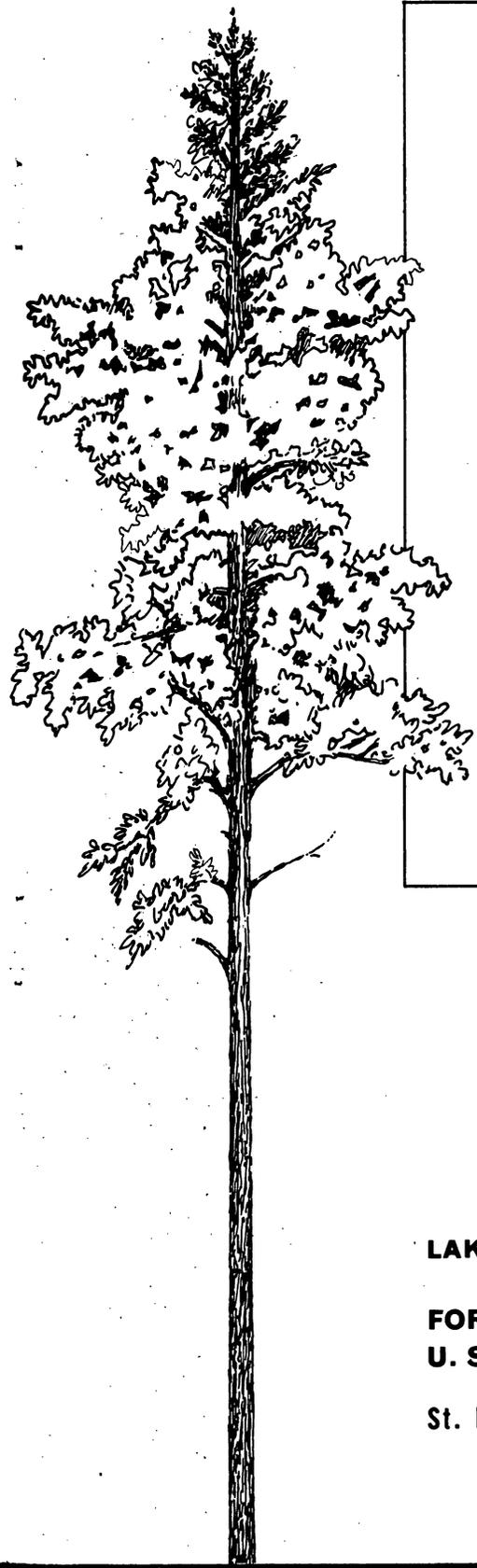
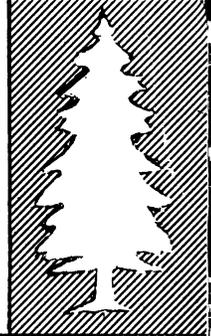


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INSTRUCTIONS FOR
FOREST SURVEY IN THE NORTHERN PLAINS

APRIL 1964

NOT FOR PUBLICATION

LAKE STATES FOREST EXPERIMENT STATION

**FOREST SERVICE
U. S. DEPARTMENT OF AGRICULTURE**

St. Paul 1, Minnesota

INSTRUCTIONS FOR
FOREST SURVEY IN THE NORTHERN PLAINS

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Lake States Forest Experimental Station
Forest Service
U. S. Department of Agriculture
St. Paul 1, Minn.

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INSTRUCTIONS FOR
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I. Introduction

The Forest Survey carries on a comprehensive and continuing inventory of the timber resources of the United States as authorized by Congress in the McSweeney-McNary Forest Research Act of May 1928 and subsequent amendments. Its objectives are to provide up-to-date information on forest land area, timber volume, growth, mortality, timber cut, potential productivity, and forest ownership. It is financed to provide this information for states and units. The interpretation of these facts provides the basis for planning the management and development of the forest resource. Reoccurring surveys at about 10-year intervals will show trends and provide guidance to developmental and management programs.

The first Forest Surveys of Kansas and South Dakota were made in the late 1930's by the Lake States Forest Experiment Station. "Forest of South Dakota, Their Economic Importance and Possibilities" was written by E. R. Ware and published by the Station in 1936. "Woodlands of Kansas" was written by E. R. Ware and Floyd F. Smith and published by the Kansas Agricultural Experiment Station as Bulletin 285 in 1939.

In 1954 the Central States Forest Experiment Station made a quickie survey of the forests of Kansas as basis for rough estimates to use in the nationwide Timber Resources Review. No state report was prepared.

In 1954 the Lake States Station made a survey of North Dakota. "The Timber Resources of North Dakota" by John R. Warner and Clarence D. Chase was published in Station Paper No. 36, February, 1956. In the mid 1950's the Forest Service made a more thorough survey of the forest resources of Nebraska. This was reported by Robert N. Stone and Walter T. Bagley as "The Forest Resources of Nebraska" in Forest Survey Release No. 4 of the Rocky Mountain Forest and Range Experiment Station, June, 1961.

Plans call for measuring the timber resources of Kansas and Eastern South Dakota during the winter of 1964-5, and of Nebraska and North Dakota about 1970. State agencies are invited to cooperate in this work in order to obtain a more accurate survey and more localized statistics. Western South Dakota (the area west of the 103 meridian) was inventoried by the Intermountain Forest and Range Experiment Station and the Administrative branch of the U. S. Forest Service in 1963. A report covering the entire state will be prepared by personnel of the Intermountain and Lake States Stations. A report on the timber resources of Kansas will be prepared by the latter Station.

No table formats to indicate subject matter to be reported are presented in this plan. The survey is designed to yield the national standard Forest Survey tables to at least the national standards of accuracy. Additional detail or localized information will be contingent upon final statistical accuracy.

The forest inventory phase is designed to utilize serial photos and electronic data processing as much as possible to reduce costs and speed up the job. Standard Forest Survey field procedures will be used. Permanent plots will be established to provide for better information in the future on growth and mortality. Temporary plots will be used in part to provide a more widespread sample, at the same cost, than could be obtained by using permanent plots only.

Timber cut studies will be made in cooperation with the State Foresters. Conversion factors have already been brought together by the Lake States Station.

The State Forester of South Dakota was anxious to obtain figures for six counties in the southeast and northeast corners of his state (fig. 1). He liked the idea of grouping remaining counties by market areas within river basins since the statistics for many counties would be too inaccurate to be meaningful. Estimated areas by counties and county groups are given in table 1.

The State Forester of Kansas wished to obtain estimates for a number of counties and small county blocks in Eastern Kansas. He was satisfied with the idea of obtaining figures for larger county groups (fig. 2) laid out by market and river basin areas in Western Kansas. Estimated areas by counties and county groups are given in table 2.

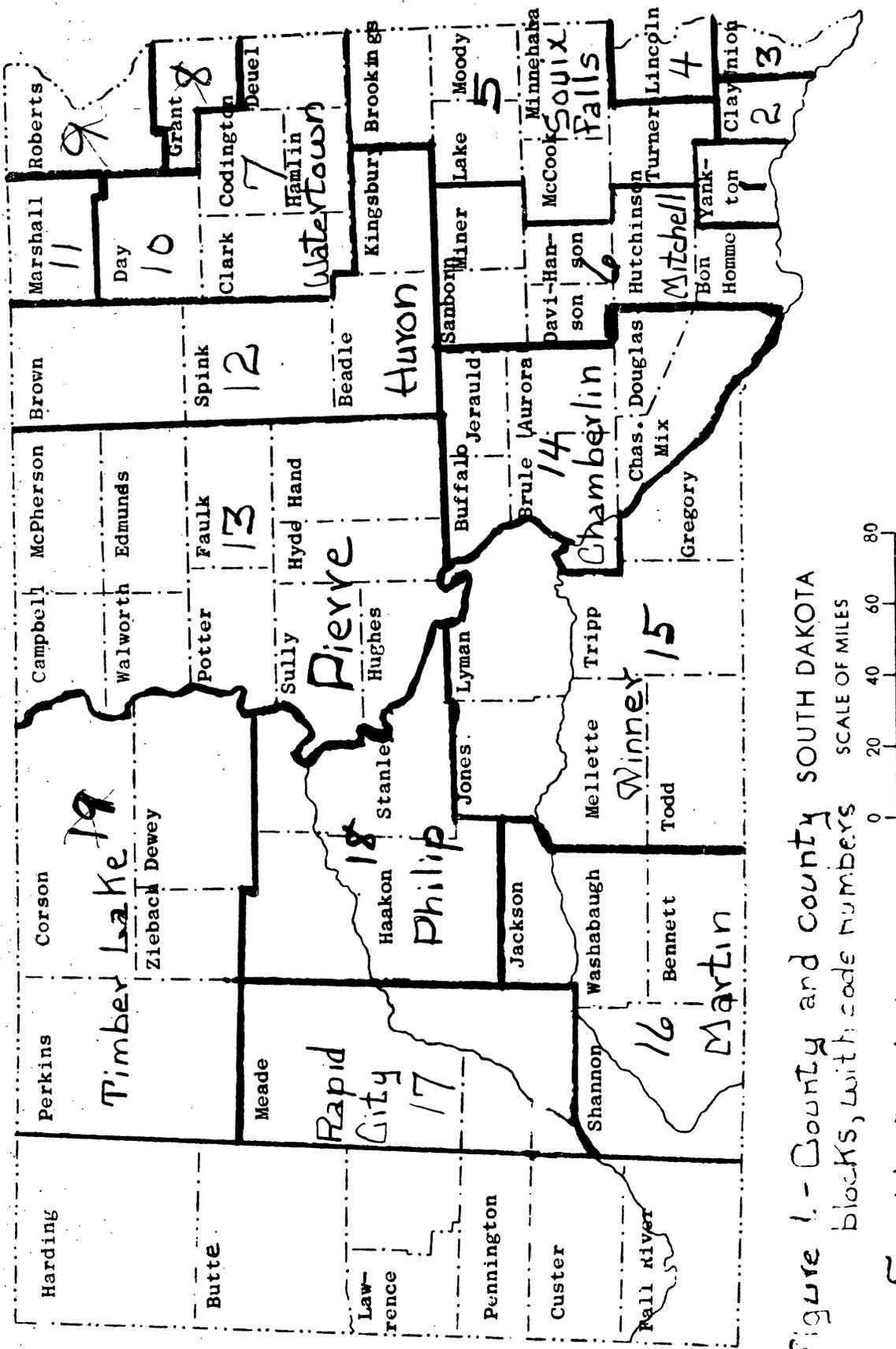


Figure 1.- County and County South Dakota blocks, with code numbers
South Dakota 1963

Table 1.--Land and estimated forest areas by counties of blocks, Eastern South Dakota (Unit 1), 1963

County or block	Gross area	Woodland ^{1/}	Percent forest
	M acres	M acres	Percent
1. Yankton	340	6.8	2.0
2 Clay	266	1.8	0.7
3 Union	298	4.9	1.6
4 Lincoln	369	3.7	1.0
5 Sioux Falls (6 co.)	2,512	21.2	0.8
6 Mitchell (6 co.)	2,180	25.0	1.1
7 Watertown (4 co.)	1,841	18.4	1.0
8 Grant	440	5.7	1.3
9 Roberts	730	13.1	1.8
10 Day	703	9.1	1.3
11 Marshall	567	12.5	2.2
12 Huron (4 co.)	3,400	44.8	1.3
13 Pierre (10 co.)	6,330	36.1	0.6
14 Chamberlain (6 co.)	2,674	17.4	0.7
15 Winner (6 co.)	5,143	58.2	1.1
16 Martin (4 co.)	3,304	54.7	1.7
17 Rapid City (part of 3 co.)	3,200	40.0	est. 1.2
18 Philip (part of 3 co.)	3,400	6.2	0.2
19 Timber Lake (3½ co.)	5,010	23.3	0.5
Total		402.9	

^{1/} From Conservation Needs Inventory

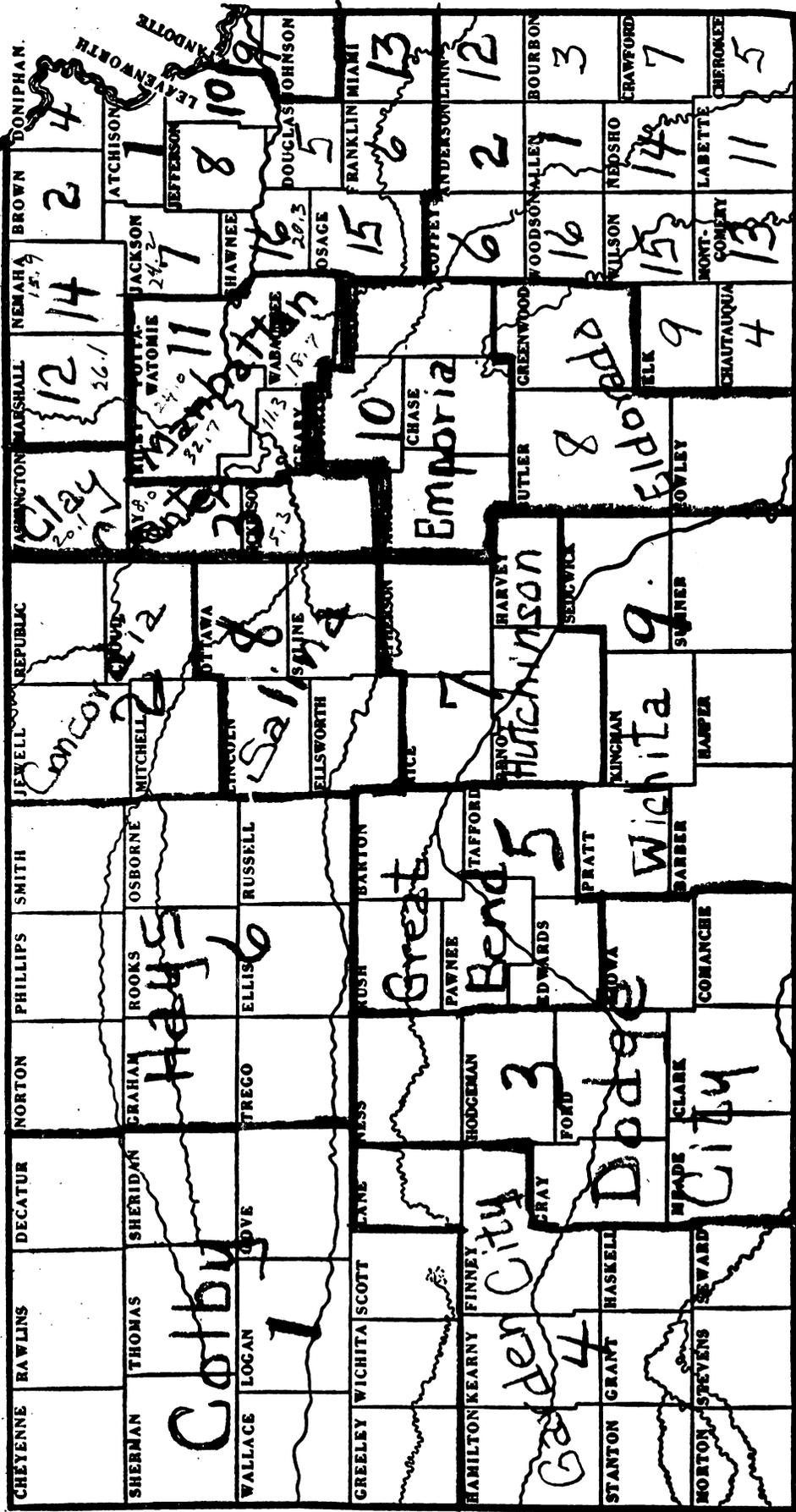


Figure 2.--Survey units, county, and county blocks, with code numbers, Kansas, 1963.

Table 2.--Land and estimated forest areas, by county or block, Kansas, 1963

County or block	Gross area	Estimated percent forest	Estimated forest
	Acres	Percent	Acres
Northeastern Unit (1)			
1 Atchison ✓	275,840	8	22,100
2 Brown ✓	369,920	4	14,800
3 Clay Center (3 co.) ✓	1,539,200	2	30,800
4 Doniphan ✓	254,720	15	38,200
5 Douglas ✓	303,360	11	33,400
6 Franklin ✓	369,280	5	18,500
7 Jackson ✓	419,840	5	21,000
8 Jefferson ✓	353,280	8	28,300
9 Johnson & Wyandotte ✓	407,680	12	48,900
10 Leavenworth ✓	302,080	11	33,200
11 Manhattan (4 co.) ✓	1,712,640	3	51,400
12 Marshall ✓	583,040	3	17,500
13 Miami ✓	378,880	13	49,300
14 Nemaha ✓	453,760	5	22,700
15 Osage ✓	461,440	5	23,100
16 Shawnee ✓	353,280	8	28,300
Total	8,538,240		481,500
Southeastern Unit (2)			
1 Allen	323,200	4	12,900
2 Anderson ✓	369,280	4	14,800
3 Bourbon ✓	408,960	13	53,200
4 Chautauqua	414,080	7	29,000
5 Cherokee	375,680	11	41,300
6 Coffey	419,840	5	21,000
7 Crawford	382,720	12	45,900
8 Eldorado (3 co.)	2,389,760	3	71,700
9 Elk	414,080	4	16,600
10 Emporia (4 co.)	2,106,880	3	63,200
11 Iabette	418,560	10	41,900
12 Linn ✓	389,120	12	46,700
13 Montgomery	415,360	10	41,500
14 Neosho	375,680	6	22,500
15 Wilson	367,360	7	25,700
16 Woodson	322,560	3	9,700
Total	9,893,120		557,600
East Kansas (N.E. & S.E.)	18,431,360	5.64	1,039,100
Western Unit (3)			
1 Colby ✓	7,236,480	.9	65,100
2 Concordia ✓	1,959,040	1.2	23,400
3 Dodge City	4,728,320	1.0	47,300
4 Garden City	4,996,480	.9	45,000
5 Great Bend	2,426,880	1.0	24,300
6 Hays ✓	5,157,760	1.0	51,600
7 Hutchison	2,190,720	1.1	24,100
8 Salina ✓	1,850,880	1.1	20,400
9 Wichita	3,671,040	1.1	40,400
Total	34,217,600	0.998	341,600
State Total	52,648,960		1,380,700

Additional details on the schedules and cooperative arrangements, survey design and accuracy, etc., are given in the following sections. These are all supplemental to the Forest Survey instructions found in Chapter 4810 of the Forest Service Handbook.

II. Scheduling and Cooperative Arrangements

In view of the large portion of Michigan which is in the deep snow belt, the relatively short time needed to inventory the woodlands of Kansas and eastern South Dakota and the pressure from all states for a resurvey, it was deemed best to work in the three states simultaneously. Present plans call for Forest Service crews to work in the Upper Peninsula of Michigan until about November 15, 1964. They will then spend 5 months (with a Christmas break) in the Plains States before returning to work in the Upper Peninsula of Michigan about April 15, 1965.

Harold Gallaher, the Kansas State Forester, expects to raise \$38,000 for intensifying the survey of his state. He plans to assign one man to photo interpretation in June of 1964 and to field 2 two-man crews beginning in July.

Paul DeBald, who was party leader for the Illinois Survey, will direct the Plains Survey and provide necessary training and limited supervision from St. Paul. He will also do photo interpretation work for the inventory of eastern South Dakota.

Robert Arkins, the South Dakota State Forester, is considering assigning one man for 6 months (late October through April) and 2 or 3 men for 2½ months (November 15 through January) to the resource survey.

Plans call for a brief training session in mid November to orient Forest Service crews to prairie conditions and train South Dakota foresters. Forest Service men will then pair off with South Dakota men for a follow-up training on the job period of several weeks. Thereafter, most of the work will be by one man crews. Emphasis will be given to Kansas in an effort to complete it by the end of February.

Field records will be sent in to St. Paul weekly for editing and card punching. Computing of the field inventory data will be handled as quickly as possible. Eastern South Dakota will be handled as one survey unit; Kansas as 2 or preferably 3 units.

The State Foresters for both states have their staff alerted to watch for sawmills and other primary wood industries. Their men will canvass these plants during the winter and early spring of 1965 for the timber cut in 1964. This information will be compiled in St. Paul following the usual routines.

A state report plus a set of unpublished work tables are planned for South Dakota. The State report will be a joint effort by the staff of the Intermountain and Lake States Experiment Stations. A state report plus two local reports are anticipated for Kansas. Effort will be made to complete the local reports by September and the state report by December 1965.

This plan is based upon the assumption that each cooperator will do that portion of the job he is best fitted or located to do. Hence State men will make the sawmill canvass and do the greater share of the field job which must be done in the Plains States. This will save time and costs for survey field men. In return, the St. Paul Survey office will take over all computing and report writing. It will publish the Kansas State Report but the State Forester will publish the local reports. No transfer of funds is required but a memorandum of understanding will be suggested prior to start of the survey.

III. Survey Design, Accuracy and Costs

The inventory design basically provides for a two-stage proportional sample to facilitate making comparisons between surveys. Additional nonforest ground checks will be made to increase area accuracy in the present survey. First, a dot count will be made on aerial photographs to determine general land-use classes--forest, water, wooded strips and other nonforest. All points dot counted as forest will be examined immediately under a stereoscope and further classified as to cover type and stand-density. Secondly, ground checks will be made of a proportion of both the forest and nonforest dots. A plot will be established at each ground check (forest and nonforest) that is found to be on commercial forest land. The first stage will provide uncorrected estimates of forest and nonforest land and of type and stand-density using a very large and well distributed sample. The second stage provides correction factors for area estimates and a small but well distributed sample of forest stand composition and volume. One-third of the plots in the basic sample will be permanent plots which may be remeasured in future years to determine growth and mortality more accurately than is now possible. Proportionate sampling helps make comparisons between surveys more meaningful.

The accuracy goals, variability, and costs were the basis for determining the numbers of samples of various kinds. Two formulae are used to determine optimum allocation for least cost. The area accuracy goals were ± 3 percent statistical error at one standard deviation per million acres of commercial forest land in eastern South Dakota and western Kansas and 10.7 percent per average county in eastern Kansas. The latter worked out to 1.6 percent per million acres. The volume accuracy goals were ± 5 percent statistical error at one standard deviation per billion cubic feet in eastern South Dakota and western Kansas, and ± 12 percent per average county in eastern Kansas. Indications are that volume accuracy will be approximately 3.0 percent, 3.0 percent and 2.2 percent per billion acres for the three areas respectively; when samples are adequate to meet the area accuracy goals.

The sampling design calls for laying a 20 dot transparency over every second photo on every flight line. Since each grid covers two stereo models, 100 percent of the land area will be sampled. The grid was designed in accordance with the Multiple Random Starts principle to provide a systematic sample unbiased by photos being flown along roads. Five samples of 4 dots each may be used or the 20 dots may be used as one sample. Adjustments in sample size of subsequent surveys and changes in design (perhaps to remeasuring a few plots each year) are greatly facilitated.

Every forest dot will be stereoclassified in order to provide a sufficient sample of forest cover. One-twelfth of the stereoclassified points will be sampled on the ground. At one-third of these permanent plots will be established. At two-thirds, temporary plots will be taken. One-fourth of the nonforest dots will be checked. Plots will be established at those found to be on commercial forest land. One twelfth (the basic sample) of the nonforest points will be ground checked in the same proportions as the forest points. The additional nonforest ground checks will be in the form of temporary plots. Relationships between areas and samples are given in table 3. Higher percent of forest automatically requires more stereo points and plots in areas where State Foresters wish greater accuracy. Hence the accuracy will be better in the more wooded counties of eastern South Dakota than shown--paralleling the accuracies shown for eastern and western Kansas.

Time and cost estimates are given in tables 4 and 5. The size of the photo job is strikingly shown by the man-day figures. Some 33,400 photos in South Dakota and 41,100 photos in Kansas will have to be handled. Costs are unusually high because of the considerable travel involved. The cost per gross acre varies from 0.07 of a cent in South Dakota to 0.12 of a cent in Kansas. The cost per commercial forest acre varies from 7.5 cents in South Dakota to 4.5 cents in Kansas--varying inversely with the amount of commercial forest land. The distribution of Lake States Station costs to states appears to favor South Dakota considerably. However, when weighted by gross area the cost per acre is almost identical (0.047 vs. 0.045 cents). The cost per commercial forest acre to the states are estimated at 2.5 cents for South Dakota and 2.8 cents for Kansas.

Table 3.--Relations between areas and samples, Kansas and South Dakota, 1964

Item	: Eastern : Se. Dakota	: Western : Kansas	: Eastern : Kansas
Gross area (acres)	42,707,552	33,937,000	18,711,960
Dot grid	20	20	20
Number dots	333,653	265,132	146,187
Photo coverage	Every 2nd photo in every flight line		
Percent forest	0.95	0.92	5.72
Forest area (acres)	402,900	310,700	1,070,000
Forest dots	3,170	2,439	8,362
Stereo dots	3,170	2,439	8,362
Forest plots (1/12)	264	203	697
Permanent plots (1/3)	88	68	232
Temporary plots	176	135	465
Nonforest dots	330,483	262,693	137,825
Nonforest checks (1/4)	82,620	65,673	34,456
Actual ground checks (1/100)	826	657	345
Number acres per dot	128	128	128
Number acres per plot	1,526	1,530	1,535
Area accuracy (million acres, percent)	2.7	2.7	1.6
Volumé accuracy (billion cu. ft., percent)	3.0	3.1	2.2

Table 4.--Time and cost estimates, Eastern South Dakota, 1/29/64

Item	Number	Time (man-days)	Cost (dollars)
Dots	333,653	83	3,002*
Stereopoints	3,170	20	680*
Plots	264		
Permanent	88	57	2,865
Temporary	176	91	4,095
Ground checks	82,620		
Photo	81,794		
Actual	826	165	7,425
Misc. P.I.-Organization, gen. map, editing		20 (12)	608 (408)*
Ownership		16	720
Training & field supervision		20	900
Travel fares		-	210*
Lost time		6	270
Industry survey		15	675
Supplies		-	210
Total field costs		493	21,660
Planning			500
Training & supervision			340
Computing (1 unit)			1,200
Prepare statistical report			800
Local report (by State-mimeographed?)			0
Write and publish State report			2,000
Station overhead (incl. Division-25%) (includes 10 yrs. servicing)			4,000
Lake States Office costs			8,840
Grand total		493	30,500
Distribution - field S. Dak. (total)		238	10,150
* - P.I. L.S. (starred items above)		115	4,300
- field L.S.		140	7,210
- office L.S.		No est.	8,840
- Lake States total		-	20,350

No transfer of funds required.

Table 5.--Time and cost estimates, Kansas Survey, 1/29/64

Item	Actual Total	Planned Total	West Kansas			East Kansas		
			Number	Time (man-days)	Cost (\$)	Number	Time (man-days)	Cost (\$)
Dots	410,851	411,317	265,132	66	1,156	146,187	58	1,608
Stereo points		10,801	2,439	15	610	8,362	56	2,090
Plots		900	203			697		
Permanent			68	45	3,740	232	155	11,600
Temporary			135	68	4,725	465	233	13,950
Ground checks			65,673			34,456		
Photo		99,127	65,016	(included in stereo class)		34,111	(included in stereo class)	
Actual		1,002	657	164	328	345	77	138
Misc. P.I.-organization, gen. map, editing			9 counties	9	225	32 counties	32	288
Ownership			203 plots	12	540	697 plots	28	1,260
Training & field supervision				12	540		36	1,620
Lost time				5	225		10	450
Industry survey				8	360		42	1,890
Supplies				-	101		-	348
Total field costs				404	12,550		727	35,242
			<u>Kansas Total</u>					
Planning (incl. travel)					1,000			
Training & supervision (incl. travel)					1,000			
Computing (3 units)					3,000			
Writing (2 reports)					1,500			
Publishing (2 reports)					1,500			
Write & publish State report					2,000			
Station overhead (incl. 10 yr. servicing) (incl. Div. overhead)					4,698			
Grand total				1,131	62,490			
Kansas contrib.				880	38,000			
IS in field				251	13,992			
IS in office				No est.	10,498			

No transfer of funds is required.

IV. Photo Interpretation Instructions

A. General

The dot count and stereoclassification phase of Forest Survey is extremely important because it forms the basis for subsequent fieldwork. Great care must be taken to insure the accurate classifying and proper recording of photo data.

The procedures and definitions used in photo work are designed for use by an interpreter who is familiar with the area being classified. He must be able to relate what he sees on a photograph to what is actually on the ground. He must have confidence in his classifications. Since plans call for the completion of photowork before the fieldwork is begun, he will not have the advantage of checking his photoclassifications as fieldwork progresses over the State. He should take some time to familiarize himself with ground conditions in the various parts of the State before beginning photowork. He should take some reconnaissance drives, comparing serial photos with ground conditions. He should make some preliminary photoclassifications on areas about which he is uncertain and check them in the field. The time taken to know the aerial photos will more than pay for itself in efficient and confident photoclassifications.

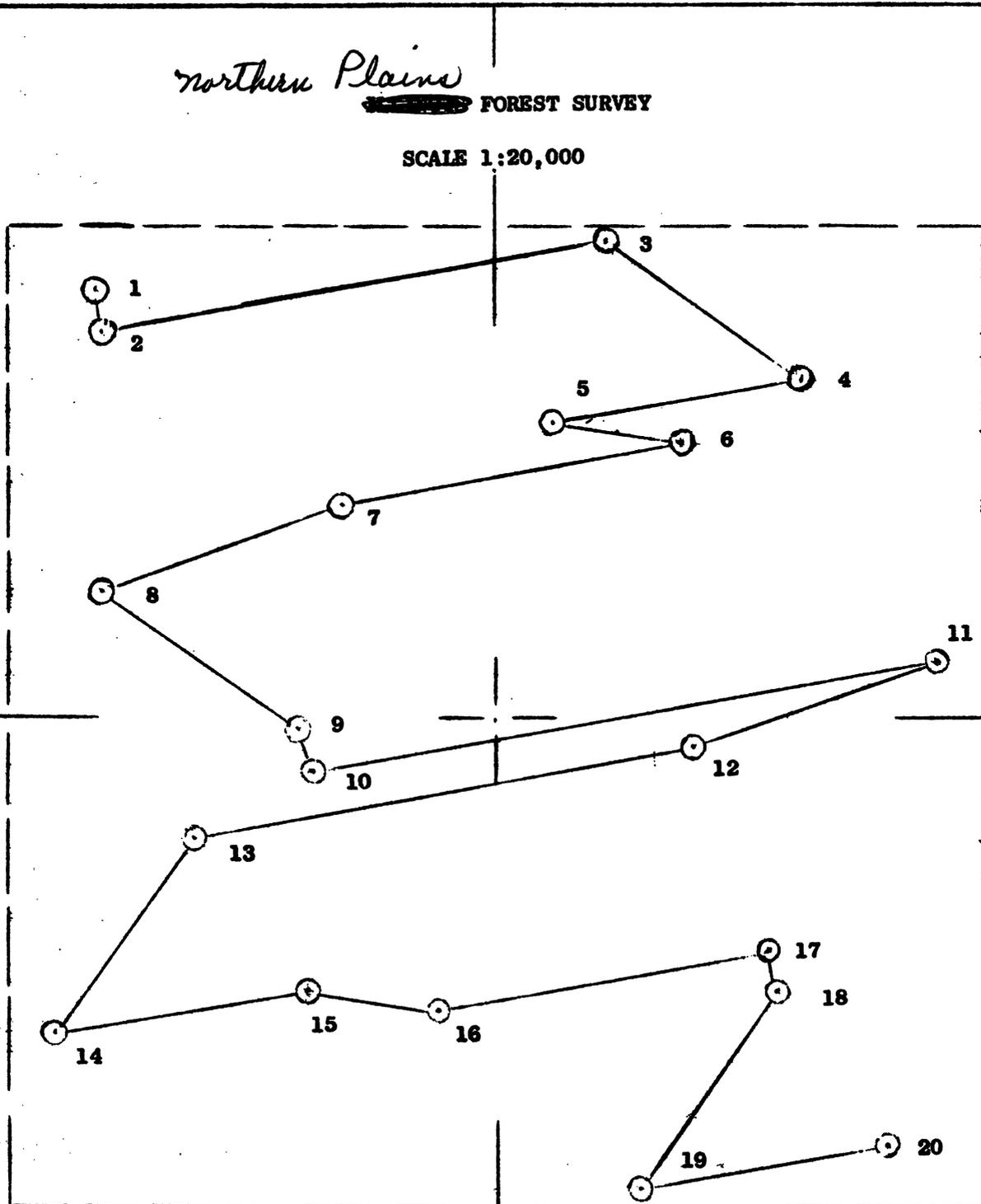
Proper recording of photo data is extremely important. The value of an accurate classification should not be lost by recording it in the wrong place or assigning it the wrong code. The interpreter will be working with pinholes, basically. Each must be treated as an individual. Many of them must be identified for future reference and records must be kept on them to various degrees throughout the Survey. The codes assigned to sample points will serve to identify them. Enter the proper codes, locational and classifying, in the proper spaces of the recording forms. These codes must be complete, accurate, and consistent. The interpreter may find the book-keeping to be a chore. It is necessary. The more care taken to keep the records in order, the quicker and easier the photo job will be.

B. The Grid

The grid has been tested in the Illinois Survey in 1961-62. It is a transparent acetate sheet containing 20 circular sample acres at a scale of 1:20,000, representing approximately 128 acres each (fig. 3). In the center of each sample acre is a pinhole used for locating sample points on photographs. The points are laid out as 5 independent sample groups (starts). Start 1 includes points 1, 6, 11, and 16; start 2 points 2, 7, 12, and 17; etc. Each start represents a valid sample of the photo area. Because of the small number of plots involved, all may be used as one sample in eastern South Dakota and in western Kansas. The survey may be maintained by re-cruising one start every 2 years. Intensity may be changed by adding or dropping starts. Bias due to flights following section line roads is avoided.

The grid is designed to cover two stereomodels and provides 100-percent area coverage when every second photo along a particular flight line is dot

Figure 3.--Illustration of transparent grid composed of 20 sample acres
(4 in each of 5 random starts).



counted. The dot locations have been adjusted for sidelap and overlap so that no area will be covered twice or left unsampled.

C. Dot Count Procedures

The dot count will be made by counties. Begin in the northwest corner of the county and proceed to the southeast corner. Randomly select and dot count either the first or second photo in each flight line that "catches in the county" - that is, has at least one grid sample point in the county. Then dot count every second photo in the flight line until no more photos catch in the county. Photo areas of adjacent counties will be sampled as the adjacent counties are dot counted. It may be necessary to delineate county lines on contact prints in grease pencil to avoid dot counting points in adjacent counties.

To dot classify an aerial photograph carefully align the index marks on each side of the grid over the fiducial marks on the photograph. Always align the top of the grid with the top of the photograph (the side with the photoidentification numbers). This will insure proper stereo-model sampling and allow the dot count to consistently progress from northwest to southeast.

With the grid aligned over the contact print, examine the point under the pinhole in the center of each sample acre. Classify each point as being forest, water, wooded strip, or other nonforest, according to the definitions and letter codes found in the appendix. Note the word "point". While the minimum sample is one acre and an area must be at least one acre in size to be considered a separate dot land-use class, the land class of the point under the pinhole determines the dot land-use class of the sample acre. Even though the sample acre may straddle two distinct land classes, the dot land-use class will be assigned to define the point in the center of the sample acre. In some cases the point itself may seem to be centered on a line between land classes. If it does, "move" the point slightly, first to the north. If the point no longer straddles the land line, code the dot land-use class according to that just north of the point. If it still lies on the line, imagine the point is moved from its original position slightly to the east. The dot land-use class will then be the land class just to the east of the point. If the classification of any dot is questionable, examine it under the stereoscope to improve accuracy.

The dot land-use classification of each point will be recorded on a Photo Dot Record sheet (fig. 4) by start and point. Begin a new sheet for each county. As each photo is completed, summarize the points by land-use classes (OA indicates outside the area--points which fall outside the county). The totals will always be 20. As each sheet is completed, summarize the points by land-use classes within each start. The total points in each dot land-use class for all starts should equal the total points in each dot land-use class for all the photos on the sheet.

D. Stereoclassification

Because the percent of forest land in the Northern Plains is relatively small, all forest points will be stereoclassified. Make the classification of each forest dot as the dot count is made to avoid extra photo handling.

Pinprick and mark (usually with a small diagonal grease pencil slash mark) each forest point. Using a 2 or 4-power stereoscope classify each forest point according to one of three general cover types and one of six stand-size stocking classes. (See definitions and codes in the appendix.) Record the numerical codes on a Stereoclassification and Ground Check Record (fig. 5). As each point is classified fill in all columns from Flight # through Stereoclass Size-Stocking.

E. Selection of Ground Checks

After photointerpreting the forest points in a county, select sample points for ground checking. The Plains basic sampling plan requires the ground checking of 1/12 of the points in each dot land-use class in each start. That is, within each of the 5 starts, every 12th forest point, every 12th water point, every 12th wooded strip, and every 12th other nonforest point, will be ground checked. The additional sample of nonforest land classes will be "superimposed" on the basic sample.

1. Forest points

Refer to the first county's photo dot record. Randomly select a number between 1 and 12 for each of the five starts. For example, these might be 7, 4, 10, 2, and 6. The 7th forest point in Start 1 would be the first forest ground check in Start 1. Determine subsequent forest ground checks by counting every 12th forest point after the 7th one in Start 1. The first forest ground checks in Starts 2 through 5 would be the 4th, 10th, 2nd, and 6th, respectively. Additional ground checks in each start would be every 12th forest point after the first forest ground check in each start. Square out with red pencil the blocks on the photo dot records that contain the forest points selected for ground checking.

Randomly select a number between 1 and 3 for each start.

Suppose these numbers were 2, 1, 1, 3, 2. In Start 1 "x" out with red pencil the second forest ground check point (second red block). This will indicate the location of the first permanent forest plot to be established in Start 1. Additional permanent plots are determined by counting every 3rd forest ground check in the start. "X" these out. Repeat this procedure for starts 2-5 using (for this example) the above random numbers.

Temporary plots will be established at the forest ground checks that are squared in red; permanent plots will be established at those marked with x's.

2. Nonforest points

Randomly select a number between 1 and 4 for each of the nonforest land-use classes in Start 1. For example, these might be 3, 4, and 2. The first water "ground check" would be the 3rd water point found in Start 1. Additional water "ground checks" will be made at every 4th water point in Start 1 after that. The 4th wooded strip in Start 1 would be the first wooded strip selected for ground check and every 4th one following it. The 2nd "other nonforest" and every 4th one after it in Start 1 would be ground checked. Selecting other sets of random numbers for the initial ground checks in each nonforest land-use class, repeat this procedure for Starts 2 through 5.

As the ground checks for each nonforest land-use class are determined, square out with blue pencil the corresponding blocks on the photo dot record.

The points thus indicated represent the basic proportional nonforest sample (1/12 of the points in each nonforest land-use class) with an additional nonforest ground check sample "superimposed."

Select at random one of the first 9 water "ground checks", one of the first 9 wooded strip ground checks, and one of the first 9 other nonforest ground checks (squared out in blue, above), in each start. These represent the initial permanent nonforest plot locations for each nonforest land-use class in each start. "X" them out on the photo dot record. Count and "x" out every 9th ground check after the first one for each nonforest land-use class in each start.

Temporary plots will be established at all points marked with squares that are found to be on commercial forest land; permanent plots will be established at those marked with x's that are found to be on commercial forest land.

The sample thus determined includes the basic proportional sample (ground checking 1/12 of the nonforest points, with permanent plots at 1/3 and temporary plots at 2/3 of the points that are found to be commercial forest_ plus the additional sample (with temporary plots at all points found to be commercial forest .

"Carry over" the count of ground checks (permanent and temporary) within each land-use class by start from one record form to the next and from one county to the next. As an example, suppose there are 4 forest points in Start 3 left after the last forest ground check. Carrying these 4 over to the next record sheet, the first forest point in Start 3 would be the 5th in the series of 12. Similarly, if there were only 2 water points in Start 4 of "county x," continue the count for water ground checks starting with 3 in Start 4 of "county y." Carry the count of land-use classes from county to county throughout the State.

Indicate the carryover for temporary and permanent ground checks in each land-use class by start at the bottom of the last sheet for the county.

F. Setting Up for Fieldwork

Having selected the ground check points for a county, set up the fieldwork--sort out primary and adjacent photographs for plots, mark plot photos, complete the Stereoclassification and Ground Check Records for forest ground checks, prepare Ground Check Records for nonforest ground checks, mark county road maps, and prepare plot sheets.

As the photos are sorted "cull out" nonforest ground checks that are

definitely nonforest--urban areas, lakes, cropland. You can exclude these from plots which must be visited on the ground and save a good bit of field time. If, however, a nonforest ground check lies in an area that might possibly become forest, it must be checked in the field.

Pinprick on the aerial photos the location of each nonforest point that must be visited on the ground (all forest points have been marked). Circle each such nonforest point in grease pencil on the face of the photo. Assign plot numbers consecutively for forest and for nonforest ground checks for each county. On the backs of the ground check photos (forest and nonforest) circle the ground check points in pencil and note the plot numbers. With grease pencil square the corners of the forties containing ground check locations to aid in locating the plots in the field.

As the photos are sorted and marked, fill in the legal descriptions and plot numbers of the forest ground checks on the Stereoclassification-Ground Check Record used for photointerpretation. Prepare a separate Stereoclassification-Ground Check Record for all nonforest ground checks--those done in the office as well as the ones to be done in the field. On it, fill in the columns from Flight Number through Dot Land Use and also the ground land use column for nonforest ground checks done in the office. No plot number or legal description is necessary for "office ground checks." For nonforest ground checks to be visited in the field record the Flight # through Dot Land Use and also the plot number and legal description. The Ground Land Use will be recorded after the actual ground check is made.

Mark the ground check locations and plot numbers on a county highway map. Use a color code--red for forest plots, blue for nonforest plots.

Prepare a plot (fig. 6) sheet for each ground check except the

nonforest checks done in the office. Enter codes for State, unit, county or county group, location (plot) number, sample kind, and P.I. land use (see appendix). Record the county name in the upper left corner of the sheet. In the upper right hand corner label each plot as being permanent or temporary. Clip it to the ground check photos. Be sure the photo pair for each plot gives stereo coverage. File the plot sheets, ground check records, and county maps, for each county in separate folders for fieldwork.

V. Field inventory instructions

The field inventory plans and forms which have been developed for Forest Survey work nationally will be employed. They are currently being revised. When available, they will be studied and supplemented, if necessary, in this chapter. Copies of both the national and local instructions must be made available for each crew.

VI. Timber cut studies

Instructions for conducting an industry canvass will be developed by Mr. Horn and inserted here. No fuel and fence post or conversion factor studies are anticipated.

VII. Computing and compiling

Computing and compiling will follow the plans used for the Illinois and Kentucky Forest Surveys. Since this work will be done in St. Paul, this chapter is mainly "for the record." It will be completed when the job is about completed so that it may contain the specific programs and their adaptations which were used.

VIII. Reporting and publishing

The general plans regarding analyzing, reporting, and publishing are

covered in Chapters I and II. The State reports may very well follow the Illinois Report which is now in first draft. All standard Forest Survey tables will be presented in the State reports. The local reports will present data for a number of counties giving more information than in "Timber Resources of the Missouri Prairie Region." While it would be desirable to insert or refer to specific table and report formats, both time and uncertainties as to how much data will be publishable prohibit such action now. When the present revolution in reporting is farther along, this chapter may be more complete.

IX. Appendix

This section supplements the definitions and codes found in Chapter 4810 of the Forest Service Handbook. It repeats certain basic definitions for convenience of field workers, provides "aids" and codes to handle "localized" classifications and includes forms and an illustration of the transparent grid.

The following area classification key will help to make accurate and consistent classifications:

<u>Key #</u>	<u>Characteristics</u>	<u>Classify or refer to Key #</u>
1a.	Rivers, lakes, ponds	2
1b.	Other land area	3
2a.	Rivers more than 1/8 mile wide; lakes and ponds larger than 40 acres in area	Water, census (code 91)
2b.	Rivers less than 1/8 mile wide; lakes and ponds smaller than 40 acres in area	Water, small (non-Census)(code 92)
3a.	Land developed for nonforest use, <u>except</u> <u>pastured</u> lands	Other nonforest Code
	1. Urban and residential areas	66
	2. Industrial developments	66
	3. Cropland	61
	4. Resort areas	66

5.	Improved roads and maintained right-of-ways....	66
6.	City parks	66
7.	Orchards	64
8.	Shelterbelt or windbreak less than 120 feet wide and less than 1 acre in area. Classify as wooded strip	67
3b.	Land not developed for nonforest use and pastured lands	4
4a.	Heavily grazed land Use these characteristics as evidence:	5
	1. Fencing	
	2. Stock ponds	
	3. Presence of stock	
	4. Abundant stock droppings	
	5. Compact, soddy ground cover	
	6. Cattle trails	
	7. Absence of low ground cover	
	8. Heavy clipping of palatable plants	
4b.	Land not heavily grazed	8
5a.	Less than 10 percent stocked with forest tree cover (growing stock, cull, and noncommercial trees)	Improved pasture (code 62)
5b.	More than 10 percent stocked with forest tree cover	6
6a.	More than 10 percent stocked with forest trees but less than 25 percent stocked with growing stock trees	Wooded pasture (code 68)
6b.	More than 25 percent stocked with growing stock trees	7
7a.	Land incapable of yielding crops of industrial wood because of adverse site condition (total height at maturity below 35 feet)	Unproductive forest land (code 40)
7b.	Land capable of yielding crops of industrial wood	10
8a.	Land that does not and has never had 10 percent forest tree cover. There are no stumps present and land history indicates no past tree cover (marsh, bog, prairie).	Other nonforest

- 8b. Land having evidence of 10 percent forest tree cover, present or past
- 9a. Land incapable of yielding crops of industrial wood because of adverse site conditions Unproductive forest land (code 40)
- 9b. Land capable of yielding crops of industrial wood 10
- 10a. Public land withdrawn from timber utilization through statute or administrative regulation (state parks, wilderness areas, etc.) Productive-reserved forest land (code 50)
- 10b. Land not withdrawn from timber utilization Commercial forest land (code 20)

A. Cover Type.--Since specific forest cover types cannot be recognized and classified on aerial photos, it is necessary to use general classes in stereoclassifying forest points: softwoods (over 50 percent softwoods), upland hardwoods (over 50 percent upland hardwoods), bottomland hardwoods (over 50 percent bottomland hardwoods). Softwoods include pine and cedar types; upland hardwoods include post-black jack oak, upland elm-ash-locust, oak hickory, and upland plains mixed hardwoods types; bottomland hardwoods include cottonwood, willow, lowland plains mixed hardwoods and bottomland elm-ash-cottonwood types.

Forest Types

<u>Photo</u>	<u>Code</u>	<u>Ground</u>	<u>Code</u>
Softwoods	1	Pine	19
		Eastern redcedar-hardwood	42
Upland hardwoods	2	Post-blackjack oak	51
		Oak-hickory	53
		Upland elm-ash-locust	58
Bottomland hardwoods	3	Upland Plains mixed hardwoods	59
		Cottonwood	73
		Willow	74
		Lowland plains mixed hardwoods	76
		Bottomland elm-ash-cottonwood	77

B. Stand size-stocking.--Variations in cull cause difficulties in photo-classifying stand size-stocking. These variations are more notable in stocking classifications. The broader P.I. Stand Size-Stocking classes will be used in stereoclassifications to compensate for the effect of cull in classifying density.

P.I. Stand Size-Stocking

<u>Code</u>	<u>Class</u>	<u>Stocking</u>
1	Sawtimber good	70-100%
3	Sawtimber medium-poor	10-70%
4	Poletimber good	70-100%
6	Poletimber medium-poor	10-70%
7	Seedlings and saplings good	70-100%
9	Seedlings and saplings medium-poor and nonstocked	0-70%

C. State and County Codes

1. Kansas

a. State

Code Kansas 15

b. Forest Survey Unit (figure 4)

<u>Code</u>	<u>Unit</u>
1	Northeastern
2	Southeastern
3	Western

c. County Group (figure 4)

<u>Unit Code</u>	<u>County group code</u>	<u>County Name</u>
2	1	Allen
2	2	Anderson
1	1	Atchison
3	9	Barber
3	5	Barton
2	3	Bourbon
1	2	Brown
2	8	Butler
2	10	Chase
2	4	Chautauqua
2	5	Cherokee
3	1	Cheyenne
3	3	Clark
1	3	Clay
3	2	Cloud
2	6	Coffey
3	3	Comanche
2	10	Cowley
2	7	Crawford
3	1	Decatur
1	3	Dickinson
1	4	Doniphan
1	5	Douglas
3	5	Edwards
2	9	Elk
3	6	Ellis
3	8	Ellsworth
3	4	Finney
3	3	Ford
1	6	Franklin
1	11	Geary
3	1	Gove

<u>Unit Code</u>	<u>County group code</u>	<u>County Name</u>
3	6	Graham
3	4	Grant
3	3	Gray
3	1	Greeley
2	8	Greenwood
3	4	Hamilton
3	9	Harper
3	7	Harvey
3	4	Haskell
3	3	Hodgeman
1	7	Jackson
1	8	Jefferson
3	2	Jewell
1	9	Johnson
3	4	Kearny
3	9	Kingman
3	3	Kiowa
2	11	Labette
3	4	Lane
1	10	Leavenworth
3	8	Lincoln
2	12	Linn
3	1	Logan
2	10	Lyon
3	7	McPherson
2	10	Marion
1	12	Marshall
3	3	Meade
1	13	Miami
3	2	Mitchell
2	13	Montgomery
2	10	Morris
3	4	Morton
1	14	Nemaha
2	14	Neosho
3	3	Ness
3	6	Norton
1	15	Osage
3	6	Osborne
3	8	Ottawa
3	5	Pawnee
3	6	Phillips
1	11	Pottawatomie
3	9	Pratt
3	1	Rawlins
3	7	Reno

<u>Unit Code</u>	<u>County group code</u>	<u>County Name</u>
3	2	Republic
3	7	Rice
1	11	Riley
3	6	Rooks
3	5	Rush
3	6	Russell
3	8	Saline
3	1	Scott
3	9	Sedgwick
3	4	Seward
1	16	Shawnee
3	1	Sheridan
3	1	Sherman
3	6	Smith
3	5	Stafford
3	4	Stanton
3	4	Stevens
3	9	Sumner
3	1	Thomas
3	6	Trego
1	11	Wabaunsee
3	1	Wallace
1	3	Washington
3	1	Wichita
2	15	Wilson
2	16	Woodson
1	9	Wyandotte

2. South Dakota

a. State

Code South Dakota 40

b. Forest Survey Unit (figure 5)

<u>Code</u>	<u>Unit</u>
1	Eastern (to be surveyed by South Dakota and the Lake States)
2	Western (area surveyed by Rocky Mountain Station and the National Forest)

c. County Groups in Unit 2 (figure 5)

<u>County Code</u>	<u>County Name</u>
14	Aurora
12	Beadle
16	Bennett
6	Bon Homme
5	Brookings
12	Brown

<u>County Code</u>	<u>County Name</u>
14	Brule
14	Buffalo
13	Campbell
14	Charles Mix
7	Clark
2	Clay
7	Codington
19	Corson
17	Custer
6	Davison
10	Day
7	Deuel
18	Dewey (S)
19	Dewey (N)
14	Douglas
13	Edmunds
13	Faulk
8	Grant
15	Gregory
18	Haakon
7	Hamlin
13	Hand
6	Hanson
13	Hughes
6	Hutchinson
13	Hyde
16	Jackson
14	Jerauld
15	Jones
12	Kingsbury
5	Lake
4	Lincoln
15	Lyman
5	McCook
13	McPherson
11	Marshall
17	Meade
15	Mellette
6	Miner
5	Minnehaha
5	Moody
17	Pennington
19	Perkins
13	Potter
9	Roberts
6	Sanborn
16	Shannon
12	Spink
18	Stanley

<u>County Code</u>	<u>County Name</u>
13	Sully
15	Todd
15	Tripp
5	Turner
3	Union
13	Walworth
16	Washabaugh
1	Yankton
18	Ziebach (S)
19	Ziebach (N)

D. Codes used with Dot Count Record

Dot Land Use:

<u>Code</u>	<u>Land Use</u>
F	Forest land
WC	Water, Census
WS	Water, Survey
S	Wooded strip
- (dash)	Other nonforest
0	Outside area (county)

E. Codes Used with Stereoclassification and Ground Check Record

1. Dot and PI Land Use:

10	Forest land
60	Other nonforest
67	Wooded strips
91	Water, Census
92	Water, Survey

2. PI Cover Type

1	Softwood
2	Upland hardwood
3	Bottomland hardwood

3. PI Stand Size-Stocking

1	Sawtimber good
3	Sawtimber poor-medium
4	Poletimber good
6	Poletimber poor-medium
7	Seedlings and saplings good
9	Nonstocked, seedlings and saplings poor and medium.