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North Slope Borough Resource Inventory
and
Geographic Information System

Volume 1 - Final Report

May 1984

Prepared for: North Slope Borough
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October 7, 1985

Mr. Ian Sneddon
Department of Indian & Northern
Affairs
Northern Affairs Program
Renewable Resources & Northern
Environment Branch
Ottawa, Ontario
Canada K1A 0H4

Dear Mr. Sneddon:

Cindy Whitfield of ESRI-Canada has asked that we send you materials regarding our GIS project for the North Slope Borough, Alaska. Mr. Nordstrand of NSB will be sending you some sample map products and I have enclosed a copy of the final report.

I hope these materials are of use to you. If you would like further information, please contact Karl von Schlieder at ESRI, (714) 793-2853.

Best regards,

Karen Hurlbut

Karen Hurlbut

KH/ad
Enclosure: NSB Final Report

Oct 23 8 38 AM '85

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Figures and Tables

CHAPTER I: INTRODUCTION

In December of 1982, the North Slope Borough (NSB) contracted Environmental Systems Research Institute (ESRI) to conduct a natural resource inventory of the Borough, and to create a geographic information system containing this inventory information, in order to more effectively and efficiently manage the land and resources within the borough. The project is a two year effort, the first year work covering coastal areas and the foothills of the extreme east and west ends of the Brooks Range within the Borough (see Figure 3.1, Page III-3). Second year work will cover the principal interior of the Borough.

This report details the methodologies used to conduct the resource inventory and develop the geographic information system for the first year as well as providing documentation on the structure and content of the final automated data base.

The resource inventory portion of the project involved the collection, cataloging and evaluation of all existing data which is pertinent to the inventory. This data was then transferred to a common base at a scale of 1:250,000. Where necessary, certain published information was reformatted and rectified to the 1:250,000 scale. In certain cases where published information was not available, aerial photography (both black and white and color infrared) and Landsat imagery were used to photointerpret certain features of the landscape, (e.g., vegetation, landforms). The mapping phase resulted in the development of nine distinct sets of mapped data, termed manuscript maps. These manuscript maps, listed in Table 1.1, are produced by either the integration or compilation of related types of data onto one sheet. For each map sheet, attribute codes were developed which define each feature delineated on a map.

The automation portion of the project was accomplished by digitizing all manuscripts for all modules in the study area. Utilizing ARC/INFO software, the automated maps were processed and edited into final spatial data files. Attribute codes were keypunched and merged with the spatial data files to produce clean ARC coverges containing both spatila and attribute data.

REPORT SUMMARY - VOLUME 1, FINAL REPORT

Chapter II describes the elements involved in the design of the data base, including the projected uses of the GIS based on a data needs assessment, the methods of data collection and selection, and the overal design of the data base and its component parts. Chapter III gives detailed discussions on the procedures used to map and encode the diverse types of information in the data bank. This chapter deals specifically with the methods involved in the preparation of maps to be accurately and efficiently digitized and incorporated into the GIS. Chapter IV provides detailed descriptions of the mapping methods, data sources and attribute descriptions for each variable

Table 1.1
Manuscript Organization

Manuscript Number	Manuscript Name	Data Format	Data Type
I	Integrated Terrain Unit	Polygon	Natural resources such as vegetation, soils, geology, slope, etc.
II	Surface Hydrology	Line, Polygon	Physical and biological characteristics of streams and simple watersheds
III	Political and Administrative Units	Polygon, Point	Political and administrative units, coal leases, census areas, land ownership, etc.
IV	Infrastructure, Settlements, and Special Features	Line, Point	Faults, roads, transmission lines, pipelines, trails, settlements, airports, etc.
V	Energy and Mineral Resources	Polygon, Point	Coal resources, oil and gas fields,
VI	Elevation Provinces	Polygon	Four general elevation provinces
VII	Historic/ Archaeologic Sites	Polygon	Historic/Archaeologic site locations
VIII	North Slope Borough Planning Data	Polygon Point, Line	Data contained in the NSB Comprehensive Plan, Coastal Management Plan
IX	Subsistence Land Use	Polygon	Subsistence land use activities for each Borough village

contained in the data base. The actual structure and file formats of the final automated data bank are given in Chapter V.

REPORT SUMMARY - VOLUME 2, APPENDICES

Volume 2 of the final report contains information to be used by the GIS users in the analysis and manipulation of data. Section 1 contains descriptions and listings of interpretive matrices for landforms, general and quadrangle-based geology, soils, oil and gas leases, settlements and mineral resources. Section 2 is a listing of all unique landform combinations which have been identified thus far in Alaska. Finally, Section 3 contains the comments and responses to the two Quality Review sessions conducted by the North Slope Borough to ensure consistent and accurate interpretations. As such, this section serves as documentation for how interpretations were made for each variable reviewed.

CHAPTER II: DATA BASE DESIGN

DATA NEEDS ASSESSMENT

The North Slope Borough resource inventory and information system is designed to be a data bank containing information useful for a wide range of resource management and planning functions. General areas of applications include:

Natural and Cultural Resource Inventory. A basic requirement for any land planning activity is a knowledge of the type and distribution of natural and cultural resources.

Allocation. Based on understandings derived from the analysis of resource distributions, allocations for diverse, and many times conflicting, land uses can be made in a timely manner.

Management and Planning. Ongoing management and future planning operations can be supported by the information in the data bank, both for analysis of decision alternatives in management and the updating of existing information for future planning objectives. Specific applications include:

- stream inventory and monitoring
- habitat analysis and modeling
- wetlands identification
- coastal zone management
- game population density and tracking
- subsistence land use identification
- oil and gas lease monitoring and management
- general development

Permit Review and Environmental Impact Assessment. The data bank can be used for the analysis of land use and development activities, to facilitate permit review and serve as the basis for impact assessment of proposed activities.

Site Selection. Information within the data bank can be utilized for site selection analysis on a regional scale, for both facility siting and transportation corridor selection. This site selection can be the screening step to more detailed analysis of smaller sites, or the end product on a regional scale.

DESIGN CRITERIA

The design of the data base was guided by certain basic principles of cost and time considerations, data needs of users of the data bank, and the requirement for an integrated geographic information system characterized by ease of data manipulation, analysis and display. More specifically, the data base design followed the guidelines listed below:

- created at a scale which allows full coverage of the Borough within a reasonable time and cost framework.
- The development of a borough-wide data bank at a regional scale precedes more detailed inventory work, to facilitate the identification of areas warranting more detailed and costly study.
- The data bank is based primarily on existing data, resulting in time and cost savings for original data collection and generation.
- The content of the data bank reflects the wide range of data needs expressed by participating/contributing agencies.
- the data bank employs standard and consistent classifications and codes to describe the data throughout the borough, to facilitate inter-regional comparisons within the borough, as well as maintaining consistency with the Statewide Alaska Land and Resource Mapping Program.
- The data bank is structured and coded in an integrated way to minimize data storage and processing requirements.
- The data bank is structured into a geographic information system which provides for maximum opportunity for manipulation, analysis and display.

DATA COLLECTION

Based on the needs assessment and design criteria outlined above, a data collection effort was conducted to gather the necessary information for incorporation into the data base. This was initially accomplished by summarizing the data requirements for each identified application. For example, to use the data base for terrain stability assessment, information required for analysis would include slope, landform type, underlying geologic material type, vegetation, etc. By applying this process of breaking down identified needs into requisite data, a hierarchical structuring of specific data needs was established.

The data collection effort itself involved identifying and collecting sources of geographic information including maps, books, reports, aerial photography, Landsat imagery, and other related documents. They were obtained from the North Slope Borough, participating State and Federal agencies, local governments, universities, public libraries, and private firms.

DATA CATALOGING AND EVALUATION

The documents were grouped into categories developed through the data assessment. ESRI staff cataloged and evaluated each document for its reliability and importance to the data base. To assist in this process a standard bibliography form was completed for all collected data.

Citation No. ______________
Call No. ______________
Shelf No. ______________

Figure 2.1

Resource Center Catalog Form

Authors: ______________________________

Title: ______________________________

Publisher/ Source/Date: ______________________________

Subject: ______________________________

Data Location: ______________________________

Geographic Coverage: ______________________________

Scale: ______________________________

Notes: ______________________________

Data Type: ☐ Map ☐ Aerial Photography ☐ Other

☐ Book ☐ Geocoded Data Base

Information on these forms (see Figure 2.1) were subsequently keypunched to produce an automated bibliography system. This data file allows rapid sorting, searching, and listing of any or all of the data in the file. For example, a user could request a listing of all geology data sources for the Barrow quadrangle. Evaluation of appropriate methods of mapping the data for subsequent automation was also performed at this time.

After the available data had been reviewed and the results compared to the data needs of the user groups, data variables for which reliable coverage was not available were identified. These data included landforms, slope, soils, vegetation and land use. Mapping for these variables was based upon image interpretaion of aerial photography and Landsat imagery. In addition, data on many of the other source documents were verified and/or updated using this imagery (See Chapter III for a complete discussion of the process).

DATA FILE DESIGN

Data Classification

The data classification which was developed for the study systematically organized information about the natural and cultural environments of the North Slope Borough. It was based upon a hierarchy of information which organized the data into progressively more specific levels of classification. This hierarchical structure built into the classification the flexibility needed to expand the data files as new data types are identified. For ultimate application and display of the data base, the hierarchy allowed for aggregation of classes at different levels within the scheme in response to specific analysis requirements or map output needs.

The individual data classes developed for each variable were largely based upon the source documents when appropriate. Existing data categories were either used as they appeared on the source or were revised to an appropriate scheme for use at a 1:250,000 mapping scale. For those variables that were photo interpreted, it was necessary to devise a classification or use an accepted standard system.

After the individual data classes were developed for each variable, they were assigned a numeric code for use in automation. Once automated, these codes can be used to produce maps, generate various tabular listings and produce analytical models. It was important, therefore, to keep all of the classifications in a logical order - start with the smallest and end with the largest; start with low and end with high, etc.

Manuscript Map Design

For efficiency in mapping and automation, it was desirable to combine related variables onto a single overlay called a manuscript map. Nine manuscript maps were designed to capture all of the data based upon data type (natural resources, political and administrative unit, etc.) and data format. Three formats were used to display all mapped data - polygons, lines and points. Data which covered large areas, or which had complete coverage such as vegetation were mapped as polygons. The mapping resolution for polygons (smallest area mapped) was generally 640 acres. Two exceptions to this minimum resolution were Surface Cover by Water (Manuscript I) ånd Land Ownership (Manuscript III) whose minimum mapping resolution is 160 acres. Data such as streams, faults, roads, etc., were delineated as lines with a resolution of one-quarter mile in length. Data which at 1:250,000 covered very small areas such as settlements, cemeteries, airports, etc., were depicted as points. A summary of the manuscript oganization is found in Table 2.1. The variables contained within each manuscript are listed in Chapter V as a summary of each manuscript. An alphabetical and topical listing of all variables is given in Tables 4.1 and 4.2 in Chapter IV.

DATA BIBLIOGRAPHY REPORT

After the data had been cataloged, reviewed and the data classification devised, a data bibilography report was prepared. This report identified the data sources which had been collected for each quadrangle, by variable, and the classification scheme for each variable. The report was reviewed by the Borough to ensure that all pertinent data had been collected, and that the classification system would meet user needs. This data bibliography, entitled "Alaska Land and Resource Mapping Program, Data Bibliography for the First Year Quadrangles, North Slope Borough", is an auxiliary volume to the final report, and represents the bilbiographic reference of the project.

Table 2.1
Manuscript Organization

Manuscript Number	Manuscript Name	Data Format	Data Type
I	Integrated Terrain Unit	Polygon	Natural resources such as vegetation, soils, geology, slope, etc.
II	Surface Hydrology	Line, Polygon	Physical and biological characteristics of streams and simple watersheds
III	Political and Administrative Units	Polygon, Point	Political and administrative units, coal leases, census areas, land ownership, etc.
IV	Infrastructure, Settlements, and Special Features	Line, Point	Faults, roads, transmission lines, pipelines, trails, settlements, airports, etc.
V	Energy and Mineral Resources	Polygon, Point	Coal resources, oil and gas fields
VI	Elevation Provinces	Polygon	Four general elevation provinces
VII	Historic/ Archaeologic Sites	Polygon	Historic/Archaeologic site locations
VIII	North Slope Borough Planning Data	Polygon Point, Line	Data contained in the NSB Comprehensive Plan, Coastal Management Plan
IX	Subsistence Land Use	Polygon	Subsistence land use activities for each Borough village

CHAPTER III: DATA MAPPING AND ENCODING

INTRODUCTION

This section provides a description of the mapping and encoding phase of the GIS development, in which maps are manually drawn and encoded with attributes from the code classification system. The use of standardized basemaps is described, as well as the use of boundary templates to maintain consistency of common borders among manuscripts. Descriptions of the two major mapping procedures used in developing the data bank are given, along with the methods used to assign attribute codes to each feature mapped.

OVERVIEW OF MAPPING AND ENCODING PROCEDURES

Mylar reproductions of USGS 1:250,000 scale topographic maps were used as the control base for all mapping. Each 1:250,000 quadrangle was identified as a mapping module. For each quadrangle, a standardized overlay (quadrangle boundary, waterbodies, coastlines) was prepared to ensure precise replication of this information for each manuscript. Geographic reference points called tic marks were drafted onto these template overlays and numbered for reference during automation. Using mylar drafting film registered to the basemap, a compilation overlay was prepared for each variable by transferring, interpreting or rectifying data from aerial photographs, Landsat imagery and available maps and reports. The data were transferred to the overlays in the form of polygons, lines or points, as defined in the data classification. Compilation overlays depicting variables to be displayed on the Integrated Terrain Unit map (Manuscript I) were integrated through an overlay and rectification process which resulted in integration overlays. These integration overlays were used to draft the final Integrated Terrain Unit manuscript. Compilation overlays depicting variables on Manuscripts II-IX did not require integration and were directly composited or rectified. Manuscript VI - Elevation - did not require either of these procedures designated elevation contours were simply transferred from the basemap to the manuscript. Manuscript VII - Historic/Archaeologic Sites - was produced by entering latitude-longitude coordinates directly into a data terminal and is discussed in Chapter IV. The spatial data displayed on each manuscript map were then assigned sequential numbers, and corresponding data entry forms were encoded for the data classes portrayed. Throughout the mapping, numbering and encoding process, visual edits were conducted of all overlays to ensure the standards for delineation and encoding were met. At the conclusion of manuscript map delineation, matrices were prepared which contained carefully structured arrays of data which provided supplemental interpretations for characteristics of selected variables which had been mapped. Finally, these matrices and the integration overlays for some of the variables were reviewed by appropriate Borough, State and Federal agencies. Revisions resulting from the reviews were made to the integration overlays, manuscript maps and matrices prior to their submittal for final automation.

GENERAL MAPPING METHODS

Basemap Numbers and Tic Mark Designations

Figure 3.1 portrays the study area modules (USGS quadrangles) and their numbers. Figure 3.2 to 3.4 are more detailed diagrams of the modules by production priority areas, showing their module numbers and tick mark designations. The tick mark designations are used as a spatial reference system during automation, as a control for rectifying the nine manuscripts together for each module, and utlimately as a reference system for relating the coordinate files of each module to a geo-based coordinate reference system. The bottom part of Figures 3.2-3.4 identifies for each control tick the latitude/longitude and Universal Transverse Mercator (UTM) coordinates. Note that the UTM coordinates are listed by UTM zone, and one tick mark may have more than one UTM coordinate pair, depending on its location within a UTM Zone.

Template Overlays

A total of nine manuscripts were prepared for each module. In order to maintain consistency of line placement of common boundaries on the module among the manuscripts, and to avoid the repetitive automation of common lines, boundary templates were prepared for each mdoule. These templates represent permanent, hard lines to which all data within a manuscript is rectified. There were four types of templates used in the mapping and automation of the data base. The particular templates used for a manuscript was dependent upon the data used for mapping. The four template types are as follows:

1) Module Boundary - defines the boundary of the USGS quadrangle, addressing not only the control tics but also the curvature of the lines of latitude. Used on manuscripts with point coverages, and manuscripts where data does not recognize the existence of exact coastlines (e.g., subsistence land use, hydrology polygons).

2) General Coastline - defines the coastline within each module in a general manner, delineating major promentories, embayments, and barrier islands. Used on manuscripts where the land/water interface is more important than the actual shape of the coastline, e.g., hydrology lines, or where data used in manuscript preparation is very general in its treatment of the coastline (e.g., maps at 1:1,000,000 rescaled to 1:250,000).

3) Specific Coastline - defines the coastline in a detailed manner, delineating all promentories, embayments and barrier islands resolvable at the 1:250,000 scale. Used on manuscripts whose data sources contain detailed coastline delineations (e.g., ITUM, Political/Administrative Units).

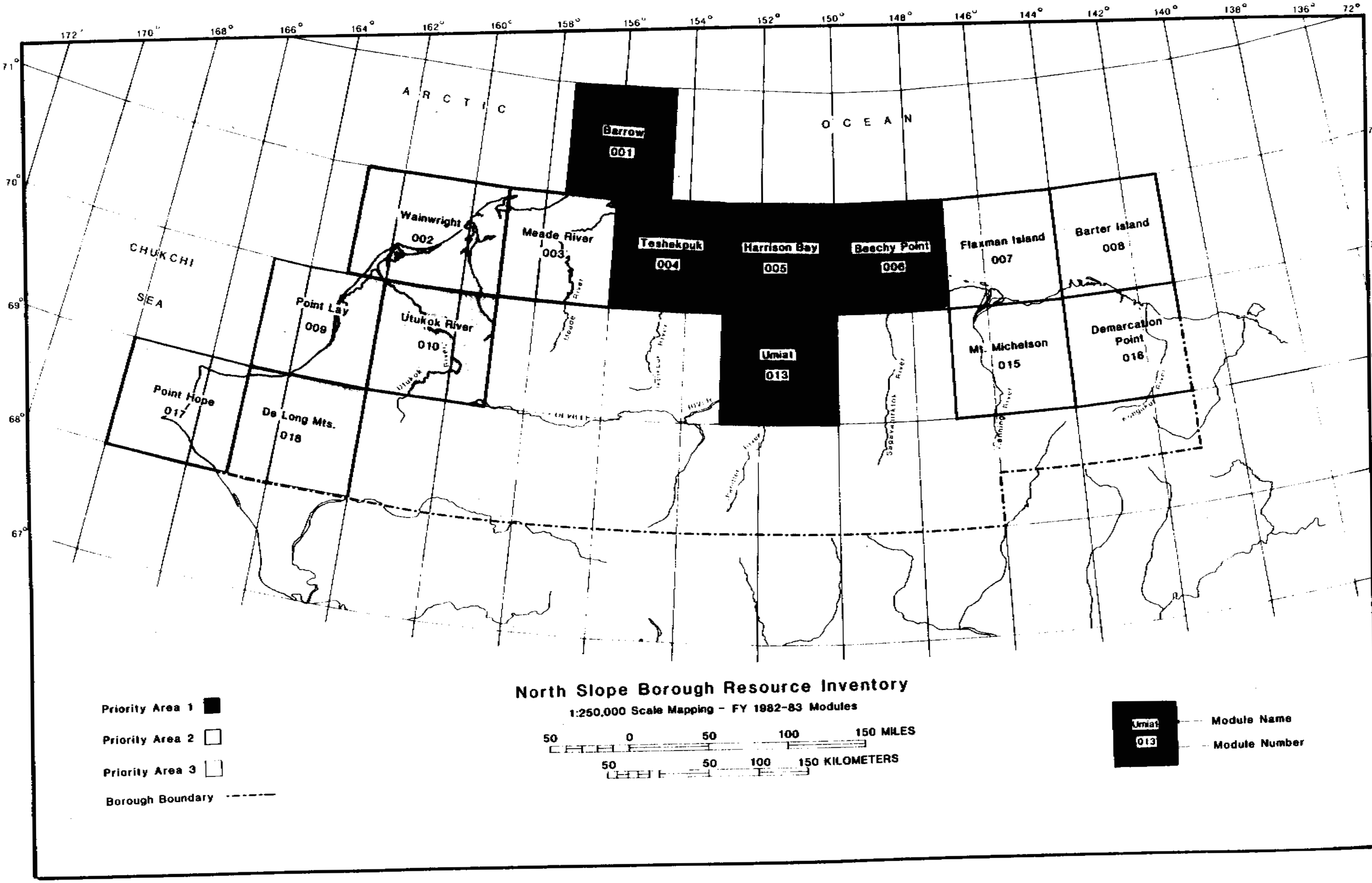
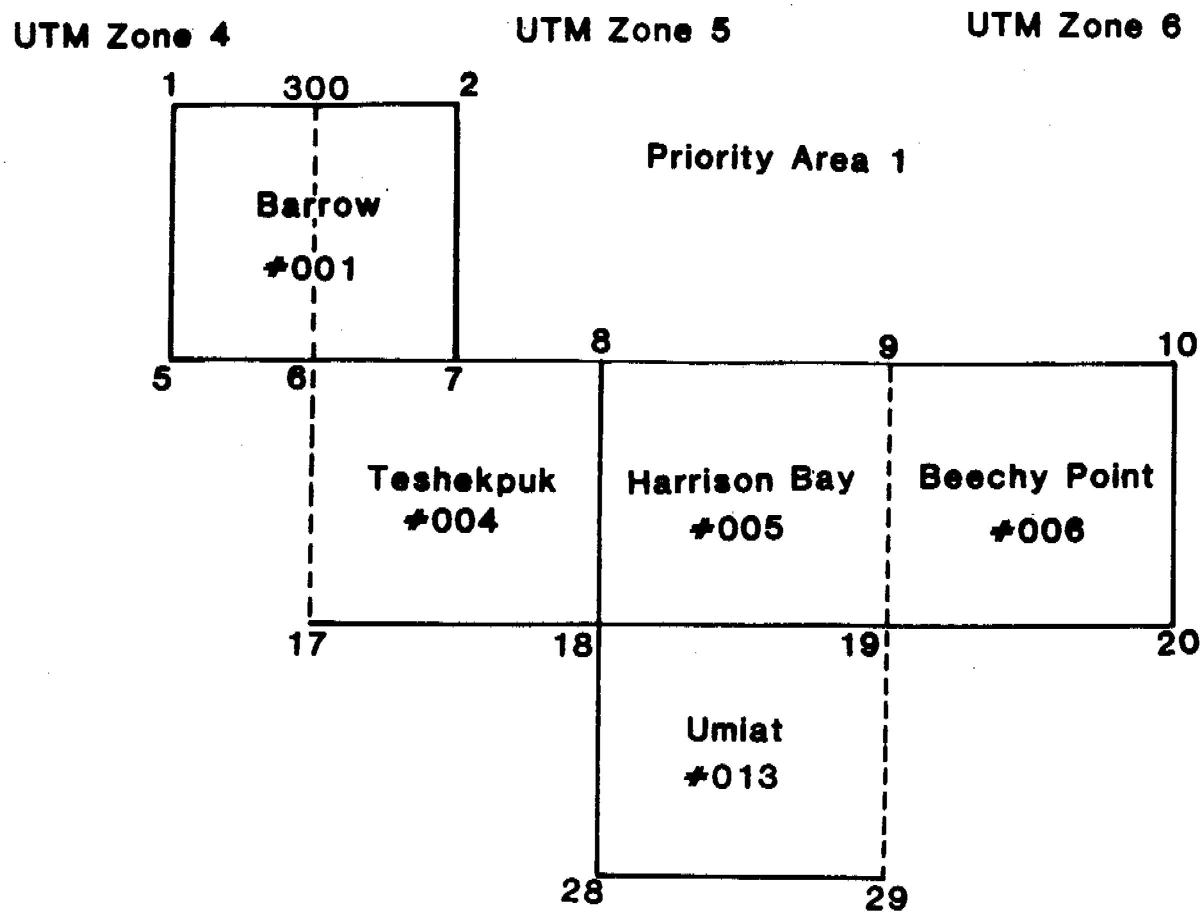

ARCTIC OCEAN
CHUKCHI SEA
Barrow
001
Wainwright
002
Meade River
003
Teshekpuk
004
Harrison Bay
005
Beechy Point
006
Flaxman Island
007
Barter Island
008
Point Lay
009
Utukok River
010
Umiat
013
Mt. Michelson
015
Demarcation Point
016
Point Hope
017
De Long Mts.
018
North Slope Borough Resource Inventory
1:250,000 Scale Mapping - FY 1982-83 Modules
50 0 50 100 150 MILES
50 50 100 150 KILOMETERS
Priority Area 1
Priority Area 2
Priority Area 3
Borough Boundary
Umiat
013
Module Name
Module Number

Figure 3.1

Figure 3.2



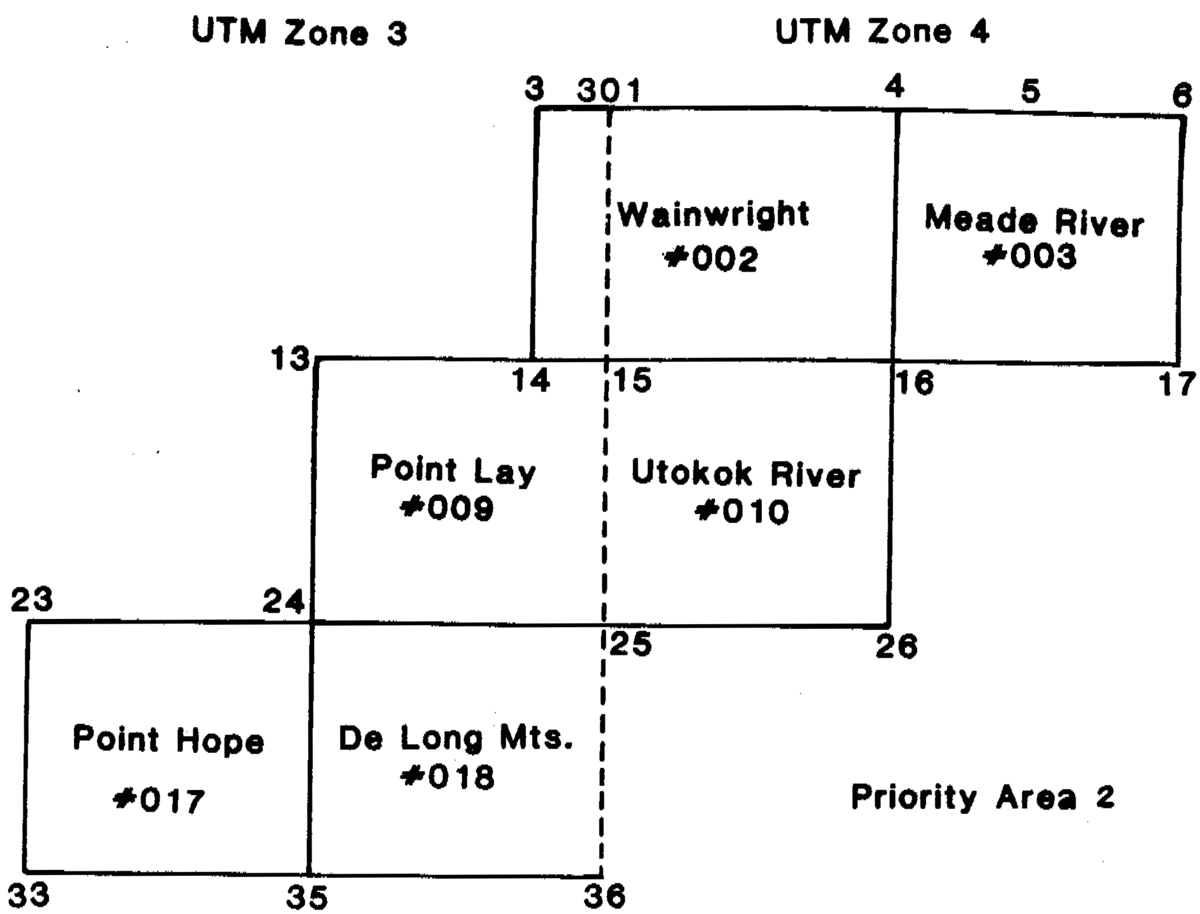
TIC#	Latitude	Longitude	UTM* Easting	UTM* Northing	UTM Zone
1	72°00′	157°30′	551733.0	989409.0	4
300	72°00′	156°00′	603437.0	991341.0	4
300	72°00′	156°00′	396562.0	991341.0	5
2	72°00′	154°30′	448266.0	989409.0	5
5	71°00′	157°30′	554502.0	877899.0	4
6	71°00′	156°00′	608975.0	879923.0	4
6	71°00′	156°00′	391024.0	879923.0	5
7	71°00′	154°30′	445497.0	877899.0	5
8	71°00	153°00′	500000.0	877225.0	5
9	71°00′	150°00′	608975.0	879923.0	5
9	71°00′	150°00′	391024.0	879923.0	6
10	71°00′	147°00′	50000.0	877225.0	6

*6,000,000 meters subtracted to decrease the number of digits for expediting processing.

Figure 3.2, continued

TIC#	Latitude	Longitude	UTM* Easting	UTM Northing	UTM Zone
17	70°00'	156°00'	614478.0	768514.0	4
17	70°00'	156°00'	385521.0	768514.0	5
18	70°00'	153°00'	500000.0	765697.0	5
19	70°00'	150°00'	614478.0	768514.0	5
19	70°00'	150°00'	385521.0	768514.0	6
20	70°00'	147°00'	500000.0	765697.0	6
28	69°00'	153°00'	500000.0	654182.0	5
29	69°00	150°00'	619947.0	657115.0	5
29	69°00	150°00'	380052.0	657115.0	6

Figure 3.3



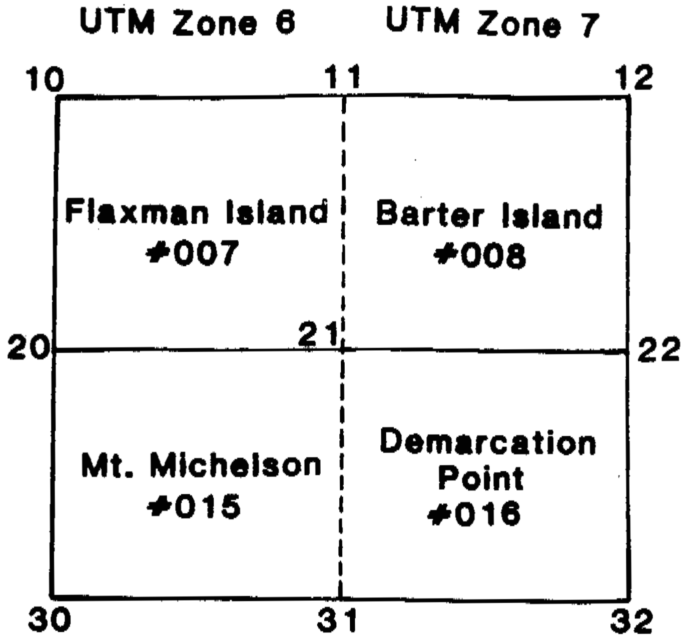
TIC#	Latitude	Longitude	UTM* Easting	UTM Northing	UTM Zone
3	71°00′	163	572664.0	878424.0	3
301	71°00′	162	608975.0	879923.0	3
301	71°00′	162	391024.0	879923.0	4
4	71°00′	159	500000.0	877225.0	4
5	71°00′	157°30′	554502.0	877899.0	4
6	71°00′	156	608975.0	879923.0	4
13	70°00′	165	500000.0	765697.0	3
14	70°00′	163	576334.0	766949.0	3
15	70°00′	162	614478.0	768514.0	3
15	70°00′	162	385521.0	768514.0	4
16	70°00′	159	500000.0	765697.0	4
17	70°00′	156	614478.0	768514.0	4

*6,000,000 meters subtracted to decrease the number of digits for expediting processing.

Figure 3.3, continued

TIC#	Latitude	Longitude	UTM* Easting	UTM·· Northing	UTM Zone
23	69°00′	168	380052.0	657115.0	3
24	69°00′	165	500000.0	654182.0	3
25	69°00′	162	619947.0	657115.0	3
25	69°00′	162	380052.0	657115.0	4
26	69°00′	159	500000.0	654182.0	4
33	68°00′	168	374621.0	545725.0	3
35	68°00′	165	500000.0	542681.0	3
36	68°00′	162	625378.0	545725.0	3

Figure 3.4



Priority Area 3

TIC#	Latitude	Longitude	UTM* Easting	UTM Northing	UTM Zone
10	71°	147°	500000.0	877225.0	6
11	71°	144°	608975.0	879923.0	6
11	71°	144°	391024.0	879923.0	7
12	71°	141°	500000.0	877225.0	7
20	70°	147°	500000.0	765697.0	6
21	70°	144°	614478.0	768514.0	6
21	70°	144°	385521.0	768514.0	7
22	70°	141°	500000.0	765697.0	7
30	69°	147°	500000.0	654182.0	6
31	69°	144°	619947.0	657115.0	6
31	69°	144°	380052.0	657115.0	7
32	69°	141°	500000.0	654182.0	7

*6,000,000 meters subtracted to decrease the number of digits for expediting processing.

4) Three-Mile Limit - defines a boundary which is three miles seaward of the general coastline boundary. Used specifically to identify the seaward limit of the North Slope Borough.

Table 3.1 provides a listing of the type of template(s) used on each coverage in each manuscript.

Table 3.1

Template Overlay Types

Manuscript	Coverage	Template
Integrated Terrain Unit	Polygon	Specific Coastline
Surface Hydrology	Polygon	Module Boundary
	Line	General Coastline
	Point	Module Boundary
Political/Administrative Units	Polygon	Specific Coastline/ Three Mile Limit
	Point	Module Boundary
Infrastructure, Settlements, Special Features	Line	Specific Coastline
	Point	Module Boundary
Energy and Mineral Resources	Polygon	Specific Coastline
	Point	Module Boundary
Elevation Provinces	Polygon	Module Boundary
Historic/Archaeologic Sites	Point	Module Boundary
NSB Planning Data	Polygon	General Coastline
	Line	General Coastline
	Point	Module Boundary
Subsistence Land Use	Polygon	Module boundary

INTEGRATED TERRAIN UNIT MAPPING PROCEDURES

Mapping Concept and Approach

The type of map with which most project managers and resource planners are familiar are termed parametric maps. These maps depict a single environmental characteristic, for example, geology or vegetation, and are primarily intended for analysis or display focused on that characteristic alone. The concept underlying integrated terrain unit mapping (ITUM) is the systematic combining (integration) of several such characterstics onto a single map which depicts all of them collectively while still maintaining the integrity and spatial accuracy of each individually.

The concept of the ITUM process is underlain by four general principles dealing with the distribution of natural features and the resolution of cartographic errors that are associated with combining mapped data from a multiplicity of scales and sources. These principles are summarized in Table 3.2. This table also presents problems encountered when attempting to do comprehensive analysis by overlaying parametric (single variable) maps and how these problems are resolved by the ITUM approach.

The first problem resolved through the use of the ITUM approach is a basic cartographic one and is important from the standpoint of information interpretation and display. The many environmental attributes present at a given location are naturally interrelated and coincident although each has unique characteristics which make the pattern of interrelationship infinitely variable (i.e., Principle One: Attributes of the landscape are truly interrelated). With parametric mapping, these attributes are mapped independently by disciplined professionals with different objectives using various map accuracies and standards. Therefore, the interrelatedness of attributes and their characteristics is not captured in the mapping. As a consequence, the overlay of this information to conduct comprehensive analysis almost invariably results in classification inconsistencies and geometric sliver errors - small areas created by the mismatching of boundaries which should be coincident.

Sliver errors derive in large part from a second associated principle presented in Table 3.2 which is that the change in natural geographic attributes from one classification to another is usually gradational and not an absolute fixed line. Therefore, the line represented on a map, either parametric or integrated, is actually an abstracted line representing a zone of transition. As a result, when independently prepared parametric maps are overlain, lines that are truly coincident almost never exactly overlay one another but instead produce sliver errors. The integration process resolves this sliver error problem by using a common basemap and common imagery to assist in defining the boundaries of the various attributes and resolving those boundaries into a single line representing the best fit of all the attributes. However, it should be noted that small polygons that truly have

Table 3.2

ITUM Principles and Solutions for Cartographic Error

Principle	Common Situations	Problems in Map Overlay	ITUM Solutions
1. Features of the Landscape are Interrelated	Parametric Mapping Rarely Recognizes Interrelationship of Land Attributes	Inconsistent Map Classes Inconsistent Sliver Errors	Reorganize Classification System Spatially Derive Lowest Common Integrated Unit
2. Polygon Boundaries Reflect Gradational Change	Inconsistent Gradational Boundary Delineations Between Parameters	Sliver Errors	Common Boundary Determination Through Multi-State Integration
3. Multiple Scales of Data can be Accurate but Inconsistent when Integrated to Common Scale	Line Crenulations and Unit Resolutions Vary	Sliver Errors Resolution Inconsistencies	Remap all Parametric Data to Common Resolution and Scale
4. Areal Information Changes Over Time	Maps are out of Date and Inconsistent with Respect to Time	Inconsistent Map Classes Inconsistent Data Reliability	Update Information Overlays to Common Data

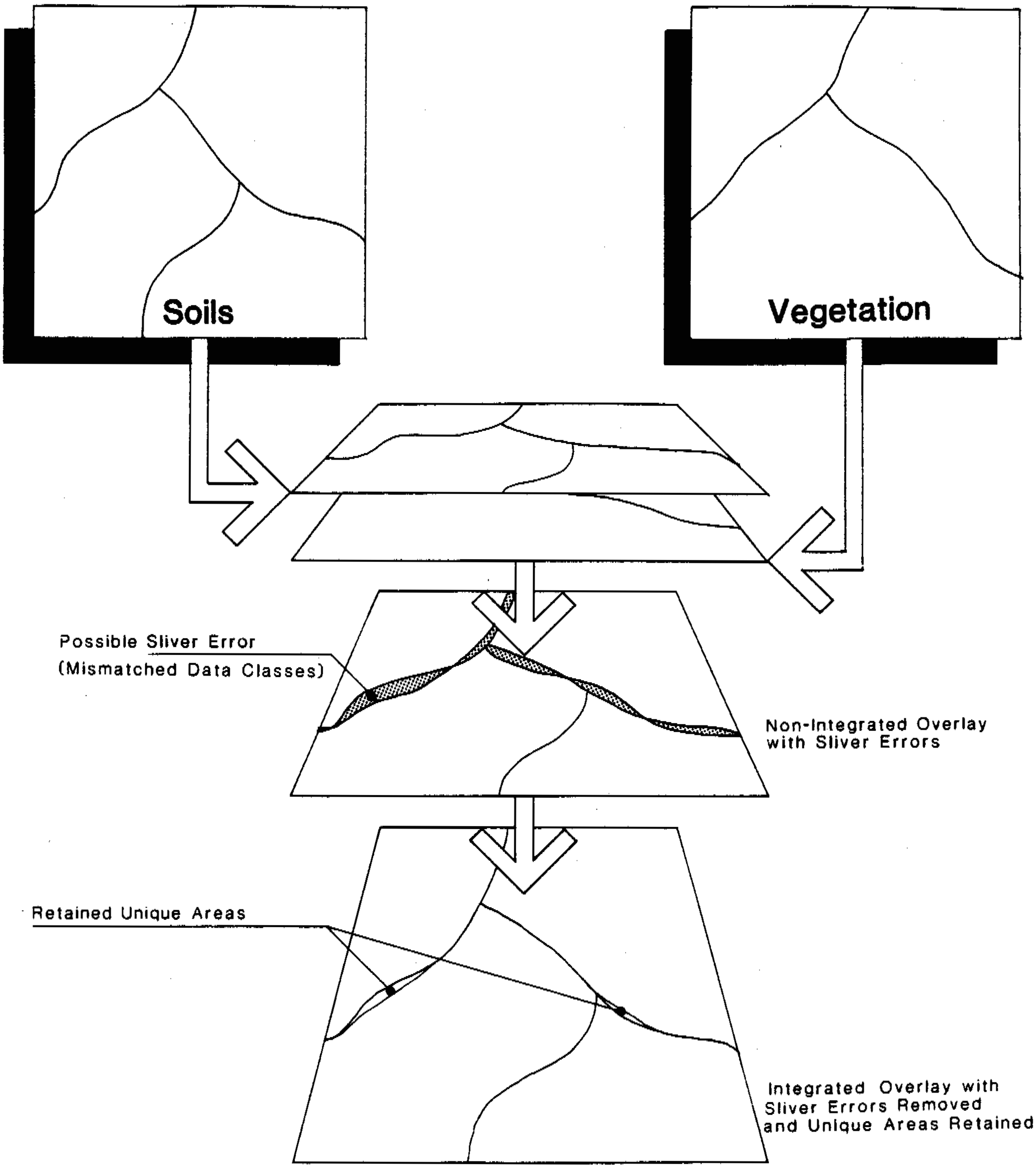
unique characteristics are retained. A simple illustration of this idea is presented in Figure 3.5.

The second major problem resolved through the ITUM process is data discrepancies resulting from using various sources at multiple scales which were prepared at different times (i.e., Principles 3 and 4). All information prepared for automation using the ITUM process is subjected to a second and simultaneous round of verification, updating and improvement of resolution using aerial photography and Landsat images. By methodically applying routine principles of image interpretation to each data class, the attributes included in the data base are consistently scrutinized. During this process, data discrepancies resulting from using various sources at multiple scales are detected and corrected either through applying image interpretation procedures or by obtaining verification or correction of the questionable data from the agency or group responsible for initial interpretation. Furthermore, automated techniques are used to conduct additional error checking following integration, including code and consistency checking between and among the variables.

The third problem resolved through the ITUM process deals with cost of automation. The cost of data base automation is a function of the number of maps to be automated, the complexity of lines on those maps and the computer time required to manipulate automated data. With parametric maps, a separate map for each data variable would require automation. The individual automated data files for each parameter would be cumbersome to overlay and would result in mismatched data sets, including sliver errors. In contrast, the ITUM process compresses many related variables onto one map. Consequently, the integration process reduces the time required to effectively computerize large numbers of variables. The manual integration process is more than paid for by savings of computer time to automate and manipulate the data. Moreover, the storage and analysis of the data in the computer is more efficient.

In summary, the ITUM process was developed to capture and coordinate the various environmental attributes. This type of mapping is a method of compressing a number of environmental factors from a variety of data sources onto a single map. This map displays homogeneous units (polygons) which have the same general characteristics distributed throughout. This procedure overcomes a number of basic problems of automating and analyzing natural resource data, and ultimately results in data incorporated into a data base which is of superior quality to the data input to such a process. This ITUM procedure was used in the preparation of Manuscript I. A discussion of the steps involved in the ITUM process follows.

Figure 3.5. Solving Sliver Errors Through Integration. When the soil and vegetation parametric maps are overlaid atop each other, boundaries which should be common to both are not precisely the same. Integration solves this problem.



Compilation Overlay Preparation

The first step in the ITUM process was the preparation of a compilation overlay for each variable contained on Manuscript I (slope, vegetation, geology, etc.). These maps were not integrated but independently drawn by resource specialists to the scale and map projection of the topographic basemaps. Three different methods were used to prepare the compilation overlays: 1) direct transfer with rectification/rescaling; 2) image interpretation; and 3) photorevision. Table 3.3 indicates the technique most frequently used for each variable mapped. After each compilation overlay was drafted the codes from the classification were assigned to each polygon.

1. Direct Transfer and Rectification/Rescaling

Data from source maps existing at a scale of 1:250,000 could be transferred directly to a compilation overlay. However, rectification of this data to the basemap was often required because of the many different cartographic techniques, mapping formats and map projections used in compilation of the original source maps.

Rectification was accomplished by carefully registering the source map with the basemap and comparing observable points or lines common on both, such as roads, buildings, ridges, stream course lines or waterbodies. The information was then drafted onto a mylar sheet (compilation overlay) which was pin registered to the basemap. Landsat imagery was used to check this reformatted data to ensure the currentness and accuracy of the information. The resulting compilation overlays displayed the scale, format, and projection of the basemaps and were suitable for use in subsequent data integration steps. Those data typically requiring rectification as part of direct transfer are identified in Table 3.3.

If the source data was mapped at a scale other than 1:250,000, rescaling preceded the rectification and transfer steps and was performed either manually or photographically. Data items which displayed simple legends or contained large mapping units were normally rescaled using an optical pantograph (Keuffel and Esser Kargl). This is a type of reflecting projector with a rated distortion of less than 0.01 percent. To rescale, the source map was placed on the Kargl platform and projected onto a glass surface. The scale of projection was controlled by altering the image-to-lens and lens-to-projection surface ratios. Once adjusted to the basemap scale (1:250,000), the data was manually drafted onto a mylar overlay registered to the topographic basemap. The maps drawn on the Kargl instrument were then carefully edited visually to ensure that all information had been transferred correctly.

Table 3.3
Thematic Map Compilation Overlay Method of Preparation

Variable	Direct Transfer Manual Rescaling	Direct Transfer Photo Rescaling	Image Interpretation	Photo Revision
Physiographic Province		1		
Topographic Character		1		
Landform			2	1
Slope				1
General Geology		1		2
Geology Quadrangle Based		1		
Mineral Terrane		1		
Flood Zone		1		
Soil			2	1
Vegetation			1	
Land Use				1
Scenic/Special Places		1		
Surficial Geology		1		
Surface Cover by Water				1

1 = Primary Method
2 = Secondary Method

When data items contained complex or detailed information, manual rescaling was too time consuming and the risk of code error through transposition or omission was also increased. In such instances, it was more efficient to photographically rescale the source data. A precision copy camera with a high resolution lens was used in this process to produce paper positives. The proper scale was assured by using a method called triangulation in which three points of known location were marked on the source data and then matched against the basemap on the camera's viewing glass. All three points were matched as closely as possible. This process achieved the most satisfactory match of map scales in both the horizontal and vertical directions.

2. Image Interpretation

Based on the initial data evaluation discussed in Chapter II, deficiencies in available data were identified. In some instances these deficiencies were remedied through the use of a remote sensing technique called image interpretation, or more commonly referred to as photointerpretation.

Image interpretation began with the development of an interpretive key for each variable. The key associated visually recognizable units of color, density, texture, and pattern with environmental surroundings such as landform, elevation, drainage pattern, and the relation of one area to another.

In cases where overlapping photography was available, a separate stereoscopic interpretation key was developed and used to provide three-dimensional image interpretation. Both keys provided information to the interpreters for facilitating consistent judgments and decisions for the interpretation of the map variables. Individual interpreters contributed to these keys those factors which worked best for them, while keeping consistent with keys used by other interpreters. Each interpreter kept a set of working decision rules which were regularly reviewed and updated by all interpreters. Interpretation relied upon a variety of remote sensor data types including: Landsat MSS, high and low altitude color infrared aerial photography, and high and low altitude black and white photography.

Image interpretations were performed by overlaying the Landsat images with the appropriate quadrangle basemap and a compilation overlay (mylar drafting film). Interpretive patterns and descriptive codes were identified through stereo viewing of the color infrared photography. These patterns were then identified on the Landsat images and were transferred directly onto the compilation overlay. Registration of the images to the basemaps gave careful consideration to resolving parallax problems. Though the Landsat images were scaled to the basemaps, a perfect match was frequently not attained. To resolve this, the interpreter registered one area of the image at a time, constantly re-registering the image to the basemap as mapping progressed. Accurate registration required alignment of linear or point features on the

Landsat image with those same features on the basemap. Such features included roads, stream courses, waterbodies, valleys, mountain ridges, and peaks.

3. Photorevision

In instances where the initial data evaluation showed a data source to be of good quality but out-of-date, subject to frequent change, or cartographically generalized, it was possible to upgrade the data through photorevision using the image interpretation techniques just described. In these instances, image interpretation did not result in the creation of totally new data, but rather, served to improve and add more detail to existing data when drafting the compilation overlay.

The process of photorevision involved a visual comparison of the data source in question to Landsat or other selected imagery. A compilation overlay on which the source data had already been drafted was attached to the topographic basemap. The map and compilation overlay were laid atop the imagery and the data were compared. Changes were made to the compilation overlay to reflect more accurate or detailed information identified on the imagery. As with image interpretation, registration during photorevision was maintained by shifting the image to match linear or point features.

Manuscript Map Integration

The next step in the ITUM process was the integration of the compilation overlays (CO), representing parametric maps of each variable to create a single sheet called a manuscript map. This involved manually merging the data shown on the compilation overlays together onto a single map, through comparison to Landsat images, the topographic basemaps, and each other.

Integration of the COs in a single ITUM for each quadrangle began by registering the two most reliable yet complex compilation overlays to the basemap at one time. This was generally landforms, vegetation or slope. A new mylar sheet, to be called an integration overlay (IO), was placed on top of this set for use in drafting of the integrated form of the first of the two compilation overlays, say landforms. The entire set was then registered and compared to the Landsat image and lines forming the integrated polygons of landforms were drafted onto the integration overlay. Deciding the best fit location for each integrated line delineating the landforms involved judgments by the integrator about the correlation between the variables, the reliability (accuracy) of each variable in terms of the original source data and its representation on the Landsat image, and the accuracy of registration between the layers forming the integration set (compilation overlays, basemap, Landsat image). For example, a landform unit might be identified as an old terrace deposit, and a corresponding soil type might be described as forming on old terrace deposits. Therefore, the polygons depicting these variables should have coincident boundaries. Through integration these coincident boundaries were achieved by using the Landsat image and basemap to make slight adjustments to the lines drawn around each unit forming the compilation overlays. The judgments leading to the line adjustments found their basis in the integration principles discussed at the beginning of this section. As integration judgments were made, they were documented to ensure consistent application for each quadrangle.

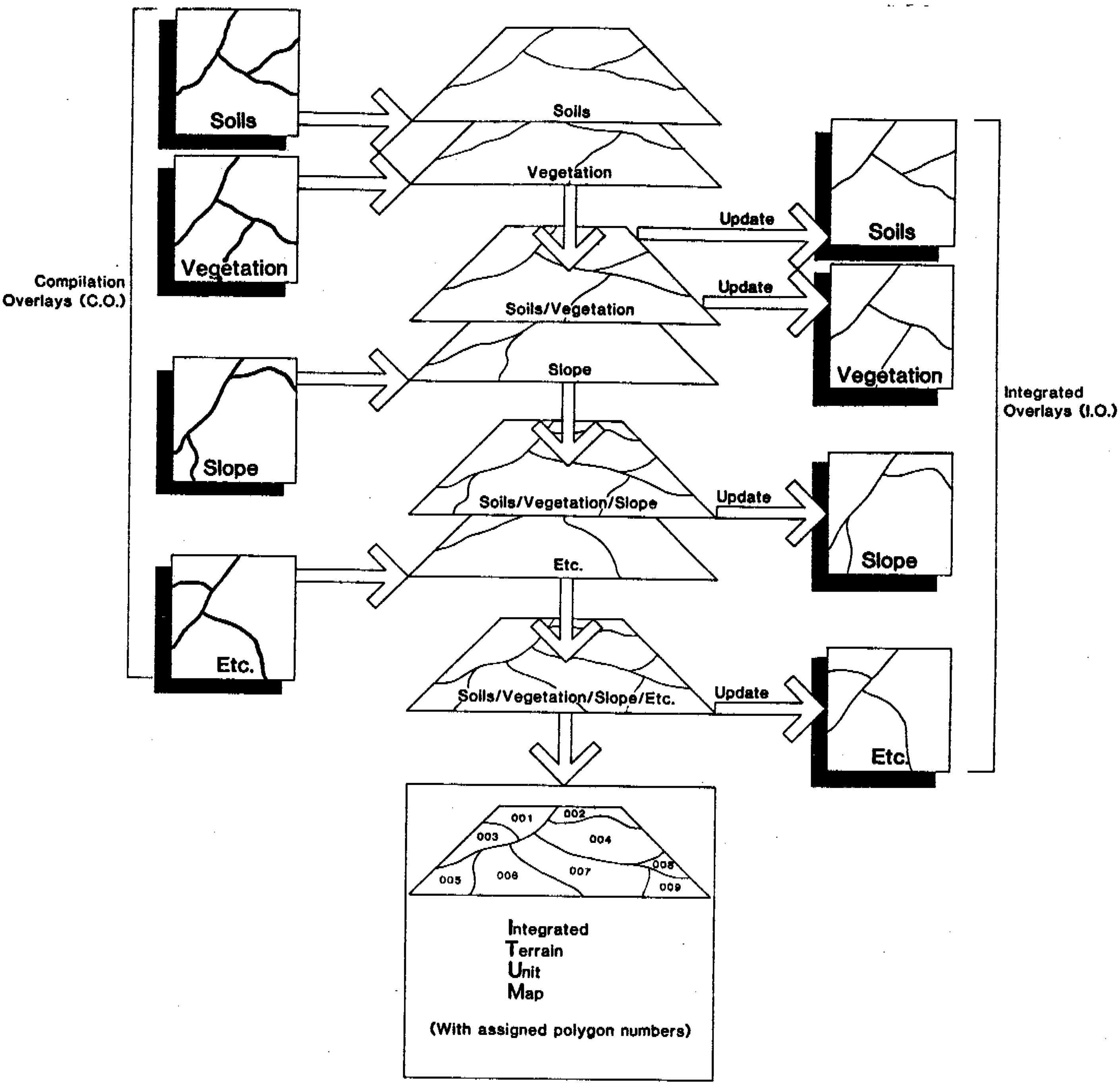
This integration process for the first variable continued until every map feature (polygon) had been checked against the Landsat images and basemap. Data codes were then transferred from the compilation overlay to the integration overlay. Upon completing integration of the first integration overlay, it replaced the corresponding compilation overlay within the integration set. At that point, the compilation overlay for the next most reliable data variable and a new, clean integration overlay were added to the set in order to begin integration of the second variable. Using the same process of checking and registering, a new integration overlay was drawn for the second and subsequently each of the other compilation overlays. Each new integration overlay was retained in the integration set so that the integrated polygon boundaries already decided upon were matched in drafting subsequent integration overlays. This ensured that the reliability of the first compilation overlays to be integrated was retained and, at times, added reliability to the delineation of subsequent variables. At the end of the entire integration process, a corresponding integration overlay had been prepared for each original compilation overlay. The compilation overlays represented a permanent record of the parametric rescaling, rectifying and/or interpreting of each variable, and the integration overlays represented the integrated form of each variable. That is, the compilation overlays represent the delineation from source data of variables alone, while the integration overlays for each variable represent the same parametric map, only now with its boundaries adjusted through the integration process. As a final step in preparing the integration overlays, each sheet was visually edited for correct transfer of information from the compilation overlays and correlation among data variables.

Following editing, the integration overlays were ready for consolidation to form the final integrated terrain unit blank manuscript map. Information from the boundaries overlay was first drafted onto the blank manuscript map, followed by compositing of all the integration overlays, one at a time. Each polygon formed through this process represented a terrain unit having its own unique set of characteristics which distinguished it from the adjacent areas. The manuscript map and integration overlays were subsequently used in the encoding and editing steps. These integration procedures are summarized in Figure 3.6. Portions of several integration overlays and the resulting final manuscript map for the Anchorage quadrangle are illustrated in Figure 3.7.

Adjacent Map Edge Match

To avoid mismatching of data sets between quadrangles, an important function of mapping was edgematching of lines and codes crossing over from one

Figure 3.6. Summary of the Integration Process. The process begins with integrations of the two most reliable compilation overlays (CO). To the resulting overlay is added data from the next CO, and so on. The process results in the ITUM manuscript and an integrated version of each CO.



quadrangle to an adjacent quadrangle. Edge matching was first performed during drafting of the compilation overlays by abutting adjoining sheets and editing/modifying line work and attribute codes using imagery or collateral maps. The edge match procedures were repeated during the integration process to ensure lines moved during integration remained properly matched.

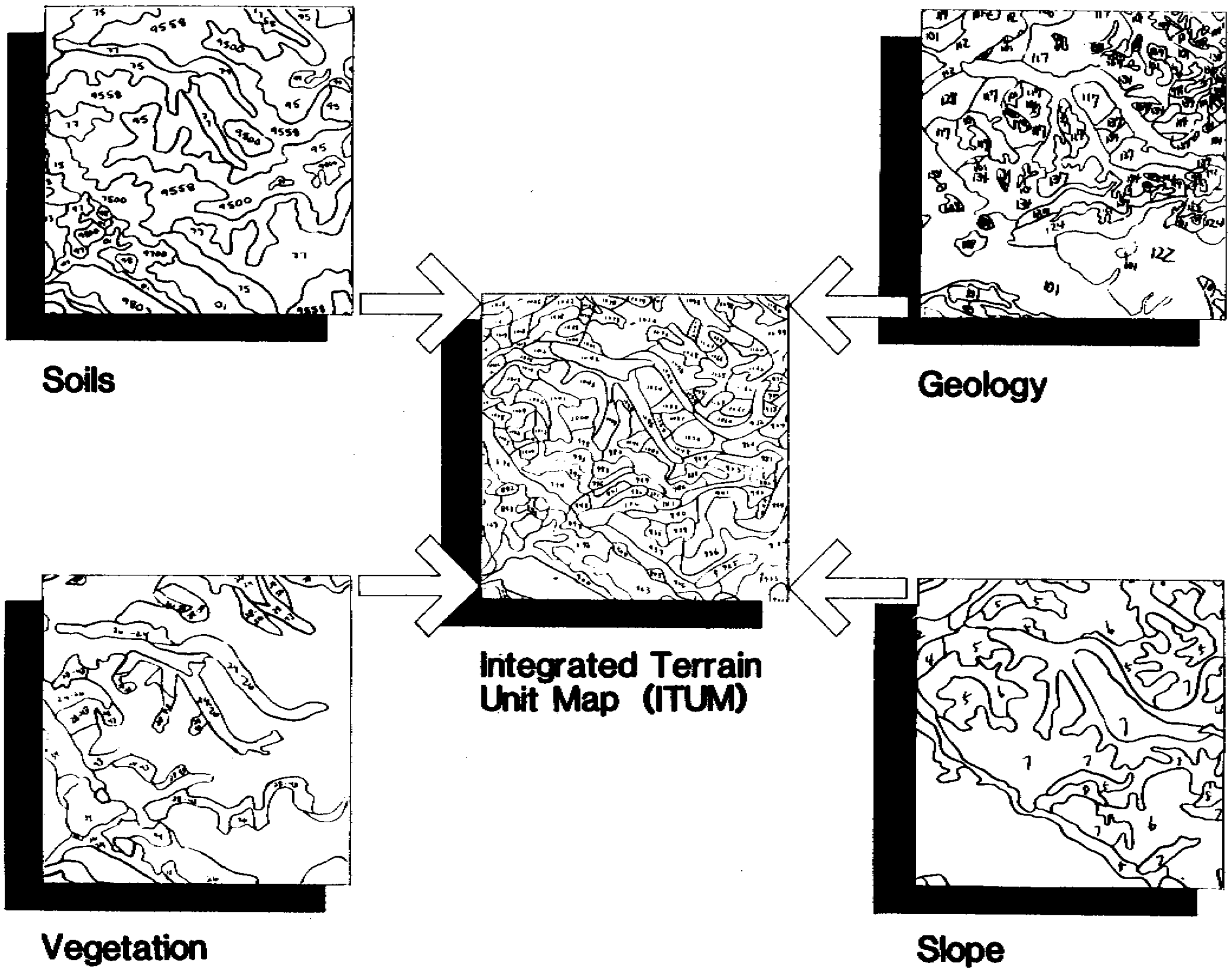


Figure 3. 8. Portions of the Anchorage ITUM. These examples are at mapping scale (1:250,000) and show the detail of data on the Anchorage ITUM. Numbers on the individual variable maps are codes from the data classification. Numbers on the ITUM are sequential numbers assigned to each polygon.

COMPOSITE MAPPING PROCEDURES

Composite Mapping Concept and Approach

The ITUM process was applied to Manuscript I where environmental characteristics exhibited complex interrelatedness in their distribution pattern. Data on Manuscripts II-IX generally did not exhibit such interrelatedness and were mapped using composite mapping procedures.

Composite mapping is based upon the same concept as ITUM, that is, combining several variables onto a single map in order to achieve more efficient automation and computer analysis while maintaining the integrity and accuracy of each variable. However, the approach to composite mapping is less complicated because the principles dealing with the distribution of natural geographic attributes are not a major consideration. Rather, the primary consideration is resolution of cartographic errors associated with the combining of mapped data from a multiplicity of scales and sources.

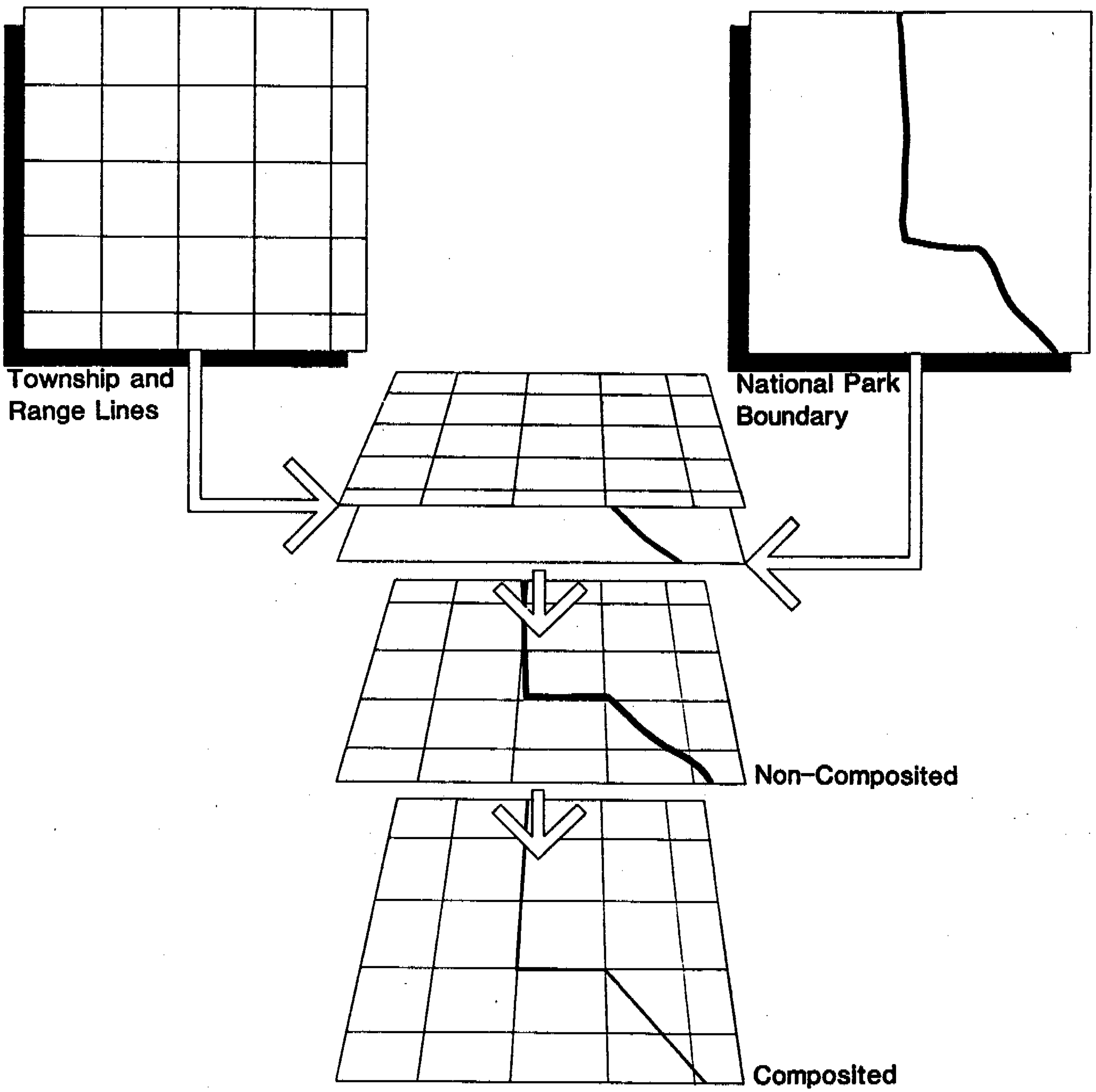
Composite Mapping Procedures

Similar to the ITUM, the first step in the composite mapping was preparing compilation overlays. These were prepared using the three procedures described previously for the ITUM process - direct transfer with rectification and rescaling, image interpretation, and photorevision.

To prepare composite manuscript maps from the compilation overlays, the intervening step of preparing integration overlays was not necessary. In most cases the polygon, line or point data were transferred directly to a mylar overlay to create the final manuscript. To avoid potential data conflicts, such as splinter polygons or other mismatched data sets, the source data and imagery were consulted during compositing. For example, if an administrative boundary was coincident with a township and range line, care was taken that these two data types were drafted as a single line. When it was necessary to combine coincident data sets such as in the example, the integration considerations of data reliability, accuracy and, when appropriate, correlation were applied. For linear and point data, correlation of coincident data was only infrequently a consideration as each line or point typically represented a single variable. Furthermore, its characteristics did not intersect or overlap with other point or line data on the same manuscript.

As each composite manuscript map was prepared, it was visually edited for correct transfer of information from the compilation overlay as well as correlation of coincident data. Following editing, the compilation overlays were used for encoding the manuscript maps, as described in the next section. Finally, the manuscript maps were edge matched with adjacent quadrangles. The composite mapping process is illustrated in Figure 3.8.

Figure 3.8. Summary of the Composite Mapping Process. This process ensures precise registration between variables that share similar boundaries.



NUMBERING AND ENCODING

Manuscript Numbering

The integrated or composited features (polygons, lines, points) displayed on the manuscripts were assigned sequential numbers according to the procedures outlined below. On composite manuscripts depicting more than one format of data (polygon, line, point), each format type was numbered separately and in a different color. For example, if a manuscript contained polygons and points, the polygons were drafted in lead pencil and numbered beginning with one. Points were then drafted in red pencil and numbered beginning with one. This procedure allowed easy visual separation of features, and was necessary for subsequent automation. The sequential numbering procedures included:

1) Starting Point - Numbering started in the upper left hand corner and generally ended in the lower right hand corner.

2) Numbering Sequence - The path of numbering flowed across the map in one direction, and then down and across the map in the reverse direction. This permitted any single sequence number to easily be found.

3) Donut Polygons - Polygons inside of larger polygons, called donut polygons, were numbered directly preceding the surrounding polygon in order to extract out the donut area during processing.

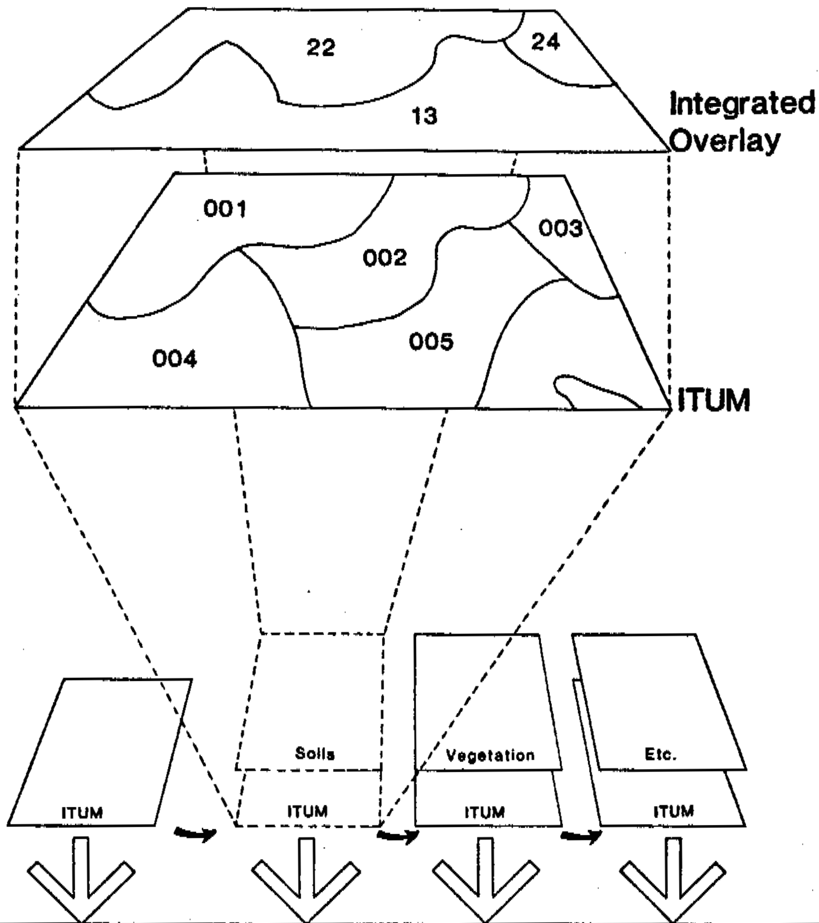
4) Missed Features - If a polygon, line or point was missed in the numbering flow after the manuscript had been completed, then the next sequence number to be given to the feature missed on the original numbering process was given in a contrasting color so that it could be easily found. It was also identified at the bottom of the manuscript along with an adjacent polygon number.

Encoding Forms

After every polygon, line or point on the manuscripts had been sequentially numbered, an encoding form was prepared. The encoding form served to associate the sequential numbers on the manuscripts with the data codes (from the classification system) on the integration or compilation overlays. To the first set of columns on the encoding forms were assigned the quadrangle number of the basemap and the sequence numbers of the polygons, lines or points. Data codes were then assigned specific fields, or sets of columns, on the encoding form. Each data layer represented by the integration or compilation overlay was encoded by overlaying the manuscript on top of the appropriate overlay. The variables were coded by reading the manuscript's sequential number and the corresponding data code number for that polygon, line or point. The data code was then recorded in the assigned column for that corresponding sequence number. The coding process continued until all data codes had been recorded for all polygons, lines, and points on the manuscripts. This process is graphically illustrated in Figure 3.9. For manuscripts containing features in more than one format (polygon, line, point), separate sets of encoding forms were prepared and appropriately identified for each format.

Variables were coded one at a time in order to minimize the potential for coding errors, such as transposed numerals or encoding in the wrong column(s). In addition, a manual edit including a final edge match followed to ensure the accuracy of the line delineations as well as the encoding process.

Figure 3.9. Manuscript Coding. Coding of the manuscript takes place by overlaying each integration or compilation overlay atop the manuscript and assigning the appropriate data codes to each polygon. In this example, polygon 001 on the ITUM has a soil code of 22.



Polygon Number			Soils		Vegetation		Etc.		
0	0	1	2	2	1	5	1	6	
0	0	2	2	2	2	5	0	9	

Code Sheet

CHAPTER IV: MAPPING METHODS AND CODE DESCRIPTIONS

INTRODUCTION

Chapter III described the two major procedures used to map information onto discrete manuscript maps, as well as the methods employed in encoding the mapped data. This chapter provides information on the specific methods used to map each variable onto its particular manuscript, the type of data source(s) used, and numeric codes and the descriptions used to define the different data classes for that variable. Specific citations of data sources are found in the volume entitled "Alaska Land and Resource Mapping Program, Data Bibliography for the First Year Priority Quadrangles, North Slope Borough".

For ease of reference, an alphabetical and topical listing of all variables in the data base are provided in Tables 4.1 and 4.2 These listings give the variable name, its manuscript location, its coverage name, and the page of its location within this chapter.

Table 4.1
Alphabetical Listing of Variables
and Their Manuscript Location

Variable	Manuscript Number	Coverage* Name	Page
Abandoned Mine Land Problem Areas	III	PAPL(module #)	4-III-21
Airport	IV	ICLN___	4-IV-10
Archaeology - State Historic/Archaeologic Sites	VII	HAPT___	4-VII-1
Area Meriting Special Attention, NSB (Polygon)	VIII	BPPL___	4-VIII-7
Area Meriting Special Attention, NSB (Line)	VIII	BPLN___	4-VIII-7
Arctic Slope Regional Corporation Boundary	VIII	ARC____	4-III-19
Cemetary	IV	ICPT___	4-IV-10
Census Areas	III	PAPL___	4-III-13
Coal - DGGS General Resource Areas	V	EMPL___	4-V-2
Coal - DGGS Isolated Resource Sites and Underground Mines (Inactive)	V	EMPT___	4-V-4
Coal Leases (Polygon)	III	PAPL___	4-III-11
Coal Leases (Point)	III	PAPT___	4-III-11
Coal Mining Permits	III	PAPL___	4-III-21
Coal Prospecting Permit Application (Polygon)	III	PAPL___	4-III-13
Coal Prospecting Permit Application (Point)	III	PAPT___	4-III-13
Coastal Zone, NSB	VIII	BPPL___	4-VIII-7
Electric Generation/Distribution Facility	IV	ICPT___	4-IV-12
Elevation Province	VI	EPPL___	4-VI-1
Escarpments	IV	INLN___	4-IV-2
Faults	IV	INLN___	4-IV-1
Fish - Anadromous Stream Surveys	II	HLN___	4-II-5
Fish - Anadromous Type	II	HLN___	4-II-5
Fish-Known Distribution of Selected Freshwater Species	II	HLN___	4-II-6
Fish - Selected Freshwater Species Type	II	HLN___	4-II-7
Flood Zone	I	TUPL___	4-Ig-1
Geology - General Source - Statewide	I	TUPL___	4-Id-1
Geology - General Unit - Statewide	I	TUPL___	4-Id-1
Geology - Quadrangle Based	I	TUPL___	4-Ie-1
Geology - Surficial	I	TUPL___	4-Im-1
Habitat/Game Distribution	VIII	BPDL___	4-VIII-1
Haul Road Corridor	III	PAPL___	4-III-18
Hazards, Natural	VIII	BPPL___	4-VIII-2
Historic and Cultural Resources	VIII	BPPL___	4-VIII-4
Historic Rivers	VIII	BPLN___	4-VIII-4
Hydroelectric Generation Site	IV	ICPT___	4-IV-13
Hydrologic Units-USGS	II	HPL___	4-II-7

*Each coverage is identified by acronym plus the three digit module number.

Table 4.1
Alphabetical Listing of Variables and Their Manuscript Location (continued)

Land Ownership - General (Polygon)	III	PAPL___	4-III-16
Land Ownership - General (Point)	III	PAPT___	4-III-16
Land Use	I	TUPL___	4-Ik-1
Landform Combination	I	TUPL___	4-Ib-2
Landform Connectors/Modifiers	I	TUPL___	4-Ib-3
Landform Type	I	TUPL___	4-Ib-3
Military Facility	III	PAPT___	4-III-20
Mine/Quarry (Surface) and Underground Mine Entrance	V	EMPT___	4-V-6
Mineral Deposits and Occurrences	V	EMPT___	4-V-6
Mineral Deposits and Occurences Folio Status	V	EMPT___	4-V-6
Mineral Terrane (ITUM)	I	TUPY___	4-If-1
Mineral Terrane (Energy & Minerals)	V	EMPY___	4-V-1
Mineral Terrane Documentation (ITUM)	I	TUPY___	4-If-1
Mineral Terrane Documentation (Energy & Minerals)	V	EMPY___	4-V-1
Minerals - Favorable Resource Areas Folio Status	V	EMPY___	4-V-4
Minerals - Favaorable Resource Areas	V	EMPY___	4-V-4
Municipality - Borough - Number/Name	III	PAPL___	4-III-2
National System Type	III	PAPL___	4-III-4
National System Type Number/Name	III	PAPL___	4-III-4
Navigation Facility	IV	PAPT___	4-IV-11
Oil and Gas Field	V	EMPY___	4-V-5
Oil and Gas Leases	III	PAPY___	4-III-17
Oil and Gas Well Status	V	EMPT___	4-V-5
Oil and Gas Wells	V	EMPT___	4-V-5
Passes, Mountain	VIII	BPLN___	4-VIII-5
Physiographic Province	I	TUPY___	4-Ia-1
Pingo or Mound	IV	INLN___	4-IV-9
Pipeline - Major System	IV	ICLN___	4-IV-5
Pipeline Type	IV	ICLN___	4-IV-5
Railroad	IV	ICLN___	4-IV-3
Reserves - Other Public and Private (Polygon)	III	PAPL___	4-III-11
Reserves - Other Public and Private (Point)	III	PAPT___	4-III-11
Road - State Highway Number	IV	ICLN___	4-IV-2
Road Capacity	IV	ICLN___	4-IV-2
Road Class	IV	ICLN___	4-IV-2
Road Surface Type	IV	ICLN___	4-IV-2
Roads, Winter	VIII	BPPL___	4-VIII-5
Resource Development Districts, NSB	VIII	BPPL___	4-III-18
Scenic/Special Places	I	TUPY___	4-Il-1
School and Mental Health Grant Lands (Historical) (Polygon)	III	PAPL___	4-III-20
School and Mental Health Grant Lands (Historical) (Point)	III	PAPT___	4-III-20

Table 4.1
Alphabetical Listing of Variables and Their Manuscript Location
(Continued)

Seabird Colony, Major	VIII	BPLN___	4-VIII-4
Seabird Colony, Minor	VIII	BPPT___	4-VIII-6
Service Area 10, NSB	VIII	BPPL___	4-III-19
Settlement	IV	ICPT___	4-IV-9
Slope	I	TUPY___	4-Ic-1
Soil - MLRA	I	TUPY___	4-Ih-1
Soil - Primary	I	TUPY___	4-Ii-1
Soil - Secondary	I	TUPY___	4-Ii-1
Special National Designation	III	PAPY___	4-III-3
State System Type (Polygon)	III	PAPY___	4-III-7
State System Type (Point)	III	PAPT___	4-III-7
State System Type Number/Name (Polygon)	III	PAPY___	4-III-7
State System Type Number/Name (Point)	III	PAPT___	4-III-7
Stream - Special National Designation	II	HLN___	4-II-4
Stream Condition	II	HLN___	4-II-3
Stream Discharge Profile	II	HLN___	4-II-3
Stream Order	II	HLN___	4-II-1
Stream Origin	II	HLN___	4-II-2
Stream Periodicity	II	HLN___	4-II-2
Stream Situation	II	HLN___	4-II-4
Subdivisions - Quadrangle Based (Polygon)	III	PAPL___	4-III-21
Subdivisions - Quadrangle Based (Point)	III	PAPT___	4-III-22
Surface Cover by Water	I	TUPY___	4-In-1
Thermal Springs	IV	INPT___	4-IV-8
Topographic Character and Situation	I	TUPY___	4-Ia-45
Township and Range - Half Township or Range Identifier	III	PAPY___	4-III-2
Township and Range - Quadrant	III	PAPY___	4-III-2
Township and Range - Range Number	III	PAPY___	4-III-2
Township and Range - Township Number	III	PAPY___	4-III-2
Trail - Department of Transportation Trail Number	IV	ICLN___	4-IV-6
Trail - Department of Transportation Quadrangle and Number	IV	ICLN___	4-IV-6
Trail - Iditarod National Historic Trail	IV	ICLN___	4-IV-6
Trail Type	IV	ICLN___	4-IV-6
Transmission Line Number	IV	ICLN___	4-IV-4
Transmission Line Type/Capacity	IV	ICLN___	4-IV-4
Vegetation - Modifier	I	TUPY___	4-Ij-8
Vegetation - Primary	I	TUPY___	4-Ij-1
Vegetation - Secondary	I	TUPY___	4-Ij-1
Village Areas of Influence	VIII	BPPL___	4-VIII-3
Volcano	IV	INPT___	4-IV-7
Watershed Units - ADNR STORET	II	HPL___	4-II-9

Table 4.2
Topical Listing of Variable and
Their Manuscript Location

Variable	Manuscript Number	Coverage Name	Page
Administrative Units			
Abandoned Mine Land Problem Areas	III	PAPL___	4-III-21
Areas Meriting Special Attention	VIII	BPPL___	4-VIII-7
Arctic Slope Regional Corporation	VIII	BPPL___	4-III-19
Census Areas	III	PAPL___	4-III-13
Coal Leases (Polygon)	III	PAPL___	4-III-11
Coal Leases (Point)	III	PAPT___	4-III-11
Coal Mining Permits	III	PAPL___	4-III-21
Coal Prospecting Permit Application (Polygon)	III	PAPL___	4-III-13
Coal Prospecting Permit Application (Point)	III	PAPT___	4-III-13
Coastal Zones, NSB	VIII	BPPL___	4-VIII-7
Municipality - Borough - Number/Name	III	PAPL___	4-III-2
National System Type	III	PAPL___	4-III-4
National System Type Number/Name	III	PAPL___	4-III-4
Oil and Gas Leases	III	PAPL___	4-III-17
Reserves - Other Public and Private (Polygon)	III	PAPL___	4-III-11
Reserves - Other Public and Private (Point)	III	PAPT___	4-III-11
Resource Development Districts	VIII	BPPY___	
Service Area 10	VIII	BPPY___	4-III-19
Special National Designation	III	PAPL___	4-III-3
State System Type (Polygon)	III	PAPL___	4-III-7
State System Type (Point)	III	PAPT___	4-III-7
State System Type Number/Name (Polygon)	III	PAPL___	4-III-7
State System Type Number/Name (Point)	III	PAPT___	4-III-7
Subdivisions - Quadrangle Based (Polygon)	III	PAPL___	4-III-21
Subdivisions - Quadrangle Based (Point)	III	PAPT___	4-III-22
Township and Range - Half Township or Range Identifier	III	PAPL___	4-III-1
Township and Range - Baseline and Principal Meridian Name	III	PAPL___	4-III-1
Township and Range - Quadrant	III	PAPL___	4-III-1
Township and Range - Range Number	III	PAPL___	4-III-1
Township and Range - Township Number	III	PAPL___	4-III-1
Village Areas of Influence	VIII	BPPL___	4-VIII-3
Archaeology			
Archaeology - State Historic/Archaeologic Sites	VII	HAPT___	4-VII-1
Historic and Cultural Resources	VIII	BPPY___	4-VIII-3
Historic Rivers	VIII	BPLN___	4-VIII-4
Biology			
Fish - Anadromous Stream Surveys	II	HLN___	4-II-5
Fish - Anadromous Type	II	HLN___	4-II-5
Fish - Known Distribution of Selected Freshwater Species	II	HLM___	4-II-6
Fish - Selected Freshwater Species Type	II	HLN___	4-II-6

North Slope Borough
Geographic Information System
Mapping Methodology and Code Description
Manuscript I
Integrated Terrain Unit

Overview

This manuscript is a polygon map which contains variables generally related to the natural features of the environment. These data include physiography, landforms, slope, geology, mineral terranes, flood zones, soils, vegetation, land use and scenic/special places. A detailed description of the integrated terrain unit mapping methodology is found in Chapter II of the Final Report. In summary, the underlying concept of the Integrated Terrain Unit approach is that the many environmental characteristics present at a given location are naturally interrelated and can be carefully integrated onto a single manuscript map for efficiency in data automation and manipulation. Individual parameter maps were produced at 1:250,000 for each variable using available source maps, aerial photography and Landsat imagery. The individual maps were then integrated with each other, one at a time, until a single manuscript had been produced. Line differences were resolved among related variables. Minimum mapping resolution was 640 acres except for waterbodies which were resolved to approximately 160 acres.

MINERAL TERRANES

Discussion

Mineral Terranes are those rocks whose environment of deposition, emplacement, or alteration is appropriate for the formation of specific types of mineral deposits. The mapped units are indicative of areas where such mineral formation has been known to occur. The original data was manually rescaled to 1:250,000. Following the rescaling, image interpretation was used to match terranes with their corresponding geologic units. Each Mineral Terrane was delineated to match only the particular geologic unit in the area where the collateral source indicated the presence of the Mineral Terrane. The same geologic unit occurring in other areas but not indicated as a Mineral Terrane was not identified or mapped as a Mineral Terrane. Those Mineral Terranes that do not correspond to data in the ITUM were put in Manuscript V.

Data Sources

Primary: - Arctic Environmental Information and Data Center, University of Alaska, Mineral Terranes of Alaska, Arctic Environmental Information and Data Center, University of Alaska, November, 1979 (1:1,000,000).

Secondary: - Geology maps and reports

Classification and Code Description

The classification system which was employed was based upon and is consistent with that identified in the collateral data source. Alpha symbols appear in parentheses.

The classification and codes are outlined below:

10 = Undifferentiated (includes Waterbodies) = Areas with no known Mineral Terrane.

Plutonic Igneous Terrane. Rocks formed at great depth by solidification of hot mobile material termed magma.

Granitic and Syenitic Rocks. Deep-seated intrusive (plutonic igneous) coarse and medium-grained.
21 = Undivided (IUG)
22 = Syenite, Monzonite and Peralkaline Granite (ISY)
23 = Granite and Quartz Monzonite (IGU)
24 = Granodiorite-Quartz Diorite (IGQ)

Mafic and Ultramafic Rocks
26 = Gabbro, Mafic Monzonite and Diorite (IGB)
27 = Ultramafic, Largely Peridotite (IBB)

Volcanic Igneous Terrane

Rhyolitic and Alkalitic Rocks
31 = Rhyolite and Quartz Latite (VRU)
32 = Trachyandesite, Alkalic or Peralkaline Volcanics (VTA)

Mafic Rocks
36 = Basalt (VGA)

Sedimentary Terrane

Marine Siliceous Shale and Carbonate Rocks
41 = Argillaceous Limestone, Intergrading Limestone and Shale (SLA)
42 = Bituminous or Carbonaceous Shale, Bituminous Limestone and Dark Chert (SHB)
43 = Phosphatic Shale and Phosphorite (SHP)
44 = Chert (SCH)

Mixed Volcanic-Sedimentary Terrane

Mafic Volcanic and Sedimentary Rocks
61 = Gradational Sequences Igneous to Sedimentary (VOP-VSU-SVU)
62 = Ophiolite: Ultramafic Rocks, Gabbro, Pillow Basalt, Dike Complexes, Minor Chert and Volcanic Sediments (VOP)
63 = Mafic Marine Volcanics (VSW)
64 = Marine Volcaniclastic Sediments (SVU)
65 = Tuffaceous Siliceous Shale and Siltstone (SVS)

Acidic Volcanic and Sedimentary Rocks
66 = Sedimentary and Volcanic Rocks Undivided (SVS)
67 = Quartz Latite Tuffs Intrusives and Domes (VRU)
68 = Bituminous or Carbonaceous Shale (SHB)

99 = Not a Mineral Terrane (includes areas of no data)

MINERAL TERRANE DOCUMENTATION

The following codes identify the relationship of Mineral Terranes to the mapped geology units.

1 = Documented. Modified to geology map
2 = Documented. No corresponding geology map
3 = Interpreted. No corresponding Mineral Terrane unit.

9 = Not a Mineral Terrane

PHYSIOGRAPHIC PROVINCE AND TOPOGRAPHIC CHARACTER AND SITUATION

Discussion

Physiographic Provinces or divisions divide Alaska into areas which are homogeneous topographically and are sufficiently distinct from the areas around them that the physical appearance of each region can be described. These regional areas are differentiated on the basis of general topography, drainage, geology and presence or absence of lakes and glaciers. These regions are illustrated in Figure 4.1. The U.S. Geological Survey source map was manually rescaled to 1:250,000. Integration of this data was achieved by comparing the generalized boundaries of this data with more specific geologic and topographic boundaries. Because these units were designed to provide a regional perspective rather than detailed site information, no attempt was made to substantially alter the source map. Line adjustments reflect a more detailed map scale and a different map projection. Landsat image patterns and topographic patterns were used to establish final line placement.

Data Sources

Primary: - Wahrhaftig, Clyde, Physiographic Divisions of Alaska, U.S. Geological Survey, Professional Paper 482, 1965 (1:2,500,000).

Secondary: - Landsat imagery

Classification and Code Description

A. Physiographic Province

INTERIOR PLAINS
Arctic Coastal Plains
011 = Teshekpuk Lake
012 = White Hills

General Topography - The Arctic Coastal Plain is a smooth plain rising imperceptibly from the Arctic Ocean to a maximum altitude of 600 feet at its southern margin. The coastline makes little break in the profile of the coastal plain and shelf, and the shore is generally only 1 to 10 feet above the ocean; the highest coastal cliffs are only 50 feet high. The Arctic Coastal Plain province is divided into the Teshekpuk and White Hills sections. Scattered groups of low hills rise above the plain in the White Hills section; the Teshekpuk section is flat. Locally, an abrupt scarp 50 to 200

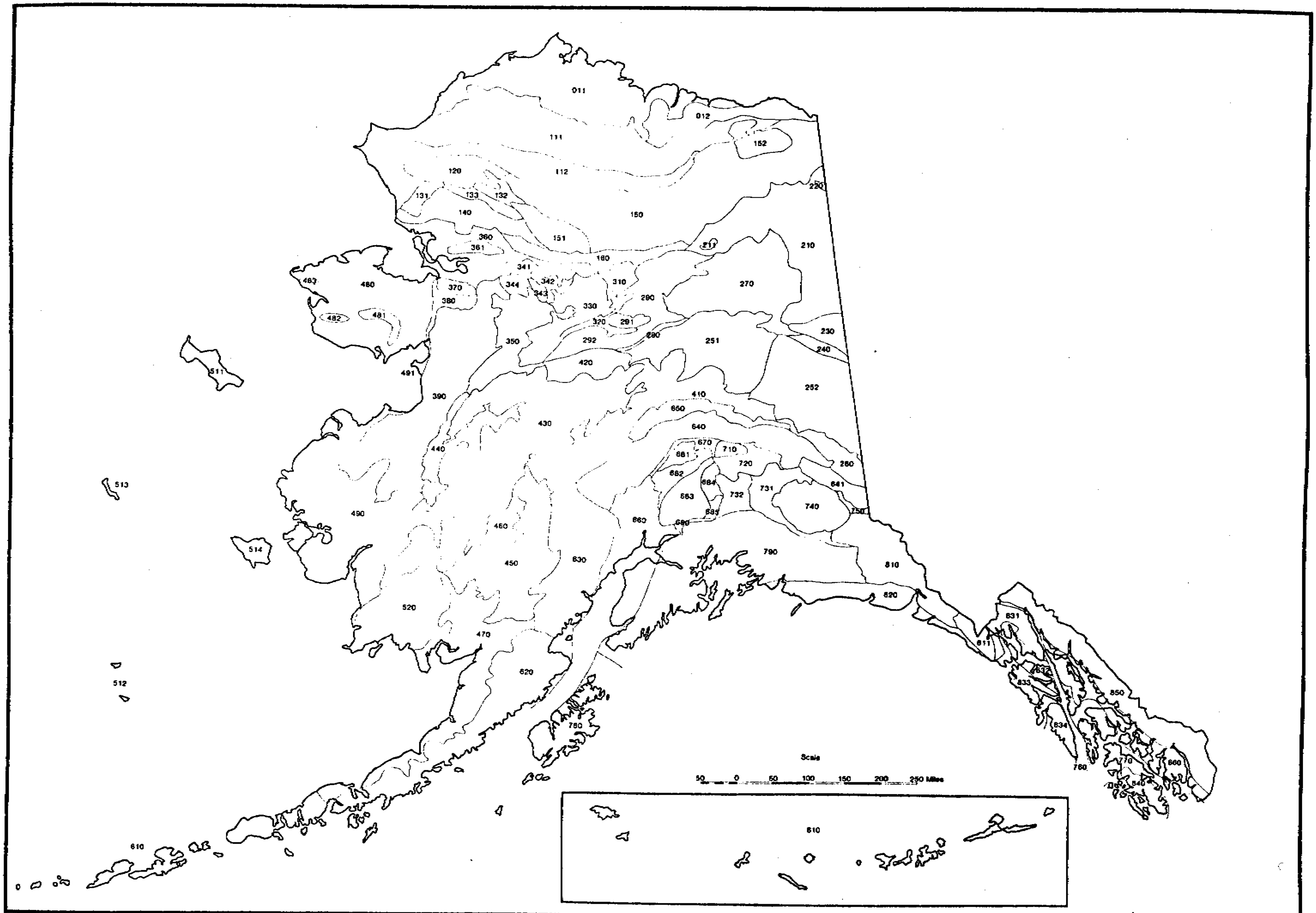


Figure 4.1
Physiographic Provinces of Alaska

feet high separates the coastal plain from the Arctic Foothills. Locally pingos are sufficiently abundant to give an undulatory skyline. The part of the coastal plain between the Kuk and Colville Rivers has scattered longitudinal sand dunes 10 to 20 feet high trending N. 55 to 75 E.

Drainage - The Arctic Coastal Plain is very poorly drained and consequently is very marshy in summer. It is crossed by rivers which head in the highlands to the south. Rivers west of the Colville River meander sluggishly in valleys incised 50 to 300 feet; those east of the Colville cross the plain in braided channels and are building deltas into the Arctic Ocean.

Lakes - The Teshekpuk Lake section of the Arctic Coastal Plain province is covered by elongated thaw lakes oriented N. 15 W.; these range from a few feet to 9 miles long, are from 2 to 20 feet deep, and are oval or rectangular in shape. The lakes expand about 1 meter per year in places, and several generations of drained lake basins may be seen.

Glaciers and Permafrost - There are no glaciers. The entire land area is underlain by permafrost at least 1,000 feet thick. The permafrost table (base of zone of summer thaw) is 1/2 to 4 feet below the surface. A network of ice-wedge polygons covers the coastal plain. These are oriented parallel and perpendicular to receding shorelines because of stress differences set up by horizontal temperature gradients. Random ice wedge polygons form in areas where the stress is more uniform.

Geology - The Teshekpuk Lake section is underlain by 10 to 150 feet of unconsolidated Quarternary marine sediments resting on nearly flat coal bearing Cretaceous sedimentary rocks. In addition, the White Hills section contains lower Tertiary sedimentary deposits.

ROCKY MOUNTAIN SYSTEM
Arctic Foothills
111 = Northern
112 = Southern

General Topography - The Arctic Foothills consist of rolling plateaus and low linear mountains; they are divided into two sections: the northern section rises from an altitude of 600 feet on the north to 1,200 feet on the south and has broad east-trending ridges, dominated locally by mesalike mountains and the southern section is 1,200 to 3,500 feet in altitude, has local relief of as much as 2,500 feet, and is characterized by irregular buttes, knobs, mesas, east-trending ridges and intervening gently undulating tundra plains.

Drainage - The Arctic Foothills are crossed by north-flowing rivers from sources in the Brooks Range. The Colville River, the largest stream, has an anomalous east-trending course for more than 220 miles along the boundary between the northern and southern sections. Most streams have swift, braided courses across broad gravel flats that are locally covered in winter with extensive sheets of aufeis, or anchor ice, that freezes to the riverbeds; this filling of the channels causes the streams to flood their gravel flats.

Lakes - A few thaw lakes are present in the river valleys and on some divides. The upper valleys of major rivers from the Brooks Range contain many morainal lakes.

Glaciers and Permafrost - There are no glaciers. The entire province is underlain by permafrost. Ice wedges, stone stripes, polygonal ground, and other features of a frost climate are common.

Geology - The northern section is underlain by Cretaceous sedimentary rocks deformed into long linear folds of the Appalachian type. Unequal erosion of layers of rock that differ in hardness has produced the linear-ridge topography. The southern section is underlain by diverse sedimentary rocks of Devonian to Cretaceous age together with mafic intrusions, all tightly folded and overthrust to the north. A pre-glacial gravel-covered pediment surface is preserved on some divides between north-flowing rivers. Hummocky morainal ridges border most valleys issuing from the central Brooks Range.

Arctic Mountains Province

120 = <u>De Long Mountains</u>

General Topography - The central part of the De Long Mountains consists of rugged glaciated ridges that are 4,000 to 4,900 feet in altitude and have a local relief of 1,500 to 3,000 feet. Narrow even-crested ridges in the lower eastern and western parts rise to 3,000 to 4,000 feet. Many passes about 3,500 feet in altitude cross the range. The north boundary with the Arctic Foothills is irregular and indistinct, but the south front is abrupt.

Drainage - Streams from the De Long Mountains flow south and west to the Noatak River and the Chukchi Sea and north to the Arctic Ocean. The drainage divide is at the north edge of the mountains. Asymmetry of passes, barbed drainage, wind gaps, perched tributaries, and abandoned valley systems suggest that the divide has moved northward by stream capture.

Lakes, Glaciers, and Permafrost - There are no lakes or glaciers in the De Long Mountains. The entire section is underlain by permafrost.

Geology - The De Long Mountains consist of folded and faulted sedimentary rocks of Devonian to Cretaceous age, intruded by massive diabae sills that are the chief cliff-forming units; structural trends are westward in the eastern and northern mountains and change to southwestward in the southwestern part. The eastern and northern De Long Mountains are a great sheet thrust north over the rocks of the Arctic Foothills.

Noatak Lowlands

131 = Mission Lowland

132 = Aniuk Lowland

133 = Cutler River Upland

General Topography - Two broad lowlands surrounded by hills and separated by a rolling upland lie along the Noatak River. The Mission Lowland is broad tundra flat, containing thaw lakes and pingos 25 to 300 feet high and crossed by the forested floodplain of the Noatak River; it merges with the surrounding foothills by silt uplands intricately dissected by thaw sinks. The Aniuk Lowland is an irregular rolling plain that slopes gradually upward on the south to merge with a subsummit upland in the Baird Mountains. The intervening upland is the Cutler River Upland.

Drainage - The two lowlands and the Cutler River Upland are drained entirely by the Noatak River, which rises in the western part of the Schwatka Mountains. The Noatak crosses the Cutler River Upland and the Igichuk Hills south of the Mission Lowland by narrow cliffed gorges a few hundred feet deep.

Lakes - The Mission Lowland has numerous thaw lakes. There are scattered morainal and thaw lakes in the Aniuk Lowland.

Glaciers and Permafrost - There are no glaciers. The entire section is underlain by permafrost, and pingos abound in the Mission Lowland.

Geology - Bedrock geology beneath the lowlands is probably similar to that of surrounding uplands and mountains. The entire valley of the Noatak was probably glaciated in pre-Wisconsin time, but glaciers of Wisconsin time occupied only part of the Aniuk Lowland and reached only the north edge of the Mission Lowland. The depth of alluvial fill in the lowlands is unknown. Rounded gravel is reported 850 feet above the Noatak in the Cutler River Upland, and the course of the Noatak across the upland may be superposed.

140 = Baird Mountains

General Topography - Moderately rugged mountains having rounded to sharp summits 2,500 to 3,000 feet in altitude rise abruptly from lowlands on the south and west to a subsummit upland along the crest of the Baird Mountains. This subsummit upland slopes gently northward and merges with the Aniuk Lowland and Cutler River Upland. Scattered groups of higher mountains (3,500 to 4,500 feet in altitude) rise above the subsummit upland; they were centers of glaciation in Pleistocene time. The indistinct boundary with the Schwatka Mountains on the east is drawn where the relief increases abruptly eastward.

Drainage - The Baird Mountains are drained by streams that flow north to the Noatak River and south to the Kobuk River. The south-flowing streams head in narrow ravines having steep headwalls, several hundred feet high, incised in broad flat passes that are the beheaded parts of north-draining valleys. This relationship indicates that the divide is migrating to the north by headward erosion.

Lakes and Glaciers - There are no lakes or glaciers in the Baird Mountains.

Geology - Schist, quartzite, and limestone of Paleozoic age make up most of the Baird Mountains. Structural trends are eastward and the internal structure is probably anticlinorial. Differential erosion involving limestone and volcanic rocks of a northeast-trending anticline along the northwest border of the mountains has produced prominant northeast-trending ridges.

Central and Eastern Brooks Range

150 = <u>Main Unit</u>

151 = <u>Schwatka Mountains</u>

152 = <u>Romazof Mountains</u>

General Topography - The central and eastern Brooks Range is a wilderness of rugged glaciated east-trending ridges that rise to generally accordant summits 7,000 to 8,000 feet in altitude in the northern part and 4,000 to 6,000 feet in altitude in the southern part. The easterly grain of the topography is due to belts of hard and soft sedimentary and volcanic rocks. The mountains have cliff-and-bench slopes characteristic of glacially eroded bedded rocks. Abrupt mountain fronts face foothills and lowlands on the north.

Drainage - The drainage divide between the Bering Sea and Arctic Ocean drainages is near the north edge of the range west of long. 149 W. and in the center of the range east of long. 149 W. The major rivers flow north to the Arctic Ocean and south to the Yukon, Koyukuk, and Kobuk Rivers in flat-floored glaciated valleys 1/2 to 2 miles wide; they have a broad dendritic pattern. Minor tributaries flow east and west parallel to the structure, superimposing a trellised pattern on the dendritic pattern of the major drainage.

Lakes - Large rock-basin lakes lie at the mouths of several large glaciated valleys on the north and south sides of the range. The Brooks Range in general is characterized by a paucity of lakes for a glaciated area.

Glaciers - Small cirque glaciers are common in the higher parts of the range, in the Schwatka Mountains and in mountains around Mount Doonerak. The firn line is at an altitude of about 6,000 feet in north-facing cirques and about 8,000 feet in south-facing cirques. Valley glaciers 6 miles long are fed from cirques and small icecaps in the Romanzof Mountains.

Geology - The central and eastern Brooks Range is composed chiefly of Paleozoic limestone, shale, quartzite, slate, and schist. Northeast of the Sagavanirktok River the Paleozoic rocks are in faulted folds overturned to the north. Elsewhere, they are in giant plates or nappes thrust to the north. The deformation is of Laramide age. The north front of the range is made of light-colored cliff-forming Mississippian limestone. Rocks south of lat. 68 N. are metamorphosed and generally equivalent in age to those far ther north. Granitic intrusions underlie the higher parts of the Schwatka Mountains and Romanzof Mountains, both of which rise to 8,500 to 9,000 feet in altitude.

160 = <u>Ambler-Chandalar Ridge and Lowland Section</u>

General Topography - This section consists of one or two east-trending lines of lowlands and low passes 3 to 10 miles wide and 200 to 2,000 feet above sea level, bordered on the north by the abrupt front of the Brooks Range. Along the south side is a discontinuous line of rolling to rugged ridges, 25 to 75 miles long and 5 to 10 miles wide, rising to 3,000 to 4,500 feet in altitude. Some of these ridges were intensely glaciated. Within the lowlands are east-trending ridges 5 to 10 miles long.

Drainage - The western part of the section is drained by tributaries of the Kobuk River; the central part, by the Koyukuk River and its tributaries; and the eastern part, by the Chandalar River. Most streams flow south out of the Brooks Range across both the lowlands and the ridges to lowlands farther south. The drainage was probably superposed but may have been disoriented later by glaciers. The Chandalar River flows east along the eastern part of the trough.

Lakes - Several large lakes fill ice-carved rock basins in deep narrow canyons across the southern ridge. Areas of ground and end moraines contain many ponds. The floodplains of the major streams have thaw lakes and oxbow lakes.

Glaciers and Permafrost - The section contains no glaciers but is underlain by continuous permafrost.

Geology - The ridges are composed in part of resistant massive greenstone (metamorphosed basalt) of Mesozoic (?) age. The lowlands are underlain largely by Cretaceous sedimentary rocks, folded into synclines. Pleistocene glaciers from the Brooks Range extended across the lowland and through passes in the line of ridges.

INTERMONTANE PLATEAU
Northern Plateaus Province
Porcupine Plateau
210 = Main Unit
211 = Thazzik Mountains

General Topography - Low ridges having gentle slopes and rounded to flat summits 1,500 to 2,500 feet in altitude dominate the topography of the Porcupine Plateau; a few domes and mountains rise to 3,500 feet. Valley floors are broad; and valley patterns, irregular, having many imperceptible divides. Thazzik Mountain in the extreme west, a rugged glaciated mountain group, rises to 5,800 feet.

Drainage - The entire plateau, except the extreme northeastern part, is drained by tributaries of the Yukon River. The Chandalar, Sheenjek, and Coleen Rivers rise in the Brooks Range and flow south across the plateau in broad vallyes floored with moraines and outwash terraces. The Porcupine River crosses the plateau in a narrow cliff-lined canyon 50 to 500 feet deep. The Black and Little Black Rivers which drain the southeastern part of the area meander through broad irregular flats.

Lakes - A few moraine-dammed lakes lie in glaciated passes and valleys along the north margin of the plateau. The largest of these is Old John Lake, 5 miles long and 2 miles wide. Scattered thaw lakes occur in lowlands and low passes.

Glaciers and Permafrost - There are no glaciers. The entire section is underlain by continuous permafrost.

Geology - The northern part is underlain by crystalline schist, granite, quartzite, slate, and mafic rocks, probably mostly Paleozoic in age; the southeastern part is underlain by moderately deformed Paleozoic and Mesozoic sedimentary rocks. Basinlike areas of Tertiary rocks and flat-lying Cenozoic flows occur along the Porcupine River.

220 = Old Crow Plain

General Topography - The Old Crow Plain lies mainly in Canada. The Alaskan section contains a wide valley in its northeastern part with a general elevation of 1,000 to 2,000 feet. The southwestern part rises from the valley and becomes the southeastern foothills of the Davidson Mountains with peak elevations of 3,000 feet.

Drainage - The Alaskan Section of the Old Crow Plain is drained in the north by the upper reaches of the Old Crow River and in the south by its tributary, Bilwaddy Creek. Ultimately, the Old Crow River empties into the Porcupine River.

Lakes - The Alaskan Section of the Old Crow Plain has several small lakes in the northeastern part on either side of the Old Crow River.

Glaciers and Permafrost - There are no glaciers. The entire section is underlain by permafrost.

Geology - The Alaskan Section of the Old Crow plain is underlain by rocks of mainly sedimentary origin from Cambrian to Triassic age. Some metasedimentary rocks underlie the hills rimming the section. The surficial geology consists mainly of alluvium of Quaternary Age.

230 = <u>Olgilvie Mountains</u>

General Topography - The Ogilvie Mountains have sharp crestlines, precipitous slopes, and deep narrow valleys; they rise to 5,000 feet in altitude, and local relief is as much as 4,000 feet. The ridges are interconnected and passes are few. The narrow valleys are interrupted by gorges where rivers cross cliff-forming layers of rock.

Drainage - The Ogilvie Mountains are drained by the Kandik, Nation, and Tatonduk Rivers, all tributaries of the Yukon River.

Lakes - Small thaw lakes and oxbow lakes are along the Yukon River in the southern part of the mountains.

Glaciers and Permafrost - There are no glaciers. Most of the section is underlain by permafrost, and pingos are common.

Geology - Moderately folded and faulted sedimentary and volcanic rocks ranging in age from late Precambrian to Cretaceous make up the mountains. Some formations of limestone, dolomite, quartzite, and greenstone are in massive cliff-forming beds. Continental sandstone and conglomerate of Late Cretaceous and early Tertiary (?) age underlie a lowland on the upper Nation River.

240 = <u>Tintina Valley</u>

General Topography - The Tintina Valley is a narrow belt of low country consisting of low rounded ridges and open valleys, which pass northwest into loess-covered terraces and a lake-dotted plain that connects with the Yukon Flats section. Relief in the southeastern part (southeast of Woodchopper Creek) is 1,000 to 1,500 feet, and ridges rise to 2,000 to 2,500 feet in altitude. Discontinuous low hills on the north separate this part from the Yukon River, and the mountains of the Yukon-Tanana Upland rise gradually above it on the southwest.

The northwestern part, around Circle Hot Springs and Birch Creek, is a lake-dotted plain that slopes gradually upward to the base of surrounding hills, and that is separated from the Yukon River by a flat-topped gravel ridge about 400 feet high and 3 to 4 miles wide.

Drainage - The southwestern part is Alaska is drained chiefly by small north-flowing streams that rise in the upland to the south and have superimposed courses to the Yukon River in narrow valleys across hills of resistant rocks on the north. The northwestern part is drained largely by Birch Creek, which flows parallel to the Yukon into the Yukon Flats.

Lakes - There are no large lakes in the southwestern part. The plain of the northwestern part has several thaw lakes; the largest, Medicine Lake, is nearly 2 miles across.

Glaciers and Permafrost - This section contains no glaciers but is generally underlain by permafrost.

Geology - The Tintina Valley is underlain by a synclinal belt of highly deformed, easily eroded continental sedimentary rocks of Cretaceous and Tertiary age that are probably in sedimentary contact with the metamorphic and granitic rocks of the Yukon-Tanana Upland on the south and with the well-consolidated Paleozoic and Mesozoic sedimentary rocks of the Ogilvie Mountains on the north. Northwest of Woodchopper Creek, loess mantles flat-topped ridges and hides most bedrock outcrops. The geology beneath the plain near Circle Hot Springs is unknown.

Yukon-Tanana Upland
251 = Western Part
252 = Eastern Part

General Topography - The Yukon-Tanana Upland is the Alaskan equivalent of the Klondike Plateau in Yukon Territory. Rounded even-topped ridges with gentle side slopes characterize this section of broad undulating divides and flat-topped spurs. In the western part these rounded ridges trend northeast to east; they have ridge-crest altitudes of 1,500 to 3,000 feet and rise 500 to 1,500 feet above adjacent valley floors. The ridges are surmounted by compact rugged mountains 4,000 to 5,000 feet in altitude. Ridges in the eastern part have no preferred direction, are 3,000 to 5,000 feet in altitude but have some domes as high as 6,800 feet, and rise 1,500 to 3,000 feet above adjacent valleys. In the extreme northeast the ridges rival the Ogilvie Mountains in ruggedness. Valleys in the western part are generally flat, alluvium floored, and 1/4 to 1/2 mile wide to within a few miles of headwaters. Streams in the eastern part that drain to the Yukon flow in narrow V-shaped terraced canyons, but the headwaters of the Fortymile and Ladue Rivers are broad alluvium-floored basins.

Drainage - The entire section is in the Yukon drainage basin. Streams flow south to the Tanana River and north to the Yukon River. Most streams in the western part follow courses parallel to the structural trends of bedrock, and several streams have sharp bends involving reversal of direction around the edge of ridges of hard rock. Drainage divides are very irregular. Small streams tend to migrate laterally southward.

Lakes - The few lakes in this section are mainly thaw lakes in valley floors and low passes.

Glaciers and Permafrost - There are no glaciers. The entire section is underlain by discontinuous permafrost. Periglacial mass-wasting is active at high altitudes, and ice wedges lace the frozen muck of valley bottoms.

Geology - A belt of highly deformed Paleozoic sedimentary and volcanic rocks containing conspicuous limestone units, overthrust and overturned to the north, extends along the north side of the upland. The rest of the upland is chiefly Precambrian (?) schist and gneiss but has scattered small elliptical granitic intrusions in the northwestern part; large irregular batholiths make up much of the southeastern part. In the western part a thick mantle of windborne silt lies on the lower slopes of hills, and thick accumulations of muck overlie deep stream gravels in the valleys. Alluvial deposits of gold and other metals abound.

260 = <u>Northway-Tanacross Lowland</u>

General Topography - The Northway-Tanacross Lowland consists of three small basins, separated by screens of low rolling hills. The two basins along the north side of the lowland are nearly level plains, broadly oval in plan. Scattered longitudinal dunes mark the floor of the eastern one of these two basins. The third basin, on the southeast, is a gently rolling moraine-covered plain.

Drainage - The entire lowland is drained by the Tanana River, which may have captured the lowland in early Pleistocene time, for the drainage divide with the Yukon River is only 2 to 5 miles north of the Tanana and the north tributaries of the Tanana are steep barbed streams. The headwaters of the Yukon drainage north of the divide are underfit streams in broad valleys that head in wind gaps.

The main tributaries of the Tanana rise in glaciers in mountains to the south, and their deposits of outwash have pushed the Tanana against the north side of the lowland. The upper courses of these streams are swift and braided; their lower courses and the course of the Tanana are sluggish and meandering.

Lakes - Large lakes in reentrants in the surrounding hills may be caused by alluviation of the lowland. Thaw lakes abound in areas of fine alluvium, which are as much as 70 percent lake surface. Oxbow lakes and morainal ponds are also present.

Glaciers and Permafrost - The lowland has no glaciers; it is in the area of discontinuous permafrost.

Geology - The basins are mantled with outwash gravel, silt, and morainal deposits. The two northern basins were probably occupied by a lake dammed by a glacier at Cathedral Rapids. Tertiary rocks have been reported on the north wide and may extend beneath the Quarternary deposits. Bedrock hills are Precambrian (?) schist and Mesozoic granitic intrusions. The Taylor Highway immediately north of Tetlin Junction passes through a field of stabilized sand dunes.

270 = Yukon Flats Section

General Topography - The central part of the Yukon Flats section consists of marshy lake-dotted flats rising from 300 feet in altitude on the west to 600 to 900 feet on the north and east. The northern part of the flats is made up of gently sloping outwash fans on the Chandalar, Christian, and Sheenjek Rivers; the southeastern part of the flats is the broad gentle outwash fan of the Yukon River. Other areas are nearly flat flood plains. Rolling-silt and gravel-covered marginal terraces having sharp escarpments 150 to 600 feet high rise above the flats and slope gradually upward to altitudes of about 1,500 feet at the base of surrounding uplands and mountains. Their boundaries with surrounding uplands and mountains are gradational.

Drainage - The Yukon Flats section is drained by the Yukon River, which has a braided course southeast of the bend at Fort Yukon and a meandering course, containing many sloughs, southwest of the bend at Fort Yukon. Most tributaries rise in surrounding uplands and mountains and have a meandering course through the flats.

Lakes - Thaw lakes are abundant throughout the flats. Thaw lakes and thaw sinks are common on the marginal terraces.

Glaciers and Permafrost - There are no glaciers. Permafrost probably underlies most of the section except rivers, recently abandoned meander belts, and large thaw lakes.

Geology - Escarpments bounding the Yukon Flats expose well-consolidated or crystalline rocks of Paleozoic and possibly Mesozoic age. The marginal terraces are capped with gravel on which rests a layer of windborne silt. A well drilled at Fort Yukon in 1954 disclosed 48 feet of aeolian sand of late Pleistocene or Recent age, underlain by 100 feet of sandy gravel of Pleistocene age, underlain in turn by at least 292 feet of fine lake sediments of late Pliocene or early Pleistocene age. On the basis of this well it is thought that the Yukon Flats are the site of a late Tertiary lake that occupied a downwarped basin.

280 = Rampart Trough

General Topography - The Rampart Trough is a structurally controlled depression having gently rolling topography 500-1,500 feet in altitude; it is incised 500 to 2,500 feet below highlands on either side. Terraces on tributaries of the Yukon River near Rampart are 20 feet, 100 feet, 150 feet, 250 feet, and 500 feet above stream level.

Drainage - The Yukon River enters the east end of the trough through a narrow rocky gorge and swings in broad bends from one side of the trough to the other within a narrow floodplain. Near the southwest end, a ridge of hard rock separates the Yukon River from the trough. Short tributaries rise in hills to the south, and flow across the trough and through the bedrock ridge on its north side to the Yukon. The Yukon and its tributaries appear to be superposed from a surface at least 1,500 feet in altitude.

Lakes - Scattered thaw lakes lie on the Yukon floodplain and elsewhere in the trough.

Glaciers and Permafrost - The Rampart Trough contains no glaciers. Permafrost underlies all the lowland except the Yukon floodplain.

Geology - The Rampart Trough was eroded along a tightly folded belt of soft continental coal-bearing rocks of Tertiary age. Hard rock hills and the surrounding uplands are partly metamorphosed sedimentary and volcanic rocks of Mississippian age that strike about N. 60 E. and are cut by granitic intrusions.

Kokrine - Hodzana Highlands

290 = Main Unit

291 = Ray Mountains

292 = Kokrine Hills

General Topography - The Kokrine-Hodzana Highlands consist of even-topped rounded ridges rising to 2,000 to 4,000 feet in altitude surmounted by isolated areas of more rugged mountains. A rugged compact highland in the northeastern part has many peaks between 4,500 and 5,700 feet in altitude. The Ray Mountains, rising to 5,500 feet, have cirques and glaciated valleys and craggy cliffed tors that rise abruptly from broad granite ridgetops. Valleys have alluviated floors to within a few miles of their heads.

Drainage - The irregular drainage divide between the Yukon River and its large tributary, the Koyukuk River, passes through these highlands. Drainage to the Yukon is by way of the Hodzana, Tozitna, Melozitna and Dall Rivers and many shorter streams. Drainage to the Koyukuk is by the Kanuti River and the South Fork of the Koyukuk.

Lakes - There are a few thaw lakes in the lowland areas and a few lakes in north-facing cirques in the Kokrine Hills and the Ray Mountains.

Glaciers and Permafrost - There are no glaciers. The entire section is probably underlain by permafrost. This section contains classic examples of altiplanation terraces, stone polygons, and other periglacial phenomena.

Geology - The highlands are underlain chiefly by Paleozoic and Precambrian (?) schist and gneiss having a northeast-trending structural grain, cut by several granitic intrusions, the largest of which is the granite batholith that upholds the Ray Mountains. Small placers of tin and gold occur in the southern part of the highlands.

Western Alaska Province

310 = Kanuti Flats

General Topography - The Kanuti Flats form an irregular shaped lake-dotted plain 400 to 1,000 feet in altitude that merges with low surrounding hills. Scattered low irregular hills rise in the central part of the plain, which is crossed by the forest-covered meander belts of the Koyukuk and Kanuti Rivers.

Drainage - The Kanuti Flats are drained by the Koyukuk River and its tributaries. The Kanuti River, which drains the southern part of the plain, flows through a narrow canyon in the Indian River Upland before joining the Koyukuk River.

Lakes - There are numerous thaw lakes, some as large as 2 miles across. Some parts of the flats are more than 50 percent lake surface.

Glaciers and Permafrost - The flats contain no glaciers. The section is underlain by permafrost except beneath large lakes, rivers, and recently formed floodplains.

Geology - The geology of the Kanuti Flats in unknown.

320 = Tozitna-Melozitna Lowland

General Topography - The Tozitna-Melozitna Lowland is a long, narrow rolling plain, 5 to 10 miles wide, at the heads of the Tozitna and Melozitna Rivers. The pass between these streams is less than 1,000 feet in altitude.

Drainage - The lowland is drained by the Tozitna and Melozitna Rivers, which flow south from the lowland in narrow gorges across the Kokrine-Hodzana Highlands to the Yukon River.

Lakes - The lowland contains numerous thaw lakes. Oxbow lakes are common along the Melozitna River.

Glaciers and Permafrost - The section has no glaciers; it is in the area of discontinuous permafrost.

Geology - Nothing is known of the geology of this lowland.

330 = Indian River Upland

General Topography - Groups of low gentle ridges having rounded accordant summits at 1,500 to 2,000 feet altitude are interspersed with irregular lowlands and broad flat divides. The ridges in the southeastern part are generally parallel and trend northeastward; ridges in the northwestern part have irregular trends. A few mountains rise to 4,000 feet in altitude. The Koyukuk and Kanuti Rivers cross the upland in narrow canyons a few hundred feet deep.

Drainage - Most of the Indian River Upland is drained by the Koyukuk River and its tributaries. The northwest corner drains to the Kobuk River and the southeastern part drains by the Melozitna River to the Yukon. Many of the streams have extremely irregular courses.

Lakes - Numerous thaw lakes, the largest 2 1/2 miles across, are in the lowlands, valleys, and broad passes.

Glaciers and Permafrost - There are no glaciers. The entire land area, except recent floodplains, is underlain by permafrost, and periglacial processes predominate. Altiplanation terraces are common at high altitudes.

Geology - The Indian River Upland is underlain chiefly by folded sedimentary and volcanic rocks of Mesozoic age, in which sandstone, shale, and conglomerate predominate. These rocks are intruded by small granitic stocks, and are overlain by remnants of flat-lying avas of Tertiary or Quaternary age. Structural trends are northeastward in the southeastern part but are poorly defined in the northern part.

340 = Pah River Section
341 = Lockwood Hills
342 = Pah River Flats
343 = Zane Hills
344 = Purcell Mountains

General Topography - The Pah River section is an area of diversified topography. Compact groups of hills and low mountains 20 to 40 miles long and rising to 4,000 feet in altitude are surrounded by rolling plateaus 500 to 1,500 feet in altitude and broad lowland flats 5 to 10 miles across. The lower parts of the mountain groups consist of gently rounded ridges; their higher glaciated parts contain broad, shallow cirques having flaring walls.

Drainage - The northern and western parts of the Pah River section drain to the Selawik and Kobuk Rivers. The southern and eastern parts drain via the Huslia and Hogatza Rivers to the Koyukuk River. The major streams meander sluggishly through the broad lowlands. The Pah River, which drains the Pah River flat flows north to the Kobuk through a narrow canyon across the Lockwood Hills.

Lakes - Numerous thaw lakes lie in the lowland flats. The central part of the Pah River flats is probably 50 percent lake surface. A few small cirque lakes occur in the higher glaciated parts of the Lockwood Hills and the Zane Hills.

Glaciers and Permafrost - There are no glaciers. The entire section is underlain by permafrost, and periglacial erosional processes predominate. Altiplanation terraces are common below the level of glaciation in the Zane Hills and the Purcell Mountains.

Geology - The Pah River section is underlain by Mesozoic volcanic and sedimentary rocks that are intensely deformed and locally contact metamorphosed, without strong persistent structural grain, and by Mesozoic granitic stocks and batholiths.

350 = Koykuk Flats

General Topography - The Koyukuk Flats form an extensive lowland of irregular outline at the junction of the Yukon and Koyukuk Rivers. The central parts of th Koyukuk Flats are flat plains 5 to 20 miles wide, along the major rivers. The parts immediately adjacent to the rivers are meander belts 5 to 10 miles wide; the parts farther away are dotted by thaw lakes. Broad rolling silt plains, in part mantled by dunes and in part pocked by thaw sinks, stand 100 to 200 feet above these central plains and merge imperceptibly with the surrounding uplands. Several low bedrock hills rise from the center of the lowland.

Drainage - The Koyukuk Flats are drained by the Yukon River and its tributaries. Streams meander wildly across the lowland and have numerous meandering side sloughs. Lateral migration of meanders is as much as 75 feet per year, and elaborate patterns of bars and swales (meander-scroll pattern) are left behind.

Lakes - The meander belt has innumerable narrow meander-scroll lakes and small oxbow lakes; these are generally silted by floods, and the newly formed ground freezes perennially. Subsequently, thaw lakes form in the frozen ground and pass through a complicated cycle of enlargement, coalescence, and destruction by infilling or drainage. These thaw lakes are abundant away from the rivers.

Glaciers and Permafrost - No glaciers exist in the flats. All the land area except recently formed floodplains is underlain by permafrost.

Geology - The bedrock hills and surrounding uplands are chiefly Cretaceous sedimentary rocks, older Mesozoic volcanic rocks, and some intrusions. Low basalt hills rise from the central part of the lowland. The plains are underlain by water-laid and windborne silt. Sand dunes are common; a large barren area of active sand dunes lies in the northwestern part. Northeast-trending scarplets and low rises that cross the lowland presumably mark active faults.

Kobuk-Selawik Lowland
360 = Main Unit
361 = Waring Mountains

General Topography - The Kobuk-Selawik Lowland consists chiefly of broad river floodplains and lake-dotted lowlands that pass at their seaward margins into deltas. The Baldwin Peninsula, which separates Hotham Inlet from Kotzebue Sound, is a rolling lake-dotted lowland containing hills as high as 350 feet in altitude, bordered by bluffs. The Waring Mountains are an east-trending group of low rounded hills less than 2,000 feet in altitude. The upper valley of the Kobuk River is bordered by gravel and sand terraces 100 to 200 feet above river level that are dotted with thaw lakes and thaw sinks and, on the south side of the river, have large areas of both stabilized and active sand dunes.

Drainage - The lowland is drained mainly by the Kobuk and Selawik Rivers. Most streams are sluggish, meandering, of low gradient, and have numerous side sloughs.

Lakes - The area around the Selawik River, in particular, has numerous large thaw lakes. Hotham Inlet and Selawik Lake are large bodies of water at sea level that are kept nearly fresh by the great outflow of the Selawik, Kobuk, and Noatak Rivers.

Glaciers and Permafrost - Glaciers are absent. Most land area is underlain by permafrost. Pingos are abundant in the lowland around the Selawik River.

Geology - Most of the lowland areas are underlain by morainal deposits and by stream and lake deposits of unknown thickness.

Baldwin Peninsula is probably the end moraine of a pre-Wisconsin glacial advance. In Wisconsin time glaciers from the Brooks Range sent tongues into the upper valley of the Kobuk but did not advance farther. The Waring Hills are underlain by Cretaceous sedimentary rocks.

370 = Selawik Hills

General Topography - The Selawik Hills are gentle hills having rounded to flat summits as much as 3,300 feet in altitude. The hills rise fairly abruptly, with a relatively straight scarp, from the Kobuk-Selawik Lowland on the north and decline gently to the Buckland River Lowland on the south. Altiplanation terraces are common on the higher summits.

Drainage - The hills are drained by short streams that flow south and west to the Buckland River or north to the Kauk River, Selawik River, and Selawik Lake.

Lakes, Glaciers, and Permafrost - There are no lakes or glaciers. The entire section is underlain by permafrost.

Geology - The Selawik Hills are underlain chiefly by Paleozoic and Mesozoic metamorphosed volcanic rocks and granitic intrusive rocks. Quaternary volcanic rocks lie on the flanks.

380 = Buckland River Lowland

General Topography - The Buckland River Lowland is a rolling lowland having slopes of a few feet to a few hundred feet per mile and consisting largely of the original surfaces of lava flows.

Drainage - The lowland is drained mostly by the Buckland River. The Tagagawik River drains the extreme eastern part, and the Koyuk River the southern prong.

Lakes - Small thaw and oxbow lakes are common along the Buckland River and in other flat valleys. A few thaw lakes lie on some flat interfluves.

Glaciers and Permafrost - There are no glaciers. The entire section is probably underlain by permafrost.

Geology - The lowland is underlain chiefly by flat lying lava flows of Quaternary age, mantled by a thick layer of windborne silt.

390 = Nulato Hills

General Topography - The Nulato Hills consist, in general, of northeast-trending even-crested ridges, 1,000 to 2,000 feet in altitude, having rounded summits and gentle slopes. Valleys are narrow and have flat floors that are generally trenched in their upstream parts to depths of about 30 feet. Local relief is 500 to 1,500 feet. The topography is relatively fine textured; gullies are spaced 500 to 1,500 feet apart and second-order tributaries are 1/2 to 1 mile apart. Three highland areas of steeper ridges rise to about 4,000 feet in altitude.

Drainage - Streams on the east side of the section flow to the Yukon River and those on the west side to Norton Sound. Major streams are markedly parallel, flowing either northeast or southwest, and their courses are eroded along northeast-trending fault zones. Valley heads are generally connected by low passes along the faults.

Lakes - There are a few thaw lakes in the valleys.

Glaciers and Permafrost - There are no glaciers. The entire section is probably underlain by permafrost.

Geology - Almost all of the hills are composed of tightly folded sandstone, conglomerate, and shale of Cretaceous age. The folds trend about N. 45 E. but bend around to northward in the northern part. The rocks are cut by northeast and north-trending faults. A few mountains are underlain by post-Cretaceous intrusive and volcanic rocks. Older rocks, chiefly of volcanic origin, make up the hills in the extreme northern part and extreme southern part.

410 = Tanana-Kuskokwim Lowland

General Topography - The Tanana-Kuskokwim Lowland is a broad depression bordering the Alaska Range on the north; its surfaces are of diversified origin. Coalescing outwash fans from the Alaska Range slope 20 to 50 feet per mile northward to flood plains along the axial streams of the lowland. Rivers from the range flow for a few miles at the heads of the fans in broad terraced valleys 50 to 200 feet deep. Semi-circular belts of moranal topography lie on the upper end of some fans. The floodplains of the Kuskokwim and Kantishna Rivers and of the Tanana River west of the Tolovana are incised 50 to 200 feet below the level of the lowland. Several nearly level projections of the lowland extend into uplands on the north. Large fields of stabilized dunes cover the northern part of the lowland and lower slopes of adjacent hills between Nenana and McGrath.

Drainage - The central and eastern parts of the lowland are drained by the Tanana River, and the southwestern part is drained by the Kuskokwim River. Braided glacial streams rising in the Alaska Range flow north across the lowland at intervals of 5 to 20 miles. Outwash has pushed the axial streams -- the Tanana, Kuskokwim, and Kantishna Rivers -- against the base of hills on the north side. Tightly meandering tributaries of low gradient flow into the section from the north.

Lakes - Thaw lakes abound in areas of fine alluvium. Thaw sinks are abundant in areas of thick loess cover.

Glaciers and Permafrost - The lowland contains no glaciers. The entire section is an area of permafrost. Porous gravel at the heads of the outwash fans, however, have a deep water table and dry permafrost (ground perennially at temperatures below freezing but having no ice).

Geology - The outwash fans grade from coarse gravel near the Alaska Range to sand and silt along the axial streams. Areas north of the axial streams are underlain by thick deposits of "muck", a mixture of frozen organic matter and silt. Parts of the southwestern part of the lowland have thick loess cover, but the central and eastern parts are free of loess south of the Tanana River. Scattered low hills of granite, ultramafic rocks, and Precambrian (?) schist rise above the outwash. Tertiary conglomerate in the foothills of the Alaska Range plunges beneath the lowland in a monocline, and the heads of the outwash fans may rest on a pediment cut across this conglomerate. The base of the alluvial fill near Fairbanks is at or below sea level.

420 = Nowitna Lowland

General Topography - The Nowitna Lowland is a rolling silt-covered tableland ranging from 250 to 900 feet in altitude and having a local relief of 50 to 250 feet and slopes of 100 to 150 feet per mile into which the flat floodplains of the major rivers (valleys 1 1/2 to 10 miles wide) have been incised 150 to 300 feet. A line of gentle bedrock hills in the center rises to 1,500 feet. The tableland south of the line of hills is covered with longitudinal and sigmoid dunes and has been dissected by steep-walled gullied canyons.

Drainage - The entire lowland is drained by the Yukon River, which follows the north boundary. The confluence of the Yukon with the Tanana River is in the eastern part of the lowland. The southern part of the lowland is drained by the Nowitna River, a tributary of the Yukon, and its tributaries. Parallel drainage of small tributaries of the Chitinana River and other streams in silt uplands of the eastern part may be consequent upon the flanks of a recent upwarp.

Lakes - Oxbow lakes are common in the central parts of the meander belts. Thaw lakes abound in the marginal areas and throughout the silt- and dune-covered uplands.

Glaciers and Permafrost - The lowland contains no glaciers; it is underlain by permafrost, except in recently abandoned floodplains.

Geology - Bedrock in the hills is similar to that of surrounding highlands -- schist and gneiss on the west and Cretaceous sedimentary rocks on the east, all cut by granitic intrusions. Tilted and faulted Tertiary and possibly Quaternary sedimentary deposits are exposed on the south bank of the Yukon. Most of the lowland is covered by windborne silt and sand of unknown thickness. Depth of alluvium is at least 180 feet.

430 = Kuskokwim Mountains

General Topography - The Kuskokwim Mountains are a monotonous succession of northeast-trending ridges having rounded to flat summits 1,500 to 2,000 feet in altitude and broad gentle slopes. Ridge crests north of the Kuskokwim River are accordant at about 2,000 feet and are surmounted at intervals of 10 to 30 miles by isolated circular groups of rugged glaciated mountains 3,000 to 4,000 feet in altitude. Valleys have flat floors 1 to 5 miles wide.

Drainage - The Kuskokwim Mountains are drained by tributaries of the Yukon and Kuskokwim Rivers. Major streams generally flow northeast to southwest along valleys that are probably controlled by faults; streams are fast and meandering and generally lie near the northwest walls of their valleys. The Kuskokwim River crosses the mountains in a gorge 100 to 400 feet deep incised in an older valley about 1,000 feet deep and 2 to 8 miles wide.

Lakes - Lakes are few. There are oxbow and thaw lakes in the valleys and a few cirque lakes in the glaciated mountains.

Glaciers and Permafrost - There are no glaciers. Permafrost underlies most of the section, and periglacial erosional processes predominate.

Geology - Most of the Kuskokwim Mountains are made of tightly folded Cretaceous rocks that strike northeast. Graywacke upholds the ridges, and argillite underlies the valleys. The northeastern and northwestern parts are underlain by Paleozoic sedimentary rocks and Precambrian (?) schist. The isolated circular groups of high mountains are underlain by monzonitic intrusions and their surrounding hornfels aureoles. Flat-lying basalt caps the remnants of a mid-Tertiary erosion surface. Pleistocene and Recent block faulting has occurred south of the Kuskokwim River.

440 = Innoko Lowlands

General Topography - The Innoko Lowlands are a group of flat river floodplains, dendritic in pattern, whose bounding slopes are generally steep banks cut into the surrounding hills; in places, however, gentle silt-covered slopes merge with the surrounding hills.

Drainage - The Yukon River and a large tributary, the Innoko River, cross the lowlands. The main part of the lowlands has a complex intersecting network of meandering sloughs of these two streams.

Lakes - Oxbow and meander-scroll lakes are abundant in recently abandoned floodplains and partly silted sloughs. Thaw lakes abound in old floodplains and on gentle silt-covered slopes. The lower parts of many tributaries from surrounding hills are dammed by alluvium from the Yukon and form narrow dendritic lakes.

Glaciers and Permafrost - No glaciers exist in the lowlands. Much of the section is underlain by permafrost.

Geology - Bedrock geology is probably the same as that of the surrounding hills. The plains are mantled by river-flood-plain deposits and by windborne silt, which also extends up the slopes of the surrounding hills.

450 = Nushagak-Big River Hills

General Topography - The Nushagak-Big River Hills are largely rounded, flat-topped ridges rising to an altitude of 1,500 feet on the west and 2,500 feet on the east; the hills have broad gentle slopes and broad flat or gently sloping valleys. Local relief is 1,000 to 2,500 feet. Mountains in the northeastern part rise to an altitude of 4,200 feet. Ridges trend northeastward in the eastern part but have no preferred trend in the southwestern part.

Drainage - The northern part of the hills drains to the Kuskokwim River via the Big, Stony, Swift, and Holitna Rivers; the southern part is drained by the Mulchatna and Nushagak Rivers. The rivers that rise from glaciers in the Alaska Range and flow across the hills, like the Stony and Swift, are braided muddy streams. Others, like the Holitna, are clear and meandering.

Lakes - A few thaw lakes are in some valleys. Ponds are abundant in the moraine-mantled eastern part of the hills.

Glaciers and Permafrost - There are no glaciers. Most of the section is underlain by permafrost, and periglacial erosional processes predominate.

Geology - Most of the hills consist of tightly folded Mesozoic graywacke, argillite, conglomerate, and greenstone flows. There is a central northeast-trending belt of Paleozoic rocks, including steep isolated ridges of limestone. Early Tertiary intrusions and their metamorphic aureoles uphold two small circular groups of high mountains in the southwestern part.

460 = Holitna Lowland

General Topography - The Holitna Lowland is largely a moraine-covered plain 300 to 800 feet in altitude and is crossed by several low arcuate hummocky ridges marking the end moraines of glacial advanced and by broad outwash and meander plains along rivers. The Lime Hills, conspicuous isolated steep-sided ridges in the southern part of the lowland, rise to an altitude of 1,000 to 2,300 feet.

Drainage - The Holitna Lowland is drained by the Kuskokwim River and three of its tributaries, the Stony and Swift Rivers, which are glacial streams from the Alaska Range that have braided gravelly courses, and the Holitna River, a clear meandering stream that rises in uplands to the south.

Lakes - There are numerous morainal and thaw lakes throughout the lowland.

Glaciers and Permafrost - There are no glaciers. This section is probably one of discontinuous permafrost.

Geology - The bedrock hills are of Mesozoic graywacke, argillite, and conglomerate and early Paleozoic limestone. Most of the lowland is underlain by moraine and outwash together with thick accumulations of windborne silt.

470 = Nushagak-Bristol Bay Lowland

General Topography - The Nushagak-Bristol Bay Lowland is a moraine and outwash-mantled lowland having local relief of 50 to 250 feet and rising from sea level to an altitude of 300 to 500 feet at its inner margins. High-steep-sided outliers of the Ahklun Mountains rise from the western part. Arcuate belts of morainal topography, 100 to 300 feet high and 1 to 5 miles wide, enclose large deep glacial lakes on the southeast margin and cross parts of the lowland west of the Nashagak River.

Drainage - The lowland is drained by the Nushagak and other large rivers that flow into Bristol Bay. Most streams rise in large lakes in ice-carved basins bordering the surrounding mountains and flow into tidal estuaries that appear to be drowned river mouths.

Lakes - The lowland is dotted with morainal and thaw lakes. Large lakes occupy ice-scoured basins along the margins of the lowland. The largest of these, Lake Iliamna, is 80 miles long and 20 miles wide.

Glaciers and Permafrost - There are no glaciers in this section, and permafrost is sporadic or absent.

Geology - The lowland is underlain by several hundred feet of outwash and morainal deposits that are mantled in part by silt and peat. Outwash deposits are coarse near the mountains and grade to fine sand along the coast. Quarternary deposits thin to a feather-edge along the base of surrounding mountains. A small area of low stabilized and active dunes lies east of the Nushagak River.

Seward Peninsula

480 = Main Unit

481 = Bendeleben Mountains

482 = Kigluaik Mountains

483 = York Mountains

General Topography - The Seward Peninsula contains: extensive uplands of broad convex hills and flat divides that are 500 to 2,000 feet in altitude and are indented by sharp V-shaped valleys; isolated groups of rugged glaciated mountains, 20 to 60 miles long and 10 miles wide, having peaks 2,500 to 4,700 feet in altitude; and coastal lowland and interior basins.

Drainage - Many small rivers, whose lower courses are sluggish and meandering, drain the peninsula. Some of these build deltas into the heads of protected lagoons and bays. The interior basins are drained through narrow canyons across intervening uplands.

Lakes - The lowlands have numerous thaw lakes. There are several rock-basin and morainal lakes in the glaciated Bendeleben and Kigluaik craters in the northern part of the peninsula and several depressions between lava flows in the central upland; some of the depressions were accentuated by faulting and warping.

Glaciers and Permafrost - The Seward Peninsula has no glaciers. The entire peninsula is underlain by permafrost; periglacial erosional processes predominate and ice-wedge polygons are common.

Geology - The bedrock of the peninsula is chiefly Paleozoic schist, gneiss, marble, and metamorphosed volcanic rocks, all of which are cut by granitic intrusive masses. Structural trends in the metamorphic rocks are chiefly northward. The York Mountains are carved in a mass of resistant marble. The Kigluaik, Bendeleben, and Draby Mountains have recent scarplets along their bases and may be Cenozoic uplifts. A Quaternary lava plateau lies in the northcentral part. The southern and western mountains are extensively glaciated. In exposures of beach placer deposits along the south coast, layers of till are interbedded with beach and shore deposits that are both above and below sea level; it is therefore possible to correlate glacial advances in the Seward Peninsula with the history of rise and fall of sea level in the late Cenozoic time.

Bering Shelf

Yukon-Kuskokwim Coastal Lowland

490 = Main Unit

491 = Norton Bay Lowland

General Topography - The Yukon-Kuskokwim Coastal Lowland is a triangular lake-dotted marshy plain rising from sea level on it west margin to 100 to 300 feet at its east end. Many low hills of basalt surmounted by cinder cones and broad shallow volcanic craters and a few craggy mountains of older rocks 2,300 to 2,450 feet high, rise from the western part of the plain. Low beach ridges, marked by lines of thaw lakes, lie along part of the west coast.

The Norton Bay Lowland is a lake-dotted coastal plain on the east side of Norton Bay, similar to the northern end of the Yukon-Kuskokwim Coastal Lowland. At its western extremity is an isolated range of hills, the Denbigh Hills.

Drainage - The lowland is crossed by meandering streams of extremely low gradient, many of them distributaries or former channels of the Yukon River; these flow to the Bering Sea. The Yukon River flows along the base of hills on the north side of the lowland and is building a delta into the Bering Sea. The Kuskokwim River on the southeast side ends in a marine estuary that appears to be a drowned river mouth.

Lakes - The lowland is dotted with innumerable thaw lakes, many of them 10 or more miles long. Some have scalloped shorelines and probably formed through the coalescence of several smaller lakes. Probably 30 to 50 percent of the lowland is lake surface.

Glaciers and Permafrost - The area contains no glaciers; it is underlain by discontinuous permafrost.

Geology - The lowland is underlain by Quarternary sand and silt to unknown depth. Basalt flows and cinder cones are of Tertiary and Quarternary age. Other bedrock hills consist of Cretaceous sedimentary rocks, cut by early Tertiary intrusions, and of crystalline rocks of unknown age.

Bering Platform

511 = St. Lawrence Island

512 = Pribilof Islands

513 = St. Matthew Island

514 = Nunivak Island

General Topography - The Bering Platform is a montonously smooth submarine plain 100 to 500 feet deep bordered on the southwest by a submarine scarp several thousand feet deep. A coastal lowland at the head of Norton Sound is included in the platform. Several islands rise abruptly from the plain. Most of the islands are rolling uplands a few hundred to 1,000 feet high bordered by wave-cut cliffs. St. Lawrence Island, the largest, is about 100 miles long and 20 miles wide. It is chiefly a lake-dotted bedrock plain less than 100 feet in altitude above which isolated mountain groups bordered by old sea cliffs rise to altitudes of 1,000 to 1,500 feet. A large shield volcano with many vents is on the north coast of St. Lawrence Island. St. Paul and Nunivak Islands consist largely of undissected volcanic topography.

Drainage - Many small rivers drain St. Lawrence Island and Nunivak Island; most small islands have no permanent streams.

Lakes - Thaw lakes abound on the lowlands of St. Lawrence Island and the lower part of Nunivak Island; there are small crater lakes on Nunivak and the Pribilof Islands.

Glaciers and Permafrost - There are no glaciers. Part of St. Lawrence Island and possibly Nunvak Island may be underlain by permafrost.

Geology - The Pribilof Islands, St. Matthew Island, Nunivak Island, and north-central St. Lawrence Island are made of Cenozoic basalt flows and pyroclastic debris interbedded with some sediments. Cinder cones are present on the Pribilofs and Nunivak Island. St. Lawrence, Diomede, and King Islands are underlain by intensely deformed Paleozoic and Mesozoic sedimentary and volcanic rocks and granitic intrusions.

520 - Ahklun Mountains

General Topography - Groups of rugged steep-walled mountains, having sharp summits 2,000 to 5,000 feet in altitude, separated by broad flat valleys and lowlands, rise abruptly above the lowlands and low hills on the north and east. Mountains in the southwestern part have rounded summits 1,500 to 2,500 feet in altitude.

Drainage - The Ahklun Mountains are drained by shallow, clear streams that flow directly to the Bering Sea on the south and west, to the Nushagak River via the Nuyakuk River on the northeast, and to the Kuskokwim River on the northwest. Most rivers are incised in bedrock gorges 20 to 50 feet deep in the downstream parts of their valleys. Drainage is roughly radial, and several streams in the northwestern part flow through canyons that cut directly across structurally controlled ridges.

Lakes - This province is outstanding for the number and beauty of its glacial lakes, which are long narrow bodies of water on U-shaped canyons. The largest, Lake Nerka, is 20 miles long, and at least 40 lakes are more than 20 miles long. Lake depths as great as 900 feet have been reported.

Glaciers and Permafrost - A few small cirque glaciers are found in the highest parts of the mountains from Mount Waskey northward. Permafrost occurs sporadically.

Geology - The mountains are made of strongly deformed sedimentary and volcanic rocks of late Paleozoic and Mesozoic age together with some bodies of older schist. These rocks are cut by great northeast-trending faults along which many of the valleys have been eroded. Structural trends control many ridges. Small granitic masses surrounded by more resistant hornfels have formed many ringlike mountain groups. Late Cenozoic basalts lie on the floor of Togiak valley. The entire province was intensely glaciated.

PACIFIC MOUNTAIN SYSTEM
Alaska-Aleutian Province
610 - Aleutian Islands

General Topography - The Aleutian Islands are a chain of islands surmounting the crest of a submarine ridge 1,400 miles long, 20 to 60 miles wide, and 12,000 feet high above the sea floor on either side. An arcuate line of 57 volcanoes of Quaternary age, 27 reported active, rise 2,000 to 9,000 feet above sea level along the north side of the Aleutian Islands. Other topography in the Aleutian Islands is of two types: (a) wave-cut platforms less than 600 feet above sea level, bordered by low sea cliffs, and (b) intensely glaciated mountainous islands 600 to 3,000 feet above sea level, indented with fiords and bordered by cliffs as high as 2,000 feet. Broad level intertidal platforms border some islands; they were probably produced by frost weathering.

Drainage - Streams in the Aleutian Islands are short and swift. Many plunge into the sea over waterfalls. Volcanoes of porous rock have widely spaced stream courses that are filled with water only during exceptionally heavy rains.

Lakes - Many small lakes occupy irregular ice-carved basins in rolling topography on the glaciated islands. Numerous ponds were enlarged when ice, expanding by freezing, shoved the banks aside to form ramparts of soil and turf. Lakes fill a few volcanic craters and calderas.

Glaciers and Permafrost - The firn line is at an altitude of about 3,000 feet east of Unimak Pass and about 4,500 feet west of it. Most high volcanoes bear icecaps or small glaciers, and there are a few cirque glaciers on the mountainous islands. There is probably no permafrost in the Aleutian Islands, but periglacial erosional processes are active because of the cold, wet climate.

Geology - The linear chain of volcanoes on the north side of the islands is of constructional origin and late Cenozoic age; it includes many calderas. The remaining islands appear to be emerged parts of tilted fault blocks consisting chiefly of faulted and folded Cenozoic volcanic rocks, locally mildly metamorphosed; granitic intrusions of Cenozoic age are present on Sedanka, Unalaska, Ilak, and other islands. Submarine topography of the Aleutian ridge shows it to be complexly blockfaulted along its crest.

620 = Aleutian Range

General Topography - The Aleutian Range consists of rounded east-trending ridges 1,000 to 4,000 feet in altitude, surmounted at intervals of 5 to 85 miles by volcanoes 4,500 to 8,500 feet in altitude. It merges northward with the Bristol Bay-Nushagak Lowland and has an abrupt and rugged south coast. The range is extensively glaciated as shown by the U-shaped valleys, cirques, and other features of glacial erosion. Most of the volcanoes reached their final growth after the extensive glaciation of the range.

Drainage - The drainage divide between the Bering Sea and the Pacific Ocean is generally along the highest ridges, within 10 miles of the south coast. Streams to the Pacific area are short and steep; those flowing to Bering Sea are longer and have braided channels.

Lakes - Along the north side of the range are many large lakes, partly held in by end moraines. Most of them extend well below sea level. The largest is Lake Iliamna.

Glaciers and Permafrost - The firn line is at an altitude of about 3,000 to 3,500 feet along the axis of the range and rises northward across the range to 4,000 to 5,000 feet in the northwestern part. Most volcanoes have glaciers on all sides and some have summit icefields. There is probably no permafrost, but periglacial erosional processes are active in the cold, wet climate.

Geology - Most of the range is composed of mildly deformed folded and faulted Mesozoic and Cenozoic sedimentary rocks, locally intruded by granitic stocks and surrounded at intervals by volcanic piles of late Tertiary to Recent age. Many volcanoes have calderas. A major fault extends along the north side to the eastern part of the range, separating the sedimentary rocks from a large Mesozoic granitic batholith on the north.

630 = Alaska Range (Southern Part)

General Topography - Between Rainy Pass and Lake Chakachamna the Alaska Range consists of many parallel rugged glaciated north-trending ridges 7,000 to 12,000 feet in altitude; south of Lake Chakachamna the ridges trend northeast and are 4,000 to 6,000 feet in altitude. Between the ridges lie broad glaciated valleys which have floors less than 3,000 feet in altitude. Local relief is between 4,000 and 9,000 feet. Many spirelike mountains rise in the central part of the range.

Drainage - Large braided glacial streams follow the north and northeast-trending valleys; they flow north or south to the Kuskokwim River, southwest to the Nushagak or Kvichak Rivers, and east to the Susitna River and Cook Inlet.

Lakes - Many large lakes occupy glaciated valleys within and on the margins of the range; the largest of these is Lake Clark, 49 miles long and 1 to 4 miles wide.

Glaciers and Permafrost - Extensive systems of valley glaciers radiate from the higher mountains. The firn line is lower and the glaciers are larger on the southeast side of the range than on the northwest and west side of the range. The extent of permafrost is unknown.

Geology - Most of the range is underlain by large granitic batholiths, intrusive into moderately methamorphosed and highly deformed Paleozoic and Mesozoic volcanic and sedimentary rocks, which form scattered areas of lower mountains. Structural trends are generally northerly, but change abruptly to northeasterly and easterly northward across Rainy Pass. Mount Spurr, Mount Iliama, and Mount Redoubt are large active volcanoes. Well-bedded Jurassic sedimentary rocks form prominent hogbacks and cuestas dipping southward off the south flank of the range toward Cook Inlet.

Alaska Range (Central and Eastern Part)
640 = Main Unit
641 = Mentasta-Nutzotin Mountain Segment

General Topography - The central and eastern part of the Alaska Range consists of two or three parallel rugged glaciated ridges, 6,000 to 9,000 feet in altitude, surmounted by groups of extremely rugged snowcapped mountains more than 9,500 feet in altitude. The Mentasta-Nutzotin Mountain segment at the east end of the Alaska Range has a single axial ridge. The ridges are broken at intervals of 10 to 50 miles by cross-drainage or low passes; most of the drainage appears superimposed. The range rises abruptly from lower country on either side, and its longitudinal profile, seen from a distance, is irregular. Mount McKinley, 20,269 feet high and the highest mountain in North America, is in this part of the Alaska Range.

Drainage - The central and eastern part of the Alaska Range is crossed at places 25 to 100 miles apart by north-flowing tributaries of the Tanana and Yukon Rivers. Most of the range drains to the Tanana. The western part drains to the Kuskokwim River and parts of the south flank drain to the Susitna and Copper Rivers. Streams are swift and braided, and most rivers head in glaciers.

Lakes - There are a few rock-basin lakes and many small ponds in areas of ground moraine. Lakes are rare for a glaciated area.

Glaciers and Permafrost - The firn line on the south side of the range is 5,000 to 7,000 feet in altitude and on the north side is 6,000 to 8,000 feet in altitude; this change reflects the northward decrease in cloudiness and precipitation as one passes from the Gulf of Alaska coast to the interior. The high mountains are sheathed in ice, and valley glaciers as much as 40 miles long and 5 miles wide radiate from them. For some glaciers (for example, Black Rapids Glacier and Muldrow Glacier) short periods of rapid advance have alternated with long periods of stagnation. Short valley glaciers lie in north-facing valleys in the lower parts of the range. Rock glaciers are common. Permafrost is extensive and solifluction features are well developed.

Geology - The internal structure of the Alaska Range is a complex synclinorium having Cretaceous rocks in the center and Paleozoic and Precambrian (?) rocks on the flanks. This synclinorium is cut by great longitudinal faults that trend approximately parallel to the length of the range and are marked by lines of valleys and low passes. The synclinorium was probably formed near the close of the Mesozoic Era. Many roughly oval granitic stocks and batholiths support groups of high mountains that have cliffs as high as 5,000 feet. Synclinal areas of Tertiary rocks underlie lowlands that trend parallel to the length of the range. Much of the major topography of the range was probably produced from mid-Tertiary structures by removal of easily eroded Tertiary rocks to form lowlands. Recently formed scarples as high as 30 feet can be seen on several longitudinal faults. At least four periods of glaciation have been recognized; the earliest is indicated only by scattered giant granite erratics on uplands in the foothills to the north.

650 = <u>Northern Foothills of the Alaska Range</u>

General Topography - The Northern Foothills of the Alaska Range are flat-topped east-trending ridges 2,000 to 4,500 feet in altitude, 3 to 7 miles wide, and 5 to 20 miles long that are separated by rolling lowlands 700 to 1,500 feet in altitude and 2 to 10 miles wide. The foothills are largely unglaciated, but some valleys were widened during the Pleistocene Epoch by glaciers from the Alaska Range. Colorful badlands abound in areas of rapid erosion in soft Tertiary rocks.

Drainage - The major streams of the foothills are superimposed across the topography. Most streams are nearly parallel, rise for the most part in the Alaska Range, and flow north to N. 20 W. across the ridges in rugged impassable V-shaped canyons and across the lowland in broad terraced valleys. The entire section drains to the Tanana River.

Lakes - A few small lakes of thaw origin lie in the lowland passes, and morainal areas have shallow irregular ponds.

Glaciers and Permafrost - The entire section is below the firn line, and there are no local glaciers, although a few glaciers from the Alaska Range terminate in the foothills. Permafrost is extensive, and polygonal ground and solifluction features are well developed.

Geology - Crystalline schist and granitic intrusive rocks make up most of the ridges, which are anticlinal. Poorly consolidated Tertiary rocks underlie the lowlands; thick coarse conglomerate near the top of the Tertiary section forms cuestas and ridges where it dips 20 - 60, and broad dissected plateaus where it is flat lying. The topography reflects closely the structure of monoclines and short, broad flat-topped anticlines having steep north flanks. Flights of tilted terraces on north-flowing streams indicate Quaternary tilting and uplift of the Alaska Range. The Tertiary rocks contain thick beds of subbituminous coal.

Coastal Trough Province

660 = Cook Inlet - Susitna Lowland

General Topography - The Cook Inlet-Susitna Lowland is a glaciated lowland containing areas of ground moraine and stagnant ice topography, drumlin fields, eskers, and outwash plains. Most of the lowland is less than 500 feet above sea level and has a local relief of 50 to 250 feet. Rolling upland areas near the bordering mountain ranges rise to about 3,000 feet in altitude, and isolated mountains as high as 4,800 feet rise from the central part of the lowland. The Cook Inlet-Susitna Lowland is the major population center of Alaska and contains most of the developed agricultural land.

Drainage - The lowland is drained by the Susitna River and other streams that flow into Cook Inlet. Most of these streams head in glaciers in the surrounding mountains. The shores of Cook Inlet are for the most part gently curving steep bluffs 50 to 250 feet high.

Lakes - Three large lakes -- Tustumena, Skilak, and Beluga -- fill ice-carved basins at the orgins of surrounding mountains. Lake Tustumena, the largest, is 23 miles long and 7 miles wide. Hundreds of small irregular lakes and ponds occur in areas of stagnant ice topography and on ground moraines. Strang-moor ponds are common in marshes.

Glaciers and Permafrost - The section is almost ice-free, although one glacier reaches the lowland from the Alaska Range on the west, and sporadic permafrost is present in the northern part.

Geology - Bedrock beneath the lowland consists mainly of poorly consolidated coal-bearing rocks of Tertiary age, generally mildly deformed or flat lying; this rock is mantled by glacial moraine and outwash and marine and lake deposits. Sequences of moraines record successive glacial advances. The boundaries of the lowlands are of two kinds: (a) abrupt straight mountain fronts that are probably faultline scarps, and (b) uplands of hard pre-Tertiary rocks that slope gently towrd the lowland. The uplands are probably uplifted parts of the surface on which the Tertiary rocks were deposited; the edge of the lowland generally marks the edge of the Tertiary cover, which dips gently away from the mountains. The isolated mountains in the center of the lowland generally consist of metamorphic and granitic rocks of Mesozoic age.

670 - <u>Broad Pass Depression</u>

General Topography - The Broad Pass Depression, 1,000 to 2,500 feet in altitude and 5 miles wide, is a trough having a glaciated floor; it opens on the east to a broad glaciated lowland with rolling morainal topography and central outwash flats. The bounding mountain walls of the trough are several thousand feet high. Long, narrow drumlinlike hills on the floor of the trough trend parallel to its axis, and the main streams in the trough are incised in rock-walled gorges a few hundred feet deep. The trough opens on its south end to the Cook Inlet-Susitna Lowland.

Drainage - The divide between the Bering Sea and Pacific Ocean drainages crosses this depression in two places and is marked by nearly imperceptible passes. The southwestern part drains by the Chulitna River to the Susitna River; the central part, by the Nenana River north to the Yukon River; and the eastern part, by the headwaters of the Susitna. Most streams head in glaciers in the surrounding mountains and are swift, turbid, and braided.

Lakes - Many long, narrow lakes lie in morainal depressions in the central part of the trough. Morainal and thaw lakes are common in the eastern part.

Glaciers and Permafrost - There are no glaciers. Most of the depression is underlain by permafrost.

Geology - Patches of poorly consolidated Tertiary coal-bearing rocks, in fault contact with older rocks of the surrounding mountains, show that this depression marks a graben of Tertiary age. Most of the bedrock consists of highly deformed slightly metamorphosed Paleozoic and Mesozoic rocks that are also exposed in the surrounding mountains. Ground moraine mantles the lowland.

Talkeetna Mountains
681 = <u>Chulitna Mountains</u>
682 = <u>Fog Lakes Upland</u>
683 = <u>Central Talkeetna Mountains</u>
684 = <u>Clarence Lake Upland</u>
685 = <u>Southeastern Talkeetna Foothills</u>

General Topography - The Talkeetna Mountains are an oval highland of diversified topography that interrupts the belt of lowlands of the Coastal Trough province. The central Talkeetna Mountains are a compact group of extremely rugged radial ridges 6,000 to 8,000 feet in altitude, having only few low passes, that isolate steep-walled U-shaped valleys. Accordant flat ridge crests in the western and eastern parts of the central Talkeetna Mountains suggest a warped peneplain that plunges beneath Tertiary rocks in the adjacent lowlands. The glaciated Chulitna Mountains, a compact group of mountain blocks separated by low passes, are isolated from the central Talkeetna Mountains by the Fog Lakes Upland, a northeast-trending area of broad rolling summits, 3,000 to 4,500 feet in altitude, which has a glacially sculptured mammillated surface in its southwestern part but is unglaciated in the northeastern part. A similar upland (the Clarence Lake Upland borders the mountains on the east.

Drainage - The central Talkeetna Mountains have a radial drainage of large braided glacial streams that are tributary to the Susitna, Matanuska, and Copper Rivers. The extreme northern part drains to the Yukon River via the Nenana River. The Susitna River flows west across the Talkeenta Mountains in a narrow steep-walled gorge that in places is more than 1,000 feet deep. West-flowing streams in the southwestern Talkeetna Mountains have many long southern tributaries and few or no northern tributaries; low slanting solar rays from the south, favoring the growth of glaciers in shaded north-facing valley heads and inhibiting their growth on sunny south-facing slopes, probably caused this asymmetry.

Lakes - There are few lakes in the southern part of the Talkeetna Mountains. Many lakes, some 5 miles long, occupy ice-carved and moraine-dammed basins in the northern part. Many lakes, some 5 miles long, occupy ice-carved and moraine-dammed basins in the northern part.

Glaciers and Permafrost - The firn line is between altitudes 6,500 and 7,000 feet. Glaciers 5 to 15 miles long lie at the heads of most valleys in the central Talkeetna Mountains. A few cirque glaciers occupy north-facing valley heads in the northeastern Talkeetna Mountains and Chulitna Mountains. Rock glaciers are common in the southeastern Talkeetna Mountains and in the Chulitna Mountains. Permafrost probably underlies most of the section; antiplanation terraces are present in unglaciated parts of the northeastern Talkeetna Mountains.

Geology - A large mid-Jurassic batholith in the central and western Talkeetna Mountains intrudes Jurassic volcanic rocks and older rocks and is eroded into cliffs and spires. The southeastern Talkeetna Foothills are composed of soft sandstone and shale of Jurassic and Cretaceous age, capped by flat-lying cliff-forming Tertiary basalt flows aggregating several thousand feet in thickness. The northern part of the Talkeetna Mountains consist of Paleozoic and Mesozoic greenstone, graywacke, and argillite in northeast-trending belts. The greenstone forms rugged mountains.

690 = Upper Matanuska Valley

General Topography - The Upper Matanuska Valley is a glaciated trough 2 to 5 miles wide containing longitudinal bedrock hills 500 to 1,000 feet high and having steep bounding walls several thousand feet high. Altitude of its floor ranges from 800 feet on the west to 2,000 feet on the east.

Drainage - The Upper Matanuska Valley is drained entirely by the Matanuska River, which flows westward along the trough.

Lakes - Many small narrow lakes occupy ice-carved bedrock basins, and ponds are common in morainal areas.

Glaciers and Permafrost - The terminus of the Matanuska Glacier reaches the east end of the trough. Permafrost is present in the eastern part of the trough, but its extent is unknown.

Geology - The Upper Matanuska Valley is a structurally controlled trough bounded on the north by a major fault, the Castle Mountain fault, and on the south by a steep unconformity and faults. It is underlain by easily eroded rocks of Cretaceous and Tertiary age, which are highly deformed and were intruded by gabbro sills and stocks. It contains several coal fields. The bordering mountains are of older and more resistant rocks.

710 = Clearwater Mountains

General Topography - The Clearwater Mountains consist of two or three steep, rugged east-trending ridges rising to altitudes of 5,500 to 6,500 feet, separated by U-shaped valleys 3,000 to 3,500 feet in altitude. They are intensely glaciated. The ridges are asymmetrical; long spurs on their north sides separate large compound cirques; their south side are relatively smooth mountains walls grooved by short steep canyons.

Drainage - The entire section is tributary to the Susitna River.

Lakes - There are a few rock-basin lakes in cirques and passes. The largest lake is less than 1 mile long.

Glaciers - The north slopes of the highest peaks have a few cirque glaciers.

Geology - The Clearwater Mountains are underlain chiefly by Triassic greenstone and Mesozoic argillite and graywacke. The rocks are highly deformed, strike generally east, and dip steeply.

720 = <u>Gulkana Upland</u>

General Topography - The Gulkana Upland consists of rounded east-trending ridges separated by lowlands 2 to 10 miles wide. The ridge crests, 3,500 to 5,500 feet in altitude, are 4 to 15 miles apart and are cut at intervals of 5 to 15 miles by notches and gaps that were eroded by glaciers or glacial melt water. The lowlands are floored by glacial deposits showing morainal and stagnant-ice topography and contain large esker systems.

Drainage - The southeastern and eastern part drains south to the Copper River; the western part drains southwest to the Susitna River; and the north-central part drains north via the Delta River to the Tanana and Yukon. The drainage divide between the Pacific Ocean and Bering Sea has an irregular course through this section and is in part along eskers.

Lakes - Many long, narrow lakes occupy rock-cut basins in notches through the ridges. Irregular lakes abound in some areas of morainal topography.

Glaciers and Permafrost - A few cirque glaciers lie on the north sides of the highest ridges. The lower ends of a few glaciers from the Alaska Range are in this section. The upland is underlain by permafrost and contains ice-wedges, pingos, and altiplanation terraces.

Geology - Bedrock is chiefly greenstone and of late Paleozoic and Mesozoic age; structure trends eastward. Areas of relatively low relief in the northern part are underlain by poorly consolidated Tertiary sedimentary rocks.

Copper River Lowland

731 = <u>Eastern Section</u>

732 = <u>Lake Louise Plateau</u>

General Topography - The eastern part of the Copper River Lowland is a relatively smooth plain, 1,000 to 2,000 feet in altitude trenched by the valleys of the Copper River and its tributaries, which have steep walls 100 to 500 feet high. The Copper and Chitina valleys, eastward prongs of this lowland, contain longitudinal morainal and ice-scoured bedrock ridges that rise above axial outwash plains. The western part of the Copper River Lowland, the Lake Louise Plateau, is a rolling upland 2,200 to 3,500 feet in altitude, and has morainal and stagnant-ice topography; the broad valley of the Nelchina and Tazlina Rivers separates this upland from the Chugach Mountains.

Drainage - The eastern and southern parts of the Copper River Lowland are drained by the Copper River and its tributaries. The northwestern part is drained by the Susitna River. Low passes lead to the heads of the Delta, Tok, and Matanuska Rivers. Most rivers head in glaciers in surrounding mountains and have braided upper courses. Salty ground water has formed salt springs and mud volcanoes.

Lakes - Large lakes occupy deep basins in the mountain fronts. Thaw lakes are abundant in the eastern plain. Lakes occupy abandoned melt-water channels; those in morainal depressions in the western upland are as much as 6 miles across. Beaches and wave-cut cliffs border lakes more than 2 miles wide whereas irregular muskeg marshes encroach on smaller lakes.

Glaciers and Permafrost - There are no glaciers. The entire lowland is underlain by permafrost. The permafrost table is within 5 feet of the surface and permafrost is at least 100 feet thick.

Geology - Bedrock beneath the southern part of the lowland is chiefly easily eroded sandstone and shale of Mesozoic age; bedrock beneath the northern part is chiefly resistant late Paleozoic and Mesozoic metamorphosed volcanic rocks. Tertiary gravels cap some hills. Ground and end moraine and stagnant ice deposits mantle much of the lowland. The eastern plain is underlain by glaciolacustrine and glaciofluvial deposits at least 500 feet thick.

740 = <u>Wrangell Mountains</u>

General Topography - The Wrangell Mountains are an oval group of great shield and composite volcanoes (Mount Wrangell, 14,005 feet in altitude, is still active) that rises above a low plain on the north and west and above heavily glaciated cliffed and castellated ridges on the south and east. Six volcanoes at altitudes higher than 12,000 feet -- the highest is Mount Blackburn, 16,523 feet -- make up the greater part of the mountains.

Drainage - Seventy-five percent of the section drains to the Copper River, which encircles the mountains on the west. The remainder drains to the Tanana River via the Nabesna and Chisana Rivers and to the Yukon River via the White River.

Lakes - There are a few rock-basin lakes in the extreme northern part. Several ice-marginal lakes lie in Skolai Pass at the east end of the mountains.

Glaciers and Permafrost - The firn line is at an altitude of about 7,000 feet. A large icecap covers most of the high mountains and feeds large valley glaciers. Rock glaciers are common in the Southeastern Wrangell Mountains. Permafrost is probably present in the glacier-free areas, but its extent is unknown.

Geology - The Wrangell Mountains are a great pile of Cenozoic volcanic rocks that rests on deformed Paleozoic and Mesozoic sedimentary and volcanic rocks, among which are cliff-forming units of limestone and greenstone. Some granitic masses intrude the Mesozoic rocks. An important belt of copper deposits, including the Kennicott Mine, lies on the south side of the Wrangell Mountains.

750 - Duke Depression

General Topography - The Duke Depression is mainly in Canada. The Alaskan section is characterized by two heavily glaciated valleys ranging from 2,500 to 4,000 feet in elevation at the Northeastern base of the Wrangell Mountains. It is separated by and includes an upland area between the Wrangell Mountains and the Nutzotin Mountains of the Alaska Range. This upland area ranges between 2,500 and 5,500 feet, with one peak of 6,500 feet.

Drainage - The Alaskan section is drained by two major rivers. The White river, a glacier fed braided stream, drains the Southeastern valley and upland areas. It ultimately flows into the Yukon River. The Chisana River, also a glacier fed braided stream, drains the Northwesten valley and upland areas. It flows north into the Northway-Tanacross Lowland.

Lakes - Several small lakes are in the upland region.

Glacier and Permafrost - There are no glaciers. It is likely that most of this area is underlain by permafrost.

Geology - The Alaskan section of the Duke Depression is underlain by rock of mainly volcanic origin from Pennsylvanian to Quaternary age. Most of the rocks are of intermediate composition and include andesitric fragmental volcanic rocks, lava flows and tuffs. Some Triassic rocks of mafic composition are also found. The far Northern part of the section is underlain by shallow and deep water clastic deposits of Jurassic to Cretaceous age. The surficial geology consists mainly of Quaternary deposits of Glacial or Glaciofluvial origin in the valleys and Quaternary deposits of volcanic origin in the uplands.

760 = Chatham Trough

General Topography - The Chatham Trough is a deep, straight trench, 4 to 15 miles wide, which is entirely below the sea except for its north end. Average depth of water in the trough is more than 1,900 feet, and it maximum depth is 2,900 feet. Mountains on either side rise to 2,500 to 5,000 feet above sea level.

Geology - The Chatham Trough probably marks a major fault line. Rocks on opposite sides of the trough do not match across the trough, either in their structure or in their age. It probably owes its greater depth to glacial erosion of relatively soft rocks.

770 = Kupreanof Lowland

General Topography - The Kupreanof Lowland consists of islands and channels. Islands of rolling heavily glaciated terrain having a local relief of 1,000 to 1,500 feet are separated by an intricate network of waterways. Scattered blocklike mountains having rounded hummocky summits 2,000 to 3,000 feet in altitude rise above the general level of the lowland. Parts of some islands are plains which are a few feet above sea level and are cut across rocks of varying hardness.

Drainage - The islands of the lowland are drained by many short clear streams that generally follow linear depressions etched by the Pleistocene ice sheets along joints, faults, bedding, and schistosity.

Lakes - There are abundant lakes in glacially scoured basins. Parts of some islands are almost 50 percent lake surface.

Glaciers and Permafrost - There are no glaciers or permafrost.

Geology - The lowland is underlain mainly by well-consolidated faulted and folded Paleozoic and Mesozoic sedimentary rocks, locally metamorphosed. Small elliptical granitic and ultramafic masses underlie most of the high mountains. The northern part of the lowland has an extensive Cenozoic basalt field. Small patches of Tertiary sedimentary rocks have been found.

Pacific Border Ranges Province

780 = Kodiak Mountains

General Topography - The Kodiak Mountains include a group of mountainous islands that are the structural continuation of the Kenai-Chugach Mountains but whose topography is more finely textured and on a smaller scale than that of the Kenai-Chugach Mountains. The Kodiak Mountains section is mostly glaciated, but the glaciation of western Kodiak Island was very early. Summit altitudes are between

2,000 and 4,000 feet. Kodiak Island has a rugged northeast-trending divide having horns and aretes from which broad smooth ridges extend northwestward. The topography southeast of the divide has a strong northeasterly grain normal to the drainage. The coastline is extremely irregular, havng many fiords and islands. The northern part of Afognak Island is a hilly lowland, and the western part of Kodiak Island has many broad valleys.

Drainage - The islands of the Kodiak Mountains are drained mostly by swift, clear streams that are less than 10 miles long. Two rivers, each about 25 miles long, drain much of southwestern Kodiak Island.

Lakes - There are several lakes more than a mile long in the southwestern part of Kodiak Island and on Afognak Island. Small ponds are scattered over the glacially sculptured topography. The glaciated valleys heading in the main divide have chains of paternoster lakes.

Glaciers and Permafrost - The firn line is between altitudes of 3,000 and 3,500 feet along the main divide of Kodiak Island, which has 40 cirque glaciers, all less than 2 miles long; the firn line rises to much more than 4,000 feet in the northwestern part of Kodiak Island. Permafrost is probably absent.

Geology - The Kodiak Mountains are underlain mostly by Mesozoic argillite and graywacke. Older rocks, chiefly greenstone and schist, lie along the northwest coast. The main divide of Kodiak Island is underlain by a granitic batholith. Northeast-trending belts of downfaulted and easily eroded Tertiary rocks lie on the southeast side of Kodiak Island and also make up the Trinity Islands. Lateral moraines, ice-marginal drainage channels through the ends of ridges, and old greatly modified cirques half buried in alluvium indicate that western Kodiak Island was not covered by ice of the last glaciation and that ice from the Aleutian Range banked against its western shore.

790 = Kenai-Chugach Mountains

General Topography - The Kenai-Chugach Mountains form a rugged barrier along the north coast of the Gulf of Alaska. High segments of the mountains are dominated by extremely rugged east-trending ridges 7,000 to 13,000 feet in altitude. Low segments consist of discrete massive mountains 5 to 10 miles across and 3,000 to 6,000 feet in altitude, separated by a reticulate system of trough valleys and passes 1/2 to 1 mile wide that are eroded along joints and cleavage. The entire range has been heavily glaciated, and the topography is characterized by horns, aretes, cirques, U-shaped valleys and passes, rock-basin lakes, and grooved and mammillated topography. The south coast is deeply indented by fiords and sounds, and ridges extend southward as chains of islands. The north front is an abrupt mountain wall.

Drainage - The drainage divide, generally an ice divide, is along the highest ridges, and is commonly only a few miles from the Pacific Ocean. Streams are short and swift; most head in glaciers. The copper River crosses the eastern part of the Chugach Mountains in a canyon 6,000 to 7,000 feet deep.

Lakes - Large lakes fill many ice-carved basins along the north margin of the Chugach Mountains and throughout the northern Kenai Mountains. Lake George is an ice-margin lake dammed by the Knik Glacier; it empties in an annual flood.

Glaciers and Permafrost - The firn line rises from an altitude of 2,500 to 3,500 feet on the south side of the mountains to 7,000 to 8,000 feet on the north side of the central Chugach Mountains. All higher parts of the range are buried in great icefields from which valley and piedmont glaciers radiate. Many of the glaciers on the south side of the mountains end in tidewater. The extent of permafrost is unknown.

Geology - The Kenai-Chugach Mountains are composed chiefly of dark-gray argillite and graywacke of Mesozoic age that are mildly metamorphosed and have a pronounced vertical cleavage that strikes parallel to the trend of the range. In the Prince William Sound area large bodies of greenstone are associated with the argillite and graywacke. A belt of Paleozoic and Mesozoic schist, greenstone, chert, and limestone lies along the north edge of the Kenai and Chugach Mountains. All these rocks are cut by granitic instrusions.

810 = <u>St. Elias Mountains</u>

General Topography - The St. Elias Mountains are probably the most spectacular mountains of North America. Massive isolated blocklike mountains 14,000 to 19,000 feet in altitude rise at intervals of 5 to 30 miles from a myriad of narrow ridges and sharp peaks 8,000 to 10,000 feet in altitude that, seen from a distance, gives the impression of a broad ice dome. The average altitude of icefields in the interconnected valley system is 3,000 to 7,000 feet. Local relief is extreme and jagged cliffs abound.

Drainage - Drainage is almost entirely by glaciers. The ice divides between dranages of the Yukon, Copper, and Alsek Rivers and the Pacific Ocean meet in this range. The Alsek River flows west to the Pacific across this range from lowlands on the northeast side and separates the Fairweather Range subsection from the rest of the mountains.

Lakes - There are no lakes.

Glaciers and Permafrost - All parts of the range gentle enough to hold snow are sheathed in glacial ice. A continuous network of icefields and glaciers 4 to 15 miles wide and as much as 80 miles long penetrates the range and feeds piedmont glaciers to the south. The extent of permafrost is unknown.

Geology - The high mountains are probably underlain by crystalline schist and granitic intrusive masses. A belt of Permian and Triassic volcanic and sedimentary rocks extend along the north side of the range. Lower Cretaceous sedimentary rocks lie in down-faulted basins in the center of the range and probably underlie ice-filled valleys. The entire sequence is thrust southward against Cretaceous and Cenozoic rocks; thrusting may be active today. Cenozoic volcanoes are present in the northern part of the range; some of these may still be active.

811 = <u>Fairweather Range</u>

General Topography - The Fairweather Range is an exceedingly steep and high unbroken barrier between the Pacific Ocean and Glacier Bay; mountains rise to 12,000 to 15,000 feet in altitude only 15 miles from tidewater. Peaks are high ice-clad pyramids having steep-cliffed walls, sharp ridges, and spirelike summits. There are a few subsummit ice plateaus but no passes across the range.

Drainage - The Fairweather Range is drained entirely by glaciers; most of these discharge into the Pacific Ocean or Glacier Bay.

Lakes - There are no lakes.

Glaciers and Permafrost - Most of the range is above firn line (4,000 ft) and supports vigorous glaciers that descend to tidewater. Glaciers on the west side have not advanced or retreated in recent years; those on the east side have retreated in the last 60 years and expose fiords having walls nearly 6,000 feet high. Permafrost is probably absent.

Geology - The Fairweather Range is underlain mainly by crystalline schist that has northwesterly structural trends parallel to the length of the range. Many large granitic stocks and three large elliptical layered mafic bodies have intruded the schist. The range is bounded on its southwest side by a major fault, the Fairweather fault, on which a lateral displacement of 21 feet took place in July 1958.

820 = <u>Gulf of Alaska Coastal Section</u>

General Topography - The Gulf of Alaska section has a diversified topography carved in Tertiary rocks. A coastal plain marked by longitudinal beach and dune ridges, crossed in places by outwash plains and by belts of moranal topography, is backed by marine terraces as high as 800 feet in altitude and by rugged intricately gullied mountain ridges as high as 12,000 feet. The straight exposed coastline is broken at intervals 50 to 100 miles by large fiords.

Drainage - Short melt-water streams of large volume cross the lowland. Bars built by coastal currents cause the river mouths to go through cycles of westward migration followed by breakthrough at their original sites during periods of high runoff.

Lakes - There are many ephermeral lakes along the margins of the piedmont glaciers. A few large lakes occupy ice-carved basins.

Glaciers and Permafrost - The firn line is at an altitude of 2,000 to 4,000 feet. Icefields on higher mountains and valley glaciers in most of the valleys coming from the St. Elias and Chugach Mountains feed enormous piedmont glaciers, of which the Malaspina Glacier is the largest. Glacial advances within the last thousand years are greater than any advance recorded in the Pleistocene. Permafrost is absent.

Geology - The Cenozoic rocks are intensely deformed yet easily eroded claystone, sandstone, and conglomeratic sandy mudstone, all tightly folded and thrust to the south. Large thrust faults separate this section from mountains to the north and northeast. Marine terraces show that the area has been uplifted rapidly. The conglomeratic sandy mudstone interbedded in the Cenozoic section is interpreted to be marine tillite; it indicates recurrent tidewater glaciation on this coast as far back as Pliocene time or earlier. An earthquake-induced landslide on July 9, 1958, created a flood wave on Lituya Bay that splashed to a height of 1,700 feet on the side of a mountains, sweeping the forest in its path into the bay.

Chilkat-Baranof Mountains

831 = Alsek Ranges
832 = Glacier Bay
833 = Chichagof Highland
834 = Baranof Mountains

General Topography - The Chilkat-Baranof Mountains are a highland of diversified topography, which is divided into four subsections: the Alsek Ranges, a subsection of rugged glaciated mountains 4,000 to 7,500 feet altitude, containing horns and aretes; the Glacier Bay subsection, a lowland, largely drowned, that contains isolated rounded, and 3,000 to 3,500 feet in altitude and of long fiords and through valleys; and the Baranof Mountains, a rugged asymmetic chain 3,000 to 5,300 feet in altitude, having a steep eastern slope and a more gentle southwest slope deeply indented by fiords. The southern two-thirds of the Chilkat-Baranof Mountains consists of islands. A narrow strandflat lies on the west coast of Chichagof and Baranof Islands.

Drainage - The Chilkat-Baranof Mountains are drained by short, swift streams that flow directly to the ocean. Chains of cascades are common on the east side of Baranof Island.

Lakes - Lakes abound in ice-carved basins in Baranof and southwestern Chichagof Islands. Elsewhere lakes are few.

Glaciers and Permafrost - The Alsek Ranges have large icefields containing tidal glaciers; Glacier Bay was filled with ice at least 2,000 feet thick as late as 1750, and glaciers have retreated more than 50 miles since then to expose the bay. Mountains on Baranof Island higher than 4,500 feet support cirque glaciers and small icefields. Permafrost is probably absent.

Geology - Northwest-trending belts of Paleozoic and Mesozoic sedimentary and volcanic rocks underlie the Alsek Ranges and Glacier Bay subsections; northwest-trending belts of crystalline schist and gneiss and large areas of migmatitic and granitic rocks underlie the Chichagof Highland and the northeastern part of the Baranof Mountains and are bordered on the west by a belt of Mesozoic graywacke and greenstone. The rocks are cut by many northwest-trending faults. Quaternary volcanoes make up southern Kruzof Island.

840 = Prince of Wales Mountains

General Topography - The Prince of Wales Mountains are moderately rugged glaciated mountains having rounded hummocky summits 2,000 to 3,500 feet in altitude and some spirelike aretes as much as 3,800 feet in altitude. They are dissected by steep-walled U-shaped valleys and by fiords 600 to 1,000 feet deep. Several passes less than 500 feet in altitude cross the range. The northeast front is abrupt, and the northwest boundary is indistinct. Karst topography is found in areas of marble on Dall and Long Islands in the southwest Prince of Wales Mountains.

Drainage - Short, swift streams, having many lakes and waterfalls, drain the mountains and generally follow trenches eroded by Pleistocene glaciers along joints, faults, and bedding.

Lakes - There are many rock-basin and cirque lakes, a few as much as 2,000 feet above sea level. The largest lake is 7 miles long and 1 mile wide.

Glaciers and Permafrost - One or two very small glaciers lie on the protected north sides of the highest peaks. There is no permafrost.

Geology - The Prince of Wales Mountains are underlain in part by well-consolidated slightly metamorphosed Paleozoic sedimentary and volcanic rocks and in part by crystalline schist and marble. Several small granitic stocks cut these rocks. The mountains were entirely covered by the Pleistocene cordilleran ice sheet, which was fed partly from local centers but mainly from the Coast Mountains to the east.

Coast Ranges

850 = <u>Boundary Ranges</u>

General Topography - The Boundary Ranges are a glacier-covered upland 5,000 to 7,000 feet in altitude disssected by a dendritic pattern of deep steep-walled U-shaped valleys. The ridges have rounded accordant summits and are surmounted by aretes and horns rising to 8,000 to 10,000 feet. Many of the valleys are drowned and form fiords. Passes are scarce, and valley heads are isolated. The mountains give an impression of great bulk and are bordered largely by cliffs that plunge several thousand feet to tidewater.

Drainage - The summit of the Coast Mountains coincides approximately with the international boundary; most of the range in Alaska is drained by glacial streams less than 2 miles long. Large braided rivers flow southwestward across the range at intervals of 30 to 120 miles from low-lying areas in northwestern British Columbia.

Lakes - A few small lakes lie in rock basins on valley floors and in mountainside hollows in the western, glacier-free part of the range.

Glaciers and Permafrost - The firn line is about 4,500 to 5,000 feet in altitude. Extensive mountain icecaps, the largest 90 miles long, feed many valley glaciers, some of which descend to tidewater. Extent of permafrost is unknown.

Geology - The Boundary Ranges are underlain mostly by the massive granitic rocks of the Coast Range batholith; a belt of schist and phyllite along its western margin and migmatized roof pendants within the batholith give a strong northwesterly grain to the topography.

860 = <u>Coastal Foothills</u>

General Topography - The Coastal Foothills consist of blocks of high mountains 3 to 30 miles across separated by flat-floored valleys and straits 1/2 to 10 miles wide; they include closely spaced mountainous islands and peninsulas 1,000 to 4,500 feet in altitude. Mountains less than 3,500 feet in altitude were glacially overridden and have rounded hummocky summits. High mountains are generally sharp crested. The boundaries with bordering sections are indistinct.

Drainage - Few streams are more than 10 miles long. The lower parts of most valleys are drowned, forming inlets and harbors.

Lakes - There are many rock-basin lakes, the largest 8 miles long and 1 mile wide.

Glaciers and Permafrost - The Coastal Foothills are almost entirely ice free. A few small glaciers lie on the north sides of the high peaks on Admiralty Island. There is no permafrost.

Geology - Northwest-trending belts of metamorphic rocks, cut by many faults parallel to the northwesterly trend of the rocks, give the topography a pronounced northwest grain. Small granitic and ultramafic bodies and westerly projections of the Coast Range batholith cut the metamorphic rocks. Southwest Admiralty Island is a high Tertiary basalt plateau.

B. Topographic Character and Situation

0 = Ocean, Bay or Fjord. Major water areas containing saltwater.

1 = Plains and Lowlands: Mainland. Flat areas on the mainland generally less than 1,000 feet in altitude.

2 = Plains and Lowlands: Island. Flat areas on islands generally less than 1,000 feet in altitude.

3 = Gentle to Rolling Plateaus and Highlands: Mainland. Plateaus and highlands on the mainland with rolling topography and gentle slopes with summit altitudes of 1,000 - 3,000 feet.

4 = Gentle to Rolling Plateaus and Highlands: Mainland. Plateaus and highlands on island with rolling topograhy and gentle slopes with summit altitudes of 1,000 - 3,000 feet.

5 = Low Rolling Mountains: Mainland. Low mountains on the mainland that are generally rolling with summit altitudes of 1,000 - 5,000 feet.

6 = Low Rolling Mountains: Island. Low mountains on islands that are generally rolling with summit altitudes of 1,000 - 5,000 feet.

7 = Moderately High Rugged Mountains: Mainland. Rugged mountains on the mainland that are moderately high; summmmit of 5,000 - 10,000 feet.

9 = Extremely High Rugged Mountains: Mainland. Rugged mountains on the mainland that are extremely high; summit altitudes more than 10,000 feet.

LANDFORMS

Discussion

Landforms are elements of the natural landscape which are characterized by a distinctive surface depression-and-interval structure. These characteristics can include topographic form, drainage pattern, and gully morphology. Landform as used here, is a special purpose term used to describe the land surface form and the geologic materials expected to occur from the surface to a depth of 15 to 25 feet. The landforms were grouped into classes based on common modes of origin because similar geologic processes usually produce similar topography, soil properties and engineering characteristics.

Landforms were interpreted from color infrared aerial photography. The characteristics used to identify the different landforms included topography, drainage patterns, vegetation, outcrops, fractures, permafrost indicators and photographic tone, color, and texture. Other data such as geology and soil maps and reports were used when available.

The landforms were first identified by viewing stereo-pairs of the aerial photographs. Delineations were then made on a mylar sheet registered to the basemap and Landsat image. The aerial photographs allowed proper identification of the landform type while the Landsat image provided for the correct location, delineation and resolution of each landform. Complex and/or questionable landforms were specifically identified.

Data Sources

Primary:
- Aerial photography
- Landsat imagery

Secondary:
- Geology maps and reports
- Soil maps and reports

Classification and Code Descriptions

Each polygon within the integrated terrain unit map is coded for a landform designation using a code structure which allows the identification of up to three discrete landform types. These landform types are connected together, and their meanings modified, by special codes preceding and following each landform type. An example of this concept and the actual coding scheme is provided below. The example is for an area composed of till deposits complexly intermingled with organic deposits, both of which overlay bedrock, whose composition, although not verified by ground investigation, is tentatively identified as schist.

The conceptual organization of this landform for coding purposes is:

> (LF Combination) (1st LF Type) (1st LF Connector/Modifier) (2nd LF Type) (2nd LF Connector/Modifier) (3rd LF Type) (3rd Connector/Modifier)

Substituting the specific codes given below to the landform combination (A), connector/modifier (B), and type (C) for the conceptual names above, results in a thirteen digit code representing the landform type, which is:

7 6 5 0 2 8 9 0 0 1 6 0 1

Translated, this thirteen digit number represents:

$$(X + Y)/Z \text{ or } \frac{\text{Colluvial Deposits + Till Sheet}}{\text{Intrusive-acidic Bedrock?}}$$

A. Landform Combination

Each photointerpreted landform unit can be characterized by the use of some combination of up to three individual landform types. The possible combinations of landform types used to describe a single, resolvable landform unit are as follows:

1 = X	Designates a single landform type which characterizes an area. Example: Till Sheet (landform code 650)
2 = X + Y	Designates two landform types which can be identified on imagery, but are not separable at the mapping resolution due to the complexity of their association, with the X-type predominant in area. Example: Till Sheet (650) + Organic Deposits (890)
3 = X/Y	Designates two landform types, with X-type overlying Y-type. Y-type is usually identified using supporting published geology information. Example: Till Sheet (650)/Schist (160)
4 = X +(Y/Z)	Designates a complex of three landform types. X-type predominant with an association of Y/Z types. Again, Z-type is usually supported by geology information. Example: Till Sheet (650) + (Organic Deposits (890)/Schist (160))
5 = (X/Y)+Z	Designates a complex of landform types, (X/Y) unit predominant, with inclusions of Z-type. Example: (Organic Deposits (890)/Schist (160)) + Till Sheet (650)
6 = X/(Y+Z)	Designates a complex of landform types, with X-type overlying (Y + Z) unit. The (Y + Z) unit is a complex of landform types usually supported by geology information. Example: Organic Deposits (890)/(Colluvial Deposits (300) + Till Sheet (650))

7 = (X+Y)/Z — Designates a complex of landform types, with (X+Y) unit overlying Z-type. Z-type is supported by geology information.
Example: (Till Sheet (650) + Organic Deposits (890))/Schist (160)

B. Connector/Modifier

Within the landform coding system, special connectors and modifiers are used to signify the relationship between the various landform types, as well as to modify any specific landform call. The connectors/modifiers are as follows:

0 = — No Connector/Modifier; or Divisor Situation (/).

1 = ? — Signifies that the landform type designation is questionable.

2 = + — Signifies that two landforms are connected, as in landform combination #2 above.

3 = ?/+ — Signifies that two landforms are connected as X+Y, with X-type being a questionable call.

4 = or — Signifies that the following landform type is an alternative call to the preceding type.

5 = ?or — Signifies that the following landform type is an alternative call to the preceding questionable type.

C. Landform Type

An Alpha code has been developed for each landform type and appears in parentheses.

000 = No Y or Z Landform Types. No additional landform types other than the primary landform type.

001 = Unknown Origin. Complex or buried deposits for which insufficient data is available for classification. This class may also be utilized as a modifier to another landform type to indicate a lower confidence level for the identification of the unit.

010 = Bedrock undifferentiated (Bx). Bedrock is any solid relatively consolidated rock which may be exposed in surface outcrops or may be overlain by unconsolidated materials. This class is used to identify those areas in which the bedrock type is undefined or is too complex to be easily characterized by a more specific rock type.

019 = Bedrock undifferentiated with thermokarst (Bxt). This class is utilized for areas of undifferentiated bedrock which have a thermokarst modified surface. Bedrock is defined as in Class 010, and thermokarst is the topography, resulting from the settling or caving of the bedrock due to the melting of interstitial ice or ice contained in fractures. Thermokarst topography appears as an irregular land surface containing numerous depressions; hence, this variety of topography greatly resembles karst topography, which results from the dissolution of limestone bedrock, although thermokarst may occur on any bedrock surface.

030 = Igneous Bedrock (I). Igneous rock is that which is formed by solidification from a molten or partially molten state. This designation involves both the deep-seated plutonic igneous rocks as well as the hypabyssal (shallow) intrusive and volcanic or extrusive igneous rocks, including pyroclastics. The class is utilized when the bedrock is not specified to any greater detail than igneous, or when the bedrock is too complex to be easily assigned a more specific class.

040 = Extrusive Igneous Bedrock (Ib). Extrusive rocks are those which are derived from magmatic materials poured out or ejected onto the earth's surface from vents in the earth's crust. This class includes both extrusive (volcanic) flow rocks, pyroclastic rocks, and some hypabyssal (shallow) intrusive rocks of all compositions, and is utilized when the composition is not defined to a sufficiently high degree to permit assignation to a more specific class.

041 = Extrusive-acidic (Iba). Acidic extrusive rocks are those extrusive rocks which have a chemical content of more than 66% free or combined silica dioxide, resulting in a mineral assemblage which is high in silica content, such as quartz, alkaline feldspars, and muscovite mica. This designation includes some of the intermediate composition rocks as well as acidic rocks, and therefore includes such rock types such as rhyolite, rhyodacite, dacite, and trachyte.

042 = Rhyolite Shield Volcano (Ibav). A rhyolitic shield volcano refers to a broad, gently sloping (4^{o} to 10^{o}) volcanic cone of flat domical shape comprised primarily of overlapping and interfingering extrusive flows of acidic (rhyolitic, rhyodacitic, dicitic, or trachytic) composition. These features are commonly several tens to hundred of square miles in extent.

045 = Extrusive-basic (Ibb). Basic extrusive rocks are those extrusive rocks which have a free or combined silica content of 45 to 52 percent, resulting in a mineral assemblage that is low in silica and high in the metallic bases, and in which the amphiboles, pyroxenes, biotite mica, and olivine, are dominant. This designation, however, involves not only the basic extrusive rocks, but some of the rocks of intermediate composition. Extrusive rocks thus included within this group are trachyandesite, andesite, basalt, diabase, olivine-basalt, and olivine-diabase.

046 = Basalt Shield Volcano (Ibbv). A basaltic shield volcano refers to a broad, gently sloping (4^{o} to 10^{o}) volcanic cone of flat, domical shape comprised primarily of overlapping and interfingering extrusive flows of basic (trachyandesite, andesite, basalt, diabase, olivine-basalt, or olivine-diabase) composition. These features are commonly several tens to hundreds of square miles in extent.

048 = Shield Volcano (rock composition unspecified) (Ibv). A shield volcano is a broad, gently sloping (4^{o} to 10^{o}) volcanic cone of flat, domical slope composed of overlapping and intercolating extrusive flows of unspecified or highly varied composition. These features are commonly of quite a large scale.

050 = Composite Volcano (Iv). A composite volano is a volcanic cone, usually of large dimension, which is comprised of alternating and interfingering layers of extrusive flows and pyroclastic materials. This term is synonymous with strato-volcano.

060 = Plutonic Igneous Intrusive Bedrock (Ig). Plutonic intrusive rocks are those that are derived from magmatic materials which, while a fluid, penetrated into or between other rocks, and which solidified before reaching the surface. Plutonic intrusive rocks tend to be much more coarsely crystalline than the finely crystalline extrusive and hypabyssal intrusive rocks. This class is used when the rock composition is not specified to any greater degree than plutonic, or when the composition is too complex or too widely varied to permit dividing the rock unit into more specific classes.

061 = Intrusive-acidic (Iga). Acidic intrusive rocks are those which have a free or combined silica content of more than 66 percent, resulting in a mineral assemblage which is high in silica content, such as quartz, alkaline feldspars, and muscovite mica. However, this designation includes both acidic rocks and some of intermediate composition. Thus, this class is considered to include such rock types as granite, granodiorite, quartz-monzonite, quartz-diorite, and syenite.

063 = Intrusive-basic (Igb). Basic intrusive rocks have a free or combined silica content of 45 to 52 percent, resulting in a mineral assemblage which is low in silica and high in the metallic bases, and in which the amphiboles, pyroxenes, biotite mica, and olivine are dominant. The class, however, involves not only the basic intrusive rocks, but also rocks of intermediate composition. Intrusive rocks included within this designation are monzonite, diorite, gabbro, and olivine gabbro.

066 = Intrusive-ultramafic (Igu). Ultramafic intrusive igneous rocks are deep-seated igneous intrusive bodies which contain less than 45 percent free or combined silica, resulting in a mineral assemblage composited of ferromagnesian silicates, metallic oxides and sulfides, and native metals, or any combination thereof, with essentially no quartz or feldspar. These rocks typically include hornblendite, pyroxenite, and peridotite.

070 = Pyroclastics (Ip). Pyroclastic materials include all detrital volcanic materials that have been explosively or aerially expelled from a volcanic vent. The pyroclastic deposits thus contained within this class include volcanic conglomerates, agglomerates, volcanic tuffs, volcanic ash, ash-flow tuffs, and all other tephra.

080 = Cinder Cone (Ipv). A cinder cone is a conical elevation or hill formed by the accumulation of volcanic cinders (clinkerlike material) volcanic ash, and other pyroclastic materials around a volcanic vent. This class is synonymous to ash cones.

100 = Metamorphic Bedrock (N). Metamorphic rocks are those which are formed by the alteration in composition, texture, or internal structure of pre-existing consolidated rocks which are subjected to heat, pressure, and the introduction of new chemical substances. The alterations in composition generaly result in the development of a new suite of minerals for the rock. This class is utilized when the metamorphic bedrock includes two or more specific landform types which are too intimately associated to be separated, or when the bedrock type is not defined more specifically than being metamorphic.

110 = Gneiss (Ng). Gneiss is a high-grade metamorphic coarse-grained rock in which bands rich in granular minerals alternate with bands rich in schistose (micaceous) mineals. Gneiss may result from the metamorphism of igneous, sedimentary, or other metamorphic rocks.

120 = Slate, Phyllite (Nl). Slate is a fine-grained metamorphic rock which possesses a well-developed fissility, known as slaty cleavage. Phyllite is an argillaceous metamorphic rock in which the mica flakes impart a silky sheen to the cleavage surfaces. Phyllite and slate generally represent low-grade metamorphism of shales, and phyllite represents a grade of metamorphism intermediate between schist and slate.

130 = Marble (Nm). Marble is a metamorphic rock consisting essentially of calcite and/or dolomite. This class represents the complete recrystallization by metamorphic processes of pre-existing limestone and dolostone.

140 = Serpentinite (Np). Serpentinite is a metamorphic rock comprised almost entirely of serpentine minerals derived from the alteration of pre-existing olivine and pyroxene (mafic rocks).

150 = Quartzite (Nq). Quartzite is a granulose metamorphic rock consisting almost entirely of quartz which formed by the metamorphism of sandstones.

160 = Schist (Ns). Schist is a medium to coarse-grained, medium to high-grade metamorphic rock with subparallel orientation of the micaceous minerals which dominate its composition. Schist is characterized by a variety of foliation known as schistosity, which is caused by the subparallel orientation of the platy and ellipsoidal mineral grains. Schist generally results from the metamorphism of sedimentary or some metamorphic rocks.

200 = Sedimentary Bedrock (S). Sedimentary rocks are formed by the accumulation of sediment in water or from the air. The sediments may consist of detrital fragments of various sizes (conglomerate, sandstone, siltstone, shale) of remains of products of plants or animals (coal, bioclastic limestones), of the products of chemical action (precipitation) or evaporation (salt, gypsum, some carbonate rocks, etc.) or of combinations of these materials/processes. This class is utilized when the bedrock consists of two or more sedimentary rocks which are too intimately associated to permit separation into component classes, or when the bedrock type is not defined more specifically than being sedimentary.

210 = Conglomerate (Sc). Conglomerate is a cemented clastic sedimentary rock containing rounded to subrounded waterworn fragments, which have grain sizes greater than two millimeters in diameter (granules, pebbles, cobbles, boulders) in a finer-grained groundmass. This designation includes breccia, which is the same as conglomerate except the fragments are angular to subangular. In a few limited cases, this class was also used to indicate tectonic breccias, which are the result of tectonic movement, but otherwise are similar to all other breccias. Tectonic breccias include both fault and fold breccias.

211 = Conglomerate-residual soil (Sc-r). This class is used to represent areas underlain by a conglomerate which has had its surface modified in any of several ways. The conglomeratic bedrock is equivalent to that described as class 210, and the surface modification or form may appear as residual soils, or as a mantle of weathered detritus covering the bedrock surface, which may result from deep weathering of well-consolidated bedrock, or from the slight weathering of poorly consolidated bedrock. These surface (residual) materials are generally thin, and may include a small quantity of colluvial as well as a small quantity of eolian deposits.

220 = Shale, Siltstone, Chert (Sh). Shale and siltstone are detrital sedimentary rocks of varying mineral composition in which the predominant grain size of the constituent particles is the chief determinent of rock type. Shale, as here defined, is a laminated body of sediment of which the predominant grain size is less than 1/256 millimeter in diameter, while siltstone may range in predominant grain size from 1/16 to 1/256 millimeter in diameter. This usage of the term "shale" is comparable to that of "claystone", which term unfortunately connotes a number of inappropriate definitions, as per Dictionary of Geological Terms, 1957. One additional definition of shale includes both siltstone and claystone, but currently shale is used to refer only to claystone. However, both grain sizes collectively are referred to as "fine-grained". Shale may be laminated, indurated, or fissile (cleaves easily parallel to bedding). The "cherts" included within this class are only the compact, siliceous rock formed of chalcedonic and/or apaline silica of either organic or precipitated origin (i.e., deep-sea marine), particularly those commonly associated with, but yet separable from, deep-sea marine limestones.

230 = Limestone (Sl). Limestone is a bedded sedimentary rock comprised primarily of calcite (calcium carbonate), and is the consolidated equivalent of limy mud, calcareous sand, or shell fragments. Limestone may be chemically precipitated from water in a marine or nonmarine environment, or may be biogenic in origin.

240 = Sandstone (Ss). Sandstone is a cemented or otherwise compacted, bedded, clastic detrital sedimentary rock composed of grains ranging in size from one-sixteenth to two millimeters in diameter. The detritus consists primarily of quartz grains, but sandstone may also be feldspathic, glauconitic, argillaceous, siliceous, calcareous, ferruginous, etc. Sandstone may be deposited by various processes in a marine environment, or may be deposited in a nonmarine fluvial or colian environment.

300 = Colluvial Deposits (C). Colluvium consists of deposits of widely varying composition that have been moved down slope chiefly by gravity. Fluvial slope wash deposits are usually intermixed with colluvial deposits.

310 = Avalanche Deposits (Ca). Avalanche deposits consist of rock fragments, plant debris, and soil deposited by slush and snow avalanches. These resulting deposits are generally fan or cone-shaped and are covered with scattered large blocks of rock. Avalanche deposits frequently form part of alluvial/colluvial fans since avalanche paths extend down slope into valleys and out onto the fans in larger valleys which drain the smaller upland valleys.

315 = Rock Glacier (Cg). A rock glacier is a tongue-shaped mass of angular rock fragments formed by movement of an ice core or interstitial ice. These features are found at the base of an extensive talus-producing surface such as a steep valley wall, the headwall of an empty cirque or recent moraines. This includes both inactive forms that may no longer contain ice, and active forms that may grade to modem, active glaciers.

320 = Landslide Deposits (Cl). Landslide deposits are lobe or tongue-shaped deposits of relatively dry rock rubble or unconsolidated debris that has moved down slope due to gravity, moisture content, and weight of overburden. This class, however, also includes rock and debris slides, slump blocks, earth flows, and debris flows.

325 = Mudflow Deposits (Cm). Mudflows consist of heterogenous unconsolidated debris lubricated with large amounts of water, resulting in a saturated mass which flows rapidly down slope. This type of deposit usually follows a former stream course and occurs as a hummocky fan or lobe-shaped body at the mouth of a gully or tributary valley.

330 = Solifluction Deposits (Cs). Solifluction deposits are formed by the slow down slope, viscous flow of saturated soil material and rock debris in the active layer. Frost creep is also a major component in forming these deposits. This unit is generally used only where obvious solifluction lobes are identifiable. Solifluction is also a major component of retransported deposits (See 500).

331 = Solifluction Colluvial Fan (Csf). A solifluction colluvial fan is formed where solifluction deposits (330) emerge from a confined channel on a hillside onto a level plain or valley. This type commonly includes coarse-grained as well as fine-grained sediments, and may contain some incorporated fine-grained alluvial fan materials.

335 = Talus (Ct). Talus consists of deposits of angular rubble and rock fragments or accumulated by gravity at the base of cliffs and steep slopes. Talus may accumulate either as steep cones (see 336), or as talus aprons, which are comprised of mantles of accumulated detritus overlying a broad slope.

336 = Talus Cone (Ctc). A talus cone is a deposit of talus that accumulates at the mouth of a canyon or gully, forming a steep cone.

337 = Protalus Rampart, Winter Protalus Mounds, and Protalus Lobe (Ctp). The protalus rampart consists of an arcuate ridge of talus that accumulates along the lower margin of a perennial snow patch lying at the base of a steep slope or cliff. This talus may contain interstitial ice, and is usually concave upslope in form, although some ramparts may form linear benches or be convex upslope. Winter Protalus mounds are a landform of similar origin which consists of conical mounds of rubble 0.6 to 7.6 meters high. These mounds probably originated from a single episode of sliding, and then evolved by unequal ablation of the underlying snow and ice, while protalus ramparts appear to be the result of repeated sliding. The protalus lobe originates as rampart which begins a downslope movement, forming a lobate structure. If the lobe moves sufficiently downslope as a tongue of rock rubble, it is then classified as a rock glacier. These colluvial materials are typically coarse, angular, and non-oriented, and are commonly produced by frost-wedging prior to movement downslope by gravity.

340 = Basin Colluvium - Arctic Slope (Cx). Basin colluvium deposits consist of generally fine-grained, organic-rich deposits with variable amounts of granular material present in basins occurring between smoothly rounded slopes on the Arctic Slope. It is usually associocited with frozen upland silt (373). The origin of this landform is not definitely known. However, the material appears to have moved into small basins from surrounding slopes by solifluction, creep and/or slopewash. Other processes that could have a role in the genesis of this deposit are thaw basin formation and drainage, organic deposit development and perhaps eolian deposition. Nivation may also result in modification of basin margins and minor reworking of basin marginal deposits in some localities. Basin colluvium is differentiated from thaw lake materials by smooth gradation with surrounding slopes and the highly variable and thin character of accumulated deposits.

360 = Eolian Deposits (E). Eolian deposits consist of materials, generally silt and fine sand, eroded, transported, and deposited by the action of the wind.

370 = Loess (El). Loess is a homogeneous, nonstratified, nonindurated deposit consisting primarily of silt, with subordinate amounts of fine sand and/or clay. This type of sediment frequently displays a well-developed vertical parting. Loess generally consists of angular to subangular particles of quartz, feldspar, calcite, dolomite, and other minerals held together with montmorillonite binder.

371 = "Lowland Loess" (Ell). Lowland loess consists of wind-blown silt deposited on poorly drained "lowland" locations, mixed with organic material and frequently with finer floodplain or other fluvial/colluvial materials. This unit is normally frozen with a high ice content, and generally has a low proportion of wind-blown silt in relation to the amount of organic material and massive ice present. This class is also used for surficial layers that are silty, organic, and high in ice content, but are of uncertain origin. Lowland loess is generally found as a somewhat continuous surficial layer one to three meters thick throughout the majority of the Arctic Coastal Plain of Alaska, and in fact, is commonly only one meter thick. This designation has also been utilized in "upland" locations in association with thaw basin and thaw lake materials where conditions appear to replicate those found more commonly in the "lowland" locations, i.e., poorly drained and quite boggy.

372 = "Upland Loess" (Elu). Upland loess is comprised of wind-blown silt deposited on well-drained upland locations; generally used only for thick, unfrozen silt deposits (see 500 for further discussion).

373 = Frozen Upland Silt (Elx). The origin of this unit is not completely understood; it is probably eolian due to its uniform silty gradation. However, it differs from "upland" loess (372), in that it consists of thick, frozen silt with organic-rich zones and contains massive ice formations. Its properties are similar to silty retransported deposits (500), yet it frequently occurs at the tops of ridges and hills where a transported origin is not possible. The presence of unoxidized organic-rich zones indicates the unit may be loess that has remained frozen since deposition. It may include silty colluvium in upland depressions or gullies, and is also used to represent deposits of loess with large amounts of massive ice in "lowland" localities, particularly along thermokarst floodplains where improved suprapermafrost drainage has created aerobic conditions, thereby reducing the organic layers, and conversely, increasing the susceptibility to frost-heave and massive-ice buildup. Thus, this problem of "upland" versus "lowland" loess has arisen. Some workers feel that the units are valid only if the relativitistic terms "upland" and "lowland" are strictly adhered to by physiographic positioning or are dropped in favor of redefining the types of silt in terms of massive ice volume.

380 = Eolian Sand (Es). Eolian sand deposits consist of unconsolidated, wind-deposited accumulations of primarly fine sand which may take the form of sand sheets or hill-like masses of sand, referred to as sand dunes. Sand dunes may be migratory or stationary.

400 = Fluvial Deposits (F). Fluvial deposits consist of detrital sediments transported and deposited by running water, such as in rivers and streams. This class, however, includes alluvial fan deposits, floodplain deposits, terrace deposits, mud volcanoes, deltaic deposits, and various types of retransported deposits, a few of which involve more processes than simply running water.

405 = Aufeis (Fa). This landform consists of a mass of surface ice formed during winter by successive freezing of sheets of water that may seep from the ground, from a river, or from a spring. River icings occur by a shallow stream breaking through its ice cover during freeze-up due to hydrostatic pressure developed by the continual flow of water beneath the ice as freezing approaches the river bed. Icings evolve particularly with underlying permafrost, and occur commonly from seepages at the base of south-facing slopes. Groundwater icings are relatively small, usually less than half a square kilometer in area and less than one meter thick, while stream icings range up to five kilometers wide, fifty kilometers long, and ten meters thick in Alaska. Aufeis ice generally contains little fine-grained materals, and usually overlies cleanly washed gravels.

410 = Delta (Fd). A delta is an alluvial deposit formed at the mouth of a river or stream which flows into a standing body of water, such as a lake or ocean. Deltas tend to form triangular-shaped salients of sediments into the water bodies. The forward margin of a delta extending into the ocean may also be subject to tidal influences, and thus, may have associated tidal flats. Delta deposits primarily consist of sandy silt.

415 = Sandy Delta (Fds). This class is utilized for deltas which are formed as a glacier retreats and the fluvial outwash sediments are deposited directly into a water body. These deposits are primarily sandy in texture, but have intercalated finer-grained sediments at subsurface levels where delta deposits cover lacustrine or glaciolacustrine deposits.

420 = Alluvial Fan (Ff). An alluvial fan is a gently sloping cone-shaped deposit of alluvium formed where a stream course extends onto a relatively level plain such as the points where streams issue from mountains onto a lowland. Alluvial fans are composed predominantly of sandy and gravelly materials, but may also have varying quantities of silt and clay. The primary depositional agent of this landform is running water, while a solifluction fan is primarily colluvial in origin. However, this class does include varying proportions of avalanche and mudflow deposits, especially in mountainous regions. Glacial outwash fans have been identified in abundance east of the Kadleroshilik River on the Arctic Slope of Alaska; these fans were separated by relative states of activity. Relatively inactive fan surfaces were identified with the landform combination Ff/GFo in order to indicate the initial glaciofluvial origin. Active fan surfaces had well-developed floodplain signatures throughout the lateral extent of the fan, and were, therefore, identified by placing the various flooplain units in a superpositional relationship to alluvial fan deposits (i.e. Fpa/Ff, Ft/Ff, etc.) It should be noted at this point that these glacial outwash fans have a large quantity of interbedded and some suspected overlying eolian sand deposits closely associated with these alluvial fan deposits.

421 = Granular Alluvial Fan (Ffg): This class is utilized for alluvial fans which contain essentially no colluvial deposits, such as mudflows, landslides, avalanche materials, etc. (see 420), and are comprised almost entirely of coarse-grained detritus (gravel and sand).

422 = Finer-grained Alluvial Fan (Ffs). This class is used for alluvial fans composed primarily of finer-grained materials (sand and silt) which have been deposited by fluvial action rather than by colluvial processes, such as sheetflow and solifluction, as are solifluction fans (331) which may include some coarse-grained detritus, and retransported deposit fans (530) that are chiefly comprised of finer-grained sediments.

430 = Mud Volcano (Fm). A mud volcano consists of a cone-shaped mound with a maximum height of up to 250 feet constructed around a natural spring by mud and water carried to the surface and extruded by slowly escaping natural gas.

440 = Floodplain (Fp). A floodplain is comprised of deposits laid down by a river or stream and flooded during periods of highest water in the present stream regimen. Floodplains are composed of two major types of alluvium lateral accretion deposits (see 443) and vertical accretion deposits (See 441). In detailed subsurface profiling it is sometimes possible to differentiate point bar deposits (Fp-p). These deposits are laid down on the inside of meander loops during floods which are lower than bank overflow stage and are intermediate in soil texture between cover deposits (441) and riverbed deposits (443). This class is used when the precise floodplain type is not apparent due to mapping scale and resolution, and the relative size of the floodplain is in question.

441 = Floodplain Finer Cover Deposits (Fp-c). This class is comprised of the finer-grained, relatively thin cover or vertical accretion deposits laid down from the suspension load over relatively coarse-grained riverbed or lateral accretion deposits by streams at bank overflow (flood) stages. Floodplain deposits are composed primarily of lateral accretion sediments, with vertical accretion deposits comprising usually less than ten percent of the total detrital accumulation. Therefore, whenever cover deposits are mentioned, except where specified to be greater than twenty feet thick, the cover deposits are assumed to be at the surface, and the surficial deposits are assumed to include some quantity of underlying riverbed materials.

443 = Floodplain Riverbed Deposits (Fp-r). This class is comprised of the coarser-grained (generally granular) riverbed or lateral accretion deposits laid down in the areas of channeled flow from the bed load of the stream.

445 = Braided Floodplain (Fpb). This class is utilized for floodplain materials deposited in a river or stream with branching, anastomizing channels, which are caused by the sediments within the stream acting as obstructions to the flow of the stream. This condition is the result of the stream possessing a much higher sediment load than the energy level of the stream can transport. Braided floodplains are generally composed of course-grained detritus, but the lateral and vertical accretion subdivisions of floodplain sediments still apply. The braided floodplain is generally unfrozen or is sporadically frozen in permafrost areas.

446 = Braided Floodplain Cover Deposits (Fpb-c). This class is comprised of the relatively fine-grained cover or vertical accretion deposits of a braided floodplain laid down over the relatively coarse-grained riverbed or lateral accretion deposits by streams at bank overflow (flood) stages. Floodplain deposits generally consist of less than ten percent cover deposits.

447 = Braided Floodplain - gravelly sand or coarser (Fpbg). This class is used when the braided floodplain deposits consist of lateral accretion sediments of gravelly sand or greater grain size.

448 = Braided Floodplain Riverbed Deposits (Fpb-r). This class is composed of the coarse-grained (generally granular) riverbed or lateral accretion sediments of a braided floodplain deposited within the areas of channeled flow from the bed load of the stream. This class may be divided into classes 447 and 449.

449 = Braided Floodplain - sand or finer (Fpbs). This class is used when the sediments of a braided floodplain consist of lateral accretion detritus with a grain size of medium sand or finer.

450 = Meander Floodplain (Fpm). A meander floodplain is one that winds freely in rather regular, well-developed, s-shaped curves. This characteristic is generally considered a standard habit of mature rivers. The meander floodplain, unlike the braided floodplain, does not suffer the wide disparity between sediment load and the load the stream is capable of transporting, although at flood stages, the meander floodplain loses sufficient energy to lose not only the bed load, but the majority of the suspension load. This class is also divided into the vertical and lateral accretion deposits. Meander floodplains are generally unfrozen or sporadically frozen in permafrost areas.

451 = Meander Floodplain Cover Deposits (Fpm-c). This class is composed of the finer-grained relatively thin cover or vertical accretion sediments deposited from the suspension load of the stream over the riverbed or lateral accretion sediments, which comprise the majority (approximately 90%) of all floodplain detritus, during bank overflow (flood) stages. This class may be subdivided into classes 457 and 459.

452 = Meander Floodplain - gravelly sand or coarser (Fpmg). This class is used for a meander floodplain deposits which are composed predominantly of lateral accretion detritus of gravelly sand or coarser grain size.

453 = Meander Floodplain Riverbed Deposits (Fpm-r). This class is composed of the relatively coarse-grained (generally granular) riverbed or lateral accretion sediments which were denied from the bed load of the stream and deposited in areas of channeled flow within the stream course. This class may be subdivided into classes 452 and 454.

454 = Meander Floodplain - sand or finer (Fpms). This class is utilized for meander floodplains composed of sediments which are of medium and grain size or finer.

455 = Floodplain - thermal state unspecified, sand or finer (Fps). These sediments are composed of detritus which is deposited by a river or stream and which is flooded relatively frequently during periods of highest water (bank overflow stages) in the present fluvial regime. This variety is used to refer to those floodplain areas which are of unspecified form (neither braided, meandering, or abandoned), and which are not classified as to thermal state. These deposits are composed of lateral accretion detritus which may be of medium sand or finer grain size, but are usually of sandy texture.

456 = Floodplain - thermal state unspecified, sand or finer, thick cover deposits (greater than 20′) (Fps-c). This class is reserved for floodplain areas of unspecified form and unspecified thermal state which have surface deposits comprised of vertical accretion detritus exceeding twenty feet in thickness with a homogeneous texture of medium sand or finer. These deposits are typically composed of silt-sized grains.

457 = Meander Floodplain - gravelly sand or coarser, thick cover deposits (greater than 20′ thick) (Fpmg-c). This class is used for a meander floodplain which has surface deposits consisting of vertical accretion detritus exceeding twenty feet in thickness with a homogeneous texture of gravelly sand or coarser.

459 = Meander Floodplain - sand or finer, thick cover deposits (greater than 20′ thick) (Fpms-c). This class is used for a meander floodplain which has surface deposits consisting of vertical accretion detritus exceeding twenty feet in thickness with a homogeneous texture of medium sand or finer.

460 = Abandoned Floodplain (Fpa). This floodplain type is one which is no longer associated with the present fluvial regime. An abandoned floodplain is an older, commonly frozen portion of a floodplain, especially in permafrost areas, which frequently contains a surface layer of ice-rich "lowland" loess and fine-grained alluvium up to ten feet thick over coarser-grained (granular) alluvium. The presence of abandoned floodplain areas implies maturity for that stream, and the abandoned floodplain may be meandering or braided in form. An abandoned floodplain retains the applicable divisions into cover and riverbed deposits, and tends to be flooded less frequently than meandering and braided streams, and yet not so infrequently as to be called a terrace.

461 = Abandoned Floodplain Cover Deposits (Fpa-c). This class refers to the vertical accretion deposits of a floodplain which is no longer associated with the present fluvial regime. Since the form is unspecified, the cover deposits may have a variety of compositions by grain size, but the relative grain size of vertical accretion deposits versus lateral accretion deposits still apply. These deposits are generally frozen in permafrost areas.

462 = Abandoned Floodplain - gravelly sand or coarser (Fpag). This class is used for abandoned floodplain deposits which consist of lateral accretion sediments of gravelly sand or greater grain size. As with class 460, this unit is of unspecified form, is flooded less frequently than the specified form floodplains, and is generally frozen in permafrost areas.

463 = Abandoned Floodplain - gravelly sand or coarser, thick cover deposits (greater than 20′ thick) (Fpag-c). This class is used for an abandoned floodplain which has surface deposits consisting of vertical accretion detritus exceeding twenty feet in thickness with a homogeneous texture of gravelly sand or coarser. As with the other abandoned floodplain classes, this unit is of unspecified form, is flooded less frequently than the specified form floodplains, and is generally frozen in permafrost areas.

464 = Abandoned Floodplain - sand or finer (Fpas). This class is used for abandoned floodplains deposits which are comprised of lateral accretion sediments of medium sand or finer grain size. This unit retains all other general characteristics of abandoned floodplains as detailed previously.

465 = Abandoned Floodplain - sand or finer, thick cover deposits (greater than 20′ thick) (Fpas-c). This class is used for an abandoned floodplain which has surface deposits composed of vertical accretion detritus exceeding twenty feet in thickness with a homogeneous texture of medium sand or finer. This unit also retains the general characteristics of abandoned floodplains as detailed previously.

470 = "Bog" Floodplain (Fpo). The "bog" floodplain consists of floodplain sediments deposited over organic deposits in the form of bogs. These deposits may or may not be underlain by granular deposits, and therefore may have developed concurrently in the past, or the floodplain may be developing subsequent to the prior development of the organic deposits.

475 = Old Terrace (Fpt). This class consists of old, relatively flat or gently inclined dissected floodplain surfaces which are no longer flooded. Specifically, only the older terraces which are weathered sufficiently to alter the character of the detrital deposits are included within this class. Recent terraces and dissection remnants whose materials are relatively unaltered by weathering are indicated by the landform types 541 and 542. The "old terrace" is a "high level" terrace, while the "recent terrace" is a "low level" terrace. This class is separated from class 545 because it may be composed of both fluvial and glacial detritus, while class 545 is non-glacial in origin.

480 = Floodplain - form unspecified (Fpu). These sediments are comprised of detrital materials deposited by a river or stream and flooded relatively frequently during periods of highest water (bank overflow stages) in the present stream regimen. This class refers to those floodplain areas which can not be classified as braided, meandering, or abandoned. These deposits are typically unfrozen or sporadically frozen in permafrost areas. As with all floodplain deposits, this type is divisible into the lateral and vertical accretion deposits.

481 = Floodplain - form unspecified, gravelly sand or coarser (Fpug). This class is utilized for lateral accretion floodplain deposits of unspecified form (not braided, meandering, or abandoned), but with a specified thermal state (unfrozen or sporadically frozen in permafrost areas) and which are composed primarily of gravelly sand or coarser-grained materials.

482 = Floodplain - form unspecified, gravelly sand or coarser, thick cover deposits (greater than 20′ thick) (Fpug-c). This class is designated as a floodplain of unspecified form but specified thermal state (unfrozen or sporadically frozen in permafrost areas) which has surface deposits composed of vertical accretion detritus exceeding twenty feet in thickness with a homogeneous texture of gravelly sand or coarser. Otherwise, these deposits retain all the general characteristics of floodplains of unspecified form but with a specified thermal state as detailed previously.

483 = Floodplain - form unspecified, sand or finer (Fpus). This class is used for lateral accretion floodplain deposits of unspecified form (not easily described as braided, meandering, or abandoned), with a specified thermal state (unfrozen or sporadically frozen in permafrost areas) and which are composed of medium sand or finer-grained detritus.

484 = Floodplain - form unspecified, sand or finer, thick cover deposits (greater than 20′ thick) (Fpus-c). This class is reserved for floodplains of unspecified form but with a specified thermal state (as detailed under code 483) which has surface deposits composed of vertical accretion detritus exceeding twenty feet in thickness, with a homogeneous texture of medium sand or finer.

485 = Floodplain - thermal state unspecified, gravelly sand or coarser (Fpg). These sediments are composed of detritus which is deposited by a river or stream and which is flooded relatively frequently during periods of highest water (bank overflow stages) in the present fluvial regimen. This class refers to those floodplain areas which can not be classified as braided, meandering, or abandoned (unspecified form), and which are not classified as to thermal state. These deposits are comprised of lateral accretion detritus of gravelly sand or coarser grain size.

486 = Floodplain - thermal state unspecified, gravelly sand or coarser, thick cover deposits (greater than 20' thick) (Fpg-c). This class is reserved for floodplain areas of unspecified form and unspecified thermal state which have surface deposits comprised of vertical accretion detritus exceeding twenty feet in thickness with a homogeneous texture of medium sand or finer.

500 = Retransported Deposits (Fs). This class consists of generally fine-grained, organic-rich materials moved downslope by slopewash, solifluction, and in some cases, piping. These processes are dominantly gravity-induced, but are also assisted and modified by running water. Slopewash consists of materials moved downslope by the action of gravity with the assistance of moving water that has not been channelized. Piping is a subterranean erosion of clastic particles by percolating waters which produce tubular subsurface conduits. Piping may occur in materials ranging in grain size from clay to gravel in the form of alluvium, loess, volcanic ash and soil, various clastic sedimentary rocks (primarily siltstone, claystone, and mudstone), and tuff. This mechanism occurs worldwide in predominantly arid and semiarid regions, and is chiefly a fluvial process. Solifluction is primarly a process of the slow downslope flow of mass-wasting materials saturated with water. The mechanism of solifluction occurs predominantly within materials subject to frost-heaving, in which the materials contain an excess quantity of water in the form of discrete lenses of ice when frozen. When thawing occurs, the formerly ice-supported structure collapses, with a resultant downslope displacement. Materials not subject to frostheaving are much less likely to be subject to solifluction. Solifluction is typically aided in areas with underlying still-frozen layers (not necessarily permafrost), because the freezing hinders drainage, leading to the inevitable oversaturation of the materials which have already been weakened by frost-heaving. Solifluction movements are apparently a natural mechanism in permafrost areas which occur to much greater depths than in areas affected only by annual freeze-thaw processes. In sum, retransported deposits are the product of a hybrid process in which the role of water versus that of gravity is complexly related. These deposits are frequently frozen and contain massive ice. Frozen loess is commonly a component part of, or shares a gradational contact with these sediments, and is usually included within this unit. Retransported deposits have been divided principally on the basis of topography, vegetation, and composition.

510 = "Hilly" Retransported Deposits (Fsh). This class generally occurs in areas with complex slopes of hills and depressions, often resembling a topography dominated by glacial moraines. These deposits are covered predominantly by black spruce, tussocks, or bog vegetation in the lower, more poorly drained areas and by white spruce, deciduous forest, or shrub vegetation in the higher, more well-drained areas. This topography may result from ground-ice aggradation and/or thermokarst processes.

515 = "Lowland" Retransported Deposits (Fsl). These deposits typically occur in depressions, or on concave or flat slopes with black spruce, tussocks, or bog vegetation. This class is utilized for the more poorly drained retransported materials. "Lowland" retransported deposits are generally frozen and ice-rich.

520 = "Rounded" Retransported Deposits (Fsr). This class is found on convex ridges, upland areas dissected by periglacial processes, or on moderate, simple slopes, and is generally vegetated with black spruce and tussocks. This unit is better drained than the "lowland" retransported deposits, but is not as well drained as the "wooded" retransported deposits. These sediments are also generally frozen and ice-rich.

525 = "Wooded" Retransported Deposits (Fsw). These deposits are typically found on convex ridges, upland areas affected by periglacial processes, or on moderate, simple slopes, but is vegetated with white spruce, deciduous forest, or shrubs. This class occurs at the upper portion of lower slopes near the transitions to unfrozen terrain (generally below or at the inflection point of the slope). Thus, this unit occurs on similar terrain to that of class 520, but this class is the most well-drained phase of retransported deposits and is covered by a different variety of vegetation. Nonetheless, these deposits are discontinuously frozen and may be ice-rich. The depth to the top of the permafrost layer for this unit can be from five to fifteen feet deep.

530 = Retransported Deposit Fan (Fsf). This class is used to identify sediments comprised of detrital materials as described in class 500, which are deposited in the form of a gently sloping cone formed where confined channels emerge onto a level plain or valley. These deposits tend to be steeply sloped at the outermost margins of the fan, but gently sloped throughout the body of the fan. The retransported deposit fan consists predominantly of finer-grained materials of chiefly colluvial origin, but may also include small quantities of alluvial materials..

535 = Sandy Retransported Deposits (Fsa). This form of retransported deposits is derived predominantly from upland areas comprised of eolian sand dune detritus. These deposits are generally fine-grained (fine sand), and, like other retransported deposits, are the result of downslope movement by solifluction, slopewash, and piping. These materials are also generally frozen and ice-rich, and may contain actual eolian sand and various quantities of organic materials.

540 = Terrace (Ft). This class consists of relatively flat or gently inclined surfaces resulting from the dissection of former floodplain areas. An area is referred to as a terrace only when the terrace surface is high enough not to be floodprone. This class includes both the high-level, older terraces, and the low-level recent terraces, as described in classes 475, 541, 542, 543, 545.

541 = Recent Terrace - gravelly sand or coarser (Ftg). This class consists of younger, relatively flat or gently inclined, dissected floodplain surfaces which are no longer floodprone. Recent terraces are distinguished from older terraces by the recent terrace material characteristically being unaltered by weathering processes. This class is subdivided from other recent terraces by compositional differences; it is composed predominantly of detritus of gravelly sand or coarser texture which was chiefly lateral accretion deposits in a former stream regimen. This class is characterized as a relatively "low-level terrace".

542 = Recent Terrace - sand or finer (Fts). This variety of terrace material is composed of the younger, relatively flat or gently inclined, dissected floodplain surfaces which are no longer floodprone. Recent terraces are divided from the older terraces by being relatively unaltered by weathering processes. This class is distinguished from other recent terrace materials by compositional variations; it is comprised primarily of sediments of medium sand or finer texture which were chiefly lateral accretion deposits in a former stream regimen. This terrace class is a relatively "low-level terrace".

543 = Recent Terrace - sand or finer, thick cover deposits (greater than 20' thick) (Fts-c). This class is comprised of the younger, relatively flat or gently inclined, dissected floodplain surfaces which are no longer prone to flooding. As with all recent terrace materials, these deposits are not altered by weathering processes. This class is separated from other recent terrace materials by compositional means; these sediments are composed of materials of medium sand or finer texture which are primarily vertical accretion deposits of a former stream regimen. This class is a relatively "low-level terrace".

545 = Old, Non-Glacial Terrace (Fto). This class is composed of the old, relatively flat or gently inclined, dissected floodplain surfaces which are no longer flooded. Older terraces are characterized by a sufficient amount of weathering to alter the character of the fluvial deposits included within this class. This class is considered a relatively "high-level terrace" and is separated from class 475 by compositional differences; class 475 may include detritus of fluvial or glacial origin, while this class is exclusively of non-glacial origin.

590 = Undifferentiated Glacial and Non-Glacial Granular Deposits (FG). This class is composed of granular deposits with an unspecified origin, and may be used in areas of non-glacial floodplains, granular alluvial fans, and glacial outwash plains. In proglacial environments (areas beyond the margins of glaciers), glaciofluvial deposits grade downstream into entire non-glacial, fluvial deposits. This class is utilized in the transitional areas between the exclusively glacial and exclusively fluvial environments for granular deposits of mixed or unknown origin.

600 = Glacier (Gg). This class consists of a mass of ice and firn with definite lateral limits, with motion in a specific direction, and originating from the recrystallization and compaction of snow and melt-water by pressure of overburden. Glaciers originate in snowfields as granular snow, and through a number of processes, the ice is compacted by expulsion of air. The original granular snow has a density of 0.06 to 0.16, whereas firn (a stage of ice compaction intermediate between snow and glacial ice) has a density of 0.72 to 0.84, while glacial ice has a density of approximately 0.9, and pure ice with no interstitial air has a density of 0.916. This density increase is caused by sublimation, recrystallization with the growth of large crystals at the expense of small crystals, melting and refreezing of ice under pressure (a process known as regelation), and compaction under weight. Snow and ice must apparently be 100 to 150 feet thick to allow the density increase. With the increase in density, the glacial ice is sufficiently heavy to allow ice flow. A glacier may be divided into an accumulation zone and an ablation zone. Glaciers may or may not be accompanied by lateral, terminal, medial, or ground moraine. This class is used when the division into ablation and accumulation zones is not possible from available data sources.

601 = Glacier - accumulation zone (Gga). This class consists of portions of a glacier (described in class 600) which show a net increase of snow and ice per year. The line separating ablation zones from accumulation zones changes with the seasons in accordance with climatic changes. Accumulation zones tend to occur in the headward portions of glaciers, while ablation zones tend to occur in the terminal portions of glaciers. Outlet glaciers are nourished by ice from massive snowfields located upslope from the outlet glacier, but most glaciers are fed by orographic snowfall, and avalanching from enclosed cirques and valley walls, and may be influenced by position versus dominant wind direction (leeward areas accumulate more snow than windward areas), and by sun exposure (deep valleys shaded by the sun, particularly during midday and early afternoon, are most likely to accumulate the mandatory thickness of ice to produce a glacier).

602 = Glacier - ablation zone (Ggw). This class is comprised of those portions of a glacier, described under class 600, which are subject to a net decrease in the quantity of glacial snow and ice per year. The line dividing ablation from accumulation zones changes with the season in accordance with climatic changes. Ablation zones tend to occur at or near the terminal margins of glaciers, while accumulation zones tend to occur at the headward portions of a glacier. Glacial wastage occurs chiefly by melting, evaporation, or sublimation, and if the terminus of the glacier extends into a waterbody, the glacier may lose mass by calving of ice into the waterbody.

603 = Snowfield (Ggs). This class identifies areas covered by snow and ice year-round which show little or no relative movement of the ice. For very large areas covered by glacial ice and snow, the snowfield tends to occupy the upland areas, and is a major source of ice for outlet glaciers.

610 = Glacial Deposits (G). This class is utilized for sediments deposited either in direct contact with glacial ice or deposited by melt-water. It includes glacial drift, glacio-fluvial, glaciomarine, and glaciolocustrine deposits, and may be utilized either to map a complex of these sediments, such as glacial and glacio-fluvial deposit complex or water-worked till, or to map undifferentiated glacial drift. Glacial drift deposits range from unsorted, unstratified, silt, sand, gravel, and boulders to poorly to moderately sorted sand and gravel with some boulders, with some local stratification evident.

611 = "Lowland" Glacial Deposits (Gl). This class is used for the more poorly drained portions of any glacial drift deposits that occur in lowland areas, in depressions, and on gentle side slopes. It is generally covered with open or dense black spruce and ground vegetation suited to seasonally wet ground conditions. "Lowland" glacial deposits are commonly accompanied by organic materials, which may dominate the deposits, and are frequently frozen and ice-rich, and are therefore subject to frost action.

612 = Ice-Cored Glacial Moraine (Ggm). This class represents residual accumulations of glacial till and remnant ice deposited by wastage (ablation) at the lateral and terminal margins of modern active glaciers. These moraines are generally frozen and ice-rich, and are distinguished by steep slopes, collapse features, and characteristically high instability. This class may share a transitional boundary to existing, slightly older moraines which contain little or no ice.

620 = Moraine (Gm). This class is composed entirely of glacial till deposited at the terminal or lateral margins of a glacier which has since receded or disappeared. Ground moraine deposits form till sheets, as described for class 650. Lateral moraines form along the lateral margin of a glacier and are composed chiefly of materials contributed from valley walls by weathering, landslides, avalanches, and other forms of mass movement. Lateral moraines often join to form medial moraines, but these are commonly removed by stream erosion following glaciation. Lateral moraines usually appear as ridges of till on valley walls. Terminal moraines result from the recession and advancement of glaciers, but their size and relative conspicuousness are determined by the duration of the glacial front's stay at that position, the sediment load of the stream, and the load-carrying capacity of melt-water streams emerging from the glacier. Slight oscillations during the recession of an ice front may result in an irregular belt of knolls and basins, often described as knob and basin topography. This class is usually utilized to identify these areas of irregular topography in till of discontinuous ridges, knowls, and hummocks surrounding closed depressions. These depressions may contain "lowland" till as described for class 611, and organic deposits. However, the class is also used to identify erosional remnants of lateral moraines, particularly on valley walls. Moraines have also been divided into younger and older moraines, as described for classes 621 and 622.

621 = Older Moraine (Gmo). This deposit consists of relatively older moraine with a somewhat more subdued topography and morphology, and has more advanced basin-filling present than younger moraines. Older moraine deposits have a more integrated drainage network and a higher ground-ice content than younger moraines. This class tends to have fewer active organic deposits accumulating on the moraine due to the more well-developed drainage network. Otherwise, older moraine matches the characteristics of class 620.

622 = Younger Moraine (Gmy). This class is comprised of relatively younger moraines which exhibit a much more pronounced moraine topography and less integrated drainage network than older moraines. Younger moraines have little basin-filling present, and a lower ground-ice content than older moraines. This class is more poorly drained in the depressions within its topography than older moraines, and thus, tends to have more organic deposits developing in these depressions. Other than the characteristics specified in this description, younger moraines retain all other features of moraines as detailed for class 620.

650 = Till Sheet (Gt). This class consists of heterogeneous deposits of unsorted, unstratified sediments ranging in size from clay to boulders, which are transported and deposited by a glacier. These sediments may locally consist of poorly to moderately sorted sand and gravel with some boulders. A "till sheet" originates as ground moraine which is deposited in sheets over the landscape as basal or superglacial till. The ground moraine tends to be thin and relatively scarce in glacial troughs due to glacial-scouring and post-glacial stream erosion, but thick till sheets may accumulate on glacial plains to apear as a swell and swale topography. Some till sheets may be preserved on valley sidewalls and on glacial terraces near valley floors. This class includes erosional remnant moraines which do not display characteristic moraine topography, till layers left on valley sideslopes, and till plains with associated moraines and glaciofluvial deposits of similar age/event.

651 = Drumlins (Gtd). Drumlins consist of a streamlined hill or ridge of till of elliptical base and arched profile with the longitudinal axis, often measuring half a mile or more, paralleling the direction of ice movement. These hills may vary from twenty to two hundred feet or more in height, and are usually spoon-shaped, but many variations in shape exist. Drumlins are usually found not singly but in swarms, and are commonly located a short distance headward of end moraines. This form frequently has a core of rock or stratified materials usually near the upglacier end.

652 = Fluted Till (Gtf). This class is comprised of till sheet deposits which have been modified by glacial flow into straight parallel grooves with intervening ridges. These grooves often contain organic deposits in the form of bogs and "lowland" till. Fluted till sheets have a topography somewhat resembling moraines, but terminal moraines occur in arcuate bands oriented perpendicular to the direction of ice flow, while fluted till displays an orientation with the longitudinal axis parallel to the direction of ice flow. Fluted till is similar in form to drumlines, but drumlines consist of discrete hills, while fluted till occurs in long ridges. Fluted till also resembles, on Landsat images, scoured bedrock surfaces which retain a veneer of till, but careful examination of signatures can alleviate this problem.

653 = "Lowland" Till (Gtl). This class is used for the more poorly drained portions of glacial till deposits that occur in lowland areas, in depressions, and on gentle side slopes. It is generally covered with open or dense black spruce and ground vegetation suited to seasonally wet ground conditions. "Lowland" till deposits are commonly accompanied by organic deposits, which may dominate the surface of the deposits, and are frequently frozen and ice-rich, and therefore, are subject to frost-action.

654 = Older Till (Gto). This variety of till sheet is distinguished by a subdued swell and swale topography, advanced basin filling, and possesses a more integrated drainage network than younger till sheets. Older till may have a higher ground-ice content than younger till sheets. Otherwise, older till sheets retain all the traits which characterize fill sheets as described for class 650.

655 = Younger Till (Gty). This class is distinguished by a pronounced swell and swale topography, little or no basin filling, and possesses a less integrated drainage network than older till sheets. Younger till tends to have a lower ground-ice content than older till sheets. Otherwise, younger till sheets possess all the traits which characterize till sheets as described for unit 650.

700 = Glaciofluvial Deposits (GF). This class consists of sediments which have been transported and deposited by glacial melt-water streams which flow within or beyond the terminal margin of an ice sheet or glacier. Sediments deposited by meltwater on, under, or within the ice are defined as ice-contact deposits, which include kame, esker, and crevasse filling deposits. Glaciofluvial sediments also include detritus deposited by meltwater beyond the terminal margin of an ice sheet or glacier. Meltwater concentrates beyond the ice margin and accompanying deposition produces a thick fill of proglacial sediments known as outwash. These deposits may fill a valley leading to a glacier or moraine, and is termed a valley train. Descriptions of the materials included with glaciofluvial deposits follow in the descriptions for classes 705, 710, 711, 720, and 730.

705 = "Lowland" Glaciofluvial Deposits (GFl). This class is reserved for the more poorly drained phases of glaciofluvial deposits that occur on nearly level surfaces in depressions and in broad lowland areas. This unit is generally covered with open or dense black spruce and ground vegetation sited to seasonally wet ground conditions. "Lowland" glaciofluvial deposits are commonly associated with organic deposits, which may dominate the surface. They are frequently frozen and ice-rich and are subject to frost-action.

710 = Outwash - active (GFa). Outwash is the type of glacial drift which is deposited by meltwater streams beyond the terminal glacial margin. This form of proglacial drift includes outwash fans, deltas, and aprons, valley trains, and both pitted and nonpitted outwash plains. These sediments are characteristically well-stratified and locally foreset-bedded, and are composed of moderately to well-sorted, clean-washed bedload sand and gravel with some boulders. This class is distinguished from class 711 by being currently active; that is, the outwash deposits lead to an active glacial front where meltwater is currently depositing new sediments.

711 = <u>Outwash - older</u> (GFo). This class of outwash consists of glacial drift which was deposited by meltwater streams beyond the terminal margin of a glacier. It includes outwash fans, deltas, and aprons, valley trains, and both pitted and nonpitted outwash plains. These sediments are characteristically well-stratified and locally foreset-bedded, and are composed of moderately to well-sorted, clean-washed bedload sand and gravel with some boulders. This class is separated from class 710 by being comprised of inactive outwash deposits; that is, the active processes within the area no longer include meltwater deposition.

720 = <u>Kame Deposits</u> (GFk). This class consists of depositional features commonly associated with stagnant ice. Kame sediments are formed by the deposition of meltwater detritus either as fillings or as partial fillings of depressions against valley walls or within glacial crevasses, or as part of steep-sided alluvial fans deposited against the margin of an ice sheet by debauching streams. A kame may, therefore, appear as a terrace, a conical hill, or a short irregular ridge of gravel and sand. A kame terrace appears as a low, flat-topped or slightly down-valley sloped, steep-sided hill which was deposited between a generally stagnant ice-lake and the bounding rock slope of a valley, or which is an erosional remnant of a depositional valley surface built in contact with glacial ice. The short, irregular ridge-like form of kame deposit is commonly designated as a crevasse filling. Crevasse fillings appear to represent fillings made in crevasses at or near the margin of a stagnant ice mass. Kame deposits typically display some stratification as a result of settling during the melting of the ice against or upon which the sediment accumulated. Kame sediments are generally comprised of poorly to locally moderately sorted sand and gravel with some boulders, but kame materials tend to be much more poorly sorted than esker materials due to the much more intensive reworking of esker materials by stream-action.

730 = <u>Esker Deposits</u> (GFe). This class consists of ice-contact deposits in the form of long, serpentine ridges of sand and gravel. They form in either subglacial channels within the decaying ice sheet, or in trenches on the surface of the ice. Eskers may terminate in esker fans, which are small plains of gravel and sand built at the mouths of subglacial tunnels and channels within the ice. Eskers may also appear as hummocks or mounds, but these are either erosional remnants, or represent the shape of the channel within the ice. Eskers may show tributary structures, are associated with terminal moraines, and are seemingly a definite indicator of stagnant ice. Eskers generally are comprised of moderately (but locally poorly) sorted, crudely to well-stratified sand and gravel with some boulders. Esker sediments tend to be better sorted than kame materials because esker detritus is much more thoroughly reworked by stream-action.

750 = Glaciolacustrine Deposits (GL). Glacial lake deposits may form in a variety of ways, as lakes within irregular morainal topography or swell and swale topography of till plains, behind terminal or lateral moraines, in kettles on outwash plains, in scoured bedrock surfaces, in ice-marginal areas, or by damming by glacial lobes or outwash sediments. Old lake surfaces may be marked by lacustrine plains for emergent lake bottom areas or by bogs or "lowland" glaciolacustrine sediments if the surface materials are still wet. Lacustrine plains are the most nearly flat topographic features, and are commonly composed of well-laminated clays and silts. This unit is usually utilized for complexes of glacial, glaciofluvial, and lacustrine sediment complexes for which it is not practical to delineate separately due to mapping resolution. Predominantly lacustrine sediments in glacial lakes are mapped under classes 800, 810, 815, and 820. Lake shoreline sediments, such as beach ridges, bars, and sand dunes are mapped as either marine or eolian deposits.

755 = "Lowland" Glaciolacustrine Deposits (GLl). This class is used for the more poorly drained portions of glaciolacustrine deposits that occur in lowland areas, in depressions, and on nearly level or broadly concave surfaces. It is generally covered with open or dense black spruce and ground vegetation suited to seasonally wet conditions. "Lowland" glaciolacustrine deposits are commonly accompanied by organic deposits, which may dominate the surface of the deposits, and are frequently frozen and ice-rich, and therefore are subject to frost-action.

800 = Lacustrine Deposits (L). This class consists of generally fine-grained sediments (silt and clay) which are deposited in both glacial and non-glacial lakes. Lakes may be formed in many ways, and most are very short-lived. Lake sediments are generally well-stratified into very thin laminations, but may also include coarser-grained (sandy to cobbly) shoreline sediments in beaches and bars, eolian sand in sand dunes, and fluvial materials in deltas, fans, or aprons. When mapping resolution permits, the beach and bar sediments are delineated as class 861, dune materials as class 360 or 380, and the fluvial detritus as the appropriate fluvial or floodplain units.

810 = Emergent Lake Bottom (Le). This class identifies emergent lake bottom sediments resulting from a recent drop in lake level. It is also used for lacustrine plains. These sediments otherwise are as those indicated for class 800.

815 = Thaw Basins and Thaw Lakes (Lt). This type of lake or basin (which has contained a lake in the past) occurs in permafrost areas and is the result of thawing of the ground ice, which can form a basin in bedrock or surficial materials. Thaw basins and thaw lakes generally contain fine-grained, organic-rich deposits. Thaw basin and thaw lake materials are usually frozen, display collapse features, and are somewhat unstable at the surface. According to some workers, most of the surface of the Arctic Coastal Plain has probably been, at one time or another, occupied by thaw basins or disturbed by thaw basin activity. This supposition is supported by the very high density of thaw basins and the large degree of overlap of older and younger thaw basins. Consequently, the utility of mapping thaw basins has been questioned; however, for modeling purposes of capability/suitability analyses, the active thaw basins are required, and have therefore, been retained. This high amount of thaw basin overlap along with minimum mapping resolution limitations have necessitated the mapping of areas whose surface is occupied by more than 95% thaw basin activity as simply "Lt", since in areas with closely spaced thaw basins, the interlacustrine areas become far too small to delineate at these mapping scales. Areas where thaw basins are not sufficiently large enough to map individually, are delinated as Ell + Lt or Lt + Ell, depending on how much of the surface is actively occupied by thaw basin material. The thickness of thaw basin sediments has been a problem due to the high degree of variability in the reported thicknesses of the thaw basin detritus in the outer versus the inner coastal plain areas. In the outer coastal plain, thaw basin sediments range in depth from one to three meters, and generally are thinner as the shoreline is approached. Within the inner coastal plain, thicknesses of eleven meters have been reported. In most locations, where "Lt" appears as the sole designator, the thaw basin may be assumed to overlie coastal plain deposits (Mp) since the larger basins tend to obscure any contacts between coarser or fine-grained marine sediments west of the Colville River and the underlying material is always specified when it differs from marine or coastal plain deposits (i.e., floodplain materials, bedrock, etc.).

816 = Thaw Basin and Thaw Lake Strandline (Rim) Deposits. This type is used for deposits of former (abandoned) strandlines of thaw lakes in which the shoreline has receded recently due to alteration of lake shape, resulting in lake volume changes, westward migration of the lake, caused by the wind, and large decreases in lake size. These abandoned strandlines are commonly visible as very low, subtle lacustrine terraces ten to twenty meters wide between terrace scarps. Abandoned lacustrine strandlines commonly parallel the present shoreline, and usually appear as a succession of small strandlines which together, are greater in area than the minimum resolution cell size of this study.

820 = Playas (Lp). This class of lake deposit is ephemeral and occurs in areas of low rainfall. This variety of emergent lake bottom consists of fine-grained detritus (silt and clay) which will occasionally be submerged during periods of rainfall, but which will be emergent shortly thereafter.

850 = Marine Deposits (M). This class identifies all materials deposited below an ocean and along its coastal margins. These deposits range in composition from very fine-grained to coarse-grained, and may include beach, bar, spit, and other coarse-grained littoral and intertidal deposits, vegetated and non-vegetated tidal flats, and lagoonal and estuarine deposits, and recnetly emerged abyssal, bathyal and neritic marine sediments.

860 = Coastal and Coastal Plain Deposits (Mp). Coastal plains are regional features of low relief bounded oceanward by the shoreline and landward by highlands. These features generally display nearly flat or gentle regional slopes, but may also rise from 250 to 500 feet in altitude through a series of steep-sided scarps and terraces. The transition to highlands is usually abrupt in interstream areas, but is gradational in stream valleys. Coastal plain deposits generally represent a fluctuating pattern of intercalating and interfingering facies of marine and continental materials. Estuarine and deltaic deposits represent a transitional phase between marine and continental sequences, and frequently all these deposits may be arranged in great cyclic sequences of coastal and coastal plain deposits. Coastal plain deposits differ from the more general marine unit because coastal plain detritus is of predominantly neritic, littoral and marginal continental influence, while marine detritus may be deposited in abyssal, bathyal, neritic, or littoral environments. On the Arctic Coastal Plain of Alaska, much of the plain east of the Colville River is identified as coastal plain deposits; most of these deposits consist of sand and gravel of fluvial and glaciofluvial origin, and these deposits show a gradational contact (facies change) with marine deposits along the coastline. East of the Kadleroshilik River, the coastal plain is comprised of glacial moraines and glacial outwash fans, which have been delineated accordingly, but there are also some older coastal plain remnants hose composition probably approximates those typical of other coastla plain deposits east of the Colville river. West of the Colville River, sediments identified as coastal plain deposits may be either marine or nonmarine, but are generally of medium sand or finer grain size.

861 = Beach Deposits (Mb). This class is comprised of predominantly coarse-grained materials deposited along a coastline, and includes bar, spit, and barrier island deposits, and other coarser-grained littoral and intertidal sediments. Beach materials must consist at least partially of unconsolidated sediments, and most often are comprised of sandy detritus, but sand may be replaced by cobbles or shingle, yielding a boulder beach or shingle beach. Finer-grained argillaceous source material may also produce a mud beach. This class is also utilized for emerged beach deposits which still preserve their surface morphology, and some lacustrine shoreline deposits (thaw lake and thaw basin strandline deposits in particular are handled by type 816).

862 = Tidal Flat (Mt). This class includes areas of nearly flat, barren mud or sand which alternates between periodic inundations by tidal waters and subaerial conditions. Tidal flats may occur on the oceanward margin of deltaic estuarine and alluvial fan deposits, in the quieter, leeward portions of bays and inlets, along perdominantly depositional coasts, at the mouths of rivers, and in sheltered areas protected by reefs, rock promontories, rock thresholds, sand bars, spits, barrier islands and barrier island chains, mudbanks, and deltas. Tidal flats are frequently found in association with lagoons and estuaries. Tidal flats all contain salt-tolerant lifeforms, but tidal flats may vary widely in actual salinity depending on how open the flat is to salt-water incursion and the rate of influx of freshwater. This class is separated from class 863 by being essentially barren of vegetation or only slightly vegetated, and is subject to frequent tidal inundation, while class 863 is distinctive because it is vegetated and is less subject to tidal inundation.

863 = Recently Emerged Tidal Flat (Mte). This class is essentially the same as class 862 except that this variety has experienced recent uplift, and thus is much more vegetated than class 862 and is somewhat less subject to tidal inundation.

870 = Emerged Fine-Grained Marine Deposits (Mf). This class is composed of the finer-grained facies (dominantly silt and clay with some sand and little gravel) of the marine deposits which have recently emerged and now display mature subaerial features such as larger relative uplift, substantially altered surface morphology, sediment oxidation, groundwater freshening, dissection and burial by other terrestrial deposits, and so forth. The deposits may be any of those delineated among class 850 or 860, but this type predominantly represents estuarine and lagoonal sediments uplifted continental shelf deposits, and other fine-grained marine or marginal marine detritus.

875 = Emerged Coarse-Grained Marine Deposits (Mc). This class is comprised of the coarser-grained facies of marine deposits as described for classes 850 and 860, which have recently emerged and now display mature subaerial features, such as large relative uplift, substantially altered surface morphology, sediment oxidation, ground-water freshening, dissection and burial by other terrestrial deposits. These sediments generally consist of sand and gravel with varying amounts of silt and clay.

880 = Glaciomarine Deposits (MG). This class is utilized to represent complex areas comprised of marine, glacial, and lacustrine deposits in which the individual components can not be mapped independently due to mapping resolution restrictions or in which the origin of the detrital sediments are not adequately described as marine, glacial, or lacustrine. This would include situations such as sediments deposited in shallow marine or estuarine waters in an areal complex of submarine till sheets, ice-rafted materials, and quiescent water deposits. These deposits tend to be quite fine, generally consisting of silt and clay with some sand but few boulders.

881 = "Lowland" Glaciomarine Deposits (MGl). This class is reserved for the more poorly drained phases of glaciomarine deposits that occur in broad lowland areas, in depressions, and on gentle slopes. This unit is generally covered with open or dense black spruce and ground vegetation suited to seasonally wet ground conditions. "Lowland" glaciomarine deposits are commonly accompanied by organic deposits, which dominate the surface of the deposits, and are frequently frozen and ice-rich, and therefore are subject to frost-acion.

890 = Organic Deposits (O). This class is comprised of generally thin deposits of decaying vegetable matter, humus, muck, and peat with varying amounts of fine-grained detritus (silt and clay) in swamps, bogs, marshs, muskegs, and fens. These deposits frequently occur in association with "lowland" deposits of all types (classes 371, 611, 653, 705, 755, and 881), and are generally frozen and ice-rich, and thereby are subject to frost-action.

895 = String Bog (Fen) (Os). This class consists of a specific variety of class 890, and is a bog or fen develoed on a gently sloping surface with an irregularly patterned microtopography oriented at right angles to the surface and subsurface drainage. Other characteristics are as those described for class 890.

900 = Miscellaneous. This class is utilized for deposits which may be identified and classified (and thus is different from class 001, which is totally unknown), but whose nature and composition is not adequately by any of the existing units already defined within this classification. Whenever this class is used, such new surficial deposits would be described specifically as a portion of this class.

980 = Man-Made Deposits (H). This class includes all deposits or surface modifications resulting from human activity, particularly construction and mining. It includes fill and embankments, cuts and excavations, and mine tailing accumulations. Cuts and excavations do not alter the character of the surficial materials present which generally remain identifiable; therefore, cuts and excavation areas will be classified according to the surficial material present wherever possible, but if the original character of the surficial material is changed or obscured this type may be used. Artificial fill and mine tailings involve materials which are different from the original surficial materials, and thus, will be identified as a separate class. Class 980 is also used wherever the nature of the man-made deposit or surface modification is unknown.

982 = Fill and Embankments (Hf). This class involves all forms of artificial fill or embankment materials, including road and foundation embankments, dikes, and other artificial earth fills. Fill materials are usually obtained from a nearby source, and although composition may vary somewhat, artificial fill generally is controlled for all engineering parameters, and is often comprised largely of sand and/or gravel.

983 = Mine Tailings (Ht). This material includes fine to coarse-grained man-made deposits resulting from placer mining activities in which portions of washed ore which are regarded as too poor to be treated further are accumulated in hills or as debris aprons. This detritus is not controlled for engineering parameters, and tends to respond as a talus cone or apron in engineering charcteristics.

990 = Water or Pack Ice (W). This general class involves any type of waterbody, including streams, lakes, estuaries, bays, fjords, straits, lagoons, or oceans, and pack ice, which consists of any large areas of free-floating sea ice in which the pieces of ice have been driven closely together to reveal little or no open water at the surface.

991 = Stream/River (Ws). This type of waterbody includes all natural bodies of flowing water regardless of size, which are fed by converging tributaries, glaciers, groundwater, slope runoff, lakes, or springs. Rivers or streams transport siliceous detritus downslope, and eventually, to the ocean. Rill, rivulet, brook, and creek generally apply to streams of small to moderate stature, but river is generally reserved for the larger trunk portions of a stream system.

992 = Pond/Lake (Wl). This class consists of any standing body of inland water of virtually any size. This water is chiefly fresh, but it may also be brackish. A pond or lake may be fed by a stream, or may simply constitute a rise in the groundwater table, and lake waters may also occasionally flow into an external drainage system.

993 = Estuary (We). This variety of waterbody is comprised of drainage channels adjacent to the ocean and subject to tidal influences. Estuaries may represent either a gradually infilling stream channel, or may represent a drainage path for tidal marshes and coastal lagoons. Estuaries have a varying salinity content which depends on the degree of penetration by the saltwater wedge from the ocean and the rate of influx of freshwater from the stream. The infilling stream channels are generally funnel-shaped, overdeepened, and open to the ocean, while the barred estuary is partially cut off from the ocean, which may be caused by the presence of rock promontories, rock thresholds, sand bars, spits, barrier islands, mudbanks, or deltas, and may often grade into a coastal lagoon. The funnel-shaped estuary is hydrologically related more to the ocean, with a more well-developed saltwater wedge, strong tidal effects, and noticeable oceanic wave and swell-action. The barred estuary is hydrologically similar to the inflowing stream with more effective mixing of the water, reduced tidal effects, and neglible oceanic wave action.

994 = Bay (Wb). This class involves all waterbodies which consist of either a recess in a coastal shoreline or an inlet of an ocean between two capes or headlands. A bay is a partially restricted portion of an ocean.

995 = Fjord (Wf). This class is comprised of glacial troughs eroded below sea level which act as long, deep, armlike extensions of the ocean. Fjords are characterized by the presence of thresholds or sills at their oceanward margins which seem to indicate that as the glacial ice erodes the trough, glacial scouring is more active where the ice was thicker and less active at the terminus of the ice lake where the ice was thinner. Fjords tend to have relatively little unconsolidated sediment present (a response to glacial scouring), steep-sided walls, and hanging tributary valleys and streams.

996 = Ocean (Wo). This class refers to any or all of the open bodies of saltwater which girdle the globe. The ocean includes all depth ranges from abyssal to littoral, although bays, estuaries, and fjords tend to restrict the areas mapped as ocean to the deeper and more open portions of the ocean.

997 = Strait (Wt). This waterbody refers to the relatively narrow waterways between two larger bodies of water, such as between two bays. A sound, which is wider and more extensive than a strait, is also included within this class. A sound is a relatively long arm of the sea or ocean which connects two larger bodies of water, or two parts of the same waterbody, or which forms a channel between an island and the mainland. This class additionally includes channels, which are merely larger straits.

998 = Lagoon (Wg). This class consists of shallow bodies of water which possess a restricted access to the ocean. Lagoons may be partially cut off from the ocean by the presence of reefs, rock promontories, rock thresholds, sand bars, spits, barrier islands and barrier island chains, mudbanks, or deltas. Lagoons commonly grade into tidal flats, estuaries, or tidal channels. Lagoonal water also shows varying degrees of salinity depending on the relative influx of saline ocean water versus fresh continental runoff.

999 = Pack Ice (Wi). This class consists of large areas of floating ice in which the pieces of ice have been driven closely together to reveal little or no open water at the surface.

SLOPE

Discussion

Slope defines the angle of inclination of any part of the earth's surface. Local slopes can vary greatly, and the value recorded represents the average slope within a given area. Slope is expressed as a percentage and represents the number of units of vertical rise per 100 units of horizontal distance or run. The USGS topographic basemap served as the basis for the delineation and coding of slope. A standard slope scale was constructed for each set of topographic maps with a similar contour interval. The scales identified contour line densities for each of the slope classes. The contour line densities on the topographic map were compared to the densities on the appropriate slope scale, and the interpreted units were drafted onto a mylar overlay for each basemap. The resulting set of slope polygons was reviewed against stereo pairs of aerial photographs to ensure that the delineated areas were sensitive to situations which may have been masked by the 100 or 200 foot contour intervals present at the 1:250,000 scale.

Data Sources

Primary:
- USGS basemap
- Black and white aerial photography

Classification and Code Descriptions

1 = 0-5%
2 = 6-10%
3 = 11-15%
4 = 16-20%
5 = 21-30%
6 = 31-50%
7 = 51-75%
8 = Greater than 75%

GENERAL GEOLOGY

Discussion

Geology represents the subsurface material of the landscape and includes solid rocks exposed at the surface or overlain by unconsolidated materials. The term "General Geology" is used here because a statewide series of maps is available from USGS at 1:1,000,000. Although general in scale, it is the most detailed geology consistently available for the entire State and is very useful for statewide applications. Where more detailed geology information was available, it was included in the "Geology-Quadrangle Based" variable. The geology maps were manually rescaled to 1:250,000. The rescaled data were then rectified to the basemap and line placements were enhanced using the aerial photography and Landsat imagery. To allow the user to identify the original mapping sources, a unique coding scheme was developed. Each of the geology sources (identified below) was assigned a number. Geologic units on each source map were then numbered sequentially beginning with the number 1 for each source. This coding system allows the user to identify which geology source maps were used in mapping any particular quadrangle. It also provides for the consistent use of codes for a source map. That is, once a source map has been used and the geologic units coded, those same codes were used when that source was used on other quadrangles. Descriptive and interpretive information for each geology unit is included in an interpretive matrix.

Data Sources

Primary: - Identified under "Classification and Code Descriptions"

Secondary: - Aerial photography
- Landsat imagery

Classification and Code Descriptions

A. General Geology Source

01 = Generalized Geologic Map of the Eastern Part of Southern Alaska. USGS OF 77-169-B and G
02 = Preliminary Geologic Map of Central Alaska. USGS OF 77-168-A
03 = Preliminary Geologic Map of the Seward Peninsula. USGS OF 77-167-A
04 = Geologic Map of the Brooks Range. USGS OF 77-166-B
05 = Preliminary Geologic Map of Northern Alaska. USGS MF-789
06 = Preliminary Geologic Map of the Alaska Peninsula and the Aleutian Islands. USGS MF-674
07 = Preliminary Geologic Map of Southeastern Alaska. USGS MF-673
08 = Preliminary Geologic Map, Southeast Quadrant of Alaska. USGS MF-612
09 = Preliminary Geologic Map, Southwest Quadrant of Alaska. USGS MF-611

B. <u>General Geology Unit</u>

Please refer to Chapter V for General Geology Units.

01-N = Geologic Unit Number/Name (By Source)
97 = Glaciers and Permanent Snowfields
98 = Water

666/g

GEOLOGY - QUADRANGLE BASED

Discussion

Geology represents the subsurface material of the landscape and includes solid rocks exposed at the surface or overlain by unconsolidated materials. This variable differs from General Geology in that more detailed 1:250,000 data sources were used in its compilaton. Existing 1:250,000 scale geology maps were rectified if necessary to the USGS basemap. Where larger scale data was available it was used to enhance delineations of the 1:250,000 data. Bedrock units were mapped as shown on the source map, and boundaries of surficial units were enhanced using the aerial photography and Landsat imagery.

The coding system is different from General Geology in that geology sources do not have a standard code; the code a source receives identifies its importance in compiling a particular quadrangle. That is, the primary source of data for a quadrangle is coded as 1, the second most important source as 2, and so on. Therefore, if source A was the most important source for one quadrangle, it would receive a code of 1, but for an adjacent quadrangle it may be only a secondary source and would receive a code of 2 or 3. However, similar to General Geology, each geology unit on a source was sequentially numbered. The number a geology unit receives is fixed and does not change as the source is used for different quadrangles. Descriptive information for each geology unit is included in an interpretive matrix in Section 1, Volume 2.

Data Sources

Primary: - Geology maps and reports

Secondary: - Aerial photography
- Landsat imagery

Classification and Code Descriptions

Please refer to Chapter V for geology units.

101-N = Source 1: Unit Number/Name (By Quadrangle)
201-N = Source 2: Unit Number/Name (By Quadrangle)
301-N = Source 3: Unit Number/Name (By Quadrangle)
401-N = Source 4: Unit Number/Name (By Quadrangle)
501-N = Source 5: Unit Number/Name (By Quadrangle)
601-N = Source 6: Unit Number/Name (By Quadrangle)
701-N = Source 7: Unit Number/Name (By Quadrangle)
801-N = Source 8: Unit Number/Name (By Quadrangle)
997 = Glaciers and Permanent Snowfields
998 = Water
999 = No 1:250,000 Scale Data

CHAPTER V: DATA FILE STRUCTURE AND CONTENT

INTRODUCTION

Chapter V provides information on the structure of the data files in the data bank, and the contents of all files. The manuscripts which are produced through the processes outlined in Capter III are automated and processed into final spatial and attribute files referred to as coverages. Each manuscript, representing a collection of related information for a particular area, is made up of one or more coverages, depending on the number of data formats (points, lines, polygons) used to represent the manuscript. Thus, the integrated terrain unit manuscript (ITUM) is represented by one polygon coverage, while the North Slope Borough Planning Data manuscript is represented by three coverages on each for polygon, line and point data. Table 5.1 is an index to all coverages in the data base, organized by Manuscript, and sub-User File Directories (sub-UFD). Note that each sub-UFD and coverage is referenced by a prefix and a module number (refer to Figures 3.1-3.4 in Chapter III).

Page numbers next to each coverage in Table 5.1 refer to the appropriate section of Chapter V which contain the ITEMs and ITEM codes making up each coverage. In these sections each ITEM is identified by the 1) normal variable name, 2) the defined ITEM Name, 4) the input width, and 5) the ITEM format type. An example is the first variable (ITEM) of the Integrated Terrain Unit Map.

1	2	3	4	5
PHYSIOGRAPHIC PROVINCE	PHY-PROVINCE,	(PPRO),	4,	I

Table 5.1
Coverage Index

Manuscript	Sub-UFD	Coverage Name	Page No.
Integrated Terrain Unit			
Polygon	P01(Module #)	TUPL (Module #)	5-I-1
Surface Hydrology			
Polygon	P12 ___	HPL ___	5-II-3
Line	P22 ___	HLN ___	5-II-1
Point	P32 ___	HPT ___	5-II-3
Political/Administrative Units			
Polygon	P13 ___	PAPL ___	5-III-1
Point	P23 ___	PAPT ___	5-III-13
Infrastructure, Settlements, Special Features			
Line (Cultural)	P14 ___	ICLN ___	5-IV-1
Line (Natural)	P24 ___	INLN ___	5-IV-1
Point (Cultural)	P34 ___	ICPT ___	5-IV-5
Point (Natural)	P44 ___	INPT ___	5-IV-4
Energy and Mineral Resources			
Polygon	P15 ___	EMPL ___	5-V-1
Point	P25 ___	EMPT ___	5-V-2
Elevation Provinces			
Polygon	P06 ___	EPPL ___	5-VI-1
Historic/Archaeologic Sites			
Point	P04 ___	HAPT ___	5-VII-1
NSB Planning Data			
Polygon	P17 ___	BPPL ___	5-VIII-1
Line	P27 ___	BPLN ___	5-VIII-3
Point	P37 ___	BPPT ___	5-VIII-3
Subsistence Land Use			
Polygon	P18 ___	SPL ___	5-IX-1
Line	P28 ___	None	

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North Slope Borough
Geographic Information System
Manuscript Structure Summary
Manuscript Map I
Integrated Terrain Unit

SUB-UFD: P01 (module #)

Coverage: TUPL ___

Variable Name	ITEM Name	Redefined ITEM Name	Page Nos.
Physiographic Province	PHY-PROVINCE	PPRO	5-I-1
Topographic Character and Situation	TOPO-CHAR-SIT	TOPCS	5-I-3
Landform Combination	LF-COMBINE	LFCOM	5-I-3
Primary Landform	LF-PRIMARY	LF1	5-I-4
Landform Connector/Modifier	LF1-CONN-MOD	LFCM1	5-I-4
Secondary Landform	LF-SECONDARY	LF2	5-I-4
Landform Connector/Modifier	LF2-CONN-MOD	LFCM2	5-I-4
Tertiary Landform	LF-Tertiary	LF3	5-I-4
Landform Connector/Modifier	LF3-CONN-MOD	LFCM3	5-I-4
Slope	SLOPE	SLP	5-I-8
General Geology Source-Statewide	GEN-GEOL-SOURCE	GGEOS	5-I-8
General Geology Unit-Statewide	GEN-GEOL-UNIT	GGEOU	5-I-8
Geology-Quadrangle Based	GEOL-QUAD-BASE	GEOQB	5-I-11
Mineral Terrane	MINERAL-TERRANE	MINT	5-I-16
Mineral Terrane Documentation	MINERAL-TERR-DOC	MINTD	5-I-17
Flood Zone	FLOOD-ZONE	FZ	5-I-17
Soil-Major Land Resource Area	SOIL-MLRA	SOILM	5-I-17
Soil-Primary	SOIL-PRIMARY	SOIL1	5-I-18
Soil-Secondary	SOIL-SECONDARY	SOIL2	5-I-18
Vegetation-Primary	VEG-PRIMARY	VEG1	5-I-20
Vegetation-Secondary	VEG-SECONDARY	VEG2	5-I-20
Vegetation-Modifier	VEG-MODIFIER	VEGMD	5-I-22
Land Use	LAND-USE	LU	5-I-22
Scenic/Special Places	SCENIC-SPC-PLACE	SSPLC	5-I-22

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Data Classification and Codes
Manuscript Map I
Integrated Terrain Unit

Polygon Coverage

PHYSIOGRAPHIC PROVINCE PHY-PROVINCE, (PPRO), 4, I

Interior Plains
Arctic Coastal Plain
011 = Teshekpuk Lake
012 = White Hills

Rocky Mountain System
Arctic Foothills
111 = Northern
112 = Southern
Arctic Mountains Province
120 = DeLong Mountains
Noatak Lowlands
131 = Mission Lowland
132 = Aniuk Lowland
133 = Cutler River Upland
140 = Baird Mountains
Central and Eastern Brooks Range
150 = Main Unit
151 = Schwatka Mountains
152 = Romanzof Mountains
160 = Ambler-Chandalar Ridge and Lowland Section

Intermontane Plateaus
Northern Plateaus Province
Porcupine Plateau
210 = Main Unit
211 = Thazzik Mountains
220 = Old Crow Plain
230 = Ogilvie Mountains
240 = Tintina Valley
Yukon-Tanana Upland
251 = Western Part
252 = Eastern Part
260 = Northway-Tanacross Lowland
270 = Yukon Flats Section
280 = Rampart Trough
Kokrine-Hodzana Highlands
290 = Main Unit
291 = Ray Mountains
292 = Kokrine Hills
Western Alaska Province

310 = Kanuti Flats
320 = Tozitna-Melozitna Lowland
330 = Indian River Upland
Pah River Section
341 = Lockwood Hills
342 = Pah River Flats
343 = Zane Hills
344 = Purcell Mountains
350 = Koykuk Flats
Kobuk-Selawik Lowland
360 = Main Unit
361 = Waring Mountains
370 = Selawik Hills
380 = Buckland River Lowland
390 = Nulato Hills
410 = Tanana-Kuskokwim Lowland
420 = Nowitna Lowland
430 = Kuskokwim Mountains
440 = Innoko Lowlands
450 = Nushagak-Big River Hills
460 = Holitna Lowland
470 = Nushagak-Bristol Bay Lowland
Seward Peninsula
480 = Main Unit
481 = Bendeleben Mountains
482 = Kigluaik Mountains
483 = York Mountains
Bering Shelf
Yukon-Kuskokwim Coastal Lowland
490 = Main Unit
491 = Norton Bay Lowland
Bering Platform
511 = St. Lawrence Island
512 = Pribilof Islands
513 = St. Matthew Islands
514 = Nunivak Island
520 = Ahklun Mountains

Pacific Mountain System
Alaska-Aleutian Province
610 = Aleutian Islands
620 = Aleutian Range
630 = Alaska Range (Southern Part)
Alaska Range (Central and Eastern Part)
640 = Main Unit
641 = Mentasta-Nutzotin Mountain Segment
650 = Northern Foothills of Alaska Range
Coastal Trough Province
660 = Cook Inlet-Susitna Lowland

670 = Broad Pass Depression
Talkeetna Mountains
681 = Chulitna Mountains
682 = Fog Lakes Upland
683 = Central Talkeetna Mountains
684 = Clarence Lake Upland
685 = Southeastern Talkeetna Foothills
690 = Upper Matanuska Valley
710 = Clearwater Mountains
720 = Gulkana Upland
Copper River Lowland
731 = Eastern Section
732 = Lake Course Plateau
740 = Wrangell Mountains
750 = Duke Depression
760 = Chatham Trough
770 = Kupreanof Lowland
Pacific Border Ranges Province
780 = Kodiak Mountains
790 = Kenai-Chugach Mountains
St. Elias Mountains
810 = Main Unit
811 = Fairweather Range
820 = Gulf of Alaska Coastal Section
Chilkat-Baranof Mountains
831 = Alsek Ranges
832 = Glacier Bay
833 = Chichagof Highland
834 = Baranof Mountains
840 = Prince of Wales Mountains
Coast Mountains
850 = Boundary Ranges
860 = Coastal Foothills

TOPOGRAPHIC CHARACTER AND SITUATION TOPO-CHAR-SIT, (TOPCS), 1, I
0 = Ocean, Bay, or Fjord
1 = Plains and Lowlands: Mainland
2 = Plains and Lowlands: Island
3 = Gentle to Rolling Plateaus and Highlands: Mainland
4 = Gentle to Rolling Plateaus and Highlands: Island
5 = Low Rolling Mountains: Mainland
6 = Low Rolling Mountains: Island
7 = Moderately High Rugged Mountains: Mainland
8 = Moderately High Rugged Mountains: Island
9 = Extremely High Rugged Mountains: Mainland

LANDFORM COMBINATION LF-COMBINE, (LFCOM), 1, I

1 = X
2 = X + Y

3 = X/Y
4 = X + (Y/Z)
5 = (X/Y) + Z
6 = X/(Y + Z)
7 = (X + Y)/Z

LANDFORM CONNECTOR/MODIFIER

Primary Landform Connector/Modifier LF-CONN-MOD, (LF1CM), 1, I
Secondary Landform Connector/Modifier LF-CONN-MOD, (LF2CM), 1, I
Tertiary Landform Connector/Modifier LF-CONNMOD, (LF3CM), 1, I

0 = No Connector/Modifier
1 = ? (Previous Landform Type Questionable)
2 = +
3 = ?/+
4 = or
5 = ? or

LANDFORM TYPE

Primary Landform Type(X) LF-PRIMARY, (LF1), 3, I
Secondary Landform Type(Y) LF-SECONDARY, (LF2), 3, I
Tertiary Landform Type(Z) LF-TERTIARY, (LF3), 3, I

000 = No Y or Z Landform Types
001 = Unknown Origin

Bedrock

010 = Bedrock - undifferentiated (Bx)
019 = Bedrock - undifferentiated with thermokarst (Bxt)
030 = Igneous Bedrock (I)
040 = Extrusive Igneous Bedrock (Ib)
041 = Extrusive - acidic Bedrock (Iba)
042 = Rhyolite Shield Volcano (Ibav)
045 = Extrusive - basic bedrock (Ibb)
046 = Basalt Shield Volcano (Ibbv)
048 = Shield Volcano (rock composition unspecified) (Ibv)
050 = Composite Volcano (Iv)
060 = Plutonic Igneous Intrusive Bedrock (Ig)
061 = Intrusive - acidic Bedrock (Iga)
063 = Intrusive - basic Bedrock (Igb)
066 = Intrusive - ultramafic Bedrock (Igu)
070 = Pyroclastics (Ip) (includes extrusive fragmentals, ash and tuff)
080 = Cinder Cone (Ipv)
100 = Metamorphic Bedrock (N)
110 = Gneiss (Ng)
120 = Slate, Phyllite (Nl)
130 = Marble (Nm)
140 = Serpentinite (Np)
150 = Quartzite (Nq)
160 = Schist (Ns)

200 = Sedimentary Bedrock (S)
210 = Conglomerate (Sc)
211 = Conglomerate - residual soil (Sc-r)
220 = Shale, Siltstone (Sh)
230 = Limestone (Sl)
240 = Sandstone (Ss)

Colluvial Deposits

300 = Colluvial Deposits (C)
310 = Avalanche Deposits (Ca)
315 = Rock Glacier (Cg)
320 = Landslide Deposits (Cl)
325 = Mudflow Deposits (Cm)
330 = Solifluction Deposits (Cs)
331 = Solifluction Colluvial Fan (Csf)
335 = Talus (Ct)
336 = Talus Cone (Ctc)
337 = Protalus Rampart, Protalus Mound and Protalus Lobe (Ctp)
340 = Basin Colluvium-Arctic Slope (Cx)

Eolian Deposits

360 = Eolian Deposits (E)
370 = Loess (El)
371 = "Lowland" Loess (Ell)
372 = "Upland" Loess (Elu) (predominantly unfrozen)
373 = Frozen Upland Silt (Elx)
380 = Eolian Sand (Es)

Fluvial Deposits

400 = Fluvial Deposits (F)
405 = Aufeis (Fa)
410 = Delta (Fd)
415 = Sandy Delta (Fds)
420 = Alluvial Fan (Ff)
421 = Granular Alluvial Fan (Ffg)
422 = Finer-Grained Alluvial Fan (Ffs) (primarily silt and sand)
430 = Mud Volcano (Fm)
440 = Floodplain (Fp)
441 = Floodplain Finer Cover Deposits (Fp-c)
443 = Floodplain Riverbed Deposits (Fp-r)
445 = Braided Floodplain (Fpb)
446 = Braided Floodplain Cover Deposits (Fpb-c)
447 = Braided Floodplain - gravelly sand or coarser (Fpbg)
448 = Braided Floodplain Riverbed Deposits (Fpb-r)
449 = Braided Floodplain - sand or finer (Fpbs)
450 = Meander Floodplain (Fpm)
451 = Meander Floodplain Cover Deposits (Fpm-c)
452 = Meander Floodplain - gravelly sand or coarser (Fpmg)
453 = Meander Floodplain Riverbed Deposits (Fpm-r)
454 = Meander Floodplain - sand or finer (Fpms)

455 = Floodplain - thermal state unspecified, sand or finer (Fps)
456 = Floodplain - thermal state unspecified, sand or finer, thick cover deposits (>20´) (Fps-c)
457 = Meander Floodplain - gravelly sand or coarser, thick cover deposits (>20´) (Fpmg-c)
459 = Meander Floodplain - sand or finer, thick cover deposits (>20´) (Fpms-c)
460 = Abandoned Floodplain (Fpa)
461 = Abandoned Floodplain Cover Deposits (Fpa-c)
462 = Abandoned Floodplain - gravelly sand or coarser (Fpag)
463 = Abandoned Floodplain - gravelly sand or coarser, thick cover deposits (>20´) (Fpag-c)
464 = Abandoned Floodplain - sand or finer (Fpas)
465 = Abandoned Floodplain - sand or finer, thick cover deposits (>20´) (Fpas-c)
470 = "Bog" Floodplain (Fpo)
475 = Old Terrace (Fpt)
480 = Floodplain - form unspecified (Fpu)
481 = Floodplain - form unspecified, gravelly sand or coarser (Fpug)
482 = Floodplain - form unspecified, gravelly sand or coarser, thick cover deposits (>20´) (Fpug-c)
483 = Floodplain - form unspecified, sand or finer (Fpus)
484 = Floodplain - form unspecified, sand or finer, thick cover deposits (>20´) (Fpus-c)
485 = Floodplain - thermal state unspecified, gravelly sand or coarser (Fpg)
486 = Floodplain - thermal state unspecified, gravelly sand or coarser, thick cover deposits (>20´) (Fpg-c)
500 = Retransported Deposits (Fs)
510 = "Hilly" Retransported Deposits (Fsh)
515 = "Lowland" Retransported Deposits (Fsl)
520 = "Rounded" Retransported Deposits (Fsr)
525 = "Wooded" Retransported Deposits (Fsw)
530 = Retransported Deposits - Fan (Fsf)
535 = Sandy Retransported Deposits (Fsa) (From dune sand areas)
540 = Terrace (Ft)
541 = Recent Terrace - gravelly sand or coarser (Ftg)
542 = Recent Terrace - sand or finer (Fts)
543 = Recent Terrace - sand or finer, thick cover deposits (>20´) (Fts-c)
545 = Old, Non-Glacial Terrace (Fto)

Undifferentiated Deposits

590 = Undifferentiated Glacial and Non-Glacial Granular Deposits (FG)

Glaciers and Snowfields

600 = Glacier (Gg)
601 = Glacier-accumulation zone (Gga)
602 = Glacier-ablation zone (Ggw)
603 = Snowfield (Ggs)

Glacial Deposits

610 = Glacial Deposits (G)
611 = "Lowland" Glacial Deposits (Gl)
612 = Ice-Cored Glacial Moraine (Ggm)
620 = Moraine (Gm)
621 = Older Moraine (Gmo)
622 = Younger Moraine (Gmy)
650 = Till Sheet (Gt)
651 = Drumlins (Gtd)
652 = Fluted Till (Gtf)
653 = "Lowland" Till (Gtl)
654 = Older Till (Gto)
655 = Younger Till (Gty)

Glaciofluvial Deposits

700 = Glaciofluvial Deposits (GF)
705 = "Lowland" Glaciofluvial Deposits (GFl)
710 = Outwash-active (GFa)
711 = Outwash-older (GFo)
720 = Kame Deposits (GFk)
730 = Esker Deposits (GFe)

Glaciolacustrine Deposits

750 = Glaciolacustrine Deposits (GL)
755 = "Lowland" Glaciolacustrine Deposits (GLl)

Lacustrine Deposits

800 = Lacustrine Deposits (L)
810 = Emergent Lake Bottom (Le)
815 = Thaw Basins and Thaw Lakes (Lt)
816 = Thaw Basin and Thaw Lake Strand Line Deposits (Lr)
820 = Playas (Lp)

Marine Deposits

850 = Marine Deposits (M)
860 = Coastal and Coastal Plain Deposits (Mp)
861 = Beach Deposits (Mb)
862 = Tidal Flat (Mt)
863 = Recently Emerged Tidal Flats (Mte)
870 = Emerged Fine-Grained Marine Deposits (Mf)
875 = Emerged Coarse-Grained Marine Deposits (Mc)

Glaciomarine Deposits

880 = Glaciomarine Deposits (MG)
881 = "Lowland" Glaciomarine Deposits (MGl)

Organic Deposits

890 = Organic Deposits (O)
895 = String Bog (Fen) (Os)

Miscellaneous
900 = Miscellaneous

Man-Made Deposits
980 = Man-Made Deposits (H)
982 = Fill and Embankments (Hf)
983 = Mine Tailings (Ht)

Water
990 = Water or Pack Ice (W)
991 = Stream/River (Ws)
992 = Pond/Lake (Wl)
993 = Estuary (We)
994 = Bay (Wb)
995 = Fjord (Wf)
996 = Ocean (Wo)
997 = Strait (Wt)
998 = Lagoon (Wg)
999 = Pack Ice (Wi)

SLOPE SLOPE, (SLP), 1, I
1 = 0-5%
2 = 6-10%
3 = 11-15%
4 = 16-20%
5 = 21-30%
6 = 31-50%
7 = 51-75%
8 = >75%

GENERAL GEOLOGY SOURCE-STATEWIDE* GEN-GEOL-SOURCE, (GGEOS), 2, I
05 = Preliminary Geologic Map of Northern Alaska. USGS MF-789

GENERAL GEOLOGY UNIT-STATEWIDE* GEN-GEOL-UNIT, (GGEOU), 2, I

Source 05 (Alpha symbols appear in parentheses after each geologic unit)

01 = Holocene deposits (Qh)
02 = Quaternary deposits (Q)
03 = Pleistocene deposits (Qp)
04 = Quaternary volcanic rocks (Qv)
05 = Quaternary-Tertiary volcanic rocks (QTv)
06 = Pliocene continental sedimentary rocks (Tpc)
07 = Upper Tertiary marine sedimentary rocks (uT)

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*Additional data is available in an interpretive matrix for this variable.

08 = Miocene continental sedimentary rocks (Tmc)
09 = Middle Tertiary (Oligocene-Miocene) continental sedimentary rocks (mTc)
10 = Lower Tertiary (Paleocene-Oligocene) continental sedimentary rocks (lTc)
11 = Tertiary sedimentary rocks (T)
12 = Tertiary volcanic rocks (Tv)
13 = Tertiary felsic volcanic rocks (Tvf)
14 = Tertiary granitic rocks (Tg)
15 = Tertiary and Cretaceous continental sedimentary rocks (TKc)
16 = Tertiary and Cretaceous felsic volcanic rocks (TKvf)
17 = Tertiary and Cretaceous granitic rocks (TKg)
18 = Tertiary and Mesozoic granitic rocks (TMzg)
19 = Tertiary and/or Mesozoic mafic rocks (TMzmi)
20 = Upper Cretaceous marine sedimentary rocks (uK)
21 = Upper Cretaceous continental sedimentary rocks (uKc)
22 = Upper Cretaceous felsic volcanic rocks (uKvf)
23 = Lower Cretaceous marine sedimentary rocks (lK)
24 = Lower Cretaceous continental sedimentary rocks (lKc)
25 = Lower Cretaceous volcanic rocks (lKv)
26 = Cretaceous sedimentary rocks (K)
27 = Cretaceous continental sedimentary rocks (Kc)
28 = Cretaceous volcanic and volcaniclastic rocks (Kv)
29 = Cretaceous granitic rocks (Kg)
30 = Cretaceous mafic intrusive rocks (Kmi)
31 = Cretaceous ultramafic rocks (Kum)
32 = Cretaceous-Jurassic primarily marine sedimentary rocks, in part metamorphosed (KJ)
33 = Cretaceous-Jurassic volcanic and associated sedimentary rocks (KJv)
34 = Mesozoic marine sedimentary rocks, in part metamorphosed (Mz)
35 = Mesozoic granitic rocks (Mzg)
36 = Mesozoic mafic intrusive rocks (Mzmi)
37 = Jurassic marine sedimentary rocks (J)
38 = Jurassic volcanic rocks (Jv)
39 = Jurassic granitic rocks (Jg)
40 = Jurassic ultramafic rocks (Jum)
41 = Jurassic-Triassic marine sedimentary rocks (JTr)
42 = Jurassic-Triassic granitic rocks (JTrg)
43 = Jurassic, Triassic, and Permian marine sedimentary rocks (JP)
44 = Jurassic, Triassic, and Permian volcanic and interbedded sedimentary rocks (JPv)
45 = Jurassic, Triassic, and Permian ultramafic rocks (JPum)
46 = Triassic marine sedimentary rocks (Tr)
47 = Mesozoic-Paleozoic marine sedimentary rocks (MzPz)
48 = Mesozoic and/or Paleozoic granitic rocks (MzPzg)
49 = Mesozoic-Paleozoic ultramafic rocks (MzPzum)
50 = Jurassic-Mississippian marine metasedimentary rocks (JM)
51 = Triassic-Devonian marine metasedimentary rocks (TrD)
52 = Triassic-Permian marine metasedimentary rocks (TrP)
53 = Permian marine sedimentary rocks (P)
54 = Permian volcanic rocks (Pv)
55 = Upper Paleozoic marine sedimentary rocks (uPz)

56 = Upper Paleozoic granitic rocks (uPzg)
57 = Pennsylvanian-Mississippian marine sedimentary rocks (PM)
58 = Mississippian marine sedimentary rocks (M)
59 = Mississippian and/or Devonian marine sedimentary rocks (MD)
60 = Devonian marine sedimentary rocks, in part metamorphosed (D)
61 = Upper Devonian marine sedimentary rocks (uD)
62 = Middle (?) Devonian marine sedimentary rocks (mD)
63 = Lower Upper and/or Upper Middle (?) Devonian marine sedimentary rocks, in part metamorphosed (umD)
64 = Paleozoic metasedimentary rocks (Pz)
65 = Paleozoic rocks with minor associated metasedimentary rocks (Pzv)
66 = Paleozoic ultramafic rocks (Pzum)
67 = Devonian volcanic rocks with minor associated sedimentary rocks (Dv)
68 = Devonian-Silurion marine sedimentary rocks (DS)
69 = Ordovician marine sedimentary rocks (O)
70 = Ordovician volcanic rocks with intercalated metasedimentary rocks (Ov)
71 = Lower Paleozoic marine sedimentary rocks, locally slightly to moderately metamorphosed (lPz)
72 = Lower Paleozoic mafic and ultramafic intrusive rocks (lPzmi)
73 = Lower Paleozoic ultramafic rocks (lPzum)
74 = Cambrian marine sedimentary rocks, locally moderately metamorphosed (E)
75 = Cambrian volcanic rocks with minor associated marine sedimentary rocks (Ev)
76 = Ordovician, Cambrian, and Precambrian marine sedimentary rocks, locally moderately metamorphosed (OpE)
77 = Paleozoic and/or Precambrian metasedimentary and metaigneous rocks (PzpE)
78 = Lower Paleozoic and/or Precambrian marine sedimentary rocks, nonmetamorphosed to highly metamorphosd (lPzpE)
79 = Lower Paleozoic and/or Precambrian granitic rocks (lPzpEg)
80 = Younger Precambrian moderately metamorphosed marine sedimentary rocks (pEy)
81 = Younger Precambrian metavolcanic rocks (pEvy)
82 = Precambrian marine sedimentary rocks, nonmetamorphosed to highly metamorphosd (pE)
83 = Precambrian metavolcanic rocks with minor associated marine sedimentary rocks (pEv)
84 = Precambrian granitic rocks (pEg)
85 = Precambrian mafic intrusive rocks (pEmi)
86 = Older Precambrian metamorphic rocks (pEo)
87 = Felsic volcanic rocks of unknown age (f)
88 = Granitic rocks of unknown age (g)
89 = Mafic intrusive rocks of unknown age (mi)
90 = Ultramafic rocks of unknown age (um)
97 = Glaciers and Permanent Snowfields (G)
98 = Water (W)

GEOLOGY-QUADRANGLE BASED* GEOL-QUAD-BASE, (GEOQB), 3, I

Beechey Point

Source 1 - Preliminary geologic map of a prospective transportation route from Prudhoe Bay, Alaska to Canadian border, Part I, Beechey Point and Sagavanirktok quadrangles. (USGS MF-489)

101 = Quaternary floodplain gravel (Gfg)
102 = Quaternary landslide deposits (Recent) (Qrs)
103 = Quaternary colluvium (Qc)
104 = Quaternary drained thaw lake basin deposits (Qlb)
105 = Quaternary dune sand (Qds)
106 = Quaternary carbonaceous sand, silt, and clay of residual, eolian, and colluvial origin (Qs)
107 = Quaternary vegetated gravel (Qvg)
108 = Quaternary coastal plain silt, sand, and gravel (coastal materials are entirely gravelly, and unit lacks pebbles and cobbles) (Qg)
109 = Quaternary terrace gravels (often mantled with 1-5 feet of carbonaceous silt) (Qtg)
110 = Quaternary outwash gravel (often mantled with 1-2 feet of carbonaceous silt) (Qog)
111 = Tertiary poorly consolidated sandstone, conglomerate, and siltstone, with some low grade coal (Ts)
112 = Cretaceous moderately consolidated sandstone and siltstone, with low-grade coal beds common (Kc)

Source 2 - Preliminary engineering geologic maps of the proposed trans-Alaska pipeline route: Beechey Point and Sagavanirktok quadrangles. (USGS OFR 491)

201 = Quaternary active floodplain deposits (Qac)
202 = Quaternary alluvial fan deposits (Qaf)
203 = Quaternary colluvium (Ac)
204 = Quaternary young alluvial terraces (Qty)
205 = Quaternary old alluvial terraces (Qto)
206 = Quaternary five-grained alluvium and colluvium (Qas)
207 = Quaternary drained thaw lake basin deposits (Qlb)
208 = Quaternary landslide deposits (Qls)
209 = Quaternary coastal-plain silt and sand (Qs)
210 = Quaternary old moraine deposits (Qmmo)
211 = Tertiary poorly consolidated conglomerate, sandstone, and siltstone, locally with minor interbedded coal (often with gravelly, sandy silt or silty sand cover) (Ts)
212 = Cretaceous generally well consolidated sandstone and conglomerate (chiefly sandstone in north, conglomerate in south; mantled as unit Ts) (Ksc)
997 = Glaciers and Permanent Snowfields (G)
998 = Water (W).

*Additional data is available in an interpretive matrix for this variable.
666aa

Demarcation Point

Source 1 - Geologic map of the Demarcation Point quadrangle, Alaska. (USGS Map I-1133)

101 = Quaternary alluvium (Qa)
102 = Quaternary beach deposits (Qb)
103 = Quaternary colluvium (Qc)
104 = Quaternary alluvial fan deposits (qf)
105 = Quaternary terrace deposits (Qt)
106 = Quaternary marine terrace deposits (Qmt)
107 = Quaternary glacial deposits undifferentiated (Qg)
108 = Quaternary glaciofluvial deposits (Qgf)
109 = Quaternary glacial and glaciofluvial deposits (Qg4)
110 = Quaternary glacial deposits (youngest advance) (Qgz)
111 = Quaternary glacial deposits (intermediate advance) (Qgz)
112 = Quaternary glacial deposits (oldest advance) (Qgl)
113 = Gubik formation (Pleistocene) (Qgk)
114 = Upper part of Sagavanirktok Formation (Miocene? and Pliocene) (Ts)
115 = Tertiary and Cretaceous sedimentary rocks (TKs)
116 = Colville Group (Upper Cretaceous) (Kc)
117 = Lower Nanushuk Group (Lower Cretaceous) (Kn)
118 = Bathtub graywacke (Lower Cretaceous) (Kb)
119 = Kongakut Formation (Lower Cretaceous) (Kk)
120 = Kingak shale (Jurassic) (Jk)
121 = Karen Creek sandstone (Upper Triassic) (Trk)
122 = Shublik Formation (Triassic) (Trs)
123 = Karen Creek sandstone and Shublik Formation undivided (Triassic) (Trks)
124 = Sadlerochit group (Permian and Triassic) (TrPs)
125 = Ivishak Formation (Lower Triassic) (Tri)
126 = Echooka Formation (Lower to Upper Permian) (Pe)
127 = Lisburne Group (Missippian and Pennsylvanian) (IPMl)
128 = Endicott Group (Mississippian?) (Mc)
129 = Kayak (?) shale (Mississippian?) (Mk)
130 = Kekiktuk conglomerate (Mississippian) (Mkc)
131 = Devonian sandstone and calcareous sandstone (Ds)
132 = Ordovician black slate (Os)
133 = Ordovician gray phyllite and chert (Opc)
134 = Ordovician volcaniclastic and volcanic rocks (Ovc)
135 = Ordovician-Cambrian volcanic wacke and tuffaceous sandstone (OEw)
136 = Ordovician-Cambrian chert and phyllite (OEcp)
137 = Cambrian volcanic and volcaniclastic rocks (Ev)
138 = Cambrian basaltic tuff (EE)
139 = Cambrian mafic intrusive rocks (Ei)
140 = Cambrian limestone (El)
141 = Cambrian phyllite (Ep)
142 = Cambrian sandstone (Es)
143 = Cambrian calcareous siltsone and sandstone (Ess)

144 = Cambrian chert and phyllite (Ecp)
145 = Neruokpuk Schist of Leffingwell (1919) (Precambrian) (pEn)
146 = Precambrian phyllite and argillite (pEpa)
147 = Precambrian argillite and limestone (pEal)
148 = Precambrian limestone and calcareous sandstone (pEls)
149 = Precambrian shale (pEs)
150 = Precambrian red-weathering limestone (pElr)
151 = Precambrian limestone (pEl)
152 = Precambrian volcaniclastic rocks of Redwacke Creek (pEv)
153 = Precambrian brown-weathering limestone and shale (pElb)
154 = Precambrian sandstone and dolomite (pEsd)
155 = Precambrian phyllite and quartzite of Old Grungy Mountain (pEpg)
156 = Pre-Mississippian black slate (Os), gray phyllite and chert (Opc), undivided (Oss)
157 = Pre-Mississippian limestone (El), volanic and volcaniclastic rocks (Ev), undivided (Elv)
158 = Pre-Mississippian phyllite and argillite (pEpa), argillite and limestone (pEal), chert and phyllite (Ecp), undifferentiated (EpE)
159 = Pre-Mississippian phyllite and limestone (pEal), sandstone and dolomite (pEsd), undivided (pEas)
160 = Tectonic breccia of unknown age (tb)
161 = Slate, argillite, quartzite, and chert of unknown age (sc)
162 = Red and green phyllite of unknown age (ph)
163 = Argillite, quartzite and limestone of unknown age (ag)
164 = Limestone of unknown age (ls)
165 = Mafic rocks of unknown age (mi)
166 = Dacitic rocks of unknown age (da)
167 = Granite of Romanzof Mountains of unknown age (gr)
168 = Okpilak Batholith (Granite of Romanzof Mountains) (ob)
169 = Jago Stock (Granite of Romanzof Mountains) (js)
170 = Altered rocks of unknown age (ar)
171 = Quaternary rock glacier (Qrg)
997 = Glaciers and Permanent Snowfields (G)
998 = Water (W)

Mt. Michelson

Source 1 - Preliminary geologic map, Mt. Michelson quadrangle, 1971. (USGS OFR - 490)

101 = Quaternary alluvium (Qa)
102 = Quaternary beach deposits (Qb)
103 = Quaternary fans and cones (Qf)
104 = Quaternary landslides (Qls)
105 = Quaternary colluvium (Qc)
106 = Quaternary stream terrace deposits (Qt)
107 = Quaternary marine terrace deposits (Qtm)
108 = Pleistocene glacial moraines undifferentiated (Qg)
109 = Pleistocene glacial moraine-youngest (Qgl)
110 = Pleistocene glacial moraine-younger intermediate (Qgz)

111 = Pleistocene glacial moraine-older intermediate (Qg3)
112 = Pleistocene glacial moraine-oldest advance (Qg4)
113 = Pleistocene glaciofluvial gravels (Qgf)
114 = Quaternary unconsolidated deposits undifferentiated (Qu)
115 = Gubik Formation (Pleistocene, unconsolidated silt, sand, gravel) (Qgb)
116 = Tertiary sedimentary rocks (poorly consolidated, marine-nonmarine, siltstone, mudstone, sandstone, and conglomerate) (T)
117 = Upper Cretaceous sandstone, siltsone with some coal (equivalent to Prince Creek Formation (Kcp)
118 = Upper Cretaceous silicified tuff and bentonitic shale, minor silty shale and locally includes underlying black organic shale (Kp)
119 = Upper Cretaceous sandstone and shale (thin sandstone and conglomerate above pyroclastic rocks, and organic shale below pyroclastic rocks) (equivalent to Upper Members of Ignek Formation, and to portions of Colville group) (includes units Kc and Kp) (Kc)
120 = Nanushuk Group (Lower Cretaceous sandstone, wacke, siltstone and shale) (Kn)
121 = Ignek sandstone (Lower Cretaceous (?) subgraywacke and naceous sandstone, chert and quartz-pebble conglomerate) (Ki)
122 = Lower Cretaceous sandstone and shale (Equivalent to Lower Member of Ignek Formation, 1961) (includes units Kn and Ki) (Kl)
123 = Jurassic-cretaceous pebbly silty shale, siltstone, sandstone,and quartzite (KJ)
124 = Kingak shale (Upper-Middle Jurassic clay shale, silty shale, and siltstone; Lower Jurassic black, fissile shale) (Jk)
125 = Shublik Formation (Middle and Upper Triassic, includes units Trk, Trss) (Trs)
126 = Shublik Formation-Upper Member (Uppermost Triassic, quartzitic sandstone and siltstone, locally calcareous or dolomitic, phosphatic nodules common) (Trk)
127 = Shublik Formation-Lower Member (Middle-Upper Triassic, calcareous siltstone limestone) (Trss)
128 = Kingak shale and Shublik Formation undifferentiated (Jr)
129 = Sadlerochit Formation (Upper Part: Lower Triassic quartzitic sandstone, conglomerate, siltstone, and shale; Lower Part: Upper Permian quartzite and quartzitic siltstone) (TrPs)
130 = Lisburne Group (Upper Mississippian to Middle Pennslyvanian, included units TRo, Ma) (TPMl)
131 = Lisburne Group-Wahoo limestone (Upper-Middle Pennsylvanian) (TPw)
132 = Lisburne Group-Alapah limestone (Mississippian; limestone, dolomite, chert) (Ma)
133 = Lisburne Group and Kayak shale undifferentiated (TPMl-Mky)
134 = Kayak shale (Upper Mississippian) (Mky)
135 = Kekiktuk conglomerate (Lower-Upper Mississippian; quartzite, quartz, chert-pebble conglomerate with local anthracite coal) (Mkt)
136 = Lower Mississippian phyllitic siltstone, ferruginous siltstone, local anthracite coal (Mks)
137 = Mississippian shale and sandstone undifferentiated (includes units Mky, Mkt, Mks) (Mk)
138 = Devonian silstone, shale, sandstone, limestone (Dcs)

139 = Devonian black chert (Dc)
140 = Devonian phyllite, shale, and siltstone (Ds)
141 = Nanook limestone (Middle Devonian calcilutite and dolomite) (Dn)
142 = Paleozoic black limestone (Penl)
143 = Katakturuk dolomite (Silurian (?) (Sk)
144 = Silurian or older dolomite and dolomitic conglomerate (SO)
145 = Paleozoic chert and phyllite (Cambrian (?) (Pzncp)
146 = Cambrian undifferentiated phyllite, graywacke, volcanic, and carbonate rocks (Eu)
147 = Cambrian limestone and dolomite, partially oolitic (Ec)
148 = Cambrian volcanic flows, tuffs, volcaniclastic rocks, and agglomerate (Ev)
149 = Precambrian quartz wacke and semischist in Nerukpuk Formation (pEng)
150 = Precambrian quartz grit, chert, argillite, and minor volcanic rocks (pEng?)
151 = Slate and minor quartzite of unknown age (Paleozoic (?) (Pznsq)
152 = Mafic sills and dikes of unknown age (Ml)
153 = Romanzof granite (uncertain age) (gr)
154 = Schist at margin of granite contact - probably seared Mississippian clastic rocks of units Mky and Mkt (s)
155 = Altered schist at margin of granite contact - quartzite of unit pEng (as)
997 = Glaciers and Permanent Snowfields (G)
998 = Water (W)

Delong Mountains

Source 1 = Unpublished geologic map of Delong Mountains compiled by ESCA-TECH Corporation, 1980. (DOE 1:250,000)

101 = Quaternary alluvium (Qal)
102 = Quaternary high-level terrace gravels (Qtg)
103 = Nanushuk Group undifferentiated (Cretaceous) (Kn)
104 = Torok Formation (Lower Cretaceous) (Kt)
105 = Fortress Mountain Formation (Lower Cretaceous) (Kf)
106 = Okipikruak Formation (Lower Cretaceous) (Ko)
107 = Cretaceous rocks undifferentiated (Ku)
108 = Okipikruak Formation through Lower Mississippian, undifferentiated (KM)
109 = Mississippian to Lower Cretaceous arkosic sandstone and glauconitic sandstone (KD)
110 = Jurassic and Cretaceous ultramafic rocks (Ju)
111 = Jurassic and Cretaceous mafic igneous rocks (m)
112 = Okipikruak Formation through Devonian, undifferentiated (MD)
997 = Glaciers and Permanent Snowfields (G)
998 = Water (W)

Point Hope

Source 1 - Unpublished geologic map of Point Hope, compiled by ESCA-TECH Corporation, 1980. (DOE 1:250,000)

101 = Quaternary alluvium (Qal)
102 = Quaternary lake, lagoon, and swamp deposits (Qp)
103 = Quaternary wind-blown deposits (Qw)
104 = Nanushuk Group (Cretaceous) (Kn)
105 = Fortress Mountain Formation (Lower Cretaceous) (Kf)
106 = Kisimilok Formation (Lower Cretaceous) (Kk)
107 = Telavirak Formation (Jurassic or Cretaceous) (KJt)
108 = Ogotoruk Formation (Jurasic or Cretaceous) (KJo)
109 = Shublik Formation (Triassic) (Trs)
110 = Triassic and Permian rocks undifferentiated (TrP)
111 = Siksikpuk Formation (Permian) (Ps)
112 = Lisburne Group (Mississippian) (Ml)
113 = Mississippian sedimentary rocks undivided (Ms)
997 = Glaciers and Permanent Snowfields (G)
998 = Water (W)

MINERAL TERRANE MINERAL-TERRANE, (MINT), 2, I

10 = Undifferentiated

Plutonic Igneous Terrane
Granitic and Syenitic Rocks
21 = Undivided
22 = Syenite, Monzonite and Peralkaline Granite
23 = Granite and Quartz Monzonite
24 = Granodiorite-Quartz Diorite
Mafic and Ultramafic Rocks
26 = Gabbro, Mafic Monzonite and Diorite
27 = Ultramafic, Largely Peridotite

Volcanic Igneous Terrane
Rhyolitic and Alkalitic Rocks
31 = Rhyolite and Quartz Latite
32 = Trachyandesite, Alkalic or Peralkaline Volcanics
Mafic Rocks
36 = Basalt

Sedimentary Terrane
Marine Siliceous Shale and Carbonate Rocks
41 = Argillaceous Limestone, Intergrading Limestone and Shale
42 = Bituminous or Carbonaceous Shale, Bituminous Limestone and Dark Chert
43 = Phosphatic Shale and Phosphorite
44 = Chert

Mixed Volcanic-Sedimentary Terrane

Mafic Volcanic and Sedimentary Rocks

61 = Gradational Sequences Igneous to Sedimentary
62 = Ophiolite: Ultramafic Rocks, Gabbro, Pillow Basalt, Dike Complexes, Minor Chert and Volcanic Sediments
63 = Mafic Marine Volcanics
64 = Marine Volcaniclastic Sediments
65 = Tuffaceous Siliceous Shale and Siltstone

Acidic Volcanic and Sedimentary Rocks

66 = Undivided
67 = Intrusives and Domes
68 = Bituminous and Carbonaceous Shale
99 = Not a Mineral Terrane

MINERAL TERRANE DOCUMENTATION MINERAL-TERR-DOC, (MINTD), 1, I

1 = Documented (Modified to Geology Map)
2 = Documented (No Corresponding Geology Map)
3 = Interpreted (No Corresponding Mineral Terrane Map)
9 = Not a Mineral Terrane

FLOOD ZONE FLOOD-ZONE (FZ), 1, I

1 = Known Glacial Outburst Flood Course and Known or Inferred River Flood Zone
2 = Known Glacial Outburst Flood Course
3 = Inferred Glacial Outburst Flood Course and Known or Inferred River Flood Zone
4 = Inferred Glacial Outburst Flood Course
5 = Lake Affected by Glacial Outburst Flood and Known or Inferred River Flood Zone
6 = Lake Affected by Glacial Outburst Flood
7 = Known or Inferred River Flood Zone
8 = Lakes Affected by Known or Inferred River Flood Zone
9 = Not a Known or Inferred Flood Course or Zone

SOIL-MAJOR LAND RESOURCE AREA SOIL-MLRA, (SOILM), 2, I

Southern Alaska

68 = Southeastern Alaska
69 = South Central Alaska Mountains
70 = Cook Inlet-Susitna Lowland
71 = Alaska Peninsula and Southwestern Islands

Interior Alaska

72 = Copper River Plateau
73 = Alaska Range
74 = Interior Alaska Lowlands
75 = Kuskokwim Highlands
76 = Interior Alaska Highlands

Arctic and Western Alaska

77 = Norton Sound Highlands
78 = Western Alaska Coastal Plains and Deltas
79 = Bering Sea Islands
80 = Brooks Range
81 = Arctic Foothills
82 = Arctic Coastal Plain

98 = Water

SOIL TYPE*
Primary Soil Type SOIL-PRIMARY, (SOIL1), 2, I
Secondary Soil Type SOIL-SECONDARY, (SOIL2), 2, C

01 = Typic Cryaquents
02 = Andaqueptic Cryaquents
03 = Typic Cryofluvents
04 = Typic Cryorthents
05 = Andeptic Cryorthents
06 = Aquic Cryorthents
07 = Lithic Cryorthents
08 = Pergelic Cryorthents
09 = Typic Cryopsamments
10 = Pergelic Cryopsamments
11 = Hydric Borofibrists
12 = Terric Borofibrists
13 = Sphagnic Borofibrists
14 = Fluvaquentic Cryofibrists
15 = Pergelic Cryofibrists
16 = Typic Sphagnofibrists
17 = Pergelic Sphagnofibrists
18 = Terric Sphagnofibrists
19 = Lithic Borofolists
20 = Typic Cryofolists
21 = Lithic Cryofolists
22 = Typic Borohemists
23 = Fluvaquentic Borohemists
24 = Terric Borohemists
25 = Typic Cryohemists
26 = Lithic Cryohemists
27 = Pergelic Cryohemists
28 = Terric Cryohemists
29 = Terric Borosaprists
30 = Typic Cryosaprists
31 = Lithic Cryosaprists

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*Additional data is available in an interpretive matrix for this variable.

32 = Terric Cryosaprists
33 = Typic Cryandepts
34 = Dystric Cryandepts
35 = Dystric Lithic Cryandepts
36 = Lithic Cryandepts
37 = Typic Cryaquepts
38 = Aeric Cryaquepts
39 = Aeric Humic Cryaquepts
40 = Andic Cryaquepts
41 = Histic Cryaquepts
42 = Histic Pergelic Cryaquepts
43 = Humic Cryaquepts
44 = Lithic Cryaquepts
45 = Pergelic Cryaquepts
46 = Pergelic Ruptic-Histic Cryaquepts
47 = Typic Cryochrepts
48 = Alfic Cryochrepts
49 = Andic Cryochrepts
50 = Aquic Cryochrepts
51 = Dystric Cryochrepts
52 = Lithic Cryochrepts
53 = Pergelic Cryochrepts
54 = Typic Cryumbrepts
55 = Entic Cryumbrepts
56 = Lithic Cryumbrepts
57 = Lithic Ruptic-Entic Cryumbrepts
58 = Pergelic Cryumbrepts
59 = Typic Cryaquolls
60 = Pergelic Cryaquolls
61 = Typic Cryoborolls
62 = Lithic Ruptic-Entic Cryoborolls
63 = Pergelic Cryoborolls
64 = Typic Cryaquods
65 = Humic-Lithic Cryaquods
66 = Lithic Cryaquods
67 = Pergelic Sideric Cryaquods
68 = Sideric Cryaquods
69 = Cryic Fragiaquods
70 = Placic Haplaquods
71 = Typic Placaquods
72 = Typic Cryohumods
73 = Lithic Cryohumods
74 = Cryic Placohumods
75 = Typic Cryorthods
76 = Entic Cryorthods
77 = Humic Cryorthods
78 = Humic Lithic Cryorthods
79 = Lithic Cryorthods
80 = Pergelic Cryorthods
81 = Cryic Fragiorthods

82 = Fluvaquentic Borosaprist
83 = Spodic Cryopsamment
86 = Cinder Land
87 = Dune Land
88 = Escarpments
89 = Gravelly Beaches
90 = Gravel Pits and Strip Mines
91 = Lava Flows
92 = Mixed Alluvial Land
93 = Terric Cryofibrists
94 = Tidal Marsh/Tidal Flat
95 = Rough Mountainous Land
96 = Rubble Land
97 = Glaciers and Permanent Snowfields
98 = Water
99 = Urban Land

00 = No Secondary Soil

<u>VEGETATION</u>

Primary Vegetation Type VEG-PRIMARY, (VEG1), 2, I
Secondary Vegetation Type VEG-SECONDARY, (VEG2), 2, C

Crown cover (for Forest and Scrub types) and alpha symbols appear in parentheses after each vegetation type.

A, B. <u>Primary and Secondary Vegetation Types</u>

<u>Forest-Intermediate</u> (10-30 feet)
Coniferous Forest
01 = Closed Coniferous Forest (60-100%) (CIc)
02 = Open Coniferous Forest (25-60%) (CIo)
03 = Coniferous Woodland (10-25%) (CIw)
Deciduous Forest
04 = Closed Deciduous Forest (60-100%) (DIc)
05 = Open Deciduous Forest (25-60%) (DIo)
06 = Deciduous Woodland (10-25%) (DIw)
Mixed Forest
07 = Closed Mixed Forest (60-100%) (MIc)
08 = Open Mixed Forest (25-60%) (MIo)
09 = Mixed Woodland (10-25%) (MIw)

<u>Forest - Tall (>30 feet)</u>
Coniferous Forest
11 = Closed Coniferous Forest (60-100%) (CTc)
12 = Open Coniferous Forest (25-60%) (CTo)
13 = Coniferous Woodland (10-25%) (CTw)
Deciduous Forest
14 = Closed Deciduous Forest (60-100%) (DTc)

15 = Open Deciduous Forest (25-60%) (DTo)
16 = Deciduous Woodland (10-25%) (DTw)
Mixed Forest
17 = Closed Mixed Forest (60-100%) (MTc)
18 = Open Mixed Forest (25-60%) (MTo)
19 = Mixed Woodland (10-25%) (MTw)

<u>Scrub</u>
Dwarf Tree Scrub (<10 Feet)
21 = Closed Dwarf Tree Scrub (75-100%) (SFc)
22 = Open Dwarf Tree Scrub (25-75% (SFo)
Tall Shrub (>5 Feet)
23 = Closed Tall Shrub Scrub (75-100%) (STc)
24 = Open Tall Shrub Scrub (25-75%) (STo)
Low Shrub (8 Inches-5 Feet)
25 = Closed Low Shrub Scrub (75-100%) (SLc)
26 = Open Low Shrub Scrub (25-75%) (SLo)
Dwarf Shrub (<8 Inches)
27 = Closed Dwarf Shrub (75-100%) (SMc)
28 = Open Dwarf Shrub Scrub (25-75%) (SMo)

<u>Herbaceous</u>
Aquatic (Non-Emergent) Herbaceous
31 = Fresh Water Aquatic Herbaceous (Non-Emergent) (HAf)
32 = Brackish Water Aquatic Herbaceous (Non-Emergent) (HAb)
33 = Marine Aquatic Herbaceous (Non-Emergent) (HAm)
Bryoids Herbaceous
34 = Mosses (HBm)
35 = Lichens (HBl)
Graminoid Herbaceous (sedge/grass)
36 = Dry Graminoid Herbaceous (HGd)
37 = Mesic Graminoid Herbaceous (HGm)
38 = Wet Graminoid Herbaceous (HGw)
Forb Herbaceous
39 = Dry Forb Herbaceous (HFd)
41 = Mesic Forb Herbaceous (HFm)
42 = Wet Forb Herbaceous (HFw)
Herbaceous (graminoids and forbs)
43 = Dry Herbaceous (HMd)
44 = Mesic Herbaceous (HMm)
45 = Wet Herbaceous (HMw)

50 = <u>Barren</u> (O)

98 = <u>Water</u> (W)

99 = <u>Urban/Disturbed</u> (U)

00 = No Secondary Vegetation

Vegetation Modifier VEG-MODIFIER, (VEGMO), 1, I

1 = Burns
2 = Regrowth
3 = Site Stunted
4 = Black Spruce
5 = Black Spruce/Burn
6 = Black Spruce/Regrowth
7 = Black Spruce/Stunted
0 = No Modifier

LAND USE LAND-USE, (LU), 2, I

Urban

11 = Concentrated Residential
12 = Rural Dispersed Residential
13 = Commercial and Services
14 = Industrial
15 = Industrial and Commercial Complexes
16 = Transportation, Communication and Utilities
17 = Mixed Urban or Built Up Land
18 = Other Urban or Built Up Land

Agriculture

21 = Cropland and Pasture
22 = Orchards, Groves, Vineyards, Nurseries and Ornamental Horticulture Areas
23 = Confined Feeding Operations
24 = Other Agricultural Land

30 = Rangeland

40 = Natural Land

50 = Resource Extraction

60 = Transition Areas

98 = Water

SCENIC/SPECIAL PLACES SCENIC-SPC-PLACE, (SSPLC), 1, I

1 = ANL Special Place and Outstanding Scenic Complex
2 = ANL Special Place
3 = ANL Outstanding Scenic Complex and Outstanding Visual Unit
9 = Not an ANL Scenic/Special Place

SURFICIAL GEOLOGY - QUADRANGLE BASED SURF-GEOL-QUAD, (SGEOQ), 3, I

101-N = Source 1: Unit Number/Name (By Quadrangle)
997 = Glaciers and Permanent Snowfields
998 = Water
999 = No 1:250,000 Scale Data

SURFACE COVER BY WATER WATER-COVER (WCOV), 1, I

1 = 0-5%
2 = 6-30%
3 = 31-60%
4 = 61-99%
8 = 100%

North Slope Borough
Geographic Information System
Manuscript Structure Summary
Manuscript Map II
Surface Hydrology

SUB-UFD: P12 ___ (Polygon)
P22 ___ (Line)
P32 ___ (Point)

Coverage: HPL ___ (Polygon)
HLN ___ (Line)
HPT ___ (Point)

Variable Name	ITEM Name	Redefined ITEM Name	Page Nos.
LINE			
Stream Order	STREAM-ORDER	SOD	5-II-1
Stream Periodicity	STREAM-PERIOD	SP	5-II-1
Stream Origin	STREAM-ORIGIN	SOR	5-II-1
Stream Discharge Profile	STREAM-DISC-PROF	SOP	5-II-1
Stream Condition	STREAM-CONDITION	SC	5-II-1
Stream Situation	STREAM-SITUATION	SS	5-II-1
Special National Designation	SPEC-NATION-DESG	SND	5-II-1
Anadromous Fish Stream Surveys	ANADROMOUS-FISH	AF	5-II-1
Anadromous Fish Type	A-(fish-name)	A (Abbrev.)	5-II-1
Known Distributions of Selected Freshwater Fish Species	FRESHWATER-FISH	FF	5-II-2
Selected Freshwater Fish Species Type	F-(fish-name)	F (Abbrev.)	5-II-2
DNR Documented or Potential Water Travel Usage	DNR-WATER-TRAVEL	DNR	5-II-2
POLYGON			
U.S.G.S. Hydrologic Units	USGS-HYDRO-UNITS	HU	5-II-3
A.D.N.R. STORET Watershed Units	ADNR-STORET	ASWU	5-II-3
POINT			
DNR Documented or Potential Water Travel Usage	DNR-WATER-TRAVEL	DNR	5-II-3

Data Classification and Codes
Manuscript Map II
Surface Hydrology

Line Coverage

STREAM ORDER STREAM-ORDER, (SOD), 2, I
- 1 = First Order (Smallest)
- 2 = Second Order
- 3 = Third Order
- 4 = Fourth Order
- 5 = Fifth Order
- 6 = Sixth Order
- 7 = Seventh Order
- 8 = Eighth Order (Largest)

STREAM PERIODICITY STREAM-PERIOD, (SP), 1, I
- 1 = Intermittent
- 2 = Perennial

STREAM ORIGIN STREAM-ORIGIN, (SOR), 1, I
- 1 = Non-Glacial
- 2 = Glacial

STREAM DISCHARGE PROFILE STREAM-DISC-PROF, (SDP), 1, I
- 1 = Lowland
- 2 = Mountain

STREAM CONDITION STREAM-CONDITION, (SC), 1, I
- 1 = Non-Braided
- 2 = Braided

STREAM SITUATION STREAM-CONDITION, (SC), 1, I
- 1 = Not within a Glacier or Waterbody
- 2 = Within a Glacier
- 3 = Within a Waterbody

SPECIAL NATIONAL DESIGNATION SPEC-NATION-DESG, (SND), 1, I
- 1 = Not a National Wild and Scenic River or Study River
- 2 = National Study River
- 3 = National Wild and Scenic River

ANADROMOUS FISH STREAM SURVEYS ANADROMOUS-FISH, (AF), 1, I
- 1 = Anadromous Fish Not Observed
- 2 = Anadromous Fish Observed

ANADROMOUS FISH TYPE
- Sockeye Salmon A-SOCKEYE-SALMON, (AS), 1, I
- King Salmon A-KING-SALMON, (AK), 1, I

Coho Salmon A-COHO-SALMON, (ACH), 1, I
Pink Salmon A-PINK-SALMON, (AP), 1, I
Chum Salmon A-CHUM-SALMON, (ACH), 1, I
Steelhead Trout A-STEELHEAD, (AST), 1, I
Dolly Varden A-DOLLY-VARDEN, (ADV), 1, I
Arctic Char A-ARCTIC-CHAR, (AA), 1, I
Sheefish A-SHEEFISH, (ASH), 1, I
Whitefish A-WHITEFISH, (AW), 1, I
Cutthroat Trout A-CUTTHROAT, (ACT), 1, I

1 = Not Observed
2 = Present (Assumed) Migration
3 = Present
4 = Present - Rearing
5 = Present - Known Spawning
6 = Present - Known Spawning and Rearing

KNOWN DISTRIBUTIONS OF SELECTED FRESHWATER FISH SPECIES FRESHWATER-FISH, (FF), 1, I
6 = Not Observed
7 = Present

SELECTED FRESHWATER FISH SPECIES TYPE
Rainbow Trout F-RAINBOW TROUT, (FR), 1, I
Steelhead Trout F-STEELHEAD, (FS), 1, I
Cutthroat Trout F-CHTTHROAT, (FC), 1, I
Arctic Char F-ARCTIC-CHAR, (FA), 1, I
Dolly Varden F-DOLLY-VARDEN, (FD), 1, I
Lake Trout F-LAKE-TROUT, (FL), 1, I
Eastern Brook Trout F-EAST-BROOK, (FEB), 1, I
Arctic Grayling F-ARCTIC-GRAY, (FAG), 1, I
Sheefish F-SHEEFISH, (FSF), 1, I
Whitefish F-WHITEFISH, (FW), 1, I
Northern Pike F-NORTHERN-PIKE, (FNP), 1, I
Arctic Cisco F-ARCTIC-CISCO, (FAC), 1, I
Bering Cisco F-BERING-CISCO, (FBC), 1, I
Least Cisco F-LEAST-CISCO, (FLC), 1, I
Burbot F-BURBOT, (FB), 1, I

6 = Not Observed
7 = Present

ALASKA DNR DOCUMENTED OR POTENTIAL WATER TRAVEL USAGE DNR-WATER-TRAVEL, (DNR), 1, I
1 = Waterways where water travel is not documented or having characteristics dissimilar to those where travel has occurred.
2 = Rivers where no water travel has been documented but show physical characteristics similar to those where travel has occurred.
3 = Lakes where water travel has been documented.
4 = Rivers where water travel has been documented.

Polygon Coverage

U.S.G.S. HYDROLOGIC UNITS USGS-HYDRO-UNITS, (HU), 3, I

	Subregion	Catalog Unit	Unit Name
11 =	1	1	East Arctic Slope
12 =	1	2	Colville
13 =	1	3	West Arctic Slope
21 =	2	1	Kotzebue Sound
22 =	2	2	Norton Sound - St. Lawrence Island
31 =	3	1	Fortymile - White
32 =	3	2	Uppr Yukon
33 =	3	3	Middle Yukon
34 =	3	4	Tanana
35 =	3	5	Koyukuk
36 =	3	6	Lower Yukon
41 =	4	1	Kuskokwim Bay-Nunivak Is.-St Matthew Is.
42 =	4	2	Bristol Bay
43 =	4	3	Aleutian - Pribilof Island
51 =	5	1	Kodiak - Shelikof
52 =	5	2	Cook Inlet
53 =	5	3	Gulf of Alaska
60 =	6	0	Southeast Alaska

Alaska DNR STORET WATERSHED UNITS ADNR-STORET, (ASWU), 2, I
1-58 = ADNR Number

Point Coverage

ALASKA DNR DOCUMENTED OR POTENTIAL WATER TRAVEL USAGE DNR-WATER-TRAVEL (DNR), 2, I
3 = Lake where water travel has been documented

North Slope Borough
Geographic Information System
Manuscript Structure Summary
Manuscript Map III
Political and Administrative Units

SUB-UFD: P13 (module #) (Polygon)
P23 ___ (Point)

Coverage: PAPL ___ (Polygon)
PAPT ___ (Point)

Variable Name	ITEM Name	Redefined ITEM Name	Page No.
POLYGON			
Township, Baseline and Principal Meridian name	TOWNSHIP-MERIDIAN	TM	5-III-1
Quadrant	QUADRANT	QUAD	5-III-1
Township Number	TOWNSHIP-NUMBER	TN	5-III-1
Half Township or Range Identifier	HALF-TOWN-RANGE	HTR	5-III-1
Range Number	RANGE-NUMBER	RN	5-III-1
Municipality-Borough Number/Name	MUNI-BORO-NO-NAM	MBNN	5-III-1
Special National Designation	SPEC-NAT-DESIGN	SND	5-III-2
National System Type	NATION-SYSTEM-TP	NST	5-III-2
National System Type Number/Name	NATION-TP-NB-NAM	NTNN	5-III-2
State System Type	STATE-SYSTEM-TP	SST	5-III-4
State System Type	STATE-SYSTEM-NO-NAM	STNN	5-III-4
Other Public and Private Reserves	PUBLIC-PRIV-RES	PPR	5-III-7
Coal Leases	COAL-LEASES	CL	5-III-7
Coal Prospecting Permit Application	COAL-PERMIT-APPL	CPA	5-III-8
Census Areas	CENSUS-AREAS	CA	5-III-9
General Land Ownership	GEN-LAND-OWNSHIP	GLO	5-III-10
School and Mental Health Grant Lands (Historical)	SCHOOL-MNTL-LAND	SML	5-III-11
Subdivisions-Quadrangle Based	SUBDIVISION-QUAD	SQ	5-III-11

Oil and Gas Leases			
Agency	OIL-GAS-AGENCY	OGA	5-III-12
Status	OIL-GAS-STATUS	OGS	5-III-12
Lease Sequence Number	OIL-GAS-SEQ-NO	OGSN	5-III-12
NSB Comprehensive Plan Resource Development Districts	NSB-RESOURCE-DIS	NRD	5-III-12
Haul Road Corridor	HAUL-ROAD-CORRID	HRC	5-III-12
Arctic Slope Regional Corporation	ARCTIC-REGI-CORP	ARC	5-III-12
NSB Service Area 10	NSB-SERVICE-AREA	NSA	5-III-12
POINT			
General Land Ownership	GEN-LAND-OWNSHIP	GLO	5-III-13
School and Mental Health Grant Lands (Historical)	SCHL-MENTAL-LAND	SML	5-III-13
U.S. Military Facility	US-MILITARY-FAC	USMF	5-III-14
State System Type	STATE-SYSTEM-TP	SST	5-III-14
State System Type Number/Name	STATE-TP-NO-NAM	STNN	5-III-14
Other Public and Private Reserve	PUBLIC-PRIV-RES	PPR	5-III-14
Coal Mining Permits	COAL-MINE-PERMIT	CMP	5-III-14
Abandoned Mine Land Problem Areas	ABAN-MINE-PROB-A	AMLPA	5-III-14
Coal Leases	COAL-LEASES	CL	5-III-15
Coal Prospecting Permit Application	COAL-PERMIT-APPL	CPA	5-III-15
Subdivisions-Quadrangle Based Classification and Codes	SUBDIVISION-QUAD	SQ	5-III-15

Data Classification and Codes
Manuscript Map III
Political and Administrative Units

Polygon Coverage

TOWNSHIP BASELINE AND PRINCIPAL MERIDIAN NAME TOWNSHIP-MERIDIAN, (TM), 1, I
1 = Copper River Baseline and Meridian
2 = Fairbanks Baseline and Meridian
3 = Kateel Baseline and Meridian
4 = Seward Baseline and Meridian
5 = Umiat Baseline and Meridian
9 = No Data

QUADRANT QUADRANT, (QUAD), 1, I
1 = NE
2 = NW
3 = SE
4 = SW
9 = No Data

TOWNSHIP NUMBER TOWNSHIP-NUMBER, (TN), 3, I
001 - N = Township Number
999 = No Data

HALF TOWNSHIP OR RANGE IDENTIFIER HALF-TOWN-RANGE, (HTR), 1, I
3 = Half Township
6 = Half Range
9 = Half Township and Range
0 = Not a Half Township or Range or No Data

RANGE NUMBER RANGE-NUMBER, (RN), 2, I
01 - N = Range Number
99 = No Data

MUNICIPALITY-BOROUGH NUMBER/NAME MUNI-BORO-NO-NAM, (MBNN), 2, I

Unified Home Rule
11 = Juneau
12 = Sitka
13 = Anchorage

Home Rule
21 = North Slope

Second Class
31 = Bristol Bay
32 = Fairbanks North Star
33 = Kenai

34 = Ketchikan Gateway
35 = Kodiak Island
36 = Matanuska-Susitna

Third Class
41 = Haines

99 = Not a Borough

SPECIAL NATIONAL DESIGNATION SPEC-NAT-DESIGN, (SND), 1, I
1 = National Wilderness
2 = National Petroleum Reserve
9 = No Special Designation

NATIONAL SYSTEM TYPE NATION-SYSTEM-TP, (NST), 2, I

National Wildlife Refuge System
11 = National Wildlife Refuge

National Park System
21 = National Park
22 = National Monument
23 = National Preserve

Bureau of Land Management System
31 = National Conservation Area
32 = National Recreation Area

National Forest System
41 = National Forest
42 = National Monument

Military Reservation System
51 = Military Reservation/Base or Other Large Facility

99 = Not a National System Type

NATIONAL SYSTEM TYPE NUMBER/NAME NATION-TP-NO-NAM, (NTNN), 2, I

National Wildlife Refuge System
National Wildlife Refuges
01 = Alaska Maritime NWR: Chukchi Sea Unit
02 = Alaska Maritime NWR: Bering Sea Unit
03 = Alaska Maritime NWR: Aleutian Islands Unit
04 = Alaska Maritime NWR: Alaska Peninsula Unit
05 = Alaska Maritime NWR: Gulf of Alaska Unit
06 = Alaska Peninsula NWR
07 = Arctic NWR
08 = Becharof NWR
09 = Innoko NWR

10 = Izembek NWR
11 = Kanuti NWR
12 = Kenai NWR
13 = Kodiak NWR
14 = Koyukuk NWR
15 = Nwitna NWR
16 = Selawik NWR
17 = Tetlin NWR
18 = Togiak NWR
19 = Yukon Delta NWR
20 = Yukon Flats NWR
21 = Tuxedni NWR

National Park System

National Parks, Monuments and Preserves

01 = Aniakchak National Monument and Preserve
02 = Bering Land Bridge National Preserve
03 = Cape Krusenstern National Monument
04 = Denali National Park and Preserve
05 = Gates of the Arctic National Park and Preserve
06 = Glacier Bay National Park and Preserve
07 = Katmai National Park and Preserve
08 = Kenai Fjords National Park
09 = Kobuk Valley National Park
10 = Lake Clark National Park and Preserve
11 = Noatak National Preserve
12 = Wrangell-Saint Elias National Park and Preserve
13 = Yukon-Charley Rivers National Preserve
14 = Sitka National Historic Park (Not D-2)
15 = Klondike Goldrush National Historic Park (Not D-2)

Bureau of Land Management System

National Conservation and Recreation Areas

01 = Steese National Conservation Area
02 = White Mountains National Recreation Area

National Forest System

National Forests and Monuments

01 = Chugach National Forest
02 = Tongass National Forest
03 = Admiralty Island National Monument (Tongass)
04 = Misty Fjords National Monument (Tongass)

National Military System

Military Reservations/Bases

01 = Elmendorf Air Force Base
02 = Fort Richardson Military Reserve
03 = Point Campbell Military Reserve
04 = Cape Newenham AF Station
05 = Port Heiden Radio Relay Site

06 = Big Mountain AF Station
07 = Elmendorf/Ft. Richardson Nike Battery "C"
08 = Eklutna Dispersal Site
09 = Ft. Greeley
10 = Kenai Airfield
11 = Naptowne Radio Relay Site
12 = Barter Island DEW Station
13 = Cape Lisburne Air Force Station
14 = Lonely DEW Station
15 = Oliktok DEW Station
16 = Point Barrow DEW Station
17 = Point Barrow National Guard Site
18 = Point Lay DEW Station
19 = Wainwright DEW Station
20 = Yakataga Radio Relay Station
21 = Black Rapids Military Reservation
22 = Gersel River Test Site
23 = Ft. Wanwright
24 = Yukon Command Training Site
25 = Flaxman Island DEW Station
99 = Not a National System Type

STATE SYSTEM TYPE STATE-SYSTEM-TP, (SST), 2, I

State Fish and Game System
11 = State Game Refuge
12 = State Critical Habitat Area
13 = State Game Sanctuary
14 = State Game Range

State Park and Recreation System
21 = State Park
22 = State Recreation Area
23 = State Recreation Site
24 = State Historic Park

State System Overlay Areas
51 = State Critical Habitat Area and State Park

40 = Proposed Capitol Site

99 = Not a State System Type

STATE SYSTEM TYPE NUMBER/NAME STATE-TP-NO-NAM, (STNN), 2, I

State Fish and Game System
State Game Refuge
01 = Camp Newenham
02 = Goose Bay
03 = Izembek

04 = Mendenhall Wetlands
05 = Palmer Hayflats
06 = Potter Point
07 = Susitna Flats
08 = Trading Bay

State Critical Habitat Area

01 = Chilkat River
02 = Cinder River
03 = Clam Gulch
04 = Copper River Delta
05 = Egegik
06 = Fox River Flats
07 = Kachemak Bay
08 = Kalgin Island
09 = Pilot Point
10 = Port Heiden
11 = Port Moller

State Game Sanctuary

01 = McNeil River
02 = Walrus Island

State Game Range

01 = Delta Junction Bison Range

State Parks and Recreation System

State Park

01 = Chilkat
02 = Chugach
03 = Denali
04 = Kachemak Bay
05 = Wood-Tikchik
06 = Kachemak Bay Wilderness

State Recreation Area

01 = Coines Head
02 = Captain Cook
03 = Chena River
04 = Clam Gulch
05 = Harding Lake
06 = Johnson Lake
07 = Lake Louise
08 = Morgans Landing
09 = Nancy Lake
10 = Quartz Lake
11 = Silver King

State Recreation Site

01 = Anchor River

02 = Bernice Lake
03 = Big Lake (East)
04 = Big Lake (South)
05 = Bings Landing
06 = Blueberry Lake
07 = Bonnie Lake
08 = Chatanika River (Lower)
09 = Chatanika River (Upper)
10 = Chena River
11 = Chilkoot Lake
12 = Clearwater
13 = Dead Man Lake
14 = Deep Creek
15 = Donnelly Creek
16 = Dry Creek
17 = Eagle Trail
18 = Fingers Lake
19 = Funny River
20 = Gardiner Creek
21 = Halibut
22 = Izaak Walton
23 = Kasilof River
24 = Kenai River Island
25 = Kenai River (Lower)
26 = Kenai River (Upper)
27 = King Mountain
28 = Lake View
29 = Liarsville
30 = Little Nelchina
31 = Little Tonsina
32 = Long Lake
33 = Matanuska Glacier
34 = Mirror Lake
35 = Moon Lake
36 = Moose Creek
37 = Mosquito Lake
38 = Nancy Lake
39 = Ninilchik
40 = Pasagshak River
41 = Pats Creek
42 = Peters Creek
43 = Porcupine Creek
44 = Portage Cove
45 = Refuge Cove
46 = Rocky Lake
47 = Salcha River
48 = Slikok Creek
49 = Sports Lake
50 = Squirrel Creek
51 = Stariski

52 = Tok River
53 = Tolsona Creek
54 = Willow Creek
55 = Worthington Glacier

<u>State Historic Park</u>
01 = Fort Abercrombie
02 = Independence Mine
03 = Totem Bight

State University Reserve System
<u>State University Reserve</u>
01 = State University Land

Proposed Capitol Site
<u>Proposed Capitol Site</u>
01 = Proposed Capitol Site

State System Overlay Areas
01 = Kachemak Bay Critical Habitat Area and Kachemak Bay State Park

99 = Not a State System Type

<u>OTHER PUBLIC AND PRIVATE RESERVES</u> PUBLIC-PRIV-RES, (PPR), 1, I
1 = Regional and Local Public Reserves
2 = Private Reserve
9 = Not a Public or Private Reserve

<u>COAL LEASES</u> COAL-LEASES, (CL), 3, I
<u>State Leases</u>
001 = 16925
002 = 16926
003 = 16927
004 = 20633
005 = 21545
006 = 21864
007 = 22721
008 = 23803
009 = 24295
010 = 24296
011 = 25060
012 = 32136
013 = 32144
014 = 33795
015 = 33978
016 = 36282
017 = 36911
018 = 36913
019 = 36914
020 = 37002

021 = 37471
022 = 50699
023 = 53048
024 = 53509
025 = 55259
026 = 56505
027 = 56982
028 = 58957
029 = 58959
030 = 59502
031 = 60496
032 = 61957
033 = 61958
034 = 62403
035 = 62404
036 = 62405
037 = 62406
038 = 62407
039 = 62408
040 = 62409
041 = 62410
042 = 62753
043 = 62754
044 = 62985
045 = 64560
046 = 64596
047 = 64598
048 = 64830
049 = 65669
050 = 65671
051 = 65672
052 = 65673
053 = 65681
054 = 65695
055 = 79816
056 = 309744
057 = 309947
058 = 324600
059 = 327217
060 = 72831

500 = Federal Leases

999 = Not a Coal Lease

<u>COAL PROSPECTING PERMIT APPLICATION</u> COAL-PERMIT-APPL, (CPA), 1, I
1 = Prospecting Permit Application
9 = Not a Coal Prospecting Permit Application

CENSUS AREAS AND SUBAREAS CENSUS-AREAS, (CA), 4, I

North Slope Borough
0131 = Barrow-Point Hope CSA (Census Sub Area)
0132 = Prudhoe Bay-Kaktovik CSA

Kobuk Census Area
0233 = Kobuk

Nome Census Area
0334 = Nome

Yukon-Koyukuk Census Area
0441 = McGrath-HolyCross CSA
0442 = Koyukuk-Middle Yukon CSA
0443 = Yukon Flats CSA

Fairbanks North Star Borough
0544 = Eielson Reservation CSA
0545 = Balance of Fairbanks CSA

Southeast Fairbanks Census Area
0646 = Southeast Fairbanks

Wade Hampton Census Area
0751 = Wade Hampton

Bethel Census Area
0852 = Lower Kuskokwim CSA
0853 = Aniak CSA

Dillingham Census Area
0954 = Dillingham

Bristol Bay Borough
1055 = Bristol Bay Borough

Aleutian Islands Census Area
1156 = Aleutian Islands

Matanuska-Susitna Borough
1261 = Matanuska-Susitna Borough

Municipality of Anchorage
1362 = Municipality of Anchorage

Kenai Peninsula Borough
1471 = Kenai-Cook Inlet CSA
1472 = Seward CSA

Kodiak Island Borough

1573 = Kodiak Station CSA
1574 = Balance of Kokiak CSA

Valdez-Cordova Census Area

1675 = Prince William Sound CSA
1676 = Cordova CSA
1677 = Copper River CSA

Skagway-Yakutat-Angoon Census Area

1781 = Hoonah-Yakutat CSA
1782 = Angoon CSA
1783 = Skagway CSA
1784 = Klukwan CSA

Haines Borough

1885 = Haines Borough

City and Borough of Juneau

1986 = City and Borough of Juneau

City and Borough of Sitka

2087 = City and Borough of Sitka

Wrangell-Petersburg Census Area

2191 = Petersburg CSA
2192 = Wrangell CSA

Prince of Wales-Outer Ketchikan Census Area

2293 = Outer Ketchikan CSA
2294 = Prince of Wales CSA

Ketchikan Gateway Borough

2395 = Ketchikan Gateway Borough

9999 = Not a Census Area

GENERAL LAND OWNERSHIP GEN-LAND-OWNSHIP, (GLO), 4, I

Unique Codes

0001 = Barrow West Quadrangle - Multiple Land Ownership Codes of 60, 70, 82, 90
0002 = Pt. Hope Quadrangle - Multiple Land Ownership codes of 11, 82, 85

Generic Codes - Primary/Secondary Land Ownership

10 = State General Grant Land
11 = Patented
12 = Tentative Approved Selection
13 = Disposed of to Private Parties
14 = Patented with Native Allotment Application

15 = Tentative Approved Selection with Native Allotment Application

20 = Borough Land
21 = Tentative Approved or Patent
22 = Disposed of to Private Parties
23 = Borough Selection - not approved

30 = School Grant Land Area Still in State Ownership

40 = Mental Health Grant Land
41 = Mental Health Grant Land Still in State Ownership
42 = Mental Health Grant Land Disposed of to Private Parties

50 = University Grant Land

60 = Land purchased by the State for State Purposes

70 = Native IC or Patent Land
71 = Native IC or Patent Land with Native Allotment Application
72 = In Lieu of Subsurface IC or Patent

80 = Federal Land
81 = Vacant and Unappropriated
82 = Withdrawn for a Federal System
83 = State of Alaska Selection
84 = Native Corporation Selection
85 = Native Allotment Applications
86 = Trade and Manufacturing Site Application, Homestead Application or Headquarters Site Application
87 = State Selection and Native Corporation Selection
88 = State Selection and Native Allotment Application
89 = Native Allotment Application and Native Corporation Selection

90 = Private Ownership - Land Obtained from the Federal Public Domain - Homestead, etc.

99 = No Data

00 = No Land Ownership 2

SCHOOL AND MENTAL HEALTH GRANT LANDS (HISTORICAL) SCHOOL-MNTL-LAND, (SML), 1, I
3 = School Grant Land
4 = Mental Health Grant Land
9 = Not a School or Mental Health Grant Land

SUBDIVISIONS - QUADRANGLE BASED SUBDIVISION-QUAD, (SQ), 2, I
01-N = Subdivision Name/Number
99 = Not a Subdivision

OIL AND GAS LEASES

A. Agency OIL-GAS-AGENCY, (OGA), 2, I
01 = State
02 = Federal
03 = Arctic Slope Regional Corporation
99 = Not an Oil and Gas Lease

B. Status OIL-GAS-STATUS, (OGS), 1, I
1 = Existing
2 = Proposed
8 = Unknown
9 = Not an Oil and Gas Lease

C. Sequential Number OIL-GAS-SEQ-NO, (OGSN), 4, I
0001-N = Sequential Number by Quadrangle
9999 = Not an Oil and Gas Lease

NSB COMPREHENSIVE PLAN RESOURCE DEVELOPMENT DISTRICTS NSB-RESOURCE-DIS, (NRD), 1, I
1 = Duck Island
2 = Gwydyr Bay
3 = Kuparuk River
4 = Milne Point
5 = Point Thompson
6 = Prudhoe Bay
7 = West Mikkelsen
8 = Kavik
9 = Not a NSB Comprehensive Plan Resource Development District

HAUL ROAD CORRIDOR HAUL-ROAD-CORRIDOR, (HRC), 1, I
1 = State Lands Corridor (North of Umiat Meridian)
2 = BLM Land Inner Corridor (South of Umiat Meridian)
3 = BLM Lands Outer Corridor (South of Umiat Meridian)
4 = Five Mile No Hunting Limit
5 = BLM Lands Inner Corridor and Five Mile No Hunting Limit
6 = State Lands Corridor and Five Mile No Hunting Limit
7 = BLM Lands Outer Corridor and Five Mile No Hunting Limit
9 = Not Haul Road Corridor or Five Mile No Hunting Limit

ARCTIC SLOPE REGIONAL CORPORATION, ARCTIC-REGI-CORP, ARC, 1, I
1 = ASRC
9 = Not ASRC

NSB SERVICE AREA 10 NSB-SERVICE-AREA, (NSA), 1, I
1 = NSB Service Area 10
9 = Not NSB Service Area 10

Point Coverage

GENERAL LAND OWNERSHIP GEN-LAND-OWNSHIP, (GLO), 3, I

10 = State General Grant Land
11 = Patented
12 = Tentative Approved Selection
13 = Disposed of to Private Parties
14 = Patented with Native Allotment Application
15 = Tentative Approved Selection with Native Allotment Application

20 = Borough Land
21 = Tentative Approved or Patent
22 = Disposed of to Private Parties
23 = Borough Selection - Not Approved

30 = School Grant Land Area Still in State Ownership

40 = Mental Health Land
41 = Mental Health Grant Land Still in State Ownership
42 = Mental Health Grant Land Disposed of to Private Parties

50 = University Grant Land

60 = Land Purchased by the State for State Purposes

70 = Native IC or Patent Land
71 = Native IC or Patent Land with Native Allotment Application
72 = Lieu of Subsurface IC or Patent

80 = Federal Land
81 = Vacant and Unappropriated
82 = Withdrawn for a Federal System
83 = State of Alaska Selection
84 = Native Corporation Selection
85 = Native Allotment Applications
86 = Trade and Manufacturing Site Application, Homestead Application or Headquarters Site Application
87 = State Selection and Native Corporation Selection
88 = State Selection and Native Allotment Application
89 = Native Allotment Application and Native Corporation Selection

90 = Private Ownership - Land Obtained from the Federal Public Domain - Homestead, etc.

99 = Not a General Land Ownership Point

SCHOOL AND MENTAL HEALTH GRANT LAND (HISTORICAL) SCHL-MENTAL-LAND,(SML), 1, I

3 = School Grant Land

4 = Mental Health Land
9 = Not a School or Mental Health Grand Land (Historical)

<u>U.S. MILITARY FACILITY</u> US-MILITARY-FAC, (USMF), 1, I
1 = Base, Fort, Station or Reservation
2 = Experiment or Research Facility
3 = Training Facility
4 = National Guard Facility
5 = Recreation Facility
6 = Storage or Dispersal Facility
7 = Communication, Navigation or Radar Facility
8 = Missile Facility
9 = Not U.S. Military Facility

<u>STATE SYSTEM TYPE</u> STATE-SYSTEM-TP, (SST), 2, I

<u>State Fish and Game System</u>
11 = State Game Refuge
12 = State Critical Habitat Area
13 = State Game Sanctuary

<u>State Park and Recreation System</u>
21 = State Park
22 = State Recreation Area
23 = State Recreation Site
24 = State Historic Park

99 = Not a State System Type

<u>STATE SYSTEM TYPE NUMBER/NAME</u> STATE-TP-NO-NAM, (STNN), 2, I
Same Number System as Polygon Data

<u>OTHER PUBLIC AND PRIVATE RESERVE</u> PUBLIC-PRIV-RES, (PPR), 1, I
1 = Regional and Local Public Reserves
2 = Private Reserve
9 = Not Public or Private Reserve

<u>COAL MINING PERMITS</u> COAL-MINE-PERMIT, (CMP), 3, I
001-N = Coal Mine Permit Number
999 = Not a Coal Mine Permit

<u>ABANDONED MINE LAND (AML) PROBLEM AREAS</u> ABAN-MINE-PROB-A, (AMPLA), 3, I
001 = AML Area 1 and 2
002 = AML Area 3
003 = AML Area 4
004 = AML Area 5 and 6
005 = AML Area 6
006 = AML Area 7, 8 and 9
007 = AML Area 7, 8 and 9

008 = AML Area 10 and 11
009 = AML Area 12, 13 and 14
010 = AML Area 15
011 = AML Area 16
012 = AML Area 17
013 = AML Area 18
999 = Not an AML Site

<u>COAL LEASES</u> COAL-LEASES, (CL), 3, I
Same Number as Polygon Data

<u>COAL PROSPECTING PERMIT APPLICATIONS</u> COAL-PERMIT-APPL, (CPA), 1, I
1 = Coal Prospecting Permit Application
9 = Not a Coal Prospecting Permit Application

<u>SUBDIVISIONS - QUADRANGLE BASED</u> SUBDIVISION-QUAD, (SQ), 2, I
01-N = Subdivision Name/Number
99 = Not a Subdivision

North Slope Borough
Geographic Information System
Manuscript Structure Summary
Manuscript Map IV
Infrastructure, Settlements and Special Features

SUB-UFD: P14 (module#) (Cultural Lines)
P24 ___ (Natural Lines)
P34 ___ (Cultural Points)
P44 ___ (Natural Points)

Coverage: ICLN ___ (Cultural Lines)
INLN ___ (Natural Lines)
ICPT ___ (Cultural Points)
INPT ___ (Natural Points)

Variable Name	ITEM Name	Redefined ITEM Name	Page No.
NATURAL LINES			
Faults	FAULTS	FLT	5-IV-1
Escarpments	ESCARPMENTS	ESC	5-IV-1
CULTURAL LINES			
Road Class	ROAD-CLASS	RCL	5-IV-1
Road Capacity	ROAD-CAPACITY	RCP	5-IV-1
Road Surface Type	ROAD-SURFACE-TYPE	RST	5-IV-1
State Highway Number	STATE-HIGHWAY#	SHN	5-IV-2
Railroad	RAILROAD	RR	5-IV-2
Transmission Line Number	TRANSLINE#	TLN	5-IV-2
Transmission Line Type Capacity			
First Line - Type	TRANS-LINE-TP1	TLT1	5-IV-2
First Line - Capacity	TRANS-LINE-CP1	TLC1	5-IV-2
Second Line-Type	TRANS-LINE-TP2	TLT2	5-IV-2
Second Line - Capacity	TRANS-LINE-CP2	TLC2	5-IV-2
Third Line - Type	TRANS-LINE-TP3	TLT3	5-IV-2
Third Line - Capacity	TRANS-LINE-CP3	TLC3	5-IV-2
Fourth Line - Type	TRANS-LINE-TP4	TLT4	5-IV-2
Fourth Line - Capacity	TRANS-LINE-CP4	TLC4	5-IV-2
Pipeline Type	PIPELINE-TYPE	PT	5-IV-3
Major Pipeline System	MAJ-PIPE-SYSTEM	MPS	5-IV-3
Trail Type	TRAIL-TYPE	TT	5-IV-3

Iditarod National Historic Trail	IDIT-NAT-HIST-TR	INHT	5-IV-3
Dept. of Transportation Quadrangle and Number	DOT-QUAD-#	DTQN	5-IV-3
Dept. of Transportation Trail Number	DOT-TRAIL#	DTTN	5-IV-4
Dept. of Transportation Alpha Identifier	DOT-ALPHA-IDENT	DTAI	5-IV-4

NATURAL POINTS

Volcano	VOLCANO	VOL	5-IV-4
Thermal Springs	THERMAL-SPRINGS	TS	5-IV-4
Pingo or Mound	PINGO-OR-MOUND	PM	5-IV-5

CULTURAL POINTS

Settlements	SETTLEMENTS	SET	5-IV-5
Cemetary	CEMETARY	CEM	5-IV-6
Airport	AIRPORT	AIR	5-IV-7
Navigation Facility	NAVIGATION-FCLTY	NF	5-IV-7
Electric Generation/Distribution Facility	ELEC-GEN/DIS-FAC	EGDF	5-IV-7
Hydroelectric Generation Site	HYDROELEC-GEN-ST	HEGS	5-IV-7

Data Classification and Codes
Manuscript Map IV
Infrastructure, Settlements and Special Features

Natural Line Coverage

FAULTS FAULTS, (FLT), 2, I

1 = Known Fault
2 = Approximately Located Fault
3 = Suspected or Inferred Fault
9 = Not a Fault

ESCARPMENTS ESCARPMENTS, (ESC), 1, I

1 = Major Escarpment (GT 100 Feet)
2 = Minor Escarpment (LT 100 Feet)
9 = Not an Escarpment

Cultural Line Coverage

ROAD CLASS ROAD-CLASS, (RCL), 2, I

1 = Federal
2 = State
3 = Local
9 = Not a Road

ROAD CAPACITY ROAD-CAPACITY, (RCP), 1, I

1 = Heavy Duty
2 = Medium Duty
3 = Light Duty
4 = Unimproved Dirt
9 = Not a Road

ROAD SURFACE TYPE ROAD-SURFCE-TYPE, (RST), 1, I

1 = Paved
2 = Not Paved
9 = Not a Road

STATE HIGHWAY NUMBER STATE-HIGHWAY#, (SHN), 2, I

1-97 = State Highway Number
98 = Unnumbered State Highway
99 = Not a State Highway

RAILROAD RAILROAD, (RR), 1, I

1 = Railroad
9 = Not a Railroad

TRANSMISSION LINE NUMBER TRANS-LINE#, (TLN), 1, I

1 = Four Transmission Lines
2 = Three Transmission Lines
3 = Two Transmission Lines
4 = One Transmission Line
9 = Not a Transmission Line

TRANSMISSION LINE TYPE/CAPACITY

First Line - Type TRANS-LINE-TP1, (TLT1), 1, I
First Line - Capacity TRANS-LINE-CP1, (TLC1), 1, I
Second Line - Type TRANS-LINE-TP2, (TLT2), 1, I
Second Line - Capacity TRANS-LINE-CP2, (TLC2), 1, I
Third Line - Type TRANS-LINE-TP3, (TLT3), 1, I
Third Line - Capacity TRANS-LINE-CP3, (TLC3), 1, I
Fourth Line - Type TRANS-LINE-TP4, (TLT4), 1, I
Fourth Line - Capacity TRANS-LINE-CP4, (TLC4), 1, I

Transmission Line Type

1 = Existing Transmission Line
2 = Existing Submarine Cable Field
3 = Proposed Transmission Line
4 = Proposed Submarine Cable Field
9 = Not a Transmission Line

Transmission Line Capacity

1 = 230 KV or Greater
2 = 138 KV
3 = 115 KV
4 = 69 KV
5 = 34.5 KV

6 = 24.9 KV
7 = 14.5 KV
8 = 12.5 KV
9 = Not a Transmission Line

PIPELINE TYPE PIPELINE-TYPE, (PT), 1, I

1 = Oil and Natural Gas
2 = Oil
3 = Natural Gas
9 = Not a Pipeline

MAJOR PIPELINE SYSTEM MAJ-PIPE-SYSTEM, (MPS), 1, I

1 = Trans-Alaska Pipeline (TAPS)
8 = Unknown Name
9 = Not a Major Pipeline System

TRAIL TYPE TRAIL-TYPE, (TT), 1, I

1 = Documented Historic or Department of Transportation Trail
2 = Other Trails - Documented
3 = Other Trails - Undocumented
9 = Not a Trail

IDITAROD NATIONAL HISTORIC TRAIL IDIT-NAT-HIST-TR, (INHT), 1, I

1 = Primary Trail, Located
2 = Primary Trail, Not Located or Visible
3 = Primary Trail, Meandering
4 = Connecting Trail, Located
5 = Connecting Trail, Not Located or Visible
6 = Connecting Trail, Meandering
9 = Not Iditarod Trail

DEPARTMENT OF TRANSPORTATION QUADRANGLE AND NUMBER DOT-QUAD-#, (DTQN), 3, I

129 = Pt. Hope
130 = DeLong Mts.
131 = Misheguk Mts.
132 = Howard Pass
133 = Killik River
134 = Chandler Lake
135 = Philip Smith Mts.
136 = Arctic

137 = Table Mt.
138 = Demarcation Pt.
139 = Mt. Michelson
140 = Sagavanirktok
141 = Umiat
142 = Ikpikpuk
143 = Lookout Ridge
144 = Utukok River
145 = Pt. Lay
146 = Wainwright
147 = Meade River
148 = Teshekpuk
149 = Harrison Bay
150 = Beechey Pt.
151 = Flaxman Is.
152 = Barter Is.
153 = Barrow
999 = Not a Department of Transportation Trail

<u>DEPARTMENT OF TRANSPORTATION TRAIL NUMBER</u> DOT-TRAIL#, (DTTN), 3, I

001-899 = Department of Transportation Trail Number (By Quadrangle)
901-998 = Unnumbered Department of Transportation Trail (By Quadrangle)
999 = Not a Department of Transportation Trail

<u>DEPARTMENT OF TRANSPORTATION ALPHA IDENTIFIER</u> DOT-ALPHA-IDENT, (DTAI), 2, I
00 = No DOT Alpha Identifier
01 = A
02 = B
99 = Not a DOT Trail

<u>Natural Point Coverage</u>

<u>VOLCANO</u> VOLCANO, (VOL), 2, I

1 = Active Volcano
2 = Active Caldera
3 = Inactive Volcano
4 = Inactive Caldera
5 = Cinder Cone
9 = Not a Volcano, Caldera or Cinder Cone

<u>THERMAL SPRINGS</u> THERMAL-SPRINGS, (TS), 1, I

1 = Thermal Spring Location Certain
2 = Thermal Spring Location Uncertain
8 = Geothermal Well
9 = Not a Thermal Spring or Geothermal Well

PINGO OR MOUND PINGO-OR-MOUND, (PM), 1, I

1 = Pingo
2 = Mound
3 = Not a Pingo or Mound

Cultural Point Coverage

SETTLEMENT* SETTLEMENT, (SET), 4, I

Barrow A (West)
001 = Barrow
002 = Browerville
004 = Nulavik
005 = Nuwuk

Barrow B (East)
003 = Ikiak

Barter Island
001 = Elupak
002 = Kaktovik

Beechey Pt.
001 = Deadhorse
002 = Prudhoe Bay

Demarcation Pt.
001 = Gordon
002 = Kulurvak

Flaxman Island
001 = Bullen

*Additional interpretive data is available in an expansion matrix for this variable.

Harrison Bay

001 = Esook Trading Post
002 = Nuiqsut

Meade River

001 = Atqasuk

Point Hope

001 = Alolukrok
002 = Chariot
003 = Ipnot
004 = Itublark
005 = Jabbertown
006 = Kayak
007 = Kukpuk
008 = Ogsachak
010 = Wevok

Point Lay

001 = Naokok
002 = Point Lay

Teshekpuk

001 = Alaktak
002 = Anakruak
003 = Kokruagarok
004 = Kolovik

Umiat

001 = Umiat

Wainwright B (East)

001 = Akeonik
002 = Anaktuk
003 = Atanik
004 = Kongik
005 = Kilimantavi
006 = Mitliktovik
007 = Pingasagruk
009 = Wainwright

Wainwright A (West)

008 = Tolageak

CEMETERY CEMETARY, (CEM), 1, I

1 = Cemetery
9 = Not a Cemetery

AIRPORT AIRPORT, (AIR), 2, I

01 = International Airport
02 = Trunk Airport A. - C.A.B. Jet (3,500 feet or longer)
03 = Trunk Airport B. - C.A.B. Prop (3,500 feet or longer)
04 = Trunk Airport C. - Non C.A.B. Service (3,500 feet or longer)
05 = Secondary Airport A. - C.A.B. Prop (3,500 feet or less)
06 = Secondary Airport B. - Utility (3,500 feet or less)
07 = Seaplane A
08 = Seaplane B
09 = Heliport
10 = Trunk, Unknown Serviceability
11 = Secondary, Unknown Serviceability
12 = Secondary, Restricted Use
20 = Military
98 = Unknown Status
99 = Not an Airport

NAVIGATION FACILITY NAVIGATION-FCLTY, (NF), 1, I

1 = VOR, VORTAC, VOR-DME
9 = Not a Select Navigation Facility

ELECTRIC GENERATION/DISTRIBUTION FACILITY ELEC-GEN/DIS-FAC, (EGDF), 1, I

1 = Generation Station/Bulk Power Substation
2 = Generation Station
3 = Bulk Power Substation
4 = Distributor Substation
9 = Not an Electric Generation/Distribution Facility

HYDROELECTRIC GENERATION SITE HYDROELEC-GEN-ST, (HEGS), 1, I

1 = Existing
2 = Proposed
9 = Not an Existing or Proposed Hydroelectric Site

North Slope Borough
Geographic Information System
Manuscript Structure Summary
Manuscript Map V
Energy and Mineral Resources

SUB-UFD: P15 (module #) (Polygon)
P25 ___ (Point)

Coverage: EMPL ___ (Polygon)
EMPT ___ (Point)

Variable Name	ITEM Name	Redefined ITEM Name	Page No.
POLYGON			
Mineral Terrane	MINERAL-TERRANE	MT	5-V-1
Mineral Terrane Documentation	MIN-TERR-DOCUMEN	MTD	5-V-1
DGGS General Coal Resource Areas	DGGS-COAL-AREAS	DGGSCA	5-V-1
Oil and Gas Field	OIL-GAS-FIELD	OGP	5-V-1
Favorable Mineral Resource Areas	MIN-RES-AREAS	MRA	5-V-2
Favorable Mineral Resource Areas Folio Status	MIN-RES-AREA-FOL	MRAF	5-V-2
POINT			
DGGS Isolated Coal Resource Sites and Underground Mines (Inactive)	DGGS-COAL-SITES	DGGSCS	5-V-2
Oil and Gas Wells	OIL-GAS-WELLS	OGW	5-V-2
Oil and Gas Well Status	OIL-GAS-STAT	OGS	5-V-2
Mineral Deposits and Occurrences	MIN-DEPOS-OCCUR	MDO	5-V-2
Mineral Deposits and Occurences Folio Status	MIN-DEP-OCC-STAT	MDOS	5-V-2
Surface Mine/Quarry and Underground Mine Entrance	SURFACE-MINE	SM	5-V-2

Data Classification and Codes
Manuscript Map V
Energy and Mineral Resources

Polygon Coverage

MINERAL TERRANE MINERAL-TERRANE, (MT), 3, I

Sedimentary Continental Coal-Bearing Sandstone, Conglomerate and Clay-Stone
51 = Anthracite
52 = Bituminous
53 = Subbituminous
54 = Lignite
55 = Areas with Possibly Recoverable Coal

Hydrothermal and Mechanical Processes Dominant
71 = Graywacke-Argillite
72 = Limestone-Dolostone
73 = Conglomerate
74 = Basalt

99 = Not a Mineral Terrane

MINERAL TERRANE DOCUMENTATION MIN-TERR-DOCUMEN, (MTD), 1, I
1 = Documented (Modified to Geology Map Units)
2 = Documented (No Corresponding Geology Map Units)
9 = Not a Mineral Terrane

DGGS GENERAL COAL RESOURCE AREAS DGGS-COAL-AREAS, (DGGSCA), 1, I
1 = Semianthracite and Anthracite
2 = Bituminous
3 = Subbituminous
4 = Lignite
9 = Not a DGGS General Coal Resource Area

OIL AND GAS FIELD OIL-GAS-FIELD, (OGP), 1, I
1 = Oil and Gas Field
2 = Oil Field
3 = Gas Field
8 = Unknown Field
9 = Not an Oil or Gas Field

FAVORABLE MINERAL RESOURCE AREAS* MIN-RES-AREAS, (MRA), 2, I
01-N = Unit Number (By Quadrangle)
99 = Not a Favorable Mineral Resource Area

FAVORABLE MINERAL RESOURCE AREA FOLIO STATUS MIN-RES-AREA-FOL, (MRAF), 1, I
1 = Complete
2 = In Progress
9 = No Data

Point Coverage

DGGS ISOLATED COAL RESOURCE SITES AND UNDERGROUND MINES (INACTIVE) DGGS-COAL-SITES, (DGGSCS), 2, I
1 = Isolated Coal Resource Site
2 = Underground Mine (Inactive)
9 = Not an Isolated Coal Resource Site or Undergound Mine (Inactive)

OIL AND GAS WELLS OIL-GAS-WELLS, (OGW), 1, I
1 = Oil and Gas Well
2 = Oil Well
3 = Gas Well
8 = Unknown
9 = Not an Oil or Gas Well

OIL AND GAS WELL STATUS OIL-GAS-STAT, (OGS), 1, I
1 = Active
2 = Inactive
8 = Unknown
9 = Not an Oil or Gas Well

MINERAL DEPOSITS AND OCCURRENCES* MIN-DEPOS-OCCUR, (MDO), 3, I
001-998 = Unit Number (By Quadrangle)
999 = Not a Mineral Deposit or Occurrence

MINERAL DEPOSITS AND OCCURRENCES FOLIO STATUS MIN-DEP-OCC-STAT, (MDOS), 1, I
1 = Complete
2 = In Progress
9 = No Data

SURFACE MINE/QUARRY AND UNDERGROUND MINE ENTRANCE SURFACE-MINE, (SM), 1, I
1 = Surface Mine/Quarry
2 = Underground Mine Entrance
9 = Not a Surface Mine/Quarry or Underground Mine Entrance

*Additional data is available in an interpretive matrix for this variable.

North Slope Borough
Geographic Information System
Manuscript Structure Summary
Manuscript Map VI
Elevation Provinces

SUB-UFD: P06 (module #)

Coverage: EPPL ___

Variable Name	ITEM Name	Redefined ITEM Name	Page No.
Elevation Province	ELEVATION	EP	5-VI-1

Data Classification and Codes
Manuscript Map VI
Elevation Provinces

Polygon Coverage

ELEVATION PROVINCES ELEVATION, EP, 2, I

1 = Less than 1,000 Feet
2 = 1,000 to 2,000 Feet
3 = 2,000 to 4,000 Feet
4 = Greater than 4,000 Feet

North Slope Borough
Geographic Information System
Manuscript Structure Summary
Manuscript Map VII
Historic/Archaeologic Sites

SUB-UFD: P04 (module #)

Coverage: HAPT ___

Variable Name	ITEM Name	Redefined ITEM Name	Page No.
Archaeologic/Historic Sites	HIST-ARCH-SITES	HAS	5-VII-1

Data Classification and Codes
Manuscript Map VII
Historic/Archaelogic Sites

HISTORIC/ARCHAEOLOGIC SITES HIST-ARCH-SITES, (HAS), 4, I

Barrow

001 = Birnirk
002 = Uikiavir
003 = Kugusugaruk
004 = Pres Mission Ch
005 = Rogers Postmem
006 = Cp Smythe Wh Cu
007 = Browerville
008 = Ireniviq
009 = Isutkwa
010 = Napawrax
011 = Nuwuk
012 = Pt Barrow Ref S
013 = Walakpa Site
014 = Coffin Site
015 = Sod House
016 = Elavgak House
091 = Kahrauk Site
093 = Tangent Borrow2
094 = Brant Point

Beechey Point

001 = Anxiety Point
002 = Oliktuk Point
003 = Ahvakana Home
004 = Kavearak Point
005 = Prudhoe Bay #1
006 = Heald Point
007 = XBP-7
009 = Cross Island
010 = Milne Point
011 = Pingok Is N. Sta
012 = Pingok Is O Vil
013 = Peet Island
014 = Cottle Island
015 = Black Point
016 = Gwydyr Bay
017 = Kuparuk River
018 = Long Is Whlg Bt
019 = Point McIntyre
020 = Sag Rvr Mn Chnl
021 = Small Boat #1
022 = Point Brower
023 = Foggy Is Bay #1

024 = Foggy Is Bay #2
025 = Kadleroshillik
026 = Foggy Is Bay #3
027 = Shaviovik R D S
028 = Mikkelson Bay
029 = Pinguk Is Grave
030 = Pole Island
031 = Tigvarik Island
032 = Shaviovik Rvr C

DeLong Mts.

001 = Kokolik Crk Mth
002 = Akulik Crk Vic
003 = Kivilina Drnge
004 = Kivilina R. Vic
005 = Kokulik R #154
006 = Kokolik R #157
007 = Kokolik R #159
008 = Kokolik R #160
009 = Kokolik R #161
010 = Kokolik R #162
011 = Kokolik R #163
012 = Kukpowruk #30
013 = Kukpowruk #31
014 = Kukpowruk #32
015 = Kukpowruk #1
016 = Kukpowruk #12
017 = Kukpowruk #13
018 = Kukpowruk #14
019 = Kukpowruk #29
020 = Kukpowruk #28
021 = Kukpowruk #11
022 = Kukpowruk #10
023 = Kukpowruk #7
024 = Kukpowruk #6
025 = Kukpowruk #5
026 = Kukpowruk #3
027 = Kukpowruk #26
028 = Kukpowruk #27
029 = Kukpowruk #21
030 = Kukpowruk #4
031 = Kukpowruk #9
032 = Kukpowruk #34
033 = Kukpowruk #25
034 = Kukpowruk #24
035 = Kukpowruk #23
036 = Kukpowruk #2
037 = Kukpowruk #22
038 = Kukpowruk #15

039 = Kukpowruk #20
040 = Kukpowruk #16
041 = Kukpowruk #17
042 = Kukpowruk #19
043 = Kukpowruk #18
044 = Kukpowruk #39
045 = Kukpowruk #41
046 = Kukpowruk #40
047 = Kukpowruk #35
048 = Kukpowruk #37
049 = Kukpowruk #36
050 = Kukpowruk #38
051 = Kukpowruk #56
052 = Kukpowruk #57
053 = Kukpowruk #58
054 = Kukpowruk #59
055 = Kukpowruk #54
056 = Kukpowruk #53
057 = Kukpowruk #55
058 = Kukpowruk #62
059 = Kukpowruk #64
060 = Kukpowruk #52
061 = Kukpowruk #63
062 = Kukpowruk #61
063 = Kukpowruk #60
064 = Kukpowruk #42
065 = Kukpowruk #43
066 = Kukpowruk #44
067 = Kukpowruk #48
068 = Kukpowruk #47
069 = Kukpowruk #46
070 = Kukpowruk #45
071 = Kukpowruk #49
072 = Kukpowruk #50
073 = Kukpowruk #51
074 = Kukpowruk #65
075 = Kukpowruk #67
076 = Kukpowruk #74
077 = Kukpowruk #68
078 = Kukpowruk #66
079 = Kukpowruk #72
080 = Kukpowruk #69
081 = Kukpowruk #73
082 = Kukpowruk #75
083 = Kukpowruk #76
084 = Kukpowruk #71
085 = Kukpowruk #70
086 = Kukpowruk #81
087 = Kukpowruk #87
088 = Kukpowruk #89

089 = Kukpowruk #88
090 = Kukpowruk #80
091 = Kukpowruk #78
092 = Kukpowruk #79
093 = Kukpowruk #83
094 = Kukpowruk #77
095 = Kukpowruk #86
096 = Kukpowruk #84
097 = Kukpowruk #82
098 = Kukpowruk #85
099 = Kukpowruk #95
100 = Kukpowruk #97
101 = Kukpowruk #98
102 = Kukpowruk #96
103 = Kukpowruk #101
104 = Kukpowruk #102
105 = Kukpowruk #92
106 = Kukpowruk #93
107 = Kukpowruk #94
108 = Kukpowruk #100
109 = Kukpowruk #99
110 = Kukpowruk #105
111 = Kukpowruk #103
112 = Kukpowruk #104
113 = Kukpowruk #106
114 = Kukpowruk #107
115 = NKR-1
116 = Hall's #26
117 = Hall's #27
118 = Texaco Site
119 = Del-119
120 = Del-120
121 = Del-121
122 = Del-122
123 = Del-123
124 = Del-124
125 = Del-125
126 = Del-126
127 = Del-127
128 = Del-128
129 = Del-129
130 = Del-130
131 = Del-131
132 = Del-132
133 = Del-133
134 = Del-134
135 = Del-135
136 = Del-136
137 = Del-137
138 = Del-138

139 = Del-139
140 = Del-140
141 = Del-141

Demarcation Point

001 = Angun
002 = Gordon
003 = Pingokraluk Gal
004 = Pokok Bay

Flaxman Island

001 = Bullen
002 = Leffingwell CMP
004 = Point Gordon
005 = Point Hobson
006 = Point Thompson
007 = Flaxman Is. Grvs.
008 = East Flaxman Is.
009 = Brownlow Point

Harrison Bay

001 = Harrison Bay
002 = Har-2
003 = Har-3
155 = Uyagagvik
156 = Nanuk
157 = Niglivik
158 = Putu
159 = First Nuiqsut
160 = Niglinaat
162 = Anajuk
163 = Itkillikpaat
164 = Tiragroak
165 = Puviksuk
166 = Agki Creek
167 = Kayuktisiluk
169 = Neglik

Meade River

001 = Attenok
002 = Charnrokruit
003 = XMR-003
004 = XMR-4
005 = XMR-5
006 = XMR-6
007 = XMR-7

008 = XMR-8
009 = XMR-9
010 = XRM-10
011 = XMR-11
012 = XMR-12
013 = XMR-13
014 = XMR-14
015 = XMR-15
016 = XMR-16
017 = XMR-17
018 = XMR-18
019 = XMR-19
020 = XMR-20
021 = XMR-21
022 = XMR-22
023 = XMR-23
024 = XMR-24
025 = XMR-25
026 = XMR-26
027 = XMR-27
028 = XMR-28
029 = XMR-29
030 = XMR-30
031 = XMR-31
032 = XMR-32
033 = XMR-33
034 = XMR-34
035 = XMR-35
036 = XMR-36
037 = XMR-37
038 = XMR-38
039 = XMR-39
040 = XMR-40
041 = XMR-41
042 = XMR-42

<u>Mt. Michelson</u>

001 = Camden Bay
002 = West Patuk Crk
003 = Neruokpuk Lakes

<u>Point Hope</u>

001 = Old Tigara
002 = Jabbertown
003 = Ipiutak Site
004 = Ipnot
005 = Initkilly
006 = Corwin Mine

007 = Nuna
008 = Pt Hope Village
009 = Ouyahtona House
011 = Iptutak Dist

Point Lay

001 = Kukpowruk
002 = Kokolik
003 = Amatusuk Creek
004 = Kikplukpiklak
005 = Kahkatak Ridge
006 = Kahkatak Creek
007 = Kukpowruk R 108
008 = Kukpowruk R 109
009 = Kukpowruk R 119
010 = Kukpowruk R 112
011 = Kukpowruk R 118
012 = Kukpowruk R 120
013 = Kukpowruk R 117
014 = Kukpowruk R 116
015 = Kukpowruk R 121
016 = Kukpowruk R 123
017 = Kukpowruk R 122
018 = Kukpowruk R 124
019 = Kukpowruk R 113
020 = Kukpowruk R 114
021 = Kukpowruk R 115
022 = Kukpowruk R 111
023 = Kukpowruk R 110
024 = Kukpowruk R 125
025 = Kukpowruk R 131
026 = Kukpowruk R 126
027 = Kukpowruk R 127
028 = Kukpowruk R 128
029 = Kukpowruk R 135
030 = Kukpowruk R 129
031 = Kukpowruk R 130
032 = Kukpowruk R 136
033 = Kukpowruk R 137
034 = Kukpowruk R 140
035 = Kukpowrukr R 138
036 = Kukpowruk R 139
037 = Kukpowruk R 145
038 = Kukpowruk R 147
039 = Kukpowruk R 132
040 = Kukpowruk R 133
041 = Kukpowruk R 134
042 = Kukpowruk R 144
043 = Kukpowruk R 143

044 = Kukpowruk R 142
045 = Kukpowruk R 141
046 = Kukpowruk R 146
047 = Kukpowruk R 149
048 = Kukpowruk R 150
049 = Kukpowruk R 151
050 = Kukpowruk R 152
051 = Kukpowruk R 153
052 = Pt Lay Village
053 = Pt Lay V Site

Teshekpuk

001 = Alaktak
002 = Paptaun
003 = Tes-003
004 = Tes-4
005 = Tes-5
006 = Tes-6
007 = Tes-7
008 = Tes-8
009 = Tes-9
011 = Tes-11
012 = Tes-12
013 = Tes-13
014 = Tes-14
015 = Tes-15
016 = Tes-16
017 = Tes-17
018 = Tes-18
019 = Tes-19
020 = Tes-20
021 = Tes-21
057 = Kealock
058 = Tes-58

Umiat

001 = UMI 001
002 = UMI 002
003 = UMI 003
004 = UMI 004
005 = UMI 005
006 = ROS78-003
091 = Kik River

Utukok River

001 = Kokolik R. 172
002 = Kokolik R. 173

003 = Kokolik R. 174
004 = Kokolik R. 175
005 = Kokolik R. 176
006 = Kokolik R. 177
007 = Kokolik R. 178
008 = Kokolik R. 179
009 = Kokolik R. 180
010 = Kokolik R. 181
011 = Kokolik R. 182
012 = Kokolik R. 183
013 = Kokolik R. 184
014 = Kokolik R. 185
015 = Kokolik R. 186
016 = Kokolik R. 187
017 = Kokolik R. 188
018 = Kokolik R. 189
019 = Kokolik R. 190
020 = Kokolik R. 191
021 = XUR-21
022 = XUR-22
023 = XUR-23
024 = XUR-24
025 = XUR-25
026 = XUR-26
027 = XUR 027
028 = XUR-28
029 = XUR-29
030 = XUR-30
031 = XUR-31
032 = XUR-32
033 = XUR-33
034 = XUR-34
035 = XUR-35
036 = XUR-36
037 = XUR-37
038 = XUR-38
039 = XUR-39
040 = XUR-40
041 = XUR-41
042 = XUR-42
043 = XUR-43
044 = XUR-44
045 = XUR-45
046 = XUR-46
047 = XUR-47
048 = XUR-48
049 = XUR-49
050 = XUR-50
051 = XUR-51
052 = XUR-52

053 = XUR-53
054 = XUR-54
055 = XUR-55
056 = XUR-56
057 = XUR-57
058 = XUR-58
059 = XUR-59
060 = XUR-60
061 = XUR-61
062 = XUR-62
063 = XUR-63
064 = XUR-64
065 = XUR-65
066 = XUR-66
067 = XUR-67
068 = XUR-68
069 = XUR-69
070 = XUR-70
071 = XUR-71
072 = XUR-72
073 = XUR-73
074 = XUR-74
075 = XUR-75
076 = XUR-76
077 = XUR-77
078 = XUR-78
079 = XUR-79
080 = XUR-80
081 = XUR-81
082 = XUR-82
083 = XUR-83
084 = XUR-84
085 = XUR-85
086 = XUR-86
087 = XUR-87
088 = XUR-88
089 = XUR-89
090 = XUR-90
091 = XUR-91
092 = XUR-92
093 = XUR-93
094 = XUR-94
095 = XUR-95
096 = XUR-96
097 = XUR-97
098 = XUR-98
099 = XUR-99
100 = XUR-100
101 = XUR-101
102 = XUR-102

103 = XUR-103
104 = XUR-104
105 = XUR-105
106 = XUR-106
107 = XUR-107
108 = XUR-108
109 = XUR-109
110 = XUR-110
111 = XUR-111
112 = XUR-112
113 = XUR-113
114 = XUR-114
115 = XUR-115
116 = XUR-116
117 = XUR-117
118 = XUR-118
119 = XUR-119
120 = XUR-120
121 = XUR-121
122 = XUR-122
123 = XUR-123
124 = XUR-124
125 = XUR-125
126 = XUR-126
127 = XUR-127
128 = XUR-128
129 = XUR-129
130 = XUR-130
244 = Avignak
245 = Kirgavik
246 = CSI

Wainwright

001 = Nunagiak Site
002 = Kilimantavi
003 = Kuk
004 = Atanik
005 = Maudhiem
006 = Milikiavik
007 = Kaiaksekawik
012 = Akoliakatat
017 = Ahaliraq
018 = Tolageak
019 = Akinak
020 = Akeonik
022 = Nokotlek #2
023 = Nokotlek #1
025 = Nevat
026 = Avak East Bank

027 = West Aviak
091 = Tunalik
093 = Pingorok Hill
094 = W78/2
095 = Shipwreck City
096 = Pingasagruk

North Slope Borough
Geographic Information System
Manuscript Structure Summary
Manuscript Map VIII
North Slope Borough Planning Data

SUB-UFD: P17 (module #) Polygon)
P27 ___ (Line)
P37 ___ (Point)

Coverage: BPPL ___ (Polygon)
BPLN ___ (Line)
BPPT ___ (Point)

Variable Name	ITEM Name	Redefined ITEM Name	Page Nos.
POLYGON			
North Slope Borough Comprehensive Plan (NSBCP)			
Habitat/Game Distribution			
Caribou and Moose	CARIBOU-MOOSE	CM	5-VIII-1
Dall Sheep, Muskoxen, Grizzly Bear	DALL-MUSK-GRIZ	DMG	5-VIII-1
Seals and Polar Bears	SEAL-POLAR	SP	5-VIII-1
Whales	WHALE	W	5-VIII-1
Fish	FISH	F	5-VIII-1
Birds	BIRD	B	5-VIII-2
Hazards			
Ice Hazards, Spring Flooding	ICE-HAZARD-FLOOD	IHF	5-VIII-2
Fault Scarp, Epicentral Region	FAULT-SCARP-EPI	FSE	5-VIII-2
Cultural Resources			
Village Area of Influence I	VILLAGE 1	V1	5-VIII-2
Village Area of Influence II	VILLAGE 2	V2	5-VIII-2
Village Area of Influence III	VILLAGE 3	V3	5-VIII-2
Historic and Cultural Resources	HIST-CULT-RES	HCR	5-VIII-2
Coastal Management Plan (CMP) Data			
North Slope Borough Coastal Zone	BORO-COAST-ZONE	BCZ	5-VIII-2
Areas Meriting Special Attention	AREA-SPEC-ATTENT	AMSA	5-VIII-3
LINE			
NSBCP Major Seabird Colonies	MAJOR-SEABIRD	MS	5-VIII-3
NSBCP Historic Rivers	HISTORIC-RIVERS	HR	5-VIII-3
NSBCP Native Winter Routes	NATIVE-WINTER-RT	NWR	5-VIII-3

NSBCP Mountain Passes	MTN-PASSES	MP	5-VIII-3
NSBCP Winter Roads	WINTER-ROADS	WR	5-VIII-3
CMP Area Meriting Spec. Attention	AREA-SPEC-ATTENT	AMSA	5-VIII-3

POINT

NSBCP Minor Seabird Colonies	MINOR-SEABIRD	MIS	5-VIII-3

Data Classification and Codes
Manuscript VIII
North Slope Borough Planning Data

Polygon Coverage

NSBCP CARIBOU AND MOOSE CARIBOU-MOOSE, (CM), 2, I

1 = Caribou Core Calving Area
2 = Major Caribou Calving Area
3 = Major Moose High Use Area
5 = Caribou Core Calving Area + Major Moose High Use Area
6 = Major Caribou Calving Area + Major Moose High Use Area
9 = Not a Caribou and Moose Area

NSBCP DALL SHEEP, MUSKOXEN, GRIZZLY BEAR DALL-MUSK-GRIZ, (DMG), 1, I

1 = Dall Sheep Habitat
2 = Muskoxen High Use Area
3 = Grizzly Bear High Use Area
4 = Dall Sheep Habitat + Muskoxen High Use Area
5 = Dall Sheep Habitat + Grizzly Bear High Use Area
6 = Muskoxen High Use Area + Grizzly Bear High Use Area
7 = Dall Sheep Habitat + Muskoxen High Use Area + Grizzly Bear High Use Area
9 = Not a Dall Sheep, Muskoxen, Grizzly Bear Area

NSBCP SEALS AND POLAR BEARS SEAL-POLAR, (SP), 1, I

1 = Ringed Seal Pupping Areas
2 = Spotted Seal Summer/Fall High Use Area
3 = Confirmed Polar Bear Denning
4 = Ringed Seal Pupping Areas + Spotted Seal Summer/Fall High Use Area
5 = Ringed Seal Pupping Areas + Confirmed Polar Bear Denning
6 = Spotted Seal Summer/Fall High Use Area + Confirmed Polar Bear Denning
7 = Ringed Seal Pupping Areas + Spotted Seal Summer/Fall High Use Area + Confirmed Polar Bear Denning
9 = Not a Seal or Polar Bear Area

NSBCP WHALES WHALE, (W), 1, I

1 = Bowhead Whale Possible Fall Feeding Area
2 = Beluga Whale Critical Feeding and Calving Area
9 = Not a Whale Area

NSBCP FISH FISH, (F), 1, I

1 = Nearshore Feeding Habitat and Migration Route for Marine and Anadromous Fish
2 = Primary Whitefish Habitat
3 = Fish Overwintering and Spawning Area
4 = Nearshore Feeding Habitat and Migration Route for Marine and Anadromous Fish + Primary Whitefish Habitat
5 = Nearshore Feeding Habitat and Migration Route for Marine and Anadromous Fish + Fish Overwintering and Spawning Area

6 = Primary Whitefish Habitat + Fish Overwintering and Spawning Area
7 = Nearshore Feeding Habitat and Migration Route for Marine and Anadromous Fish + Primary Whitefish Habitat + Fish Overwintering and Spawning Area
9 = Not a Fish Area

NSBCP BIRDS BIRD, (B), 1, I
1 = Documented Peregrin Falcon Nesting
2 = Potential Peregrin Falcon Nesting
3 = Primary Goose, Duck and Swan Habitat
4 = Secondary Goose, Duck and Swan Habitat
9 = Not a Bird Area

NSBCP ICE HAZARDS, SPRING FLOODING ICE-HAZARD-FLOOD, (IHF), 1, I
1 = Pack Ice
2 = Shorefast Ice Area
3 = Bottomfast Ice Area - Area Affected by Storm Surges
4 = Potential Spring Flooding Area
9 = Not an Ice or Flood Area

NSBCP HOLOCENE FAULT SCARPS AND EPICENTRAL REGION FOR EARTHQUAKES SINCE 1968 FAULT-SCARP-EPI (FSE), 1, I
1 = Fault Scarp and Epicentral Region
9 = Not a Fault Scarp and Epicentral Region

NSBCP VILLAGE AREA OF INFLUENCE I VILLAGE1, (V1), 1, I
1 = Wainwright
2 = Anaktuvuk
3 = Kaktovik
9 = Not a Village Area of Influence

NSBCP VILLAGE AREA OF INFLUENCE II VILLAGE1, (V2), 1, I
1 = Point Hope
2 = Barrow
9 = Not a Village Area of Influence

NSBCP VILLAGE AREA OF INFLUENCE III VILLAGE3, (V3), 1, I
1 = Point Lay
2 = Atqasuk
3 = Nuiqsut
9 = Not a Village Area of Influence

NSBCP HISTORIC AND CULTURAL RESOURCES HIST-CULT-RES, (HCR), 1, I
1 = Areas of High Sensitivity
2 = Areas of High Density
9 = Not a Historic and Cultural Resource

CMP NORTH SLOPE BOROUGH COASTAL ZONE BORO-COAST-ZONE, (BCZ), 1, I
1 = Coastal Zone
9 = Not Coastal Zone

CMP AREA MERITING SPECIAL ATTENTION (AMSA) AREA-SPEC-ATTENT, (AMSA), 1, I
1 = Cape Thompson
2 = Kasegaluk Lagoon
9 = Not an Area Meriting Special Attention

Line Coverage

NSBCP MAJOR SEABIRD COLONY NUMBER/NAME MAJOR-SEABIRD, (MS), 3, I
01-N = Individual Number/Name (Quadrangle Based)
99 = Not an NSBCP Major Seabird Colony Number/Name

NSBCP HISTORIC RIVERS HISTORIC-RIVERS, (HR), 1, I
1 = Historic River
9 = Not a Historic River

NSBCP NATIVE WINTER ROUTES NATIVE-WINTER-RT, (NWR), 1, I
1 = Native Winter Route
9 = Not a Native Winter Route

NSBCP MOUNTAIN PASSES MTN-PASSES, (MP), 1, I
1 = Mountain Pass
9 = Not a Mountain Pass

NSBCP WINTER ROADS WINTER-ROADS, (WR), 1, I
1 = Winter Road
9 = Not a Winter Road

CMP AREA MERITING SPECIAL ATTENTION AREA-SPEC-ATTENT, (AMSA), 1, I
1 = Cape Thompson
2 = Kasegaluk Lagoon
9 = Not an Area Meriting Special Attention

Point Coverage

NSBCP MINOR SEABIRD COLONY NUMBER/NAME MINOR-SEABIRD, (MIS), 5, I
01-N = Individual Number/Name (Quadrangle Based)

North Slope Borough
Geographic Information System
Manuscript Structure Summary
Manuscript IX
Subsistence Land Use Activities

SUB-UFD: P18 (module #) (Polygon)
P28 ___ (Line)

Coverage: SPL ___ (Polygon)
None (Line)

Variable Name	ITEM Name	Redefined ITEM Name	Page No.
POLYGON			
Trapping Fishing	TRAP-FISH-(Village Name)	(TF (vill abbrev.))	5-IX-1
Hunting I - Herding Mammals	HUNT-I-(Village Name)	(HI__)	5-IX-1
Hunting II - Marine Mammals	HUNT-II-(Village Name)	(HII__)	5-IX-1
Hunting III - Small Mammals, Wildfowl	HUNT-III-(Village Name)	(HIII__)	5-IX-1
Hunting IV - Bear and Furbearer	HUNT-IV-(Village Name)	(HIV__)	5-IX-2
Gathering	GATHER-(Village Name)	(G__)	5-IX-2

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Data Classification and Codes
Manuscript Map IX
North Slope Borough Regional Subsistence Land Use

Polygon Data

TRAPPING, FISHING, HUNTING AND GATHERING

Village: Barrow (BARROW), (BA)
Village: Wainwright (WAINW), (WA)
Village: Atqasuk (ATQASK), (AK)
Village: Anaktuvuk Pass (ANAKTU), (AN)
Village: Nuiqsut (NUIQST), (NU)
Village: Kaktovik (KAKTUK), (KA)
Village: Point Lay (PT-LAY), (PL)
Village: Point Hope (PT-HOP), (PH)

TRAPPING AND FISHING TRAP-FISH-(Village Name), (TF__), 1, I
1 = Furbearer Trapping
2 = Fishing
3 = Furbearer Trapping and Fishing
9 = Not Indicated

HUNTING I - Herding Mammals HUNT-I-(Village Name), (HII__, 1, I
1 = Moose
2 = Caribou
3 = Caribou, Moose
9 = Not Indicated

HUNTING II - Marine Mammals HUNT-II-(Village Name), (HII__), 1, I
1 = Whales
2 = Seals
3 = Walrus
4 = Whales, Seals
5 = Whales, Walrus
6 = Seals, Walrus
7 = Whales, Seals, Walrus
9 = Not Indicated

HUNTING III - Small Mammals, Wildfowl HUNT-III-(Village Name), (HIII___)1, I
1 = Wildfowl
2 = Sheep
3 = Small Mammals
4 = Wildfowl, Sheep
5 = Wildfowl, Small Mamals
6 = Sheep, Small Mammals
7 = Wildfowl, Sheep, Small Mammals
9 = Not Indicated

HUNTING IV - Bear and Furbearer HUNT-IV-(Village Name), (HIV__), 1, I

1 = Furbearer Hunting
2 = Polar Bear
3 = Grizzly Bear
4 = Furbearer Hunting, Polar Bear
5 = Furbearer Hunting, Grizzly Bear
6 = Polar Bear, Grizzly Bear
7 = Furbearer Hunting, Polar Bear, Grizzly Bear
9 = Not Indicted

GATHERING GATHER-(Village Name), (G__), 1, I

1 = Fuel and Structural Material (Wood)
2 = Vegetation
3 = Invertebrates
4 = Fuel and Structural Material (Wood), Vegetation
5 = Fuel and Structural Material (Wood), Invertebrates
6 = Vegetation, Invertebrates
7 = Fuel and Structural Material (Wood), Vegetation, Invertebrates
9 = Not Indicated