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GREENS CREEK JOINT VENTURE  
ADMIRALTY ISLAND, ALASKA

ADDENDUM  
FRESHWATER BIOLOGICAL INVESTIGATIONS

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UPPER UNNAMED TRIBUTARY TO FOWLER CREEK DRAINING THE "NORTH HAWK" SITE

The stream draining the "North Hawk" alternate tailings disposal site was surveyed during late July, 1981. The drainage area is a very large, flat area with large muskeg bogs and old beaver impoundments. The upper drainage area of the creek is very tannic in color and heavily influenced by old beaver activity. The drainage of the entire upper portion of this part of the Fowler Creek watershed is poorly developed and relatively flat. It is very heavily vegetated and the ground is extremely spongy.

Toward the eastern margin of this flat portion of the drainage, the stream at the time of the survey was flowing less than 1 cfs. The channel is incised fairly deep and extremely quiet. The only turbulent flow is at the spillways of old beaver dams. The substrate is composed primarily of mud and organic debris. All current beaver activity in this drainage is confined to this margin of the flat portion of the drainage. Several renovated beaver dams and a beaver lodge which appears to be in use at the present time were found in this area. A very long beaver dam was observed which holds back the pool containing the lodge. This beaver dam is recently constructed and there is abundant evidence of intense beaver activity in this area.

A small ancillary drainage enters the main stream from the west near the new beaver dam. From this point downstream the gradient increases to 2 or 3% and substrate texture becomes more rough. Because this steeper portion of the stream is outside any zone of potential influence of the proposed "North Hawk" tailings disposal area, the survey was not continued to the confluence with Fowler Creek. Qualitative electrofishing investigations in this upper part of the drainage yielded negative results; no fish of any kind were found. Although sufficient habitat exists to support small populations of resident fish, spawning habitat is virtually nonexistent in the upper part of this drainage and reproductive success would be very difficult. Under present conditions, fish habitat value of the upper portion of this drainage is considered nil.

UNNAMED TRIBUTARIES TO UPPER HAWK INLET

The lower portions of four small tributaries to upper Hawk Inlet were surveyed in August 1981 for fish habitat value and evidence of use by anadromous salmonids. All four streams enter the head of Hawk Inlet along the north and west shores. The three northern-most streams have produced contiguous alluvial fans; the fourth stream has produced a separate small rocky delta.

The three northern-most streams all have relatively abundant good to excellent spawning habitat for pink and chum salmon. The smaller two of these streams showed evidence of fair to moderate use by pink salmon for spawning in the form of redds and carcasses in the stream and along the banks. The largest northeastern-most stream showed evidence of fairly heavy use by pink salmon for spawning. Redds were numerous and in many cases overlapping. Carcasses littered the shorelines and several live fish were observed in the stream. Bear scavenging activity had been intense along the lower reaches of all three streams. A few juvenile coho salmon and Dolly Varden char were seen only in the largest stream in pools and quiet backwaters about 300 feet from its mouth. Large numbers of sculpins and stickleback were seen.

The fourth (western-most) stream was found to have a steeper gradient near its mouth (about 3%) and a much coarser substrate. Good spawning habitat was observed to be rare and evidence of pink salmon use was rare. Trampling of the riparian area by bears was not intense and only two salmon carcasses were found. This stream branches about 300 feet from its mouth and both branches continue uphill at 3-6% gradients, the right-hand branch being the steeper. The stream is saturated with angular sediment and pools are very small and shallow. No juvenile salmonids were seen.

Of these streams the largest was of significantly greater importance for anadromous salmon production than the other three. The southwestern-most stream is apparently of little value at all.

UNNAMED TRIBUTARY TO YOUNG BAY

A small unnamed tributary to Young Bay drains an area of less than one square mile near the proposed pedestrian dock site. The creek flows generally in an easterly direction and enters Young Bay about 1/2 mile northeast of the mouth of Fowler Creek. Figure 3 is a schematic representation of this stream showing major habitat features and physical characteristics.

First reconnaissance of this creek was conducted in July 1981. Figure 4 is a diagrammatic representation of a portion of this small stream system showing the major aquatic habitat features and areas where various species of fish were observed or captured. The area upstream of the beaver impoundment and associated marsh is primarily muskeg. About 150 feet from its mouth, this stream has been impounded by beaver dams forming a large pond of about 3-1/2 acres in size. This is a fairly old beaver pond and much of the upstream portion of it has turned into a marsh. During low summer flow periods, the stream has a discharge of less than 2 cfs. The beaver impoundment is a complex of two ponds, the downstream one being much smaller in size and measuring approximately 50 feet long by 30 feet wide. There are two large, deep pools immediately downstream of the beaver impoundment. From this point to the intertidal zone the stream is comprised mostly of riffles, with a few shallow pools. The riffles contain some suitable spawning habitat totalling approximately three to four square yards. At the upper intertidal zone margin there is a complex of small pools. From this point downstream the creek flows over the gravel and cobble intertidal zone into Young Bay. Several juveniles coho salmon were seen in these lower pools swimming below the halocline and feeding up through it into the fresh water layer. Other juvenile coho and young Dolly Varden char were observed in the larger pools immediately downstream of the beaver impoundments. Qualitative electrofishing efforts conducted between the intertidal area and the portion of stream between the two beaver dams revealed the presence of large numbers of sculpin, two year classes of juvenile coho, three spine stickleback, two year classes of cutthroat trout, and two sockeye salmon smolts. One of the sockeye smolts was found in the lower beaver pond, the other in one of the deep pools below the lower beaver dam. These findings suggest that the lower portion of the stream is used for spawning by coho, Dolly Varden char, and probably cutthroat trout, and that adult sockeye must get into the beaver ponds and probably spawn along the shoreline in areas of upwelling or springs. Considering its size, this small stream is very productive of fish. Rearing habitat quality in the beaver impoundments is excellent for juvenile sockeye salmon which, unlike other salmonids, rear almost exclusively in lakes and feed on plankton. Rearing habitat is excellent, although very limited by the size of the stream, for the other salmonid species in the small portion of stream which is accessible to them.

LOWER FOWLER CREEK AND LOWER TRIBUTARIES

The lower portion of Fowler Creek was first surveyed during early June of 1981. This stream drains a watershed of about 7 square miles and flows generally northward into Young Bay. There is a large brackish lagoon just west of the mouth of the stream which receives salt water influence by percolation through a storm berm and empties into Fowler Creek about 400 feet upstream of the creek mouth.

Lower Fowler Creek meanders through a large meadow area. The substrate is comprised primarily of medium gravels (1-3" dia.) with some cobbles and boulders. Some deep pools have formed along the outsides of meanders. The lower stream contains excellent spawning habitat for coho, pink and chum salmon, as well as some good habitat for anadromous Dolly Varden char. Large numbers of juvenile salmonids were observed in the lower reaches of Fowler Creek and in some of the small tributaries entering from the east. Qualitative electrofishing efforts conducted in late July indicated the presence of two year classes of juvenile coho salmon, two year classes of juvenile Dolly Varden char, two year classes of juvenile cutthroat trout, large numbers of sculpins, and a few three spine stickleback. The coho were generally distributed in pools near woody debris at the upstream limits of the meadow through which the lower portion of Fowler Creek flows, and in deep areas along the outsides of meanders in the meadow area. Juvenile Dolly Varden and cutthroat trout tended to be distributed in somewhat faster waters, with the cutthroat preferring bank and overhanging cover. Also present during the qualitative electrofishing investigations were large numbers of adult pink salmon and chum salmon, and moderate numbers of adult Dolly Varden char, measuring 30 to 35 cm in length. The densities of juvenile salmonids in lower Fowler Creek was judged to be high to very high, especially in comparison to other streams in the area. This was also true of the lower portions of two small unnamed tributaries to lower Fowler Creek. Judging from the densities of adult and juvenile anadromous fishes observed in lower Fowler Creek, this stream should be considered an important producer of these resources.

## DISCUSSION

The various freshwater areas covered in this addendum displayed a wide variety of physical and hydrological forms and conditions and an equally wide variety of habitat values for freshwater biological resources. Small, low gradient systems were generally found to have very low overall resource value and, as might be expected, larger, less stable systems were found to have higher productive capacities.

Qualitative electrofishing efforts revealed the nature of fish resources in several systems which had not previously been investigated. Table 2 is a checklist of fish species found in each system investigated and an indication of relative abundances. In several cases, electrofishing or other observations were not carried out at the time of year which would detect the presence of anadromous adults, but the presence of juveniles strongly suggests that adults frequent these streams during the spawning season, and the table reflects this.

Of the freshwater systems investigated, four were found to have little or no fish resource habitat value. These are the unnamed tributary to Greens Creek draining the "Football Field" site, the upper tributary to Fowler Creek draining the "North Hawk" site, "Pristine Pond" and its drainage into Greens Creek and Cannery Creek. In the case of "Pristine Pond" and its drainage, good habitat exists, especially for trout and char in the lake and juvenile coho in the lower drainage, but no fish are present because of access problems. The good to excellent coho habitat exists above a migration barrier near the mouth, but access is presently impossible. Resident Dolly Varden char and possibly cutthroat trout are thought to exist in the Cannery Creek system, but none were found.

Certain other systems were found to have low productive capacities for fish resources, either because of the system's size or because of limited access or certain adverse conditions. These systems include Big Sore Creek, one of the tributaries to upper Hawk Inlet, and the unnamed tributary to Young Bay. In spite of its size, Big Sore Creek exhibits low productive capacity for resident char primarily because of very limited access and very steep gradient. Habitat quality in the lowest reach is fair to good, but this is a small percentage of the stream. The western-most tributary to upper Hawk Inlet was found to have a low productive capacity, especially for anadromous forms, because of the general lack of good spawning and rearing habitat and the relatively small size of the system. Although the unnamed tributary to Young Bay was found to support as wide a variety of anadromous fishes as any of the systems investigated, including sockeye salmon, the very small size of this system limits its total productive capacity. On a production per unit size basis, the lower 150 feet of this very small stream was one of the most productive of those investigated.

Certain other systems were concluded to have moderate value in terms of productive capacity for fish resources. These systems include portions of upper Greens Creek, "Tributary Creek", the unnamed tributary to Piledriver Creek and three of the tributaries to upper Hawk Inlet. Limiting factors for production of resident Dolly Varden char in upper Greens Creek include very low winter flows in upper reaches, high instability in lower reaches

Table 2. Checklist of fishes found in streams not previously investigated for fish resources. Observations were made during the 1981 field season. ++ = relatively abundant; + = moderate occurrence or few; 0 = none observed; ? = none seen but presence strongly suspected.

	Juveniles or Resident Adults						Anadromous Adults			
	Coho	Cutthroat	Dolly V.	Sockeye	Sculpin (lower reaches)	Stickleback (lower reaches)	Pink	Chum	Dolly V.	Coho
Zinc Creek	++	+	++	0	++	+	++	++	+	+
"Tributary Creek"	+	+	+	0	++	0	++	0	+	+
Tributary to Young Bay	++	++	+	+	++	++	0	0	?	?
Fowler Creek	++	+	++	0	++	+	++	+	++	?
Lower Fowler Tributary	++	+	++	0	?	0	0	0	?	?
Upper Fowler Tributary	0	0	0	0	0	0	0	0	0	0
Tributary to Lower Greens Creek	0	0	0	0	0	0	0	0	0	0
Tributary to Piledriver Creek	++	0	+	0	?	0	?	0	?	?
Piledriver Creek	++	0	+	0	++	+	++	+	+	?
Tributaries to Upper Hawk Inlet	+	?	+	0	++	++	++	+	?	?
"Pristine Pond"	0	0	0	0	0	0	0	0	0	0
Cannery Creek	0	?	?	0	0	0	0	0	0	0

and a large number of barriers to instream movement of sexually mature individuals. Factors limiting productive capacity of fish resources in "Tributary Creek" are its size and its relatively low gradient which limits the number and depth of rearing pools, especially in the lower reaches, and the rate of introduction of woody debris. A special study on the populations of juvenile salmonids in "Tributary Creek" (Appendix A) demonstrates the relatively low level of production in this stream. Limitations to production in the unnamed tributary to Piledriver Creek are primarily its size (about one half mile of useable stream) and relative instability. High bedload transport would tend to scour or silt in redds, although good to excellent rearing habitat is present during low flows. The three productive tributaries to upper Hawk Inlet are limited in productive capacities for anadromous salmonids primarily by their size; the largest is the most productive.

Those systems which were concluded to have comparatively high productive capacities include middle Greens Creek for resident char, lower Greens Creek for anadromous fish, Zinc Creek, Fowler Creek, and Piledriver Creek. Although portions of middle Greens Creek had relatively low resident char habitat value, most of the stream contained good to excellent habitat, especially in controlled areas. The size of the system is also a major contributor to its comparatively high productive capacity. The same conditions hold true for anadromous production in lower Greens Creek. Portions of the stream contain inferior habitat, but the size of the system combined with a consideration of those areas with excellent habitat value, especially the braided channel area, lead to the classification of lower Greens Creek as a stream with a high productive capacity. Zinc Creek, despite its relatively smaller size, contains over two miles of abundant good to excellent spawning and rearing habitat. Although probably not nearly as productive as Greens Creek, Zinc Creek should be classified as having a relatively high capacity for production of anadromous salmonids. Lower Fowler Creek is extremely productive of anadromous salmonids, despite its relatively small size. Qualitative electrofishing efforts in this stream indicated higher densities of both juvenile and adult salmonids than in either Greens Creek or Zinc Creek, attributed primarily to habitat quality. Piledriver Creek is also a small system compared to Greens Creek, but has excellent spawning and rearing habitat quality in many areas and is relatively heavily utilized by anadromous fish stocks.

The freshwater systems investigated also differ significantly in their relative sensitivities to environmental perturbations. In general, those systems with lower gradients are more sensitive because of a reduced capacity to maintain characteristic configurations in the face of minor changes in land form and runoff characteristics and to cleanse themselves of material which may be introduced as a consequence of some activity. Systems such as Big Sore Creek, Greens Creek, Fowler Creek, Piledriver Creek, Cannery Creek, and other systems with appreciable gradients are comparatively resistant to non-catastrophic degradation. Low gradient systems such as the unnamed tributary to Young Bay (except for the lower 150 feet) and to a certain extent "Tributary Creek" have a greater sensitivity to changes in land form or drainage patterns (especially the unnamed tributary to Young Bay). In the case of "Tributary Creek", a slight decrease in stream stability, particularly in the lower reaches, would probably precipitate an increase in productive capacity for salmonids for reasons discussed above.





— PRINCIPAL SITES —

NO. LOCATION

- ① UPPER GREENS CREEK
- ② BIG SORE CREEK
- ③ LOWER EAST MINE DRAINAGE
- ④ UPPER WEST MINE DRAINAGE
- ⑤ LOWER WEST MINE DRAINAGE
- ⑥ MIDDLE GREENS CREEK
- ⑦ LOWER GREENS CREEK
- ⑧ UPPER ZINC CREEK
- ⑨ ZINC CREEK TRIBUTARY
- ⑩ ZINC CREEK BELOW TRIBUTARY
- ⑪ CANNERY CREEK

— MISCELLANEOUS SITES —

NO. LOCATION

- ⑫ MINE ADIT DISCHARGE EAST
- ⑬ MINE ADIT DISCHARGE EAST BELOW SEDIMENT POND
- ⑭ MINE ADIT DISCHARGE WEST
- ⑮ DRILL STATION NO. 7
- ⑯ DRILL STATION NO. 9
- ⑰ DRILL STATION NO. 17 - CROSSCUT
- ⑱ BIG SORE SEEP
- ⑲ PILEDRIVER TAILINGS DRAINAGE NORTHEAST
- ⑳ PILEDRIVER TAILINGS DRAINAGE SOUTHWEST
- ㉑ NORTH HAWK INLET TAILINGS DRAINAGE

FIGURE 1

GREENS CREEK PROJECT

WATER QUALITY

MONITORING SITES

