TABLE 2.- Continued.

Segment no.	Location (county, state)	Acquisitions available, 1978 Julian day	Sample field (time, pixel)	Comments
		197		
		233		
		260		
		251		
		268		
		269		
		304		
842	Henry, Ind.	027 (L-3)	(3, 133)	Shortage of acquisitions, but acquisitions
		160	(3, 145)	are well distributed. Segment is preferred
		178	(6, 147)	for use in program development. On Julian
		232	(9, 127)	days 160, emergence; 268, harvest
		260		beginning.
		268		
		304		
843	Henry, Ind.	088	(13, 121)	Good acquisition history and data quality.
		027 (L-3)	(13, 129)	Some unusual corn signatures, which may
		151 (L-3)	(22, 127)	reflect Indiana cropping practices. Some
		152 (L-3)	(22, 125)	fields reverse the maturing trend on day 268
		160		and green-up. This may be due to double
		178		cropping or another crop planted among the
		197		corn. For this segment, 10% of scene is
		232		pasture. Segment is preferred for use in
		233		program development. On Julian days 178,
		251		emergence; 268, harvest.
		268		
		269		
		304		
844	Jasper, Ind.	089	(3, 62)	Acquisition history is good; 13% of the
		107	(3, 80)	scene is not identified ground truth.
		117 (L-3)	(7, 80)	Segment is preferred for use in program
		126	(7, 62)	development. On Julian days 126,
		161		misreg. stered; 161, emergence; 180, maize;
		180		270, harvest; 297, clouds.
		197		
		198		
		215		
		233		
		243 (L-3)		
		251		
		270		
		297 (L-3)		
		306 (L-3)		
844	Madison, Ind.	089	(3, 12)	Acquisition coverage is good; 13% of the
		097 (L-3)	(3, 15)	scene is trees. Cornfields tend to be
		107 (L-3)	(10, 15)	small. Segment is preferred for use in
		116 (L-3)	(10, 12)	program development. On Julian days 107, 116,
		152 (L-3)		imagery not available; 160, emergence; 232,
		160		two small clouds; 260, harvest beginning.
		161		
		179		
		197		
		232		
		233		
		251		
		269		
		305		
851	Newton, Ind.	126	(3, 41)	Acquisition coverage is marginal due to data
		180	(3, 51)	quality. Segment is marginal for use in
		198	(9, 51)	program development. On Julian days 180,
		207 (L-3)	(9, 41)	maize, emergence; 207, maize; 216, small
		216		scattered clouds; 252, maize, 270, one cloud;
		225 (L-3)		306, harvest.
		234		
		243 (L-3)		
		252		
		270		
		306 (L-3)		
852	Randolph, Ind.	088 (L-3)	(49, 36)	Data quality is good, and acquisition
		097	(49, 44)	history is adequate. Segment has small
		1c: (L-3)	(51, 46)	fields, and 22% of the scene is pasture and
		160	(53, 37)	trees. Many of the cornfields fail to
		178		exhibit a consistent signature sequence
		232		through day 178. Segment is marginal for
		250		use in program development. On Julian days
		268		160, emergence; 268, harvest.
853	Randolph, Ind.	088 (L-3)	(35, 68)	As with sample segment 852, this segment exhibits
		097	(34, 72)	cornfield signatures which fail to sequence
		151 (L-3)	(41, 77)	through day 178. Segment is marginal for use in
		160	(43, 71)	program development. On Julian days 160, emergence;

AgRISTARS

A Joint Program for Agriculture and Resources Inventory Surveys Through Aerospace Remote Sensing

Supporting Research

April 1981

RECOMMENDED DATA SETS, CORN SEGMENTS AND SPRING WHEAT SEGMENTS, FOR USE IN PROGRAM DEVELOPMENT

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16 Abstract

This report presents the sets of Large Area Crop Inventory Experiment sites, crop year 1978, which are recommended for use in the development and evaluation of classification techniques based on Landsat spectral data. For each site, the following exists: (1) accuracy assessment digitized ground truth, (2) a minimum of 5 percent of the scene ground truth identified as corn or spring wheat, and (3) at least four acquisitions of acceptable data quality during the growing season of the crop of interest. The recommended data sets consist of 41 corn/soybean sites and 17 spring wheat sites.

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RECOMMENDED DATA SETS, CORN SEGMENTS AND SPRING WHEAT SEGMENTS, FOR USE IN PROGRAM DEVELOPMENT

Job Order 71-306

This report describes Classification activities of the Supporting Research project of the AgRISTARS program.

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Under Contract NAS 9-15800

For

Earth Resources Research Division

Space and Life Sciences Directorate

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION
LYNDON B. JOHNSON SPACE CENTER
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April 1981

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PREFACE

The Agriculture and Resources Inventory Surveys Through Aerospace Remote Sensing is an 8-year program of research, development, evaluation, and application of aerospace remote sensing for agricultural resources, which began in fiscal year 1980. This program is a cooperative effort of the National Aeronautics and Space Administration, the U.S. Agency for International Development, and the U.S. Departments of Agriculture, Commerce, and the Interior.

The work which is the subject of this document was performed within the Earth Resources Research Division, Space and Life Sciences Directorate, at the Lyndon B. Johnson Space Center, National Aeronautics and Space Administration. Under Contract NAS 9-15800, personnel of Lockheed Engineering and Management Services Company, Inc., performed the tasks which contributed to the completion of this research.

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1. INTRODUCTION

The following sets of Large Area Crop Inventory Experiment (LACIE) sites, crop year 1978, are recommended for use in the development and the evaluation of classification techniques based on Landsat spectral data. For each site, the following exists: accuracy assessment (A.A.) digitized ground truth, a minimum of 5 percent of the scene ground truth identified as corn (for the corn data set) or sp ing wheat (for the spring wheat sites), and at least four acquisitions of acceptable data quality during the growing season of the crop of interest.

Recommended segments have a variety of acquisition date distributions relative to the crop growth cycle and exhibit different cropping practices. The subset of these segments, designated as "preferred" for use in development of classification techniques, exhibits good acquisition coverage, reasonable field size, and minimum usage of unusual agricultural practices. Due to these factors, the use of this preferred data set will permit evaluation of classification techniques and comparison of different techniques with a minimum of confusion. Inclusion of the "marginal" segments will allow testing of classification techniques over a broader range of problems.

2. CORN SEGMENT DATA SET

This data set was derived from the set of 1978 corn/soybean sites for which A.A. digitized ground truth is available. Table 1 displays the complete data set: segment number and location with the A.A. percentages of the segment identified (ground truth) as corn, soybeans, and sorghum. These percentages are computed at the subpixel level. That is, for ground truth pixel identification, each pixel is divided into six components, and the components are identified. There are 22 932 pixels in a LACIE segment; the proportions given are computed at the subpixel level on the 137 592 pixel components. Of the 81 segments, 40 are unsuitable for use in program development; this is noted in the Comments column of table 1. Segments were rejected if:

TABLE 1.- CORN SEGMENTS, 1978 CROP YEAR, ACCURACY ASSESSMENT PERCENTAGES OF SUMMER CROPS

Sample segment	Location	Corn	Soybeans	Sorghum	Comments
107	Boone, Ill.	50.5	29.3	0.0	Rejected - inadequate acquisition coverage
123	Hamilton, Ind.	31.2	30.7	0.1	
127	Montgomery, Ind.	49.4	30.6	0.0	
133	Whitley, Ind.	31.1	17.2	0.0	
134	Butler, Iowa	20.0	12.7	0.0	Rejected - poor data quality
135	Chickasaw, Iowa	38.3	24.2	0.0	Rejected - poor data quality
141	Madison, Iowa	24.1	18.9	0.1	
142	O'Brien, Iowa	39.3	26.6	0.1	
144	Wapello, Iowa	19.4	20.1	0.0	Rejected - poor distribution for acquisitions of good data quality
145	Warren, Iowa	22.2	16.9	0.0	Rejected - 27% of scene not identified ground truth
146	Ballard, Ky.	16.2	36.2	2.0	
153	Crittenden, Ky.	12.9	12.4	0.2	
161	McCracken, Ky.	8.7	24.2	1.7	
174	Morehouse, La.	0.0	27.1	1.4	Rejected - insufficient corn
175	Red River, La.	0.6	4.7	0.0	Rejected - insufficient corn
178	Ingham, Mich.	23.2	8.4	0.0	Rejected - insufficient acquisitions
180	Kent, Mich.	14.6	0.2	0.2	Rejected - poor acquisition distribution
183	Freeborn, Minn.	47.2	33.7	0.0	Rejected - insufficient acquisitions
184	Goodhue, Minn.	19.9	6.1	0.0	Rejected - poor acquisition distribution
185	Traverse, Minn.	5.6	6.8	0.0	
190	Hinds, Miss.	7.0	8.6	0.0	
194	Noxubee, Miss.	0.4	57.9	1.0	Rejected - insufficient corn
195	Pontotoc, Miss.	3.4	55.6	0.2	Rejected - insufficient corn
196	Sharkey, Miss.	0.0	75.8	0.0	Rejected - insufficient corn
198	Tunica, Miss.	0.0	65.0	0.0	Rejected - insufficient corn
200	Yazoo, Miss.	0.9	27.7	0.9	Rejected - insufficient corn
202	Atchison, Mo.	23.5	32.6	1.3	Rejected - poor data quality
204	Callaway, Mo.	11.7	32.3	2.9	Rejected - 26% of segment not identified ground truth
205	Clark, Mo.	17.2	46.5	0.0	
209	Gentry, Mo.	8.3	21.1	1.6	
211	Grundy, Mo.	6.6	22.4	4.9	Rejected - poor data quality
215	Lincoln, Mo.	18.4	15.7	6.3	Rejected - poor data quality
216	Mercer, Mo.	6.6	19.2	1.3	
221	Antelope, Nebr.	24.4	0.0	0.6	
222	Dawson, Nebr.	48.5	0.0	0.1	
240	Bronkings, S. Dak.	27.7	4.1	0.3	
241	Deuel, S. Dak.	25.6	5.8	0.7	
246	Dane, Wis.	35.6	2.2	0.0	Rejected - insufficient acquisitions
247	Eau Claire, Wis.	1.0	0.0	0.0	Rejected - insufficient corn
800	Clinton, Iowa	53.9	27.3	0.0	Rejected - insufficient acquisitions
804	Marshall, Iowa	46.0	28.6	0.0	Rejected - poor acquisition distribution
807	Henry, Ill.	53.8	9.2	0.0	Rejected - insufficient acquisiutions of good data quality
809	Ogle, Ill.	53.2	12.7	0.0	
812	Bolivar, Miss.	0.0	40.3	0.0	Rejected - insufficient corn
824	Iroquois, Ill.	49.8	43.0	0.2	Rejected - inadequate acquisition coverage of good data quality
828	Kankakee, Ill.	50.6	35.4	0.0	
832	Adams, Indiana	21.6	39.0	0.1	Rejected - inadequate acquisition coverage
837	Benton, Ind.	43.1	36.8	0.0	
840	Delaware, Ind.	21.7	37.1	0.0	
842	Henry, Ind.	42.6	28.5	0.0	
843	Henry, Ind.	32.3	31.2	0.0	
844	Jasper, Ind.	39.2	21.7	0.1	
848	Madison, Ind.	32.4	30.0	0.0	
851	Newton, Ind.	52.4	34.3	0.0	
852	Randolph, Ind.	27.0	30.7	0.0	
853	Randolph, Ind.	34.9	30.3	0.0	
854	Tippecanoe, Ind.	49.2	41.2	0.2	
856	Warren, Ind.	29.4	28.8	0.0	
860	Wells, Ind.	28.2	31.3	0.0	
862	Calhoun, Iowa	32.0	26.2	1.0	Rejected - 24% of scene not identified ground truth
864	Crawford, Iowa	45.2	11.7	0.0	
865	Crawford, Iowa	33.1	14.2	1.3	
867	Emmet, Iowa	42.1	41.8	0.1	Rejected - poor acquisition distribution
870	Hancock, Iowa	45.3	30.1	0.0	Rejected - insufficient acquisitions
874	Humboldt, Iowa	47.4	43.8	0.0	Rejected - insufficient acquisitions
877	Ida, Iowa	38.3	19.7	0.0	Rejected - 21% of segment not identified ground truth
878	Kossuth, Iowa	43.0	42.5	0.0	Rejected - insufficient acquisitions
880	Monona, Iowa	44.6	37.8	0.7	
881	Monona, Iowa	43.5	7.9	0.1	
882	Palo Alto, Iowa	42.9	38.9	0.1	
883	Palo Alto, Iowa	29.6	32.0	0.0	
886	Pottawattamie, Iowa	46.8	25.5	0.2	
890	Sac, Iowa	48.2	29.7	0.0	
891	Shelby, Iowa	46.4	16.8	0.0	Rejected - poor data quality for acquisitions in growing season
892	Shelby, Iowa	50.1	14.3	0.2	Rejected - inadequate acquisition coverage of good data quality
893	Webster, Iowa	41.3	38.2	0.0	Rejected - inadequate acquisition coverage
894	Webster, Iowa	34.8	32.8	0.0	Rejected - insufficient acquisitions
895	Woodbury, Iowa	53.7	9.2	0.2	
1388	Dixon, Nebr.	48.5	14.7	1.0	
1567	Carver, Minn.	24.8	2.2	0.0	Rejected - 34% of scene not identified ground truth
1872	Cottonwood, Minn.	35.2	36.2	0.0	Rejected - poor acquisition distribution

a. The percentage of ground truth identified as corn was less than 5 percent of the segment.

b. The percentage of the segment which was not identified by ground truth was greater than 20 percent.

c. Acquisitions available were of inadequate data quality or distribution to characterize the growth cycle of corn.

Nine segments were rejected for insufficient corn; 5 segments were rejected for inadequate ground truth identification; and 26 segments failed to have 4 acquisitions of good data quality which were adequately distributed over the corn growth season as defined by crop calendars for the region.

Additional information for the 41 segments acceptable for use is given in table 2 where it is listed as follows:

a. All available acquisitions (1978 dates prior to Julian date 78 310) with an "L-3" identification if data was from Landsat 3

b. Sample cornfield (line, pixel) coordinates

c. Commentary which includes the following: identification of scene components (other than corn, soybeans, and sorghum) which comprise more than 10 percent of the scene; comments on data quality; some agronomic observations; and an evaluation, "marginal" or "preferred," of segment usefulness in program development.

Listed in table 3 are scene components (other than corn, soybeans, or sorghum) which comprise more than 10 percent of the scene in each of the segments rejected for use in program development. This table is intended as a reference for experimental application of programs to different vegetative covers.

Geographical distribution of the acceptable corn segments is illustrated in figure 1.

TABLE 2.- CORN SEGMENT DATA SET

Segment no.	Location (county, state)	Acquisitions available, 1978 Julian day	Sample field (line, pixel)	Comments
123	Hamilton, Ind.	089 107 152 (L-3) 161 197 233 269 305	(3, 58) (3, 64) (8, 66) (8, 60)	Acquisition history marginal. Segment is marginal for use in program development. On Julian days 152, clouds; 161, emergence; 305, harvest.
127	Montgomery, Ind.	089 107 152 (L-3) 161 197 207 (L-3) 216 243 (L-3) 252 269 306	(104, 167) (101, 174) (107, 176) (110, 168)	Acquisition coverage marginal; a later date would help crop separation. Segment is preferred for use in program development. On Julian days 161, some emergence; 197, haze, clouds; 207, haze.
133	Whitley, Ind.	107 152 (L-3) 197 233 251 260 (L-3) 269	(3, 108) (3, 115) (8, 117) (8, 110)	Fields are small and acquisition history is marginal. Trees make up 16% of the scene. Segment is marginal for use in program development. On Julian days 260, cloud shadow; 269, harvest in progress.
141	Madison, Iowa	086 103 (L-3) 130 166 167 212 (L-3) 220 221 256 265 (L-3) 266 (L-3) 274 292	(46, 148) (46, 154) (53, 157) (53, 152)	Scene is 26% pasture. Segment is preferred for use in program development. On Julian days 167, emergence; 212, three small clouds; 220, misregistered; 221, haze; 256, clouds, haze; 265, harvest beginning.
142	O'Brien, Iowa	078 105 (L-3) 141 (L-3) 213 (L-3) 222 (L-3) 231 (L-3) 258 267 303 (L-3)	(3, 100) (3, 108) (8, 108) (3, 108)	Acquisition history marginal. Approximately one-third of segment is affected by flood. The scene is 12% pasture and 18% of the scene has not been identified ground truth. Segment is marginal for use in program development. On Julian day 078, snow; 141, some emergence.
146	Ballard, Ky.	180 198 207 (L-3) 234 270 306	(33, 70) (33, 80) (36, 80) (36, 70)	Acquisition coverage is marginal since corn is vigorous by day 180; there is no coverage of the green-up stage. Grass makes up 11% of the scene; 19% of the scene has not been ground truth identified. Segment is marginal for use in program development. On Julian days 180, emergence; 270, corn is ripe.
153	Crittenden, Ky.	089 152 (L-3) 180 197 207 (L-3) 233 251 260 (L-3) 269 297 (L-3) 305	(44, 130) (44, 138) (47, 138) (47, 130)	Acquisition coverage is good for this segment, but fields tend to be small. Trees and pasture make up 59% of the sene. Segment is preferred for use in program development. On Julian days 152, emergence; 260, one cloud.
161	McCracken, Ky.	117 (L-3) 180 198 234 243 (L-3) 270 279 (L-3) 297 (L-3) 306	(110, 61) (110, 67) (114, 67) (114, 61)	Acquistion coverage is poor, especially for the green-up growth stage. For this segment, 21% of the scene is nonagricultural; 13% is trees, and 14% has not been identified ground truth. Segment is marginal for use in program development. On Julian days 117, emergence; 243, clouds and haze; 279, clouds; 306, harvest.
185	Traverse, Minn.	089 (L-3) 098	(104, 97) (104, 104)	Cornfields are small, but acquisition coverage is good. Scene is 21% sunflowers,

TABLE 2.- Continued.

Segment no.	Location (county, state)	Acquisitions available, 1978 Julian day	Sample field (line, pixel)	Comments
		106 (L-3) 133 134 143 (L-3) 169 197 (L-3) 205 214 (L-3) 224 232 (L-3) 250 (L-3) 287 (L-3) 296	(109, 104) (109, 97 Spring-wheat field (37, 63) (35, 78) (39, 78) (41, 68)	27% spring wheat. Segment is recommended for program development for spring wheat as well as for corn; a sample spring wheat field is listed. Segment is preferred for program development. On Julian days 224, wheat harvest; 250, haze; 287, corn harvest
190	Hinds, Miss.	117 (L-3) 135 (L-3) 207 (L-3) 216 234 243 (L-3) 279 (L-3) 297 (L-3) 306	(43, 72) (43, 60) (49, 60) (49, 52)	Acquisition distribution is very poor for this segment; 19% of the segment has not been ground truth identified. Corn percentage is low, and 46% of the scene is pasture and trees. Segment is accepted as marginal for use in program development because of the location and the presence of 12% cotton in the scene. Harvest was on Julian day 306.
205	Clark, Mo.	093 (L-3) 101 137 (L-3) 138 (L-3) 155 (L-3) 156 (L-3) 209 (L-3) 218 219 246 (L-3) 272 282 (L-3) 290 308	(48, 169) (48, 173) (55, 175) (56, 172)	Marginal acquisition coverage. Segment is 10% trees. Soybeans exhibit two crop profiles. Segment is marginal for use in program development. On Julian days 155,emergence; 209, clouds; 272, haze.
209	Gentry, Mo.	086 (L-3) 130 167 185 212 (L-3) 220 221 238 247 (L-3) 266 (L-3) 274 292 293 301 (L-3)	(11, 187) (11, 193) (13, 193) (13, 187)	This is a low corn segment and cornfields tend to be small. For this segment, 50% of the scene is pasture and trees. Acquisition coverage is good. Segment is preferred for use in program development as an example of low corn percentage. On Julian days 167, emergence; 212, small clouds; 238, misregistered; 292, harvest; 301, misregistered.
216	Mercer, Mo.	103 (L-3) 130 184 202 220 238 247 (L-3) 265 (L-3) 274 292 301 (L-3)	(82, 63) (80, 74) (85, 75) (86, 65)	Acquisition coverage marginal in green-up phase of corn. For this segment, 59% of the scene is hay, trees, and pasture. This is a low corn segment and fields tend to be small. Segment is marginal for use in program development. On Julian days 202, banded; 265, haze.
221	Antelope, Nebr.	089 (L-3) 125 (L-3) 134 188 206 215 (L-3) 224 233 (L-3) 242 251 (L-3) 269 (L-3) 296	(113, 115) (113, 126) (117, 126) (117, 115)	Acquisition coverage is marginal for the green-up phase of corn. For this segment, 54% of the scene is grassland. Segment is marginal for use in program development. On Julian days 188, small clouds, emergence; 206, cloud shadow; 296, harvest.
222	Dawson, Nebr.	080 089 (L-3) 090 (L-3) 171 198 (L-3) 206 224 234 (L-3)	(4, 142) (4, 150) (8, 150) (8, 142)	Acquisition coverage is good; 39% of the scene is alfalfa. Segment is preferred for use in program development. On Julian days 171, clouds, emergence; 288, harvest; 297, clouds.

TABLE 2.- Continued.

Segment no.	Location (county, state)	Acquisitions available, 1978 Julian day	Sample field (line, pixel)	Comments
		243 251 (L-3) 252 (L-3) 270 (L-3) 278 288 (L-3) 296 297		
240	Brookings, S. Dak.	089 (L-3) 133 142 (L-3) 169 197 (L-3) 205 215 (L-3) 224 233 (L-3) 241 250 (L-3) 268 (L-3) 287 (L-3) 296 305 (L-3)	(38, 25) (38, 30) (44, 30) (44, 75)	Acquisition coverage is good; 13% of the scene is pasture, 14% is oats. Preferred for use in program development. On Julian days 169, emergence; 215, clouds; 287, harvest.
241	Deuel, S. Dak.	106 (L-3) 133 134 169 187 196 (L-3) 205 224 233 (L-3) 241 251 (L-3) 268 296 (L-3) 305	(6, 174) (6, 185) (10, 185) (10, 177)	Acquisition coverage is good; 21% of the scene is pasture. Segment is preferred for use in program development. On Julian days 187, two small clouds, emergence; 296, harvest.
809	Ogle, Ill.	101 (L-3) 163 164 209 (L-3) 218 244 (L-3) 254 262 (L-3) 271 272 281 (L-3) 289 290 307	(43, 6) (40, 17) (47, 20) (50, 6)	Acquisition coverage is good. Segment is preferred for use in program development. On Julian days 101, clouds; 163, clouds; 164, emergence; 209, haze; 262, small clouds; 271, harvest beginning.
828	Kankakee, Ill.	091 126 163 180 198 207 (L-3) 216 226 (L-3) 234 243 (L-3) 252 262 (L-3) 271	(50, 80) (50, 90) (55, 90) (55, 80)	Segment is preferred for use in program development. On Julian days 163, emergence; 180, haze; 198, small clouds, haze; 216, three clouds; 262, haze; 271, harvest beginning.
837	Benton, Ind.	089 107 180 198 207 (L-3) 216 225 (L-3) 234 243 (L-3) 251 252 270 306	(98, 35) (96, 47) (101, 48) (104, 37)	Acquisition coverage is very good. There are two corn profiles evident in channels 3 and 4, which may reflect cropping practices or a meteorological event such as hail damage. Segment is preferred for use in program development. On Julian days 180, emergence; 216, small clouds; 252, harvest beginning.
840	Delaware, Ind.	088 097 (L-3) 151 (L-3) 160 178	(24, 110) (24, 116) (28, 116) (28, 110)	Acquisition history is good, 14% of the scene is trees. Segment is preferred for use in program development. On Julian days 178, very slight haze, emergence; 304, haze, harvest.

TABLE 2.- Continued.

Segment no.	Location (county, state)	Acquisitions available, 1978 Julian day	Sample field (line, pixel)	Comments
		197 233 250 251 268 269 304		
842	Henry, Ind.	097 (L-3) 160 178 232 250 268 304	(3, 133) (3, 145) (6, 147) (9, 137)	Shortage of acquisitions, but acquisitions are well distributed. Segment is preferred for use in program development. On Julian days 160, emergence; 268, harvest beginning.
843	Henry, Ind.	088 097 (L-3) 151 (L-3) 152 (L-3) 160 178 197 232 233 251 268 269 304	(13, 121) (13, 123) (22, 127) (22, 125)	Good acquisition history and data quality. Some unusual corn signatures, which may reflect Indiana cropping practices. Some fields reverse the maturing trend on day 268 and green-up. This may be due to double cropping or another crop planted among the corn. For this segmnet, 10% of scene is pasture. Segment is preferred for use in program development. On Julian days 178, emergence; 268, harvest.
844	Jasper, Ind.	089 107 117 (L-3) 126 161 180 197 198 215 233 243 (L-3) 251 270 297 (L-3) 306 (L-3)	(3, 62) (3, 80) (7, 80) (7, 62)	Acquisition history is good; 13% of the scene is not identified ground truth. Segment is preferred for use in program development. On Julian days 126, misregistered; 161, emergence; 180, haze; 270, harvest; 297, clouds.
848	Madison, Ind.	089 097 (L-3) 107 (L-3) 116 (L-3) 152 (L-3) 160 161 179 197 232 233 251 269 305	(3, 12) (3, 15) (10, 15) (10, 12)	Acquisition coverage is good; 13% of the scene is trees. Cornfields tend to be small. Segment is preferred for use in program development. On Julian days 107, 116, imagery not available; 160, emergence; 232, two small clouds; 269, harvest beginning.
851	Newton, Ind.	126 180 198 207 (L-3) 216 225 (L-3) 234 243 (L-3) 252 270 306 (L-3)	(3, 41) (3, 51) (9, 51) (9, 41)	Acquisition coverage is marginal due to data quality. Segment is marginal for use in program development. On Julian days 180, haze, emergence; 207, haze; 216, small, scattered clouds; 252, haze; 270, one cloud; 306, harvest.
852	Randolph, Ind.	088 (L-3) 097 151 (L-3) 160 178 232 250 268	(49, 36) (49, 44) (51, 46) (53, 37)	Data quality is good, and acquisition history is adequate. Segment has small fields, and 22% of the scene is pasture and trees. Many of the cornfields fail to exhibit a consistent signature sequence through day 178. Segment is marginal for use in program development. On Julian days 160, emergence; 268, harvest.
853	Randolph, Ind.	088 (L-3) 097 151 (L-3) 160	(35, 68) (34, 72) (41, 77) (43, 71)	As with sample segment 852, this segment exhibits cornfield signatures which fail to sequence through day 178. Segment is marginal for use in program development. On Julian days 160, emergence;

TABLE 2.- Continued.

Segment no.	Location (county, state)	Acquisitions available, 1978 Julian day	Sample field (line, pixel)	Comments
		178 232 250 268 304		268, corn ripe but no harvest evident.
854	Tippecanoe, Ind.	089 107 152 (L-3) 161 197 207 (L-3) 216 234 243 (L-3) 251 252 269 270 306	(73, 148) (73, 155) (80, 155) (80, 148)	Data quality limits the number of acquisitions avaliable. Corn in this segment exhibits some unusual signatures, and segment is marginal for use in program development. On Julian days 152, clouds; 161, emergence; 197, clouds; 216, clouds; 270, harvest of some fields.
856	Warren, Ind.	089 107 152 (L-3) 161 180 198 207 (L-3) 215 234 243 (L-3) 251 269 270 305	(3, 49) (3, 53) (9, 53) (9, 49)	Good acquisition history; 23% of the scene is trees. Segment is preferred for use in program development. On Julian days 107, haze; 161, emergence; 251; harvest beginning.
860	Wells, Ind.	088 (L-3) 097 107 (L-3) 116 151 (L-3) 152 (L-3) 160 161 178 197 232 233 251 268 269 304	(91, 61) (91, 66) (95, 67) (95, 62)	Misregistration between acquisitions is a problem with this segment. The scene is 13% nonagriculture. Segment is marginal for use in program development. On Julian days 160, emergence; 178, clouds; 269, corn still vigorous.
864	Crawford, Iowa	087 096 141 (L-3) 150 159 (L-3) 186 222 231 (L-3) 249 (L-3) 258 267 (L-3) 294 303 (L-3)	(65, 116) (65, 120) (69, 120) (69, 116)	Acquisition coverage is marginal for this segment; 17% of the scene is pasture. Segment is marginal for use in program development. On Julian days 159, emergence; 222, clouds; 249, haze; 258, haze and clouds; 267, some harvest.
865	Crawford, Iowa	087 096 131 141 (L-3) 150 159 (L-3) 168 186 231 (L-3) 249 (L-3) 267 (L-3) 294	(7, 71) (7, 79) (11, 79) (11, 71)	Acquisition coverage is good; 22% of the scene is pasture. Segment is preferred for use in program development. On Julian days 168, emergence; 249, haze; 267, harvest beginning.
880	Monona, Iowa	087 (L-3) 096 141 (L-3) 150 186 204	(46, 123) (46, 133) (54, 136) (54, 127)	Segment is preferred for use in program development. On Julian days 186, emergence; 204, clouds; 222, small, scattered clouds; 267, harvest beginning.

TABLE 2.- Continued.

Segment no.	Location (county, state)	Acquisitions available, 1978 Julian day	Sample field (line, pixel)	Comments
		222 231 (L-3) 249 (L-3) 267 (L-3) 294		
881	Monona, Iowa	087 (L-3) 096 141 (L-3) 159 (L-3) 186 213 (L-3) 222 231 (L-3) 249 (L-3) 267 (L-3) 303	(13, 81) (12, 90) (16, 90) (17, 82)	Good acquisition coverage; 22% of the scene is pasture. Segment is preferred for use in program development. On Julian days 159, one small cloud, emergence; 213, clouds; 249, much of image is dark; 267, harvest.
882	Palo Alto, Iowa	086 (L-3) 096 131 141 (L-3) 150 159 (L-3) 186 213 (L-3) 222 231 (L-3) 258 267 293 303 (L-3)	(77, 77) (76, 84) (81, 87) (82, 80)	Very good acquisition history for this segment. Segment is preferred for use in program development. On Julian days 159, emergence; 258, cloudy; 267, harvest beginning.
883	Palo Alto, Iowa	096 105 (L-3) 131 141 (L-3) 150 186 204 213 (L-3) 221 222 231 (L-3) 258 267 (L-3) 293 303 (L-3)	(22, 109) (22, 118) (29, 120) (29, 111)	Distribution of acquisitions of good data quality is marginal for this segment. The scene is 11% pasture, and 11% of the segment has not been identified ground truth. Segment is marginal for use in program development. On Julian days 186, emergence; 204, small clouds; 213, haze; 258, clouds; 267, harvest beginning.
886	Pottawatamie, Iowa	086 (L-3) 096 131 167 186 204 212 (L-3) 231 (L-3) 249 (L-3) 258 267 (L-3) 293 303 (L-3)	(102, 77) (102, 86) (110, 91) (110, 81)	Data quality is a problem. Segment is marginal for use in program development. On Julian days 167, haze, emergence; 186, haze; 204, clouds; 212, clouds; 249, haze; 258, harvest beginning.
890	Sac, Iowa	087 (L-3) 096 105 (L-3) 131 141 (L-3) 186 221 222 231 (L-3) 267 (L-3) 293 303 (L-3)	(4, 127) (4, 131) (6, 131) (6, 127)	Acquisition coverage of the corn green-up period is marginal. Segment is marginal for use in program development. On Julian days 105, haze; 131, haze; 141, emergence; 222, popcorn clouds; 293, harvest.
895	Woodbury, Iowa	087 (L-3) 096 133 141 (L-3) 150 159 (L-3) 169 186 196 (L-3) 205	(3, 180) (3, 190) (9, 190) (9, 180)	Acquisition coverage for this segment is very good; 13% of the scene is pasture. Segment is preferred for use in program development. On Julian days 096, three small clouds; 159, emergence; 249, haze; 267, harvest beginning.

TABLE 2.- Concluded.

Segment no.	Location (county, state)	Acquisitions available, 1978 Julian day	Sample field (line, pixel)	Comments
1388	Dixon, Nebr.	222 231 (L-3) 249 (L-3) 267 (L-3) 303 (L-3) 115 133 169 196 (L-3) 205 259 268 (L-3)	(3, 41) (3, 47) (6, 47) (6, 41)	Acquisition coverage is marginal. Segment is designated a "winter wheat" segment so coverage starts in fall 1977. Segment is marginal for use in program development. On Julian days 115, few small clouds; 169, emergence; 259, harvest beginning.

TABLE 3.- SCENE COMPONENTS OF REJECTED CORN SEGMENTS[a]
[Refer to table 1]

Sample segment	Scene component
107	None
134	58% trees
135	None
144	31% trees
145	16% pasture, 27% not identified ground truth
174	12% trees, 29% cotton, 15% rice
175	26% pasture, 59% trees
178	16% trees, 28% not identified ground truth
180	11% alfalfa, 32% trees, 14% orchards
183	None
184	31% trees, 13% not identified ground truth
194	21% pasture
195	21% trees
196	None
198	11% trees
200	24% cotton, 16% pasture, 23% trees
202	22% pasture
204	26% not identified ground truth
211	11% hay, 26% pasture, 13% trees
215	10% pasture, 19% trees, 19% not identified ground truth
246	11% alfalfa
247	95% trees
800	None
804	None
807	None
812	34% rice, 13% not identified ground truth
824	None
832	None
862	24% not identified ground truth
867	None
870	None
874	None
877	11% pasture, 21% not identified ground truth
878	None
891	13% spring oats
892	None
893	None
894	None
1567	12% trees, 35% not identified ground truth
1872	None

[a]These components are those other than corn, soybeans, or sorghum which comprise more than 10 percent of the scene.

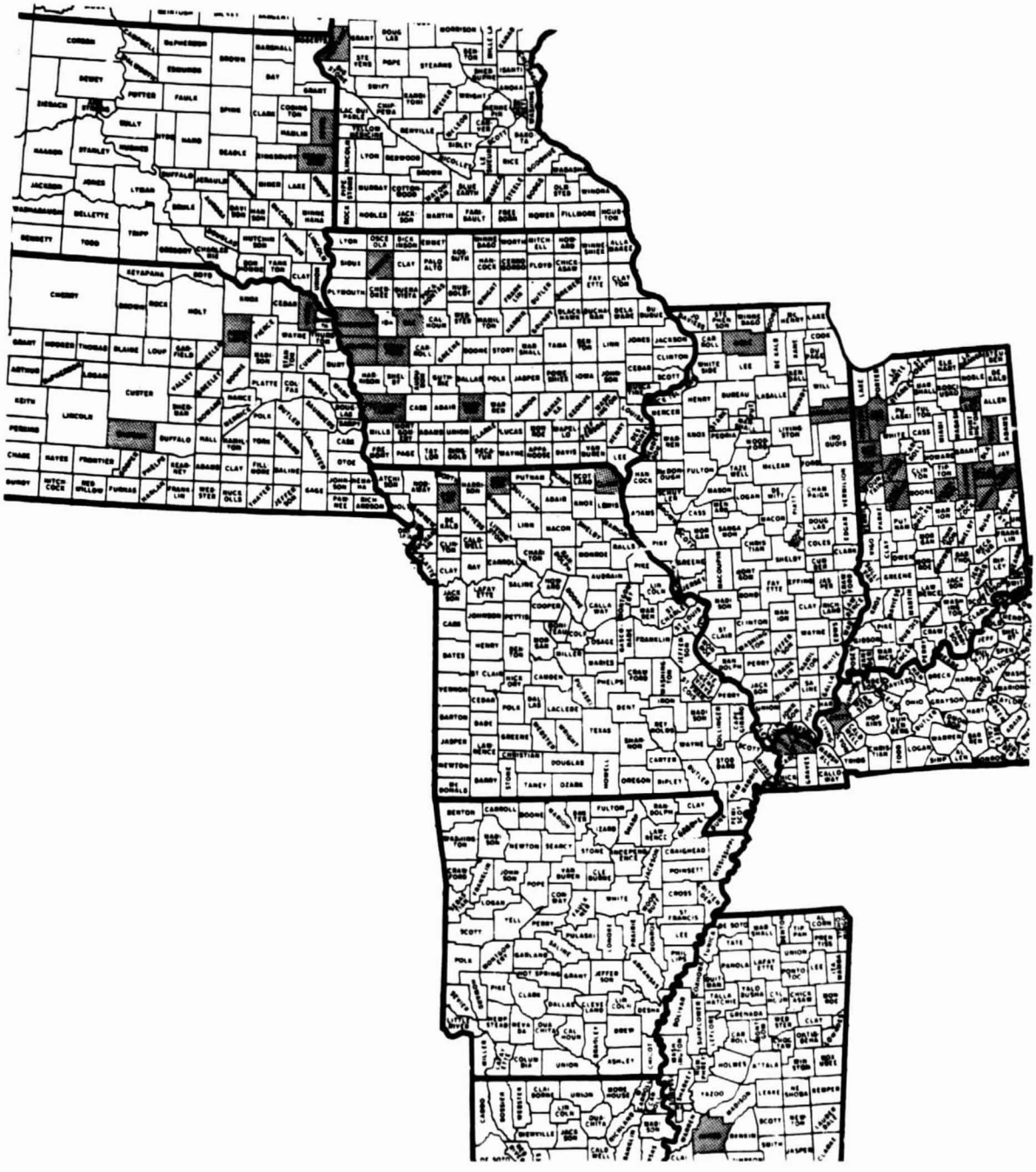

Figure 1.- Distribution of corn segment data set.

3. SPRING WHEAT SEGMENT DATA SET

This spring wheat data set, like the corn data set, was derived from the set of 1978 spring wheat sites for which the A.A. digitized ground truth is available.

Table 4 lists the complete data set: segment number and location with the A.A. percentages of the segment ground truth identified as spring wheat (including durum wheat), barley, and oats. Of the 88 segments for which this information is available, 67 are unsuitable for use in spring wheat program development. Segments were rejected if:

a. The percentage of ground truth identified as spring wheat was less than 5 percent of the segment.

b. The percentage of the segment which was not identified by ground truth was greater than 20 percent.

c. Acquisitions available were of inadequate data quality or distribution to characterize the growth cycle of spring wheat.

Fifty two segments were rejected for insufficient spring wheat. Many of these segments had appreciable amounts of winter wheat acreage and would be suitable for program development based on winter wheat. Three segments were rejected for insufficient ground truth identification, and 16 segments failed to have acquisitions of good data quality that were well distributed relative to the spring wheat growth cycle.

For the 17 segments recommended for use in program development, the following additional information is given in table 5 for each site:

a. All available acquisitions with an "L-3" identification if data is from Landsat 3

b. Sample spring wheat field (line, pixel) coordinates

c. Commentary which includes: identification of scene components (other than spring grains) which comprise more than 10 percent of the scene; comments

TABLE 4.- SPRING WHEAT SEGMENTS, 1978 CROP YEAR, ACCURACY ASSESSMENT PERCENTAGES OF SPRING SMALL GRAINS

Sample segment	Location	Spring wheat and durum wheat	Barley	Oats	Comments
1003	Adams, Colo.	0.14	0.0	0.0	Rejected - insufficient spring wheat
1009	Hall, Nebr.	0.0	0.0	0.19	Rejected - insufficient spring wheat
1023	Thomas, Kans.	0.0	0.0	0.0	Rejected - insufficient spring wheat
1035	Sherman, Kans.	0.0	0.0	0.06	Rejected - insufficient spring wheat
1041	Meade, Kans.	0.0	0.0	0.0	Rejected - insufficient spring wheat
1047	Stanton, Kans.	0.0	0.0	0.0	Rejected - insufficient spring wheat
1075	Howard, Nebr.	0.0	0.0	0.05	Rejected - insufficient spring wheat
1077	Castro, Tex.	0.19	0.0	2.46	Rejected - insufficient spring wheat
1091	Washington, Colo.	0.0	0.06	0.15	Rejected - insufficient spring wheat
1151	Clay, Kans.	0.0	0.0	0.76	Rejected - insufficient spring wheat
1154	Jones, S. Dak.	0.36	0.0	0.12	Rejected - insufficient spring wheat
1156	Atchison, Kans.	0.02	0.0	0.90	Rejected - insufficient spring wheat
1159	Johnson, Nebr.	0.0	0.0	0.82	Rejected - insufficient spring wheat
1173	Kiowa, Kans.	0.0	0.07	0.0	Rejected - insufficient spring wheat
1175	Sedgwick, Kans.	0.07	0.92	0.1	Rejected - insufficient spring wheat
1229	Reno, Kans.	0.0	0.0	0.0	Rejected - insufficient spring wheat
1239	Chase, Kans.	0.0	0.0	0.02	Rejected - insufficient spring wheat
1253	Sequoyah, Okla.	0.0	0.0	0.05	Rejected - insufficient spring wheat
1281	Rawlins, Kans.	0.0	0.0	0.0	Rejected - insufficient spring wheat
1286	Sheridan, Kans.	0.0	0.0	0.0	Rejected - insufficient spring wheat
1299	Rice, Kans.	0.0	0.0	0.1	Rejected - insufficient spring wheat
1341	Brown, Kans.	0.0	0.6	0.0	Rejected - insufficient spring wheat
1346	Morgan, Colo.	0.05	0.0	0.06	Rejected - insufficient spring wheat
1377	Lubbock, Tex.	0.0	0.0	0.0	Rejected - insufficient spring wheat
1379	Cheyenne, Nebr.	0.10	0.0	0.35	Rejected - insufficient spring wheat
1380	Kimball, Nebr.	7.0	0.09	1.81	
1382	Sheridan, Nebr.	0.0	0.0	1.76	Rejected - insufficient spring wheat
1387	Ramsey, N. Dak.	30.5	17.8	0.26	
1392	Benson, N. Dak.	26.24	5.37	1.14	Rejected - inadequate acquisitions of good data quality
1394	Burke, N. Dak.	31.80	2.23	0.88	
1457	Ward, N. Dak.	42.04	1.22	2.67	
1461	Pierce, N. Dak.	31.7	4.67	3.47	
1467	Towner, N. LDak.	39.81	10.79	0.31	Rejected - poor data quality of acquisitions in growth cycle of wheat
1472	Barnes, N. Dak.	24.4	8.93	3.55	Rejected - poor acquisition coverage of growth cycle of wheat
1473	Cass, N. Dak.	31.73	16.99	0.64	Rejected - poor acquisition coverage of green-up stage of wheat
1476	Lincoln, Nebr.	0.0	0.0	0.0	Rejected - insufficient spring wheat
1485	Dewey, S. Dak.	9.37	0.0	5.29	Rejected - 24% of segment not identified ground truth
1499	Carter, Okla.	0.0	0.0	0.81	Rejected - insufficient spring wheat
1502	Larimer, Colo.	0.55	0.0	0.70	Rejected - insufficient spring wheat
1518	Roseau, Minn.	22.19	2.79	7.53	Rejected - poor data quality of acquisitions in growth cycle of wheat
1537	McCone, Mont.	5.94	2.69	0.82	
1542	Roosevelt, Mont.	23.04	0.17	0.0	
1544	Sheridan, Mont.	35.01	1.51	1.22	
1553	Carter, Mont.	4.82	1.28	0.50	Rejected - insufficient spring wheat
1566	Red Lake, Minn.	17.73	5.19	5.07	
1572	Custer, Nebr.	0.0	0.0	0.68	Rejected - insufficient spring wheat
1583	Hitchcock, Nebr.	0.19	0.0	0.0	Rejected - insufficient spring wheat
1584	Pembina, N. Dak.	29.63	19.84	0.35	Rejected - insufficient acquisitions in growing season of spring wheat
1591	Webster, Nebr.	0.0	0.0	0.29	Rejected - insufficient spring wheat
1594	Gage, Nebr.	0.0	0.0	0.9	Rejected - insufficient spring wheat
1596	Thayer, Nebr.	0.0	0.0	0.40	Rejected - insufficient spring wheat
1599	Edmunds, S. Dak.	10.0	0.0	6.28	Rejected - inadequate acquisition coverage
1602	Mountrail, N. Dak.	26.47	1.08	1.90	Rejected - inadequate acquisition coverage
1612	McHenry, N. Dak.	10.99	0.26	0.23	Rejected - inadequate acquisition coverage
1619	Grand Forks, N. Dak.	35.72	11.5	0.41	Rejected - insufficient acquisitions of good data quality
1636	Stutsman, N. Dak.	36.76	2.24	3.9	
1650	Hettinger, N. Dak.	16.39	0.91	4.43	
1653	Burleigh, N. Dak.	14.64	0.40	3.71	
1656	Morton, N. Dak.	3.75	0.47	2.85	Rejected - insufficient spring wheat
1658	Dickey, N. Dak.	28.60	10.89	4.03	Rejected - poor acquisition distribution
1664	Sargent, N. Dak.	20.81	6.45	4.77	Rejected - inadequate acquisition coverage in growing season of wheat
1668	Perkins, S. Dak.	6.51	0.0	0.59	
1671	Garvin, Okla.	0.0	0.0	0.84	Rejected - insufficient spring wheat
1676	Brule, S. Dak.	0.48	0.0	6.19	Rejected - insufficient spring wheat
1678	Clark, S. Dak.	22.67	3.01	2.45	Rejected - inadequate acquisition coverage
1695	Ellis, Okla.	0.0	0.0	0.40	Rejected - insufficient spring wheat
1725	Flathead, Mont.	2.21	12.29	2.05	Rejected - insufficient spring wheat
1731	Chouteau, Mont.	1.61	2.55	0.22	Rejected - insufficient spring wheat
1755	Jerauld, S. Dak.	1.62	4.19	5.52	Rejected - insufficient spring wheat
1784	Minnehaha, S. Dak.	0.0	7.99	15.01	Rejected - insufficient spring wheat
1811	Kingsbury, S. Dak.	9.08	2.49	9.04	
1825	Norman, Minn.	12.83	4.88	8.45	Rejected - 26% of scene not identified ground truth

TABLE 4.- Concluded.

Sample segment	Location	Spring wheat and durum wheat	Barley	Oats	Comments
1842	Yellow-Medicine, Minn.	8.54	0.0	2.70	Rejected - 23% of scene not identified ground truth
1850	Baca, Colo.	0.0	0.0	0.0	Rejected - insufficient spring wheat
1861	Kearny, Kans.	0.0	0.0	0.0	Rejected - insufficient spring wheat
1876	Ottawa, Kans.	0.0	0.0	0.15	Rejected - insufficient spring wheat
1877	Morrill, Nebr.	0.06	3.79	0.49	Rejected - insufficient spring wheat
1880	Ellis, Kans.	0.0	0.0	0.41	Rejected - insufficient spring wheat
1883	Marion, Kans.	0.3	0.0	0.8	Rejected - insufficient spring wheat
1890	Pawnee, Kans.	0.0	0.0	0.0	Rejected - insufficient spring wheat
1891	Mitchell, Kans.	0.0	0.0	0.23	Rejected - insufficient spring wheat
1909	Kidder, N. Dak.	15.30	2.07	4.11	Rejected - inadequate acquisitions of good data quality
1918	Grant, N. Dak.	5.86	1.92	6.89	Rejected - inadequate acquisition coverage
1920	Sioux, N. Dak.	16.89	0.47	4.9	
1924	La Moure, N. Dak.	29.04	1.43	4.79	
1938	Teton, Mont.	6.00	7.49	0.14	Rejected - insufficient acquisitions in growing season of spring wheat
1942	Richland, Mont.	12.06	2.84	0.42	
1948	Fergus, Mont.	2.11	3.65	0.0	Rejected - insufficient spring wheat

TABLE 5.-SPRING WHEAT SEGMENT DATA SET

Segment no.	Location (county, state)	Acquisitions available, 1978 Julian day	Sample field (line, pixel)	Comments
1380	Kimball, Nebr.	115 169 196 (L-3) 204 205 222 231 (L-3) 232 (L-3) 241 249 (L-3) 268 (L-3)	(110, 130) (110, 134) (113, 134) (113, 130)	This segment has good acquisition coverage, nice-sized fields in general and little wheat. Wheatfields tend to be small so training fields of wheat are difficult to locate. Segment is predominately corn (32%) and soybeans (39%). Acquisition coverage of the wheat growth cycle is good, but small wheatfield size and low percentage of wheat in the scene make the segment marginal for use in program development for wheat classification. On Julian days 222, oats in harvest; 268, clouds.
1387	Ramsey, N. Dak.	135 136 154 216 (L-3) 252 (L-3) 270 (L-3)	(30, 130) (25, 140) (32, 140) (34, 130)	This segment has a shortage of acquisitions but acquisitions are well distributed over the wheat growth cycle. Spring wheat in this segment is primarily durum wheat. Area is dotted with small lakes; field size good; 27% of the segment is idle cropland. Segment is marginal for use in program development. On Julian days 154, some clouds; 252, some harvest of small grains.
1394	Burke, N. Dak.	120 156 174 175 211 219 (L-3) 220 (L-3) 228 238 246 247 264 273 (L-3)	(19, 60) (10, 70) (25, 70) (25, 80)	Segment has small fields and some strip fields. Acquisition coverage is good. Area is dotted with small lakes; 26% of scene is idle cropland, 11% is grass, and 11% of the scene has not been identified ground truth. Segment is marginal for use in program development. On Julian days 156, small grain emergence; 175, cloudy; 211, a few clouds; 238, a few clouds; 264, harvest.
1457	Ward, N. Dak.	156 174 228 246 264 273 (L-3)	(34, 170) (34, 175) (40, 175) (40, 170)	Area is dotted with small lakes. There are two distinct planting dates for spring wheat: emergent on 156 and emergent on 174. With the acquisitions available, "late" spring wheat could be confused with the predominate summer crop, sunflowers. For this segment, 22% is idle cropland. Segment is preferred for use in program development. On Julian days 156, clouds; 228, one field of wheat harvested; 246, early cycle wheat harvested.
1461	Pierce, N. Dak.	118 136 137 154 155 190 199 (L-3) 208 209 217 (L-3) 218 (L-3) 236 (L-3) 263	(7, 159) (7, 166) (11, 166) (11, 159)	This segment has been analyzed extensively. A severe hail storm between acquisitions 190 and 199 damaged fields in the triangular area [(line 40, pixel 0) to (line 0, pixel 150)] as well as some fields outside this area. On the imagery, these fields exhibit a barley-like growth cycle; in the individual channel plots, hail-damaged wheat fields exhibit a different signature both from barley and from wheat. Hail damage shows most clearly on the production film converter products for acquisition 78 208. This segment has a good acquisition history, and hail damage at the peak of the spring wheat growing season produces a visibly unusual signature. This segment is 22% idle cropland. Segment is preferred for use in program development. On Julian days 118, cloudy; 136, haze; 199, three small clouds; 208, slight haze; 209 clouds; 218 misregistered; 236, harvest of wheat
1537	McCone, Mont.	122 141 159 194 195 213 221 (L-3) 222 (L-3) 231 266	(15, 9) (13, 22) (15, 22) (17, 9)	Segment has good field size and both winter and spring wheat; 54% of the scene is pasture and 18% idle cropland. Segment is preferred for use in program development. Harvest of winter wheat begins on Julian day 195; small grain harvest extends to day 266. On Julian day 141, winter wheat emergent; 159, spring wheat emergent; day 195, some winter wheat harvest; 231, spring grain harvest.
1542	Roosevelt, Mont.	122 141 159 176 194 222 (L-3) 231 258 (L-3)	(8, 1) (8, 7) (15, 7) (15, 1)	Segment has some strip fields; 45% of the scene is pasture, 21% is idle cropland. There is some winter wheat acreage. Segment is preferred for use in program development. On Julian days 159, emergence; 231, harvest begins.

TABLE 5.-Continued.

Segment no.	Location (county, state)	Acquisitions available, 1978 Julian day	Sample field (line, pixel)	Comments
1544	Sheridan, Mont.	104 122 140 158 176 221 (L-3) 230 239 (L-3) 266	(9, 57) (9, 69) (11, 69) (11, 57)	Data quality is a problem in this segment. Most of the spring wheat is durum wheat, and predominance of strip fields makes field definition difficult. Segment is marginal for use in program development. Of the scene, 23% is pasture and 31% is idle cropland. On Julian days 158, small cloud; 221, haze, cloud; 230, harvest begins; 239, cloudy.
1566	Red Lake, Minn.	115 133 169 196 (L-3) 232 (L-3)	(51, 180) (51, 185) (55, 186) (55, 181)	This segment has a shortage of acquisitions, but acquisitions are well distributed relative to the spring wheat growth cycle. Fields are of reasonable size; 16% of the scene is not identified ground truth; 17% of the scene is corn. Segment is marginal for use in program development. On Julian days 133, some emergence; 232, some wheat harvest.
1636	Stutsman, N. Dak.	117 135 136 154 190 207 208 216 (L-3) 217 (L-3) 226 243 270 (L-3)	(27, 90) (28, 96) (30, 96) (30, 90)	This segment has a wide range of planting dates. Some ground truth wheat is very late but most is harvested on day 226. The area is dotted with small lakes; 11% of the scene is sunflowers, 11% is pasture, and 19% is idle cropland. Segment is preferred for use in program development. On Julian days 117, haze; 136, some emergence; 154, three clouds with shadows; 190, six clouds with shadows; 208, harvest of barley; 226, haze, harvest of wheat.
1650	Hettinger, N. Dak.	136 137 155 156 191 209 218 (L-3) 228 236 (L-3) 246 264 273 (L-3)	(17, 3) (17, 10) (22, 10) (22, 3)	This is a strip field area and much of this segment (17%) has been "block" ground truthed (strips are not delineated but the area has been given one designation). Ground truth comparison cannot be made in these areas. A sample spring wheatfield of acceptable size was difficult to locate. The scene is 21% pasture, 12% idle cropland. Segment is marginal for use in program development. On Julian days 137, clouds; 155, emergence; 191, three clouds; 218, some harvest; 228, wheat harvest.
1653	Burleigh, N. Dak.	101 119 136 137 154 155 190 191 199 (L-3) 208 209 217 (L-3)	(93, 48) (93, 55) (98, 57) (98, 49)	Scene is strip field area. Acquisition coverage is good, but wheatfields of adequate size are difficult to define. Segment is 12% grass and 39% pasture. Segment is preferred for program development. On Julian days 101, haze; 136, early emergence; 137, clouds; 190, clouds; 191, some small clouds; 199, clouds; 208, barley in harvest; 217, some wheat harvest.
1668	Perkins, S. Dak.	156 174 219 (L-3) 228 246 264 273 (L-3)	(36, 158) (36, 163) (38, 162) (38, 157)	Scene is strip field area and low percentage of wheat. Segment is 67% pasture, and acquisition coverage is marginal. Segment is marginal for use in program development. On Julian days 156, emergence; 219, haze; 246, harvest of small grains beginning.
1811	Kingsbury, S. Dak.	115 133 134 197 (L-3) 215 (L-3) 224 232 (L-3) 233 (L-3) 250 (L-3) 251 (L-3) 268 (L-3) 269 (L-3)	(70, 70) (70, 80) (78, 80) (78, 70)	Fields in this segment tend to be small and acquisition coverage of the early part of the growth cycle is poor. The scene is 24% corn and 17% has not been identified ground truth. Segment is marginal for use in program development. On Julian days 115, few clouds; 232, cloud shadow; 250, small grain harvest; 269, haze.

TABLE 5.- Concluded.

Segment no.	Location (county, state)	Acquisitions available, 1978 Julian day	Sample field (line, pixel)	Comments
1920	Sioux, N. Dak.	101 136 137 199 (L-3) 209 217 (L-3) 218 (L-3) 236 (L-3) 271 (L-3)	(78, 28) (78, 37) (82, 37) (82, 28)	This is a strip field area, and acquisition history is marginal. The segment is 12% hay and 45% pasture. Segment is marginal for use in program development. On Julian days 199, some small clouds; 236, some harvest; 271, clouds.
1924	La Moure, N. Dak.	135 136 154 198 (L-3) 207 208 216 (L-3) 217 (L-3) 226 243 252 (L-3) 270 (L-3)	(2, 21) (2, 31) (6, 31) (6, 21)	For this segment, 14% of the scene is pasture, 10% is idle cropland, and 12% has not been identified ground truth. Segment is preferred for use in program development. On Julian days 154, two small clouds, emergence; 198, slight haze; 226, haze, some harvest; 243, slight haze; 252, 25% clouds.
1942	Richland, Mon.	104 122 176 194 221 (L-3) 230 248 266	(18, 40) (18, 50) (22, 50) (22, 40)	Acquisition coverage of growth cycle of wheat is marginal; 53% of the scene is mountains, 11% idle cropland. Segment is marginal for use in program development. On Julian days 176, three small clouds; 221, a few clouds; 230, some harvest; 248, haze.

on data quality; some agronomic observations; and an evaluation, "preferred" or "marginal," of segment usefulness in program development.

Table 6 lists scene components (other than spring small grains) which comprise more than 10 percent of the scene in each of the segments rejected from use in program development.

Geographical distribution of the recommended data set is illustrated in figure 2.

TABLE 6.-SCENE COMPONENTS OF REJECTED SPRING WHEAT SEGMENTS

[Refer to table 3]

Sample segment	Scene component
1003	19% winter wheat, 26% pasture, 25% idle cropland
1009	68% corn
1023	29% winter wheat, 20% corn, 25% idle cropland, 13% pasture
1035	37% winter wheat, 12% corn, 32% idle cropland
1041	35% winter wheat, 15% grass, 35% idle cropland, 11% not identified ground truth
1047	34% winter wheat, 12% pasture, 33% idle cropland
1075	28% corn, 40% pasture
1077	39% corn, 10% idle cropland
1091	71% pasture, 12% idle cropland
1151	22% winter wheat, 15% sorghum, 14% pasture
1154	20% winter wheat, 44% pasture, 16% idle cropland
1156	23% sorghum, 14% soybeans, 26% pasture
1159	11% corn, 28% sorghum, 28% pasture
1173	28% winter wheat, 14% sorghum, 21% pasture, 22% idle cropland
1175	39% winter wheat, 22% idle cropland
1229	44% winter wheat, 22% pasture
1239	82% pasture
1253	33% soybeans, 27% pasture, 11% trees
1281	29% winter wheat, 30% pasture, 32% idle cropland
1286	23% winter wheat, 40% pasture, 28% idle cropland
1299	46% winter wheat, 15% sorghum, 10% pasture, 17% idle cropland
1341	13% winter wheat, 14% soybeans, 10% sorghum, 40% corn
1346	16% winter wheat, 45% pasture, 19% idle cropland
1377	64% cotton
1379	37% winter wheat, 41% idle cropland
1382	13% winter wheat, 56% pasture, 13% idle cropland
1392	10% sunflowers, 13% pasture, 21% idle cropland
1467	30% idle cropland
1472	14% sunflowers, 11% idle cropland
1473	14% sunflowers, 11% soybeans
1476	72% pasture
1485	16% alfalfa, 31% pasture
1499	30% pasture, 27% trees, 14% nonagriculture
1502	20% winter wheat, 10% pasture, 11% corn, 13% water, 12% homestead, 10% idle cropland
1518	17% trees, 13% nonagriculture
1553	28% pasture, 30% mountains, 13% idle cropland
1572	64% pasture, 14% corn
1583	40% pasture, 11% water, 17% idle cropland
1586	11% sunflowers, 11% grass, 13% idle cropland
1591	15% corn, 37% pasture
1594	10% winter wheat, 24% pasture, 29% sorghum
1596	18% winter wheat, 36% pasture, 18% sorghum
1599	17% hay, 24% pasture, 13% water
1602	11% pasture, 11% water, 28% idle cropland
1612	20% hay, 30% pasture
1619	15% sunflower, 11% idle fallow
1656	68% pasture, 16% hay
1658	none
1664	10% pasture, 11% sunflowers
1671	68% pasture, 18% trees
1676	10% alfalfa, 42% pasture, 13% hay
1678	None
1695	52% pasture, 30% trees
1725	25% trees, 15% pasture, 12% hay
1731	18% winter wheat, 36% mountains, 22% idle cropland
1755	50% pasture, 11% hay
1784	19% pasture, 30% corn
1825	25% trees
1842	28% corn, 27% soybeans, 23% not identified ground truth
1850	24% winter wheat, 43% pasture
1861	34% winter wheat, 16% pasture, 37% idle cropland
1876	18% winter wheat, 68% pasture
1877	68% pasture
1880	20% winter wheat, 39% pasture, 16% idle cropland
1883	15% winter wheat, 51% pasture, 16% sorghum
1890	29% winter wheat, 19% alfalfa, 17% sorghum, 16% idle cropland
1891	46% winter wheat, 13% sorghum, 13% pasture, 21% idle cropland
1909	13% alfalfa, 20% grass, 12% pasture, 11% water
1918	56% pasture
1938	17% winter wheat, 28% idle cropland, 17% not identified ground truth
1948	60% mountains, 13% idle cropland

[a]These components are those other than spring small grains which comprise more than 10 percent of the scene.

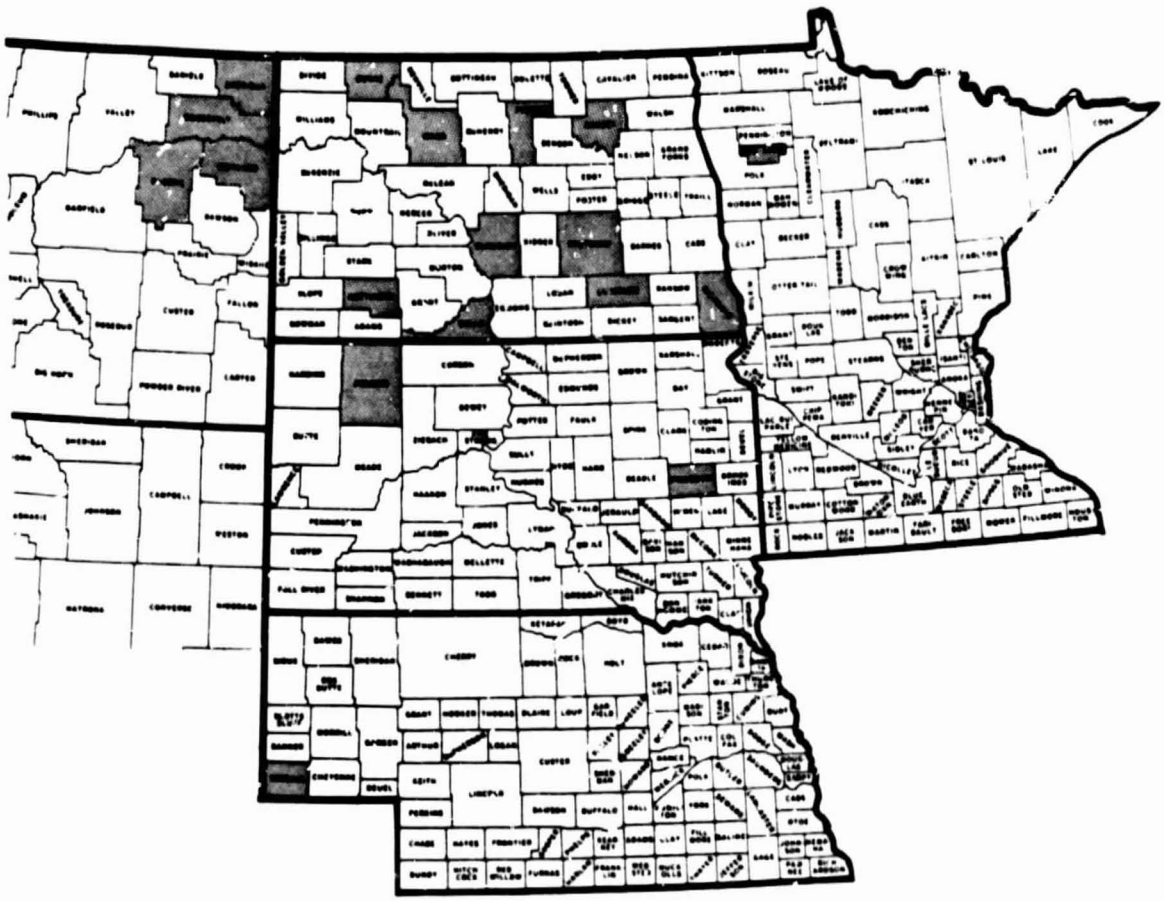

Figure 2.- Distribution of spring wheat segment data set.

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