KNIK ARM CROSSING

TECHNICAL MEMORANDUM No. 16

Freshwater & Terrestrial Habitat Studies

January 27, 1984

U.S. Department of Transportation
Federal Highway Administration

Alaska Department of Transportation
and Public Facilities

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RECONNAISSANCE OF FRESHWATER HABITATS POTENTIALLY AFFECTED BY THE NORTH APPROACH CORRIDORS OF THE KNIK ARM CROSSING PROJECT

A. INTRODUCTION

This study was initiated as part of a baseline data collection program relating to environmental analysis of the proposed Knik Arm Crossing Project. North approach highway corridors, connecting the crossing itself with the Parks Highway, would traverse substantial areas of relatively undisturbed terrain including crossing of numerous streams. The biological and physical characteristics of most of these streams were not well known, especially in the vicinity of proposed north approach highway crossings. Therefore, a study program was initiated to fill specific information gaps relative to freshwater habitats.

The program was designed to address the following questions or needs:

1. Determination of whether a stream is a fish stream relative to permitting and mitigation requirements

2. Assessment of mitigation needs and opportunities for these fish streams

   - Overall assessment of fish value to provide information needed to make major decisions on crossing mode; e.g. bridge vs. culvert

   - Identification of species composition and dominant fish values so that "design" fish species and life stages can be selected as a basis for design of highway drainage structures; e.g. determination of acceptable culvert velocities

   - Assessment of optional road alignments within limits of the corridors to avoid sensitive habitats and minimize construction impacts

   - Identification of sensitive time periods

3. Assessment of aquatic habitat values at a level of detail sufficient for impact analysis as required by the EIS process

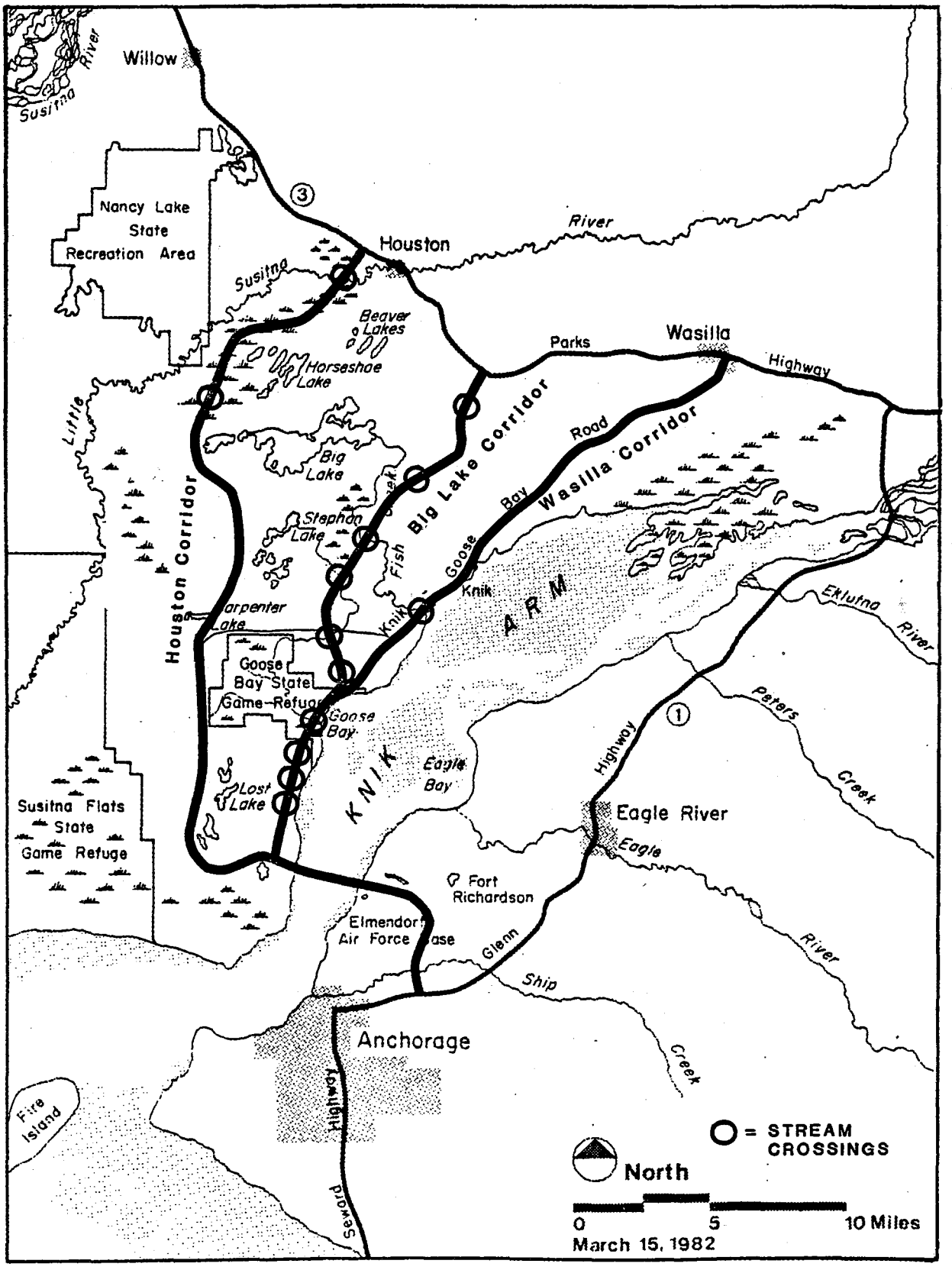
   - o Assessment of values in the vicinity of the road crossing site to allow assessment of direct impacts from road construction and operation

   - o Assessment of values within the stream system as a whole to allow assessment of indirect impacts (e.g. from downstream siltation) and secondary impacts (e.g. from human exploitation). Stream-wide field data were only collected for those streams where the existing information base was too small to allow a reasonable impact assessment

During initial analysis of potential north approach corridors, several logical alternatives were identified. Because of seasonal constraints on biological field work, it was necessary to conduct the study prior to the formal decision regarding which corridors would be considered in the EIS. For purposes of this study, therefore, the two most likely alternatives (Houston and Wasilla corridors) were selected for further evaluation. While the study was in progress a modification of the Wasilla corridor, the Big Lake corridor, was also selected for evaluation. Representative alignments within the corridors were drawn by project engineers and used as the basis for stream investigations (Figure 1 and Plate 1).

B. GENERAL METHODOLOGY

Because the data requirements and physical characteristics varied greatly among the study streams, methods used on the streams also varied. Specific methodology will be described in the discussions for each stream in subsequent sections of this report. This section discusses only general methodology.



STUDY CORRIDORS

Figure 1

Pre-Field Assessment of Data Needs

Prior to initiation of field investigations, an inventory was made of the information already available for each of the streams to be crossed by the proposed alternative roadways as determined from map interpretation. Interviews were conducted with Alaska Department of Fish & Game (ADF&G) field personnel to gain additional knowledge for the subject streams. ADF&G files and reports were examined as applicable. Field data collection needs for each stream were determined on the basis of the information available and the needs of the Knik Arm Crossing Project.

Overall Approach

A two-man biological team surveyed the alternative north approach routes travelling via helicopter with supplemental visits to some streams via ground transportation. Investigative methodology and sequence to be applied at each stream crossing was approximately as follows:

1. A stream reach about 0.5 mile (0.8 km) wide centered on the proposed roadway was reconnoitered from the air. Physiographic features of the stream were noted and aerial photographs taken. The 0.5 mile zone was assumed to include the area where the actual crossing would ultimately occur as well as a substantial distance on either side.

2. Using a combination of aerial and ground travel, a selected area within the 0.5 mile zone was sampled for fish. Sample sites included a range of typical habitat types. Fish were sampled using a variety of methods including backpack electroshocker, beach seine, minnow traps, visual observation, and angling. The primary emphasis was to obtain qualitative samples of fish distribution. However, standard methods were employed for some sampling techniques so that samples within and among streams could be quantitatively compared on the basis of catch per unit effort.

   Most fish captured were measured and then released. A few fish were retained for confirmation of species identification.

If initial observations and sampling indicated that fish use was improbable, then the investigation was aborted or abbreviated.

3. Aquatic habitats were characterized within the study zone for each fish stream crossing. Habitat characteristics that were described included stream width, depth, water velocity, flow, substrate composition and availability of cover. Flow measurements on wadeable streams were made at one location in the study reach using standard stream cross section methods in conjunction with a Marsh-McBirney or Gurley current meter. Habitat characteristics within the study reach were entered onto standard data sheets (Appendix A). Three types of data sheets were used for each stream: a cover sheet which includes general stream information as well as discharge data, stream reach inventory sheets for each study reach which include data specific to the reach, and fish data sheets which include field data for fish captured. Stream habitat maps were constructed for some of the streams to aid in future impact analysis and final siting of road crossings.

Additional effort beyond that described above was spent on selected streams where background information was lacking or where special needs were perceived. This effort is described in the discussion for each stream.

Sampling Periods

The initial investigation occurred between the dates of August 16 - August 25, 1983. It included three days of helicopter-based sampling and three days of supplemental ground survey.

A boat-based investigation of the Little Susitna River occurred on September 13 and 14, 1983.

A final study effort occurred on October 18 and 19, 1983. It included one day of helicopter travel and one day of ground travel. This last study period was initiated because of the addition of the Big Lake corridor.

C. HOUSTON CORRIDOR

The Houston corridor, along with stream crossing sites, is shown in Figure 1 and Plate 1. Aerial reconnaissance indicated that only two fish streams cross the route. Two wetland swales contributing to a Goose Creek tributary at the south end of the corridor were inspected on the ground as likely stream locations; however, in both areas no defined channel existed and, consequently, fish potential was assumed to be nil.

Hourglass Lake Drainage System

Background Information. This small stream flows from Hourglass Lake (with a tributary from Colt Lake) southwest to the Little Susitna River (Plate 1). Stream length including meanders was estimated from aerial photos at about 10 miles (16 km). No known biological research has been conducted on the stream. However, Lebida (1983) investigated the coho salmon rearing potential of Hourglass and Colt Lakes. Hourglass Lake was found to contain juvenile coho salmon as well as rainbow trout, threespine stickleback, and longnose suckers. All of the fish species in the Little Susitna River have access to the stream.

Methods. Because of the lack of information available for this stream, three separate reaches were examined: at the proposed road crossing site, near Hourglass Lake, and near the confluence with the Little Susitna River (Plate 1). Aquatic habitat survey forms were completed for each reach and fish populations were sampled. At the crossing site, a 100-foot (30-m) section of stream was sampled using the backpack electroshocker. A block net was set at the lower end of the reach and two passes were made working downstream with the shocker. At the reach near Hourglass Lake, stream depth and soft bottom prevented instream sampling; therefore, shocking from the bank and visual observations were relied upon to provide fish information. Stream depth was also marginal at the lower study reach and instream shocking was not effective. Three minnow traps were set overnight supplemented by visual observations and shocking from the bank.

Results. Aquatic habitat surveys and fish data forms for the Hourglass Lake drainage stream are provided in Appendix A. This low gradient stream flows within a deep, incised channel that meanders through a continuous wetland area. Discharge, measured at the crossing site, was about 2 cfs. Substrate consists of sand and silt and aquatic vegetation is common covering up to 90 percent of the bottom. The stream margin in most areas consists of a sedge-shrub mat except at the extreme upper end where the stream flows through a floating bog. Habitat is very uniform throughout the length of the stream. Two beaver dams were present downstream from the crossing site resulting in short ponded areas.

Juvenile coho salmon were abundant throughout the stream. At the crossing site 132 juvenile cohos from two length groups were caught in a 100-foot (30-m) stream section. It was estimated that shocking was 60-80 percent efficient; therefore, a conservative estimate of the number of cohos in the study reach is about 170. Quantitative sampling was not possible at the other two study reaches, but visual observations suggested that juvenile salmonids were at least as abundant at the upper site as at the crossing site. Abundance at the lower study reach was probably somewhat lower. If it is assumed that there were 170 cohos per 100 feet (30 m) and 10 miles (16 km) of total stream, then about 90,000 juvenile cohos were present in the stream. The stream evidently provides excellent rearing habitat.

Two rainbow trout juveniles, several ninespine sticklebacks, and one sculpin were also caught. The stream probably provides significant rearing habitat for rainbow trout from Hourglass Lake.

Project Implications. A culvert crossing of the Hourglass Lake drainage stream appears practical due to the very flat terrain and low flow. However, the stream is probably sensitive to disturbance for much of the year because of juvenile salmon presence and the regulatory agencies may require mitigative construction procedures to protect downstream fish. The culvert will have to be carefully designed and placed to provide the low water velocity required for young salmon. Crossing location is not critical because of very uniform habitat in the corridor zone.

Little Susitna River

Background. The Little Susitna River is one of the most important streams in the Matanuska-Susitna Borough from the standpoint of salmon production and sport fishing use. The biology of the stream is relatively well known as a consequence of several study programs initiated by ADF&G. All five species of Pacific salmon are present in the Little Susitna River and all except sockeye spawn in the main river (ADF&G 1982). Creel census studies and escapement surveys of chinook and coho salmon have provided detailed information on harvest and exploitation rates as well as population and age structure for these species (Watsjold 1979, 1980, 1981; Bentz 1982).

Additional studies have been conducted on the early life history of chinook and coho salmon in the river (Delaney and Wadman 1979). Chinook, coho and pink salmon spawn in the general area of the Houston corridor crossing (ADF&G 1982), and juvenile chinook and coho salmon use the area for rearing (Delaney and Wadman 1979).

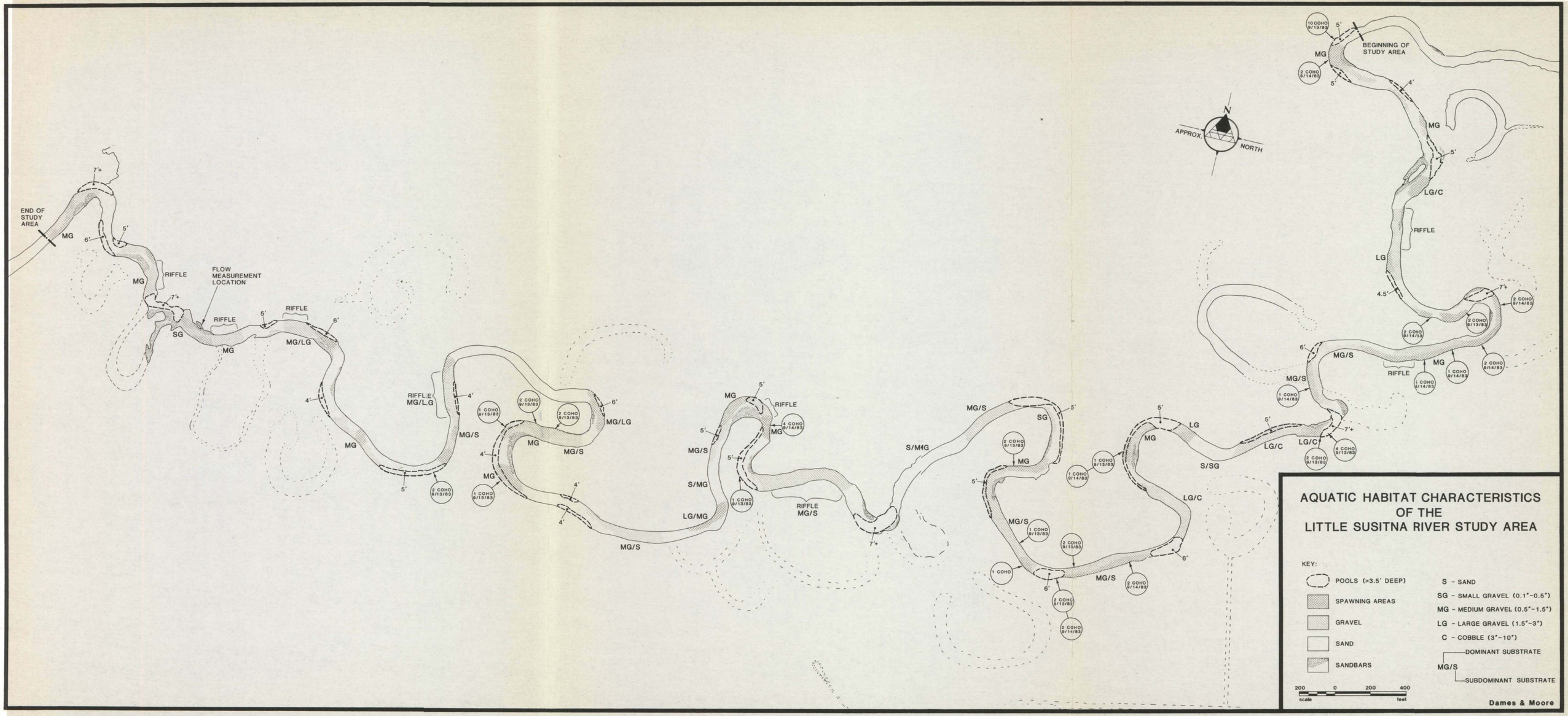
Methods. Because of the extensive information on biological resources available for the Little Susitna River, a somewhat different approach was taken during the investigation. Interviews with ADF&G personnel suggested that site specific habitat descriptions would be more useful than a detailed biological study. Therefore, the primary effort was dedicated to habitat mapping. An aerial photo enlargement at a scale of 1 inch equal 200 feet was made for a 4-mile (6-km) section of river centered on the proposed corridor crossing (Plate 1). A tracing of the river was made from the photo and used as the basis for a habitat map. The entire study section of the river was floated in an inflatable raft, first on September 13 and again on September 14. Habitat characteristics, particularly depth and substrate, were noted directly on the tracing. Potential salmon spawning areas were also noted on the basis of a subjective judgement of spawning suitability. The field work was timed to correspond with coho salmon spawning, and observations of salmon were noted on the habitat map. Stream reach inventory sheets were not completed for the Little Susitna River. The habitat map was considered to be a more useful format for describing stream conditions.

In addition to the September mapping work, a visit to the river was also made during the aerial survey on August 18, 1983. At that time, a reach about 1,500 feet (457 m) long was observed from the ground and selected slow water areas were sampled for juvenile fish using the backpack electroshocker.

Results. During most of the September survey the water level was low (discharge was 270 cfs) and visibility was very good. Poor weather and increasing turbidity hampered the work somewhat on September 14 especially late in the day. The habitat map (Figure 2) illustrates that the Little Susitna within the study reach is a meandering river 50-90 feet (15-27 m) wide with predominantly sand and gravel bottom. Significant pools were found along the outside bank in most bend areas. Some of the pools were more than 7 feet (2 m) deep. Sand was a dominant substrate material and most gravel substrates were imbedded to some degree in sand. Riffles (turbulent areas with depth less than 1 foot [0.3 m]) were not common at the time of observation but would be much more prevalent at a lower water level.

Coho salmon adults were observed throughout the study reach except at the extreme west end (Figure 2). Thirty-five cohos were observed on September 13 and 22 were observed on September 14. Visibility was much better on September 13 which undoubtedly accounts for the higher number seen on that date. Most adult cohos observed were single fish or paired fish and their behavior suggested that they were in the early stages of spawning. Preferred spawning areas appeared to be on medium gravels located on either the upstream or downstream edge of a pool in water about 2 feet (0.6 m) deep. Scattered potential spawning areas were found throughout the study reach although most areas were small (Figure 2).

The electroshocker survey conducted on August 18 indicated that portions of the stream margin were used as rearing habitat by juvenile coho and chinook salmon. About ten cohos were caught for each chinook (Appendix A). However, much of the stream was not suitable as rearing habitat and there were few large areas of slackwater that would be preferred by young cohos.



AQUATIC HABITAT CHARACTERISTICS OF THE LITTLE SUSITNA RIVER STUDY AREA

KEY:

- POOLS (>3.5' DEEP)
- SPAWNING AREAS
- GRAVEL
- SAND
- SANDBARS

S - SAND
SG - SMALL GRAVEL (0.1"-0.5")
MG - MEDIUM GRAVEL (0.5"-1.5")
LG - LARGE GRAVEL (1.5"-3")
C - COBBLE (3"-10")

MG/S — DOMINANT SUBSTRATE / SUBDOMINANT SUBSTRATE

200 0 200 400
scale feet

Dames & Moore

Figure 2

The numerous deep pools would be expected to provide good resting habitat for adult salmon as well as habitat for resident species such as trout. However, resident fish appeared to be scarce during the September float trip. Only two fish other than coho salmon were visually observed. Beach seining and angling produced no fish.

Project Implications. Location of the Little Susitna River bridge crossing of the Houston corridor should be carefully considered both to avoid impacting known spawning areas and to minimize overall disturbance to the river. The river meanders widely in the corridor zone; therefore, the route should be selected so that it infringes on the river at only one location and crosses the river at a right angle. The stream habitat map (Figure 2) should provide the information necessary to design a crossing with a minimum of impact.

D. WASILLA/BIG LAKE CORRIDOR

The Wasilla/Big Lake Corridor along with stream crossing sites is shown in Figure 1. Because of uncertainty regarding corridor location, some streams were observed at several locations. A total of seven streams were observed, two of which were determined to be non-fish streams.

Mule Creek

Background. Mule Creek is a small isolated stream that flows eastward into Knik Arm (Plate 1). The stream has two forks which join together about 3/4 mile (1 km) from the stream mouth. No known physical or biological information was available for the stream.

Methods. Three separate reaches of this stream were examined: at the mouth where the stream traverses the bluff overlooking Knik Arm, the lower portion on wooded upland terrain, and the upper portion where the stream follows a wetland swale. Stream reach inventory sheets were completed for each reach. Fish were sampled using the backpack electroshocker within the latter two reaches.

Results. Mule Creek is a very small stream ranging in width from 3 to 15 feet (1 to 4.5 m) and having a discharge, at the time of observation, of 0.5 cfs. Two major kinds of stream habitats are present. The lower part of the stream (east of the fork) is characterized by a shallow channel, moderate gradient and gravel substrate with much overhanging woody vegetation. The upper part of the stream is characterized by a narrow, relatively deep, incised channel that flows through a grassy wetland.

Juvenile coho salmon were found in low density throughout the portions of the stream that were sampled. The density was on the order of 1 coho per 25 feet (8 m) of stream. Mule Creek is isolated from other stream systems; therefore, the presence of juvenile salmon suggests either that adults spawn in the stream or that young coho entered the stream from Knik Arm. The former explanation appears more plausible since the gradient of the stream near the mouth appeared to be too high to allow access by small fish, except possibly during extreme high tide.

Project Implications. A culvert appears to be a practical highway drainage structure for Mule Creek. This very small stream contains salmon rearing habitat and the culvert will have to be carefully placed to assure low water velocity and minimize downstream impact. Culvert installation during the period June 1 - August 1 would be advisable to avoid disturbance of spawning salmon and incubating eggs. Mule Creek divides into two forks about 2/3 mile (1 km) upstream from its mouth. Both forks would require adequate culverts if the roadway were to cross above the split.

Unnamed Stream No. 1

Background. This small stream enters Knik Arm about 1.5 miles (2 km) north of Mule Creek (Plate 1). Its watershed is similar to that of Mule Creek. No known physical or biological information was available for the stream.

Methods. One section of this stream was observed at the lower end during the October survey. A stream reach inventory form was completed and fish were sampled using the backpack electroshocker in a 300-foot (91-m)stream section.

Results. This very small stream is nearly hidden from view by vegetation. It was not noticed during the summer survey when water levels were lower; therefore, flow may have been much less in August and the stream may be intermittant. No fish were observed in the stream and the value to fish is considered to be marginal. However, the sampling occurred just prior to freezeup and fish may have vacated the stream. Therefore, the possibility of fish entering from Knik Arm and using the stream as rearing habitat should not be discarded completely.

Project Implications. A culvert would be a practical highway drainage structure for this stream. Because of the possibility of fish use, the slope and elevation of the culvert should match the natural stream to allow passage. Special construction procedures or timing would probably not be necessary.

Unnamed Stream No. 2

Background. This very short stream flows eastward into Knik Arm about 1 mile (1.6 km) south of the southern margin of the Goose Bay flats (Plate 1). No physical or biological information was available for the stream.

Methods. A portion of the stream (from the mouth upstream for about 1,000 feet [305 m]) was observed on August 16. No fish sampling was conducted.

Results. This very small stream has an average width of about 2 feet (0.6 m) and depth of about 0.5 feet (0.2 m). The stream is probably too small to support fish. Access for fish entering from Knik Arm would be difficult because of steep gradient at the top of the Knik Arm beach and because of debris jams at the stream mouth.

At the level of the Wasilla corridor crossing, the stream channel becomes poorly defined and grades into a wetland area with no defined flow.

Project Implications. Special precautions to protect fish would probably not be necessary for a highway crossing of this stream.

Goose Creek

Background. Goose Creek is a small stream that originates at Stephan and Sevenmile lakes and flows in a southerly direction through extensive wetland areas. It enters the Goose Bay State Game Refuge on its north side and flows into Knik Arm at the mouth of the refuge area. The stream is about 9 miles (14.5 km) long, exclusive of meanders.

Some biological information was available for the stream. Adult and juvenile coho salmon are known to be present as well as rainbow trout (ADF&G 1982; Engle, pers. comm.). Coho salmon spawn within the stream between the Pt. Mackenzie road and the Goose Bay refuge and rearing occurs in Stephan Lake (ADF&G 1982).

Methods. Three reaches of lower Goose Creek were investigated on August 18 in relation to the proposed Wasilla corridor crossing. In addition, aerial reconnaissance of upper Goose Creek and ground investigations of one more reach was conducted on October 18 in relation to the proposed Big Lake corridor crossing. Stream reach inventory forms were completed for all study reaches with a separate series of habitat survey forms completed for each of the two sampling periods. Fish were sampled with the backpack shocker at three of the four reaches, and at reach No. 2 of the August survey, a block net was utilized to trap downstream migrating sticklebacks. Upper Goose Creek near the upper Big Lake corridor crossing could not be sampled during the fall survey because of very high water; water level was over the banks and had flooded the adjoining wetlands.

Results. Goose Creek can be conveniently divided into four sections of similar habitat. The creek where it traverses the eastern portion of the Goose Bay refuge, within the intertidal zone, can be considered poor fish habitat because of the periodic inflow of turbid water from Knik Arm and heavy silt deposition. Within the western portion of the refuge, the stream is characterized by a low gradient and incised channel and probably provides fair to good rearing habitat for juvenile salmonids. North of the refuge for about 2 miles (3 km), Goose Creek crosses wooded terrain with a higher

gradient and is characterized by some gravelly and rocky substrates and alternating pools and riffles. Moderate numbers of juvenile rainbow trout and a few coho salmon were found in this section. Coho salmon are also reported to spawn in this general vicinity (ADF&G 1982). The balance of the stream north of the Pt. Mackenzie road, traverses low gradient wetland terrain and is characterized by a narrow, deep channel. This latter portion is probably good coho salmon rearing habitat; however, the rearing capacity was not confirmed during this study since no sampling was done in the upper reaches.

Very large numbers of young-of-the-year threespine sticklebacks were caught in lower Goose Creek in August and were evidently migrating seaward. The sticklebacks evidently spawn somewhere in the Goose Creek drainage.

Project Implications. A bridge or trestle crossing near the mouth of Goose Creek would have little impact on the stream. Special precautions are probably not necessary since the road corridor is in the intertidal zone and the stream is subjected daily to wide fluctuation in turbidity, depth and salinity.

The Big Lake corridor, as aligned in Figure 1, would cross the upper part of Goose Creek in two locations. In both locations stream gradient is low and a large culvert would probably be a practical drainage structure. Goose Creek is a significant fish stream containing rearing habitat for coho salmon and rainbow trout and it provides a migratory corridor for young fish to Stephan Lake. Therefore, the culverts would have to be carefully designed to provide suitable velocity that would allow passage of juvenile fish. Mitigation measures may be required during construction to avoid downstream impacts from dewatering and/or siltation.

Unnamed Stream No. 3

Background. This very small stream enters the Goose Bay Flat from the north. It crosses the existing Goose Bay road via a culvert near the abandoned Nike missile site (Plate 1). No known physical or biological information was available prior to this study.

Methods. A brief reconnaissance of this stream was conducted on August 24. Aquatic habitat survey forms were completed and fish were sampled qualitatively using the backpack electroshocker at selected locations.

Results. The stream appears to drain wetland areas north of Goose Bay. The Goose Bay road has interrupted the flow creating a pond about 1 acre (0.4 ha) in size which drains via a 24" culvert. At the time of the survey, the culvert discharge was about 2.5 cfs. The pond water appeared stagnant and may have been lacking in dissolved oxygen. Downstream from the culvert, the stream channel was poorly defined flowing through a wetland area dominated by grass and willow. The stream channel disappeared completely in the Goose Bay flat.

No fish were observed or captured either above or below the road culvert and the stream has little potential as fish habitat.

Project Implications. No special precautions would be necessary to protect fish resources in the event of a highway crossing of this stream. A culvert installed using normal good construction practices would be adequate.

Fish Creek

Background. Fish Creek is a substantial stream that flows from Big Lake southward into Knik Arm. The drainage system supports significant fish resources of value to both sport and commercial fishermen. In addition, ADF&G operates a hatchery on Meadow Creek near Big Lake that produces coho and sockeye salmon, some of which are released into the Fish Creek drainage. The existence of these important resources within a heavily used recreation area has inspired research activity and consequently, the biology of Fish Creek is relatively well known. All five species of Pacific salmon are present in Fish Creek with king, coho and pink salmon spawning in the creek (ADF&G 1982). Sockeye salmon spawn in lakes and streams upstream from Fish Creek with Big Lake serving as a primary rearing area for both natural and hatchery produced sockeyes. Substantial information is available on the development and migration timing of salmon smolts in Fish Creek (Chlupach 1982).

Resident fish species such as rainbow trout and Dolly Varden are also present in Fish Creek.

Methods. Emphasis during the investigation was on site specific habitat characteristics since fish distribution was already well known. A stream reach about 2,000 feet (609 m) long was examined on August 24 and 25 in the vicinity of the existing Knik Road crossing (Plate 1) since the proposed Wasilla Corridor was planned to cross Fish Creek at or near this location. Aquatic habitat survey forms were completed and enough information was collected so that a habitat map could be drawn if needed. Selected stream areas were sampled for fish using the backpack electroshocker.

After the Big Lake corridor was proposed, a second investigation was conducted on October 18 to survey upper Fish Creek near the new crossing site (Plate 1). A stream reach about 500 feet (152 m) long was examined and a second set of aquatic habitat survey forms was completed. Again selected stream areas were sampled for fish using the backpack shocker. In addition, an aerial survey of upper Fish Creek was conducted and the locations of spawning salmon were noted.

Results. Lower Fish Creek above the intertidal zone appeared to be a classical, moderate gradient stream with alternating pools and riffles except in the vicinity of the Knik Road where a substantial portion had been disturbed by past and present roadway crossings. Substrate materials were predominantly gravel and cobble. Discharge at the time of the August survey was about 99 cfs. Fish Creek crosses under the Knik Road via two 150-foot (46-m) long, 10-foot (3-m) diameter culverts, one set at a higher elevation than the other to handle high water. Deep pools have formed at both the inlet and outlet of the culvert. At the time of the survey all of the flow was being carried by the lower culvert and water velocity was measured through the culvert at 7.8 ft/sec using the floating chip method. About 400 feet (122 m) below the Knik Road the character of Fish Creek changes because of influence from tidal water of Knik Arm. Gradient becomes reduced and stream bottom and bank materials are dominated by glacial silt. The stream widens near the mouth and depth varies with tide stage.

Electroshocking upstream from the Knik Road indicated that juvenile salmonids were common within selected slower water habitat areas. The fish were dominated by coho salmon with smaller numbers of chinook salmon and rainbow trout also observed. Juvenile salmon were also abundant along the fringes of the plunge pool area below the culvert. Again cohos were the dominant species but several chinooks were also caught. It appeared likely that the concentration of young fish below the culvert was a result of the high water velocity in the culvert; young fish may have been washed through the culvert and then became trapped between the culvert on one end and the saltwater influence of Knik Arm on the other.

The character of Fish Creek is somewhat different at the proposed Big Lake corridor crossing. Gradient is less, width is greater and the substrate is dominated by sand with patches of fine gravel. Aquatic vegetation covered much of the stream bottom. The only salmonids captured with the shocker were two juvenile coho salmon and one juvenile rainbow trout. The stream appeared to provide good rearing habitat and it is suspected that the low fish density was a reflection of the time of year. The water temperature was only 2°C and most juvenile salmonids may have moved into Big Lake for the winter. The aerial survey indicated that coho salmon spawn in the general vicinity of the Big Lake corridor, but in very low density. Nine adult cohos were observed on three redds within the 5 mile (8 km) stream section (Plate 1). Suitable spawning habitat is widely scattered and limited to small patches of gravel. Some of the better spawning habitat appeared to be located adjacent to the knob-like hill just east of the study reach.

Project Implications. Fish Creek is important habitat from the standpoint of rearing, spawning and migration. If development of the Wasilla corridor will involve reconstruction of the existing Fish Creek crossing, then serious consideration should be given to the use of a bridge rather than culverts. The natural stream bed gradient is relatively steep which would make it difficult to satisfy velocity criteria with a culvert, especially in a stream as large as Fish Creek. Placement of a culvert at less than natural slope to achieve lower velocity would create problems downstream and step-down structures would probably be required in the stream below the culvert to allow fish access to the culvert outlet.

A bridge would also be a preferred structure for upper Fish Creek at the proposed Big Lake corridor crossing. Because of stream width and habitat sensitivity at this location, culverts would probably cause some adverse impact.

Threemile Lake Inlet Streams

Background. Topographic maps indicate that two small streams enter Threemile Lake, one at the extreme northwest corner of the lake and the other at the southeast corner. The Big Lake corridor as shown on Figure 1 would cross the former stream while a possible alternative routing would be south of Threemile Lake and thus would cross the latter stream. No known physical or biological information was available for these streams. However, Threemile Lake and its outlet stream (a tributary to Fish Creek) are known to contain coho and sockeye salmon (ADF&G 1982). The lake presumably provides rearing habitat for juveniles.

Methods. Aerial surveys were conducted of both inlet streams along with brief ground surveys. Aquatic habitat survey forms were completed for the east inlet stream and selected stream areas were sampled for fish using the backpack electroshocker.

Results. The west inlet stream is identifiable only intermittantly as it flows through a narrow wetland adjoining the end of the lake. No consistent stream channel exists and the stream has no fish potential. Survey sheets were not completed and fish were not sampled.

The east inlet stream is about 1.5 miles (2.5 km) long and contains several beaver ponds. Discharge is less than 0.5 cfs and the stream is generally less than 1.5 feet (0.5 m) deep with a low gradient. The channel is well defined in most areas with a muck bottom. Fish potential is probably limited by the low flow and extensive beaver activity. Portions of the stream appeared to be fair rearing habitat and it is likely that at least the lower portion of the stream is utilized by juvenile salmonids during the summer. No salmonids were observed during the October survey but the presence of sculpins suggests that stream conditions would probably support juvenile salmonids.

Project Implications. Low gradient and minimal flow suggests that a culvert would be a suitable highway drainage structure. Mitigation during construction could be required depending on crossing location and time of year.

Lucille Creek

Background. Lucille Creek originates at Lucille Lake, near Wasilla, and flows westward for about 11 miles (18 km) until it joins Meadow Creek, a tributary to Big Lake. Some biological information was available for the creek prior to this study. Lucille Creek is known to provide rearing habitat for coho salmon (ADF&G 1982). Sockeye salmon have also been observed in the stream. Most of the fish species found in the Big Lake/Fish Creek drainage would be expected to be present in Lucille Creek at some time.

Methods. An aerial survey and ground investigation of one reach was conducted on October 18. A second reach was observed on October 19 using ground transportation. Aquatic habitat survey forms were completed and selected areas were sampled for fish using the electroshocker.

Results. Lucille Creek is in most areas a deep, narrow stream with abundant aquatic vegetation. Discharge was about 12 cfs at the time of the survey. Channel configuration and habitat value are uniform for most of the western half of the stream. The stream appears to be very good salmonid rearing habitat; however, spawning potential is marginal with only a few patches of gravel substrate noted in the study area.

No fish were observed at the time of the survey. Since water temperature was near freezing and the stream margins were icing up, it is suspected that most fish that reside in the creek during the summer had vacated the area for wintering areas in Lucille or Big Lake. The same phenomenon was observed in Goose Creek and upper Fish Creek during the October study period.

Project Implications. A culvert crossing of Lucille Creek appears practical because of the low gradient and flow. However, the stream is probably sensitive to disturbance, at least during the summer, because of juvenile

salmon presence and mitigative construction procedures may be required to protect downstream fish. A culvert across Lucille Creek would have to be carefully designed to provide the low water velocity required for young salmon. The crossing location should be selected to avoid stream segments with higher than average gradients as typified by study reach No. 2.

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TERRESTRIAL HABITAT MAPPING FOR THE NORTH APPROACH CORRIDORS

A. INTRODUCTION

This study was initiated as part of a baseline data collection program relating to environmental analysis of the proposed Knik Arm Crossing project. The study identifies and evaluates terrestrial habitats within the proposed highway approach corridors on the north side of Knik Arm in order to evaluate impacts, select environmentally preferred highway alignments and comply with Federal regulations protecting wetland habitats.

The U.S. Soil Conservation Service (SCS) in conjunction with the Susitna River Basin Cooperative Study Program (U.S. Dept. of Agriculture 1981), previously mapped the study area according to vegetation and soil conditions. These maps were at a scale of 1:63,360. In addition, the U.S. Fish & Wildlife Service (FWS) mapped wetland areas, at the same scale, as part of the National Wetlands Inventory Program. The FWS wetland maps use the wetland classification system developed by Cowardin et al. (1979). Using the above maps and associated field data, the FWS further evaluated major habitat types according to their ability to provide life requisites for key wildlife species (U.S. Fish & Wildlife Service 1981). Habitat evaluations were modelled and, with the help of a computer, habitat maps for key species were generated as part of the analysis for the Willow subbasin report (U.S. Dept. of Agriculture 1981).

The original SCS scale of 1:63,360 was considered too large to provide adequate resolution for assessment of direct impacts from highway development that might result from the Knik Arm Crossing Project. The existing information base was expanded, therefore, mapping specific corridors at a substantially smaller scale while using a methodology similar to that employed previously.

B. METHODS

Probable road alignments within the alternative north approach corridors were identified by project engineers (Plate 1). It was assumed that direct impacts would be confined within a one-mile wide corridor centered on the

proposed alignments. Detailed habitat mapping was, therefore, prepared for these one-mile zones.

Photomosaics of each corridor were constructed using true color aerial photographs at a scale of 1:12,000. These mosaics formed the basis for all subsequent mapping.

Vegetation

The vegetation of the road corridors was mapped using aerial photo interpretation and classified according to the revised hierarchical classification system of Viereck et al. (1982). The Viereck system was developed subsequent to the original mapping effort of the SCS and provides a more useful tool for delineating habitat values (USFWS 1981). Map units reflect the third level of resolution of this classification scheme (Table 1). The units were cross-checked against map units developed by SCS to insure consistency. Infrared aerial photographs (scale 1:250,000) were also used to aid in identification of vegetation types. Vegetation maps were prepared as mylar overlays over the photomosaics.

A field survey of the routes was conducted by helicopter on August 2-5 and September 20-21 for purposes of ground truthing habitat types. Selected plant communities were observed on the ground and community composition was noted.

Wetlands

Wetland areas were delineated within the study corridors relying heavily on the FWS Wetlands Inventory maps as the basis for determining wetland boundaries. Since the mapping units for the Knik Arm Project are at a smaller scale than the FWS maps, greater resolution was possible and modifications were made to the boundaries of some wetlands relative to the FWS maps. However, for the most part, there was a high correlation between FWS wetlands inventory maps and the more detailed maps prepared for the Knik Arm north approach corridors.

TABLE 1

First Three Levels of the Preliminary Classification
For Alaska Vegetation (Viereck et al. 1982)

Level I	Level II	Level III
1. Forest	A. Needleleaf (Conifer) Forest	(1) Closed Needleleaf (Conifer) Forest (2) Open Needleleaf (Conifer) Forest (3) Needleleaf (Conifer) Woodland
	B. Broadleaf Forest	(1) Closed Broadleaf Forest (2) Open Broadleaf Forest (3) Broadleaf Woodland
	C. Mixed Forest	(1) Closed Mixed Forest (2) Open Mixed Forest (3) Mixed Woodland
2. Scrub	A. Dwarf Tree Scrub	(1) Closed Dwarf Tree Scrub (2) Open Dwarf Tree Scrub (3) Dwarf Tree Scrub Woodland
	B. Tall Shrub Scrub	(1) Closed Tall Shrub Scrub (2) Open Tall Shrub Scrub
	C. Low Shrub Scrub	(1) Closed Low Shrub Scrub (2) Open Low Shrub Scrub
	D. Dwarf Scrub	(1) Closed Dwarf Shrub Scrub (2) Open Dwarf Shrub Scrub
3. Herbaceous	A. Graminoid Herbaceous	(1) Dry Graminoid Herbaceous (2) Mesic Graminoid Herbaceous (3) Wet Graminoid Herbaceous (Emergent
	B. Forb Herbaceous	(1) Dry Forbs Herbaceous (2) Mesic Forbs Herbaceous (3) Wet Forb Herbaceous
	C. Bryoid Herbaceous	(1) Mosses (2) Lichens
	D. Aquatic (Non-emergent) Herbaceous	(1) Freshwater Aquatic Herbaceous (2) Brackishwater Aquatic Herbaceous (3) Marine Aquatic Herbaceous

Wetlands maps were prepared as a separate mylar overlay over the corridor photomosaics. Map units represent three categories: streams and open water, wetlands (all types combined), and non-wetlands or uplands. This nomenclature corresponds to that of Cowardin et al. (1979).

Habitat Evaluation

Models of species-specific habitat requirements have been constructed for many of the major wildlife species in Alaska using all the pertinent published and unpublished data on these species (U.S. Fish & Wildlife Service 1980). These models rank habitats according to their ability to provide life requisites for these species. The FWS applied these models to the vegetation data collected by the SCS for the Willow subbasin (translated into the Viereck classification system) and ranked habitats in the study area according to suitability for five species; moose, snowshoe hare, willow ptarmigan, red squirrel and spruce grouse. Digitized maps, with the minimum map unit size of 10 acres, were developed and are presented in the final Willow subbasin report (U.S. Dept. of Agriculture 1981). The same methodology was used in evaluating the vegetation categories delineated within each road corridor (except that willow ptarmigan was deleted as a key species). Life requisite categories by habitat type for the key species are given in Table 2. The wildlife habitat values expressed in Table 2 were illustrated on a mylar overlay for use with the corridor photomosaics.

C. RESULTS

The results of the habitat mapping consist of a series of aerial photomosaic strips each representing a one-mile wide corridor centered on the proposed alternative road alignments as presented on Plate 1. Three transparent overlays were prepared for each photomosaic: (1) vegetation types, (2) wetlands and open water habitats, and (3) wildlife habitats.

These maps are available for viewing on request from the Knik Arm Crossing Project office (907/278-1565) or by contacting the Alaska Department of Transportation and Public Facilities.

TABLE 2

Life Requisites By Habitat Types for Moose, Snowshoe Hare, Red Squirrel and Spruce Grouse (Adapted From USDA, and USFWS, 1981)

Habitat Type(1)	Map Unit(2)	Moose	Snowshoe Hare	Red Squirrel	Spruce Grouse
Coniferous Forest	IA1, IA2, IA3	Year-round food and cover	Year-round food and cover	Year-round food and cover	Year-round food and cover
	IA1-Closed Black Spruce	Year-round cover marginal, year-round food	Marginal year-round food and cover	Year-round food and cover	Winter food and cover, marginal spring, summer and fall food
Deciduous Forest	IB1, IB2, IB3	Year-round food, limited year-round cover	Low quality food	Inadequate food	Inadequate food
Mixed Deciduous and Coniferous Forest	IC1, IC2, IC3	Year-round food and cover	Year-round food and cover	Year-round food and cover	Year-round food and cover
Tall Shrub Scrub	IIA1, IIA2	Year-round food limited year-round cover	Low quality food	Inadequate food	Inadequate food
Low Shrub Scrub	IIB1, IIB2	Year-round food limited year-round	Year-round food and cover	--	--
Graminoid Herbaceous	IIIA3	Additional spring, summer, and fall food	--	--	--
Forb Herbaceous	IIB3	Additional spring, summer, and fall food	--	--	--

(1) Level II - Viereck et al., 1982.
(2) Level III - Viereck et al., 1982.

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Appendix A

Appendix A
Aquatic Habitat Survey Forms

AQUATIC HABITAT SURVEY

Observers: Morsell, Erikson Date: 8/17/83 Time: 0930-1200 Stream No.: K-3

Stream Name: Hourglass Lake drainage Watershed: Little Susitna River

Survey Location: See reach inventory sheets Photo No.: A6-A11

Weather: Cloudy; calm

Water Color: very light brown Turbidity: very low

Air Temperature: 12°C Water Temperature: 12°C

Stream Stage: Moderate to low

Discharge Measurement

	Station	Width (ft.)	Depth (ft.)	Vel. (ft/sec)	Qi (cfs)
Water's edge	1.0				
	2.0	1	1.6	0.02	0.032
	3.0	1	2.0	0.02	0.04
	4.0	1	2.2	0.03	0.066
	5.0	1.5	2.0	0.03	0.09
	7.0	1.5	2.2	0.08	0.264
	8.0	1.5	2.2	0.1	0.33
	10.0	2	2.5	0.05	0.25
	12.0	1.5	2.8	0.15/0.12	0.567
	13.0	1	2.5	0.1	0.25
	14.0	1	2.2	0.02	0.044
	15.0	1.6	1.9	0.02	0.061
Water's edge	17.2				

Discharge: 1.99 cfs

Location of Measurement: Houston Corridor crossing

ΣQi = 1.99

Overall Habitat Value

Spawning: Poor Overwinter: ?

Rearing: Excellent Overall: Very good

Comments: Uniform stream - all deep incised channel - main change between headwaters and mouth is width

Beaver dam ~ 1 mi. downstream from corridor crossing - a 2nd dam ~ 1 mi. below first - dams evidently are not a block to salmon

8/17/83

Reach #1
Stream K-3
Photos A7+A11

STREAM REACH INVENTORY

Stream Name: Hourglass Lake drainage Stream No.: K-3

Reach Location: Houston Corridor crossing

Reach Length: ~300' Velocity (est.): 0.1 ft/sec

Max. Depth: 4' Max. Width: 15'

Average Depth: 2' Average Width: 12'

Gradient: very low High Flow Width: 15'

Cover

Bank: Good – overhanging shrub

Instream: Very good – 60% coverage aquatic vegetation

Substrate: Poor

Bank

Bank Height: 1-2'

Bank Composition: Vegetative mat underlain by fine soil

Erodability: High if mat disturbed

Riparian Vegetation:

Aquatic: 60% coverage – Equisetum, sedge, Potentilla, water milfoil

Emergent: Carex and Myrica at stream edge

Floodplain: Broad wetland – Myrica and grasses

Substrate

Silt (%): 40 Sand (%): 60 Fine Gravel(%):

Medium Gravel (%): Coarse Gravel (%):

Cobble (%): Boulder (%): Bedrock (%):

Habitat Value

Spawning: Poor Rearing: Excellent

Overwintering: ? Overall: Very good

Comments

This reach characterizes most of the stream very well

8/17/83

Fish Data

Stream Name Hourglass Lake . Outlet

Stream No. K-3

Species	Reach No.	Capture Method	Fork Length	~~Weight~~ Fork Length	Comments
Coho salmon	1	Shocker	2.1 in.	3.7	
			2.2	3.9	
			3.4	3.3	
			2.2	3.3	
			2.3	4.0	A sample of ~6 fish
			3.1	4.1	was preserved
			1.9	3.9	
			1.9	3.4	
			2.3	3.4	
			1.9	3.4	
			1.8	3.3	
			2.1		
			2.4		
			2.1		
			4.2		
			3.5		
Small cohos		unmeasured			99 total
Larger cohos		unmeasured			5 total
Rainbow trout			4.1		
			3.9		
Ninespine sticklebacks		unmeasured			5 total

Comments: Shocked a 100' section with block net at lower end 2 passes with shocker - shocker not working well at end of 2nd pass - drove fish into block net and pulled net in with good success - estimate that caught 60-80% of fish in section

8/17/83

Reach #2
Stream K-3
Photos A-6

STREAM REACH INVENTORY

Stream Name: Hourglass Lake drainage Stream No.: K-3

Reach Location: about ¼ mile below Hourglass Lake

Reach Length: ~300' Velocity (est.): < 0.1 ft./sec.

Max. Depth: 6' Max. Width: 12'

Average Depth: 3.5' Average Width: 9'

Gradient: very low High Flow Width: 15'

Cover

Bank: Good - floating sedge mat overhangs channel

Instream: Excellent 90% coverage aquatic vegetation

Substrate: Fair - organic debris

Bank

Bank Height: 0.5'

Bank Composition: Floating sedge mat with scattered shrubs

Erodability: low unless stream bottom exposed

Riparian Vegetation:

Aquatic: 90% coverage Potamilla, water milfoil, pond lilly, sedge

Emergent: Stream edge Carex and Myrica

Floodplain: Floating sedge bog with scattered shrubs

Substrate

Silt (%): 80 Sand (%): Fine Gravel(%):

Medium Gravel (%): Coarse Gravel (%):

Cobble (%): Boulder (%): Bedrock (%):

Organic debris (%): 20

Habitat Value

Spawning: poor Rearing: Excellent

Overwintering: ? Overall: Very good

Comments

Very deep, narrow channel meanders through floating bog

8/17/83

Fish Data

Stream Name Hourglass Lake Outlet

Stream No. LK-3

Species	Reach No.	Capture Method	Length	Weight	Comments
Coho salmon	2	Shocker	1.9 in.		
			2.2		Fish preserved and retained
			2.3		

Comments: Too deep to shock from instream - shocked from bank - bank unstable because of floating mat

Visual observations suggest that cohos very abundant - at least as abundant as at Reach 1

8/17/83

Reach #3
Stream K-3
Photos A8-A9

STREAM REACH INVENTORY

Stream Name: Hourglass Lake drainage Stream No.: K-3

Reach Location: about 500' upstream from confluence with Little Susitna R.

Reach Length: about 300' Velocity (est.): 0.1 ft./sec

Max. Depth: 6' Max. Width: 25'

Average Depth: 3' Average Width: 12-20'

Gradient: very low High Flow Width: 25'

Cover

Bank: Fair — overhanging shrubs

Instream: Good — 60% coverage aquatic vegetation

Substrate: Poor

Bank

Bank Height: 1-3'

Bank Composition: Grass-shrub mat underlain with fine soil

Erodability: Moderate to high

Riparian Vegetation:

Aquatic: 60% coverage sedge, water milfoil

Emergent: not much

Floodplain: Grass with scattered tall willows

Substrate

Silt (%): 30 Sand (%): 70 Fine Gravel(%):

Medium Gravel (%): Coarse Gravel (%):

Cobble (%): Boulder (%): Bedrock (%):

Habitat Value

Spawning: Poor Rearing: Good

Overwintering: ? Overall: Good

Comments

Lower portion of stream probably not as valuable as rearing habitat as the middle and upper portions

8/17/83

Fish Data

Stream Name Hourglass Cable Outlet

Stream No. K-3

Species	Reach No.	Capture Method	Fork Length	Weight	Comments
Coho salmon	3	Shocker	1.6 in.		
"			1.5		
"			1.7		
"			1.5		
"			1.6		
"			1.7		
Ninespine stickleback			1.2		Total length
"			0.9		"
"			1.2		"
Coho salmon	3	Minnow Traps	2.1		Trap #1
Sculpin		"	2.8		Trap #2
					} 19 hrs. set time
Coho salmon		"	3.4		Trap #3
Ninespine stickleback			2.1		

Comments: Tried to shock 50' section with block net at lower end but water too deep and shocker battery setting weak — shocked from bank selectively waiting for fish to come clear

Set 3 minnow traps baited with salmon eggs on 8/17 and picked up on 8/18 —

AQUATIC HABITAT SURVEY

Observers: Morsell, Eriksen Date: 8/18/83, 9/13/83, 9/14/83 Time: — Stream No.: K-4

Stream Name: Little Susitna River Watershed: Little Susitna River

Survey Location: Houston corridor crossing and vicinity Photo No.: A7

Weather: 8/18/83 - Sunny, warm 9/13/83 - cloudy, cool 9/14/83 - Rain, cool

Water Color: clear Turbidity: slight

Air Temperature: Water Temperature:

Stream Stage: 8/18 - moderate to high 9/13 + 9/14 - low to moderate

Discharge Measurement 9/14/83

	Station	Width	Depth	Vel.	Qi
Water's edge	4.6				
	7	3.2	0.6	0.9	1.73
	11	5.5	1.0	1.2	6.6
	18	6.5	1.0	1.9	12.35
	24	7.0	1.0	2.3	16.1
	32	8.0	1.2	2.8	26.88
	40	7.0	1.5	2.2	23.1
	46	6.0	1.7	2.5	25.5
	52	6.0	2.0	2.6	31.2
	58	7.0	2.5	3.0	52.5
	66	7.0	2.4	2.0	33.6
	72	6.0	2.0	1.9	22.8
	78	5.0	1.2	1.8	10.8
	82	5.6	0.8	1.8	8.01
Waters edge	87.2				

Discharge: 271 cfs

Location of Measurement: West end of study reach - see habitat map

Σ Qi = 271.17

Overall Habitat Value

Spawning: Very good Overwinter: Good

Rearing: Fair Overall: Good

Comments: Reach inventory forms not completed for this stream - see habitat map for stream characteristics

8/18/83

Fish Data

Stream Name Little Susitna R.

Stream No. K-4

Species	Reach No.	Capture Method	(mm) Length	Weight	Comments
Coho salmon	1	Shocker	33		
			39		
			36		
			39		
			36		
			40		
			41		
			39		
			56		
			42		
			45		
			40		
			47		All fish were preserved for ID confirmation
			41		
			38		
			35		
			38		
			41		
			34		
			32		
			37		
			38		
			38		
Chinook salmon			46		
			46		

Comments: Shocked selected slow water habitat near stream bank and around debris — sometimes guinnets fish were located visually before shocking

AQUATIC HABITAT SURVEY

Observers: Morsell, Erikson Date: 8/16/83 Time: 10:00 Stream No.: K-1

Stream Name: Mule Creek Watershed: Knik Arm

Survey Location: From mouth upstream ± mile Photo No.: A1-A5

Weather: Clear, warm

Water Color: Clear Turbidity: Very little

Air Temperature: 12°C Water Temperature: 9°C

Stream Stage: Low to moderate

Discharge Measurement

	Station	Width (ft)	Depth (ft)	Vel. (ft/sec)	Qi (cfs)
Waters edge	4.9				
	6.5	1.3	0.4	0.22	0.114
	7.5	1	0.3	0.21	0.063
	8.5	1	0.3	0.2	0.06
	9.5	1	0.4	0.3	0.12
	10.5	1	0.5	0.3	0.15
	11.5	1.5	0.3	0.1	0.045
Waters edge	13.5				

Discharge: 0.45 cfs

Location of Measurement: about 400 ft. upstream from mouth

$\Sigma Qi = 0.449$

Overall Habitat Value

Spawning: Marginal Overwinter: ?

Rearing: Fair Overall: Fair

Comments: This creek probably does not fit into any Index-ables for Knik Arm drainage - must have a small run of Coho - probably spawn in lower portion - stream forks ~¼ mi. from mouth - north fork is the source of the flow, south fork has little habitat potential

8/16/83

Reach #1
Stream K-1

STREAM REACH INVENTORY

Stream Name: Mule Creek Stream No.: K-1

Reach Location: Stream mouth — intertidal area

Reach Length: 300' Velocity (est.): 0.5 - 1.5

Max. Depth: 1.5' (at low tide) Max. Width: 12'

Average Depth: 0.7' (at low tide) Average Width: 4'

Gradient: moderate High Flow Width: flooded at high tide

Cover

Bank: none

Instream: poor - some woody debris

Substrate: none

Bank

Bank Height: 3-5' at low tide

Bank Composition: clay/silt

Erodability: high

Riparian Vegetation:

Aquatic: none

Emergent: none

Floodplain: very little, silt deposition zone

Substrate

Silt (%): 100 Sand (%): Fine Gravel(%):

Medium Gravel (%): Coarse Gravel (%):

Cobble (%): Boulder (%): Bedrock (%):

Habitat Value

Spawning: poor Rearing: poor

Overwintering: poor Overall: poor

Comments

Intertidal area - flows down bluff in a silt-lined gulley - has higher gradient than N.F. of stream - debris in stream may block fish passage at low tide

8/16/83

Reach #2
Stream K-1.

STREAM REACH INVENTORY

Stream Name: Mule Creek Stream No.: K-1

Reach Location: From top of bluff inland for about 2/3 mile

Reach Length: 2/3 mile Velocity (est.): 0.3 fps

Max. Depth: 1.5' Max. Width: 12'

Average Depth: 0.5' Average Width: 5'

Gradient: moderate High Flow Width: 8-12'

Cover

Bank: Good; overhanging branches + debris

Instream: Good; branches in stream

Substrate: Poor

Bank

Bank Height: 1-2'

Bank Composition: fine soil with organic mat

Erodability: moderate

Riparian Vegetation:

Aquatic: none

Emergent: none

Floodplain: very narrow zone of midgrass and shrub

Substrate

Silt (%): 10 Sand (%): 10 Fine Gravel(%): 80

Medium Gravel (%): Coarse Gravel (%):

Cobble (%): Boulder (%): Bedrock (%):

Habitat Value

Spawning: fair Rearing: Good

Overwintering: ? Overall: fair

Comments

Reach consists of limited pools and riffle, about 10-20' apart - some overhanging vegetation - if spawning occurs in the stream, it probably occurs in this reach

8/16/83

Reach #3
Stream K-1

STREAM REACH INVENTORY

Stream Name: Mule Creek Stream No.: K-1

Reach Location: About 1 mile upstream from mouth on North fork

Reach Length: ~300' Velocity (est.): <0.5 fps

Max. Depth: 2' Max. Width: 6'

Average Depth: 0.8' Average Width: 3'

Gradient: low High Flow Width: 4-6'

Cover

Bank: Good; undercut bank + overhanging grass

Instream: Fair; some debris

Substrate: Poor

Bank

Bank Height: 0.2-1.5'

Bank Composition: Vegetative mat underlain by fine soil

Erodability: moderate

Riparian Vegetation:

Aquatic: little

Emergent: little

Floodplain: Grass

Substrate

Silt (%): 100 Sand (%): Fine Gravel(%):

Medium Gravel (%): Coarse Gravel (%):

Cobble (%): Boulder (%): Bedrock (%):

Habitat Value

Spawning: Poor Rearing: Fair to Good

Overwintering: ? Overall: Fair

Comments

Narrow, small channel flows through a narrow cattail — very hard to see from the air — obscured by vegetation — typifies upper part of Mule Creek

Fish Data

Stream Name Mule Creek
Stream No. K-1

Species	Reach No.	Capture Method	Length (in)	Weight	Comments
Cohd salmon	2	Shocker	3.6		shocked ~ 150' of stream – observed 3 more juvenile salmonids in same length range
	2		2.8		
	2		2.7		
Cohd salmon	3		3.0		shocked ~ 50' of stream – observed 1 more juvenile salmonid
	3		2.6		
	3		2.9		
Threespine Stickle.	3	↓	2.8		
					All fish released

Comments: Electroshocking difficult because of overhanging vegetation – cohos widely spaced in stream

AQUATIC HABITAT SURVEY

Observers: Morsell, Erikson Date: 10/18/83 Time: 1545 Stream No.: K-11

Stream Name: Unnamed Watershed: Knik Arm

Survey Location: From mouth upstream about 500' Photo No.: B15-16

Weather: Cloudy, cool

Water Color: Clear Turbidity: Very little

Air Temperature: 3°C Water Temperature: —

Stream Stage: high

Discharge Measurement

Station	Width	Depth	Vel.	Qi

Not measured — Estimated only

Discharge: ~ 1 cfs

Location of Measurement:

Qi =

Overall Habitat Value

Spawning: poor Overwinter: poor

Rearing: Fair Overall: poor

Comments: This stream was completely missed during the summer survey when water levels were much lower; therefore, flow may be intermittent. Small numbers of fish entering from Knik Arm could use the stream in summer but no confirmed fish presence

10/18/82

Reach #1 of 1
Stream K-11

STREAM REACH INVENTORY

Stream Name: Unnamed Stream No.: K-11

Reach Location: about 500' upstream from mouth

Reach Length: 300' Velocity (est.): 0.5 fps

Max. Depth: 4' Max. Width: 6'

Average Depth: 2.5' Average Width: 2'

Gradient: moderate High Flow Width: 4-6'

Cover

Bank: Good; some undercutting + overhanging grass + shrub

Instream: Fair; woody debris

Substrate: Poor

Bank

Bank Height: 1-2'

Bank Composition: vegetative mat underlain by fine soil

Erodability: moderate

Riparian Vegetation:

Aquatic: Very little

Emergent: Very little

Floodplain: Grass/shrub wetland

Substrate

Silt (%): 40 Sand (%): 60 Fine Gravel(%):

Medium Gravel (%): Coarse Gravel (%):

Cobble (%): Boulder (%): Bedrock (%):

Habitat Value

Spawning: Poor Rearing: Fair

Overwintering: Poor Overall: Poor

Comments

Very narrow deep incised channel that is covered in some place almost completely by over hanging vegetation almost invisible from the air.

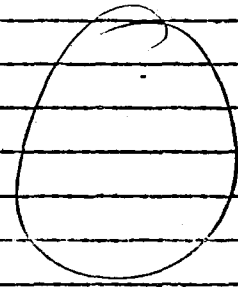
10/18/83

Fish Data

Stream Name Unnamed

Stream No. IX-11

Species	Reach No.	Capture Method	Length	Weight	Comments:



Comments: Should about 300' of stream — no fish — could be used as rearing habitat during summer by fish entering from Knik Arm

AQUATIC HABITAT SURVEY

Observers: Mansell, Erikson Date: 8/16/83 Time: 1530 Stream No.: K-2

Stream Name: Unnamed Watershed: Knik Arm

Survey Location: From mouth upstream about 1000' Photo No.: —

Weather: Partly Cloudy

Water Color: Clear Turbidity: Very little

Air Temperature: 12°C Water Temperature: 11°C

Stream Stage: low to moderate

Discharge Measurement

Station	Width	Depth	Vel.	Qi

Estimated – not measured

Discharge: < 0.2 cfs

Location of Measurement:

Qi =

Overall Habitat Value

Spawning: Poor Overwinter: Poor

Rearing: Poor Overall: Poor

Comments: Not a fish stream because of insufficient flow + depth — also numerous debris blocking lower end of stream — No fish sampling was conducted. Channel not possible to distinguish riparian boundary is intermittent and poorly defined — tapers off into a shrubby wetland

8/16/83

Reach #1 of 1
Stream K-2

STREAM REACH INVENTORY

Stream Name: Unnamed Stream No.: K-2

Reach Location: From mouth upstream for 1000'

Reach Length: 1000' Velocity (est.): 0.1 - 0.5 fps

Max. Depth: 1.5' Max. Width: 4'

Average Depth: .5' Average Width: 2'

Gradient: low to moderate High Flow Width: 4'

Cover

Bank: Fair — overhanging vegetation

Instream: Fair — woody debris

Substrate: Poor

Bank

Bank Height: 0.5-1'

Bank Composition: Vegetative mat underlain by fine soil

Erodability: moderate

Riparian Vegetation:

Aquatic: 50% coverage by Sparganium

Emergent: Sedge on bank.

Floodplain: None

Substrate

Silt (%): 100 Sand (%): Fine Gravel(%):

Medium Gravel (%): Coarse Gravel (%):

Cobble (%): Boulder (%): Bedrock (%):

some gravel + cobble at mouth.

Habitat Value

Spawning: Poor Rearing: Poor

Overwintering: Poor Overall: Poor

Comments

Probably insufficient flow + depth for fish

AQUATIC HABITAT SURVEY

Observers: Morsell, Erikson Date: 8/18/83 Time: 1330 Stream No.: K-5

Stream Name: Goose Cr. (lower) Watershed: Knik Arm

Survey Location: From mouth to just above Goose Bay flat Photo No.: A13-18

Weather: Clear

Water Color: light brown Turbidity: slight

Air Temperature: 18°C Water Temperature: 15.5°C

Stream Stage: moderate

Discharge Measurement

	Station	Width	Depth	Vel.	Qi
Waters edge (vertical bank)	1				
	1.5	1	1.6	0.9	1.44
	2.5	1	2.0	0.7	1.4
	3.5	1.25	2.3	0.5	1.44
	5.0	1.5	2.1	0.7	2.21
	6.5	1.25	2.0	0.7	1.75
	7.5	1	2.0	0.6	1.2
	8.5	1	2.0	0.6	1.2
Waters edge (vertical bank)	9				

Discharge: 10.6 cfs

Location of Measurement: Reach #2 - 1 mi. upstream from mouth

Σ Qi = 10.64

Overall Habitat Value

Spawning: Marginal Overwinter: Poor

Rearing: Good Overall: Fair to Good

Comments: Stream within Goose Bay Refuge probably provide some rearing habitat above area of tidal influence - above refuge habitat improves

8/18/83

Reach #1 of 3
Stream K-5

STREAM REACH INVENTORY

Stream Name: Goose Creek (lower section) Stream No.: K-5

Reach Location: Mouth - intertidal area - near Wasilla corridor crossing

Reach Length: ~ 5000' Velocity (est.): 0.5 fps

Max. Depth: at high tide 20+' Max. Width: 50' at high tide

Average Depth: at low tide - 2' Average Width: 15' at low tide

Gradient: moderate High Flow Width: 50'

Cover

Bank: Poor

Instream: Poor

Substrate: Poor

Bank

Bank Height: 10-15'

Bank Composition: Glacial silt

Erodability: high

Riparian Vegetation:

Aquatic: none

Emergent: none

Floodplain: Intertidal flat -

Substrate

Silt (%): 100 Sand (%): Fine Gravel(%):

Medium Gravel (%): Coarse Gravel (%):

Cobble (%): Boulder (%): Bedrock (%):

Habitat Value

Spawning: Poor Rearing: Poor

Overwintering: Poor Overall: Poor

Comments

Very high turbidity excludes most productivity - primary fish value is as migratory zone to upstream habitats - did not sample for fish in this reach

Reach #2 of 3
Stream K-5

STREAM REACH INVENTORY

Stream Name: Coarse Creek Stream No.: K-5

Reach Location: ~1 mi. upstream from mouth of Coarse Bay flat

Reach Length: ~ 300' Velocity (est.): 0.8 fps

Max. Depth: 3.5' Max. Width: 15'

Average Depth: 2' Average Width: 8'

Gradient: low to moderate High Flow Width: 15'

Cover

Bank: Fair; some undercutting

Instream: Good; 30% coverage by aquatic veg.

Substrate: Poor

Bank

Bank Height: 3-4' — bank nearly vertical — uniform channel shape

Bank Composition: Glacial silt

Erodability: high

Riparian Vegetation:

Aquatic: 30% covered by Potamogeton + Alopecurus

Emergent: None

Floodplain: Saline flat — tall grass

Substrate

Silt (%): 100 Sand (%): Fine Gravel(%):

Medium Gravel (%): Coarse Gravel (%):

Cobble (%): Boulder (%): Bedrock (%):

Habitat Value

Spawning: Poor Rearing: Fair to Good

Overwintering: ? Overall: Fair

Comments

Brackish water — still within upper intertidal zone of extreme tides — water was clear at time of survey suggesting that tidal flow had not reached the area for quite a while — width and depth very uniform throughout reach — almost resembles a man-made channel

Reach #3 of 3
Stream IX-5.

STREAM REACH INVENTORY

Stream Name: Goose Creek Stream No.: IX-5
Reach Location: In wooded area about ¼ mi. north of Goose Bay flat
Reach Length: ~700' Velocity (est.): 1-2 fps
Max. Depth: 2' Max. Width: 15'
Average Depth: 0.6' Average Width: 9'
Gradient: Moderate High Flow Width: 15'

Cover
Bank: Good; overhanging bank + vegetation
Instream: Good; woody debris
Substrate: Good; abundant boulders + cobble

Bank
Bank Height: 1-3'
Bank Composition: vegetative mat underlain by fine soil
Erodability: moderate

Riparian Vegetation:
Aquatic: Scattered areas of Sparganium — 10-20% coverage
Emergent: Some sedge along margin
Floodplain: Grass + shrub on stream bank

Substrate
Silt (%): 10 Sand (%): 20 Fine Gravel(%):
Medium Gravel (%): Coarse Gravel (%):
Cobble (%): 40 Boulder (%): 30 Bedrock (%):

Habitat Value
Spawning: marginal - substrate too coarse Rearing: Good
Overwintering: poor Overall: Fair to Good

Comments
Reach consists of mixed pools and riffles — Significant rearing habitat for rainbow trout

8/18/83

Fish Data

Stream Name Goose Creek
Stream No. 4-5

Species	Reach No.	Capture Method	(mm) Length	Weight	Comments
Threespine stickleback	2	Stationary Net	27-30 mm		3500 young-of-the-year caught in 15 minutes — downstream migrants caught in block net — moving in schools of 20-50 fish — sample of ~20 fish preserved
Rainbow trout	3	Shocker	46		Shocked 600 ft. of stream — estimate that 50-80% of fish were caught
			46		
			56		
			49		
			45		
			40		
			47		
			42		
			32		
			32		
			46		
			39		
			39		All fish preserved
			32		
Coho salmon	3	Shocker	47		
			47		
Threespine stickleback	3	Shocker	57		
Sculpin	3	Shocker	33		

Comments: Tried shocking in Reach #2 but evidently conductivity was too high because of brackish water

AQUATIC HABITAT SURVEY

Observers: Marshall, Erikson Date: 10/18/83 Time: 1045 Stream No.: K-8

Stream Name: Goose Creek (upper) Watershed: Knik Arm

Survey Location: Downstream from Mackenzie Rd. crossing Photo No.: B8+B14

Weather: Cloudy, cool

Water Color: Clear Turbidity: Very little

Air Temperature: 2°C. Water Temperature: 0°C.

Stream Stage: High

Discharge Measurement

	Station	Width	Depth	Vel.	Qi
Waters edge	0				
Edge of bank	2.3				
	3.0	1.0	2.1	0	0
	3.6	0.75	2.3	0.3	0.52
	4.5	1.2	2.4	0.8	2.3
	6.0	1.25	2.6	1.0	3.25
	7.0	1.0	2.5	0.7	1.75
	8.0	1.5	2.6	0.5	1.95
Edge of bank	9.0				
Waters edge	11.0				

Discharge: 9.8 cfs

Location of Measurement: Reach #1

Depth of water over bank = 0.4

Σ Qi = 9.77

Overall Habitat Value

Spawning: Marginal Overwinter: ?

Rearing: Good Overall: Good

Comments: Stream appears to be good rearing habitat - juvenile fish were observed at the Mackenzie Road culvert in August - fish have evidently moved out to overwintering areas by date of this survey

Reach # 1 of 1
Stream K-8

STREAM REACH INVENTORY

Stream Name: Goose Creek (upper) Stream No.: K-8

Reach Location: 1/2 mile downstream from Pt. Mackenzie road

Reach Length: ~ 1000' Velocity (est.): 1 fps

Max. Depth: 4-5' Max. Width: 15'

Average Depth: 2.5' Average Width: 6'

Gradient: low High Flow Width: 20'

Cover

Bank: Good; undercut and overhanging shrubs

Instream: Poor to Fair - some woody debris

Substrate: Poor

Bank

Bank Height: water over bank at time of observation

Bank Composition: Vegetative mat over organic soil

Erodability: moderate

Riparian Vegetation:

Aquatic: Algae mats + Potamogeton - 20% coverage

Emergent: little

Floodplain: Sedge/shrub wetland

Substrate

Silt (%): 10 Sand (%): 60 Fine Gravel(%): 30

Medium Gravel (%): Coarse Gravel (%):

Cobble (%): Boulder (%): Bedrock (%):

Habitat Value

Spawning: Marginal Rearing: Good

Overwintering: ? Overall: Good

Comments

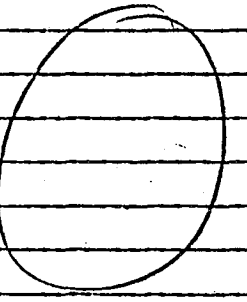
Starting to ice over at time of survey - fish had evidently moved out to wintering areas -

Fish Data

Stream Name Goose Cr. (upper)

Stream No. 12-8

Species	Reach No.	Capture Method	Length	Weight	Comments



Comments: Shocked 300' of stream — observed no fish

AQUATIC HABITAT SURVEY

Observers: Morsell, Erikson Date: 8/24/83 Time: 1100 Stream No.: K-6

Stream Name: Unnamed trib. to Goose Bay Watershed: Knik Arm

Survey Location: Near crossing of Goose Bay road Photo No.: —

Weather: rain, cool

Water Color: Clear Turbidity: Very little

Air Temperature: 8°C Water Temperature: —

Stream Stage: moderate

Discharge Measurement

Station	Width	Depth	Vel.	Qi

Estimated from culvert flow

Discharge: 2.5 cfs

Location of Measurement: at road culvert

24" culvert running half full - floating chip. indicated velocity of 2 fps

Qi =

Overall Habitat Value

Spawning: None Overwinter: Poor

Rearing: Fair Overall: Poor

Comments: No fish observed upon/down from road culvert - stream flows through wetland and is poorly defined - pond exists above the road - pond looks stagnant and O_2 poor - culvert is partly rollapsed on edge of road but fish passage still possible

Reach #1 of 1
Stream K-6

STREAM REACH INVENTORY

Stream Name: Unnamed trib. to Goose Bay Stream No.: K-6

Reach Location: Near crossing of Goose Bay road

Reach Length: ~ 500' Velocity (est.): < 0.5 fps

Max. Depth: 4' Max. Width: 8' except in ponded area

Average Depth: 1' Average Width: 4'

Gradient: low High Flow Width: 8'

Cover

Bank: Bank poorly defined - grades into wetland

Instream: Fair - emergent vegetation

Substrate: Poor

Bank

Bank Height: Poorly defined - up to 1'

Bank Composition: Vegetative mat over fine soil

Erodability: Moderate

Riparian Vegetation:

Aquatic: little

Emergent: Equisetum, Grass, willow

Floodplain: Wetland - Grass, willow

Substrate

Silt (%): 100 Sand (%): Fine Gravel(%):

Medium Gravel (%): Coarse Gravel (%):

Cobble (%): Boulder (%): Bedrock (%):

Habitat Value

Spawning: Poor Rearing: Poor

Overwintering: Poor Overall: Poor

Comments

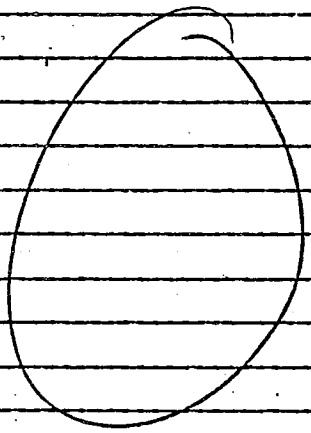
8/24/83

Fish Data

Stream Name Unnamed

Stream No. IX-6

Species	Reach No.	Capture Method	Length	Weight	Comments
	1				



Comments: Shocked short sections of stream below inlet but no fish stream too difficult or marked with vegetation to shock in most places — also shocked along pond shoreline and mixed sediment — cobble like stickleBacks should be present but none observed

AQUATIC HABITAT SURVEY

Observers: Morsell, Erikson **Date:** 8/24/83 8/25/83 **Time:** **Stream No.:** K-7

Stream Name: Fish Creek (lower) **Watershed:** Big Lake / Fish Creek

Survey Location: Adjacent to Knik Road crossing **Photo No.:** A20-A23

Weather: Cloudy

Water Color: Clear **Turbidity:** Slight except in intertidal zone

Air Temperature: ~ 50°F **Water Temperature:** —

Stream Stage: moderate

Discharge Measurement

	Station	Width	Depth	Vel.	Qi
Waters edge	6.5				
	8	2.25	0.6	1.4	1.89
	11	3	1.0	1.9	5.7
	14	3	1.2	1.7	6.12
	17	3	1.1	2.6	8.58
	20	4	1.1	2.9	12.76
	25	5	1.0	3.1	15.5
	30	4	1.3	2.9	15.08
	33	3	1.5	2.3	10.35
	36	3	1.5	3.1	13.95
	39	2.5	1.2	1.8	5.4
	41	2	0.8	1.4	2.24
	43	3.1	0.5	1.1	1.71
Waters edge	47.2				

Σ Qi = 99.28

Discharge: 99 cfs

Location of Measurement: ~ 200' upstream from Knik Rd.

Overall Habitat Value

Spawning: Good **Overwinter:** ?

Rearing: Good **Overall:** Good

Comments: Stream crosses Knik Rd. via 2 10-foot diameter culverts ea about 150' long – Velocity thru the culvert was computed at 7.8 fps by timing a partly submerged soda can – the can traversed the culvert in 20 seconds – very fast water is probably a velocity block to all juvenile fish

Reach #1 of 2
Stream K-7

STREAM REACH INVENTORY

Stream Name: Fish Creek Stream No.: K-7

Reach Location: Upstream from Knik Road

Reach Length: 1050' Velocity (est.): 0.5-3 fps Av. ~2 fps

Max. Depth: 5' Max. Width: 50'

Average Depth: 1.3' Average Width: 30'

Gradient: moderate ~ 0.5% High Flow Width: 50'

Cover

Bank: Fair to Good - undercutting and overhanging branches

Instream: Fair to Good - woody debris

Substrate: Good - cobble and boulders

Bank

Bank Height: 2-4'

Bank Composition: varies from cut mud banks to gravel and sand

Erodability: moderate

Riparian Vegetation:

Aquatic: little

Emergent: little

Floodplain: Narrow; 30% willow, 30% alder, fireweed, grass

Substrate

Silt (%): Sand (%): 5 Fine Gravel(%): 15

Medium Gravel (%): 30 Coarse Gravel (%): 25

Cobble (%): 20 Boulder (%): 5 Bedrock (%):

Habitat Value

Spawning: Good Rearing: Good

Overwintering: ? Overall: Good

Comments

This reach includes about 60% riffle-pool formation; therefore conditions are variable with pools about 150' apart on the average

8/25/83

Fish Data

Stream Name Fish Creek

Stream No. K-7

Species	Reach No.	Capture Method	(mm) Length	Length ~~Weight~~	Comments
Rainbow trout	1	Shocker	42	35	
			49		
Threespine stickleback			25		All caught in natural stream area above old bridge abutments
Coho salmon			90	35	
			59	37	
			41	40	
			48	46	
			40	45	
			46	42	
	↓	↓	39		
Chinook salmon	1	Shocker	59		All caught in pool immediately above Sterik Road culvert
Coho salmon			42		
			51		
			55		
			49		
			52		
			53		
			48		
			49		
			47		
			48		
	↓	↓	41		

Comments: Shocked about 300' of stream in Sterik Road culvert - visual observations suggested that juvenile salmonids quite abundant in area above culvert

Reach #2 of 3
Stream # K-7

STREAM REACH INVENTORY

Stream Name: Fish Creek (lower) Stream No.: K-7

Reach Location: Downstream from Kuik Road crossing

Reach Length: 400' Velocity (est.): 1-3 fps

Max. Depth: >6' in culvert plunge pool Max. Width: 45'

Average Depth: 1.7' Average Width: 28'

Gradient: moderate High Flow Width: 45'

Cover

Bank: Fair; overhanging shrubs + some undercut bank

Instream: Fair; woody debris

Substrate: Good; cobble + boulder

Bank

Bank Height: 2-4'

Bank Composition: Vegetative mat over glacial till

Erodability: moderate

Riparian Vegetation:

Aquatic: little

Emergent: little

Floodplain: Narrow; willow, alder, grass

Substrate

Silt (%): Sand (%): 5 Fine Gravel(%): 25

Medium Gravel (%): 15 Coarse Gravel (%): 15

Cobble (%): 20 Boulder (%): 20 Bedrock (%):

Habitat Value

Spawning: Fair to Good Rearing: Good

Overwintering: ? Overall: Good

Comments

This reach includes a riffle and plunge pool below culvert is a deep, atypical habitat type — juvenile fish abundant in area below culvert probably because culvert velocity prevents them from dispersing upstream and tidal influence prevents dispersal downstream

8/25/83

Fish Data

Stream Name Fish Creek

Stream No. IX-7

Species	Reach No.	Capture Method	Length	Weight	Comments
Chinook salmon	2	Shocker	103		
" "			100		
" "			516		
Coho salmon			89		
			64		
			70		All caught in area below Knik Road culvert — within 100' of culvert outlet
			66		
			50		
			56		
			69		
			43		
			40		
			44		
			43		
			45		
			59		
			49		
			50		
			42		
			55		

Comments:

Reach #3 of 3.
Stream K-7

STREAM REACH INVENTORY

Stream Name: Fish Creek (lower) Stream No.: K-7

Reach Location: Intertidal portion of creek

Reach Length: ~ 2200' Velocity (est.): variable depending on tide

Max. Depth: variable depending on tides Max. Width: ~ 200'

Average Depth: variable Average Width: ~ 80'

Gradient: low High Flow Width: 200'

Cover

Bank: Poor

Instream: Poor

Substrate: Poor

Bank

Bank Height: 1-10'

Bank Composition: Glacial silt

Erodability: High

Riparian Vegetation:

Aquatic: None

Emergent: None

Floodplain: Saline grass flat - tall grass

Substrate — at lower end of reach - some coarse material at upper end

Silt (%): 100 Sand (%): Fine Gravel(%):

Medium Gravel (%): Coarse Gravel (%):

Cobble (%): Boulder (%): Bedrock (%):

Habitat Value

Spawning: Poor Rearing: Poor

Overwintering: ? Overall: Poor

Comments

Very turbid tidal inflow and silt deposition reduce productivity of this reach - fish sampling was not conducted - primarily migratory corridor

AQUATIC HABITAT SURVEY

Observers: Morsell, Erikson Date: 10/18/83 Time: 1000 Stream No.: K-9

Stream Name: Fish Creek (upper) Watershed: Big Lake / Fish Cr.

Survey Location: Near Big Lake corridor crossing Photo No.: B4-B7

Weather: PCl

Water Color: Clear Turbidity: Very little

Air Temperature: 4°C Water Temperature: 2°C

Stream Stage: Moderate

Discharge Measurement

	Station	Width	Depth	Vel.	Qi
Waters edge	1.5				
	6	5.25	1.5	0.4	3.15
	12	7.0	2.2	0.9	13.86
	20	9.0	2.1	1.4	26.46
	30	10.0	1.8	0.7	12.6
	40	10.0	2.0	1.0	20.0
	50	8.0	2.5	1.1	22.0
	56	5.0	2.6	0.9	11.7
	60	5.0	2.8	0.7	9.8
Waters edge	66				

Discharge: 120 cfs

Location of Measurement: Near Big Lake corridor crossing

Σ Qi = 119.57

Overall Habitat Value

Spawning: Good Overwinter: Fair

Rearing: Good Overall: Good

Comments: Good spawning habitat with scattered patches of gravel suitable for spawning – coho salmon spawn in very low density – one salmon redd was observed close to the corridor crossing vicinity

Reach #1 of 1
Stream K-9

STREAM REACH INVENTORY

Stream Name: Fish Creek (upper) Stream No.: K-9
Reach Location: Near Big Lake corridor crossing
Reach Length: 500' Velocity (est.): 1 fps
Max. Depth: 3' Max. Width: 90'
Average Depth: 1.5-2' Average Width: 60'
Gradient: low - moderate High Flow Width: 70'

Cover

Bank: Good; overhanging brush, some undercutting
Instream: Good; woody debris + aquatic vegetation
Substrate: Poor

Bank

Bank Height: 2-3'
Bank Composition: vegetative mat underlain by fine soils
Erodability: moderate

Riparian Vegetation:

Aquatic: Mixed Sparganium sp. and Potamogeton sp. 40%-90% coverage
Emergent: little
Floodplain: Grass and alder

Substrate

Silt (%): 5 Sand (%): 75 Fine Gravel(%): 20
Medium Gravel (%): Coarse Gravel (%):
Cobble (%): Boulder (%): Bedrock (%):

Habitat Value

Spawning: Fair Rearing: Good
Overwintering: ? Overall: Good

Comments

Appears to be good rearing habitat although density of fish was low - density is probably more [illegible] in summer - likely that juvenile fish move into lakes for the winter

Fish Data

Stream Name Fish Creek
Stream No. IX-9

Species	Reach No.	Capture Method	Length (mm)	Weight	Comments
Rainbow trout	1	Shocker	140		Mint of dorsal fin missing
Coho salmon	1	"	82		
	1	"	104		
Sculpin	1				(5) total – not measured
Threespine sticklebacks	1				(4) total – not measured

Comments: Shocked selected habitat within about 200' of stream

Aerial survey of ~ 5 mile of stream – observed 9 adult coho salmon on 3 redds – spawn within widely scattered patches of gravel – see map

AQUATIC HABITAT SURVEY

Observers: Morsell, Eriksen Date: 10/18/83 Time: 1310 Stream No.: K-10

Stream Name: East inlet to Threemile Lake Watershed: Fish Creek

Survey Location: From lake east to end of stream Photo No.: B11

Weather: Partly cloudy

Water Color: Clear Turbidity: Very little

Air Temperature: 3°C Water Temperature: 1°C

Stream Stage: moderate

Discharge Measurement

Station	Width	Depth	Vel.	Qi

No Measurement

Estimated

Discharge: < 0.5 cfs

Location of Measurement:

Qi =

Overall Habitat Value

Spawning: Poor Overwinter: Poor

Rearing: Fair Overall: Poor

Comments: Several beaver dams and ponds in the lower end of stream — may reduce fish access to stream — lower end of stream probably provide rearing habitat for coho

Reach #1 of 1
Stream K-10

STREAM REACH INVENTORY

Stream Name: East inlet to Threemile Lake Stream No.: K-10
Reach Location: ~2 miles inland from lake - E. of power line
Reach Length: ~500' Velocity (est.): 0.2 fps
Max. Depth: 2.5' Max. Width: 8'
Average Depth: 1' Average Width: 2'
Gradient: low High Flow Width: 4-8'

Cover
Bank: Fair; overhanging brush
Instream: Fair; woody debris, some aquatic vegetation
Substrate: Poor

Bank
Bank Height: 0.5-1'
Bank Composition: Vegetative mat over fine soil
Erodability: Moderate

Riparian Vegetation:
Aquatic: Sparganium sp. and Potamogeton sp. ~20% coverage
Emergent: Sedge along banks
Floodplain: Floating bog - sedge and shrub

Substrate
Silt (%): 100 w/ organics Sand (%): Fine Gravel(%):
Medium Gravel (%): Coarse Gravel (%):
Cobble (%): Boulder (%): Bedrock (%):

Habitat Value
Spawning: Poor Rearing: Fair
Overwintering: Poor Overall: Poor

Comments
Low flow and shallow water limit value to fish - could probably be utilized by coho juveniles if access is available from lake

Fish Data

East inlet to
Stream Name Threemile Lake
Stream No. K-10

Species	Reach No.	Capture Method	Length (mm)	Weight	Comments
Ninespine stickleback	1	Shocker	62		
Sculpin	1	"	≥9		
		"	≥6		

Comments: Shocked about 300' of stream - small sculpins and ninespine - no salmonids observed - 1 fish ~100 mm escaped

AQUATIC HABITAT SURVEY

Observers: Morsell, Erikson Date: ~~10/19/83~~ 10/18/83 Time: Stream No.: IX-10

Stream Name: Lucille Creek Watershed: Big Lake/Fish Creek

Survey Location: Near proposed Big Lake corridor crossing Photo No.: B12 #13

Weather: Cloudy, cool

Water Color: Clear Turbidity: Very little

Air Temperature: 2°C. Water Temperature: 0.5°C

Stream Stage: high

Discharge Measurement

	Station	Width	Depth	Vel.	Qi
Water edge	1.5				
Bank edge	3.0				
	3.5	1.25	2.0	0.73	1.83
	5.0	1.75	2.2	0.8	3.08
vertical bank	7.0	1.75	2.3	0.9	3.62
	8.5	1.5	2.2	0.57	1.88
	10.0	1.35	1.8	0.43	1.04
Water + bank edge	10.6				

Discharge: 11.5 cfs

Location of Measurement: Reach #2

Σ Qi = 11.45

Overall Habitat Value

Spawning: Poor to Fair Overwinter: ?

Rearing: Good to excellent Overall: Good

Comments: Appeared to be very good rearing habitat in spite of the fact that no fish were observed - since water temp. was near freezing at the time of study it is likely that all fish had moved to overwintering areas.

Reach #1 of 2
Stream LK-10.

STREAM REACH INVENTORY

Stream Name: Lanville Creek Stream No.: LK-10
Reach Location: ~ 3/4 mile west of proposed Big L. corridor alignment
Reach Length: ~ 500 Velocity (est.): 0.6 fps
Max. Depth: 6' Max. Width: 15'
Average Depth: 3.5' Average Width: 7-8'
Gradient: low to moderate High Flow Width: 10-15'

Cover
Bank: Good; uniform brush and willow bearing shrubs
Instream: Good; 80% covered by aquatic vegetation
Substrate: Poor

Bank
Bank Height: 0.5-2'
Bank Composition: Vegetative mat over fine soil
Erodability: moderate

Riparian Vegetation:
Aquatic: Sparganium and Alopecurus sp. ~80% coverage
Emergent: Some sedge at stream edge
Floodplain: Sedge-shrub floating bog

Substrate
Silt (%): 20 Sand (%): 70 Fine Gravel (%): 10
Medium Gravel (%): Coarse Gravel (%):
Cobble (%): Boulder (%): Bedrock (%):

Habitat Value
Spawning: Poor Rearing: Good to excellent
Overwintering: ? Overall: Good

Comments
Very deep incised channel within a wetland area — this reach is probably regressive at moving the stream.

Reach #2 of 2
Stream K-10

STREAM REACH INVENTORY

Stream Name: Lasville Creek Stream No.: K-10

Reach Location: Near Big Lake corridor xing ~ 3/4 mile east of Reach #1

Reach Length: ~ 500' Velocity (est.): 0.9 fps

Max. Depth: 3' Max. Width: 15'

Average Depth: 2.5' Average Width: 10'

Gradient: moderate High Flow Width: 10-15'

Cover

Bank: Good; undercut bank and overhanging shrubs

Instream: Good; 40% cover by aquatic vegetation

Substrate: Good; boulders and rubble

Bank

Bank Height: 0.5 - 2'

Bank Composition: Vegetation mat over fine soils

Erodability: moderate

Riparian Vegetation:

Aquatic: Potamogeton, Sparganium, Alopecurus - 40% co-dom

Emergent: Some scrub alder bushes

Floodplain: Forest/shrub wetland

Substrate

Silt (%): 10 Sand (%): 10 Fine Gravel (%): 20

Medium Gravel (%): Coarse Gravel (%):

Cobble (%): 50 Boulder (%): 50 Bedrock (%):

clumps of fibrous organics also present

Habitat Value

Spawning: Poor to Fair Rearing: Good to excellent

Overwintering: ? Overall: Good

Comments

Some evidence of very old beaver activity - reach may be atypical - gradient somewhat higher than mainstem and large boulders not seen elsewhere

Fish Data

Stream Name Lucille Creek

Stream No. LC-10

Species	Reach No.	Capture Method	Length	Weight	Comments
					No fish captured or observed in Reaches 1 or 2

Comments: Reach #1 was too deep & shock from instream; shocked ~100' from bank

Shocked about 150' of Reach #2 from instream

PRINCIPAL CONTRIBUTORS FOR DAMES & MOORE

PART ONE:

John Morsell
and
David Erikson

PART TWO:

David Erikson

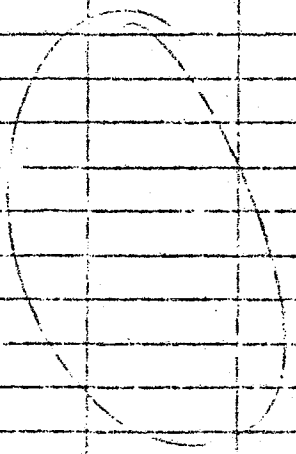


Plate 1

PROPOSED HIGHWAY CORRIDORS WITH STREAM CROSSINGS AND STUDY REACHES

N

NANCY LAKE RECREATION AREA

RIVER RECREATION CORRIDOR

STUDY AREA (See Figure 2)

HOUSTON

LITTLE SUSITNA RIVER # K-4

PARKS HIGHWAY

WASILLA

PROPOSED LITTLE SUSITNA

③

BEAVER DAMS

① HOURGLASS LAKE DRAINAGE #K-3

② HORSESHOE LAKE ROAD

BIG LAKE ROAD

① ② LUCILLE CREEK #K-10

SOUTH BIG LAKE ROAD

AERIAL SURVEY

BIG LAKE CORRIDOR

① WEST INLET TO THREEMILE LAKE

① EAST INLET TO THREEMILE LAKE

KNIK-GOOSE BAY ROAD

WASILLA CORRIDOR

HOUSTON CORRIDOR

IDITAROD TRAIL (approx)

AERIAL SURVEY

KNIK

① UPPER FISH CREEK #K-9
x = coho salmon redd

① ② ③ LOWER FISH CREEK # K-7

PT. MacKENZIE ACCESS ROAD

① UPPER GOOSE CREEK # K-8

GOOSE BAY STATE GAME REFUGE

① UNNAMED #K-6

PT. MacKENZIE AGRICULTURAL TRACTS

① LOWER GOOSE CREEK #K-5

① UNNAMED #K-2

① UNNAMED #K-11

① ② ③ MULE CREEK #K-1

SUSITNA FLATS STATE GAME REFUGE

Susitna

FORT RICHARDSON MILITARY RESERVATION

ELMENDORF AIR FORCE BASE

Ski Bowl

South Fork

Eagle River