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RINGNECKED PHEASANT ABUNDANCE AND FOOD AVAILABILITY IN CLINTON AND CASS COUNTIES, MICHIGAN

Thesis for the Degree of M. S.

MICHIGAN STATE COLLEGE

C. Richard Terman

1954

This is to certify that the

thesis entitled

Ringnecked Pheasant Abundance and Food Availability in Clinton and Cass Counties, Michigan

presented by

C. Richard Terman

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RINGNECKED PHEASANT ABUNDANCE AND FOOD AVAILABILITY IN CLINTON AND CASS COUNTIES, MICHIGAN

By

C. RICHARD TERMAN

A THESIS

Submitted to the School of Graduate Studies of Michigan State College of Agriculture and Applied Science in partial fulfillment of the requirements for the degree of

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AN ABSTRACT

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ABSTRACT

Clinton and Cass counties of Michigan differ greatly in populations of the ringnecked pheasant with Cass having very few birds. Samples of the winter foods available to the pheasant were taken from these two counties during the winter of 1953-1954 with the aim of ascertaining if there existed differences in quantity of food available to pheasants during this critical period of their annual cycle.

The samples were selected systematically in fields bordering the crowing count survey route for each county. The crop types sampled were corn (mechanically picked), wheat stubble, hay (all types), fallow fields, herbaceous field borders, and shrubby field borders. Four fields of each crop type were sampled in each county. A one foot square quadrat was used and the area sampled was one foot square extending two feet above the surface of the ground. The food materials (seeds and fruits) included within the quadrat were gathered in sacks, sorted, dried uniformly, and weighed to the nearest milligram. The tedious nature of the collecting, sorting, and weighing processes became evident as this phase of the work was undertaken. Time limitations resulted in comparisons being available only for November, December and March.

The weights of food collected for each crop type during each month were totaled and comparison of counties undertaken. Analysis of variance tests for each crop type by months between counties showed that significant differences at the five per cent level occurred in four of the eighteen comparisons made. In December these were hay, fallow fields, and herbaceous field borders. There was also a significant difference between herbaceous field borders sampled in November. Where differences occurred, Cass had the largest quantity of food available.

Analyses of variance were completed on the pooled total weights of samples from corn, wheat, hay and fallow fields, and on the entire set of data. In each case significant difference was found to exist in the quantity of food available along the census routes in Cass and Clinton counties with Cass having more food available.

Since Cass county has a low pheasant population the availability of food does not seem to be a causative factor for the difference in pheasant abundance in these two areas.

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I. INTRODUCTION

The ringnecked pheasant (*Phasianus colchicus* Linnaeus) is distributed through portions of northern and western United States. In Michigan, the species is confined chiefly to the southern half of the lower peninsula although abundance within this area varies locally. The purpose of this study was to examine two localities differing markedly in pheasant population size and to ascertain if there existed a significant difference between these localities in the quantity of food available for pheasants during the critical winter season.

II. STUDY AREAS

Due to the great difference in pheasant population levels, study areas were selected in Clinton and Cass counties. Indices of pheasant abundance in these two counties are shown in Table 1 (Anonymous, 1952, 1953, 1954; Blouch, 1953b, 1954).

TABLE 1

INDICES OF PHEASANT POPULATIONS IN CLINTON AND CASS COUNTIES

	1951	1952	1953
Clinton			
Crowing count	14.9	24.2	16.3
Broods (mail carriers)	8.8	9.2	7.5
Kill			
Total	17,176	16,009	24,199
Birds per pheasant hunter	2.8	2.7	2.9
Cass			
Crowing count	(none made)	(none made)	.8
Broods (mail carriers)	1.7	.6	1.2
Kill			
Total	2,599	2,673	3,104
Birds per pheasant hunter	1.5	1.5	1.3

The crowing count is the average number of pheasant calls heard per two minute stop along a twenty mile route (Kimball, 1949). In this study, the routes were those adopted by the Game Division, Michigan Department of Conservation (Blouch, 1953a). Maps of the crowing routes are in the pocket of the back cover and the fields studied border these routes.

County pheasant populations are estimated from numbers of broods seen per ten day period by rural mail carriers and from kill figures which indicate the total kill and the number of cocks bagged per hunter as tabulated from the hunter reports.

III. EXPERIMENTAL STUDIES

A. Field Procedure

1. Preparation and background. Pheasant foods and food habits have been studied by Allen (1938), Dalke (1934, 1935, 1943), Fried (1940), Green (1938), Grimmer (1940), Leedy (1936), Trautman (1952), Wright (1941), and others through analysis of crop, gizzard, or fecal materials.

Despite the large quantity of literature available concerning food habits, relatively little work seems to have been done on the field availability of pheasant foods. Allen (1941) collected random samples of grain and weeds on meter square plots at the Rose Lake Wildlife Experiment Station near Lansing, Michigan, from October to March, 1940. Only seeds on stems were collected and the number of samples taken varied from one to five for each field. Fields sampled were corn, wheat, oat stubble, fallow land and gardens, and lespedeza.

Dalke (1934) studied the food available for pheasants in selected counties of southern Michigan during the fall and winter by sampling stubble fields, wild herbaceous areas, and fence rows. Grains and seeds on sample plots four feet square were collected and weighed, and the relative availability by species determined. Leedy (1939)

in Wood County, Ohio, sampled weeds by using rod square plots and soybeans by foot square quadrats.

In Colorado, Sandfort (1949) sampled six major crop types between September 15, 1948, and March 31, 1949. These included corn (stalks and stubble), wheat stubble (disked and undisked), barley stubble (undisked), and oat stubble (undisked). Six fields of each of these types were selected and sampled, using plots one foot square. Five samples were taken in each field during each of four collecting periods. The seeds collected were cleaned and weighed and relative seasonal abundance was determined.

In the summer of 1953, a Michigan State College field class in wildlife management made surveys of the acreages of crops grown in a square section of land surrounding five systematically selected observation stations along the crowing routes in Clinton and Cass counties (Petrides, unpublished). A roadside crop tally was also made by the class, in which only those fields which bordered the routes were tabulated and field borders which were perpendicular to the routes classified according to plant growth. The percentages of occurrence of major crop types were computed for each census route. Some of these data are summarized in Table 2 which also gives crop acreage percentages for each county (Hill, 1953). From the roadside field and field border tally, four field habitat types and two field border types were selected for sampling.

TABLE 2

PERCENTAGES OF CROP AND FIELD BORDER TYPES

	Corn	Wheat	Hay	Fallow	Herbaceous Field Border	Shrubby Field Border
Clinton						
*1950 Mich. Agri. Census	13.9	12.3	17.2			
**Section survey	15.1	21.8	17.3	8.1		
***Roadside tally	11.2	14.0	19.0	10.5	59.0	20.5
Cass						
*1950 Mich. Agri. Census	14.6	9.3	16.2			
**Section survey	16.2	10.4	7.0	8.3		
***Roadside tally	16.7	9.7	13.0	23.2	49.5	21.1

* Per cent of total acres farmed in county.
** Per cent of total acres tabulated on census routes.
*** Per cent of total fields tabulated on census routes.

The four crop types decided upon as best representing the two county census routes were corn (mechanically picked), wheat stubble, hay (all types), and fallow ground (fields which were uncultivated for at least the preceding year). The field borders were herbaceous, in which the height of the predominant vegetation did not exceed three and one-half feet and trees and shrubs did not occupy more than 25 per cent of the area, and shrubby field borders in which the vegetation ranged in height from three and one-half to ten feet with tall trees not occupying more than 25 per cent of the area.

2. Sampling techniques. Soon after the counties were selected, letters explaining the problem and the proposed method of attack were delivered to the owners of land along the study routes and permission to go on the land was requested. The problem was of interest to many of those contacted and permission was given by almost all.

Sampling was begun in November, 1953, and continued once a month in each county through March, 1954. In order to eliminate bias, a systematic procedure was followed in the selection of fields to be sampled. The twenty-mile census routes were divided into four equal portions and the first field of each of the six selected cover types in each five mile portion of the route was sampled.

Due to limitations of time it was decided that five samples would be taken from each cover or crop type with the exception of corn. Since corn has a predominating influence in the pheasant diet (Dalke, 1934; Green, 1938; Leopold, 1933, p. 259; Nelson, 1940) ten samples were taken from corn fields beginning with the December sampling. In November, five plots had been sampled.

The materials used in the field were as follows: a one foot square metal quadrat, a small pointed trowel, for scraping up seeds, numerous ten-pound size paper sacks in which materials from each quadrat were placed, a ruler to measure snow depth, a hand axe for cutting and clearing debris around and in the quadrat, and heavy rubberized gloves when snow was present.

The sampling in each field was done along a line perpendicular to the road and beginning at a point approximately at the center of the field along the road border. The first sample was taken ten paces from the fence or edge of the field or fifteen paces from the road, whichever was more obvious. Ten paces were left between plots in all fields except corn, where five paces separated the plots. The total distance the sample series extended into each field was equal. The collector paced into the field to each sample site and then held the quadrat at arm's length in front of him, after which it was dropped. Care was taken not to influence the exact placing of the quadrat. This was done by looking away or closing the eyes. The seeds and plant materials in the circumscribed areas and on the vegetation two feet above that area were placed in a bag. The two foot height was selected as approximately that which could be reached by a pheasant.

Field borders were sampled similarly, though due to the density of the vegetation the quadrat had to be forced into the field border. This was particularly frequent in the shrubby borders. This caused some disturbance of the area, but care was taken to collect as closely as possible those food materials which would ordinarily be found in the quadrat.

Monthly samples were taken in approximately the same area of each field. Correction had to be made for the

sampling technique in the field borders when it was obvious that the quadrat would fall on the same spot as the previous sample. When this occurred, the quadrat was placed near by in an undisturbed part of the field border.

In individual samples, care was taken to gather all food materials visible. When snow was present, it was removed as much as possible and seeds and fruits visible were taken. The maximum depth of snow encountered was about five inches, and it never crusted sufficiently to deter the pheasants in their search for food.

The December sampling in Clinton county had to be done in two parts due to a blizzard which prevented back-road travel. This postponement of sampling with its resultant change in snow cover, temperature, and other environmental factors, did not appear to have appreciably affected the weight of the food.

Samples taken over the five month period totaled 1,360 but only 800 could be analyzed. Of this number, 200 were from corn fields while 120 samples represented each of the other five cover types.

B. Laboratory Materials and Methods

1. Sorting. Soil screens were used to sift separately the material collected from each plot. All waste plant material, gravel, and dirt were discarded and only food materials such as seeds and fruits were saved. Most of the

work was slow and tedious with some samples taking as long as 5½ hours to complete. After the material was sorted, all the food was placed in small envelopes which were folded, stapled, and filed.

2. Drying. The seeds and fruits were left in the envelopes and put in an electric oven at 80°C for 48 hours. All the same crop collections were placed in the oven together to insure identical preparation for weighing. After the 48 hour period, the envelopes were placed in glass desiccators, and kept there until they were individually weighed.

3. Weighing. Weighing was done on a chain-o-matic balance and the gross weight recorded to the nearest milligram. The food material was removed from the envelopes for the weighing, but plant species were not separated. Each plot sample was weighed separately and samples were in the open air only during the actual weighing. The occurrence of seeds of the following four species also were recorded: foxtail (Setaria sp.), common ragweed (Ambrosia elatior), giant ragweed (Ambrosia trifida), and wild carrot (Daucus carota).

Gross sample weights were used as an indication of food availability since work by Dalke (1934) and Leedy (1940) indicate that pheasants eat a very wide range of foods. As an extreme example, Nelson and Janson (1949) reported finding pheasants which had been killed by automobiles, with their crops and gizzards full of pheasant flesh, feathers,

and bones. These birds were well fleshed and in good condition during a period of observation which followed a heavy storm in South Dakota. From these data, it seems reasonable to conclude that practically all weed and crop seeds taken by the present sampling method would be used as food by pheasants, at least if a shortage of normal foods developed.

IV. RESULTS AND DISCUSSION

A. Data Analyses

Due to the great amount of time found to be involved in sorting and processing the data, only three complete monthly samples could be analyzed for this report. These samples are for November, December, and March. The weight of food from each field was totaled and is recorded in Table 3. Since only five quadrats were taken from each cornfield in November, the total of each was doubled to permit direct comparisons with the later corn data. With the data thus arranged, an analysis of variance test was performed between counties for each crop, each month. This test is summarized in Table 4. With six degrees of freedom, an F value of 5.99 or higher is significant at the 5 per cent level. Of the eighteen tests made, only four fields provided samples which differed significantly in weight from their counterparts in the other county. These were herbaceous field borders for November and hay, fallow fields, and herbaceous field borders for December. In all cases these differences were due to a greater quantity of food in Cass county.

After completion of the month by month analyses, analyses of variance were made for the lumped data excluding field

borders (Table 5) and for the total data including all types sampled (Table 6). Although significant differences by months occurred in only four of the eighteen crop-month tests (Table 4) the analyses of lumped data (Tables 5 & 6) did reveal significant differences in total food availability between the two counties at both the 5 per cent and 1 per cent level of significance.

A record of the occurrence of foxtail, lesser ragweed, giant ragweed, and wild carrot in the crop fields was kept. With a total of 24 fields sampled in each county, percentages of field occurrence were recorded. Little difference existed between counties. The largest difference was in the occurrence of foxtail. In Cass county, this species was found in 16 fields; in Clinton county in only 11. For all weeds combined, Cass county had the greatest percentage occurrence.

From all these data, it appears that pheasant food abundance is higher along the route in Cass county than in Clinton county. In view of sampling difficulties, perhaps the more suitable conclusion would be that there is no evidence of lower food availabilities in the Cass county area of low pheasant abundance.

TABLE 3

WEIGHT OF FOOD MATERIAL COLLECTED (IN GRAMS) BY FIELDS

		November		December		March	
Field		Clinton	Cass	Clinton	Cass	Clinton	Cass
Corn	1	8.384	5.908	6.783	1.461	6.886	4.285
	2	1.968	8.408	.668	20.295	.011	9.683
	3	8.690	7.824	14.455	8.683	2.866	10.440
	4	3.274	6.226	.487	6.504	1.695	5.981
Total		22.316	28.366	22.393	36.943	11.458	30.389
Wheat	1	.208	1.442	.096	1.294	.117	.349
	2	2.749	2.123	3.038	2.348	3.810	.736
	3	2.143	.984	1.218	.782	.191	.076
	4	1.234	1.692	.414	.479	.639	1.006
Total		6.334	6.241	4.766	4.903	4.757	2.167
Hay	1	.000	.000	.043	.081	.000	.001
	2	.037	.116	.040	.764	.234	.074
	3	.011	.226	.030	.891	.277	.033
	4	.002	.102	.001	.577	.001	.283
Total		.050	.444	.114	2.313	.512	.391
Fallow Field	1	.582	.718	.058	.810	.819	.104
	2	.571	2.114	.722	1.574	.010	.836
	3	.726	9.633	.676	1.939	1.235	2.819
	4	.102	1.088	.121	2.065	.123	1.300
Total		1.981	13.553	1.577	6.388	2.187	5.059
Shrubby Field Border	1	4.421	.059	1.031	1.039	.882	3.174
	2	7.426	1.403	.222	1.595	3.328	7.535
	3	.320	.639	.514	.222	.818	.368
	4	9.684	2.631	.816	2.226	5.133	1.319
Total		21.851	4.732	2.583	5.082	10.161	12.396
Herba-ceous Field Border	1	.277	4.986	.311	4.194	3.580	2.716
	2	.126	.273	.032	.893	.106	.553
	3	.424	3.656	.183	1.406	.319	1.460
	4	.108	3.453	.001	3.023	.056	2.325
		.935	12.368	.527	9.516	4.061	7.054

TABLE 4

CROP PER MONTH-COUNTY ANALYSIS OF VARIANCE

Crop	Month	Source of Variation	Degrees of Freedom	Sum of Squares	Mean Square	F Value
	N	Total	7	44.895		
	O	Between Counties	1	4.575	4.575	.681
	V.	Error	6	40.32	6.72	
	D	Total	7	347.263		
Corn	E	Between Counties	1	62.463	62.463	1.316
	C.	Error	6	284.80	47.467	
	M	Total	7	96.496		
	A	Between Counties	1	44.798	44.798	5.199
	R.	Error	6	51.698	8.616	
	N	Total	7	4.367		
	O	Between Counties	1	.002	.002	.003
	V.	Error	6	4.365	.728	
	D	Total	7	7.235		
Wheat	E	Between Counties	1	.003	.003	.003
	C.	Error	6	7.232	1.205	
	M	Total	7	10.664		
	A	Between Counties	1	.838	.838	.512
	R.	Error	6	9.826	1.638	
	N	Total	7	.046		
	O	Between Counties	1	.019	.019	4.2
	V.	Error	6	.027	.0045	
	D	Total	7	.987		
Hay	E	Between Counties	1	.605	.605	9.45*
	C.	Error	6	.382	.064	
	M	Total	7	.117		
	A	Between Counties	1	.002	.002	.105
	R.	Error	6	.115	.019	

TABLE 4 (continued)

Crop	Month	Source of Variation	Degrees of Freedom	Sum of Squares	Mean Square	F Value
	N	Total	7	70.003		
	O	Between Counties	1	16.739	16.739	1.886
	V.	Error	6	53.264	8.877	
	D	Total	7	4.224		
Fallow	E	Between Counties	1	2.893	2.893	13.032*
Field	C.	Error	6	1.331	.222	
	M	Total	7	5.995		
	A	Between Counties	1	1.031	1.031	1.247
	R.	Error	6	4.964	.827	
	N	Total	7	89.543		
	O	Between Counties	1	36.633	36.633	4.154
	V.	Error	6	52.910	8.818	
Shrubby	D	Total	7	3.326		
Field	E	Between Counties	1	.781	.781	1.842
Border	C.	Error	6	2.545	.424	
	M	Total	7	43.994		
	A	Between Counties	1	.625	.625	.086
	R.	Error	6	43.369	7.228	
	N	Total	7	28.388		
	O	Between Counties	1	16.34	16.34	8.137*
	V.	Error	6	12.048	2.008	
Herba-	D	Total	7	17.028		
ceous	E	Between Counties	1	10.1	10.1	8.745*
Field	C.	Error	6	6.928	1.155	
Border						
	M	Total	7	12.71		
	A	Between Counties	1	1.119	1.119	.579
	R.	Error	6	11.591	1.932	

* Indicates significance
F: 5% = 5.99

TABLE 5

TOTAL FOOD WEIGHTS IN GRAMS FOR CROP FIELDS (CORN, WHEAT, HAY, FALLOW FIELD) BY ROUTE PORTIONS

Portion	Clinton County			
	November	December	March	Total
1	9.174	6.98	7.822	23.976
2	5.325	4.468	4.065	13.858
3	11.570	16.379	4.569	32.518
4	4.612	1.023	2.458	8.093
Total	30.681	28.850	18.914	78.445
	Cass County			
1	8.068	3.646	4.739	16.453
2	12.761	24.981	11.329	49.071
3	18.667	12.295	13.368	44.330
4	9.108	9.625	8.570	27.303
Total	48.604	50.547	38.006	137.157

TABLE 5 (continued)

ANALYSIS OF VARIANCE FOR TOTAL OF FOUR CROP WEIGHTS

Source of Variation	Degrees of Freedom	Sum of Squares	Mean Square	F Value
Total	23	716.889		
Between sections	6	345.887	57.648	
Between months	2	41.892	20.946	
Between counties	1	143.629	143.629	9.339*
Counties x months	2	.934	.467	
Error	12	184.547	15.379	

* Indicates significance
F: 5% = 4.75
1% = 9.33

TABLE 6

TOTAL FOOD WEIGHTS IN GRAMS FOR ALL FIELDS BY ROUTE PORTIONS

Portion	Clinton County			
	November	December	March	Total
1	13.872	8.322	12.284	34.478
2	12.877	4.722	7.499	25.098
3	12.314	17.076	5.706	35.096
4	14.404	1.84	7.647	23.891
Total	53.467	31.96	33.136	118.463
	Cass County			
1	13.113	8.879	10.629	32.621
2	14.437	27.469	19.417	61.323
3	22.962	13.923	15.196	52.081
4	15.192	14.874	12.214	42.280
Total	65.704	65.145	57.456	188.305

TABLE 6 (continued)

ANALYSIS OF VARIANCE OF TOTAL FOOD WEIGHTS

Source of Variation	Degrees of Freedom	Sum of Squares	Mean Square	F Value
Total	23	735.381		
Between sections	6	188.943	31.491	
Between months	2	56.087	28.044	
Between counties	1	202.394	202.394	9.3299*
Counties x months	2	27.642	13.821	
Error	12	260.315	21.693	

* Indicates significance
F: 5% = 4.75
1% = 9.33

B. Weather Factors

Regulation of the weather factors involved in a study of this type is impossible. From the United States Weather Bureau (1953; 1954) detailed weather averages were obtained for the two counties. Stations selected to represent each county were St. Johns, in Clinton County and Three Rivers in Cass County. Inspection of these averages showed that the total snow, sleet, and hail for the entire winter period differed only slightly between counties with Clinton having 4.5 inches more. However, during the three months studied, Cass had a total of 2.1 inches more than Clinton. Table 7 shows depth of snow on collecting days.

TABLE 7

SNOW COVER ON COLLECTING DAYS

Clinton County		Cass County	
Nov. 25	Trace snow, ground frozen.	Nov. 27	Five inches and less as day progressed.
Dec. 22	Three to five inches, blizzard.	Dec. 21	Rain, no snow.
Dec. 29	Snow spotty, two to three inches and less.		
March 29	One to six inches progressively, blizzard conditions, ground frozen.	March 22	No snow, ground soft.

C. Future Research

In any study sufficient manpower to permit adequate sampling is a necessity. Yet the return of knowledge obtained for effort put forth is a practical consideration.

The following suggestions are made in the event that further research in this problem is undertaken. In corn fields, a quadrat large enough to include one row in every sample would perhaps eliminate the effect of a possibly abnormal distribution of corn seeds due to row planting, growth, and picking techniques. This variable might be controlled if samples in corn fields were taken across the field perpendicular to the rows.

The great variation within plant populations in field borders was a problem encountered in this sampling. Shrubby field borders tend to offer the greatest difficulty in this respect. It may be that a more extensive survey before sampling begins would enable the investigator to control more adequately this variable and compare two areas which are more nearly alike.

V. SUMMARY

Clinton and Cass counties of Michigan differ greatly in populations of the ringnecked pheasant with Cass having very few birds. Samples of the winter foods available to the pheasant were taken from these two counties during the winter of 1953-1954 with the aim of ascertaining if there existed differences in quantity of food available to pheasants during this critical period of their annual cycle.

The samples were selected systematically in fields bordering the crowing count survey route for each county. Six crop types were sampled. Four fields of each crop type were sampled in each county. A one foot square quadrat was used and the area sampled was one foot square extending two feet above the surface of the ground. The food materials within the quadrat were collected, processed, and analyzed. These operations were so tedious that comparisons were made only for November, December, and March.

The weights of food collected for each crop type during each month were totaled and comparison of counties undertaken. Analysis of variance tests for each crop type by months between counties showed that significant differences at the five per cent level occurred in four of the eighteen comparisons made. In December these were hay, fallow fields,

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Analyses of variance were completed on the pooled total weights of samples from corn, wheat, hay and fallow fields, and on the entire set of data. In each case significant difference was found to exist in the quantity of food available along the survey routes in Cass and Clinton counties with Cass having more food available.

Since Cass county has a low pheasant population the availability of food does not seem to be a causative factor for the difference in pheasant abundance in these two areas.

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CLINTON COUNTY

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MICHIGAN
DEPARTMENT OF CONSERVATION

* * *

YOU COULD NOT ENJOY THE CLEAN WHOLESOME RECREATION OF THIS COUNTY

IF

ITS FORESTS WERE BURNED OVER

ITS STREAMS WERE POLLUTED

ITS CAMP SITES WERE UNSANITARY

AND IF

THERE WERE NO GAME OR FISH

✶ BOUNDARY LINES ARE SHOWN TO DESIGNATE THE LIMITS OF CONSERVATION PROJECTS. ONLY COLORED AREAS ARE PUBLIC LANDS. UNCOLORED AREAS ARE PRIVATE LANDS.

KEEP MICHIGAN CLEAN AND GREEN

REPORT FOREST FIRES AND RETURN NEXT YEAR

* * *

LEGEND GROWING CENSUS ROUTE

- STATE LANDS DEDICATED FOR STATE FORESTS, PARKS AND OTHER PUBLIC CONSERVATION USES.
- UNDEDICATED STATE LANDS SUBJECT TO SALE OR EXCHANGE APPLICATION.
- BOUNDARY STATE FORESTS, PARKS, ETC. ✶
- PUBLIC FISHING SITES. ⊙ SITE NOT USABLE

IT IS THE POLICY NOT TO DISPOSE OF STATE LANDS IN STATE OR NATIONAL PROJECT AREAS. EXCEPTIONS MAY BE MADE IN CERTAIN CASES WHERE THE LANDS ARE DESIRED FOR AGRICULTURE OR TO CONSOLIDATE OWNERSHIP. FOR FURTHER INFORMATION INQUIRE LANDS DIVISION, DEPARTMENT OF CONSERVATION, LANSING 13, MICHIGAN.

STATE OWNERSHIP JUNE 1, 1953

BASE BY MICHIGAN STATE HIGHWAY DEPARTMENT

LEGEND

ROADS

- PRIMITIVE ROAD
- UNIMPROVED ROAD
- GRADED AND DRAINED ROAD
- SOIL SURFACED ROAD
- METAL SURFACED ROAD
- BITUMINOUS SURFACED ROAD
- PAVED ROAD

ROAD SYSTEM DESIGNATION

- UNITED STATES HIGHWAY — 27
- STATE HIGHWAY SYSTEM — 78
- FEDERAL AID HIGHWAY SYSTEM — FA
- FEDERAL AID SECONDARY HIGHWAY SYSTEM — FAS
- END OF FEDERAL AID DESIGNATED ROUTE — FA OR FAS

AIRWAYS

- AIR ROUTES
- ARMY, NAVY OR MARINE CORPS FIELD
- DEPARTMENT OF COMMERCE INTERMEDIATE FIELD
- COMMERCIAL OR MUNICIPAL FIELD
- MARKED AUXILIARY FIELD
- AIRPLANE LANDING FIELD MARKED OR EMERGENCY

RAILROADS

- RAILROAD (ANY NUMBER TRACKS)
- USED BY SINGLE OPERATING COMPANY
- RAILROAD (ANY NUMBER TRACKS) USED BY MORE THAN ONE OPERATING COMPANY ON SAME OR ADJACENT RIGHTS OF WAY (NOT TRACKAGE RIGHTS)
- RAILROAD (STANDARD GAUGE)
- PRIVATELY OWNED (NARROW GAUGE)
- RAILROAD STATION
- RAILROAD GRADE CROSSING
- RAILROAD ABOVE ROAD
- RAILROAD BELOW ROAD
- RAILROAD TUNNEL

HIGHWAY BRIDGES

(20 TO 300 FT. LENGTH)

- GENERAL
- DRAWBRIDGE

(300 FT. LENGTH OR OVER)

- GENERAL
- DRAWBRIDGE
- SUSPENSION
- ARCH
- TRUSS OR GIRDER

DAMS

- DAM WITH ROAD
- DAM WITHOUT ROAD

CITY AND VILLAGE

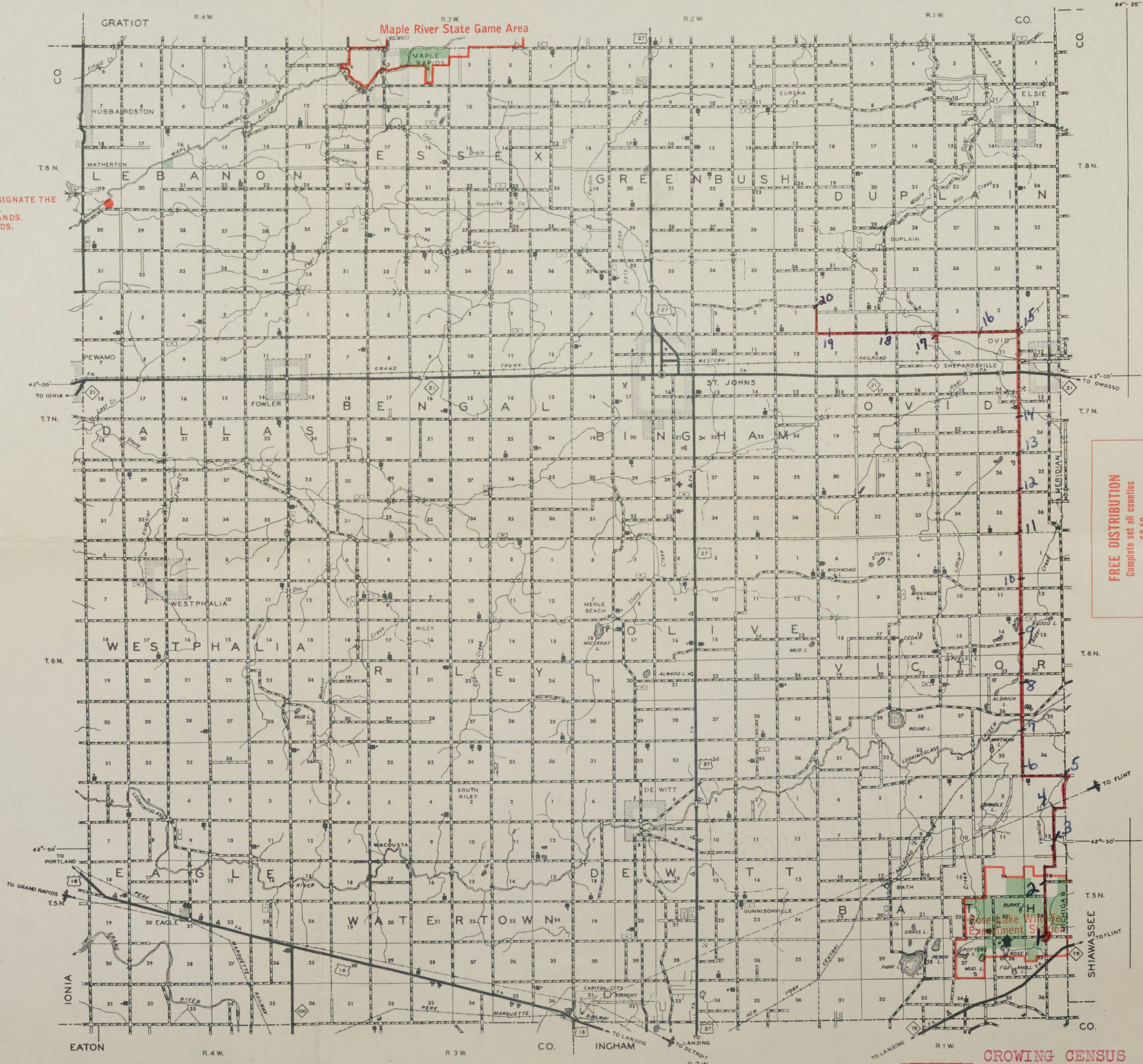
- STATE CAPITOL
- COUNTY SEAT
- OTHER CITIES AND VILLAGES
- INCORPORATED CITY OR VILLAGE
- UNINCORPORATED COMPACT

WATERWAYS

- OPERATED SHIP AND BARGE LINES
- DOCK, PIER OR LANDING
- FREE FERRY
- TOLL FERRY
- HEAD OF NAVIGATION (SEASONAL)
- NAVIGABLE STREAM

GENERAL CULTURAL FEATURES

	NOT IN USE	IN USE
FARM UNIT		
DWELLING (OTHER THAN FARM)		
ROWS OR GROUPS OF DWELLINGS (CLOSELY SPACED)		
STORE OR SMALL BUSINESS ESTABLISHMENT		
SEASONAL DWELLING		
SEASONAL DWELLINGS (CLOSELY SPACED)		
POST OFFICE		
TOWNHALL, GRANGE OR COMMUNITY HALL		
HOTEL		
CHURCH (OTHER RELIGIOUS INSTITUTIONS)		
SCHOOLHOUSE (OTHER EDUCATIONAL INSTITUTIONS)		
CORRECTIONAL INSTITUTION		
HOSPITAL		
FACTORY OR INDUSTRIAL PLANT		
SAWMILL (STATIONARY)		
POWER PLANT		
RADIO STATION		
STATE ROAD GARAGE		
SEASONAL INDUSTRY		
MINE SHAFT		
OPEN MINE		
GRAVEL PIT		
STONE QUARRY		
STOCK YARD		
OIL OR GAS WELLS		
WELL (BRINE)		
TANKS		
CLUBS (G.C.-GOLF OR COUNTRY CLUB, H.C.-HUNTING CLUB, F.C.-FISHING CLUB, S.C.-GUN CLUB)		GC
ATHLETIC FIELDS OR AMUSEMENT PARKS, PLAYGROUNDS, ETC.		
INTENSIVE RECREATION AREAS		
SMALL PARKS (S.P.-STATE, C.P.-COUNTY, M.P.-MUNICIPAL)		SP
FAIR GROUND, RACE COURSE, SPEEDWAY		
CEMETERY		
STATE POLICE SUBSTATION		
INDIAN RESERVATION		
CAMP OR LODGE		
CAMP GROUND		
TOURIST CAMP		
PICNIC GROUNDS OR ROADSIDE TABLE		
BATHING BEACH		
SCENIC SITE		
BIRD SANCTUARY		
GAME FARM		
GAME PRESERVE		
FISH HATCHERY		
C.C.C.-CAMP		
LIGHT (NAUTICAL)		
LIGHTHOUSE		
AIRWAY BEACON LIGHT		
LANDMARK LIGHT BEACON		
FOREST RANGER STATION		
FOREST SERVICE LOOKOUT STATION		
GAUGING OR PUMPING STATION		
ROADSIDE SPRING		
FOREST NURSERY-EXPERIMENTAL STATION		
U.S.C.G. STATION		
U.S. LIFE SAVING STATION		
PIPE LINE, GAS		
PIPE LINE, OIL		OIL



HELP PREVENT FOREST FIRES

CASS COUNTY

DISTRIBUTED BY
MICHIGAN
DEPARTMENT OF CONSERVATION

* * *

YOU COULD NOT ENJOY THE CLEAN WHOLESOME RECREATION OF THIS COUNTY

IF

ITS FORESTS WERE BURNED OVER

ITS STREAMS WERE POLLUTED

ITS CAMP SITES WERE UNSANITARY

AND IF

THERE WERE NO GAME OR FISH

KEEP MICHIGAN CLEAN AND GREEN

REPORT FOREST FIRES AND RETURN NEXT YEAR

* * *

LEGEND GROWING CENSUS ROUTE

STATE LANDS DEDICATED FOR STATE FORESTS, PARKS AND OTHER PUBLIC CONSERVATION USES.

UNDEDICATED STATE LANDS SUBJECT TO SALE OR EXCHANGE APPLICATION.

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STATE OWNERSHIP JUNE 1, 1953

BASE BY MICHIGAN STATE HIGHWAY DEPARTMENT

LEGEND

ROADS

- PRIMITIVE ROAD
- UNIMPROVED ROAD
- GRADED AND DRAINED ROAD
- SOIL SURFACED ROAD
- METAL SURFACED ROAD
- BITUMINOUS SURFACED ROAD
- PAVED ROAD

ROAD SYSTEM DESIGNATION

- UNITED STATES HIGHWAY (27)
- STATE HIGHWAY SYSTEM (78)
- FEDERAL AID HIGHWAY SYSTEM FA
- FEDERAL AID SECONDARY HIGHWAY SYSTEM FAS
- END OF FEDERAL AID DESIGNATED ROUTE — FAS OR FAS OR FA

AIRWAYS

- AIR ROUTES
- ARMY, NAVY OR MARINE CORPS FIELD
- DEPARTMENT OF COMMERCE INTERMEDIATE FIELD
- COMMERCIAL OR MUNICIPAL FIELD
- MARKED AUXILIARY FIELD
- AIRPLANE LANDING FIELD MARKED OR EMERGENCY

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- RAILROAD ABOVE ROAD
- RAILROAD BELOW ROAD
- RAILROAD TUNNEL

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(20 TO 300 FT. LENGTH)

- GENERAL
- DRAWBRIDGE

(300 FT. LENGTH OR OVER)

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- DRAWBRIDGE
- SUSPENSION
- ARCH
- TRUSS OR GIRDER

DAMS

- DAM WITH ROAD
- DAM WITHOUT ROAD

CITY AND VILLAGE

- STATE CAPITOL
- COUNTY SEAT
- OTHER CITIES AND VILLAGES
- INCORPORATED CITY OR VILLAGE
- UNINCORPORATED COMPACT

WATERWAYS

- OPERATED SHIP AND BARGE LINES
- DOCK, PIER OR LANDING
- FREE FERRY (FF)
- TOLL FERRY (TF)
- HEAD OF NAVIGATION (HEAD OF NAVIGATION)
- NAVIGABLE STREAM

GENERAL CULTURAL FEATURES

	IN USE	OUT OF USE
FARM UNIT		
DWELLING (OTHER THAN FARM)	■	■
ROWS OR GROUPS OF DWELLINGS (CLOSELY SPACED)		
STORE OR SMALL BUSINESS ESTABLISHMENT		
SEASONAL DWELLING		
SEASONAL DWELLINGS (CLOSELY SPACED)		
POST OFFICE		
TOWNHALL, GRANGE OR COMMUNITY HALL		
HOTEL		
CHURCH (OTHER RELIGIOUS INSTITUTIONS)		
SCHOOLHOUSE (OTHER EDUCATIONAL INSTITUTIONS)		
CORRECTIONAL INSTITUTION		
HOSPITAL		
FACTORY OR INDUSTRIAL PLANT		
SAWMILL (STATIONARY)		
POWER PLANT		
RADIO STATION		
STATE ROAD GARAGE		
SEASONAL INDUSTRY		
MINE SHAFT		
OPEN MINE		
GRAVEL PIT		
STONE QUARRY		
STOCK YARD		
OIL OR GAS WELLS		
WELL (BRINE)		
TANKS		
CLUBS (G.C.-GOLF OR COUNTRY CLUB, HC.-HUNTING CLUB, F.C.-FISHING CLUB, S.C.-GUN CLUB)	GC	
ATHLETIC FIELDS OR AMUSEMENT PARKS, PLAYGROUNDS, ETC.		
INTENSIVE RECREATION AREAS		
SMALL PARKS (S.P.-STATE, C.P.-COUNTY, M.P.-MUNICIPAL)	S P	
FAIR GROUND, RACE COURSE, SPEEDWAY		
CEMETERY		
STATE POLICE SUBSTATION		
INDIAN RESERVATION		
CAMP OR LODGE		
CAMP GROUND		
TOURIST CAMP		
PICNIC GROUNDS OR ROADSIDE TABLE		
BATHING BEACH		
SCENIC SITE		
BIRD SANCTUARY		
GAME FARM		
GAME PRESERVE		
FISH HATCHERY		
C C C - CAMP		
LIGHT (NAUTICAL)		
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AIRWAY BEACON LIGHT		
LANDMARK LIGHT BEACON		
FOREST RANGER STATION		
FOREST SERVICE LOOKOUT STATION		
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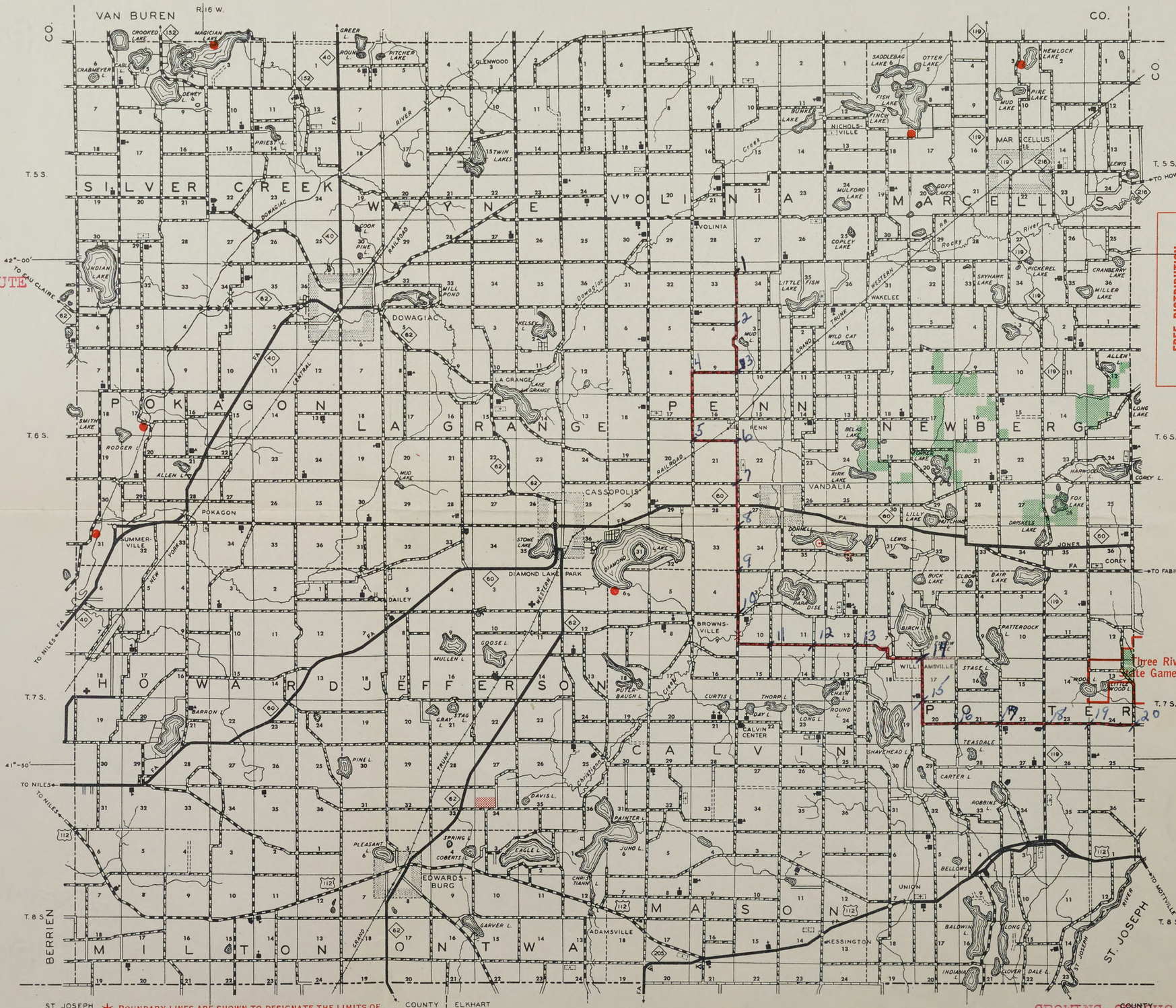
ROADSIDE SPRING		
FOREST NURSERY-EXPERIMENTAL STATION		
U.S.C.G. STATION		
U.S. LIFE SAVING STATION		
PIPE LINE, GAS	------	
PIPE LINE, OIL	---OIL---	



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HELP PREVENT FOREST FIRES

GROWING CENSUS ROUTE

CASS

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