YUKON FLATS
NATIONAL WILDLIFE REFUGE
LAND COVER MAPPING PROJECT

USERS GUIDE

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USGS/EROS FIELD OFFICE
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INTRODUCTION

Title III of the Alaska National Interest Lands Conservation Act (ANILCA, 1980) established the Yukon Flats National Wildlife Refuge (YFNWR). Section 304 of the Act requires the Secretary of Interior to "prepare, and from time to time revise, a comprehensive conservation plan" for the refuge. Before developing a plan for the refuge, the Secretary shall "identify and describe--a) the populations and habitats of the fish and wildlife resources of the refuge; b) the special values of the refuge as well as any other archeological, cultural, ecological, geological, historical, palentological, scenic, or wilderness value of the refuge; c) areas within the refuge that are suitable for use as administrative sites or visitor facilities...; d) present the potential requirements for access with respect to the refuge...; and e) significant problems which may adversely affect the populations and habitats of fish and wildlife identified and described..." (ANILCA, 1980). Vegetation, water, and terrain (elevation, slope, and aspect) are the components of habitat and can be used in the determination of the above requirements.

The U. S. Fish & Wildlife Service (USFWS) has the responsibility for collecting the resource information to address the research, management, development and planning requirements identified in Section 304. Because of the brief period provided by the Act for data collection, habitat mapping, and habitat assessment, the USFWS in cooperation with the U.S. Geological Survey's EROS Field Office, used digital Landsat multispectral scanner (MSS) data and digital terrain data to produce land cover and terrain maps. A computer assisted digital analysis of Landsat MSS data was used because coverage by aerial photographs was incomplete for much of the refuge and because the level of detail obtained from Landsat data was adequate to meet most USFWS research, management and planning needs. Relative cost and time requirements were also factors in the decision to use the digital analysis approach.

OBJECTIVES

The primary objectives of the mapping project were to:

1) produce digital land cover/terrain classifications for the YFNWR, using digital Landsat and terrain data,

2) provide Landsat MSS data for the entire study area defined as the YFNWR,

3) provide other derivative products and output products as required,

4) train USFWS personnel in digital analysis procedures.

The primary objectives of this user guide are to give a brief discussion of the methodology used and describe the different types of data products produced.

AREAS OF COVERAGE

The YFNWR consists of approximately 11.2 million acres of land and water in the central portion of Alaska. The northwest and southeast latitude/longitude coordinates of the mapped area are 68 00'/153 15' and 65 00'/140 45' respectively. The entire study area covers roughly 3 degrees of latitude by 12 degrees of longitude and involves seven USGS 1:250,000-scale topographic maps (Figure 1). Portions of six Landsat scenes (Table 1) were required to provide complete coverage of YFNWR and the surrounding areas (Figure 2).

METHODOLOGY

A computer compatible tape (CCT) was obtained for each Landsat scene covering refuge lands. Training blocks (sample areas containing representative land cover types) were selected for field study, and training statistics were derived from them. Figure 3 shows the location of the training blocks used in this study. A modified clustering technique (Fleming, 1975) was used to generate initial spectral classifications, using the EROS Field Office computer system (HP-3000) and IDIMS software (ESL 1981). The classified scenes were radiometrically and geometrically corrected (registered to a 127-meter Universal Transverse Mercator [UTM] grid) and the boundaries of the refuge and the corresponding 1:250000-scale USGS quadrangles digitized. This made it possible to summarize land cover information for each quadrangle and the refuge as a whole.

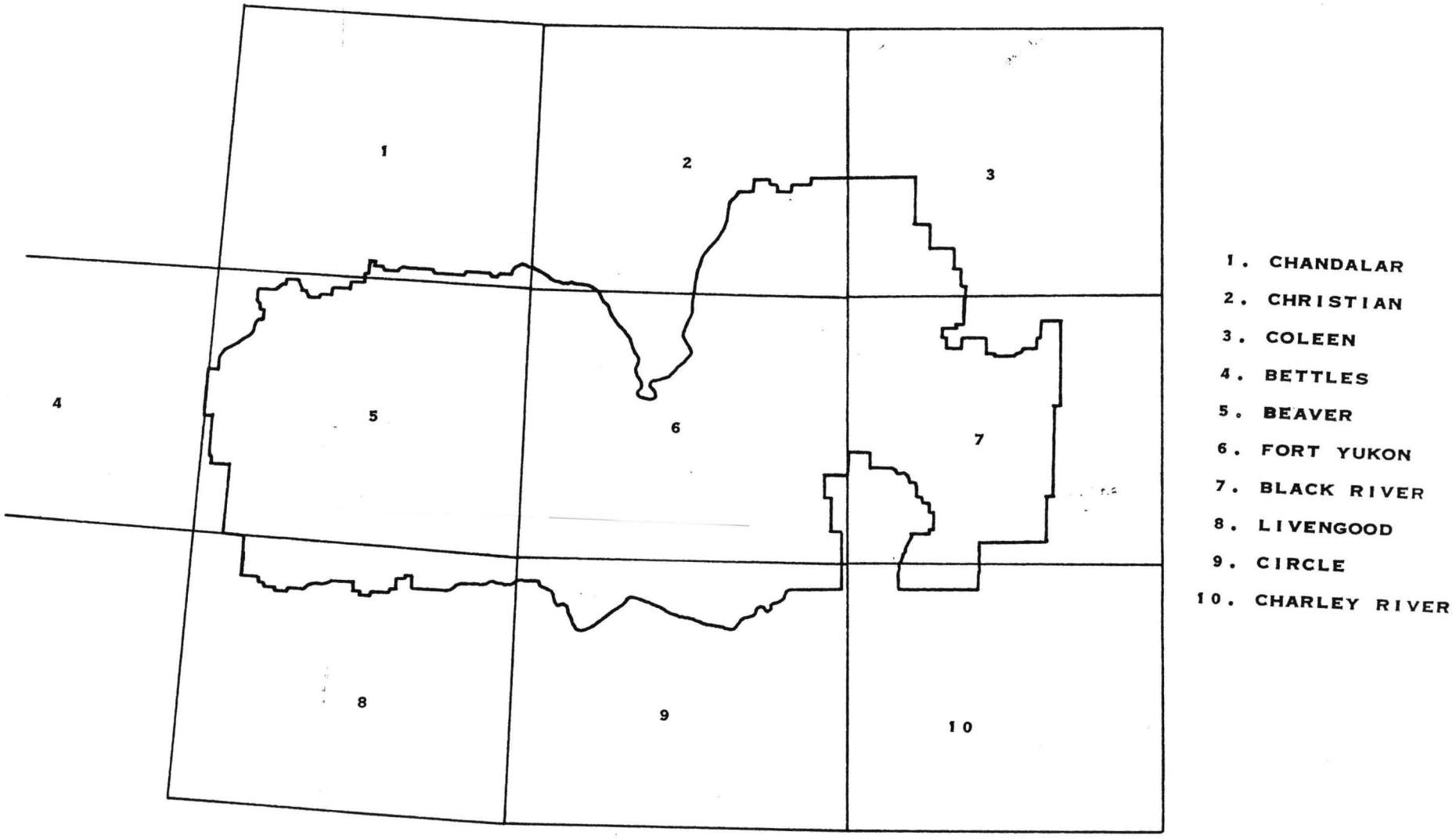

Figure 1. The 1:250,000 USGS quadrangles covering the Yukon Flats National Wildlife Refuge.

Table 1. List of Landsat scenes acquired to cover the Yukon Flats National Wildlife Refuge.

Path/Row	Scene I.D.	Date
77/13	21289-20294	8- 3-78
77/14	21289-20300	8- 3-78
75/12	21305-20183	8-19-78
75/13	21305-20185	8-19-78
75/14	21305-20192	8-19-78
73/13	2583-20181	8-27-76

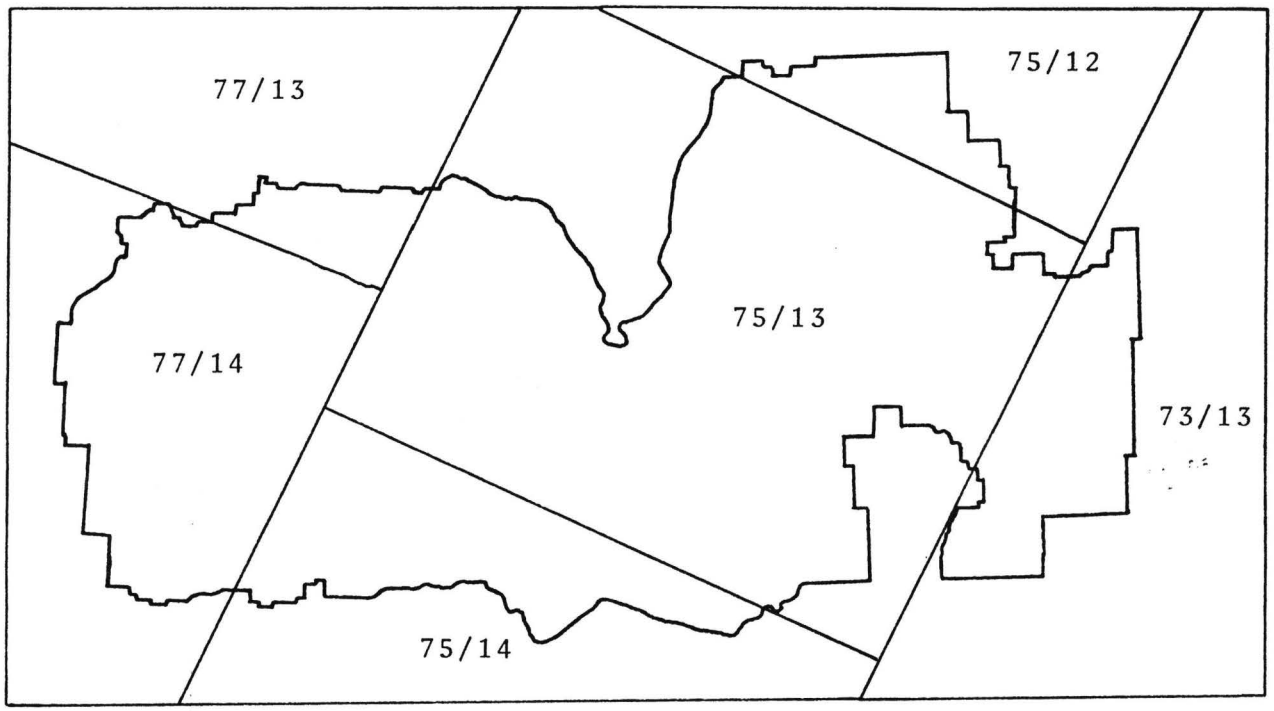

Figure 2. Path/Row numbers identifying the Landsat scene locations for the Yukon Flats National Wildlife Refuge.

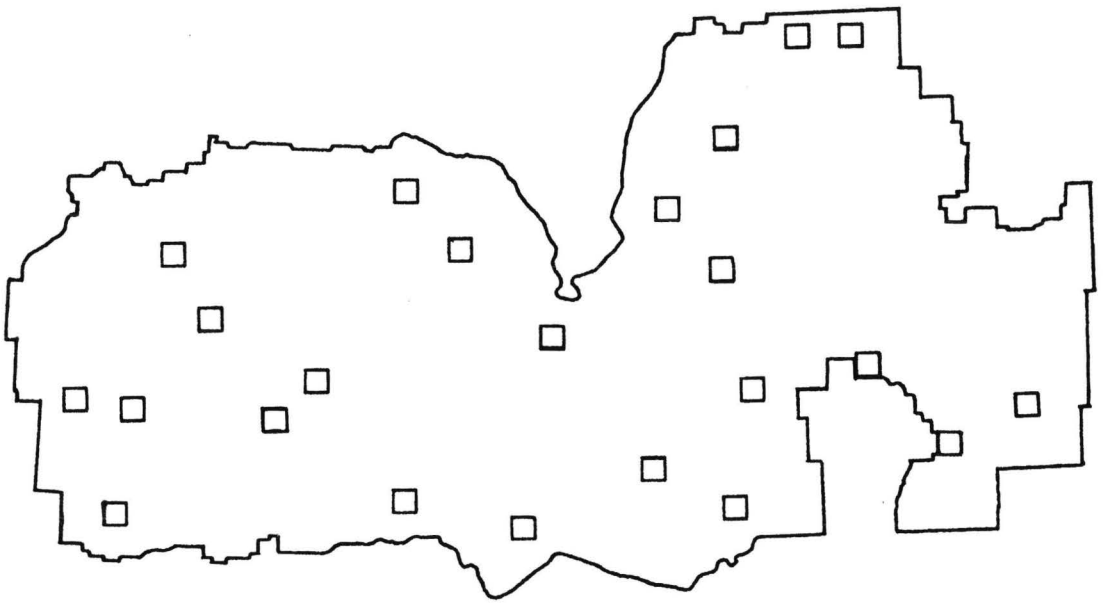

Figure 3. Location of training blocks used for the Yukon Flats National Wildlife Refuge Landsat classification.

Field data on vegetation cover, structure, and composition were collected in each training block to identify land cover types corresponding to computer-derived spectral classes. Final land cover classifications, designated by USFWS personnel, were produced after applying stratification techniques to improve classification accuracy. Land cover classifications were merged with digital terrain data derived from 1:250,000-scale USGS quadrangles to improve classification accuracy and to make possible the production of additional resource data products such as elevation, slope, and aspect. Specific procedures used in producing land cover/terrain classifications and output products are detailed in Appendix A.

Land cover classifications covering the YFNWR quadrangles were extracted from each classified Landsat scene (where applicable) and mosaicked together. Further enhancement was applied to the classification using terrain data and information obtained from USFWS personnel. A schematic diagram of the mapping process is shown in Figure 4.

USFWS personnel worked with EROS personnel to conduct the digital analysis required to produce land cover classifications for the refuge and coordinated with USFWS Information Resource Management personnel to ensure that the digital data were compatible with the USFWS geobased information system.

PRODUCTS

The following products were produced for the mapping project:

1) Computer tapes containing land cover and terrain data classifications.

2) Photographic prints of the land cover and terrain maps at a 1:250,000 scale.

3) Acreage estimates for each land cover type in the refuge for each 1:250,000-scale USGS quadrangle, and for the entire refuge.

4) Computer tapes of resampled land cover and terrain data.

5) This users guide.

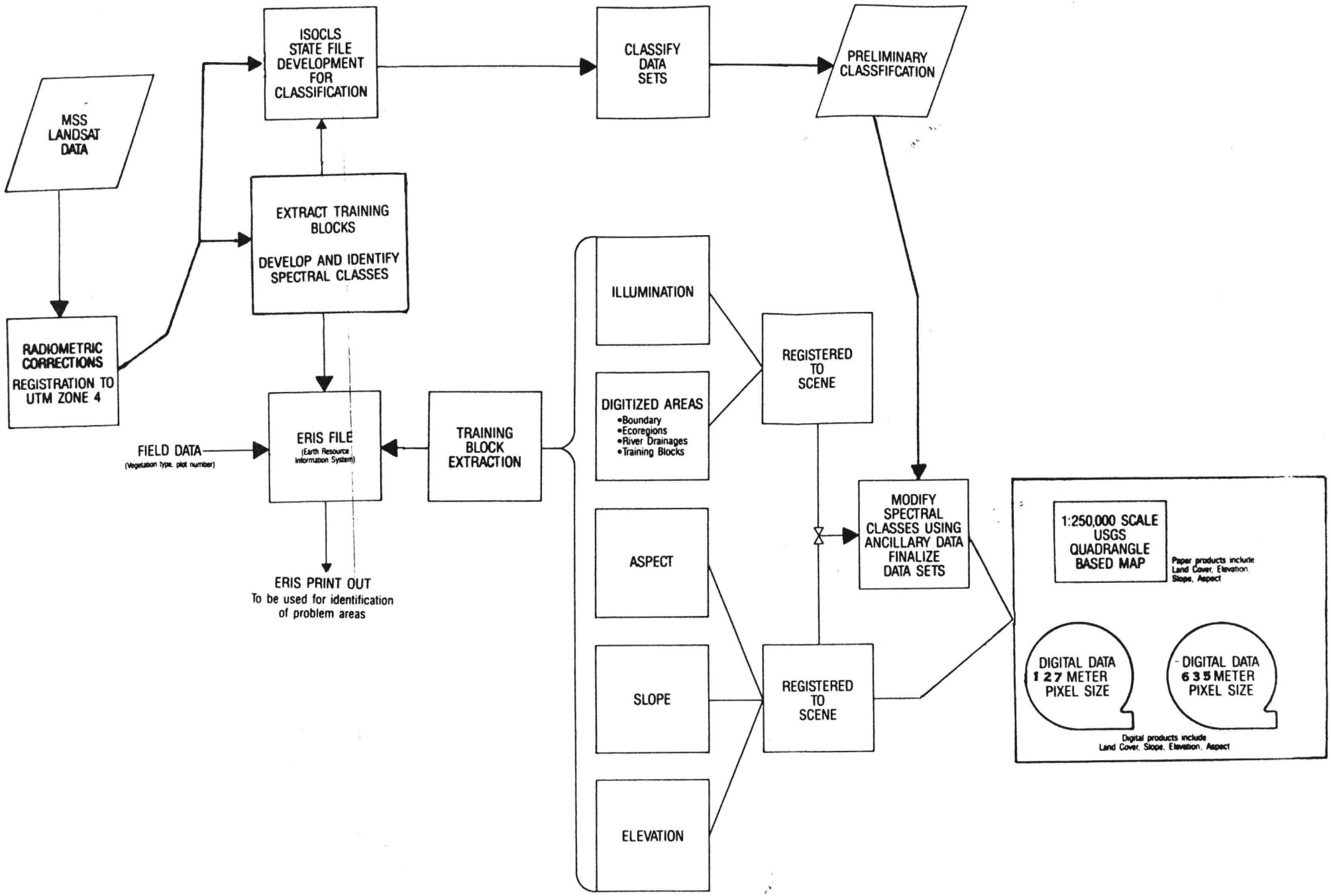

Figure 4. Schematic diagram of the mapping process used to produce the land cover classification of the Yukon Flats National Wildlife Refuge.

PRODUCT DESCRIPTIONS-HARD COPY

LAND COVER CLASS DESCRIPTIONS

Based on information acquired in the field, discussions with USFWS personnel, and Landsat spectral discrimination, five major land cover classes were recognized: Forest, Scrub, Herbaceous, Barren, and Water. Included in these major classes are 13 subclasses (Table 2). A general description of each of the major classes and subclasses is in Appendix B.

Acreage estimates for each land cover class within the refuge were summarized for each 1:250,000 USGS quadrangle and the entire refuge (Table 3). Final hard copy land cover maps were produced for the refuge in the form of photographic prints. Map collar information included: map title, a list of vegetation classes, locational diagram of the refuge with respect to the State of Alaska, scale bar, and latitude/longitude tick marks. Each land cover class was depicted on the map as a color. The color scheme used was based on input from USFWS and USGS/EROS personnel.

TERRAIN CLASS DESCRIPTIONS

Terrain class maps were produced from the elevation, slope, and aspect digital data. Elevation classes were broken into the following catagories (in meters): 0-80, 81-152, 153-304, 305-456, 457-610, 611-762, 763-914, 915-1066, 1067-1218, 1219-1370, 1371 and higher. Slope classes were broken into 0-2%, 3-5%, 6-10%, 11-15%, 16-25%, 26-40%, 41-70%, and 71% and higher. The aspect classes were broken into the four cardinal directions: north, south, east, and west. All of the maps contained the water classes, and the aspect map contained the 0-2% slope class. Collar information included: map title, scale, locational diagram, map legend, latitude/longitude, and tick marks.

PRODUCT DESCRIPTIONS-DIGITAL

GENERAL

Digital data are stored at USGS/EROS on CCT's in either an IDTRANS or TRANSFER format. Digital data stored in the IDTRANS format are used at USGS/EROS for internal processing. The TRANSFER format is usually used when data are shipped to other U.S. government agencies or the private sector. Images are generally written on a TRANSFER tape with one image line per record and one image per file. Images may be band-by-band or line-by-line. If the data format is floating point, either a Hewlett-Packard 3000 or IBM format may be specified. Data may

Table 2. List of land cover classes and subclasses used during the mapping process.

CLASS	SUBCLASS	CLASS NUMBER
Water	Clear	1
	Sedimented	2
Forest	Closed Needleleaf	3
	Open Needleleaf	4*
	Mixed	5
	Deciduous Forest and Scrub	8
Scrub	Lowland Alluvium and Mud	6
	Closed Deciduous Scrub	7**
	Open Deciduous Scrub	13
	Alpine Scrub	10, 14
	Prostrate Dwarf Shrub Tundra	12
Herbaceous	Graminoid Marsh	9
Barren	Alpine Barren	11

* Also includes Dwarf Shrub-Graminoid Peatland

** Also includes Patterned Fens, Graminoid Fens, Shruby Marshes, and Meadows

Table 3. Acreage estimates for each land cover class for the 1:250,000-scale USGS quadrangles covering the Yukon Flats National Wildlife Refuge.

CLASS	CHRISTIAN			CHANDALAR			COLEEN		
	Acres	%	% OF T	Acres	%	% OF T	Acres	%	% OF T
Clear	4136.43	0.58%	0.04%	0.00	0.00%	0.00%	13748.25	2.98%	0.12%
Sedimented	3666.20	0.52%	0.03%	613.69	0.53%	0.01%	155.42	0.03%	.00%
Closed Needleleaf	162695.60	22.87%	1.45%	697.38	0.60%	0.01%	139283.72	30.16%	1.24%
Open Needleleaf	372426.15	52.35%	3.33%	22929.69	19.84%	0.20%	135270.83	29.29%	1.21%
Mixed	81254.15	11.42%	0.73%	25914.46	22.43%	0.23%	114106.49	24.71%	1.02%
Lowland Alluvium and Mud	968.36	0.14%	0.01%	0.00	0.00%	0.00%	131.51	0.03%	0.00%
Closed Deciduous Scrub	54757.89	7.70%	0.49%	14672.77	12.70%	0.13%	21714.27	4.70%	0.19%
Deciduous Forest and Scrub	24942.12	3.51%	0.22%	5535.17	4.79%	0.05%	27544.32	5.96%	0.25%
Graminoid Marsh	59.78	0.01%	0.00%	7.97	0.01%	0.00%	3.99	0.00%	0.00%
Alpine Scrub	35.87	0.01%	0.00%	11.96	0.01%	0.00%	470.23	0.10%	0.00%
Alpine Barren	19.93	0.00%	0.00%	7607.37	6.58%	0.07%	31.88	0.01%	0.00%
Prostrate Dwarf Shrub Tundra	5993.44	0.84%	0.05%	15804.51	13.68%	0.14%	7858.42	1.70%	0.07%
Open Deciduous Scrub	338.73	0.05%	0.00%	14923.83	12.92%	0.13%	1362.87	0.30%	0.01%
Alpine Scrub	67.75	0.01%	0.00%	6830.29	5.91%	0.06%	107.60	0.02%	0.00%
Total	711362.35		6.35%	115549.06		1.03%	461789.77		4.12%

CLASS	BETTLES			BEAVER			BLACK RIVER		
	Acres	%	% of T	Acres	%	% of T	Acres	%	% OF T
Clear	0.00	0.00%	0.00%	65226.48	1.91%	0.58%	53108.10	2.91%	0.47%
Sedimented	0.00	0.00%	0.00%	56869.94	1.67%	0.51%	5005.16	0.27%	0.04%
Closed Needleleaf	0.00	0.00%	0.00%	258200.11	7.58%	2.31%	208897.69	11.43%	1.87%
Open Needleleaf	0.00	0.00%	0.00%	1412144.53	41.44%	12.61%	436233.97	23.86%	3.90%
Mixed	0.00	0.00%	0.00%	734204.37	21.55%	6.56%	378164.55	20.69%	3.38%
Lowland Alluvium and Mud	0.00	0.00%	0.00%	3160.11	0.09	0.03%	5714.49	0.31%	0.05%
Closed Deciduous Scrub	0.00	0.00%	0.00%	202354.32	5.94%	1.81%	189757.73	10.38%	1.69%
Deciduous Forest and Scrub	0.00	0.00%	0.00%	365635.71	10.73%	3.27%	520795.67	28.49%	4.65%
Graminoid Marsh	0.00	0.00%	0.00%	35805.23	1.05%	0.32%	21116.52	1.16%	0.19%
Alpine Scrub	0.00	0.00%	0.00%	426.40	0.01%	0.00%	310.83	0.02%	0.00%
Alpine Barren	1765.36	24.72%	0.02%	54865.48	1.61%	0.49%	79.70	0.00%	0.00%
Prostrate Dwarf Shrub Tundra	3267.70	45.76%	0.03%	117665.10	3.45%	1.05%	3132.21	0.17%	0.03%
Open Deciduous Scrub	346.70	4.85%	0.00%	71757.90	2.11%	0.64%	3566.58	0.20%	0.03%
Alpine Scrub	1761.37	24.67%	0.02%	29309.68	0.86%	0.26%	2139.95	0.12%	0.02%
Total	7141.12		0.06%	3407625.31		30.43%	1828023.11		16.32%

Table 3. (cont.) Acreage estimates for each land cover class for the 1:250,000-scale USGS quadrangles covering the Yukon Flats National Wildlife Refuge.

CLASS	LIVENGOOD			CIRCLE		
	Acres	%	% OF T	Acres	%	% OF T
Clear	1251.29	0.24%	0.01%	5160.58	0.78%	0.05%
Sedimented	9488.29	1.82%	0.08%	6085.10	0.91%	0.05%
Closed Needleleaf	43914.70	8.43%	0.39%	99828.24	15.00%	0.89%
Open Needleleaf	187546.06	36.01%	1.67%	194723.04	29.27%	1.74%
Mixed	148158.32	28.44%	1.32%	164544.64	24.73%	1.47%
Lowland Alluvium and Mud	59.78	0.01%	0.00%	537.98	0.08%	0.00%
Closed Deciduous Scrub	9456.41	1.82%	0.08%	33378.36	5.02%	0.30%
Deciduous Forest and Scrub	77839.01	14.94%	0.70%	103598.05	15.57%	0.93%
Graminoid Marsh	1060.01	0.20	0.01%	83.69	0.01%	0.00%
Alpine Scrub	5495.32	1.06%	0.05%	7559.55	1.14%	0.07%
Alpine Barren	2546.42	0.49%	0.02%	589.78	0.09%	0.01%
Prostrate Dwarf Shrub Tundra	13150.50	2.52%	0.12%	22989.47	3.46%	0.21%
Open Deciduous Scrub	16195.04	3.11%	0.14%	21774.04	3.27%	0.19%
Alpine Scrub	4706.29	0.90%	0.04%	4515.01	0.68%	0.04%
Total	520867.40		4.65%	665367.48		5.94%

CLASS	CHARLEY RIVER			FORT YUKON			TOTAL	
	Acres	%	% OF T	Acres	%	% OF T	Acres	% OF T
Clear	11524.62	12.57%	0.34%	118302.70	3.49%	1.06%	272458.44	2.43%
Sedimented	163.39	0.18%	0.00%	96692.04	2.85%	0.86%	178739.21	1.60%
Closed Needleleaf	5857.95	6.39%	0.17%	340526.22	10.05%	0.04%	1259901.59	11.25%
Open Needleleaf	24607.38	26.83%	0.73%	1022770.18	30.18%	9.13%	3808651.80	34.01%
Mixed	11213.79	12.23%	0.33%	319517.30	9.43%	2.85%	1977078.05	17.66%
Lowland Alluvium and Mud	0.00	0.00%	0.00%	15294.43	0.45%	0.14%	25866.64	0.23%
Closed Deciduous Scrub	7714.96	8.41%	0.23%	496319.80	14.65%	4.43%	1030126.49	9.20%
Deciduous Forest and Scrub	30616.76	33.39%	0.90%	755225.25	22.29%	6.74%	1911732.02	17.07%
Graminoid Marsh	0.00	0.00%	0.00%	224004.82	6.61%	2.00%	282141.99	2.52%
Alpine Scrub	0.00	0.00%	0.00%	0.00	0.00%	0.00%	14310.14	0.13%
Alpine Barren	0.00	0.00%	0.00%	0.00	0.00%	0.00%	67505.90	0.60%
Prostrate Dwarf Shrub Tundra	0.00	0.00%	0.00%	286.92	0.01%	0.00%	190148.26	1.70%
Open Deciduous Scrub	0.00	0.00%	0.00%	0.00	0.00%	0.00%	130265.67	1.16%
Alpine Scrub	0.00	0.00%	0.00%	0.00	0.00%	0.00%	49437.91	0.44%
Total	91698.84		2.71%	3388939.64		30.26%	11198364.07	100.00%

be read onto the tape at either 1600 or 6250 bits/inch (bpi). All data relating to this project have been delivered to USFWS at 1600 bpi using the Hewlett-Packard 3000 floating point format.

An attempt was made to standardize the pixel size and UTM origins of the data. For this project most, if not all, of the final data sets were produced at two different pixel sizes 127 x 127 meter and 57 x 57 meter. The 127 meter pixel size was predetermined by the USFWS to be the finalized cell size of the registered land cover classification. The unregistered classified land cover data is at the original 57 x 57 meter cell size. This would facilitate registration of the data to any other cell size other than 127 meters in the future. All of the data which have been transferred to the USFWS covered under the Interagency Service Agreement are summarized in Appendix C. This summarization contains image name, data type, number of lines and samples, UTM origins and pixel size.

LAND COVER

The land cover images contain up to 14 different classes (Table 2). The data is byte data. The lowest class, 0, is a background or fill class. The general class descriptions corresponding to each class number may be found in Appendix B.

ELEVATION DATA

The digital elevation data were derived from digital terrain data created by the Defense Mapping Agency (DMA). The DMA generated the data by digitizing contour lines, spot elevations, and stream and ridge line data from the 1:250,000-scale USGS quadrangles. The contour intervals range from 50 to 200 feet. These data were then converted to a rectangular grid of values, producing elevation estimates spaced every 0.01 inches on each 1:250,000-scale map (approximately 200 feet on the ground). The data are integer data and can range in values from 0 to about 3000 meters. The data is recorded in one meter increments.

SLOPE DATA

The slope data were computed using the digital elevation data. Slope is computed as percent slope, i.e. units of rise per 100 units of run. The data is byte data and is recorded in one percent increments. Values can range from 0 to 255.

ASPECT DATA

The aspect data were computed using the digital elevation data. Aspect is computed clockwise from north in degrees. The data are byte data with values from 0 to 180: 0 and 180 = north, east = 45, south = 90, and west = 135. Values increase in two degree increments.

ACKNOWLEDGEMENTS

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REFERENCES

ANILCA, 1980. Alaska National Interest Lands Conservation Act, Public Law 96-487, Washington, D.C.

ESL Incorporated, 1981. IDIMS Functional Guide, Technical Manual ESL-TM705. ESL Incorporated, Sunnyvale, California. Vol. I, 716 p., Vol. II, 319 p.

Fleming, M. D., 1975, Computer aided analysis of Landsat data: a comparison of three approaches including modified clustering approach: West Lafayette, Indiana, Purdue University Laboratory for Applications of Remote Sensing, LARS Information Note 072475, 9 p.

APPENDIX A

PROCEDURES FOR LAND COVER CLASSIFICATION USING LANDSAT CCT'S

Preprocessing

1. Enter Landsat Data (CCT format) into IDIMS
2. Display and select Landsat subscenes
3. Perform radiometric corrections
   a. Destrip to correct for detector miscalibration
   b. Fix bad data lines
4. Perform geometric corrections
   a. Select control points from Landsat data and maps for image registration
   b. Digitize control points and map boundaries
   c. Generate transformations and rotate Landsat scenes
   d. Register Landsat image to 50 meter UTM grid
5. Produce strata mask for study areas
6. Digitize refuge boundaries
7. Mosaic and register DEM data

Image Training and Classification

1. Select training blocks for study area in each Landsat scene
2. Apply IDIMS clustering algorithm (ISOCLAS)
3. Produce statistics of the spectral classes within the training blocks
4. Produce photographic image of each Landsat training block and color coded cluster map
5. Prepare for field investigations
   a. Acquire aerial photographs of cluster blocks for annotation in field
   b. Develop strategy for aerial reconnaissance and on-the-ground investigations

APPENDIX A

6. Field verification

   a. Describe land cover type associated with each cluster class
   b. Collect auxiliary information when appropriate, e.g. wildlife habitat value, soils, quantitative plant description, etc.

7. Return to IDIMS and edit cluster statistics and pool and/or delete cluster classes

8. Produce preliminary classification based on edited cluster statistics

9. Evaluate preliminary classification based on edited cluster statistics

10. Post-classification refinement where necessary to improve classification accuracy. This step may be facilitated by several approaches, two of which are presented:

    a. Stratification based upon physiognomic, soil or other resource data

       (1) Digitize boundaries of strata
       (2) Produce and apply strata mask
       (3) Identify cluster classes for each strata
       (4) Combine classifications for all strata
       (5) Reclassify entire study area

    b. Merge DEM digital terrain data with Landsat data

       (1) Define control points for DEM
       (2) Generate transformation between latitude/longitude (DEM) and UTM grid
       (3) Register DEM to UTM grid
       (4) Generate slope and aspect data
       (5) Define strata based on combinations of elevation, slope, and aspect
       (6) Identify cluster classes within each strata

APPENDIX A

Generate Output Products

1. Generate digital tape file for classification of refuge

2. Produce acreage estimate for refuge or units (quadrangles) within refuge area

3. Produce photographic prints for the final classification of the refuge

APPENDIX B

GENERAL DESCRIPTION OF LAND COVER CLASSES MAPPED ON YUKON FLATS NATIONAL WILDLIFE REFUGE*

Closed needleleaf forest--Found from lowland to uplands on moist to well-drained sites. This type covers approximately 11 percent of the refuge and is dominated by white spruce. Tree cover varies from 50 to 100 percent. Understory shrubs, including prickly rose, alder, grayleaf, willow, and red-osier dogwood, are scattered to abundant.

Open needleleaf forest--Areas that are moderately to poorly drained with a 10 to 50 percent tree cover. Black spruce dominates this type which covers 40 percent of the refuge. There is a well developed, tall deciduous shrub layer as well as dwarf shrubs and an herb layer. Common understory plants include prickly rose, willow, lingonberry, red bearberry, and dwarf scouring rush. Dwarf shrub graminoid (tussock peatland) is included within this land cover class because it is spectrally similar.

Deciduous forest and scrub--Areas include deciduous forest and scrub classes that cannot be spectrally separated. Dominant trees in the forest class are aspen, balsam poplar, and white birch. White spruce may be present. In scrub areas closely spaced deciduous shrubs range from one half to four meters tall. Willow and alder are the most common shrubs.

Closed deciduous scrub--Scrub areas that can be distinguished from forests are included in this class. Attributes of this cover type are described under deciduous forest and scrub. In addition, patterned fens (i.e. string bogs) and graminoid marshes are included in this land cover type.

Mixed forest--White spruce and paper birch are co-dominants. Willows, prickly rose, and linnea are common shrub understory plants in this type.

Open deciduous scrub--The dominant land cover in wetlands, shrubs are spaced so that most do not touch. Willows, dwarf birch, blueberries, red bearberry, and Labrador tea are the most common plants.

Graminoid marsh--Also included under closed deciduous scrub, this wetland cover type is dominated by grasslike plants which are periodically flooded.

APPENDIX B

Alpine scrub--Alpine mesic areas covered with deciduous shrubs including glandular birch, green alder, willow, and spirea.

Prostrate dwarf shrub tundra--Areas are covered with slow growing dwarf shrubs, chiefly heaths and crowberry. Mosses and lichens are abundant.

Alpine barren--Alpine areas where rocks and bare mineral soils dominate.

Lowland alluvium and mud--Frequently flooded areas that are sparsely vegetated. Colonizing species include balsam poplar, yellow dryas, and fireweed.

Clear water--Water, typically lakes, that are low in particulates.

Sedimented water--Water, such as the Yukon River, that is high in particulates.

*From: USFWS, 1985. Yukon Flats National Wildlife Refuge, Comprehensive Conservation Plan, Environmental Impact Statement and Wilderness Review, Draft, U.S. Fish and Wildlife Service, Region 7, Anchorage, Alaska, p. 49.

APPENDIX C

The following source data is relevant to all images listed below.

Coverage: Yukon Flats NWR

UTM Northing	= 7490000	Number of Lines	= 1654
UTM Easting	= 360000	Number of Samples	= 3150
UTM Zone	= 6	Pixel Size (in meters)	= 127
		Tape Format	= IDTRANS

TYPE OF IMAGE	DATA TYPE	EROS FIELD OFFICE TAPE LOCATION	FILE
Landcover	Byte	1304	9
Elevation	Integer	1304	1
Slope	Byte	1304	5
Aspect	Byte	1304	3
Refuge Mask	Byte	1304	7

The following source data is relevant to all images listed below.

Coverage: Yukon Flats NWR

UTM Northing	= 7490000	Number of Lines	= 331
UTM Easting	= 360000	Number of Samples	= 630
UTM Zone	= 6	Pixel Size (in meters)	= 635
		Tape Format	= IDTRANS

TYPE OF IMAGE	DATA TYPE	EROS FIELD OFFICE TAPE LOCATION	FILE
Landcover	Byte	1304	10
Elevation	Integer	1304	2
Slope	Byte	1304	6
Aspect	Byte	1304	4
Refuge Mask	Byte	1304	8

APPENDIX C

The following source data is relevant to all images listed below.

Coverage: Yukon Flats NWR

UTM Northing	= 7490000	Number of Lines	= 1050
UTM Easting	= 360000	Number of Samples	= 2000
UTM Zone	= 6	Pixel Size (in meters)	= 200
		Tape Format	= IDTRANS

TYPE OF IMAGE	DATA TYPE	EROS FIELD OFFICE TAPE LOCATION	FILE
Landcover	Byte	1035	5
Elevation	Integer	1035	1
Slope	Byte	1035	3
Aspect	Byte	1035	2
Refuge Mask	Byte	1035	4

The following source data is relevant to all images listed below.

Coverage: West portion of preliminary classification for Yukon Flats NWR

UTM Northing	= 7490000	Number of Lines	= 4200
UTM Easting	= 360000	Number of Samples	= 4000
UTM Zone	= 6	Pixel Size (in meters)	= 50
		Tape Format	= IDTRANS

TYPE OF IMAGE	DATA TYPE	EROS FIELD OFFICE TAPE LOCATION	FILE
Landcover	Byte	1207	1
Elevation	Integer		
Slope	Byte		
Aspect	Byte		

APPENDIX C

The following source data is relevant to all images listed below.

Coverage: Central portion of preliminary classification for Yukon Flats NWR

UTM Northing	= 7490000	Number of Lines	= 4200
UTM Easting	= 450000	Number of Samples	= 4000
UTM Zone	= 6	Pixel Size (in meters)	= 50
		Tape Format	= IDTRANS

TYPE OF IMAGE	DATA TYPE	EROS FIELD OFFICE TAPE LOCATION	FILE
Landcover	Byte	1207	2
Elevation	Integer		
Slope	Byte		
Aspect	Byte		

The following source data is relevant to all images listed below.

Coverage: Unregistered eastern portion of Yukon Flats NWR

Number of Lines	= 1690
Number of Samples	= 1320
Pixel Size (in meters)	= 57
Tape Format	= IDTRANS

TYPE OF IMAGE	DATA TYPE	EROS FIELD OFFICE TAPE LOCATION	FILE
Landcover	Byte	1038	2
Elevation	Integer		
Slope	Byte		
Aspect	Byte		

APPENDIX C

The following source data is relevant to all images listed below.

Coverage: Unregistered central portion of Yukon Flats NWR

Number of Lines	= 3684
Number of Samples	= 3388
Pixel Size (in meters)	= 57
Tape Format	= IDTRANS

TYPE OF IMAGE	DATA TYPE	EROS FIELD OFFICE TAPE LOCATION	FILE
Landcover	Byte	1040	4
Elevation	Integer		
Slope	Byte		
Aspect	Integer		

The following source data is relevant to all images listed below.

Coverage: Unregistered western portion of Yukon Flats NWR

Number of Lines	= 2840
Number of Samples	= 2300
Pixel Size (in meters)	= 57
Tape Format	= IDTRANS

TYPE OF IMAGE	DATA TYPE	EROS FIELD OFFICE TAPE LOCATION	FILE
Landcover	Byte	1040	5
Elevation	Integer		
Slope	Byte		
Aspect	Integer		

APPENDIX C

The following source data is relevant to all images listed below.

Coverage: Fort Yukon Quadrangle (1:250,000 scale); data extends outside quadrangle boundary

UTM Northing	= 7440500	Number of Lines	= 2550
UTM Easting	= 496400	Number of Samples	= 3000
UTM Zone	= 6	Pixel Size (in meters)	= 50
		Tape Format	= IDTRANS

TYPE OF IMAGE	DATA TYPE	EROS FIELD OFFICE TAPE LOCATION	FILE
Landcover	Byte	IDT 1367	4
Elevation	Integer	IDT 1385	1
Slope	Byte	IDT 1385	3
Aspect	Byte	IDT 1385	2
MSS; 4 Band	Byte	IDT 1367	5

The following source data is relevant to all images listed below.

Coverage: Fort Yukon Quadrangle (1:250,000); data ends at quadrangle boundary

UTM Northing	= 7440500	Number of Lines	= 2550
UTM Easting	= 496400	Number of Samples	= 2000
UTM Zone	= 6	Pixel Size (in meters)	= 50
		Tape Format	= IDTRANS

TYPE OF IMAGE	DATA TYPE	EROS FIELD OFFICE TAPE LOCATION	FILE
Landcover	Byte	IDT 1367	1
Elevation	Integer	-	-
Slope	Byte	-	-
Aspect	Byte	-	-
Quadmask	Byte	IDT 1367	3
MSS; 4 Band	Byte	IDT 1367	2