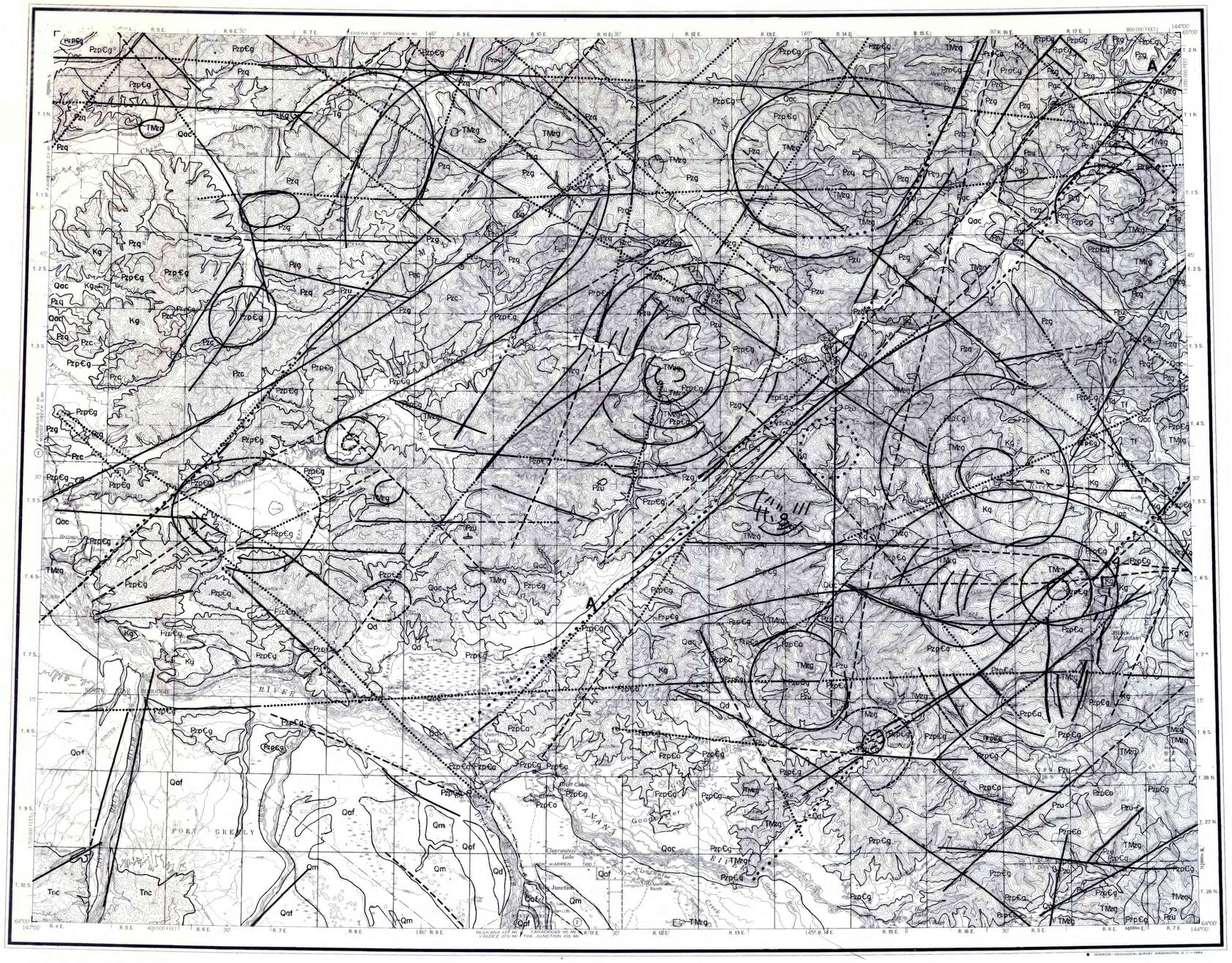
DEPARTMENT OF THE INTERIOR
UNITED STATES GEOLOGICAL SURVEY

FOLIO OF THE BIG DELTA QUADRANGLE, ALASKA

OPEN-FILE REPORT 78-529C

SHEET 1 OF 2

ALBERT AND STEELE--INTERPRETATION OF LANDSAT IMAGERY



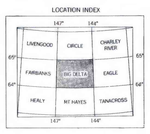
BASE BY U.S. GEOLOGICAL SURVEY, 1963

SCALE 1:250 000

5 0 5 10 15 20 25 MILES

5 0 5 10 15 20 25 KILOMETERS

CONTOUR INTERVAL 200 FEET
DATUM IS MEAN SEA LEVEL



EXPLANATION

GEOLOGY GENERALIZED FROM WEBER, FOSTER, AND OTHERS (1978)

CORRELATION OF MAP UNITS

UNCONSOLIDATED DEPOSITS

Qac; Qaf, Qd, Qm — QUATERNARY

SEDIMENTARY ROCKS

Tnc, Td — TERTIARY

IGNEOUS ROCKS

Tg — TERTIARY
Tf — TERTIARY(?)
TMzg — TERTIARY OR MESOZOIC
Kg — CRETACEOUS

METAMORPHIC ROCKS

Pzc — PERMIAN
Pzu, Pzc, Pzg, Pzq — PALEOZOIC
PzpCu, PzpCg — PALEOZOIC AND (OR) PRECAMBRIAN

DESCRIPTION OF MAP UNITS

UNCONSOLIDATED DEPOSITS

- Qac — ALLUVIUM, COLLUVIUM, AND MINOR GLACIAL AND EOLIAN DEPOSITS
- Qaf — ALLUVIAL FAN AND GLACIAL OUTWASH DEPOSITS
- Qd — DUNE SAND
- Qm — MORAINAL DEPOSITS

SEDIMENTARY ROCKS

- Tnc — NENANA GRAVEL AND COAL-BEARING FORMATION
- Td — DETRITAL ROCKS

IGNEOUS ROCKS

- Tg — GRANITE AND QUARTZ MONZONITE
- Tf — FELSIC TUFF AND LAVA
- TMzg — UNDIVIDED GRANITIC AND DIORITIC ROCKS
- Kg — UNDIVIDED GRANITIC AND MINOR DIORITIC ROCKS

METAMORPHIC ROCKS

- Pzc — GREENSTONE AND CHERT
- Pzu — ULTRAMAFIC ROCKS
- Pzc — CATACLASTIC SCHIST AND GNEISS
- Pzg — GREENSCHIST, QUARTZITE, MARBLE, COARSE META- ARENITE GREENSTONE, AND META-TUFF
- Pzq — QUARTZITE, SLATE, CALC-PHYLLITE, AND MARBLE
- PzpCu — AUGEN GNEISS AND MINOR AMOUNTS OF OTHER GNEISSIC ROCKS
- PzpCg — GNEISS, SCHIST, AUGEN GNEISS, AMPHIBOLITE, AND MARBLE

GEOLOGIC SYMBOLS

CONTACT, APPROXIMATELY LOCATED

FAULT OR PROBABLE FAULT, DOTTED WHERE CONCEALED

EXPLANATION OF IMAGERY INTERPRETATION

WELL-DEFINED LINEAMENT OR CIRCULAR FEATURE

MODERATELY DEFINED LINEAMENT OR CIRCULAR FEATURE

POORLY DEFINED LINEAMENT OR CIRCULAR FEATURE

DISCUSSION

Landsat images of the Big Delta quadrangle were analyzed for lineaments, circular and arcuate features, and telegeologic units (areas) which might be related to known mineral occurrences or to areas of mineral resource potential (Menzie and Foster, 1978). The methodology and limitations of this type of study, excluding the identification of telegeologic units, are discussed in detail by Albert (1975) and Albert and Steele (1976a,b).

Details concerning the different types of imagery used are given in Table 1. Computer-enhanced Landsat images were produced from computer compatible tapes processed by Pat S. Chavez, Jr., Teresa E. Grow, and Lynda Sowers, U.S. Geological Survey, Flagstaff, Arizona. Copies of the images used are available from the EROS Data Center, Sioux Falls, South Dakota 57198. PAO number must be specified when ordering. More detailed descriptions of the various computer enhancement techniques used in these images are given by Albert and Steele (1976a,b) and Condit and Chavez (1978).

Lineament A, corresponding to the Shaw Creek fault in the Big Delta quadrangle, coincides with a major lineament described by Steele and Albert (1978) that follows the trace of the Farewell fault and part of the Denali fault, to the southwest. These data suggest that the Shaw Creek fault may be a northeastern extension of the Farewell fault.

Identification of telegelogic units (sheet 2) involved analyzing the sinusoidally stretched image for areas having different colors and photographic textures and patterns (table 2). A total of 9 colors were subjectively identified and are shown in decreasing order according to areal dominance. Colors not considered significant in any given area have been omitted.

Photographic textures are relative and are determined subjectively. Mostly, they reflect drainage and topographic features, but are also influenced by other factors such as: vegetation distribution, human activities, scale, and slope.

Photographic patterns are also determined subjectively. Photographic pattern, as used in this study, refers to orderly areal arrangement of various features, namely geologic, topographic, drainage, and vegetation features. Terms used to describe photographic patterns have no implied genetic significance and merely reflect visual impressions.

Telegeologic units (areas) identified on the computer-enhanced imagery show a fair correlation with mapped geologic units (Weber, Foster, and others, 1978). The correlation is best for unconsolidated deposits. Correlations with igneous and metamorphic rocks are not as good, perhaps partly because of similarities between actual rock types from one geologic unit to another. Although a number of geologic units can be seen in more than one telegeologic unit, many boundaries between geologic units correspond to boundaries between telegeologic units.

No direct relation was observed between telegeologic elements identified in this study and other criteria used for evaluating the mineral resource potential of the Big Delta quadrangle.

References cited

Albert, N. R. D., 1975, Interpretation of Earth Resources Technology Satellite imagery of the Nabesna quadrangle, Alaska: U.S. Geological Survey Miscellaneous Field Studies Map MF-655J, 2 sheets, scale 1:250,000.

Albert, N. R. D., and Steele, W. C., 1976a, Interpretation of Landsat imagery of the McCarthy quadrangle, Alaska: U.S. Geological Survey Miscellaneous Field Studies Map MF-773N, 3 sheets, scale 1:250,000.

Albert, N. R. D., and Steele, W. C., 1976b, Interpretation of Landsat imagery of the Tanacross quadrangle, Alaska: U.S. Geological Survey Miscellaneous Field Studies Map MF-767C, 3 sheets, scale 1:250,000.

Condit, C. D., and Chavez, P. S., Jr., 1978, Basic concepts of computerized digital image processing for geologists: U.S. Geological Survey Bulletin 1462 (in press).

Menzie, W. D., and Foster, H. L., 1978, Mineral resources map of the Big Delta quadrangle, Alaska: U.S. Geological Survey Open-File Report OF 78-529-D, scale 1:250,000.

Steele, W. C., and Albert, N. R. D., 1978, Interpretation of Landsat imagery of the Talkeetna quadrangle, Alaska: U.S. Geological Survey Miscellaneous Field Studies Map MF-870C, 2 sheets, scale 1:250,000.

Weber, F. R., Foster, H. L., Keith, T. E. C., and Dusel-Bacon, Cynthia, 1978, Preliminary geologic map of the Big Delta quadrangle, Alaska: U.S. Geological Survey Open-File Report OF 78-529-A, 1 sheet, scale 1:250,000.

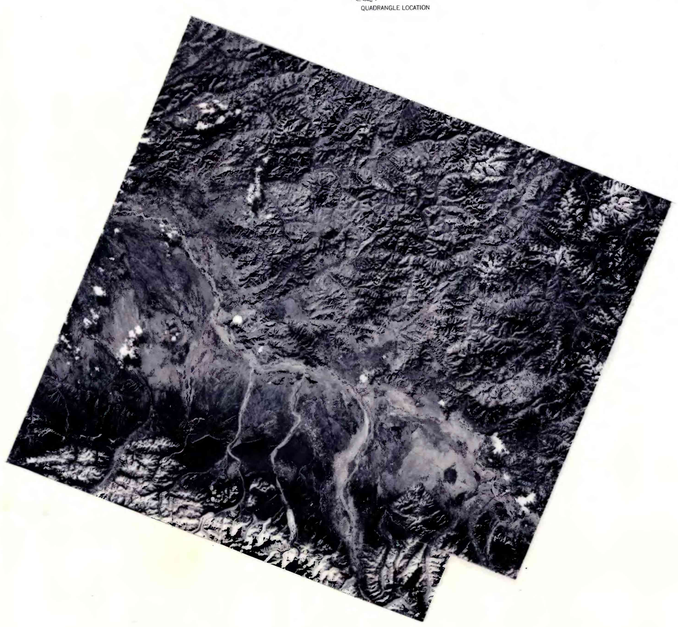


Figure 1.--Example of Landsat imagery used in this study. Image is composed of parts of three Landsat scenes: 1768-20342, 1768-20345, and 1029-20383 (see fig. 2). Band 7 shown.

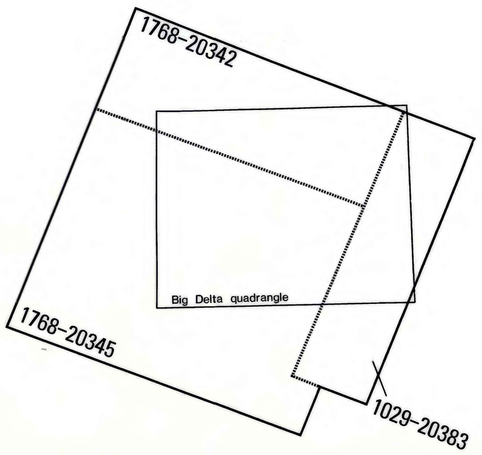


Figure 2.--Index map of the Big Delta quadrangle showing coverage of the Landsat imagery used in this study. Hatchured lines indicate approximate mosaic boundaries between scenes.

Table 1.--*Information regarding imagery used in this study. U.S.D.A. Alaska mosaic was prepared by the U.S. Department of Agriculture, Soil Conservation Service, with imagery obtained from Landsat 1.*

IMAGE TYPE	COMPUTER-ENHANCED	BANDS AND COLORS USED	PROJECTION	PAO NUMBER	TRANSPARENCY SCALE	PRINT SCALE
U.S.D.A. Alaska mosaic	No	7 B&W	Alber's Equal Area	this item is not available from EROS Data Center		1:1,000,000
Simulated natural color	Yes	4 Green 5 Red Syn Blue	Orthographic	E-740-67CT	1:1,075,000	1:250,000
False-color with linear stretch	Yes	4 Blue 5 Green 7 Red	Orthographic	E-741-78CT	1:1,075,000	1:250,000
False-color with sinusoidal stretch	Yes	5 Blue 6 Green 7 Red	Orthographic	E-742-78CT	1:1,075,000	1:250,000
Diagonal first derivative	Yes	6 B&W	Orthographic	E-373-558N	1:1,581,200	1:250,000

This report is preliminary and has not been edited or reviewed for conformity with Geological Survey standards and nomenclature.

MAP SHOWING INTERPRETATION OF LANDSAT IMAGERY OF THE BIG DELTA QUADRANGLE, ALASKA

BY

NAIRN R.D. ALBERT AND WM. CLINTON STEELE

1979