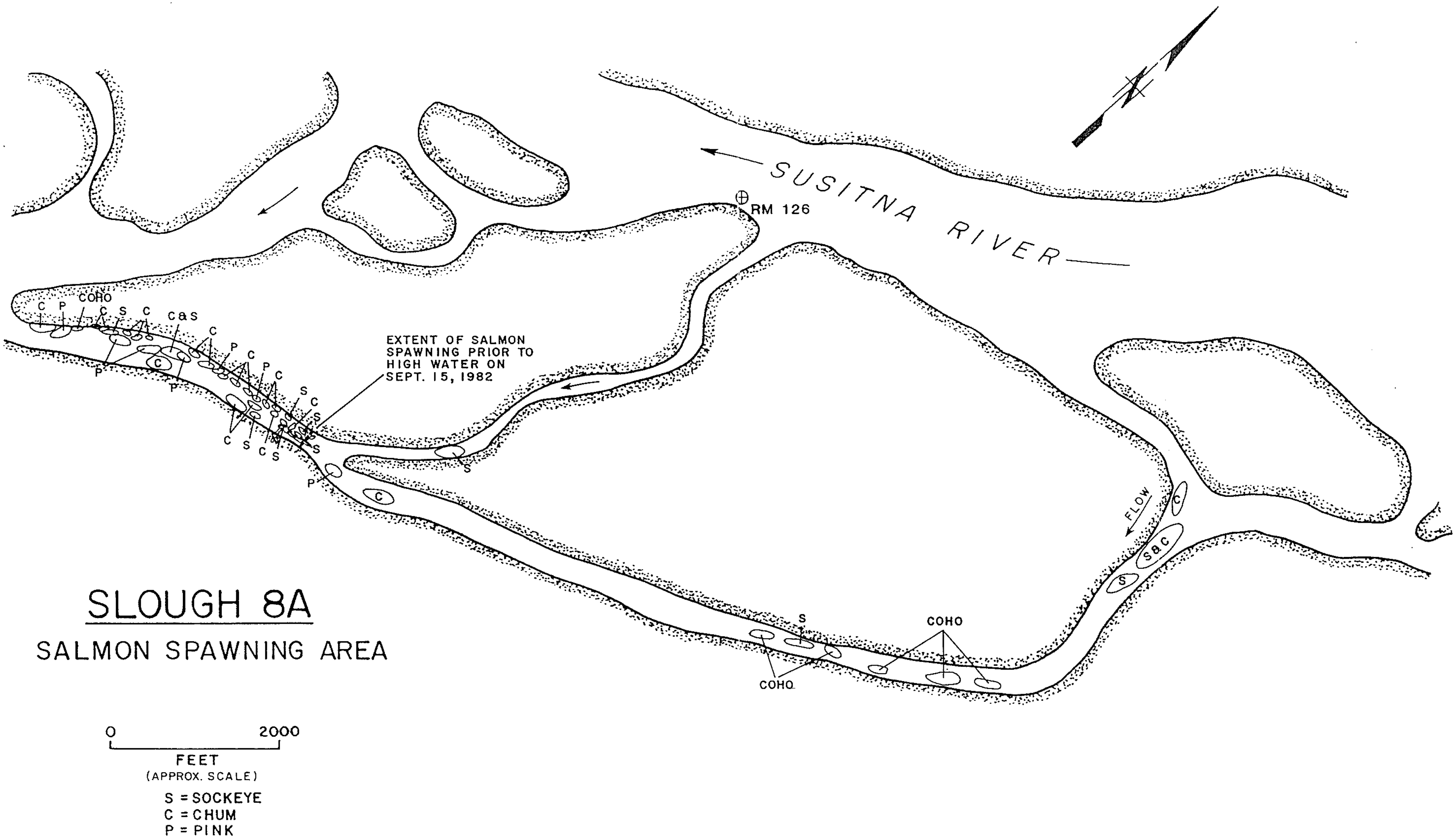



Figure 4II-3-15. Slough 8A spawning areas, 1982.

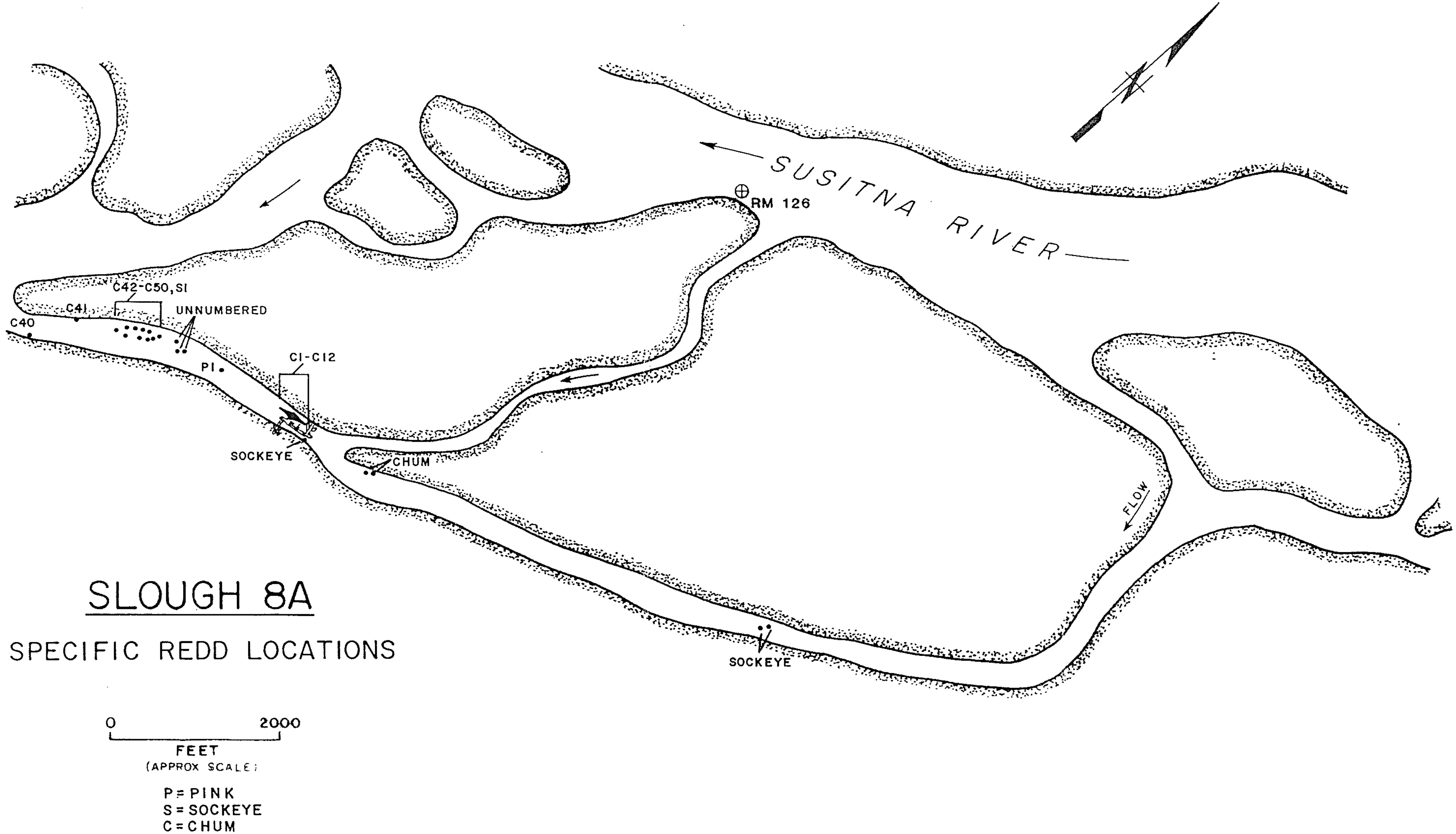



Figure 4II-3-16. Slough 8A redd locations, 1982.

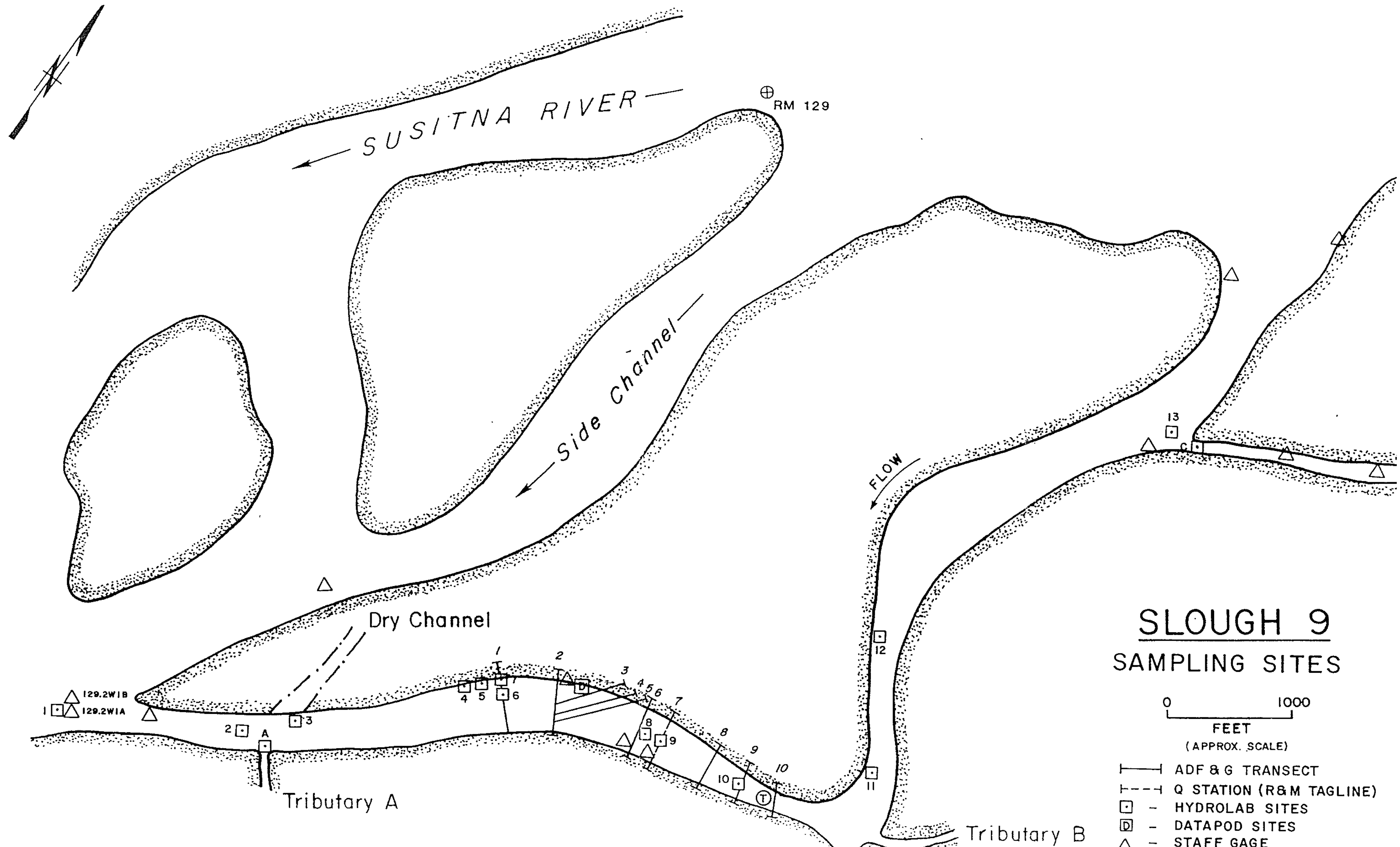



Figure 4II-3-17. Slough 9 sampling sites, 1982.

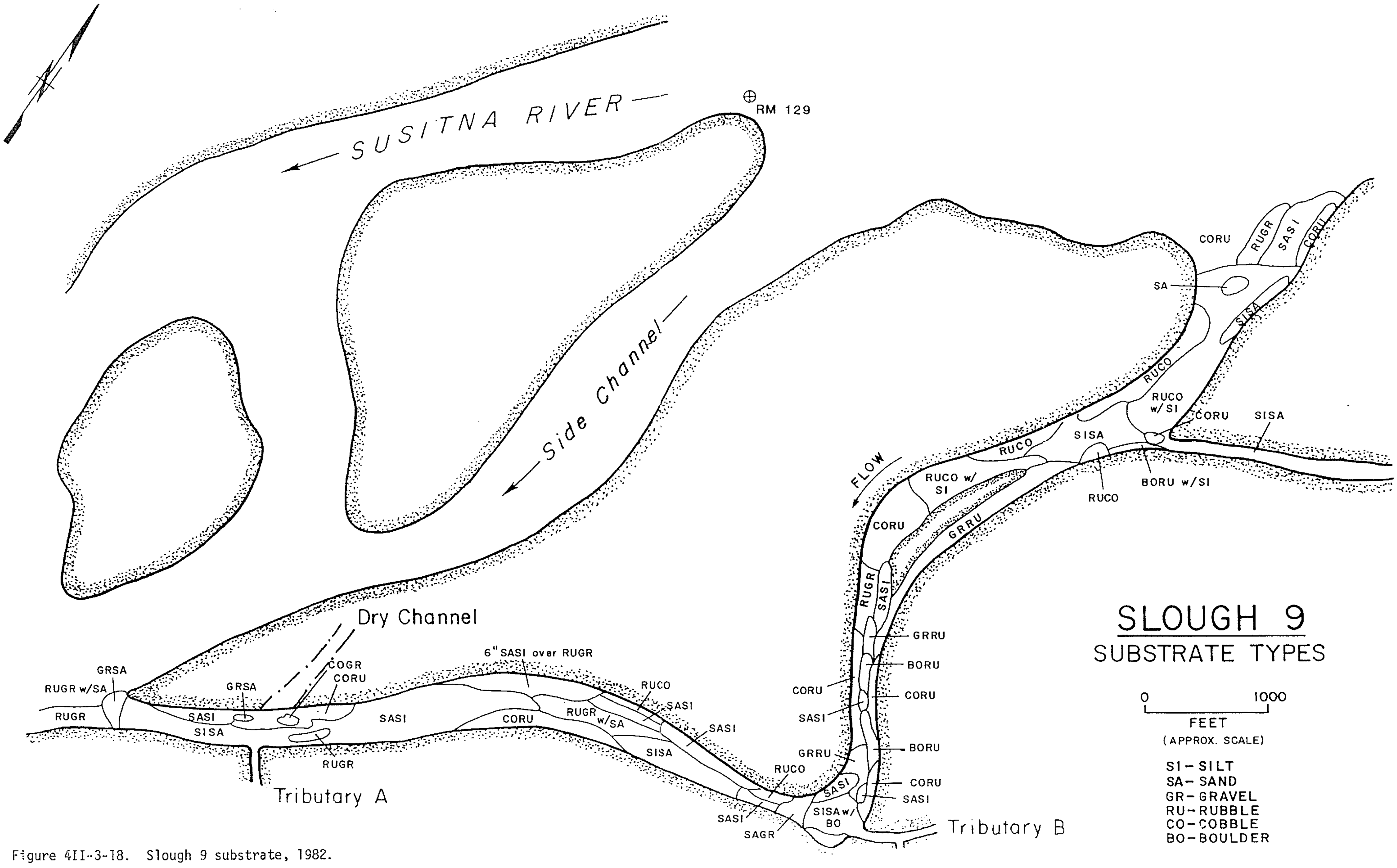



Figure 4II-3-18. Slough 9 substrate, 1982.

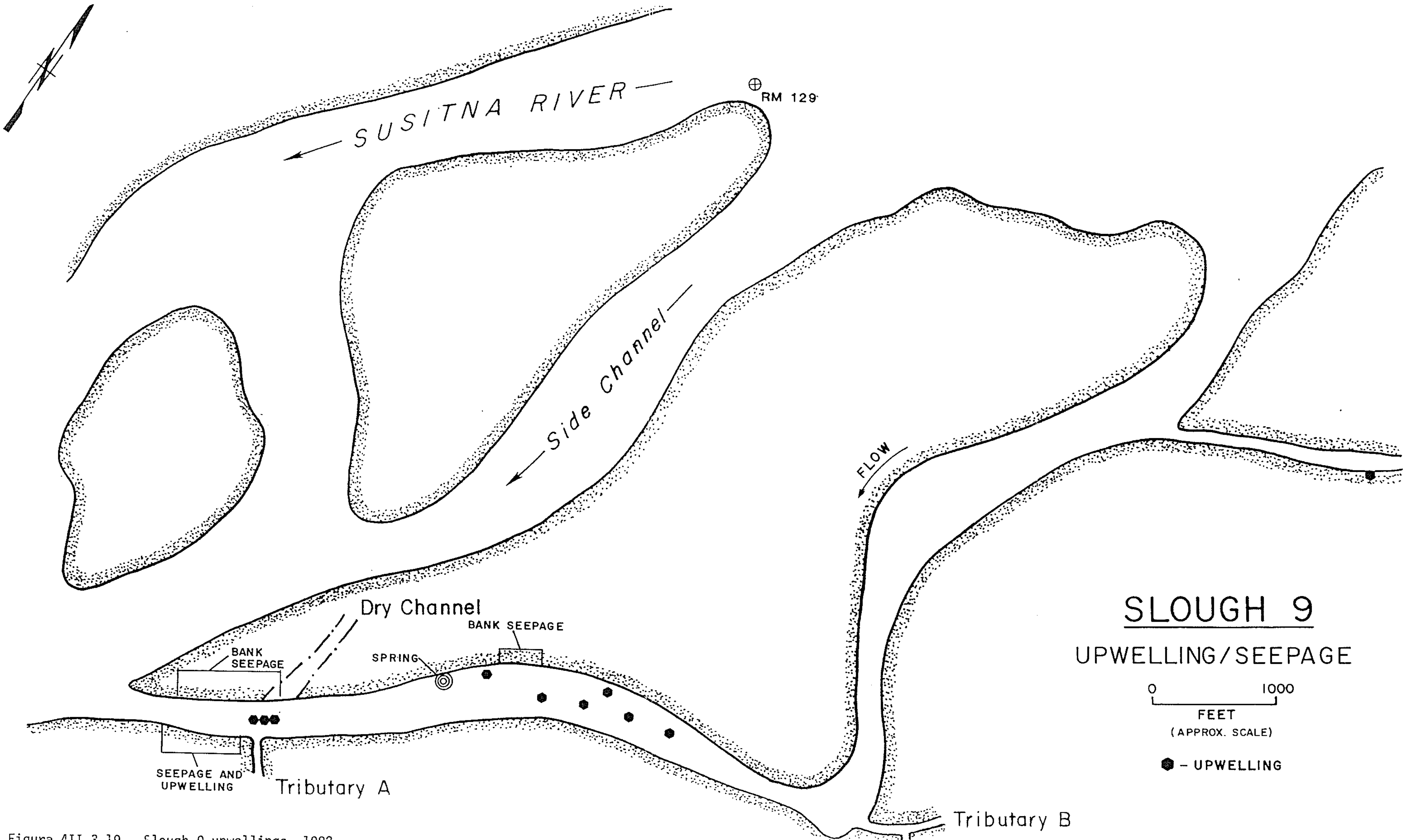



Figure 4II-3-19. Slough 9 upwellings, 1982.

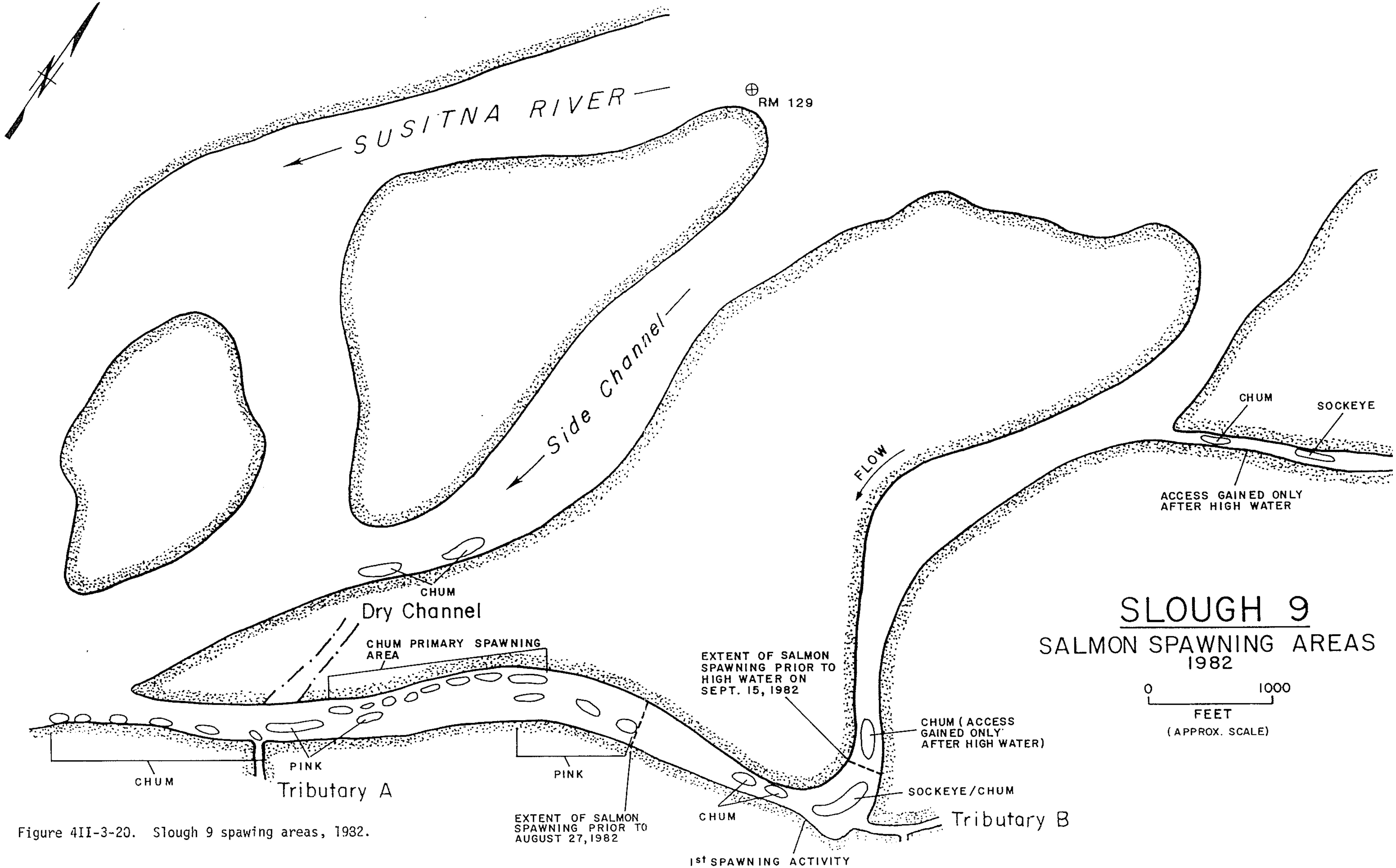



Figure 4II-3-20. Slough 9 spawing areas, 1932.

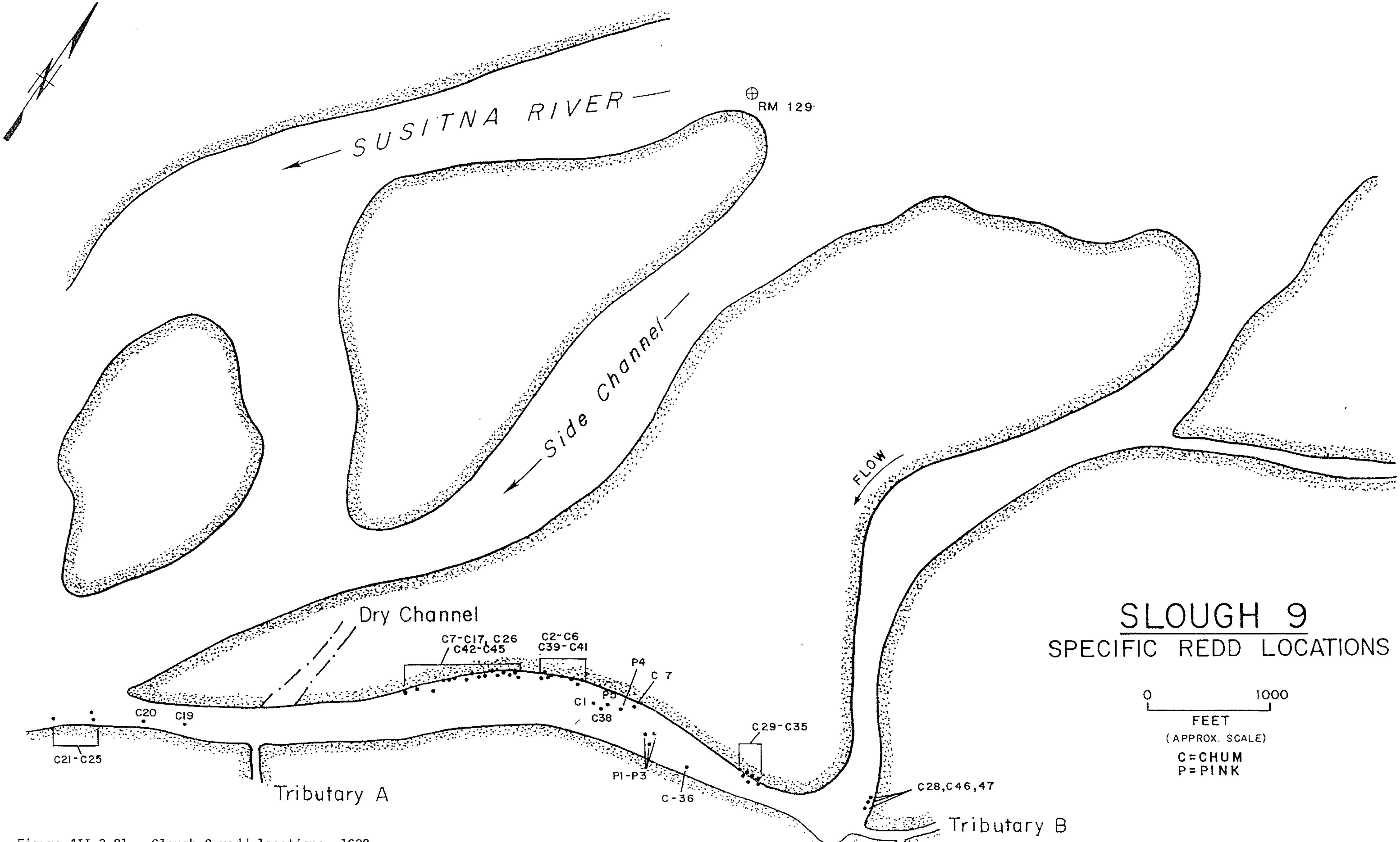



Figure 4II-3-21. Slough 9 redd locations, 1982.

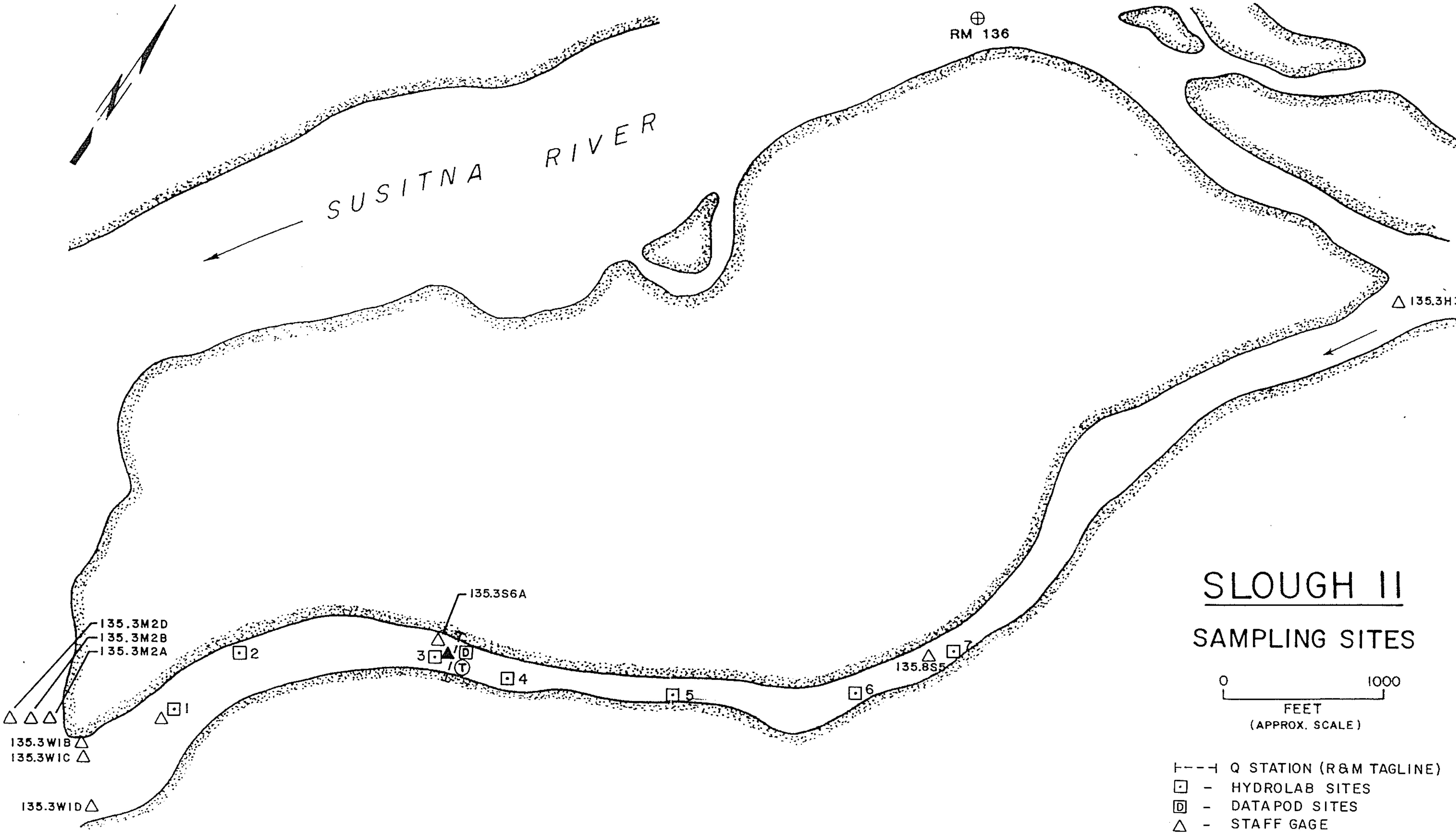



Figure 4II-3-22. Slough 11 sampling sites, 1982.

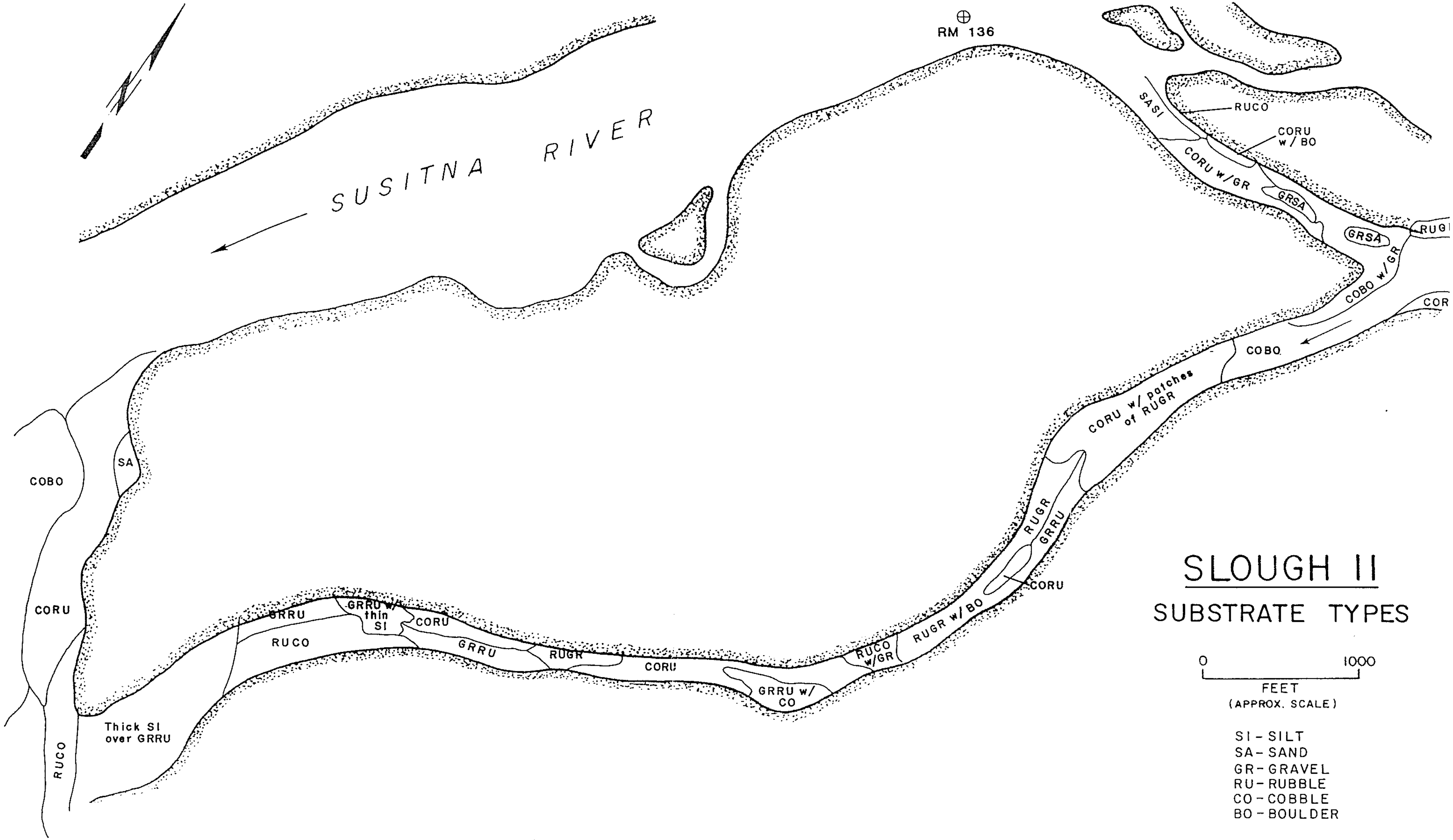



Figure 4II-3-23. Slough 11 substrate, 1982.

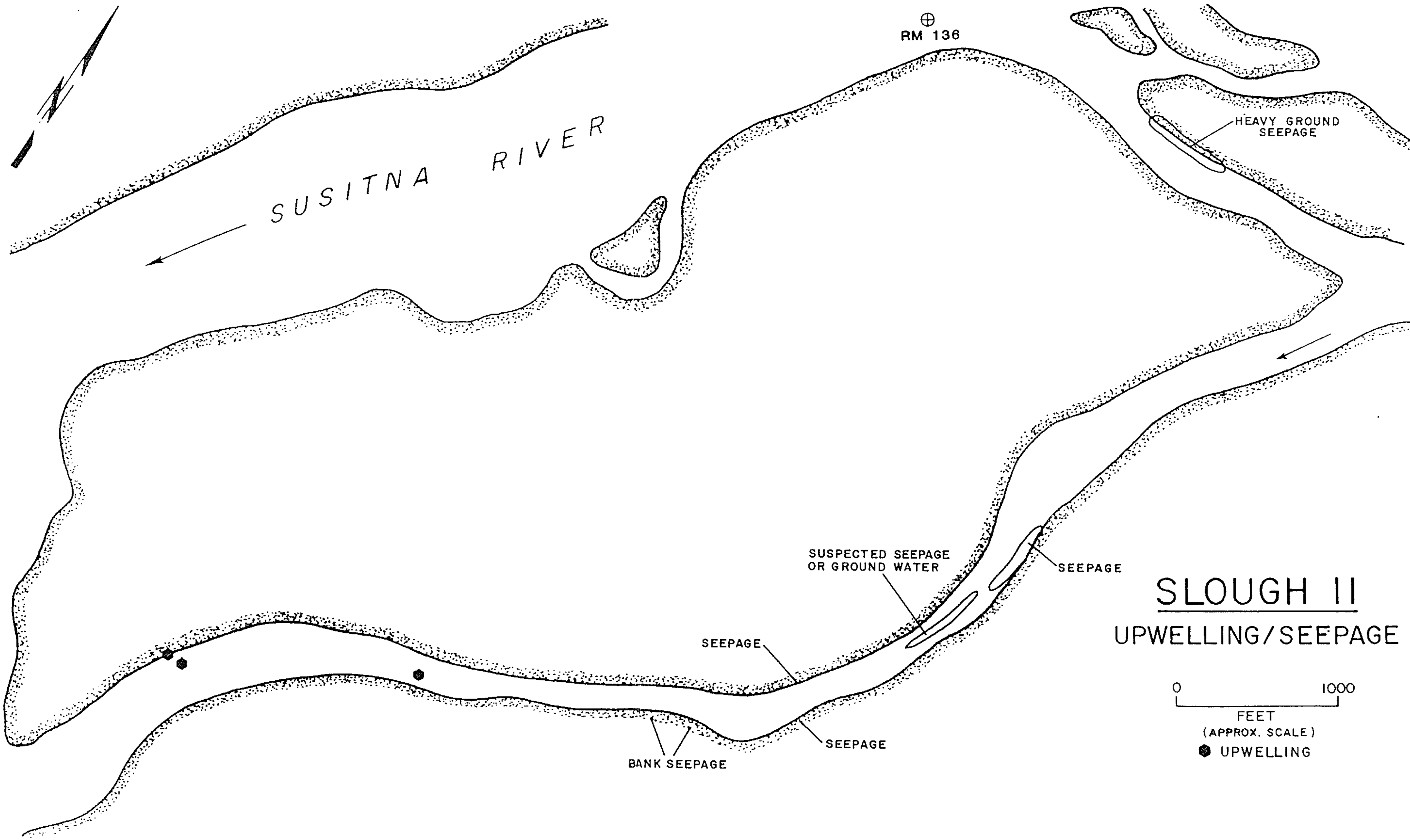



Figure 4II-3-24. Slough 11 upwellings, 1982.

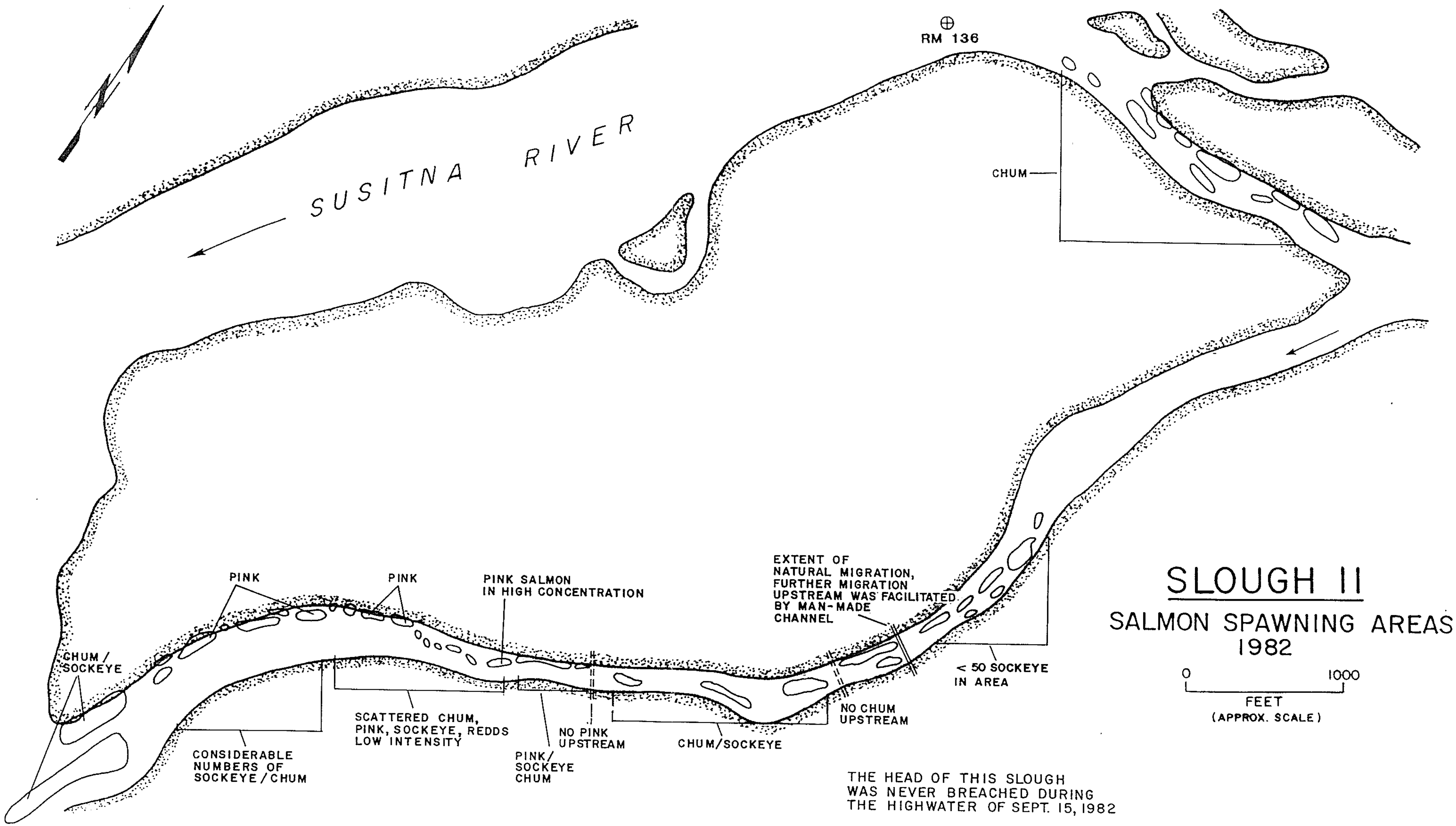



Figure 4II-3-25. Slough 11 spawning areas, 1982.

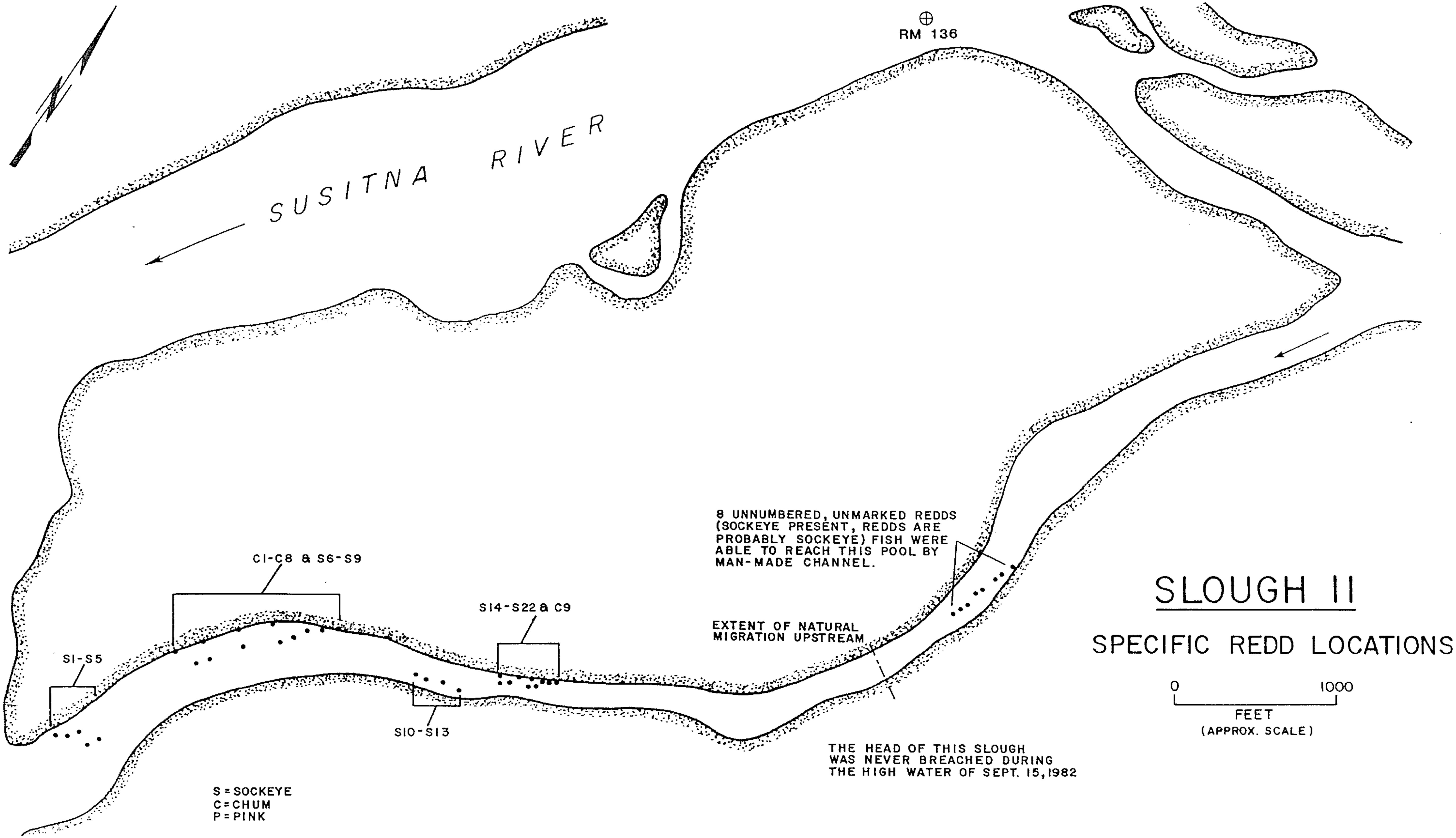



Figure 4II-3-26. Slough 11 redd locations, 1982.

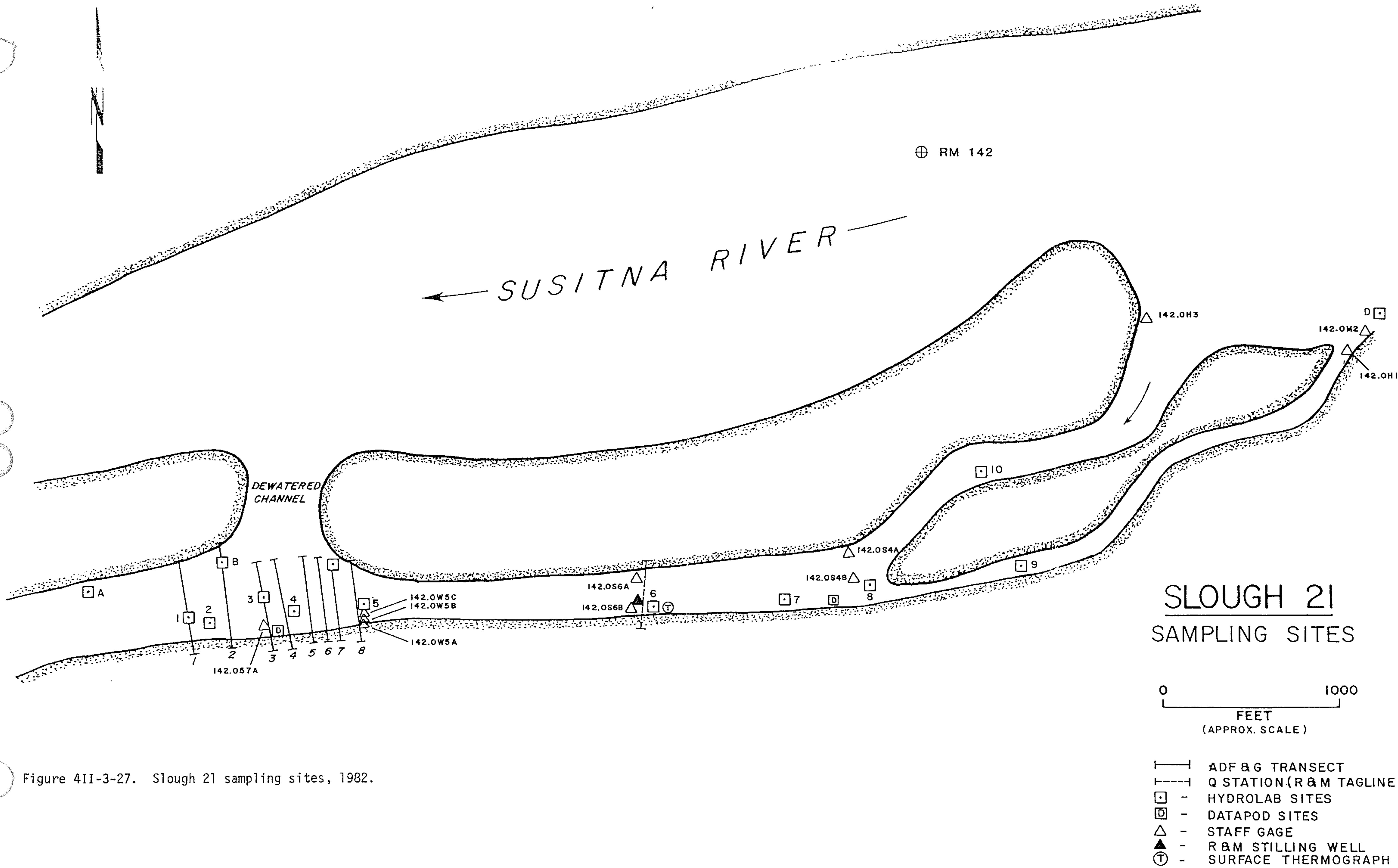



Figure 4II-3-27. Slough 21 sampling sites, 1982.

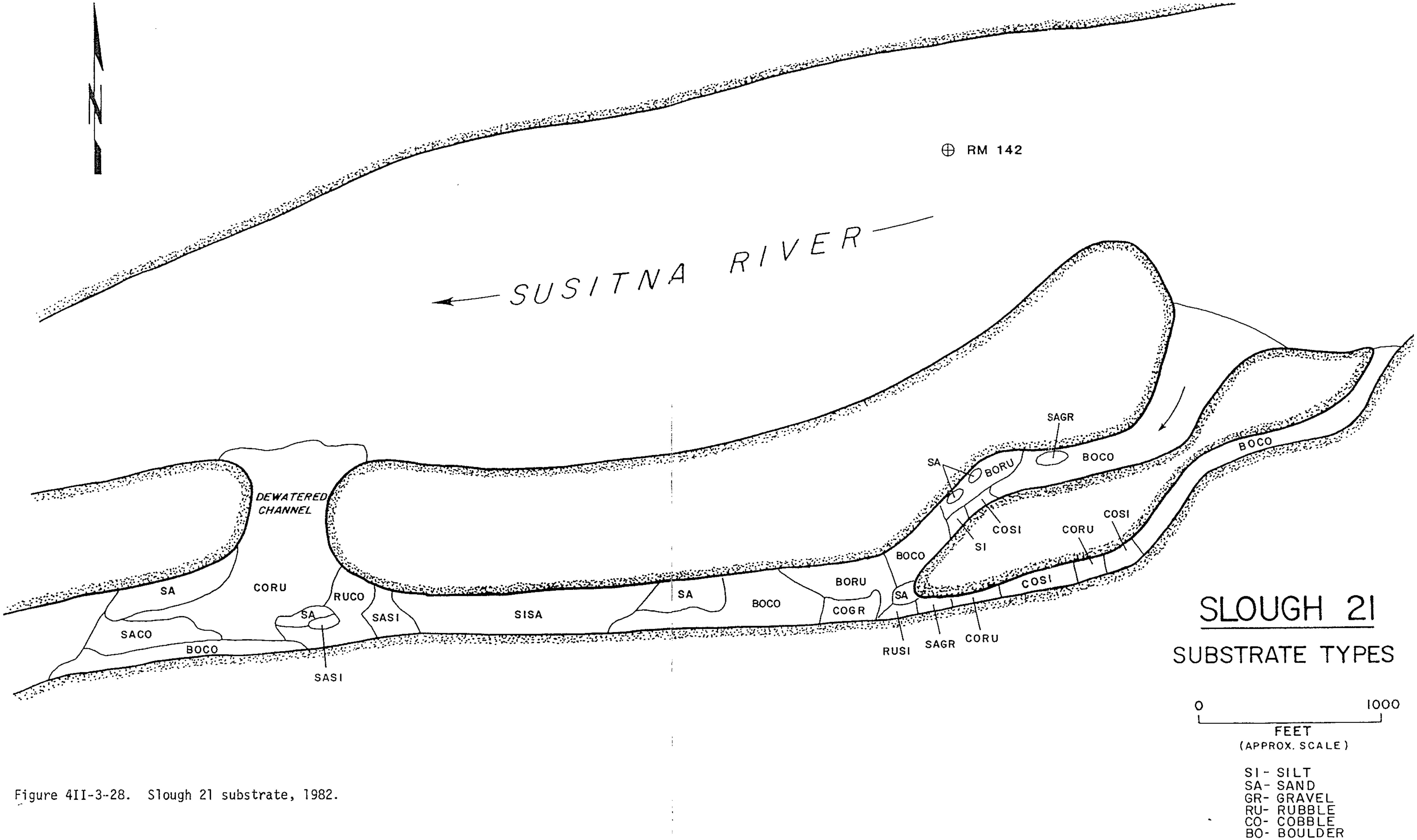



Figure 4II-3-28. Slough 21 substrate, 1982.

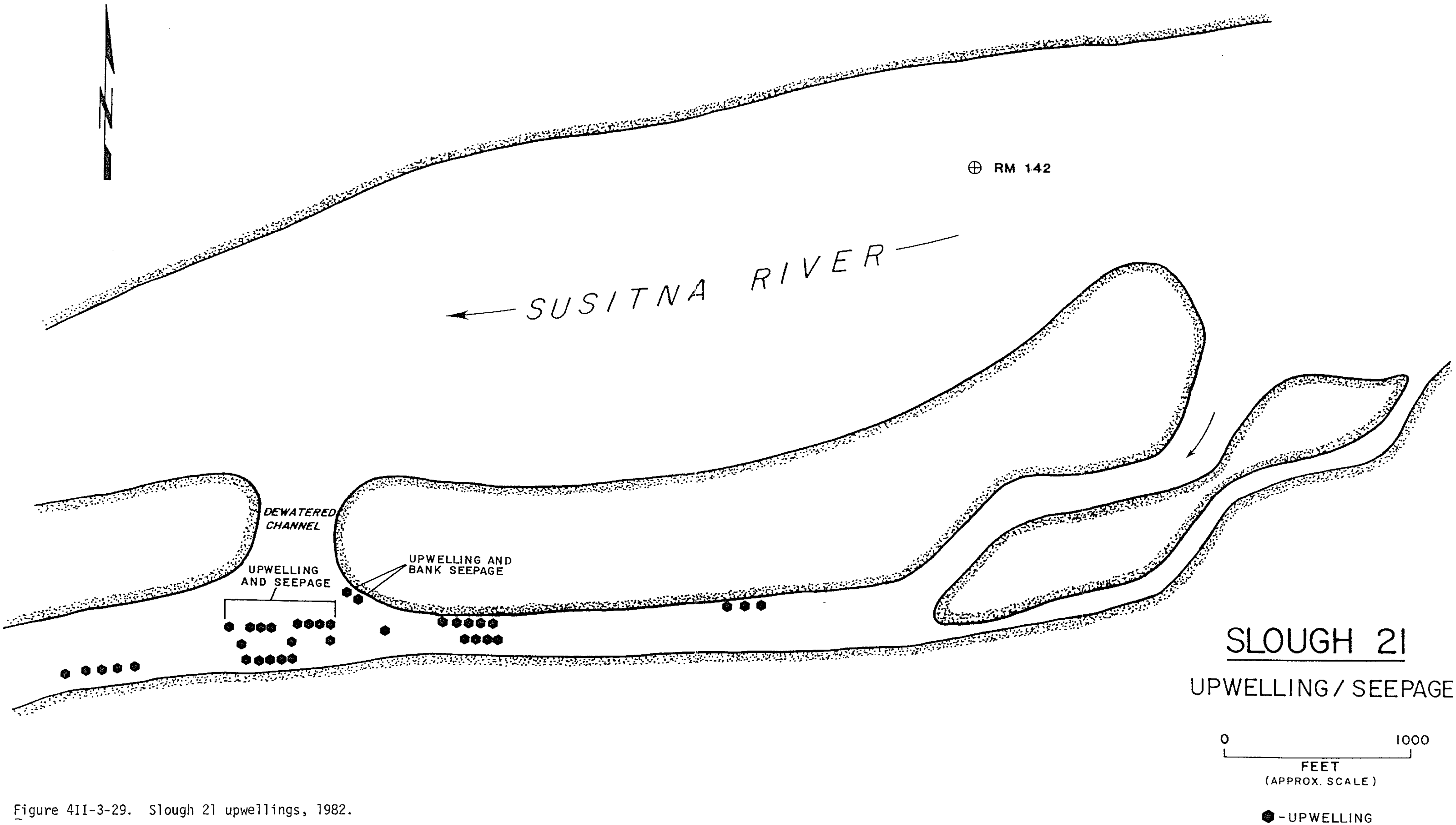



Figure 4II-3-29. Slough 21 upwellings, 1982.

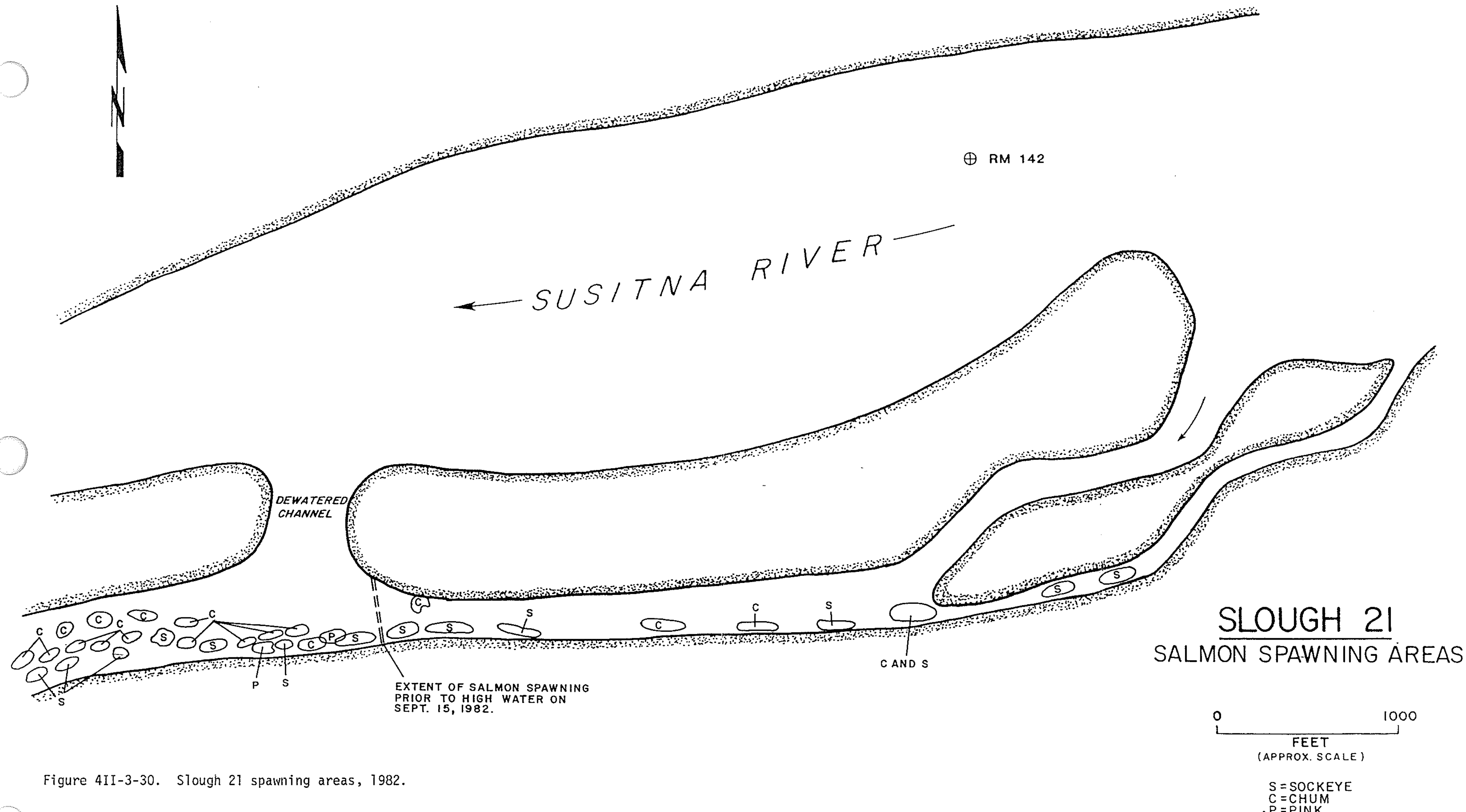



Figure 4II-3-30. Slough 21 spawning areas, 1982.

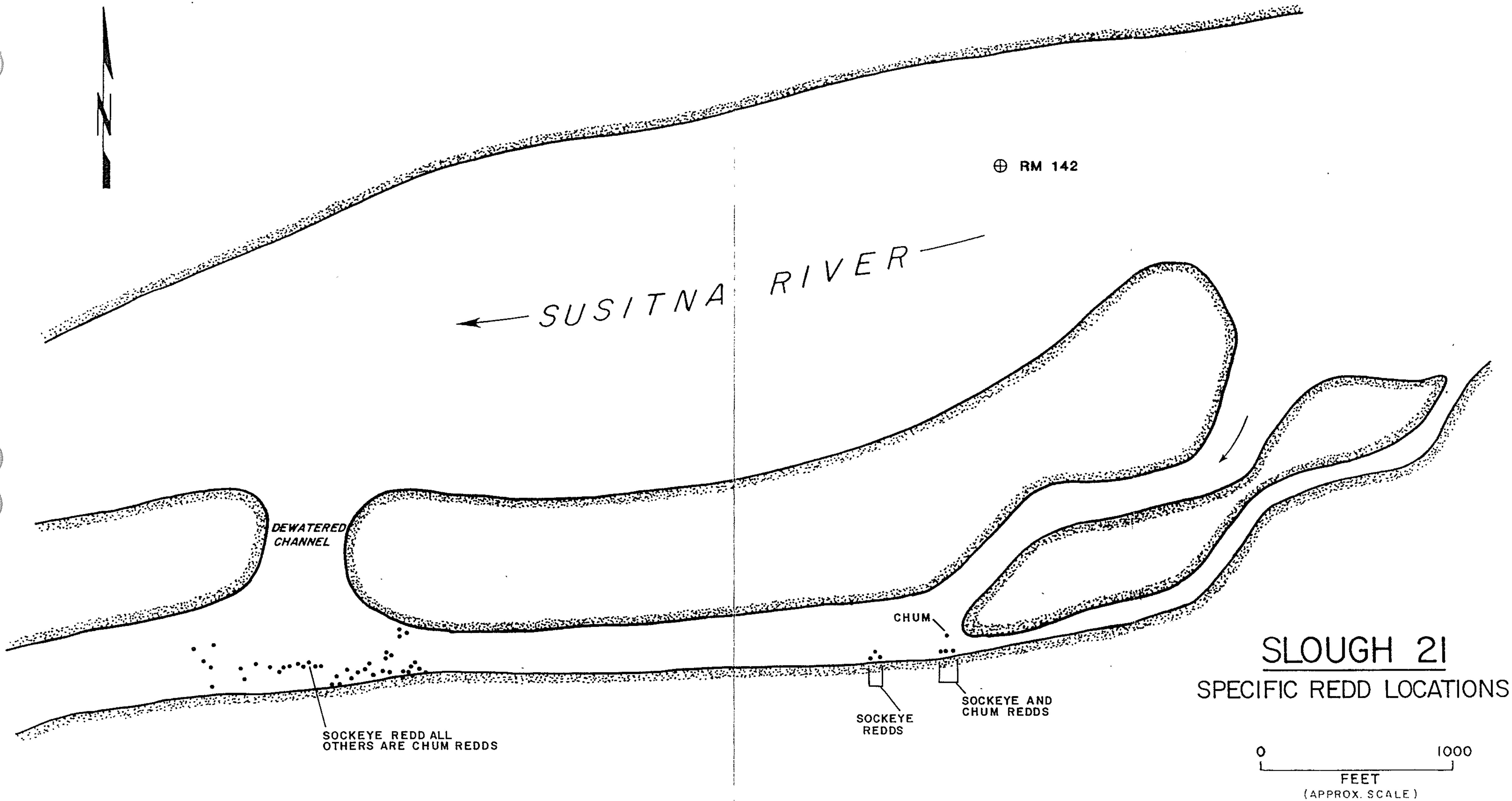



Figure 4II-3-31. Slough 21 redd locations, 1982.

### 3.1.1.2.2 Habitat Summaries

Site maps of substrates, upwelling areas, salmon spawning areas, specific redd sites, and sampling sites for sloughs 8A, 9, 11 and 12 show relationships of upwelling and substrates to selected spawning sites in each slough (Figures 4II-3-12 to 31). Chum salmon were the most abundant species found spawning in these sloughs, however, sockeye, pink and coho salmon were also observed spawning (also refer to sections 3.1.2, 3.1.3 and 3.1.4 of this report). Locations of observed spawning areas in the studied sloughs for these four species are presented in Figures 4II-3-15, 4II-3-20, 4II-3-25 and 4II-3-30.

Slough 8A

Slough 8A is relatively long (1.8 miles) and narrow, possessing two side branches and four major "heads" that allow hydrological influence with the mainstem Susitna River during medium and high flows.

At periods of low mainstem flow, the upper half of the slough was characterized by very low discharges (less than 5.0 cfs). During these periods, slough water is apparently comprised of surface runoff (from the right bank) and ground water, with no single source comprising an obvious majority of total water.

Due to restrictive beaver dams in the lower 0.5 mile section of the slough, the majority of chum salmon spawning sites occurred in the area below the dams. Cobble-rubble was the most commonly used substrate and only one site of upwelling was observed in this area. Dense concentrations of fish were found immediately below the dams, probably not because of a preference for this habitat but due to lack of access to upper slough areas.

During the high flow period in September, 1982, when the dams were breached, several salmon were observed spawning in upper slough areas. These fish also appeared to show a preference for cobble-rubble substrate. Several spawning sites occurred in areas of upwelling or seepage.

## Slough 9

Slough 9 is a relatively short (1.2 miles) slough containing two tributaries along its right bank. Its non-vegetated channel is relatively wide and is maintained by periodic high flows of mainstem water breaching the head.

The extent of the backwater zone is highly variable, dependent upon the mainstem stage. In general, it varies from a small, relatively confined pool at very low mainstem levels, to an extensive backwater zone, over 600 feet long, at high mainstem discharges (for detailed discussion see Trihey 1982).

During periods when the head is not breached by mainstem water, most of the slough flow is contributed by surface runoff and groundwater, with groundwater sources probably being of lesser magnitude. During these times, flows are generally less than 10 cfs (when mainstem discharge at Gold Creek was 12,500 cfs on August 24, 1982 (USGS 1982), flow in Slough 9 was 3 cfs) which pose significant access problems for salmon.

Chum salmon spawning areas were found to be on both gravel-rubble and cobble-rubble substrates. However, it should be noted that when they occurred on gravel-rubble substrates there was extensive seepage and ground water in that area. This was the case in the primary chum spawning area for this slough.

Salmon spawning activity was limited to the lower half of the slough until high water on September 15, 1982, allowed access to the upper slough. During that period, salmon were observed as far up as Slough 9B.

Slough 11

Slough 11 is a relatively short slough (approximately 1.0 miles) that is essentially linear in shape and oriented almost parallel to the mainstem Susitna River. Unlike most sloughs, the head of this slough was never breached after spring breakup in 1982.

The channel bed is primarily devoid of silt (likely a result of infrequent breaching) and is arranged in an obvious pool/riffle sequence. Because it has no obvious tributaries, its flow is comprised almost entirely of ground water. However, since there is little or no silt on the slough bottom, upwelling areas are difficult to observe.

High concentrations of salmon were observed spawning in this slough. Chum salmon were observed most often on cobble-rubble substrates and several upwellings were observed in these areas.

Slough 21 Complex

The Slough 21 complex is basically comprised of the slough (as defined in ADF&G 1982a) and an extended access channel oriented parallel to the mainstem Susitna River.

During periods when the head is not breached, the relatively small discharge in the slough is primarily composed of water from a single small tributary (entering the right fork) and from ground water. Ground water appears to originate from localized seepages and upwellings along both banks below the mouth up to the fork (Plates 4II-3-3 and 4II-3-4).

Prior to the high water period on September 15, 1982, salmon spawning in this slough complex was limited to the channel immediately below the mouth of the slough. Observations of spawning fish was difficult in much of the access channel due to turbid water. Chum salmon were the most abundant species found spawning here. Most redds occurred on rubble-cobble substrates. Extensive upwelling and seepage were observed in these areas.

After high flows occurred, chum salmon were observed above the mouth. Several of these were found to be on silt-sand substrate in areas where upwelling occurred.

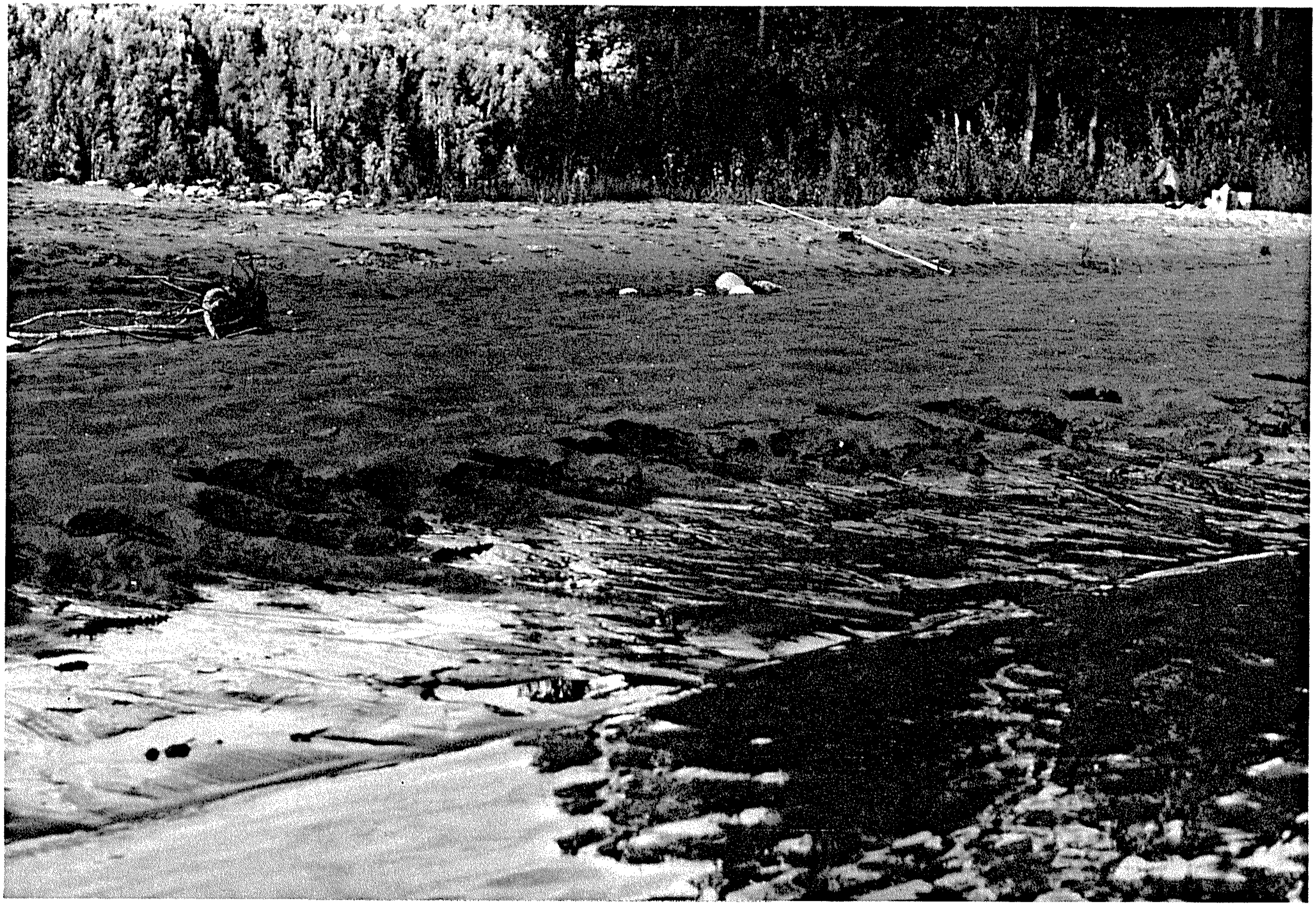


Plate 4II-3-3. Seepage of ground water sources into Slough 21

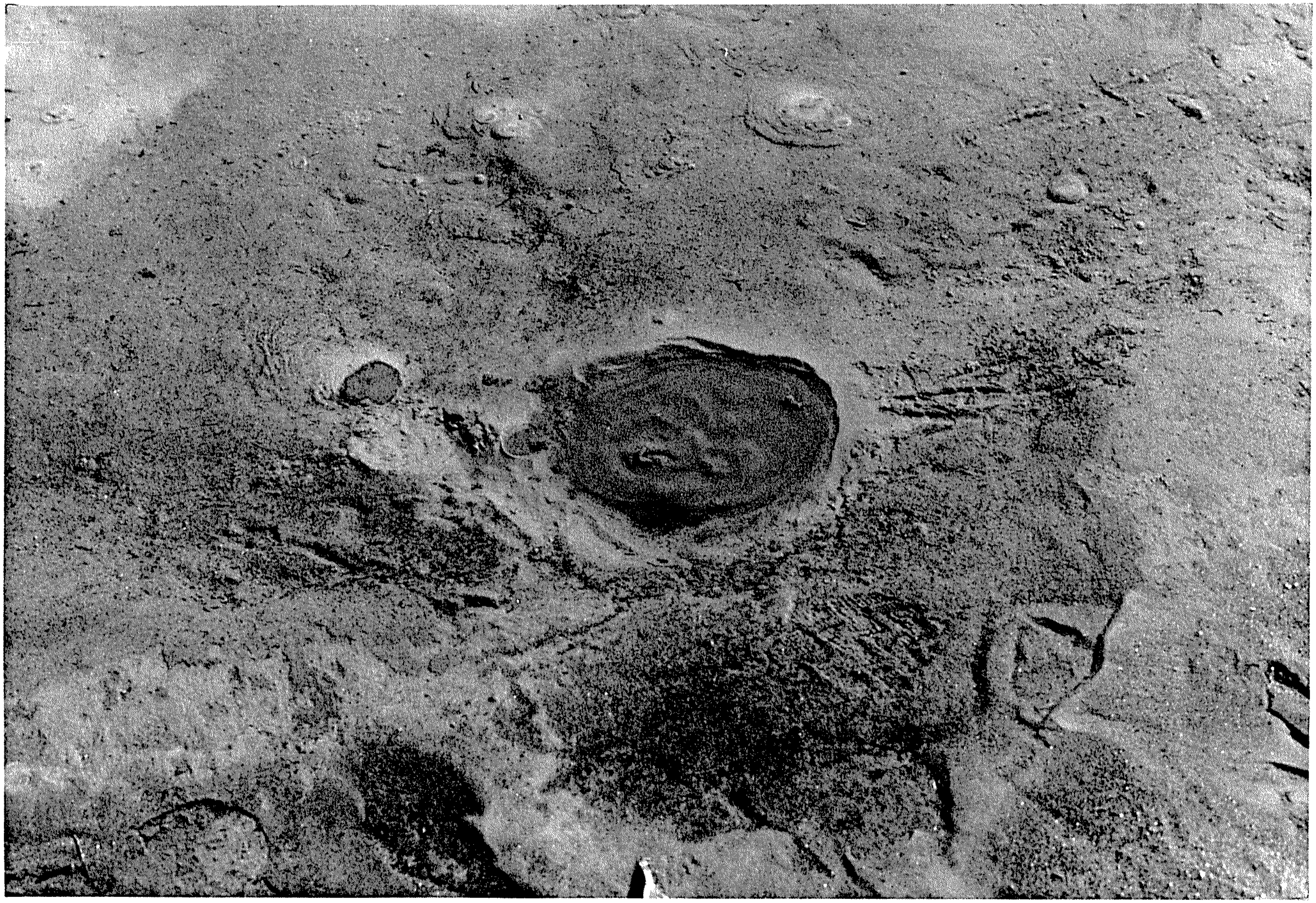


Plate 4II-3-4 Upwelling ground water in silted area of Slough 21.

### 3.1.1.2.3 Water Quality

The general water quality data collected in the sloughs to describe the characteristics in the slough are presented in Part I, section 3.2. The results of the specific study designed to look at intragravel water sources follows.

Intragravel temperatures were obtained along study transects to provide a basis for comparison to data collected at specified locations. In addition this data provides a means of evaluating variability in intragravel temperatures within transects of a particular slough and between study sites (data pooled for all transects within a study site). of different sloughs. These data (at study transects as well as at specific locations) are intended to supplement the continuous thermograph data (Appendix C) by providing a more detailed description of variability in water temperatures in sloughs at a single point in time (October, 1982). This time period was selected because mainstem flows and flows in sloughs are very low, allowing sources of ground water to be more easily observed. A summary of mean intragravel temperatures collected at transects (sloughs 8A, 9, 11, 21) and at specified locations (Slough 9B) is presented in Table 4II-3-3.

Surface water temperatures (Table 4II-3-4) were generally very cold since data were collected in early October. Mean temperatures for all locations (excluding tributaries and side channels) in sloughs 8A, 9, and 9B ranged between 1.4°C (Slough 9) and 4.2°C (Slough 9B). However,

Table 4II-3-3. Data summary of intragravel temperatures obtained at 1982 ADF&G study transects (sloughs 8A, 9, 21) and specified locations (sloughs 9B and 11) from September 30 to October 5, 1982.

| Location | Mean (x) | Standard Deviation | Range | Sample Size (n) |
|---|---|---|---|---|
| Slough 8A | 3.3 | 0.92 | 1.5 - 4.7 | 20 |
| Slough 9 | 3.0 | 0.58 | 1.9 - 4.2 | 17 |
| Slough 21 | 3.3 | 0.37 | 2.9 - 4.2 | 72 |
| Slough 9B | 3.8 | 0.18 | 3.6 - 4.3 | 16 |
| Slough 11 | 4.6 | 0.65 | 3.7 - 5.7 | 18 |

Table 4II-3-4. Data summary for surface water temperatures (°C) at specified locations in sloughs 8A, 9, 9B, and 11 collected during October 1-5, 1982 (raw data in Appendix D).

| Slough | Location[a] | $\bar{X}$ | SD | Range | N |
|---|---|---|---|---|---|
| 8A | Side channel | 3.2 | -- | 3.1-3.4 | 2 |
| 8A | Spawning A | 3.0 | -- | 2.5-3.4 | 2 |
| 8A | Spawning B | 2.4 | -- | 2.1-2.6 | 3 |
| 8A | Spawning C | 2.8 | -- | 2.7-2.9 | 3 |
| 9 | Pool A | 3.2 | 0.59 | 2.7-3.9 | 6 |
| 9 | Upwelling A | 3.1 | 0.94 | 1.8-4.7 | 10 |
| 9 | Datapod (1-6) | 3.1 | 0.08 | 3.0-3.2 | 6 |
| 9 | Transects (5-6)L | 1.8 | 0.18 | 1.5-2.2 | 10 |
| 9 | Transects (5-6)M | 1.6 | 0.00 | 1.6-1.6 | 10 |
| 9 | Transects (5-6)R | 1.4 | 0.11 | 1.2-1.5 | 10 |
| 9 | Mid-slough | 3.2 | -- | -- | 1 |
| 9 | Tributary B | 2.2 | -- | -- | 1 |
| 9 | Tributary B' | 2.3 | -- | -- | 1 |
| 9 | Tributary B" | 1.8 | -- | -- | 1 |
| 9 | Pool C | 2.9 | -- | 2.4-3.2 | 4 |
| 9B | Mouth | 2.5 | 0.81 | 1.5-3.2 | 5 |
| 9B | Mid-slough | 2.9 | 0.25 | 2.5-3.2 | 5 |
| 9B | Upwelling B | 4.2 | 0.20 | 3.9-4.4 | 7 |
| 11 | Left bank (LB) | 5.3 | 0.32 | 4.7-5.6 | 6 |
| 11 | Mid-slough (M) | 5.2 | 0.30 | 4.7-5.6 | 6 |
| 11 | Right bank (RB) | 5.0 | 0.53 | 4.2-5.6 | 6 |
| 11 | Upper pool | 5.2 | 0.11 | 5.0-5.3 | 5 |

[a] Refer to Figures 4II-2-1 to 4II-2-3 for schematic maps of sloughs 8A and 9.

surface water temperatures in Slough 11 were generally 1-2°C higher. Surface temperatures were not obtained in Slough 21.

Mean temperatures obtained at the substrate/water interface were generally between intragravel and surface water temperatures (Table 4II-3-5). The degree to which they resembled surface or intragravel temperatures appeared to be a function of depth and/or velocity, thus substrate/water temperatures were not reliable predictors of ground water upwelling.

Surface Water Sources

Specific conductance was a reliable indicator of different surface water sources (tributaries of prominent seepage) in sloughs 8A and 9. Their contribution to water quality in these sloughs was evaluated by measuring specific conductance at several locations downstream of their observed points of entry.

In Slough 8A (Table 4II-3-6) values of specific conductance varied in a consistent pattern. The mean value for the left side of the channel (Transects (1-11)L) was highest mid-channel (Transects (1-11)M) was intermediate and right side (Transects (1-11)R) was lowest. Specific conductance along the right side was probably due to surface water draining from beaver ponds along the bank (values were as low as 44 umhos/cm in this area).

Table 4II-3-5. Data summary for substrate/water interface temperatures (°C) collected at specified locations in sloughs 8A, 9, 9B, 11 and 21 during October 1-5, 1982 (raw data in Appendix D).

| Slough | Location[a] | $\bar{x}$ | SD | Range | N |
|---|---|---|---|---|---|
| 8A | Transects (1-11)L | 3.3 | 0.56 | 2.4-4.2 | 11 |
| 8A | Transects (1-11)M | 2.6 | 0.37 | 2.1-3.4 | 11 |
| 8A | Transects (1-11)R | 3.0 | 0.21 | 2.7-3.3 | 11 |
| 8A | Pool (L,M,R) | 4.2 | -- | 4.1-4.4 | 3 |
| 8A | Channel (L,M,R) Transect (1-2)L | 2.4 | -- | 2.2-2.6 | 3 |
| 9 | Datapod (1-6) Transect (1-2)L' | 3.0 | 0.20 | 2.6-3.2 | 6 |
| 9 | Datapod (1'-6') | 3.5 | 0.36 | 2.9-3.9 | 6 |
| 9B | Mouth | 3.8 | 0.20 | 3.6-4.0 | 5 |
| 9B | Mid-slough | 3.9 | 0.32 | 3.6-4.4 | 5 |
| 9B | Upwelling B | 3.8 | 0.12 | 3.7-4.0 | 6 |
| 11 | Left bank (LB) | 4.9 | 0.79 | 3.8-5.8 | 6 |
| 11 | Mid-slough (M) | 4.7 | 0.50 | 4.2-5.5 | 6 |
| 11 | Right bank (R) | 5.0 | 0.64 | 4.1-5.6 | 6 |
| 11 | Upper pool | 4.4 | 0.11 | 4.2-4.5 | 5 |

[a] Refer to Figures 4II-2-1 to 4II-2-3 for schematic maps of sloughs 8A and 9.

Table 4II-3-6. Data summary for specific conductance (umhos/cm), collected at specified locations in sloughs 8A and 9 during October 3-5, 1982 (raw data in Appendix D).

| Slough | Location[a] | $\bar{X}$ | SD | Range | N |
|---|---|---|---|---|---|
| 8A | Transects (1-11)L | 118 | 16.60 | 98-147 | 11 |
| 8A | Transects (1-11)M | 89 | 6.71 | 84-108 | 11 |
| 8A | Transects (1-11)R | 74 | 16.16 | 44-90 | 11 |
| 8A | Pool (L,M,R) | 139 | -- | 132-152 | 3 |
| 8A | Channel (L,M,R) | 86 | -- | 84-88 | 3 |
| 8A | Side channel | 166 | -- | 115-218 | 2 |
| 8A | Spawning A | 128 | -- | 123-133 | 2 |
| 8A | Spawning B | 111 | -- | 110-112 | 3 |
| 8A | Spawning C | 114 | -- | 111-117 | 3 |
| 9 | Pool A Transect (1-2)L | 215 | 17.77 | 194-233 | 6 |
| 9 | Datapod (1-6) Transect (1-2)L' | 102 | 3.58 | 98-108 | 6 |
| 9 | Datapod (1'-6') | 115 | 2.58 | 111-118 | 6 |
| 9 | Transect (5-6)L | 132 | 6.29 | 121-140 | 10 |
| 9 | Transects (5-6)M | 92 | 3.92 | 89-102 | 10 |
| 9 | Transects (5-6)R | 89 | 1.10 | 87-90 | 10 |
| 9 | Transects (6-10)L | 132 | 5.79 | 122-142 | 8 |
| 9 | Mid-slough | 153 | -- | -- | 1 |
| 9 | Tributary B | 70 | -- | -- | 1 |
| 9 | Tributary B' | 69 | -- | -- | 1 |

Table 4II-3-6 (Continued).

| Slough | Location[a] | $\bar{x}$ | SD | Range | N |
|---|---|---|---|---|---|
| 9 | Tributary B" | 39 | -- | -- | 1 |
| 9 | Pool C | 125 | -- | 119-137 | 4 |
| 9 | Transects (B1-B5) | 94 | 9.73 | 78-103 | 5 |
| 9 | Transects (A1-A5) | 104 | 28.01 | 72-149 | 5 |
| 9 | Transects (C1-C5) | 72 | 4.82 | 65-76 | 5 |
| 9 | Transects (C1'-C5') | 82 | 3.42 | 78-87 | 5 |

[a] Refer to Figures 4II-2-1 to 4II-2-3 for schematic maps of sloughs 8A and 9.

Spawning areas had relatively higher specific conductance. It is likely that water from a side channel entering the left slough side immediately above the spawning location. Specific conductance elevated in downstream locations.

A similar pattern occurred in Slough 9. Low specific conductance on the right side of the slough was undoubtedly due to the effect of a plume extending downstream from the confluence of the Tributary B, B', B" complex (Table 4II-3-6). Specific conductance immediately above the tributary complex (153 umhos/cm) higher than either left, mid, or right bank specific conductance between transects five and six. These data indicate that tributary water remained partially unmixed as far downstream as transect 5 and resulted in a downstream reduction in specific conductance values. This was also evidenced along two parallel transects located below Tributary A. Specific conductance values along the right bank transect (C1-C5) were lower than those in the slough channel, suggesting a "plume effect" due to water entering from Tributary A (values in Tributary A were not obtained).

Ground Water Sources

Relatively high specific conductance was also detected Pool A, Transects (1-2)L and Pool C of Slough 9. Specific conductance in Pool A were the highest encountered. Water was apparently originating from a dry channel bed connecting the slough with the mainstem Susitna River. At Transects (1-2)L the specific conductance along the bank was significantly higher (Mann-Whitney U test, P=0.05) along a parallel transect, six feet into the slough channel. Pool C had a mean specific conductance similar to that at Transects (1-2)L and was also significantly different from water in the slough channel at Datapod (1-6) (Mann-Whitney U test, P=0.05).

In general, sloughs 8A and 9 exhibited the widest ranges in mean intragravel temperatures (Table 4II-3-7). Means within sloughs 9B, 11 and 21 differed by less than 1°C (0.2, 0.7 and 0.3°C, respectively). Undoubtedly, time of year, choice of sampling locations and different levels of sampling effort would effect mean temperature, limiting the application of the above data outside its present context.

In Slough 8A, intragravel water temperatures from Spawning B were lowest, probably reflecting surface water temperatures. This spawning area had more rapidly flowing water than either of the other locations, and water may have inundated the substrate to a greater degree.

In Slough 9, mean intragravel water temperatures were also quite variable between locations. Pool A and Upwelling A temperatures were approximately 1°C warmer than either transect near the datapod, with the warmest and coldest mean intragravel water temperatures at Pool A and Transects (1-2)L, respectively. Intragravel water temperature at Slough 9B were very uniform. Mean temperatures at three locations (Table 4II-3-7) were within 0.2°C. Since all values at Upwelling B were obtained in obvious upwelling vents, the uniformity in temperatures (and standard deviations) suggests that upwelling may be occurring in the other areas as well. However, this conclusion does not comply with

Table 4II-3-7. Data summary for intragravel temperatures (°C) collected at specified locations in sloughs 8A, 9B, 11 and 21 during October 1-5, 1982 (raw data in Appendix D).

| Slough | Location[a] | $\bar{X}$ | SD | Range | N |
|---|---|---|---|---|---|
| 8A | Spawning A | 4.0 | -- | 3.9-4.1 | 2 |
| 8A | Spawning B | 2.6 | -- | 2.1-3.1 | 3 |
| 8A | Spawning C | 4.6 | -- | 4.4-4.9 | 3 |
| 9 | Pool A | 4.2 | 0.33 | 3.8-4.6 | 6 |
| 9 | Upwelling A | 4.0 | 0.32 | 3.6-4.7 | 10 |
| 9 | Transects (1-2)L | 2.8 | 0.24 | 2.7-3.2 | 6 |
| 9 | Transects (1-2)L' | 3.1 | 0.32 | 2.8-3.6 | 6 |
| 9B | Mouth | 3.7 | 0.19 | 3.4-3.9 | 5 |
| 9B | Mid-slough | 3.9 | 0.27 | 3.6-4.3 | 5 |
| 9B | Upwelling B | 3.8 | 0.14 | 3.6-4.0 | 7 |
| 11 | Left bank (LB) | 4.8 | 0.87 | 3.7-5.9 | 6 |
| 11 | Left bank (M) | 4.7 | 0.50 | 4.2-5.5 | 6 |
| 11 | Left bank (RB) | 5.0 | 0.64 | 4.3-5.6 | 6 |
| 11 | Upper pool | 4.3 | 0.10 | 4.2-4.4 | 5 |
| 21 | Transects (4-5)L | 3.4 | 0.15 | 3.3-3.6 | 6 |
| 21 | Transects (4-5)R | 3.1 | 0.05 | 3.0-3.1 | 6 |

[a] Refer to Figures 4II-2-1 to 4II-2-3 for schematic maps of sloughs 8A and 9.

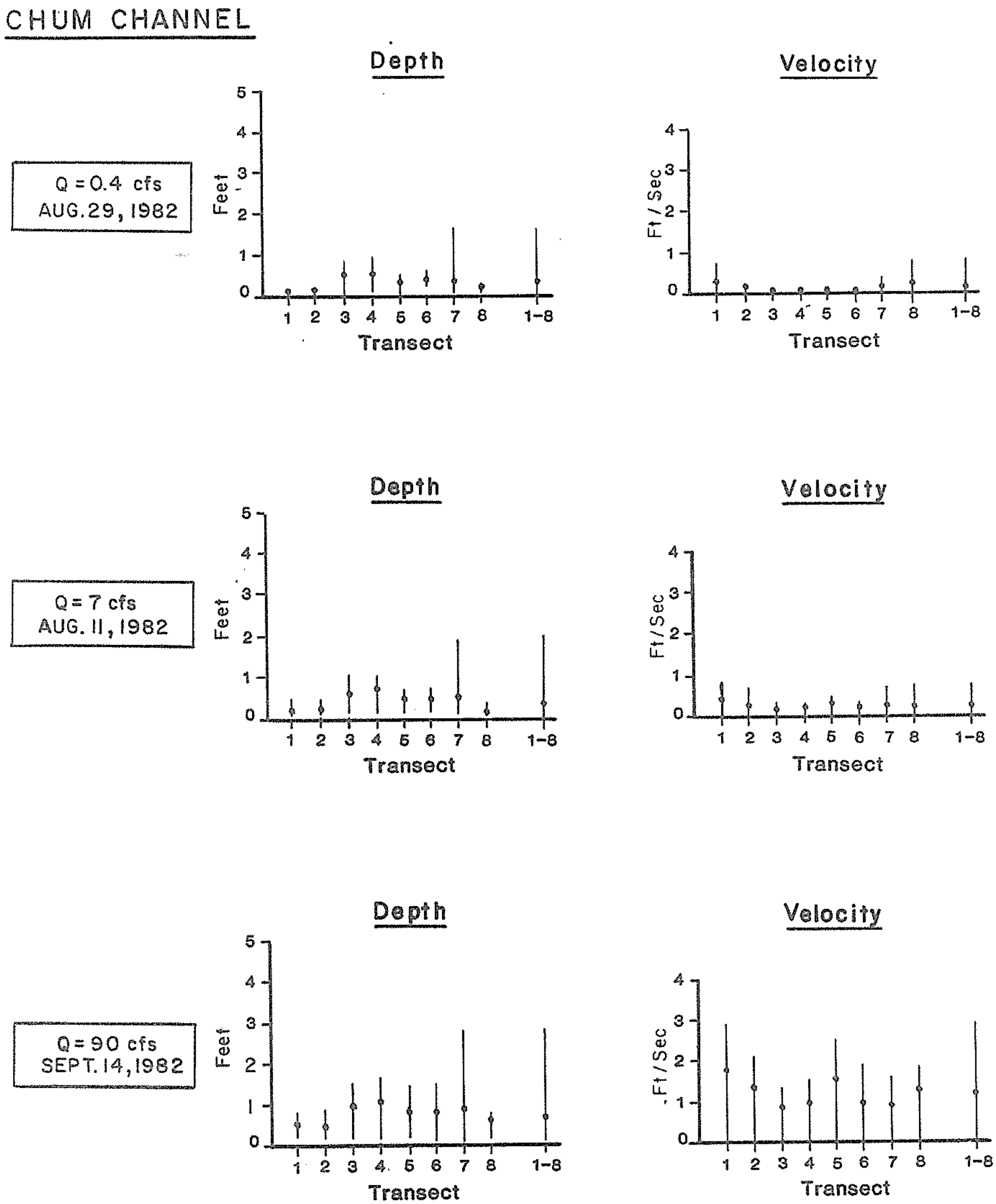



Figure VII-3-32. Depths and velocities (mean and range) of chum channel transects at three discharges in 1982.

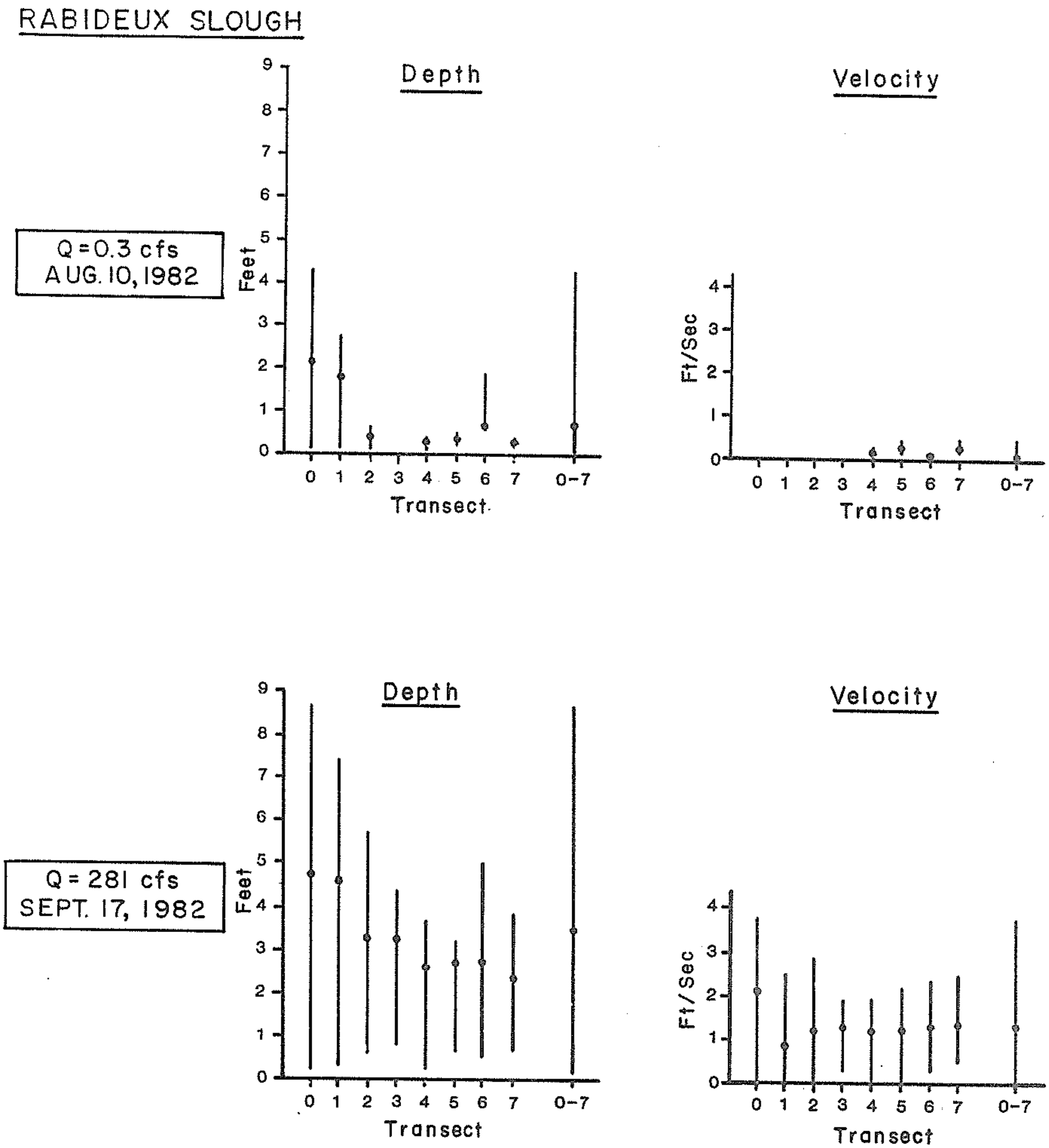



Figure 4/II-3-33. Depths and velocities (mean and range) of Rabideux Slough transects at two discharges in 1982.

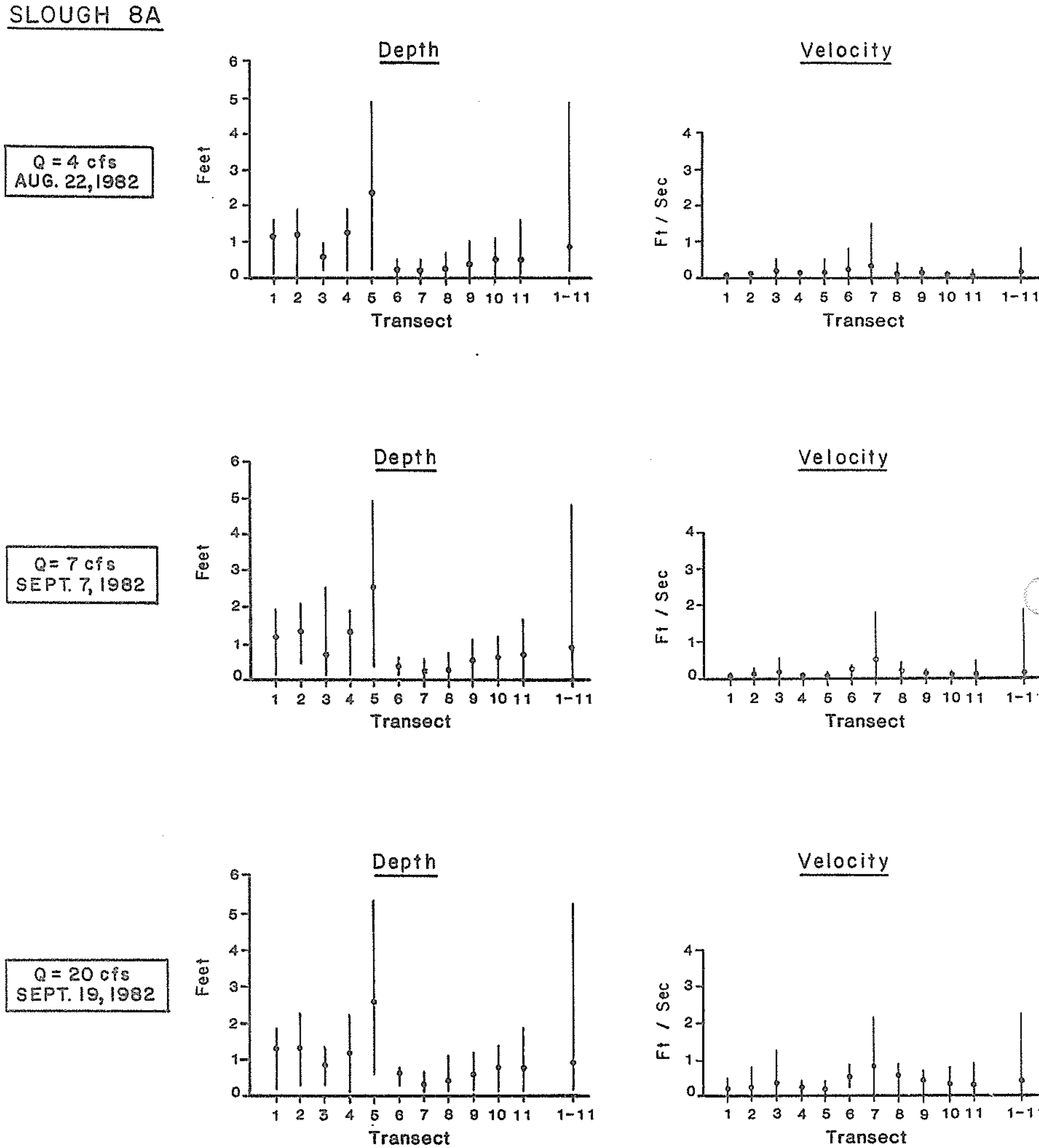
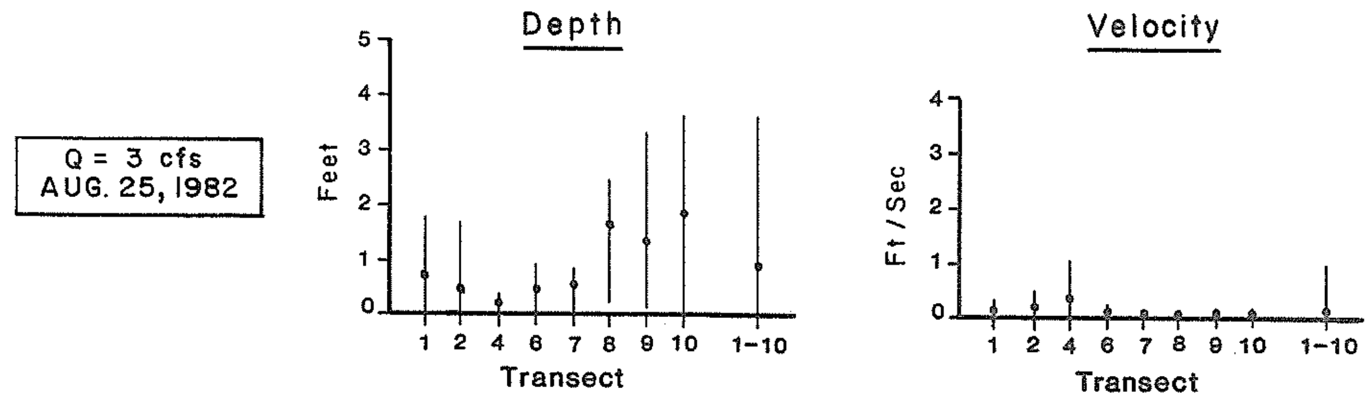



Figure VII-3-34. Depths and velocities (mean and range) of Slough 8A transects at three discharges in 1982.

## SLOUGH 9



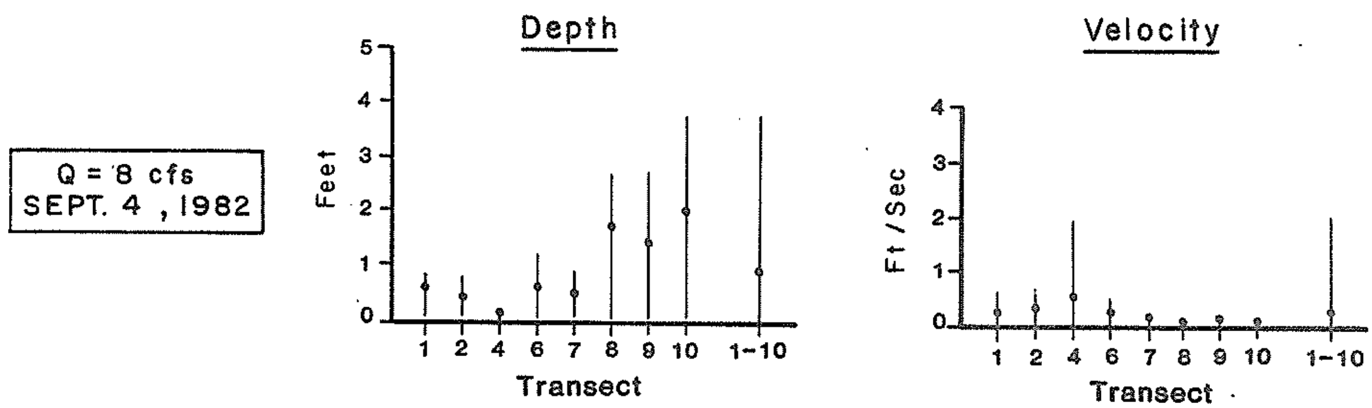




Figure 4II-3-35. Depths and velocities (mean and range) of Slough 9 transects at four discharges 1982.

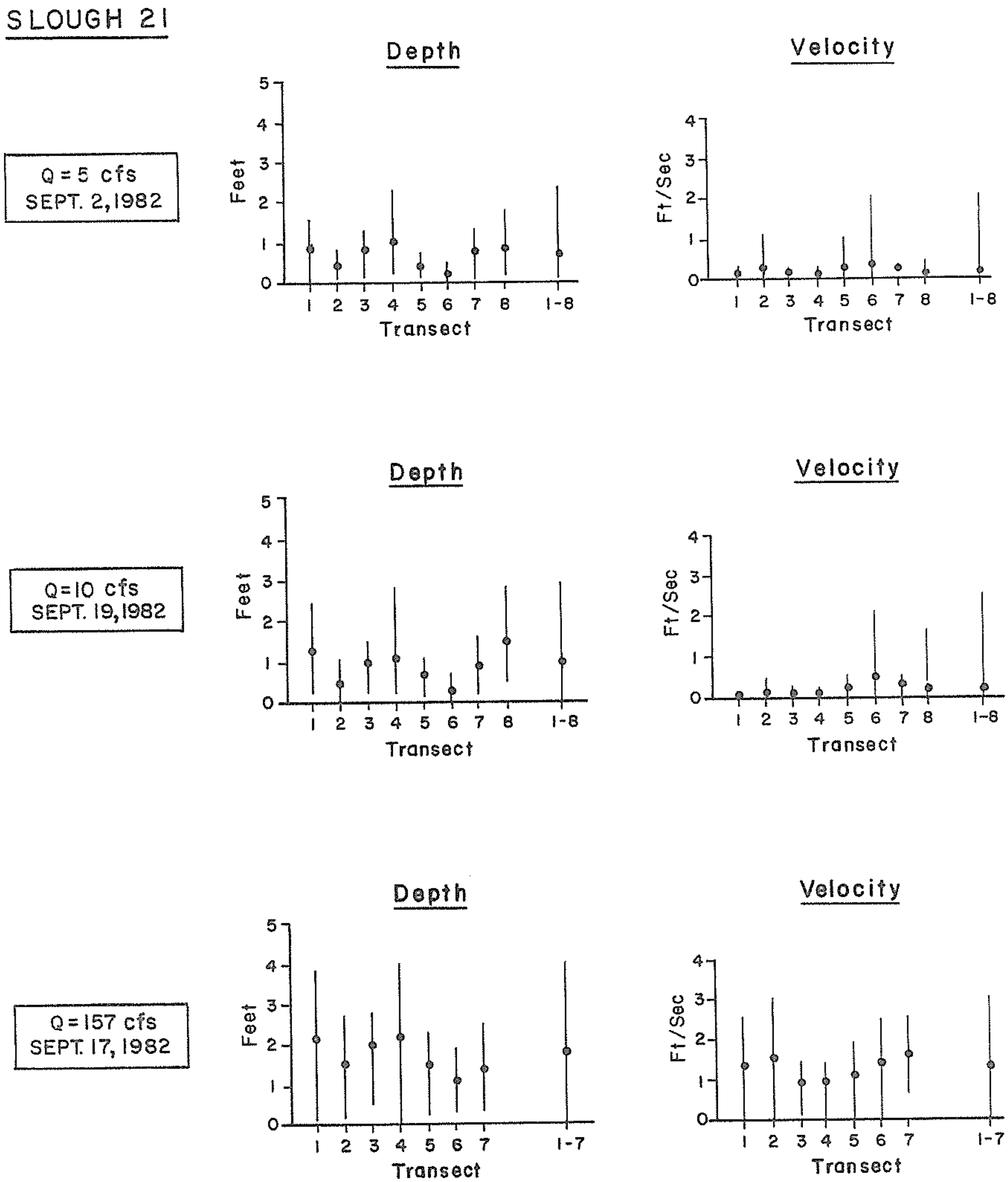



Figure VII-3-36. Depths and velocities (mean and range) of Slough 21 transects at three discharges in 1982.

observations made at the mid-slough location. Although this area was overlain with several inches of silt, no obvious upwelling vents were observed. More data would be necessary to support or refute the above hypotheses.

Mean intragravel water temperatures in Slough 11 were warmer than those in other sloughs, except in the uppermost pool (Table 4II-3-7). Readings in this pool were collected along the left bank where sockeye salmon had selected redds. This is noteworthy, since mean surface water temperatures were typically lower than mean intragravel water temperatures in all sloughs except Slough 11. Intragravel water temperatures in this pool were well below surface water temperature ($\bar{x}$ = 5.2°C). This suggests that one or more warm water sources were not detected. This is understandable since there is little silt in the entire slough, making visual detection of upwelling nearly impossible. To locate all areas of upwelling undoubtedly would have required a much larger sampling effort.

3.1.1.2.4 Available Habitat

Water depths and velocities were sampled across segments, including riffles, runs and pools, of Chum Channel, Rabideux Slough and sloughs 8A, 9 and 21, (Figures 4II-3-32 to 36, Appendix B). At low discharges, a transect with a narrow range of depths and wide range of velocities indicates a riffle. A transect with a wide range of depths and a narrow range of velocities indicates a pool. At higher discharges this relationship is obscured.

The range and weighted mean for each discharge (Figures 4II-3-34 to 36) are compared with the ranges and means of the depths and velocities at chum salmon redds in three sloughs during August and September (Figure 4II-3-37, Appendix B). The means of available and utilized water depths and velocities were approximately the same. However, chum salmon redds were located in the shallower depths, less than 2.5 feet. More samples are needed to verify this relationship at higher discharges. Not enough data are yet available to indicate similar patterns for sockeye and pink salmon which also spawn in these sloughs (Appendix B).

Because chum salmon are the primary users of side slough habitats for spawning, most intragravel temperatures were obtained at chum salmon redds. Temperatures at pink salmon redds were only collected at two redds in Slough 9, and data collected at sockeye redds was primarily limited to Slough 11. With the exception of two redds in Slough 8A, all intragravel temperatures collected at chum redds were between 4.7 and 6.3°C, with most temperatures between 4.5 and 4.9°C.

#### 3.1.2.2.5 General Slough

Water quality data for Whiskers Creek Slough, Slough 6A, Lane Creek Slough, sloughs 9A, 10, 16, 19, 20 and 22 are found in Appendix D. Maps showing substrate, upwelling, and spawning areas are on file at ADF&G Su Hydro office (2207 Spenard Road, Anchorage, Alaska 99503). Detailed maps are not presented in draft due to limitations of time and manpower.

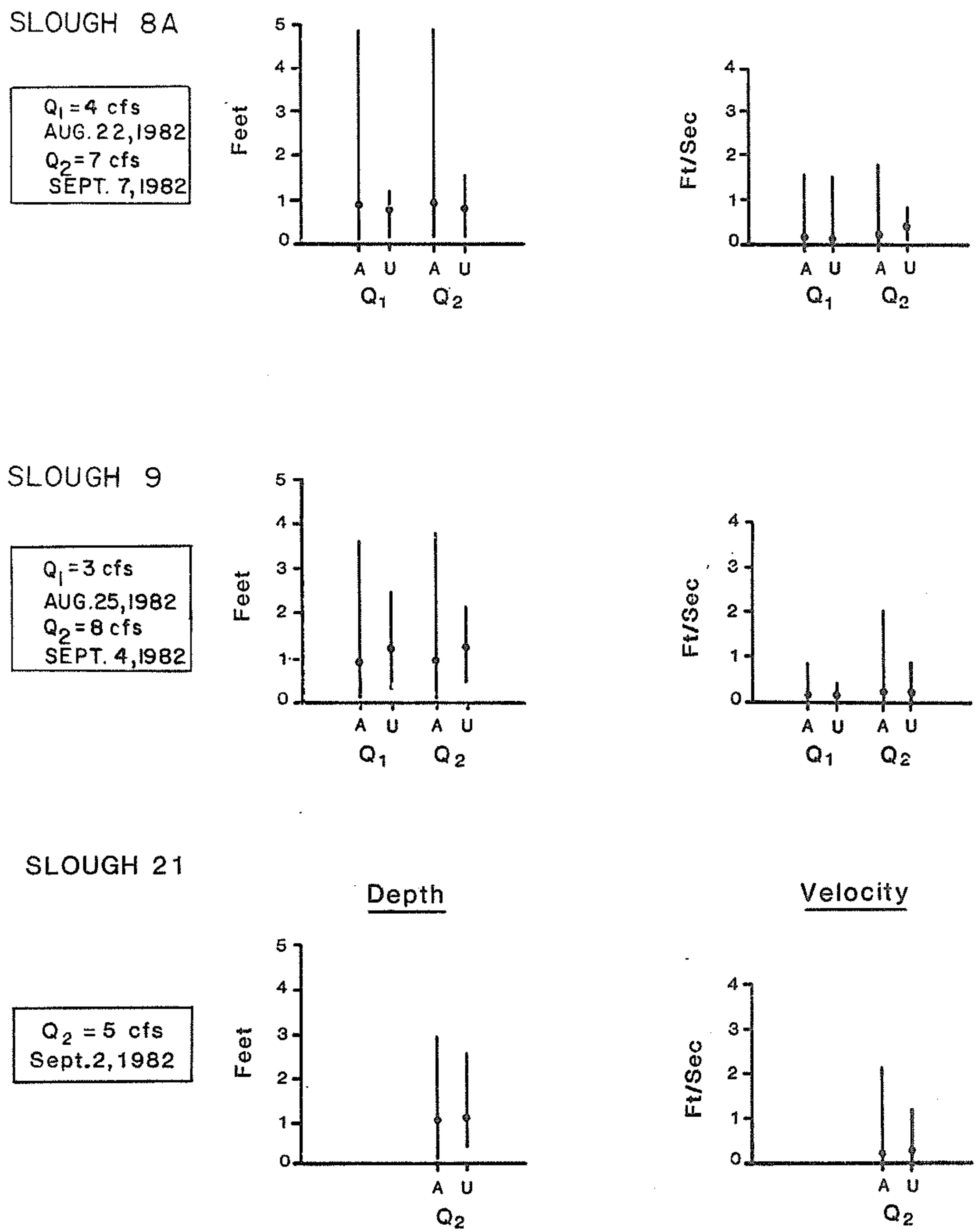



Figure 4II-3-37 Mean and range of depths and velocities available (A) and utilized (U) for chum redds in three sloughs during August 25-26 ($Q_1$) and September 2-7 ($Q_2$), 1982.

### 3.1.2 Sockeye

Sockeye salmon were observed spawning in specific study sloughs, however, they were not fund in large numbers. In Slough 11 (Figures 4II-3-23 to 26) they were observed most often on gravel-rubble substrates in areas of suspected or known groundwater seepage. It should be noted that access to the upper slough area was facilitated by a man-made channel in this slough as shown in Figure 4II-3-25. Prior to high flows, sockeye redds in Slough 21 were found among chum redds in rubble-cobble substrates, below the mouth of the slough. After high flows, they were also located on silt sand substrates in areas above the mouth where upwelling occurred.

### 3.1.3 Pink Salmon

Limited numbers of pink salmon were observed spawning in sloughs 9, 11 and 21 (Figures 4II-3-17 to 31). Gravel-rubble substrates were most commonly chosen. In Slough 9, both areas where pink salmon spawning occurred contained upwelling. Upwellings also were present in several areas where pink salmon were found in Slough 11.

### 3.1.4 Coho Salmon

Slough 8A is the only specific study slough where coho salmon were observed spawning. Most of their spawning activity occurred in areas where rubble-cobble substrate and ground water seepage were present (Figures 4II-3-13 to 15).

### 3.1.5 Chinook Salmon

Adult chinook salmon spawning occurred exclusively in tributaries and were not addressed in this study.

### 3.1.6 Eulachon

Twenty sites (Figure 4II-3-38) were surveyed for their spawning habitat utilizing the procedures outlined in the methods section. These include:

| Site Number | River Mile | Geographic Code |
|---|---|---|
| 1 | 26.0 | S17N07W22DAA |
| 2 | 25.9 | S17W07W22DDA |
| 3 | 26.3 | S17N07W23CAB |
| 4 | 25.5 | S17N02W22CAA |
| 5 | 25.8 | S17N07W22DCD |
| 6 | 21.4 | S16N07W04CAC |
| 7 | 18.2 | S16N07W15CDB |
| 8 | 16.5 | S16N07W22DCD |
| 9 | 44.0 | S19N05W20CAC |
| 10 | 41.3 | S19N06W25CCD |
| 11 | 28.0 | S17N07W13DBB |
| 12 | 31.1 | S17N06W18BAA |
| 13 | 31.8 | S17N06W05ABA |
| 14 | 15.0 | S16N07W35BDD |

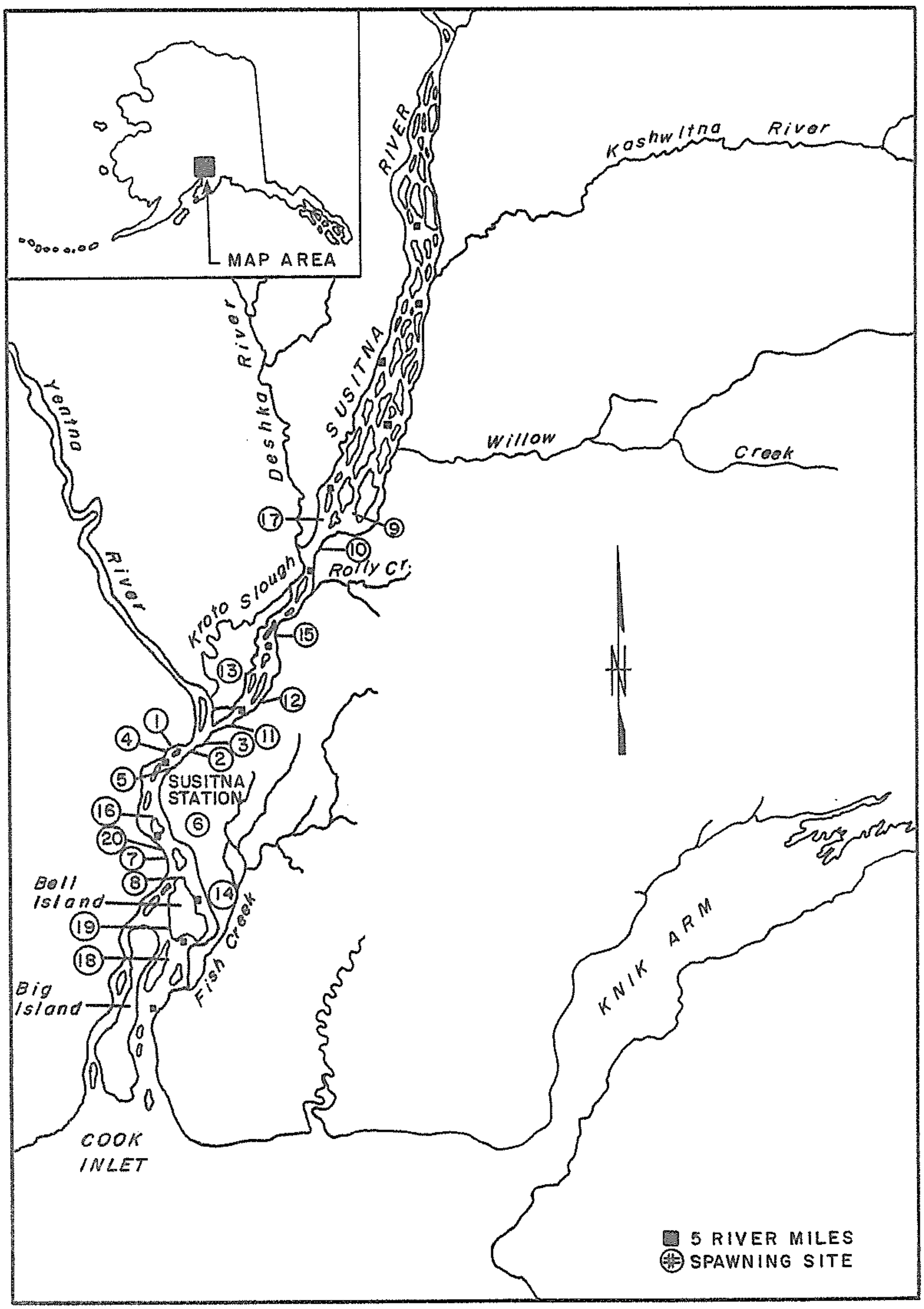



Figure 4II-3-36 Eulachon spawning sites surveyed for habitat characteristics on the Susitna River: May 24 - June 7, 1982.

| Site Number | River Mile | Geographic Code |
|---|---|---|
| 15 | 35.5 | S18N06W15CCC |
| 16 | 22.8 | S16N07W04BBA |
| 17 | 43.3 | S19N06W24ACC |
| 18 | 8.5 | S14N07W22ACA |
| 19 | 11.0 | S15N07W10DCC |
| 20 | 18.3 | S16N07W15CDB |

Water quality measurements were taken at 12 other sites (Table 4II-3-8) where it could not be determined whether eulachon were milling, migrating or spawning, using criteria outlined in the methods section. These sites include:

Planimetric maps identify spawning areas at each site (Figures 4II-3-39 to 58). Water quality, mean spawning depths, mean spawning velocities and substrates are tabulated for each site (Table 4II-3-9, Figures 4II-3-59 and 4II-3-60).

The water temperatures of the Susitna River at Susitna Station (RM 25.5) are graphed (Figure 4II-3-61). Mean daily water temperature and provisional discharge data (USGS 1982) for the Susitna River at Susitna Station are plotted with catch per unit effort (catch per minute per net) calculated for the gill net sets at high tides May 17 through June 9, 1982 (Figure 4II-3-62; refer also to Volume 2).

Table 411-3-8. Eulachon spawning site evaluations on the Susitna River: May 24 - June 7, 1982.

| Site | Date | Water Temp (°C) | pH | Conductance (umhos/cm) | Dissolved Oxygen (mg/l) | Mean Spawning Depth (ft) | Standard Deviation | Velocity (ft/sec) | Standard Deviation | Substrate |
|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 820531 | 8.5 | 7.1 | 96 | 11.1 | 1.4 | 0.5 (n=15)[a] | 1.5 | 0.3 | Silty sand interspersed with 10% gravel. |
| 2 | 820531 | 9.3 | 6.7 | 73 | 10.8 | 1.9 | 0.5 (n=18)[a] | 1.1 | 0.6 | Silty sand interspersed with 20% gravel and cobble. |
| 3 | 820531 | 8.8 | 7.1 | 66 | 10.9 | 2.1 | 0.4 (n=16)[a] | 0.8 | 0.3 | Silty sand interspersed with 10% gravel. |
| 4 | 820531 | 11.1 | 7.1 | 95 | 10.3 | 3.1 | 0.8 (n-10)[a] | 0.8 | 0.3 | Silty sand with 30-50% gravel and cobble present. |
| 5 | 820601 | 9.3 | 7.0 | 72 | 10.7 | 2.7 | 10. (n=12)[a] | 1.8 | 0.5 | 30% silty sand<br>30% gravel<br>30% rubble<br>10% cobble |
| 6 | 820601 | 10.2 | 6.7 | 72 | 8.2 | 2.2 | 0.7 (n=24)[a] | 1.3 | 0.4 | Silty sand intermixed with 40% gravel and 20% rubble. |
| 7 | 820601 | 11.2 | 6.8 | 100 | 7.5 | 1.8 | 0.7 (n=33)[a] | 1.2 | 0.7 | Silty sand mixed with 40% gravel and 20% rubble. |
| 8 | 820601 | 11.2 | 6.7 | 102 | 6.4 | 1.2 | 0.4 (n=16)[a] | 1.9 | 0.4 | 100% silt |
| 9 | 820603 | 8.3 | 7.5 | 41 | 12.4 | 1.9 | 0.5 (n=27)[a] | 1.7 | 0.5 | Silty sand interspersed with 30% rubble. |
| 10 | 820604 | 8.3 | 7.1 | 46 | 10.8 | 2.0 | 0.6 (n=16)[a] | 0.7 | 0.5 | 100% silt |
| 11 | 820605 | 7.9 | 7.2 | 63 | 11.0 | 1.9 | 0.8 (n=24)[a] | 0.7 | 0.5 | 100% silt |

[a] Sample size.

Table 411-3-8 (Continued).

| Site | Date | Water Temp (°C) | pH | Conductance (umhos/cm) | Dissolved Oxygen (mg/l) | Depth (ft) | Mean Spawning Standard Deviation | Velocity (ft/sec) | Standard Deviation | Substrate |
|---|---|---|---|---|---|---|---|---|---|---|
| 12 | 820605 | 7.9 | 7.2 | 64 | 11.5 | 1.1 | 0.5 (n=18)[a] | 1.4 | 0.9 | 50% gravel 30% rubble 10% cobble 10% silt |
| 13 | 820605 | 8.2 | 7.2 | 67 | 10.6 | 1.9 | 0.6 (n=14)[a] | 0.9 | 0.4 | 100% silt |
| 14 | 820606 | 7.6 | 7.1 | 69 | 10.2 | 1.2 | 0.6 (n=29)[a] | 1.6 | 0.8 | 30% silty sand 50% gravel 20% cobble |
| 15 | 820607 | 7.1 | 7.0 | 51 | 12.3 | 1.7 | 0.6 (n=21)[a] | 1.8 | 0.8 | 30% gravel 40% rubble 20% cobble 10% silty sand |
| 16 | 820530 | 6.3 | 7.0 | 64 | 12.2 | 1.9 | 0.8 (n=17)[a] | 0.9 | 0.6 | Sand intermixed with 20% gravel. |
| 17 | 820524 | (hydrolab malfunction) | | | | 1.7 | 0.9 (n=10)[a] | 0.7 | 0.3 | Sand intermixed with 10% silt and gravel. |
| 18 | 820526 | 6.2 | 6.6 | 70 | 11.9 | 1.8 | 0.8 (n=6)[a] | 0.9 | 0.5 | Sand interspersed with 5% gravel. |
| 19 | 820526 | 6.3 | 6.3 | 71 | 11.3 | 2.3 | 0.5 (n=6)[a] | 0.6 | 0.2 | Sand interspersed with 10% gravel. |
| 20 | 820526 | 6.9 | 6.8 | 82 | 10.9 | 2.0 | 1.0 (n=3)[a] | 0.9 | 0.5 | 80% gravel intermixed with 70% sand. |

[a] Sample size.

283

Table 411-3-9. Miscellaneous eulachon spawning site habitat evaluations on the Susitna River: May 16 - June 12, 1982.

| Site | River Mile | Date | Water Temp (°C) | pH | Specific Conductance (umhos/cm) | Dissolved Oxygen (mg/l) | Notes |
|---|---|---|---|---|---|---|---|
| Misc. 1 | 19.5 | 820601 | 10.0 | 6.7 | 72 | 7.9 | |
| Misc. 2 | 41.1 | 820603 | 6.8 | 7.2 | 40 | 10.4 | |
| Misc. 3 | 47.0 | 820602 | 9.2 | 7.2 | 61 | 11.5 | |
| Misc. 4 | 5.0 | 820605 | 8.7 | 7.1 | 77 | 9.5 | West Bank gill net site |
| Misc. 5 | 5.0 | 820538 | 6.1 | 6.8 | 78 | 11.9 | West Bank gill net site |
| Misc. 6 | 5.5 | 820528 | 6.3 | 6.8 | 73 | 12.0 | East Bank gill net site |
| Misc. 7 | 16.5 | 820528 | 6.8 | 6.9 | 81 | 11.3 | Spawning site #8 |
| Misc. 8 | 24.8 | 820530 | 6.1 | 6.9 | 70 | 12.0 | |
| Misc. 9 | 36.7 | 820529 | 6.4 | 6.8 | 66 | 12.0 | |
| Misc. 10 | 42.7 | 820529 | 6.1 | 6.9 | 65 | 12.2 | |
| Misc. 11 | 49.0 | 820529 | 6.1 | 6.8 | 65 | 12.1 | |
| Misc. 12 | 49.2 | 820529 | 5.0 | 6.9 | 46 | 12.0 | Mouth of Willow Creek |

2-85

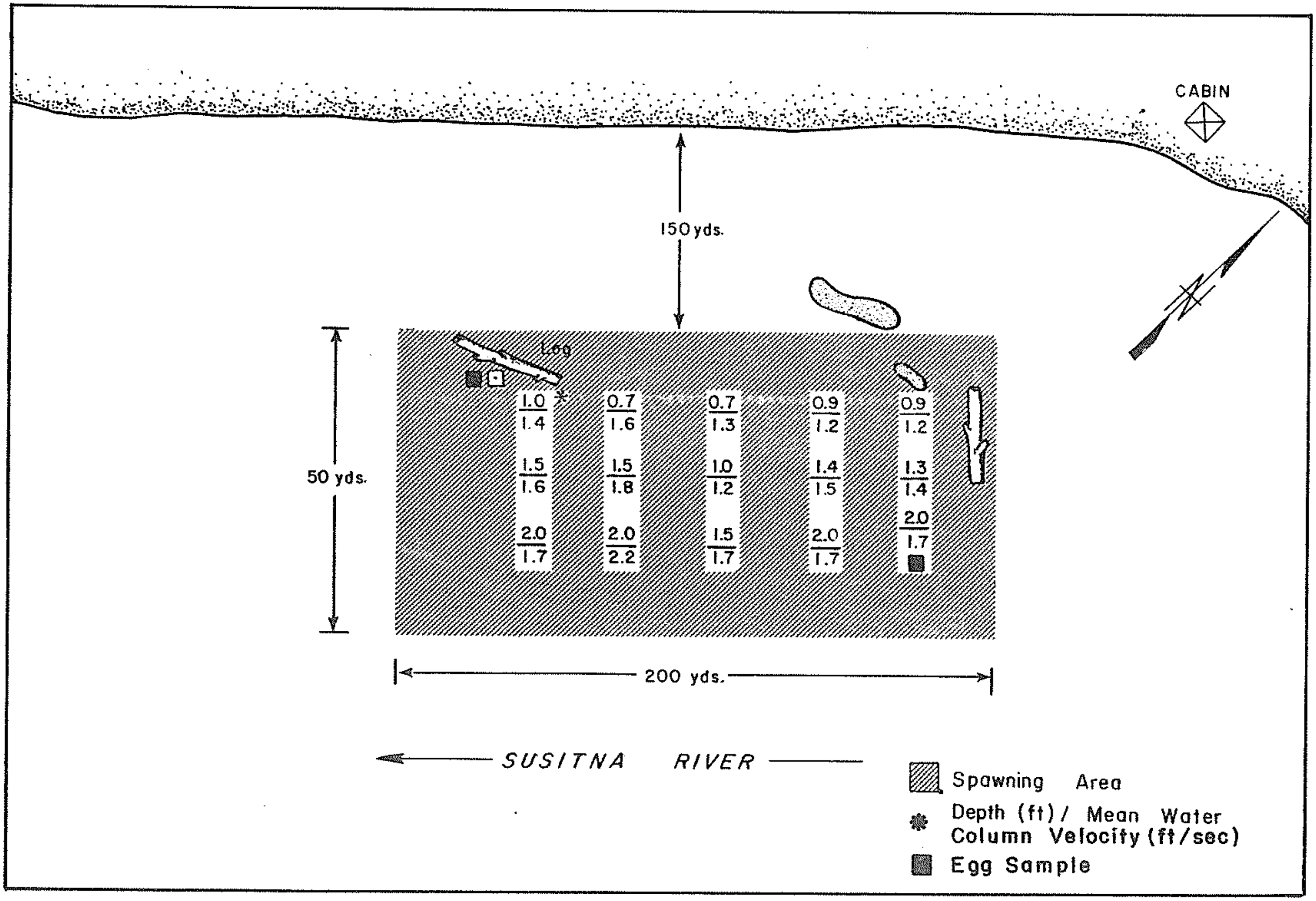



Figure 4II-3-39. Eulachon spawning area on the Susitna River at RM 26.0, GC S17N07W22DAA: May 31, 1982.

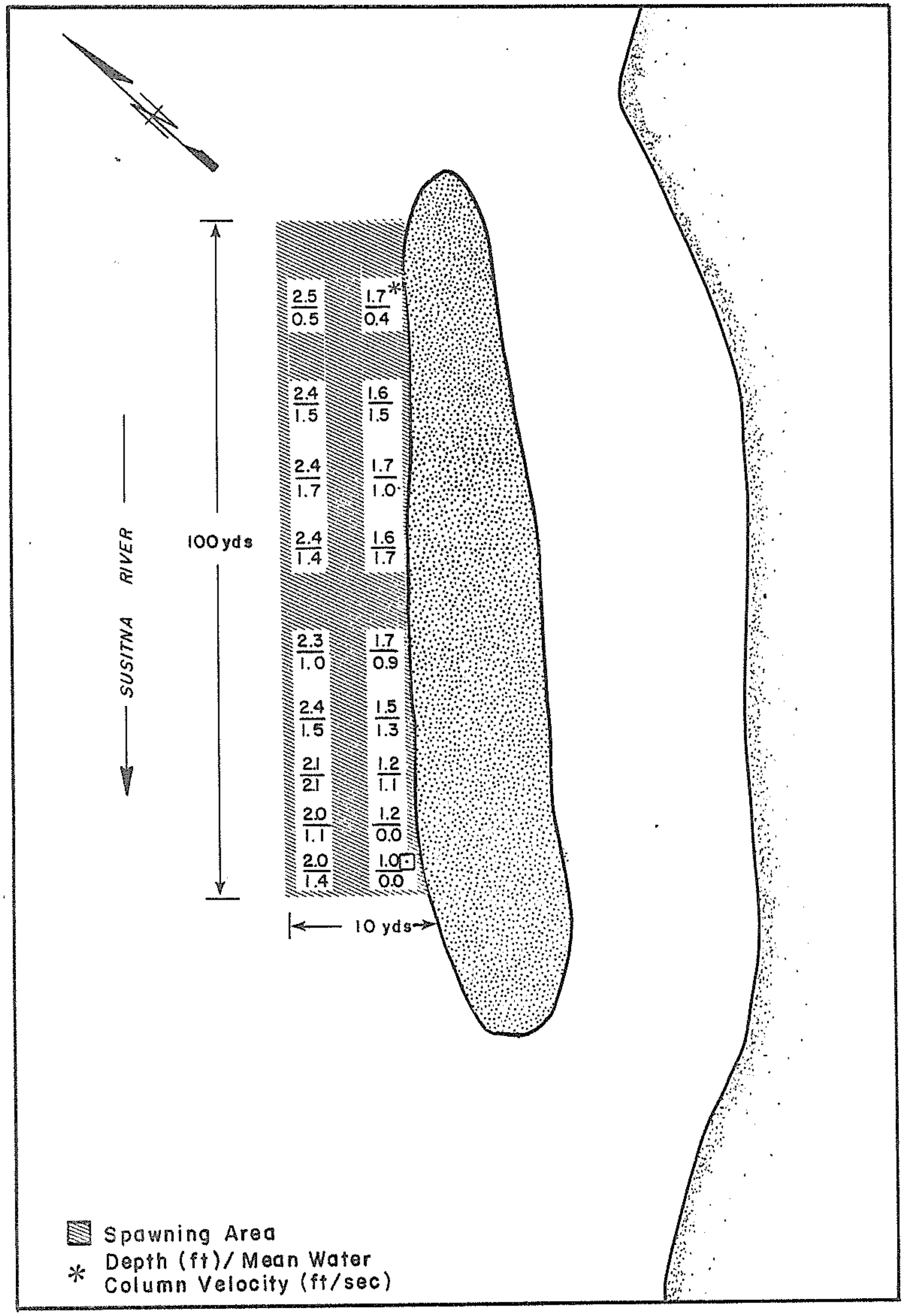



Figure 4II-3-40. Eulachon spawning area on the Susitna River at RM 25.9, GC S17N07W22DDA: May 31, 1982.

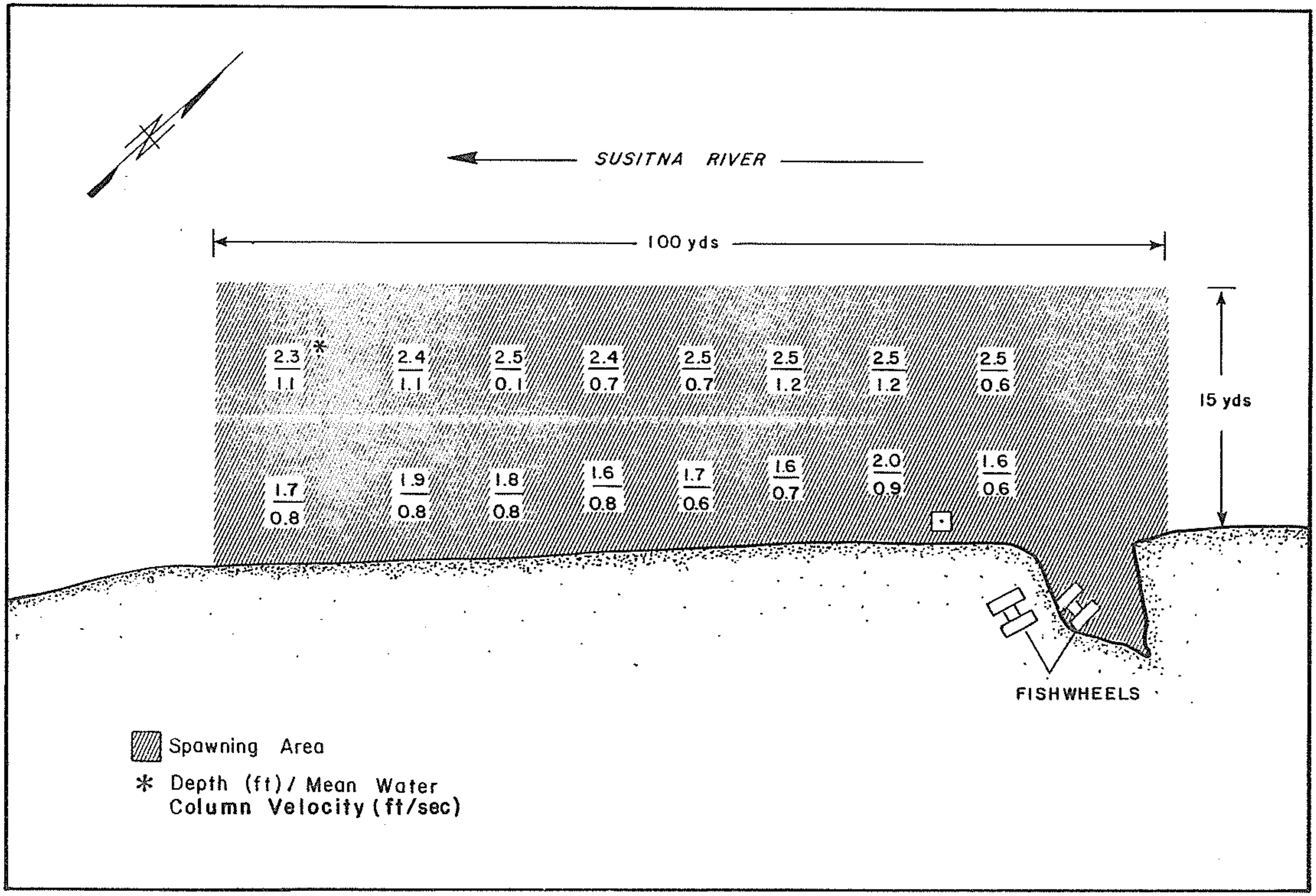



Figure 4II-3-41. Eulachon spawning area on the Susitna River at RM 26.3, GC S17N07W23CAB: May 31, 1982.

287

288

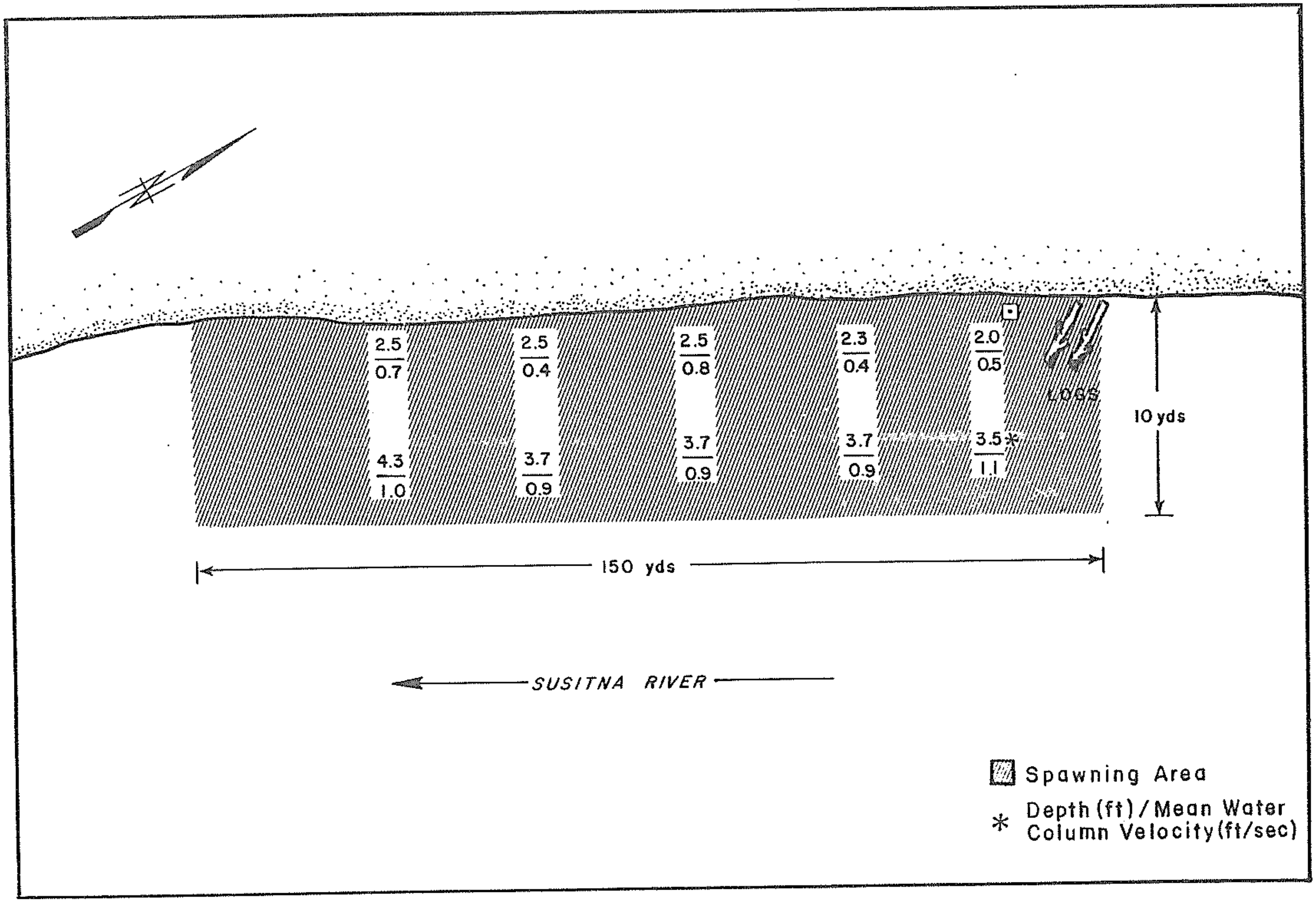



Figure 4II-3-42 Eulachon spawning area on the Susitna River at RM 25.5, GC S17N07W22CAA: May 31, 1982.

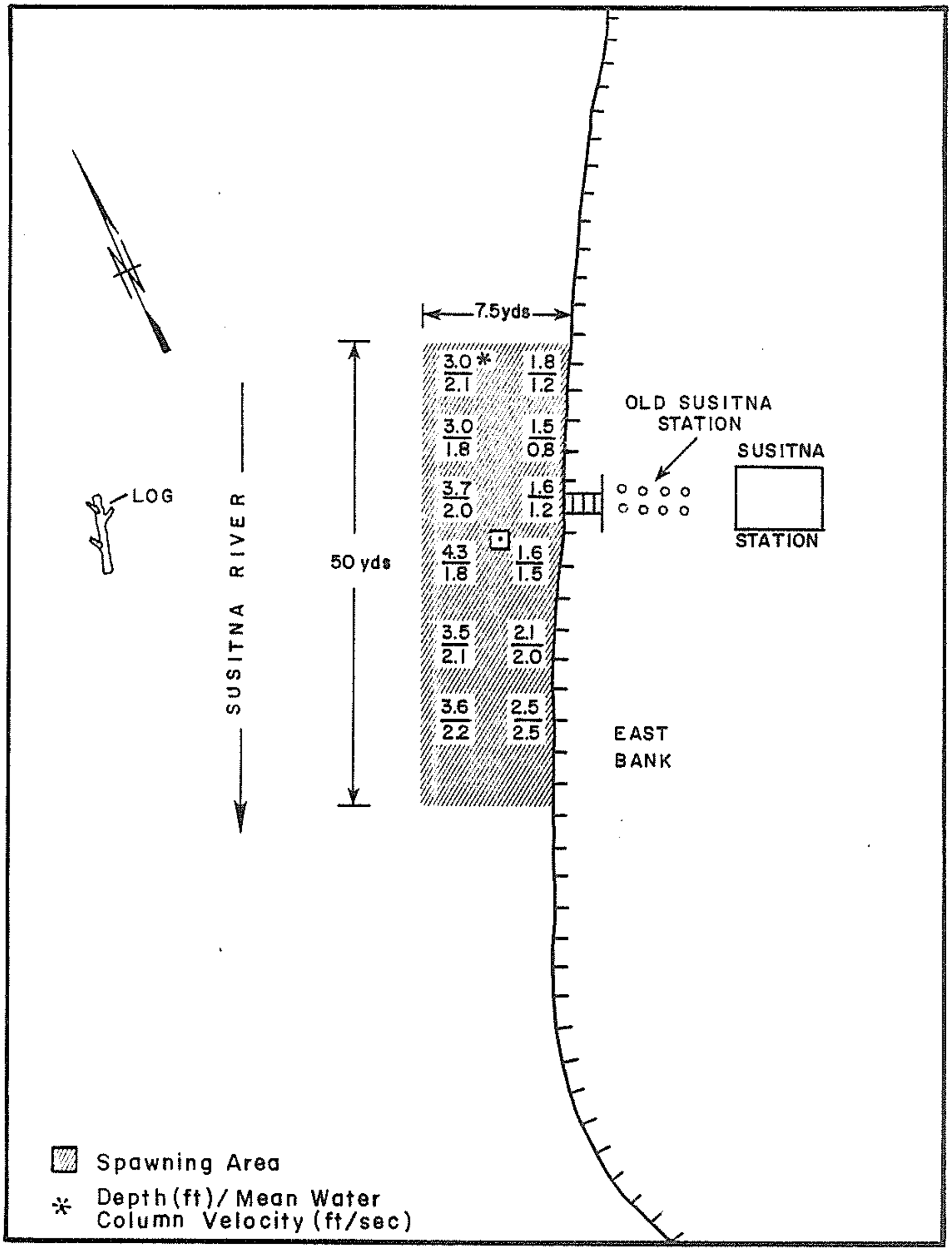



Figure 4II 3-43 Eulachon spawning area on the Susitna River at RM 25.8, GC S17N07W22DCD: June 1, 1982.

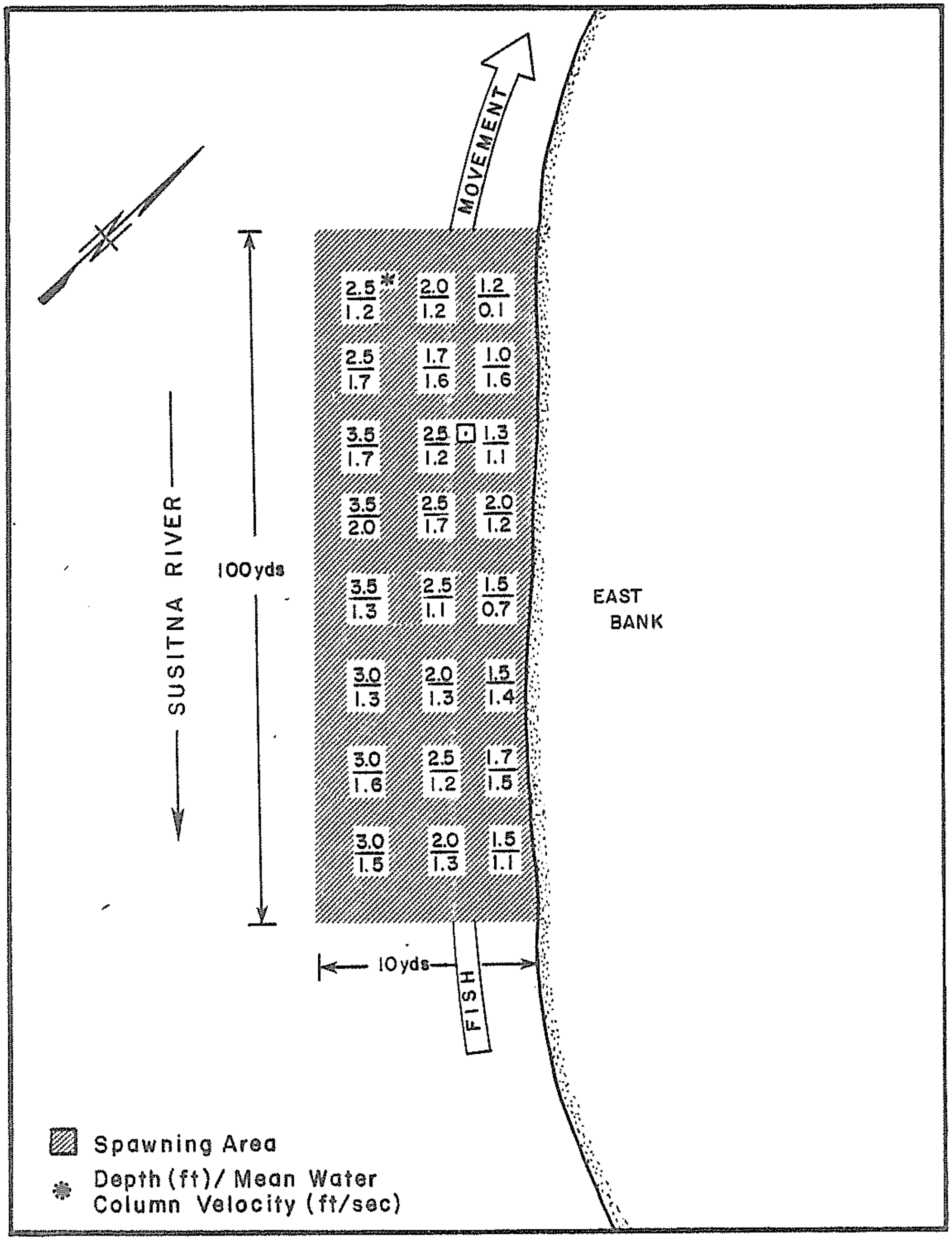



Figure VII-3-44 Eulachon spawning area on the Susitna River at RM 21.4, GC S16N07W04CAC: June 1, 1982.

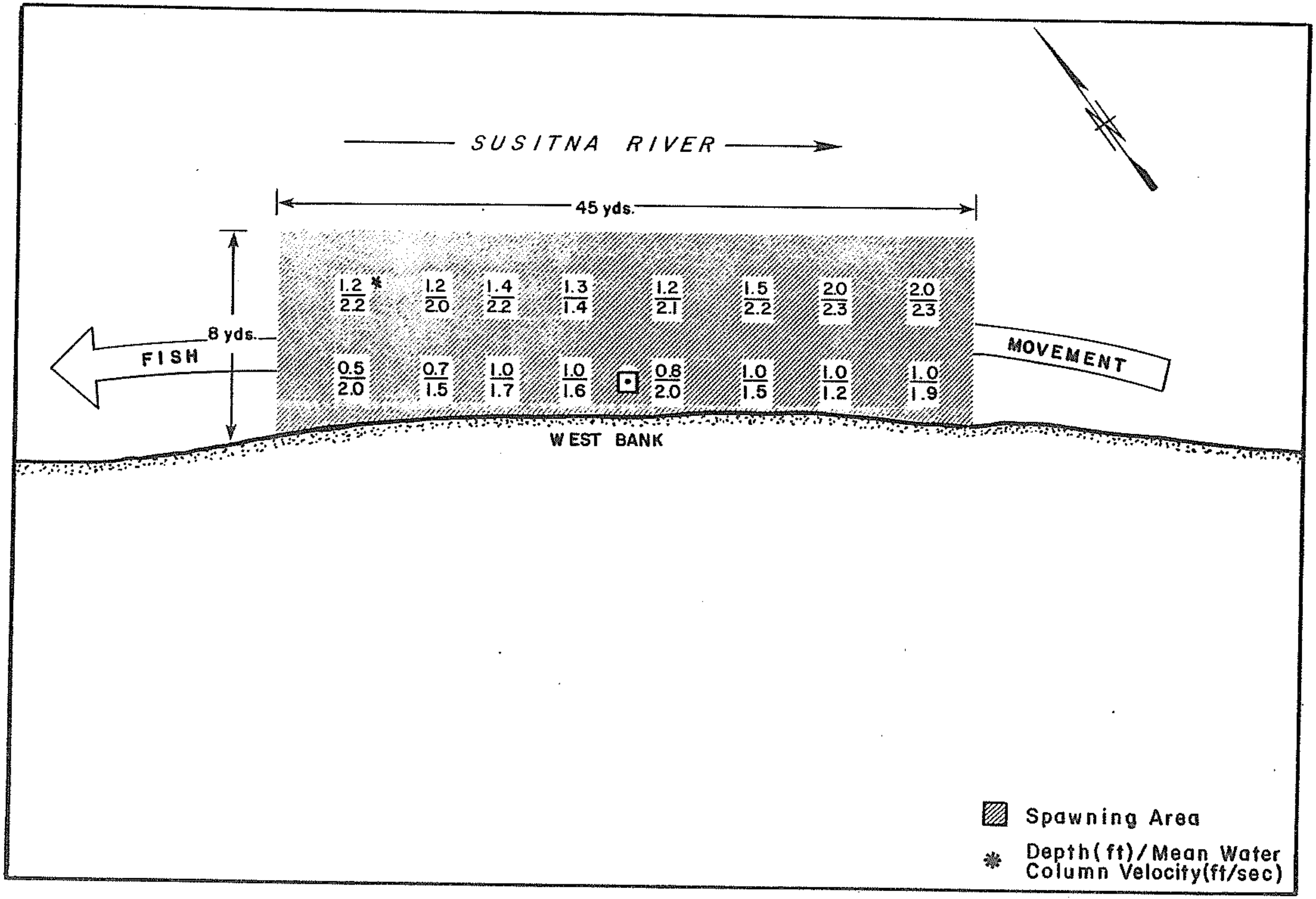



Figure 4II-3-45 Eulachon spawning area on the Susitna River at RM 18.2, GC S16N07W15CDB: June 1, 1982.

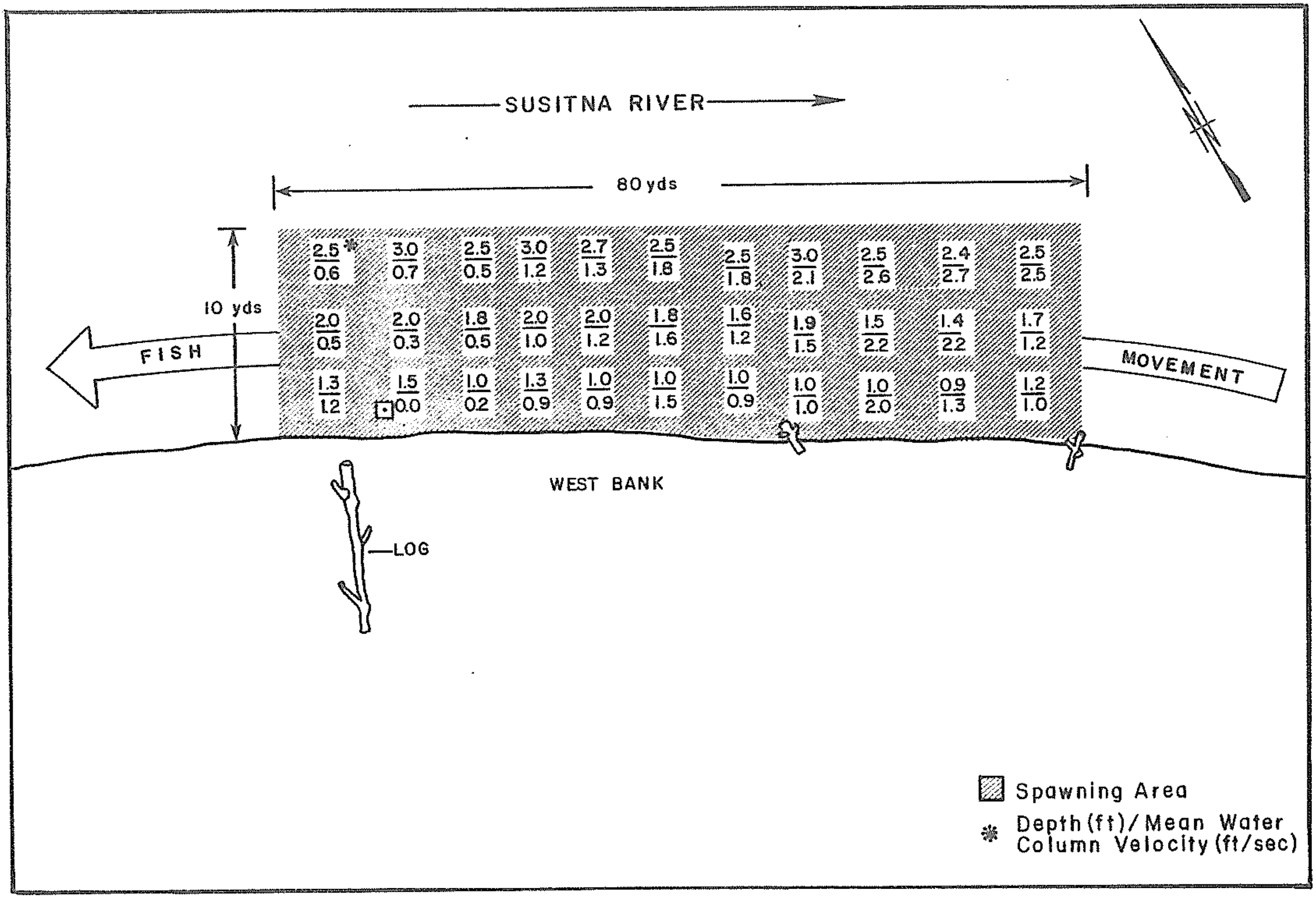



Figure Eulachon spawning area on the Susitna River at RM 16.5, GC S17N07W22DCD: June 1, 1982.

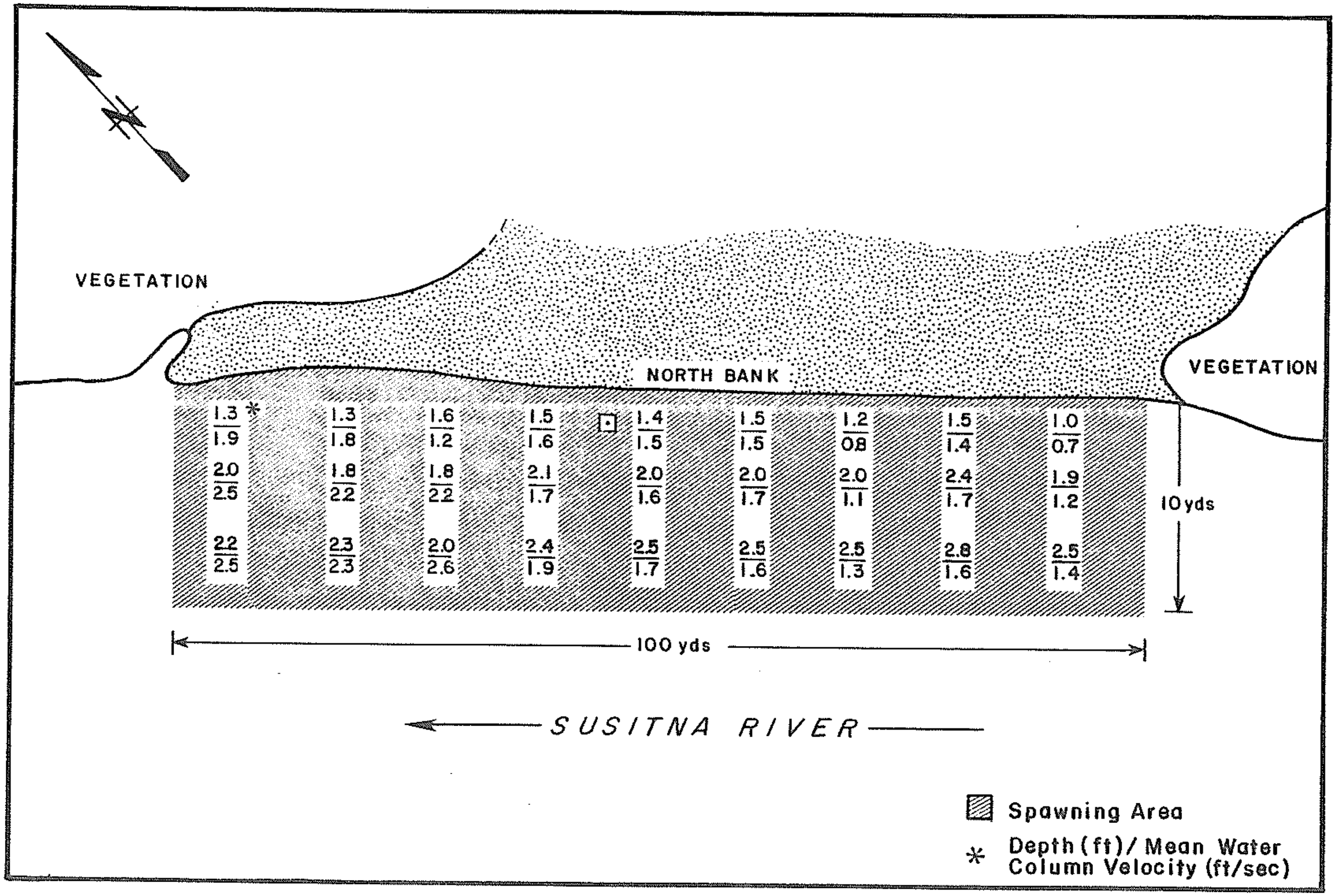



Figure 4II-3-47 Eulachon spawning area on the Susitna River at RM 44.0, GC S19N05W20CAC: June 3, 1982.

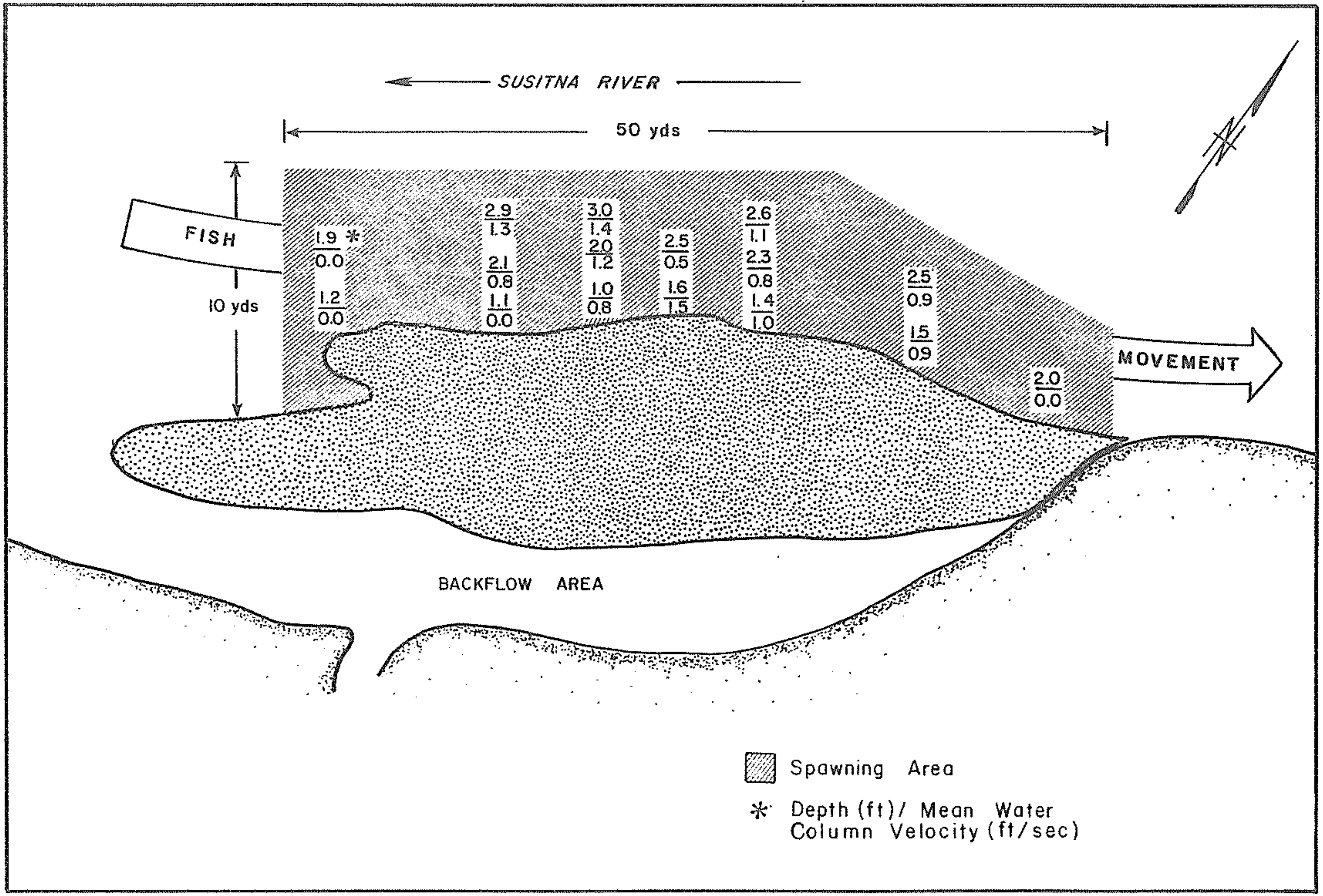



Figure 4II-3-13 Eulachon spawning area on the Susitna River at RM 41.3. GC S19N06W25CCD: June 4, 1982.

294

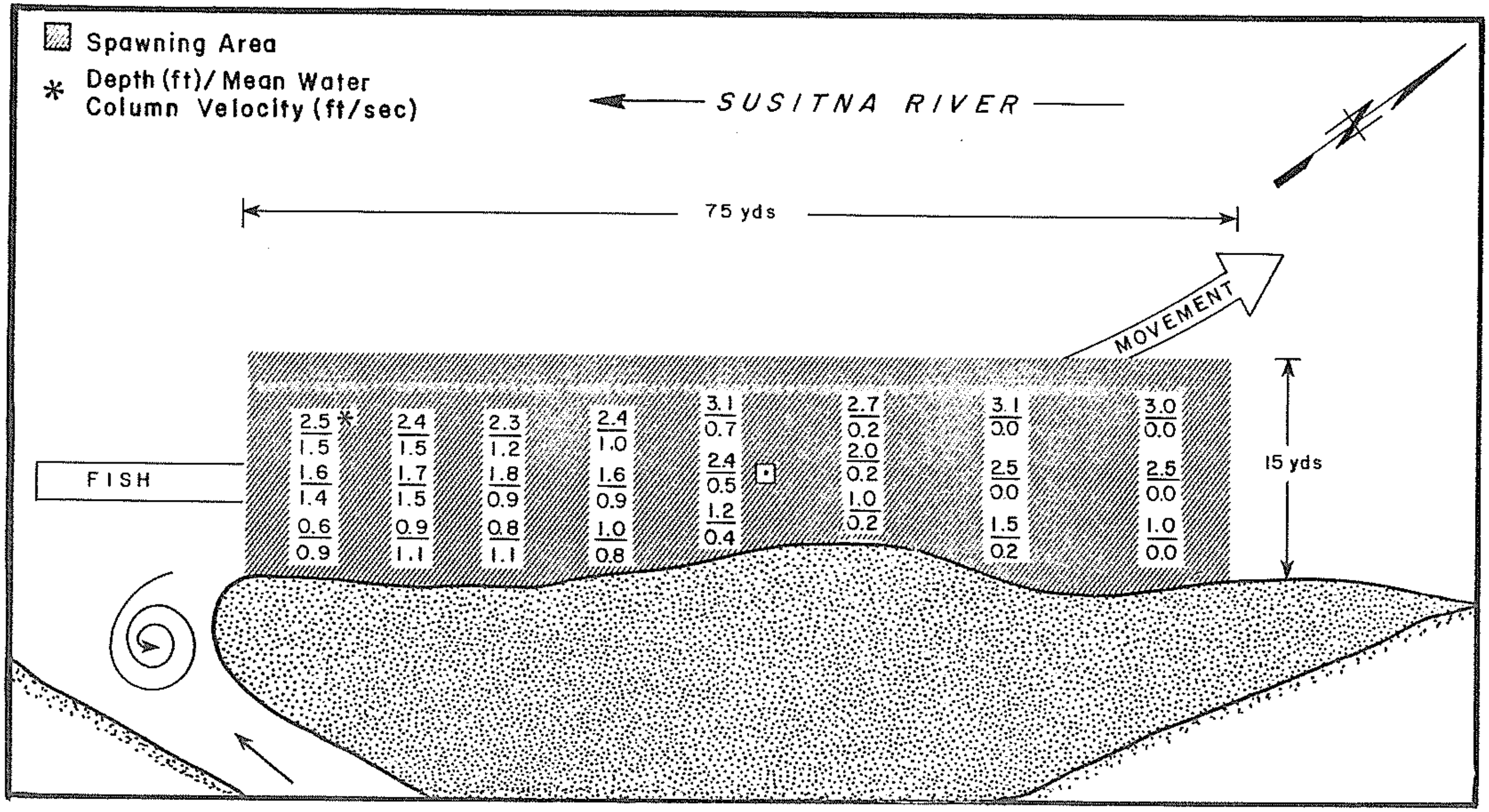



Figure 4II-3-49 Eulachon spawning area on the Susitna River at RM 28.0, GC S17N07W13DBB: June 5, 1982.

296

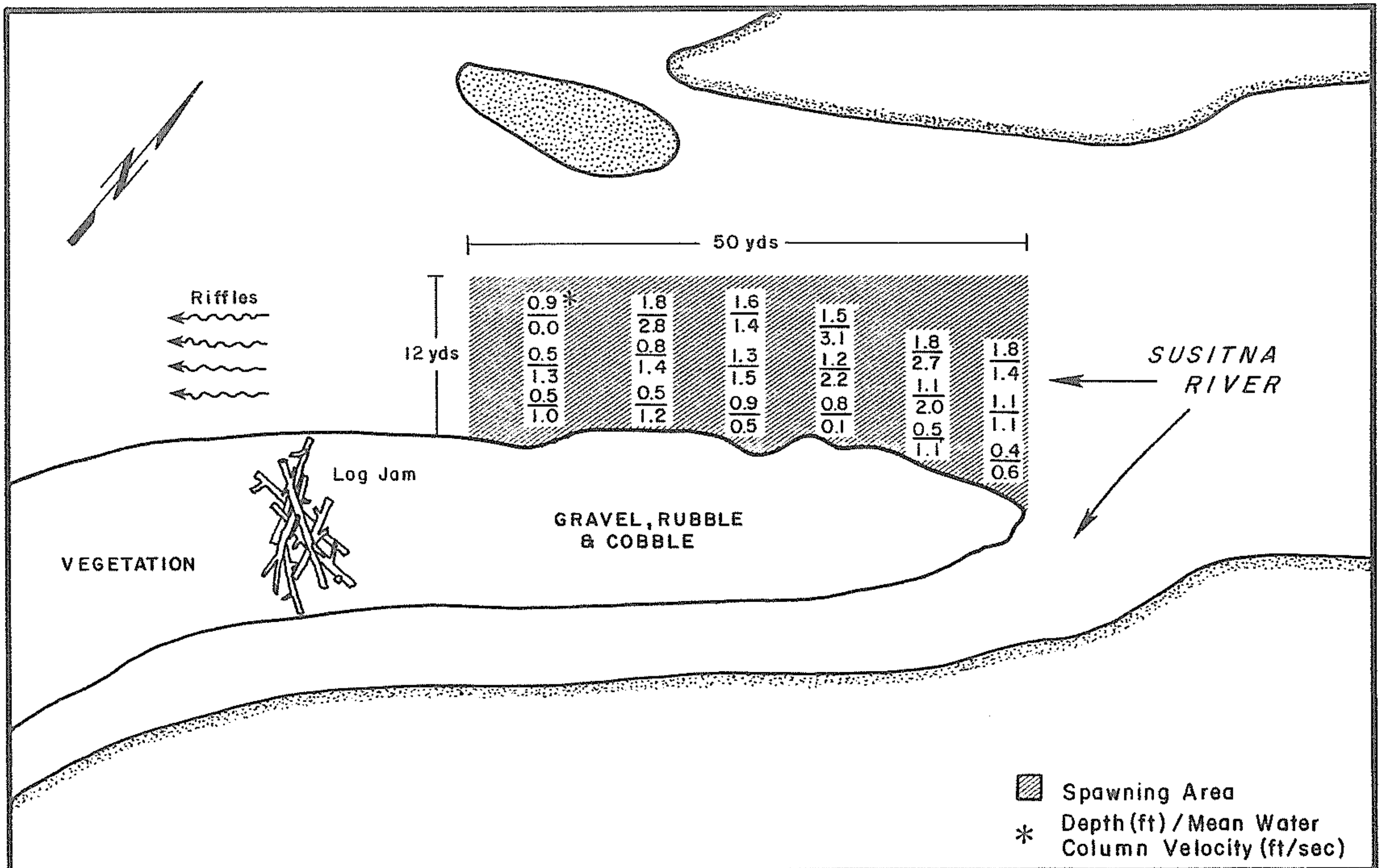



Figure 4E-3-56 Eulachon spawning area on the Susitna River at RM 31.1, GC S17N06W18BAA: June 5, 1982.

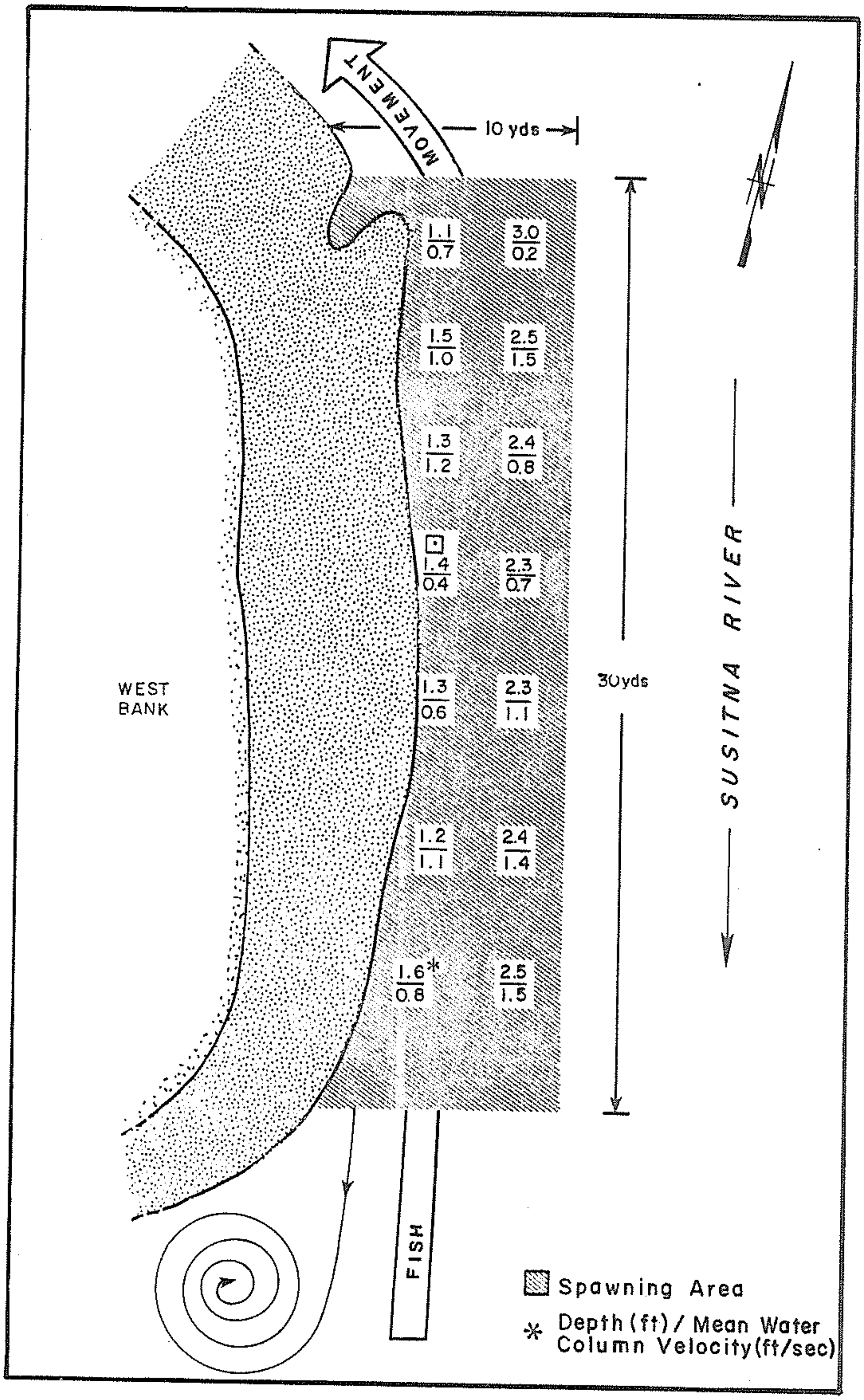



Figure 4II-3-51 Eulachon spawning area on the Susitna River at RM 31.8, GC S17N06W05ABA: June 5, 1982.

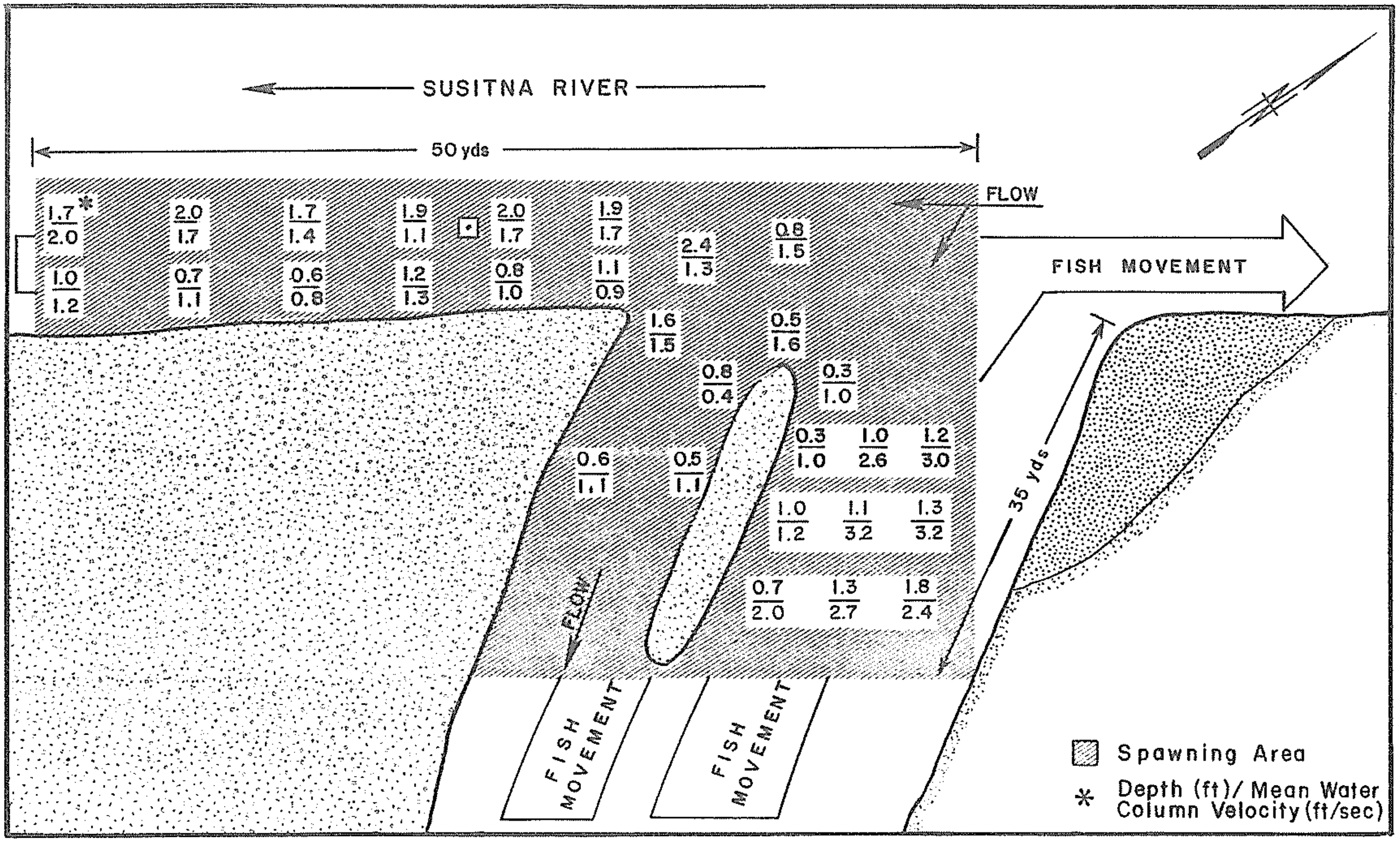



Figure 4II-3-32 Eulachon spawning area on the Susitna River at RM 15.0, GC S16N07W35BDD: June 6, 1982.

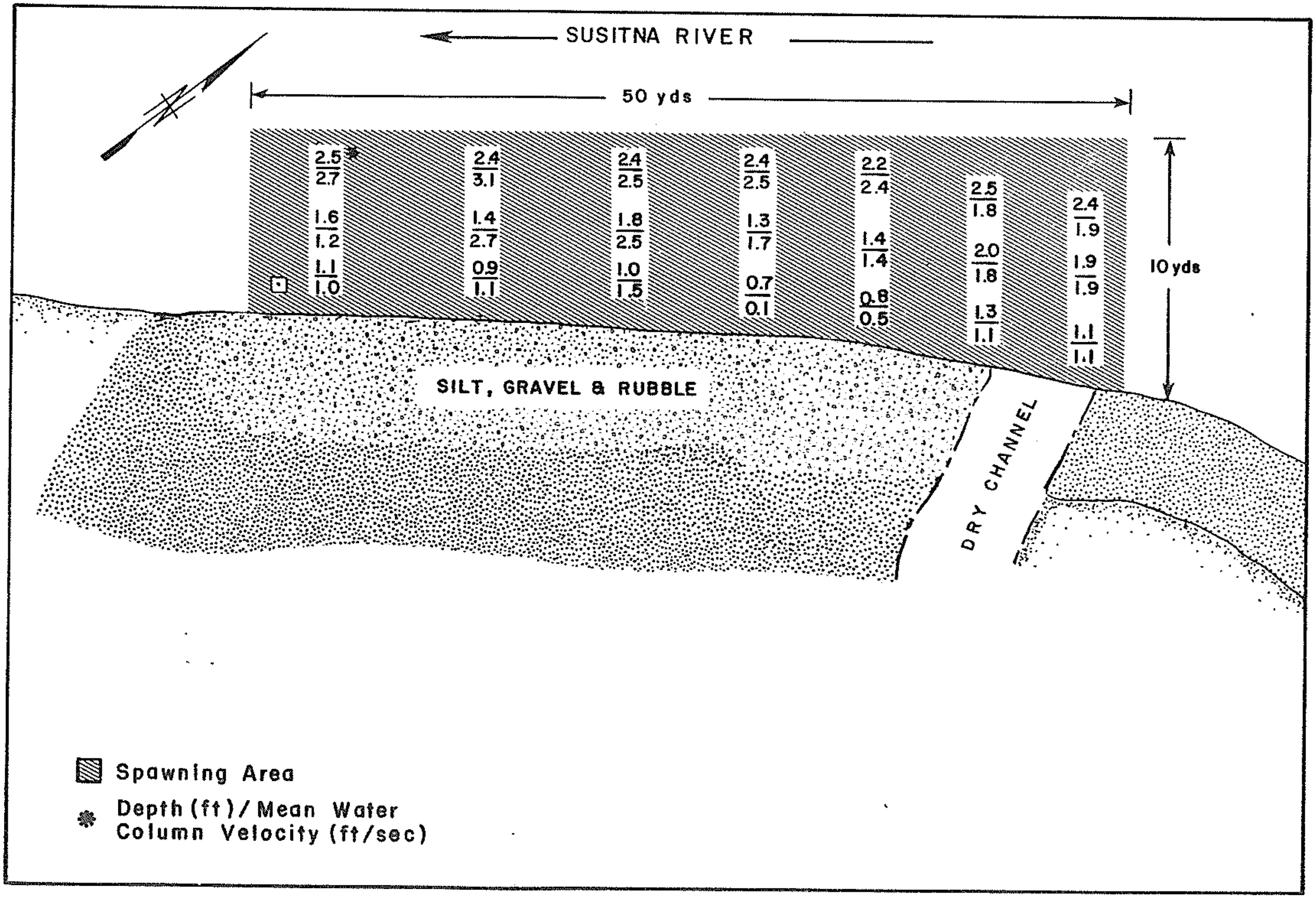



Figure 4II-3-53 Eulachon spawning area on the Susitna River at RM 35.5, GC S18N06W15CCC: June 7, 1982.

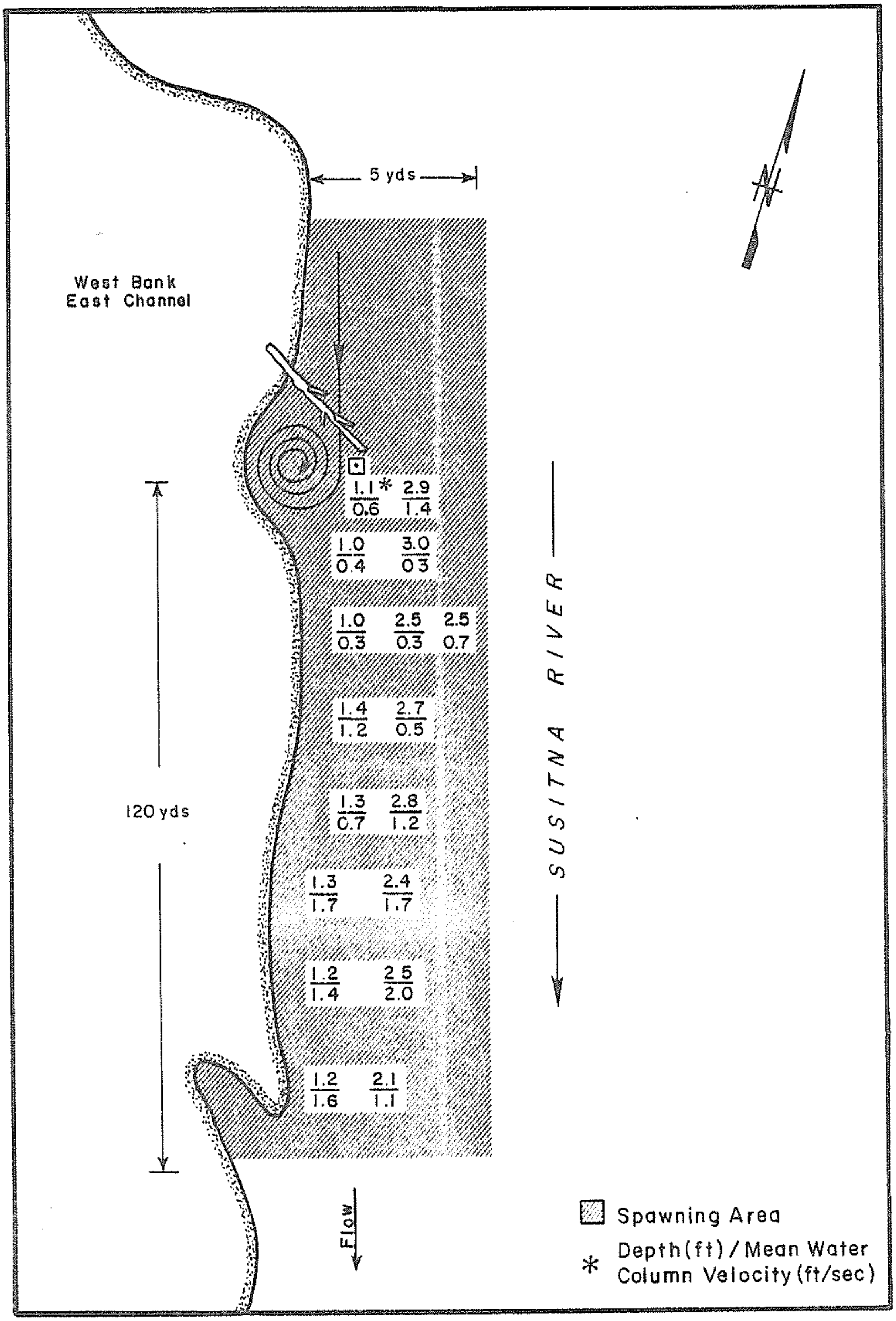



Figure 4II-3-54 Eulachon spawning area on the Susitna River at RM 22.8, GC S16N07W04BBA: May 30, 1982.

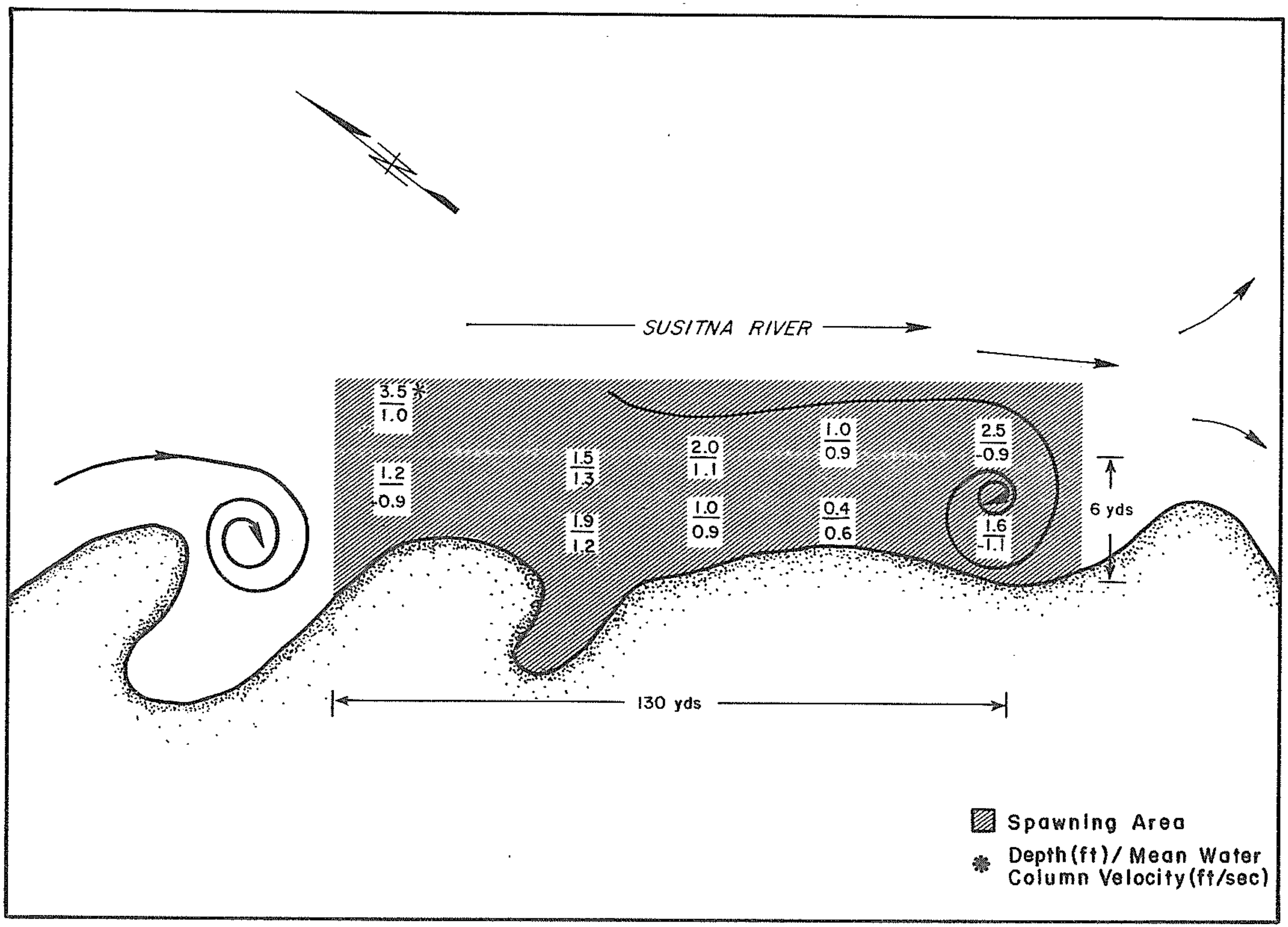



Figure 4II-3-55 Eulachon spawning area on the Susitna River at R 43.3, GC S19N06W24ACC: May 24, 1982.

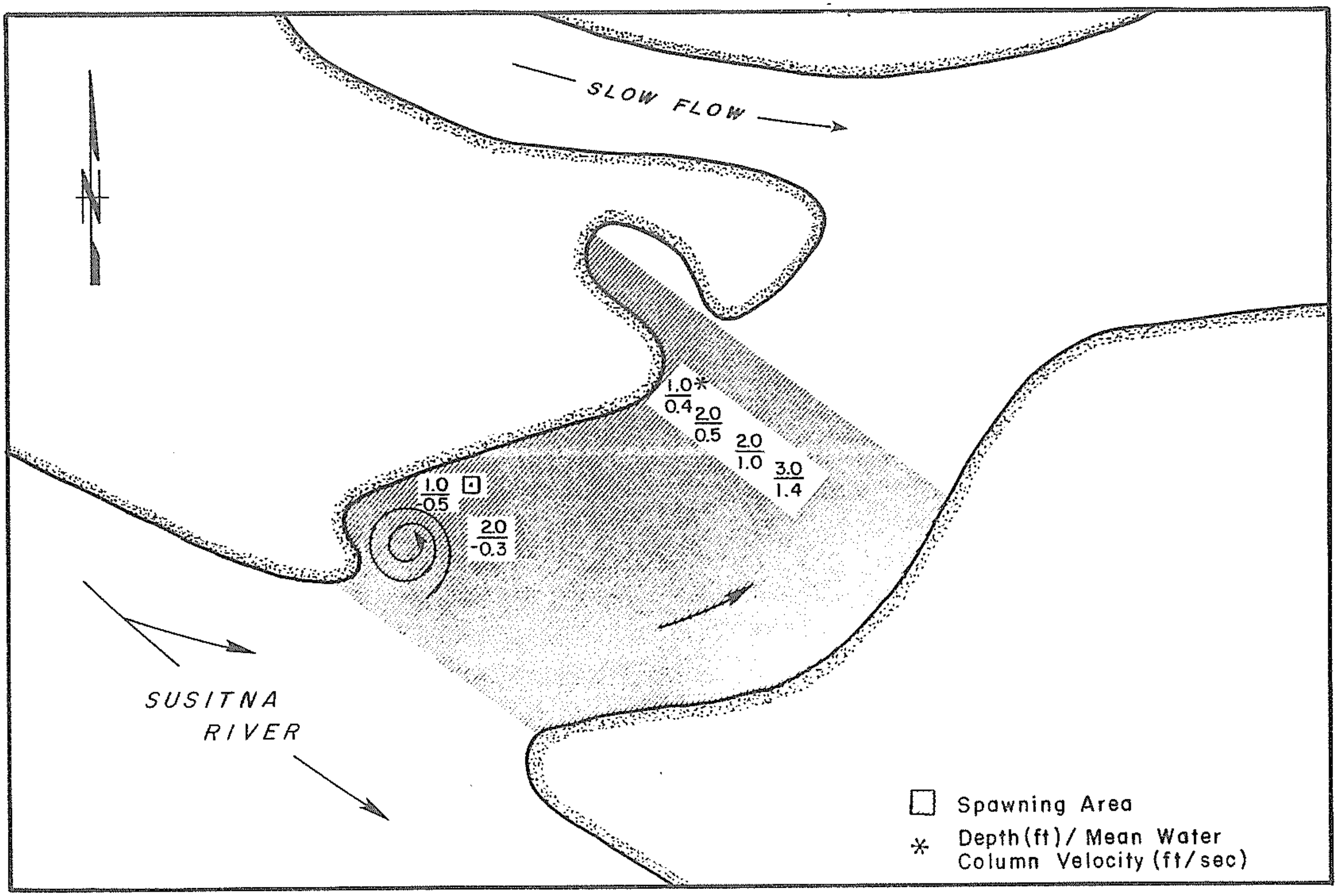



Figure ~~4-3-56~~ Eulachon spawning area on the Susitna River at RM 8.5, GC S14N07W22ACA: May 26, 1982.

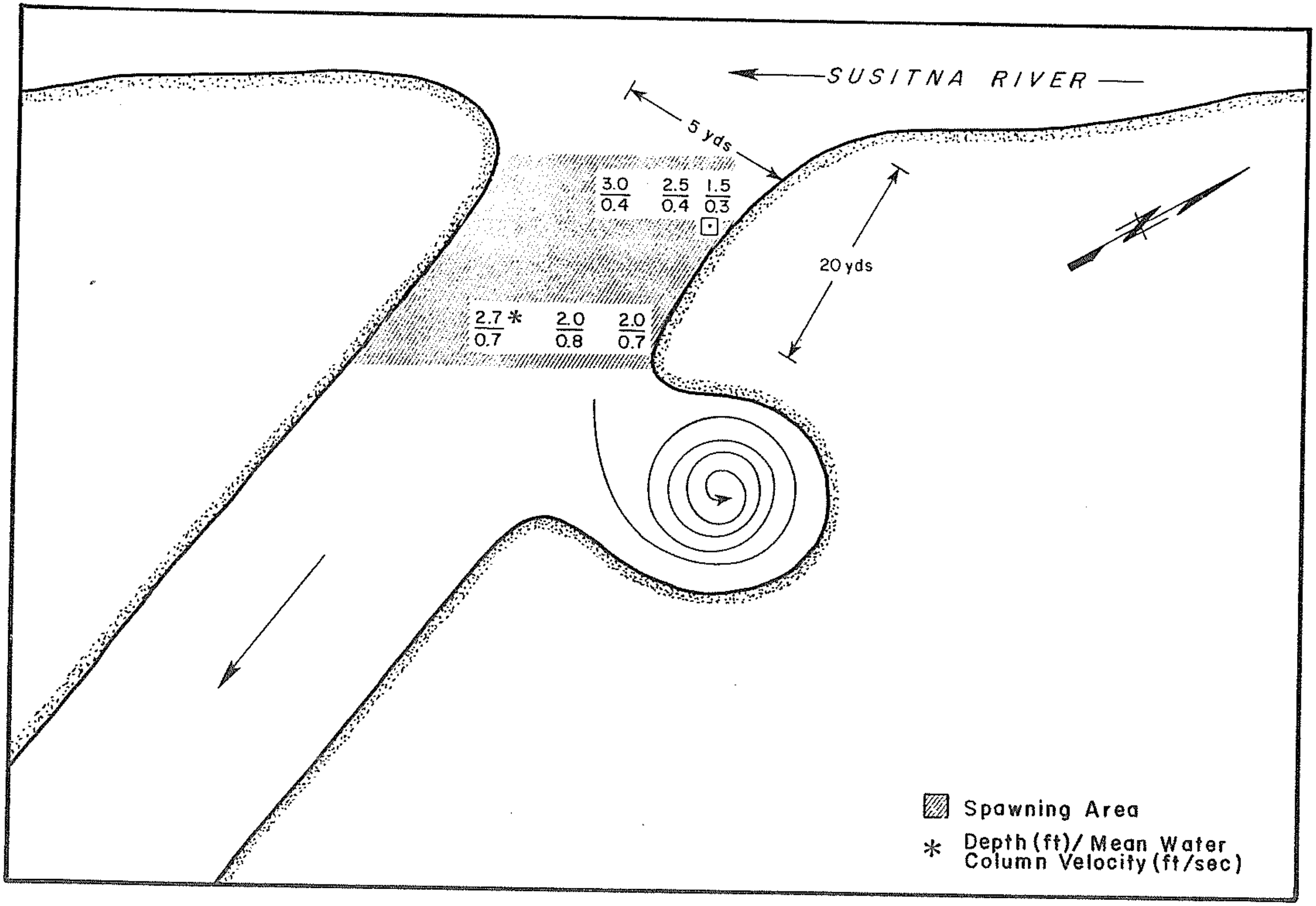



Figure 4II-3-51 Eulachon spawning area on the Susitna River at RM 11.0, GC S15N07W10DCC: May 26, 1982.

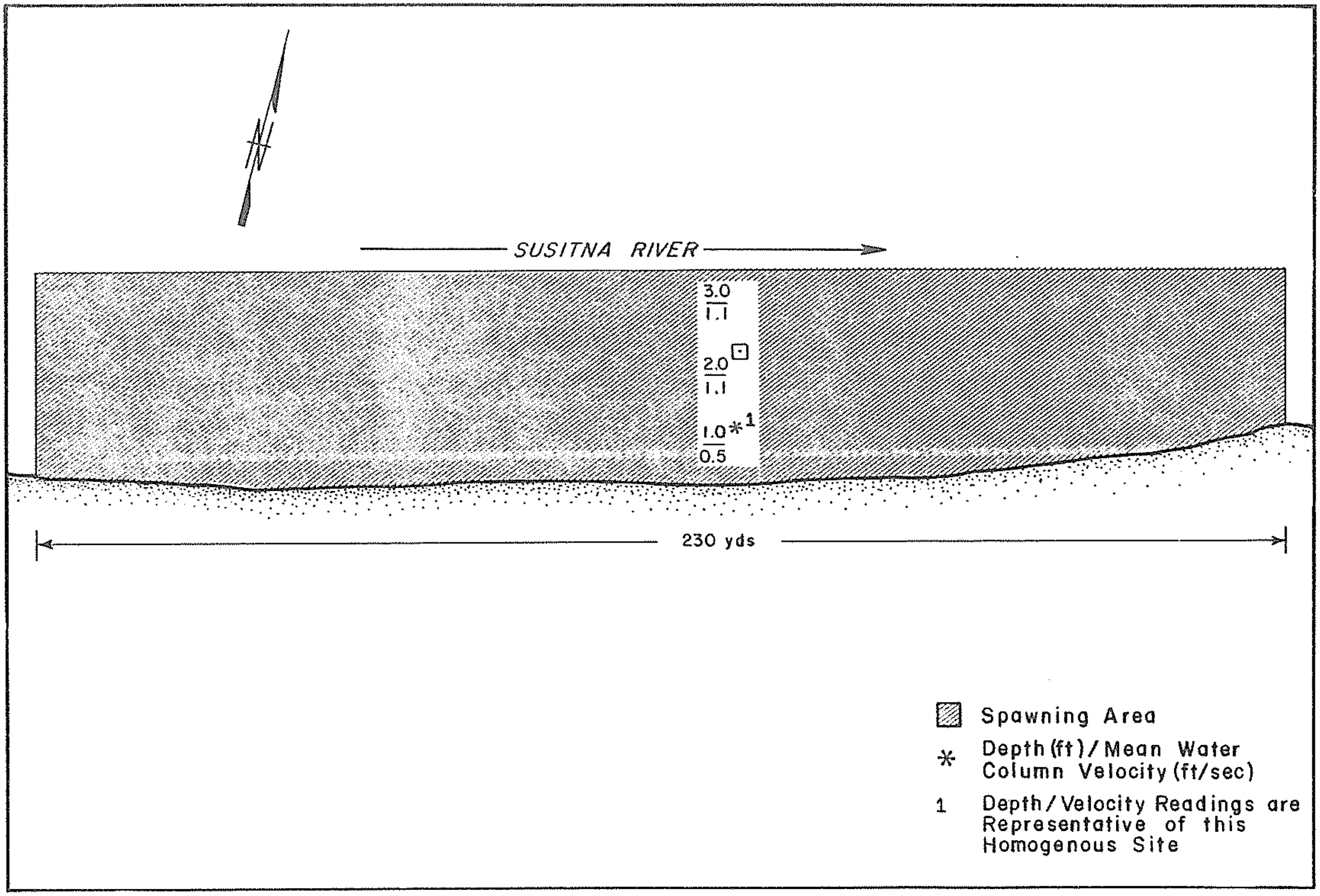



Figure 4[illegible] Eulachon spawning area on the Susitna River at RM 18.3, GC S16N07W15CDB: May 26, 1982.

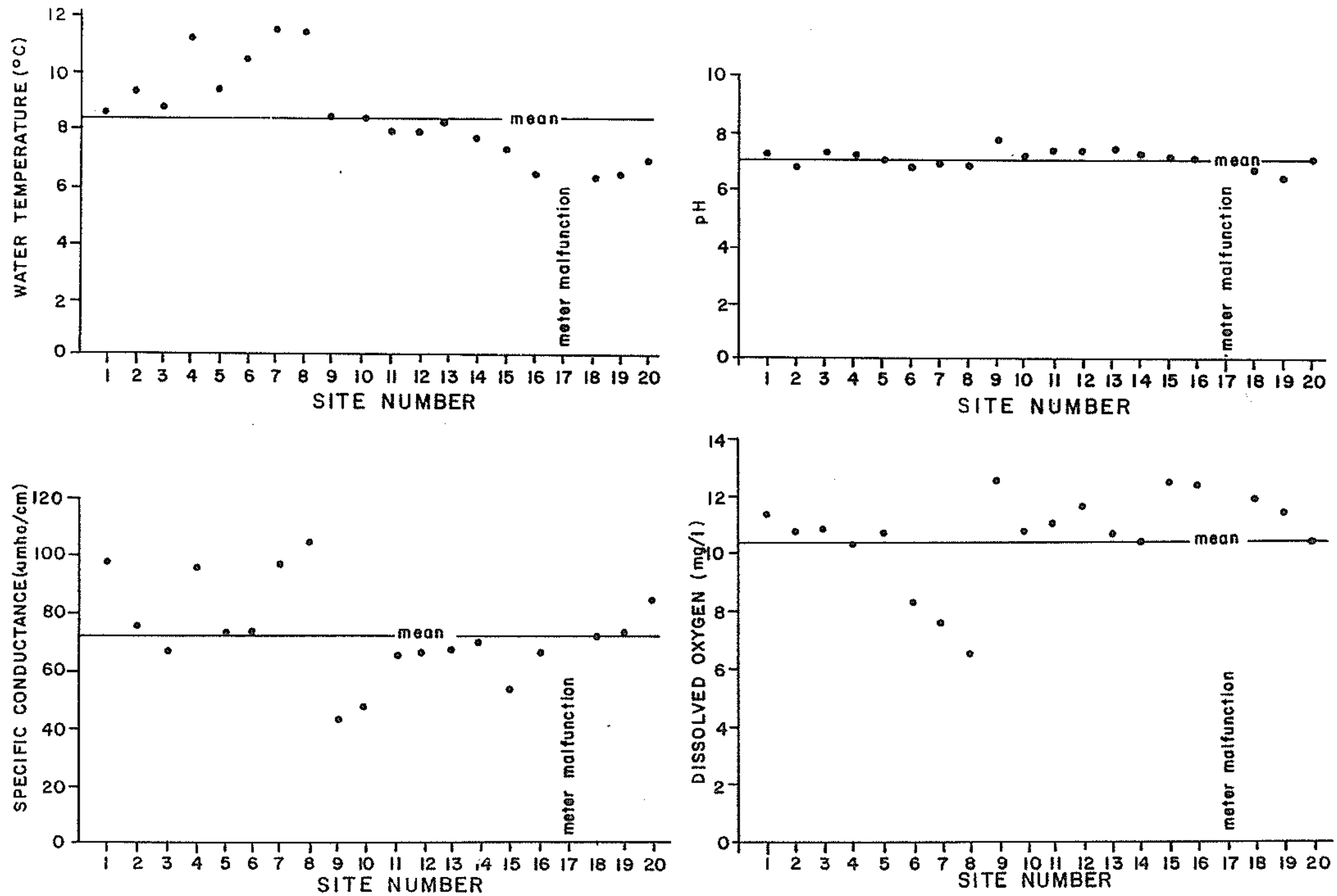



Figure 4II-3-59 Surface water temperature, pH, specific conductance and dissolved oxygen at 20 eulachon spawning areas on the Susitna River: May 24 - June 7, 1982.

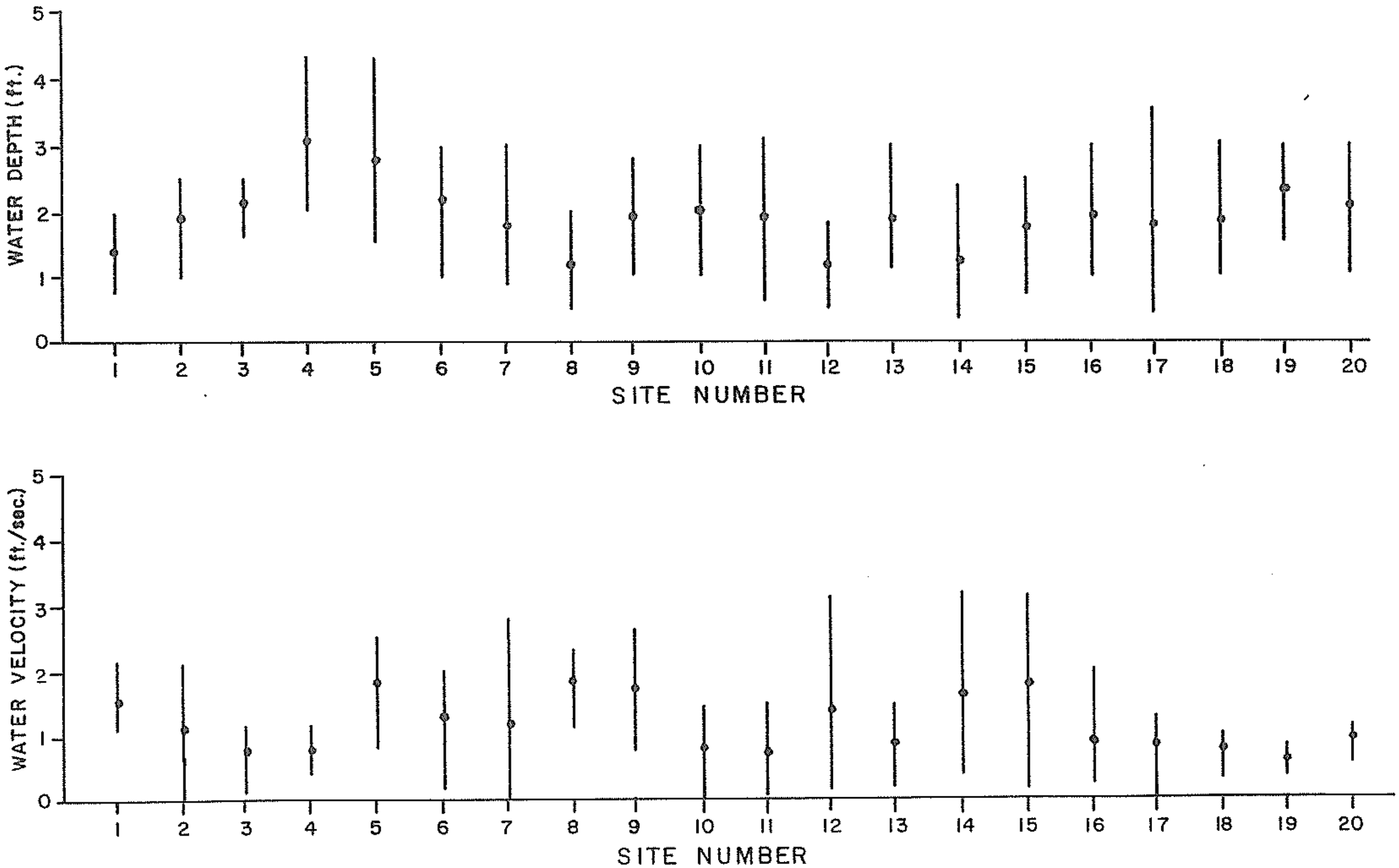



Figure [illegible] Water depths and velocities (mean and range) at 20 eulachon spawning sites on the Susitna River: May 24 - June 7, 1982.

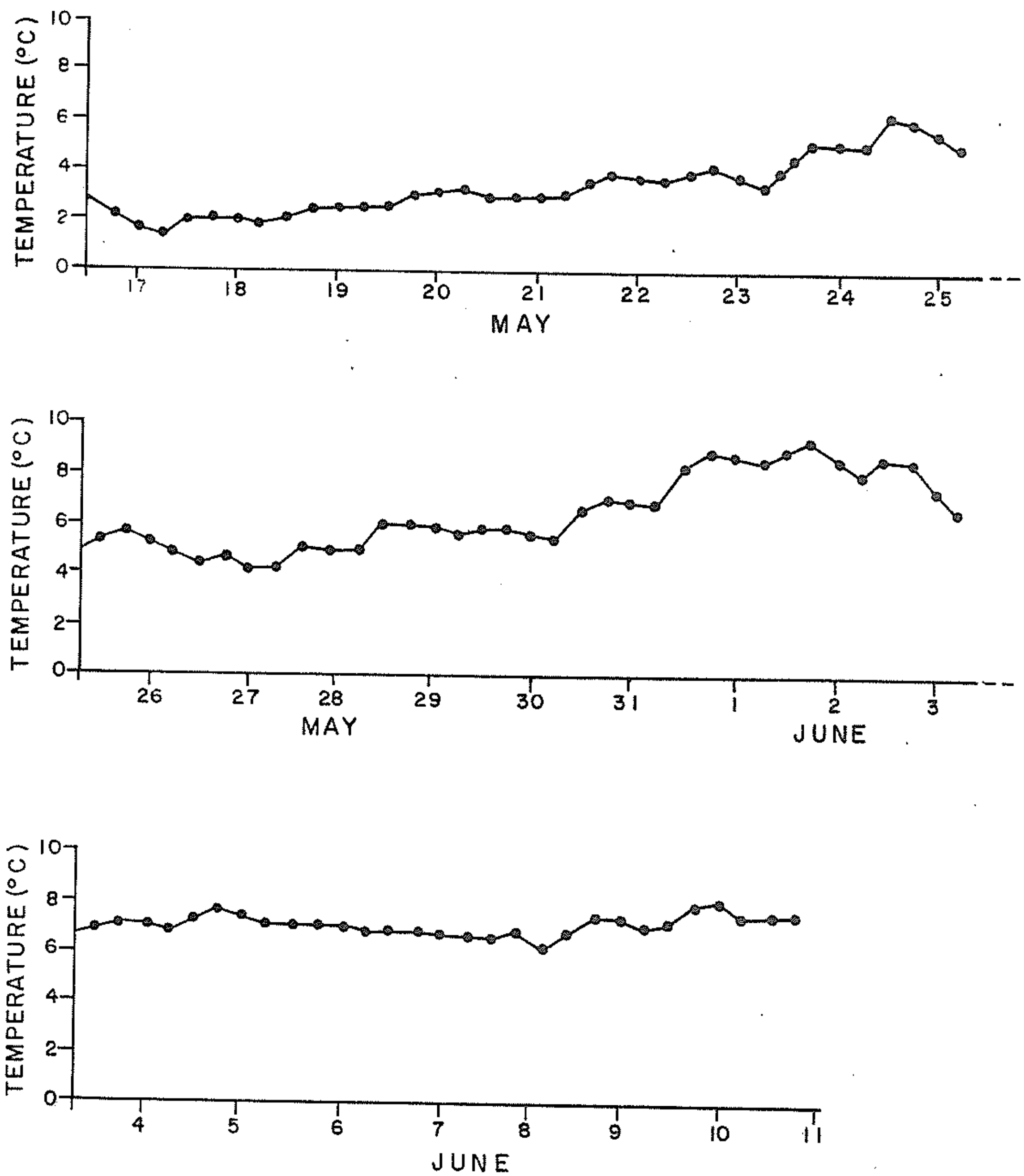



Figure 4Ⅱ 3-61 Water temperatures for the Susitna River at Susitna Station (RM 25.5): May 16 - June 10, 1982.

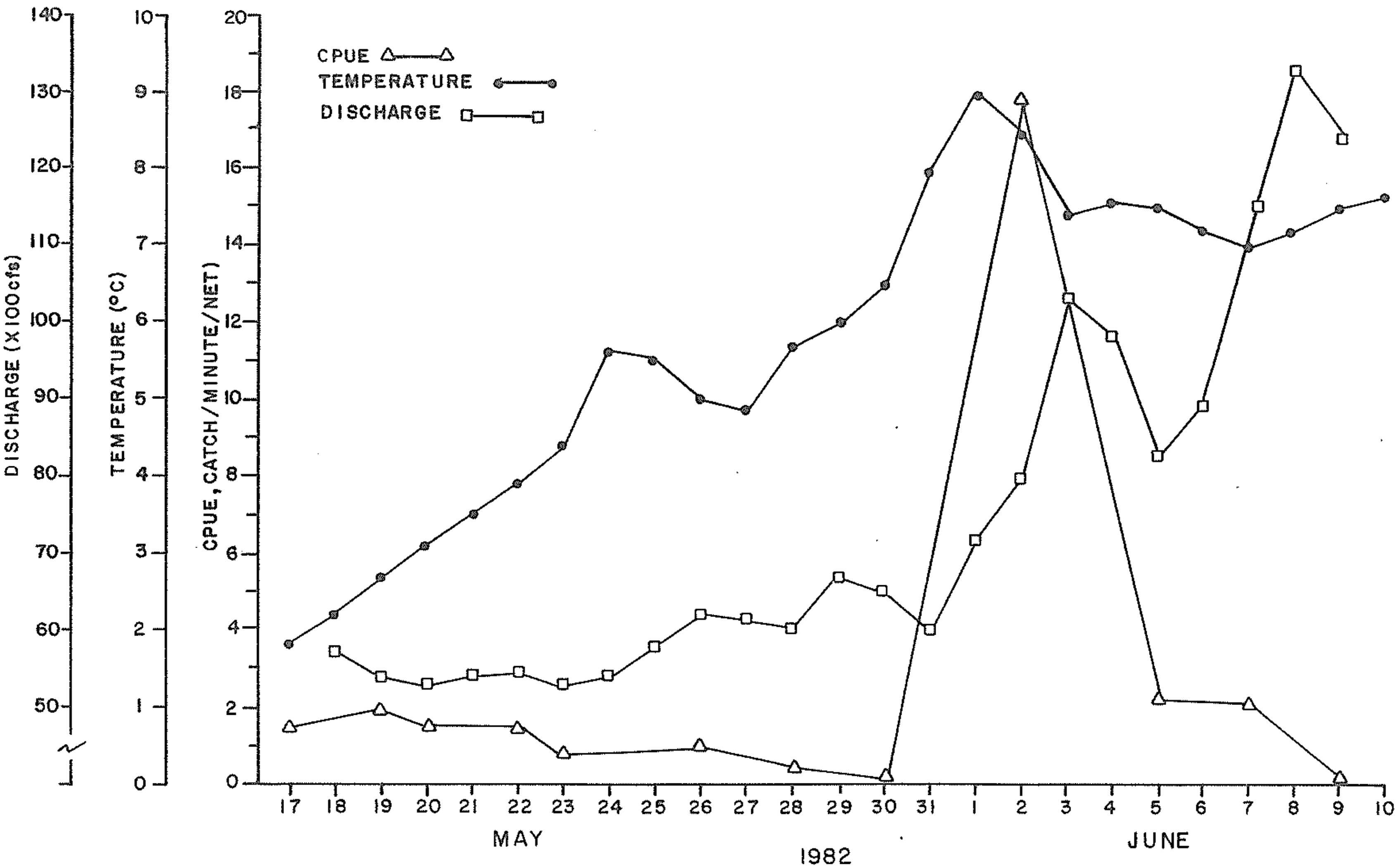



Figure 4-3-6 Discharge and daily mean water temperatures for the Susitna River at Susitna Station (RM 25.5) compared with CPUE (catch/minute/net) for the gillnet set at RM 5.0: May 17 - June 10, 1982.

### 3.1.7 Bering Cisco

A total of 730 Bering cisco were sampled by fishwheel (212/780, 29 percent) and electroshocking gear (518/730, 71 percent) from August 7 to freeze-up on October 15 (Volume 2). Only one catch site was determined to have Bering cisco spawning. The site (Figures 4II-3-63 and 4II-3-64) located along a gravel bar in the mainstem channel of the Susitna River opposite Montana Creek (RM 76.8-77.6), was a documented spawning site during last year's Bering cisco study (ADF&G 1981a). Fish were present at the site beginning in early September of this year, although none were in spawning condition until October 13, 1982. It is not known whether the fish present in early September were migrating through the site, milling or preparing to spawn at the site, because tagging studies were not initiated this past year. Based on last year's preliminary studies which included a limited tagging effort, however, it appears as though a portion of the fish which arrive early at a site remain and spawn at a latter date when river conditions facilitate spawning.

The spawning site was surveyed for its spawning habitat (Table 4II-3-10) utilizing procedures described in the methods section. Water temperatures and discharge data at time of spawning for the 1981 and 1982 Bering cisco spawning sites are also compared (Table 4II-3-11). Another catch site, located at RM 81.2 was suspected to have Bering cisco spawning, however spawning could not be confirmed. No habitat surveys were performed at this catch site.

310

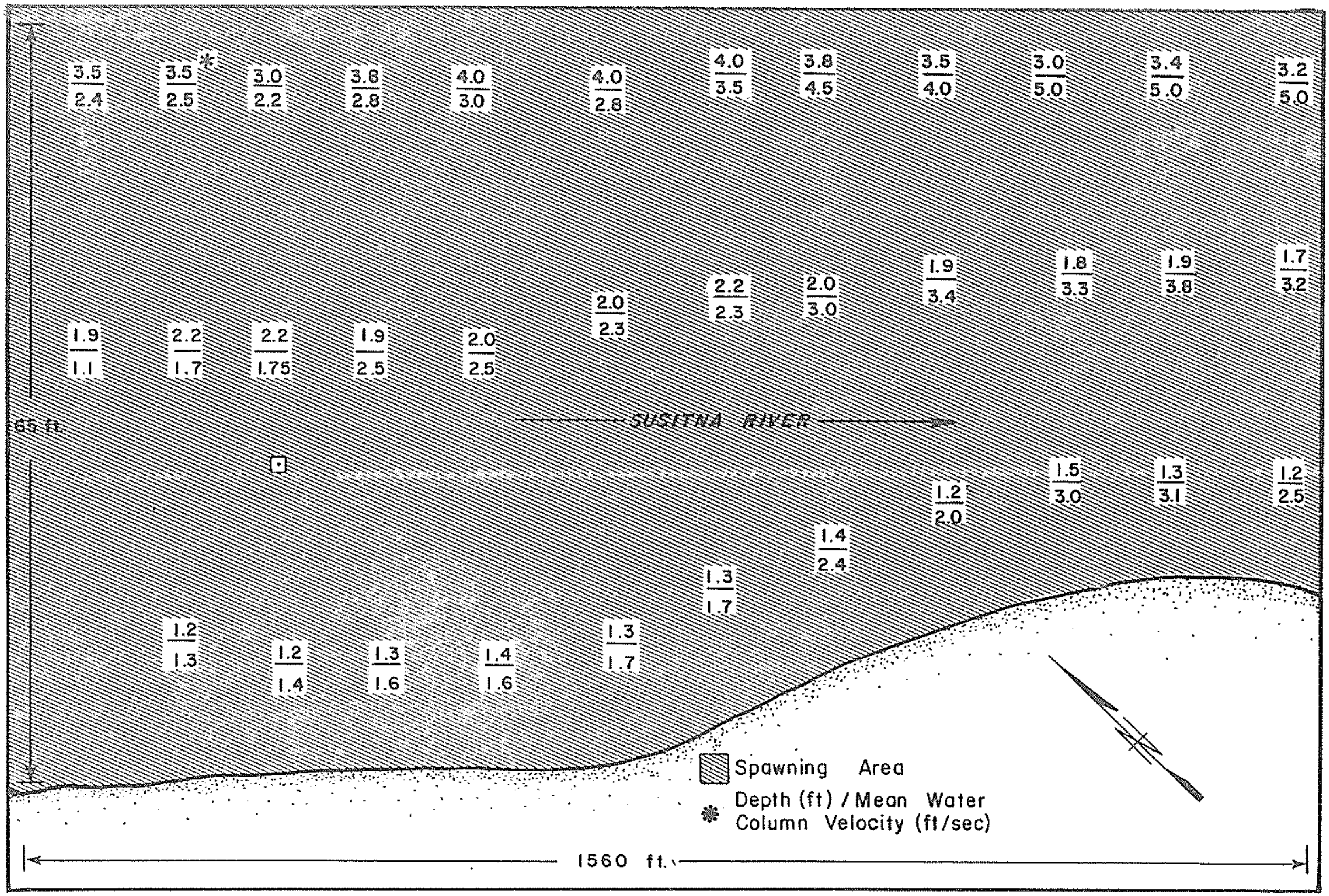



Figure 4E-3-63 The Lower Montana Bering cisco spawning area on the Susitna River at RM 76.8 - 77.3, GC S23N04W06ADD: October 14, 1982.

311

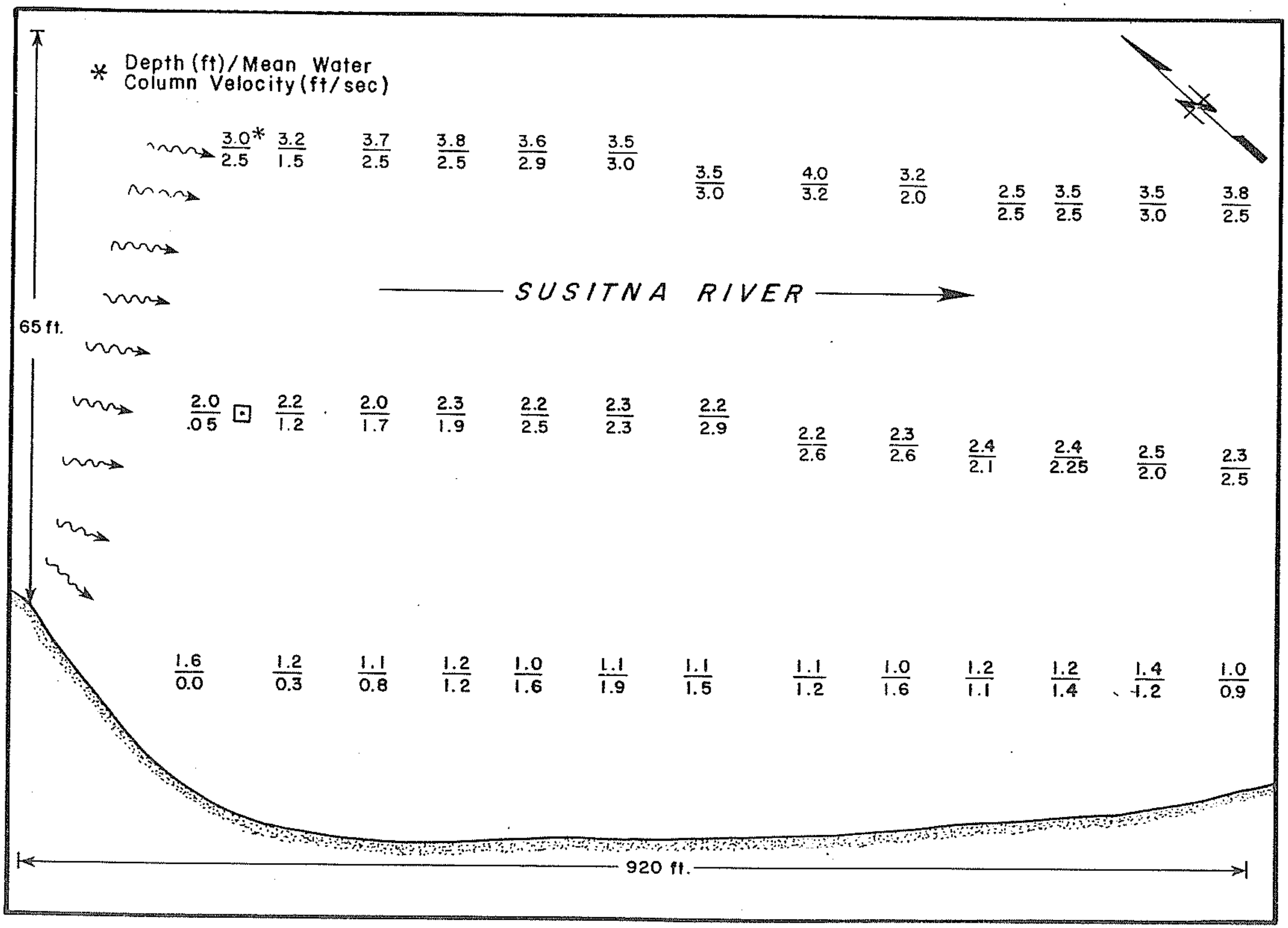



Figure 4II-3-64 The Upper Montana Bering cisco spawning area on the Susitna River at RM 77.3 - 77.6, GC S23N04W06CBB: October 14, 1982.

Table 4II-3-10. Bering cisco spawning site habitat evaluations for RM 76.8 - 77.6 on the Susitna River: October 14, 1982.

| Site | River Mile | Water Temp (°C) | pH | Conductance (umhos/cm) | Dissolved Oxygen (mg/l) | Mean Spawning Depth (ft) | Standard Deviation | Velocity (ft/sec) | Standard Deviation | Substrate |
|---|---|---|---|---|---|---|---|---|---|---|
| Upper Montana | 77.3 - 77.6 | 0.4 | 7.6 | 126 | 1.80[a] | 2.3 | 0.97 (n=39)[b] | 1.9 | 0.84 | Onshore 50% gravel 50% rubble Offshore 20% cobble 60% rubble 20% gravel |
| Lower Montana | 76.8 - 77.3 | 0.2 | 7.6 | 131 | 17.8[a] | 2.4 | 0.99 (n=35)[b] | 2.7 | 1.06 | Onshore 50% gravel 50% rubble Offshore 20% cobble 60% rubble 20% gravel |

[a] These figures are probably inaccurate due to a meter malfunction.

[b] Sample size.

312 + 313

Table 4II-3-11. Water temperatures (°C) and discharges at Bering cisco spawning sites: 1981 and 1982.

| Site | River Mile | Date | Water Temperature | Discharge[a] (cfs) |
|---|---|---|---|---|
| | | (1981) | | |
| Sunshine | 78.0 - 79.0 | 811013 | 3.8 | 17,000 |
| Montana 1 | 77.0 - 77.5 | 811015 | 3.0 | 19,000 |
| Montana 2 | 76.0 - 77.0 | 811015 | 3.3 | 19,000 |
| Mainstem-West Bank | 75.0 | 811013 | 3.1 | 17,000 |
| | | (1982) | | |
| Montana (Upper) | 77.3 - 77.6 | 821014 | 0.4 | 17,900 |
| Montana (Lower) | 76.8 - 77.3 | 821014 | 0.2 | 17,900 |

[a] USGS data collected at Sunshine (Parks Highway Bridge), provisional data.

To determine the effects water temperature has on the movement patterns and timing of spawning of Bering cisco, surface water temperature was continuously collected for the Susitna River at Sunshine (Parks Highway Bridge, RM 84.0). This data was converted into daily means calculated as the mean of twelve two-hour point temperature readings. Daily mean water temperatures and provisional discharge data (USGS 1982) for the Susitna River at Sunshine (RM 84.0) are plotted with fishwheel catch per day at Sunshine for the period September 1-30, 1982 (Figure 4II-3-65). A similar graph of Bering cisco data (ADF&G 1981a) is included for comparison (Figure 4II-3-66).

### 3.2 Juvenile Anadromous Fish Habitat Investigations

Catch and catch per unit effort (CPUE) data for all juvenile salmon species at Designated Fish Habitat (DFH) sites is presented in Volume 3 (section 3.1.2). Catch and CPUE data ordered by specific site are contained in Appendices G and H of this volume (boat electrofishing data are not included in these tables). Habitat data for the DFH sites are contained in Appendix I of this volume and hydraulic conditions and discharge data are presented in Part I of this volume (section 3.1.3.1). Summaries of the hydraulic conditions, habitat data, and biological data for each DFH site are in Appendix F.

### 3.3 Resident Fish Habitat Investigations

Resident fish catch and CPUE data at DFH sites are presented with juvenile anadromous data (see previous section, section 3.2). Resident

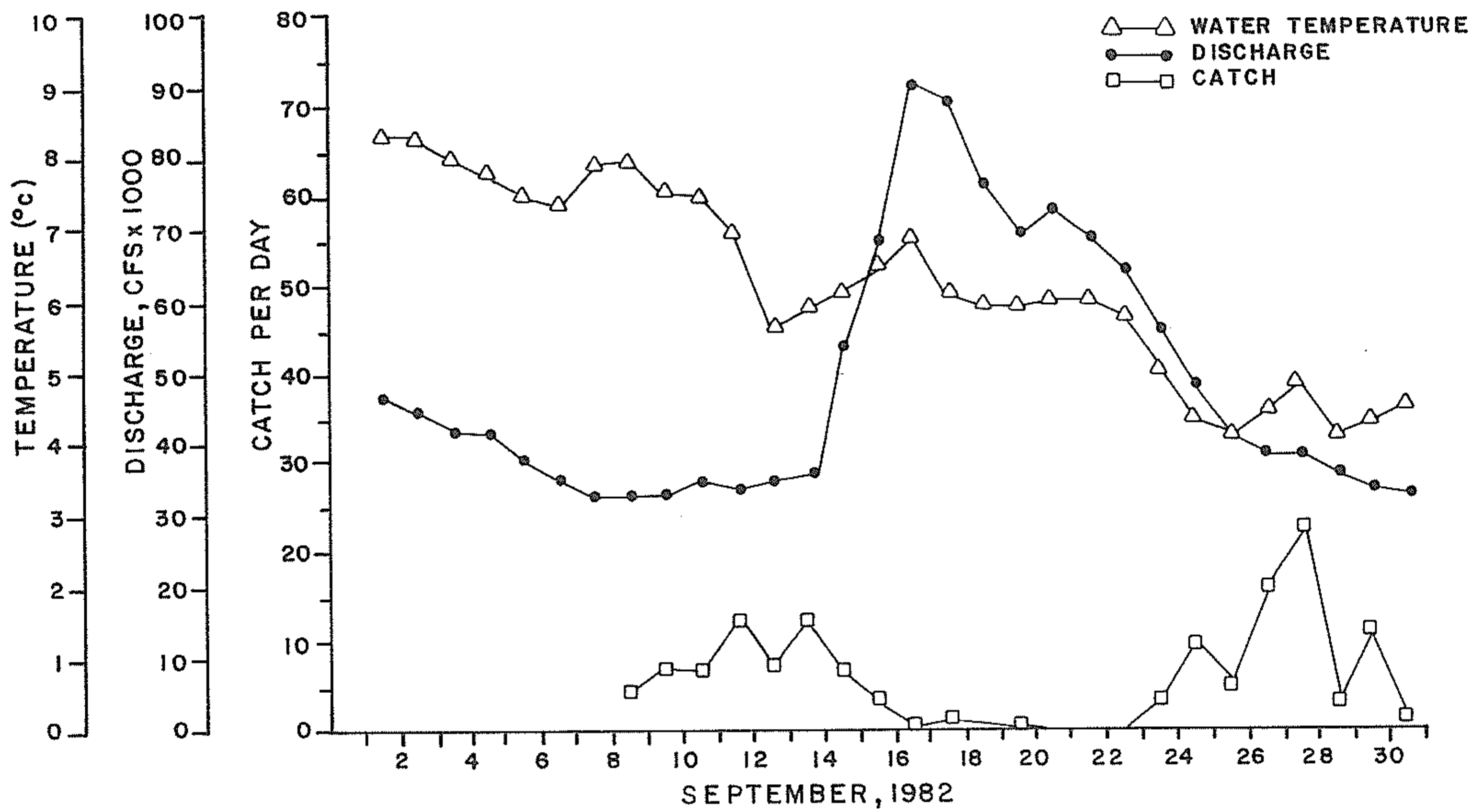



Figure 4-3-65 Bering cisco catch per day at the Sunshine fishwheel compared with daily mean surface water temperatures of the Susitna River at Sunshine (RM 84.0) and provisional discharge at Sunshine (USGS, 1982): September, 1982.

3/6

3/7

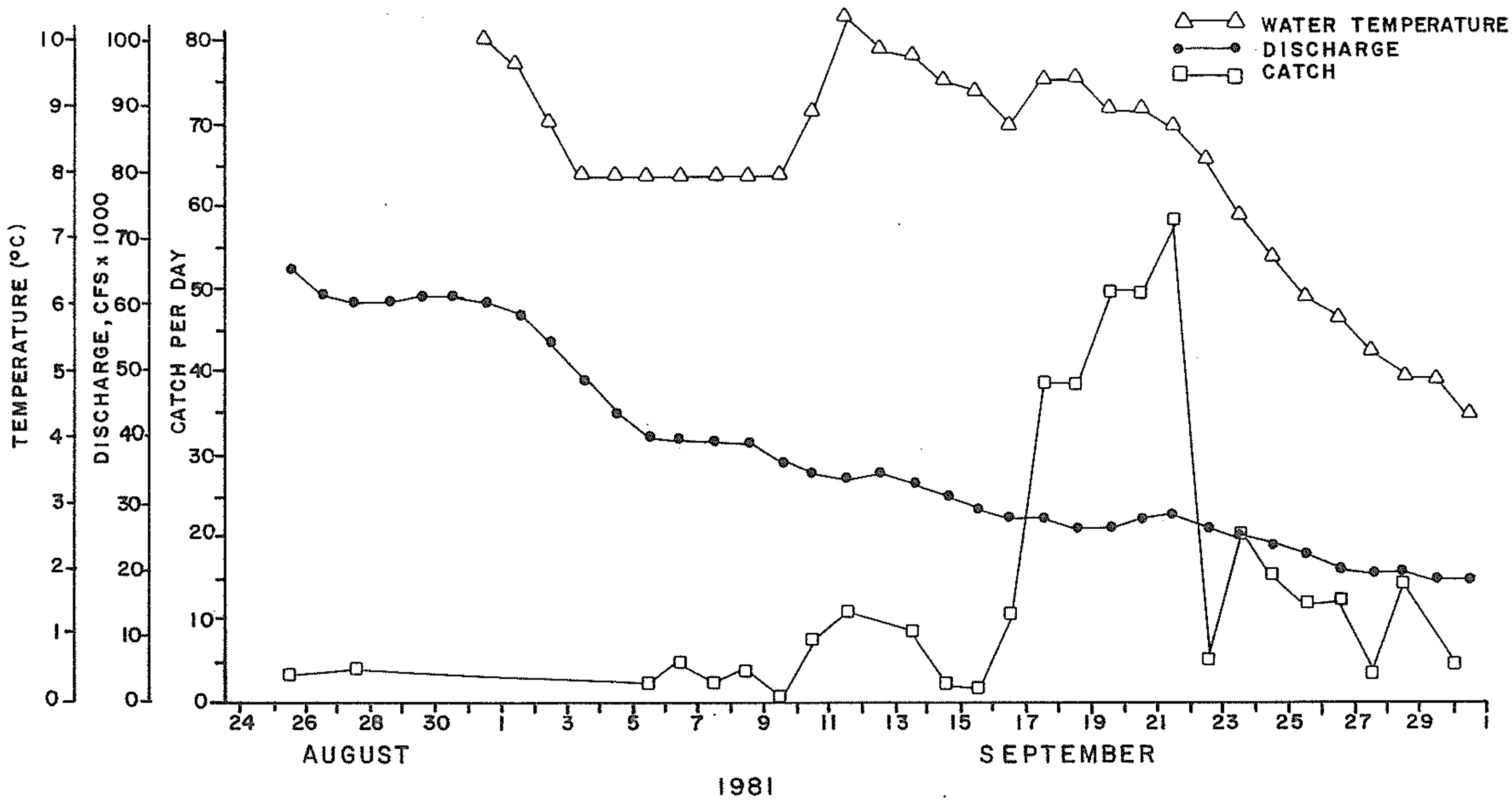



Figure 4F-3-66 Bering cisco catch per day at the Sunshine fishwheel compared with daily mean surface water temperature of the Susitna River above Montana Creek (RM 77.5) and provisional discharge (USGS, 1981) at Sunshine (RM 84.0): August 25 - September 30, 1981).

fish catch and CPUE data at Selected Fish Habitat (SFH) sites are contained in section 3.1.1 and Appendix A of Volume 3.

### 3.3.1 Rainbow Trout

The results of the 1981-82 winter radio telemetry studies for rainbow trout are presented in Figure 4II-3-67 and Table 4II-3-12.

### 3.3.2 Burbot

The results of the 1981-82 winter radio telemetry studies for burbot are presented in Figure 4II-3-68 and Table 4II-3-13.

### 3.3.3 Others

Two areas of longnose sucker spawning and one area of arctic lamprey spawning were located in 1982. Preliminary evaluations of these spawning habitats were attempted. The results of these preliminary evaluations are presented in Table 4II-3-14.

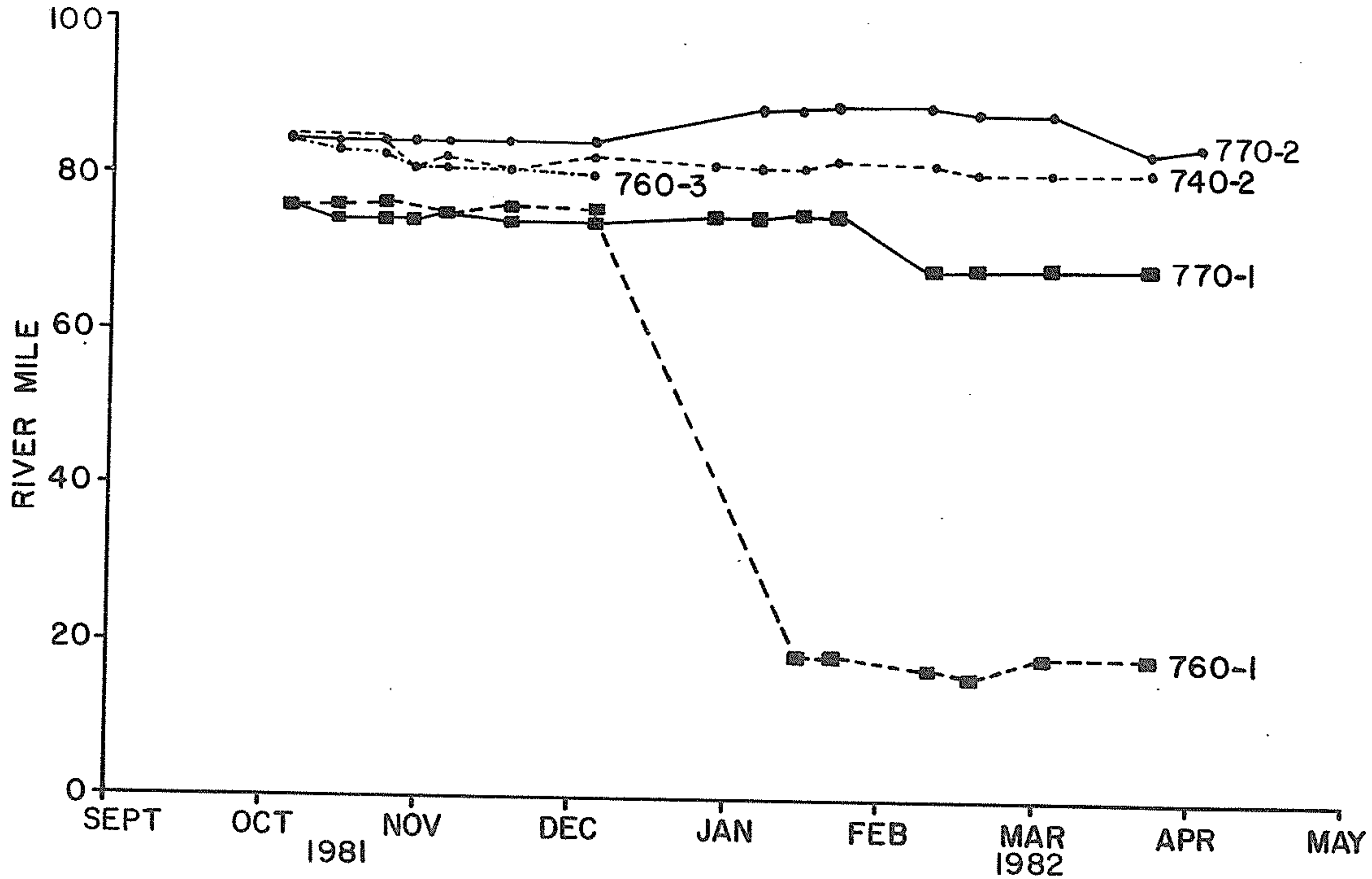



Figure 4II-3-67 Movement of five radio tagged rainbow trout in the Susitna River, October, 1981 through April, 1982.

320

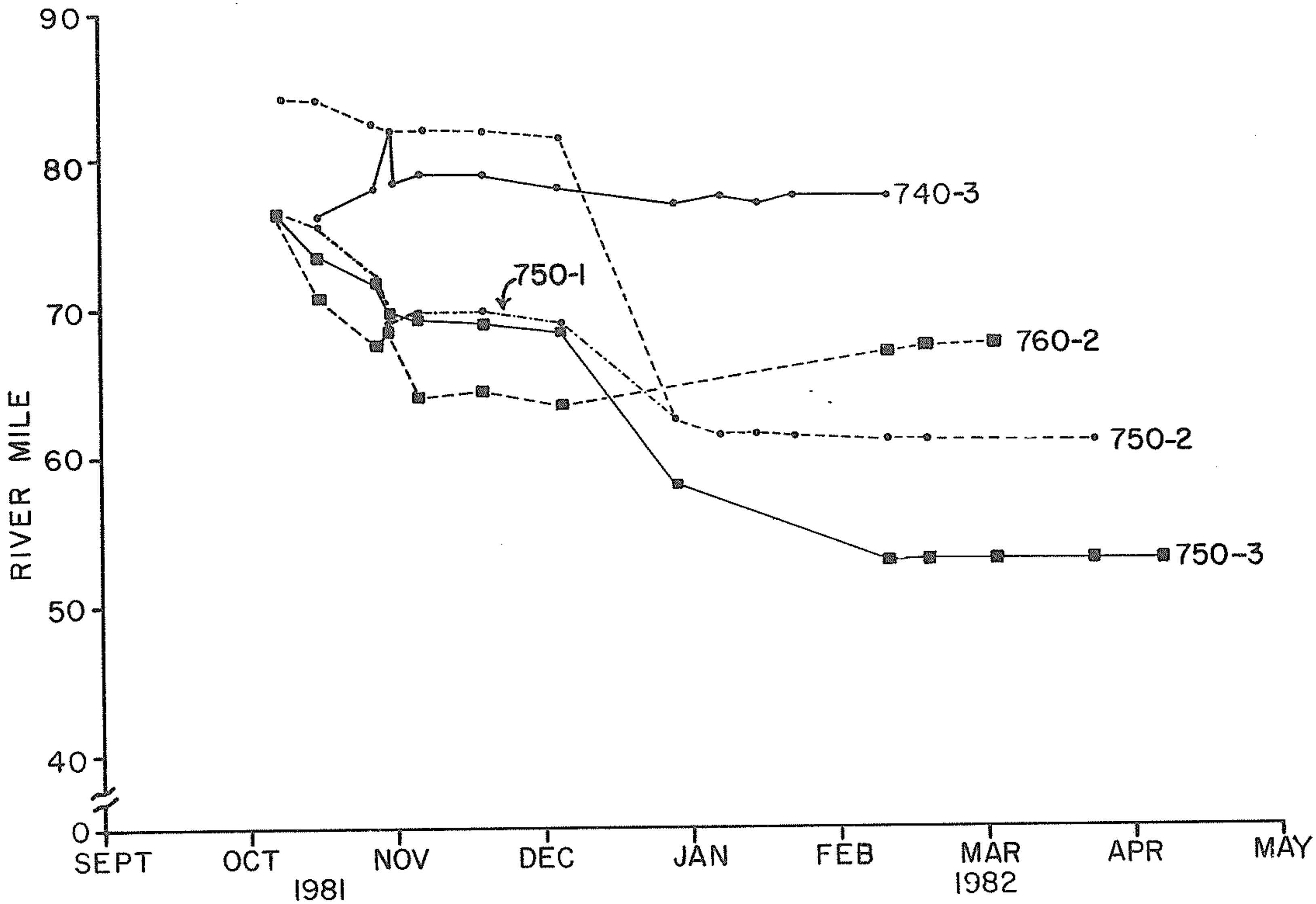



Figure [illegible] Movement of five radio tagged burbot in the Susitna River, October, 1981 through April, 1982.

Table 4II-3-12. Water quality and quantity and substrate data at overwintering areas utilized by radio tagged rainbow trout during 1981.

| River Mile | Geographic Code | Date | Time | Water Temp. (°C) | pH | Dissolved Oxygen (mg/l) | Specific Conductance (umho/cm) | Water Depth (ft) | Water Velocity (ft/sec) | Substrate |
|---|---|---|---|---|---|---|---|---|---|---|
| 67.5 | S22N05W240AC | 820304 | 1230 | 0.0 | 7.1 | 11.2 | 162 | -.- | 0.5 | 30% sand<br>30% cobble<br>30% gravel |
| 53.5 | S20N05W14BCA | 820221 | 1330 | 0.3 | 5.7 | 7.9 | 134 | 1.0 | -.- | 100% gravel |
| 53.5 | S20N05W14BCA | 820221 | 1330 | 0.4 | 5.9 | 11.0 | 212 | 1.2 | -.- | 80% gravel<br>20% sand |
| 61.0 | S21N05W13BBA | 820304 | 1200 | 0.0 | 7.3 | 11.6 | 243 | 5.8 | 0.1 | ----- |
| 61.0 | S21N05W13BBA | 820221 | 1630 | -0.1 | 6.1 | 11.4 | 147 | 2.5 | -.- | 20% cobble<br>50% gravel<br>20% sand |

Table 4II-3-13. Water quality and quantity data at overwintering areas utilized by radio tagged burbot during 1981.

| River Mile | Geographic Code | Date | Time | Water Temp. (°C) | pH | Dissolved Oxygen (mg/l) | Specific Conductance (umho/cm) | Water Depth (ft) | Water Velocity (ft/sec) |
|---|---|---|---|---|---|---|---|---|---|
| 68.5 | S22N05W14ADD | 820305 | 1300 | +0.6 | 7.1 | 12.8 | 225 | 6.2 | -.- |
| 68.5 | S22N05W14ADD | 820305 | 1300 | +0.5 | 6.7 | 13.2 | 223 | 7.0 | -.- |
| 82.0 | S24N05W22DAC | 820308 | 1600 | 0.0 | 7.1 | 13.4 | 216 | 7.5 | -.- |
| 84.0 | S24N05W10DCC | 820305 | 1200 | +0.1 | 6.6 | 9.7 | 119 | -.- | -.- |

Table 411-3-14. Spawning site habitat evaluations for longnose sucker and arctic lamprey: 1982.

| Species | Site (River Mile) | Date | Water Temp (°C) | pH | Specific Conductance (umhos/cm) | Dissolved Oxygen (mg/l) | Range of Spawning Depths (feet) | Range of Spawning Velocity feet/second | Substrate | Embedded |
|---|---|---|---|---|---|---|---|---|---|---|
| Sucker | Sunshine Slough (RM 85.7) | 820525 | 6.4 | 7.1 | 54 | 11.4 | 1.5 - 1.7 (n=5)[b] | 0.9 - 1.7 (n=5)[b] | 60% cobble<br>20% gravel<br>20% silt | Yes |
| Sucker | Trapper Creek mouth (RM 91.5) | 820605 | 10.0 | -[a] | -[a] | -[a] | 2.2 - 2.8 (n=5)[b] | 0.5 - 1.1 (n=5)[a] | 60% cobble<br>20% gravel<br>20% silt | Yes |
| Arctic Lamprey | Birch Creek mouth (RM 89.2) | 820624 | 15.3 | 6.8 | 50 | 10.0 | 0.9 (n=1)[b] | 1.4 (n=1)[b] | 100% gravel | No |

[a] Data not available.

[b] Sample size.

# 4. DISCUSSION

## 4.1 Adult Anadromous Habitat Investigations

### 4.1.1 Salmon Species

#### 4.1.1.1 Mainstem

Adult anadromous fish distribution data collected during the 1981 (ADF&G 1981b) and 1982 (Volume 2) open water field seasons indicate that adult salmon spawning activity in the mainstem Susitna River is limited (for a definition of how "mainstem" is defined in this report, refer to Part II, section 2.1.1.1 of this volume). It is currently unknown whether the limited use of the mainstem for spawning is the result of lack of suitable spawning habitats or the relative higher availability of more suitable spawning habitats in other areas (e.g., sloughs). Preliminary data, however, indicate that the substrate in the majority of the mainstem is cemented, making it unsuitable for adult salmon spawning.

Chum salmon appear to be the only salmon species which utilize the mainstem Susitna River for spawning. Coho, pink or sockeye salmon were not found to spawn in the mainstem Susitna River during the 1982 open water field season. Based on an evaluation of the data presented in Tables 4II-3-1 and 4II-3-2 and Figures 4II-3-2 through 4II-3-9, the majority of the mainstem chum salmon spawning sites surveyed were located in clear backwater habitats situated in side channels which were cut off either entirely or partially from mainstem water influence at their heads. Only one surveyed spawning site (located at RM 148.2, study site number 3) was located in the main channel (Figures 4II-3-1 and 4II-3-4).

Mean water depths and water column velocities measured at chum salmon spawning sites ranged from 0.0-4.0 feet and 0.0-1.0 feet/second, respectively. Substrate utilized for spawning ranged from silty sand to boulders. Gravel, rubble and cobble were preferred. The substrate was most often loosely embedded with silty sand which was cleared in areas of redds. Surface water temperatures, taken at a depth of approximately 1 to 2 feet below the surface, ranged from 3.3-7.0°C.

Each chum salmon spawning site, except site number 3 (at RM 148.2), had clear water zones indicating the surveyed spawning areas were isolated either entirely or partially from mainstem surface water influence. The clear water found suggests that these spawning sites receive a significant portion of their surface water flow from subsurface percolation, since very little surface drainage was observed into the study areas. Intragravel water temperatures ranged from 0.2 to 5.3°C cooler than surface water temperatures, suggesting that a subsurface water flow exists in the areas of spawning activity and that it is of a different nature ~~than~~ from the surface waterflow.

The tributary-mainstem confluence zone, which includes the area of the mainstem influenced either directly (i.e., the delta area and the downstream mixing zone) or indirectly (i.e., the tributary ground water influence zones) by the tributary, was not investigated this past year.

Observations, however, suggest that these zones may provide a substantial amount of spawning and juvenile rearing habitat for chum, pink and coho salmon, in addition to rearing habitat for selected resident fish. Since these confluence zones will be directly impacted by the proposed project, studies are planned to investigate the habitat of these zones during 1983.

Because this year was the first attempt at describing the habitat characteristics of mainstem salmon spawning areas, data and evaluations presented should be considered preliminary. Continuation of these studies are planned in 1983.

### 4.1.1.2 Slough

Chum salmon were found to be the salmon species which used the slough habitats most extensively for spawning. Sockeye and pink salmon were found to spawn frequently in the sloughs, coho salmon were found rarely and chinook salmon were not found to spawn in sloughs at all. Chum salmon were found in most sloughs upstream of Susitna RM 107 (sloughs 5, 6A, 8D, 8C, 8A, B, 9, 8B, Moose Slough, sloughs 9B, 9A, 10, 11, 15, 17, 19, 20, 21). Sloughs 8A, 9, 11 and 21 had the highest number of spawning chum salmon.

#### 4.1.1.2.1 Spawning Site Selection

During the 1982 spawning season chum were observed using areas with significant amounts of silt overlaying rubble and gravel substrates

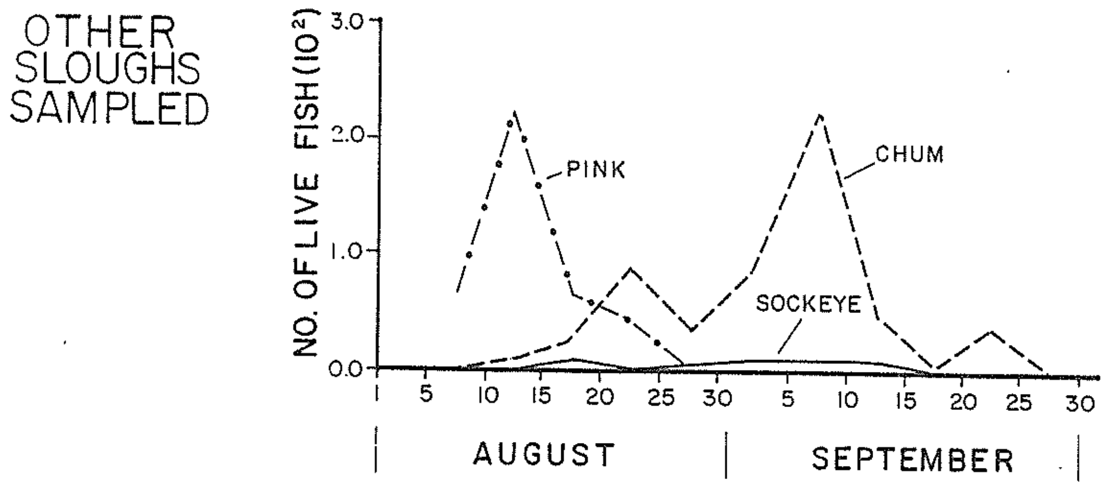
(Plate 4II-4-1). In Slough 21, one redd was observed where nearly 18 inches of silt had been fanned away. Survival of eggs deposited at this extreme depth of silt is questionable however upwelling ground water observed in silt covered areas could allow survival of eggs and alevin in this type of substrate by providing a continuous flow of sufficiently oxygenated water over the incubating eggs. The utilization of areas of heavy silt was likely a result of the salmon being forced to use less than ~~optional~~ OPTIMAL areas due to tow flows denying migration upstream to more desirable substrates. Chum salmon did appear to prefer areas with upwelling present.

### 4.1.1.2.2 Timing of Spawning

Much of the following discussion was derived from data obtained and presented in Volume 2. Information has been arranged here to facilitate comparisons between sloughs that were most intensively studied by Fish Habitat Utilization personnel. Numbers of live chum, pink and sockeye salmon observed in side sloughs during the spawning season are presented in Figure 4II-4-I. Data for sloughs 8A, 9, 11 and 21 are presented individually and all other sloughs sampled are combined and presented collectively. In addition to sloughs 8A, 9, 11 and 21, other sloughs sampled include a, 2, 3A, 3B, 4, 5, 6, 6A, 7, 8, 8B, 8C, 8D, 9, 9A, 9B, 10, 12, 13, 14, 15, 16, 17, 18, 19, 20. Because coho salmon were only present in limited numbers, they have not been included in the figures.

Sloughs 8A, 9, 11 and 21 each contained more fish than the other sloughs combined (Figure 4II-4-1). With the exception of Slough 11, where

Plate 4II-4-1. Chum salmon spawning in silted area at Slough 21. Note fish have fanned silt from spawning area.



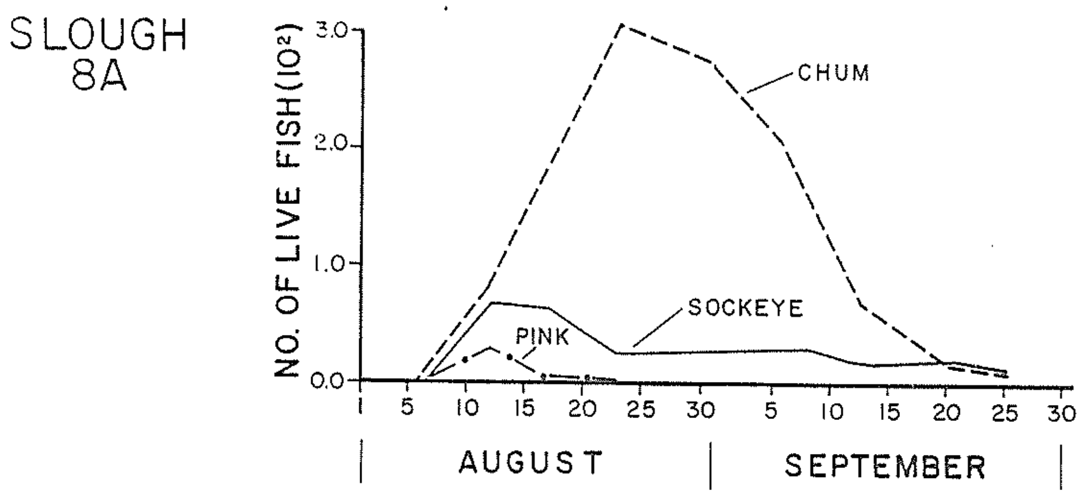
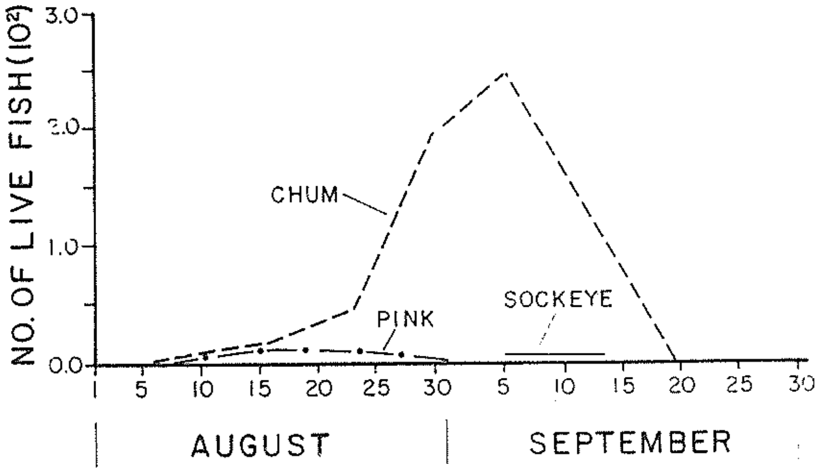




Figure 4II-4-1 Numbers of line salmon counted in August and September, 1982, in sloughs 8A, 9, 11, 21 and others (1, 2, 3A, 3B, 4, 5, 6, 6A, 7, 8, 8B, 8C, 8D, A, 9A, 9B, 10,12, 13, 14, 15, 16, 17, 18, 19, 20).

SLOUGH 9




SLOUGH 11

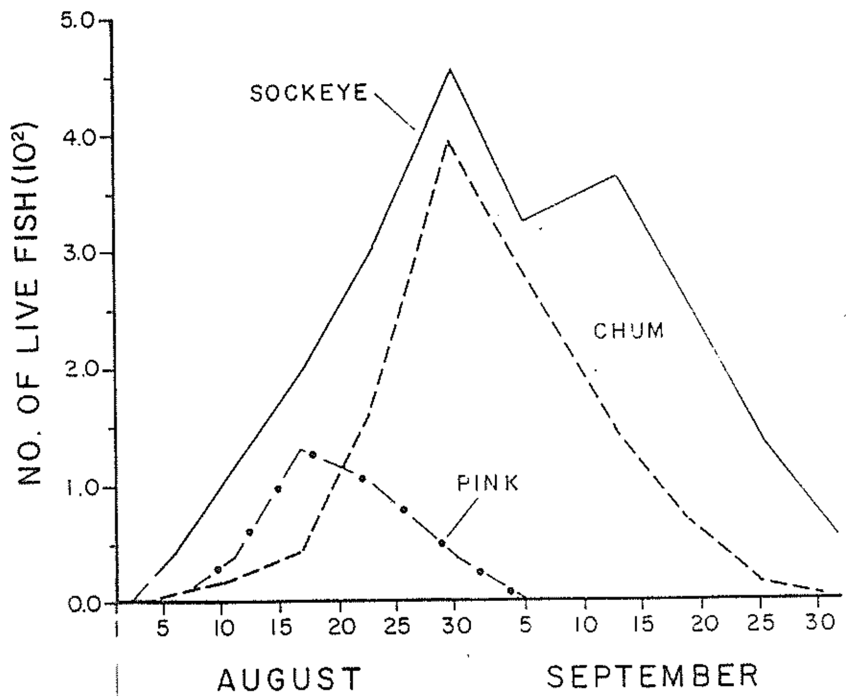



Figure 4II-4-1 Continued.

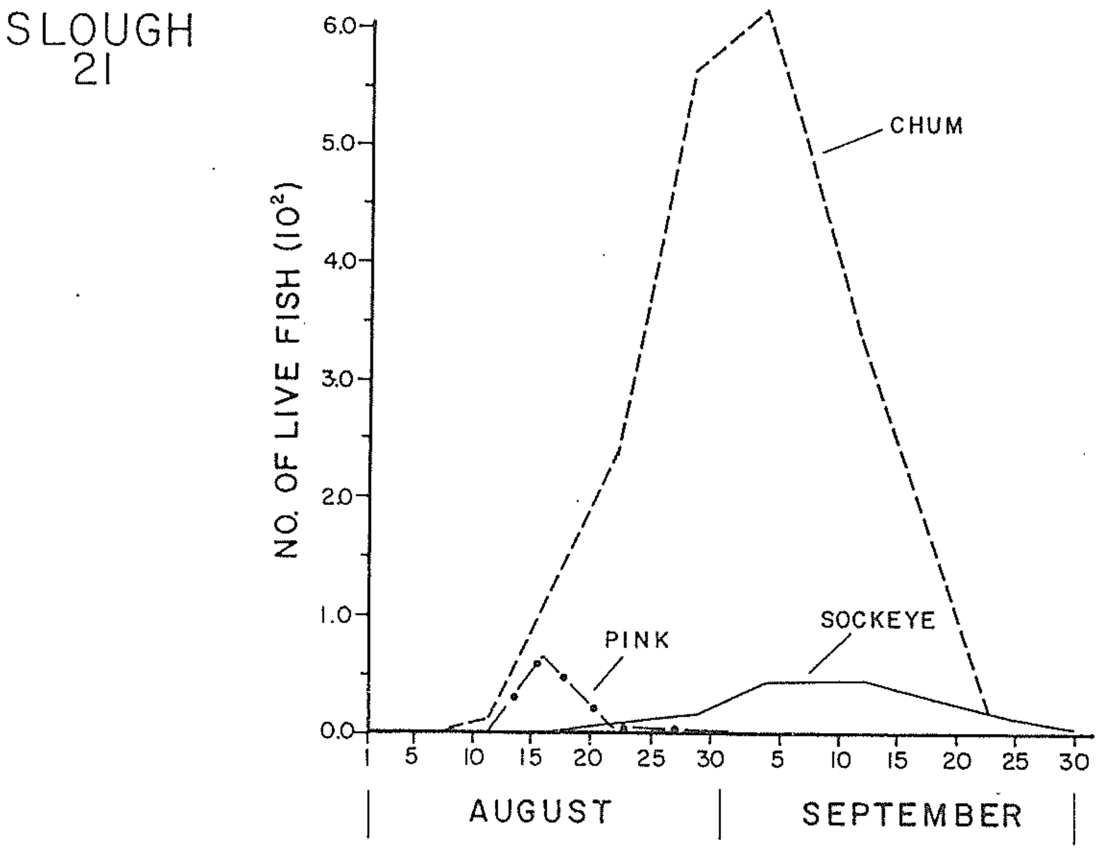



Figure 4II-4-1 Continued

sockeye salmon outnumbered chum salmon, chum salmon were numerically dominant almost every day (refer to Volume 2 for specific numbers). The timing of peak numbers of fish and their duration of residence inside sloughs generally followed consistent patterns. In general, pink salmon numbers peaked earlier than chum salmon in all sloughs. With the exception of Slough 11, numbers of pink salmon entered sloughs in early to mid-August, peaked in mid-August and were completely absent by September 1. Chum salmon typically entered sloughs by August 10, peaked sometime between August 20 and September 1, declined rapidly in mid-September and were completely absent by the end of September. In contrast to the pattern for pink and chum salmon, numbers of sockeye salmon generally lacked definite peaks, were much less abundant than chum salmon and persisted in low numbers in late September (sloughs 8A, 11, 21). The obvious exception to the above generalizations occurred in Slough 11 where sockeye salmon numbers exhibited a bimodal peak at August 30 and September 13 and persisted in the slough until mid-October.

In spite of the unique characteristics of Slough 11, it is obvious that of all sloughs sampled, sloughs 8A, 9, 11 and 21 contained the largest numbers of live salmon in 1982. In addition, there was a temporal segregation in usage pattern between species. This was most evident between pink and chum salmon, with numbers of pink salmon consistently peaking before chum salmon. The pattern for sockeye salmon was less distinct, but generally indicated that sockeye salmon spawned in sloughs during the period of, or later than, chum salmon spawning.

The above generalizations comprise a short summary description of the spatial and temporal distributions of live fish in side sloughs, as observed in 1982. However, at this time, factors accounting for these patterns are not known with certainty. We do know that the distributions of a species in space and time can be affected by limitation of dispersal ability, behavioral preferences, other species, or by physical and chemical factors (Krebs 1972).

Access to spawning areas may prohibit spawning in otherwise suitable habitats. This may occur on a large scale, such as the barrier imposed by the rapids at Devil Canyon to all upstream salmon migration, or it may occur on a smaller scale, such as access into a slough or tributary. Because access denied into an area eliminates consideration of all other factors (Figure 4II-4-2), it is of critical concern in light of potential impacts resulting from construction and operation of hydroelectric dams, the focus of the remainder of the discussion will be concerned with the access of salmon to sloughs between Talkeetna and Devil Canyon.

### 4.1.1.2.3 Access

If proposed Susitna hydroelectric dams are constructed, existing discharge levels, rates of sediment transport and seasonal thermal regimes are expected to change. Changes in these habitat characteristics are expected to alter existing quantity and/or quality of fish habitat (Acres American, Inc. 1982). It is anticipated that routine operations of the hydroelectric dams will result in reduced summer discharge levels and elevated winter flows, and that these changes in space

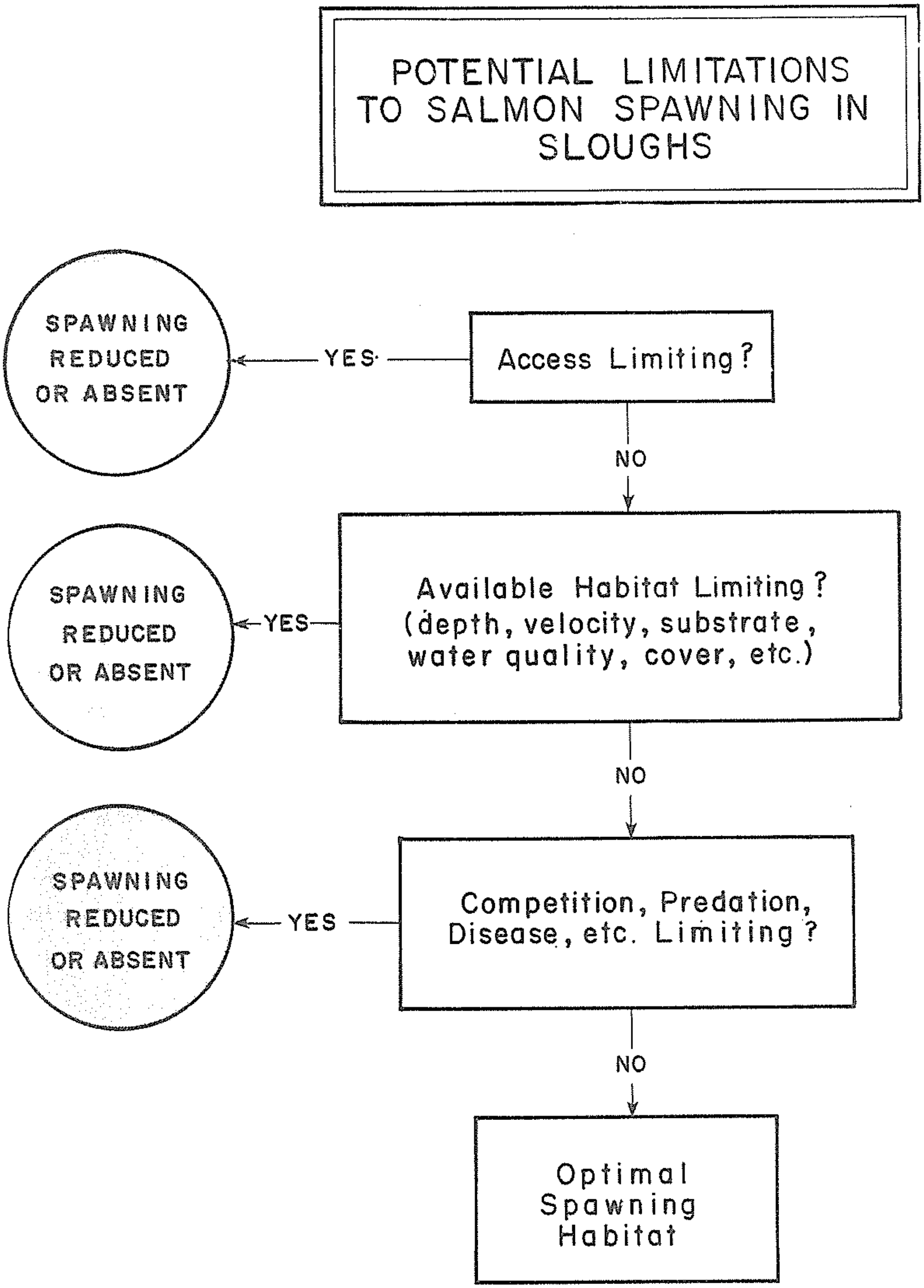



Figure 4II-4-2 Factors limiting salmon spawning.

flow-dependent habitat characteristics will be greatest between Talkeetna and Devil Canyon. In addition, it is feared that reductions in mainstem discharge levels may seriously inhibit fish access to traditional spawning habitats.

Streambed elevations at the downstream entrance to side sloughs are generally lower than the stage (water surface elevation) in the adjoining mainstem channel. Thus, the stage of the mainstem causes a hydraulic plug which impedes the flow of clear water from the mouth of the slough, causing a clear backwater zone to form in the vicinity of the mouth that may extend several hundred feet upstream into the slough. As mainstem discharge increases, the depth and size of the backwater zone at the mouth of the slough continues to increase. At some point, the stage in the mainstem river reaches a critical level, allowing flow from the mainstem to enter the slough at its upstream end. Once overtopped, flows within the sloughs often increase rapidly from less than 10 cfs to more than 500 cfs (ADF&G 1982a, R&M 1982).

Because sloughs 8A, 9, 11 and 21 contained the greatest numbers of live fish, they were studied more intensively and are the primary focus of the remaining discussion regarding fish access problems in side sloughs.

Although some mainstem spawning was documented (Section 4.1.1.1), the most intensively used spawning areas between the Talkeetna and Devil Canyon were located in tributary streams and side sloughs (ADF&G 1981a). It is hypothesized that changes in mainstem flows affect access of salmon into tributaries and side sloughs. The most complete information regarding access pertains to side slough and is the central topic of the following discussion.

Discharge levels in the mainstem Susitna River principally influence side slough habitats in two ways: 1) intermediate discharges cause a backwater effect at the mouth of the slough creating a special type of slough habitat which facilitates access of fish into the slough (ADF&G 1981b and 1982a); and 2) high flows overtop (breach) the upstream end of the slough and may provide a temporary access corridor to upper reaches of sloughs that would otherwise have been prohibited (refer to section 3.1.1.2 for summary of mainstem discharges at which sloughs breach).

Trihey (1982) emphasized that the interaction of mainstem and slough discharges, extent of backwater zone and the characteristics of streambed gradient largely define access conditions to a slough. Although high velocities have been identified as blocking the upstream migration of spawning fish in some Alaskan river, entrance conditions and associated backwater effects in the lower portions of the side sloughs between Talkeetna and Devil Canyon make it nearly impossible for velocity barriers to exist at these locations. Thus, the ease at which adult salmon can enter the side sloughs from the mainstem Susitna appears to be primarily a function of depth.

Slough 9 was selected for detailed discussion because it represents an intermediate level of access difficulty: easier than sloughs 16 or 19, more difficult than Whiskers Slough or Slough 8A and comparable to sloughs 20 and 21 (Trihey 1982).

The thalweg and water surface profiles which defined entrance conditions for Slough 9 on August 24, 1982 are presented in Figure 4I-3-27. The mainstem discharge at Gold Creek was 12,500 cfs and flow in Slough 9 was 3 cfs.

The depth of flow at the mouth of Slough 9 is a function of the water surface elevation of the mainstem and the discharge from the slough. Data obtained during the 1981 and 1982 field seasons indicate that the flow from Slough 9 is quite small unless it is breached (Table 4II-4-1). On the basis of these data, 3 cfs was selected as being typical of the mid-summer clearwater flow from Slough 9.

A staff gauge was installed at the lower entrance to Slough 9, and numerous gauge height readings were recorded through September. The staff gauge was installed in the deepest water available in the passage reach so that it would not dewater before the reach. As a result, gauge height readings are 0.3 feet greater than the controlling depth at the mouth of the slough. Water surface elevations were determined for each staff gauge reading and compared to the average daily mainstem discharge at Gold Creek (Table 4II-4-2). A plot of these data indicates the relationship between mainstem discharge and the water surface elevation in the mouth of Slough 9 is well defined for the range of streamflows from 11,000 to 33,000 cfs (Figure 4II-4-3).

To evaluation the influence of mainstem discharge on fish passage, backwater profiles were determined for the 2,200-foot reach near the mouth of Slough 9 for incremental levels of mainstem discharge and a

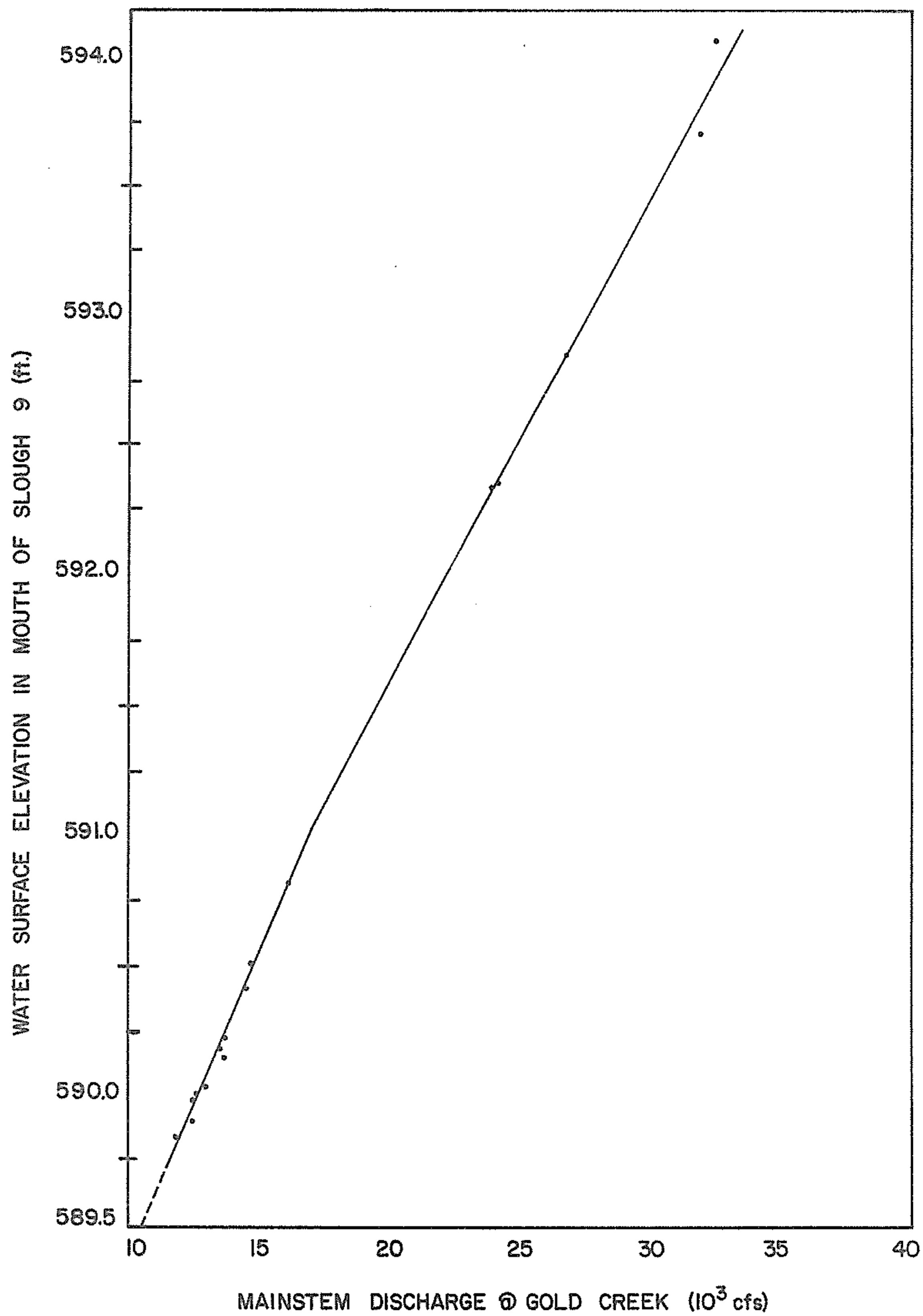



Figure III-43 Water surface elevation at mouth of Slough 9 versus mainstem discharge at Gold Creek.

Table 4II-4-1. Comparison of Slough 9 streamflow measurements with the average daily mainstem discharge at Gold Creek.

| Date | Streamflow (cfs) | Mainstem (cfs) |
|---|---|---|
| 6/24/81 | 2.9[a] | 16,600 |
| 7/21/81 | 714.0[a] | 40,800 |
| 9/30/81 | 1.5[a] | 8,000 |
| 10/14/81 | 1.2[a] | 7,290 |
| 6/23/82 | 182.0[b] | No Record |
| 7/15/82 | 108.0[b] | 25,600 |
| 7/20/82 | 28.5[b] | 22,900 |
| 8/25/82 | 3.4[a] | 13,400 |
| 9/4/82 | 8.4[a] | 14,400 |
| 9/9/82 | 3.0[b] | 13,400 |
| 9/18/82 | 232.0[a] | 26,800 |
| 9/20/82 | 145.0[a] | 24,000 |

[a] ADF&G 1981c and 1982.
[b] R&M Consultants 1982.

Table 4II-4-2. Comparison of water surface elevations (WSEL) at the entrance to Slough 9 and the average daily mainstem discharge at Gold Creek, 1982.

| Date | WSEL[a] (ft) | Gold Creek Discharge (cfs) | Date | WSEL (ft) | Gold Creek Discharge (cfs) |
|---|---|---|---|---|---|
| 8/24/82 | 590.03 | 12,500 | 9/05/82 | 590.16 | 13,600 |
| 8/25/82 | 590.19 | 13,400 | 9/06/82 | 589.91 | 12,200 |
| 8/26/82 | 590.24 | 13,600 | 9/07/82 | 589.84 | 11,700 |
| 8/27/82 | 590.04 | 12,900 | 9/16/82 | 594.09 | 32,500 |
| 8/28/82 | 589.98 | 12,400 | 9/17/82 | 593.71 | 32,000 |
| 8/29/82 | 589.91 | 12,200 | 9/18/82 | 592.86 | 26,800 |
| 9/02/82 | 590.82 | 16,000 | 9/19/82 | 592.37 | 24,100 |
| 9/03/82 | 590.51 | 14,600 | 9/20/82 | 592.36 | 24,000 |
| 9/04/82 | 590.42 | 14,400 | 9/29/82 | 589.98 | 12,400 |

[a] ADF&G gages 129.2 W1A and W1B.

constant sloughflow of 3 cfs (Figure 4II-4-4). Two potential problem areas exist for adult salmon entering Slough 9: a 125-foot reach approximately 400 feet downstream from the mouth of the slough, and a 280-foot reach from 620 to 900 feet upstream of the mouth. The approximate length and average depth within the two critical passage reaches were determined for each backwater profile (Table 4II-4-3.).

Based on data in Table 4II-4-3 and field observations by ADF&G personnel, upstream passage into Slough 9 by adult chum salmon does not appear restrictive at either passage reach A or B when mainstem discharges are 18,000 cfs or higher. At this discharge passage, reach A is no longer an obstacle, having an estimated depth of 1.75 feet (Table 4II-4-3); and passage reach B increases slightly in depth (from 0.20 to 0.30 feet) and decreased greatly in length (from 280 feet to 80 feet). However, access becomes increasingly more difficult as mainstem discharge decreases with acute access problem existing at streamflows of 12,000 cfs or less.

On August 24, 1982, when mainstem discharge at Gold Creek was 12,500 cfs and no appreciable backwater zone was observed at the entrance of the slough, several chum salmon were observed grounded in shallow water near the entrance to the slough (passage reach A) as well as at passage reach B (Plate 4II-4-2). Depths were measured at numerous points where fish were grounded, although few isolated depths of 0.5 feet were measured, the most representative depth restricting access at the entrance to the slough was found to be 0.2 feet.

Plate 4II-4-2 Chum salmon stranded in riffle (see Figure 4II-4-4, station 8 + 00) during low flow conditions in Slough 9, inhibiting access to spawning areas.

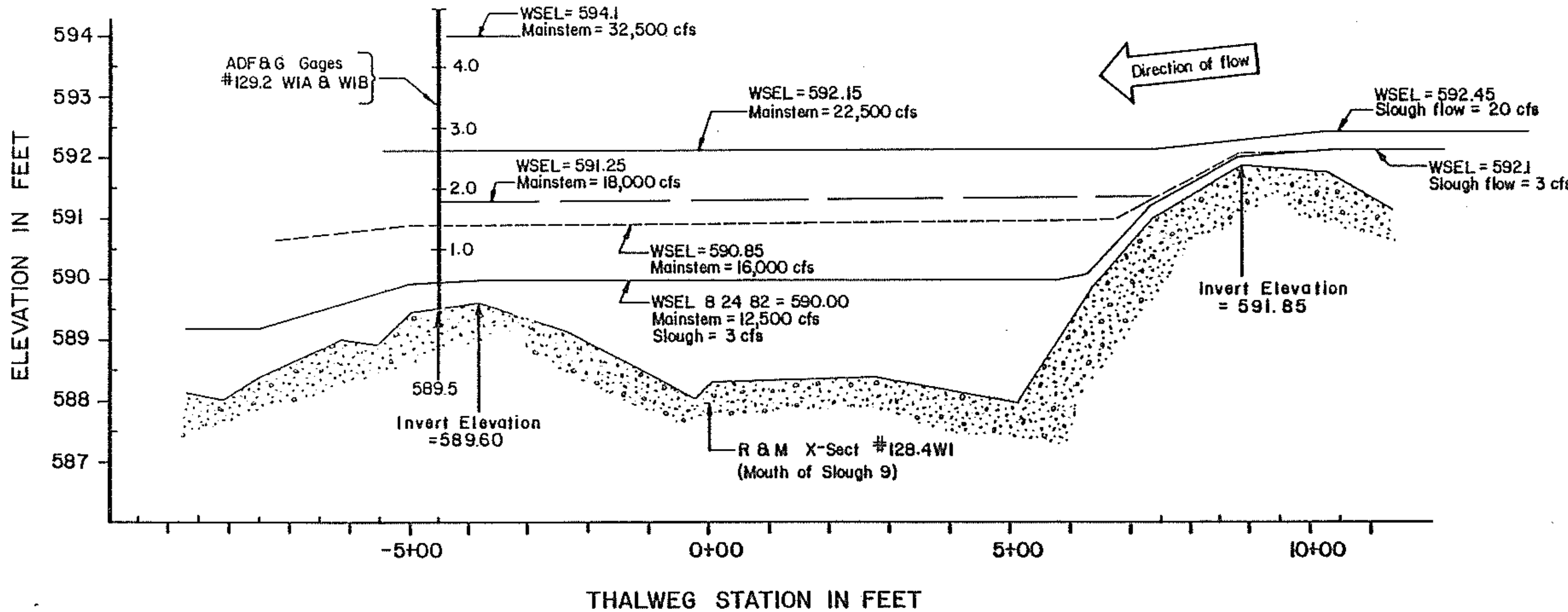



Figure 4II-4-4 Backwater profiles at the entrance to Slough 9 for selected mainstem stream flows at Gold Creek.

342

Table 4II-4-3 Entrance conditions at the mouth of Slough 9 at various mainstem discharges at Gold Creek when slough discharge was 3 cfs.

| Mainstem Discharge cfs | Slough 9 WSEL (ft) | Passage Reach A | | Passage Reach B | |
|---|---|---|---|---|---|
| | | Average Depth (ft) | Reach Length (ft) | Average Depth (ft) | Reach Length (ft) |
| 10,000 | 589.50 | 0.10 | 125 | 0.20 | 280 |
| 12,000 | 589.90 | 0.40 | 125 | 0.20 | 240 |
| 14,000 | 590.35 | 0.85 | 125 | 0.20 | 200 |
| 16,000 | 590.85 | 1.35 | 125 | 0.25 | 140 |
| 18,000 | 591.25 | 1.75 | 125 | 0.30 | 80 |
| 20,000 | 591.60 | 2.10 | 125 | 0.50 | 30 |
| 22,000 | 591.90 | 2.40 | 125 | 0.60 | 10 |

Mainstem conditions ranged between 12,200 and 13,300 cfs during the five days preceding these observations (USGS 1982). The limited number of chum salmon (20 total) observed above passage reach B, indicate that even during poor access conditions, blockage was not complete.

Additional evidence concerning access difficulty in sloughs involves observed changes in distributions of spawning salmon before and after heads of sloughs 8A, 9, and 21 were breached in mid-September (since the head of Slough 11 was not breached, access into this slough was relatively unchanged.) When the head of a slough is breached, water from the mainstem Susitna River enters the slough at its upstream end. Once overtopped, flows within sloughs often increase rapidly from less than 10 cfs to more than 500 cfs (ADF&G 1982a; R&M 1982). With these increased flows, fish are able to proceed to upper slough reaches that may otherwise have been inaccessible.

The breaching event in mid-September occurred as numbers of live chum salmon were sharply declining (Figure 4II-4-1) thereby limiting numbers of fish available to move upstream. Because this figure represents only live fish, and the mortality rates at this time were very high, it is likely that many live fish at September 15 were in poor condition and not able to migrate upslough. However, it is believed that if this high water event had occurred earlier in the year, when numbers of live fish were greatest (late August, early September), considerable spawning may have occurred in upper reaches of sloughs 8A, 9 and 21.

These observations suggest that if the timing of a peak mainstem flow (resulting in temporary breaching) more closely coincided with peak numbers of live spawners, access to upper reaches of sloughs may be facilitated. Such an event, if properly timed would probably reduce many access problems near the mouth (e.g., Slough 9).

In this discussion, the quantification of flow-related access problems for spawning salmon has only been attempted for Slough 9. However, a similar analysis is possible for sloughs 8A, 11 and 21, and will be presented in a future report. However, in light of the magnitude of its restrictive potential for salmon spawning, the following questions involving access to spawning habitats need to be addressed before flow-related impacts can be properly assessed.

1) Does denied or restricted access play a role in defining present distributions of spawning salmon in tributaries and side sloughs?

2) If hydroelectric dams are constructed and summer flows reduced in the mainstem Susitna River, what effect will this have on access to present and/or potential spawning areas?

3) Will changes in access difficulty favor particular species, due to a competitive advantage resulting from physiological differences?

A plan of study for FY 84 is being developed to address the first two questions in a quantitative fashion. Much hydraulic data involving the relationship of the mainstem Susitna River to side sloughs and tributaries already exists and will provide a basis from which to proceed.

#### 4.1.1.2.4 Modeling

Discharge of the Susitna River sloughs cannot be correlated with discharges in the mainstem at this time because 1982 discharges were so low that samples were not representative of the normal range of conditions. The ranges of the various aquatic habitat types utilized by salmon species are also still being developed. The computer models will predict the surface area suitable for a species and/or specific life stage by weighing the utilized depth, velocity and substrate variables against those that were available (Milhous, et al. 1981). Some data have been collected for chum salmon redds. However, none of these variables have been measured at pink, sockeye and coho redds in the Susitna River sloughs. Data from other studies cannot be used to model Susitna River sloughs because fish habitat suitability data may not be comparable between stream systems (Estes, et al. 1981). For these reasons, the surface area utilized for salmon redds cannot be determined.

The vulnerability of salmon redds in sloughs is an important consideration in regulating mainstem flows during the critical spawning season. It is essential that the data base which predicts usable spawning area be reliable under a variety of hydraulic conditions. Because utilized and suitable habitat surface areas cannot be determined this year, they cannot be correlated with discharge regimes on the mainstem Susitna River. Long-term objectives of this study are to develop habitat utilization curves for the salmon species and life phases using the sloughs and side channels of the Susitna River, to develop relationships between the discharge (in mainstem and sloughs) and useable area and to determine mainstem discharges that would minimize impact to the fishery.

The data are sufficient to discuss the general hydraulic conditions and range of flows present when sloughs are breached by the mainstem versus when they are not. This discussion will be included in the 1983 Final Draft Fisheries Habitat Relationships report.

### 4.1.2 Eulachon

Eulachon (Plate 4II-4-3) were observed from the mouth of the Susitna River (RM 0) to a point upstream of the Susitna River near Willow Creek (RM 49.5). The Yentna River was not surveyed upstream of Kroto Slough mouth where eulachon were observed, however, historical accounts (personal communications) of past runs show an upstream limit of the run on the Yentna River to Big Bend with isolated accounts of fish presence to Skwentna.

Eulachon appeared to utilize the majority of the mainstem Susitna River and its associated side channels for passage and spawning. Eulachon did not, however, appear to utilize the clear water tributaries upstream of the confluence zones.

Eulachon appeared to key on water velocity for upstream direction during their spawning migration run. Eulachon were seldom observed in areas of low water velocity (less than 0.3 ft/sec) or backwater or eddy habitat zones. They appear to bypass these areas in favor of areas with moderate downstream velocities. The majority of the upstream eulachon migration appeared to occur along banks with moderate water velocities (0.3-3.0 ft/sec). At times, the upstream movement of fish was so dense as to create a visible surface wave (Plates 4II-4-4 and 4II-4-5).

The habitat requirements necessary for eulachon appear quite broad (Tables 4II-3-8 and 4II-3-9, Figures 4II-3-39 to 60). Thus, a significant portion of the lower Susitna River is available as spawning habitat.

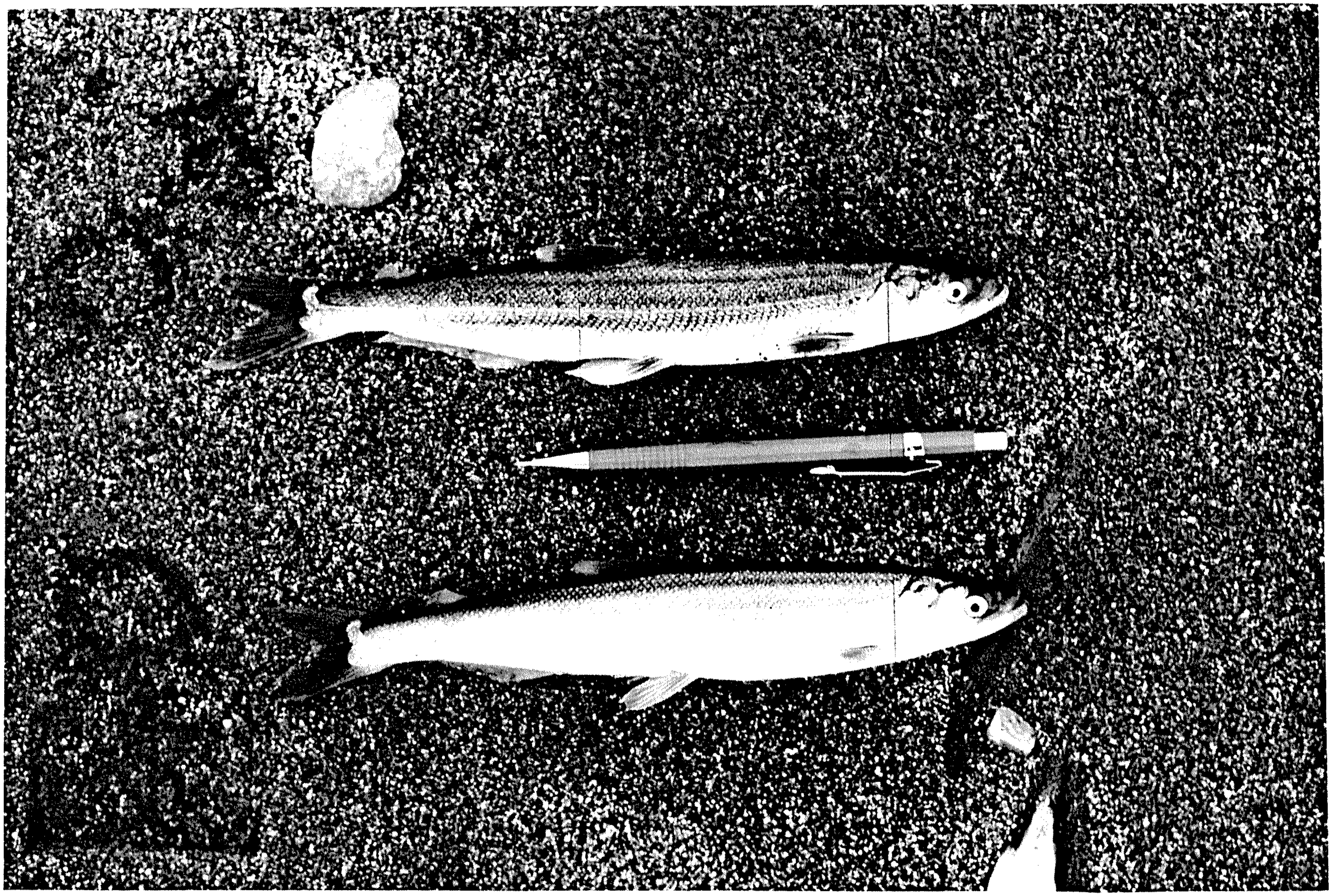


Plate 4II-43 Male and female eulachon taken from the Susitna River at RM 21.4, June 1, 1982.

Plate 4II-4-4 Upstream movement of Eulachon along the west bank of the Susitna River at RM 16.5, June 1, 1982.

Plate 4II-4-5 Upstream movement of eulachon creating a visible surface wave along the east bank of the Susitna River at RM 15.0, June 6, 1982.

Spawning occurred throughout the mainstem Susitna River and its associated side channels, but bar and riffle zones with moderate water velocities appeared to be preferred. One riffle zone (spawning site #14) had approximately 10,000 fish milling in what appeared to be spawning behavior (Plates 4II-4-6 and 4II-4-7). In addition, over 10,000 fish were observed dead along the banks, with most fish being spawned out (Plates 4II-4-8). Deposited eggs were found in substrate samples at this site.

Eulachon spawn over course sand and pea-sized gravel in water up to 7.6 feet deep (Morrow 1980). The mean water depth measured at surveyed spawning sites ranged from 1.1 - 3.1 feet with the range of depths varying at all survey sites from 0.3 - 4.3 feet. The mean water column velocity measured at surveyed spawning sites ranged 0.6 - 1.9 ft/sec with the range of velocities varying at all survey sites from 0.0 - 3.2 ft/sec. Substrate used for spawning varied from 100 percent silt to silt and sand intermixed with gravel, rubble and cobble. The preferred substrate ranged from silt to sand intermixed with gravel.

Water temperatures at surveyed spawning sites ranged from 6.2° to 11.2°C. These values are somewhat higher than the water temperatures recorded at Susitna Station (RM 25.5) which range from 1.0° - 9.0°C (Figure 4II-3-61). Local variability may be in part responsible for these deviations in values. Water temperature at time of spawning ranged form 3.0° - 9.5°C while during the peak of the run (as seen by an

Plate 4II-4-6. Milling fish in what appeared to be spawning behavior along the east bank of the Susitna River at RM 15.0, June 6, 1982.

353

Plate 4II-4-7 Milling fish in what appeared to be spawning behavior along the east bank of the Susitna River at RM 15.0, June 6, 1982.

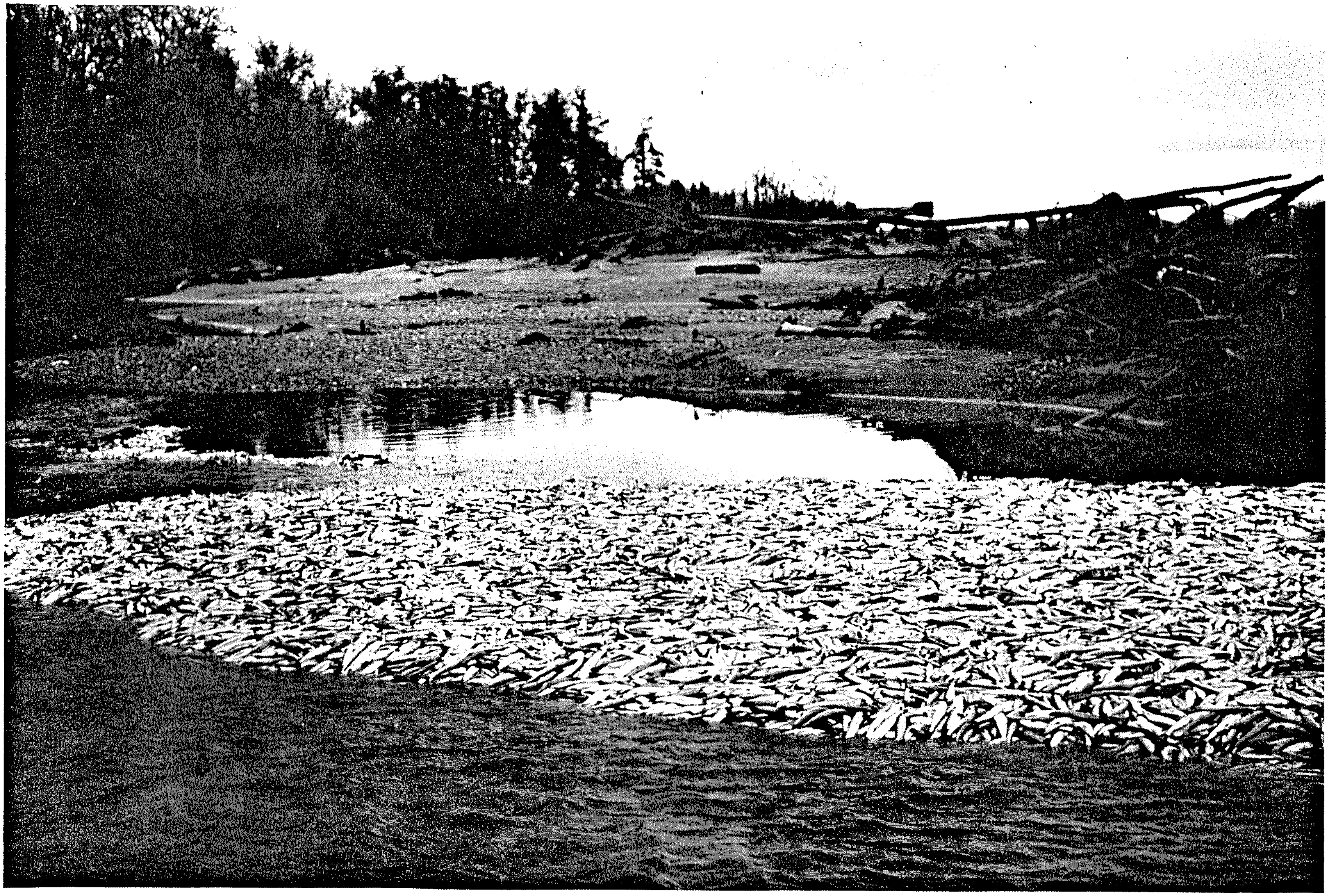


Plate 4II-4-8 Accumulation of dead eulachon along the east bank of the Susitna River at RM 15.0, June 6 1982.

increased CPUE) varied from 6.0° - 9.0°C (Figure 4II-3-62). These observed water temperatures are somewhat higher than previously reported, preferred spawning temperatures of 4.4° - 7.8°C (Morrow 1980).

In closing, it should be noted that because this was a first year attempt at describing the habitat characteristics of eulachon spawning areas, these data and evaluations that are presented should be considered preliminary. Continuation of these studies are planned in 1983.

### 4.1.3 Bering Cisco

Based on 1982 fishwheel and electrofishing catch data in this report (Volume 2), Bering cisco began their spawning migration into the Susitna River during early August. The earliest capture of a Bering cisco was in a fishwheel at Susitna River (RM 25.5) on August 7. The upstream limit of migration in the Susitna River (based on 1982 electrofishing catch data) appears to be RM 101.9. This compares to 1981 findings (ADF&G 1981b), which showed the upstream limit of migration to be RM 100.5. The Yentna, Chulitna and Talkeetna Rivers were not sampled above their confluence, however, it is possible that a portion of the spawning run utilizes these drainages. Bering cisco have been captured at the ADF&G fishwheel site six miles upstream on the Yentna River.

In general, Bering cisco spawning runs occur during periods of general declines in both surface water temperature and discharge (Figures 4II-3-65 and 4II-3-66). In addition, increases in discharge seem to discourage movement. For example, during 1982 a high discharge event which occurred on September 13 corresponded to a reduced catch at the Sunshine fishwheel. Further, during this period the electrofishing catch was low.

Bering cisco appear to utilize the mainstem channels of the Susitna River exclusively for spawnings and passage. They do not appear to utilize sloughs or clear water tributary confluence zones. They were most often distributed individually or in small aggregates along gravel bars in the mainstem channel. These findings generally concur with 1981 findings.

Bering cisco were not present in the east channel of the Susitna River between RM 62 and RM 70.0 during either 1981 or 1982, although habitats in this reach of the river are similar to those in other reaches utilized by Bering cisco. There were no discharge or velocity measurements taken in the east channel. However, the discharge and overall velocity regime of the east channel is less than that in the main west channel, which may, in part, be responsible for these observations. In addition, the east channel has several clearwater tributaries which empty into it, which may create less favorable conditions of turbidity or temperature. Bering cisco have never been observed in the vicinity of clearwater tributaries in the Susitna River Basin.

Only one spawning site for Bering cisco was found in 1982. This site, which was a documented spawning site in 1981 (ADF&G 1981b) was located along a mainstem gravel bar opposite Montana Creek (RM 76.8 - 77.6). The site was divided into two study areas and surveyed for its spawning habitat and had substrate which ranged from gravel to cobble, with gravel being predominant. The smaller substrate types were located in zones with low to medium velocities (less than 3.5 ft/sec) and shallow depths (less than 2.5 feet). Spawning water column velocities and depths ranged from 0.0 to 5.0 ft/sec and 1.0 to 4.0 feet, respectively. The mean spawning water column velocity and depth were 2.3 ft/sec and 2.4 feet, respectively. These habitat characteristics generally concur with 1981 findings at this site (ADF&G 1981b). Water temperatures at the time of spawning, however, were different. Water temperatures in 1981 at the time of spawning ranged from 3.0 - 3.8°C, while 1982 water temperatures ranged from 0.2 - 0.4°C (Table 4II-3-11). Discharge at the time of spawning during both 1981 and 1982 ranged from 15,000 - 20,000 cfs.

Fewer spawning sites for Bering cisco were located in 1982 than in 1981. One reason for this may be that in 1982 Bering cisco appeared to have begun spawning later. No ripe fish were found in 1982 until October 13, while in 1981 ripe fish were found beginning in early October. Due to an early freeze up, sampling was prevented after October 14, 1982, because spawning sites could not be located and studied. It is likely that Bering cisco utilized other areas for spawning after October 14, 1982.

Because there is a limited data base on Bering cisco spawning sites during 1981 and 1982, the data and evaluations presented should be considered preliminary. Continuation of these studies are planned in 1983.

## 4.2 Juvenile Anadromous Fish Habitat Investigations

The assumption in the study design for sampling based on hydraulic zones was that the fish have a choice of habitat types at each sampling location and will be found in the highest concentration in those zones which have the habitat conditions most desirable to the fish. This assumption holds well for chinook and coho juveniles which remain in the system for one or two years and have the capability of moving upstream in tributaries and sloughs. The assumption may not hold as well for chum and pink juveniles which do not overwinter and may be outmigrating from the spawning areas. Sockeye salmon juveniles probably exhibit both types of behavior. Chum juveniles rear in the Susitna system, holding in some of the slough and tributary areas, and exhibiting growth (see Volume 3, Section 3.2); however, they probably would not migrate from a slough up into a tributary. Chum adults spawn in tributaries and both chum and sockeyes spawn in the free-flowing area (zone 1) of sloughs such as Slough 21, Slough 11, and Slough 8A. In these sloughs, juveniles can remain in the zone 1 areas or migrate, either down to the mainstem backwater area or into the mainstem itself. At the time of spawning by chum and sockeyes in these three sloughs, the zone 1 areas were located in the slough channel, fed by springs or by very small tributaries.

Birch Creek and Slough is an example of an area where the juvenile salmon catch was strongly segregated by zone. During June and July, the slough was backed up by the mainstem to a point about 600 feet above the confluence of Birch Creek, creating a zone 6 in the slough above the creek, a zone 7 in the slough below the creek, and a zone 1 in the creek itself. Sixty percent of the chinook salmon juveniles captured were from zone 7, the rest were evenly distributed between zone 1 and zone 6. Chums were evenly distributed between zone 6 and zone 7; none were captured in zone 1. Eighty-eight percent of all cohos captured were from zone 1. These three species were clearly exhibiting a preference for a particular habitat type. No sockeye or pink salmon were captured at this site. An attempt will be made in the next report (Fish and Habitat Relationships) to correlate these kinds of habitat preferences with measured habitat variables such as temperature, turbidity, and the amount of cover available.

In the following discussion of each juvenile salmon species, the number of juvenile salmon of each species captured in the mainstem backwater zone as a percentage of the total juveniles of that species captured in all zones sampled is presented to provide an indication of the relative habitat importance of the backwater zone to that species. Because the surface area of the backup zone is a function of mainstem discharge, this analysis provides an indication of how varying mainstem discharge might be related to those juvenile salmon that demonstrate use of these areas. Chum and sockeye salmon juveniles were captured mainly in the backwater zone, whereas cohos and chinooks were captured mainly in other zones. Cohos were the least likely to be captured in the backwater zone. Pink salmon juveniles are not discussed because very few were captured. Our present hypothesis is that low discharges which lead to the closure of slough heads and the decline in surface area of mainstem backwater zones have the most serious repercussions for chum and sockeye juveniles; there is a lesser impact on chinook and coho juveniles.

The nature of habitat conditions that make the mainstem backwater zone a desirable habitat for juvenile salmon will be analyzed more thoroughly in the next report (Fish and Habitat Relationships). Habitat conditions in sloughs can undergo radical changes when the slough head opens or closes because of the change in water source and water velocity. The backwater zone may buffer this phenomenon, as well as rainwater runoff, and may provide a more stable set of habitat conditions than the zones above and below. Backwater zones are generally conducive to vegetative growth, which provides cover. Water velocities are low, thus providing a good holding area. Backup zones may provide juvenile salmon with an edge effect; a variety of habitat conditions are available in a usually short distance. Also, tributaries of various sizes are often near the backup zones, providing a source of food.

A further analysis of the effect of slough heads opening and closing on fish distribution in sloughs will be presented in the next report. This phenomenon causes changes in slough habitat conditions and fish respond to these changes. The opening or closing of a slough head is not an abrupt event; fish have time to respond by moving to areas of more favorable habitat if the new conditions are not desirable.

### 4.2.1 Chum Salmon

Of the five species of Pacific salmon which spawn in the Susitna River, the chum salmon, *Oncorhynchus keta* (Walbaum), is the only one which spawns extensively in both tributaries and sloughs. Consequently, the population of fry is exposed to a wider variety of habitat conditions than other species from the time of emergence to the time of outmigration from the system.

The number of chum salmon juveniles captured steadily declined from the beginning of sampling in early June to mid-August, when the last chum was caught. Generally, juvenile chum salmon distribution and relative abundance appeared to be a function of where the parents spawned the previous fall and of seasonal outmigration.

Little can be concluded regarding chum salmon preference for a certain range of any particular habitat parameter because of their relatively short time in the system and the relatively small numbers of fish collected. A general idea of the ranges of values for varying habitat parameters can be obtained by extracting from Appendix G those sites where chum juveniles were abundant and, from Appendix I, the habitat data for those sites. Chums were generally captured in areas of low water velocity. The chums present in Indian River (zone 1) during June were observed in small backwaters created by gravel bars and by deadfall. They also seemed to prefer areas with cover provided by turbidity contributed by the mainstem. There is a possibility that the different temperature regime in tributary redds versus slough redds affects emergence timing. The chum eggs in sloughs, which have warmer intragravel temperature resulting from upwelling ground water, would be expected to have a shorter incubation time than chum eggs in tributaries. Data are needed on intragravel temperatures at spawning areas in tributaries.

Interpretation of the relative importance of different habitat conditions is difficult because of difficulty in determining if the fish collected were rearing (feeding) or simply migrating through an area where they were collected. Chums were mainly captured in zones backed up by the mainstem except for areas where adult chums spawn in tributaries (for example, Indian River and Goose Creek). Slough areas with slack water caused by mainstem backwater and with at least moderate turbidity were evidently an important habitat type which chums used as rearing areas during outmigration. An example of such an area is Slough 6A. Very few adult chums spawn in this slough, but juvenile chums were abundant during June. Taking the percentage of chums caught in the zones influenced by mainstem backwater (zone 2, zone 6, zone 7) as a percentage of chums caught in all zones at each sampling site (only for those sampling periods where there was beach seine or electrofishing sampling effort in both kinds of areas) and summing all sites shows that 59 percent of all chum juveniles captured in early June, 85 percent in late June, and 94 percent in early July were captured in a mainstem backwater zone. The lower percentages earlier in the season reflects chums captured in Zone 1 during outmigration from stream spawning areas.

The relationship of the total surface area of the aggregate type H-II backwater zone habitat type to mainstem discharge is shown in Figures 4I-4-1 and 4I-4-2. The availability (surface area) of this type of habitat at the sampling site generally declined with a decrease in mainstem discharge over the range of mainstem discharges observed. Although chum juveniles were caught in this kind of habitat more than in other zones, the relationship of chum catch to the availability of this type of habitat cannot be explicitly analyzed because there are only three data points (sampling periods). A more definitive analysis is presented for chinook and coho juveniles, which are present in the system all year and were caught in larger numbers than chums. A more intensive sampling effort for chums will have to be conducted in late spring and early summer of next season to understand the dependency of this species on mainstem discharge conditions.

The closure of slough heads during the early part of the summer may create conditions that are undesirable to juvenile chums rearing in sloughs. About 1,800 chum fry were visually observed in Slough 8 (adjacent to Lane Creek) in late June in a mainstem backwater zone. The head of this slough had recently closed and the backwater zone was undergoing significant changes in habitat conditions, including water temperature and turbidity. Fourteen days later, no chums were observed in this area. It can not be concluded at this time whether their absence at the later date is a function of undesirable habitat caused by closure of the slough head or simply a result of seasonal outmigration out of this slough. This problem points out difficulties in establishing cause-effect relationships when behavior of juveniles correlates with natural changes in habitat conditions. An examination of behavior differences between sites may ultimately provide better insight into the importance of the stimulus associated with mainstem by discharge changes.

The closure of slough heads can also cause stranding of juvenile salmon in isolated pools. Shortly after the head of Slough 8 closed, 10 juvenile chum salmon were observed in an isolated pool in the slough just below the head. This has also been noted elsewhere on the river.

### 4.2.2 Sockeye Salmon

Surveys conducted to date indicate that adult sockeye salmon, Oncorhynchus nerka (Walbaum), which spawn above Curry (RM 130.7) in the Susitna River, do so almost entirely in sloughs. The majority of the few thousand sockeye adults which migrate upstream past Curry have spent one additional winter after the winter of emergence in the freshwater system. However, the scanty evidence collected so far on juvenile sockeyes indicates that there may not be much overwintering occurring above Curry (see discussion in Volume 3, section 4.1.2.4). The farthest upstream that an age 1+ or 2+ sockeye juvenile has been collected is Slough 6A (RM 112.3). This does not mean that sockeyes do not overwinter above this point. The methods used in 1981 did not effectively collect sockeye juveniles, and effective techniques (electrofishing and beach seining) used in 1982 were not as intensive in early June as they were later. The sockeye smolts may have moved downstream before these methods were fully deployed.

Sockeye juveniles are found in those sloughs where adults spawn and also in the mainstem backwater zone of other sloughs. The number of sockeye juveniles captured in the mainstem backwater zone (zone 2, zone 6, zone 7) as a percentage of the total sockeyes captured in all zones was high (greater than 88 percent) for all sites in the lower reach (Goose Creek to Chulitna confluence). Except for Slough 8A, Slough 11, and Slough 21, this percentage was also high (greater than 71 percent) for all sites in the upper reach (Chulitna confluence to Portage Creek). The free-flowing areas (zone 1) of Slough 8A, Slough 11, and Slough 21 have a low gradient with many small pools which sockeye juveniles seemed to prefer. Also, the adult sockeye normally spawn in zone 1 at these sloughs, which contributes to the broader distribution of the juveniles.

The availability of the mainstem backwater zone type of habitat as a function of mainstem discharge is shown in Figures 4I-4-1 and 4I-4-2. The surface area of this habitat type generally declines with a decrease in mainstem discharge over the range of mainstem discharges observed. This could have deleterious effects for this species which was found in such high proportions in this habitat type. A more intensive sampling effort at sloughs during the period immediately after ice-out will be necessary to collect more definitive data on this species.

### 4.2.3 Coho Salmon

Coho salmon, Onchorhynchus kisutch (Walbaum), adults in the Susitna River system spawn primarily in tributaries.

Coho salmon juveniles were captured in the tributaries and sloughs of the Susitna River between Goose Creek-2 (RM 73.1) and Slough 21 (RM 142.0) from June to September. Juvenile coho salmon were found in all major habitat types in the system, including tributaries, sloughs, sidechannels and the mainstem, but were observed with a greater frequency at tributary sites, including sloughs associated with tributaries.

Adult cohos spawn in the tributaries upstream of all the sampling sites where the most cohos were captured (Rabideux Creek, Sunshine Creek, Birch Creek).

Juvenile cohos exhibit a seasonal movement between the major habitat types with a preference for tributaries and sloughs that have an abundance of cover. They were captured in larger numbers and with a greater frequency in areas with emergent or aquatic vegetation and/or overhanging and deadfall cover. Fewer juvenile cohos were observed at many of the sites in the Chulitna to Portage reach than observed at similar habitat types in the reach below the Chulitna confluence. These sites above and below the Chulitna confluence were significantly different in the amount of available cover. Several sites above the Chulitna confluence were lacking in the amount and quality of cover as compared to some sites below the Chulitna confluence. Juvenile coho salmon were generally captured in areas of low water velocity with moderate turbidity and abundant aquatic or emergent vegetation. Some of these areas of low velocity and emergent cover were created by the backwater effects of the mainstem water surface elevation at the mouths of tributaries and sloughs. The mainstem backwater zones at sites below the Chulitna confluence inundated considerable amounts of emergent vegetation creating suitable rearing habitat with sufficient cover for coho juveniles. Mainstem backwater areas at sites above the Chulitna confluence were typically smaller in area than sites below Chulitna, primarily because of steeper gradients in the sloughs and tributaries and the narrowness of the flood plain.

Coho juvenile salmon were often captured in the mainstem backwater zone, but were also frequently captured in tributaries above the influence of the mainstem backwater. They were not captured in the area below the mainstem backwater zone nearly as often as were chinook salmon.

The following table indicates the number of coho juveniles captured in the mainstem backwater zones (zone 2, zone 6, and zone 7) as a percentage of the number of cohos captured in all zones sampled at the site, summed for all 17 Designated Fish Habitat (DFH) sites. The data are from minnow traps only and are weighted by the effort (number of traps) deployed in each zone.

| Sampling Period | Percent cohos captured in mainstem backwater zones |
|---|---|
| June 1-15 | 23 |
| June 16-30 | 32 |
| July 1-15 | 31 |
| July 16-31 | 15 |
| August 1-15 | 20 |
| August 16-31 | 20 |
| September 1-15 | 23 |
| September 16-30 | 23 |

One-third or less of cohos captured at all sites were captured in the mainstem backwater zone. This percentage is lower than that of any other salmon species. Specific sites did show higher percentages. Goose Creek and Side Channel, Whitefish Slough, and Slough 6A were all greater than 50 percent. However, in general, coho salmon juveniles appear to use the mainstem backwater zone less than other salmon species. Furthermore, compared to the other salmon species, the percent use of the mainstem backup zone by coho salmon juveniles is relatively constant from June to September, thus indicating that there is not a seasonal dependence on this type of habitat as there may be with chinook salmon juveniles. The availability (surface area) of the type of habitat as a function of mainstem discharge is shown in Figures 4I-4-1, and 4I-4-2, for the range of mainstem discharge observed.

### 4.2.4 Chinook Salmon

Chinook salmon, *Oncorhynchus tshawytscha* (Walbaum), adults spawn primarily in tributaries of the Susitna River in the reach covered by the juvenile anadromous fish studies. However, juvenile chinooks are found in all major habitat types in the system, including large and small tributaries, sloughs, sidechannels, and the mainstem. The juveniles exhibit seasonal movement back and forth among these areas, but present data do not allow a definite conclusion with regard to the seasonal importance of each of these major habitat types. The majority of adult chinooks migrating upstream past the Talkeetna camp have spent an additional winter as juveniles after the winter of emergence in the freshwater system.

Chinook juveniles were often captured in the area of the sampling sites which was backed up due to mainstem stage, but were also frequently captured in tributary mouths (zone 1) and in the mixing zone (zone 3) below the mouth of a slough or tributary. The following table shows the number of chinook juveniles captured in the mainstem backwater zone (zone 2, zone 6 and zone 7) as a percentage of the number of chinooks captures in all zones sampled at the site, summed for all 17 DFH sites. The catch data are from minnow traps only and are weighted by the effort (number of traps) deployed in each zone.

| Sampling Period | Percent Chinooks Captured in mainstem backup zones |
|---|---|
| June I | 60 |
| June II | 68 |
| July I | 33 |
| July II | 33 |
| Aug I | 22 |
| Aug II | 35 |
| Sept I | 41 |
| Sept II | 4 |

The majority of chinooks captured in June were in the mainstem backwater zone; the percentage in this zone halved in July and remained below 50 percent the rest of the season. It is difficult to determine why the percentage was high in June, but it is probably a result of chinook juvenile migrating out of tributary systems at that time of year. The availability (total surface area) of the mainstem backwater zone habitat type as a function of mainstem discharge is shown in Figures 4I-4-1 and 4I-4-2. Generally, the greatest amount of this type of habitat was present in June when mainstem discharge was highest.

The aggregate mainstem backewater zone in sloughs includes zone 6 in sloughs above the confluence of tributaries and zone 7 in sloughs below tributaries. Chinook juveniles exhibited a preference for zone 7 over zone 6, evidently attracted by tributary effluents. Chinooks were also often found in zone 3, which is the mixing zone of tributary/slough effluent with mainstem water. The desirability of these types of habitats is probably related to a supply of food drifting out of tributaries and the availability of cover provided by the turbidity of mainstem water.

## 4.3 Resident Fish Habitat Investigations

Similar habitat conditions may attract different species of resident fish with comparable habitat requirements. These fish may be in association with at a site and may compete with each other for food, space, or other biological needs. Interspecies associations, however, need not be competitive but it is unlikely that such associations would be beneficial.

The mixing zones (zone 3) of Lane Creek, 4th of July Creek, Indian River, Slough 20, and Portage Creek are all very similar and the species composition of resident fish inhabiting them is also similar. Mixing zones at these sites typically have moderate water velocities, turbidities, and temperatures and the substrate is normally gravel or sand with rocks ranging up to several feet in diameter with cover provided by the turbid water flow of the Susitna River. Resident fish associated with these mixing zones normally include round whitefish, Arctic grayling, and rainbow trout. Large longnose suckers also may congregate in these zones, especially in August and September. Skull Creek and Jack Long Creek, two selected fish habitat sites, also have similar mixing zones and resident fish populations using them.

During June and July, the associated species of rainbow trout, Arctic grayling, and round whitefish may compete for food. Food habits of these species are very similar and food items generally include immature stages of various insects (TES 1981, Morrow 1980). Competition might be reduced, however, by time or place of feeding. Arctic grayling are primarily surface or mid-depth feeders (TES 1981) while round whitefish feed on the bottom (Hale 1981). It is also possible that the various species partition the space within a mixing zone; for instance, Arctic grayling might feed in areas with higher water velocities than round whitefish do. Rainbow trout, being larger in size, would probably be more able to compete for available cover in the form of large rocks or submerged brush piles.

In August and September, the resident fish present presumably feed almost entirely on salmon eggs of which there is an abundant supply. Stomachs of sampling mortalities examined during this period were almost always full of eggs. Large longnose suckers may gather at the mixing zones at this time to take advantage of this food source. Food would probably not limit resident numbers and competition for space may become more important.

At designated fish habitat sites such as Goose Creek 2 and Side Channel, Sunshine Creek and Side Channel, and Whiskers Creek and Slough, mixing zones typically have lower water velocities, higher turbidities and finer materials for substrates than in many of the upper sites. Species associated here are adult and juvenile longnose suckers, juvenile round whitefish, slimy sculpins, and sometimes juvenile Arctic grayling. With the exception of Arctic grayling, all of these fish are bottom feeders. Spatial separation of habitat within a zone could be important in limiting competition.

Sloughs not associated with tributaries, such as Whitefish Slough and sloughs 6A, 8A, 11, 19, and 21 typically had fewer residents present. Often these sloughs were used by rearing juvenile round whitefish, Arctic grayling, longnose suckers and slimy sculpins. Adult rainbows also made some use of these sloughs and probably preyed on these juveniles at times. Sometimes adult longnose suckers, round whitefish, and humpback whitefish were also found in mixing zones and backed up zones where the turbidity was moderate.

### 4.3.1 Rainbow Trout

Rainbow trout (*Salmo gairdneri* Richardson) are generally recognized as spring spawners (Morrow 1980, Scott and Crossman 1970). Susitna River rainbow trout generally begin their spawning migration to the clear water tributaries from the mainstem and its various side channels during May to late June (Volume 3). Trotline catches of rainbow trout at designated fish habitat sites were comparatively high in June in mixing zones of slough or tributary water and mainstem water (aggregate zone W-III) and then dropped in July as the rainbow trout moved from these zones farther up into the tributaries to spawn (Figure 4II-4-5). Electrofishing catch rates at mainstem and tributary or slough sites also dropped in July indicating a spawning migration during June (Figure 3-4-1).

Actual spawning of rainbow trout has not been observed in the Susitna River basin and therefore the exact periods of spawning and the habitat conditions associated with successful spawning are not known. Spawning has been shown to occur over a bed of fine gravels in a riffle zone above a pool (Morrow 1980). The female fans a redd, drops her eggs which are simultaneously fertilized by the male during a courtship ritual then recovers the redd. Several redds may be used, with 800-1000 eggs deposited per redd. The eggs hatch in 4-7 weeks with alevin development lasting 3-7 weeks. The young emerge from the redds during June-September, depending on temperature (Morrow 1980, Scott and Crossman 1973). After spawning, rainbow trout move into their summer rearing habitat.

Rainbow trout were captured with trotlines at designated fish habitat sites in zones with a tributary or slough water source (aggregate zone W-I) consistently during July and August (Figure 4II-4-5). Trotline catches of rainbow trout in mixing zones (zone W-III) and mainstem water zones (zone W-II), on the other hand, were comparatively lower during this time period. In addition, boat electrofishing catch rates were also very low in these habitat zones during July and August (Volume 3,

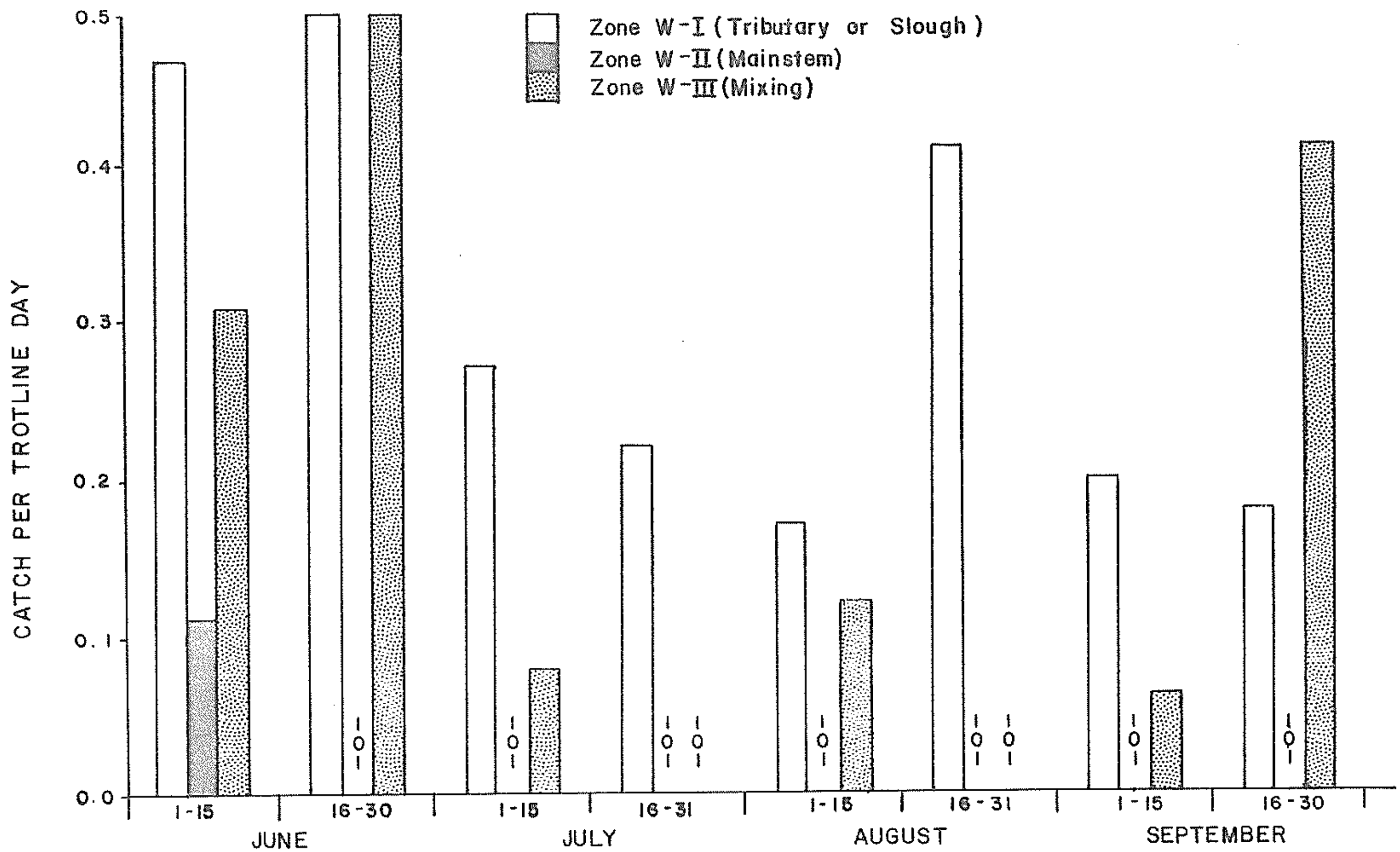



Figure II-4.5 Rainbow trout catch per unit of trotline effort by aggregate water source zones at Designated Fish Habitat (DFH) sites on the Susitna River between Goose Creek 2 and Portage Creek, June through September, 1982.

Figure 3-4-1). These data suggest that the preferred summer rearing habitat for rainbow trout in the Susitna River basin are the clear water tributaries and sloughs upstream from their confluence zones. Juvenile rainbow trout in particular are very rarely captured near confluence zones of tributaries or sloughs during the summer. Since very little study has been conducted in these upstream areas, little is known of the habitat characteristics associated with summer rearing habitats of rainbow trout in the Susitna River basin.

Trotline catch rates of rainbow trout in mixing zones (aggregate zone W-III) of slough or tributary water with mainstem water rose in September (Figure 4II-4-5) as did boat electrofishing catch rates at both tributary and mainstem sites (Figure 3-4-1). These results indicate that rainbow trout move out of the tributaries into the mainstem and its various side channels for overwintering during mid-August to late September. The movement out of the tributaries is likely cued to water temperature, with decreasing water temperatures in the tributaries during fall, initiating out migration.

Based on 1981-82 catches Volume 3 and radio telemetry studies, the preferred habitats for overwintering rainbow trout are the sloughs and side channel habitats exhibiting slow to moderate velocities (0.2 to 3.0 ft/sec) free of under-ice slush. (Table 4II-3-12). Fish are generally not observed or caught in areas of open leads, suggesting that ice may be used as cover. The preferred substrate is gravel, rubble, and cobble rather than silt and sand, although fish are present in areas of silt and sand. Rainbow trout are most often observed in areas of higher specific conductance (above 200 umhos/cm) and water temperatures (above 0.5°C), indicating areas of upward percolation of water. Food sources during the winter period are unknown, since studies on food habits were not initiated this past year. Preliminary observations indicated however, that benthic invertebrates may make up a significant portion of the winter diet of rainbow trout.

The movement patterns of rainbow trout from the time they leave the tributaries in fall to when they re-enter the tributaries in spring has been largely unknown. Radio telemetry studies (Figure 3-3-3) show that between the period of freeze-up and the time the fish move into their overwintering habitat, the fish move in a general downstream pattern, probably in searching for suitable overwintering habitat. Once in their overwintering habitats, they appear to remain fairly sedentary until they begin their movement into the tributaries after breakup.

### 4.3.2 Arctic Grayling

Arctic graying (Thymallus arcticus Pallas) are generally recognized as spring spawners, with spawning occurring immediately after breakup (Morrow 1980, Scott and Crossman 1973). Arctic grayling in the Susitna River begin their spawning migration from their overwintering habitats into clear water tributaries in May (Volume 3). Although Arctic grayling spawning has not been observed in the Susitna River basin it is presumed to occur only in the clear water tributaries during May to mid June. Arctic grayling sampled in late June were found to be spawned out. Male and female Arctic grayling have been reported to engage in a courtship ritual, during which time spawning takes place (Morrow 1980). No particular substrate is reportedly preferred for spawning, but sandy gravel substrate is reported to be most often used. Development to hatching requires 11 to 21 days, depending on temperature. No ~~date~~ data is currently available on the habitat requirements of Arctic grayling spawning in the river.

Do spawning fish rear?

After spawning, Arctic grayling move into their summer rearing habitats. Boat electrofishing catch rates (see Volume 3, section 3.1.1.2) show that the preferred summer rearing habitat for adult Arctic grayling appears to be the clear water tributaries, especially those above the Chulitna River confluence, rather than the mainstem. Adult Arctic grayling were captured most often during the summer in mixing zones (zone 3) at the mouths of large tributaries such as Lane Creek, Indian River, and Portage Creek (see Volume 3, section 3.1.1.2). Very large Arctic grayling greater than 300-mm fork length comprised only a very small portion of the catch during July and August. (Figure 3-4-3). These large fish are probably able to set up feeding territories in desirable pools in upstream areas of the tributaries and displace small fish which then move down to the less desirable habitat at the confluence and in the mainstem. Since very little study has been conducted in the upstream areas of clear water tributaries, little is known of the specific habitat characteristics associated with summer rearing habitats of adult Arctic grayling in the Susitna River, below Devil Canyon.

Juvenile (fork length under 200mm) Arctic grayling during the summer were found mostly in the mixing zone (zone 3) of tributaries in the reach of river between the Chulitna River confluence and Devil Canyon. These tributaries, such as Lane Creek, Skull Creek, Indian River, and Jack Long Creek, seasonally flow clear and cold water. The juveniles appeared to rear in areas of slow to moderate water velocities (under 1.5 ft/sec) and with moderate to high turbidities (over 20 NTUs) at the mouths of these tributaries.

Although Arctic grayling juveniles were most prevalent at tributary mouths, they were also found in relatively large numbers at mainstem sites above the confluence, notably after August. At these sites, juveniles were found rearing in areas with similar water velocities and turbidities to that found at tributary sites. With the decrease in water discharge at the tributaries and the decrease in turbidity in the mainstem during fall, it is probable that these fish were migrating to overwintering areas, or were at their overwintering habitat.

Adult Arctic grayling begin to move out of their summer rearing habitats into their overwintering habitats in late August to early September (Volume 3, Section 4.1.1.2). Due to very low catches of Arctic grayling during the winter, the locations and habitat characteristics of Arctic grayling overwintering habitats in the Susitna River are currently unknown. It is presumed that Arctic grayling overwinter in the mainstem and its associated side channels.

### 4.3.3 Burbot

Burbot (Lota lota) are generally recognized as under-ice winter spawners (Morrow 1980, Scott and Crossman 1973). Due to the timing of burbot spawning (i.e., during freeze up causing logistical and safety problems) and that spawning is presumed to occur under the ice at night, actual spawning of burbot in the Susitna River has not been observed. Because of this, the exact period of burbot spawning in the Susitna River is currently unknown. In the lower reaches of the Susitna River, the gonads of burbot begin to enlarge in late August, but spawning does not appear to take place until sometime in mid-winter. Burbot have been shown to congregate in what appears to be preparation for spawning beginning in late September, with actual spawning not taking place until late January to February in such areas as the mouth of the Deshka River (RM 40.6) (Volume 3). The habitat characteristics necessary for successful spawning of burbot to occur in the Susitna River basin, are unknown. Burbot have been shown to congregate in moderately shallow water under the ice over a substrate ranging from sand to coarse gravel (Morrow 1980). During spawning, males and females form a "globular mass of fish" during which spawning takes place (Morrow 1980). Preliminary investigations of habitat conducted in areas of burbot milling during the 1982-83 winter (Table 4II-3-13) reveal that burbot appear to mill in preparation for spawning in areas with an ice cover having low to medium (0.1-4.0 ft/sec) water column velocities. In areas of milling, moderately high specific conductances (70-150 umhos/cm) have been observed, suggesting that upwelling may be occurring. Development of eggs takes 30-70 days, depending on temperature (Morrow 1980).

After spawning, burbot appear to use the mainstem and to a lesser extent the associated side channels and sloughs for overwintering habitats. (Volume 3). Areas of relatively deep water (2-10 ft) under the ice in the mainstem seem to be preferred (Table 4II-3-13). Burbot are rarely observed or captured in areas of open leads, which may be due to their strong negative phototrophism (Morrow 1980). Burbot have been observed utilizing areas of both gravel, rubble and cobble and silt and sand substrate during the winter, but seem to prefer a substrate composed of silt and sand. Burbot are most often found in lower velocity backwater areas (0.0-1.0 ft/sec), but have been observed in areas of higher velocities. Since burbot are bottom dwellers, they do not seem to be hampered by under ice slush so long as at least six inches of water is present. Based on radio telemetry studies, most burbot overwinter in mainstem areas having relatively high specific conductances (above 200 umhos/cm) and water temperatures (above 0.5°C) indicating areas with an upward percolation of flow.

For summer rearing habitat adult burbot appear to prefer relatively deep eddies in the mainstem (Appendix 4-G). Trotline catch rates at designated fish habitat sites were highest in mainstem water (zone W-II) and in mixing zones (zone W-III) (Figure 4II-4-6). Tributary or slough water (zone W-I) held relatively few adult burbot as indicated by very low catch rates. Burbot may avoid this clear water due to their negative phototrophism. After water temperatures in sloughs, side channels, and tributaries drop below 10°C, adult burbot have been observed to move into shallow water at night to feed. Trotline catches suggest this may happen in early September (Figure 4II-4-6). Prior to this time, the

381

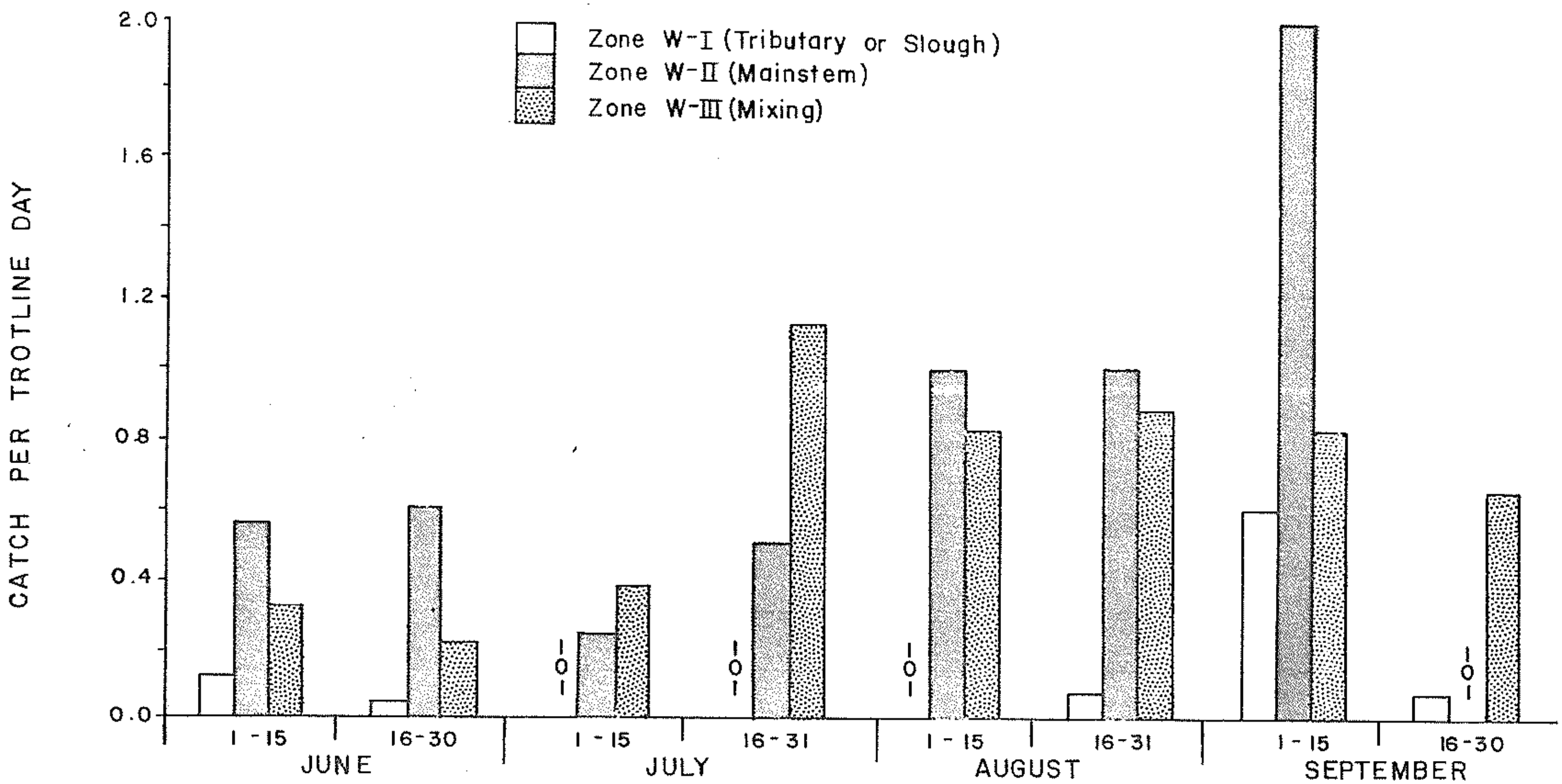



Figure 4II-4-6 Burbot catch per unit of trotline effort by aggregate water source zones at Designated Fish Habitat (DFH) sites on the Susitna River between Goose Creek 2 and Portage Creek, June through September, 1982.

burbot remain in the mainstem in deep holes or in mixing zones. Scott and Crossman (1973) report the optimal temperature for burbot ranges from 15.6° to 18.3°C. Catches of juvenile burbot (Appendix 4-G) at designated fish habitat sites were small but they were most often captured in mixing zones (zone 3) and in backed up zones or pools (zones 2, 6, 7 and 8).

The movement patterns of burbot are largely unknown (Morrow 1980). Based on radio telemetry studies (Volume 3), burbot in the Susitna River are usually sedentary, but they are capable of long distance movements (Volume 3). One radio tagged burbot, for instance, moved downstream a distance of approximately 60 miles in the winter and then held its new position.

### 4.3.4 Round Whitefish

Round whitefish (Prosopium cylindraceum Pallas) are recognized as fall spawners with spawning taking place from late September to early November (Morrow 1980). Because round whitefish spawn during freezeup, actual spawning of round whitefish in the Susitna River has not been observed; although ripe fish have been captured in the mainstem during late summer to early fall (ADF&G 1981a). Thus, the exact period of round whitefish spawning in the Susitna River is unknown. In the upper reaches of the Susitna River, the gonads of round whitefish appear to enlarge in late June, but spawning does not appear to take place until at least late September or early October. Spawning has been reported to be annual, with spawning beds located along gravelly shallows or rivers

(Morrow 1980). In the Susitna River, round whitefish may utilize both the clear water tributaries and the mainstem for spawning (Volume 3). No nest is dug during spawning, with eggs being broadcast over the substrate. Egg development has been reported to take about 140 days depending on temperature (Morrow 1980).

After spawning, round whitefish move into their overwintering habitats. Due to very low catches of round whitefish during the winter, the locations and habitat characteristics of round whitefish overwintering in the Susitna River are unknown. It is presumed round whitefish overwinter in the mainstem and its associated side channels.

Round whitefish appear to move out of their overwintering habitats into their summer rearing habitats from May to June (Figure 3-4-4). Large concentrations of round whitefish were observed at tributary mouths in June. Preferred summer rearing habitat for adult round whitefish appears to be the clear water tributaries upstream of their confluences. However, round whitefish also appear to utilize, to a lesser extent, the mainstem for summer rearing habitat. Small numbers of adult round whitefish were electroshocked along mouths of sloughs and tributaries and along bars in the mainstem throughout the summer (Figure 3-4-4). Adult round whitefish were usually captured in mixing zones with a moderate current (zone 3) or in backed up zones (zone 2 or zone 7) at the designated fish habitat sites studied. In late August or early September, round whitefish apparently begin to move into overwintering habitat or to spawning areas (Volume 3).

Juvenile round whitefish (fork length less than 200mm) were found at all of the designated fish habitat sites studied (Appendix 4-G). Juvenile round whitefish were most often found rearing in clear water sloughs such as Slough 6A, Slough 8A, Slough 9, and Slough 21 in the reach of river between the Chulitna River confluence and Devil Canyon. The hydraulic zone in the sloughs which recorded the highest catch was the mixing zone (zone 3). Most of the catch at tributary sites was also in the mixing zones (zones 2 and 3). Juveniles, however, were also present in areas at sloughs and tributaries that contained mainstem water. The only areas where juveniles were captured in clear tributary or slough water were Whitefish Slough, Slough 6A and Slough 8A. Most of the zones with juvenile round whitefish present were characterized by low water velocities or pools.

Turbidity, at least under 120 NTUs, does not appear to exclude juvenile round whitefish from a rearing area. Juveniles were captured at a variety of sites with the turbidities ranging to 120 NTUs. However, no mainstem sites were consistently sampled by effective juvenile capture methods and very high turbidities may exclude juvenile round whitefish from rearing in an area.

Little is currently known of the specific habitat requirements of summer rearing of juvenile or adult round whitefish in the Susitna River

### 4.3.5 Humpback Whitefish

The taxonomy of the humpback whitefish (*Coregonus* spp.) is unclear. Morrow (1980) states that the humpback whitefish appears to be truly anadromous, while McPhail and Lindsey (1970) state that humpback whitefish typically occur in lakes and large rivers, with a portion of the population in rivers being anadromous. In the Susitna River, the humpback whitefish population appears to be divided into both an anadromous and resident population. The species of humpback whitefish inhabiting the Susitna River below Devil Canyon is believed to be *Coregonus pidschian* (Volume 3).

Anadromous populations of humpback whitefish in Alaska have been reported to spawn during the fall, with their spawning runs beginning in June and lasting through October (Morrow 1980). In the Susitna River, the anadromous portion of the humpback whitefish population begins their spawning runs in early August in the lower reaches of the river, reaching the upper reaches by mid-September (Volume 3). Although actual spawning of humpback whitefish has not been observed in the Susitna River, it is presumed that spawning occurs in the fall prior to freeze-up.

Little is known of the spawning behavior or spawning habitat, but it is assumed to be similar to the Alaska whitefish (Morrow 1980). Following the completion of spawning, humpback whitefish are reported to move back downstream, with small numbers remaining in deep pools to overwinter

(Morrow 1980). The timing of their return migration in the Susitna River is also not known.

Young of the year have been reported to hatch in the late winter to early spring, subsequently moving downstream. Due to the limited catch of juvenile humpback whitefish in the Susitna River, little is known of their timing of outmigration and the characteristics of rearing habitat in the Susitna River. Catches of juvenile humpback whitefish at a downstream migrant trap in the mainstem (RM 102.0) peaked in August (Volume 3) suggesting a juvenile outmigration during August.

A resident population of humpback whitefish appear to inhabit a number of clear water sloughs and tributaries of the Susitna River especially those above the Chulitna River confluence such as Slough 1, Slough 6A, Slough 17, Slough 19 and Portage Creek (Volume 3). Many of the catches were made in backed up zones (zones 2 or 7), or in areas where the water from a tributary or clear water slough mixed with mainstem water in a low velocity mixing zone or pool (zone 3). Few habitat measurements were taken during 1981 and 1982, however, so little is known of the characteristics of summer rearing habitats used by humpback whitefish in the Susitna River.

The timing of resident humpback whitefish spawning is expected to be very similar to that of any anadromous populations present although it is possible that resident humpback whitefish spawn at a different time than anadromous fish. Spawning migrations, of course, would be shorter in length than those of anadromous populations. It is not known if the distribution of wintering fish is similar to that of fish rearing during the summer. No juvenile humpback whitefish (fork length less than 200mm) have been captured above RM 102.0 (Volume 3).

### 4.3.6 Longnose Sucker

Longnose suckers (Catostomus catostanus Forster) are generally recognized as spring spawners, with spawning occurring as early as May and as late as July (Morrow 1980). In the lower Susitna River, longnose suckers have been observed spawning in late May to early June (Table 4-3-14). Spawning occurs most commonly over a gravel substrate in shallow water (0.3-2.0 feet) with a current ranging from 1.0 to 1.5 feet per second (Morrow 1980). Water temperature at time of spawning is reported to be between 5.0 to 10.0°C.

The limited data collected on longnose sucker spawning habitat in the Susitna River basin concur fairly well with published data The data, however, suggest that longnose suckers utilize a wider range of depths and water velocities for spawning than previously reported. In the Susitna River, longnose suckers have also been captured in ripe condition during the fall. Males upon slight abdominal pressure, discharged milt; and females, upon necropsy, showed well developed, separated eggs. Longnose suckers have not been previously reported to spawn in the fall. It is possible that the fish overwinter in this ripe condition.

After spawning, longnose suckers move into their summer rearing habitats. In the Susitna River, longnose suckers appear to prefer tributary and clear water slough mouths for summer rearing over mainstem sites (Volume 3). Longnose suckers however, have been observed to utilize deep back eddy zones in the mainstem as summer rearing habitat.

Schools of longnose suckers were present in Rabideux Creek Slough in a backed up zone (zone 2) during July and August in 2-5 feet of water. Often these fish were in submerged brush piles or near overhanging riparian vegetation. Adult longnose suckers were associated with this type of habitat at a number of other sites electrofished.

Data collected at Designated Fish Habitat (DFH) sites allow a basic description of rearing areas used by juvenile longnose suckers (Appendix 4-F). Juvenile longnose suckers (less than 200mm fork length) were most often found in association with clear water slough sites where water velocities were less than 1 ft/sec. Catches at tributary mouths were also typically in backed up zones (zones 2, 6, 7, and 9) where flow was insignificant. Turbidity in these backed up zones varied greatly and juvenile longnose suckers were often found in very turbid water. At Goose Creek 2 and side channel for example, longnose sucker juveniles were captured in zones 4 and 6 during June and July when the turbidity in these zones was very high. In Slough 9, longnose sucker juveniles were also captured in turbid water in zones 4 and 6 in late June and early July. On the other hand, young of the year longnose suckers were captured in Slough 8A during early September in clear water in zone 1. Slough 6A also provided a clear water rearing area for age class 1+ longnose suckers in zone 2 during late June and early July. Mainstem sites may also provide suitable rearing area for longnose sucker juveniles, but these sites have not been extensively sampled with beach seines.

Based on this years electrofishing observations, adult longnose suckers appear to begin to move out of their summer rearing habitats into their overwintering habitats during August. Due to very low catches of longnose suckers during the winter, the locations and habitat characteristics of longnose sucker overwintering habitats in the Susitna River are currently unknown. It is presumed that longnose suckers overwinter in the mainstem and its associated side channels. Morrow (1980) states that "except for movement to and from spawning grounds, the longnose sucker apparently does not undertake any definite migrations." No major migrations have been observed for longnose suckers in the Susitna River to date.

### 4.3.7 Other Species

#### 4.3.7.1 Dolly Varden

Dolly Varden (*Salvelinus malma* Walbaum) were infrequently caught at the sites sampled in the Susitna River below Devil Canyon. When found, they were most frequently associated with large, cold, fast flowing tributaries such as the Kashwitna River, Lane Creek, Indian River, and Portage Creek. Dolly Varden are generally recognized as fall spawners (Morrow 1980). Adult catches at these sites and other sites are typically highest in June and September. The high catches in June are believed to be due to fish moving into the tributaries for summer rearing from the mainstem and the high catches in September are due to movements back into the mainstem or to spawning streams (ADF&G 1981d).

Dolly Varden occupied the designated fish habitat sites studied only during spring or fall migrations. No more than a few scattered fish were thought to occupy any of the hydraulic zones studied on a consistent basis during the ice-free season (Appendix G). Dolly Varden captured are mostly likely transients passing through the zone. Because of low catch rates, little specific information is currently known about the summer rearing or fall spawning habitat requirements of Dolly Varden in the Susitna River.

### 4.3.7.2 Threespine Stickleback

Threespine stickleback (*Gasterostens aculeatus* L.) usually inhabit shallow water areas associated with aquatic plants (Morrow 1980) and this appears to be the case in the Susitna River. In the Susitna River, threespine stickleback are found in shallow warm-water sloughs or slow flowing tributaries, especially those with emergent vegetation such as Rolly Creek, Caswell Creek, Whitefish Slough, Sunshine Creek and Side Channel, and Birch Creek and Slough. Substrate at sites preferred by threespine stickleback was often silt or sand. Populations at these sites may fluctuate greatly from year to year (Volume 3).

Distribution may also vary from year to year but populations generally decrease upstream of the Chulitna River confluence (RM 98.5). Threespine stickleback are only rarely present at the mouths of cold, fast flowing tributaries like Lane Creek and Slough, 4th of July Creek, Indian River, or Portage Creek. Sloughs well above the Chulitna confluence such as Slough 10 have very few threespine stickleback even though they may have abundant emergent vegetation. Abundance and distribution above the Chulitna confluence may be limited by water temperatures or velocities or a combination of these factors.

### 4.3.7.3 Slimy Sculpin

The slimy sculpin (Cottus cognatus Richardson) is an often abundant species which inhabits lakes and streams across northern North America. It prefers streams with a rocky substrate and fairly high water velocities (Morrow 1980). Spawning occurs in the spring soon after breakup.

In the Susitna River, the slimy sculpin is a widely distributed species. It has been sampled in moderate numbers during the summer at most locations sampled with relatively high numbers being observed along rocky banks of the mainstem and its associated side channels, tributaries and sloughs (Volume 3). At a given designated fish habitat site, slimy sculpins were found to inhabit almost all zones present (Appendix 4-G. Generally the highest numbers of slimy sculpins were found in zones 1, 2, and 3. Often slimy sculpins were associated with substrates where some rocks were present. Rocks are used by slimy sculpins as escape cover and as spawning nest sites (Morrow 1980). Since winter catch data on slimy sculpins are limited, little is currently known about the overwintering habitat of this species although catches have often been made in the same areas where they were found in the summer.

#### 4.3.7.4 Arctic Lamprey

Arctic lamprey (*Lampetra japonica* Martens) are generally recognized as spring spawners (Morrow 1980). In the Susitna River basin, Arctic lamprey have been observed spawning in late June in isolated locations (Table 4II-3-14). During spawning, male and female engage in a nest building ritual in an area of gravel substrate in water depths ranging from a few inches to 3.0 feet deep in a current of 0.5 to 1.0 ft/sec (Morrow 1980). Based on preliminary habitat evaluation data Arctic lamprey spawning habitat at Birch Creek and Slough (RM 88.3) concur fairly well with the published data. Since very few arctic lamprey have been captured, little is known about their summer rearing or overwintering habitats.

## 7. LITERATURE CITED

Acres American, Inc. 1982. Susitna Hydroelectric Project: FERC license application. Exhibit E. Volume 1, Chapter 2 (Draft Report). Prepared for Alaska Power Authority, Alaska Department of Commerce and Economic Development, Anchorage, Alaska.

ADF&G. 1981a. Aquatic studies procedures manual. Phase I Final Draft. Subtask 7.10. Prepared for Acres American, Incorporated, by the Alaska Department of Fish and Game/Su Hydro. Anchorage, Alaska.

______. 1981b. Adult Anadromous Fisheries Project. Phase I Final Draft. Subtask 7.10. Prepared for Acres American, Incorporated, by the Alaska Department of Fish and Game/Su Hydro. Anchorage, Alaska.

______. 1981c. Aquatic habitat and instream flow. Phase I. Final Draft. Prepared for Acres American, Incorporated, by the Alaska Department of Fish and Game/Su-Hydro. Anchorage, Alaska.

______. 1981d. Resident fish investigation on the lower susitna River. Phase I Final Draft. Prepared for Acres American, Incorporated by Alaska Department of Fish and game/Su Hydro. Anchorage, Alaska.

______. 1982a. Aquatic studies procedures manual. Phase II. Prepared for Acres American, Incorporated, by the Alaska Department of Fish and Game/Su Hydro. Anchorage, Alaska.

______. 1982b. Aquatic Studies Program. Phase I. Final Draft Report. Subtask 7.10. Prepared for Acres American, Incorporated, by the Alaska Department of Fish and Game/Su Hydro. Anchorage, Alaska.

Arctic Environmental and Information Data Center (AEIDC). 1982. Illustration of Susitna River habitats. AEIDC. Unpublished file. Anchorage, Alaska.

Arnette, J.J. 1975. Nomenclature for Instream Flow Assessments. Western Water Allocation Office of Biological Services, U.S. Fish and Wildlife Service. 7 pp.

Bouck, G.R. 1982. Gasometer: An inexpensive device for continuous monitoring of dissolved gases and supersaturation. Trans. Am. Fish. Soc. 111:505-516.

Bovee, K.D. and T. Cochnauer. 1977. Development and evaluation of weighted criteria, Probability-of-Use curves for instream flow assessments: Fisheries Instream Flow Information Paper No. 3. Cooperative Instream Flow Group USFWS/OBS. Ft. Collins, CO. 39 pp.

Buchanan, T.J., and W.P. Somers. 1973. Discharge measurements at gaging stations, techniques of water resources investigations of the United States Geological Survey. Book 5, Chapter A8 Arlington, Virginia.

Carter, R.W., and J. Davidian. 1968. General procedure for gaging streams. Techniques of Water-Resources Investigations of the United States Geological Survey. Book 3 Applications of Hydraulics. Arlington, Virginia.

D'Aoust, B.G. and M.J.R. Clark. 1980. Analysis of supersaturated air in natural water and reservoirs. Trans. Am. Fish. Soc. 109:708-724.

Estes, C., K. Hepler, and A. Hoffman. 1981 Willow and Deception Creeks instream flow demonstration study. For the USDA-SCS by ADF&G, Habitat Protection and Sport Fish Divisions. Anchorage, Alaska.

Hale, S.S. 1981. Freshwater habitat relationships round whitefish Prosopium cylindraceum). ADF&G Habitat Division Resource Assessment Branch. Anchorage, Alaska.

Krebs, C. J. 1972. Ecology. Harper and Row, Publishers, Inc., 49 East 33rd Street, New York, NY, 10016, 694 pp.

Lee, D.S., C.R. Gilbert, C.H. Hocutt, R.E. Jenkins, D.E. McAllister, J.R. Stauffer, Jr. 1980. Atlas of North American freshwater fishes. Publication #1980-12. North Carolina State Museum of Natural History. 854 pp.

McPhail, J.D., and C.C. Lindsey. 1970. Freshwater fishes of northwestern Canada and Alaska. Bull. Fish. Res. Bd. Canada 173. 381 pp.

Milhous, R.T., D.L. Wegner, and T. Waddle. 1981. Users' guide to the Physical Habitat Simulation System. Cooperative Instream Flow Service Group. USFWS/OBS-81/43. Washington, D.C.

Morrow, J.E. 1980. The freshwater fishes of Alaska. Alaska Northwest Publishing Co., Anchorage, Alaska. 248 pp.

R&M Consultants, Inc., 1982. Susitna Hydroelectric Project, hydraulic and ice studies, prepared for Acres American, Inc., Anchorage, Alaska.

Scott, W.B. and E.J. Crossman. 1973. Freshwater fishes of Canada. Fish. Res. Bd. Canada Bull. 184. Ottawa. 966 pp.

Scully, D.R., L.S. Leveen, and R.S. George. 1978. Surface water records of Cook Inlet Basin, Alaska, through September 1975. USGS. Open file report 78-498. Anchorage, Alaska. 1978.

Terrestrial Environmental Specialists, 1981. Subtask 7.10 - fish ecology. A preliminary assessment of natural supersaturation of Devil Canyon. June, 1981. Prepared for Acres American, Inc. Buffalo, New York. Unpublished technical report.

______. 1982. Appendix A. Summary of significant findings from the 1981 dissolved gas investigations of the Susitna River in the Devil Canyon vicinity. pp A-1 to A-8. In: Task 7, Environmental Studies, Subtask 7.10 - Fish Ecology Phase I Supporting Documentation, May 1982. Prepared for Acres American, Inc. Buffalo, New York. Unpublished technical report.

Trihey, E. W. 1982. Preliminary assessment of access by spawning salmon to side slough habitat above Talkeetna. Draft Report. Prepared for Acres American, Inc., Anchorage, Alaska.

U.S. Army Corps of Engineers. 1981. Unpublished data file on the dissolved gas below Libby Dam on the Kootenai River, Montana. From: Thomas Bonde, USACOE, Seattle, Washington.

U.S. Geological Survey (USGS). 1977. Summary of water resources for Alaska. 1976 AK-76-1. Anchorage, Alaska.

______. 1978a. Summary of water resources for Alaska. 1977. AK-77-1. Anchorage, Alaska.

______. 1978b. See Scully, et al.

______. 1979. Summary of water resources for Alaska. 1978. AK-78-1. Anchorage, Alaska.

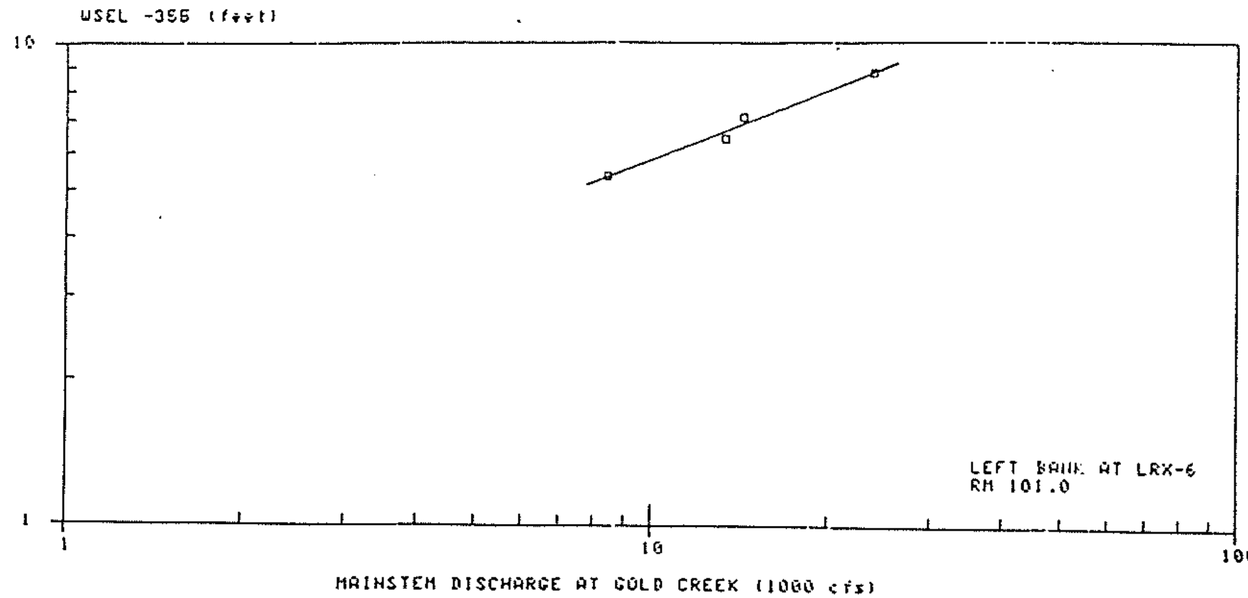
______. 1980. Summary of water resources for Alaska. 1979. AK-79-1. Anchorage, Alaska.

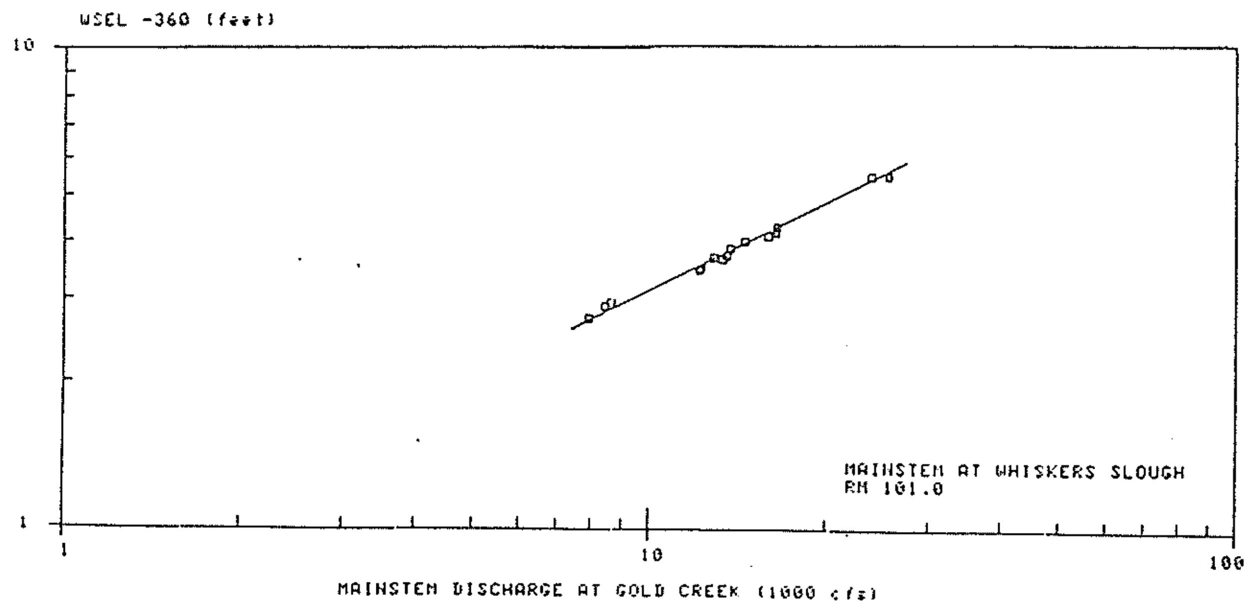
______. 1981. Summary of water resources for Alaska. 1980. AK-80-1. Anchorage, Alaska.

______. 1982a. Provisional summary of 1982 water resources for Alaska.

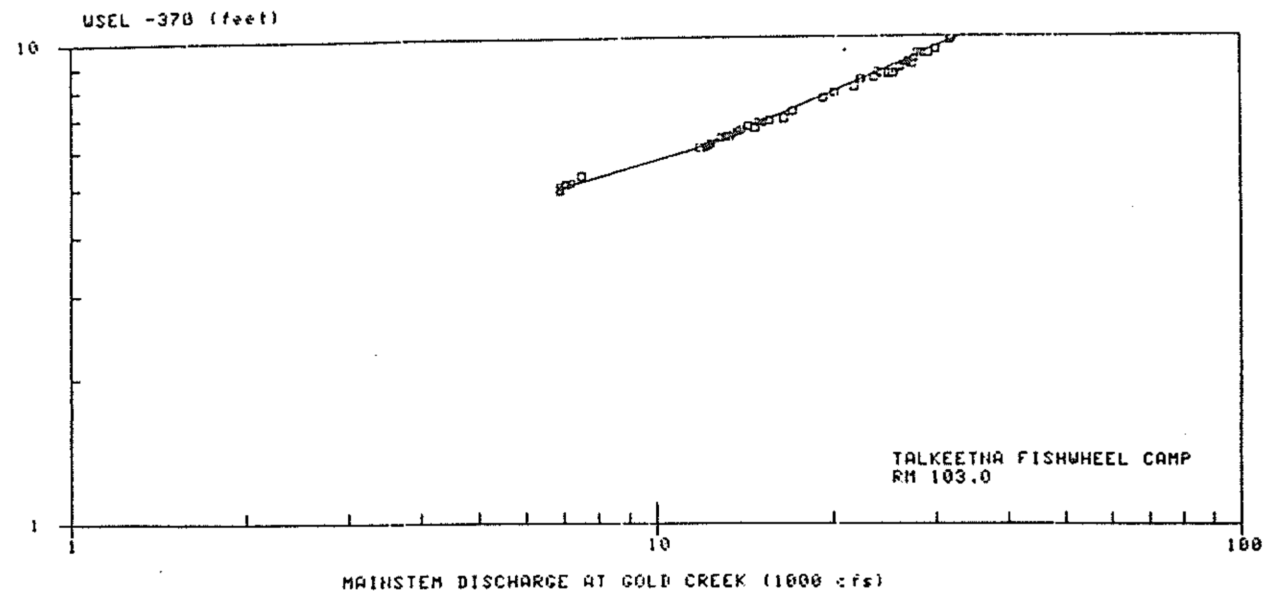
______. 1978b. Summary of water resources for Alaska. 1981. AK-81-1. Anchorage, Alaska.

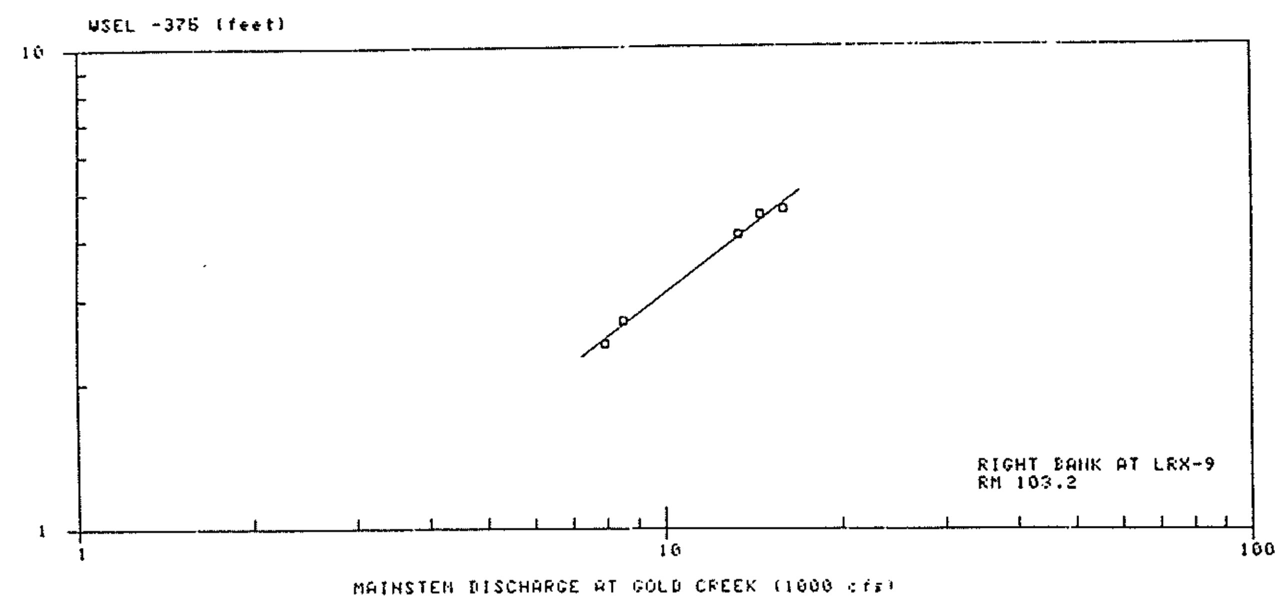
Weitkamp, D.E. and M. Katz. 1980. A review of dissolved gas supersaturation literature. Trans. Am. Fish. Soc. 109:659-702.



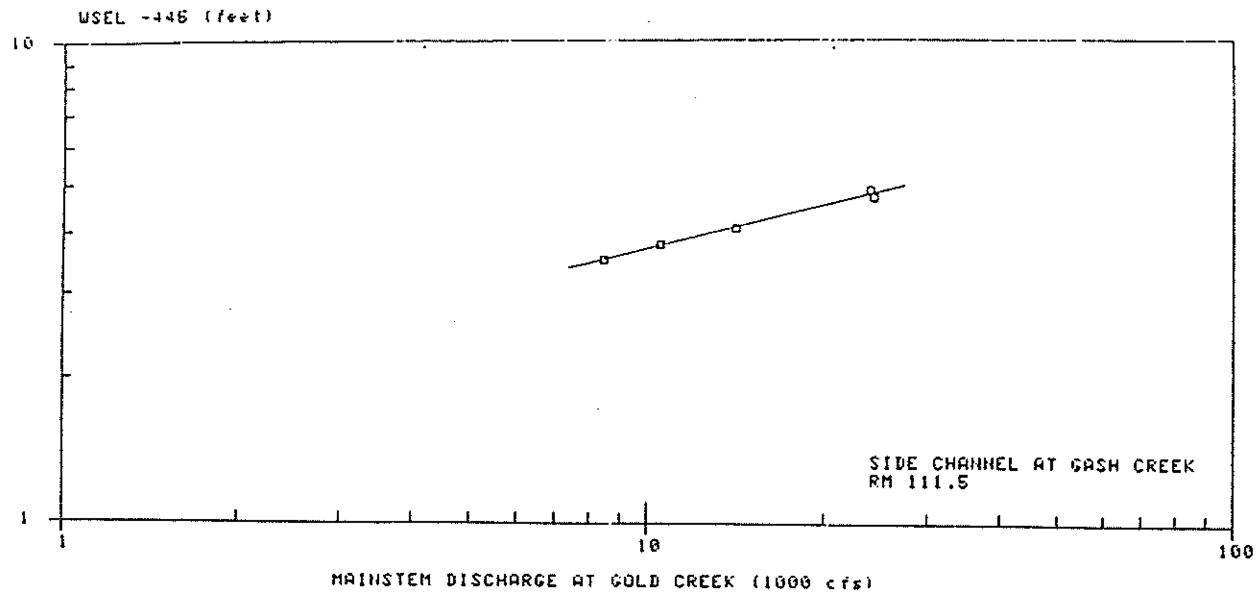



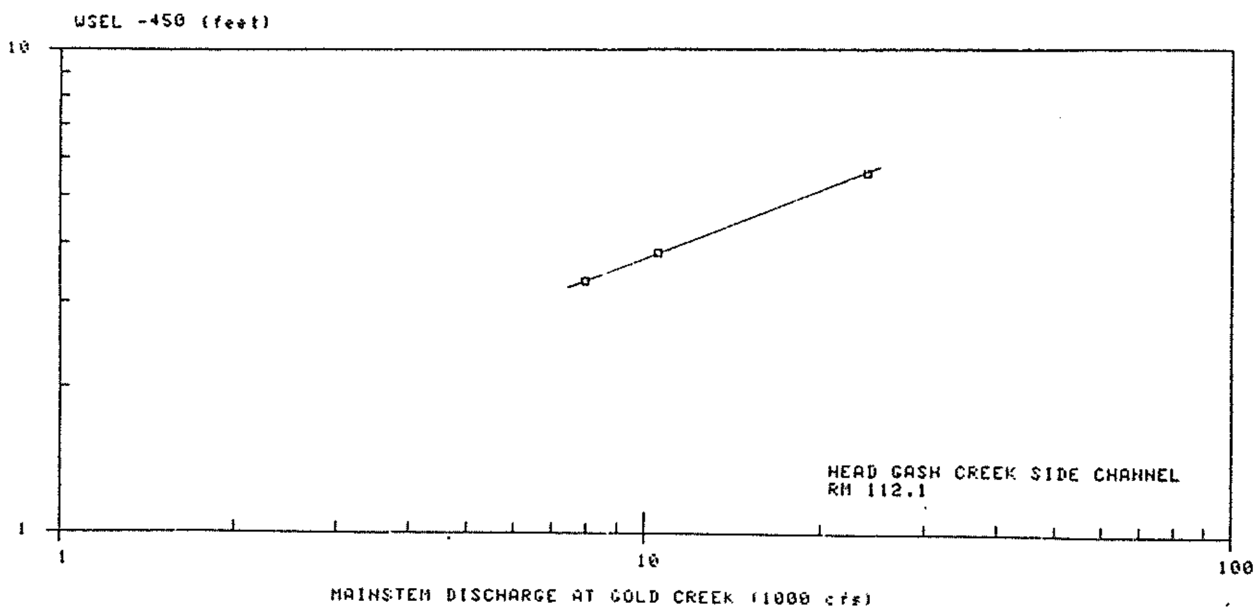

Appendix Figure 4-A-1 Mainstem discharge versus mainstem water surface elevation at left bank of LRX-6 and Whiskers Creek/Slough.



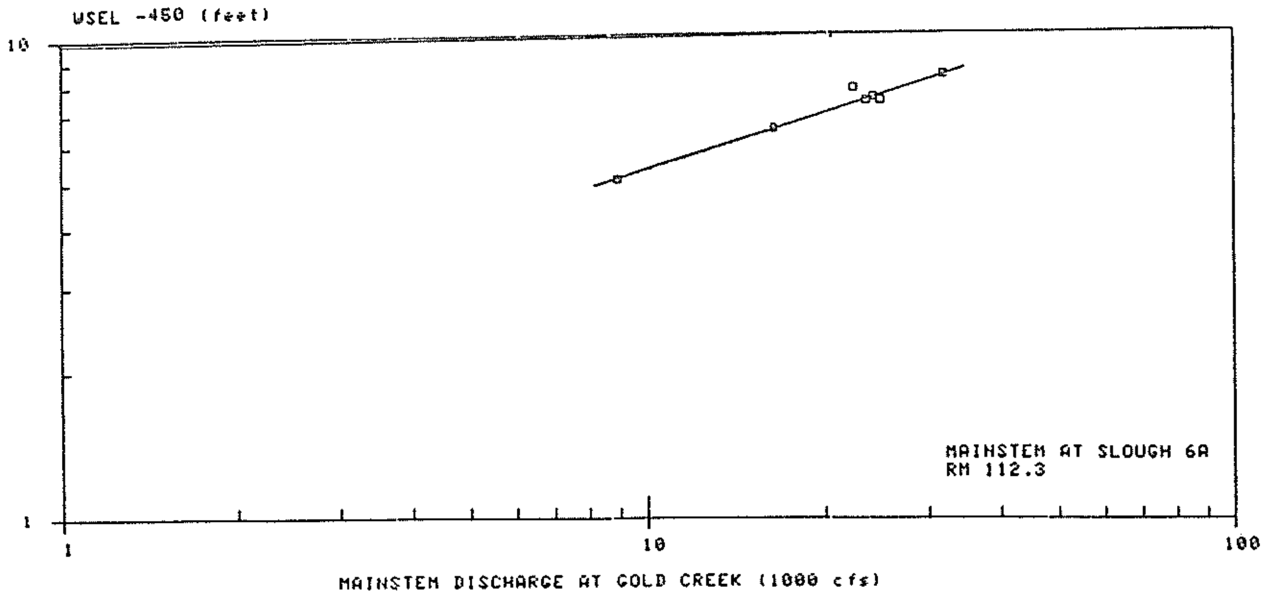



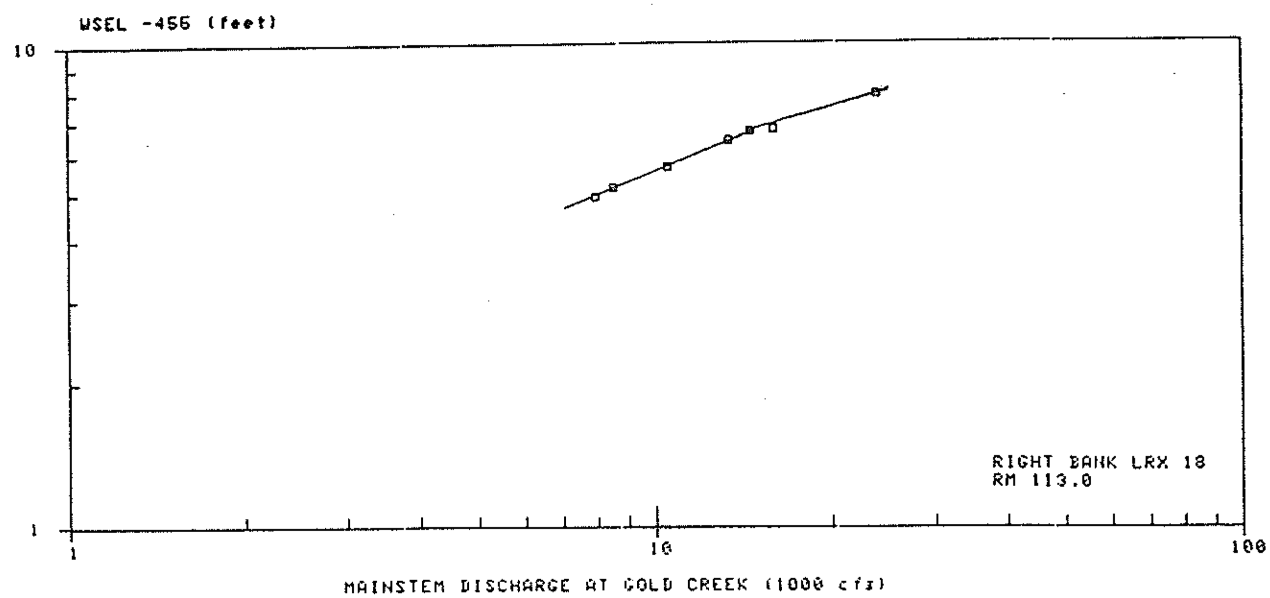

Appendix Figure 4-A-2 Mainstem discharge versus mainstem water surface elevation at Talkeetna Fishwheel Camp and right bank of LRX-9.



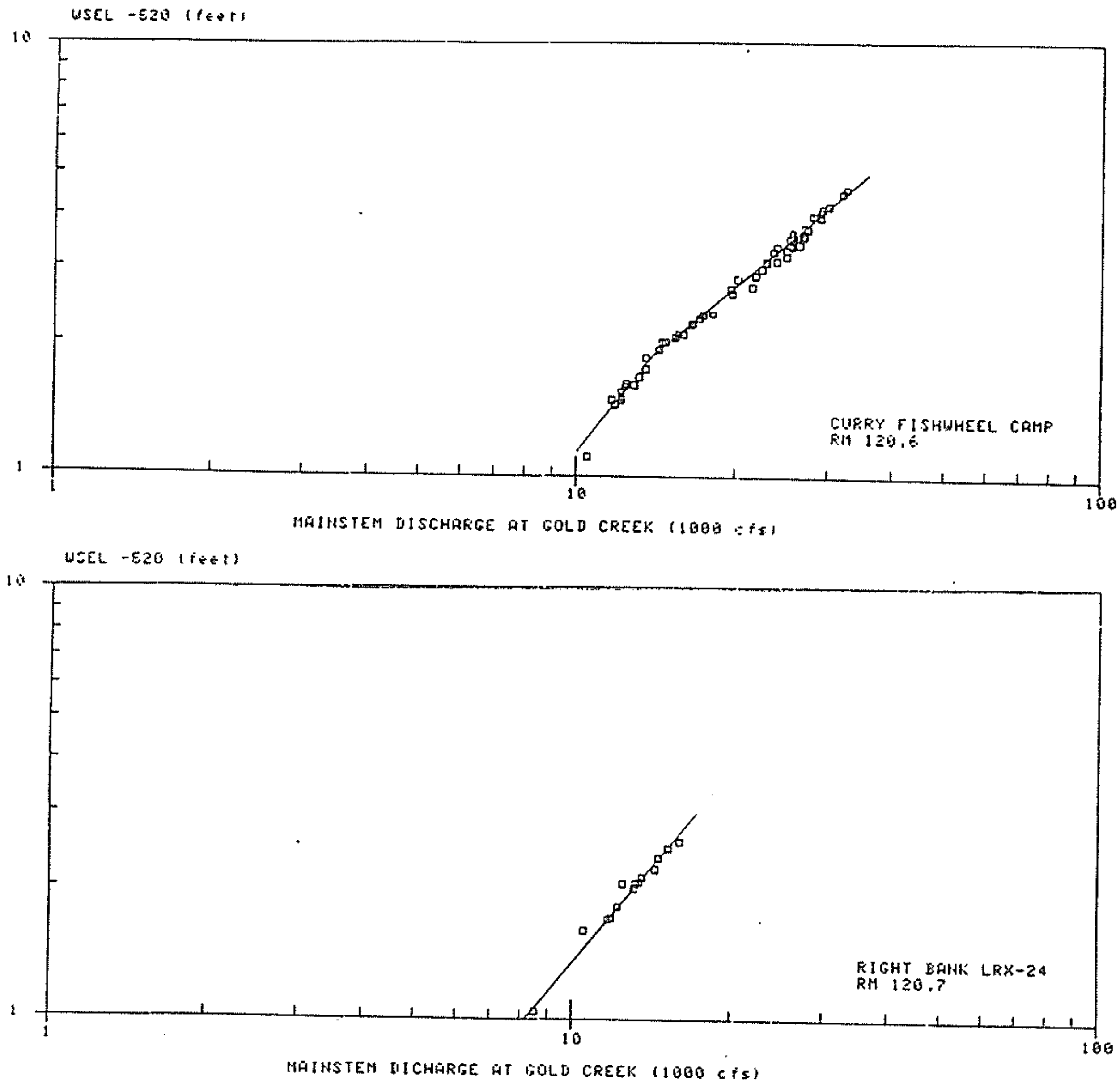




Appendix Figure 4-A-3 Mainstem discharge versus mainstem water surface elevation at Side Channel at Gash Creek and head of Gash Creek side Channel.

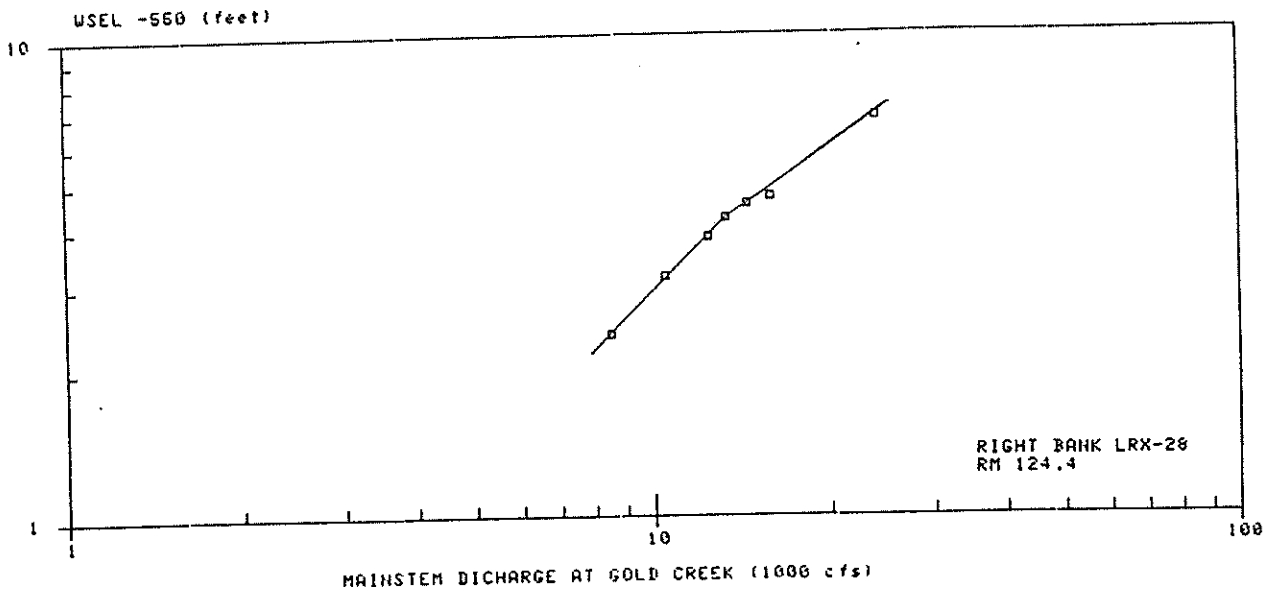


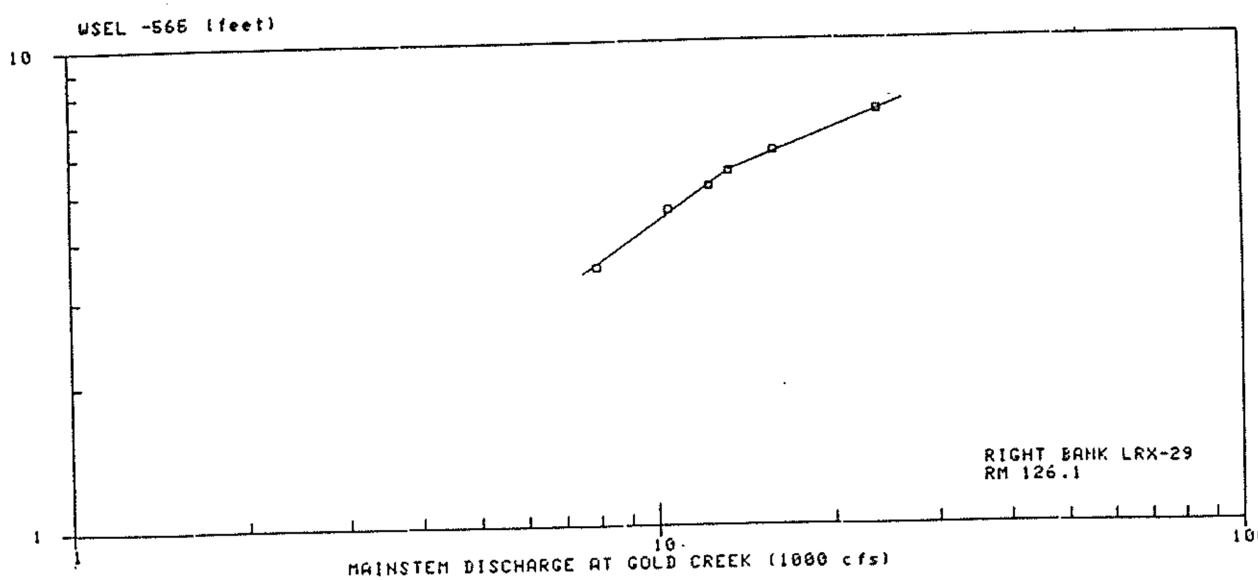




Appendix Figure 4-A-4 Mainstem discharge versus mainstem water surface elevation at Slough 6A and right bank LRX-18.

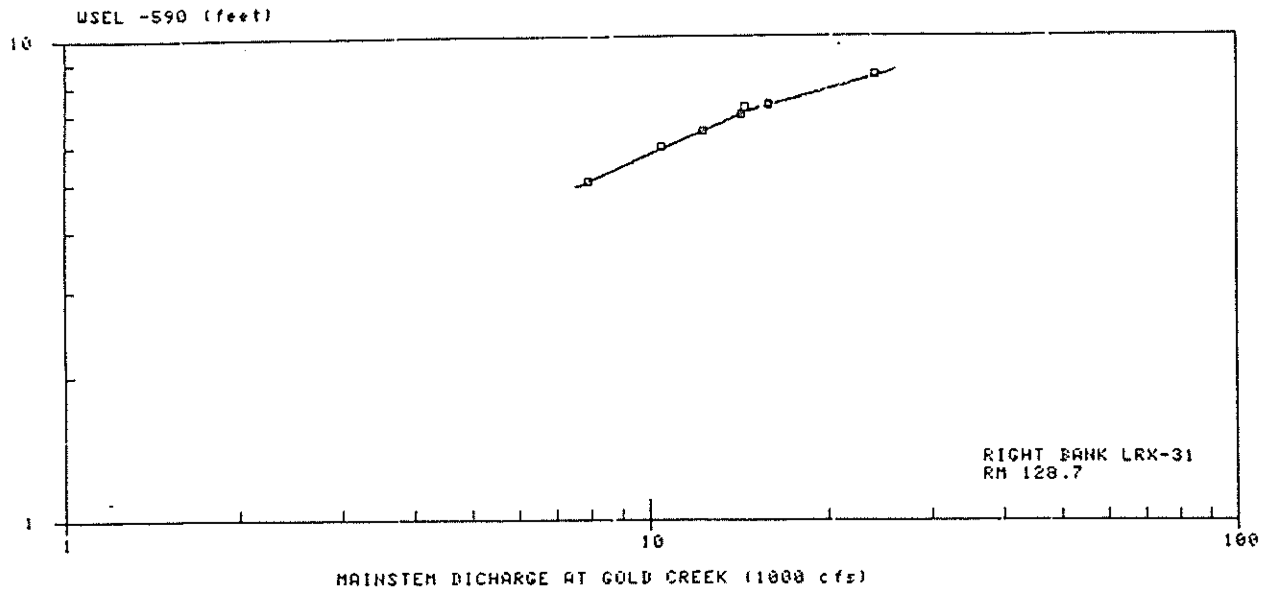


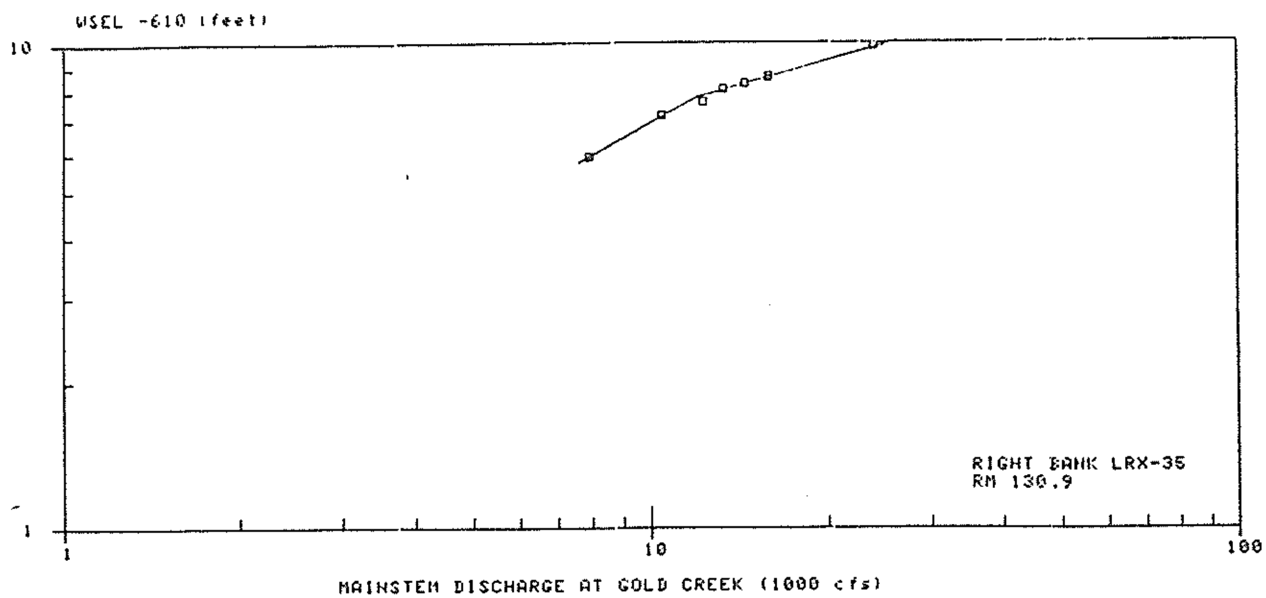

Appendix Figure 4-A-5 Mainstem discharge versus mainstem water surface elevation at Curry Fishwheel Camp and right bank LRX-24.



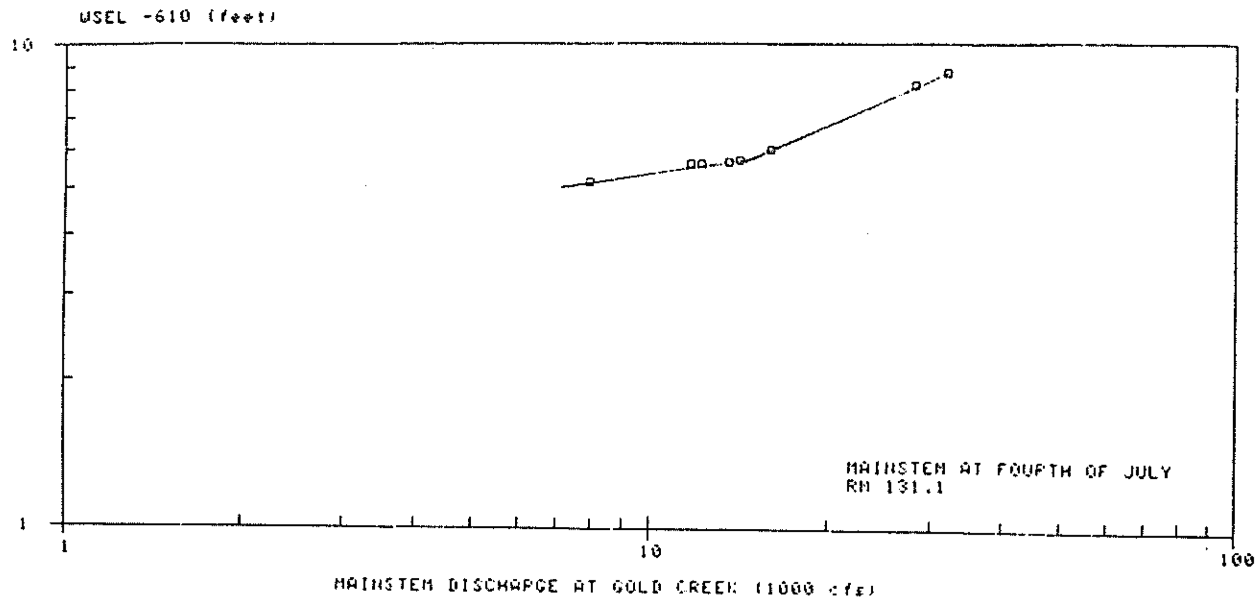



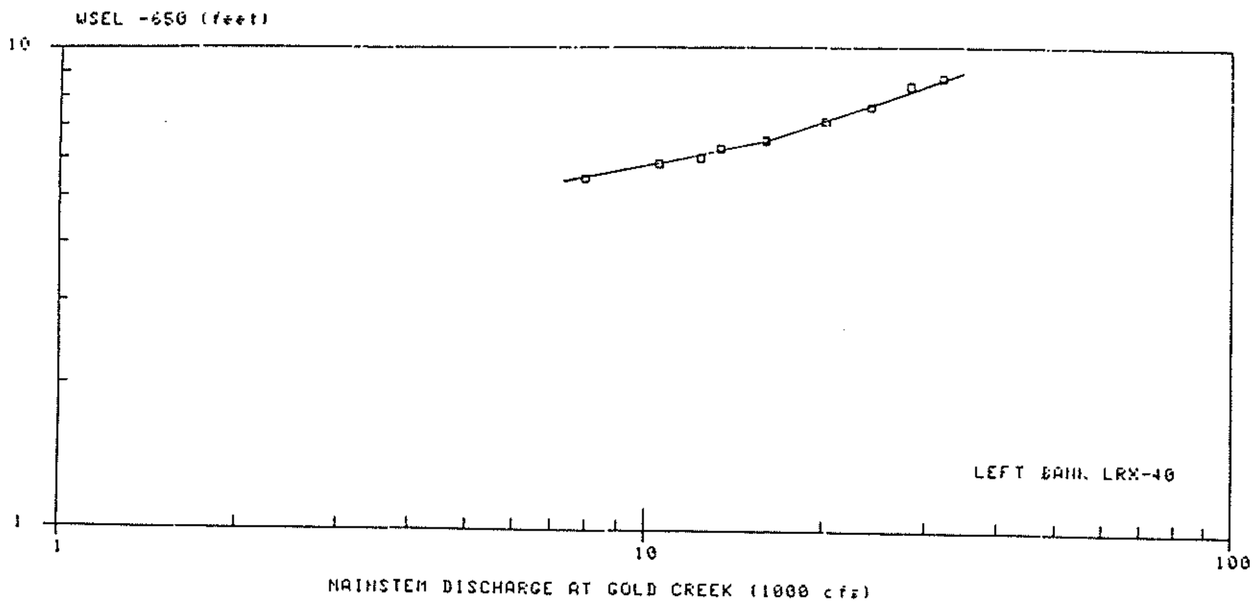

*Appendix* Figure *4-A-6* Mainstem discharge versus mainstem water surface elevation at right bank of LRX-28 and right bank of LRX-29.



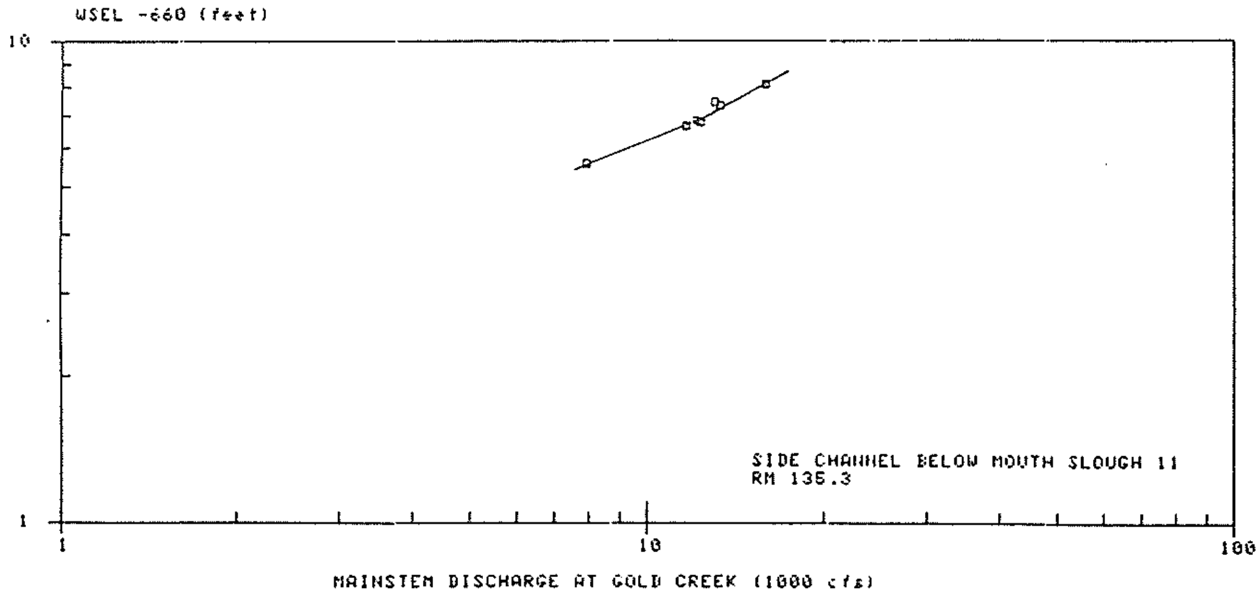



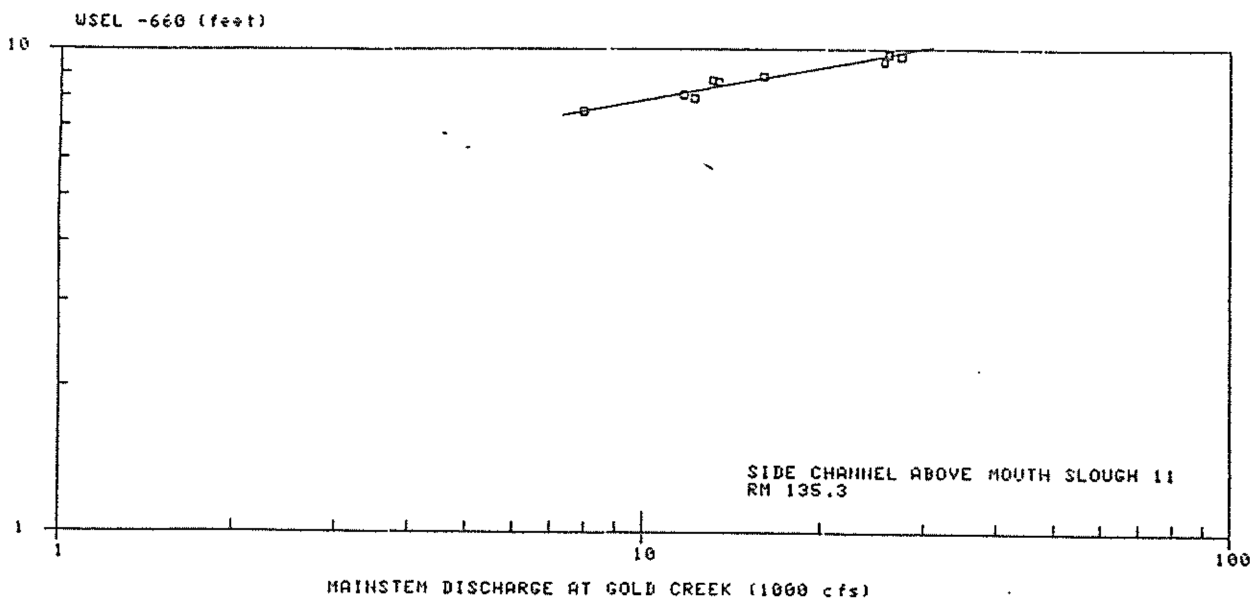

Appendix Figure 4-A-7 Mainstem discharge versus mainstem water surface elevation at right bank of LRX-31 and right bank of LRX-35.



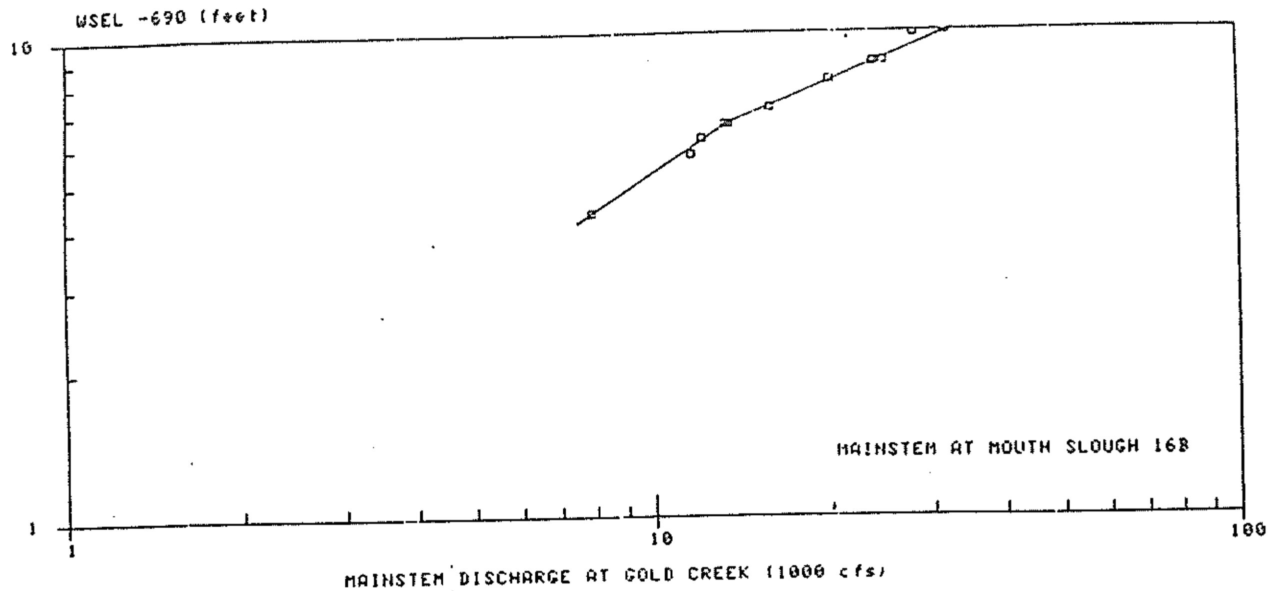



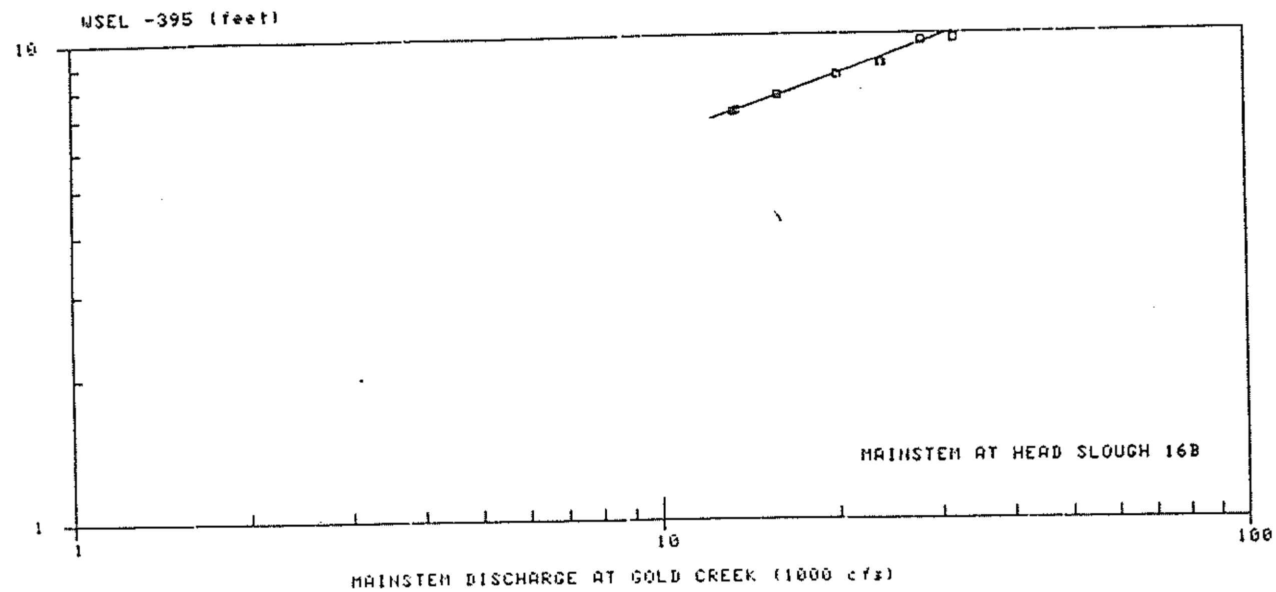

*Appendix* Figure *4-A-8* Mainstem discharge versus mainstem water surface elevation at Fourth of July Creek and left bank of LRX-40.



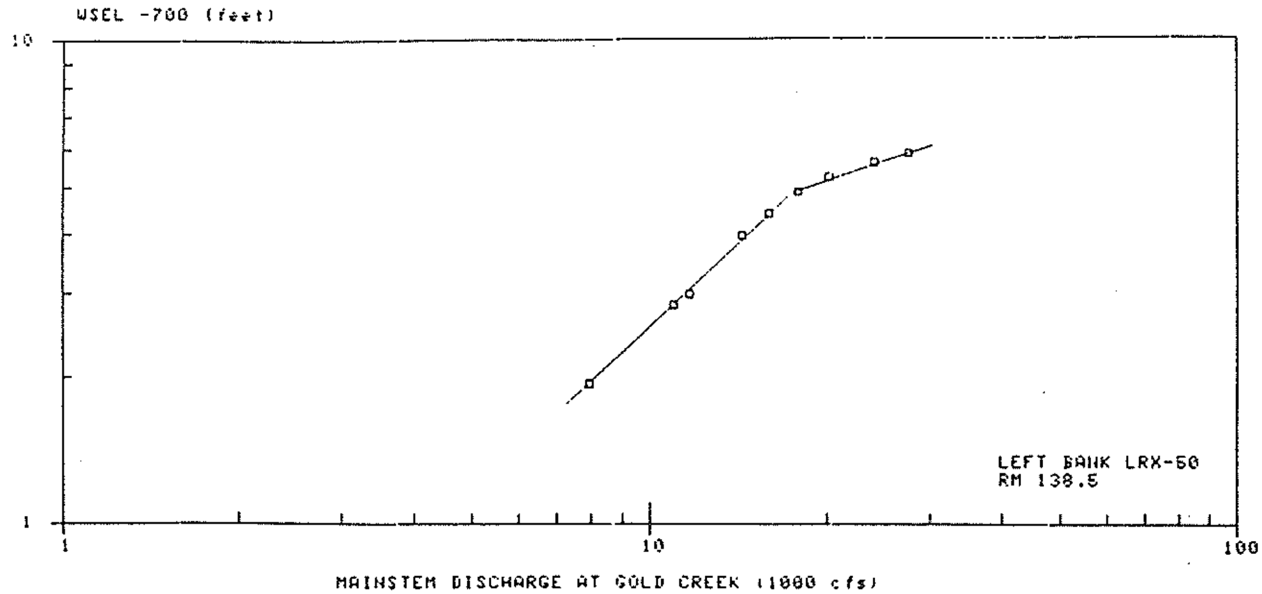



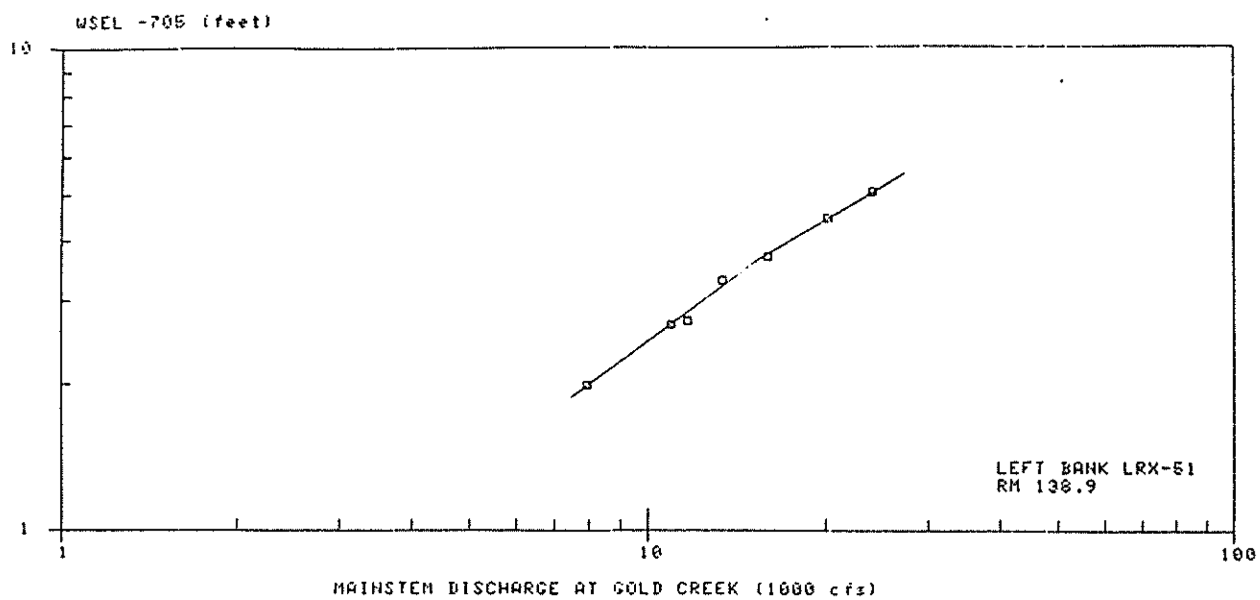

*Appendix* Figure *4-A-9* Mainstem discharge versus mainstem water surface elevation at side channel below mouth of Slough 11 and side channel above mouth of Slough 11.



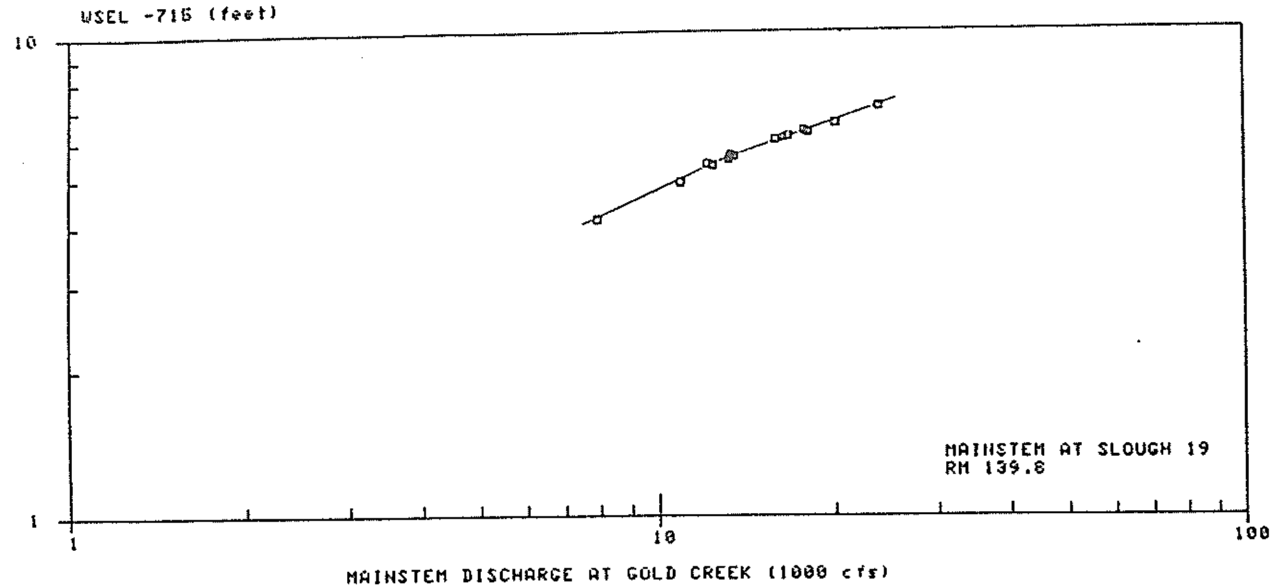



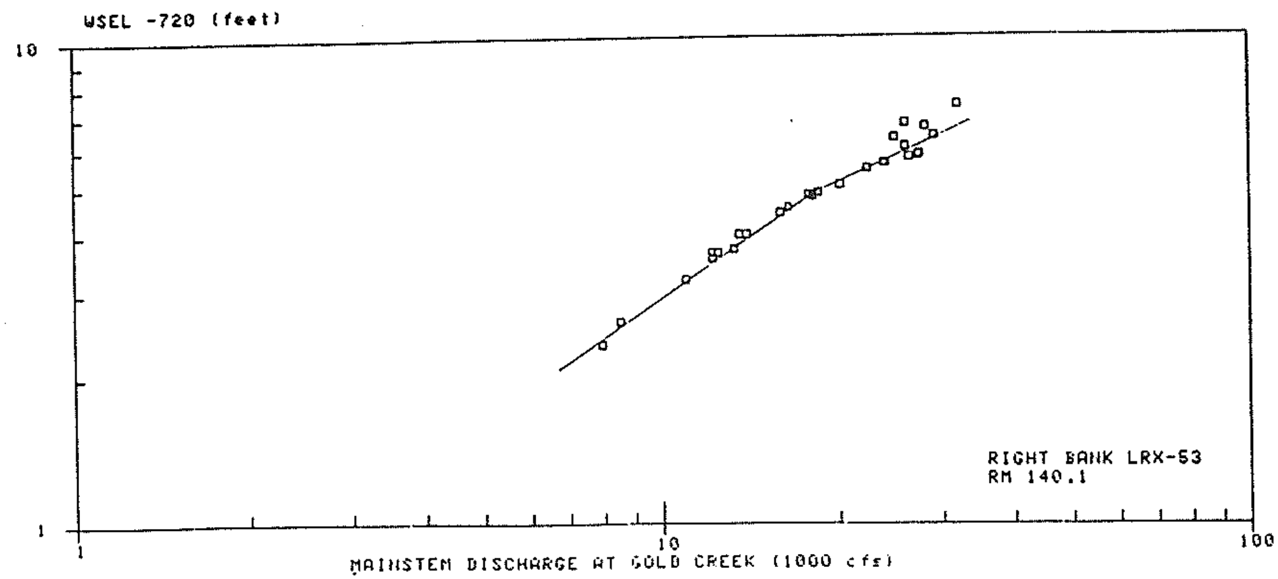

*Appendix* Figure 4-A-10 Mainstem discharge versus mainstem water surface elevation at Slough 16B mouth and head.



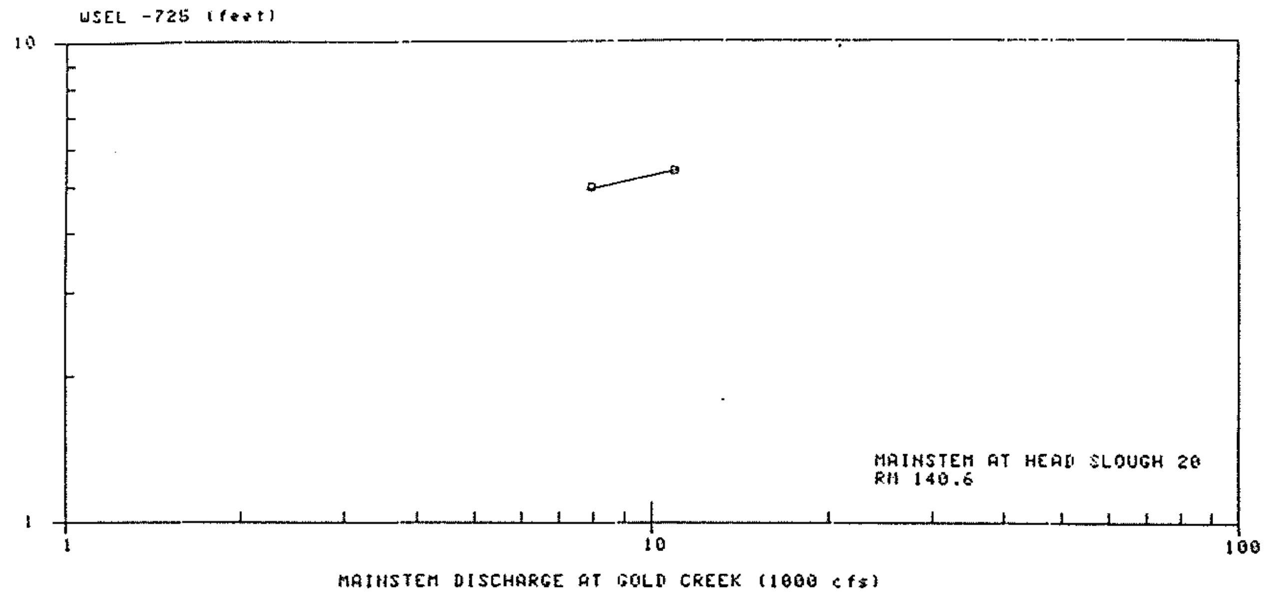



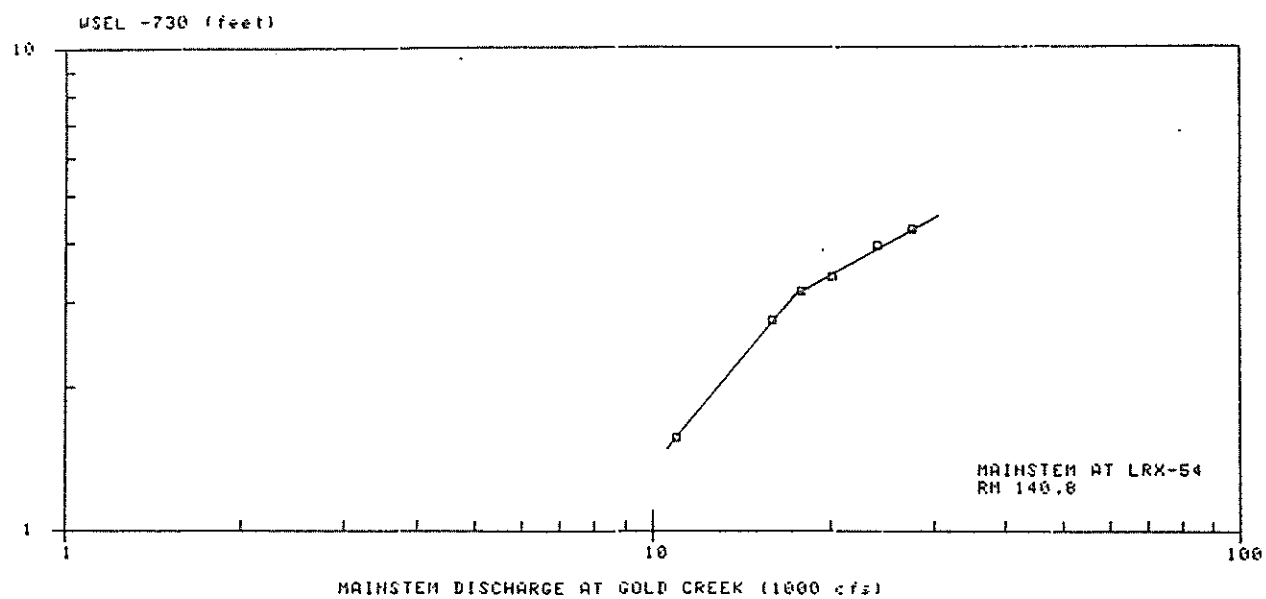

Appendix Figure 4-A-11 Mainstem discharge versus mainstem water surface elevation at left bank of LRX-50 and left bank of LRX-51.



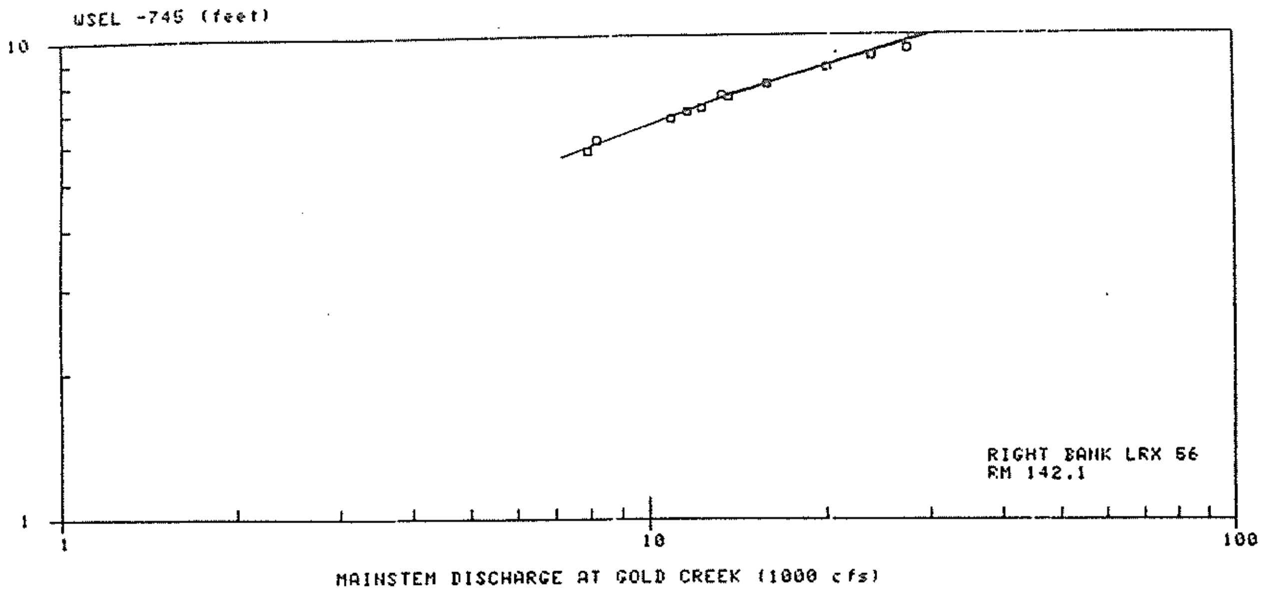



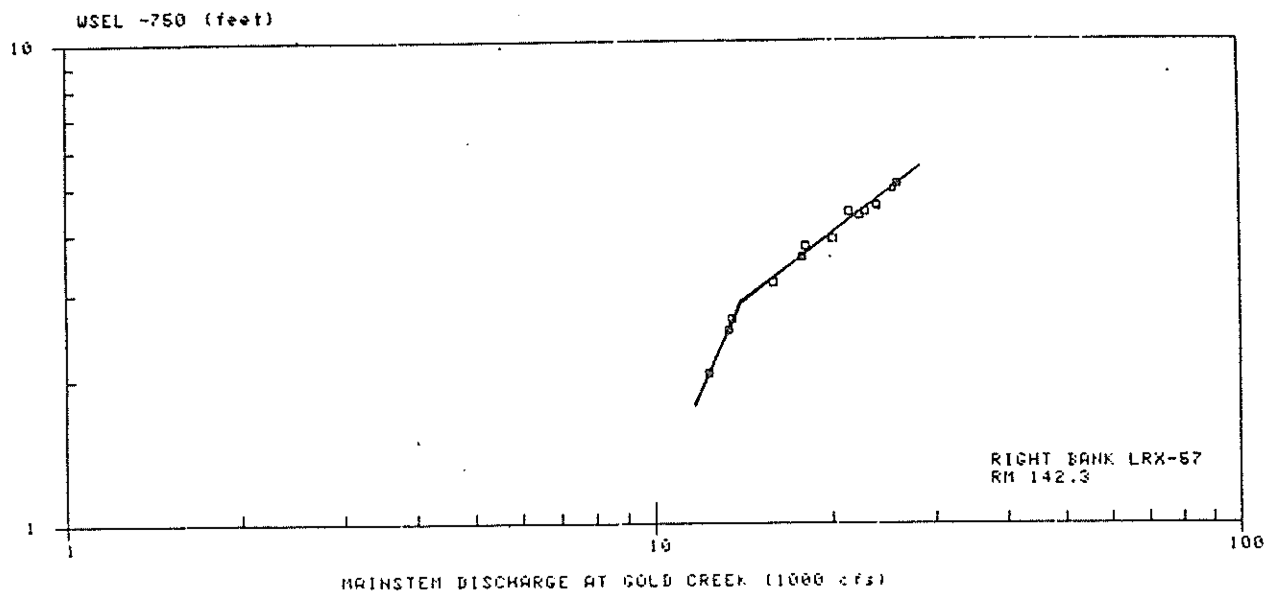

Appendix Figure 4-A-12 Mainstem discharge versus mainstem water surface elevation at Slough 19 and the right bank of LRX-53.



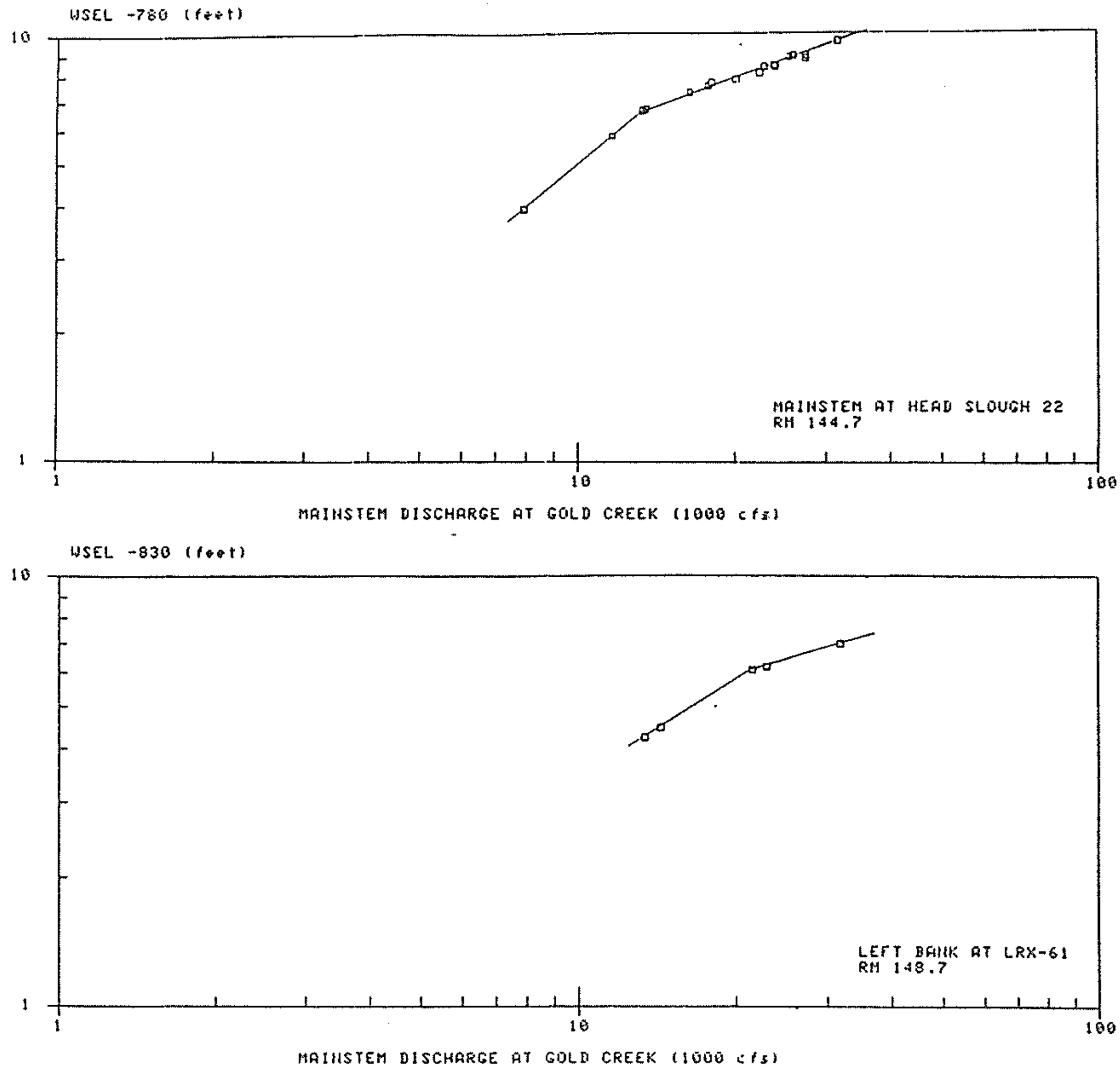




Appendix Figure 4-A-13 Mainstem discharge versus mainstem water surface elevation at head of Slough 20 and at right bank at LRX-54.

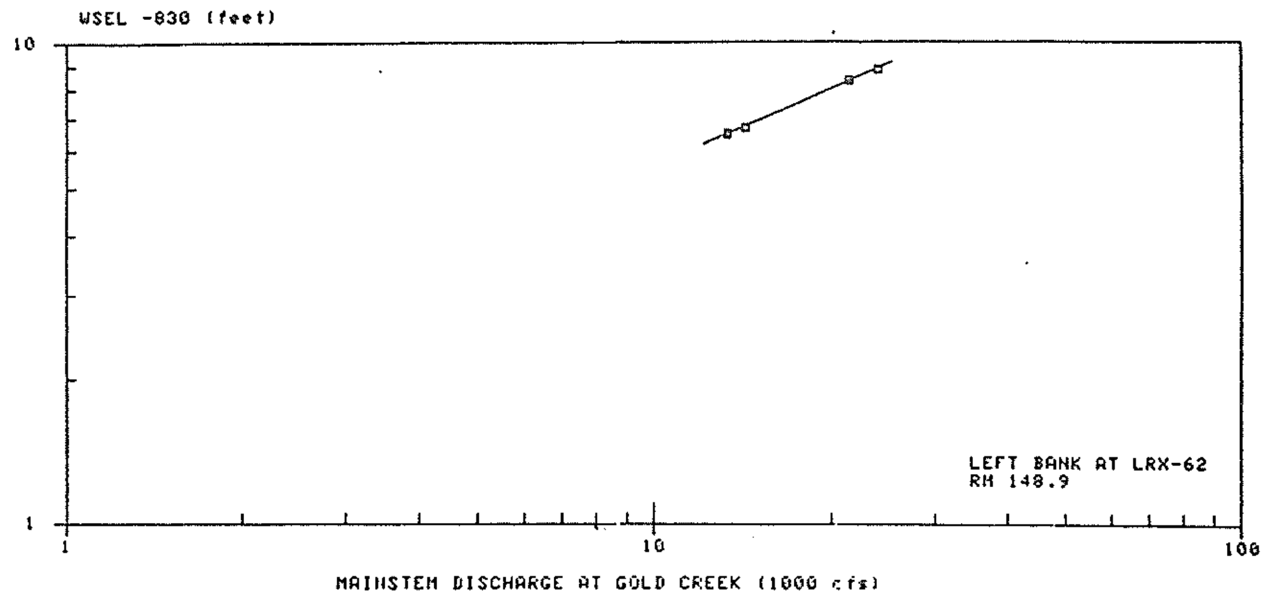


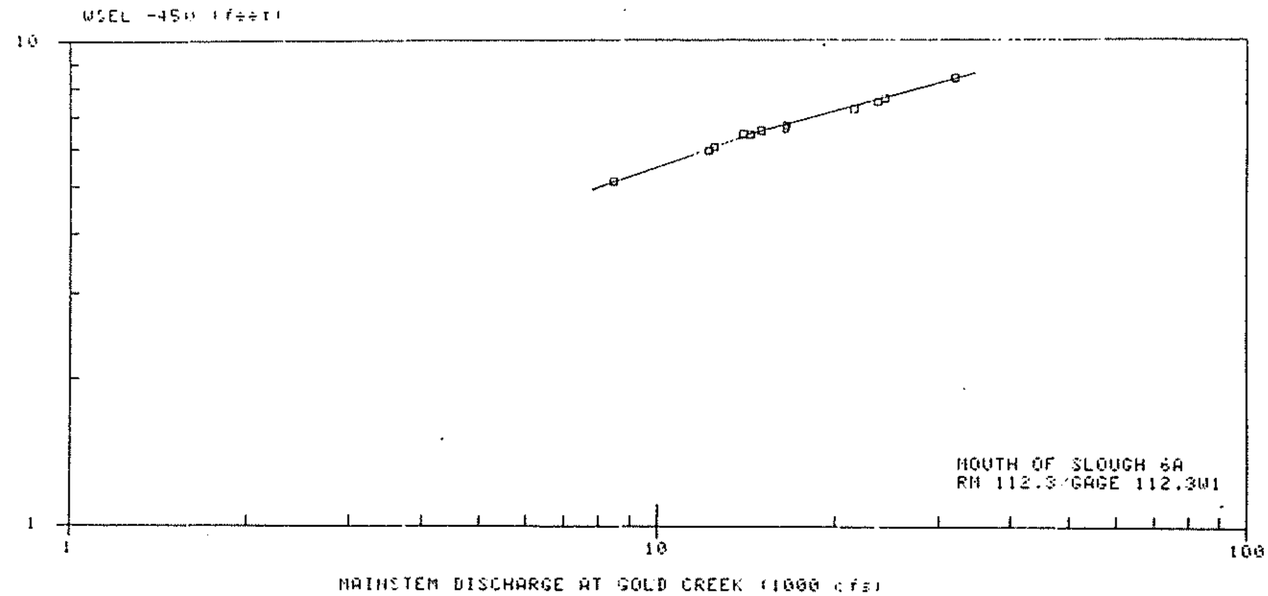

Appendix Figure 4-A-14 Mainstem discharge versus mainstem water surface elevation at right bank of LRX-56 and right bank of LRX-57.

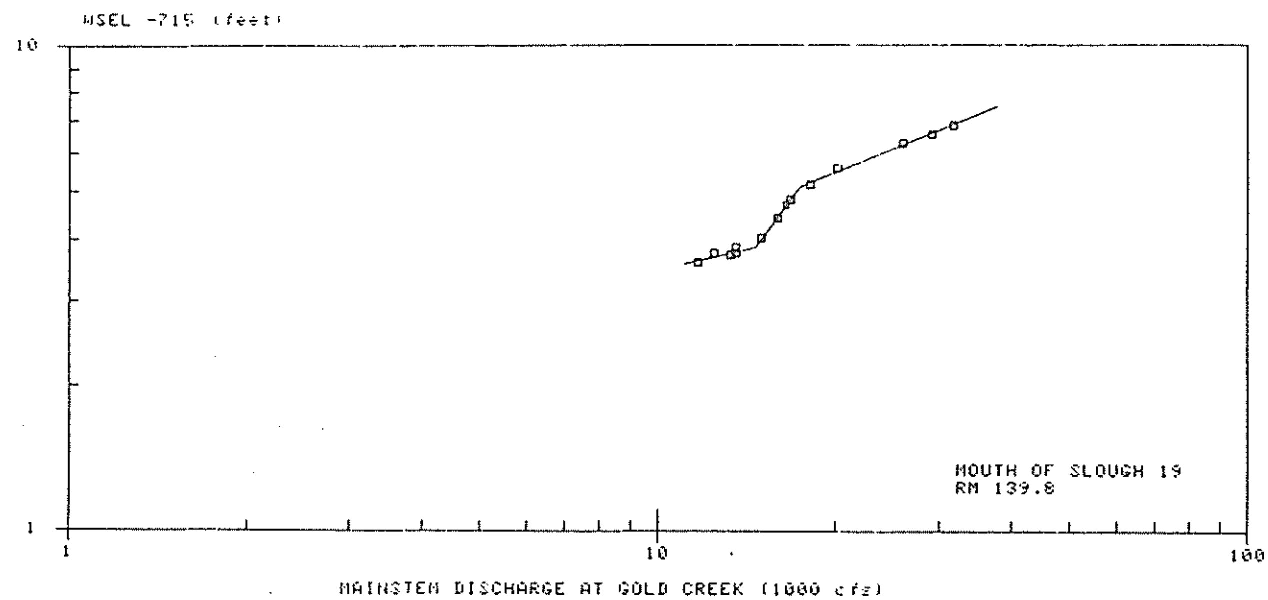



Appendix Figure 4-A-15 Mainstem discharge versus mainstem water surface elevation at head of Slough 22 and left bank at LRX-61.

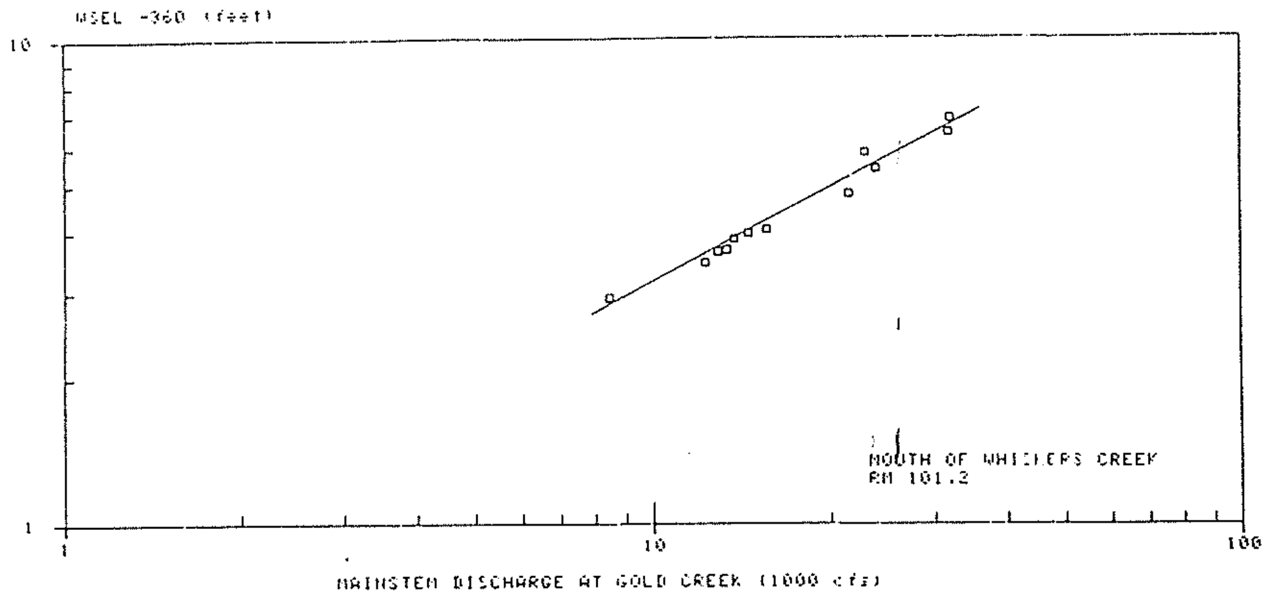



Appendix Figure 4-A-16 Mainstem discharge versus mainstem water surface elevation at left bank of LRX-62.




APPENDIX Figure 4-A-17 Mainstem discharge versus the water surface elevation of Slough 6A mouth and at Slough 19 mouth.



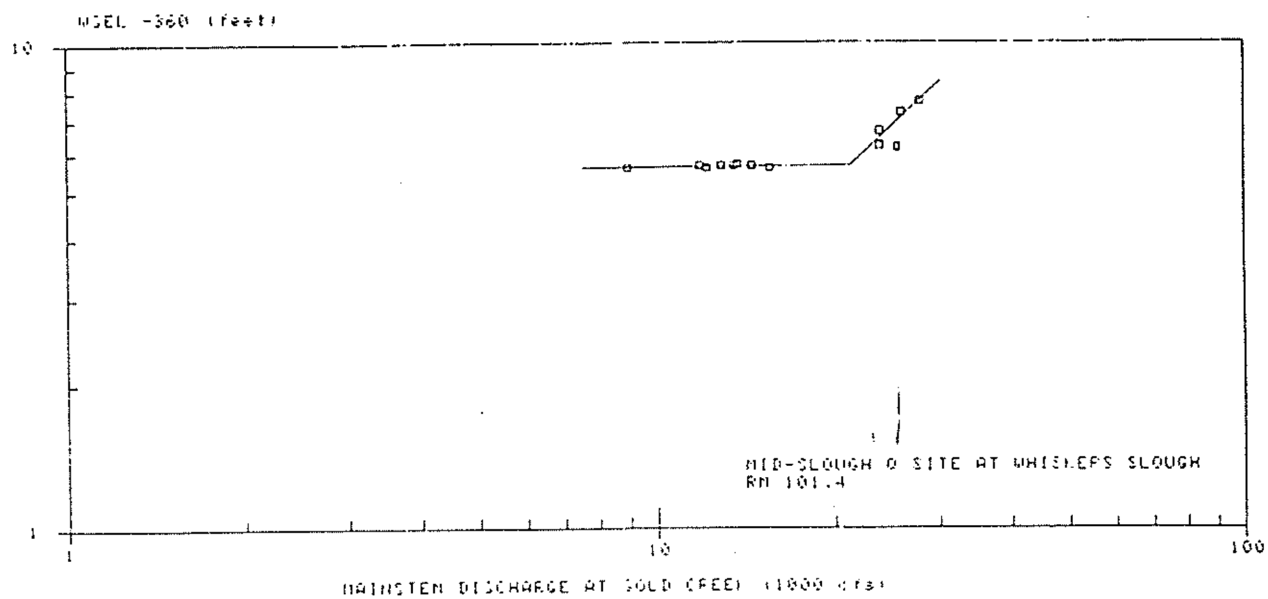
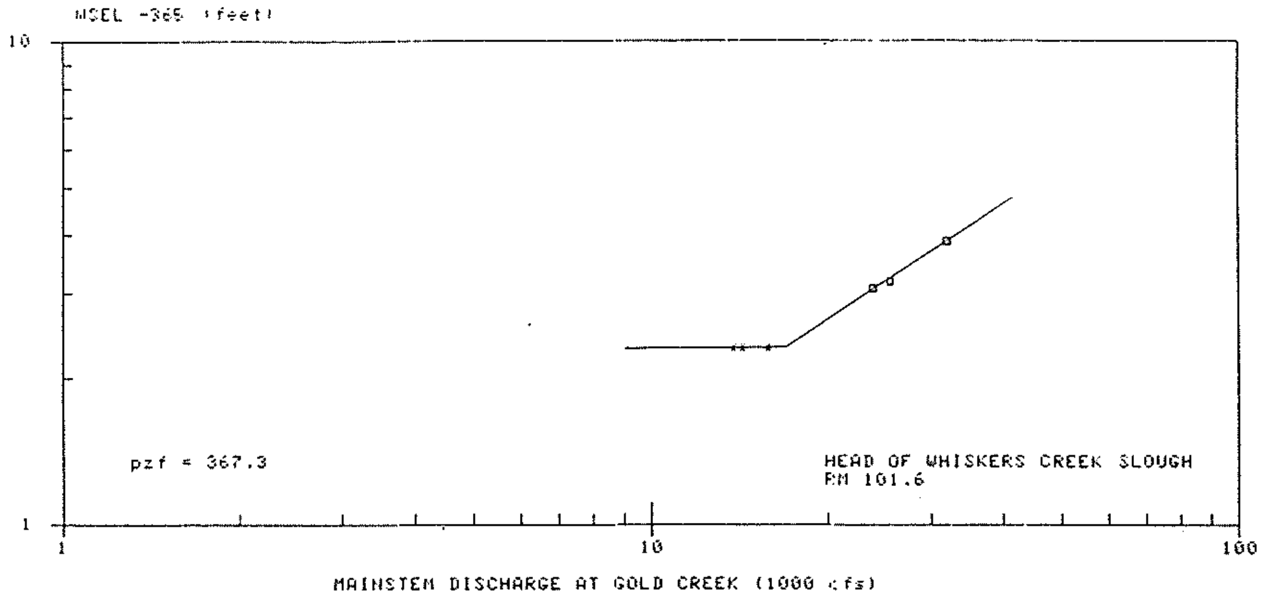
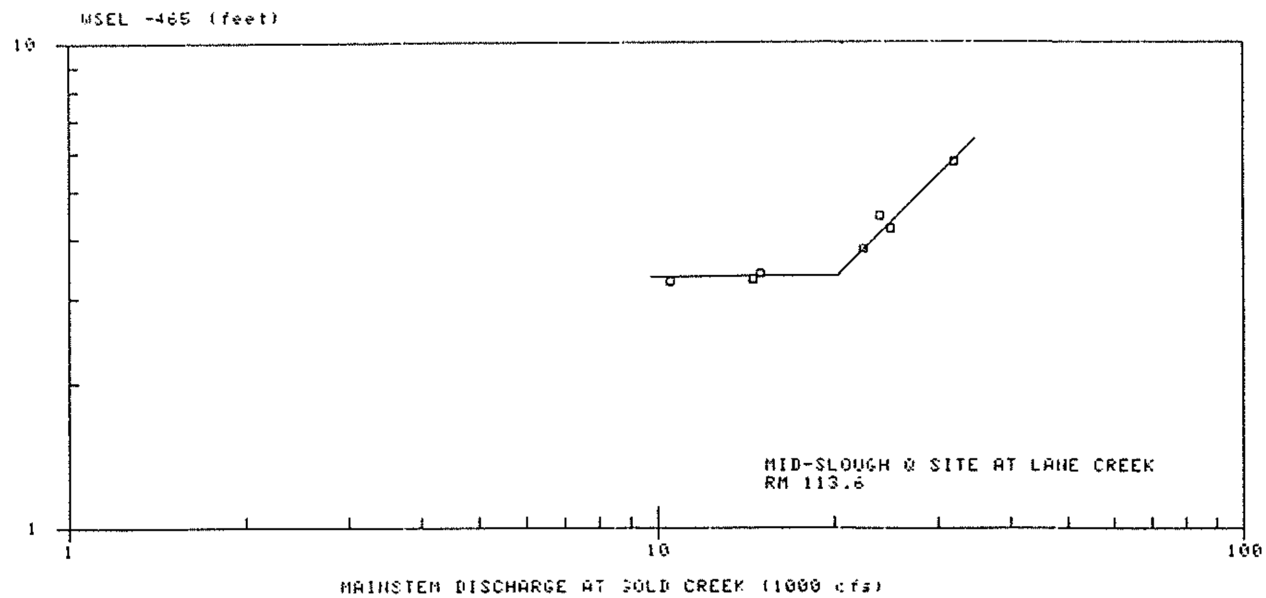




Figure Mainstem discharge versus the water surface elevation at Whiskers Creek/Slough mouth and mid-slough Q site.




APPENDIX Figure 4-A-19 Mainstem discharge versus the water surface elevation of Whiskers Creek Slough head.



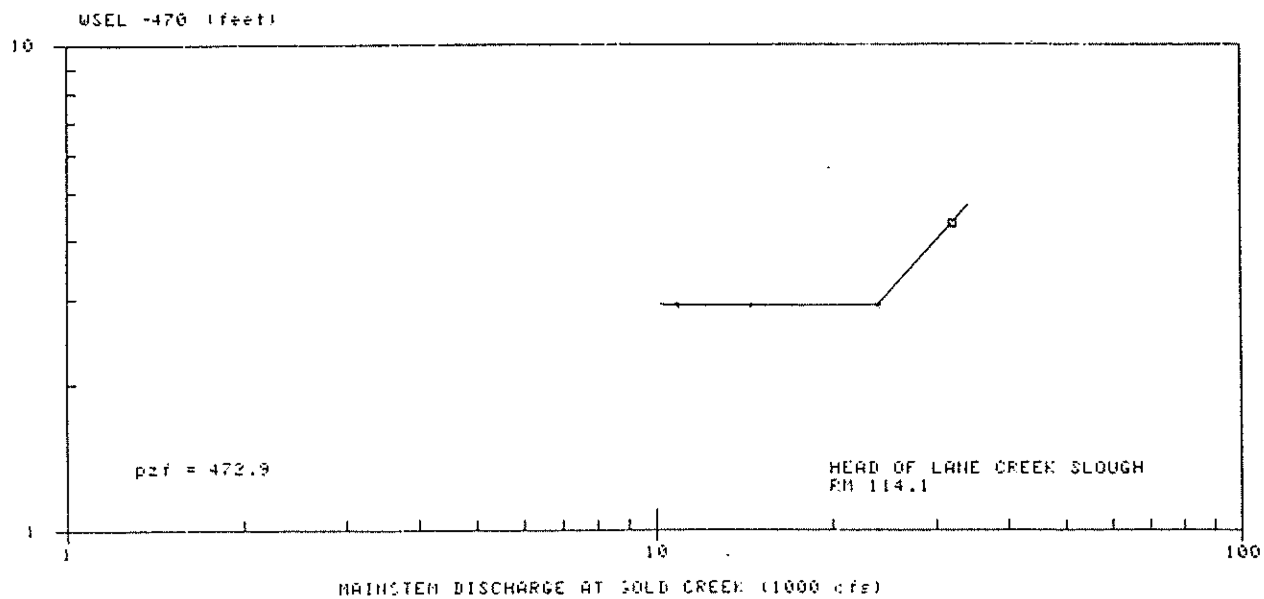
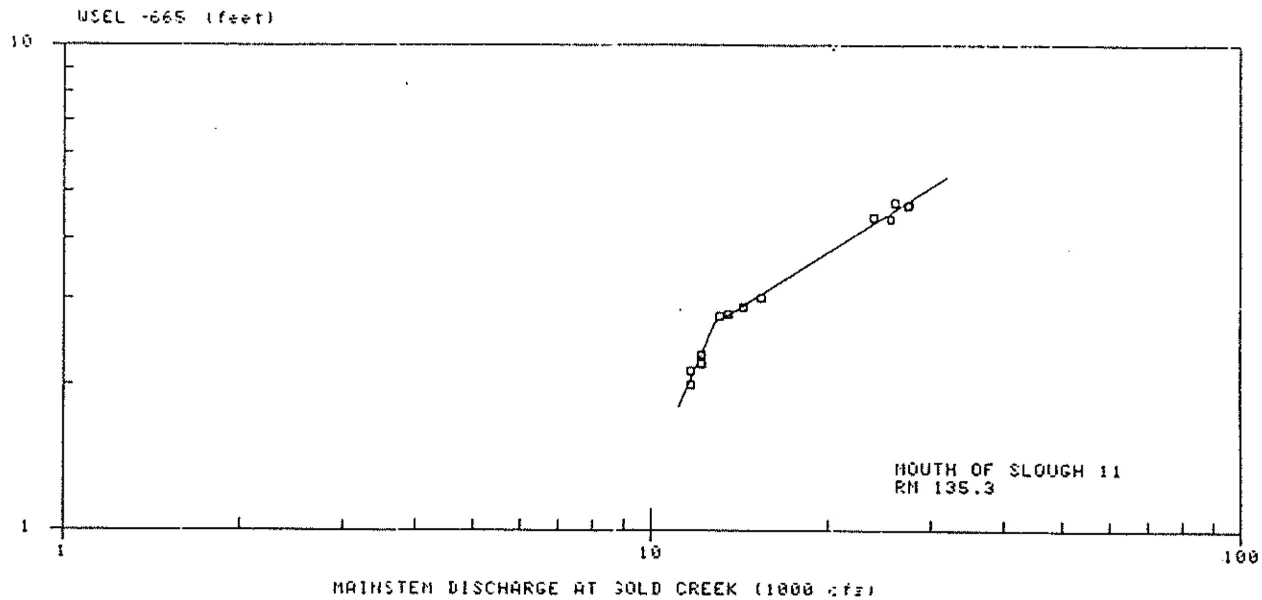
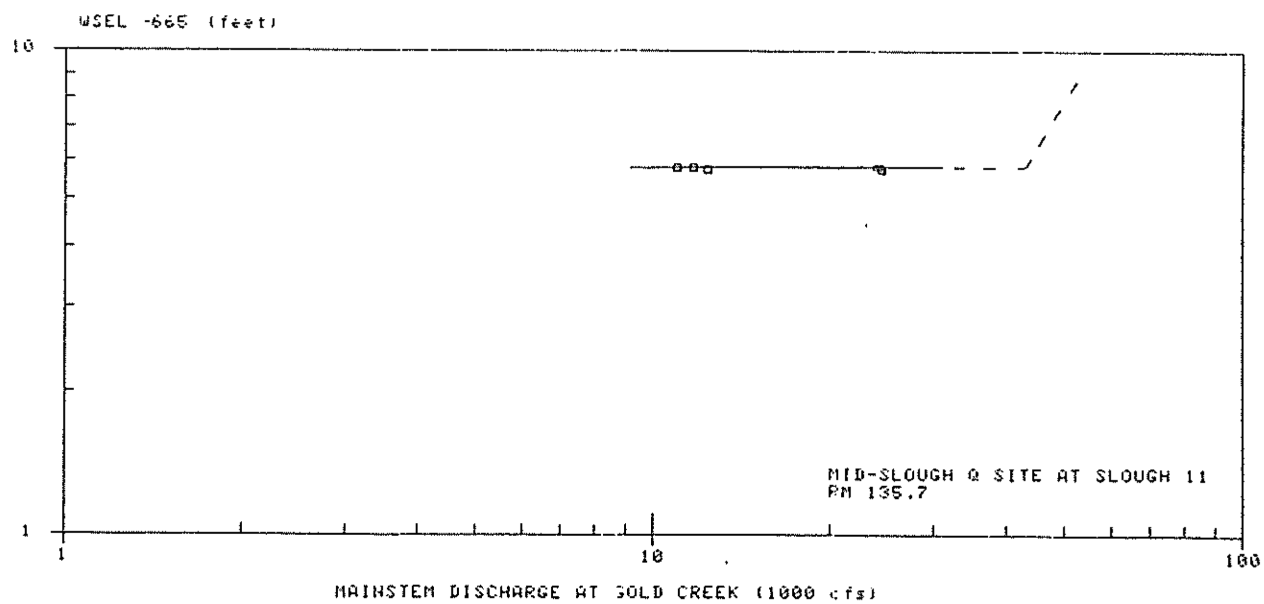
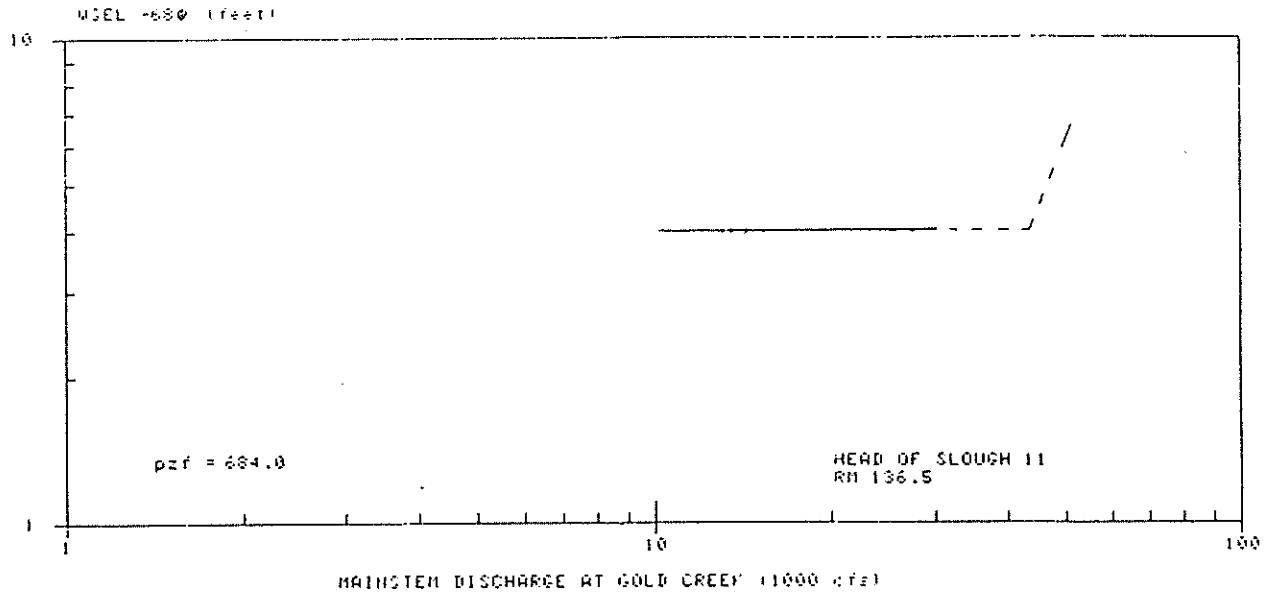




Figure 4-A-20 Mainstem discharge versus the water surface elevation of Lane Creek Slough mid-slough and head.

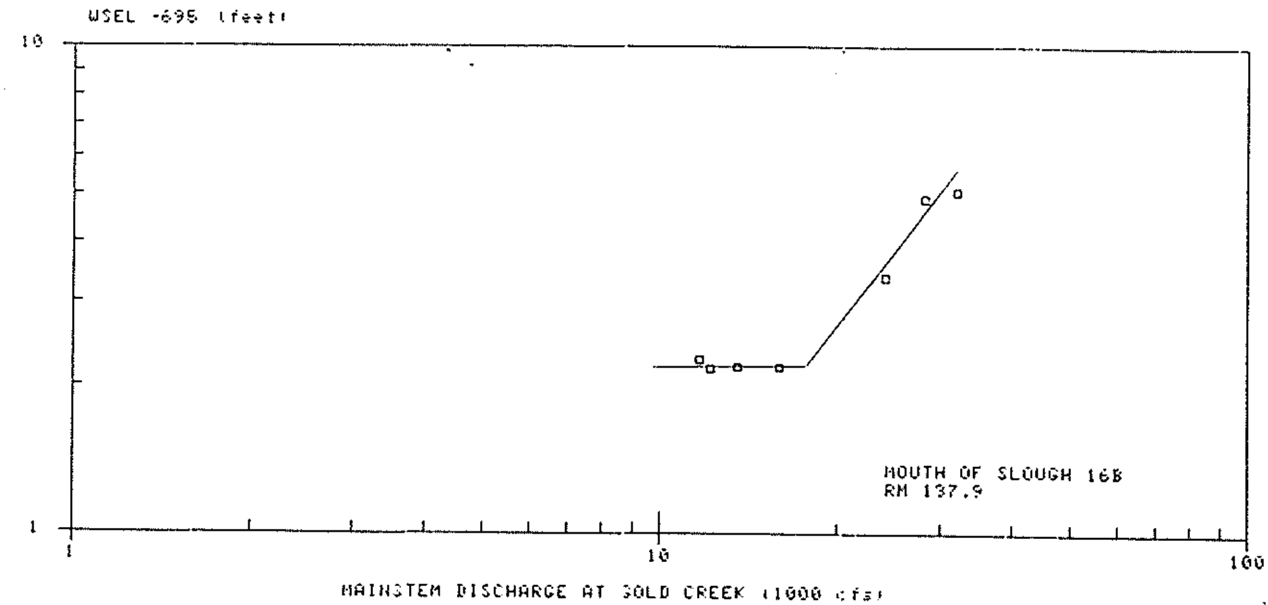


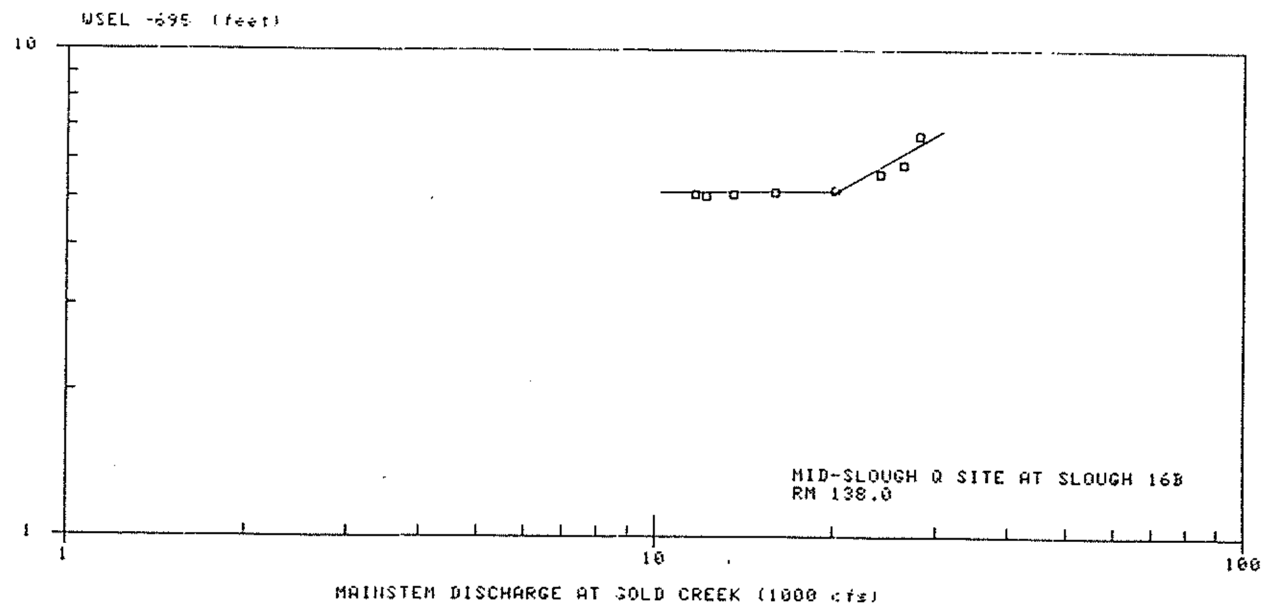




APPENDIX Figure 4-A-21 Mainstem discharge versus the water surface elevation of Slough 11 mouth and mid-slough.

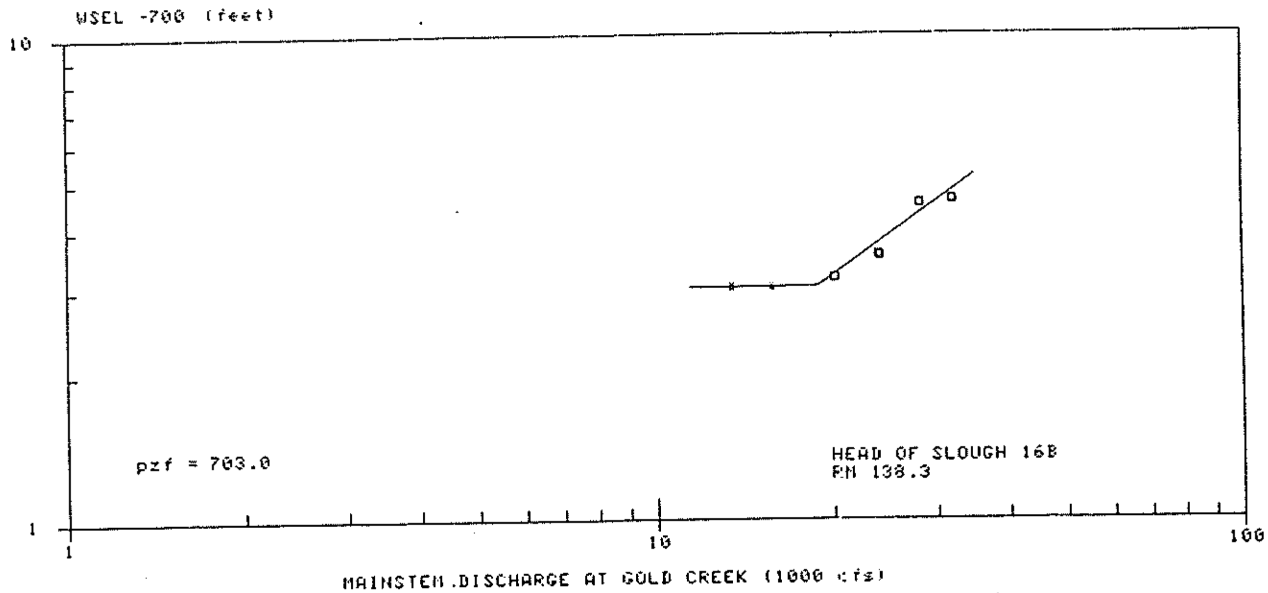



APPENDIX Figure 4-A-22 Mainstem discharge versus the water surface elevation of Slough 11 head.

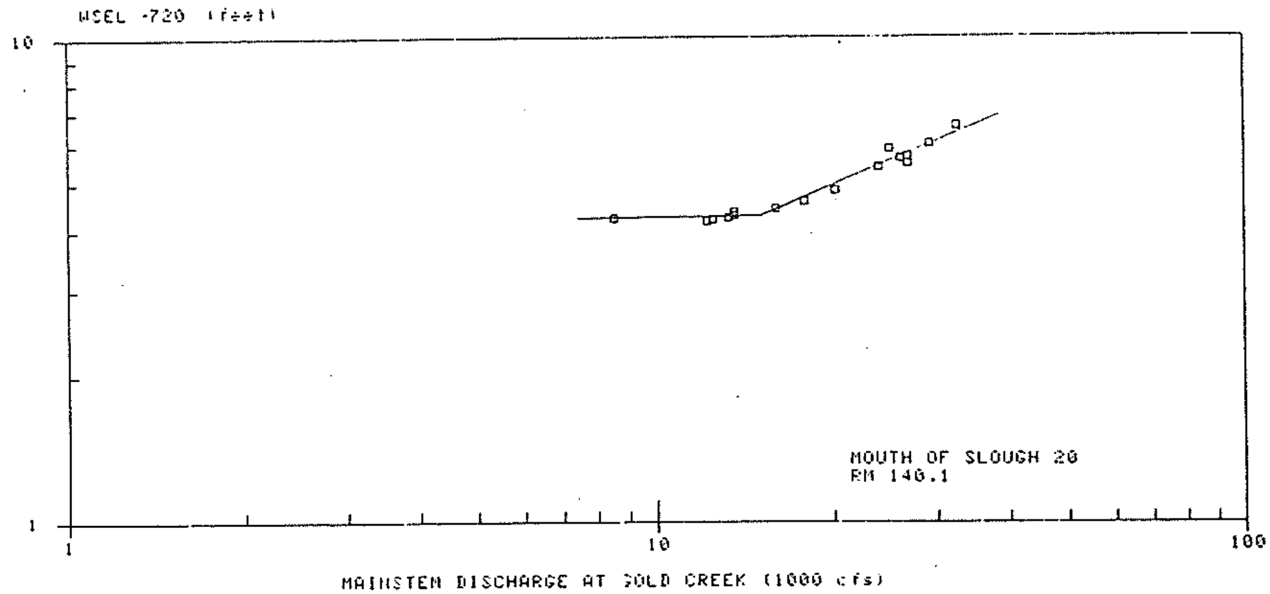


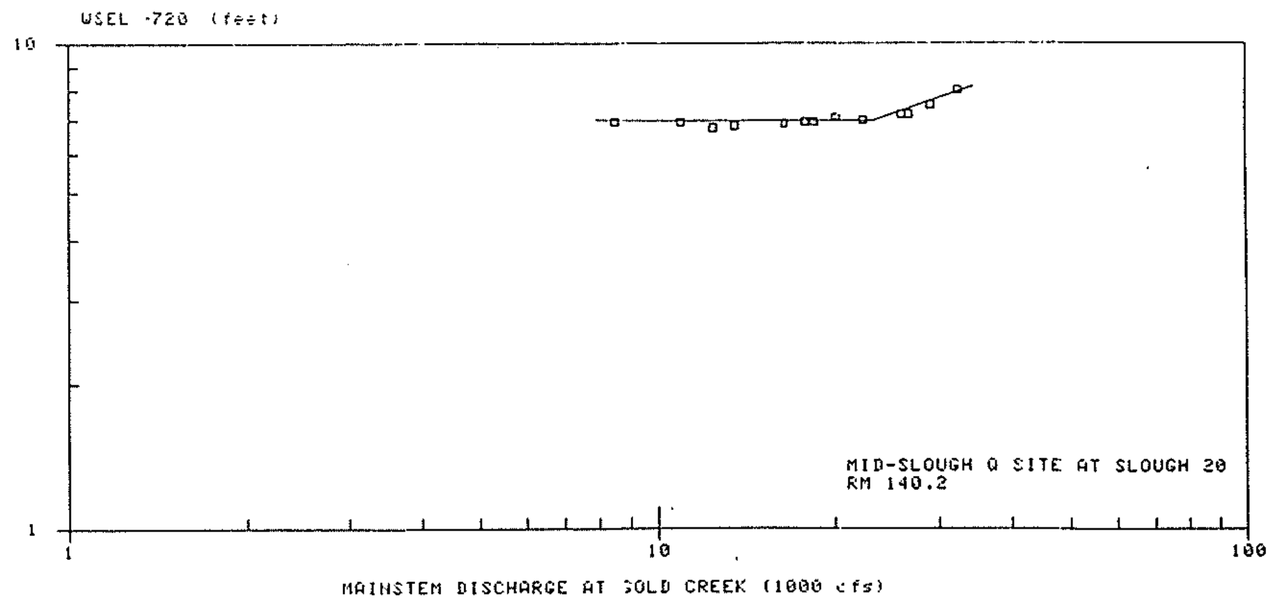




APPENDIX Figure 4-A-23 Mainstem discharge versus the water surface elevation of Slough 16B mouth and mid-slough.

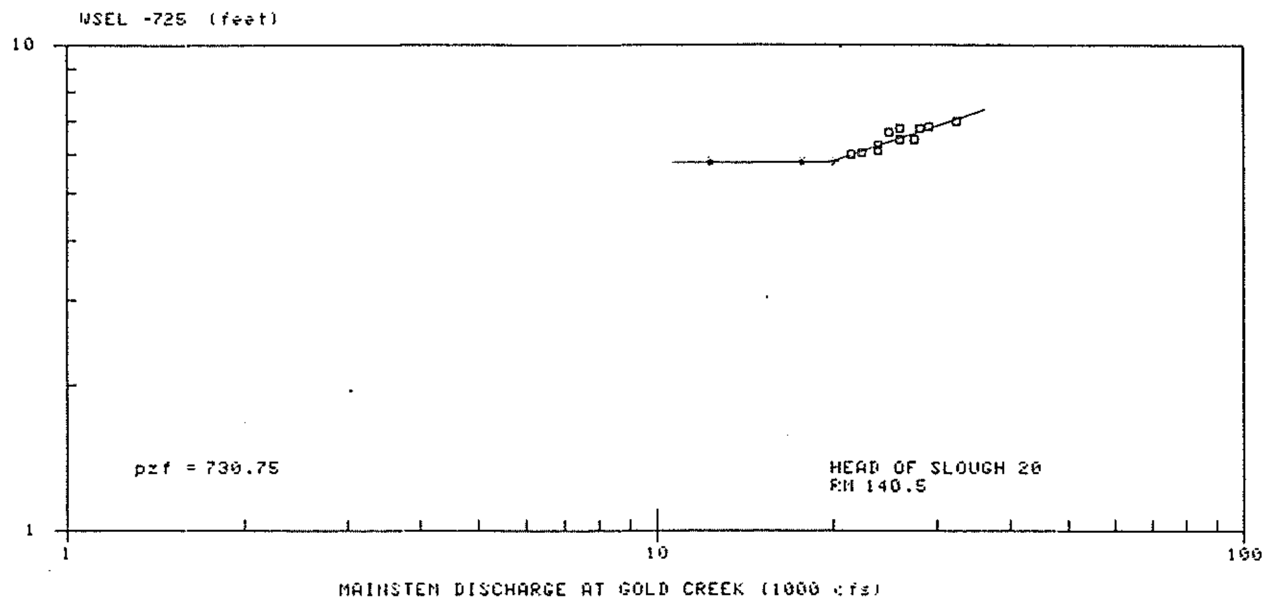



APPENDIX Figure 4-A-24 Mainstem discharge versus the water surface elevation of Slough 16B head.

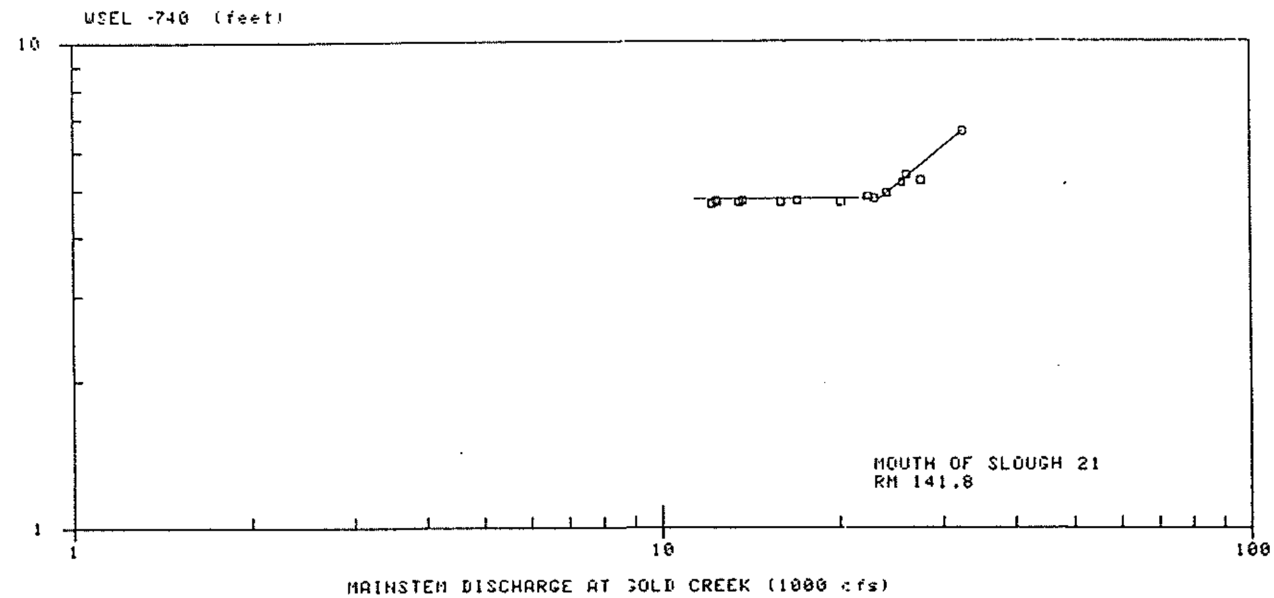


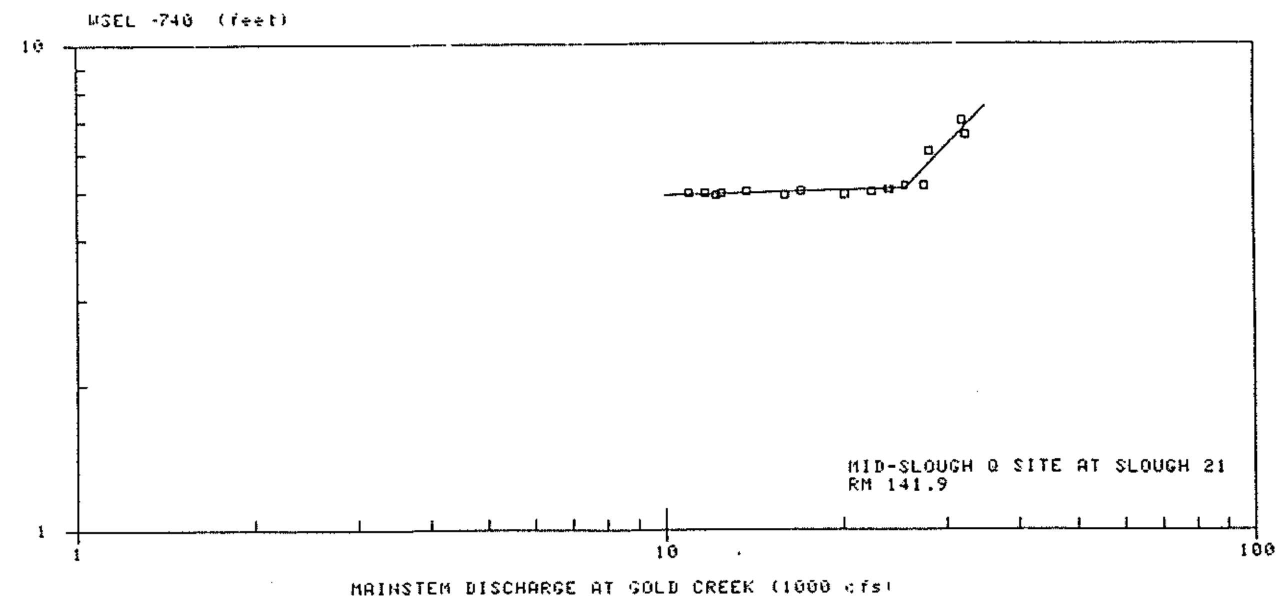




APPENDIX Figure 4-A-25 Mainstem discharge versus the water surface elevation of Slough 20 mouth and mid-slough.

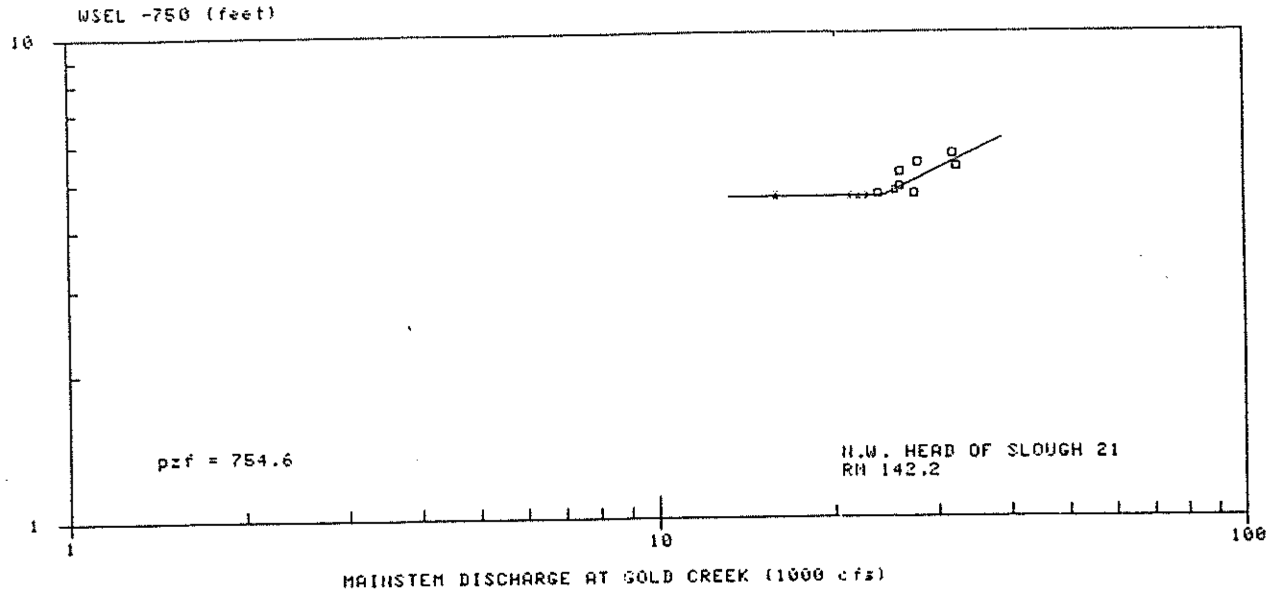


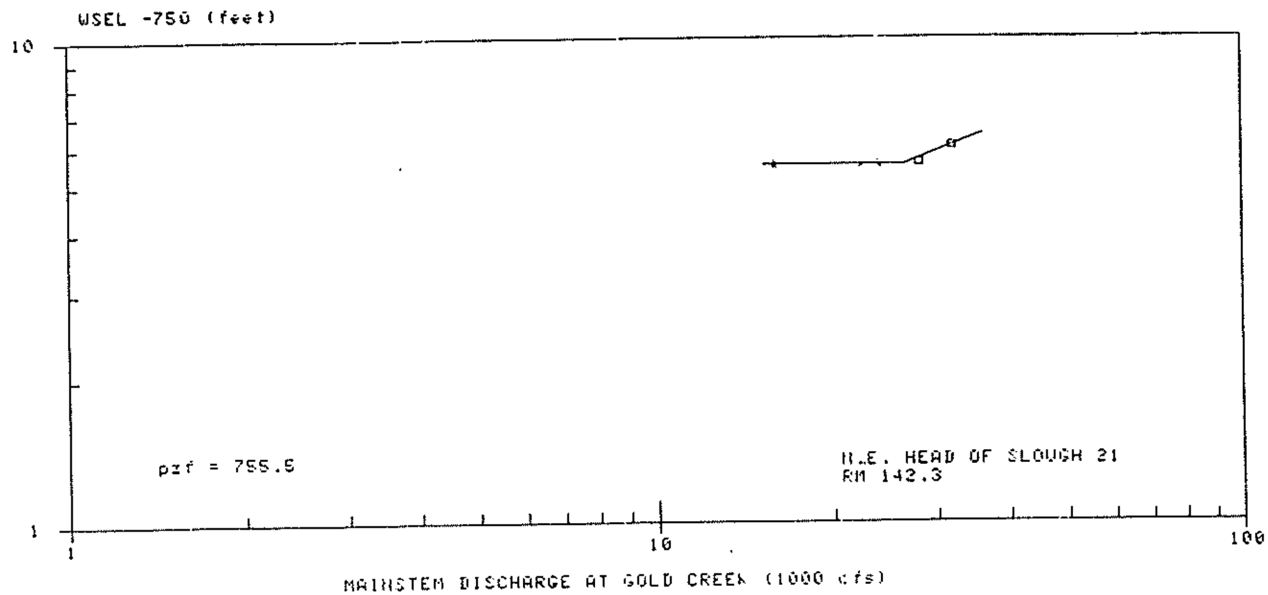

APPENDIX Figure 4-A-26 Mainstem discharge versus the water surface elevation of Slough 20 head.



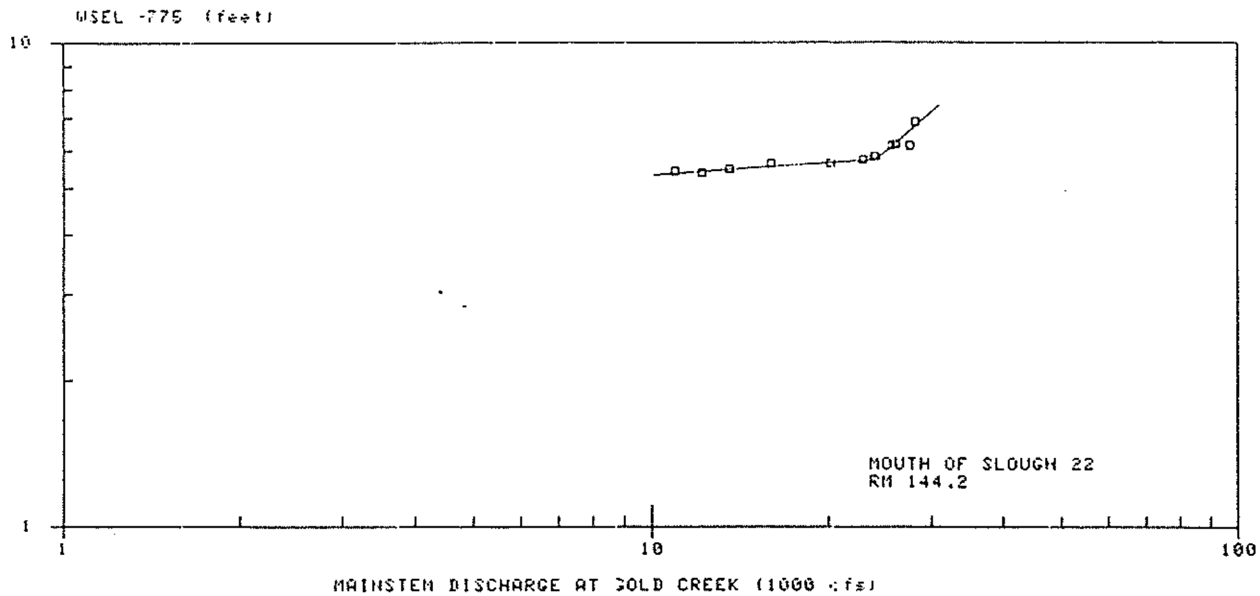



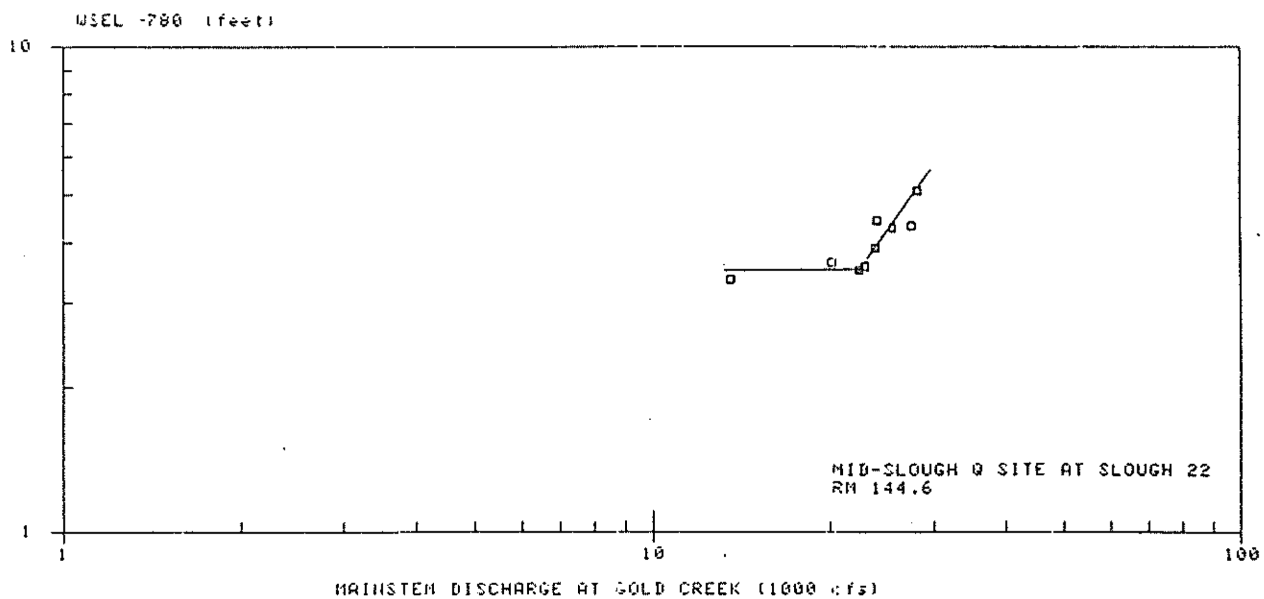

APPENDIX Figure 4-A-27 Mainstem discharge versus the water surface elevation of Slough 21 mouth and mid-slough.



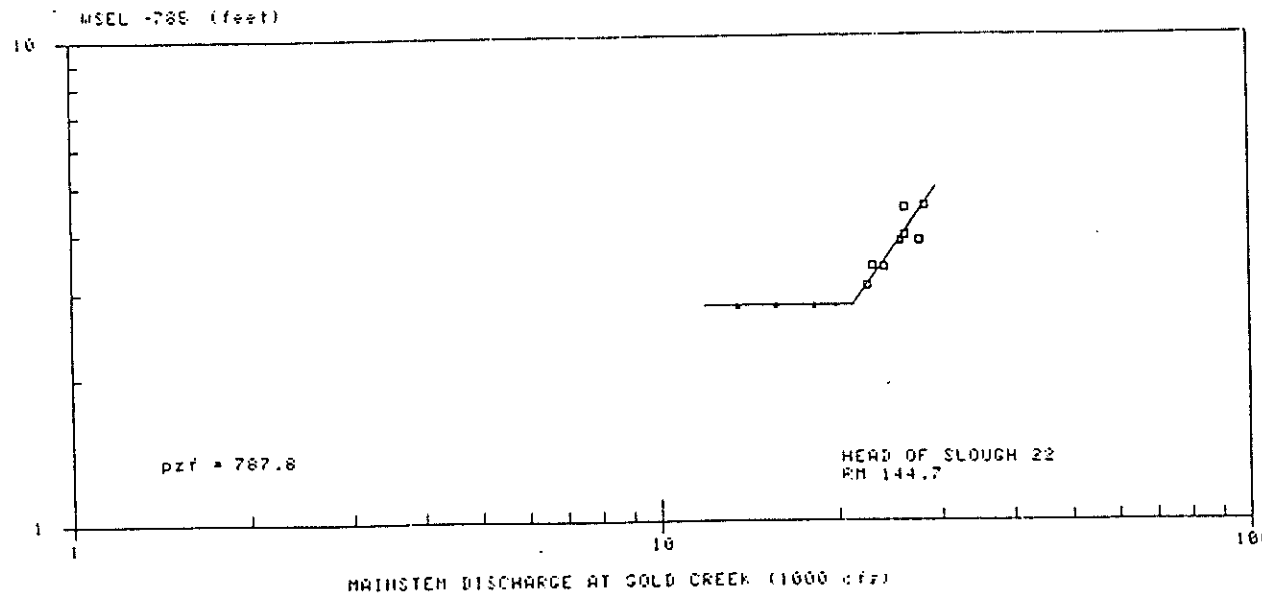




APPENDIX Figure 4-A-28 Mainstem discharge versus the water surface elevation of the N.W. and N.E. head of Slough 21.

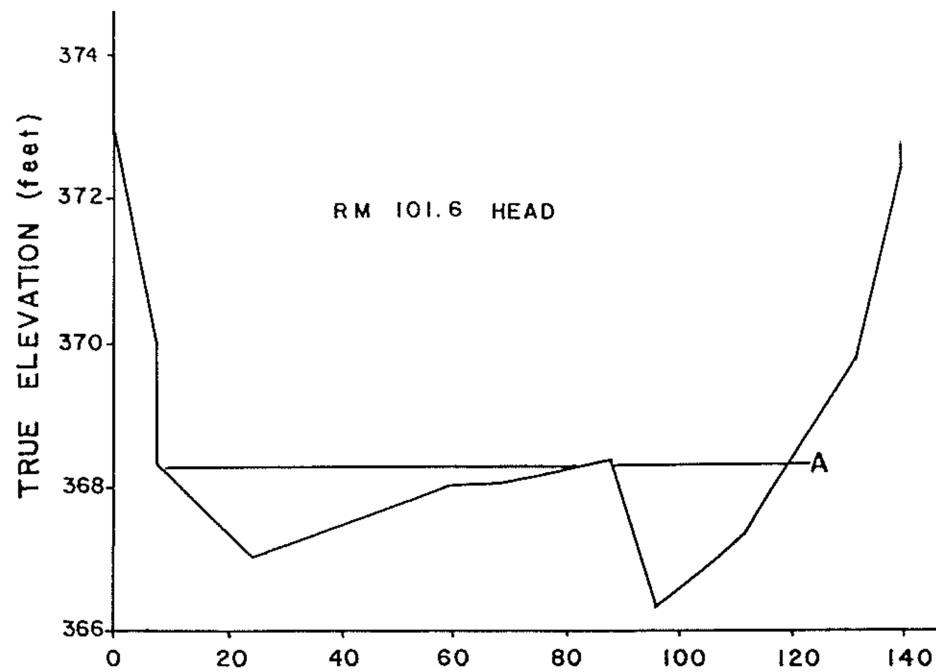


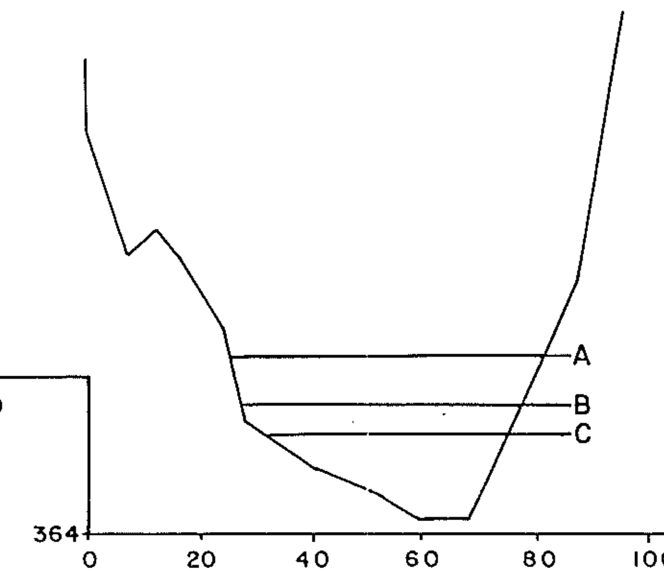



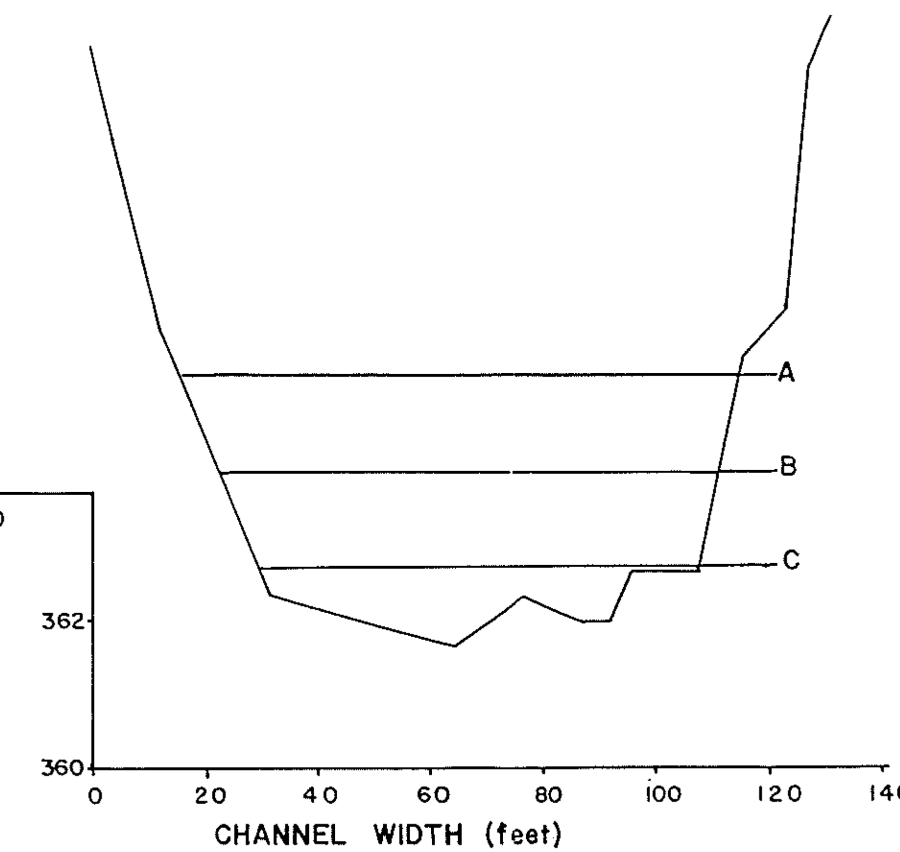

APPENDIX Figure 4-A-29 Mainstem discharge versus the water surface elevation of Slough 22 mouth and mid-slough.




APPENDIX Figure 4-A-30 Mainstem discharge versus the water surface elevation of Slough 22 head.

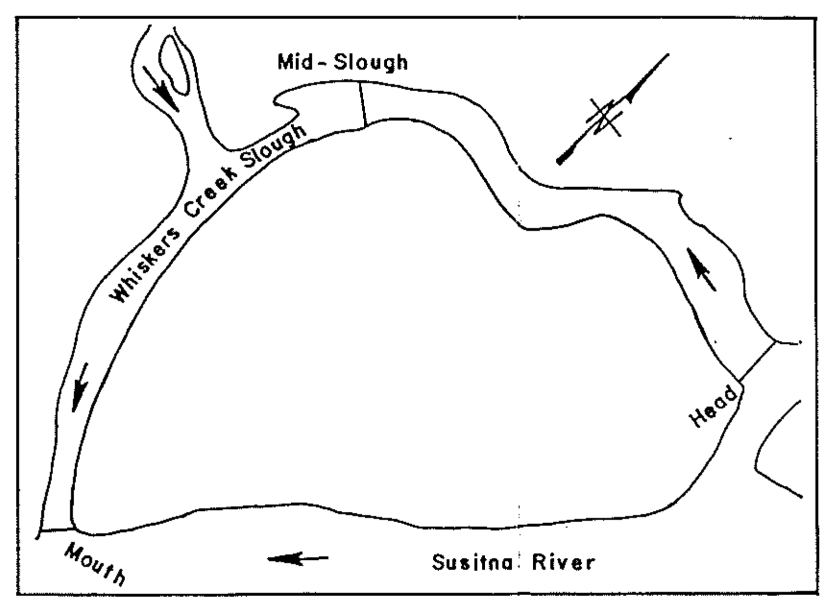


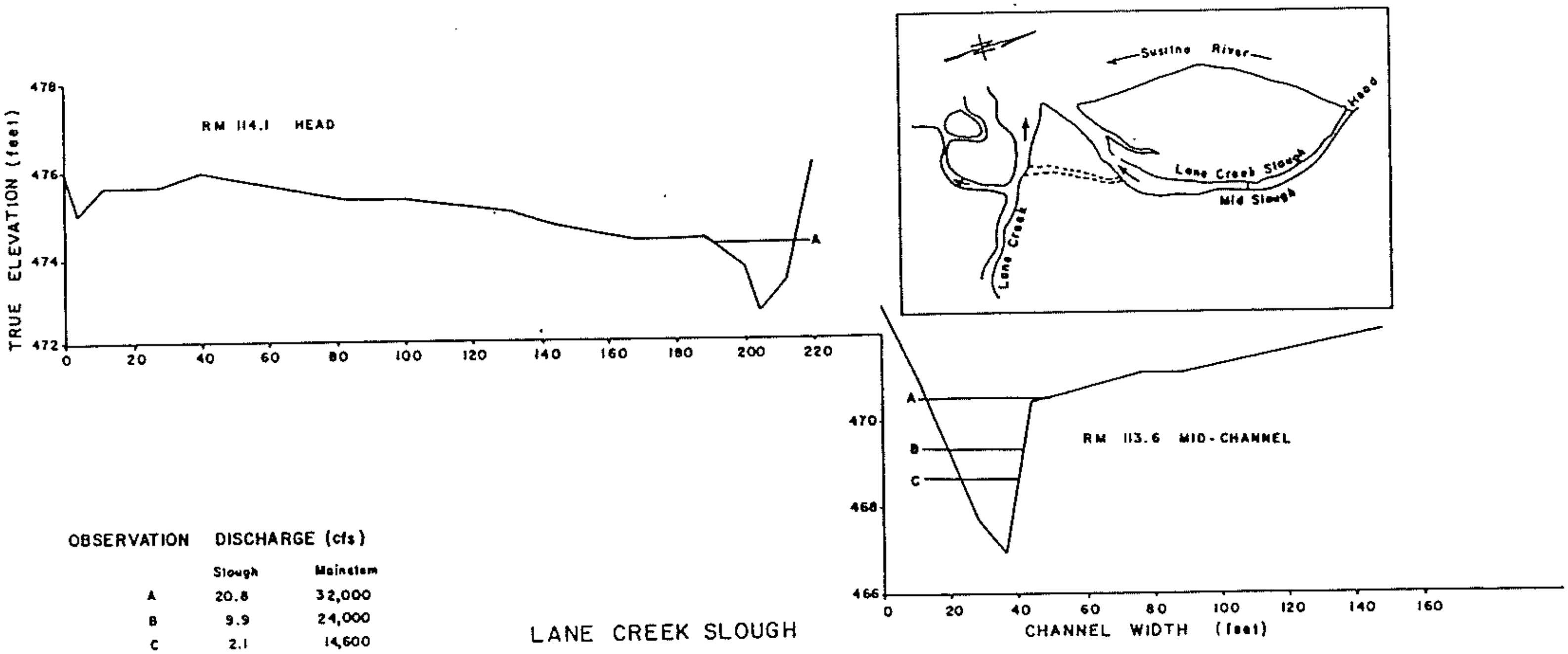




## WHISKERS CREEK SLOUGH

| OBSERVATION | DISCHARGE (cfs) | |
|---|---|---|
| | Slough | Mainstem |
| A | 35.1 | 24,000 |
| B | 0.2 | 15,600 |
| C | 2.0 | 7,800 |

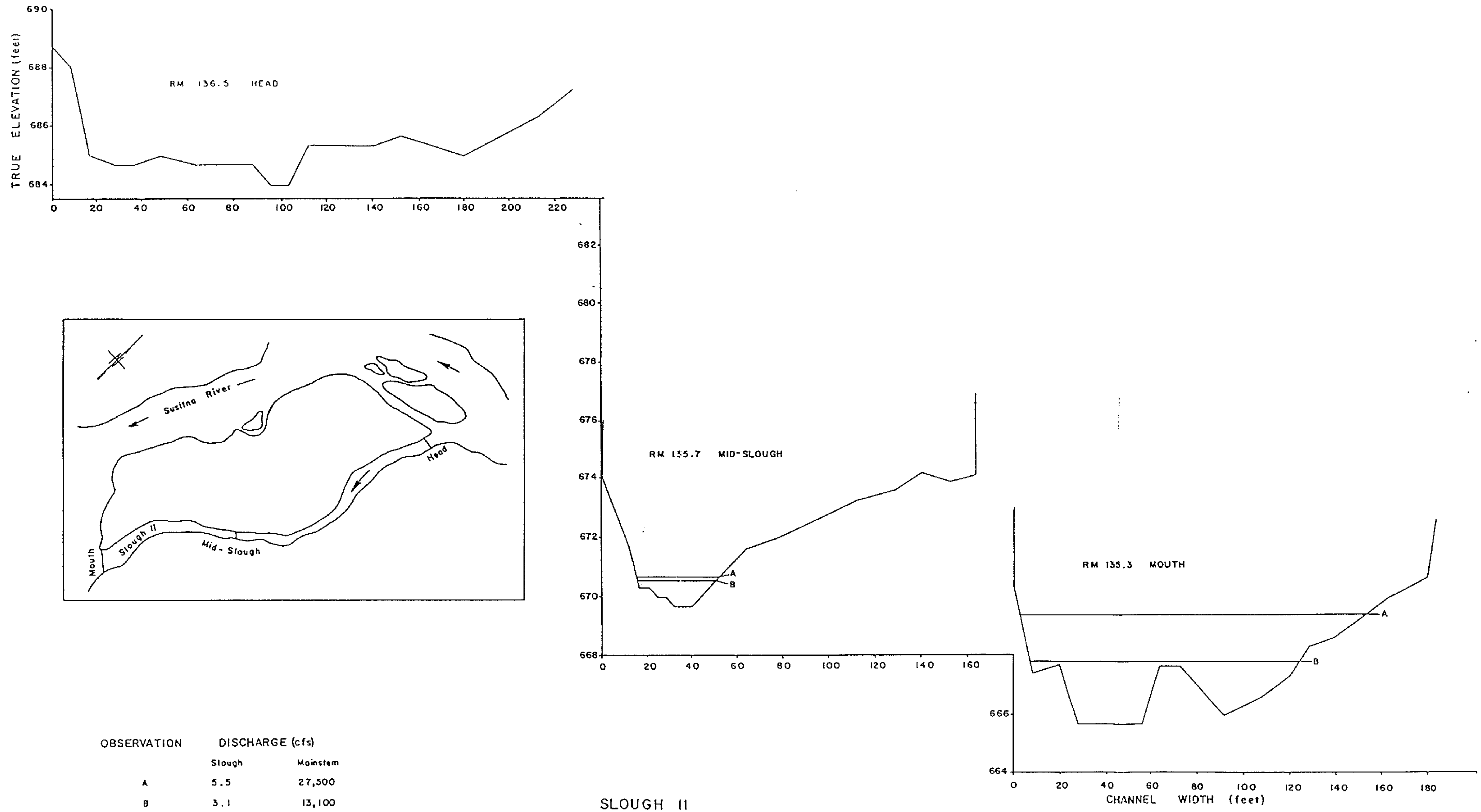



Appendix Figure 4-A-31. Cross sections of the head, mid-slough and mouth of Whiskers Creek Slough depicting the water surface elevation corresponding to the slough and mainstem discharge.




| OBSERVATION | DISCHARGE (cfs) | |
|---|---|---|
| | Slough | Mainstem |
| A | 20.8 | 32,000 |
| B | 9.9 | 24,000 |
| C | 2.1 | 14,600 |

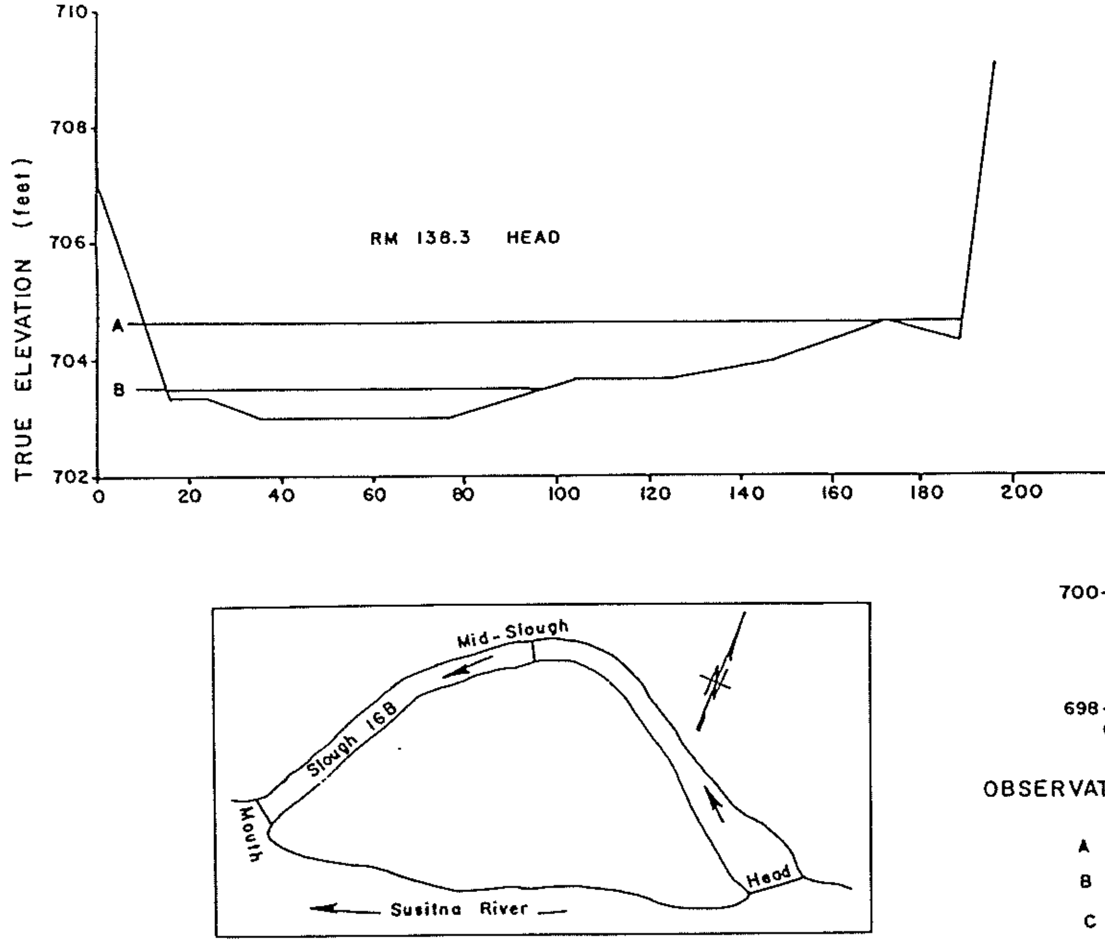
Figure 4-A-32 Cross sections of the head and mid-slough of Lane Creek Slough depicting the water surface elevation corresponding to the slough and mainstem.

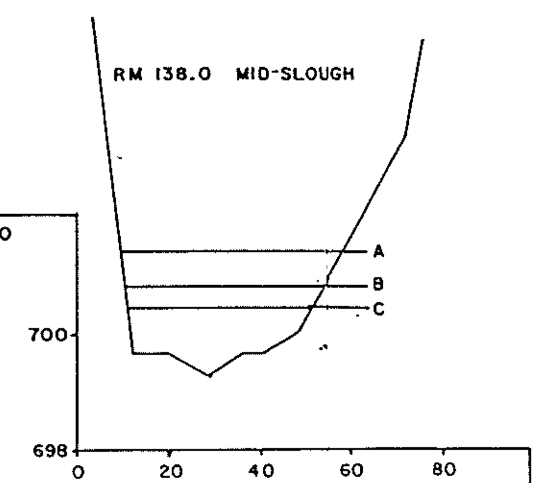


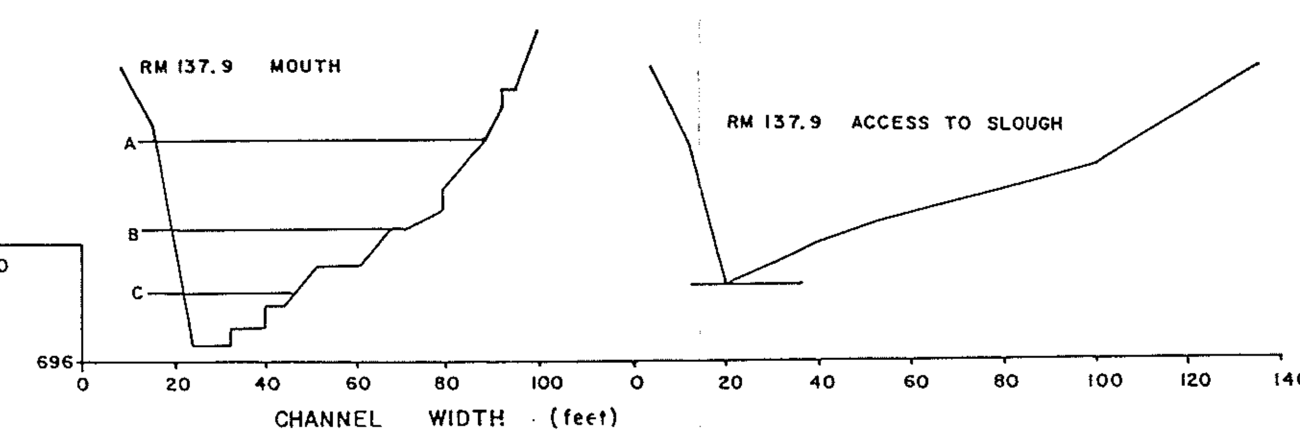

| OBSERVATION | DISCHARGE (cfs) | |
|---|---|---|
| | Slough | Mainstem |
| A | 5.5 | 27,500 |
| B | 3.1 | 13,100 |

Appendix Figure 4-A-33. Cross sections of the head, the mid-slough and mouth of Slough 11 depicting the water surface elevation corresponding to the slough and mainstem discharge.

# SLOUGH 16 B

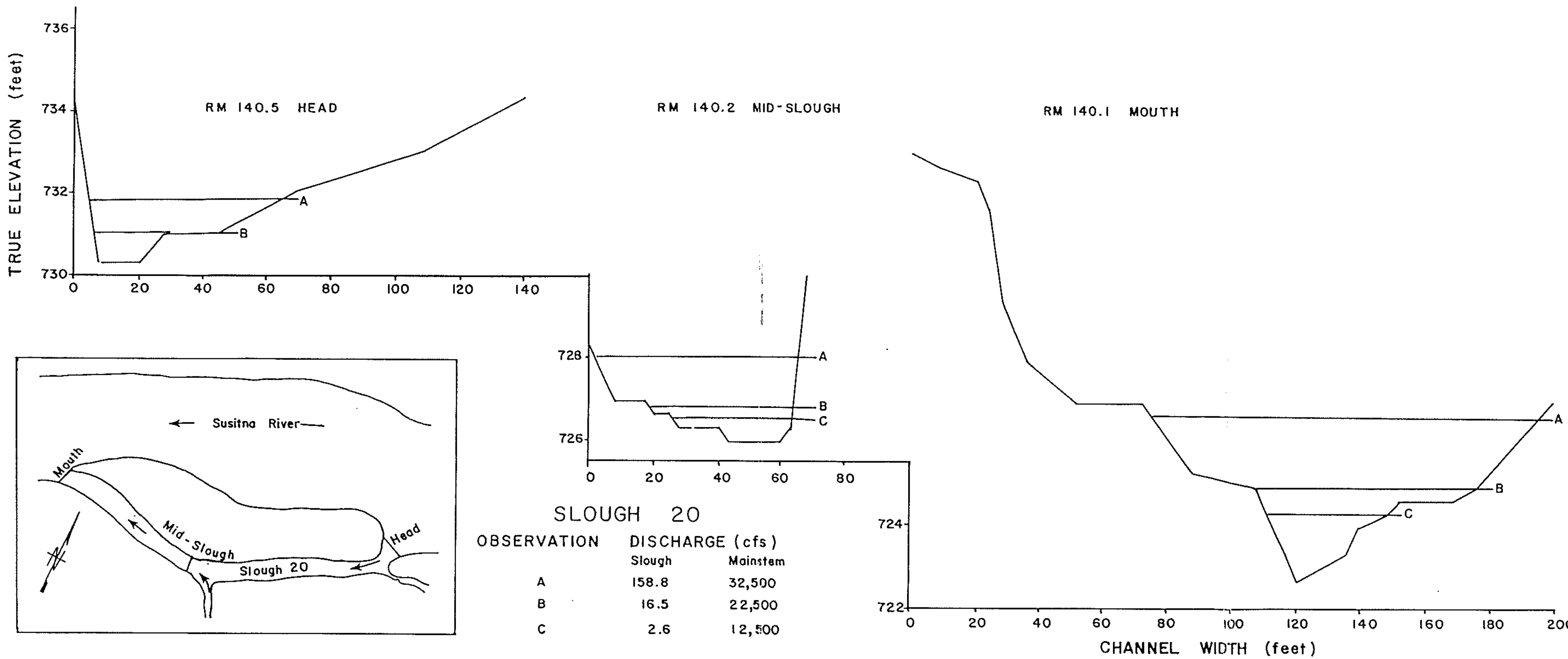


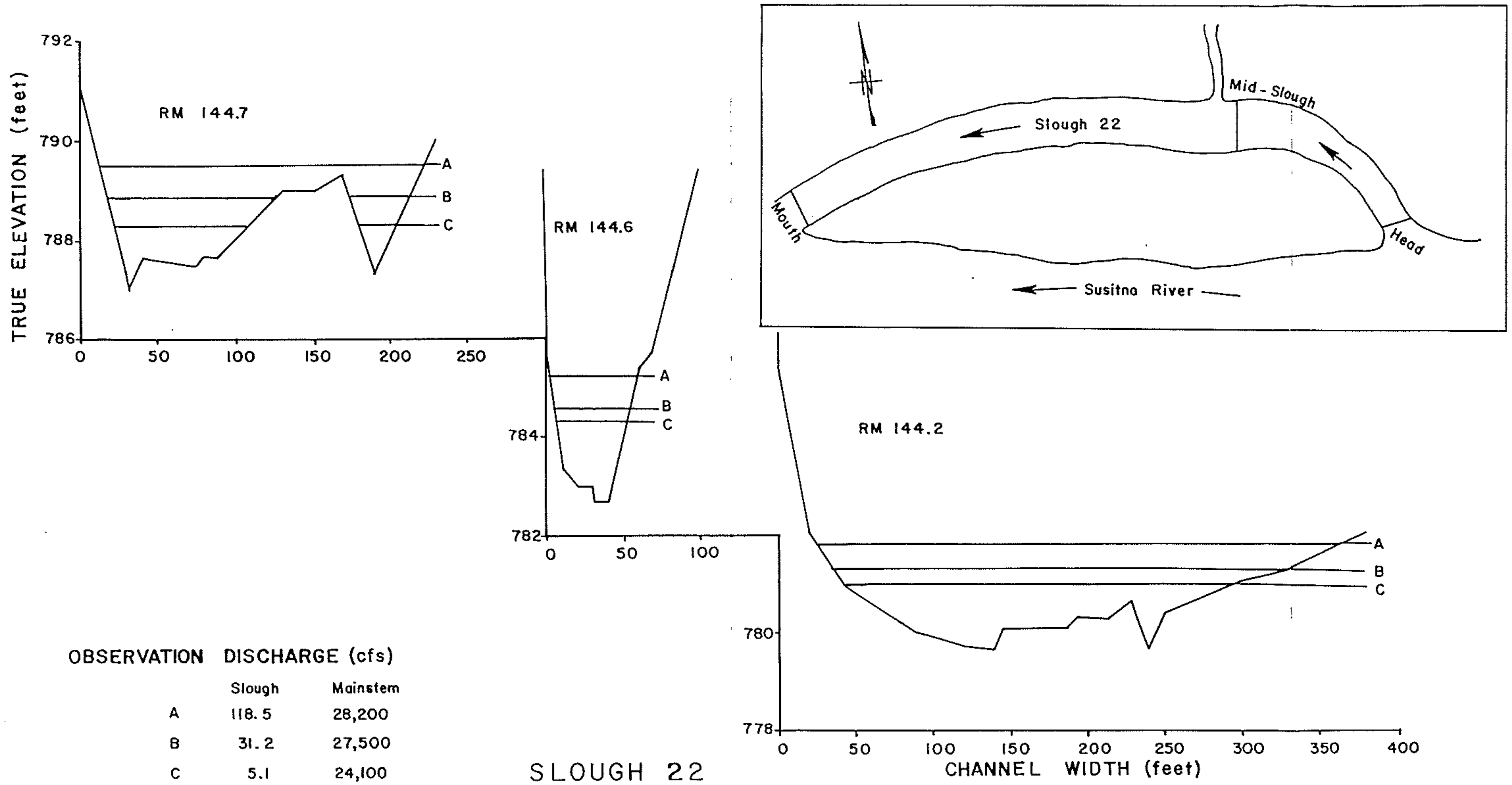

| OBSERVATION | DISCHARGE (cfs) Slough | Mainstem |
|---|---|---|
| A | 257.6 | 28,200 |
| B | 54.8 | 26,400 |
| C | 23.5 | 24,100 |

Appendix Figure 4-A-34. Cross sections of the head, mid-slough, mouth and access to Slough 16B depicting the water surface elevation corresponding to the slough and mainstem discharge.

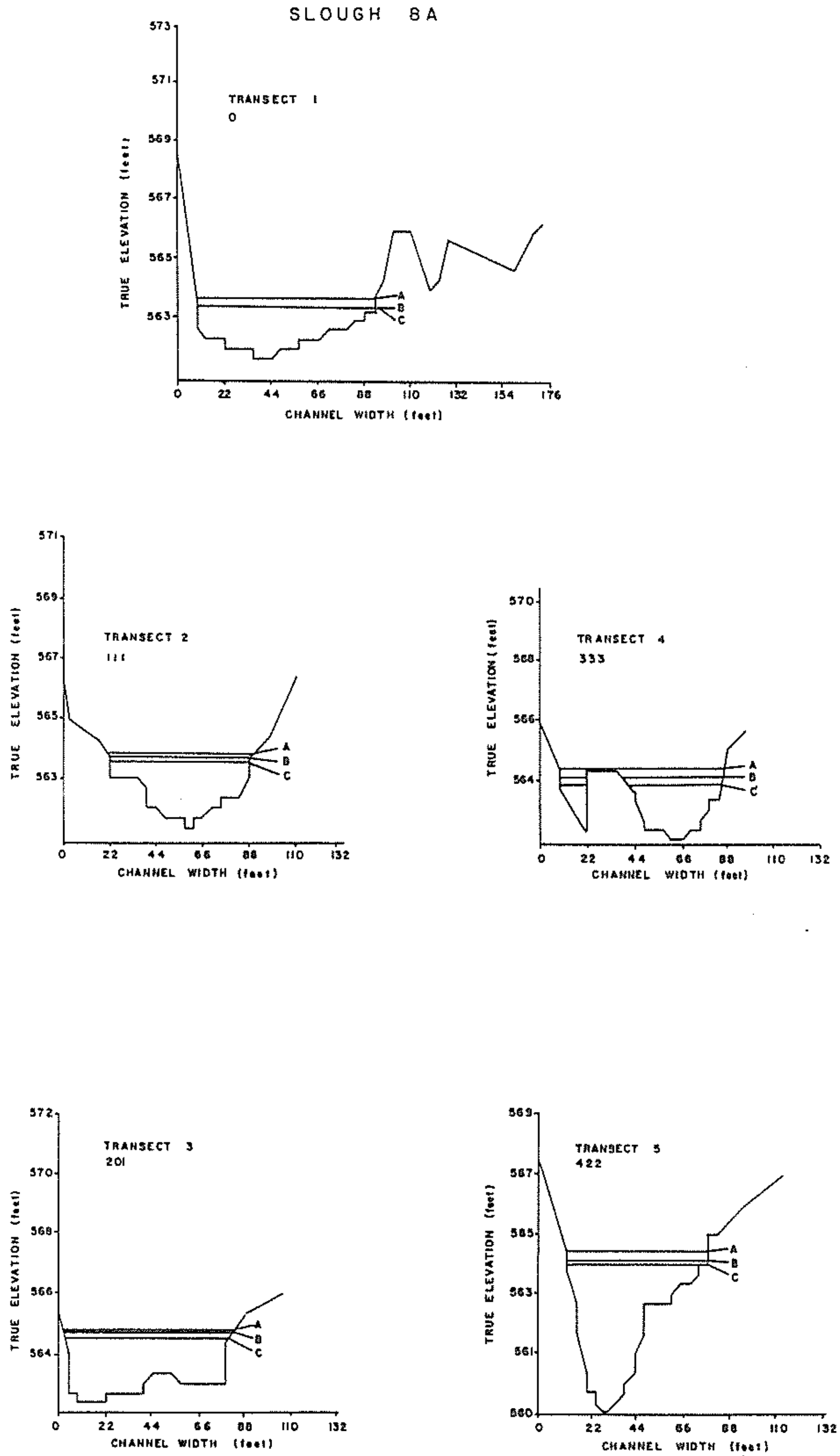



| OBSERVATION | DISCHARGE (cfs) Slough | Mainstem |
|---|---|---|
| A | 158.8 | 32,500 |
| B | 16.5 | 22,500 |
| C | 2.6 | 12,500 |

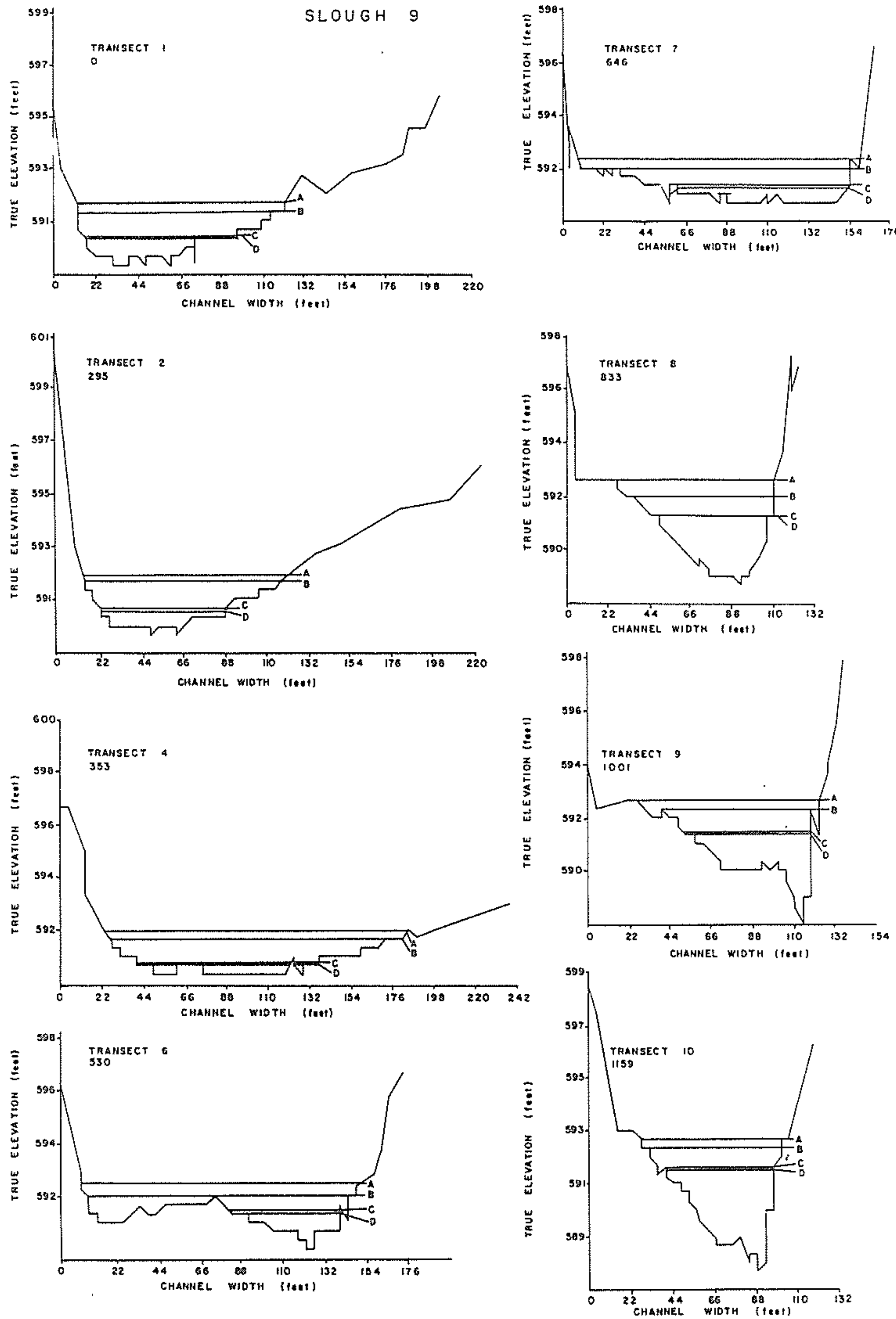
Appendix Figure 4-A-35. Cross sections of the head, mid-slough and mouth of Slough 20 depicting the water surface elevation corresponding to the slough and mainstem discharge.



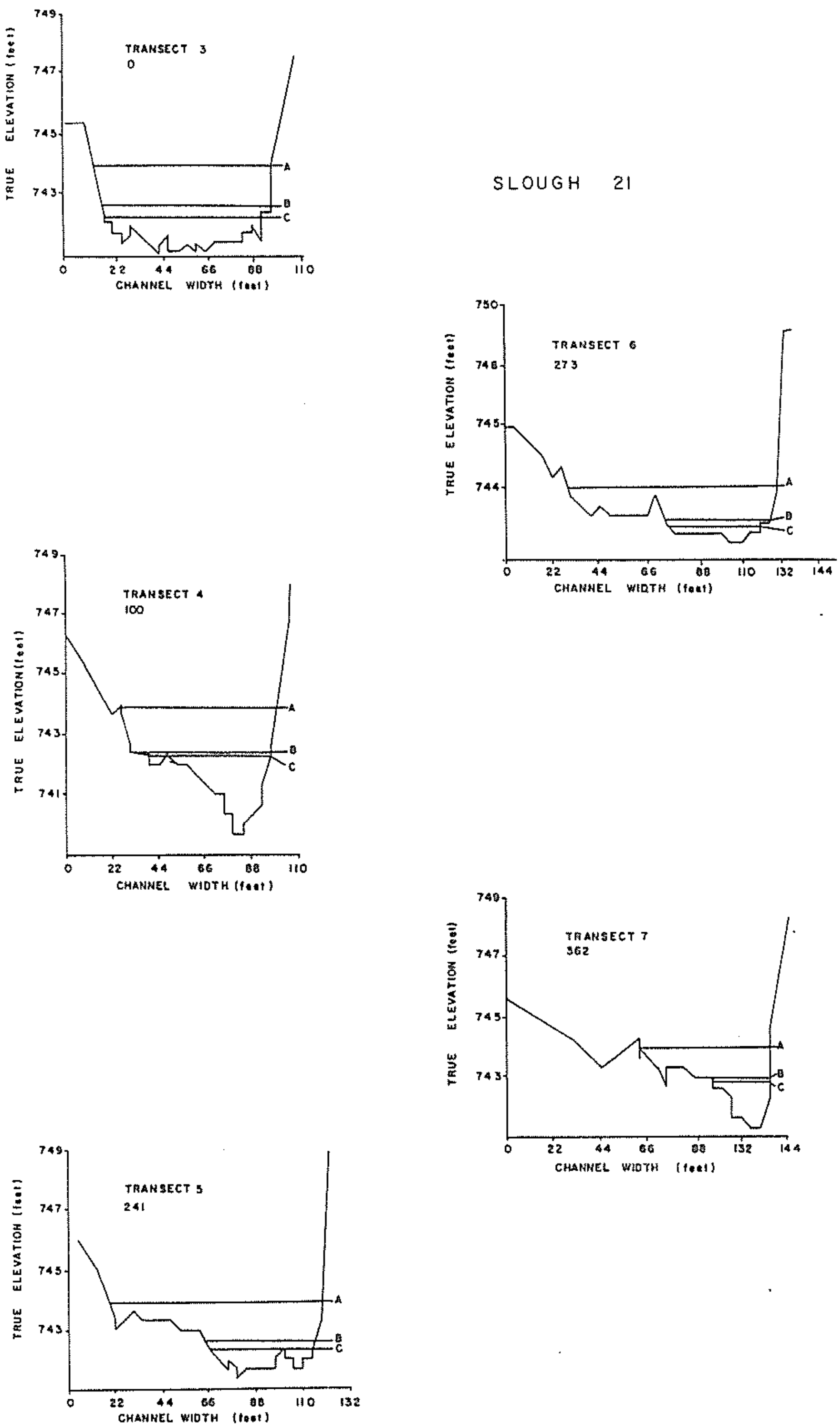

Appendix Figure 4-A-36. Cross sections of the head, mid-slough and mouth of Slough 22 depicting the water surface elevation corresponding to the slough and mainstem discharge.



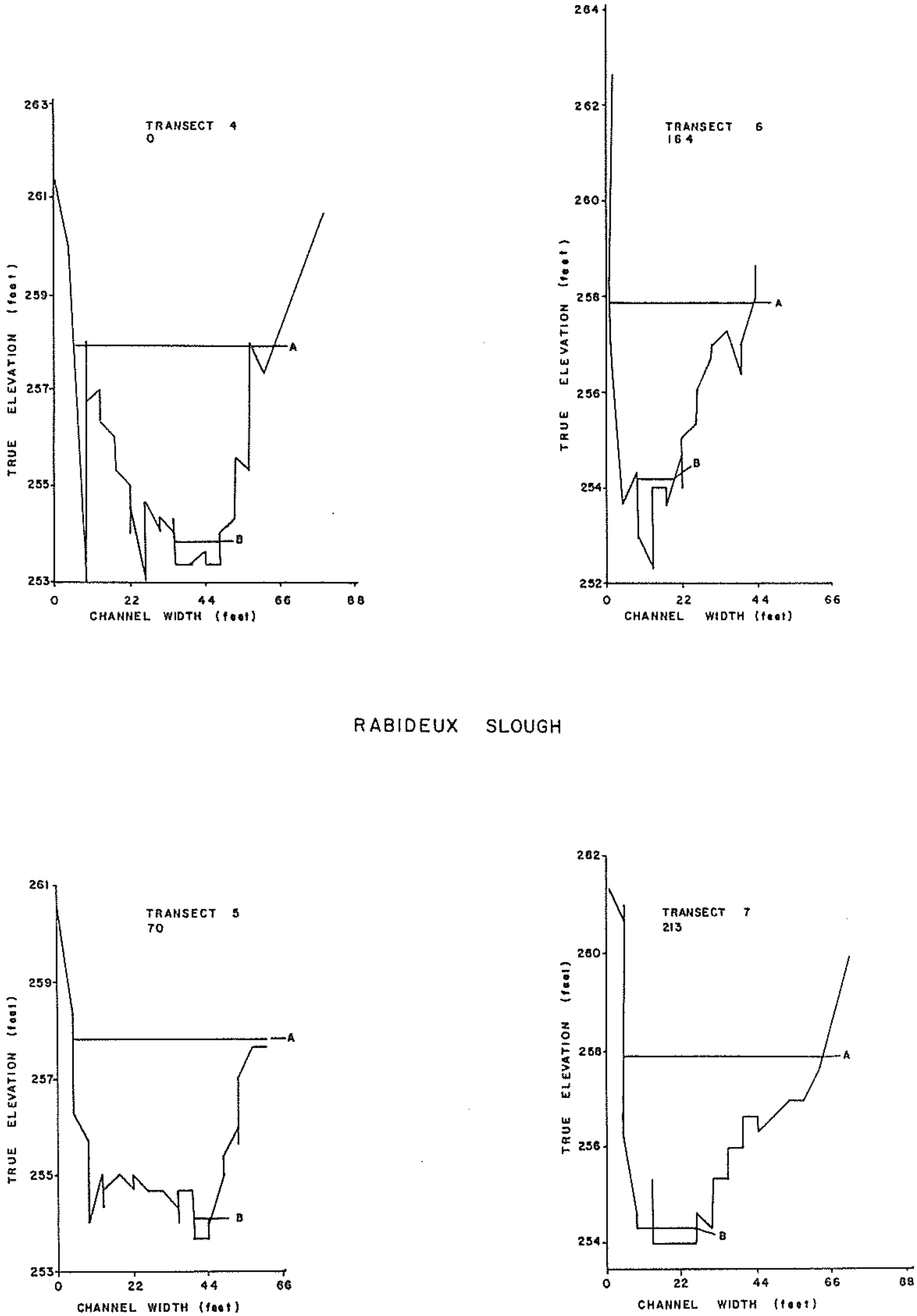

Appendix Figure 4-A-37 Cross sections of Slough 8A at 1982 survey transects at these discharges: A = 4 cfs, B = 7 cfs, C=20 cfs.



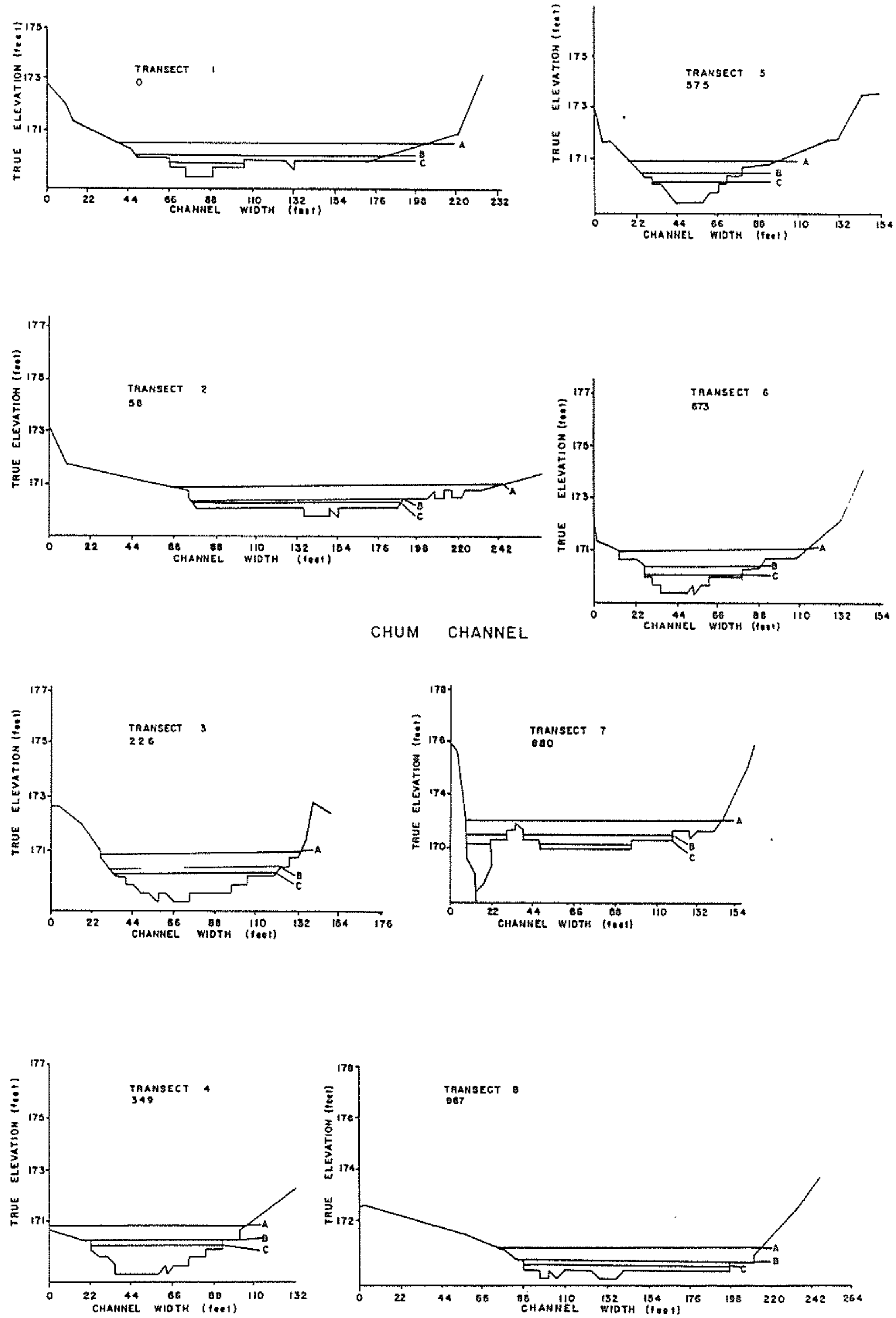

Appendix Figure 4-A-38 Cross sections of Slough 9 at 1982 ADF&G survey transects at four discharges: A = 3cfs, B = 8 cfs, C = 145 cfs, D = cfs.




Appendix Figure 4-A-39 Cross section of Slough 21 at 1982 ADF&G survey transects at three discharges: A = 5cfs, B = 10 cfs, C = 157 cfs.




Appendix Figure 4-A-40 Cross sections of Rabideux Slough at 1982 ADF&G survey transects at two discharges: A = 0.3 cfs, B = 281 cfs.




Appendix Figure 4-A-41 Cross sections of chum channel at 1982 ADF&G survey transects at three discharges: A - 0.4 cfs, B = 7 cfs, C = 90 cfs.

Appendix Table 4-A-1. Discharge measurements obtained during the open water season of 1982 from within the Susitna River basin.

| River Mile[a] | Site | Geographic Code[b] | Date | Time | Gage No. | WSEL | Discharge (cfs) Non Mainstem Instream Flow Evaluation | Discharge (cfs) Mainstem USGS Sunshine |
|---|---|---|---|---|---|---|---|---|
| 73.5 | Lower Goose 2 Slough Above Creek Confluence | S23N04W30BCB | 820830 | 1540 | ---- | ---- | 10.30 | 78,000 |
| | | | 820915 | 1310 | 73.1S4A | 208.95 | 458.00 | 140,000 |
| | | | 821001 | 1200 | 73.1S4A | 207.35 | 1.76 | 31,500 |
| 73.2 | Lower Goose 2 Slough Below Creek Confluence | S23N04W30BCB | 820830 | 1430 | 73.1S1C | 209.30 | 101.00 | 78,000 |
| 73.2 | Lower Goose Creek 2 | S23N04W30BCB | 820830 | 1030 | 73.1T2C | 212.85 | 84.10 | 78,000 |
| | | | 820915 | 1030 | 73.1T2C | 213.76 | 251.00 | 140,000 |
| | | | 821001 | 1015 | 73.1T2C | 213.06 | 137.38 | 31,500 |
| 78.7 | Whitefish Slough Tributary to Slough | S23N05W01BBC | 820915 | 1020 | ---- | ---- | 31.00 | 91,300 |
| 78.7 | Whitefish Slough Mouth | S23N05W01BBC | 820831 | 1930 | 78.7W1B | 238.55 | 22.31 | 48,700 |
| | | | 820916 | 1200 | 78.7W1A | 242.62 | 24.20 | 91,300 |
| | | | 821002 | 1000 | 78.7W1C | 234.99 | 6.58 | 29,700 |
| 83.1 | Rabideux Creek Mouth | S24N05W16ADC | 820913 | 1630 | 83.1W1D | 258.62 | 271.00 | 36,400 |
| | | | 821002 | 1600 | 83.1W1D | 247.73 | 131.00 | 29,700 |
| | Rabideux Creek Free Flowing | S24N05W16ADC | 820831 | 1345 | 83.1T2C | 261.67 | 222.91 | 48,700 |
| | | | 820913 | 1145 | 83.1T2C | 261.49 | 209.50 | 36,400 |
| | | | 821002 | 1400 | 83.1T2C | 261.27 | 129.20 | 29,700 |
| 85.7 | Sunshine Creek | S24N05W14AAB | 820805 | 1810 | 85.7T2C | 266.69 | 47.20 | 50,400 |
| | | | 820901 | 1130 | 85.7T2C | 267.20 | 31.76 | 47,200 |
| | | | 820918 | 1400 | 85.7T2B | 268.88 | 103.88 | 76,500 |
| | | | 821004 | 1040 | 85.7T2C | 266.94 | 68.58 | 25,800 |
| 85.7 | Sunshine Creek Slough | S24N05W14AAB | 820901 | 1330 | 85.7S3E | 265.43 | 85.75 | 47,200 |
| | | | 820918 | 1545 | 85.7S3B | 270.08 | 607.00 | 76,500 |
| | | | 821004 | 1015 | 85.7S3E | 264.55 | 0.25 | 25,800 |

[a]River mile taken from the most downstream portion of study site.

[b]Geographic code taken from the center of the study site

Appendix Table 4-A-1 (Continued).

| River Mile[a] | Site | Geographic Code[b] | Date | Time | Gage No. | WSEL | Discharge (cfs) Non Mainstem: Instream Flow Evaluation | Discharge (cfs) Mainstem: USGS Sunshine |
|---|---|---|---|---|---|---|---|---|
| 89.0 | Birch Creek Slough 100 Yds Below Q Site | S25N05W25DCC | 820805 | 1335 | 88.4S5B | 284.58 | 89.30 | 50,400 |
| | | | 820902 | 1145 | 88.4S5B | 284.42 | 75.40 | 43,700 |
| | | | 820919 | 1145 | 88.4S5B | 285.33 | 131.80 | 69,500 |
| | | | 821003 | 1430 | 88.4S8A | 284.42 | 86.48 | 27,800 |
| 89.1 | Birch Creek Slough Above Creek Confluence | S25N05W25DCC | 820902 | 1445 | 88.4S1C | 284.75 | 15.68 | 43,700 |
| 89.0 | Birch Creek 200 Ft Above Q Site | S25N05W25DCC | 820805 | 1607 | 88.4T2B | 281.10 | 62.38 | 50,400 |
| | | | 820805 | 1615 | 88.4T2B | 281.10 | 64.30 | 50,400 |
| | | | 820902 | 1315 | 88.4T4B | 282.46 | 68.20 | 43,700 |
| | | | 820919 | 1055 | 88.4T4B | 282.81 | 114.10 | 69,500 |
| | | | 821003 | 1245 | 88.4T4B | 282.56 | 76.40 | 27,800 |
| | | | | | | | | Gold Creek |
| 101.4 | Whiskers Creek Slough Q Site | S26N05W03AAC | 820816 | 1700 | 101.2S3C | 365.33 | 0.20 | 15,600 |
| | | | 820903 | 1625 | 101.2S3C | 365.88 | 0.71 | 14,600 |
| | | | 820920 | 1530 | 101.2S3B | 366.22 | 35.12 | 24,000 |
| | | | 821009 | 1145 | 101.2S3C | 365.58 | 1.98 | 8,400 |
| 101.4 | Whiskers Creek Q Site | S26N05W03ACC | 820816 | 1830 | 101.2T1B | 366.36 | 18.30 | 15,600 |
| | | | 820903 | 1830 | 101.2T2B | 366.87 | 54.72 | 14,600 |
| | | | 820920 | 1615 | 101.2T2A | 367.91 | 142.50 | 24,000 |
| | | | 821009 | 1100 | 101.2T2B | 366.51 | 31.78 | 8,440 |
| 111.5 | Gash Creek | S25N05W24ADA | 820818 | 1150 | 111.5T1A | 433.18 | 1.26 | 14,200 |
| | | | 820920 | 1645 | 111.5T1A | 453.72 | 16.60 | 24,000 |
| | | | 821009 | 1515 | 111.5T1A | 453.32 | 5.88 | 8,400 |
| 112.3 | Slough 6A Mouth | S28N05W13CAC | 820921 | 1040 | 112.3W1B | 457.61 | 0.63 | 24,200 |
| 113.6 | Lane Creek | S28N05W12ADD | 820817 | 1424 | 113.6R&M | 475.79 | 27.49 | 15,100 |
| 113.7 | Lane Creek Slough | S28N05W12ADD | 820903 | 1456 | 113.6S2B | 468.30 | 2.05 | 14,600 |
| | | | 820917 | 1517 | 113.6S2A | 470.71 | 20.75 | 32,000 |
| | | | 820920 | 1333 | 113.6S2B | 469.40 | 9.92 | 24,000 |

[a]River mile taken from the most downstream portion of study site.
[b]Geographic code taken from the center of the study site.

Appendix Table 4-A-1 (Continued).

| River Mile[a] | Site | Geographic Code[b] | Date | Time | Discharge (cfs) Non Mainstem: Fishery[c] Habitat Utilization | Discharge (cfs) Mainstem: USGS Gold Creek |
|---|---|---|---|---|---|---|
| 125.2 | Slough 8A | S30N03W30BCC | 820827 | | | 12,900 |
| | Transect 1 | | | 1130 | 03.21 | |
| | Transect 2 | | | 1200 | 04.57 | |
| | Transect 3 | | | 1225 | 04.03 | |
| | Transect 4 | | | 1255 | 04.95 | |
| | Transect 5 | | | 1400 | 11.92 | |
| | Transect 6 | | | 1500 | 03.62 | |
| | Transect 7 | | | 1530 | 04.52 | |
| | Transect 8 | | | 1600 | 02.09 | |
| | Transect 9 | | | 1620 | 02.79 | |
| | Transect 10 | | | 1640 | 03.03 | |
| | Transect 11 | | | 1705 | 02.49 | |
| | Transect A | | 820826 | 1720 | 09.81 | 13,600 |
| | Transect B | | | 1636 | 0.55 | |
| | Transect C | | | 1620 | 01.68 | |
| | Transect 1 | | 820907 | 1630 | 08.52 | 11,700 |
| | Transect 2 | | | 1605 | 09.23 | |
| | Transect 3 | | | 1545 | 07.93 | |
| | Transect 4 | | | 1530 | 06.78 | |
| | Transect 5 | | | 1456 | 11.42 | |
| | Transect 6 | | | 1433 | 06.15 | |
| | Transect 7 | | | 1405 | 06.81 | |
| | Transect 8 | | | 1340 | 05.49 | |
| | Transect 9 | | | 1314 | 05.98 | |
| | Transect 10 | | | 1153 | 06.07 | |
| | Transect 11 | | | 1127 | 06.58 | |
| | Transect A | | | 1830 | 04.18 | |
| | Transect B | | | 1723 | 04.98 | |
| | Transect C | | | 1713 | 02.55 | |
| | Transect 1 | | 820919 | 1152 | 20.05 | 24,100 |
| | Transect 2 | | | 1224 | 20.05 | |
| | Transect 3 | | | 1250 | 21.97 | |
| | Transect 4 | | | 1315 | 20.35 | |
| | Transect 5 | | | 1450 | 20.61 | |
| | Transect 6 | | | 1352 | 25.39 | |
| | Transect 7 | | | 1409 | 20.19 | |

[a] River mile taken from the most downstream portion of study site.

[b] Geographic code taken from the center of the study site.

[c] No stage measurements were obtained.

Appendix Table 4-A-1 (Continued).

| River Mile[a] | Site | Geographic Code[b] | Date | Time | Discharge (cfs) Non Mainstem: Fishery[c] Habitat Utilization | Discharge (cfs) Mainstem: USGS Gold Creek |
|---|---|---|---|---|---|---|
| 125.2 | Slough 8A - Cont'd | S30N03W30BCC | 820919 | | | 24,100 |
| | Transect 8 | | | 1430 | 20.16 | |
| | Transect 9 | | | 1535 | 19.13 | |
| | Transect 10 | | | 1458 | 19.11 | |
| | Transect 11 | | | 1601 | 19.19 | |
| | | | | | 18.91 | |
| 129.2 | Slough 9 | S30N03W16BDC | | | | |
| | Transect 1 | | 820812 | 1000 | 07.68 | 13,200 |
| | Transect 2 | | | 1245 | 06.25 | |
| | Transect 3 | | | 1430 | 07.69 | |
| | Transect 4 | | | 1645 | 06.18 | |
| | Transect 5 | | | 1845 | 04.77 | |
| | Transect 6 | | | 1905 | 04.66 | |
| | Transect 7 | | | 1930 | 02.96 | |
| | Transect 8 | | | 2000 | 00.00 | |
| | Transect 9 | | | 2030 | 00.00 | |
| | Transect 10 | | | 2200 | 00.00 | |
| | Transect 1 | | 820825 | 1144 | 04.03 | 13,400 |
| | Transect 2 | | | 1219 | 03.19 | |
| | Transect 3 | | | ---- | --- | |
| | Transect 4 | | | 1247 | 02.59 | |
| | Transect 5 | | | ---- | --- | |
| | Transect 6 | | | 1316 | 03.01 | |
| | Transect 7 | | | 1340 | 02.61 | |
| | Transect 8 | | | 1415 | 02.74 | |
| | Transect 9 | | | 1438 | 03.42 | |
| | Transect 10 | | | 1508 | 05.71 | |
| | Transect A | | | 1829 | 07.83 | |
| | Transect B | | | 2000 | 10.63 | |
| | Transect C | | | 1914 | 08.04 | |
| | Transect D | | | 1938 | 04.35 | |
| | Transect 1 | | 820904 | 1219 | 09.44 | 14,400 |
| | Transect 2 | | | 1245 | 07.51 | |
| | Transect 3 | | | ---- | --- | |
| | Transect 4 | | | 1316 | 06.87 | |
| | Transect 5 | | | ---- | --- | |

[a]River mile taken from the most downstream portion of study site.
[b]Geographic code taken from the center of the study site.
[c]No stage measurements were obtained.

Appendix Table 4-A-1 (Continued).

| River Mile[a] | Site | Geographic Code[b] | Date | Time | Discharge (cfs) Non Mainstem: Fishery[c] Habitat Utilization | Discharge (cfs) Mainstem: USGS Gold Creek |
|---|---|---|---|---|---|---|
| 129.2 | Slough 9 - Cont'd | S30N03W16BDC | 820904 | | | 14,400 |
| | Transect 6 | | | 1433 | 08.43 | |
| | Transect 7 | | | 1452 | 07.57 | |
| | Transect 8 | | | 1518 | 08.47 | |
| | Transect 9 | | | 1543 | 08.73 | |
| | Transect 10 | | | 1605 | 10.34 | |
| | Transect A | | | 1010 | 18.38 | |
| | Transect B | | | 1041 | 17.36 | |
| | Transect C | | | 1105 | 17.30 | |
| | Transect D | | | 1134 | 09.58 | |
| | Transect 1 | | 820918 | 1550 | 198.30 | 27,500 |
| | Transect 2 | | | 1510 | 219.90 | |
| | Transect 3 | | | ---- | --- | |
| | Transect 4 | | | 1430 | 223.40 | |
| | Transect 5 | | | ---- | --- | |
| | Transect 6 | | | 1340 | 236.30 | |
| | Transect 7 | | | 1305 | 206.90 | |
| | Transect 8 | | | 1146 | 243.50 | |
| | Transect 9 | | | 1045 | 249.20 | |
| | Transect 10 | | | 0945 | 282.00 | |
| | Transect 1 | | 820920 | 1722 | 141.40 | 24,000 |
| | Transect 2 | | | 1705 | 125.00 | |
| | Transect 3 | | | ---- | --- | |
| | Transect 4 | | | 1633 | 136.70 | |
| | Transect 5 | | | ---- | --- | |
| | Transect 6 | | | 1557 | 146.10 | |
| | Transect 7 | | | 1536 | 160.92 | |
| | Transect 8 | | | 1450 | 177.40 | |
| | Transect 9 | | | 1359 | 141.10 | |
| | Transect 10 | | | 1255 | 133.10 | |

[a]River mile taken from the most downstream portion of study site.

[b]Geographic code taken from the center of the study site.

[c]No stage measurements were obtained.

Appendix Table 4-A-1 (Continued).

| River Mile[a] | Site | Geographic Code[b] | Date | Time | Gage No. | WSEL | Discharge (cfs) Non Mainstem: Instream Flow Evaluation | Discharge (cfs) Mainstem: USGS Gold Creek |
|---|---|---|---|---|---|---|---|---|
| 131.1 | 4th of July Creek | S30N03W03DAC | 820803 | 1200 | 131.1T1A | 625.35 | 38.33 | 19,800 |
| 135.3 | Slough 11 Above Mouth | S31N02W30ABB | 820830 | 1710 | ------ | ---- | 5.44 | 13,100 |
| 135.7 | Slough 11 Q Site | S31N02W30ABB | 820830 | 1425 | ------ | 670.72 | 3.06 | 13,100 |
| | | | 820918 | 1010 | 135.3S6A | 670.80 | 5.52 | 27,500 |
| 135.8 | Slough 11 Above Q Site | S31N02W30ABB | 820830 | 1244 | 135.3S5A | 675.42 | 1.30 | 13,100 |
| 138.0 | Slough 16B Below Q Site | S31N02W17ABD | 820902 | 1212 | ------ | ---- | 0.96 | 16,000 |
| | | | 820914 | 1718 | ------ | ---- | 0.41 | 20,200 |
| 138.0 | Slough 16B Q Site | S31N02W17ABD | 820801 | 1551 | 138.0S5B | 700.85 | 54.80 | 26,400 |
| | | | 820915 | 1412 | 138.0S5A | 701.70 | 257.64 | 28,200 |
| | | | 820919 | ---- | 138.0S5B | 700.58 | 23.50 | 24,100 |
| 140.0 | Slough 19 | S31N02W10DBD | 820819 | 1700 | 140.0W1B | 718.79 | 0.18 | 13,300 |
| | | | 820819 | 1730 | 140.0W1B | 718.79 | 0.40 | 13,300 |
| 140.2 | Slough 20 | S31N02W10ADB | 820820 | 1643 | 140.1S5B | 726.76 | 2.60 | 12,500 |
| | | | 820901 | 1545 | 140.1S5B | 726.88 | 11.57 | 17,900 |
| | | | 820916 | 1415 | 140.1S5B | 728.06 | 158.80 | 32,500 |
| | | | 820918 | 1825 | 140.1S5B | 727.27 | 44.82 | 27,500 |
| | | | 820802 | 1220 | 140.1S5B | 726.99 | 16.45 | 22,500 |
| 140.6 | Slough 20 Tributary at Head | S31N02W10ADB | 820901 | 1545 | 140.1T3B | 730.22 | 0.17 | 17,900 |
| | | | 820916 | 1232 | 140.1T3B | 731.40 | 23.45 | 32,500 |
| | | | 820918 | 1717 | 140.1T3B | 730.74 | 9.28 | 27,500 |

[a]River mile taken from the most downstream portion of study site.
[b]Geographic code taken from the center of the study site.

Appendix Table 4-A-1 (Continued).

| River Mile[a] | Site | Geographic Code[b] | Date | Time | Discharge (cfs) Non Mainstem: Fishery[c] Habitat Utilization | Discharge (cfs) Mainstem: USGS Gold Creek |
|---|---|---|---|---|---|---|
| 141.8 | Slough 21 | S31N11W02AAA | 820902 | | | 16,000 |
| | Transect 1 | | | 1818 | 6.34 | |
| | Transect 2 | | | 1750 | 6.49 | |
| | Transect 3 | | | 1720 | 6.14 | |
| | Transect 4 | | | 1705 | 5.57 | |
| | Transect 5 | | | 1650 | 4.86 | |
| | Transect 6 | | | 1635 | 4.39 | |
| | Transect 7 | | | 1622 | 4.74 | |
| | Transect 8 | | | 1540 | 7.78 | |
| | Transect 1 | | 820917 | 1140 | 538.00 | 32,000 |
| | Transect 2 | | | 1510 | 513.51 | |
| | Transect 3 | | | 1712 | 170.15 | |
| | Transect 4 | | | 1800 | 161.93 | |
| | Transect 5 | | | 1836 | 154.54 | |
| | Transect 6 | | | 1900 | 152.36 | |
| | Transect 7 | | | 1925 | 145.07 | |
| | Transect 8 | | | ---- | ---- | |
| | Transect 1 | | 820919 | 1100 | 10.50 | 24,100 |
| | Transect 2 | | | 1140 | 10.69 | |
| | Transect 3 | | | 1100 | 10.53 | |
| | Transect 4 | | | 1136 | 9.31 | |
| | Transect 5 | | | 1215 | 9.27 | |
| | Transect 6 | | | 1240 | 11.19 | |
| | Transect 7 | | | 1235 | 19.23 | |
| | Transect 8 | | | 1300 | 0.19 | |

[a]River mile taken from the most downstream portion of study site.
[b]Geographic code taken from the center of the study site.
[c]No stage measurements were obtained.

Appendix Table 4-A-1 (Continued).

| | | | | | | | Discharge (cfs) Non Mainstem | Discharge (cfs) Mainstem |
|---|---|---|---|---|---|---|---|---|
| River Mile[a] | Site | Geographic Code[b] | Date | Time | Gage No. | WSEL | Instream Flow Evaluation | USGS Gold Creek |
| 141.9 | Slough 21 Q Site | S31N02W02AAA | 820802 | 1400 | 142.0S6B | 744.93 | 5.03 | 22,500 |
| | | | 820831 | 1518 | 142.0S6B | 744.90 | 3.25 | 16,000 |
| | | | 820916 | 1024 | 142.0S6B | 746.52 | 59.24 | 32,500 |
| 144.4 | Slough 22 ADF&G Q Site | S32N01W32BBC | 820802 | 1600 | 144.3S5B | 783.52 | 2.47 | 22,500 |
| | | | 820831 | 1141 | 144.3S5B | 783.60 | 1.64 | 16,000 |
| 144.4 | Slough 22 | S32N01W32BBC | 820915 | 1642 | 144.3S6B | 785.09 | 118.52 | 28,200 |
| | | | 820918 | 1425 | 144.3S6B | 784.28 | 31.22 | 27,500 |
| | | | 820919 | 1124 | 144.3S6B | 784.42 | 5.11 | 24,100 |

[a]River mile taken from the most downstream portion of study site.

[b]Geographic code taken from the center of the study site.

Appendix Table 4-A-1 (Continued).

| River Mile[a] | Site | Geographic Code[b] | Date | Discharge (cfs) Non Mainstem: Impoundment[c] | Discharge (cfs) Mainstem: USGS V Canyon |
|---|---|---|---|---|---|
| 176.7 | Fog Creek | S31N04E16DBB | 820815 | 269 | 11,800 |
| | | | 820912 | 307 | 7,830 |
| 181.3 | Tsusena Creek | S32N04E36ADB | 820816 | 330 | 12,200 |
| | | | 820912 | 363 | 7,830 |
| 186.7 | Deadman Creek | S32N05E26CDB | 820821 | 228 | 9,220 |
| 194.1 | Wotana Creek | S32N06E25CCA | 820815 | 229 | 11,800 |
| | | | 820919 | 557 | 12,400 |
| 208.5 | Jay Creek | S31N05E13BCC | 820812 | 61 | 9,990 |
| | | | 820919 | 154 | 12,400 |
| 231.3 | Goose Creek | S30N11E32DBC | 820819 | 79 | 9,580 |
| | | | 820916 | 150 | 18,800 |

[a]River mile taken from the most downstream portion of study site.
[b]Geographic code taken from the center of the study site.
[c]No stage measurements were obtained.

Appendix Table 4-A-2 Comparison of mainstem water surface elevations to mean daily mainstem discharge (CFS), obtained at the USGS gaging station at Gold Creek.

| Location | Date | Time | WSEL (ft) | Discharge (CFS) |
|---|---|---|---|---|
| Left Bank at LRX-6 (R.M. 101.0) | 821009 | 1245 | 360.36 | 8,400 |
| | 820909 | 1700 | 361.40 | 13,400 |
| | 820904 | 1330 | 362.13 | 14,400 |
| | 820920 | 1500 | 363.72 | 24,000 |
| Mainstem at Whiskers Creek Slough (R.M. 101.2) | 821012 | 1633 | 362.73 | 7,950 |
| | 821009 | 1030 | 362.89 | 8,440 |
| | 821007 | 1415 | 362.96 | 8,640 |
| | 820822 | 1630 | 363.44 | 12,200 |
| | 820823 | 1124 | 363.47 | 12,300 |
| | 820924 | 1720 | 363.65 | 12,900 |
| | 820909 | 1250 | 363.64 | 13,400 |
| | 820813 | 1420 | 363.70 | 13,600 |
| | 810927 | 1825 | 363.83 | 13,800 |
| | 820903 | 1545 | 363.97 | 14,600 |
| | 820831 | ---- | 364.07 | 16,000 |
| | 820807 | 1347 | 364.13 | 16,500 |
| | 820808 | 1950 | 364.22 | 16,600 |
| | 820920 | 1450 | 365.39 | 24,000 |
| | 820715 | 1110 | 365.38 | 25,600 |
| Talkeetna Fish Wheel Camp (R.M. 103.0) | 821012 | 1150 | 374.90 | 6,900 |
| | 821011 | 1325 | 374.97 | 6,900 |
| | 821010 | 1310 | 375.06 | 7,050 |
| | 821009 | 1350 | 375.04 | 7,080 |
| | 821008 | 1300 | 375.07 | 7,170 |
| | 821006 | 1305 | 375.26 | 7,500 |
| | 820908 | 1535 | 375.99 | 11,900 |
| | 820822 | 1000 | 375.98 | 12,200 |
| | 820821 | 1415 | 376.05 | 12,200 |
| | 820829 | 1000 | 376.00 | 12,200 |
| | 820823 | 1000 | 376.02 | 12,300 |
| | 820828 | 1725 | 376.10 | 12,400 |
| | 820929 | 1345 | 376.12 | 12,400 |
| | 820930 | 0830 | 376.09 | 12,500 |
| | 820820 | 1100 | 376.12 | 12,500 |
| | 820928 | 1410 | 376.27 | 12,900 |
| | 820827 | 1715 | 376.24 | 12,900 |
| | 820912 | 1420 | 376.33 | 13,200 |
| | 820909 | 1440 | 376.32 | 13,400 |
| | 820911 | 1530 | 376.39 | 13,600 |
| | 820905 | 2030 | 376.43 | 13,600 |
| | 820814 | 1505 | 376.39 | 13,600 |
| | 820927 | 1610 | 376.47 | 13,800 |

---- Data not available.

Appendix Table 4-A-2 (Continued).

| Location | Date | Time | WSEL (ft) | Discharge (CFS) |
|---|---|---|---|---|
| Talkeetna Fish Wheel Camp - Cont'd (R.M. 103.0) | 820910 | 1440 | 376.60 | 14,400 |
| | 820812 | 2000 | 376.61 | 14,400 |
| | 820815 | 1300 | 376.58 | 14,800 |
| | 820925 | 1410 | 376.76 | 15,000 |
| | 820913 | 1520 | 376.72 | 15,200 |
| | 820816 | 0930 | 376.80 | 15,600 |
| | 820707 | 1715 | 376.86 | 16,600 |
| | 820924 | 1530 | 377.13 | 17,100 |
| | 820923 | 1800 | 377.53 | 19,400 |
| | 820914 | 1510 | 377.75 | 20,200 |
| | 820721 | 2400 | 377.92 | 21,900 |
| | 820922 | 1255 | 378.20 | 22,300 |
| | 820802 | 1425 | 378.21 | 22,500 |
| | 820729 | 1630 | 378.31 | 23,600 |
| | 820920 | 1610 | 378.51 | 24,000 |
| | 820921 | 1340 | 378.41 | 24,200 |
| | 820719 | 0715 | 378.42 | 24,900 |
| | 820718 | 2300 | 378.43 | 25,400 |
| | 820716 | 1300 | 378.42 | 25,600 |
| | 820623 | 2130 | 378.67 | 26,000[a] |
| | 820801 | 1645 | 378.76 | 26,400 |
| | 820730 | 1320 | 378.90 | 26,400 |
| | 820724 | 1345 | 378.87 | 26,800 |
| | 820625 | 2200 | 378.99 | 27,000[a] |
| | 820714 | 0745 | 378.81 | 27,300 |
| | 820918 | 1217 | 379.02 | 27,500 |
| | 820626 | 1535 | 379.24 | 28,000[a] |
| | 820731 | 1100 | 379.24 | 28,400 |
| | 820727 | 1535 | 379.24 | 29,100 |
| | 820628 | 1600 | 379.40 | 30,000[a] |
| | 820726 | 1430 | 379.88 | 31,800 |
| | 820725 | 1255 | 379.95 | 31,900 |
| | 820916 | 1445 | 380.01 | 32,500 |
| Right Bank at LRX-9 (R.M. 103.2) | 821012 | 1631 | 377.42 | 7,950 |
| | 821010 | 1000 | 377.70 | 8,480 |
| | 820909 | 1700 | 379.10 | 13,400 |
| | 820903 | 1630 | 379.49 | 14,600 |
| | 820831 | ---- | 379.60 | 16,000 |
| Side Channel at Gash Creek (R.M. 111.5) | 821009 | 1500 | 448.54 | 8,440 |
| | 821004 | 1505 | 448.79 | 10,500 |
| | 820818 | 1328 | 449.09 | 14,200 |
| | 820920 | 1710 | 449.92 | 24,000 |
| | 820921 | 1240 | 449.75 | 24,200 |

Data not available.

[a]Gold Creek stream gage malfunctioned, USGS estimated value. Not used in plotting stage-discharge curve.

Appendix Table 4-A-2 (Continued).

| Location | Date | Time | WSEL (ft) | Discharge (CFS) |
|---|---|---|---|---|
| Head Gash Creek Side Channel (R.M. 112.1) | 821012 | 1625 | 453.34 | 7,950 |
| | 821004 | 1737 | 453.82 | 10,500 |
| | 820920 | 1539 | 455.59 | 24,000 |
| Mainstem at Slough 6A (R.M. 112.3) | 821006 | 1600 | 455.04 | 8,960 |
| | 820807 | 1205 | 456.43 | 16,500 |
| | 820722 | 1515 | 457.11 | 22,400 |
| | 820729 | 1445 | 457.29 | 23,600 |
| | 820921 | 1000 | 457.41 | 24,200 |
| | 820723 | 1100 | 457.27 | 24,900 |
| | 820917 | 1720 | 458.22 | 32,000 |
| Right Bank at LRX-18 (R.M. 113.0) | 821012 | 1623 | 459.92 | 7,950 |
| | 821008 | 1500 | 460.14 | 8,480 |
| | 821004 | 1325 | 460.65 | 10,500 |
| | 820909 | 1645 | 461.36 | 13,400 |
| | 820903 | 1600 | 461.64 | 14,600 |
| | 820831 | ---- | 461.66 | 16,000 |
| | 820920 | 1518 | 462.89 | 24,000 |
| Curry Fish Wheel Camp (R.M. 120.6) | 821004 | 1144 | 521.11 | 10,500 |
| | 820907 | 1930 | 521.49 | 11,700 |
| | 820908 | 2030 | 521.46 | 11,900 |
| | 820906 | 2030 | 521.49 | 12,200 |
| | 820829 | 2030 | 521.56 | 12,200 |
| | 820821 | 1000 | 521.52 | 12,200 |
| | 820828 | 2030 | 521.60 | 12,400 |
| | 820820 | 1800 | 521.63 | 12,500 |
| | 820827 | 2000 | 521.62 | 12,900 |
| | 820912 | 2000 | 521.68 | 13,200 |
| | 820911 | 2000 | 521.87 | 13,600 |
| | 820905 | 2030 | 521.76 | 13,600 |
| | 820910 | 2000 | 521.95 | 14,400 |
| | 820812 | 2000 | 521.96 | 14,400 |
| | 820903 | 2030 | 522.03 | 14,600 |
| | 820815 | 1230 | 522.03 | 14,800 |
| | 820811 | 1800 | 522.09 | 15,400 |
| | 820816 | 1830 | 522.13 | 15,600 |
| | 820902 | 2030 | 522.13 | 16,000 |
| | 820707 | 1030 | 522.25 | 16,600 |
| | 820810 | 1800 | 522.27 | 16,700 |
| | 820706 | 1000 | 522.32 | 17,100 |
| | 820705 | 1000 | 522.35 | 17,400 |
| | 820704 | 1200 | 522.48 | 18,000 |
| | 820708 | 1100 | 522.37 | 18,100 |
| | 820703 | 1130 | 522.70 | 19,600 |

---- Data not available.

Appendix Table 4-A-2 (Continued).

| Location | Date | Time | WSEL (ft) | Discharge (CFS) |
|---|---|---|---|---|
| Curry Fish Wheel Camp - Cont'd (R.M. 120.6) | 820803 | 1900 | 522.65 | 19,800 |
| | 820914 | 2000 | 522.85 | 20,200 |
| | 820709 | 1000 | 522.73 | 21,500 |
| | 820721 | 1930 | 522.89 | 21,900 |
| | 820722 | 2130 | 522.01 | 22,400 |
| | 820702 | 1200 | 523.14 | 22,800 |
| | 820710 | 1800 | 523.11 | 23,000 |
| | 820729 | 1500 | 523.31 | 23,600 |
| | 820711 | ---- | 523.13 | 24,000 |
| | 820920 | 1239 | 523.40 | 24,000 |
| | 820719 | 2000 | 523.23 | 24,900 |
| | 820701 | 1130 | 523.34 | 25,000 |
| | 820717 | 1800 | 523.43 | 25,300 |
| | 820718 | 1830 | 523.54 | 25,400 |
| | 820728 | 1530 | 523.53 | 25,600 |
| | 820716 | 2000 | 523.39 | 25,600 |
| | 820715 | 0900 | 523.66 | 25,600 |
| | 820624 | 1500 | 523.64 | 26,000[a] |
| | 820623 | 1030 | 523.63 | 26,000[a] |
| | 820801 | 2100 | 523.42 | 26,400 |
| | 820712 | 1600 | 523.57 | 26,500 |
| | 820724 | 2200 | 523.59 | 26,800 |
| | 820625 | 1300 | 523.77 | 27,000[a] |
| | 820630 | 1100 | 523.57 | 27,000[a] |
| | 820714 | 1500 | 523.72 | 27,300 |
| | 820626 | 1030 | 523.98 | 28,000[a] |
| | 820731 | 1100 | 524.00 | 28,400 |
| | 820627 | 1200 | 523.94 | 29,000[a] |
| | 820629 | 1100 | 524.05 | 29,000[a] |
| | 820727 | 1800 | 524.14 | 29,100 |
| | 820628 | 2230 | 524.19 | 30,000[a] |
| | 820726 | 1300 | 524.46 | 31,800 |
| | 820725 | 1800 | 524.49 | 31,900 |
| | 820916 | 2000 | 524.56 | 32,500 |
| Right Bank at LRX-24 (R.M. 120.7) | 821012 | 1617 | 520.88 | 7,950 |
| | 821008 | 1300 | 521.04 | 8,480 |
| | 821004 | 1139 | 521.60 | 10,500 |
| | 820907 | 1000 | 521.70 | 11,700 |
| | 820908 | 0930 | 521.72 | 11,900 |
| | 820829 | 1500 | 521.82 | 12,200 |
| | 820906 | 1800 | 521.82 | 12,200 |
| | 820930 | 1652 | 522.06 | 12,500 |
| | 820830 | 1330 | 522.01 | 13,100 |
| | 820912 | 1030 | 522.06 | 13,200 |

---- Data not available.

Appendix Table 4-A-2 (Continued).

| Location | Date | Time | WSEL (ft) | Discharge (CFS) |
|---|---|---|---|---|
| Right Bank at LRX-24 - Cont'd (R.M. 120.7) | 820909 | 1645 | 522.08 | 13,400 |
| | 820911 | 1030 | 522.12 | 13,600 |
| | 820910 | 0945 | 522.22 | 14,400 |
| | 820903 | 1350 | 522.35 | 14,600 |
| | 820913 | 1220 | 522.49 | 15,200 |
| | 820831 | 1230 | 522.58 | 16,000 |
| | 820914 | 1600 | 523.18 | 18,200 |
| | 820919 | 1226 | 524.05 | 24,100 |
| Right Bank at LRX-28 (R.M. 124.4) | 821008 | 1000 | 552.39 | 8,480 |
| | 821004 | 1129 | 553.14 | 10,500 |
| | 820930 | 1352 | 553.80 | 12,500 |
| | 820909 | 1645 | 554.17 | 13,400 |
| | 820903 | 1233 | 554.47 | 14,600 |
| | 820902 | 1836 | 554.61 | 16,000 |
| | 820919 | 1201 | 556.77 | 24,100 |
| Right Bank at LRX-29 (R.M. 126.1) | 821012 | 1608 | 568.41 | 7,950 |
| | 821004 | 1123 | 569.51 | 10,500 |
| | 821001 | 1100 | 570.02 | 12,400 |
| | 820909 | 1640 | 570.41 | 13,400 |
| | 820831 | ---- | 570.91 | 16,000 |
| | 820920 | 1131 | 572.18 | 24,000 |
| Right Bank at LRX-31 (R.M. 128.7) | 821012 | 1605 | 595.05 | 7,950 |
| | 821004 | 1117 | 595.95 | 10,500 |
| | 821001 | 1259 | 596.39 | 12,400 |
| | 820909 | 1640 | 596.92 | 14,400 |
| | 820903 | 1220 | 597.15 | 14,600 |
| | 820902 | 1619 | 597.29 | 16,000 |
| | 820831 | ---- | 597.22 | 16,000 |
| | 820919 | 1103 | 598.38 | 24,100 |
| Right Bank at LRX-35 (R.M. 130.9) | 821012 | 1603 | 615.95 | 7,950 |
| | 821004 | 1107 | 617.14 | 10,500 |
| | 821001 | 1406 | 617.58 | 12,400 |
| | 820909 | 1630 | 618.05 | 13,400 |
| | 820903 | 1210 | 618.28 | 14,600 |
| | 820902 | 1518 | 618.47 | 16,000 |
| | 820831 | ---- | 618.55 | 16,000 |
| | 820919 | 1040 | 619.86 | 24,100 |
| | 820915 | 1047 | 620.66 | 28,200 |
| | 820917 | 1016 | 621.08 | 32,000 |
| Mainstem at 4th of July Creek (R.M. 131.1) | 821012 | 1603 | 615.17 | 7,950 |
| | 820907 | 1750 | 615.64 | 11,700 |

---- Data not available.

4-A-56

Appendix Table 4-A-2 (Continued).

| Location | Date | Time | WSEL (ft) | Discharge (CFS) |
|---|---|---|---|---|
| Mainstem at 4th of July Creek - Cont'd (R.M. 131.1) | 820822 | 1340 | 615.63 | 12,200 |
| | 820813 | 1235 | 615.69 | 13,600 |
| | 820818 | 1735 | 615.74 | 14,200 |
| | 820902 | 1705 | 616.01 | 16,000 |
| | 820915 | 1100 | 618.19 | 28,200 |
| | 820917 | 1104 | 618.72 | 32,000 |
| Left Bank at LRX-40 (R.M. 134.3) | 821012 | 1601 | 655.44 | 7,950 |
| | 821004 | 1059 | 655.83 | 10,500 |
| | 821001 | 1631 | 655.99 | 12,400 |
| | 820909 | 1430 | 656.24 | 13,400 |
| | 820902 | 1452 | 656.47 | 16,000 |
| | 820831 | ---- | 656.49 | 16,000 |
| | 820914 | 1815 | 657.12 | 20,200 |
| | 820919 | 1006 | 657.60 | 24,100 |
| | 820915 | 1119 | 658.37 | 28,200 |
| | 820917 | 1005 | 658.67 | 32,000 |
| Side Channel below mouth of Slough 11 (R.M. 135.3) | 821012 | 1555 | 665.56 | 7,950 |
| | 821002 | 1040 | 666.68 | 11,700 |
| | 820906 | 1600 | 666.86 | 12,200 |
| | 820929 | 1830 | 666.81 | 12,400 |
| | 820830 | 1740 | 667.46 | 13,100 |
| | 820909 | 1420 | 667.36 | 13,400 |
| | 820831 | ---- | 668.16 | 16,000 |
| Side Channel above mouth of Slough 11 (R.M. 135.3) | 821012 | 1555 | 667.50 | 7,950 |
| | 820907 | 1820 | 668.10 | 11,700 |
| | 820822 | 1535 | 667.92 | 12,200 |
| | 820830 | 1735 | 668.62 | 13,100 |
| | 820909 | 1420 | 668.55 | 13,400 |
| | 820831 | ---- | 668.80 | 16,000 |
| | 820728 | 2030 | 669.44 | 25,600 |
| | 820624 | 1020 | 669.75 | 26,000 |
| | 820622 | 1050 | 670.15 | 26,000[a] |
| | 820714 | 1210 | 669.67 | 27,300[a] |
| | 820621 | 1045 | 670.64 | 28,000[a] |
| Mainstem at Mouth of Slough 16B (R.M. 137.9) | 821012 | 1551 | 694.22 | 7,950 |
| | 821002 | 1425 | 695.62 | 11,700 |
| | 820822 | 1440 | 696.06 | 12,200 |
| | 820909 | 1420 | 696.49 | 13,400 |
| | 820813 | 1105 | 696.53 | 13,600 |
| | 820902 | 1115 | 697.05 | 16,000 |
| | 820914 | 1656 | 698.04 | 20,200 |

---- Data not available.

[a]Gold Creek stream gage malfunctioned, USGS estimated value. Not used in plotting stage-discharge curve.

Appendix Table 4-A-2 (Continued).

| Location | Date | Time | WSEL (ft) | Discharge (CFS) |
|---|---|---|---|---|
| Mainstem at Mouth of Slough 16B - Cont'd (R.M. 137.9) | 820920 | 1340 | 698.69 | 24,000 |
| | 820919 | 1705 | 698.72 | 24,100 |
| | 820723 | 1000 | 698.74 | 24,900 |
| | 820915 | 1259 | 699.93 | 28,200 |
| | 820726 | 1230 | 700.00 | 31,800 |
| | 820725 | 1105 | 700.05 | 31,900 |
| Mainstem at Head of Slough 16B (R.M. 138.3) | 820909 | 1420 | 701.98 | 13,400 |
| | 820813 | 1020 | 702.02 | 13,600 |
| | 820831 | 1900 | 702.55 | 16,000 |
| | 820914 | 1623 | 703.32 | 20,200 |
| | 820920 | 1330 | 703.76 | 24,000 |
| | 820919 | 1540 | 703.73 | 24,100 |
| | 820915 | 1249 | 704.72 | 28,200 |
| | 820725 | 1120 | 704.78 | 31,900 |
| Right Bank at LRX-50 (R.M. 138.5) | 821012 | 1550 | 701.95 | 7,950 |
| | 821003 | 1743 | 702.86 | 11,000 |
| | 821002 | 1620 | 703.01 | 11,700 |
| | 820904 | 1415 | 703.97 | 14,400 |
| | 820902 | 1210 | 704.39 | 16,000 |
| | 820901 | 1906 | 704.88 | 17,900 |
| | 820914 | 1515 | 705.22 | 20,200 |
| | 820919 | 1531 | 705.57 | 24,100 |
| | 820918 | 1912 | 705.82 | 27,500 |
| Right Bank at LRX-51 (R.M. 138.9) | 821012 | 1549 | 707.00 | 7,950 |
| | 821003 | 1742 | 707.68 | 11,000 |
| | 821002 | ---- | 707.72 | 11,700 |
| | 820909 | 1415 | 708.34 | 13,400 |
| | 820902 | 1205 | 708.73 | 16,000 |
| | 820914 | 1512 | 709.47 | 20,200 |
| | 820919 | 1530 | 710.07 | 24,100 |
| Mainstem at Slough 19 (R.M. 139.8) | 821012 | 1548 | 719.13 | 7,950 |
| | 821003 | 1740 | 719.91 | 11,000 |
| | 820822 | 1400 | 720.33 | 12,200 |
| | 820820 | 0910 | 720.31 | 12,500 |
| | 820819 | 1020 | 720.43 | 13,300 |
| | 820819 | 1734 | 720.47 | 13,300 |
| | 820909 | 1330 | 720.59 | 13,400 |
| | 820905 | 1530 | 720.52 | 13,600 |
| | 820831 | 1825 | 721.00 | 16,000 |
| | 820807 | 1000 | 721.03 | 16,500 |
| | 820806 | 1505 | 721.08 | 16,800 |
| | 820901 | 1747 | 721.23 | 17,900 |

---- Data not available.

Appendix Table 4-A-2 (Continued).

| Location | Date | Time | WSEL (ft) | Discharge (CFS) |
|---|---|---|---|---|
| Mainstem at Slough 19 - Cont'd (R.M. 139.8) | 820708 | 1315 | 721.21 | 18,100 |
| | 820914 | 1502 | 721.45 | 20,200 |
| | 820711 | 1930 | 721.98 | 24,000 |
| | 820919 | 1525 | 721.75 | 24,100 |
| | 820622 | 1110 | 722.75 | 26,000[a] |
| | 820623 | 0940 | 722.20 | 26,000[a] |
| | 820801 | 1706 | 721.96 | 26,400 |
| | 820620 | 1920 | 723.08 | 28,000[a] |
| | 820621 | ---- | 723.24 | 28,000[a] |
| | 820727 | 1310 | 722.44 | 29,100 |
| | 820726 | 1245 | 722.61 | 31,800 |
| | 820725 | 1140 | 722.67 | 31,900 |
| | 820916 | 1530 | 722.92 | 32,500 |
| Right Bank at LRX-53 (R.M. 140.1) | 821012 | 1547 | 722.34 | 7,950 |
| | 821010 | 1300 | 722.62 | 8,480 |
| | 821003 | 1621 | 723.19 | 11,000 |
| | 820822 | 1335 | 723.62 | 12,200 |
| | 820821 | 0930 | 723.53 | 12,200 |
| | 820820 | 1905 | 723.62 | 12,500 |
| | 820819 | 1945 | 723.70 | 13,300 |
| | 820813 | 0930 | 723.97 | 13,600 |
| | 820926 | 1215 | 723.96 | 14,000 |
| | 820831 | 1820 | 724.39 | 16,000 |
| | 820807 | 1045 | 724.51 | 16,500 |
| | 820901 | 1500 | 724.76 | 17,900 |
| | 820708 | 1500 | 724.73 | 18,100 |
| | 820804 | 1430 | 724.80 | 18,500 |
| | 820914 | 1412 | 724.98 | 20,200 |
| | 820802 | 1305 | 725.41 | 22,500 |
| | 820920 | 1248 | 725.52 | 24,000 |
| | 820919 | 1514 | 725.52 | 24,100 |
| | 820619 | ---- | 726.23 | 25,000[a] |
| | 820623 | 0940 | 725.96 | 26,000[a] |
| | 820622 | 1115 | 726.66 | 26,000[a] |
| | 820801 | 1803 | 725.69 | 26,400 |
| | 820714 | 1200 | 725.71 | 27,300 |
| | 820918 | 1806 | 725.78 | 27,500 |
| | 820915 | 1532 | 726.55 | 28,200 |
| | 820727 | 1150 | 726.32 | 29,100 |
| | 820725 | 1700 | 726.31 | 31,900 |
| Mainstem at Head of Slough 20 (R.M. 140.6) | 821012 | 1546 | 729.99 | 7,950 |
| | 821003 | 1540 | 730.39 | 11,000 |

---- Data not available.

[a]Gold Creek stream gage malfunctioned, USGS estimated value. Not used in plotting stage-discharge curve.

Appendix Table 4-A-2 (Continued).

| Location | Date | Time | WSEL (ft) | Discharge (CFS) |
|---|---|---|---|---|
| Right Bank at LRX-54 (R.M. 140.8) | 821003 | 1527 | 731.58 | 11,000 |
| | 820831 | 1802 | 732.75 | 16,000 |
| | 820901 | 1412 | 733.16 | 17,900 |
| | 820914 | 1400 | 733.40 | 20,200 |
| | 820919 | 1443 | 733.91 | 24,100 |
| | 820918 | 1658 | 734.22 | 27,500 |
| Right Bank at LRX-56 (R.M. 142.1) | 821012 | 1543 | 750.72 | 7,950 |
| | 821011 | 1600 | 751.06 | 8,220 |
| | 821003 | 1300 | 751.73 | 11,000 |
| | 821002 | 0950 | 751.96 | 11,700 |
| | 821001 | 1110 | 752.07 | 12,400 |
| | 820909 | 1330 | 752.56 | 13,400 |
| | 820927 | 1500 | 752.48 | 13,800 |
| | 820831 | ---- | 752.96 | 16,000 |
| | 820914 | 1252 | 753.59 | 20,200 |
| | 820920 | 1230 | 754.06 | 24,000 |
| | 820919 | 1319 | 754.09 | 24,100 |
| | 820918 | 1600 | 754.33 | 27,500 |
| | 820915 | 1602 | 754.94 | 28,200 |
| Right Bank at LRX-57 (R.M. 142.3) | 821012 | 1542 | 750.74 | 7,950 |
| | 821001 | 1310 | 752.05 | 12,400 |
| | 820909 | 1330 | 752.53 | 13,400 |
| | 820813 | 0915 | 752.67 | 13,600 |
| | 820831 | ---- | 753.17 | 16,000 |
| | 820901 | 1257 | 753.57 | 17,900 |
| | 820708 | 1615 | 753.76 | 18,100 |
| | 820914 | 1248 | 753.89 | 20,200 |
| | 820709 | 1250 | 754.41 | 21,500 |
| | 820802 | 1450 | 754.34 | 22,500 |
| | 820720 | 1535 | 754.41 | 22,900 |
| | 820920 | 1214 | 754.58 | 24,000 |
| | 820919 | 1317 | 754.55 | 24,100 |
| | 820728 | 1225 | 754.94 | 25,600[a] |
| | 820623 | 1100 | 755.08 | 26,000[a] |
| | 820622 | 1330 | 755.67 | 26,000[a] |
| | 820620 | ---- | 756.16 | 28,000[a] |
| | 820915 | 1604 | 755.66 | 28,200 |
| | 820726 | 1300 | 755.63 | 31,800 |
| | 820725 | 1500 | 756.16 | 31,900 |
| | 820916 | 1002 | 755.96 | 32,500 |
| Mainstem at Slough 22 (R.M. 144.7) | 821012 | 1534 | 783.95 | 7,950 |
| | 821002 | 0959 | 785.80 | 11,700 |

---- Data not available.

[a]Gold Creek stream gage malfunctioned, USGS estimated value. Not used in plotting stage-discharge curve.

Appendix Table 4-A-2 (Continued).

| Location | Date | Time | WSEL (ft) | Discharge (CFS) |
| --- | --- | --- | --- | --- |
| Mainstem at Slough 22 - Cont'd (R.M. 144.7) | 820909 | 1330 | 786.60 | 13,400 |
| | 820813 | 0855 | 786.69 | 13,600 |
| | 820831 | 1115 | 787.07 | 16,000 |
| | 820807 | 1215 | 787.27 | 16,500 |
| | 820901 | 1240 | 787.52 | 17,900 |
| | 820708 | 1800 | 787.69 | 18,100 |
| | 820914 | 1129 | 787.78 | 20,200 |
| | 820802 | 1720 | 788.06 | 22,500 |
| | 820720 | 1100 | 788.39 | 22,900 |
| | 820920 | 1125 | 788.40 | 24,000 |
| | 820919 | 1038 | 788.37 | 24,100 |
| | 820728 | 1135 | 788.82 | 25,600 |
| | 820623 | 1735 | 788.90 | 26,000 |
| | 820622 | 1615 | 789.48 | 26,000 |
| | 820918 | 1547 | 788.76 | 27,500 |
| | 820918 | 1400 | 788.85 | 27,500 |
| | 820726 | 1315 | 789.57 | 31,800 |
| Left Bank at LRX-61 (R.M. 148.7) | 821012 | 1535 | Dry | 7,950 |
| | 820909 | 1325 | 834.25 | 13,400 |
| | 820904 | 1800 | 834.45 | 14,400 |
| | 820709 | ---- | 836.09 | 21,500 |
| | 820710 | 1600 | 836.20 | 23,000 |
| | 820726 | 1500 | 837.00 | 31,800 |
| Left Bank at LRX-62 (R.M. 148.9) | 821012 | 1532 | Dry | 7,950 |
| | 820909 | 1325 | 836.53 | 13,400 |
| | 820909 | ---- | 836.45 | 13,400 |
| | 820904 | 1800 | 836.68 | 14,400 |
| | 820709 | ---- | 838.39 | 21,500 |
| | 820919 | 1800 | 838.79 | 24,100 |

---- Data not available.

Appendix Table 4-A-3. Comparison of periodic water surface elevations (WSEL) at selected sloughs upstream of Talkeetna to the corresponding average daily mainstem discharge at Gold Creek[a].

Part A: Upland Sloughs[b]

| Location | Date | Time | WSEL (ft) | Discharge (cfs) |
|---|---|---|---|---|
| Mouth of Slough 6A Gage Site 112.3W1 (R.M. 112.3) | 821009 | 1600 | 455.13 | 8,440 |
| | 820822 | 1645 | 455.92 | 12,200 |
| | 820820 | 1725 | 456.02 | 12,500 |
| | 820926 | 1405 | 456.41 | 14,000 |
| | 820910 | 1330 | 456.40 | 14,400 |
| | 820925 | 1740 | 456.53 | 15,000 |
| | 820807 | 1200 | 456.58 | 16,500 |
| | 820808 | 1720 | 456.68 | 16,600 |
| | 820709 | 1850 | 457.20 | 21,500 |
| | 820729 | 1445 | 457.46 | 23,600 |
| | 820921 | 1000 | 457.63 | 24,200 |
| | 820917 | 1717 | 458.33 | 32,000 |
| Mouth of Slough 19 Gage Site 140.0W1 (R.M. 139.8) | 821002 | 1733 | 718.61 | 11,700 |
| | 820820 | 0925 | 718.76 | 12,500 |
| | 820819 | 1050 | 718.73 | 13,300 |
| | 820813 | 1015 | 718.85 | 13,600 |
| | 820905 | 1515 | 718.76 | 13,600 |
| | 820925 | 1150 | 719.02 | 15,000 |
| | 820831 | 1832 | 719.43 | 16,000 |
| | 820807 | 1000 | 719.69 | 16,500 |
| | 820806 | 1510 | 719.83 | 16,800 |
| | 820708 | 1300 | 720.16 | 18,100 |
| | 820914 | 1507 | 720.60 | 20,200 |
| | 820622 | 1110 | 721.28 | 26,000[c] |
| | 820623 | 0940 | 721.79 | 26,000[c] |
| | 820801 | 1656 | 722.20 | 26,400 |
| | 820620 | 1910 | 722.18 | 28,000[c] |
| | 820620 | 1110 | 722.30 | 28,000[c] |
| | 820915 | 1550 | 721.97 | 28,200 |
| | 820727 | 1315 | 721.55 | 29,100 |
| | 820726 | 1245 | 721.88 | 31,800 |

[a]USGS provisional data, 1982.

[b]The upstream end (head) of a side slough is usually connected to the mainsteam (breached) during high flows.

[c]Gold Creek stream gage malfunctioned, USGS estimated value.

Appendix Table 4-A-3 (Continued)

Part B: Side Sloughs[b]

| Location | Date | Time | WSEL (ft) | Discharge (cfs) |
|---|---|---|---|---|
| Mouth of Whiskers Creek Slough | 821009 | 1030 | 362.92 | 8,440 |
| Gage Site 101.2W1 | 820823 | 1126 | 363.44 | 12,300 |
| (R.M. 101.2) | 820928 | 1715 | 363.64 | 12,900 |
| | 820909 | 1500 | 363.67 | 13,400 |
| | 820927 | 1605 | 363.85 | 13,800 |
| | 820903 | 1550 | 363.97 | 14,600 |
| | 820816 | 1715 | 364.03 | 15,600 |
| | 820709 | 1715 | 364.77 | 21,500 |
| | 820710 | 1030 | 365.84 | 23,000 |
| | 820920 | 1515 | 365.38 | 24,000 |
| | 820611 | ---- | 365.86 | 24,000[c] |
| | 820621 | 1300 | 366.75 | 28,000[c] |
| | 820726 | 1720 | 366.38 | 31,800 |
| | 820725 | 1100 | 366.88 | 31,900 |
| Mid-Slough at Whiskers Creek Slough | 821009 | 1145 | 365.58 | 8,440 |
| | 821006 | 1300 | 365.58 | 8,960 |
| Gage Site 101.2S3 | 820908 | 1540 | 365.61 | 11,900 |
| (R.M. 101.4) | 820822 | 1353 | 365.56 | 12,200 |
| | 820928 | 1705 | 365.64 | 12,900 |
| | 820813 | 1355 | 365.61 | 13,600 |
| | 820927 | 1550 | 365.68 | 13,800 |
| | 820903 | 1550 | 365.65 | 14,600 |
| | 820816 | 1445 | 365.60 | 15,600 |
| | 820920 | 1530 | 366.20 | 24,000 |
| | 820611 | ---- | 366.64 | 24,000[c] |
| | 820715 | 1300 | 366.16 | 25,600 |
| | 820622 | 0935 | 367.22 | 26,000[c] |
| | 820621 | 1300 | 367.61 | 28,000[c] |
| Head of Whiskers Creek Slough | 820904 | 1300 | 367.3[d] | 14,400 |
| Gage Site 101.2H5 | 820903 | 1550 | 367.3[d] | 14,600 |
| (R.M. 101.6) | 820816 | 1445 | 367.3[d] | 15,600 |
| | 820920 | 1830 | 368.09 | 24,000 |
| | 820715 | 1415 | 368.18 | 25,600 |
| | 820725 | 1040 | 368.89 | 31,900 |

[a]USGS provisional data, 1982.

[b]The upstream end (head) of a side slough is usually connected to the mainsteam (breached) during high flows.

[c]Gold Creek stream gage malfunctioned, USGS estimated value.

[d]Gage was dewatered, 703.75 ft. was point of zero flow.

Appendix Table 4-A-3 (Continued)

Part B: Side Sloughs[b]

| Location | Date | Time | WSEL (ft) | Discharge (cfs) |
|---|---|---|---|---|
| Mid-Slough at Lane Creek Slough Gage Site 113.6S2 (R.M. 113.6) | 821004 | 1235 | 468.24 | 10,500 |
| | 820903 | 1456 | 468.28 | 14,600 |
| | 820925 | 1110 | 468.35 | 15,000 |
| | 820722 | 1010 | 468.80 | 22,400 |
| | 820920 | 1329 | 469.41 | 24,000 |
| | 820723 | 1010 | 469.15 | 24,900 |
| | 820917 | 1517 | 470.75 | 32,100 |
| Head of Lane Creek Slough Gage Site 113.6H4 (R.M. 114.1) | 820903 | ---- | Dry | 14,600 |
| | 820920 | 1310 | Dry | 24,000 |
| | 820917 | 1830 | 474.30 | 32,000 |
| Mouth of Slough 11 Gage Site 135.3W1 (R.M. 135.3) | 821002 | 1040 | 667.01 | 11,700 |
| | 820907 | 1825 | 667.15 | 11,700 |
| | 820822 | 1540 | 667.32 | 12,200 |
| | 820906 | 1600 | 667.23 | 12,200 |
| | 820830 | 1740 | 667.77 | 13,100 |
| | 820813 | 1115 | 667.81 | 13,600 |
| | 820812 | 0935 | 667.91 | 14,400 |
| | 820811 | 1825 | 668.04 | 15,400 |
| | 820920 | 1026 | 669.41 | 24,000 |
| | 820728 | 2030 | 669.37 | 25,600 |
| Mouth of Slough 11 Gage Site 135.3W1 (R.M. 135.3) | 820622 | 1045 | 670.16 | 26,000[c] |
| | 820624 | 1020 | 669.72 | 26,000[c] |
| | 820714 | 1210 | 669.67 | 27,300 |
| | 820918 | 1026 | 669.71 | 27,500 |
| | 820621 | 1040 | 670.66 | 28,000[c] |
| Mid-Slough at Slough 11 Gage Site 135.3S6 (R.M. 135.7) | 821003 | 1513 | 670.77 | 11,000 |
| | 821002 | 1100 | 670.76 | 11,700 |
| | 820929 | 1800 | 670.75 | 12,400 |
| | 820920 | 1300 | 670.80 | 24,000 |
| | 820921 | 1130 | 670.80 | 24,200 |
| | 820929 | 1800 | 670.75 | 24,400 |

[a]USGS provisional data, 1982

[b]The upstream end (head) of an upland slough is not normally connected to the mainstem (breached) during high flows.

[c]Gold Creek stream gage malfunctioned, USGS estimated value.

Appendix Table 4-A-3 (Continued)

Part B: Side Sloughs[b]

| Location | Date | Time | WSEL (ft) | Discharge (cfs) |
|---|---|---|---|---|
| Head of Slough 11 Gage Site 135.3H3 (R.M. 136.5) | 820830 | ---- | 684.0[c] | 13,100 |
| | 820813 | 1140 | 684.0[c] | 13,600 |
| | 820812 | 0935 | 684.0[c] | 14,400 |
| | 820811 | 1805 | 684.0[c] | 15,400 |
| | 820716 | 1255 | 684.0[c] | 25,600 |
| | 820918 | 1025 | 684.0[c] | 27,500 |
| Mouth of Slough 16B Gage Site 138.0W1 (R.M. 137.9) | 821002 | 1435 | 697.28 | 11,700 |
| | 820822 | 1445 | 697.18 | 12,200 |
| | 820813 | 1035 | 697.20 | 13,600 |
| | 820902 | 1130 | 697.20 | 16,000 |
| | 820919 | 1641 | 698.38 | 24,100 |
| | 820915 | 1352 | 699.92 | 28,200 |
| | 820725 | 1110 | 700.06 | 31,900 |
| Mid-Slough at Slough 16B Gage Site 138.0S5 (R.M. 138.0) | 821002 | 1454 | 700.08 | 11,700 |
| | 820822 | 1500 | 700.05 | 12,200 |
| | 820813 | 1040 | 700.07 | 13,600 |
| | 820902 | 1140 | 700.10 | 16,000 |
| | 820914 | 1722 | 700.18 | 20,200 |
| | 820919 | 1617 | 700.58 | 24,100 |
| | 820801 | 1551 | 700.85 | 26,400 |
| | 820915 | 1412 | 701.69 | 28,200 |
| Head of Slough 16B Gage Site 138.0H3 (R.M. 138.3) | 820813 | 1020 | 703.0[d] | 13,600 |
| | 820831 | 1900 | 703.0[d] | 16,000 |
| | 820914 | 1626 | 703.17 | 20,200 |
| | 820920 | 1310 | 703.55 | 24,000 |
| | 820919 | 1543 | 703.51 | 24,100 |
| | 820915 | 1252 | 704.50 | 28,200 |
| | 820725 | 1115 | 704.59 | 31,900 |

[a] USGS provisional data, 1982.

[b] The upstream end (head) of a side slough is usually connected to the mainsteam (breached) during high flows.

[c] Gold Creek stream gage malfunctioned, USGS estimated value.

[d] Gage was dewatered, 703.75 ft. was point of zero flow.

Appendix Table 4-A-3 (Continued)

Part B: Side Sloughs[b]

| Location | Date | Time | WSEL (ft) | Discharge (cfs) |
|---|---|---|---|---|
| Mouth of Slough 20 Gage Site 140.1W4 (R.M. 140.1) | 821010 | 1700 | 724.23 | 8,480 |
| | 820822 | 1330 | 724.16 | 12,200 |
| | 820821 | 0935 | 724.16 | 12,200 |
| | 820820 | 1850 | 724.20 | 12,500 |
| | 820819 | 1950 | 724.22 | 13,300 |
| | 820813 | 0920 | 724.29 | 13,600 |
| | 820905 | 1550 | 724.33 | 13,600 |
| | 820831 | 1820 | 724.43 | 16,000 |
| Mouth of Slough 20 - Cont'd Gage Site 140.1W4 (R.M. 140.1) | 820901 | 1500 | 724.57 | 17,900 |
| | 820914 | 1420 | 724.82 | 20,200 |
| | 820802 | 1300 | 724.15 | 22,500 |
| | 820711 | 1900 | 725.26 | 24,000 |
| | 820920 | 1255 | 725.40 | 24,000 |
| | 820619 | ---- | 725.90 | 25,000[c] |
| | 820622 | 1115 | 726.30 | 26,000[c] |
| | 820623 | 0945 | 725.65 | 26,000[c] |
| | 820724 | 1100 | 725.69 | 26,800 |
| | 820918 | 1810 | 725.48 | 26,800 |
| | 820727 | 1125 | 726.04 | 29,100 |
| | 820916 | 1345 | 726.59 | 32,500 |
| Mid-Slough at Slough 20 Gage Site 140.1S5 (R.M. 140.2) | 821010 | 1730 | 726.89 | 8,480 |
| | 821003 | 1645 | 726.92 | 11,000 |
| | 820820 | 1115 | 726.72 | 12,500 |
| | 820813 | 0920 | 726.80 | 13,600 |
| | 820807 | 1130 | 726.85 | 16,500 |
| | 820901 | 1715 | 726.89 | 17,900 |
| | 820804 | 1200 | 726.90 | 18,500 |
| | 820914 | 1424 | 727.07 | 20,200 |
| | 820802 | 1210 | 726.99 | 22,500 |
| | 820623 | 0950 | 727.17 | 26,000[c] |
| | 820724 | 1130 | 727.19 | 26,800 |
| | 820727 | 1125 | 727.50 | 29,100 |
| | 820916 | 1415 | 728.00 | 32,500 |

[a] USGS provisional data, 1982.

[b] The upstream end (head) of a side slough is usually connected to the mainsteam (breached) during high flows.

[c] Gold Creek stream gage malfunctioned, USGS estimated value.

Appendix Table 4-A-3 (Continued)

Part B: Side Sloughs[b]

| Location | Date | Time | WSEL (ft) | Discharge (cfs) |
|---|---|---|---|---|
| Head of Slough 20 | 820820 | 1145 | 730.75[d] | 12,500 |
| Gage Site 140.1H2 | 820901 | 1715 | 730.75[d] | 17,900 |
| (R.M. 140.5) | 820914 | 1430 | 730.75[d] | 20,200 |
| | 820709 | 1225 | 730.96 | 21,500 |
| | 820802 | 1235 | 731.04 | 22,500 |
| | 820920 | 1240 | 731.08 | 24,000 |
| | 820711 | 1800 | 731.26 | 24,000 |
| | 820619 | ---- | 731.61 | 25,000[c] |
| Head of Slough 20 - Cont'd | 820622 | 1145 | 731.43 | 26,000[c] |
| Gage Site 140.1H2 | 820623 | 1010 | 731.77 | 26,000[c] |
| (R.M. 140.5) | 820918 | 1712 | 731.39 | 27,500 |
| | 820915 | 1539 | 731.76 | 28,200 |
| | 820727 | 1200 | 731.82 | 29,100 |
| | 820916 | 1220 | 731.95 | 32,500 |
| Mouth of Slough 21 | 820821 | 1000 | 744.67 | 12,200 |
| Gage Site 142.0W5 | 821001 | 1350 | 744.72 | 12,400 |
| (R.M. 141.8) | 820820 | 1700 | 744.68 | 12,500 |
| | 820813 | 0925 | 744.70 | 13,600 |
| | 820927 | 1645 | 744.75 | 13,800 |
| | 820831 | 1612 | 744.69 | 16,000 |
| | 820809 | 1335 | 744.72 | 17,000 |
| | 820914 | 1315 | 744.70 | 20,200 |
| | 820922 | 1111 | 744.82 | 22,300 |
| | 820802 | 1400 | 744.82 | 22,500 |
| | 820720 | 1850 | 744.76 | 22,900 |
| | 820920 | 1225 | 744.92 | 24,000 |
| | 820919 | 1225 | 744.89 | 24,100 |
| | 820728 | 1310 | 745.17 | 25,600 |
| | 820623 | 1040 | 745.34 | 26,000[c] |
| | 820918 | 1415 | 745.22 | 27,500 |
| | 820916 | 1134 | 746.59 | 32,500 |

[a]USGS provisional data, 1982.

[b]The upstream end (head) of a side slough is usually connected to the mainsteam (breached) during high flows.

[c]Gold Creek stream gage malfunctioned, USGS estimated value.

[d]Gage was dewatered, 703.75 ft. was point of zero flow.

Appendix Table 4-A-3 (Continued)

Part B: Side Sloughs[b]

| Location | Date | Time | WSEL (ft) | Discharge (cfs) |
|---|---|---|---|---|
| Mid-Slough at Slough 21 Gage Site 142.0S6 (R.M. 141.9) | 821003 | 1319 | 744.96 | 11,000 |
| | 821002 | 1515 | 744.96 | 11,700 |
| | 820906 | 1240 | 744.89 | 12,200 |
| | 820820 | 1645 | 744.95 | 12,500 |
| | 820927 | 1635 | 744.98 | 13,800 |
| | 820831 | 1512 | 744.91 | 16,000 |
| | 820809 | 1340 | 745.00 | 17,000 |
| | 820914 | 1310 | 744.92 | 20,200 |
| | 820802 | 1400 | 744.99 | 22,500 |
| | 820720 | 1800 | 744.93 | 22,900 |
| Mid-Slough at Slough 21 - Cont'd Gage Site 142.0S6 (R.M. 141.9) | 820920 | 1216 | 745.04 | 24,000 |
| | 820919 | 1408 | 745.03 | 24,100 |
| | 820728 | 1305 | 745.13 | 25,600 |
| | 820918 | 1531 | 745.14 | 27,500 |
| | 820915 | 1830 | 746.05 | 28,200 |
| | 820725 | 1710 | 746.99 | 31,900 |
| | 820916 | 1020 | 746.52 | 32,500 |
| Head of Slough 21, N.E. Gage Site 142.0H1 (R.M. 142.3) | 820831 | 1335 | 755.5[d] | 16,000 |
| | 820802 | 1449 | 755.5[d] | 22,500 |
| | 820920 | 1210 | 755.5[d] | 24,100 |
| | 820728 | 1235 | 755.5[d] | 25,600 |
| | 820622 | 1300 | 755.55 | 26,000[c] |
| | 820623 | 1100 | 755.5[d] | 26,000[c] |
| | 820620 | ---- | 755.97 | 28,000[c] |
| | 820915 | 1604 | 755.51 | 28,200 |
| | 820725 | 1500 | 755.97 | 31,900 |

[a]USGS provisional data, 1982.

[b]The upstream end (head) of a side slough is usually connected to the mainsteam (breached) during high flows.

[c]Gold Creek stream gage malfunctioned, USGS estimated value.

[d]Gage was dewatered, 703.75 ft. was point of zero flow.

Appendix Table 4-A-3 (Continued)

Part B: Side Sloughs[b]

| Location | Date | Time | WSEL (ft) | Discharge (cfs) |
|---|---|---|---|---|
| Head of Slough 21, N.W. Gage Site 142.0H3 (R.M. 142.2) | 820831 | 1500 | 754.6[e] | 16,000 |
| | 820709 | 1300 | 754.6[e] | 21,500 |
| | 820802 | 1433 | 754.6[e] | 22,500 |
| | 820720 | 1635 | 754.6[e] | 22,900 |
| | 820711 | 1730 | 754.64 | 24,000 |
| | 820728 | 1235 | 754.72 | 25,600 |
| | 820623 | 1055 | 754.81 | 26,000[c] |
| | 820622 | 1230 | 755.17 | 26,000[c] |
| | 820918 | 1600 | 754.66 | 27,500 |
| | 820620 | ---- | 755.40 | 28,000[c] |
| | 820725 | 1745 | 755.61 | 31,900 |
| | 820916 | 1004 | 755.30 | 32,500 |
| Mouth of Slough 22 Gage Site 144.3W3 (R.M. 144.2) | 821003 | 1130 | 780.43 | 11,000 |
| | 820822 | 1200 | 780.41 | 12,200 |
| | 820813 | 0900 | 780.47 | 13,600 |
| | 820831 | 1155 | 780.61 | 16,000 |
| Mouth of Slough 22 - Cont'd Gage Site 144.3W3 (R.M. 144.2) | 820914 | 1203 | 780.64 | 20,200 |
| | 820720 | 1435 | 780.73 | 22,900 |
| | 820920 | 1145 | 780.85 | 24,000 |
| | 820919 | 1223 | 780.85 | 24,100 |
| | 820728 | 1205 | 781.14 | 25,600 |
| | 820623 | 1730 | 781.19 | 26,000[c] |
| | 820918 | 1525 | 781.12 | 27,500 |
| | 820915 | 1735 | 781.84 | 28,200 |
| Mid-Slough at Slough 22 Gage Site 144.3S6 (R.M. 144.6) | 820813 | 0900 | 783.36 | 13,600 |
| | 820914 | 1141 | 783.63 | 20,200 |
| | 820802 | 1710 | 783.52 | 22,500 |
| | 820720 | 1415 | 783.58 | 22,900 |
| | 820920 | 1130 | 783.89 | 24,000 |
| | 820919 | 1217 | 784.42 | 24,100 |
| | 820728 | 1145 | 784.26 | 25,600 |
| | 820918 | 1424 | 784.30 | 27,500 |
| | 820915 | 1640 | 785.08 | 28,200 |

[a]USGS provisional data, 1982.

[b]The upstream end (head) of a side slough is usually connected to the mainsteam (breached) during high flows.

[c]Gold Creek stream gage malfunctioned, USGS estimated value.

[e]Gage was dewatered, 754.6 ft. was point of zero flow.

Appendix Table 4-A-3 (Continued)

Part B: Side Sloughs[b]

| Location | Date | Time | WSEL (ft) | Discharge (cfs) |
|---|---|---|---|---|
| Head of Slough 22 Gage Site 144.3H2 (R.M. 144.7) | 820813 | 0855 | 787.8[d] | 13,600 |
| | 820831 | 1130 | 787.8[d] | 16,000 |
| | 820708 | 1815 | 787.8[d] | 18,000 |
| | 820914 | ---- | 787.8[d] | 20,000 |
| | 820802 | 1717 | 788.06 | 22,500 |
| | 820720 | 1100 | 788.35 | 22,900 |
| | 820920 | 1125 | 788.37 | 24,000 |
| | 820919 | 1102 | 788.34 | 24,100 |
| | 820728 | 1140 | 788.78 | 25,600 |
| | 820623 | 1735 | 788.88 | 26,000[c] |
| | 820622 | 1615 | 789.43 | 26,000[c] |
| | 820918 | 1410 | 788.79 | 27,500 |
| | 820915 | 1631 | 789.46 | 28,200 |

[a]USGS provisional data, 1982.

[b]The upstream end (head) of a side slough is usually connected to the mainsteam (breached) during high flows.

[c]Gold Creek stream gage malfunctioned, USGS estimated value.

[d]Gage was dewatered, 787.8[d] ft. was point of zero flow.

Appendix Table 4-A-4 Continuous hourly streamflow and surface water temperature record for Indian River, Alaska.

| DATE | TIME | GAGE HEIGHT (ft) | DISCHARGE (cfs) | SURFACE WATER TEMPERATURE (C) |
|---|---|---|---|---|
| 820808 | 1300 | 1.67 | 220 | 9.5 |
| 820808 | 1400 | 1.67 | 220 | 10.5 |
| 820808 | 1500 | 1.67 | 220 | 11.0 |
| 820808 | 1600 | 1.67 | 220 | 11.0 |
| 820808 | 1700 | 1.67 | 220 | 11.0 |
| 820808 | 1800 | 1.63 | 208 | 11.0 |
| 820808 | 1900 | 1.63 | 208 | 10.5 |
| 820808 | 2000 | 1.63 | 208 | 10.0 |
| 820808 | 2100 | 1.67 | 220 | 10.0 |
| 820808 | 2200 | 1.70 | 233 | 9.5 |
| 820808 | 2300 | 1.73 | 246 | 9.5 |
| 820808 | 2400 | 1.73 | 246 | 9.0 |
| 820808 | DAILY MEAN | ----- | ----- | ----- |
| 820809 | 0100 | 1.77 | 259 | 9.0 |
| 820809 | 0200 | 1.77 | 259 | 8.5 |
| 820809 | 0300 | 1.80 | 273 | 8.5 |
| 820809 | 0400 | 1.77 | 259 | 8.5 |
| 820809 | 0500 | 1.80 | 273 | 8.0 |
| 820809 | 0600 | 1.80 | 273 | 8.0 |
| 820809 | 0700 | 1.80 | 273 | 8.0 |
| 820809 | 0800 | 1.77 | 259 | 8.0 |
| 820809 | 0900 | 1.77 | 259 | 8.0 |
| 820809 | 1000 | 1.80 | 273 | 8.0 |
| 820809 | 1100 | 1.80 | 273 | 8.5 |
| 820809 | 1200 | 1.77 | 259 | 9.0 |
| 820809 | 1300 | 1.77 | 259 | 9.0 |
| 820809 | 1400 | 1.77 | 259 | 9.0 |
| 820809 | 1500 | 1.77 | 259 | 9.0 |
| 820809 | 1600 | 1.73 | 246 | 9.5 |
| 820809 | 1700 | 1.77 | 259 | 9.5 |
| 820809 | 1800 | 1.73 | 246 | 9.5 |
| 820809 | 1900 | 1.73 | 246 | 9.0 |
| 820809 | 2000 | 1.73 | 246 | 9.0 |
| 820809 | 2100 | 1.70 | 233 | 8.5 |
| 820809 | 2200 | 1.73 | 246 | 8.5 |
| 820809 | 2300 | 1.73 | 246 | 8.5 |
| 820809 | 2400 | 1.73 | 246 | 8.0 |
| 820809 | DAILY MEAN | 1.76 | 257 | 8.6 |

Appendix Table 4-A-4 Cont.

| DATE | TIME | GAGE HEIGHT (ft) | DISCHARGE (cfs) | SURFACE WATER TEMPERATURE (C) |
|---|---|---|---|---|
| 820810 | 0100 | 1.73 | 246 | 8.0 |
| 820810 | 0200 | 1.73 | 246 | 8.0 |
| 820810 | 0300 | 1.73 | 246 | 8.0 |
| 820810 | 0400 | 1.73 | 246 | 8.0 |
| 820810 | 0500 | 1.73 | 246 | 8.0 |
| 820810 | 0600 | 1.70 | 233 | 8.0 |
| 820810 | 0700 | 1.70 | 233 | 8.0 |
| 820810 | 0800 | 1.70 | 233 | 8.0 |
| 820810 | 0900 | 1.73 | 246 | 8.0 |
| 820810 | 1000 | 1.73 | 246 | 8.0 |
| 820810 | 1100 | 1.73 | 246 | 8.5 |
| 820810 | 1200 | 1.73 | 246 | 8.5 |
| 820810 | 1300 | 1.73 | 246 | 8.5 |
| 820810 | 1400 | 1.73 | 246 | 9.0 |
| 820810 | 1500 | 1.73 | 246 | 9.0 |
| 820810 | 1600 | 1.73 | 246 | 9.0 |
| 820810 | 1700 | 1.73 | 246 | 9.0 |
| 820810 | 1800 | 1.73 | 246 | 9.0 |
| 820810 | 1900 | 1.73 | 246 | 9.0 |
| 820810 | 2000 | 1.73 | 246 | 9.0 |
| 820810 | 2100 | 1.73 | 246 | 8.5 |
| 820810 | 2200 | 1.73 | 246 | 8.5 |
| 820810 | 2300 | 1.73 | 246 | 8.0 |
| 820810 | 2400 | 1.73 | 246 | 8.0 |
| 820810 | DAILY MEAN | 1.73 | 244 | 8.4 |
| 820811 | 0100 | 1.73 | 246 | 8.0 |
| 820811 | 0200 | 1.77 | 259 | 7.5 |
| 820811 | 0300 | 1.73 | 246 | 7.5 |
| 820811 | 0400 | 1.73 | 246 | 7.5 |
| 820811 | 0500 | 1.73 | 246 | 7.5 |
| 820811 | 0600 | 1.73 | 246 | 7.5 |
| 820811 | 0700 | 1.73 | 246 | 7.5 |
| 820811 | 0800 | 1.70 | 233 | 7.5 |
| 820811 | 0900 | 1.70 | 233 | 8.0 |
| 820811 | 1000 | 1.70 | 233 | 8.0 |
| 820811 | 1100 | 1.70 | 233 | 8.5 |
| 820811 | 1200 | 1.70 | 233 | 9.0 |
| 820811 | 1300 | 1.70 | 233 | 9.5 |
| 820811 | 1400 | 1.70 | 233 | 10.0 |
| 820811 | 1500 | 1.67 | 220 | 10.5 |

Appendix Table 4-A-4 Cont.

| DATE | TIME | GAGE HEIGHT (ft) | DISCHARGE (cfs) | SURFACE WATER TEMPERATURE (C) |
|---|---|---|---|---|
| 820811 | 1600 | 1.67 | 220 | 11.0 |
| 820811 | 1700 | 1.67 | 220 | 11.0 |
| 820811 | 1800 | 1.67 | 220 | 10.5 |
| 820811 | 1900 | 1.63 | 208 | 10.5 |
| 820811 | 2000 | 1.63 | 208 | 10.0 |
| 820811 | 2100 | 1.63 | 208 | 9.5 |
| 820811 | 2200 | 1.63 | 208 | 9.5 |
| 820811 | 2300 | 1.63 | 208 | 8.5 |
| 820811 | 2400 | 1.63 | 208 | 8.5 |
| 820811 | DAILY MEAN | 1.69 | 228 | 8.9 |
| 820812 | 0100 | 1.63 | 208 | 8.0 |
| 820812 | 0200 | 1.63 | 208 | 7.5 |
| 820812 | 0300 | 1.63 | 208 | 7.5 |
| 820812 | 0400 | 1.63 | 208 | 7.0 |
| 820812 | 0500 | 1.60 | 197 | 7.0 |
| 820812 | 0600 | 1.63 | 208 | 6.5 |
| 820812 | 0700 | 1.60 | 197 | 6.5 |
| 820812 | 0800 | 1.60 | 197 | 7.0 |
| 820812 | 0900 | 1.60 | 197 | 7.0 |
| 820812 | 1000 | 1.60 | 197 | 7.5 |
| 820812 | 1100 | 1.60 | 197 | 8.0 |
| 820812 | 1200 | 1.60 | 197 | 9.0 |
| 820812 | 1300 | 1.60 | 197 | 9.5 |
| 820812 | 1400 | 1.60 | 197 | 10.5 |
| 820812 | 1500 | 1.57 | 187 | 11.0 |
| 820812 | 1600 | 1.57 | 187 | 11.5 |
| 820812 | 1700 | 1.57 | 187 | 11.5 |
| 820812 | 1800 | 1.57 | 187 | 11.0 |
| 820812 | 1900 | 1.57 | 187 | 11.0 |
| 820812 | 2000 | 1.57 | 187 | 10.5 |
| 820812 | 2100 | 1.57 | 187 | 10.0 |
| 820812 | 2200 | 1.57 | 187 | 9.5 |
| 820812 | 2300 | 1.57 | 187 | 9.0 |
| 820812 | 2400 | 1.57 | 187 | 9.0 |
| 820812 | DAILY MEAN | 1.59 | 195 | 8.9 |
| 820813 | 0100 | 1.57 | 187 | 8.5 |
| 820813 | 0200 | 1.57 | 187 | 8.0 |
| 820813 | 0300 | 1.57 | 187 | 8.0 |

Appendix Table 4-A-4 Cont.

| DATE | TIME | GAGE HEIGHT (ft) | DISCHARGE (cfs) | SURFACE WATER TEMPERATURE (C) |
|---|---|---|---|---|
| 820813 | 0400 | 1.57 | 187 | 8.0 |
| 820813 | 0500 | 1.57 | 187 | 8.0 |
| 820813 | 0600 | 1.57 | 187 | 7.5 |
| 820813 | 0700 | 1.57 | 187 | 7.5 |
| 820813 | 0800 | 1.53 | 176 | 7.5 |
| 820813 | 0900 | 1.53 | 176 | 8.0 |
| 820813 | 1000 | 1.57 | 187 | 8.5 |
| 820813 | 1100 | 1.53 | 176 | 9.0 |
| 820813 | 1200 | 1.53 | 176 | 9.5 |
| 820813 | 1300 | 1.53 | 176 | 10.5 |
| 820813 | 1400 | 1.53 | 176 | 11.0 |
| 820813 | 1500 | 1.53 | 176 | 11.5 |
| 820813 | 1600 | 1.50 | 167 | 12.0 |
| 820813 | 1700 | 1.50 | 167 | 12.0 |
| 820813 | 1800 | 1.50 | 167 | 12.0 |
| 820813 | 1900 | 1.50 | 167 | 11.5 |
| 820813 | 2000 | 1.53 | 176 | 11.0 |
| 820813 | 2100 | 1.50 | 167 | 10.5 |
| 820813 | 2200 | 1.50 | 167 | 10.5 |
| 820813 | 2300 | 1.50 | 167 | 10.0 |
| 820813 | 2400 | 1.50 | 167 | 10.0 |
| 820813 | DAILY MEAN | 1.53 | 176 | 9.6 |
| 820814 | 0100 | 1.50 | 167 | 9.5 |
| 820814 | 0200 | 1.50 | 167 | 9.5 |
| 820814 | 0300 | 1.50 | 167 | 9.0 |
| 820814 | 0400 | 1.50 | 167 | 9.0 |
| 820814 | 0500 | 1.50 | 167 | 9.0 |
| 820814 | 0600 | 1.50 | 167 | 9.0 |
| 820814 | 0700 | 1.50 | 167 | 9.0 |
| 820814 | 0800 | 1.50 | 167 | 9.0 |
| 820814 | 0900 | 1.50 | 167 | 8.5 |
| 820814 | 1000 | 1.50 | 167 | 8.5 |
| 820814 | 1100 | 1.50 | 167 | 8.5 |
| 820814 | 1200 | 1.50 | 167 | 8.5 |
| 820814 | 1300 | 1.50 | 167 | 9.0 |
| 820814 | 1400 | 1.50 | 167 | 9.0 |
| 820814 | 1500 | 1.53 | 176 | 9.0 |
| 820814 | 1600 | 1.50 | 167 | 9.0 |
| 820814 | 1700 | 1.53 | 176 | 9.5 |
| 820814 | 1800 | 1.53 | 176 | 9.5 |

Appendix Table 4-A-4 Cont.

| DATE | TIME | GAGE HEIGHT (ft) | DISCHARGE (cfs) | SURFACE WATER TEMPERATURE (C) |
|---|---|---|---|---|
| 820814 | 1900 | 1.53 | 176 | 9.5 |
| 820814 | 2000 | 1.50 | 167 | 9.5 |
| 820814 | 2100 | 1.50 | 167 | 9.5 |
| 820814 | 2200 | 1.53 | 176 | 9.0 |
| 820814 | 2300 | 1.50 | 167 | 9.0 |
| 820814 | 2400 | 1.53 | 176 | 8.5 |
| 820814 | DAILY MEAN | 1.51 | 169 | 9.0 |
| 820815 | 0100 | 1.53 | 176 | 8.5 |
| 820815 | 0200 | 1.50 | 167 | 8.5 |
| 820815 | 0300 | 1.50 | 167 | 8.5 |
| 820815 | 0400 | 1.50 | 167 | 8.0 |
| 820815 | 0500 | 1.53 | 176 | 8.0 |
| 820815 | 0600 | 1.50 | 167 | 8.0 |
| 820815 | 0700 | 1.50 | 167 | 8.0 |
| 820815 | 0800 | 1.50 | 167 | 8.0 |
| 820815 | 0900 | 1.53 | 176 | 8.5 |
| 820815 | 1000 | 1.50 | 167 | 8.5 |
| 820815 | 1100 | 1.50 | 167 | 8.5 |
| 820815 | 1200 | 1.50 | 167 | 9.0 |
| 820815 | 1300 | 1.50 | 167 | 9.5 |
| 820815 | 1400 | 1.53 | 176 | 10.0 |
| 820815 | 1500 | 1.50 | 167 | 10.5 |
| 820815 | 1600 | 1.50 | 167 | 10.5 |
| 820815 | 1700 | 1.50 | 167 | 10.0 |
| 820815 | 1800 | 1.47 | 157 | 10.5 |
| 820815 | 1900 | 1.50 | 167 | 10.0 |
| 820815 | 2000 | 1.50 | 167 | 9.5 |
| 820815 | 2100 | 1.50 | 167 | 9.5 |
| 820815 | 2200 | 1.50 | 167 | 9.0 |
| 820815 | 2300 | 1.50 | 167 | 8.5 |
| 820815 | 2400 | 1.50 | 167 | 8.5 |
| 820815 | DAILY MEAN | 1.50 | 168 | 9.0 |
| 820816 | 0100 | 1.47 | 157 | 8.5 |
| 820816 | 0200 | 1.50 | 167 | 8.0 |
| 820816 | 0300 | 1.50 | 167 | 8.0 |
| 820816 | 0400 | 1.47 | 157 | 8.0 |
| 820816 | 0500 | 1.50 | 167 | 8.0 |
| 820816 | 0600 | 1.47 | 157 | 8.0 |

Appendix Table 4-A4 Cont.

| DATE | TIME | GAGE HEIGHT (ft) | DISCHARGE (cfs) | SURFACE WATER TEMPERATURE (C) |
|---|---|---|---|---|
| 820816 | 0700 | 1.50 | 167 | 8.0 |
| 820816 | 0800 | 1.50 | 167 | 8.0 |
| 820816 | 0900 | 1.47 | 157 | 8.0 |
| 820816 | 1000 | 1.50 | 167 | 8.5 |
| 820816 | 1100 | 1.47 | 157 | 9.0 |
| 820816 | 1200 | 1.47 | 157 | 9.5 |
| 820816 | 1300 | 1.47 | 157 | 10.5 |
| 820816 | 1400 | 1.47 | 157 | 10.5 |
| 820816 | 1500 | 1.43 | 149 | 11.0 |
| 820816 | 1600 | 1.43 | 149 | 11.0 |
| 820816 | 1700 | 1.43 | 149 | 11.0 |
| 820816 | 1800 | 1.43 | 149 | 11.0 |
| 820816 | 1900 | 1.43 | 149 | 11.0 |
| 820816 | 2000 | 1.43 | 149 | 10.5 |
| 820816 | 2100 | 1.43 | 149 | 10.5 |
| 820816 | 2200 | 1.43 | 149 | 10.0 |
| 820816 | 2300 | 1.43 | 149 | 9.5 |
| 820816 | 2400 | 1.43 | 149 | 9.5 |
| 820816 | DAILY MEAN | 1.46 | 156 | 9.4 |
| 820817 | 0100 | 1.43 | 149 | 9.0 |
| 820817 | 0200 | 1.43 | 149 | 9.0 |
| 820817 | 0300 | 1.43 | 149 | 9.0 |
| 820817 | 0400 | 1.47 | 157 | 8.5 |
| 820817 | 0500 | 1.47 | 157 | 8.5 |
| 820817 | 0600 | 1.47 | 157 | 8.5 |
| 820817 | 0700 | 1.47 | 157 | 8.5 |
| 820817 | 0800 | 1.47 | 157 | 8.5 |
| 820817 | 0900 | 1.47 | 157 | 8.5 |
| 820817 | 1000 | 1.50 | 167 | 8.5 |
| 820817 | 1100 | 1.53 | 176 | 8.5 |
| 820817 | 1200 | 1.53 | 176 | 8.5 |
| 820817 | 1300 | 1.53 | 176 | 9.0 |
| 820817 | 1400 | 1.57 | 187 | 9.0 |
| 820817 | 1500 | 1.57 | 187 | 9.0 |
| 820817 | 1600 | 1.60 | 197 | 9.5 |
| 820817 | 1700 | 1.57 | 187 | 9.5 |
| 820817 | 1800 | 1.60 | 197 | 9.5 |
| 820817 | 1900 | 1.57 | 187 | 9.0 |
| 820817 | 2000 | 1.60 | 197 | 9.0 |
| 820817 | 2100 | 1.60 | 197 | 8.5 |

Appendix Table 4-A-4 Cont.

| DATE | TIME | GAGE HEIGHT (ft) | DISCHARGE (cfs) | SURFACE WATER TEMPERATURE (C) |
|---|---|---|---|---|
| 820817 | 2200 | 1.60 | 197 | 8.5 |
| 820817 | 2300 | 1.60 | 197 | 8.0 |
| 820817 | 2400 | 1.60 | 197 | 8.0 |
| 820817 | DAILY MEAN | 1.53 | 175 | 8.8 |
| 820818 | 0100 | 1.60 | 197 | 7.5 |
| 820818 | 0200 | 1.60 | 197 | 7.5 |
| 820818 | 0300 | 1.57 | 187 | 7.5 |
| 820818 | 0400 | 1.57 | 187 | 7.5 |
| 820818 | 0500 | 1.57 | 187 | 7.5 |
| 820818 | 0600 | 1.57 | 187 | 7.5 |
| 820818 | 0700 | 1.53 | 176 | 7.5 |
| 820818 | 0800 | 1.57 | 187 | 7.5 |
| 820818 | 0900 | 1.57 | 187 | 8.0 |
| 820818 | 1000 | 1.53 | 176 | 8.0 |
| 820818 | 1100 | 1.53 | 176 | 8.5 |
| 820818 | 1200 | 1.53 | 176 | 9.0 |
| 820818 | 1300 | 1.53 | 176 | 9.0 |
| 820818 | 1400 | 1.53 | 176 | 9.5 |
| 820818 | 1500 | 1.50 | 167 | 9.5 |
| 820818 | 1600 | 1.53 | 176 | 9.5 |
| 820818 | 1700 | 1.50 | 167 | 9.5 |
| 820818 | 1800 | 1.50 | 167 | 9.5 |
| 820818 | 1900 | 1.50 | 167 | 9.5 |
| 820818 | 2000 | 1.50 | 167 | 9.0 |
| 820818 | 2100 | 1.50 | 167 | 9.0 |
| 820818 | 2200 | 1.50 | 167 | 8.5 |
| 820818 | 2300 | 1.50 | 167 | 8.0 |
| 820818 | 2400 | 1.50 | 167 | 8.0 |
| 820818 | DAILY MEAN | 1.53 | 177 | 8.4 |
| 820819 | 0100 | 1.47 | 157 | 7.5 |
| 820819 | 0200 | 1.50 | 167 | 7.0 |
| 820819 | 0300 | 1.50 | 167 | 7.0 |
| 820819 | 0400 | 1.47 | 157 | 7.0 |
| 820819 | 0500 | 1.50 | 167 | 6.5 |
| 820819 | 0600 | 1.50 | 167 | 7.0 |
| 820819 | 0700 | 1.50 | 167 | 7.0 |
| 820819 | 0800 | 1.50 | 167 | 7.0 |
| 820819 | 0900 | 1.47 | 157 | 7.5 |

Appendix Table 4-A4 Cont.

| DATE | TIME | GAGE HEIGHT (ft) | DISCHARGE (cfs) | SURFACE WATER TEMPERATURE (C) |
|---|---|---|---|---|
| 820819 | 1000 | 1.47 | 157 | 8.0 |
| 820819 | 1100 | 1.47 | 157 | 8.5 |
| 820819 | 1200 | 1.47 | 157 | 9.0 |
| 820819 | 1300 | 1.47 | 157 | 9.5 |
| 820819 | 1400 | 1.47 | 157 | 9.5 |
| 820819 | 1500 | 1.47 | 157 | 10.0 |
| 820819 | 1600 | 1.43 | 149 | 10.5 |
| 820819 | 1700 | 1.47 | 157 | 10.5 |
| 820819 | 1800 | 1.47 | 157 | 10.5 |
| 820819 | 1900 | 1.43 | 149 | 10.0 |
| 820819 | 2000 | 1.47 | 157 | 10.0 |
| 820819 | 2100 | 1.47 | 157 | 9.5 |
| 820819 | 2200 | 1.47 | 157 | 9.5 |
| 820819 | 2300 | 1.43 | 149 | 9.0 |
| 820819 | 2400 | 1.43 | 149 | 8.5 |
| 820819 | DAILY MEAN | 1.47 | 158 | 8.6 |
| 820820 | 0100 | 1.43 | 149 | 8.5 |
| 820820 | 0200 | 1.43 | 149 | 8.0 |
| 820820 | 0300 | 1.43 | 149 | 8.0 |
| 820820 | 0400 | 1.43 | 149 | 7.5 |
| 820820 | 0500 | 1.43 | 149 | 7.5 |
| 820820 | 0600 | 1.43 | 149 | 7.5 |
| 820820 | 0700 | 1.43 | 149 | 7.5 |
| 820820 | 0800 | 1.43 | 149 | 7.5 |
| 820820 | 0900 | 1.43 | 149 | 8.0 |
| 820820 | 1000 | 1.43 | 149 | 8.5 |
| 820820 | 1100 | 1.43 | 149 | 9.0 |
| 820820 | 1200 | 1.43 | 149 | 9.5 |
| 820820 | 1300 | 1.40 | 140 | 10.0 |
| 820820 | 1400 | 1.43 | 149 | 11.0 |
| 820820 | 1500 | 1.40 | 140 | 11.5 |
| 820820 | 1600 | 1.40 | 140 | 11.5 |
| 820820 | 1700 | 1.40 | 140 | 11.5 |
| 820820 | 1800 | 1.40 | 140 | 11.5 |
| 820820 | 1900 | 1.40 | 140 | 11.0 |
| 820820 | 2000 | 1.40 | 140 | 11.0 |
| 820820 | 2100 | 1.40 | 140 | 10.5 |
| 820820 | 2200 | 1.40 | 140 | 10.0 |
| 820820 | 2300 | 1.40 | 140 | 9.5 |
| 820820 | 2400 | 1.40 | 140 | 9.0 |

Appendix Table 4-A-4 Cont.

| DATE | TIME | GAGE HEIGHT (ft) | DISCHARGE (cfs) | SURFACE WATER TEMPERATURE (C) |
|---|---|---|---|---|
| 820820 | DAILY MEAN | 1.42 | 145 | 9.4 |
| 820821 | 0100 | 1.40 | 140 | 8.5 |
| 820821 | 0200 | 1.40 | 140 | 8.5 |
| 820821 | 0300 | 1.40 | 140 | 8.0 |
| 820821 | 0400 | 1.40 | 140 | 8.0 |
| 820821 | 0500 | 1.40 | 140 | 7.5 |
| 820821 | 0600 | 1.40 | 140 | 7.0 |
| 820821 | 0700 | 1.40 | 140 | 7.0 |
| 820821 | 0800 | 1.40 | 140 | 7.0 |
| 820821 | 0900 | 1.40 | 140 | 7.5 |
| 820821 | 1000 | 1.40 | 140 | 8.0 |
| 820821 | 1100 | 1.40 | 140 | 8.5 |
| 820821 | 1200 | 1.37 | 132 | 9.0 |
| 820821 | 1300 | 1.37 | 132 | 10.0 |
| 820821 | 1400 | 1.37 | 132 | 10.5 |
| 820821 | 1500 | 1.37 | 132 | 11.5 |
| 820821 | 1600 | 1.40 | 140 | 11.5 |
| 820821 | 1700 | 1.37 | 132 | 12.0 |
| 820821 | 1800 | 1.37 | 132 | 11.5 |
| 820821 | 1900 | 1.37 | 132 | 11.0 |
| 820821 | 2000 | 1.37 | 132 | 11.0 |
| 820821 | 2100 | 1.37 | 132 | 10.5 |
| 820821 | 2200 | 1.37 | 132 | 10.0 |
| 820821 | 2300 | 1.37 | 132 | 9.5 |
| 820821 | 2400 | 1.37 | 132 | 9.0 |
| 820821 | DAILY MEAN | 1.38 | 136 | 9.3 |
| 820822 | 0100 | 1.37 | 132 | 8.5 |
| 820822 | 0200 | 1.37 | 132 | 8.5 |
| 820822 | 0300 | 1.37 | 132 | 8.0 |
| 820822 | 0400 | 1.37 | 132 | 7.5 |
| 820822 | 0500 | 1.37 | 132 | 7.5 |
| 820822 | 0600 | 1.40 | 140 | 7.0 |
| 820822 | 0700 | 1.37 | 132 | 7.0 |
| 820822 | 0800 | 1.40 | 140 | 7.0 |
| 820822 | 0900 | 1.37 | 132 | 7.5 |
| 820822 | 1000 | 1.37 | 132 | 8.0 |
| 820822 | 1100 | 1.37 | 132 | 8.5 |
| 820822 | 1200 | 1.37 | 132 | 9.0 |

Appendix Table 4-A-4 Cont.

| DATE | TIME | GAGE HEIGHT (ft) | DISCHARGE (cfs) | SURFACE WATER TEMPERATURE (C) |
|---|---|---|---|---|
| 820822 | 1300 | 1.37 | 132 | 10.0 |
| 820822 | 1400 | 1.37 | 132 | 10.5 |
| 820822 | 1500 | 1.37 | 132 | 11.0 |
| 820822 | 1600 | 1.37 | 132 | 11.5 |
| 820822 | 1700 | 1.37 | 132 | 11.5 |
| 820822 | 1800 | 1.33 | 125 | 11.5 |
| 820822 | 1900 | 1.33 | 125 | 11.5 |
| 820822 | 2000 | 1.33 | 125 | 11.0 |
| 820822 | 2100 | 1.33 | 125 | 10.5 |
| 820822 | 2200 | 1.33 | 125 | 10.5 |
| 820822 | 2300 | 1.33 | 125 | 10.0 |
| 820822 | 2400 | 1.33 | 125 | 9.5 |
| 820822 | DAILY MEAN | 1.36 | 131 | 9.3 |
| 820823 | 0100 | 1.37 | 132 | 9.5 |
| 820823 | 0200 | 1.37 | 132 | 9.5 |
| 820823 | 0300 | 1.37 | 132 | 9.0 |
| 820823 | 0400 | 1.37 | 132 | 9.0 |
| 820823 | 0500 | 1.37 | 132 | 9.0 |
| 820823 | 0600 | 1.33 | 125 | 9.0 |
| 820823 | 0700 | 1.37 | 132 | 9.0 |
| 820823 | 0800 | 1.37 | 132 | 9.0 |
| 820823 | 0900 | 1.37 | 132 | 9.0 |
| 820823 | 1000 | 1.37 | 132 | 9.5 |
| 820823 | 1100 | 1.37 | 132 | 9.5 |
| 820823 | 1200 | 1.37 | 132 | 9.5 |
| 820823 | 1300 | 1.37 | 132 | 9.5 |
| 820823 | 1400 | 1.37 | 132 | 10.0 |
| 820823 | 1500 | 1.37 | 132 | 10.5 |
| 820823 | 1600 | 1.37 | 132 | 10.5 |
| 820823 | 1700 | 1.37 | 132 | 11.0 |
| 820823 | 1800 | 1.37 | 132 | 10.5 |
| 820823 | 1900 | 1.37 | 132 | 10.5 |
| 820823 | 2000 | 1.37 | 132 | 10.0 |
| 820823 | 2100 | 1.37 | 132 | 10.0 |
| 820823 | 2200 | 1.37 | 132 | 9.5 |
| 820823 | 2300 | 1.37 | 132 | 9.0 |
| 820823 | 2400 | 1.37 | 132 | 9.0 |
| 820823 | DAILY MEAN | 1.37 | 132 | 9.6 |

Appendix Table 4-A-4 Cont.

| DATE | TIME | GAGE HEIGHT (ft) | DISCHARGE (cfs) | SURFACE WATER TEMPERATURE (C) |
|---|---|---|---|---|
| 820824 | 0100 | 1.37 | 132 | 8.5 |
| 820824 | 0200 | 1.37 | 132 | 8.5 |
| 820824 | 0300 | 1.40 | 140 | 8.5 |
| 820824 | 0400 | 1.37 | 132 | 8.5 |
| 820824 | 0500 | 1.37 | 132 | 8.5 |
| 820824 | 0600 | 1.37 | 132 | 8.5 |
| 820824 | 0700 | 1.37 | 132 | 8.5 |
| 820824 | 0800 | 1.37 | 132 | 8.5 |
| 820824 | 0900 | 1.37 | 132 | 9.0 |
| 820824 | 1000 | 1.37 | 132 | 9.0 |
| 820824 | 1100 | 1.37 | 132 | 9.0 |
| 820824 | 1200 | 1.33 | 125 | 10.0 |
| 820824 | 1300 | 1.37 | 132 | 10.5 |
| 820824 | 1400 | 1.33 | 125 | 10.5 |
| 820824 | 1500 | 1.33 | 125 | 11.0 |
| 820824 | 1600 | 1.33 | 125 | 11.0 |
| 820824 | 1700 | 1.33 | 125 | 11.5 |
| 820824 | 1800 | 1.33 | 125 | 11.5 |
| 820824 | 1900 | 1.37 | 132 | 11.0 |
| 820824 | 2000 | 1.37 | 132 | 11.0 |
| 820824 | 2100 | 1.33 | 125 | 10.5 |
| 820824 | 2200 | 1.33 | 125 | 10.5 |
| 820824 | 2300 | 1.33 | 125 | 10.0 |
| 820824 | 2400 | 1.33 | 125 | 9.5 |
| 820824 | DAILY MEAN | 1.35 | 130 | 9.7 |
| 820825 | 0100 | 1.37 | 132 | 9.5 |
| 820825 | 0200 | 1.37 | 132 | 9.0 |
| 820825 | 0300 | 1.37 | 132 | 9.0 |
| 820825 | 0400 | 1.37 | 132 | 9.0 |
| 820825 | 0500 | 1.37 | 132 | 9.0 |
| 820825 | 0600 | 1.37 | 132 | 9.0 |
| 820825 | 0700 | 1.37 | 132 | 9.0 |
| 820825 | 0800 | 1.37 | 132 | 9.0 |
| 820825 | 0900 | 1.37 | 132 | 9.0 |
| 820825 | 1000 | 1.37 | 132 | 9.0 |
| 820825 | 1100 | 1.37 | 132 | 9.5 |
| 820825 | 1200 | 1.37 | 132 | 9.5 |
| 820825 | 1300 | 1.37 | 132 | 10.0 |
| 820825 | 1400 | 1.37 | 132 | 10.5 |
| 820825 | 1500 | 1.33 | 125 | 10.5 |

Appendix Table 4-A-4 Cont.

| DATE | TIME | GAGE HEIGHT (ft) | DISCHARGE (cfs) | SURFACE WATER TEMPERATURE (C) |
|---|---|---|---|---|
| 820825 | 1600 | 1.37 | 132 | 11.0 |
| 820825 | 1700 | 1.33 | 125 | 11.0 |
| 820825 | 1800 | 1.33 | 125 | 11.0 |
| 820825 | 1900 | 1.33 | 125 | 11.0 |
| 820825 | 2000 | 1.33 | 125 | 10.5 |
| 820825 | 2100 | 1.33 | 125 | 10.0 |
| 820825 | 2200 | 1.37 | 132 | 10.0 |
| 820825 | 2300 | 1.37 | 132 | 10.0 |
| 820825 | 2400 | 1.33 | 125 | 9.5 |
| 820825 | DAILY MEAN | 1.36 | 130 | 9.8 |
| 820826 | 0100 | 1.37 | 132 | 9.5 |
| 820826 | 0200 | 1.37 | 132 | 9.0 |
| 820826 | 0300 | 1.37 | 132 | 9.0 |
| 820826 | 0400 | 1.37 | 132 | 9.0 |
| 820826 | 0500 | 1.37 | 132 | 8.5 |
| 820826 | 0600 | 1.37 | 132 | 8.5 |
| 820826 | 0700 | 1.37 | 132 | 8.5 |
| 820826 | 0800 | 1.37 | 132 | 8.5 |
| 820826 | 0900 | 1.37 | 132 | 9.0 |
| 820826 | 1000 | 1.37 | 132 | 9.0 |
| 820826 | 1100 | 1.37 | 132 | 9.5 |
| 820826 | 1200 | 1.37 | 132 | 10.0 |
| 820826 | 1300 | 1.37 | 132 | 10.0 |
| 820826 | 1400 | 1.37 | 132 | 10.5 |
| 820826 | 1500 | 1.37 | 132 | 11.0 |
| 820826 | 1600 | 1.37 | 132 | 11.5 |
| 820826 | 1700 | 1.37 | 132 | 11.5 |
| 820826 | 1800 | 1.33 | 125 | 11.0 |
| 820826 | 1900 | 1.33 | 125 | 11.0 |
| 820826 | 2000 | 1.37 | 132 | 10.5 |
| 820826 | 2100 | 1.37 | 132 | 10.0 |
| 820826 | 2200 | 1.33 | 125 | 9.5 |
| 820826 | 2300 | 1.37 | 132 | 9.5 |
| 820826 | 2400 | 1.33 | 125 | 9.0 |
| 820826 | DAILY MEAN | 1.36 | 131 | 9.7 |
| 820827 | 0100 | 1.33 | 125 | 8.5 |
| 820827 | 0200 | 1.37 | 132 | 8.0 |
| 820827 | 0300 | 1.33 | 125 | 8.0 |

Appendix Table 4-A-4 Cont.

| DATE | TIME | GAGE HEIGHT (ft) | DISCHARGE (cfs) | SURFACE WATER TEMPERATURE (C) |
|---|---|---|---|---|
| 820827 | 0400 | 1.33 | 125 | 7.5 |
| 820827 | 0500 | 1.33 | 125 | 7.0 |
| 820827 | 0600 | 1.33 | 125 | 6.5 |
| 820827 | 0700 | 1.33 | 125 | 6.5 |
| 820827 | 0800 | 1.37 | 132 | 6.5 |
| 820827 | 0900 | 1.33 | 125 | 7.0 |
| 820827 | 1000 | 1.33 | 125 | 7.5 |
| 820827 | 1100 | 1.33 | 125 | 8.0 |
| 820827 | 1200 | 1.33 | 125 | 8.5 |
| 820827 | 1300 | 1.33 | 125 | 9.5 |
| 820827 | 1400 | 1.33 | 125 | 10.0 |
| 820827 | 1500 | 1.33 | 125 | 10.5 |
| 820827 | 1600 | 1.33 | 125 | 11.0 |
| 820827 | 1700 | 1.33 | 125 | 11.0 |
| 820827 | 1800 | 1.30 | 118 | 11.0 |
| 820827 | 1900 | 1.30 | 118 | 10.5 |
| 820827 | 2000 | 1.33 | 125 | 10.5 |
| 820827 | 2100 | 1.33 | 125 | 9.5 |
| 820827 | 2200 | 1.33 | 125 | 9.5 |
| 820827 | 2300 | 1.30 | 118 | 9.0 |
| 820827 | 2400 | 1.30 | 118 | 8.5 |
| 820827 | DAILY MEAN | 1.33 | 124 | 8.8 |
| 820828 | 0100 | 1.33 | 125 | 8.0 |
| 820828 | 0200 | 1.33 | 125 | 8.0 |
| 820828 | 0300 | 1.33 | 125 | 7.5 |
| 820828 | 0400 | 1.33 | 125 | 7.5 |
| 820828 | 0500 | 1.33 | 125 | 7.5 |
| 820828 | 0600 | 1.30 | 118 | 7.0 |
| 820828 | 0700 | 1.33 | 125 | 7.5 |
| 820828 | 0800 | 1.33 | 125 | 7.5 |
| 820828 | 0900 | 1.33 | 125 | 7.5 |
| 820828 | 1000 | 1.33 | 125 | 8.0 |
| 820828 | 1100 | 1.33 | 125 | 8.0 |
| 820828 | 1200 | 1.33 | 125 | 8.5 |
| 820828 | 1300 | 1.33 | 125 | 8.5 |
| 820828 | 1400 | 1.33 | 125 | 9.0 |
| 820828 | 1500 | 1.33 | 125 | 9.5 |
| 820828 | 1600 | 1.33 | 125 | 10.0 |
| 820828 | 1700 | 1.30 | 118 | 10.0 |
| 820828 | 1800 | 1.33 | 125 | 10.0 |

Appendix Table 4-A-4 Cont.

| DATE | TIME | GAGE HEIGHT (ft) | DISCHARGE (cfs) | SURFACE WATER TEMPERATURE (C) |
|---|---|---|---|---|
| 820828 | 1900 | 1.30 | 118 | 10.0 |
| 820828 | 2000 | 1.30 | 118 | 10.0 |
| 820828 | 2100 | 1.33 | 125 | 9.5 |
| 820828 | 2200 | 1.33 | 125 | 9.0 |
| 820828 | 2300 | 1.30 | 118 | 9.0 |
| 820828 | 2400 | 1.33 | 125 | 9.0 |
| 820828 | DAILY MEAN | 1.33 | 123 | 8.6 |
| 820829 | 0100 | 1.30 | 118 | 8.5 |
| 820829 | 0200 | 1.33 | 125 | 8.5 |
| 820829 | 0300 | 1.30 | 118 | 8.5 |
| 820829 | 0400 | 1.33 | 125 | 8.5 |
| 820829 | 0500 | 1.33 | 125 | 8.0 |
| 820829 | 0600 | 1.37 | 132 | 8.0 |
| 820829 | 0700 | 1.33 | 125 | 8.0 |
| 820829 | 0800 | 1.33 | 125 | 8.0 |
| 820829 | 0900 | 1.37 | 132 | 8.0 |
| 820829 | 1000 | 1.37 | 132 | 8.0 |
| 820829 | 1100 | 1.40 | 140 | 8.5 |
| 820829 | 1200 | 1.40 | 140 | 8.5 |
| 820829 | 1300 | 1.40 | 140 | 9.0 |
| 820829 | 1400 | 1.40 | 140 | 9.0 |
| 820829 | 1500 | 1.40 | 140 | 9.5 |
| 820829 | 1600 | 1.40 | 140 | 9.5 |
| 820829 | 1700 | 1.43 | 149 | 9.5 |
| 820829 | 1800 | 1.43 | 149 | 9.5 |
| 820829 | 1900 | 1.43 | 149 | 9.0 |
| 820829 | 2000 | 1.47 | 157 | 9.0 |
| 820829 | 2100 | 1.47 | 157 | 9.0 |
| 820829 | 2200 | 1.47 | 157 | 8.5 |
| 820829 | 2300 | 1.47 | 157 | 8.5 |
| 820829 | 2400 | 1.50 | 167 | 8.5 |
| 820829 | DAILY MEAN | 1.39 | 139 | 8.6 |
| 820830 | 0100 | 1.50 | 167 | 8.5 |
| 820830 | 0200 | 1.50 | 167 | 8.5 |
| 820830 | 0300 | 1.50 | 167 | 8.5 |
| 820830 | 0400 | 1.50 | 167 | 8.0 |
| 820830 | 0500 | 1.53 | 176 | 8.0 |
| 820830 | 0600 | 1.57 | 187 | 8.0 |

Appendix Table 4-A-4 Cont.

| DATE | TIME | GAGE HEIGHT (ft) | DISCHARGE (cfs) | SURFACE WATER TEMPERATURE (C) |
|---|---|---|---|---|
| 820830 | 0700 | 1.60 | 197 | 8.0 |
| 820830 | 0800 | 1.63 | 208 | 8.0 |
| 820830 | 0900 | 1.67 | 220 | 8.0 |
| 820830 | 1000 | 1.70 | 233 | 8.0 |
| 820830 | 1100 | 1.73 | 246 | 8.0 |
| 820830 | 1200 | 1.80 | 273 | 8.0 |
| 820830 | 1300 | 1.87 | 304 | 8.0 |
| 820830 | 1400 | 1.87 | 304 | 8.0 |
| 820830 | 1500 | 1.93 | 337 | 8.0 |
| 820830 | 1600 | 1.97 | 355 | 8.0 |
| 820830 | 1700 | 2.00 | 374 | 8.0 |
| 820830 | 1800 | 2.00 | 374 | 8.0 |
| 820830 | 1900 | 2.03 | 394 | 8.0 |
| 820830 | 2000 | 2.03 | 394 | 8.0 |
| 820830 | 2100 | 2.07 | 414 | 8.0 |
| 820830 | 2200 | 2.10 | 436 | 8.0 |
| 820830 | 2300 | 2.10 | 436 | 7.5 |
| 820830 | 2400 | 2.10 | 436 | 7.5 |
| 820830 | DAILY MEAN | 1.80 | 275 | 8.0 |
| 820831 | 0100 | 2.10 | 436 | 7.5 |
| 820831 | 0200 | 2.10 | 436 | 7.5 |
| 820831 | 0300 | 2.13 | 458 | 7.5 |
| 820831 | 0400 | 2.13 | 458 | 7.5 |
| 820831 | 0500 | 2.13 | 458 | 7.5 |
| 820831 | 0600 | 2.13 | 458 | 7.5 |
| 820831 | 0700 | 2.17 | 482 | 7.0 |
| 820831 | 0800 | 2.17 | 482 | 7.0 |
| 820831 | 0900 | 2.17 | 482 | 7.0 |
| 820831 | 1000 | 2.13 | 458 | 7.5 |
| 820831 | 1100 | 2.13 | 458 | 7.5 |
| 820831 | 1200 | 2.13 | 458 | 7.5 |
| 820831 | 1300 | 2.13 | 458 | 7.5 |
| 820831 | 1400 | 2.13 | 458 | 8.0 |
| 820831 | 1500 | 2.13 | 458 | 8.5 |
| 820831 | 1600 | 2.10 | 436 | 9.0 |
| 820831 | 1700 | 2.13 | 458 | 9.0 |
| 820831 | 1800 | 2.10 | 436 | 8.5 |
| 820831 | 1900 | 2.10 | 436 | 8.5 |
| 820831 | 2000 | 2.07 | 414 | 8.0 |
| 820831 | 2100 | 2.07 | 414 | 8.0 |

Appendix Table 4-A-4 Cont.

| DATE | TIME | GAGE HEIGHT (ft) | DISCHARGE (cfs) | SURFACE WATER TEMPERATURE (C) |
|---|---|---|---|---|
| 820831 | 2200 | 2.07 | 414 | 7.5 |
| 820831 | 2300 | 2.07 | 414 | 7.5 |
| 820831 | 2400 | 2.03 | 394 | 7.5 |
| 820831 | DAILY MEAN | 2.12 | 446 | 7.8 |
| 820901 | 0100 | 2.03 | 394 | 7.5 |
| 820901 | 0200 | 2.03 | 394 | 7.5 |
| 820901 | 0300 | 2.03 | 394 | 7.5 |
| 820901 | 0400 | 2.07 | 414 | 7.5 |
| 820901 | 0500 | 2.03 | 394 | 7.5 |
| 820901 | 0600 | 2.03 | 394 | 7.0 |
| 820901 | 0700 | 2.03 | 394 | 7.0 |
| 820901 | 0800 | 2.03 | 394 | 7.0 |
| 820901 | 0900 | 2.03 | 394 | 7.5 |
| 820901 | 1000 | 2.00 | 374 | 7.5 |
| 820901 | 1100 | 2.00 | 374 | 8.0 |
| 820901 | 1200 | 2.00 | 374 | 8.0 |
| 820901 | 1300 | 2.00 | 374 | 8.5 |
| 820901 | 1400 | 1.97 | 355 | 9.0 |
| 820901 | 1500 | 1.97 | 355 | 9.0 |
| 820901 | 1600 | 1.97 | 355 | 9.0 |
| 820901 | 1700 | 1.97 | 355 | 9.0 |
| 820901 | 1800 | 1.93 | 337 | 9.0 |
| 820901 | 1900 | 1.93 | 337 | 8.5 |
| 820901 | 2000 | 1.93 | 337 | 8.5 |
| 820901 | 2100 | 1.93 | 337 | 8.0 |
| 820901 | 2200 | 1.93 | 337 | 7.5 |
| 820901 | 2300 | 1.93 | 337 | 7.5 |
| 820901 | 2400 | 1.90 | 320 | 7.5 |
| 820901 | DAILY MEAN | 1.99 | 367 | 7.9 |
| 820902 | 0100 | 1.93 | 337 | 7.0 |
| 820902 | 0200 | 1.90 | 320 | 7.0 |
| 820902 | 0300 | 1.90 | 320 | 7.0 |
| 820902 | 0400 | 1.90 | 320 | 7.0 |
| 820902 | 0500 | 1.90 | 320 | 7.0 |
| 820902 | 0600 | 1.90 | 320 | 7.0 |
| 820902 | 0700 | 1.90 | 320 | 7.0 |
| 820902 | 0800 | 1.90 | 320 | 7.0 |
| 820902 | 0900 | 1.90 | 320 | 7.0 |

Appendix Table 4-A-4 Cont.

| DATE | TIME | GAGE HEIGHT (ft) | DISCHARGE (cfs) | SURFACE WATER TEMPERATURE (C) |
|---|---|---|---|---|
| 820902 | 1000 | 1.90 | 320 | 7.0 |
| 820902 | 1100 | 1.90 | 320 | 7.5 |
| 820902 | 1200 | 1.90 | 320 | 8.0 |
| 820902 | 1300 | 1.87 | 304 | 8.5 |
| 820902 | 1400 | 1.87 | 304 | 9.0 |
| 820902 | 1500 | 1.87 | 304 | 9.0 |
| 820902 | 1600 | 1.87 | 304 | 9.5 |
| 820902 | 1700 | 1.83 | 288 | 9.5 |
| 820902 | 1800 | 1.83 | 288 | 9.0 |
| 820902 | 1900 | 1.83 | 288 | 9.0 |
| 820902 | 2000 | 1.83 | 288 | 9.0 |
| 820902 | 2100 | 1.83 | 288 | 8.5 |
| 820902 | 2200 | 1.80 | 273 | 8.0 |
| 820902 | 2300 | 1.83 | 288 | 8.0 |
| 820902 | 2400 | 1.83 | 288 | 8.0 |
| 820902 | DAILY MEAN | 1.87 | 307 | 7.9 |
| 820903 | 0100 | 1.83 | 288 | 8.0 |
| 820903 | 0200 | 1.87 | 304 | 7.5 |
| 820903 | 0300 | 1.83 | 288 | 7.5 |
| 820903 | 0400 | 1.87 | 304 | 7.5 |
| 820903 | 0500 | 1.87 | 304 | 7.0 |
| 820903 | 0600 | 1.90 | 320 | 7.5 |
| 820903 | 0700 | 1.90 | 320 | 7.0 |
| 820903 | 0800 | 1.90 | 320 | 7.0 |
| 820903 | 0900 | 1.93 | 337 | 7.0 |
| 820903 | 1000 | 1.93 | 337 | 7.0 |
| 820903 | 1100 | 1.93 | 337 | 7.0 |
| 820903 | 1200 | 1.97 | 355 | 7.5 |
| 820903 | 1300 | 1.93 | 337 | 7.5 |
| 820903 | 1400 | 1.93 | 337 | 8.0 |
| 820903 | 1500 | 1.93 | 337 | 8.5 |
| 820903 | 1600 | 1.93 | 337 | 8.5 |
| 820903 | 1700 | 1.93 | 337 | 8.5 |
| 820903 | 1800 | 1.90 | 320 | 8.5 |
| 820903 | 1900 | 1.90 | 320 | 8.5 |
| 820903 | 2000 | 1.90 | 320 | 8.0 |
| 820903 | 2100 | 1.90 | 320 | 8.0 |
| 820903 | 2200 | 1.90 | 320 | 7.5 |
| 820903 | 2300 | 1.90 | 320 | 7.5 |
| 820903 | 2400 | 1.87 | 304 | 7.0 |

Appendix Table 4-A-4 Cont.

| DATE | TIME | GAGE HEIGHT (ft) | DISCHARGE (cfs) | SURFACE WATER TEMPERATURE (C) |
|---|---|---|---|---|
| 820903 | DAILY MEAN | 1.90 | 322 | 7.6 |
| 820904 | 0100 | 1.90 | 320 | 7.0 |
| 820904 | 0200 | 1.90 | 320 | 7.0 |
| 820904 | 0300 | 1.90 | 320 | 7.0 |
| 820904 | 0400 | 1.90 | 320 | 7.0 |
| 820904 | 0500 | 1.87 | 304 | 6.5 |
| 820904 | 0600 | 1.87 | 304 | 6.5 |
| 820904 | 0700 | 1.87 | 304 | 6.5 |
| 820904 | 0800 | 1.83 | 288 | 6.5 |
| 820904 | 0900 | 1.87 | 304 | 7.0 |
| 820904 | 1000 | 1.83 | 288 | 7.0 |
| 820904 | 1100 | 1.83 | 288 | 7.5 |
| 820904 | 1200 | 1.83 | 288 | 8.0 |
| 820904 | 1300 | 1.83 | 288 | 8.0 |
| 820904 | 1400 | 1.80 | 273 | 8.5 |
| 820904 | 1500 | 1.80 | 273 | 9.0 |
| 820904 | 1600 | 1.80 | 273 | 9.0 |
| 820904 | 1700 | 1.77 | 259 | 9.0 |
| 820904 | 1800 | 1.80 | 273 | 9.0 |
| 820904 | 1900 | 1.80 | 273 | 8.5 |
| 820904 | 2000 | 1.80 | 273 | 8.5 |
| 820904 | 2100 | 1.80 | 273 | 8.0 |
| 820904 | 2200 | 1.80 | 273 | 7.5 |
| 820904 | 2300 | 1.80 | 273 | 7.5 |
| 820904 | 2400 | 1.80 | 273 | 7.0 |
| 820904 | DAILY MEAN | 1.83 | 288 | 7.6 |
| 820905 | 0100 | 1.77 | 259 | 7.0 |
| 820905 | 0200 | 1.77 | 259 | 6.5 |
| 820905 | 0300 | 1.80 | 273 | 6.5 |
| 820905 | 0400 | 1.80 | 273 | 6.5 |
| 820905 | 0500 | 1.80 | 273 | 6.5 |
| 820905 | 0600 | 1.80 | 273 | 6.5 |
| 820905 | 0700 | 1.77 | 259 | 6.5 |
| 820905 | 0800 | 1.77 | 259 | 6.5 |
| 820905 | 0900 | 1.80 | 273 | 7.0 |
| 820905 | 1000 | 1.80 | 273 | 7.0 |
| 820905 | 1100 | 1.77 | 259 | 7.5 |
| 820905 | 1200 | 1.77 | 259 | 7.5 |

Appendix Table 4-A-4 Cont.

| DATE | TIME | GAGE HEIGHT (ft) | DISCHARGE (cfs) | SURFACE WATER TEMPERATURE (C) |
|---|---|---|---|---|
| 820905 | 1300 | 1.77 | 259 | 7.5 |
| 820905 | 1400 | 1.77 | 259 | 8.0 |
| 820905 | 1500 | 1.77 | 259 | 8.0 |
| 820905 | 1600 | 1.77 | 259 | 8.5 |
| 820905 | 1700 | 1.77 | 259 | 8.5 |
| 820905 | 1800 | 1.73 | 246 | 8.5 |
| 820905 | 1900 | 1.77 | 259 | 8.5 |
| 820905 | 2000 | 1.73 | 246 | 8.0 |
| 820905 | 2100 | 1.73 | 246 | 8.0 |
| 820905 | 2200 | 1.73 | 246 | 8.0 |
| 820905 | 2300 | 1.73 | 246 | 8.0 |
| 820905 | 2400 | 1.73 | 246 | 8.0 |
| 820905 | DAILY MEAN | 1.77 | 259 | 7.5 |
| 820906 | 0100 | 1.73 | 246 | 7.5 |
| 820906 | 0200 | 1.73 | 246 | 7.5 |
| 820906 | 0300 | 1.73 | 246 | 7.5 |
| 820906 | 0400 | 1.70 | 233 | 7.5 |
| 820906 | 0500 | 1.73 | 246 | 7.5 |
| 820906 | 0600 | 1.73 | 246 | 7.5 |
| 820906 | 0700 | 1.73 | 246 | 7.5 |
| 820906 | 0800 | 1.73 | 246 | 7.0 |
| 820906 | 0900 | 1.70 | 233 | 7.5 |
| 820906 | 1000 | 1.70 | 233 | 7.5 |
| 820906 | 1100 | 1.70 | 233 | 7.5 |
| 820906 | 1200 | 1.70 | 233 | 8.0 |
| 820906 | 1300 | 1.73 | 246 | 8.0 |
| 820906 | 1400 | 1.70 | 233 | 8.0 |
| 820906 | 1500 | 1.70 | 233 | 8.5 |
| 820906 | 1600 | 1.70 | 233 | 8.5 |
| 820906 | 1700 | 1.70 | 233 | 8.5 |
| 820906 | 1800 | 1.70 | 233 | 8.5 |
| 820906 | 1900 | 1.70 | 233 | 8.5 |
| 820906 | 2000 | 1.70 | 233 | 8.0 |
| 820906 | 2100 | 1.70 | 233 | 8.0 |
| 820906 | 2200 | 1.67 | 220 | 8.0 |
| 820906 | 2300 | 1.67 | 220 | 7.5 |
| 820906 | 2400 | 1.67 | 220 | 7.5 |
| 820906 | DAILY MEAN | 1.71 | 235 | 7.8 |

Appendix Table 4-A4 Cont.

| DATE | TIME | GAGE HEIGHT (ft) | DISCHARGE (cfs) | SURFACE WATER TEMPERATURE (C) |
|---|---|---|---|---|
| 820907 | 0100 | 1.67 | 220 | 7.5 |
| 820907 | 0200 | 1.67 | 220 | 7.5 |
| 820907 | 0300 | 1.67 | 220 | 7.5 |
| 820907 | 0400 | 1.67 | 220 | 7.5 |
| 820907 | 0500 | 1.70 | 233 | 7.5 |
| 820907 | 0600 | 1.70 | 233 | 7.5 |
| 820907 | 0700 | 1.70 | 233 | 7.5 |
| 820907 | 0800 | 1.73 | 246 | 7.5 |
| 820907 | 0900 | 1.70 | 233 | 7.5 |
| 820907 | 1000 | 1.73 | 246 | 7.5 |
| 820907 | 1100 | 1.73 | 246 | 7.5 |
| 820907 | 1200 | 1.73 | 246 | 8.0 |
| 820907 | 1300 | 1.73 | 246 | 8.5 |
| 820907 | 1400 | 1.73 | 246 | 9.0 |
| 820907 | 1500 | 1.77 | 259 | 9.0 |
| 820907 | 1600 | 1.73 | 246 | 9.5 |
| 820907 | 1700 | 1.73 | 246 | 9.5 |
| 820907 | 1800 | 1.73 | 246 | 9.0 |
| 820907 | 1900 | 1.73 | 246 | 9.0 |
| 820907 | 2000 | 1.73 | 246 | 8.5 |
| 820907 | 2100 | 1.73 | 246 | 8.0 |
| 820907 | 2200 | 1.73 | 246 | 8.0 |
| 820907 | 2300 | 1.73 | 246 | 8.0 |
| 820907 | 2400 | 1.73 | 246 | 7.5 |
| 820907 | DAILY MEAN | 1.72 | 240 | 8.1 |
| 820908 | 0100 | 1.70 | 233 | 7.5 |
| 820908 | 0200 | 1.70 | 233 | 7.5 |
| 820908 | 0300 | 1.73 | 246 | 7.5 |
| 820908 | 0400 | 1.70 | 233 | 7.5 |
| 820908 | 0500 | 1.70 | 233 | 7.5 |
| 820908 | 0600 | 1.70 | 233 | 7.0 |
| 820908 | 0700 | 1.70 | 233 | 7.0 |
| 820908 | 0800 | 1.70 | 233 | 7.0 |
| 820908 | 0900 | 1.70 | 233 | 7.5 |
| 820908 | 1000 | 1.67 | 220 | 7.5 |
| 820908 | 1100 | 1.70 | 233 | 7.5 |
| 820908 | 1200 | 1.67 | 220 | 7.5 |
| 820908 | 1300 | 1.70 | 233 | 8.0 |
| 820908 | 1400 | 1.67 | 220 | 7.5 |
| 820908 | 1500 | 1.70 | 233 | 8.0 |

*Appendix* Table *4-A-4* Cont.

| DATE | TIME | GAGE HEIGHT (ft) | DISCHARGE (cfs) | SURFACE WATER TEMPERATURE (C) |
|---|---|---|---|---|
| 820908 | 1600 | 1.67 | 220 | 8.0 |
| 820908 | 1700 | 1.67 | 220 | 8.0 |
| 820908 | 1800 | 1.67 | 220 | 8.0 |
| 820908 | 1900 | 1.67 | 220 | 8.0 |
| 820908 | 2000 | 1.67 | 220 | 7.5 |
| 820908 | 2100 | 1.67 | 220 | 7.5 |
| 820908 | 2200 | 1.67 | 220 | 7.5 |
| 820908 | 2300 | 1.67 | 220 | 7.5 |
| 820908 | 2400 | 1.67 | 220 | 7.5 |
| 820908 | DAILY MEAN | 1.68 | 227 | 7.6 |
| 820909 | 0100 | 1.67 | 220 | 7.0 |
| 820909 | 0200 | 1.67 | 220 | 7.0 |
| 820909 | 0300 | 1.67 | 220 | 7.0 |
| 820909 | 0400 | 1.67 | 220 | 7.0 |
| 820909 | 0500 | 1.67 | 220 | 7.0 |
| 820909 | 0600 | 1.67 | 220 | 7.0 |
| 820909 | 0700 | 1.63 | 208 | 7.0 |
| 820909 | 0800 | 1.67 | 220 | 7.0 |
| 820909 | 0900 | 1.67 | 220 | 7.0 |
| 820909 | 1000 | 1.67 | 220 | 7.0 |
| 820909 | 1100 | 1.67 | 220 | 7.5 |
| 820909 | 1200 | 1.67 | 220 | 7.5 |
| 820909 | 1300 | 1.67 | 220 | 7.5 |
| 820909 | 1400 | 1.67 | 220 | 7.5 |
| 820909 | 1500 | 1.67 | 220 | 8.0 |
| 820909 | 1600 | 1.67 | 220 | 8.5 |
| 820909 | 1700 | 1.67 | 220 | 8.5 |
| 820909 | 1800 | 1.67 | 220 | 8.0 |
| 820909 | 1900 | 1.67 | 220 | 8.0 |
| 820909 | 2000 | 1.63 | 208 | 8.0 |
| 820909 | 2100 | 1.67 | 220 | 7.5 |
| 820909 | 2200 | 1.70 | 233 | 7.5 |
| 820909 | 2300 | 1.67 | 220 | 7.5 |
| 820909 | 2400 | 1.67 | 220 | 7.0 |
| 820909 | DAILY MEAN | 1.67 | 220 | 7.4 |
| 820910 | 0100 | 1.70 | 233 | 7.0 |
| 820910 | 0200 | 1.70 | 233 | 6.5 |
| 820910 | 0300 | 1.70 | 233 | 6.5 |

Appendix Table 4-A-4 Cont.

| DATE | TIME | GAGE HEIGHT (ft) | DISCHARGE (cfs) | SURFACE WATER TEMPERATURE (C) |
|---|---|---|---|---|
| 820910 | 0400 | 1.70 | 233 | 6.5 |
| 820910 | 0500 | 1.70 | 233 | 6.5 |
| 820910 | 0600 | 1.70 | 233 | 6.5 |
| 820910 | 0700 | 1.67 | 220 | 6.5 |
| 820910 | 0800 | 1.70 | 233 | 6.5 |
| 820910 | 0900 | 1.70 | 233 | 6.5 |
| 820910 | 1000 | 1.70 | 233 | 6.5 |
| 820910 | 1100 | 1.67 | 220 | 7.0 |
| 820910 | 1200 | 1.67 | 220 | 7.0 |
| 820910 | 1300 | 1.67 | 220 | 7.5 |
| 820910 | 1400 | 1.67 | 220 | 8.0 |
| 820910 | 1500 | 1.67 | 220 | 8.0 |
| 820910 | 1600 | 1.67 | 220 | 8.0 |
| 820910 | 1700 | 1.67 | 220 | 8.5 |
| 820910 | 1800 | 1.67 | 220 | 8.0 |
| 820910 | 1900 | 1.67 | 220 | 8.0 |
| 820910 | 2000 | 1.67 | 220 | 7.5 |
| 820910 | 2100 | 1.67 | 220 | 7.5 |
| 820910 | 2200 | 1.63 | 208 | 7.0 |
| 820910 | 2300 | 1.63 | 208 | 7.0 |
| 820910 | 2400 | 1.63 | 208 | 6.5 |
| 820910 | DAILY MEAN | 1.68 | 223 | 7.1 |
| 820911 | 0100 | 1.67 | 220 | 6.5 |
| 820911 | 0200 | 1.67 | 220 | 6.5 |
| 820911 | 0300 | 1.63 | 208 | 6.5 |
| 820911 | 0400 | 1.67 | 220 | 6.5 |
| 820911 | 0500 | 1.67 | 220 | 6.5 |
| 820911 | 0600 | 1.63 | 208 | 6.0 |
| 820911 | 0700 | 1.67 | 220 | 6.0 |
| 820911 | 0800 | 1.63 | 208 | 6.5 |
| 820911 | 0900 | 1.67 | 220 | 6.5 |
| 820911 | 1000 | 1.63 | 208 | 6.5 |
| 820911 | 1100 | 1.67 | 220 | 6.5 |
| 820911 | 1200 | 1.70 | 233 | 6.5 |
| 820911 | 1300 | 1.70 | 233 | 7.0 |
| 820911 | 1400 | 1.73 | 246 | 7.0 |
| 820911 | 1500 | 1.73 | 246 | 7.0 |
| 820911 | 1600 | 1.77 | 259 | 7.0 |
| 820911 | 1700 | 1.77 | 259 | 7.0 |
| 820911 | 1800 | 1.80 | 273 | 7.0 |

Appendix Table 4-A-4 Cont.

| DATE | TIME | GAGE HEIGHT (ft) | DISCHARGE (cfs) | SURFACE WATER TEMPERATURE (C) |
|---|---|---|---|---|
| 820911 | 1900 | 1.77 | 259 | 6.5 |
| 820911 | 2000 | 1.80 | 273 | 6.5 |
| 820911 | 2100 | 1.77 | 259 | 6.5 |
| 820911 | 2200 | 1.80 | 273 | 6.5 |
| 820911 | 2300 | 1.80 | 273 | 6.5 |
| 820911 | 2400 | 1.80 | 273 | 6.0 |
| 820911 | DAILY MEAN | 1.71 | 238 | 6.6 |
| 820912 | 0100 | 1.77 | 259 | 6.0 |
| 820912 | 0200 | 1.77 | 259 | 6.0 |
| 820912 | 0300 | 1.77 | 259 | 5.5 |
| 820912 | 0400 | 1.77 | 259 | 5.5 |
| 820912 | 0500 | 1.77 | 259 | 5.5 |
| 820912 | 0600 | 1.73 | 246 | 5.0 |
| 820912 | 0700 | 1.73 | 246 | 5.0 |
| 820912 | 0800 | 1.73 | 246 | 5.0 |
| 820912 | 0900 | 1.73 | 246 | 5.0 |
| 820912 | 1000 | 1.73 | 246 | 5.0 |
| 820912 | 1100 | 1.70 | 233 | 5.5 |
| 820912 | 1200 | 1.70 | 233 | 6.0 |
| 820912 | 1300 | 1.70 | 233 | 6.5 |
| 820912 | 1400 | 1.70 | 233 | 7.0 |
| 820912 | 1500 | 1.70 | 233 | 7.5 |
| 820912 | 1600 | 1.70 | 233 | 7.5 |
| 820912 | 1700 | 1.70 | 233 | 7.5 |
| 820912 | 1800 | 1.70 | 233 | 7.5 |
| 820912 | 1900 | 1.67 | 220 | 7.5 |
| 820912 | 2000 | 1.70 | 233 | 7.0 |
| 820912 | 2100 | 1.70 | 233 | 7.0 |
| 820912 | 2200 | 1.70 | 233 | 6.5 |
| 820912 | 2300 | 1.70 | 233 | 6.5 |
| 820912 | 2400 | 1.70 | 233 | 6.5 |
| 820912 | DAILY MEAN | 1.72 | 240 | 6.2 |
| 820913 | 0100 | 1.73 | 246 | 6.5 |
| 820913 | 0200 | 1.77 | 259 | 6.0 |
| 820913 | 0300 | 1.77 | 259 | 6.0 |
| 820913 | 0400 | 1.80 | 273 | 6.0 |
| 820913 | 0500 | 1.83 | 288 | 6.0 |
| 820913 | 0600 | 1.90 | 320 | 6.0 |

Appendix Table 4-A4 Cont.

| DATE | TIME | GAGE HEIGHT (ft) | DISCHARGE (cfs) | SURFACE WATER TEMPERATURE (C) |
|---|---|---|---|---|
| 820913 | 0700 | 1.93 | 337 | 6.0 |
| 820913 | 0800 | 2.00 | 374 | 6.0 |
| 820913 | 0900 | 2.07 | 414 | 6.0 |
| 820913 | 1000 | 2.13 | 458 | 6.0 |
| 820913 | 1100 | 2.17 | 482 | 6.0 |
| 820913 | 1200 | 2.23 | 532 | 6.0 |
| 820913 | 1300 | 2.30 | 586 | 6.0 |
| 820913 | 1400 | 2.33 | 615 | 6.0 |
| 820913 | 1500 | 2.40 | 677 | 6.5 |
| 820913 | 1600 | 2.40 | 677 | 6.5 |
| 820913 | 1700 | 2.40 | 677 | 6.5 |
| 820913 | 1800 | 2.37 | 645 | 6.5 |
| 820913 | 1900 | 2.37 | 645 | 6.5 |
| 820913 | 2000 | 2.37 | 645 | 6.5 |
| 820913 | 2100 | 2.37 | 645 | 6.5 |
| 820913 | 2200 | 2.33 | 615 | 6.5 |
| 820913 | 2300 | 2.37 | 645 | 6.5 |
| 820913 | 2400 | 2.37 | 645 | 6.5 |
| 820913 | DAILY MEAN | 2.15 | 473 | 6.2 |
| 820914 | 0100 | 2.33 | 615 | 6.5 |
| 820914 | 0200 | 2.37 | 645 | 6.5 |
| 820914 | 0300 | 2.37 | 645 | 6.5 |
| 820914 | 0400 | 2.37 | 645 | 6.5 |
| 820914 | 0500 | 2.40 | 677 | 6.5 |
| 820914 | 0600 | 2.43 | 710 | 6.5 |
| 820914 | 0700 | 2.47 | 744 | 6.5 |
| 820914 | 0800 | 2.47 | 744 | 6.5 |
| 820914 | 0900 | 2.47 | 744 | 6.5 |
| 820914 | 1000 | 2.47 | 744 | 6.5 |
| 820914 | 1100 | 2.47 | 744 | 6.5 |
| 820914 | 1200 | 2.50 | 780 | 6.5 |
| 820914 | 1300 | 2.53 | 817 | 6.5 |
| 820914 | 1400 | 2.50 | 780 | 7.0 |
| 820914 | 1500 | 2.50 | 780 | 7.0 |
| 820914 | 1600 | 2.47 | 744 | 7.0 |
| 820914 | 1700 | 2.47 | 744 | 6.5 |
| 820914 | 1800 | 2.50 | 780 | 7.0 |
| 820914 | 1900 | 2.53 | 817 | 6.5 |
| 820914 | 2000 | 2.53 | 817 | 6.5 |
| 820914 | 2100 | 2.57 | 856 | 6.5 |

Appendix Table 4-A-4 Cont.

| DATE | TIME | GAGE HEIGHT (ft) | DISCHARGE (cfs) | SURFACE WATER TEMPERATURE (C) |
|---|---|---|---|---|
| 820914 | 2200 | 2.60 | 896 | 6.5 |
| 820914 | 2300 | 2.63 | 938 | 6.5 |
| 820914 | 2400 | 2.67 | 982 | 6.5 |
| 820914 | DAILY MEAN | 2.48 | 762 | 6.6 |
| 820915 | 0100 | 2.77 | 1125 | 6.5 |
| 820915 | 0200 | 2.80 | 1176 | 6.5 |
| 820915 | 0300 | 2.87 | 1284 | 6.5 |
| 820915 | 0400 | 2.93 | 1402 | 6.5 |
| 820915 | 0500 | 2.93 | 1402 | 6.5 |
| 820915 | 0600 | 3.03 | 1595 | 6.0 |
| 820915 | 0700 | 3.07 | 1665 | 6.5 |
| 820915 | 0800 | 3.17 | 1890 | 6.5 |
| 820915 | 0900 | 3.27 | 2141 | 6.5 |
| 820915 | 1000 | 3.37 | 2420 | 6.5 |
| 820915 | 1100 | 3.40 | 2520 | 6.5 |
| 820915 | 1200 | 3.40 | 2520 | 7.0 |
| 820915 | 1300 | 3.43 | 2624 | 7.5 |
| 820915 | 1400 | 3.33 | 2324 | 7.5 |
| 820915 | 1500 | 3.23 | 2054 | 8.0 |
| 820915 | 1600 | 3.30 | 2231 | 8.0 |
| 820915 | 1700 | 3.20 | 1970 | 8.0 |
| 820915 | 1800 | 3.13 | 1812 | 8.0 |
| 820915 | 1900 | 3.17 | 1890 | 8.0 |
| 820915 | 2000 | 3.13 | 1812 | 8.0 |
| 820915 | 2100 | 3.07 | 1665 | 8.0 |
| 820915 | 2200 | 3.07 | 1665 | 7.5 |
| 820915 | 2300 | 3.10 | 1737 | 7.5 |
| 820915 | 2400 | 3.07 | 1665 | 7.5 |
| 820915 | DAILY MEAN | 3.13 | 1815 | 7.1 |
| 820916 | 0100 | 3.07 | 1665 | 7.5 |
| 820916 | 0200 | 3.10 | 1737 | 7.0 |
| 820916 | 0300 | 3.07 | 1665 | 7.0 |
| 820916 | 0400 | 3.07 | 1665 | 7.0 |
| 820916 | 0500 | 3.07 | 1665 | 7.0 |
| 820916 | 0600 | 3.07 | 1665 | 7.0 |
| 820916 | 0700 | 3.10 | 1737 | 6.5 |
| 820916 | 0800 | 3.13 | 1812 | 6.5 |
| 820916 | 0900 | 3.20 | 1970 | 6.5 |

Appendix Table 4-A-4 Cont.

| DATE | TIME | GAGE HEIGHT (ft) | DISCHARGE (cfs) | SURFACE WATER TEMPERATURE (C) |
|---|---|---|---|---|
| 820916 | 1000 | 3.17 | 1890 | 6.5 |
| 820916 | 1100 | 3.13 | 1812 | 6.5 |
| 820916 | 1200 | 3.13 | 1812 | 6.5 |
| 820916 | 1300 | 3.10 | 1737 | 7.0 |
| 820916 | 1500 | 3.03 | 1595 | 7.0 |
| 820916 | 1600 | 2.97 | 1464 | 7.0 |
| 820916 | 1700 | 2.97 | 1464 | 7.0 |
| 820916 | 1800 | 2.97 | 1464 | 7.0 |
| 820916 | 1900 | 2.90 | 1342 | 6.5 |
| 820916 | 2000 | 2.87 | 1284 | 6.5 |
| 820916 | 2100 | 2.87 | 1284 | 6.5 |
| 820916 | 2200 | 2.83 | 1229 | 6.0 |
| 820916 | 2300 | 2.77 | 1125 | 6.0 |
| 820916 | 2400 | 2.77 | 1125 | 6.0 |
| 820916 | DAILY MEAN | 3.01 | 1557 | 6.7 |
| 820917 | 0100 | 2.77 | 1125 | 6.0 |
| 820917 | 0200 | 2.77 | 1125 | 6.0 |
| 820917 | 0300 | 2.77 | 1125 | 6.0 |
| 820917 | 0400 | 2.77 | 1125 | 5.5 |
| 820917 | 0500 | 2.80 | 1176 | 5.5 |
| 820917 | 0600 | 2.80 | 1176 | 5.5 |
| 820917 | 0700 | 2.77 | 1125 | 5.5 |
| 820917 | 0800 | 2.77 | 1125 | 5.5 |
| 820917 | 0900 | 2.77 | 1125 | 5.5 |
| 820917 | 1000 | 2.77 | 1125 | 5.5 |
| 820917 | 1100 | 2.73 | 1075 | 5.5 |
| 820917 | 1200 | 2.77 | 1125 | 5.5 |
| 820917 | 1300 | 2.70 | 1028 | 6.0 |
| 820917 | 1400 | 2.70 | 1028 | 6.0 |
| 820917 | 1500 | 2.73 | 1075 | 6.0 |
| 820917 | 1600 | 2.70 | 1028 | 6.0 |
| 820917 | 1700 | 2.70 | 1028 | 6.5 |
| 820917 | 1800 | 2.67 | 982 | 6.0 |
| 820917 | 1900 | 2.63 | 938 | 6.0 |
| 820917 | 2000 | 2.63 | 938 | 6.0 |
| 820917 | 2100 | 2.63 | 938 | 6.0 |
| 820917 | 2200 | 2.57 | 856 | 6.0 |
| 820917 | 2300 | 2.57 | 856 | 6.0 |
| 820917 | 2400 | 2.57 | 856 | 5.5 |

Appendix Table 4-A-4 Cont.

| DATE | TIME | GAGE HEIGHT (ft) | DISCHARGE (cfs) | SURFACE WATER TEMPERATURE (C) |
|---|---|---|---|---|
| 820917 | DAILY MEAN | 2.71 | 1041 | 5.8 |
| 820918 | 0100 | 2.53 | 817 | 5.5 |
| 820918 | 0200 | 2.53 | 817 | 5.5 |
| 820918 | 0300 | 2.53 | 817 | 5.5 |
| 820918 | 0400 | 2.50 | 780 | 5.5 |
| 820918 | 0500 | 2.50 | 780 | 5.5 |
| 820918 | 0600 | 2.50 | 780 | 5.5 |
| 820918 | 0700 | 2.43 | 710 | 5.5 |
| 820918 | 0800 | 2.47 | 744 | 5.5 |
| 820918 | 0900 | 2.43 | 710 | 5.5 |
| 820918 | 1000 | 2.40 | 677 | 5.5 |
| 820918 | 1100 | 2.40 | 677 | 6.0 |
| 820918 | 1200 | 2.40 | 677 | 6.0 |
| 820918 | 1300 | 2.40 | 677 | 6.5 |
| 820918 | 1400 | 2.40 | 677 | 6.5 |
| 820918 | 1500 | 2.40 | 677 | 6.5 |
| 820918 | 1600 | 2.37 | 645 | 6.5 |
| 820918 | 1700 | 2.37 | 645 | 6.5 |
| 820918 | 1800 | 2.37 | 645 | 6.5 |
| 820918 | 1900 | 2.40 | 677 | 6.5 |
| 820918 | 2000 | 2.40 | 677 | 6.5 |
| 820918 | 2100 | 2.40 | 677 | 6.5 |
| 820918 | 2200 | 2.43 | 710 | 6.5 |
| 820918 | 2300 | 2.47 | 744 | 6.0 |
| 820918 | 2400 | 2.50 | 780 | 6.0 |
| 820918 | DAILY MEAN | 2.44 | 716 | 6.0 |
| 820919 | 0100 | 2.53 | 817 | 6.0 |
| 820919 | 0200 | 2.53 | 817 | 6.0 |
| 820919 | 0300 | 2.53 | 817 | 6.0 |
| 820919 | 0400 | 2.53 | 817 | 6.0 |
| 820919 | 0500 | 2.57 | 856 | 6.0 |
| 820919 | 0600 | 2.53 | 817 | 6.0 |
| 820919 | 0700 | 2.50 | 780 | 6.0 |
| 820919 | 0800 | 2.53 | 817 | 6.0 |
| 820919 | 0900 | 2.50 | 780 | 6.0 |
| 820919 | 1000 | 2.53 | 817 | 6.0 |
| 820919 | 1100 | 2.53 | 817 | 6.0 |
| 820919 | 1200 | 2.50 | 780 | 6.0 |
| 820919 | 1300 | 2.53 | 817 | 6.5 |

Appendix Table 4-A-4 Cont.

| DATE | TIME | GAGE HEIGHT (ft) | DISCHARGE (cfs) | SURFACE WATER TEMPERATURE (C) |
|---|---|---|---|---|
| 820919 | 1400 | 2.57 | 856 | 6.5 |
| 820919 | 1500 | 2.57 | 856 | 6.5 |
| 820919 | 1600 | 2.63 | 938 | 6.5 |
| 820919 | 1700 | 2.63 | 938 | 6.5 |
| 820919 | 1800 | 2.73 | 1075 | 6.5 |
| 820919 | 1900 | 2.77 | 1125 | 6.5 |
| 820919 | 2000 | 2.80 | 1176 | 6.5 |
| 820919 | 2100 | 2.83 | 1229 | 6.5 |
| 820919 | 2200 | 2.83 | 1229 | 6.0 |
| 820919 | 2300 | 2.90 | 1342 | 6.0 |
| 820919 | 2400 | 2.93 | 1402 | 6.0 |
| 820919 | DAILY MEAN | 2.63 | 931 | 6.2 |
| 820920 | 0100 | 2.97 | 1464 | 6.0 |
| 820920 | 0200 | 3.00 | 1528 | 6.0 |
| 820920 | 0300 | 3.00 | 1528 | 6.0 |
| 820920 | 0400 | 3.00 | 1528 | 6.0 |
| 820920 | 0500 | 2.97 | 1464 | 6.0 |
| 820920 | 0600 | 3.00 | 1528 | 6.0 |
| 820920 | 0700 | 2.93 | 1402 | 5.5 |
| 820920 | 0800 | 2.97 | 1464 | 5.5 |
| 820920 | 0900 | 2.93 | 1402 | 6.0 |
| 820920 | 1000 | 2.93 | 1402 | 6.0 |
| 820920 | 1100 | 2.93 | 1402 | 6.0 |
| 820920 | 1200 | 2.90 | 1342 | 6.0 |
| 820920 | 1300 | 2.87 | 1284 | 6.5 |
| 820920 | 1400 | 2.83 | 1229 | 6.5 |
| 820920 | 1500 | 2.83 | 1229 | 6.5 |
| 820920 | 1600 | 2.80 | 1176 | 6.5 |
| 820920 | 1700 | 2.80 | 1176 | 6.5 |
| 820920 | 1800 | 2.80 | 1176 | 6.5 |
| 820920 | 1900 | 2.77 | 1125 | 6.5 |
| 820920 | 2000 | 2.77 | 1125 | 6.0 |
| 820920 | 2100 | 2.77 | 1125 | 6.0 |
| 820920 | 2200 | 2.73 | 1075 | 6.0 |
| 820920 | 2300 | 2.70 | 1028 | 6.0 |
| 820920 | 2400 | 2.70 | 1028 | 6.0 |
| 820920 | DAILY MEAN | 2.87 | 1291 | 6.1 |
| 820921 | 0100 | 2.70 | 1028 | 5.5 |

Appendix Table 4-A-4 Cont.

| DATE | TIME | GAGE HEIGHT (ft) | DISCHARGE (cfs) | SURFACE WATER TEMPERATURE (C) |
|---|---|---|---|---|
| 820921 | 0200 | 2.67 | 982 | 5.5 |
| 820921 | 0300 | 2.70 | 1028 | 5.5 |
| 820921 | 0400 | 2.67 | 982 | 5.5 |
| 820921 | 0500 | 2.63 | 938 | 5.5 |
| 820921 | 0600 | 2.63 | 938 | 5.5 |
| 820921 | 0700 | 2.60 | 896 | 5.5 |
| 820921 | 0800 | 2.63 | 938 | 5.5 |
| 820921 | 0900 | 2.63 | 938 | 5.5 |
| 820921 | 1000 | 2.60 | 896 | 5.5 |
| 820921 | 1100 | 2.60 | 896 | 6.0 |
| 820921 | 1200 | 2.57 | 856 | 6.0 |
| 820921 | 1300 | 2.57 | 856 | 6.5 |
| 820921 | 1400 | 2.53 | 817 | 6.5 |
| 820921 | 1500 | 2.57 | 856 | 6.5 |
| 820921 | 1600 | 2.57 | 856 | 6.5 |
| 820921 | 1700 | 2.53 | 817 | 6.5 |
| 820921 | 1800 | 2.57 | 856 | 6.5 |
| 820921 | 1900 | 2.57 | 856 | 6.5 |
| 820921 | 2000 | 2.53 | 817 | 6.0 |
| 820921 | 2100 | 2.53 | 817 | 6.0 |
| 820921 | 2200 | 2.53 | 817 | 6.0 |
| 820921 | 2300 | 2.47 | 744 | 6.0 |
| 820921 | 2400 | 2.47 | 744 | 6.0 |
| 820921 | DAILY MEAN | 2.59 | 879 | 5.9 |
| 820922 | 0100 | 2.47 | 744 | 6.0 |
| 820922 | 0200 | 2.47 | 744 | 5.5 |
| 820922 | 0300 | 2.47 | 744 | 6.0 |
| 820922 | 0400 | 2.43 | 710 | 5.5 |
| 820922 | 0500 | 2.43 | 710 | 5.5 |
| 820922 | 0600 | 2.43 | 710 | 5.5 |
| 820922 | 0700 | 2.43 | 710 | 5.5 |
| 820922 | 0800 | 2.43 | 710 | 5.5 |
| 820922 | 0900 | 2.43 | 710 | 5.5 |
| 820922 | 1000 | 2.43 | 710 | 5.5 |
| 820922 | 1100 | 2.40 | 677 | 5.5 |
| 820922 | 1200 | 2.40 | 677 | 6.0 |
| 820922 | 1300 | 2.43 | 710 | 6.0 |
| 820922 | 1400 | 2.43 | 710 | 6.0 |
| 820922 | 1500 | 2.43 | 710 | 6.0 |
| 820922 | 1600 | 2.43 | 710 | 6.0 |

Appendix Table 4-A-4 Cont.

| DATE | TIME | GAGE HEIGHT (ft) | DISCHARGE (cfs) | SURFACE WATER TEMPERATURE (C) |
|---|---|---|---|---|
| 820925 | 2000 | 1.97 | 355 | 5.5 |
| 820925 | 2100 | 1.97 | 355 | 5.5 |
| 820925 | 2200 | 1.97 | 355 | 5.5 |
| 820925 | 2300 | 1.97 | 355 | 5.0 |
| 820925 | 2400 | 1.97 | 355 | 5.0 |
| 820925 | DAILY MEAN | 2.01 | 378 | 4.6 |
| 820926 | 0100 | 1.97 | 355 | 5.0 |
| 820926 | 0200 | 1.97 | 355 | 5.0 |
| 820926 | 0300 | 1.97 | 355 | 5.0 |
| 820926 | 0400 | 1.93 | 337 | 4.5 |
| 820926 | 0500 | 1.93 | 337 | 4.5 |
| 820926 | 0600 | 1.93 | 337 | 4.5 |
| 820926 | 0700 | 1.93 | 337 | 4.5 |
| 820926 | 0800 | 1.93 | 337 | 4.5 |
| 820926 | 0900 | 1.93 | 337 | 4.5 |
| 820926 | 1000 | 1.93 | 337 | 5.0 |
| 820926 | 1100 | 1.93 | 337 | 5.0 |
| 820926 | 1200 | 1.93 | 337 | 5.0 |
| 820926 | 1300 | 1.97 | 355 | 5.0 |
| 820926 | 1400 | 1.97 | 355 | 5.5 |
| 820926 | 1500 | 1.93 | 337 | 5.5 |
| 820926 | 1600 | 1.97 | 355 | 5.5 |
| 820926 | 1700 | 1.97 | 355 | 5.5 |
| 820926 | 1800 | 1.97 | 355 | 5.5 |
| 820926 | 1900 | 2.00 | 374 | 5.5 |
| 820926 | 2000 | 2.00 | 374 | 5.5 |
| 820926 | 2100 | 2.00 | 374 | 5.0 |
| 820926 | 2200 | 2.00 | 374 | 5.0 |
| 820926 | 2300 | 2.00 | 374 | 5.0 |
| 820926 | 2400 | 2.00 | 374 | 5.0 |
| 820926 | DAILY MEAN | 1.96 | 352 | 5.0 |
| 820927 | 0100 | 2.03 | 394 | 5.0 |
| 820927 | 0200 | 2.03 | 394 | 5.0 |
| 820927 | 0300 | 2.07 | 414 | 5.0 |
| 820927 | 0400 | 2.07 | 414 | 5.0 |
| 820927 | 0500 | 2.07 | 414 | 5.0 |
| 820927 | 0600 | 2.07 | 414 | 4.5 |
| 820927 | 0700 | 2.13 | 458 | 4.5 |

Appendix Table 4-A4 Cont.

| DATE | TIME | GAGE HEIGHT (ft) | DISCHARGE (cfs) | SURFACE WATER TEMPERATURE (C) |
|---|---|---|---|---|
| 820924 | 0500 | 2.13 | 458 | 3.5 |
| 820924 | 0600 | 2.17 | 482 | 3.0 |
| 820924 | 0700 | 2.13 | 458 | 3.0 |
| 820924 | 0800 | 2.13 | 458 | 3.0 |
| 820924 | 0900 | 2.13 | 458 | 3.0 |
| 820924 | 1000 | 2.13 | 458 | 3.5 |
| 820924 | 1100 | 2.10 | 436 | 3.5 |
| 820924 | 1200 | 2.10 | 436 | 4.0 |
| 820924 | 1300 | 2.10 | 436 | 4.5 |
| 820924 | 1400 | 2.10 | 436 | 5.0 |
| 820924 | 1500 | 2.10 | 436 | 5.0 |
| 820924 | 1600 | 2.10 | 436 | 5.5 |
| 820924 | 1700 | 2.10 | 436 | 5.5 |
| 820924 | 1800 | 2.07 | 414 | 5.5 |
| 820924 | 1900 | 2.10 | 436 | 5.0 |
| 820924 | 2000 | 2.07 | 414 | 5.0 |
| 820924 | 2100 | 2.07 | 414 | 5.0 |
| 820924 | 2200 | 2.07 | 414 | 5.0 |
| 820924 | 2300 | 2.07 | 414 | 4.5 |
| 820924 | 2400 | 2.07 | 414 | 4.5 |
| 820924 | DAILY MEAN | 2.11 | 444 | 4.2 |
| 820925 | 0100 | 2.07 | 414 | 4.5 |
| 820925 | 0200 | 2.03 | 394 | 4.0 |
| 820925 | 0300 | 2.07 | 414 | 4.0 |
| 820925 | 0400 | 2.03 | 394 | 4.0 |
| 820925 | 0500 | 2.03 | 394 | 4.0 |
| 820925 | 0600 | 2.03 | 394 | 3.5 |
| 820925 | 0700 | 2.03 | 394 | 3.5 |
| 820925 | 0800 | 2.03 | 394 | 3.5 |
| 820925 | 0900 | 2.03 | 394 | 3.5 |
| 820925 | 1000 | 2.00 | 374 | 4.0 |
| 820925 | 1100 | 2.03 | 394 | 4.0 |
| 820925 | 1200 | 2.00 | 374 | 4.5 |
| 820925 | 1300 | 2.00 | 374 | 5.0 |
| 820925 | 1400 | 2.00 | 374 | 5.0 |
| 820925 | 1500 | 2.00 | 374 | 5.5 |
| 820925 | 1600 | 2.00 | 374 | 5.5 |
| 820925 | 1700 | 2.00 | 374 | 5.5 |
| 820925 | 1800 | 1.97 | 355 | 5.5 |
| 820925 | 1900 | 1.97 | 355 | 5.5 |

Appendix Table 4-A-4 Cont.

| DATE | TIME | GAGE HEIGHT (ft) | DISCHARGE (cfs) | SURFACE WATER TEMPERATURE (C) |
|---|---|---|---|---|
| 820922 | 1700 | 2.40 | 677 | 6.0 |
| 820922 | 1800 | 2.40 | 677 | 6.0 |
| 820922 | 1900 | 2.40 | 677 | 6.0 |
| 820922 | 2000 | 2.40 | 677 | 6.0 |
| 820922 | 2100 | 2.37 | 645 | 5.5 |
| 820922 | 2200 | 2.37 | 645 | 5.5 |
| 820922 | 2300 | 2.37 | 645 | 5.0 |
| 820922 | 2400 | 2.33 | 615 | 5.0 |
| 820922 | DAILY MEAN | 2.42 | 693 | 5.7 |
| 820923 | 0100 | 2.37 | 645 | 5.0 |
| 820923 | 0200 | 2.33 | 615 | 4.5 |
| 820923 | 0300 | 2.30 | 586 | 4.5 |
| 820923 | 0400 | 2.33 | 615 | 4.5 |
| 820923 | 0500 | 2.30 | 586 | 4.5 |
| 820923 | 0600 | 2.30 | 586 | 4.0 |
| 820923 | 0700 | 2.27 | 558 | 4.0 |
| 820923 | 0800 | 2.27 | 558 | 4.0 |
| 820923 | 0900 | 2.27 | 558 | 4.0 |
| 820923 | 1000 | 2.23 | 532 | 4.0 |
| 820923 | 1100 | 2.23 | 532 | 4.0 |
| 820923 | 1200 | 2.23 | 532 | 4.5 |
| 820923 | 1300 | 2.23 | 532 | 5.0 |
| 820923 | 1400 | 2.23 | 532 | 5.5 |
| 820923 | 1500 | 2.23 | 532 | 5.5 |
| 820923 | 1600 | 2.23 | 532 | 6.0 |
| 820923 | 1700 | 2.20 | 506 | 6.0 |
| 820923 | 1800 | 2.20 | 506 | 5.5 |
| 820923 | 1900 | 2.20 | 506 | 5.5 |
| 820923 | 2000 | 2.20 | 506 | 5.0 |
| 820923 | 2100 | 2.17 | 482 | 4.5 |
| 820923 | 2200 | 2.17 | 482 | 4.5 |
| 820923 | 2300 | 2.17 | 482 | 4.5 |
| 820923 | 2400 | 2.17 | 482 | 4.0 |
| 820923 | DAILY MEAN | 2.24 | 539 | 4.7 |
| 820924 | 0100 | 2.20 | 506 | 4.0 |
| 820924 | 0200 | 2.17 | 482 | 3.5 |
| 820924 | 0300 | 2.17 | 482 | 3.5 |
| 820924 | 0400 | 2.13 | 458 | 3.5 |

Appendix Table 4-A-4 Cont.

| DATE | TIME | GAGE HEIGHT (ft) | DISCHARGE (cfs) | SURFACE WATER TEMPERATURE (C) |
|---|---|---|---|---|
| 820927 | 0800 | 2.13 | 458 | 4.5 |
| 820927 | 0900 | 2.17 | 482 | 4.5 |
| 820927 | 1000 | 2.20 | 506 | 4.5 |
| 820927 | 1100 | 2.17 | 482 | 5.0 |
| 820927 | 1200 | 2.20 | 506 | 5.0 |
| 820927 | 1300 | 2.17 | 482 | 5.0 |
| 820927 | 1400 | 2.17 | 482 | 5.5 |
| 820927 | 1500 | 2.10 | 436 | 5.5 |
| 820927 | 1600 | 2.10 | 436 | 6.0 |
| 820927 | 1700 | 2.10 | 436 | 5.5 |
| 820927 | 1800 | 2.10 | 436 | 5.5 |
| 820927 | 1900 | 2.07 | 414 | 5.5 |
| 820927 | 2000 | 2.07 | 414 | 5.0 |
| 820927 | 2100 | 2.07 | 414 | 5.0 |
| 820927 | 2200 | 2.03 | 394 | 4.5 |
| 820927 | 2300 | 2.03 | 394 | 4.5 |
| 820927 | 2400 | 2.00 | 374 | 4.0 |
| 820927 | DAILY MEAN | 2.10 | 434 | 5.0 |
| 820928 | 0100 | 2.03 | 394 | 4.0 |
| 820928 | 0200 | 2.03 | 394 | 3.5 |
| 820928 | 0300 | 2.00 | 374 | 3.5 |
| 820928 | 0400 | 2.00 | 374 | 3.5 |
| 820928 | 0500 | 1.97 | 355 | 3.5 |
| 820928 | 0600 | 1.97 | 355 | 3.5 |
| 820928 | 0700 | 1.97 | 355 | 3.0 |
| 820928 | 0800 | 1.97 | 355 | 3.0 |
| 820928 | 0900 | 1.97 | 355 | 3.5 |
| 820928 | 1000 | 1.97 | 355 | 3.5 |
| 820928 | 1100 | 1.93 | 337 | 3.5 |
| 820928 | 1200 | 1.93 | 337 | 4.0 |
| 820928 | 1300 | 1.93 | 337 | 4.5 |
| 820928 | 1400 | 1.90 | 320 | 4.5 |
| 820928 | 1500 | 1.93 | 337 | 4.5 |
| 820928 | 1600 | 1.93 | 337 | 4.5 |
| 820928 | 1700 | 1.90 | 320 | 4.5 |
| 820928 | 1800 | 1.90 | 320 | 5.0 |
| 820928 | 1900 | 1.93 | 337 | 4.5 |
| 820928 | 2000 | 1.93 | 337 | 4.5 |
| 820928 | 2100 | 1.93 | 337 | 4.5 |
| 820928 | 2200 | 1.93 | 337 | 4.5 |

Appendix Table 4-A-4 Cont.

| DATE | TIME | GAGE HEIGHT (ft) | DISCHARGE (cfs) | SURFACE WATER TEMPERATURE (C) |
|---|---|---|---|---|
| 820928 | 2300 | 1.93 | 337 | 4.5 |
| 820928 | 2400 | 1.93 | 337 | 4.5 |
| 820928 | DAILY MEAN | 1.95 | 347 | 4.0 |
| 820929 | 0100 | 1.97 | 355 | 4.5 |
| 820929 | 0200 | 1.97 | 355 | 4.5 |
| 820929 | 0300 | 1.97 | 355 | 4.5 |
| 820929 | 0400 | 2.00 | 374 | 4.5 |
| 820929 | 0500 | 1.97 | 355 | 4.5 |
| 820929 | 0600 | 1.97 | 355 | 4.5 |
| 820929 | 0700 | 1.97 | 355 | 4.5 |
| 820929 | 0800 | 1.97 | 355 | 4.5 |
| 820929 | 0900 | 1.97 | 355 | 4.5 |
| 820929 | 1000 | 1.97 | 355 | 4.5 |
| 820929 | 1100 | 1.97 | 355 | 4.5 |
| 820929 | 1200 | 1.97 | 355 | 5.0 |
| 820929 | 1300 | 1.93 | 337 | 5.0 |
| 820929 | 1400 | 1.93 | 337 | 5.5 |
| 820929 | 1500 | 1.93 | 337 | 5.5 |
| 820929 | 1600 | 1.90 | 320 | 5.5 |
| 820929 | 1700 | 1.93 | 337 | 5.5 |
| 820929 | 1800 | 1.93 | 337 | 5.5 |
| 820929 | 1900 | 1.93 | 337 | 5.5 |
| 820929 | 2000 | 1.90 | 320 | 5.0 |
| 820929 | 2100 | 1.90 | 320 | 5.5 |
| 820929 | 2200 | 1.93 | 337 | 5.0 |
| 820929 | 2300 | 1.93 | 337 | 5.0 |
| 820929 | 2400 | 1.93 | 337 | 5.0 |
| 820929 | DAILY MEAN | 1.95 | 345 | 4.9 |
| 820930 | 0100 | 1.93 | 337 | 5.0 |
| 820930 | 0200 | 1.93 | 337 | 5.0 |
| 820930 | 0300 | 1.93 | 337 | 5.0 |
| 820930 | 0400 | 1.97 | 355 | 5.0 |
| 820930 | 0500 | 1.97 | 355 | 4.5 |
| 820930 | 0600 | 1.97 | 355 | 4.5 |
| 820930 | 0700 | 1.93 | 337 | 4.5 |
| 820930 | 0800 | 1.93 | 337 | 4.5 |
| 820930 | 0900 | 1.93 | 337 | 4.5 |
| 820930 | 1000 | 1.93 | 337 | 4.5 |

Appendix Table 4-A-4 Cont.

| DATE | TIME | GAGE HEIGHT (ft) | DISCHARGE (cfs) | SURFACE WATER TEMPERATURE (C) |
|---|---|---|---|---|
| 820930 | 1100 | 1.93 | 337 | 5.0 |
| 820930 | 1200 | 1.90 | 320 | 5.0 |
| 820930 | 1300 | 1.93 | 337 | 5.5 |
| 820930 | 1400 | 1.90 | 320 | 5.5 |
| 820930 | 1500 | 1.90 | 320 | 6.0 |
| 820930 | 1600 | 1.90 | 320 | 6.0 |
| 820930 | 1700 | 1.90 | 320 | 6.0 |
| 820930 | 1800 | 1.90 | 320 | 5.5 |
| 820930 | 1900 | 1.90 | 320 | 5.5 |
| 820930 | 2000 | 1.90 | 320 | 5.5 |
| 820930 | 2100 | 1.90 | 320 | 5.5 |
| 820930 | 2200 | 1.90 | 320 | 5.0 |
| 820930 | 2300 | 1.90 | 320 | 5.0 |
| 820930 | 2400 | 1.87 | 304 | 5.0 |
| 820930 | DAILY MEAN | 1.92 | 330 | 5.1 |
| 821001 | 0100 | 1.87 | 281 | 4.5 |
| 821001 | 0200 | 1.87 | 281 | 4.5 |
| 821001 | 0300 | 1.87 | 281 | 4.5 |
| 821001 | 0400 | 1.87 | 281 | 4.5 |
| 821001 | 0500 | 1.87 | 281 | 4.5 |
| 821001 | 0600 | 1.87 | 281 | 4.5 |
| 821001 | 0700 | 1.87 | 281 | 4.5 |
| 821001 | 0800 | 1.87 | 281 | 4.0 |
| 821001 | 0900 | 1.87 | 281 | 4.5 |
| 821001 | 1000 | 1.87 | 281 | 4.5 |
| 821001 | 1100 | 1.87 | 281 | 4.5 |
| 821001 | 1200 | 1.87 | 281 | 4.5 |
| 821001 | 1300 | 1.87 | 281 | 5.0 |
| 821001 | 1400 | 1.87 | 281 | 5.0 |
| 821001 | 1500 | 1.87 | 281 | 5.0 |
| 821001 | 1600 | 1.87 | 281 | 5.0 |
| 821001 | 1700 | 1.83 | 266 | 5.0 |
| 821001 | 1800 | 1.87 | 281 | 5.0 |
| 821001 | 1900 | 1.87 | 281 | 5.0 |
| 821001 | 2000 | 1.83 | 266 | 4.5 |
| 821001 | 2100 | 1.83 | 266 | 4.5 |
| 821001 | 2200 | 1.83 | 266 | 4.5 |
| 821001 | 2300 | 1.83 | 266 | 4.5 |
| 821001 | 2400 | 1.83 | 266 | 4.5 |

Appendix Table 4-A-4 Cont.

| DATE | TIME | GAGE HEIGHT (ft) | DISCHARGE (cfs) | SURFACE WATER TEMPERATURE (C) |
|---|---|---|---|---|
| 821001 | DAILY MEAN | 1.86 | 277 | 4.6 |
| 821002 | 0100 | 1.83 | 266 | 4.0 |
| 821002 | 0200 | 1.83 | 266 | 4.0 |
| 821002 | 0300 | 1.83 | 266 | 4.0 |
| 821002 | 0400 | 1.80 | 252 | 4.0 |
| 821002 | 0500 | 1.83 | 266 | 4.0 |
| 821002 | 0600 | 1.80 | 252 | 4.0 |
| 821002 | 0700 | 1.80 | 252 | 4.0 |
| 821002 | 0800 | 1.83 | 266 | 4.0 |
| 821002 | 0900 | 1.80 | 252 | 4.0 |
| 821002 | 1000 | 1.80 | 252 | 4.0 |
| 821002 | 1100 | 1.80 | 252 | 4.5 |
| 821002 | 1200 | 1.80 | 252 | 4.5 |
| 821002 | 1300 | 1.80 | 252 | 5.0 |
| 821002 | 1400 | 1.80 | 252 | 5.0 |
| 821002 | 1500 | 1.80 | 252 | 5.5 |
| 821002 | 1600 | 1.80 | 252 | 5.0 |
| 821002 | 1700 | 1.80 | 252 | 5.0 |
| 821002 | 1800 | 1.77 | 239 | 5.0 |
| 821002 | 1900 | 1.77 | 239 | 5.0 |
| 821002 | 2000 | 1.80 | 252 | 5.0 |
| 821002 | 2100 | 1.77 | 239 | 4.5 |
| 821002 | 2200 | 1.77 | 239 | 4.5 |
| 821002 | 2300 | 1.77 | 239 | 4.5 |
| 821002 | 2400 | 1.77 | 239 | 4.0 |
| 821002 | DAILY MEAN | 1.80 | 252 | 4.5 |
| 821003 | 0100 | 1.77 | 239 | 4.0 |
| 821003 | 0200 | 1.77 | 239 | 4.0 |
| 821003 | 0300 | 1.77 | 239 | 4.0 |
| 821003 | 0400 | 1.77 | 239 | 4.0 |
| 821003 | 0500 | 1.77 | 239 | 4.0 |
| 821003 | 0600 | 1.77 | 239 | 4.0 |
| 821003 | 0700 | 1.77 | 239 | 4.0 |
| 821003 | 0800 | 1.77 | 239 | 4.0 |
| 821003 | 0900 | 1.77 | 239 | 4.0 |
| 821003 | 1000 | 1.77 | 239 | 4.0 |
| 821003 | 1100 | 1.77 | 239 | 4.5 |
| 821003 | 1200 | 1.77 | 239 | 4.5 |
| 821003 | 1300 | 1.73 | 226 | 5.0 |

'pendix Table 4-A-4 Cont.

| DATE | TIME | GAGE HEIGHT (ft) | DISCHARGE (cfs) | SURFACE WATER TEMPERATURE (C) |
|---|---|---|---|---|
| 821003 | 1400 | 1.73 | 226 | 5.0 |
| 821003 | 1500 | 1.73 | 226 | 5.0 |
| 821003 | 1600 | 1.73 | 226 | 5.0 |
| 821003 | 1700 | 1.77 | 239 | 5.0 |
| 821003 | 1800 | 1.73 | 226 | 5.0 |
| 821003 | 1900 | 1.73 | 226 | 5.0 |
| 821003 | 2000 | 1.73 | 226 | 4.5 |
| 821003 | 2100 | 1.73 | 226 | 4.0 |
| 821003 | 2200 | 1.73 | 226 | 4.0 |
| 821003 | 2300 | 1.73 | 226 | 4.0 |
| 821003 | 2400 | 1.73 | 226 | 3.5 |
| 821003 | DAILY MEAN | 1.75 | 233 | 4.3 |
| 821004 | 0100 | 1.73 | 226 | 3.5 |
| 821004 | 0200 | 1.73 | 226 | 3.5 |
| 821004 | 0300 | 1.70 | 214 | 3.0 |
| 821004 | 0400 | 1.73 | 226 | 3.0 |
| 821004 | 0500 | 1.73 | 226 | 3.0 |
| 821004 | 0600 | 1.70 | 214 | 2.5 |
| 821004 | 0700 | 1.70 | 214 | 2.5 |
| 821004 | 0800 | 1.70 | 214 | 2.5 |
| 821004 | 0900 | 1.70 | 214 | 2.5 |
| 821004 | 1000 | 1.70 | 214 | 2.5 |
| 821004 | 1100 | 1.70 | 214 | 3.0 |
| 821004 | 1200 | 1.70 | 214 | 3.0 |
| 821004 | 1300 | 1.70 | 214 | 3.5 |
| 821004 | 1400 | 1.70 | 214 | 4.0 |
| 821004 | 1500 | 1.70 | 214 | 4.0 |
| 821004 | 1600 | 1.70 | 214 | 4.0 |
| 821004 | 1700 | 1.67 | 203 | 4.0 |
| 821004 | 1800 | 1.67 | 203 | 4.0 |
| 821004 | 1900 | 1.67 | 203 | 4.0 |
| 821004 | 2000 | 1.70 | 214 | 3.5 |
| 821004 | 2100 | 1.70 | 214 | 3.5 |
| 821004 | 2200 | 1.70 | 214 | 3.5 |
| 821004 | 2300 | 1.70 | 214 | 3.0 |
| 821004 | 2400 | 1.70 | 214 | 3.0 |
| 821004 | DAILY MEAN | 1.70 | 215 | 3.3 |
| 821005 | 0100 | 1.70 | 214 | 3.0 |

Appendix Table 4-A-4 Cont.

| DATE | TIME | GAGE HEIGHT (ft) | DISCHARGE (cfs) | SURFACE WATER TEMPERATURE (C) |
|---|---|---|---|---|
| 821006 | 1700 | 1.60 | 181 | 3.0 |
| 821006 | 1800 | 1.60 | 181 | 3.0 |
| 821006 | 1900 | 1.60 | 181 | 3.0 |
| 821006 | 2000 | 1.60 | 181 | 3.0 |
| 821006 | 2100 | 1.60 | 181 | 2.5 |
| 821006 | 2200 | 1.60 | 181 | 2.5 |
| 821006 | 2300 | 1.60 | 181 | 2.5 |
| 821006 | 2400 | 1.60 | 181 | 2.5 |
| 821006 | DAILY MEAN | 1.61 | 183 | 2.2 |
| 821007 | 0100 | 1.60 | 181 | 2.5 |
| 821007 | 0200 | 1.60 | 181 | 2.0 |
| 821007 | 0300 | 1.60 | 181 | 2.0 |
| 821007 | 0400 | 1.60 | 181 | 2.0 |
| 821007 | 0500 | 1.60 | 181 | 2.0 |
| 821007 | 0600 | 1.60 | 181 | 2.0 |
| 821007 | 0700 | 1.60 | 181 | 2.0 |
| 821007 | 0800 | 1.60 | 181 | 2.0 |
| 821007 | 0900 | 1.60 | 181 | 2.0 |
| 821007 | 1000 | 1.60 | 181 | 2.0 |
| 821007 | 1100 | 1.60 | 181 | 2.0 |
| 821007 | 1200 | 1.60 | 181 | 2.0 |
| 821007 | 1300 | 1.60 | 181 | 2.0 |
| 821007 | 1400 | 1.63 | 192 | 2.5 |
| 821007 | 1500 | 1.60 | 181 | 2.5 |
| 821007 | 1600 | 1.60 | 181 | 3.0 |
| 821007 | 1700 | 1.60 | 181 | 3.0 |
| 821007 | 1800 | 1.60 | 181 | 3.0 |
| 821007 | 1900 | 1.60 | 181 | 3.0 |
| 821007 | 2000 | 1.60 | 181 | 3.0 |
| 821007 | 2100 | 1.60 | 181 | 2.5 |
| 821007 | 2200 | 1.60 | 181 | 2.5 |
| 821007 | 2300 | 1.60 | 181 | 2.5 |
| 821007 | 2400 | 1.60 | 181 | 2.5 |
| 821007 | DAILY MEAN | 1.60 | 182 | 2.4 |
| 821008 | 0100 | 1.60 | 181 | 2.5 |
| 821008 | 0200 | 1.60 | 181 | 2.5 |
| 821008 | 0300 | 1.57 | 171 | 2.0 |
| 821008 | 0400 | 1.60 | 181 | 2.0 |

Appendix Table 4-A-4 Cont.

| DATE | TIME | GAGE HEIGHT (ft) | DISCHARGE (cfs) | SURFACE WATER TEMPERATURE (C) |
|---|---|---|---|---|
| 821008 | 0500 | 1.60 | 181 | 2.0 |
| 821008 | 0600 | 1.60 | 181 | 2.0 |
| 821008 | 0700 | 1.57 | 171 | 2.0 |
| 821008 | 0800 | 1.60 | 181 | 2.0 |
| 821008 | 0900 | 1.57 | 171 | 2.0 |
| 821008 | 1000 | 1.57 | 171 | 2.0 |
| 821008 | 1100 | 1.57 | 171 | 2.5 |
| 821008 | 1200 | 1.57 | 171 | 2.5 |
| 821008 | 1300 | 1.57 | 171 | 2.5 |
| 821008 | 1400 | 1.57 | 171 | 3.0 |
| 821008 | 1500 | 1.57 | 171 | 3.0 |
| 821008 | 1600 | 1.57 | 171 | 3.0 |
| 821008 | 1700 | 1.57 | 171 | 3.0 |
| 821008 | 1800 | 1.57 | 171 | 3.0 |
| 821008 | 1900 | 1.57 | 171 | 3.0 |
| 821008 | 2000 | 1.57 | 171 | 2.5 |
| 821008 | 2100 | 1.57 | 171 | 2.5 |
| 821008 | 2200 | 1.57 | 171 | 2.5 |
| 821008 | 2300 | 1.57 | 171 | 2.0 |
| 821008 | 2400 | 1.57 | 171 | 2.0 |
| 821008 | DAILY MEAN | 1.58 | 174 | 2.4 |
| 821009 | 0100 | 1.57 | 171 | 2.0 |
| 821009 | 0200 | 1.57 | 171 | 2.0 |
| 821009 | 0300 | 1.57 | 171 | 2.0 |
| 821009 | 0400 | 1.57 | 171 | 2.0 |
| 821009 | 0500 | 1.57 | 171 | 2.0 |
| 821009 | 0600 | 1.57 | 171 | 2.0 |
| 821009 | 0700 | 1.57 | 171 | 2.0 |
| 821009 | 0800 | 1.57 | 171 | 2.0 |
| 821009 | 0900 | 1.57 | 171 | 2.0 |
| 821009 | 1000 | 1.57 | 171 | 2.0 |
| 821009 | 1100 | 1.57 | 171 | 2.5 |
| 821009 | 1200 | 1.57 | 171 | 3.0 |
| 821009 | 1300 | 1.57 | 171 | 3.0 |
| 821009 | 1400 | 1.57 | 171 | 3.0 |
| 821009 | 1500 | 1.57 | 171 | 3.5 |
| 821009 | 1600 | 1.57 | 171 | 3.5 |
| 821009 | 1700 | 1.57 | 171 | 3.5 |
| 821009 | 1800 | 1.57 | 171 | 3.0 |
| 821009 | 1900 | 1.57 | 171 | 3.0 |

Appendix Table 4-A-4 Cont.

| DATE | TIME | GAGE HEIGHT (ft) | DISCHARGE (cfs) | SURFACE WATER TEMPERATURE (C) |
|---|---|---|---|---|
| 821009 | 2000 | 1.53 | 162 | 3.0 |
| 821009 | 2100 | 1.57 | 171 | 3.0 |
| 821009 | 2200 | 1.53 | 162 | 3.0 |
| 821009 | 2300 | 1.53 | 162 | 3.0 |
| 821009 | 2400 | 1.53 | 162 | 2.5 |
| 821009 | DAILY MEAN | 1.56 | 170 | 2.6 |
| 821010 | 0100 | 1.53 | 162 | 3.0 |
| 821010 | 0200 | 1.53 | 162 | 2.5 |
| 821010 | 0300 | 1.53 | 162 | 2.5 |
| 821010 | 0400 | 1.53 | 162 | 2.5 |
| 821010 | 0500 | 1.53 | 162 | 2.5 |
| 821010 | 0600 | 1.53 | 162 | 2.5 |
| 821010 | 0700 | 1.53 | 162 | 2.5 |
| 821010 | 0800 | 1.53 | 162 | 2.0 |
| 821010 | 0900 | 1.53 | 162 | 2.0 |
| 821010 | 1000 | 1.53 | 162 | 2.5 |
| 821010 | 1100 | 1.53 | 162 | 2.5 |
| 821010 | 1200 | 1.53 | 162 | 2.5 |
| 821010 | 1300 | 1.53 | 162 | 3.0 |
| 821010 | 1400 | 1.53 | 162 | 3.0 |
| 821010 | 1500 | 1.53 | 162 | 3.0 |
| 821010 | 1600 | 1.53 | 162 | 3.0 |
| 821010 | 1700 | 1.53 | 162 | 3.0 |
| 821010 | 1800 | 1.53 | 162 | 2.5 |
| 821010 | 1900 | 1.50 | 153 | 2.5 |
| 821010 | 2000 | 1.50 | 153 | 2.5 |
| 821010 | 2100 | 1.53 | 162 | 2.5 |
| 821010 | 2200 | 1.53 | 162 | 2.5 |
| 821010 | 2300 | 1.50 | 153 | 2.5 |
| 821010 | 2400 | 1.53 | 162 | 2.0 |
| 821010 | DAILY MEAN | 1.53 | 161 | 2.6 |
| 821011 | 0100 | 1.53 | 162 | 2.0 |
| 821011 | 0200 | 1.50 | 153 | 2.0 |
| 821011 | 0300 | 1.50 | 153 | 2.0 |
| 821011 | 0400 | 1.50 | 153 | 2.0 |
| 821011 | 0500 | 1.50 | 153 | 2.0 |
| 821011 | 0600 | 1.50 | 153 | 2.0 |
| 821011 | 0700 | 1.50 | 153 | 2.0 |

Appendix Table 4-A-4 Cont.

| DATE | TIME | GAGE HEIGHT (ft) | DISCHARGE (cfs) | SURFACE WATER TEMPERATURE (C) |
|---|---|---|---|---|
| 821011 | 0800 | 1.50 | 153 | 2.0 |
| 821011 | 0900 | 1.53 | 162 | 2.0 |
| 821011 | 1000 | 1.50 | 153 | 2.0 |
| 821011 | 1100 | 1.50 | 153 | 2.0 |
| 821011 | 1200 | 1.50 | 153 | 2.5 |
| 821011 | 1300 | 1.50 | 153 | 2.5 |
| 821011 | 1400 | 1.50 | 153 | 2.5 |
| 821011 | 1500 | 1.50 | 153 | 2.5 |
| 821011 | 1600 | 1.50 | 153 | 2.5 |
| 821011 | 1700 | 1.50 | 153 | 2.5 |
| 821011 | 1800 | 1.50 | 153 | 2.0 |
| 821011 | 1900 | 1.50 | 153 | 2.0 |
| 821011 | 2000 | 1.50 | 153 | 2.0 |
| 821011 | 2100 | 1.50 | 153 | 2.0 |
| 821011 | 2200 | 1.50 | 153 | 2.0 |
| 821011 | 2300 | 1.50 | 153 | 2.0 |
| 821011 | 2400 | 1.50 | 153 | 1.5 |
| 821011 | DAILY MEAN | 1.50 | 154 | 2.1 |
| 821012 | 0100 | 1.53 | 162 | 1.5 |
| 821012 | 0200 | 1.53 | 162 | 1.5 |
| 821012 | 0300 | 1.53 | 162 | 1.0 |
| 821012 | 0400 | 1.53 | 162 | 1.0 |
| 821012 | 0500 | 1.53 | 162 | 1.5 |
| 821012 | 0600 | 1.53 | 162 | 1.5 |
| 821012 | 0700 | 1.53 | 162 | 1.5 |
| 821012 | 0800 | 1.53 | 162 | 1.5 |
| 821012 | 0900 | 1.53 | 162 | 1.5 |
| 821012 | 1000 | 1.53 | 162 | 2.0 |
| 821012 | 1100 | 1.50 | 153 | 2.0 |
| 821012 | 1200 | 1.53 | 162 | 2.0 |
| 821012 | 1300 | 1.53 | 162 | 2.0 |
| 821012 | 1400 | 1.50 | 153 | 2.5 |
| 821012 | 1500 | 1.50 | 153 | 2.5 |
| 821012 | 1600 | 1.50 | 153 | 2.5 |
| 821012 | 1700 | 1.53 | 162 | 2.5 |
| 821012 | 1800 | 1.53 | 162 | 2.5 |
| 821012 | 1900 | 1.53 | 162 | 2.5 |
| 821012 | 2000 | 1.53 | 162 | 2.5 |
| 821012 | 2100 | 1.57 | 171 | 2.5 |
| 821012 | 2200 | 1.57 | 171 | 2.5 |

Appendix Table 4-A-4 Cont.

| DATE | TIME | GAGE HEIGHT (ft) | DISCHARGE (cfs) | SURFACE WATER TEMPERATURE (C) |
|---|---|---|---|---|
| 821012 | 2300 | 1.57 | 171 | 2.5 |
| 821012 | 2400 | 1.60 | 181 | 2.5 |
| 821012 | DAILY MEAN | 1.53 | 162 | 2.0 |
| 821013 | 0100 | 1.57 | 171 | 2.0 |
| 821013 | 0200 | 1.57 | 171 | 2.0 |
| 821013 | 0300 | 1.57 | 171 | 2.0 |
| 821013 | 0400 | 1.57 | 171 | 1.5 |
| 821013 | 0500 | 1.57 | 171 | 1.5 |
| 821013 | 0600 | 1.53 | 162 | 1.5 |
| 821013 | 0700 | 1.53 | 162 | 1.5 |
| 821013 | 0800 | 1.53 | 162 | 1.5 |
| 821013 | 0900 | 1.53 | 162 | 1.5 |
| 821013 | 1000 | 1.53 | 162 | 1.5 |
| 821013 | 1100 | 1.53 | 162 | 1.5 |
| 821013 | 1200 | 1.53 | 162 | 1.5 |
| 821013 | 1300 | 1.53 | 162 | 1.5 |
| 821013 | 1400 | 1.50 | 153 | 2.0 |
| 821013 | 1500 | 1.53 | 162 | 2.0 |
| 821013 | 1600 | 1.50 | 153 | 2.0 |
| 821013 | 1700 | 1.50 | 153 | 2.0 |
| 821013 | 1800 | 1.50 | 153 | 2.0 |
| 821013 | 1900 | 1.50 | 153 | 2.0 |
| 821013 | 2000 | 1.50 | 153 | 2.0 |
| 821013 | 2100 | 1.50 | 153 | 2.0 |
| 821013 | 2200 | 1.50 | 153 | 1.5 |
| 821013 | 2300 | 1.50 | 153 | 1.5 |
| 821013 | 2400 | 1.50 | 153 | 1.5 |
| 821013 | DAILY MEAN | 1.53 | 160 | 1.7 |
| 821014 | 0100 | 1.50 | 153 | 1.5 |
| 821014 | 0200 | 1.50 | 153 | 1.0 |
| 821014 | 0300 | 1.50 | 153 | 1.5 |
| 821014 | 0400 | 1.50 | 153 | 1.0 |
| 821014 | 0500 | 1.50 | 153 | 1.0 |
| 821014 | 0600 | 1.47 | 144 | 1.0 |
| 821014 | 0700 | 1.47 | 144 | 1.0 |
| 821014 | 0800 | 1.47 | 144 | 1.0 |
| 821014 | 0900 | 1.47 | 144 | 1.0 |
| 821014 | 1000 | 1.47 | 144 | 1.0 |

Appendix Table 4-A-4 Cont.

| DATE | TIME | GAGE HEIGHT (ft) | DISCHARGE (cfs) | SURFACE WATER TEMPERATURE (C) |
|---|---|---|---|---|
| 821014 | 1100 | 1.47 | 144 | 1.5 |
| 821014 | 1200 | 1.47 | 144 | 1.5 |
| 821014 | 1300 | 1.47 | 144 | 2.0 |
| 821014 | 1400 | 1.47 | 144 | 2.0 |
| 821014 | 1500 | 1.47 | 144 | 2.0 |
| 821014 | 1600 | 1.47 | 144 | 2.0 |
| 821014 | 1700 | 1.47 | 144 | 2.0 |
| 821014 | 1800 | 1.47 | 144 | 2.0 |
| 821014 | 1900 | 1.47 | 144 | 1.5 |
| 821014 | 2000 | 1.47 | 144 | 1.5 |
| 821014 | 2100 | 1.47 | 144 | 1.0 |
| 821014 | 2200 | 1.47 | 144 | 1.0 |
| 821014 | 2300 | 1.47 | 144 | .5 |
| 821014 | 2400 | 1.47 | 144 | .5 |
| 821014 | DAILY MEAN | 1.47 | 146 | 1.3 |
| 821015 | 0100 | 1.47 | 144 | 0.0 |
| 821015 | 0200 | 1.43 | 136 | 0.0 |
| 821015 | 0300 | 1.43 | 136 | 0.0 |
| 821015 | 0400 | 1.43 | 136 | 0.0 |
| 821015 | 0500 | 1.43 | 136 | 0.0 |
| 821015 | 0600 | 1.40 | 129 | 0.0 |
| 821015 | 0700 | 1.40 | 129 | 0.0 |
| 821015 | 0800 | 1.40 | 129 | 0.0 |
| 821015 | 0900 | 1.40 | 129 | 0.0 |
| 821015 | 1000 | 1.37 | 121 | 0.0 |
| 821015 | 1100 | 1.37 | 121 | 0.0 |
| 821015 | 1200 | 1.37 | 121 | 0.0 |
| 821015 | 1300 | 1.40 | 129 | .5 |
| 821015 | 1400 | 1.40 | 129 | .5 |
| 821015 | 1500 | 1.43 | 136 | .5 |
| 821015 | 1600 | 1.43 | 136 | .5 |
| 821015 | 1700 | 1.43 | 136 | .5 |
| 821015 | 1800 | 1.40 | 129 | .5 |
| 821015 | 1900 | 1.40 | 129 | .5 |
| 821015 | 2000 | 1.43 | 136 | 0.0 |
| 821015 | 2100 | 1.43 | 136 | 0.0 |
| 821015 | 2200 | 1.43 | 136 | 0.0 |
| 821015 | 2300 | 1.43 | 136 | 0.0 |
| 821015 | 2400 | 1.43 | 136 | 0.0 |

Appendix Table 4-A-4 Cont.

| DATE | TIME | GAGE HEIGHT (ft) | DISCHARGE (cfs) | SURFACE WATER TEMPERATURE (C) |
|---|---|---|---|---|
| 821015 | DAILY MEAN | 1.42 | 132 | .1 |
| 821016 | 0100 | 1.43 | 136 | 0.0 |
| 821016 | 0200 | 1.40 | 129 | 0.0 |
| 821016 | 0300 | 1.43 | 136 | 0.0 |
| 821016 | 0400 | 1.40 | 129 | 0.0 |
| 821016 | 0500 | 1.40 | 129 | 0.0 |
| 821016 | 0600 | 1.40 | 129 | 0.0 |
| 821016 | 0700 | 1.40 | 129 | .5 |
| 821016 | 0800 | 1.40 | 129 | .5 |
| 821016 | 0900 | 1.43 | 136 | .5 |
| 821016 | 1000 | 1.43 | 136 | .5 |
| 821016 | 1100 | 1.43 | 136 | .5 |
| 821016 | 1200 | 1.43 | 136 | 1.0 |
| 821016 | 1300 | 1.43 | 136 | .5 |
| 821016 | 1400 | 1.43 | 136 | .5 |
| 821016 | 1500 | 1.43 | 136 | .5 |
| 821016 | 1600 | 1.43 | 136 | 1.0 |
| 821016 | 1700 | 1.43 | 136 | 1.0 |
| 821016 | 1800 | 1.43 | 136 | 1.0 |
| 821016 | 1900 | 1.43 | 136 | 1.0 |
| 821016 | 2000 | 1.43 | 136 | 1.0 |
| 821016 | 2100 | 1.43 | 136 | 1.0 |
| 821016 | 2200 | 1.43 | 136 | 1.0 |
| 821016 | 2300 | 1.43 | 136 | 1.0 |
| 821016 | 2400 | 1.43 | 136 | 1.0 |
| 821016 | DAILY MEAN | 1.42 | 134 | .6 |
| 821017 | 0100 | 1.43 | 136 | 1.0 |
| 821017 | 0200 | 1.43 | 136 | 1.0 |
| 821017 | 0300 | 1.43 | 136 | 1.0 |
| 821017 | 0400 | 1.43 | 136 | 1.0 |
| 821017 | 0500 | 1.43 | 136 | 1.0 |
| 821017 | 0600 | 1.43 | 136 | 1.5 |
| 821017 | 0700 | 1.43 | 136 | 1.5 |
| 821017 | 0800 | 1.43 | 136 | 1.5 |
| 821017 | 0900 | 1.43 | 136 | 1.5 |
| 821017 | 1000 | 1.43 | 136 | 1.5 |
| 821017 | 1100 | 1.43 | 136 | 2.0 |
| 821017 | 1200 | 1.43 | 136 | 2.0 |
| 821017 | 1300 | 1.43 | 136 | 2.0 |

Appendix Table 4-A-4 Cont.

| DATE | TIME | GAGE HEIGHT (ft) | DISCHARGE (cfs) | SURFACE WATER TEMPERATURE (C) |
|---|---|---|---|---|
| 821017 | 1400 | 1.43 | 136 | 2.5 |
| 821017 | 1500 | 1.43 | 136 | 2.5 |
| 821017 | 1600 | 1.43 | 136 | 2.5 |
| 821017 | 1700 | 1.43 | 136 | 2.0 |
| 821017 | 1800 | 1.43 | 136 | 2.0 |
| 821017 | 1900 | 1.43 | 136 | 2.0 |
| 821017 | 2000 | 1.43 | 136 | 1.5 |
| 821017 | 2100 | 1.43 | 136 | 1.5 |
| 821017 | 2200 | 1.43 | 136 | 1.0 |
| 821017 | 2300 | 1.43 | 136 | 1.0 |
| 821017 | 2400 | 1.43 | 136 | .5 |
| 821017 | DAILY MEAN | 1.43 | 136 | 1.6 |
| 821018 | 0100 | 1.43 | 136 | .5 |
| 821018 | 0200 | 1.43 | 136 | 0.0 |
| 821018 | 0300 | 1.40 | 129 | 0.0 |
| 821018 | 0400 | 1.40 | 129 | 0.0 |
| 821018 | 0500 | 1.40 | 129 | 0.0 |
| 821018 | 0600 | 1.40 | 129 | 0.0 |
| 821018 | 0700 | 1.40 | 129 | 0.0 |
| 821018 | 0800 | 1.40 | 129 | 0.0 |
| 821018 | 0900 | 1.40 | 129 | 0.0 |
| 821018 | 1000 | 1.40 | 129 | 0.0 |
| 821018 | 1100 | 1.40 | 129 | .5 |
| 821018 | 1200 | 1.40 | 129 | .5 |
| 821018 | 1300 | 1.40 | 129 | .5 |
| 821018 | 1400 | 1.40 | 129 | 1.0 |
| 821018 | 1500 | 1.40 | 129 | 1.0 |
| 821018 | 1600 | 1.40 | 129 | 1.5 |
| 821018 | 1700 | 1.40 | 129 | 1.0 |
| 821018 | 1800 | 1.40 | 129 | 1.5 |
| 821018 | 1900 | 1.40 | 129 | 1.5 |
| 821018 | 2000 | 1.43 | 136 | 1.0 |
| 821018 | 2100 | 1.40 | 129 | 1.0 |
| 821018 | 2200 | 1.40 | 129 | 1.0 |
| 821018 | 2300 | 1.40 | 129 | 1.0 |
| 821018 | 2400 | 1.40 | 129 | 1.0 |
| 821018 | DAILY MEAN | 1.40 | 130 | .6 |
| 821019 | 0100 | 1.40 | 129 | 1.0 |

Appendix Table 4-A-4 Cont.

| DATE | TIME | GAGE HEIGHT (ft) | DISCHARGE (cfs) | SURFACE WATER TEMPERATURE (C) |
|---|---|---|---|---|
| 821019 | 0200 | 1.40 | 129 | 1.0 |
| 821019 | 0300 | 1.40 | 129 | 1.0 |
| 821019 | 0400 | 1.40 | 129 | 1.0 |
| 821019 | 0500 | 1.40 | 129 | 1.0 |
| 821019 | 0600 | 1.40 | 129 | 1.0 |
| 821019 | 0700 | 1.40 | 129 | .5 |
| 821019 | 0800 | 1.40 | 129 | .5 |
| 821019 | 0900 | 1.40 | 129 | 0.0 |
| 821019 | 1000 | 1.40 | 129 | .5 |
| 821019 | 1100 | 1.43 | 136 | .5 |
| 821019 | 1200 | 1.40 | 129 | .5 |
| 821019 | 1300 | 1.40 | 129 | 1.0 |
| 821019 | 1400 | 1.40 | 129 | 1.0 |
| 821019 | 1500 | 1.40 | 129 | 1.5 |
| 821019 | 1600 | 1.40 | 129 | 1.5 |
| 821019 | 1700 | 1.40 | 129 | 1.5 |
| 821019 | 1800 | 1.40 | 129 | 1.5 |
| 821019 | 1900 | 1.40 | 129 | 1.5 |
| 821019 | 2000 | 1.40 | 129 | 1.5 |
| 821019 | 2100 | 1.40 | 129 | 1.5 |
| 821019 | 2200 | 1.40 | 129 | 1.5 |
| 821019 | 2300 | 1.40 | 129 | 1.0 |
| 821019 | 2400 | 1.40 | 129 | 1.0 |
| 821019 | DAILY MEAN | 1.40 | 129 | 1.0 |
| 821020 | 0100 | 1.40 | 129 | 1.0 |
| 821020 | 0200 | 1.40 | 129 | 1.0 |
| 821020 | 0300 | 1.40 | 129 | .5 |
| 821020 | 0400 | 1.40 | 129 | .5 |
| 821020 | 0500 | 1.37 | 121 | .5 |
| 821020 | 0600 | 1.37 | 121 | .5 |
| 821020 | 0700 | 1.40 | 129 | .5 |
| 821020 | 0800 | 1.37 | 121 | .5 |
| 821020 | 0900 | 1.37 | 121 | .5 |
| 821020 | 1000 | 1.37 | 121 | .5 |
| 821020 | 1100 | 1.37 | 121 | .5 |
| 821020 | 1200 | 1.37 | 121 | 1.0 |
| 821020 | 1300 | 1.37 | 121 | 1.0 |
| 821020 | 1400 | 1.37 | 121 | 1.0 |
| 821020 | 1500 | 1.37 | 121 | 1.0 |
| 821020 | 1600 | 1.37 | 121 | 1.0 |

Appendix Table 4-A-4 Cont.

| DATE | TIME | GAGE HEIGHT (ft) | DISCHARGE (cfs) | SURFACE WATER TEMPERATURE (C) |
|---|---|---|---|---|
| 821020 | 1700 | 1.37 | 121 | 1.0 |
| 821020 | 1800 | 1.37 | 121 | 1.0 |
| 821020 | 1900 | 1.37 | 121 | .5 |
| 821020 | 2000 | 1.37 | 121 | .5 |
| 821020 | 2100 | 1.37 | 121 | .5 |
| 821020 | 2200 | 1.37 | 121 | 0.0 |
| 821020 | 2300 | 1.37 | 121 | 0.0 |
| 821020 | 2400 | 1.37 | 121 | 0.0 |
| 821020 | DAILY MEAN | 1.37 | 123 | .6 |
| 821021 | 0100 | 1.33 | 114 | 0.0 |
| 821021 | 0200 | 1.33 | 114 | 0.0 |
| 821021 | 0300 | 1.33 | 114 | 0.0 |
| 821021 | 0400 | 1.33 | 114 | 0.0 |
| 821021 | 0500 | 1.33 | 114 | 0.0 |
| 821021 | 0600 | 1.33 | 114 | 0.0 |
| 821021 | 0700 | 1.33 | 114 | 0.0 |
| 821021 | 0800 | 1.33 | 114 | 0.0 |
| 821021 | 0900 | 1.33 | 114 | 0.0 |
| 821021 | 1000 | 1.33 | 114 | 0.0 |
| 821021 | 1100 | 1.30 | 108 | 0.0 |
| 821021 | 1200 | 1.30 | 108 | 0.0 |
| 821021 | 1300 | 1.30 | 108 | 0.0 |
| 821021 | 1400 | 1.30 | 108 | 0.0 |
| 821021 | 1500 | 1.30 | 108 | 0.0 |
| 821021 | 1600 | 1.30 | 108 | 0.0 |
| 821021 | 1700 | 1.30 | 108 | 0.0 |
| 821021 | 1800 | 1.30 | 108 | 0.0 |
| 821021 | 1900 | 1.30 | 108 | 0.0 |
| 821021 | 2000 | 1.30 | 108 | 0.0 |
| 821021 | 2100 | 1.30 | 108 | 0.0 |
| 821021 | 2200 | 1.30 | 108 | 0.0 |
| 821021 | 2300 | 1.27 | 101 | 0.0 |
| 821021 | 2400 | 1.27 | 101 | 0.0 |
| 821021 | DAILY MEAN | 1.31 | 110 | 0.0 |
| 821022 | 0100 | 1.27 | 101 | 0.0 |
| 821022 | 0200 | 1.30 | 108 | 0.0 |
| 821022 | 0300 | 1.30 | 108 | 0.0 |
| 821022 | 0400 | 1.30 | 108 | 0.0 |

Appendix Table 4-A-4 Cont.

| DATE | TIME | GAGE HEIGHT (ft) | DISCHARGE (cfs) | SURFACE WATER TEMPERATURE (C) |
|---|---|---|---|---|
| 821022 | 0500 | 1.30 | 108 | 0.0 |
| 821022 | 0600 | 1.30 | 108 | 0.0 |
| 821022 | 0700 | 1.30 | 108 | 0.0 |
| 821022 | 0800 | 1.30 | 108 | 0.0 |
| 821022 | 0900 | 1.30 | 108 | 0.0 |
| 821022 | 1000 | 1.30 | 108 | 0.0 |
| 821022 | 1100 | 1.30 | 108 | 0.0 |
| 821022 | 1200 | 1.30 | 108 | 0.0 |
| 821022 | 1300 | 1.30 | 108 | 0.0 |
| 821022 | 1400 | 1.30 | 108 | 0.0 |
| 821022 | 1500 | 1.33 | 114 | 0.0 |
| 821022 | 1600 | 1.37 | 121 | 0.0 |
| 821022 | 1700 | 1.33 | 114 | 0.0 |
| 821022 | 1800 | 1.33 | 114 | 0.0 |
| 821022 | 1900 | 1.33 | 114 | 0.0 |
| 821022 | 2000 | 1.33 | 114 | 0.0 |
| 821022 | 2100 | 1.37 | 121 | 0.0 |
| 821022 | 2200 | 1.37 | 121 | 0.0 |
| 821022 | 2300 | 1.37 | 121 | 0.0 |
| 821022 | 2400 | 1.37 | 121 | 0.0 |
| 821022 | DAILY MEAN | 1.32 | 111 | 0.0 |

Appendix Table 4-A-5 Continuous hourly streamflow and surface water temperature record for Portage Creek, Alaska.

| DATE | TIME | GAGE HEIGHT (ft) | DISCHARGE (cfs) | SURFACE WATER TEMPERATURE (C) |
|---|---|---|---|---|
| 820808 | 1300 | 2.17 | 598 | 10.5 |
| 820808 | 1400 | 2.13 | 582 | 10.0 |
| 820808 | 1500 | 2.13 | 582 | 10.0 |
| 820808 | 1600 | 2.13 | 582 | 10.5 |
| 820808 | 1700 | 2.13 | 582 | 10.0 |
| 820808 | 1800 | 2.10 | 565 | 10.5 |
| 820808 | 1900 | 2.10 | 565 | 10.0 |
| 820808 | 2000 | 2.13 | 582 | 9.5 |
| 820808 | 2100 | 2.13 | 582 | 9.5 |
| 820808 | 2200 | 2.17 | 598 | 9.5 |
| 820808 | 2300 | 2.17 | 598 | 9.0 |
| 820808 | 2400 | 2.17 | 598 | 9.0 |
| 820808 | DAILY MEAN | ----- | ------ | ----- |
| 820809 | 0100 | 2.17 | 598 | 8.5 |
| 820809 | 0200 | 2.17 | 598 | 8.5 |
| 820809 | 0300 | 2.20 | 615 | 8.0 |
| 820809 | 0400 | 2.17 | 598 | 8.0 |
| 820809 | 0500 | 2.17 | 598 | 8.0 |
| 820809 | 0600 | 2.17 | 598 | 8.0 |
| 820809 | 0700 | 2.17 | 598 | 7.5 |
| 820809 | 0800 | 2.17 | 598 | 7.5 |
| 820809 | 0900 | 2.17 | 598 | 7.5 |
| 820809 | 1000 | 2.17 | 598 | 8.0 |
| 820809 | 1100 | 2.13 | 582 | 8.0 |
| 820809 | 1200 | 2.17 | 598 | 8.0 |
| 820809 | 1300 | 2.17 | 598 | 8.0 |
| 820809 | 1400 | 2.17 | 598 | 8.0 |
| 820809 | 1500 | 2.17 | 598 | 9.0 |
| 820809 | 1600 | 2.17 | 598 | 8.5 |
| 820809 | 1700 | 2.17 | 598 | 8.0 |
| 820809 | 1800 | 2.20 | 615 | 8.0 |
| 820809 | 1900 | 2.20 | 615 | 8.0 |
| 820809 | 2000 | 2.20 | 615 | 8.0 |
| 820809 | 2100 | 2.20 | 615 | 8.0 |
| 820809 | 2200 | 2.17 | 598 | 8.0 |
| 820809 | 2300 | 2.20 | 615 | 7.5 |
| 820809 | 2400 | 2.17 | 598 | 7.5 |
| 820809 | DAILY MEAN | 2.17 | 602 | 8.0 |

Appendix Table 4-A-5 Cont.

| DATE | TIME | GAGE HEIGHT (ft) | DISCHARGE (cfs) | SURFACE WATER TEMPERATURE (C) |
|---|---|---|---|---|
| 820810 | 0100 | 2.17 | 598 | 7.5 |
| 820810 | 0200 | 2.13 | 582 | 7.5 |
| 820810 | 0300 | 2.17 | 598 | 7.5 |
| 820810 | 0400 | 2.17 | 598 | 7.5 |
| 820810 | 0500 | 2.17 | 598 | 7.0 |
| 820810 | 0600 | 2.17 | 598 | 7.0 |
| 820810 | 0700 | 2.17 | 598 | 7.0 |
| 820810 | 0800 | 2.17 | 598 | 7.0 |
| 820810 | 0900 | 2.20 | 615 | 7.5 |
| 820810 | 1000 | 2.20 | 615 | 7.0 |
| 820810 | 1100 | 2.23 | 632 | 7.5 |
| 820810 | 1200 | 2.23 | 632 | 8.0 |
| 820810 | 1300 | 2.23 | 632 | 8.0 |
| 820810 | 1400 | 2.23 | 632 | 8.5 |
| 820810 | 1500 | 2.27 | 649 | 8.5 |
| 820810 | 1600 | 2.27 | 649 | 8.5 |
| 820810 | 1700 | 2.27 | 649 | 9.0 |
| 820810 | 1800 | 2.27 | 649 | 8.5 |
| 820810 | 1900 | 2.27 | 649 | 8.5 |
| 820810 | 2000 | 2.27 | 649 | 8.5 |
| 820810 | 2100 | 2.27 | 649 | 8.5 |
| 820810 | 2200 | 2.27 | 649 | 8.0 |
| 820810 | 2300 | 2.27 | 649 | 8.0 |
| 820810 | 2400 | 2.27 | 649 | 8.0 |
| 820810 | DAILY MEAN | 2.22 | 625 | 7.9 |
| 820811 | 0100 | 2.23 | 632 | 7.5 |
| 820811 | 0200 | 2.27 | 649 | 7.5 |
| 820811 | 0300 | 2.23 | 632 | 7.5 |
| 820811 | 0400 | 2.23 | 632 | 7.0 |
| 820811 | 0500 | 2.23 | 632 | 7.0 |
| 820811 | 0600 | 2.20 | 615 | 7.0 |
| 820811 | 0700 | 2.20 | 615 | 7.0 |
| 820811 | 0800 | 2.20 | 615 | 7.0 |
| 820811 | 0900 | 2.17 | 598 | 7.0 |
| 820811 | 1000 | 2.17 | 598 | 7.0 |
| 820811 | 1100 | 2.17 | 598 | 7.5 |
| 820811 | 1200 | 2.17 | 598 | 8.5 |
| 820811 | 1300 | 2.17 | 598 | 9.0 |
| 820811 | 1400 | 2.13 | 582 | 11.0 |
| 820811 | 1500 | 2.13 | 582 | 11.0 |

Appendix Table 4-A-5 Cont.

| DATE | TIME | GAGE HEIGHT (ft) | DISCHARGE (cfs) | SURFACE WATER TEMPERATURE (C) |
|---|---|---|---|---|
| 820811 | 1600 | 2.13 | 582 | 12.0 |
| 820811 | 1700 | 2.10 | 565 | 10.5 |
| 820811 | 1800 | 2.10 | 565 | 10.5 |
| 820811 | 1900 | 2.10 | 565 | 10.0 |
| 820811 | 2000 | 2.10 | 565 | 10.0 |
| 820811 | 2100 | 2.10 | 565 | 9.5 |
| 820811 | 2200 | 2.10 | 565 | 9.5 |
| 820811 | 2300 | 2.10 | 565 | 9.0 |
| 820811 | 2400 | 2.07 | 549 | 8.5 |
| 820811 | DAILY MEAN | 2.16 | 594 | 8.7 |
| 820812 | 0100 | 2.07 | 549 | 8.0 |
| 820812 | 0200 | 2.07 | 549 | 7.5 |
| 820812 | 0300 | 2.07 | 549 | 7.5 |
| 820812 | 0400 | 2.07 | 549 | 7.0 |
| 820812 | 0500 | 2.07 | 549 | 6.5 |
| 820812 | 0600 | 2.07 | 549 | 6.5 |
| 820812 | 0700 | 2.03 | 533 | 6.0 |
| 820812 | 0800 | 2.07 | 549 | 6.0 |
| 820812 | 0900 | 2.03 | 533 | 6.0 |
| 820812 | 1000 | 2.03 | 533 | 6.0 |
| 820812 | 1100 | 2.03 | 533 | 6.5 |
| 820812 | 1200 | 2.03 | 533 | 7.5 |
| 820812 | 1300 | 2.00 | 516 | 10.5 |
| 820812 | 1400 | 2.00 | 516 | 11.0 |
| 820812 | 1500 | 2.00 | 516 | 11.5 |
| 820812 | 1600 | 2.00 | 516 | 11.5 |
| 820812 | 1700 | 1.97 | 500 | 11.5 |
| 820812 | 1800 | 2.00 | 516 | 10.5 |
| 820812 | 1900 | 1.97 | 500 | 10.5 |
| 820812 | 2000 | 2.00 | 516 | 10.5 |
| 820812 | 2100 | 1.97 | 500 | 10.5 |
| 820812 | 2200 | 2.00 | 516 | 10.0 |
| 820812 | 2300 | 2.00 | 516 | 9.5 |
| 820812 | 2400 | 1.97 | 500 | 9.5 |
| 820812 | DAILY MEAN | 2.02 | 527 | 8.7 |
| 820813 | 0100 | 1.97 | 500 | 9.0 |
| 820813 | 0200 | 1.97 | 500 | 8.5 |
| 820813 | 0300 | 1.97 | 500 | 8.0 |

Appendix Table 4-A-5 Cont.

| DATE | TIME | GAGE HEIGHT (ft) | DISCHARGE (cfs) | SURFACE WATER TEMPERATURE (C) |
|---|---|---|---|---|
| 820813 | 0400 | 1.97 | 500 | 8.0 |
| 820813 | 0500 | 1.97 | 500 | 7.5 |
| 820813 | 0600 | 1.97 | 500 | 7.5 |
| 820813 | 0700 | 1.97 | 500 | 7.0 |
| 820813 | 0800 | 1.97 | 500 | 7.0 |
| 820813 | 0900 | 1.97 | 500 | 7.0 |
| 820813 | 1000 | 1.97 | 500 | 7.5 |
| 820813 | 1100 | 1.93 | 484 | 7.5 |
| 820813 | 1200 | 1.93 | 484 | 8.5 |
| 820813 | 1300 | 1.93 | 484 | 12.0 |
| 820813 | 1400 | 1.93 | 484 | 12.0 |
| 820813 | 1500 | 1.93 | 484 | 13.0 |
| 820813 | 1600 | 1.93 | 484 | 13.0 |
| 820813 | 1700 | 1.93 | 484 | 12.5 |
| 820813 | 1800 | 1.93 | 484 | 11.5 |
| 820813 | 1900 | 1.93 | 484 | 11.5 |
| 820813 | 2000 | 1.90 | 468 | 11.5 |
| 820813 | 2100 | 1.93 | 484 | 11.0 |
| 820813 | 2200 | 1.93 | 484 | 11.0 |
| 820813 | 2300 | 1.90 | 468 | 10.5 |
| 820813 | 2400 | 1.90 | 468 | 10.5 |
| 820813 | DAILY MEAN | 1.94 | 489 | 9.7 |
| 820814 | 0100 | 1.93 | 484 | 10.5 |
| 820814 | 0200 | 1.90 | 468 | 10.0 |
| 820814 | 0300 | 1.93 | 484 | 10.0 |
| 820814 | 0400 | 1.90 | 468 | 9.5 |
| 820814 | 0500 | 1.90 | 468 | 9.5 |
| 820814 | 0600 | 1.93 | 484 | 9.0 |
| 820814 | 0700 | 1.93 | 484 | 9.0 |
| 820814 | 0800 | 1.90 | 468 | 9.0 |
| 820814 | 0900 | 1.93 | 484 | 9.0 |
| 820814 | 1000 | 1.90 | 468 | 9.0 |
| 820814 | 1100 | 1.93 | 484 | 9.0 |
| 820814 | 1200 | 1.90 | 468 | 9.0 |
| 820814 | 1300 | 1.93 | 484 | 8.5 |
| 820814 | 1400 | 1.93 | 484 | 9.0 |
| 820814 | 1500 | 1.93 | 484 | 11.0 |
| 820814 | 1600 | 1.93 | 484 | 10.0 |
| 820814 | 1700 | 1.93 | 484 | 9.5 |
| 820814 | 1800 | 1.93 | 484 | 9.5 |

Appendix Table 4-A5 Cont.

| DATE | TIME | GAGE HEIGHT (ft) | DISCHARGE (cfs) | SURFACE WATER TEMPERATURE (C) |
|---|---|---|---|---|
| 820814 | 1900 | 1.97 | 500 | 9.5 |
| 820814 | 2000 | 1.97 | 500 | 9.5 |
| 820814 | 2100 | 1.97 | 500 | 9.5 |
| 820814 | 2200 | 1.97 | 500 | 9.5 |
| 820814 | 2300 | 1.97 | 500 | 9.5 |
| 820814 | 2400 | 1.97 | 500 | 9.0 |
| 820814 | DAILY MEAN | 1.93 | 484 | 9.4 |
| 820815 | 0100 | 1.97 | 500 | 9.0 |
| 820815 | 0200 | 1.97 | 500 | 9.0 |
| 820815 | 0300 | 1.97 | 500 | 8.5 |
| 820815 | 0400 | 2.00 | 516 | 8.5 |
| 820815 | 0500 | 1.97 | 500 | 8.5 |
| 820815 | 0600 | 1.97 | 500 | 8.0 |
| 820815 | 0700 | 1.97 | 500 | 8.0 |
| 820815 | 0800 | 2.00 | 516 | 8.0 |
| 820815 | 0900 | 2.00 | 516 | 8.0 |
| 820815 | 1000 | 1.97 | 500 | 8.5 |
| 820815 | 1100 | 2.00 | 516 | 9.0 |
| 820815 | 1200 | 1.97 | 500 | 9.5 |
| 820815 | 1300 | 1.97 | 500 | 10.0 |
| 820815 | 1400 | 1.97 | 500 | 11.5 |
| 820815 | 1500 | 1.97 | 500 | 10.5 |
| 820815 | 1600 | 1.93 | 484 | 10.5 |
| 820815 | 1700 | 1.93 | 484 | 10.5 |
| 820815 | 1800 | 1.93 | 484 | 10.5 |
| 820815 | 1900 | 1.93 | 484 | 10.0 |
| 820815 | 2000 | 1.93 | 484 | 10.0 |
| 820815 | 2100 | 1.93 | 484 | 9.5 |
| 820815 | 2200 | 1.90 | 468 | 9.5 |
| 820815 | 2300 | 1.90 | 468 | 9.0 |
| 820815 | 2400 | 1.90 | 468 | 9.0 |
| 820815 | DAILY MEAN | 1.96 | 495 | 9.3 |
| 820816 | 0100 | 1.90 | 468 | 8.5 |
| 820816 | 0200 | 1.90 | 468 | 8.5 |
| 820816 | 0300 | 1.90 | 468 | 8.5 |
| 820816 | 0400 | 1.90 | 468 | 8.0 |
| 820816 | 0500 | 1.90 | 468 | 8.0 |
| 820816 | 0600 | 1.90 | 468 | 8.0 |

Appendix Table 4-A-5 Cont.

| DATE | TIME | GAGE HEIGHT (ft) | DISCHARGE (cfs) | SURFACE WATER TEMPERATURE (C) |
|---|---|---|---|---|
| 820816 | 0700 | 1.87 | 453 | 8.0 |
| 820816 | 0800 | 1.87 | 453 | 8.0 |
| 820816 | 0900 | 1.87 | 453 | 8.0 |
| 820816 | 1000 | 1.87 | 453 | 8.0 |
| 820816 | 1100 | 1.87 | 453 | 8.0 |
| 820816 | 1200 | 1.87 | 453 | 8.5 |
| 820816 | 1300 | 1.87 | 453 | 11.0 |
| 820816 | 1400 | 1.87 | 453 | 11.0 |
| 820816 | 1500 | 1.87 | 453 | 12.5 |
| 820816 | 1600 | 1.83 | 437 | 12.5 |
| 820816 | 1700 | 1.83 | 437 | 12.0 |
| 820816 | 1800 | 1.83 | 437 | 11.0 |
| 820816 | 1900 | 1.83 | 437 | 11.0 |
| 820816 | 2000 | 1.83 | 437 | 11.0 |
| 820816 | 2100 | 1.83 | 437 | 10.5 |
| 820816 | 2200 | 1.83 | 437 | 10.5 |
| 820816 | 2300 | 1.83 | 437 | 10.0 |
| 820816 | 2400 | 1.83 | 437 | 9.5 |
| 820816 | DAILY MEAN | 1.86 | 451 | 9.6 |
| 820817 | 0100 | 1.83 | 437 | 9.5 |
| 820817 | 0200 | 1.83 | 437 | 9.5 |
| 820817 | 0300 | 1.83 | 437 | 9.0 |
| 820817 | 0400 | 1.83 | 437 | 9.0 |
| 820817 | 0500 | 1.83 | 437 | 8.5 |
| 820817 | 0600 | 1.83 | 437 | 8.5 |
| 820817 | 0700 | 1.83 | 437 | 8.5 |
| 820817 | 0800 | 1.83 | 437 | 8.0 |
| 820817 | 0900 | 1.87 | 453 | 8.0 |
| 820817 | 1000 | 1.87 | 453 | 8.0 |
| 820817 | 1100 | 1.90 | 468 | 8.0 |
| 820817 | 1200 | 1.90 | 468 | 8.0 |
| 820817 | 1300 | 1.90 | 468 | 8.0 |
| 820817 | 1400 | 1.90 | 468 | 8.5 |
| 820817 | 1500 | 1.93 | 484 | 8.5 |
| 820817 | 1600 | 1.93 | 484 | 9.5 |
| 820817 | 1700 | 1.93 | 484 | 9.0 |
| 820817 | 1800 | 1.93 | 484 | 9.5 |
| 820817 | 1900 | 1.97 | 500 | 9.0 |
| 820817 | 2000 | 1.93 | 484 | 9.0 |
| 820817 | 2100 | 1.97 | 500 | 9.0 |

Appendix Table 4-A-5 Cont.

| DATE | TIME | GAGE HEIGHT (ft) | DISCHARGE (cfs) | SURFACE WATER TEMPERATURE (C) |
|---|---|---|---|---|
| 820817 | 2200 | 1.93 | 484 | 8.5 |
| 820817 | 2300 | 1.93 | 484 | 8.0 |
| 820817 | 2400 | 1.93 | 484 | 8.0 |
| 820817 | DAILY MEAN | 1.89 | 464 | 8.6 |
| 820818 | 0100 | 1.93 | 484 | 8.0 |
| 820818 | 0200 | 1.93 | 484 | 7.5 |
| 820818 | 0300 | 1.93 | 484 | 7.5 |
| 820818 | 0400 | 1.90 | 468 | 7.0 |
| 820818 | 0500 | 1.90 | 468 | 7.0 |
| 820818 | 0600 | 1.90 | 468 | 7.0 |
| 820818 | 0700 | 1.90 | 468 | 7.0 |
| 820818 | 0800 | 1.90 | 468 | 7.5 |
| 820818 | 0900 | 1.90 | 468 | 7.5 |
| 820818 | 1000 | 1.87 | 453 | 7.5 |
| 820818 | 1100 | 1.87 | 453 | 8.0 |
| 820818 | 1200 | 1.87 | 453 | 8.5 |
| 820818 | 1300 | 1.87 | 453 | 9.0 |
| 820818 | 1400 | 1.87 | 453 | 9.0 |
| 820818 | 1500 | 1.87 | 453 | 9.5 |
| 820818 | 1600 | 1.87 | 453 | 9.5 |
| 820818 | 1700 | 1.83 | 437 | 9.5 |
| 820818 | 1800 | 1.83 | 437 | 10.0 |
| 820818 | 1900 | 1.83 | 437 | 9.5 |
| 820818 | 2000 | 1.83 | 437 | 9.5 |
| 820818 | 2100 | 1.83 | 437 | 9.0 |
| 820818 | 2200 | 1.83 | 437 | 9.0 |
| 820818 | 2300 | 1.83 | 437 | 8.5 |
| 820818 | 2400 | 1.83 | 437 | 8.5 |
| 820818 | DAILY MEAN | 1.87 | 455 | 8.4 |
| 820819 | 0100 | 1.83 | 437 | 8.0 |
| 820819 | 0200 | 1.83 | 437 | 7.5 |
| 820819 | 0300 | 1.83 | 437 | 7.5 |
| 820819 | 0400 | 1.80 | 421 | 7.0 |
| 820819 | 0500 | 1.83 | 437 | 7.0 |
| 820819 | 0600 | 1.80 | 421 | 6.5 |
| 820819 | 0700 | 1.80 | 421 | 6.5 |
| 820819 | 0800 | 1.80 | 421 | 6.5 |
| 820819 | 0900 | 1.80 | 421 | 7.0 |

Appendix Table 4-A-5 Cont.

| DATE | TIME | GAGE HEIGHT (ft) | DISCHARGE (cfs) | SURFACE WATER TEMPERATURE (C) |
|---|---|---|---|---|
| 820819 | 1000 | 1.80 | 421 | 7.0 |
| 820819 | 1100 | 1.80 | 421 | 7.0 |
| 820819 | 1200 | 1.80 | 421 | 8.0 |
| 820819 | 1300 | 1.80 | 421 | 8.5 |
| 820819 | 1400 | 1.80 | 421 | 9.5 |
| 820819 | 1500 | 1.80 | 421 | 11.0 |
| 820819 | 1600 | 1.77 | 406 | 11.0 |
| 820819 | 1700 | 1.77 | 406 | 11.0 |
| 820819 | 1800 | 1.77 | 406 | 10.5 |
| 820819 | 1900 | 1.77 | 406 | 10.5 |
| 820819 | 2000 | 1.77 | 406 | 10.5 |
| 820819 | 2100 | 1.77 | 406 | 10.5 |
| 820819 | 2200 | 1.77 | 406 | 10.0 |
| 820819 | 2300 | 1.77 | 406 | 9.5 |
| 820819 | 2400 | 1.77 | 406 | 9.5 |
| 820819 | DAILY MEAN | 1.79 | 418 | 8.6 |
| 820820 | 0100 | 1.77 | 406 | 9.0 |
| 820820 | 0200 | 1.77 | 406 | 8.5 |
| 820820 | 0300 | 1.77 | 406 | 8.0 |
| 820820 | 0400 | 1.77 | 406 | 8.0 |
| 820820 | 0500 | 1.77 | 406 | 8.0 |
| 820820 | 0600 | 1.77 | 406 | 7.5 |
| 820820 | 0700 | 1.73 | 390 | 7.5 |
| 820820 | 0800 | 1.77 | 406 | 7.5 |
| 820820 | 0900 | 1.73 | 390 | 8.0 |
| 820820 | 1000 | 1.77 | 406 | 7.5 |
| 820820 | 1100 | 1.73 | 390 | 8.0 |
| 820820 | 1200 | 1.73 | 390 | 8.5 |
| 820820 | 1300 | 1.73 | 390 | 9.5 |
| 820820 | 1400 | 1.73 | 390 | 10.5 |
| 820820 | 1500 | 1.73 | 390 | 12.5 |
| 820820 | 1600 | 1.73 | 390 | 12.5 |
| 820820 | 1700 | 1.70 | 375 | 12.5 |
| 820820 | 1800 | 1.73 | 390 | 11.5 |
| 820820 | 1900 | 1.70 | 375 | 11.5 |
| 820820 | 2000 | 1.73 | 390 | 11.0 |
| 820820 | 2100 | 1.73 | 390 | 10.5 |
| 820820 | 2200 | 1.70 | 375 | 10.0 |
| 820820 | 2300 | 1.70 | 375 | 10.0 |
| 820820 | 2400 | 1.70 | 375 | 9.5 |

Appendix Table 4-A-5 Cont.

| DATE | TIME | GAGE HEIGHT (ft) | DISCHARGE (cfs) | SURFACE WATER TEMPERATURE (C) |
|---|---|---|---|---|
| 820820 | DAILY MEAN | 1.74 | 392 | 9.5 |
| 820821 | 0100 | 1.73 | 390 | 9.5 |
| 820821 | 0200 | 1.73 | 390 | 9.0 |
| 820821 | 0300 | 1.73 | 390 | 8.5 |
| 820821 | 0400 | 1.70 | 375 | 8.5 |
| 820821 | 0500 | 1.70 | 375 | 8.0 |
| 820821 | 0600 | 1.73 | 390 | 7.5 |
| 820821 | 0700 | 1.73 | 390 | 7.5 |
| 820821 | 0800 | 1.70 | 375 | 7.0 |
| 820821 | 0900 | 1.70 | 375 | 7.0 |
| 820821 | 1000 | 1.70 | 375 | 7.0 |
| 820821 | 1100 | 1.70 | 375 | 7.5 |
| 820821 | 1200 | 1.70 | 375 | 8.0 |
| 820821 | 1300 | 1.70 | 375 | 9.5 |
| 820821 | 1400 | 1.70 | 375 | 11.0 |
| 820821 | 1500 | 1.70 | 375 | 12.0 |
| 820821 | 1600 | 1.67 | 360 | 12.0 |
| 820821 | 1700 | 1.67 | 360 | 11.5 |
| 820821 | 1800 | 1.70 | 375 | 11.0 |
| 820821 | 1900 | 1.70 | 375 | 11.0 |
| 820821 | 2000 | 1.67 | 360 | 11.0 |
| 820821 | 2100 | 1.67 | 360 | 11.0 |
| 820821 | 2200 | 1.70 | 375 | 10.5 |
| 820821 | 2300 | 1.70 | 375 | 10.5 |
| 820821 | 2400 | 1.70 | 375 | 10.0 |
| 820821 | DAILY MEAN | 1.70 | 376 | 9.4 |
| 820822 | 0100 | 1.67 | 360 | 9.5 |
| 820822 | 0200 | 1.70 | 375 | 9.0 |
| 820822 | 0300 | 1.70 | 375 | 8.5 |
| 820822 | 0400 | 1.70 | 375 | 8.0 |
| 820822 | 0500 | 1.67 | 360 | 8.0 |
| 820822 | 0600 | 1.67 | 360 | 7.5 |
| 820822 | 0700 | 1.67 | 360 | 7.0 |
| 820822 | 0800 | 1.67 | 360 | 7.0 |
| 820822 | 0900 | 1.67 | 360 | 7.0 |
| 820822 | 1000 | 1.67 | 360 | 7.0 |
| 820822 | 1100 | 1.67 | 360 | 7.0 |
| 820822 | 1200 | 1.67 | 360 | 8.0 |

Appendix Table 4-A-5 Cont.

| DATE | TIME | GAGE HEIGHT (ft) | DISCHARGE (cfs) | SURFACE WATER TEMPERATURE (C) |
|---|---|---|---|---|
| 820822 | 1300 | 1.67 | 360 | 10.0 |
| 820822 | 1400 | 1.67 | 360 | 10.5 |
| 820822 | 1500 | 1.67 | 360 | 12.0 |
| 820822 | 1600 | 1.67 | 360 | 11.5 |
| 820822 | 1700 | 1.63 | 345 | 11.5 |
| 820822 | 1800 | 1.67 | 360 | 11.0 |
| 820822 | 1900 | 1.63 | 345 | 11.0 |
| 820822 | 2000 | 1.67 | 360 | 11.0 |
| 820822 | 2100 | 1.63 | 345 | 11.0 |
| 820822 | 2200 | 1.63 | 345 | 10.5 |
| 820822 | 2300 | 1.67 | 360 | 10.5 |
| 820822 | 2400 | 1.67 | 360 | 10.5 |
| 820822 | DAILY MEAN | 1.67 | 359 | 9.4 |
| 820823 | 0100 | 1.67 | 360 | 10.0 |
| 820823 | 0200 | 1.63 | 345 | 10.0 |
| 820823 | 0300 | 1.67 | 360 | 9.5 |
| 820823 | 0400 | 1.67 | 360 | 9.5 |
| 820823 | 0500 | 1.67 | 360 | 9.5 |
| 820823 | 0600 | 1.67 | 360 | 9.0 |
| 820823 | 0700 | 1.67 | 360 | 9.0 |
| 820823 | 0800 | 1.67 | 360 | 9.0 |
| 820823 | 0900 | 1.67 | 360 | 9.0 |
| 820823 | 1000 | 1.67 | 360 | 9.0 |
| 820823 | 1100 | 1.67 | 360 | 9.0 |
| 820823 | 1200 | 1.67 | 360 | 9.5 |
| 820823 | 1300 | 1.70 | 375 | 10.0 |
| 820823 | 1400 | 1.70 | 375 | 10.0 |
| 820823 | 1500 | 1.70 | 375 | 10.5 |
| 820823 | 1600 | 1.70 | 375 | 10.5 |
| 820823 | 1700 | 1.70 | 375 | 10.0 |
| 820823 | 1800 | 1.70 | 375 | 10.5 |
| 820823 | 1900 | 1.70 | 375 | 10.5 |
| 820823 | 2000 | 1.73 | 390 | 10.5 |
| 820823 | 2100 | 1.70 | 375 | 10.5 |
| 820823 | 2200 | 1.73 | 390 | 10.0 |
| 820823 | 2300 | 1.73 | 390 | 10.0 |
| 820823 | 2400 | 1.73 | 390 | 9.5 |
| 820823 | DAILY MEAN | 1.69 | 369 | 9.8 |

Appendix Table 4-A-5 Cont.

| DATE | TIME | GAGE HEIGHT (ft) | DISCHARGE (cfs) | SURFACE WATER TEMPERATURE (C) |
|---|---|---|---|---|
| 820824 | 0100 | 1.70 | 375 | 9.5 |
| 820824 | 0200 | 1.73 | 390 | 9.0 |
| 820824 | 0300 | 1.70 | 375 | 9.0 |
| 820824 | 0400 | 1.70 | 375 | 9.0 |
| 820824 | 0500 | 1.70 | 375 | 8.5 |
| 820824 | 0600 | 1.70 | 375 | 8.5 |
| 820824 | 0700 | 1.70 | 375 | 8.5 |
| 820824 | 0800 | 1.70 | 375 | 8.5 |
| 820824 | 0900 | 1.70 | 375 | 8.5 |
| 820824 | 1000 | 1.70 | 375 | 9.0 |
| 820824 | 1100 | 1.67 | 360 | 9.0 |
| 820824 | 1200 | 1.70 | 375 | 9.5 |
| 820824 | 1300 | 1.67 | 360 | 10.5 |
| 820824 | 1400 | 1.67 | 360 | 10.5 |
| 820824 | 1500 | 1.67 | 360 | 12.0 |
| 820824 | 1600 | 1.67 | 360 | 11.0 |
| 820824 | 1700 | 1.67 | 360 | 11.5 |
| 820824 | 1800 | 1.67 | 360 | 11.5 |
| 820824 | 1900 | 1.67 | 360 | 11.0 |
| 820824 | 2000 | 1.67 | 360 | 11.0 |
| 820824 | 2100 | 1.67 | 360 | 10.5 |
| 820824 | 2200 | 1.67 | 360 | 10.0 |
| 820824 | 2300 | 1.67 | 360 | 10.0 |
| 820824 | 2400 | 1.70 | 375 | 10.0 |
| 820824 | DAILY MEAN | 1.68 | 368 | 9.8 |
| 820825 | 0100 | 1.70 | 375 | 9.5 |
| 820825 | 0200 | 1.70 | 375 | 9.5 |
| 820825 | 0300 | 1.70 | 375 | 9.5 |
| 820825 | 0400 | 1.70 | 375 | 9.0 |
| 820825 | 0500 | 1.70 | 375 | 9.0 |
| 820825 | 0600 | 1.70 | 375 | 9.0 |
| 820825 | 0700 | 1.70 | 375 | 9.0 |
| 820825 | 0800 | 1.70 | 375 | 8.5 |
| 820825 | 0900 | 1.70 | 375 | 9.0 |
| 820825 | 1000 | 1.70 | 375 | 9.0 |
| 820825 | 1100 | 1.70 | 375 | 9.5 |
| 820825 | 1200 | 1.67 | 360 | 9.5 |
| 820825 | 1300 | 1.70 | 375 | 10.0 |
| 820825 | 1400 | 1.70 | 375 | 11.0 |
| 820825 | 1500 | 1.67 | 360 | 12.5 |

Appendix Table 4-A-5 Cont.

| DATE | TIME | GAGE HEIGHT (ft) | DISCHARGE (cfs) | SURFACE WATER TEMPERATURE (C) |
|---|---|---|---|---|
| 820825 | 1600 | 1.67 | 360 | 12.0 |
| 820825 | 1700 | 1.67 | 360 | 11.0 |
| 820825 | 1800 | 1.67 | 360 | 11.0 |
| 820825 | 1900 | 1.67 | 360 | 10.5 |
| 820825 | 2000 | 1.67 | 360 | 10.5 |
| 820825 | 2100 | 1.70 | 375 | 10.5 |
| 820825 | 2200 | 1.70 | 375 | 10.5 |
| 820825 | 2300 | 1.70 | 375 | 10.0 |
| 820825 | 2400 | 1.70 | 375 | 10.0 |
| 820825 | DAILY MEAN | 1.69 | 371 | 10.0 |
| 820826 | 0100 | 1.73 | 390 | 9.5 |
| 820826 | 0200 | 1.73 | 390 | 9.5 |
| 820826 | 0300 | 1.73 | 390 | 9.5 |
| 820826 | 0400 | 1.73 | 390 | 9.0 |
| 820826 | 0500 | 1.73 | 390 | 9.0 |
| 820826 | 0600 | 1.73 | 390 | 9.0 |
| 820826 | 0700 | 1.77 | 406 | 8.5 |
| 820826 | 0800 | 1.77 | 406 | 8.5 |
| 820826 | 0900 | 1.77 | 406 | 8.5 |
| 820826 | 1000 | 1.77 | 406 | 8.5 |
| 820826 | 1100 | 1.77 | 406 | 9.0 |
| 820826 | 1200 | 1.77 | 406 | 9.0 |
| 820826 | 1300 | 1.77 | 406 | 10.0 |
| 820826 | 1400 | 1.73 | 390 | 11.0 |
| 820826 | 1500 | 1.73 | 390 | 12.0 |
| 820826 | 1600 | 1.73 | 390 | 11.5 |
| 820826 | 1700 | 1.73 | 390 | 11.5 |
| 820826 | 1800 | 1.73 | 390 | 11.0 |
| 820826 | 1900 | 1.73 | 390 | 11.0 |
| 820826 | 2000 | 1.73 | 390 | 11.0 |
| 820826 | 2100 | 1.73 | 390 | 10.5 |
| 820826 | 2200 | 1.70 | 375 | 10.0 |
| 820826 | 2300 | 1.73 | 390 | 10.0 |
| 820826 | 2400 | 1.70 | 375 | 9.5 |
| 820826 | DAILY MEAN | 1.74 | 394 | 9.9 |
| 820827 | 0100 | 1.70 | 375 | 9.0 |
| 820827 | 0200 | 1.70 | 375 | 8.5 |
| 820827 | 0300 | 1.70 | 375 | 8.0 |

Appendix Table 4-A-5 Cont.

| DATE | TIME | GAGE HEIGHT (ft) | DISCHARGE (cfs) | SURFACE WATER TEMPERATURE (C) |
|---|---|---|---|---|
| 820827 | 0400 | 1.70 | 375 | 8.0 |
| 820827 | 0500 | 1.70 | 375 | 7.5 |
| 820827 | 0600 | 1.70 | 375 | 7.0 |
| 820827 | 0700 | 1.70 | 375 | 7.0 |
| 820827 | 0800 | 1.67 | 360 | 6.5 |
| 820827 | 0900 | 1.70 | 375 | 6.5 |
| 820827 | 1000 | 1.70 | 375 | 6.5 |
| 820827 | 1100 | 1.70 | 375 | 6.5 |
| 820827 | 1200 | 1.67 | 360 | 7.5 |
| 820827 | 1300 | 1.67 | 360 | 9.0 |
| 820827 | 1400 | 1.67 | 360 | 9.5 |
| 820827 | 1500 | 1.67 | 360 | 11.5 |
| 820827 | 1600 | 1.67 | 360 | 11.5 |
| 820827 | 1700 | 1.63 | 345 | 11.0 |
| 820827 | 1800 | 1.67 | 360 | 10.0 |
| 820827 | 1900 | 1.67 | 360 | 10.0 |
| 820827 | 2000 | 1.63 | 345 | 10.0 |
| 820827 | 2100 | 1.63 | 345 | 10.0 |
| 820827 | 2200 | 1.63 | 345 | 9.5 |
| 820827 | 2300 | 1.63 | 345 | 9.5 |
| 820827 | 2400 | 1.63 | 345 | 9.0 |
| 820827 | DAILY MEAN | 1.67 | 362 | 8.7 |
| 820828 | 0100 | 1.63 | 345 | 8.5 |
| 820828 | 0200 | 1.63 | 345 | 8.5 |
| 820828 | 0300 | 1.63 | 345 | 8.0 |
| 820828 | 0400 | 1.63 | 345 | 7.5 |
| 820828 | 0500 | 1.63 | 345 | 7.5 |
| 820828 | 0600 | 1.63 | 345 | 7.0 |
| 820828 | 0700 | 1.63 | 345 | 7.0 |
| 820828 | 0800 | 1.63 | 345 | 7.0 |
| 820828 | 0900 | 1.63 | 345 | 7.0 |
| 820828 | 1000 | 1.63 | 345 | 7.0 |
| 820828 | 1100 | 1.60 | 330 | 7.5 |
| 820828 | 1200 | 1.63 | 345 | 7.5 |
| 820828 | 1300 | 1.63 | 345 | 7.5 |
| 820828 | 1400 | 1.63 | 345 | 8.0 |
| 820828 | 1500 | 1.63 | 345 | 9.5 |
| 820828 | 1600 | 1.63 | 345 | 9.0 |
| 820828 | 1700 | 1.63 | 345 | 9.0 |
| 820828 | 1800 | 1.60 | 330 | 9.0 |

Appendix Table 4-A-5 Cont.

| DATE | TIME | GAGE HEIGHT (ft) | DISCHARGE (cfs) | SURFACE WATER TEMPERATURE (C) |
|---|---|---|---|---|
| 820828 | 1900 | 1.63 | 345 | 9.0 |
| 820828 | 2000 | 1.60 | 330 | 9.0 |
| 820828 | 2100 | 1.63 | 345 | 9.0 |
| 820828 | 2200 | 1.63 | 345 | 8.5 |
| 820828 | 2300 | 1.60 | 330 | 8.5 |
| 820828 | 2400 | 1.60 | 330 | 8.5 |
| 820828 | DAILY MEAN | 1.63 | 342 | 8.1 |
| 820829 | 0100 | 1.60 | 330 | 8.5 |
| 820829 | 0200 | 1.63 | 345 | 8.5 |
| 820829 | 0300 | 1.63 | 345 | 8.0 |
| 820829 | 0400 | 1.63 | 345 | 8.0 |
| 820829 | 0500 | 1.63 | 345 | 8.0 |
| 820829 | 0600 | 1.63 | 345 | 8.0 |
| 820829 | 0700 | 1.63 | 345 | 8.0 |
| 820829 | 0800 | 1.63 | 345 | 8.0 |
| 820829 | 0900 | 1.67 | 360 | 8.0 |
| 820829 | 1000 | 1.67 | 360 | 8.0 |
| 820829 | 1100 | 1.70 | 375 | 8.0 |
| 820829 | 1200 | 1.70 | 375 | 8.5 |
| 820829 | 1300 | 1.70 | 375 | 8.5 |
| 820829 | 1400 | 1.73 | 390 | 8.5 |
| 820829 | 1500 | 1.73 | 390 | 9.0 |
| 820829 | 1600 | 1.77 | 406 | 9.0 |
| 820829 | 1700 | 1.80 | 421 | 9.0 |
| 820829 | 1800 | 1.80 | 421 | 9.0 |
| 820829 | 1900 | 1.80 | 421 | 9.0 |
| 820829 | 2000 | 1.83 | 437 | 8.5 |
| 820829 | 2100 | 1.83 | 437 | 8.5 |
| 820829 | 2200 | 1.83 | 437 | 8.5 |
| 820829 | 2300 | 1.87 | 453 | 8.5 |
| 820829 | 2400 | 1.87 | 453 | 8.5 |
| 820829 | DAILY MEAN | 1.72 | 385 | 8.4 |
| 820830 | 0100 | 1.87 | 453 | 8.0 |
| 820830 | 0200 | 1.90 | 468 | 8.0 |
| 820830 | 0300 | 1.90 | 468 | 8.0 |
| 820830 | 0400 | 1.90 | 468 | 8.0 |
| 820830 | 0500 | 1.93 | 484 | 7.5 |
| 820830 | 0600 | 1.93 | 484 | 7.5 |

Appendix Table 4-A-5 Cont.

| DATE | TIME | GAGE HEIGHT (ft) | DISCHARGE (cfs) | SURFACE WATER TEMPERATURE (C) |
|---|---|---|---|---|
| 820830 | 0700 | 1.97 | 500 | 7.5 |
| 820830 | 0800 | 2.00 | 516 | 7.5 |
| 820830 | 0900 | 2.00 | 516 | 7.5 |
| 820830 | 1000 | 2.03 | 533 | 7.5 |
| 820830 | 1100 | 2.07 | 549 | 7.5 |
| 820830 | 1200 | 2.10 | 565 | 7.5 |
| 820830 | 1300 | 2.17 | 598 | 7.5 |
| 820830 | 1400 | 2.20 | 615 | 7.5 |
| 820830 | 1500 | 2.27 | 649 | 7.5 |
| 820830 | 1600 | 2.33 | 682 | 7.5 |
| 820830 | 1700 | 2.40 | 716 | 7.5 |
| 820830 | 1800 | 2.43 | 734 | 7.5 |
| 820830 | 1900 | 2.50 | 768 | 7.5 |
| 820830 | 2000 | 2.50 | 768 | 7.5 |
| 820830 | 2100 | 2.53 | 786 | 7.5 |
| 820830 | 2200 | 2.53 | 786 | 7.0 |
| 820830 | 2300 | 2.53 | 786 | 7.0 |
| 820830 | 2400 | 2.53 | 786 | 7.0 |
| 820830 | DAILY MEAN | 2.19 | 609 | 7.5 |
| 820831 | 0100 | 2.53 | 786 | 7.0 |
| 820831 | 0200 | 2.53 | 786 | 7.0 |
| 820831 | 0300 | 2.57 | 803 | 7.0 |
| 820831 | 0400 | 2.57 | 803 | 7.0 |
| 820831 | 0500 | 2.57 | 803 | 6.5 |
| 820831 | 0600 | 2.60 | 821 | 6.5 |
| 820831 | 0700 | 2.57 | 803 | 6.5 |
| 820831 | 0800 | 2.57 | 803 | 6.5 |
| 820831 | 0900 | 2.57 | 803 | 6.5 |
| 820831 | 1000 | 2.57 | 803 | 6.5 |
| 820831 | 1100 | 2.53 | 786 | 7.0 |
| 820831 | 1200 | 2.53 | 786 | 7.0 |
| 820831 | 1300 | 2.50 | 768 | 7.0 |
| 820831 | 1400 | 2.47 | 751 | 7.5 |
| 820831 | 1500 | 2.50 | 768 | 8.0 |
| 820831 | 1600 | 2.47 | 751 | 8.0 |
| 820831 | 1700 | 2.43 | 734 | 8.0 |
| 820831 | 1800 | 2.43 | 734 | 8.0 |
| 820831 | 1900 | 2.40 | 716 | 8.0 |
| 820831 | 2000 | 2.43 | 734 | 8.0 |
| 820831 | 2100 | 2.40 | 716 | 8.0 |

Appendix Table 4-A-5 Cont.

| DATE | TIME | GAGE HEIGHT (ft) | DISCHARGE (cfs) | SURFACE WATER TEMPERATURE (C) |
|---|---|---|---|---|
| 820831 | 2200 | 2.37 | 699 | 7.5 |
| 820831 | 2300 | 2.40 | 716 | 7.5 |
| 820831 | 2400 | 2.40 | 716 | 7.5 |
| 820831 | DAILY MEAN | 2.50 | 766 | 7.3 |
| 820901 | 0100 | 2.40 | 716 | 7.0 |
| 820901 | 0200 | 2.40 | 716 | 7.0 |
| 820901 | 0300 | 2.37 | 699 | 7.0 |
| 820901 | 0400 | 2.33 | 682 | 7.0 |
| 820901 | 0500 | 2.37 | 699 | 7.0 |
| 820901 | 0600 | 2.33 | 682 | 7.0 |
| 820901 | 0700 | 2.33 | 682 | 6.5 |
| 820901 | 0800 | 2.33 | 682 | 6.5 |
| 820901 | 0900 | 2.33 | 682 | 7.0 |
| 820901 | 1000 | 2.37 | 699 | 7.0 |
| 820901 | 1100 | 2.33 | 682 | 7.5 |
| 820901 | 1200 | 2.33 | 682 | 7.5 |
| 820901 | 1300 | 2.30 | 665 | 8.0 |
| 820901 | 1400 | 2.30 | 665 | 8.0 |
| 820901 | 1500 | 2.30 | 665 | 8.5 |
| 820901 | 1600 | 2.30 | 665 | 8.5 |
| 820901 | 1700 | 2.30 | 665 | 8.5 |
| 820901 | 1800 | 2.27 | 649 | 8.5 |
| 820901 | 1900 | 2.27 | 649 | 9.0 |
| 820901 | 2000 | 2.27 | 649 | 8.5 |
| 820901 | 2100 | 2.27 | 649 | 8.5 |
| 820901 | 2200 | 2.23 | 632 | 8.0 |
| 820901 | 2300 | 2.27 | 649 | 7.5 |
| 820901 | 2400 | 2.23 | 632 | 7.5 |
| 820901 | DAILY MEAN | 2.31 | 672 | 7.6 |
| 820902 | 0100 | 2.23 | 632 | 7.0 |
| 820902 | 0200 | 2.23 | 632 | 7.0 |
| 820902 | 0300 | 2.23 | 632 | 6.5 |
| 820902 | 0400 | 2.23 | 632 | 6.5 |
| 820902 | 0500 | 2.23 | 632 | 6.5 |
| 820902 | 0600 | 2.20 | 615 | 6.5 |
| 820902 | 0700 | 2.20 | 615 | 6.5 |
| 820902 | 0800 | 2.20 | 615 | 6.5 |
| 820902 | 0900 | 2.20 | 615 | 6.5 |

Appendix Table 4-A-5 Cont.

| DATE | TIME | GAGE HEIGHT (ft) | DISCHARGE (cfs) | SURFACE WATER TEMPERATURE (C) |
|---|---|---|---|---|
| 820902 | 1000 | 2.20 | 615 | 7.0 |
| 820902 | 1100 | 2.20 | 615 | 7.0 |
| 820902 | 1200 | 2.17 | 598 | 7.5 |
| 820902 | 1300 | 2.17 | 598 | 8.0 |
| 820902 | 1400 | 2.17 | 598 | 8.5 |
| 820902 | 1500 | 2.17 | 598 | 8.5 |
| 820902 | 1600 | 2.17 | 598 | 8.5 |
| 820902 | 1700 | 2.13 | 582 | 8.5 |
| 820902 | 1800 | 2.13 | 582 | 8.5 |
| 820902 | 1900 | 2.17 | 598 | 8.5 |
| 820902 | 2000 | 2.17 | 598 | 8.5 |
| 820902 | 2100 | 2.20 | 615 | 8.0 |
| 820902 | 2200 | 2.20 | 615 | 8.0 |
| 820902 | 2300 | 2.20 | 615 | 7.5 |
| 820902 | 2400 | 2.23 | 632 | 7.5 |
| 820902 | DAILY MEAN | 2.19 | 612 | 7.5 |
| 820903 | 0100 | 2.20 | 615 | 7.5 |
| 820903 | 0200 | 2.23 | 632 | 7.5 |
| 820903 | 0300 | 2.23 | 632 | 7.0 |
| 820903 | 0400 | 2.27 | 649 | 7.0 |
| 820903 | 0500 | 2.27 | 649 | 7.0 |
| 820903 | 0600 | 2.27 | 649 | 7.0 |
| 820903 | 0700 | 2.30 | 665 | 6.5 |
| 820903 | 0800 | 2.30 | 665 | 6.5 |
| 820903 | 0900 | 2.33 | 682 | 6.5 |
| 820903 | 1000 | 2.33 | 682 | 6.5 |
| 820903 | 1100 | 2.33 | 682 | 6.5 |
| 820903 | 1200 | 2.37 | 699 | 7.0 |
| 820903 | 1300 | 2.37 | 699 | 7.0 |
| 820903 | 1400 | 2.37 | 699 | 7.0 |
| 820903 | 1500 | 2.37 | 699 | 7.5 |
| 820903 | 1600 | 2.37 | 699 | 7.5 |
| 820903 | 1700 | 2.37 | 699 | 7.5 |
| 820903 | 1800 | 2.37 | 699 | 7.5 |
| 820903 | 1900 | 2.40 | 716 | 7.5 |
| 820903 | 2000 | 2.40 | 716 | 7.5 |
| 820903 | 2100 | 2.40 | 716 | 7.0 |
| 820903 | 2200 | 2.37 | 699 | 7.0 |
| 820903 | 2300 | 2.40 | 716 | 7.0 |
| 820903 | 2400 | 2.37 | 699 | 7.0 |

Appendix Table 4-A-5 Cont.

| DATE | TIME | GAGE HEIGHT (ft) | DISCHARGE (cfs) | SURFACE WATER TEMPERATURE (C) |
|---|---|---|---|---|
| 820903 | DAILY MEAN | 2.33 | 682 | 7.1 |
| 820904 | 0100 | 2.37 | 699 | 6.5 |
| 820904 | 0200 | 2.33 | 682 | 6.5 |
| 820904 | 0300 | 2.33 | 682 | 6.5 |
| 820904 | 0400 | 2.33 | 682 | 6.5 |
| 820904 | 0500 | 2.33 | 682 | 6.0 |
| 820904 | 0600 | 2.33 | 682 | 6.0 |
| 820904 | 0700 | 2.30 | 665 | 6.0 |
| 820904 | 0800 | 2.30 | 665 | 6.0 |
| 820904 | 0900 | 2.30 | 665 | 6.0 |
| 820904 | 1000 | 2.30 | 665 | 6.5 |
| 820904 | 1100 | 2.30 | 665 | 6.5 |
| 820904 | 1200 | 2.30 | 665 | 7.0 |
| 820904 | 1300 | 2.27 | 649 | 7.5 |
| 820904 | 1400 | 2.27 | 649 | 8.0 |
| 820904 | 1500 | 2.27 | 649 | 8.0 |
| 820904 | 1600 | 2.27 | 649 | 9.0 |
| 820904 | 1700 | 2.27 | 649 | 8.0 |
| 820904 | 1800 | 2.23 | 632 | 8.5 |
| 820904 | 1900 | 2.23 | 632 | 8.0 |
| 820904 | 2000 | 2.23 | 632 | 7.5 |
| 820904 | 2100 | 2.27 | 649 | 7.5 |
| 820904 | 2200 | 2.23 | 632 | 7.5 |
| 820904 | 2300 | 2.23 | 632 | 7.5 |
| 820904 | 2400 | 2.23 | 632 | 7.0 |
| 820904 | DAILY MEAN | 2.28 | 658 | 7.1 |
| 820905 | 0100 | 2.23 | 632 | 7.0 |
| 820905 | 0200 | 2.20 | 615 | 6.5 |
| 820905 | 0300 | 2.23 | 632 | 6.5 |
| 820905 | 0400 | 2.20 | 615 | 6.5 |
| 820905 | 0500 | 2.23 | 632 | 6.0 |
| 820905 | 0600 | 2.23 | 632 | 6.0 |
| 820905 | 0700 | 2.23 | 632 | 6.0 |
| 820905 | 0800 | 2.20 | 615 | 6.0 |
| 820905 | 0900 | 2.20 | 615 | 6.0 |
| 820905 | 1000 | 2.20 | 615 | 6.5 |
| 820905 | 1100 | 2.20 | 615 | 6.5 |
| 820905 | 1200 | 2.20 | 615 | 6.5 |

Appendix Table 4-A-5 Cont.

| DATE | TIME | GAGE HEIGHT (ft) | DISCHARGE (cfs) | SURFACE WATER TEMPERATURE (C) |
|---|---|---|---|---|
| 820905 | 1300 | 2.20 | 615 | 7.0 |
| 820905 | 1400 | 2.20 | 615 | 7.5 |
| 820905 | 1500 | 2.17 | 598 | 7.5 |
| 820905 | 1600 | 2.20 | 615 | 8.0 |
| 820905 | 1700 | 2.17 | 598 | 8.0 |
| 820905 | 1800 | 2.17 | 598 | 8.0 |
| 820905 | 1900 | 2.17 | 598 | 8.0 |
| 820905 | 2000 | 2.17 | 598 | 8.0 |
| 820905 | 2100 | 2.17 | 598 | 8.0 |
| 820905 | 2200 | 2.17 | 598 | 8.0 |
| 820905 | 2300 | 2.13 | 582 | 7.5 |
| 820905 | 2400 | 2.13 | 582 | 7.5 |
| 820905 | DAILY MEAN | 2.19 | 611 | 7.0 |
| 820906 | 0100 | 2.13 | 582 | 7.5 |
| 820906 | 0200 | 2.17 | 598 | 7.5 |
| 820906 | 0300 | 2.13 | 582 | 7.5 |
| 820906 | 0400 | 2.13 | 582 | 7.0 |
| 820906 | 0500 | 2.13 | 582 | 7.0 |
| 820906 | 0600 | 2.13 | 582 | 7.0 |
| 820906 | 0700 | 2.13 | 582 | 7.0 |
| 820906 | 0800 | 2.13 | 582 | 7.0 |
| 820906 | 0900 | 2.13 | 582 | 7.0 |
| 820906 | 1000 | 2.13 | 582 | 7.5 |
| 820906 | 1100 | 2.13 | 582 | 7.5 |
| 820906 | 1200 | 2.13 | 582 | 7.5 |
| 820906 | 1300 | 2.13 | 582 | 7.5 |
| 820906 | 1400 | 2.13 | 582 | 8.0 |
| 820906 | 1500 | 2.13 | 582 | 8.0 |
| 820906 | 1600 | 2.13 | 582 | 8.0 |
| 820906 | 1700 | 2.13 | 582 | 8.0 |
| 820906 | 1800 | 2.13 | 582 | 8.0 |
| 820906 | 1900 | 2.10 | 565 | 8.0 |
| 820906 | 2000 | 2.13 | 582 | 8.0 |
| 820906 | 2100 | 2.10 | 565 | 8.0 |
| 820906 | 2200 | 2.10 | 565 | 7.5 |
| 820906 | 2300 | 2.10 | 565 | 7.5 |
| 820906 | 2400 | 2.10 | 565 | 7.5 |
| 820906 | DAILY MEAN | 2.13 | 579 | 7.5 |

Appendix Table 4-A-5 Cont.

| DATE | TIME | GAGE HEIGHT (ft) | DISCHARGE (cfs) | SURFACE WATER TEMPERATURE (C) |
|---|---|---|---|---|
| 820907 | 0100 | 2.10 | 565 | 7.5 |
| 820907 | 0200 | 2.10 | 565 | 7.0 |
| 820907 | 0300 | 2.10 | 565 | 7.0 |
| 820907 | 0400 | 2.10 | 565 | 7.0 |
| 820907 | 0500 | 2.10 | 565 | 7.0 |
| 820907 | 0600 | 2.13 | 582 | 7.0 |
| 820907 | 0700 | 2.13 | 582 | 7.0 |
| 820907 | 0800 | 2.13 | 582 | 7.0 |
| 820907 | 0900 | 2.17 | 598 | 7.0 |
| 820907 | 1000 | 2.17 | 598 | 7.5 |
| 820907 | 1100 | 2.17 | 598 | 7.5 |
| 820907 | 1200 | 2.17 | 598 | 7.5 |
| 820907 | 1300 | 2.20 | 615 | 8.0 |
| 820907 | 1400 | 2.20 | 615 | 8.5 |
| 820907 | 1500 | 2.17 | 598 | 9.0 |
| 820907 | 1600 | 2.17 | 598 | 9.0 |
| 820907 | 1700 | 2.17 | 598 | 9.0 |
| 820907 | 1800 | 2.17 | 598 | 8.5 |
| 820907 | 1900 | 2.17 | 598 | 8.5 |
| 820907 | 2000 | 2.17 | 598 | 8.5 |
| 820907 | 2100 | 2.13 | 582 | 8.0 |
| 820907 | 2200 | 2.17 | 598 | 8.0 |
| 820907 | 2300 | 2.13 | 582 | 7.5 |
| 820907 | 2400 | 2.13 | 582 | 7.5 |
| 820907 | DAILY MEAN | 2.15 | 589 | 7.8 |
| 820908 | 0100 | 2.13 | 582 | 7.5 |
| 820908 | 0200 | 2.13 | 582 | 7.5 |
| 820908 | 0300 | 2.13 | 582 | 7.0 |
| 820908 | 0400 | 2.10 | 565 | 7.0 |
| 820908 | 0500 | 2.13 | 582 | 7.0 |
| 820908 | 0600 | 2.10 | 565 | 7.0 |
| 820908 | 0700 | 2.10 | 565 | 7.0 |
| 820908 | 0800 | 2.10 | 565 | 6.5 |
| 820908 | 0900 | 2.13 | 582 | 7.0 |
| 820908 | 1000 | 2.10 | 565 | 7.0 |
| 820908 | 1100 | 2.10 | 565 | 7.0 |
| 820908 | 1200 | 2.10 | 565 | 7.0 |
| 820908 | 1300 | 2.10 | 565 | 7.0 |
| 820908 | 1400 | 2.10 | 565 | 7.0 |
| 820908 | 1500 | 2.10 | 565 | 7.0 |

Appendix Table 4-A-5 Cont.

| DATE | TIME | GAGE HEIGHT (ft) | DISCHARGE (cfs) | SURFACE WATER TEMPERATURE (C) |
|---|---|---|---|---|
| 820908 | 1600 | 2.07 | 549 | 7.0 |
| 820908 | 1700 | 2.07 | 549 | 7.0 |
| 820908 | 1800 | 2.07 | 549 | 7.0 |
| 820908 | 1900 | 2.07 | 549 | 7.5 |
| 820908 | 2000 | 2.07 | 549 | 7.0 |
| 820908 | 2100 | 2.07 | 549 | 7.0 |
| 820908 | 2200 | 2.07 | 549 | 7.0 |
| 820908 | 2300 | 2.07 | 549 | 7.0 |
| 820908 | 2400 | 2.07 | 549 | 7.0 |
| 820908 | DAILY MEAN | 2.09 | 563 | 7.0 |
| 820909 | 0100 | 2.07 | 549 | 6.5 |
| 820909 | 0200 | 2.07 | 549 | 6.5 |
| 820909 | 0300 | 2.07 | 549 | 6.5 |
| 820909 | 0400 | 2.07 | 549 | 6.5 |
| 820909 | 0500 | 2.07 | 549 | 6.5 |
| 820909 | 0600 | 2.07 | 549 | 6.5 |
| 820909 | 0700 | 2.07 | 549 | 6.5 |
| 820909 | 0800 | 2.10 | 565 | 6.5 |
| 820909 | 0900 | 2.07 | 549 | 6.5 |
| 820909 | 1000 | 2.07 | 549 | 6.5 |
| 820909 | 1100 | 2.07 | 549 | 6.5 |
| 820909 | 1200 | 2.07 | 549 | 7.0 |
| 820909 | 1300 | 2.07 | 549 | 7.0 |
| 820909 | 1400 | 2.07 | 549 | 7.5 |
| 820909 | 1500 | 2.07 | 549 | 7.5 |
| 820909 | 1600 | 2.07 | 549 | 7.5 |
| 820909 | 1700 | 2.10 | 565 | 7.5 |
| 820909 | 1800 | 2.07 | 549 | 7.5 |
| 820909 | 1900 | 2.10 | 565 | 7.5 |
| 820909 | 2000 | 2.10 | 565 | 7.5 |
| 820909 | 2100 | 2.10 | 565 | 7.5 |
| 820909 | 2200 | 2.13 | 582 | 7.0 |
| 820909 | 2300 | 2.13 | 582 | 7.0 |
| 820909 | 2400 | 2.17 | 598 | 7.0 |
| 820909 | DAILY MEAN | 2.08 | 557 | 6.9 |
| 820910 | 0100 | 2.17 | 598 | 7.0 |
| 820910 | 0200 | 2.17 | 598 | 6.5 |
| 820910 | 0300 | 2.17 | 598 | 6.5 |

Appendix Table 4-A-5 Cont.

| DATE | TIME | GAGE HEIGHT (ft) | DISCHARGE (cfs) | SURFACE WATER TEMPERATURE (C) |
|---|---|---|---|---|
| 820910 | 0400 | 2.17 | 598 | 6.5 |
| 820910 | 0500 | 2.20 | 615 | 6.5 |
| 820910 | 0600 | 2.20 | 615 | 6.0 |
| 820910 | 0700 | 2.20 | 615 | 6.0 |
| 820910 | 0800 | 2.20 | 615 | 6.0 |
| 820910 | 0900 | 2.20 | 615 | 6.0 |
| 820910 | 1000 | 2.20 | 615 | 6.5 |
| 820910 | 1100 | 2.20 | 615 | 6.5 |
| 820910 | 1200 | 2.17 | 598 | 6.5 |
| 820910 | 1300 | 2.13 | 582 | 7.0 |
| 820910 | 1400 | 2.13 | 582 | 7.5 |
| 820910 | 1500 | 2.13 | 582 | 7.5 |
| 820910 | 1600 | 2.13 | 582 | 7.5 |
| 820910 | 1700 | 2.13 | 582 | 7.5 |
| 820910 | 1800 | 2.13 | 582 | 7.5 |
| 820910 | 1900 | 2.13 | 582 | 7.5 |
| 820910 | 2000 | 2.10 | 565 | 7.5 |
| 820910 | 2100 | 2.13 | 582 | 7.0 |
| 820910 | 2200 | 2.10 | 565 | 7.0 |
| 820910 | 2300 | 2.10 | 565 | 6.5 |
| 820910 | 2400 | 2.10 | 565 | 6.5 |
| 820910 | DAILY MEAN | 2.15 | 592 | 6.8 |
| 820911 | 0100 | 2.10 | 565 | 6.5 |
| 820911 | 0200 | 2.10 | 565 | 6.0 |
| 820911 | 0300 | 2.10 | 565 | 6.0 |
| 820911 | 0400 | 2.10 | 565 | 6.0 |
| 820911 | 0500 | 2.10 | 565 | 6.0 |
| 820911 | 0600 | 2.10 | 565 | 5.5 |
| 820911 | 0700 | 2.07 | 549 | 5.5 |
| 820911 | 0800 | 2.10 | 565 | 5.5 |
| 820911 | 0900 | 2.07 | 549 | 5.5 |
| 820911 | 1000 | 2.07 | 549 | 6.0 |
| 820911 | 1100 | 2.07 | 549 | 6.0 |
| 820911 | 1200 | 2.10 | 565 | 6.0 |
| 820911 | 1300 | 2.13 | 582 | 6.0 |
| 820911 | 1400 | 2.13 | 582 | 6.0 |
| 820911 | 1500 | 2.17 | 598 | 6.0 |
| 820911 | 1600 | 2.17 | 598 | 6.5 |
| 820911 | 1700 | 2.20 | 615 | 6.5 |
| 820911 | 1800 | 2.23 | 632 | 6.5 |

Appendix Table 4-A-5 Cont.

| DATE | TIME | GAGE HEIGHT (ft) | DISCHARGE (cfs) | SURFACE WATER TEMPERATURE (C) |
|---|---|---|---|---|
| 820911 | 1900 | 2.23 | 632 | 6.0 |
| 820911 | 2000 | 2.27 | 649 | 6.0 |
| 820911 | 2100 | 2.27 | 649 | 6.0 |
| 820911 | 2200 | 2.27 | 649 | 6.0 |
| 820911 | 2300 | 2.23 | 632 | 6.0 |
| 820911 | 2400 | 2.23 | 632 | 5.5 |
| 820911 | DAILY MEAN | 2.15 | 590 | 6.0 |
| 820912 | 0100 | 2.23 | 632 | 5.5 |
| 820912 | 0200 | 2.23 | 632 | 5.5 |
| 820912 | 0300 | 2.20 | 615 | 5.5 |
| 820912 | 0400 | 2.20 | 615 | 5.5 |
| 820912 | 0500 | 2.20 | 615 | 5.0 |
| 820912 | 0600 | 2.20 | 615 | 5.0 |
| 820912 | 0700 | 2.20 | 615 | 5.0 |
| 820912 | 0800 | 2.17 | 598 | 4.5 |
| 820912 | 0900 | 2.17 | 598 | 4.5 |
| 820912 | 1000 | 2.17 | 598 | 4.5 |
| 820912 | 1100 | 2.17 | 598 | 4.5 |
| 820912 | 1200 | 2.17 | 598 | 5.0 |
| 820912 | 1300 | 2.13 | 582 | 5.5 |
| 820912 | 1400 | 2.13 | 582 | 6.0 |
| 820912 | 1500 | 2.13 | 582 | 6.5 |
| 820912 | 1600 | 2.13 | 582 | 6.5 |
| 820912 | 1700 | 2.10 | 565 | 6.5 |
| 820912 | 1800 | 2.13 | 582 | 6.5 |
| 820912 | 1900 | 2.13 | 582 | 6.5 |
| 820912 | 2000 | 2.13 | 582 | 6.5 |
| 820912 | 2100 | 2.10 | 565 | 6.5 |
| 820912 | 2200 | 2.13 | 582 | 6.5 |
| 820912 | 2300 | 2.13 | 582 | 6.5 |
| 820912 | 2400 | 2.13 | 582 | 6.5 |
| 820912 | DAILY MEAN | 2.16 | 595 | 5.7 |
| 820913 | 0100 | 2.13 | 582 | 6.0 |
| 820913 | 0200 | 2.20 | 615 | 6.0 |
| 820913 | 0300 | 2.20 | 615 | 6.0 |
| 820913 | 0400 | 2.23 | 632 | 6.0 |
| 820913 | 0500 | 2.27 | 649 | 6.0 |
| 820913 | 0600 | 2.30 | 665 | 5.5 |

Appendix Table 4-A-5 Cont.

| DATE | TIME | GAGE HEIGHT (ft) | DISCHARGE (cfs) | SURFACE WATER TEMPERATURE (C) |
|---|---|---|---|---|
| 820913 | 0700 | 2.37 | 699 | 5.5 |
| 820913 | 0800 | 2.40 | 716 | 5.5 |
| 820913 | 0900 | 2.47 | 751 | 5.5 |
| 820913 | 1000 | 2.53 | 786 | 5.5 |
| 820913 | 1100 | 2.57 | 803 | 5.5 |
| 820913 | 1200 | 2.67 | 856 | 5.5 |
| 820913 | 1300 | 2.70 | 874 | 6.0 |
| 820913 | 1400 | 2.77 | 909 | 6.0 |
| 820913 | 1500 | 2.83 | 945 | 6.0 |
| 820913 | 1600 | 2.87 | 963 | 6.5 |
| 820913 | 1700 | 2.80 | 927 | 6.0 |
| 820913 | 1800 | 2.87 | 963 | 6.5 |
| 820913 | 1900 | 2.87 | 963 | 6.5 |
| 820913 | 2000 | 2.83 | 945 | 6.5 |
| 820913 | 2100 | 2.80 | 927 | 6.5 |
| 820913 | 2200 | 2.80 | 927 | 6.5 |
| 820913 | 2300 | 2.80 | 927 | 6.5 |
| 820913 | 2400 | 2.83 | 945 | 6.5 |
| 820913 | DAILY MEAN | 2.59 | 814 | 6.0 |
| 820914 | 0100 | 2.87 | 909 | 6.5 |
| 820914 | 0200 | 2.90 | 927 | 6.5 |
| 820914 | 0300 | 2.93 | 945 | 6.5 |
| 820914 | 0400 | 3.00 | 981 | 6.5 |
| 820914 | 0500 | 3.07 | 1018 | 6.5 |
| 820914 | 0600 | 3.10 | 1036 | 6.0 |
| 820914 | 0700 | 3.13 | 1054 | 6.0 |
| 820914 | 0800 | 3.17 | 1073 | 6.0 |
| 820914 | 0900 | 3.23 | 1110 | 6.0 |
| 820914 | 1000 | 3.27 | 1128 | 6.0 |
| 820914 | 1100 | 3.30 | 1147 | 6.0 |
| 820914 | 1200 | 3.23 | 1110 | 6.0 |
| 820914 | 1300 | 3.30 | 1147 | 6.5 |
| 820914 | 1400 | 3.27 | 1128 | 6.0 |
| 820914 | 1500 | 3.23 | 1110 | 6.0 |
| 820914 | 1600 | 3.27 | 1128 | 6.0 |
| 820914 | 1700 | 3.23 | 1110 | 6.5 |
| 820914 | 1800 | 3.20 | 1091 | 6.0 |
| 820914 | 1900 | 3.23 | 1110 | 6.0 |
| 820914 | 2000 | 3.27 | 1128 | 6.0 |
| 820914 | 2100 | 3.30 | 1147 | 6.0 |

Appendix Table 4-A-5 Cont.

| DATE | TIME | GAGE HEIGHT (ft) | DISCHARGE (cfs) | SURFACE WATER TEMPERATURE (C) |
|---|---|---|---|---|
| 820914 | 2200 | 3.33 | 1166 | 6.0 |
| 820914 | 2300 | 3.37 | 1184 | 6.0 |
| 820914 | 2400 | 3.47 | 1241 | 6.0 |
| 820914 | DAILY MEAN | 3.19 | 1088 | 6.1 |
| 820915 | 0100 | 3.50 | 1260 | 6.0 |
| 820915 | 0200 | 3.57 | 1298 | 6.0 |
| 820915 | 0300 | 3.60 | 1317 | 6.0 |
| 820915 | 0400 | 3.67 | 1355 | 6.0 |
| 820915 | 0500 | 3.73 | 1394 | 6.0 |
| 820915 | 0600 | 3.80 | 1433 | 6.0 |
| 820915 | 0700 | 3.87 | 1472 | 6.0 |
| 820915 | 0800 | 3.93 | 1511 | 6.0 |
| 820915 | 0900 | 4.07 | 1589 | 6.0 |
| 820915 | 1000 | 4.07 | 1589 | 6.0 |
| 820915 | 1100 | 4.13 | 1629 | 6.0 |
| 820915 | 1200 | 4.30 | 1729 | 6.5 |
| 820915 | 1300 | 4.33 | 1749 | 6.5 |
| 820915 | 1400 | 4.27 | 1709 | 7.0 |
| 820915 | 1500 | 4.27 | 1709 | 7.0 |
| 820915 | 1600 | 4.30 | 1729 | 7.5 |
| 820915 | 1700 | 4.23 | 1689 | 7.5 |
| 820915 | 1800 | 4.33 | 1749 | 7.5 |
| 820915 | 1900 | 4.20 | 1669 | 7.5 |
| 820915 | 2000 | 4.17 | 1649 | 7.0 |
| 820915 | 2100 | 4.23 | 1689 | 7.0 |
| 820915 | 2200 | 4.27 | 1709 | 7.0 |
| 820915 | 2300 | 4.23 | 1689 | 7.0 |
| 820915 | 2400 | 4.30 | 1729 | 7.0 |
| 820915 | DAILY MEAN | 4.06 | 1584 | 6.6 |
| 820916 | 0100 | 4.30 | 1729 | 6.5 |
| 820916 | 0200 | 4.33 | 1749 | 6.5 |
| 820916 | 0300 | 4.40 | 1789 | 6.5 |
| 820916 | 0400 | 4.40 | 1789 | 6.0 |
| 820916 | 0500 | 4.40 | 1789 | 6.0 |
| 820916 | 0600 | 4.27 | 1709 | 6.0 |
| 820916 | 0700 | 4.37 | 1769 | 6.0 |
| 820916 | 0800 | 4.37 | 1769 | 6.0 |
| 820916 | 0900 | 4.30 | 1729 | 6.0 |

Appendix Table 4-A-5 Cont.

| DATE | TIME | GAGE HEIGHT (ft) | DISCHARGE (cfs) | SURFACE WATER TEMPERATURE (C) |
|---|---|---|---|---|
| 820916 | 1000 | 4.33 | 1749 | 6.0 |
| 820916 | 1100 | 4.33 | 1749 | 5.5 |
| 820916 | 1200 | 4.23 | 1689 | 6.0 |
| 820916 | 1300 | 4.23 | 1689 | 5.5 |
| 820916 | 1400 | 4.23 | 1689 | 6.0 |
| 820916 | 1500 | 4.17 | 1649 | 6.0 |
| 820916 | 1600 | 4.07 | 1589 | 6.0 |
| 820916 | 1700 | 4.13 | 1629 | 6.0 |
| 820916 | 1810 | 4.07 | 1589 | 6.0 |
| 820916 | 1910 | 4.03 | 1570 | 6.0 |
| 820916 | 2010 | 3.97 | 1530 | 5.5 |
| 820916 | 2110 | 3.97 | 1530 | 5.5 |
| 820916 | 2210 | 3.93 | 1511 | 5.5 |
| 820916 | 2310 | 3.93 | 1511 | 5.5 |
| 820916 | DAILY MEAN | 4.21 | 1673 | 5.9 |
| 820917 | 0010 | 3.87 | 1472 | 5.5 |
| 820917 | 0110 | 3.90 | 1491 | 5.0 |
| 820917 | 0210 | 3.87 | 1472 | 5.0 |
| 820917 | 0310 | 3.83 | 1452 | 5.0 |
| 820917 | 0410 | 3.83 | 1452 | 5.0 |
| 820917 | 0510 | 3.83 | 1452 | 5.0 |
| 820917 | 0610 | 3.80 | 1433 | 4.5 |
| 820917 | 0710 | 3.80 | 1433 | 4.5 |
| 820917 | 0810 | 3.80 | 1433 | 4.5 |
| 820917 | 0910 | 3.77 | 1413 | 4.5 |
| 820917 | 1010 | 3.73 | 1394 | 4.5 |
| 820917 | 1110 | 3.77 | 1413 | 4.5 |
| 820917 | 1210 | 3.73 | 1394 | 5.0 |
| 820917 | 1310 | 3.73 | 1394 | 5.0 |
| 820917 | 1410 | 3.67 | 1355 | 5.5 |
| 820917 | 1510 | 3.70 | 1375 | 5.5 |
| 820917 | 1610 | 3.67 | 1355 | 5.5 |
| 820917 | 1710 | 3.67 | 1355 | 6.0 |
| 820917 | 1810 | 3.60 | 1317 | 6.0 |
| 820917 | 1910 | 3.60 | 1317 | 6.0 |
| 820917 | 2010 | 3.60 | 1317 | 5.5 |
| 820917 | 2110 | 3.63 | 1336 | 5.5 |
| 820917 | 2210 | 3.53 | 1279 | 5.5 |
| 820917 | 2310 | 3.57 | 1298 | 5.5 |

Appendix Table 4-A-5 Cont.

| DATE | TIME | GAGE HEIGHT (ft) | DISCHARGE (cfs) | SURFACE WATER TEMPERATURE (C) |
|---|---|---|---|---|
| 820917 | DAILY MEAN | 3.73 | 1391 | 5.2 |
| 820918 | 0010 | 3.60 | 1317 | 5.0 |
| 820918 | 0110 | 3.53 | 1279 | 5.0 |
| 820918 | 0210 | 3.53 | 1279 | 5.0 |
| 820918 | 0310 | 3.50 | 1260 | 5.0 |
| 820918 | 0410 | 3.47 | 1241 | 4.5 |
| 820918 | 0510 | 3.47 | 1241 | 4.5 |
| 820918 | 0610 | 3.43 | 1222 | 4.5 |
| 820918 | 0710 | 3.43 | 1222 | 4.5 |
| 820918 | 0810 | 3.43 | 1222 | 4.5 |
| 820918 | 0910 | 3.43 | 1222 | 5.0 |
| 820918 | 1010 | 3.40 | 1203 | 5.0 |
| 820918 | 1110 | 3.40 | 1203 | 5.0 |
| 820918 | 1210 | 3.37 | 1184 | 5.5 |
| 820918 | 1310 | 3.40 | 1203 | 6.0 |
| 820918 | 1410 | 3.33 | 1166 | 6.0 |
| 820918 | 1510 | 3.37 | 1184 | 6.0 |
| 820918 | 1610 | 3.33 | 1166 | 6.0 |
| 820918 | 1710 | 3.33 | 1166 | 6.0 |
| 820918 | 1810 | 3.33 | 1166 | 6.5 |
| 820918 | 1910 | 3.33 | 1166 | 6.0 |
| 820918 | 2010 | 3.37 | 1184 | 6.0 |
| 820918 | 2110 | 3.33 | 1166 | 6.0 |
| 820918 | 2210 | 3.37 | 1184 | 6.0 |
| 820918 | 2310 | 3.40 | 1203 | 6.0 |
| 820918 | DAILY MEAN | 3.41 | 1210 | 5.4 |
| 820919 | 0010 | 3.40 | 1203 | 6.0 |
| 820919 | 0110 | 3.40 | 1203 | 6.0 |
| 820919 | 0210 | 3.40 | 1203 | 6.0 |
| 820919 | 0310 | 3.40 | 1203 | 5.5 |
| 820919 | 0410 | 3.43 | 1222 | 5.5 |
| 820919 | 0510 | 3.47 | 1241 | 6.0 |
| 820919 | 0610 | 3.47 | 1241 | 5.5 |
| 820919 | 0710 | 3.40 | 1203 | 5.5 |
| 820919 | 0810 | 3.43 | 1222 | 5.5 |
| 820919 | 0910 | 3.50 | 1260 | 5.5 |
| 820919 | 1010 | 3.50 | 1260 | 6.0 |
| 820919 | 1110 | 3.50 | 1260 | 5.5 |
| 820919 | 1210 | 3.63 | 1336 | 6.0 |

Appendix Table 4-A-5 Cont.

| DATE | TIME | GAGE HEIGHT (ft) | DISCHARGE (cfs) | SURFACE WATER TEMPERATURE (C) |
|---|---|---|---|---|
| 820919 | 1310 | 3.70 | 1375 | 6.0 |
| 820919 | 1410 | 3.63 | 1336 | 6.0 |
| 820919 | 1510 | 3.73 | 1394 | 6.0 |
| 820919 | 1610 | 3.73 | 1394 | 6.0 |
| 820919 | 1710 | 3.73 | 1394 | 6.0 |
| 820919 | 1810 | 3.67 | 1355 | 6.0 |
| 820919 | 1910 | 3.73 | 1394 | 6.0 |
| 820919 | 2010 | 3.77 | 1413 | 6.0 |
| 820919 | 2110 | 3.77 | 1413 | 6.0 |
| 820919 | 2210 | 3.77 | 1413 | 6.0 |
| 820919 | 2310 | 3.87 | 1472 | 5.5 |
| 820919 | DAILY MEAN | 3.58 | 1308 | 5.8 |
| 820920 | 0010 | 3.90 | 1491 | 5.5 |
| 820920 | 0110 | 3.83 | 1452 | 5.5 |
| 820920 | 0210 | 3.83 | 1452 | 5.5 |
| 820920 | 0310 | 3.80 | 1433 | 5.5 |
| 820920 | 0410 | 3.80 | 1433 | 5.5 |
| 820920 | 0510 | 3.77 | 1413 | 5.5 |
| 820920 | 0610 | 3.77 | 1413 | 5.0 |
| 820920 | 0710 | 3.73 | 1394 | 5.0 |
| 820920 | 0810 | 3.77 | 1413 | 5.0 |
| 820920 | 0910 | 3.73 | 1394 | 5.0 |
| 820920 | 1010 | 3.73 | 1394 | 5.5 |
| 820920 | 1110 | 3.73 | 1394 | 5.5 |
| 820920 | 1210 | 3.70 | 1375 | 5.5 |
| 820920 | 1310 | 3.63 | 1336 | 5.5 |
| 820920 | 1410 | 3.67 | 1355 | 6.0 |
| 820920 | 1510 | 3.63 | 1336 | 6.0 |
| 820920 | 1610 | 3.67 | 1355 | 6.0 |
| 820920 | 1710 | 3.60 | 1317 | 6.0 |
| 820920 | 1810 | 3.63 | 1336 | 6.0 |
| 820920 | 1910 | 3.60 | 1317 | 5.5 |
| 820920 | 2010 | 3.57 | 1298 | 6.0 |
| 820920 | 2110 | 3.57 | 1298 | 5.5 |
| 820920 | 2210 | 3.60 | 1317 | 5.5 |
| 820920 | 2310 | 3.53 | 1279 | 5.5 |
| 820920 | DAILY MEAN | 3.70 | 1375 | 5.5 |
| 820921 | 0010 | 3.53 | 1279 | 5.5 |

Appendix Table 4-A-5 Cont.

| DATE | TIME | GAGE HEIGHT (ft) | DISCHARGE (cfs) | SURFACE WATER TEMPERATURE (C) |
|---|---|---|---|---|
| 820921 | 0110 | 3.57 | 1298 | 5.5 |
| 820921 | 0210 | 3.53 | 1279 | 5.0 |
| 820921 | 0310 | 3.57 | 1298 | 5.0 |
| 820921 | 0410 | 3.50 | 1260 | 5.0 |
| 820921 | 0510 | 3.47 | 1241 | 5.0 |
| 820921 | 0610 | 3.50 | 1260 | 5.0 |
| 820921 | 0710 | 3.50 | 1260 | 5.0 |
| 820921 | 0810 | 3.53 | 1279 | 5.0 |
| 820921 | 0910 | 3.47 | 1241 | 5.0 |
| 820921 | 1010 | 3.47 | 1241 | 5.0 |
| 820921 | 1110 | 3.43 | 1222 | 5.5 |
| 820921 | 1210 | 3.43 | 1222 | 5.5 |
| 820921 | 1310 | 3.40 | 1203 | 5.5 |
| 820921 | 1410 | 3.37 | 1184 | 6.0 |
| 820921 | 1510 | 3.40 | 1203 | 6.0 |
| 820921 | 1610 | 3.40 | 1203 | 6.0 |
| 820921 | 1710 | 3.43 | 1222 | 6.0 |
| 820921 | 1810 | 3.37 | 1184 | 6.0 |
| 820921 | 1910 | 3.40 | 1203 | 6.0 |
| 820921 | 2010 | 3.37 | 1184 | 6.0 |
| 820921 | 2110 | 3.37 | 1184 | 6.0 |
| 820921 | 2210 | 3.37 | 1184 | 5.5 |
| 820921 | 2310 | 3.33 | 1166 | 5.5 |
| 820921 | DAILY MEAN | 3.45 | 1229 | 5.5 |
| 820922 | 0010 | 3.37 | 1184 | 5.5 |
| 820922 | 0110 | 3.33 | 1166 | 5.5 |
| 820922 | 0210 | 3.33 | 1166 | 5.5 |
| 820922 | 0310 | 3.33 | 1166 | 5.0 |
| 820922 | 0410 | 3.30 | 1147 | 5.0 |
| 820922 | 0510 | 3.30 | 1147 | 5.0 |
| 820922 | 0610 | 3.27 | 1128 | 5.0 |
| 820922 | 0710 | 3.30 | 1147 | 5.0 |
| 820922 | 0810 | 3.23 | 1110 | 5.0 |
| 820922 | 0910 | 3.27 | 1128 | 5.0 |
| 820922 | 1010 | 3.23 | 1110 | 5.0 |
| 820922 | 1110 | 3.23 | 1110 | 5.0 |
| 820922 | 1210 | 3.23 | 1110 | 5.5 |
| 820922 | 1310 | 3.23 | 1110 | 5.5 |
| 820922 | 1410 | 3.20 | 1091 | 5.5 |
| 820922 | 1510 | 3.23 | 1110 | 6.0 |

Appendix Table 4-A-5 Cont.

| DATE | TIME | GAGE HEIGHT (ft) | DISCHARGE (cfs) | SURFACE WATER TEMPERATURE (C) |
|---|---|---|---|---|
| 820922 | 1610 | 3.17 | 1073 | 6.0 |
| 820922 | 1710 | 3.20 | 1091 | 6.0 |
| 820922 | 1810 | 3.17 | 1073 | 6.0 |
| 820922 | 1910 | 3.20 | 1091 | 5.5 |
| 820922 | 2010 | 3.17 | 1073 | 5.5 |
| 820922 | 2110 | 3.17 | 1073 | 5.0 |
| 820922 | 2210 | 3.20 | 1091 | 5.0 |
| 820922 | 2310 | 3.13 | 1054 | 5.0 |
| 820922 | DAILY MEAN | 3.24 | 1114 | 5.3 |
| 820923 | 0010 | 3.13 | 1054 | 4.5 |
| 820923 | 0110 | 3.13 | 1054 | 4.5 |
| 820923 | 0210 | 3.10 | 1036 | 4.0 |
| 820923 | 0310 | 3.07 | 1018 | 4.0 |
| 820923 | 0410 | 3.10 | 1036 | 3.5 |
| 820923 | 0510 | 3.07 | 1018 | 3.5 |
| 820923 | 0610 | 3.03 | 999 | 3.5 |
| 820923 | 0710 | 3.03 | 999 | 3.5 |
| 820923 | 0810 | 3.03 | 999 | 3.0 |
| 820923 | 0910 | 3.03 | 999 | 3.0 |
| 820923 | 1010 | 3.03 | 999 | 3.0 |
| 820923 | 1110 | 3.00 | 981 | 3.0 |
| 820923 | 1210 | 3.00 | 981 | 3.5 |
| 820923 | 1310 | 3.00 | 981 | 4.0 |
| 820923 | 1410 | 2.97 | 963 | 5.0 |
| 820923 | 1510 | 2.97 | 963 | 5.0 |
| 820923 | 1610 | 2.97 | 963 | 5.0 |
| 820923 | 1710 | 2.97 | 963 | 5.0 |
| 820923 | 1810 | 2.97 | 963 | 5.0 |
| 820923 | 1910 | 2.97 | 963 | 5.0 |
| 820923 | 2010 | 2.93 | 945 | 4.5 |
| 820923 | 2110 | 2.93 | 945 | 4.5 |
| 820923 | 2210 | 2.93 | 945 | 4.0 |
| 820923 | 2310 | 2.93 | 945 | 4.0 |
| 820923 | DAILY MEAN | 3.01 | 988 | 4.1 |
| 820924 | 0010 | 2.93 | 945 | 3.5 |
| 820924 | 0110 | 2.90 | 927 | 3.5 |
| 820924 | 0210 | 2.90 | 927 | 3.0 |
| 820924 | 0310 | 2.90 | 927 | 3.0 |

Appendix Table 4-A-5 Cont.

| DATE | TIME | GAGE HEIGHT (ft) | DISCHARGE (cfs) | SURFACE WATER TEMPERATURE (C) |
|---|---|---|---|---|
| 820924 | 0410 | 2.87 | 909 | 3.0 |
| 820924 | 0510 | 2.90 | 927 | 3.0 |
| 820924 | 0610 | 2.87 | 909 | 2.5 |
| 820924 | 0710 | 2.87 | 909 | 2.5 |
| 820924 | 0810 | 2.87 | 909 | 2.5 |
| 820924 | 0910 | 2.87 | 909 | 2.5 |
| 820924 | 1010 | 2.83 | 891 | 2.5 |
| 820924 | 1110 | 2.80 | 874 | 3.0 |
| 820924 | 1210 | 2.80 | 874 | 3.0 |
| 820924 | 1310 | 2.80 | 874 | 3.5 |
| 820924 | 1410 | 2.80 | 874 | 4.5 |
| 820924 | 1510 | 2.80 | 874 | 4.5 |
| 820924 | 1610 | 2.80 | 874 | 4.5 |
| 820924 | 1710 | 2.80 | 874 | 4.5 |
| 820924 | 1810 | 2.80 | 874 | 4.5 |
| 820924 | 1910 | 2.80 | 874 | 5.0 |
| 820924 | 2010 | 2.77 | 856 | 5.0 |
| 820924 | 2110 | 2.77 | 856 | 4.5 |
| 820924 | 2210 | 2.77 | 856 | 4.5 |
| 820924 | 2310 | 2.80 | 874 | 4.5 |
| 820924 | DAILY MEAN | 2.83 | 891 | 3.6 |
| 820925 | 0010 | 2.77 | 856 | 4.5 |
| 820925 | 0110 | 2.77 | 856 | 4.0 |
| 820925 | 0210 | 2.77 | 856 | 4.0 |
| 820925 | 0310 | 2.70 | 821 | 3.5 |
| 820925 | 0410 | 2.73 | 838 | 3.5 |
| 820925 | 0510 | 2.73 | 838 | 3.5 |
| 820925 | 0610 | 2.73 | 838 | 3.0 |
| 820925 | 0710 | 2.73 | 838 | 3.0 |
| 820925 | 0810 | 2.73 | 838 | 3.0 |
| 820925 | 0910 | 2.70 | 821 | 3.0 |
| 820925 | 1010 | 2.67 | 803 | 3.0 |
| 820925 | 1110 | 2.70 | 821 | 3.5 |
| 820925 | 1210 | 2.70 | 821 | 3.5 |
| 820925 | 1310 | 2.67 | 803 | 4.5 |
| 820925 | 1410 | 2.67 | 803 | 4.5 |
| 820925 | 1510 | 2.67 | 803 | 5.0 |
| 820925 | 1610 | 2.67 | 803 | 5.0 |
| 820925 | 1710 | 2.67 | 803 | 5.0 |
| 820925 | 1810 | 2.67 | 803 | 5.0 |

Appendix Table 4-A-5 Cont.

| DATE | TIME | GAGE HEIGHT (ft) | DISCHARGE (cfs) | SURFACE WATER TEMPERATURE (C) |
|---|---|---|---|---|
| 820925 | 1910 | 2.63 | 786 | 5.0 |
| 820925 | 2010 | 2.67 | 803 | 5.0 |
| 820925 | 2110 | 2.63 | 786 | 5.0 |
| 820925 | 2210 | 2.63 | 786 | 5.0 |
| 820925 | 2310 | 2.63 | 786 | 5.0 |
| 820925 | DAILY MEAN | 2.69 | 817 | 4.1 |
| 820926 | 0010 | 2.63 | 786 | 5.0 |
| 820926 | 0110 | 2.63 | 786 | 4.5 |
| 820926 | 0210 | 2.60 | 768 | 4.5 |
| 820926 | 0310 | 2.63 | 786 | 4.5 |
| 820926 | 0410 | 2.60 | 768 | 4.5 |
| 820926 | 0510 | 2.60 | 768 | 4.0 |
| 820926 | 0610 | 2.60 | 768 | 4.0 |
| 820926 | 0710 | 2.60 | 768 | 4.0 |
| 820926 | 0810 | 2.60 | 768 | 4.0 |
| 820926 | 0910 | 2.60 | 768 | 4.0 |
| 820926 | 1010 | 2.60 | 768 | 4.5 |
| 820926 | 1110 | 2.60 | 768 | 4.5 |
| 820926 | 1210 | 2.60 | 768 | 4.5 |
| 820926 | 1310 | 2.57 | 751 | 5.0 |
| 820926 | 1410 | 2.60 | 768 | 5.0 |
| 820926 | 1510 | 2.57 | 751 | 5.0 |
| 820926 | 1610 | 2.60 | 768 | 5.0 |
| 820926 | 1710 | 2.57 | 751 | 5.0 |
| 820926 | 1810 | 2.60 | 768 | 5.0 |
| 820926 | 1910 | 2.57 | 751 | 5.0 |
| 820926 | 2010 | 2.60 | 768 | 5.0 |
| 820926 | 2110 | 2.57 | 751 | 5.0 |
| 820926 | 2210 | 2.57 | 751 | 5.0 |
| 820926 | 2310 | 2.57 | 751 | 5.0 |
| 820926 | DAILY MEAN | 2.59 | 765 | 4.6 |
| 820927 | 0010 | 2.63 | 786 | 4.5 |
| 820927 | 0110 | 2.60 | 768 | 4.5 |
| 820927 | 0210 | 2.60 | 768 | 4.5 |
| 820927 | 0310 | 2.60 | 768 | 4.5 |
| 820927 | 0410 | 2.60 | 768 | 4.5 |
| 820927 | 0510 | 2.60 | 768 | 4.5 |
| 820927 | 0610 | 2.60 | 768 | 4.0 |

Appendix Table 4-A-5 Cont.

| DATE | TIME | GAGE HEIGHT (ft) | DISCHARGE (cfs) | SURFACE WATER TEMPERATURE (C) |
|---|---|---|---|---|
| 820927 | 0710 | 2.57 | 751 | 4.0 |
| 820927 | 0810 | 2.60 | 768 | 4.0 |
| 820927 | 0910 | 2.60 | 768 | 4.5 |
| 820927 | 1010 | 2.60 | 768 | 4.5 |
| 820927 | 1110 | 2.57 | 751 | 4.5 |
| 820927 | 1210 | 2.57 | 751 | 4.5 |
| 820927 | 1310 | 2.60 | 768 | 5.0 |
| 820927 | 1410 | 2.57 | 751 | 5.0 |
| 820927 | 1510 | 2.57 | 751 | 5.5 |
| 820927 | 1610 | 2.57 | 751 | 5.5 |
| 820927 | 1710 | 2.57 | 751 | 5.5 |
| 820927 | 1810 | 2.53 | 734 | 5.5 |
| 820927 | 1910 | 2.53 | 734 | 5.0 |
| 820927 | 2010 | 2.50 | 716 | 5.0 |
| 820927 | 2110 | 2.53 | 734 | 4.5 |
| 820927 | 2210 | 2.50 | 716 | 4.5 |
| 820927 | 2310 | 2.53 | 734 | 4.0 |
| 820927 | DAILY MEAN | 2.57 | 754 | 4.7 |
| 820928 | 0010 | 2.53 | 734 | 4.0 |
| 820928 | 0110 | 2.50 | 716 | 3.5 |
| 820928 | 0210 | 2.50 | 716 | 3.5 |
| 820928 | 0310 | 2.50 | 716 | 3.5 |
| 820928 | 0410 | 2.47 | 699 | 3.0 |
| 820928 | 0510 | 2.47 | 699 | 3.0 |
| 820928 | 0610 | 2.47 | 699 | 3.0 |
| 820928 | 0710 | 2.47 | 699 | 2.5 |
| 820928 | 0810 | 2.47 | 699 | 2.5 |
| 820928 | 0910 | 2.43 | 682 | 2.5 |
| 820928 | 1010 | 2.43 | 682 | 2.5 |
| 820928 | 1110 | 2.47 | 699 | 3.0 |
| 820928 | 1210 | 2.43 | 682 | 3.0 |
| 820928 | 1310 | 2.43 | 682 | 3.5 |
| 820928 | 1410 | 2.43 | 682 | 3.5 |
| 820928 | 1510 | 2.43 | 682 | 4.0 |
| 820928 | 1610 | 2.43 | 682 | 4.0 |
| 820928 | 1710 | 2.43 | 682 | 4.0 |
| 820928 | 1810 | 2.40 | 665 | 4.5 |
| 820928 | 1910 | 2.43 | 682 | 4.5 |
| 820928 | 2010 | 2.40 | 665 | 4.5 |
| 820928 | 2110 | 2.40 | 665 | 4.0 |

Appendix Table 4-A-5 Cont.

| DATE | TIME | GAGE HEIGHT (ft) | DISCHARGE (cfs) | SURFACE WATER TEMPERATURE (C) |
|---|---|---|---|---|
| 820928 | 2210 | 2.43 | 682 | 4.0 |
| 820928 | 2310 | 2.43 | 682 | 4.0 |
| 820928 | DAILY MEAN | 2.45 | 691 | 3.5 |
| 820929 | 0010 | 2.43 | 682 | 4.0 |
| 820929 | 0110 | 2.43 | 682 | 4.0 |
| 820929 | 0210 | 2.43 | 682 | 4.0 |
| 820929 | 0310 | 2.43 | 682 | 4.0 |
| 820929 | 0410 | 2.47 | 699 | 4.0 |
| 820929 | 0510 | 2.43 | 682 | 4.0 |
| 820929 | 0610 | 2.43 | 682 | 4.0 |
| 820929 | 0710 | 2.43 | 682 | 3.5 |
| 820929 | 0810 | 2.43 | 682 | 3.5 |
| 820929 | 0910 | 2.43 | 682 | 4.0 |
| 820929 | 1010 | 2.40 | 665 | 4.0 |
| 820929 | 1110 | 2.40 | 665 | 4.0 |
| 820929 | 1210 | 2.43 | 682 | 4.5 |
| 820929 | 1310 | 2.40 | 665 | 4.5 |
| 820929 | 1410 | 2.40 | 665 | 5.0 |
| 820929 | 1510 | 2.40 | 665 | 5.0 |
| 820929 | 1610 | 2.40 | 665 | 5.0 |
| 820929 | 1710 | 2.37 | 649 | 5.0 |
| 820929 | 1810 | 2.37 | 649 | 5.0 |
| 820929 | 1910 | 2.40 | 665 | 5.0 |
| 820929 | 2010 | 2.37 | 649 | 5.0 |
| 820929 | 2110 | 2.37 | 649 | 5.0 |
| 820929 | 2210 | 2.37 | 649 | 5.0 |
| 820929 | 2310 | 2.40 | 665 | 5.0 |
| 820929 | DAILY MEAN | 2.41 | 670 | 4.4 |
| 820930 | 0010 | 2.40 | 665 | 5.0 |
| 820930 | 0110 | 2.40 | 665 | 4.5 |
| 820930 | 0210 | 2.40 | 665 | 4.5 |
| 820930 | 0310 | 2.43 | 682 | 4.5 |
| 820930 | 0410 | 2.43 | 682 | 4.5 |
| 820930 | 0510 | 2.43 | 682 | 4.5 |
| 820930 | 0610 | 2.43 | 682 | 4.5 |
| 820930 | 0710 | 2.43 | 682 | 4.0 |
| 820930 | 0810 | 2.40 | 665 | 4.0 |
| 820930 | 0910 | 2.43 | 682 | 4.0 |

Appendix Table 4-A-5 Cont.

| DATE | TIME | GAGE HEIGHT (ft) | DISCHARGE (cfs) | SURFACE WATER TEMPERATURE (C) |
|---|---|---|---|---|
| 820930 | 1010 | 2.40 | 665 | 4.0 |
| 820930 | 1110 | 2.40 | 665 | 4.5 |
| 820930 | 1210 | 2.37 | 649 | 4.5 |
| 820930 | 1310 | 2.40 | 665 | 5.0 |
| 820930 | 1410 | 2.37 | 649 | 5.0 |
| 820930 | 1510 | 2.37 | 649 | 5.0 |
| 820930 | 1610 | 2.37 | 649 | 5.0 |
| 820930 | 1710 | 2.37 | 649 | 5.0 |
| 820930 | 1810 | 2.33 | 632 | 5.0 |
| 820930 | 1910 | 2.37 | 649 | 5.0 |
| 820930 | 2010 | 2.37 | 649 | 5.0 |
| 820930 | 2110 | 2.37 | 649 | 5.0 |
| 820930 | 2210 | 2.33 | 632 | 4.5 |
| 820930 | 2310 | 2.33 | 632 | 4.5 |
| 820930 | DAILY MEAN | 2.39 | 660 | 4.6 |
| 821001 | 0010 | 2.33 | 632 | 4.5 |
| 821001 | 0110 | 2.33 | 632 | 4.5 |
| 821001 | 0210 | 2.33 | 632 | 4.5 |
| 821001 | 0310 | 2.33 | 632 | 4.0 |
| 821001 | 0410 | 2.33 | 632 | 4.0 |
| 821001 | 0510 | 2.33 | 632 | 4.0 |
| 821001 | 0610 | 2.30 | 615 | 4.0 |
| 821001 | 0710 | 2.30 | 615 | 4.0 |
| 821001 | 0810 | 2.30 | 615 | 3.5 |
| 821001 | 0910 | 2.30 | 615 | 3.5 |
| 821001 | 1010 | 2.30 | 615 | 4.0 |
| 821001 | 1110 | 2.30 | 615 | 4.0 |
| 821001 | 1210 | 2.30 | 615 | 4.0 |
| 821001 | 1310 | 2.27 | 598 | 4.0 |
| 821001 | 1410 | 2.30 | 615 | 4.5 |
| 821001 | 1510 | 2.27 | 598 | 4.5 |
| 821001 | 1610 | 2.27 | 598 | 4.5 |
| 821001 | 1710 | 2.30 | 615 | 4.5 |
| 821001 | 1810 | 2.27 | 598 | 4.5 |
| 821001 | 1910 | 2.27 | 598 | 4.5 |
| 821001 | 2010 | 2.27 | 598 | 4.0 |
| 821001 | 2110 | 2.27 | 598 | 4.0 |
| 821001 | 2210 | 2.27 | 598 | 4.0 |
| 821001 | 2310 | 2.27 | 598 | 4.0 |

Appendix Table 4-A-5 Cont.

| DATE | TIME | GAGE HEIGHT (ft) | DISCHARGE (cfs) | SURFACE WATER TEMPERATURE (C) |
|---|---|---|---|---|
| 821001 | DAILY MEAN | 2.30 | 613 | 4.1 |
| 821002 | 0010 | 2.27 | 598 | 4.0 |
| 821002 | 0110 | 2.27 | 598 | 4.0 |
| 821002 | 0210 | 2.27 | 598 | 3.5 |
| 821002 | 0310 | 2.27 | 598 | 3.5 |
| 821002 | 0410 | 2.27 | 598 | 3.5 |
| 821002 | 0510 | 2.23 | 582 | 3.5 |
| 821002 | 0610 | 2.23 | 582 | 3.5 |
| 821002 | 0710 | 2.23 | 582 | 3.5 |
| 821002 | 0810 | 2.23 | 582 | 3.5 |
| 821002 | 0910 | 2.23 | 582 | 3.5 |
| 821002 | 1010 | 2.20 | 565 | 3.5 |
| 821002 | 1110 | 2.23 | 582 | 4.0 |
| 821002 | 1210 | 2.23 | 582 | 4.5 |
| 821002 | 1310 | 2.20 | 565 | 4.5 |
| 821002 | 1410 | 2.20 | 565 | 4.5 |
| 821002 | 1510 | 2.20 | 565 | 4.5 |
| 821002 | 1610 | 2.23 | 582 | 4.5 |
| 821002 | 1710 | 2.20 | 565 | 4.5 |
| 821002 | 1810 | 2.20 | 565 | 4.5 |
| 821002 | 1910 | 2.20 | 565 | 4.5 |
| 821002 | 2010 | 2.20 | 565 | 4.5 |
| 821002 | 2110 | 2.20 | 565 | 4.5 |
| 821002 | 2210 | 2.20 | 565 | 4.0 |
| 821002 | 2310 | 2.20 | 565 | 4.0 |
| 821002 | DAILY MEAN | 2.22 | 578 | 4.0 |
| 821003 | 0010 | 2.20 | 565 | 4.0 |
| 821003 | 0110 | 2.17 | 549 | 3.5 |
| 821003 | 0210 | 2.17 | 549 | 3.5 |
| 821003 | 0310 | 2.17 | 549 | 3.5 |
| 821003 | 0410 | 2.17 | 549 | 3.0 |
| 821003 | 0510 | 2.17 | 549 | 3.0 |
| 821003 | 0610 | 2.17 | 549 | 3.0 |
| 821003 | 0710 | 2.17 | 549 | 3.0 |
| 821003 | 0810 | 2.17 | 549 | 3.0 |
| 821003 | 0910 | 2.17 | 549 | 3.0 |
| 821003 | 1010 | 2.17 | 549 | 3.0 |
| 821003 | 1110 | 2.17 | 549 | 3.5 |
| 821003 | 1210 | 2.17 | 549 | 3.5 |

Appendix Table 4-A-5 Cont.

| DATE | TIME | GAGE HEIGHT (ft) | DISCHARGE (cfs) | SURFACE WATER TEMPERATURE (C) |
|---|---|---|---|---|
| 821003 | 1310 | 2.13 | 533 | 4.0 |
| 821003 | 1410 | 2.13 | 533 | 4.0 |
| 821003 | 1510 | 2.17 | 549 | 4.5 |
| 821003 | 1610 | 2.17 | 549 | 4.0 |
| 821003 | 1710 | 2.13 | 533 | 4.0 |
| 821003 | 1810 | 2.13 | 533 | 4.0 |
| 821003 | 1910 | 2.13 | 533 | 4.0 |
| 821003 | 2010 | 2.13 | 533 | 4.0 |
| 821003 | 2110 | 2.17 | 549 | 4.0 |
| 821003 | 2210 | 2.13 | 533 | 4.0 |
| 821003 | 2310 | 2.13 | 533 | 3.5 |
| 821003 | DAILY MEAN | 2.16 | 544 | 3.6 |
| 821004 | 0010 | 2.13 | 533 | 3.5 |
| 821004 | 0110 | 2.13 | 533 | 3.0 |
| 821004 | 0210 | 2.13 | 533 | 3.0 |
| 821004 | 0310 | 2.13 | 533 | 3.0 |
| 821004 | 0410 | 2.10 | 516 | 2.5 |
| 821004 | 0510 | 2.13 | 533 | 2.5 |
| 821004 | 0610 | 2.10 | 516 | 2.5 |
| 821004 | 0710 | 2.10 | 516 | 2.0 |
| 821004 | 0810 | 2.10 | 516 | 2.0 |
| 821004 | 0910 | 2.10 | 516 | 2.0 |
| 821004 | 1010 | 2.10 | 516 | 2.0 |
| 821004 | 1110 | 2.10 | 516 | 1.5 |
| 821004 | 1210 | 2.07 | 500 | 2.0 |
| 821004 | 1310 | 2.07 | 500 | 2.5 |
| 821004 | 1410 | 2.07 | 500 | 3.0 |
| 821004 | 1510 | 2.07 | 500 | 3.5 |
| 821004 | 1610 | 2.07 | 500 | 3.0 |
| 821004 | 1710 | 2.07 | 500 | 3.0 |
| 821004 | 1810 | 2.07 | 500 | 3.0 |
| 821004 | 1910 | 2.07 | 500 | 3.0 |
| 821004 | 2010 | 2.07 | 500 | 2.5 |
| 821004 | 2110 | 2.07 | 500 | 2.5 |
| 821004 | 2210 | 2.07 | 500 | 2.5 |
| 821004 | 2310 | 2.07 | 500 | 2.5 |
| 821004 | DAILY MEAN | 2.09 | 512 | 2.6 |
| 821005 | 0010 | 2.07 | 500 | 2.0 |

Appendix Table 4-A-5 Cont.

| DATE | TIME | GAGE HEIGHT (ft) | DISCHARGE (cfs) | SURFACE WATER TEMPERATURE (C) |
|---|---|---|---|---|
| 821005 | 0110 | 2.07 | 500 | 2.0 |
| 821005 | 0210 | 2.07 | 500 | 2.0 |
| 821005 | 0310 | 2.07 | 500 | 2.0 |
| 821005 | 0410 | 2.07 | 500 | 2.0 |
| 821005 | 0510 | 2.07 | 500 | 2.0 |
| 821005 | 0610 | 2.03 | 484 | 2.0 |
| 821005 | 0710 | 2.03 | 484 | 2.0 |
| 821005 | 0810 | 2.03 | 484 | 1.5 |
| 821005 | 0910 | 2.03 | 484 | 1.5 |
| 821005 | 1010 | 2.03 | 484 | 1.5 |
| 821005 | 1110 | 2.03 | 484 | 1.5 |
| 821005 | 1210 | 2.03 | 484 | 1.5 |
| 821005 | 1310 | 2.03 | 484 | 2.0 |
| 821005 | 1410 | 2.03 | 484 | 2.5 |
| 821005 | 1510 | 2.00 | 468 | 2.5 |
| 821005 | 1610 | 2.03 | 484 | 2.5 |
| 821005 | 1710 | 2.00 | 468 | 2.5 |
| 821005 | 1810 | 2.00 | 468 | 2.0 |
| 821005 | 1910 | 2.00 | 468 | 2.0 |
| 821005 | 2010 | 2.00 | 468 | 2.0 |
| 821005 | 2110 | 2.00 | 468 | 2.0 |
| 821005 | 2210 | 2.03 | 484 | 2.0 |
| 821005 | 2310 | 2.03 | 484 | 1.5 |
| 821005 | DAILY MEAN | 2.03 | 484 | 2.0 |
| 821006 | 0010 | 2.03 | 484 | 1.5 |
| 821006 | 0110 | 2.00 | 468 | 1.5 |
| 821006 | 0210 | 2.00 | 468 | 1.0 |
| 821006 | 0310 | 1.97 | 453 | 1.0 |
| 821006 | 0410 | 1.97 | 453 | 1.0 |
| 821006 | 0510 | 1.97 | 453 | .5 |
| 821006 | 0610 | 1.97 | 453 | .5 |
| 821006 | 0710 | 1.93 | 437 | .5 |
| 821006 | 0810 | 1.93 | 437 | .5 |
| 821006 | 0910 | 1.93 | 437 | .5 |
| 821006 | 1010 | 1.93 | 437 | .5 |
| 821006 | 1110 | 1.93 | 437 | 1.0 |
| 821006 | 1210 | 1.93 | 437 | 1.5 |
| 821006 | 1310 | 1.93 | 437 | 1.5 |
| 821006 | 1410 | 1.93 | 437 | 2.0 |
| 821006 | 1510 | 1.93 | 437 | 2.5 |

Appendix Table 4-A-5 Cont.

| DATE | TIME | GAGE HEIGHT (ft) | DISCHARGE (cfs) | SURFACE WATER TEMPERATURE (C) |
|---|---|---|---|---|
| 821006 | 1610 | 1.93 | 437 | 2.5 |
| 821006 | 1710 | 1.97 | 453 | 2.5 |
| 821006 | 1810 | 1.97 | 453 | 2.5 |
| 821006 | 1910 | 1.97 | 453 | 2.5 |
| 821006 | 2010 | 1.97 | 453 | 2.0 |
| 821006 | 2110 | 2.00 | 468 | 2.0 |
| 821006 | 2210 | 1.97 | 453 | 2.0 |
| 821006 | 2310 | 1.97 | 453 | 2.0 |
| 821006 | DAILY MEAN | 1.96 | 449 | 1.5 |
| 821007 | 0010 | 1.97 | 453 | 1.5 |
| 821007 | 0110 | 2.00 | 468 | 1.5 |
| 821007 | 0210 | 1.97 | 453 | 1.5 |
| 821007 | 0310 | 1.97 | 453 | 1.5 |
| 821007 | 0410 | 1.93 | 437 | 1.5 |
| 821007 | 0510 | 1.97 | 453 | 1.5 |
| 821007 | 0610 | 1.93 | 437 | 1.5 |
| 821007 | 0710 | 1.93 | 437 | 1.5 |
| 821007 | 0810 | 1.93 | 437 | 1.5 |
| 821007 | 0910 | 1.93 | 437 | 1.5 |
| 821007 | 1010 | 1.93 | 437 | 1.5 |
| 821007 | 1110 | 1.93 | 437 | 1.5 |
| 821007 | 1210 | 1.93 | 437 | 1.5 |
| 821007 | 1310 | 1.93 | 437 | 1.5 |
| 821007 | 1410 | 1.93 | 437 | 1.5 |
| 821007 | 1510 | 1.93 | 437 | 2.0 |
| 821007 | 1610 | 1.93 | 437 | 2.0 |
| 821007 | 1710 | 1.93 | 437 | 2.0 |
| 821007 | 1810 | 1.93 | 437 | 2.0 |
| 821007 | 1910 | 1.93 | 437 | 2.0 |
| 821007 | 2010 | 1.93 | 437 | 2.0 |
| 821007 | 2110 | 1.93 | 437 | 2.0 |
| 821007 | 2210 | 1.93 | 437 | 1.5 |
| 821007 | 2310 | 1.93 | 437 | 1.5 |
| 821007 | DAILY MEAN | 1.94 | 441 | 1.6 |
| 821008 | 0010 | 1.93 | 437 | 1.5 |
| 821008 | 0110 | 1.93 | 437 | 1.5 |
| 821008 | 0210 | 1.93 | 437 | 1.5 |
| 821008 | 0310 | 1.93 | 437 | 1.5 |

Appendix Table 4-A-5 Cont.

| DATE | TIME | GAGE HEIGHT (ft) | DISCHARGE (cfs) | SURFACE WATER TEMPERATURE (C) |
|---|---|---|---|---|
| 821008 | 0410 | 1.93 | 437 | 1.0 |
| 821008 | 0510 | 1.93 | 437 | 1.0 |
| 821008 | 0610 | 1.93 | 437 | 1.0 |
| 821008 | 0710 | 1.90 | 421 | 1.0 |
| 821008 | 0810 | 1.93 | 437 | 1.0 |
| 821008 | 0910 | 1.93 | 437 | 1.0 |
| 821008 | 1010 | 1.93 | 437 | 1.0 |
| 821008 | 1110 | 1.90 | 421 | 1.5 |
| 821008 | 1210 | 1.90 | 421 | 1.5 |
| 821008 | 1310 | 1.90 | 421 | 2.0 |
| 821008 | 1410 | 1.90 | 421 | 2.0 |
| 821008 | 1510 | 1.90 | 421 | 2.0 |
| 821008 | 1610 | 1.90 | 421 | 2.0 |
| 821008 | 1710 | 1.90 | 421 | 2.0 |
| 821008 | 1810 | 1.90 | 421 | 2.0 |
| 821008 | 1910 | 1.90 | 421 | 2.0 |
| 821008 | 2010 | 1.90 | 421 | 2.0 |
| 821008 | 2110 | 1.90 | 421 | 2.0 |
| 821008 | 2210 | 1.90 | 421 | 1.5 |
| 821008 | 2310 | 1.90 | 421 | 1.5 |
| 821008 | DAILY MEAN | 1.91 | 428 | 1.5 |
| 821009 | 0010 | 1.90 | 421 | 1.0 |
| 821009 | 0110 | 1.90 | 421 | 1.0 |
| 821009 | 0210 | 1.90 | 421 | 1.0 |
| 821009 | 0310 | 1.90 | 421 | 1.0 |
| 821009 | 0410 | 1.90 | 421 | 1.0 |
| 821009 | 0510 | 1.90 | 421 | 1.0 |
| 821009 | 0610 | 1.90 | 421 | 1.0 |
| 821009 | 0710 | 1.90 | 421 | .5 |
| 821009 | 0810 | 1.90 | 421 | 1.0 |
| 821009 | 0910 | 1.90 | 421 | 1.0 |
| 821009 | 1010 | 1.90 | 421 | 1.0 |
| 821009 | 1110 | 1.87 | 406 | 1.5 |
| 821009 | 1210 | 1.90 | 421 | 1.5 |
| 821009 | 1310 | 1.87 | 406 | 1.5 |
| 821009 | 1410 | 1.87 | 406 | 2.0 |
| 821009 | 1510 | 1.87 | 406 | 2.0 |
| 821009 | 1610 | 1.87 | 406 | 2.0 |
| 821009 | 1710 | 1.87 | 406 | 2.0 |
| 821009 | 1810 | 1.87 | 406 | 2.0 |

Appendix Table 4-A-5 Cont.

| DATE | TIME | GAGE HEIGHT (ft) | DISCHARGE (cfs) | SURFACE WATER TEMPERATURE (C) |
|---|---|---|---|---|
| 821009 | 1910 | 1.87 | 406 | 2.0 |
| 821009 | 2010 | 1.87 | 406 | 2.0 |
| 821009 | 2110 | 1.87 | 406 | 2.0 |
| 821009 | 2210 | 1.87 | 406 | 2.0 |
| 821009 | 2310 | 1.87 | 406 | 2.0 |
| 821009 | DAILY MEAN | 1.88 | 413 | 1.5 |
| 821010 | 0010 | 1.87 | 406 | 2.0 |
| 821010 | 0110 | 1.87 | 406 | 2.0 |
| 821010 | 0210 | 1.87 | 406 | 2.0 |
| 821010 | 0310 | 1.87 | 406 | 2.0 |
| 821010 | 0410 | 1.87 | 406 | 1.5 |
| 821010 | 0510 | 1.87 | 406 | 1.5 |
| 821010 | 0610 | 1.83 | 390 | 1.5 |
| 821010 | 0710 | 1.83 | 390 | 1.5 |
| 821010 | 0810 | 1.83 | 390 | 1.5 |
| 821010 | 0910 | 1.83 | 390 | 1.5 |
| 821010 | 1010 | 1.83 | 390 | 1.5 |
| 821010 | 1110 | 1.83 | 390 | 1.5 |
| 821010 | 1210 | 1.83 | 390 | 2.0 |
| 821010 | 1310 | 1.83 | 390 | 2.0 |
| 821010 | 1410 | 1.83 | 390 | 2.0 |
| 821010 | 1510 | 1.83 | 390 | 2.0 |
| 821010 | 1610 | 1.83 | 390 | 2.0 |
| 821010 | 1710 | 1.83 | 390 | 2.0 |
| 821010 | 1810 | 1.83 | 390 | 2.0 |
| 821010 | 1910 | 1.83 | 390 | 2.0 |
| 821010 | 2010 | 1.83 | 390 | 1.5 |
| 821010 | 2110 | 1.83 | 390 | 1.5 |
| 821010 | 2210 | 1.83 | 390 | 1.5 |
| 821010 | 2310 | 1.83 | 390 | 1.5 |
| 821010 | DAILY MEAN | 1.84 | 394 | 1.7 |
| 821011 | 0010 | 1.83 | 390 | 1.5 |
| 821011 | 0110 | 1.80 | 375 | 1.5 |
| 821011 | 0210 | 1.83 | 390 | 1.0 |
| 821011 | 0310 | 1.80 | 375 | 1.0 |
| 821011 | 0410 | 1.80 | 375 | 1.0 |
| 821011 | 0510 | 1.80 | 375 | 1.0 |
| 821011 | 0610 | 1.80 | 375 | 1.0 |

Appendix Table 4-A5 Cont.

| DATE | TIME | GAGE HEIGHT (ft) | DISCHARGE (cfs) | SURFACE WATER TEMPERATURE (C) |
|---|---|---|---|---|
| 821011 | 0710 | 1.80 | 375 | 1.0 |
| 821011 | 0810 | 1.80 | 375 | 1.0 |
| 821011 | 0910 | 1.80 | 375 | 1.0 |
| 821011 | 1010 | 1.80 | 375 | 1.0 |
| 821011 | 1110 | 1.80 | 375 | 1.0 |
| 821011 | 1210 | 1.80 | 375 | 1.0 |
| 821011 | 1310 | 1.80 | 375 | 1.5 |
| 821011 | 1410 | 1.80 | 375 | 1.5 |
| 821011 | 1510 | 1.80 | 375 | 1.5 |
| 821011 | 1610 | 1.80 | 375 | 1.5 |
| 821011 | 1710 | 1.80 | 375 | 1.5 |
| 821011 | 1810 | 1.80 | 375 | 1.5 |
| 821011 | 1910 | 1.80 | 375 | 1.5 |
| 821011 | 2010 | 1.80 | 375 | 1.0 |
| 821011 | 2110 | 1.80 | 375 | 1.5 |
| 821011 | 2210 | 1.80 | 375 | 1.5 |
| 821011 | 2310 | 1.80 | 375 | 1.5 |
| 821011 | DAILY MEAN | 1.80 | 376 | 1.2 |
| 821012 | 0010 | 1.80 | 375 | 1.5 |
| 821012 | 0110 | 1.80 | 375 | 1.5 |
| 821012 | 0210 | 1.80 | 375 | 1.5 |
| 821012 | 0310 | 1.80 | 375 | 1.5 |
| 821012 | 0410 | 1.80 | 375 | 1.5 |
| 821012 | 0510 | 1.77 | 360 | 1.5 |
| 821012 | 0610 | 1.80 | 375 | 1.5 |
| 821012 | 0710 | 1.80 | 375 | 1.5 |
| 821012 | 0810 | 1.80 | 375 | 1.0 |
| 821012 | 0910 | 1.80 | 375 | 1.5 |
| 821012 | 1010 | 1.80 | 375 | 1.5 |
| 821012 | 1110 | 1.80 | 375 | 1.5 |
| 821012 | 1210 | 1.80 | 375 | 1.5 |
| 821012 | 1310 | 1.80 | 375 | 1.5 |
| 821012 | 1410 | 1.77 | 360 | 2.0 |
| 821012 | 1510 | 1.80 | 375 | 2.0 |
| 821012 | 1610 | 1.77 | 360 | 2.0 |
| 821012 | 1710 | 1.77 | 360 | 2.0 |
| 821012 | 1810 | 1.80 | 375 | 2.0 |
| 821012 | 1910 | 1.77 | 360 | 2.0 |
| 821012 | 2010 | 1.77 | 360 | 2.0 |
| 821012 | 2110 | 1.80 | 375 | 2.0 |

Appendix Table 4-A-5 Cont.

| DATE | TIME | GAGE HEIGHT (ft) | DISCHARGE (cfs) | SURFACE WATER TEMPERATURE (C) |
|---|---|---|---|---|
| 821012 | 2210 | 1.80 | 375 | 2.0 |
| 821012 | 2310 | 1.80 | 375 | 2.0 |
| 821012 | DAILY MEAN | 1.79 | 371 | 1.7 |
| 821013 | 0010 | 1.80 | 375 | 2.0 |
| 821013 | 0110 | 1.80 | 375 | 2.0 |
| 821013 | 0210 | 1.80 | 375 | 1.5 |
| 821013 | 0310 | 1.80 | 375 | 1.5 |
| 821013 | 0410 | 1.80 | 375 | 1.5 |
| 821013 | 0510 | 1.80 | 375 | 1.5 |
| 821013 | 0610 | 1.80 | 375 | 1.5 |
| 821013 | 0710 | 1.77 | 360 | 1.5 |
| 821013 | 0810 | 1.77 | 360 | 1.5 |
| 821013 | 0910 | 1.77 | 360 | 1.5 |
| 821013 | 1010 | 1.77 | 360 | 1.5 |
| 821013 | 1110 | 1.77 | 360 | 1.5 |
| 821013 | 1210 | 1.77 | 360 | 1.5 |
| 821013 | 1310 | 1.77 | 360 | 1.5 |
| 821013 | 1410 | 1.77 | 360 | 1.5 |
| 821013 | 1510 | 1.73 | 345 | 1.5 |
| 821013 | 1610 | 1.73 | 345 | 1.5 |
| 821013 | 1710 | 1.73 | 345 | 1.5 |
| 821013 | 1810 | 1.73 | 345 | 1.5 |
| 821013 | 1910 | 1.73 | 345 | 1.5 |
| 821013 | 2010 | 1.73 | 345 | 1.5 |
| 821013 | 2110 | 1.77 | 360 | 1.5 |
| 821013 | 2210 | 1.77 | 360 | 1.0 |
| 821013 | 2310 | 1.73 | 345 | 1.0 |
| 821013 | DAILY MEAN | 1.77 | 360 | 1.5 |
| 821014 | 0010 | 1.73 | 345 | 1.0 |
| 821014 | 0110 | 1.77 | 360 | 1.0 |
| 821014 | 0210 | 1.73 | 345 | 1.0 |
| 821014 | 0310 | 1.73 | 345 | 1.0 |
| 821014 | 0410 | 1.73 | 345 | 1.0 |
| 821014 | 0510 | 1.73 | 345 | 1.0 |
| 821014 | 0610 | 1.73 | 345 | 1.0 |
| 821014 | 0710 | 1.73 | 345 | .5 |
| 821014 | 0810 | 1.73 | 345 | .5 |
| 821014 | 0910 | 1.73 | 345 | .5 |

Appendix Table 4-A-5 Cont.

| DATE | TIME | GAGE HEIGHT (ft) | DISCHARGE (cfs) | SURFACE WATER TEMPERATURE (C) |
|---|---|---|---|---|
| 821014 | 1010 | 1.73 | 345 | .5 |
| 821014 | 1110 | 1.73 | 345 | 1.0 |
| 821014 | 1210 | 1.73 | 345 | 1.0 |
| 821014 | 1310 | 1.73 | 345 | 1.0 |
| 821014 | 1410 | 1.73 | 345 | 1.5 |
| 821014 | 1510 | 1.70 | 330 | 1.5 |
| 821014 | 1610 | 1.70 | 330 | 1.5 |
| 821014 | 1710 | 1.70 | 330 | 1.5 |
| 821014 | 1810 | 1.70 | 330 | 1.5 |
| 821014 | 1910 | 1.70 | 330 | 1.0 |
| 821014 | 2010 | 1.70 | 330 | 1.0 |
| 821014 | 2110 | 1.70 | 330 | 1.0 |
| 821014 | 2210 | 1.70 | 330 | .5 |
| 821014 | 2310 | 1.70 | 330 | 0.0 |
| 821014 | DAILY MEAN | 1.72 | 340 | 1.0 |
| 821015 | 0010 | 1.67 | 315 | 0.0 |
| 821015 | 0110 | 1.67 | 315 | 0.0 |
| 821015 | 0210 | 1.67 | 315 | 0.0 |
| 821015 | 0310 | 1.67 | 315 | 0.0 |
| 821015 | 0410 | 1.63 | 300 | 0.0 |
| 821015 | 0510 | 1.63 | 300 | 0.0 |
| 821015 | 0610 | 1.60 | 286 | 0.0 |
| 821015 | 0710 | 1.60 | 286 | 0.0 |
| 821015 | 0810 | 1.57 | 271 | 0.0 |
| 821015 | 0910 | 1.57 | 271 | 0.0 |
| 821015 | 1010 | 1.53 | 257 | 0.0 |
| 821015 | 1110 | 1.53 | 257 | 0.0 |
| 821015 | 1210 | 1.53 | 257 | 0.0 |
| 821015 | 1310 | 1.53 | 257 | 0.0 |
| 821015 | 1410 | 1.53 | 257 | 0.0 |
| 821015 | 1510 | 1.57 | 271 | 0.0 |
| 821015 | 1610 | 1.57 | 271 | 0.0 |
| 821015 | 1710 | 1.60 | 286 | 0.0 |
| 821015 | 1810 | 1.63 | 300 | 0.0 |
| 821015 | 1910 | 1.67 | 315 | 0.0 |
| 821015 | 2010 | 1.67 | 315 | 0.0 |
| 821015 | 2110 | 1.67 | 315 | 0.0 |
| 821015 | 2210 | 1.67 | 315 | 0.0 |
| 821015 | 2310 | 1.67 | 315 | 0.0 |

Appendix Table 4-A-5 Cont.

| DATE | TIME | GAGE HEIGHT (ft) | DISCHARGE (cfs) | SURFACE WATER TEMPERATURE (C) |
|---|---|---|---|---|
| 821015 | DAILY MEAN | 1.61 | 290 | 0.0 |
| 821016 | 0010 | 1.67 | 315 | 0.0 |
| 821016 | 0110 | 1.63 | 300 | 0.0 |
| 821016 | 0210 | 1.63 | 300 | 0.0 |
| 821016 | 0310 | 1.60 | 286 | 0.0 |
| 821016 | 0410 | 1.60 | 286 | 0.0 |
| 821016 | 0510 | 1.63 | 300 | 0.0 |
| 821016 | 0610 | 1.63 | 300 | 0.0 |
| 821016 | 0710 | 1.63 | 300 | 0.0 |
| 821016 | 0810 | 1.67 | 315 | 0.0 |
| 821016 | 0910 | 1.67 | 315 | 0.0 |
| 821016 | 1010 | 1.67 | 315 | 0.0 |
| 821016 | 1110 | 1.70 | 330 | 0.0 |
| 821016 | 1210 | 1.70 | 330 | 0.0 |
| 821016 | 1310 | 1.73 | 345 | 0.0 |
| 821016 | 1410 | 1.73 | 345 | 0.0 |
| 821016 | 1510 | 1.73 | 345 | 0.0 |
| 821016 | 1610 | 1.73 | 345 | 0.0 |
| 821016 | 1710 | 1.73 | 345 | 0.0 |
| 821016 | 1810 | 1.73 | 345 | 0.0 |
| 821016 | 1910 | 1.73 | 345 | 0.0 |
| 821016 | 2010 | 1.73 | 345 | 0.0 |
| 821016 | 2110 | 1.77 | 360 | 0.0 |
| 821016 | 2210 | 1.73 | 345 | 0.0 |
| 821016 | 2310 | 1.73 | 345 | 0.0 |
| 821016 | DAILY MEAN | 1.69 | 325 | 0.0 |
| 821017 | 0010 | 1.73 | 345 | 0.0 |
| 821017 | 0110 | 1.73 | 345 | 0.0 |
| 821017 | 0210 | 1.73 | 345 | 0.0 |
| 821017 | 0310 | 1.73 | 345 | 0.0 |
| 821017 | 0410 | 1.70 | 330 | 0.0 |
| 821017 | 0510 | 1.70 | 330 | 0.0 |
| 821017 | 0610 | 1.70 | 330 | 0.0 |
| 821017 | 0710 | 1.70 | 330 | 0.0 |
| 821017 | 0810 | 1.70 | 330 | 0.0 |
| 821017 | 0910 | 1.70 | 330 | 0.0 |
| 821017 | 1010 | 1.67 | 315 | 0.0 |
| 821017 | 1110 | 1.70 | 330 | .5 |
| 821017 | 1210 | 1.70 | 330 | .5 |

Appendix Table 4-A-5 Cont.

| DATE | TIME | GAGE HEIGHT (ft) | DISCHARGE (cfs) | SURFACE WATER TEMPERATURE (C) |
|---|---|---|---|---|
| 821017 | 1310 | 1.67 | 315 | .5 |
| 821017 | 1410 | 1.67 | 315 | .5 |
| 821017 | 1510 | 1.67 | 315 | .5 |
| 821017 | 1610 | 1.67 | 315 | .5 |
| 821017 | 1710 | 1.67 | 315 | .5 |
| 821017 | 1810 | 1.67 | 315 | .5 |
| 821017 | 1910 | 1.67 | 315 | .5 |
| 821017 | 2010 | 1.67 | 315 | .5 |
| 821017 | 2110 | 1.67 | 315 | 0.0 |
| 821017 | 2210 | 1.67 | 315 | 0.0 |
| 821017 | 2310 | 1.63 | 300 | 0.0 |
| 821017 | DAILY MEAN | 1.69 | 324 | .2 |
| 821018 | 0010 | 1.63 | 300 | 0.0 |
| 821018 | 0110 | 1.63 | 300 | 0.0 |
| 821018 | 0210 | 1.63 | 300 | 0.0 |
| 821018 | 0310 | 1.63 | 300 | 0.0 |
| 821018 | 0410 | 1.63 | 300 | 0.0 |
| 821018 | 0510 | 1.60 | 286 | 0.0 |
| 821018 | 0610 | 1.60 | 286 | 0.0 |
| 821018 | 0710 | 1.57 | 271 | 0.0 |
| 821018 | 0810 | 1.60 | 286 | 0.0 |
| 821018 | 0910 | 1.57 | 271 | 0.0 |
| 821018 | 1010 | 1.57 | 271 | 0.0 |
| 821018 | 1110 | 1.57 | 271 | 0.0 |
| 821018 | 1210 | 1.60 | 286 | 0.0 |
| 821018 | 1310 | 1.60 | 286 | 0.0 |
| 821018 | 1410 | 1.63 | 300 | 0.0 |
| 821018 | 1510 | 1.63 | 300 | 0.0 |
| 821018 | 1610 | 1.63 | 300 | 0.0 |
| 821018 | 1710 | 1.63 | 300 | 0.0 |
| 821018 | 1810 | 1.63 | 300 | 0.0 |
| 821018 | 1910 | 1.63 | 300 | 0.0 |
| 821018 | 2010 | 1.63 | 300 | 0.0 |
| 821018 | 2110 | 1.63 | 300 | 0.0 |
| 821018 | 2210 | 1.63 | 300 | 0.0 |
| 821018 | 2310 | 1.63 | 300 | 0.0 |
| 821018 | DAILY MEAN | 1.62 | 292 | 0.0 |
| 821019 | 0010 | 1.63 | 300 | 0.0 |

Appendix Table 4-A-5 Cont.

| DATE | TIME | GAGE HEIGHT (ft) | DISCHARGE (cfs) | SURFACE WATER TEMPERATURE (C) |
|---|---|---|---|---|
| 821019 | 0110 | 1.63 | 300 | 0.0 |
| 821019 | 0210 | 1.60 | 286 | 0.0 |
| 821019 | 0310 | 1.60 | 286 | 0.0 |
| 821019 | 0410 | 1.60 | 286 | 0.0 |
| 821019 | 0510 | 1.60 | 286 | 0.0 |
| 821019 | 0610 | 1.60 | 286 | 0.0 |
| 821019 | 0710 | 1.60 | 286 | 0.0 |
| 821019 | 0810 | 1.60 | 286 | 0.0 |
| 821019 | 0910 | 1.60 | 286 | 0.0 |
| 821019 | 1010 | 1.60 | 286 | 0.0 |
| 821019 | 1110 | 1.63 | 300 | 0.0 |
| 821019 | 1210 | 1.63 | 300 | 0.0 |
| 821019 | 1310 | 1.63 | 300 | 0.0 |
| 821019 | 1410 | 1.63 | 300 | 0.0 |
| 821019 | 1510 | 1.63 | 300 | 0.0 |
| 821019 | 1610 | 1.60 | 286 | 0.0 |
| 821019 | 1710 | 1.60 | 286 | 0.0 |
| 821019 | 1810 | 1.60 | 286 | 0.0 |
| 821019 | 1910 | 1.60 | 286 | .5 |
| 821019 | 2010 | 1.60 | 286 | .5 |
| 821019 | 2110 | 1.60 | 286 | .5 |
| 821019 | 2210 | 1.60 | 286 | .5 |
| 821019 | 2310 | 1.60 | 286 | 0.0 |
| 821019 | DAILY MEAN | 1.61 | 290 | .1 |
| 821020 | 0010 | 1.60 | 286 | 0.0 |
| 821020 | 0110 | 1.60 | 286 | 0.0 |
| 821020 | 0210 | 1.57 | 271 | 0.0 |
| 821020 | 0310 | 1.60 | 286 | 0.0 |
| 821020 | 0410 | 1.60 | 286 | 0.0 |
| 821020 | 0510 | 1.57 | 271 | 0.0 |
| 821020 | 0610 | 1.57 | 271 | 0.0 |
| 821020 | 0710 | 1.57 | 271 | 0.0 |
| 821020 | 0810 | 1.53 | 257 | 0.0 |
| 821020 | 0910 | 1.57 | 271 | 0.0 |
| 821020 | 1010 | 1.53 | 257 | 0.0 |
| 821020 | 1110 | 1.53 | 257 | 0.0 |
| 821020 | 1210 | 1.53 | 257 | 0.0 |
| 821020 | 1310 | 1.53 | 257 | 0.0 |
| 821020 | 1410 | 1.53 | 257 | 0.0 |
| 821020 | 1510 | 1.53 | 257 | 0.0 |

Appendix Table 4-A-5 Cont.

| DATE | TIME | GAGE HEIGHT (ft) | DISCHARGE (cfs) | SURFACE WATER TEMPERATURE (C) |
|---|---|---|---|---|
| 821020 | 1610 | 1.53 | 257 | 0.0 |
| 821020 | 1710 | 1.53 | 257 | 0.0 |
| 821020 | 1810 | 1.53 | 257 | 0.0 |
| 821020 | 1910 | 1.53 | 257 | 0.0 |
| 821020 | 2010 | 1.53 | 257 | 0.0 |
| 821020 | 2110 | 1.53 | 257 | 0.0 |
| 821020 | 2210 | 1.53 | 257 | 0.0 |
| 821020 | 2310 | 1.53 | 257 | 0.0 |
| 821020 | DAILY MEAN | 1.55 | 265 | 0.0 |
| 821021 | 0010 | 1.50 | 243 | 0.0 |
| 821021 | 0110 | 1.50 | 243 | 0.0 |
| 821021 | 0210 | 1.47 | 229 | 0.0 |
| 821021 | 0310 | 1.47 | 229 | 0.0 |
| 821021 | 0410 | 1.43 | 215 | 0.0 |
| 821021 | 0510 | 1.43 | 215 | 0.0 |
| 821021 | 0610 | 1.43 | 215 | 0.0 |
| 821021 | 0710 | 1.40 | 201 | 0.0 |
| 821021 | 0810 | 1.40 | 201 | 0.0 |
| 821021 | 0910 | 1.40 | 201 | 0.0 |
| 821021 | 1010 | 1.40 | 201 | 0.0 |
| 821021 | 1110 | 1.37 | 188 | 0.0 |
| 821021 | 1210 | 1.37 | 188 | 0.0 |
| 821021 | 1310 | 1.37 | 188 | 0.0 |
| 821021 | 1410 | 1.40 | 201 | 0.0 |
| 821021 | 1510 | 1.40 | 201 | 0.0 |
| 821021 | 1610 | 1.40 | 201 | 0.0 |
| 821021 | 1710 | 1.40 | 201 | 0.0 |
| 821021 | 1810 | 1.43 | 215 | 0.0 |
| 821021 | 1910 | 1.43 | 215 | 0.0 |
| 821021 | 2010 | 1.43 | 215 | 0.0 |
| 821021 | 2110 | 1.43 | 215 | 0.0 |
| 821021 | 2210 | 1.43 | 215 | 0.0 |
| 821021 | 2310 | 1.43 | 215 | 0.0 |
| 821021 | DAILY MEAN | 1.42 | 210 | 0.0 |
| 821022 | 0010 | 1.40 | 201 | 0.0 |
| 821022 | 0110 | 1.40 | 201 | 0.0 |
| 821022 | 0210 | 1.40 | 201 | 0.0 |
| 821022 | 0310 | 1.40 | 201 | 0.0 |

Appendix Table 4-A5 Cont.

| DATE | TIME | GAGE HEIGHT (ft) | DISCHARGE (cfs) | SURFACE WATER TEMPERATURE (C) |
|---|---|---|---|---|
| 821022 | 0410 | 1.40 | 201 | 0.0 |
| 821022 | 0510 | 1.40 | 201 | 0.0 |
| 821022 | 0610 | 1.40 | 201 | 0.0 |
| 821022 | 0710 | 1.40 | 201 | 0.0 |
| 821022 | 0810 | 1.40 | 201 | 0.0 |
| 821022 | 0910 | 1.40 | 201 | 0.0 |
| 821022 | 1010 | 1.40 | 201 | 0.0 |
| 821022 | 1110 | 1.40 | 201 | 0.0 |
| 821022 | 1210 | 1.40 | 201 | 0.0 |
| 821022 | 1310 | 1.40 | 201 | 0.0 |
| 821022 | 1410 | 1.40 | 201 | 0.0 |
| 821022 | 1510 | 1.40 | 201 | 0.0 |
| 821022 | 1610 | 1.43 | 215 | 0.0 |
| 821022 | 1710 | 1.43 | 215 | 0.0 |
| 821022 | 1810 | 1.43 | 215 | 0.0 |
| 821022 | 1910 | 1.47 | 229 | 0.0 |
| 821022 | 2010 | 1.47 | 229 | 0.0 |
| 821022 | 2110 | 1.47 | 229 | 0.0 |
| 821022 | 2210 | 1.47 | 229 | 0.0 |
| 821022 | 2310 | 1.47 | 229 | 0.0 |
| 821022 | DAILY MEAN | 1.42 | 208 | 0.0 |

Appendix Table 4-A-6. Comparison of periodic water surface elevations (WSEL), and measured flow at selected sites located downstream of Talkeetna to the corresponding average daily mainstem discharge at Sunshine[a] (Parks Highway Bridge).

| Location | Date | Time | WSEL (ft) | Measured Streamflow | Susitna River Discharge |
|---|---|---|---|---|---|
| Lower Goose 2 Creek | 821001 | 1145 | 213.05 | 137.48 | 31,500 |
| Gage Site 073.1T2 | 820929 | 1610 | 213.01 | | 33,900 |
| (R.M. 73.2; TRM 0.2) | 820913 | 1540 | 213.36 | | 36,400 |
| | 820830 | ---- | 212.85 | 84.10 | 39,000 |
| | 820811 | 1435 | 212.89 | | 47,900 |
| | 820624 | 1350 | 212.65 | | 62,700 |
| | 820713 | 1630 | 212.31 | | 63,000 |
| | 820610 | 1400 | 212.71 | | 64,200 |
| | 820625 | 1410 | 212.69 | | 66,700 |
| | 820915 | 1120 | 213.57 | | 68,700 |
| | 820915 | 1125 | 213.77 | 251.00 | 68,700 |
| | 820728 | 1230 | 213.01 | | 72,000 |
| Lower Goose 2 Slough | 821001 | 1310 | 210.51 | 1.86 | 31,500 |
| (mid-slough) | 820830 | 1600 | ------ | 10.30 | 39,000 |
| Gage Site 073.1S4 | 820915 | 1325 | 212.06 | 458.0 | 68,700 |
| (R.M. 073.1) | | | | | |
| Lower Goose 2 Slough | 821001 | 1005 | 209.25 | | 31,500 |
| (lower portion) | 820929 | 1315 | 209.30 | | 33,900 |
| Gage Site 073.1S1 | 820913 | 1410 | 209.38 | | 36,400 |
| (R.M. 73.1) | 820825 | 1220 | 209.25 | | 38,700 |
| | 820830 | 1420 | 209.33 | 101.0 | 39,000 |
| | 820811 | 1145 | 209.83 | | 47,900 |
| | 820810 | 1120 | 209.98 | | 51,600 |
| | 820914 | 1240 | 210.17 | | 53,300 |
| | 820624 | 1400 | 210.40 | | 60,800 |
| | 820713 | 1600 | 210.26 | | 63,000 |
| | 820610 | 1400 | 210.40 | | 64,200 |
| | 820611 | 1615 | 210.51 | | 65,000 |
| | 820625 | 1440 | 210.64 | | 66,700 |
| | 820915 | 1240 | 210.68 | | 68,700 |
| | 820915 | 1600 | 211.07 | | 68,700 |
| Mainstem adjacent to Lower | 821001 | 1539 | 209.10 | | 31,500 |
| Goose 2 Slough | 821001 | 0945 | 209.12 | | 31,500 |
| Gage Site 073.1M3 | 820930 | 1220 | 209.14 | | 33,400 |
| (R.M. 073.1) | 820929 | 1630 | 209.14 | | 33,900 |
| | 820913 | 1350 | 209.25 | | 36,400 |
| | 820830 | 1030 | 209.33 | | 39,000 |

[a] USGS provisional data, 1982.

Appendix Table 4-A-6 (Continued)

| Location | Date | Time | WSEL (ft) | Measured Streamflow | Susitna River Discharge |
|---|---|---|---|---|---|
| Mainstem adjacent to Lower Goose 2 Slough - Cont'd Gage Site 073.1M3 (R.M. 073.1M3) | 820624 | 1405 | 209.98 | | 62,700 |
| | 820713 | 1630 | 209.88 | | 63,000 |
| | 820610 | 1400 | 209.89 | | 64,200 |
| | 820611 | 1620 | 209.96 | | 65,000 |
| | 820625 | 1630 | 210.23 | | 66,700 |
| | 820715 | 0930 | 210.70 | | 68,700 |
| | 820915 | 1605 | 211.45 | | 68,700 |
| Whitefish Slough Tributary (R.M. 078.7) | 820916 | 1045 | ------ | 31.0 | 91,300 |
| Whitefish Slough (mouth) Gage Site 078.7W1 (R.M. 78.7) | 821008 | 1030 | 233.72 | | 20,400 |
| | 821002 | 1000 | 234.49 | 6.6 | 29,700 |
| | 820929 | 1745 | 235.75 | | 33,900 |
| | 820831 | 1930 | 238.55 | 22.3 | 48,700 |
| | 820815 | 1310 | 240.42 | | 47,900 |
| | 820914 | 1815 | 239.16 | | 53,300 |
| | 820914 | 1310 | 240.42 | | 53,300 |
| | 820713 | 1800 | 240.12 | | 63,000 |
| | 820916 | 0930 | 242.54 | 24.2 | 91,300 |
| | 820916 | 1330 | 242.66 | | 91,300 |
| Rabideux Creek Gage Site 083.1T2 (R.M. 83.1; TRM 1.7) | 821002 | 1423 | 261.27 | 129.2 | 29,700 |
| | 820913 | 1320 | 261.67 | 209.5 | 36,400 |
| | 820831 | 1345 | 261.78 | 222.9 | 48,700 |
| | 820701 | 1730 | 262.92 | | 62,100 |
| | 820729 | 1440 | 261.55 | | 67,900 |
| Rabideux Creek Mouth Gage Site 083.1W1 (R.M. 83.1; TRM 0.2) | 821005 | 1100 | 257.18 | | 24,000 |
| | 821002 | 1620 | 257.73 | 131.1 | 29,700 |
| | 820929 | 1800 | 258.19 | | 33,900 |
| | 820913 | 1520 | 258.51 | 271.0 | 36,400 |
| | 820814 | 1120 | 260.45 | | 42,800 |
| | 820812 | 1303 | 259.32 | | 44,000 |
| | 820831 | 1345 | 259.97 | | 48,700 |
| | 820914 | 1120 | 260.47 | | 53,300 |
| | 820701 | 1600 | 262.77 | | 62,100 |
| | 820729 | 1540 | 261.49 | | 67,900 |
| | 820915 | 1530 | 261.87 | | 68,700 |

[a]USGS provisional data, 1982.

Appendix Table 4-A-6 (Continued)

| Location | Date | Time | WSEL (ft) | Measured Streamflow | Susitna River Discharge |
|---|---|---|---|---|---|
| Rabideux Creek Mouth - Cont'd | 820728 | 1700 | 261.71 | | 72,000 |
| Gage Site 083.1W1 | 820918 | 1120 | 262.27 | | 76,500 |
| (R.M. 83.1; TRM 0.2) | 820917 | 1030 | 263.55 | | 88,400 |
| Sunshine Creek | 821007 | 1300 | 266.83 | | 21,400 |
| Gage Site 085.7T2 | 821004 | 1115 | 266.93 | 68.6 | 25,800 |
| (R.M. 85.7; TRM 0.7) | 820912 | 1500 | 266.67 | | 35,000 |
| | 820901 | 1330 | 267.20 | 31.8 | 45,200 |
| | 820815 | 1700 | 266.78 | | 47,900 |
| | 820805 | ---- | 266.99 | 47.2 | 50,400 |
| | 820712 | 1510 | 267.05 | | 60,100 |
| | 820624 | 1600 | 267.61 | | 62,200 |
| | 820610 | 1800 | 267.56 | | 64,200 |
| | 820625 | 1025 | 267.88 | | 66,700 |
| | 820609 | 1600 | 268.28 | | 70,800 |
| | 820728 | 1025 | 268.70 | | 72,000 |
| | 820918 | 1350 | 268.91 | 103.9 | 76,500 |
| | 820727 | 1400 | 269.47 | | 82,400 |
| | 820916 | 1815 | 270.81 | | 91,300 |
| Sunshine Slough | 821004 | 1015 | 264.55 | 0.2 | 25,800 |
| Gage Site 085.7S3 | 820930 | 1310 | 264.58 | | 33,400 |
| (R.M. 85.7) | 820912 | 1355 | 264.57 | | 35,000 |
| | 820824 | 1347 | 264.61 | | 38,700 |
| | 820901 | 1353 | 265.48 | 85.8 | 47,200 |
| | 820815 | 1650 | 265.99 | | 47,900 |
| | 820712 | 1718 | 267.01 | | 60,100 |
| | 820624 | 1600 | 267.54 | | 62,200 |
| | 820713 | 0940 | 267.27 | | 63,000 |
| | 820610 | 1800 | 267.52 | | 64,200 |
| | 820625 | 1100 | 267.94 | | 66,700 |
| | 820609 | 1600 | 268.14 | | 70,800 |
| | 820728 | 1100 | 268.64 | | 72,000 |
| | 820918 | 1448 | 268.74 | 607.0 | 76,500 |
| | 820727 | 1630 | 269.30 | | 82,400 |
| | 820916 | 1835 | 270.80 | | 91,300 |
| Sunshine Creek Mouth | 821007 | 1305 | 264.19 | | 21,400 |
| Gage Site 085.7T1 | 821004 | 1100 | 264.25 | | 25,800 |
| (R.M. 085.7; TRM 0.0) | 820930 | 1305 | 264.29 | | 33,400 |

[a] USGS provisional data, 1982.

Appendix Table 4-A-6 (Continued)

| Location | Date | Time | WSEL (ft) | Measured Streamflow | Susitna River Discharge |
|---|---|---|---|---|---|
| Sunshine Creek Mouth - Cont'd | 820901 | 1220 | 265.41 | | 47,200 |
| Gage Site 085.7T1 | 820815 | 1705 | 268.18 | | 47,900 |
| (R.M. 085.7; TRM 0.0) | 820805 | ---- | ------- | | 50,400 |
| | 820712 | 1712 | 264.40 | | 58,400 |
| | 820713 | 0935 | 264.64 | | 60,100 |
| | 820610 | 1800 | 264.81 | | 64,200 |
| | 820609 | 1600 | 265.46 | | 70,800 |
| | 820728 | 1020 | 266.00 | | 72,000 |
| | 820918 | 1255 | 268.71 | | 76,500 |
| | 820727 | 1630 | 264.12 | | 82,400 |
| | 820916 | 1830 | 270.70 | | 91,300 |
| Birch Creek | 821006 | 1330 | 286.08 | | 22,300 |
| Gage Site 088.4T4 | 821003 | 1319 | 286.10 | 76.4 | 27,800 |
| (R.M. 089.0;TRM 0.1) | 820911 | 1500 | 285.89 | | 33,800 |
| | 820928 | 1430 | 286.12 | | 35,900 |
| | 820813 | 1520 | 286.00 | | 42,000 |
| | 820902 | 1300 | 285.99 | 68.2 | 43,700 |
| | 820805 | 1607 | 285.99 | 62.4 | 50,400 |
| | 820809 | 1330 | 285.98 | | 52,500 |
| | 820919 | 1050 | 286.34 | 114.1 | 69,500 |
| | 820727 | 1010 | 286.47 | | 82,400 |
| Birch Creek Mouth | 821006 | 1220 | 284.69 | | 22,300 |
| Gage Site 088.4T3 | 821003 | 1230 | 284.80 | | 27,800 |
| (R.M. 089.0; TRM 0.0) | 820911 | 1500 | 284.52 | | 33,800 |
| | 820928 | 1350 | 284.82 | | 35,900 |
| | 820813 | 1525 | 284.68 | | 42,000 |
| | 820902 | 1250 | 284.71 | | 43,700 |
| | 820711 | 1200 | 284.56 | | 58,400 |
| | 820702 | 1200 | 284.63 | | 59,300 |
| | 820712 | 1115 | 284.59 | | 60,100 |
| | 820912 | 1110 | 285.43 | | 32,500 |
| | 820727 | 1010 | 285.93 | | 82,400 |
| | 820726 | 1330 | 286.61 | | 99,300 |
| Birch Creek Slough (Head) | 820813 | 1620 | 308.90 | | 42,000 |
| Gage Site 088.4H6 | 820902 | 1720 | 308.17 | | 43,700 |
| (R.M. 088.4) | 820919 | 1400 | 310.20 | | 69,500 |

[a]USGS provisional data, 1982.

Appendix Table 4-A-6 (Continued)

| Location | Date | Time | WSEL (ft) | Measured Streamflow | Susitna River Discharge |
|---|---|---|---|---|---|
| Birch Creek Slough (upstream of Birch Creek and slough confluence) Gage Site 088.4S1 (R.M. 089.1) | 821006 | 1335 | 284.75 | | 22,300 |
| | 821003 | 1410 | 284.81 | | 27,800 |
| | 820911 | 1500 | 284.61 | | 33,800 |
| | 820928 | 1400 | 284.86 | | 35,900 |
| | 820823 | 1435 | 284.56 | | 38,000 |
| | 820813 | 1535 | 284.65 | | 42,000 |
| | 820902 | 1240 | 284.74 | 15.7 | 43,700 |
| | 820805 | 1700 | 284.83 | | 50,400 |
| | 820809 | 1330 | 284.84 | | 52,500 |
| | 820919 | 1245 | 285.48 | | 69,500 |
| | 820727 | 1030 | 285.94 | | 82,400 |
| | 820726 | 1330 | 286.61 | | 99,300 |
| Birch Creek Slough (downstream of Birch Creek and slough confluence) Gage Site 088.4S8 (R.M. 089.0) | 821006 | 1115 | 284.63 | | 22,300 |
| | 821003 | 1455 | 284.71 | | 27,800 |
| | 820928 | 1345 | 284.76 | | 35,900 |
| | 820919 | 1208 | 285.38 | | 69,500 |
| Birch Creek Slough (downstream of Birch Creek and slough confluence) Gage Site 088.4S5 (R.M. 089.0) | 821006 | 1105 | 284.36 | | 22,300 |
| | 821003 | 1430 | 284.42 | 86.5 | 27,800 |
| | 820929 | 1345 | 284.50 | | 33,900 |
| | 820813 | 1540 | 284.33 | | 42,000 |
| | 820902 | 1130 | 284.42 | 75.4 | 43,700 |
| | 820805 | 1515 | 284.57 | 89.3 | 50,400 |
| | 820810 | 1807 | 284.57 | | 51,600 |
| | 820809 | 1500 | 284.61 | | 52,500 |
| | 820919 | 1140 | 285.34 | 131.8 | 69,500 |
| Birch Creek Slough Mouth Gage Site 088.4W2 (R.M. 088.4) | 821006 | 1425 | 279.36 | | 22,300 |
| | 821003 | 1352 | 279.94 | | 27,800 |
| | 820911 | 1500 | 280.33 | | 33,800 |
| | 820929 | 1105 | 280.45 | | 33,900 |
| | 820928 | 1055 | 280.48 | | 35,000 |
| | 820912 | 1150 | 280.64 | | 35,900 |
| | 820902 | 1325 | 281.08 | | 43,700 |
| | 820901 | 1730 | 281.29 | | 47,200 |
| | 820711 | 1635 | 281.78 | | 58,400 |
| | 820702 | ---- | 281.68 | | 59,300 |
| | 820915 | 1435 | 282.70 | | 68,700 |

[a]USGS provisional data, 1982.

Appendix Table 4-A-6 (Continued)

| Location | Date | Time | WSEL (ft) | Measured Streamflow | Susitna River Discharge |
|---|---|---|---|---|---|
| Birch Creek Slough Mouth - Cont'd Gage Site 088.4W2 (R.M. 088.4) | 820919 | 1140 | 282.44 | | 69,500 |
| | 820727 | 1000 | 283.14 | | 82,400 |
| Mainstem adjacent to Birch Creek Slough Head Gage Site 088.4M7 (R.M. 088.4) | 821003 | 1700 | 306.67 | | 27,800 |
| | 820813 | 1625 | 309.01 | | 42,000 |
| | 820902 | 1720 | 308.60 | | 43,700 |
| | 820919 | 1400 | 310.18 | | 69,500 |

[a] USGS provisional data, 1982.

Appendix Table 4-A-7 Surface area of aggregate type II hydraulic zones at Designated Fish Habitat (DFH) sites, and mainstem Susitna River discharges[a], June through September, 1982.

| DFH Site | Discharge cfs[a] | Date | Zones | Surface Area Type II (Ft²) |
|---|---|---|---|---|
| Slough 21[b] | 31,900 | 7/25 | 6 | 72,800 |
| | 25,000 | 6/19 | 6 | 16,300 |
| | 24,000 | 7/11 | none | -- |
| | 17,000 | 8/09 | 2 | 73,600 |
| | 13,800 | 9/27 | 2 | 48,200 |
| | 12,500 | 8/20 | 2 | 47,300 |
| | 12,200 | 9/06 | 2 | 61,200 |
| Slough 20 | 28,000 | 6/20 | 7 | 20,600 |
| | 26,800 | 7/24 | none | -- |
| | 23,000 | 6/04 | none | -- |
| | 18,100 | 7/08 | none | -- |
| | 16,500 | 8/07 | none | -- |
| | 14,400 | 9/04 | 2 | 500 |
| | 14,000 | 9/26 | none | -- |
| | 12,500 | 8/20 | 2 | 1,800 |
| Slough 19 | 24,900 | 7/23 | 2 | 26,000 |
| | 28,000 | 6/17 | 2 | 10,000 |
| | 22,000 | 6/05 | 2 | 16,500 |
| | 16,800 | 8/06 | 2 | 12,300 |
| | 16,600 | 7/07 | 2 | 4,800 |
| | 15,000 | 9/25 | none | -- |
| | 14,400 | 9/04 | none | -- |
| | 13,300 | 8/19 | 2 | 4,200 |
| Slough 11 | 28,000 | 6/20 | 2 | 128,000 |
| | 27,300 | 7/14 | 2 | 92,800 |
| | 23,600 | 7/29 | 2 | 124,000 |
| | 23,000 | 6/04 | 2 | 95,000 |
| | 14,400 | 8/12 | 2 | 25,600 |
| | 12,400 | 9/29 | 2 | 19,300 |
| | 12,200 | 9/06 | 2 | 25,300 |
| | 12,200 | 8/22 | 2 | 23,700 |

[a]USGS provisional data at Gold Creek, 1982, 15292000.

[b]June 10, 1982, data for Slough 21 incomplete.

Appendix Table 4-A-7 (Continued).

| DFH Site | Discharge cfs[a] | Date | Zones | Surface Area Type II (Ft²) |
|---|---|---|---|---|
| Slough 9[b] | 29,100 | 7/27 | none | -- |
| | 28,400 | 7/13 | none | -- |
| | 19,400 | 9/23 | 2 | 118,000 |
| | 16,700 | 8/10 | 2 | 133,000 |
| | 12,200 | 8/21 | none | -- |
| | 11,700 | 9/07 | none | -- |
| Slough 8A | 28,000 | 6/08 | 6 | 210,000 |
| | 26,500 | 7/12 | 2 | 202,000 |
| | 26,000 | 6/23 | 2 | 210,000 |
| | 25,600 | 7/28 | 2 | 205,000 |
| | 17,100 | 9/24 | 2 | 143,000 |
| | 15,400 | 8/11 | 2 | 193,000 |
| | 12,200 | 8/21 | 2 | 158,000 |
| | 11,700 | 9/07 | 2 | 155,000 |
| Lane Creek | 25,000 | 6/07 | 6+7 | 45,000 |
| | 25,000 | 6/19 | 2 | 48,200 |
| | 22,400 | 7/22 | 2 | 14,400 |
| | 18,100 | 7/08 | 2 | 14,700 |
| | 16,600 | 8/08 | 2 | 12,700 |
| | 15,000 | 9/25 | 2 | 8,000 |
| | 14,400 | 9/10 | 2 | 9,400 |
| | 12,500 | 8/20 | 2 | 6,100 |
| Slough 6A | 28,000 | 6/20 | 2 | 138,000 |
| | 24,900 | 7/23 | 2 | 135,000 |
| | 23,000 | 6/06 | 2 | 131,000 |
| | 21,500 | 7/09 | 2 | 134,000 |
| | 16,600 | 8/08 | 2 | 131,000 |
| | 14,400 | 9/10 | 2 | 129,000 |
| | 14,000 | 9/26 | 2 | 131,000 |
| | 12,200 | 8/21 | 2 | 127,000 |

[a] USGS provisional data at Gold Creek, 1982, 15292000.

[b] June 10 and June 22 data for Slough 9 incomplete.

Appendix Table 4-A-7 (Continued).

| DFH Site | Discharge cfs | Date | Zones | Surface Area Type II (Ft²) |
|---|---|---|---|---|
| Whisker Creek and Slough | 31,900[a] | 7/25 | 7 | 56,000[b] |
| | 28,000 | 6/21 | 7 | 76,000[b] |
| | 25,000 | 6/03 | 2+7 | 160,000[c] |
| | 23,000 | 7/10 | 7 | 83,900 |
| | 16,600 | 8/08 | 2 | 46,600 |
| | 13,800 | 9/27 | none[d] | --[d] |
| | 13,400 | 9/09 | 2 | 29,200 |
| | 12,200 | 8/22 | 2 | 28,500 |
| Birch Creek and Slough | 99,300[e] | 7/26 | 2+6+7 | 424,000 |
| | 61,600 | 6/23 | 6+7 | 354,000 |
| | 59,700 | 6/04 | 6+7 | 359,000 |
| | 58,400 | 7/11 | 6+7 | 398,000 |
| | 52,500 | 8/09 | 7 | 157,000 |
| | 38,000 | 8/23 | 2 | 147,000 |
| | 35,900 | 9/28 | 2 | 59,500 |
| | 33,800 | 9/11 | | 81,900 |
| Sunshine Creek and Sidechannel | 82,400[d] | 7/27 | 2 | 242,000 |
| | 70,200 | 6/09 | 2 | 121,000 |
| | 62,700 | 6/24 | 2 | 134,000 |
| | 60,100 | 7/12 | 2 | 178,000 |
| | 51,600 | 8/10 | 2+6+7 | 128,000[f] |
| | 38,700 | 8/24 | 2 | 46,300 |
| | 35,000 | 9/12 | 2 | 12,200 |
| | 33,400 | 9/30 | 2 | 25,300 |

[a]USGS provisional data at Gold Creek 15292000 (with Whisker Creek data).

[b]Surface area measurements for June 21 and July 25, 1982, are lower limits.

[c]Surface area measurement for June 3, 1982 is an upper limit.

[d]High tributary discharge this date eliminated zone 2 (see text).

[e]USGS provisional data at Sunshine 15292780.

[f]An area of HII water assocated with this measurement was not measured (see text).

Appendix Table 4-A-7 (Continued).

| DFH Site | Discharge cfs[a] | Date | Zones | Surface Area Type II ($Ft^2$) |
|---|---|---|---|---|
| Rabideux Creek and Slough[b] | 71,700 | 6/26 | 2+7+8 | 1,160,000 |
| | 67,900 | 7/29 | 2+7 | 1,180,000 |
| | 53,000 | 9/14 | 2 | 965,000 |
| | 44,000 | 8/12 | 2 | 876,000 |
| | 38,700 | 8/25 | 2 | 836,000 |
| | 33,400 | 9/30 | 2 | 344,000 |
| Whitefish Slough[c] | 72,000 | 7/28 | 2 | 85,800 |
| | 66,700 | 6/25 | 2 | 75,000 |
| | 60,100 | 7/12 | 2 | 65,800 |
| | 53,000 | 9/14 | 2 | 71,000 |
| | 47,900 | 8/11 | 2 | 56,200 |
| | 38,700 | 8/25 | 2 | 32,200 |
| | 33,900 | 9/29 | 2 | 14,200 |
| Goose Creek and Sidechannel | 72,000 | 7/28 | 6+7 | 75,000 |
| | 66,700 | 6/25 | 6+7 | 83,000 |
| | 64,200 | 6/10 | 6+7 | 87,000 |
| | 63,000 | 7/13 | 6+7 | 74,400 |
| | 47,900 | 8/11 | 6+7 | 113,000 |
| | 38,700 | 8/25 | 6+7 | 122,000 |
| | 36,400 | 9/13 | none | -- |
| | 33,900 | 9/29 | none | -- |

[a]USGS provisional data at Sunshine, 1982, 15292780.

[b]Not sampled in early June or in early July.

[c]Not sampled in early July.