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EROSION ALONG THE KENAI RIVER

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INTRODUCTION

In a 1982 U.S. Geological Survey Professional paper entitled "Erosion and Sedimentation in the Kenai River, Alaska", author Kevin Scott found and indication of increased bank erosion occurring since 1977 in response to river-use practices. Scott used aerial photography dated from 1950 to 1977 and field reconnaissance in conducting the study. By comparing aerial photography taken after 1977 with earlier photographs, Scott suggested that the indication of increased erosion could be verified.

It was that suggestion that stimulated this study and report. The original study plan was to extend Scott's work by comparing more recent 1984 photography with the same locations identified by Scott as subject to increased rates of erosion. This study plan was later extended to include looking at 10 additional sites identified by Division of Parks personnel as subject to erosion, and a field reconnaissance of the Kenai River.

AERIAL PHOTOGRAPHY ANALYSIS

Most of the photography Scott used was made available by the U.S. Geological Survey. In place of a Bausch and Lomb zoom transfer scope used by Scott, this study used a Kail Auto Focus projector. The Kail projector worked well in this application, compensating for differences in scale between photographs. Certain problems are inherent in any photographic work. On each photograph scales change with distance from the center. Consequently, each photograph must be matched by features most nearly adjacent the channel reach being mapped. The resolution of the aerial photography is such that small changes in bank position may not be mappable.

Figures 1 and 2 depict two of the sites mapped by Scott. The solid lines represent the channel as it appeared in 1977. The dotted lines represent channel locations in specified years. In figure 1, near river mile 41, only two areas noted toward the upstream end of the reach have shown noticeable erosion since 1977. Figure 2 near river mile 10 shows a few areas of erosion near the downstream end of the mapped reach. This reach is under tidal influence, and the bed and bank materials are therefore finer than upstream.

No noticeable increase of erosion rates of since 1977 are visible in these two sites. Rivers are dynamic systems, both eroding and redepositing continually. Erosion and deposition are mapped at both sites, however not at an apparently increased rate. At some locations there appeared to be more erosion prior to 1977.

Several more reaches of the river mentioned, though not mapped by Scott, as experiencing possible increases in the erosion rates were next mapped. The results are shown in figures 3 and 4. Figure 3 is meander 3-H near mile 16. This sharp meander bend is frequently mentioned as one with both heavy use and heavy erosion. Scott uses meander 3H as a prime example of increased erosion on the Kenai River. Specifically, Scott discusses a number of fresh slide scars on the high banks at the outside of Meander 3-H. Figure 3 shows that erosion occurred on the outside of Meander 3-H between the years 1950 and 1977, as well as some point bar development. The figure also shows that additional erosion has occurred since 1977.

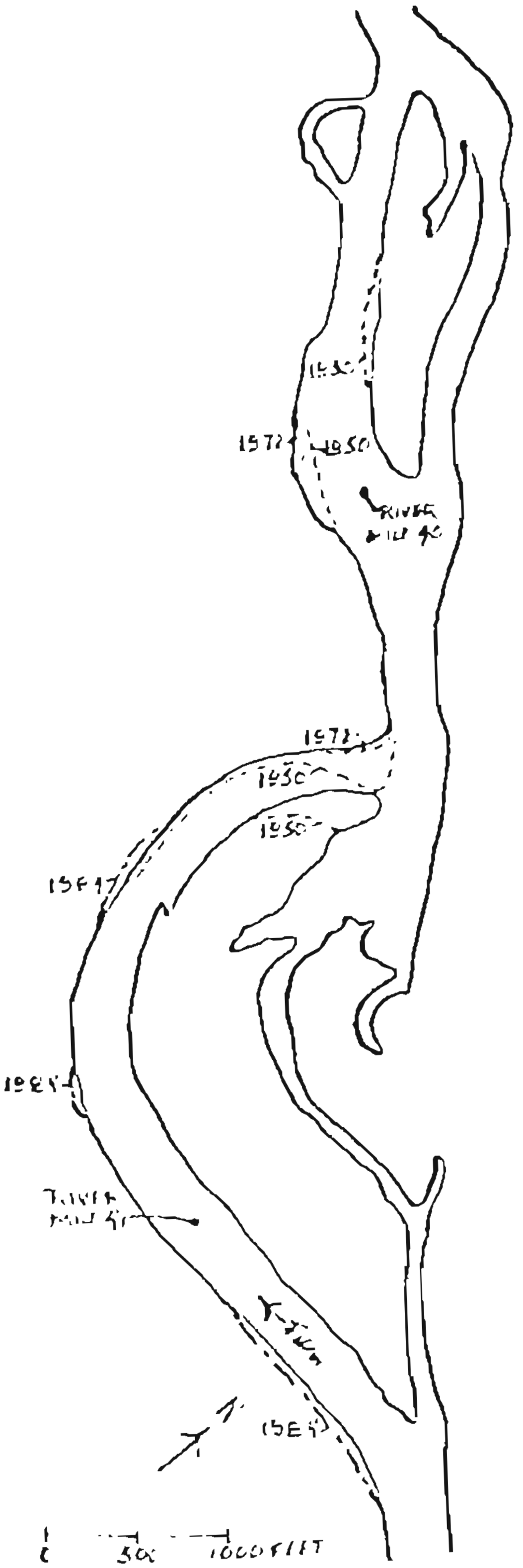

Figure 3. River reach near mile 40. Solid line is bank position in 1977.

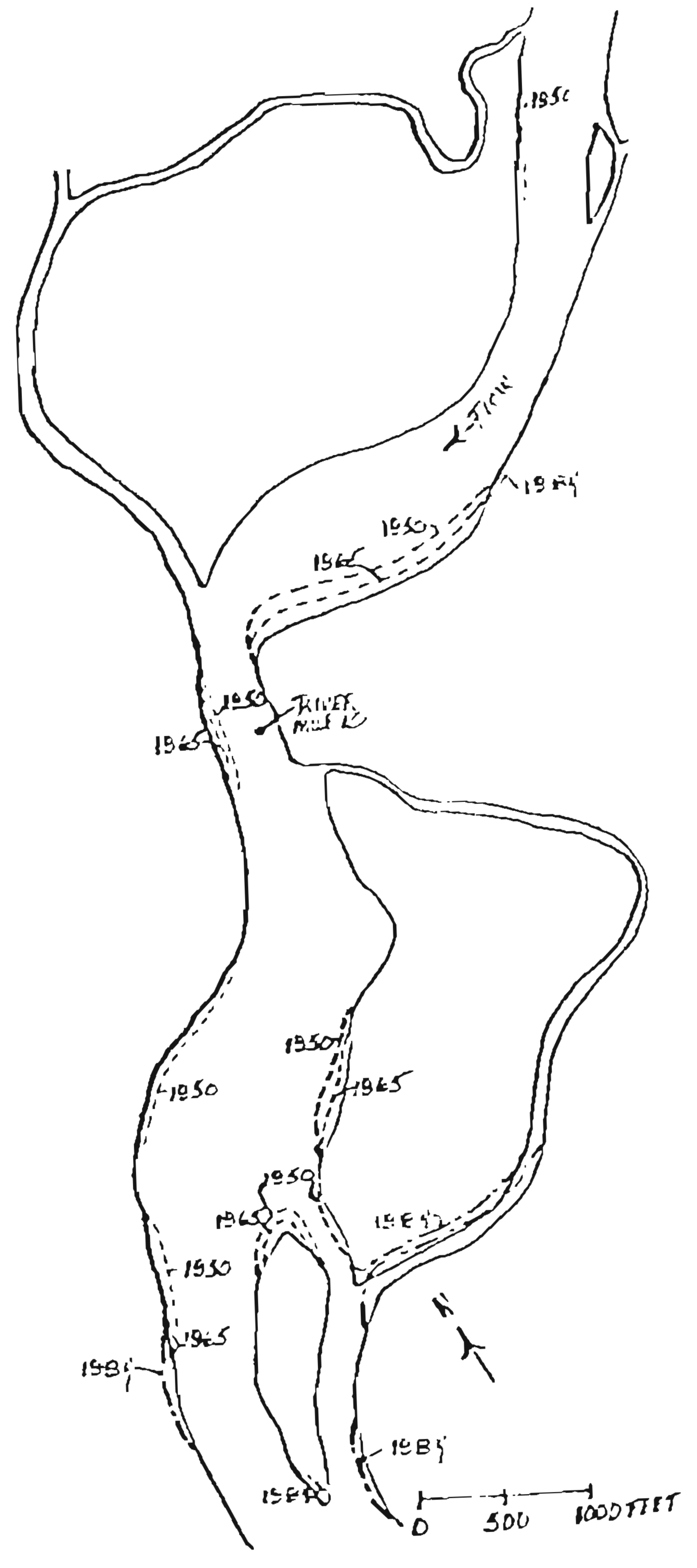

Figure 2. River reach near mile 16, close to Beaver Creek. Solid line is bank position in 1977.

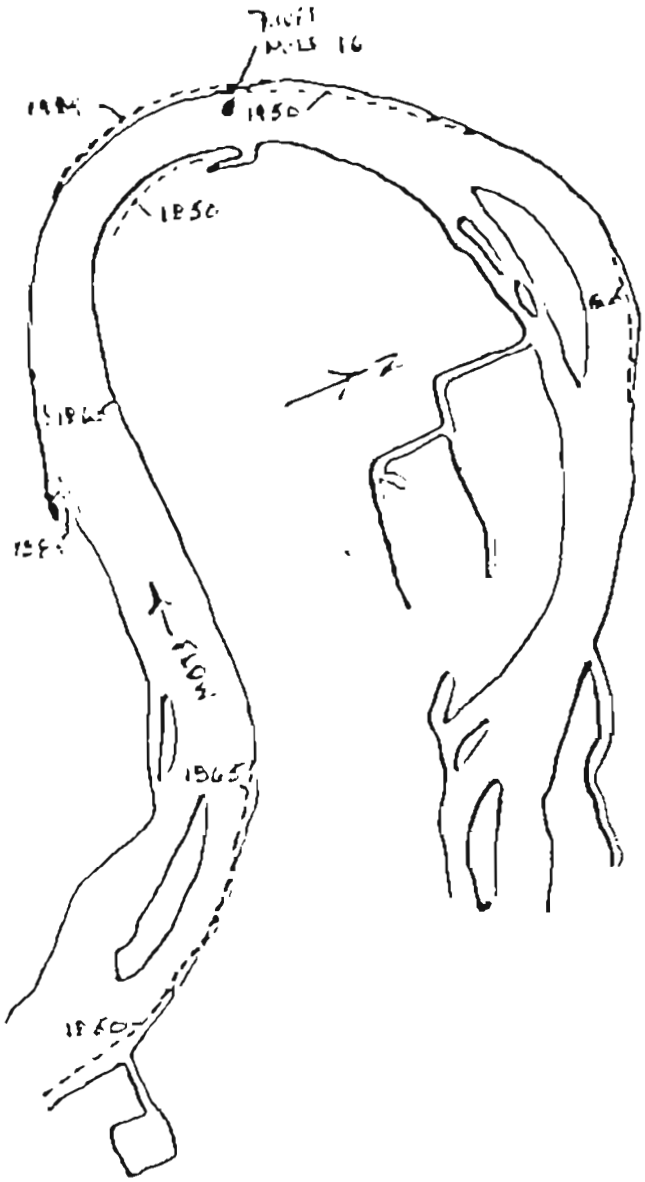

Figure 3. River reach near mile 16, on meander 3-R. Solid line is bank position in 1977. From aerial photos it appears as if the height of the cut bank on the outside of the meander has increased since 1965.

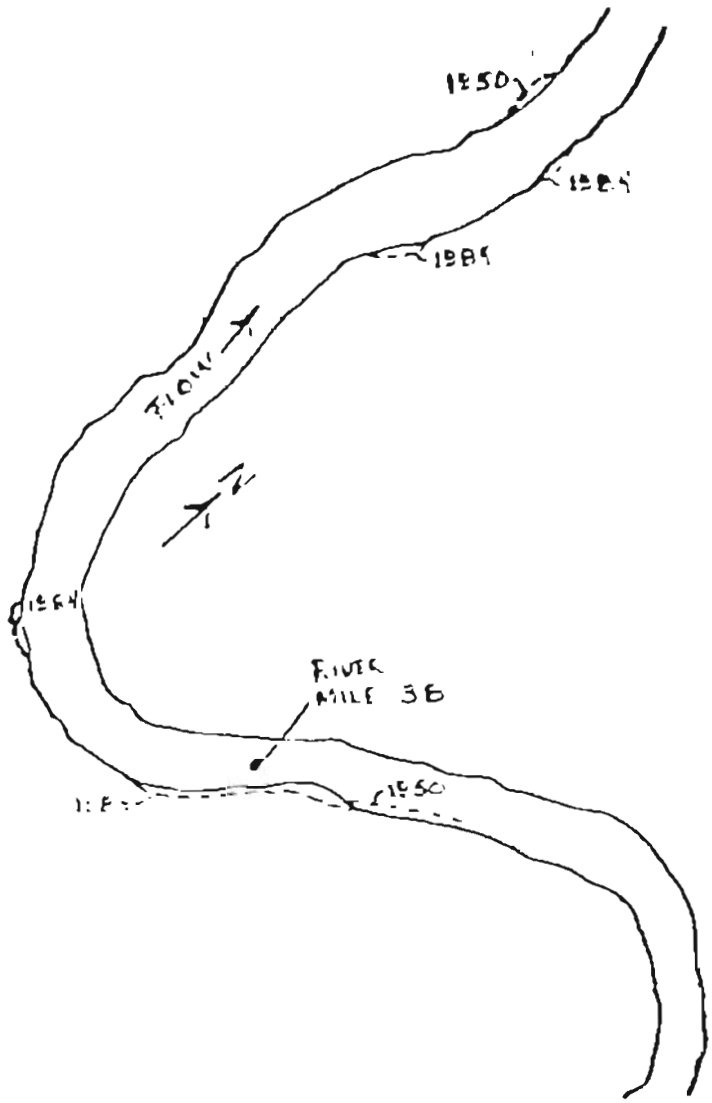

Figure 4. River reach near mile 38, on meander 1-P. Many groins are built into the river at this bend.

Banks on the outside of meander bends are exactly where rivers are expected to erode. The inside of meanders is where rivers deposit material. The outside of meander 3-H is inherently unstable. Photos dating back to 1950 clearly show high unvegetated banks. Aerial photography also shows a definite progression of abandoned meander scars migrating toward the outside of meander 3-H. The outside of meander 3-H is eroding, however, photographic comparisons do not show it eroding at a noticeably faster rate since 1977.

Meander 3-G is the sharp meander bend on figure 3 immediately upstream of meander 3-H. Measurable erosion has occurred near the Poachers Cove to Riverside camper park area. Most erosion seems to have happened in the 1950 to 1977 time period. At Poachers Cove a large harbor or inlet has been built. These intense type of river bank activities strip the bank of vegetation and expose potentially less erosion resistant materials to flowing water. Riverside campground has riprapped its bank to slow erosion.

The erosion being experienced at both meander 3-G and 3-H is in locations erosion would be expected. The photographic comparisons of 1950 through 1984 do show that erosion has occurred. However, they do not show a clear indication of increased erosion since 1977.

Figure 4 is meander 1-P near river mile 38. This reach was examined using aerial photography because of the groin construction on the inside of the meander. Some areas of erosion are noted, with the most change

occurring after 1977. Some of this erosion may be the result of groin construction. This reach deserves more detailed study.

At the request of DGGS, Division of Parks personnel stationed on the Kenai River identified additional areas experiencing bank erosion. All of these sites were examined comparing 1975 and 1984 photography. Only two of the sites showed evidence of erosion in the 1975 through 1984 time frame.

Meander 3-F near river mile 18.5 is one of the areas eroding. Bed and bank materials become finer near the lower end of the river. Bank erosion would therefore be more expected. Slikok Creek, just upstream from the eroding area, may also adversely affect erosion. Again, the erosion is occurring on the outside of a sharp meander bend in a location where erosion would be expected.

Meander 1-I at mile 43 just downstream of the Killey River and Kenai Keys area is another location where erosion occurred in the 1975 to 1984 time period. The unvegetated, high bare bank appears to have grown slightly taller toward the downstream end of the bank. No change in the position at the base of the bank is noticeable.

RIVER RECONNAISSANCE

In late July of 1985, DGGS personnel traveled the length of the river, from Cooper Landing to Kenai. This trip was multi-purpose in nature, looking at tributaries for possible gage sites, and assessing erosion.

Photo #1 is at the upstream end of the Kenai Keys area near mile 44. This site was riprapped in early 1985 due to erosion which reportedly endangered the structures built near the shore. At the resolution available in the aerial photography analysis no erosion was apparent. The location of this reach is between two sharp meanders, near the transition from the outside of one meander and the inside of the next. It is questionable whether erosion would be expected at this site. This reach is therefore a likely candidate for one in which man has induced a more rapid rate of erosion.

The Kenai Keys area receives heavy boat traffic. Yet, areas immediately upstream and downstream of the riprapped reach are not experiencing any heavy erosion. The river bank in this reach has been extensively disturbed by man. A harbor or inlet has been excavated, stripping a portion of the bank of vegetation and possibly its natural armor, and exposing it to erosion. Clearing the land for home construction, and subsequent recreational activities on the river bank likely exposed still more bank material to erosion. It appears as if man's activities along the shore are the primary causes of an apparent increase in the rate of erosion. If boats alone were to blame, the erosion would likely be more widespread. Boats may, however, have aggravated the situation.

Photo #2 was taken a short distance downstream near mile 43, at meander 1-I. The Division of Parks described this reach as a "steep gravel slope sliding down into the river". Aerial photography study indicates that the downstream end of the bank may have increased in height from 1975 to 1984, however, there was no indication that the base of the bank has moved. 1950

Photo # 1: Photo taken near Kenai Keys near mile 44. Note riprapped bank and inlet construction.

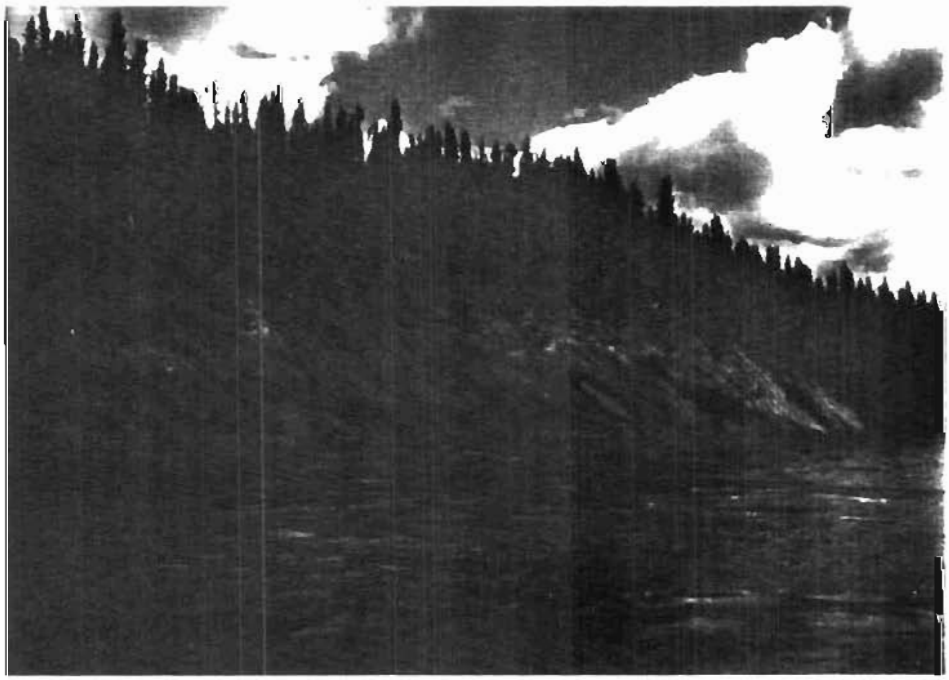

Photo # 2: Photo taken downstream of Kenai Keys, near mile 43.

photography also shows this bank as bare and unvegetated. Cut banks such as this are not uncommon in river systems the size of the Kenai.

Photo #3 was taken at the Riverside Campground near mile 17. This reach of the river, like much of the lower river, receives heavy use. Foot and boat travel are amplified at this location due to the existence of the camper park. The owner of the camper park has riprapped the bank to try and slow further erosion. Like the riprap used near the Kenai Keys, this material was not large and might fail at peak flows.

This is another location where one would expect to find erosion. Large portions of the banks have been stripped of vegetation and armoring, and Poachers Cove has excavated a harbor. The result is that large portions of the banks are exposed to flowing water. Boat traffic has probably aggravated the situation which likely began due to man's on-shore activities.

Photo #4 is the outside of meander 3-H, near river mile 16. Several of the houses visible in the photo have been constructed in close proximity to the edge of the bank. The owners of one of the pictured houses have taken measures to terrace and plant grass immediately in front of their house to try and stabilize the bank.

This meander bend is one of the more controversial on the river. Scott has identified it as one in which man's river use practices may have increased the rate of erosion. Aerial photography clearly shows a progression of abandoned meander scars on the inside of the meander, which indicate a migration of the channel toward the outside of the meander. This

Photo # 3: Photo taken of Riverside Camppground, near mile 17. Note rip-rap and heavy use.

Photo # 4: Photo taken on the outside of meander 3-H, near mile 16.

process of eroding the outside of the meander and depositing on the inside of the meander began long before man's intense use.

CONCLUSIONS

The most significant observations from both field and aerial photo studies is the overall remarkable stability of the Kenai River. Scott recognized the river to be underfit, a condition which itself suggests substantial stability.

At some isolated locations on the river erosion may indeed be progressing at a faster rate than if man were not present in large number. However the Kenai River, like all rivers, has a natural background rate of erosion. Most of the erosion currently being seen on the Kenai River can probably be contributed to the background rate. Man has undoubtedly affected the rate of erosion, but quantifying what portion of erosion is due to man's activities and what portion is due to nature may be an impossible question to answer. However, it does appear from this study that man's impacts are small, and isolated.